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Report Date: February 12, 2024

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N/C Draft	Allison Crockett and Kristin Marlett	4/7/2009	UNC0 Batch A cure cycle 2 (ETW) should be included in calculations.
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Rev	By	Date	Pages Revised or Added
A	Allison Crockett and Kristin Marlett	4/21/2011	Introduction/Scope Section 1.1 wording edited
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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-17-1G — 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.

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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-17-1G. 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-17-1G are adequate for the given program.

Aircraft companies should not use the data published in this report without specifying NCAMP Material Specification NMS 451/6. NMS 451/6 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 451/6. NMS 451/6 is a free, publicly available, non-proprietary aerospace industry material specification.

1.2 Symbols Used

Q_2^t	major Poisson's ratio, tension
P H	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
Q_2^c	major Poisson's Ratio, compression
Q_1^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

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

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

1.3 NIAR NCAMP – ACG Specimen Naming Format

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

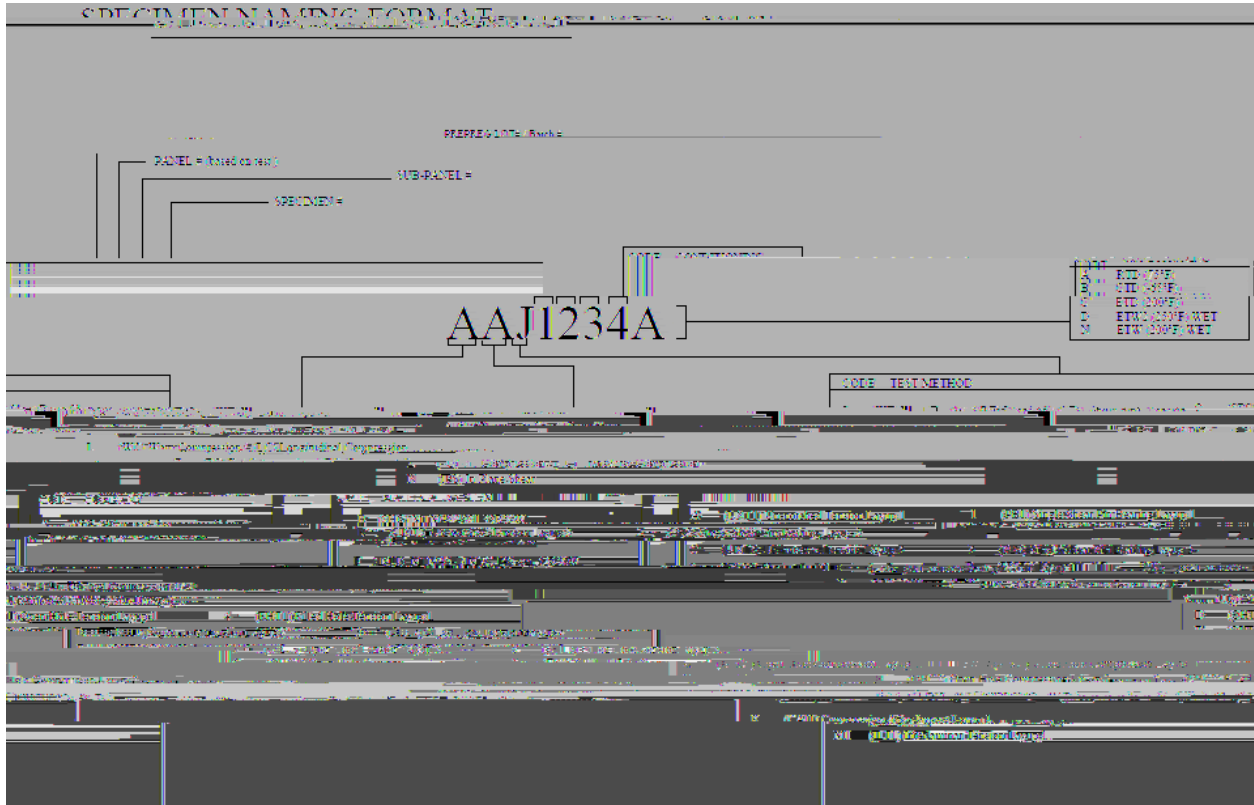


Figure 1-1: NIAR – ACG Specimen Naming Format Correlation

1.5 Methodology

1.5.1 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.

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1.5.2 Specimen & Testing Details

1.5.2.1 Tabbings

No tabs were used for this material system.

1.5.2.2 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.

ASTM D3039 tensile:

CEA-XX-250UW-120 or 350

(refer to AI/TR/1392 Rev E 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

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”.

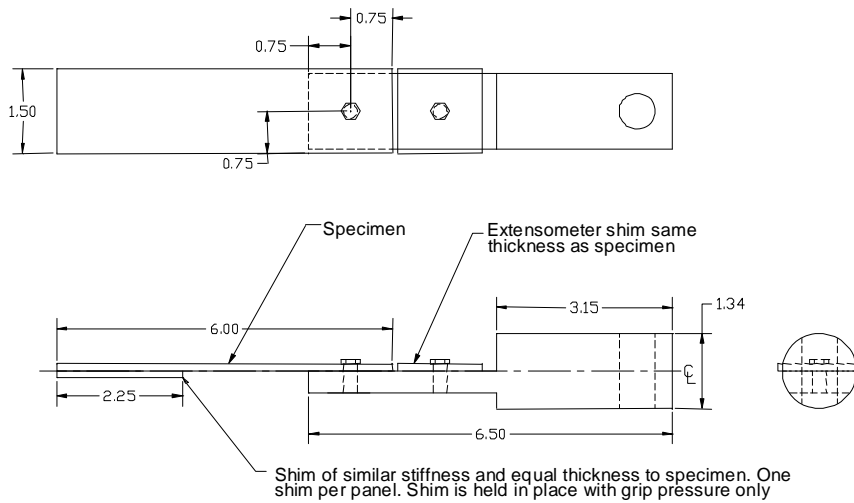


Figure 1-4: Modified ASTM D5961 (Pin Bearing) Specimen and Loading Arrangement

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

1.5.3 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 13 of Appendix 1 of AI/TR/1392 Rev E Appendix (or later revisions).

Layup	Test Type and Direction	Property	Number of Batches x Number of Panels x Number of Test Specimens Test Temperature/Moisture Condition				
			CTD	RTD	ETD	ETW	ETW2
[0] ₁₆	ASTM D3039 0° Tension	Modulus	3x2x3	3x2x3		3x2x3	3x2x3
[0] ₁₆	ASTM D6641 0° Compression (1)	Modulus and Poisson's Ratio	3x2x3	3x2x3		3x2x3	3x2x3
[90] ₁₆	ASTM D3039 90° Tension	Strength and Modulus	3x2x3	3x2x3		3x2x3	3x2x3
[90] ₁₆	ASTM D6641 90° Compression	Strength, Modulus and Poisson's Ratio	3x2x3	3x2x3		3x2x3	3x2x3
[0/90] _{4S}	ASTM D3039 0° Tension (1)	Strength and Modulus	3x2x3	3x2x3		3x2x3	3x2x3
[90/0] _{4S}	ASTM D6641 90° Compression (1)	Strength, Modulus and Poisson's Ratio	3x2x3	3x2x3	3x2x3	3x2x3	3x2x3
[45/-45] _{2S}	ASTM D3518 In-Plane Shear (2)	Strength and Modulus	3x2x4	3x2x4	3x1x4	3x2x4	3x2x4
[0] ₁₆	ASTM D2344 Short Beam Strength	Strength	3x2x3	3x2x3	3x2x3	3x2x3	3x2x3

			CTD	RTD	ETW	ETW2	
(25/50/25 - QI) OHT1	ASTM D5766 Open Hole Tension (1) [45/0/-45/90]3S	Strength	3x2x3	3x2x3	1x2x3	3x2x3	
(10/80/10) OHT2	ASTM D5766 Open Hole Tension (1) [45/-45/0/45/-45/90/45/-45/45/-45]S	Strength	3x2x3	1x2x3		1x2x3	
(50/40/10) OHT3	ASTM D5766 Open Hole Tension (1) [0/0/45/0/90/-45/0/45/0/-45]S	Strength	3x2x3	1x2x3		1x2x3	
(25/50/25 - QI) OHC1	ASTM D6484 Open Hole Compression (1) [45/0/-45/90]3S	Strength		3x2x3	1x2x3	3x2x3	
(10/80/10) OHC2	ASTM D6484 Open Hole Compression (1) [45/0/-45/90]3S	Strength	1x2x3		1x2x3		ASTM D5766 Open Hole Compression
(25/50/25 - QI) OHCHT3	ASTM D5766 Open Hole Tension (1) [45/0/-45/90]3S	Strength	5/2x[45/0/-45/90]3S	ASTM D6484E 2x[45/0/-45/90]3S	ASTM D6484E 2x[45/0/-45/90]3S	ASTM D6484E 2x[45/0/-45/90]3S	ASTM D5766 Open Hole Compression

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1.5.6 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 = $-65\pm 5^{\circ}\text{F}$, ambient moisture content dry
RTD = room temperature ambient dry
RTA = room temperature ambient – no drying required
ETD = $200\pm 5^{\circ}\text{F}$ dry
ETW = $200\pm 5^{\circ}\text{F}$, wet (equilibrium moisture content)
ETW2 = $250\pm 5^{\circ}\text{F}$, wet (equilibrium moisture content)

Unless otherwise specified, a tolerance of $\pm 5^{\circ}\text{F}$ applied to all temperature conditions specified in this document.

For dry testing, specimens were dried at $160^{\circ}\text{F}\pm 5^{\circ}\text{F}$ for 120 to 130 hours. When drying was completed, specimens were either stored until testing in a sealed oven maintained at $85^{\circ}\text{F} \pm 5^{\circ}\text{F}$ or alternately stored with desiccant in a sealed container. For wet testing, specimens were conditioned to equilibrium in a $160^{\circ}\text{F}\pm 5^{\circ}\text{F}$ and $85\% \pm 5\% \text{RH}$ 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

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1.5.8 Normalization Procedures

The nominal cure ply thicknesses for each material type are given in Appendix 3 of AI/TR/1392 Rev E (or later revisions). 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.:

$$\text{Normalized strength} = \text{Measured Strength} \times \text{Measured CPT} / \text{Nominal CPT}$$

The nominal CPT is 0.0055 inch and the average CPT was 0.0056 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.

1.5.9 Conformity

All laminates and specimens for design allowable were inspected for conformance with the requirements of this document and Appendices 1 and 2 of AI/TR/1392 Rev E. 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.

1.5.10 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.

2. Test Results

2.1 Lamina Level Test Summary

Prepreg Material: Advanced Composites Group - MTM45-1/IM7-145 gsm Unidirectional Tape
Material Specification: ACGM 1001-06 or NMS 451/6
Process Specification: ACGP 1001-02 or NPS 81451 "MH" Cure Cycle

Fiber: Hexcel Corp., IM7-GP fiber, 12K tow (HS-CP-5000/IM7specification) **Resin:** MTM45-1

Tg(dry): 349.06°F **Tg(wet):** 317.11°F **Tg METHOD:** DMA (SRM 18R-94)

	Batch A/B/C	Batch B/C/D (IPS Retest)
Fiber Batch Information:	3763-7H, 3117-7B, 3666-7E	91M0040153, 91M0041735, 91M0042859, 91M0046147, 91M0048407
Date of fiber manufacture:	12/12/2006, 1/20/2005, 8/31/2006	8/8/2021, 11/30/2021, 2/23/2022, 9/20/2022, 1/23/2023
Resin Batch Information:	2781, 2699, 2751	XXG0DC, XXG0DB, GV094Y
Date of resin manufacture:		D/17/2007, 8/25 ö, M if &y if , = 20M Or

2.2 Laminate Level Test Summary

Prepreg Material: Advanced Composites Group - MTM45-1/IM7-145 gsm Unidirectional Tape
Material Specification: ACGM 1001-06 or NMS 451/6
Process Specification: ACGP 1001-02 or NPS 81451 "MH" Cure Cycle

Fiber:	Hexcel Corp., IM7-GP fiber, 12K tow (HS-CP-5000/IM7specification)			Resin: MTM45-1
Tg(dry)	349.06°F	Tg(wet)	317.11°F	Tg METHOD: DMA (SRM 18R-94)
		Batch A	Batch B	Batch C

2.3 Individual Test Summaries

2.3.1 Longitudinal Tension Properties (LT)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni		Tension, 1-axis Gr/ Ep ACG - MTM45-1/ IM7 Uni [0]16						
Resin content: 33.997 % w t	Comp. density: 1.534 [g/cc]							
Fiber volume: 57.183 % vol								
Ply count: 16								
Test method: ASTM D3039-00		Modulus calculation: 1000 to 3000 microstrain						
Normalized by: 0.0055 in. CPT								
	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	AFJX X1XB	AFJX X1XA	AFJX X1XN	AFJX X1XD				
	Normalized	Measured	Normalized	Measured	Normalized			
	Measured		Measured		Measured			
Mean	23.36	22.34	22.90	22.00	22.12	21.37	23.82	23.24
Minimum	21.96	21.22	21.46	21.10	20.73	20.36	22.68	21.56
Maximum	25.11	22.99	25.47	22.75	23.74	22.34	25.23	25.07
E_t (Msi)								
C.V.(%)	4.81	2.21	5.28	2.23	3.64	2.90	3.19	4.52
No. Specimens	17		16		16		15	
No. Prepreg Lots	3		3		3		3	

2.3.2 Transverse Tension Properties (TT)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni		Tension, 2-axis Gr/ Ep ACG - MTM45-1/ IM7 Uni [90]16			
Resin content: 34.546 % w t	Comp. density: 1.538 [g/cc]				
Fiber volume: 56.863 % vol					
Ply count: 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	AFUX X1XB	AFUX X1XA	AFUX X1XN	AFUX X1XD	
	Normalized	Measured	Normalized	Measured	Normalized
					Measured
F₂^{tu} (ksi)	Mean	8.34	7.59	4.30	3.49
	Minimum	5.33	5.41	2.56	2.43
	Maximum	10.42	9.52	5.29	4.52
	C.V.(%)	16.97	16.97	23.44	21.10
	No. Specimens	18	21	19	18
	No. Prepreg Lots	3	3	3	3
E₂^t (Msi)	Mean	1.24	1.11	0.95	0.82
	Minimum	1.14	1.01	0.87	0.70
	Maximum	1.45	1.24	1.03	0.97
	C.V.(%)	6.07	5.08	5.12	7.55
	No. Specimens	22	23	19	18
	No. Prepreg Lots	3	3	3	3

2.3.3 Longitudinal Compression Properties (LC)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni									
Resin content: 32.970 % wt		Comp. density: 1.536 [g/cc]							
Fiber volume: 58.174 % vol									
Ply count: 16									
Test method: ASTM D6641-01e1		Modulus calculation: 1000 to 3000 microstrain							
Normalized by: 0.0055		in. CPT							
		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		AFLX X1XB		AFLX X1XA		AFLX X1XN		AFLX X1XD	
		Normalized	Measured	Normalized	Measured	Normalized	Measured	Normalized	Measured
E₁^c (Msi)	Mean	20.41	19.96	20.24	19.84	20.25	20.13	20.42	20.21
	Minimum	17.71	18.36	18.01	18.25	18.54	18.61	18.91	18.82
	Maximum	22.49	21.60	21.75	21.03	22.22	21.34	21.75	21.45
	C.V.(%)	6.89	5.17	4.86	3.78	5.06	3.73	4.43	3.17
	No. Specimens	20		23		18		20	
No. Prepreg Lots	3		3		3		3		
Q₁₂^c	Mean	0.346		0.361		0.373		0.389	
	No. Specimens	21		22		18		20	
	No. Prepreg Lots	3		3		3		3	

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2.3.4 Transverse Compression Properties (TC)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content:

2.3.5 In-Plane Shear Properties (IPS)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni
Resin content: 32.70 %wt **Comp. density:** 1.521 [g/cc]
Fiber volume: 57.49 %vol
Ply count: 8
Test method: ASTM D3518-18 **Modulus calculation:** 2000 to 6000 microstrain
Normalized by: NA

= r3 . 1

	Normalized	Measured	Normalized	Measured	Normalized	Measured	Normalized	Measured	Normalized	Measured
Mean		8.404		6.386		5.010		4.094		3.219
Minimum		8.098		6.068		4.839		3.873		2.997
Maximum		8.717		6.681		5.214		4.453		3.847
C.V.(%)		1.692		2.741		2.013		3.272		4.971
No. Specimens								30		
No. Prepreg Lots								3		
Mean		14.04		10.45		7.592		6.087		4.829
Minimum		13.37		9.875		7.416		5.764		4.468
Maximum		14.94		10.92		7.791		6.608		5.326
C.V.(%)		2.554		2.657		1.392		3.300		4.154
No. Specimens								30		
No. Prepreg Lots								3		
Mean		0.690		0.566		0.465		0.416		0.328
Minimum		0.661		0.529		0.453		0.392		0.306
Maximum		0.740		0.595		0.482		0.448		0.353
C.V.(%)		2.451		3.379		1.702		3.059		3.783
No. Specimens								30		
No. Prepreg Lots								3		

2.3.6 “50/0/50” Unnotched Tension 0 Properties (UNT0)

Material:		Advanced Composites Group - MTM45-1/ IM7 Uni							
Resin content:		33.477 % w t		Comp. dens 1.528 [g/cc]					
Fiber volume:		57.441 % vol							
Ply count:		16							
Test method:		ASTMD3039-00		Modulus calculation: 1000 to 3000 microstrain					
Normalized by:		0.0055		in. CPT					
		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		AFPX X1XB		AFPX X1XA		AFPX X1XN		AFPX X1XD	
		Normalized Measured		Normalized Measured		Normalized Measured		Normalized Measured	
UNT0 Strength (ksi)									
Mean		184.31 177.76		181.55 174.71		190.61 186.51		188.22 183.80	
Minimum		165.01 158.18		167.36 160.60		172.78 165.17		167.83 161.29	
Maximum		202.16 189.25		200.54 192.10		211.61 203.85		205.76 199.45	
C.V.(%)		5.81 4.95		4.94 4.76		5.38 4.82		6.60 6.00	
No. Specimens		18		19		22		20	
No. Prepreg Lots		3		3		3		3	
UNT0 Modulus (Msi)									
Mean		11.62 11.21		11.62 11.19		11.43 11.20		13.09 12.79	
Minimum		9.92 9.51		10.69 10.29		10.74 10.34		11.04 10.51	
Maximum		12.53 11.91		12.33 11.77		12.15 11.91		14.90 14.44	
C.V.(%)		5.20 4.70		4.48 3.91		3.99 3.39		6.92 7.41	
No. Specimens		18		20		22		20	
No. Prepreg Lots		3		3		3		3	

2.3.7 “25/50/25” Unnotched Tension 1 Properties (UNT1)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni	
Resin content: 32.666 % wt	Comp. density: 1.532 [g/cc]
Fiber volume: 58.292 % vol	
Ply count: 24	f f 1/EA
Test method: ASTM D3039-00	
Modulus calculation: 1000 to 3000 microstrain	
Normalized by: 0.0055	in. CPT

	CTD	RTD	ETW2
Test Temperature [°F]			250
Moisture Conditioning			equc 1T → r
Equilibrium at T, RH			
Source code	AFAX X1XB	AFAX X1XA	AFAX X1XD
	Normalized	Measured	Normalized
	Normalized	Measured	Measured
Mean	130.69	128.55	132.81
Minimum	119.58	117.88	125.59
Maximum	144.13	140.31	146.63
UNT1 Strength (ksi) C.V.(%)	5.78	5.26	4.94
	4.23	4.37	4.62
No. Specimens	18		6
No. Prepreg Lots	3		1
Mean	8.27	8.14	8.13
Minimum	7.71	7.59	7.65
Maximum	8.83	8.83	8.41
UNT1 Modulus (Msi) C.V.(%)	3.58	3.91	2.33
	2.59	5.38	5.50

No. Specimens	
No. Prepreg Lots	

2.3.10 “50/0/50” Unnotched Compression 0 Properties (UNC0)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni		Unnotched Compression 0 Gr/ Ep ACG - MTM45-1/ IM7 Uni [90/0]4S									
Resin content: 34.557 % wt	Comp. density: 1.537 [g/cc]										
Fiber volume: 56.824 % vol											
Ply count: 16											
Test method: ASTM D6641-01e1	Modulus calculation: 1000 to 3000 microstrain										
Normalized by: 0.0055	in. CPT										
		CTD		RTD		ETD		ETW		ETW2	
Test Temperature [°F]	-65	-65		75		200		200		250	
Moisture Conditioning	dry	dry		dry		dry		equilibrium		equilibrium	
Equilibrium at T, RH								160 F,85%		160 F,85%	
Source code	AFRX X1XB	AFRX X1XA		AFRX X1XC		AFRX X1XN		AFRX X1XD			
		Normalized	Measured	Normalized	Measured	Normalized	Measured	Normalized	Measured	Normalized	Measured
UNC0 Strength (ksi)	Mean	116.81	113.57	99.65	96.80	90.17	87.80	83.27	82.24	76.56	75.32
	Minimum	100.64	97.97	82.62	82.16	80.27	77.88	76.37	74.28	59.64	60.63
	Maximum	134.00	131.53	114.34	108.43	98.91	95.86	88.91	89.36	86.65	84.62
	C.V.(%)	8.84	8.99	9.69	8.52	6.76	7.00	6.62	6.71	9.90	9.03
	No. Specimens	10		8		8		6		9	
	No. Prepreg Lots	2		2		2		2		2	
UNC0 Modulus (Msi)	Mean	11.64	11.30	11.11	10.80	11.24	10.98	10.93	10.74	11.32	11.16
	Minimum	9.88	9.71	10.16	9.76	9.78	9.59	9.23	9.05	10.31	10.07
	Maximum	13.25	12.70	12.24	11.86	12.05	11.72	12.42	12.10	12.83	12.69
	C.V.(%)	10.38	9.30	6.54	6.64	6.46	6.40	7.90	7.62	6.89	6.95
	No. Specimens	10		8		11		12		11	
	No. Prepreg Lots	2		2		2		2		2	
√UNC0	Mean	0.047		0.040		0.039		0.039		0.036	
	No. Specimens	12		11		11		12		11	
	No. Prepreg Lots	2		2		2		2		2	

*See Section 9 Deviations, for further explanation on the data not included.

2.3.11 “25/50/25” Unnotched Compression 1 Properties (UNC1)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 32.597 % wt

Comp. density: 1.511 [g/cc]

Fiber volume: 57.543 % vol

Ply count: 24

Test method: ASTM D6641-01e1

Modulus calculation: 1000 to 3000 microstrain

Normalized by: 0.0055 in. CPT

	Normalized	Measured	Normalized	Measured	Normalized	Measured
Mean	80.93	80.24	70.42	67.84	59.76	59.32
Minimum	76.38	73.65	68.74	66.22	54.04	53.78
Maximum	84.90	84.97	71.71	69.21	71.80	76.80
Minimum		5	80	80	178	
Maximum	5					580

2.3.12 “10/80/10” Unnotched Compression 2 Properties (UNC2)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 33.050 % wt

Comp. density: 1.526 [g/cc]

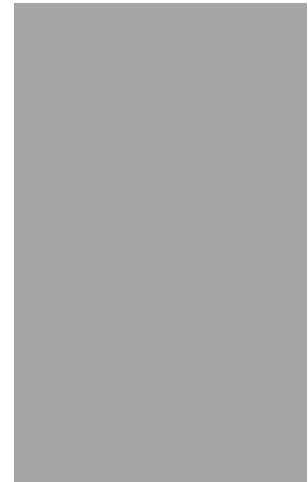
Fiber volume: 57.736 % vol

Ply count: 20

Test method: ASTM D6641-01e1

Modulus calculation: 1000 to 30000 1 - t a i0

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2.3.13 “50/40/10” Unnotched Compression 3 Properties (UNC3)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 33.394 % wt

Comp. density: 1.531 [g/cc]

Fiber volume: 57.627 % vol

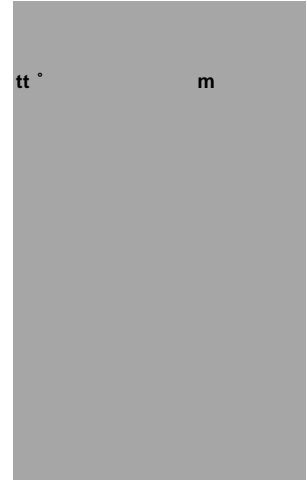
Ply count: 20

Test method: ASTM D6641-01e1

Modulus calculation: 1000 to 3000 microstrain

Normalized by: 0.0055 in. CPT

	Normalized	Measured	Normalized	Measured
Mean	93.43	91.70	71.40	70.08
Minimm R 0 4	0	. m	seas a se	tt ° m



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2.3.15 Laminate Short-Beam Strength Properties (SBS1)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: NA **Comp. density:** NA

Fiber volume: NA

Ply count: 24

Test method: ASTM D2344-00

Normalized by: NA

	RTD		ETW			
Test Temperature [°F]	75		200			
Moisture Conditioning	dry		equilibrium			
Equilibrium at T, RH			160 F, 85%			
Source code	AFqX XGXA		AFqX XGXN			
	Normalized	Measured	Normalized	Measured	Normalized	Measured
Mean		10.22		7.12		5.80
Minimum		8.85		6.51		3.24
Maximum		11.65		7.46		6.34
C.V.(%)		8.59		7.38		13.48
No. Specimens		12		3		
No. Prepreg Lots		3		1		

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2.3.17 “10/80/10” Open-Hole Tension 2 Properties (OHT2)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni		Open-Hole Tension 2 Gr/ Ep ACG - MTM45-1/ IM7 Uni [45/-45/0/45/-45/90/45/-45/45/-45]S					
Resin content: 32.093 % wt	Comp. density: 1.533 [g/cc]						
Fiber volume: 58.824 % vol							
Ply count: 20							
Test method: ASTM D5766-02a							
Normalized by: 0.0055 in. CPT							
	CTD		RTD		ETW2		
Test Temperature [°F]	-65		75		250		
Moisture Conditioning	dry		dry		equilibrium		
Equilibrium at T, RH					160 F,85%		
Source code	AFEX X1XB		AFEX X1XA		AFEX X1XD		
	Normalized	Measured	Normalized	Measured	Normalized	Measured	
OHT2 Strength (ksi)	Mean	48.77	48.06	46.98	46.41	42.72	42.04
	Minimum	47.50	46.12	44.34	44.46	40.44	40.34
	Maximum	52.81	52.19	48.68	48.90	44.11	43.79
	C.V.(%)	2.79	2.81	3.50	3.54	3.44	2.75
	No. Specimens	18		6		6	
No. Prepreg Lots	3		1		1		

2.3.18 “50/40/10” Open-Hole Tension 3 Properties (OHT3)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 32.707 % wt **Comp. density:** 1.530 [g/cc]
Fiber volume: 58.187 % vol
Ply count: 20

Test method: ASTM D5766-02a

Normalized by: 0.0055 in. CPT

2.3.19 “25/50/25” Filled-Hole Tension 1 Properties (FHT1)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 32.804 % w t **Comp. density** 1.530 [g/cc]

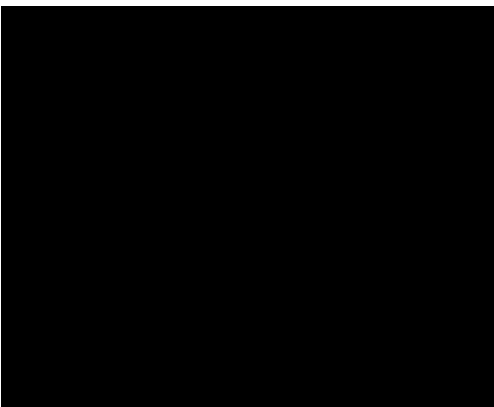
Fiber volume: 58.097 % vol

Ply count: 24

Test method: ASTM D6742-02

Normalized by: 0.0055 in. CPT

	Normalized	Measured	Normalized	Measured
Mean	69.79	68.61	70.35	69.65
Minimum	66.98	65.54	67.78	66.18
Maximum	74.36	73.75	73.19	72.10
C.V.(%)	2.46	2.83	2.51	2.82
No. Specimens				
No. PreprA				



2.3.20 “10/80/10” Filled-Hole Tension 2 Properties (FHT2)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 33.586 % wt **Comp. density** 1.537 [g/cc]

Fiber volume: 57.662 % vol

Ply count: 20

Test method: ASTM D6742-02

Normalized by: 0.0055 in. CPT

	Normalized	Measured	Normalized	Measured	Normalized	Measured
Mean	52.73	50.82	48.76	47.21	43.80	42.04
Minimum	50.84	48.50	47.37	45.46	41.25	40.00
Maximum	53.96	52.13	50.72	48.90	45.46	43.36
C.V.(%)	1.87	2.21	2.44	2.38	4	2 N

2.3.21 “50/40/10” Filled-Hole Tension 3 Properties (FHT3)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 34.156 % wt **Comp. density** 1.538 [g/cc]

Fiber volume: 57.213 % vol

Ply count: 20

Test method: ASTM D6742-02

Normalized by: 0.0055 in. CPT

CTD R ~ XA 3 2M re t-3 r med-Š sur / - Ůe
 -65
 dry dry

	AF6X X1XB		AF6X X1XA	
	Normalized	Measured	Normalized	Measured
Mean	105.08	100.27	106.60	101.87
Minimum	94.56	90.44	103.80	99.11
Maximum	109.74	104.73	109.33	104.30
C.V.(%)	6.77	6.60	2.84	2.42
No. Specimens	4		4	
No. Prepreg Lots	1		1	



2.3.22 “25/50/25” Open-Hole Compression 1 Properties (OHC1)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 33.327 % wt **Comp. density:** 1.527 [g/cc]
Fiber volume: 57.525 % vol
Ply count: 24

Test method: ASTM D6484-04

Normalized by: 0.0055 in. CPT

Nor

2.3.23 “10/80/10” Open-Hole Compression 2 Properties (OHC2)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni		Open-Hole Compression 2 Gr/ Ep ACG - MTM45-1/ IM7 Uni [45/-45/0/45/-45/90/45/-45/45/-45]S			
Resin content: 33.740 % wt	Comp. density: 1.534 [g/cc]				
Fiber volume: 57.424 % vol	Ply count: 20				
Test method: ASTM D6484-04					
Normalized by: 0.0055 in. CPT					
	RTD	ETW2			
Test Temperature [°F]	75	250			
Moisture Conditioning	dry	equilibrium			
Equilibrium at T, RH		160 F,85%			
Source code	AFHX X1XA	AFHX X1XD			
	Normalized	Measured	Normalized	Measured	
Mean	38.05	36.76	25.71	25.20	
Minimum	36.84	35.90	24.11	23.88	
Maximum	39.94	37.53	27.39	26.78	
OHC2 Strength (ksi) C.V.(%)	3.26	1.53	3.82	3.08	
No. Specimens	6		18		
No. Prepreg Lots	1		3		

2.3.24 “50/40/10” Open-Hole Compression 3 Properties (OHC3)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni		Open-Hole Compression 3 Gr/ Ep ACG - MTM45-1/ IM7 Uni			
Resin content: 33.155 % wt	Comp. density: 1.527 [g/cc]				
Fiber volume: 57.660 % vol	Ply count: 20				
Test method: ASTM D6484-04					
Normalized by: 0.0055 in. CPT					
	RTD	ETW2			
Test Temperature [°F]	75	250			
Moisture Conditioning	dry	equilibrium			
Equilibrium at T, RH		160 F,85%			
Source code	AFIX X1XA	AFIX X1XD			
	Normalized	Measured	Normalized	Measured	
Mean	49.93	49.12	39.70	39.41	
Minimum	44.21	41.99	35.42	34.13	
Maximum	56.62	56.77	45.27	45.34	
OHC3 Strength (ksi) C.V.(%)	7.64	9.90	6.55	7.49	
No. Specimens	7		18		
No. Prepreg Lots	1		3		

2.3.25 “25/50/25” Filled-Hole Compression 1 Properties (FHC1)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni
Resin content: 33.465 % wt **Comp. density** 1.534 [g/cc]
Fiber volume: 57.681 % vol
Ply count: 24
Test method: ASTM D6742-02
Normalized by: 0.0055 in. CPT

	RTD 75 dry AF7X X1XA		ETW2 250 equilibrium 160 F,85% AF7X X1XA	
	Normalized	Measured	Normalized	Measured
Mean	66.57	65.58	44.43	43.92
Minimum	64.41	63.22	42.09	41.35
Maximum	68.25	67.38	48.33	47.89
C.V.(%)	2.64	2.80	4.56	4.81
No. Specimens	6		18	
No. Prepreg Lots	1		3	



2.3.26 “10/80/10” Filled-Hole Compression 2 Properties (FHC2)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 33.467 % wt **Comp. density:** 1.537 [g/cc]

Fiber volume: 57.775 % vol

Ply count: 20

Test method: ASTM D6742-02

Normalized by: 0.0055 in. CPT

Test Temperature [°F]

Moisture Conditioning

Equilibrium at T, RH

Source code

‡ - m< A i

	Normalized	Measured	Normalized	Measured
Mean	53.80	52.58	35.67	35.34
Minimum	90	22.88	35.34	
	0%			



2.3.27 “50/40/10” Filled-Hole Compression 3 Properties (FHC3)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni		Filled-Hole Compression 3 Gr/ Ep ACG - MTM45-1/ IM7 Uni [0/0/45/0/90/-45/0/45/0/-45]S			
Resin content: 33.129 % wt	Comp. density: 1.539 [g/cc]				
Fiber volume: 58.157 % vol					
Ply count: 20					
Test method: ASTM D6742-02					
Normalized by: 0.0055 in. CPT					
	RTD	ETW2			
Test Temperature [°F]	75	250			
Moisture Conditioning	dry	equilibrium			
Equilibrium at T, RH		160 F,85%			
Source code	AF9X X1XA	AF9X X1XD			
	Normalized	Measured	Normalized	Measured	
FHC3 Strength (ksi)	Mean	77.85	77.20	51.87	51.44
	Minimum	75.38	74.50	42.47	42.73
	Maximum	80.89	80.52	59.21	58.51
	C.V.(%)	3.60	3.96	9.18	9.03
	No. Specimens	3		15	
	No. Prepreg Lots	1		3	

2.3.29 “10/80/10” Pin Bearing 2 Properties (PB2)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni					
Resin content: 33.576 % wt		Comp. density 1.534 [g/cc]			
Fiber volume: 57.576 % vol					
Ply count: 20					
Test method: ASTM D5961-05					
Normalized by: 0.0055		in CPT			
		RTD		ETW2	
Test Temperature [°F]	75		250		
Moisture Conditioning	dry		equilibrium		
Equilibrium at T, RH			160 F,85%		
Source code	AF2X X1XA		AF2X X1XD		
	Normalized	Measured	Normalized	Measured	
Mean	101.38	99.58	78.84	76.16	
Minimum	95.73	94.19	62.31	59.91	
Maximum	106.99	106.41	89.66	89.83	
PB2 2% Offset Strength (ksi)	C.V.(%)	3.73	4.26	9.02	10.87
	No. Specimens	6		18	
	No. Prepreg Lots	1		3	

2.3.30 “50/40/10” Pin Bearing 3 Properties (PB3)

Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 33.446 % wt **Comp. density** 1.538 [g/cc]

Fiber volume: 57.818 % vol

Ply count: 20

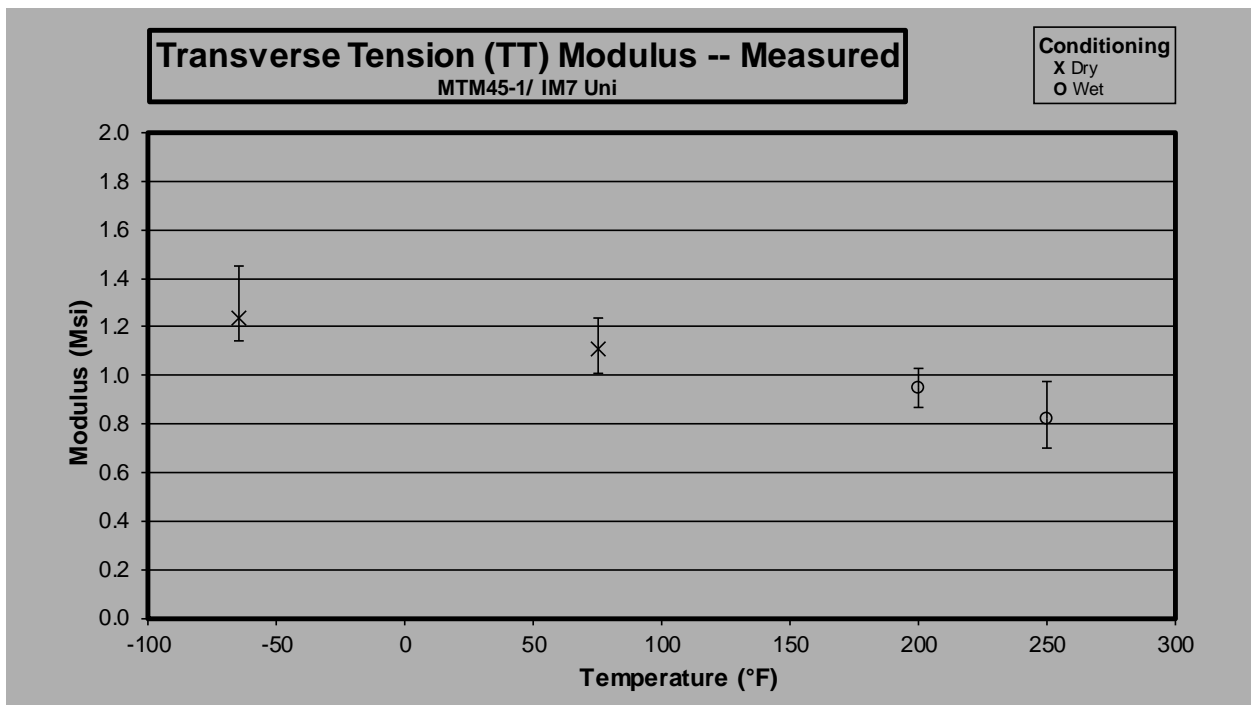
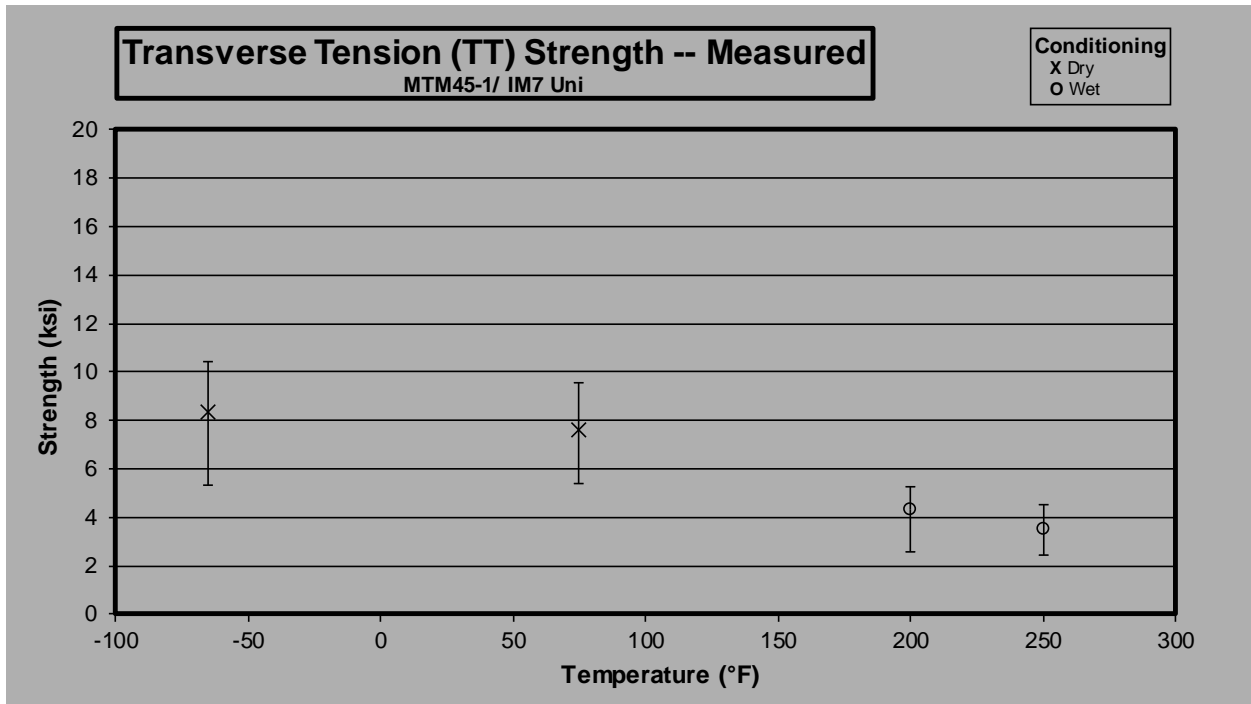
Test meth e:



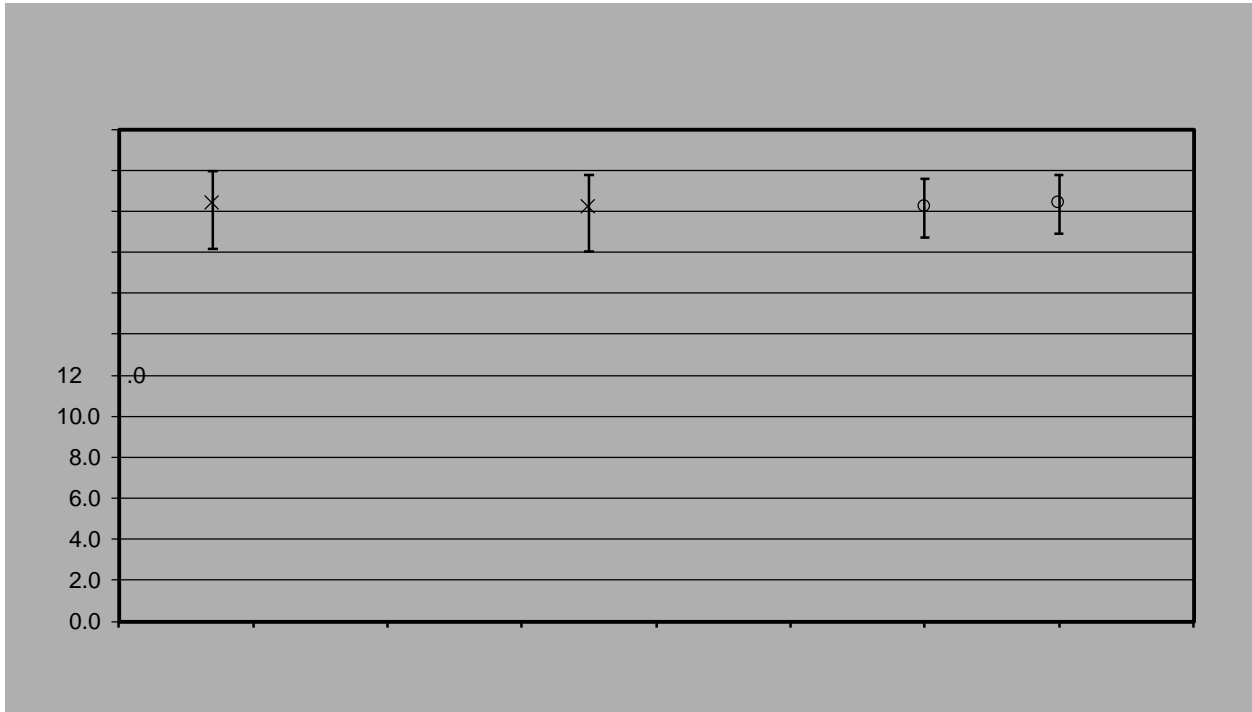
3. Individual Test Charts

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

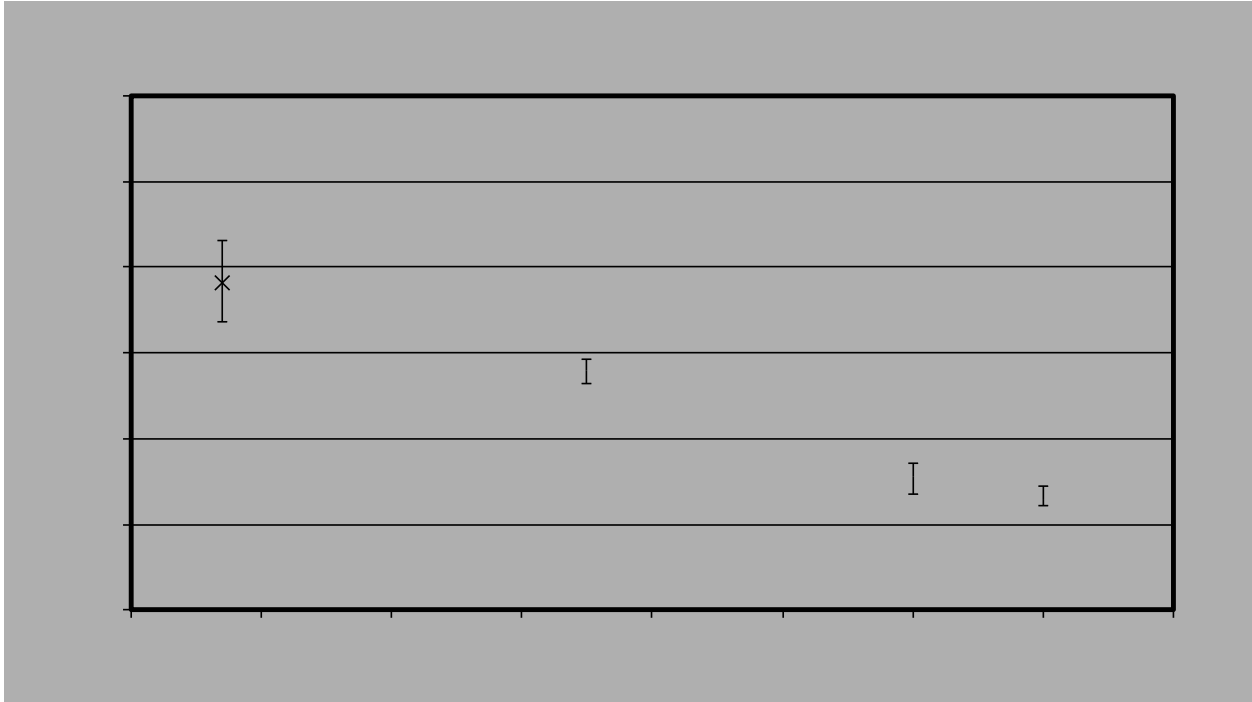
3.2 Transverse Tension Properties (TT)



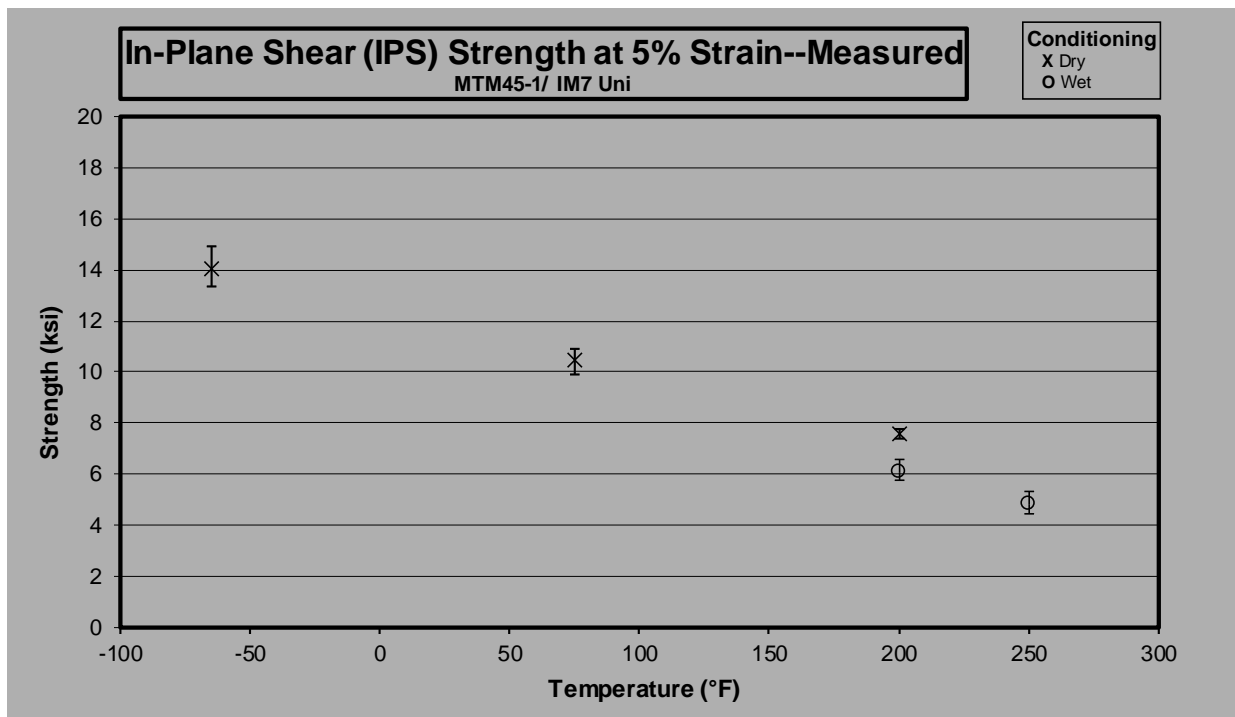
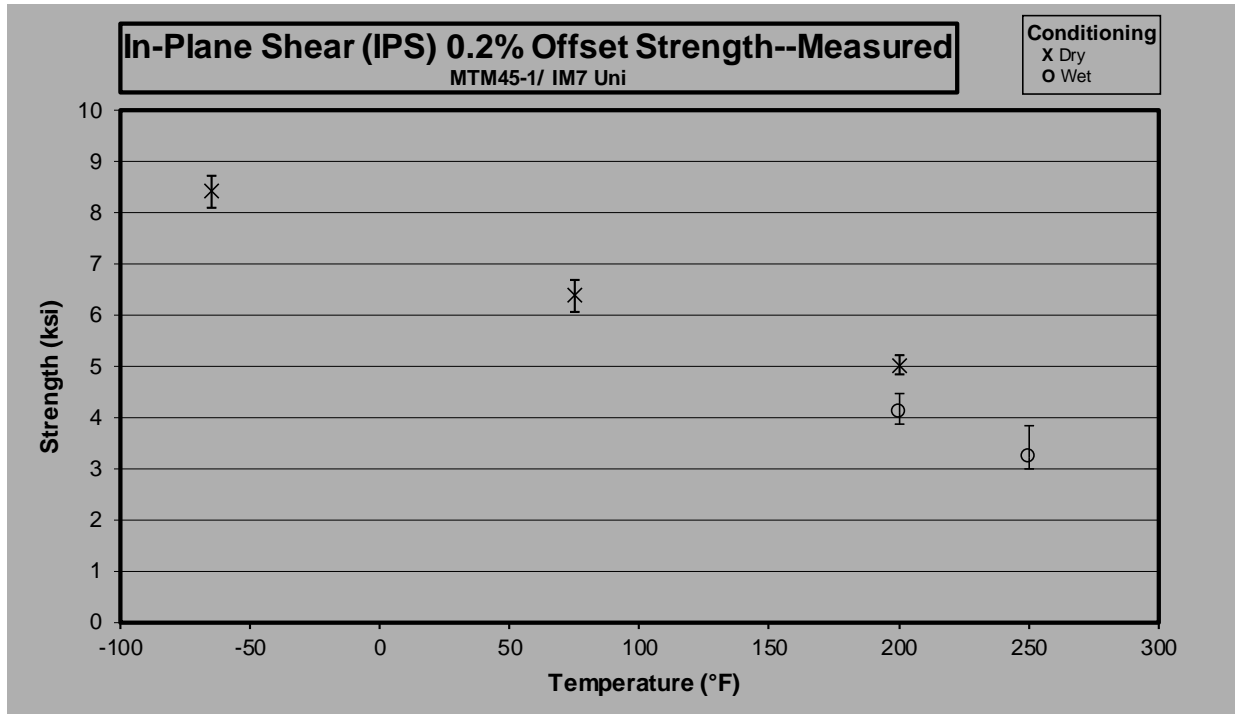
3.3 Longitudinal Compression Properties (LC)



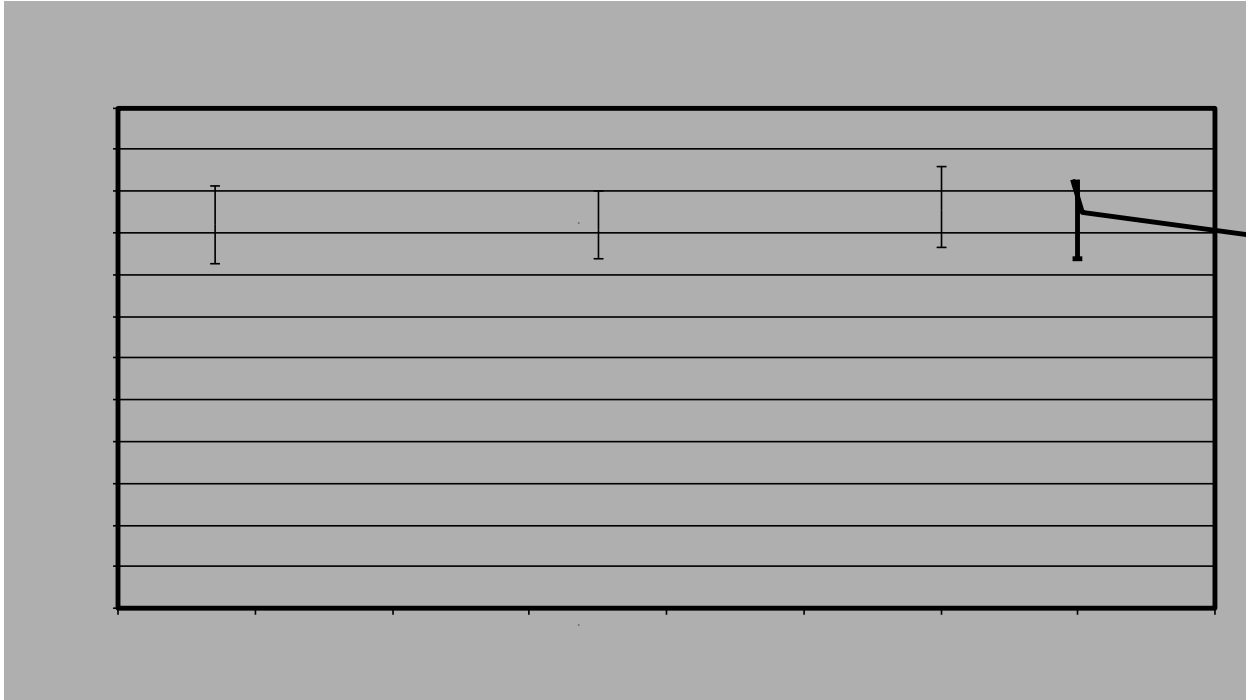
3.4 Transverse Compression Properties (TC)



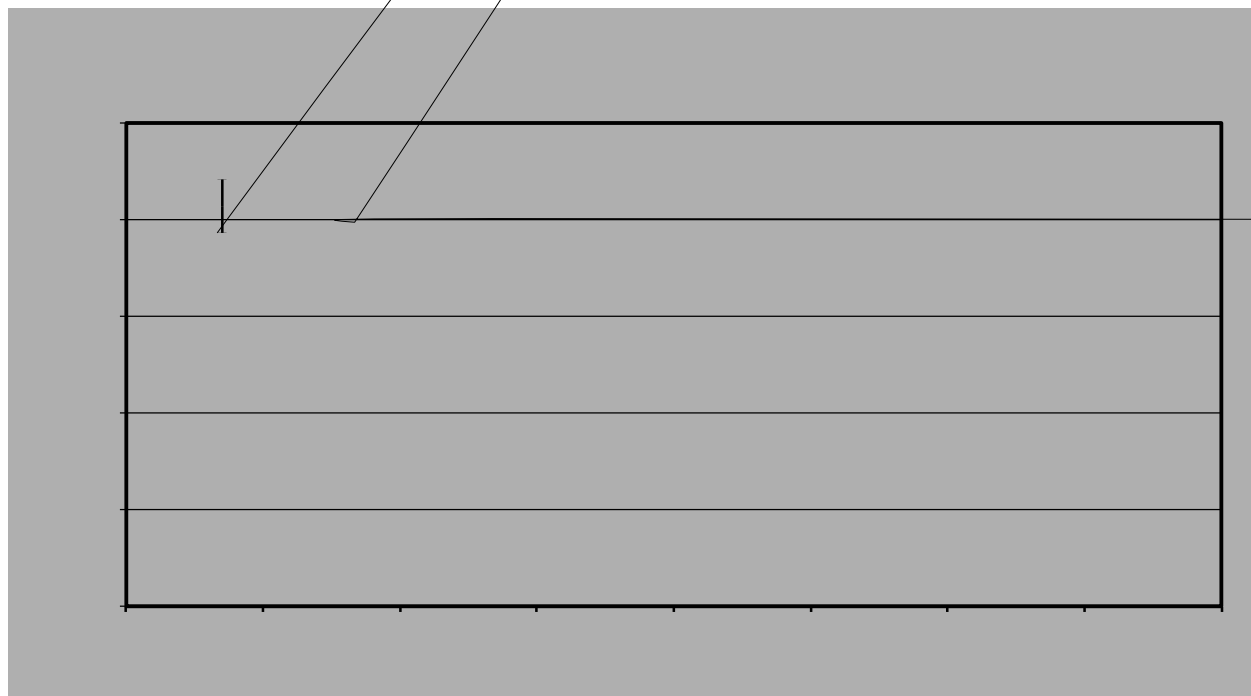
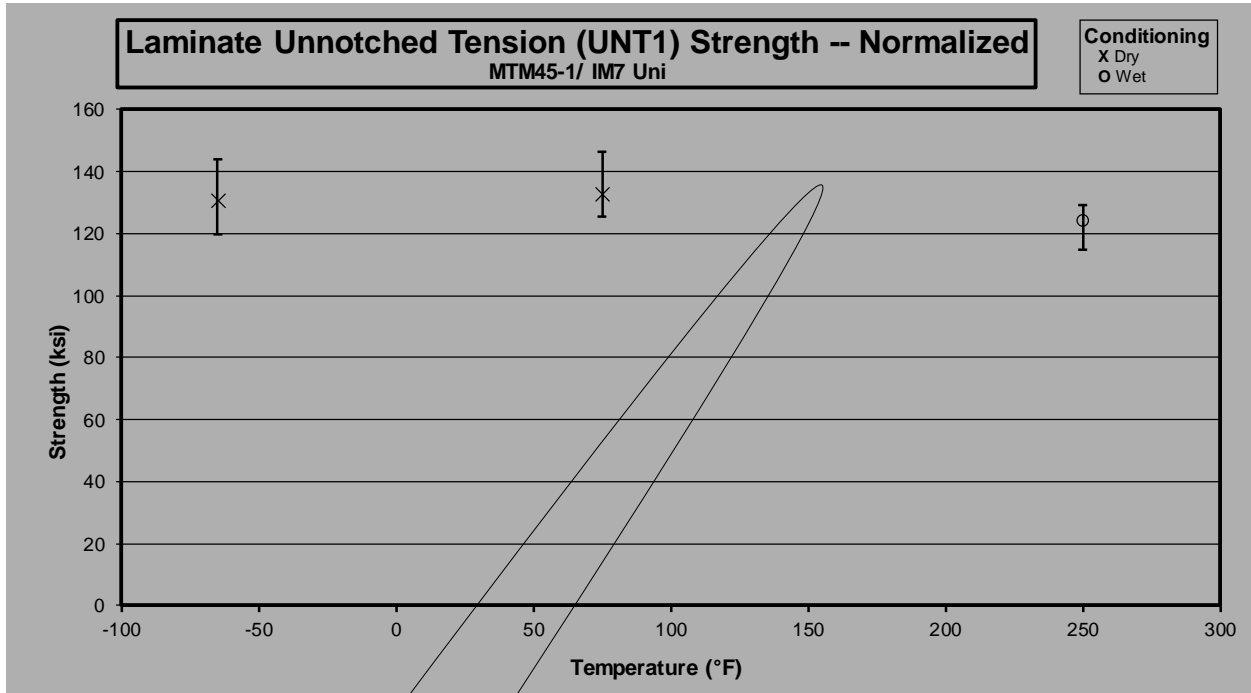
3.5 In-Plane Shear Properties (IPS)



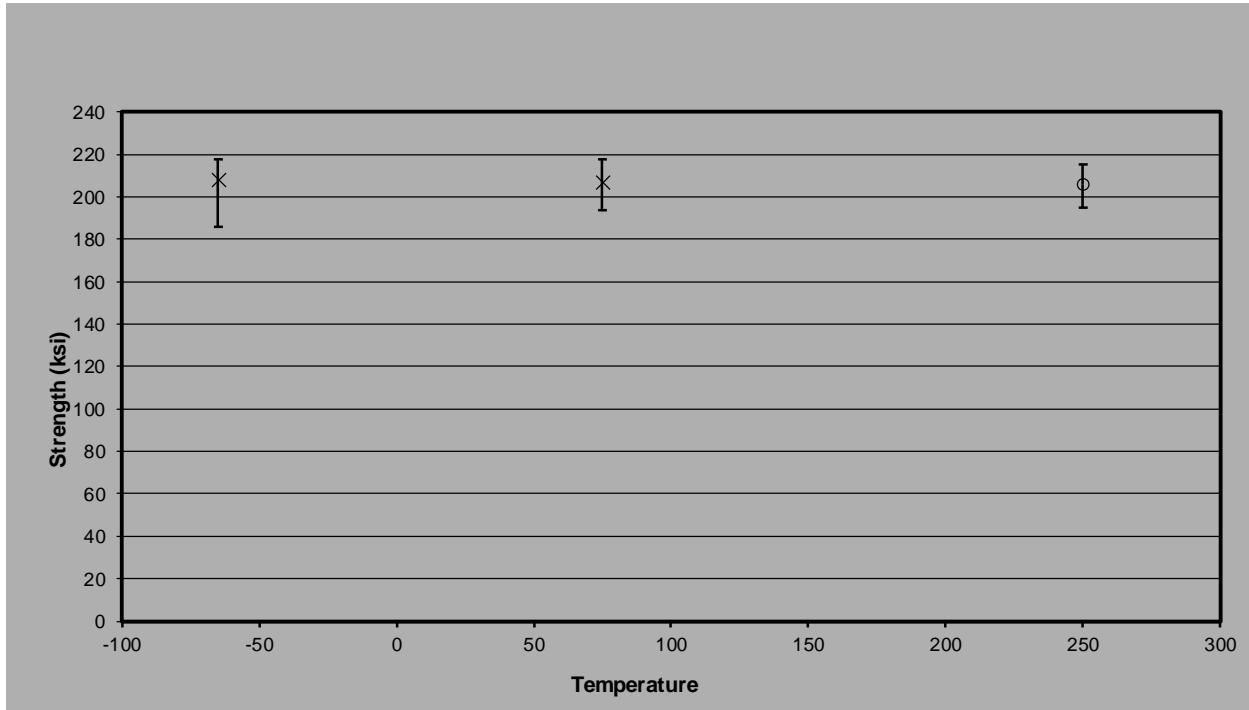
3.6 "50/0/50" Unnotched Tension 0 Properties (UNT0)



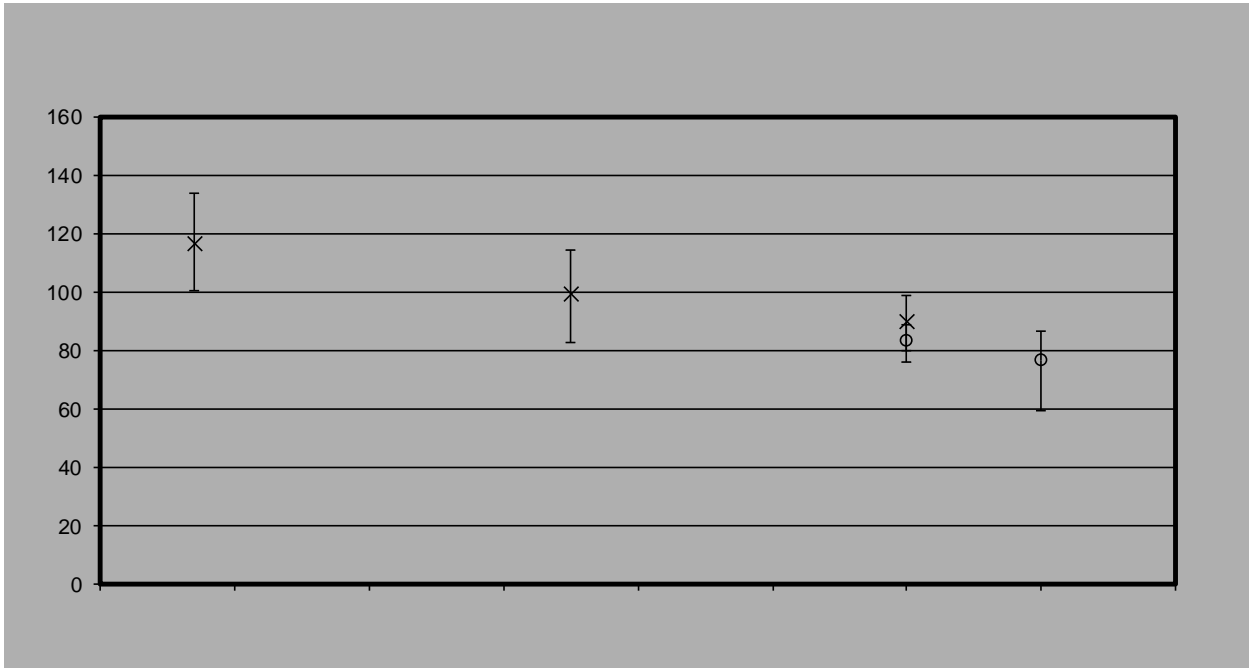
3.7 “25/50/25” Unnotched Tension 1 Properties (UNT1)



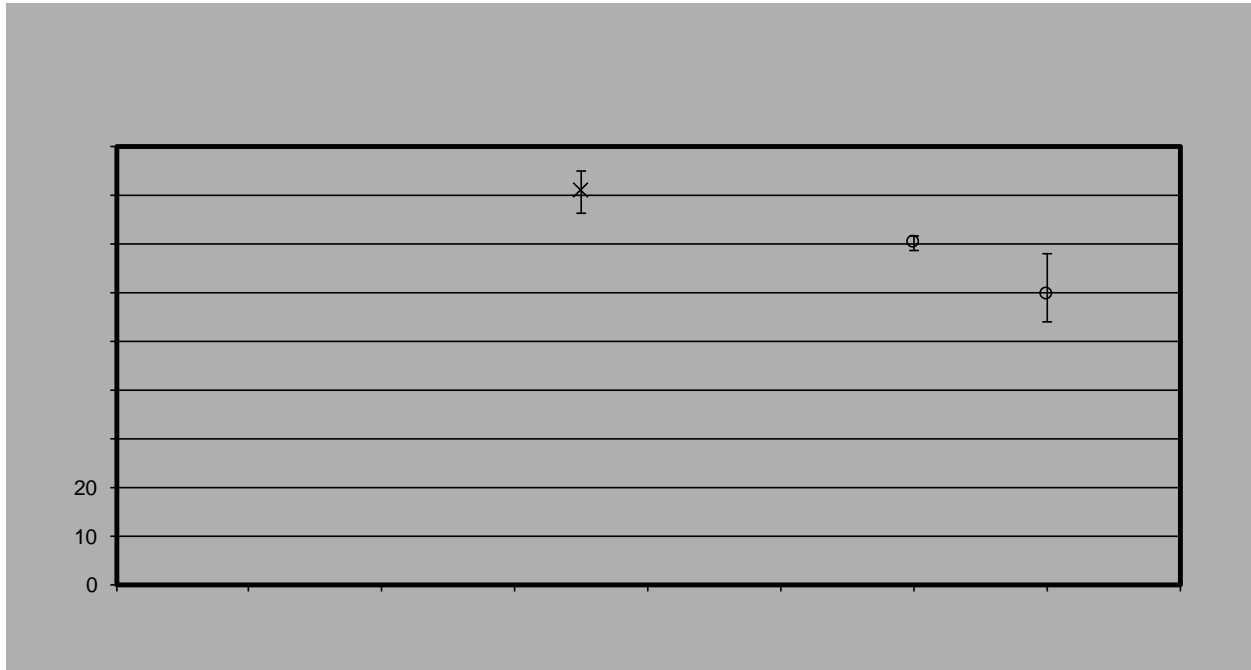
3.9 “50/40/10” Unnotched Tension 3 Properties (UNT3)



3.10 "50/0/50" Unnotched Compression 0 Properties (UNC0)



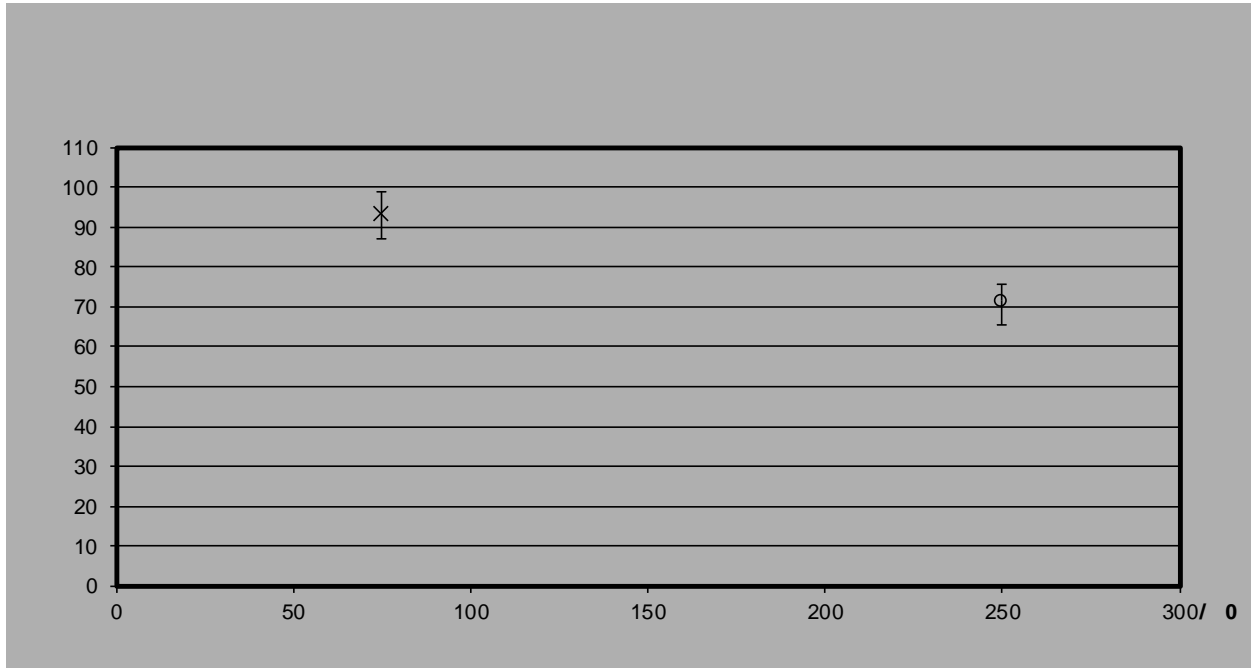
3.11 “25/50/25” Unnotched Compression 1 Properties (UNC1)



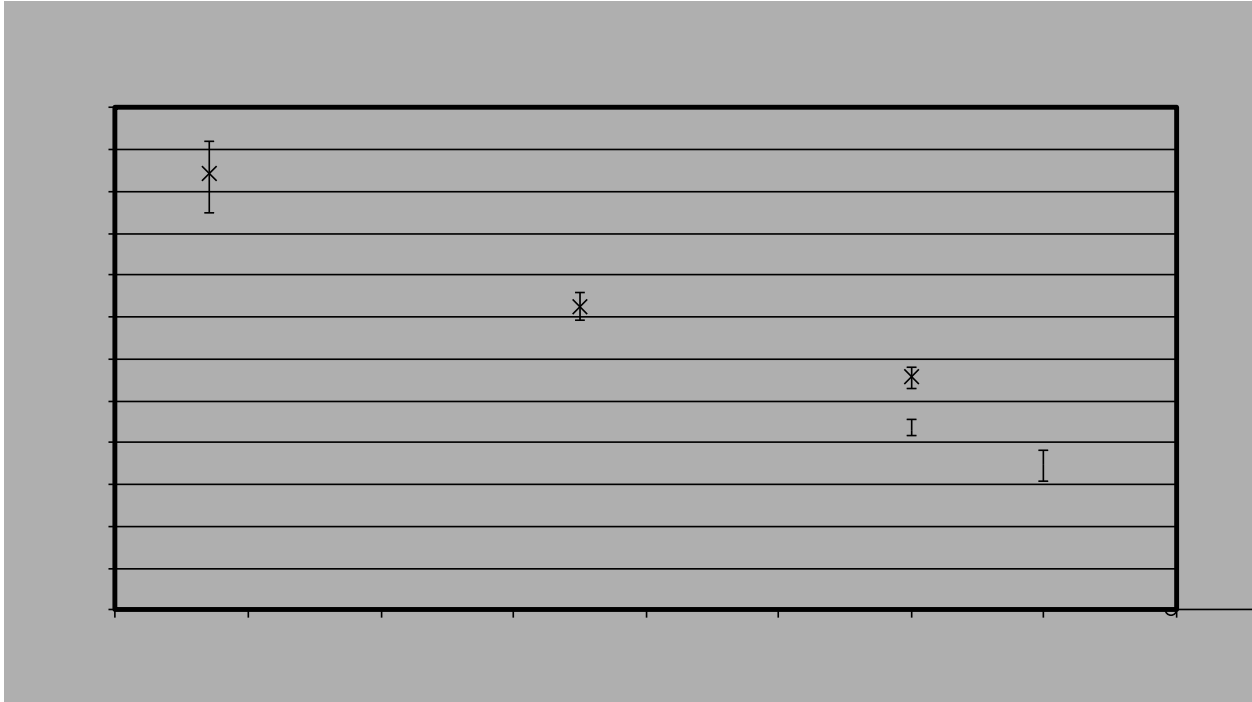
3.12 “10/80/10” Unnotched Compression 2 Properties (UNC2)



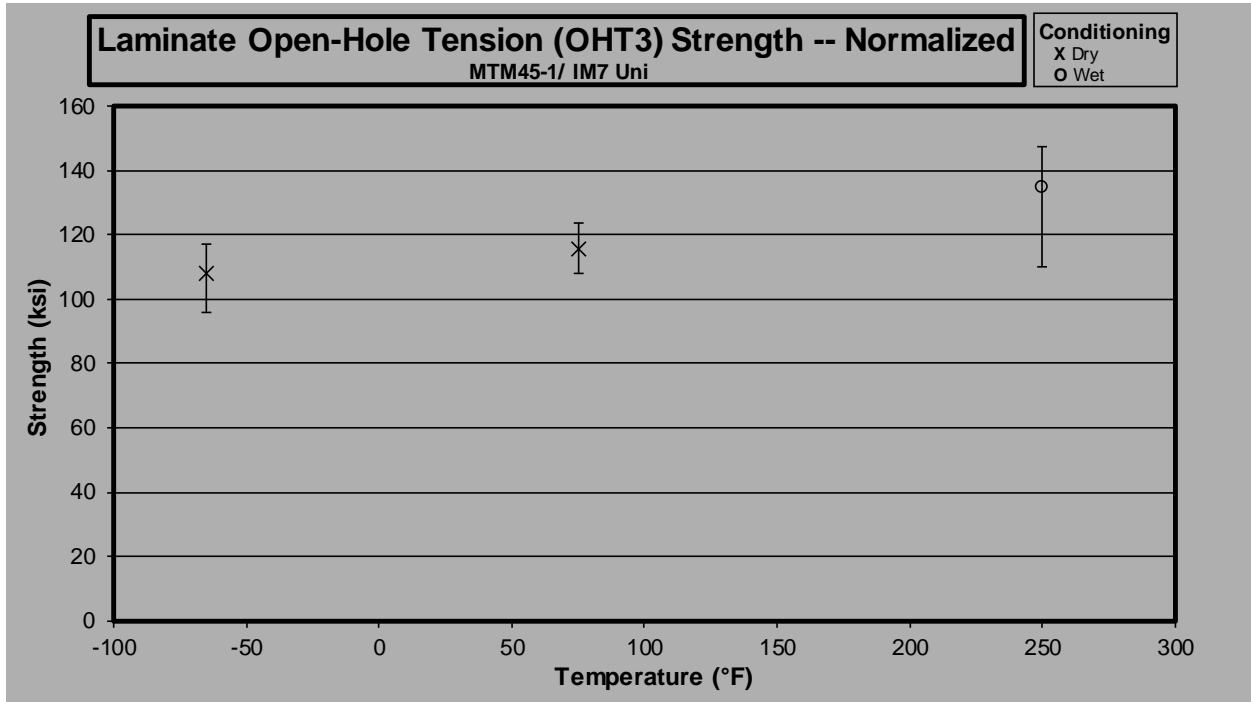
3.13 “50/40/10” Unnotched Compression 3 Properties (UNC3)



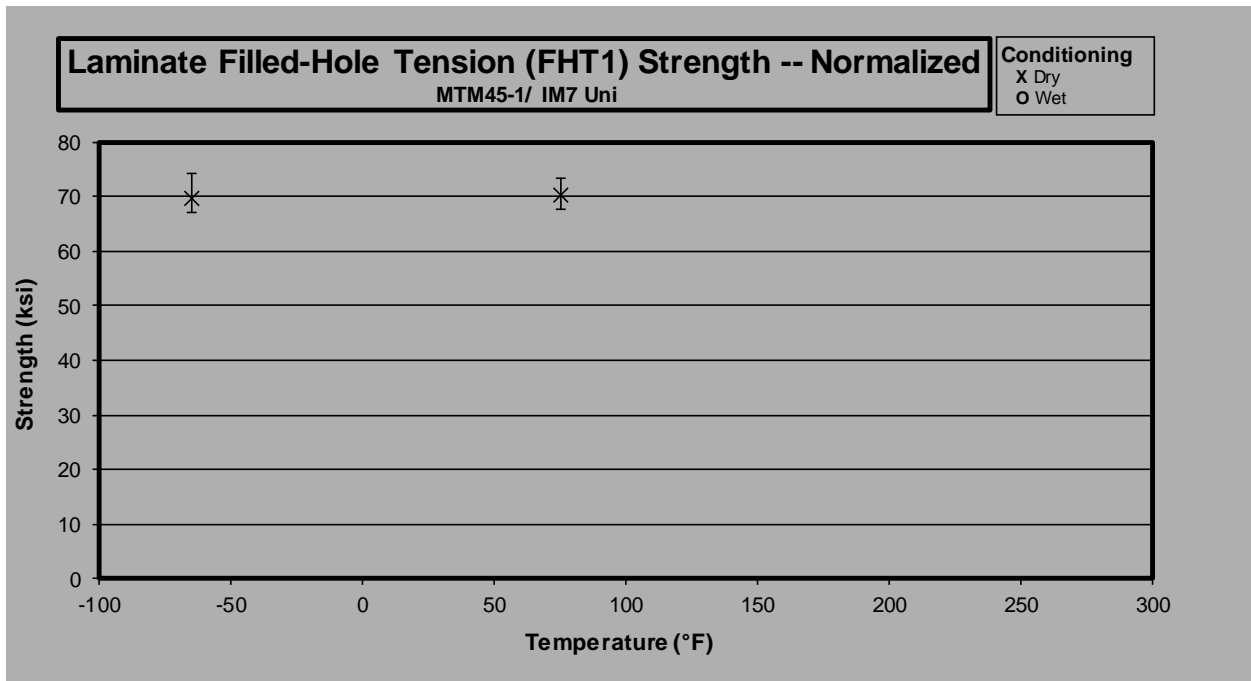
3.14 Lamina Short Beam Strength Properties (SBS)



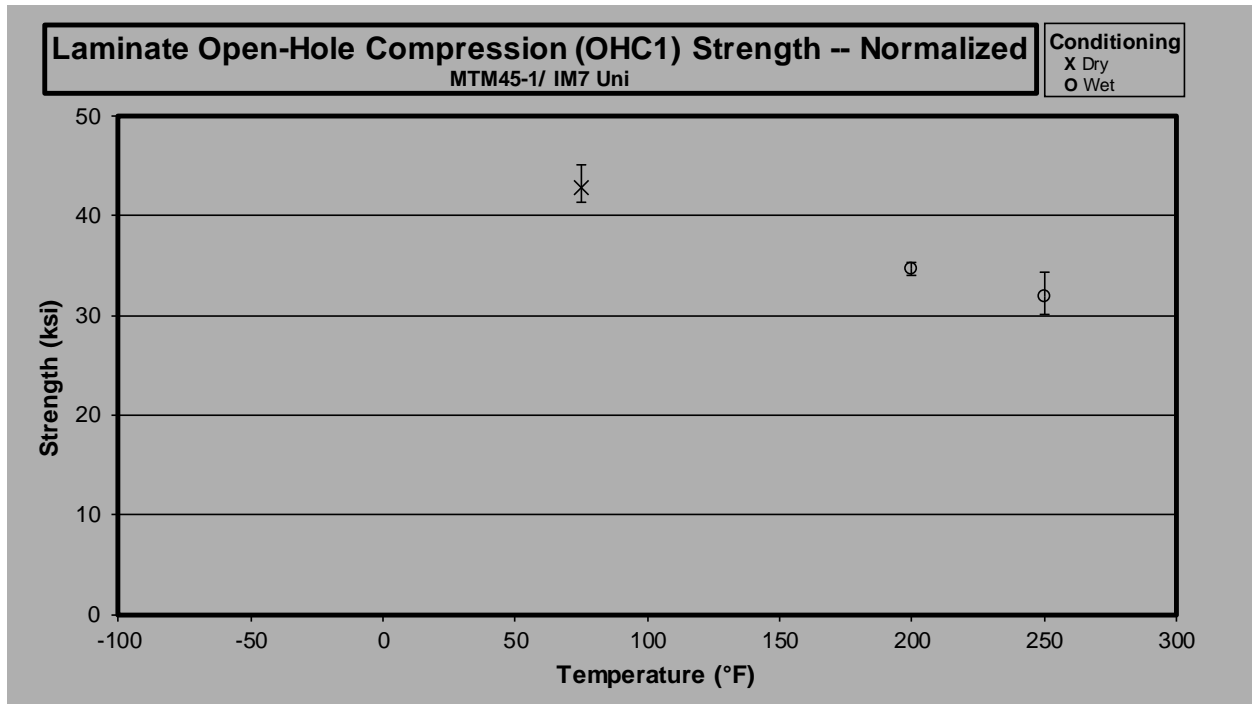
3.18 “50/40/10” Open-Hole Tension 3 Properties (OHT3)



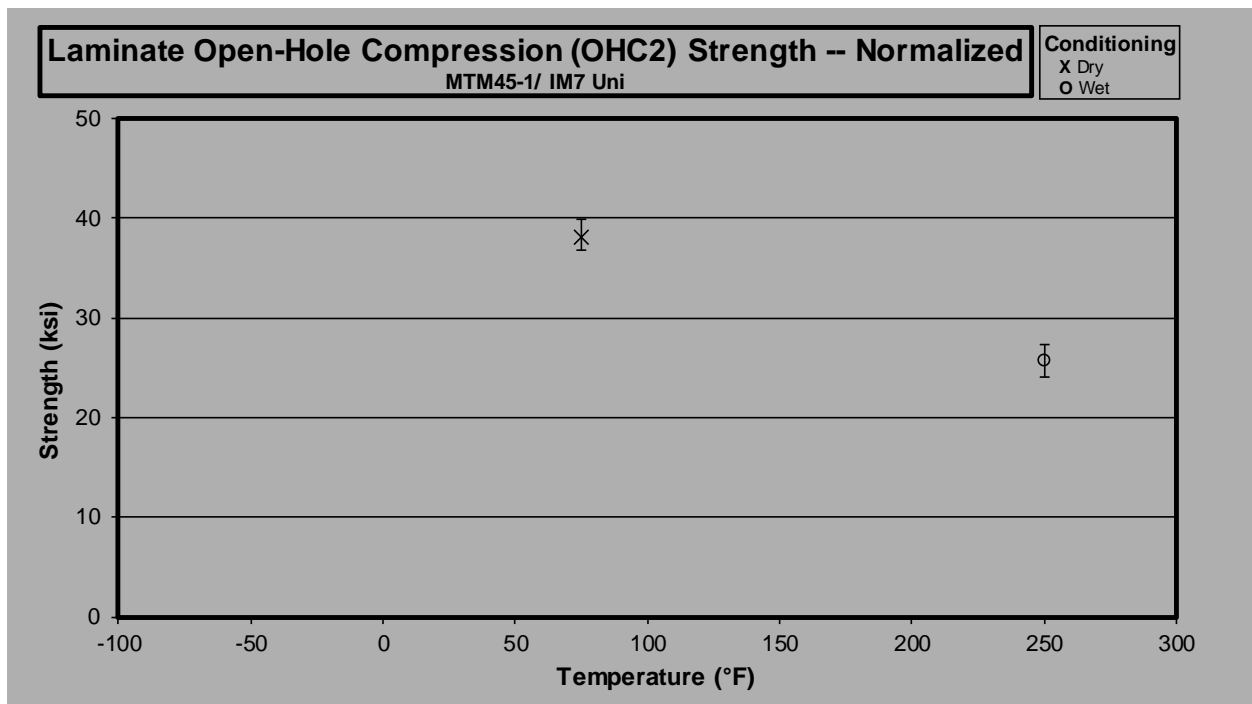
3.19 “25/50/25” Filled-Hole Tension 1 Properties (FHT1)



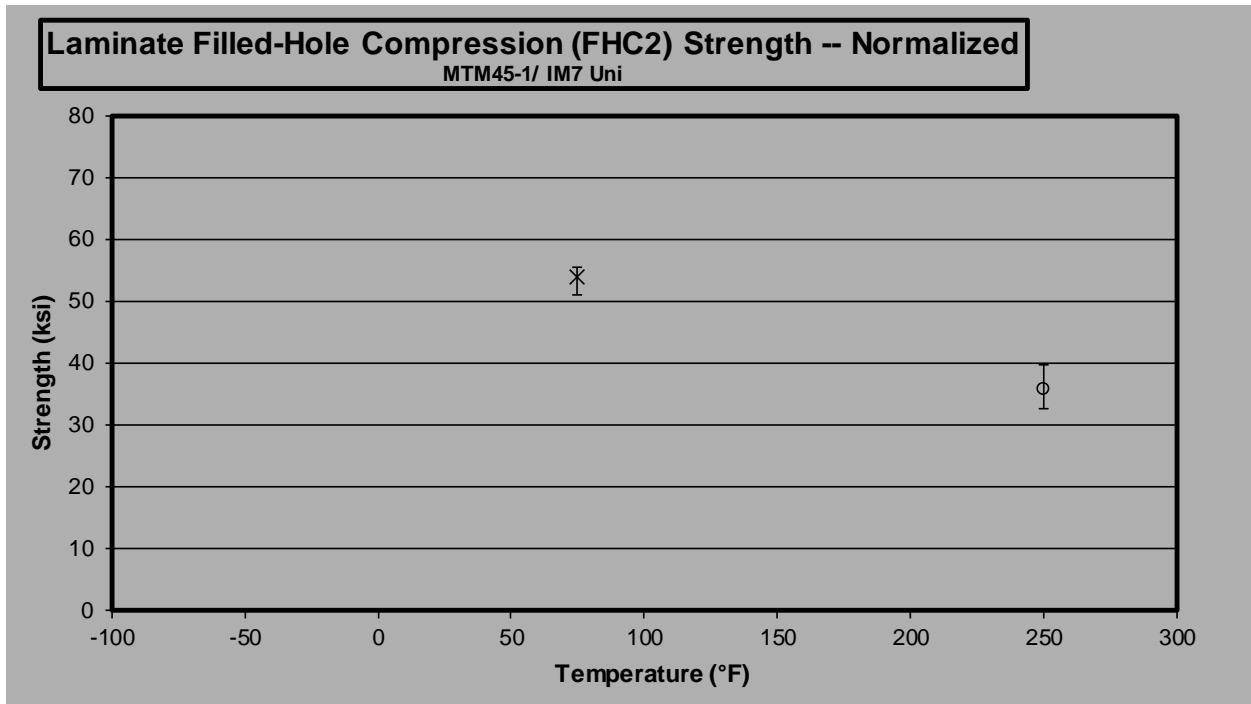
3.22 “25/50/25” Open-Hole Compression 1 Properties (OHC1)



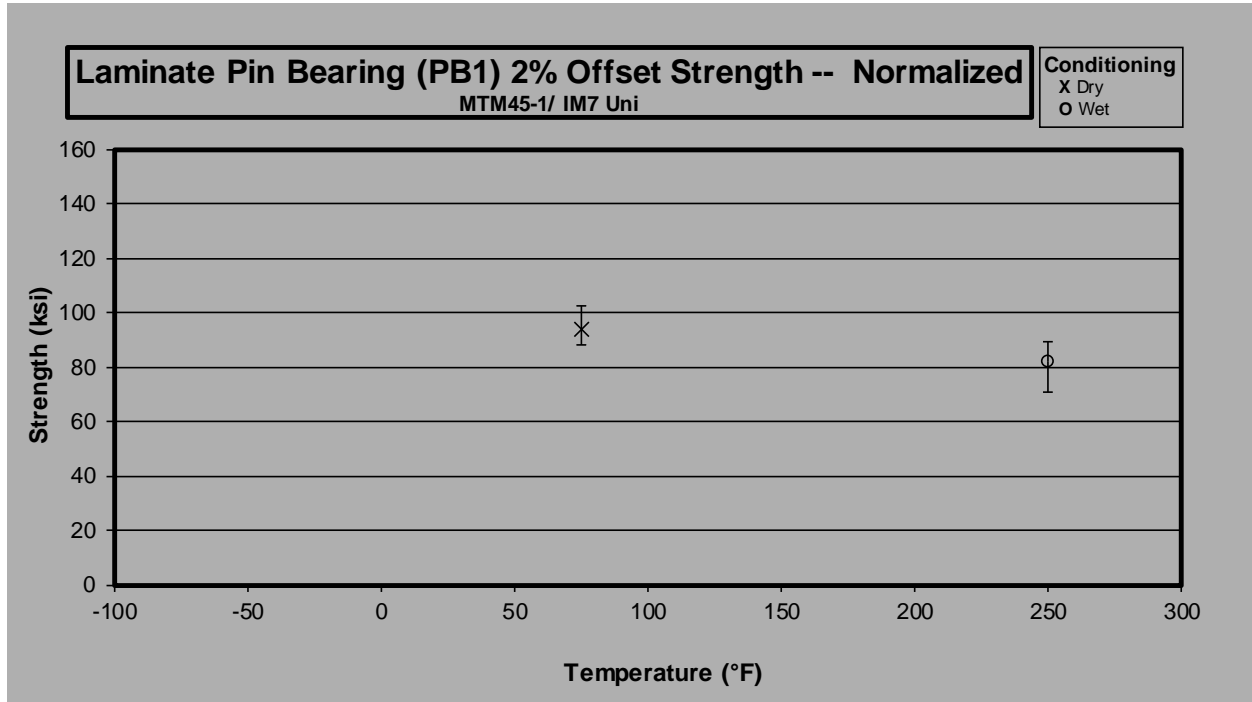
3.23 “10/80/10” Open-Hole Compression 2 Properties (OHC2)



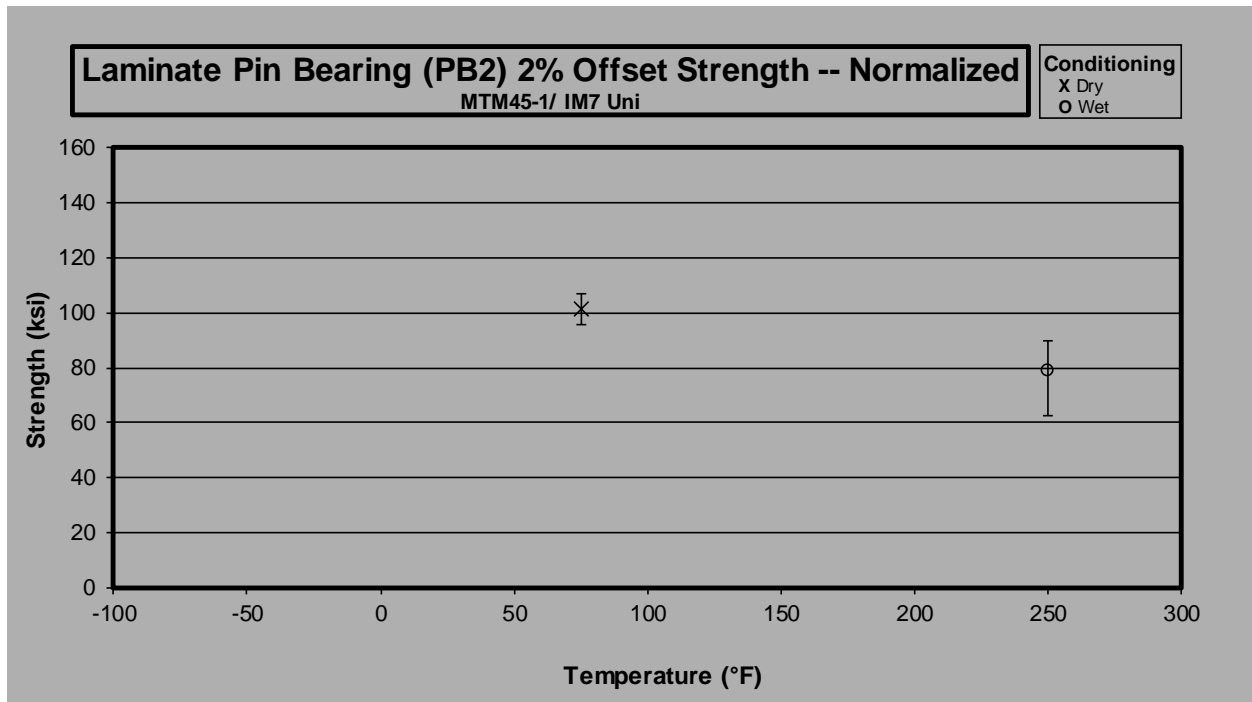
3.26 “10/80/10” Filled-Hole Compression 2 Properties (FHC2)



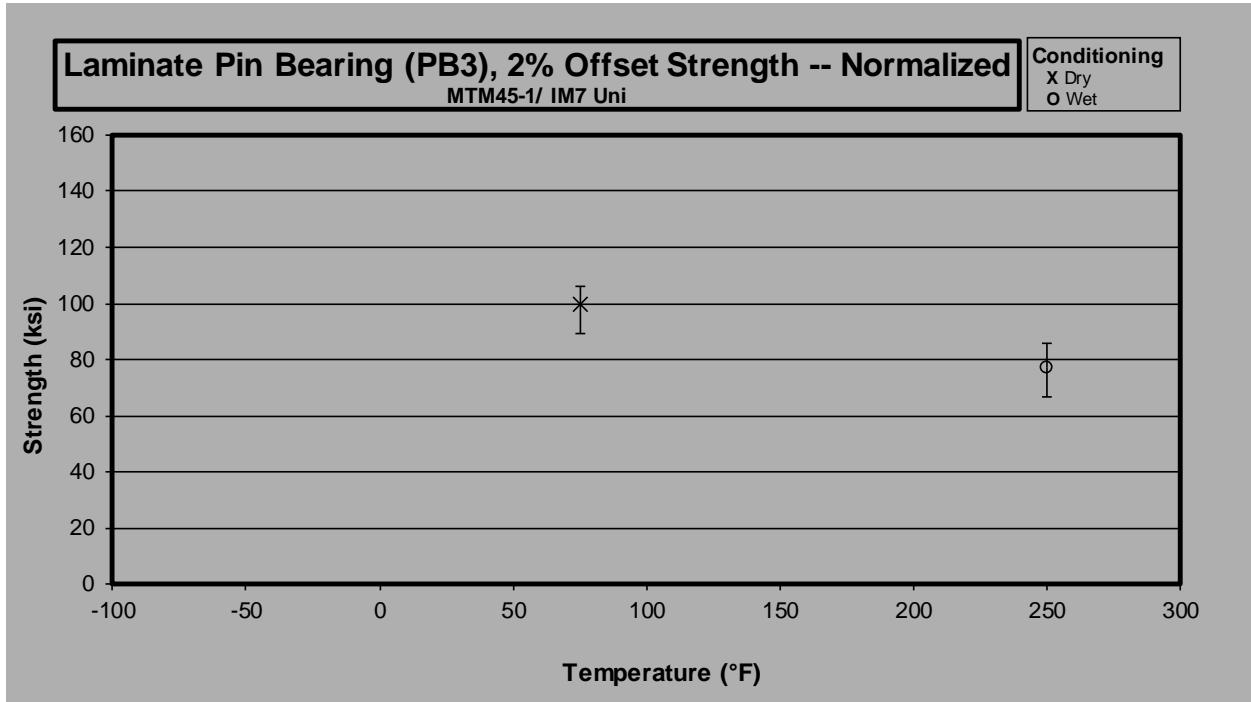
3.28 “25/50/25” Pin Bearing 1 Properties (PB1)



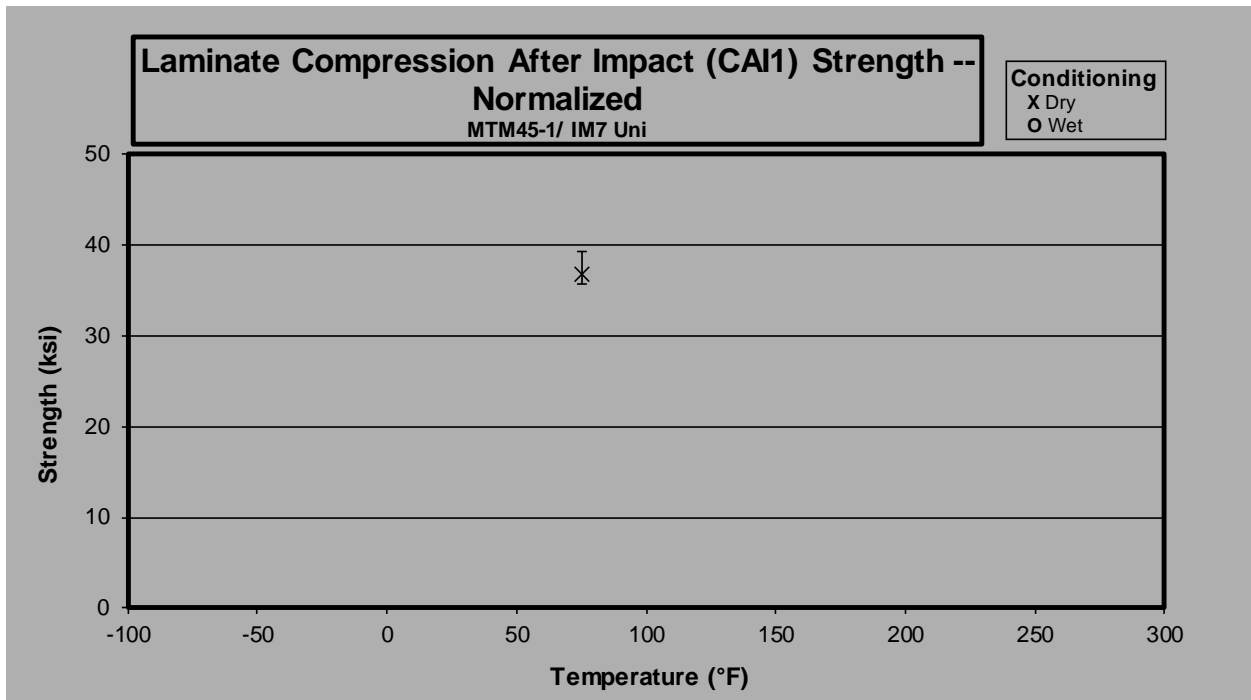
3.29 “10/80/10” Pin Bearing 2 Properties (PB2)



3.30 “50/40/10” Pin Bearing 3 Properties (PB3)



3.31 “25/50/25” Compression After Impact 1 Properties (CAI1)

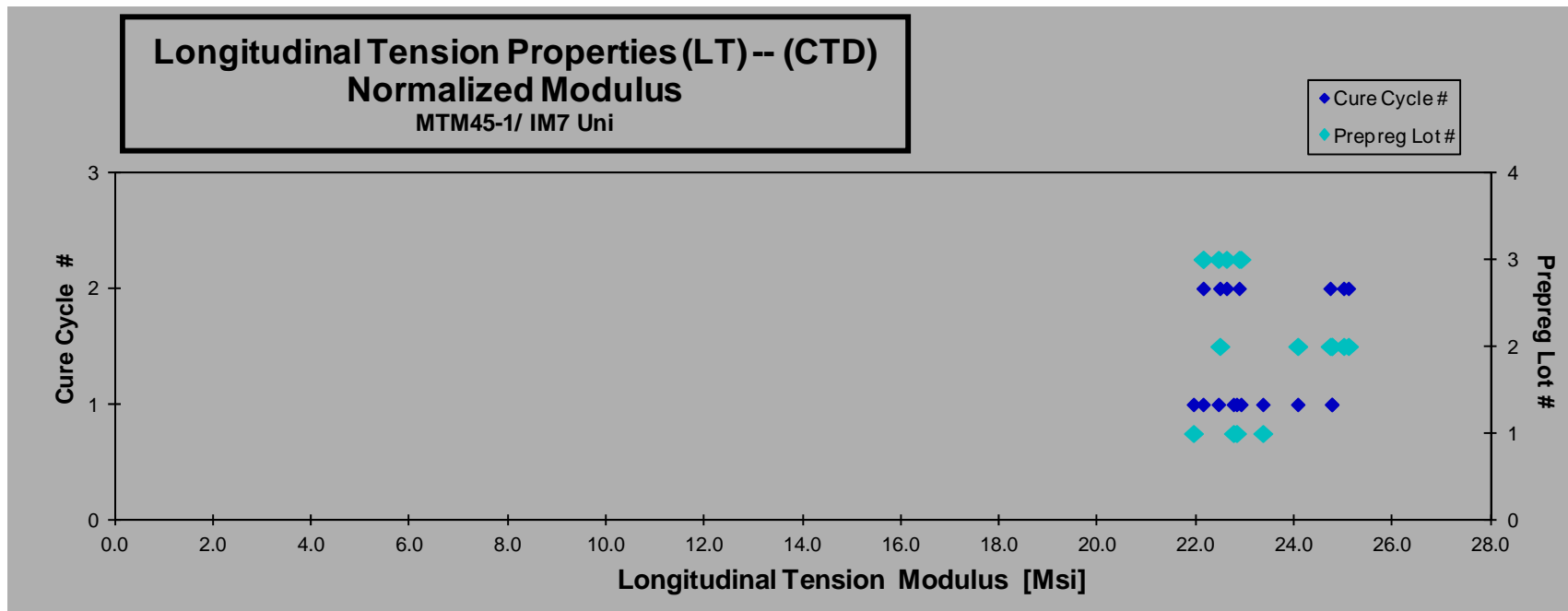


4. Raw Data

4.1 Longitudinal Tension Properties (LT)

normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Avg. Specimen Thckn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	Modulus _{norm} [Msi]
IMU-LT-A-MH1-CTD-1	AFJA111B	A	MH1	1	1	21.617	0.089	16	SGM	0.0056	21.961
IMU-LT-A-MH1-CTD-2	AFJA112B	A	MH1	1	1	22.357	0.092	16	SGM	0.0058	21.961



**Longitudinal Tension Properties (LT) -- (RTD)
Strength & Modulus
MTM45-1/ IM7 Uni**

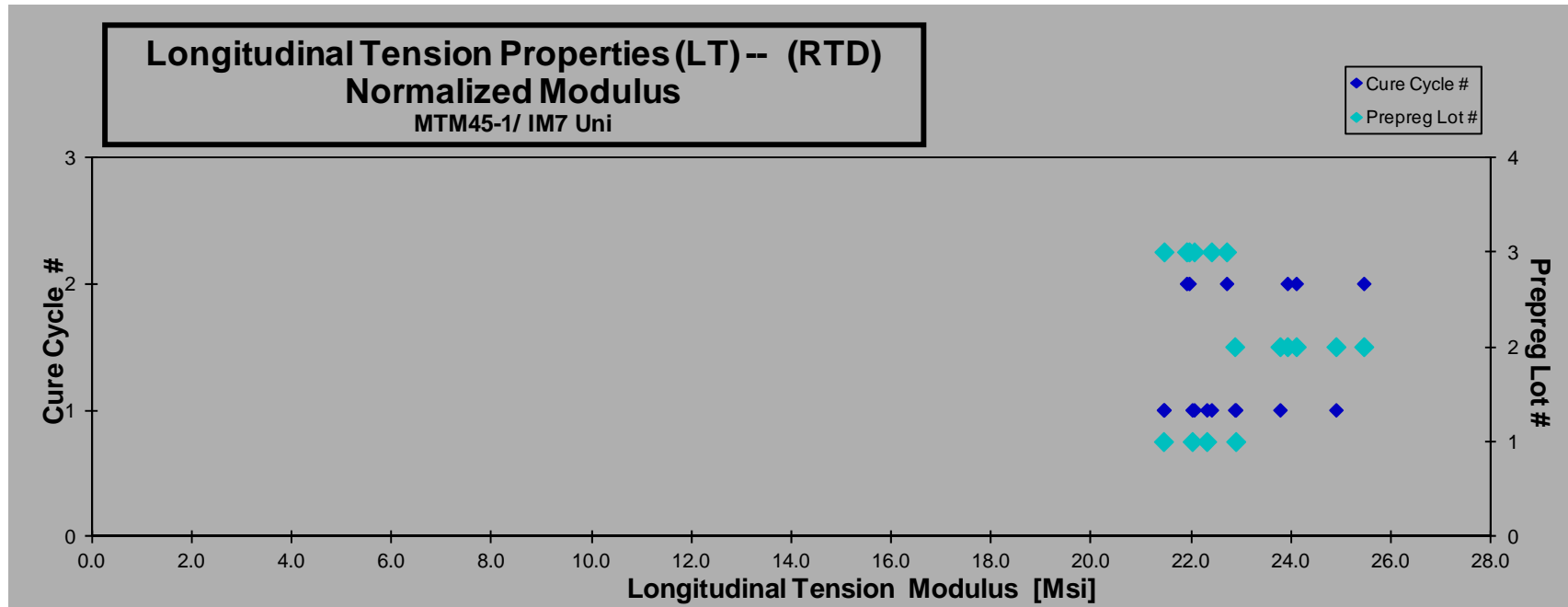
normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Avg. Specimen Thckn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	Modulus _{norm} [Msi]
IMU-LT-A-MH1-RTD-1	AFJA111A	A	MH1	1	1	22.052	0.091	16	LAT	0.0057	22.904
IMU-LT-A-MH1-RTD-2	AFJA112A	A	MH1	1	1	21.706	0.091	16	SGM	0.0057	22.323
IMU-LT-A-MH1-RTD-3	AFJA113A	A	MH1	1	1	21.353	0.091	16	SGM	0.0057	22.032
IMU-LT-A-MH1-RTD-4	AFJA114A	A	MH1	1	1	21.099	0.090	16	LAB	0.0056	21.459
IMU-LT-B-MH1-RTD-1	AFJB111A	B	MH1	2	1	21.515	0.094	16	XGM	0.0059	22.884
IMU-LT-B-MH1-RTD-2	AFJB112A	B	MH1	2	1	21.875	0.096	16	XGM	0.0060	23.789
IMU-LT-B-MH1-RTD-4	AFJB113A	B	MH1	2	1	22.645	0.097	16	XGM	0.0061	24.910
IMU-LT-B-MH2-RTD-1	AFJB211A	B	MH2	2	2	22.385	0.095	16	XGM	0.0059	24.115
IMU-LT-B-MH2-RTD-3	AFJB213A	B	MH2	2	2	22.385	0.094	16	XGM	0.0059	23.937
IMU-LT-B-MH2-RTD-4	AFJB214A	B	MH2	2	2	22.500	0.100	16	XGM	0.0062	25.466
IMU-LT-C-MH1-RTD-1	AFJC111A	C	MH1	3	1	22.469	0.088	16	XGM	0.0055	22.418
IMU-LT-C-MH1-RTD-2	AFJC112A	C	MH1	3	1	21.469	0.088	16	XGM	0.0055	21.469
IMU-LT-C-MH1-RTD-3	AFJC113A	C	MH1	3	1	22.022	0.088	16	XGM	0.0055	22.072
IMU-LT-C-MH2-RTD-1	AFJC211A	C	MH2	3	2	21.896	0.088	16	XGM	0.0055	21.921
IMU-LT-C-MH2-RTD-2	AFJC212A	C	MH2	3	2	21.896	0.088	16	XGM	0.0055	21.971
IMU-LT-C-MH2-RTD-3	AFJC213A	C	MH2	3	2	22.747	0.088	16	XGM	0.0055	22.721

* Batch A cure cycle 2: data is omitted due to wrong panel layup

Average **22.001**
Standard Dev. **0.491**
Coeff. of Var. [%] **2.231**
Min. **21.099**
Max. **22.747**
Number of Spec. **16**

Average_{norm} **0.0057** **22.899**
Standard Dev._{norm} **1.210**
Coeff. of Var. [%]_{norm} **5.282**
Min. **0.0055** **21.459**
Max. **0.0062** **25.466**
Number of Spec. **16**



**Longitudinal Tension Properties (LT) -- (ETW)
Strength & Modulus
MTM45-1/ IM7 Uni**

normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Avg. Specimen Thicken. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	Modulus _{norm} [Msi]
IMU-LT-A-MH1-ETW-2	AFJA112N	A	MH1	1	1	21.651	0.091	16	NR	0.0057	22.426
IMU-LT-A-MH1-ETW-3	AFJA113N	A	MH1	1	1	21.441	0.091	16	NR	0.0057	22.062
IMU-LT-A-MH1-ETW-4	AFJA114N	A	MH1	1	1	22.096	0.089	16	NR	0.0056	22.360
IMU-LT-B-MH1-ETW-1	AFJB111N	B	MH1	2	1	21.120	0.094	16	NR	0.0059	22.584
IMU-LT-B-MH1-ETW-2	AFJB112N	B	MH1	2	1	20.400	0.095	16	NR	0.0059	21.973
IMU-LT-B-MH1-ETW-3	AFJB113N	B	MH1	2	1	22.336	0.094	16	NR	0.0058	23.745
IMU-LT-B-MH1-ETW-4	AFJB114N	B	MH1	2	1	21.160	0.094	16	NR	0.0058	22.487
IMU-LT-B-MH2-ETW-1	AFJB211N	B	MH2	2	2	20.360	0.094	16	NR	0.0059	21.783
IMU-LT-B-MH2-ETW-3	AFJB213N	B	MH2	2	2	20.656	0.094	16	NR	0.0059	22.178
IMU-LT-B-MH2-ETW-4	AFJB214N	B	MH2	2	2	22.122	0.094	16	NR	0.0058	23.509
IMU-LT-C-MH1-ETW-2	AFJC112N	C	MH1	3	1	21.371	0.087	16	NR	0.0054	21.031
IMU-LT-C-MH1-ETW-3	AFJC113N	C	MH1	3	1	21.245	0.089	16	NR	0.0056	21.486
IMU-LT-C-MH1-ETW-4	AFJC114N	C	MH1	3	1	21.125	0.086	16	NR	0.0054	20.729
IMU-LT-C-MH2-ETW-2	AFJC212N	C	MH2	3	2	22.152	0.089	16	NR	0.0056	22.441
IMU-LT-C-MH2-ETW-3	AFJC213N	C	MH2	3	2	20.897	0.089	16	NR	0.0056	21.206
IMU-LT-C-MH2-ETW-4	AFJC214N	C	MH2	3	2	21.770	0.088	16	NR	0.0055	21.881

NR: Not recorded. Tests were stopped once 4000 microstrain was reached, so max load was not recorded.

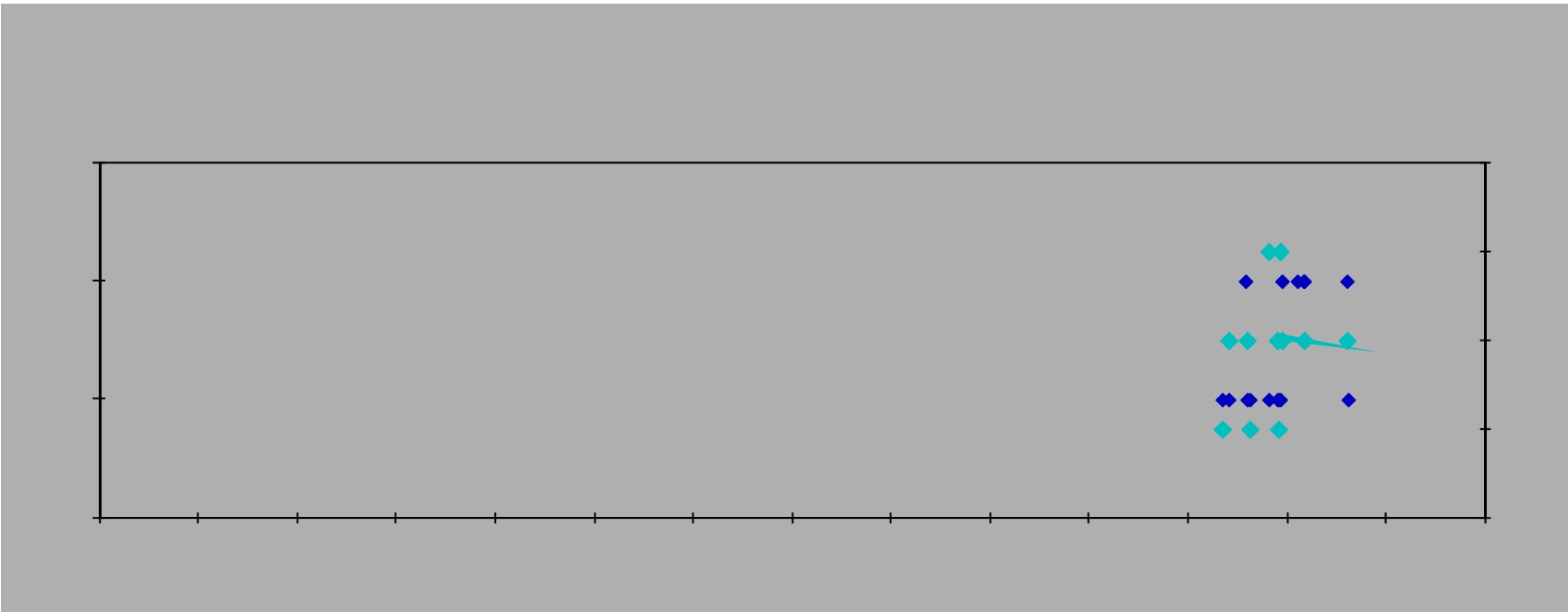
* Batch A cure cycle 2: data is omitted due to wrong panel layup

Average	21.369	Average _{norm}	0.0057	22.118
Standard Dev.	0.620	Standard Dev. _{norm}		0.805
Coeff. of Var. [%]	2.899	Coeff. of Var. [%] _{norm}		3.641
Min.	20.360	Min.	0.0054	20.729
Max.	22.336	Max.	0.0059	23.745
Number of Spec.	16	Number of Spec.		16



normalizing t_{ply}





4.2 Transverse Tension Properties (TT)

Specimen	NIAR	ACG	ACG Cure	Prepreg	Cure Cycle	Strength	Modulus	Avg. Specimen	# Plies in	Avg. tl
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February 12, 2024

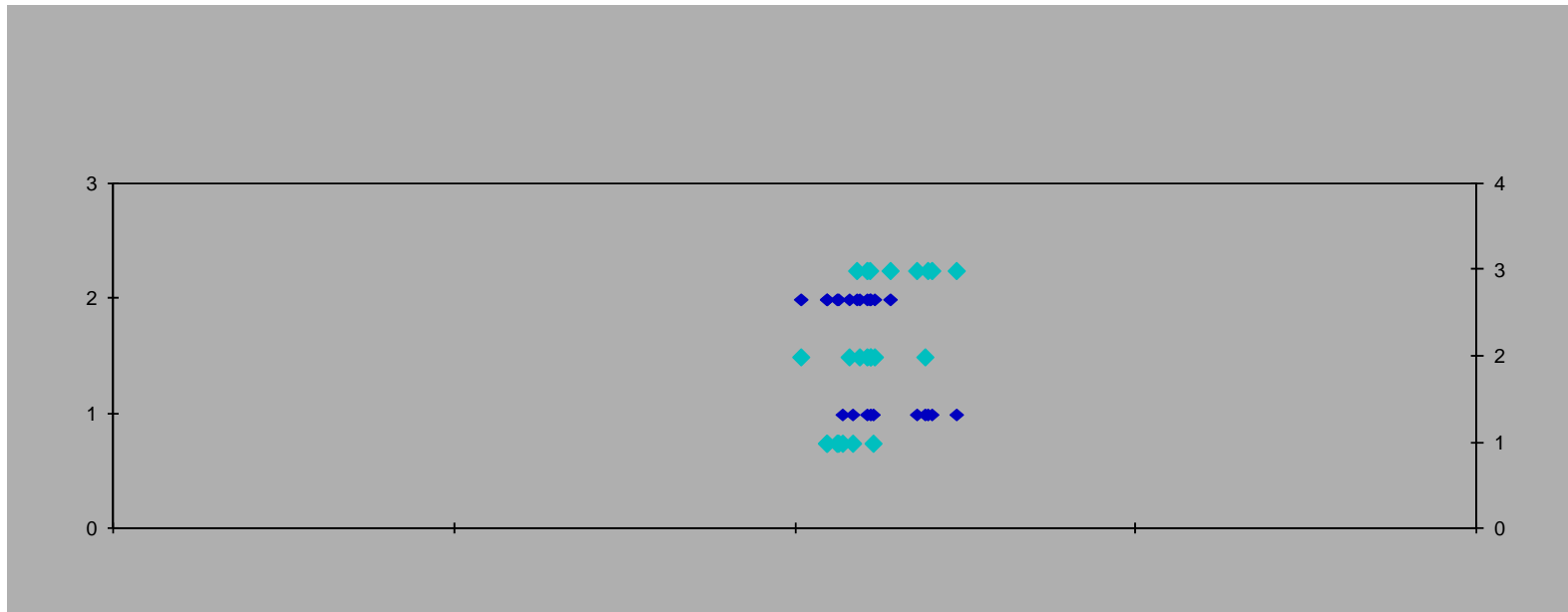
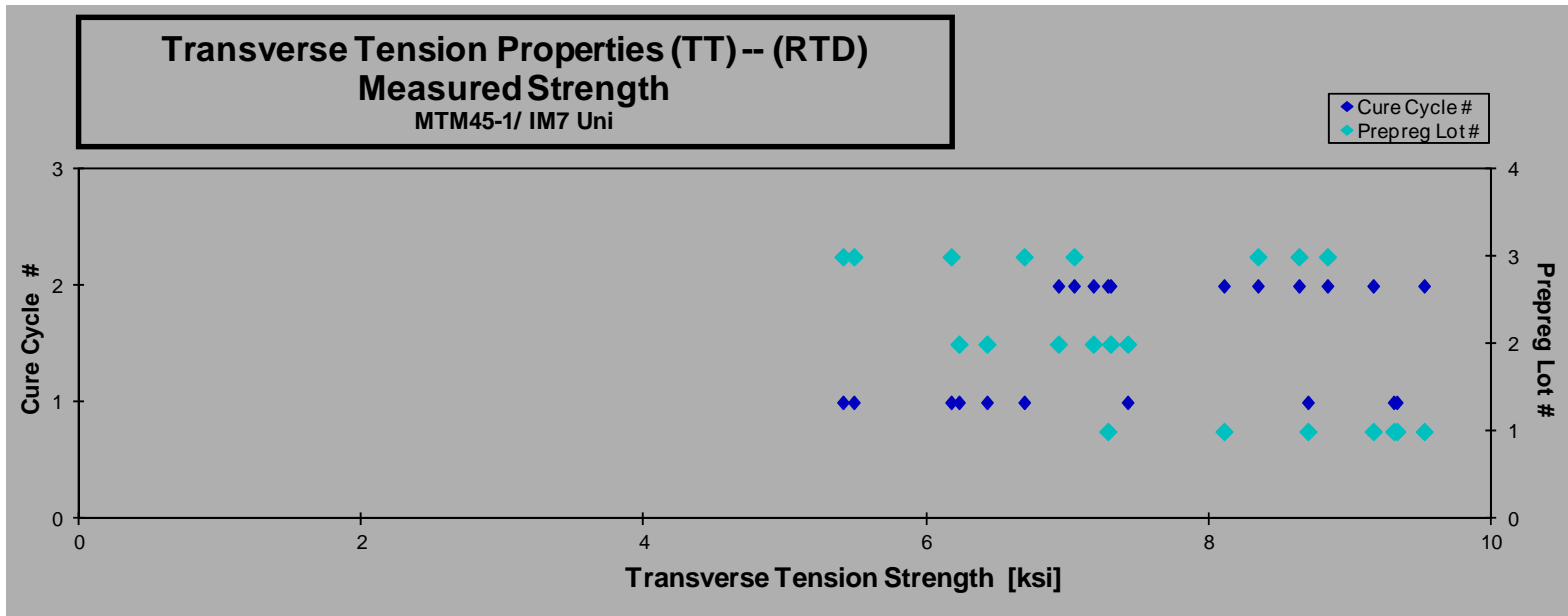
CAM-RP-2008-007 Rev C

February 12, 2024

CAM-RP-2008-007 Rev C

Specimen

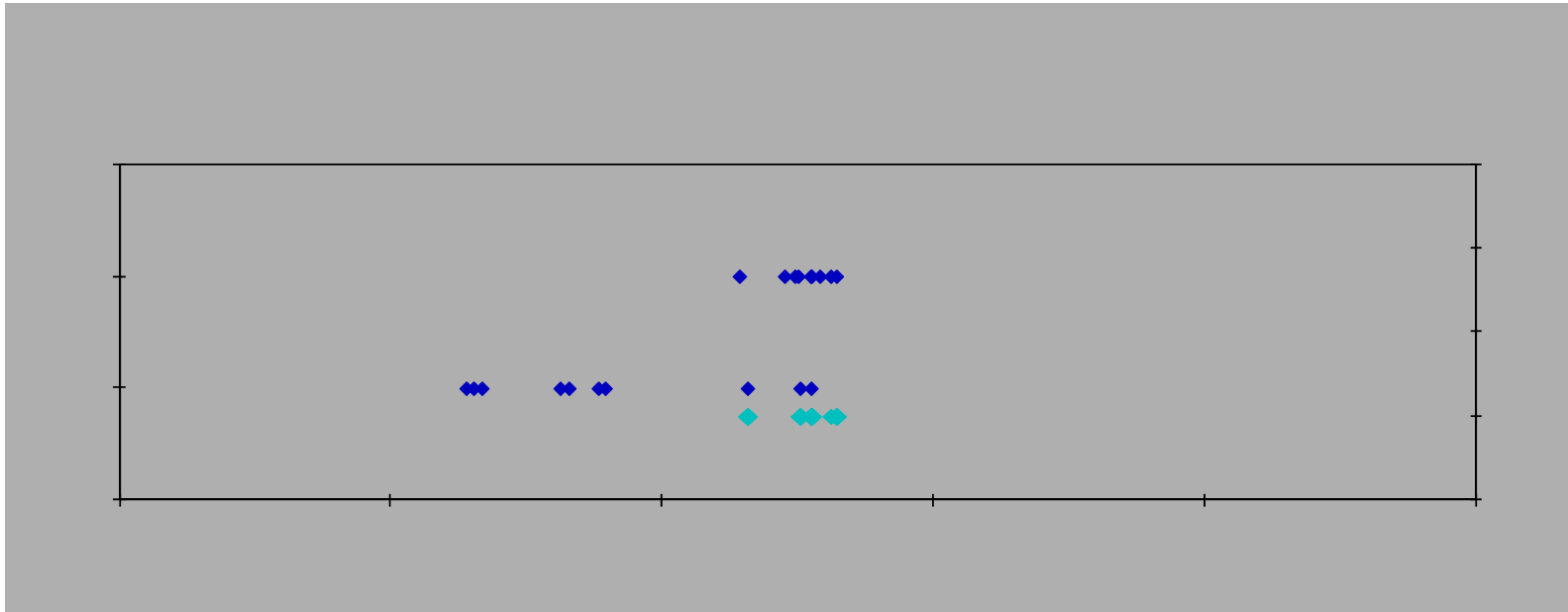
N



February 12, 2024

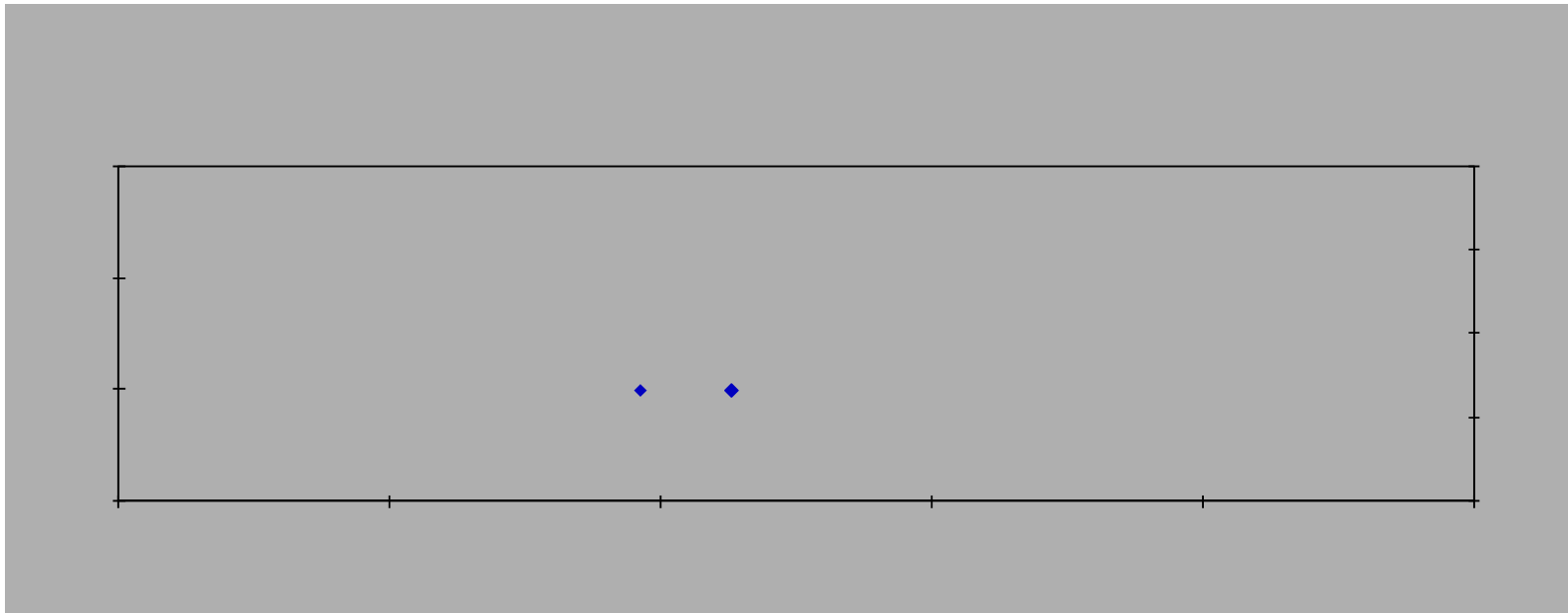
CAM-RP-2008-007 Rev C

Specimen Number	NIAR Naming	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
IMU-TT-A-MH1-ETW-2	AFUA112N	A	MH1	1	1	5.102	0.874	0.092	16	0.0058	LWB



February 12, 2024

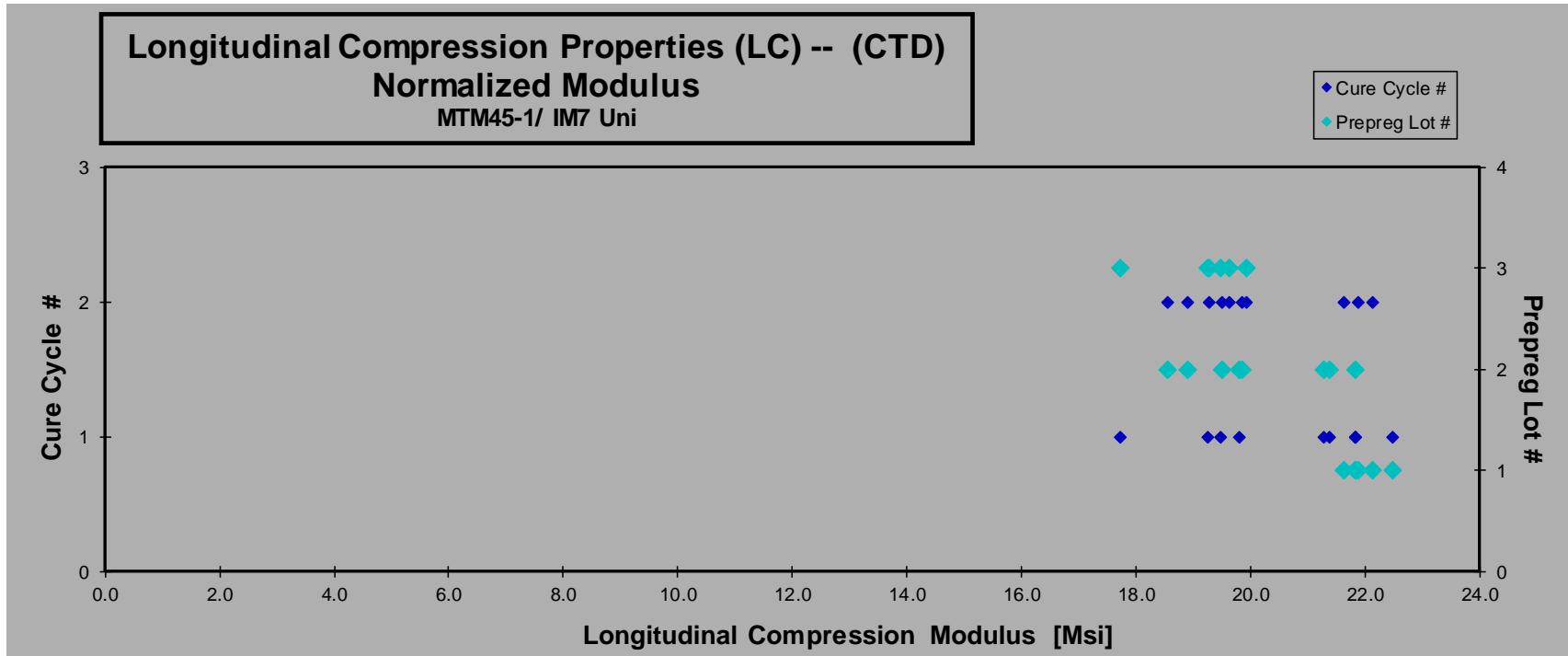
CAM-RP-2008-007 Rev C



4.3 Longitudinal Compression Properties (LC)

normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thicken. [in]	Specimen # Plies in Laminate	Avg. t_{ply} [in]	Modulus _{norm} [Msi]
IMU-LC-A-MH1-CTD-2	AFLA112B	A	MH1	1	1	21.562	0.323	0.092	16	0.0057	22.493
IMU-LC-A-MH1-CTD-3	AFLA113B	A	MH1	1	1	21.177	0.345	0.091	16	0.0057	21.827
IMU-LC-A-MH1-CTD-4	AFLA114B	A	MH1	1	1	21.602	0.337	0.089	16	0.0056	21.823
IMU-LC-A-MH2-CTD-2	AFLA212B	A	MH2	1	2	21.082	0.346	0.091	16	0.0057	21.873
IMU-LC-A-MH2-CTD-3	AFLA213B	A	MH2	1	2	21.019	0.371	0.091	16	0.0057	21.640
IMU-LC-A-MH2-CTD-4	AFLA214B	A	MH2	1	2	21.396	0.367	0.091	16	0.0057	22.125
IMU-LC-B-MH1-CTD-2	AFLB112B	B	MH1	2	1	19.617	0.403	0.096	16	0.0060	21.289
IMU-LC-B-MH1-CTD-3	AFLB113B	B	MH1	2	1	20.038	0.387	0.094	16	0.0059	21.381
IMU-LC-B-MH1-CTD-4	AFLB114B	B	MH1	2	1	18.688	0.308	0.093	16	0.0058	19.814
IMU-LC-B-MH1-CTD-R2	AFLB122B	B	MH1	2	1	20.278	0.409	0.095	16	0.0059	21.830
IMU-LC-B-MH2-CTD--094		16		6	16	-	278	0.409	0.095	0.0059	16 21.289
IMU-LC-B-MH		0059	21-381								
0.308	0.093	0.0059	16	21.814							
059	1621.	14									



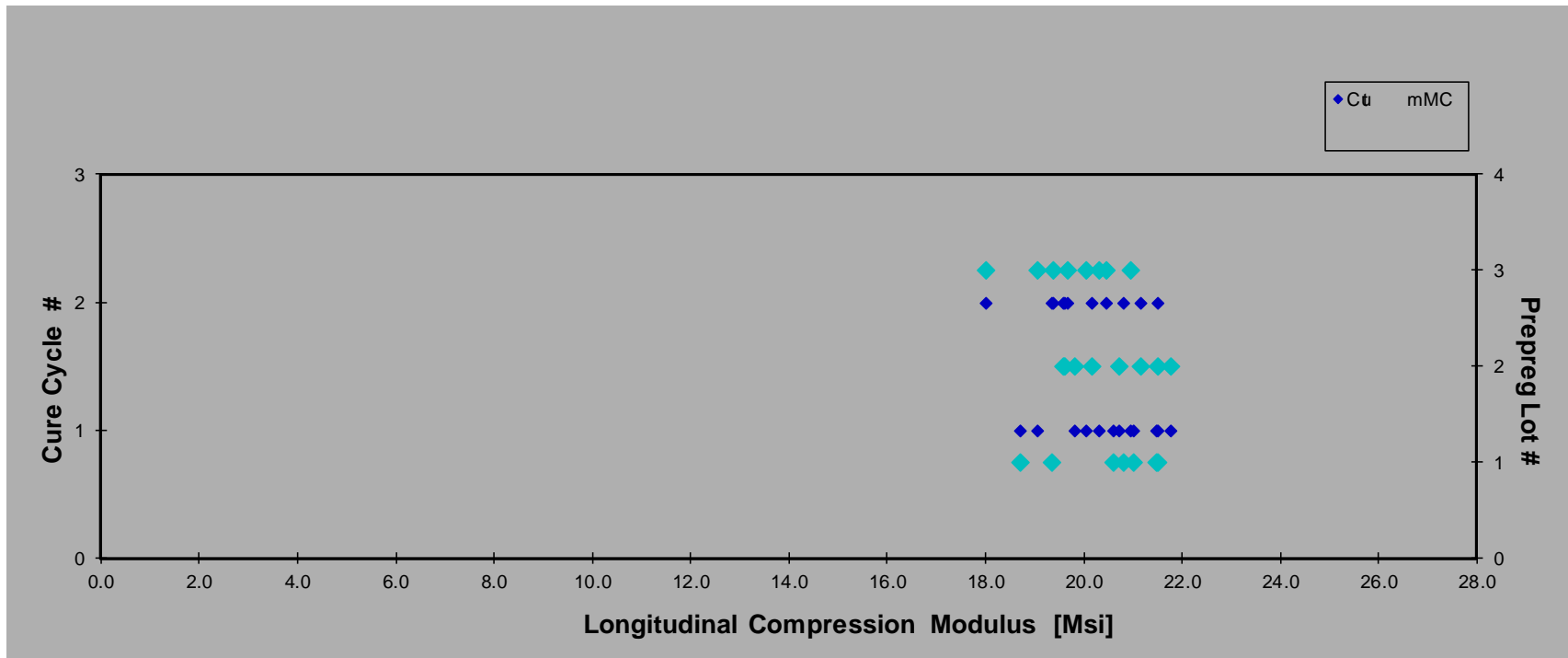


normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thicken. [in]	# Plies in Laminate	Avg. t_{ply} [in]	Modulus _{norm} [Msi]
IMU-LC-A-MH1-RTD-2	AFLA112A	A	MH1	1	1	20.526	0.334	0.090	16	0.0056	20.993
IMU-LC-A-MH1-RTD-3	AFLA113A	A	MH1	1	1	19.100	0.452	0.086	16	0.0054	18.688
IMU-LC-A-MH1-RTD-4	AFLA114A	A	MH1	1	1	20.235	0.365	0.090	16	0.0056	20.603
IMU-LC-A-MH1-RTD-R3	AFLA123A	A	MH1	1	1	21.032	0.420	0.090	16	0.0056	21.466
IMU-LC-A-MH2-RTD-2	AFLA212A	A	MH2	1	2	20.112	0.334	0.091	16	0.0057	20.798
IMU-LC-A-MH2-RTD-3	AFLA213A	A	MH2	1	2	20.621	0.330	0.092	16	0.0057	21.488
IMU-LC-A-MH2-RTD-4	AFLA214A	A	MH2	1	2	18.988	0.327	0.090	16	0.0056	19.333
IMU-LC-B-MH1-RTD-1	AFLB111A	B	MH1	2	1	20.041	*	0.094	16	0.0059	21.499
IMU-LC-B-MH1-RTD-2	AFLB112A	B	MH1	2	1	19.118	0.292	0.095	16	0.0060	20.704
IMU-LC-B-MH1-RTD-3	AFLB113A	B	MH1	2	1	19.918	0.381	0.096	16	0.0060	21.751
IMU-LC-B-MH1-RTD-4	AFLB114A	B	MH1	2	1	18.253	0.322	0.096	16	0.0060	19.809
IMU-LC-B-MH2-RTD-1	AFLB211A	B	MH2	2	2	18.921	0.284	0.091	16	0.0057	19.566
IMU-LC-B-MH2-RTD-2	AFLB212A	B	MH2	2	2	19.730	0.357	0.088	16	0.0055	19.618
IMU-LC-B-MH2-RTD-3	AFLB213A	B	MH2	2	2	20.524	0.349	0.091	16	0.0057	21.154
IMU-LC-B-MH2-RTD-4	AFLB214A	B	MH2	2	2	20.192	0.365	0.088	16	0.0055	20.146
IMU-LC-C-MH1-RTD-1	AFLC111A	C	MH1	3	1	20.269	0.350	0.088	16	0.0055	20.315
IMU-LC-C-MH1-RTD-2	AFLC112A	C	MH1	3	1	20.983	0.374	0.088	16	0.0055	20.935
IMU-LC-C-MH1-RTD-3	AFLC113A	C	MH1	3	1	19.421	0.391	0.086	16	0.0054	19.046
IMU-LC-C-MH1-RTD-4	AFLC114A	C	MH1	3	1	20.011	0.360	0.088	16	0.0055	20.034
IMU-LC-C-MH2-RTD-1	AFLC211A	C	MH2	3	2	19.768	0.404	0.088	16	0.0055	19.656
IMU-LC-C-MH2-RTD-2	AFLC212A	C	MH2	3	2	20.573	0.364	0.088	16	0.0055	20.456
IMU-LC-C-MH2-RTD-3	AFLC213A	C	MH2	3	2	19.334	0.394	0.088	16	0.0055	19.378
IMU-LC-C-MH2-RTD-4	AFLC214A	C	MH2	3	2	18.669	0.392	0.085	16	0.0053	18.011


* Poisson's ratio is not reported due to strain gauge failed prematurely.

Average	19.841	0.361	Average _{norm}	0.0056	20.237
Standard Dev.	0.751	0.040	Standard Dev. _{norm}		0.984
Coeff. of Var. [%]	3.785	11.011	Coeff. of Var. [%] _{norm}		4.864
Min.	18.253	0.284	Min.	0.0053	18.011
Max.	21.032	0.452	Max.	0.0060	21.751
Number of Spec.	23	22	Number of Spec.		23



6.0 28.0

normalizing t_{ply}
[in]

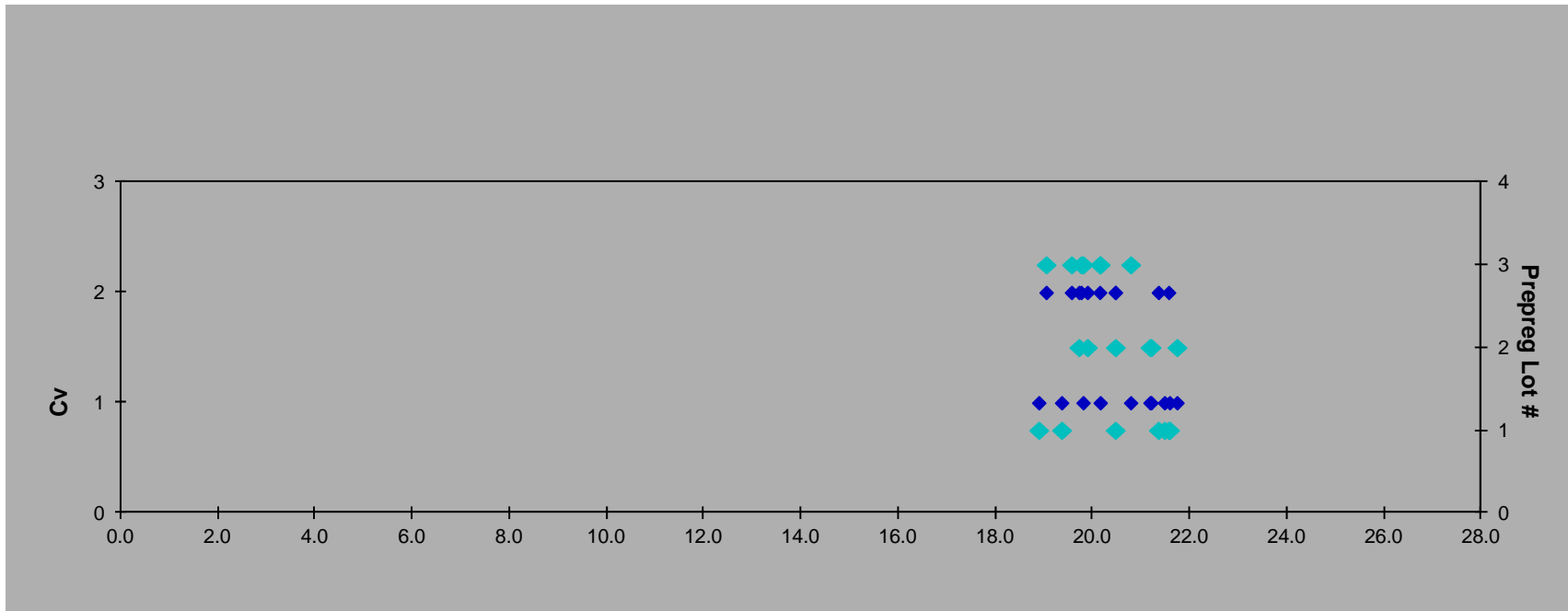




normalizing t_{ply}
[in]
0.0055

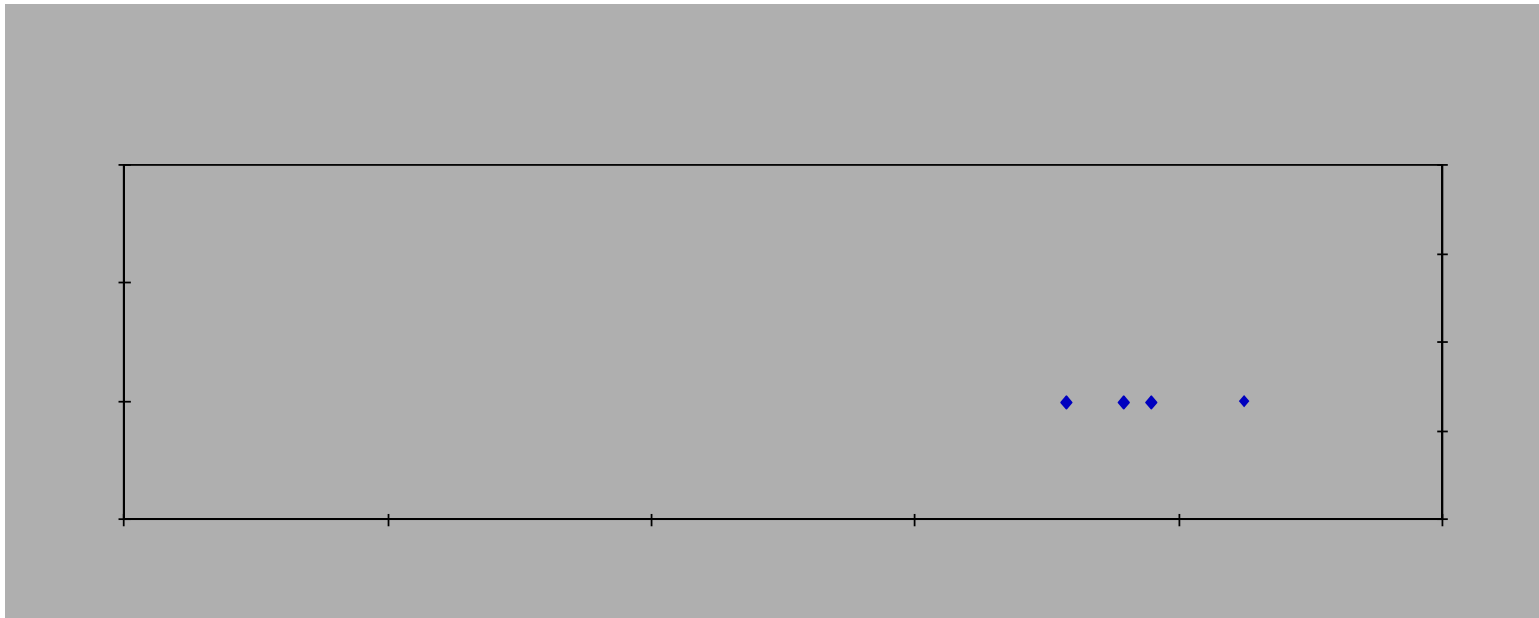
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thckn. [in]	# Plies in Laminate	Avg. t_{ply} [in]	Modulus _{norm} [Msi]
IMU-LC-A-MH1-ETW2-1	AFLA111D	A	MH1	1	1	21.448	0.365	0.089	16	0.0055	21.598
IMU-LC-A-MH1-ETW2-2	AFLA112D	A	MH1	1	1	20.929	0.368	0.090	16	0.0056	21.492
IMU-LC-A-MH1-ETW2-3	AFLA113D	A	MH1	1	1	18.820	0.370	0.091	16	0.0057	19.376
IMU-LC-A-MH1-ETW2-4	AFLA114D	A	MH1	1	1	20.041	0.358	0.083	16	0.0052	18.906
IMU-LC-A-MH2-ETW2-2	AFLA212D	A	MH2	1	2	20.055	0.365	0.090	16	0.0056	20.480
IMU-LC-A-MH2-ETW2-3	AFLA213D	A	MH2	1	2	21.201	0.379	0.090	16	0.0056	21.578
IMU-LC-A-MH2-ETW2-4	AFLA214D	A	MH2	1	2	20.310	0.458	0.093	16	0.0058	21.368
IMU-LC-B-MH1-ETW2-1	AFLB111D	B	MH1	2	1	19.993	0.432	0.093	16	0.0058	21.216
IMU-LC-B-MH1-ETW2-2	AFLB112D	B	MH1	2	1	19.927	0.408	0.094	16	0.0059	21.195
IMU-LC-B-MH1-ETW2-3	AFLB113D	B	MH1	2	1	20.122	0.448	0.095	16	0.0059	21.749
IMU-LC-B-MH2-ETW2-2	AFLB212D	B	MH2	2	2	19.642	0.399	0.089	16	0.0056	19.906
IMU-LC-B-MH2-ETW2-3	AFLB213D	B	MH2	2	2	20.043	0.444	0.087	16	0.0054	19.732
IMU-LC-B-MH2-ETW2-4	AFLB214D	B	MH2	2	2	20.489	0.375	0.088	16	0.0055	20.481
IMU-LC-C-MH1-ETW2-2	AFLC112D	C	MH1	3	1	21.145	0.377	0.087	16	0.0054	20.797
IMU-LC-C-MH1-ETW2-3	AFLC113D	C	MH1	3	1	20.385	0.386	0.086	16	0.0053	19.817
IMU-LC-C-MH1-ETW2-4	AFLC114D	C	MH1	3	1	20.568	0.357	0.086	16	0.0054	20.171
IMU-LC-C-MH2-ETW2-1	AFLC211D	C	MH2	3	2	20.076	0.394	0.088	16	0.0055	20.160
IMU-LC-C-MH2-ETW2-2	AFLC212D	C	MH2	3	2	19.792	0.366	0.087	16	0.0054	19.578
IMU-LC-C-MH2-ETW2-3	AFLC213D	C	MH2	3	2	19.829	0.370	0.088	16	0.0055	19.776
IMU-LC-C-MH2-ETW2-4	AFLC214D	C	MH2	3	2	19.292	0.358	0.087	16	0.0054	19.058

Average	20.205	0.389	Average_{norm}	0.0056	20.422
Standard Dev.	0.641	0.032	Standard Dev._{norm}		0.904
Coeff. of Var. [%]	3.172	8.329	Coeff. of Var. [%]_{norm}		4.425
Min.	18.820	0.357	Min.	0.0052	18.906
Max.	21.448	0.458	Max.	0.0059	21.749
Number	40	10	Number	10	10

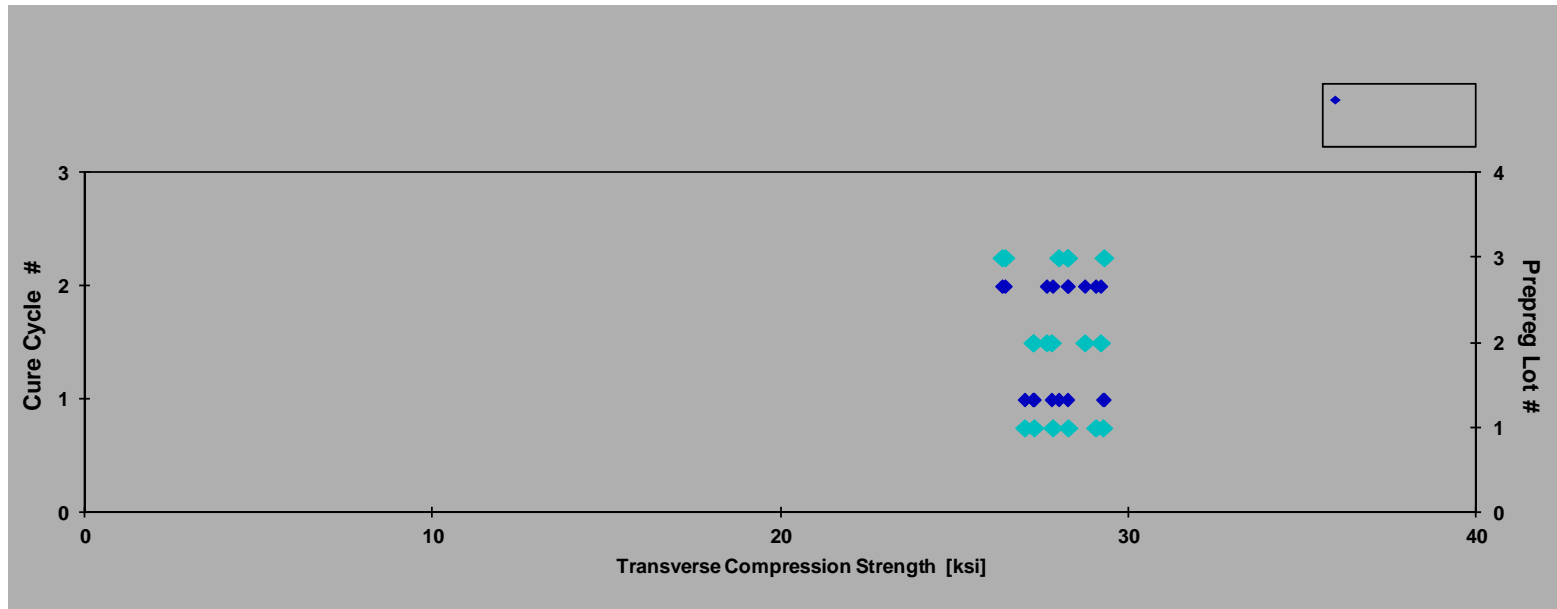


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N -M



Specimen Num	NIAR Name	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	
IMU-TC-A-M	D-2 AFZA112A	A	MH1	1	1	29.270	1.275	0.028	0.091	16	0.0057	HAB	
IMU-TC-A-M	D-3 AFZA113A	A	MH1	1	1	27.017	1.187	0.023	0.092	16	0.0058	HAB	
IMU-TC-A-M	D-4 AFZA114A	A	MH1	1	1	27.288	1.198	0.026	0.092	16	0.0058	HAT	
IMU-TC-A-M	D-2 AFZA212A	A	MH2	1	2	28.267	1.222	0.027	0.091	16	0.0057	HAT	
IMU-TC-A-M	D-3 AFZA213A	A	MH2	1	2	29.062	1.305	0.029	0.091	16	0.0057	HGM	
IMU-TC-A-M	D-4 AFZA214A	A	MH2	1	2	27.825	1.259	0.026	0.091	16	0.0057	HAT/HAB	
IMU-TC-B-M	D-1 AFZB111A	B	MH1	2	1	27.258	1.203	0.025	0.095	16	0.0059	HGM	
IMU-TC-B-M	D-2 AFZB112A	B	MH1	2	1	27.270	1.236	0.028	0.094	16	0.0059	HGM	
IMU-TC-B-M	D-3 AFZB113A	B	MH1	2	1	27.792	1.253	0.028	0.095	16	0.0059	HGM	
IMU-TC-B-M	D-1 AFZB211A	B	MH2	2	2	29.202	1.220	0.026	0.089	16	0.0056	HGM	
IMU-TC-B-M	D-2 AFZB212A	B	MH2	2	2	27.649	1.187	0.024	0.089	16	0.0056	HAB	
IMU-TC-B-M	D-3 AFZB213A	B	MH2	2	2	28.747	1.174	0.027	0.089	16	0.0056	HGM	
IMU-TC-C-M	D-2 AFZC112A	C	MH1	3	1	29.299	1.230	0.026	0.087	16	0.0055	HGM	
IMU-TC-C-M	D-3 AFZC113A	C	MH1	3	1	27.9	0.C	0	0.026	0.087	16	0.0055	MHG
IMU-TC-C-M	H1-RTD-3 AFZC113A	C	MH2	3	3							M	
IMU-TC-B-M	DA AFZC11	B	MH2	3	28.							M	
IMU-TC-B-M	DA AFZC11	B	MH2 CH	3	28.							M	
IMU-TC-B-M	DA AFZC11	B	MH2	3	28.							M	

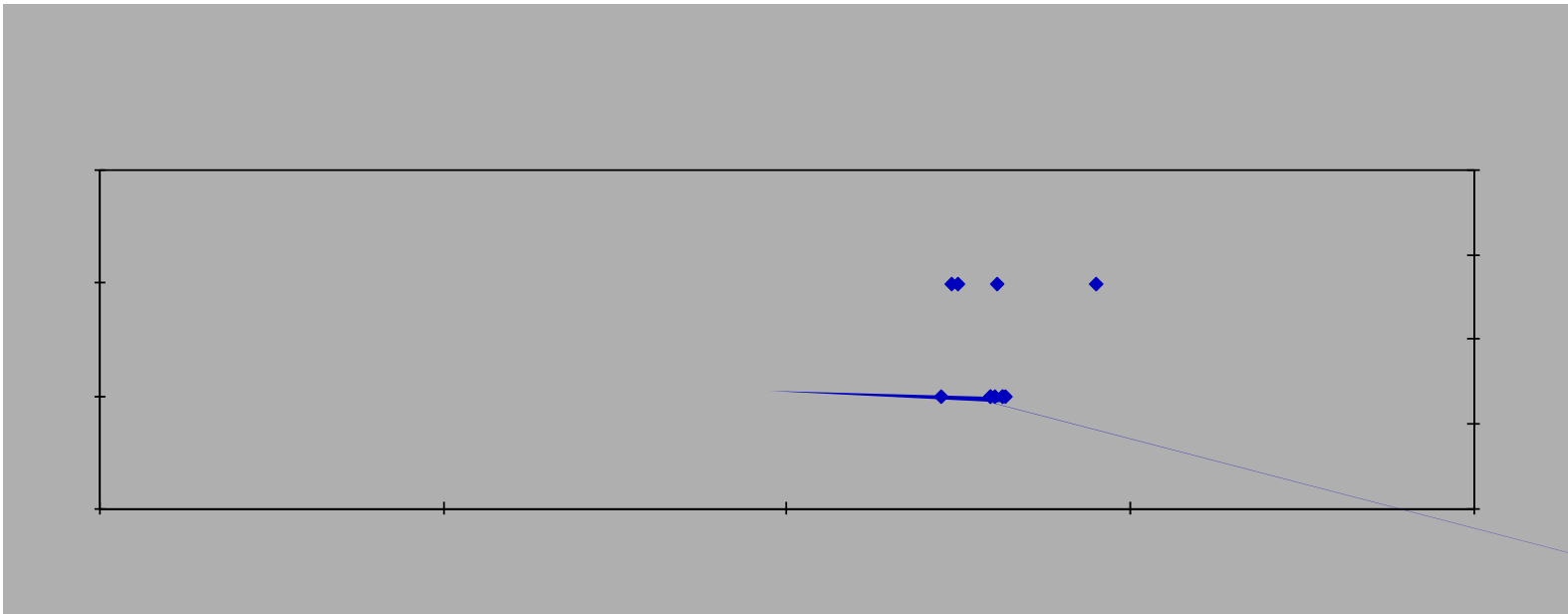


Transverse Compression Properties (TC)-- (ETW)
Strength & Modulus
 MTM45-1/ IM7 Uni

Specimen Number	NIAR Naming	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
IMU-TC-A-MH1-ETW-2	AFZA112N	A	MH1	1	1	14.935	1.076	0.020	0.091	16	0.0057	HGM
IMU-TC-A-MH1-ETW-3	AFZA113N	A	MH1	1	1	15.386	1.145	0.022	0.090	16	0.0056	HGM
IMU-TC-A-MH1-ETW-4	AFZA114N	A	MH1	1	1	15.681	1.079	0.017	0.091	16	0.0057	HGM
IMU-TC-A-MH2-ETW-2	AFZA212N	A	MH2	1	2	15.513	1.045	0.020	0.090	16	0.0057	HAB
IMU-TC-A-MH2-ETW-3	AFZA213N	A	MH2	1	2	17.065	1.137	0.021	0.091	16	0.0057	HGM
IMU-TC-A-MH2-ETW-4	AFZA214N	A	MH2	1	2	16.865	1.107	0.023	0.090	16	0.0056	BGM
IMU-TC-B-MH1-ETW-1	AFZB111N	B	MH1	2	1	15.912	1.117	0.022	0.094	16	0.0059	HAT/HGM
IMU-TC-B-MH1-ETW-2	AFZB112N	B	MH1	2	1	16.020	1.099	0.023	0.093	16	0.0058	HGM
IMU-TC-B-MH1-ETW-3	AFZB113N	B	MH1	2	1	16.322	1.120	0.024	0.092	16	0.0058	HAT/HGM
IMU-TC-B-MH2-ETW-1	AFZB211N	B	MH2	2	2	14.930	1.043	0.021	0.088	16	0.0055	HGM
IMU-TC-B-MH2-ETW-2	AFZB212N	B	MH2	2	2	15.146	1.134	0.024	0.087	16	0.0055	HAT
IMU-TC-B-MH2-ETW-3	AFZB213N	B	MH2	2	2	13.579	1.136	0.022	0.088	16	0.0055	HGM
IMU-TC-C-MH1-ETW-2	AFZC112N	C	MH1	3	1	16.681	1.113	0.022	0.086	16	0.0054	HGM/HAT
IMU-TC-C-MH1-ETW-3	AFZC113N	C	MH1	3	1	16.260	1.125	0.022	0.086	16	0.0054	HGM
IMU-TC-C-MH1-ETW-4	AFZC114N	C	MH1	3	1	16.315	1.057	0.022	0.086	16	0.0054	HGM
IMU-TC-C-MH2-ETW-2	AFZC212N	C	MH2	3	2	15.604	1.002	0.022	0.086	16	0.0054	HAT/HAB
IMU-TC-C-MH2-ETW-3	AFZC213N	C	MH2	3	2	14.828	0.956	0.020	0.087	16	0.0054	HGM
IMU-TC-C-MH2-ETW-4	AFZC214N	C	MH2	3	2	15.687	1.076	0.018	0.086	16	0.0054	HGM

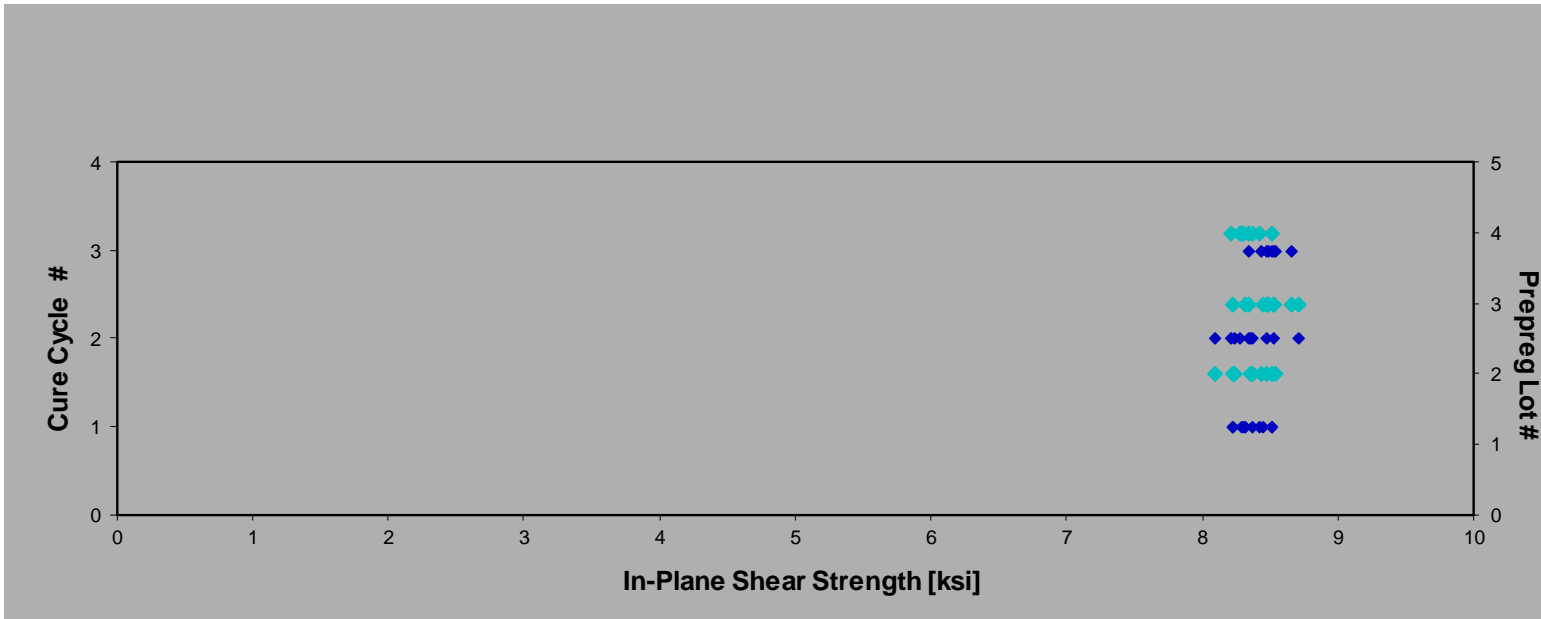
Average	15.707	1.087	0.021	Average	0.0056
Standard Dev.	0.850	0.051	0.002		
Coeff. of Var. [%]	5.414	4.705	8.555		
Min.	13.579	0.956	0.017	Min.	0.0054
Max.	17.065	1.145	0.024	Max.	0.0059
Number of Spec.	18	18	18	Number of Spec.	18





4.5 In-Plane Shear Properties (IPS)

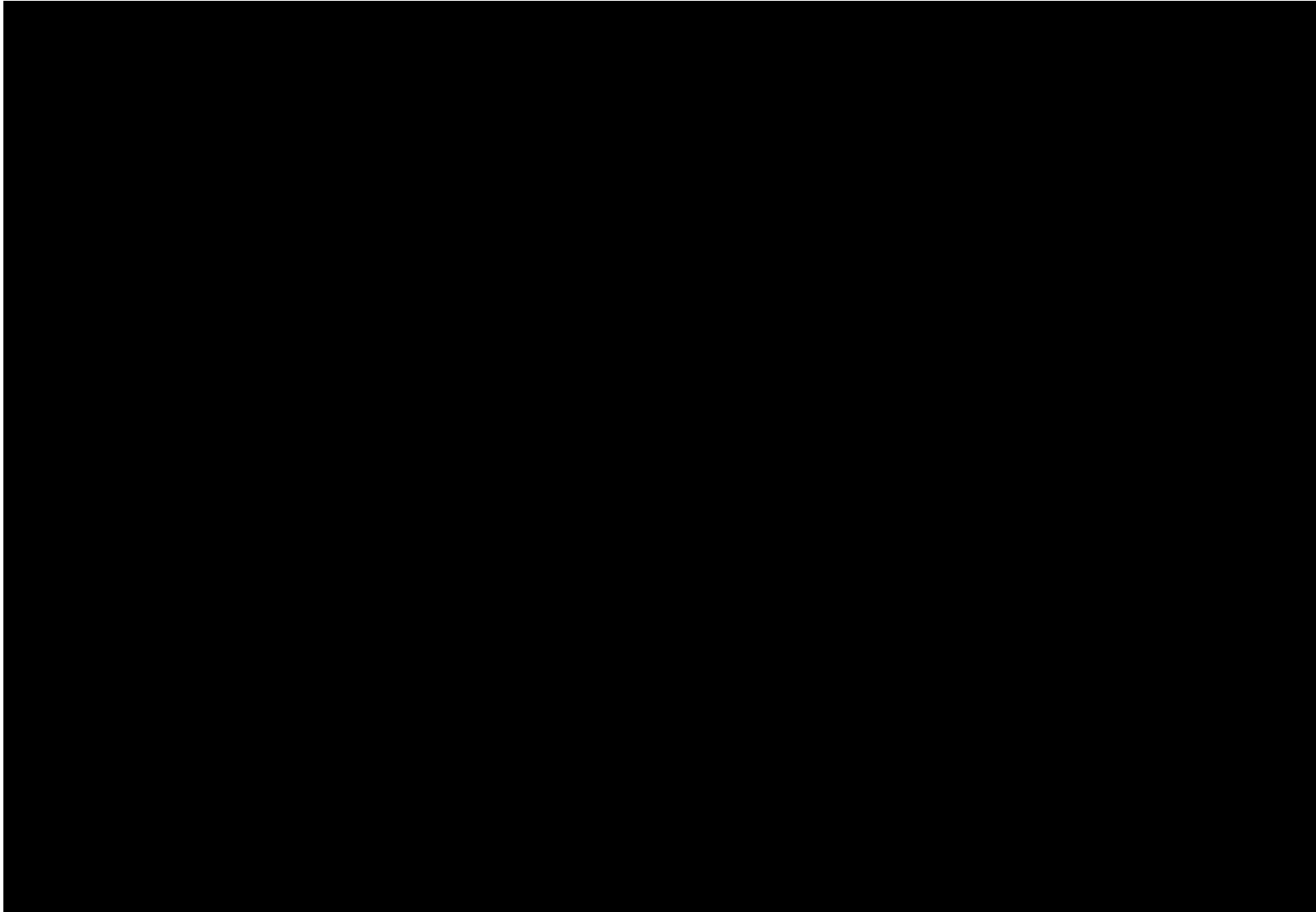
Specimen Number	NIAR Un 7t.	ACG Ep	ACG Cure G	Prepreg	Cure Cycle	0.2% Offset	Strength at	Modulus	Avg. Specimen	# Plies in	Avg. tply
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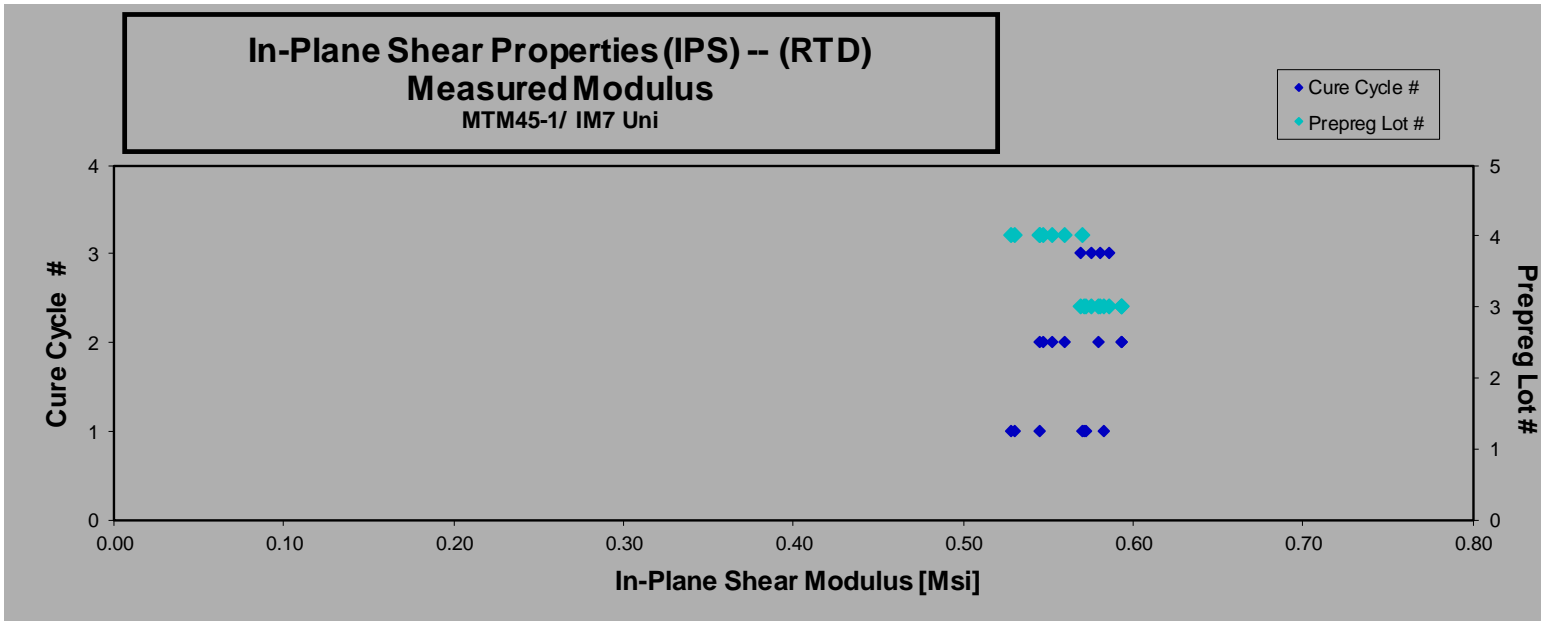


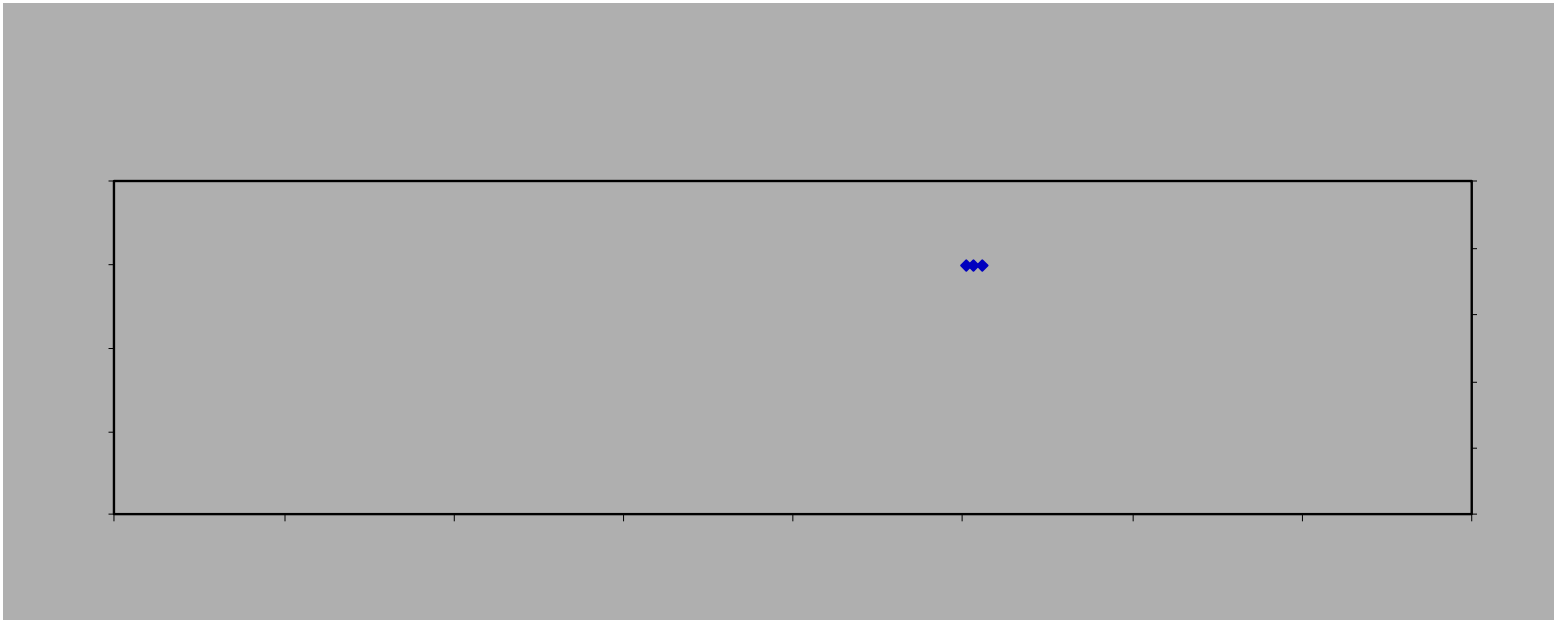
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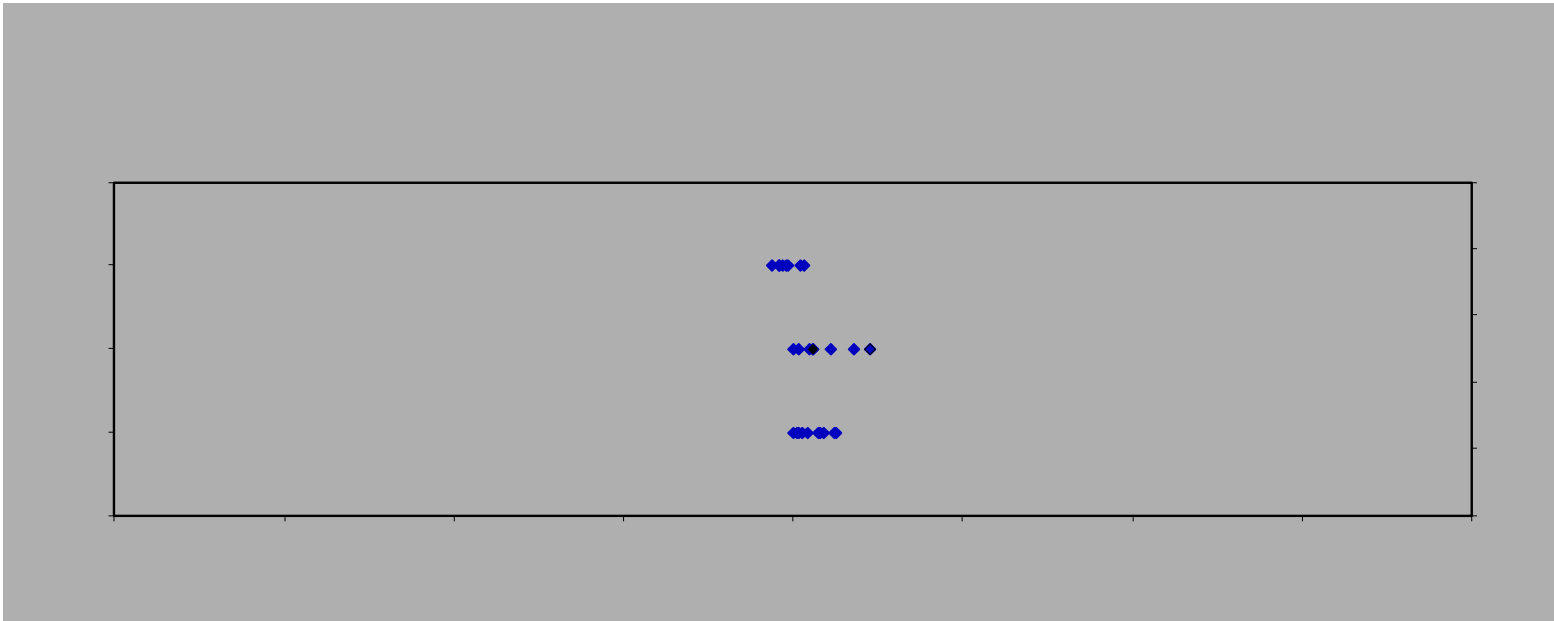


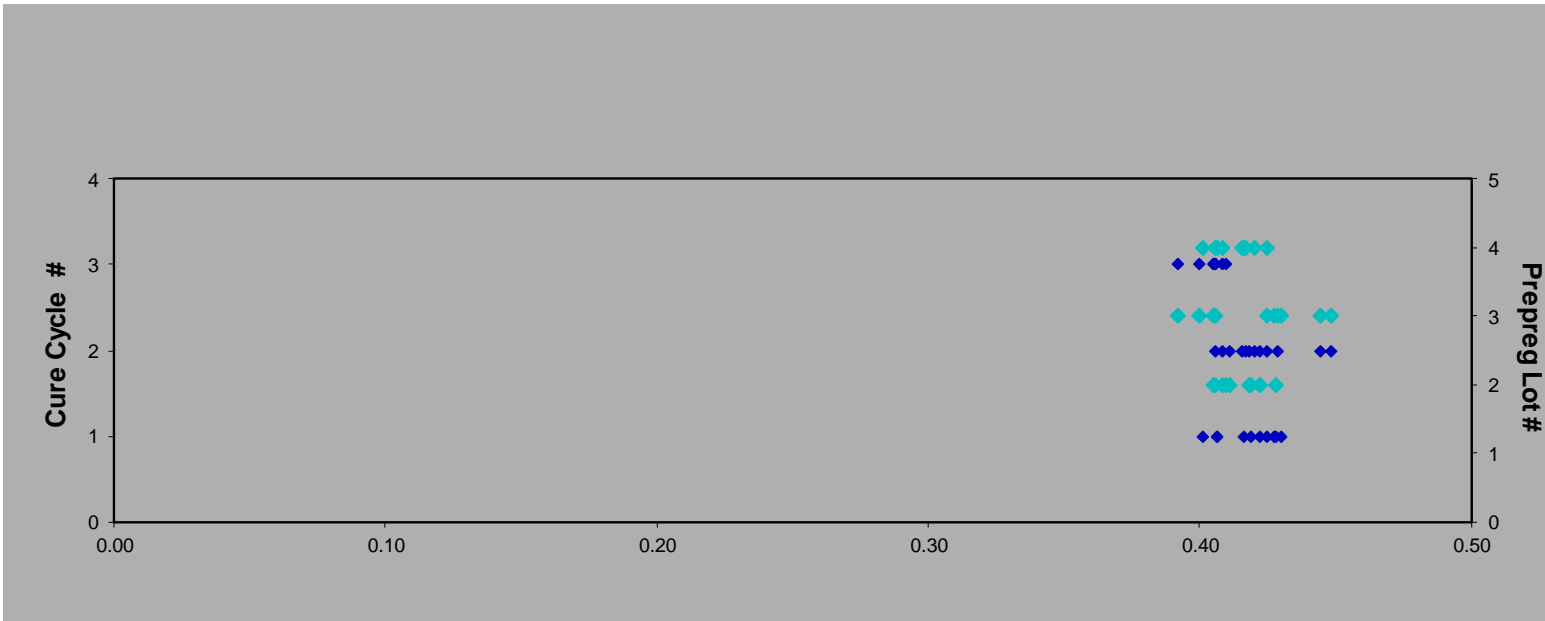






Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	0.2% Offset Strength [ksi]	Strength at 5% Strain [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. tply [in]
AITR1392-IMU-IPS-B-MH1-2-ETW-1	AFNB121N	B	MH1	2	1	4.147	6.141	0.428	0.0449	8	0.0056
AITR1392-IMU-IPS-B-MH1-2-ETW-1	AFNB121N	B	MH1	2	1	4.147	6.141	0.428	0.0449	8	0.0056





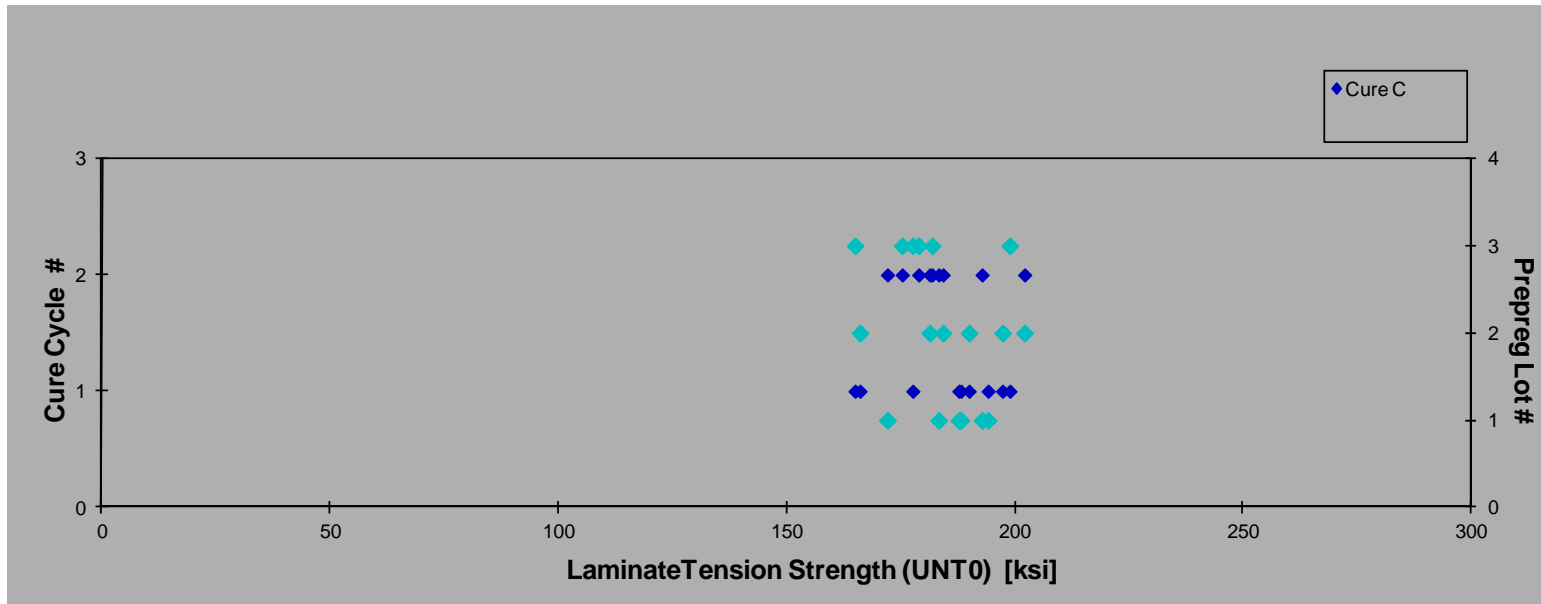
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	0.2% Offset Strength [ksi]	Strength at 5% Strain [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. tply [in]
AITR1392-IMU-IPS-B-MH1-2-ETW2-1	AFNB121D	B	MH1	2	1	3.205	4.824	0.335	0.0445	8	0.0056
AITR1392-IMU-IPS-B-MH1-2-ETW2-2	AFNB122D	B	MH1	2	1	3.048	4.696	0.315	0.0447	8	0.0056
AITR1392-IMU-IPS-B-MH1-2-ETW2-3	AFNB123D	B	MH1	2	1	3.080	4.704	0.320	0.0440	8	0.0055
AITR1392-IMU-IPS-B-MH2-2-ETW2-1	AFNB221D	B	MH2	2	2	3.183	4.771	0.333	0.0441	8	0.0055
AITR1392-IMU-IPS-B-MH2-2-ETW2-2	AFNB222D	B	MH2	2	2	3.185	4.777	0.332	0.0446	8	0.0056
AITR1392-IMU-IPS-B-MH2-2-ETW2-3	AFNB223D	B	MH2	2	2	3.155	4.774	0.330	0.0446	8	0.0056
AITR1392-IMU-IPS-B-MH3-2-ETW2-1	AFNB321D	B	MH3	2	3	3.092	4.676	0.316	0.0435	8	0.0054
AITR1392-IMU-IPS-B-MH3-2-ETW2-2	AFNB322D	B	MH3	2	3	3.149	4.730	0.318	0.0430	8	0.0054
AITR1392-IMU-IPS-B-MH3-2-ETW2-3	AFNB323D	B	MH3	2	3	3.086	4.655	0.311	0.0433	8	0.0054
AITR1392-IMU-IPS-B-MH3-2-ETW2-4	AFNB324D	B	MH3	2	3	3.040	4.584	0.309	0.0433	8	0.0054
AITR1392-IMU-IPS-C-MH1-2-ETW2-1	AFNC121D	C	MH1	3	1	3.311	4.988	0.340	0.0440	8	0.0055
AITR1392-IMU-IPS-C-MH1-2-ETW2-2	AFNC122D	C	MH1	3	1	3.259	4.966	0.335	0.0441	8	0.0055
AITR1392-IMU-IPS-C-MH1-2-ETW2-3	AFNC123D	C	MH1	3	1	3.191	4.844	0.328	0.0439	8	0.0055
AITR1392-IMU-IPS-C-MH2-2-ETW2-1	AFNC221D	C	MH2	3	2	3.405	5.186	0.348	0.0439	8	0.0055
AITR1392-IMU-IPS-C-MH2-2-ETW2-2	AFNC222D	C	MH2	3	2	3.381	5.148	0.351	0.0431	8	0.0054
AITR1392-IMU-IPS-C-MH2-2-ETW2-3	AFNC223D	C	MH2	3	2	3.212	4.973	0.336	0.0440	8	0.0055
AITR1392-IMU-IPS-C-MH3-2-ETW2-1	AFNC321D	C	MH3	3	3	3.178	4.735	0.327	0.0442	8	0.0055
AITR1392-IMU-IPS-C-MH3-2-ETW2-2	AFNC322D	C	MH3	3	3	3.041	4.485	0.310	0.0445	8	0.0056
AITR1392-IMU-IPS-C-MH3-2-ETW2-3	AFNC323D	C	MH3	3	3	3.018	4.470	0.309	0.0443	8	0.0055
AITR1392-IMU-IPS-C-MH3-2-ETW2-4	AFNC324D	C	MH3	3	3	2.997	4.468	0.306	0.0438	8	0.0055
AITR1392-IMU-IPS-D-MH1-2-ETW2-1	AFND121D	D	MH1	4	1	3.202	4.755	0.326	0.0458	8	0.0057
AITR1392-IMU-IPS-D-MH1-2-ETW2-2	AFND122D	D	MH1	4	1	3.193	4.754	0.325	0.0461	8	0.0058
AITR1392-IMU-IPS-D-MH1-2-ETW2-3	AFND123D	D	MH1	4	1	3.281	4.964	0.332	0.0457	8	0.0057
AITR1392-IMU-IPS-D-MH1-2-ETW2-4	AFND124D	D	MH1	4	1	3.263	4.861	0.325	0.0457	8	0.0057
AITR1392-IMU-IPS-D-MH1-2-ETW2-5	AFND125D	D	MH1	4	1	3.847	5.326	0.353	0.0456	8	0.0057
AITR1392-IMU-IPS-D-MH2-2-ETW2-1	AFND221D	D	MH2	4	2	3.351	4.976	0.328	0.0459	8	0.0057
AITR1392-IMU-IPS-D-MH2-2-ETW2-2	AFND222D	D	MH2	4	2	3.249	4.878	0.329	0.0455	8	0.0057
AITR1392-IMU-IPS-D-MH2-2-ETW2-3	AFND223D	D	MH2	4	2	3.269	4.850	0.329	0.0451	8	0.0056
AITR1392-IMU-IPS-D-MH2-2-ETW2-4	AFND224D	D	MH2	4	2	3.331	4.958	0.338	0.0450	8	0.0056
AITR1392-IMU-IPS-D-MH2-2-ETW2-5	AFND225D	D	MH2	4	2	3.301	4.908	0.338	0.0456	8	0.0057
AITR1392-IMU-IPS-D-MH2-2-ETW2-6	AFND226D	D	MH2	4	2	3.301	5.020	0.339	0.0453	8	0.0057

Average	3.219	4.829	0.328	Average	0.0056
Standard Dev.	0.160	0.201	0.012	Standard Dev.	
Coeff. of Var. [%a		e f=5r. f.	- . a]M	328 -	f = 6M 5. ~ /5 ^a .



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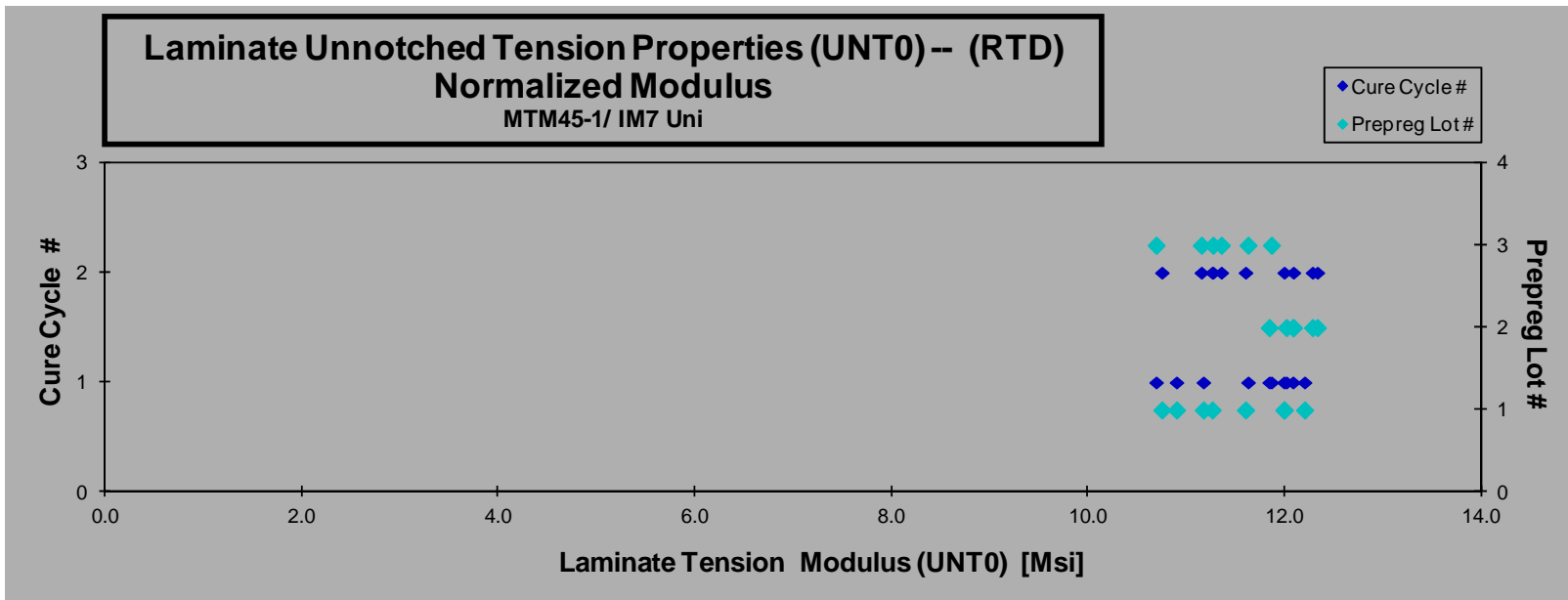
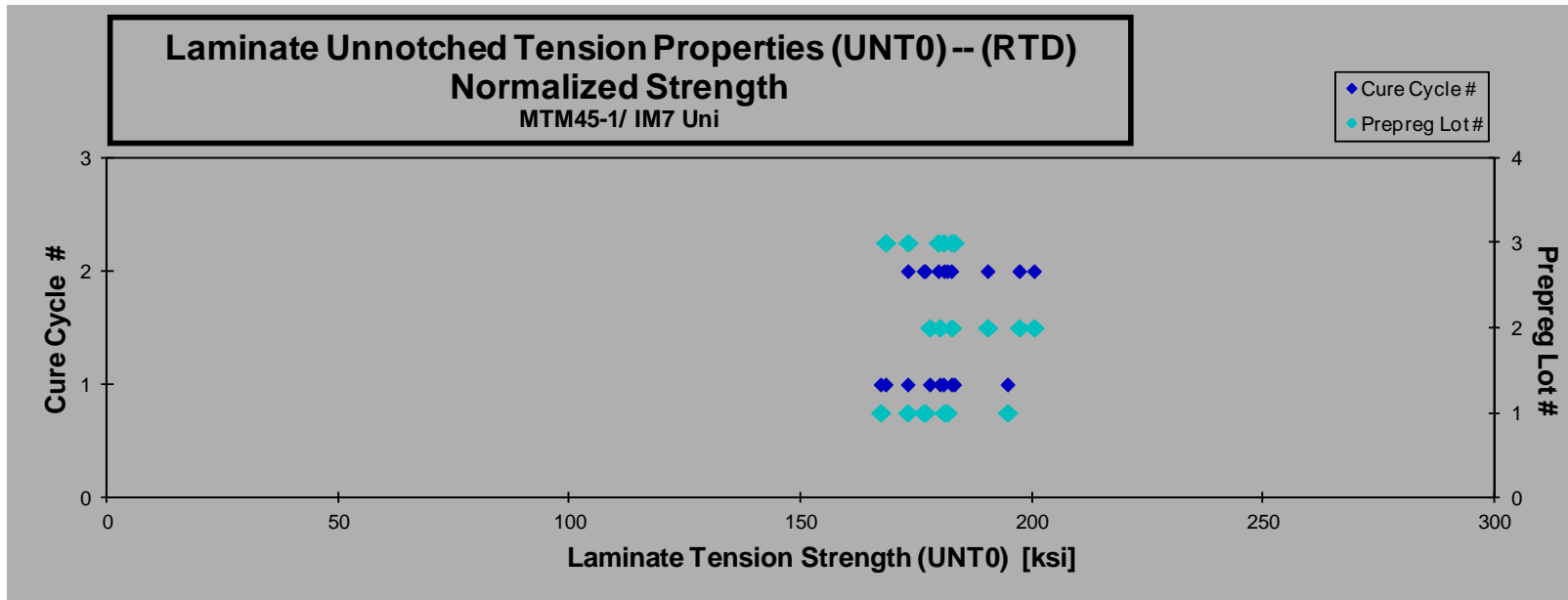


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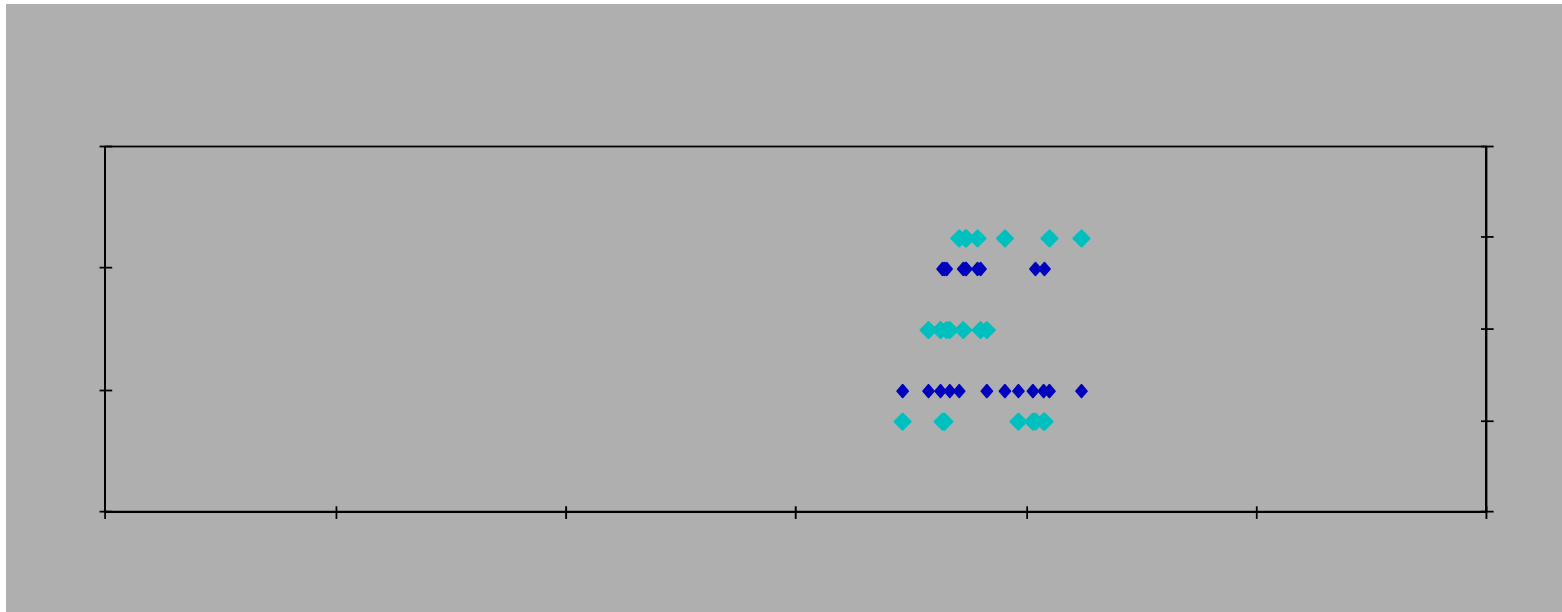
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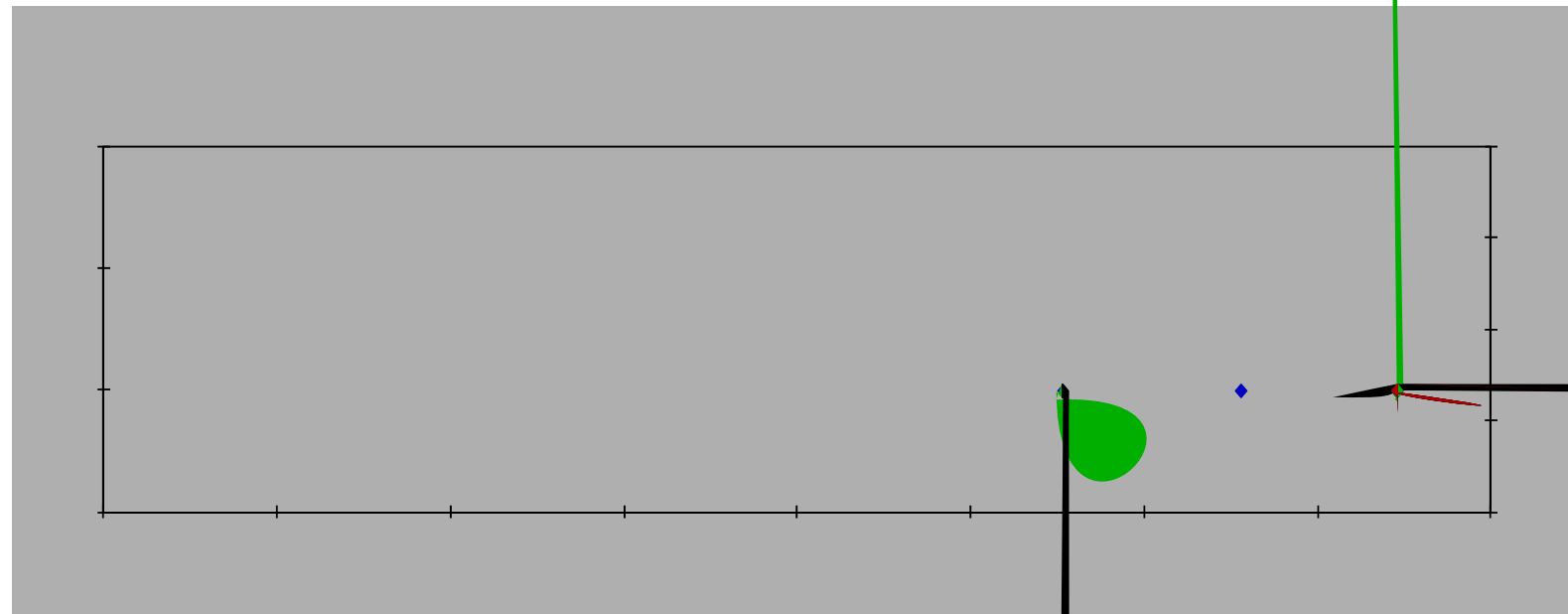
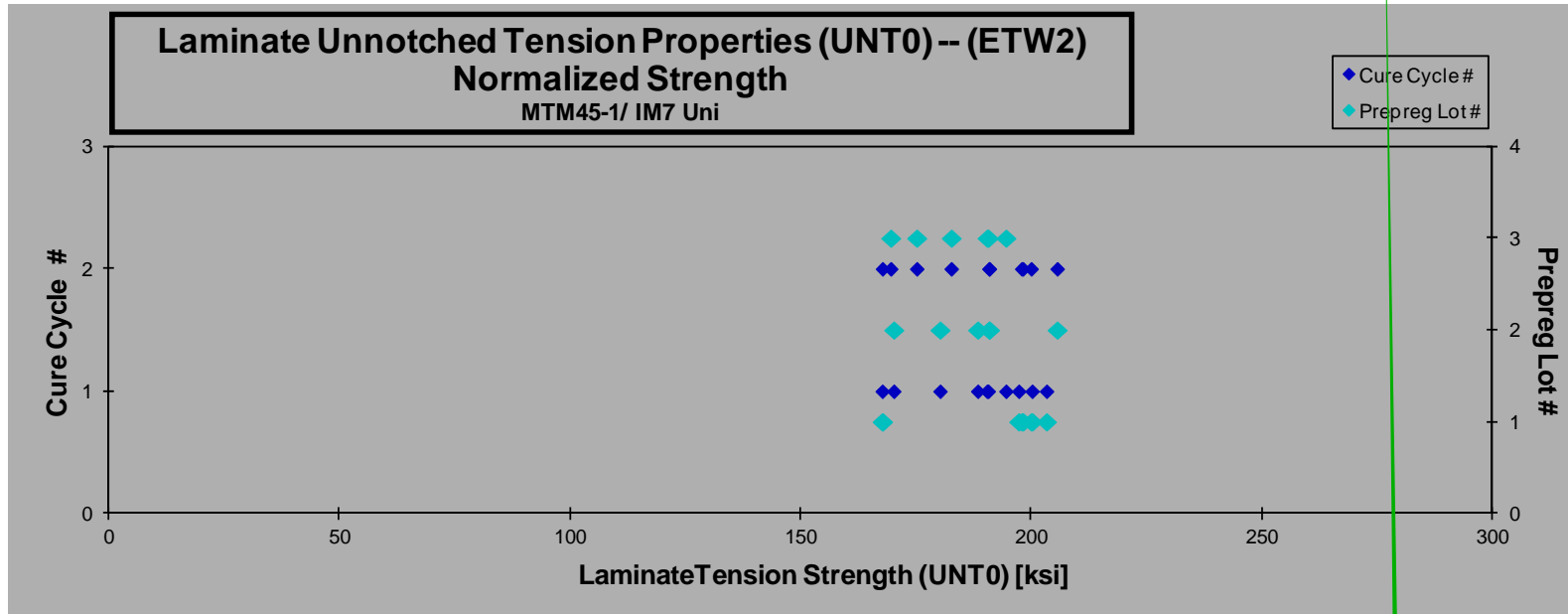




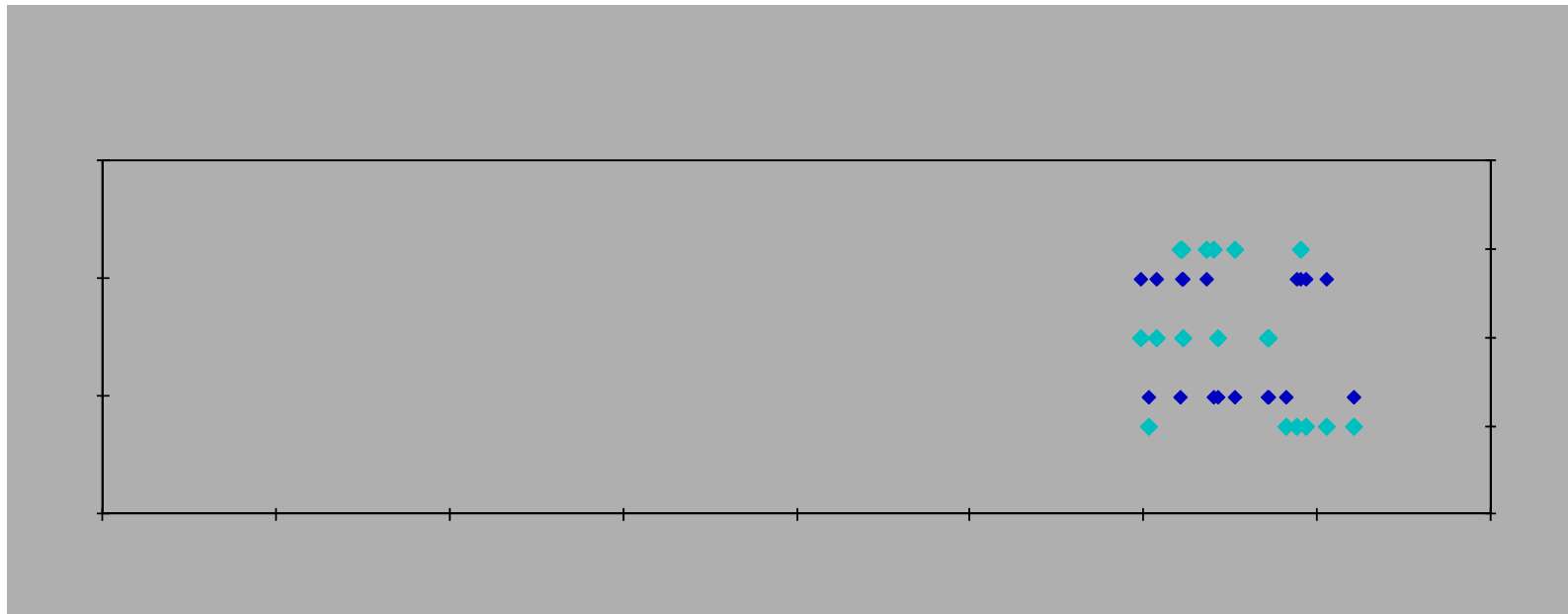
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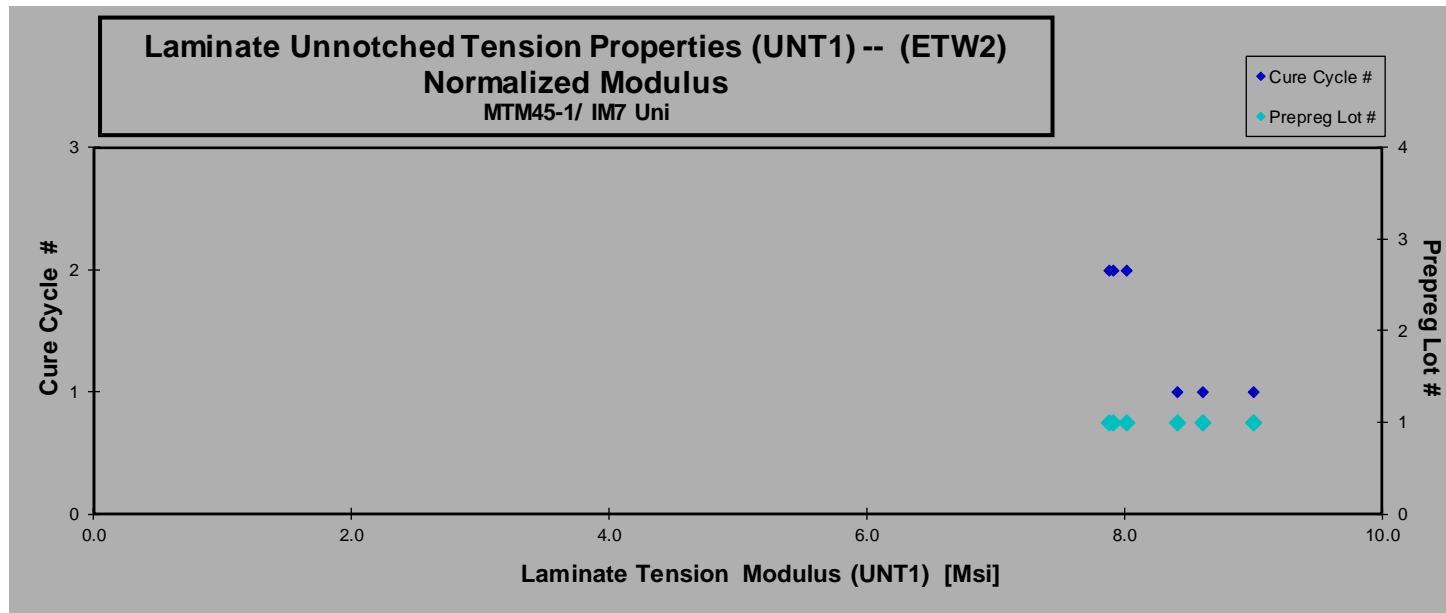
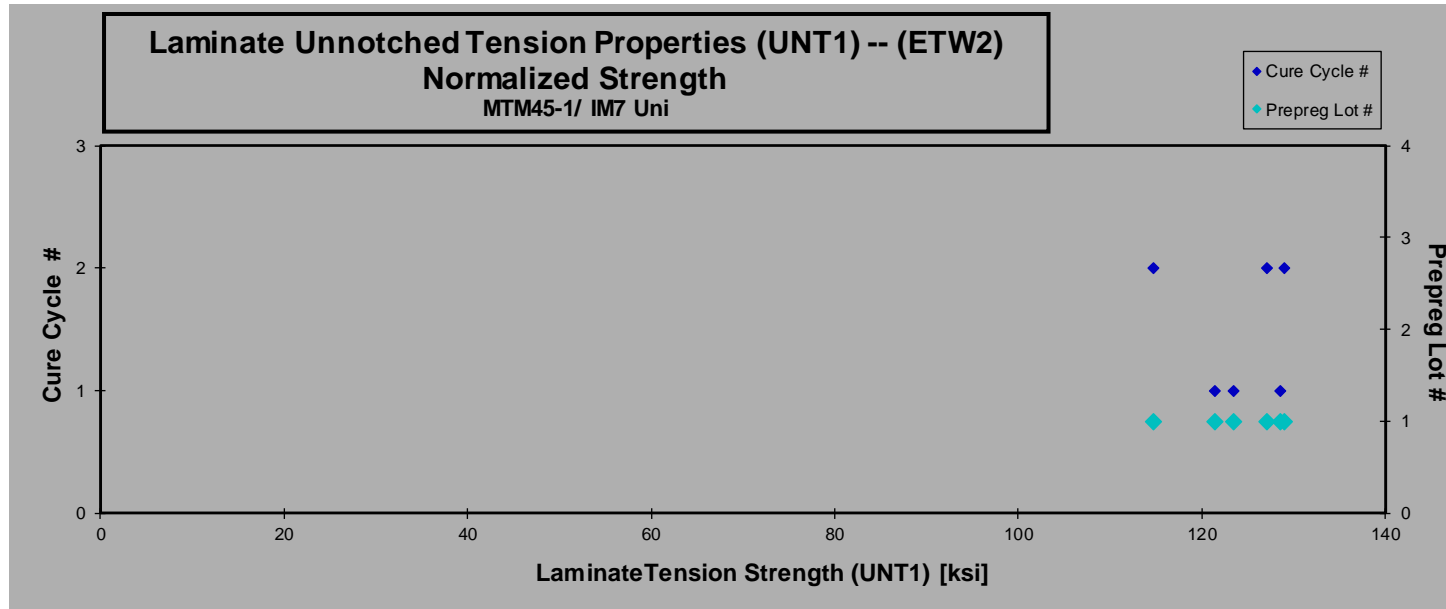
Specimen Number	NIAR Naming	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
IMU-UNT1-A-MH1-RTD-2	AFAA112A	A	MH1	1	1	132.471	7.811	0.136	24	AGM	0.0057	136.084	8.024
IMU-UNT1-A-MH1-RTD-3	AFAA113A	A	MH1	1	1	137.494	7.990	0.137	24	AGM	0.0057	142.286	8.269
IMU-UNT1-A-MH1-RTD-4	AFAA114A	A	MH1	1	1	135.719	8.198	0.135	24	AGM	0.0056	139.009	8.397
IMU-UNT1-A-MH2-RTD-2	AFAA212A	A	MH2	1	2	138.179	8.055	0.135	24	LWT / LWB / DGM	0.0056	141.424	8.244
IMU-UNT1-A-MH2-RTD-3	AFAA213A	A	MH2	1	2	124.451	7.874	0.136	24	AGM	0.0057	128.127	8.107
IMU-UNT1-A-MH2-RTD-4	AFAA214A	A	MH2	1	2	142.847	7.899	0.136	24	AGM / LWB	0.0056	146.634	8.108
IMU-UNT1-B-MH1-RTD-2	AFAB112A	B	MH1	2	1	133.550	8.072	0.136	24	LWB/AGM	0.0056	137.091	8.286
IMU-UNT1-B-MH1-RTD-3	AFAB113A	B	MH1	2	1	128.667	7.845	0.136	24	AGM/LGM	0.0057	132.761	8.095
IMU-UNT1-B-MH1-RTD-4	AFAB114A	B	MH1	2	1	126.656	7.771	0.133	24	LWT/AGM	0.0055	127.423	7.818
IMU-UNT1-B-MH2-RTD-2	AFAB212A	B	MH2	2	2	123.165	7.498	0.135	24	AGM/LGM	0.0056	125.591	7.646
IMU-UNT1-B-MH2-RTD-3	AFAB213A	B	MH2	2	2	133.652	8.320	0.134	24	AGM/LWB	0.0056	135.171	8.415
IMU-UNT1-B-MH2-RTD-4	AFAB214A	B	MH2	2	2	127.875	8.222	0.131	24	LWT/LWB	0.0055	127.003	8.166
IMU-UNT1-C-MH1-RTD-2	AFAC112A	C	MH1	3	1	131.336	8.027	0.133	24	LWB/AGM	0.0055	132.232	8.082
IMU-UNT1-C-MH1-RTD-3	AFAC113A	C	MH1	3	1	124.603	7.948	0.134	24	AGM	0.0056	126.114	8.044
IMU-UNT1-C-MH1-RTD-4	AFAC114A	C	MH1	3	1	125.345	8.052	0.133	24	LWT/LWB	0.0055	125.915	8.089
IMU-UNT1-C-MH2-RTD-1	AFAC211A	C	MH2	3	2	133.992	8.322	0.132	24	LAB/LWT	0.0055	134.094	8.328
IMU-UNT1-C-MH2-RTD-2	AFAC212A	C	MH2	3	2	127.012	8.171	0.131	24	AGM/LAT/LAB	0.0055	126.338	8.128
IMU-UNT1-C-MH2-RTD-3	AFAC213A	C	MH2	3	2	127.431	8.075	0.132	24	LWT/AGM	0.0055	127.335	8.069
Average						130.803	8.008				Average		

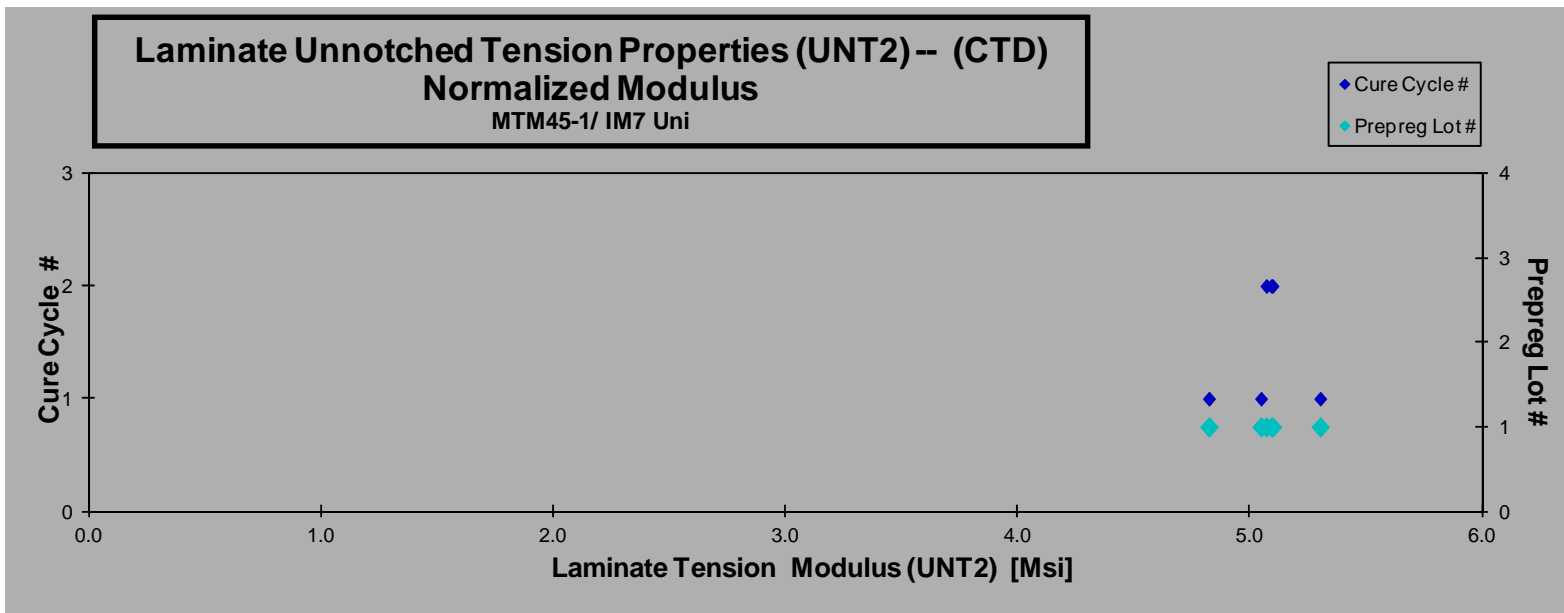
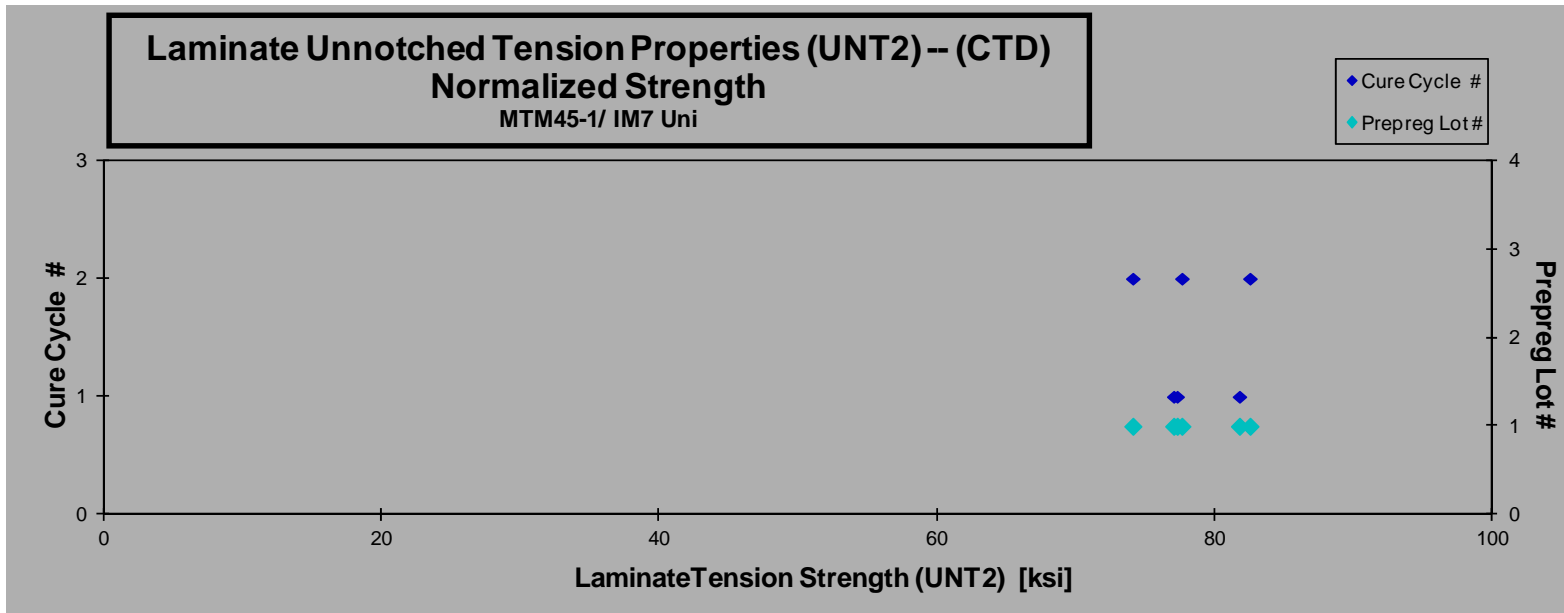


normalizing t_{ply}
 [in]
 0.0055

Specimen Number	NIAR Naming	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thicken. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
IMU-UNT1-A-MH1-ETW2-1	AFAA111D	A	MH1	1	1	118.629	8.401	0.135	24	LWT / AGM	0.0056	121.550	8.608
IMU-UNT1-A-MH1-ETW2-2	AFAA112D	A	MH1	1	1	124.973	8.745	0.136	24	LWT / AGM	0.0057	128.665	9.003
IMU-UNT1-A-MH1-ETW2-3	AFAA113D	A	MH1	1	1	121.308	8.267	0.134	24	AGM			

IMU-UNT1-A-MH -ETW2-2 AFAA 42D = A MH





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Laminate Unnotched Tension Properties (UNT2) -- (ETW2)
Strength & Modulus
 MTM45-1/ IM7 Uni

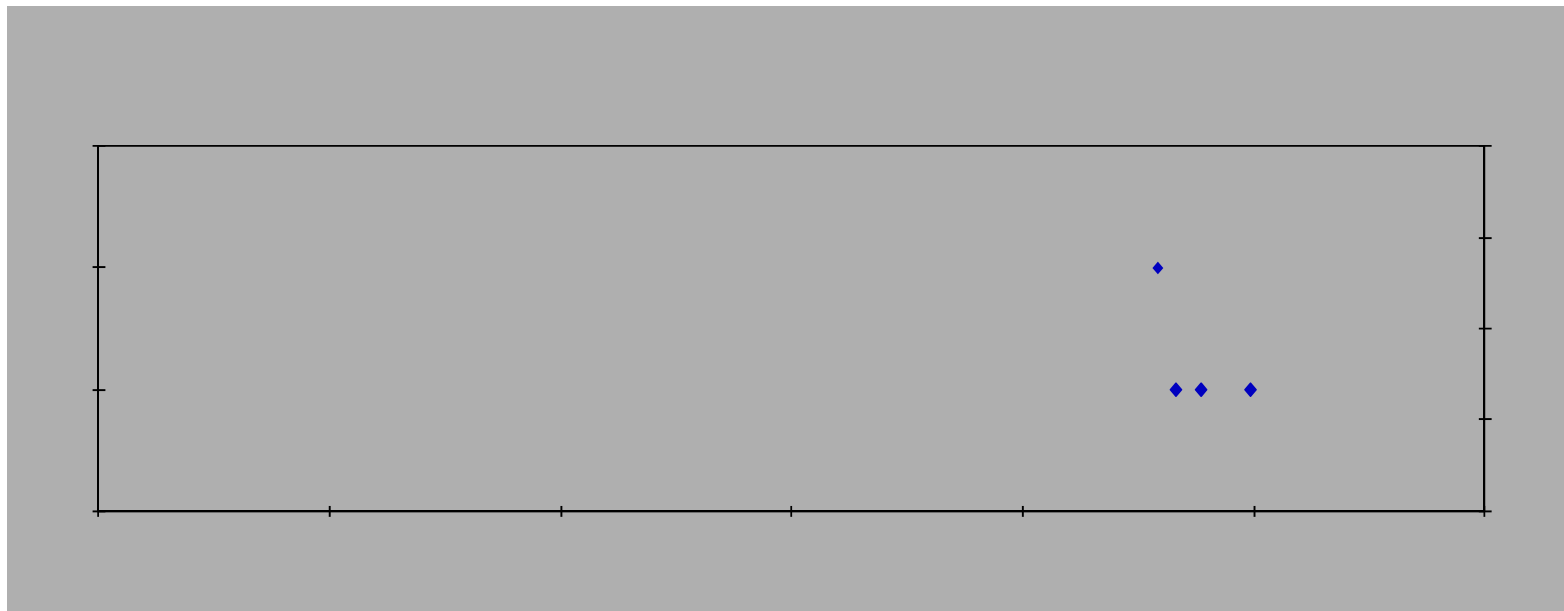
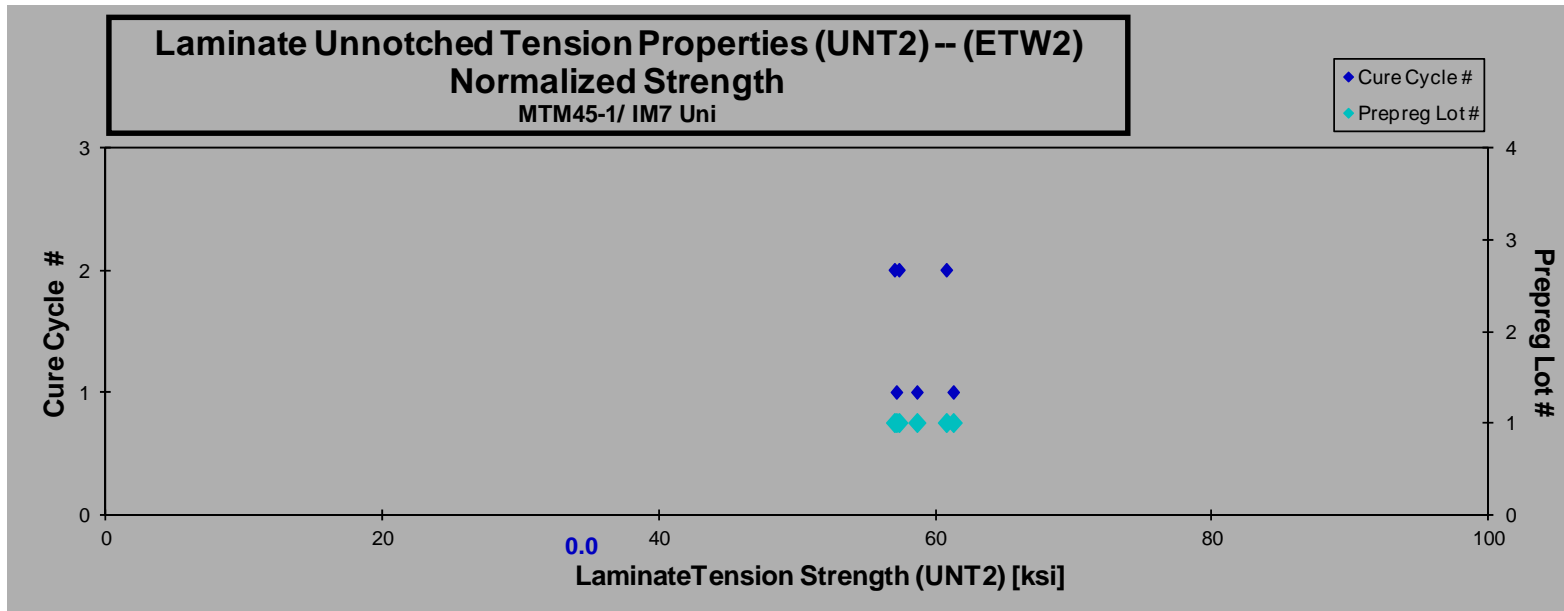
normalizing t_{ply}
 [in]
0.0055

Specimen Number	NIAR Naming	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Mode
IMU-UNT2-A-MH1-ETW2-2	AFBA112D	A	MH1	1	1	56.444	4.602	0.111	20	DGM
IMU-UNT2-A-MH1-ETW2-3	AFBA113D	A	MH1	1	1	56.822	4.621	0.113	20	DGM
IMU-UNT2-A-MH1-ETW2-4	AFBA114D	A	MH1	1	1	60.141	4.891	0.112	20	DGM
IMU-UNT2-A-MH2-ETW2-1	AFBA211D	A	MH2	1	2	55.894	4.466	0.113	20	DGM
IMU-UNT2-A-MH2-ETW2-2	AFBA212D	A	MH2	1	2	55.295	4.449	0.113	20	DGM
IMU-UNT2-A-MH2-ETW2-4	AFBA214D	A	MH2	1	2	59.850	4.781	0.112	20	DGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0056	57.102	4.655
0.0057	58.587	4.764
0.0056	61.216	4.978
0.0056	57.283	4.577
0.0057	56.962	4.583
0.0056	60.712	4.850

Average 57.407 4.635
 Standard Dev. 2.072 0.174
 Coeff. of Var. [%] 3.609 3.750
 Min. 55.295 4.449
 Max. 60.141 4.891
 Number of Spec. 6 6

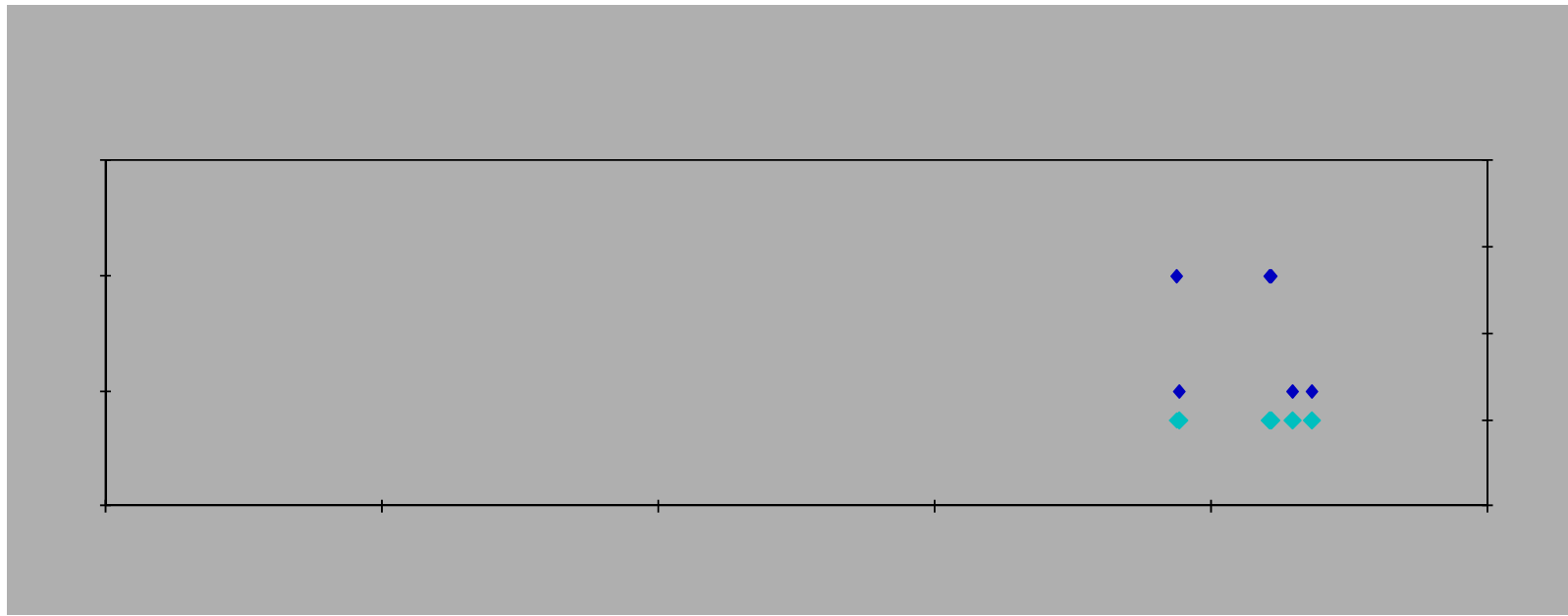
Average_{norm} 0.0056 58.643 4.735
 Standard Dev._{norm} 1.895 0.160
 Coeff. of Var. [%]_{norm} 3.231 3.372
 Min. 0.0056 56.962 4.577
 Max. 0.0057 61.216 4.978
 Number of Spec. 6 6



4.9 “50/40/10” Unnotched Tension 3 Properties (UNT3)

Specimen Number	A #	NIAR q Naming	ACG Batch #	ACG Cure Cyclc f m	Prepreg	Cure Cycle	Strength	Modulus	Avg. Specimen	# Plies in	Failure	Avg. t_{ply}	Strength _{norm}	Modulus _{norm}
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normalizing t_{ply}
[in]
0.0055

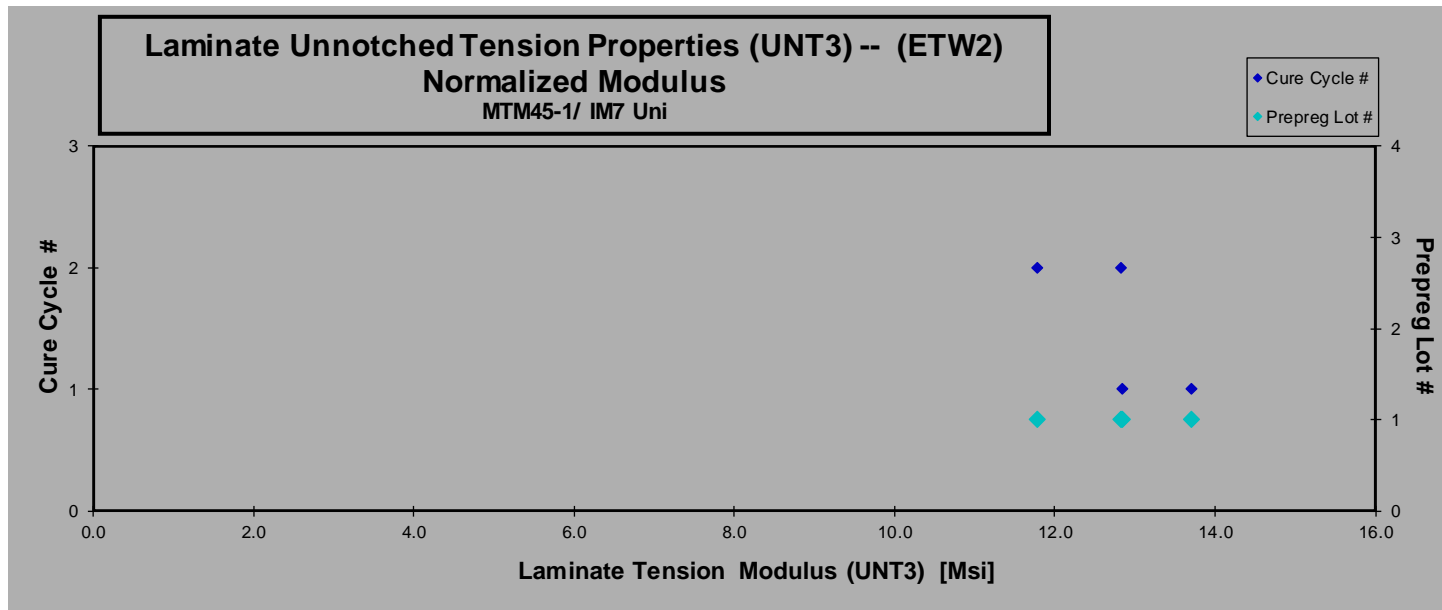
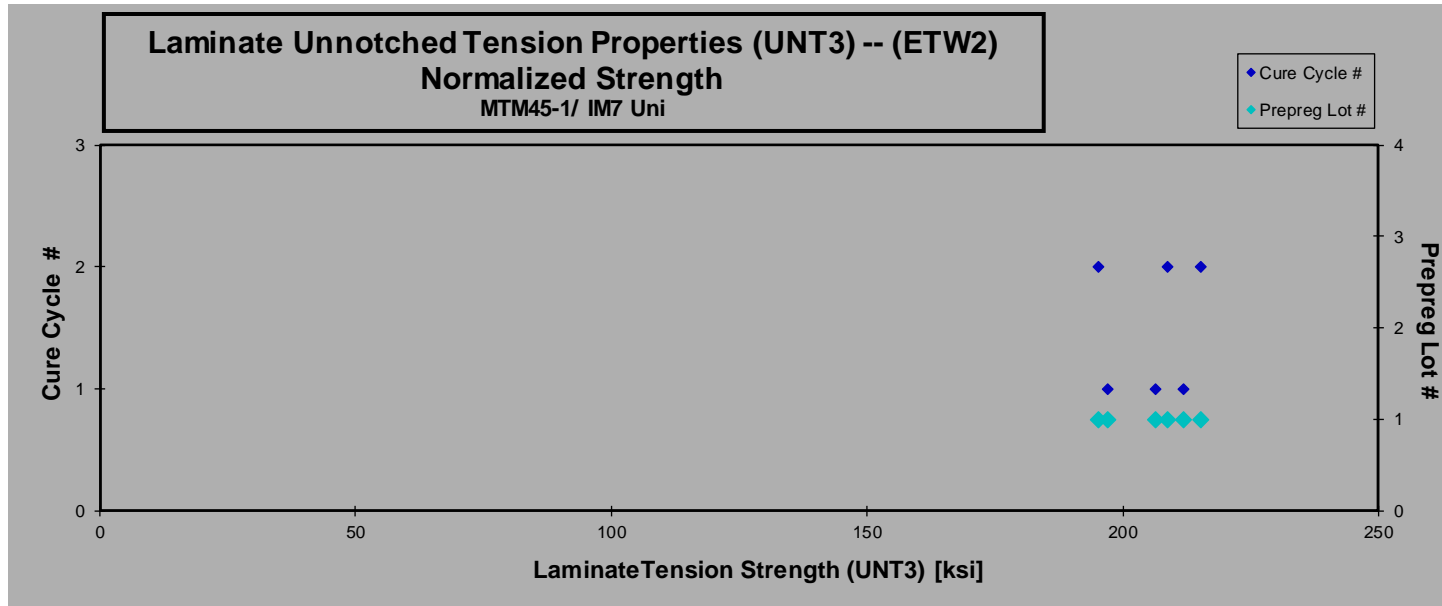


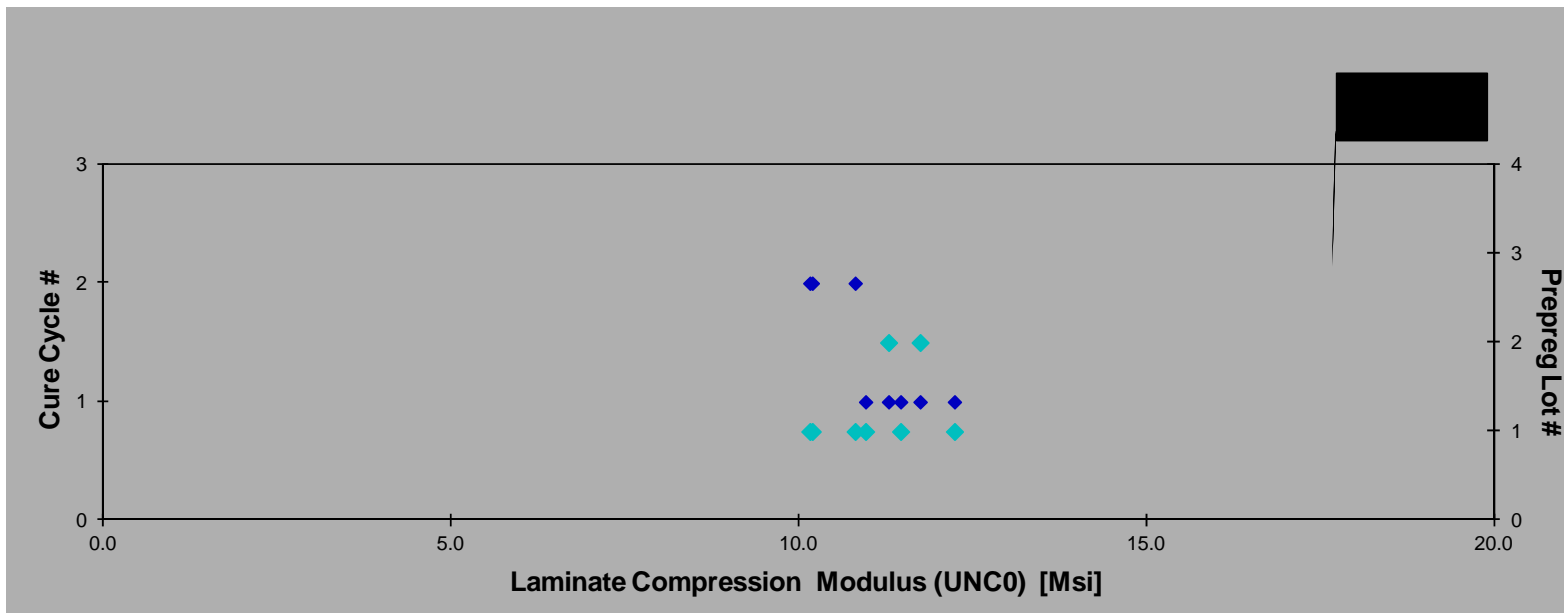
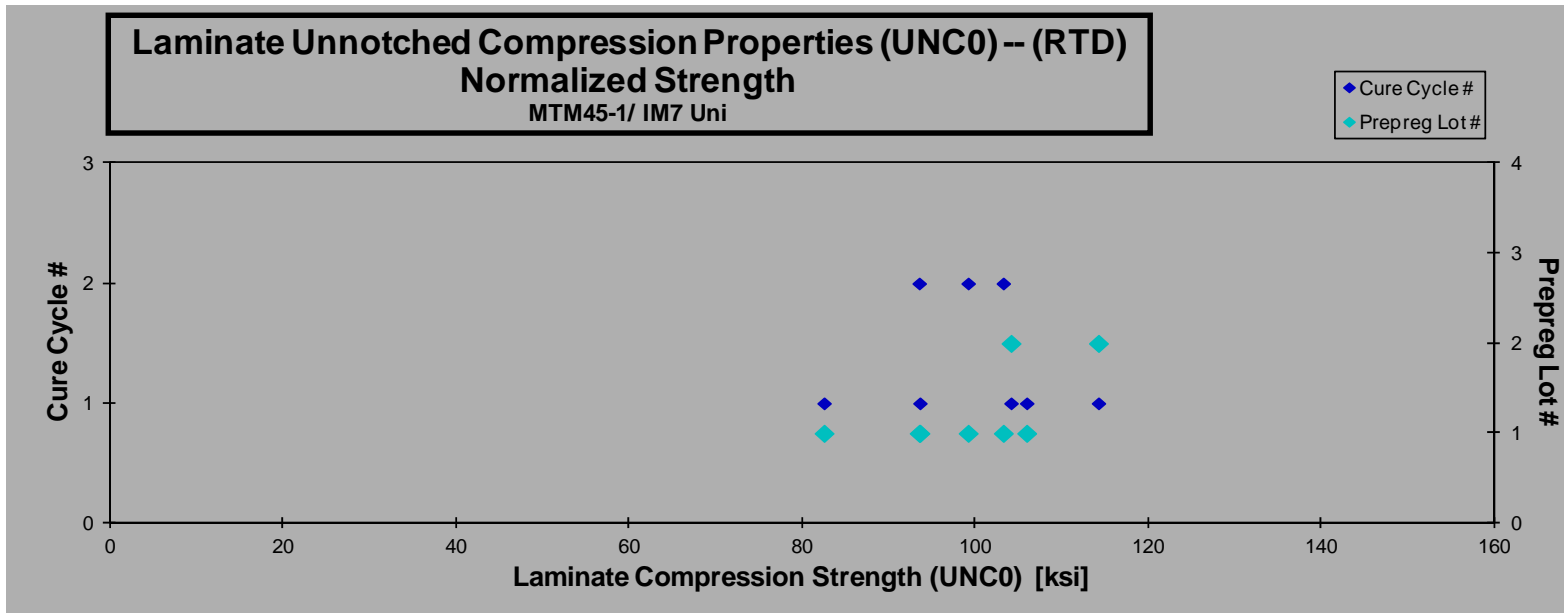
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normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Naming	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]
IMU-UNT3-A-MH1-ETW2-2	AFCA112D	A	MH1	1	1	202.405	12.594	0.112	20	DGM/AWT	0.0056	206.269	12.834
IMU-UNT3-A-MH1-ETW2-3	AFCA113D	A	MH1	1	1	190.363	13.231	0.114	20	LWT/AWB/DGM	0.0057	197.083	13.698
IMU-UNT3-A-MH1-ETW2-4	AFCA114D	A	MH1	1	1	201.763	*	0.116	20	DGM/AWT/LAB	0.0058	211.942	
IMU-UNT3-A-MH2-ETW2-1	AFCA211	13.231TR	36 02.A	5	12.59	0.							



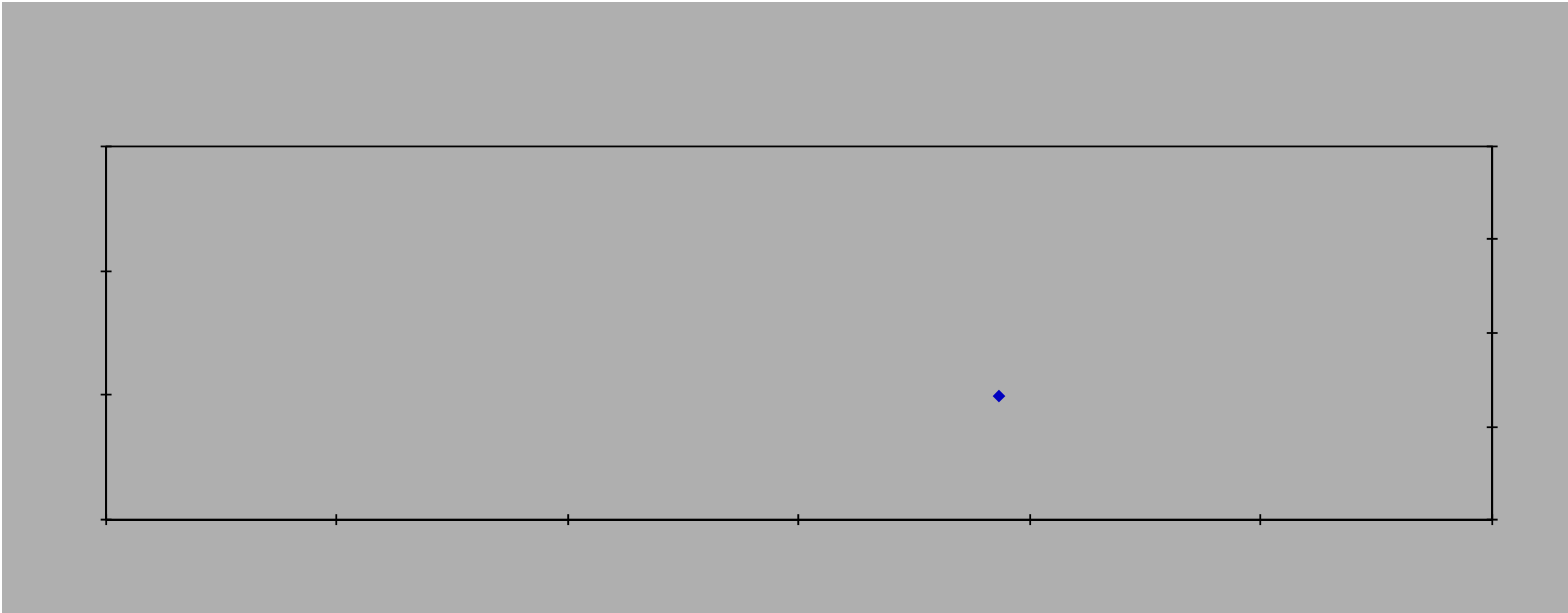


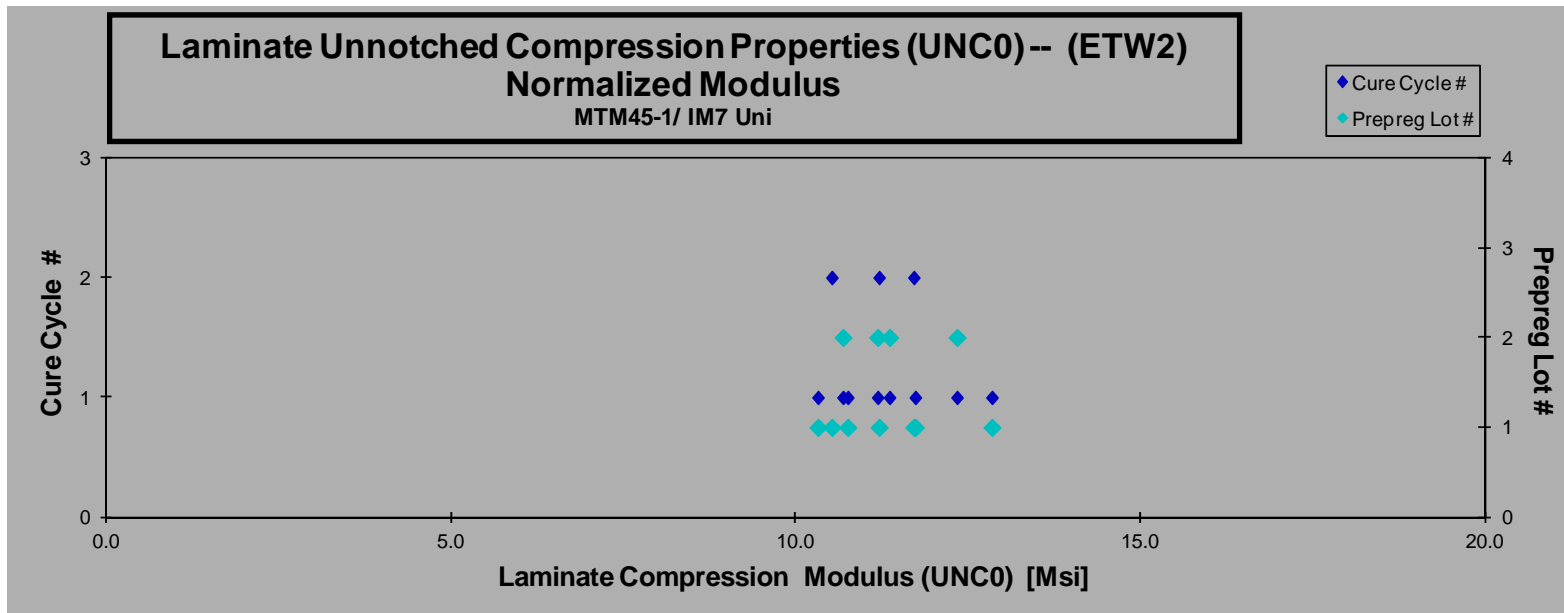
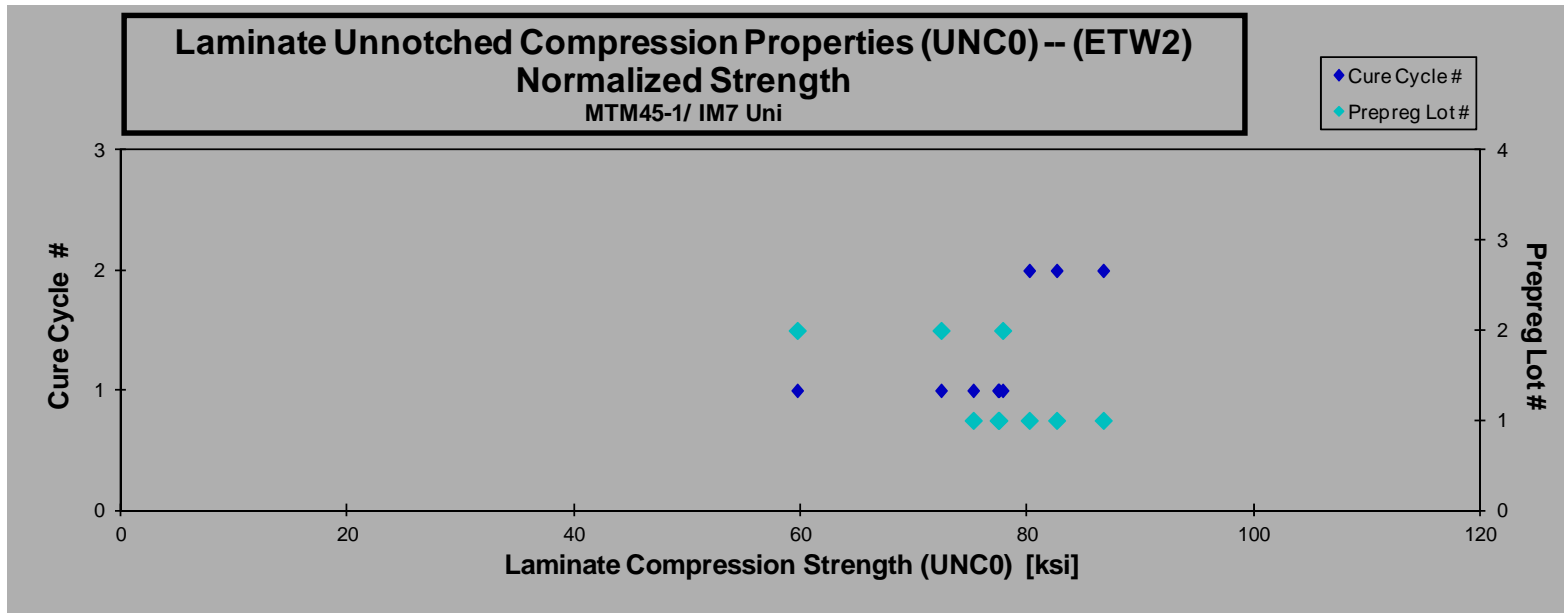
February 12, 2024

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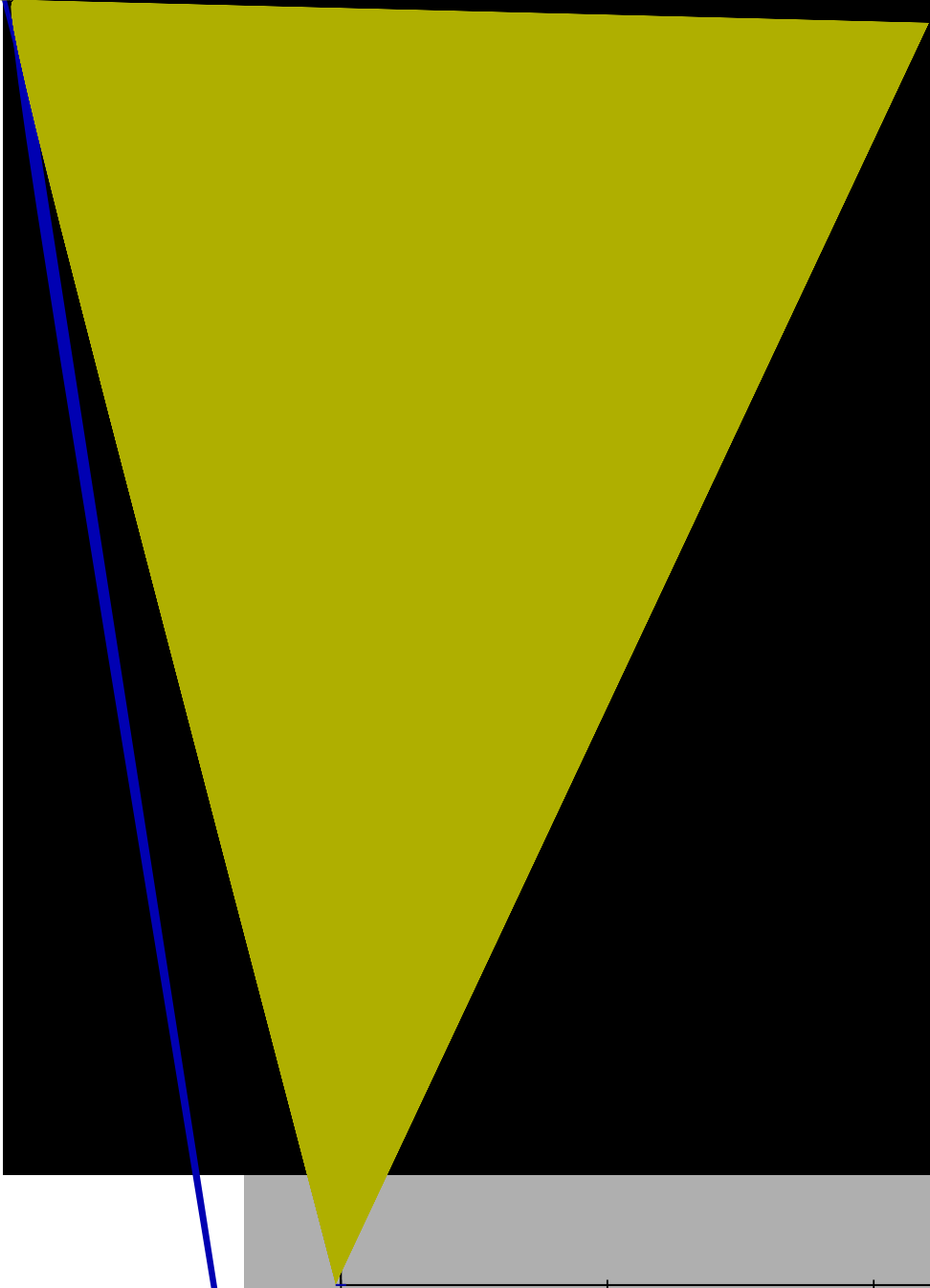
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4.11 “25/50/25” Unnotched Compression 1 Properties (UNC1)

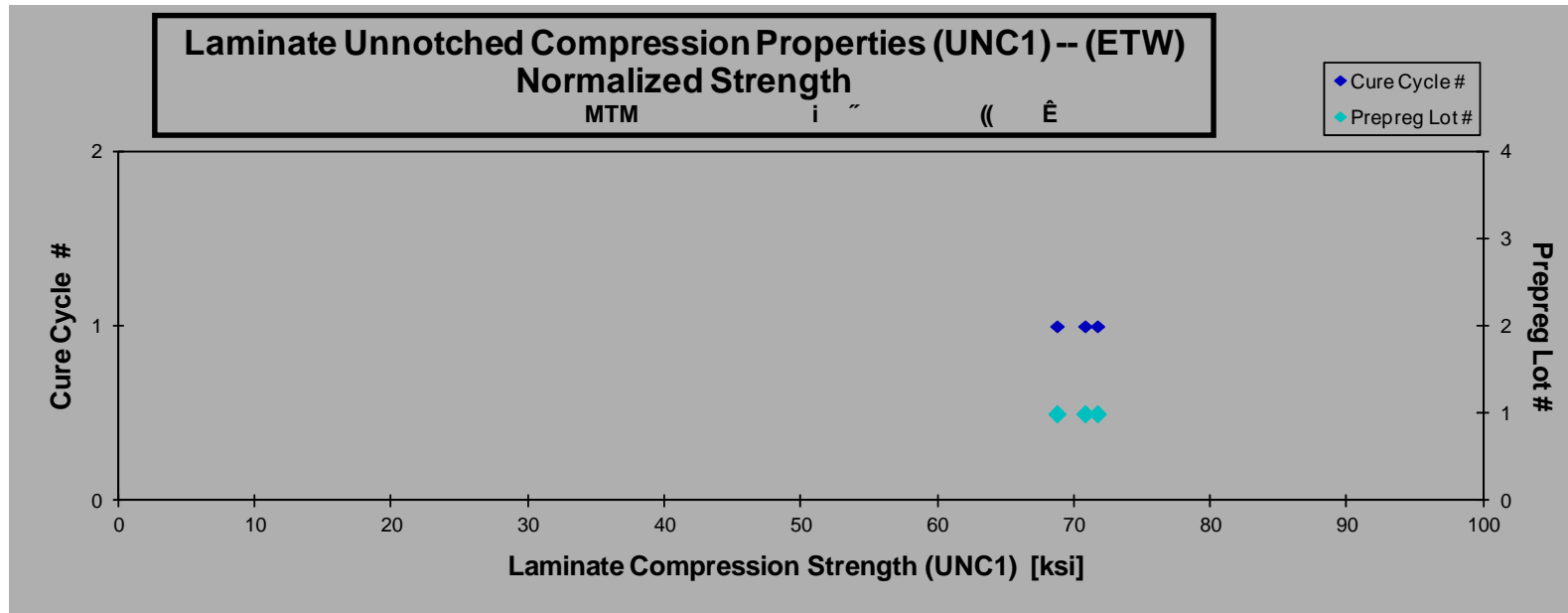


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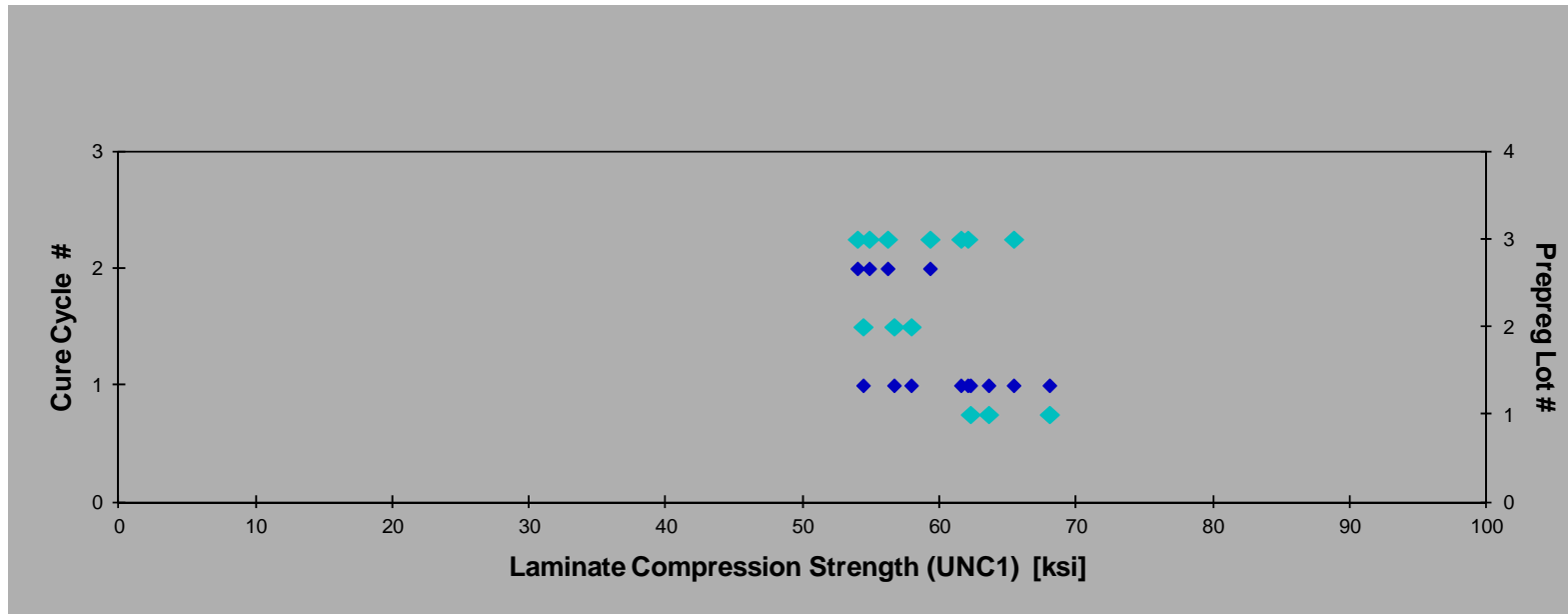
normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Naming	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]
IMU-UNC1-A-MH1-ETW-2	AF0A													



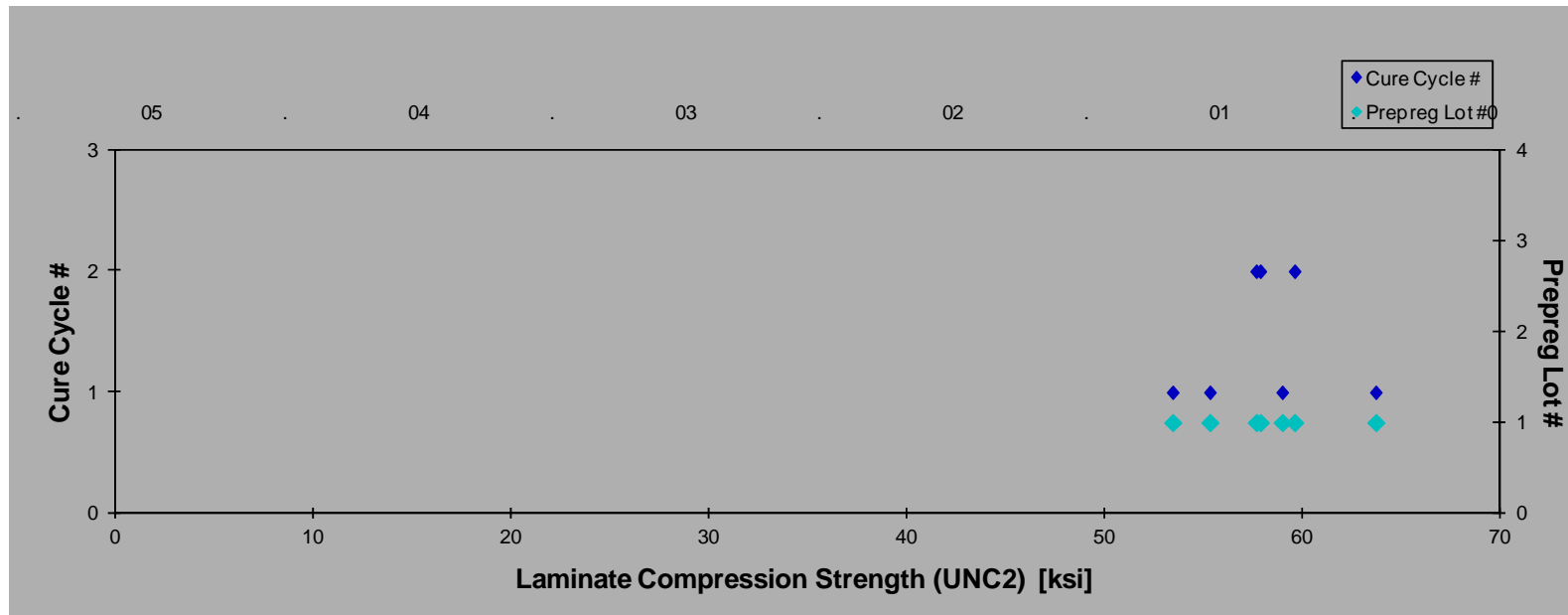
normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR	ACG	ACG Cure	Prepreg	Cure Cycle	Strength	Modulus	Poisson's	Avg. Specimen	# Plies in	Failure	Avg. t_{ply}	Strength _{norm}	Modulus _{norm}
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4.12 “10/80/10” Unnotched Compression 2 Properties (UNC2)

normalizing t_{ply}
[in]
0.0055



normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Naming	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]
IMU-UNC2-A-MH1-ETW2-1	AFXA111D	A	MH1	1	1	40.494	4.317	0.584	0.112	20	HAT	0.0056	41.322	4.405
IMU-UNC2-A-MH1-ETW2-2	AFXA112D	A	MH1	1	1	*	4.360	0.584	0.113	20	END BLOOM	0.0056		4.463
IMU-UNC2-A-MH1-ETW2-3	AFXA113D	A	MH1	1	1	41.246	4.329	0.546	0.112	20	DAB	0.0056	41.971	4.405
IMU-UNC2-A-MH1-ETW2-4	AFXA114D	A	MH1	1	1	43.568	4.415	0.530	0.112	20	DAB	0.0056	44.393	4.498
IMU-UNC2-A-MH2-ETW2-2	AFXA212D	A	MH2	1	2	43.093	4.311	0.610	0.112	20	HAB	0.0056	43.766	4.379
IMU-UNC2-A-MH2-ETW2-3	AFXA213D	A	MH2	1	2	40.521	4.414	0.607	0.112	20	HAB	0.0056	41.074	4.474
IMU-UNC2-A-MH2-ETW2-4	AFXA214D	A	MH2	1	2	41.672	4.457	0.629	0.112	20	HGM	0.0056	42.303	4.524

*Compressive strength is not reported due to unacceptable failure.

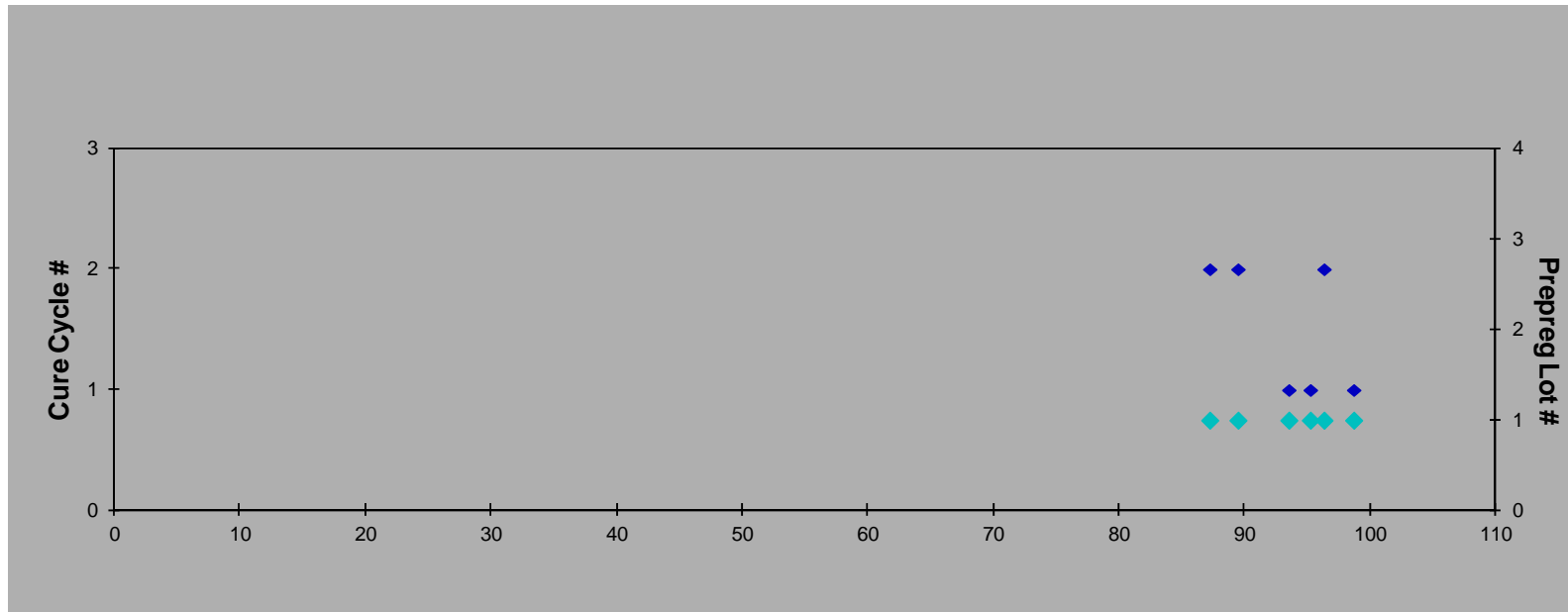
Average	41.766	4.372	Average _{norm}	0.0056	42.472	4.450
Standard Dev.	1.300	0.057	Standard Dev. _{norm}		1.336	0.054
Coeff. of Var. [%]	3.113	1.303	Coeff. of Var. [%] _{norm}		3.145	1.221
Min.	40.494	4.311	Min.	0.0056	41.074	4.379
Max.	43.568	4.457	Max.	0.0056	44.393	4.524
Number of Spec.	6	7	Number of Spec.		6	7



4.13 “50/40/10” Unnotched Compression 3 Properties (UNC3)

normalizing t_{ply}
[in]
0.0055

Specimen



normalizing t_{ply}
[in]
0.0055

Specimen NIAR ACG ACG Cure Prepreg Cure Cycle Strength Modulus Poisson's Avg. Specimen # Plies in Failure Avg. t_{ply}



4.14 Lamina Short-Beam Strength Properties (SBS)

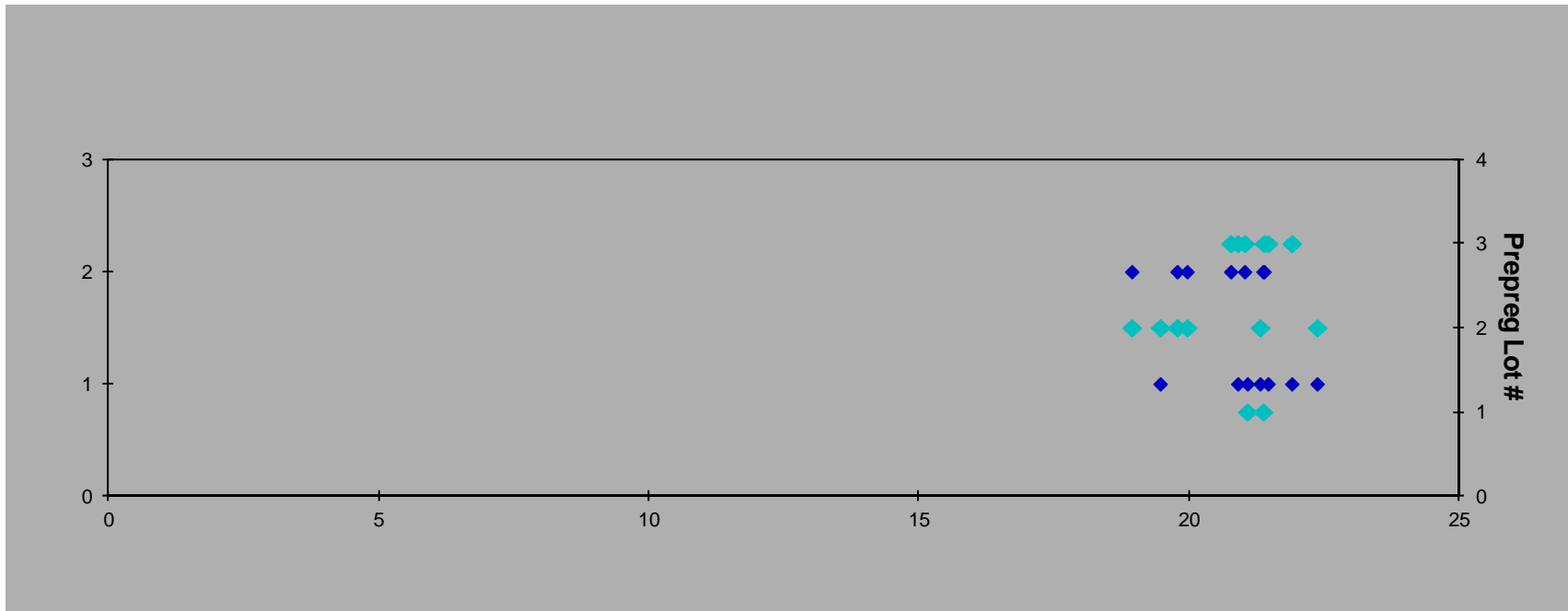
**Short Beam Strength Properties (SBS)-- (CTD)
Strength
MTM45-1/ IM7 Uni**

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thicken. [in]	# Plies in Laminate	Avg. tply [in]	Failure Mode
IMU-SBS-A-MH1-CTD-1*	AFQA111B	A	MH1	1	1		0.091	16	0.0057	COMPRESSION
IMU-SBS-A-MH1-CTD-2*	AFQA112B	A	MH1	1	1		0.091	16	0.0057	COMPRESSION
IMU-SBS-A-MH1-CTD-3*	AFQA113B	A	MH1	1	1		0.088	16	0.0055	COMPRESSION
IMU-SBS-A-MH1-CTD-4	AFQA114B	A	MH1	1	1	21.095	0.090	16	0.0056	ILS
IMU-SBS-A-MH2-CTD-1*	AFQA211B	A	MH2	1	2		0.091	16	0.0057	COMPRESSION
IMU-SBS-A-MH2-CTD-2*	AFQA212B	A	MH2	1	2		0.092	16	0.0057	COMPRESSION
IMU-SBS-A-MH2-CTD-3*	AFQA213B	A	MH2	1	2		0.090	16	0.0056	COMPRESSION
IMU-SBS-A-MH2-CTD-4	AFQA214B	A	MH2	1	2	21.386	0.088	16	0.0055	ILS
IMU-SBS-B-MH1-CTD-1	AFQB111B	B	MH1	2	1	21.329	0.093	16	0.0058	ILS
IMU-SBS-B-MH1-CTD-2	AFQB112B	B	MH1	2	1	19.482	0.093	16	0.0058	ILS
IMU-SBS-B-MH1-CTD-3	AFQB113B	B	MH1	2	1	22.386	0.093	16	0.0058	ILS
IMU-SBS-B-MH2-CTD-1	AFQB211B	B	MH2	2	2	19.979	0.088	16	0.0055	ILS
IMU-SBS-B-MH2-CTD-2	AFQB212B	B	MH2	2	2	19.795	0.088	16	0.0055	ILS
IMU-SBS-B-MH2-CTD-3	AFQB213B	B	MH2	2	2	18.954	0.088	16	0.0055	ILS
IMU-SBS-C-MH1-CTD-1	AFQC111B	C	MH1	3	1	21.918	0.088	16	0.0055	ILS
IMU-SBS-C-MH1-CTD-2	AFQC112B	C	MH1	3	1	21.477	0.087	16	0.0054	ILS
IMU-SBS-C-MH1-CTD-3	AFQC113B	C	MH1	3	1	20.917	0.087	16	0.0054	ILS
IMU-SBS-C-MH2-CTD-1	AFQC211B	C	MH2	3	2	20.788	0.088	16	0.0055	ILS
IMU-SBS-C-MH2-CTD-2	AFQC212B	C	MH2	3	2	21.045	0.087	16	0.0054	ILS
IMU-SBS-C-MH2-CTD-4	AFQC214B	C	MH2	3	2	21.403	0.087	16	0.0054	ILS

* Strength data is omitted for those that failed in compression.

Average 20.854
 Standard Dev. 0.967
 Coeff. of Var. [%] 4.638
 Min. 18.954
 Max. 22.386
 Number of Spec. 14

Average 0.0056
 Standard Dev. 0.0005
 Coeff. of Var. [%] 0.0909
 Min. 0.0054
 Max. 0.0058
 Number of Spec. 20



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

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle	Strength	Avg. Specimen	# Plies in Laminate	Avg. tply [in]	Failure Mode
IMU-SBS-A-MH1-RTD-1	AFQA111A	A	MH1	1	1	14.952	0.089	16	0.0056	COMPRESSION/ILS
IMU-SBS-A-MH1-RTD-2*	AFQA112A	A	MH1	1	1		0.090	16	0.0056	COMPRESSION
IMU-SBS-A-MH1-RTD-3*	AFQA113A	A	MH1	1	1		0.090	16	0.0056	COMPRESSION
IMU-SBS-A-MH2-RTD-1*	AFQA211A	A	MH2	1	2		0.091	16	0.0057	COMPRESSION
IMU-SBS-A-MH2-RTD-2*	AFQA212A	A	MH2	1	2		0.091	16	0.0057	COMPRESSION
IMU-SBS-A-MH2-RTD-3*	AFQA213A	A	MH2	1	2		0.091	16	0.0057	COMPRESSION
IMU-SBS-A-MH2-RTD-4*	AFQA214A	A	MH2	1	2		0.091	16	0.0057	COMPRESSION
IMU-SBS-B-MH1-RTD-1*	AFQB111A	B	MH1	2	1		0.093	16	0.0058	COMPRESSION
IMU-SBS-B-MH1-RTD-2*	AFQB112A	B	MH1	2	1		0.092	16	0.0058	COMPRESSION
IMU-SBS-B-MH1-RTD-3*	AFQB113A	B	MH1	2	1		0.093	16	0.0058	COMPRESSION
IMU-SBS-B-MH1-RTD-4	AFQB114A	B	MH1	2	1	14.526	0.094	16	0.0058	ILS
IMU-SBS-B-MH2-RTD-1*	AFQB211A	B	MH2	2	2		0.086	16	0.0054	COMPRESSION
IMU-SBS-B-MH2-RTD-2	AFQB212A	B	MH2	2	2	14.404	0.087	16	0.0055	ILS
IMU-SBS-B-MH2-RTD-3	AFQB213A	B	MH2	2	2	13.883	0.087	16	0.0054	ILS
IMU-SBS-B-MH2-RTD-4	AFQB214A	B	MH2	2	2	15.180	0.087	16	0.0054	ILS
IMU-SBS-C-MH1-RTD-1*	AFQC111A	C	MH1	3	1		0.087	16	0.0054	COMPRESSION
IMU-SBS-C-MH1-RTD-2*	AFQC112A	C	MH1	3	1		0.087	16	0.0054	COMPRESSION
IMU-SBS-C-MH1-RTD-3*	AFQC113A	C	MH1	3	1		0.087	16	0.0054	COMPRESSION
IMU-SBS-C-MH2-RTD-1*	AFQC211A	C	MH2	3	2		0.088	16	0.0055	COMPRESSION
IMU-SBS-C-MH2-RTD-2*	AFQC212A	C	MH2	3	2		0.087	16	0.0054	COMPRESSION
IMU-SBS-C-MH2-RTD-3	AFQC213A	C	MH2	3	2	13.851	0.086	16	0.0054	ILS
IMU-SBS-C-MH2-RTD-4*	AFQC214A	C	MH2	3	2		0.086	16	0.0054	COMPRESSION

* Strength data is omitted for those that failed in compression.

Average 14.466
Standard Dev. 0.542
Coeff. of Var. [%] 3.750
Min. 13.851
Max. 15.180
Number of Spec. 6

Average 0.0056
Standard Dev.
Coeff. of Var. [%]
Min. 0.0054
Max. 0.0058
Number of Spec. 22



**Short Beam Strength Properties (SBS)-- (ETD)
Strength
MTM45-1/ IM7 Uni**

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Avg. tply [in]	Failure Mode
IMU-SBS-A-MH1-ETD-1*	AFQA111C	A	MH1	1	1		0.089	16	0.0056	COMPRESSION
IMU-SBS-A-MH1-ETD-2*	AFQA112C	A	MH1	1	1		0.090	16	0.0056	COMPRESSION
IMU-SBS-A-MH1-ETD-3*	AFQA113C	A	MH1	1	1		0.090	16	0.0056	COMPRESSION
IMU-SBS-A-MH1-ETD-4*	AFQA114C	A	MH1	1	1		0.090	16	0.0056	COMPRESSION
IMU-SBS-A-MH2-ETD-1*	AFQA211C	A	MH2	1	2		0.091	16	0.0057	COMPRESSION
IMU-SBS-A-MH2-ETD-2	AFQA212C	A	MH2	1	2	10.586	0.093	16	0.0058	ILS/COMPRESSION
IMU-SBS-A-MH2-ETD-3*	AFQA213C	A	MH2	1	2		0.092	16	0.0058	COMPRESSION
IMU-SBS-A-MH2-ETD-4*	AFQA214C	A	MH2	1	2		0.092	16	0.0058	COMPRESSION
IMU-SBS-B-MH1-ETD-1	AFQB111C	B	MH1	2	1	11.369	0.093	16	0.0058	ILS
IMU-SBS-B-MH1-ETD-2	AFQB112C	B	MH1	2	1	11.433	0.093	16	0.0058	ILS
IMU-SBS-B-MH1-ETD-3	AFQB113C	B	MH1	2	1	10.911	0.093	16	0.0058	ILS
IMU-SBS-B-MH2-ETD-1	AFQB211C	B	MH2	2	2	11.569	0.087	16	0.0055	ILS
IMU-SBS-B-MH2-ETD-2	AFQB212C	B	MH2	2	2	11.128	0.087	16	0.0054	ILS
IMU-SBS-B-MH2-ETD-3	AFQB213C	B	MH2	2	2	11.135	0.087	16	0.0055	ILS
IMU-SBS-C-MH1-ETD-1	AFQC111C	C	MH1	3	1	11.394	0.087	16	0.0054	ILS
IMU-SBS-C-MH1-ETD-2	AFQC112C	C	MH1	3	1	10.848	0.087	16	0.0054	ILS
IMU-SBS-C-MH1-ETD-3	AFQC113C	C	MH1	3	1	11.073	0.087	16	0.0054	ILS
IMU-SBS-C-MH2-ETD-1	AFQC211C	C	MH2	3	2	11.506	0.087	16	0.0054	ILS
IMU-SBS-C-MH2-ETD-2	AFQC212C	C	MH2	3	2	10.744	0.087	16	0.0054	ILS
IMU-SBS-C-MH2-ETD-3	AFQC213C	C	MH2	3	2	11.276	0.087	16	0.0054	ILS

* Strength data is omitted for those that failed in compression.

Average 11.152
Standard Dev. 0.309
Coeff. of Var. [%] 2.768
Min. 10.586
Max. 11.569
Number of Spec. 13

Average 0.0056
Standard Dev. 0.0001
Coeff. of Var. [%] 1.961
Min. 0.0054
Max. 0.0058
Number of Spec. 20



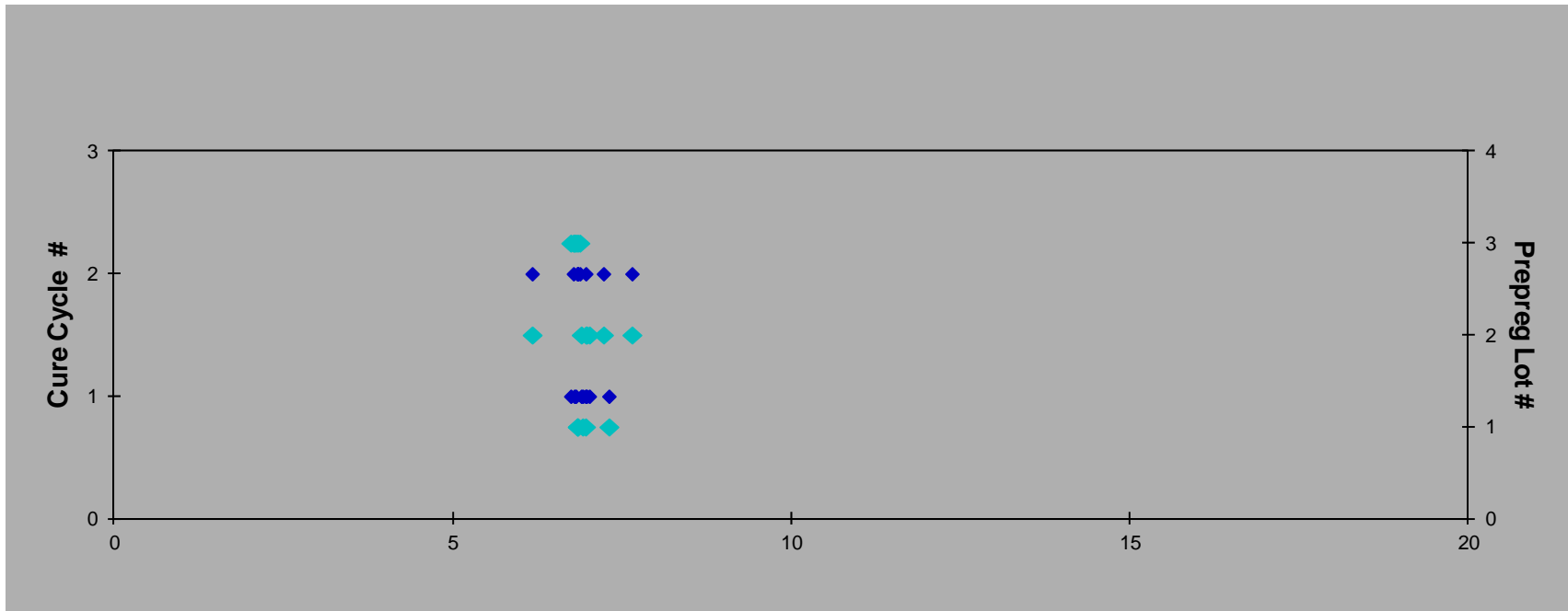
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thckn. [in]	# Plies in Laminate	Avg. tply [in]	Failure Mode
IMU-SBS-A-MH1-ETW-2	AFQA112N	A	MH1	1	1	8.383	0.088	16	0.0055	ILS
IMU-SBS-A-MH1-ETW-3	AFQA113N	A	MH1	1	1	8.548	0.089	16	0.0055	ILS
IMU-SBS-A-MH1-ETW-4	AFQA114N	A	MH1	1	1	8.446	0.091	16	0.0057	ILS
IMU-SBS-A-MH2-ETW-1	AFQA211N	A	MH2	1	2	8.368	0.090	16	0.0056	ILS
IMU-SBS-A-MH2-ETW-2	AFQA212N	A	MH2	1	2	8.405	0.089	16	0.0056	ILS
IMU-SBS-A-MH2-ETW-3	AFQA213N	A	MH2	1	2	8.460	0.091	16	0.0057	ILS
IMU-SBS-B-MH1-ETW-2	AFQB112N	B	MH1	2	1	9.124	0.095	16	0.0059	ILS
IMU-SBS-B-MH1-ETW-3	AFQB113N	B	MH1	2	1	8.657	0.094	16	0.0059	IN-ELASTIC
IMU-SBS-B-MH1-ETW-4	AFQB114N	B	MH1	2	1	8.754	0.094	16	0.0059	IN-ELASTIC
IMU-SBS-B-MH2-ETW-1	AFQB211N	B	MH2	2	2	8.566	0.088	16	0.0055	ILS
IMU-SBS-B-MH2-ETW-2	AFQB212N	B	MH2	2	2	8.682	0.088	16	0.0055	ILS
IMU-SBS-B-MH2-ETW-3	AFQB213N	B	MH2	2	2	8.413	0.088	16	0.0055	ILS
IMU-SBS-C-MH1-ETW-1	AFQC111N	C	MH1	3	1	8.408	0.086	16	0.0053	INTERLAMINAR SHEAR
IMU-SBS-C-MH1-ETW-2	AFQC112N	C	MH1	3	1	8.517	0.082	16	0.0051	INTERLAMINAR SHEAR
IMU-S	FQC112N	C	MH1							

Short Beam Strength Properties (SBS) -- (ETW2)
Strength
MTM45-1/ IM7 Uni

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Avg. tply [in]	Failure Mode
IMU-SBS-A-MH1-ETW2-1	AFQA111D	A	MH1	1	1	7.309	0.089	16	0.0056	IN-ELASTIC
IMU-SBS-A-MH1-ETW2-2	AFQA112D	A	MH1	1	1	6.922	0.091	16	0.0057	IN-ELASTIC
IMU-SBS-A-MH1-ETW2-3	AFQA113D	A	MH1	1	1	6.964	0.089	16	0.0055	IN-ELASTIC
IMU-SBS-A-MH2-ETW2-1	AFQA211D	A	MH2	1	2	6.841	0.091	16	0.0057	IN-ELASTIC
IMU-SBS-A-MH2-ETW2-2	AFQA212D	A	MH2	1	2	6.847	0.090	16	0.0056	IN-ELASTIC
IMU-SBS-A-MH2-ETW2-3	AFQA213D	A	MH2	1	2	6.847	0.090	16	0.0056	IN-ELASTIC
IMU-SBS-B-MH1-ETW2-1	AFQB111D	B	MH1	2	1	6.979	0.095	16	0.0059	IN-ELASTIC
IMU-SBS-B-MH1-ETW2-2	AFQB112D	B	MH1	2	1	6.900	0.094	16	0.0059	IN-ELASTIC
IMU-SBS-B-MH1-ETW2-3	AFQB113D	B	MH1	2	1	7.020	0.092	16	0.0058	ILS
IMU-SBS-B-MH2-ETW2-1	AFQB211D	B	MH2	2	2	7.229	0.088	16	0.0055	IN-ELASTIC
IMU-SBS-B-MH2-ETW2-2	AFQB212D	B	MH2	2	2	6.968	0.087	16	0.0054	IN-ELASTIC
IMU-SBS-B-MH2-ETW2-3	AFQB213D	B	MH2	2	2	6.176	0.088	16	0.0055	IN-ELASTIC
IMU-SBS-B-MH2-ETW2-4	AFQB214D	B	MH2	2	2	7.650	0.083	16	0.0052	IN-ELASTIC
IMU-SBS-C-MH1-ETW2-1	AFQC111D	C	MH1	3	1	6.820	0.086	16	0.0053	INTERLAMINAR SHEAR
IMU-SBS-C-MH1-ETW2-2	AFQC112D	C	MH1	3	1	6.745	0.086	16	0.0053	INTERLAMINAR SHEAR
IMU-SBS-C-MH1-ETW2-3	AFQC113D	C	MH1	3	1	6.798	0.086	16	0.0054	INTERLAMINAR SHEAR
IMU-SBS-C-MH2-ETW2-1	AFQC211D	C	MH2	3	2	6.848	0.086	16	0.0054	INTERLAMINAR SHEAR
IMU-SBS-C-MH2-ETW2-2	AFQC212D	C	MH2	3	2	6.785	0.086	16	0.0054	INTERLAMINAR SHEAR
IMU-SBS-C-MH2-ETW2-3	AFQC213D	C	MH2	3	2	6.880	0.086	16	0.0054	INTERLAMINAR SHEAR

Average 6.923
Standard Dev. 0.284
Coeff. of Var. [%] 4.099
Min. 6.176
Max. 7.650
Number of Spec. 19

Average 0.0055
Standard Dev. 0.0002
Coeff. of Var. [%] 3.636
Min. 0.0052
Max. 0.0059
Number of Spec. 19



4.15 Laminate Short-Beam Strength Properties (SBS1)



Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Avg. t _{ply} [in]	Failure Mode
IMU-SBS1-A-MH1-RTD-1	AFqA111A	A	MH1	1	1	11.306	0.135	24	0.0056	ILS
IMU-SBS1-A-MH1-RTD-2	AFqA112A	A	MH1	1	1	11.651	0.136	24	0.0057	ILS
IMU-SBS1-A-MH1-RTD-3	AFqA113A	A	MH1	1	1	11.367	0.135	24	0.0056	ILS
IMU-SBS1-B-MH1-RTD-1	AFqB111A	B	MH1	2	1	9.872	0.132	24	0.0055	ILS
IMU-SBS1-B-MH1-RTD-2	AFqB112A	B	MH1	2	1	9.883	0.134	24	0.0056	ILS
IMU-SBS1-B-MH1-RTD-3	AFqB113A	B	MH1	2	1	9.586	0.132	24	0.0055	ILS
IMU-SBS1-C-MH1-RTD-1	AFqC111A	C	MH1	3	1	9.460	0.132	24	0.0055	ILS
IMU-SBS1-C-MH1-RTD-2	AFqC112A	C	MH1	3	1	9.440	0.131	24	0.0055	ILS
IMU-SBS1-C-MH1-RTD-3	AFqC113A	C	MH1	3	1	8.847	0.132	24	0.0055	ILS
IMU-SBS1-C-MH2-RTD-1	AFqC211A	C	MH2	3	2	10.258	0.132	24	0.0055	ILS
IMU-SBS1-C-MH2-RTD-2	AFqC212A	C	MH2	3	2	10.702	0.133	24	0.0055	ILS
IMU-SBS1-C-MH2-RTD-3	AFqC213A	C	MH2	3	2	10.243	0.132	24	0.0055	ILS

Batch A and B cure cycle 2 - Data is omitted due to incorrect panel processing.

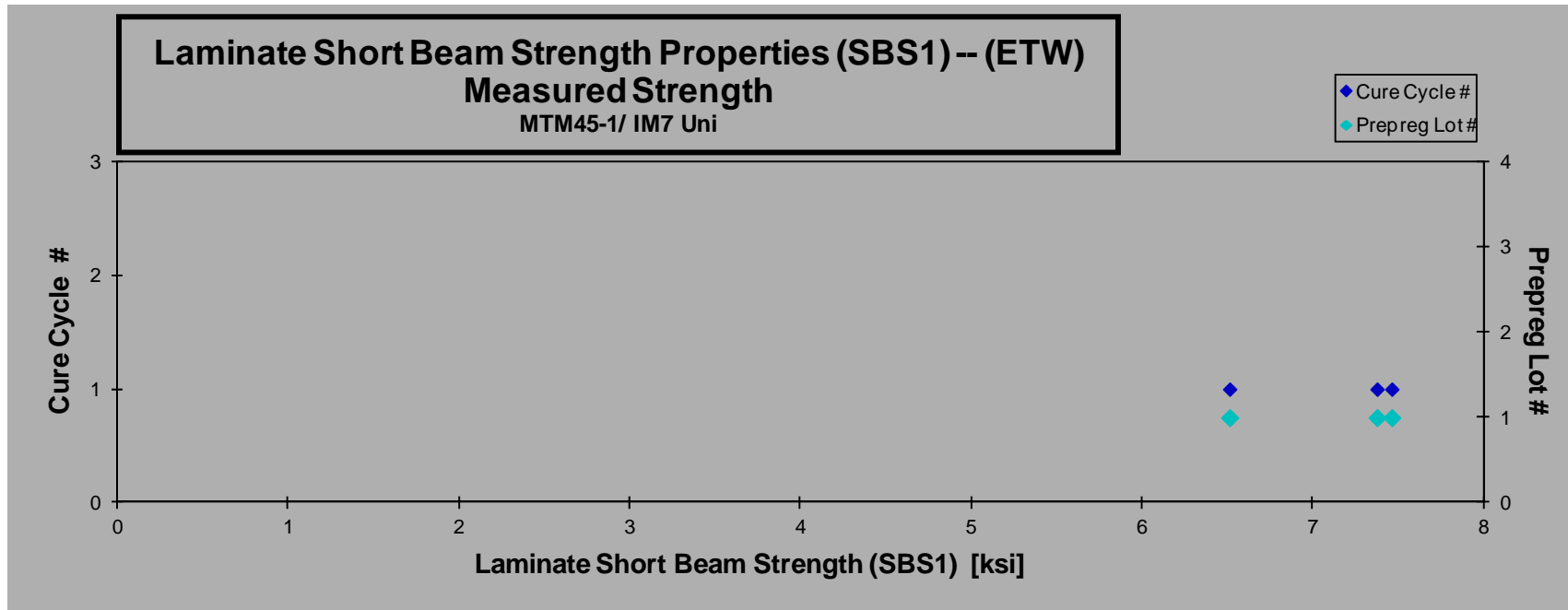
Average 10.218
 Standard Dev. 0.878
 Coeff. of Var. [%] 8.595
 Min. 8.847
 Max. 11.651
 Number of Spec. 12

Average 0.0055
 Standard Dev. 0.0001
 Coeff. of Var. [%] 2.000
 Min. 0.0055
 Max. 0.0057
 Number of Spec. 12

February 12, 2024

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
IMU-SBS1-A-MH1-ETW-1	AFqA111N	A	MH1	1	1	7.377	0.136	24	0.0057	ILS
IMU-SBS1-A-MH1-ETW-2	AFqA112N	A	MH1	1	1	7.464	0.135	24	0.0056	ILS
IMU-SBS1-A-MH1-ETW-3	AFqA113N	A	MH1	1	1	6.514	0.135	24	0.0056	ILS

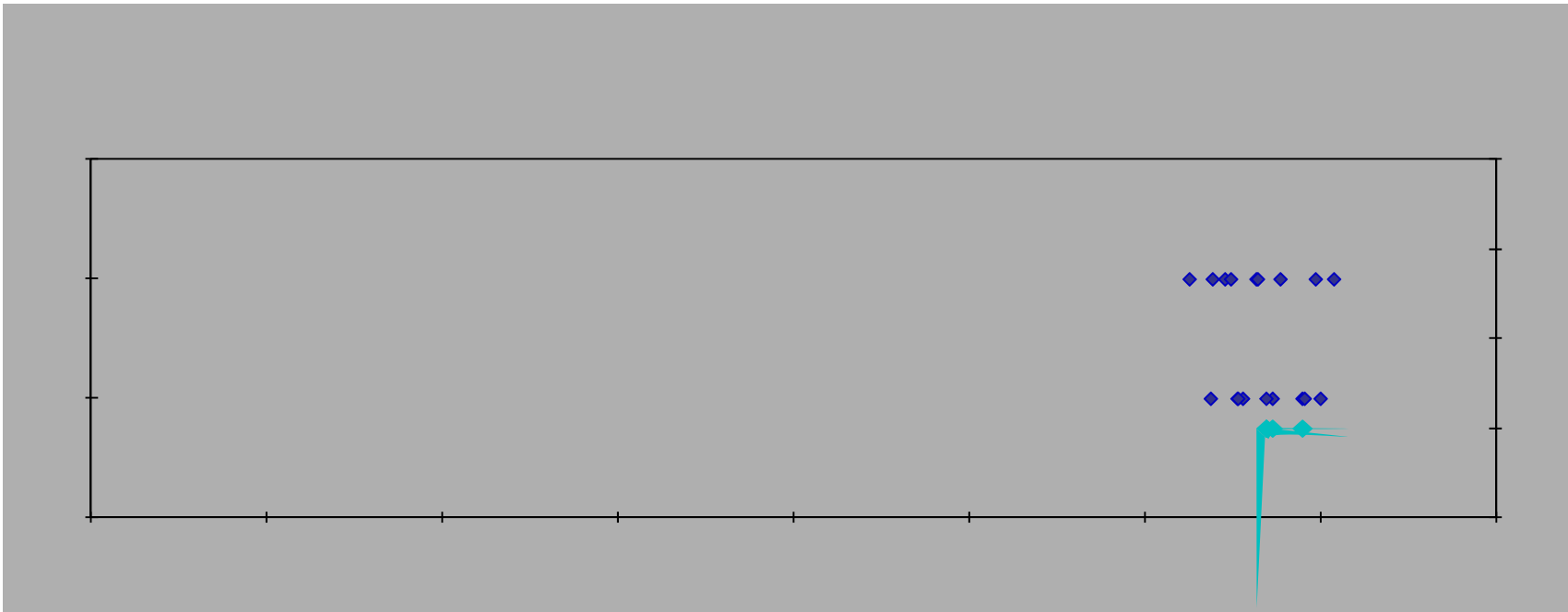
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4.16 “25/50/25” Open Hole Tension 1 Properties (OHT1)

normalizing t_{ply}
 [in]
 0.0055

Specimen Number	NIAR Name	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]
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CAM-RP-2008-007 Rev C

normalizing t_{ply}
[in]
0.0055

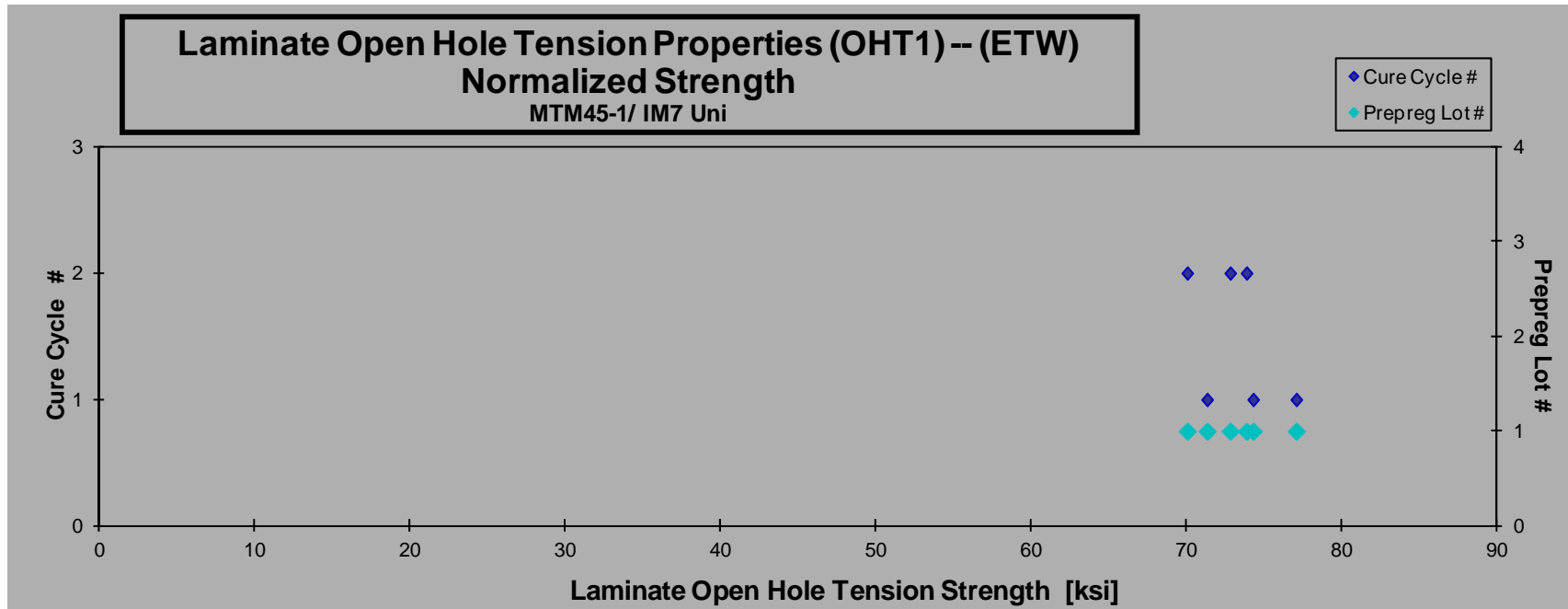
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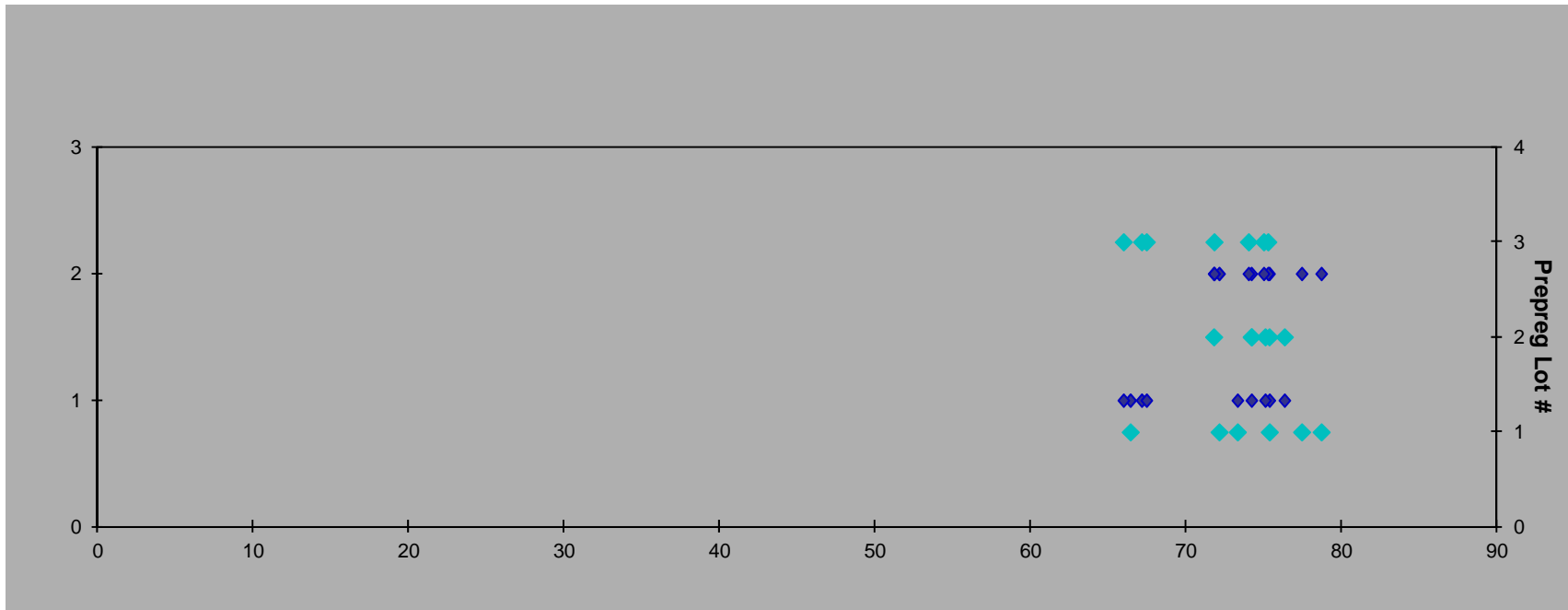
eg Cure Cycle Strength Avg. Specimen # Plies in Failure Avg. t_{ply} Strength_{norm}

Q R U P

normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thckn. [in]	# Plies in Laminate	Failure Modes	Avg. t_{ply} [in]	Strength _{norm} [ksi]
IMU-OHT1-A-MH1-ETW-1	AFDA111N	A	MH1	1	1	75.732	0.134	24	AGM	0.0056	77.071
IMU-OHT1-A-MH1-ETW-2	AFDA112N	A	MH1	1	1	70.255	0.134	24	AGM	0.0056	71.329
IMU-OHT1-A-MH1-ETW-3	AFDA113N	A	MH1	1	1	72.716	0.135	24	AGM	0.0056	74.295
IMU-OHT1-A-MH2-ETW-1	AFDA211N	A	MH2	1	2	70.723	0.136	24	AGM	0.0057	72.813
IMU-OHT1-A-MH2-ETW-2	AFDA212N	A	MH2	1	2	67.649	0.137	24	AGM	0.0057	70.049
IMU-OHT1-A-MH2-ETW-3	AFDA213N	A	MH2	1	D 1-	B -6		6			





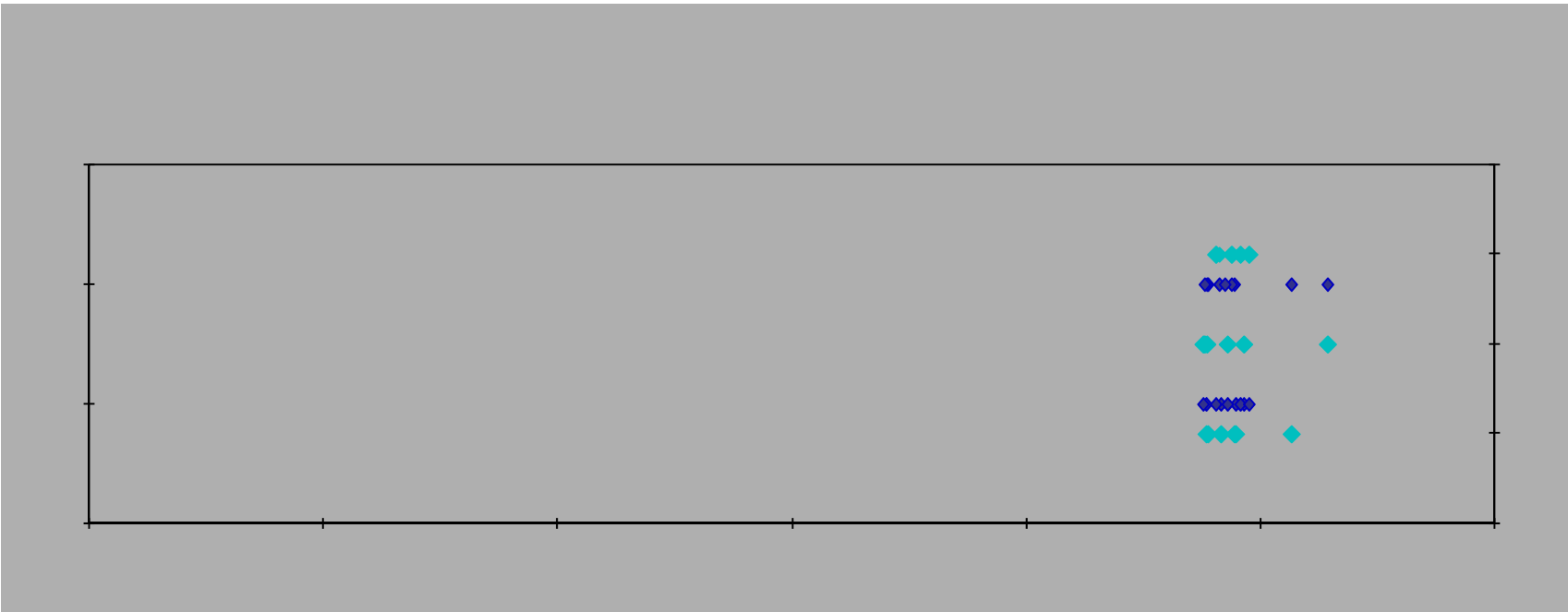
4.17 “10/80/10” Open Hole Tension 2 Properties (OHT2)

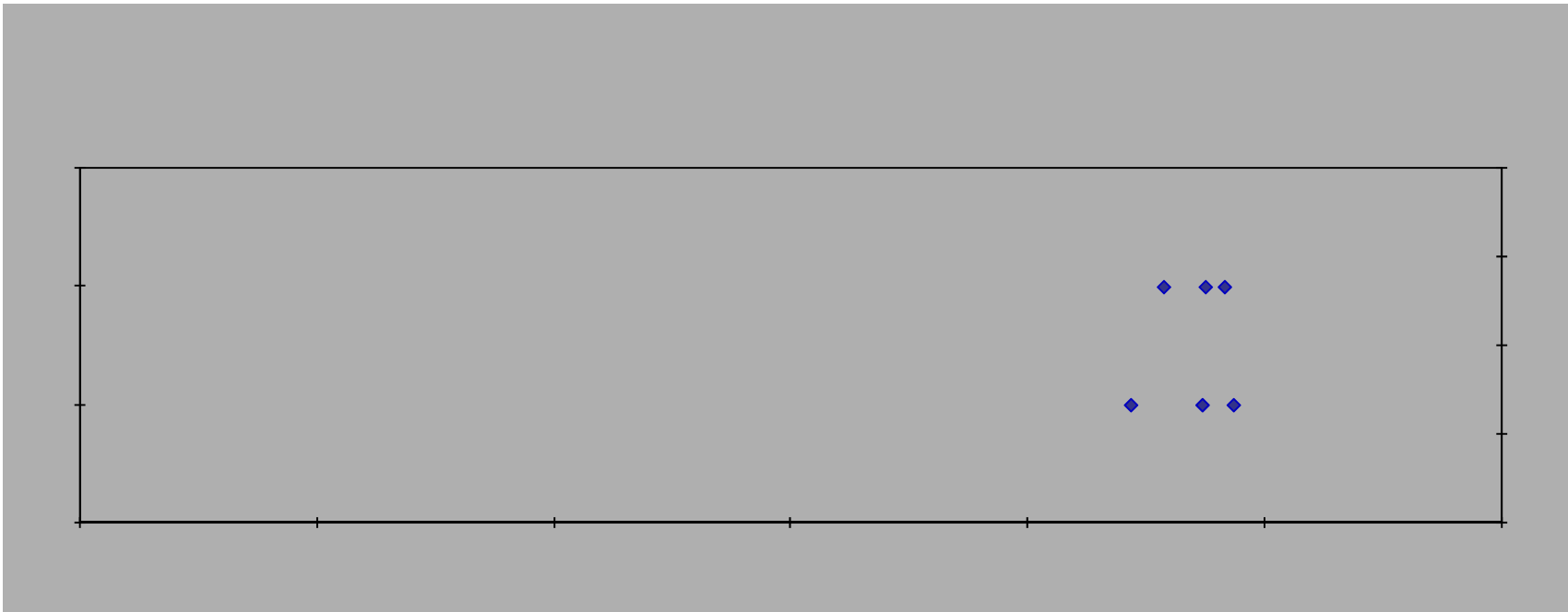
Laminate Open Hole Tension Properties (OHT2) -- (CTD)
Strength
 MTM45-1/ IM7 Uni

normalizing t_{ply}
 [in]
 0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thckn. [in]	# Plies in Laminate	Failure Modes	Avg. t_{ply} [in]	Strength _{norm} [ksi]
IMU-OHT2-A-MH1-CTD-1	AFEA111B	A	MH1	1	1	48.388	0.110	20	AGM	0.0055	48.256
IMU-OHT2-A-MH1-CTD-2	AFEA112B	A	MH1	1	1	48.890	0.110	20	AGM	0.0055	48.890
IMU-OHT2-A-MH1-CTD-3	AFEA113B	A	MH1	1	1	48.112	0.109	20	AGM	0.0054	47.630
IMU-OHT2-A-MH2-CTD-1	AFEA211B	A	MH2	1	2	46.853	0.112	20	AGM	0.0056	47.705
IMU-OHT2-A-MH2-CTD-2	AFEA212B	A	MH2	1	2	47.829	0.112	20	AGM	0.0056	48.829
IMU-OHT2-A-MH2-CTD-3	AFEA213B	A	MH2	1	2	50.038	0.113	20	AGM	0.0056	51.266
IMU-OHT2-B-MH1-CTD-1	AFEB111B	B	MH1	2	1	46.117	0.113	20	AGM	0.0057	47.501
IMU-OHT2-B-MH1-CTD-2	AFEB112B	B	MH1	2	1	48.487	0.112	20	AGM	0.0056	49.236
IMU-OHT2-B-MH1-CTD-3	AFEB113B	B	MH1	2	1	47.083	0.113	20	AGM	0.0057	48.538
IMU-OHT2-B-MH2-CTD-1	AFEB211B	B	MH2	2	2	47.318	0.111	20	AGM	0.0055	47.662
IMU-OHT2-B-MH2-CTD-2	AFEB212B	B	MH2	2	2	52.194	0.111	20	AGM	0.0056	52.811
IMU-OHT2-B-MH2-CTD-3	AFEB213B	B	MH2	2	2	47.049	0.111	20	AGM	0.0056	47.562
IMU-OHT2-C-MH1-CTD-1	AFEC111B	C	MH1	3	1	47.614	0.113	20	AGM	0.0057	49.086
IMU-OHT2-C-MH1-CTD-2	AFEC112B	C	MH1	3	1	48.016	0.113	20	AGM	0.0057	49.456
IMU-OHT2-C-MH1-CTD-3	AFEC113B	C	MH1	3	1	47.099	0.112	20	AGM	0.0056	48.041
IMU-OHT2-C-MH2-CTD-1	AFEC211B	C	MH2	3	2	48.142	0.111	20	AGM	0.0056	48.711
IMU-OHT2-C-MH2-CTD-2	AFEC212B	C	MH2	3	2	48.102	0.110	20	AGM	0.0055	48.189
IMU-OHT2-C-MH2-CTD-3	AFEC213B	C	MH2	3	2	47.818	0.111	20	AGM	0.0056	48.427

Average	48.064	Average_{norm}	0.0056	48.766
Standard Dev.	1.350	Standard Dev._{norm}		1.359
Coeff. of Var. [%]	2.809	Coeff. of Var. [%]_{norm}		2.787
Min.	46.117	Min.	0.0054	47.501
Max.	52.194	Max.	0.0057	52.811
Number of Spec.	18	Number of Spec.		18





Laminate Open Hole Tension Properties (OHT2)-- (ETW2)
Strength
 MTM45-1/ IM7 Uni

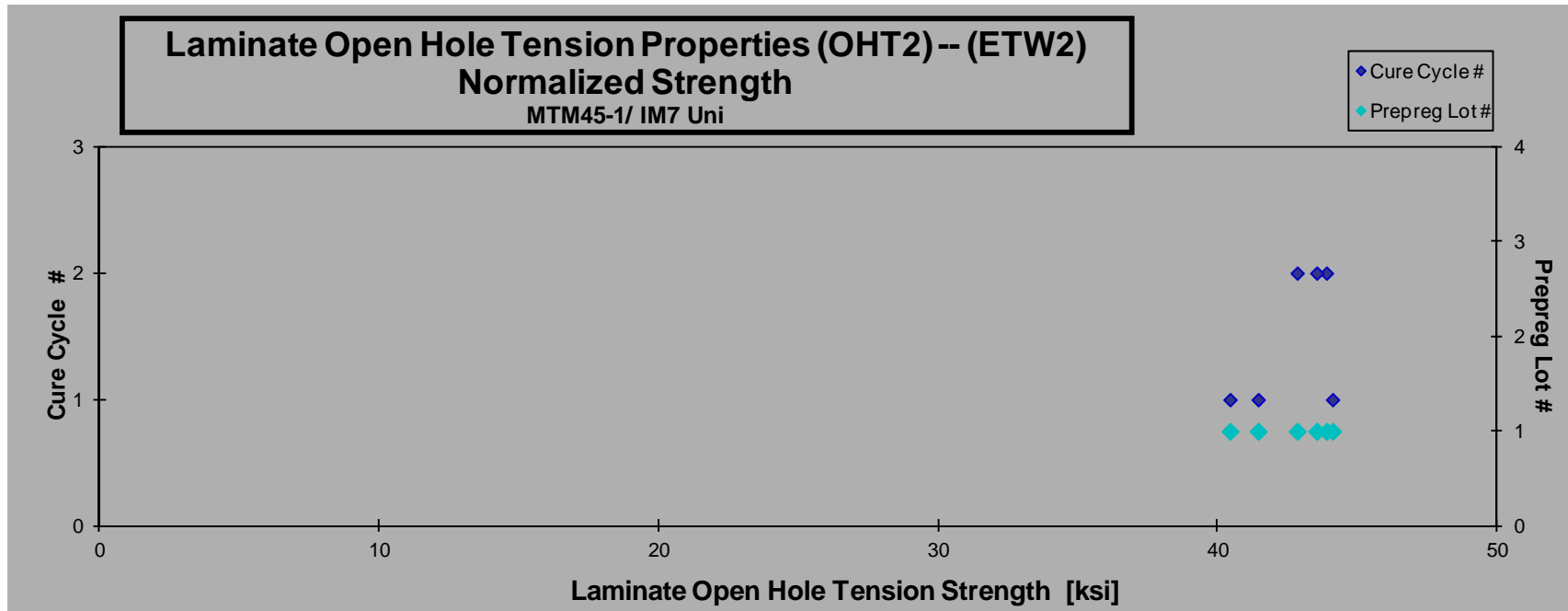
normalizing t_{ply}
 [in]
 0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Modes
IMU-OHT2-A-MH1-ETW2-1	AFEA111D	A	MH1	1	1	41.510	0.110	20	AGM
IMU-OHT2-A-MH1-ETW2-2	AFEA112D	A	MH1	1	1	43.789	0.111	20	AGM
IMU-OHT2-A-MH1-ETW2-3	AFEA113D	A	MH1	1	1	40.341	0.110	20	AGM
IMU-OHT2-A-MH2-ETW2-1	AFEA211D	A	MH2	1	2	41.716	0.113	20	AGM
IMU-OHT2-A-MH2-ETW2-2	AFEA212D	A	MH2	1	2	42.368	0.114	20	AGM
IMU-OHT2-A-MH2-ETW2-3	AFEA213D	A	MH2	1	2	42.524	0.113	20	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0055	41.453
0.0055	44.114
0.0055	40.445
0.0056	42.847
0.0057	43.896
0.0056	43.548

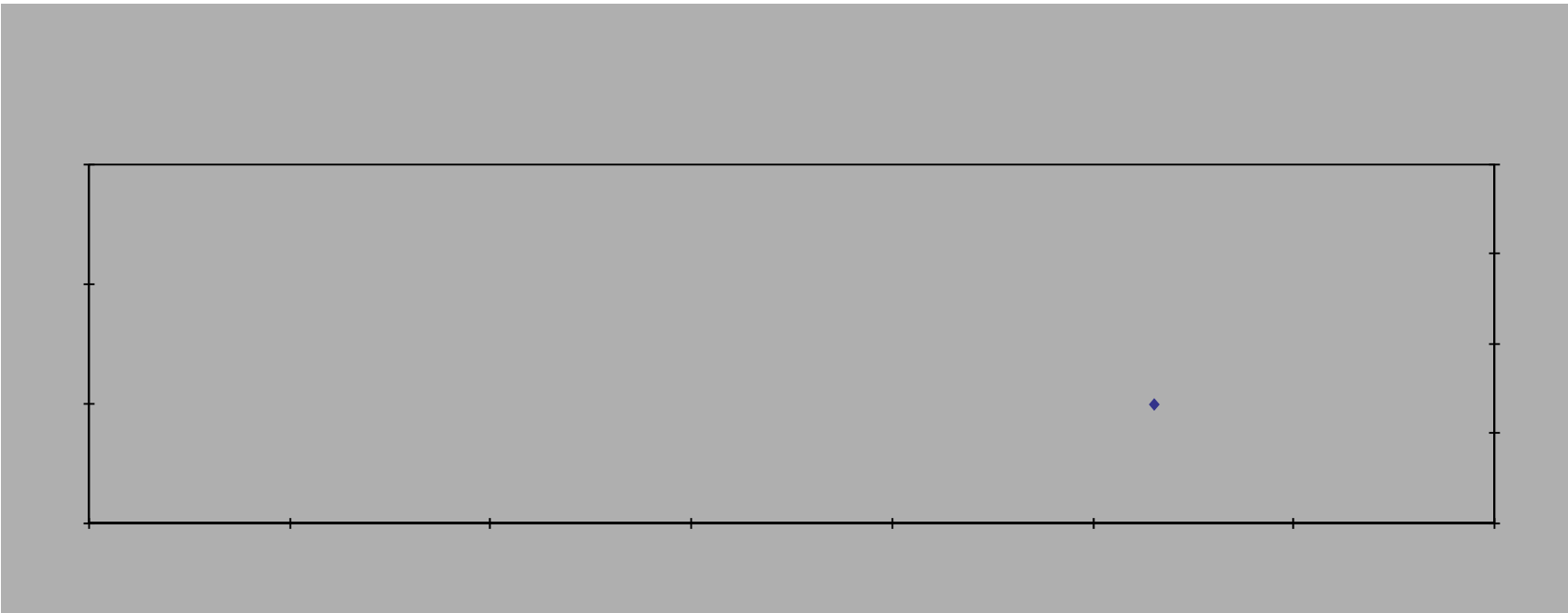
Average 42.041
 Standard Dev. 1.155
 Coeff. of Var. [%] 2.748
 Min. 40.341
 Max. 43.789
 Number of Spec. 6

Average_{norm} 0.0056 42.717
 Standard Dev._{norm} 1.470
 Coeff. of Var. [%]_{norm} 3.442
 Min. 0.0055 40.445
 Max. 0.0057 44.114
 Number of Spec. 6



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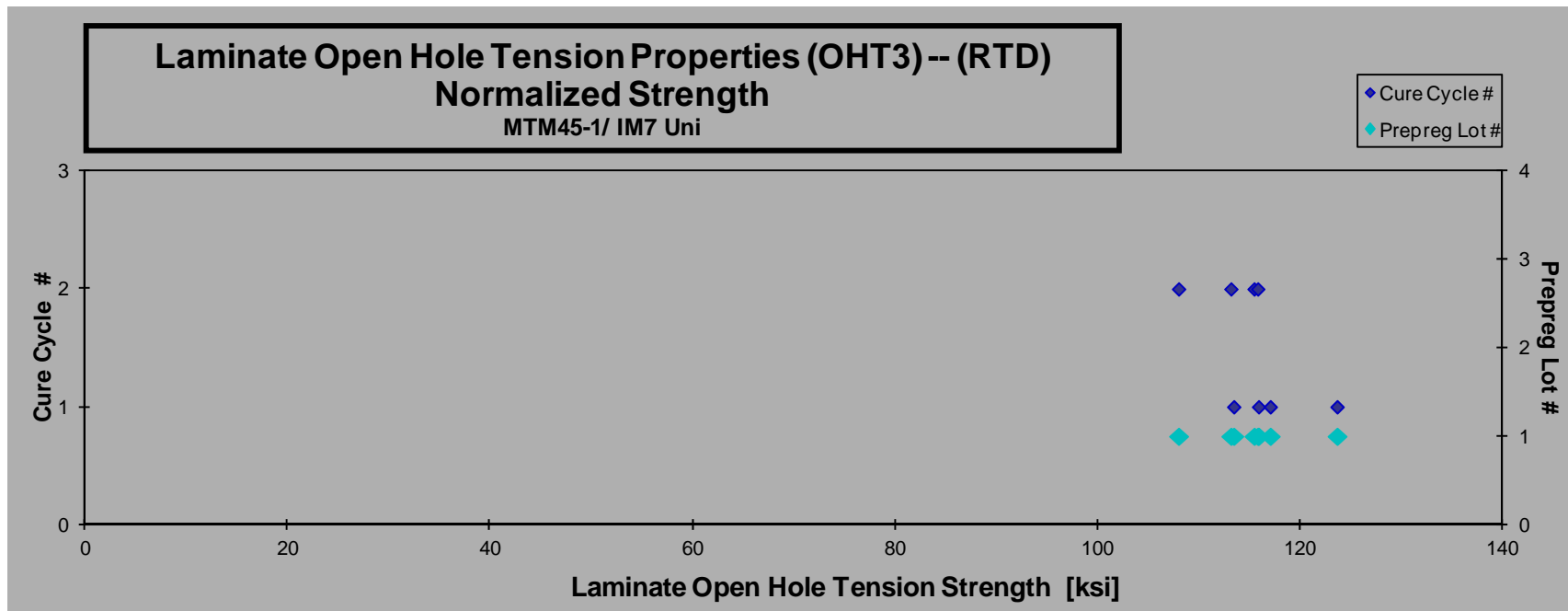
CAM-RP-2008-007 Rev C



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normalizing t_{ply}
[in]
0.0055



Laminate Open Hole Tension Properties (OHT3) -- (ETW2)
Strength
 MTM45-1/ IM7 Uni

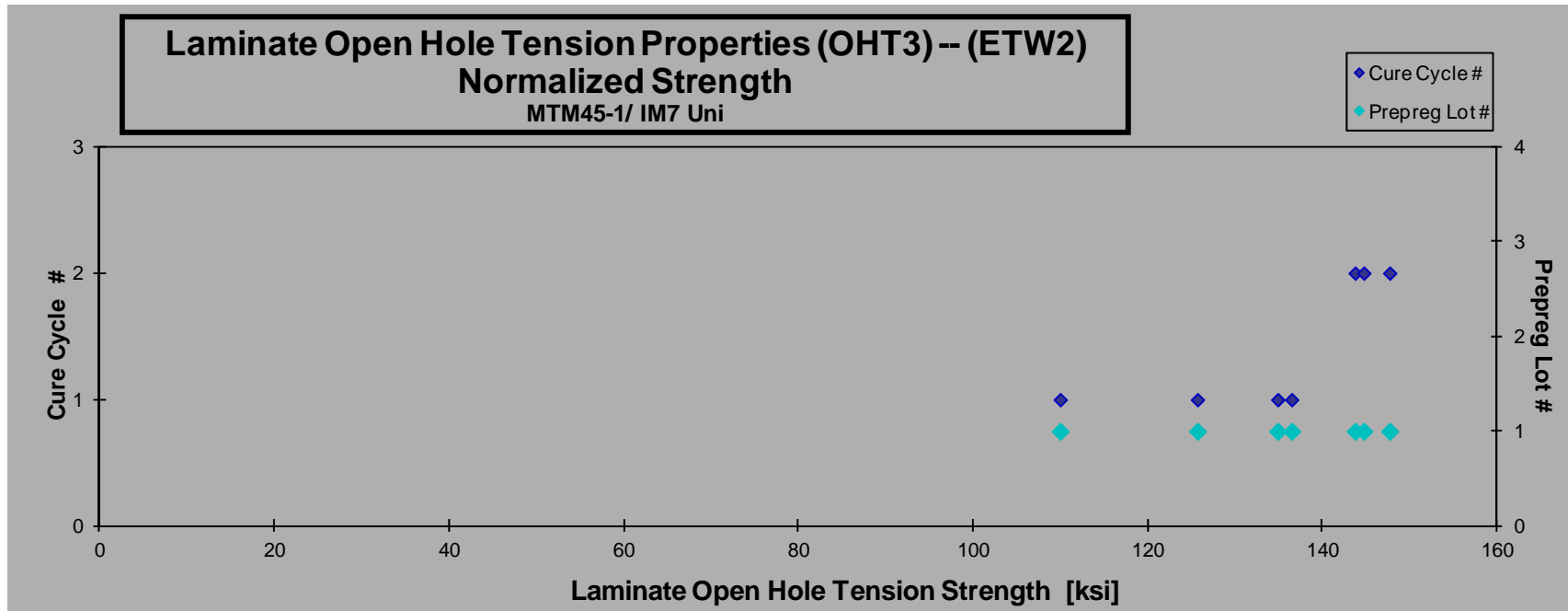
normalizing t_{ply}
 [in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Modes
IMU-OHT3-A-MH1-ETW2-1	AFFA111D	A	MH1	1	1	112.018	0.108	20	AGM
IMU-OHT3-A-MH1-ETW2-2	AFFA112D	A	MH1	1	1	136.210	0.109	20	AGM
IMU-OHT3-A-MH1-ETW2-3	AFFA113D	A	MH1	1	1	137.904	0.109	20	AGM
IMU-OHT3-A-MH1-ETW2-4	AFFA114D	A	MH1	1	1	126.932	0.109	20	AGM
IMU-OHT3-A-MH2-ETW2-2	AFFA212D	A	MH2	1	2	141.013	0.112	20	AGM
IMU-OHT3-A-MH2-ETW2-3	AFFA213D	A	MH2	1	2	143.917	0.113	20	AGM
IMU-OHT3-A-MH2-ETW2-4	AFFA214D	A	MH2	1	2	137.235	0.116	20	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0054	109.981
0.0054	134.889
0.0054	136.483
0.0054	125.701
0.0056	143.747
0.0056	147.711
0.0058	144.741

Average 133.604
Standard Dev. 10.880
Coeff. of Var. [%] 8.143
Min. 112.018
Max. 143.917
Number of Spec. 7

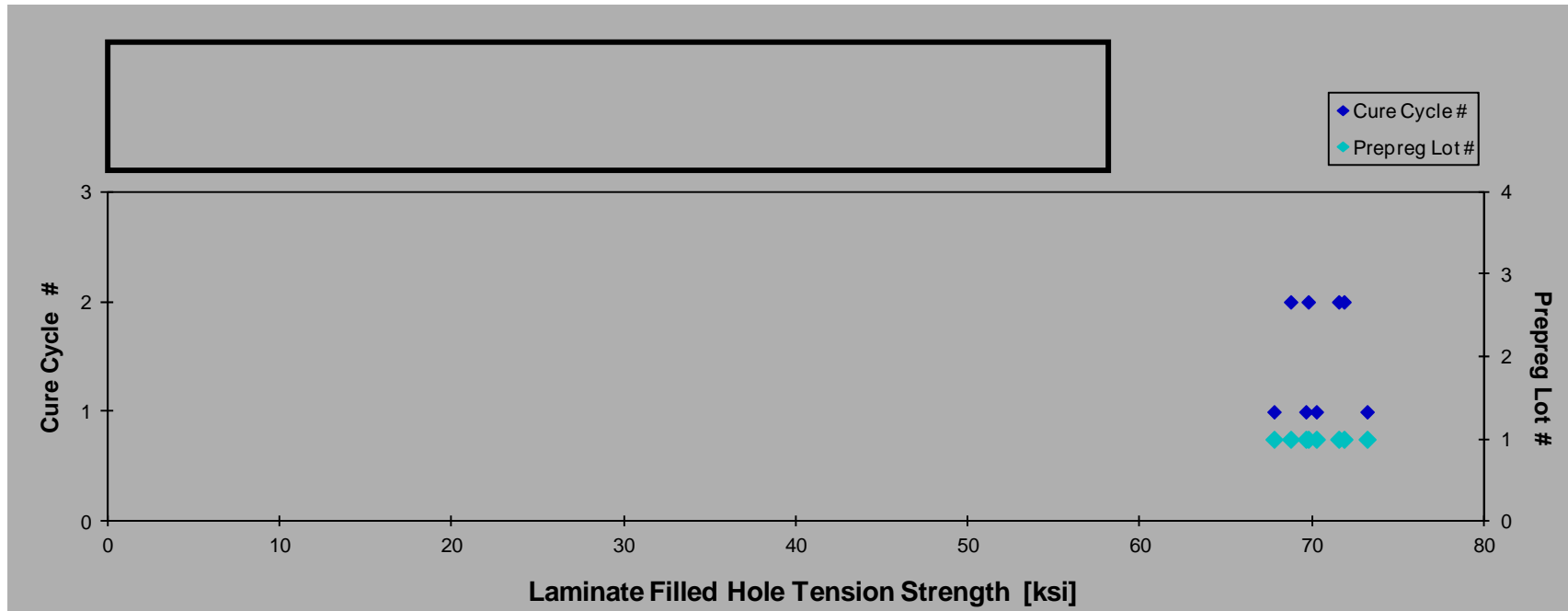
Average_{norm} 0.0055 **134.751**
Standard Dev._{norm} **13.211**
Coeff. of Var. [%]_{norm} **9.804**
Min. 0.0054 **109.981**
Max. 0.0058 **147.711**
Number of Spec. 7



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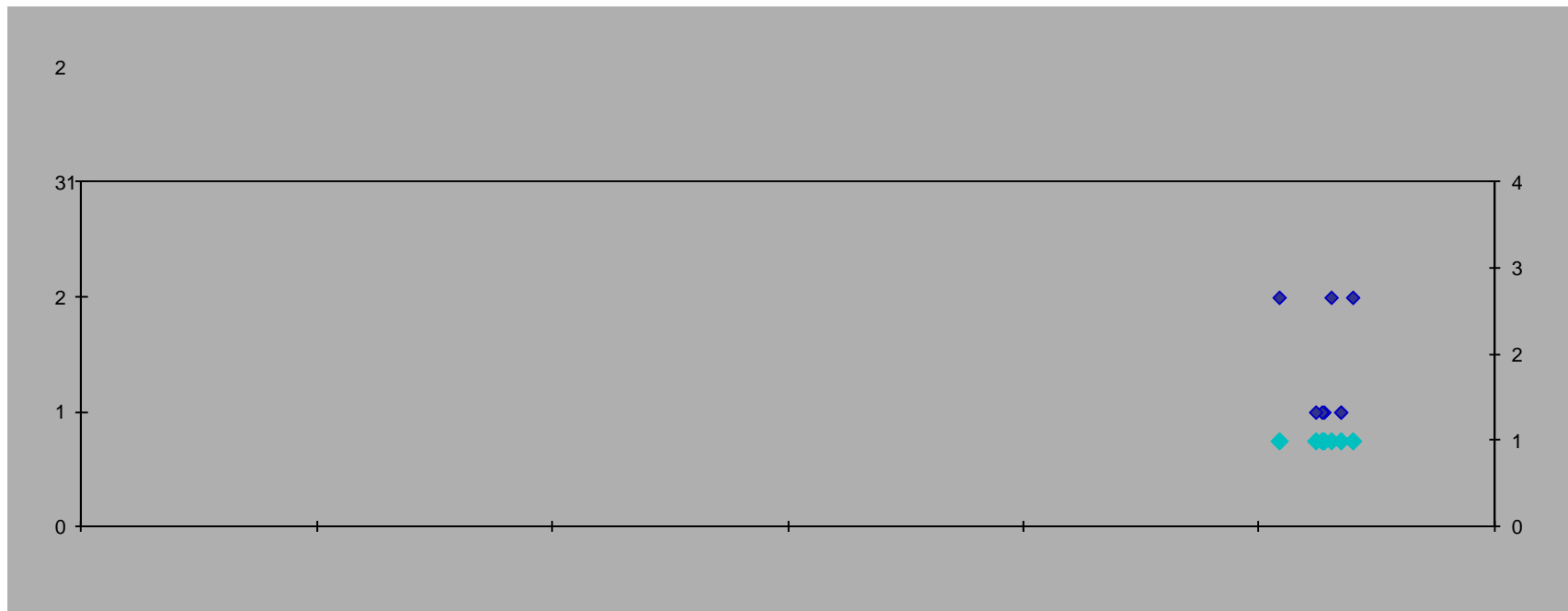




4.20 “10/80/10” Filled-Hole Tension 2 Properties (FHT2)

normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thckn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	Strength _{norm} [ksi]	
IMU-FHT2-A-MH1-CTD-1	AF5A111B	A	MH1	1	1	50.975	0.114	20	AGM	0.0057	52.736	
IMU-FHT2-A-MH1-CTD-2	AF5A112B	A	MH1	1	1	52.130	0.113	20	AGM	0.0056	53.457	
IMU-FHT2-A-MH1-CTD-3	AF5A113B	A	MH1	1	1	50.899	0.114	20	AGM	0.0057	52.657	
IMU-FHT2-A-MH1-CTD-4	AF5A114B	A	MH1	1	1	50.730	0.114	20	AGM	0.0057	52.390	
IMU-FHT2-A-MH2-CTD-1	AF5A211B	A	MH2	1	2	51.007	0.114	20	AGM	0.0057	53.048	
IMU-FHT2-A-MH2-CTD-2	AF5A212B	A	MH2	1	2	48.503	0.115	20	AGM	0.0058	50.840	
IMU-FHT2-A-MH2-CTD-3	AF5A213B	A	MH2	1	2	51.480	0.115	20	AGM	0.0058	53.961	
Average						50.818				Average_{norm}	0.0057	52.727
Standard Dev.						1.125				Standard Dev._{norm}		0.986
Coeff. of Var. [%]						2.214				Coeff. of Var. [%]_{norm}		1.871
Min.						48.503				Min.	0.0056	50.840
Max.						52.130				Max.	0.0058	53.961
Number of Spec.						7				Number of Spec.		7

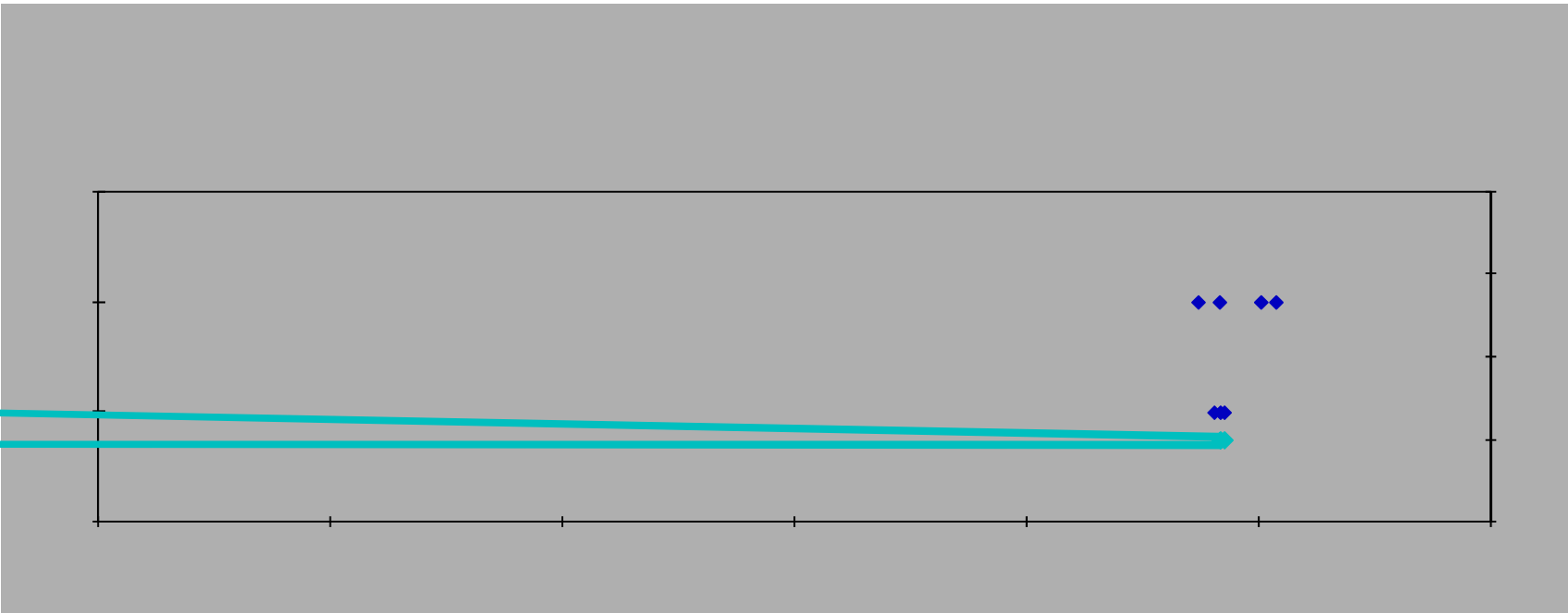


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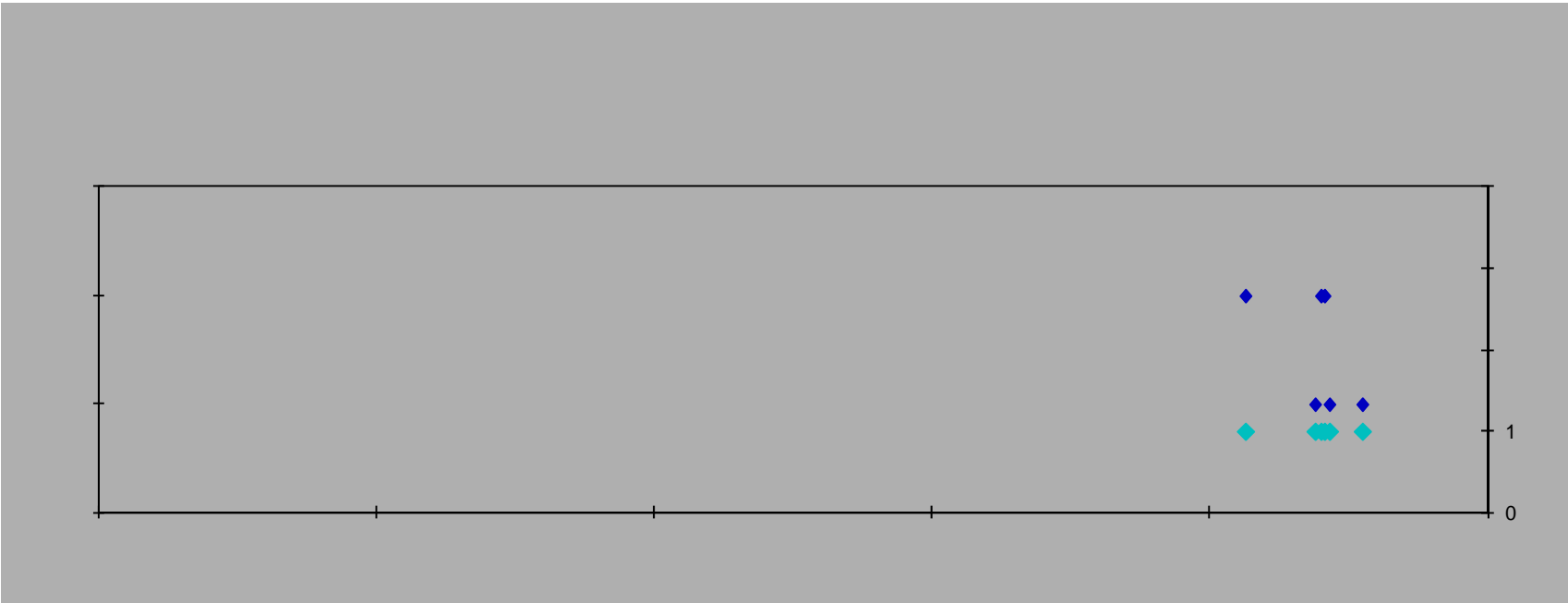
normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	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]
IMU-FHT2-A-MH1-RTD-1	AF5A111A	A	MH1	1	1	47.285	0.113	20	AGM	0.0056	48.488
IMU-FHT2-A-MH1-RTD-2	AF5A112A	A	MH1	1	1	46	=	-	-2 AF	1	tre ksi]



normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thckn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	Strength _{norm} [ksi]	
IMU-FHT2-A-MH1-ETW2-1	AF5A111D	A	MH1	1	1	41.597	0.116	20	AGM	0.0058	43.759	
IMU-FHT2-A-MH1-ETW2-2	AF5A112D	A	MH1	1	1	42.572	0.114	20	AGM	0.0057	44.275	
IMU-FHT2-A-MH1-ETW2-3	AF5A113D	A	MH1	1	1	43.362	0.115	20	AGM	0.0058	45.458	
IMU-FHT2-A-MH2-ETW2-1	AF5A211D	A	MH2	1	2	42.593	0.114	20	AGM	0.0057	44.096	
IMU-FHT2-A-MH2-ETW2-2	AF5A212D	A	MH2	1	2	40.003	0.113	20	AGM	0.0057	41.251	
IMU-FHT2-A-MH2-ETW2-3	AF5A213D	A	MH2	1	2	42.088	0.115	20	AGM	0.0057	43.969	
Average						42.036				Average_{norm}	0.0057	43.801
Standard Dev.						1.156				Standard Dev._{norm}		1.385
Coeff. of Var. [%]						2.751				Coeff. of Var. [%]_{norm}		3.162
Min.						40.003				Min.	0.0057	41.251
Max.						43.362				Max.	0.0058	45.458
Nv						58	45.	-		.00 T 02		9 ± 9



4.21 “50/40/10” Filled-Hole Tension 3 Properties (FHT3)

normalizing t_{ply}
[in]
0.0055

February 12, 2024

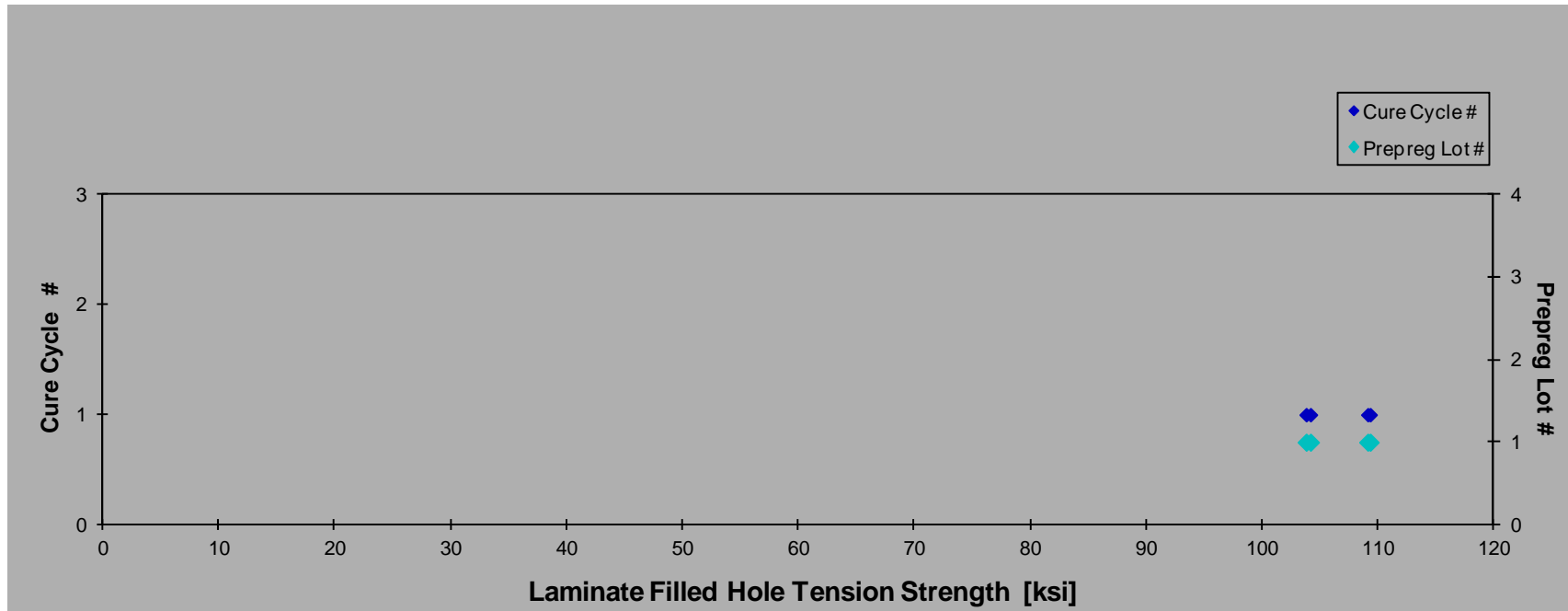
CAM-RP-2008-007 Rev C

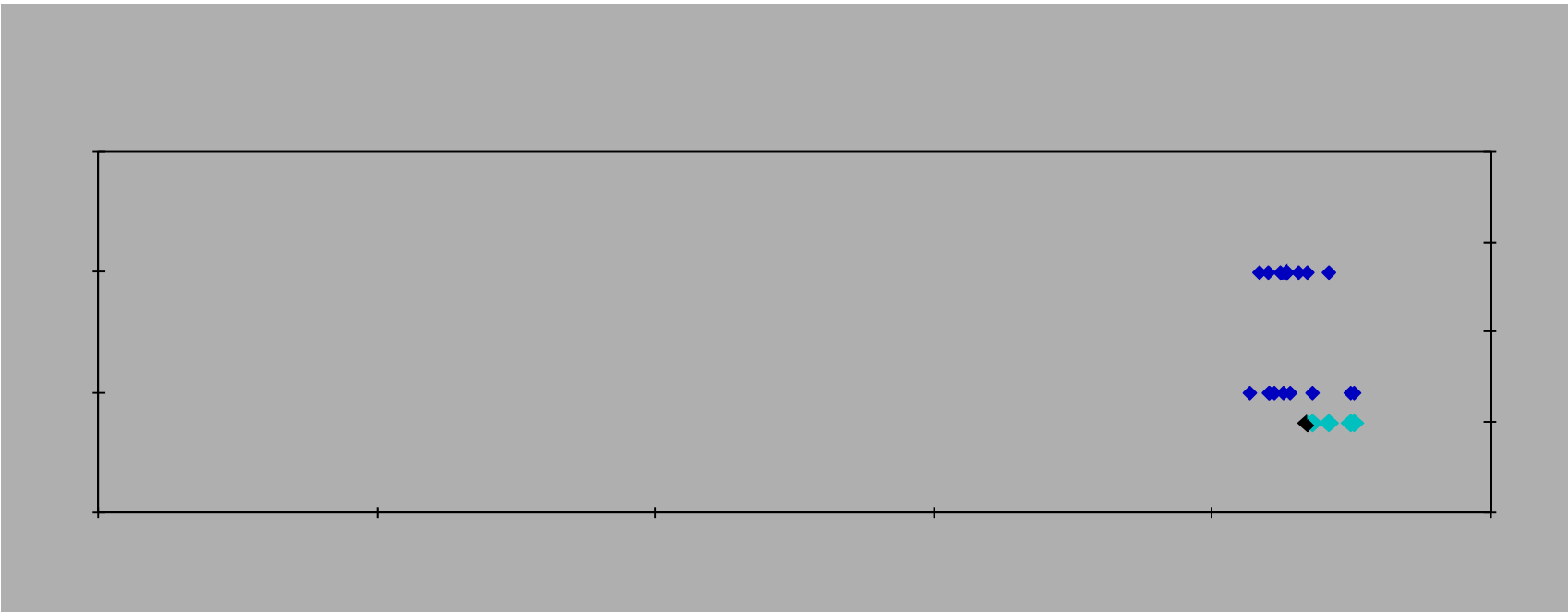
February 12, 2024

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normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	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]
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normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thicken. [in]	# Plies in Laminate	Failure Modes	Avg. t_{ply} [in]	Strength _{norm} [ksi]	
IMU-OHC1-A-MH1-ETW-1	AFGA111N	A	MH1	1	1	33.677	0.135	24	LGM	0.0056	34.404	
IMU-OHC1-A-MH1-ETW-2	AFGA112N	A	MH1	1	1	33.831	0.137	24	LGM	0.0057	34.993	
IMU-OHC1-A-MH1-ETW-3	AFGA113N	A	MH1	1	1	33.886	0.136	24	LGM	0.0057	34.840	
IMU-OHC1-A-MH2-ETW-1	AFGA211N	A	MH2	1	2	34.890	0.134	24	LGM	0.0056	35.401	
IMU-OHC1-A-MH2-ETW-2	AFGA212N	A	MH2	1	2	33.964	0.135	24	LGM	0.0056	34.830	
IMU-OHC1-A-MH2-ETW-3	AFGA213N	A	MH2	1	2	33.569	0.134	24	LGM	0.0056	34.120	
Average						33.970				Average_{norm}	0.0056	34.765
Standard Dev.						0.473				Standard Dev._{norm}		0.450
Coeff. of Var. [%]						1.393				Coeff. of Var._{norm}		

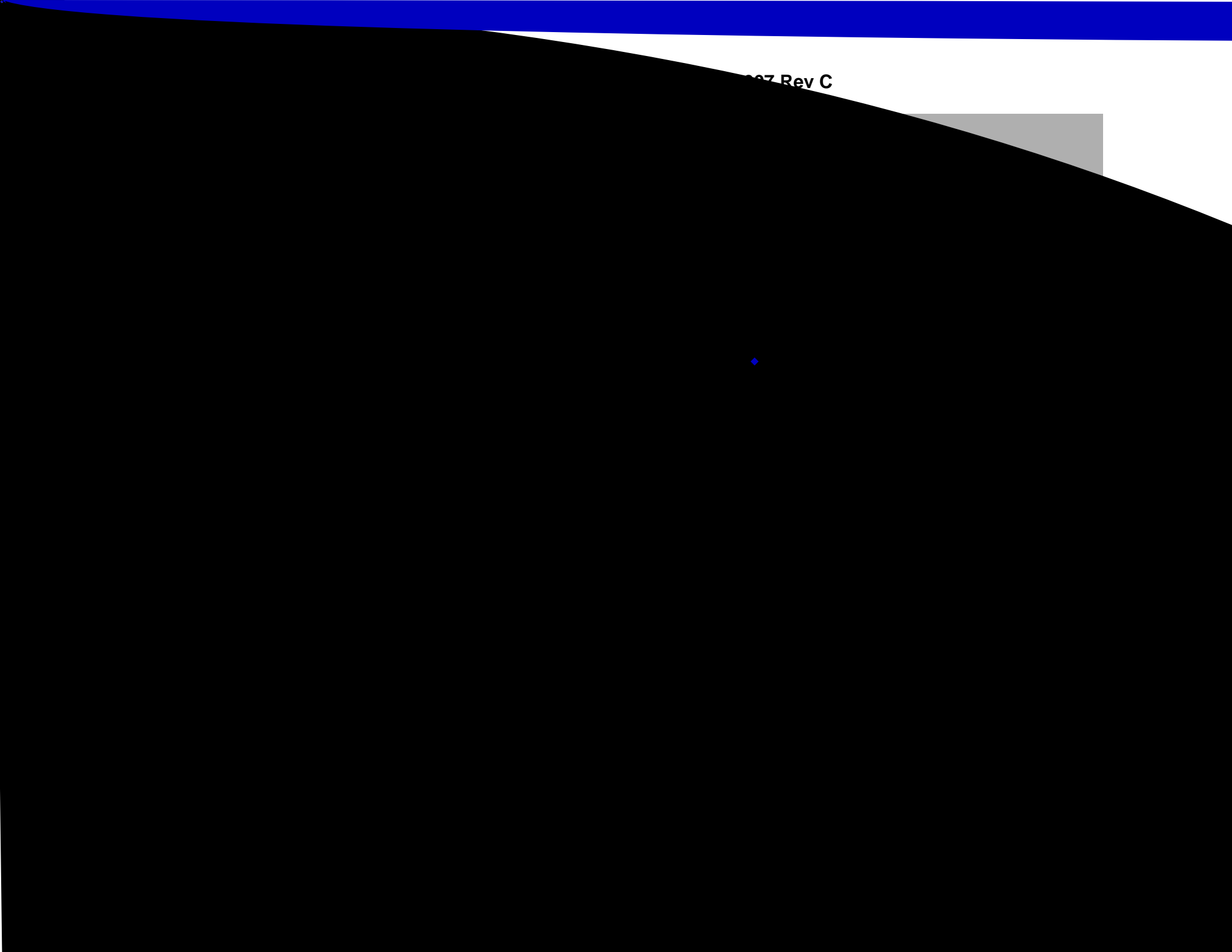


February 12, 2024

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normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thicken. [in]	# Plies in Laminate	Failure Modes	Avg. t_{ply} [in]	Strength _{norm} [ksi]
IMU-OHC1-A-MH1-ETW2-1	AFGA111D	A	MH1	1							



4.23 “10/80/10” Open-Hole Compression 2 Properties (OHC2)

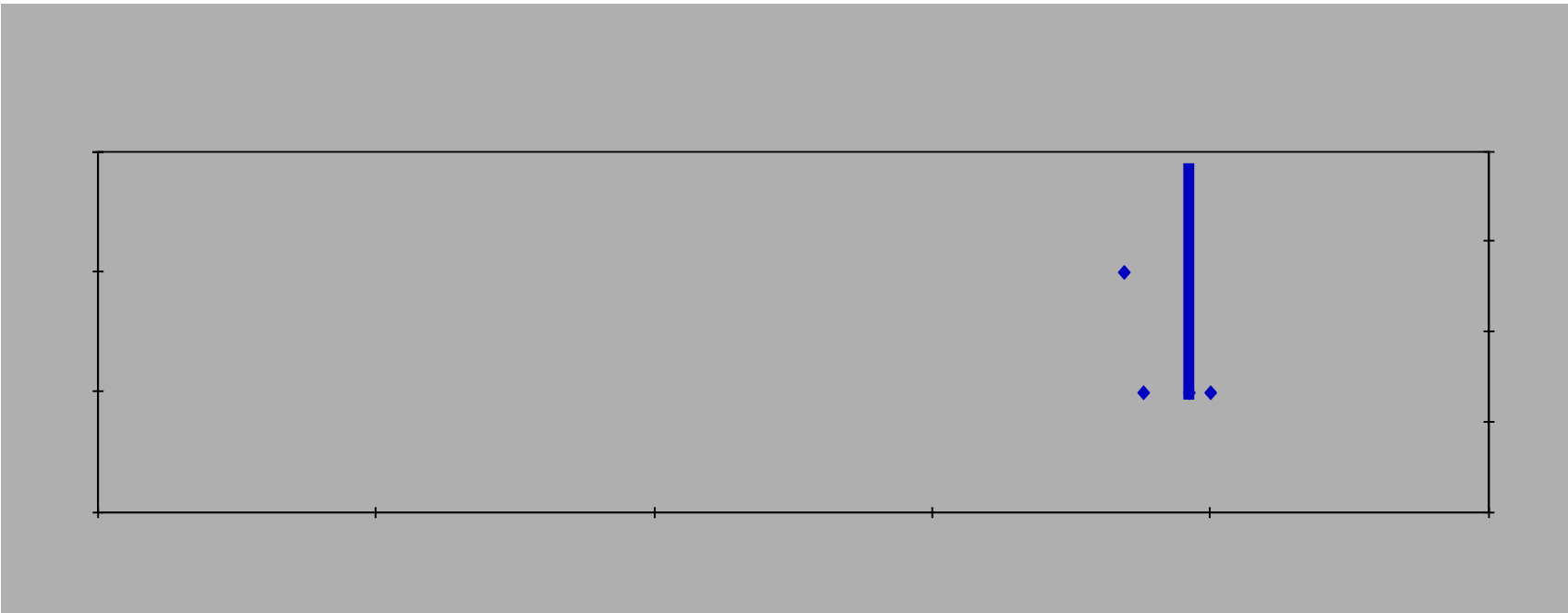
Laminate Open Hole Compression Properties (OHC2)-- (RTD)
Strength
 MTM45-1/ IM7 Uni

normalizing t_{ply}
 [in]
 0.0055

Specimen Number	NIAR Name	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]
IMU-OHC2-A-MH1-RTD-1	AFHA111A	A	MH1	1	1	37.110	0.118	20	LGM	0.0059	39.943
IMU-OHC2-A-MH1-RTD-2	AFHA112A	A	MH1	1	1	36.925	0.117	20	LGM	0.0058	39.174
IMU-OHC2-A-MH1-RTD-3	AFHA113A	A	MH1	1	1	35.899	0.115	20	LGM	0.0058	37.531
IMU-OHC2-A-MH2-RTD-1	AFHA211A	A	MH2	1	2	36.539	0.111	20	LGM	0.0055	36.837
IMU-OHC2-A-MH2-RTD-2	AFHA212A	A	MH2	1	2	37.531	0.111	20	LGM	0.0055	37.804
IMU-OHC2-A-MH2-RTD-3	AFHA213A	A	MH2	1	2	36.531	0.112	20	LGM	0.0056	37.029

Average 36.756
 Standard Dev. 0.563
 Coeff. of Var. [%] 1.533
 Min. 35.899
 Max. 37.531
 Number of Spec. 6

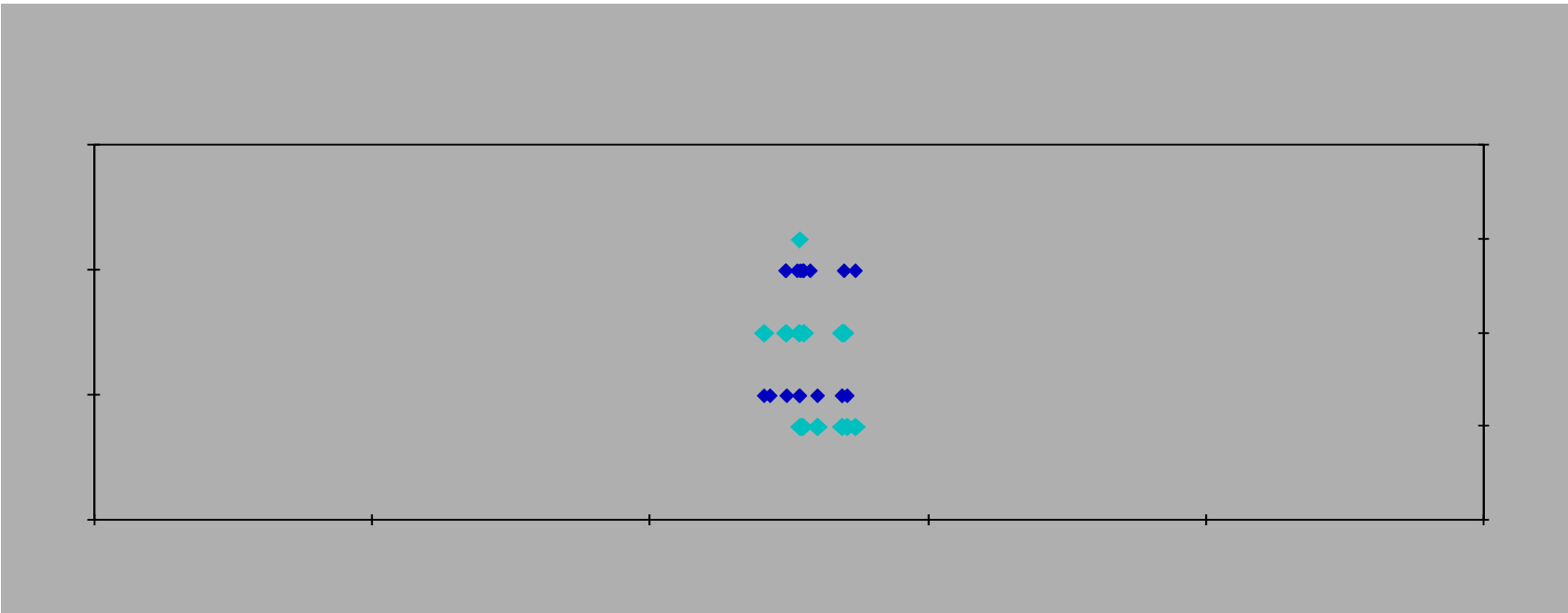
Average_{norm} 0.0057 38.053
 Standard Dev._{norm} 1.240
 Coeff. of Var. [%]_{norm} 3.259
 Min. 0.0055 36.837
 Max. 0.0059 39.943
 Number of Spec. 6

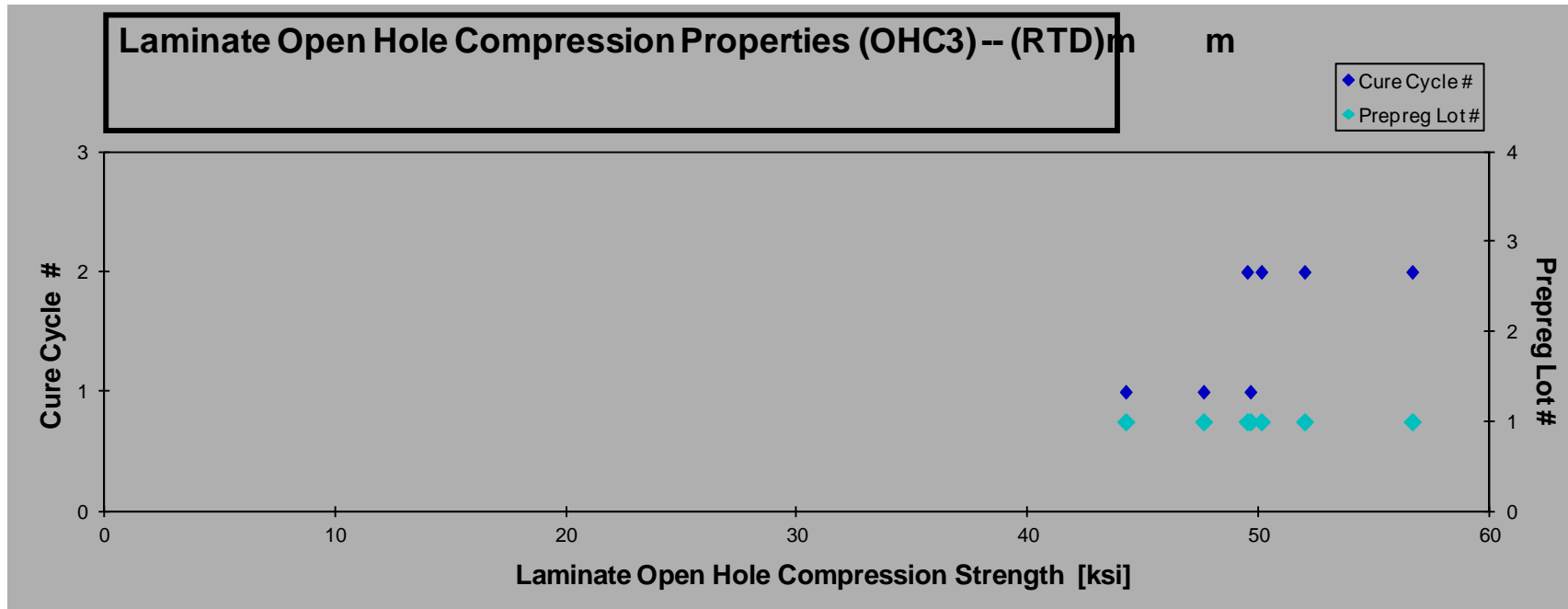


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normalizing t_{ply}
[in]
0.0055



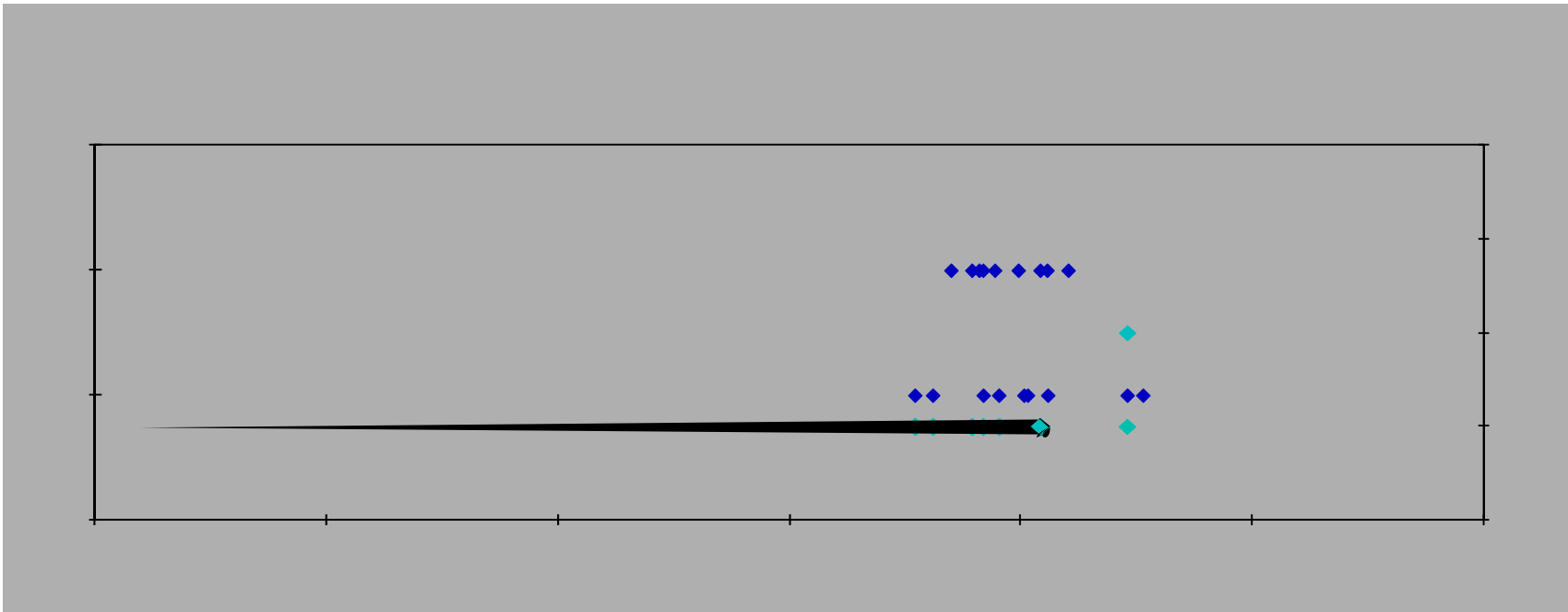


February 12, 2024

CAM-RP-2008-007 Rev C

normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thckn. [in]	# Plies in Laminate	Failure Modes	Avg. t_{ply} [in]	Strength _{norm} [ksi]	
IMU-OHC3-A-MH1-ETW2-1	AFIA111D	A	MH1	1	1	35.081	0.113	20	LGM	0.0057	36.192	
IMU-OHC3-A-MH1-ETW2-2	AFIA112D	A	MH1	1	1	34.133	0.114	20	LGM	0.0057	35.421	
IMU-OHC3-A-MH1-ETW2-3	AFIA113D	A37.1	MH1	1	1	37.623	0.114	20	LGM	0.0057	39	111111111111111111 ; L37.1



4.25 “25/50/25” Filled-Hole Compression 1 Properties (FHC1)

Laminate Filled Hole Compression Properties (FHC1)-- (RTD)
Strength
 MTM45-1/ IM7 Uni

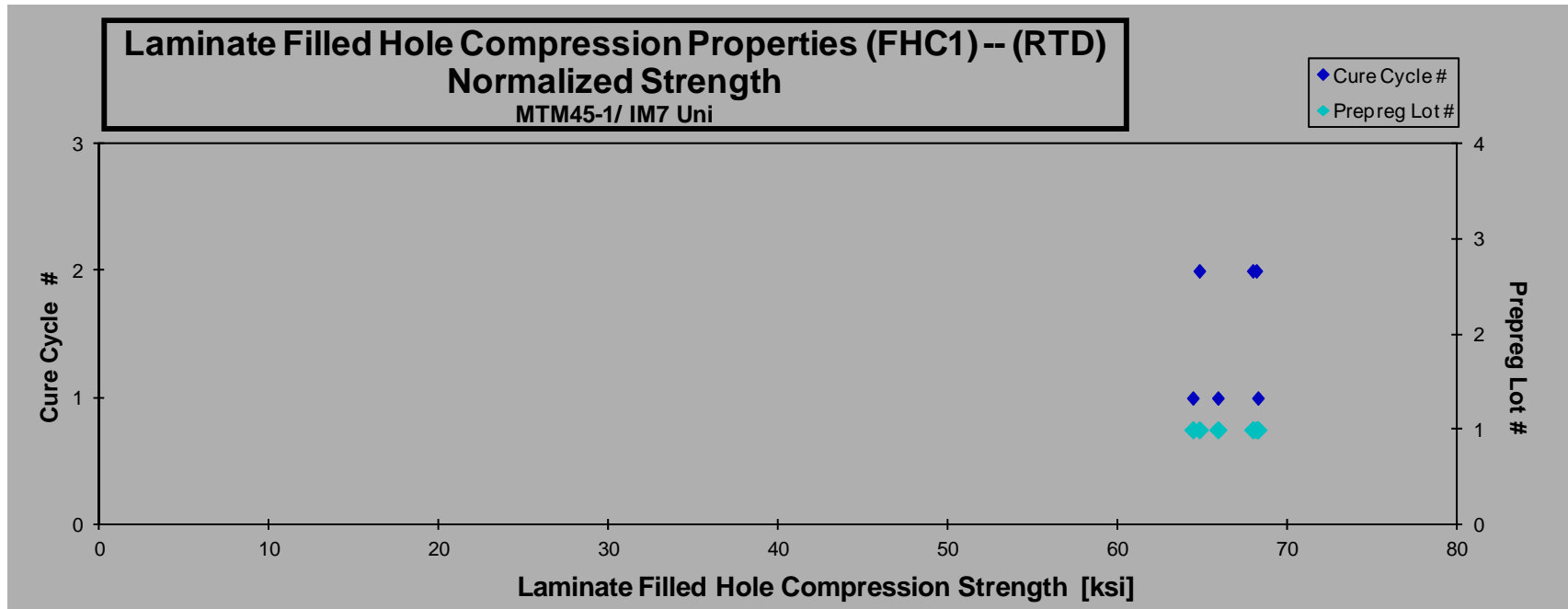
normalizing t_{ply}
 [in]
 0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Mode
IMU-FHC1-A-MH1-RTD-1	AF7A111A	A	MH1	1	1	67.078	0.134	24	LGM
IMU-FHC1-A-MH1-RTD-2	AF7A112A	A	MH1	1	1	64.473	0.135	24	LGM
IMU-FHC1-A-MH1-RTD-3	AF7A113A	A	MH1	1	1	63.216	0.135	24	LGM
IMU-FHC1-A-MH2-RTD-1	AF7A211A	A	MH2	1	2	67.180	0.134	24	LGM
IMU-FHC1-A-MH2-RTD-2	AF7A212A	A	MH2	1	2	67.384	0.134	24	LGM
IMU-FHC1-A-MH2-RTD-3	AF7A213A	A	MH2	1	2	64.160	0.133	24	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0056	68.247
0.0056	65.889
0.0056	64.413
0.0056	67.944
0.0056	68.150
0.0056	64.792

Average 65.582
 Standard Dev. 1.838
 Coeff. of Var. [%] 2.803
 Min. 63.216
 Max. 67.384
 Number of Spec. 6

Average_{norm} 0.0056 66.572
 Standard Dev._{norm} 1.759
 Coeff. of Var. [%]_{norm} 2.643
 Min. 0.0056 64.413
 Max. 0.0056 68.247
 Number of Spec. 6



Laminate Filled Hole Compression Properties (FHC1) -- (ETW2)
Strength
 MTM45-1/ IM7 Uni

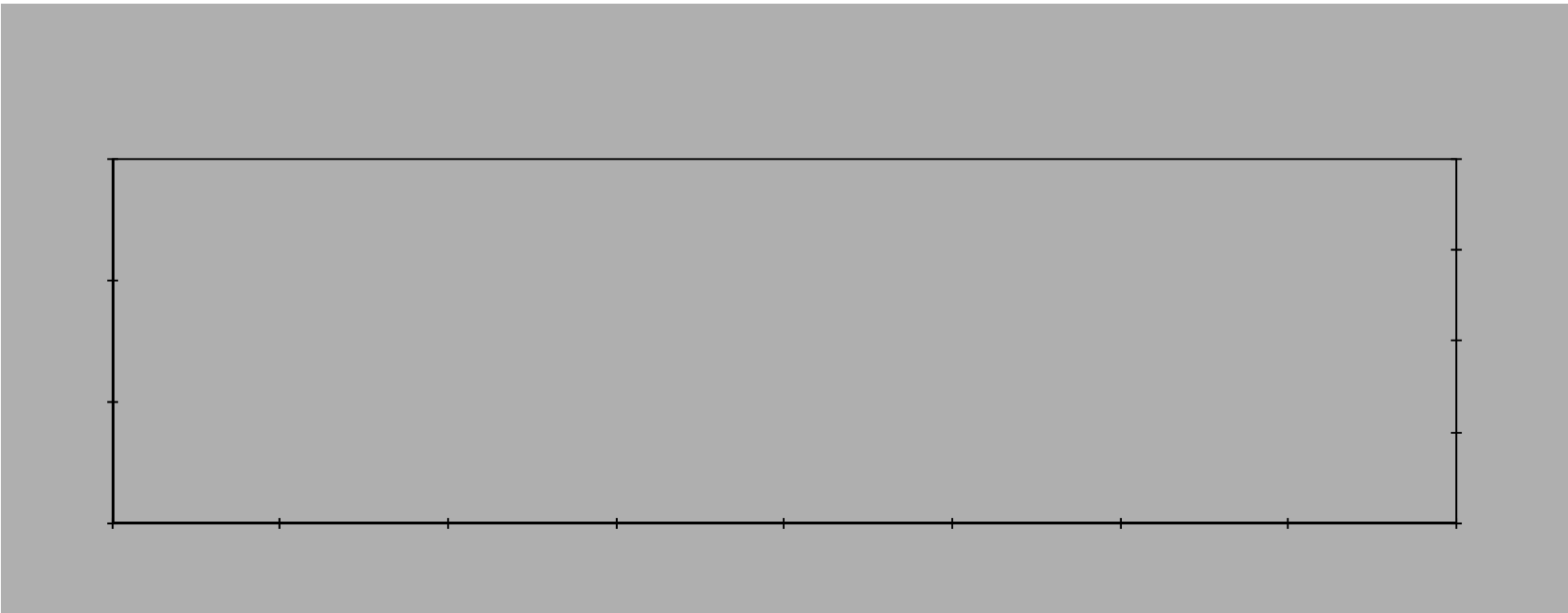
normalizing t_{ply}
 [in]
 0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Mode
IMU-FHC1-A-MH1-ETW2-1	AF7A111D	A	MH1	1	1	41.517	0.135	24	LGM
IMU-FHC1-A-MH1-ETW2-2	AF7A112D	A	MH1	1	1	42.873	0.135	24	LGM
IMU-FHC1-A-MH1-ETW2-3	AF7A113D	A	MH1	1	1	43.769	0.135	24	LGM
IMU-FHC1-A-MH2-ETW2-1	AF7A211D	A	MH2	1	2	47.887	0.133	24	LGM
IMU-FHC1-A-MH2-ETW2-2	AF7A212D	A	MH2	1	2	41.347	0.135	24	LGM
IMU-FHC1-A-MH2-ETW2-3	AF7A213D	A	MH2	1	2	45.913	0.134	24	LGM
IMU-FHC1-B-MH1-ETW2-1	AF7B111D	B	MH1	2	1	45.588	0.137	24	LGM
IMU-FHC1-B-MH1-ETW2-2	AF7B112D	B	MH1	2	1	42.098	0.139	24	LGM
IMU-FHC1-B-MH1-ETW2-3	AF7B113D	B	MH1	2	1	44.679	0.134	24	LGM
IMU-FHC1-B-MH2-ETW2-1	AF7B211D	B	MH2	2	2	42.025	0.134	24	LGM
IMU-FHC1-B-MH2-ETW2-2	AF7B212D	B	MH2	2	2	42.152	0.133	24	LGM
IMU-FHC1-B-MH2-ETW2-3	AF7B213D	B	MH2	2	2	42.291	0.135	24	LGM
IMU-FHC1-C-MH1-ETW2-1	AF7C111D	C	MH1	3	1	47.306	0.131	24	LGM
IMU-FHC1-C-MH1-ETW2-2	AF7C112D	C	MH1	3	1	42.375	0.131	24	LGM
IMU-FHC1-C-MH1-ETW2-3	AF7C113D	C	MH1	3	1	42.237	0.132	24	LGM
IMU-FHC1-C-MH2-ETW2-1	AF7C211D	C	MH2	3	2	45.953	0.131	24	LGM
IMU-FHC1-C-MH2-ETW2-2	AF7C212D	C	MH2	3	2	44.183	0.130	24	LGM
IMU-FHC1-C-MH2-ETW2-3	AF7C213D	C	MH2	3	2	46.339	0.131	24	LGM

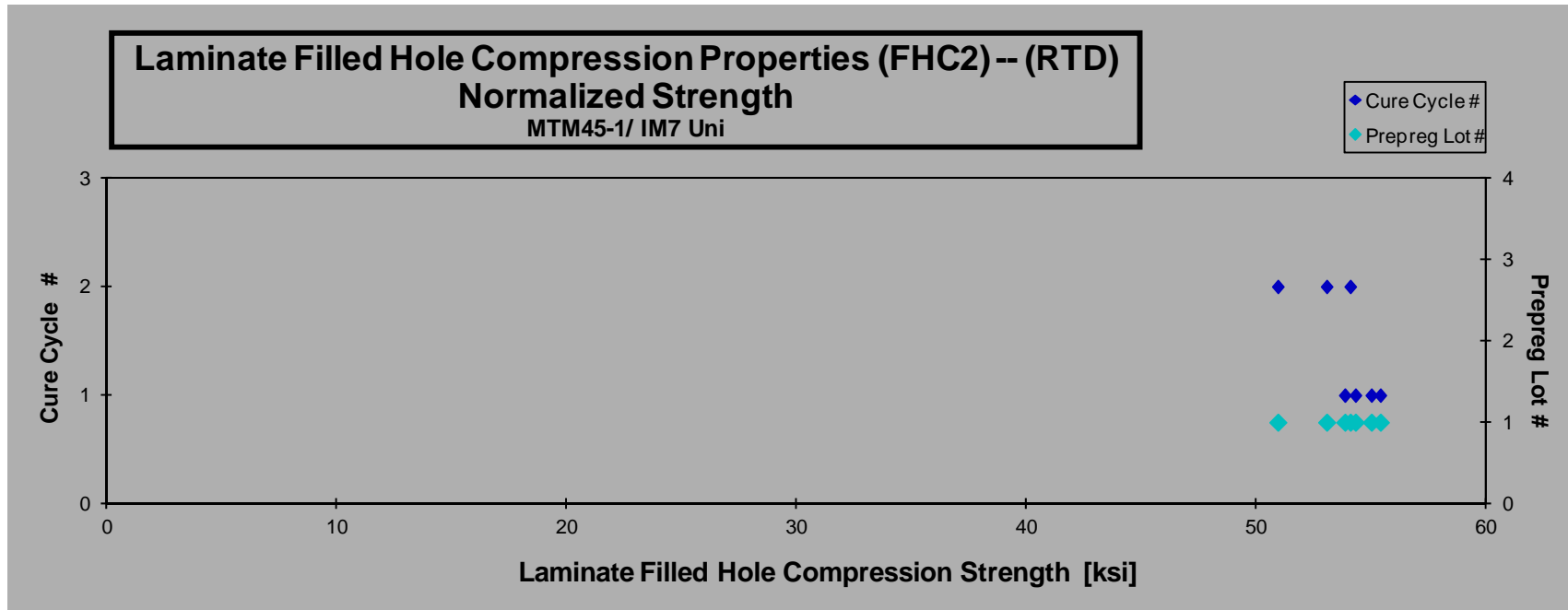
Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0056	42.492
0.0056	43.744
0.0056	44.803
0.0056	48.334
0.0056	42.161
0.0056	46.695
0.0057	47.297
0.0058	44.246
0.0056	45.362
0.0056	42.518
0.0055	42.450
0.0056	43.220
0.0055	46.942
0.0055	42.102
0.0055	42.093
0.0055	45.628
0.0054	43.659
0.0055	45.965

Average 43.918
 Standard Dev. 2.115
 Coeff. of Var. [%] 4.815
 Min. 41.347
 Max. 47.887
 Number of Spec. 18

Average_{norm} 0.0056 44.428
 Standard Dev._{norm} 2.024
 Coeff. of Var. [%]_{norm} 4.555
 Min. 0.0054 42.093
 Max. 0.0058 48.334
 Number of Spec. 18



4.26 “10/80/10” Filled-Hole Compression 2 Properties (FHC2)



normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thicken. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	Strength _{norm} [ksi]	
IMU-FHC2-A-MH1-ETW2-1	AF8A111D	A	MH1	1	1	33.182	0.114	20	LGM	0.0057	34.238	
IMU-FHC2-A-MH1-ETW2-2	AF8A112D	A	MH1	1	1	32.168	0.115	20	LGM	0.0057	33.519	
IMU-FHC2-A-MH1-ETW2-3	AF8A113D	A	MH1	1	1	34.111	0.112	20	LGM	0.0056	34.773	
IMU-FHC2-A-MH2-ETW2-1	AF8A211D	A	MH2	1	2	35.014	0.111	20	LGM	0.0056	35.476	
IMU-FHC2-A-MH2-ETW2-2	AF8A212D	A	MH2	1	2	32.318	0.111	20	LGM	0.0056	32.680	
IMU-FHC2-A-MH2-ETW2-3	AF8A213D	A	MH2	1	2	33.081	0.111	20	LGM	0.0055	33.316	
IMU-FHC2-B-MH1-ETW2-1	AF8A	3D	A	0.M H0	-E0. 1	10	-E0.	0.0056	X02-B-MH1-ETW2-1	2-B/ - /-11	1106 040056	0.0122M0.100 20

4.27 “50/40/10” Filled-Hole Compression 3 Properties (FHC3)

normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	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]			
IMU-FHC3-A-MH2-RTD-1	AF9A211A	A	MH2	1	2	76.585	0.111	20	LGM	0.0056	77.281			
IMU-FHC3-A-MH2-RTD-2	AF9A212A	A	MH2	1	2	80.524	0.111	20	LGM	0.0055	80.890			
IMU-FHC3-A-MH2-RTD-3	AF9A213A	A	MH2	1	2	74.499	0.111	20	LGM	0.0056	75.379			
*Data for IMU-FH-	I FC			I	Æ	U	%			N		JeM	A	M



normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	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]	
IMU-FHC3-A-MH2-ETW2-1	AF9A211D	A	MH2	1	2	46.717	0.112	20	LGM	0.0056	47.362	
IMU-FHC3-A-MH2-ETW2-2	AF9A212D	A	MH2	1	2	49.927	0.111	20	LGM	0.0056	50.449	
IMU-FHC3-A-MH2-ETW2-3	AF9A213D	A	MH2	1	2	50.905	0.112	20	LGM	0.0056	51.730	
IMU-FHC3-B-MH1-ETW2-1	AF9B111D	B	MH1	2	1	55.196	0.110	20	LGM	0.0055	55.346	
IMU-FHC3-B-MH1-ETW2-2	AF9B112D	B	MH1	2	1	54.285	0.111	20	LGM	0.0056	54.918	
IMU-FHC3-B-MH1-ETW2-3	AF9B113D	B	MH1	2	1	58.508	0.111	20	LGM	0.0056	59.208	
IMU-FHC3-B-MH2-ETW2-1	AF9B211D	B	MH2	2	2	47.078	0.110	20	LGM	0.0055	5H1	MU-FHC3-B-MH2-ETW2-1 IMU-FT -B2



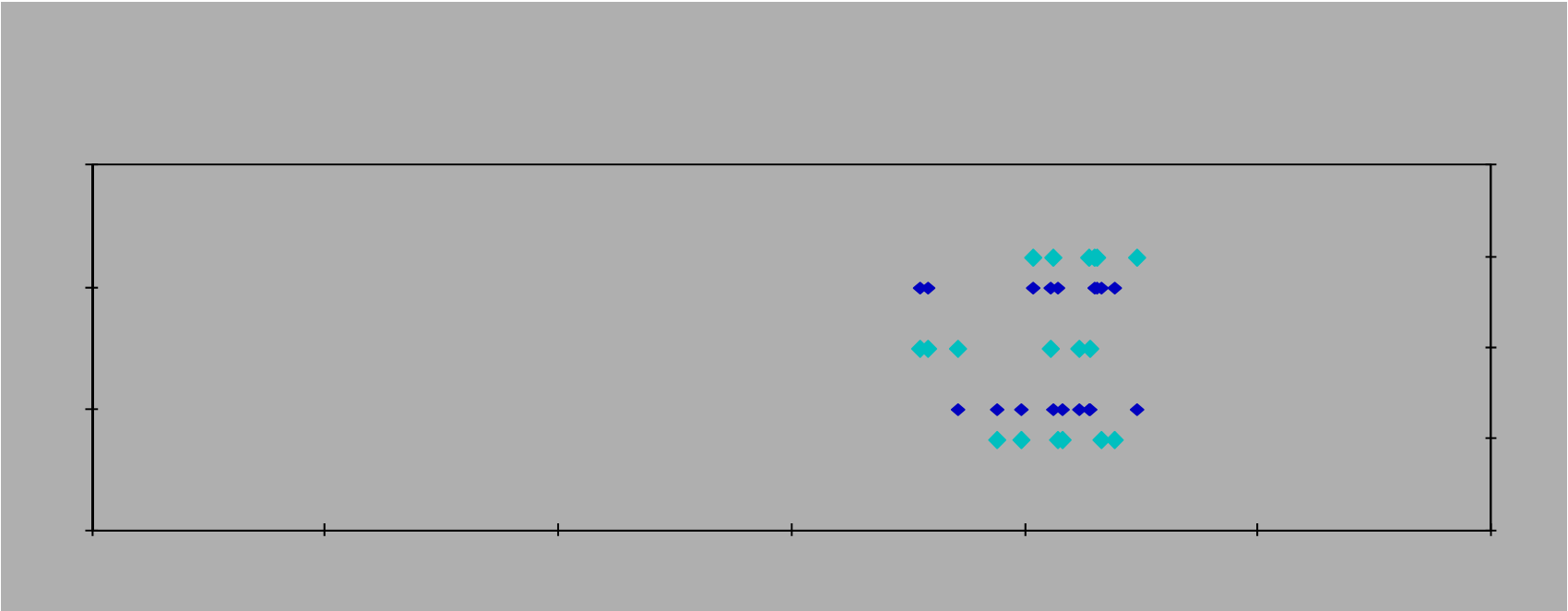


normalizing t_{ply}
[in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	2% Offset Strength [ksi]	Avg. Specimen Thckn. [in]	# Plies in Laminate	Comments	Avg. t_{ply} [in]	2% Offset Strength _{norm} [ksi]
IMU-PB1-A-MH1-ETW2-1	AF1A111D	A	MH1	1	1	78.871	0.133	24	2% Offset for UBS* / B1I	0.0056	79.657
IMU-PB1-A-MH1-ETW2-2	AF1A112D	A	MH1	1	1	82.272	0.133	24	2% Offset for UBS* / B1I	0.0056	83.186
IMU-PB1-A-MH1-ETW2-3	AF1A113D	A	MH1	1	1	76.947	0.133	24	2% Offset for UBS* / B1I	0.0055	77.578
IMU-PB1-A-MH2-ETW2-1	AF1A211D	A	MH2	1	2	84.936	0.134	24	2% Offset for UBS* / B1I	0.0056	86.523
IMU-PB1-A-MH2-ETW2-2	AF1A212D	A	MH2	1	2	81.364	0.134	24	2% Offset for UBS* / B1I	0.0056	82.792
IMU-PB1-A-MH2-ETW2-3	AF1A213D	A	MH2	1	2	86.125	0.134	24	2% Offset for UBS* / B1I	0.0056	87.658
IMU-PB1-B-MH1-ETW2-1	AF1B111D	B	MH1	2	1	72.860	0.134	24	2% Offset for UBS* / B1I	0.0056	74.221
IMU-PB1-B-MH1-ETW2-2	AF1B112D	B	MH1	2	1	84.926	0.132	24	2% Offset for UBS* / B1I	0.0055	84.626
IMU-PB1-B-MH1-ETW2-3	AF1B113D	B	MH1	2	1	85.588	0.132	24	2% Offset for UBS* / B1I	0.0055	85.555
IMU-PB1-B-MH2-ETW2-1	AF1B211D	B	MH2	2	2	73.114	0.128	24	2% Offset for UBS* / B1I	0.0053	70.972
IMU-PB1-B-MH2-ETW2-2	AF1B212D	B	MH2	2	2	74.396	0.127	24	2% Offset for UBS* / B1I	0.0053	71.653
IMU-PB1-B-MH2-ETW2-3	AF1B213D	B	MH2	2	2	84.841	0.128	24	2% Offset for UBS* / B1I	0.0053	82.173
IMU-PB1-C-MH1-ETW2-1	AF1C111D	C	MH1	3	1	82.959	0.131	24	2% Offset for UBS* / B1I	0.0055	82.393
IMU-PB1-C-MH1-ETW2-2	AF1C112D	C	MH1	3	1	90.735	0.130	24	2% Offset for UBS* / B1I	0.0054	89.578
IMU-PB1-C-MH1-ETW2-3	AF1C113D	C	MH1	3	1	86.373	0.131	24	2% Offset for UBS* / B1I	0.0054	85.467
IMU-PB1-C-MH2-ETW2-1	AF1C211D	C	MH2	3	2	81.659	0.130	24	2% Offset for UBS* / B1I	0.0054	80.669
IMU-PB1-C-MH2-ETW2-2	AF1C212D	C	MH2	3	2	87.263	0.130	24	2% Offset for UBS* / B1I	0.0054	86.150
IMU-PB1-C-MH2-ETW2-3	AF1C213D	C	MH2	3	2	86.761	0.131	24	2% Offset for UBS* / B1I	0.0054	85.939

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

Average	82.333	Average_{norm}	0.0055	82.044
Standard Dev.	5.180	Standard Dev_{norm}		5.382
Coeff. of Var. S				



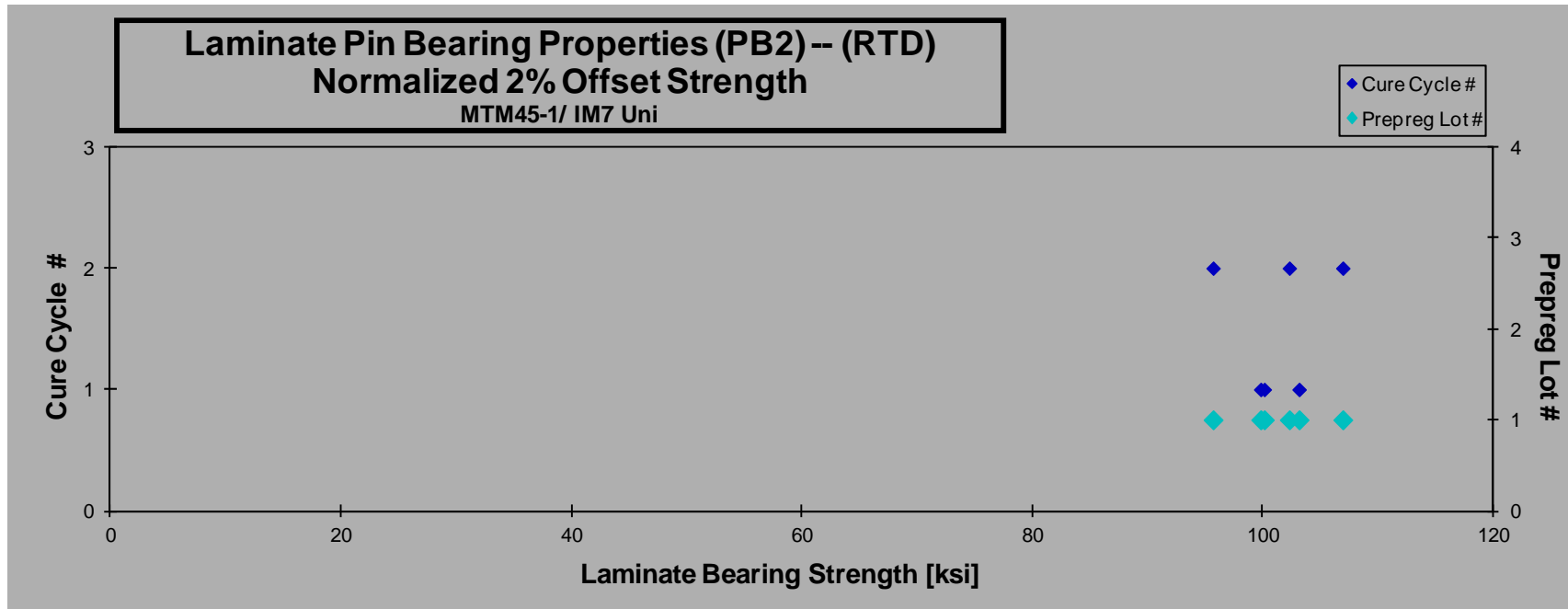
4.29 “10/80/10” Pin Bearing 2 Properties (PB2)

normalizing t_{ply}
[in]

0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	2% Offset Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Comments	Avg. t_{ply} [in]	2% Offset Strength _{norm} [ksi]
IMU-PB2-A-MH1-RTD-1	AF2A111A	A	MH1	1	1	96.866	0.113	20	2% Offset for UBS* / B1I	0.0057	99.860
IMU-PB2-A-MH1-RTD-2	AF2A112A	A	MH1	1	1	101.263	0.112	20	2% Offset for UBS* / B1I	0.0056	103.196
IMU-PB2-A-MH1-RTD-3	AF2A113A	A	MH1	1	1	97.948	0.113	20	2% Offset for UBS* / B1I	0.0056	100.174
IMU-PB2-A-MH2-RTD-1	AF2A211A	A	MH2	1	2	106.408	0.111	20	2% Offset for UBS* / B1I	0.0055	106.988
IMU-PB2-A-MH2-RTD-2	AF2A212A	A	MH2	1	2	94.190	0.112	20	2% Offset for UBS* / B1I	0.0056	95.732
IMU-PB2-A-MH2-RTD-4	AF2A214A	A	MH2	1	2	100.791	0.112	20	2% Offset for UBS* / B1I	0.0056	102.348

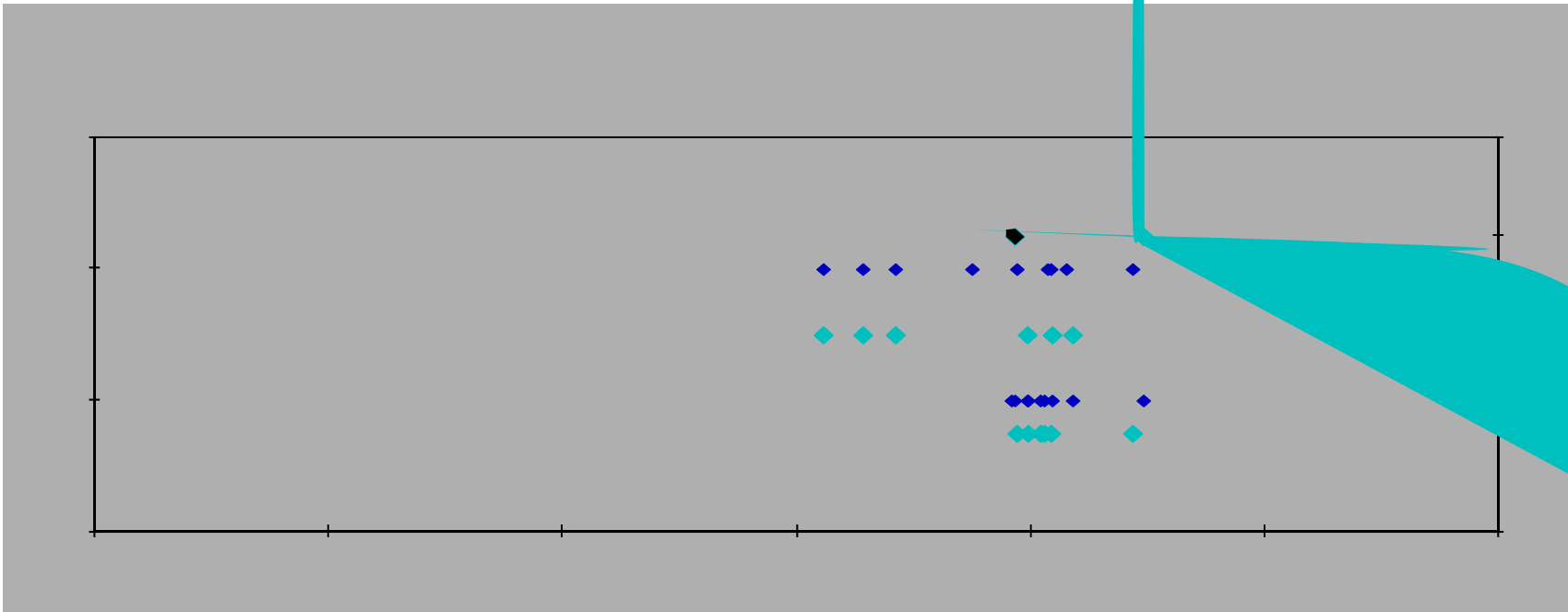
Ultimate Bearing Strength / B1I:
B: Bearing, 1: first hole, I: inapplicable



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normalizing t_{ply}
[in]
0.0055

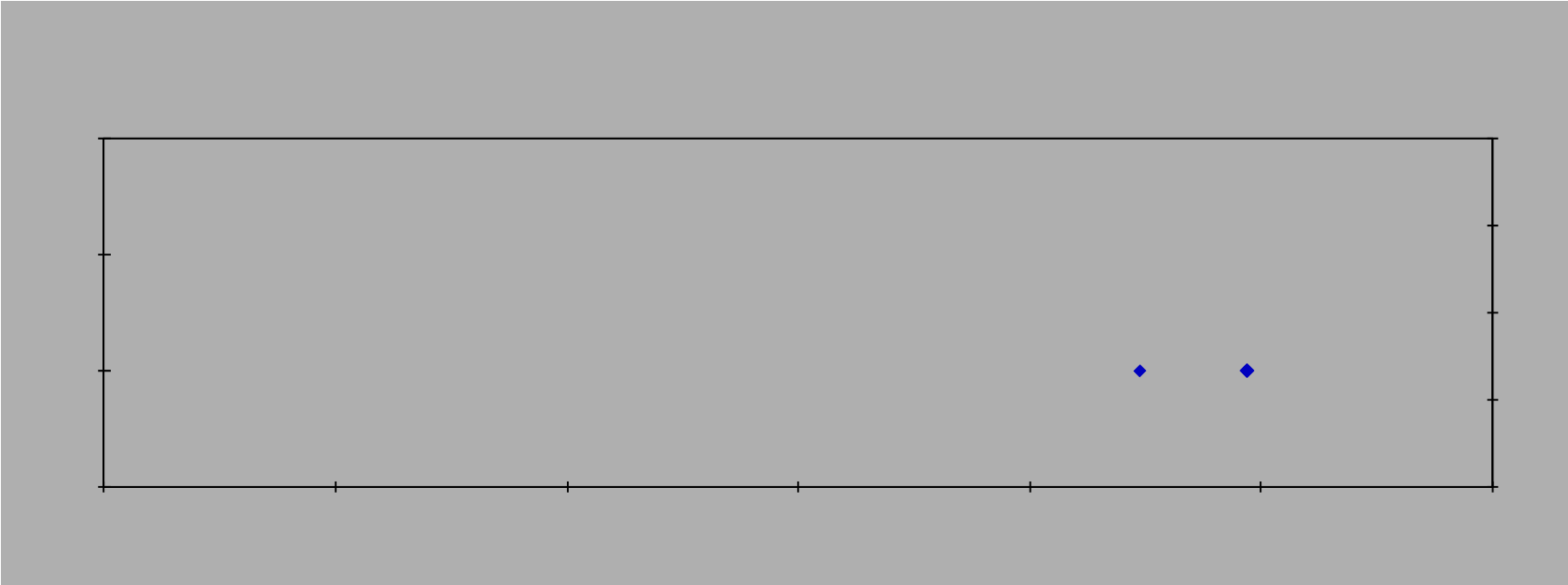


4.30 “50/40/10” Pin Bearing 3 Properties (PB3)

normalizing t_{ply}
[in]

0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	2% Offset σ	#	Avg. Specimen # Plies in	#	Comments σ	#	Avg. t_{ply}	2% Offset Strength _{norm}
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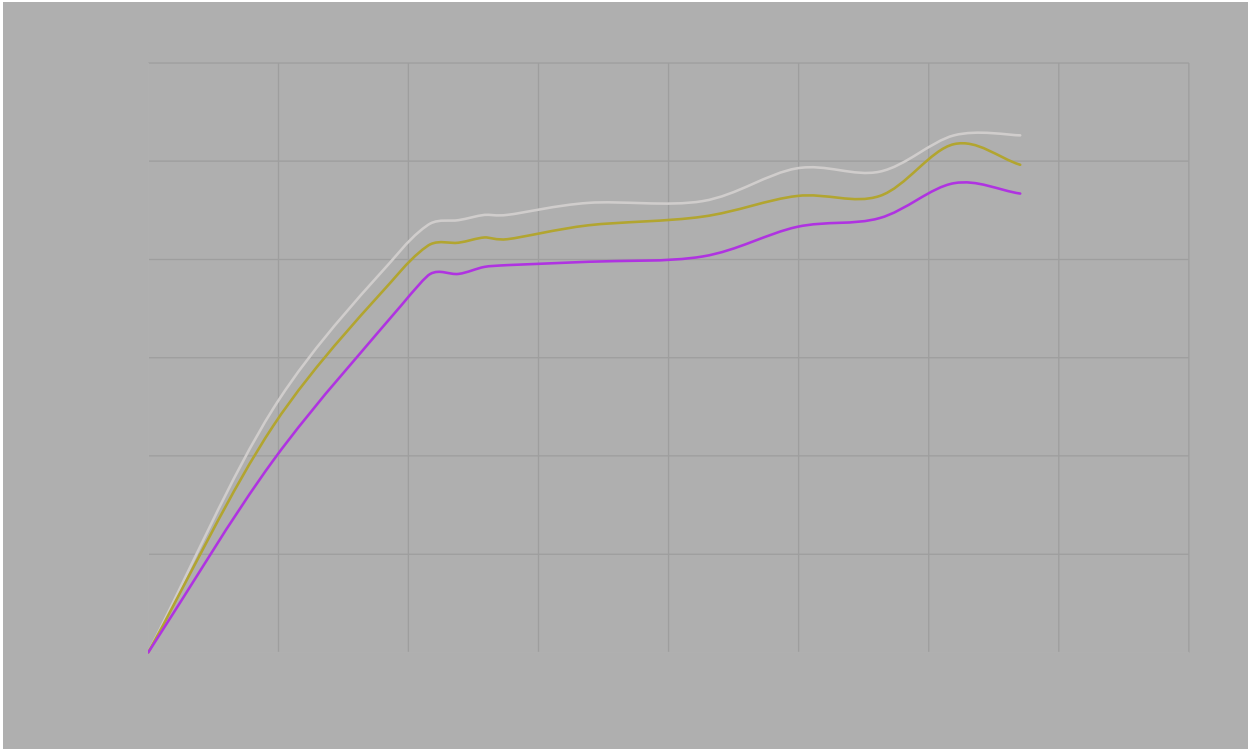


5. Shear Stress vs. Shear Strain, RTD

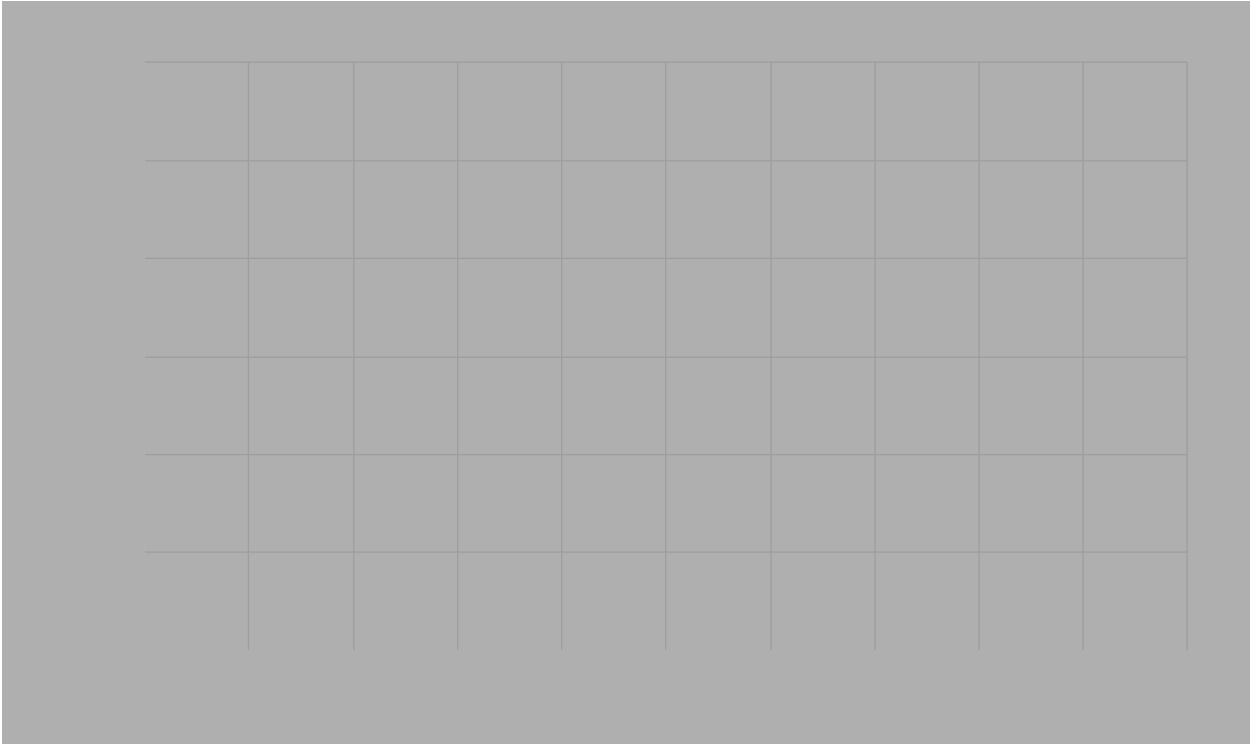


6. MOISTURE CONDITIONING CHARTS

6.1 In-Plane Shear Properties – Thinnest Panel



6.2 Pin Bearing 1 - Thickest Panel



7. DMA Results

7.1 DMA Wet Batch B

7.2 DMA Dry Batch B



Panel ID	Photomicrograph of Panel Received	Per Test Plan		Panel Received		Comment
		Correct Layup	No. of Plies	Incorrect Layup	No. of Plies	
UNC0-B-MH2-ETW		[90/0]4S	16	[90/0/90/0/90/0/90/0/0/90/0/90/0/0/90/0/90]	17	The panel has 17 plies instead of 16 plies.
UNC0-C-MH1-ETW		[90/0]4S	16	[0/90]4S	16	The 0 q plies are swapped with 90 q plies
UNC0-C-MH2-ETW		[90/0]4S	16	[0/90]4S	16	The 0 q plies are swapped with 90 q plies
UNC0-C-MH2-ETW2		[90/0]4S	16	[0/90]4S	16	The 0 q plies are swapped with 90 q plies

From the beginning a series of specimens were never tested nor included in the panel shipments to NIAR for testing. The specimens removed from the test matrix from the very beginning are the following:

- | | |
|-------------------|------------------|
| x FHT3-A-MH2-RTD | x ILT-A-MH1-ETW2 |
| x FHT3-A-MH2-CTD | x ILT-A-MH2-ET2 |
| x FHC3-A-MH1-ETW2 | x ILT-A-MH1-RTD |
| x FHC3-A-MH1-RTD | x ILT-A-MH2-RTD |

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From the material shortage noticed in the beginning, additional panels were later fabricated using two alternate cure cycles Cure 3 and Cure 4 we