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Report No: CAM-RP-2008-007 Rev C
Report Date: February 12, 2024

REVISIONS:

Rev	By	Date	Pages Revised or Added
N/C Draft	Allison Crockett and Kristin Marlett	12/4/2008	Document Initial Release
N/C Draft	Allison Crockett and Kristin Marlett	3/30/2009	Several values changed due to copy/paste error
N/C Draft	Allison Crockett and Kristin Marlett	4/7/2009	UNC0 Batch A cure cycle 2 (ETW) should be included in calculations.
N/C Draft	Allison Crockett and Kristin Marlett	4/13/2009	Backout factor changed for ETW2 from 342.58 to 342.57 normalized and 333.94

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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
B	Evelyn Lian	3/18/2018	- Typographical and Editorial changes - Updated Tg wet value in Lamina Summary Data

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List of Tables

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

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

ν_{12}^{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
ν_{12}^{c}	major Poisson's Ratio, compression
ν_{21}^{c}	minor Poisson's Ratio, compression
$F_{12}^{s5\% \text{ strain}}$	in-plane shear, strength at 5% strain
$F_{12}^{s0.2\%}$	in-plane shear, strength at 0.2% offset
G_{12}^{s}	in-plane shear modulus

Superscripts

c	compression
cu	compression ultimate
s	shear
su	shear ultimate
t	tension
tu	tension ultimate

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.

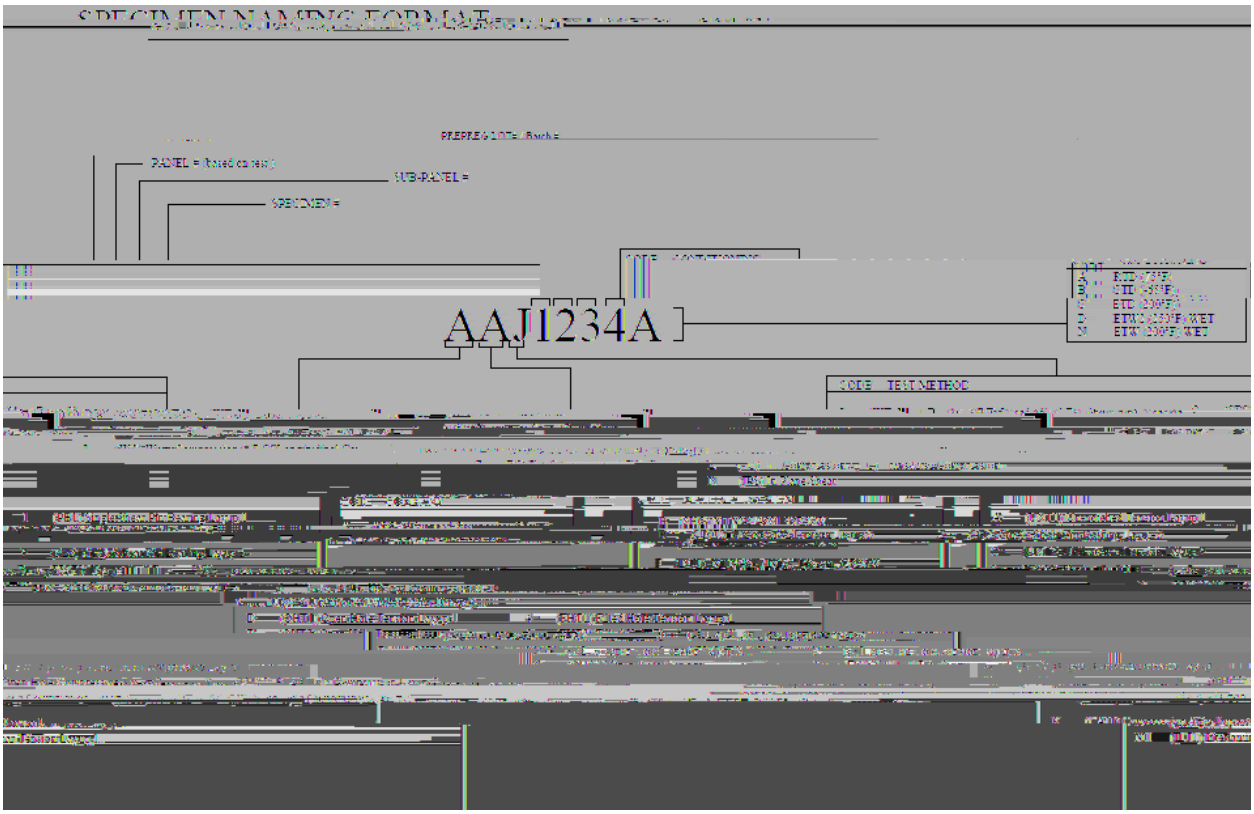
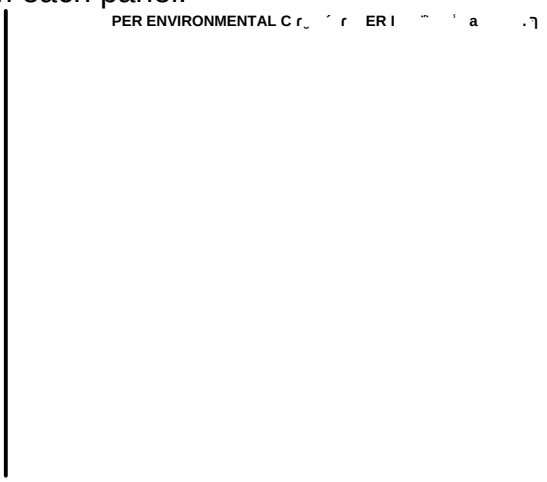


Figure 1-1: NIAR – ACG Specimen Naming Format Correlation

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.



1.5.2 Specimen & Testing Details

1.5.2.1 Tabbing

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".

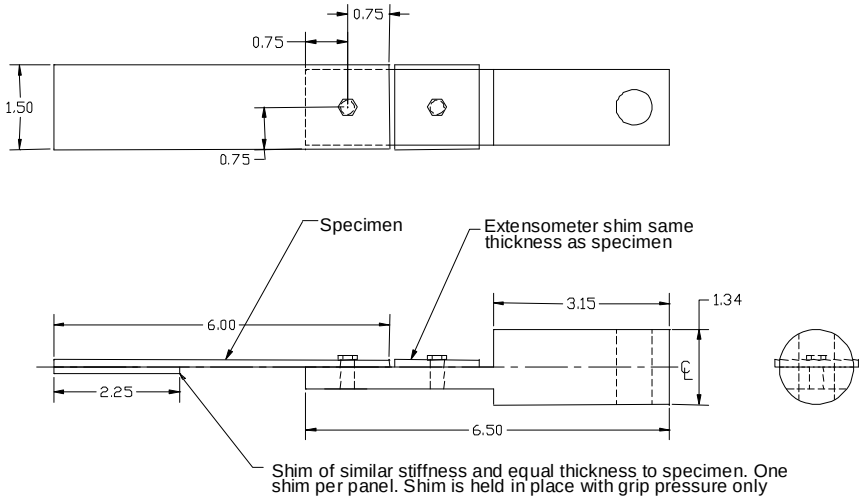


Figure 1-4: Modified ASTM D5961 (Pin Bearing) Specimen and Loading Arrangement

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 [45/0/-4/-45]S	90]3S St rTe q	2x3	1x2x3	1x2x3	
(25/50/25 - QI) OHCHT3	ASTM D5766 Open Hole Te [45/0/	90]3S Str T ž 5/	2x[45/ δ	5/0/-45]S	4 Š	

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±5°F, ambient moisture content dry
RTD = room temperature ambient dry
RTA = room temperature ambient – no drying required
ETD = 200±5°F dry
ETW= 200±5°F, wet (equilibrium moisture content)
ETW2=250±5°F, wet (equilibrium moisture content)

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

For dry testing, specimens were dried at 160°F±5°F for 120 to 130 hours. When drying was completed, specimens were either stored until testing in a sealed oven maintained at 85°F ± 5°F or alternately stored with desiccant in a sealed container. For wet testing, specimens were conditioned to equilibrium in a 160°F±5°F and 85% ± 5%RH environment in accordance with ASTM D 5229/D5229M Procedure C. Equilibrium was determined in accordance with DOT/FAA/AR-03/19 section 3.2. When conditioning was

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/m^2 and the average of the four batches of material was 143.85 g/m^2 therefore normalization by cured ply thickness (CPT) was used, i.e.:

Normalized strength=Measured Strength x Measured CPT/Nominal CPT

The nominal CPT is 0.0055 inch and the average CPT 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, 8/25Þ, M ³ if &y if , = Ş 20 M ˗ 0r

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**	**Normalized**	**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_1^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	
Resin content:	34.546 % wt	**Comp. density:** 1.538 [g/cc]		**ACG - MTM45-1/ IM7 Uni**	
Fiber volume:	56.863 % vol			**[90]16**	
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**	**Normalized**	**Measured**
	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
F_2^{tu} (ksi)	**C.V.(%)**		16.97		16.97		23.44		21.10
	No. Specimens	18		21		19		18	
	No. Prepreg Lots	3		3		3		3	
	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
E_2^t (Msi)	**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**
	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
E_1^c **(Msi)**	**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	
ν_{12}^c	**Mean**	0.346		0.361		0.373		0.389	
	No. Specimens	21		22		18		20	
	No. Prepreg Lots	3		3		3		3	

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

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	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:	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		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 ĭ ĭ ĭ µ f 1 A o o l

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 1TĐ ŧ r ?	
Equilibrium at T, RH							
Source code		AFAX X1XB		AFAX X1XA		AFAX X1XD	
		Normalized	**Measured**	**Normalized**	**Measured**	**Normalized**	**Measured**
	Mean	130.69	128.55	132.81	130.80	124.13	120.97
	Minimum	119.58	117.88	125.59	123.17	114.85	111.02
	Maximum	144.13	140.31	146.63	142.85	129.07	126.33
UNT1 Strength (ksi)	**C.V.(%)**	5.78	5.26	4.94	4.23	4.37	4.62
	No. Specimens	18		18		6	
	No. Prepreg Lots	3		3		1	
	Mean	8.27	8.14	8.13	8.01	8.31	8.10
	Minimum	7.71	7.59	7.65	7.50	7.89	7.63
	Maximum	8.83	8.83	8.41	8.32	9.00	8.75
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		75		200		200		250	
Moisture Conditioning		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	
ν_{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	76.78

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 Ɑ| - ŧ ʎa i0 l'

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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
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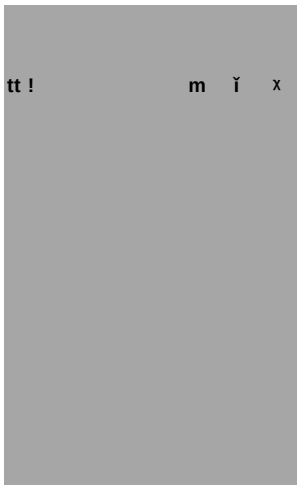

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2.3.15 Laminate Short-Beam Strength Properties (SBS1)

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			

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	
Resin content:	32.093 % wt		**Comp. density:** 1.533 [g/cc]			**ACG - MTM45-1/ IM7 Uni**	
Fiber volume:	58.824 % vol					**[45/-45/0/45/-45/90/45/-45/45/-45]S**	
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)

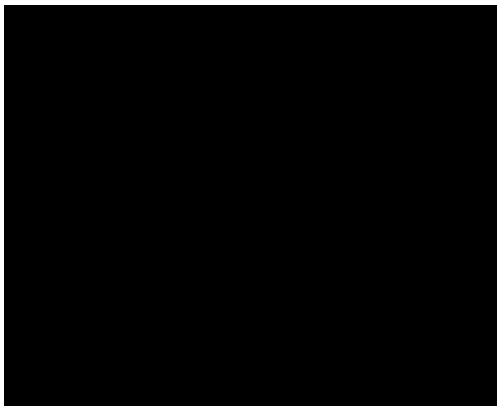
Material: Advanced Composites Group - MTM45-1/ IM7 Uni

Resin content: 32.804 % wt **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”Ω 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 åC2M re t-3 r med-µsur;-Ve**
-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

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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**		
OHC2 Strength (ksi)	**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		
	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**	
OHC3 Strength (ksi)	**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	
	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		ETW2	
	75		250	
	dry		equilibrium	
			160 F,85%	
	AF7X X1XA		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

	Normalized	Measured	Normalized	Measured
Mean	53.80	52.58	35.67	35.34
Minim n	**90**	**22.88**	**35.34**	

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

Material:	Advanced Composites Group - MTM45-1/ IM7 Uni					**Filled-Hole Compression 3**	
Resin content:	33.129 % wt	**Comp. density:** 1.539 [g/cc]				**Gr/ Ep**	
Fiber volume:	58.157 % vol					**ACG - MTM45-1/ IM7 Uni**	
Ply count:	20					**[0/0/45/0/90/-45/0/45/0/-45]S**	
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**		
PB2 2% Offset Strength (ksi)	**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		
	C.V.(%)	3.73	4.26	9.02	10.87		
	No. Specimens	6		18			
	No. Prepreg Lots	1		3			

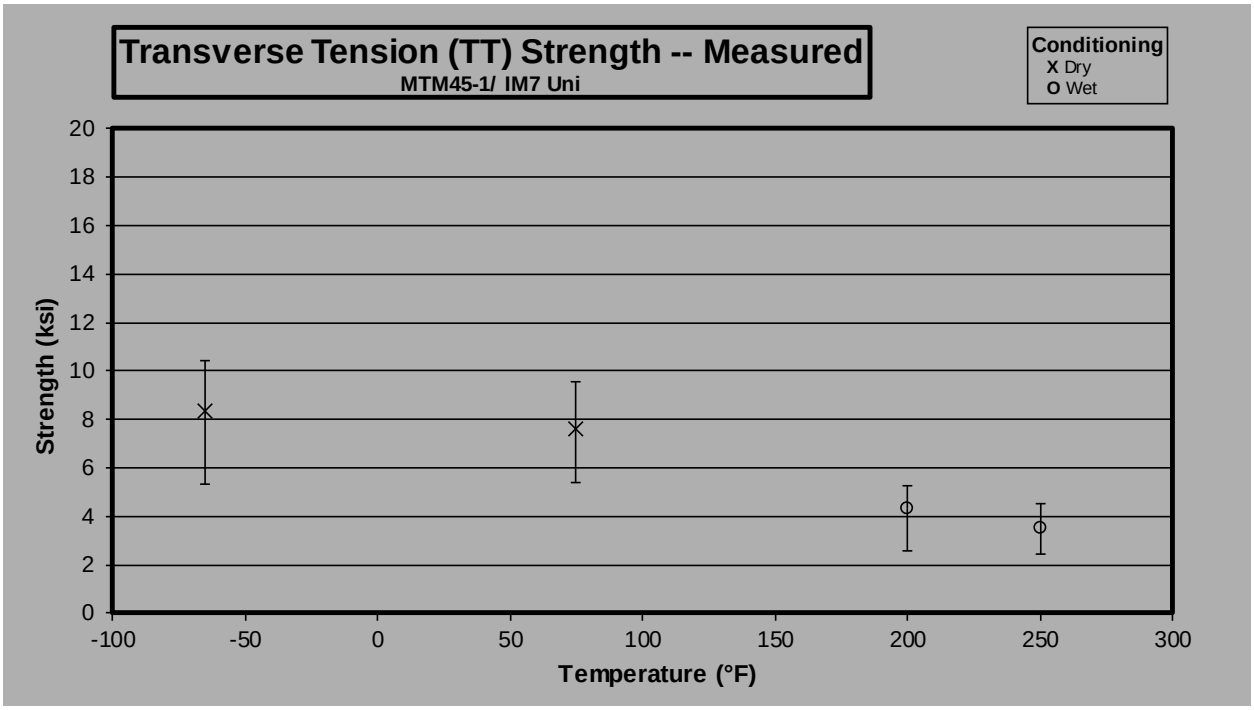
2.3.30 “50/40/10” Pin Bearing 3 Properties (PB3)

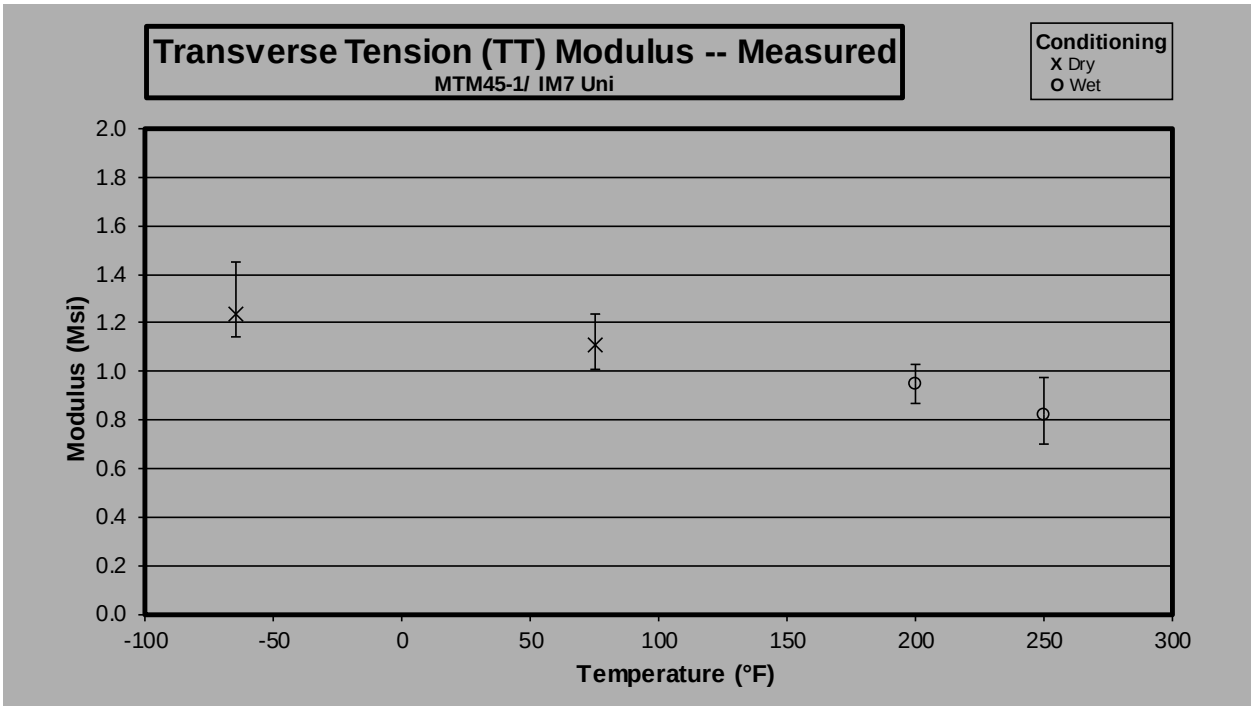
Material:	Advanced Composites Group - MTM45-1/ IM7 Uni		
Resin content:	33.446 % wt	**Comp. density**	1.538 [g/cc]
Fiber volume:	57.818 % vol		
Ply count:	20		
Test meth e:			

3. Individual Test Charts

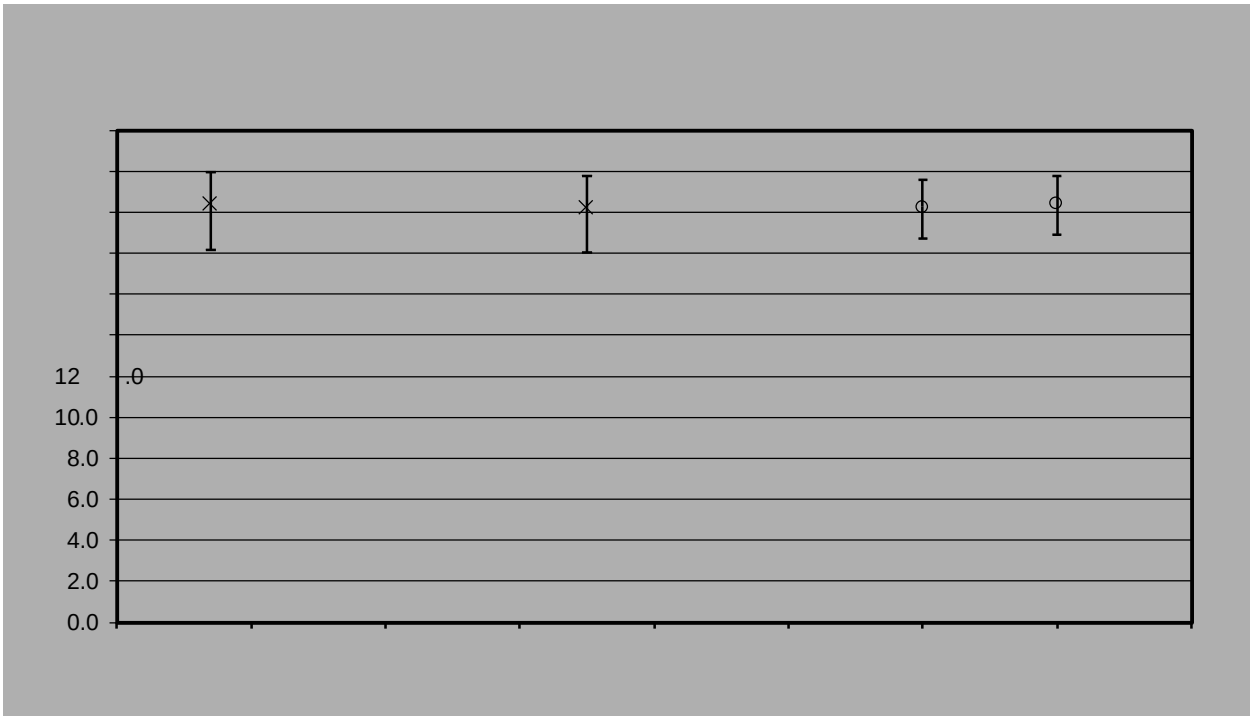
These charts combine all batches of data and plot the minimum and maximum modulus and strength range based on the test temperature.

3.2 Transverse Tension Properties (TT)

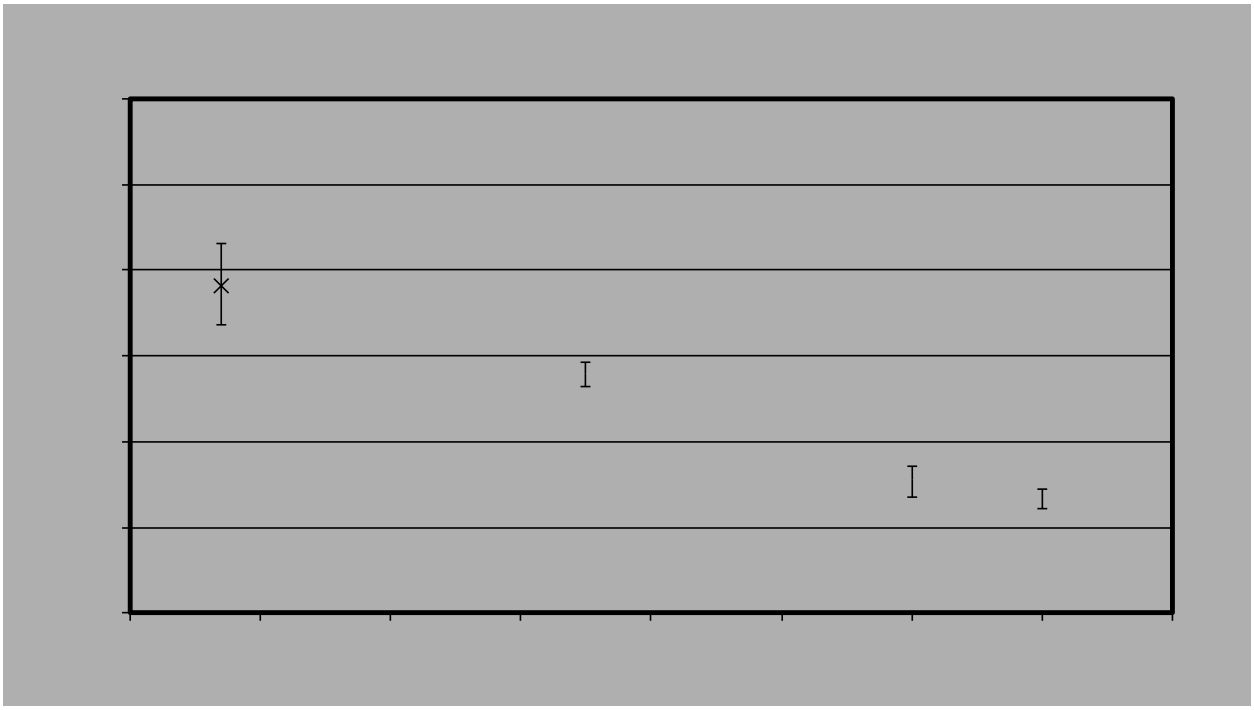




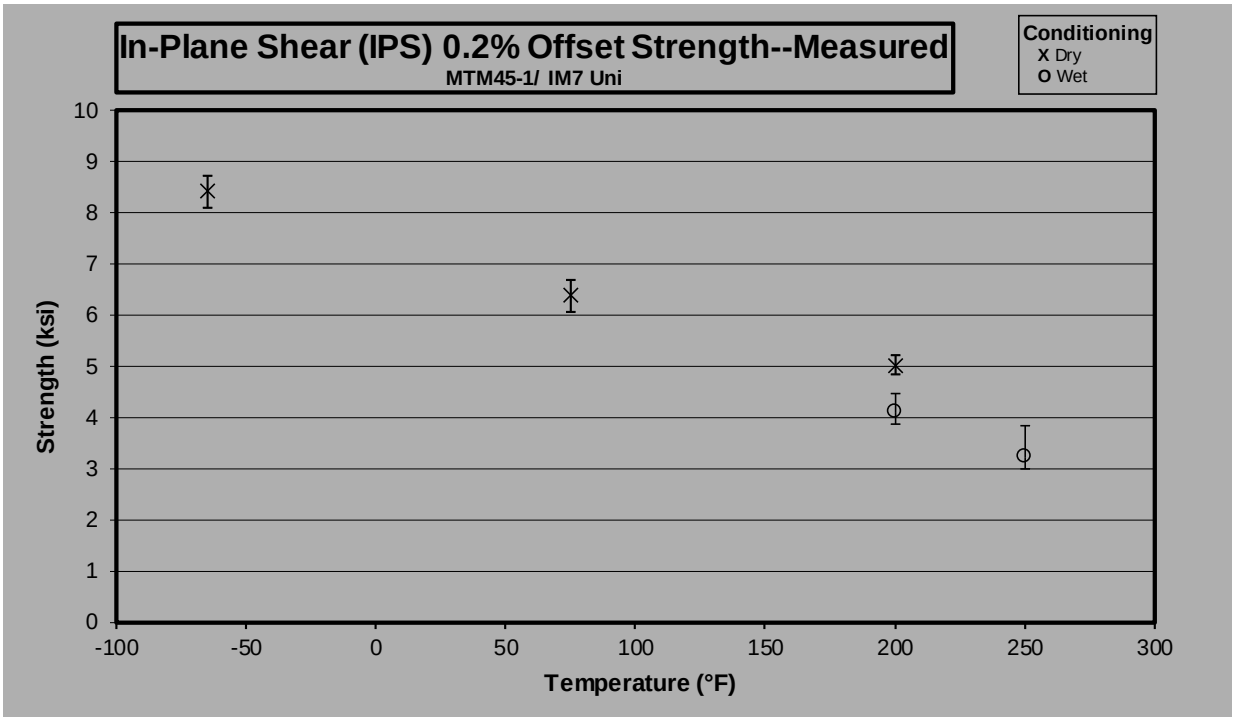
3.3 Longitudinal Compression Properties (LC)

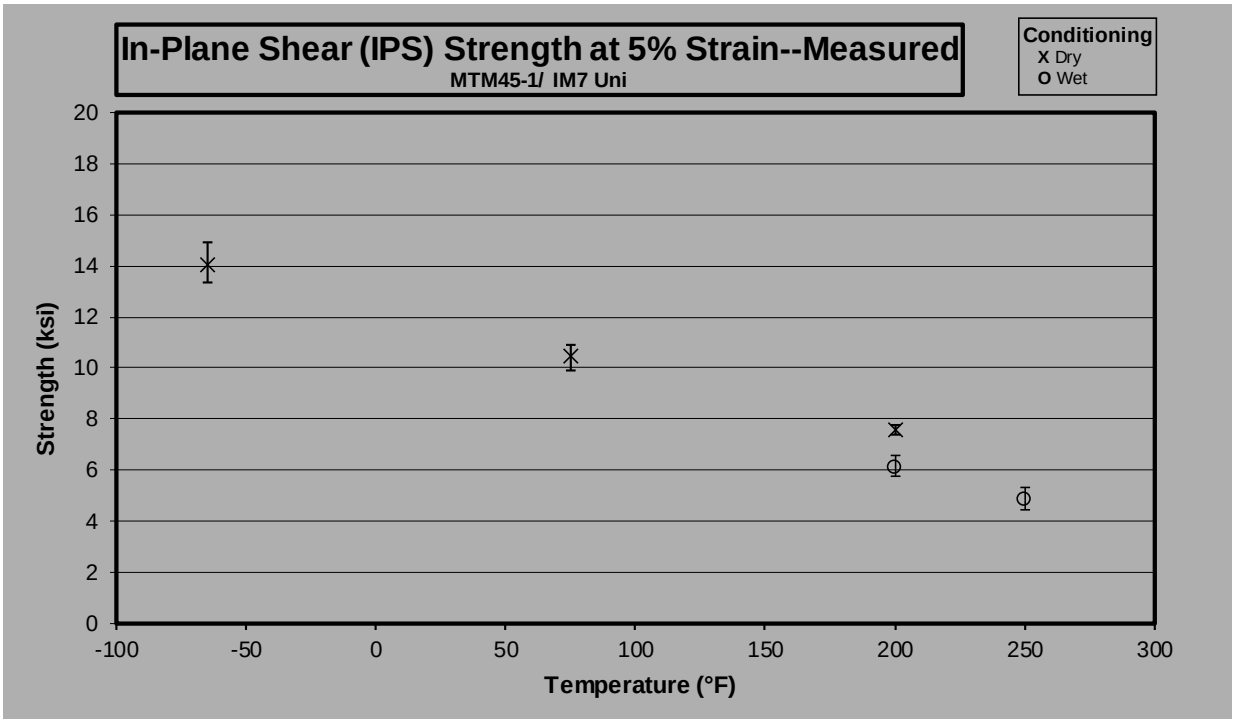


3.4 Transverse Compression Properties (TC)

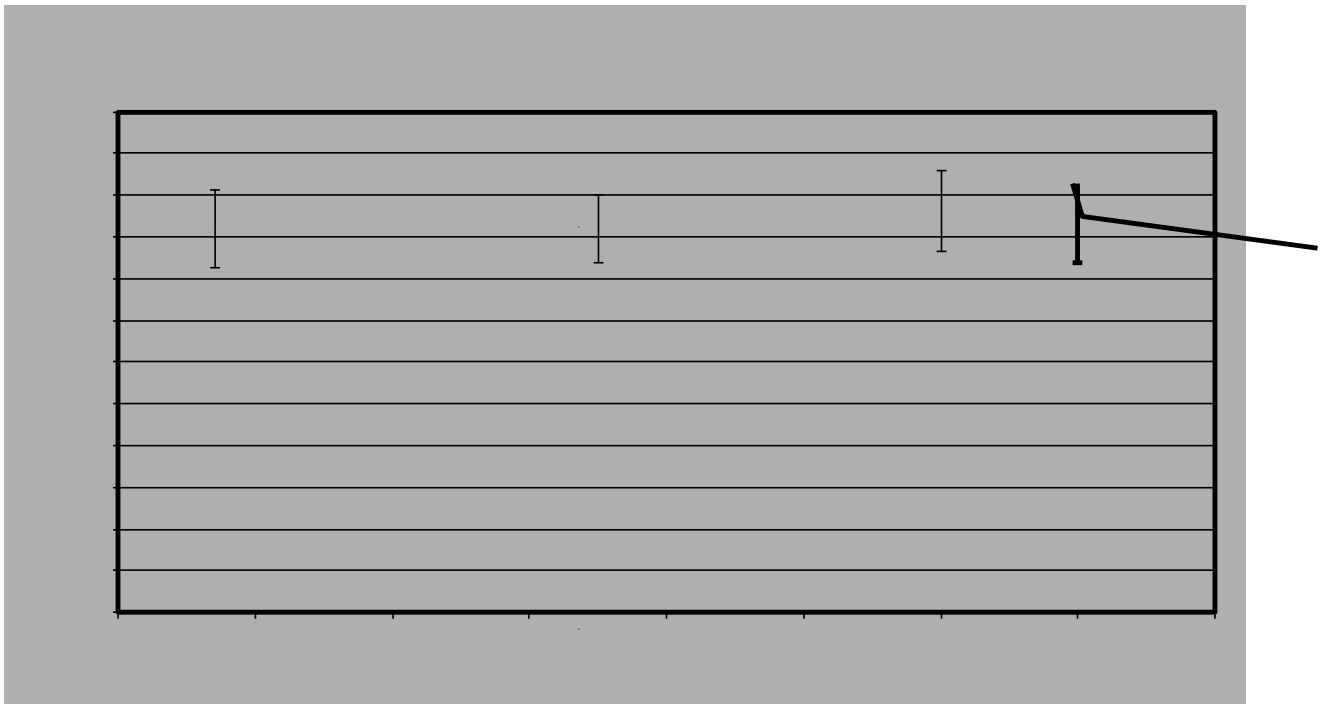


3.5 In-Plane Shear Properties (IPS)

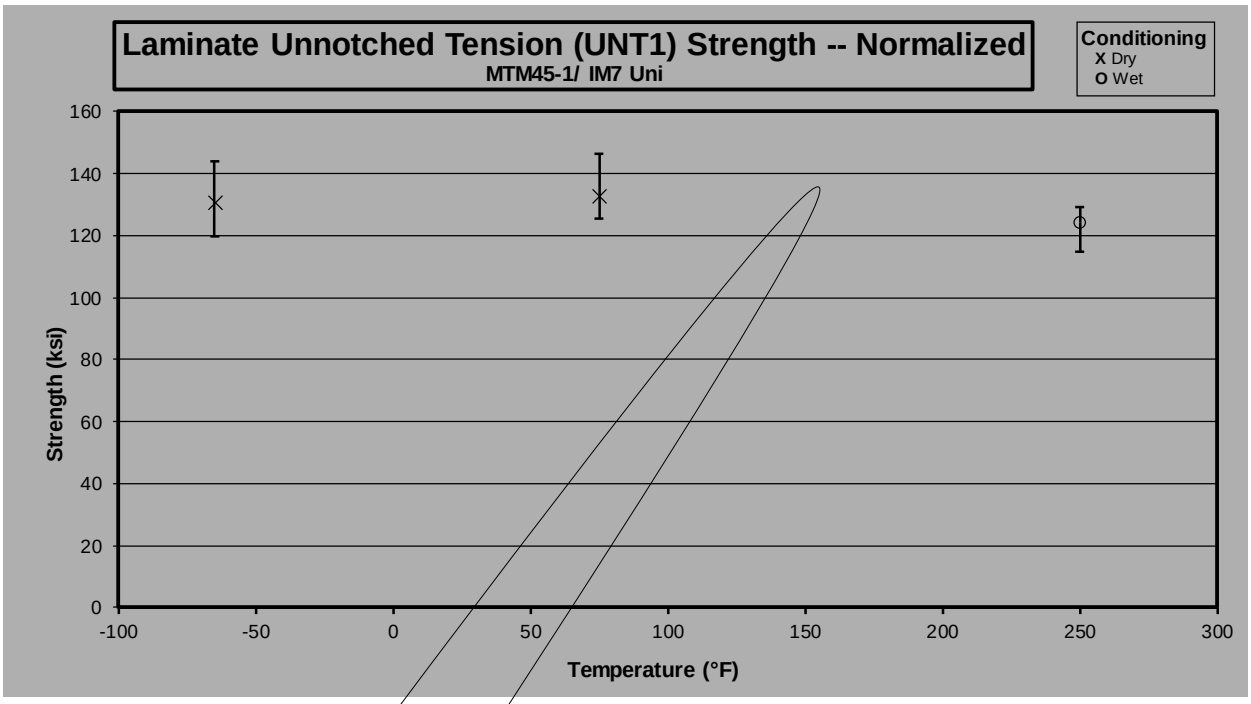




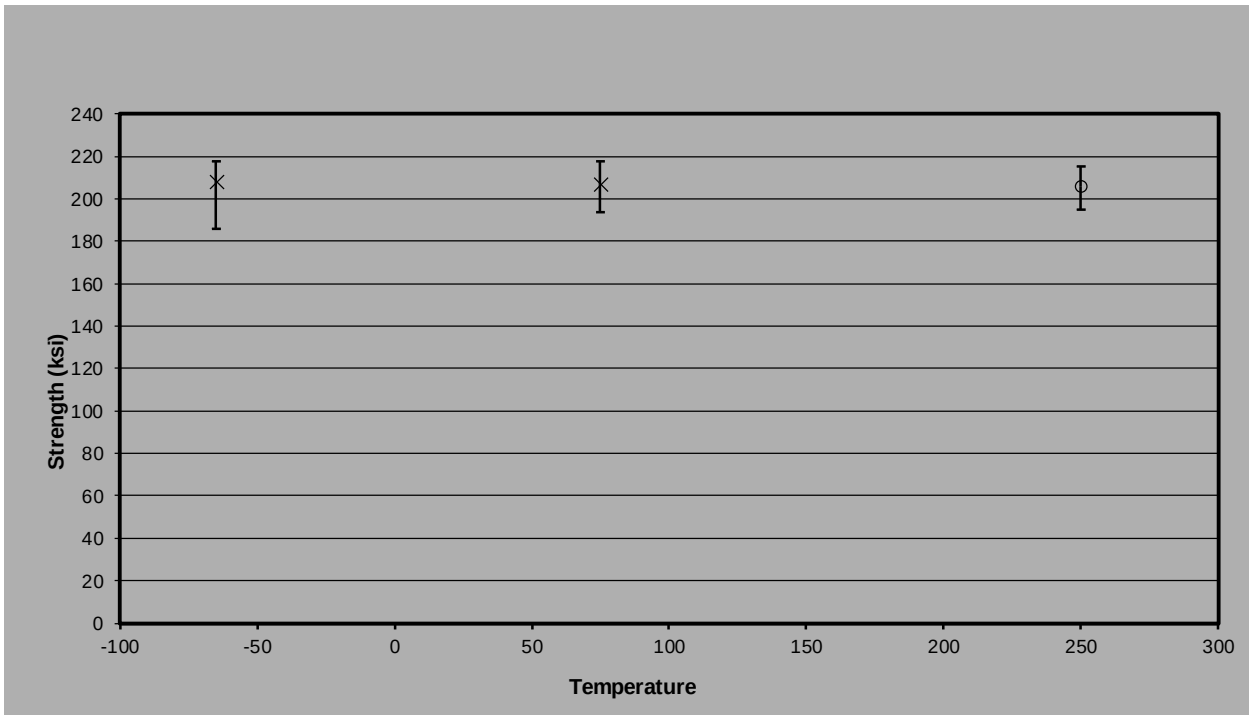
3.6 “50/0/50” Unnotched Tension 0 Properties (UNT0)



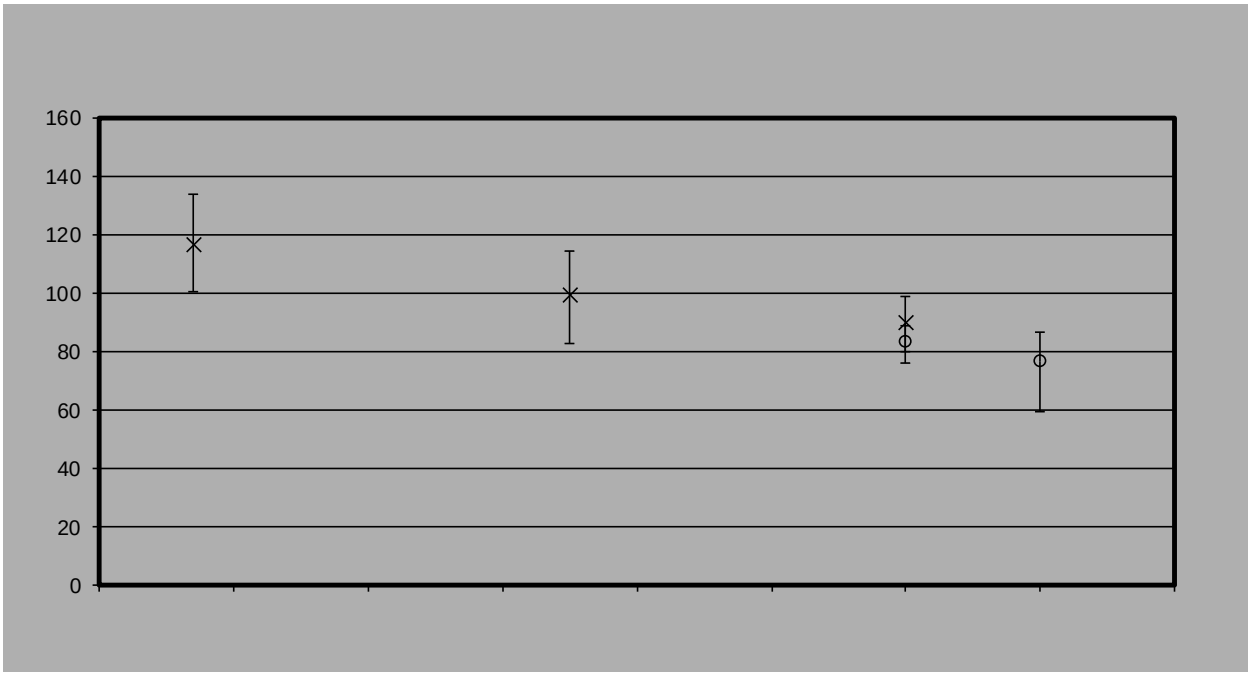
3.7 “25/50/25” Unnotched Tension 1 Properties (UNT1)



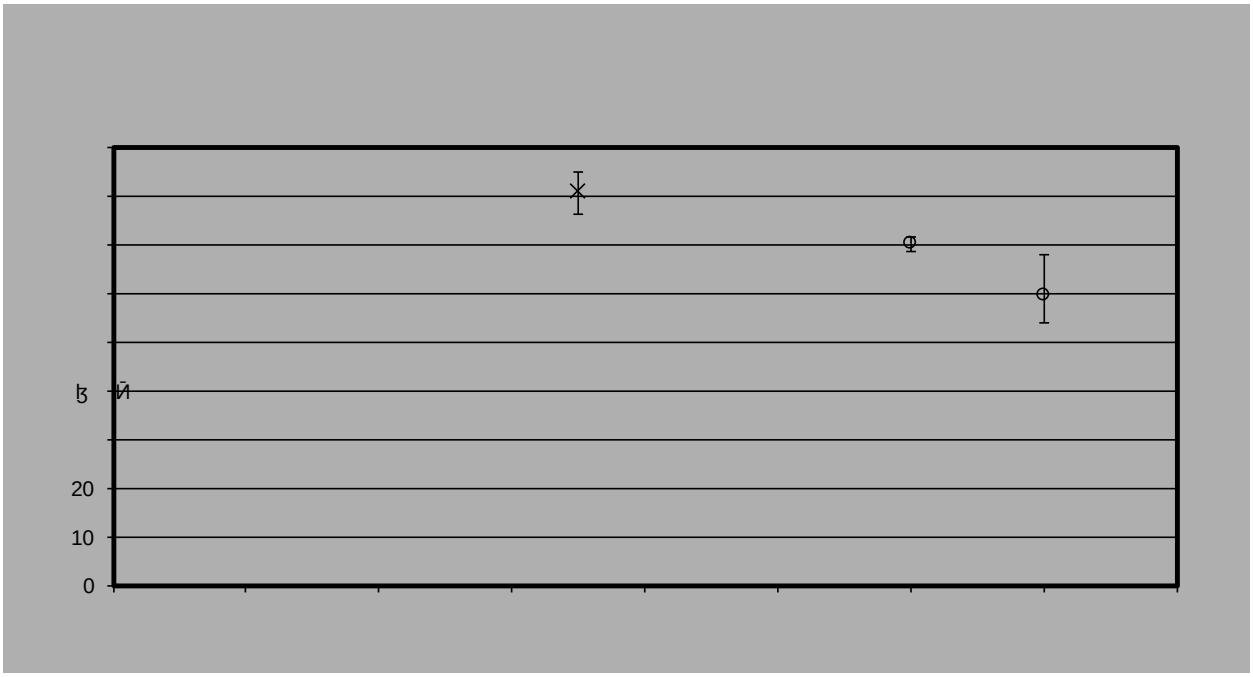
3.9 “50/40/10” Unnotched Tension 3 Properties (UNT3)



3.10 “50/0/50” Unnotched Compression 0 Properties (UNC0)

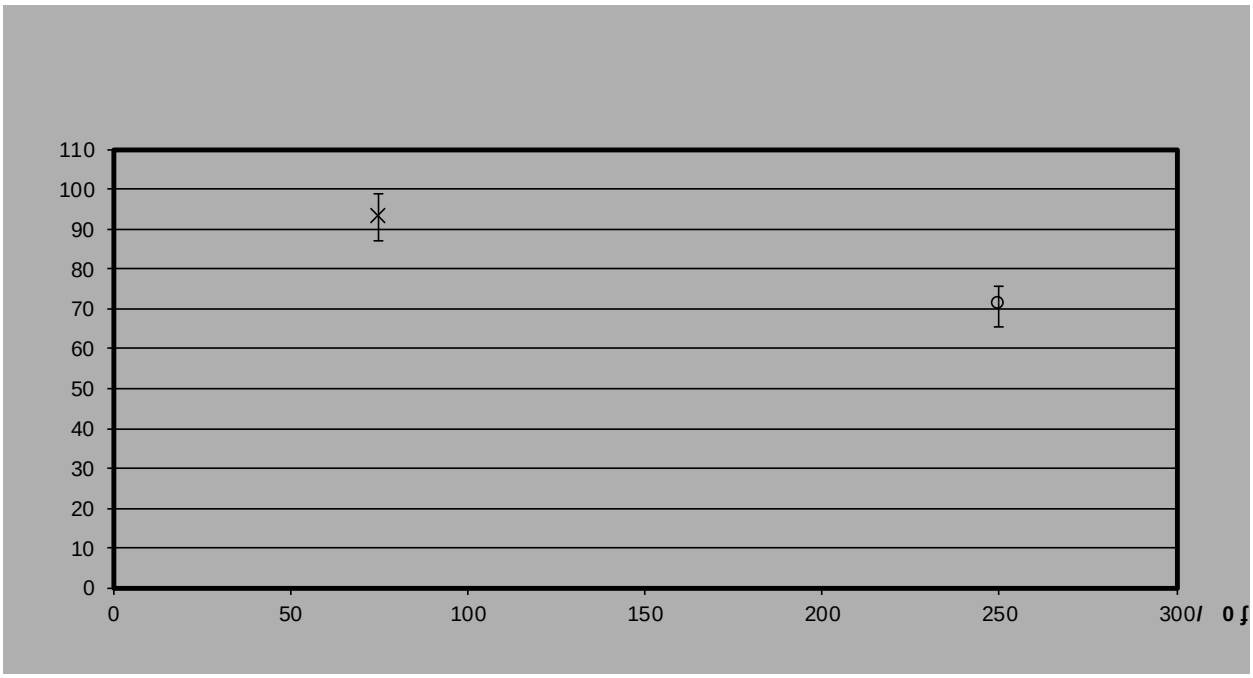


3.11 “25/50/25” Unnotched Compression 1 Properties (UNC1)

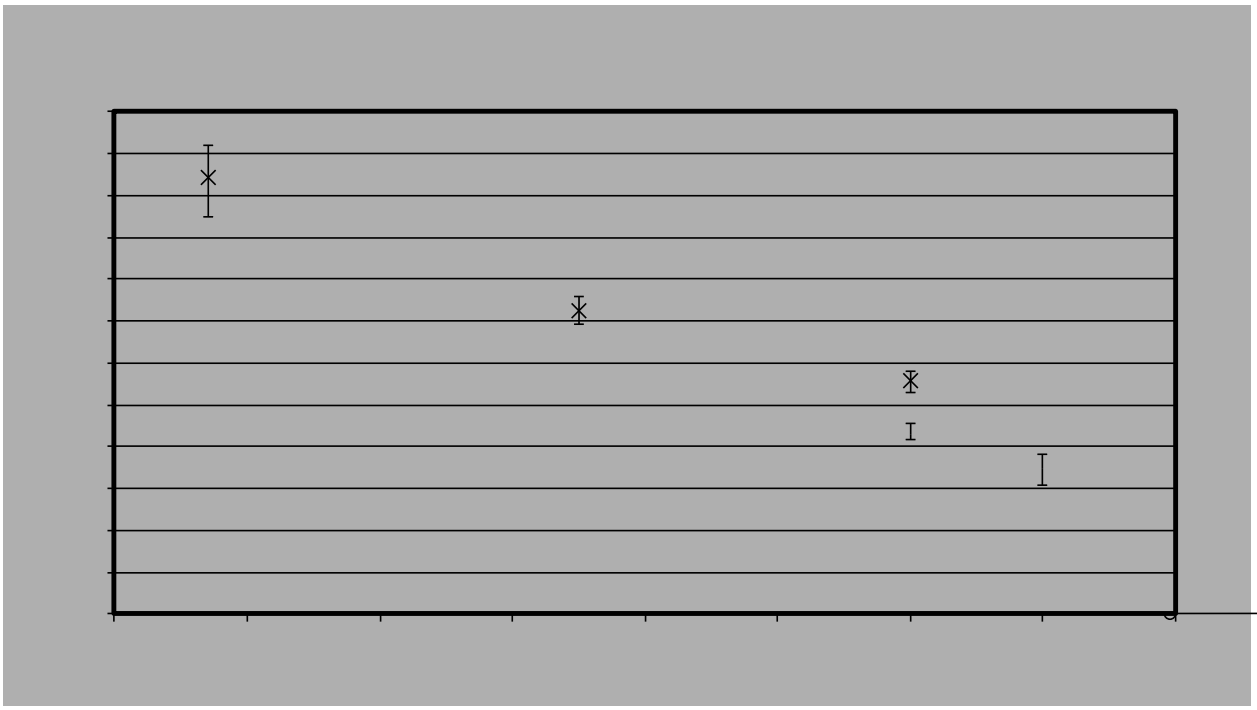


3.12 “10/80/10” Unnotched Compression 2 Properties (UNC2)

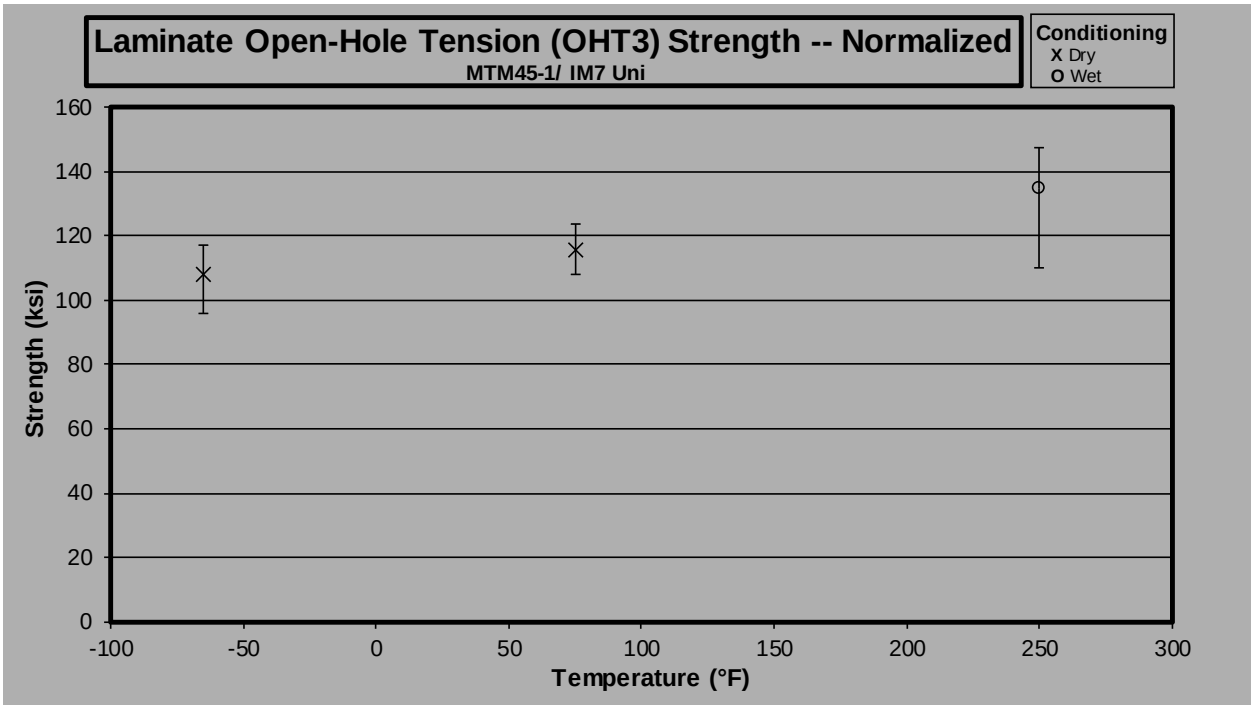
3.13 “50/40/10” Unnotched Compression 3 Properties (UNC3)



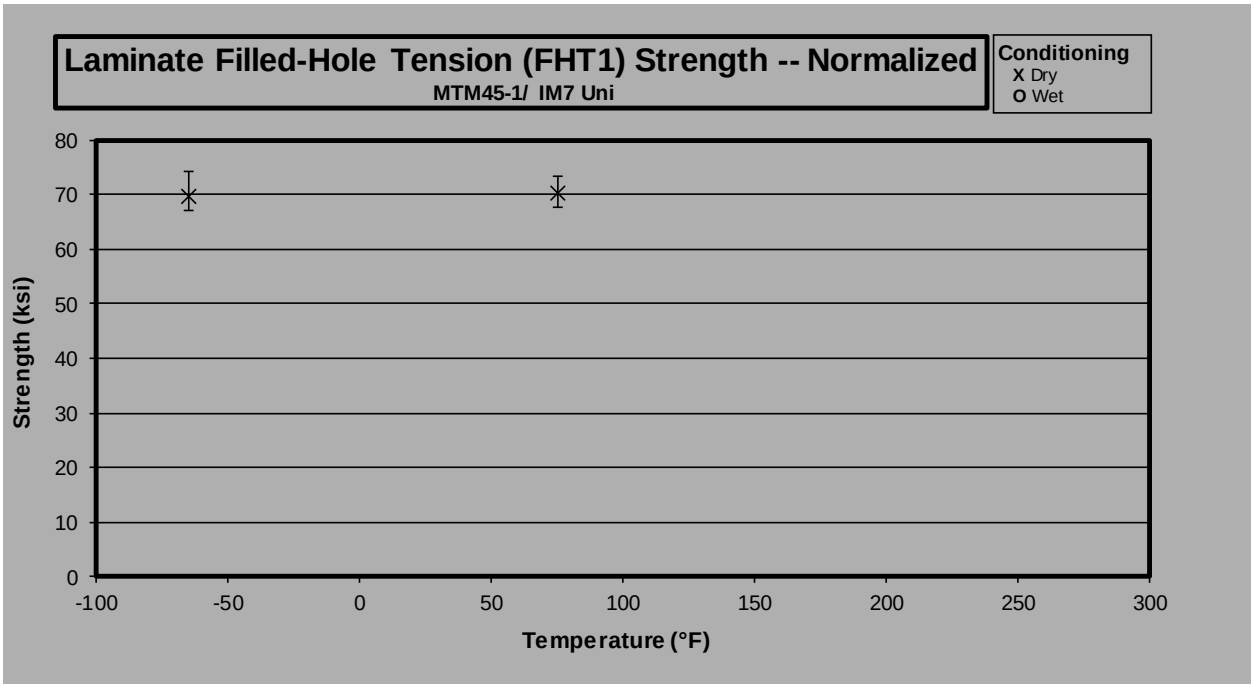
3.14 Lamina Short Beam Strength Properties (SBS)



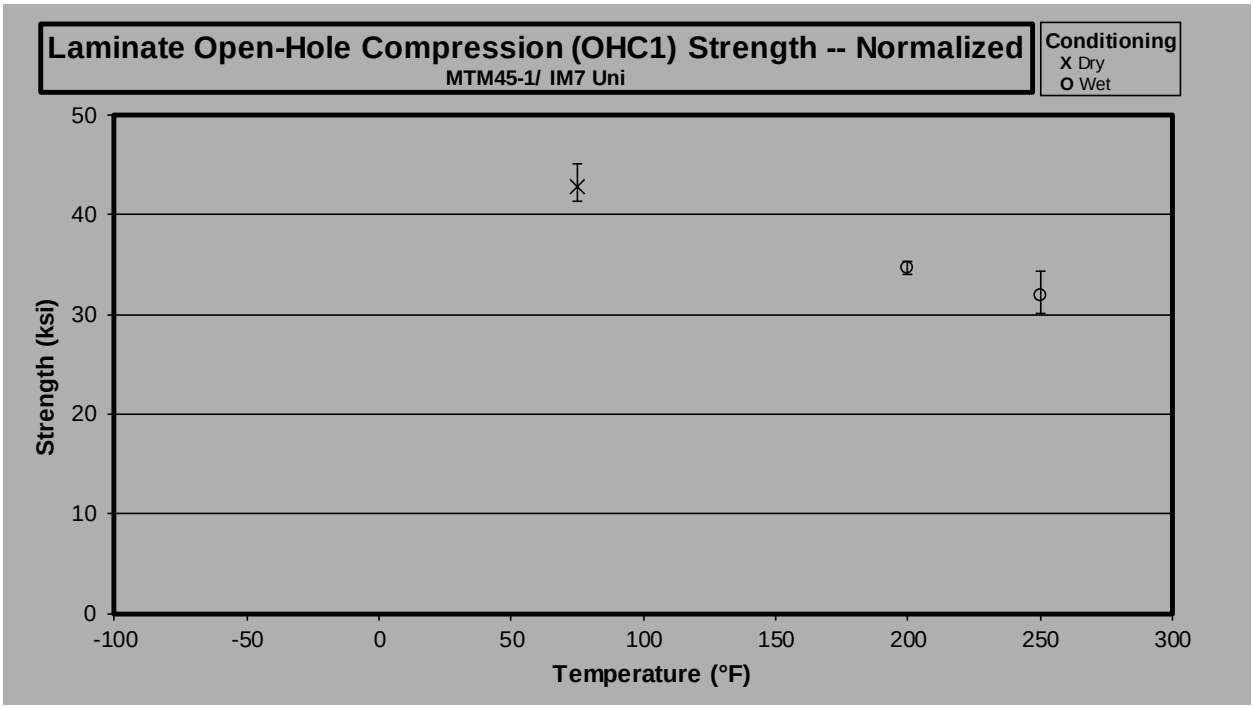
3.18 "50/40/10" Open-Hole Tension 3 Properties (OHT3)



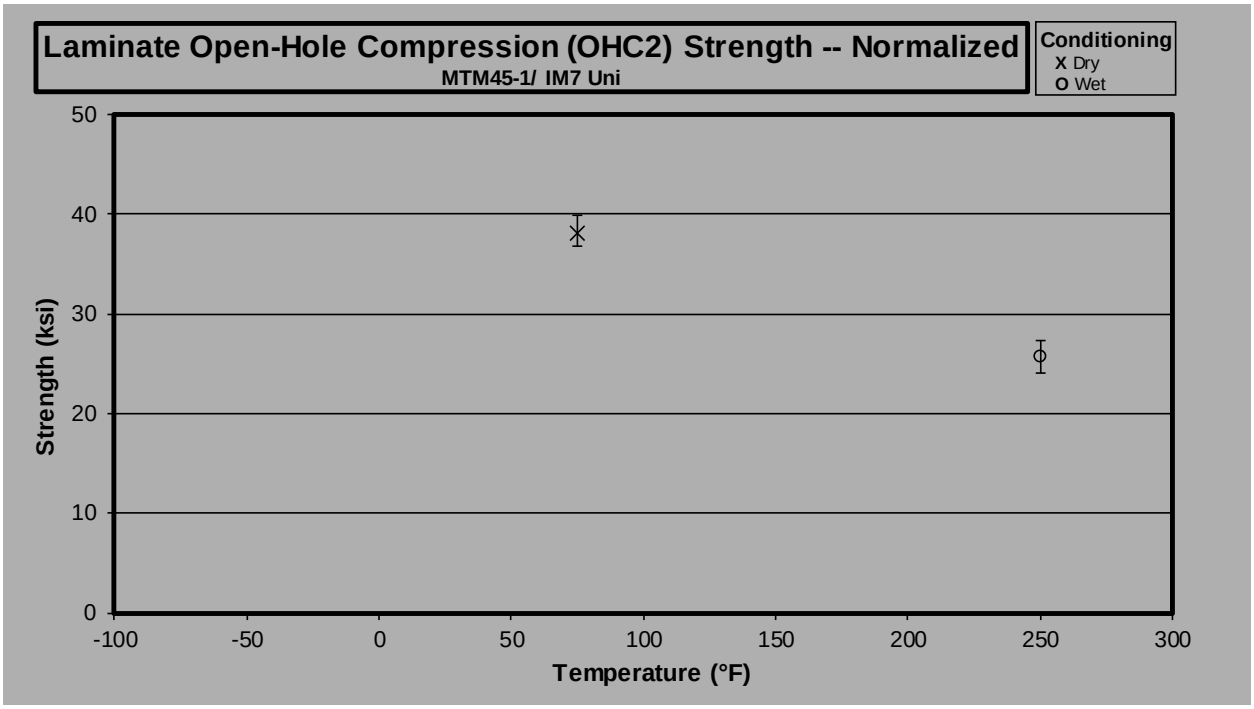
3.19 "25/50/25" Filled-Hole Tension 1 Properties (FHT1)



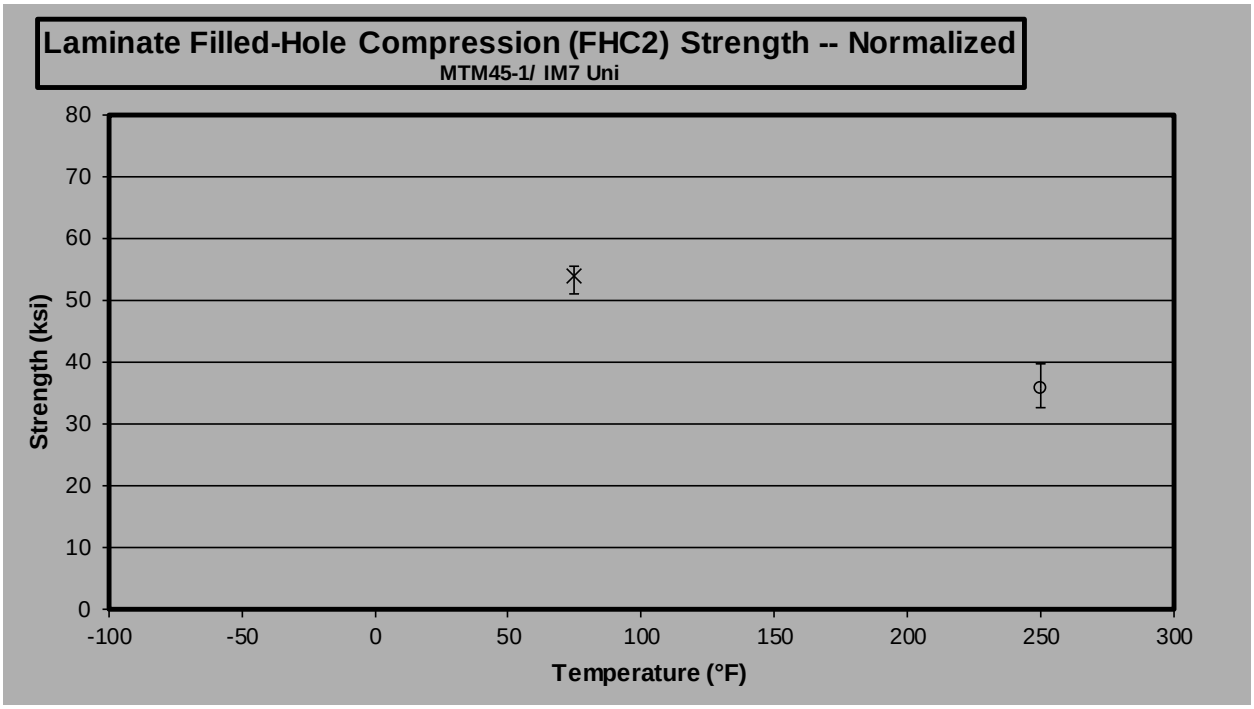
3.22 "25/50/25" Open-Hole Compression 1 Properties (OHC1)



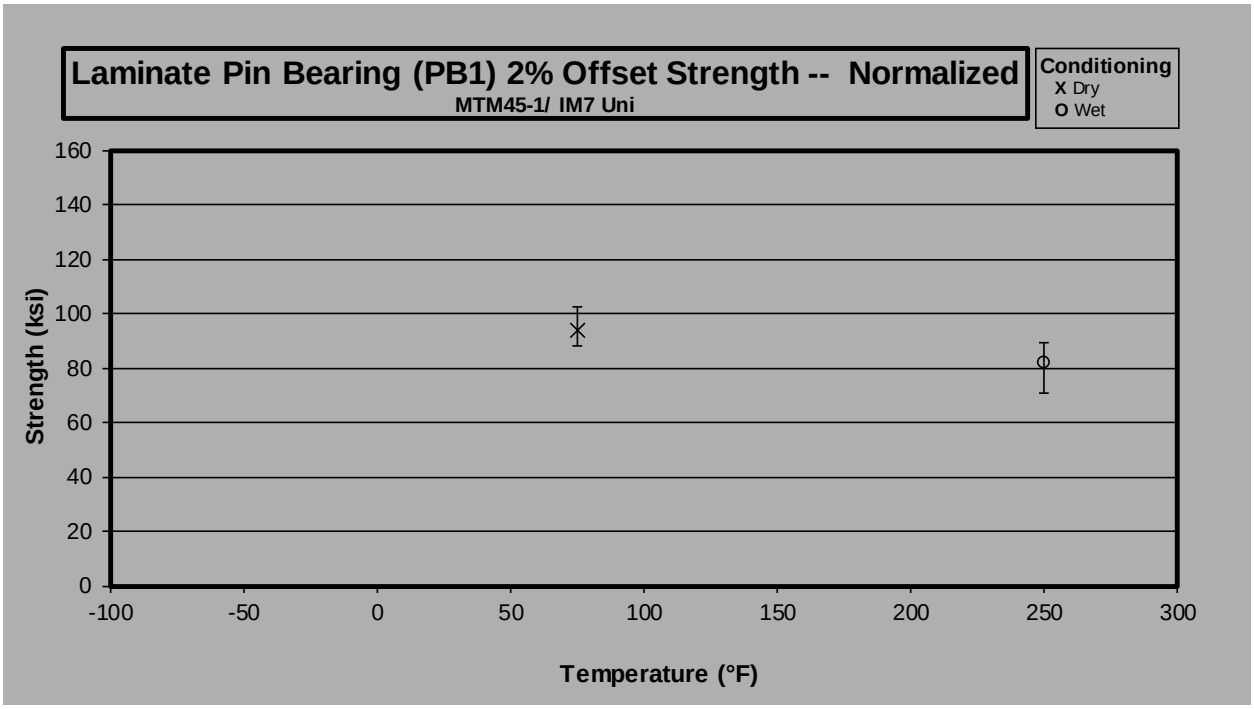
3.23 "10/80/10" Open-Hole Compression 2 Properties (OHC2)



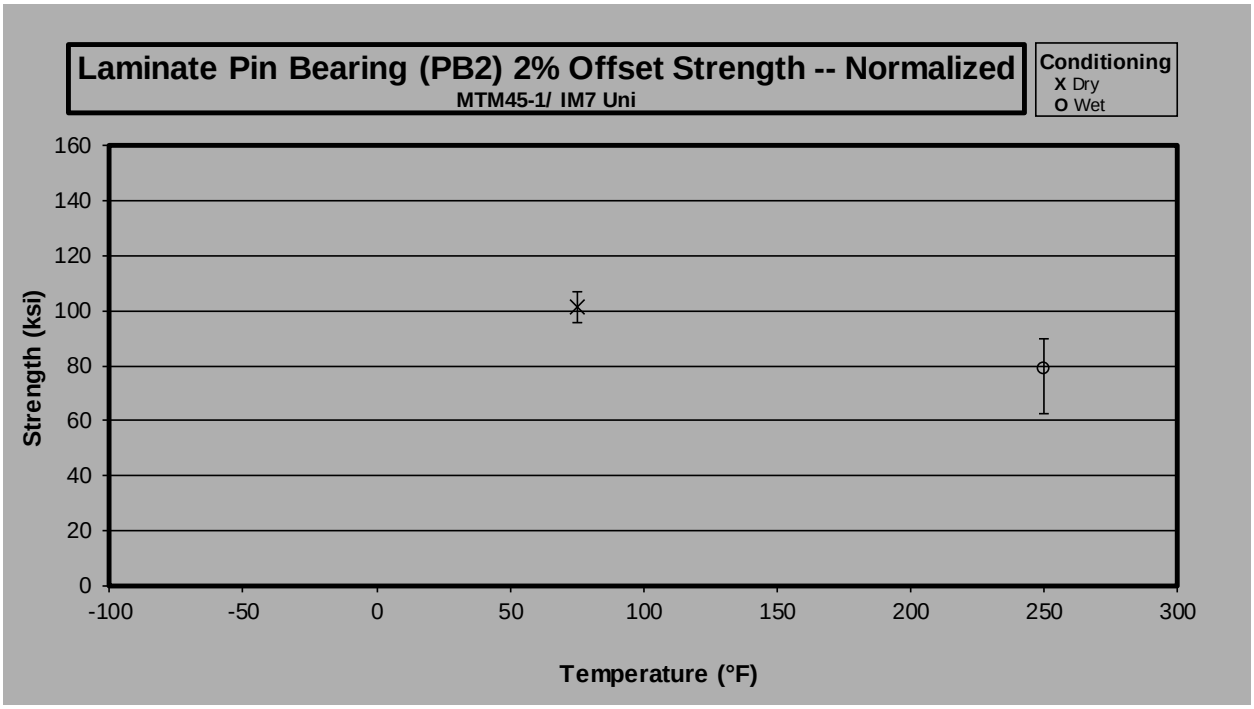
3.26 "10/80/10" Filled-Hole Compression 2 Properties (FHC2)



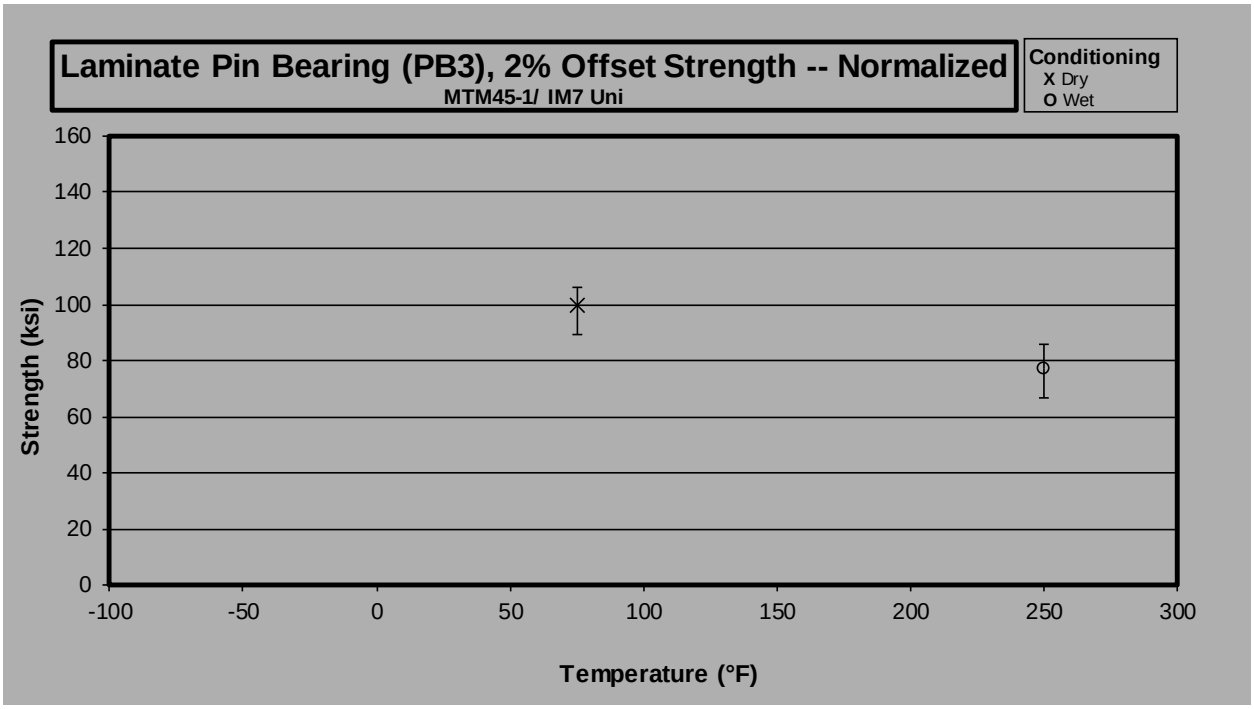
3.28 “25/50/25” Pin Bearing 1 Properties (PB1)



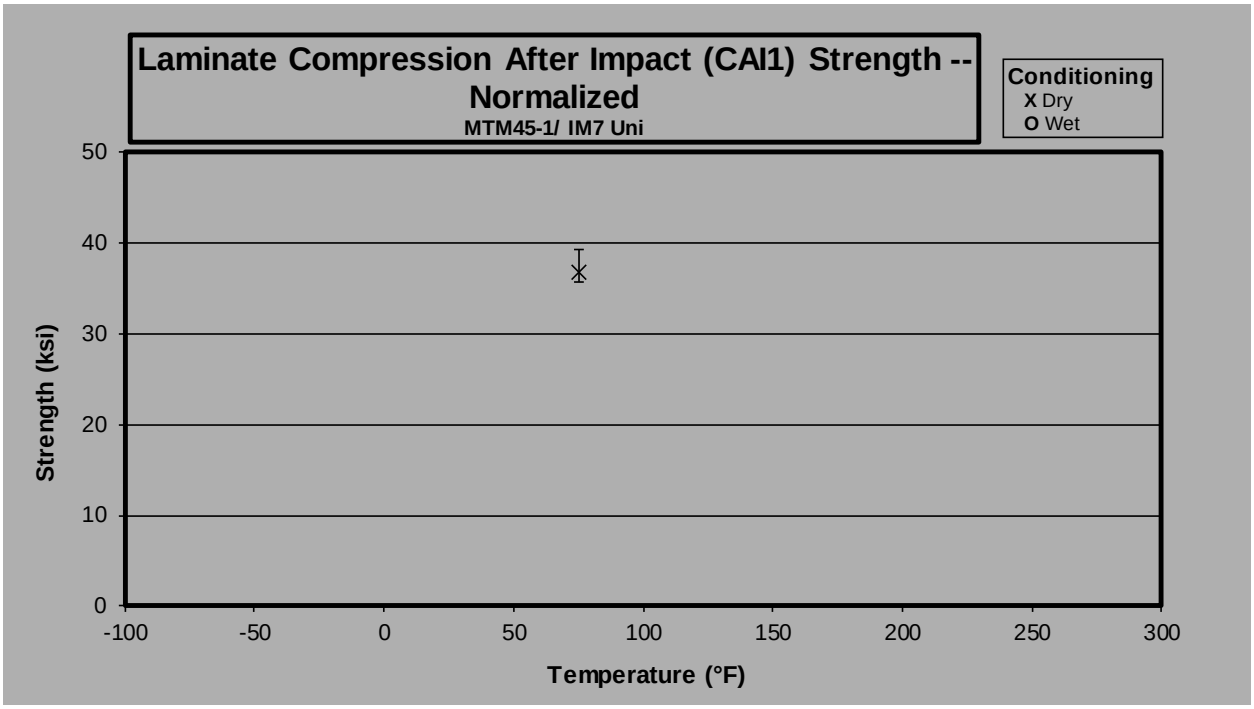
3.29 “10/80/10” Pin Bearing 2 Properties (PB2)



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



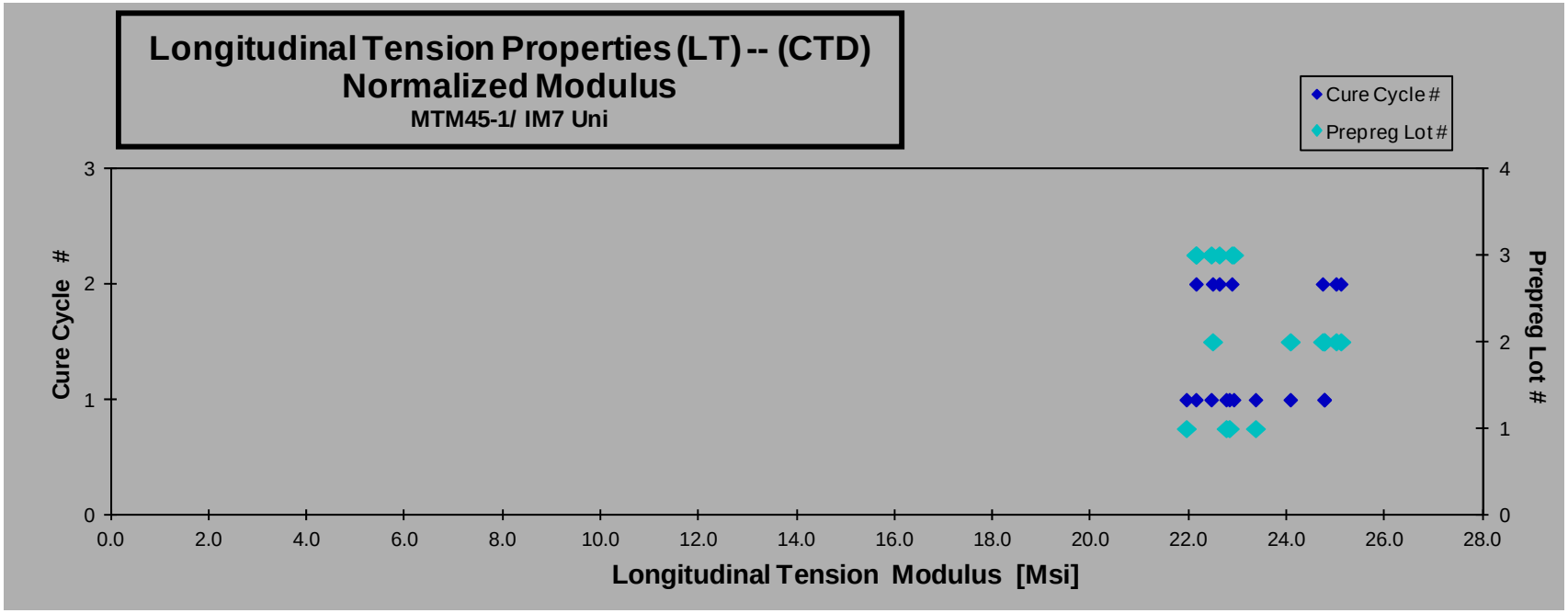
3.31 "25/50/25" Compression After Impact 1 Properties (CAI1)



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 Thickn. [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	21.357


Longitudinal Tension Properties (LT) -- (CTD)
Normalized Modulus
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
Longitudinal Tension Modulus [Msi]

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

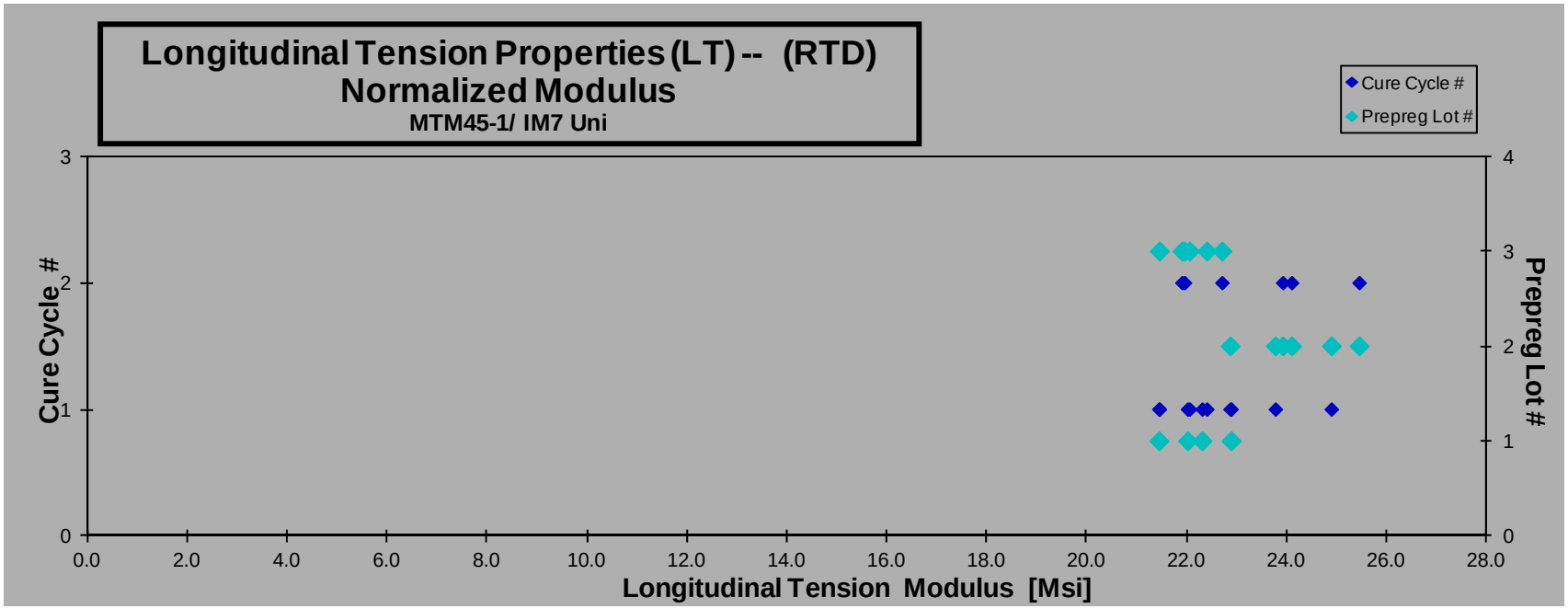
normalizing t_{ply} [in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Avg. Specimen Thickn. [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) -- (RTD)
Normalized Modulus
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Longitudinal Tension Modulus [Msi]
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
0
1
2
3
4

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

normalizing t_{ply} [in]
0.0055

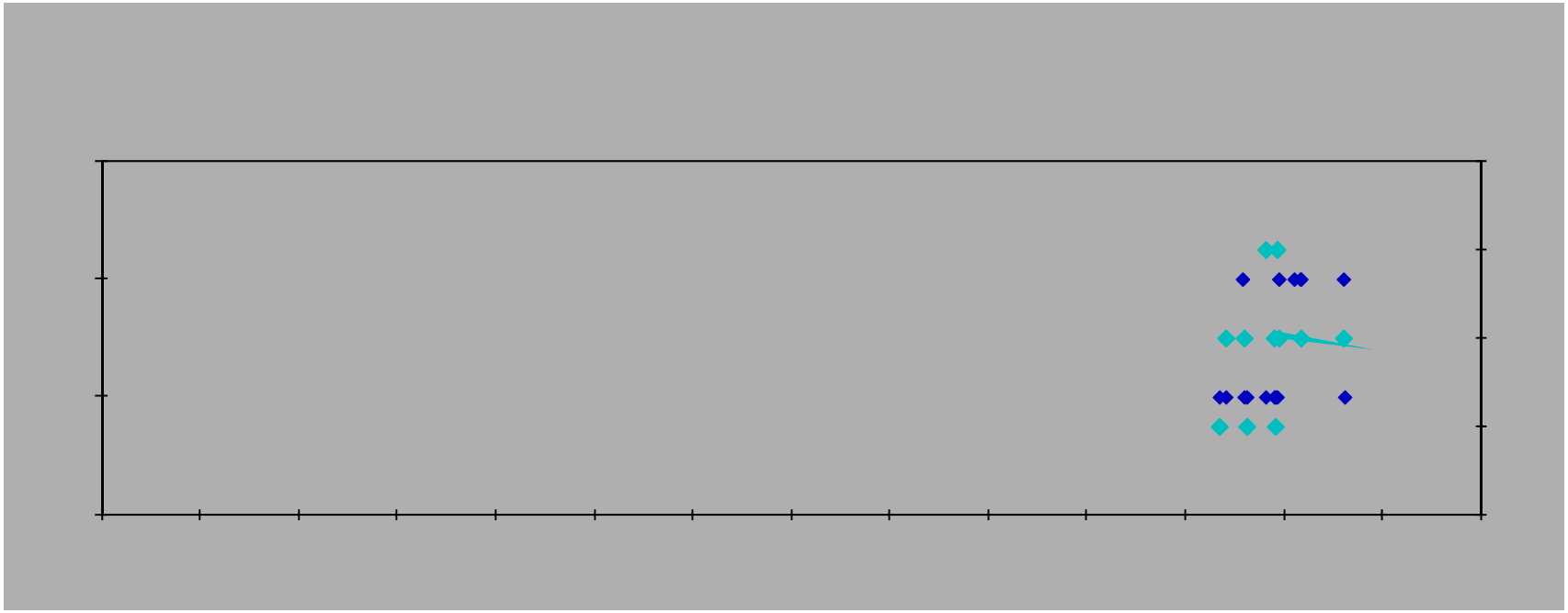
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Modulus_{norm}$ [Msi]
IMU-LT-A-MH1-ETW-2	AFJA112N	A	MH1	1	1	21.651	0.091	16	NR	0.0057	22.426
IMU-LT-A-MH1-ETW-3	AFJA113N	A	MH1	1	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**

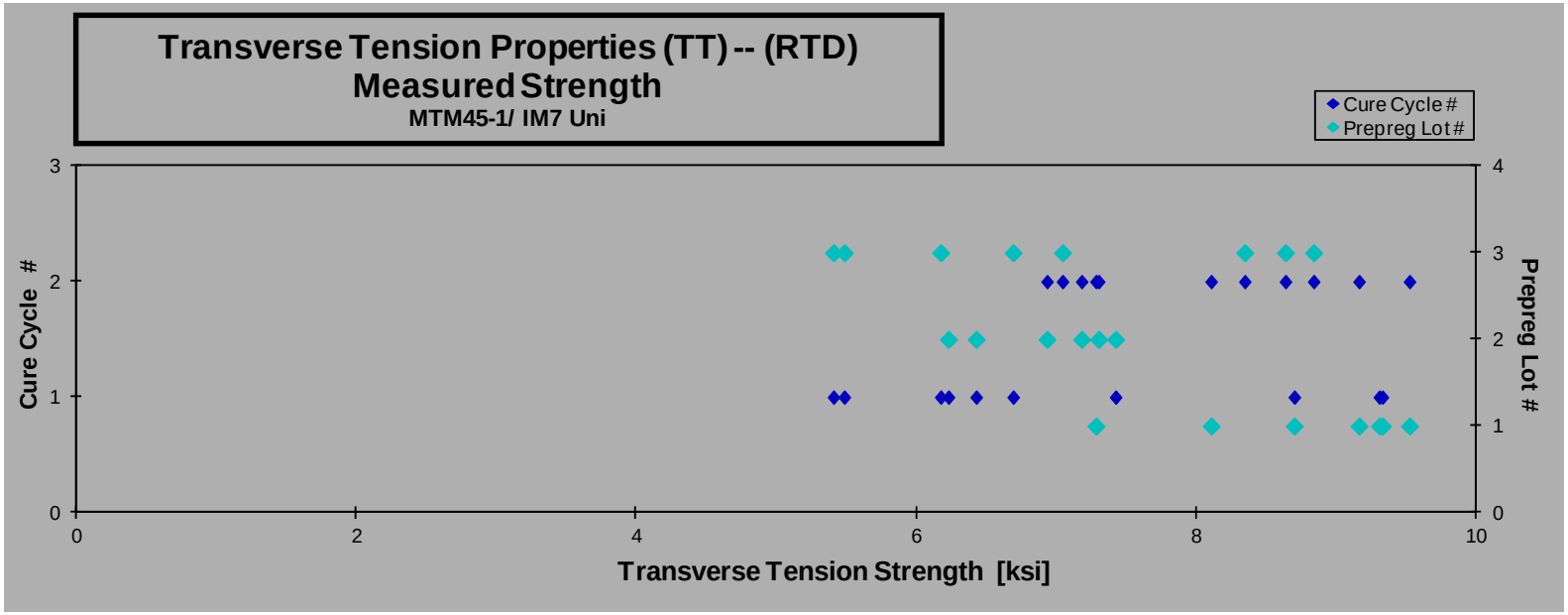
normalizing t_{ply}

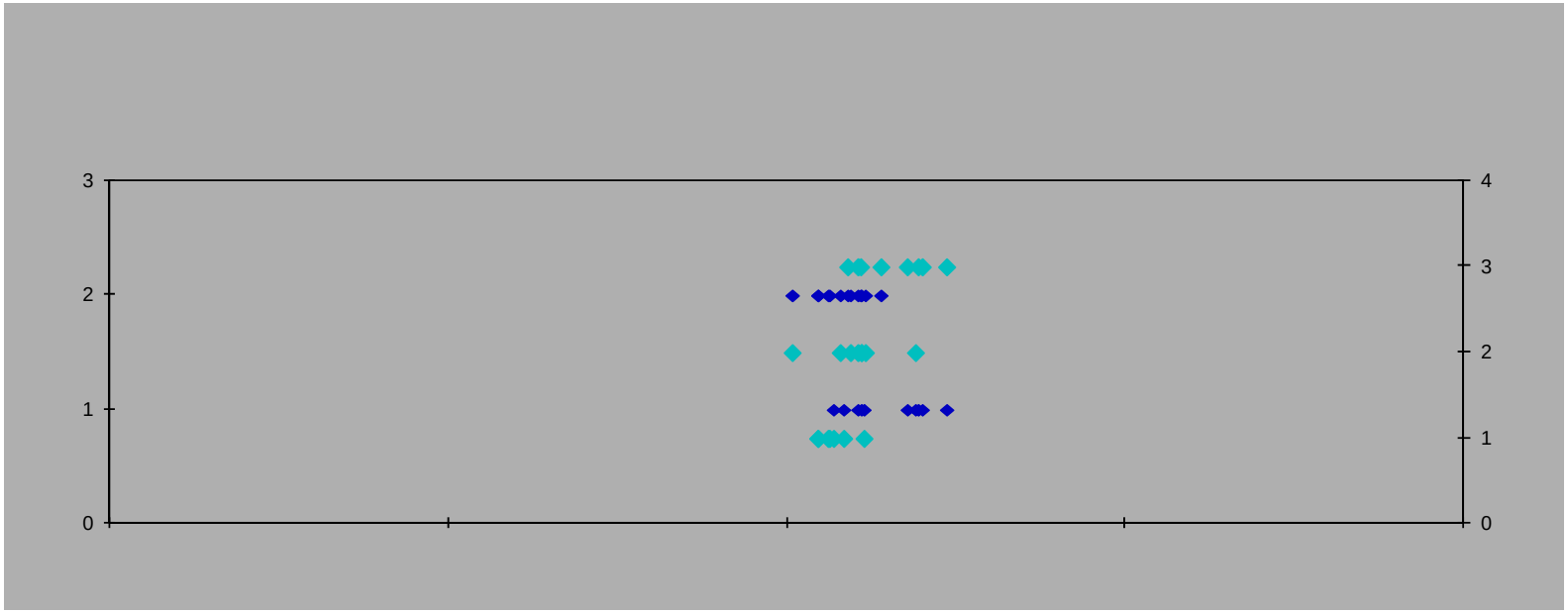


4.2 Transverse Tension Properties (TT)

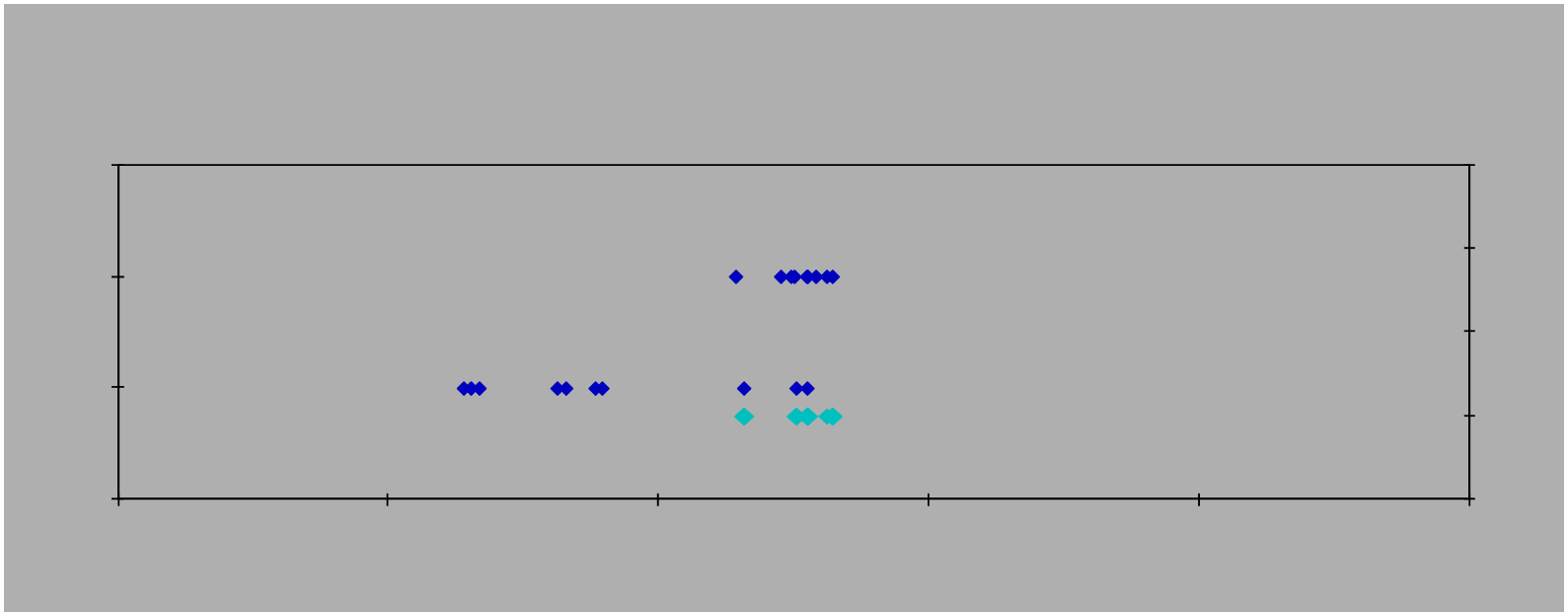
Specimen	NIAR	ACG	ACG Cure	Prepreg	Cure Cycle	Strength	Modulus	Avg. Specimen	# Plies in	Avg. tl

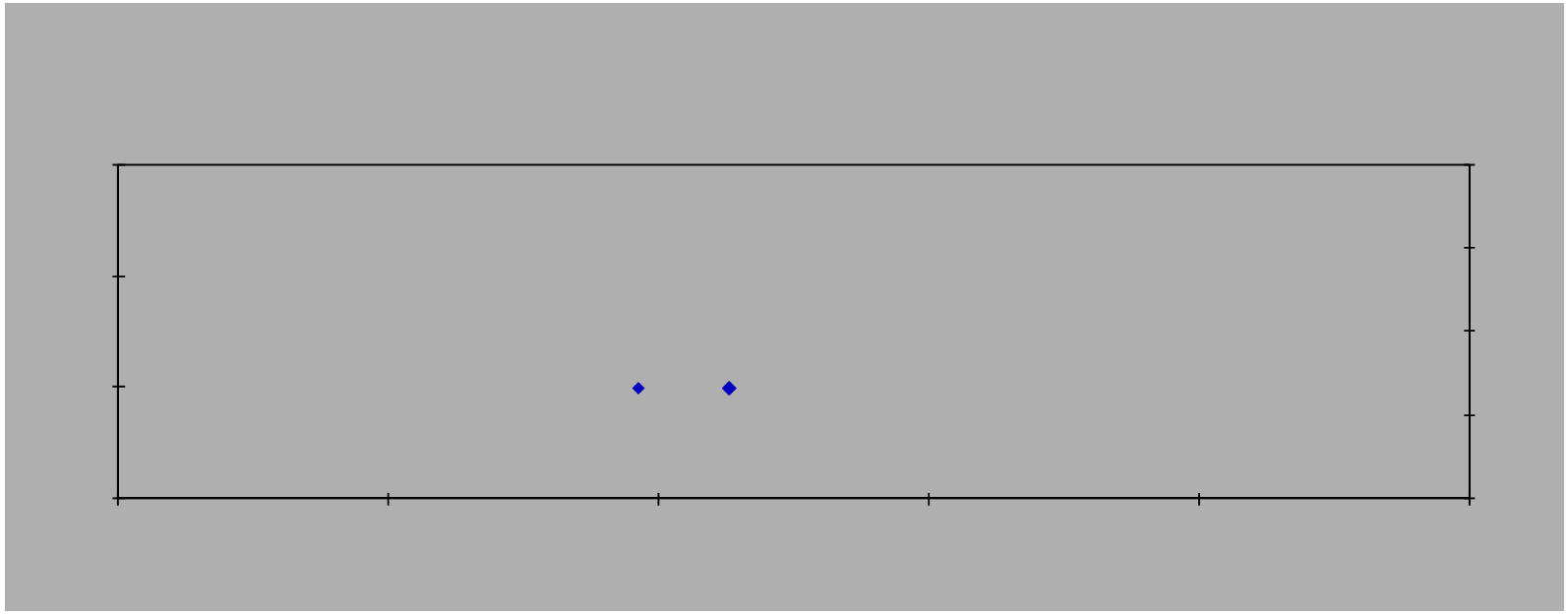
Specimen , N


Transverse Tension Properties (TT) -- (RTD)
Measured Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Transverse Tension Strength [ksi]
0
1
2
3
4
0
2
4
6
8
10



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





4.3 Longitudinal Compression Properties (LC)

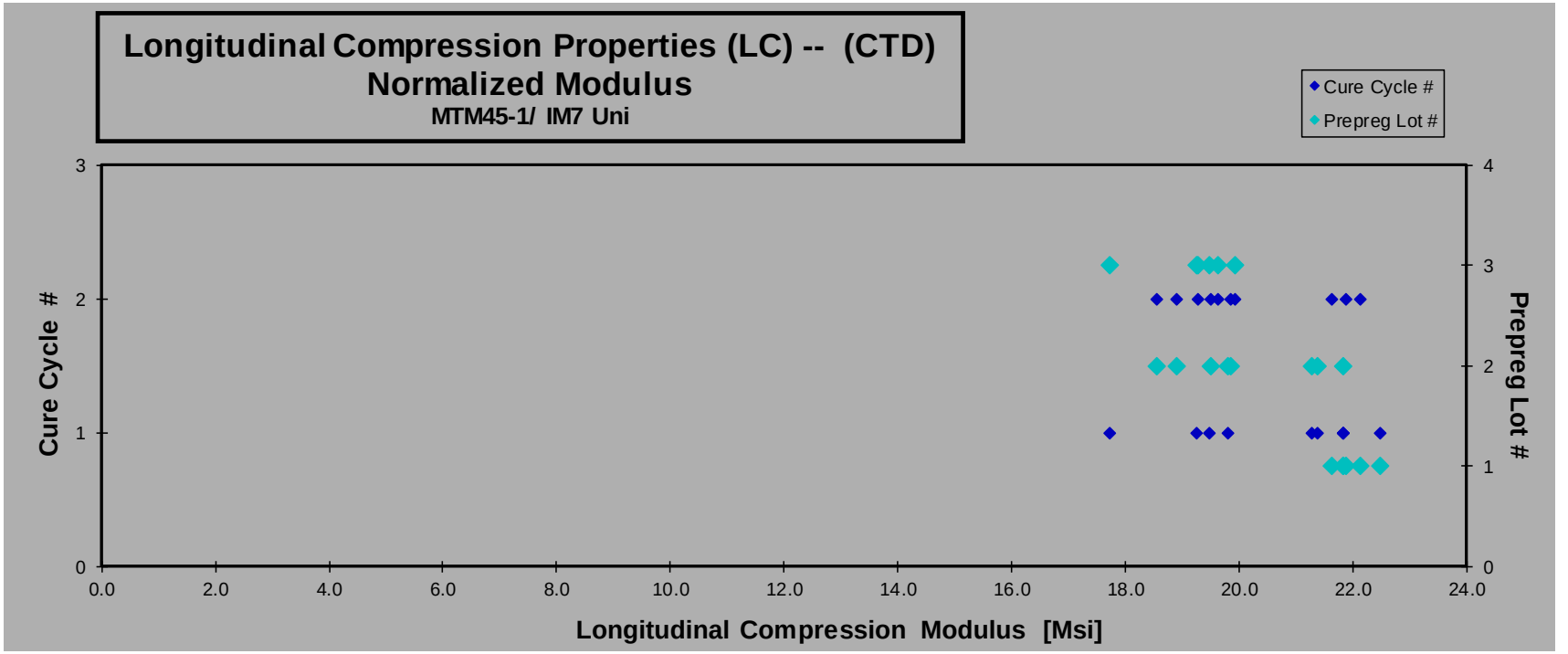
normalizing t_{ply} [in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thickn. [in]	# 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		¨H 6	16 ” - ɔ	278	0.409	0.095	0.0059 16	21.289	

MU-LC-B-MH . 0059 21-381

0.308 0.093 0.0059 16 21.814

059 1621. Î 14


Longitudinal Compression Properties (LC) -- (CTD)
Normalized Modulus
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Longitudinal Compression Modulus [Msi]
0
1
2
3
4
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0

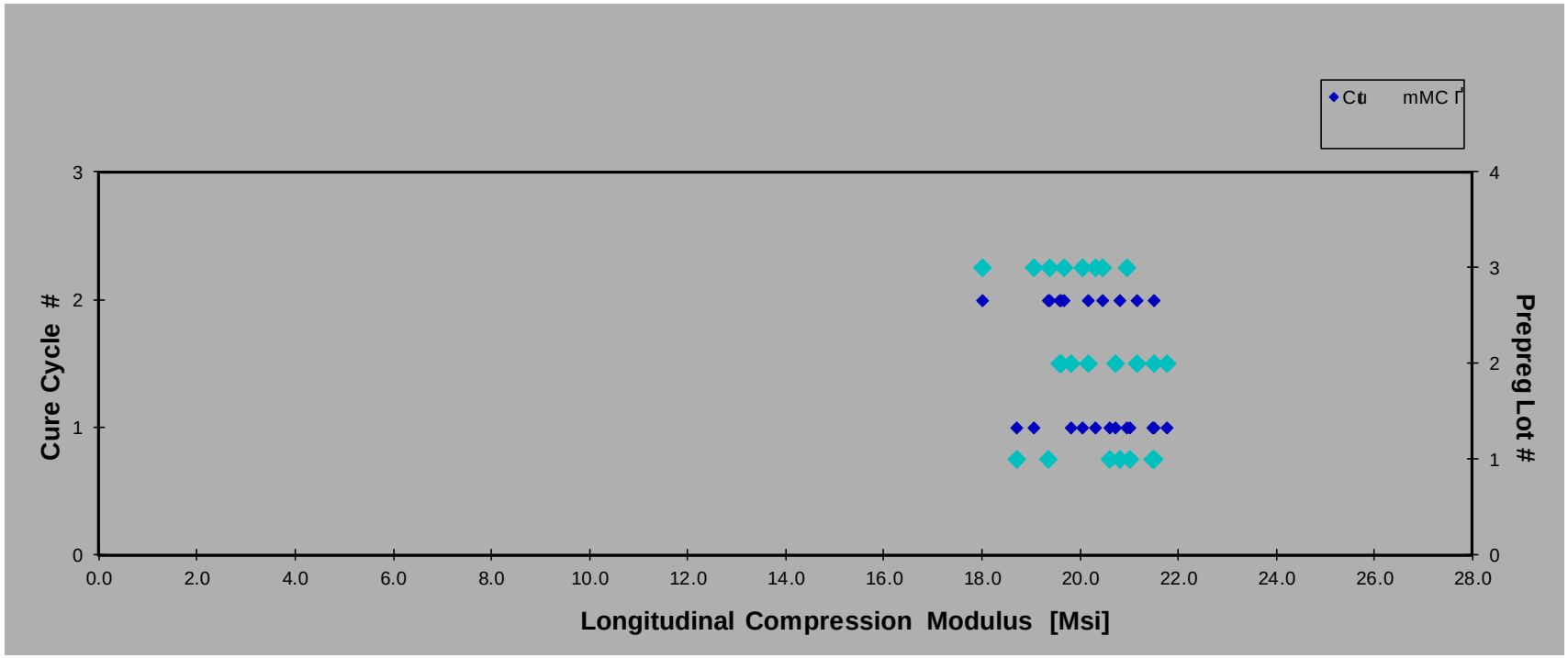
normalizing t_{ply} [in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thickn. [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**
Standard Dev.	**0.751**	**0.040**
Coeff. of Var. [%]	**3.785**	**11.011**
Min.	**18.253**	**0.284**
Max.	**21.032**	**0.452**
Number of Spec.	**23**	**22**

$Average_{norm}$	**0.0056**	**20.237**
Standard $Dev._{norm}$		**0.984**
Coeff. of Var. $[\%]_{norm}$		**4.864**
Min.	**0.0053**	**18.011**
Max.	**0.0060**	**21.751**
Number of Spec.		**23**


Cure Cycle #
Prepreg Lot #
Longitudinal Compression Modulus [Msi]
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
0
1
2
3
4

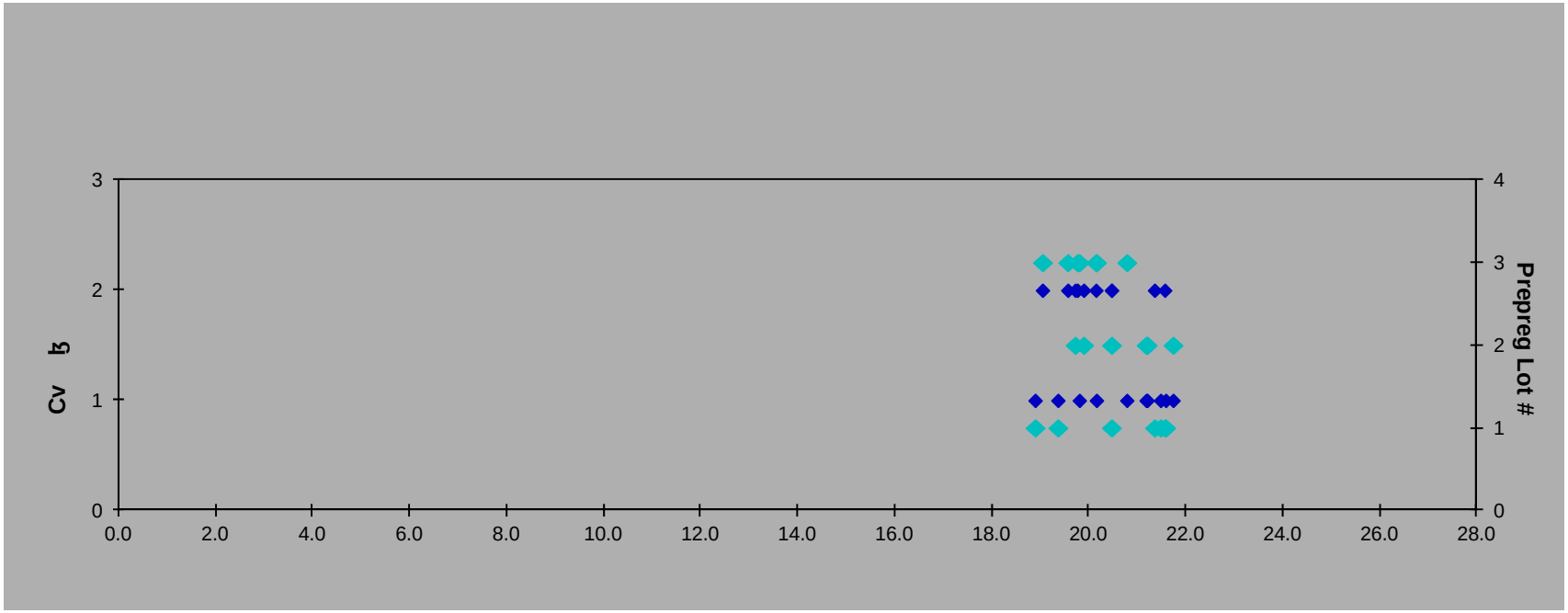
6.0 28.0

normalizing t_{ply} [in]

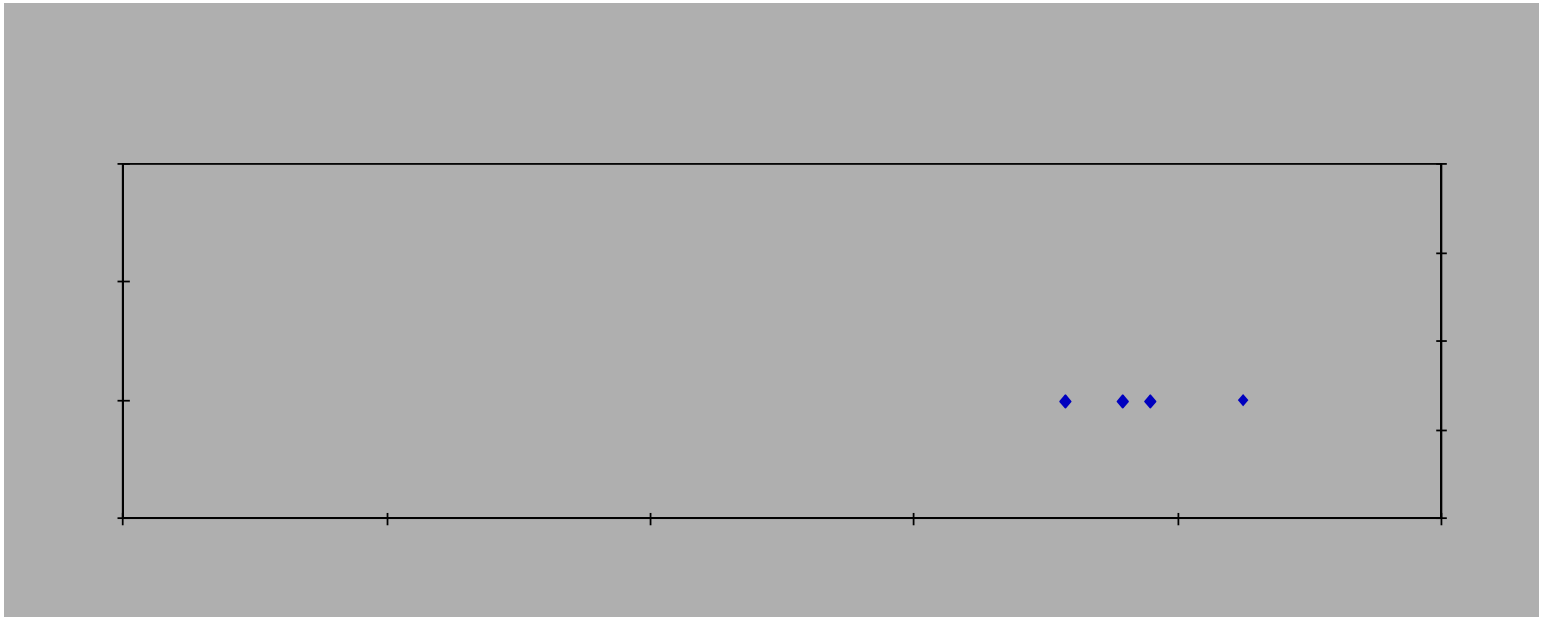
normalizing t_{ply} [in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thickn. [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

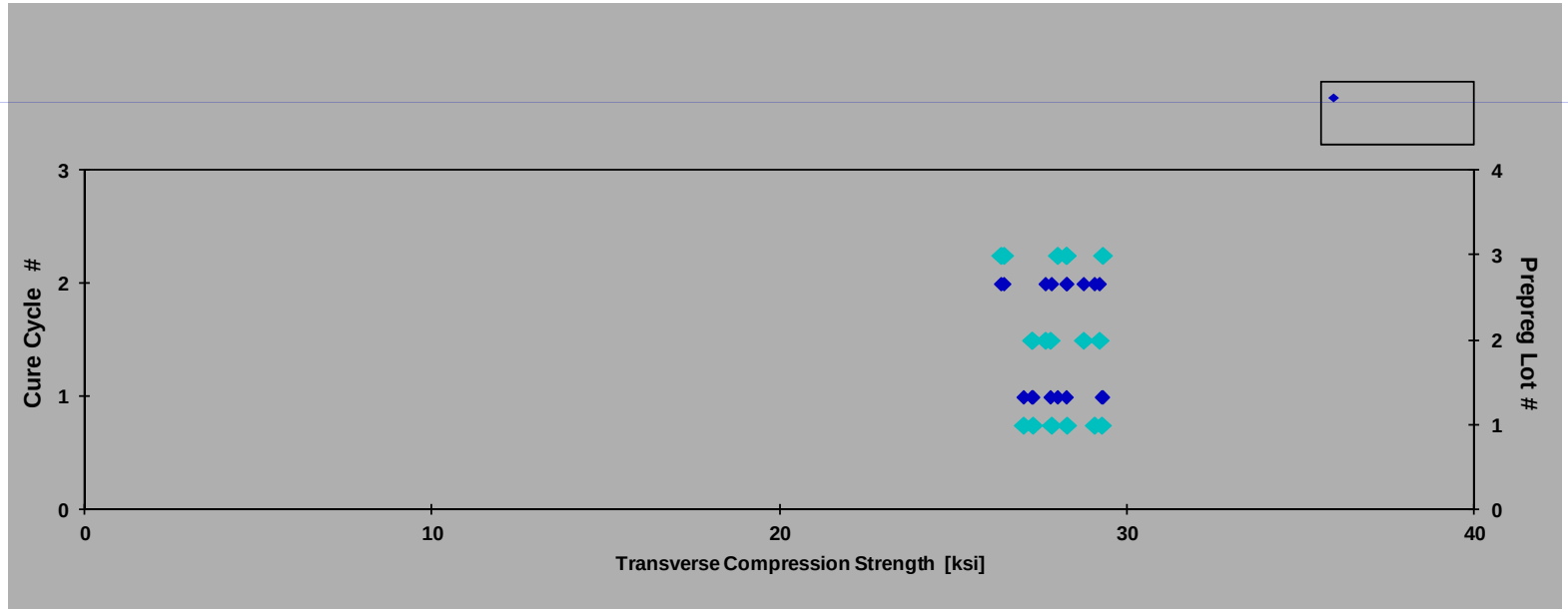
Average	**20.205**	**0.389**	**$Average_{norm}$**	**0.0056**	**20.422**
Standard Dev.	**0.641**	**0.032**	**$Standard\ Dev._{norm}$**		**0.904**
Coeff. of Var. [%]	**3.172**	**8.329**	**$Coeff.\ of\ Var.\ [\%]_{norm}$**		**4.425**
Min.	**18.820**	**0.357**	**Min.**	**0.0052**	**18.906**
Max.	**21.448**	**0.458**	**Max.**	**0.0059**	**21.749**
Number I r x0.	**iΓЭĀ**	**Ǝa**			


Cv
Prepreg Lot #
0
1
2
3
4
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0

February 12, 2024 ʒ N -M



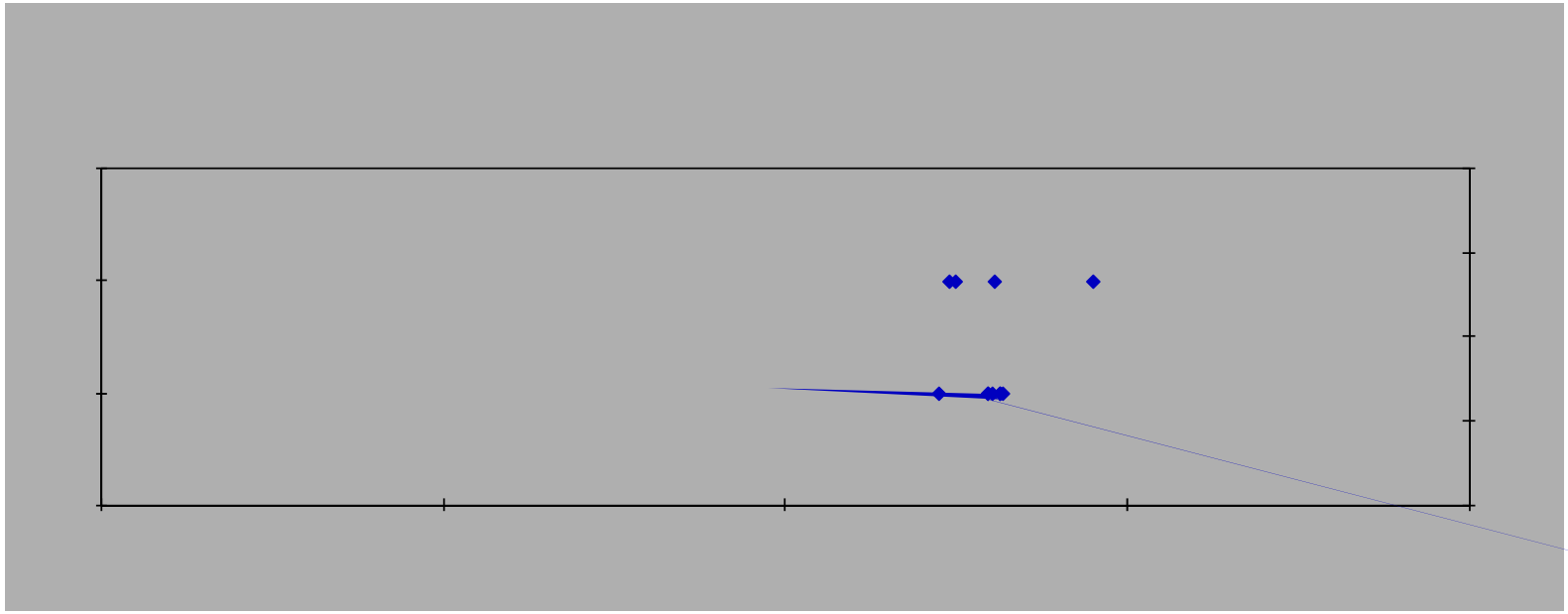
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thickn. [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
IMU-TC-A-M D-2	AFZA112A	A	MH1	1	1	29.270	1.275	0.028	0.091	16	0.0057	HAB
IMU-TC-A-M D-3	AFZA113A	A	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	0026	0.087	16	0.0055	MHG
IMU-TC-C-M H1-RTD-3	AFZC113A	C	MH2	3								M
IMU-TC-B-M D	AFZC11 η r	B	MH2	3								M
IMU-TC-B-M D	AFZC11 η r	B	MH2 CH		28.							M
IMU-TC-B-M D	AFZC11 η r	B	MH2	3								


Cure Cycle #
Prepreg Lot #
Transverse Compression Strength [ksi]
0
1
2
3
4
0
10
20
30
40

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

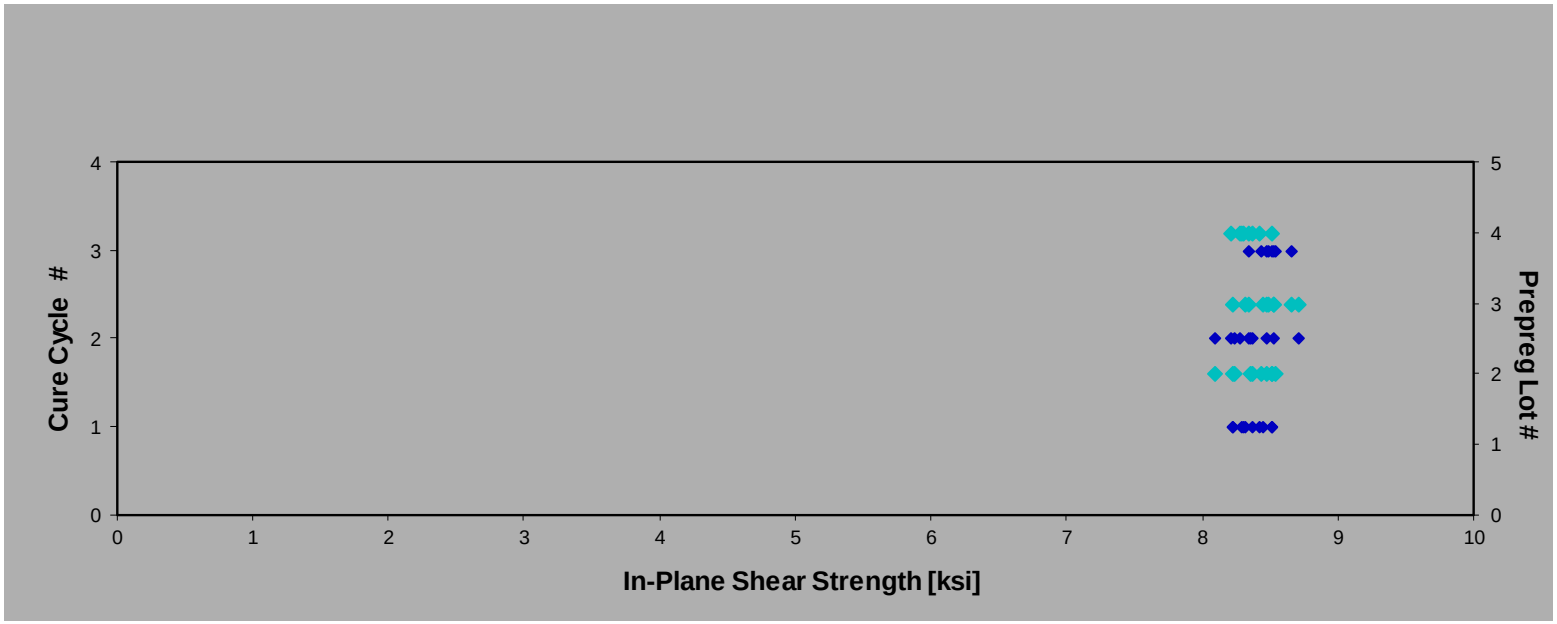
Specimen Number	NIAR Naming	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thickn. [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
IMU-TC-A-MH1-ETW-2	AFZA112N	A	MH1	1	1	14.935	1.076	0.020	0.091	16	0.0057	HGM
IMU-TC-A-MH1-ETW-3	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

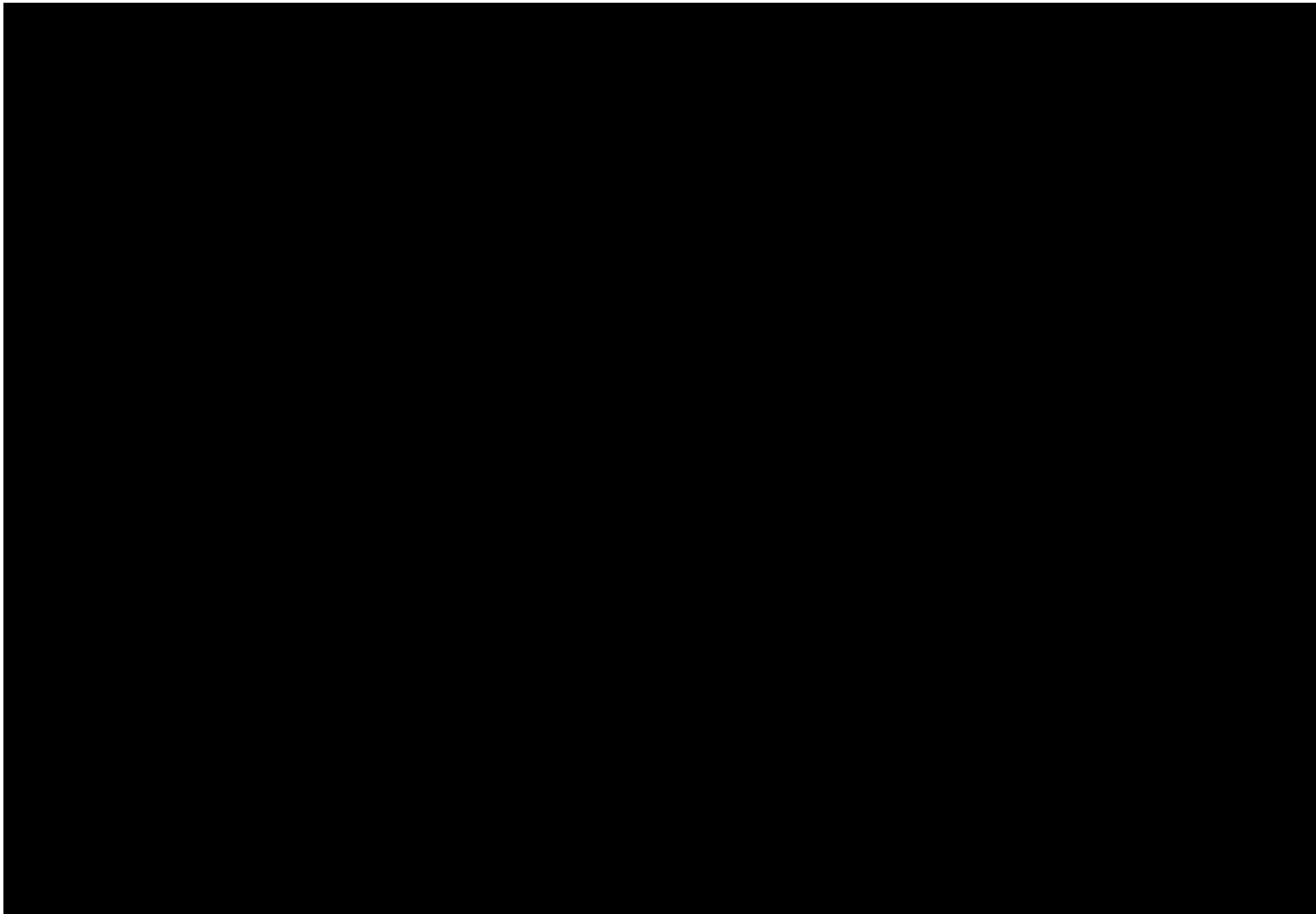
Average	**15.707**	**1.087**	**0.021**	**Average**	**0.0056**
Standard Dev.	**0.850**	**0.051**	**0.002**		
Coeff. of Var. [%]	**5.414**	**4.705**	**8.555**		
Min.	**13.579**	**0.956**	**0.017**	**Min.**	**0.0054**
Max.	**17.065**	**1.145**	**0.024**	**Max.**	**0.0059**
Number of Spec.	**18**	**18**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

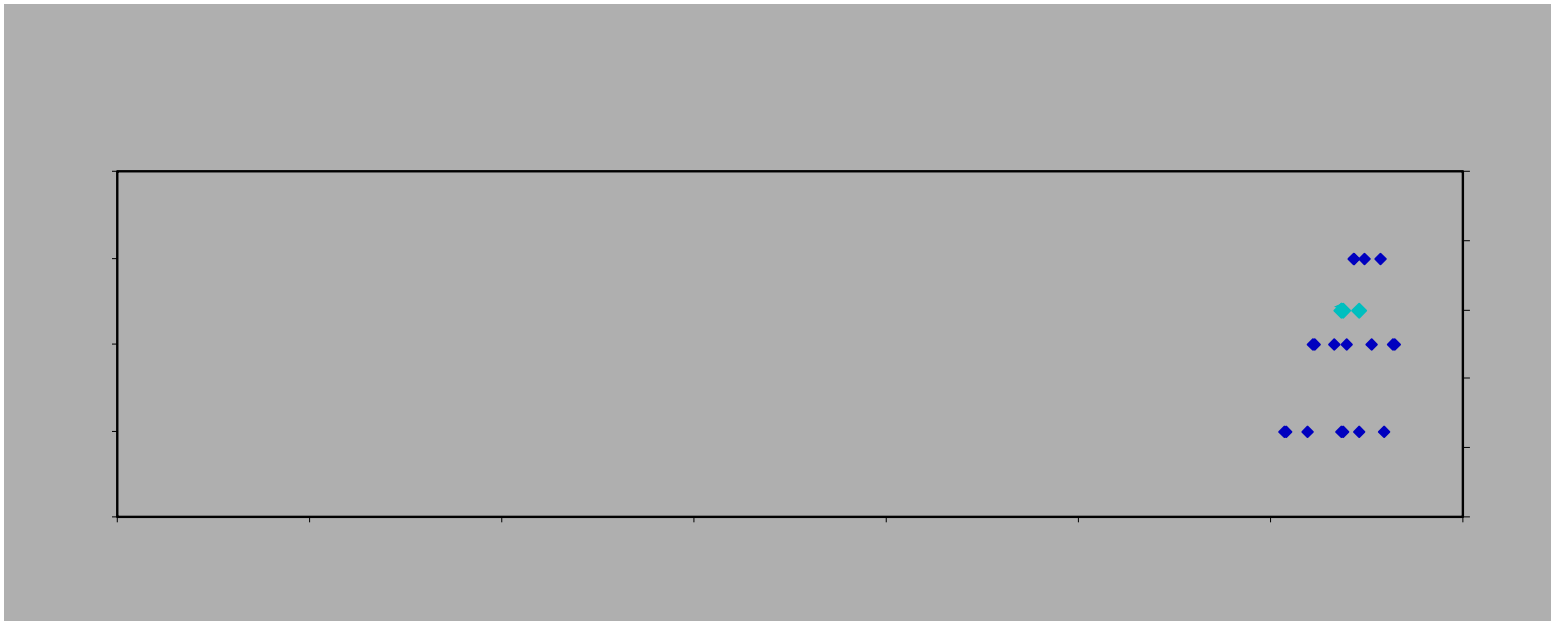


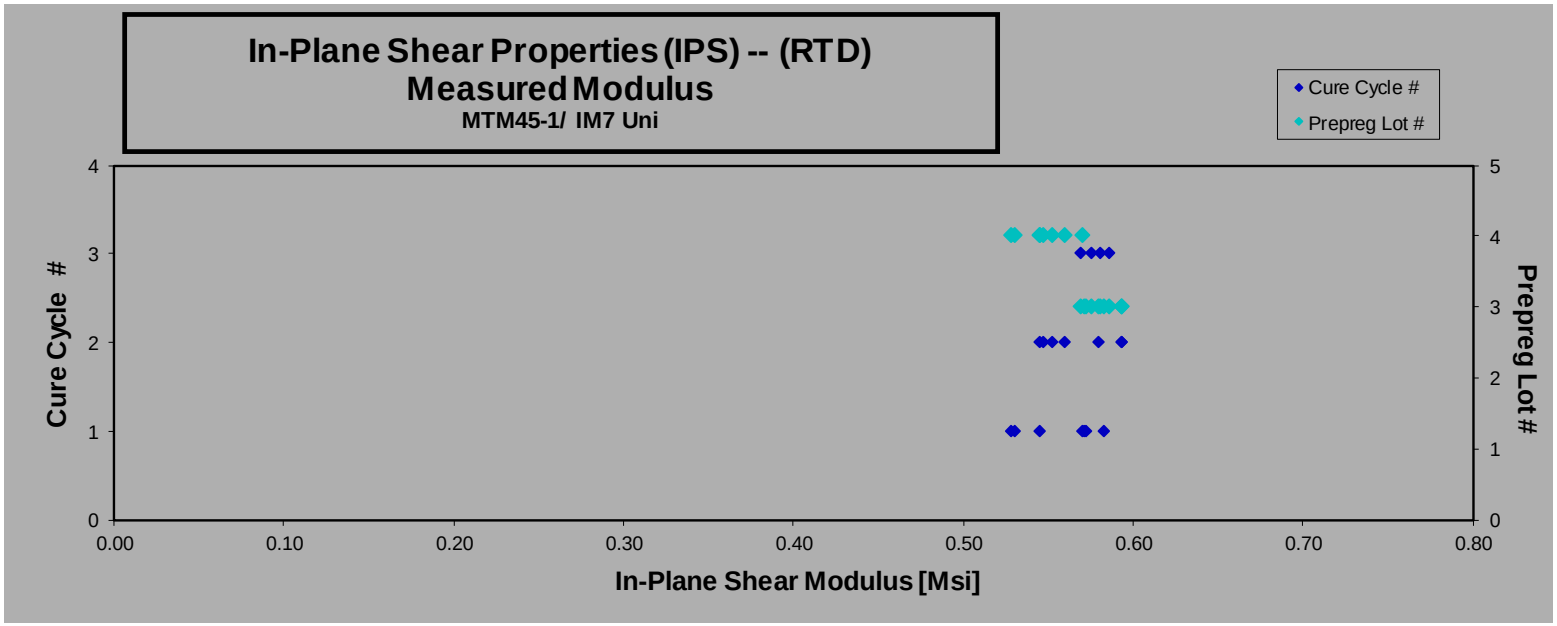
4.5 In-Plane Shear Properties (IPS)

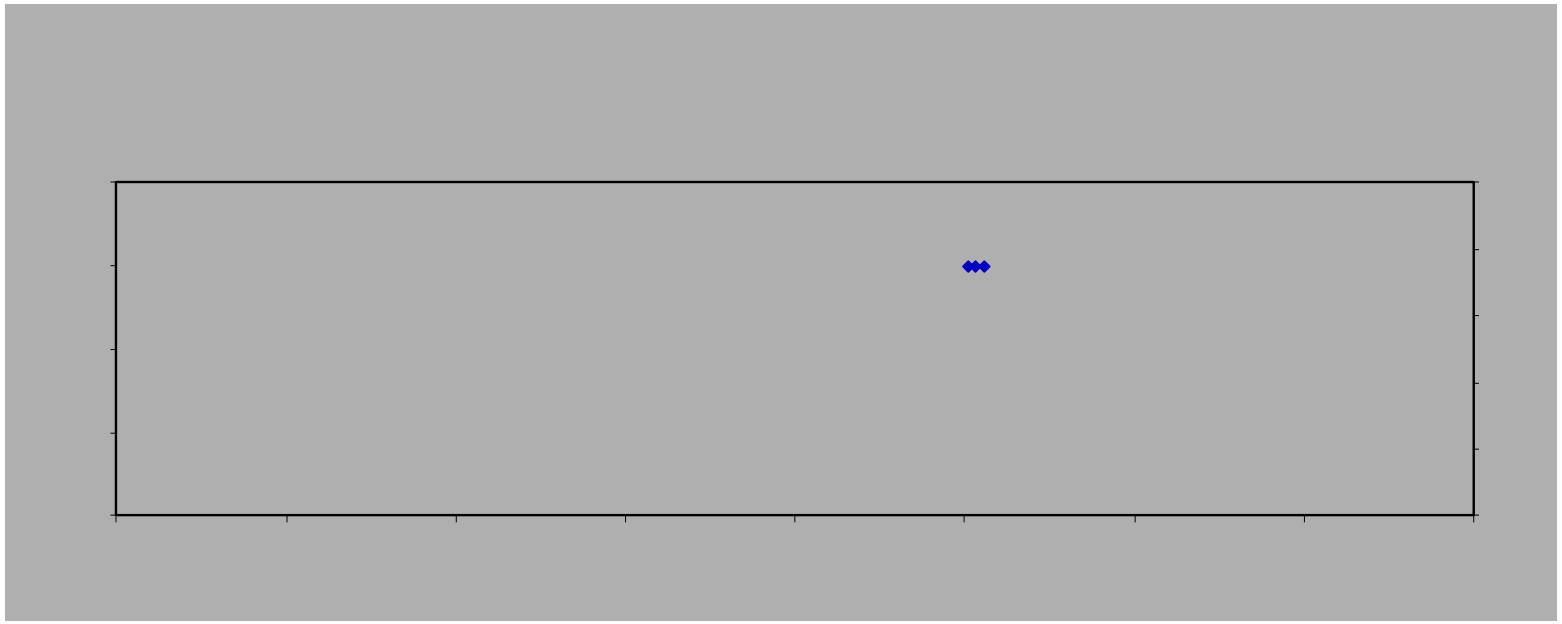
Specimen Number	NIAR	ACG	ACG Cure	Prepreg	Cure Cycle	0.2% Offset	Strength at	Modulus	Avg. Specimen	# Plies in	Avg. tply


Cure Cycle #
Prepreg Lot #
In-Plane Shear Strength [ksi]
0
1
2
3
4
5
6
7
8
9
10






In-Plane Shear Properties (IPS) -- (RTD)
Measured Modulus
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
In-Plane Shear Modulus [Msi]
0
1
2
3
4
5
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80



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-2 ITR1392-IMU-AFNB120R1392 ű-lgth [ksi] 20 ∃ ű 4.1 ´

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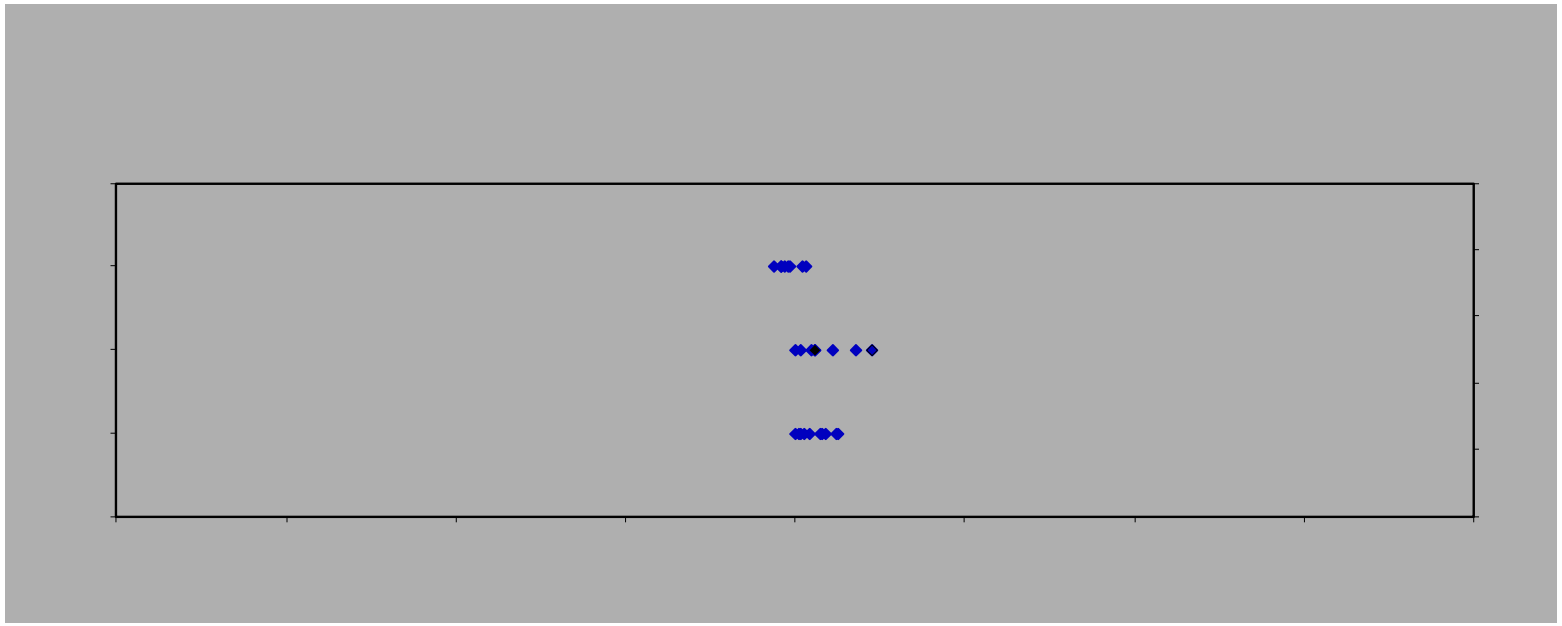
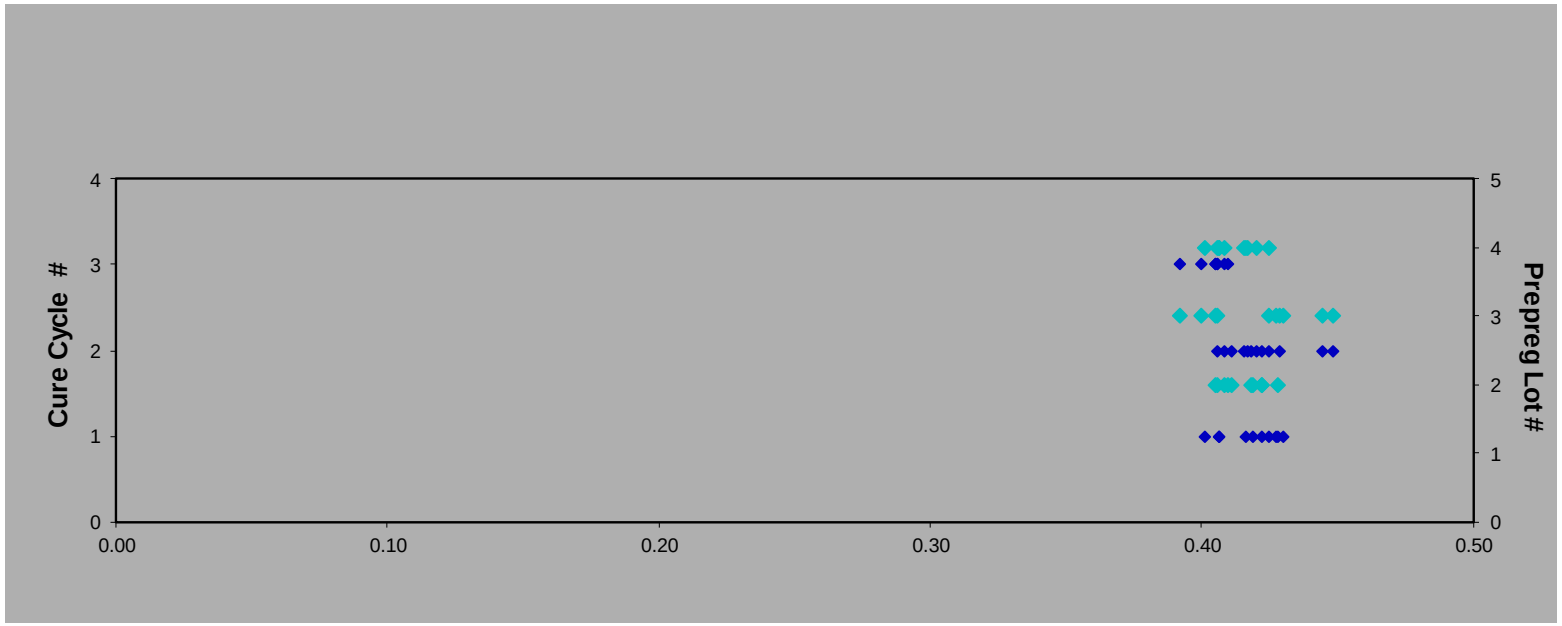
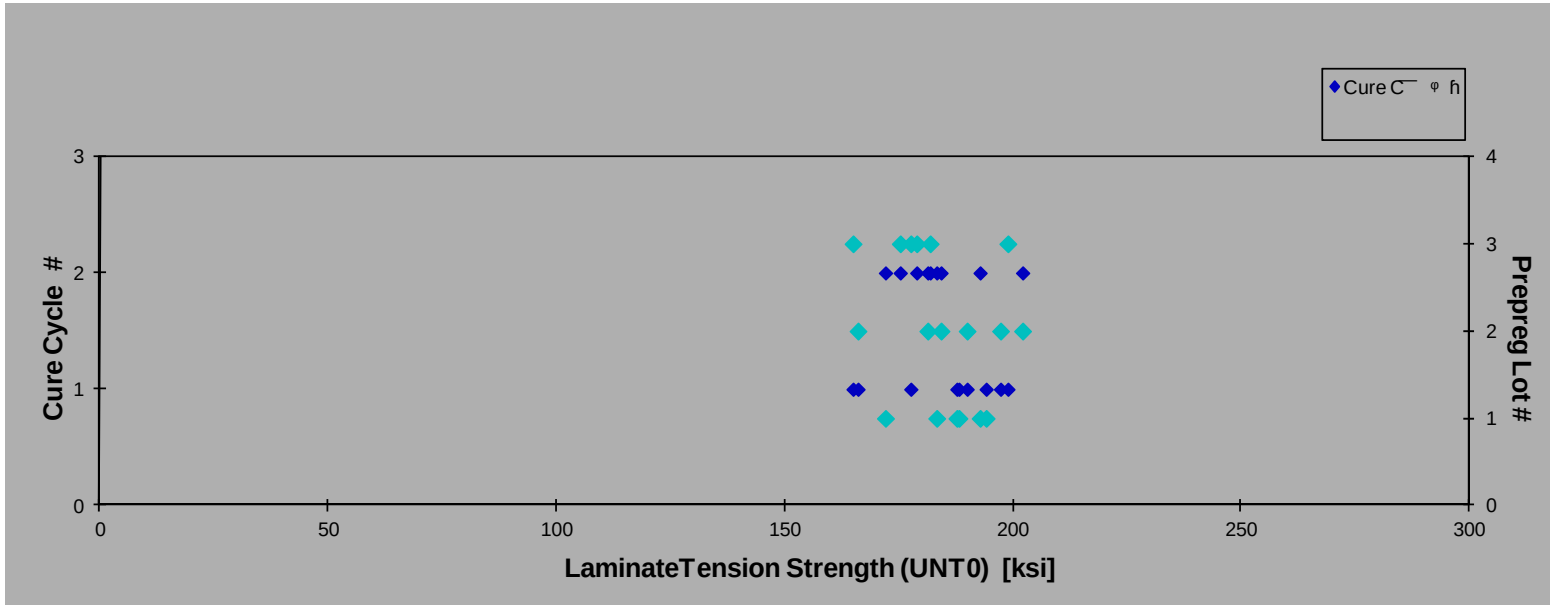
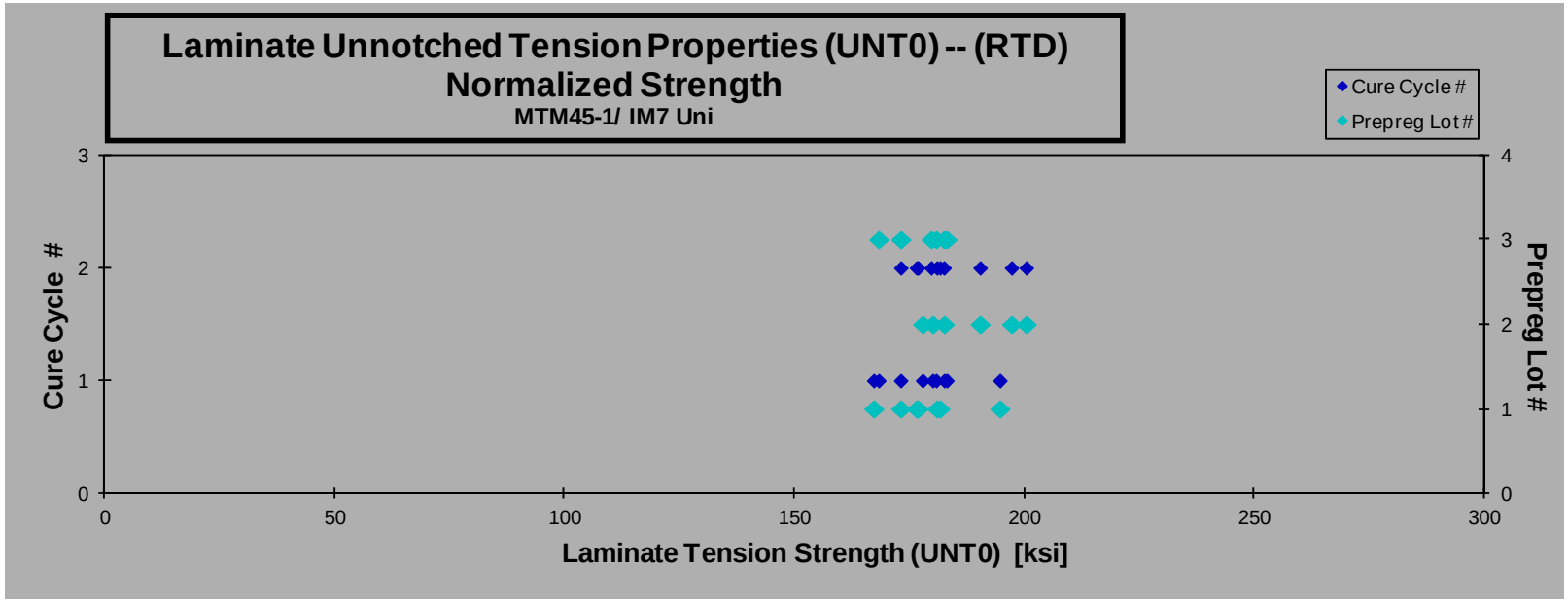


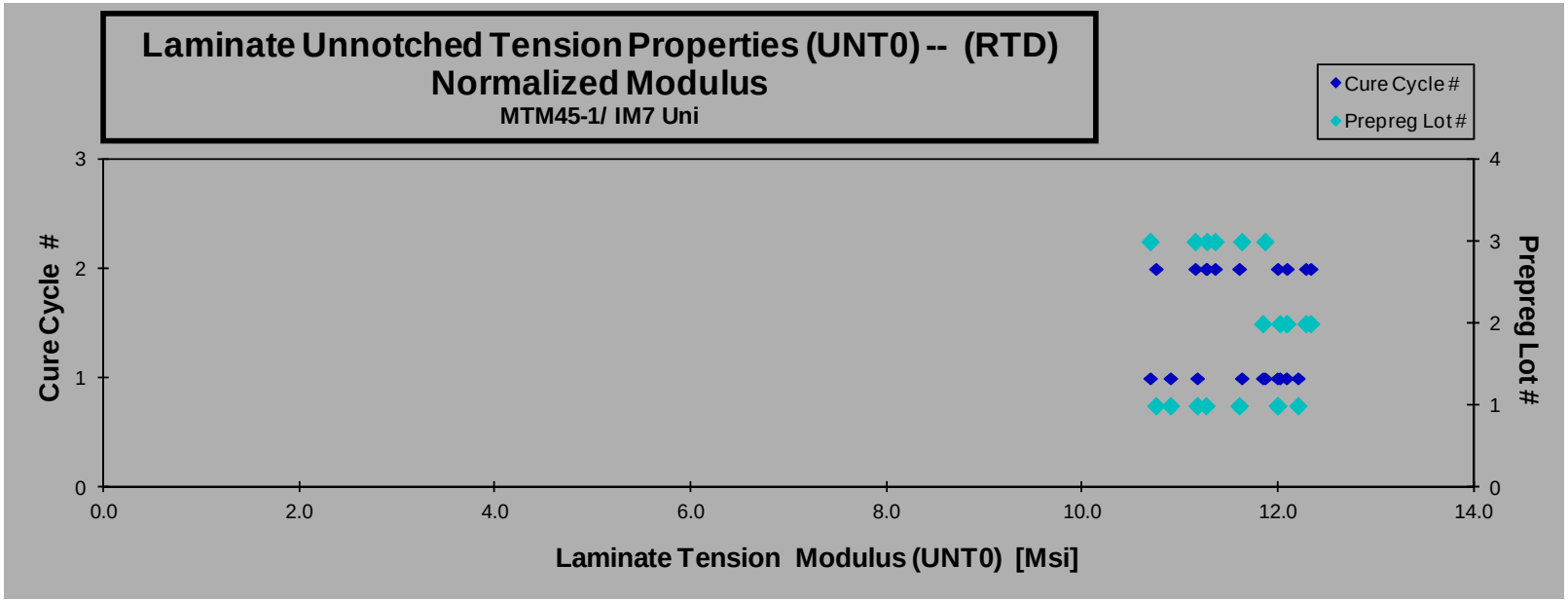

Cure Cycle #
Prepreg Lot #
0
1
2
3
4
5
0.00
0.10
0.20
0.30
0.40
0.50

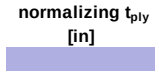
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	0.2% Offset Strength [ksi]	Strength at 5% Strain [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. tply [in]
AITR1392-IMU-IPS-B-MH1-2-ETW2-1	AFNB121D	B	MH1	2	1	3.205	4.824	0.335	0.0445	8	0.0056
AITR1392-IMU-IPS-B-MH1-2-ETW2-2	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						

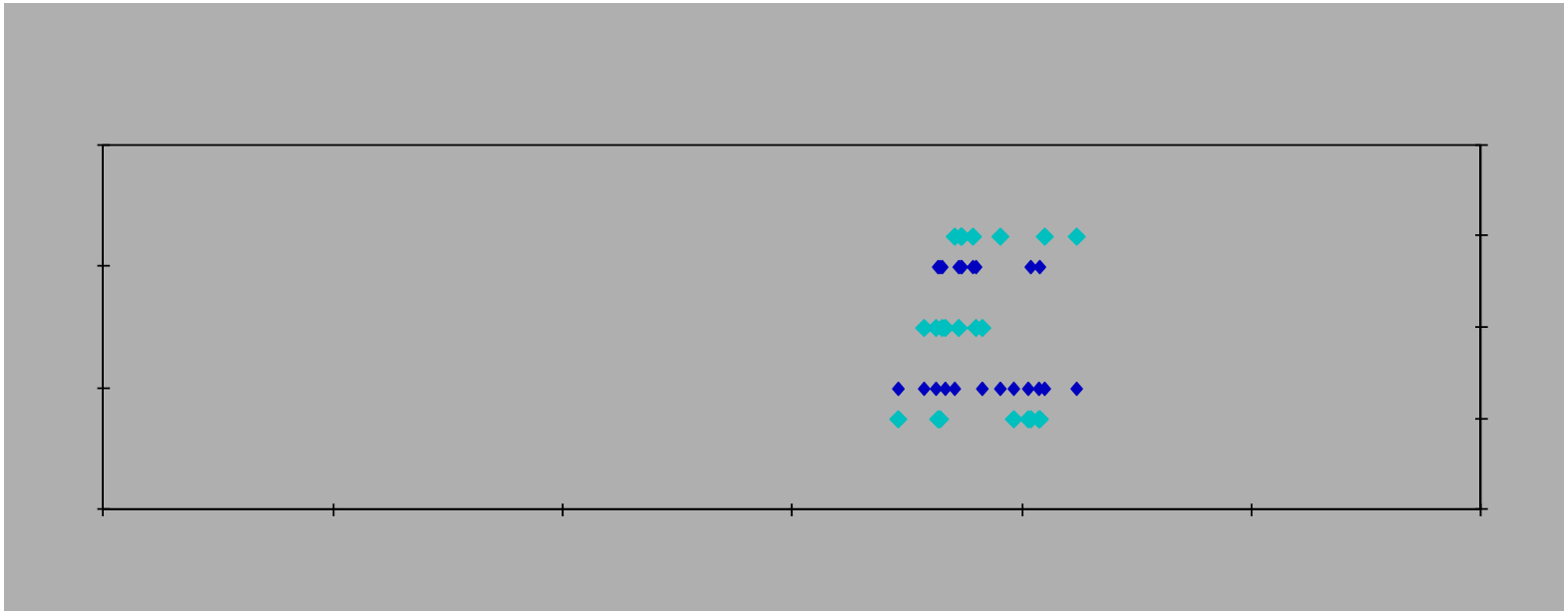

Cure C
Cure Cycle #
Prepreg Lot #
LaminateTension Strength (UNT0) [ksi]
0
1
2
3
4
0
50
100
150
200
250
300

normalizing t_{ply} [in]

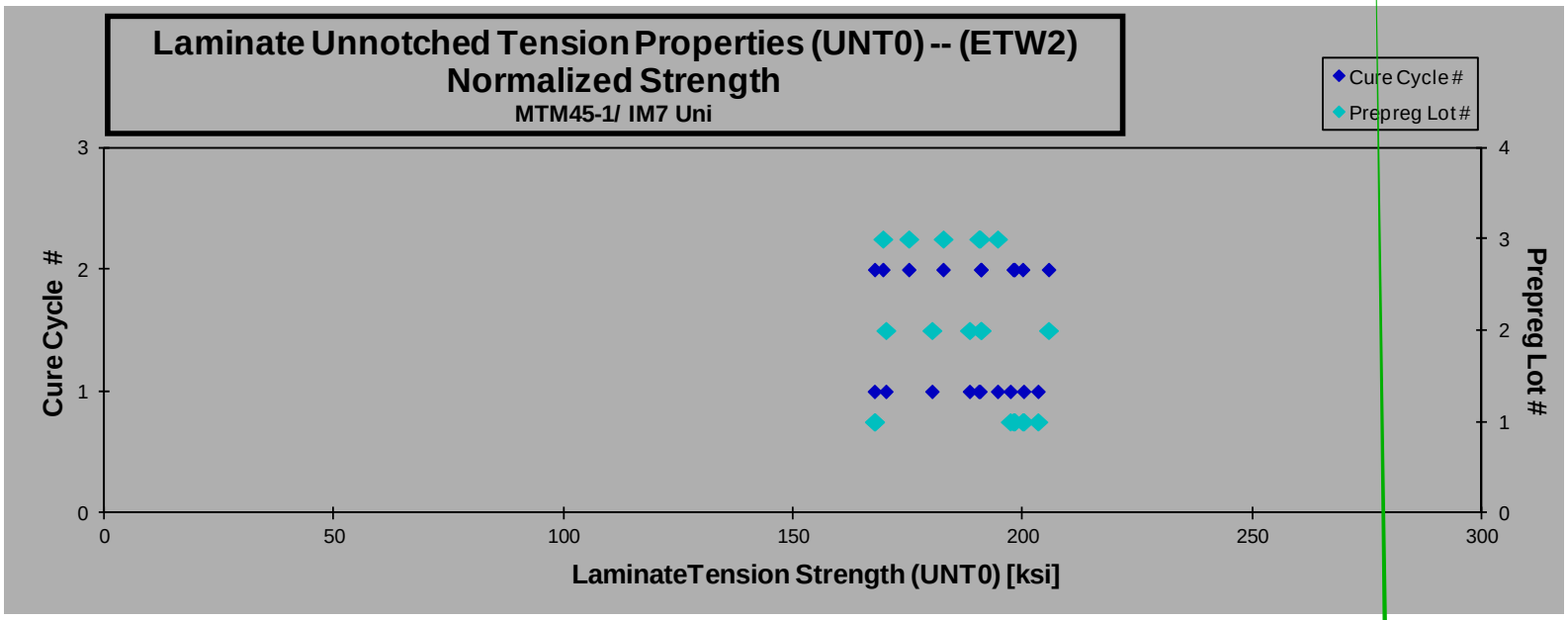

Laminate Unnotched Tension Properties (UNT0) -- (RTD)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
50
100
150
200
250
300
Laminate Tension Strength (UNT0) [ksi]

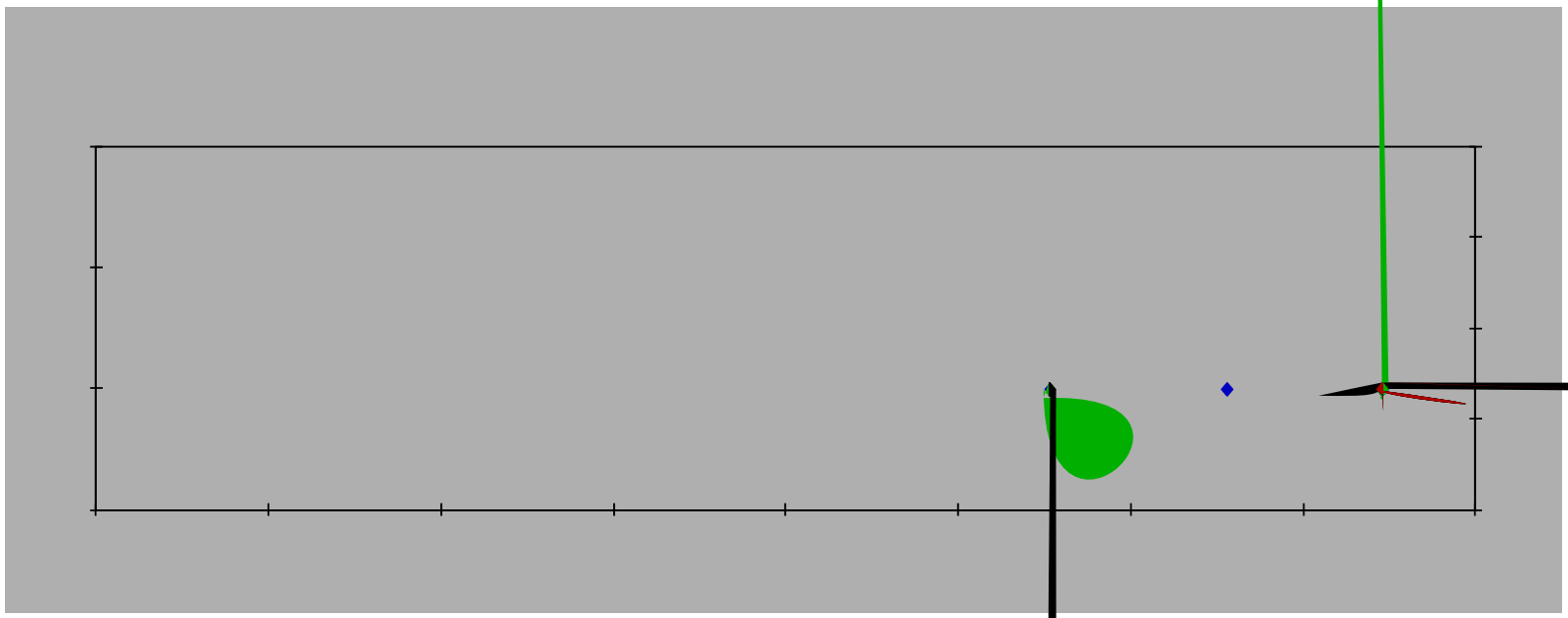

Laminate Unnotched Tension Properties (UNT0) -- (RTD)
Normalized Modulus
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Laminate Tension Modulus (UNT0) [Msi]


normalizing t_{ply}
[in]

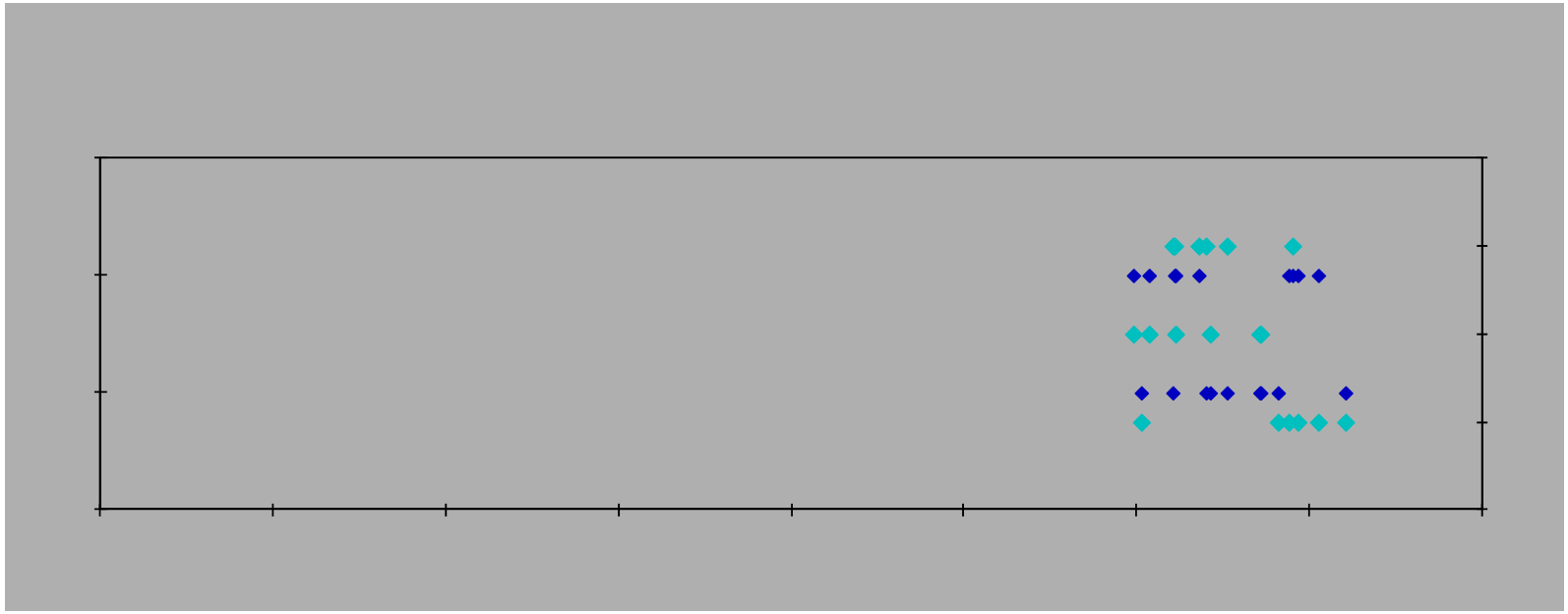


normalizing t_{ply} [in]
0.0055


Laminate Unnotched Tension Properties (UNT0) -- (ETW2)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
50
100
150
200
250
300
LaminateTension Strength (UNT0) [ksi]



February 12, 2024

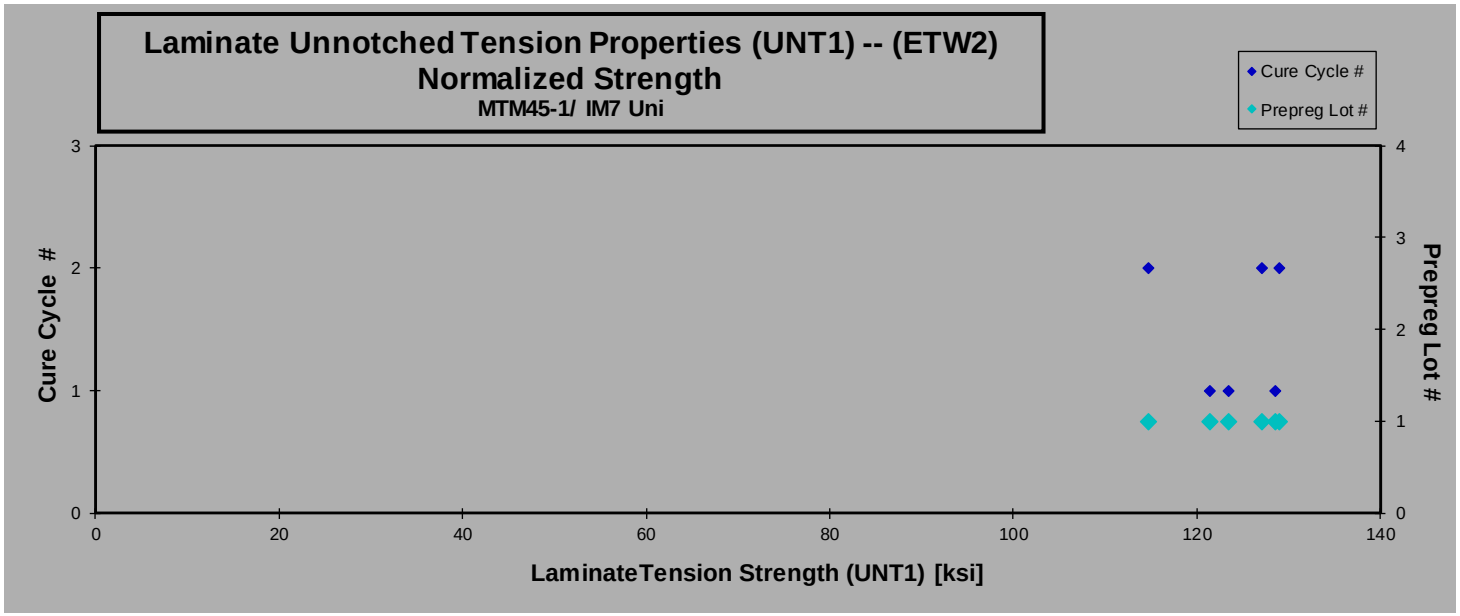


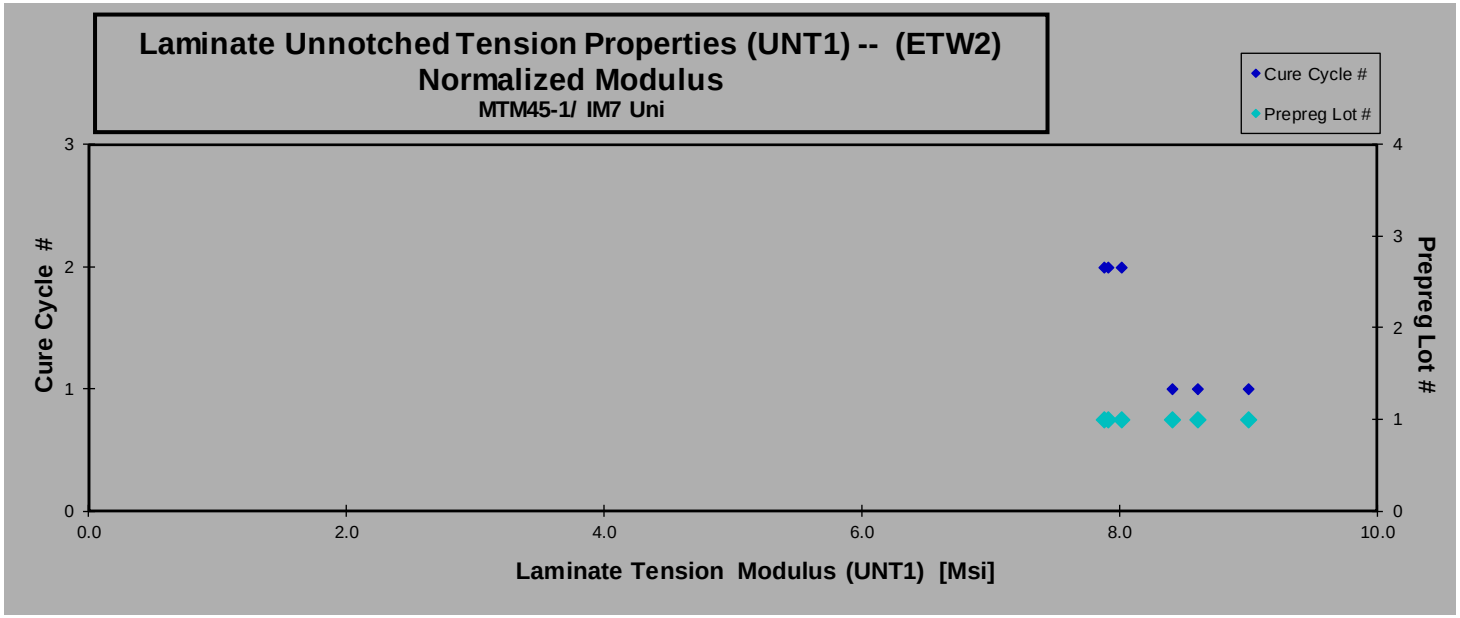
											normalizing t_{ply} [in]		
											0.0055		
Specimen Number	**NIAR Naming**	**ACG Batch #**	**ACG Cure Cycle**	**Prepreg Lot #**	**Cure Cycle #**	**Strength [ksi]**	**Modulus [Msi]**	**Avg. Specimen Thickn. [in]**	**# Plies in Laminate**	**Failure Mode**	**Avg. t_{ply} [in]**	**$Strength_{norm}$ [ksi]**	**$Modulus_{norm}$ [Msi]**
IMU-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**			

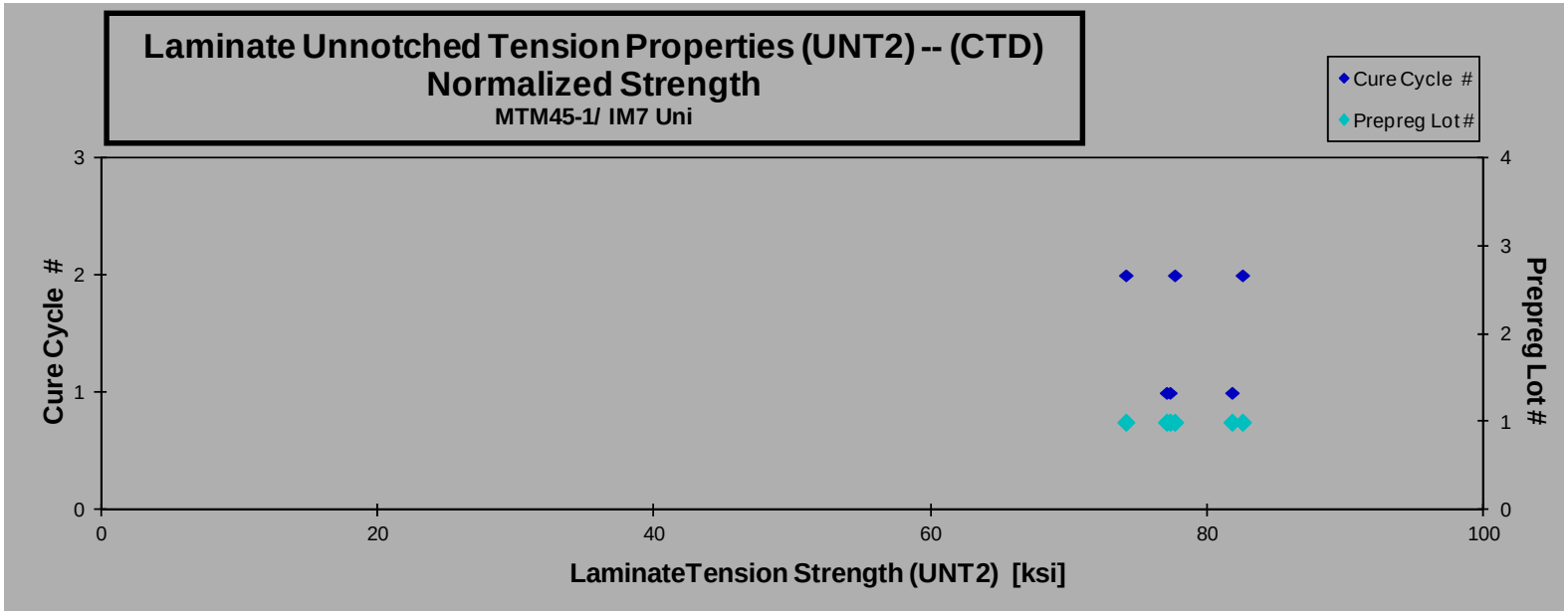
normalizing t_{ply} [in]
0.0055

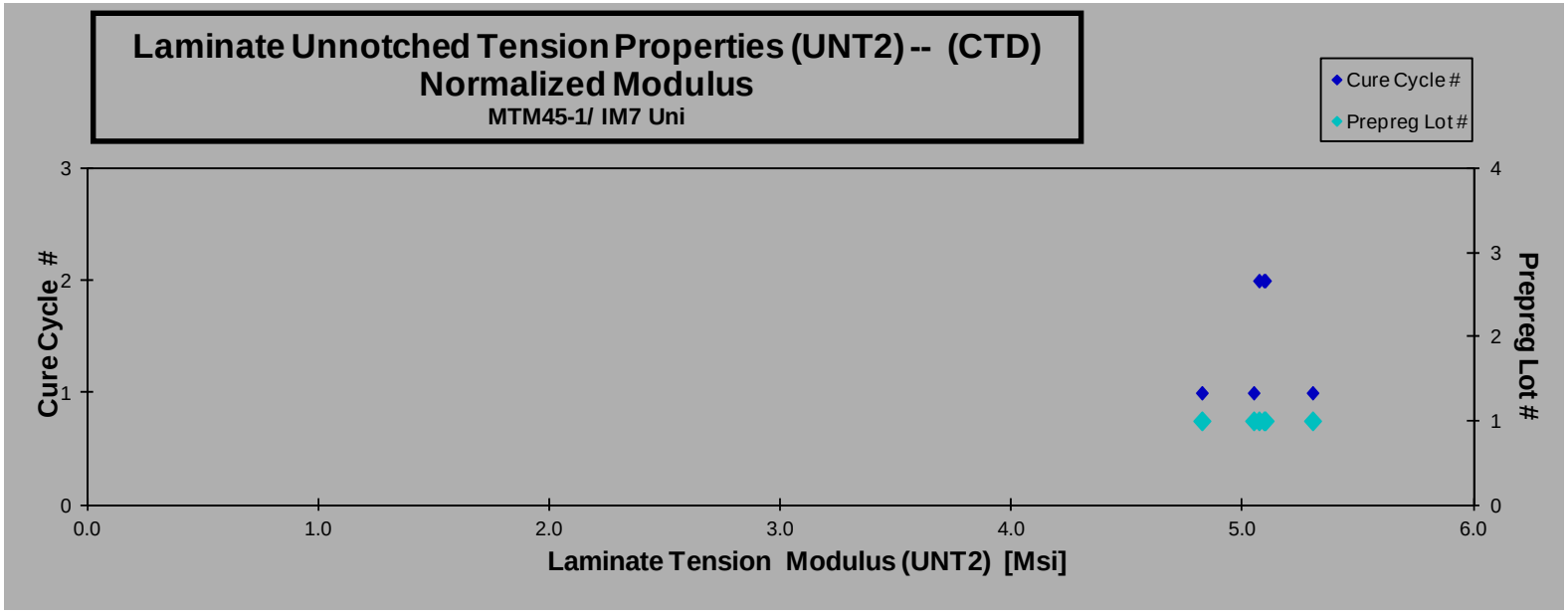
Specimen Number	NIAR Naming	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]	$Modulus_{norm}$ [Msi]
IMU-UNT1-A-MH1-ETW2-1	AFAA111D	A	MH1	1	1	118.629	8.401	0.135	24	LWT / 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 112D = A MH


Laminate Unnotched Tension Properties (UNT1) -- (ETW2)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
LaminateTension Strength (UNT1) [ksi]
0
20
40
60
80
100
120
140


Laminate Unnotched Tension Properties (UNT1) -- (ETW2)
Normalized Modulus
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Tension Modulus (UNT1) [Msi]
0.0
2.0
4.0
6.0
8.0
10.0


Laminate Unnotched Tension Properties (UNT2) -- (CTD)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
20
40
60
80
100
LaminateTension Strength (UNT2) [ksi]

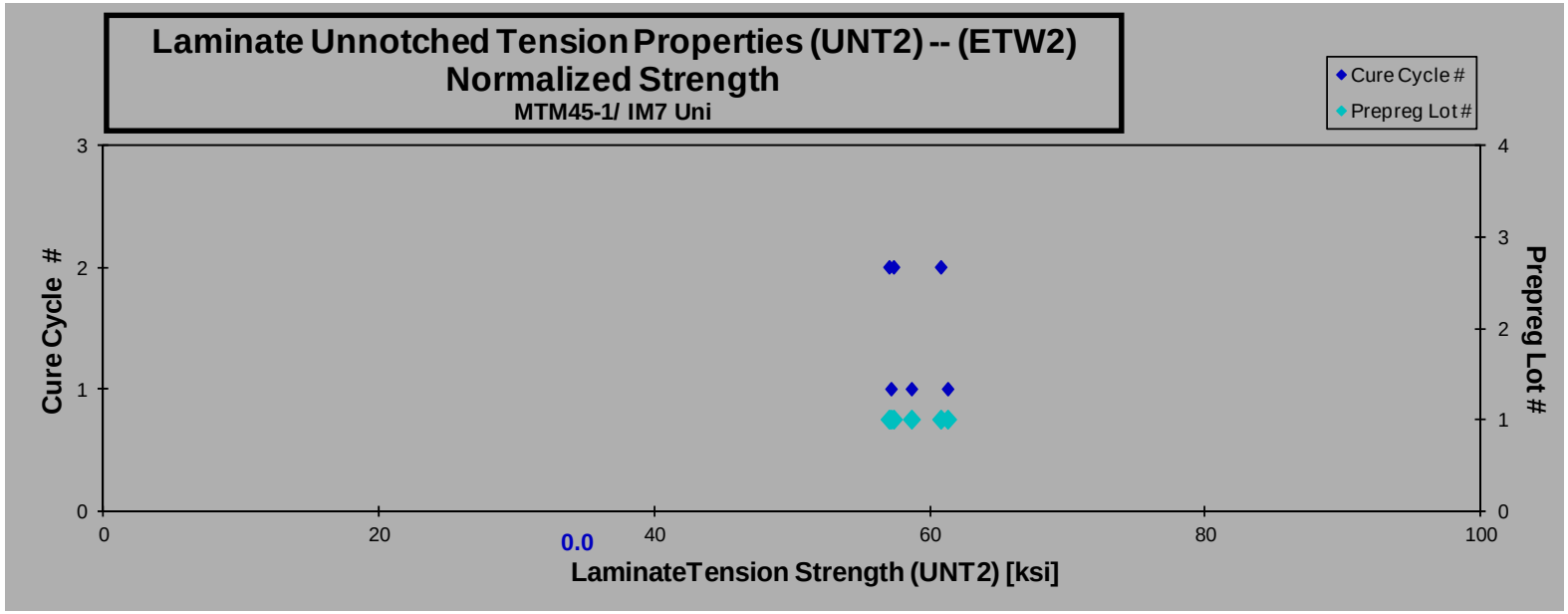

Laminate Unnotched Tension Properties (UNT2) -- (CTD)
Normalized Modulus
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0.0
1.0
2.0
3.0
4.0
5.0
6.0
Laminate Tension Modulus (UNT2) [Msi]

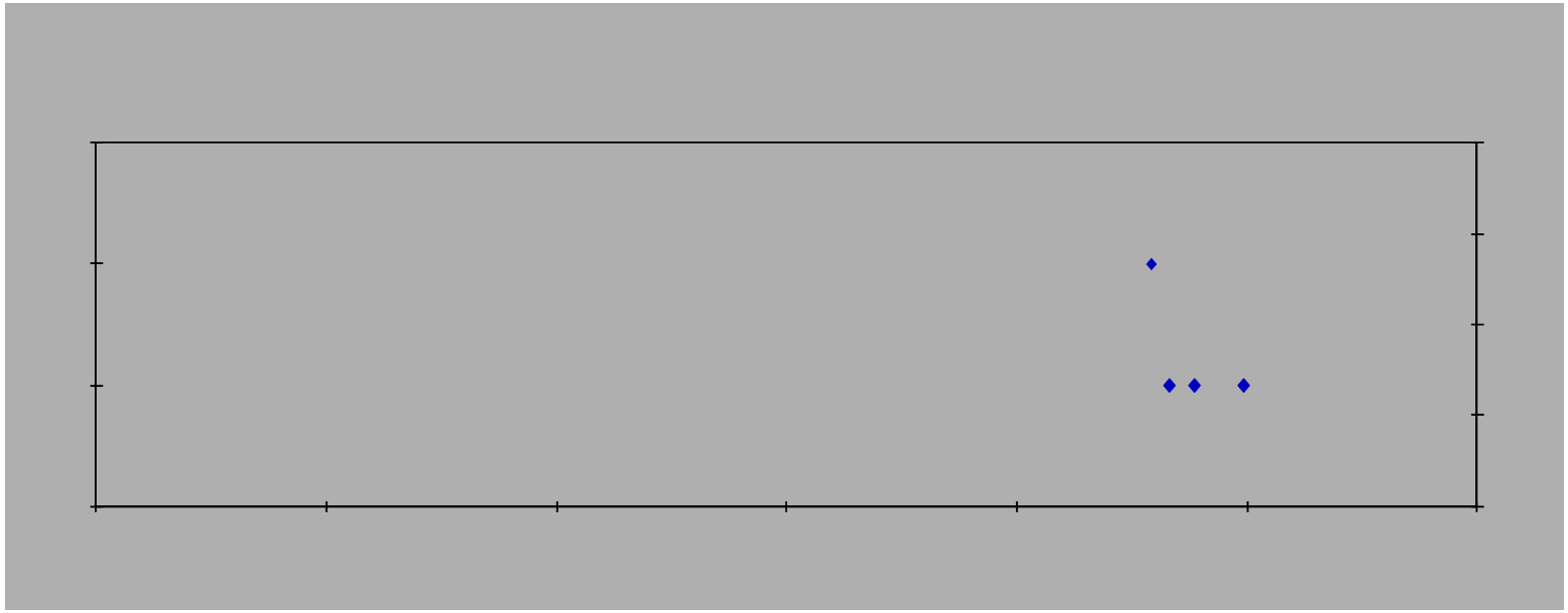
Laminate Unnotched Tension Properties (UNT2) -- (ETW2)
Strength & Modulus
MTM45-1/ IM7 Uni

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	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]	$Modulus_{norm}$ [Msi]
IMU-UNT2-A-MH1-ETW2-2	AFBA112D	A	MH1	1	1	56.444	4.602	0.111	20	DGM	0.0056	57.102	4.655
IMU-UNT2-A-MH1-ETW2-3	AFBA113D	A	MH1	1	1	56.822	4.621	0.113	20	DGM	0.0057	58.587	4.764
IMU-UNT2-A-MH1-ETW2-4	AFBA114D	A	MH1	1	1	60.141	4.891	0.112	20	DGM	0.0056	61.216	4.978
IMU-UNT2-A-MH2-ETW2-1	AFBA211D	A	MH2	1	2	55.894	4.466	0.113	20	DGM	0.0056	57.283	4.577
IMU-UNT2-A-MH2-ETW2-2	AFBA212D	A	MH2	1	2	55.295	4.449	0.113	20	DGM	0.0057	56.962	4.583
IMU-UNT2-A-MH2-ETW2-4	AFBA214D	A	MH2	1	2	59.850	4.781	0.112	20	DGM	0.0056	60.712	4.850

Average	**57.407**	**4.635**	**$Average_{norm}$**	**0.0056**	**58.643**	**4.735**
Standard Dev.	**2.072**	**0.174**	**$Standard\ Dev._{norm}$**		**1.895**	**0.160**
Coeff. of Var. [%]	**3.609**	**3.750**	**$Coeff.\ of\ Var.\ [\%]_{norm}$**		**3.231**	**3.372**
Min.	**55.295**	**4.449**	**Min.**	**0.0056**	**56.962**	**4.577**
Max.	**60.141**	**4.891**	**Max.**	**0.0057**	**61.216**	**4.978**
Number of Spec.	**6**	**6**	**Number of Spec.**		**6**	**6**

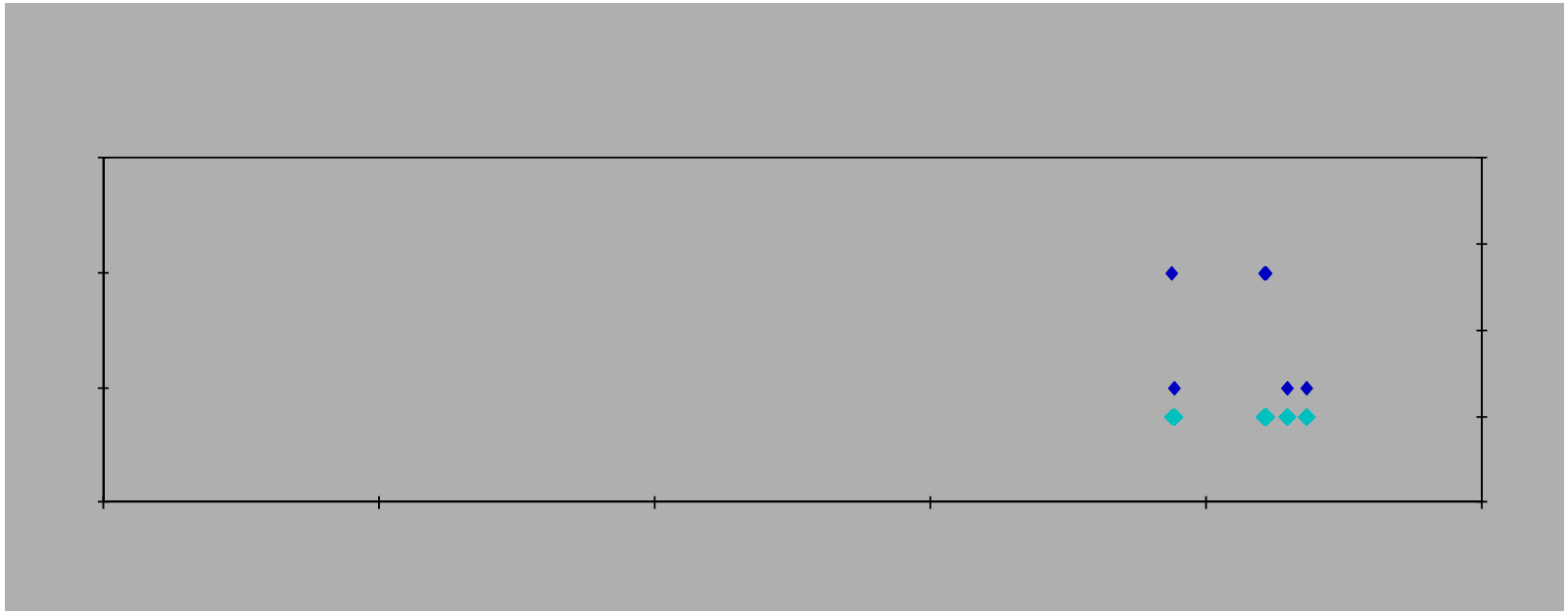

Laminate Unnotched Tension Properties (UNT2) -- (ETW2)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
20
0.0
40
60
80
100
LaminateTension Strength (UNT2) [ksi]



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

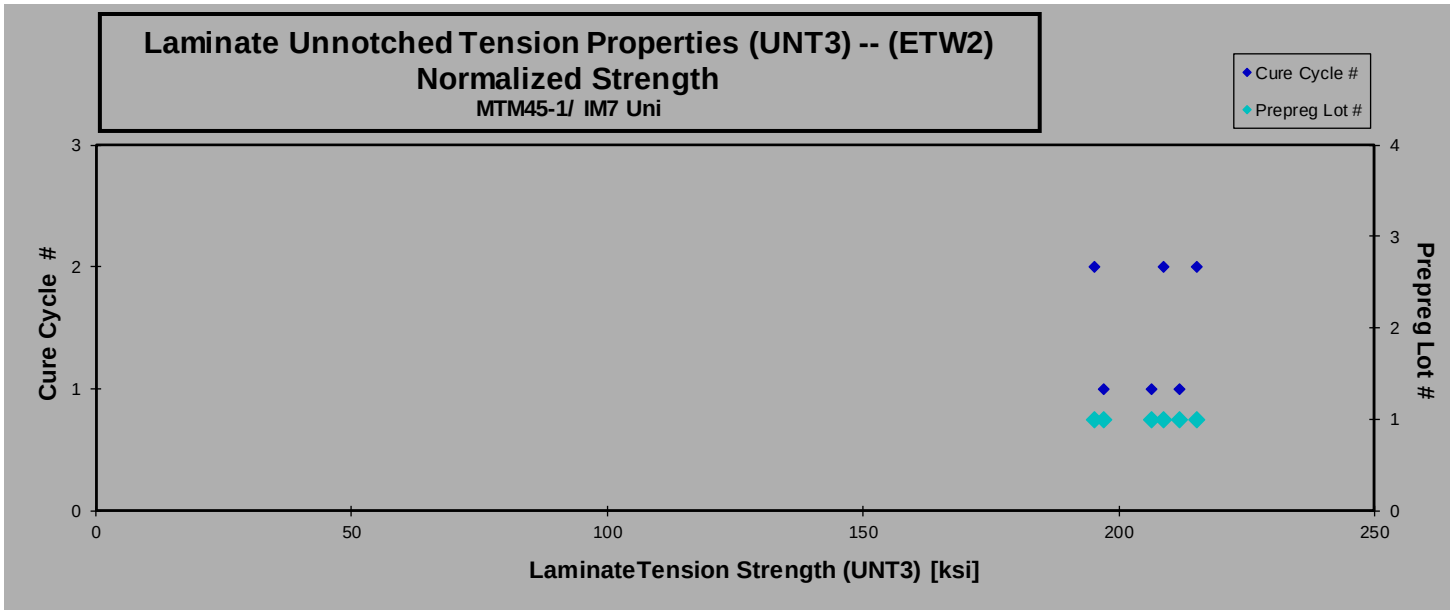
normalizing t_{ply} [in]
0.0055

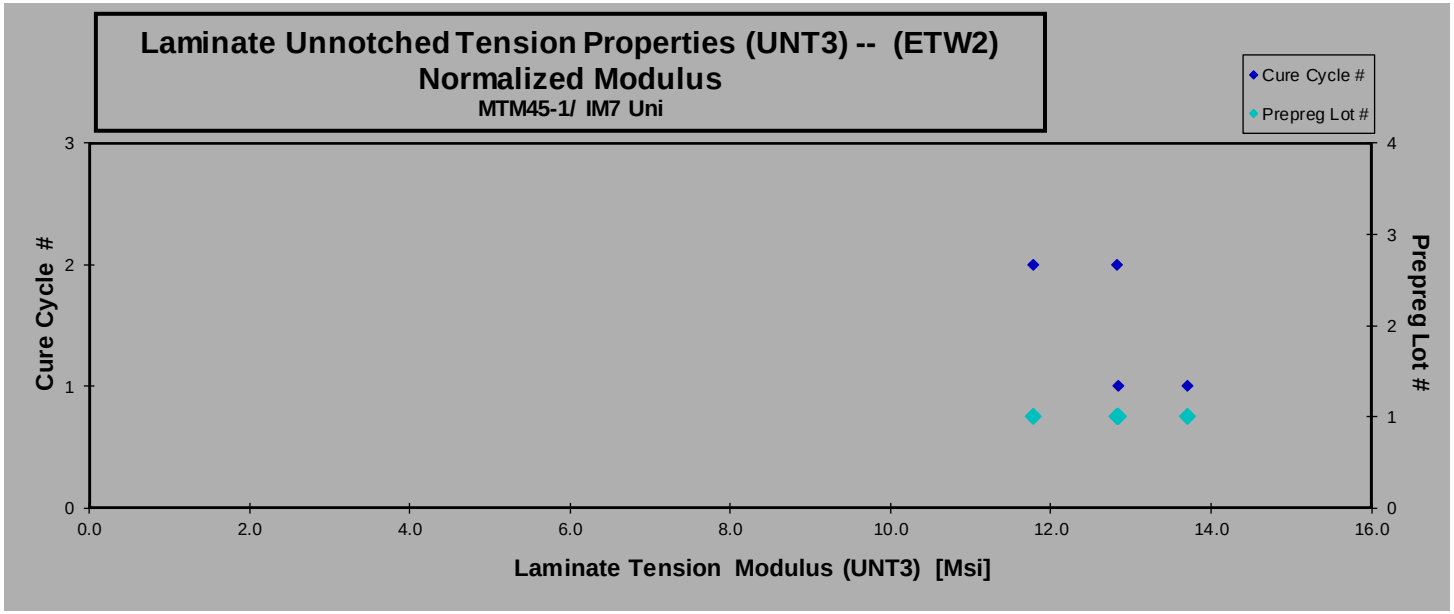
Specimen Number	#	}	NIAR Naming	ACG Batch #	ACG Cure Cyclc ®m	Prepreg	Cure Cycle	Strength	Modulus	Avg. Specimen #	Plies in	Failure	Avg. t_{ply}	$Strength_{norm}$	$Modulus_{norm}$

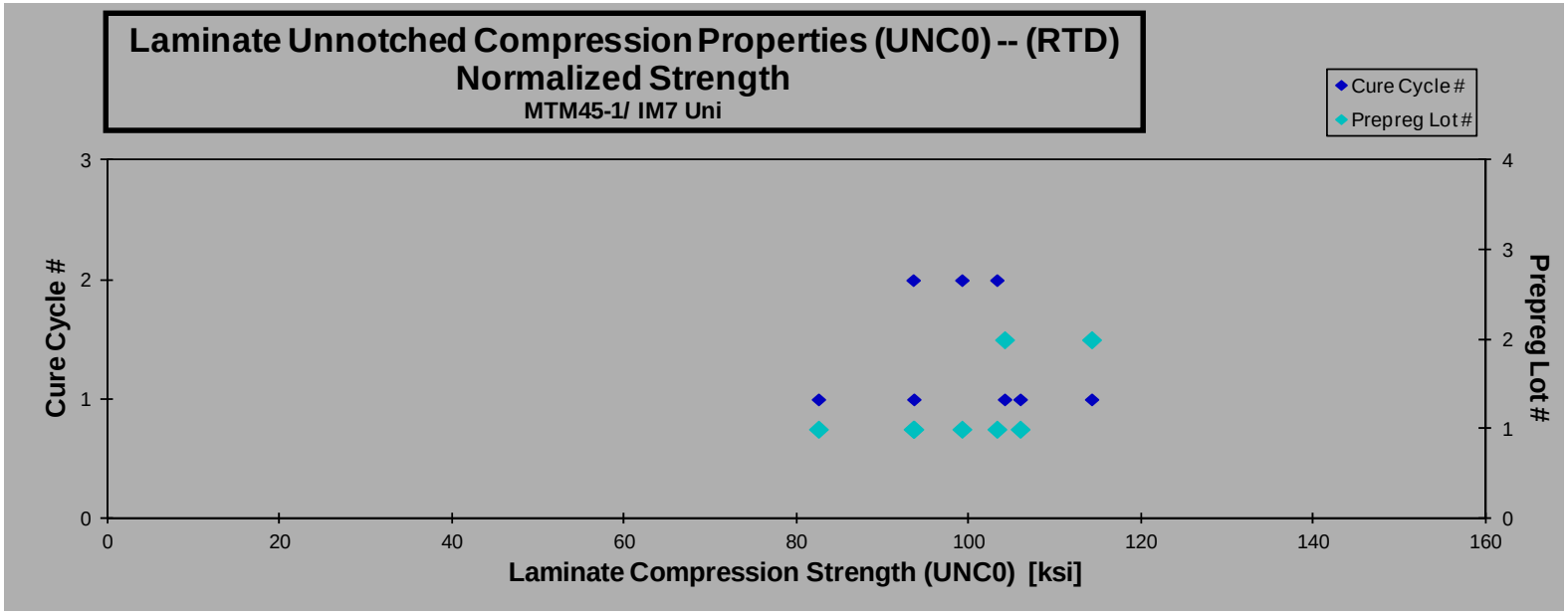


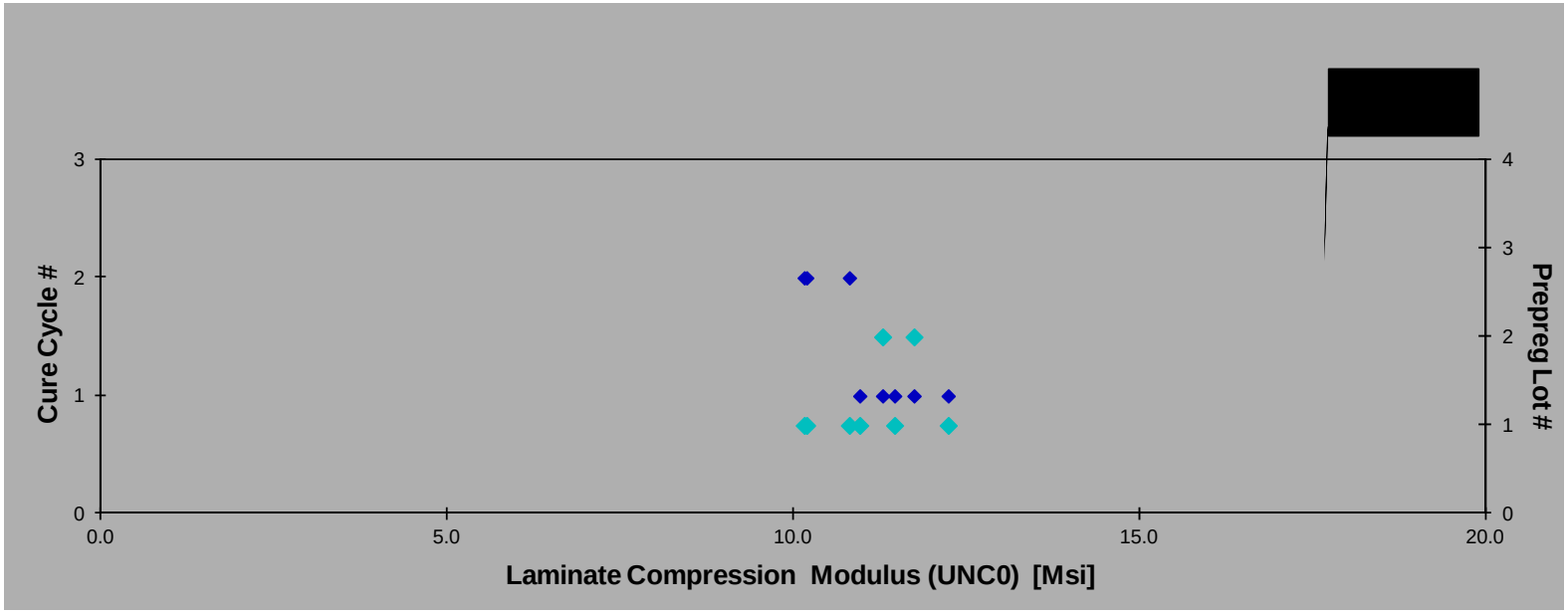
normalizing t_{ply} [in]
0.0055

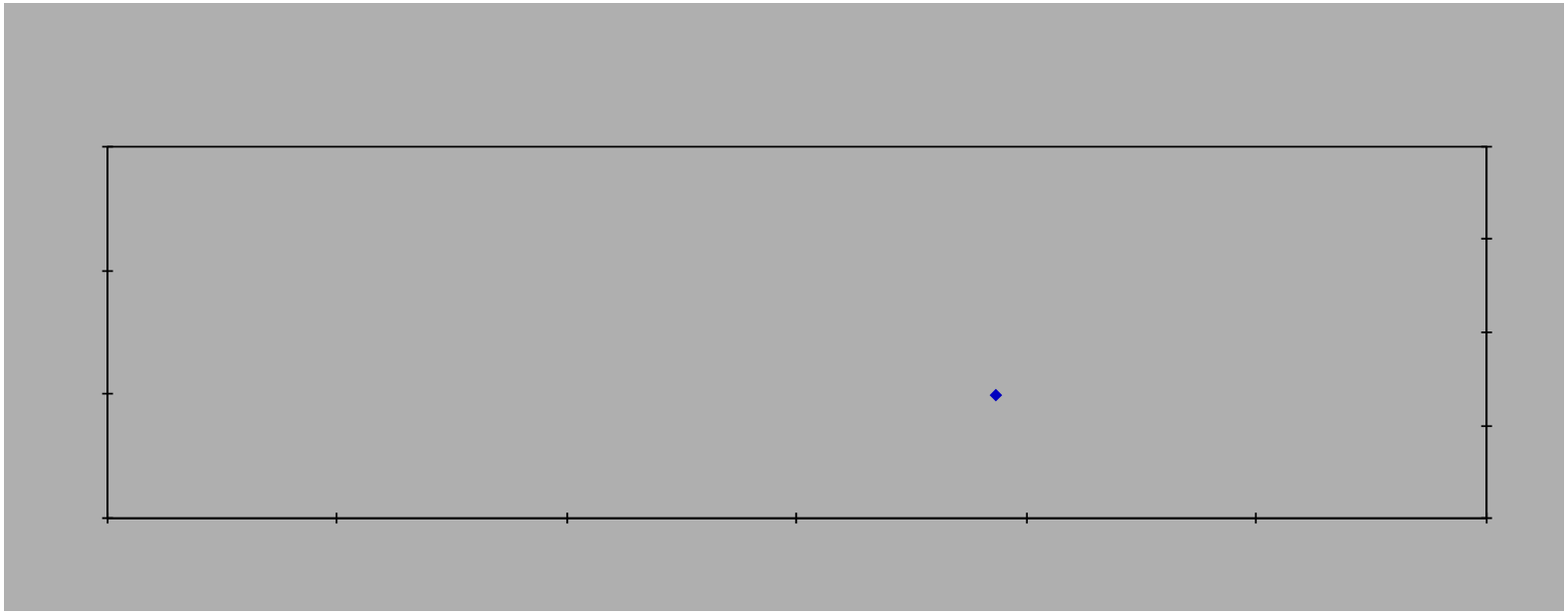
Specimen Number	NIAR Naming	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]	$Modulus_{norm}$ [Msi]
IMU-UNT3-A-MH1-ETW2-2	AFCA112D	A	MH1	1	1	202.405	12.594	0.112	20	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 T	0.							

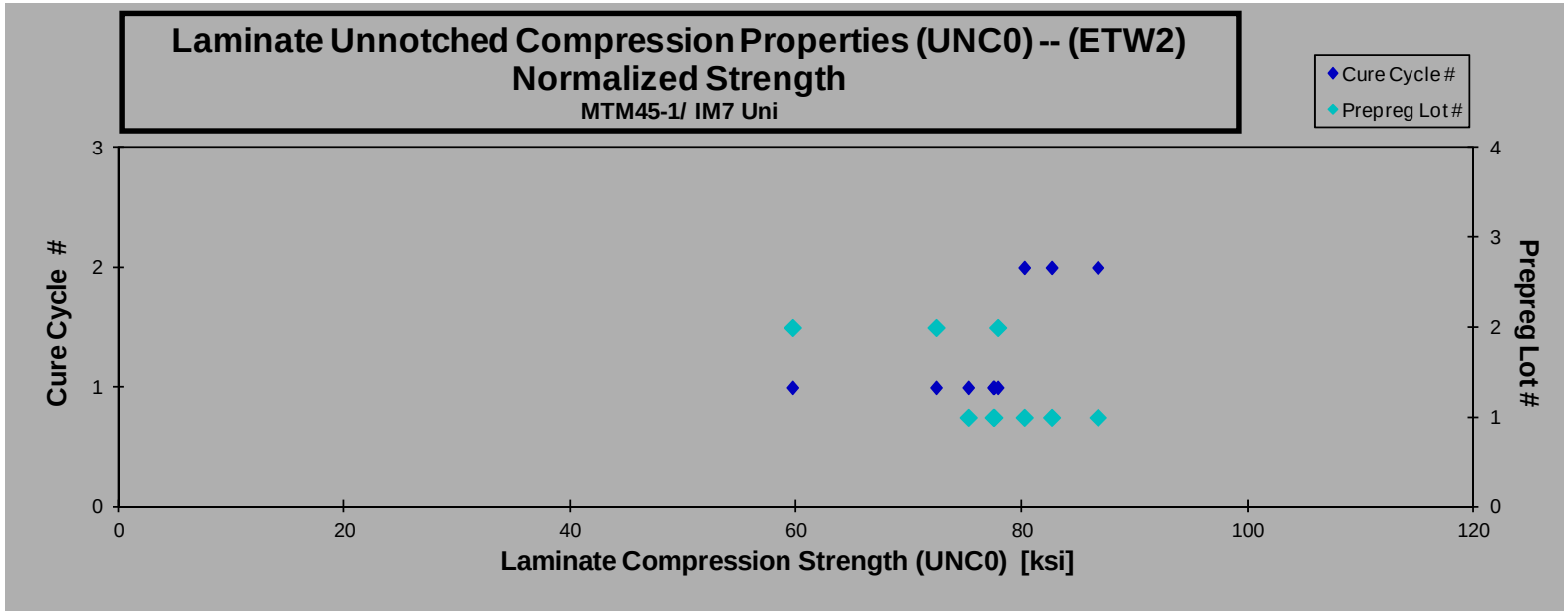

Laminate Unnotched Tension Properties (UNT3) -- (ETW2)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
LaminateTension Strength (UNT3) [ksi]
0
50
100
150
200
250
0
1
2
3
4

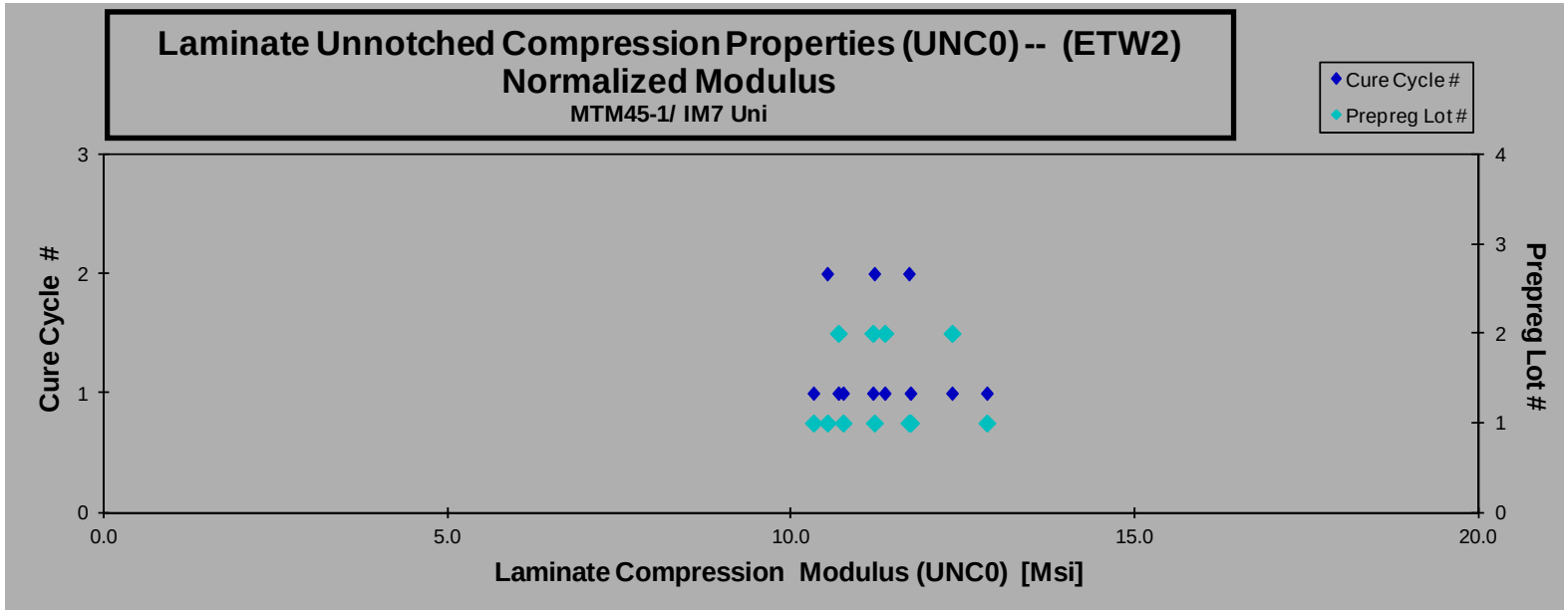

Laminate Unnotched Tension Properties (UNT3) -- (ETW2)
Normalized Modulus
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Tension Modulus (UNT3) [Msi]
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
0
1
2
3
4


Laminate Unnotched Compression Properties (UNC0) -- (RTD)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
20
40
60
80
100
120
140
160
Laminate Compression Strength (UNC0) [ksi]

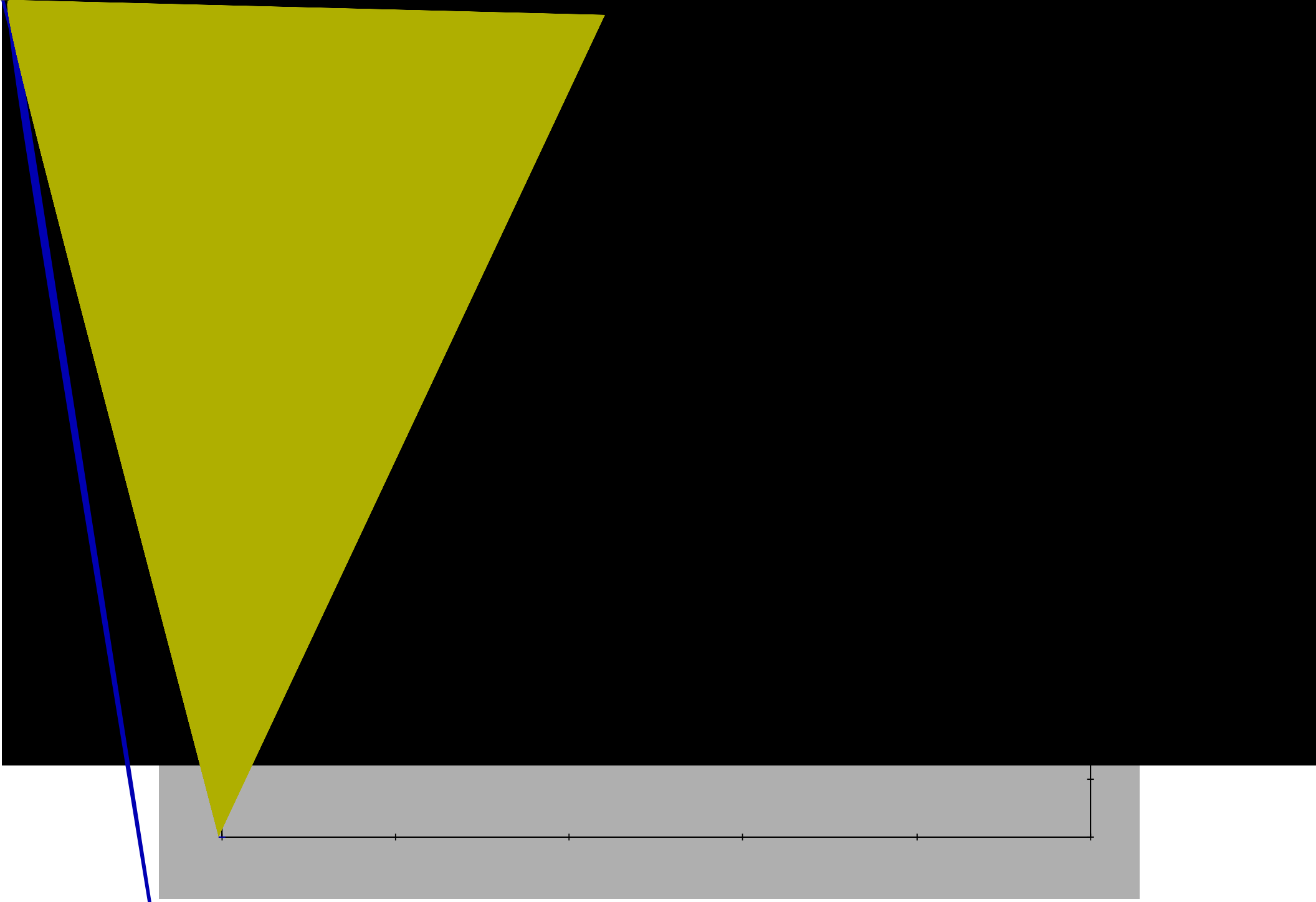

Cure Cycle #
Prepreg Lot #
0.0
5.0
10.0
15.0
20.0
Laminate Compression Modulus (UNC0) [Msi]



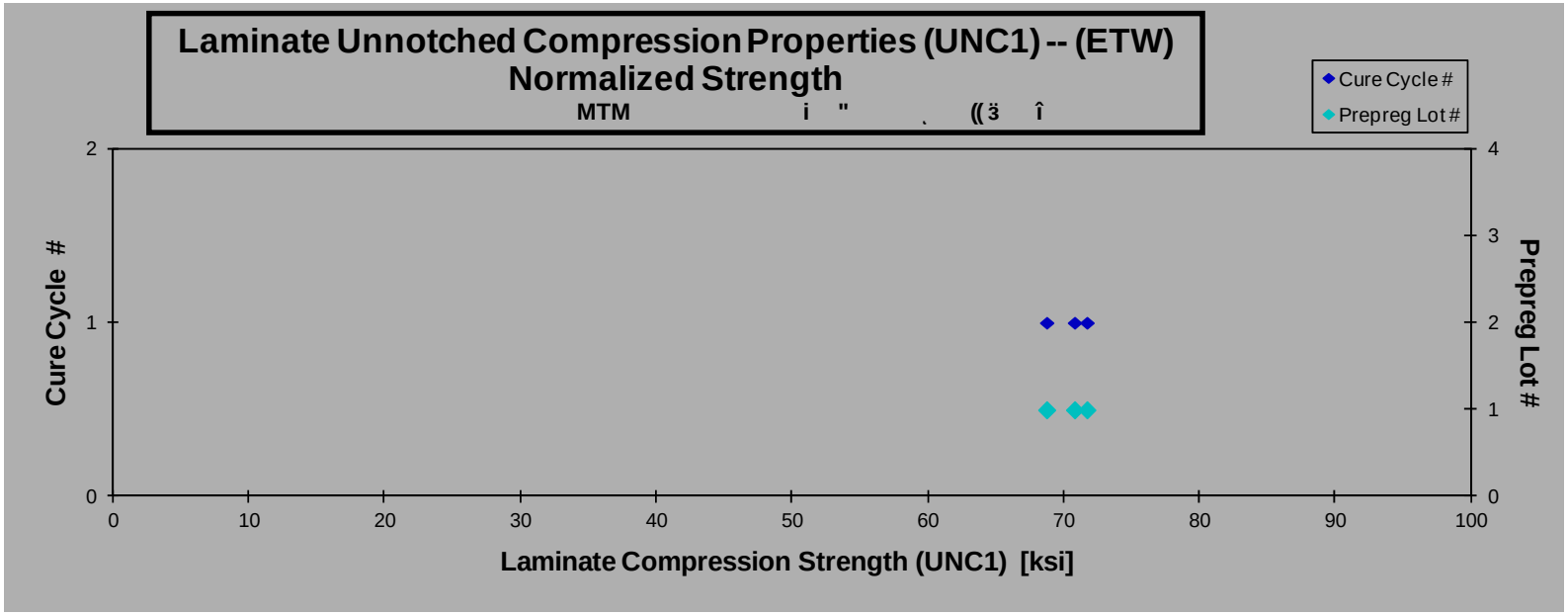

Laminate Unnotched Compression Properties (UNC0) -- (ETW2)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle
Prepreg Lot
Laminate Compression Strength (UNC0) [ksi]
0
20
40
60
80
100
120


Laminate Unnotched Compression Properties (UNC0) -- (ETW2)
Normalized Modulus
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle
Prepreg Lot
Laminate Compression Modulus (UNC0) [Msi]
0.0
5.0
10.0
15.0
20.0

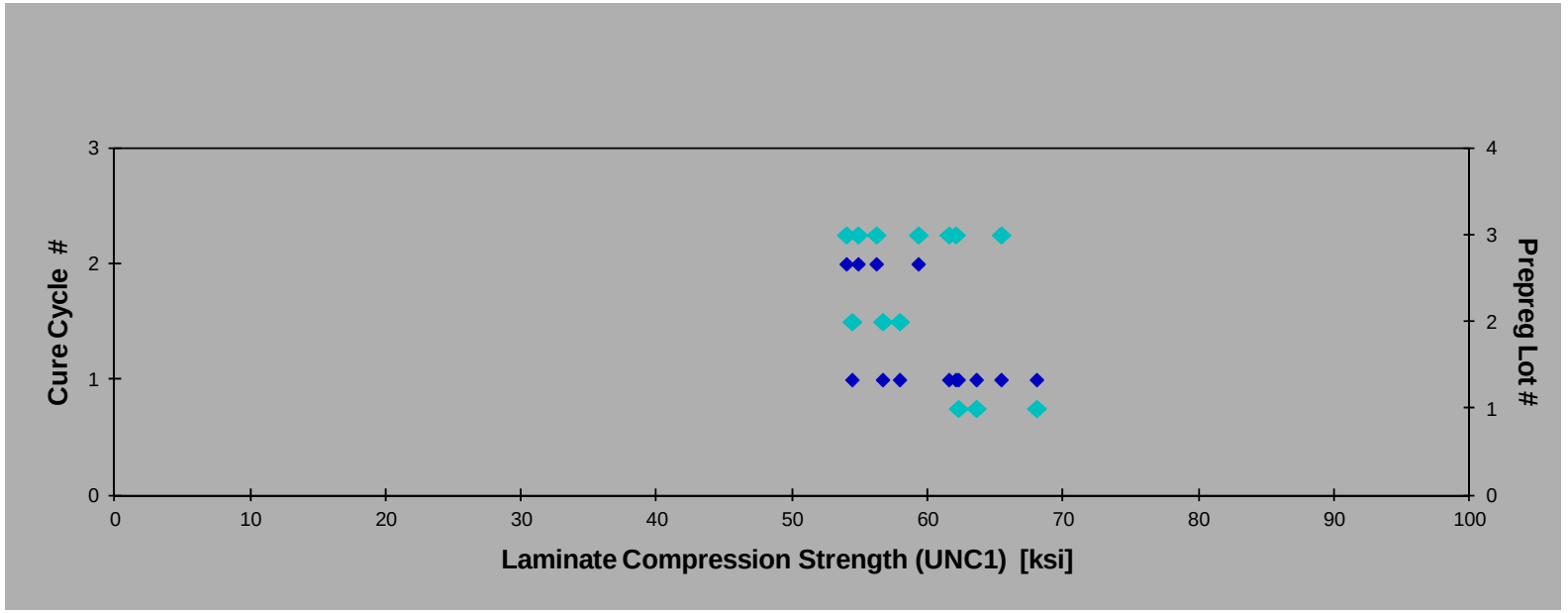
4.11 “25/50/25” Unnotched Compression 1 Properties (UNC1)



																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																	

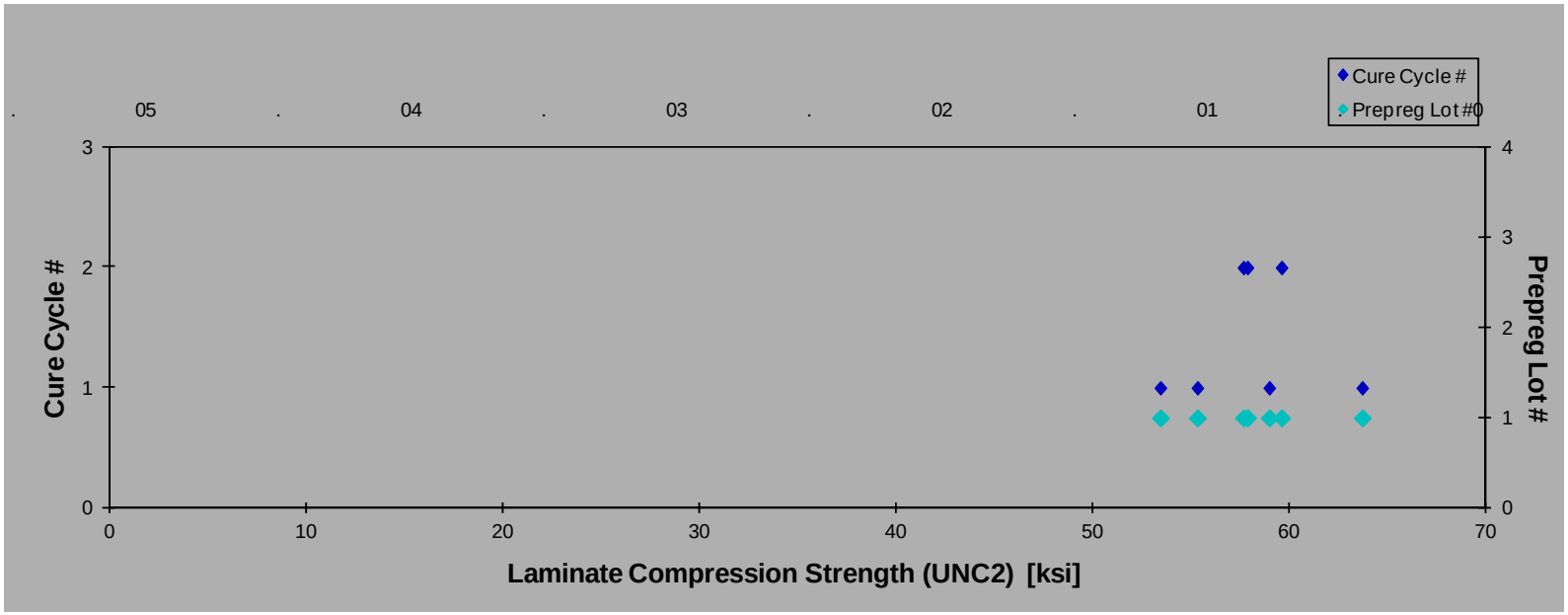

Laminate Unnotched Compression Properties (UNC1) -- (ETW)
Normalized Strength
MTM
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Compression Strength (UNC1) [ksi]
0
10
20
30
40
50
60
70
80
90
100
0
1
2
0
1
2
3
4

												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}	$Strength_{norm}$	$Modulus_{norm}$


Cure Cycle #
Prepreg Lot #
Laminate Compression Strength (UNC1) [ksi]
0
1
2
3
4
0
10
20
30
40
50
60
70
80
90
100

4.12 “10/80/10” Unnotched Compression 2 Properties (UNC2)

normalizing t_{ply} [in]
0.0055


05
04
03
02
01
Cure Cycle #
Prepreg Lot #0
Cure Cycle #
Prepreg Lot #
Laminate Compression Strength (UNC2) [ksi]
0
1
2
3
4
0
10
20
30
40
50
60
70

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

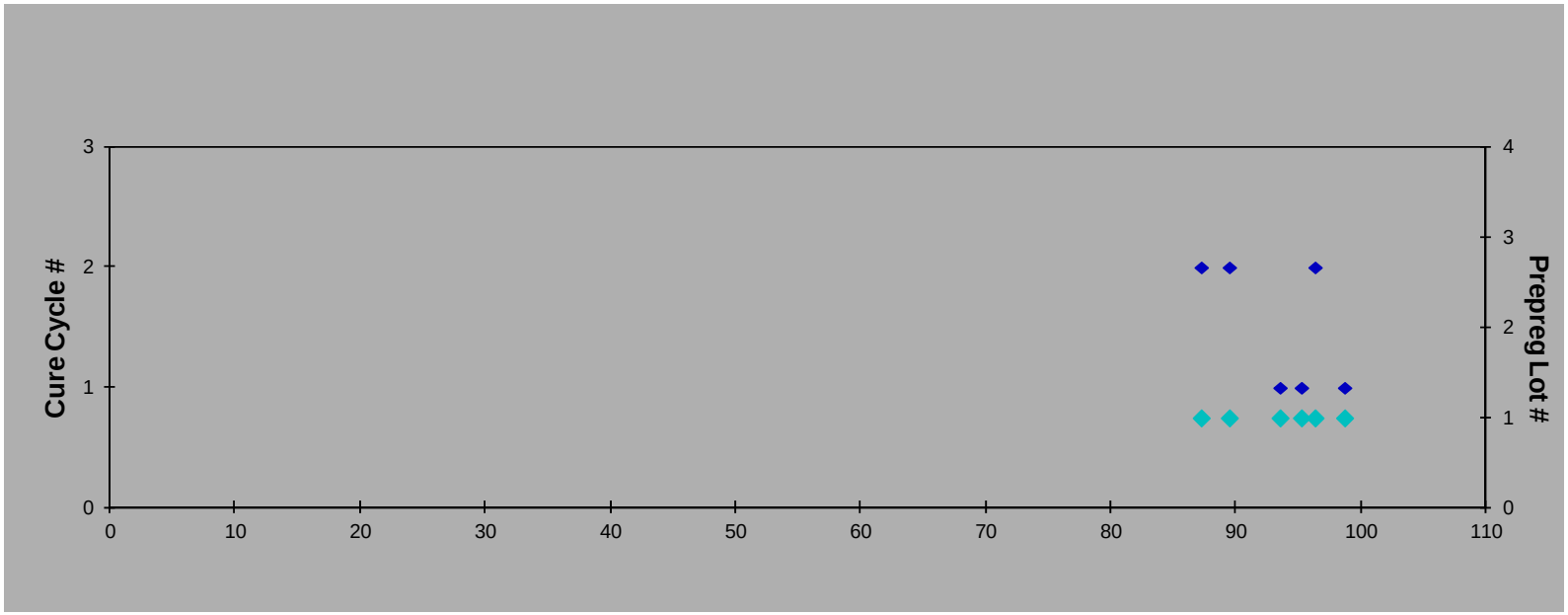
***Compressive strength is not reported due to unacceptable failure.**

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


Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
10
20
30
40
50
60
70
80
90
100
110

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}

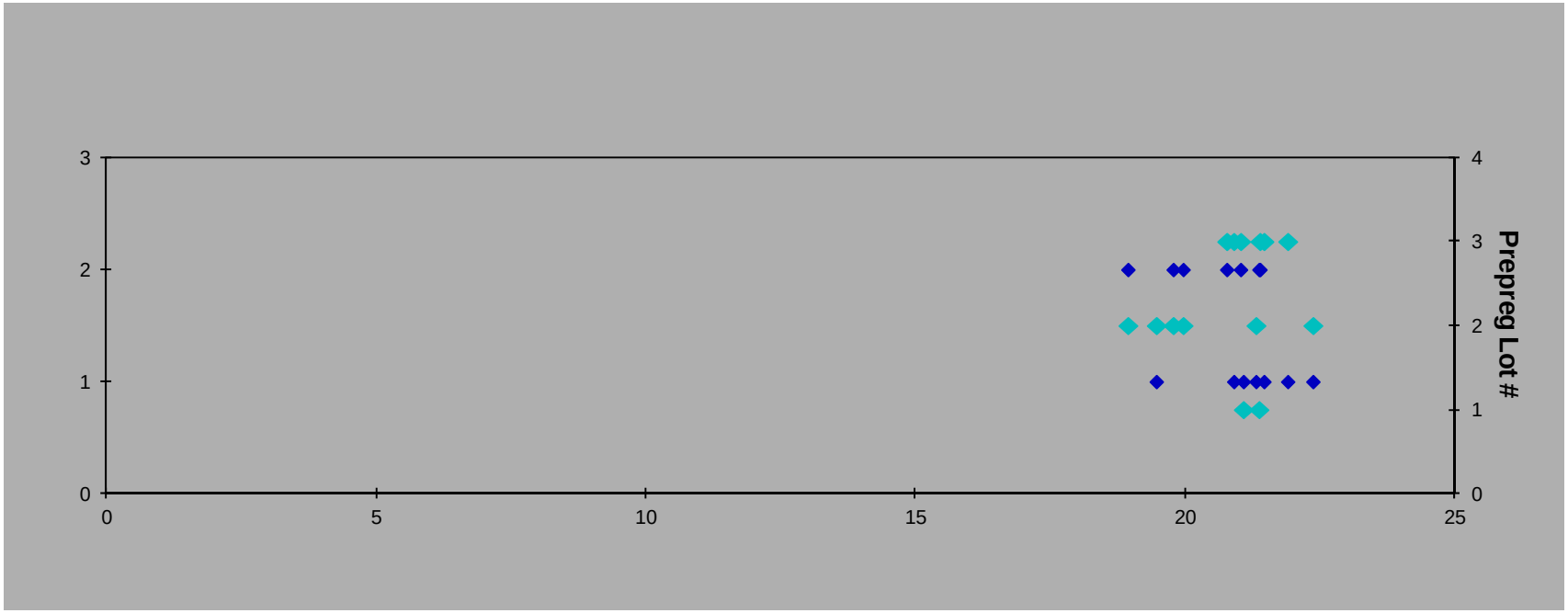
4.14 Lamina Short-Beam Strength Properties (SBS)

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 Thickn. [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**	**Average**	**0.0056**
Standard Dev.	**0.967**	**Standard Dev.**	
Coeff. of Var. [%]	**4.638**	**Coeff. of Var. [%]**	
Min.	**18.954**	**Min.**	**0.0054**
Max.	**22.386**	**Max.**	**0.0058**
Number of Spec.	**14**	**Number of Spec.**	**20**


3
2
1
0
0
5
10
15
20
25
4
3
2
1
0
Prepreg Lot #

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**	**Average**	**0.0056**
Standard Dev.	**0.542**	**Standard Dev.**	
Coeff. of Var. [%]	**3.750**	**Coeff. of Var. [%]**	
Min.	**13.851**	**Min.**	**0.0054**
Max.	**15.180**	**Max.**	**0.0058**
Number of Spec.	**6**	**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.**

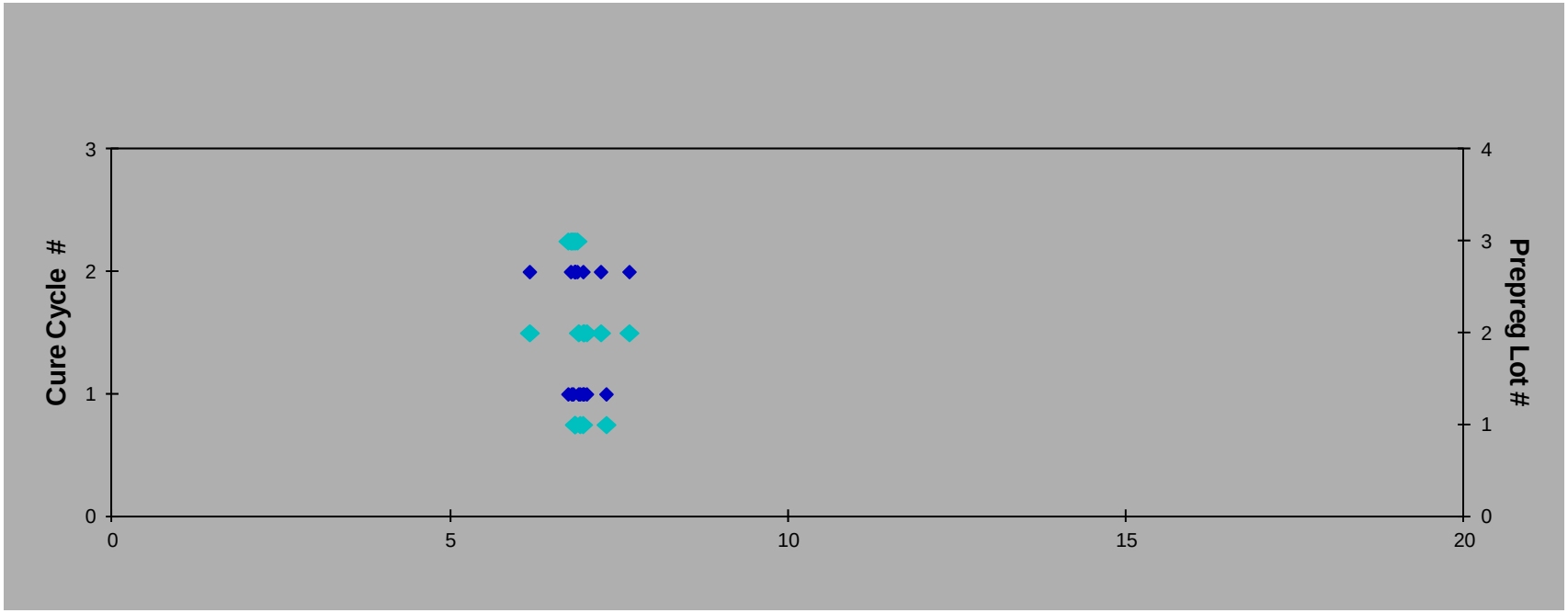
Average	**11.152**	**Average**	**0.0056**
Standard Dev.	**0.309**	**Standard Dev.**	
Coeff. of Var. [%]	**2.768**	**Coeff. of Var. [%]**	
Min.	**10.586**	**Min.**	**0.0054**
Max.	**11.569**	**Max.**	**0.0058**
Number of Spec.	**13**	**Number of Spec.**	**20**

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-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
[redacted]-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	3						

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**	**Average**	**0.0055**
Standard Dev.	**0.284**	**Standard Dev.**	
Coeff. of Var. [%]	**4.099**	**Coeff. of Var. [%]**	
Min.	**6.176**	**Min.**	**0.0052**
Max.	**7.650**	**Max.**	**0.0059**
Number of Spec.	**19**	**Number of Spec.**	**19**


Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
5
10
15
20

4.15 Laminate Short-Beam Strength Properties (SBS1)

[redacted]

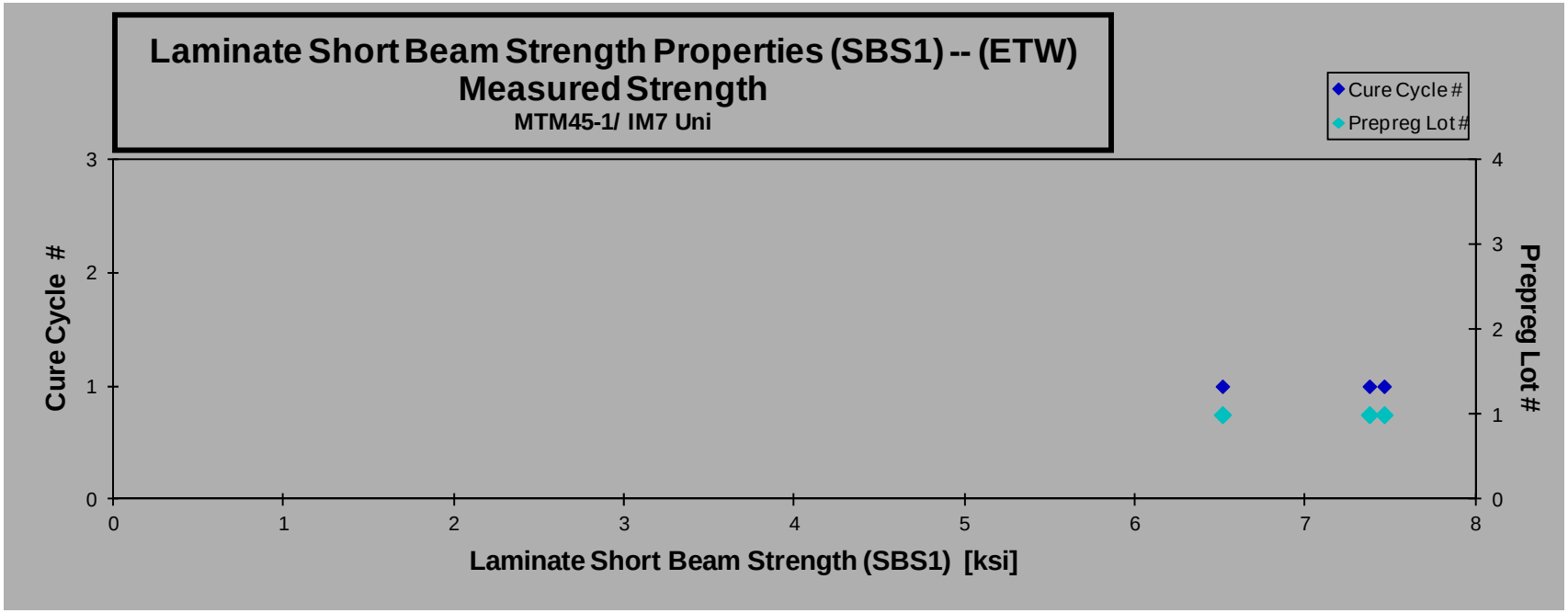
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
IMU-SBS1-A-MH1-RTD-1	AFqA111A	A	MH1	1	1	11.306	0.135	24	0.0056	ILS
IMU-SBS1-A-MH1-RTD-2	AFqA112A	A	MH1	1	1	11.651	0.136	24	0.0057	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

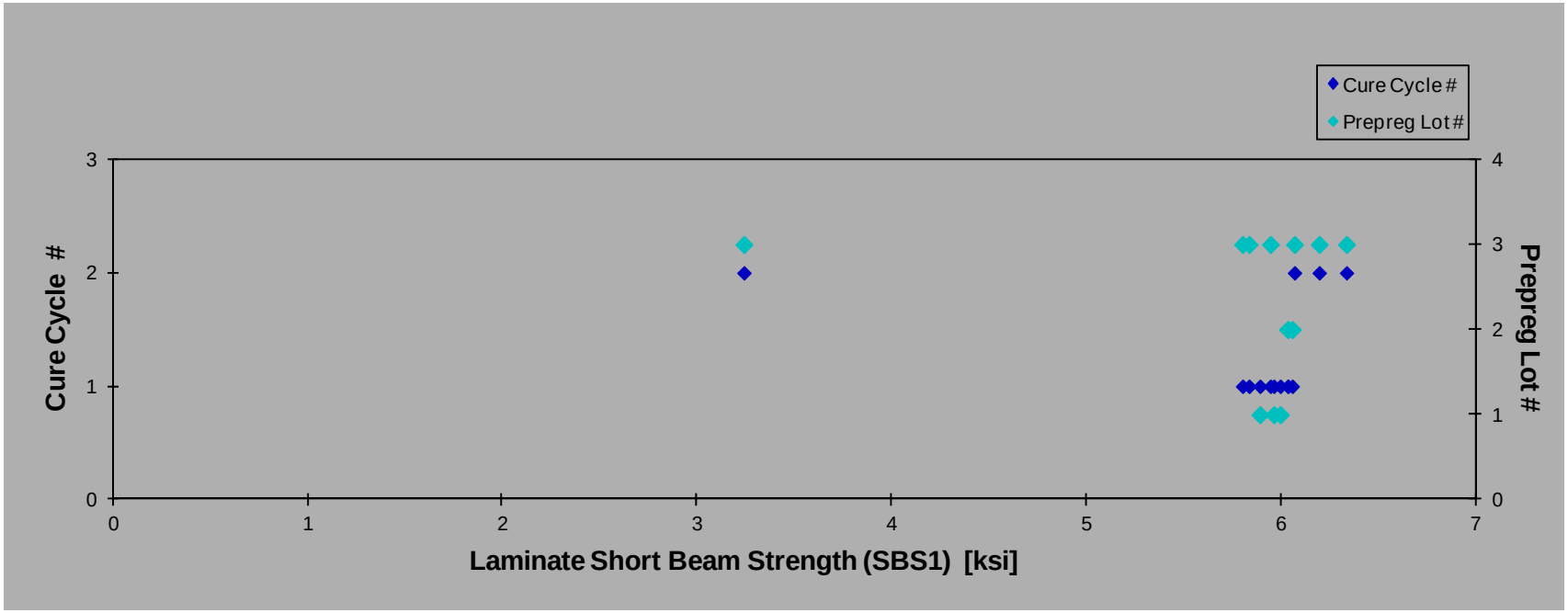
Batch A and B cure cycle 2 - Data is omitted due to incorrect panel processing.

Average	**10.218**	**Average**	**0.0055**
Standard Dev.	**0.878**	**Standard Dev.**	
Coeff. of Var. [%]	**8.595**	**Coeff. of Var. [%]**	
Min.	**8.847**	**Min.**	**0.0055**
Max.	**11.651**	**Max.**	**0.0057**
Number of Spec.	**12**	**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

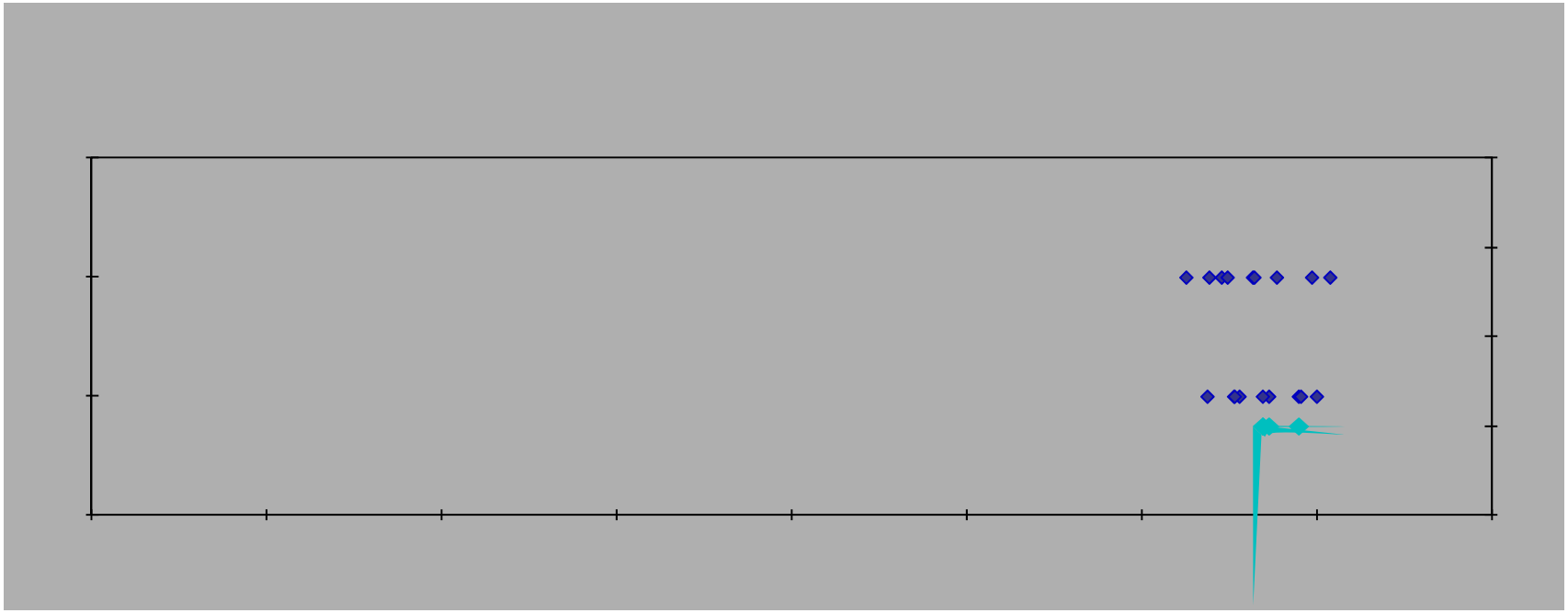

Laminate Short Beam Strength Properties (SBS1) -- (ETW)
Measured Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Short Beam Strength (SBS1) [ksi]
0
1
2
3
4
5
6
7
8


Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Short Beam Strength (SBS1) [ksi]
0
1
2
3
4
5
6
7

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]

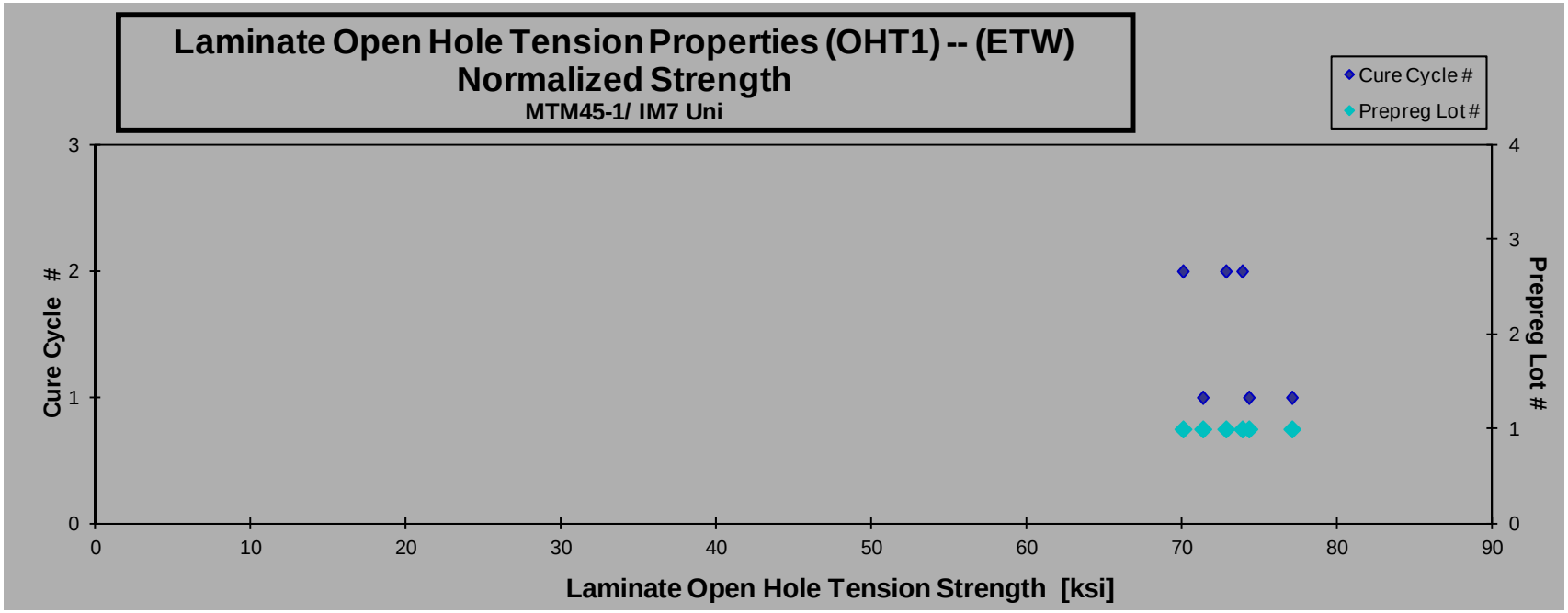


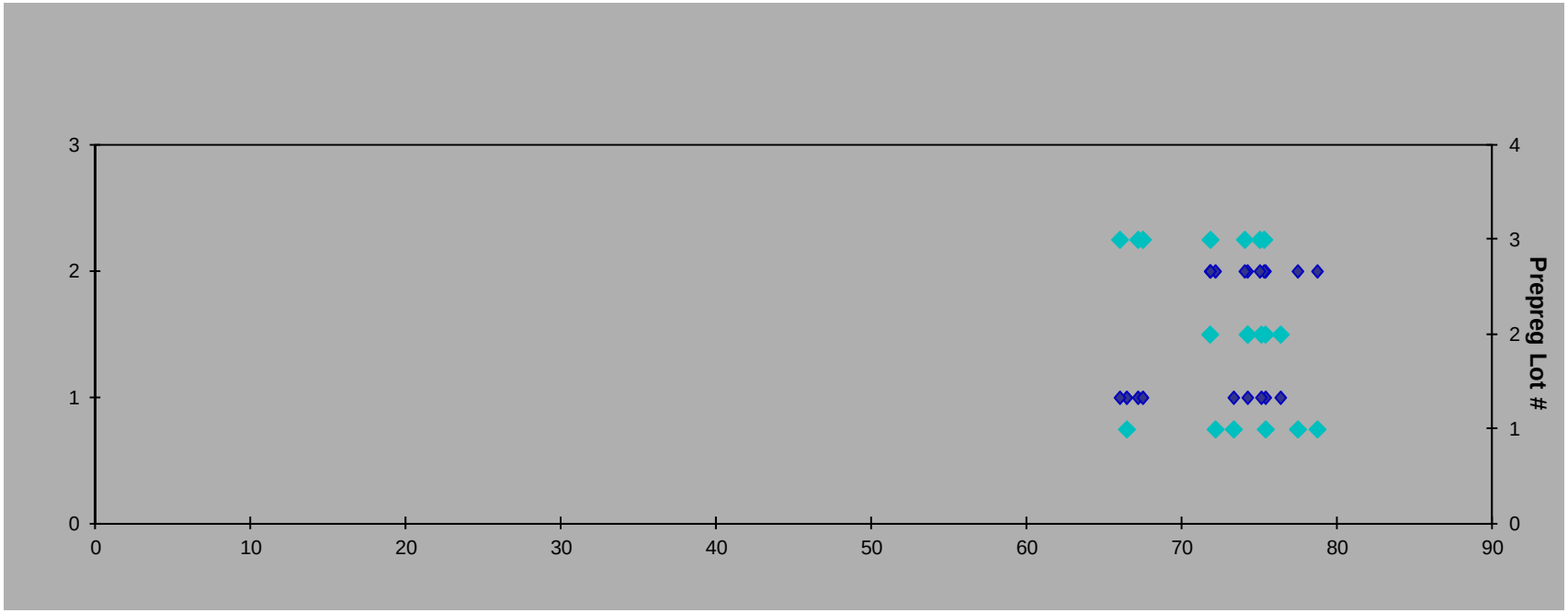
normalizing t_{ply} [in]: 0.0055

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

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-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 I-	B -6 Ŏ		ƁŦ 6			


Laminate Open Hole Tension Properties (OHT1) -- (ETW)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Tension Strength [ksi]
0
10
20
30
40
50
60
70
80
90
0
1
2
3
4


3
2
1
0
0
10
20
30
40
50
60
70
80
90
4
3
2
1
0
Prepreg Lot #

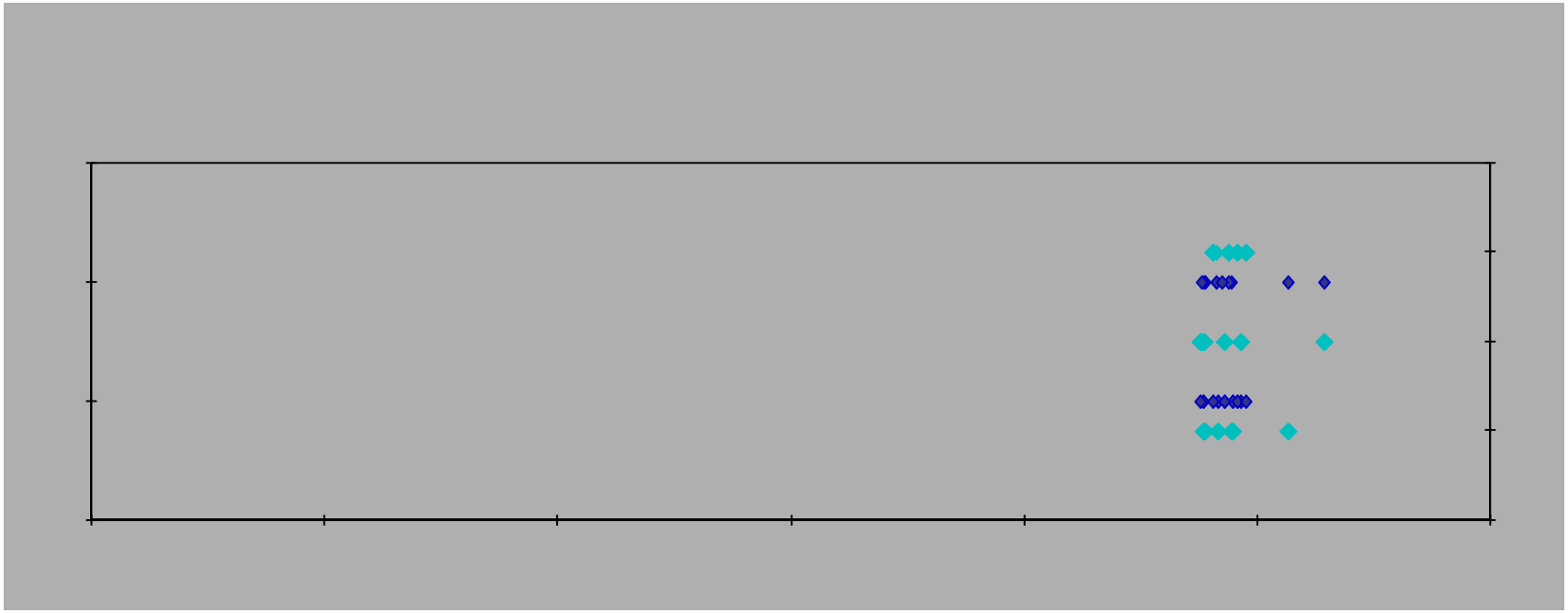
4.17 "10/80/10" Open Hole Tension 2 Properties (OHT2)

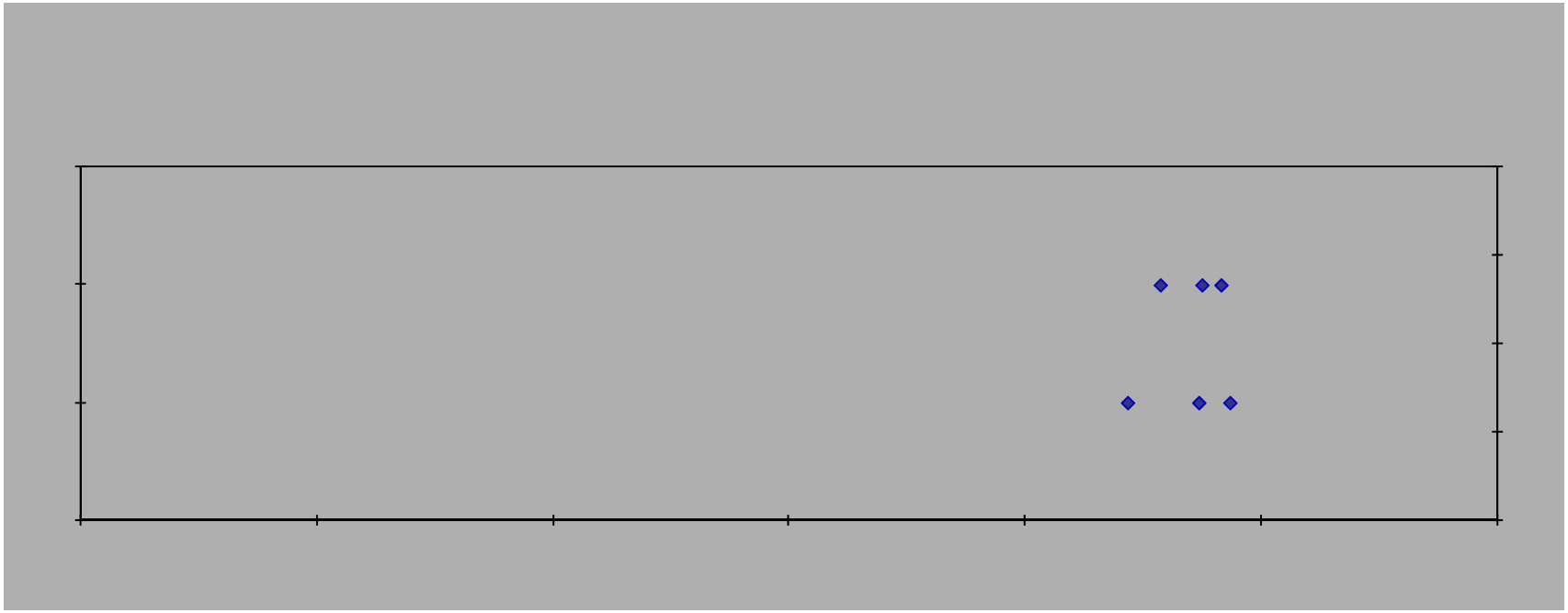
Laminate Open Hole Tension Properties (OHT2) -- (CTD)
Strength
MTM45-1/ IM7 Uni

normalizing t_{ply} [in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [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

	Strength [ksi]		Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
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





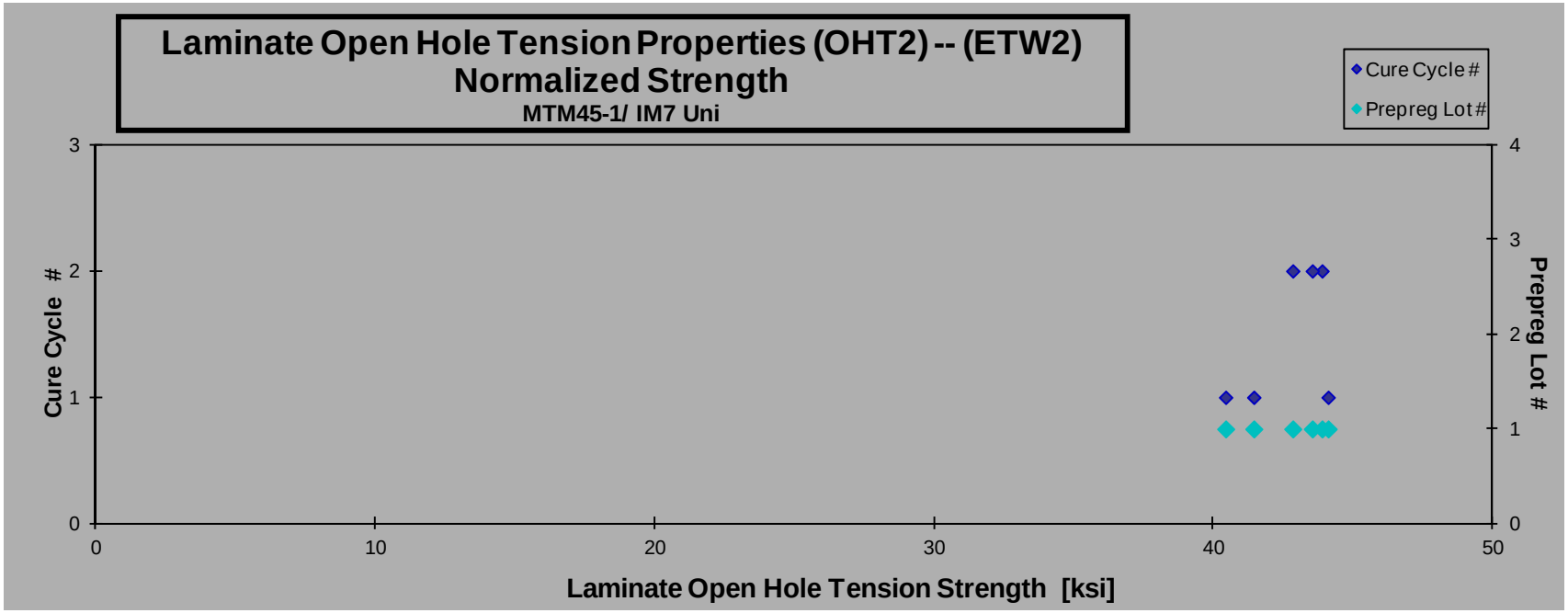
Laminate Open Hole Tension Properties (OHT2) -- (ETW2) Strength

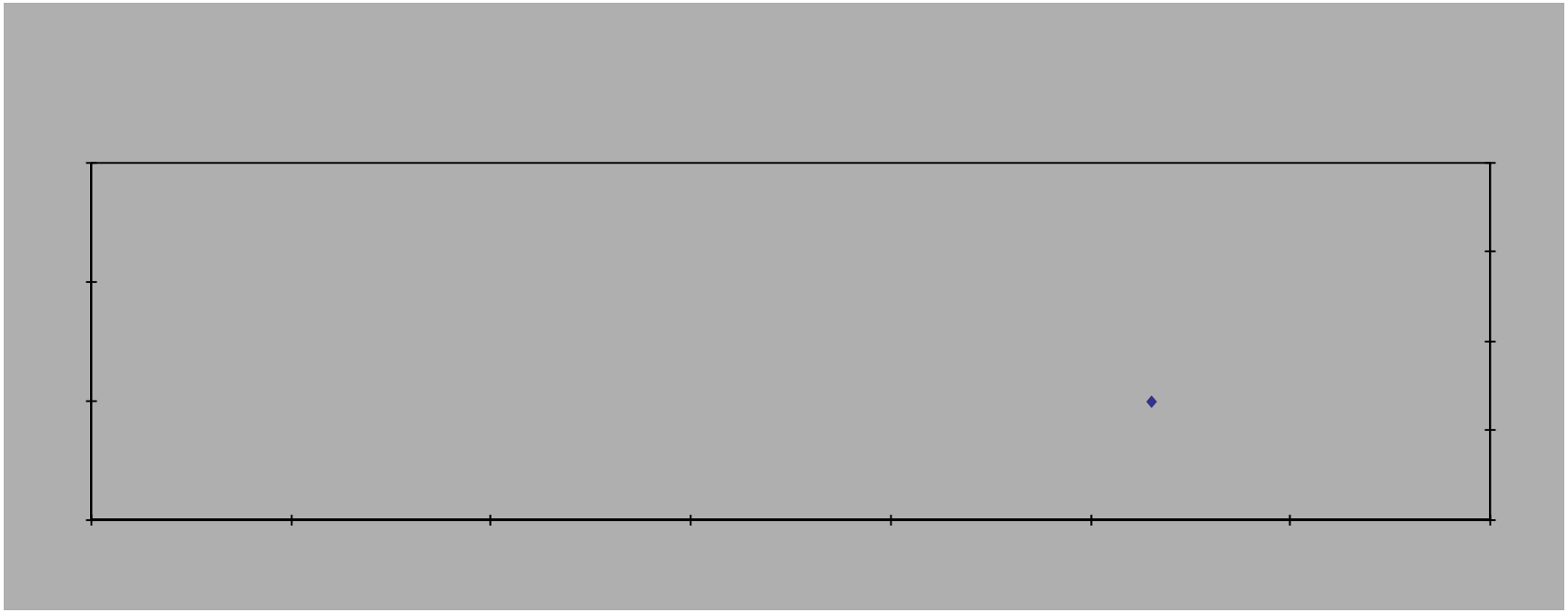
MTM45-1/ IM7 Uni

normalizing t_{ply} [in]
0.0055

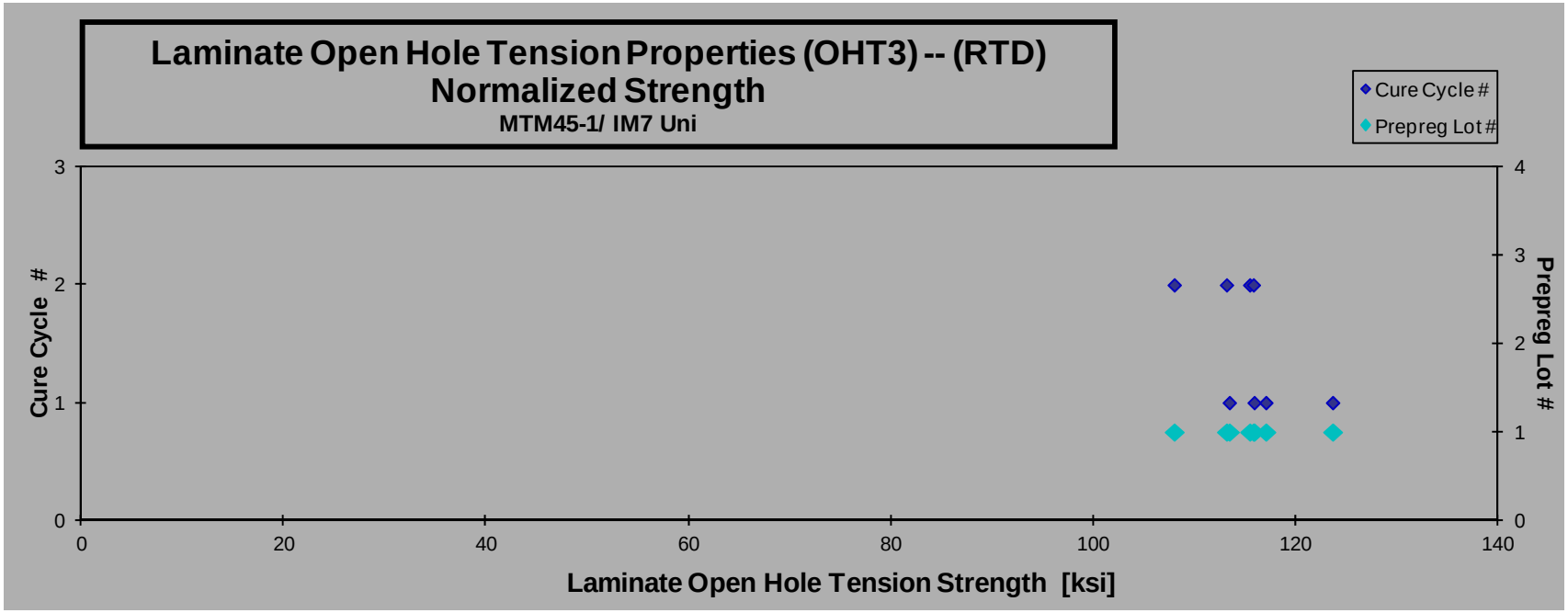
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Modes	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
IMU-OHT2-A-MH1-ETW2-1	AFEA111D	A	MH1	1	1	41.510	0.110	20	AGM	0.0055	41.453
IMU-OHT2-A-MH1-ETW2-2	AFEA112D	A	MH1	1	1	43.789	0.111	20	AGM	0.0055	44.114
IMU-OHT2-A-MH1-ETW2-3	AFEA113D	A	MH1	1	1	40.341	0.110	20	AGM	0.0055	40.445
IMU-OHT2-A-MH2-ETW2-1	AFEA211D	A	MH2	1	2	41.716	0.113	20	AGM	0.0056	42.847
IMU-OHT2-A-MH2-ETW2-2	AFEA212D	A	MH2	1	2	42.368	0.114	20	AGM	0.0057	43.896
IMU-OHT2-A-MH2-ETW2-3	AFEA213D	A	MH2	1	2	42.524	0.113	20	AGM	0.0056	43.548

Average	**42.041**		**$Average_{norm}$**	**0.0056**	**42.717**
Standard Dev.	**1.155**		**$Standard\ Dev._{norm}$**		**1.470**
Coeff. of Var. [%]	**2.748**		**$Coeff.\ of\ Var.\ [\%]_{norm}$**		**3.442**
Min.	**40.341**		**Min.**	**0.0055**	**40.445**
Max.	**43.789**		**Max.**	**0.0057**	**44.114**
Number of Spec.	**6**		**Number of Spec.**		**6**


Laminate Open Hole Tension Properties (OHT2) -- (ETW2)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Tension Strength [ksi]
0
1
2
3
4
0
10
20
30
40
50



normalizing t_{ply} [in]
0.0055

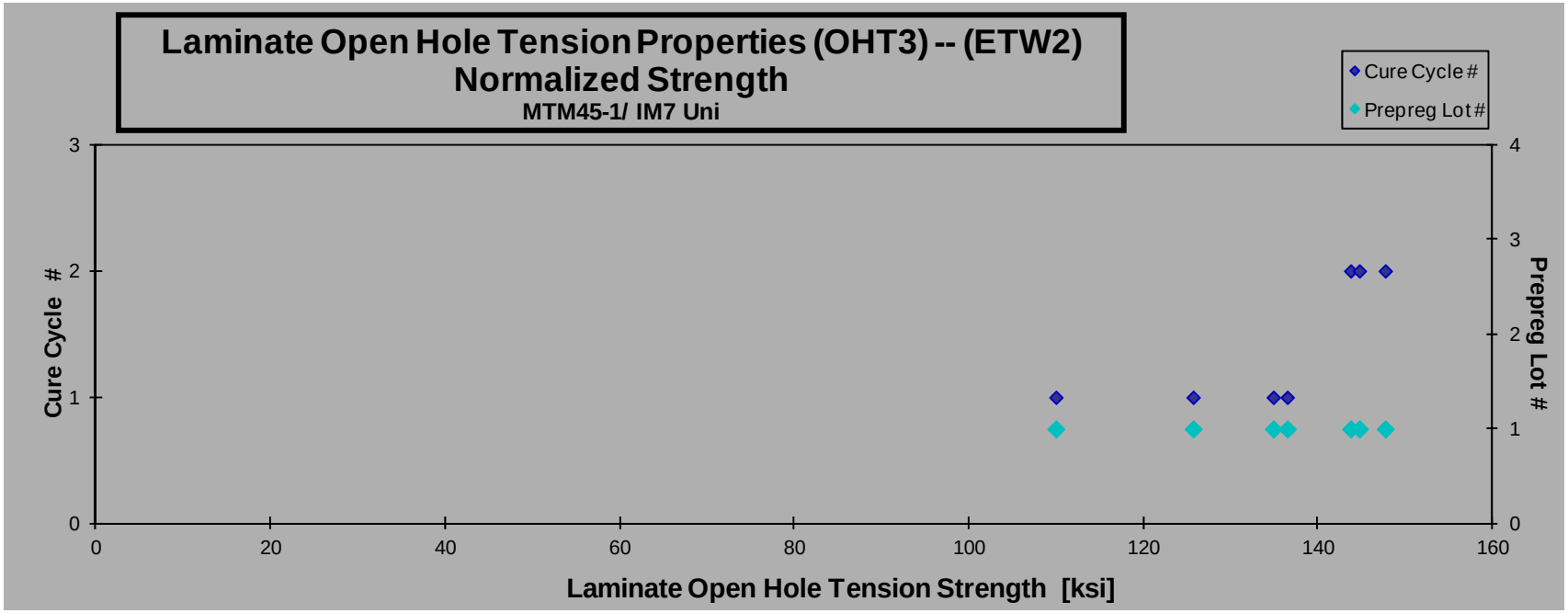

Laminate Open Hole Tension Properties (OHT3) -- (RTD)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Tension Strength [ksi]
0
1
2
3
4
0
20
40
60
80
100
120
140

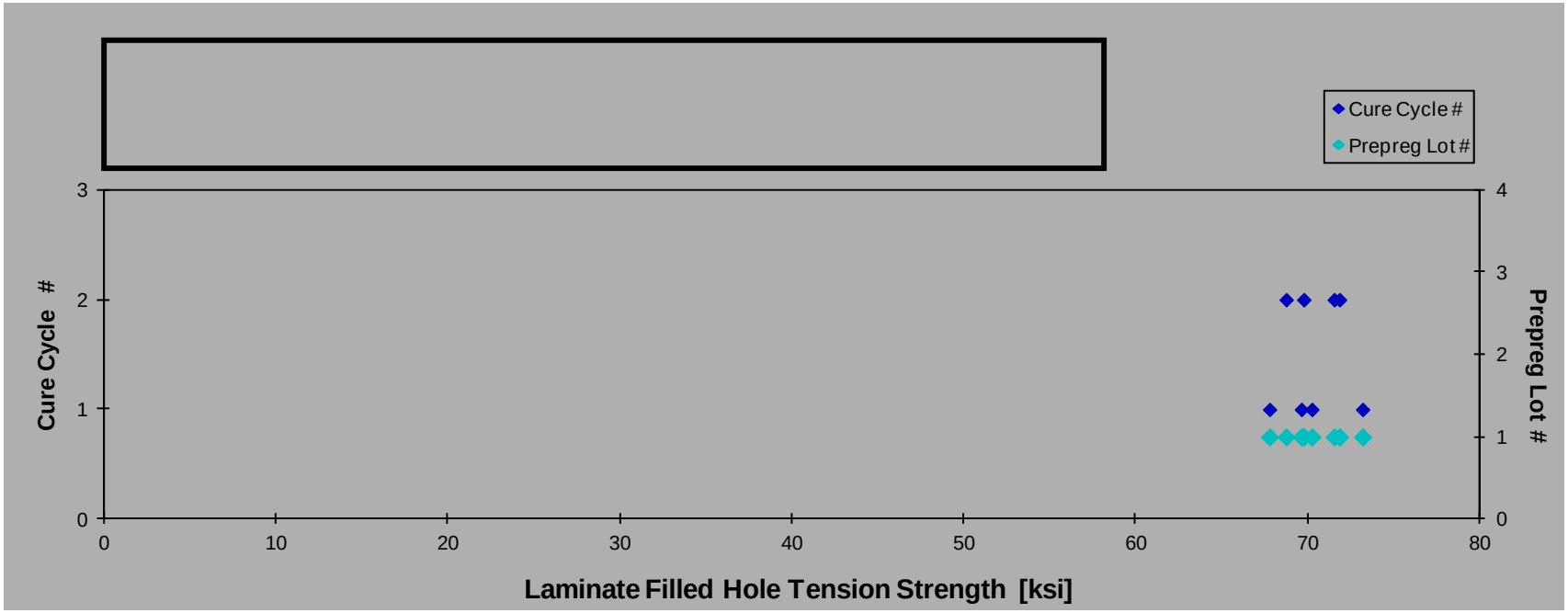
Laminate Open Hole Tension Properties (OHT3) -- (ETW2)
Strength
MTM45-1/ IM7 Uni

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	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
IMU-OHT3-A-MH1-ETW2-1	AFFA111D	A	MH1	1	1	112.018	0.108	20	AGM	0.0054	109.981
IMU-OHT3-A-MH1-ETW2-2	AFFA112D	A	MH1	1	1	136.210	0.109	20	AGM	0.0054	134.889
IMU-OHT3-A-MH1-ETW2-3	AFFA113D	A	MH1	1	1	137.904	0.109	20	AGM	0.0054	136.483
IMU-OHT3-A-MH1-ETW2-4	AFFA114D	A	MH1	1	1	126.932	0.109	20	AGM	0.0054	125.701
IMU-OHT3-A-MH2-ETW2-2	AFFA212D	A	MH2	1	2	141.013	0.112	20	AGM	0.0056	143.747
IMU-OHT3-A-MH2-ETW2-3	AFFA213D	A	MH2	1	2	143.917	0.113	20	AGM	0.0056	147.711
IMU-OHT3-A-MH2-ETW2-4	AFFA214D	A	MH2	1	2	137.235	0.116	20	AGM	0.0058	144.741

Average	**133.604**	**$Average_{norm}$**	**0.0055**	**134.751**
Standard Dev.	**10.880**	**$Standard\ Dev._{norm}$**		**13.211**
Coeff. of Var. [%]	**8.143**	**$Coeff.\ of\ Var.\ [\%]_{norm}$**		**9.804**
Min.	**112.018**	**Min.**	**0.0054**	**109.981**
Max.	**143.917**	**Max.**	**0.0058**	**147.711**
Number of Spec.	**7**	**Number of Spec.**		**7**


Laminate Open Hole Tension Properties (OHT3) -- (ETW2)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Tension Strength [ksi]
0
1
2
3
4
0
20
40
60
80
100
120
140
160

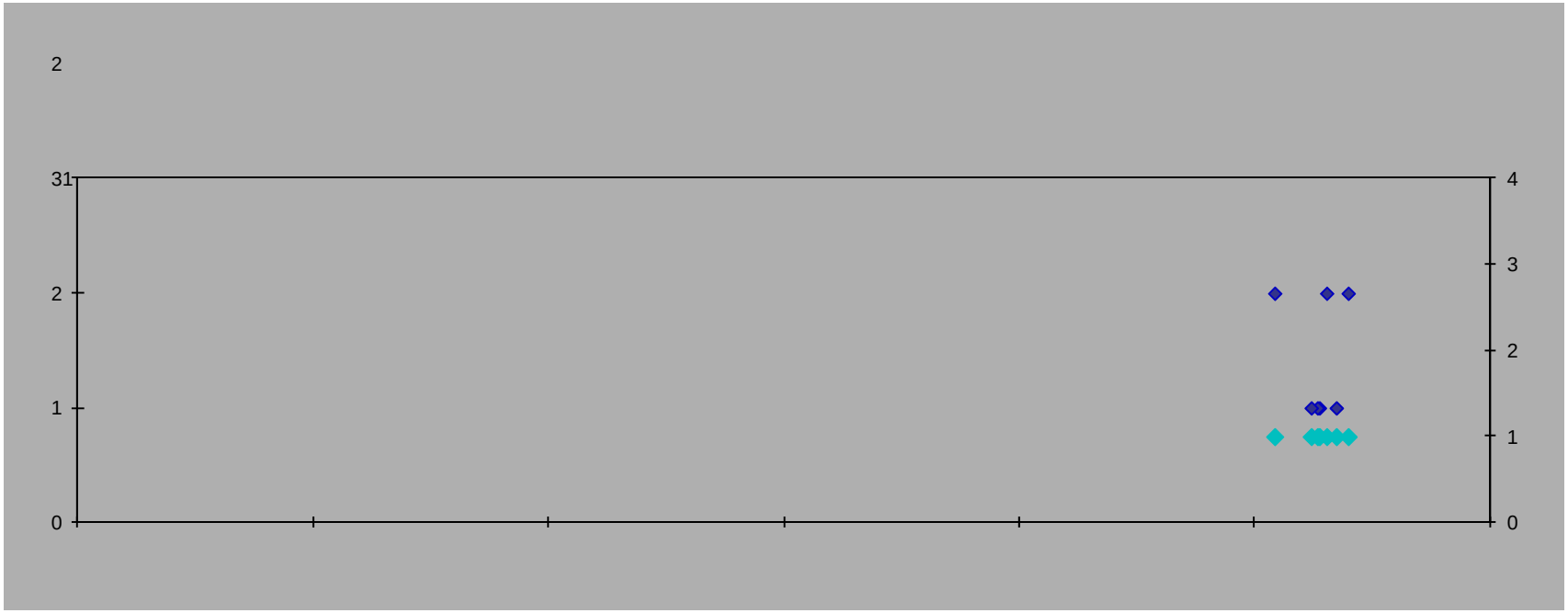

Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
10
20
30
40
50
60
70
80
Laminate Filled Hole Tension Strength [ksi]

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

normalizing t_{ply} [in]
0.0055

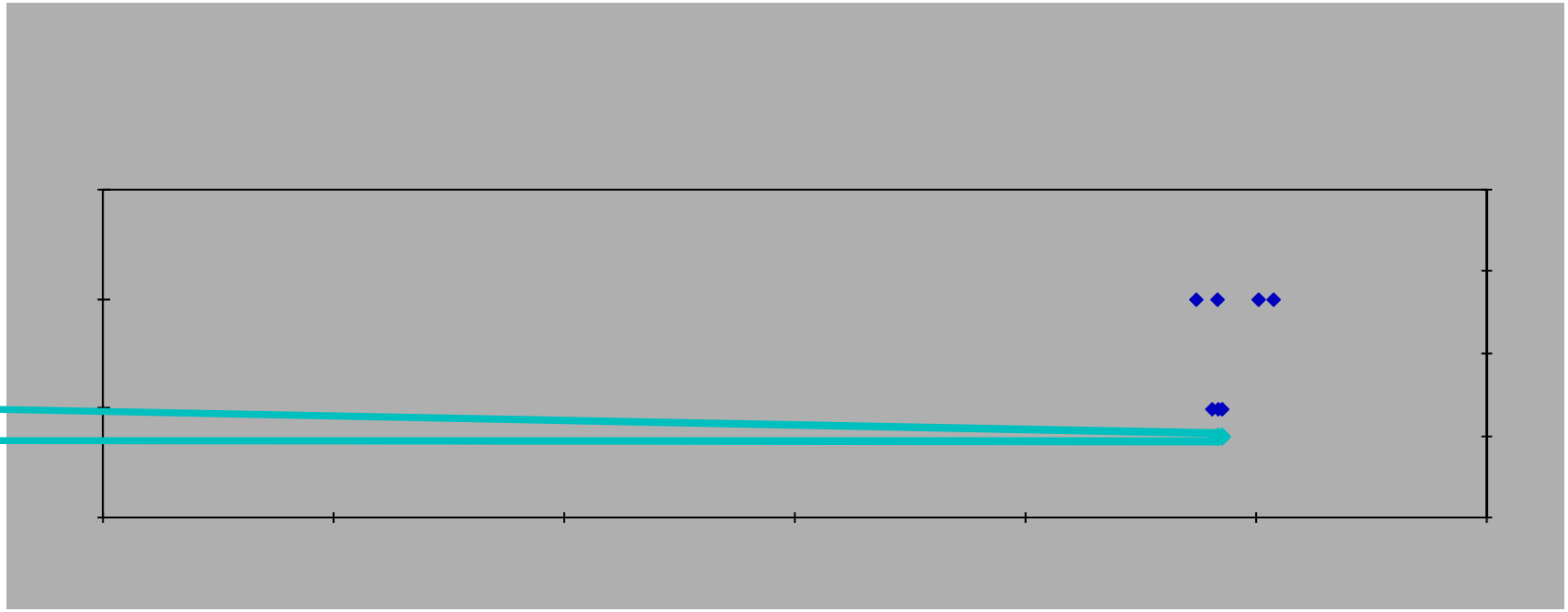
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
IMU-FHT2-A-MH1-CTD-1	AF5A111B	A	MH1	1	1	50.975	0.114	20	AGM	0.0057	52.736
IMU-FHT2-A-MH1-CTD-2	AF5A112B	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**


2
31
2
1
0
4
3
2
1
0

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 IT	AF5A112A	A	MH1	1	1	46 -= ž	-	- ч-2	AF $	1'	' tre ksi] l

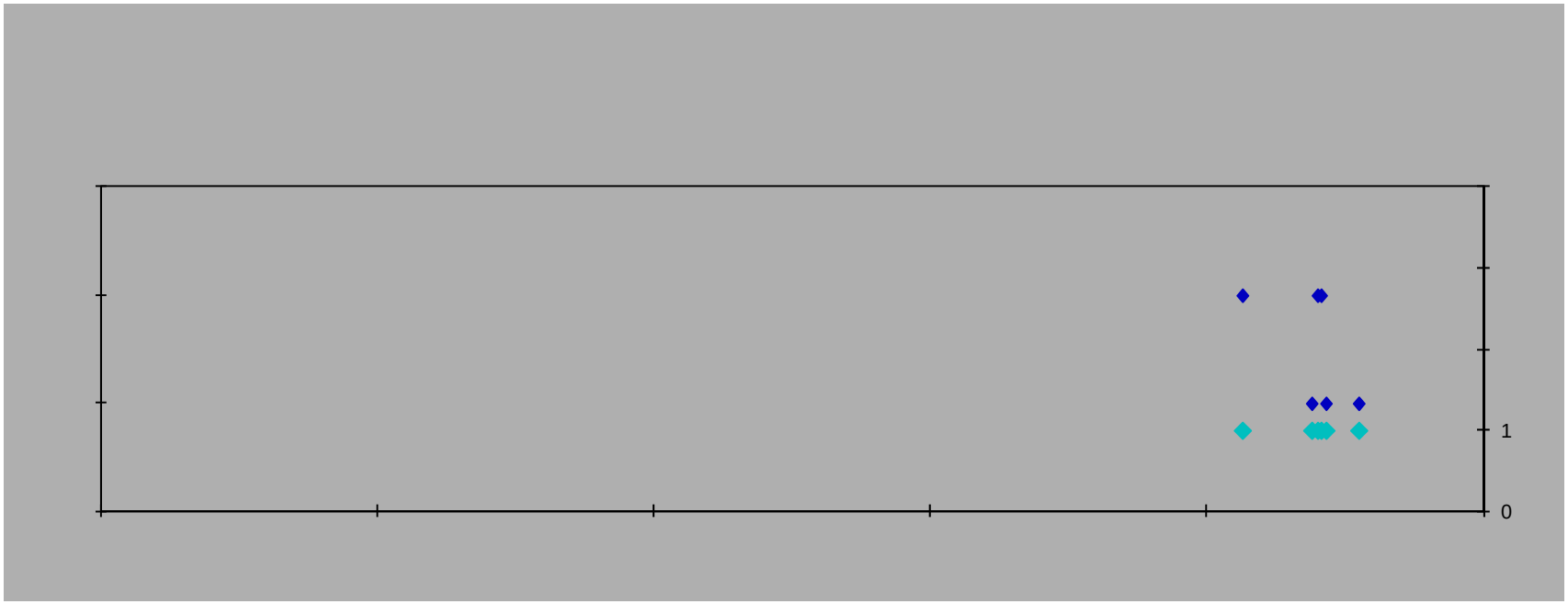


normalizing t_{ply} [in]
0.0055

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-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. ≠ -Ø Ž .00 ` 02 9Õ 9 *f* ‡ #

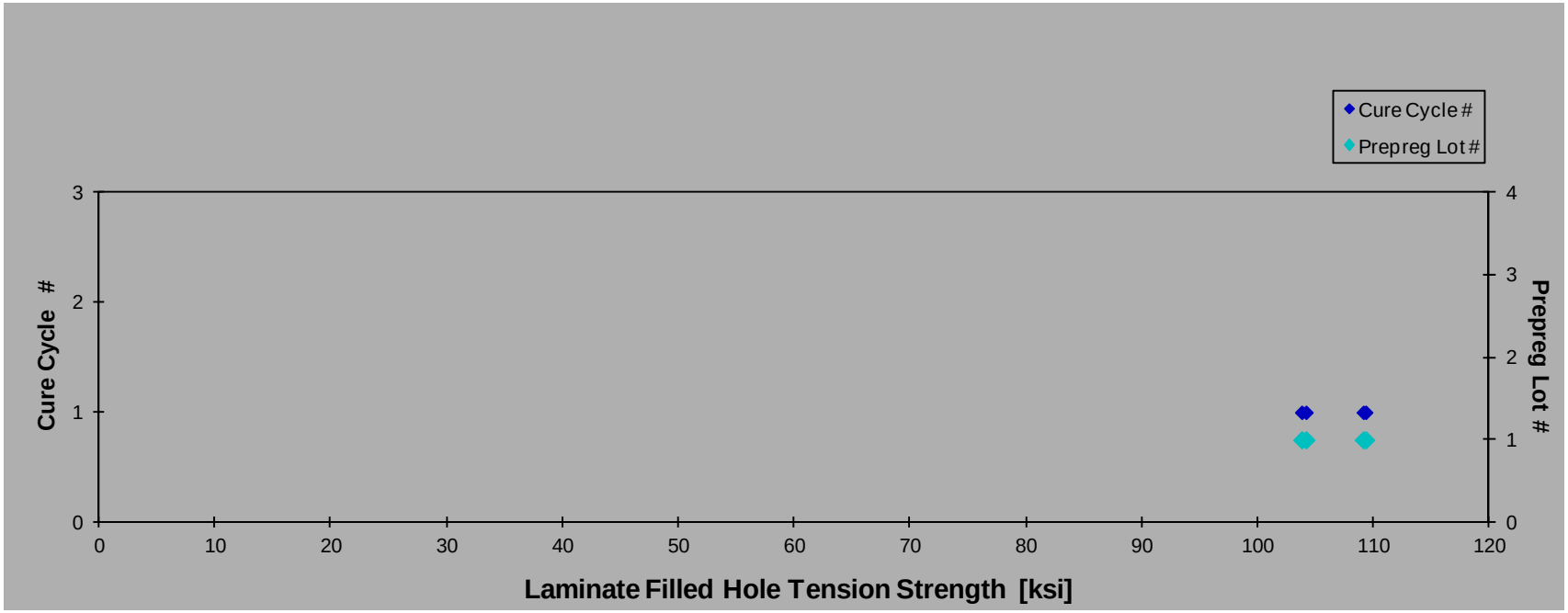

1
0

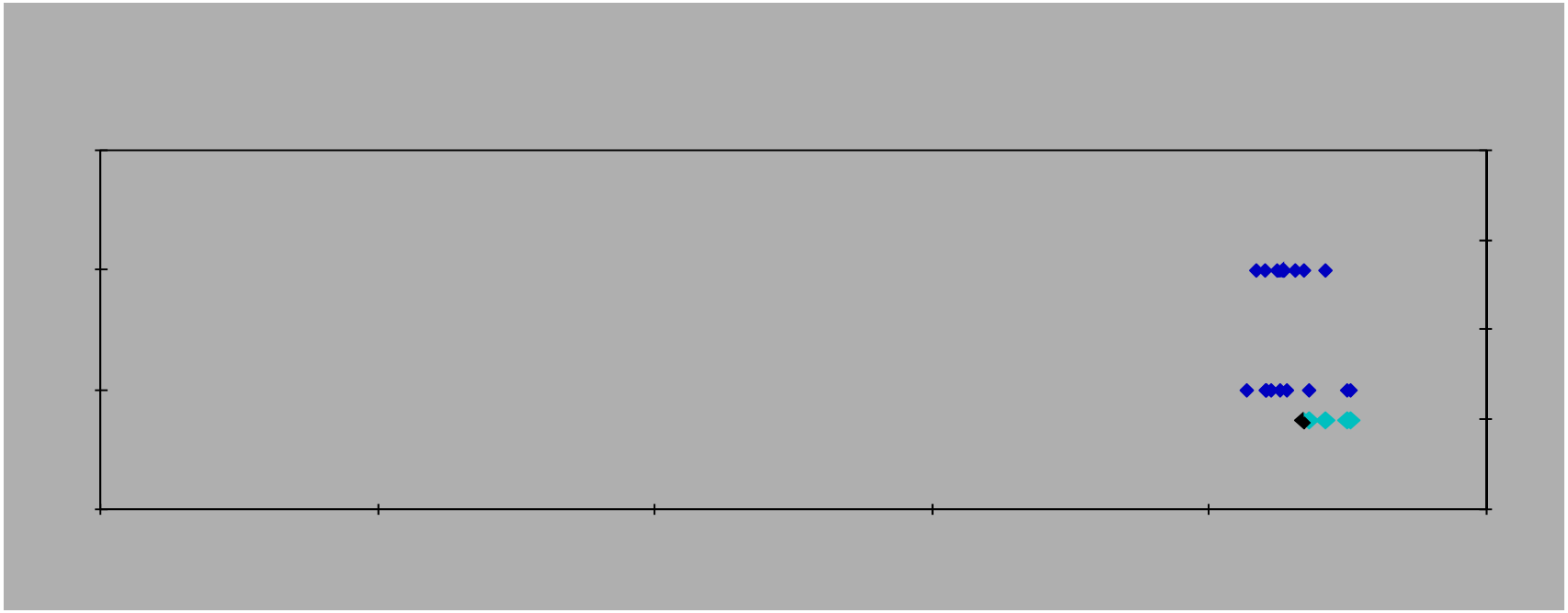
4.21 “50/40/10” Filled-Hole Tension 3 Properties (FHT3)

normalizing t_{ply} [in]
0.0055

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]


Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Filled Hole Tension Strength [ksi]
0
1
2
3
4
0
10
20
30
40
50
60
70
80
90
100
110
120



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-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. $_{norm}$**		

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-OHC1-A-MH1-ETW2-1	AFGA111D	A	MH1	1							

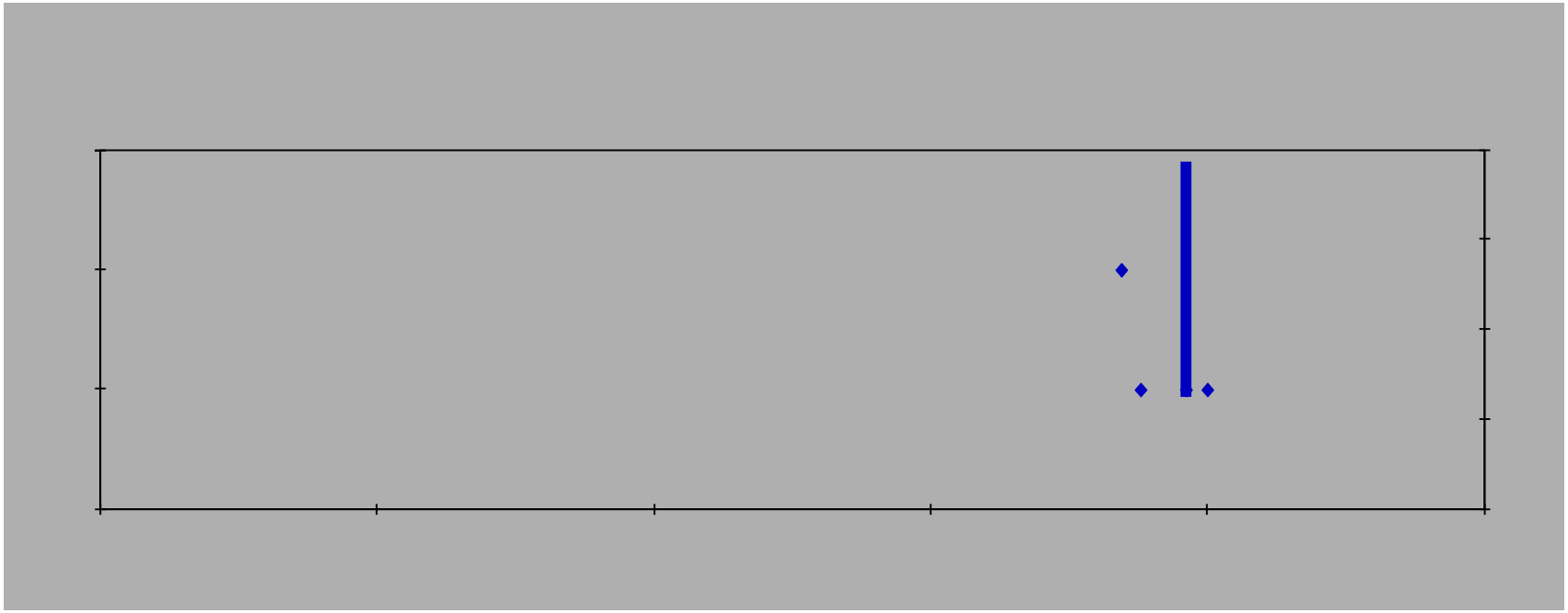
4.23 "10/80/10" Open-Hole Compression 2 Properties (OHC2)

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

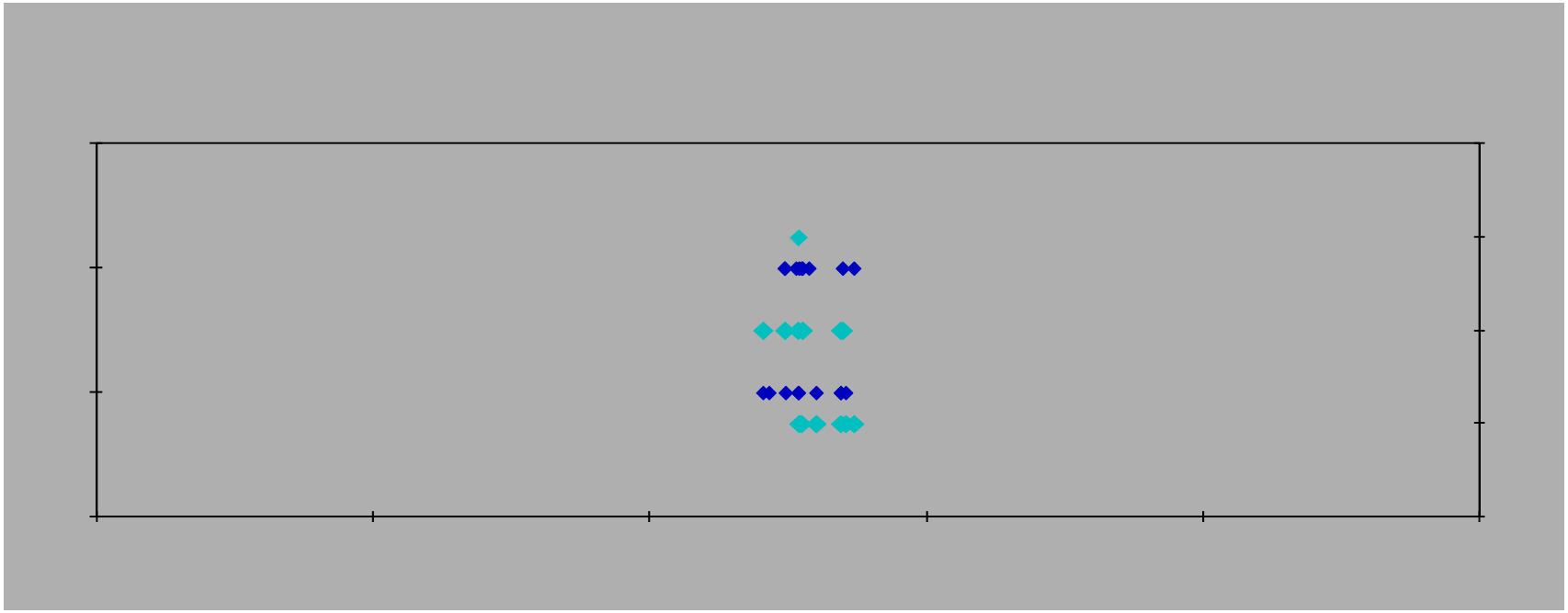
normalizing t_{ply} [in]
0.0055

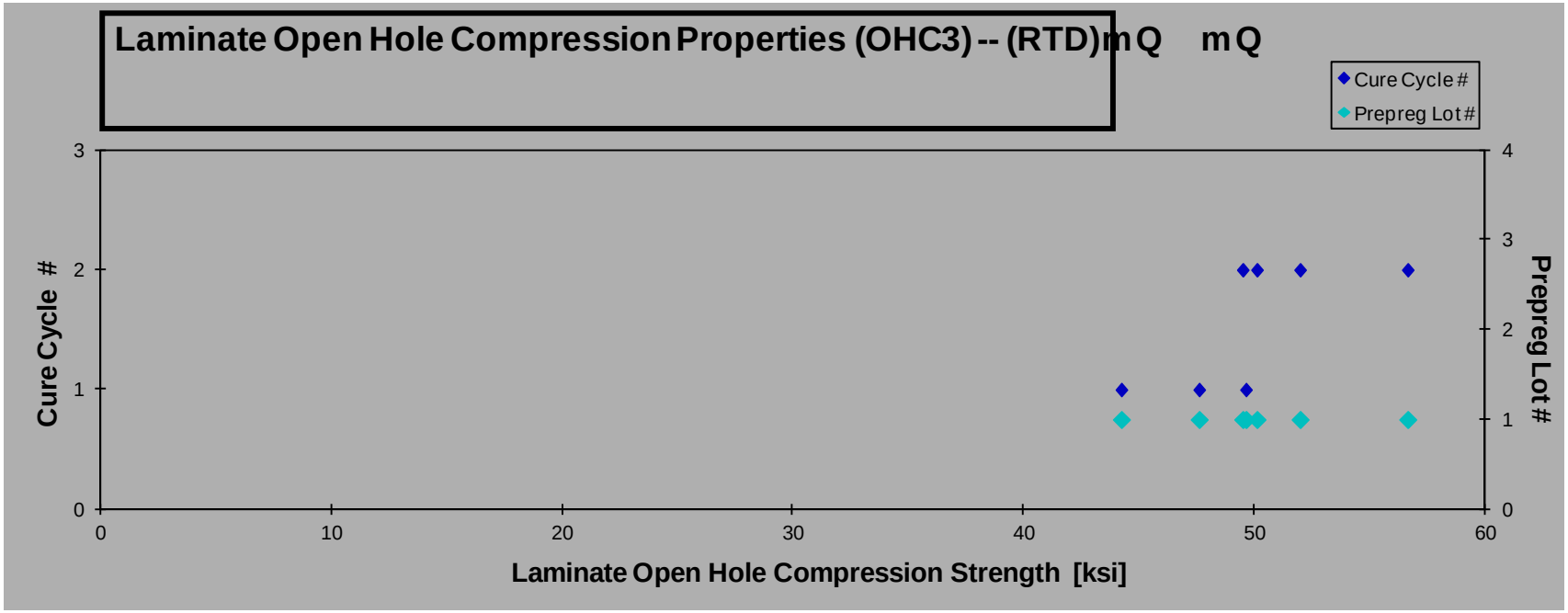
Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Modes	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
IMU-OHC2-A-MH1-RTD-1	AFHA111A	A	MH1	1	1	37.110	0.118	20	LGM	0.0059	39.943
IMU-OHC2-A-MH1-RTD-2	AFHA112A	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**		**Average$_{norm}$**	**0.0057**	**38.053**
Standard Dev.	**0.563**		**Standard Dev.$_{norm}$**		**1.240**
Coeff. of Var. [%]	**1.533**		**Coeff. of Var. [%]$_{norm}$**		**3.259**
Min.	**35.899**		**Min.**	**0.0055**	**36.837**
Max.	**37.531**		**Max.**	**0.0059**	**39.943**
Number of Spec.	**6**		**Number of Spec.**		**6**

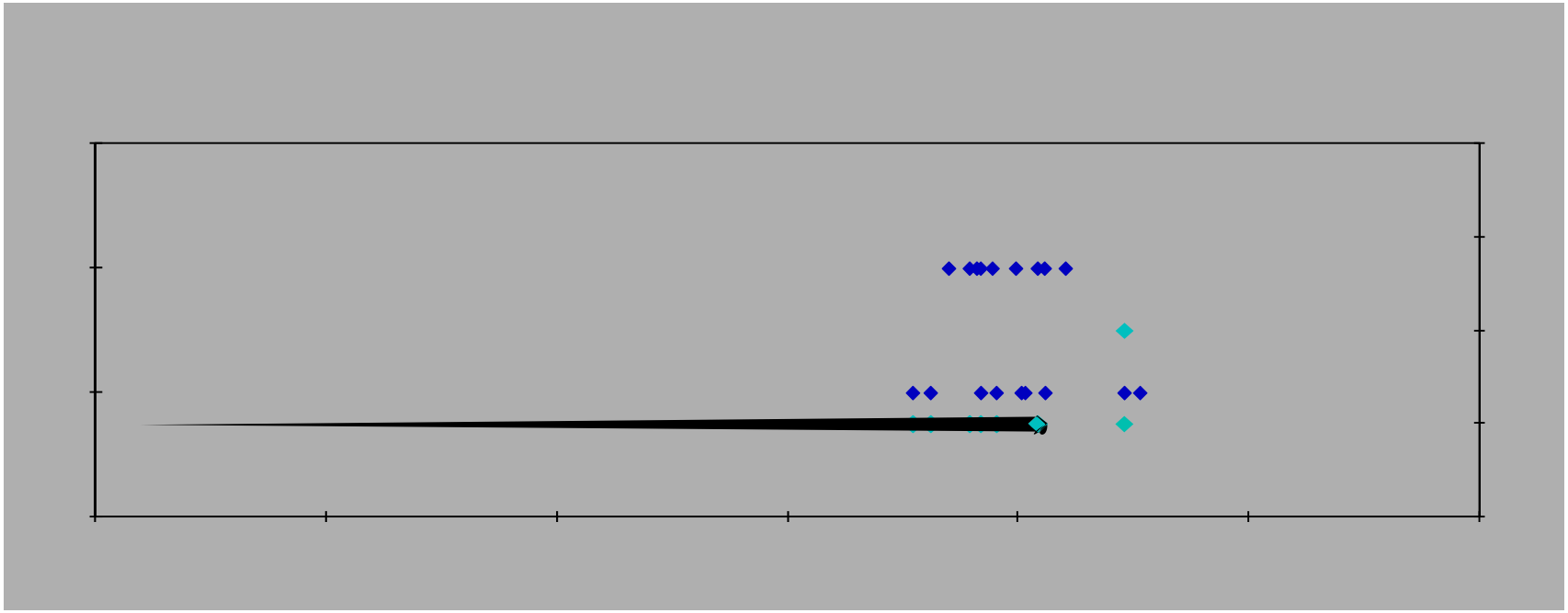


normalizing t_{ply} [in]
0.0055




Laminate Open Hole Compression Properties (OHC3) -- (RTD) m Q m Q
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Open Hole Compression Strength [ksi]
0
10
20
30
40
50
60
0
1
2
3
4

										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-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 ‰ Ã	111111111111 ´ L37.1



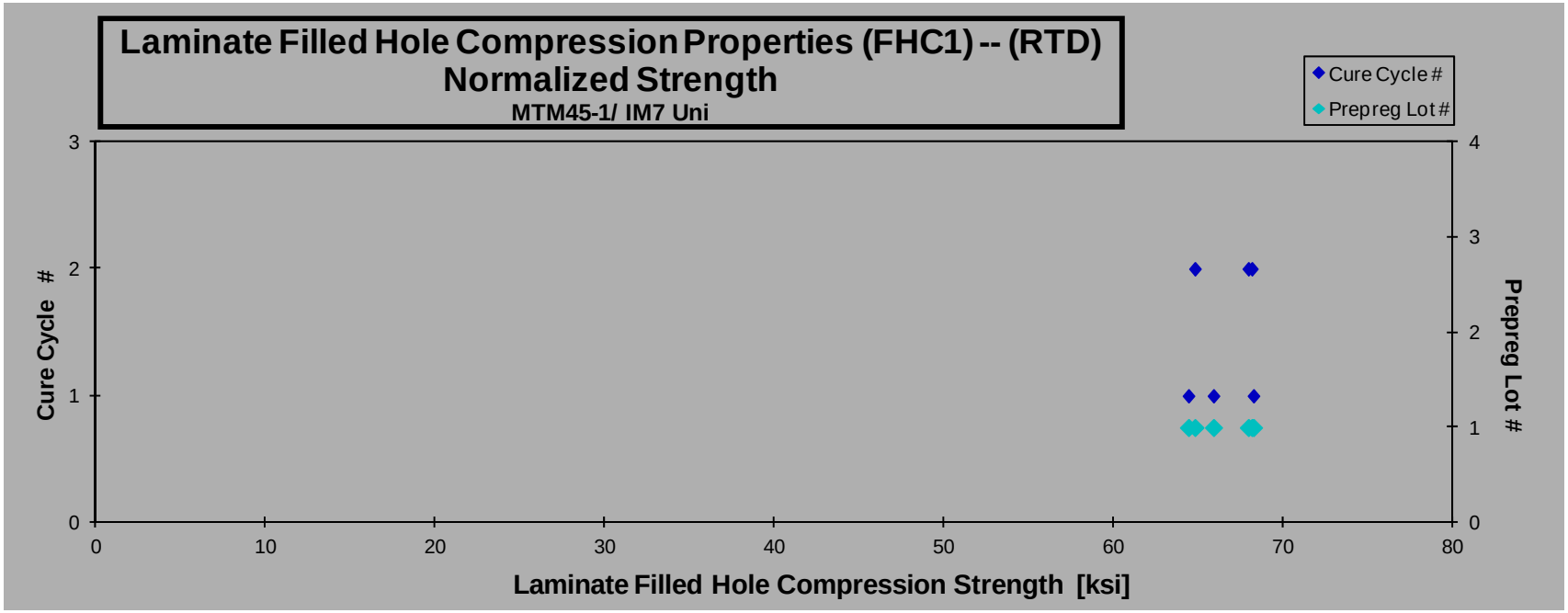
4.25 "25/50/25" Filled-Hole Compression 1 Properties (FHC1)

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	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
IMU-FHC1-A-MH1-RTD-1	AF7A111A	A	MH1	1	1	67.078	0.134	24	LGM	0.0056	68.247
IMU-FHC1-A-MH1-RTD-2	AF7A112A	A	MH1	1	1	64.473	0.135	24	LGM	0.0056	65.889
IMU-FHC1-A-MH1-RTD-3	AF7A113A	A	MH1	1	1	63.216	0.135	24	LGM	0.0056	64.413
IMU-FHC1-A-MH2-RTD-1	AF7A211A	A	MH2	1	2	67.180	0.134	24	LGM	0.0056	67.944
IMU-FHC1-A-MH2-RTD-2	AF7A212A	A	MH2	1	2	67.384	0.134	24	LGM	0.0056	68.150
IMU-FHC1-A-MH2-RTD-3	AF7A213A	A	MH2	1	2	64.160	0.133	24	LGM	0.0056	64.792

Average	**65.582**		**$Average_{norm}$**	**66.572**
Standard Dev.	**1.838**		**$Standard\ Dev._{norm}$**	**1.759**
Coeff. of Var. [%]	**2.803**		**$Coeff.\ of\ Var.\ [\%]_{norm}$**	**2.643**
Min.	**63.216**	**0.0056**	**Min.**	**64.413**
Max.	**67.384**	**0.0056**	**Max.**	**68.247**
Number of Spec.	**6**		**Number of Spec.**	**6**

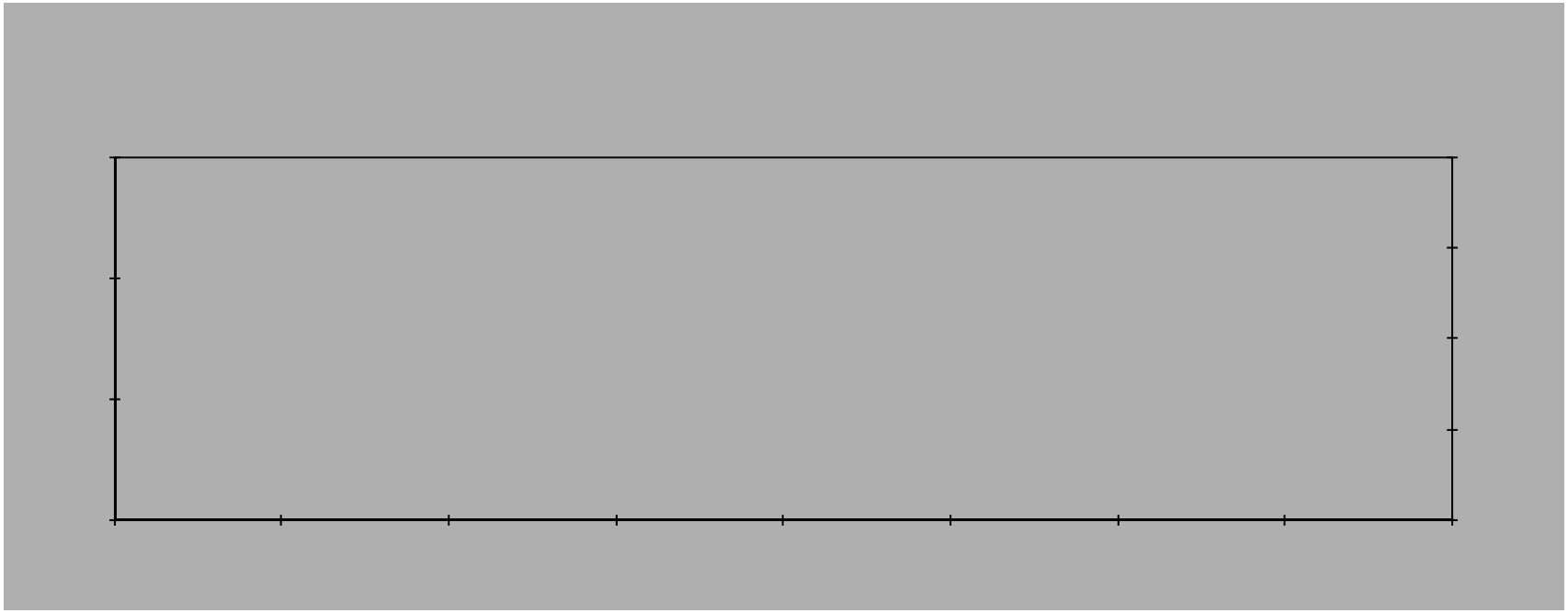

Laminate Filled Hole Compression Properties (FHC1) -- (RTD)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Filled Hole Compression Strength [ksi]
0
1
2
3
4
0
10
20
30
40
50
60
70
80

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

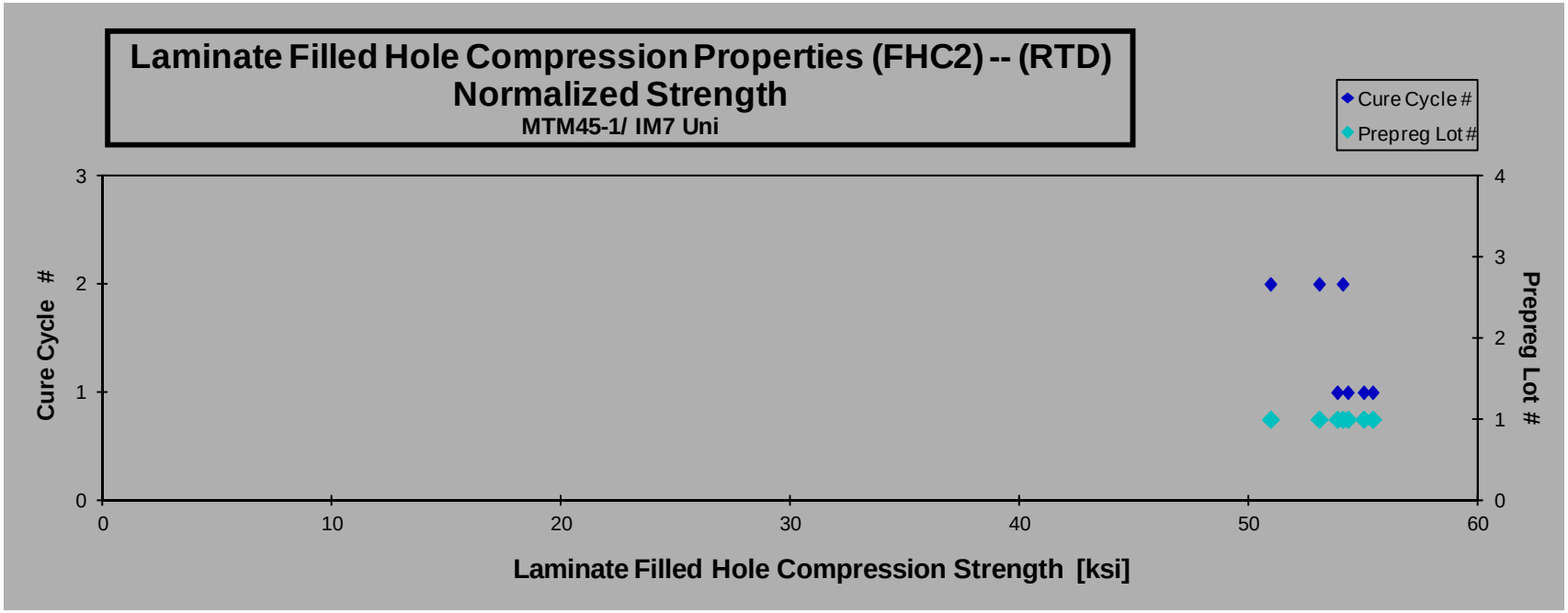
normalizing t_{ply} [in]
0.0055

Specimen Number	NIAR Name	ACG Batch #	ACG Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickn. [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
IMU-FHC1-A-MH1-ETW2-1	AF7A111D	A	MH1	1	1	41.517	0.135	24	LGM	0.0056	42.492
IMU-FHC1-A-MH1-ETW2-2	AF7A112D	A	MH1	1	1	42.873	0.135	24	LGM	0.0056	43.744
IMU-FHC1-A-MH1-ETW2-3	AF7A113D	A	MH1	1	1	43.769	0.135	24	LGM	0.0056	44.803
IMU-FHC1-A-MH2-ETW2-1	AF7A211D	A	MH2	1	2	47.887	0.133	24	LGM	0.0056	48.334
IMU-FHC1-A-MH2-ETW2-2	AF7A212D	A	MH2	1	2	41.347	0.135	24	LGM	0.0056	42.161
IMU-FHC1-A-MH2-ETW2-3	AF7A213D	A	MH2	1	2	45.913	0.134	24	LGM	0.0056	46.695
IMU-FHC1-B-MH1-ETW2-1	AF7B111D	B	MH1	2	1	45.588	0.137	24	LGM	0.0057	47.297
IMU-FHC1-B-MH1-ETW2-2	AF7B112D	B	MH1	2	1	42.098	0.139	24	LGM	0.0058	44.246
IMU-FHC1-B-MH1-ETW2-3	AF7B113D	B	MH1	2	1	44.679	0.134	24	LGM	0.0056	45.362
IMU-FHC1-B-MH2-ETW2-1	AF7B211D	B	MH2	2	2	42.025	0.134	24	LGM	0.0056	42.518
IMU-FHC1-B-MH2-ETW2-2	AF7B212D	B	MH2	2	2	42.152	0.133	24	LGM	0.0055	42.450
IMU-FHC1-B-MH2-ETW2-3	AF7B213D	B	MH2	2	2	42.291	0.135	24	LGM	0.0056	43.220
IMU-FHC1-C-MH1-ETW2-1	AF7C111D	C	MH1	3	1	47.306	0.131	24	LGM	0.0055	46.942
IMU-FHC1-C-MH1-ETW2-2	AF7C112D	C	MH1	3	1	42.375	0.131	24	LGM	0.0055	42.102
IMU-FHC1-C-MH1-ETW2-3	AF7C113D	C	MH1	3	1	42.237	0.132	24	LGM	0.0055	42.093
IMU-FHC1-C-MH2-ETW2-1	AF7C211D	C	MH2	3	2	45.953	0.131	24	LGM	0.0055	45.628
IMU-FHC1-C-MH2-ETW2-2	AF7C212D	C	MH2	3	2	44.183	0.130	24	LGM	0.0054	43.659
IMU-FHC1-C-MH2-ETW2-3	AF7C213D	C	MH2	3	2	46.339	0.131	24	LGM	0.0055	45.965

Average	**43.918**		**Average$_{norm}$**	**0.0056**	**44.428**
Standard Dev.	**2.115**		**Standard Dev.$_{norm}$**		**2.024**
Coeff. of Var. [%]	**4.815**		**Coeff. of Var. [%]$_{norm}$**		**4.555**
Min.	**41.347**		**Min.**	**0.0054**	**42.093**
Max.	**47.887**		**Max.**	**0.0058**	**48.334**
Number of Spec.	**18**		**Number of Spec.**		**18**



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


Laminate Filled Hole Compression Properties (FHC2) -- (RTD)
Normalized Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Filled Hole Compression Strength [ksi]
0
10
20
30
40
50
60
0
1
2
3
4

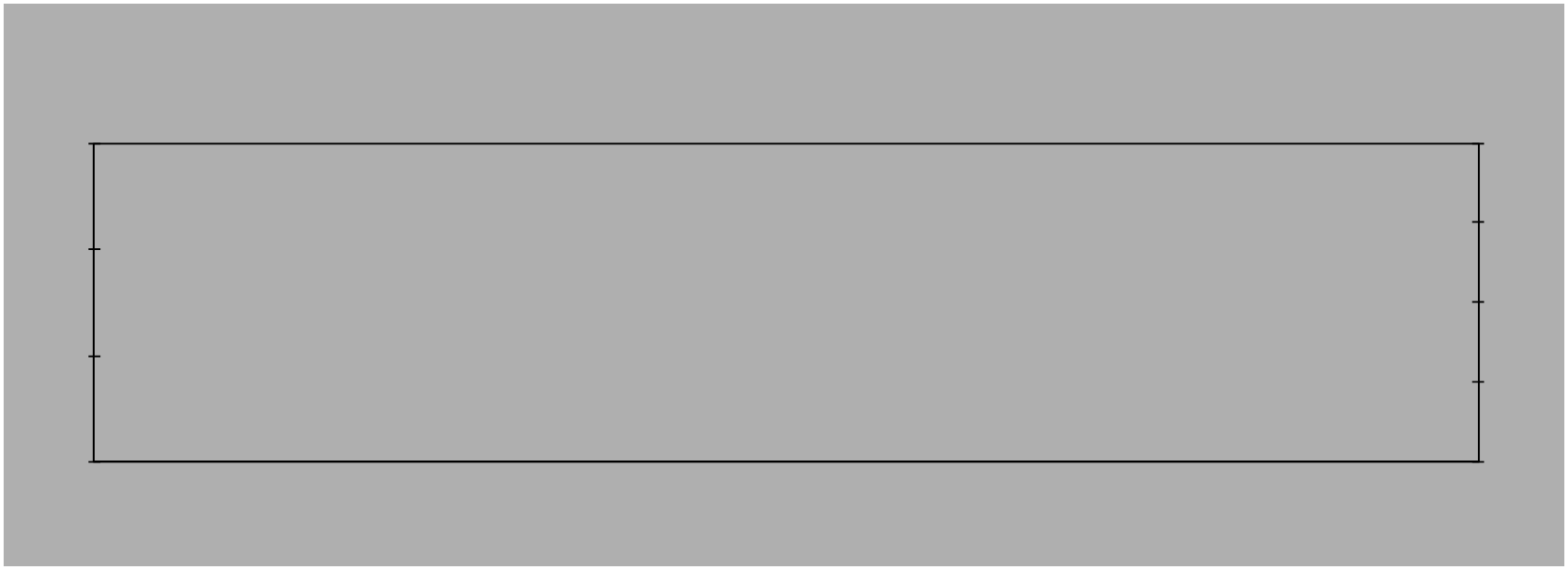
normalizing t_{ply} [in]
0.0055

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-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 ž 3D	A	0.M H10	-E0. 1 Ů Ŏ	10	-E0. Ů Ŏ	∃ ⅜ 0.00.56 Ů ּAXM02-B-MH1-ETE0	2-B/	- ũ /-l1	Ů Ŏ 1106	0.4.0156 0.0.112M0.106 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-	Î FC ɾ		ȳ	Î A ᶠ Ό ң	ľ ʔ	ľ U %	ᴱ Ό ├	ɤ Ɛ A ŭ	>	Ύ я	א	ĵ	]eM	M ِپ	א

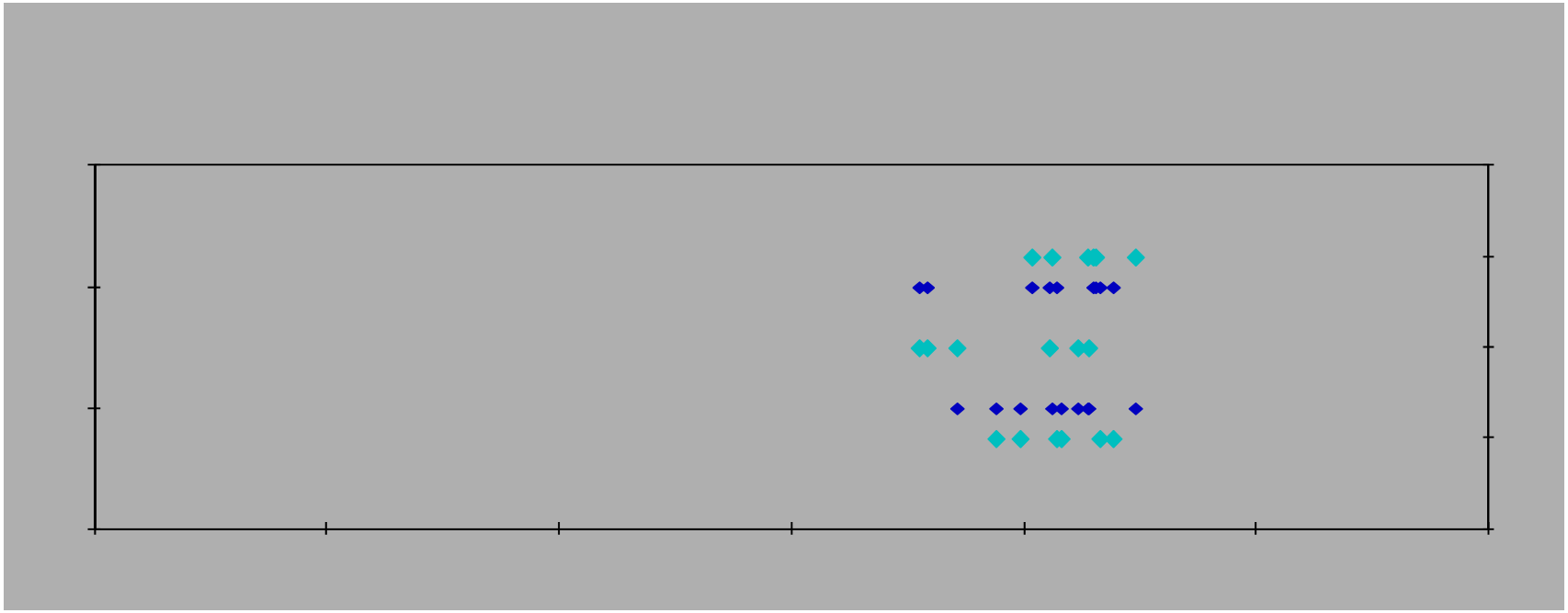


normalizing t_{ply} [in]
0.0055

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ヽ

MU-FHC3-B-MH2-ETW
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 Thickn. [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		**5.¾Ǝ bdar**	**.**	**ŝ Ŏnorm**		

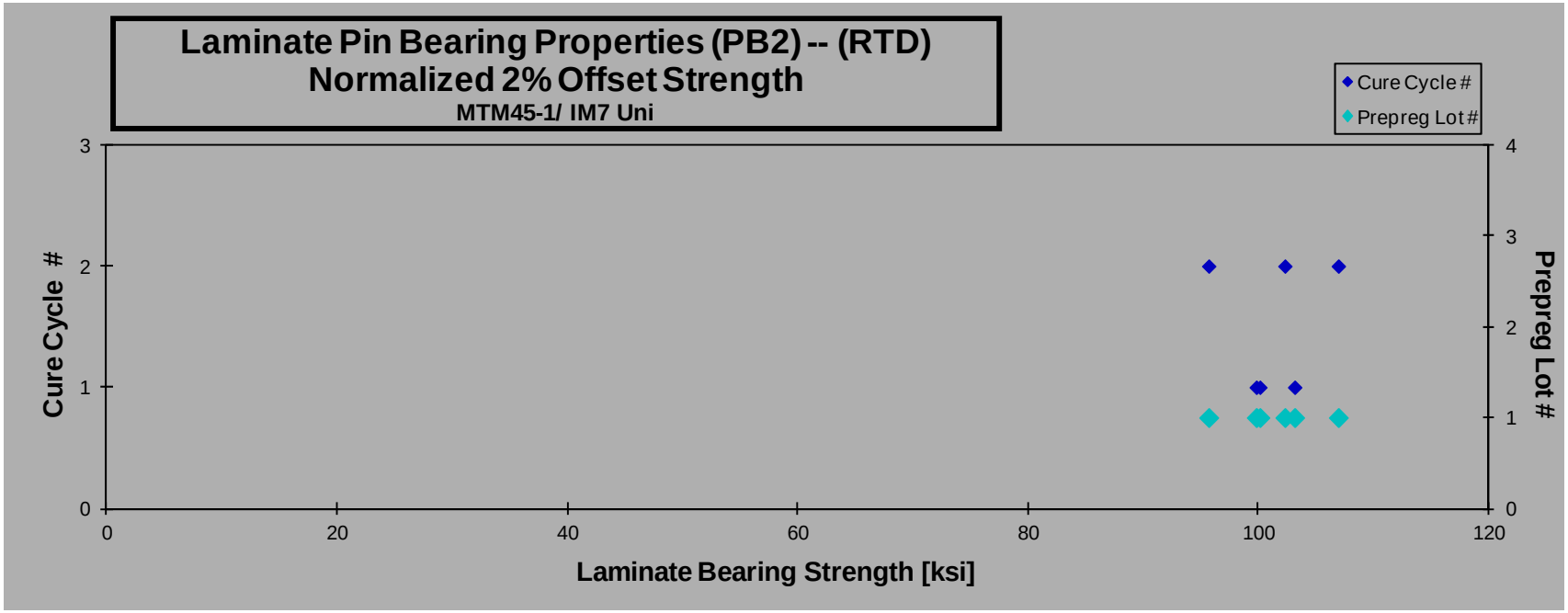


4.29 “10/80/10” Pin Bearing 2 Properties (PB2)

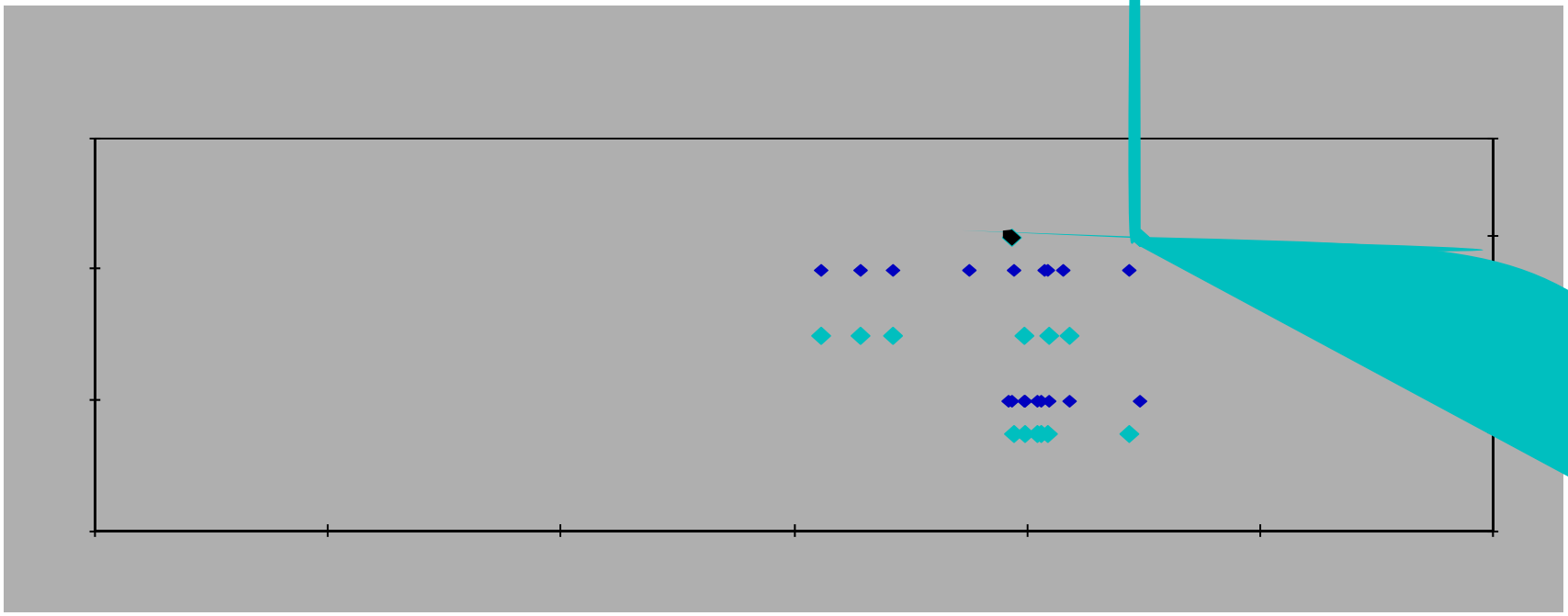
normalizing t_{ply} [in]
0.0055

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


Laminate Pin Bearing Properties (PB2) -- (RTD)
Normalized 2% Offset Strength
MTM45-1/ IM7 Uni
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Laminate Bearing Strength [ksi]
0
20
40
60
80
100
120
0
1
2
3
4

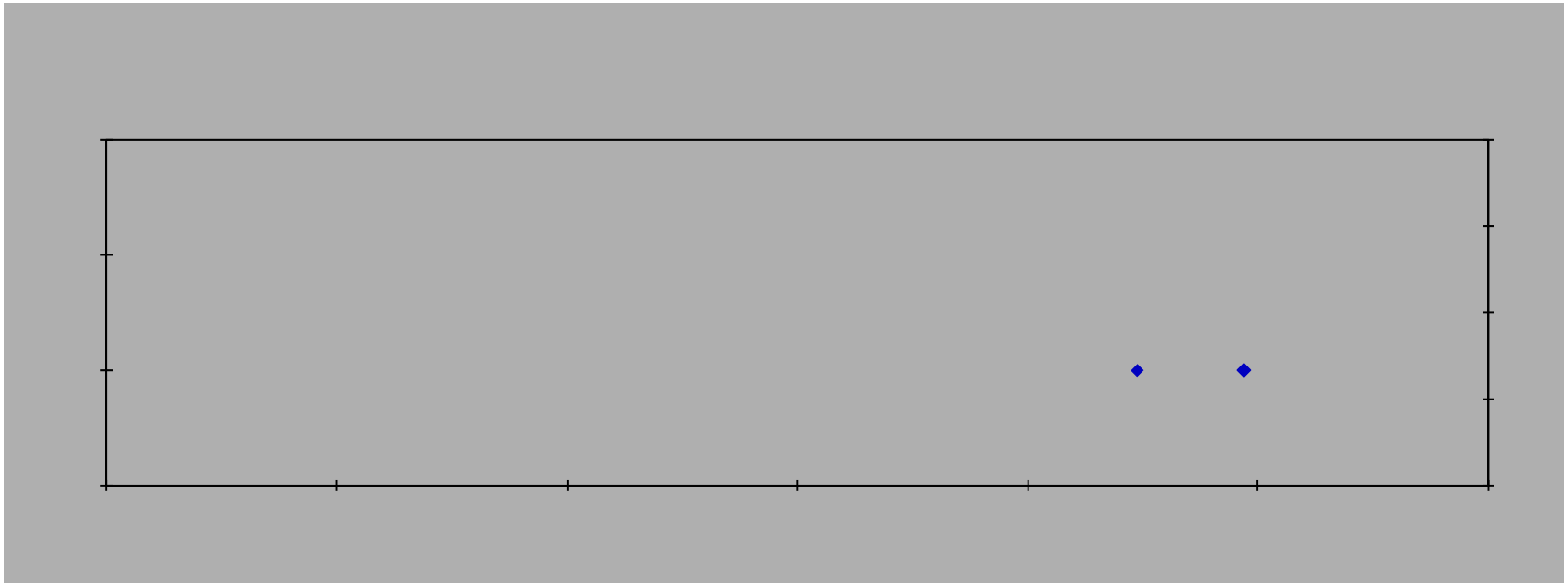
normalizing t_{ply} [in]
0.0055

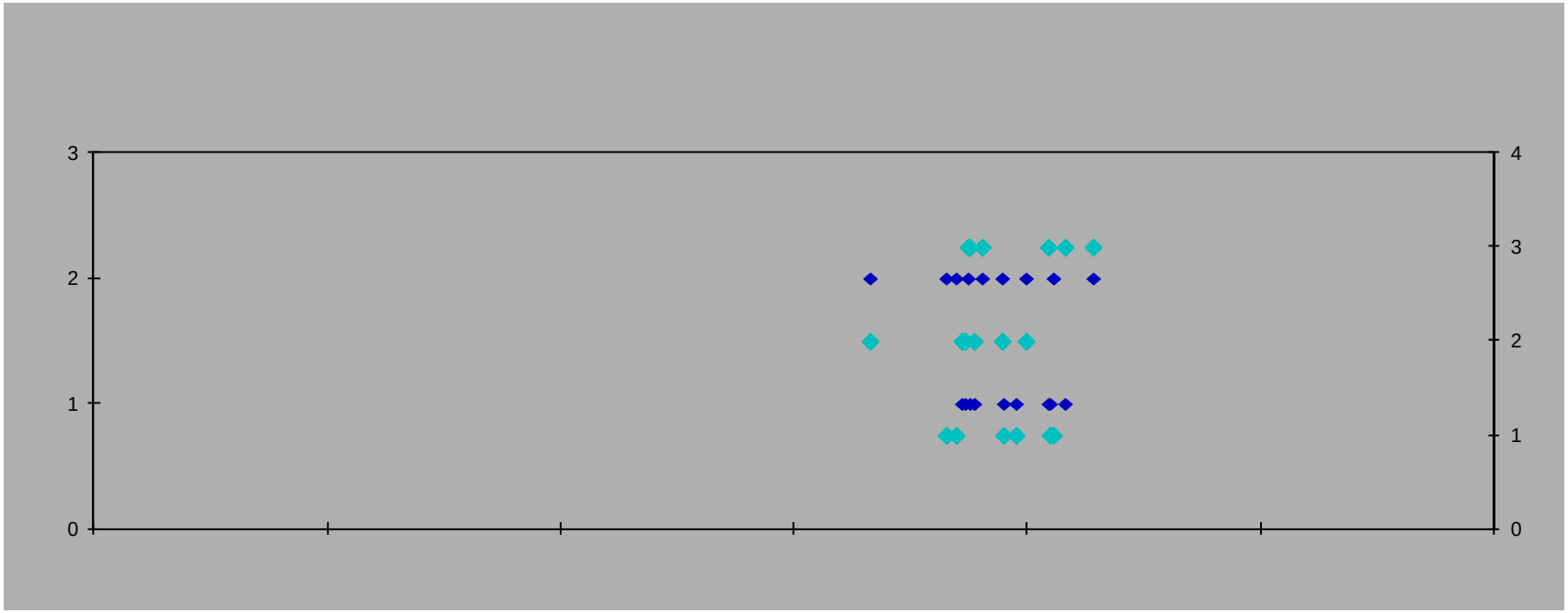


4.30 “50/40/10” Pin Bearing 3 Properties (PB3)

normalizing t_{ply} [in]
0.0055

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



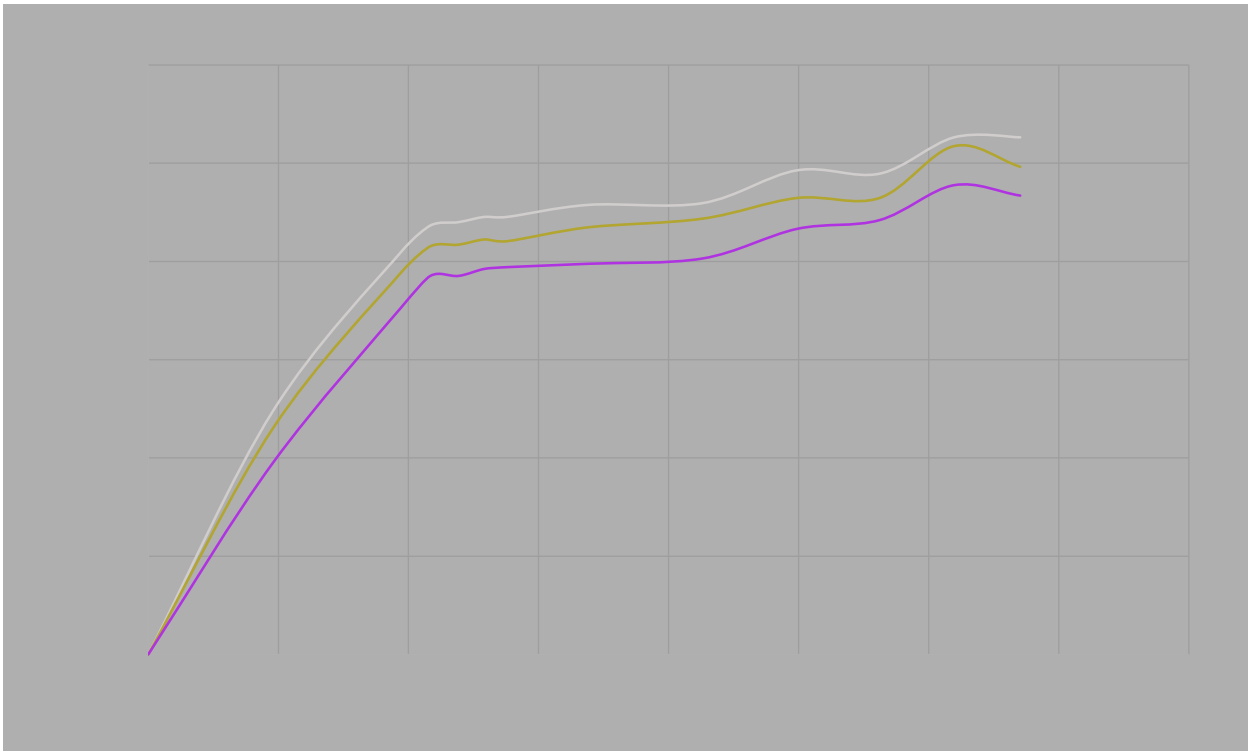

3
2
1
0
4
3
2
1
0

February 12, 2024

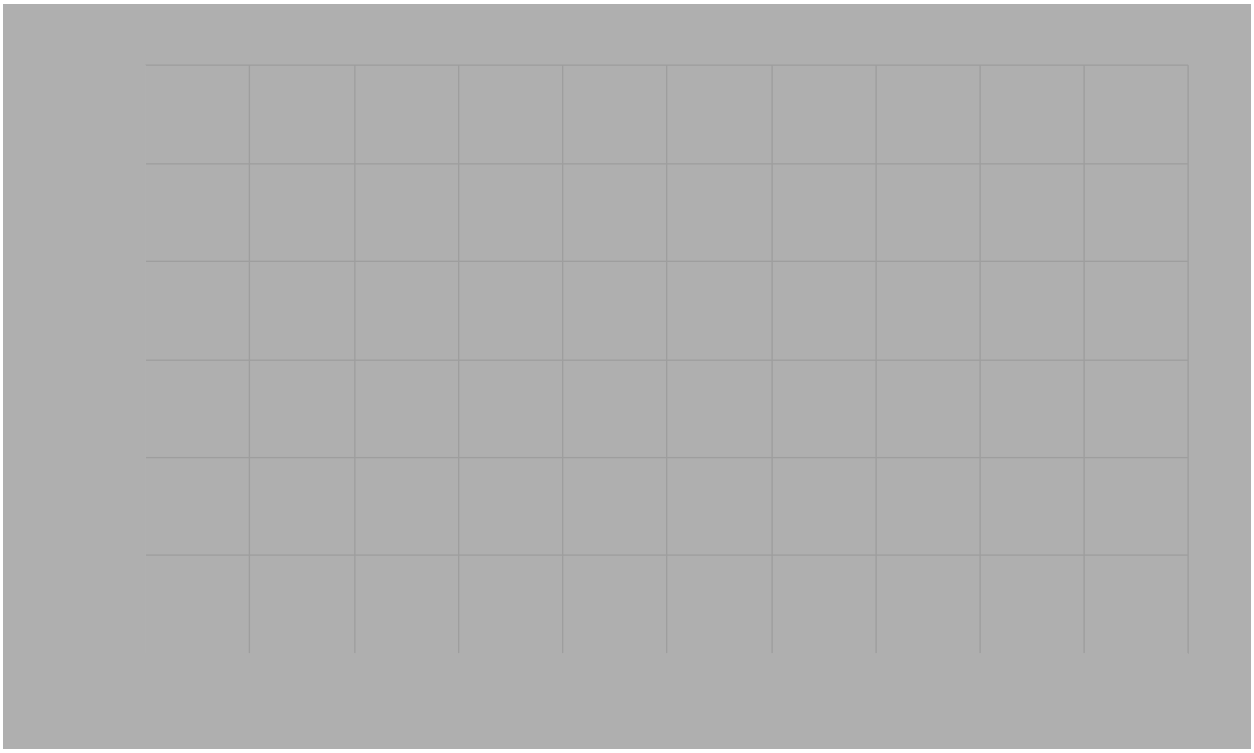
5. Shear Stress vs. Shear Strain, RTD

6. MOISTURE CONDITIONING CHARTS

6.1 In-Plane Shear Properties – Thinnest Panel



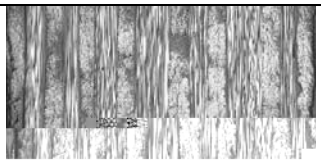
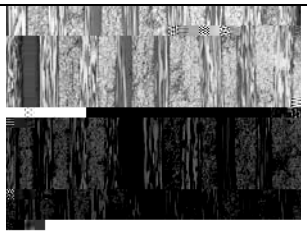
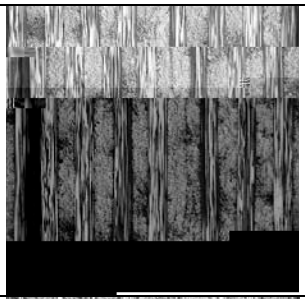
6.2 Pin Bearing 1 - Thickest Panel



7. DMA Results

7.1 DMA Wet Batch B

7.2 DMA Dry Batch B

		Per Test Plan		Panel Received		
Panel ID	Photomicrograph of Panel Received	Correct Layup	No. of Plies	Incorrect Layup	No. of Plies	Comment
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 FHT3-A-MH2-CTD
- x FHC3-A-MH1-ETW2
- x FHC3-A-MH1-RTD
- x ILT-A-MH1-ETW2
- x ILT-A-MH2-ET2
- x ILT-A-MH1-RTD
- x ILT-A-MH2-RTD

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