# CYTEC
# (Formerly Advanced Composites Group)
# 12K HTS5631 Unidirectional
# MTM45-1/HTS(12k)-145-32%RW
# Qualification Material Property Data Report

## FAA Special Project Number SP3505WI-Q

**NCAMP Test Report Number: CAM-RP-2009-010 Rev B**

**Report Date: March 25, 2016**

**Testing Facility:**
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Wichita State University
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**Test Panel Fabrication Facility:**
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WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

**Report No: CAM-RP-2009-010 Rev B**
**Report Date: March 25, 2016**

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## Submitted to: Wichita FAA ACO Office

**REVISIONS:**

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| N/C | Kristin Marlett | 2/8/2010 | Document Initial Release |
| N/C | Kristin Marlett | 7/6/2010 | minor formatting change (release date not changed) |
| A | Kristin Marlett | 3/15/2011 | Introduction/Scope Section 1.1 wording edited. Bearing Modulus removed and ILT values edited to reflect correct delta and thickness at tcurve and dy formula update to ETW template |
| B | Michelle Man & Vinsensius Tanoto | 3/25/16 | Formatting, typographical and editorial changes, updated section 1.5.2.3, added 0.2% Offset chart to section 3.4 and 4.5, added charts for all conditions to section 4.10, updated units for ILT data, Updated charts in section 5 and 6.2. Updated dry DMA data and corresponding sections. |
| | | | |

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# 1. Introduction

## 1.1 Scope

The test methods and results described in this document are intended to provide basic composite properties essential to most methods of analysis and are consistent with CMH-17 Rev G—Composite Materials Handbook for Polymer Matrix Composites.

This report contains material property data of common usefulness to wide range of projects. The lamina and laminate material property data have been generated with FAA oversight through FAA Special Project Number SP3505WI-Q; the test panels, test specimens, and test setups have been conformed by the FAA and the testing has been witnessed by the FAA. However, the data may not fulfill all the needs of any specific company's programs. Specific properties, environments, laminate architecture, and loading situations that individual companies may require additional testing.

The use of NCAMP material and process specifications do not guarantee material or structural performance. Material users should be actively involved in evaluating material performance and quality including, but not limited to, performing regular purchaser quality control tests, performing periodic equivalency/additional testing, participating in material change management activities, conducting statistical process control, and conducting regular supplier audits.

The applicability of NCAMP material property data, material allowables, and specifications must be evaluated on case-by-case basis by aircraft companies and certifying agencies. NCAMP assumes no liability whatsoever, expressed or implied, related to the use of the material property data, material allowables, and specifications.

Statistical analysis of the data including the calculations of b-basis values are given in a separate report, Advanced Composites Group MTM45-1/HTS(12k)-145-32%RW Qualification Statistical Analysis Report, NCP-RP-2009-008 N/C.

The qualification material was procured to ACG Material Specification ACGM 1001–14 Revision A dated May 25, 2006. An equivalent NCAMP Material Specification NMS 451/14 which contains specification limits that are derived from guidelines in DOT/FAA/AR-03/19 has been created. The qualification test panels were cured in accordance with ACG process specification ACGP 1001-02 Revision E “MH” cure cycle. An equivalent NCAMP Process Specification, NPS 81451 with baseline “MH” Cure Cycle, has been created. The panels were fabricated at Bell Helicopter Textron lnc, 600 East Hurst Blvd. Hurst, TX 76053. The ACG Test Plan AI/TR/1392 Revision E was used for this qualification program.

Part fabricators that wish to utilize the material property data, allowables, and specifications may be able to do so by demonstrating the capability to reproduce the original material properties; a process known as equivalency. More information about this equivalency process including the test statistics and its limitations can be found in Section 6 of DOT/FAA/AR-03/19 and Section 8.4.1 of CMH-17 Rev G. The applicability of equivalency process must be evaluated on program-by-program basis by the applicant and certifying agency. The applicant and certifying agency must agree that the equivalency test plan along with the equivalency process described in Section 6 of DOT/FAA/AR-03/19 and Section 8.4.1 of CMH-17 Rev G are adequate for the given program.

Aircraft companies should not use the data published in this report without specifying NCAMP Material Specification NMS 451/14. NMS 451/14 may have additional requirements that are listed in its prepreg process control document (PCD), fiber specification, fiber PCD and other raw material specifications and PCDs which impose essential quality controls on the raw materials and raw material manufacturing equipment and processes. *Aircraft companies and certifying agencies should assume that the material property data published in this report is not applicable when the material is not procured to NMS 451/14.* NMS 451/14 is a free, publicly available, non-proprietary aerospace industry material specification.

The data in this report is intended for general distribution to the public, either freely or at a price that does not exceed the cost of reproduction (e.g. printing) and distribution (e.g. postage).

## 1.2 Symbols Used

| | |
|---|---|
| $\nu_{12}^{tu}$ | major Poisson's ratio, tension |
| $\mu\varepsilon$ | micro-strain |
| $E_1^c$ | compressive modulus, longitudinal / warp direction |
| $E_1^t$ | tensile modulus, longitudinal / warp direction |
| $E_2^c$ | compressive modulus, transverse / fill direction |
| $E_2^t$ | tensile modulus, transverse / fill direction |
| $F_1^{cu}$ | ultimate compressive strength, longitudinal / warp direction |
| $F_1^{tu}$ | ultimate tensile strength, longitudinal / warp direction |
| $F_2^{cu}$ | ultimate compressive strength, transverse / fill direction |
| $F_2^{tu}$ | ultimate tensile strength, transverse / fill direction |
| SBS | short beam strength |
| $\nu_{12}^c$ | major Poisson's Ratio, compression |
| $\nu_{21}^c$ | minor Poisson's Ratio, compression |
| $F_{12}^{s5\% \text{ strain}}$ | in-plane shear, strength at 5% strain |
| $F_{12}^{s0.2\%}$ | in-plane shear, strength at 0.2% offset |
| $G_{12}^s$ | in-plane shear modulus |

**Superscripts**

| | |
|---|---|
| c | compression |
| cu | compression ultimate |
| s | shear |
| su | shear ultimate |
| t | tension |
| tu | tension ultimate |
| $\nu$ | Poisson's Ratio |

**Subscripts**

| | |
|---|---|
| 1-axis; | longitudinal / warp direction (parallel to warp direction of reinforcement) |
| 2-axis; | transverse / fill direction (parallel to fill direction of reinforcement) |
| 12: | in-plane shear |

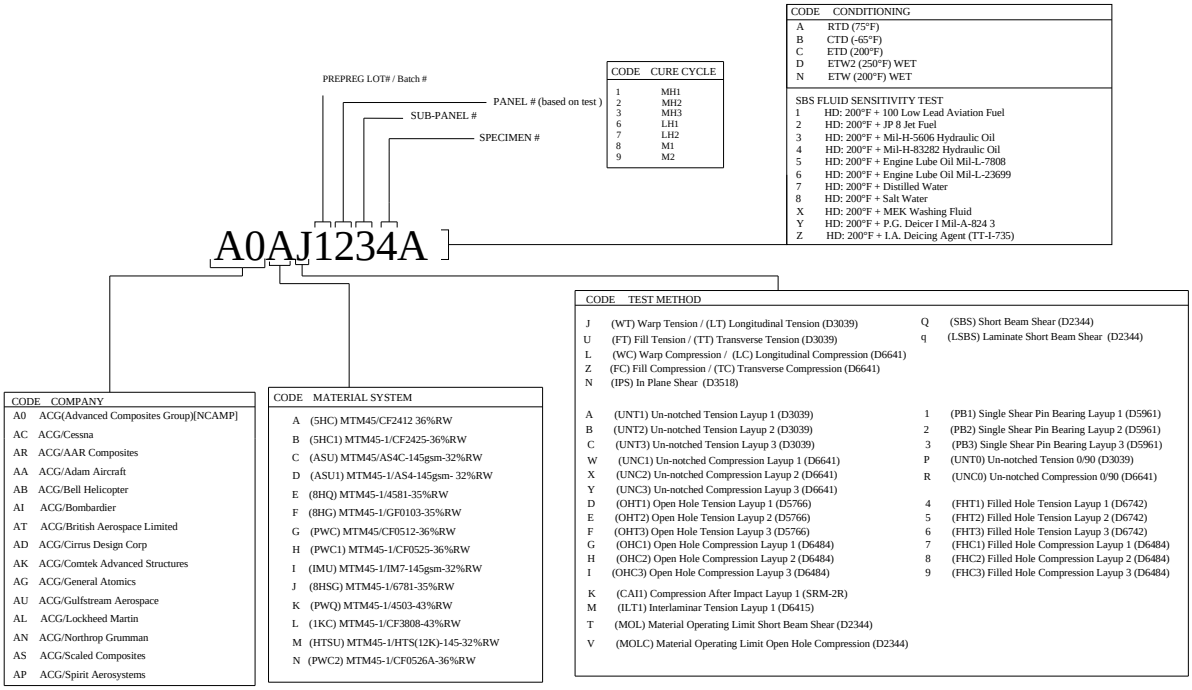
## 1.3 Acronyms and Definitions

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| B – Basis | 95% lower confidence limit on the tenth population percentile |
| CV | Coefficient of variation |
| CTD | cold temperature dry |

| | |
|---|---|
| CPT | cured ply thickness |
| ETD | elevated temperature dry |
| ETW | elevated temperature wet, lower wet temperature |
| ETW2 | elevated temperature wet, higher wet temperature |
| Gr/Ep | graphite/epoxy |
| norm | normalized |
| RTD | room temperature dry |
| SACMA | Suppliers of Advanced Composite Materials Association |
| SRM | SACMA Recommended Method |
| Tply | thickness divided by the number of plies provides the thickness average per specimen |
| wet | specimen with an “equilibrium” moisture content |
| T, RH | temperature, relative humidity |

## 1.4 NIAR NCAMP – ACG Specimen Naming Format

The NIAR specimen names can be correlated to ACG specimen names using the scheme in Figure 1-1.




NIAR NCAMP- ACG SPECIMEN NAMING FORMAT

**Figure 1-1: NIAR – ACG Specimen Naming Format Correlation**

## 1.5 ASTM Standards

ASTM D 3039/D 3039M – $00^{e2}$ *Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials*

ASTM D 6641/D 6641M – $01^{e1}$ *Standard Test Method for Determining the Compressive Properties of Polymer Matrix Composite Laminates Using a Combined Loading Compression (CLC) Test Fixture*

ASTM D 3518/D 3518M – 94 (2001) *Standard Test Method for In-Plane Shear Response of Polymer Matrix Composite Materials by Tensile Test of a 645° Laminate*

ASTM D 2344/D 2344M – $00^{e1}$ *Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates*

ASTM D 5766/D 5766M – 02a *Standard Test Method for Open Hole Tensile Strength of Polymer Matrix Composite Laminates*

ASTM D 6742/D 6742M – 02 *Standard Practice for Filled-Hole Tension and Compression Testing of Polymer Matrix Composite Laminates*

ASTM D 6484/D 6484M – 04 *Standard Test Method for Open-Hole Compressive Strength of Polymer Matrix Composite Laminates*

ASTM D 5961/D 5961M – 05 *Standard Test Method for Bearing Response of Polymer Matrix Composite Laminates*

## 1.6 SACMA Standards

SACMA SRM 2R-94 *SACMA Recommended Test Method for Compression After Impact Properties of Oriented Fiber-Resin Composites*

## 1.7 Methodology

### 1.7.1 Process Definition

For each combination of test, batch and condition, the specimens were selected from minimum two separate panels cured separately as shown in Figure 1-2 unless otherwise specified.

If more than 2 panels were required to obtain the minimum specimens, the additional panels were labeled accordingly and an equal number of specimens were tested from each panel.

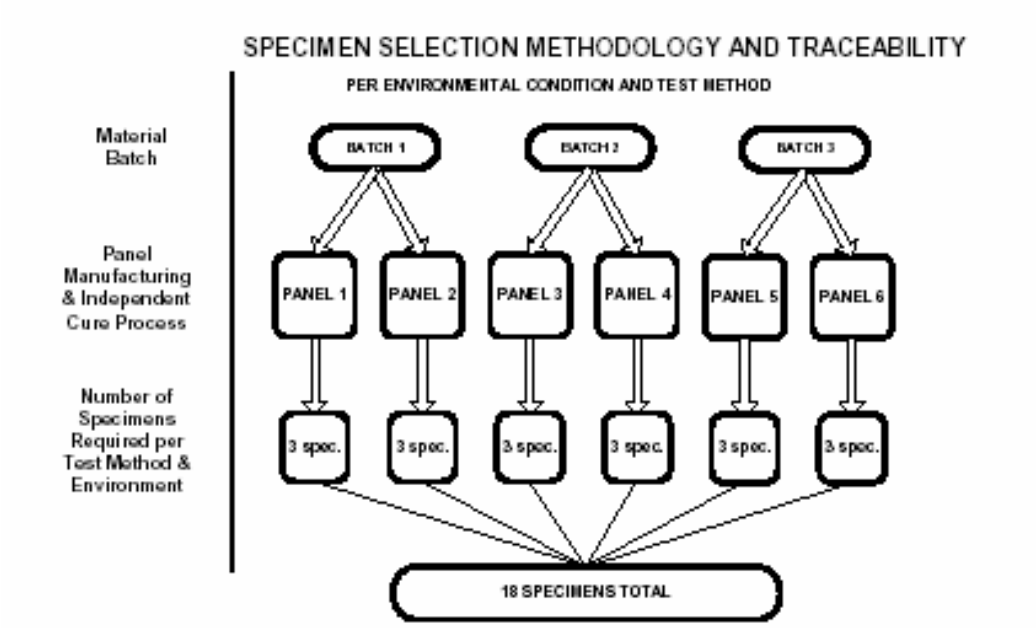



**Figure 1-2: Cure Cycle Definition for Mechanical Test Panels**

All panels were cured in accordance with ACG process specification ACGP 1001-2 Revision E.

In order to facilitate individual specimen traceability, individual specimen numbering and/or skewed lines were written or drawn across each sub-panel as shown in Figure 1-3.

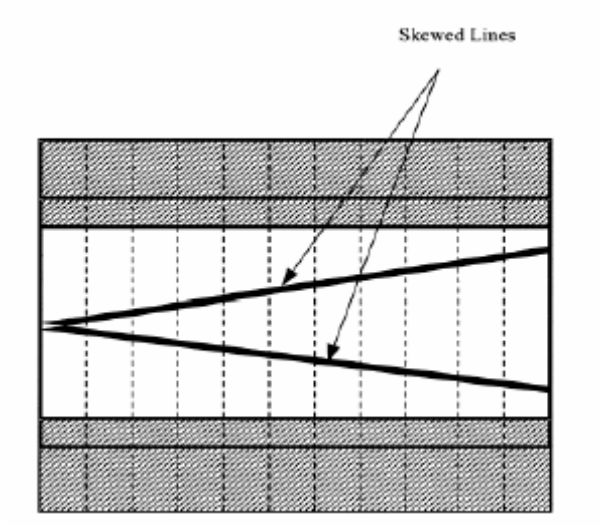



**Figure 1-3: Specimen Traceability Line**

## 1.7.2 Specimen & Testing Details

### 1.7.2.1 Tabbing

No tabs were used for this material system.

### 1.7.2.2 Strain gages

Strain gages were employed for modulus on selected test methods. The callouts below are requirements of the test plan and actual strain gages used can be found in the CD accompanying this report.

ASTM D3039 tensile: CEA-XX-250UW-120 or 350 (refer to Appendix 1 for specific requirements)
ASTM D3518 in-plane shear: CEA-XX-250UW-120 or 350 (one each 0° and 90° to specimen axis) optionally CEA-XX-125UT-120 or 350 biaxial gage
All ASTM D6641 compression: CEA-XX-125UT-120 or 350
Optional ASTM D6641 compression of unidirectional materials and fabric materials of tow/yarn 3K or smaller: CEA-XX-062UT-120 or 350
Where XX = 03 or 06 the self temperature compensation factor for the purposes and procedures of this test plan considered equivalent.

Where modulus was required for other tests, extensometers were used.

### 1.7.2.3 Specimen Hole Dimensions & Test Configuration

For the open-hole tests, the hole diameter was 0.25 in ±0.003 in. For filled-hole and bearing tests, the hole diameter as 0.25 in -0.000 +0.003 in. The fastener type was NAS674X, where 'X' is the grip length for each different specimen thickness. The grip lengths chosen are listed in Table 1-1 below.

| Fastener Type | Grip Length | Test Method |
|---|---|---|
| NAS674-V2 | 0.125 grip | FHT/FHC |
| NAS674-V13 | .812 grip | Pin Bearing |

**Table 1-1: Fastener and Corresponding Grip Length**

The washer type was NAS1149C0432R (nominal ID 0.265, nominal OD 0.500 and nominal thickness 0.032 inches) and the nut type was NAS1291C4M. Washers were used under both the head and nut as directed by ACG.

For filled hole tensile and pin bearing tests the fastener torque were 10 to 15 in-lbs above the run on torque required to bring the fastener/specimen/fixture flush. For example, if it required 15 in-lbs to flush the specimen/fastener/fixture with no

gap, an additional 10-15 in-lb was applied for a total of 25-30 in-lbs. For filled hole compression tests the fasteners were installed as above then torque released approximately one-quarter (1/4) turn to maintain fastener “flushness” and approximate zero (0) torque allowing the fastener to turn/twist with no lateral movement or “slack”. In all cases, for each laminate thickness and given test, the torque applied was equal. Fasteners were installed before conditioning.

For the pin bearing tests, the single shear method was used with one of the pairs of specimens replaced by a steel fixture. The configuration is shown in Figure 1-4 below. Thickness of specimen fixture used was 0.685”

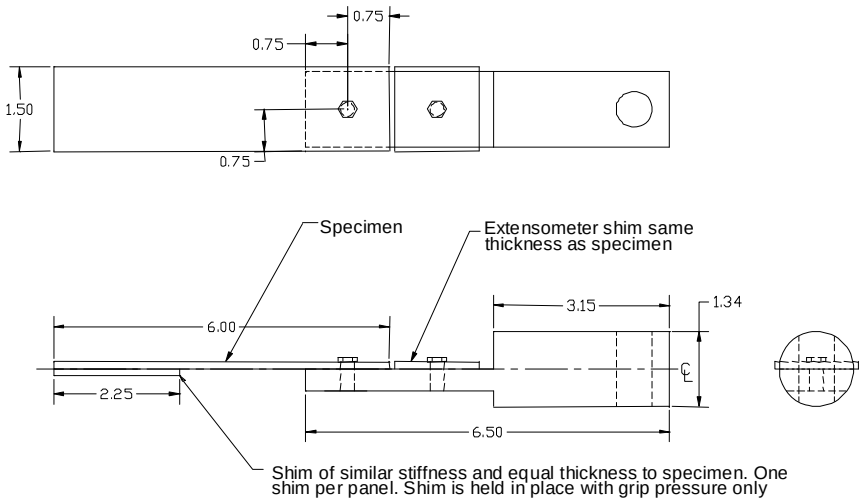



**Figure 1-4: Modified ASTM D5961 (Pin Bearing) Specimen and Loading Arrangement**

The configuration of the ASTM D6415-99 specimen is as shown in Figure 1-5. 0 degree of the stacking sequence is along L (shown in the figure below).

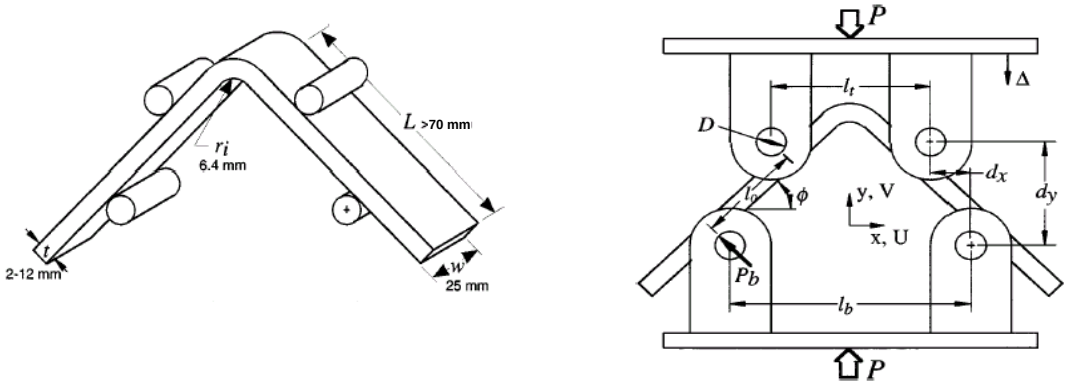



**Figure 1-5: ASTM D6415 (Interlaminar Tension) Specimen and Loading Arrangement**

For compression after impact, specimens received nondestructive inspection by c-scan to determine extent and area of damage after impact.

### 1.7.3 Test Matrix

Table 1-2 summarizes the lamina level tests carried out on unidirectional materials. The lay-ups chosen have been designed to produce the appropriate thickness required for the various types of tests performed. Table 1-3 summarizes the laminate level tests carried out on unidirectional materials. Lamina and Laminate stacking sequence can be obtained from page 6 of Appendix 1 of AI/TR/1392 E Appendix (or later revisions).

| Layup | Test Type and Direction | Property | Number of Batches x No. Of Panels x Number of Test Specimens | | | | |
|---|---|---|---|---|---|---|---|
| | | | Test Temperature/Moisture Condition | | | | |
| | | | CTD | RTD | ETD | ETW | ETW2 |
| [0°]n | 0° Tension(1) | Modulus | 3x2x3 | 3x2x3 | | 3x2x3 | 3x2x3 |
| [0°]n | 0° Compression(1) | Modulus, Poisson's | 3x2x3 | 3x2x3 | | 3x2x3 | 3x2x3 |
| [90]n | 90° Tension | Strength, Modulus | 3x2x3 | 3x2x3 | | 3x2x3 | 3x2x3 |
| [90]n | 90° Compression | Strength, Modulus, Poisson's | 3x2x3 | 3x2x3 | | 3x2x3 | 3x2x3 |
| [0°/90°]ns | 0° Tension(1) | 0°/90° Strength, 0°/90° Modulus, 0° Strength | 3x2x3 | 3x2x3 | | 3x2x3 | 3x2x3 |
| [90°/0°]ns | 90° Compression(1) | 90°/0° Strength, 90°/0° Modulus, 90°/0° Poisson's 0° Strength | 3x2x3 | 3x2x3 | 3x2x3 | 3x2x3 | 3x2x3 |
| [45°/-45°]ns | In-Plane Shear | Strength, Modulus | 3x2x3 | 3x2x3 | | 3x2x3 | 3x2x3 |
| [0°]n | Short Beam Strength | Strength | 3x2x3 | 3x2x3 | 3x2x3 | 3x2x3 | 3x2x3 |

**Table 1-2: Lamina Level Tests - Unidirectional**

Table 1-3 below indicates the laminate level tests performed on the 12K unidirectional material. This table emphasizes those properties and test condition combinations believed to constitute the worst case. Additional testing at some test conditions may be necessary depending on the results contained in this document.

| Layup | Test Type and Direction | Property | Number of Batches x Number of Panels x Number of Test Specimens | | | |
|---|---|---|---|---|---|---|
| | | | Test Temperature/Moisture Condition | | | |
| | | | CTD | RTD | ETW | ETW2 |
| (25%/50%/25% - QI) | Open Hole Tension (1) | Strength | 3x2x3 | 3x2x3 | 1x2x3 | 3x2x3 |
| (10%/80%/10%) | Open Hole Tension (1) | Strength | 3x2x3 | 1x2x3 | | 1x2x3 |
| (50%/40%/10%) | Open Hole Tension (1) | Strength | 3x2x3 | 1x2x3 | | 1x2x3 |
| (25%/50%/25% - QI) | Open Hole Compression (1) | Strength | | 3x2x3 | 1x2x3 | 3x2x3 |
| (10%/80%/10%) | Open Hole Compression (1) | Strength | | 1x2x3 | | 3x2x3 |
| (50%/40%/10%) | Open Hole Compression (1) | Strength | | 1x2x3 | | 3x2x3 |
| (25%/50%/25% - QI) | Un-notched Tension | Strength + modulus | 3x2x3 | 3x2x3 | | 1x2x3 |
| (10%/80%/10%) | Un-notched Tension | Strength + modulus | 1x2x3 | 1x2x3 | | 1x2x3 |
| (50%/40%/10%) | Un-notched Tension | Strength + modulus | 1x2x3 | 1x2x3 | | 1x2x3 |
| (25%/50%/25% - QI) | Un-notched Compression (and short beam strength) | Strength + modulus | | 3x2x3 (3x2x3) | 1x2x3 (1x2x3) | 3x2x3 (3x2x3) |
| (10%/80%/10%) | Un-notched Compression | Strength + modulus | | 1x2x3 | | 1x2x3 |
| (50%/40%/10%) | Un-notched Compression | Strength + modulus | | 1x2x3 | | 1x2x3 |
| (25%/50%/25% - QI) | Filled Hole Tension (2) | Strength | 3x2x3 | 1x2x3 | | |
| (10%/80%/10%) | Filled Hole Tension (2) | Strength | 1x2x3 | 1x2x3 | | 1x2x3 |
| (50%/40%/10%) | Filled Hole Tension (2) | Strength | 1x2x3 | 1x2x3 | | |
| (25%/50%/25% - QI) | Filled Hole Compression (2) | Strength | | 1x2x3 | | 3x2x3 |
| (10%/80%/10%) | Filled Hole Compression (2) | Strength | | 1x2x3 | | 3x2x3 |
| (50%/40%/10%) | Filled Hole Compression (2) | Strength | | 1x2x3 | | 3x2x3 |
| (25%/50%/25% - QI) | Single Shear Bearing (3) | Strength | | 3x2x3 | | 3x2x3 |
| (10%/80%/10%) | Single Shear Bearing (3) | Strength | | 1x2x3 | | 3x2x3 |
| (50%/40%/10%) | Single Shear Bearing (3) | Strength | | 1x2x3 | | 3x2x3 |
| (25%/50%/25% - QI) | Interlaminar Tension (4) | Strength | | 1x1x6 | | 1x1x6 |
| (25%/50%/25% - QI) | Compression After Impact (1500 in-lb/in) | Strength (SACMA) | | 1x1x6 | | |

(1).Open-hole configuration: 0.25” hole diameter, 1.5 inch width
(2). Filled-hole test configuration: 0.25” diameter, protruding head fastener, 1.5” width
(3). Single shear bearing test configuration: 0.25: hole diameter, 1.5” width, one protruding head fastener, e/D=3
(4). Interlaminar tension test as specified above

**Table 1-3: Laminate Level Tests – Unidirectional Tape**

### 1.7.4 Physical Testing

Physical testing was conducted at the prepreg level at ACG. See results in section 8 below. The cured physical testing results obtained by NIAR can be found in the individual summary charts in section 2.1 below.

### 1.7.5 Environmental Conditioning

The following tables define the range of tests and conditions were used to produce design allowable property and other screening data. Test environments are defined as:
CTD = -65±5°F, ambient moisture content dry
RTD = room temperature ambient dry
RTA = room temperature ambient – no drying required
ETD = 200±5°F dry
ETW= 200±5°F, wet (equilibrium moisture content)
ETW2=250±5°F, wet (equilibrium moisture content)

Unless otherwise specified, a tolerance of ±5°F applied to all temperature conditions specified in this document.

For dry testing, specimens were dried at 160°F±5°F for 120 to 130 hours. When drying was completed, specimens were either stored until testing in a sealed oven maintained at 85°F ± 5°F or alternately stored with desiccant in a sealed container. For wet testing, specimens were conditioned to equilibrium in a 160°F±5°F and 85% ± 5% RH environment in accordance with ASTM D 5229/D5229M Procedure C. Equilibrium was determined in accordance with DOT/FAA/AR-03/19 section 3.2. When conditioning was completed the specimens and traveler were stored in the conditioning chamber for up to 60 days or were wrapped in moist cloth or paper towel in a sealed container up no more than 14 days. If storage time exceeded 14 days, the traveler was reweighed to assure moisture equilibrium. In the event that moisture equilibrium was not maintained, the specimens were placed back into the chamber until equilibrium was reached. For non-ambient testing, DOT/FAA/AR-03/19 section 3.3 was followed.

### 1.7.6 Fluid Sensitivity Screening

Fluid Sensitivity was not conducted on this material.

### 1.7.7 Normalization Procedures

The nominal cure ply thicknesses (CPT) for each material type are given in appendix 3 of AI/TR/1392 E Appendix . Lamina level tension and compression strength and modulus properties were normalized to the cured ply thickness indicated. Per ACG's request, the laminate level properties were also normalized. Wherever properties are normalized, both measured and normalized data were reported.

The nominal fiber areal weight was at 145 g/m2 and the average of the four batches of material was 143.85 g/m2 therefore normalization by cured ply thickness (CPT) was used, i.e.:

Normalized strength=Measured Strength x Measured CPT/Nominal CPT

The nominal CPT is 0.0055 inch and the average CPT is .00558 inch. Individual ply thicknesses can be found in each individual summary sheet, but as an example, the range for each panel was between 0.0050 and 0.0066 inch CPT. The CPT of the individual specimens was also shown to be close to the nominal CPT.

### 1.7.8 Conformity

All laminates and specimens for design allowable property and fluid sensitivity screening were inspected for conformance with the requirements of this document and appendices 1 and 2. For all materials requiring FAA approval, the conformance was verified by an FAA approved designated airworthiness representative (DAR). Test setup and methods were approved and witnessed by the FAA or authorized designated engineering representative (DER) as required. Conformity documentation can be obtained in PDF file entitled Conformity_Final and is included on the CD accompanying this report.

### 1.7.9 Material Pedigree Information

The PMC Data collection template includes the material pedigree information required, such as material and batch information, as well as environmental conditioning and test results. This template is included in this report.

# 2. Test Results

## 2.1 Lamina Level Test Summary

| | | | | | |
|---|---|---|---|---|---|
| **Prepreg Material:** | Advanced Composites Group - MTM45-1 HTS(12K) Unitape<br>ACGM 1001-14 or NMS 451/14 Material Specification | | | | **ACG - MTM45-1/ HTS 12K Unitape Lamina Properties Summary** |
| **Fiber:** | Tenax-E HTS40 F13 12K 800tex | **Resin:** | MTM45-1 | | |
| **Tg(dry):** | 397.40° F | **Tg(wet)** | 332.59° F | **Tg METHOD:** | DMA (SRM 18-94) |
| **PROCESSING:** | ACGP 1001-02 Process Specification "MH" Cure Cycle | | | | |

| | | | |
|---|---|---|---|
| **Date of fiber manufacture** | October 2005 - January 2006 | **Date of testing** | 10/2008 to 2/2009 |
| **Date of resin manufacture** | April 6, 2006 to April 12, 2006 | **Date of data submittal** | 11/2008 to 3/2009 |
| **Date of prepreg manufacture** | April 6, 2006 to April 12, 2006 | | |
| **Date of composite manufacture** | 2/2007 to 3/2007; 6/27/2007 and 9/26/2007 to 11/10/2007 | | |

**LAMINA MECHANICAL PROPERTY SUMMARY**
**Data reported as: Normalized & Measured**
**(Normalized by CPT= .0055 inch)**

| | CTD Mean | | RTD Mean | | ETD Mean | | ETW Mean | | ETW2 Mean | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Normalized | Measured | Normalized | Measured | Normalized | Measured | Normalized | Measured | Normalized | Measured |
| $F_1^{tu}$ (ksi) from UNT0 | 306.98 | 302.74 | 310.72 | 306.84 | --- | --- | 319.89 | 315.34 | 321.85 | 317.64 |
| $E_1^t$ (Msi) from LT | 19.07 | 18.80 | 19.00 | 18.76 | --- | --- | 19.66 | 19.38 | 20.16 | 19.90 |
| $E_1^t$ (Msi) from UNT0 | 10.23 | 9.97 | 10.11 | 9.85 | --- | --- | 10.43 | 10.25 | 10.54 | 10.28 |
| $F_2^{tu}$ (ksi) | --- | 8.91 | --- | 8.72 | --- | --- | --- | 4.56 | | 4.36 |
| $E_2^t$ (Msi) of TT | --- | 1.31 | | 1.20 | --- | --- | --- | 1.04 | --- | 0.84 |
| $F_1^{cu}$ (ksi) from UNC0 | 232.59 | 229.60 | 193.30 | 195.27 | --- | --- | 176.28 | 173.97 | 140.28 | 138.83 |
| $E_1^c$ (Msi) of LC | 17.24 | 17.01 | 17.02 | 17.20 | --- | --- | 17.50 | 17.26 | 17.50 | 17.32 |
| $E_1^c$ (Msi) from UNC0 | 9.26 | 9.12 | 9.71 | 9.57 | 9.27 | 9.12 | 9.47 | 9.29 | 9.05 | 8.95 |
| $\nu_{12}^c$ from LC | --- | 0.365 | --- | 0.350 | --- | --- | --- | 0.326 | --- | 0.396 |
| $F_2^{cu}$ (ksi) of TC | --- | 36.64 | --- | 28.29 | --- | --- | --- | 17.36 | --- | 14.27 |
| $E_2^c$ (Msi) of TC | --- | 1.33 | --- | 1.26 | --- | --- | --- | 1.15 | --- | 1.07 |
| $\nu_{21}^c$ of TC | 0.025 | | 0.025 | | --- | --- | 0.020 | --- | 0.022 | --- |
| $\nu$ from UNC0 | --- | 0.047 | --- | 0.047 | | 0.039 | --- | 0.045 | --- | 0.039 |
| $F_{12}^{s5\%strain}$ (ksi) | --- | 12.01 | --- | 10.18 | --- | --- | --- | 5.84 | --- | 4.48 |
| $F_{12}^{s0.2\%}$ (ksi) | --- | 8.34 | --- | 6.07 | --- | --- | --- | 3.65 | --- | 2.64 |
| $G_{12}^s$ (Msi) | --- | 0.70 | --- | 0.57 | --- | --- | --- | 0.40 | --- | 0.30 |
| SBS (ksi) | --- | 19.55 | --- | 14.52 | --- | 10.74 | --- | 8.47 | --- | 6.98 |

LC/LT modulus values used to calculate the final UNC0/UNT0 strength utilizing the backout formula

**Table 2-1: Lamina Summary Data**

## 2.2 Laminate Level Test Summary

| | | | | | |
|---|---|---|---|---|---|
| **Prepreg Material:** | Advanced Composites Group - MTM45-1 HTS(12K) Unitape<br>ACGM 1001-14 or NMS 451/14 Material Specification | | | | **ACG - MTM45-1 HTS (12K) Unitape Laminate Properties Summary** |
| **Fiber** | Tenax-E HTS40 F13 12K 800tex | | **Resin** | MTM45-1 | |
| **Tg(dry)** | 397.40° F | **Tg(wet)** | 332.59° F | **Tg METHOD** | DMA (SRM 18-94) |
| **PROCESSING:** | ACGP 1001-02 Process Specification "MH" Cure Cycle | | | | |

| | | | |
|---|---|---|---|
| **Date of fiber manufacture** | October 2005 - January 2006 | **Date of testing** | 10/2008 to 2/2009 |
| **Date of resin manufacture** | April 6, 2006 to April 12, 2006 | **Date of data submittal** | 11/2008 to 3/2009 |
| **Date of prepreg manufacture** | April 6, 2006 to April 12, 2006 | | |
| **Date of composite manufacture** | 2/2007 to 3/2007; 6/27/2007 and 9/26/2007 to 11/10/2007 | | |

**LAMINATE MECHANICAL PROPERTY SUMMARY**
**Data reported as: Normalized & Measured**
**(Normalized by CPT= .0055 inch)**

| | Layup: | 25/50/25 | | 10/80/10 | | 50/40/10 | |
|---|---|---|---|---|---|---|---|
| | Test Condition | Normalized | Measured | Normalized | Measured | Normalized | Measured |
| **OHT Strength (ksi)** | **CTD** | 61.17 | 60.27 | 45.99 | 45.09 | 94.94 | 94.25 |
| | **RTD** | 60.47 | 59.56 | 42.06 | 41.50 | 98.29 | 97.15 |
| | **ETW** | 63.47 | 62.28 | --- | --- | --- | --- |
| | **ETW2** | 62.64 | 61.77 | 38.26 | 37.64 | 112.67 | 111.21 |
| **OHC Strength (ksi)** | **RTD** | 47.44 | 46.51 | 38.93 | 38.49 | 64.11 | 62.68 |
| | **ETW** | 41.77 | 41.20 | --- | --- | --- | --- |
| | **ETW2** | 38.28 | 37.40 | 27.87 | 27.56 | 49.04 | 48.45 |
| **UNT Strength (ksi)** | **CTD** | 115.96 | 113.38 | 73.34 | 72.58 | 184.13 | 182.25 |
| | **RTD** | 118.52 | 115.54 | 66.22 | 65.24 | 188.29 | 186.43 |
| | **ETW2** | 111.76 | 109.88 | 52.11 | 51.33 | 181.51 | 179.79 |
| **Modulus (msi)** | **CTD** | 7.26 | 7.10 | 4.69 | 4.64 | 11.68 | 11.56 |
| | **RTD** | 7.12 | 6.94 | 4.65 | 4.59 | 11.29 | 11.18 |
| | **ETW2** | 7.18 | 7.06 | 3.95 | 3.89 | 11.24 | 11.13 |
| **UNC Strength (ksi)** | **RTD** | 88.02 | 86.60 | 58.30 | 58.51 | 100.88 | 98.05 |
| | **ETW** | 74.68 | 74.13 | --- | --- | --- | --- |
| | **ETW2** | 61.81 | 60.97 | 41.81 | 41.67 | 68.66 | 66.71 |
| **Modulus (msi)** | **RTD** | 6.64 | 6.54 | 4.29 | 4.30 | 10.54 | 10.25 |
| | **ETW** | 6.72 | 6.67 | --- | --- | --- | --- |
| | **ETW2** | 6.42 | 6.33 | 3.88 | 3.86 | 10.51 | 10.20 |
| **$\nu$UNC** | **RTD** | --- | 0.340 | --- | 0.561 | --- | 0.433 |
| | **ETW** | --- | 0.338 | --- | --- | --- | --- |
| | **ETW2** | --- | 0.312 | --- | 0.504 | --- | 0.403 |
| **FHT Strength (ksi)** | **CTD** | 64.25 | 63.51 | 47.97 | 47.30 | 98.06 | 97.01 |
| | **RTD** | 64.63 | 64.44 | 43.54 | 42.91 | 98.30 | 97.35 |
| | **ETW2** | | | 38.07 | 37.51 | | |
| **FHC Strength (ksi)** | **RTD** | 66.64 | 65.30 | 51.42 | 50.41 | 86.68 | 85.21 |
| | **ETW2** | 46.16 | 45.32 | 34.46 | 33.86 | 61.40 | 60.80 |
| **LSBS Strength (ksi)** | **RTD** | --- | 11.22 | --- | --- | --- | --- |
| | **ETW** | --- | 6.74 | --- | --- | --- | --- |
| | **ETW2** | --- | 5.91 | --- | --- | --- | --- |
| **PB 2% offset Strength Strength (ksi)** | **RTD** | 102.47 | 100.54 | 109.32 | 107.47 | 112.19 | 110.62 |
| | **ETW2** | 91.67 | 90.10 | 86.68 | 85.59 | 86.37 | 85.46 |
| **ILT Strength (ksi)** | **RTD** | --- | 4.15 | --- | --- | --- | --- |
| | **ETW2** | --- | 3.28 | --- | --- | --- | --- |
| **CAI Strength (ksi)** | **RTD** | 35.30 | 34.79 | --- | --- | --- | --- |

**Table 2-2: Laminate Summary Data**

## 2.3 Individual Test Summaries

### 2.3.1 Longitudinal Tension Properties

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | | | | | | **Tension, 1-axis** | | |
| | | | | | | | | **Gr/ Ep** | | |
| **Resin content:** | 40.69% vol | | **Comp. densit** | 1.53 [g/cc] | | | | **ACG MTM45-1/HTS(12K)-145gsm-32%RW** | | |
| **Fiber volume:** | 59.31% vol | | | | | | | **[0]16** | | |
| **Ply thickness:** | 0.0053 - 0.0058 | | | | | | | | | |
| **Ply count:** | 16 | | | | | | | | | |
| **Test method:** | ASTM D3039-00 | | **Modulus calculation:** | 1000 to 3000 microstrain | | | | | | |
| **Normalized by:** | 0.0055 | | | | | | | | | |
| | | | **CTD** | | **RTD** | | **ETW** | | **ETW2** | |
| **Test Temperature [°F]** | | | -65 | | 75 | | 200 | | 250 | |
| **Moisture Conditioning** | | | dry | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | | 160 F,85% | | 160 F,85% | |
| **Source code** | | | ABMJX X1XB | | ABMJX X1XA | | ABMJX X1XN | | ABMJX X1XD | |
| | | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| $E_1^t$ (Msi) | **Mean** | | 19.07 | 18.80 | 19.00 | 18.76 | 19.66 | 19.38 | 20.16 | 19.90 |
| | **Minimum** | | 18.70 | 18.15 | 17.39 | 17.71 | 18.81 | 18.37 | 19.29 | 18.63 |
| | **Maximum** | | 19.40 | 19.26 | 19.66 | 19.62 | 22.17 | 22.43 | 21.64 | 20.97 |
| | **C.V.(%)** | | 1.04 | 1.58 | 2.82 | 3.12 | 3.54 | 4.47 | 3.47 | 3.55 |
| | **No. Specimens** | | 19 | | 19 | | 19 | | 19 | |
| | **No. Prepreg Lots** | | 3 | | 3 | | 3 | | 3 | |
| $n_{21}^t$ | **Mean** | | 0.322 | | 0.318 | | 0.332 | | 0.338 | |
| | **No. Specimens** | | 19 | | 19 | | 19 | | 19 | |
| | **No. Prepreg Lots** | | 3 | | 3 | | 3 | | 3 | |

*LT modulus values used to calculate final UNT0 strength utlizing the backout formula

## 2.3.2 Transverse Tension Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Tension, 2-axis**<br>**Gr/ Ep**<br>**ACG MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[90]16** |
| **Resin content:** | 41.20% vol | **Comp. density:** | |
| **Fiber volume:** | 58.58% vol | | |
| **Ply thickness:** | 0.0054 - 0.0058 | | |
| **Ply count:** | 16 | | |
| **Test method:** | ASTM D3039-00 | **Modulus calculation:** linear fit from 1000 to 3000 micro in/in | |
| **Normalized by:** | NA | | |

| | | CTD | | RTD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 200F | | 250F | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | 160F, 85% | | 160F, 85% | |
| **Source code** | | ABMUX X1XB | | ABMUX X1XA | | ABMUX X1XN | | ABMUX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| $F_2^{tu}$ (ksi) | **Mean** | | 8.91 | | 8.72 | | 4.56 | | 4.36 |
| | **Minimum** | | 7.97 | | 7.24 | | 3.92 | | 3.38 |
| | **Maximum** | | 9.66 | | 10.24 | | 5.04 | | 4.72 |
| | **C.V.(%)** | | 5.13 | | 7.27 | | 8.02 | | 9.05 |
| | **No. Specimens** | 19 | | 19 | | 19 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |
| $E_2^t$ (Msi) | **Mean** | | 1.31 | | 1.20 | | 1.04 | | 0.84 |
| | **Minimum** | | 1.26 | | 1.15 | | 1.00 | | 0.82 |
| | **Maximum** | | 1.36 | | 1.23 | | 1.06 | | 0.87 |
| | **C.V.(%)** | | 1.96 | | 2.04 | | 2.14 | | 1.67 |
| | **No. Specimens** | 19 | | 20 | | 19 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |

## 2.3.3 Longitudinal Compression Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32% | | |
| **Resin content:** | 43.80% vol | **Comp. density:** | 1.52 [g/cc] |
| **Fiber volume:** | 56.20% vol | | |
| **Ply thickness:** | 0.0047 - 0.0061 | | |
| **Ply count:** | 16 | | |
| **Test method:** | ASTM D6641-01 | **Modulus calculation:** | linear fit from 1000 to 3000 micro in/in |
| **Normalized by:** | 0.0055 | | |

**Compression, 1-axis**
**Gr/ Ep**
**ACG MTM45-1/HTS(12K)-145gsm-32%RW**
**[0]16**

| | | CTD | | RTD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 200 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | | 160 F,85% | |
| **Source code** | | ABMLX X1XB | | ABMLX X1XA | | ABMLX X1XN | | ABMLX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| $E_1^c$ (Msi) | **Mean** | 17.24 | 17.01 | 17.02 | 17.20 | 17.50 | 17.26 | 17.50 | 17.32 |
| | **Minimum** | 16.15 | 16.32 | 15.16 | 16.15 | 16.47 | 16.60 | 16.30 | 16.01 |
| | **Maximum** | 19.32 | 18.34 | 19.22 | 18.16 | 18.53 | 17.86 | 19.76 | 19.73 |
| | **C.V.(%)** | 5.19 | 3.68 | 6.15 | 3.43 | 3.29 | 2.28 | 4.62 | 5.73 |
| | **No. Specimens** | 19 | | 19 | | 19 | | 20 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |
| $\nu_{12}^c$ | **Mean** | 0.365 | | 0.350 | | 0.326 | | 0.396 | |
| | **No. Specimens** | 19 | | 19 | | 19 | | 20 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |

*LC modulus values used to calculate the final UNC0 strength utilizing the backout formula

## 2.3.4 Transverse Compression Properties

**Material:** Advanced Composites Group - MTM45-1/HTS(12K)-145gsm-32%RW

**Resin content:** 41.30% vol
**Fiber volume:** 58.70% vol
**Ply thickness:** 0.0052 - 0.0057
**Ply count:** 16

**Comp. densit** 1.53 [g/cc]

**Compression, 2-axis**
**Gr/ Ep**
**ACG- MTM45-1/HTS(12K)-145gsm-32%RW**
**[90]16**

**Test method:** ASTM D3039-00

**Modulus calculation:** 1000 to 3000 microstrain

**Normalized by:** NA

| | | CTD | | RTD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 200 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | | 160 F,85% | |
| **Source code** | | ABMUX X1XB | | ABMUX X1XA | | ABMUX X1XN | | ABMUX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| $F_2^{tu}$ (ksi) | **Mean** | | 36.64 | | 28.29 | | 17.36 | | 14.27 |
| | **Minimum** | | 30.85 | | 26.19 | | 16.56 | | 13.65 |
| | **Maximum** | | 40.73 | | 30.29 | | 18.13 | | 15.33 |
| | **C.V.(%)** | | 7.96 | | 4.16 | | 2.86 | | 3.35 |
| | **No. Specimens** | 22 | | 19 | | 19 | | 20 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |
| $E_2^t$ (Msi) | **Mean** | | 1.33 | | 1.26 | | 1.15 | | 1.07 |
| | **Minimum** | | 1.22 | | 1.17 | | 1.11 | | 0.98 |
| | **Maximum** | | 1.45 | | 1.40 | | 1.25 | | 1.17 |
| | **C.V.(%)** | | 4.72 | | 4.55 | | 3.24 | | 5.37 |
| | **No. Specimens** | 22 | | 19 | | 19 | | 20 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |
| $\nu_{12}^c$ | **Mean** | 0.025 | | 0.025 | | 0.020 | | 0.022 | |
| | **No. Specimens** | 22 | | 19 | | 19 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |

## 2.3.5 In-Plane Shear Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **In-Plane Shear**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[+45/-45]2s** |
| **Resin content:** | 43.83% vol | **Comp. densit** 1.53 [g/cc] | |
| **Fiber volume:** | 56.17% vol | | |
| **Ply thickness:** | 0.0053 - 0.0058 | | |
| **Ply count:** | 8 | | |
| **Test method:** | ASTM D3518-94 | | |
| | | **Modulus calculation:** linear fit from 1000 to 3000 micro in/in | |
| **Normalized by:** | NA | | |

| | | CTD | | RTD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 200 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | | 160 F,85% | |
| **Source code** | | AMBNXXXB | | AMBNXXXA | | AMBNXXXN | | AMBNXXXD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| $F_{12}^{s5\% \text{ strain}}$ (ksi) | **Mean** | | 12.01 | | 10.18 | | 5.84 | | 4.48 |
| | **Minimum** | | 10.90 | | 9.81 | | 5.53 | | 4.28 |
| | **Maximum** | | 12.60 | | 10.41 | | 6.05 | | 4.66 |
| | **C.V.(%)** | | 3.08 | | 1.49 | | 2.41 | | 3.24 |
| | **No. Specimens** | 18 | | 19 | | 18 | | 5 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |
| $F_{12}^{s0.2\%}$ (ksi) | **Mean** | | 8.34 | | 6.07 | | 3.65 | | 2.64 |
| | **Minimum** | | 7.60 | | 5.73 | | 3.43 | | 2.25 |
| | **Maximum** | | 12.60 | | 6.25 | | 3.78 | | 3.08 |
| | **C.V.(%)** | | 8.29 | | 2.19 | | 2.61 | | 7.81 |
| | **No. Specimens** | 25 | | 20 | | 19 | | 21 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |
| $G_{12}$ (Msi) | **Mean** | | 0.70 | | 0.57 | | 0.40 | | 0.30 |
| | **Minimum** | | 0.62 | | 0.53 | | 0.38 | | 0.25 |
| | **Maximum** | | 0.89 | | 0.59 | | 0.42 | | 0.35 |
| | **C.V.(%)** | | 12.38 | | 3.12 | | 2.60 | | 10.07 |
| | **No. Specimens** | 25 | | 20 | | 19 | | 21 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |

## 2.3.6 Unnotched Tension 0/90 Properties

**Material:** MTM45-1/HTS(12K)-145gsm-32%RW

**Resin content:** 41.40 % vol
**Fiber volume:** 58.60 % vol
**Ply thickness:** 0.0055 - 0.0059
**Ply count:** 16

**Comp. density:** 1.53 [g/cc]

**Test method:** ASTM D3039

**Modulus calculation:** linear fit from 1000 to 3000 micro in/in

**Normalized by:** 0.0055

**Unnotched Tension 0**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[0, 90]4S**

| | | CTD | | RTD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 200 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | | eqquilibrium | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | | 160F,85% | |
| **Source code** | | ABMPX X1XB | | ABMPX X1XA | | ABMPX X1XN | | ABMP X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 164.78 | 160.45 | 165.34 | 161.16 | 169.75 | 166.72 | 168.26 | 164.18 |
| | **Minimum** | 153.51 | 150.71 | 155.15 | 146.39 | 160.50 | 155.78 | 160.78 | 154.91 |
| | **Maximum** | 173.77 | 171.08 | 171.60 | 169.29 | 179.19 | 177.71 | 174.34 | 169.82 |
| **UNT0 Strength (ksi)** | **C.V.(%)** | 2.88 | 3.23 | 3.11 | 4.05 | 2.96 | 3.76 | 2.07 | 2.44 |
| | **No. Specimens** | 19 | | 19 | | 19 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |
| | **Mean** | 10.23 | 9.97 | 10.11 | 9.85 | 10.43 | 10.25 | 10.54 | 10.28 |
| | **Minimum** | 10.05 | 9.50 | 9.78 | 9.23 | 10.05 | 9.75 | 10.16 | 9.79 |
| | **Maximum** | 10.46 | 10.29 | 10.45 | 10.33 | 10.68 | 10.56 | 11.14 | 10.85 |
| **UNT0 Modulus (Msi)** | **C.V.(%)** | 1.18 | 2.15 | 2.04 | 3.26 | 1.92 | 2.73 | 2.29 | 2.54 |
| | **No. Specimens** | 19 | | 19 | | 19 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | |

*LT modulus values used to calculate final UNT0 strength utlizing the backout formula

## 2.3.7 Unnotched Tension 1 Properties

| | | | |
|---|---|---|---|
| **Material:** | Advanced Composites Group - MTM45-1/HTS(12K)-145gsm-32%RW | | **Unnotched Tension 1**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[45,0,-45,90]3S** |
| **Resin content:** | 42% vol | **Comp. density:** 1.52 [g/cc] | |
| **Fiber volume:** | 58% vol | | |
| **Ply thickness:** | 0.0055 - 0.0058 | | |
| **Ply count:** | 24 | | |
| **Test method:** | ASTM D3039-00 | **Modulus calculation:** linear fit from 1000 to 3000 micro in/in | |
| **Normalized by:** | 0.0055 | | |

| | | CTD | | RTD | | ETW2 | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | |
| **Source code** | | ABMAX X1XB | | ABMAX X1XA | | ABMAX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| **UNT1 Strength (ksi)** | **Mean** | 115.96 | 113.38 | 118.52 | 115.54 | 111.76 | 109.88 |
| | **Minimum** | 104.46 | 104.46 | 113.21 | 110.71 | 109.29 | 106.60 |
| | **Maximum** | 122.91 | 122.91 | 126.46 | 120.65 | 115.25 | 112.89 |
| | **C.V.(%)** | 3.72 | 3.75 | 2.81 | 2.42 | 1.95 | 1.87 |
| | **No. Specimens** | 19 | | 19 | | 7 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 1 | |
| **UNT1 Modulus (Msi)** | **Mean** | 7.26 | 7.10 | 7.12 | 6.94 | 7.18 | 7.06 |
| | **Minimum** | 7.06 | 6.82 | 6.90 | 6.64 | 6.98 | 6.89 |
| | **Maximum** | 7.60 | 7.46 | 7.43 | 7.27 | 7.42 | 7.33 |
| | **C.V.(%)** | 2.17 | 2.76 | 2.18 | 2.63 | 1.96 | 2.04 |
| | **No. Specimens** | 19 | | 19 | | 7 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 1 | |

## 2.3.8 Unnotched Tension 2 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Unnotched Tension 2**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[45,-45,0,45,-45,90,45,-45,45,-45]S** |
| **Resin content:** | 41.26% vol | **Comp. density:** 1.53 [g/cc] | |
| **Fiber volume:** | 58.74% vol | | |
| **Ply thickness:** | 0.0055 - 0.0057 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D3039-00 | **Modulus calculation:** linear fit from 1000 to 3000 micro in/in | |
| **Normalized by:** | 0.0055 | | |

| | | CTD | | RTD | | ETW2 | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | |
| **Source code** | | ABMBX X1XB | | ABMBX X1XA | | ABMBX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 73.34 | 72.58 | 66.22 | 65.24 | 52.11 | 51.33 |
| | **Minimum** | 71.07 | 70.18 | 64.55 | 62.48 | 49.92 | 49.08 |
| | **Maximum** | 75.60 | 74.29 | 68.00 | 66.65 | 54.61 | 53.87 |
| **UNT2** | **C.V.(%)** | 2.08 | 2.02 | 1.97 | 2.26 | 3.26 | 3.31 |
| **Strength (ksi)** | | | | | | | |
| | **No. Specimens** | 8 | | 7 | | 7 | |
| | **No. Prepreg Lots** | 1 | | 1 | | 1 | |
| | **Mean** | 4.69 | 4.64 | 4.65 | 4.59 | 3.95 | 3.89 |
| | **Minimum** | 4.58 | 4.55 | 4.49 | 4.46 | 3.85 | 3.77 |
| | **Maximum** | 4.88 | 4.78 | 4.83 | 4.78 | 4.12 | 4.04 |
| **UNT2** | **C.V.(%)** | 2.16 | 1.84 | 2.71 | 2.95 | 2.23 | 2.17 |
| **Modulus (Msi)** | | | | | | | |
| | **No. Specimens** | 8 | | 6 | | 7 | |
| | **No. Prepreg Lots** | 1 | | 1 | | 1 | |

## 2.3.9 Unnotched Tension 3 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | |
| **Resin content:** | 41.23% vol | **Comp. density:** 1.53 [g/cc] | |
| **Fiber volume:** | 58.77% vol | | |
| **Ply thickness:** | 0.0055 - 0.0056 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D3039-00 | **Modulus calculation:** 1000 to 3000 mircrostrain | |
| **Normalized by:** | 0.0055 | | |

**Unnotched Tension 3**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[0,0,45,0,90,-45,0,45,0,-45]S**

| | | CTD | | RTD | | ETW2 | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | |
| **Source code** | | ABMCX X1XB | | ABMCX X1XA | | ABMCX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 184.13 | 182.25 | 188.29 | 186.43 | 181.51 | 179.79 |
| | **Minimum** | 172.29 | 169.02 | 185.02 | 182.36 | 175.82 | 172.81 |
| | **Maximum** | 191.77 | 188.06 | 191.60 | 190.13 | 192.27 | 192.01 |
| **UNT3 Strength (ksi)** | **C.V.(%)** | 3.70 | 3.84 | 1.35 | 1.57 | 2.99 | 3.63 |
| | **No. Specimens** | 7 | | 7 | | 7 | |
| | **No. Prepreg Lots** | 1 | | 1 | | 1 | |
| | **Mean** | 11.68 | 11.56 | 11.29 | 11.18 | 11.24 | 11.13 |
| | **Minimum** | 11.45 | 11.24 | 11.01 | 10.93 | 10.58 | 10.57 |
| | **Maximum** | 12.00 | 11.78 | 11.59 | 11.59 | 11.66 | 11.53 |
| **UNT3 Modulus (Msi)** | **C.V.(%)** | 1.92 | 1.74 | 1.64 | 1.95 | 3.08 | 2.62 |
| | **No. Specimens** | 7 | | 7 | | 7 | |
| | **No. Prepreg Lots** | 1 | | 1 | | 1 | |

## 2.3.10 Unnotched Compression 0 Properties

**Material:** ACG - MTM45-1/HTS(12K)-145gsm-32%RW

**Resin content:** 41.05% vol
**Fiber volume:** 58.24% vol
**Ply thickness:** 0.0054 - 0.0057
**Ply count:** 16

**Comp. density:** 1.52 [g/cc]

**Test method:** ASTM D6641-01$^{E1}$

**Modulus calculation:** linear ft from 1000 to 3000 microstrain

**Normalized by:** 0.0055

**Unnotched Compression 0**
**Gr/ Ep**
**ACG - MTM45-1/HTS(12K)-145gsm-32%RW**
**[90, 0]4S**

| | | CTD | | RTD | | ETD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 F | | 200 F | | 200 F | | 250 F | |
| **Moisture Conditioning** | | dry | | dry | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | | | 160 F,85% | | 160 F,85% | |
| **Source code** | | ABMRX X1XB | | ABMRX X1XA | | ABMRX X1XC | | ABMRX X1XN | | ABMRX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| **UNC0 Strength (ksi)** | **Mean** | 124.96 | 123.01 | 110.31 | 108.65 | 96.27 | 94.81 | 95.44 | 93.64 | 72.54 | 71.73 |
| | **Minimum** | 104.90 | 101.74 | 99.09 | 98.30 | 79.58 | 79.83 | 86.03 | 83.47 | 52.68 | 53.27 |
| | **Maximum** | 137.71 | 133.82 | 118.12 | 115.79 | 109.44 | 106.93 | 115.92 | 112.06 | 84.52 | 83.60 |
| | **C.V.(%)** | 8.25 | 8.50 | 5.04 | 5.22 | 7.44 | 7.44 | 7.79 | 7.78 | 12.96 | 12.96 |
| | **No. Specimens** | 19 | | 19 | | 19 | | 19 | | 22 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | | 3 | |
| **UNC0 Modulus (Msi)** | **Mean** | 9.26 | 9.12 | 9.71 | 9.57 | 9.27 | 9.12 | 9.47 | 9.29 | 9.05 | 8.95 |
| | **Minimum** | 8.81 | 8.63 | 9.08 | 8.85 | 8.80 | 8.52 | 9.10 | 8.79 | 8.23 | 8.06 |
| | **Maximum** | 10.22 | 10.01 | 10.51 | 10.58 | 10.17 | 10.00 | 10.26 | 10.05 | 9.88 | 9.78 |
| | **C.V.(%)** | 4.27 | 4.49 | 4.57 | 5.39 | 4.03 | 4.22 | 3.82 | 3.70 | 5.14 | 5.67 |
| | **No. Specimens** | 19 | | 19 | | 22 | | 20 | | 22 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | | 3 | |
| **νUNC0** | **Mean** | | 0.0466 | | 0.047 | | 0.039 | | 0.045 | | 0.039 |
| | **No. Specimens** | 19 | | 19 | | 22 | | 20 | | 22 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | | 3 | |

*LC modulus values used to calculate the final UNC0 strength utilizing the backout formula

## 2.3.11 Unnotched Compression 1 Properties

**Material:** MTM45-1/HTS(12K)-145gsm-32%RW

**Resin content:** 41.92% vol
**Fiber volume:** 58.08% vol
**Ply thickness:** 0.0055 - 0.0058
**Ply count:** 24

**Comp. density:** 1.52 [g/cc]

**Unnotched Compression 1**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[45,0,-45,90]3S**

**Test method:** ASTM D6641-01$^{E1}$

**Modulus calculation:** 1000 to 3000 microstrain

**Normalized by:** 0.0055

| | | RTD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 F | | 200 F | | 250 F | |
| **Moisture Conditioning** | | | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | 160 F,85% | | 160 F,85% | |
| **Source code** | | ABMWX X1XA | | ABMWX X1XN | | ABMWX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 88.02 | 86.60 | 74.68 | 74.13 | 61.81 | 60.97 |
| | **Minimum** | 81.72 | 80.75 | 69.84 | 69.20 | 52.11 | 50.24 |
| | **Maximum** | 93.16 | 92.64 | 79.79 | 79.00 | 71.78 | 71.83 |
| **UNC1** | **C.V.(%)** | 3.52 | 3.79 | 4.96 | 4.77 | 8.61 | 9.09 |
| **Strength (ksi)** | | | | | | | |
| | **No. Specimens** | 19 | | 7 | | 22 | |
| | **No. Prepreg Lots** | 3 | | 1 | | 3 | |
| | **Mean** | 6.64 | 6.54 | 6.72 | 6.67 | 6.42 | 6.33 |
| | **Minimum** | 6.35 | 6.15 | 6.41 | 6.40 | 6.02 | 5.88 |
| | **Maximum** | 6.91 | 6.87 | 6.84 | 6.77 | 6.80 | 6.77 |
| **UNC1** | **C.V.(%)** | 2.22 | 2.65 | 2.28 | 1.95 | 3.37 | 3.82 |
| **Modulus (Msi)** | | | | | | | |
| | **No. Specimens** | 19 | | 7 | | 20 | |
| | **No. Prepreg Lots** | 3 | | 1 | | 3 | |
| | **Mean** | 0.340 | | 0.338 | | 0.312 | |
| **$\nu$UNC1** | **No. Specimens** | 19 | | 7 | | 20 | |
| | **No. Prepreg Lots** | 3 | | 1 | | 3 | |

## 2.3.12 Unnotched Compression 2 Properties

**Material:** MTM45-1/HTS(12K)-145gsm-32%RW

**Resin content:** 40.78% vol
**Fiber volume:** 59.22% vol
**Ply thickness:** 0.0053 - 0.0055
**Ply count:** 20

**Comp. density:** 1.53 [g/cc]

**Unnotched Compression 2**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[45,-45,0,45,-45,90,45,-45,45,-45]S**

**Test method:** ASTM D6641-01$^{E1}$

**Modulus calculation:** 1000 to 3000 microstrain

**Normalized by:** 0.0055

| | | RTD | | ETW2 | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 F | | 250 F | | | |
| **Moisture Conditioning** | | | | equilibrium | | | |
| **Equilibrium at T, RH** | | dry | | 160 F,85% | | | |
| **Source code** | | ABMXX X1XA | | ABMXX X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 58.30 | 58.51 | 41.81 | 41.67 | | |
| | **Minimum** | 53.40 | 55.15 | 37.15 | 36.98 | | |
| | **Maximum** | 62.36 | 62.00 | 48.73 | 48.49 | | |
| **UNC2** | **C.V.(%)** | 5.72 | 5.16 | 8.77 | 8.80 | | |
| **Strength (ksi)** | | | | | | | |
| | **No. Specimens** | 7 | | 7 | | | |
| | **No. Prepreg Lots** | 1 | | 1 | | | |
| | **Mean** | 4.29 | 4.30 | 3.88 | 3.86 | | |
| | **Minimum** | 4.12 | 4.12 | 3.80 | 3.78 | | |
| | **Maximum** | 4.38 | 4.45 | 4.02 | 4.00 | | |
| **UNC2** | **C.V.(%)** | 1.87 | 2.59 | 1.93 | 1.91 | | |
| **Modulus (Msi)** | | | | | | | |
| | **No. Specimens** | 7 | | 7 | | | |
| | **No. Prepreg Lots** | 1 | | 1 | | | |
| | **Mean** | 0.561 | | 0.504 | | | |
| **$\nu$UNC2** | **No. Specimens** | 7 | | 7 | | | |
| | **No. Prepreg Lots** | 1 | | 1 | | | |

## 2.3.13 Unnotched Compression 3 Properties

**Material:** MTM45-1/HTS(12K)-145gsm-32%RW

**Resin content:** 42.92% vol
**Fiber volume:** 57.08% vol
**Ply thickness:** 0.0055 - 0.0059
**Ply count:** 20

**Comp. density:** 1.52 [g/cc]

**Unnotched Compression 3**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[0,0,45,0,90,-45,0,45,0,-45]S**

**Test method:** ASTM D6641-01$^{E1}$

**Modulus calculation:** 1000 to 3000 microstrain

**Normalized by:** 0.0055

| | | RTD | | ETW2 | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 F | | 250 F | | | |
| **Moisture Conditioning** | | | | equilibrium | | | |
| **Equilibrium at T, RH** | | | | 160 F,85% | | | |
| **Source code** | | ABMYX X1X1 | | ABMYX X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 100.88 | 98.05 | 68.66 | 66.71 | | |
| | **Minimum** | 95.58 | 95.23 | 60.71 | 60.45 | | |
| | **Maximum** | 107.87 | 102.80 | 74.38 | 73.58 | | |
| **UNC3 Strength (ksi)** | **C.V.(%)** | 4.71 | 2.87 | 6.91 | 7.29 | | |
| | **No. Specimens** | 7 | | 7 | | | |
| | **No. Prepreg Lots** | 1 | | 1 | | | |
| | **Mean** | 10.54 | 10.25 | 10.51 | 10.20 | | |
| | **Minimum** | 9.97 | 9.89 | 9.33 | 9.29 | | |
| | **Maximum** | 11.15 | 10.63 | 11.86 | 11.14 | | |
| **UNC3 Modulus (Msi)** | **C.V.(%)** | 4.69 | 2.73 | 7.56 | 5.43 | | |
| | **No. Specimens** | 7 | | 7 | | | |
| | **No. Prepreg Lots** | 1 | | 1 | | | |
| | **Mean** | 0.433 | | 0.403 | | | |
| **$\nu$UNC3** | **No. Specimens** | 7 | | 7 | | | |
| | **No. Prepreg Lots** | 1 | | 1 | | | |

## 2.3.14 Laminate Short Beam Strength Properties

**Material:** MTM45-1/HTS(12K)-145gsm-32%RW

**Resin content:** See UNC1 **Comp. density:** See UNC1
**Fiber volume:** See UNC1
**Ply thickness:** 0.055 - 0.0057
**Ply count:** 24

**Test method:** ASTM D2344-00$^{E1}$

**Normalized by:** NA

**Laminate Short beam Strength**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[45,0,-45,90]3S**

| | | RTD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 200 | | 250 | |
| **Moisture Conditioning** | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | | |
| **Source code** | | ABMqX XXXA | | ABMqX XXXN | | ABMqX XXXD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| **LSBS (ksi)** | **Mean** | | 11.22 | | 6.74 | | 5.91 |
| | **Minimum** | | 10.18 | | 6.45 | | 5.41 |
| | **Maximum** | | 12.24 | | 7.03 | | 6.24 |
| | **C.V.(%)** | | 5.48 | | 3.37 | | 3.30 |
| | **No. Specimens** | 19 | | 7 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 1 | | 3 | |

## 2.3.15 Lamina Short Beam Strength Properties

**Material:** MTM45-1/HTS(12K)-145gsm-32%RW

**Resin content:** See WC
**Fiber volume:** See WC
**Ply thickness:** 0.0053 - 0.0060
**Ply count:** 16

**Comp. density:** See WC

**Test method:** ASTM D2344-00$^{E1}$

**Normalized by:** NA

**Short Beam Strength**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[ 0]16**

| | | CTD | | RTD | | ETD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 195 | | 200 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | | | 160 F,85% | | 160 F,85% | |
| **Source code** | | ABMQX X1XB | | ABMQX X1XA | | ABMQX X1WC | | ABMQX X1XN | | ABMQX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| **SBS Strength (ksi)** | **Mean** | | 19.55 | | 14.52 | | 10.74 | | 8.47 | | 6.98 |
| | **Minimum** | | 17.64 | | 13.51 | | 10.49 | | 8.20 | | 6.58 |
| | **Maximum** | | 21.38 | | 15.17 | | 10.94 | | 8.91 | | 7.39 |
| | **C.V.(%)** | | 5.57 | | 2.99 | | 1.24 | | 2.62 | | 3.37 |
| | **No. Specimens** | 19 | | 19 | | 19 | | 20 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 3 | | 3 | | 3 | |

## 2.3.16 Open Hole Tension 1 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Open Hole Tension 1**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[45,0,-45,90]3S** |
| **Resin content:** | 41.78% vol | **Comp. densit** 1.52 [g/cc] | |
| **Fiber volume:** | 58.22% vol | | |
| **Ply thickness:** | 0.0055 - 0.0057 | | |
| **Ply count:** | 24 | | |
| **Test method:** | ASTM D5766-02a | | |
| **Normalized by:** | 0.0055 | | |

| | | CTD | | RTD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 200 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | | 160 F,85% | |
| **Source code** | | ABMDX X1XB | | ABMDX X1XA | | ABMDX X1XN | | ABMDX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 61.17 | 60.27 | 60.47 | 59.56 | 63.47 | 62.28 | 62.64 | 61.77 |
| | **Minimum** | 56.42 | 55.42 | 58.73 | 56.60 | 60.14 | 59.41 | 60.72 | 59.52 |
| | **Maximum** | 64.05 | 64.15 | 62.04 | 61.43 | 68.23 | 67.18 | 64.19 | 63.85 |
| **OHT1** | **C.V.(%)** | 2.73 | 3.31 | 1.62 | 2.26 | 4.32 | 4.22 | 1.67 | 2.24 |
| **Strength (ksi)** | | | | | | | | | |
| | **No. Specimens** | 19 | | 19 | | 7 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 3 | | 1 | | 3 | |

## 2.3.17 Open Hole Tension 2 Properties

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | | | | | | **Open Hole Tension 2** Gr/ Ep MTM45-1/HTS(12K)-145gsm-32%RW [45,-45,0,45,-45,90,45,-45,45,-45]S | |
| **Resin content:** | 41.82% vol | **Comp. dens** 1.52 [g/cc] | | | | | | | |
| **Fiber volume:** | 58.18% vol | | | | | | | | |
| **Ply thickness:** | 0.0055 - 0.0058 | | | | | | | | |
| **Ply count:** | 20 | | | | | | | | |
| **Test method:** | ASTM D5766-02a | | | | | | | | |
| **Normalized by:** | 0.0055 | | | | | | | | |
| | | **CTD** | | **RTD** | | **ETW2** | | | |
| **Test Temperature [°F]** | | -65 | | 75 | | 250 | | | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | | | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | | | |
| **Source code** | | ABMEX X1XB | | ABMEX X1XA | | ABMEX X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 45.99 | 45.09 | 42.06 | 41.50 | 38.26 | 37.64 | | |
| | **Minimum** | 44.70 | 43.30 | 41.15 | 40.72 | 37.67 | 36.92 | | |
| | **Maximum** | 47.08 | 46.41 | 42.96 | 42.49 | 38.93 | 38.58 | | |
| **OHT2** | **C.V.(%)** | 1.41 | 2.34 | 1.71 | 1.69 | 1.28 | 1.60 | | |
| **Strength (ksi)** | | | | | | | | | |
| | **No. Specimens** | 19 | | 7 | | 7 | | | |
| | **No. Prepreg Lots** | 3 | | 1 | | 1 | | | |

## 2.3.18 Open Hole Tension 3 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Open Hole Tension 3**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[0,0,45,0,90,-45,0,45,0,-45]S** |
| **Resin content:** | 41.13% vol | **Comp. density:** 1.53 [g/cc] | |
| **Fiber volume:** | 58.88% vol | | |
| **Ply thickness:** | 0.0055 - 0.0056 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D5766-02a | | |
| **Normalized by:** | 0.0055 | | |

| | | CTD | | RTD | | ETW2 | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 250 | | | |
| **Moisture Conditioning** | | dry | | dry | | equilibrium | | | |
| **Equilibrium at T, RH** | | | | | | 160 F,85% | | | |
| **Source code** | | ABMFX X1XB | | ABMFX X1XA | | ABMFX X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 94.94 | 94.25 | 98.29 | 97.15 | 112.67 | 111.21 | | |
| | **Minimum** | 86.31 | 84.52 | 92.86 | 91.63 | 107.53 | 106.44 | | |
| | **Maximum** | 104.31 | 102.68 | 103.13 | 101.78 | 124.88 | 123.36 | | |
| **OHT3** | **C.V.(%)** | 4.92 | 5.14 | 3.96 | 3.81 | 5.22 | 5.22 | | |
| **Strength (ksi)** | | | | | | | | | |
| | **No. Specimens** | 19 | | 7 | | 7 | | | |
| | **No. Prepreg Lots** | 3 | | 1 | | 1 | | | |

## 2.3.19 Filled Hole Tension 1 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Filled Hole Tension 1**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[45,0,-45,90]3S** |
| **Resin content:** | 41.08% vol | **Comp. density:** 1.53 [g/cc] | |
| **Fiber volume:** | 58.92% vol | | |
| **Ply thickness:** | 0.0055 - 0.0057 | | |
| **Ply count:** | 24 | | |
| **Test method:** | ASTM D6742-02 | | |
| **Normalized by:** | 0.00550 | | |

| | | CTD | | RTD | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | | |
| **Moisture Conditioning** | | dry | | dry | | | |
| **Equilibrium at T, RH** | | | | | | | |
| **Source code** | | ABM4XX1XB | | ABM4XX1XA | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 64.25 | 63.51 | 64.63 | 64.44 | | |
| | **Minimum** | 59.42 | 58.08 | 62.24 | 61.74 | | |
| | **Maximum** | 67.65 | 67.05 | 65.78 | 65.72 | | |
| **FHT1 Strength (ksi)** | **C.V.(%)** | 3.94 | 4.50 | 1.99 | 2.13 | | |
| | **No. Specimens** | 19 | | 7 | | | |
| | **No. Prepreg Lots** | 3 | | 1 | | | |

## 2.3.20 Filled Hole Tension 2 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Filled Hole Tension 2**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[45,-45,0,45,-45,90,45,-45,45,-45]S** |
| **Resin content:** | 41.58% vol | **Comp. density:** 1.53 [g/cc] | |
| **Fiber volume:** | 58.42% vol | | |
| **Ply thickness:** | 0.0055 - 0.0056 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D6742-02 | | |
| **Normalized by:** | 0.0055 | in. CPT | |

| | | CTD | | RTD | | ETW2 | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 250 | |
| **Moisture Conditioning** | | dry | | dry | | wet | |
| **Equilibrium at T, RH** | | | | | | | |
| **Source code** | | ABM5X1XB | | ABMX1XA | | ABMX1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| **FHT2 Strength (ksi)** | **Mean** | 47.97 | 47.30 | 43.54 | 42.91 | 38.07 | 37.51 |
| | **Minimum** | 46.95 | 46.16 | 42.16 | 41.57 | 37.29 | 36.93 |
| | **Maximum** | 49.14 | 48.34 | 44.42 | 43.87 | 39.20 | 38.47 |
| | **C.V.(%)** | 1.72 | 1.80 | 1.99 | 1.88 | 1.86 | 1.72 |
| | **No. Specimens** | 7 | | 7 | | 7 | |
| | **No. Prepreg Lots** | 1 | | 1 | | 1 | |

## 2.3.21 Filled Hole Tension 3 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Filled Hole Tension 3**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[0,0,45,0,90,-45,0,45,0,-45]S** |
| **Resin content:** | 40.59% vol | **Comp. density:** 1.53 [g/cc] | |
| **Fiber volume:** | 59.41% vol | | |
| **Ply thickness:** | 0.0055 - 0.0056 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D6742-02 | | |
| **Normalized by:** | 0.00550 | | |

| | | CTD | | RTD | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | | |
| **Moisture Conditioning** | | dry | | dry | | | |
| **Equilibrium at T, RH** | | | | | | | |
| **Source code** | | ABM6X X1XB | | ABM6X X1XA | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 98.06 | 97.01 | 98.30 | 97.35 | | |
| | **Minimum** | 92.22 | 91.08 | 94.69 | 92.88 | | |
| | **Maximum** | 103.20 | 102.23 | 106.21 | 105.22 | | |
| **FHT3 Strength (ksi)** | **C.V.(%)** | 4.66 | 4.77 | 4.19 | 4.35 | | |
| | **No. Specimens** | 7 | | 7 | | | |
| | **No. Prepreg Lots** | 1 | | 1 | | | |

## 2.3.22 Open Hole Compression 1 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | |
| **Resin content:** | 41.18% vol | **Comp. density** | 1.52 [g/cc] |
| **Fiber volume:** | 58.82% vol | | |
| **Ply thickness:** | 0.0054 - 0.0058 | | |
| **Ply count:** | 24 | | |
| **Test method:** | ASTM D6484-04 | | |
| **Normalized by:** | 0.0055 | | |

**Open Hole Compression 1**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[45,0,-45,90]3S**

| | | RTD | | ETW | | ETW2 | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 200 | | 250 | |
| **Moisture Conditioning** | | dry | | equilibrium | | equilibrium | |
| **Equilibrium at T, RH** | | | | 160 F,85% | | 160 F,85% | |
| **Source code** | | ABMGX X1XA | | ABMGX X1XN | | ABMGX X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 47.44 | 46.51 | 41.77 | 41.20 | 38.28 | 37.40 |
| | **Minimum** | 44.81 | 44.94 | 39.47 | 39.30 | 36.79 | 33.11 |
| | **Maximum** | 49.67 | 48.80 | 43.74 | 42.78 | 44.94 | 44.11 |
| **OHC1** | **C.V.(%)** | 2.90 | 2.06 | 3.39 | 3.09 | 6.81 | 7.58 |
| **Strength (ksi)** | | | | | | | |
| | **No. Specimens** | 19 | | 7 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 1 | | 3 | |

## 2.3.23 Open Hole Compression 2 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | |
| **Resin content:** | 41.48% vol | **Comp. density** | 1.52 [g/cc] |
| **Fiber volume:** | 58.52% vol | | |
| **Ply thickness:** | 0.0054 - 0.0058 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D6484-04 | | |
| **Normalized by:** | 0.0055 | | |

**Open Hole Compression 2**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[45,-45,0,45,-45,90,45,-45,45,-45]S**

| | | RTD | | ETW2 | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 250 | | | |
| **Moisture Conditioning** | | dry | | equilibrium | | | |
| **Equilibrium at T, RH** | | | | 160 F,85% | | | |
| **Source code** | | ABMHX X1XA | | ABMHX X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 38.93 | 38.49 | 27.87 | 27.56 | | |
| | **Minimum** | 38.05 | 37.13 | 26.16 | 26.28 | | |
| | **Maximum** | 39.93 | 39.64 | 29.03 | 28.65 | | |
| **OHC2** | **C.V.(%)** | 1.67 | 2.13 | 2.52 | 2.47 | | |
| **Strength (ksi)** | | | | | | | |
| | **No. Specimens** | 7 | | 19 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | | |

## 2.3.24 Open Hole Compression 3 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | |
| **Resin content:** | 41.58% vol | **Comp. density** | 1.52 [g/cc] |
| **Fiber volume:** | 58.42% vol | | |
| **Ply thickness:** | 0.0054 - 0.0057 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D6484-04 | | |
| **Normalized by:** | 0.0055 | | |

**Open Hole Compression 3**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[0,0,45,0,90,-45,0,45,0,-45]S**

| | | RTD | | ETW2 | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 250 | | | |
| **Moisture Conditioning** | | dry | | equilibrium | | | |
| **Equilibrium at T, RH** | | | | 160 F,85% | | | |
| **Source code** | | ABMIX X1XA | | ABMIX X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 64.11 | 62.68 | 49.04 | 48.45 | | |
| | **Minimum** | 60.43 | 59.08 | 45.53 | 44.53 | | |
| | **Maximum** | 66.80 | 65.09 | 54.40 | 53.38 | | |
| **OHC3 Strength (ksi)** | **C.V.(%)** | 3.29 | 3.34 | 4.59 | 4.32 | | |
| | **No. Specimens** | 7 | | 18 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | | |

## 2.3.25 Filled-Hole Compression 1 Properties

| | | | |
|---|---|---|---|
| **Material:** | Advanced Composites Group - MTM45-1/HTS(12K)-145gsm-32%RW | | **Filled Hole Compression 1**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[45,0,-45,90]3S** |
| **Resin content:** | 41.7% vol | **Comp. density** 1.52 [g/cc] | |
| **Fiber volume:** | 58.3% vol | | |
| **Ply thickness:** | 0.0055 - 0.0058 | | |
| **Ply count:** | 24 | | |
| **Test method:** | ASTM D6742-02 | | |
| **Normalized by:** | 0.0055 | | |

| | | RTD | | ETW2 | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 250 | | | |
| **Moisture Conditioning** | | dry | | equilibrium | | | |
| **Equilibrium at T, RH** | | | | 160 F,85% | | | |
| **Source code** | | ABM7X X1XA | | ABM7X X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| **FHC1 Strength (ksi)** | **Mean** | 66.64 | 65.30 | 46.16 | 45.32 | | |
| | **Minimum** | 61.50 | 59.84 | 40.85 | 39.92 | | |
| | **Maximum** | 72.48 | 71.29 | 55.07 | 54.05 | | |
| | **C.V.(%)** | 7.13 | 7.71 | 7.78 | 7.72 | | |
| | **No. Specimens** | 7 | | 19 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | | |

## 2.3.26 Filled-Hole Compression 2 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | |
| **Resin content:** | 41.65% vol | **Comp. density** | 1.52 [g/cc] |
| **Fiber volume:** | 58.35% vol | | |
| **Ply thickness:** | 0.0054 - 0.0058 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D6742-02 | | |
| **Normalized by:** | 0.0055 | | |

**Filled Hole Compression 2**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[45,-45,0,45,-45,90,45,-45,45,-45]S**

| | | RTD | | ETW2 | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 250 | | | |
| **Moisture Conditioning** | | dry | | equilibrium | | | |
| **Equilibrium at T, RH** | | | | 160 F,85% | | | |
| **Source code** | | ABM8X X1XA | | ABM8X X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 51.42 | 50.41 | 34.46 | 33.86 | | |
| | **Minimum** | 49.02 | 47.96 | 31.99 | 31.90 | | |
| | **Maximum** | 52.91 | 51.70 | 36.96 | 36.06 | | |
| **FHC2** | **C.V.(%)** | 2.82 | 2.86 | 3.72 | 3.86 | | |
| **Strength (ksi)** | | | | | | | |
| | **No. Specimens** | 7 | | 19 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | | |

## 2.3.27 Filled-Hole Compression 3 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | |
| **Resin content:** | 42.09% vol | **Comp. density** | 1.52 [g/cc] |
| **Fiber volume:** | 57.91% vol | | |
| **Ply thickness:** | 0.0054 - 0.0057 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D6742-02 | | |
| **Normalized by:** | 0.0055 | | |

**Filled Hole Compression 3**
**Gr/ Ep**
**MTM45-1/HTS(12K)-145gsm-32%RW**
**[0,0,45,0,90,-45,0,45,0,-45]S**

| | | RTD | | ETW2 | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 250 | | | |
| **Moisture Conditioning** | | dry | | equilibrium | | | |
| **Equilibrium at T, RH** | | | | 160 F,85% | | | |
| **Source code** | | ABM9X X1XA | | ABM9X X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| **FHC3 Strength (ksi)** | **Mean** | 86.68 | 85.21 | 61.40 | 60.80 | | |
| | **Minimum** | 85.17 | 83.81 | 55.74 | 54.19 | | |
| | **Maximum** | 87.79 | 86.69 | 66.39 | 66.37 | | |
| | **C.V.(%)** | 1.00 | 1.12 | 4.67 | 5.66 | | |
| | **No. Specimens** | 7 | | 18 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | | |

## 2.3.28 Pin Bearing 1 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Pin Bearing 1**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[45,0,-45,90]3S** |
| **Resin content:** | 41.55% vol | **Comp. density:** 1.52 [g/cc] | |
| **Fiber volume:** | 58.45% vol | | |
| **Ply thickness:** | 0.0055 - 0.0058 | | |
| **Ply count:** | 24 | | |
| **Test method:** | ASTM D5961-08 | | |
| **Normalized by:** | 0.00550 | | |

| | | RTD | | ETW2 | |
|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 250 | |
| **Moisture Conditioning** | | dry | | equilibrium | |
| **Equilibrium at T, RH** | | | | 160 F,85% | |
| **Source code** | | ABM1XX1XA | | ABM1XX1XA | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 102.47 | 100.54 | 91.67 | 90.10 |
| | **Minimum** | 94.97 | 93.70 | 85.88 | 84.02 |
| | **Maximum** | 112.00 | 111.54 | 97.81 | 95.96 |
| **PB1** | **C.V.(%)** | 4.27 | 4.46 | 3.83 | 3.98 |
| **2% offset Strength** | | | | | |
| **(ksi)** | **No. Specimens** | 19 | | 19 | |
| | **No. Prepreg Lots** | 3 | | 3 | |

## 2.3.29 Pin Bearing 2 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Pin Bearing 2**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[45,-45,0,45,-45,90,45,-45,45,-45]S** |
| **Resin content:** | 41.31% vol | **Comp. density:** 1.52 [g/cc] | |
| **Fiber volume:** | 58.69% vol | | |
| **Ply thickness:** | 0.0055 - 0.0057 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D5961-08 | | |
| **Normalized by:** | 0.0055 | | |

| | | RTD | | ETW2 | |
|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 250 | |
| **Moisture Conditioning** | | dry | | equilibrium | |
| **Equilibrium at T, RH** | | | | 160 F,85% | |
| **Source code** | | ABM2XX1XA | | ABM2XX1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 109.32 | 107.47 | 86.68 | 85.59 |
| | **Minimum** | 105.26 | 102.30 | 79.40 | 77.82 |
| | **Maximum** | 112.65 | 111.07 | 101.62 | 100.66 |
| **PB2** | **C.V.(%)** | 2.63 | 2.79 | 5.98 | 6.08 |
| **2% offset Strength** | | | | | |
| **(ksi)** | **No. Specimens** | 7 | | 19 | |
| | **No. Prepreg Lots** | 1 | | 3 | |

## 2.3.30 Pin Bearing 3 Properties

| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Pin Bearing 3**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[0,0,45,0,90,-45,0,45,0,-45]S** |
| **Resin content:** | 41.38% vol | **Comp. density:** 1.52 [g/cc] | |
| **Fiber volume:** | 58.62% vol | | |
| **Ply thickness:** | 0.0055 - 0.0057 | | |
| **Ply count:** | 20 | | |
| **Test method:** | ASTM D5961-08 | | |
| **Normalized by:** | 0.0055 | | |

| | | RTD | | ETW2 | |
|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | 250 | |
| **Moisture Conditioning** | | dry | | equilibrium | |
| **Equilibrium at T, RH** | | | | 160 F,85% | |
| **Source code** | | ABM3X X1XA | | ABM3X X1XD | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 112.19 | 110.62 | 86.37 | 85.46 |
| | **Minimum** | 100.89 | 99.31 | 77.70 | 76.74 |
| | **Maximum** | 120.99 | 119.79 | 96.91 | 95.77 |
| **PB3** | **C.V.(%)** | 5.86 | 6.01 | 6.24 | 6.24 |
| **2% offset Strength** | | | | | |
| **(ksi)** | **No. Specimens** | 7 | | 19 | |
| | **No. Prepreg Lots** | 1 | | 3 | |

## 2.3.31 Interlaminar Tension Properties

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Material:** | ACG MTM45-1/HTS(12K)-145gsm-32%RW | | | | | **Interlaminar Tension** Gr/ Ep ACG MTM45-1/HTS(12K)-145gsm-32%RW [0,45,90,-45]4s | |
| **Resin content:** | 42.06% vol | **Comp. density:** | 1.51 [g/cc] | | | | |
| **Fiber volume:** | 57.94% vol | | | | | | |
| **Ply thickness:** | 0.0057 - 0.0059 | | | | | | |
| **Ply count:** | 32 | | | | | | |
| **Test method:** | ASTM D6415-99$^{E1}$ | | | | | | |
| **Normalized by:** | NA | | | | | | |
| | | **RTD** | | **ETW2** | | | |
| **Test Temperature [°F]** | | 75 | | 250 | | | |
| **Moisture Conditioning** | | dry | | equilibrium | | | |
| **Equilibrium at T, RH** | | | | 160 F,85% | | | |
| **Source code** | | ABMMX X1XA | | ABMMX X1XD | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | | 4.15 | | 3.28 | | |
| | **Minimum** | | 3.44 | | 2.82 | | |
| | **Maximum** | | 5.37 | | 3.53 | | |
| **ILT** | **C.V.(%)** | | 16.10 | | 7.86 | | |
| **Strength (ksi)** | | | | | | | |
| | **No. Specimens** | | 6 | | 6 | | |
| | **No. Prepreg Lots** | | 1 | | 1 | | |

## 2.3.32 Compression after Impact Properties

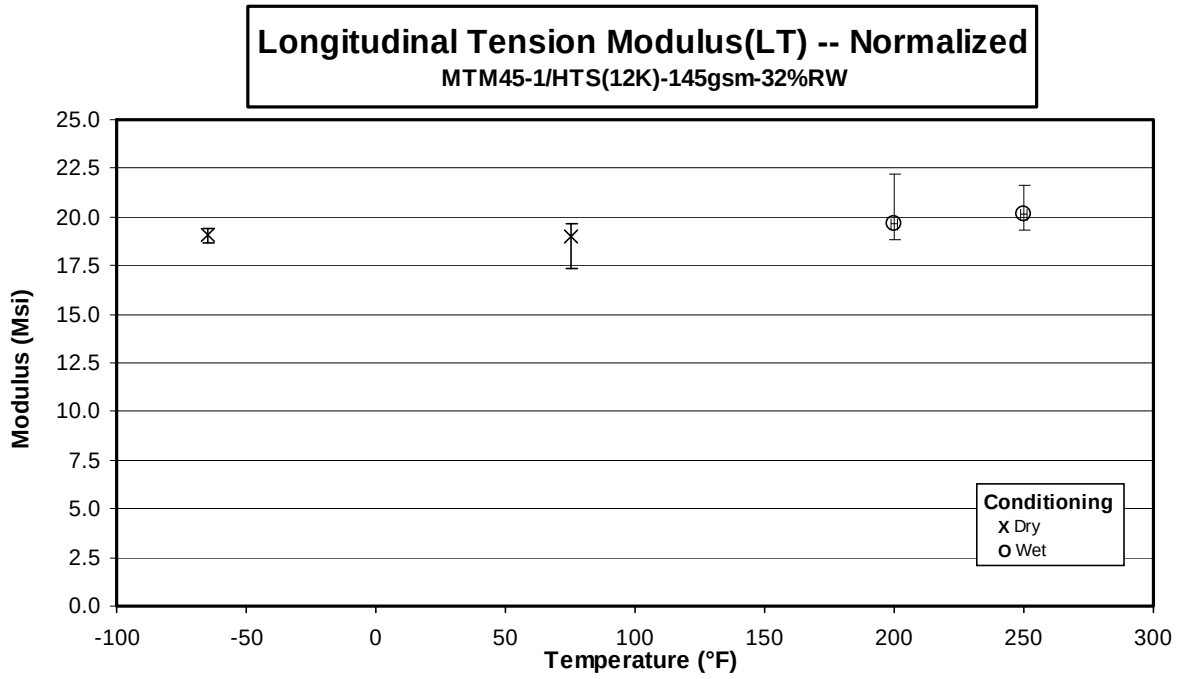
| | | | |
|---|---|---|---|
| **Material:** | MTM45-1/HTS(12K)-145gsm-32%RW | | **Compression After Impact**<br>**Gr/ Ep**<br>**MTM45-1/HTS(12K)-145gsm-32%RW**<br>**[0,45,90,-45]4S** |
| **Resin content:** | 42.15% vol | **Comp. density:** 1.52 [g/cc] | |
| **Fiber volume:** | 57.85% vol | | |
| **Ply thickness:** | 0.0056 | | |
| **Ply count:** | 32 | | |
| **Test method:** | SACMA SRM 2R-94 | | |
| **Normalized by:** | 0.0055 | | |

| | | RTD | | | | | |
|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | 75 | | | | | |
| **Moisture Conditioning** | | dry | | | | | |
| **Equilibrium at T, RH** | | | | | | | |
| **Source code** | | AMBKXXXA | | | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 35.30 | 34.79 | | | | |
| | **Minimum** | 31.84 | 31.37 | | | | |
| | **Maximum** | 38.53 | 38.12 | | | | |
| **CAI** | **C.V.(%)** | 6.47 | 6.74 | | | | |
| **Strength (ksi)** | | | | | | | |
| | **No. Specimens** | 7 | | | | | |
| | **No. Prepreg Lots** | 1 | | | | | |

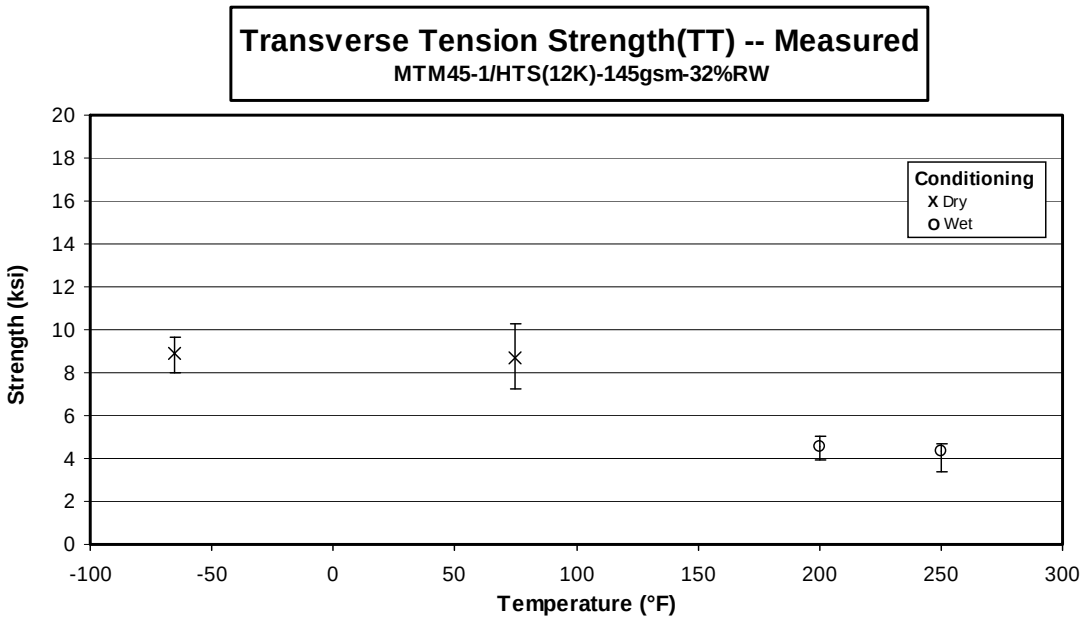
## 3. Individual Test Charts

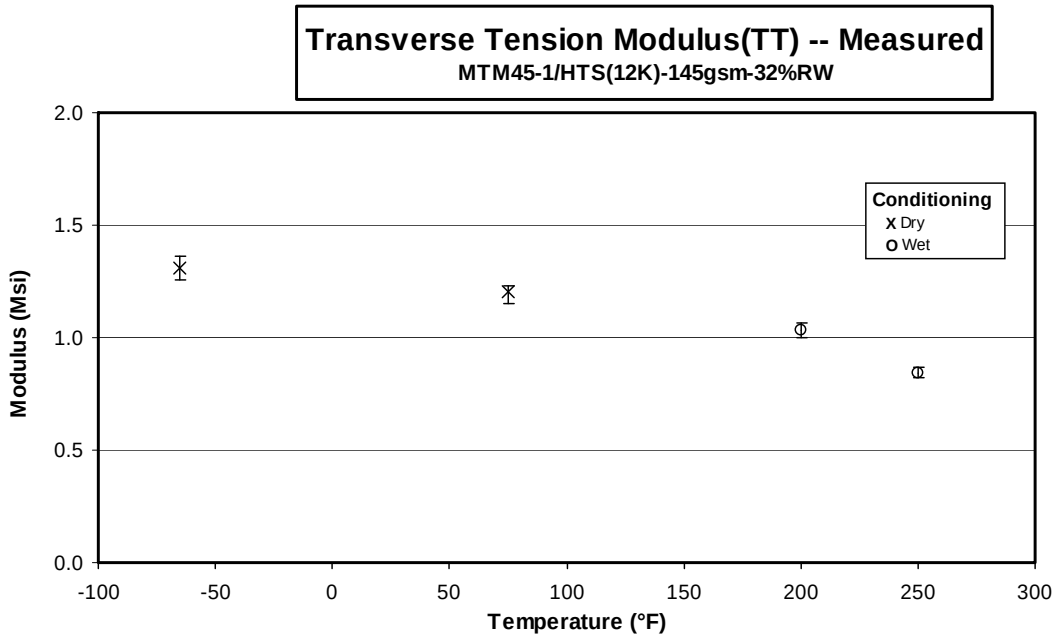
These charts combine all three batches of data and plot the minimum and maximum modulus and strength range based on the test temperature.

## 3.1 Longitudinal Tension Properties

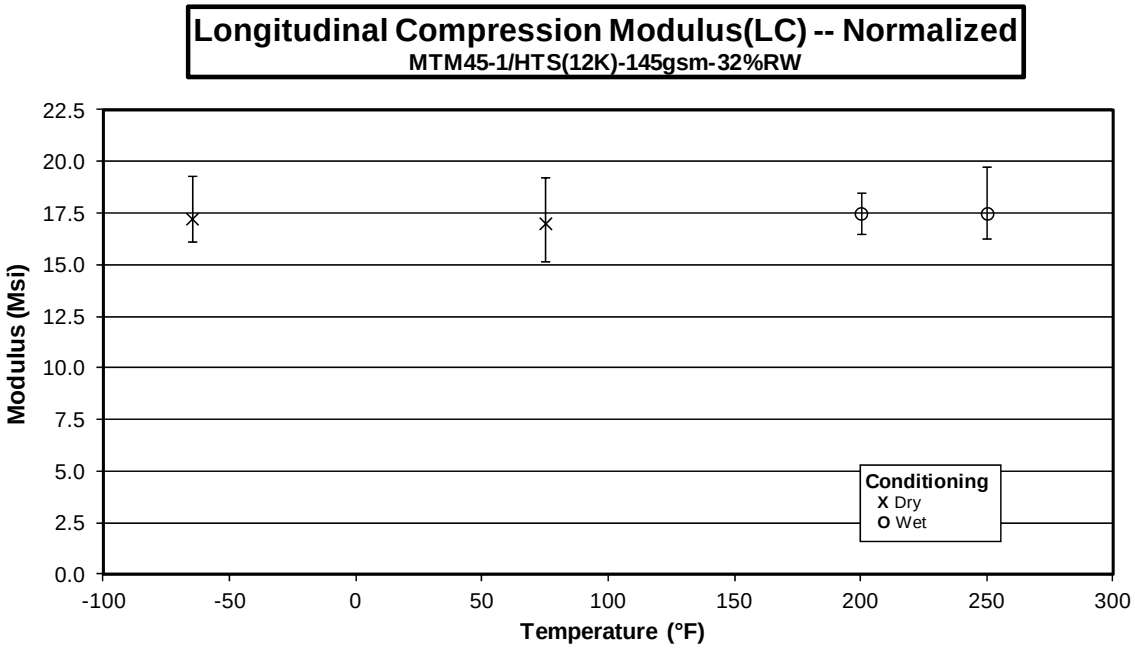


## 3.2 Transverse Tension Properties

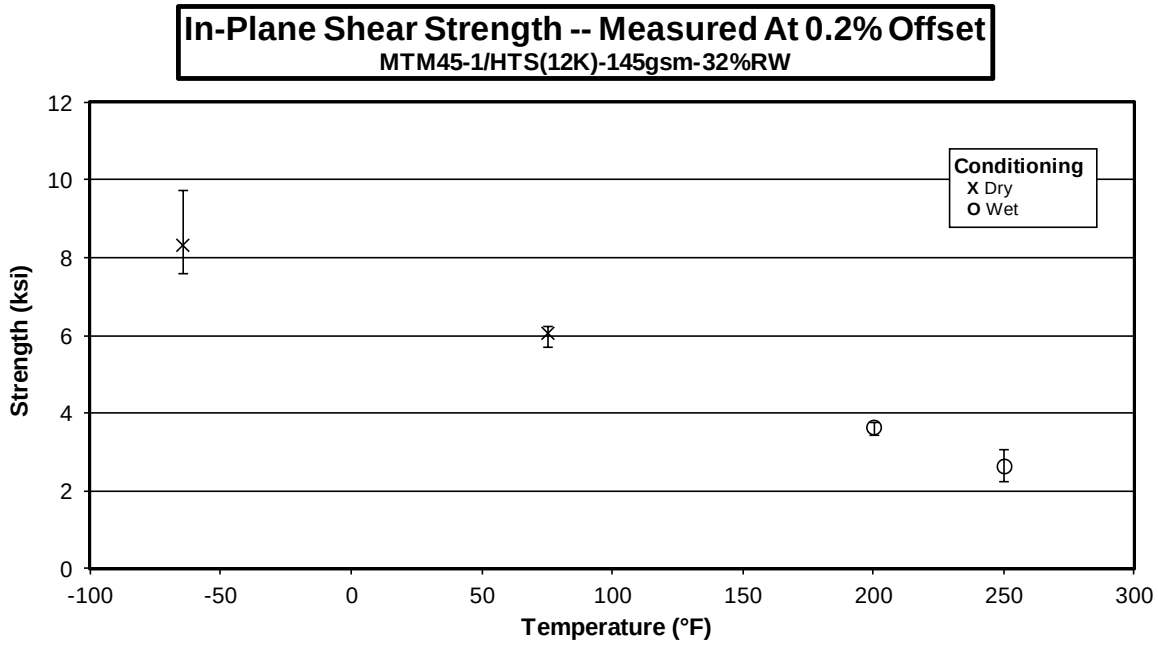


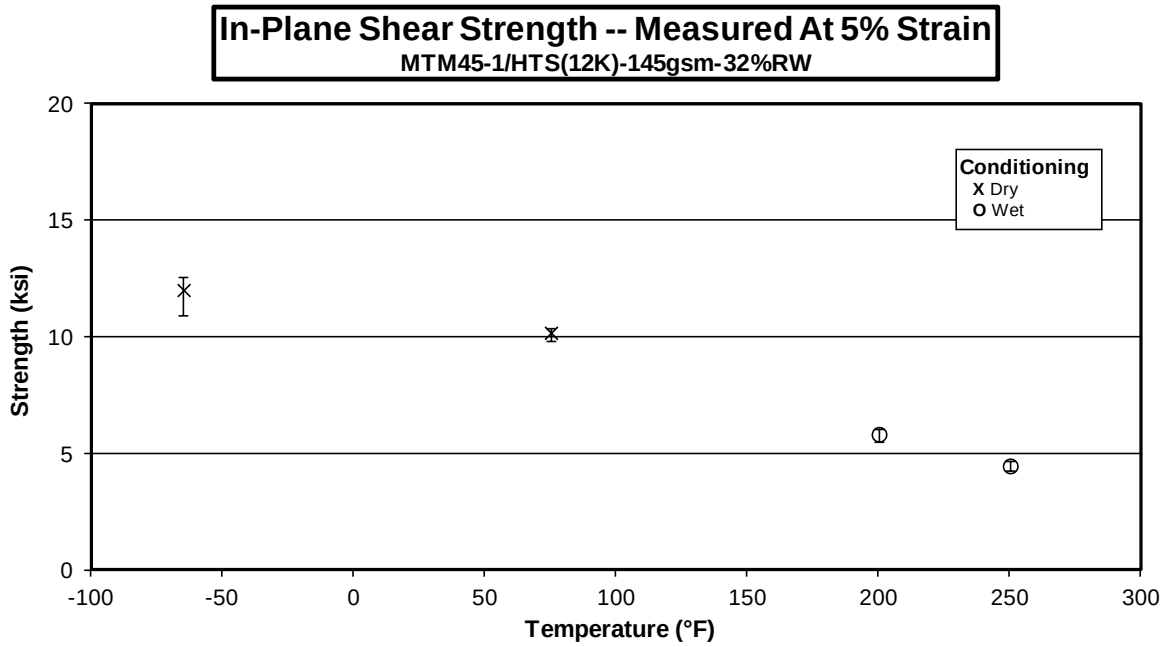



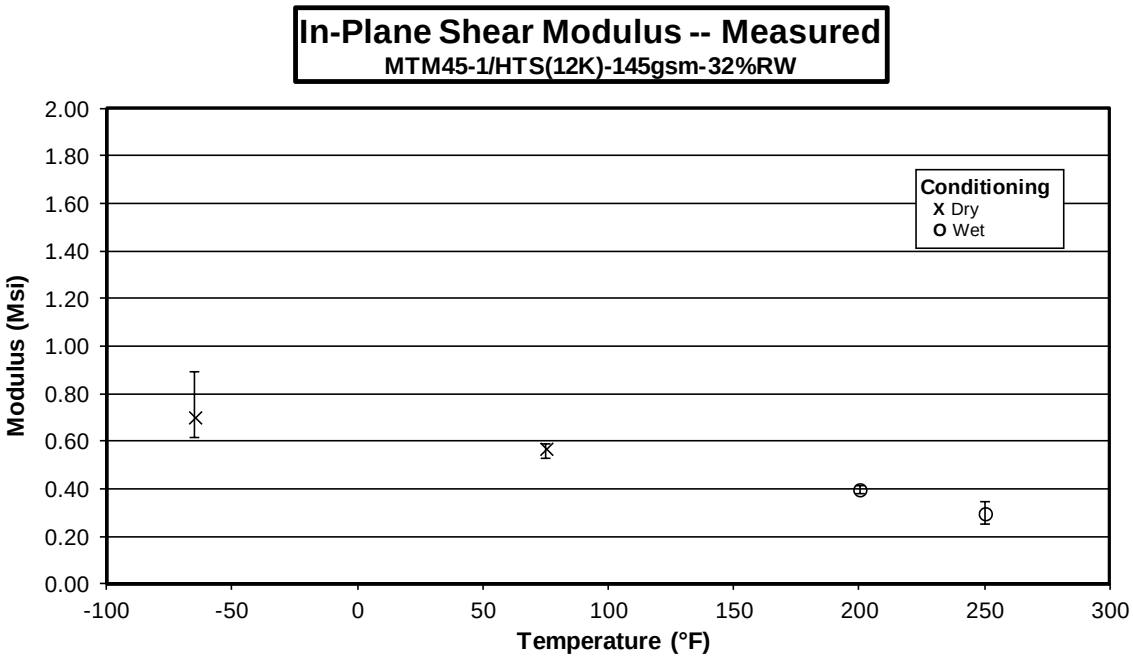
## 3.3 Longitudinal Compression Properties



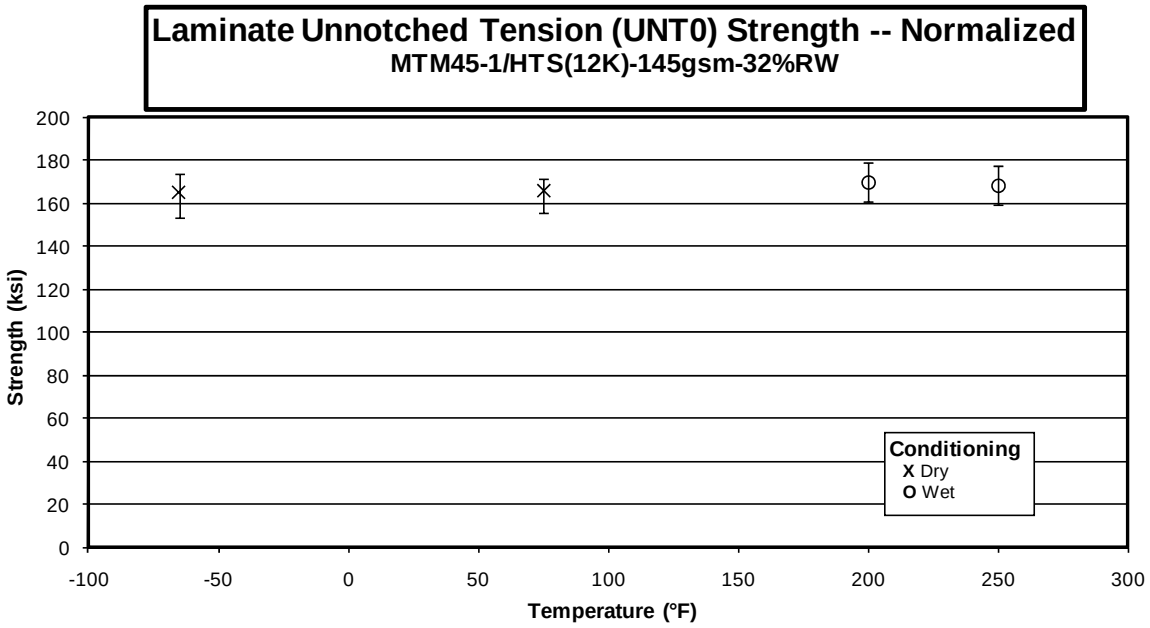
## 3.4 In-Plane Shear Properties

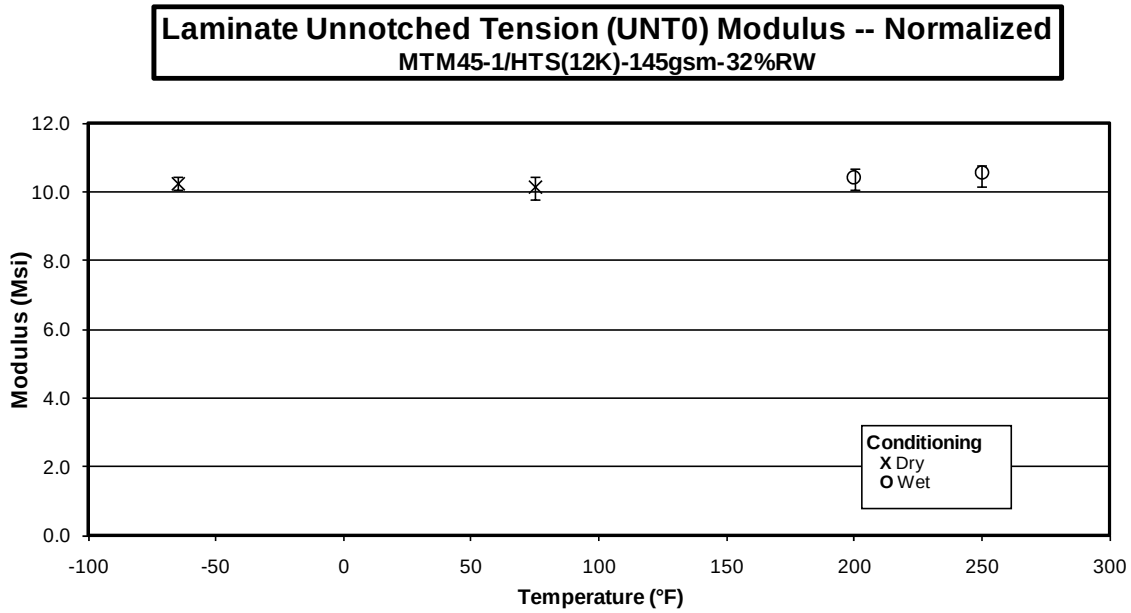


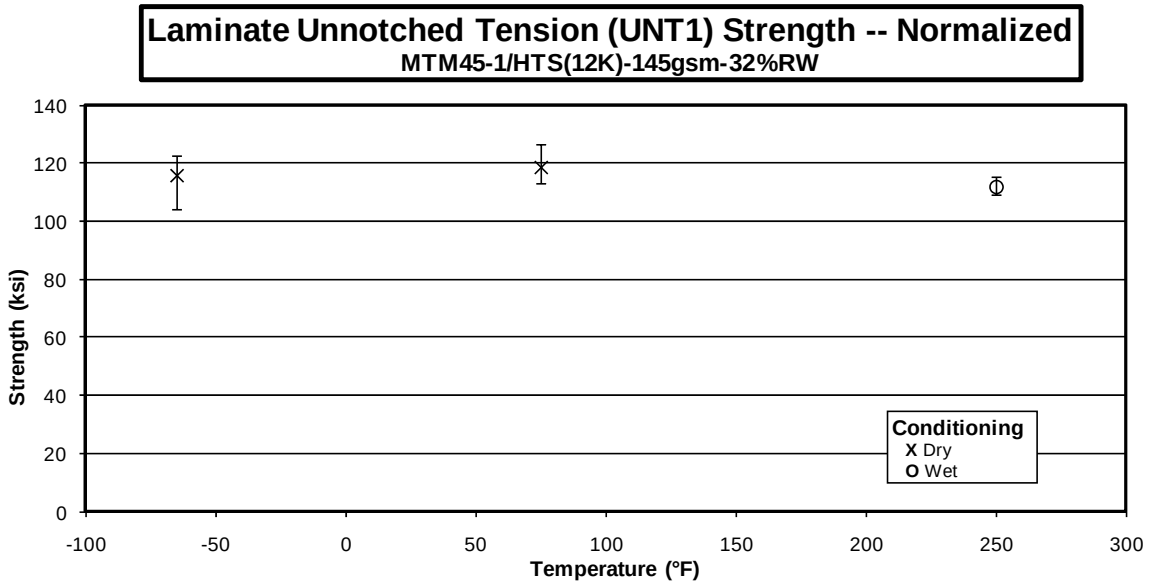

In-Plane Shear Modulus -- Measured
MTM45-1/HTS(12K)-145gsm-32%RW
Modulus (Msi)
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-100
-50
0
50
100
150
200
250
300
Temperature (°F)
Conditioning
X Dry
O Wet

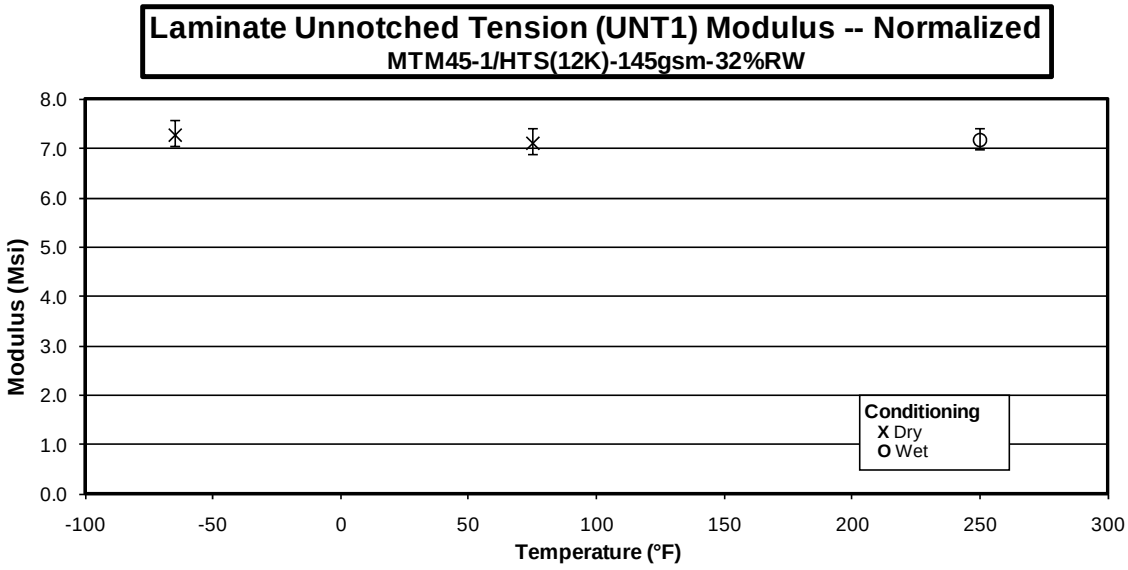
## 3.5 Unnotched Tension 0 Properties



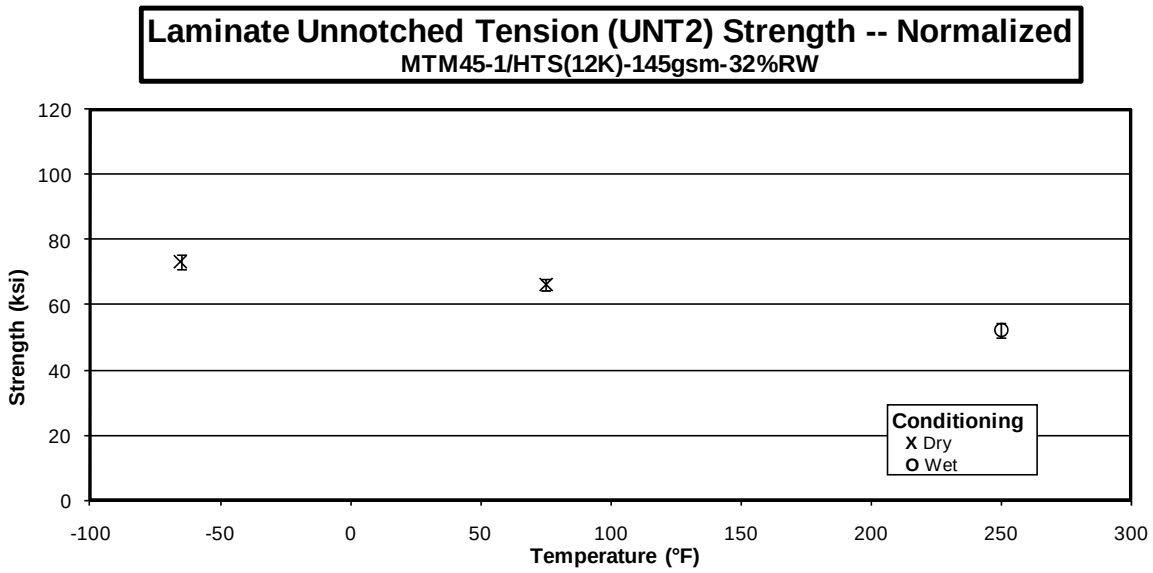



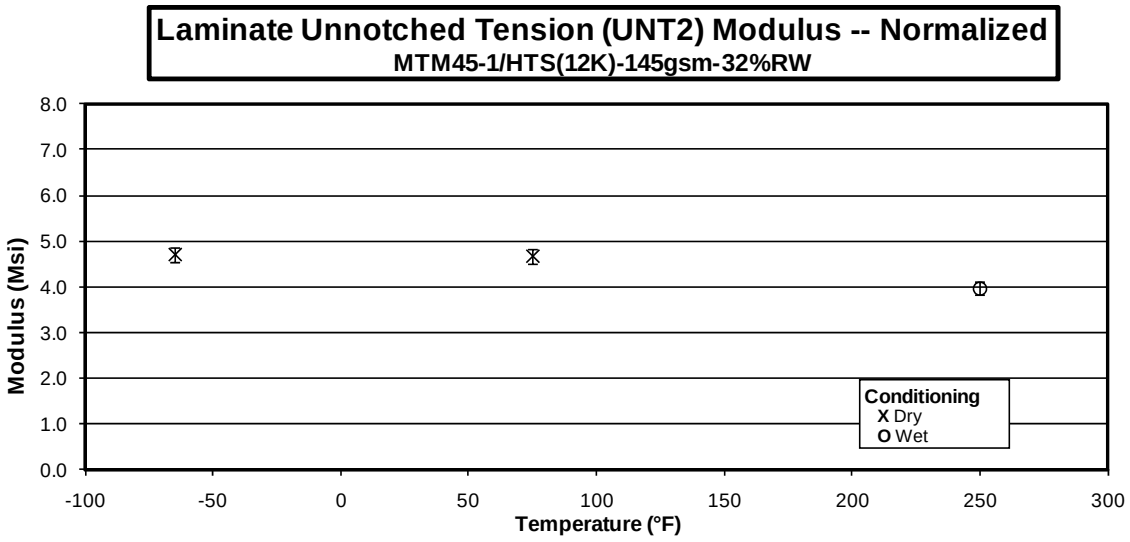
## 3.6 Unnotched Tension 1 Properties



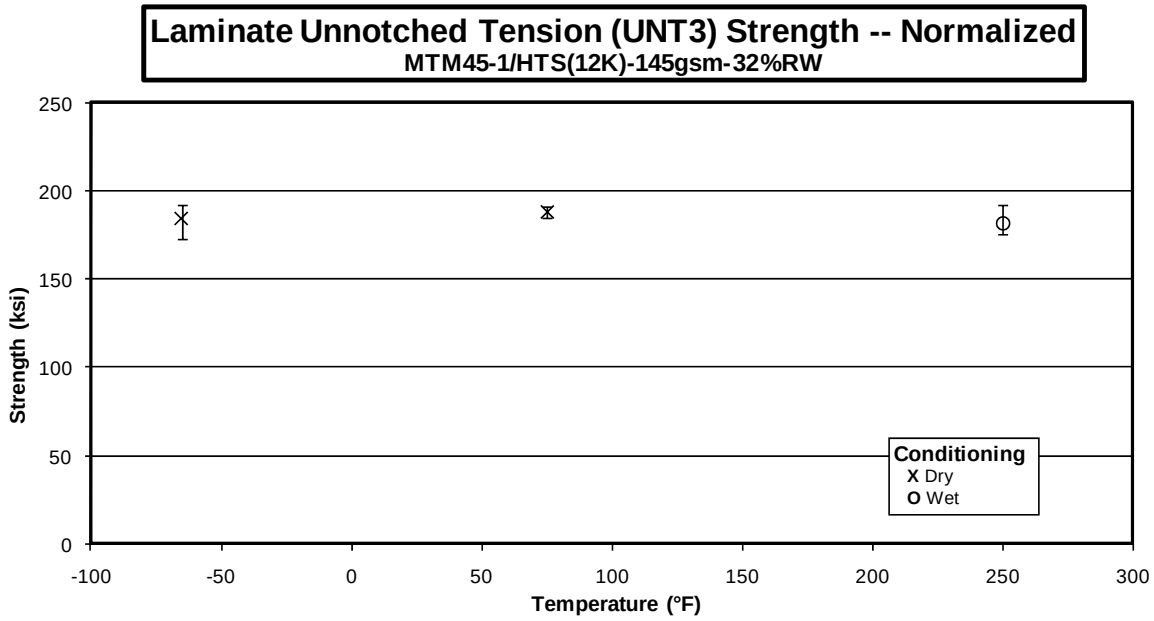



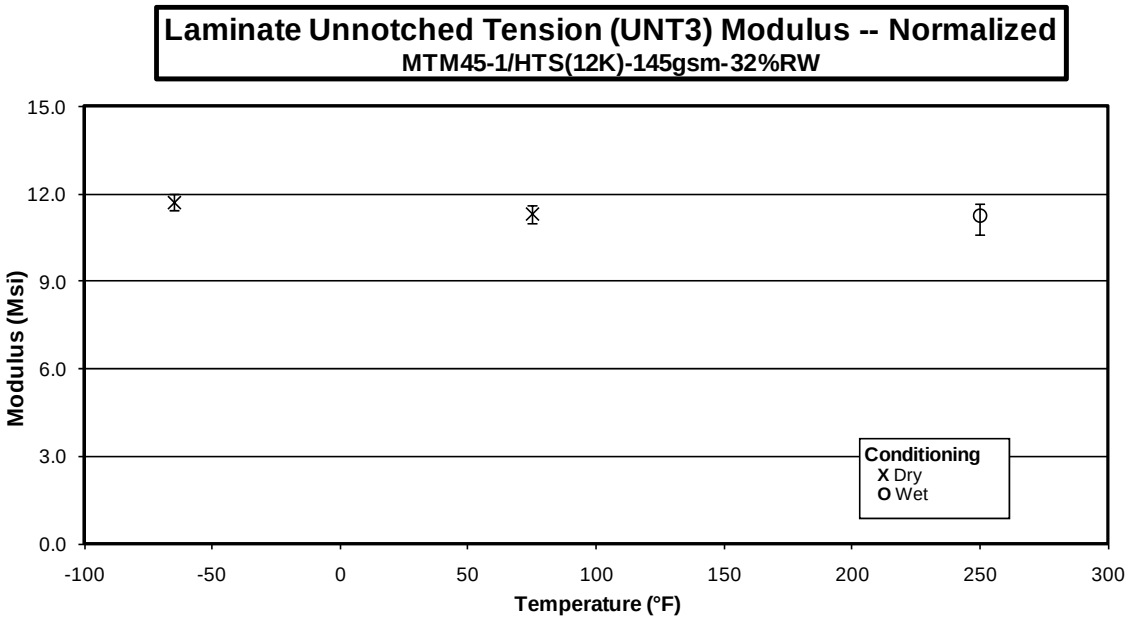
## 3.7 Unnotched Tension 2 Properties



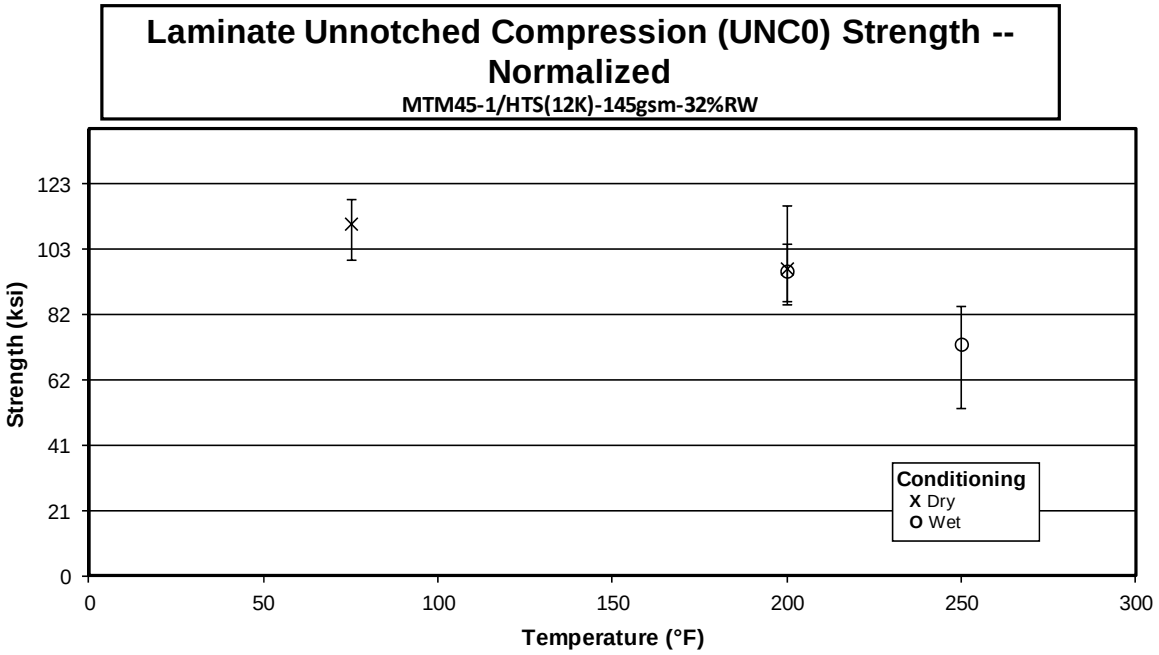



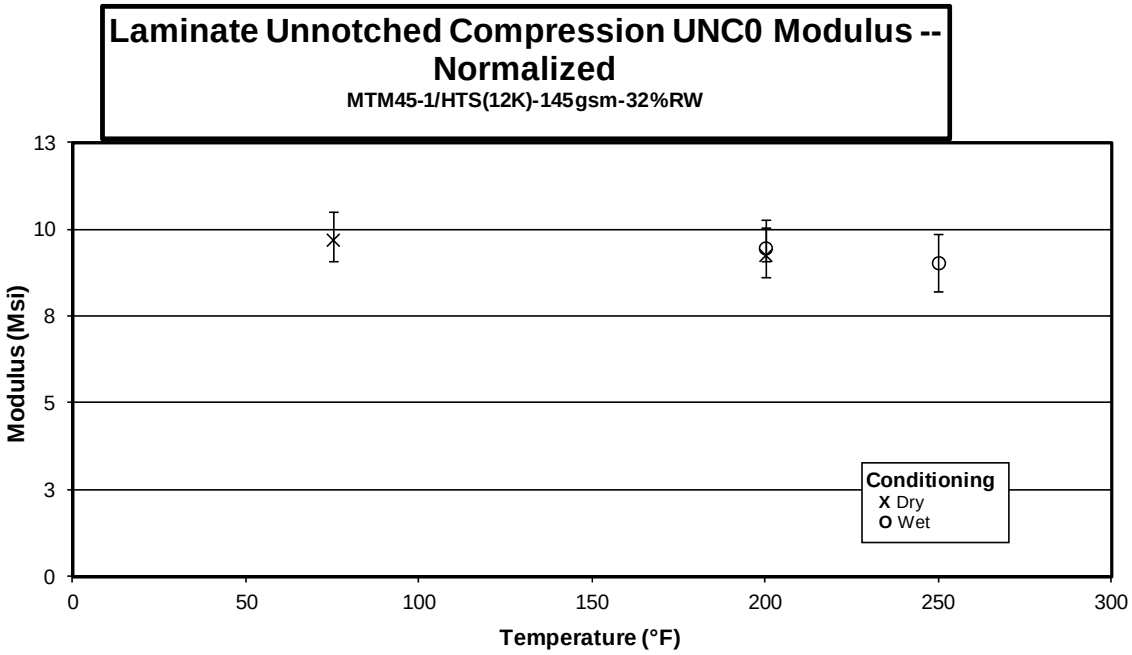
## 3.8 Unnotched Tension 3 Properties



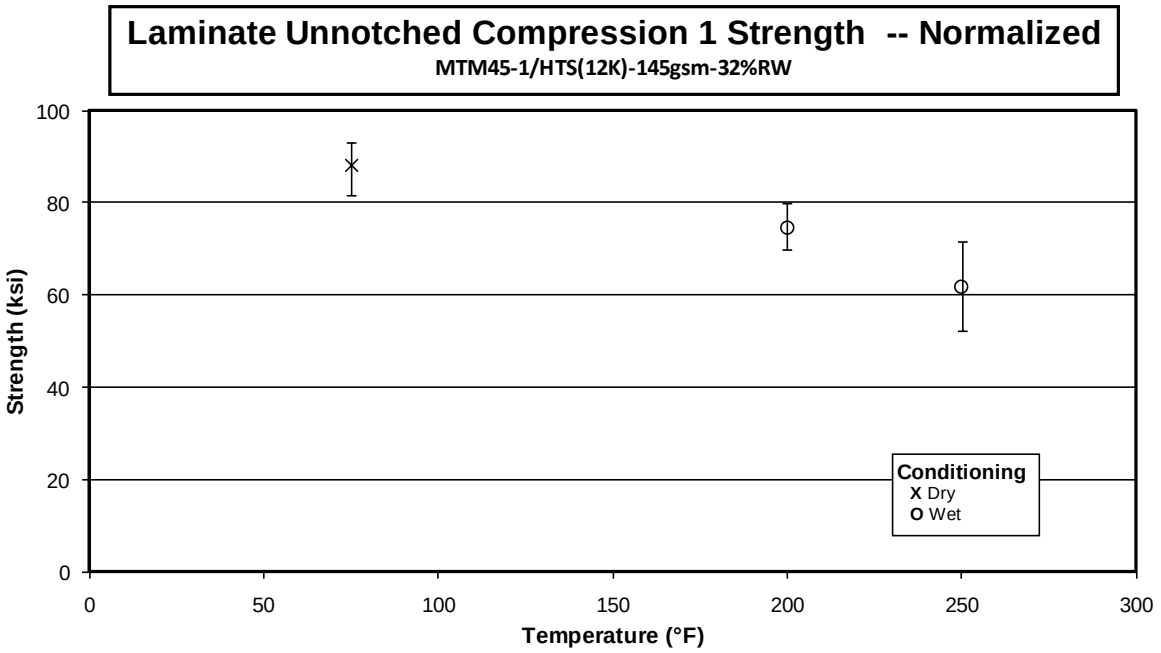



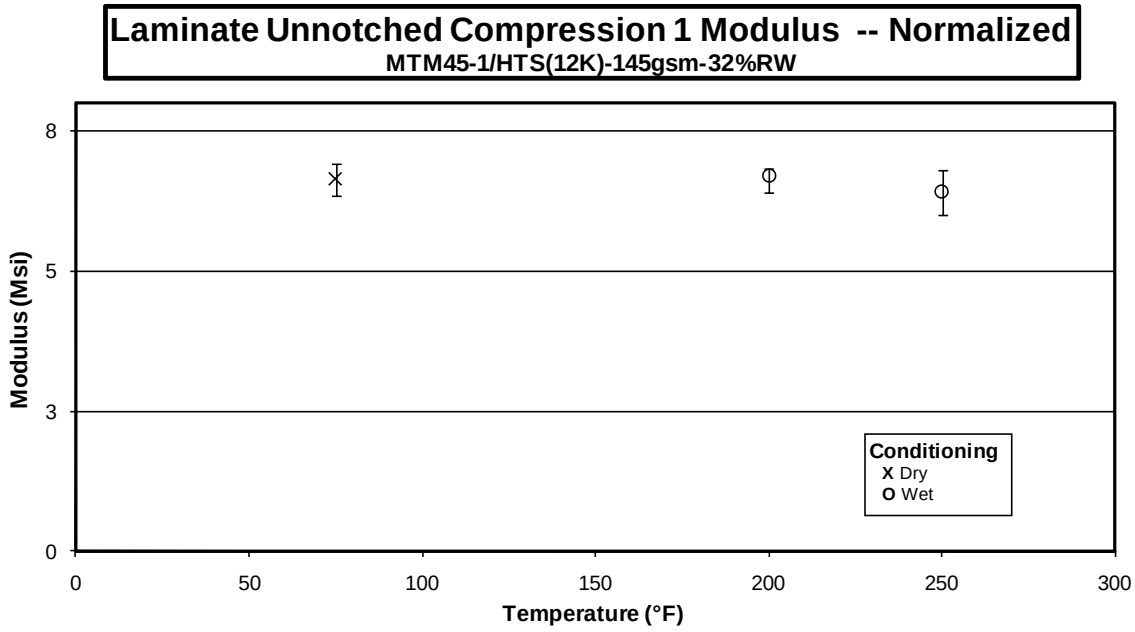
## 3.9 Unnotched Compression 0 Properties



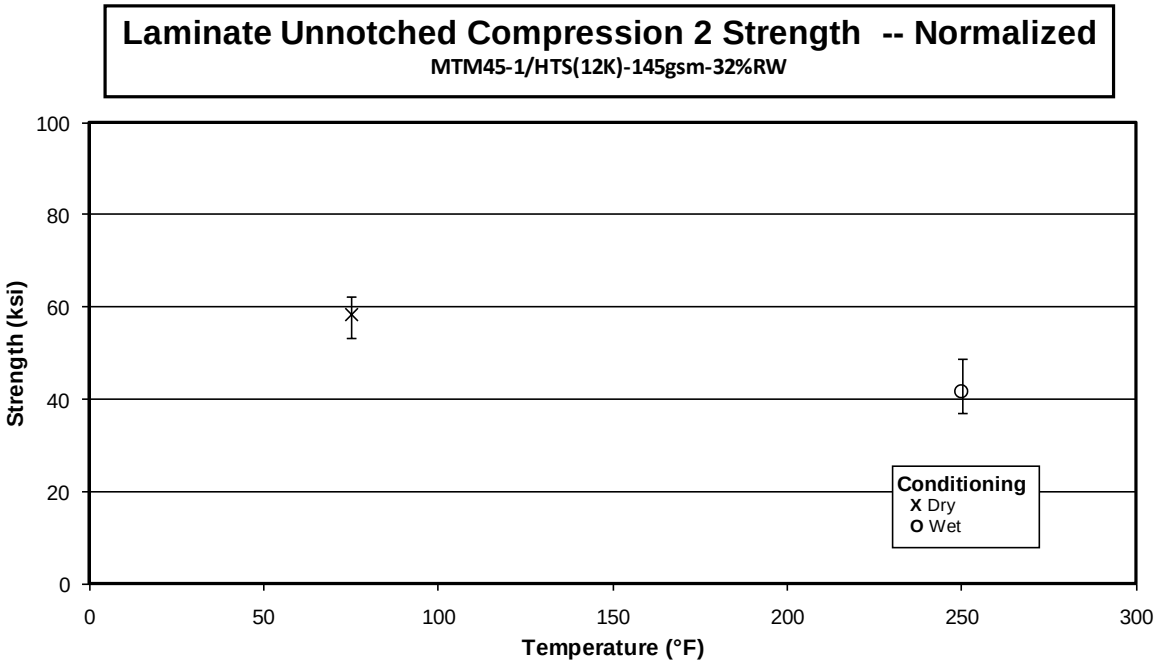



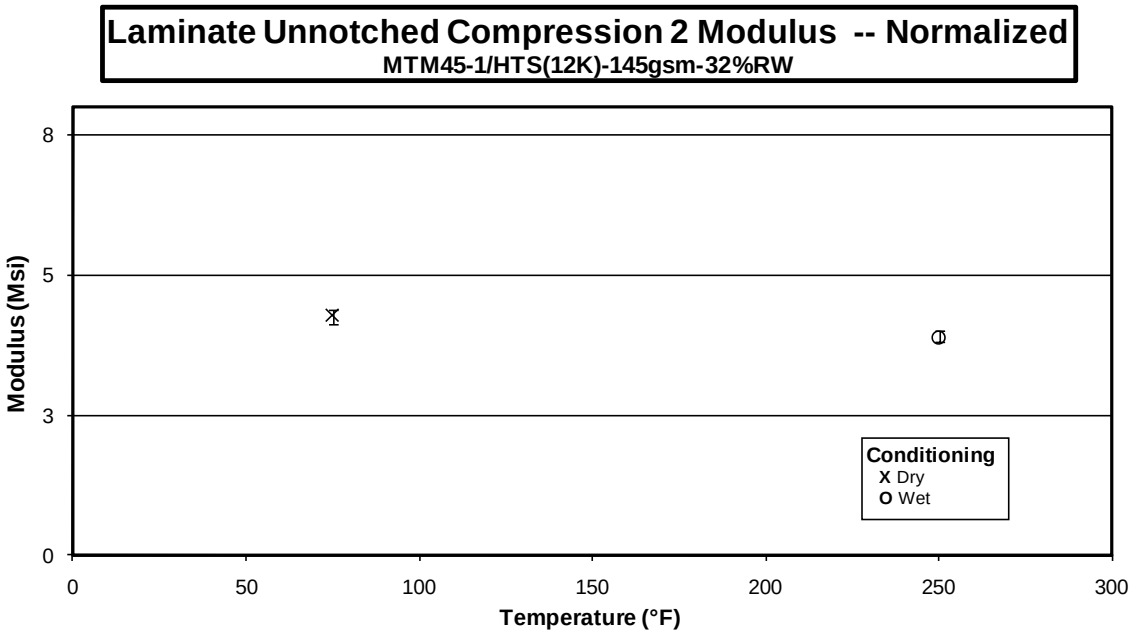
## 3.10 Unnotched Compression 1 Properties



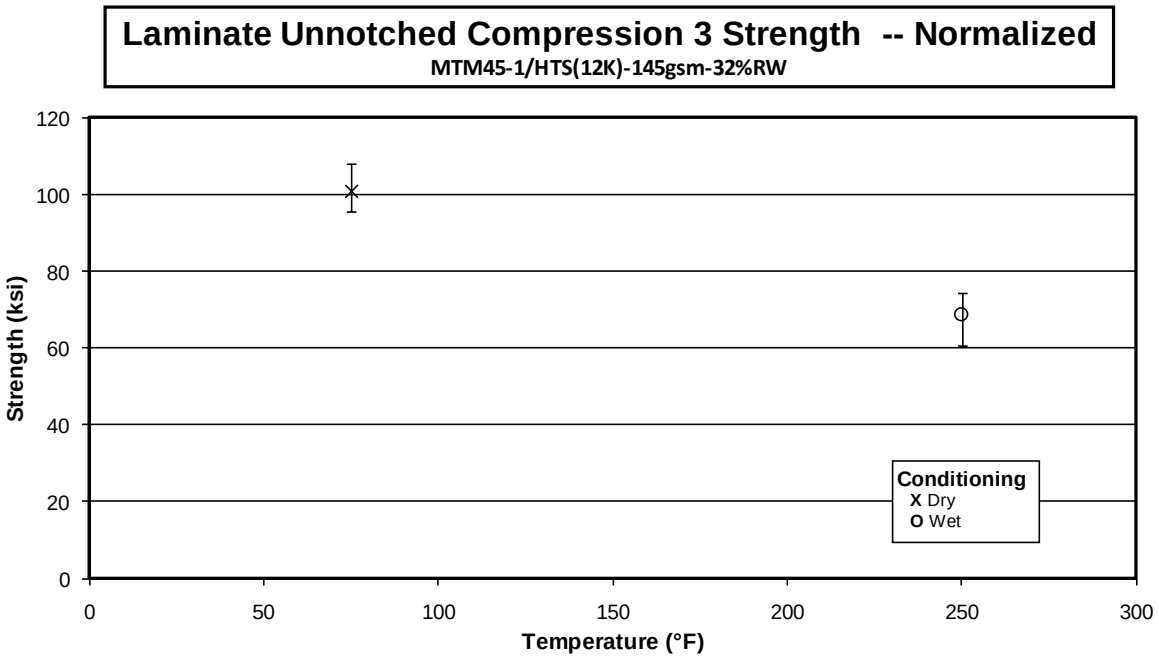



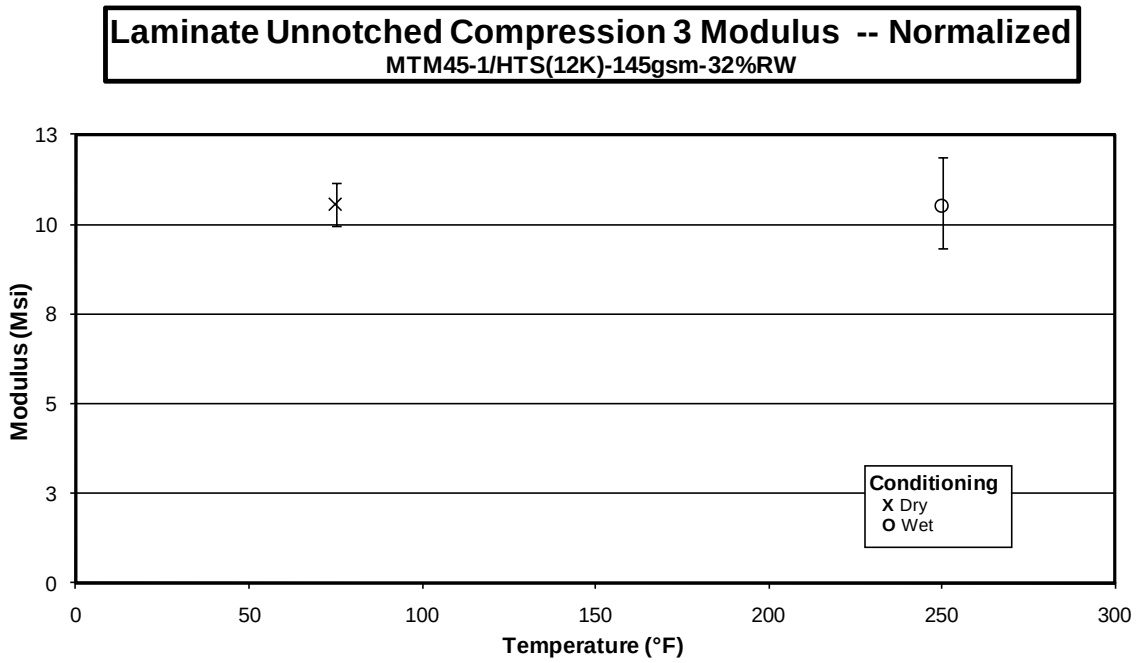
## 3.11 Unnotched Compression 2 Properties



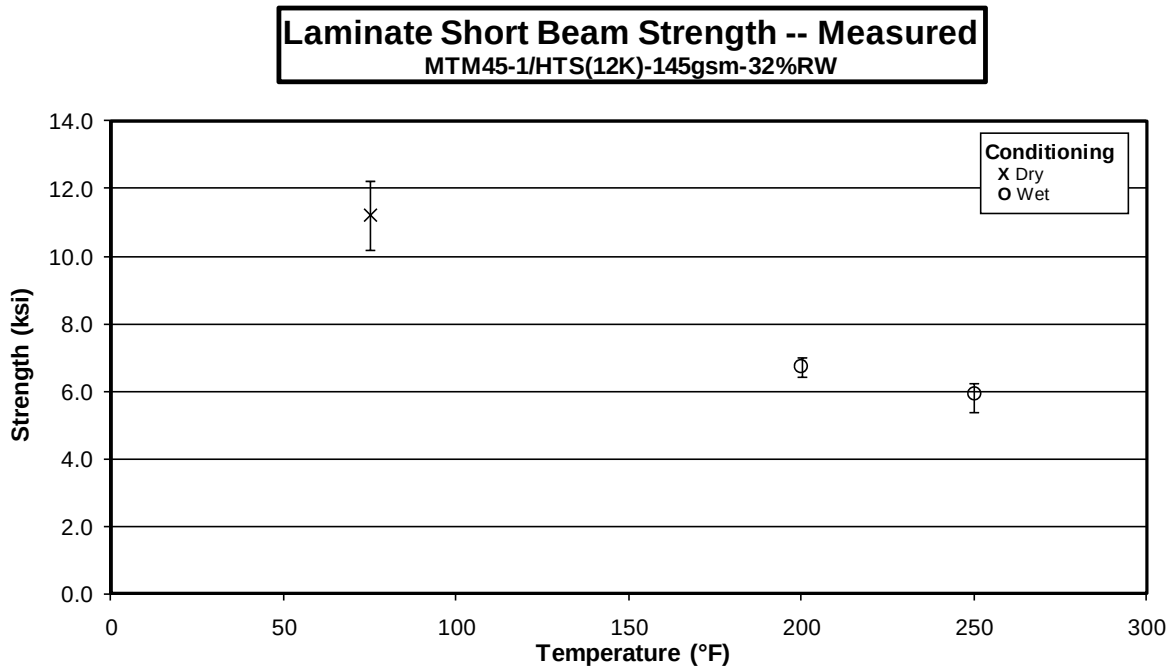



## 3.12 Unnotched Compression 3 Properties

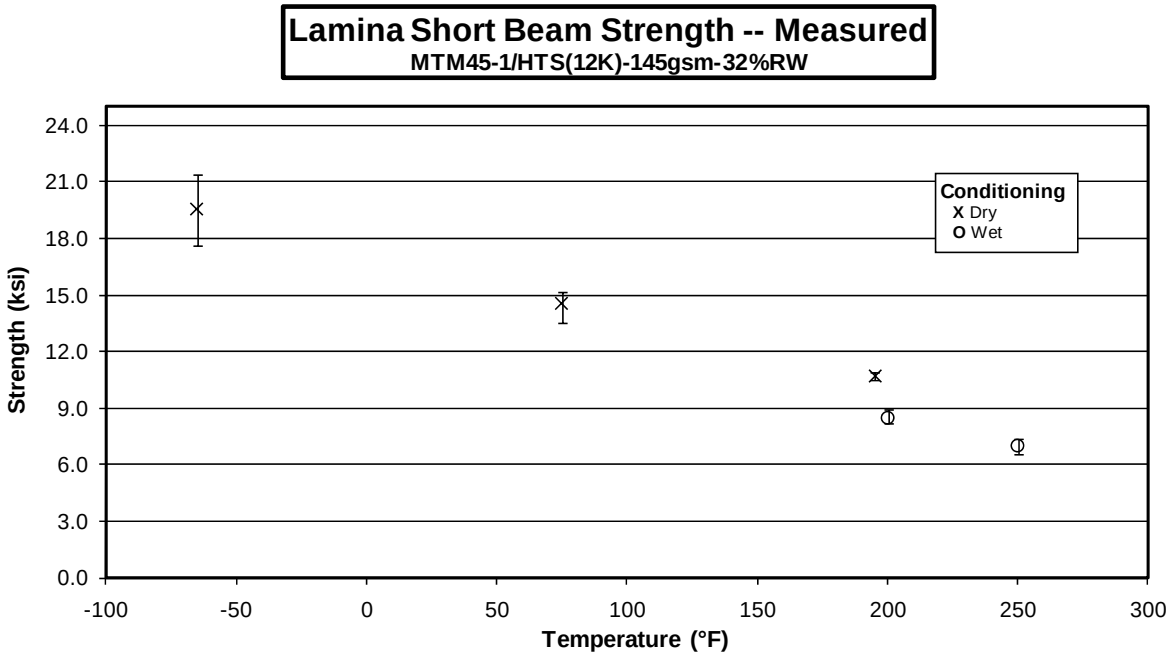


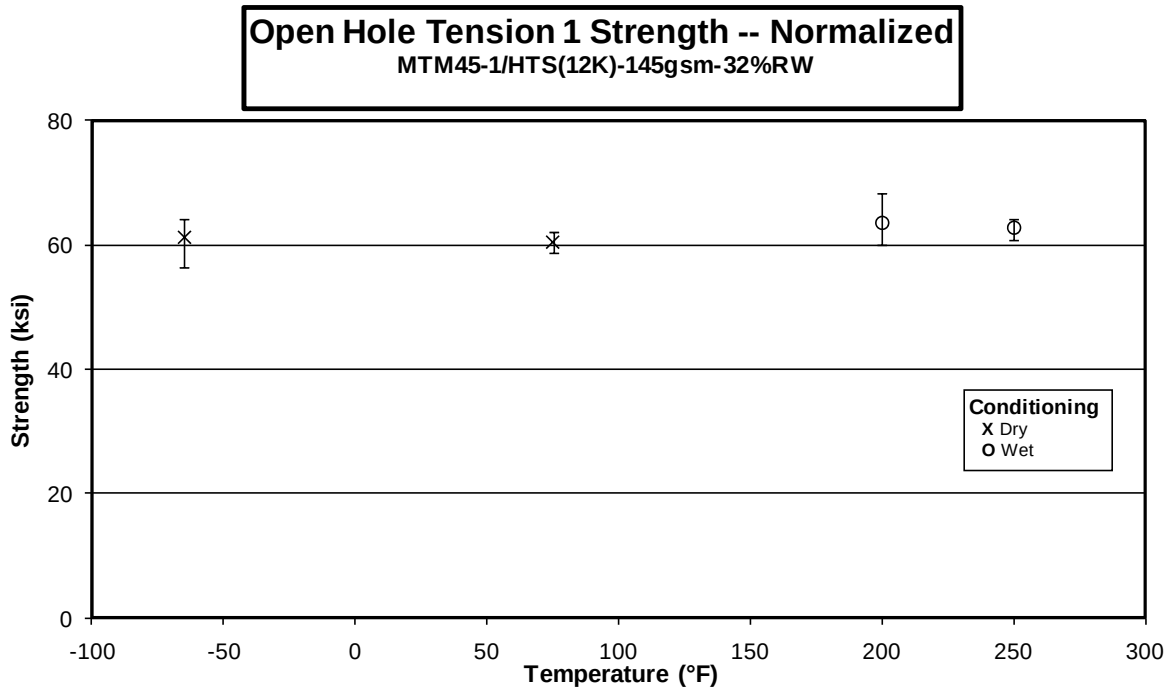
## 3.13 Laminate Short Beam Strength Properties



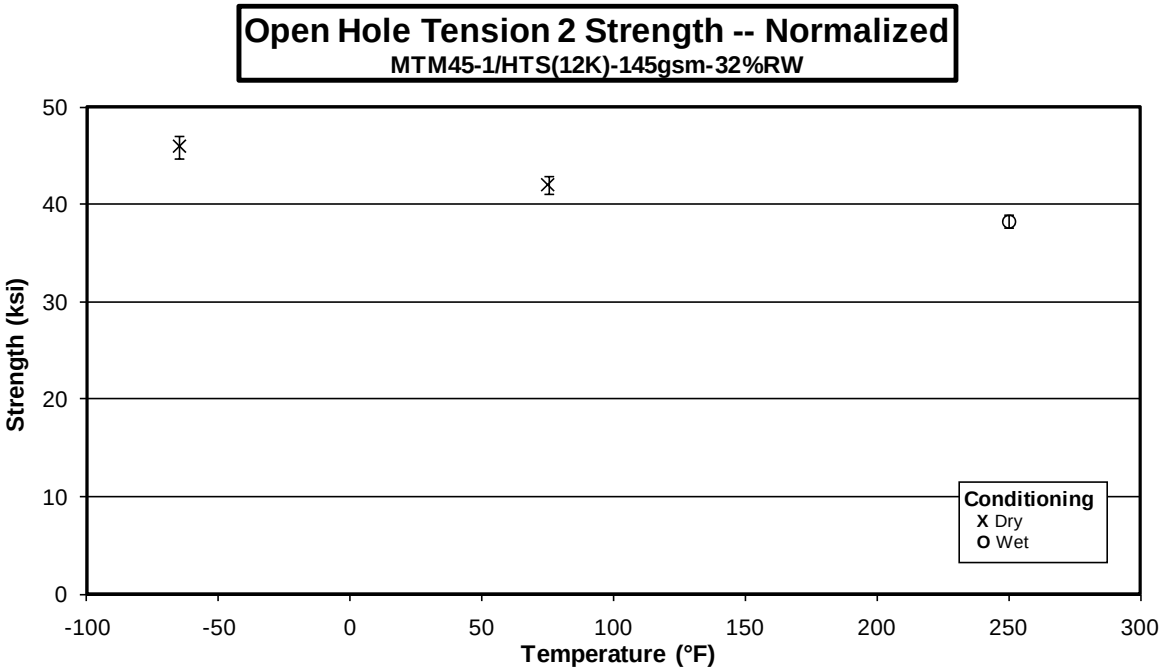
## 3.14 Lamina Short Beam Strength Properties



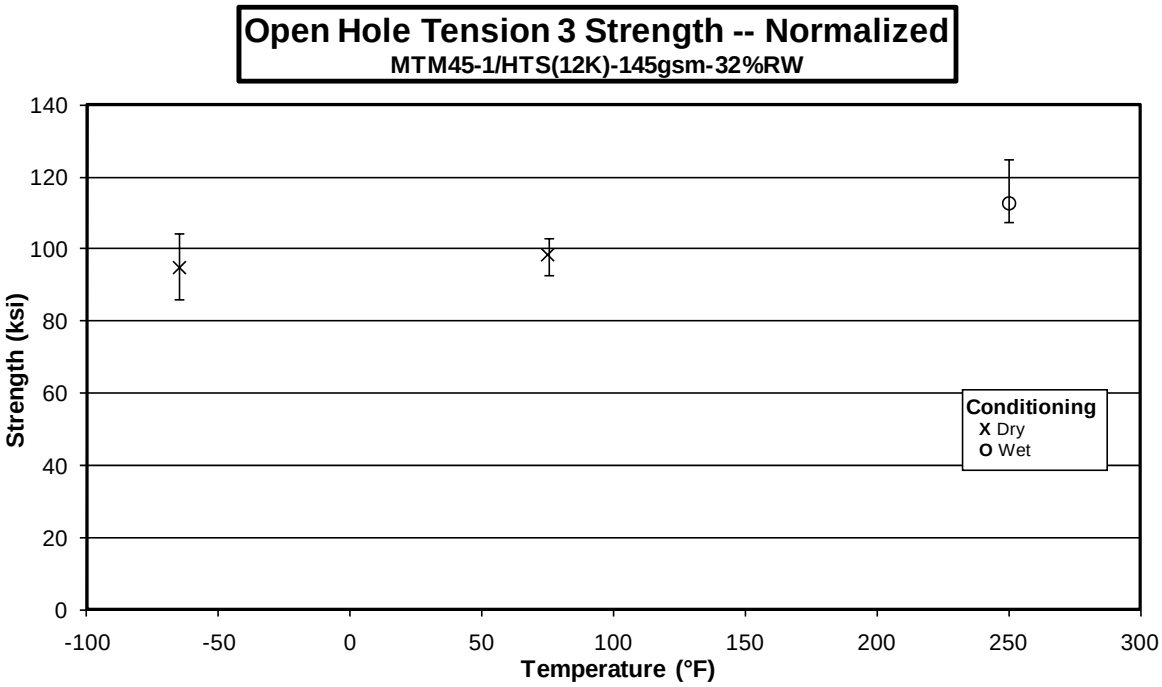

## 3.15 Open Hole Tension 1 Properties



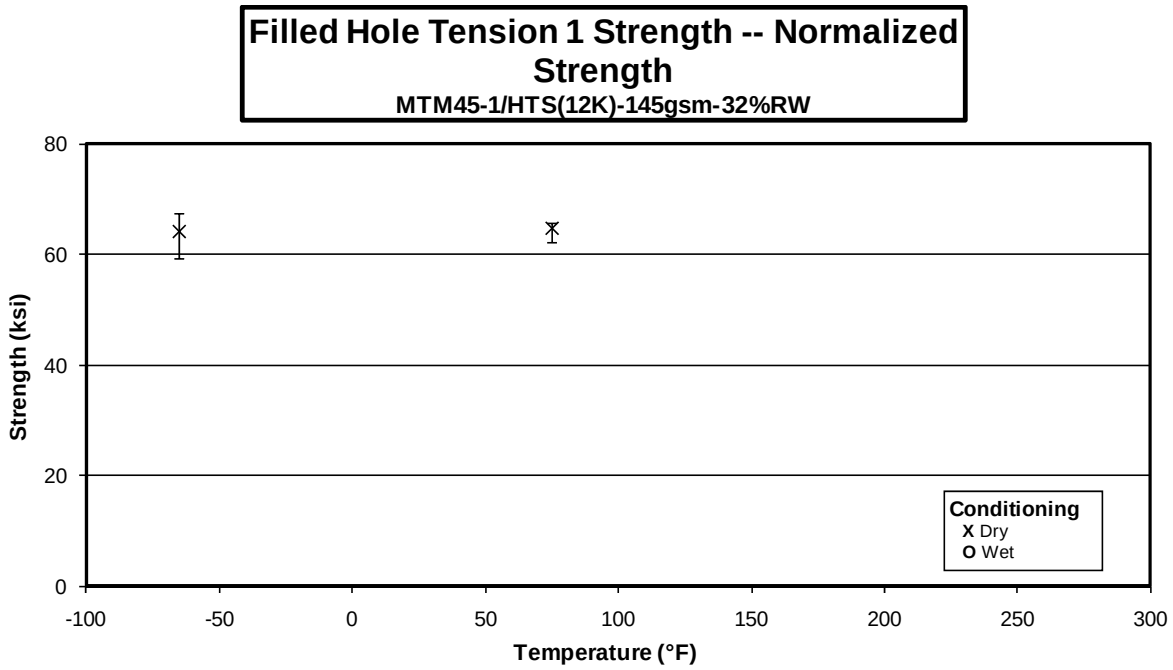
## 3.16 Open Hole Tension 2 Properties



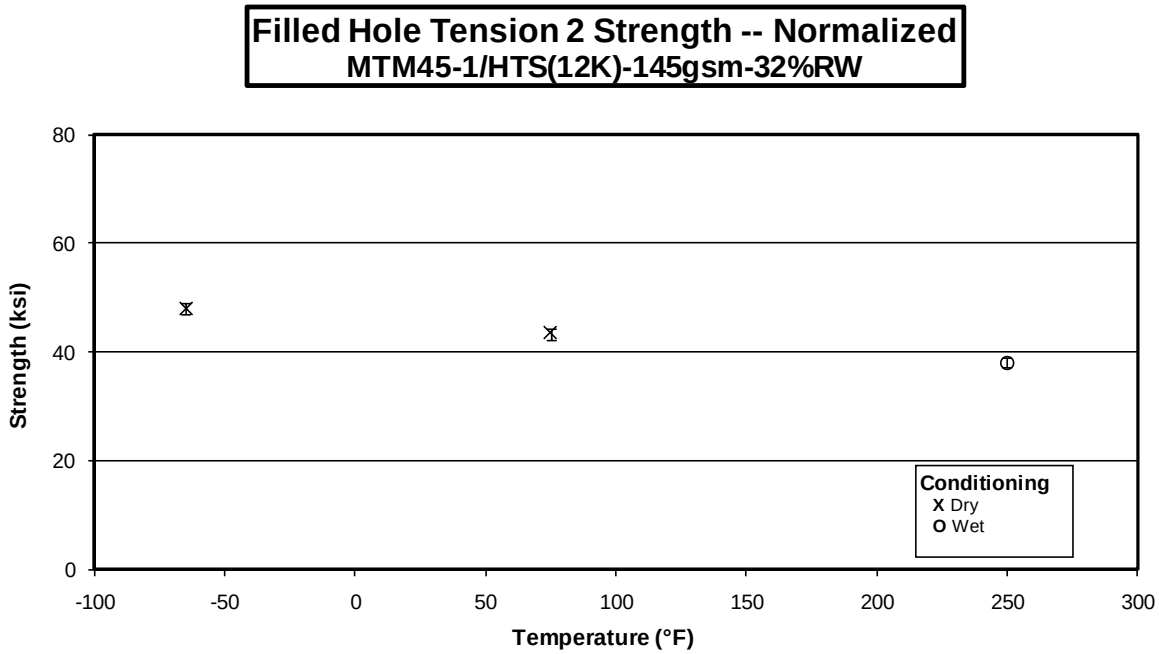
## 3.17 Open Hole Tension 3 Properties



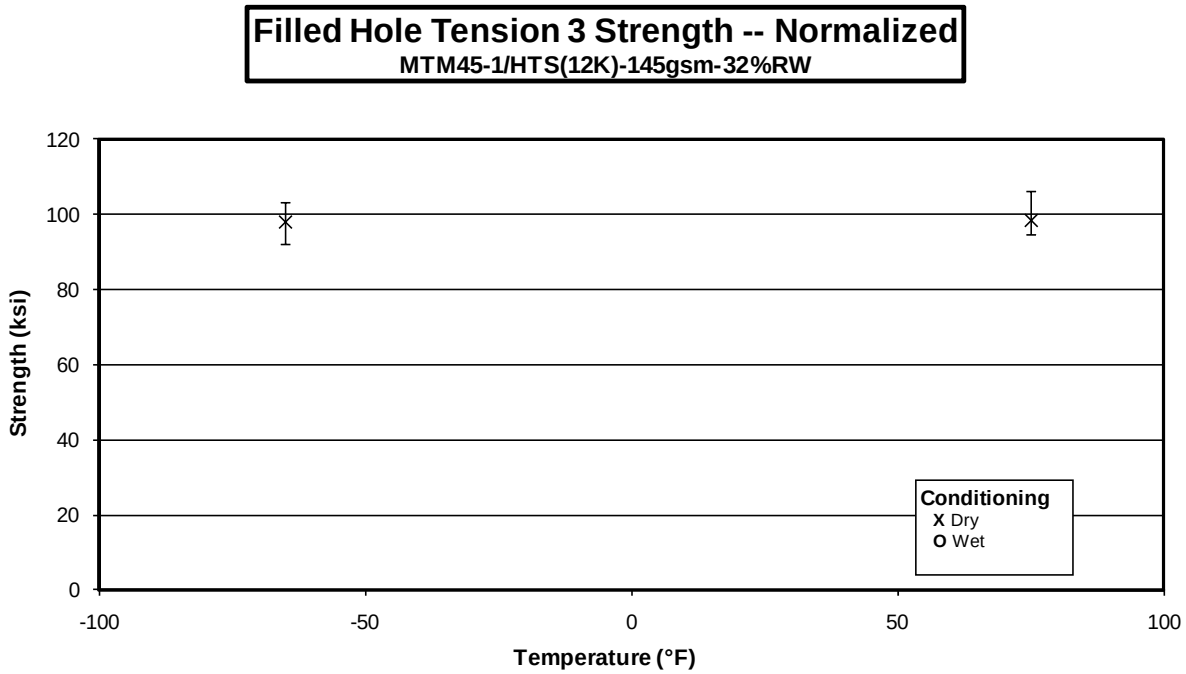
## 3.18 Filled-Hole Tension 1 Properties



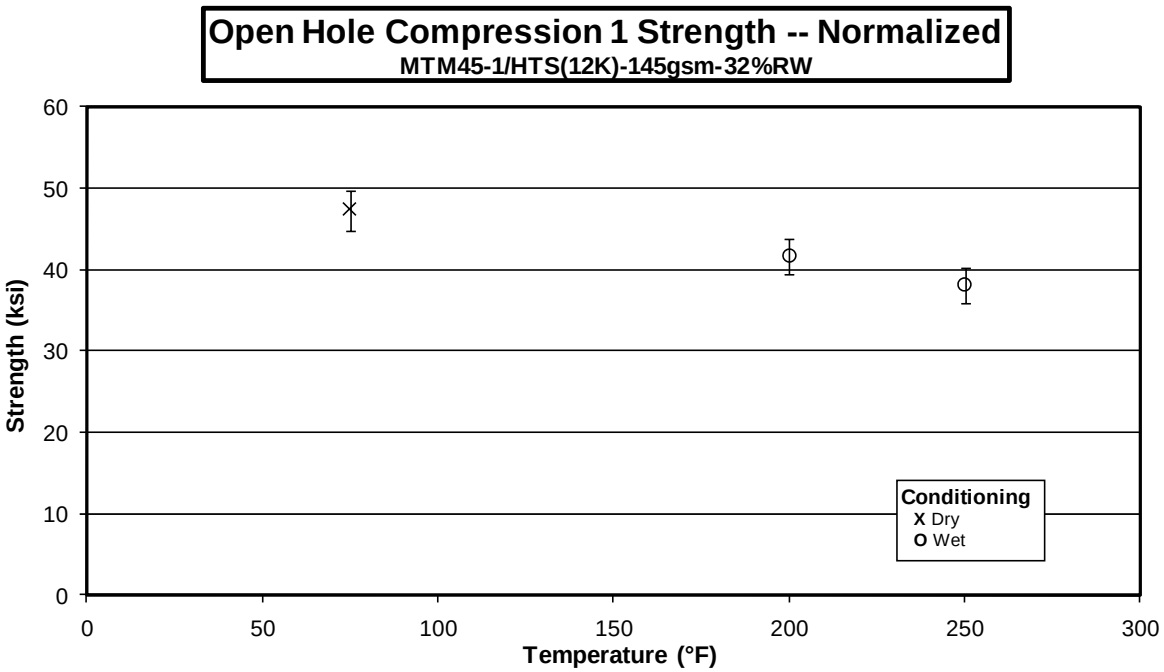

## 3.19 Filled-Hole Tension 2 Properties



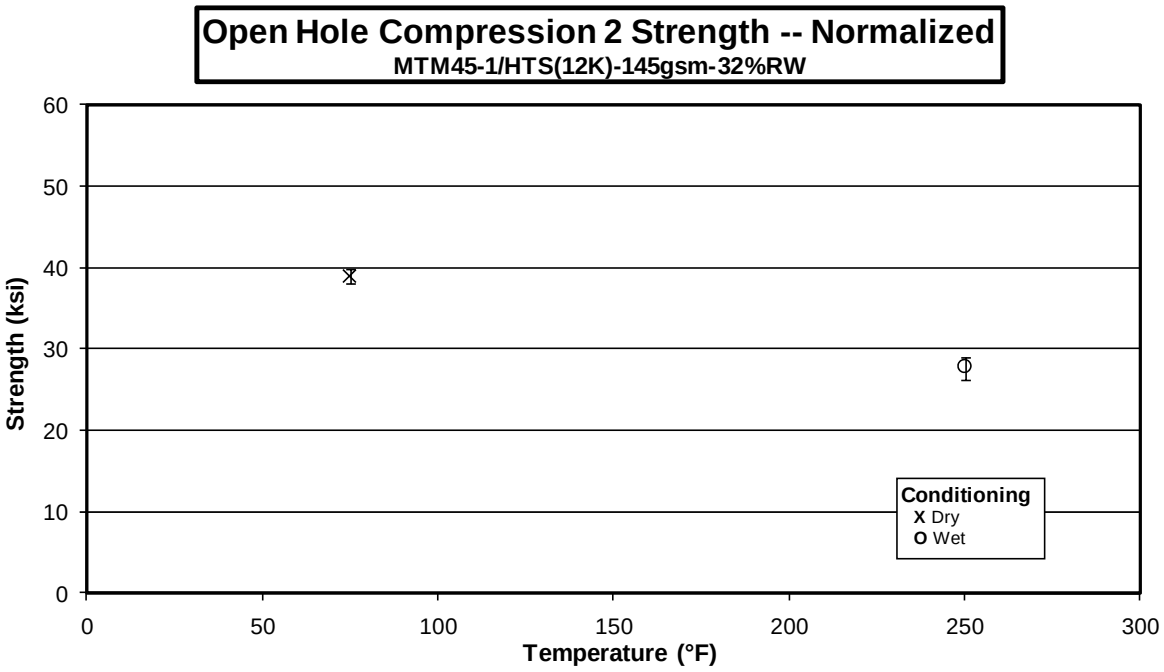
## 3.20 Filled-Hole Tension 3 Properties



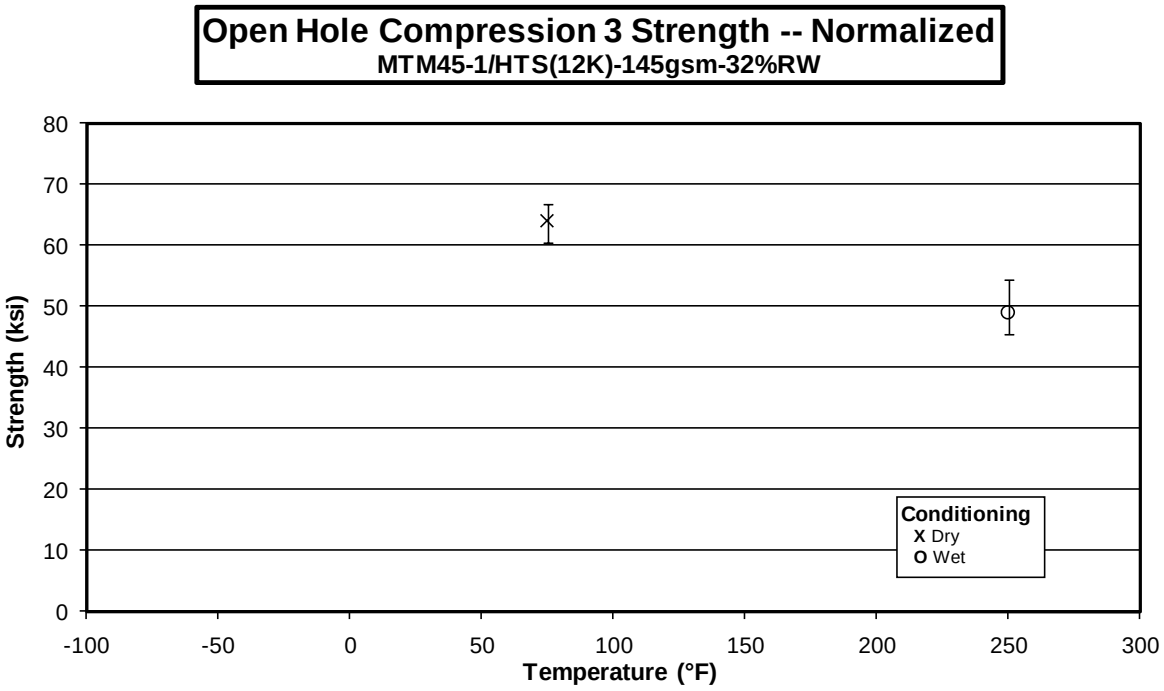
## 3.21 Open Hole Compression 1 Properties



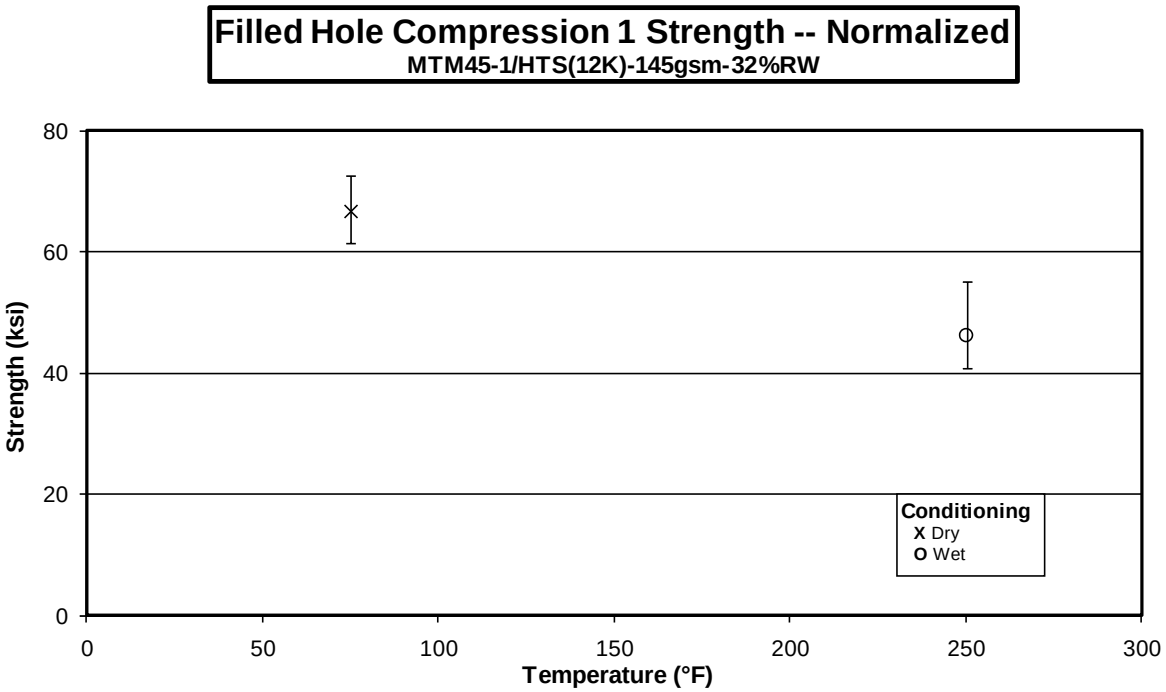

## 3.22 Open Hole Compression 2 Properties



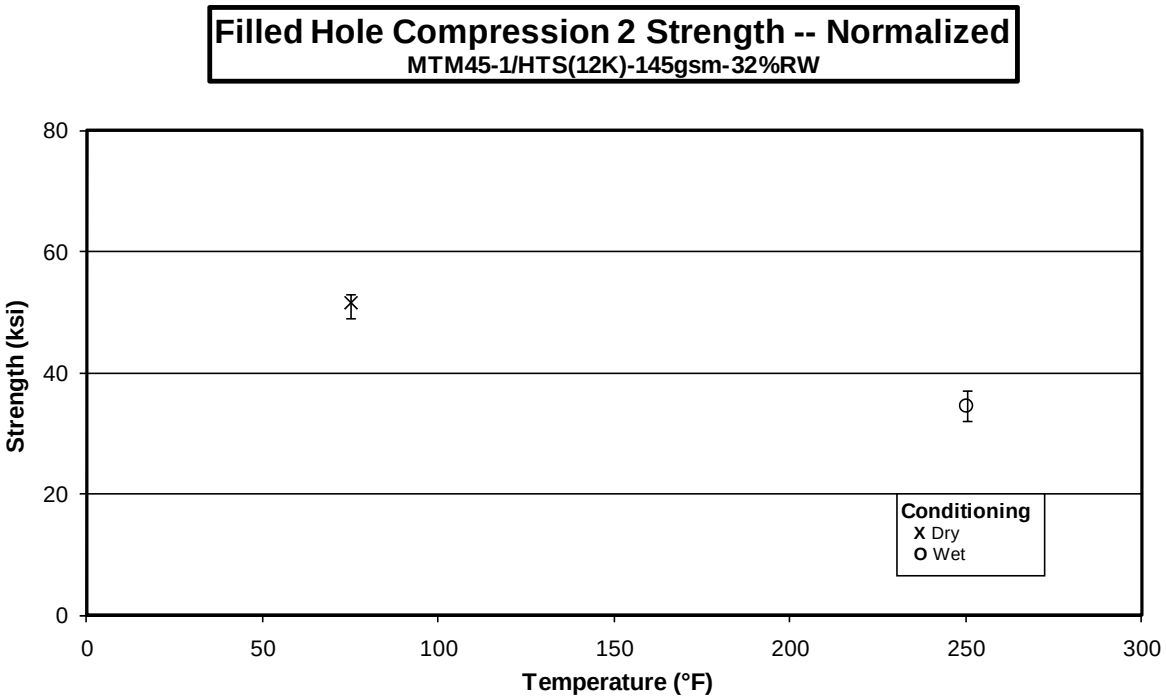
## 3.23 Open Hole Compression 3 Properties



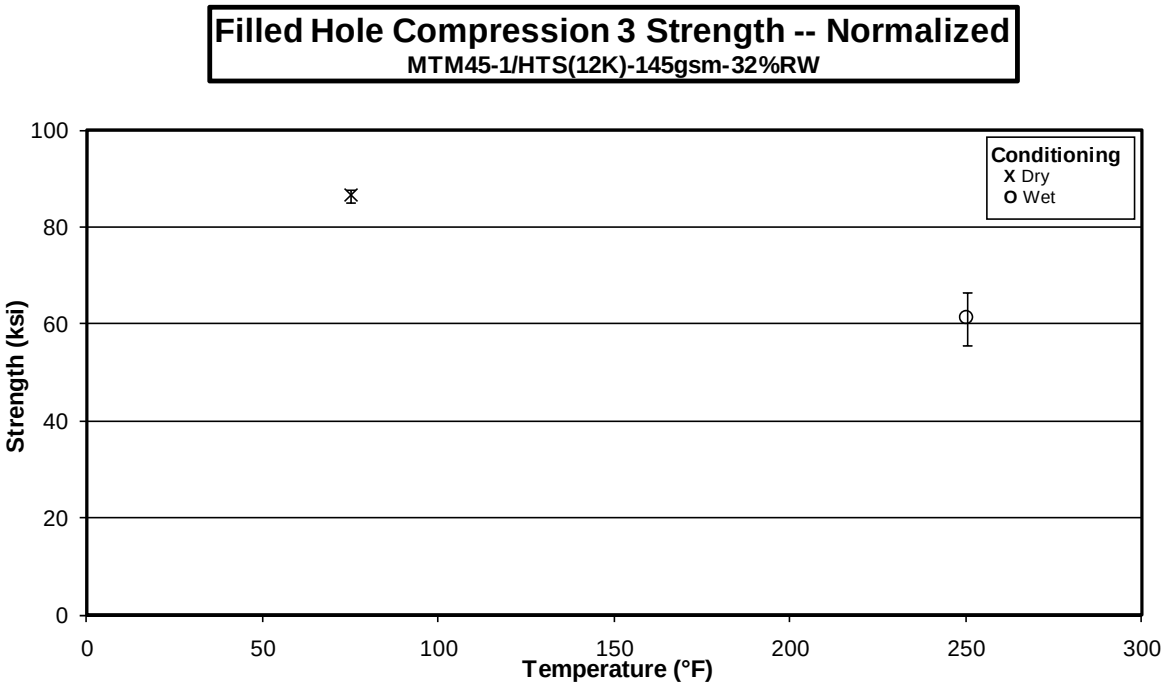
## 3.24 Filled-Hole Compression 1 Properties



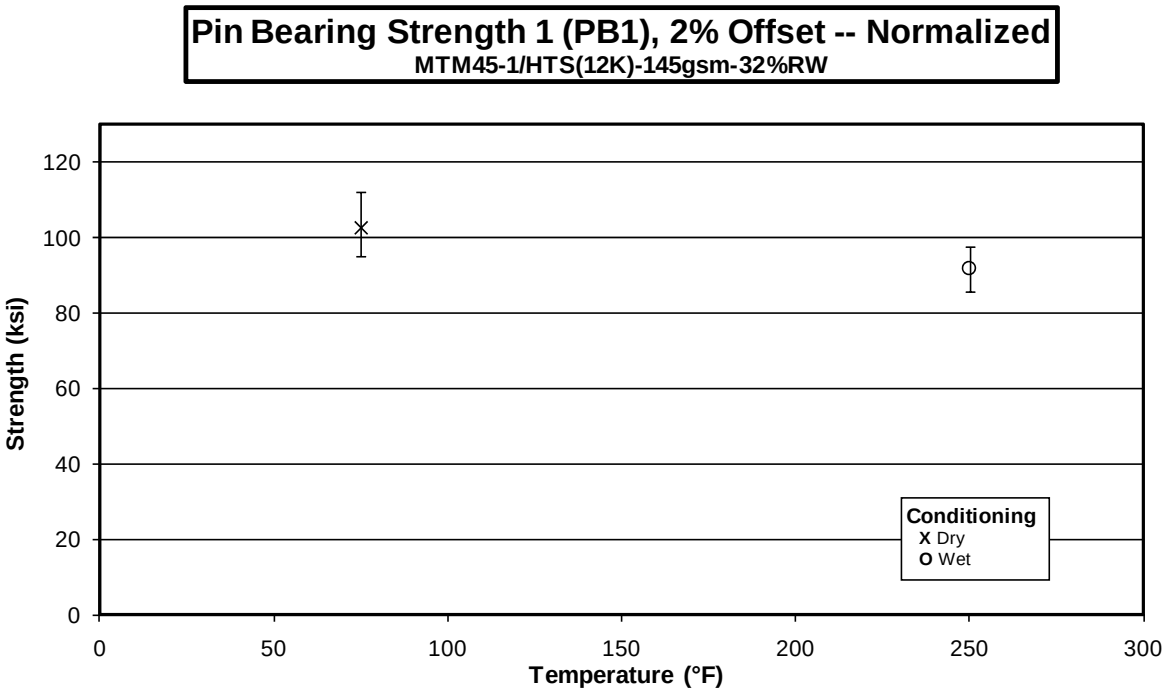

## 3.25 Filled-Hole Compression 2 Properties



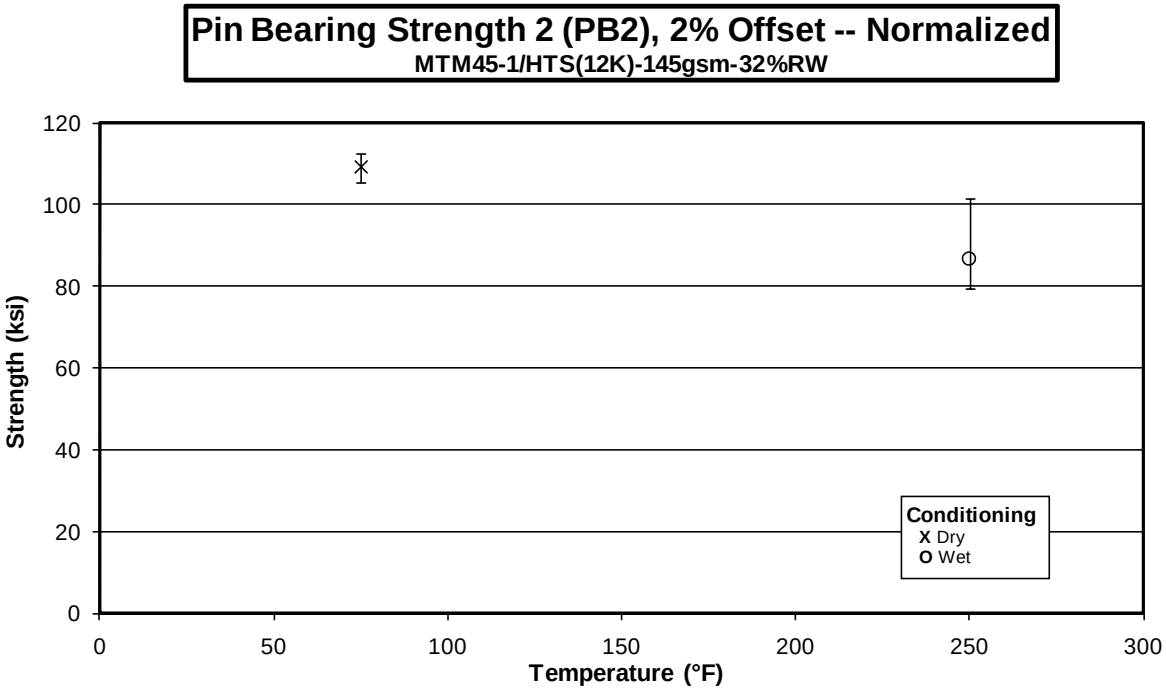
## 3.26 Filled-Hole Compression 3 Properties



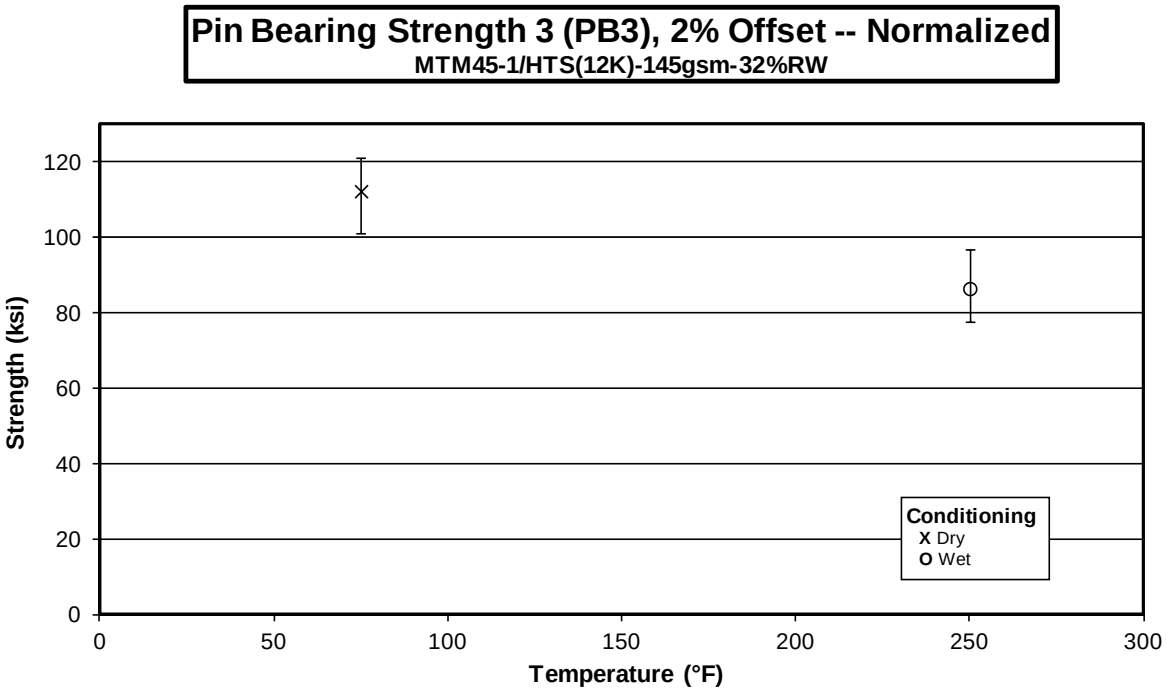
## 3.27 Pin Bearing 1 Properties



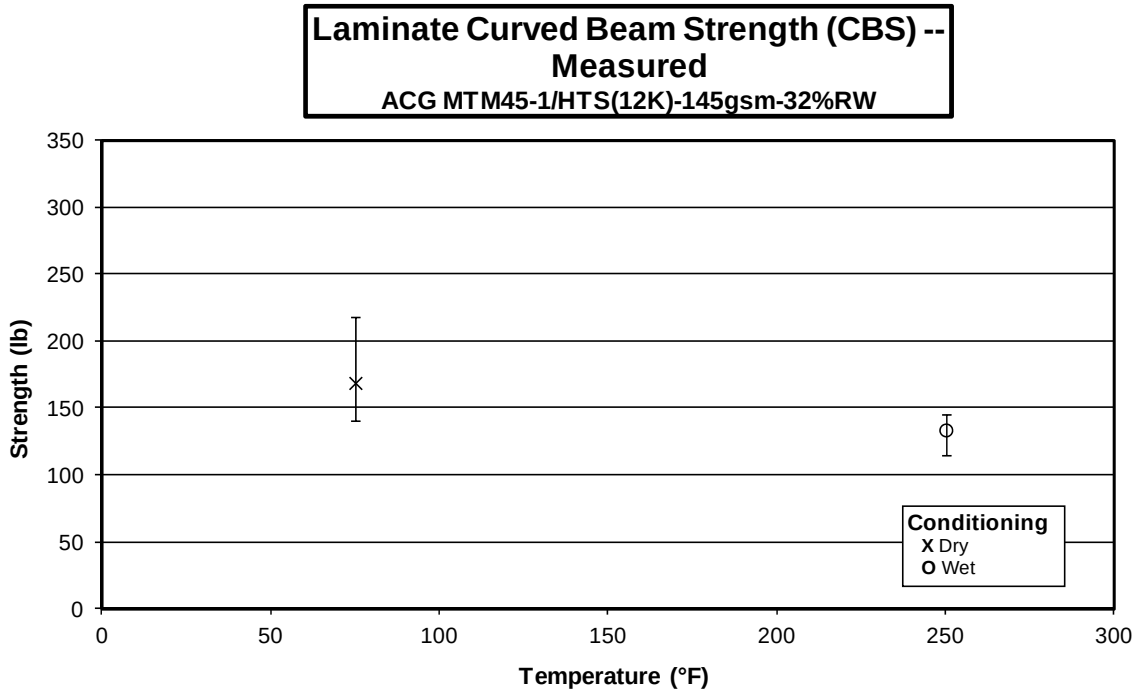

## 3.28 Pin Bearing 2 Properties

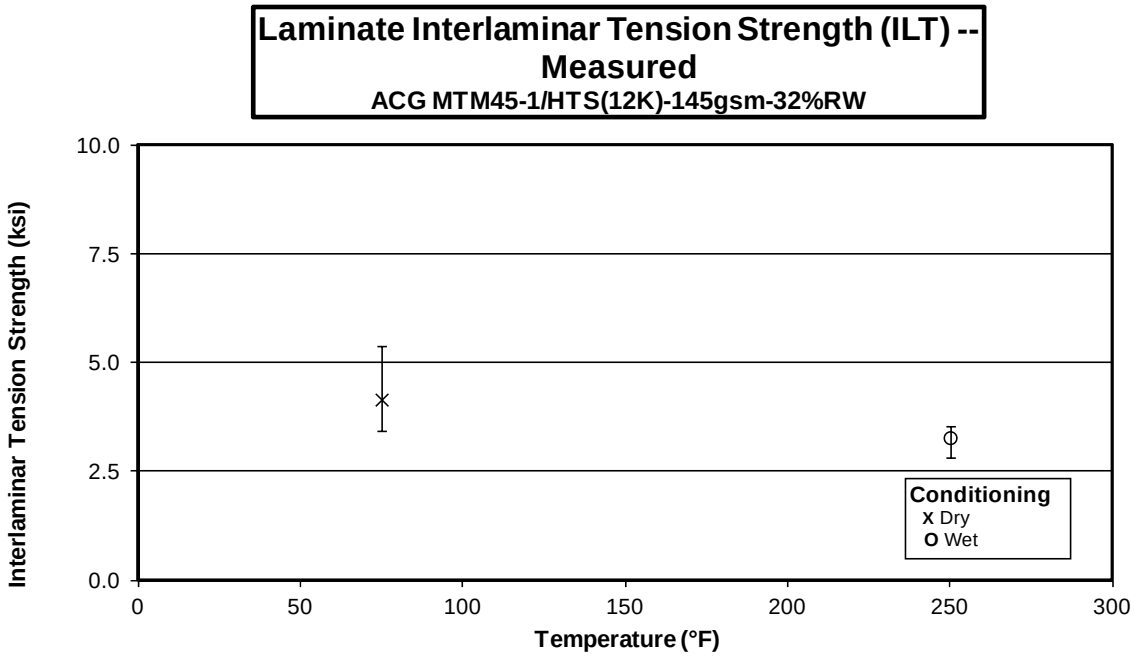


## 3.29 Pin Bearing 3 Properties

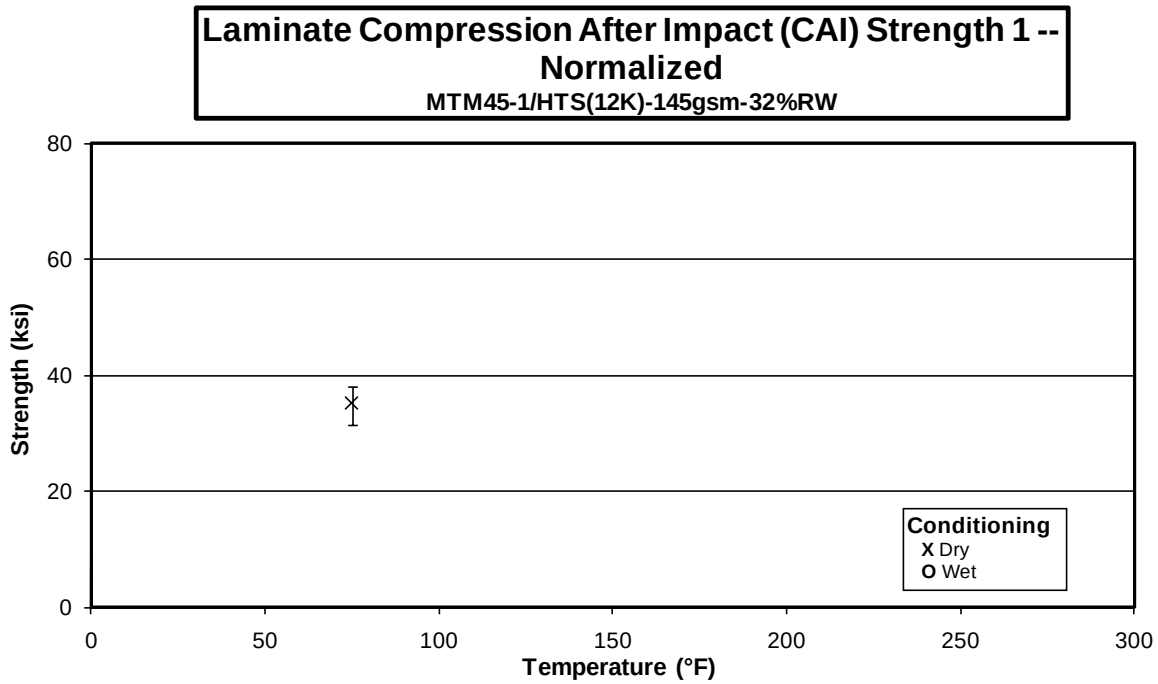


## 3.30 Interlaminar Tension Properties



## 3.31 Compression Strength after Impact 1 Properties



# 4. Raw Data

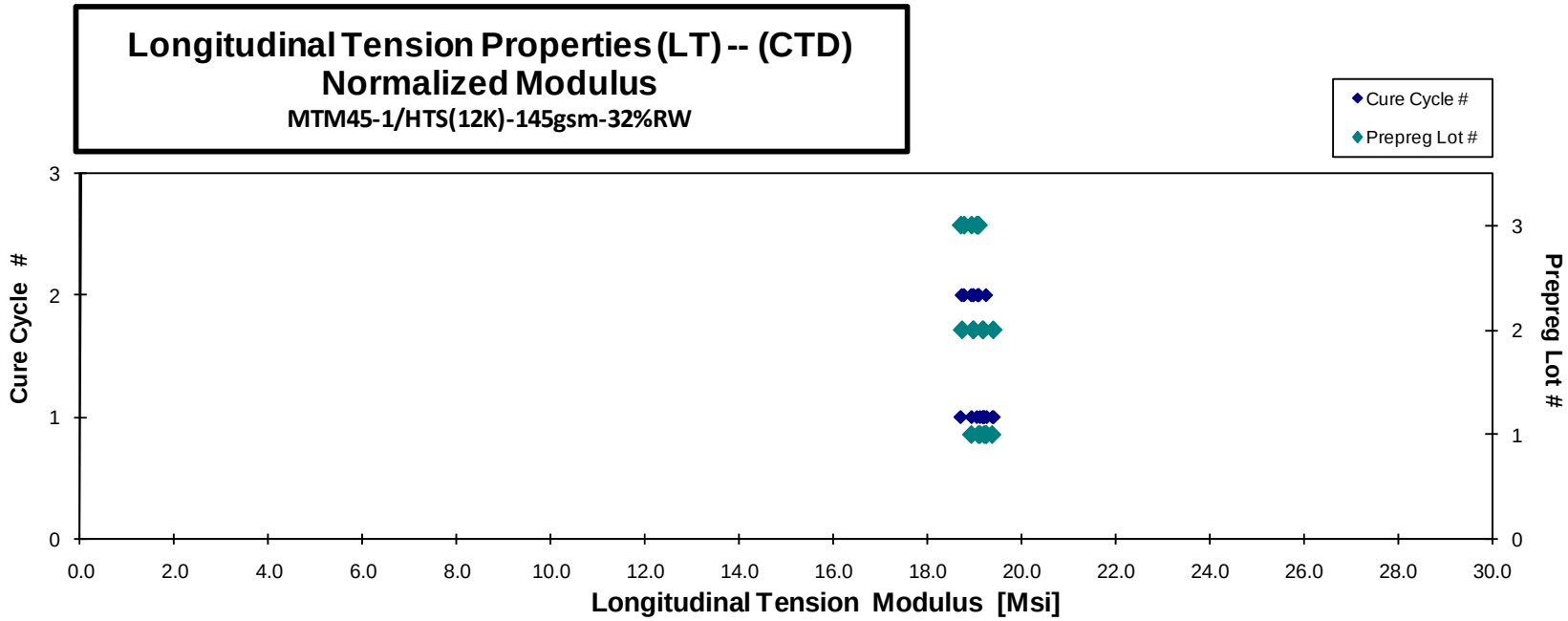
## 4.1 Longitudinal Tension Properties

**Longitudinal Tension Properties (LT) -- (CTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMJA116B | A | MH1 | 1 | 1 | 18.963 | 0.312 | 0.089 | 16 | 0.0055 | 19.117 |
| ABMJA117B | A | MH1 | 1 | 1 | 19.164 | 0.311 | 0.089 | 16 | 0.0056 | 19.379 |
| ABMJA118B | A | MH1 | 1 | 1 | 19.130 | 0.327 | 0.089 | 16 | 0.0055 | 19.256 |
| ABMJA215B | A | MH2 | 1 | 1 | 18.799 | 0.327 | 0.090 | 16 | 0.0056 | 19.209 |
| ABMJA216B | A | MH2 | 1 | 2 | 18.712 | 0.328 | 0.089 | 16 | 0.0056 | 18.929 |
| ABMJA217B | A | MH2 | 1 | 2 | 18.450 | 0.314 | 0.092 | 16 | 0.0057 | 19.243 |
| ABMJA218B | A | MH2 | 1 | 2 | 19.058 | 0.327 | 0.088 | 16 | 0.0055 | 19.086 |
| ABMJB115B | B | MH1 | 2 | 1 | 18.744 | 0.312 | 0.090 | 16 | 0.0056 | 19.188 |
| ABMJB116B | B | MH1 | 2 | 1 | 18.590 | 0.312 | 0.091 | 16 | 0.0057 | 19.175 |
| ABMJB117B | B | MH1 | 2 | 1 | 18.892 | 0.326 | 0.090 | 16 | 0.0056 | 19.404 |
| ABMJB215B | B | MH2 | 2 | 2 | 18.420 | 0.342 | 0.091 | 16 | 0.0057 | 18.968 |
| ABMJB216B | B | MH2 | 2 | 2 | 18.389 | 0.339 | 0.091 | 16 | 0.0057 | 18.978 |
| ABMJB217B | B | MH2 | 2 | 2 | 18.151 | 0.345 | 0.091 | 16 | 0.0057 | 18.729 |
| ABMJC115B | C | MH1 | 3 | 1 | 18.717 | 0.333 | 0.089 | 16 | 0.0056 | 18.936 |
| ABMJC116B | C | MH1 | 3 | 1 | 18.895 | 0.321 | 0.089 | 16 | 0.0055 | 19.049 |
| ABMJC117B | C | MH1 | 3 | 1 | 18.919 | 0.329 | 0.087 | 16 | 0.0054 | 18.704 |
| ABMJC215B | C | MH2 | 3 | 2 | 19.048 | 0.298 | 0.088 | 16 | 0.0055 | 19.066 |
| ABMJC216B | C | MH2 | 3 | 2 | 19.265 | 0.319 | 0.087 | 16 | 0.0054 | 19.086 |
| ABMJC217B | C | MH2 | 3 | 2 | 18.988 | 0.300 | 0.087 | 16 | 0.0054 | 18.776 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **18.805** | **0.322** | **$Average_{norm}$** | **0.0056** | **19.067** |
| **Standard Dev.** | **0.298** | **0.013** | **$Standard\ Dev._{norm}$** | | **0.199** |
| **Coeff. of Var. [%]** | **1.584** | **4.018** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **1.043** |
| **Min.** | **18.151** | **0.298** | | **0.0054** | **18.704** |
| **Max.** | **19.265** | **0.345** | | **0.0057** | **19.404** |
| **Number of Spec.** | **19** | **19** | | | **19** |

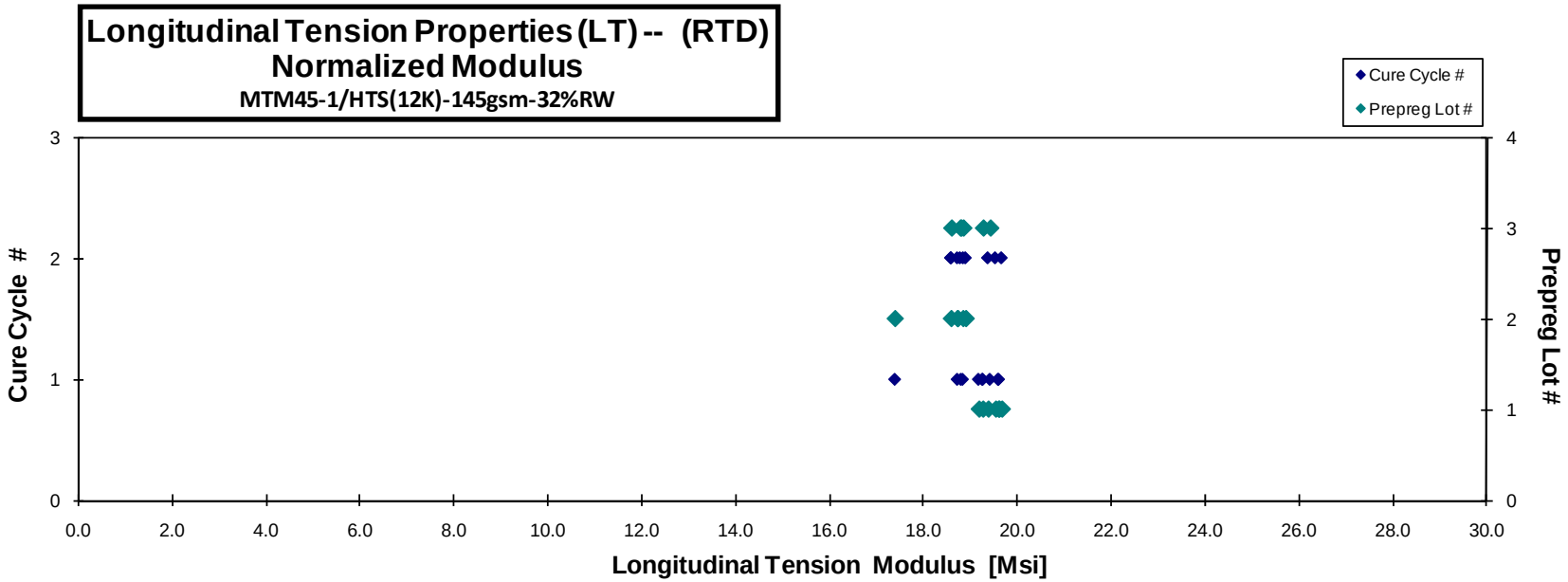

Longitudinal Tension Properties (LT) -- (CTD)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
Longitudinal Tension Modulus [Msi]

# Longidudinal Tension Properties (LT) -- (RTD)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMJA111A | A | MH1 | 1 | 1 | 18.881 | 0.313 | 0.089 | 16 | 0.0056 | 19.174 |
| ABMJA112A | A | MH1 | 1 | 1 | 19.616 | 0.320 | 0.088 | 16 | 0.0055 | 19.590 |
| ABMJA113A | A | MH1 | 1 | 1 | 19.175 | 0.314 | 0.090 | 16 | 0.0056 | 19.604 |
| ABMJA114A | A | MH1 | 1 | 1 | 19.233 | 0.316 | 0.088 | 16 | 0.0055 | 19.258 |
| ABMJA211A | A | MH2 | 1 | 2 | 19.285 | 0.327 | 0.089 | 16 | 0.0056 | 19.529 |
| ABMJA212A | A | MH2 | 1 | 2 | 19.136 | 0.320 | 0.089 | 16 | 0.0056 | 19.371 |
| ABMJA213A | A | MH2 | 1 | 2 | 19.452 | 0.322 | 0.089 | 16 | 0.0056 | 19.662 |
| ABMJB111A | B | MH1 | 2 | 1 | 17.891 | 0.323 | 0.086 | 16 | 0.0053 | 17.386 |
| ABMJB112A | B | MH1 | 2 | 1 | 18.193 | 0.320 | 0.091 | 16 | 0.0057 | 18.834 |
| ABMJB113A | B | MH1 | 2 | 1 | 18.268 | 0.315 | 0.090 | 16 | 0.0056 | 18.721 |
| ABMJB211A | B | MH2 | 2 | 2 | 17.715 | 0.320 | 0.092 | 16 | 0.0058 | 18.580 |
| ABMJB212A | B | MH2 | 2 | 2 | 17.859 | 0.318 | 0.092 | 16 | 0.0058 | 18.718 |
| ABMJB213A | B | MH2 | 2 | 2 | 18.409 | 0.314 | 0.090 | 16 | 0.0056 | 18.894 |
| ABMJC111A | C | MH1 | 3 | 1 | 19.368 | 0.318 | 0.088 | 16 | 0.0055 | 19.416 |
| ABMJC112A | C | MH1 | 3 | 1 | 18.829 | 0.317 | 0.088 | 16 | 0.0055 | 18.797 |
| ABMJC113A | C | MH1 | 3 | 1 | 19.297 | 0.316 | 0.088 | 16 | 0.0055 | 19.264 |
| ABMJC211A | C | MH2 | 3 | 2 | 18.599 | 0.313 | 0.089 | 16 | 0.0056 | 18.779 |
| ABMJC212A | C | MH2 | 3 | 2 | 18.447 | 0.318 | 0.089 | 16 | 0.0055 | 18.590 |
| ABMJC213A | C | MH2 | 3 | 2 | 18.844 | 0.313 | 0.088 | 16 | 0.0055 | 18.844 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **18.763** | **0.318** | **$Average_{norm}$** | **0.0056** | **19.001** |
| **Standard Dev.** | **0.586** | **0.004** | **$Standard\ Dev._{norm}$** | | **0.536** |
| **Coeff. of Var. [%]** | **3.123** | **1.197** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **2.820** |
| **Min.** | **17.715** | **0.313** | | **0.0053** | **17.386** |
| **Max.** | **19.616** | **0.327** | | **0.0058** | **19.662** |
| **Number of Spec.** | **19** | **19** | | | **19** |


Longitudinal Tension Properties (LT) -- (RTD)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
Longitudinal Tension Modulus [Msi]

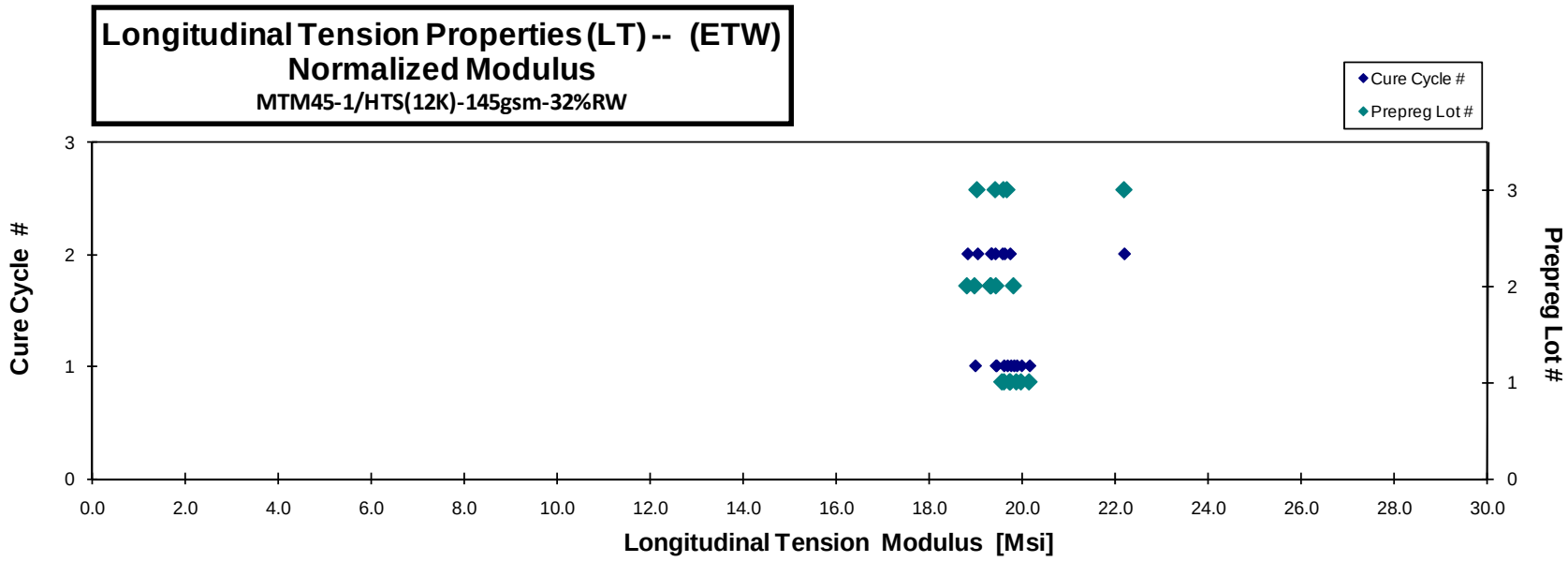
# Longitudinal Tension Properties (LT) -- (ETW) Strength & Modulus

**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.005500

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMJA11AN | A | MH1 | 1 | 1 | 19.503 | 0.340 | 0.089 | 16 | 0.0056 | 19.743 |
| ABMJA11BN | A | MH1 | 1 | 1 | 20.030 | 0.346 | 0.089 | 16 | 0.0055 | 20.144 |
| ABMJA11CN | A | MH1 | 1 | 1 | 19.702 | 0.341 | 0.089 | 16 | 0.0055 | 19.870 |
| ABMJA11DN | A | MH1 | 1 | 1 | 19.692 | 0.314 | 0.089 | 16 | 0.0056 | 19.971 |
| ABMJA21AN | A | MH2 | 1 | 2 | 19.121 | 0.324 | 0.090 | 16 | 0.0056 | 19.607 |
| ABMJA21BN | A | MH2 | 1 | 2 | 19.127 | 0.339 | 0.090 | 16 | 0.0056 | 19.562 |
| ABMJA21CN | A | MH2 | 1 | 2 | 19.316 | 0.322 | 0.090 | 16 | 0.0056 | 19.726 |
| ABMJB119N | B | MH1 | 2 | 1 | 18.559 | 0.319 | 0.090 | 16 | 0.0056 | 18.977 |
| ABMJB11AN | B | MH1 | 2 | 1 | 19.247 | 0.334 | 0.091 | 16 | 0.0057 | 19.808 |
| ABMJB11BN | B | MH1 | 2 | 1 | 18.886 | 0.340 | 0.091 | 16 | 0.0057 | 19.433 |
| ABMJB219N | B | MH2 | 2 | 2 | 18.588 | 0.323 | 0.091 | 16 | 0.0057 | 19.317 |
| ABMJB21AN | B | MH2 | 2 | 2 | 18.371 | 0.340 | 0.090 | 16 | 0.0056 | 18.812 |
| ABMJB21BN | B | MH2 | 2 | 2 | 18.561 | 0.341 | 0.092 | 16 | 0.0057 | 19.328 |
| ABMJC119N | C | MH1 | 3 | 1 | 19.122 | 0.333 | 0.089 | 16 | 0.0056 | 19.419 |
| ABMJC11AN | C | MH1 | 3 | 1 | 19.425 | 0.327 | 0.089 | 16 | 0.0055 | 19.595 |
| ABMJC11BN | C | MH1 | 3 | 1 | 19.613 | 0.323 | 0.088 | 16 | 0.0055 | 19.669 |
| ABMJC219N | C | MH2 | 3 | 2 | 19.418 | 0.323 | 0.086 | 16 | 0.0054 | 19.028 |
| ABMJC21AN | C | MH2 | 3 | 2 | 22.434 | 0.361 | 0.087 | 16 | 0.0054 | 22.175 |
| ABMJC21BN | C | MH2 | 3 | 2 | 19.537 | 0.318 | 0.087 | 16 | 0.0055 | 19.407 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **19.382** | **0.332** | **$Average_{norm}$** | **0.0056** | **19.663** |
| **Standard Dev.** | **0.866** | **0.012** | **$Standard\ Dev._{norm}$** | | **0.697** |
| **Coeff. of Var. [%]** | **4.469** | **3.588** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **3.543** |
| **Min.** | **18.371** | **0.314** | | **0.0054** | **18.812** |
| **Max.** | **22.434** | **0.361** | | **0.0057** | **22.175** |
| **Number of Spec.** | **19** | **19** | | | **19** |


Longitudinal Tension Properties (LT) -- (ETW)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
Longitudinal Tension Modulus [Msi]

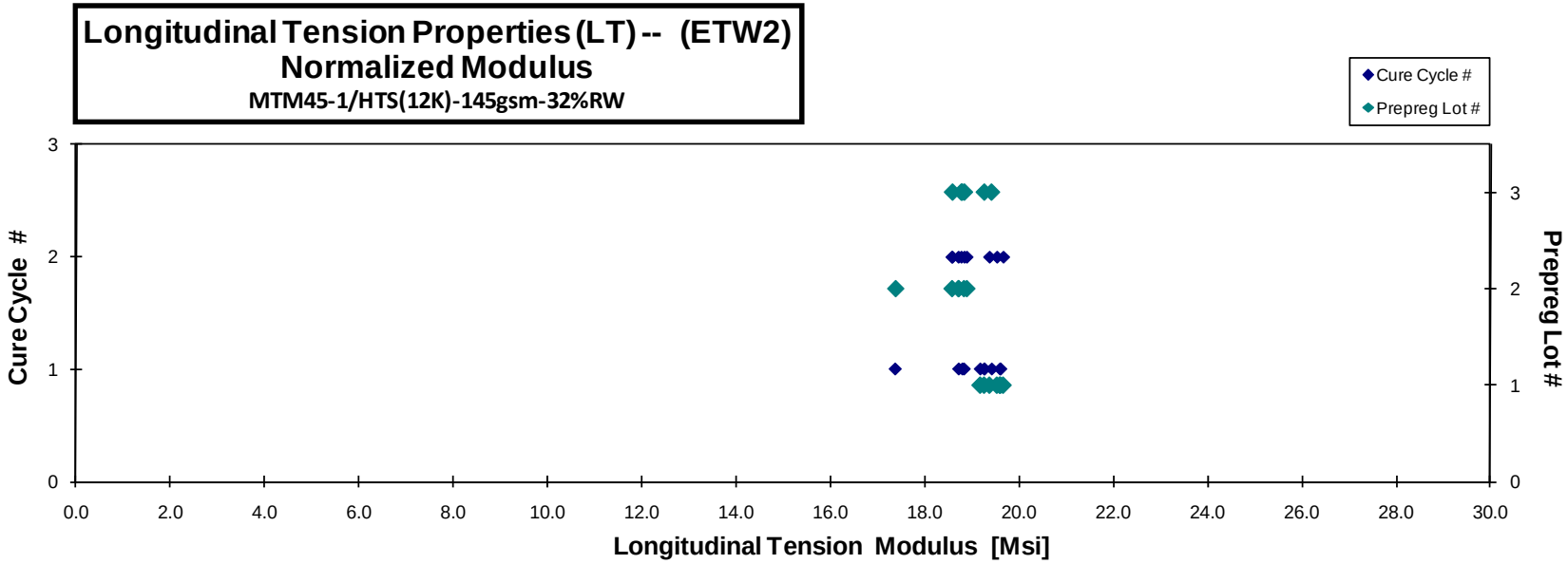
# Longitudinal Tension Properties (LT) -- (ETW2) Strength & Modulus

**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMJA11FD | A | MH1 | 1 | 1 | 20.020 | 0.317 | 0.088 | 16 | 0.0055 | 20.081 |
| ABMJA11GD | A | MH1 | 1 | 1 | 19.290 | 0.348 | 0.089 | 16 | 0.0056 | 19.476 |
| ABMJA11HD | A | MH1 | 1 | 1 | 20.380 | 0.331 | 0.088 | 16 | 0.0055 | 20.330 |
| ABMJA21ED | A | MH2 | 1 | 2 | 20.782 | 0.345 | 0.089 | 16 | 0.0056 | 21.097 |
| ABMJA21FD | A | MH2 | 1 | 2 | 19.495 | 0.299 | 0.089 | 16 | 0.0056 | 19.805 |
| ABMJA21GD | A | MH2 | 1 | 2 | 19.644 | 0.325 | 0.089 | 16 | 0.0056 | 19.834 |
| ABMJA21HD | A | MH2 | 1 | 2 | 20.524 | 0.345 | 0.090 | 16 | 0.0056 | 20.893 |
| ABMJB11ED | B | MH1 | 2 | 1 | 19.119 | 0.340 | 0.090 | 16 | 0.0056 | 19.586 |
| ABMJB11FD | B | MH1 | 2 | 1 | 20.973 | 0.368 | 0.091 | 16 | 0.0057 | 21.644 |
| ABMJB11GD | B | MH1 | 2 | 1 | 19.721 | 0.324 | 0.090 | 16 | 0.0057 | 20.274 |
| ABMJB21ED | B | MH2 | 2 | 2 | 18.849 | 0.342 | 0.091 | 16 | 0.0057 | 19.567 |
| ABMJB21FD | B | MH2 | 2 | 2 | 20.866 | 0.359 | 0.091 | 16 | 0.0057 | 21.574 |
| ABMJB21GD | B | MH2 | 2 | 2 | 18.628 | 0.337 | 0.093 | 16 | 0.0058 | 19.640 |
| ABMJC11ED | C | MH1 | 3 | 1 | 19.801 | 0.348 | 0.088 | 16 | 0.0055 | 19.748 |
| ABMJC11FD | C | MH1 | 3 | 1 | 19.611 | 0.332 | 0.087 | 16 | 0.0055 | 19.466 |
| ABMJC11GD | C | MH1 | 3 | 1 | 19.156 | 0.320 | 0.089 | 16 | 0.0055 | 19.290 |
| ABMJC21ED | C | MH2 | 3 | 2 | 20.191 | 0.344 | 0.088 | 16 | 0.0055 | 20.152 |
| ABMJC21FD | C | MH2 | 3 | 2 | 20.318 | 0.344 | 0.087 | 16 | 0.0055 | 20.191 |
| ABMJC21GD | C | MH2 | 3 | 2 | 20.687 | 0.357 | 0.087 | 16 | 0.0054 | 20.424 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **19.898** | **0.338** | **$Average_{norm}$** | **0.0056** | **20.162** |
| **Standard Dev.** | **0.707** | **0.016** | **$Standard\ Dev._{norm}$** | | **0.699** |
| **Coeff. of Var. [%]** | **3.552** | **4.843** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **3.467** |
| **Min.** | **18.628** | **0.299** | | **0.0054** | **19.290** |
| **Max.** | **20.973** | **0.368** | | **0.0058** | **21.644** |
| **Number of Spec.** | **19** | **19** | | | **19** |


Longitudinal Tension Properties (LT) -- (ETW2)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
Longitudinal Tension Modulus [Msi]

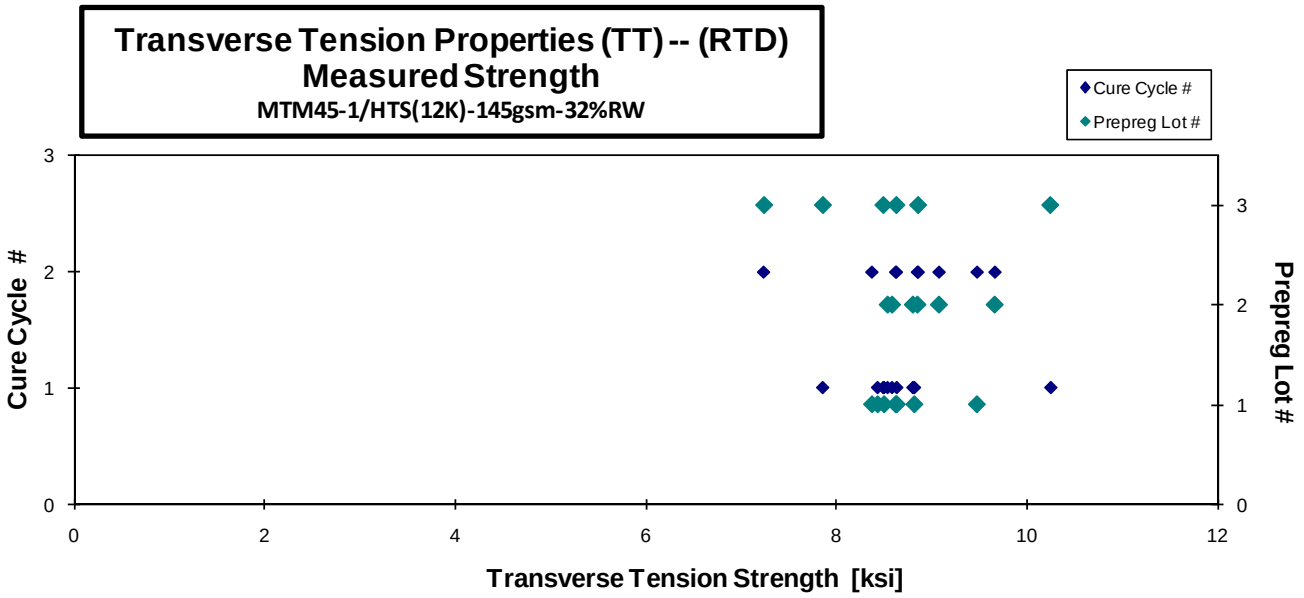
## 4.2 Transverse Tension Properties

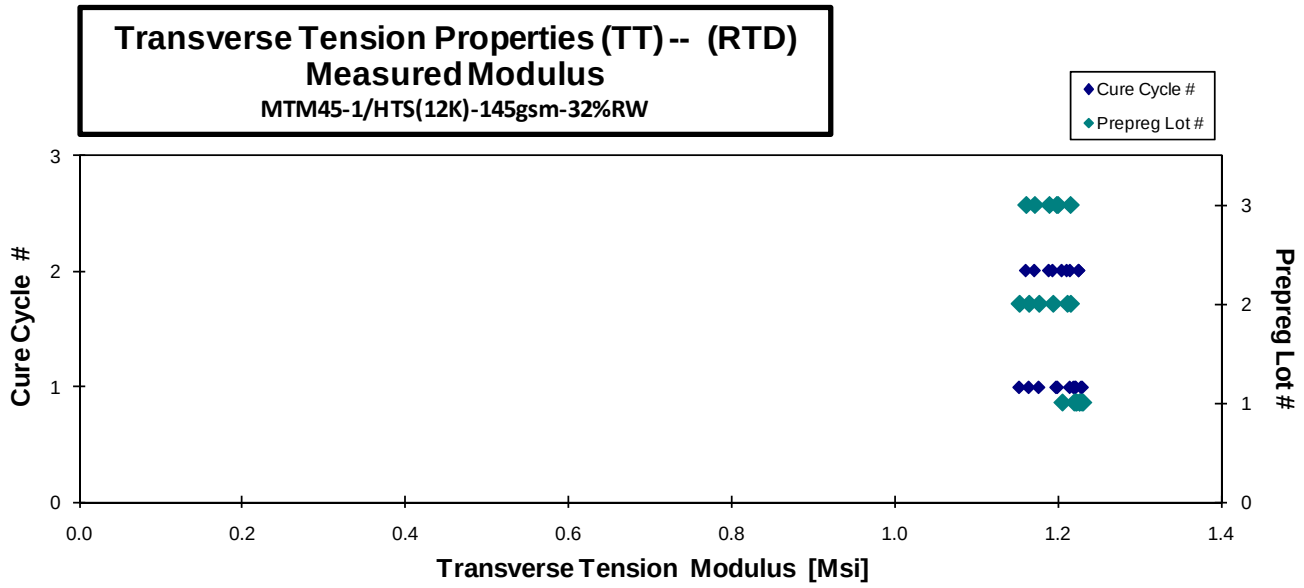
**Transverse Tension Properties (TT) -- (RTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMUA111A* | A | MH1 | 1 | 1 | | 1.230 | 0.088 | 16 | 0.0055 | LIT |
| ABMUA112A | A | MH1 | 1 | 1 | 8.435 | 1.220 | 0.089 | 16 | 0.0056 | LAT |
| ABMUA113A | A | MH1 | 1 | 1 | 8.635 | 1.222 | 0.089 | 16 | 0.0055 | LAT |
| ABMUA114A | A | MH1 | 1 | 1 | 8.502 | 1.223 | 0.089 | 16 | 0.0056 | LAB |
| ABMUA115A | A | MH1 | 1 | 1 | 8.819 | 1.229 | 0.089 | 16 | 0.0055 | LAT |
| ABMUA211A | A | MH2 | 1 | 2 | 8.375 | 1.226 | 0.088 | 16 | 0.0055 | LAT |
| ABMUA212A | A | MH2 | 1 | 2 | 9.474 | 1.226 | 0.088 | 16 | 0.0055 | LAB |
| ABMUA213A | A | MH2 | 1 | 2 | 8.624 | 1.205 | 0.088 | 16 | 0.0055 | LAT |
| ABMUB111A | B | MH1 | 2 | 1 | 8.539 | 1.154 | 0.091 | 16 | 0.0057 | LAT |
| ABMUB112A | B | MH1 | 2 | 1 | 8.585 | 1.177 | 0.089 | 16 | 0.0056 | LAB |
| ABMUB113A | B | MH1 | 2 | 1 | 8.804 | 1.165 | 0.090 | 16 | 0.0056 | LAT |
| ABMUB211A | B | MH2 | 2 | 2 | 9.077 | 1.194 | 0.089 | 16 | 0.0056 | LAB |
| ABMUB212A | B | MH2 | 2 | 2 | 8.851 | 1.215 | 0.090 | 16 | 0.0056 | LAB |
| ABMUB213A | B | MH2 | 2 | 2 | 9.661 | 1.212 | 0.089 | 16 | 0.0056 | LAT |
| ABMUC111A | C | MH1 | 3 | 1 | 7.861 | 1.199 | 0.091 | 16 | 0.0057 | LAT |
| ABMUC112A | C | MH1 | 3 | 1 | 8.495 | 1.200 | 0.090 | 16 | 0.0057 | LAT |
| ABMUC113A | C | MH1 | 3 | 1 | 10.243 | 1.215 | 0.089 | 16 | 0.0055 | LAB |
| ABMUC211A | C | MH2 | 3 | 2 | 7.245 | 1.162 | 0.093 | 16 | 0.0058 | LAB |
| ABMUC212A | C | MH2 | 3 | 2 | 8.858 | 1.172 | 0.091 | 16 | 0.0057 | LAB |
| ABMUC213A | C | MH2 | 3 | 2 | 8.630 | 1.190 | 0.091 | 16 | 0.0057 | LAB |

*Strength not recorded due to bad failure mode

| | | | | |
|---|---|---|---|---|
| **Average** | **8.722** | **1.202** | **0.090** | **0.0056** |
| **Standard Dev.** | **0.634** | **0.024** | | |
| **Coeff. of Var. [%]** | **7.273** | **2.036** | | |
| **Min.** | **7.245** | **1.154** | **0.088** | **0.0055** |
| **Max.** | **10.243** | **1.230** | **0.093** | **0.0058** |
| **Number of Spec.** | **19** | **20** | | |

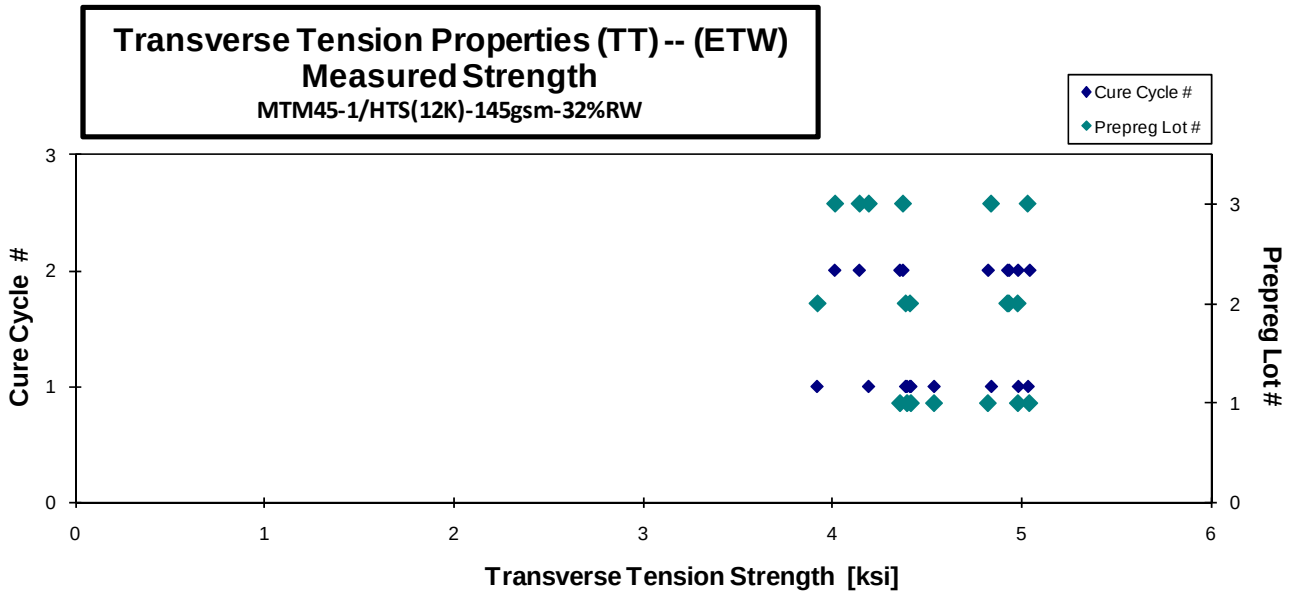

Transverse Tension Properties (TT) -- (RTD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Tension Strength [ksi]
0
2
4
6
8
10
12

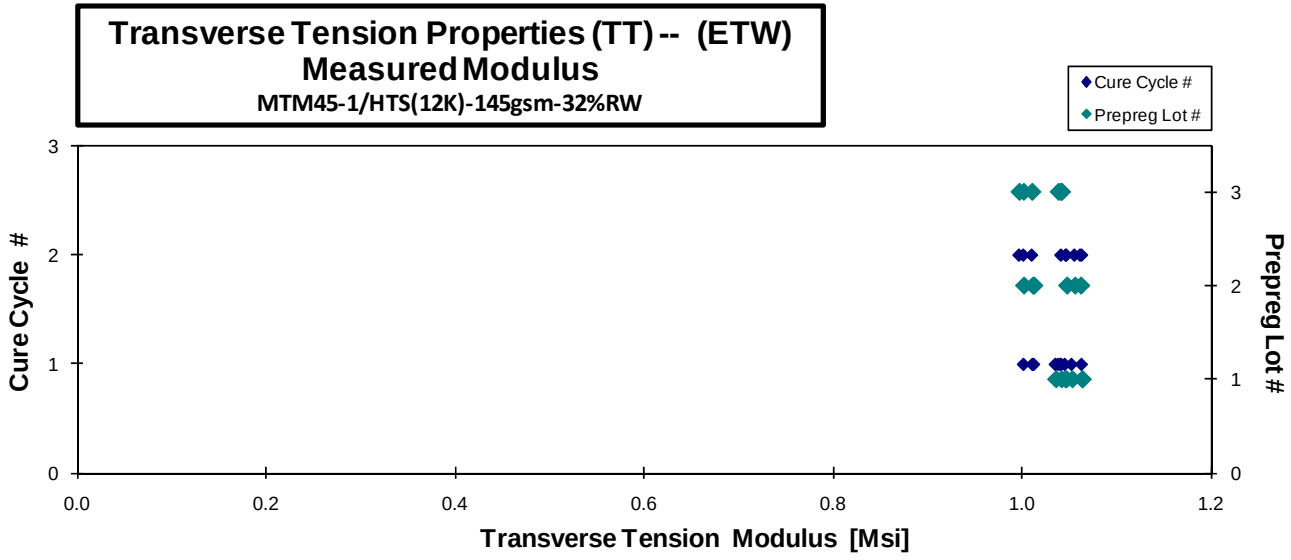

Transverse Tension Properties (TT) -- (RTD)
Measured Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Tension Modulus [Msi]
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4

# Transverse Tension Properties (TT) -- (ETW)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMUA11AN | A | MH1 | 1 | 1 | 4.417 | 1.036 | 0.089 | 16 | 0.0055 | LAB |
| ABMUA11BN | A | MH1 | 1 | 1 | 4.982 | 1.064 | 0.087 | 16 | 0.0054 | LAB |
| ABMUA11DN | A | MH1 | 1 | 1 | 4.396 | 1.046 | 0.088 | 16 | 0.0055 | LGM |
| ABMUA11EN | A | MH1 | 1 | 1 | 4.539 | 1.053 | 0.088 | 16 | 0.0055 | LGM |
| ABMUA21AN | A | MH2 | 1 | 2 | 4.359 | 1.047 | 0.088 | 16 | 0.0055 | LGM |
| ABMUA21BN | A | MH2 | 1 | 2 | 4.823 | 1.064 | 0.088 | 16 | 0.0055 | LGM |
| ABMUA21CN | A | MH2 | 1 | 2 | 5.042 | 1.042 | 0.089 | 16 | 0.0055 | LWB |
| ABMUB119N | B | MH1 | 2 | 1 | 4.412 | 1.012 | 0.091 | 16 | 0.0057 | LGM |
| ABMUB11CN | B | MH1 | 2 | 1 | 3.923 | 1.013 | 0.091 | 16 | 0.0057 | LAB |
| ABMUB11DN | B | MH1 | 2 | 1 | 4.389 | 1.003 | 0.090 | 16 | 0.0056 | LAB |
| ABMUB219N | B | MH2 | 2 | 2 | 4.980 | 1.048 | 0.091 | 16 | 0.0057 | LWT |
| ABMUB21AN | B | MH2 | 2 | 2 | 4.934 | 1.056 | 0.090 | 16 | 0.0056 | LAB |
| ABMUB21BN | B | MH2 | 2 | 2 | 4.926 | 1.062 | 0.089 | 16 | 0.0056 | LAB |
| ABMUC119N | C | MH1 | 3 | 1 | 4.194 | 1.039 | 0.089 | 16 | 0.0056 | LGM |
| ABMUC11AN | C | MH1 | 3 | 1 | 4.840 | 1.042 | 0.089 | 16 | 0.0055 | LGM |
| ABMUC11DN | C | MH1 | 3 | 1 | 5.033 | 1.041 | 0.089 | 16 | 0.0056 | LGM |
| ABMUC219N | C | MH2 | 3 | 2 | 4.145 | 1.011 | 0.091 | 16 | 0.0057 | LGM |
| ABMUC21AN | C | MH2 | 3 | 2 | 4.375 | 0.998 | 0.091 | 16 | 0.0057 | LGM |
| ABMUC21BN | C | MH2 | 3 | 2 | 4.016 | 1.002 | 0.091 | 16 | 0.0057 | LGM |

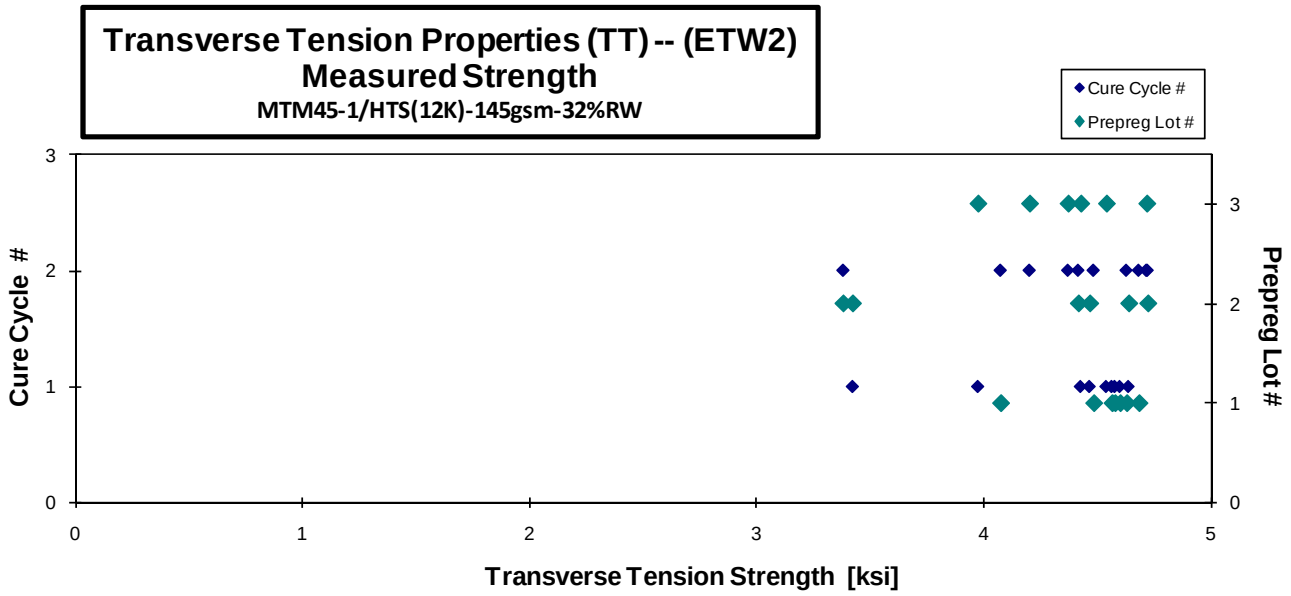
| | | | | |
|---|---|---|---|---|
| **Average** | **4.564** | **1.036** | **0.089** | **0.0056** |
| **Standard Dev.** | **0.366** | **0.022** | | |
| **Coeff. of Var. [%]** | **8.022** | **2.136** | | |
| **Min.** | **3.923** | **0.998** | **0.087** | **0.0054** |
| **Max.** | **5.042** | **1.064** | **0.091** | **0.0057** |
| **Number of Spec.** | **19** | **19** | | |

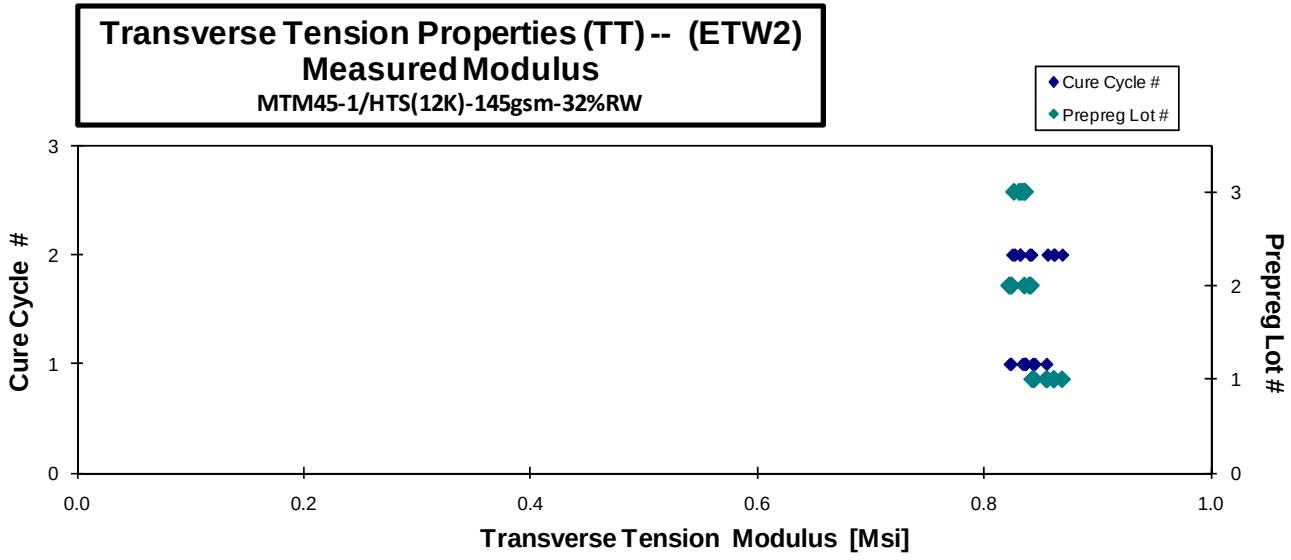

Transverse Tension Properties (TT) -- (ETW)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Tension Strength [ksi]
0
1
2
3
4
5
6


Transverse Tension Properties (TT) -- (ETW)
Measured Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Tension Modulus [Msi]
0.0
0.2
0.4
0.6
0.8
1.0
1.2

## Transverse Tension Properties (TT) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMUA11FD | A | MH1 | 1 | 1 | 4.578 | 0.843 | 0.088 | 16 | 0.0055 | LGM |
| ABMUA11GD | A | MH1 | 1 | 1 | 4.565 | 0.856 | 0.087 | 16 | 0.0054 | LGM |
| ABMUA11HD | A | MH1 | 1 | 1 | 4.600 | 0.845 | 0.088 | 16 | 0.0055 | LGM |
| ABMUA21ED | A | MH2 | 1 | 2 | 4.076 | 0.870 | 0.089 | 16 | 0.0055 | LGM |
| ABMUA21FD | A | MH2 | 1 | 2 | 4.683 | 0.857 | 0.088 | 16 | 0.0055 | LGM |
| ABMUA21GD | A | MH2 | 1 | 2 | 4.629 | 0.863 | 0.088 | 16 | 0.0055 | LGM |
| ABMUA21HD | A | MH2 | 1 | 2 | 4.484 | 0.862 | 0.088 | 16 | 0.0055 | LGM |
| ABMUB11ED | B | MH1 | 2 | 1 | 4.638 | 0.836 | 0.090 | 16 | 0.0056 | LWB |
| ABMUB11FD | B | MH1 | 2 | 1 | 4.467 | 0.823 | 0.090 | 16 | 0.0056 | LAT |
| ABMUB11GD | B | MH1 | 2 | 1 | 3.426 | 0.824 | 0.090 | 16 | 0.0056 | LGM |
| ABMUB21ED | B | MH2 | 2 | 2 | 4.722 | 0.842 | 0.089 | 16 | 0.0056 | LGM |
| ABMUB21FD | B | MH2 | 2 | 2 | 3.384 | 0.841 | 0.088 | 16 | 0.0055 | LGM |
| ABMUB21GD | B | MH2 | 2 | 2 | 4.417 | 0.825 | 0.090 | 16 | 0.0056 | LAB |
| ABMUC11ED | C | MH1 | 3 | 1 | 4.541 | 0.836 | 0.089 | 16 | 0.0056 | LGM |
| ABMUC11FD | C | MH1 | 3 | 1 | 3.976 | 0.834 | 0.089 | 16 | 0.0056 | LGM |
| ABMUC11GD | C | MH1 | 3 | 1 | 4.428 | 0.837 | 0.089 | 16 | 0.0056 | LGM |
| ABMUC21ED | C | MH2 | 3 | 2 | 4.372 | 0.827 | 0.091 | 16 | 0.0057 | LGM |
| ABMUC21FD | C | MH2 | 3 | 2 | 4.718 | 0.832 | 0.090 | 16 | 0.0056 | LGM |
| ABMUC21GD | C | MH2 | 3 | 2 | 4.203 | 0.832 | 0.090 | 16 | 0.0056 | LGM |
| | | | | **Average** | **4.364** | **0.841** | **0.089** | | **0.0056** | |
| | | | | **Standard Dev.** | **0.395** | **0.014** | | | | |
| | | | | **Coeff. of Var. [%]** | **9.049** | **1.667** | | | | |
| | | | | **Min.** | **3.384** | **0.823** | **0.087** | | **0.0054** | |
| | | | | **Max.** | **4.722** | **0.870** | **0.091** | | **0.0057** | |
| | | | | **Number of Spec.** | **19** | **19** | | | | |


Transverse Tension Properties (TT) -- (ETW2)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Tension Strength [ksi]
0
1
2
3
4
5


Transverse Tension Properties (TT) -- (ETW2)
Measured Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Tension Modulus [Msi]
0.0
0.2
0.4
0.6
0.8
1.0

## 4.3 Longitudinal Compression Properties

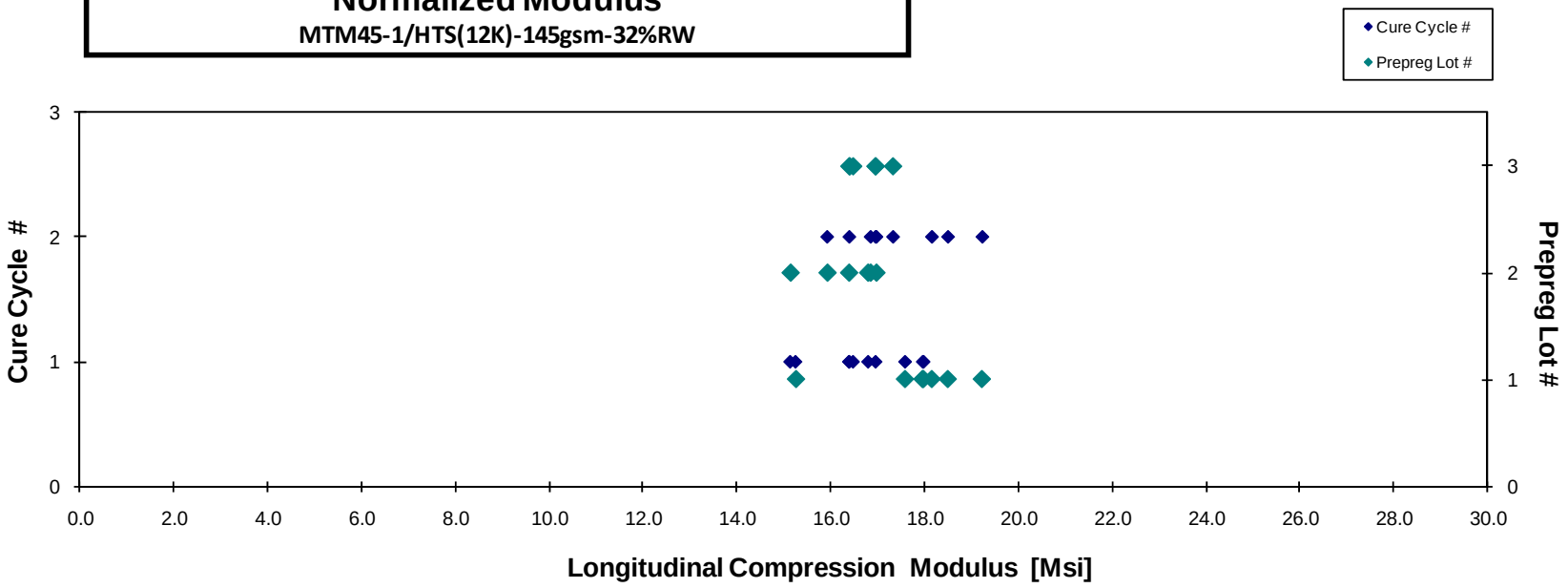
**Longitudinal Compression Properties (LC) -- (CTD)**
**Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMLA115B | A | MH1 | 1 | 1 | 16.348 | 0.413 | 0.087 | 16 | 0.0055 | 16.199 |
| ABMLA116B | A | MH1 | 1 | 1 | 16.601 | 0.312 | 0.088 | 16 | 0.0055 | 16.544 |
| ABMLA117B | A | MH1 | 1 | 1 | 17.300 | 0.406 | 0.087 | 16 | 0.0055 | 17.182 |
| ABMLA215B | A | MH2 | 1 | 2 | 17.430 | 0.363 | 0.091 | 16 | 0.0057 | 17.988 |
| ABMLA216B | A | MH2 | 1 | 2 | 17.780 | 0.413 | 0.092 | 16 | 0.0057 | 18.585 |
| ABMLA217B | A | MH2 | 1 | 2 | 18.339 | 0.344 | 0.093 | 16 | 0.0058 | 19.322 |
| ABMLA218B | A | MH2 | 1 | 2 | 17.893 | 0.381 | 0.093 | 16 | 0.0058 | 18.845 |
| ABMLB115B | B | MH1 | 2 | 1 | 16.713 | 0.329 | 0.090 | 16 | 0.0056 | 17.004 |
| ABMLB116B | B | MH1 | 2 | 1 | 17.322 | 0.453 | 0.090 | 16 | 0.0056 | 17.732 |
| ABMLB117B | B | MH1 | 2 | 1 | 16.553 | 0.376 | 0.091 | 16 | 0.0057 | 17.042 |
| ABMLB214B | B | MH2 | 2 | 2 | 16.319 | 0.289 | 0.089 | 16 | 0.0056 | 16.529 |
| ABMLB217B | B | MH2 | 2 | 2 | 16.629 | 0.361 | 0.090 | 16 | 0.0056 | 17.063 |
| ABMLB218B | B | MH2 | 2 | 2 | 16.378 | 0.388 | 0.090 | 16 | 0.0057 | 16.831 |
| ABMLC115B | C | MH1 | 3 | 1 | 17.035 | 0.329 | 0.088 | 16 | 0.0055 | 17.010 |
| ABMLC116B | C | MH1 | 3 | 1 | 16.591 | 0.339 | 0.088 | 16 | 0.0055 | 16.591 |
| ABMLC117B | C | MH1 | 3 | 1 | 16.968 | 0.336 | 0.089 | 16 | 0.0055 | 17.077 |
| ABMLC215B | C | MH2 | 3 | 2 | 17.977 | 0.349 | 0.086 | 16 | 0.0053 | 17.470 |
| ABMLC216B | C | MH2 | 3 | 2 | 16.347 | 0.416 | 0.088 | 16 | 0.0055 | 16.375 |
| ABMLC217B | C | MH2 | 3 | 2 | 16.761 | 0.342 | 0.085 | 16 | 0.0053 | 16.148 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **17.015** | **0.365** | **$Average_{norm}$** | **0.0056** | **17.239** |
| **Standard Dev.** | **0.625** | **0.042** | **$Standard\ Dev._{norm}$** | | **0.894** |
| **Coeff. of Var. [%]** | **3.675** | **11.481** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **5.187** |
| **Min.** | **16.319** | **0.289** | | **0.0053** | **16.148** |
| **Max.** | **18.339** | **0.453** | | **0.0058** | **19.322** |
| **Number of Spec.** | **19** | **19** | | | **19** |

## Longitudinal Compression Properties (LC) -- (CTD)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



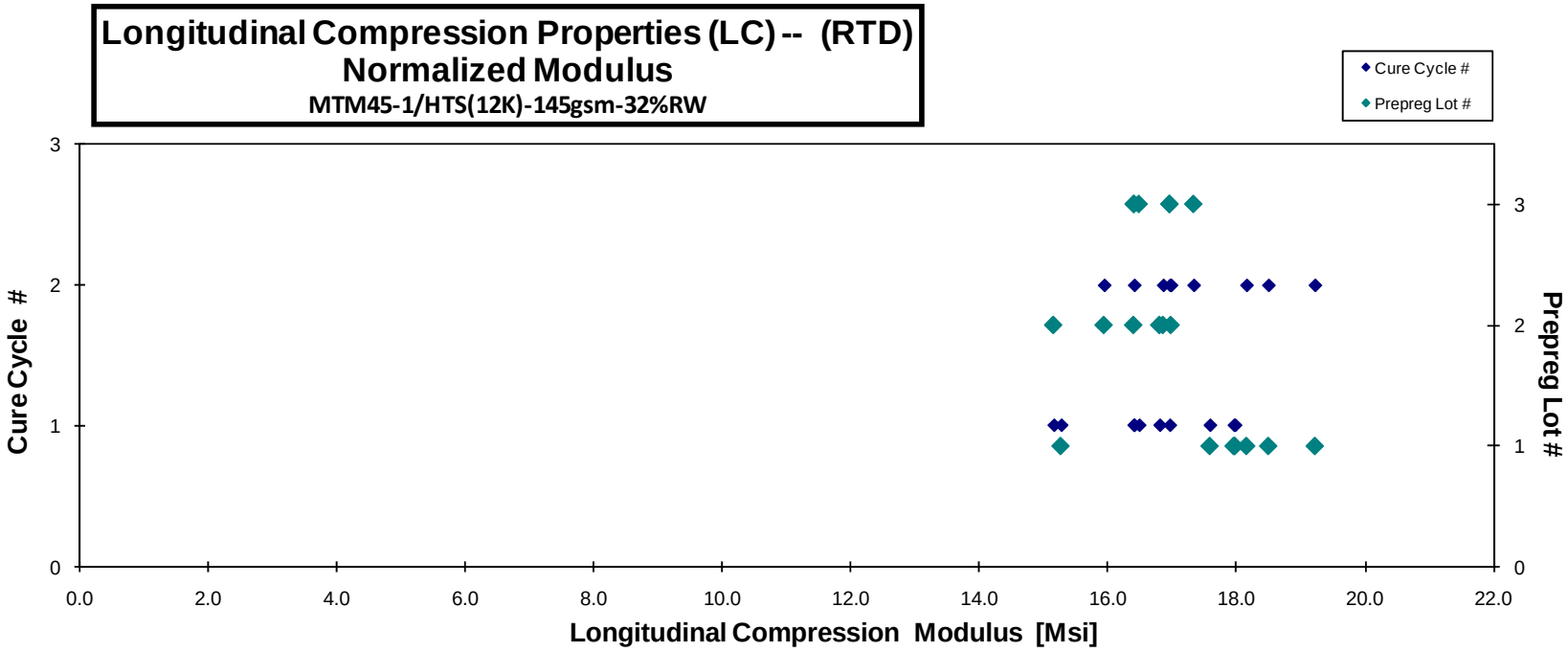
# Longitudinal Compression Properties (LC) -- (RTD) Modulus

**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMLA111A | A | MH1 | 1 | 1 | 17.818 | 0.322 | 0.075 | 16 | 0.0047 | 15.270 |
| ABMLA112A | A | MH1 | 1 | 1 | 17.627 | 0.346 | 0.090 | 16 | 0.0056 | 17.978 |
| ABMLA113A | A | MH1 | 1 | 1 | 17.637 | 0.330 | 0.088 | 16 | 0.0055 | 17.587 |
| ABMLA114A | A | MH1 | 1 | 1 | 17.885 | 0.346 | 0.088 | 16 | 0.0055 | 17.960 |
| ABMLA211A | A | MH2 | 1 | 2 | 17.705 | 0.413 | 0.092 | 16 | 0.0057 | 18.497 |
| ABMLA212A | A | MH2 | 1 | 2 | 17.579 | 0.329 | 0.091 | 16 | 0.0057 | 18.155 |
| ABMLA213A | A | MH2 | 1 | 2 | 18.155 | 0.382 | 0.093 | 16 | 0.0058 | 19.221 |
| ABMLB111A | B | MH1 | 2 | 1 | 17.340 | 0.335 | 0.077 | 16 | 0.0048 | 15.156 |
| ABMLB112A | B | MH1 | 2 | 1 | 16.152 | 0.336 | 0.089 | 16 | 0.0056 | 16.400 |
| ABMLB113A | B | MH1 | 2 | 1 | 16.603 | 0.321 | 0.089 | 16 | 0.0056 | 16.804 |
| ABMLB211A | B | MH2 | 2 | 2 | 17.786 | 0.382 | 0.079 | 16 | 0.0049 | 15.940 |
| ABMLB212A | B | MH2 | 2 | 2 | 16.598 | 0.335 | 0.089 | 16 | 0.0056 | 16.859 |
| ABMLB213A | B | MH2 | 2 | 2 | 16.588 | 0.294 | 0.090 | 16 | 0.0056 | 16.981 |
| ABMLC111A | C | MH1 | 3 | 1 | 16.839 | 0.328 | 0.086 | 16 | 0.0054 | 16.485 |
| ABMLC112A | C | MH1 | 3 | 1 | 16.831 | 0.328 | 0.089 | 16 | 0.0055 | 16.962 |
| ABMLC113A | C | MH1 | 3 | 1 | 16.518 | 0.377 | 0.087 | 16 | 0.0055 | 16.409 |
| ABMLC211A | C | MH2 | 3 | 2 | 16.927 | 0.450 | 0.088 | 16 | 0.0055 | 16.962 |
| ABMLC212A | C | MH2 | 3 | 2 | 16.661 | 0.303 | 0.087 | 16 | 0.0054 | 16.408 |
| ABMLC213A | C | MH2 | 3 | 2 | 17.502 | 0.392 | 0.087 | 16 | 0.0054 | 17.333 |

| | | | | |
|---|---|---|---|---|
| **Average** | **17.198** | **0.350** | **Average$_{norm}$** | **0.0054** | **17.019** |
| **Standard Dev.** | **0.591** | **0.039** | **Standard Dev.$_{norm}$** | | **1.047** |
| **Coeff. of Var. [%]** | **3.434** | **11.252** | **Coeff. of Var. [%]$_{norm}$** | | **6.152** |
| **Min.** | **16.152** | **0.294** | | **0.0047** | **15.156** |
| **Max.** | **18.155** | **0.450** | | **0.0058** | **19.221** |
| **Number of Spec.** | **19** | **19** | | | **19** |


Longitudinal Compression Properties (LC) -- (RTD)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Longitudinal Compression Modulus [Msi]
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
0
1
2
3

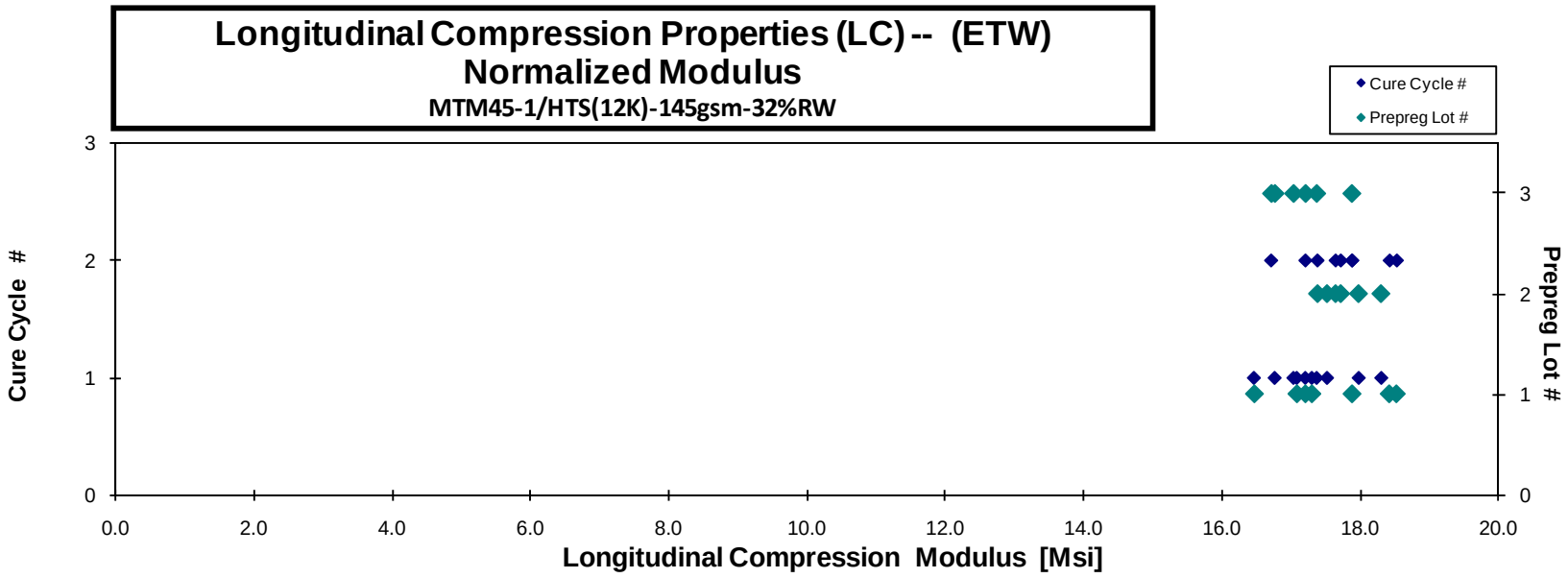
# Longitudinal Compression Properties (LC) -- (ETW) Modulus

**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMLA119N | A | MH1 | 1 | 1 | 16.621 | 0.290 | 0.087 | 16 | 0.0055 | 16.470 |
| ABMLA11AN | A | MH1 | 1 | 1 | 17.341 | 0.330 | 0.088 | 16 | 0.0055 | 17.302 |
| ABMLA11BN | A | MH1 | 1 | 1 | 17.755 | 0.347 | 0.085 | 16 | 0.0053 | 17.086 |
| ABMLA11CN | A | MH1 | 1 | 1 | 17.367 | 0.352 | 0.087 | 16 | 0.0055 | 17.209 |
| ABMLA219N | A | MH2 | 1 | 2 | 17.408 | 0.343 | 0.094 | 16 | 0.0059 | 18.525 |
| ABMLA21AN | A | MH2 | 1 | 2 | 16.601 | 0.301 | 0.095 | 16 | 0.0059 | 17.884 |
| ABMLA21BN | A | MH2 | 1 | 2 | 17.059 | 0.334 | 0.095 | 16 | 0.0059 | 18.423 |
| ABMLB119N | B | MH1 | 2 | 1 | 17.453 | 0.316 | 0.092 | 16 | 0.0058 | 18.302 |
| ABMLB11AN | B | MH1 | 2 | 1 | 17.000 | 0.365 | 0.091 | 16 | 0.0057 | 17.521 |
| ABMLB11BN | B | MH1 | 2 | 1 | 17.334 | 0.340 | 0.091 | 16 | 0.0057 | 17.977 |
| ABMLB219N | B | MH2 | 2 | 2 | 16.783 | 0.303 | 0.091 | 16 | 0.0057 | 17.384 |
| ABMLB21AN | B | MH2 | 2 | 2 | 17.208 | 0.367 | 0.091 | 16 | 0.0057 | 17.719 |
| ABMLB21BN | B | MH2 | 2 | 2 | 16.860 | 0.341 | 0.092 | 16 | 0.0058 | 17.645 |
| ABMLC119N | C | MH1 | 3 | 1 | 17.698 | 0.338 | 0.086 | 16 | 0.0054 | 17.372 |
| ABMLC11AN | C | MH1 | 3 | 1 | 17.821 | 0.318 | 0.084 | 16 | 0.0053 | 17.038 |
| ABMLC11BN | C | MH1 | 3 | 1 | 17.374 | 0.342 | 0.085 | 16 | 0.0053 | 16.768 |
| ABMLC219N | C | MH2 | 3 | 2 | 17.564 | 0.270 | 0.086 | 16 | 0.0054 | 17.211 |
| ABMLC21AN | C | MH2 | 3 | 2 | 16.887 | 0.315 | 0.087 | 16 | 0.0054 | 16.718 |
| ABMLC21BN | C | MH2 | 3 | 2 | 17.864 | 0.283 | 0.088 | 16 | 0.0055 | 17.881 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **17.263** | **0.326** | **$Average_{norm}$** | **0.0056** | **17.497** |
| **Standard Dev.** | **0.393** | **0.027** | **$Standard\ Dev._{norm}$** | | **0.576** |
| **Coeff. of Var. [%]** | **2.278** | **8.339** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **3.290** |
| **Min.** | **16.601** | **0.270** | | **0.0053** | **16.470** |
| **Max.** | **17.864** | **0.367** | | **0.0059** | **18.525** |
| **Number of Spec.** | **19** | **19** | | | **19** |


Longitudinal Compression Properties (LC) -- (ETW)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
Longitudinal Compression Modulus [Msi]

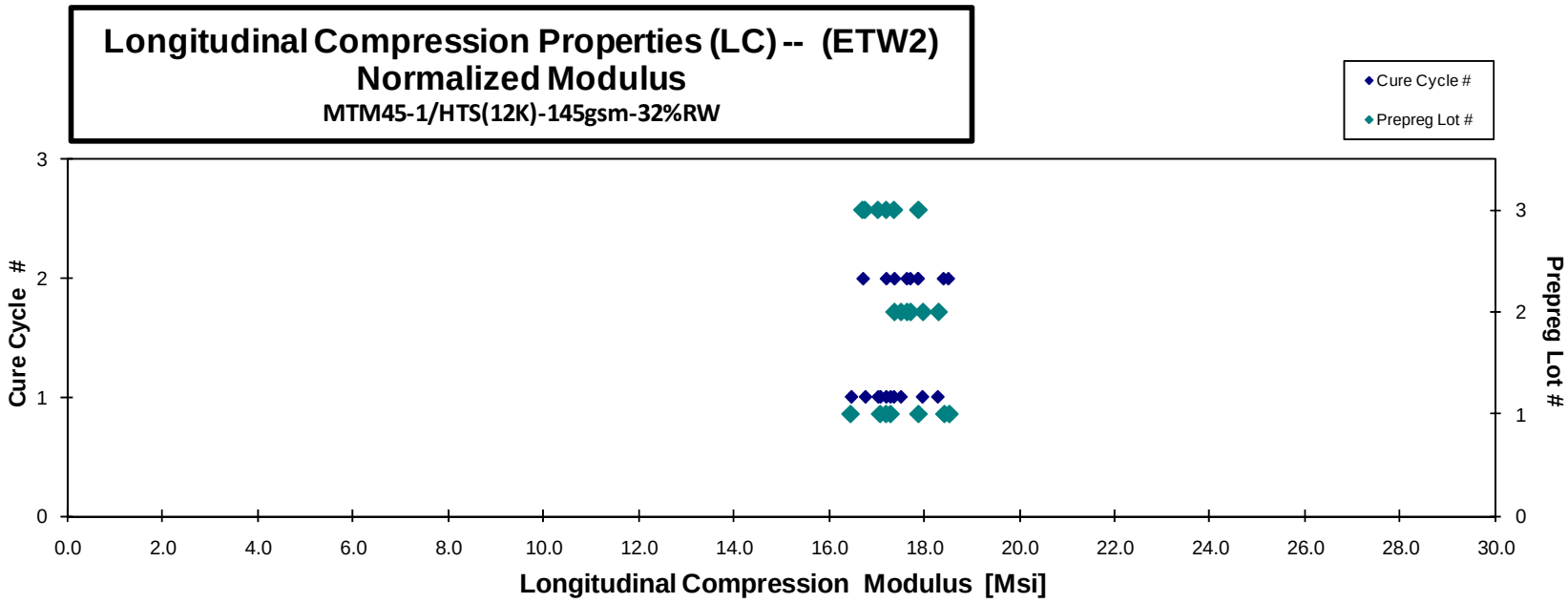
# Longitudinal Compression Properties (LC) -- (ETW2) Modulus

**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMLA11DD | A | MH1 | 1 | 1 | 17.666 | 0.353 | 0.085 | 16 | 0.0053 | 17.050 |
| ABMLA11ED | A | MH1 | 1 | 1 | 17.982 | 0.355 | 0.088 | 16 | 0.0055 | 17.948 |
| ABMLA11FD | A | MH1 | 1 | 1 | 17.004 | 0.335 | 0.090 | 16 | 0.0056 | 17.294 |
| ABMLA11GD | A | MH1 | 1 | 2 | 17.897 | 0.340 | 0.088 | 16 | 0.0055 | 17.798 |
| ABMLA21ED | A | MH2 | 1 | 2 | 16.916 | 0.368 | 0.096 | 16 | 0.0060 | 18.409 |
| ABMLA21GD | A | MH2 | 1 | 2 | 18.498 | 0.172 | 0.084 | 16 | 0.0053 | 17.734 |
| ABMLA21HD | A | MH2 | 1 | 2 | 16.390 | 0.643 | 0.093 | 16 | 0.0058 | 17.346 |
| ABMLB11ED | B | MH1 | 2 | 1 | 16.542 | 0.395 | 0.093 | 16 | 0.0058 | 17.391 |
| ABMLB11FD | B | MH1 | 2 | 1 | 16.011 | 0.344 | 0.093 | 16 | 0.0058 | 16.903 |
| ABMLB11GD | B | MH1 | 2 | 1 | 17.200 | 0.408 | 0.092 | 16 | 0.0057 | 17.966 |
| ABMLB21DD | B | MH2 | 2 | 2 | 16.061 | 0.349 | 0.091 | 16 | 0.0057 | 16.651 |
| ABMLB21ED | B | MH2 | 2 | 2 | 16.430 | 0.462 | 0.092 | 16 | 0.0057 | 17.084 |
| ABMLB21GD | B | MH2 | 2 | 2 | 17.134 | 0.414 | 0.088 | 16 | 0.0055 | 17.091 |
| ABMLC11FD | C | MH1 | 3 | 1 | 19.162 | 0.464 | 0.087 | 16 | 0.0054 | 18.923 |
| ABMLC11GD | C | MH1 | 3 | 1 | 19.731 | 0.527 | 0.088 | 16 | 0.0055 | 19.761 |
| ABMLC11HD | C | MH1 | 3 | 1 | 16.853 | 0.340 | 0.089 | 16 | 0.0055 | 16.968 |
| ABMLC11ID | C | MH1 | 3 | 2 | 17.960 | 0.468 | 0.083 | 16 | 0.0052 | 16.950 |
| ABMLC21ED | C | MH2 | 3 | 2 | 16.483 | 0.373 | 0.087 | 16 | 0.0054 | 16.305 |
| ABMLC21FD | C | MH2 | 3 | 2 | 17.424 | 0.445 | 0.087 | 16 | 0.0054 | 17.252 |
| ABMLC21GD | C | MH2 | 3 | 2 | 17.123 | 0.370 | 0.088 | 16 | 0.0055 | 17.136 |

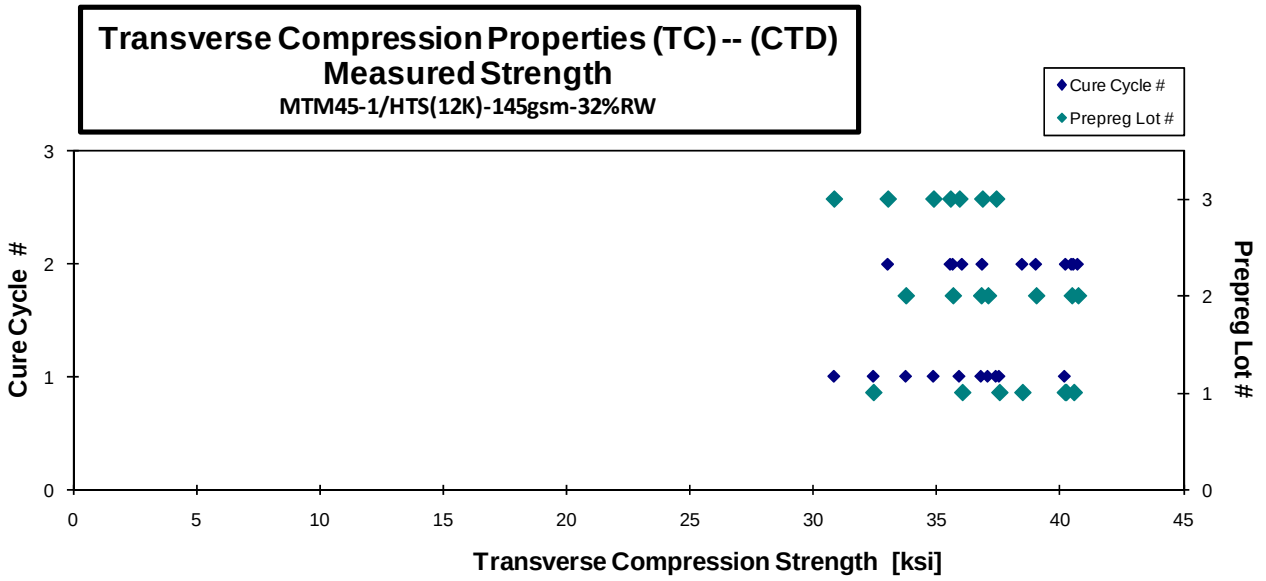
| | | | | | |
|---|---|---|---|---|---|
| **Average** | **17.323** | **0.396** | **$Average_{norm}$** | **0.0056** | **17.498** |
| **Standard Dev.** | **0.993** | **0.094** | **$Standard\ Dev._{norm}$** | | **0.809** |
| **Coeff. of Var. [%]** | **5.733** | **23.598** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **4.623** |
| **Min.** | **16.011** | **0.172** | | **0.0052** | **16.305** |
| **Max.** | **19.731** | **0.643** | | **0.0060** | **19.761** |
| **Number of Spec.** | **20** | **20** | | | **20** |

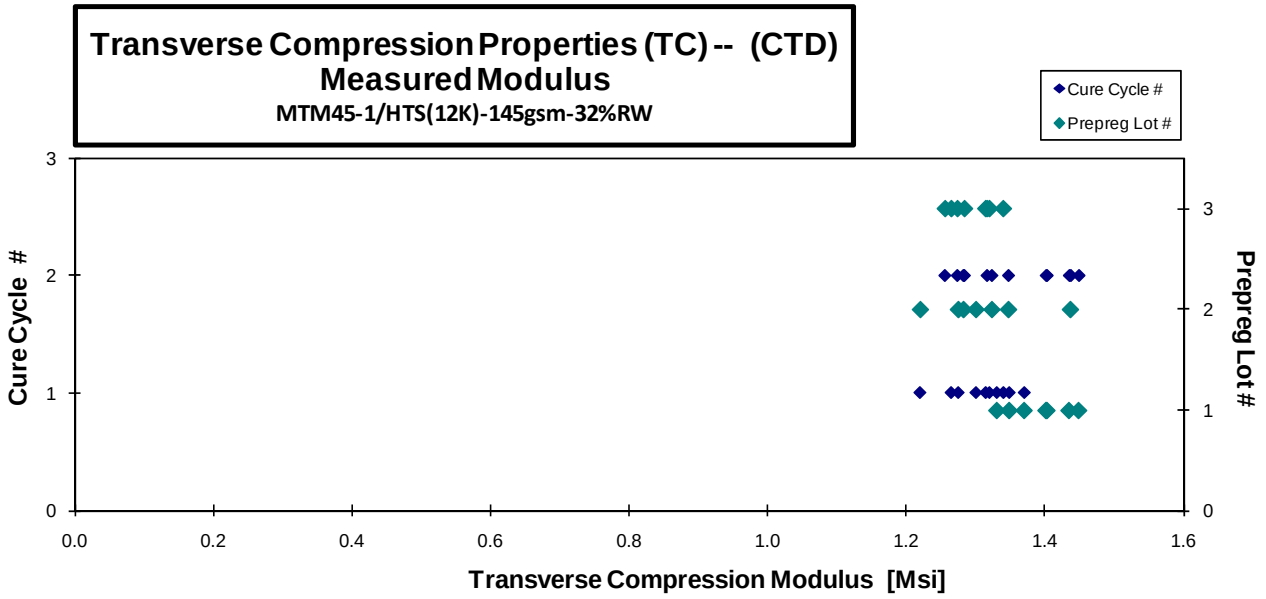

Longitudinal Compression Properties (LC) -- (ETW2)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
Longitudinal Compression Modulus [Msi]

## 4.4 Transverse Compression Properties

**Transverse Compression Properties (TC) -- (CTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMZA115B | A | MH1 | 1 | 1 | 40.195 | 1.370 | 0.027 | 0.088 | 16 | 0.0055 | HGM |
| ABMZA116B | A | MH1 | 1 | 1 | 37.542 | 1.348 | 0.028 | 0.089 | 16 | 0.0055 | HGM |
| ABMZA118B | A | MH1 | 1 | 1 | 32.445 | 1.330 | 0.026 | 0.088 | 16 | 0.0055 | HGM |
| ABMZA215B | A | MH2 | 1 | 2 | 40.553 | 1.448 | 0.030 | 0.089 | 16 | 0.0056 | HGM |
| ABMZA216B | A | MH2 | 1 | 2 | 40.236 | 1.434 | 0.022 | 0.089 | 16 | 0.0056 | HAT |
| ABMZA217B | A | MH2 | 1 | 2 | 36.040 | 1.402 | 0.025 | 0.089 | 16 | 0.0056 | HGM |
| ABMZA218B | A | MH2 | 1 | 2 | 38.475 | 1.401 | 0.022 | 0.090 | 16 | 0.0056 | HGM |
| ABMZB115B | B | MH1 | 2 | 1 | 37.082 | 1.300 | 0.025 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB116B | B | MH1 | 2 | 1 | 33.758 | 1.220 | 0.026 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB117B | B | MH1 | 2 | 1 | 36.807 | 1.275 | 0.023 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB215B | B | MH2 | 2 | 2 | 40.726 | 1.323 | 0.026 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB216B | B | MH2 | 2 | 2 | 40.474 | 1.347 | 0.027 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB217B | B | MH2 | 2 | 2 | 39.031 | 1.437 | 0.028 | 0.090 | 16 | 0.0056 | HGM |
| ABMZB218B | B | MH2 | 2 | 2 | 35.664 | 1.282 | 0.026 | 0.090 | 16 | 0.0056 | HGM |
| ABMZC115B | C | MH1 | 3 | 1 | 37.412 | 1.314 | 0.026 | 0.089 | 16 | 0.0055 | HGM |
| ABMZC116B | C | MH1 | 3 | 1 | 35.924 | 1.319 | 0.026 | 0.088 | 16 | 0.0055 | HGM |
| ABMZC117B | C | MH1 | 3 | 1 | 34.877 | 1.340 | 0.025 | 0.087 | 16 | 0.0054 | HGM |
| ABMZC118B | C | MH1 | 3 | 1 | 30.849 | 1.264 | 0.025 | 0.089 | 16 | 0.0055 | HGM |
| ABMZC215B | C | MH2 | 3 | 2 | 33.029 | 1.256 | 0.017 | 0.088 | 16 | 0.0055 | HGM |
| ABMZC216B | C | MH2 | 3 | 2 | 36.855 | 1.273 | 0.024 | 0.087 | 16 | 0.0055 | HGM |
| ABMZC217B | C | MH2 | 3 | 2 | 35.562 | 1.316 | 0.026 | 0.088 | 16 | 0.0055 | HGM |
| ABMZC218B | C | MH2 | 3 | 2 | 32.532 | 1.284 | 0.023 | 0.088 | 16 | 0.0055 | HGM |
| | | | | **Average** | **36.639** | **1.331** | **0.025** | **0.089** | | **0.0056** | |
| | | | | **Standard Dev.** | **2.915** | **0.063** | **0.003** | | | | |
| | | | | **Coeff. of Var. [%]** | **7.957** | **4.725** | **10.442** | | | | |
| | | | | **Min.** | **30.849** | **1.220** | **0.017** | **0.087** | | **0.0054** | |
| | | | | **Max.** | **40.726** | **1.448** | **0.030** | **0.091** | | **0.0057** | |
| | | | | **Number of Spec.** | **22** | **22** | **22** | | | | |


Transverse Compression Properties (TC) -- (CTD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Compression Strength [ksi]
0
5
10
15
20
25
30
35
40
45
0
1
2
3


Transverse Compression Properties (TC) -- (CTD)
Measured Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Compression Modulus [Msi]
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
0
1
2
3

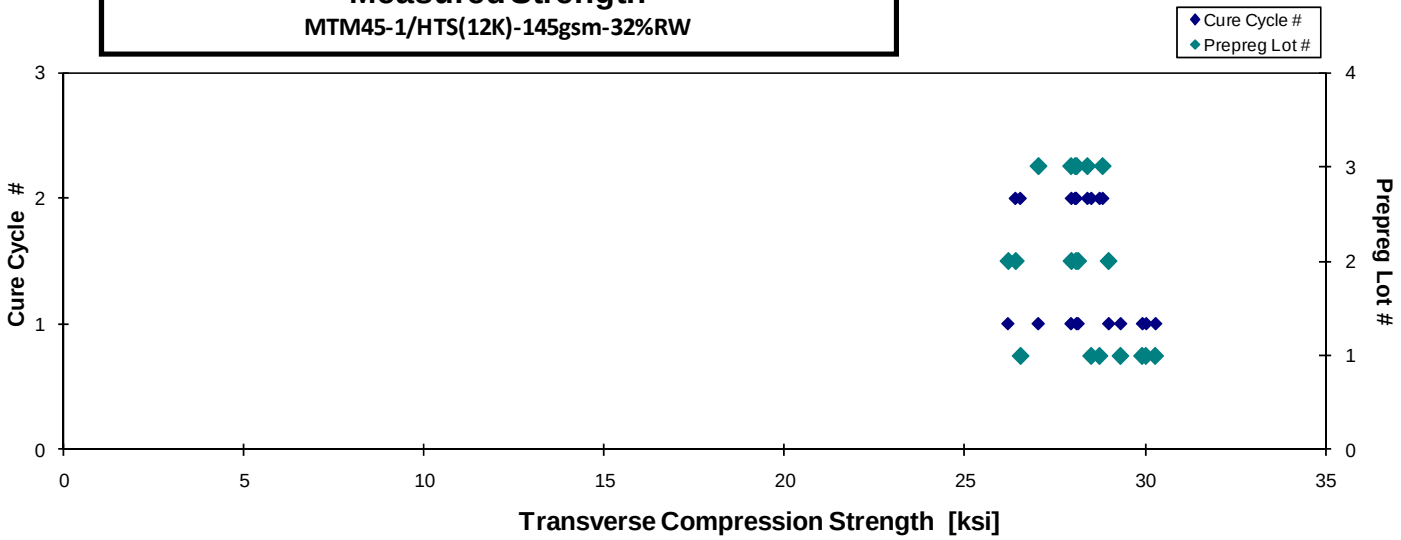
## Transverse Compression Properties (TC) -- (RTD)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMZA111A | A | MH1 | 1 | 1 | 30.294 | 1.346 | 0.028 | 0.087 | 16 | 0.0055 | HAT/HAB |
| ABMZA112A | A | MH1 | 1 | 1 | 29.928 | 1.284 | 0.023 | 0.089 | 16 | 0.0056 | HGM |
| ABMZA113A | A | MH1 | 1 | 1 | 30.033 | 1.294 | 0.026 | 0.088 | 16 | 0.0055 | HGM |
| ABMZA114A | A | MH1 | 1 | 1 | 29.322 | 1.257 | 0.023 | 0.089 | 16 | 0.0055 | HAT/HGM |
| ABMZA211A | A | MH2 | 1 | 2 | 26.531 | 1.402 | 0.024 | 0.082 | 16 | 0.0052 | HAT |
| ABMZA212A | A | MH2 | 1 | 2 | 28.505 | 1.274 | 0.031 | 0.089 | 16 | 0.0056 | HAT |
| ABMZA213A | A | MH2 | 1 | 2 | 28.737 | 1.290 | 0.028 | 0.090 | 16 | 0.0056 | HGM |
| ABMZB111A | B | MH1 | 2 | 1 | 26.188 | 1.346 | 0.022 | 0.084 | 16 | 0.0053 | HAT |
| ABMZB113A | B | MH1 | 2 | 1 | 28.990 | 1.237 | 0.026 | 0.091 | 16 | 0.0057 | HAT |
| ABMZB114A | B | MH1 | 2 | 1 | 28.140 | 1.178 | 0.025 | 0.091 | 16 | 0.0057 | HAT |
| ABMZB211A | B | MH2 | 2 | 2 | 27.952 | 1.257 | 0.028 | 0.089 | 16 | 0.0055 | HAT |
| ABMZB212A | B | MH2 | 2 | 2 | 28.083 | 1.215 | 0.026 | 0.090 | 16 | 0.0057 | HAT |
| ABMZB212A | B | MH2 | 2 | 2 | 26.396 | 1.256 | 0.025 | 0.091 | 16 | 0.0057 | HAT |
| ABMZC111A | C | MH1 | 3 | 1 | 28.098 | 1.259 | 0.026 | 0.086 | 16 | 0.0054 | HGM/HAB |
| ABMZC112A | C | MH1 | 3 | 1 | 27.030 | 1.244 | 0.024 | 0.089 | 16 | 0.0055 | HAB |
| ABMZC113A | C | MH1 | 3 | 1 | 27.942 | 1.216 | 0.026 | 0.088 | 16 | 0.0055 | HGM |
| ABMZC211A | C | MH2 | 3 | 2 | 28.058 | 1.267 | 0.024 | 0.087 | 16 | 0.0054 | HAT |
| ABMZC212A | C | MH2 | 3 | 2 | 28.824 | 1.211 | 0.022 | 0.087 | 16 | 0.0054 | HAT |
| ABMZC213A | C | MH2 | 3 | 2 | 28.398 | 1.169 | 0.024 | 0.087 | 16 | 0.0055 | HAT |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **28.287** | **1.263** | **0.025** | **0.088** | **0.0055** |
| **Standard Dev.** | **1.176** | **0.058** | **0.002** | | |
| **Coeff. of Var. [%]** | **4.159** | **4.552** | **9.510** | | |
| **Min.** | **26.188** | **1.169** | **0.022** | **0.082** | **0.0052** |
| **Max.** | **30.294** | **1.402** | **0.031** | **0.091** | **0.0057** |
| **Number of Spec.** | **19** | **19** | **19** | | |

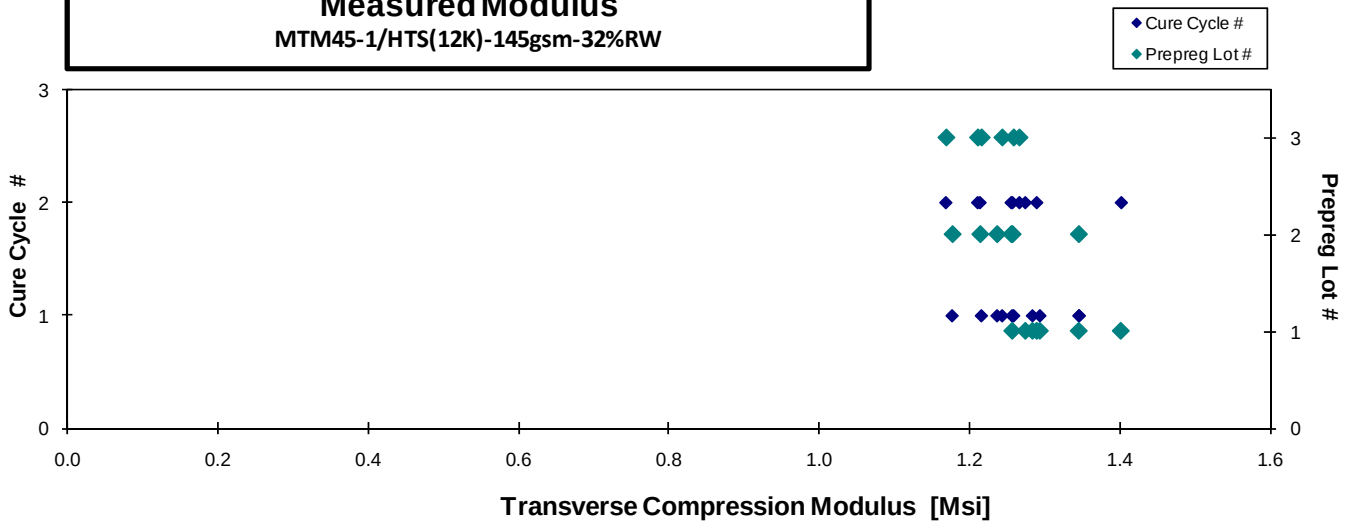
## Transverse Compression Properties (TC) -- (RTD) Measured Strength

**MTM45-1/HTS(12K)-145gsm-32%RW**




## Transverse Compression Properties (TC) -- (RTD) Measured Modulus

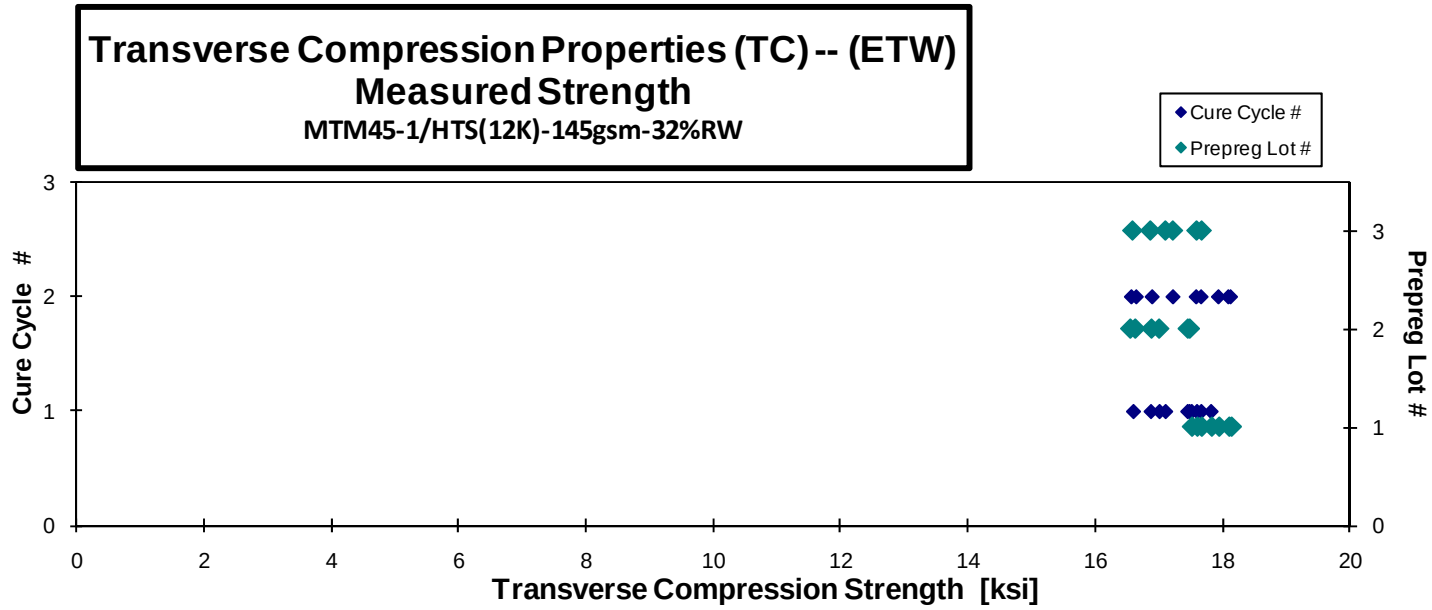
**MTM45-1/HTS(12K)-145gsm-32%RW**

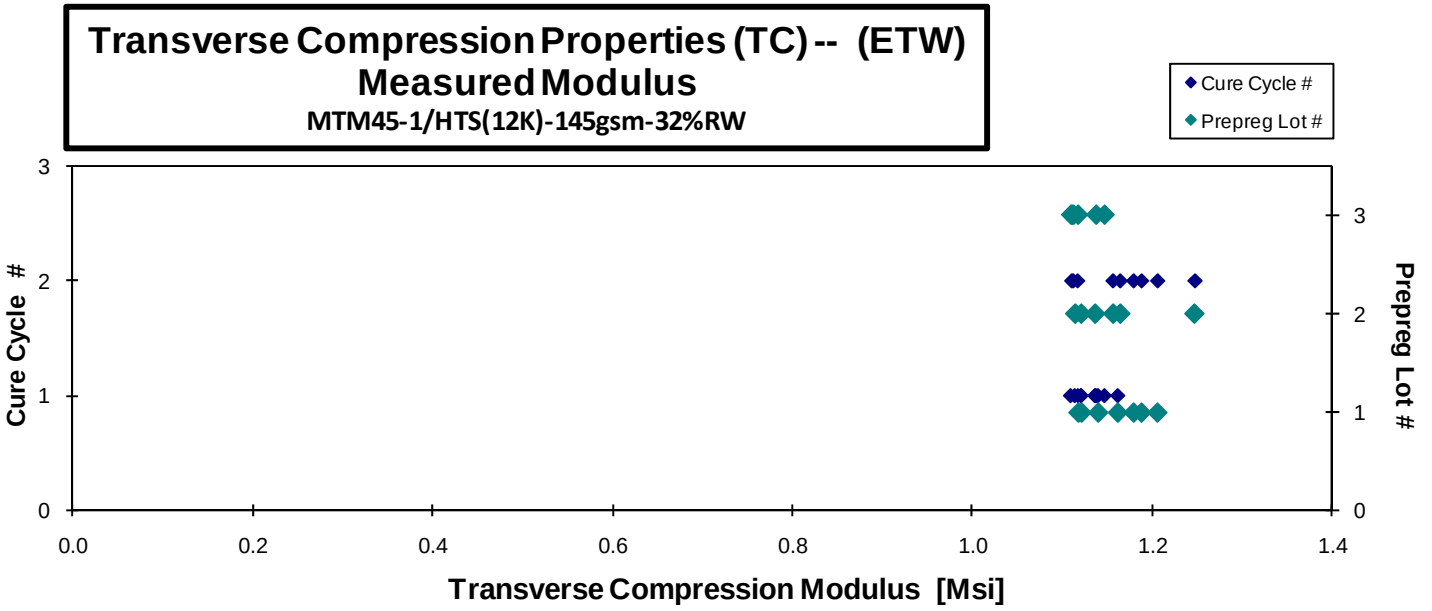


# Transverse Compression Properties (TC) -- (ETW)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMZA119N | A | MH1 | 1 | 1 | 17.518 | 1.118 | 0.018 | 0.088 | 16 | 0.0055 | HGM |
| ABMZA11AN | A | MH1 | 1 | 1 | 17.669 | 1.122 | 0.019 | 0.088 | 16 | 0.0055 | HGM |
| ABMZA11BN | A | MH1 | 1 | 1 | 17.602 | 1.140 | 0.019 | 0.088 | 16 | 0.0055 | HGM |
| ABMZA11CN | A | MH1 | 1 | 1 | 17.824 | 1.162 | 0.021 | 0.089 | 16 | 0.0055 | HGM |
| ABMZA219N | A | MH2 | 1 | 2 | 17.939 | 1.206 | 0.020 | 0.089 | 16 | 0.0056 | HAB |
| ABMZA21AN | A | MH2 | 1 | 2 | 18.131 | 1.188 | 0.021 | 0.089 | 16 | 0.0056 | HGM |
| ABMZA21BN | A | MH2 | 1 | 2 | 18.096 | 1.180 | 0.021 | 0.089 | 16 | 0.0055 | HAB |
| ABMZB119N | B | MH1 | 2 | 1 | 17.009 | 1.137 | 0.022 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB11AN | B | MH1 | 2 | 1 | 17.453 | 1.121 | 0.021 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB11BN | B | MH1 | 2 | 1 | 17.482 | 1.115 | 0.021 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB219N | B | MH2 | 2 | 2 | 16.640 | 1.157 | 0.018 | 0.090 | 16 | 0.0056 | HGM |
| ABMZB21AN | B | MH2 | 2 | 2 | 16.563 | 1.165 | 0.018 | 0.090 | 16 | 0.0056 | HGM |
| ABMZB21BN | B | MH2 | 2 | 2 | 16.892 | 1.247 | 0.017 | 0.089 | 16 | 0.0056 | HGM |
| ABMZC119N | C | MH1 | 3 | 1 | 17.106 | 1.138 | 0.022 | 0.088 | 16 | 0.0055 | HGM |
| ABMZC11AN | C | MH1 | 3 | 1 | 16.873 | 1.110 | 0.024 | 0.089 | 16 | 0.0055 | HGM |
| ABMZC11BN | C | MH1 | 3 | 1 | 16.597 | 1.147 | 0.022 | 0.089 | 16 | 0.0055 | HGM |
| ABMZC219N | C | MH2 | 3 | 2 | 17.221 | 1.118 | 0.018 | 0.087 | 16 | 0.0055 | HGM |
| ABMZC21AN | C | MH2 | 3 | 2 | 17.588 | 1.111 | 0.019 | 0.088 | 16 | 0.0055 | HGM |
| ABMZC21BN | C | MH2 | 3 | 2 | 17.665 | 1.113 | 0.018 | 0.088 | 16 | 0.0055 | HGM |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **17.361** | **1.147** | **0.020** | **0.089** | **0.0056** |
| **Standard Dev.** | **0.496** | **0.037** | **0.002** | | |
| **Coeff. of Var. [%]** | **2.858** | **3.244** | **9.352** | | |
| **Min.** | **16.563** | **1.110** | **0.017** | **0.087** | **0.0055** |
| **Max.** | **18.131** | **1.247** | **0.024** | **0.091** | **0.0057** |
| **Number of Spec.** | **19** | **19** | **19** | | |


Transverse Compression Properties (TC) -- (ETW)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Compression Strength [ksi]
0
2
4
6
8
10
12
14
16
18
20
0
1
2
3


Transverse Compression Properties (TC) -- (ETW)
Measured Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Compression Modulus [Msi]
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
0
1
2
3

## Transverse Compression Properties (TC) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

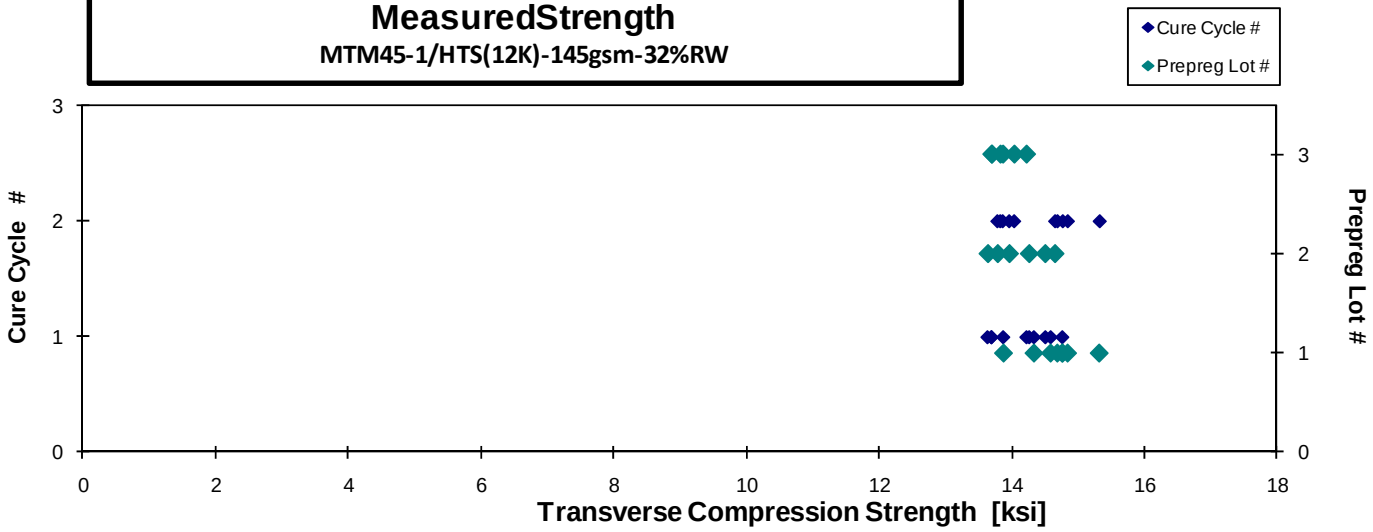
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMZA11ED | A | MH1 | 1 | 1 | 14.767 | 1.109 | 0.021 | 0.089 | 16 | 0.0055 | HGM |
| ABMZA11FD | A | MH1 | 1 | 1 | 14.593 | 1.103 | 0.019 | 0.088 | 16 | 0.0055 | HGM |
| ABMZA11GD* | A | MH1 | 1 | 1 | 13.883 | 1.109 | | 0.088 | 16 | 0.0055 | HGM |
| ABMZA11HD | A | MH1 | 1 | 1 | 14.342 | 1.047 | 0.021 | 0.084 | 16 | 0.0052 | HGM |
| ABMZA21ED | A | MH2 | 1 | 2 | 14.775 | 1.089 | 0.022 | 0.089 | 16 | 0.0056 | HGM |
| ABMZA21FD | A | MH2 | 1 | 2 | 15.327 | 1.078 | 0.019 | 0.089 | 16 | 0.0056 | HGM |
| ABMZA21GD | A | MH2 | 1 | 2 | 14.849 | 1.066 | 0.016 | 0.090 | 16 | 0.0056 | HGM |
| ABMZA21HD | A | MH2 | 1 | 2 | 14.694 | 1.119 | 0.026 | 0.088 | 16 | 0.0055 | HGM |
| ABMZB11ED | B | MH1 | 2 | 1 | 13.648 | 0.981 | 0.020 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB11FD | B | MH1 | 2 | 1 | 14.513 | 1.002 | 0.019 | 0.091 | 16 | 0.0057 | HGM |
| ABMZB11GD | B | MH1 | 2 | 1 | 14.271 | 1.107 | 0.032 | 0.090 | 16 | 0.0057 | HGM |
| ABMZB21ED | B | MH2 | 2 | 2 | 14.660 | 1.093 | 0.021 | 0.090 | 16 | 0.0056 | HGM |
| ABMZB21FD | B | MH2 | 2 | 2 | 13.972 | 1.135 | 0.021 | 0.090 | 16 | 0.0056 | HGM |
| ABMZB21GD | B | MH2 | 2 | 2 | 13.796 | 1.173 | 0.034 | 0.090 | 16 | 0.0056 | HGM |
| ABMZC11DD | C | MH1 | 3 | 1 | 14.231 | 1.046 | 0.022 | 0.088 | 16 | 0.0055 | HGM |
| ABMZC11ED | C | MH1 | 3 | 1 | 13.707 | 1.025 | 0.020 | 0.089 | 16 | 0.0055 | HGM |
| ABMZC11FD | C | MH1 | 3 | 1 | 13.706 | 1.174 | 0.030 | 0.087 | 16 | 0.0054 | HGM |
| ABMZC21ED | C | MH2 | 3 | 2 | 13.838 | 0.998 | 0.019 | 0.087 | 16 | 0.0054 | HGM |
| ABMZC21FD | C | MH2 | 3 | 2 | 14.047 | 1.042 | 0.020 | 0.087 | 16 | 0.0054 | HGM |
| ABMZC21GD | C | MH2 | 3 | 2 | 13.875 | 0.984 | 0.018 | 0.088 | 16 | 0.0055 | HGM |

*SPECIMEN ABMZA11GD POISSON RATIO WAS REMOVED DUE TO NON-LINEARITY OF THE GRAPH

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **14.275** | **1.074** | **0.022** | **0.089** | **0.0055** |
| **Standard Dev.** | **0.478** | **0.058** | **0.005** | | |
| **Coeff. of Var. [%]** | **3.345** | **5.374** | **22.094** | | |
| **Min.** | **13.648** | **0.981** | **0.016** | **0.084** | **0.0052** |
| **Max.** | **15.327** | **1.174** | **0.034** | **0.091** | **0.0057** |
| **Number of Spec.** | **20** | **20** | **19** | | |

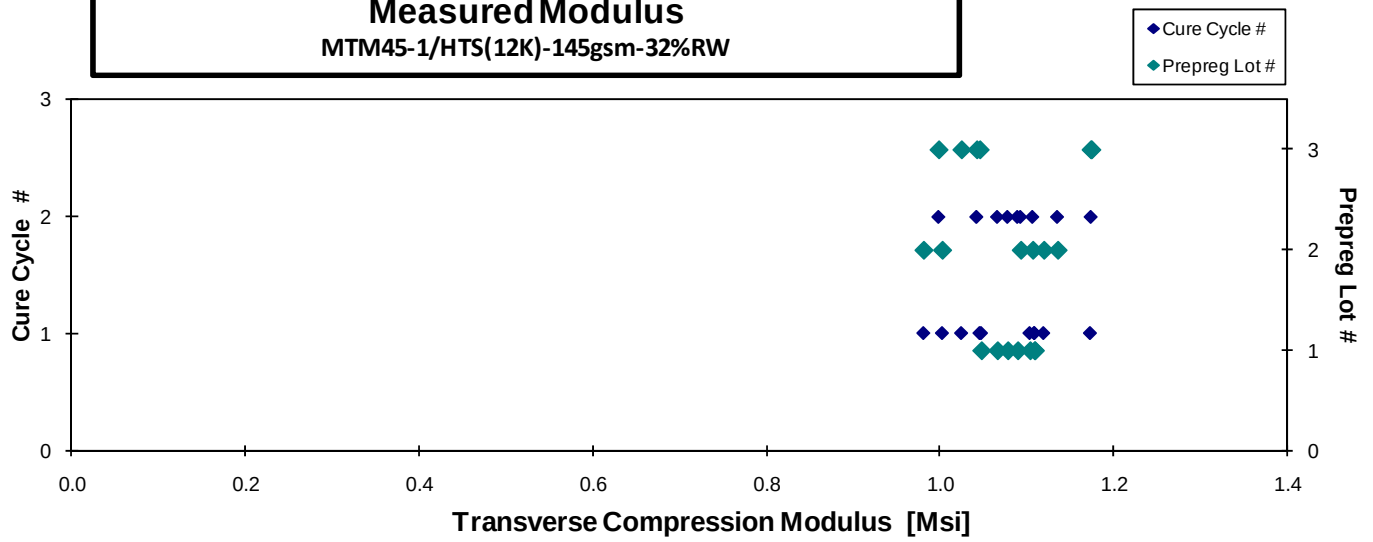
## Transverse Compression Properties (TC) -- (ETW2) MeasuredStrength

**MTM45-1/HTS(12K)-145gsm-32%RW**




## Transverse Compression Properties (TC) -- (ETW2) Measured Modulus

**MTM45-1/HTS(12K)-145gsm-32%RW**



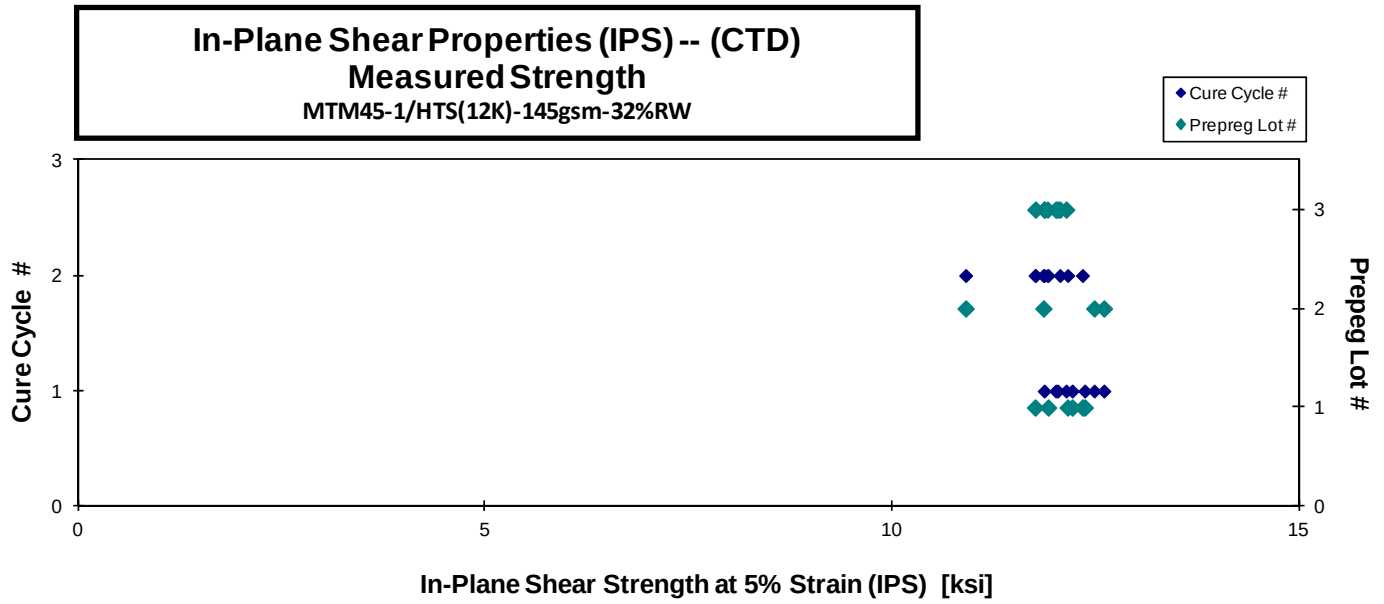
## 4.5 In-Plane Shear Properties

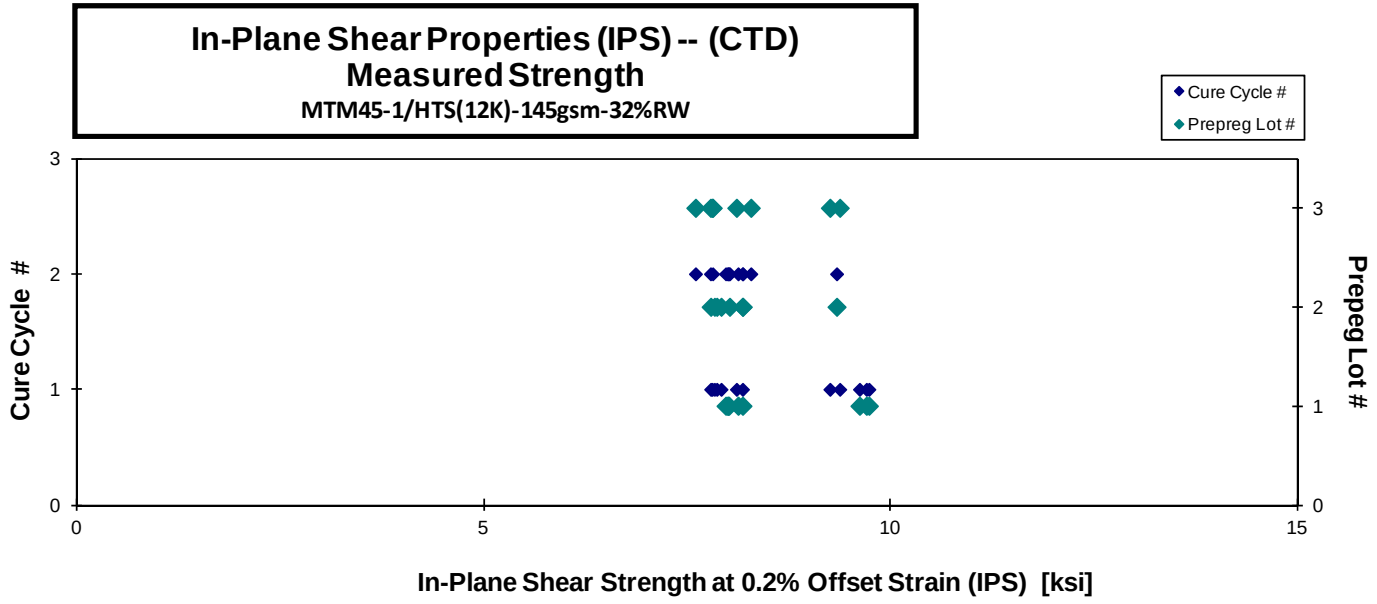
**In-Plane Shear Properties (IPS) -- (CTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

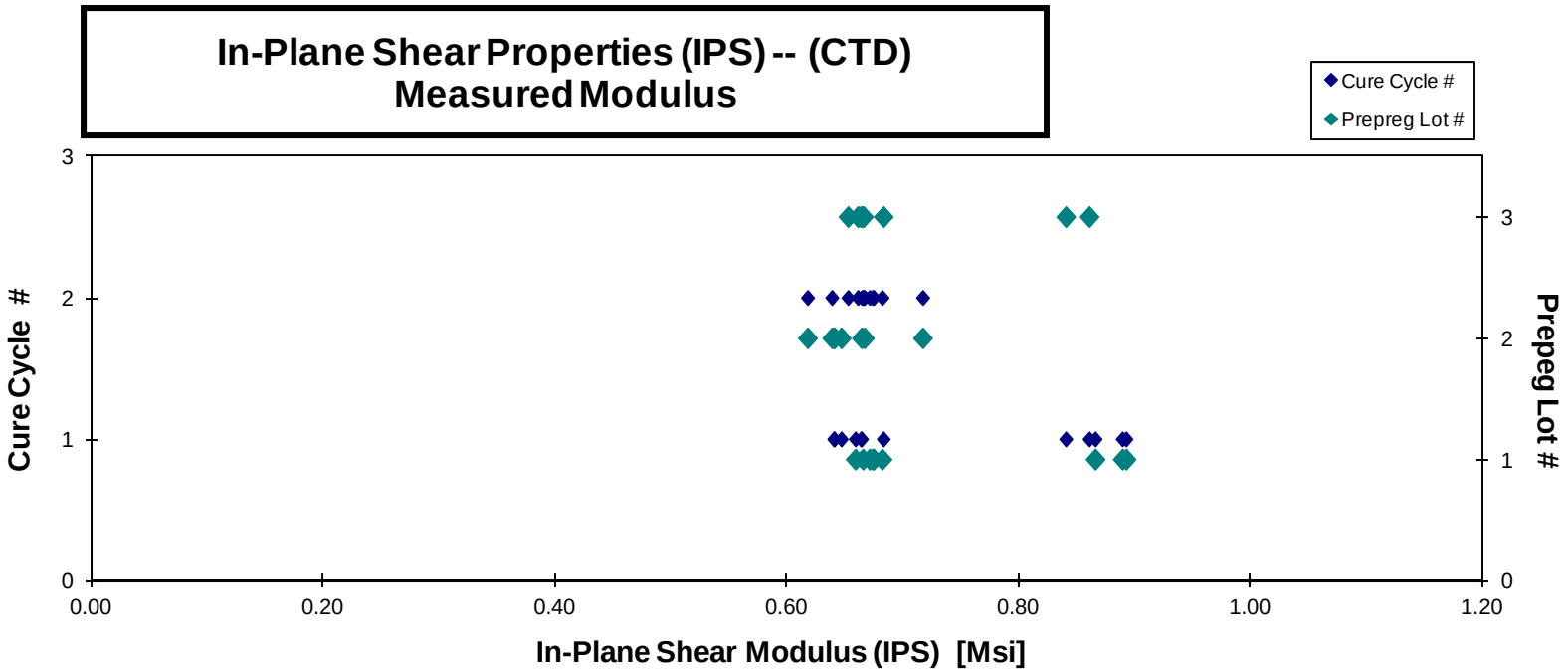
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength at 5% Strain [ksi] | 0.2% Offset Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMNA116B | A | MH1 | 1 | 1 | 12.213 | 8.1832 | 0.658 | 0.044 | 8 | 0.0055 |
| ABMNA117B | A | MH1 | 1 | 1 | 12.367 | 9.6211 | 0.865 | 0.044 | 8 | 0.0055 |
| ABMNA118B* | A | MH1 | 1 | 1 | | 9.7055 | 0.892 | 0.044 | 8 | 0.0055 |
| ABMNA119B* | A | MH1 | 1 | 1 | | 9.737 | 0.889 | 0.044 | 8 | 0.0055 |
| ABMNA214B* | A | MH2 | 1 | 2 | | 7.997 | 0.665 | 0.044 | 8 | 0.0055 |
| ABMNA215B | A | MH2 | 1 | 2 | 12.339 | 8.129 | 0.681 | 0.044 | 8 | 0.0055 |
| ABMNA216B | A | MH2 | 1 | 2 | 12.157 | 8.013 | 0.673 | 0.044 | 8 | 0.0056 |
| ABMNA217B | A | MH2 | 1 | 2 | 11.917 | 8.003 | 0.671 | 0.044 | 8 | 0.0055 |
| ABMNA218B | A | MH2 | 1 | 2 | 11.757 | 7.976 | 0.674 | 0.045 | 8 | 0.0056 |
| ABMNB115B | B | MH1 | 2 | 1 | 12.484 | 7.866 | 0.640 | 0.045 | 8 | 0.0056 |
| ABMNB116B | B | MH1 | 2 | 1 | 12.602 | 7.838 | 0.640 | 0.045 | 8 | 0.0056 |
| ABMNB117B* | B | MH1 | 2 | 1 | | 7.792 | 0.646 | 0.045 | 8 | 0.0056 |
| ABMNB118B* | B | MH1 | 2 | 1 | | 7.919 | 0.664 | 0.045 | 8 | 0.0057 |
| ABMNB215B* | B | MH2 | 2 | 2 | | 8.185 | 0.666 | 0.045 | 8 | 0.0056 |
| ABMNB216B | B | MH2 | 2 | 2 | 10.904 | 8.023 | 0.638 | 0.045 | 8 | 0.0056 |
| ABMNB217B* | B | MH2 | 2 | 2 | | 8.182 | 0.617 | 0.045 | 8 | 0.0056 |
| ABMNB218B | B | MH2 | 2 | 2 | 11.859 | 9.339 | 0.716 | 0.045 | 8 | 0.0056 |
| ABMNC114B | C | MH1 | 3 | 1 | 12.034 | 9.257 | 0.860 | 0.043 | 8 | 0.0054 |
| ABMNC115B | C | MH1 | 3 | 1 | 12.139 | 9.378 | 0.840 | 0.043 | 8 | 0.0054 |
| ABMNC116B | C | MH1 | 3 | 1 | 11.869 | 7.810 | 0.663 | 0.044 | 8 | 0.0055 |
| ABMNC117B | C | MH1 | 3 | 1 | 12.011 | 8.108 | 0.682 | 0.043 | 8 | 0.0054 |
| ABMNC215B | C | MH2 | 3 | 2 | 12.062 | 8.285 | 0.665 | 0.043 | 8 | 0.0054 |
| ABMNC216B | C | MH2 | 3 | 2 | 11.761 | 7.604 | 0.652 | 0.044 | 8 | 0.0055 |
| ABMNC217B | C | MH2 | 3 | 2 | 11.909 | 7.789 | 0.660 | 0.044 | 8 | 0.0055 |
| ABMNC218B | C | MH2 | 3 | 2 | 11.870 | 7.816 | 0.664 | 0.044 | 8 | 0.0055 |

*PEAK BEFORE 5% STRAIN

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **12.014** | **8.342** | **0.703** | **Average** | **0.0055** |
| **Standard Dev.** | **0.370** | **0.691** | **0.087** | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **3.077** | **8.287** | **12.375** | **Coeff. of Var. [%]** | |
| **Min.** | **10.904** | **7.604** | **0.617** | **Min.** | **0.0054** |
| **Max.** | **12.602** | **9.737** | **0.892** | **Max.** | **0.0057** |
| **Number of Spec.** | **18** | **25** | **25** | **Number of Spec.** | **25** |


In-Plane Shear Properties (IPS) -- (CTD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepeg Lot #
In-Plane Shear Strength at 5% Strain (IPS) [ksi]


In-Plane Shear Properties (IPS) -- (CTD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepeg Lot #
In-Plane Shear Strength at 0.2% Offset Strain (IPS) [ksi]


In-Plane Shear Properties (IPS) -- (CTD)
Measured Modulus
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepeg Lot #
0
1
2
3
0.00
0.20
0.40
0.60
0.80
1.00
1.20
In-Plane Shear Modulus (IPS) [Msi]

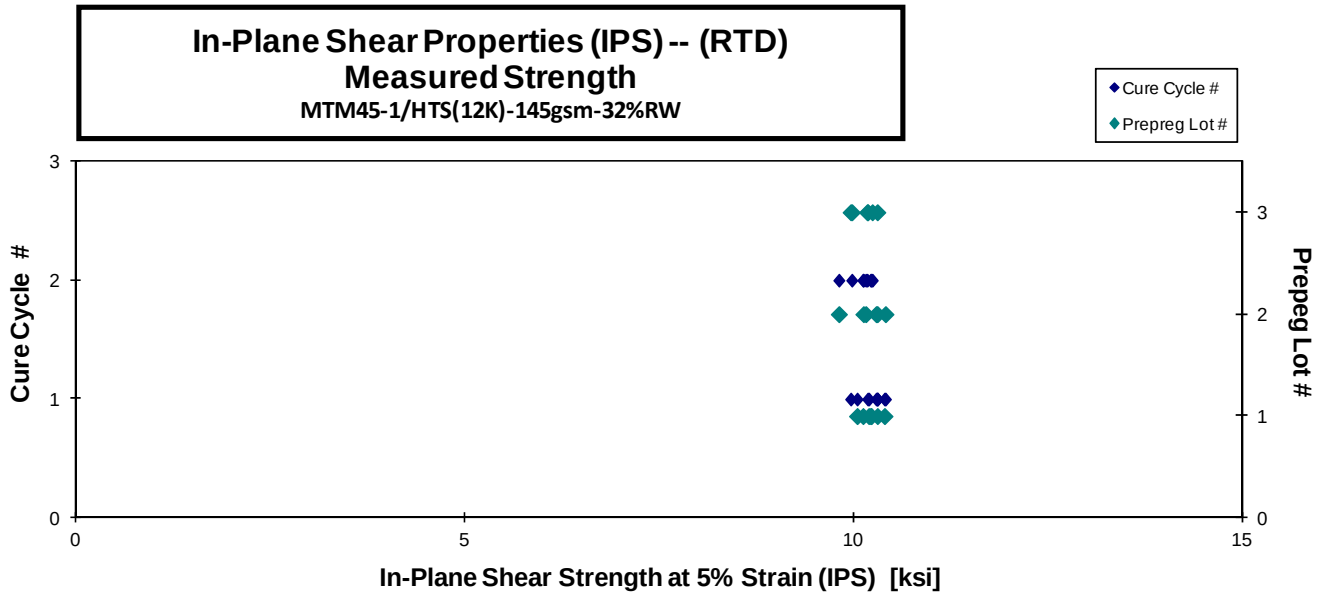
# In-Plane Shear Properties (IPS) -- (RTD) Strength & Modulus

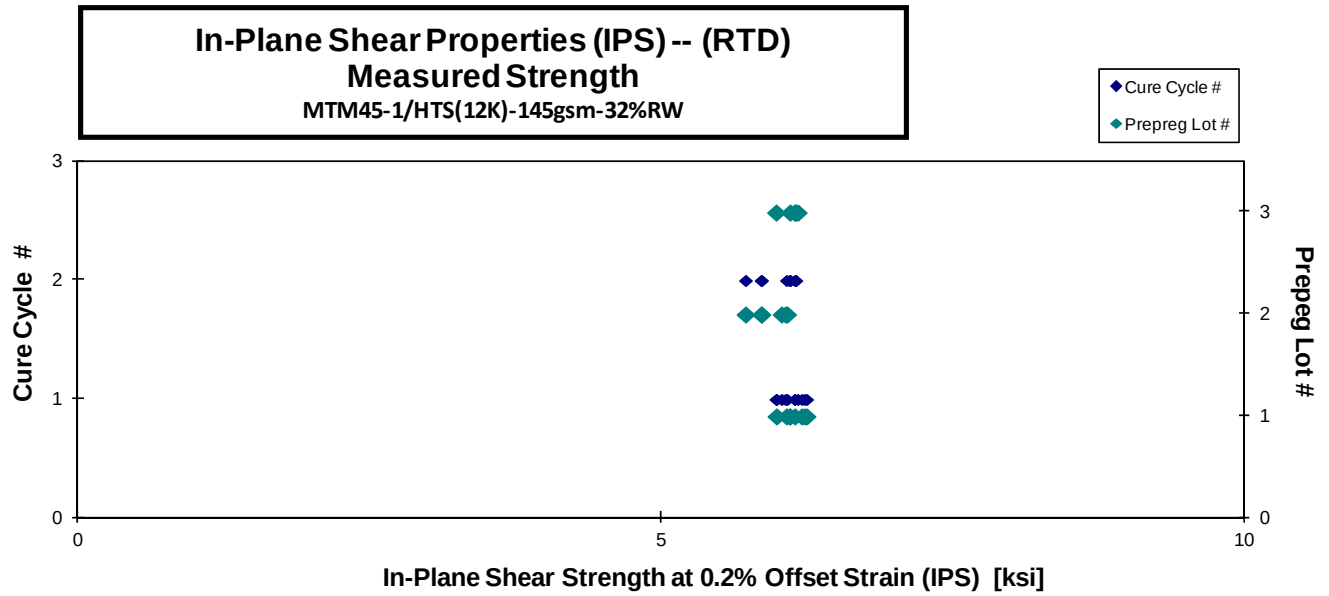
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength at 5% Strain [ksi] | 0.2% Offset Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMNA111A* | A | MH1 | 1 | 1 | | 6.208 | 0.587 | 0.044 | 8 | 0.0055 |
| ABMNA112A | A | MH1 | 1 | 1 | 10.398 | 6.231 | 0.584 | 0.044 | 8 | 0.0054 |
| ABMNA113A | A | MH1 | 1 | 1 | 10.307 | 6.249 | 0.589 | 0.044 | 8 | 0.0055 |
| ABMNA114A | A | MH1 | 1 | 1 | 10.195 | 6.148 | 0.580 | 0.044 | 8 | 0.0055 |
| ABMNA115A | A | MH1 | 1 | 1 | 10.046 | 5.991 | 0.566 | 0.045 | 8 | 0.0056 |
| ABMNA211A | A | MH2 | 1 | 2 | 10.226 | 6.106 | 0.571 | 0.044 | 8 | 0.0055 |
| ABMNA212A | A | MH2 | 1 | 2 | 10.218 | 6.104 | 0.575 | 0.044 | 8 | 0.0055 |
| ABMNA213A | A | MH2 | 1 | 2 | 10.121 | 6.077 | 0.574 | 0.044 | 8 | 0.0055 |
| ABMNB111A | B | MH1 | 2 | 1 | 10.291 | 6.068 | 0.563 | 0.045 | 8 | 0.0056 |
| ABMNB112A | B | MH1 | 2 | 1 | 10.410 | 6.083 | 0.567 | 0.045 | 8 | 0.0056 |
| ABMNB113A | B | MH1 | 2 | 1 | 10.305 | 6.034 | 0.563 | 0.045 | 8 | 0.0057 |
| ABMNB211A | B | MH2 | 2 | 2 | 9.811 | 5.726 | 0.530 | 0.046 | 8 | 0.0058 |
| ABMNB212A | B | MH2 | 2 | 2 | 10.157 | 5.860 | 0.535 | 0.045 | 8 | 0.0057 |
| ABMNB213A | B | MH2 | 2 | 2 | 10.127 | 5.863 | 0.542 | 0.046 | 8 | 0.0057 |
| ABMNC111A | C | MH1 | 3 | 1 | 10.305 | 6.174 | 0.591 | 0.043 | 8 | 0.0053 |
| ABMNC112A | C | MH1 | 3 | 1 | 10.182 | 6.147 | 0.587 | 0.043 | 8 | 0.0054 |
| ABMNC113A | C | MH1 | 3 | 1 | 9.963 | 5.987 | 0.571 | 0.044 | 8 | 0.0055 |
| ABMNC211A | C | MH2 | 3 | 2 | 10.175 | 6.148 | 0.584 | 0.044 | 8 | 0.0054 |
| ABMNC212A | C | MH2 | 3 | 2 | 9.978 | 6.157 | 0.590 | 0.044 | 8 | 0.0054 |
| ABMNC213A | C | MH2 | 3 | 2 | 10.241 | 6.107 | 0.576 | 0.043 | 8 | 0.0054 |

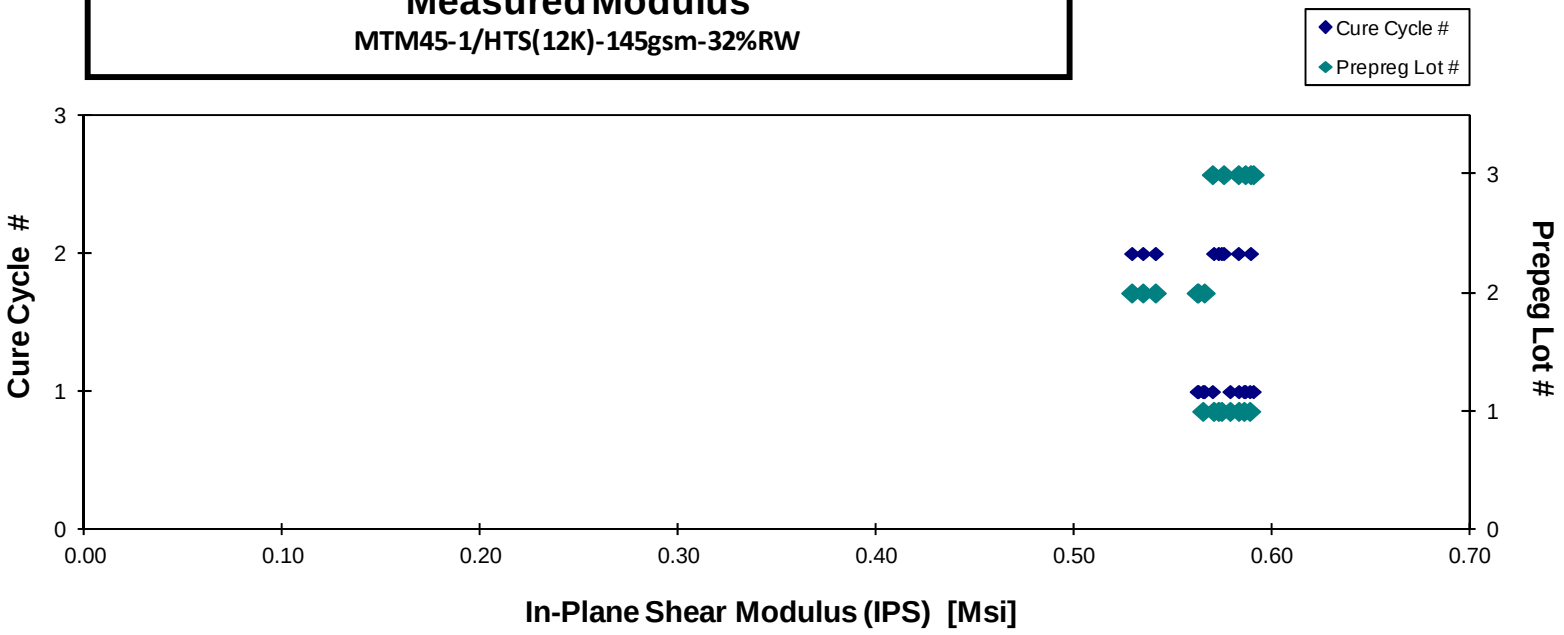
*PEAK BEFORE 5% STRAIN

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **10.182** | **6.073** | **0.571** | **Average** | **0.0055** |
| **Standard Dev.** | **0.152** | **0.133** | **0.018** | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **1.493** | **2.194** | **3.125** | **Coeff. of Var. [%]** | |
| **Min.** | **9.811** | **5.726** | **0.530** | **Min.** | **0.0053** |
| **Max.** | **10.410** | **6.249** | **0.591** | **Max.** | **0.0058** |
| **Number of Spec.** | **19** | **20** | **20** | **Number of Spec.** | **20** |


In-Plane Shear Properties (IPS) -- (RTD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
5
10
15
In-Plane Shear Strength at 5% Strain (IPS) [ksi]


In-Plane Shear Properties (IPS) -- (RTD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
5
10
In-Plane Shear Strength at 0.2% Offset Strain (IPS) [ksi]

## In-Plane Shear Properties (IPS) -- (RTD)
## Measured Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

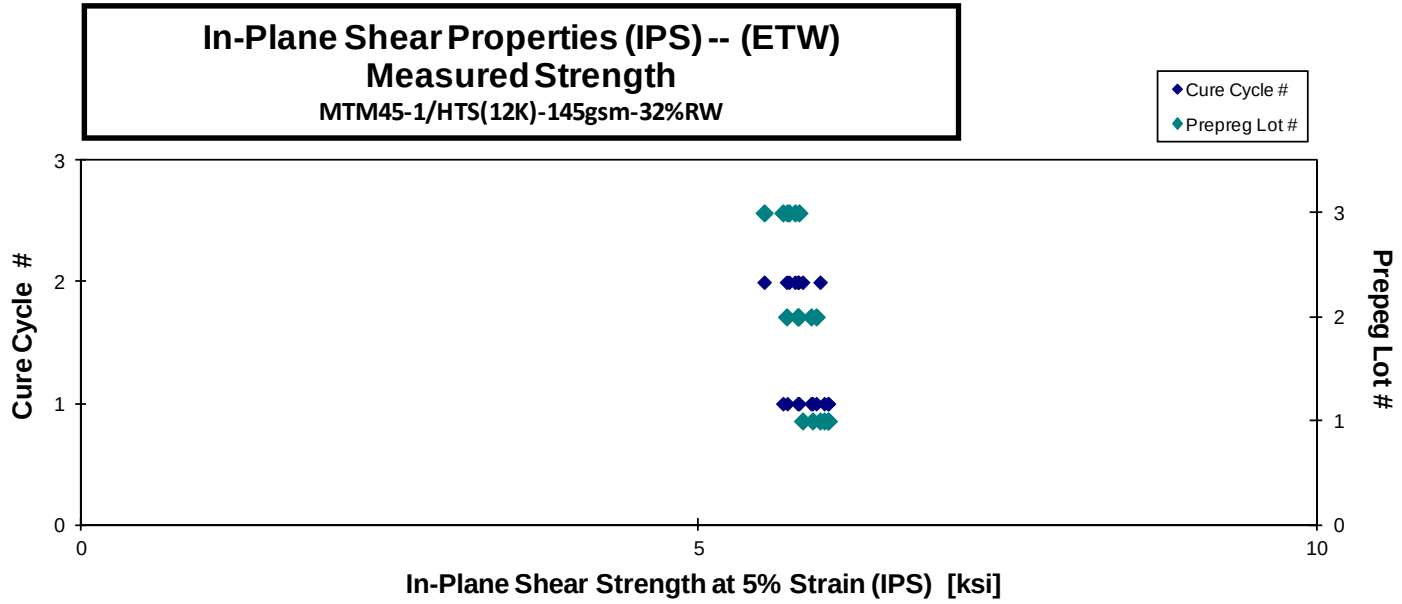


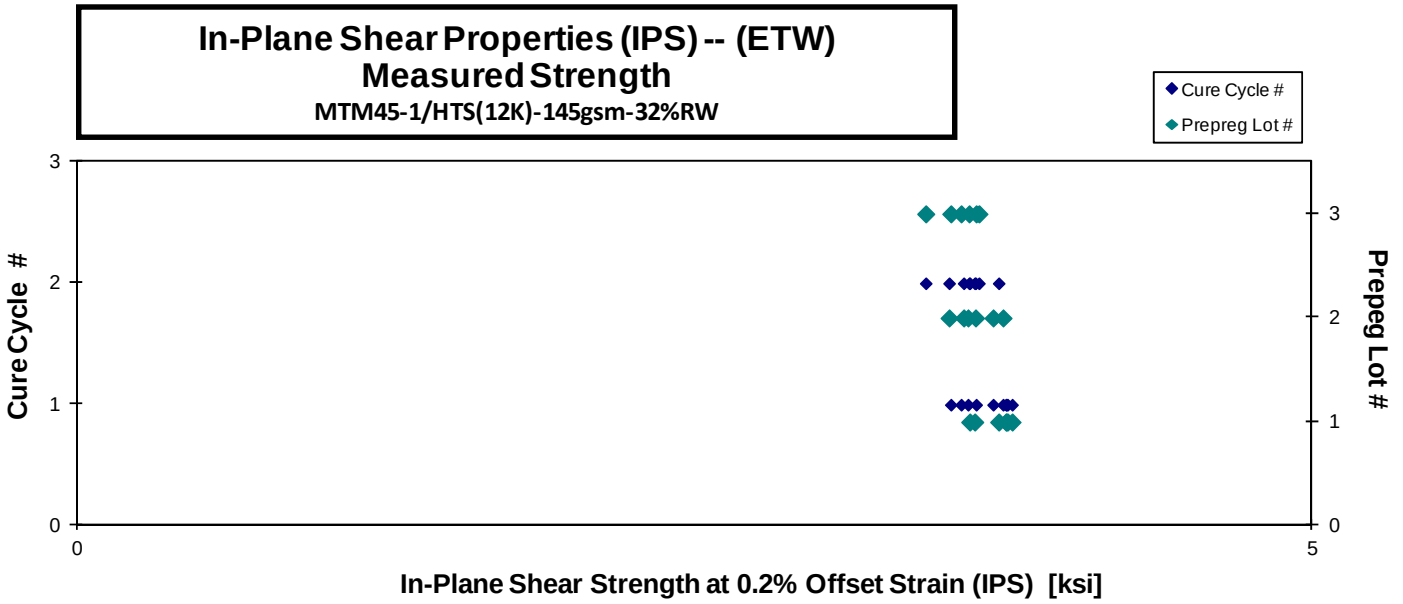
## In-Plane Shear Properties (IPS) -- (ETW)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

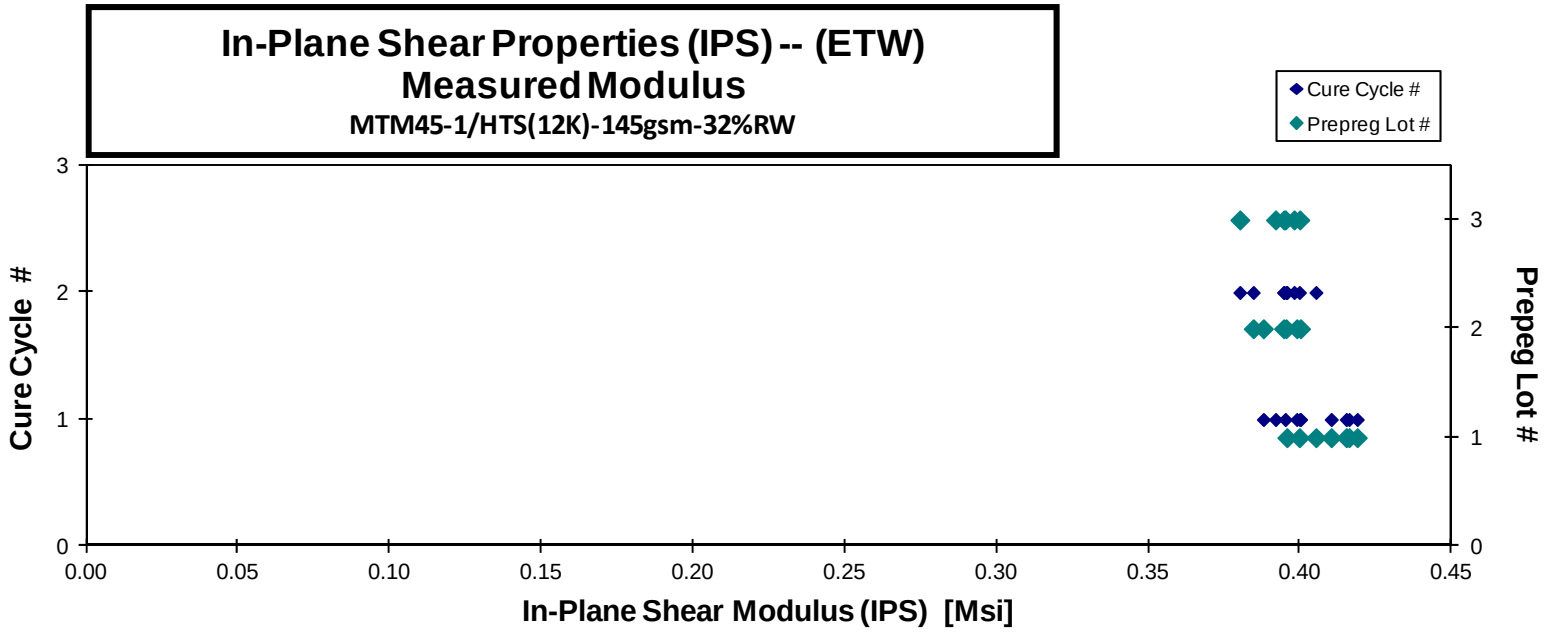
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength at 5% Strain [ksi] | 0.2% Offset Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMNA11EN | A | MH1 | 1 | 1 | 6.013 | 3.759 | 0.410 | 0.044 | 8 | 0.0054 |
| ABMNA11FN | A | MH1 | 1 | 1 | 6.046 | 3.764 | 0.415 | 0.044 | 8 | 0.0055 |
| ABMNA11GN | A | MH1 | 1 | 1 | 5.919 | 3.757 | 0.416 | 0.044 | 8 | 0.0055 |
| ABMNA11HN | A | MH1 | 1 | 1 | 6.042 | 3.782 | 0.419 | 0.043 | 8 | 0.0054 |
| ABMNA21FN* | A | MH2 | 1 | 2 | | 3.611 | 0.395 | 0.045 | 8 | 0.0056 |
| ABMNA21GN | A | MH2 | 1 | 2 | 5.838 | 3.631 | 0.400 | 0.045 | 8 | 0.0056 |
| ABMNA21HN | A | MH2 | 1 | 2 | 5.979 | 3.728 | 0.405 | 0.044 | 8 | 0.0055 |
| ABMNB119N | B | MH1 | 2 | 1 | 5.949 | 3.705 | 0.400 | 0.045 | 8 | 0.0057 |
| ABMNB11AN | B | MH1 | 2 | 1 | 5.907 | 3.746 | 0.399 | 0.046 | 8 | 0.0058 |
| ABMNB11BN | B | MH1 | 2 | 1 | 5.799 | 3.604 | 0.388 | 0.046 | 8 | 0.0057 |
| ABMNB219N | B | MH2 | 2 | 2 | 5.708 | 3.528 | 0.384 | 0.046 | 8 | 0.0057 |
| ABMNB21AN | B | MH2 | 2 | 2 | 5.799 | 3.586 | 0.395 | 0.044 | 8 | 0.0056 |
| ABMNB21BN | B | MH2 | 2 | 2 | 5.805 | 3.634 | 0.394 | 0.045 | 8 | 0.0057 |
| ABMNC11DN | C | MH1 | 3 | 1 | 5.809 | 3.637 | 0.400 | 0.044 | 8 | 0.0055 |
| ABMNC11EN | C | MH1 | 3 | 1 | 5.678 | 3.534 | 0.392 | 0.044 | 8 | 0.0055 |
| ABMNC11FN | C | MH1 | 3 | 1 | 5.713 | 3.576 | 0.395 | 0.043 | 8 | 0.0054 |
| ABMNC21DN | C | MH2 | 3 | 2 | 5.527 | 3.433 | 0.380 | 0.044 | 8 | 0.0055 |
| ABMNC21EN | C | MH2 | 3 | 2 | 5.727 | 3.608 | 0.394 | 0.043 | 8 | 0.0054 |
| ABMNC21FN | C | MH2 | 3 | 2 | 5.776 | 3.648 | 0.398 | 0.043 | 8 | 0.0054 |

*PEAK BEFORE 5% STRAIN

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **5.835** | **3.646** | **0.399** | **Average** | **0.0055** |
| **Standard Dev.** | **0.140** | **0.095** | **0.010** | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **2.405** | **2.610** | **2.599** | **Coeff. of Var. [%]** | |
| **Min.** | **5.527** | **3.433** | **0.380** | **Min.** | **0.0054** |
| **Max.** | **6.046** | **3.782** | **0.419** | **Max.** | **0.0058** |
| **Number of Spec.** | **18** | **19** | **19** | **Number of Spec.** | **19** |


In-Plane Shear Properties (IPS) -- (ETW)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepeg Lot #
In-Plane Shear Strength at 5% Strain (IPS) [ksi]


In-Plane Shear Properties (IPS) -- (ETW)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepeg Lot #
In-Plane Shear Strength at 0.2% Offset Strain (IPS) [ksi]

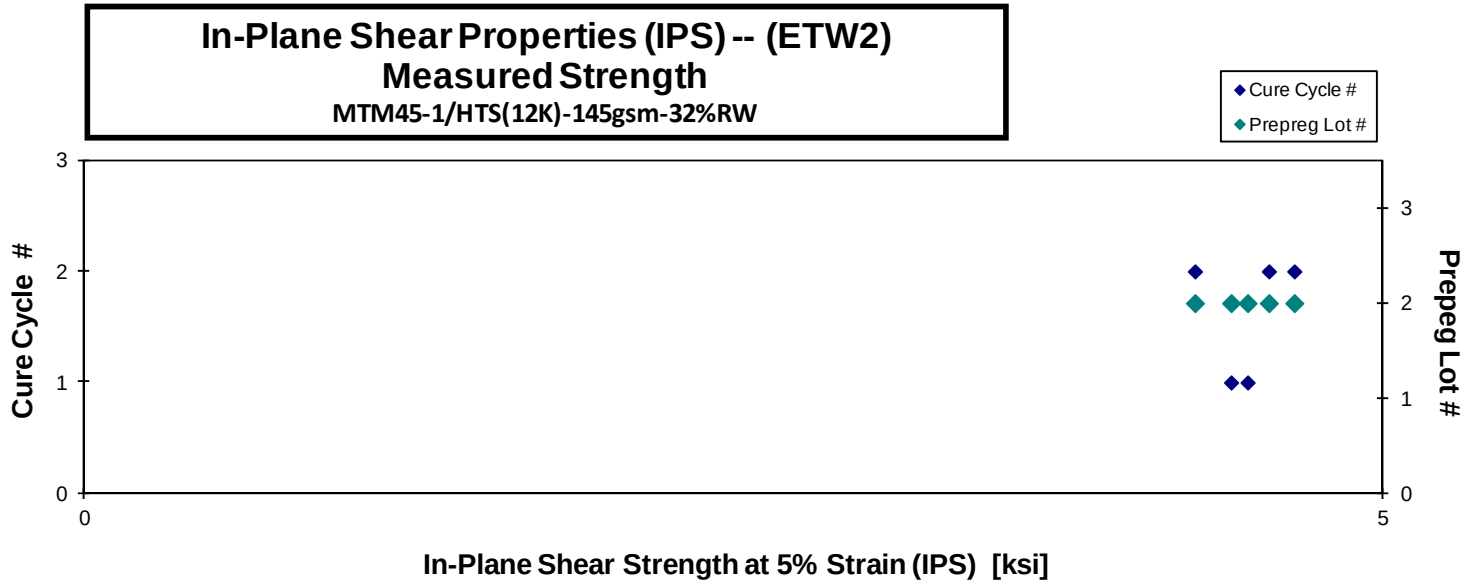

In-Plane Shear Properties (IPS) -- (ETW)
Measured Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepeg Lot #
0
1
2
3
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
In-Plane Shear Modulus (IPS) [Msi]

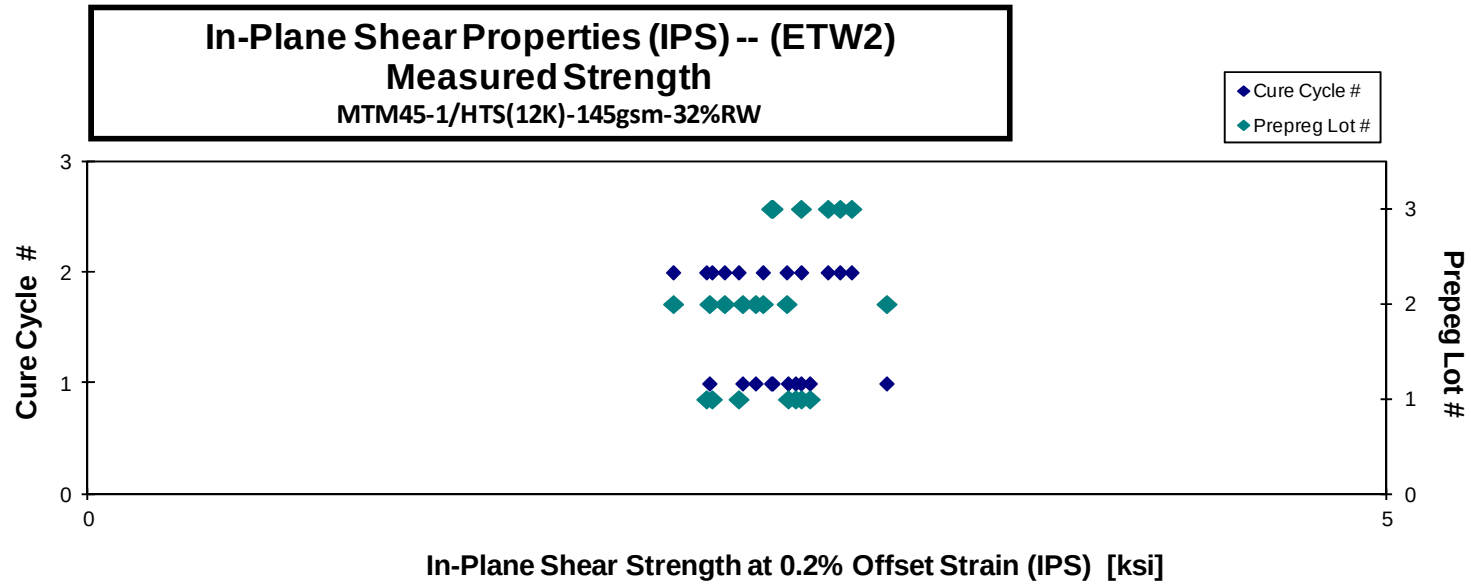
## In-Plane Shear Properties (IPS) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

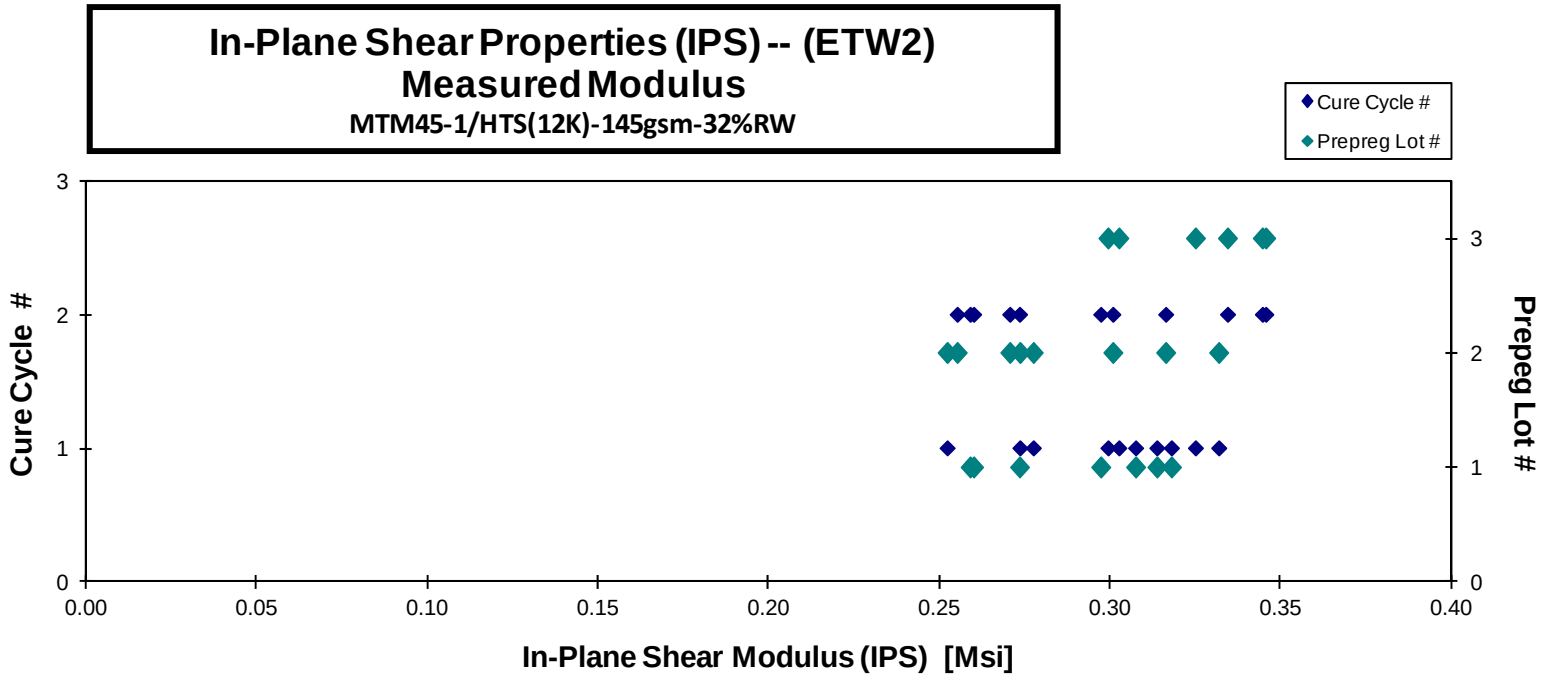
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength at 5% Strain [ksi] | 0.2% Offset Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMNA11BD* | A | MH1 | 1 | 1 | | 2.696 | 0.307 | 0.044 | 8 | 0.0055 |
| ABMNA11CD* | A | MH1 | 1 | 1 | | 2.724 | 0.314 | 0.045 | 8 | 0.0056 |
| ABMNA11DD* | A | MH1 | 1 | 1 | | 2.780 | 0.318 | 0.043 | 8 | 0.0054 |
| ABMNA219D* | A | MH2 | 1 | 2 | | 2.747 | 0.297 | 0.044 | 8 | 0.0055 |
| ABMNA21AD* | A | MH2 | 1 | 2 | | 2.381 | 0.259 | 0.044 | 8 | 0.0055 |
| ABMNA21BD* | A | MH2 | 1 | 2 | | 2.403 | 0.260 | 0.044 | 8 | 0.0055 |
| ABMNA21CD* | A | MH2 | 1 | 2 | | 2.506 | 0.273 | 0.044 | 8 | 0.0055 |
| ABMNB11DD* | B | MH1 | 2 | 1 | | 2.393 | 0.252 | 0.046 | 8 | 0.0058 |
| ABMNB11ED* | B | MH1 | 2 | 1 | | 3.075 | 0.332 | 0.046 | 8 | 0.0057 |
| ABMNB11FD | B | MH1 | 2 | 1 | 4.480 | 2.571 | 0.277 | 0.045 | 8 | 0.0056 |
| ABMNB11GD | B | MH1 | 2 | 1 | 4.417 | 2.521 | 0.274 | 0.045 | 8 | 0.0057 |
| ABMNB21DD | B | MH2 | 2 | 2 | 4.562 | 2.599 | 0.301 | 0.046 | 8 | 0.0058 |
| ABMNB21ED* | B | MH2 | 2 | 2 | | 2.254 | 0.255 | 0.047 | 8 | 0.0058 |
| ABMNB21FD | B | MH2 | 2 | 2 | 4.660 | 2.691 | 0.316 | 0.046 | 8 | 0.0057 |
| ABMNB21GD | B | MH2 | 2 | 2 | 4.278 | 2.451 | 0.271 | 0.046 | 8 | 0.0058 |
| ABMNC118D* | C | MH1 | 3 | 1 | | 2.746 | 0.325 | 0.044 | 8 | 0.0055 |
| ABMNC119D* | C | MH1 | 3 | 1 | | 2.631 | 0.299 | 0.043 | 8 | 0.0054 |
| ABMNC11AD* | C | MH1 | 3 | 1 | | 2.637 | 0.303 | 0.044 | 8 | 0.0055 |
| ABMNC219D* | C | MH2 | 3 | 2 | | 2.940 | 0.346 | 0.043 | 8 | 0.0054 |
| ABMNC21AD* | C | MH2 | 3 | 2 | | 2.896 | 0.345 | 0.044 | 8 | 0.0055 |
| ABMNC21BD* | C | MH2 | 3 | 2 | | 2.849 | 0.334 | 0.044 | 8 | 0.0054 |

*PEAK BEFORE 5% STRAIN

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **4.480** | **2.642** | **0.298** | **Average** | **0.0056** |
| **Standard Dev.** | **0.145** | **0.206** | **0.030** | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **3.240** | **7.808** | **10.066** | **Coeff. of Var. [%]** | |
| **Min.** | **4.278** | **2.254** | **0.252** | **Min.** | **0.0054** |
| **Max.** | **4.660** | **3.075** | **0.346** | **Max.** | **0.0058** |
| **Number of Spec.** | **5** | **21** | **21** | **Number of Spec.** | **21** |


In-Plane Shear Properties (IPS) -- (ETW2)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepeg Lot #
0
1
2
3
0
5
In-Plane Shear Strength at 5% Strain (IPS) [ksi]


In-Plane Shear Properties (IPS) -- (ETW2)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepeg Lot #
0
1
2
3
0
5
In-Plane Shear Strength at 0.2% Offset Strain (IPS) [ksi]


In-Plane Shear Properties (IPS) -- (ETW2)
Measured Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepeg Lot #
0
1
2
3
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
In-Plane Shear Modulus (IPS) [Msi]

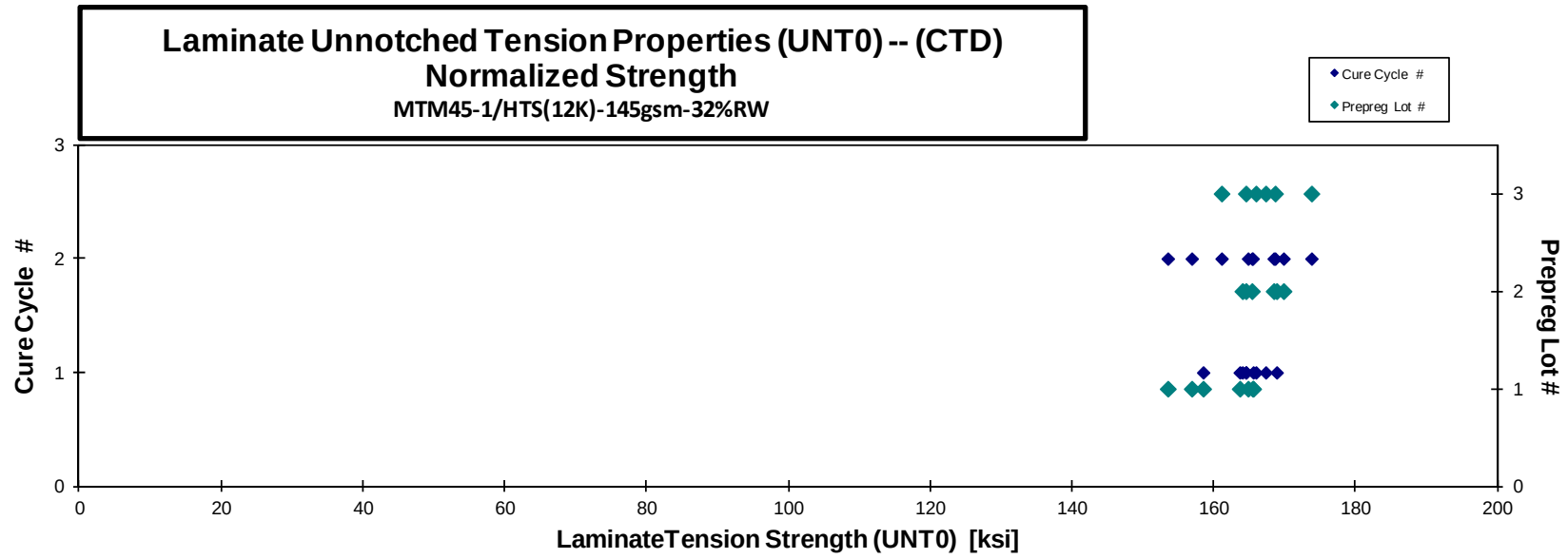
## 4.6 Unnotched Tension 0/90 Properties

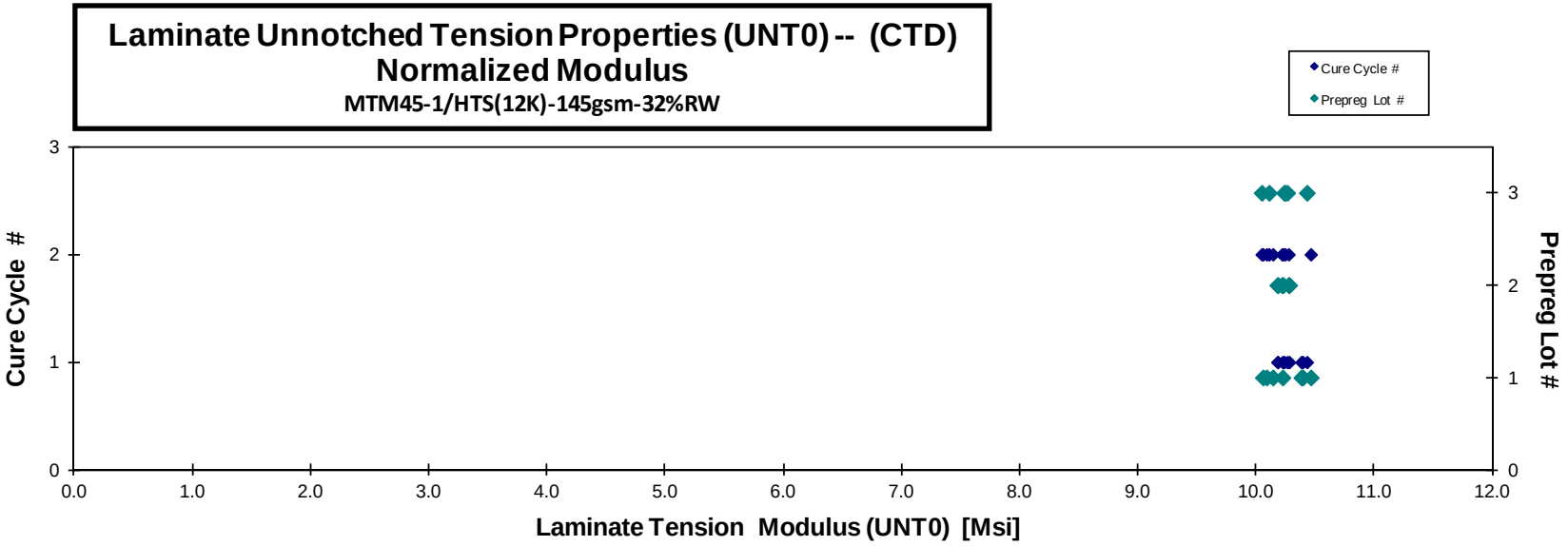
**Laminate Unnotched Tension Properties (UNT0) -- (CTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMPA116B | A | MH1 | 1 | 1 | 163.809 | 10.286 | 0.089 | 16 | LAB | 0.0056 | 165.546 | 10.395 |
| ABMPA117B | A | MH1 | 1 | 1 | 160.853 | 10.205 | 0.090 | 16 | LAB | 0.0056 | 163.656 | 10.383 |
| ABMPA118B | A | MH1 | 1 | 1 | 155.461 | 10.028 | 0.090 | 16 | LAB | 0.0056 | 158.494 | 10.224 |
| ABMPA216B | A | MH2 | 1 | 2 | 150.709 | 9.905 | 0.090 | 16 | LAB/DGM | 0.0056 | 153.506 | 10.089 |
| ABMPA217B | A | MH2 | 1 | 2 | 151.992 | 9.744 | 0.091 | 16 | LAB | 0.0057 | 156.886 | 10.058 |
| ABMPA218B | A | MH2 | 1 | 2 | 161.551 | 9.902 | 0.090 | 16 | LAB | 0.0056 | 165.467 | 10.142 |
| ABMPA219B | A | MH2 | 1 | 2 | 160.657 | 10.199 | 0.090 | 16 | LAB/DGM | 0.0056 | 164.826 | 10.463 |
| ABMPB115B | B | MH1 | 2 | 1 | 153.942 | 9.619 | 0.094 | 16 | LAT | 0.0059 | 164.525 | 10.280 |
| ABMPB116B | B | MH1 | 2 | 1 | 157.635 | 9.504 | 0.094 | 16 | LAB | 0.0059 | 168.860 | 10.181 |
| ABMPB117B | B | MH1 | 2 | 1 | 157.614 | 9.784 | 0.092 | 16 | LAT/LAB | 0.0057 | 164.032 | 10.183 |
| ABMPB215B | B | MH2 | 2 | 2 | 162.150 | 9.891 | 0.091 | 16 | LAB/DGM | 0.0057 | 168.445 | 10.275 |
| ABMPB216B | B | MH2 | 2 | 2 | 164.716 | 9.920 | 0.091 | 16 | LAT/LWB | 0.0057 | 169.833 | 10.228 |
| ABMPB217B | B | MH2 | 2 | 2 | 160.978 | 9.948 | 0.090 | 16 | LAB/DGM | 0.0057 | 165.368 | 10.219 |
| ABMPC115B | C | MH1 | 3 | 1 | 166.028 | 10.159 | 0.089 | 16 | LAB | 0.0055 | 167.317 | 10.238 |
| ABMPC116B | C | MH1 | 3 | 1 | 161.768 | 10.256 | 0.090 | 16 | LAB | 0.0056 | 164.525 | 10.430 |
| ABMPC117B | C | MH1 | 3 | 1 | 163.739 | 10.128 | 0.089 | 16 | LAT | 0.0056 | 165.941 | 10.264 |
| ABMPC215B | C | MH2 | 3 | 2 | 171.082 | 10.087 | 0.089 | 16 | LAB | 0.0056 | 173.771 | 10.245 |
| ABMPC216B | C | MH2 | 3 | 2 | 166.309 | 9.970 | 0.089 | 16 | LAT | 0.0056 | 168.640 | 10.109 |
| ABMPC217B | C | MH2 | 3 | 2 | 157.601 | 9.830 | 0.090 | 16 | LAB | 0.0056 | 161.094 | 10.048 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Average** | **160.452** | **9.967** | **$Average_{norm}$** | **0.0056** | **164.775** | **10.235** |
| **Standard Dev.** | **5.179** | **0.215** | **$Standard\ Dev._{norm}$** | | **4.743** | **0.120** |
| **Coeff. of Var. [%]** | **3.228** | **2.154** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **2.879** | **1.175** |
| **Min.** | **150.709** | **9.504** | **Min.** | **0.0055** | **153.506** | **10.048** |
| **Max.** | **171.082** | **10.286** | **Max.** | **0.0059** | **173.771** | **10.463** |
| **Number of Spec.** | **19** | **19** | **Number of Spec.** | | **19** | **19** |


Laminate Unnotched Tension Properties (UNT0) -- (CTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
20
40
60
80
100
120
140
160
180
200
LaminateTension Strength (UNT0) [ksi]

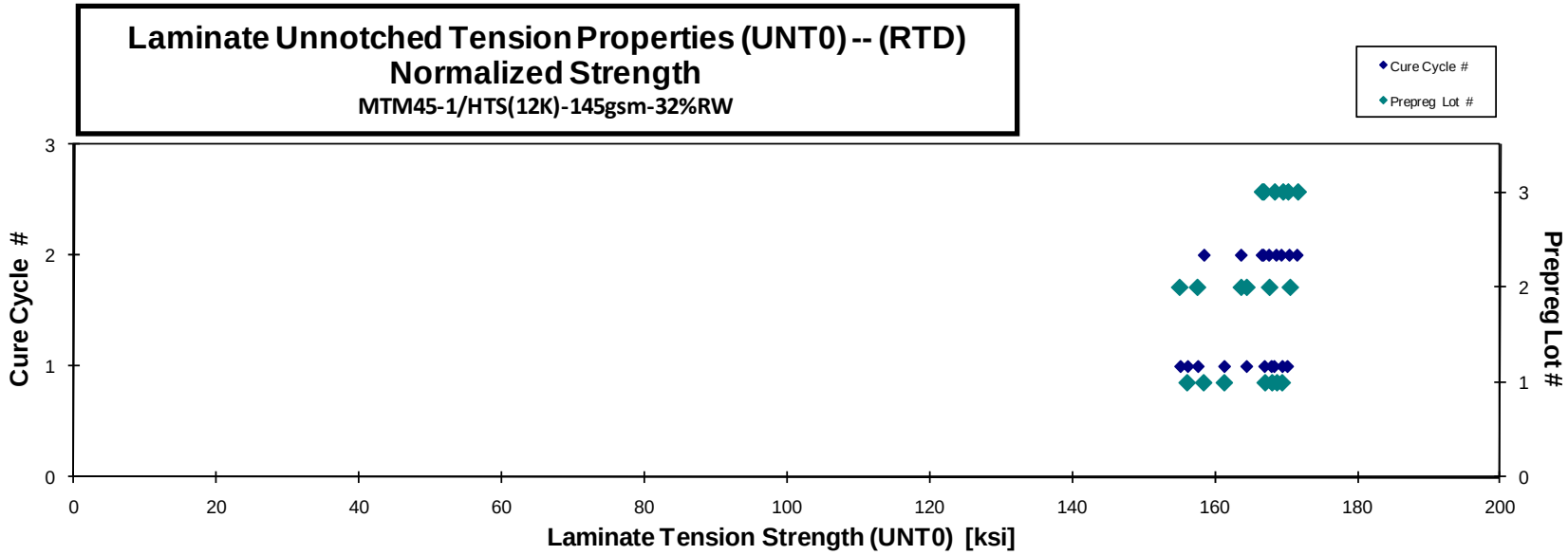

Laminate Unnotched Tension Properties (UNT0) -- (CTD)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
Laminate Tension Modulus (UNT0) [Msi]

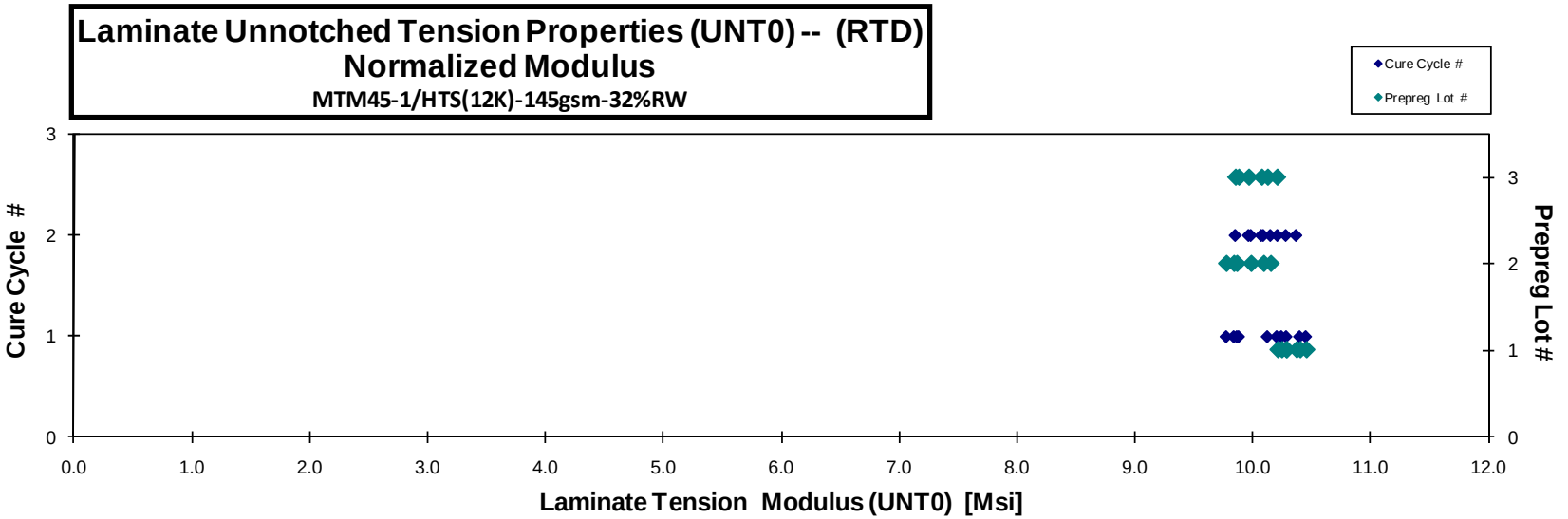
## Laminate Unnotched Tension Properties (UNT0) -- (RTD)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMPA111A | A | MH1 | 1 | 1 | 155.273 | 10.227 | 0.089 | 16 | LAT | 0.0055 | 156.184 | 10.287 |
| ABMPA112A | A | MH1 | 1 | 1 | 156.804 | 9.958 | 0.091 | 16 | LAB | 0.0057 | 161.348 | 10.246 |
| ABMPA113A | A | MH1 | 1 | 1 | 166.038 | 10.333 | 0.089 | 16 | LAT | 0.0056 | 167.988 | 10.454 |
| ABMPA114A | A | MH1 | 1 | 1 | 164.402 | 10.239 | 0.089 | 16 | LAT | 0.0056 | 167.018 | 10.402 |
| ABMPA211A | A | MH2 | 1 | 2 | 164.469 | 10.070 | 0.091 | 16 | LAT / LWB | 0.0057 | 169.390 | 10.372 |
| ABMPA212A | A | MH2 | 1 | 2 | 164.922 | 10.056 | 0.090 | 16 | LAT / LWB | 0.0056 | 168.671 | 10.284 |
| ABMPA213A | A | MH2 | 1 | 2 | 156.030 | 10.055 | 0.089 | 16 | DGM / LAB | 0.0056 | 158.482 | 10.213 |
| ABMPB111A | B | MH1 | 2 | 1 | 146.388 | 9.225 | 0.093 | 16 | LAB | 0.0058 | 155.149 | 9.778 |
| ABMPB112A | B | MH1 | 2 | 1 | 156.733 | 9.379 | 0.092 | 16 | LAB | 0.0058 | 164.481 | 9.842 |
| ABMPB113A | B | MH1 | 2 | 1 | 147.488 | 9.233 | 0.094 | 16 | LAB | 0.0059 | 157.628 | 9.868 |
| ABMPB211A | B | MH2 | 2 | 2 | 162.735 | 9.856 | 0.091 | 16 | LAB | 0.0057 | 167.636 | 10.153 |
| ABMPB212A | B | MH2 | 2 | 2 | 164.707 | 9.750 | 0.091 | 16 | LAB | 0.0057 | 170.509 | 10.093 |
| ABMPB213A | B | MH2 | 2 | 2 | 159.949 | 9.758 | 0.090 | 16 | LAB / LAT | 0.0056 | 163.706 | 9.987 |
| ABMPC111A | C | MH1 | 3 | 1 | 167.534 | 10.087 | 0.089 | 16 | DGM / LAT | 0.0056 | 169.533 | 10.207 |
| ABMPC112A | C | MH1 | 3 | 1 | 166.544 | 9.776 | 0.089 | 16 | LWB / LAT | 0.0056 | 168.373 | 9.884 |
| ABMPC113A | C | MH1 | 3 | 1 | 167.916 | 9.989 | 0.089 | 16 | LWB / LAT | 0.0056 | 170.238 | 10.127 |
| ABMPC211A | C | MH2 | 3 | 2 | 169.292 | 9.941 | 0.089 | 16 | LAB / DGM | 0.0056 | 171.600 | 10.076 |
| ABMPC212A | C | MH2 | 3 | 2 | 162.227 | 9.594 | 0.090 | 16 | LAB | 0.0057 | 166.651 | 9.855 |
| ABMPC213A | C | MH2 | 3 | 2 | 162.632 | 9.716 | 0.090 | 16 | LAT | 0.0056 | 166.852 | 9.968 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Average** | **161.162** | **9.855** | | **$Average_{norm}$** | **0.0056** | **165.339** | **10.110** |
| **Standard Dev.** | **6.521** | **0.321** | | **$Standard\ Dev._{norm}$** | | **5.147** | **0.207** |
| **Coeff. of Var. [%]** | **4.046** | **3.258** | | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **3.113** | **2.044** |
| **Min.** | **146.388** | **9.225** | | **Min.** | **0.0055** | **155.149** | **9.778** |
| **Max.** | **169.292** | **10.333** | | **Max.** | **0.0059** | **171.600** | **10.454** |
| **Number of Spec.** | **19** | **19** | | **Number of Spec.** | | **19** | **19** |


Laminate Unnotched Tension Properties (UNT0) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
20
40
60
80
100
120
140
160
180
200
Laminate Tension Strength (UNT0) [ksi]


Laminate Unnotched Tension Properties (UNT0) -- (RTD)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
Laminate Tension Modulus (UNT0) [Msi]

## Laminate Unnotched Tension Properties (UNT0) -- (ETW)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

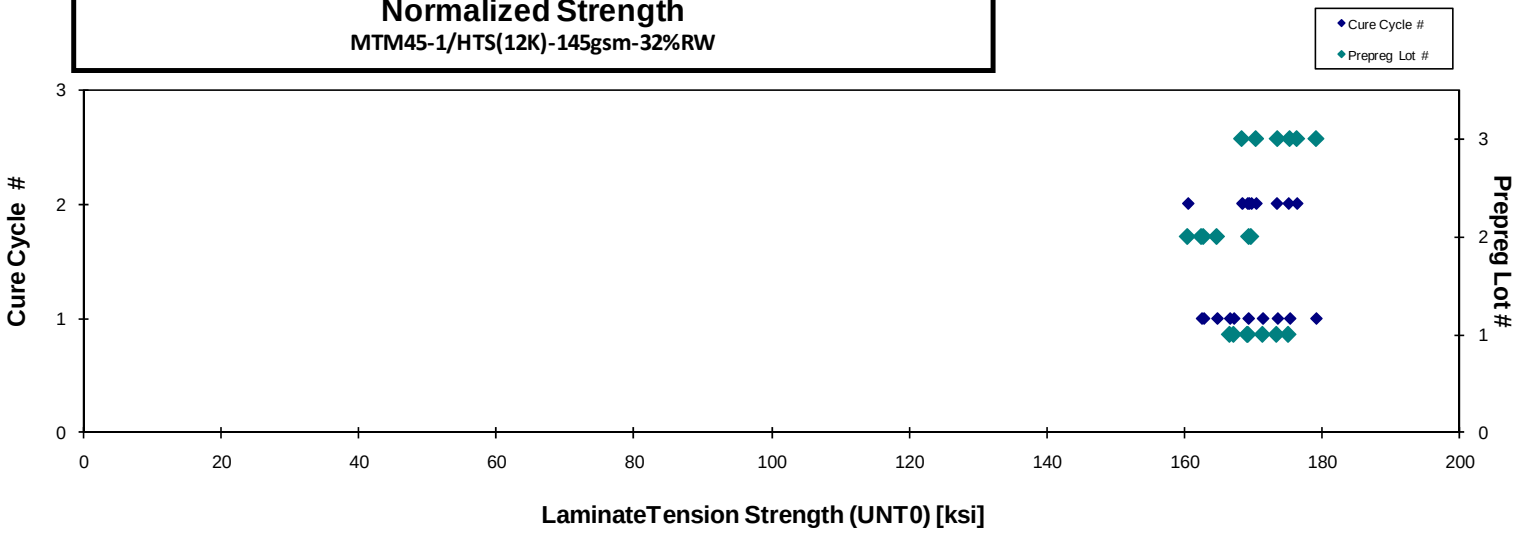
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMPA11AN | A | MH1 | 1 | 1 | 166.838 | 10.359 | 0.089 | 16 | LAT / LWB | 0.0056 | 169.303 | 10.512 |
| ABMPA11BN | A | MH1 | 1 | 1 | 167.514 | 10.565 | 0.088 | 16 | LAT / LAB | 0.0055 | 167.197 | 10.545 |
| ABMPA11CN | A | MH1 | 1 | 1 | 164.899 | 10.535 | 0.089 | 16 | LAB | 0.0056 | 166.616 | 10.645 |
| ABMPA11DN | A | MH1 | 1 | 1 | 168.718 | 10.512 | 0.089 | 16 | LAB | 0.0056 | 171.402 | 10.680 |
| ABMPA21AN | A | MH2 | 1 | 2 | 163.848 | 10.341 | 0.091 | 16 | LAT / LAB | 0.0057 | 169.186 | 10.678 |
| ABMPA21BN | A | MH2 | 1 | 2 | 170.907 | 10.383 | 0.089 | 16 | LAT / LAB | 0.0056 | 173.432 | 10.536 |
| ABMPA21CN | A | MH2 | 1 | 2 | 171.535 | 10.162 | 0.090 | 16 | LWT / LAB | 0.0056 | 175.141 | 10.376 |
| ABMPB119N | B | MH1 | 2 | 1 | 161.661 | 9.878 | 0.090 | 16 | LWT / LAB | 0.0056 | 164.754 | 10.067 |
| ABMPB11AN | B | MH1 | 2 | 1 | 157.153 | 9.873 | 0.091 | 16 | LAT / LAB | 0.0057 | 162.808 | 10.228 |
| ABMPB11BN | B | MH1 | 2 | 1 | 156.096 | 9.907 | 0.092 | 16 | LAB | 0.0057 | 162.512 | 10.314 |
| ABMPB219N | B | MH2 | 2 | 2 | 166.697 | 10.055 | 0.090 | 16 | LAT | 0.0056 | 169.728 | 10.238 |
| ABMPB21AN | B | MH2 | 2 | 2 | 155.780 | 9.753 | 0.091 | 16 | LAB | 0.0057 | 160.501 | 10.049 |
| ABMPB21BN | B | MH2 | 2 | 2 | 163.203 | 9.867 | 0.091 | 16 | LAT / LAB | 0.0057 | 169.415 | 10.243 |
| ABMPC118N | C | MH1 | 3 | 1 | 172.229 | 10.562 | 0.089 | 16 | LAT / LAB | 0.0055 | 173.566 | 10.645 |
| ABMPC119N | C | MH1 | 3 | 1 | 174.441 | 10.431 | 0.088 | 16 | LAT / LAB | 0.0055 | 175.366 | 10.486 |
| ABMPC11AN | C | MH1 | 3 | 1 | 177.709 | 10.512 | 0.089 | 16 | LAT / LAB | 0.0055 | 179.190 | 10.599 |
| ABMPC219N | C | MH2 | 3 | 2 | 168.141 | 10.449 | 0.089 | 16 | LAT / LAB | 0.0056 | 170.433 | 10.592 |
| ABMPC21AN | C | MH2 | 3 | 2 | 175.231 | 10.421 | 0.089 | 16 | LAT / LAB | 0.0055 | 176.392 | 10.490 |
| ABMPC21BN | C | MH2 | 3 | 2 | 165.051 | 10.127 | 0.090 | 16 | LAT / LWB | 0.0056 | 168.396 | 10.332 |

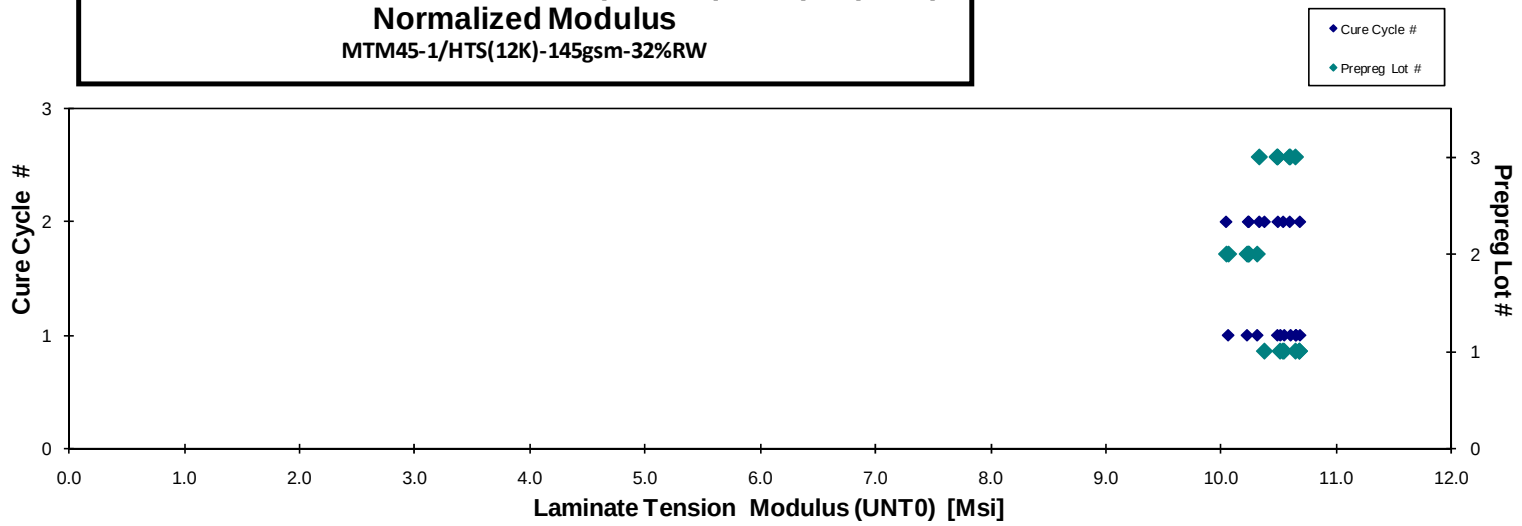
| | Strength | Modulus |
|---|---|---|
| **Average** | **166.719** | **10.247** |
| **Standard Dev.** | **6.267** | **0.280** |
| **Coeff. of Var. [%]** | **3.759** | **2.729** |
| **Min.** | **155.780** | **9.753** |
| **Max.** | **177.709** | **10.565** |
| **Number of Spec.** | **19** | **19** |

| | $t_{ply}$ | $Strength_{norm}$ | $Modulus_{norm}$ |
|---|---|---|---|
| **$Average_{norm}$** | **0.0056** | **169.755** | **10.434** |
| **Standard $Dev._{norm}$** | | **5.028** | **0.201** |
| **Coeff. of Var. $[\%]_{norm}$** | | **2.962** | **1.923** |
| **Min.** | **0.0055** | **160.501** | **10.049** |
| **Max.** | **0.0057** | **179.190** | **10.680** |
| **Number of Spec.** | | **19** | **19** |

## Laminate Unnotched Tension Properties (UNT0) -- (ETW)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Tension Properties (UNT0) -- (ETW)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



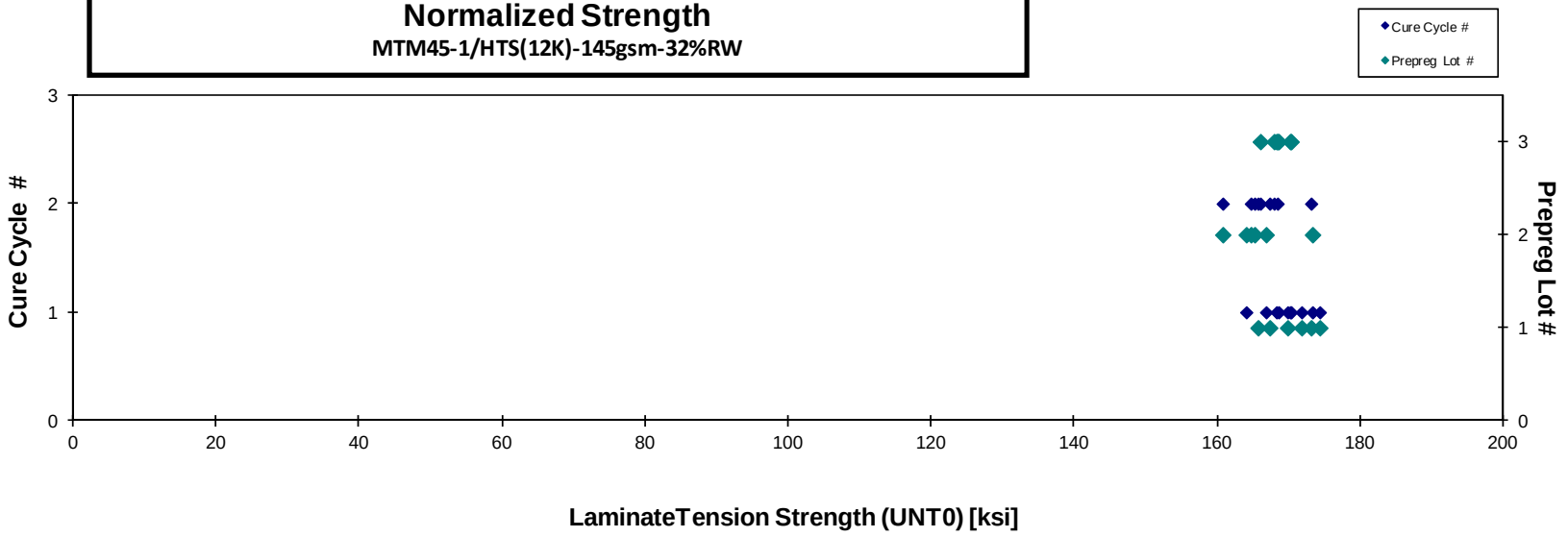
## Laminate Unnotched Tension Properties (UNT0) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

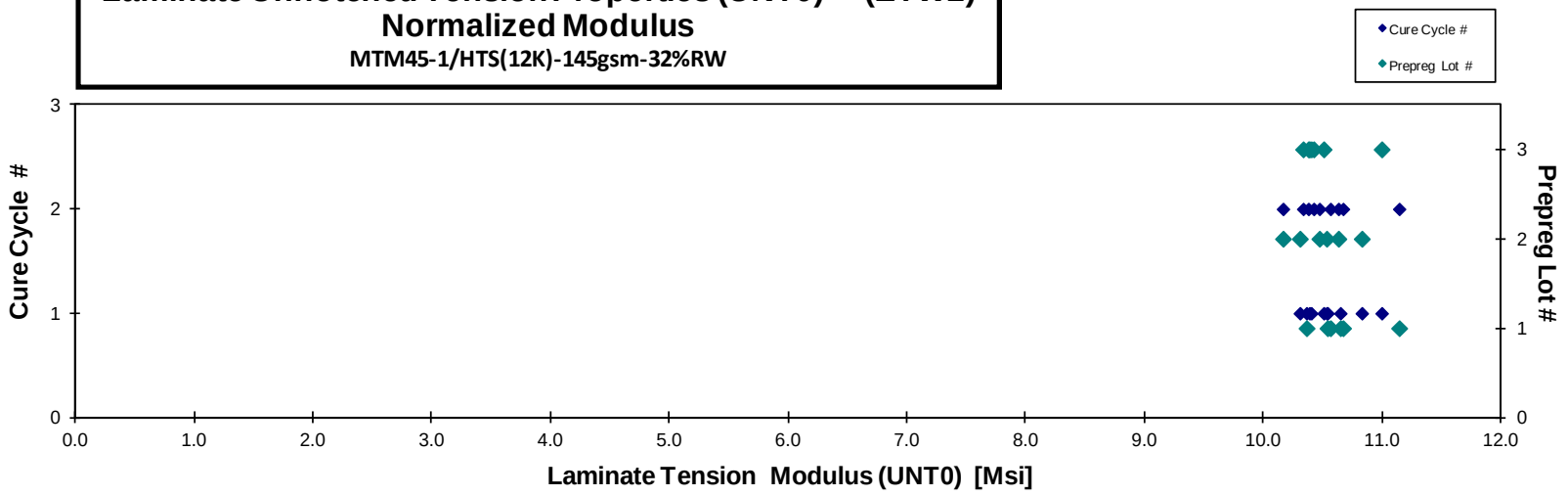
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMPA11ED | A | MH1 | 1 | 1 | 167.335 | 10.092 | 0.090 | 16 | LAB/LWT | 0.0056 | 171.803 | 10.362 |
| ABMPA11FD | A | MH1 | 1 | 1 | 166.045 | 10.302 | 0.090 | 16 | LAB/LWT | 0.0056 | 169.850 | 10.538 |
| ABMPA11GD | A | MH1 | 1 | 1 | 169.809 | 10.370 | 0.090 | 16 | LAB/LAT | 0.0056 | 174.344 | 10.647 |
| ABMPA21ED | A | MH2 | 1 | 2 | 162.871 | 10.280 | 0.090 | 16 | LWB/LAT | 0.0057 | 167.344 | 10.563 |
| ABMPA21FD | A | MH2 | 1 | 2 | 169.820 | 10.465 | 0.090 | 16 | LAT/LAB | 0.0056 | 173.133 | 10.669 |
| ABMPA21GD | A | MH2 | 1 | 2 | 161.431 | 10.854 | 0.090 | 16 | LAB | 0.0056 | 165.712 | 11.141 |
| ABMPB11DD | B | MH1 | 2 | 1 | 159.180 | 9.999 | 0.091 | 16 | DWT/LAB | 0.0057 | 164.064 | 10.306 |
| ABMPB11ED | B | MH1 | 2 | 1 | 161.188 | 10.174 | 0.091 | 16 | LAT/LAB | 0.0057 | 166.835 | 10.531 |
| ABMPB11FD | B | MH1 | 2 | 1 | 168.479 | 10.524 | 0.091 | 16 | LAB | 0.0057 | 173.329 | 10.827 |
| ABMPB21DD | B | MH2 | 2 | 2 | 154.910 | 9.793 | 0.091 | 16 | LAB/LWT | 0.0057 | 160.778 | 10.164 |
| ABMPB21ED | B | MH2 | 2 | 2 | 159.176 | 10.086 | 0.091 | 16 | LAB/LWT | 0.0057 | 165.236 | 10.470 |
| ABMPB21FD | B | MH2 | 2 | 2 | 161.383 | 10.415 | 0.090 | 16 | LAB/LWT | 0.0056 | 164.714 | 10.630 |
| ABMPC11CD | C | MH1 | 3 | 1 | 167.851 | 10.843 | 0.089 | 16 | LAT/LAB | 0.0056 | 170.204 | 10.995 |
| ABMPC11DD | C | MH1 | 3 | 1 | 168.069 | 10.249 | 0.089 | 16 | LWT/LAB | 0.0056 | 170.329 | 10.387 |
| ABMPC11ED | C | MH1 | 3 | 1 | 164.707 | 10.180 | 0.090 | 16 | LAT/LWB | 0.0056 | 168.294 | 10.402 |
| ABMPC11FD | C | MH1 | 3 | 1 | 164.667 | 10.261 | 0.090 | 16 | LAT/LAB | 0.0056 | 168.596 | 10.506 |
| ABMPC21DD | C | MH2 | 3 | 2 | 163.381 | 10.255 | 0.089 | 16 | LAT/LAB | 0.0056 | 166.042 | 10.422 |
| ABMPC21ED | C | MH2 | 3 | 2 | 165.558 | 10.156 | 0.090 | 16 | LAT/LAB | 0.0056 | 168.443 | 10.333 |
| ABMPC21FD | C | MH2 | 3 | 2 | 163.527 | 10.104 | 0.090 | 16 | LAT/LAB | 0.0056 | 167.956 | 10.377 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **164.178** | **10.284** | **$Average_{norm}$** | **0.0056** | **168.263** | **10.541** |
| **Standard Dev.** | **4.010** | **0.261** | **$Standard\ Dev._{norm}$** | | **3.491** | **0.241** |
| **Coeff. of Var. [%]** | **2.443** | **2.536** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **2.075** | **2.288** |
| **Min.** | **154.910** | **9.793** | **Min.** | **0.0056** | **160.778** | **10.164** |
| **Max.** | **169.820** | **10.854** | **Max.** | **0.0057** | **174.344** | **11.141** |
| **Number of Spec.** | **19** | **19** | **Number of Spec.** | | **19** | **19** |

## Laminate Unnotched Tension Properties (UNT0) -- (ETW2)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Tension Properties (UNT0) -- (ETW2)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## 4.7 Unnotched Tension 1 Properties

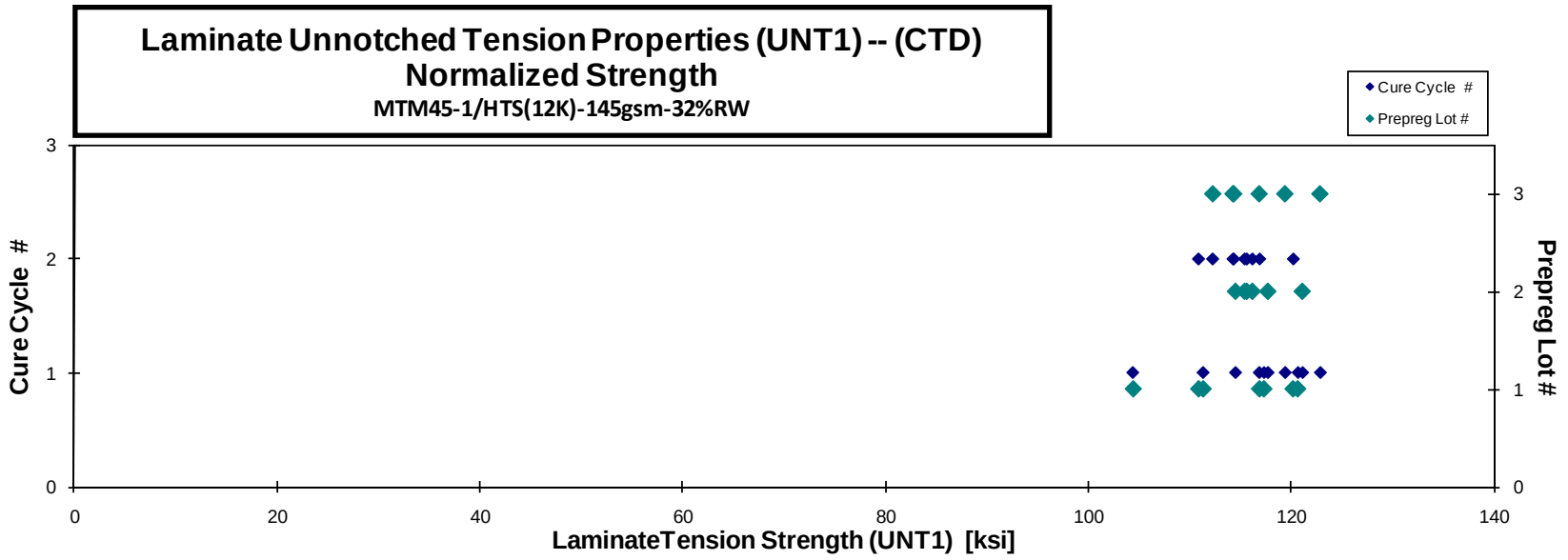
**Laminate Unnotched Tension Properties (UNT1) -- (CTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

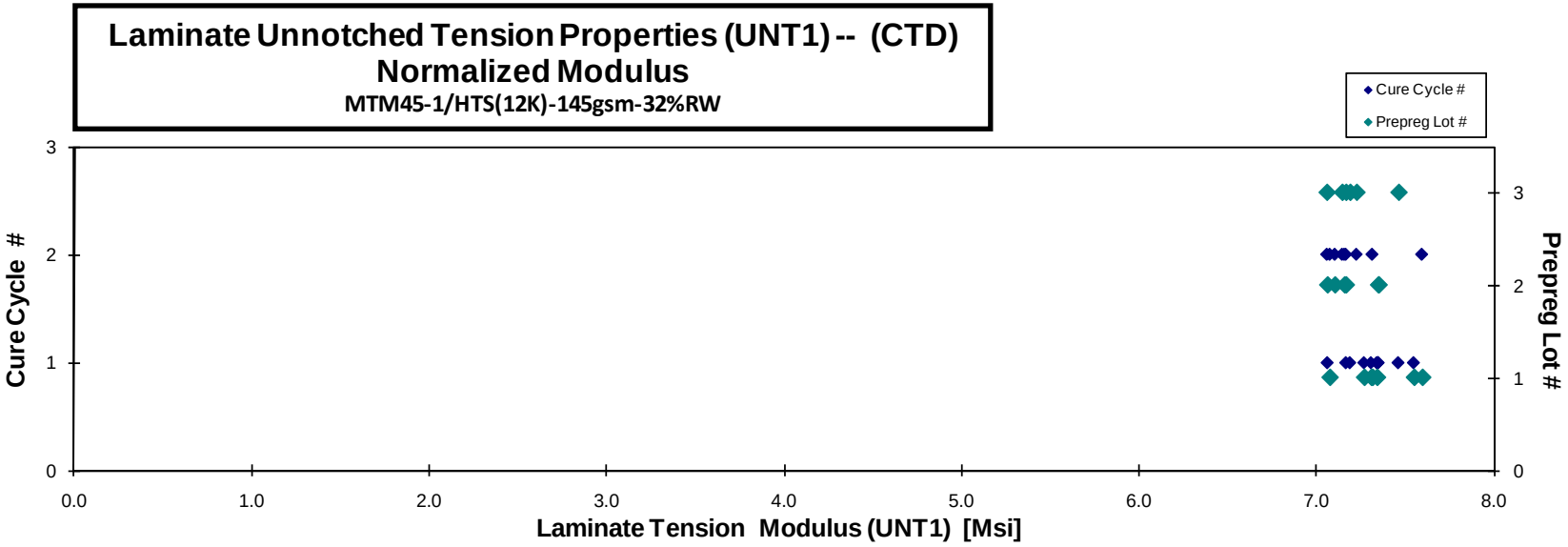
**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMAA115B | A | MH1 | 1 | 1 | 109.832 | 7.171 | 0.134 | 24 | LWT / LWB | 0.0056 | 111.372 | 7.271 |
| ABMAA116B | A | MH1 | 1 | 1 | 104.141 | 7.322 | 0.132 | 24 | LWB | 0.0055 | 104.457 | 7.344 |
| ABMAA117B | A | MH1 | 1 | 1 | 115.881 | 7.455 | 0.134 | 24 | LGM | 0.0056 | 117.373 | 7.551 |
| ABMAA118B | A | MH1 | 1 | 1 | 119.243 | 7.222 | 0.134 | 24 | LGM | 0.0056 | 120.718 | 7.311 |
| ABMAA214B | A | MH2 | 1 | 2 | 117.434 | 7.419 | 0.135 | 24 | LGM | 0.0056 | 120.251 | 7.597 |
| ABMAA215B | A | MH2 | 1 | 2 | 114.739 | 7.180 | 0.135 | 24 | LGM | 0.0056 | 116.941 | 7.318 |
| ABMAA216B | A | MH2 | 1 | 2 | 108.633 | 6.932 | 0.135 | 24 | LGM | 0.0056 | 110.924 | 7.078 |
| ABMAB116B | B | MH1 | 2 | 1 | 111.301 | 6.864 | 0.136 | 24 | AGM | 0.0057 | 114.562 | 7.065 |
| ABMAB117B | B | MH1 | 2 | 1 | 114.550 | 7.150 | 0.136 | 24 | AGM | 0.0057 | 117.761 | 7.351 |
| ABMAB118B | B | MH1 | 2 | 1 | 116.589 | 7.074 | 0.137 | 24 | AWT | 0.0057 | 121.167 | 7.352 |
| ABMAB216B | B | MH2 | 2 | 2 | 111.578 | 6.928 | 0.137 | 24 | AGM | 0.0057 | 115.466 | 7.169 |
| ABMAB217B | B | MH2 | 2 | 2 | 111.950 | 6.897 | 0.137 | 24 | AGM | 0.0057 | 116.233 | 7.160 |
| ABMAB218B | B | MH2 | 2 | 2 | 111.065 | 6.824 | 0.137 | 24 | AGM | 0.0057 | 115.678 | 7.107 |
| ABMAC116B | C | MH1 | 3 | 1 | 118.019 | 7.084 | 0.134 | 24 | LGM | 0.0056 | 119.450 | 7.169 |
| ABMAC117B | C | MH1 | 3 | 1 | 115.088 | 7.081 | 0.134 | 24 | LWT | 0.0056 | 116.904 | 7.192 |
| ABMAC118B | C | MH1 | 3 | 1 | 121.698 | 7.391 | 0.133 | 24 | LGM | 0.0056 | 122.912 | 7.464 |
| ABMAC216B | C | MH2 | 3 | 2 | 111.958 | 7.075 | 0.135 | 24 | LGM | 0.0056 | 114.389 | 7.229 |
| ABMAC217B | C | MH2 | 3 | 2 | 111.762 | 6.904 | 0.135 | 24 | LGM / LWT | 0.0056 | 114.316 | 7.062 |
| ABMAC218B | C | MH2 | 3 | 2 | 108.799 | 6.924 | 0.136 | 24 | LWT | 0.0057 | 112.316 | 7.148 |

| | | | |
|---|---|---|---|
| **Average** | **113.382** | **7.100** | |
| **Standard Dev.** | **4.251** | **0.196** | |
| **Coeff. of Var. [%]** | **3.749** | **2.762** | |
| **Min.** | **104.141** | **6.824** | |
| **Max.** | **121.698** | **7.455** | |
| **Number of Spec.** | **19** | **19** | |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0056** | **115.957** | **7.260** |
| **$Standard\ Dev._{norm}$** | | **4.316** | **0.158** |
| **Coeff. of Var. $[\%]_{norm}$** | | **3.722** | **2.172** |
| **Min.** | **0.0055** | **104.457** | **7.062** |
| **Max.** | **0.0057** | **122.912** | **7.597** |
| **Number of Spec.** | | **19** | **19** |


Laminate Unnotched Tension Properties (UNT1) -- (CTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
20
40
60
80
100
120
140
LaminateTension Strength (UNT1) [ksi]


Laminate Unnotched Tension Properties (UNT1) -- (CTD)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Laminate Tension Modulus (UNT1) [Msi]

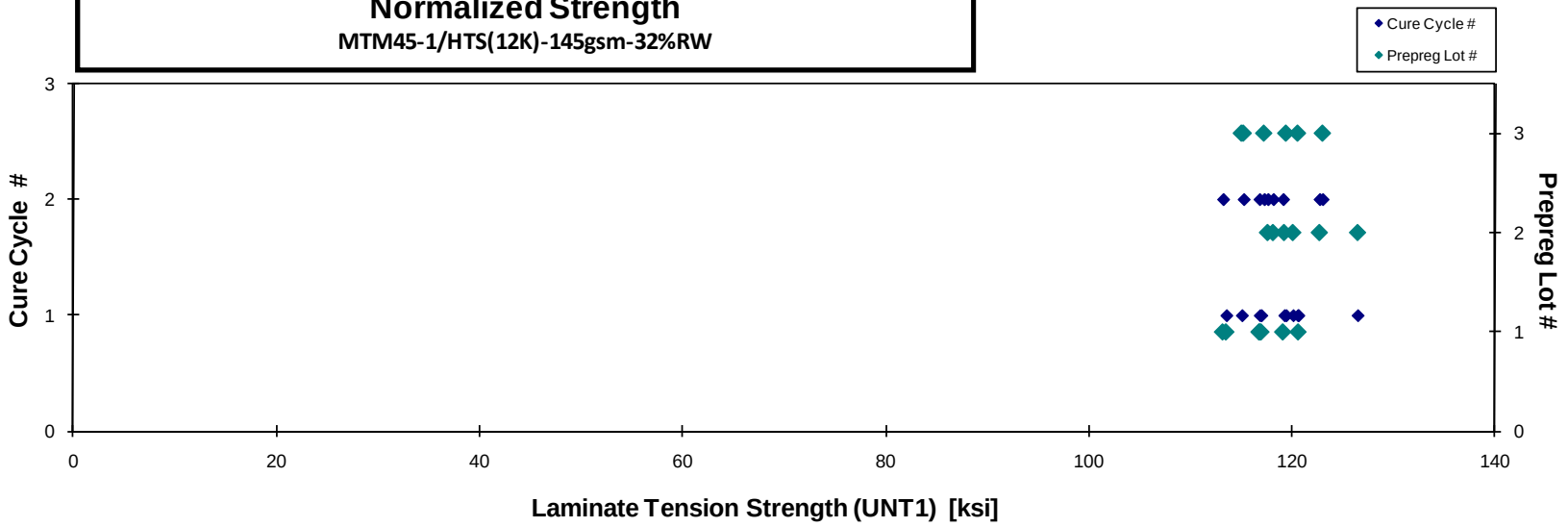
## Laminate Unnotched Tension Properties (UNT1) -- (RTD)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

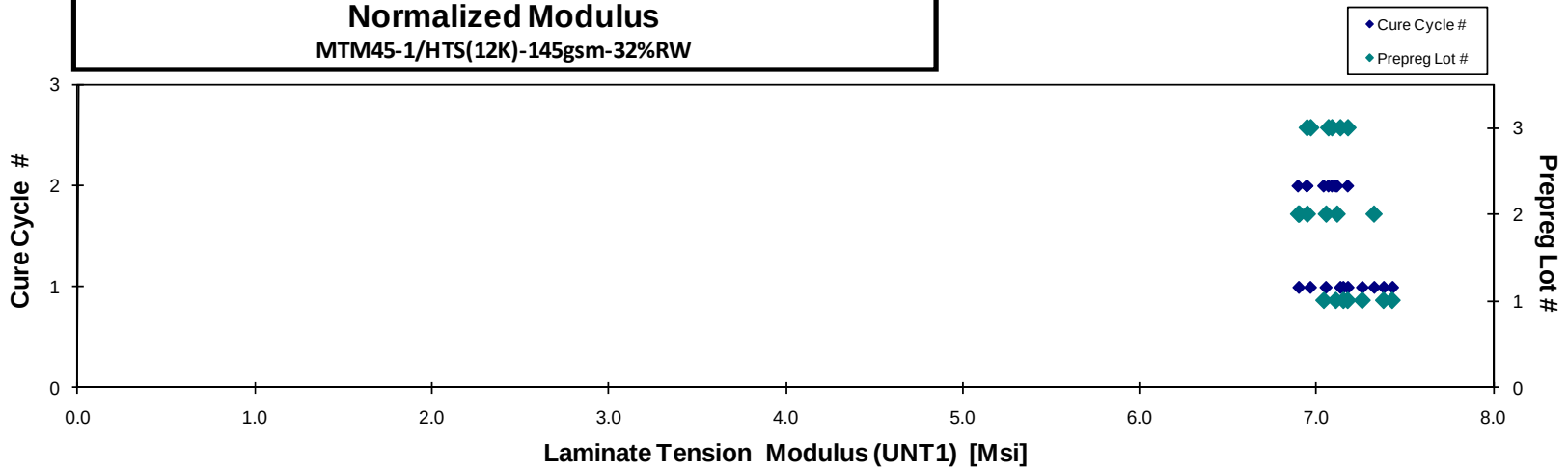
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMAA111A | A | MH1 | 1 | 1 | 110.706 | 7.246 | 0.135 | 24 | AWB/DGM | 0.0056 | 113.529 | 7.431 |
| ABMAA112A | A | MH1 | 1 | 1 | 114.738 | 7.131 | 0.134 | 24 | LGM/LAT | 0.0056 | 116.824 | 7.261 |
| ABMAA113A | A | MH1 | 1 | 1 | 118.636 | 7.036 | 0.134 | 24 | LGM | 0.0056 | 120.613 | 7.153 |
| ABMAA114A | A | MH1 | 1 | 1 | 115.141 | 7.267 | 0.134 | 24 | LGM | 0.0056 | 116.972 | 7.382 |
| ABMAA211A | A | MH2 | 1 | 2 | 117.133 | 7.058 | 0.134 | 24 | AWT | 0.0056 | 119.115 | 7.178 |
| ABMAA212A | A | MH2 | 1 | 2 | 112.298 | 6.985 | 0.133 | 24 | AGM | 0.0055 | 113.205 | 7.042 |
| ABMAA213A | A | MH2 | 1 | 2 | 114.991 | 7.000 | 0.134 | 24 | AWB | 0.0056 | 116.791 | 7.110 |
| ABMAB111A | B | MH1 | 2 | 1 | 115.473 | 6.636 | 0.137 | 24 | AWT/DGM | 0.0057 | 120.095 | 6.902 |
| ABMAB112A | B | MH1 | 2 | 1 | 115.772 | 6.850 | 0.136 | 24 | AWB | 0.0057 | 119.237 | 7.055 |
| ABMAB113A | B | MH1 | 2 | 1 | 120.652 | 6.992 | 0.138 | 24 | HGM | 0.0058 | 126.457 | 7.328 |
| ABMAB211A | B | MH2 | 2 | 2 | 117.498 | 6.815 | 0.138 | 24 | AGM | 0.0057 | 122.705 | 7.118 |
| ABMAB212A | B | MH2 | 2 | 2 | 112.641 | 6.654 | 0.138 | 24 | AGM | 0.0057 | 117.619 | 6.948 |
| ABMAB213A | B | MH2 | 2 | 2 | 114.110 | 6.661 | 0.137 | 24 | AWB | 0.0057 | 118.144 | 6.896 |
| ABMAC111A | C | MH1 | 3 | 1 | 118.494 | 7.057 | 0.134 | 24 | AWT/AWB | 0.0056 | 120.559 | 7.180 |
| ABMAC112A | C | MH1 | 3 | 1 | 112.720 | 6.826 | 0.135 | 24 | AGM | 0.0056 | 115.054 | 6.967 |
| ABMAC113A | C | MH1 | 3 | 1 | 117.118 | 7.000 | 0.135 | 24 | AGM | 0.0056 | 119.410 | 7.137 |
| ABMAC211A | C | MH2 | 3 | 2 | 112.950 | 6.808 | 0.135 | 24 | AGM | 0.0056 | 115.231 | 6.946 |
| ABMAC212A | C | MH2 | 3 | 2 | 113.773 | 6.859 | 0.136 | 24 | AGM | 0.0057 | 117.249 | 7.069 |
| ABMAC213A | C | MH2 | 3 | 2 | 120.405 | 6.939 | 0.135 | 24 | LWT/AWB | 0.0056 | 123.005 | 7.088 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **115.539** | **6.938** | **$Average_{norm}$** | **0.0056** | **118.517** | **7.115** |
| **Standard Dev.** | **2.791** | **0.182** | **$Standard\ Dev._{norm}$** | | **3.334** | **0.155** |
| **Coeff. of Var. [%]** | **2.416** | **2.628** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **2.813** | **2.176** |
| **Min.** | **110.706** | **6.636** | **Min.** | **0.0055** | **113.205** | **6.896** |
| **Max.** | **120.652** | **7.267** | **Max.** | **0.0058** | **126.457** | **7.431** |
| **Number of Spec.** | **19** | **19** | **Number of Spec.** | | **19** | **19** |

## Laminate Unnotched Tension Properties (UNT1) -- (RTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Tension Properties (UNT1) -- (RTD)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Unnotched Tension Properties (UNT1) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

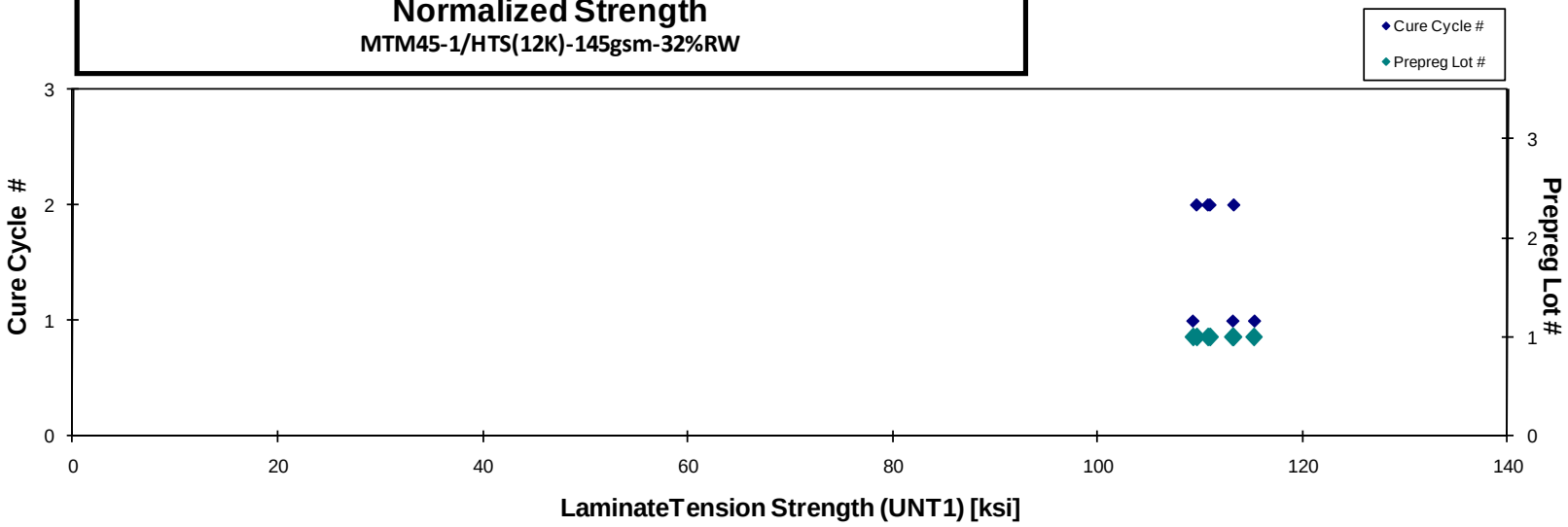
**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMAA11AD | A | MH1 | 1 | 1 | 112.887 | 7.116 | 0.135 | 24 | LGM | 0.0056 | 115.254 | 7.265 |
| ABMAA11BD | A | MH1 | 1 | 1 | 110.713 | 7.075 | 0.135 | 24 | LGM | 0.0056 | 113.159 | 7.232 |
| ABMAA11CD | A | MH1 | 1 | 1 | 106.598 | 6.950 | 0.135 | 24 | AGM | 0.0056 | 109.290 | 7.125 |
| ABMAA218D | A | MH2 | 1 | 2 | 111.278 | 6.970 | 0.134 | 24 | AGM | 0.0056 | 113.245 | 7.093 |
| ABMAA219D | A | MH2 | 1 | 2 | 109.340 | 6.892 | 0.134 | 24 | AGM | 0.0056 | 110.748 | 6.980 |
| ABMAA21AD | A | MH2 | 1 | 2 | 110.039 | 7.085 | 0.133 | 24 | AGM | 0.0055 | 110.942 | 7.143 |
| ABMAA21BD | A | MH2 | 1 | 2 | 108.281 | 7.327 | 0.134 | 24 | AGM | 0.0056 | 109.649 | 7.419 |

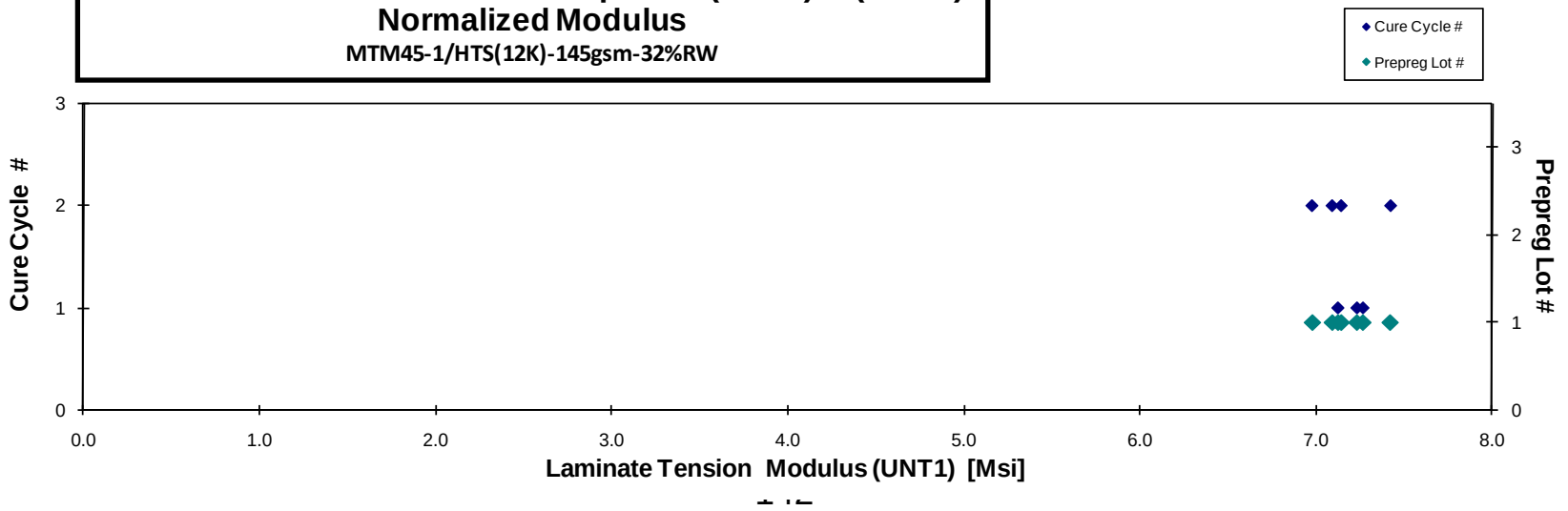
| | Strength [ksi] | Modulus [Msi] |
|---|---|---|
| Average | 109.877 | 7.059 |
| Standard Dev. | 2.055 | 0.144 |
| Coeff. of Var. [%] | 1.870 | 2.037 |
| Min. | 106.598 | 6.892 |
| Max. | 112.887 | 7.327 |
| Number of Spec. | 7 | 7 |

| | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|
| $Average_{norm}$ | 0.0056 | 111.755 | 7.180 |
| $Standard\ Dev._{norm}$ | | 2.184 | 0.141 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 1.954 | 1.962 |
| Min. | 0.0055 | 109.290 | 6.980 |
| Max. | 0.0056 | 115.254 | 7.419 |
| Number of Spec. | | 7 | 7 |

## Laminate Unnotched Tension Properties (UNT1) -- (ETW2)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Tension Properties (UNT1) -- (ETW2)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## 4.8 Unnotched Tension 2 Properties

**Laminate Unnotched Tension Properties (UNT2) -- (CTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

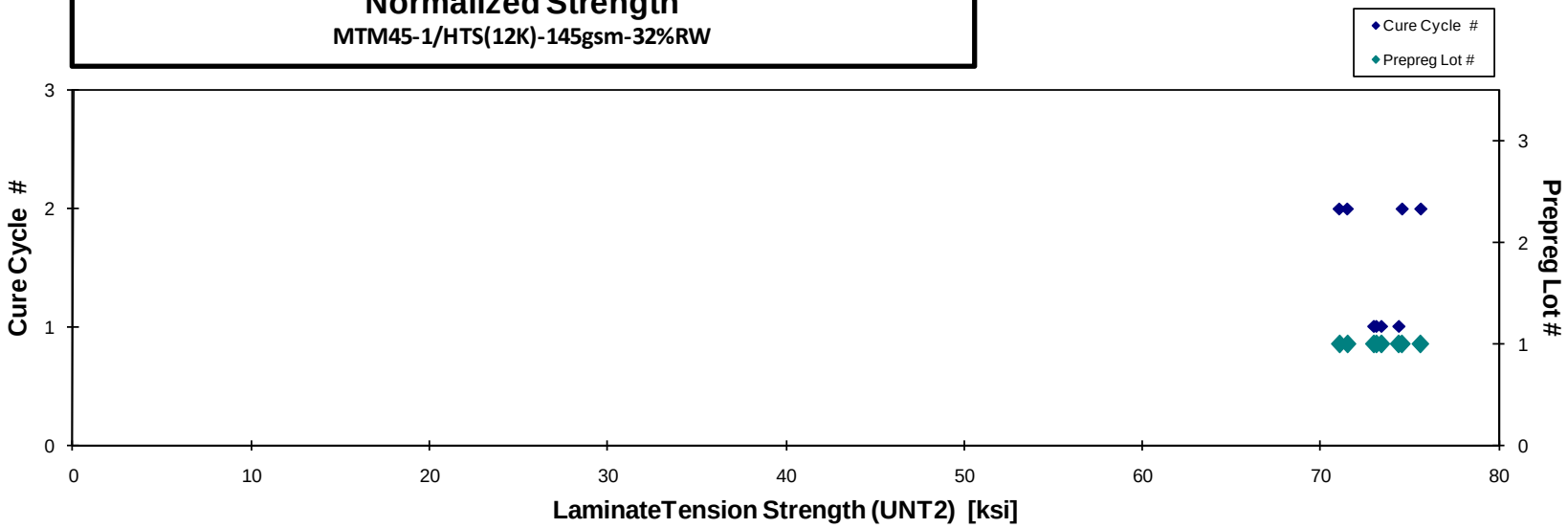
**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMBA115B | A | MH1 | 1 | 1 | 72.816 | 4.556 | 0.110 | 20 | LWB | 0.0055 | 73.136 | 4.576 |
| ABMBA116B | A | MH1 | 1 | 1 | 73.305 | 4.671 | 0.110 | 20 | AWT | 0.0055 | 73.416 | 4.678 |
| ABMBA117B | A | MH1 | 1 | 1 | 72.552 | 4.552 | 0.111 | 20 | AWB | 0.0055 | 72.992 | 4.579 |
| ABMBA118B | A | MH1 | 1 | 1 | 73.810 | 4.728 | 0.111 | 20 | LGM | 0.0055 | 74.380 | 4.765 |
| ABMBA215B | A | MH2 | 1 | 2 | 73.069 | 4.781 | 0.112 | 20 | AGM | 0.0056 | 74.564 | 4.879 |
| ABMBA216B | A | MH2 | 1 | 2 | 70.578 | 4.648 | 0.111 | 20 | AGM | 0.0056 | 71.519 | 4.710 |
| ABMBA217B | A | MH2 | 1 | 2 | 70.181 | 4.561 | 0.111 | 20 | AGM | 0.0056 | 71.075 | 4.619 |
| ABMBA218B | A | MH2 | 1 | 2 | 74.294 | 4.601 | 0.112 | 20 | AGM | 0.0056 | 75.600 | 4.682 |

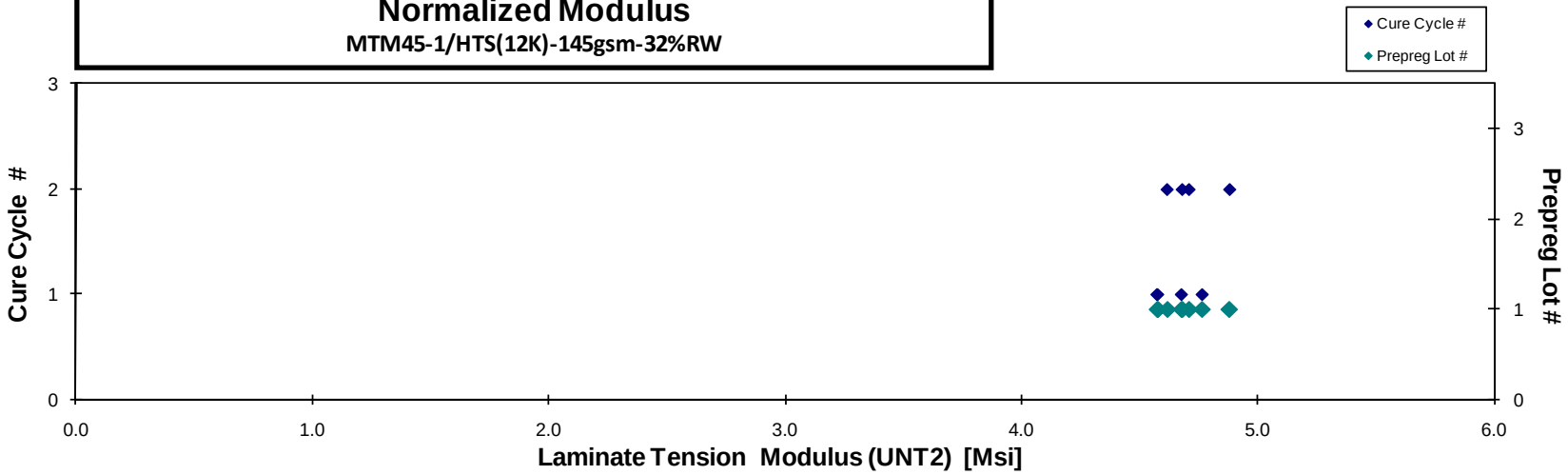
| | | | |
|---|---|---|---|
| **Average** | **72.576** | **4.637** | |
| **Standard Dev.** | **1.465** | **0.086** | |
| **Coeff. of Var. [%]** | **2.019** | **1.845** | |
| **Min.** | **70.181** | **4.552** | |
| **Max.** | **74.294** | **4.781** | |
| **Number of Spec.** | **8** | **8** | |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0056** | **73.335** | **4.686** |
| **Standard $Dev._{norm}$** | | **1.526** | **0.101** |
| **Coeff. of Var. $[\%]_{norm}$** | | **2.081** | **2.164** |
| **Min.** | **0.0055** | **71.075** | **4.576** |
| **Max.** | **0.0056** | **75.600** | **4.879** |
| **Number of Spec.** | | **8** | **8** |

## Laminate Unnotched Tension Properties (UNT2) -- (CTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Tension Properties (UNT2) -- (CTD)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Unnotched Tension Properties (UNT2) -- (RTD)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

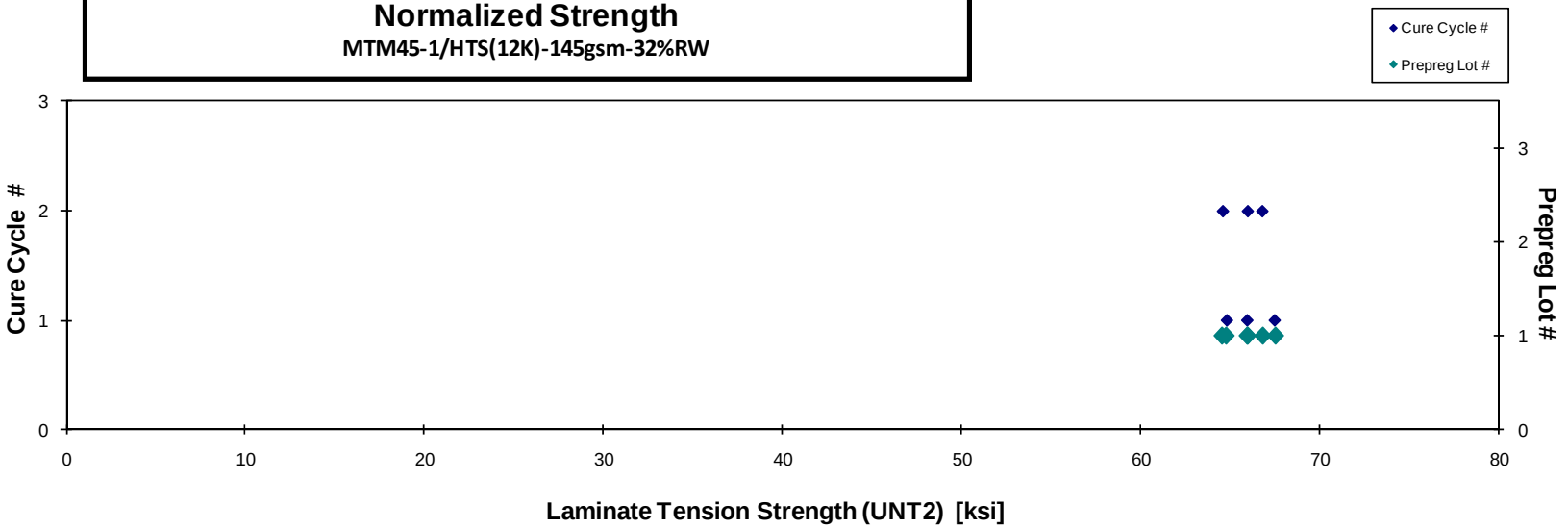
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMBA111A* | A | MH1 | 1 | 1 | 66.647 | | 0.112 | 20 | DGM/AGM | 0.0056 | 68.000 | |
| ABMBA112A | A | MH1 | 1 | 1 | 66.405 | 4.492 | 0.112 | 20 | DGM/AGM | 0.0056 | 67.502 | 4.566 |
| ABMBA113A | A | MH1 | 1 | 1 | 65.195 | 4.776 | 0.111 | 20 | DGM/AGM | 0.0056 | 65.936 | 4.830 |
| ABMBA114A | A | MH1 | 1 | 1 | 64.367 | 4.738 | 0.111 | 20 | DGM/AGM | 0.0055 | 64.776 | 4.768 |
| ABMBA211A | A | MH2 | 1 | 2 | 62.484 | 4.498 | 0.114 | 20 | DGM/AGM | 0.0057 | 64.548 | 4.646 |
| ABMBA212A | A | MH2 | 1 | 2 | 65.198 | 4.558 | 0.111 | 20 | DGM/AGM | 0.0056 | 65.968 | 4.612 |
| ABMBA213A | A | MH2 | 1 | 2 | 66.375 | 4.464 | 0.111 | 20 | DGM/AGM | 0.0055 | 66.797 | 4.492 |

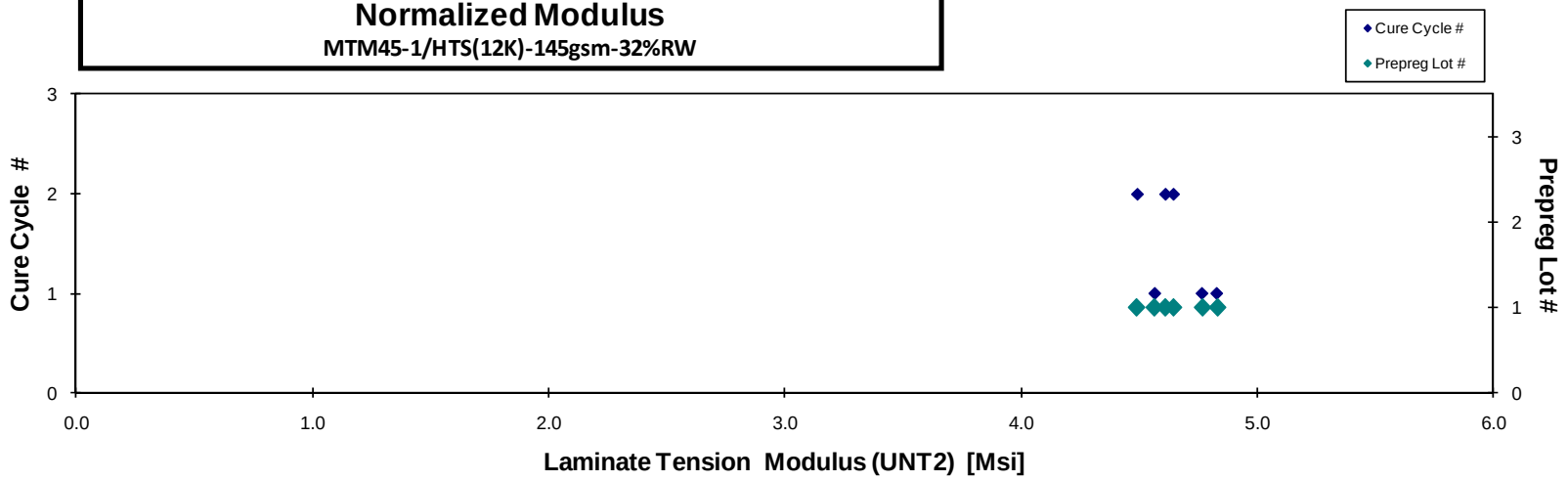
Note: Modulus data was not available for specimen 111A.

| | Strength [ksi] | Modulus [Msi] | | $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|
| **Average** | **65.239** | **4.588** | **$Average_{norm}$** | **0.0056** | **66.218** | **4.653** |
| **Standard Dev.** | **1.471** | **0.135** | **$Standard\ Dev._{norm}$** | | **1.302** | **0.126** |
| **Coeff. of Var. [%]** | **2.255** | **2.946** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **1.966** | **2.713** |
| **Min.** | **62.484** | **4.464** | **Min.** | **0.0055** | **64.548** | **4.492** |
| **Max.** | **66.647** | **4.776** | **Max.** | **0.0057** | **68.000** | **4.830** |
| **Number of Spec.** | **7** | **6** | **Number of Spec.** | | **7** | **6** |

## Laminate Unnotched Tension Properties (UNT2) -- (RTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Tension Properties (UNT2) -- (RTD)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



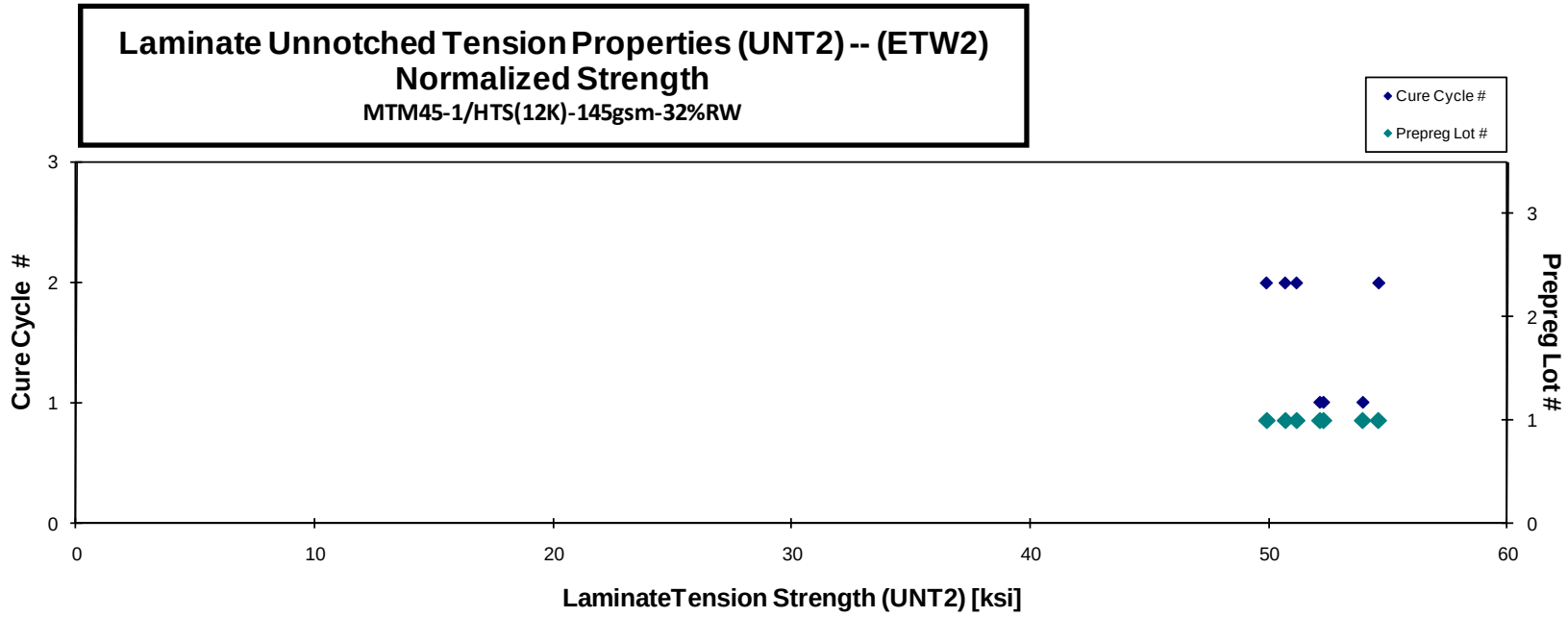
## Laminate Unnotched Tension Properties (UNT2) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

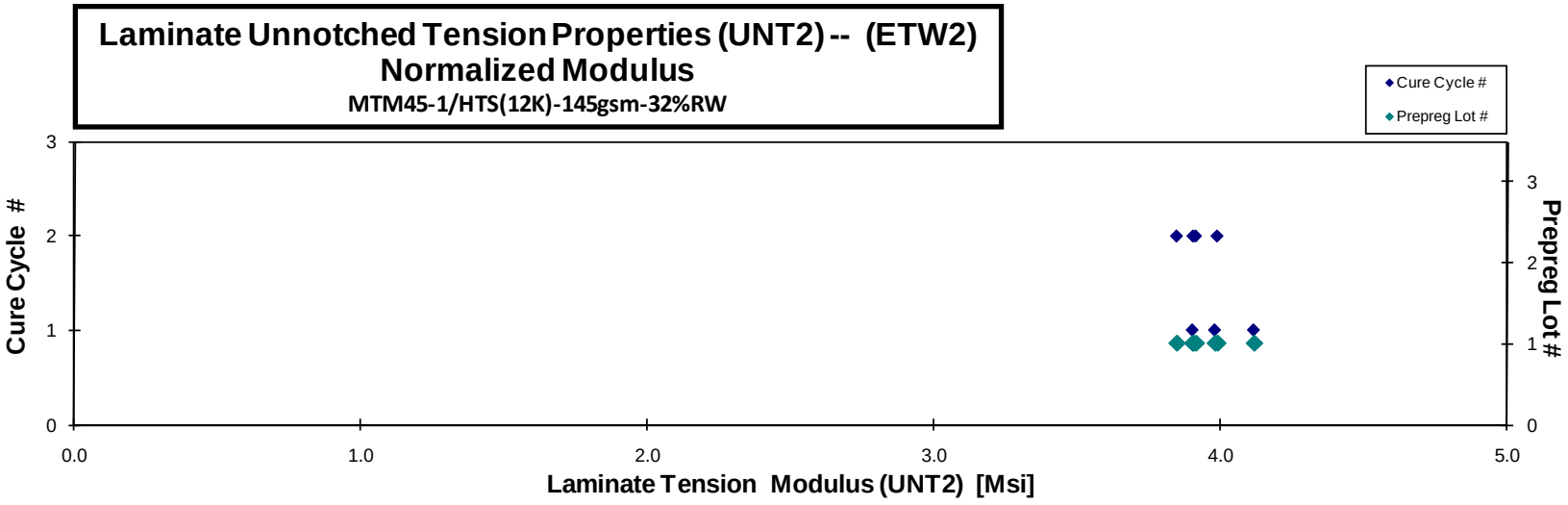
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMBA119D | A | MH1 | 1 | 1 | 51.658 | 3.864 | 0.111 | 20 | DGM | 0.0056 | 52.151 | 3.901 |
| ABMBA11AD | A | MH1 | 1 | 1 | 51.405 | 3.911 | 0.112 | 20 | DGM | 0.0056 | 52.301 | 3.980 |
| ABMBA11BD | A | MH1 | 1 | 1 | 52.936 | 4.039 | 0.112 | 20 | DGM | 0.0056 | 53.946 | 4.116 |
| ABMBA219D | A | MH2 | 1 | 2 | 50.666 | 3.874 | 0.111 | 20 | DGM | 0.0056 | 51.173 | 3.913 |
| ABMBA21AD | A | MH2 | 1 | 2 | 53.873 | 3.935 | 0.112 | 20 | DGM | 0.0056 | 54.607 | 3.988 |
| ABMBA21BD | A | MH2 | 1 | 2 | 49.084 | 3.839 | 0.112 | 20 | DGM | 0.0056 | 49.917 | 3.904 |
| ABMBA21CD | A | MH2 | 1 | 2 | 49.698 | 3.770 | 0.112 | 20 | DGM | 0.0056 | 50.699 | 3.846 |

| | Strength [ksi] | Modulus [Msi] |
|---|---|---|
| Average | 51.331 | 3.890 |
| Standard Dev. | 1.698 | 0.084 |
| Coeff. of Var. [%] | 3.308 | 2.167 |
| Min. | 49.084 | 3.770 |
| Max. | 53.873 | 4.039 |
| Number of Spec. | 7 | 7 |

| | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|
| $Average_{norm}$ | 0.0056 | 52.113 | 3.950 |
| $Standard\ Dev._{norm}$ | | 1.699 | 0.088 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 3.261 | 2.234 |
| Min. | 0.0056 | 49.917 | 3.846 |
| Max. | 0.0056 | 54.607 | 4.116 |
| Number of Spec. | | 7 | 7 |


Laminate Unnotched Tension Properties (UNT2) -- (ETW2)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
10
20
30
40
50
60
LaminateTension Strength (UNT2) [ksi]


Laminate Unnotched Tension Properties (UNT2) -- (ETW2)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
1.0
2.0
3.0
4.0
5.0
Laminate Tension Modulus (UNT2) [Msi]

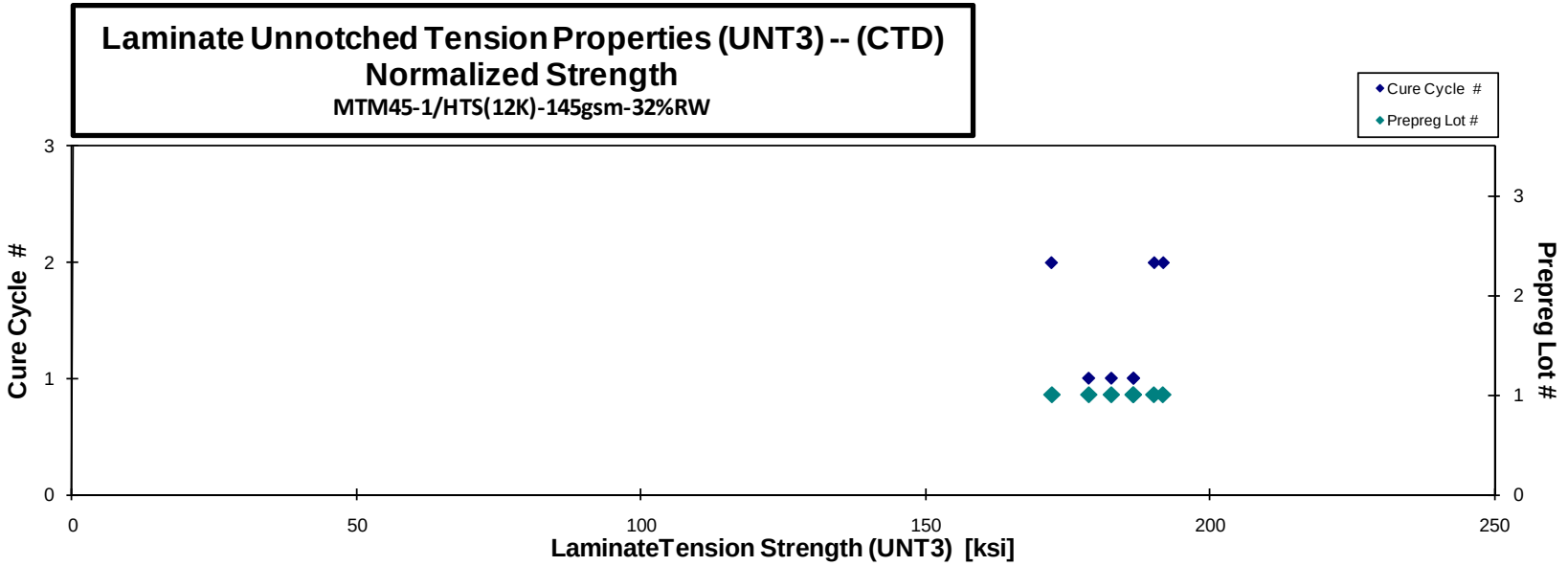
## 4.9 Unnotched Tension 3 Properties

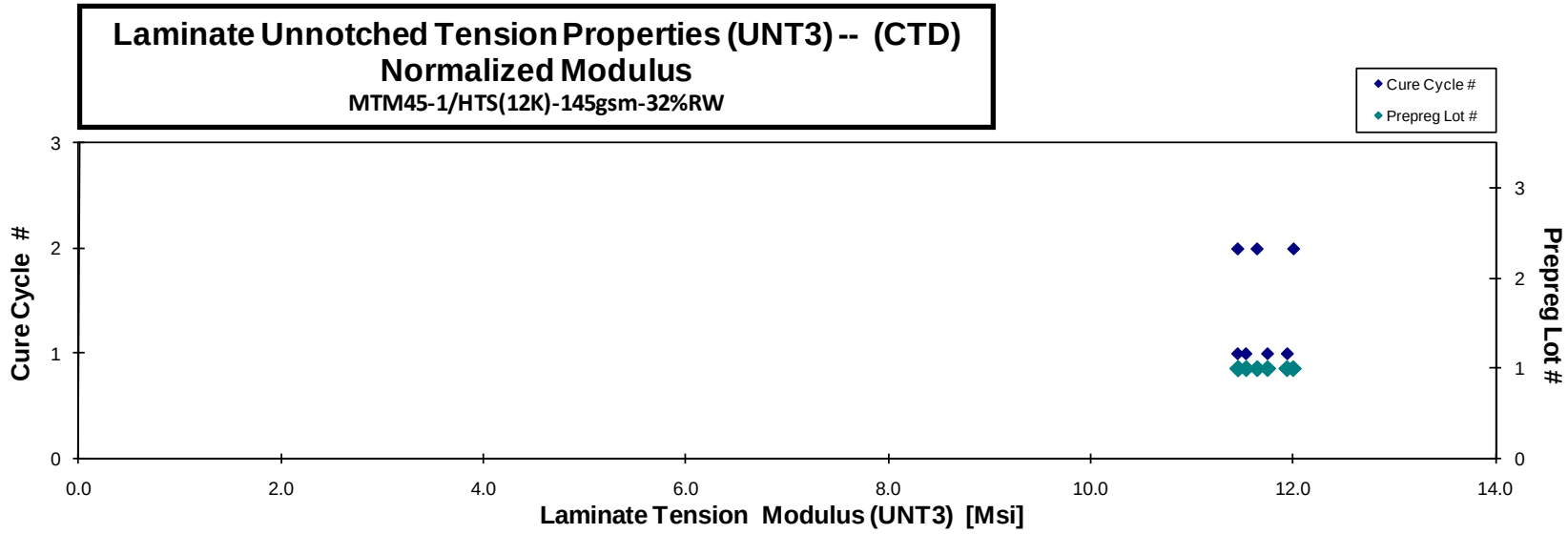
**Laminate Unnotched Tension Properties (UNT3) -- (CTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMCA115B | A | MH1 | 1 | 1 | 184.035 | 11.780 | 0.112 | 20 | LAT | 0.0056 | 186.572 | 11.943 |
| ABMCA116B | A | MH1 | 1 | 1 | 176.923 | 11.416 | 0.111 | 20 | LWB | 0.0056 | 178.773 | 11.535 |
| ABMCA117B | A | MH1 | 1 | 1 | 182.920 | 11.761 | 0.110 | 20 | LAT | 0.0055 | 182.726 | 11.748 |
| ABMCA118B | A | MH1 | 1 | 1 | 187.672 | 11.520 | 0.109 | 20 | LAT / LWB | 0.0055 | 186.592 | 11.454 |
| ABMCA214B | A | MH2 | 1 | 2 | 188.061 | 11.514 | 0.111 | 20 | LAT | 0.0056 | 190.198 | 11.645 |
| ABMCA215B | A | MH2 | 1 | 2 | 187.148 | 11.716 | 0.113 | 20 | LAT / LWB | 0.0056 | 191.770 | 12.005 |
| ABMCA216B | A | MH2 | 1 | 2 | 169.016 | 11.237 | 0.112 | 20 | LAT | 0.0056 | 172.294 | 11.455 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Average** | **182.254** | **11.563** | **$Average_{norm}$** | **0.0056** | **184.132** | **11.684** |
| **Standard Dev.** | **7.004** | **0.201** | **$Standard\ Dev._{norm}$** | | **6.807** | **0.225** |
| **Coeff. of Var. [%]** | **3.843** | **1.736** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **3.697** | **1.924** |
| **Min.** | **169.016** | **11.237** | **Min.** | **0.0055** | **172.294** | **11.454** |
| **Max.** | **188.061** | **11.780** | **Max.** | **0.0056** | **191.770** | **12.005** |
| **Number of Spec.** | **7** | **7** | **Number of Spec.** | | **7** | **7** |


Laminate Unnotched Tension Properties (UNT3) -- (CTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
50
100
150
200
250
LaminateTension Strength (UNT3) [ksi]


Laminate Unnotched Tension Properties (UNT3) -- (CTD)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Laminate Tension Modulus (UNT3) [Msi]

## Laminate Unnotched Tension Properties (UNT3) -- (RTD)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

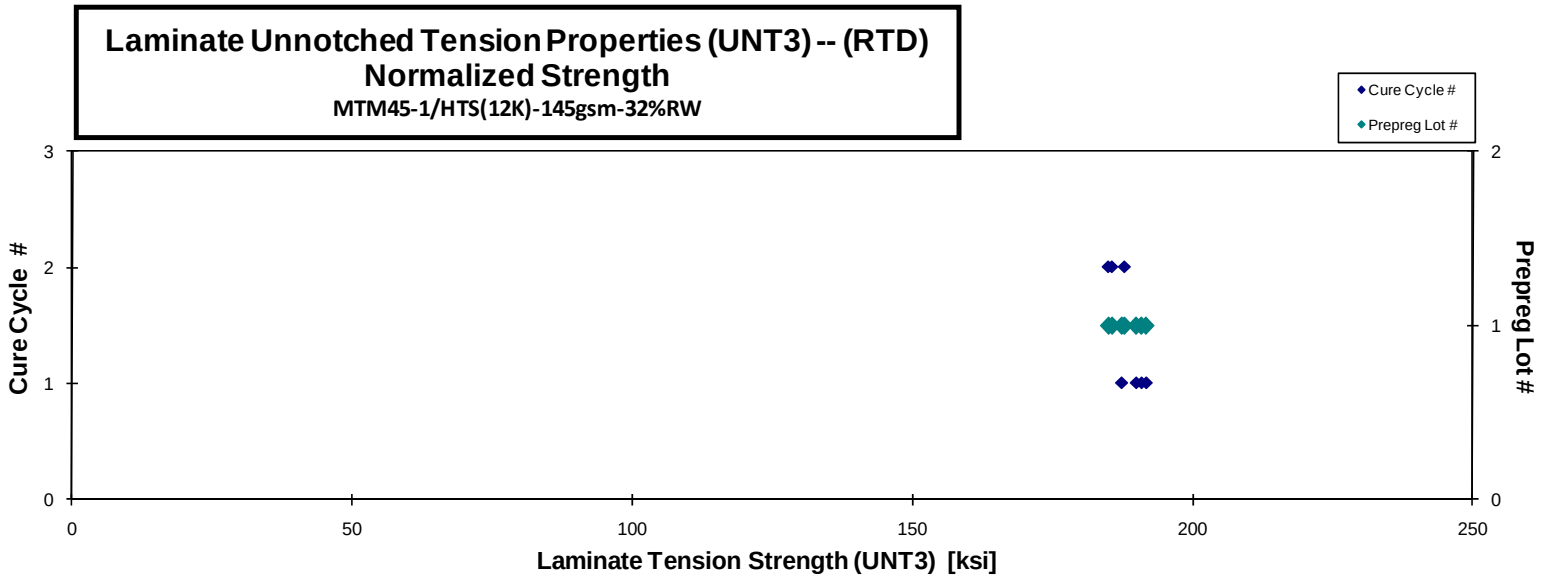
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMCA111A | A | MH1 | 1 | 1 | 184.315 | 10.983 | 0.112 | 20 | LWB/LWT | 0.0056 | 187.331 | 11.163 |
| ABMCA112A | A | MH1 | 1 | 1 | 188.763 | 11.257 | 0.111 | 20 | LWB/LAT | 0.0056 | 190.794 | 11.378 |
| ABMCA113A | A | MH1 | 1 | 1 | 190.130 | 10.930 | 0.111 | 20 | LWB/LWT | 0.0055 | 191.600 | 11.014 |
| ABMCA114A | A | MH1 | 1 | 1 | 187.870 | 11.145 | 0.111 | 20 | LWB | 0.0056 | 189.863 | 11.263 |
| ABMCA211A | A | MH2 | 1 | 2 | 183.719 | 11.115 | 0.111 | 20 | LWT/LAB | 0.0056 | 185.640 | 11.231 |
| ABMCA212A | A | MH2 | 1 | 2 | 182.363 | 11.235 | 0.112 | 20 | LAT/LWB | 0.0056 | 185.015 | 11.399 |
| ABMCA213A | A | MH2 | 1 | 2 | 187.835 | 11.591 | 0.110 | 20 | LWT | 0.0055 | 187.806 | 11.590 |

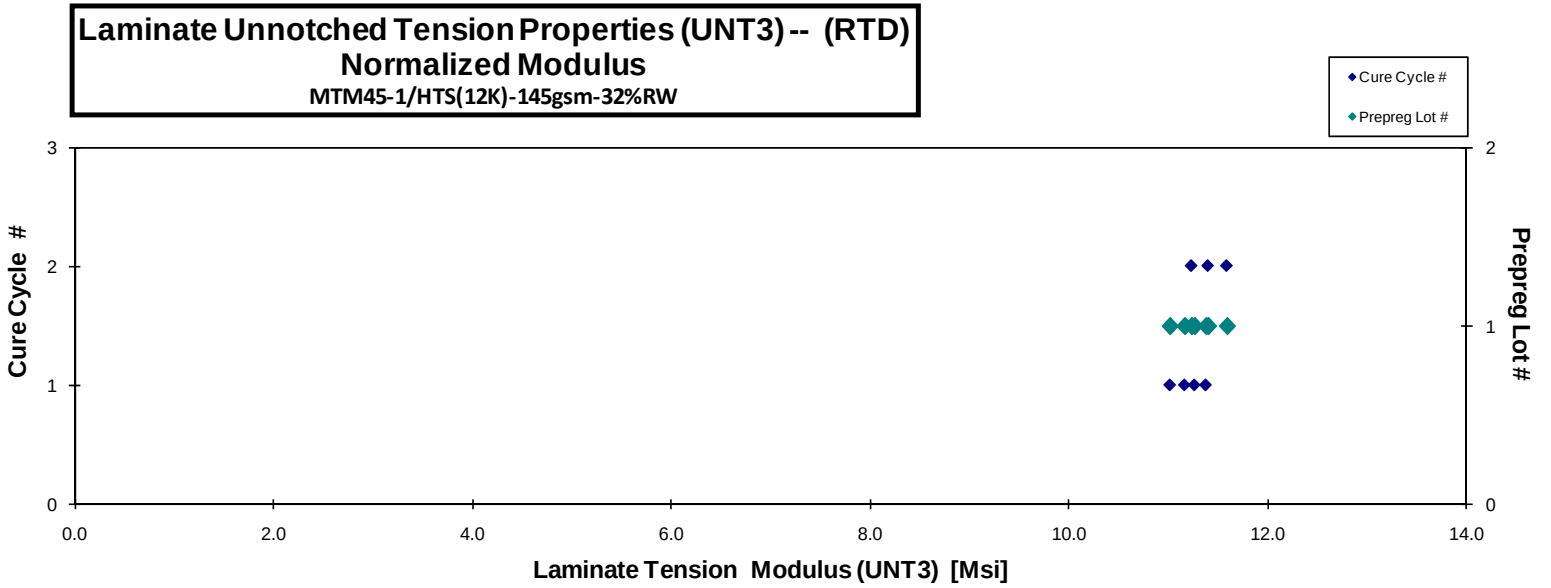
| | Strength [ksi] | Modulus [Msi] |
|---|---|---|
| Average | 186.428 | 11.179 |
| Standard Dev. | 2.931 | 0.218 |
| Coeff. of Var. [%] | 1.572 | 1.949 |
| Min. | 182.363 | 10.930 |
| Max. | 190.130 | 11.591 |
| Number of Spec. | 7 | 7 |

| | $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|
| $Average_{norm}$ | 0.0056 | 188.293 | 11.291 |
| $Standard\ Dev._{norm}$ | | 2.536 | 0.185 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 1.347 | 1.640 |
| Min. | 0.0055 | 185.015 | 11.014 |
| Max. | 0.0056 | 191.600 | 11.590 |
| Number of Spec. | | 7 | 7 |

WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

**Report No: CAM-RP-2009-010 Rev B**
**Report Date: March 25, 2016**



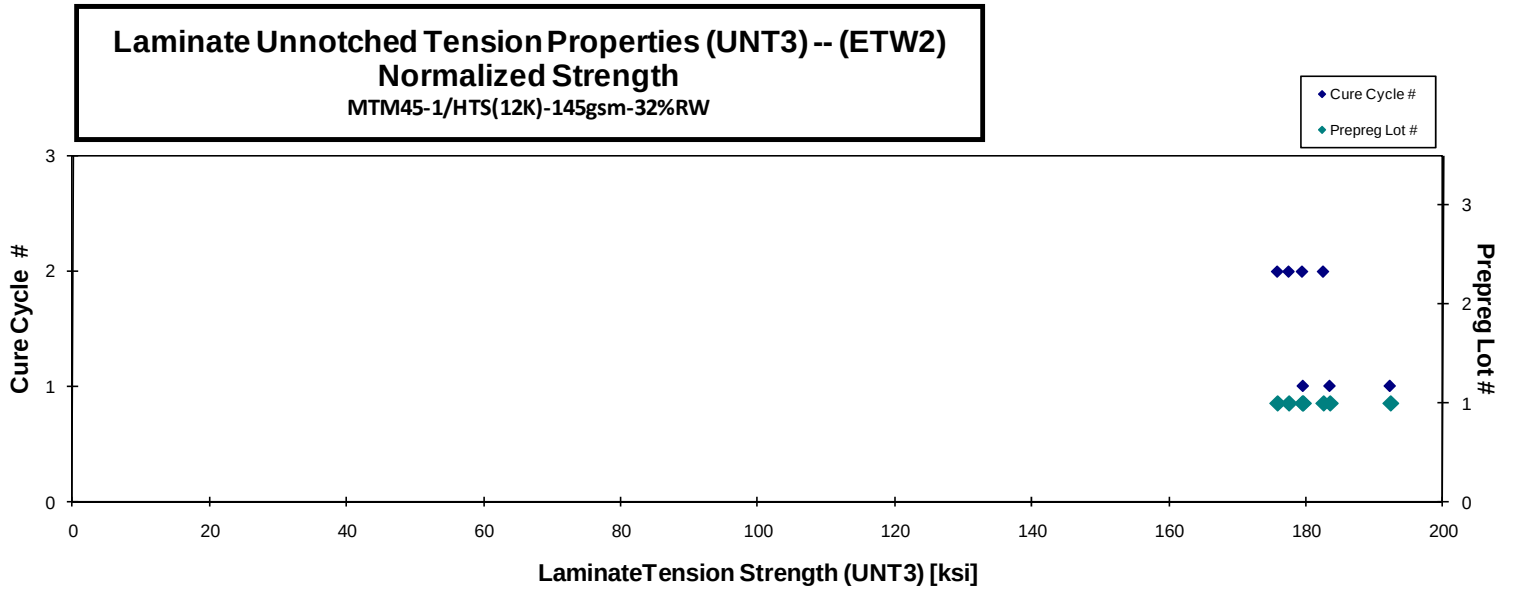
## Laminate Unnotched Tension Properties (UNT3) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

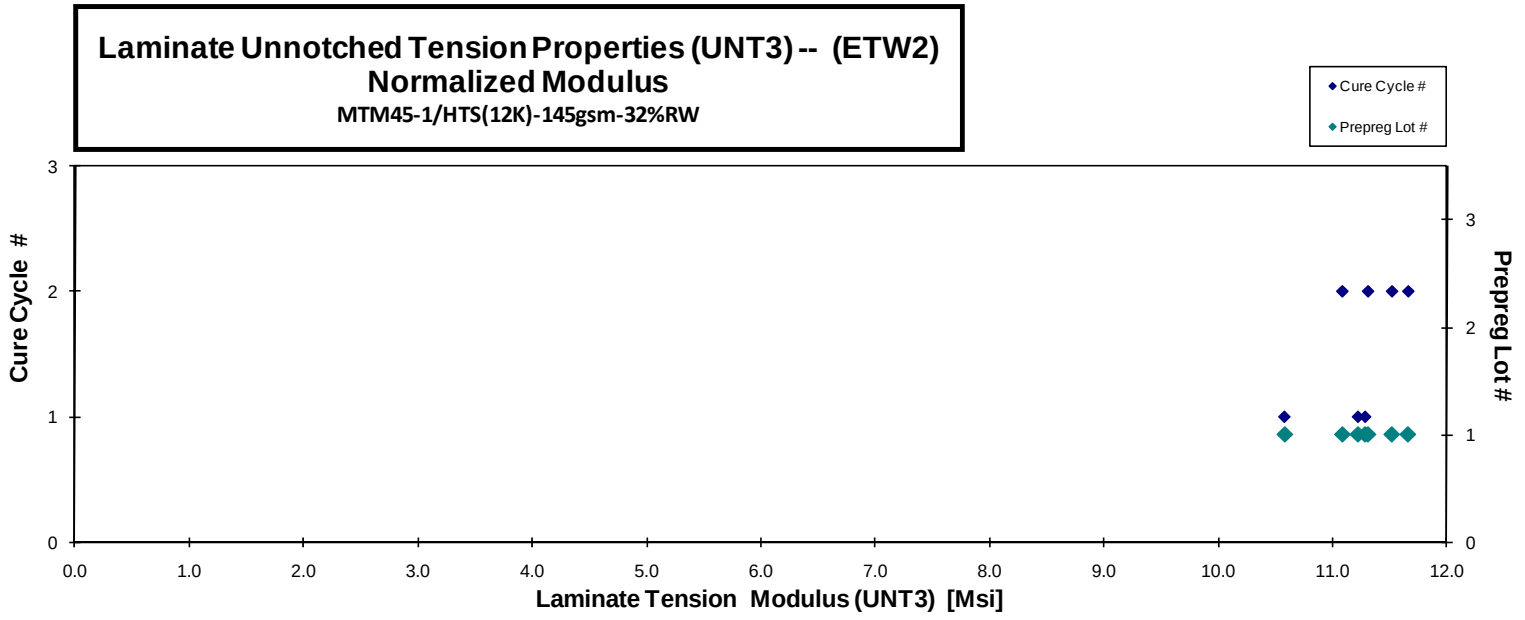
**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMCA119D | A | MH1 | 1 | 1 | 183.275 | 10.573 | 0.110 | 20 | AWB | 0.0055 | 183.469 | 10.584 |
| ABMCA11AD | A | MH1 | 1 | 1 | 192.006 | 11.273 | 0.110 | 20 | LWB/LWT | 0.0055 | 192.267 | 11.288 |
| ABMCA11BD | A | MH1 | 1 | 1 | 177.683 | 11.107 | 0.111 | 20 | AWB/LWT | 0.0056 | 179.567 | 11.225 |
| ABMCA218D | A | MH2 | 1 | 2 | 178.993 | 11.061 | 0.110 | 20 | AWT/LWB | 0.0055 | 179.455 | 11.089 |
| ABMCA219D | A | MH2 | 1 | 2 | 180.363 | 11.526 | 0.111 | 20 | AWT/LWB | 0.0056 | 182.522 | 11.664 |
| ABMCA21AD | A | MH2 | 1 | 2 | 173.431 | 11.260 | 0.113 | 20 | AWT/LWB | 0.0056 | 177.478 | 11.522 |
| ABMCA21BD | A | MH2 | 1 | 2 | 172.811 | 11.120 | 0.112 | 20 | AGM | 0.0056 | 175.822 | 11.313 |

| | Strength | Modulus |
|---|---|---|
| Average | 179.795 | 11.131 |
| Standard Dev. | 6.531 | 0.291 |
| Coeff. of Var. [%] | 3.632 | 2.618 |
| Min. | 172.811 | 10.573 |
| Max. | 192.006 | 11.526 |
| Number of Spec. | 7 | 7 |

| | | $Strength_{norm}$ | $Modulus_{norm}$ |
|---|---|---|---|
| $Average_{norm}$ | 0.0056 | 181.511 | 11.241 |
| $Standard\ Dev._{norm}$ | | 5.434 | 0.346 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 2.994 | 3.082 |
| Min. | 0.0055 | 175.822 | 10.584 |
| Max. | 0.0056 | 192.267 | 11.664 |
| Number of Spec. | | 7 | 7 |


Laminate Unnotched Tension Properties (UNT3) -- (ETW2)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
20
40
60
80
100
120
140
160
180
200
LaminateTension Strength (UNT3) [ksi]


Laminate Unnotched Tension Properties (UNT3) -- (ETW2)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
Laminate Tension Modulus (UNT3) [Msi]

## 4.10 Unnotched Compression 0/90 Properties

**Laminate Unnotched Compression Properties (UNC0) -- (CTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

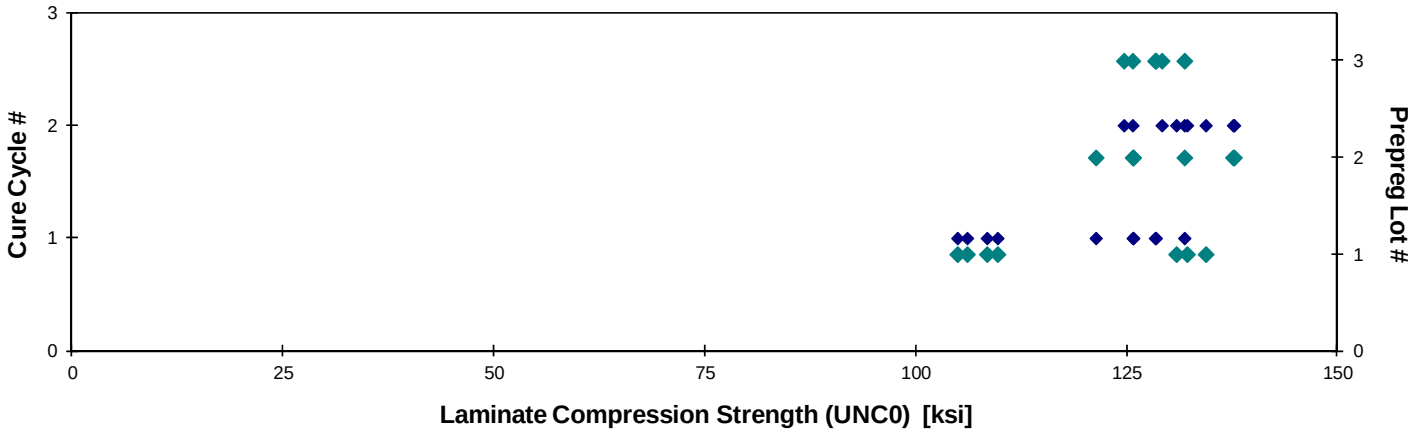
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMRA116B | A | MH1 | 1 | 1 | 106.468 | 9.180 | 0.036 | 0.090 | 16 | BGM | 0.0056 | 108.403 | 9.347 |
| ABMRA117B | A | MH1 | 1 | 1 | 101.743 | 8.863 | 0.034 | 0.091 | 16 | BGM | 0.0057 | 104.904 | 9.138 |
| ABMRA118B | A | MH1 | 1 | 1 | 104.214 | 9.140 | 0.039 | 0.090 | 16 | BGM | 0.0056 | 106.049 | 9.301 |
| ABMRA119B | A | MH1 | 1 | 1 | 107.242 | 9.239 | 0.044 | 0.090 | 16 | BGM | 0.0056 | 109.659 | 9.447 |
| ABMRA216B | A | MH2 | 1 | 2 | 130.511 | 9.929 | 0.038 | 0.091 | 16 | BGM | 0.0057 | 134.343 | 10.220 |
| ABMRA217B | A | MH2 | 1 | 2 | 130.309 | 10.010 | 0.048 | 0.088 | 16 | BGM | 0.0055 | 130.852 | 10.052 |
| ABMRA218B | A | MH2 | 1 | 2 | 129.144 | 9.645 | 0.053 | 0.090 | 16 | BGM | 0.0056 | 132.128 | 9.868 |
| ABMRB115B | B | MH1 | 2 | 1 | 122.790 | 8.742 | 0.054 | 0.090 | 16 | BAT | 0.0056 | 125.697 | 8.949 |
| ABMRB116B | B | MH1 | 2 | 1 | 118.615 | 8.790 | 0.022 | 0.090 | 16 | BAT | 0.0056 | 121.311 | 8.989 |
| ABMRB117B | B | MH1 | 2 | 1 | 121.275 | 8.633 | 0.047 | 0.091 | 16 | BAT | 0.0057 | 125.754 | 8.952 |
| ABMRB215B | B | MH2 | 2 | 2 | 132.784 | 8.717 | 0.050 | 0.091 | 16 | BAB | 0.0057 | 137.587 | 9.033 |
| ABMRB216B | B | MH2 | 2 | 2 | 133.417 | 8.786 | 0.046 | 0.091 | 16 | BAB | 0.0057 | 137.713 | 9.069 |
| ABMRB217B | B | MH2 | 2 | 2 | 128.743 | 9.068 | 0.045 | 0.090 | 16 | BAT | 0.0056 | 131.815 | 9.284 |
| ABMRC115B | C | MH1 | 3 | 1 | 133.820 | 9.587 | 0.057 | 0.087 | 16 | BAT | 0.0054 | 131.818 | 9.444 |
| ABMRC116B | C | MH1 | 3 | 1 | 130.295 | 9.224 | 0.058 | 0.087 | 16 | BGM | 0.0054 | 128.346 | 9.086 |
| ABMRC117B | C | MH1 | 3 | 1 | 128.853 | 9.045 | 0.061 | 0.088 | 16 | BAB | 0.0055 | 128.438 | 9.016 |
| ABMRC215B | C | MH2 | 3 | 2 | 124.093 | 8.830 | 0.061 | 0.089 | 16 | BAT | 0.0056 | 125.667 | 8.942 |
| ABMRC216B | C | MH2 | 3 | 2 | 128.335 | 8.972 | 0.038 | 0.089 | 16 | BAT | 0.0055 | 129.137 | 9.028 |
| ABMRC217B | C | MH2 | 3 | 2 | 124.523 | 8.803 | 0.054 | 0.088 | 16 | BAT | 0.0055 | 124.641 | 8.811 |

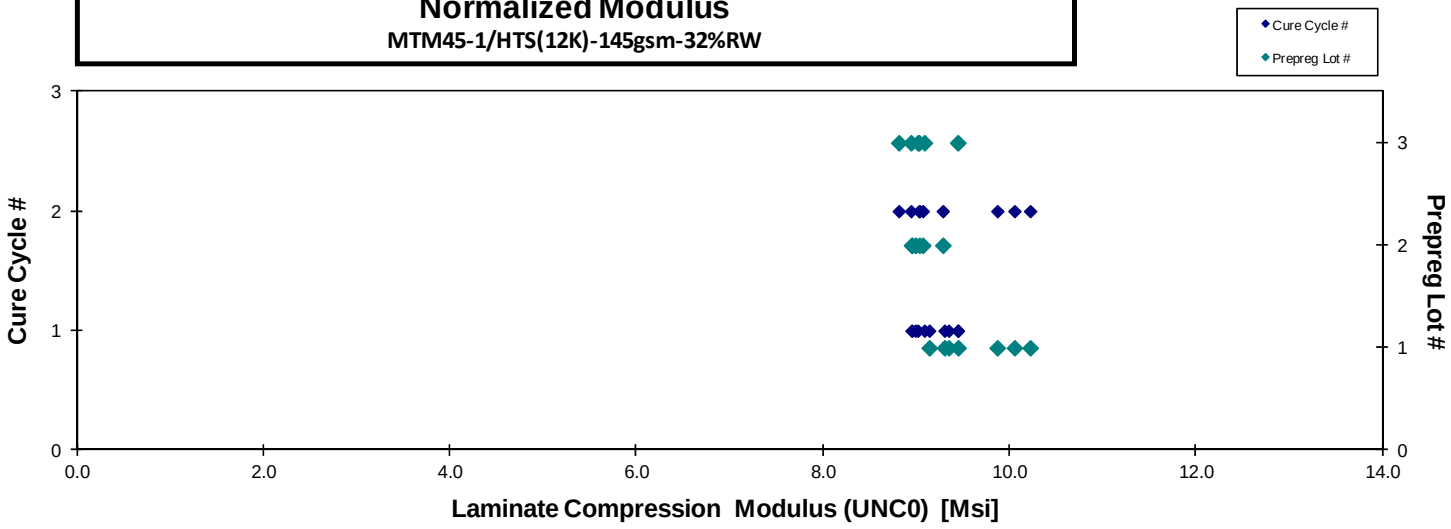
| | | | |
|---|---|---|---|
| **Average** | **123.009** | **9.116** | **0.047** |
| **Standard Dev.** | **10.462** | **0.409** | **0.010** |
| **Coeff. of Var. [%]** | **8.505** | **4.488** | **21.908** |
| **Min.** | **101.743** | **8.633** | **0.022** |
| **Max.** | **133.820** | **10.010** | **0.061** |
| **Number of Spec.** | **19** | **19** | **19** |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0056** | **124.961** | **9.262** |
| **Standard $Dev._{norm}$** | | **10.313** | **0.395** |
| **Coeff. of Var. $[\%]_{norm}$** | | **8.253** | **4.267** |
| **Min.** | **0.0054** | **104.904** | **8.811** |
| **Max.** | **0.0057** | **137.713** | **10.220** |
| **Number of Spec.** | | **19** | **19** |

## Laminate Unnotched Compression Properties (UNC0) -- (CTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC0) -- (CTD)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Unnotched Compression Properties (UNC0) -- (RTD)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

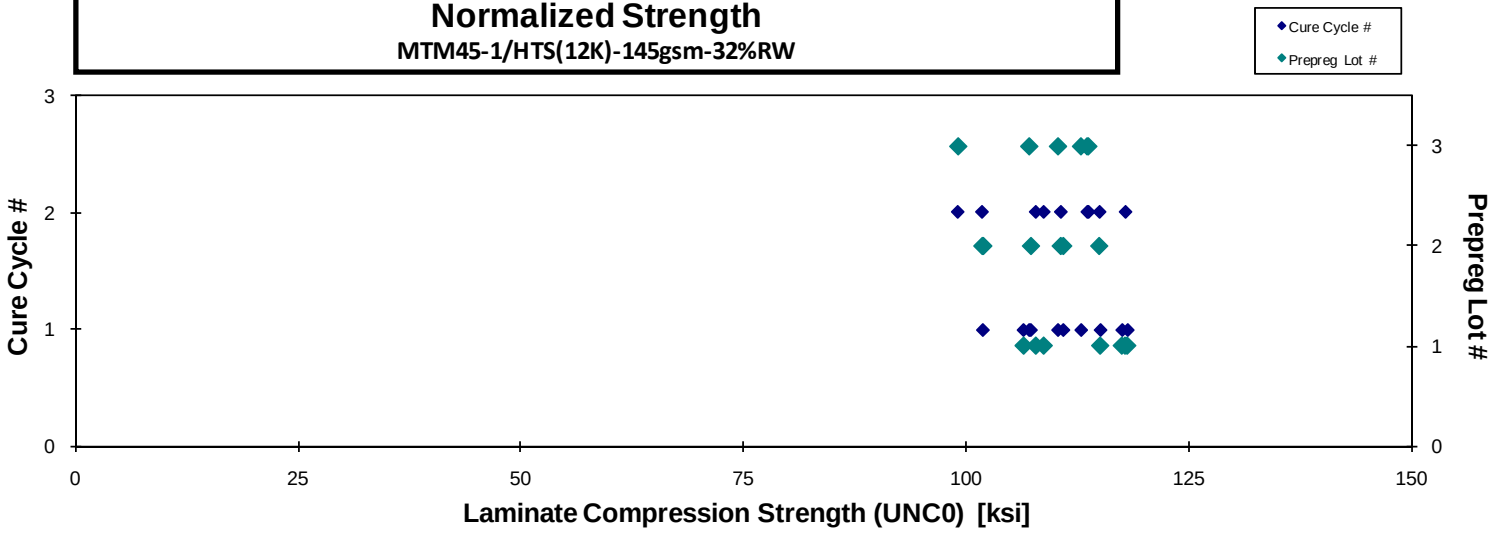
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMRA111A | A | MH1 | 1 | 1 | 115.540 | 8.988 | 0.046 | 0.090 | 16 | BGM | 0.0056 | 117.509 | 9.141 |
| ABMRA112A | A | MH1 | 1 | 1 | 112.643 | 8.970 | 0.041 | 0.090 | 16 | BGM | 0.0056 | 115.075 | 9.164 |
| ABMRA113A | A | MH1 | 1 | 1 | 115.707 | 9.053 | 0.043 | 0.090 | 16 | BGM | 0.0056 | 118.118 | 9.242 |
| ABMRA114A | A | MH1 | 1 | 1 | 103.783 | 8.852 | 0.054 | 0.090 | 16 | BGM | 0.0056 | 106.456 | 9.080 |
| ABMRA211A | A | MH2 | 1 | 2 | 105.482 | 9.952 | 0.045 | 0.090 | 16 | BGM | 0.0056 | 107.820 | 10.173 |
| ABMRA212A | A | MH2 | 1 | 2 | 106.632 | 9.218 | 0.047 | 0.090 | 16 | BGM/HAT | 0.0056 | 108.712 | 9.398 |
| ABMRA213A | A | MH2 | 1 | 2 | 115.788 | 9.459 | 0.050 | 0.090 | 16 | BGM/HAT | 0.0056 | 117.871 | 9.629 |
| ABMRB111A | B | MH1 | 2 | 1 | 104.277 | 9.554 | 0.046 | 0.091 | 16 | BGM | 0.0057 | 107.279 | 9.829 |
| ABMRB112A | B | MH1 | 2 | 1 | 108.169 | 9.077 | 0.051 | 0.090 | 16 | BGM | 0.0056 | 110.914 | 9.307 |
| ABMRB113A | B | MH1 | 2 | 1 | 100.068 | 9.062 | 0.051 | 0.090 | 16 | BGM | 0.0056 | 101.906 | 9.229 |
| ABMRB211A | B | MH2 | 2 | 2 | 113.420 | 9.460 | 0.063 | 0.089 | 16 | HAT | 0.0056 | 114.966 | 9.589 |
| ABMRB212A | B | MH2 | 2 | 2 | 106.671 | 9.470 | 0.042 | 0.091 | 16 | BAB | 0.0057 | 110.631 | 9.821 |
| ABMRB213A | B | MH2 | 2 | 2 | 98.303 | 9.692 | 0.043 | 0.091 | 16 | BAB | 0.0057 | 101.803 | 10.037 |
| ABMRC111A | C | MH1 | 3 | 1 | 114.012 | 9.873 | 0.049 | 0.087 | 16 | HAT | 0.0054 | 112.911 | 9.778 |
| ABMRC112A | C | MH1 | 3 | 1 | 110.806 | 10.329 | 0.041 | 0.088 | 16 | BAB | 0.0055 | 110.323 | 10.284 |
| ABMRC113A | C | MH1 | 3 | 1 | 107.821 | 10.583 | 0.042 | 0.087 | 16 | BAB | 0.0055 | 107.086 | 10.511 |
| ABMRC211A | C | MH2 | 3 | 2 | 112.365 | 9.938 | 0.044 | 0.089 | 16 | BAB | 0.0056 | 113.600 | 10.047 |
| ABMRC212A | C | MH2 | 3 | 2 | 113.227 | 10.050 | 0.050 | 0.088 | 16 | BAB | 0.0055 | 113.742 | 10.095 |
| ABMRC213A | C | MH2 | 3 | 2 | 99.597 | 10.228 | 0.051 | 0.088 | 16 | HAT | 0.0055 | 99.088 | 10.176 |

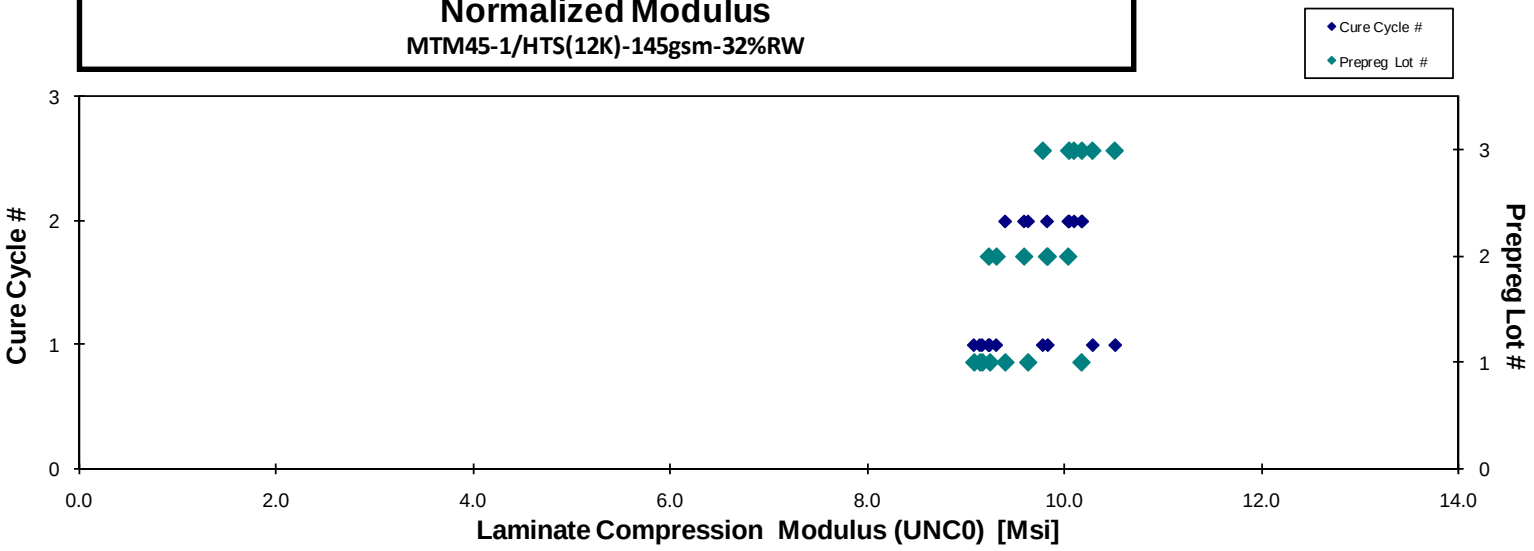
| | | | |
|---|---|---|---|
| **Average** | **108.648** | **9.569** | **0.047** |
| **Standard Dev.** | **5.674** | **0.516** | **0.005** |
| **Coeff. of Var. [%]** | **5.222** | **5.394** | **11.580** |
| **Min.** | **98.303** | **8.852** | **0.041** |
| **Max.** | **115.788** | **10.583** | **0.063** |
| **Number of Spec.** | **19** | **19** | **19** |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0056** | **110.306** | **9.712** |
| **$Standard\ Dev._{norm}$** | | **5.559** | **0.444** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **5.040** | **4.574** |
| **Min.** | **0.0054** | **99.088** | **9.080** |
| **Max.** | **0.0057** | **118.118** | **10.511** |
| **Number of Spec.** | | **19** | **19** |

## Laminate Unnotched Compression Properties (UNC0) -- (RTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC0) -- (RTD)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Unnotched Compression Properties (UNC0) -- (ETD)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

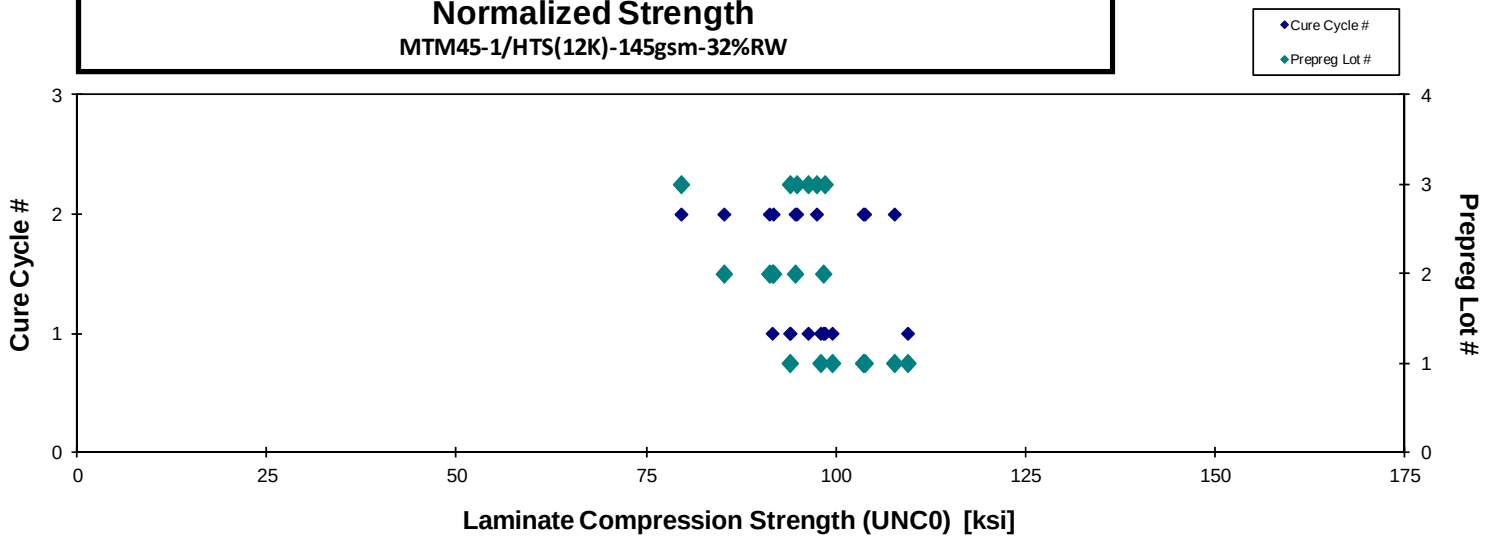
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMRA11AC | A | MH1 | 1 | 1 | 106.928 | 9.083 | 0.042 | 0.090 | 16 | TAT | 0.0056 | 109.439 | 9.296 |
| ABMRA11BC | A | MH1 | 1 | 1 | 97.482 | 8.769 | 0.047 | 0.090 | 16 | TAB | 0.0056 | 99.495 | 8.950 |
| ABMRA11CC | A | MH1 | 1 | 1 | 95.122 | 8.771 | 0.046 | 0.091 | 16 | BGM | 0.0057 | 97.969 | 9.033 |
| ABMRA11EC | A | MH1 | 1 | 1 | 92.439 | 8.872 | 0.037 | 0.089 | 16 | BGM | 0.0056 | 93.909 | 9.013 |
| ABMRA21AC | A | MH2 | 1 | 2 | 101.868 | 9.997 | 0.036 | 0.089 | 16 | BGM | 0.0056 | 103.585 | 10.165 |
| ABMRA21BC* | A | MH2 | 1 | 2 | | 9.693 | 0.039 | 0.090 | 16 | HIB | 0.0056 | | 9.922 |
| ABMRA21CC | A | MH2 | 1 | 2 | 105.688 | 9.569 | 0.042 | 0.090 | 16 | HAB | 0.0056 | 107.690 | 9.750 |
| ABMRA21DC | A | MH2 | 1 | 2 | 101.731 | 9.444 | 0.038 | 0.090 | 16 | BGM | 0.0056 | 103.793 | 9.635 |
| ABMRA21EC* | A | MH2 | 1 | 2 | | 9.332 | 0.031 | 0.090 | 16 | HAT | 0.0056 | | 9.573 |
| ABMRB119C* | B | MH1 | 2 | 1 | | 9.241 | 0.046 | 0.091 | 16 | HIT | 0.0057 | | 9.537 |
| ABMRB11AC | B | MH1 | 2 | 1 | 88.973 | 8.934 | 0.040 | 0.091 | 16 | BGM | 0.0057 | 91.585 | 9.196 |
| ABMRB11BC | B | MH1 | 2 | 1 | 95.380 | 9.113 | 0.028 | 0.091 | 16 | BGM | 0.0057 | 98.324 | 9.394 |
| ABMRB219C | B | MH2 | 2 | 2 | 83.115 | 8.741 | 0.036 | 0.090 | 16 | HGM | 0.0056 | 85.224 | 8.962 |
| ABMRB21AC | B | MH2 | 2 | 2 | 87.793 | 8.546 | 0.034 | 0.091 | 16 | HGM | 0.0057 | 91.218 | 8.879 |
| ABMRB21BC | B | MH2 | 2 | 2 | 92.246 | 8.515 | 0.030 | 0.090 | 16 | BGM | 0.0056 | 94.605 | 8.733 |
| ABMRB21CC | B | MH2 | 2 | 2 | 88.535 | 8.800 | 0.047 | 0.091 | 16 | BGM | 0.0057 | 91.721 | 9.116 |
| ABMRC119C | C | MH1 | 3 | 1 | 98.740 | 8.989 | 0.041 | 0.088 | 16 | HGM | 0.0055 | 98.516 | 8.968 |
| ABMRC11AC | C | MH1 | 3 | 1 | 97.742 | 9.320 | 0.033 | 0.087 | 16 | HGM/BGM | 0.0054 | 96.317 | 9.184 |
| ABMRC11BC | C | MH1 | 3 | 1 | 95.718 | 9.596 | 0.044 | 0.086 | 16 | BGM | 0.0054 | 93.942 | 9.418 |
| ABMRC219C | C | MH2 | 3 | 2 | 96.509 | 9.256 | 0.047 | 0.089 | 16 | BGM | 0.0056 | 97.441 | 9.345 |
| ABMRC21AC | C | MH2 | 3 | 2 | 79.832 | 9.114 | 0.037 | 0.088 | 16 | HGM | 0.0055 | 79.575 | 9.085 |
| ABMRC21BC | C | MH2 | 3 | 2 | 95.508 | 8.867 | 0.049 | 0.087 | 16 | HGM | 0.0055 | 94.820 | 8.803 |

*Strength removed due to bad failure mode achieved

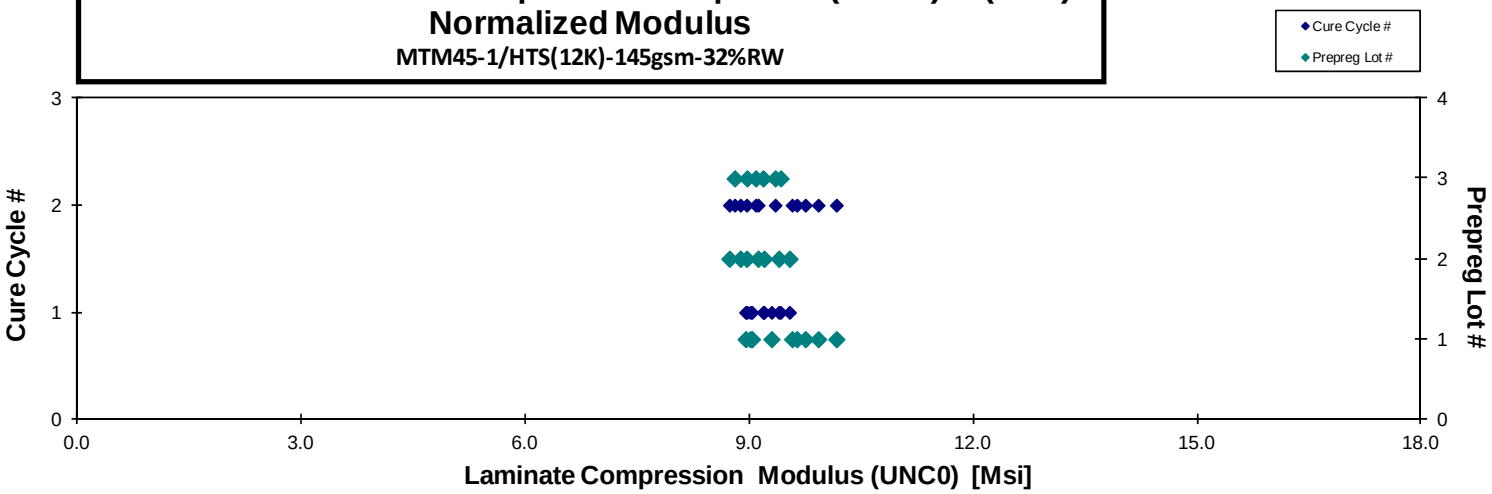
| | | | |
|---|---|---|---|
| **Average** | **94.808** | **9.116** | **0.039** |
| **Standard Dev.** | **7.050** | **0.385** | **0.006** |
| **Coeff. of Var. [%]** | **7.436** | **4.224** | **15.380** |
| **Min.** | **79.832** | **8.515** | **0.028** |
| **Max.** | **106.928** | **9.997** | **0.049** |
| **Number of Spec.** | **19** | **22** | **22** |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0056** | **96.272** | **9.271** |
| **$Standard\ Dev._{norm}$** | | **7.159** | **0.374** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **7.437** | **4.034** |
| **Min.** | **0.0054** | **79.575** | **8.803** |
| **Max.** | **0.0057** | **109.439** | **10.165** |
| **Number of Spec.** | | **19** | **22** |

## Laminate Unnotched Compression Properties (UNC0) -- (ETD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC0) -- (ETD)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Unnotched Compression Properties (UNC0) -- (ETW)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

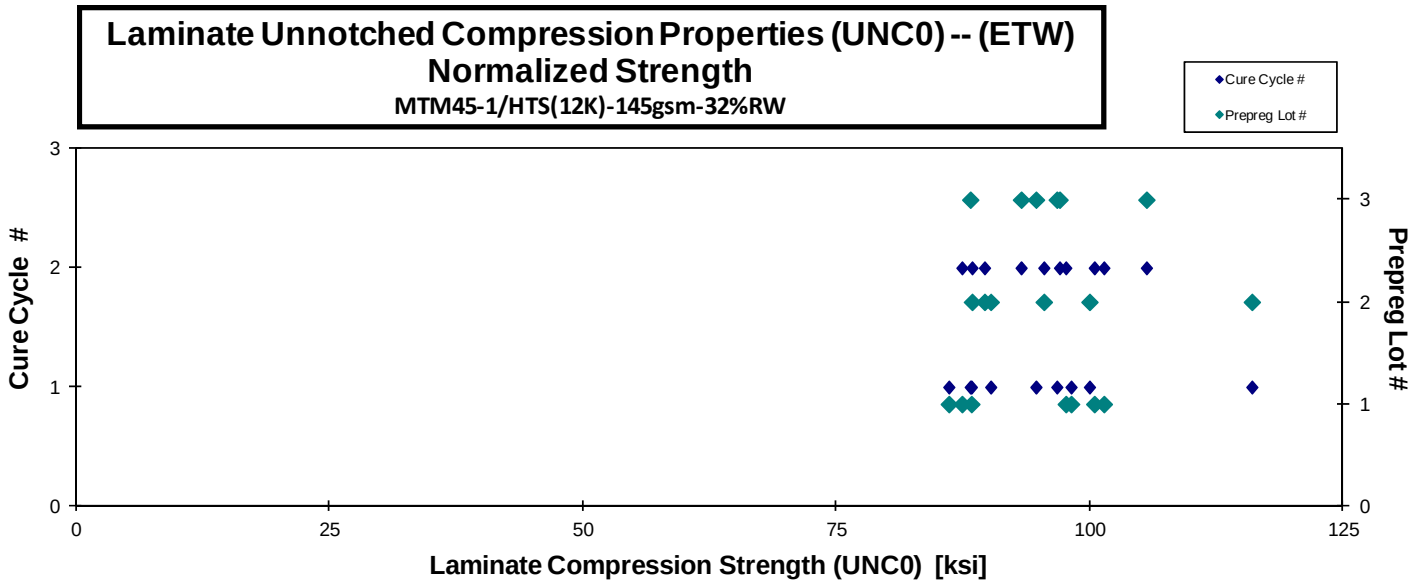
normalizing $t_{ply}$ [in]: 0.0055

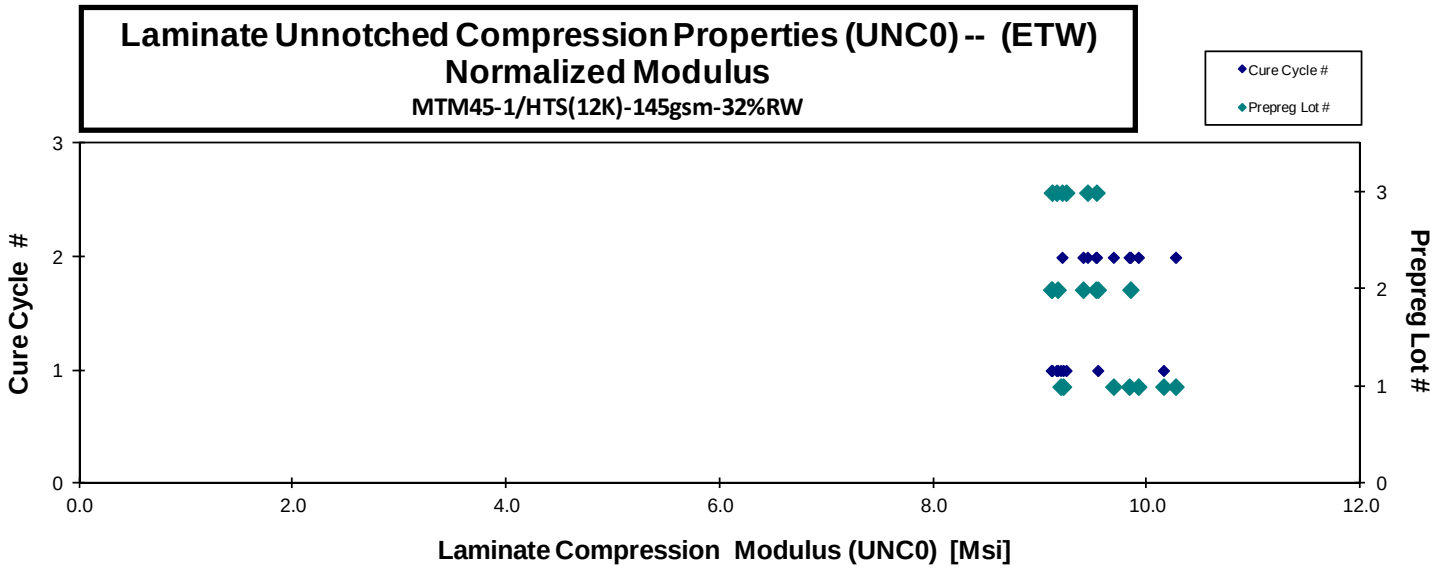
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMRA11FN | A | MH1 | 1 | 1 | 95.647 | 8.954 | 0.047 | 0.090 | 16 | BGM | 0.0056 | 98.092 | 9.183 |
| ABMRA11GN | A | MH1 | 1 | 1 | 86.579 | 9.031 | 0.046 | 0.090 | 16 | HAT | 0.0056 | 88.251 | 9.205 |
| ABMRA11HN | A | MH1 | 1 | 1 | 83.470 | 9.844 | 0.044 | 0.091 | 16 | HAB | 0.0057 | 86.031 | 10.146 |
| ABMRA21FN | A | MH2 | 1 | 2 | 85.355 | 9.458 | 0.042 | 0.090 | 16 | HAT | 0.0056 | 87.327 | 9.677 |
| ABMRA21GN | A | MH2 | 1 | 2 | 95.683 | 9.635 | 0.030 | 0.090 | 16 | HAB | 0.0056 | 97.568 | 9.825 |
| ABMRA21HN | A | MH2 | 1 | 2 | 99.585 | 9.740 | 0.043 | 0.090 | 16 | HAB | 0.0056 | 101.321 | 9.910 |
| ABMRA21IN | A | MH2 | 1 | 2 | 98.371 | 10.054 | 0.040 | 0.090 | 16 | BGM | 0.0056 | 100.383 | 10.259 |
| ABMRB11DN | B | MH1 | 2 | 1 | 112.059 | 9.213 | 0.048 | 0.091 | 16 | HAT | 0.0057 | 115.921 | 9.530 |
| ABMRB11EN | B | MH1 | 2 | 1 | 87.076 | 8.787 | 0.051 | 0.091 | 16 | BGM | 0.0057 | 90.160 | 9.098 |
| ABMRB11FN* | B | MH1 | 2 | 1 | | 8.893 | 0.041 | 0.090 | 16 | HIT | 0.0056 | | 9.097 |
| ABMRB11GN | B | MH1 | 2 | 1 | 97.649 | 8.948 | 0.038 | 0.090 | 16 | HAB | 0.0056 | 99.905 | 9.154 |
| ABMRB21DN | B | MH2 | 2 | 2 | 86.659 | 9.519 | 0.045 | 0.091 | 16 | BGM | 0.0057 | 89.547 | 9.836 |
| ABMRB21EN | B | MH2 | 2 | 2 | 85.563 | 9.216 | 0.040 | 0.091 | 16 | HAB | 0.0057 | 88.318 | 9.512 |
| ABMRB21FN | B | MH2 | 2 | 2 | 91.886 | 9.047 | 0.045 | 0.091 | 16 | HAT | 0.0057 | 95.401 | 9.393 |
| ABMRC11DN | C | MH1 | 3 | 1 | 98.169 | 9.285 | 0.047 | 0.087 | 16 | BGM | 0.0054 | 96.682 | 9.145 |
| ABMRC11EN | C | MH1 | 3 | 1 | 94.285 | 9.069 | 0.053 | 0.088 | 16 | HGM | 0.0055 | 94.625 | 9.102 |
| ABMRC11FN | C | MH1 | 3 | 1 | 88.447 | 9.265 | 0.052 | 0.088 | 16 | HAB | 0.0055 | 88.146 | 9.234 |
| ABMRC21DN | C | MH2 | 3 | 2 | 93.001 | 9.502 | 0.053 | 0.088 | 16 | HAB | 0.0055 | 93.159 | 9.518 |
| ABMRC21EN | C | MH2 | 3 | 2 | 103.520 | 9.022 | 0.060 | 0.090 | 16 | HAB | 0.0056 | 105.520 | 9.196 |
| ABMRC21FN | C | MH2 | 3 | 2 | 96.150 | 9.356 | 0.039 | 0.089 | 16 | HAB | 0.0055 | 96.951 | 9.434 |

*Strength removed due to bad failure mode achieved

| | | | |
|---|---|---|---|
| **Average** | **93.640** | **9.292** | **0.045** |
| **Standard Dev.** | **7.286** | **0.344** | **0.007** |
| **Coeff. of Var. [%]** | **7.781** | **3.698** | **14.665** |
| **Min.** | **83.470** | **8.787** | **0.030** |
| **Max.** | **112.059** | **10.054** | **0.060** |
| **Number of Spec.** | **19** | **20** | **20** |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0056** | **95.437** | **9.473** |
| **Standard $Dev._{norm}$** | | **7.431** | **0.362** |
| **Coeff. of Var. $[\%]_{norm}$** | | **7.786** | **3.825** |
| **Min.** | **0.0054** | **86.031** | **9.097** |
| **Max.** | **0.0057** | **115.921** | **10.259** |
| **Number of Spec.** | | **19** | **20** |


Laminate Unnotched Compression Properties (UNC0) -- (ETW)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
25
50
75
100
125
Laminate Compression Strength (UNC0) [ksi]


Laminate Unnotched Compression Properties (UNC0) -- (ETW)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Laminate Compression Modulus (UNC0) [Msi]

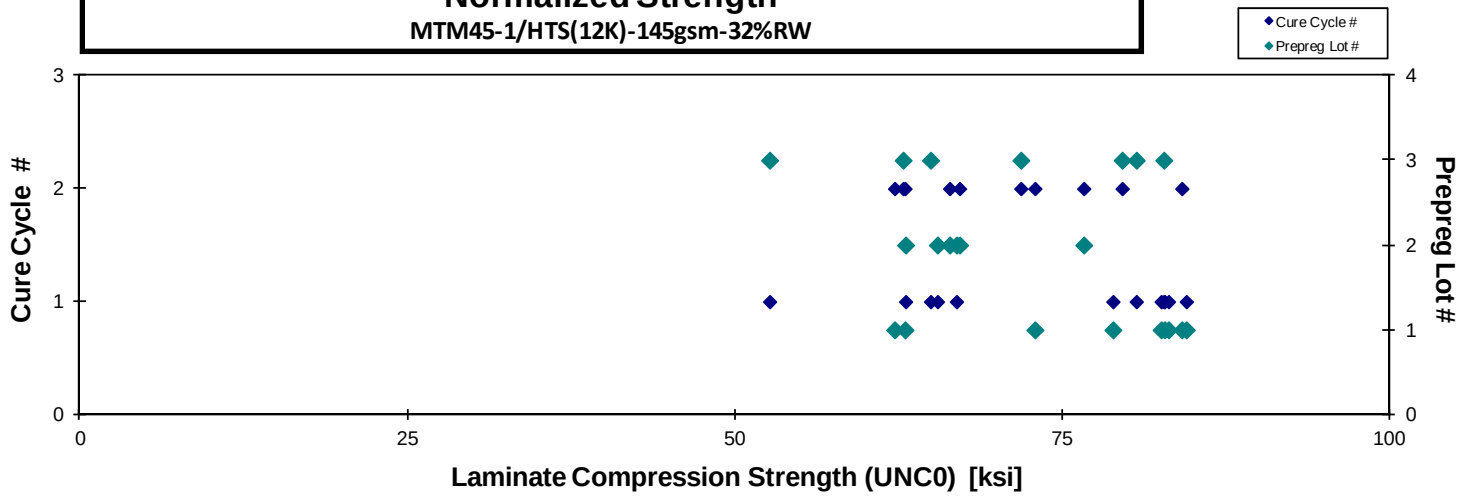
## Laminate Unnotched Compression Properties (UNC0) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

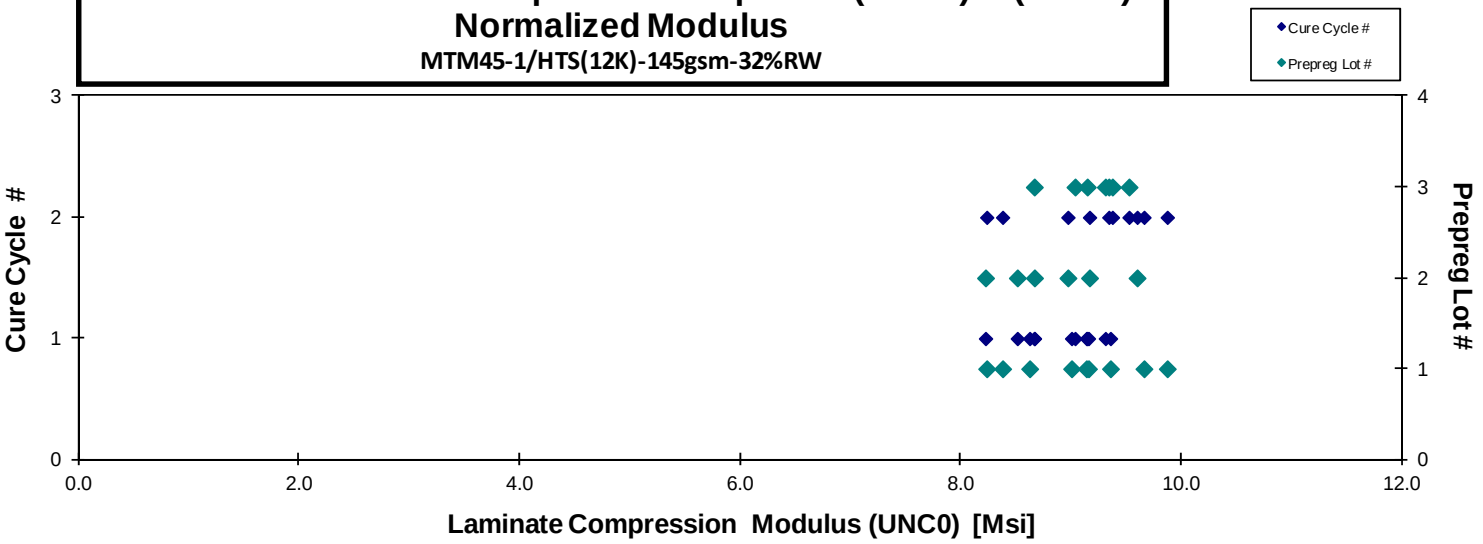
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMRA11KD | A | MH1 | 1 | 1 | 81.840 | 8.866 | 0.048 | 0.089 | 16 | HAT | 0.0056 | 83.157 | 9.008 |
| ABMRA11LD | A | MH1 | 1 | 1 | 81.274 | 8.968 | 0.040 | 0.090 | 16 | BGM | 0.0056 | 82.859 | 9.143 |
| ABMRA11MD | A | MH1 | 1 | 1 | 77.767 | 9.225 | 0.046 | 0.089 | 16 | TAB | 0.0056 | 78.916 | 9.361 |
| ABMRA11ND | A | MH1 | 1 | 1 | 82.858 | 8.981 | 0.036 | 0.090 | 16 | HAB | 0.0056 | 84.522 | 9.161 |
| ABMRA11OD | A | MH1 | 1 | 1 | 80.568 | 8.416 | 0.036 | 0.090 | 16 | HAT | 0.0056 | 82.597 | 8.628 |
| ABMRA21KD | A | MH2 | 1 | 2 | 71.359 | 8.059 | 0.037 | 0.090 | 16 | HAB | 0.0056 | 72.954 | 8.239 |
| ABMRA21LD | A | MH2 | 1 | 2 | 61.685 | 9.459 | 0.055 | 0.090 | 16 | HAB | 0.0056 | 63.029 | 9.665 |
| ABMRA21MD | A | MH2 | 1 | 2 | 83.391 | 9.784 | 0.035 | 0.089 | 16 | HAB | 0.0056 | 84.181 | 9.876 |
| ABMRA21ND | A | MH2 | 1 | 2 | 61.826 | 8.327 | 0.034 | 0.089 | 16 | HAB | 0.0055 | 62.235 | 8.383 |
| ABMRB11HD | B | MH1 | 2 | 1 | 64.134 | 8.055 | 0.037 | 0.090 | 16 | HAT | 0.0056 | 65.507 | 8.228 |
| ABMRB11ID | B | MH1 | 2 | 1 | 65.001 | 8.268 | 0.039 | 0.091 | 16 | HAT | 0.0057 | 66.958 | 8.517 |
| ABMRB11JD | B | MH1 | 2 | 1 | 61.366 | 8.437 | 0.038 | 0.090 | 16 | HAT | 0.0057 | 63.074 | 8.671 |
| ABMRB21HD | B | MH2 | 2 | 2 | 74.872 | 9.375 | 0.029 | 0.090 | 16 | BGM | 0.0056 | 76.687 | 9.602 |
| ABMRB21ID | B | MH2 | 2 | 2 | 64.950 | 8.965 | 0.044 | 0.090 | 16 | HAT | 0.0056 | 66.439 | 9.171 |
| ABMRB21JD | B | MH2 | 2 | 2 | 65.861 | 8.797 | 0.015 | 0.090 | 16 | HAT | 0.0056 | 67.196 | 8.975 |
| ABMRC11HD | C | MH1 | 3 | 1 | 83.596 | 9.404 | 0.046 | 0.087 | 16 | BGM | 0.0054 | 82.804 | 9.315 |
| ABMRC11ID | C | MH1 | 3 | 1 | 65.931 | 9.284 | 0.047 | 0.087 | 16 | BGM | 0.0054 | 64.982 | 9.150 |
| ABMRC11JD | C | MH1 | 3 | 1 | 53.269 | 8.767 | 0.028 | 0.087 | 16 | HAT | 0.0054 | 52.684 | 8.670 |
| ABMRC11KD | C | MH1 | 3 | 1 | 81.160 | 9.091 | 0.042 | 0.088 | 16 | HAT | 0.0055 | 80.699 | 9.039 |
| ABMRC21HD | C | MH2 | 3 | 2 | 79.861 | 9.407 | 0.042 | 0.088 | 16 | HAT | 0.0055 | 79.619 | 9.378 |
| ABMRC21ID | C | MH2 | 3 | 2 | 63.161 | 9.387 | 0.055 | 0.088 | 16 | HAT | 0.0055 | 62.886 | 9.346 |
| ABMRC21JD | C | MH2 | 3 | 2 | 72.307 | 9.585 | 0.035 | 0.087 | 16 | HAB | 0.0055 | 71.882 | 9.529 |

| | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | | | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|
| **Average** | **71.729** | **8.950** | **0.039** | **$Average_{norm}$** | **0.0056** | **72.539** | **9.048** |
| **Standard Dev.** | **9.288** | **0.508** | **0.009** | **Standard $Dev._{norm}$** | | **9.404** | **0.465** |
| **Coeff. of Var. [%]** | **12.948** | **5.672** | **22.829** | **Coeff. of Var. $[\%]_{norm}$** | | **12.964** | **5.139** |
| **Min.** | **53.269** | **8.055** | **0.015** | **Min.** | **0.0054** | **52.684** | **8.228** |
| **Max.** | **83.596** | **9.784** | **0.055** | **Max.** | **0.0057** | **84.522** | **9.876** |
| **Number of Spec.** | **22** | **22** | **22** | **Number of Spec.** | | **22** | **22** |

## Laminate Unnotched Compression Properties (UNC0) -- (ETW2)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC0) -- (ETW2)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## 4.11 Unnotched Compression 1 Properties

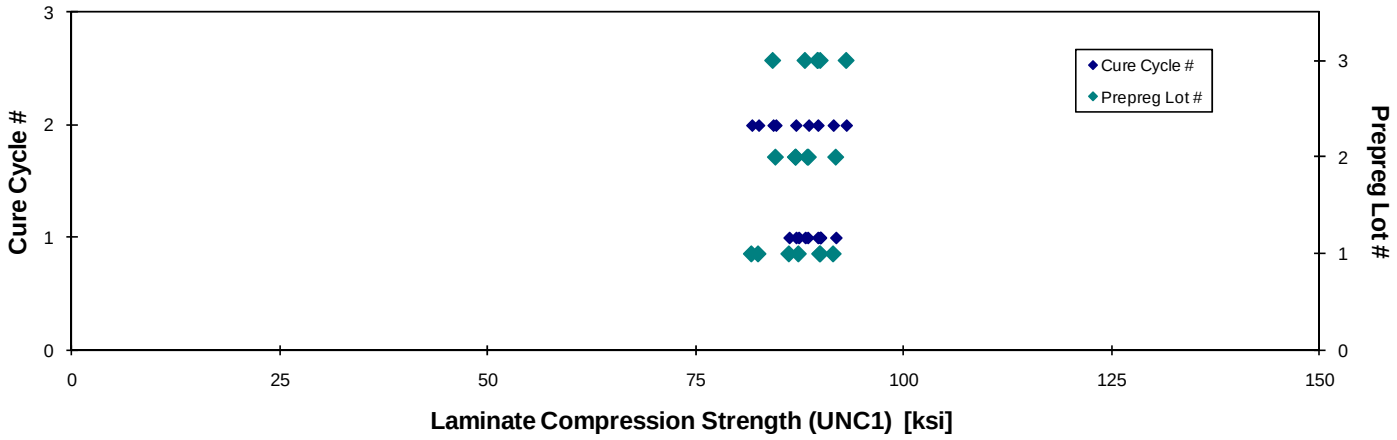
**Laminate Unnotched Compression Properties (UNC1) -- (RTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

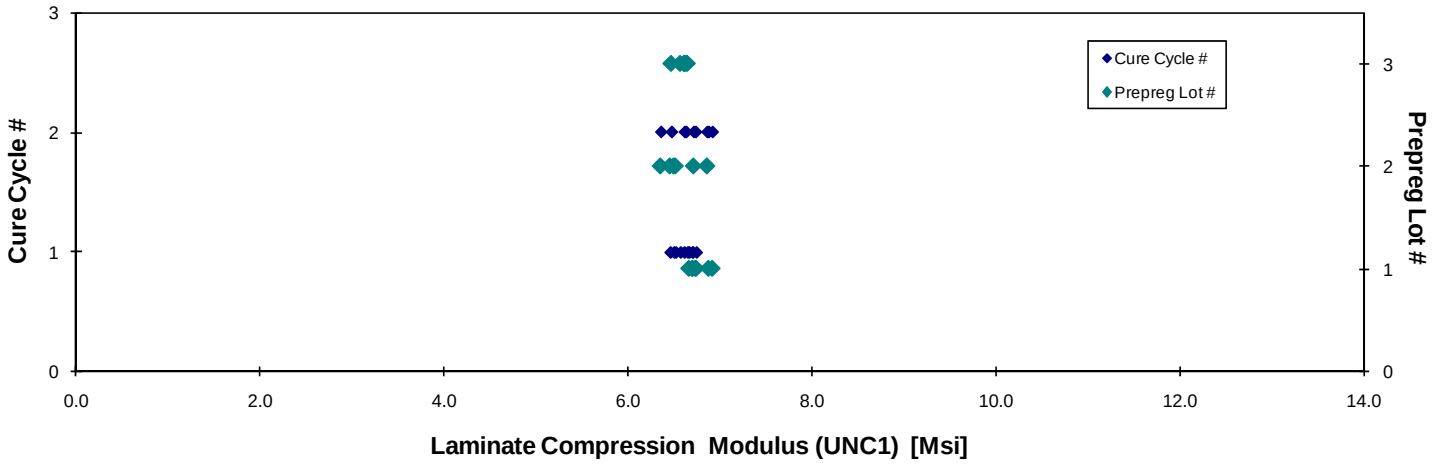
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMWA111A | A | MH1 | 1 | 1 | 86.392 | 6.619 | 0.321 | 0.134 | 24 | BGM | 0.0056 | 87.396 | 6.696 |
| ABMWA112A | A | MH1 | 1 | 1 | 89.254 | 6.643 | 0.345 | 0.133 | 24 | BGM | 0.0055 | 90.031 | 6.701 |
| ABMWA113A | A | MH1 | 1 | 1 | 88.642 | 6.640 | 0.349 | 0.134 | 24 | BGM | 0.0056 | 89.974 | 6.739 |
| ABMWA115A | A | MH1 | 1 | 1 | 85.511 | 6.604 | 0.351 | 0.133 | 24 | BGM | 0.0055 | 86.245 | 6.661 |
| ABMWA211A | A | MH2 | 1 | 2 | 81.791 | 6.810 | 0.353 | 0.133 | 24 | BGM | 0.0056 | 82.534 | 6.872 |
| ABMWA212A | A | MH2 | 1 | 2 | 91.047 | 6.872 | 0.345 | 0.133 | 24 | BGM | 0.0055 | 91.587 | 6.912 |
| ABMWA213A | A | MH2 | 1 | 2 | 80.746 | 6.650 | 0.373 | 0.134 | 24 | BGM | 0.0056 | 81.724 | 6.731 |
| ABMWB111A | B | MH1 | 2 | 1 | 85.735 | 6.395 | 0.351 | 0.134 | 24 | BGM | 0.0056 | 87.077 | 6.496 |
| ABMWB112A | B | MH1 | 2 | 1 | 86.211 | 6.290 | 0.340 | 0.135 | 24 | BGM | 0.0056 | 88.486 | 6.456 |
| ABMWB113A | B | MH1 | 2 | 1 | 89.478 | 6.343 | 0.334 | 0.136 | 24 | BGM | 0.0056 | 91.907 | 6.515 |
| ABMWB211A | B | MH2 | 2 | 2 | 83.769 | 6.597 | 0.337 | 0.137 | 24 | BGM | 0.0057 | 87.048 | 6.855 |
| ABMWB212A | B | MH2 | 2 | 2 | 84.722 | 6.416 | 0.323 | 0.138 | 24 | BGM | 0.0058 | 88.605 | 6.710 |
| ABMWB213A | B | MH2 | 2 | 2 | 81.853 | 6.145 | 0.308 | 0.136 | 24 | BGM | 0.0057 | 84.633 | 6.354 |
| ABMWC111A | C | MH1 | 3 | 1 | 88.829 | 6.556 | 0.341 | 0.134 | 24 | BGM | 0.0056 | 90.029 | 6.645 |
| ABMWC112A | C | MH1 | 3 | 1 | 86.881 | 6.510 | 0.332 | 0.134 | 24 | BGM | 0.0056 | 88.187 | 6.608 |
| ABMWC113A | C | MH1 | 3 | 1 | 88.847 | 6.502 | 0.342 | 0.133 | 24 | BGM | 0.0056 | 89.722 | 6.567 |
| ABMWC211A | C | MH2 | 3 | 2 | 92.639 | 6.433 | 0.342 | 0.133 | 24 | BGM | 0.0055 | 93.165 | 6.470 |
| ABMWC212A | C | MH2 | 3 | 2 | 83.862 | 6.593 | 0.344 | 0.133 | 24 | BGM | 0.0055 | 84.296 | 6.627 |
| ABMWC213A | C | MH2 | 3 | 2 | 89.237 | 6.575 | 0.328 | 0.133 | 24 | BGM | 0.0055 | 89.722 | 6.611 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Average** | **86.602** | **6.536** | **0.340** | **$Average_{norm}$** | **0.0056** | **88.019** | **6.643** |
| **Standard Dev.** | **3.282** | **0.173** | **0.014** | **$Standard\ Dev._{norm}$** | | **3.100** | **0.148** |
| **Coeff. of Var. [%]** | **3.790** | **2.651** | **4.145** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **3.522** | **2.224** |
| **Min.** | **80.746** | **6.145** | **0.308** | **Min.** | **0.0055** | **81.724** | **6.354** |
| **Max.** | **92.639** | **6.872** | **0.373** | **Max.** | **0.0058** | **93.165** | **6.912** |
| **Number of Spec.** | **19** | **19** | **19** | **Number of Spec.** | | **19** | **19** |

## Laminate Unnotched Compression Properties (UNC1) -- (RTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC1) -- (RTD)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Unnotched Compression Properties (UNC1) -- (ETW)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

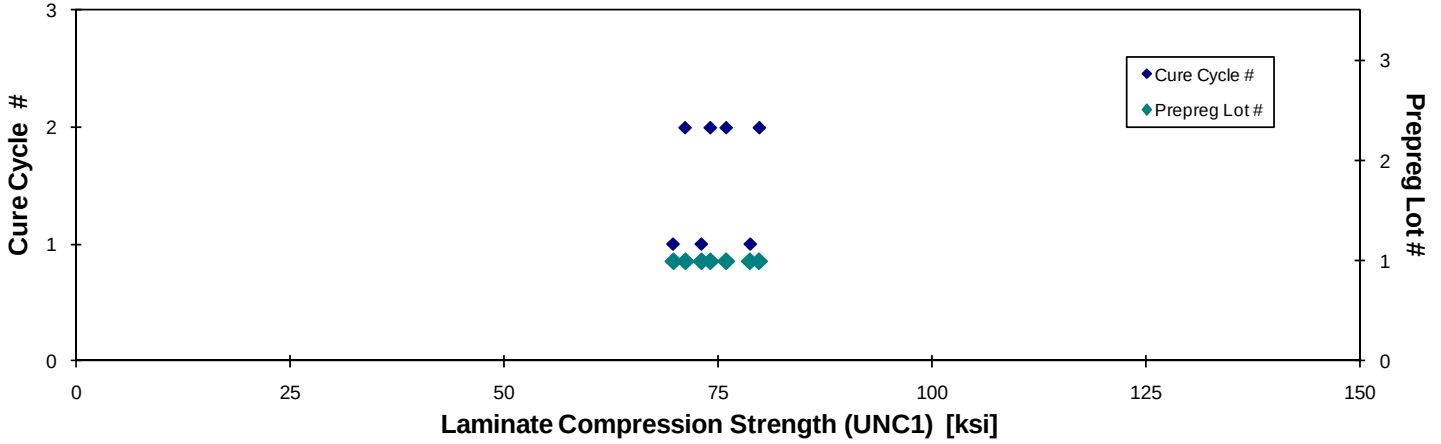
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMWA118N | A | MH1 | 1 | 1 | 72.534 | 6.714 | 0.370 | 0.133 | 24 | BGM | 0.0055 | 73.092 | 6.766 |
| ABMWA119N | A | MH1 | 1 | 1 | 78.018 | 6.774 | 0.336 | 0.133 | 24 | BGM | 0.0056 | 78.738 | 6.837 |
| ABMWA11AN | A | MH1 | 1 | 1 | 69.200 | 6.675 | 0.350 | 0.133 | 24 | BGM | 0.0056 | 69.838 | 6.737 |
| ABMWA216N | A | MH2 | 1 | 2 | 71.206 | 6.630 | 0.328 | 0.132 | 24 | BGM | 0.0055 | 71.224 | 6.631 |
| ABMWA217N | A | MH2 | 1 | 2 | 79.001 | 6.752 | 0.330 | 0.133 | 24 | BGM | 0.0056 | 79.789 | 6.820 |
| ABMWA218N | A | MH2 | 1 | 2 | 74.997 | 6.737 | 0.337 | 0.134 | 24 | BGM | 0.0056 | 75.963 | 6.824 |
| ABMWA219N | A | MH2 | 1 | 2 | 73.969 | 6.395 | 0.318 | 0.132 | 24 | BGM | 0.0055 | 74.127 | 6.409 |

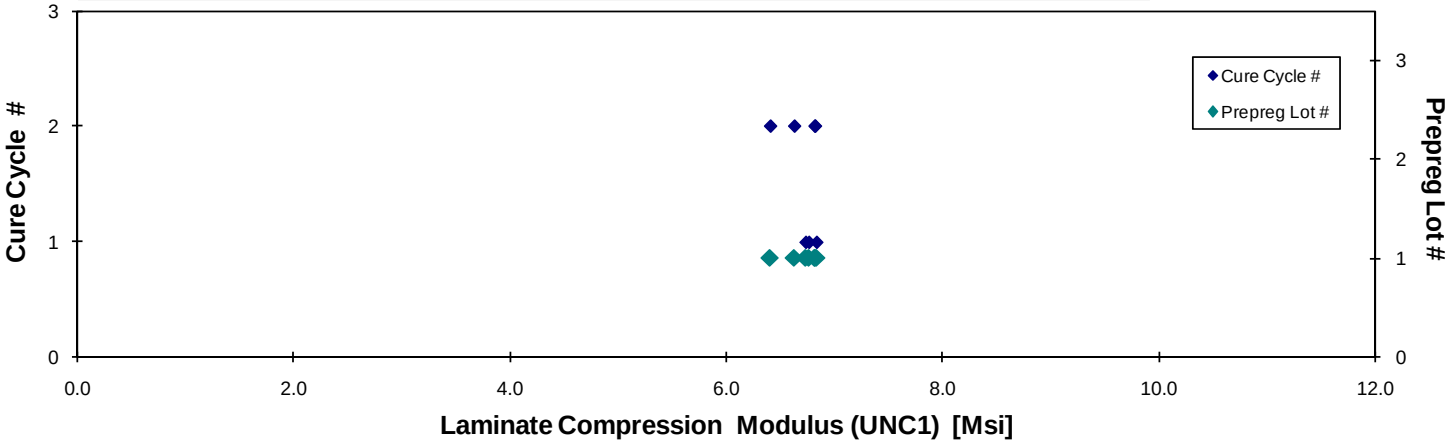
| | | | |
|---|---|---|---|
| **Average** | **74.132** | **6.668** | **0.338** |
| **Standard Dev.** | **3.536** | **0.130** | **0.017** |
| **Coeff. of Var. [%]** | **4.770** | **1.947** | **5.068** |
| **Min.** | **69.200** | **6.395** | **0.318** |
| **Max.** | **79.001** | **6.774** | **0.370** |
| **Number of Spec.** | **7** | **7** | **7** |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0055** | **74.682** | **6.718** |
| **Standard $Dev._{norm}$** | | **3.706** | **0.153** |
| **Coeff. of Var. $[\%]_{norm}$** | | **4.963** | **2.284** |
| **Min.** | **0.0055** | **69.838** | **6.409** |
| **Max.** | **0.0056** | **79.789** | **6.837** |
| **Number of Spec.** | | **7** | **7** |

## Laminate Unnotched Compression Properties (UNC1) -- (ETW)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC1) -- (ETW)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Unnotched Compression Properties (UNC1) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

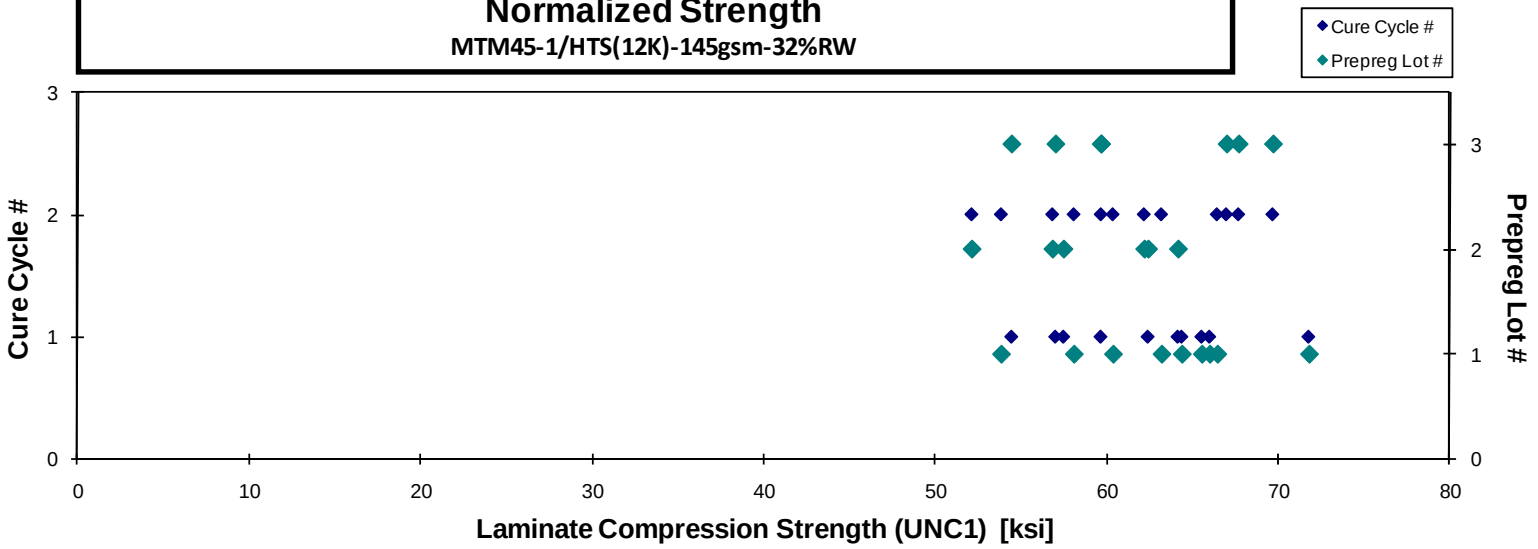
| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMWA11BD | A | MH1 | 1 | 1 | 64.006 | 6.766 | 0.356 | 0.133 | 24 | BGM | 0.0055 | 64.370 | 6.805 |
| ABMWA11CD | A | MH1 | 1 | 1 | 66.036 | 6.575 | 0.355 | 0.132 | 24 | BGM | 0.0055 | 65.994 | 6.571 |
| ABMWA11DD | A | MH1 | 1 | 1 | 65.133 | 6.570 | 0.366 | 0.133 | 24 | BGM | 0.0055 | 65.536 | 6.611 |
| ABMWA11ED | A | MH1 | 1 | 1 | 71.830 | 6.612 | 0.345 | 0.132 | 24 | BGM | 0.0055 | 71.784 | 6.608 |
| ABMWA21BD* | A | MH2 | 1 | 2 | 53.445 | | | 0.133 | 24 | BGM | 0.0055 | 53.830 | |
| ABMWA21CD | A | MH2 | 1 | 2 | 60.194 | 6.286 | 0.302 | 0.132 | 24 | HAT | 0.0055 | 60.354 | 6.303 |
| ABMWA21DD | A | MH2 | 1 | 2 | 57.393 | 6.391 | 0.312 | 0.134 | 24 | BGM | 0.0056 | 58.075 | 6.467 |
| ABMWA21ED | A | MH2 | 1 | 2 | 66.329 | 6.375 | 0.321 | 0.132 | 24 | BGM | 0.0055 | 66.438 | 6.385 |
| ABMWA21FD | A | MH2 | 1 | 2 | 62.718 | 6.459 | 0.350 | 0.133 | 24 | BGM | 0.0055 | 63.185 | 6.507 |
| ABMWB117D | B | MH1 | 2 | 1 | 60.524 | 6.092 | 0.292 | 0.136 | 24 | SGV | 0.0057 | 62.396 | 6.281 |
| ABMWB118D | B | MH1 | 2 | 1 | 55.873 | 6.178 | 0.333 | 0.136 | 24 | BGM | 0.0057 | 57.468 | 6.354 |
| ABMWB119D | B | MH1 | 2 | 1 | 62.018 | 6.450 | 0.341 | 0.137 | 24 | BGM | 0.0057 | 64.147 | 6.671 |
| ABMWB216D | B | MH2 | 2 | 2 | 59.721 | 6.152 | 0.315 | 0.137 | 24 | SGV | 0.0057 | 62.172 | 6.405 |
| ABMWB217D | B | MH2 | 2 | 2 | 55.186 | 5.877 | 0.264 | 0.136 | 24 | BGM | 0.0057 | 56.824 | 6.052 |
| ABMWB218D | B | MH2 | 2 | 2 | 50.244 | 6.208 | 0.236 | 0.137 | 24 | BGM | 0.0057 | 52.109 | 6.438 |
| ABMWC116D | C | MH1 | 3 | 1 | 53.811 | 5.950 | 0.251 | 0.134 | 24 | BGM | 0.0056 | 54.436 | 6.019 |
| ABMWC117D | C | MH1 | 3 | 1 | 56.770 | 6.182 | 0.259 | 0.133 | 24 | BGM | 0.0055 | 57.000 | 6.207 |
| ABMWC118D* | C | MH1 | 3 | 1 | 59.502 | | | 0.132 | 24 | BGM | 0.0055 | 59.645 | |
| ABMWC216D | C | MH2 | 3 | 2 | 68.770 | 6.573 | 0.343 | 0.134 | 24 | BGM | 0.0056 | 69.682 | 6.660 |
| ABMWC217D | C | MH2 | 3 | 2 | 66.083 | 6.048 | 0.261 | 0.134 | 24 | BGM/SGV | 0.0056 | 66.976 | 6.130 |
| ABMWC218D | C | MH2 | 3 | 2 | 59.044 | 6.250 | 0.316 | 0.133 | 24 | BGM | 0.0056 | 59.656 | 6.315 |
| ABMWC219D | C | MH2 | 3 | 2 | 66.756 | 6.530 | 0.329 | 0.134 | 24 | BGM | 0.0056 | 67.683 | 6.621 |

* Compressive modulus and poisson's ratio were not added due to bad strain readings.

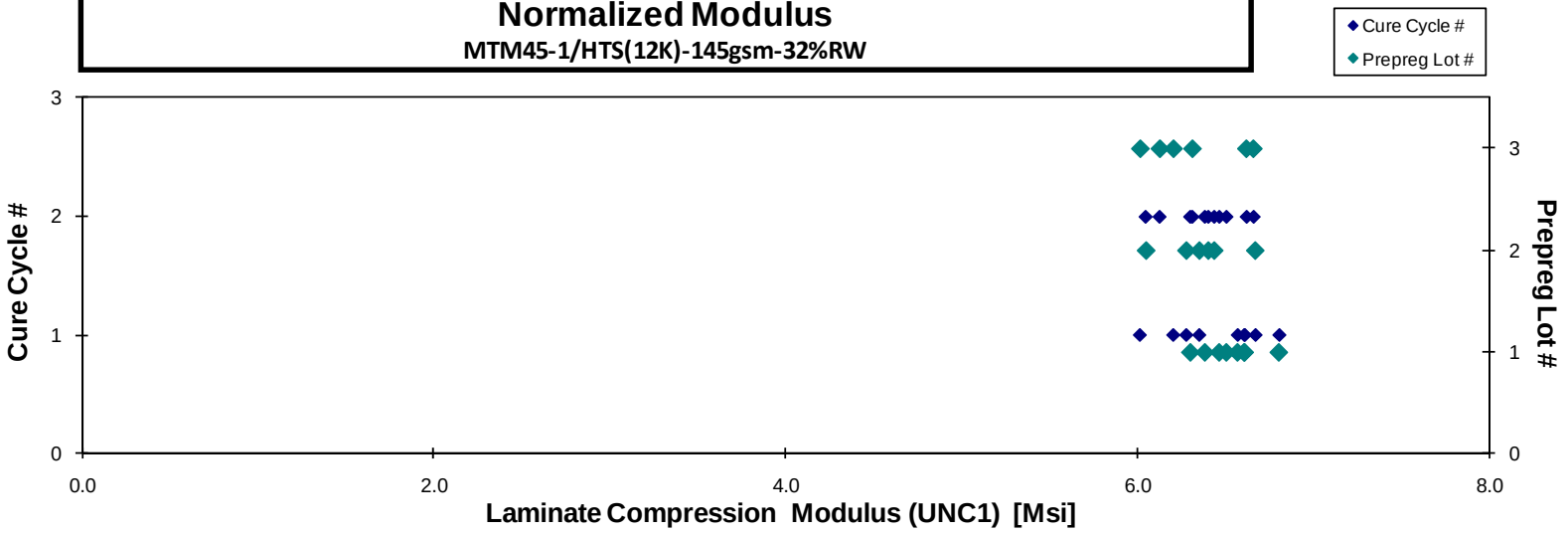
| | | | |
|---|---|---|---|
| **Average** | **60.972** | **6.326** | **0.312** |
| **Standard Dev.** | **5.540** | **0.242** | **0.039** |
| **Coeff. of Var. [%]** | **9.086** | **3.818** | **12.635** |
| **Min.** | **50.244** | **5.877** | **0.236** |
| **Max.** | **71.830** | **6.766** | **0.366** |
| **Number of Spec.** | **22** | **20** | **20** |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0056** | **61.807** | **6.420** |
| **$Standard\ Dev._{norm}$** | | **5.320** | **0.216** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **8.607** | **3.370** |
| **Min.** | **0.0055** | **52.109** | **6.019** |
| **Max.** | **0.0057** | **71.784** | **6.805** |
| **Number of Spec.** | | **22** | **20** |

## Laminate Unnotched Compression Properties (UNC1) -- (ETW2)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC1) -- (ETW2)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## 4.12 Unnotched Compression 2 Properties

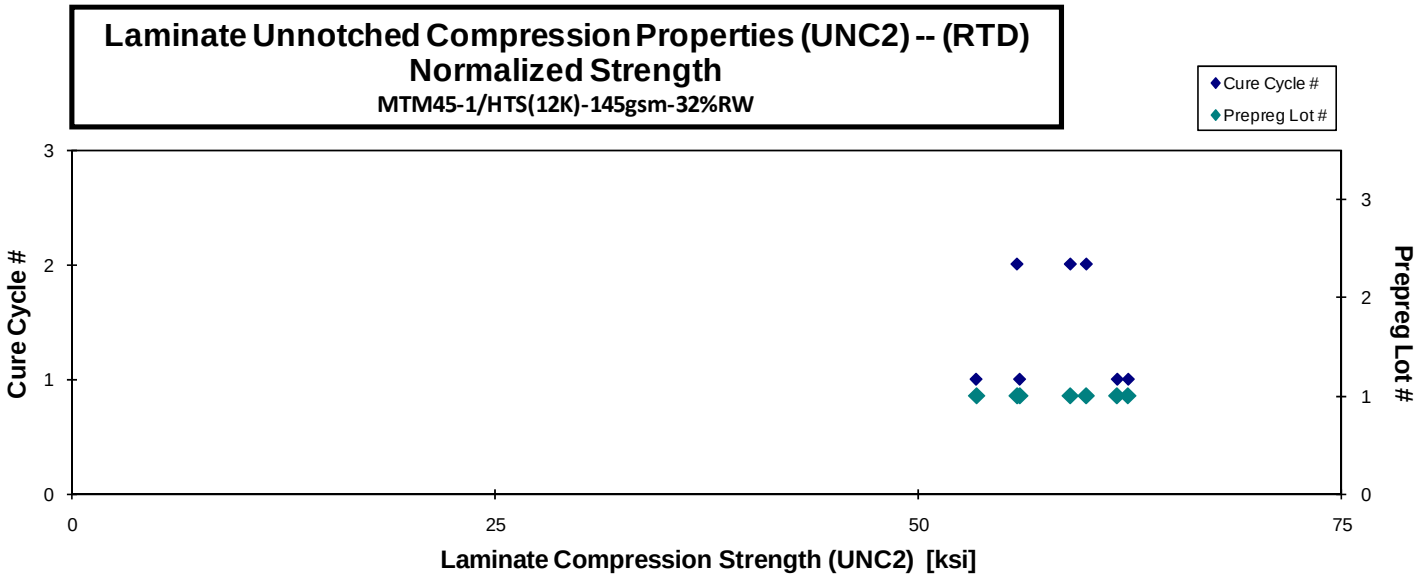
**Laminate Unnotched Compression Properties (UNC2) -- (RTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

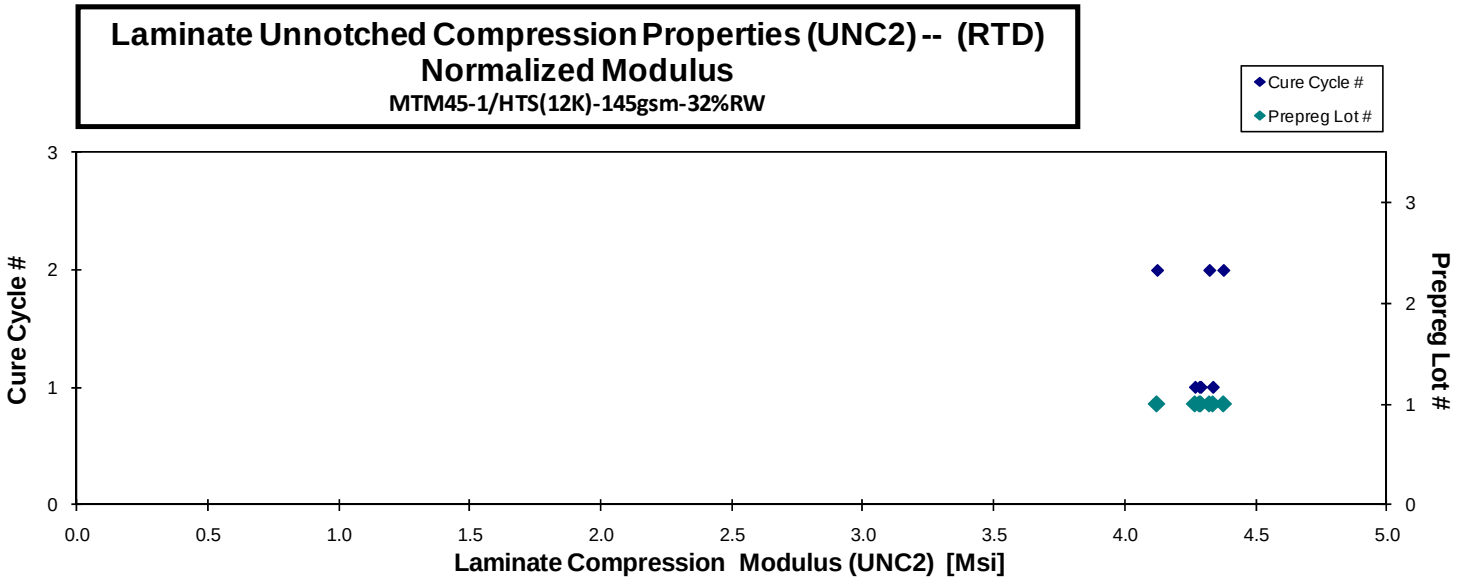
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle Batch # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMXA111A | A | MH1 | 1 | 1 | 55.147 | 4.425 | 0.551 | 0.107 | 20 | BGM | 0.0053 | 53.401 | 4.285 |
| ABMXA112A | A | MH1 | 1 | 1 | 55.610 | 4.262 | 0.574 | 0.111 | 20 | BGM | 0.0055 | 55.964 | 4.289 |
| ABMXA113A | A | MH1 | 1 | 1 | 62.004 | 4.243 | 0.570 | 0.111 | 20 | BGM | 0.0055 | 62.361 | 4.268 |
| ABMXA114A | A | MH1 | 1 | 1 | 61.639 | 4.330 | 0.567 | 0.110 | 20 | BGM | 0.0055 | 61.714 | 4.335 |
| ABMXA211A | A | MH2 | 1 | 2 | 60.870 | 4.447 | 0.547 | 0.108 | 20 | BGM | 0.0054 | 59.892 | 4.375 |
| ABMXA212A | A | MH2 | 1 | 2 | 58.489 | 4.288 | 0.558 | 0.111 | 20 | BGM | 0.0055 | 58.950 | 4.322 |
| ABMXA213A | A | MH2 | 1 | 2 | 55.790 | 4.122 | 0.559 | 0.110 | 20 | BGM | 0.0055 | 55.807 | 4.124 |

| | | | |
|---|---|---|---|
| **Average** | **58.507** | **4.302** | **0.561** |
| **Standard Dev.** | **3.019** | **0.111** | **0.010** |
| **Coeff. of Var. [%]** | **5.160** | **2.587** | **1.789** |
| **Min.** | **55.147** | **4.122** | **0.547** |
| **Max.** | **62.004** | **4.447** | **0.574** |
| **Number of Spec.** | **7** | **7** | **7** |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0055** | **58.298** | **4.285** |
| **Standard $Dev._{norm}$** | | **3.336** | **0.080** |
| **Coeff. of Var. $[\%]_{norm}$** | | **5.722** | **1.868** |
| **Min.** | **0.0053** | **53.401** | **4.124** |
| **Max.** | **0.0055** | **62.361** | **4.375** |
| **Number of Spec.** | | **7** | **7** |


Laminate Unnotched Compression Properties (UNC2) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
25
50
75
Laminate Compression Strength (UNC2) [ksi]


Laminate Unnotched Compression Properties (UNC2) -- (RTD)
Normalized Modulus
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Laminate Compression Modulus (UNC2) [Msi]

## Laminate Unnotched Compression Properties (UNC2) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

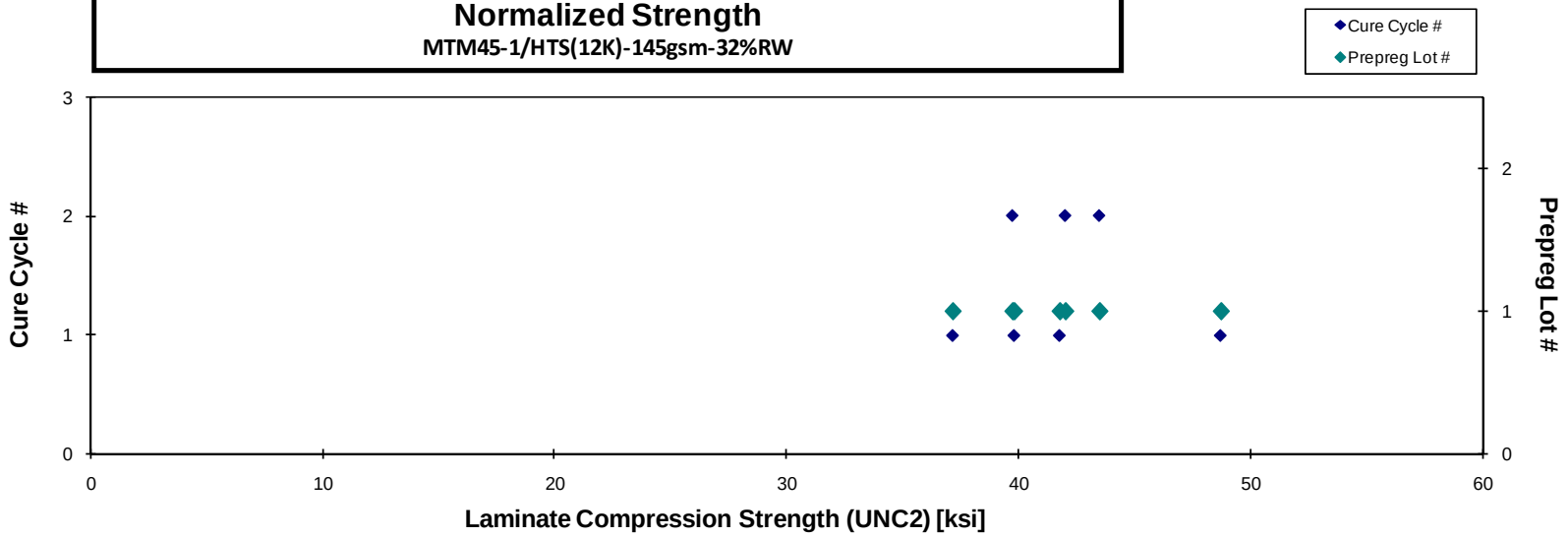
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMXA118D | A | MH1 | 1 | 1 | 48.486 | 3.998 | 0.549 | 0.111 | 20 | BGM | 0.0055 | 48.728 | 4.018 |
| ABMXA119D | A | MH | 1 | 1 | 36.980 | 3.889 | 0.544 | 0.111 | 20 | SGV | 0.0055 | 37.153 | 3.907 |
| ABMXA11AD | A | MH | 1 | 1 | 39.597 | 3.781 | 0.487 | 0.111 | 20 | SGV | 0.0055 | 39.807 | 3.801 |
| ABMXA11BD | A | MH | 1 | 1 | 41.606 | 3.863 | 0.565 | 0.110 | 20 | SGV | 0.0055 | 41.770 | 3.878 |
| ABMXA216D | A | MH | 1 | 2 | 42.016 | 3.897 | 0.462 | 0.110 | 20 | BGM | 0.0055 | 42.016 | 3.897 |
| ABMXA217D | A | MH | 1 | 2 | 43.480 | 3.820 | 0.461 | 0.110 | 20 | BGM | 0.0055 | 43.486 | 3.821 |
| ABMXA218D | A | MH | 1 | 2 | 39.523 | 3.798 | 0.460 | 0.111 | 20 | BGM | 0.0055 | 39.733 | 3.818 |

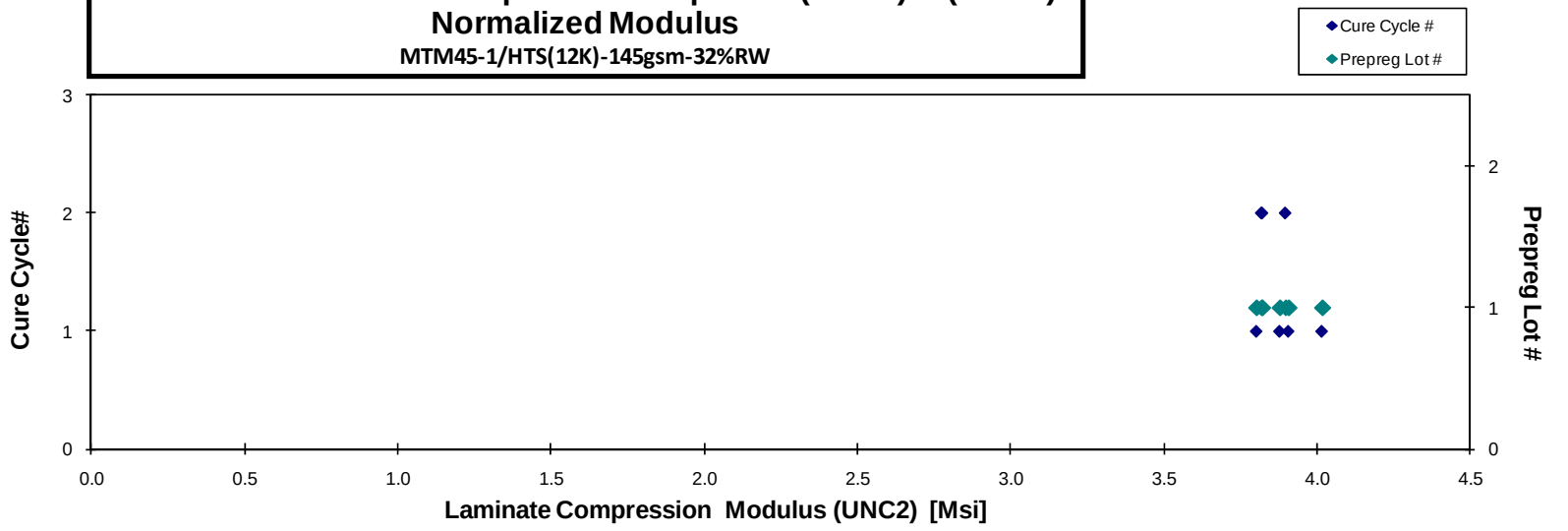
| | Strength [ksi] | Modulus [Msi] | Poisson's Ratio |
|---|---|---|---|
| Average | 41.670 | 3.864 | 0.504 |
| Standard Dev. | 3.669 | 0.074 | 0.047 |
| Coeff. of Var. [%] | 8.805 | 1.910 | 9.328 |
| Min. | 36.980 | 3.781 | 0.460 |
| Max. | 48.486 | 3.998 | 0.565 |
| Number of Spec. | 7 | 7 | 7 |

| | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|
| $Average_{norm}$ | 0.0055 | 41.813 | 3.877 |
| $Standard\ Dev._{norm}$ | | 3.668 | 0.075 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 8.773 | 1.926 |
| Min. | 0.0055 | 37.153 | 3.801 |
| Max. | 0.0055 | 48.728 | 4.018 |
| Number of Spec. | | 7 | 7 |

## Laminate Unnotched Compression Properties (UNC2) -- (ETW2)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC2) -- (ETW2)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## 4.13 Unnotched Compression 3 Properties

**Laminate Unnotched Compression Properties (UNC3) -- (RTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

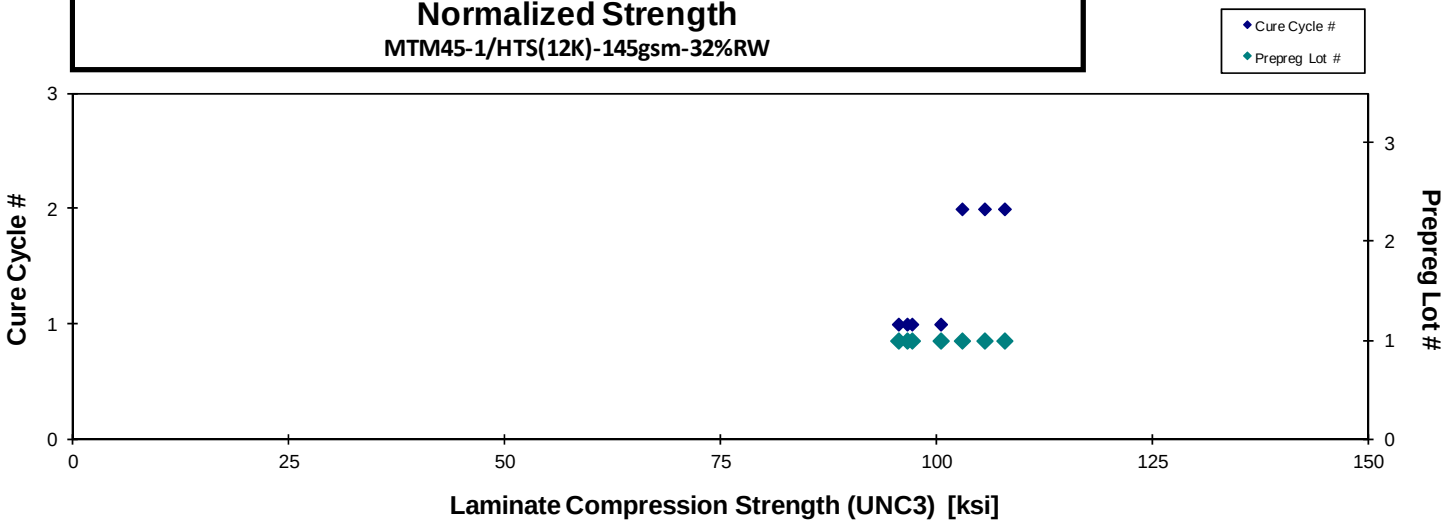
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle Batch # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMYA111A | A | MH1 | 1 | 1 | 96.044 | 10.132 | 0.433 | 0.111 | 20 | BGM | 0.0056 | 97.150 | 10.249 |
| ABMYA112A | A | MH1 | 1 | 1 | 99.215 | 9.886 | 0.427 | 0.111 | 20 | BGM | 0.0056 | 100.478 | 10.012 |
| ABMYA113A | A | MH1 | 1 | 1 | 95.986 | 9.909 | 0.440 | 0.111 | 20 | BGM | 0.0055 | 96.582 | 9.970 |
| ABMYA114A | A | MH1 | 1 | 1 | 95.234 | 10.429 | 0.450 | 0.110 | 20 | BGM | 0.0055 | 95.580 | 10.467 |
| ABMYA211A | A | MH2 | 1 | 2 | 102.803 | 10.626 | 0.423 | 0.115 | 20 | BGM | 0.0058 | 107.865 | 11.149 |
| ABMYA212A | A | MH2 | 1 | 2 | 96.677 | 10.379 | 0.434 | 0.117 | 20 | BGM | 0.0059 | 102.947 | 11.052 |
| ABMYA213A | A | MH2 | 1 | 2 | 100.368 | 10.378 | 0.424 | 0.116 | 20 | BGM | 0.0058 | 105.554 | 10.915 |

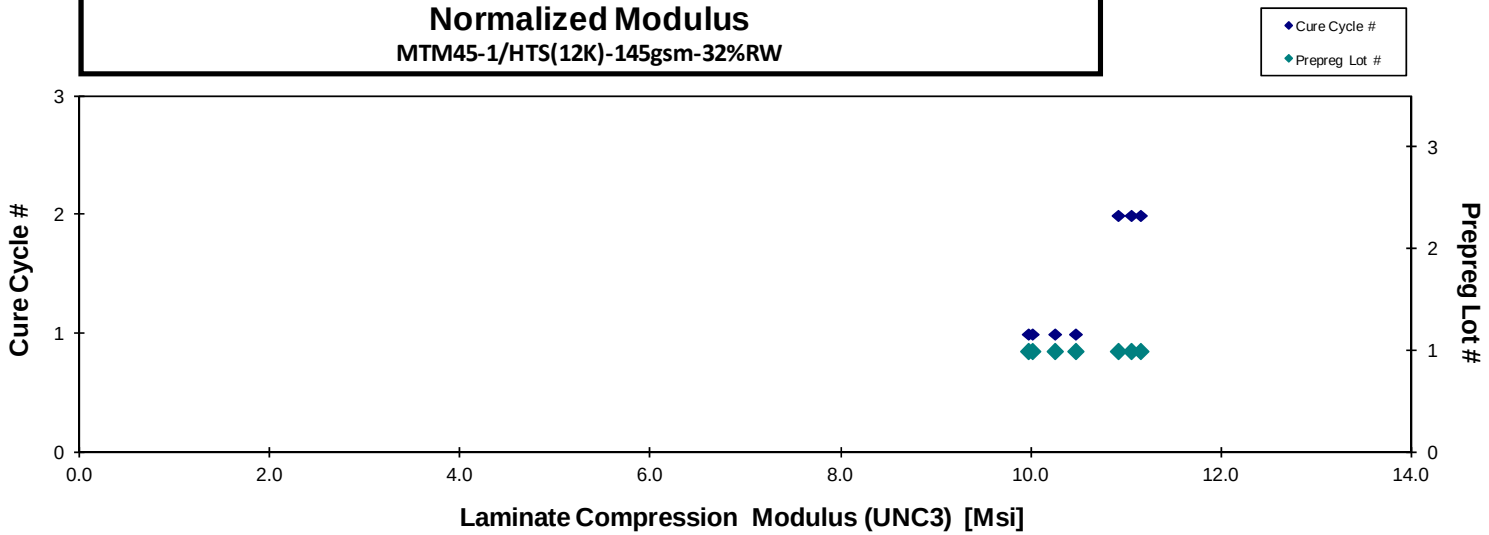
| | | | |
|---|---|---|---|
| **Average** | **98.047** | **10.249** | **0.433** |
| **Standard Dev.** | **2.812** | **0.280** | **0.010** |
| **Coeff. of Var. [%]** | **2.868** | **2.729** | **2.229** |
| **Min.** | **95.234** | **9.886** | **0.423** |
| **Max.** | **102.803** | **10.626** | **0.450** |
| **Number of Spec.** | **7** | **7** | **7** |

| | | | |
|---|---|---|---|
| **$Average_{norm}$** | **0.0057** | **100.879** | **10.545** |
| **$Standard\ Dev._{norm}$** | | **4.753** | **0.494** |
| **Coeff. of Var. [%]$_{norm}$** | | **4.712** | **4.689** |
| **Min.** | **0.0055** | **95.580** | **9.970** |
| **Max.** | **0.0059** | **107.865** | **11.149** |
| **Number of Spec.** | | **7** | **7** |

## Laminate Unnotched Compression Properties (UNC3) -- (RTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC3) -- (RTD)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Unnotched Compression Properties (UNC3) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

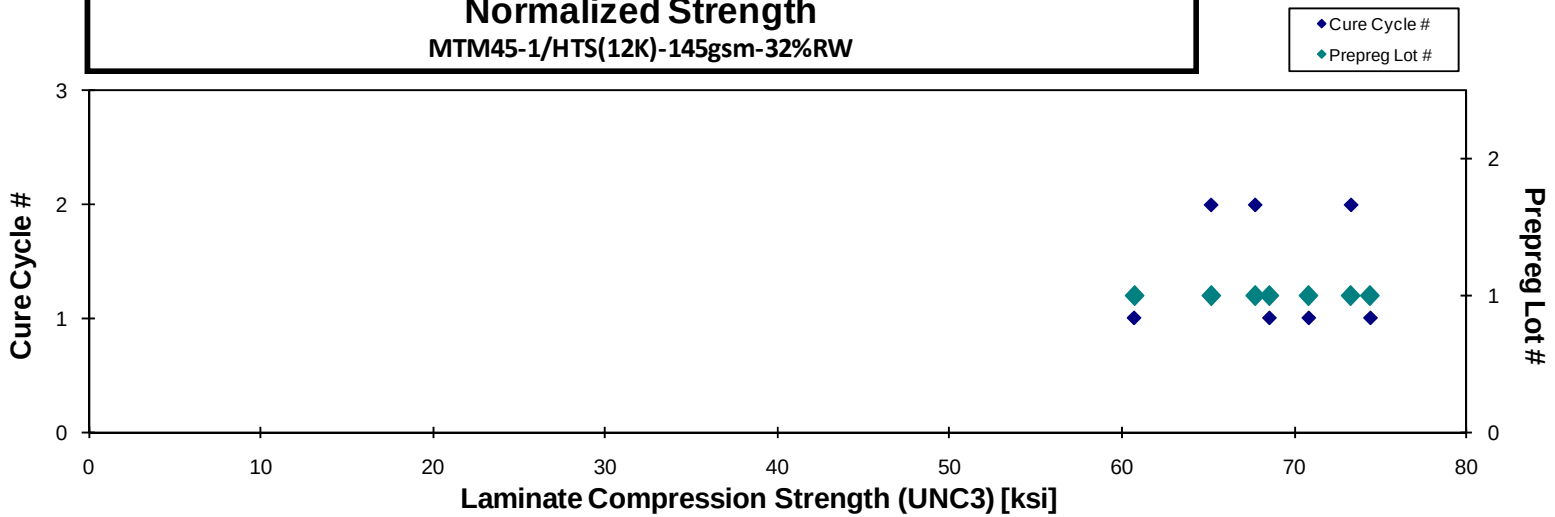
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMYA118D | A | MH1 | 1 | 1 | 73.581 | 10.098 | 0.398 | 0.111 | 20 | BGM | 0.0056 | 74.383 | 10.208 |
| ABMYA119D | A | MH1 | 1 | 1 | 68.045 | 9.941 | 0.392 | 0.111 | 20 | BGM | 0.0055 | 68.539 | 10.014 |
| ABMYA11AD | A | MH1 | 1 | 1 | 70.283 | 10.393 | 0.421 | 0.111 | 20 | HAT | 0.0055 | 70.816 | 10.472 |
| ABMYA11BD | A | MH1 | 1 | 1 | 60.453 | 9.291 | 0.400 | 0.110 | 20 | HAB | 0.0055 | 60.710 | 9.331 |
| ABMYA215D | A | MH2 | 1 | 2 | 69.255 | 10.345 | 0.370 | 0.116 | 20 | HGM/SGV | 0.0058 | 73.263 | 10.944 |
| ABMYA216D | A | MH2 | 1 | 2 | 63.601 | 11.136 | 0.449 | 0.117 | 20 | BGM | 0.0059 | 67.716 | 11.857 |
| ABMYA217D | A | MH2 | 1 | 2 | 61.725 | 10.184 | 0.390 | 0.116 | 20 | SGV | 0.0058 | 65.166 | 10.752 |

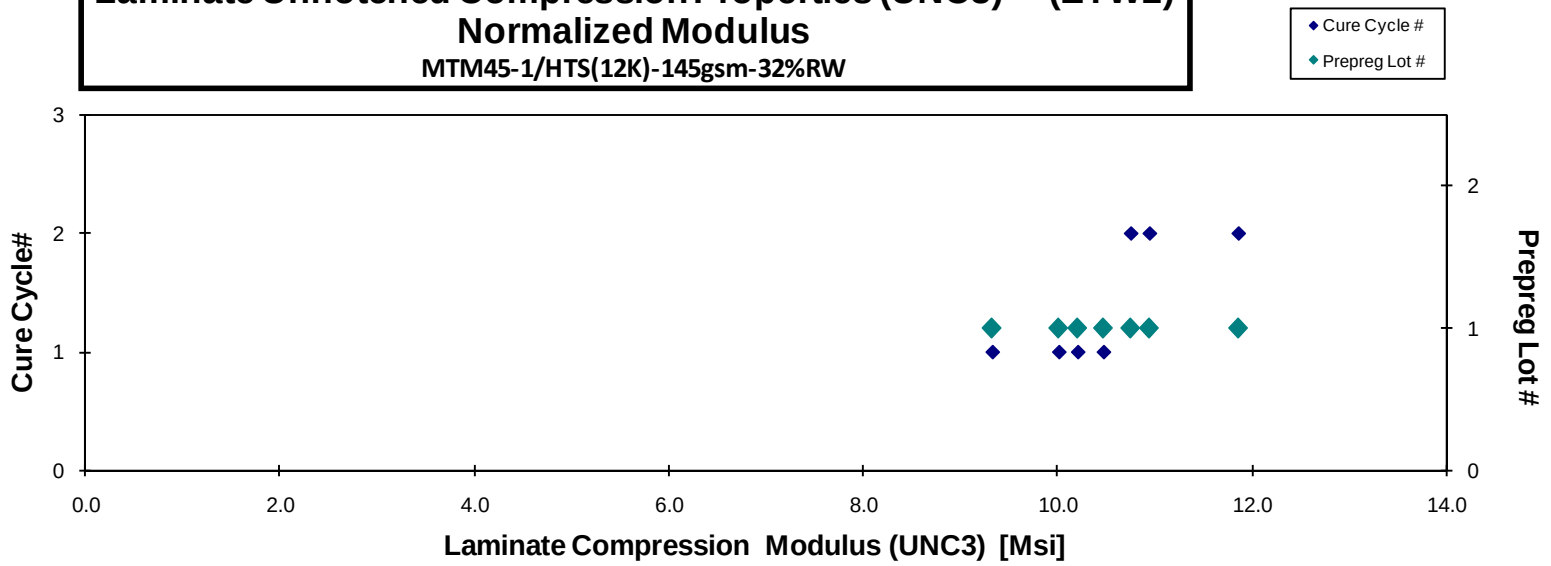
| | Strength [ksi] | Modulus [Msi] | Poisson's Ratio |
|---|---|---|---|
| **Average** | **66.706** | **10.198** | **0.403** |
| **Standard Dev.** | **4.863** | **0.554** | **0.025** |
| **Coeff. of Var. [%]** | **7.290** | **5.428** | **6.260** |
| **Min.** | **60.453** | **9.291** | **0.370** |
| **Max.** | **73.581** | **11.136** | **0.449** |
| **Number of Spec.** | **7** | **7** | **7** |

| | $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|
| **$Average_{norm}$** | **0.0057** | **68.656** | **10.511** |
| **Standard $Dev._{norm}$** | | **4.742** | **0.795** |
| **Coeff. of Var. $[\%]_{norm}$** | | **6.907** | **7.562** |
| **Min.** | **0.0055** | **60.710** | **9.331** |
| **Max.** | **0.0059** | **74.383** | **11.857** |
| **Number of Spec.** | | **7** | **7** |

## Laminate Unnotched Compression Properties (UNC3) -- (ETW2)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Unnotched Compression Properties (UNC3) -- (ETW2)
## Normalized Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

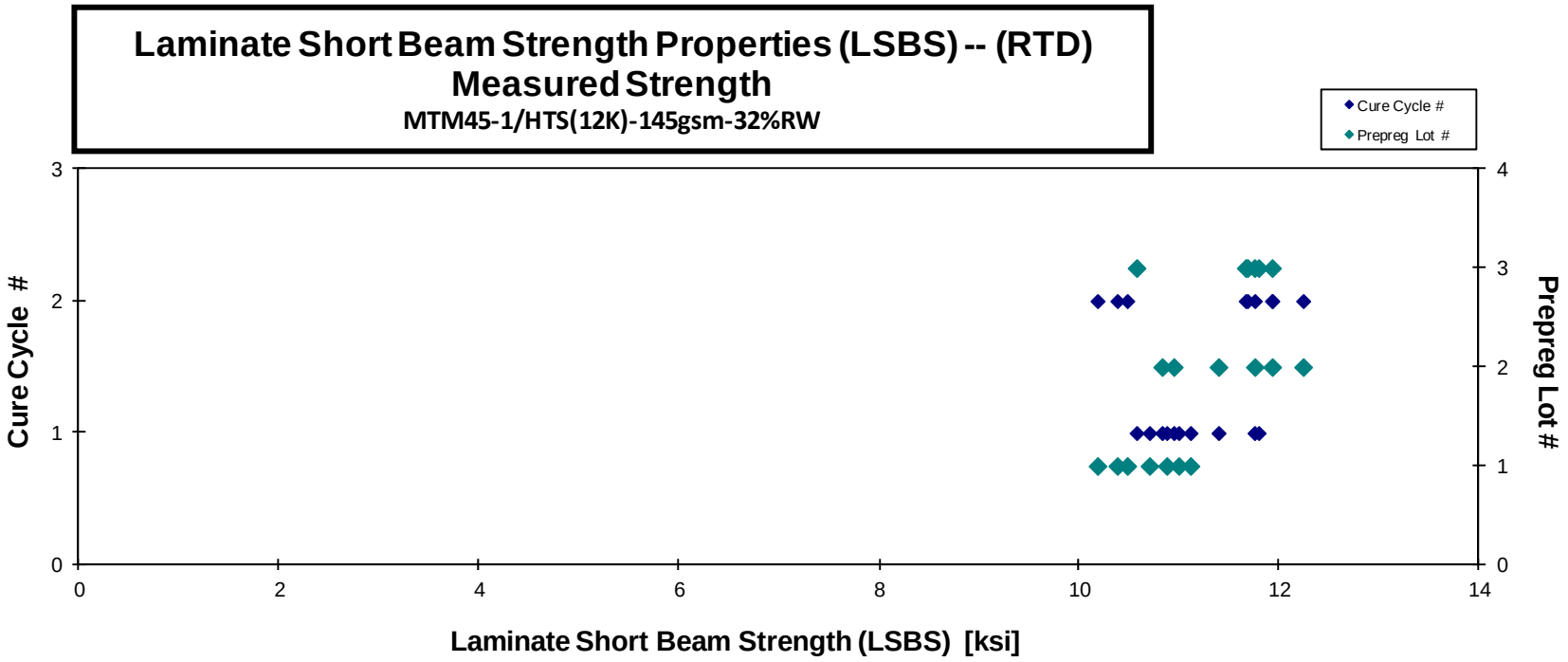


## 4.14 Laminate Short Beam Strength Properties

**Laminate Short Beam Strength Properties (LSBS) -- (RTD)**
**Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|
| ABMqA1W1A | A | MH1 | 1 | 1 | 10.992 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA1W3A | A | MH1 | 1 | 1 | 11.110 | 0.132 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA1W4A | A | MH1 | 1 | 1 | 10.699 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA1W5A | A | MH1 | 1 | 1 | 10.872 | 0.132 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA2W3A | A | MH2 | 1 | 2 | 10.477 | 0.134 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqA2W4A | A | MH2 | 1 | 2 | 10.180 | 0.133 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqA2W5A | A | MH2 | 1 | 2 | 10.378 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqB1W1A | B | MH1 | 2 | 1 | 11.390 | 0.135 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqB1W2A | B | MH1 | 2 | 1 | 10.826 | 0.136 | 24 | 0.0057 | INTERLAMINAR SHEAR |
| ABMqB1W3A | B | MH1 | 2 | 1 | 10.943 | 0.134 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqB2W1A | B | MH2 | 2 | 2 | 12.236 | 0.137 | 24 | 0.0057 | INTERLAMINAR SHEAR |
| ABMqB2W2A | B | MH2 | 2 | 2 | 11.927 | 0.137 | 24 | 0.0057 | INTERLAMINAR SHEAR |
| ABMqB2W4A | B | MH2 | 2 | 2 | 11.753 | 0.136 | 24 | 0.0057 | INTERLAMINAR SHEAR |
| ABMqC1W1A | C | MH1 | 3 | 1 | 11.791 | 0.133 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqC1W2A | C | MH1 | 3 | 1 | 10.571 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqC1W3A | C | MH1 | 3 | 1 | 11.750 | 0.134 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqC2W3A | C | MH2 | 3 | 2 | 11.925 | 0.133 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqC2W4A | C | MH2 | 3 | 2 | 11.680 | 0.134 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqC2W5A | C | MH2 | 3 | 2 | 11.661 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |

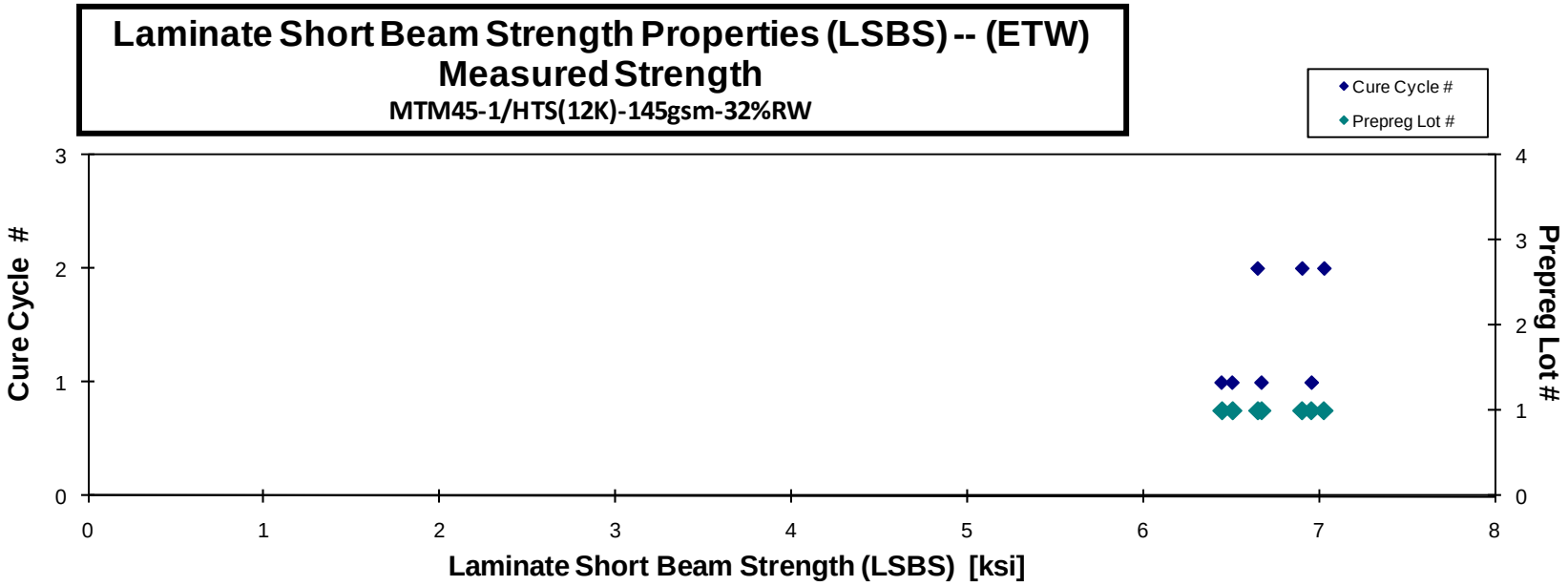
| | | | | | |
|---|---|---|---|---|---|
| **Average** | **11.219** | **0.134** | **Average** | **0.0056** | |
| **Standard Dev.** | **0.615** | | **Standard Dev.** | | |
| **Coeff. of Var. [%]** | **5.482** | | **Coeff. of Var. [%]** | | |
| **Min.** | **10.180** | **0.132** | **Min.** | **0.0055** | |
| **Max.** | **12.236** | **0.137** | **Max.** | **0.0057** | |
| **Number of Spec.** | **19** | | **Number of Spec.** | **19** | |


Laminate Short Beam Strength Properties (LSBS) -- (RTD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
2
4
6
8
10
12
14
Laminate Short Beam Strength (LSBS) [ksi]

## Laminate Short Beam Strength Properties (LSBS) -- (ETW)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|
| ABMqA1W6N | A | MH1 | 1 | 1 | 6.959 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA1W8N | A | MH1 | 1 | 1 | 6.448 | 0.132 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA1W9N | A | MH1 | 1 | 1 | 6.509 | 0.132 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA1WAN | A | MH1 | 1 | 1 | 6.675 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA2W8N | A | MH2 | 1 | 2 | 7.031 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA2W9N | A | MH2 | 1 | 2 | 6.653 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA2WAN | A | MH2 | 1 | 2 | 6.906 | 0.134 | 24 | 0.0056 | INTERLAMINAR SHEAR |

| | | | | |
|---|---|---|---|---|
| **Average** | **6.740** | **0.133** | **Average** | **0.0055** |
| **Standard Dev.** | **0.227** | | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **3.373** | | **Coeff. of Var. [%]** | |
| **Min.** | **6.448** | **0.132** | **Min.** | **0.0055** |
| **Max.** | **7.031** | **0.134** | **Max.** | **0.0056** |
| **Number of Spec.** | **7** | | **Number of Spec.** | **7** |

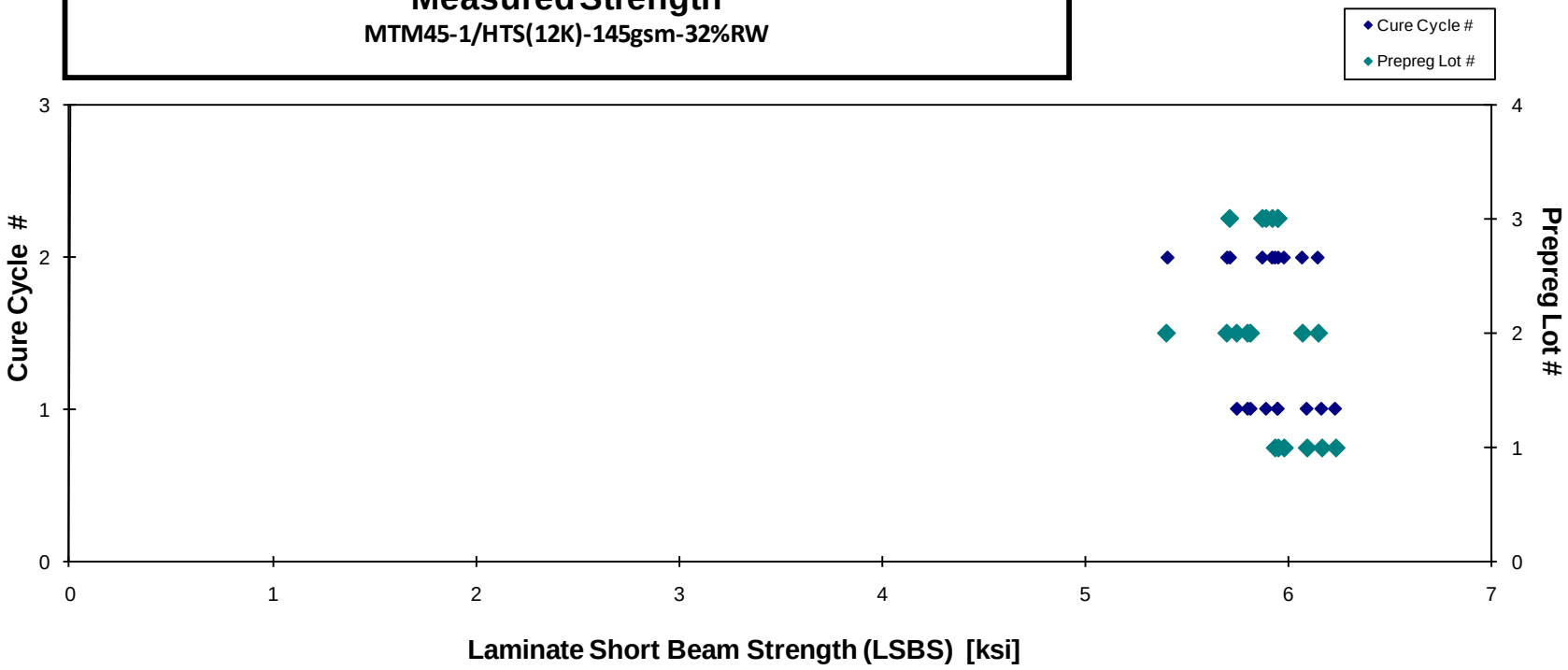

Laminate Short Beam Strength Properties (LSBS) -- (ETW)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Short Beam Strength (LSBS) [ksi]
0
1
2
3
4
5
6
7
8

## Laminate Short Beam Strength Properties (LSBS) -- (ETW2)
## Measured Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|
| ABMqA1WBD | A | MH1 | 1 | 1 | 6.094 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA1WCD | A | MH1 | 1 | 1 | 6.235 | 0.134 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqA1WDD | A | MH1 | 1 | 1 | 6.167 | 0.132 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA2WDD | A | MH2 | 1 | 2 | 5.938 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqA2WED | A | MH2 | 1 | 2 | 5.982 | 0.133 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqA2WFD | A | MH2 | 1 | 2 | 5.954 | 0.134 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqB1W7D | B | MH1 | 2 | 1 | 5.817 | 0.136 | 24 | 0.0057 | INTERLAMINAR SHEAR |
| ABMqB1W9D | B | MH1 | 2 | 1 | 5.803 | 0.135 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqB1WAD | B | MH1 | 2 | 1 | 5.749 | 0.135 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqB2W6D | B | MH2 | 2 | 2 | 6.149 | 0.136 | 24 | 0.0057 | INTERLAMINAR SHEAR |
| ABMqB2W8D | B | MH2 | 2 | 2 | 6.072 | 0.136 | 24 | 0.0057 | INTERLAMINAR SHEAR |
| ABMqB2W9D | B | MH2 | 2 | 2 | 5.405 | 0.136 | 24 | 0.0057 | INTERLAMINAR SHEAR |
| ABMqB2WAD | B | MH2 | 2 | 2 | 5.701 | 0.136 | 24 | 0.0057 | INTERLAMINAR SHEAR |
| ABMqC1W8D | C | MH1 | 3 | 1 | 5.951 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqC1W9D | C | MH1 | 3 | 1 | 5.950 | 0.132 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqC1WAD | C | MH1 | 3 | 1 | 5.893 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |
| ABMqC2W6D | C | MH2 | 3 | 2 | 5.715 | 0.133 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqC2W7D | C | MH2 | 3 | 2 | 5.924 | 0.133 | 24 | 0.0056 | INTERLAMINAR SHEAR |
| ABMqC2W9D | C | MH2 | 3 | 2 | 5.875 | 0.133 | 24 | 0.0055 | INTERLAMINAR SHEAR |

| | | | | |
|---|---|---|---|---|
| **Average** | **5.914** | **0.134** | **Average** | **0.0056** |
| **Standard Dev.** | **0.195** | | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **3.297** | | **Coeff. of Var. [%]** | |
| **Min.** | **5.405** | **0.132** | **Min.** | **0.0055** |
| **Max.** | **6.235** | **0.136** | **Max.** | **0.0057** |
| **Number of Spec.** | **19** | | **Number of Spec.** | **19** |

## Laminate Short Beam Strength Properties (LSBS) -- (ETW2)
## Measured Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

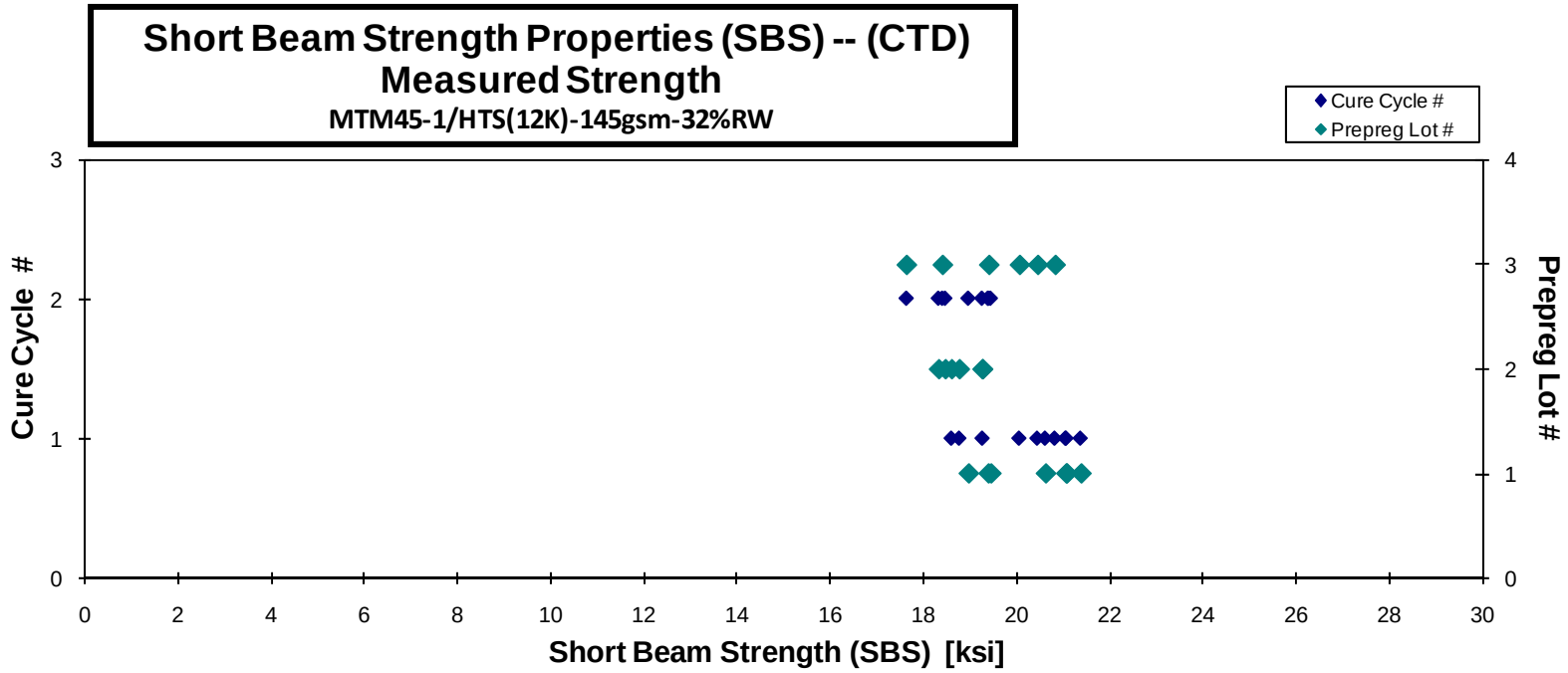


## 4.15 Lamina Short Beam Strength Properties

**Short Beam Strength Properties (SBS) -- (CTD) Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|
| ABMQA1L5B | A | MH1 | 1 | 1 | 21.057 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA1L6B | A | MH1 | 1 | 1 | 21.072 | 0.087 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQA1L7B | A | MH1 | 1 | 1 | 20.620 | 0.089 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA1L8B | A | MH1 | 1 | 1 | 21.377 | 0.089 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA2L5B | A | MH2 | 1 | 2 | 19.395 | 0.096 | 16 | 0.0060 | INTERLAMINAR SHEAR |
| ABMQA2L7B | A | MH2 | 1 | 2 | 18.971 | 0.095 | 16 | 0.0060 | INTERLAMINAR SHEAR |
| ABMQA2L8B | A | MH2 | 1 | 2 | 19.451 | 0.094 | 16 | 0.0059 | INTERLAMINAR SHEAR |
| ABMQB1L5B | B | MH1 | 2 | 1 | 18.609 | 0.090 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQB1L7B | B | MH1 | 2 | 1 | 18.775 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB1L8B | B | MH1 | 2 | 1 | 19.273 | 0.092 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB2L5B | B | MH2 | 2 | 2 | 19.266 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB2L6B | B | MH2 | 2 | 2 | 18.333 | 0.092 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB2L8B | B | MH2 | 2 | 2 | 18.475 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQC1L5B | C | MH1 | 3 | 1 | 20.062 | 0.086 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQC1L6B | C | MH1 | 3 | 1 | 20.450 | 0.089 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQC1L7B | C | MH1 | 3 | 1 | 20.825 | 0.090 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQC2L5B | C | MH2 | 3 | 2 | 19.407 | 0.087 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQC2L6B | C | MH2 | 3 | 2 | 18.414 | 0.090 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQC2L7B | C | MH2 | 3 | 2 | 17.644 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |

| | | | |
|---|---|---|---|
| **Average** | **19.551** | **Average** | **0.0056** |
| **Standard Dev.** | **1.089** | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **5.572** | **Coeff. of Var. [%]** | |
| **Min.** | **17.644** | **Min.** | **0.0054** |
| **Max.** | **21.377** | **Max.** | **0.0060** |
| **Number of Spec.** | **19** | **Number of Spec.** | **19** |

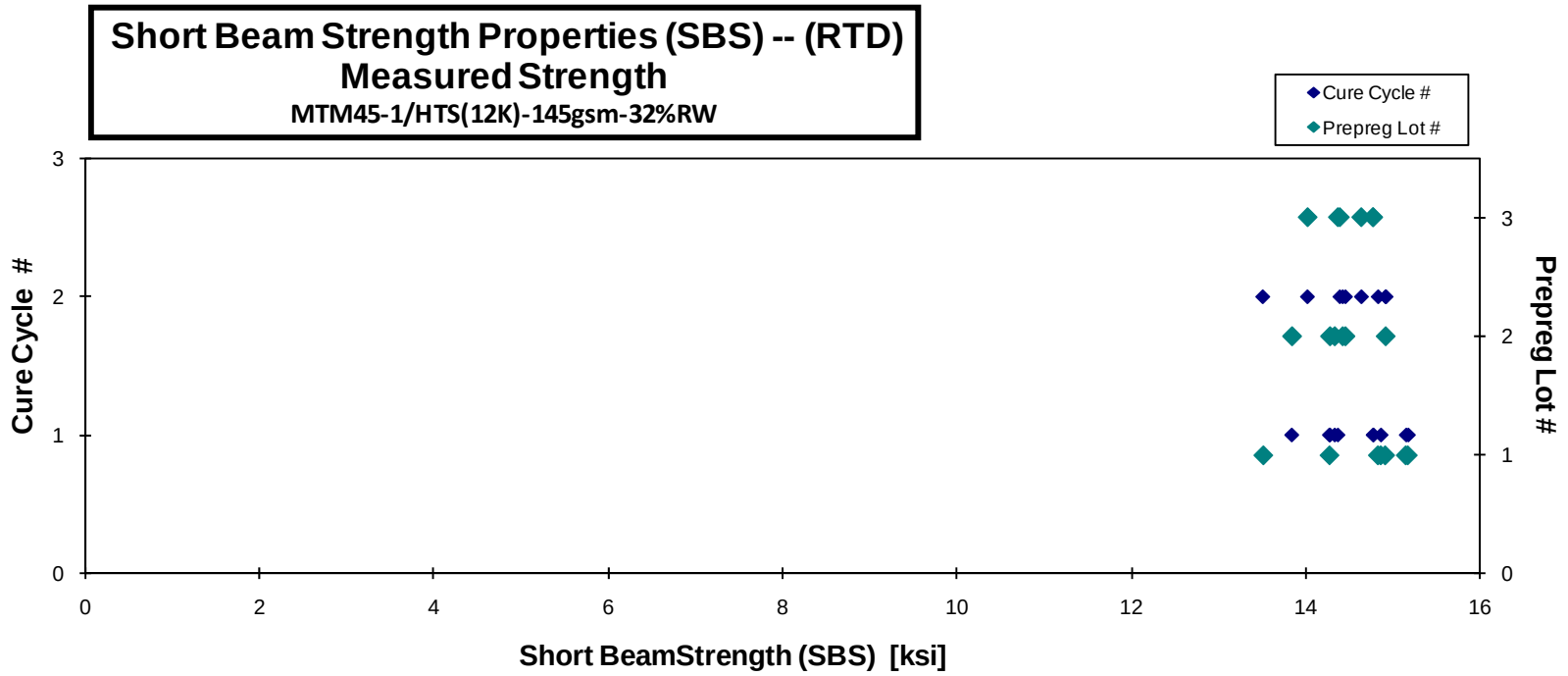

Short Beam Strength Properties (SBS) -- (CTD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Short Beam Strength (SBS) [ksi]
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
0
1
2
3
4

## Short Beam Strength Properties (SBS) -- (RTD) Strength

**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|
| ABMQA1L1A | A | MH1 | 1 | 1 | 14.272 | 0.086 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQA1L2A | A | MH1 | 1 | 1 | 15.145 | 0.090 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQA1L3A | A | MH1 | 1 | 1 | 14.858 | 0.089 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA1L4A | A | MH1 | 1 | 1 | 15.169 | 0.089 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA2L1A | A | MH2 | 1 | 2 | 13.515 | 0.092 | 16 | 0.0058 | INTERLAMINAR SHEAR |
| ABMQA2L2A | A | MH2 | 1 | 2 | 14.826 | 0.096 | 16 | 0.0060 | INTERLAMINAR SHEAR |
| ABMQA2L3A | A | MH2 | 1 | 2 | 14.909 | 0.096 | 16 | 0.0060 | INTERLAMINAR SHEAR |
| ABMQB1L1A | B | MH1 | 2 | 1 | 14.333 | 0.089 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQB1L2A | B | MH1 | 2 | 1 | 14.279 | 0.090 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQB1L3A | B | MH1 | 2 | 1 | 13.844 | 0.090 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQB2L1A | B | MH2 | 2 | 2 | 14.423 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB2L3A | B | MH2 | 2 | 2 | 14.915 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB2L4A | B | MH2 | 2 | 2 | 14.454 | 0.090 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQC1L1A | C | MH1 | 3 | 1 | 14.369 | 0.085 | 16 | 0.0053 | INTERLAMINAR SHEAR |
| ABMQC1L3A | C | MH1 | 3 | 1 | 14.773 | 0.086 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQC1L4A | C | MH1 | 3 | 1 | 14.768 | 0.086 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQC2L1A | C | MH2 | 3 | 2 | 14.022 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQC2L2A | C | MH2 | 3 | 2 | 14.636 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQC2L4A | C | MH2 | 3 | 2 | 14.391 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |

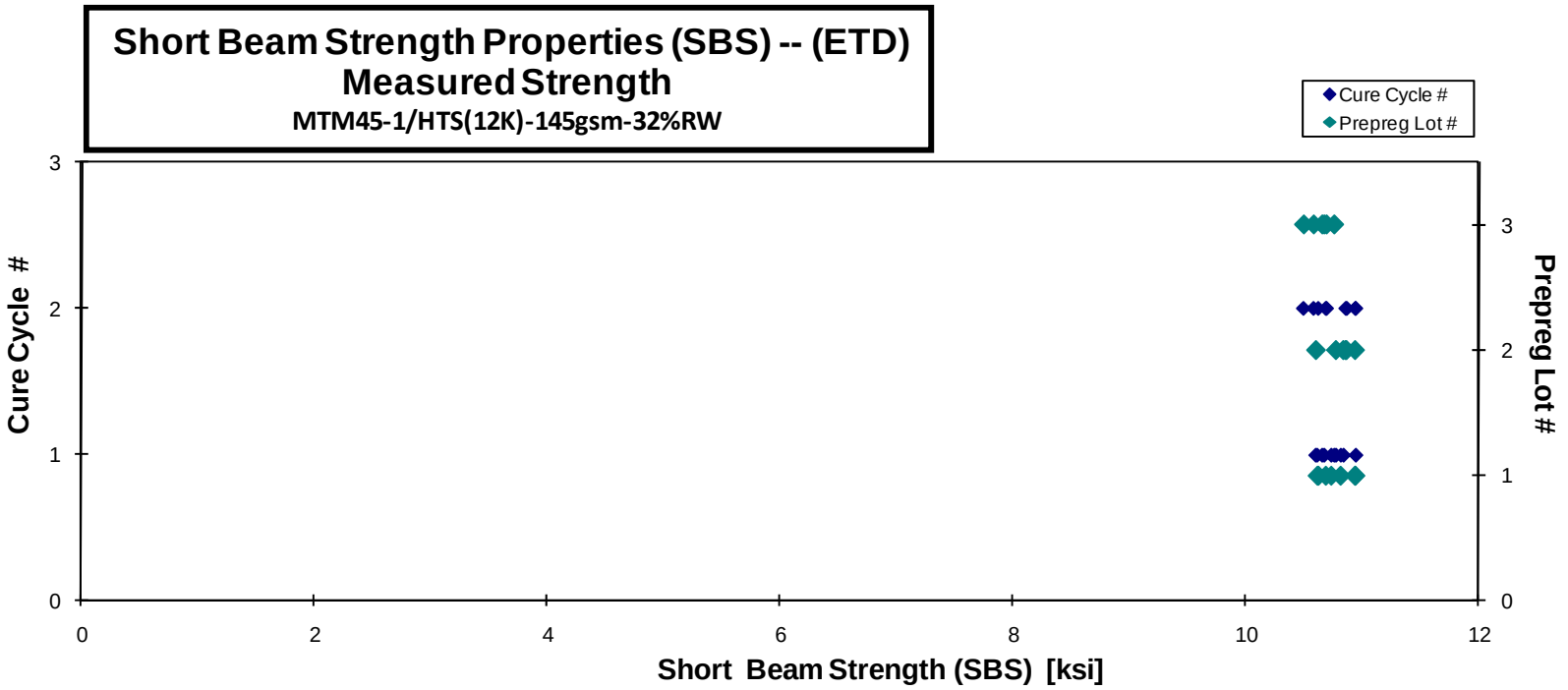
| | | | |
|---|---|---|---|
| **Average** | **14.521** | **Average** | **0.0056** |
| **Standard Dev.** | **0.434** | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **2.988** | **Coeff. of Var. [%]** | |
| **Min.** | **13.515** | **Min.** | **0.0053** |
| **Max.** | **15.169** | **Max.** | **0.0060** |
| **Number of Spec.** | **19** | **Number of Spec.** | **19** |


Short Beam Strength Properties (SBS) -- (RTD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Short BeamStrength (SBS) [ksi]
0
1
2
3
0
2
4
6
8
10
12
14
16

## Short Beam Strength Properties (SBS) -- (ETD)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|
| ABMQA1L9C | A | MH1 | 1 | 1 | 10.609 | 0.087 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQA1LAC | A | MH1 | 1 | 1 | 10.810 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA1LBC | A | MH1 | 1 | 1 | 10.729 | 0.087 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQA1LCC | A | MH1 | 1 | 1 | 10.938 | 0.089 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA2LAC | A | MH2 | 1 | 2 | 10.935 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQA2LBC | A | MH2 | 1 | 2 | 10.617 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQA2LCC | A | MH2 | 1 | 2 | 10.682 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB1L9C | B | MH1 | 2 | 1 | 10.833 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB1LAC | B | MH1 | 2 | 1 | 10.596 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB1LBC | B | MH1 | 2 | 1 | 10.769 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB2L9C | B | MH2 | 2 | 2 | 10.935 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB2LAC | B | MH2 | 2 | 2 | 10.852 | 0.091 | 16 | 0.0057 | INTERLAMINAR SHEAR |
| ABMQB2LBC | B | MH2 | 2 | 2 | 10.861 | 0.089 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQC1L8C | C | MH1 | 3 | 1 | 10.755 | 0.087 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQC1L9C | C | MH1 | 3 | 1 | 10.651 | 0.085 | 16 | 0.0053 | INTERLAMINAR SHEAR |
| ABMQC1LBC | C | MH1 | 3 | 1 | 10.669 | 0.086 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQC2L8C | C | MH2 | 3 | 2 | 10.491 | 0.089 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQC2L9C | C | MH2 | 3 | 2 | 10.577 | 0.089 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQC2LBC | C | MH2 | 3 | 2 | 10.688 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |

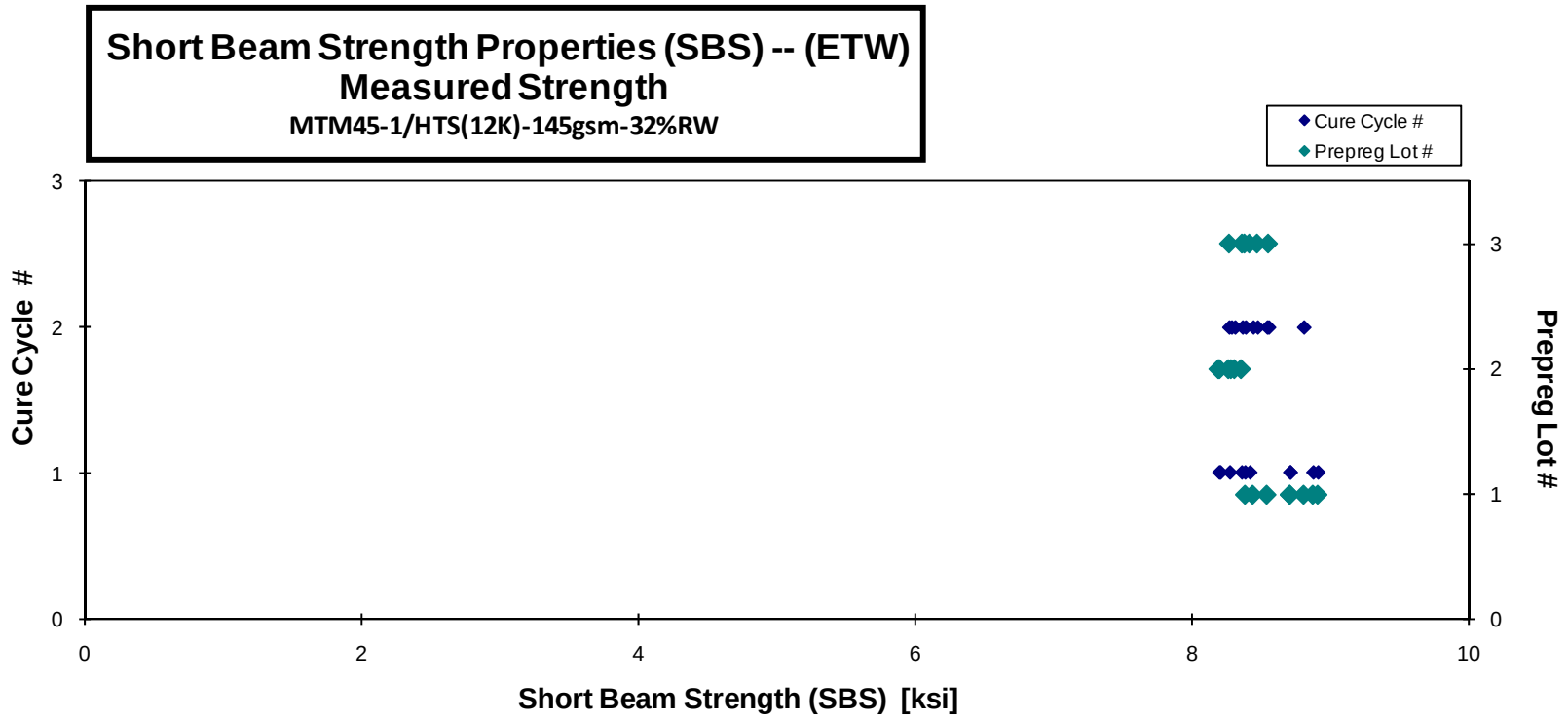
| | | | |
|---|---|---|---|
| **Average** | **10.737** | **Average** | **0.0056** |
| **Standard Dev.** | **0.133** | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **1.238** | **Coeff. of Var. [%]** | |
| **Min.** | **10.491** | **Min.** | **0.0053** |
| **Max.** | **10.938** | **Max.** | **0.0057** |
| **Number of Spec.** | **19** | **Number of Spec.** | **19** |


Short Beam Strength Properties (SBS) -- (ETD)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Short Beam Strength (SBS) [ksi]
0
1
2
3
0
2
4
6
8
10
12

## Short Beam Strength Properties (SBS) -- (ETW)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|
| ABMQA1LDN | A | MH1 | 1 | 1 | 8.711 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA1LEN | A | MH1 | 1 | 1 | 8.913 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA1LFN | A | MH1 | 1 | 1 | 8.878 | 0.089 | 16 | 0.0056 | INTERLAMINAR SHEAR |
| ABMQA1LGN | A | MH1 | 1 | 1 | 8.711 | 0.087 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQA2LEN | A | MH2 | 1 | 2 | 8.387 | 0.096 | 16 | 0.0060 | FLEXURE |
| ABMQA2LFN | A | MH2 | 1 | 2 | 8.544 | 0.094 | 16 | 0.0059 | FLEXURE |
| ABMQA2LGN | A | MH2 | 1 | 2 | 8.443 | 0.092 | 16 | 0.0057 | FLEXURE |
| ABMQA2LHN | A | MH2 | 1 | 2 | 8.811 | 0.093 | 16 | 0.0058 | FLEXURE |
| ABMQB1LDN | B | MH1 | 2 | 1 | 8.359 | 0.092 | 16 | 0.0057 | FLEXURE |
| ABMQB1LEN | B | MH1 | 2 | 1 | 8.196 | 0.090 | 16 | 0.0056 | FLEXURE |
| ABMQB1LGN | B | MH1 | 2 | 1 | 8.203 | 0.092 | 16 | 0.0058 | FLEXURE |
| ABMQB2LDN | B | MH2 | 2 | 2 | 8.286 | 0.088 | 16 | 0.0055 | FLEXURE |
| ABMQB2LEN | B | MH2 | 2 | 2 | 8.311 | 0.091 | 16 | 0.0057 | FLEXURE |
| ABMQB2LFN | B | MH2 | 2 | 2 | 8.268 | 0.089 | 16 | 0.0056 | FLEXURE |
| ABMQC1LCN | C | MH1 | 3 | 1 | 8.273 | 0.086 | 16 | 0.0054 | FLEXURE |
| ABMQC1LDN | C | MH1 | 3 | 1 | 8.419 | 0.089 | 16 | 0.0055 | FLEXURE |
| ABMQC1LEN | C | MH1 | 3 | 1 | 8.383 | 0.089 | 16 | 0.0056 | FLEXURE |
| ABMQC2LCN | C | MH2 | 3 | 2 | 8.365 | 0.087 | 16 | 0.0054 | FLEXURE |
| ABMQC2LEN | C | MH2 | 3 | 2 | 8.555 | 0.087 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQC2LFN | C | MH2 | 3 | 2 | 8.474 | 0.088 | 16 | 0.0055 | FLEXURE |

| | | | |
|---|---|---|---|
| **Average** | **8.475** | **Average** | **0.0056** |
| **Standard Dev.** | **0.222** | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **2.616** | **Coeff. of Var. [%]** | |
| **Min.** | **8.196** | **Min.** | **0.0054** |
| **Max.** | **8.913** | **Max.** | **0.0060** |
| **Number of Spec.** | **20** | **Number of Spec.** | **20** |

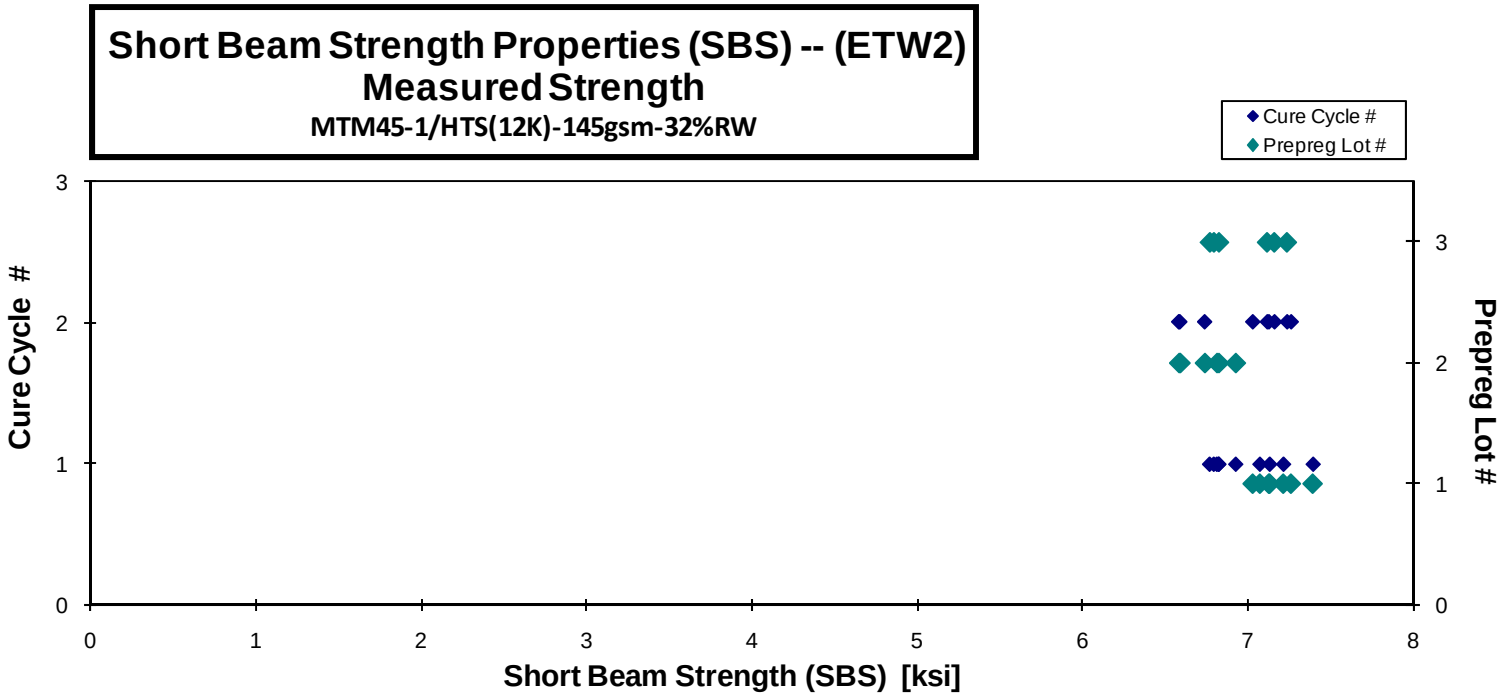

Short Beam Strength Properties (SBS) -- (ETW)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Short Beam Strength (SBS) [ksi]
0
1
2
3
0
2
4
6
8
10

# Short Beam Strength Properties (SBS) -- (ETW2) Strength

**MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Failure Mode |
|---|---|---|---|---|---|---|---|---|---|
| ABMQA1LID | A | MH1 | 1 | 1 | 7.392 | 0.087 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA1LJD | A | MH1 | 1 | 1 | 7.072 | 0.087 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQA1LKD | A | MH1 | 1 | 1 | 7.131 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQA2LID | A | MH2 | 1 | 1 | 7.214 | 0.096 | 16 | 0.0060 | FLEXURE |
| ABMQA2LJD | A | MH2 | 1 | 2 | 7.260 | 0.093 | 16 | 0.0058 | FLEXURE |
| ABMQA2LKD | A | MH2 | 1 | 2 | 7.029 | 0.093 | 16 | 0.0058 | FLEXURE |
| ABMQA2LLD | A | MH2 | 1 | 2 | 7.126 | 0.092 | 16 | 0.0057 | FLEXURE |
| ABMQB1LHD | B | MH1 | 2 | 1 | 6.813 | 0.092 | 16 | 0.0057 | FLEXURE |
| ABMQB1LID | B | MH1 | 2 | 1 | 6.927 | 0.091 | 16 | 0.0057 | FLEXURE |
| ABMQB1LJD | B | MH1 | 2 | 1 | 6.824 | 0.092 | 16 | 0.0058 | INTERLAMINAR SHEAR |
| ABMQB2LHD | B | MH2 | 2 | 2 | 6.740 | 0.089 | 16 | 0.0055 | FLEXURE |
| ABMQB2LID | B | MH2 | 2 | 2 | 6.591 | 0.091 | 16 | 0.0057 | FLEXURE |
| ABMQB2LJD | B | MH2 | 2 | 2 | 6.584 | 0.091 | 16 | 0.0057 | FLEXURE |
| ABMQC1LGD | C | MH1 | 3 | 1 | 6.794 | 0.089 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQC1LID | C | MH1 | 3 | 1 | 6.770 | 0.086 | 16 | 0.0054 | INTERLAMINAR SHEAR |
| ABMQC1LJD | C | MH1 | 3 | 1 | 6.824 | 0.088 | 16 | 0.0055 | INTERLAMINAR SHEAR |
| ABMQC2LGD | C | MH2 | 3 | 2 | 7.116 | 0.087 | 16 | 0.0054 | FLEXURE |
| ABMQC2LHD | C | MH2 | 3 | 2 | 7.159 | 0.088 | 16 | 0.0055 | FLEXURE |
| ABMQC2LID | C | MH2 | 3 | 2 | 7.235 | 0.089 | 16 | 0.0056 | FLEXURE |

| | | | |
|---|---|---|---|
| **Average** | **6.979** | **Average** | **0.0056** |
| **Standard Dev.** | **0.235** | **Standard Dev.** | |
| **Coeff. of Var. [%]** | **3.372** | **Coeff. of Var. [%]** | |
| **Min.** | **6.584** | **Min.** | **0.0054** |
| **Max.** | **7.392** | **Max.** | **0.0060** |
| **Number of Spec.** | **19** | **Number of Spec.** | **19** |


Short Beam Strength Properties (SBS) -- (ETW2)
Measured Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Short Beam Strength (SBS) [ksi]
0
1
2
3
4
5
6
7
8

## 4.16 Open Hole Tension 1 Properties

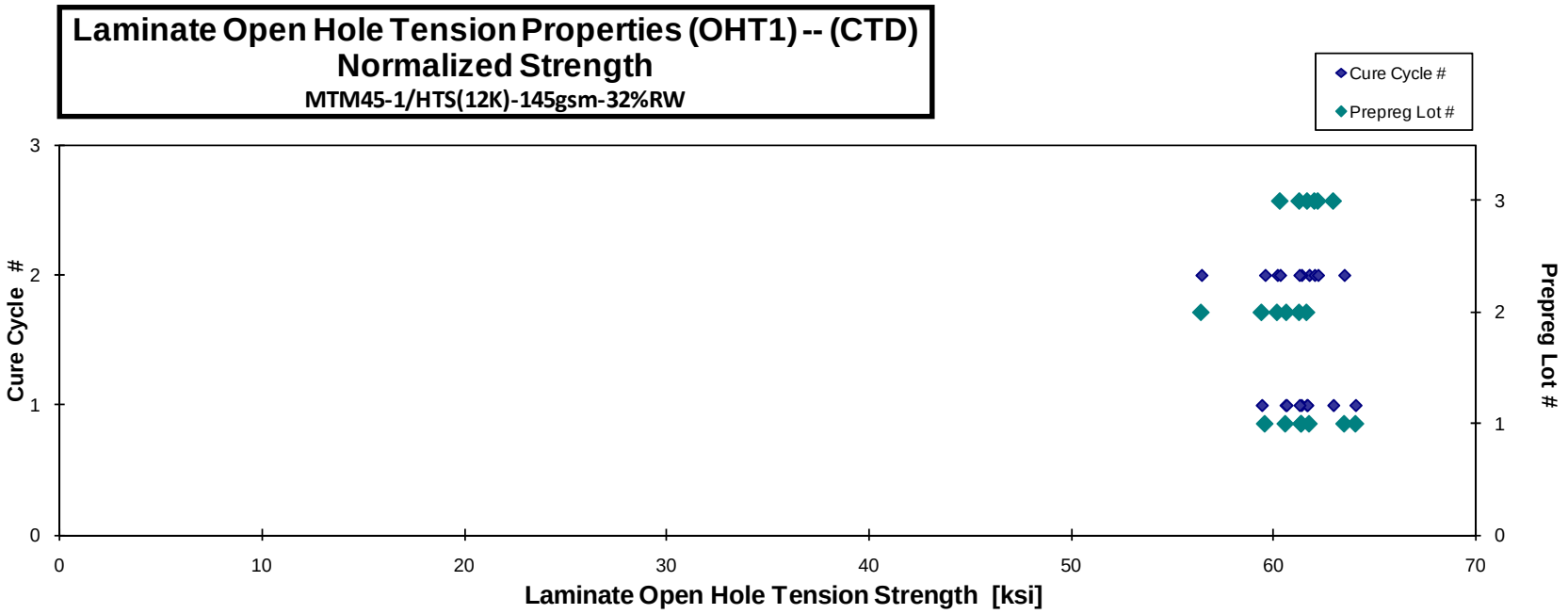
**Laminate Open Hole Tension Properties (OHT1) -- (CTD) Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMDA116B | A | MH1 | 1 | 1 | 59.460 | 0.135 | 24 | LGM | 0.0056 | 60.587 |
| ABMDA117B | A | MH1 | 1 | 1 | 60.959 | 0.133 | 24 | AGM | 0.0055 | 61.367 |
| ABMDA118B | A | MH1 | 1 | 1 | 64.152 | 0.132 | 24 | AGM | 0.0055 | 64.055 |
| ABMDA215B | A | MH2 | 1 | 2 | 59.258 | 0.14 | 24 | LGM | 0.0057 | 61.76 |
| ABMDA216B | A | MH2 | 1 | 2 | 59.806 | 0.135 | 24 | LGM | 0.0056 | 61.377 |
| ABMDA217B | A | MH2 | 1 | 2 | 62.760 | 0.134 | 24 | LGM | 0.0056 | 63.497 |
| ABMDA218B | A | MH2 | 1 | 2 | 58.763 | 0.134 | 24 | LGM | 0.0056 | 59.572 |
| ABMDB116B | B | MH1 | 2 | 1 | 57.994 | 0.135 | 24 | LGM | 0.0056 | 59.407 |
| ABMDB117B | B | MH1 | 2 | 1 | 59.270 | 0.135 | 24 | LGM | 0.0056 | 60.632 |
| ABMDB118B | B | MH1 | 2 | 1 | 60.162 | 0.135 | 24 | AGM | 0.0056 | 61.636 |
| ABMDB216B | B | MH2 | 2 | 2 | 59.405 | 0.134 | 24 | LGM | 0.0056 | 60.178 |
| ABMDB217B | B | MH2 | 2 | 2 | 59.695 | 0.135 | 24 | LGM | 0.0056 | 61.271 |
| ABMDB218B | B | MH2 | 2 | 2 | 55.416 | 0.134 | 24 | LGM | 0.0056 | 56.417 |
| ABMDC116B | C | MH1 | 3 | 1 | 61.735 | 0.132 | 24 | LGM | 0.0055 | 61.665 |
| ABMDC117B | C | MH1 | 3 | 1 | 60.724 | 0.133 | 24 | LGM | 0.0056 | 61.276 |
| ABMDC118B | C | MH1 | 3 | 1 | 63.024 | 0.132 | 24 | LGM | 0.0055 | 62.953 |
| ABMDC216B | C | MH2 | 3 | 2 | 61.228 | 0.134 | 24 | LGM | 0.0056 | 62.024 |
| ABMDC217B | C | MH2 | 3 | 2 | 62.045 | 0.132 | 24 | LGM | 0.0055 | 62.194 |
| ABMDC218B | C | MH2 | 3 | 2 | 59.247 | 0.134 | 24 | AGM | 0.0056 | 60.317 |

| | | |
|---|---|---|
| **Average** | **60.269** | |
| **Standard Dev.** | **1.997** | |
| **Coeff. of Var. [%]** | **3.314** | |
| **Min.** | **55.416** | |
| **Max.** | **64.152** | |
| **Number of Spec.** | **19** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **61.167** |
| **$Standard\ Dev._{norm}$** | | **1.670** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **2.730** |
| **Min.** | **0.0055** | **56.417** |
| **Max.** | **0.0057** | **64.055** |
| **Number of Spec.** | | **19** |


Laminate Open Hole Tension Properties (OHT1) -- (CTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
10
20
30
40
50
60
70
Laminate Open Hole Tension Strength [ksi]

## Laminate Open Hole Tension Properties (OHT1) -- (RTD) Strength

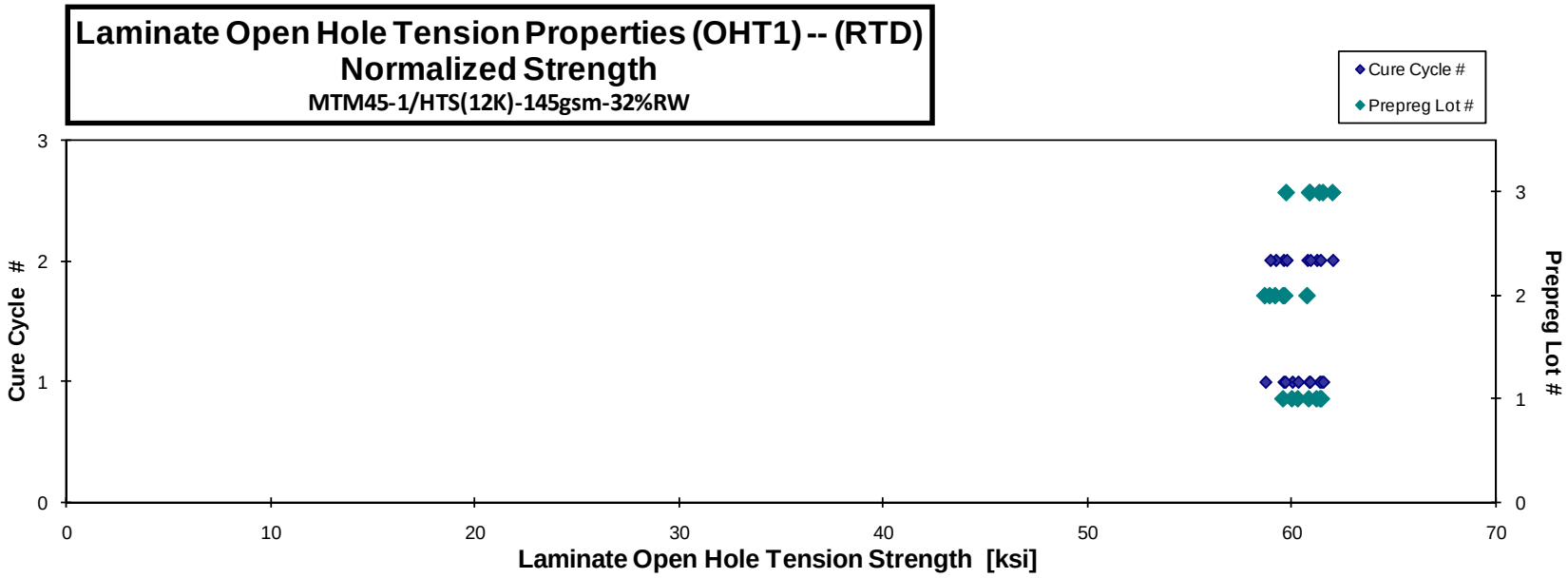
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMDA111A | A | MH1 | 1 | 1 | 59.294 | 0.134 | 24 | LGM | 0.0056 | 60.058 |
| ABMDA112A | A | MH1 | 1 | 1 | 59.576 | 0.134 | 24 | AGM | 0.0056 | 60.343 |
| ABMDA113A | A | MH1 | 1 | 1 | 60.204 | 0.133 | 24 | AGM | 0.0056 | 60.880 |
| ABMDA114A | A | MH1 | 1 | 1 | 60.115 | 0.135 | 24 | LGM | 0.0056 | 61.497 |
| ABMDA211A | A | MH2 | 1 | 2 | 58.698 | 0.134 | 24 | AGM | 0.0056 | 59.625 |
| ABMDA212A | A | MH2 | 1 | 2 | 59.750 | 0.135 | 24 | AGM | 0.0056 | 61.259 |
| ABMDA213A | A | MH2 | 1 | 2 | 60.416 | 0.134 | 24 | AGM | 0.0056 | 61.438 |
| ABMDB111A | B | MH1 | 2 | 1 | 56.604 | 0.137 | 24 | AGM | 0.0057 | 58.733 |
| ABMDB112A | B | MH1 | 2 | 1 | 57.513 | 0.137 | 24 | AGM | 0.0057 | 59.626 |
| ABMDB113A | B | MH1 | 2 | 1 | 57.887 | 0.136 | 24 | LGM | 0.0057 | 59.707 |
| ABMDB211A | B | MH2 | 2 | 2 | 58.663 | 0.133 | 24 | AGM | 0.0056 | 59.241 |
| ABMDB212A | B | MH2 | 2 | 2 | 58.668 | 0.133 | 24 | LGM | 0.0055 | 58.972 |
| ABMDB213A | B | MH2 | 2 | 2 | 60.084 | 0.134 | 24 | AGM | 0.0056 | 60.797 |
| ABMDC111A | C | MH1 | 3 | 1 | 61.032 | 0.133 | 24 | AGM | 0.0055 | 61.402 |
| ABMDC112A | C | MH1 | 3 | 1 | 61.362 | 0.132 | 24 | AGM | 0.0055 | 61.579 |
| ABMDC113A | C | MH1 | 3 | 1 | 61.305 | 0.131 | 24 | AGM | 0.0055 | 60.925 |
| ABMDC211A | C | MH2 | 3 | 2 | 61.431 | 0.133 | 24 | AGM | 0.0056 | 62.044 |
| ABMDC212A | C | MH2 | 3 | 2 | 60.079 | 0.134 | 24 | AGM | 0.0056 | 60.943 |
| ABMDC213A | C | MH2 | 3 | 2 | 58.968 | 0.134 | 24 | AGM | 0.0056 | 59.779 |

| | Strength [ksi] |
|---|---|
| Average | 59.560 |
| Standard Dev. | 1.343 |
| Coeff. of Var. [%] | 2.256 |
| Min. | 56.604 |
| Max. | 61.431 |
| Number of Spec. | 19 |

| | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|
| $Average_{norm}$ | 0.0056 | 60.466 |
| $Standard\ Dev._{norm}$ | | 0.982 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 1.623 |
| Min. | 0.0055 | 58.733 |
| Max. | 0.0057 | 62.044 |
| Number of Spec. | | 19 |


Laminate Open Hole Tension Properties (OHT1) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
10
20
30
40
50
60
70
Laminate Open Hole Tension Strength [ksi]

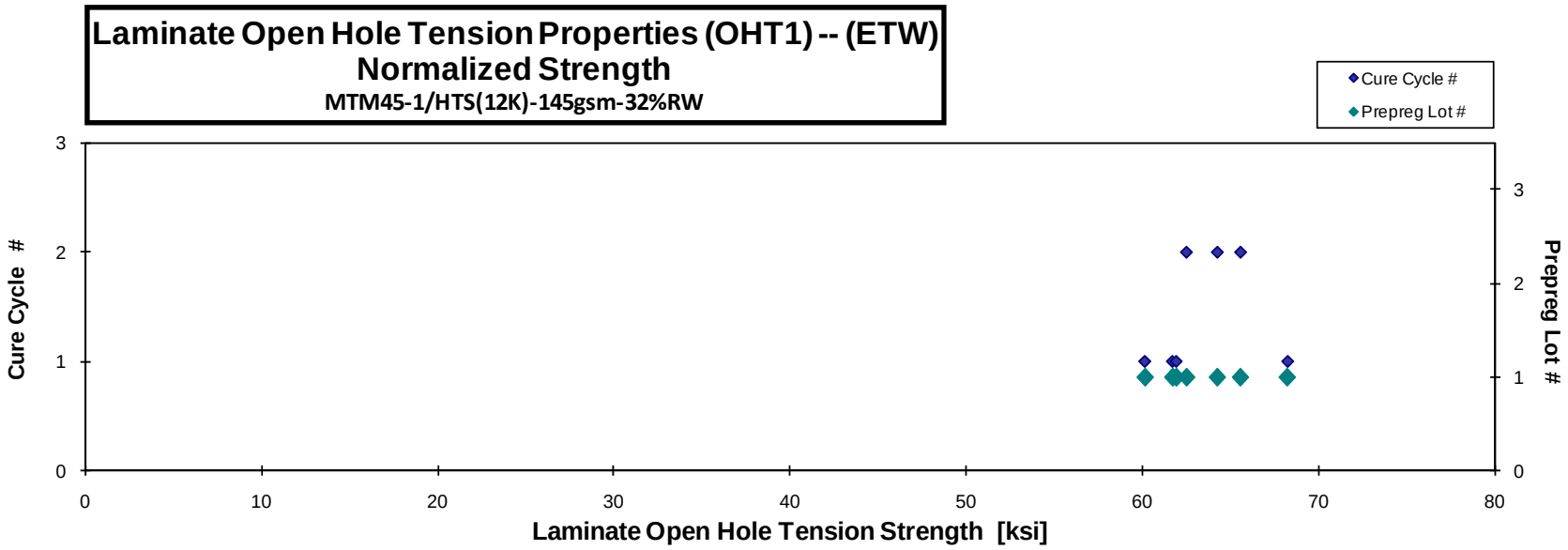
## Laminate Open Hole Tension Properties (OHT1) -- (ETW)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMDA11AN | A | MH1 | 1 | 1 | 59.410 | 0.134 | 24 | AGM | 0.0056 | 60.145 |
| ABMDA11BN | A | MH1 | 1 | 1 | 67.182 | 0.134 | 24 | AGM | 0.0056 | 68.225 |
| ABMDA11CN | A | MH1 | 1 | 1 | 60.766 | 0.134 | 24 | AGM | 0.0056 | 61.710 |
| ABMDA11DN | A | MH1 | 1 | 1 | 60.525 | 0.135 | 24 | AGM | 0.0056 | 61.924 |
| ABMDA21AN | A | MH2 | 1 | 2 | 62.782 | 0.135 | 24 | AGM | 0.0056 | 64.249 |
| ABMDA21BN | A | MH2 | 1 | 2 | 63.956 | 0.135 | 24 | AGM | 0.0056 | 65.563 |
| ABMDA21CN | A | MH2 | 1 | 2 | 61.363 | 0.134 | 24 | AGM | 0.0056 | 62.502 |

| | | |
|---|---|---|
| **Average** | **62.283** | |
| **Standard Dev.** | **2.631** | |
| **Coeff. of Var. [%]** | **4.225** | |
| **Min.** | **59.410** | |
| **Max.** | **67.182** | |
| **Number of Spec.** | **7** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **63.474** |
| **$Standard\ Dev._{norm}$** | | **2.741** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **4.319** |
| **Min.** | **0.0056** | **60.145** |
| **Max.** | **0.0056** | **68.225** |
| **Number of Spec.** | | **7** |


Laminate Open Hole Tension Properties (OHT1) -- (ETW)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Tension Strength [ksi]
0
10
20
30
40
50
60
70
80
0
1
2
3

## Laminate Open Hole Tension Properties (OHT1) -- (ETW2)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

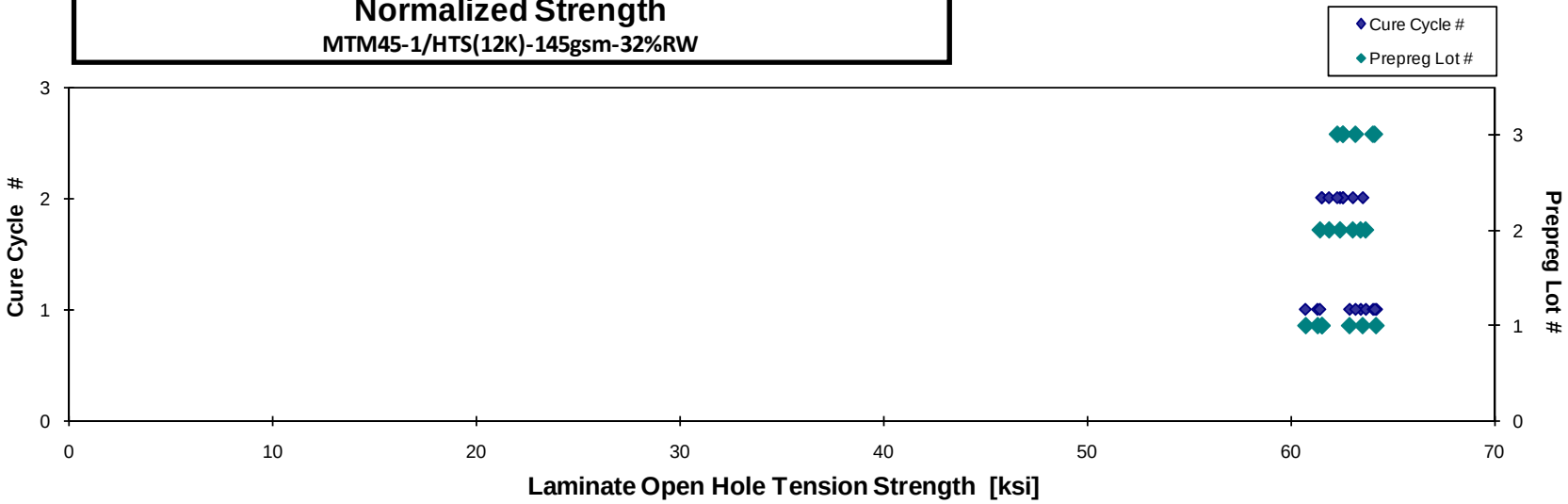
normalizing $t_{ply}$ [in]: 0.005500

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMDA11FD | A | MH1 | 1 | 1 | 63.852 | 0.133 | 24 | AGM | 0.0055 | 64.190 |
| ABMDA11GD | A | MH1 | 1 | 1 | 62.690 | 0.132 | 24 | AGM | 0.0055 | 62.880 |
| ABMDA11HD | A | MH1 | 1 | 1 | 60.379 | 0.133 | 24 | AGM | 0.0055 | 60.722 |
| ABMDA21ED | A | MH2 | 1 | 1 | 59.685 | 0.136 | 24 | AGM | 0.0057 | 61.312 |
| ABMDA21FD | A | MH2 | 1 | 2 | 60.558 | 0.134 | 24 | AGM | 0.0056 | 61.521 |
| ABMDA21GD | A | MH2 | 1 | 2 | 60.091 | 0.135 | 24 | AGM | 0.0056 | 61.525 |
| ABMDA21HD | A | MH2 | 1 | 2 | 62.859 | 0.133 | 24 | AGM | 0.0056 | 63.526 |
| ABMDB11AD | B | MH1 | 2 | 1 | 60.808 | 0.138 | 24 | AGM | 0.0057 | 63.426 |
| ABMDB11BD | B | MH1 | 2 | 1 | 61.268 | 0.137 | 24 | AGM | 0.0057 | 63.674 |
| ABMDB11CD | B | MH1 | 2 | 1 | 59.518 | 0.136 | 24 | AGM | 0.0057 | 61.426 |
| ABMDB21AD | B | MH2 | 2 | 2 | 61.678 | 0.135 | 24 | AGM | 0.0056 | 63.041 |
| ABMDB21BD | B | MH2 | 2 | 2 | 61.163 | 0.134 | 24 | AGM | 0.0056 | 61.873 |
| ABMDB21CD | B | MH2 | 2 | 2 | 62.557 | 0.132 | 24 | AGM | 0.0055 | 62.415 |
| ABMDC11AD | C | MH1 | 3 | 1 | 63.147 | 0.132 | 24 | AGM | 0.0055 | 63.171 |
| ABMDC11BD | C | MH1 | 3 | 1 | 63.797 | 0.132 | 24 | AGM | 0.0055 | 64.030 |
| ABMDC11CD | C | MH1 | 3 | 1 | 63.801 | 0.133 | 24 | AGM | 0.0055 | 64.115 |
| ABMDC21AD | C | MH2 | 3 | 2 | 61.923 | 0.133 | 24 | AGM | 0.0056 | 62.556 |
| ABMDC21BD | C | MH2 | 3 | 2 | 61.958 | 0.133 | 24 | AGM | 0.0056 | 62.561 |
| ABMDC21CD | C | MH2 | 3 | 2 | 61.847 | 0.133 | 24 | AGM | 0.0055 | 62.276 |

| | | |
|---|---|---|
| **Average** | **61.767** | |
| **Standard Dev.** | **1.382** | |
| **Coeff. of Var. [%]** | **2.237** | |
| **Min.** | **59.518** | |
| **Max.** | **63.852** | |
| **Number of Spec.** | **19** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **62.644** |
| **$Standard\ Dev._{norm}$** | | **1.045** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **1.669** |
| **Min.** | **0.0055** | **60.722** |
| **Max.** | **0.0057** | **64.190** |
| **Number of Spec.** | | **19** |

**Laminate Open Hole Tension Properties (OHT1) -- (ETW2)**
**Normalized Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**



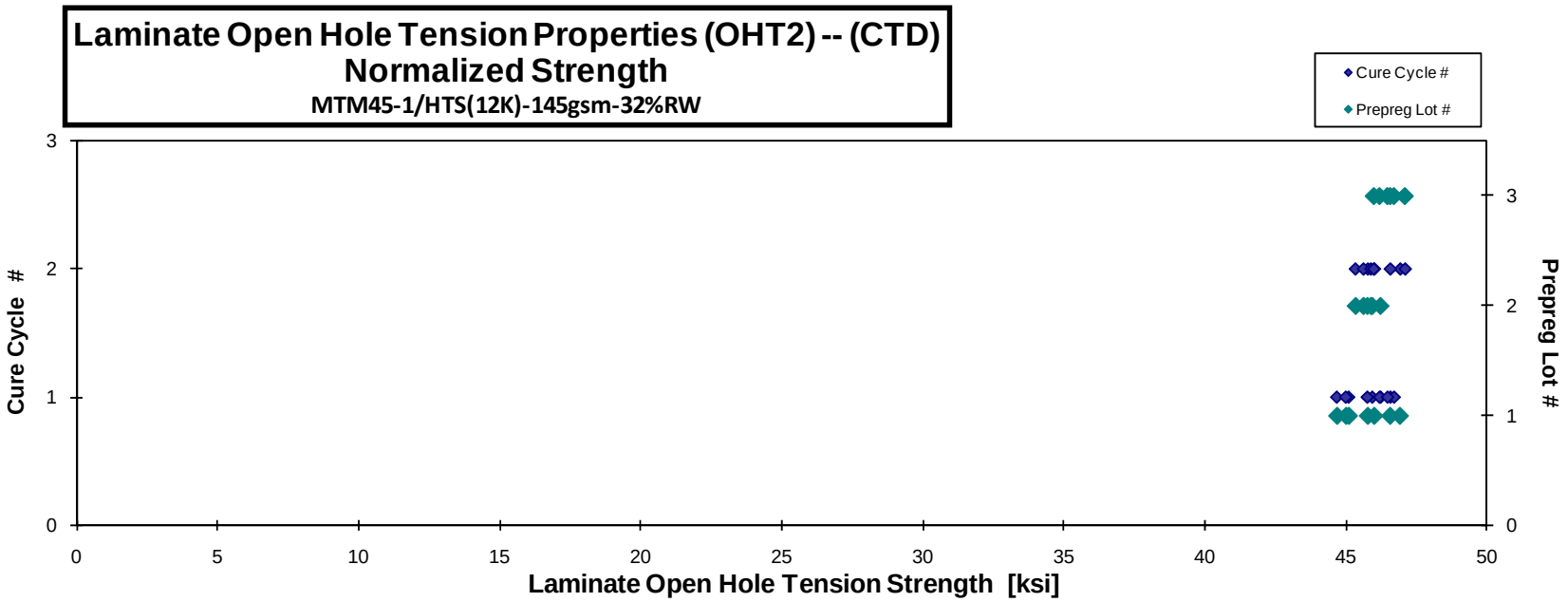
## 4.17 Open Hole Tension 2 Properties

**Laminate Open Hole Tension Properties (OHT2) -- (CTD)**
**Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMEA115B | A | MH1 | 1 | 1 | 43.879 | 0.112 | 20 | AGM | 0.0056 | 44.697 |
| ABMEA116B | A | MH1 | 1 | 1 | 44.369 | 0.112 | 20 | AGM | 0.0056 | 45.109 |
| ABMEA117B | A | MH1 | 1 | 1 | 45.988 | 0.111 | 20 | AGM | 0.0056 | 46.566 |
| ABMEA118B | A | MH1 | 1 | 1 | 44.135 | 0.112 | 20 | AGM | 0.0056 | 45.011 |
| ABMEA215B | A | MH2 | 1 | 2 | 45.947 | 0.112 | 20 | AGM | 0.0056 | 46.908 |
| ABMEA216B | A | MH2 | 1 | 2 | 45.501 | 0.111 | 20 | AGM | 0.0056 | 46.005 |
| ABMEA217B | A | MH2 | 1 | 2 | 45.291 | 0.111 | 20 | AGM | 0.0056 | 45.778 |
| ABMEB111B | B | MH1 | 2 | 1 | 44.477 | 0.114 | 20 | AGM | 0.0057 | 45.933 |
| ABMEB112B | B | MH1 | 2 | 1 | 44.757 | 0.112 | 20 | AGM | 0.0056 | 45.761 |
| ABMEB113B | B | MH1 | 2 | 1 | 44.990 | 0.113 | 20 | AGM | 0.0057 | 46.224 |
| ABMEB211B | B | MH2 | 2 | 2 | 43.483 | 0.115 | 20 | AGM | 0.0057 | 45.347 |
| ABMEB212B | B | MH2 | 2 | 2 | 43.296 | 0.116 | 20 | AGM | 0.0058 | 45.625 |
| ABMEB213B | B | MH2 | 2 | 2 | 43.682 | 0.116 | 20 | AGM | 0.0058 | 45.886 |
| ABMEC111B | C | MH1 | 3 | 1 | 46.161 | 0.111 | 20 | AGM | 0.0056 | 46.693 |
| ABMEC112B | C | MH1 | 3 | 1 | 45.832 | 0.111 | 20 | AGM | 0.0055 | 46.187 |
| ABMEC113B | C | MH1 | 3 | 1 | 46.060 | 0.111 | 20 | AGM | 0.0055 | 46.465 |
| ABMEC211B | C | MH2 | 3 | 2 | 46.084 | 0.110 | 20 | AGM | 0.0055 | 45.986 |
| ABMEC212B | C | MH2 | 3 | 2 | 46.414 | 0.110 | 20 | AGM | 0.0055 | 46.562 |
| ABMEC213B | C | MH2 | 3 | 2 | 46.388 | 0.112 | 20 | AGM | 0.0056 | 47.077 |

| | | | | |
|---|---|---|---|---|
| **Average** | **45.091** | | **Average$_{norm}$** | **0.0056** | **45.990** |
| **Standard Dev.** | **1.054** | | **Standard Dev.$_{norm}$** | | **0.648** |
| **Coeff. of Var. [%]** | **2.337** | | **Coeff. of Var. [%]$_{norm}$** | | **1.409** |
| **Min.** | **43.296** | | **Min.** | **0.0055** | **44.697** |
| **Max.** | **46.414** | | **Max.** | **0.0058** | **47.077** |
| **Number of Spec.** | **19** | | **Number of Spec.** | | **19** |


Laminate Open Hole Tension Properties (OHT2) -- (CTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
5
10
15
20
25
30
35
40
45
50
Laminate Open Hole Tension Strength [ksi]

## Laminate Open Hole Tension Properties (OHT2) -- (RTD) Strength

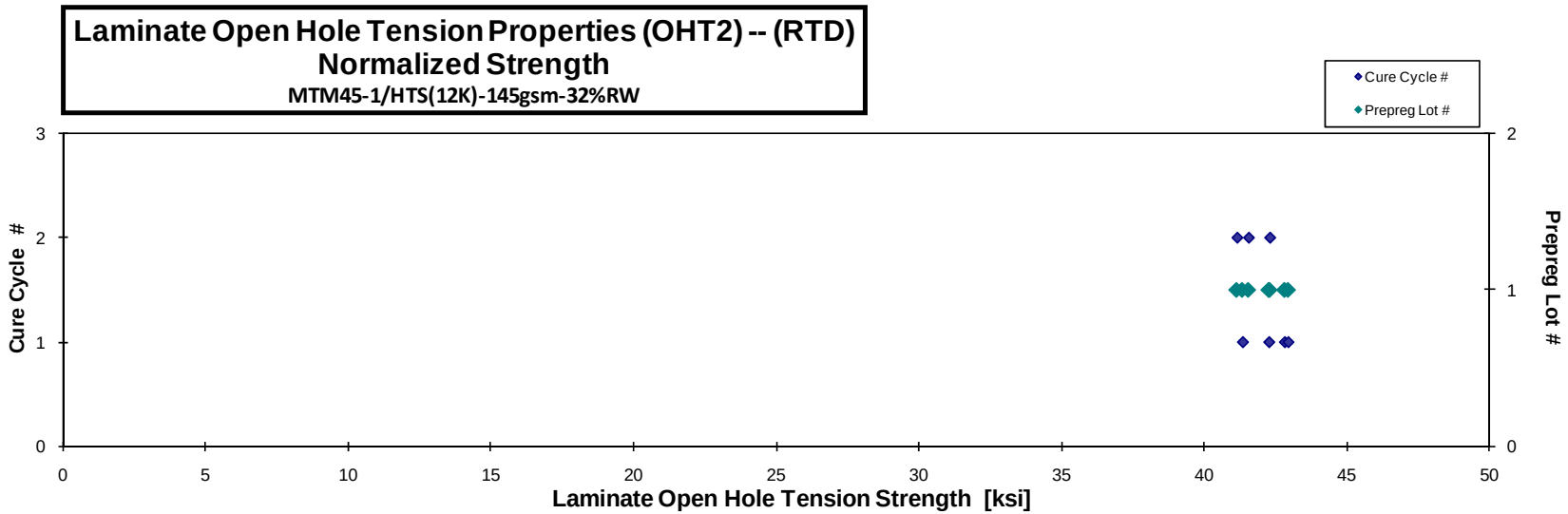
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMEA111A | A | MH1 | 1 | 1 | 40.913 | 0.111 | 20 | AGM/DGM | 0.0056 | 41.347 |
| ABMEA112A | A | MH1 | 1 | 1 | 42.490 | 0.111 | 20 | AGM/DGM | 0.0055 | 42.832 |
| ABMEA113A | A | MH1 | 1 | 1 | 41.363 | 0.112 | 20 | AGM/DGM | 0.0056 | 42.278 |
| ABMEA114A | A | MH1 | 1 | 1 | 42.278 | 0.112 | 20 | AGM/DGM | 0.0056 | 42.957 |
| ABMEA211A | A | MH2 | 1 | 2 | 41.785 | 0.111 | 20 | AGM | 0.0056 | 42.311 |
| ABMEA212A | A | MH2 | 1 | 2 | 40.723 | 0.111 | 20 | AGM | 0.0056 | 41.149 |
| ABMEA213A | A | MH2 | 1 | 2 | 40.950 | 0.112 | 20 | AGM | 0.0056 | 41.558 |

| | Strength [ksi] |
|---|---|
| Average | 41.500 |
| Standard Dev. | 0.700 |
| Coeff. of Var. [%] | 1.686 |
| Min. | 40.723 |
| Max. | 42.490 |
| Number of Spec. | 7 |

| | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|
| Average | 0.00557 | 42.062 |
| Standard Dev. | | 0.719 |
| Coeff. of Var. [%] | | 1.709 |
| Min. | 0.0055 | 41.149 |
| Max. | 0.0056 | 42.957 |
| Number of Spec. | | 7 |


Laminate Open Hole Tension Properties (OHT2) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Tension Strength [ksi]
0
1
2
3
0
5
10
15
20
25
30
35
40
45
50

## Laminate Open Hole Tension Properties (OHT2) -- (ETW2) Strength

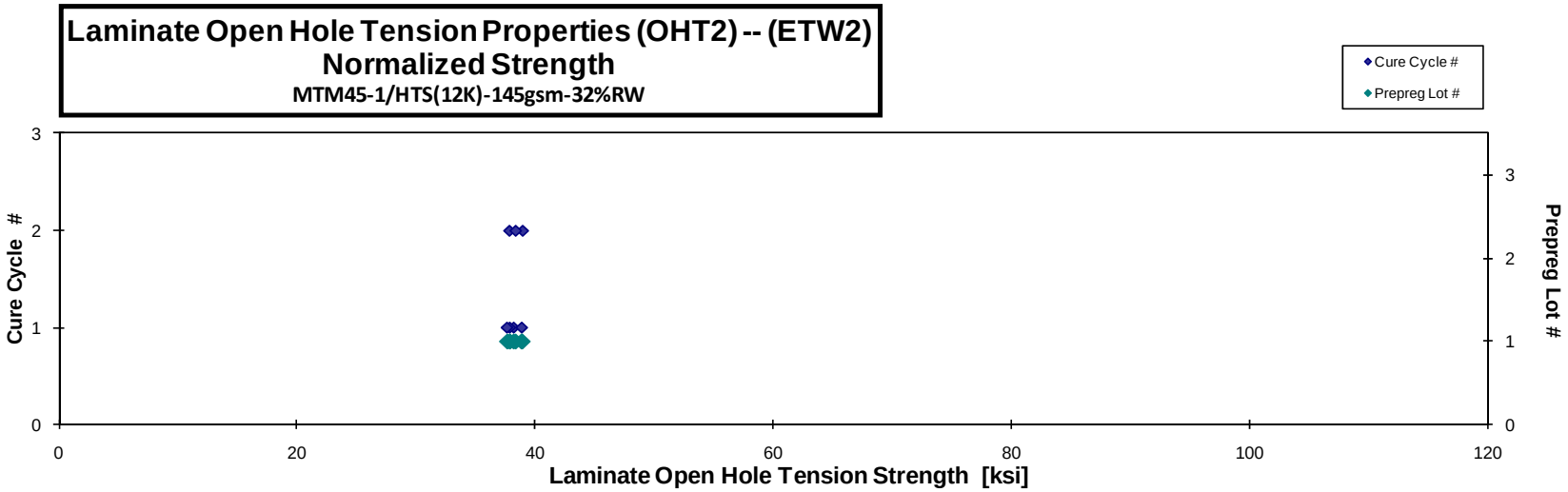
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMEA119D | A | MH1 | 1 | 1 | 37.496 | 0.112 | 20 | AGM | 0.0056 | 38.206 |
| ABMEA11AD | A | MH1 | 1 | 1 | 36.924 | 0.113 | 20 | AGM | 0.0056 | 37.898 |
| ABMEA11BD | A | MH1 | 1 | 1 | 37.067 | 0.112 | 20 | AGM | 0.0056 | 37.674 |
| ABMEA11CD | A | MH1 | 1 | 1 | 38.034 | 0.112 | 20 | AGM | 0.0056 | 38.847 |
| ABMEA21AD | A | MH2 | 1 | 2 | 37.319 | 0.112 | 20 | AGM | 0.0056 | 37.873 |
| ABMEA21BD | A | MH2 | 1 | 2 | 38.582 | 0.111 | 20 | AGM | 0.0055 | 38.927 |
| ABMEA21CD | A | MH2 | 1 | 2 | 38.034 | 0.111 | 20 | AGM | 0.0055 | 38.369 |

| | | |
|---|---|---|
| Average | 37.637 | |
| Standard Dev. | 0.600 | |
| Coeff. of Var. [%] | 1.595 | |
| Min. | 36.924 | |
| Max. | 38.582 | |
| Number of Spec. | 7 | |

| | | |
|---|---|---|
| $Average_{norm}$ | 0.00559 | 38.256 |
| $Standard\ Dev._{norm}$ | | 0.488 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 1.276 |
| Min. | 0.0055 | 37.674 |
| Max. | 0.0056 | 38.927 |
| Number of Spec. | | 7 |


Laminate Open Hole Tension Properties (OHT2) -- (ETW2)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Tension Strength [ksi]
0
1
2
3
0
20
40
60
80
100
120

## 4.18 Open Hole Tension 3 Properties

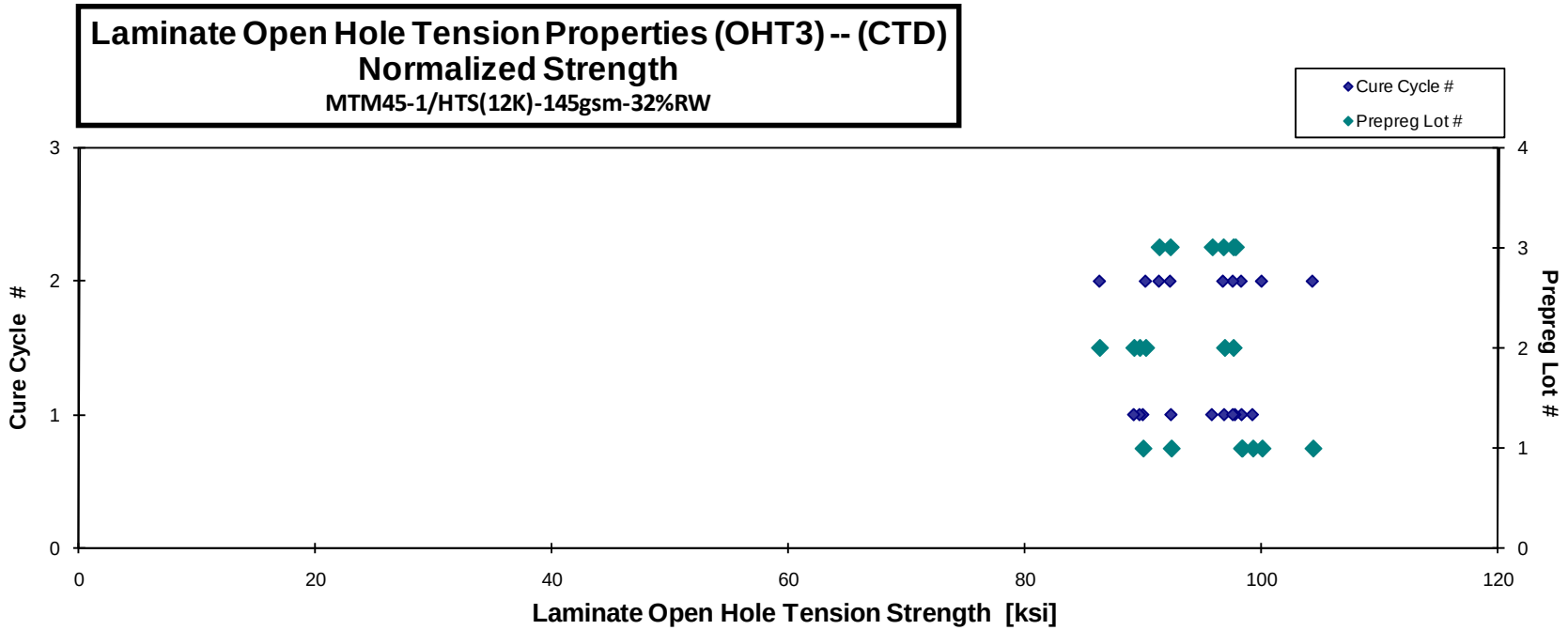
**Laminate Open Hole Tension Properties (OHT3) -- (CTD) Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMFA115B | A | MH1 | 1 | 1 | 88.585 | 0.112 | 20 | DGM | 0.0056 | 89.981 |
| ABMFA116B | A | MH1 | 1 | 1 | 90.605 | 0.112 | 20 | LGM | 0.0056 | 92.362 |
| ABMFA117B | A | MH1 | 1 | 1 | 97.173 | 0.111 | 20 | LGM / DGM | 0.0056 | 98.336 |
| ABMFA118B | A | MH1 | 1 | 1 | 98.779 | 0.111 | 20 | LGM | 0.0055 | 99.243 |
| ABMFA215B | A | MH2 | 1 | 2 | 98.585 | 0.112 | 20 | LGM | 0.0056 | 100.019 |
| ABMFA216B | A | MH2 | 1 | 2 | 97.888 | 0.110 | 20 | LGM / DGM | 0.0055 | 98.288 |
| ABMFA217B | A | MH2 | 1 | 2 | 102.681 | 0.112 | 20 | LGM / DGM | 0.0056 | 104.315 |
| ABMFB111B | B | MH1 | 2 | 1 | 89.277 | 0.111 | 20 | LGM | 0.0055 | 89.696 |
| ABMFB112B | B | MH1 | 2 | 1 | 87.332 | 0.112 | 20 | LGM / DGM | 0.0056 | 89.211 |
| ABMFB113B | B | MH1 | 2 | 1 | 97.110 | 0.110 | 20 | LGM | 0.0055 | 96.860 |
| ABMFB211B | B | MH2 | 2 | 2 | 84.518 | 0.112 | 20 | DGM | 0.0056 | 86.311 |
| ABMFB212B | B | MH2 | 2 | 2 | 96.649 | 0.111 | 20 | LGM / DGM | 0.0056 | 97.586 |
| ABMFB213B | B | MH2 | 2 | 2 | 89.080 | 0.111 | 20 | LGM | 0.0056 | 90.200 |
| ABMFC111B | C | MH1 | 3 | 1 | 97.768 | 0.110 | 20 | LGM / DGM | 0.0055 | 97.768 |
| ABMFC112B | C | MH1 | 3 | 1 | 95.222 | 0.111 | 20 | LGM / DGM | 0.0055 | 95.813 |
| ABMFC113B | C | MH1 | 3 | 1 | 97.177 | 0.110 | 20 | LGM / DGM | 0.0055 | 97.589 |
| ABMFC211B | C | MH2 | 3 | 2 | 97.279 | 0.109 | 20 | LGM / DGM | 0.0055 | 96.749 |
| ABMFC212B | C | MH2 | 3 | 2 | 92.856 | 0.109 | 20 | LGM / DGM | 0.0055 | 92.279 |
| ABMFC213B | C | MH2 | 3 | 2 | 92.110 | 0.109 | 20 | DGM | 0.0055 | 91.342 |

| | | |
|---|---|---|
| **Average** | **94.246** | |
| **Standard Dev.** | **4.848** | |
| **Coeff. of Var. [%]** | **5.144** | |
| **Min.** | **84.518** | |
| **Max.** | **102.681** | |
| **Number of Spec.** | **19** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0055** | **94.945** |
| **$Standard\ Dev._{norm}$** | | **4.674** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **4.923** |
| **Min.** | **0.0055** | **86.311** |
| **Max.** | **0.0056** | **104.315** |
| **Number of Spec.** | | **19** |


Laminate Open Hole Tension Properties (OHT3) -- (CTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Tension Strength [ksi]
0
20
40
60
80
100
120
0
1
2
3
4

## Laminate Open Hole Tension Properties (OHT3) -- (RTD) Strength

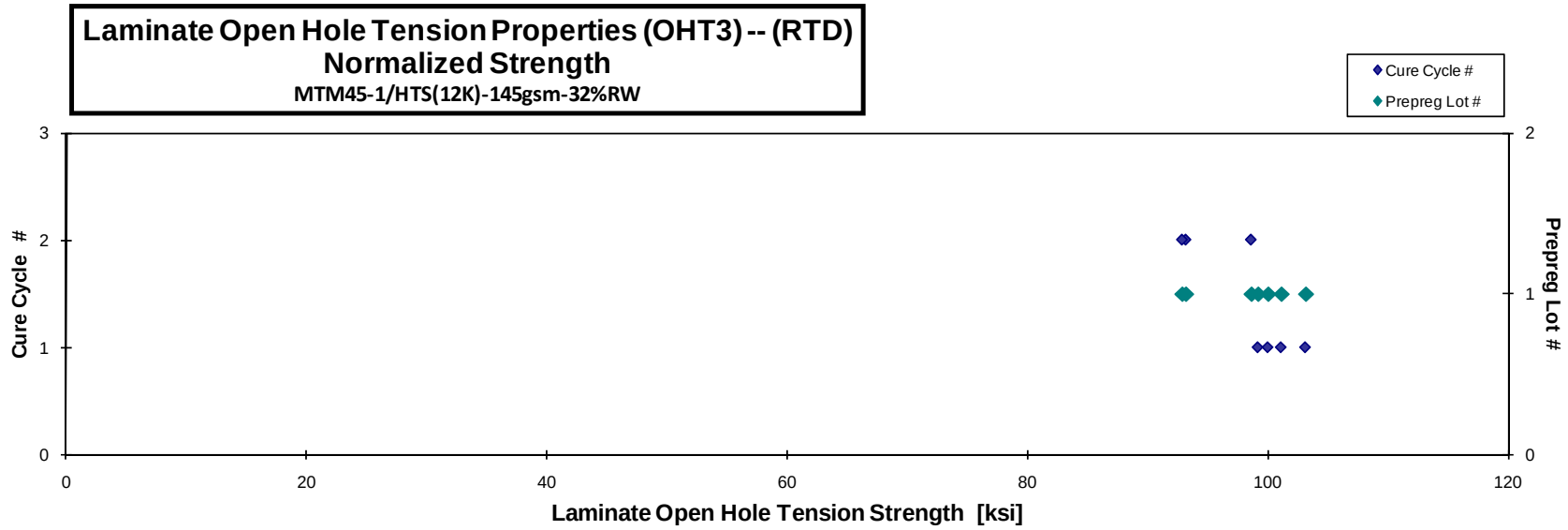
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMFA111A | A | MH1 | 1 | 1 | 97.645 | 0.112 | 20 | LGM | 0.0056 | 99.169 |
| ABMFA112A | A | MH1 | 1 | 1 | 98.639 | 0.112 | 20 | LGM | 0.0056 | 99.999 |
| ABMFA113A | A | MH1 | 1 | 1 | 99.490 | 0.112 | 20 | LGM | 0.0056 | 101.103 |
| ABMFA114A | A | MH1 | 1 | 1 | 101.784 | 0.111 | 20 | LGM | 0.0056 | 103.126 |
| ABMFA211A | A | MH2 | 1 | 2 | 92.567 | 0.111 | 20 | LGM | 0.0055 | 93.170 |
| ABMFA212A | A | MH2 | 1 | 2 | 98.327 | 0.110 | 20 | LGM | 0.0055 | 98.610 |
| ABMFA213A | A | MH2 | 1 | 2 | 91.627 | 0.111 | 20 | LGM | 0.0056 | 92.863 |

| | | |
|---|---|---|
| Average | 97.154 | |
| Standard Dev. | 3.704 | |
| Coeff. of Var. [%] | 3.812 | |
| Min. | 91.627 | |
| Max. | 101.784 | |
| Number of Spec. | 7 | |

| | | |
|---|---|---|
| $Average_{norm}$ | 0.00556 | 98.291 |
| $Standard\ Dev._{norm}$ | | 3.889 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 3.957 |
| Min. | 0.0055 | 92.863 |
| Max. | 0.0056 | 103.126 |
| Number of Spec. | | 7 |


Laminate Open Hole Tension Properties (OHT3) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
20
40
60
80
100
120
Laminate Open Hole Tension Strength [ksi]

## Laminate Open Hole Tension Properties (OHT3) -- (ETW2) Strength

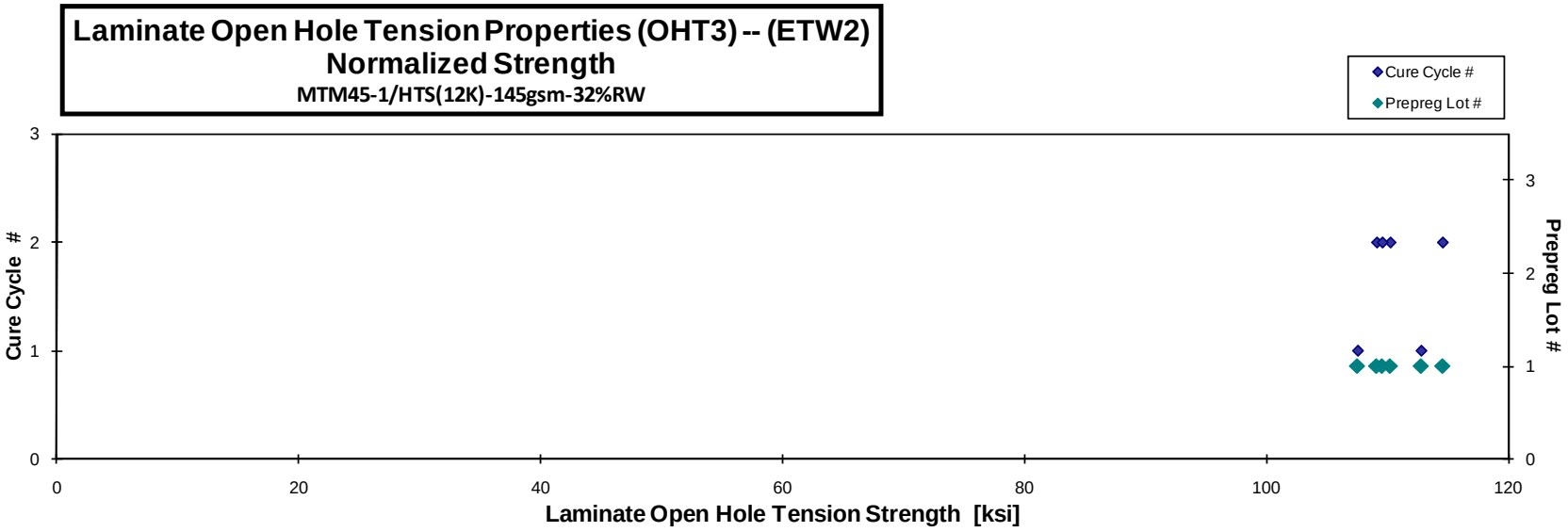
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMFA11AD | A | MH1 | 1 | 1 | 123.364 | 0.111 | 20 | LGM | 0.0056 | 124.878 |
| ABMFA11BD | A | MH1 | 1 | 1 | 106.436 | 0.111 | 20 | LGM | 0.0056 | 107.532 |
| ABMFA11CD | A | MH1 | 1 | 1 | 111.624 | 0.111 | 20 | LGM | 0.0056 | 112.791 |
| ABMFA219D | A | MH2 | 1 | 2 | 107.615 | 0.112 | 20 | LGM | 0.0056 | 109.115 |
| ABMFA21AD | A | MH2 | 1 | 2 | 112.708 | 0.112 | 20 | LGM | 0.0056 | 114.570 |
| ABMFA21BD | A | MH2 | 1 | 2 | 108.703 | 0.112 | 20 | AGM | 0.0056 | 110.235 |
| ABMFA21CD | A | MH2 | 1 | 2 | 107.985 | 0.112 | 20 | LGM | 0.0056 | 109.572 |

| | | |
|---|---|---|
| Average | 111.205 | |
| Standard Dev. | 5.810 | |
| Coeff. of Var. [%] | 5.225 | |
| Min. | 106.436 | |
| Max. | 123.364 | |
| Number of Spec. | 7 | |

| | | |
|---|---|---|
| $Average_{norm}$ | 0.00557 | 112.671 |
| $Standard\ Dev._{norm}$ | | 5.877 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 5.216 |
| Min. | 0.0056 | 107.532 |
| Max. | 0.0056 | 124.878 |
| Number of Spec. | | 7 |


Laminate Open Hole Tension Properties (OHT3) -- (ETW2)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Tension Strength [ksi]
0
20
40
60
80
100
120
0
1
2
3

## 4.19 Filled-Hole Tension 1 Properties

**Laminate Filled Hole Tension Properties (FHT1) -- (CTD) Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

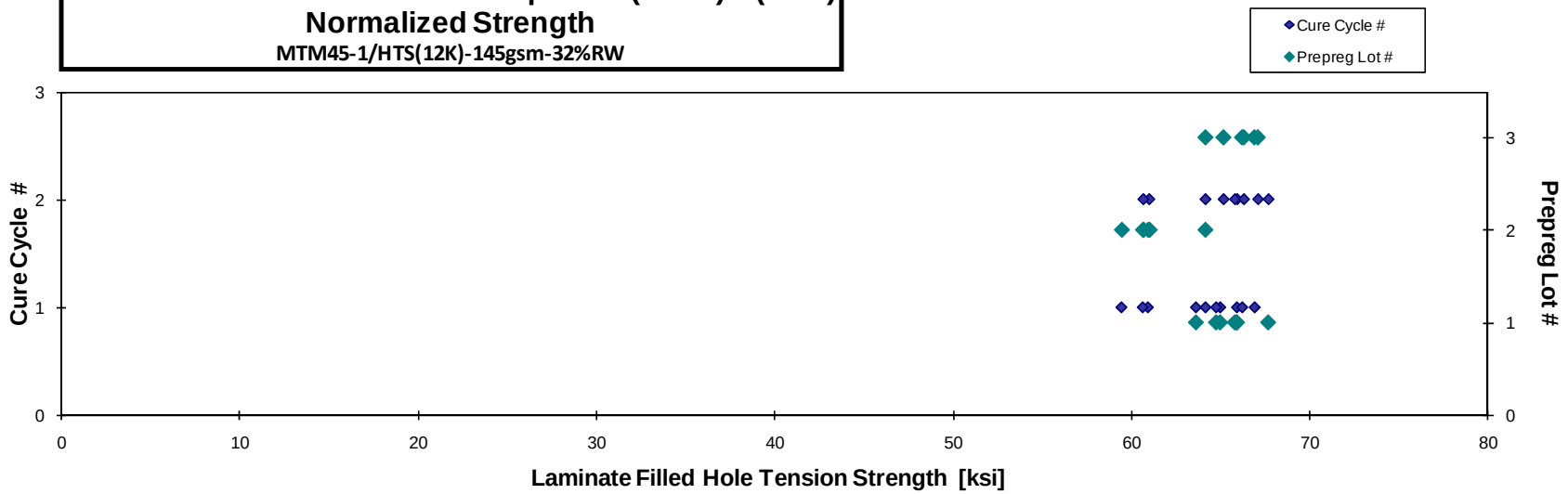
| normalizing $t_{ply}$ [in] |
|---|
| 0.00550 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABM4A116B | A | MH1 | 1 | 1 | 65.393 | 0.133 | 24 | LGM | 0.0055 | 65.881 |
| ABM4A117B | A | MH1 | 1 | 1 | 64.505 | 0.133 | 24 | LGM | 0.0055 | 64.945 |
| ABM4A118B | A | MH1 | 1 | 1 | 62.965 | 0.133 | 24 | LGM | 0.0056 | 63.586 |
| ABM4A119B | A | MH1 | 1 | 1 | 64.174 | 0.133 | 24 | LGM | 0.0055 | 64.717 |
| ABM4A217B | A | MH2 | 1 | 2 | 65.379 | 0.133 | 24 | AGM/LGM | 0.0055 | 65.891 |
| ABM4A218B | A | MH2 | 1 | 2 | 65.516 | 0.133 | 24 | AGM/LGM | 0.0055 | 65.772 |
| ABM4A219B | A | MH2 | 1 | 2 | 67.048 | 0.133 | 24 | AGM/LGM | 0.0055 | 67.649 |
| ABM4B113B | B | MH1 | 2 | 1 | 59.321 | 0.136 | 24 | LGM | 0.0056 | 60.902 |
| ABM4B115B | B | MH1 | 2 | 1 | 58.085 | 0.135 | 24 | LGM | 0.0056 | 59.420 |
| ABM4B116B | B | MH1 | 2 | 1 | 58.713 | 0.136 | 24 | LGM | 0.0057 | 60.610 |
| ABM4B213B | B | MH2 | 2 | 2 | 59.952 | 0.134 | 24 | LGM | 0.0056 | 60.981 |
| ABM4B214B | B | MH2 | 2 | 2 | 63.100 | 0.134 | 24 | LGM | 0.0056 | 64.120 |
| ABM4B216B | B | MH2 | 2 | 2 | 60.099 | 0.133 | 24 | LGM | 0.0056 | 60.646 |
| ABM4C111B | C | MH1 | 3 | 1 | 63.832 | 0.133 | 24 | LGM | 0.0055 | 64.122 |
| ABM4C112B | C | MH1 | 3 | 1 | 65.730 | 0.133 | 24 | AGM | 0.0055 | 66.178 |
| ABM4C115B | C | MH1 | 3 | 1 | 66.627 | 0.132 | 24 | LGM | 0.0055 | 66.871 |
| ABM4C211B | C | MH2 | 3 | 2 | 64.509 | 0.133 | 24 | AGM | 0.0056 | 65.136 |
| ABM4C212B | C | MH2 | 3 | 2 | 65.934 | 0.133 | 24 | AGM | 0.0055 | 66.275 |
| ABM4C214B | C | MH2 | 3 | 2 | 65.895 | 0.134 | 24 | LGM | 0.0056 | 67.068 |

| | | |
|---|---|---|
| **Average** | **63.515** | |
| **Standard Dev.** | **2.858** | |
| **Coeff. of Var. [%]** | **4.500** | |
| **Min.** | **58.085** | |
| **Max.** | **67.048** | |
| **Number of Spec.** | **19** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **64.251** |
| **$Standard\ Dev._{norm}$** | | **2.531** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **3.939** |
| **Min.** | **0.0055** | **59.420** |
| **Max.** | **0.0057** | **67.649** |
| **Number of Spec.** | | **19** |

**Laminate Filled Hole Tension Properties (FHT1) -- (CTD)**
**Normalized Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Filled Hole Tension Properties (FHT1) -- (RTD) Strength

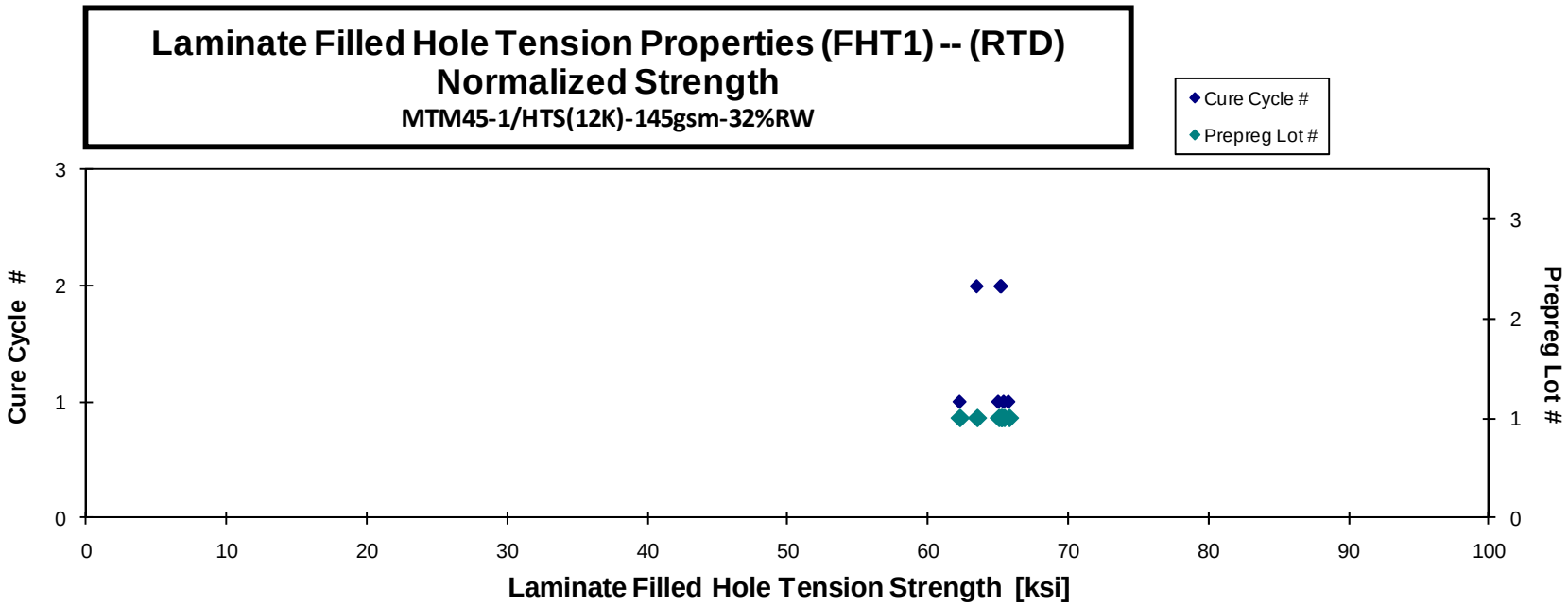
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.00550

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABM4A111A | A | MH 1 | 1 | 1 | 61.745 | 0.133 | 24 | AGM | 0.0055 | 62.236 |
| ABM4A112A | A | MH1 | 1 | 1 | 64.554 | 0.133 | 24 | AGM | 0.0055 | 65.035 |
| ABM4A113A | A | MH1 | 1 | 1 | 65.083 | 0.133 | 24 | AGM | 0.0055 | 65.428 |
| ABM4A114A | A | MH1 | 1 | 1 | 65.719 | 0.132 | 24 | AGM | 0.0055 | 65.777 |
| ABM4A213A | A | MH2 | 1 | 2 | 65.055 | 0.132 | 24 | AGM | 0.0055 | 65.195 |
| ABM4A214A | A | MH2 | 1 | 2 | 65.349 | 0.132 | 24 | AGM | 0.0055 | 65.267 |
| ABM4A215A | A | MH2 | 1 | 2 | 63.545 | 0.132 | 24 | AGM | 0.0055 | 63.481 |

| | | |
|---|---|---|
| **Average** | **64.436** | |
| **Standard Dev.** | **1.374** | |
| **Coeff. of Var. [%]** | **2.133** | |
| **Min.** | **61.745** | |
| **Max.** | **65.719** | |
| **Number of Spec.** | **7** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0055** | **64.631** |
| **$Standard\ Dev._{norm}$** | | **1.284** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **1.987** |
| **Min.** | **0.0055** | **62.236** |
| **Max.** | **0.0055** | **65.777** |
| **Number of Spec.** | | **7** |


Laminate Filled Hole Tension Properties (FHT1) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
10
20
30
40
50
60
70
80
90
100
Laminate Filled Hole Tension Strength [ksi]

## 4.20 Filled-Hole Tension 2 Properties

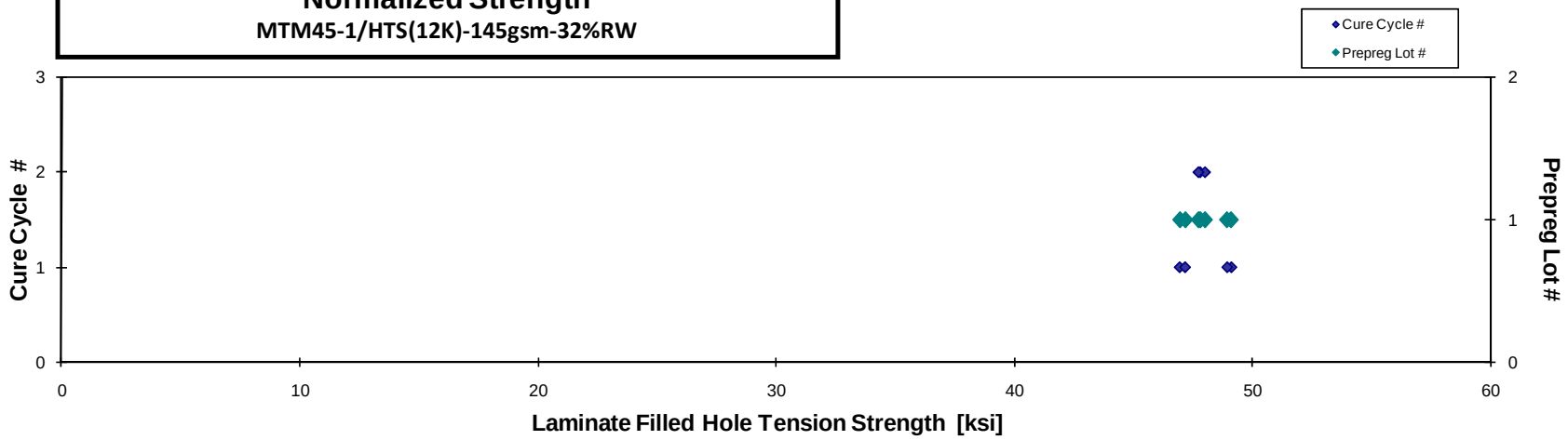
**Laminate Filled Hole Tension Properties (FHT2) -- (CTD)**
**Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM5A116B | A | MH1 | 1 | 1 | 48.201 | 0.112 | 20 | 0.0056 | LGM | 0.0056 | 49.135 |
| ABM5A117B | A | MH1 | 1 | 1 | 46.161 | 0.112 | 20 | 0.0056 | LGM | 0.0056 | 46.952 |
| ABM5A118B | A | MH1 | 1 | 1 | 46.278 | 0.112 | 20 | 0.0056 | LGM | 0.0056 | 47.182 |
| ABM5A119B | A | MH1 | 1 | 1 | 48.338 | 0.111 | 20 | 0.0056 | LGM | 0.0056 | 48.960 |
| ABM5A217B | A | MH2 | 1 | 2 | 47.296 | 0.111 | 20 | 0.0056 | AGM | 0.0056 | 47.819 |
| ABM5A218B | A | MH2 | 1 | 2 | 47.640 | 0.111 | 20 | 0.0055 | AGM | 0.0055 | 48.022 |
| ABM5A219B | A | MH2 | 1 | 2 | 47.201 | 0.111 | 20 | 0.0056 | AGM | 0.0056 | 47.745 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Average** | **47.302** | **Average** | **0.0056** | **$Average_{norm}$** | **0.0056** | **47.974** |
| **Standard Dev.** | **0.852** | | | **$Standard\ Dev._{norm}$** | | **0.824** |
| **Coeff. of Var. [%]** | **1.801** | | | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **1.717** |
| **Min.** | **46.161** | **Min.** | **0.0055** | **Min.** | **0.0055** | **46.952** |
| **Max.** | **48.338** | **Max.** | **0.0056** | **Max.** | **0.0056** | **49.135** |
| **Number of Spec.** | **7** | | | **Number of Spec.** | | **7** |

## Laminate Filled Hole Tension Properties (FHT2) -- (CTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**



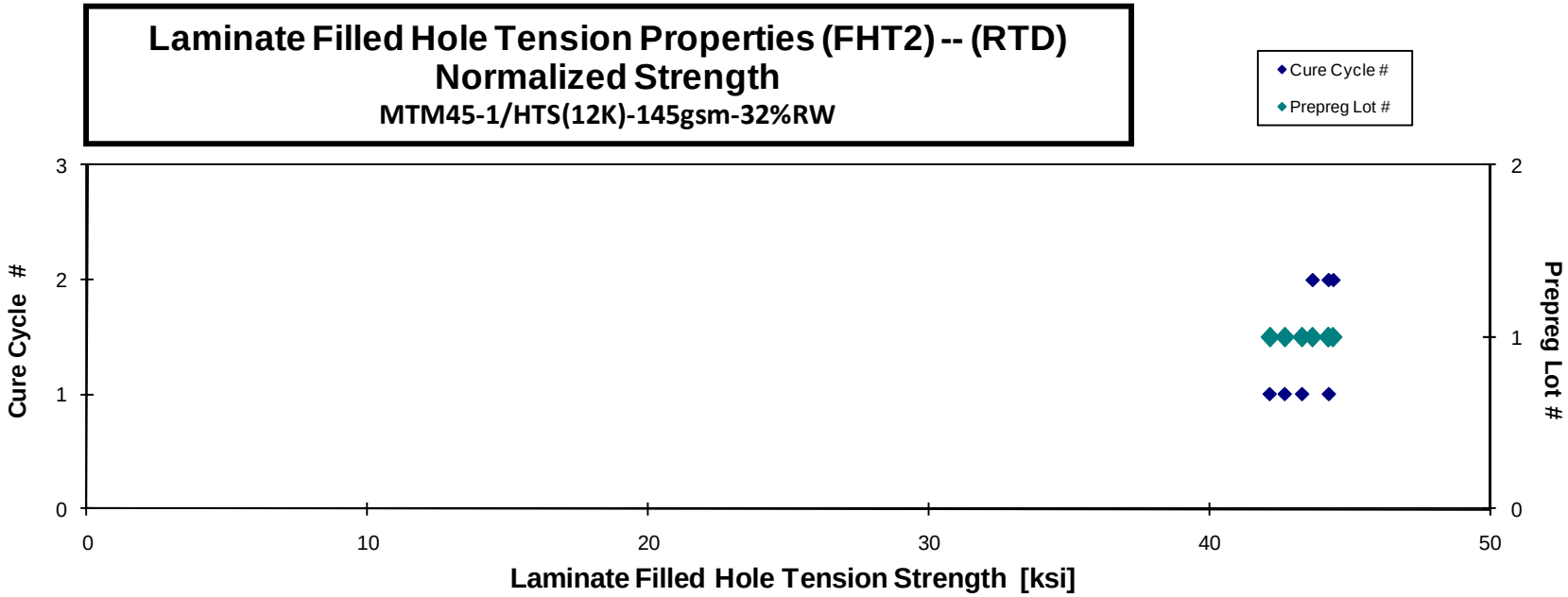
## Laminate Filled Hole Tension Properties (FHT2) -- (RTD) Strength

**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM5A111A | A | MH1 | 1 | 1 | 42.428 | 0.111 | 20 | 0.0055 | AGM/DGM | 0.0055 | 42.692 |
| ABM5A112A | A | MH1 | 1 | 1 | 42.526 | 0.112 | 20 | 0.0056 | AGM/DGM | 0.0056 | 43.306 |
| ABM5A113A | A | MH1 | 1 | 1 | 41.570 | 0.112 | 20 | 0.0056 | AGM/DGM | 0.0056 | 42.156 |
| ABM5A115A | A | MH1 | 1 | 1 | 43.184 | 0.113 | 20 | 0.0056 | AGM/DGM | 0.0056 | 44.258 |
| ABM5A211A | A | MH2 | 1 | 2 | 43.013 | 0.112 | 20 | 0.0056 | AGM/DGM | 0.0056 | 43.684 |
| ABM5A212A | A | MH2 | 1 | 2 | 43.749 | 0.111 | 20 | 0.0056 | AGM/DGM | 0.0056 | 44.253 |
| ABM5A213A | A | MH2 | 1 | 2 | 43.870 | 0.111 | 20 | 0.0056 | AGM/DGM | 0.0056 | 44.422 |

| | Strength [ksi] | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|
| **Average** | **42.906** | **0.0056** | **43.539** |
| **Standard Dev.** | **0.805** | | **0.867** |
| **Coeff. of Var. [%]** | **1.876** | | **1.992** |
| **Min.** | **41.570** | **0.0055** | **42.156** |
| **Max.** | **43.870** | **0.0056** | **44.422** |
| **Number of Spec.** | **7** | | **7** |


Laminate Filled Hole Tension Properties (FHT2) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
1
2
0
10
20
30
40
50
Laminate Filled Hole Tension Strength [ksi]

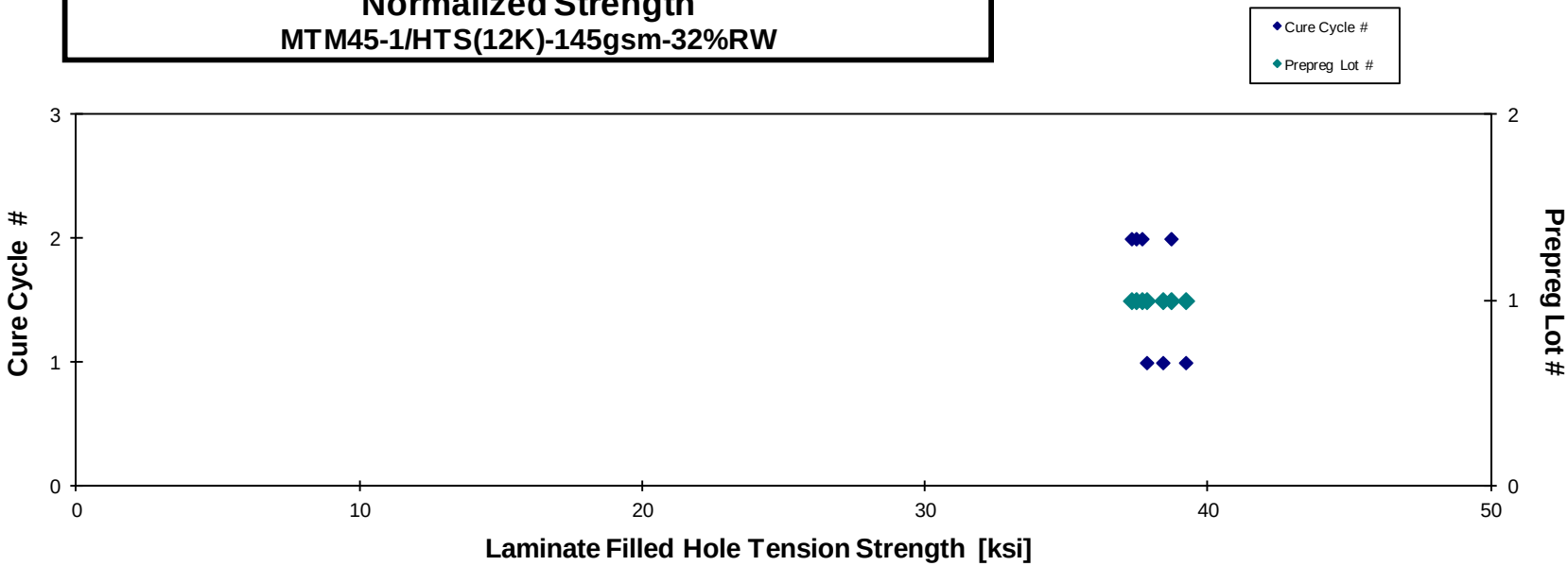
## Laminate Filled Hole Tension Properties (FHT2) -- (ETW2)
## Strength
### MTM45-1/HTS(12K)-145gsm-32%RW

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM5A11AD | A | MH1 | 1 | 1 | 37.011 | 0.112 | 20 | 0.0056 | AGM | 0.0056 | 37.824 |
| ABM5A11BD | A | MH1 | 1 | 1 | 38.470 | 0.112 | 20 | 0.0056 | AGM | 0.0056 | 39.205 |
| ABM5A11CD | A | MH1 | 1 | 1 | 37.427 | 0.113 | 20 | 0.0056 | AGM | 0.0056 | 38.397 |
| ABM5A21AD | A | MH2 | 1 | 2 | 38.345 | 0.111 | 20 | 0.0055 | AGM | 0.0055 | 38.688 |
| ABM5A21BD | A | MH2 | 1 | 2 | 36.931 | 0.111 | 20 | 0.0056 | AGM | 0.0056 | 37.289 |
| ABM5A21CD | A | MH2 | 1 | 2 | 37.370 | 0.111 | 20 | 0.0055 | AGM | 0.0055 | 37.659 |
| ABM5A21DD | A | MH2 | 1 | 2 | 36.981 | 0.111 | 20 | 0.0056 | AGM | 0.0056 | 37.452 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **37.505** | **Average** | **0.0056** | **$Average_{norm}$** | **0.0056** | **38.073** |
| **Standard Dev.** | **0.647** | | | **$Standard\ Dev._{norm}$** | | **0.707** |
| **Coeff. of Var. [%]** | **1.724** | | | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **1.856** |
| **Min.** | **36.931** | **Min.** | **0.0055** | **Min.** | **0.0055** | **37.289** |
| **Max.** | **38.470** | **Max.** | **0.0056** | **Max.** | **0.0056** | **39.205** |
| **Number of Spec.** | **7** | | | **Number of Spec.** | | **7** |

## Laminate Filled Hole Tension Properties (FHT2) -- (ETW2)
## Normalized Strength
### MTM45-1/HTS(12K)-145gsm-32%RW



## 4.21 Filled-Hole Tension 3 Properties

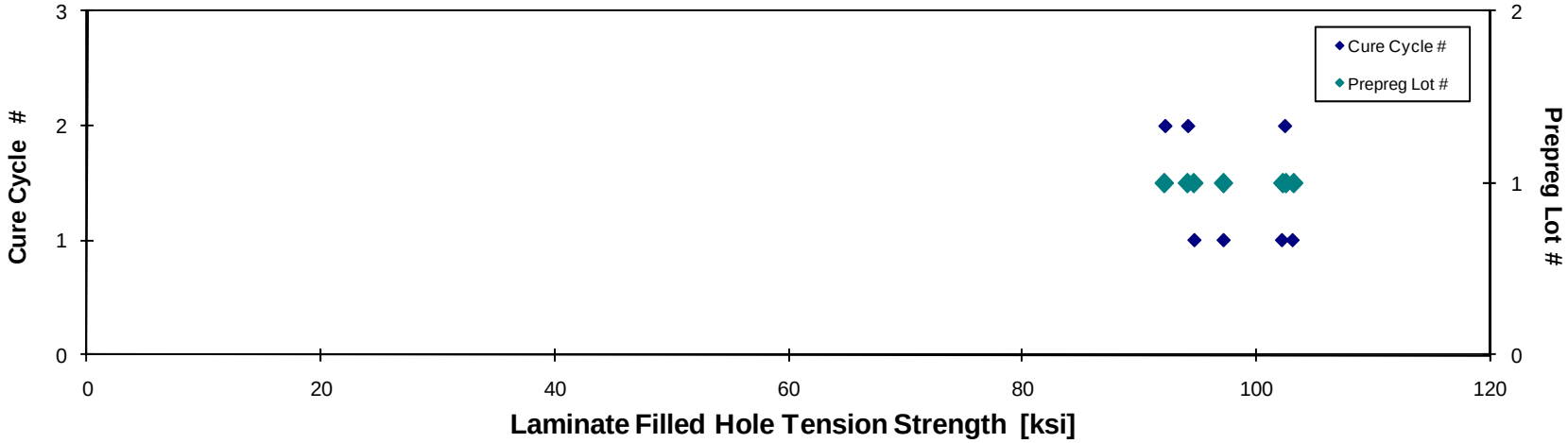
**Laminate Filled Hole Tension Properties (FHT3) -- (CTD)**
**Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.005500 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM6A116B | A | MH1 | 1 | 1 | 102.227 | 0.111 | 20 | 0.0056 | LGM | 0.0056 | 103.203 |
| ABM6A117B | A | MH1 | 1 | 1 | 94.072 | 0.111 | 20 | 0.0055 | LGM | 0.0055 | 94.727 |
| ABM6A118B | A | MH1 | 1 | 1 | 100.428 | 0.112 | 20 | 0.0056 | AGM / DGM | 0.0056 | 102.284 |
| ABM6A119B | A | MH1 | 1 | 1 | 96.458 | 0.111 | 20 | 0.0055 | LGM | 0.0055 | 97.247 |
| ABM6A215B | A | MH2 | 1 | 2 | 102.152 | 0.110 | 20 | 0.0055 | LGM | 0.0055 | 102.554 |
| ABM6A216B | A | MH2 | 1 | 2 | 91.078 | 0.111 | 20 | 0.0056 | DGM | 0.0056 | 92.223 |
| ABM6A217B | A | MH2 | 1 | 2 | 92.645 | 0.112 | 20 | 0.0056 | LGM | 0.0056 | 94.189 |

| | Strength [ksi] | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|
| Average | 97.008 | 0.0056 | 98.061 |
| Standard Dev. | 4.628 | | 4.570 |
| Coeff. of Var. [%] | 4.771 | | 4.660 |
| Min. | 91.078 | 0.0055 | 92.223 |
| Max. | 102.227 | 0.0056 | 103.203 |
| Number of Spec. | 7 | | 7 |

## Laminate Filled Hole Tension Properties (FHT3) -- (CTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**



## Laminate Filled Hole Tension Properties (FHT3) -- (RTD) Strength

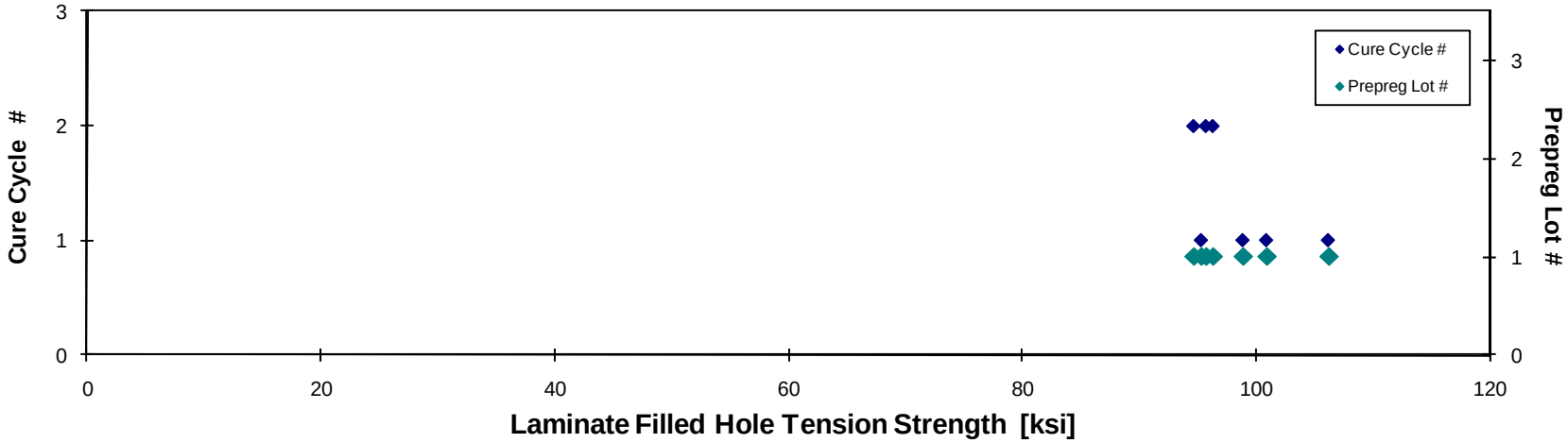
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.005500

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM6A111A | A | MH1 | 1 | 1 | 105.220 | 0.111 | 20 | 0.0056 | LGM | 0.0056 | 106.209 |
| ABM6A112A | A | MH1 | 1 | 1 | 99.946 | 0.111 | 20 | 0.0056 | LGM | 0.0056 | 100.916 |
| ABM6A113A | A | MH1 | 1 | 1 | 92.883 | 0.113 | 20 | 0.0056 | LGM | 0.0056 | 95.332 |
| ABM6A114A | A | MH1 | 1 | 1 | 98.343 | 0.111 | 20 | 0.0055 | LGM | 0.0055 | 98.895 |
| ABM6A211A | A | MH2 | 1 | 2 | 94.375 | 0.110 | 20 | 0.0055 | LGM | 0.0055 | 94.690 |
| ABM6A212A | A | MH2 | 1 | 2 | 96.112 | 0.110 | 20 | 0.0055 | LGM | 0.0055 | 96.330 |
| ABM6A213A | A | MH2 | 1 | 2 | 94.597 | 0.111 | 20 | 0.0056 | LGM | 0.0056 | 95.744 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **97.354** | **Average** | **0.0056** | **$Average_{norm}$** | **98.302** |
| **Standard Dev.** | **4.234** | | | **$Standard\ Dev._{norm}$** | **4.123** |
| **Coeff. of Var. [%]** | **4.350** | | | **Coeff. of Var. $[\%]_{norm}$** | **4.194** |
| **Min.** | **92.883** | **Min.** | **0.0055** | **Min.** | **94.690** |
| **Max.** | **105.220** | **Max.** | **0.0056** | **Max.** | **106.209** |
| **Number of Spec.** | **7** | | | **Number of Spec.** | **7** |

## Laminate Filled Hole Tension Properties (FHT3) -- (RTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**



## 4.22 Open-Hole Compression 1 Properties

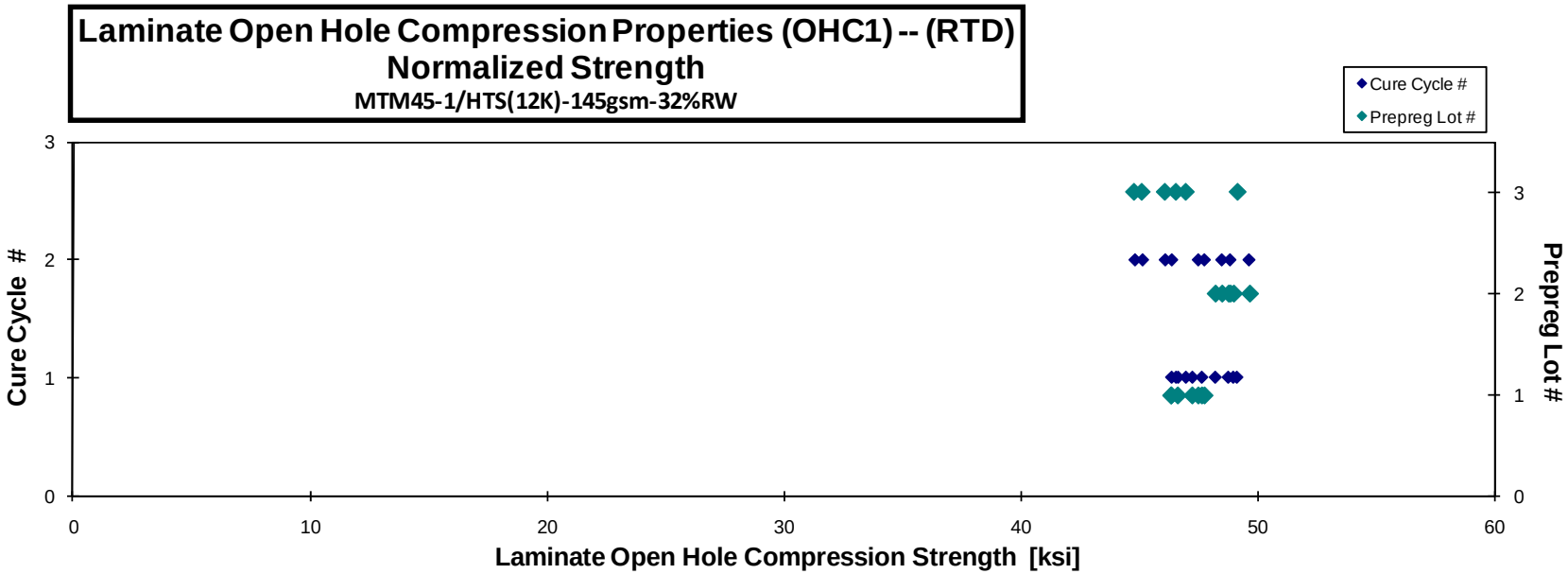
**Laminate Open Hole Compression Properties (OHC1) -- (RTD)**
**Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMGA111A | A | MH1 | 1 | 1 | 46.518 | 0.134 | 24 | LGM | 0.0056 | 47.252 |
| ABMGA112A | A | MH1 | 1 | 1 | 45.506 | 0.135 | 24 | LGM | 0.0056 | 46.368 |
| ABMGA113A | A | MH1 | 1 | 1 | 46.482 | 0.135 | 24 | LGM | 0.0056 | 47.656 |
| ABMGA211A | A | MH2 | 1 | 1 | 46.459 | 0.133 | 24 | LGM | 0.0055 | 46.647 |
| ABMGA212A | A | MH2 | 1 | 2 | 47.109 | 0.134 | 24 | LGM | 0.0056 | 47.763 |
| ABMGA213A | A | MH2 | 1 | 2 | 46.633 | 0.134 | 24 | LGM | 0.0056 | 47.504 |
| ABMGA214A | A | MH2 | 1 | 2 | 45.612 | 0.134 | 24 | LGM | 0.0056 | 46.373 |
| ABMGB111A | B | MH1 | 2 | 1 | 47.152 | 0.137 | 24 | LGM | 0.0057 | 48.998 |
| ABMGB112A | B | MH1 | 2 | 1 | 45.796 | 0.139 | 24 | LGM | 0.0058 | 48.230 |
| ABMGB113A | B | MH1 | 2 | 1 | 46.197 | 0.139 | 24 | LGM | 0.0058 | 48.781 |
| ABMGB211A | B | MH2 | 2 | 2 | 47.554 | 0.136 | 24 | LGM | 0.0057 | 48.857 |
| ABMGB212A | B | MH2 | 2 | 2 | 47.967 | 0.137 | 24 | LGM | 0.0057 | 49.669 |
| ABMGB213A | B | MH2 | 2 | 2 | 46.764 | 0.137 | 24 | LGM | 0.0057 | 48.506 |
| ABMGC111A | C | MH1 | 3 | 1 | 48.805 | 0.133 | 24 | LGM | 0.0055 | 49.150 |
| ABMGC112A | C | MH1 | 3 | 1 | 46.553 | 0.133 | 24 | LGM | 0.0056 | 46.977 |
| ABMGC113A | C | MH1 | 3 | 1 | 45.916 | 0.134 | 24 | LGM | 0.0056 | 46.559 |
| ABMGC211A | C | MH2 | 3 | 2 | 46.556 | 0.131 | 24 | LGM | 0.0054 | 46.098 |
| ABMGC212A | C | MH2 | 3 | 2 | 45.142 | 0.132 | 24 | LGM | 0.0055 | 45.131 |
| ABMGC213A | C | MH2 | 3 | 2 | 44.938 | 0.132 | 24 | LGM | 0.0055 | 44.807 |

| | | |
|---|---|---|
| **Average** | **46.508** | |
| **Standard Dev.** | **0.956** | |
| **Coeff. of Var. [%]** | **2.056** | |
| **Min.** | **44.938** | |
| **Max.** | **48.805** | |
| **Number of Spec.** | **19** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **47.438** |
| **$Standard\ Dev._{norm}$** | | **1.375** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **2.899** |
| **Min.** | **0.0054** | **44.807** |
| **Max.** | **0.0058** | **49.669** |
| **Number of Spec.** | | **19** |


Laminate Open Hole Compression Properties (OHC1) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
10
20
30
40
50
60
Laminate Open Hole Compression Strength [ksi]

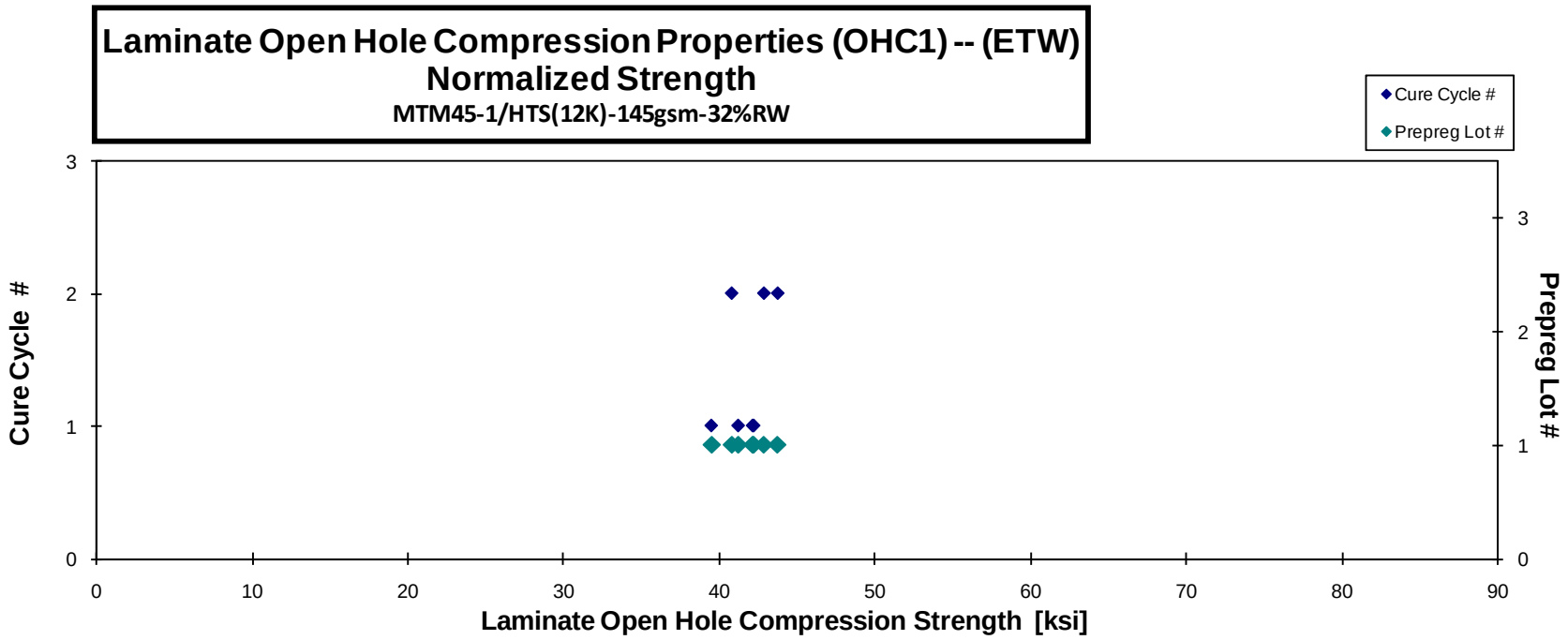
## Laminate Open Hole Compression Properties (OHC1) -- (ETW)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMGA115N | A | MH1 | 1 | 1 | 41.657 | 0.134 | 24 | LGM | 0.0056 | 42.194 |
| ABMGA116N | A | MH1 | 1 | 1 | 39.298 | 0.133 | 24 | LGM | 0.0055 | 39.467 |
| ABMGA117N | A | MH1 | 1 | 1 | 40.579 | 0.134 | 24 | LGM | 0.0056 | 41.194 |
| ABMGA118N | A | MH1 | 1 | 1 | 41.555 | 0.134 | 24 | LGM | 0.0056 | 42.127 |
| ABMGA216N | A | MH2 | 1 | 2 | 42.777 | 0.135 | 24 | LGM | 0.0056 | 43.743 |
| ABMGA217N | A | MH2 | 1 | 2 | 42.448 | 0.133 | 24 | LGM | 0.0056 | 42.855 |
| ABMGA218N | A | MH2 | 1 | 2 | 40.055 | 0.134 | 24 | LGM | 0.0056 | 40.778 |

| | Strength [ksi] |
|---|---|
| Average | 41.196 |
| Standard Dev. | 1.271 |
| Coeff. of Var. [%] | 3.085 |
| Min. | 39.298 |
| Max. | 42.777 |
| Number of Spec. | 7 |

| | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|
| $Average_{norm}$ | 0.0056 | 41.765 |
| $Standard\ Dev._{norm}$ | | 1.414 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 3.386 |
| Min. | 0.0055 | 39.467 |
| Max. | 0.0056 | 43.743 |
| Number of Spec. | | 7 |


Laminate Open Hole Compression Properties (OHC1) -- (ETW)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
10
20
30
40
50
60
70
80
90
Laminate Open Hole Compression Strength [ksi]

## Laminate Open Hole Compression Properties (OHC1) -- (ETW2) Strength

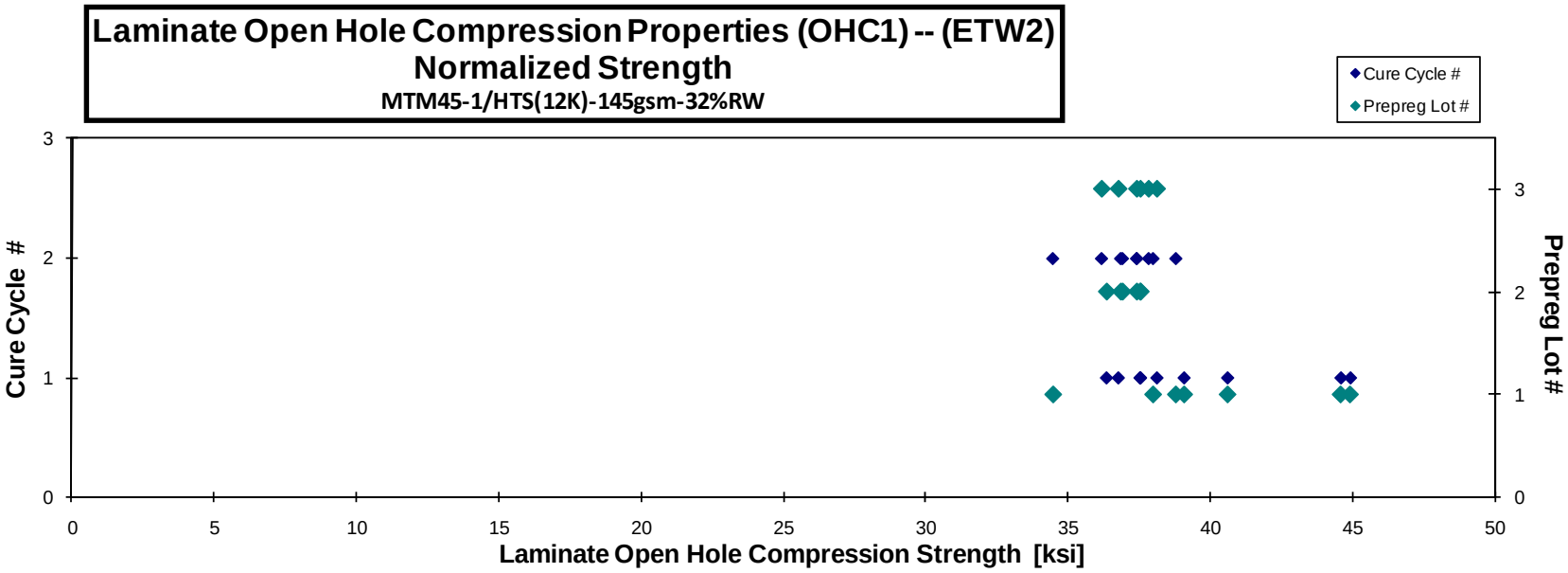
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMGA11AD | A | MH1 | 1 | 1 | 38.736 | 0.133 | 24 | LGM | 0.0056 | 39.102 |
| ABMGA11BD | A | MH1 | 1 | 1 | 44.109 | 0.134 | 24 | LGM | 0.0056 | 44.610 |
| ABMGA11CD | A | MH1 | 1 | 1 | 40.179 | 0.133 | 24 | LGM | 0.0056 | 40.631 |
| ABMGA11DD | A | MH1 | 1 | 1 | 43.993 | 0.135 | 24 | LGM | 0.0056 | 44.942 |
| ABMGA21AD | A | MH2 | 1 | 2 | 38.175 | 0.134 | 24 | LGM | 0.0056 | 38.811 |
| ABMGA21BD | A | MH2 | 1 | 2 | 37.333 | 0.134 | 24 | LGM | 0.0056 | 38.011 |
| ABMGA21CD | A | MH2 | 1 | 2 | 33.107 | 0.138 | 24 | LGM | 0.0057 | 34.490 |
| ABMGB115D | B | MH1 | 2 | 1 | 34.479 | 0.139 | 24 | LGM | 0.0058 | 36.378 |
| ABMGB116D | B | MH1 | 2 | 1 | 35.786 | 0.139 | 24 | LGM | 0.0058 | 37.571 |
| ABMGB117D | B | MH1 | 2 | 1 | 35.944 | 0.138 | 24 | LGM | 0.0057 | 37.556 |
| ABMGB216D | B | MH2 | 2 | 2 | 35.216 | 0.138 | 24 | LGM | 0.0058 | 36.874 |
| ABMGB217D | B | MH2 | 2 | 2 | 35.356 | 0.138 | 24 | LGM | 0.0057 | 36.937 |
| ABMGB218D | B | MH2 | 2 | 2 | 35.946 | 0.137 | 24 | LGM | 0.0057 | 37.439 |
| ABMGC116D | C | MH1 | 3 | 1 | 36.252 | 0.134 | 24 | LGM | 0.0056 | 36.792 |
| ABMGC117D | C | MH1 | 3 | 1 | 37.612 | 0.134 | 24 | LGM | 0.0056 | 38.148 |
| ABMGC118D | C | MH1 | 3 | 1 | 37.229 | 0.133 | 24 | LGM | 0.0056 | 37.568 |
| ABMGC216D | C | MH2 | 3 | 2 | 37.693 | 0.133 | 24 | LGM | 0.0055 | 37.855 |
| ABMGC217D | C | MH2 | 3 | 2 | 37.393 | 0.132 | 24 | LGM | 0.0055 | 37.440 |
| ABMGC218D | C | MH2 | 3 | 2 | 36.011 | 0.133 | 24 | LGM | 0.0055 | 36.202 |

| | | |
|---|---|---|
| **Average** | **37.397** | |
| **Standard Dev.** | **2.836** | |
| **Coeff. of Var. [%]** | **7.583** | |
| **Min.** | **33.107** | |
| **Max.** | **44.109** | |
| **Number of Spec.** | **19** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **38.282** |
| **$Standard\ Dev._{norm}$** | | **2.608** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **6.813** |
| **Min.** | **0.0055** | **34.490** |
| **Max.** | **0.0058** | **44.942** |
| **Number of Spec.** | | **19** |


Laminate Open Hole Compression Properties (OHC1) -- (ETW2)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Compression Strength [ksi]
0
1
2
3
0
5
10
15
20
25
30
35
40
45
50

## 4.23 Open-Hole Compression 2 Properties

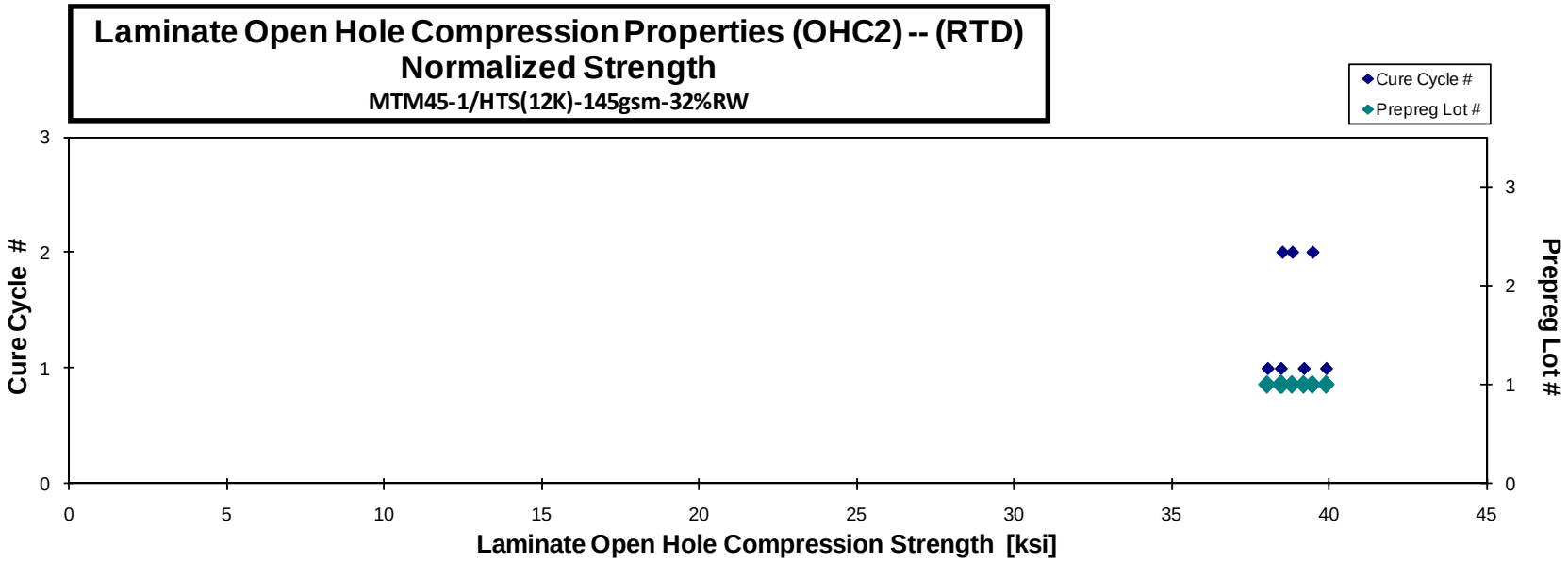
**Laminate Open Hole Compression Properties (OHC2) -- (RTD)**
**Strength**
MTM45-1/HTS(12K)-145gsm-32%RW

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMHA111A | A | MH1 | 1 | 1 | 38.013 | 0.111 | 20 | LGM | 0.0056 | 38.474 |
| ABMHA112A | A | MH1 | 1 | 1 | 39.638 | 0.111 | 20 | LGM | 0.0055 | 39.926 |
| ABMHA113A | A | MH1 | 1 | 1 | 38.821 | 0.111 | 20 | LGM | 0.0056 | 39.209 |
| ABMHA114A | A | MH1 | 1 | 1 | 37.131 | 0.113 | 20 | LGM | 0.0056 | 38.048 |
| ABMHA211A | A | MH2 | 1 | 2 | 38.098 | 0.111 | 20 | LGM | 0.0056 | 38.519 |
| ABMHA212A | A | MH2 | 1 | 2 | 39.098 | 0.111 | 20 | LGM | 0.0056 | 39.489 |
| ABMHA213A | A | MH2 | 1 | 2 | 38.652 | 0.111 | 20 | LGM | 0.0055 | 38.839 |

| | Strength [ksi] |
|---|---|
| Average | 38.493 |
| Standard Dev. | 0.822 |
| Coeff. of Var. [%] | 2.135 |
| Min. | 37.131 |
| Max. | 39.638 |
| Number of Spec. | 7 |

| | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|
| $Average_{norm}$ | 0.0056 | 38.929 |
| $Standard\ Dev._{norm}$ | | 0.651 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 1.673 |
| Min. | 0.0055 | 38.048 |
| Max. | 0.0056 | 39.926 |
| Number of Spec. | | 7 |


Laminate Open Hole Compression Properties (OHC2) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
5
10
15
20
25
30
35
40
45
Laminate Open Hole Compression Strength [ksi]

## Laminate Open Hole Compression Properties (OHC2) -- (ETW2) Strength

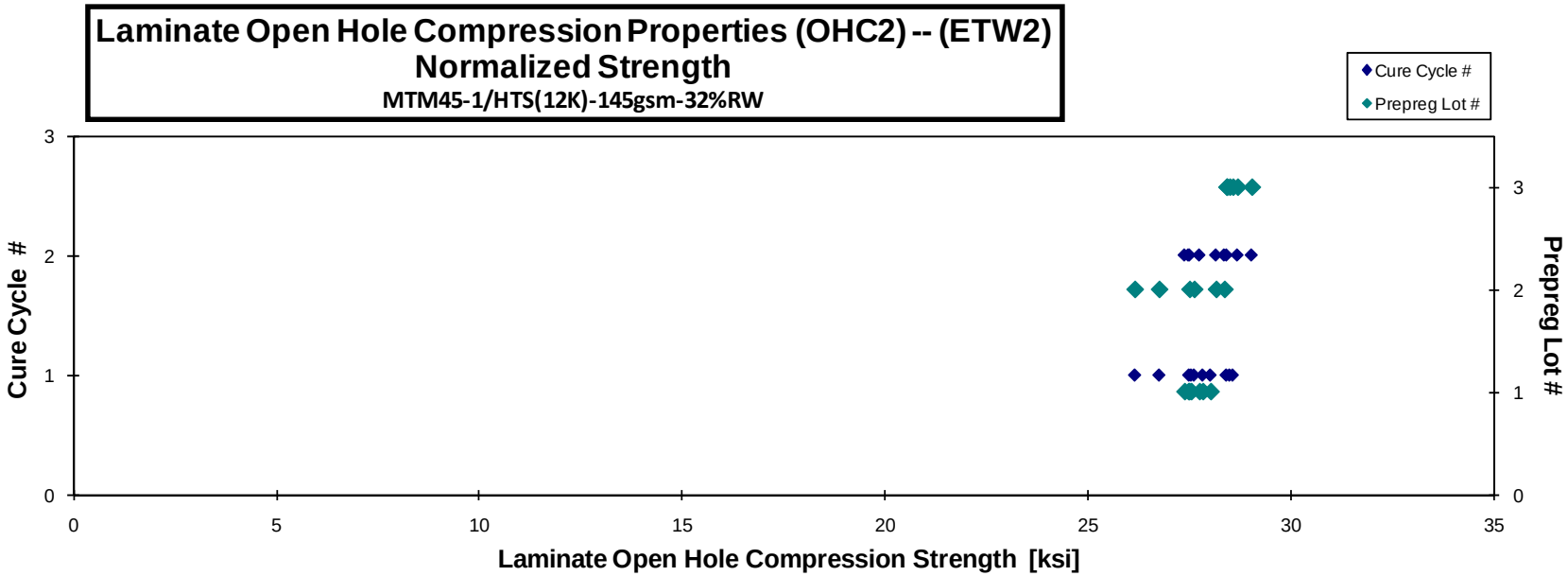
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMHA115D | A | MH1 | 1 | 1 | 27.289 | 0.113 | 20 | AGM | 0.0056 | 28.017 |
| ABMHA116D | A | MH1 | 1 | 1 | 27.243 | 0.111 | 20 | AGM / LGM | 0.0056 | 27.540 |
| ABMHA117D | A | MH1 | 1 | 1 | 27.176 | 0.113 | 20 | AGM / LGM | 0.0056 | 27.826 |
| ABMHA215D | A | MH2 | 1 | 1 | 27.469 | 0.110 | 20 | AGM / LGM | 0.0055 | 27.490 |
| ABMHA216D | A | MH2 | 1 | 2 | 27.835 | 0.110 | 20 | AGM / LGM | 0.0055 | 27.742 |
| ABMHA217D | A | MH2 | 1 | 2 | 27.365 | 0.110 | 20 | LGM | 0.0055 | 27.378 |
| ABMHA218D | A | MH2 | 1 | 2 | 27.336 | 0.111 | 20 | AGM / LGM | 0.0055 | 27.472 |
| ABMHB111D | B | MH1 | 2 | 1 | 27.025 | 0.109 | 20 | LGM | 0.0054 | 26.755 |
| ABMHB112D | B | MH1 | 2 | 1 | 27.656 | 0.110 | 20 | LGM / AGM | 0.0055 | 27.614 |
| ABMHB113D | B | MH1 | 2 | 1 | 26.423 | 0.109 | 20 | LGM / AGM | 0.0054 | 26.155 |
| ABMHB211D | B | MH2 | 2 | 2 | 26.921 | 0.115 | 20 | LGM | 0.0058 | 28.152 |
| ABMHB212D | B | MH2 | 2 | 2 | 27.305 | 0.114 | 20 | LGM | 0.0057 | 28.356 |
| ABMHB213D | B | MH2 | 2 | 2 | 26.278 | 0.115 | 20 | LGM | 0.0058 | 27.501 |
| ABMHC111D | C | MH1 | 3 | 1 | 28.142 | 0.111 | 20 | LGM | 0.0056 | 28.410 |
| ABMHC112D | C | MH1 | 3 | 1 | 28.410 | 0.110 | 20 | LGM | 0.0055 | 28.487 |
| ABMHC113D | C | MH1 | 3 | 1 | 28.333 | 0.111 | 20 | LGM / AGM | 0.0055 | 28.565 |
| ABMHC211D | C | MH2 | 3 | 2 | 28.647 | 0.111 | 20 | LGM / AGM | 0.0056 | 29.029 |
| ABMHC212D | C | MH2 | 3 | 2 | 28.291 | 0.110 | 20 | LGM / AGM | 0.0055 | 28.416 |
| ABMHC213D | C | MH2 | 3 | 2 | 28.428 | 0.111 | 20 | LGM / AGM | 0.0055 | 28.678 |

| | | |
|---|---|---|
| **Average** | **27.556** | |
| **Standard Dev.** | **0.680** | |
| **Coeff. of Var. [%]** | **2.468** | |
| **Min.** | **26.278** | |
| **Max.** | **28.647** | |
| **Number of Spec.** | **19** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **27.873** |
| **$Standard\ Dev._{norm}$** | | **0.701** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **2.515** |
| **Min.** | **0.0054** | **26.155** |
| **Max.** | **0.0058** | **29.029** |
| **Number of Spec.** | | **19** |


Laminate Open Hole Compression Properties (OHC2) -- (ETW2)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
5
10
15
20
25
30
35
Laminate Open Hole Compression Strength [ksi]

## 4.24 Open-Hole Compression 3 Properties

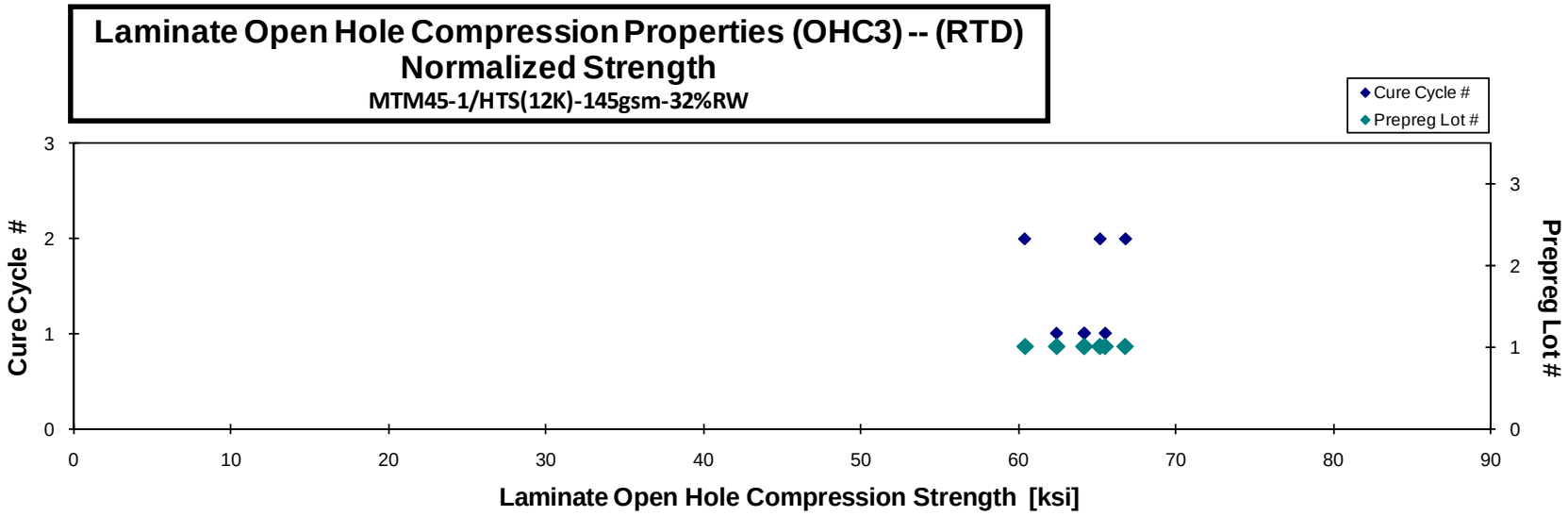
**Laminate Open Hole Compression Properties (OHC3) -- (RTD) Strength**
MTM45-1/HTS(12K)-145gsm-32%RW

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMIA111A | A | MH1 | 1 | 1 | 63.841 | 0.113 | 20 | LGM | 0.0056 | 65.524 |
| ABMIA112A | A | MH1 | 1 | 1 | 62.397 | 0.113 | 20 | LGM | 0.0057 | 64.183 |
| ABMIA113A | A | MH1 | 1 | 1 | 61.038 | 0.113 | 20 | LGM | 0.0056 | 62.444 |
| ABMIA114A | A | MH1 | 1 | 1 | 62.798 | 0.112 | 20 | LGM | 0.0056 | 64.206 |
| ABMIA211A | A | MH2 | 1 | 2 | 65.086 | 0.113 | 20 | LGM | 0.0056 | 66.802 |
| ABMIA212A | A | MH2 | 1 | 2 | 59.079 | 0.113 | 20 | LGM | 0.0056 | 60.431 |
| ABMIA214A | A | MH2 | 1 | 2 | 64.519 | 0.111 | 20 | LGM | 0.0056 | 65.194 |

| | |
|---|---|
| Average | 62.680 |
| Standard Dev. | 2.093 |
| Coeff. of Var. [%] | 3.339 |
| Min. | 59.079 |
| Max. | 65.086 |
| Number of Spec. | 7 |

| | | |
|---|---|---|
| $Average_{norm}$ | 0.0056 | 64.112 |
| $Standard\ Dev._{norm}$ | | 2.111 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 3.293 |
| Min. | 0.0056 | 60.431 |
| Max. | 0.0057 | 66.802 |
| Number of Spec. | | 7 |


Laminate Open Hole Compression Properties (OHC3) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
10
20
30
40
50
60
70
80
90
Laminate Open Hole Compression Strength [ksi]

## Laminate Open Hole Compression Properties (OHC3) -- (ETW2)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

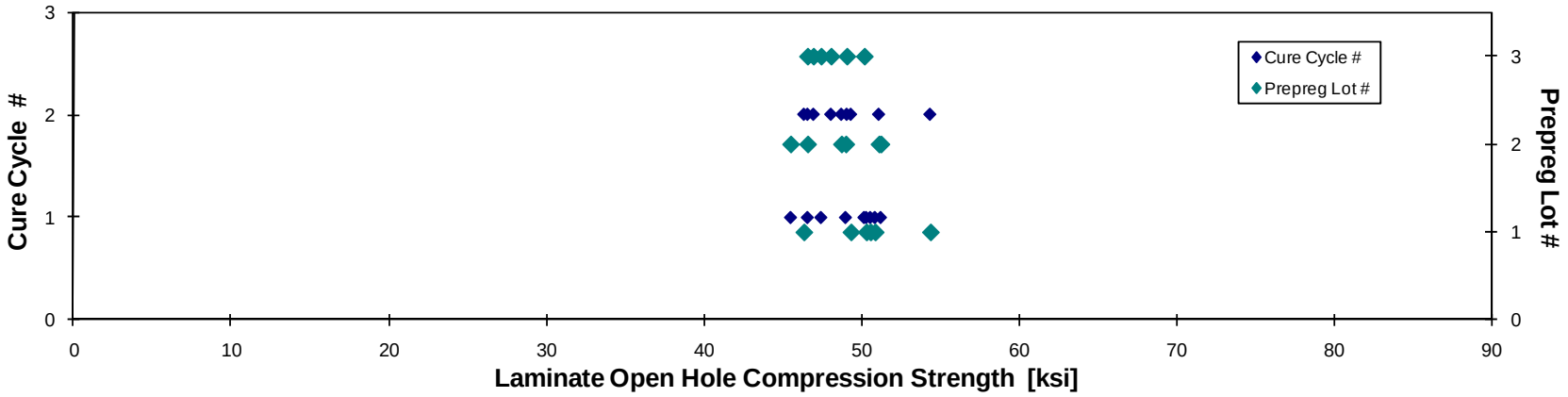
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Modes | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABMIA115D | A | MH1 | 1 | 1 | 49.645 | 0.113 | 20 | LGM | 0.0056 | 50.894 |
| ABMIA116D | A | MH1 | 1 | 1 | 49.213 | 0.113 | 20 | LGM | 0.0056 | 50.339 |
| ABMIA117D | A | MH1 | 1 | 1 | 49.590 | 0.112 | 20 | LGM | 0.0056 | 50.597 |
| ABMIA215D | A | MH2 | 1 | 2 | 45.602 | 0.112 | 20 | LGM | 0.0056 | 46.369 |
| ABMIA216D | A | MH2 | 1 | 2 | 53.384 | 0.112 | 20 | LGM | 0.0056 | 54.403 |
| ABMIA217D | A | MH2 | 1 | 2 | 48.390 | 0.112 | 20 | LGM | 0.0056 | 49.358 |
| ABMIB111D | B | MH1 | 2 | 1 | 48.011 | 0.112 | 20 | LGM | 0.0056 | 49.029 |
| ABMIB112D | B | MH1 | 2 | 1 | 44.533 | 0.112 | 20 | LGM | 0.0056 | 45.532 |
| ABMIB113D | B | MH1 | 2 | 1 | 49.674 | 0.114 | 20 | LGM | 0.0057 | 51.262 |
| ABMIB211D | B | MH2 | 2 | 2 | 50.322 | 0.112 | 20 | LGM | 0.0056 | 51.138 |
| ABMIB212D | B | MH2 | 2 | 2 | 45.802 | 0.112 | 20 | LGM | 0.0056 | 46.607 |
| ABMIB213D | B | MH2 | 2 | 2 | 47.774 | 0.112 | 20 | LGM | 0.0056 | 48.758 |
| ABMIC112D | C | MH1 | 3 | 1 | 47.298 | 0.110 | 20 | LGM | 0.0055 | 47.463 |
| ABMIC113D | C | MH1 | 3 | 1 | 50.358 | 0.110 | 20 | LGM | 0.0055 | 50.205 |
| ABMIC114D | C | MH1 | 3 | 1 | 46.707 | 0.110 | 20 | LGM | 0.0055 | 46.601 |
| ABMIC211D | C | MH2 | 3 | 2 | 48.410 | 0.109 | 20 | LGM | 0.0055 | 48.094 |
| ABMIC212D | C | MH2 | 3 | 2 | 47.553 | 0.109 | 20 | LGM | 0.0054 | 46.976 |
| ABMIC213D | C | MH2 | 3 | 2 | 49.798 | 0.108 | 20 | LGM | 0.0054 | 49.104 |

| | | |
|---|---|---|
| **Average** | **48.448** | |
| **Standard Dev.** | **2.092** | |
| **Coeff. of Var. [%]** | **4.318** | |
| **Min.** | **44.533** | |
| **Max.** | **53.384** | |
| **Number of Spec.** | **18** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **49.040** |
| **Standard $Dev._{norm}$** | | **2.251** |
| **Coeff. of Var. $[\%]_{norm}$** | | **4.590** |
| **Min.** | **0.0054** | **45.532** |
| **Max.** | **0.0057** | **54.403** |
| **Number of Spec.** | | **18** |

## Laminate Open Hole Compression Properties (OHC3) -- (ETW2)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**



## 4.25 Filled-Hole Compression 1 Properties

**Laminate Filled Hole Compression Properties (FHC1) -- (RTD)**
**Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

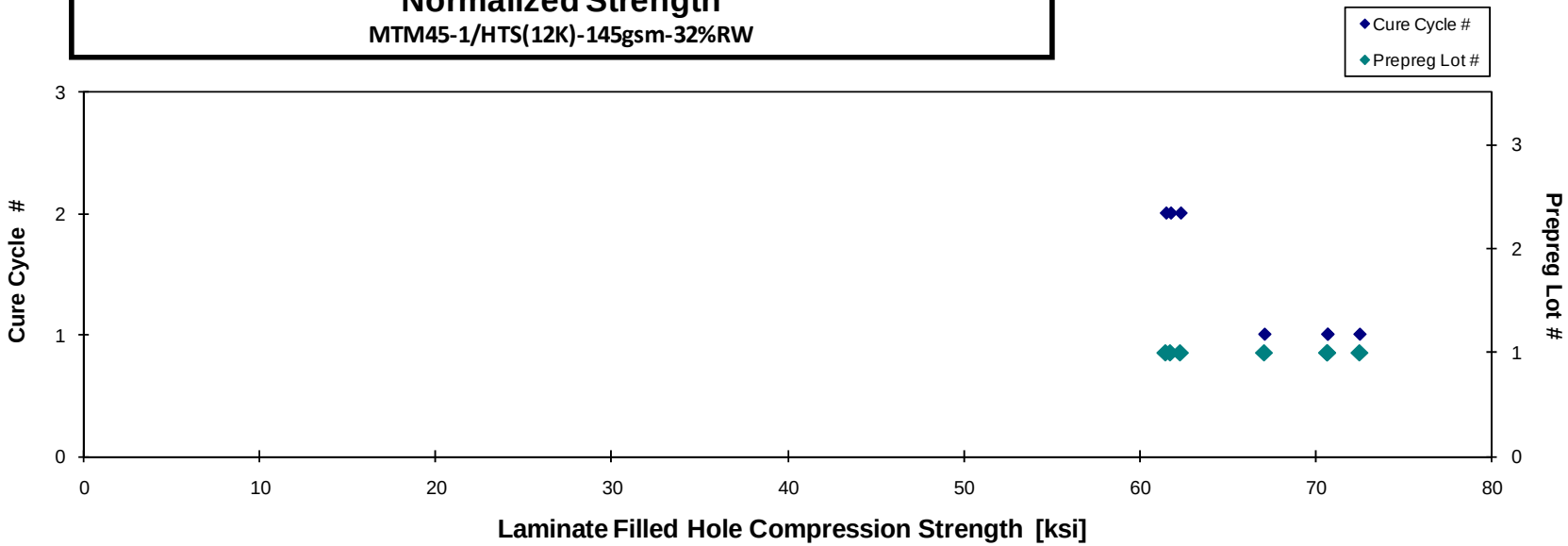
| normalizing $t_{ply}$ [in] |
|---|
| 0.00550 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABM7A111A | A | MH1 | 1 | 1 | 69.582 | 0.134 | 24 | LGM | 0.0056 | 70.654 |
| ABM7A112A | A | MH1 | 1 | 1 | 66.251 | 0.134 | 24 | LGM | 0.0056 | 67.080 |
| ABM7A113A | A | MH1 | 1 | 1 | 69.482 | 0.134 | 24 | LGM | 0.0056 | 70.658 |
| ABM7A114A | A | MH1 | 1 | 1 | 71.292 | 0.134 | 24 | LGM | 0.0056 | 72.480 |
| ABM7A211A | A | MH2 | 1 | 2 | 60.086 | 0.135 | 24 | LGM | 0.0056 | 61.497 |
| ABM7A212A | A | MH2 | 1 | 2 | 59.843 | 0.136 | 24 | LGM | 0.0057 | 61.762 |
| ABM7A213A | A | MH2 | 1 | 2 | 60.566 | 0.136 | 24 | LGM | 0.0057 | 62.325 |

| | Strength [ksi] |
|---|---|
| Average | 65.300 |
| Standard Dev. | 5.033 |
| Coeff. of Var. [%] | 7.708 |
| Min. | 59.843 |
| Max. | 71.292 |
| Number of Spec. | 7 |

| | $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|
| $Average_{norm}$ | 0.0056 | 66.637 |
| $Standard\ Dev._{norm}$ | | 4.751 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 7.129 |
| Min. | 0.0056 | 61.497 |
| Max. | 0.0057 | 72.480 |
| Number of Spec. | | 7 |

## Laminate Filled Hole Compression Properties (FHC1) -- (RTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**



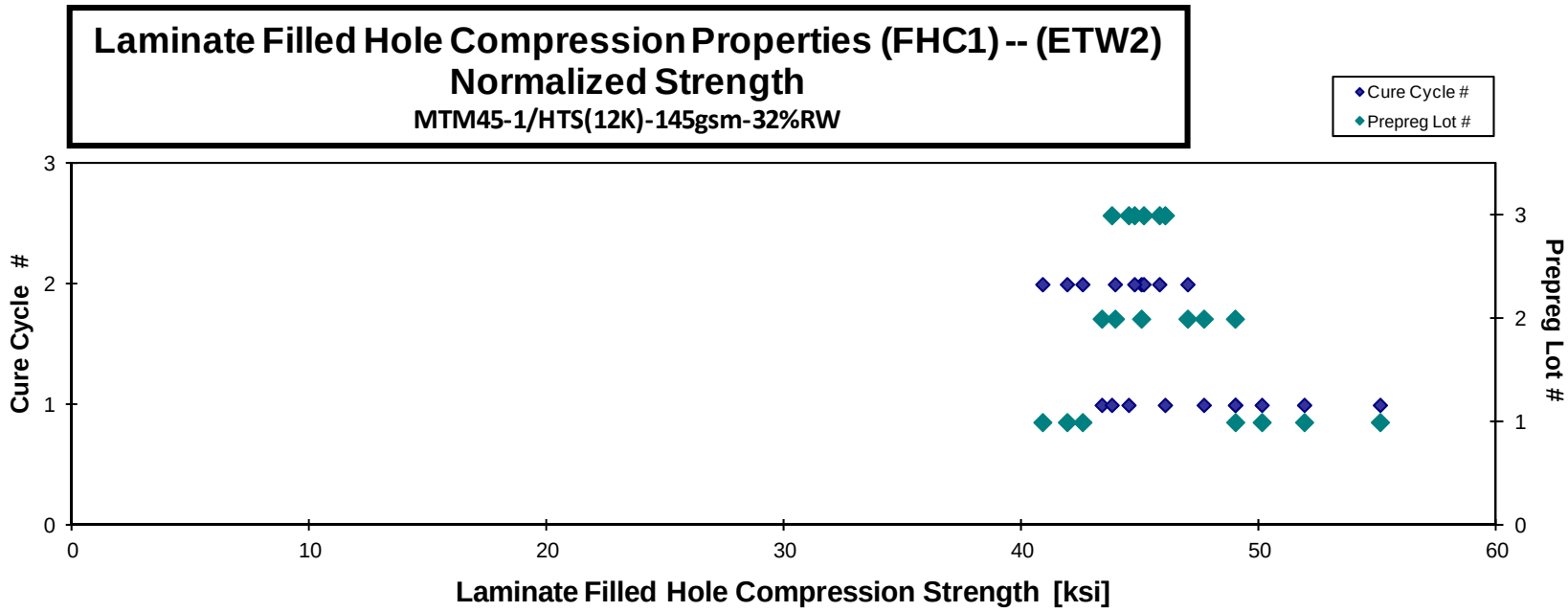
## Laminate Filled Hole Compression Properties (FHC1) -- (ETW2)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.00550

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABM7A115D | A | MH1 | 1 | 1 | 48.187 | 0.134 | 24 | LGM | 0.0056 | 48.978 |
| ABM7A116D | A | MH1 | 1 | 1 | 48.997 | 0.135 | 24 | LGM | 0.0056 | 50.092 |
| ABM7A117D | A | MH1 | 1 | 1 | 51.024 | 0.134 | 24 | LGM | 0.0056 | 51.881 |
| ABM7A118D | A | MH1 | 1 | 1 | 54.054 | 0.134 | 24 | LGM | 0.0056 | 55.071 |
| ABM7A215D | A | MH2 | 1 | 2 | 41.126 | 0.134 | 24 | AGM | 0.0056 | 41.889 |
| ABM7A216D | A | MH2 | 1 | 2 | 39.916 | 0.135 | 24 | LGM,AGM | 0.0056 | 40.853 |
| ABM7A218D | A | MH2 | 1 | 2 | 41.447 | 0.135 | 24 | LGM | 0.0056 | 42.540 |
| ABM7B111D | B | MH1 | 2 | 1 | 45.816 | 0.137 | 24 | LGO,LGM | 0.0057 | 47.650 |
| ABM7B112D | B | MH1 | 2 | 1 | 46.662 | 0.139 | 24 | AGF,LGM | 0.0058 | 48.966 |
| ABM7B113D | B | MH1 | 2 | 1 | 41.468 | 0.138 | 24 | LGM | 0.0058 | 43.353 |
| ABM7B211D | B | MH2 | 2 | 2 | 44.037 | 0.135 | 24 | LGM | 0.0056 | 45.016 |
| ABM7B212D | B | MH2 | 2 | 2 | 43.491 | 0.133 | 24 | LGM,AGM | 0.0056 | 43.909 |
| ABM7B213D | B | MH2 | 2 | 2 | 46.173 | 0.134 | 24 | AGO,AGM | 0.0056 | 46.966 |
| ABM7C114D | C | MH1 | 3 | 1 | 45.813 | 0.133 | 24 | LGM | 0.0055 | 46.015 |
| ABM7C115D | C | MH1 | 3 | 1 | 44.381 | 0.132 | 24 | LGM | 0.0055 | 44.482 |
| ABM7C116D | C | MH1 | 3 | 1 | 43.498 | 0.133 | 24 | LGM | 0.0055 | 43.773 |
| ABM7C211D | C | MH2 | 3 | 2 | 44.849 | 0.133 | 24 | LGM | 0.0055 | 45.115 |
| ABM7C212D | C | MH2 | 3 | 2 | 44.511 | 0.133 | 24 | LGM | 0.0055 | 44.724 |
| ABM7C214D | C | MH2 | 3 | 2 | 45.594 | 0.133 | 24 | LGM,LGO | 0.0055 | 45.778 |

| | | |
|---|---|---|
| **Average** | **45.318** | |
| **Standard Dev.** | **3.499** | |
| **Coeff. of Var. [%]** | **7.721** | |
| **Min.** | **39.916** | |
| **Max.** | **54.054** | |
| **Number of Spec.** | **19** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **46.160** |
| **$Standard\ Dev._{norm}$** | | **3.589** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **7.775** |
| **Min.** | **0.0055** | **40.853** |
| **Max.** | **0.0058** | **55.071** |
| **Number of Spec.** | | **19** |


Laminate Filled Hole Compression Properties (FHC1) -- (ETW2)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
10
20
30
40
50
60
Laminate Filled Hole Compression Strength [ksi]

## 4.26 Filled-Hole Compression 2 Properties

**Laminate Filled Hole Compression Properties (FHC2) -- (RTD) Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

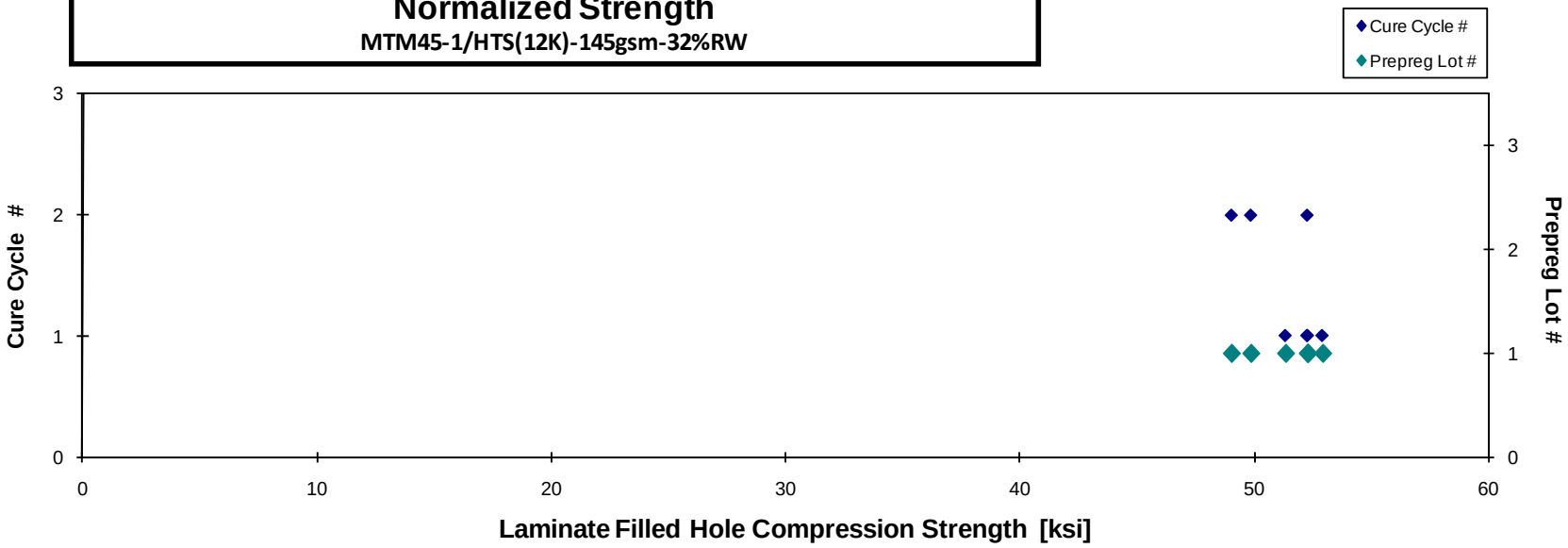
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABM8A111A | A | MH1 | 1 | 1 | 50.294 | 0.112 | 20 | LGM | 0.0056 | 51.330 |
| ABM8A112A | A | MH1 | 1 | 1 | 51.281 | 0.112 | 20 | LGM | 0.0056 | 52.260 |
| ABM8A113A | A | MH1 | 1 | 1 | 51.084 | 0.113 | 20 | LGM | 0.0056 | 52.283 |
| ABM8A114A | A | MH1 | 1 | 1 | 51.705 | 0.113 | 20 | LGM | 0.0056 | 52.911 |
| ABM8A212A | A | MH2 | 1 | 2 | 48.937 | 0.112 | 20 | LGM | 0.0056 | 49.849 |
| ABM8A213A | A | MH2 | 1 | 2 | 51.595 | 0.111 | 20 | LGM | 0.0056 | 52.268 |
| ABM8A214A | A | MH2 | 1 | 2 | 47.958 | 0.112 | 20 | LGM | 0.0056 | 49.019 |

| | | |
|---|---|---|
| Average | 50.408 | |
| Standard Dev. | 1.443 | |
| Coeff. of Var. [%] | 2.862 | |
| Min. | 47.958 | |
| Max. | 51.705 | |
| Number of Spec. | 7 | |

| | | |
|---|---|---|
| $Average_{norm}$ | 0.0056 | 51.417 |
| $Standard\ Dev._{norm}$ | | 1.451 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 2.822 |
| Min. | 0.0056 | 49.019 |
| Max. | 0.0056 | 52.911 |
| Number of Spec. | | 7 |

## Laminate Filled Hole Compression Properties (FHC2) -- (RTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**



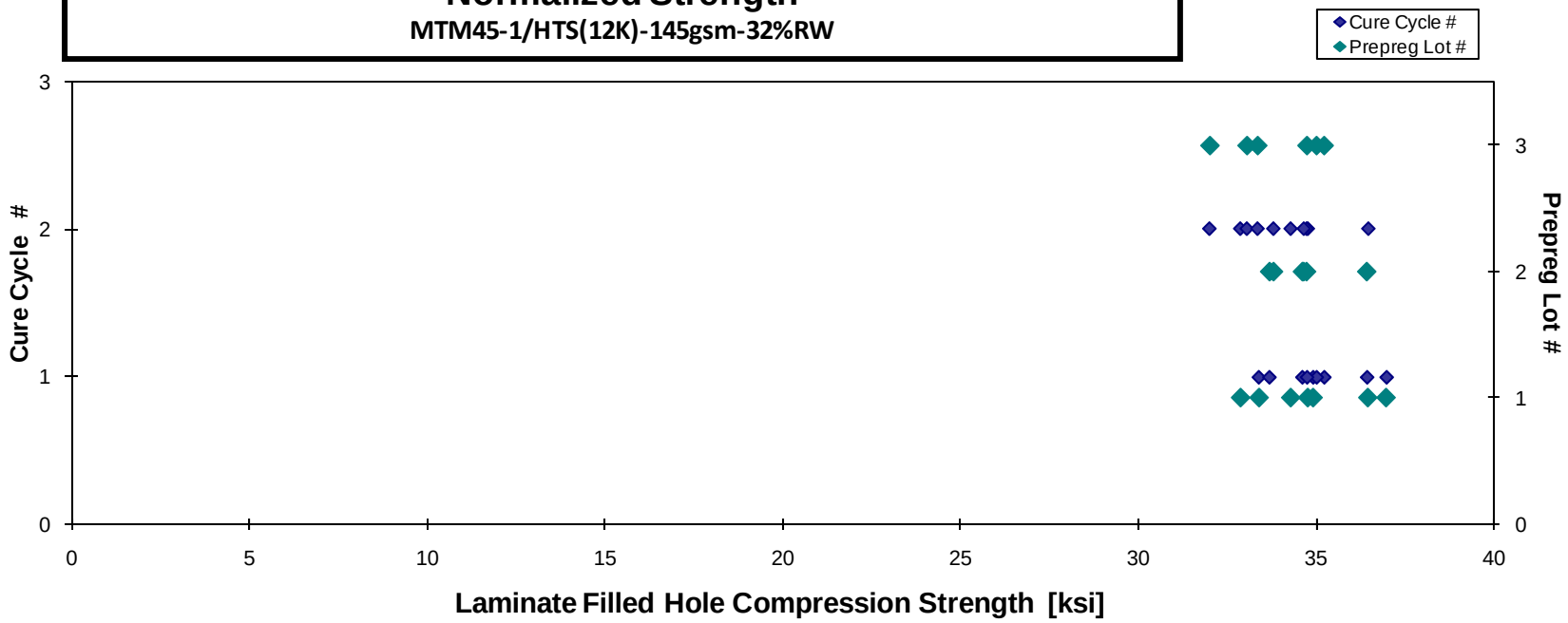
## Laminate Filled Hole Compression Properties (FHC2) -- (ETW2)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM8A115D | A | MH1 | 1 | 1 | 36.061 | 0.113 | 20 | 0.0056 | LGM / AGM | 0.0056 | 36.958 |
| ABM8A116D | A | MH1 | 1 | 1 | 32.334 | 0.114 | 20 | 0.0057 | LGM | 0.0057 | 33.377 |
| ABM8A117D | A | MH1 | 1 | 1 | 33.799 | 0.114 | 20 | 0.0057 | LGM | 0.0057 | 34.900 |
| ABM8A216D | A | MH2 | 1 | 2 | 33.352 | 0.113 | 20 | 0.0057 | AGM , LGM | 0.0057 | 34.267 |
| ABM8A217D | A | MH2 | 1 | 2 | 33.977 | 0.113 | 20 | 0.0056 | LGF , AGM , LGM | 0.0056 | 34.749 |
| ABM8A218D | A | MH2 | 1 | 2 | 35.739 | 0.112 | 20 | 0.0056 | AGM | 0.0056 | 36.443 |
| ABM8A219D | A | MH2 | 1 | 2 | 32.073 | 0.113 | 20 | 0.0056 | LGM , AGM | 0.0056 | 32.856 |
| ABM8B114D | B | MH1 | 2 | 1 | 34.994 | 0.114 | 20 | 0.0057 | AGM / LGM | 0.0057 | 36.410 |
| ABM8B115D | B | MH1 | 2 | 1 | 31.900 | 0.116 | 20 | 0.0058 | LGM | 0.0058 | 33.674 |
| ABM8B116D | B | MH1 | 2 | 1 | 33.354 | 0.114 | 20 | 0.0057 | LGM | 0.0057 | 34.597 |
| ABM8B214D | B | MH2 | 2 | 2 | 34.350 | 0.108 | 20 | 0.0054 | LGM , AGM | 0.0054 | 33.783 |
| ABM8B215D | B | MH2 | 2 | 2 | 35.478 | 0.108 | 20 | 0.0054 | AGM | 0.0054 | 34.715 |
| ABM8B216D | B | MH2 | 2 | 2 | 34.856 | 0.109 | 20 | 0.0055 | LGM , LGF, AGM | 0.0055 | 34.634 |
| ABM8C114D | C | MH1 | 3 | 1 | 34.618 | 0.112 | 20 | 0.0056 | LGM , AGM | 0.0056 | 35.211 |
| ABM8C115D | C | MH1 | 3 | 1 | 34.788 | 0.111 | 20 | 0.0055 | LGM , AGM | 0.0055 | 34.998 |
| ABM8C116D | C | MH1 | 3 | 1 | 34.098 | 0.112 | 20 | 0.0056 | LGM , AGM | 0.0056 | 34.728 |
| ABM8C211D | C | MH2 | 3 | 2 | 32.677 | 0.111 | 20 | 0.0056 | LGM , AGM | 0.0056 | 33.038 |
| ABM8C214D | C | MH2 | 3 | 2 | 33.038 | 0.111 | 20 | 0.0056 | LGM , AGM | 0.0056 | 33.339 |
| ABM8C216D | C | MH2 | 3 | 2 | 31.933 | 0.110 | 20 | 0.0055 | AGM | 0.0055 | 31.992 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **33.864** | **Average** | **0.0056** | **$Average_{norm}$** | **0.0056** | **34.456** |
| **Standard Dev.** | **1.306** | | | **$Standard\ Dev._{norm}$** | | **1.281** |
| **Coeff. of Var. [%]** | **3.856** | | | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **3.717** |
| **Min.** | **31.900** | **Min.** | **0.0054** | **Min.** | **0.0054** | **31.992** |
| **Max.** | **36.061** | **Max.** | **0.0058** | **Max.** | **0.0058** | **36.958** |
| **Number of Spec.** | **19** | | | **Number of Spec.** | | **19** |

## Laminate Filled Hole Compression Properties (FHC2) -- (ETW2)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**



## 4.27 Filled-Hole Compression 3 Properties

**Laminate Filled Hole Compression Properties (FHC3) -- (RTD) Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

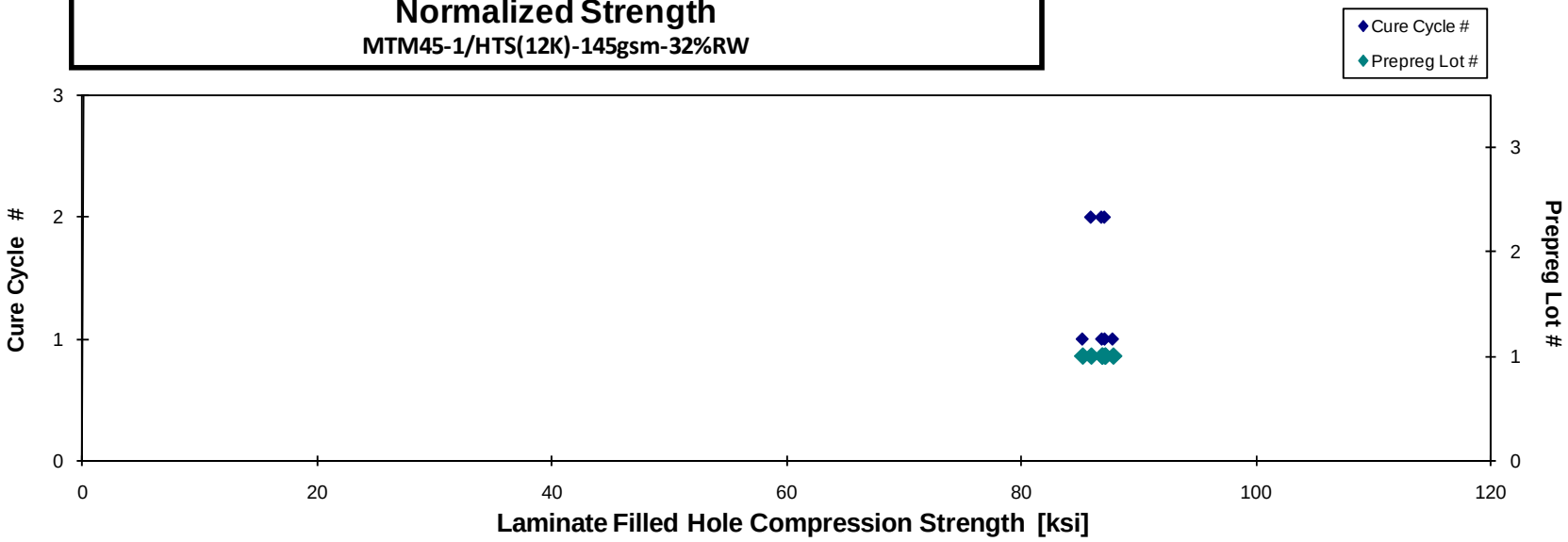
normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABM9A112A | A | MH1 | 1 | 1 | 85.412 | 0.112 | 20 | LGM | 0.0056 | 87.108 |
| ABM9A113A | A | MH1 | 1 | 1 | 86.003 | 0.112 | 20 | LGM | 0.0056 | 87.789 |
| ABM9A114A | A | MH1 | 1 | 1 | 83.808 | 0.112 | 20 | LGM | 0.0056 | 85.167 |
| ABM9A115A | A | MH1 | 1 | 1 | 85.310 | 0.112 | 20 | LGM | 0.0056 | 86.861 |
| ABM9A212A | A | MH2 | 1 | 2 | 84.662 | 0.113 | 20 | LGM | 0.0057 | 87.086 |
| ABM9A213A | A | MH2 | 1 | 2 | 86.690 | 0.110 | 20 | LGM | 0.0055 | 86.821 |
| ABM9A214A | A | MH2 | 1 | 2 | 84.619 | 0.112 | 20 | LGM | 0.0056 | 85.902 |

| | Strength [ksi] |
|---|---|
| Average | 85.215 |
| Standard Dev. | 0.956 |
| Coeff. of Var. [%] | 1.122 |
| Min. | 83.808 |
| Max. | 86.690 |
| Number of Spec. | 7 |

| | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|
| Average | 0.0056 | 86.676 |
| Standard Dev. | | 0.868 |
| Coeff. of Var. [%] | | 1.002 |
| Min. | 0.0055 | 85.167 |
| Max. | 0.0057 | 87.789 |
| Number of Spec. | | 7 |

## Laminate Filled Hole Compression Properties (FHC3) -- (RTD)
## Normalized Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**



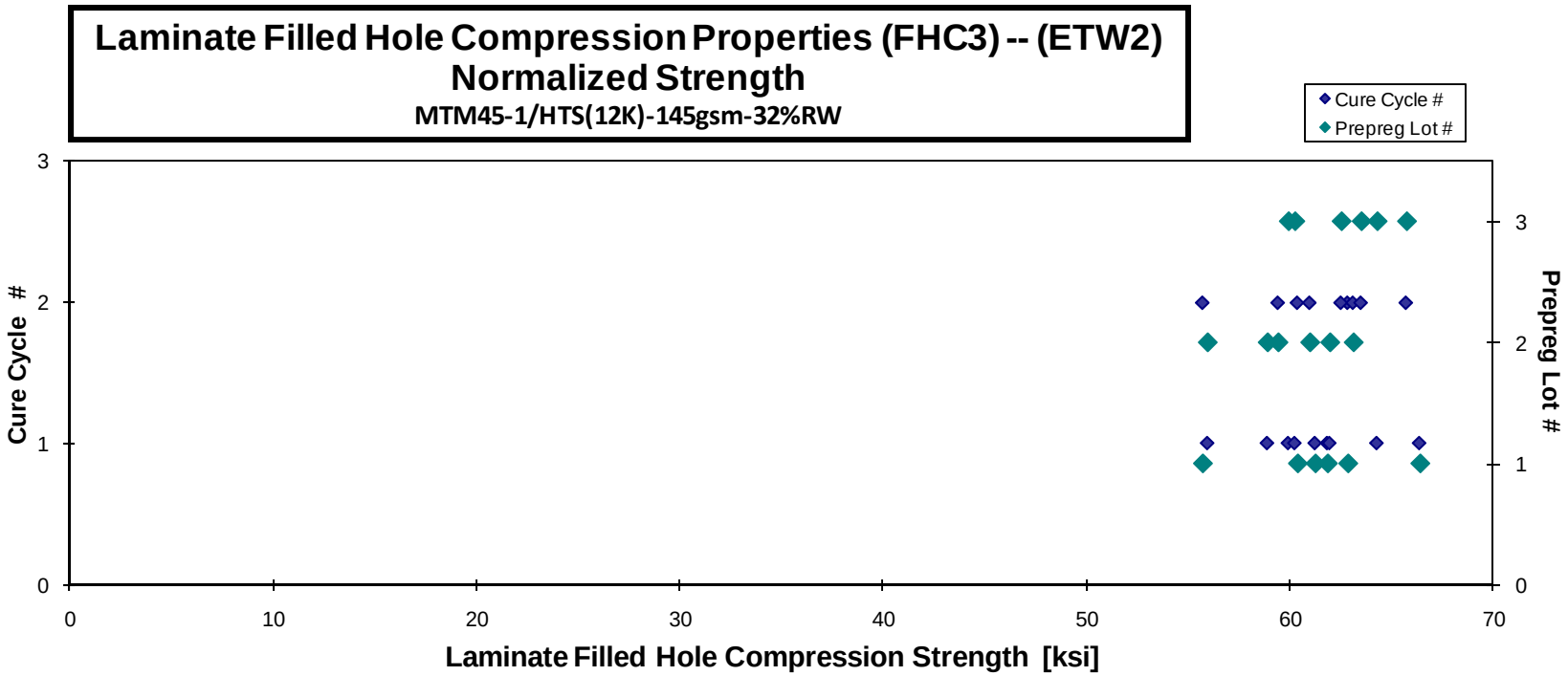
## Laminate Filled Hole Compression Properties (FHC3) -- (ETW2)
## Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|
| ABM9A116D | A | MH1 | 1 | 1 | 65.353 | 0.112 | 20 | LGM | 0.006 | 66.392 |
| ABM9A117D | A | MH1 | 1 | 1 | 59.432 | 0.115 | 20 | AGO / LGM | 0.006 | 61.863 |
| ABM9A118D | A | MH1 | 1 | 1 | 59.625 | 0.113 | 20 | LGO / LGM | 0.006 | 61.260 |
| ABM9A215D | A | MH2 | 1 | 2 | 59.616 | 0.111 | 20 | LGM | 0.006 | 60.392 |
| ABM9A218D | A | MH2 | 1 | 2 | 54.799 | 0.112 | 20 | LGO / LGM | 0.006 | 55.737 |
| ABM9A219D | A | MH2 | 1 | 2 | 62.313 | 0.111 | 20 | AGO / AGM | 0.006 | 62.861 |
| ABM9B111D | B | MH1 | 2 | 1 | 54.194 | 0.114 | 20 | AGM / LGM | 0.006 | 55.976 |
| ABM9B112D | B | MH1 | 2 | 1 | 56.458 | 0.115 | 20 | AGM / LGM | 0.006 | 58.913 |
| ABM9B114D | B | MH1 | 2 | 1 | 59.472 | 0.115 | 20 | LGM | 0.006 | 61.977 |
| ABM9B212D | B | MH2 | 2 | 2 | 59.575 | 0.110 | 20 | LGM | 0.005 | 59.440 |
| ABM9B213D | B | MH2 | 2 | 2 | 63.931 | 0.109 | 20 | LGM | 0.005 | 63.127 |
| ABM9B214D | B | MH2 | 2 | 2 | 61.896 | 0.108 | 20 | LGM | 0.005 | 60.996 |
| ABM9C114D | C | MH1 | 3 | 1 | 59.766 | 0.110 | 20 | LGM | 0.006 | 59.947 |
| ABM9C115D | C | MH1 | 3 | 1 | 64.728 | 0.109 | 20 | LGM | 0.005 | 64.296 |
| ABM9C116D | C | MH1 | 3 | 1 | 60.419 | 0.110 | 20 | LGM | 0.005 | 60.263 |
| ABM9C213D | C | MH2 | 3 | 2 | 62.386 | 0.110 | 20 | AGO / LGM | 0.006 | 62.537 |
| ABM9C214D | C | MH2 | 3 | 2 | 66.371 | 0.109 | 20 | LGM | 0.005 | 65.737 |
| ABM9C215D | C | MH2 | 3 | 2 | 64.041 | 0.109 | 20 | AGM | 0.005 | 63.517 |

| | | |
|---|---|---|
| **Average** | **60.798** | |
| **Standard Dev.** | **3.440** | |
| **Coeff. of Var. [%]** | **5.658** | |
| **Min.** | **54.194** | |
| **Max.** | **66.371** | |
| **Number of Spec.** | **18** | |

| | | |
|---|---|---|
| **$Average_{norm}$** | **0.0056** | **61.402** |
| **$Standard\ Dev._{norm}$** | | **2.866** |
| **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **4.668** |
| **Min.** | **0.0054** | **55.737** |
| **Max.** | **0.0057** | **66.392** |
| **Number of Spec.** | | **18** |


Laminate Filled Hole Compression Properties (FHC3) -- (ETW2)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
10
20
30
40
50
60
70
Laminate Filled Hole Compression Strength [ksi]

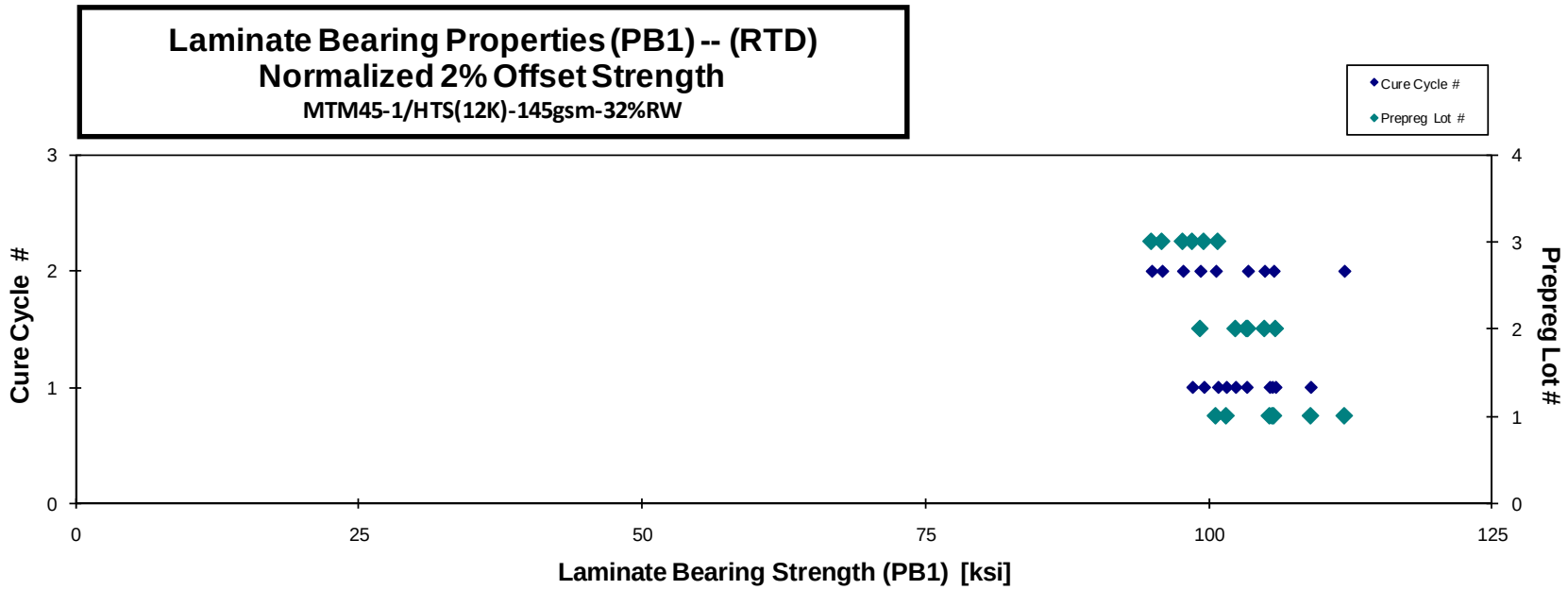
## 4.28 Pin Bearing 1 Properties

**Laminate Bearing Properties (PB1) -- (RTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | 2% Offset Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Comments | Avg. $t_{ply}$ [in] | 2% $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM1A111A | A | MH1 | 1 | 1 | 103.653 | 0.135 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 105.629 |
| ABM1A112A | A | MH1 | 1 | 1 | 104.550 | 0.133 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 105.395 |
| ABM1A113A | A | MH1 | 1 | 1 | 107.443 | 0.134 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 109.017 |
| ABM1A114A | A | MH1 | 1 | 1 | 100.679 | 0.133 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 101.569 |
| ABM1A211A | A | MH2 | 1 | 2 | 105.433 | 0.132 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 105.753 |
| ABM1A212A | A | MH2 | 1 | 2 | 111.545 | 0.133 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 111.996 |
| ABM1A213A | A | MH2 | 1 | 2 | 99.936 | 0.133 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.006 | 100.643 |
| ABM1B111A | B | MH1 | 2 | 1 | 100.953 | 0.138 | 24 | 0.0058 | B1I / 2% OFFSET FOR UBS* | 0.006 | 105.911 |
| ABM1B112A | B | MH1 | 2 | 1 | 98.747 | 0.138 | 24 | 0.0058 | B1I / 2% OFFSET FOR UBS* | 0.0058 | 103.360 |
| ABM1B113A | B | MH1 | 2 | 1 | 98.252 | 0.138 | 24 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 102.383 |
| ABM1B211A | B | MH2 | 2 | 2 | 98.608 | 0.139 | 24 | 0.0058 | B1I / 2% OFFSET FOR UBS* | 0.0058 | 103.476 |
| ABM1B212A | B | MH2 | 2 | 2 | 100.645 | 0.138 | 24 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 104.941 |
| ABM1B213A | B | MH2 | 2 | 2 | 95.625 | 0.137 | 24 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 99.271 |
| ABM1C111A | C | MH1 | 3 | 1 | 101.316 | 0.131 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 100.830 |
| ABM1C112A | C | MH1 | 3 | 1 | 99.478 | 0.132 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 99.591 |
| ABM1C113A | C | MH1 | 3 | 1 | 98.663 | 0.132 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 98.563 |
| ABM1C212A | C | MH2 | 3 | 2 | 93.704 | 0.134 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 94.970 |
| ABM1C213A | C | MH2 | 3 | 2 | 94.191 | 0.134 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 95.892 |
| ABM1C214A | C | MH2 | 3 | 2 | 96.780 | 0.133 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 97.733 |
| | | | | | | | | | Ultimate Bearing Strength / B1I: B:Bearing, 1:first hole, I: Inapplicable (not on bolt, nut or head side) | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Average** | **100.537** | **Average** | **0.0056** | **$Average_{norm}$** | **0.0056** | **102.470** |
| **Standard Dev.** | **4.483** | **Standard Dev.** | | **$Standard\ Dev._{norm}$** | | **4.380** |
| **Coeff. of Var. [%]** | **4.459** | **Coeff. of Var. [%]** | | **Coeff. of Var. [%]$_{norm}$** | | **4.274** |
| **Min.** | **93.704** | **Min.** | **0.0055** | **Min.** | **0.0055** | **94.970** |
| **Max.** | **111.545** | **Max.** | **0.0058** | **Max.** | **0.0058** | **111.996** |
| **Number of Spec.** | **19** | **Number of Spec.** | **19** | **Number of Spec.** | **19** | **19** |

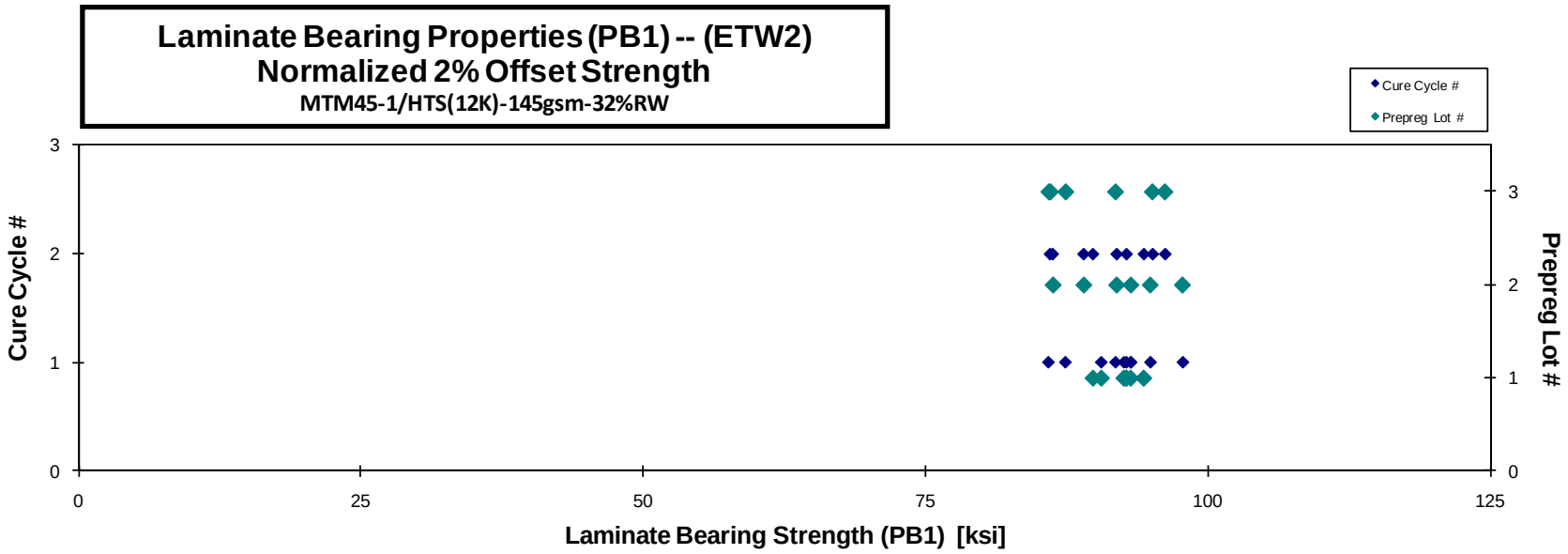

Laminate Bearing Properties (PB1) -- (RTD)
Normalized 2% Offset Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
25
50
75
100
125
Laminate Bearing Strength (PB1) [ksi]

## Laminate Bearing Properties (PB1) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | 2% Offset Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Comments | Avg. $t_{ply}$ [in] | 2% $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM1A117D | A | MH1 | 1 | 1 | 90.283 | 0.132 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 90.568 |
| ABM1A118D | A | MH1 | 1 | 1 | 92.371 | 0.133 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 93.187 |
| ABM1A119D | A | MH1 | 1 | 1 | 92.148 | 0.133 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 92.799 |
| ABM1A11AD | A | MH1 | 1 | 1 | 91.425 | 0.134 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 92.579 |
| ABM1A216D | A | MH2 | 1 | 2 | 92.199 | 0.133 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 92.805 |
| ABM1A217D | A | MH2 | 1 | 2 | 89.731 | 0.132 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 89.822 |
| ABM1A218D | A | MH2 | 1 | 2 | 93.710 | 0.133 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.006 | 94.349 |
| ABM1B116D | B | MH1 | 2 | 1 | 93.930 | 0.137 | 24 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 97.808 |
| ABM1B117D | B | MH1 | 2 | 1 | 90.433 | 0.139 | 24 | 0.0058 | B1I / 2% OFFSET FOR UBS* | 0.0058 | 94.932 |
| ABM1B118D | B | MH1 | 2 | 1 | 88.571 | 0.139 | 24 | 0.0058 | B1I / 2% OFFSET FOR UBS* | 0.0058 | 93.201 |
| ABM1B216D | B | MH2 | 2 | 2 | 88.483 | 0.137 | 24 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 91.936 |
| ABM1B217D | B | MH2 | 2 | 2 | 86.268 | 0.136 | 24 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 89.001 |
| ABM1B218D | B | MH2 | 2 | 2 | 84.017 | 0.136 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 86.256 |
| ABM1C116D | C | MH1 | 3 | 1 | 86.228 | 0.134 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 87.383 |
| ABM1C117D | C | MH1 | 3 | 1 | 91.477 | 0.133 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 91.835 |
| ABM1C118D | C | MH1 | 3 | 1 | 84.755 | 0.134 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 85.878 |
| ABM1C216D | C | MH2 | 3 | 2 | 95.962 | 0.132 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 96.241 |
| ABM1C217D | C | MH2 | 3 | 2 | 95.010 | 0.132 | 24 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 95.130 |
| ABM1C218D | C | MH2 | 3 | 2 | 84.877 | 0.134 | 24 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 86.023 |
| | | | | | | | | | Ultimate Bearing Strength / B1I: B:Bearing, 1:first hole, I: Inapplicable (not on bolt, nut or head side) | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Average** | **90.099** | **Average** | **0.0056** | **$Average_{norm}$** | **0.0056** | **91.670** |
| **Standard Dev.** | **3.585** | **Standard Dev.** | | **$Standard\ Dev._{norm}$** | | **3.507** |
| **Coeff. of Var. [%]** | **3.979** | **Coeff. of Var. [%]** | | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **3.826** |
| **Min.** | **84.017** | **Min.** | **0.0055** | **Min.** | **0.0055** | **85.878** |
| **Max.** | **95.962** | **Max.** | **0.0058** | **Max.** | **0.0058** | **97.808** |
| **Number of Spec.** | **19** | **Number of Spec.** | **19** | **Number of Spec.** | **19** | **19** |


Laminate Bearing Properties (PB1) -- (ETW2)
Normalized 2% Offset Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
25
50
75
100
125
Laminate Bearing Strength (PB1) [ksi]

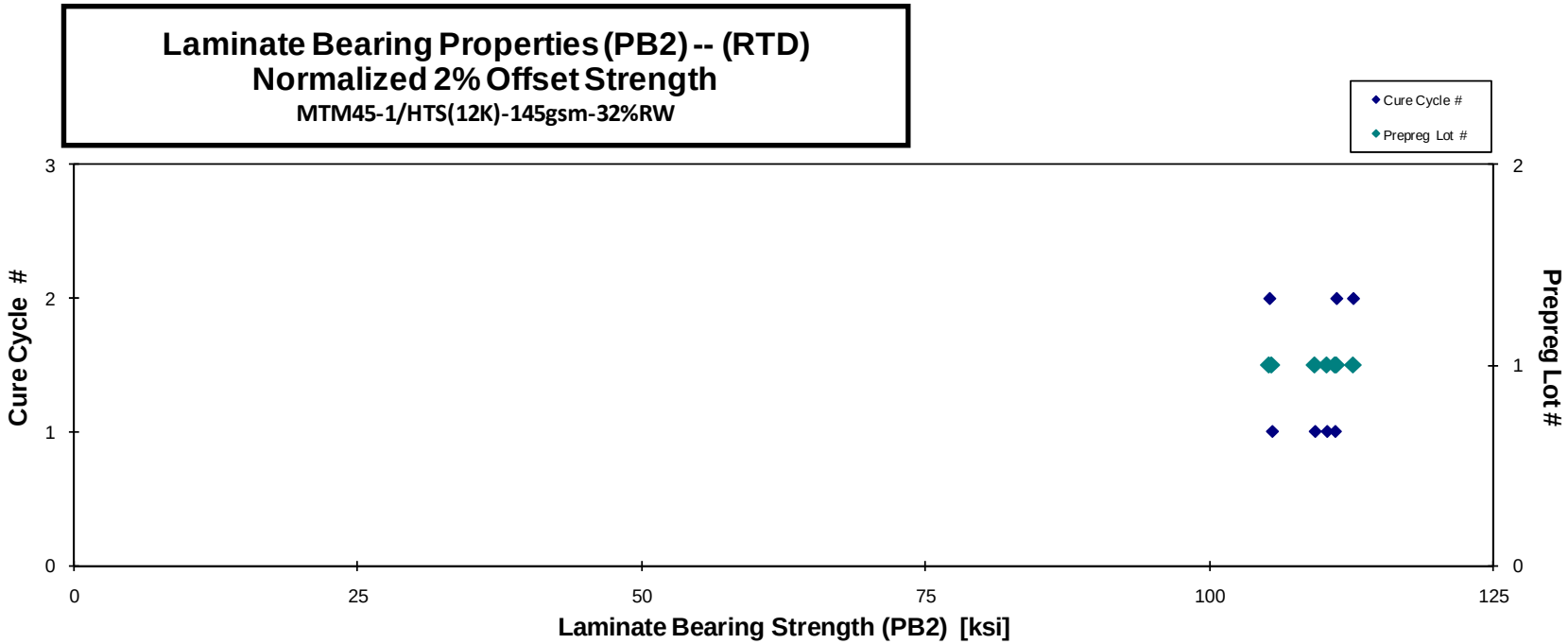
## 4.29 Pin Bearing 2 Properties

**Laminate Bearing Properties (PB2) -- (RTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | 2% Offset Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Comments | Avg. $t_{ply}$ [in] | 2% $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM2A111A | A | MH1 | 1 | 1 | 108.517 | 0.111 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 109.273 |
| ABM2A112A | A | MH1 | 1 | 1 | 108.119 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 110.330 |
| ABM2A113A | A | MH1 | 1 | 1 | 102.299 | 0.113 | 20 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 105.492 |
| ABM2A114A | A | MH1 | 1 | 1 | 107.757 | 0.113 | 20 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 111.055 |
| ABM2A211A | A | MH2 | 1 | 2 | 104.769 | 0.111 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 105.261 |
| ABM2A213A | A | MH2 | 1 | 2 | 111.068 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 112.650 |
| ABM2A214A | A | MH2 | 1 | 2 | 109.781 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.006 | 111.178 |
| | | | | | | | | | Ultimate Bearing Strength / B1I: B:Bearing, 1:first hole, I: Inapplicable (not on bolt, nut or head side) | | |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **107.473** | **Average** | **0.0056** | **$Average_{norm}$** | **109.320** |
| **Standard Dev.** | **2.998** | **Standard Dev.** | | **$Standard\ Dev._{norm}$** | **2.878** |
| **Coeff. of Var. [%]** | **2.789** | **Coeff. of Var. [%]** | | **Coeff. of Var. $[\%]_{norm}$** | **2.633** |
| **Min.** | **102.299** | **Min.** | **0.0055** | **Min.** | **105.261** |
| **Max.** | **111.068** | **Max.** | **0.0057** | **Max.** | **112.650** |
| **Number of Spec.** | **7** | **Number of Spec.** | **7** | **Number of Spec.** | **7** |


Laminate Bearing Properties (PB2) -- (RTD)
Normalized 2% Offset Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Bearing Strength (PB2) [ksi]
0
25
50
75
100
125
0
1
2
3

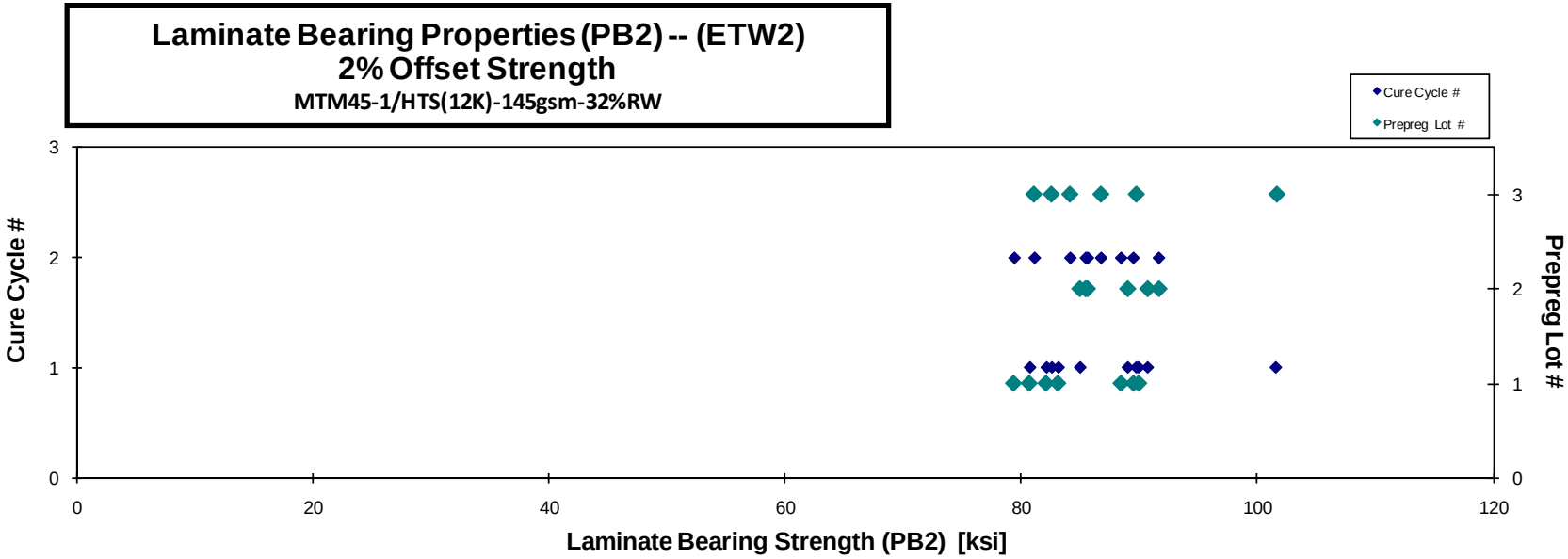
## Laminate Bearing Properties (PB2) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | 2% Offset Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Comments | Avg. $t_{ply}$ [in] | 2% $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM2A117D | A | MH1 | 1 | 1 | 88.829 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 89.959 |
| ABM2A118D | A | MH1 | 1 | 1 | 81.441 | 0.111 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 82.132 |
| ABM2A119D | A | MH1 | 1 | 1 | 81.580 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 83.137 |
| ABM2A11AD | A | MH1 | 1 | 1 | 78.739 | 0.113 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 80.719 |
| ABM2A216D | A | MH2 | 1 | 2 | 86.863 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 88.469 |
| ABM2A217D | A | MH2 | 1 | 2 | 87.721 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 89.515 |
| ABM2A218D | A | MH2 | 1 | 2 | 77.818 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.006 | 79.398 |
| ABM2B111D | B | MH1 | 2 | 1 | 89.540 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.006 | 90.721 |
| ABM2B112D | B | MH1 | 2 | 1 | 82.622 | 0.113 | 20 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 84.988 |
| ABM2B113D | B | MH1 | 2 | 1 | 87.402 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 89.031 |
| ABM2B211D | B | MH2 | 2 | 2 | 90.766 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 91.673 |
| ABM2B212D | B | MH2 | 2 | 2 | 84.435 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 85.638 |
| ABM2B213D | B | MH2 | 2 | 2 | 84.609 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 85.468 |
| ABM2C111D | C | MH1 | 3 | 1 | 100.660 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 101.621 |
| ABM2C112D | C | MH1 | 3 | 1 | 88.486 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 89.760 |
| ABM2C113D | C | MH1 | 3 | 1 | 81.962 | 0.111 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 82.583 |
| ABM2C211D | C | MH2 | 3 | 2 | 87.288 | 0.109 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 86.772 |
| ABM2C212D | C | MH2 | 3 | 2 | 84.346 | 0.110 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 84.154 |
| ABM2C213D | C | MH2 | 3 | 2 | 81.148 | 0.110 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 81.111 |

Ultimate Bearing Strength / B1I: B:Bearing, 1:first hole, I: Inapplicable (not on bolt, nut or head side)

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **85.592** | **Average** | **0.0056** | **$Average_{norm}$** | **0.0056** | **86.676** |
| **Standard Dev.** | **5.201** | **Standard Dev.** | | **$Standard\ Dev._{norm}$** | | **5.180** |
| **Coeff. of Var. [%]** | **6.076** | **Coeff. of Var. [%]** | | **Coeff. of Var. $[\%]_{norm}$** | | **5.976** |
| **Min.** | **77.818** | **Min.** | **0.0055** | **Min.** | **0.0055** | **79.398** |
| **Max.** | **100.660** | **Max.** | **0.0057** | **Max.** | **0.0057** | **101.621** |
| **Number of Spec.** | **19** | **Number of Spec.** | **19** | **Number of Spec.** | **19** | **19** |


Laminate Bearing Properties (PB2) -- (ETW2)
2% Offset Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Bearing Strength (PB2) [ksi]
0
20
40
60
80
100
120
0
1
2
3

## 4.30 Pin Bearing 3 Properties

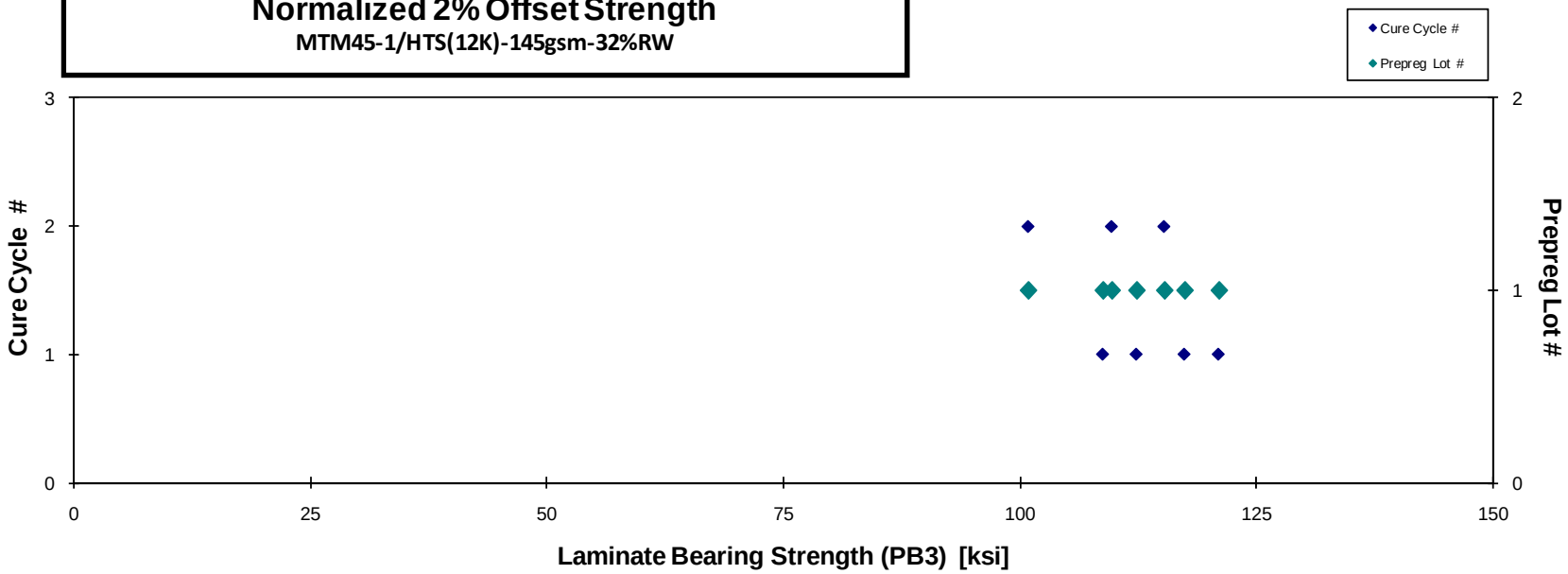
**Laminate Bearing Properties (PB3) -- (RTD)**
**Strength & Modulus**
**MTM45-1/HTS(12K)-145gsm-32%RW**

**normalizing $t_{ply}$ [in]**: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | 2% Offset Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Comments | Avg. $t_{ply}$ [in] | 2% $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM3A111A | A | MH1 | 1 | 1 | 112.639 | 0.110 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 112.314 |
| ABM3A112A | A | MH1 | 1 | 1 | 116.168 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 117.383 |
| ABM3A113A | A | MH1 | 1 | 1 | 119.791 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 120.989 |
| ABM3A114A | A | MH1 | 1 | 1 | 107.210 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 108.770 |
| ABM3A211A | A | MH2 | 1 | 2 | 111.108 | 0.114 | 20 | 0.0057 | B1I / 2% OFFSET FOR UBS* | 0.0057 | 115.249 |
| ABM3A212A | A | MH2 | 1 | 2 | 108.133 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 109.706 |
| ABM3A213A | A | MH2 | 1 | 2 | 99.313 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 100.893 |
| | | | | | | | | | Ultimate Bearing Strength / B1I: B:Bearing, 1:first hole, I: Inapplicable (not on bolt, nut or head side) | | |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **110.623** | **Average** | **0.0056** | **$Average_{norm}$** | **0.0056** | **112.186** |
| **Standard Dev.** | **6.644** | **Standard Dev.** | | **$Standard\ Dev._{norm}$** | | **6.573** |
| **Coeff. of Var. [%]** | **6.006** | **Coeff. of Var. [%]** | | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **5.859** |
| **Min.** | **99.313** | **Min.** | **0.0055** | **Min.** | **0.0055** | **100.893** |
| **Max.** | **119.791** | **Max.** | **0.0057** | **Max.** | **0.0057** | **120.989** |
| **Number of Spec.** | **7** | **Number of Spec.** | **7** | **Number of Spec.** | **7** | **7** |

## Laminate Bearing Properties (PB3) -- (RTD)
## Normalized 2% Offset Strength
**MTM45-1/HTS(12K)-145gsm-32%RW**

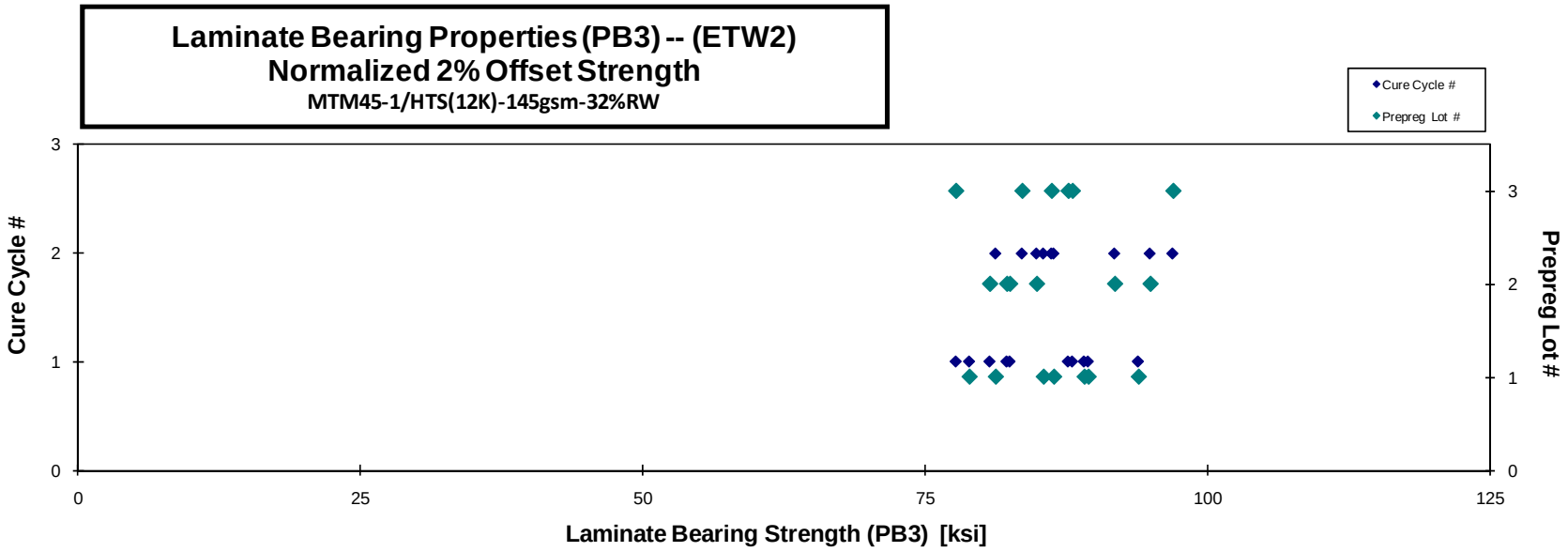


## Laminate Bearing Properties (PB3) -- (ETW2)
## Strength & Modulus
**MTM45-1/HTS(12K)-145gsm-32%RW**

| normalizing $t_{ply}$ [in] |
|---|
| 0.0055 |

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | 2% Offset Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. tply [in] | Comments | Avg. $t_{ply}$ [in] | 2% $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABM3A117D | A | MH1 | 1 | 1 | 89.674 | 0.110 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 89.415 |
| ABM3A118D | A | MH1 | 1 | 1 | 78.271 | 0.111 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 78.888 |
| ABM3A119D | A | MH1 | 1 | 1 | 93.526 | 0.110 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 93.852 |
| ABM3A11AD | A | MH1 | 1 | 1 | 88.152 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 89.060 |
| ABM3A216D | A | MH2 | 1 | 2 | 85.704 | 0.111 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 86.366 |
| ABM3A217D | A | MH2 | 1 | 2 | 79.881 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 81.212 |
| ABM3A218D | A | MH2 | 1 | 2 | 83.833 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.006 | 85.446 |
| ABM3B111D | B | MH1 | 2 | 1 | 82.573 | 0.110 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.005 | 82.473 |
| ABM3B112D | B | MH1 | 2 | 1 | 79.961 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 80.700 |
| ABM3B113D | B | MH1 | 2 | 1 | 81.480 | 0.111 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 82.209 |
| ABM3B211D | B | MH2 | 2 | 2 | 93.803 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 94.897 |
| ABM3B212D | B | MH2 | 2 | 2 | 89.651 | 0.113 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 91.757 |
| ABM3B213D | B | MH2 | 2 | 2 | 83.871 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 84.849 |
| ABM3C111D | C | MH1 | 3 | 1 | 86.867 | 0.111 | 20 | 0.0055 | B1I / 2% OFFSET FOR UBS* | 0.0055 | 87.643 |
| ABM3C112D | C | MH1 | 3 | 1 | 76.736 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 77.701 |
| ABM3C113D | C | MH1 | 3 | 1 | 86.494 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 88.014 |
| ABM3C211D | C | MH2 | 3 | 2 | 95.768 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 96.914 |
| ABM3C212D | C | MH2 | 3 | 2 | 82.771 | 0.111 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 83.561 |
| ABM3C213D | C | MH2 | 3 | 2 | 84.817 | 0.112 | 20 | 0.0056 | B1I / 2% OFFSET FOR UBS* | 0.0056 | 86.167 |
| | | | | | | | | | Ultimate Bearing Strength / B1I: B:Bearing, 1:first hole, I: Inapplicable (not on bolt, nut or head side) | | |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **85.465** | **Average** | **0.0056** | **$Average_{norm}$** | **0.0056** | **86.375** |
| **Standard Dev.** | **5.337** | **Standard Dev.** | | **$Standard\ Dev._{norm}$** | | **5.391** |
| **Coeff. of Var. [%]** | **6.245** | **Coeff. of Var. [%]** | | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **6.242** |
| **Min.** | **76.736** | **Min.** | **0.0055** | **Min.** | **0.0055** | **77.701** |
| **Max.** | **95.768** | **Max.** | **0.0056** | **Max.** | **0.0056** | **96.914** |
| **Number of Spec.** | **19** | **Number of Spec.** | **19** | **Number of Spec.** | **19** | **19** |


Laminate Bearing Properties (PB3) -- (ETW2)
Normalized 2% Offset Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
0
25
50
75
100
125
Laminate Bearing Strength (PB3) [ksi]

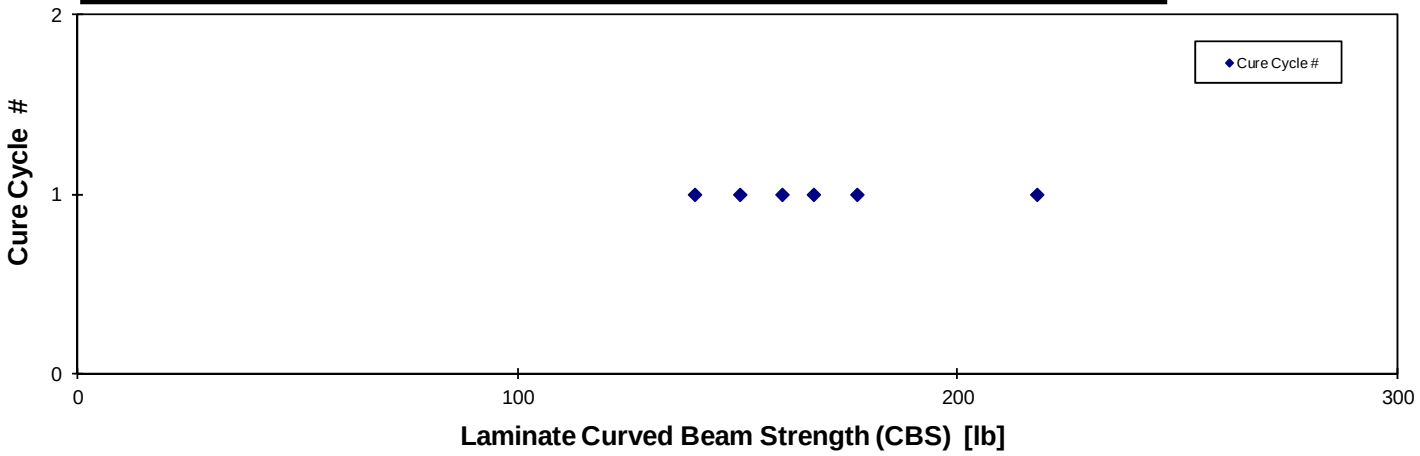
## 4.31 Interlaminar Tension Properties

**Laminate Curved Beam Strength Properties (ILT) -- (RTD) Strength**
**ACG MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Curved Beam Strength [lb] | Interlaminar Tension Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate |
|---|---|---|---|---|---|---|---|---|
| ABMMA111A | A | MH1 | 1 | 1 | 150.405 | 3.752 | 0.183 | 32 |
| ABMMA112A | A | MH1 | 1 | 1 | 167.149 | 4.098 | 0.185 | 32 |
| ABMMA113A | A | MH1 | 1 | 1 | 140.134 | 3.442 | 0.185 | 32 |
| ABMMA114A | A | MH1 | 1 | 1 | 177.018 | 4.332 | 0.186 | 32 |
| ABMMA115A | A | MH1 | 1 | 1 | 217.912 | 5.366 | 0.185 | 32 |
| ABMMA116A | A | MH1 | 1 | 1 | 159.995 | 3.909 | 0.186 | 32 |
| | | | | **Average** | **168.769** | **4.150** | **0.185** | |
| | | | | **Standard Dev.** | **27.276** | **0.668** | | |
| | | | | **Coeff. of Var. [%]** | **16.162** | **16.104** | | |
| | | | | **Min.** | **140.134** | **3.442** | **0.183** | |
| | | | | **Max.** | **217.912** | **5.366** | **0.186** | |
| | | | | **Number of Spec.** | **6** | **6** | | |

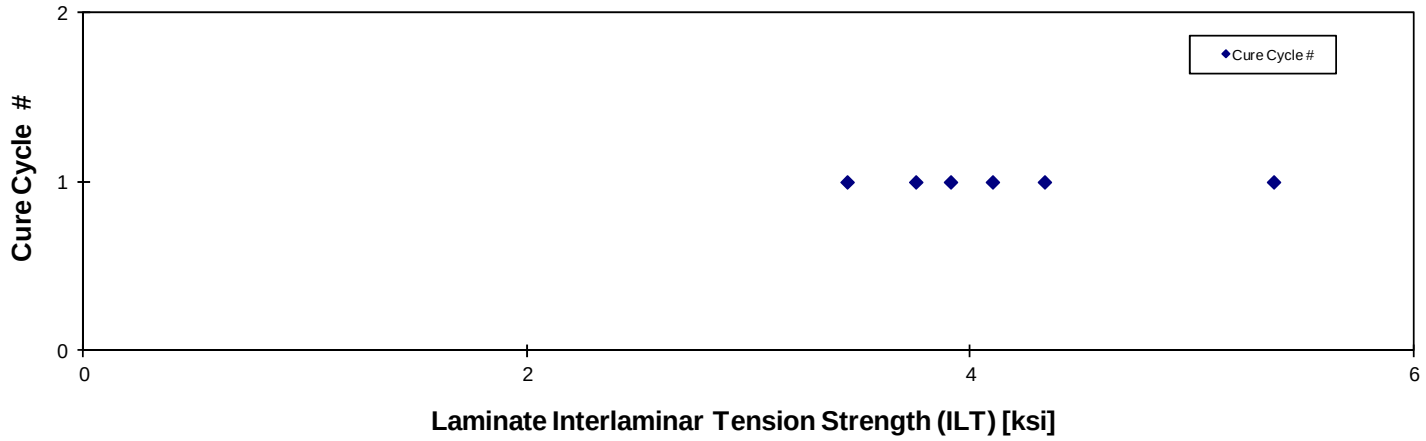
## Laminate Curved Beam Strength Properties (CBS) -- (RTD) Measured Strength

**ACG MTM45-1/HTS(12K)-145gsm-32%RW**




## Laminate Interlaminar Tension Strength (ILT) -- (RTD) Measured Strength

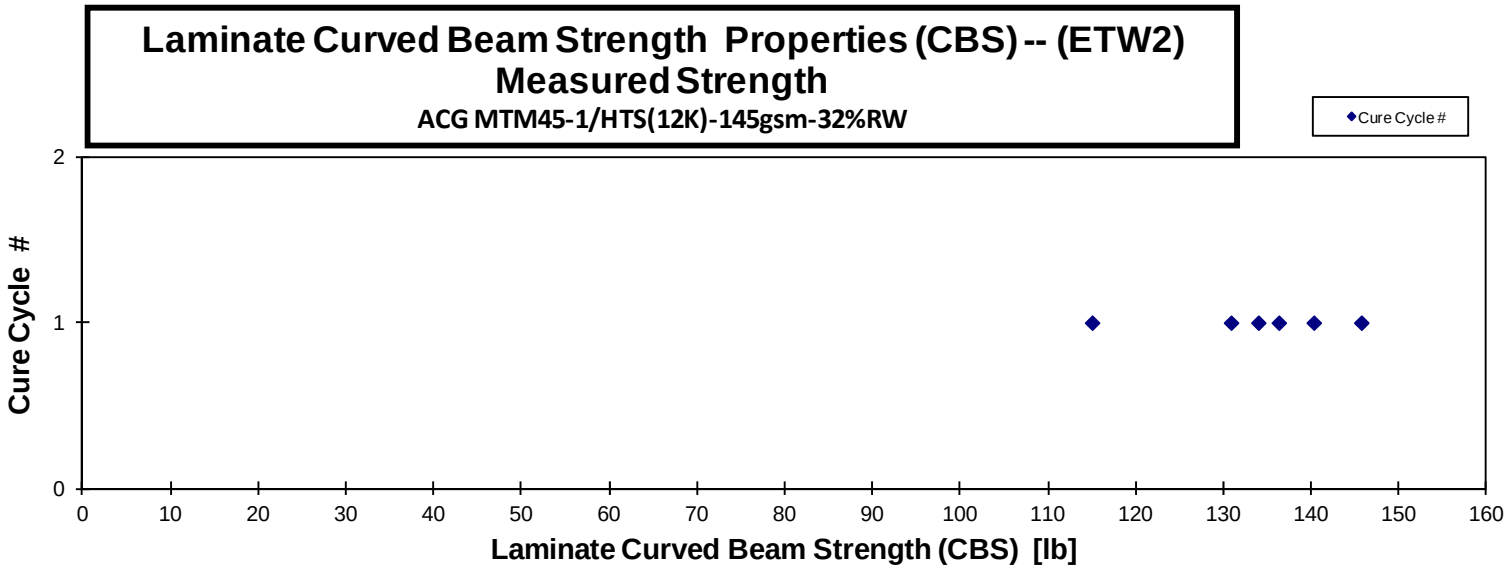
**ACG MTM45-1/HTS(12K)-145gsm-32%RW**

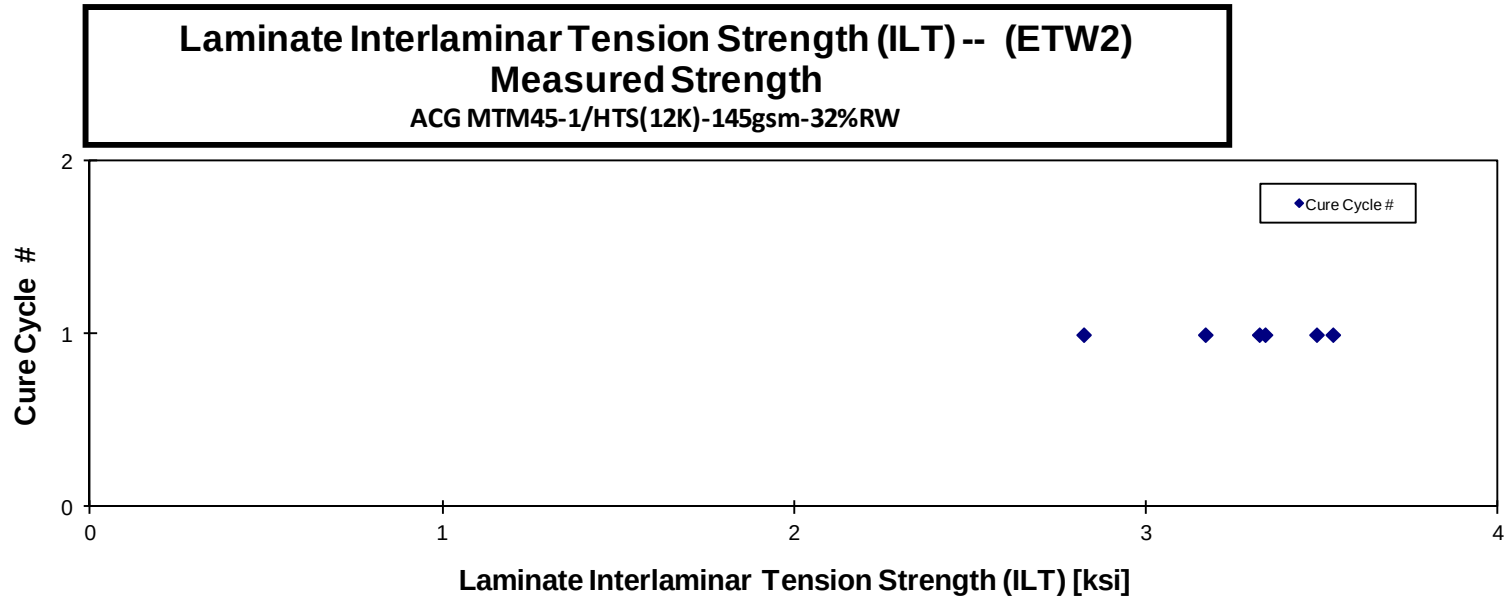


# Laminate Curved Beam Strength Properties (ILT) -- (ETW2) Strength

**ACG MTM45-1/HTS(12K)-145gsm-32%RW**

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Curved Beam Strength [lb] | Interlaminar Tension Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate |
|---|---|---|---|---|---|---|---|---|
| ABMMA117D | A | MH1 | 1 | 1 | 114.987 | 2.820 | 0.185 | 32 |
| ABMMA118D | A | MH1 | 1 | 1 | 133.928 | 3.320 | 0.184 | 32 |
| ABMMA119D | A | MH1 | 1 | 1 | 145.671 | 3.529 | 0.187 | 32 |
| ABMMA11AD | A | MH1 | 1 | 1 | 136.266 | 3.336 | 0.186 | 32 |
| ABMMA11BD | A | MH1 | 1 | 1 | 130.827 | 3.166 | 0.187 | 32 |
| ABMMA11CD | A | MH1 | 1 | 1 | 140.248 | 3.482 | 0.184 | 32 |
| | | | | **Average** | **133.655** | **3.276** | **0.186** | |
| | | | | **Standard Dev.** | **10.500** | **0.257** | | |
| | | | | **Coeff. of Var. [%]** | **7.856** | **7.860** | | |
| | | | | **Min.** | **114.987** | **2.820** | **0.184** | |
| | | | | **Max.** | **145.671** | **3.529** | **0.187** | |
| | | | | **Number of Spec.** | **6** | **6** | | |


Laminate Curved Beam Strength Properties (CBS) -- (ETW2)
Measured Strength
ACG MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Cure Cycle #
0
1
2
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
Laminate Curved Beam Strength (CBS) [lb]


Laminate Interlaminar Tension Strength (ILT) -- (ETW2)
Measured Strength
ACG MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Cure Cycle #
0
1
2
0
1
2
3
4
Laminate Interlaminar Tension Strength (ILT) [ksi]

## 4.32 Compression Strength after Impact 1 Properties

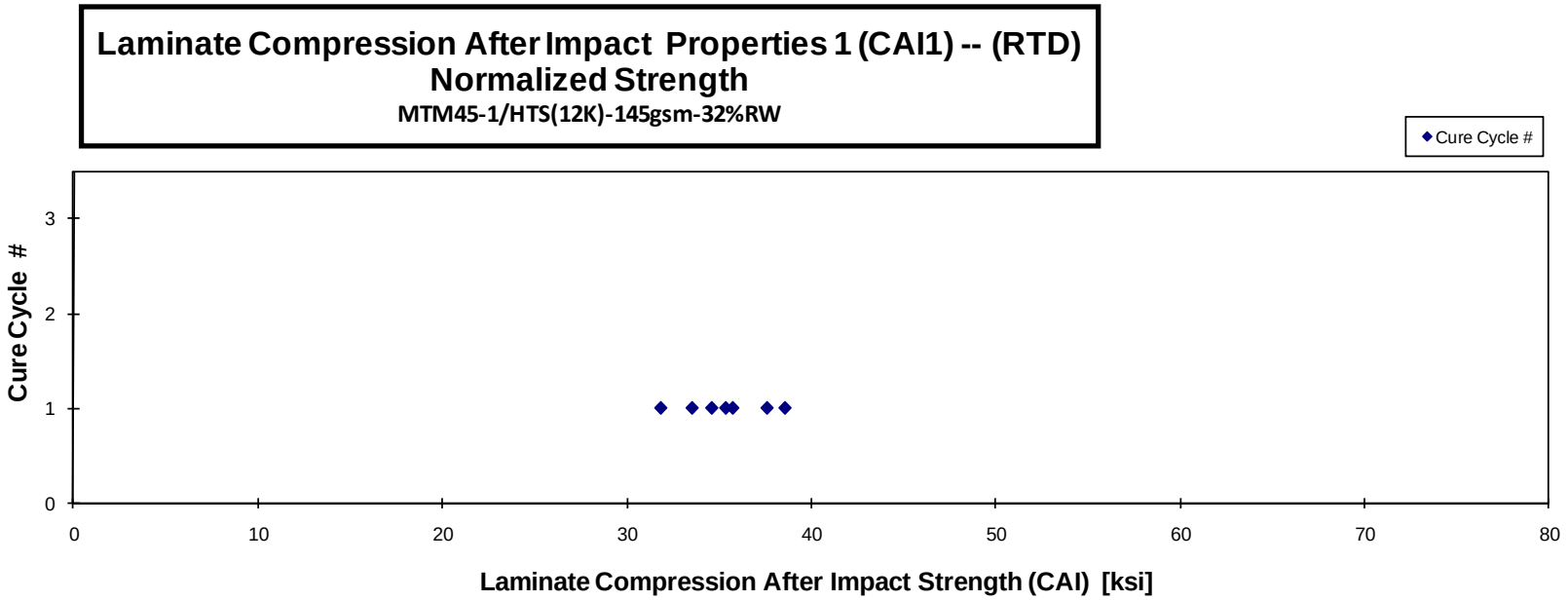
**Laminate Compression After Impact Properties (CAI1) -- (RTD) Strength**
**MTM45-1/HTS(12K)-145gsm-32%RW**

normalizing $t_{ply}$ [in]: 0.0055

| Specimen Number | ACG Batch # | ACG Cure Cycle | Prepreg Lot # | Cure Cycle # | Measured Impact Energy (in-lbf) | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Failure Mode | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABMKA111A | A | MH1 | 1 | 1 | 267.70 | 37.148 | 0.178 | 32 | LDM | 0.0056 | 37.560 |
| ABMKA112A | A | MH1 | 1 | 1 | 267.57 | 35.151 | 0.179 | 32 | LDM | 0.0056 | 35.717 |
| ABMKA113A | A | MH1 | 1 | 1 | 271.98 | 32.817 | 0.180 | 32 | LDM | 0.0056 | 33.528 |
| ABMKA114A | A | MH1 | 1 | 1 | 269.08 | 34.021 | 0.179 | 32 | LDM | 0.0056 | 34.585 |
| ABMKA115A | A | MH1 | 1 | 1 | 267.64 | 38.119 | 0.178 | 32 | LDM | 0.0056 | 38.527 |
| ABMKA116A | A | MH1 | 1 | 1 | 268.67 | 31.367 | 0.179 | 32 | LDM | 0.0056 | 31.839 |
| ABMKA117A | A | MH1 | 1 | 1 | 266.73 | 34.920 | 0.178 | 32 | LDM | 0.0056 | 35.340 |

| | | |
|---|---|---|
| Average | 34.792 | |
| Standard Dev. | 2.345 | |
| Coeff. of Var. [%] | 6.740 | |
| Min. | 31.367 | |
| Max. | 38.119 | |
| Number of Spec. | 7 | |

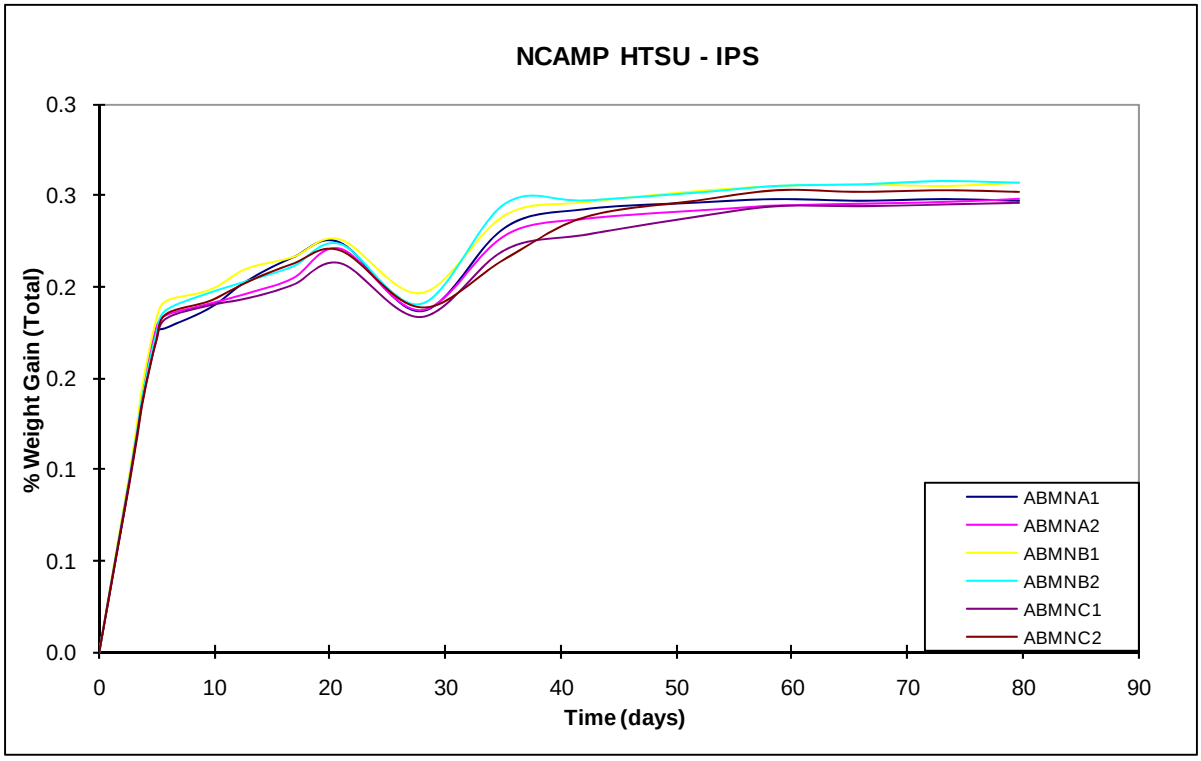
| | | |
|---|---|---|
| $Average_{norm}$ | 0.00558 | 35.300 |
| $Standard\ Dev._{norm}$ | | 2.285 |
| $Coeff.\ of\ Var.\ [\%]_{norm}$ | | 6.473 |
| Min. | 0.0056 | 31.839 |
| Max. | 0.0056 | 38.527 |
| Number of Spec. | | 7 |


Laminate Compression After Impact Properties 1 (CAI1) -- (RTD)
Normalized Strength
MTM45-1/HTS(12K)-145gsm-32%RW
Cure Cycle #
Cure Cycle #
0
1
2
3
0
10
20
30
40
50
60
70
80
Laminate Compression After Impact Strength (CAI) [ksi]

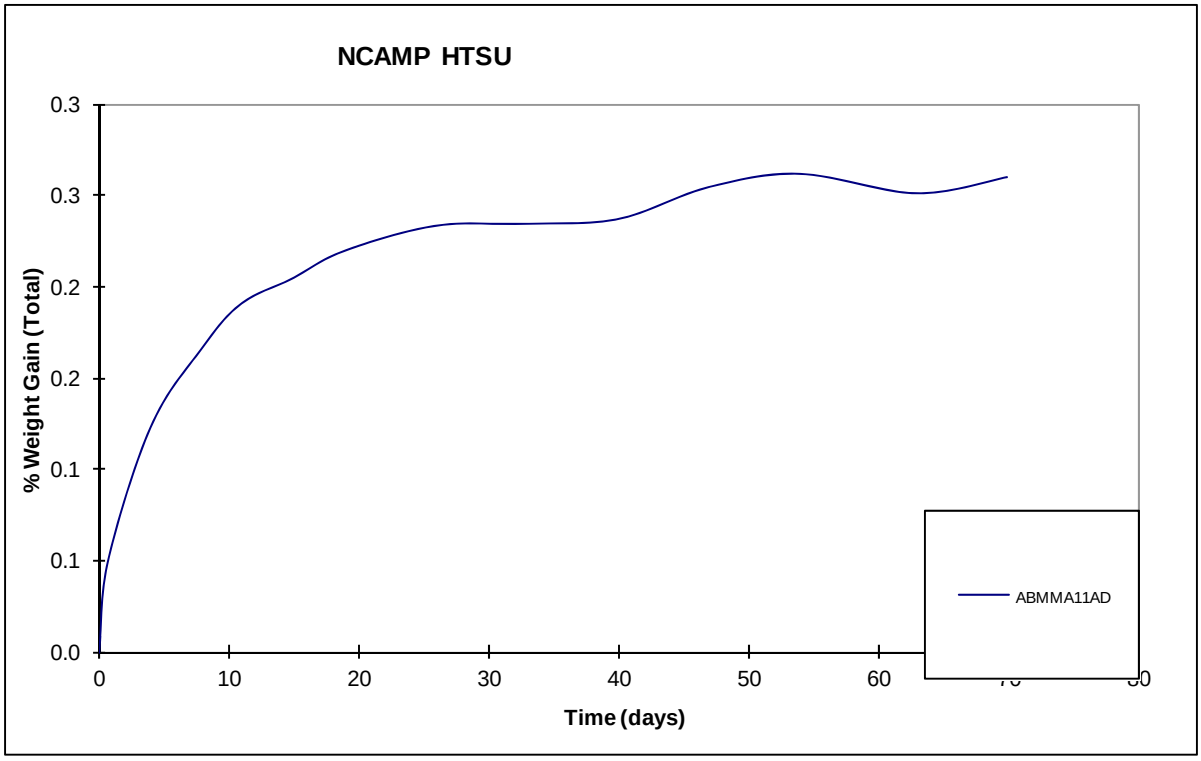
## 5. Shear Stress vs. Shear Strain, RTD

# 6. MOISTURE CONDITIONING CHARTS

## 6.1 In-Plane Shear Properties – Thinnest Panel



## 6.2 Interlaminar Tension Properties – Thickest Panel




For “wet” mechanical test specimens, the drying procedures may not have completely dried the specimens prior to moisture conditioning, so the total amount of moisture absorbed by the specimens may be higher than those recorded in the moisture gain charts. The remaining moisture conditioning curves can be found on the CD that is available this report.

## 7. DMA Results

The following DMA results only account for 12 wet and 12 dry specimens. Additional testing is being conducted and will be included in this summary shortly.

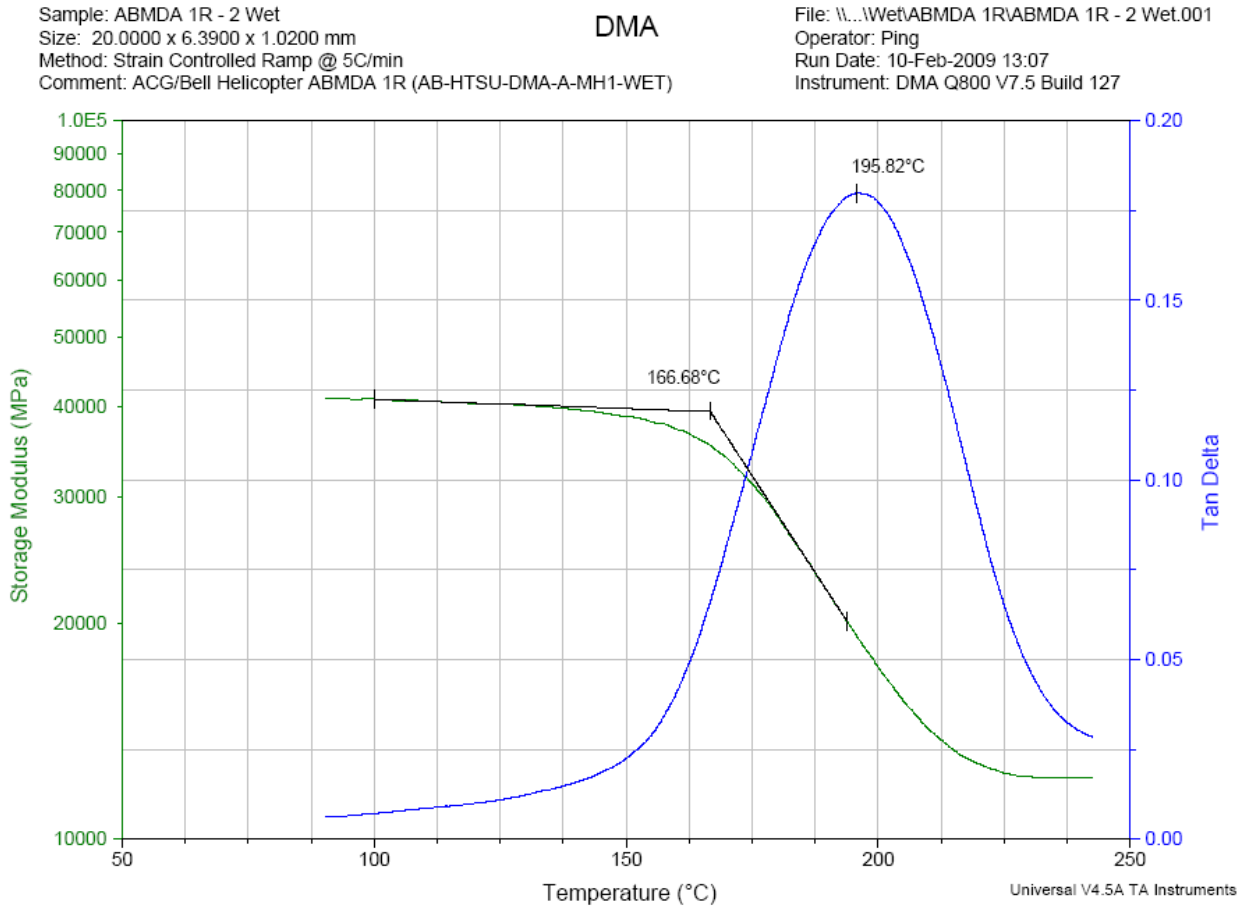
| DMA Results Summary | | | | |
|---|---|---|---|---|
| ACG 12K Uni 060922C1 AXMDX XX Wet | | | | |
| Sample # | Onset Storage Modulus | | Peak of Tangent Delta | |
| | Average | | Average | |
| | Tg [°C] | Tg [°F] | Tg [°C] | Tg [°F] |
| ABMDA 1R | 166.44 | 331.58 | 195.70 | 384.25 |
| ABMDA 2R | 167.65 | 333.76 | 198.68 | 389.62 |
| ABMDB 1R | 166.91 | 332.44 | 195.70 | 384.25 |
| ABMDB 2R | 167.20 | 332.96 | 195.18 | 383.32 |
| ABMDC 1R | 166.51 | 331.71 | 197.04 | 386.67 |
| ABMDC 2R | 167.27 | 333.09 | 196.73 | 386.11 |
| **AVERAGE** | | **332.59** | | |

| DMA Results Summary | | | | |
|---|---|---|---|---|
| ACG 12K Uni 060922C1 AXMDX XX Dry | | | | |
| Sample # | Onset Storage Modulus | | Peak of Tangent Delta | |
| | Average | | Average | |
| | Tg [°C] | Tg [°F] | Tg [°C] | Tg [°F] |
| ABMDA 1R | 203.94 | 399.09 | 218.41 | 425.13 |
| ABMDA 2R | 203.59 | 398.45 | 217.98 | 424.36 |
| ABMDB 1R | 203.61 | 398.50 | 218.42 | 425.15 |
| ABMDB 2R | 203.04 | 397.47 | 218.23 | 424.82 |
| ABMDC 1R | 201.67 | 395.00 | 216.75 | 422.14 |
| ABMDC 2R | 202.14 | 395.86 | 217.54 | 423.57 |
| Average | | 397.40 | | |

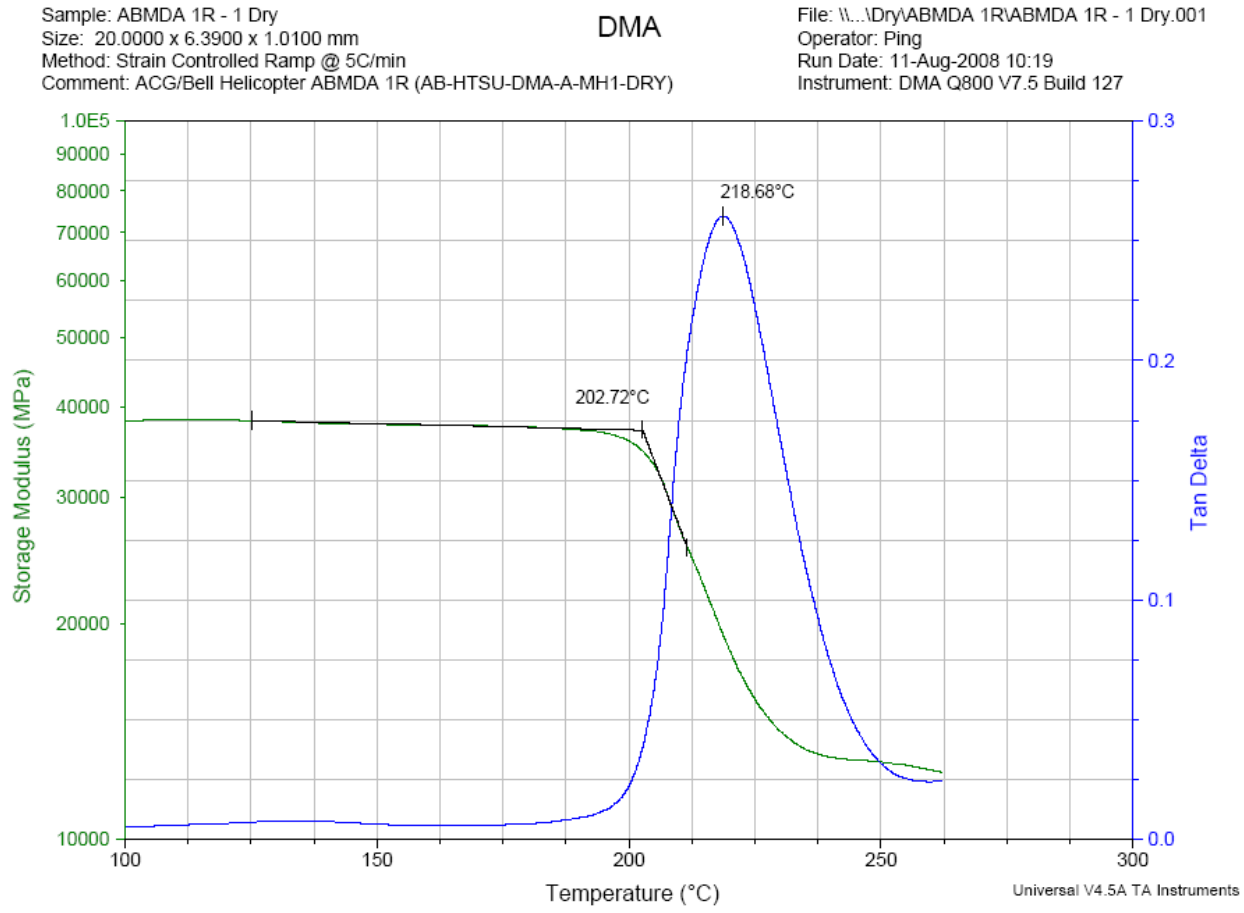
**Table 7-1: DMA Results Summary**

## 7.1 DMA Wet Batch A

These charts are only examples. The remaining files can be obtained in the CD accompanying this report.



## 7.2 DMA Dry Batch A



## 8. Prepreg Physical Test Results

The following physical test results were obtained at ACG's Tulsa, OK facility.

| RESIN | FIBER | BATCH # | D.O.M. | J/G | PEAK TEMP | RC% RANGE | FAW RANGE | CUSTOMER: | LTCP |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INDIVIDUAL: | INDIVIDUAL: | MAT SPEC: | PCD |
| MTM45-4 | HTS5631 | 2577 UD3 | 4/11/2006 | N/A | N/A | 29 35 | 136.3-153.7 | SHIP DATE: | |
| | | | | | | AVERAGE: | AVERAGE: | INITIALS: | |
| | | | | | | 30 34 | 137.75-152.25 | S.O. # : | 19242 |

ALL INFORMATION SHOULD BE OBTAINED FROM THE SALES ORDER

| | TEST PIECE | SAMPLE WEIGHT (GRAMS) | FOIL WEIGHT (GRAMS) | PREPREG WEIGHT (G.S.M.) | SAMPLE AFTER DEVOL | FIBER WEIGHT (G.S.M.) | FIBER WEIGHT (%) | RESIN WEIGHT (%) | VOLATILE CONTENT (%) | GEL TIME N/A |
|---|---|---|---|---|---|---|---|---|---|---|
| ROLL 1 | M | 2.0648 | 1.3012 | 206.48 | 2.7639 | 146.27 | 70.83979 | 29.16021 | 1.2868 | FOIL WEIGHT |
| | C | 2.0883 | 1.3045 | 208.83 | 2.7631 | 145.86 | 69.84629 | 30.15371 | 3.6232 | SAMPLE & FOIL |
| | O | 2.0671 | 1.2698 | 206.71 | 2.6674 | 139.76 | 67.61163 | 32.38837 | 3.6157 | AFTER DEVOL. |
| AVERAGE | | | | **207.34** | | **143.96** | **69.43** | **30.57** | **0.32** | VOL (%) |
| ROLL 2 | M | 2.0667 | 1.2953 | 206.67 | 2.7301 | 143.48 | 69.42469 | 30.57531 | 1.2838 | FOIL WEIGHT |
| | C | 2.0923 | 1.2838 | 209.23 | 2.7148 | 143.1 | 68.39363 | 31.60637 | 3.6376 | SAMPLE & FOIL |
| | O | 2.1379 | 1.2752 | 213.79 | 2.7284 | 145.32 | 67.97324 | 32.02676 | 3.6298 | AFTER DEVOL. |
| AVERAGE | | | | **209.90** | | **143.97** | **68.60** | **31.40** | **0.33** | VOL (%) |
| ROLL 3 | M | 2.1008 | 1.2486 | 210.08 | 2.7308 | 148.22 | 70.55407 | 29.44593 | 1.2757 | FOIL WEIGHT |
| | C | 2.0717 | 1.2636 | 207.17 | 2.7247 | 146.11 | 70.52662 | 29.47338 | 3.6588 | SAMPLE & FOIL |
| | O | 2.0874 | 1.2538 | 208.74 | 2.6774 | 142.36 | 68.19967 | 31.80033 | 3.651 | AFTER DEVOL. |
| AVERAGE | | | | **208.66** | | **145.56** | **69.76** | **30.24** | **0.33** | VOL (%) |
| ROLL 4 | M | 2.1653 | 1.2761 | 216.53 | 2.7328 | 145.67 | 67.27474 | 32.72526 | 1.2691 | FOIL WEIGHT |
| | C | 2.1355 | 1.2771 | 213.55 | 2.7283 | 145.12 | 67.95598 | 32.04402 | 3.5015 | SAMPLE & FOIL |
| | O | 2.1044 | 1.2831 | 210.44 | 2.7311 | 144.8 | 68.80821 | 31.19179 | 3.4944 | AFTER DEVOL. |
| AVERAGE | | | | **213.51** | | **145.20** | **68.01** | **31.99** | **0.32** | VOL (%) |
| ROLL 5 | M | 2.205 | 1.2529 | 220.5 | 2.7615 | 150.86 | 68.41723 | 31.58277 | 1.2691 | FOIL WEIGHT |
| | C | 2.1245 | 1.2803 | 212.45 | 2.7468 | 146.65 | 69.02801 | 30.97199 | 3.5876 | SAMPLE & FOIL |
| | O | 2.0961 | 1.2631 | 209.61 | 2.7125 | 144.94 | 69.14746 | 30.85254 | 3.5826 | AFTER DEVOL. |
| AVERAGE | | | | **214.19** | | **147.48** | **68.86** | **31.14** | **0.22** | VOL (%) |
| | | | | | | | | | 1.256 | FOIL WEIGHT |
| | | | | | | | | | 3.3237 | SAMPLE & FOIL |
| | | | | | | | | | 3.3178 | AFTER DEVOL. |
| | | | | | | | | | **0.29** | VOL (%) |
| | | | | | | | | | | FOIL WEIGHT |
| | | | | | | | | | | SAMPLE & FOIL |
| | | | | | | | | | | AFTER DEVOL. |
| | | | | | | | | | | VOL (%) |
| | | | | | | | | | | FOIL WEIGHT |
| | | | | | | | | | | SAMPLE & FOIL |
| | | | | | | | | | | AFTER DEVOL. |
| | | | | | | | | | | VOL (%) |

| DSC Results | | Flow Results | | Gel Times | |
|---|---|---|---|---|---|
| Peak Exo. | 228.98 °C | 1 | 12.15% | Neat Resin | 5m 11s |
| Enthalpy | 333.99 j/g | 2 | 10.28% | Prepreg | |
| | | 3 | 11.53% | 1 | 62m 11s |
| | | Avg. | 11.32% | 2 | 61m 48s |
| | | 1 | 7.69% | 3 | 62m 21s |
| | | 2 | 11.62% | Prepreg | |
| | | 3 | 11.41% | 1 | 61m 38s |
| | | Avg. | 10.24% | 2 | 61m 47s |
| | | | | 3 | 62m 01s |

**Table 8-1: Batch A Physical Test Results**

| RESIN | FIBER | BATCH # | D.O.M. | J/G | PEAK TEMP | RC% RANGE | FAW RANGE | CUSTOMER: | LTCP |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INDIVIDUAL: | INDIVIDUAL: | MAT SPEC: | PCD |
| MTM45-1 | HTS5631 | 2572 UD3 | 4/6/2006 | N/A | N/A | 29-35 | 136.3-153.7 | SHIP DATE: | |
| | | | | | | AVERAGE: | AVERAGE: | INITIALS: | |
| | | | | | | 30-34 | 137.75-152.25 | S.O. # : | 19242 |

**ALL INFORMATION SHOULD BE OBTAINED FROM THE SALES ORDER**

| | TEST PIECE | SAMPLE WEIGHT (GRAMS) | FOIL WEIGHT (GRAMS) | PREPREG WEIGHT (G.S.M.) | SAMPLE AFTER DEVOL | FIBER WEIGHT (G.S.M.) | FIBER WEIGHT (%) | RESIN WEIGHT (%) | VOLATILE CONTENT (%) | GEL TIME N/A |
|---|---|---|---|---|---|---|---|---|---|---|
| ROLL 1 | M | 2.0818 | 1.2864 | 208.18 | 2.6816 | 139.52 | 67.01893 | 32.98107 | 1.2825 | FOIL WEIGHT |
| | C | 2.1396 | 1.2854 | 213.96 | 2.7289 | 144.35 | 67.46588 | 32.53412 | 3.9105 | SAMPLE & FOIL |
| | O | 2.1612 | 1.2869 | 216.12 | 2.6903 | 140.34 | 64.93615 | 35.06385 | 3.9041 | AFTER DEVOL. |
| AVERAGE | | | | 212.75 | | 141.40 | 66.47 | 33.53 | 0.24 | VOL (%) |
| ROLL 2 | M | 2.1274 | 1.2847 | 212.74 | 2.7153 | 143.06 | 67.2464 | 32.7536 | 1.2845 | FOIL WEIGHT |
| | C | 2.1733 | 1.2777 | 217.33 | 2.7346 | 145.69 | 67.0363 | 32.9637 | 3.9586 | SAMPLE & FOIL |
| | O | 2.1963 | 1.2824 | 219.63 | 2.7377 | 145.53 | 66.26144 | 33.73856 | 3.9482 | AFTER DEVOL. |
| AVERAGE | | | | 216.57 | | 144.76 | 66.85 | 33.15 | 0.39 | VOL (%) |
| ROLL 3 | M | 2.1108 | 1.2782 | 211.08 | 2.6964 | 141.82 | 67.1878 | 32.8122 | 1.2834 | FOIL WEIGHT |
| | C | 2.1317 | 1.2857 | 213.17 | 2.7144 | 142.87 | 67.02163 | 32.97837 | 4.0654 | SAMPLE & FOIL |
| | O | 2.1814 | 1.278 | 218.14 | 2.7241 | 144.61 | 66.29229 | 33.70771 | 4.0592 | AFTER DEVOL. |
| AVERAGE | | | | 214.13 | | 143.10 | 66.83 | 33.17 | 0.22 | VOL (%) |
| ROLL 4 | M | 2.1078 | 1.2881 | 210.78 | 2.6924 | 140.43 | 66.62397 | 33.37603 | 1.2864 | FOIL WEIGHT |
| | C | 2.1378 | 1.2797 | 213.78 | 2.7131 | 143.34 | 67.05024 | 32.94976 | 3.9851 | SAMPLE & FOIL |
| | O | 2.1901 | 1.2886 | 219.01 | 2.7598 | 147.12 | 67.17501 | 32.82499 | 3.9764 | AFTER DEVOL. |
| AVERAGE | | | | 214.52 | | 143.63 | 66.95 | 33.05 | 0.32 | VOL (%) |
| ROLL 5 | M | 2.0691 | 1.2506 | 206.91 | 2.6514 | 140.08 | 67.70093 | 32.29907 | 1.2922 | FOIL WEIGHT |
| | C | 2.095 | 1.2478 | 209.5 | 2.6633 | 141.55 | 67.56563 | 32.43437 | 4.2574 | SAMPLE & FOIL |
| | O | 2.1403 | 1.2811 | 214.03 | 2.6984 | 141.73 | 66.21969 | 33.78031 | 4.2505 | AFTER DEVOL. |
| AVERAGE | | | | 210.15 | | 141.12 | 67.16 | 32.84 | 0.23 | VOL (%) |
| | | | | | | | | | 1.2895 | FOIL WEIGHT |
| | | | | | | | | | 4.0598 | SAMPLE & FOIL |
| | | | | | | | | | 4.0523 | AFTER DEVOL. |
| | | | | | | | | | 0.27 | VOL (%) |

| DSC Results | |
|---|---|
| Peak Exo. | 230.90 °C |
| Enthalpy | 346.31 j/g |

| Flow Results | |
|---|---|
| 1 | 10.48% |
| 2 | 10.50% |
| 3 | 15.30% |
| Avg. | 12.09% |
| 1 | 17.55% |
| 2 | 17.02% |
| 3 | 12.63% |
| Avg. | 15.73% |

| Gel Times | |
|---|---|
| Neat Resin | 5m 08s |
| Prepreg | |
| 1 | 60m 41s |
| 2 | 60m 32s |
| 3 | 61m 12s |
| Prepreg | |
| 1 | 60m 33s |
| 2 | 61m 29s |
| 3 | 60m 56s |

**Table 8-2: Batch B Physical Test Results**

| RESIN | FIBER | BATCH # | D.O.M. | J/G | PEAK TEMP | RC% RANGE | FAW RANGE | CUSTOMER: | LTCP |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INDIVIDUAL: | INDIVIDUAL: | MAT SPEC: | ACG/0101 |
| MTM45-1 | HTS5631 | 2573 UD3 | 4/7/2006 | N/A | N/A | 29-35 | 136.3-153.7 | SHIP DATE: | |
| | | | | | | AVERAGE: | AVERAGE: | INITIALS: | |
| | | | | | | 30-34 | 137.75-152.25 | S.O. # : | 19242 |

**ALL INFORMATION SHOULD BE OBTAINED FROM THE SALES ORDER**

| | TEST PIECE | SAMPLE WEIGHT (GRAMS) | FOIL WEIGHT (GRAMS) | PREPREG WEIGHT (G.S.M.) | SAMPLE AFTER DEVOL | FIBER WEIGHT (G.S.M.) | FIBER WEIGHT (%) | RESIN WEIGHT (%) | VOLATILE CONTENT (%) | GEL TIME N/A |
|---|---|---|---|---|---|---|---|---|---|---|
| ROLL 1 | M | 2.1031 | 1.2888 | 210.31 | 2.7271 | 143.83 | 68.38952 | 31.61048 | 1.3084 | FOIL WEIGHT |
| | C | 2.1023 | 1.2849 | 210.23 | 2.7107 | 142.58 | 67.82096 | 32.17904 | 3.393 | SAMPLE & FOIL |
| | O | 2.1744 | 1.2875 | 217.44 | 2.7262 | 143.87 | 66.16538 | 33.83462 | 3.3839 | AFTER DEVOL. |
| AVERAGE | | | | **212.66** | | **143.43** | **67.46** | **32.54** | **0.44** | VOL (%) |
| ROLL 2 | M | 2.1051 | 1.2553 | 210.51 | 2.7101 | 145.48 | 69.10836 | 30.89164 | 1.3071 | FOIL WEIGHT |
| | C | 2.1143 | 1.2574 | 211.43 | 2.7002 | 144.28 | 68.24008 | 31.75992 | 3.3805 | SAMPLE & FOIL |
| | O | 2.1329 | 1.2583 | 213.29 | 2.6794 | 142.11 | 66.6276 | 33.3724 | 3.372 | AFTER DEVOL. |
| AVERAGE | | | | **211.74** | | **143.96** | **67.99** | **32.01** | **0.41** | VOL (%) |
| ROLL 3 | M | 2.058 | 1.2583 | 205.8 | 2.7006 | 144.23 | 70.0826 | 29.9174 | 1.2834 | FOIL WEIGHT |
| | C | 2.073 | 1.2404 | 207.3 | 2.6716 | 143.12 | 69.04004 | 30.95996 | 3.3509 | SAMPLE & FOIL |
| | O | 2.0913 | 1.2378 | 209.13 | 2.6306 | 139.28 | 66.59972 | 33.40028 | 3.339 | AFTER DEVOL. |
| AVERAGE | | | | **207.41** | | **142.21** | **68.57** | **31.43** | **0.58** | VOL (%) |
| ROLL 4 | M | 2.0606 | 1.2349 | 206.06 | 2.6569 | 142.2 | 69.00903 | 30.99097 | 1.315 | FOIL WEIGHT |
| | C | 2.047 | 1.2265 | 204.7 | 2.6376 | 141.11 | 68.93503 | 31.06497 | 3.3984 | SAMPLE & FOIL |
| | O | 2.1204 | 1.2313 | 212.04 | 2.6465 | 141.52 | 66.74212 | 33.25788 | 3.3878 | AFTER DEVOL. |
| AVERAGE | | | | **207.60** | | **141.61** | **68.23** | **31.77** | **0.51** | VOL (%) |
| ROLL 5 | M | 2.0484 | 1.2672 | 204.84 | 2.6938 | 142.66 | 69.6446 | 30.3554 | 1.3128 | FOIL WEIGHT |
| | C | 2.0735 | 1.2689 | 207.35 | 2.7112 | 144.23 | 69.55872 | 30.44128 | 3.3223 | SAMPLE & FOIL |
| | O | 2.0953 | 1.2926 | 209.53 | 2.7135 | 142.09 | 67.81368 | 32.18632 | 3.3137 | AFTER DEVOL. |
| AVERAGE | | | | **207.24** | | **142.99** | **69.01** | **30.99** | **0.43** | VOL (%) |

| DSC Results | | Flow Results | | Gel Times | |
|---|---|---|---|---|---|
| Peak Exo. | 232.28 °C | 1 | 13.59% | Neat Resin | 5m 06s |
| Enthalpy | 322.37 j/g | 2 | 11.95% | Prepreg | |
| | | 3 | 7.50% | 1 | 60m 06s |
| | | Avg. | 11.01% | 2 | 60m 22s |
| | | 1 | 13.34% | 3 | 60m 13s |
| | | 2 | 8.91% | Prepreg | |
| | | 3 | 12.93% | 1 | 60m 19s |
| | | Avg. | 11.72% | 2 | 60m 38s |
| | | | | 3 | 60m 29s |

| | |
|---|---|
| 1.3151 | FOIL WEIGHT |
| 3.3451 | SAMPLE & FOIL |
| 3.3362 | AFTER DEVOL. |
| **0.44** | VOL (%) |
| | FOIL WEIGHT |
| | SAMPLE & FOIL |
| | AFTER DEVOL. |
| | VOL (%) |
| | FOIL WEIGHT |
| | SAMPLE & FOIL |
| | AFTER DEVOL. |
| | VOL (%) |

**Table 8-3: Batch C Physical Test Results**

## 9. Deviations

1. Short beam shear specimen length is 6 times thickness, not 1.5 inches.
   Justification: Longer specimens may restrict shear failure to the center section only and preclude shear failures that run to one end of the specimens.
2. Use 350 ohm instead of 120 ohm strain gages. Specifically, in page 6,
   a. D3039: CEA-XX-250UW-120 will be replaced by CEA-XX-250UW-350
   b. D6641: CEA-XX-125UT-120 will be replaced by CEA-XX-125UT-350

   Justification: 350 ohm gages will produce less heat than 120 ohm gages so we can increase excitation voltage to increase signal to noise ratio.
3. Option to use one 350 ohm biaxial gage instead of using two 120 ohm single axial gage
   a. D3518: two CEA-XX-250UW-120 will be replaced by one CEA-XX-125UT-350

   Justification: Using one biaxial gage will ensure that the two single axial elements are perfectly perpendicular to each other.