SAFETY COMPLIANCE TESTING FOR FMVSS No. 218 MOTORCYCLE HELMETS

Brand: GMAX
Model: 78S
Size: M (57-58 cm)

Prepared By

ACT Lab LLC
3280 East 59th Street
Long Beach CA 90805
www.act-lab.com

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Final Report 218-ACT-15-006

Prepared For

U.S. Department of Transportation

National Highway Traffic Safety Administration

Office of Vehicle Safety Compliance (NVS-220)

1200 New Jersey Ave., S.E.

Washington, DC 20590

Technician: _____
Devon Dahm

Project Manager: _____
David Thom

Approved By: _____
John Bogler

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7. Author(s) David R. Thom, Program Manager		**8. Performing Organization Report No.** 52.0606.001-B253	
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12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (NVS-220) 1200 New Jersey Avenue, S.E. Washington, D.C. 20590		**13. Type of Report and Period Covered** Final Test Report	
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16. Abstract

Compliance tests were conducted on the subject model motorcycle helmet in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-218-07.Test failures identified were as follows: S5.2 Penetration. The striker contacted the surface of the test headform on the low temperature sample.

17. Key Words Helmet Compliance Testing Safety Engineering FMVSS No. 218	**18. Distribution Statement** Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division (NPO-411) 1200 New Jersey Avenue, S.E. Washington, D.C. 20590		
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Form DOT F1700.7 (8-69)

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PURPOSE OF COMPLIANCE TEST

1. PURPOSE OF COMPLIANCE TEST

This testing was conducted as part of the Department of Transportation, National Highway Traffic Safety Administration's Federal Motor Vehicle Safety Standard (FMVSS) No. 218, "Motorcycle Helmets"[1] Compliance Program. The purpose of the test was to determine if the production helmets supplied by the Office of Vehicle Safety Compliance satisfy the requirements of TP-218-07[2], as governed by the contract.

2. TEST PROCEDURE

The ACT Lab Helmet Testing Manual, Part I – Motorcycle Helmets[3] submitted to the Office of Vehicle Safety Compliance, National Highway Traffic Safety Administration, contains the specific procedures used to conduct this test. The ACT Lab Helmet Testing Manual, Part I – Motorcycle Helmets as modified by Project-Specific notations is in accordance with TP-218-07.

The test procedure shall not be in conflict with any portion of FMVSS No. 218 nor amendments in effect as noted in the applicable contract.

[1] NHTSA, FMVSS No. 218, Motorcycle Helmets, 49 CFR Chapter V Section 571.218, August 20, 1973 as last amended FR 28132 Vol. 76, No. 93, May 13, 2011.
[2] NHTSA, TP-218-07, Laboratory Test Procedure for FMVSS 218, Motorcycle Helmets, 13 May 2011.
[3] ACT Lab Helmet Test Manual, Version 4.2 – Motorcycle Helmets in accordance with FMVSS No. 218, 22 July 2013.

HELMET DATA

Helmet Brand Name	GMAX								
Model Designation	78S								
Manufacturer	Anyng Co. Ltd.								
Helmet Size Label	M (57-58 cm)								
Test Headform size	Small		Medium	X	Large				
Helmet Positioning Index (HPI)	45 mm		Manufacturer supplied	X	ACT determined				
Helmet Coverage	Partial		Full		Complete	X			
Shell Material	ABS								
Liner Material	Expanded Polystyrene								
Comfort Padding	Resilient Foam								
Buckle Description	Double D-Rings								

HELMET	A Ambient	B Low Temp	C High Temp	D Water Immersed	E Spare
SHELL COLOR/PATTERN	White	White	White	White	White
WEIGHT (grams)	1496	1489	1476	1484	1786
MONTH & YEAR OF MANUFACTURE	Sep 2013	Sep 2013	Sep 2013	Sep 2013	Sep 2013

OTHER STANDARD LABELS PRESENT: _____None_____

COMMENTS:

1. All helmets were received in undamaged condition and were appropriate for testing.
2. Weights listed above for helmets A-D are as tested with face shield and sun shield removed.
3. Weight for helmet E is complete with all components in place.
4. NHTSA provided the HPI based on information obtained from the manufacturer.

SUMMARY OF TEST RESULTS

INDICATE Pass or Fail

HELMET	A	B	C	D
TEST	AMBIENT	LOW TEMP	HIGH TEMP	WATER IMMERSED
IMPACT	Pass	Pass	Pass	Pass
PENETRATION	Pass	Fail	Pass	Pass
RETENTION	Pass	Pass	Pass	Pass

INDICATE Pass or Fail

TEST	PASS/FAIL
PERIPHERAL VISION	Pass
LABELING	Pass

COMMENT: S5.2 Penetration. The striker contacted the surface of the test headform at the front left location on the low temperature sample.

SELECTION OF APPROPRIATE HEADFORM

Paragraph S6.1 - If the helmet size designation falls into more than one of three size ranges, it shall be tested on each appropriate headform.

HELMET SIZE DESIGNATION	HEADFORM SIZE
Less than or equal to 6-3/4 (European Size 54)	SMALL
Greater than 6-3/4, but less than or equal to 7-1/2 (European Size 60)	MEDIUM
Greater than 7-1/2 (European 60)	LARGE

COMMENTS: The manufacturer marked the helmet with its corresponding discrete size: 57-58 cm; Headform Size: DOT Medium.

CONDITIONING FOR TESTING — Paragraph S6.4 — The protective headgear shall be conditioned for not less than 4 hours and no more than 24 hours, in the specified environmental condition shown below, prior to test.

Ambient Conditions	16°C to 26°C (61ºF to 79ºF); 30% to 70% Relative Humidity
Low Temperature	-15°C to -5°C (5ºF to 23ºF)
High Temperature	45°C to 55°C (113ºF to 131ºF)
Water Immersion	16°C to 26°C (61ºF to 79ºF)

The maximum time during which the protective headgear may be out of the conditioning environment shall not exceed 4 minutes. It must then be returned to the conditioned environment for a minimum of 3 minutes for each minute or portion of a minute in excess of 4 minutes out of the conditioning environment or 12 hours, whichever is less, prior to resumption of testing.

IMPACT ATTENUATION

SYSTEMS CHECK	TRIAL DROP	DROP (meters)	VEL. (m/s)	PEAK (g)	DWELL TIME (ms)		TEST RECORD	HEADFORM POSITION
					150 g	200 g		
PRETEST	1	1.4	5.09	394.6	2.4	2.0	Pre 1	Crown
	2	1.4	5.16	396.9	2.5	2.1	Pre 2	Crown
	3	1.4	5.16	398.9	2.5	2.1	Pre 3	Crown
PRETEST AVERAGE		XXXX	XXXX	396.8	XXX	XXX	XXXX	XXXX
POSTTEST	1	1.4	5.09	389.0	2.4	2.1	Post 1	Crown
	2	1.4	5.16	387.7	2.5	2.1	Post 2	Crown
	3	1.4	5.16	385.3	2.5	2.1	Post 3	Crown
POSTTEST AVERAGE		XXXX	XXXX	387.3	XXX	XXX	XXXX	XXXX
DIFFERENCE BETWEEN PRE-TEST AND POST-TEST AVERAGES				9.5	DIFFERENCE NOT TO EXCEED 15 g			

Helmet Designation	Helmet Condition	Impact Location	Front		Left		Right		Rear	
		Impact Number	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
A	Ambient	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	1	2	3	4	5	6	7	8
		Peak g	87	109	122	132	185	193	143	140
		ms @ 150	0.0	0.0	0.0	0.0	3.3	2.0	0.0	0.0
		ms @ 200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Velocity m/s	5.24	5.24	5.24	5.24	5.99	6.10	6.10	6.21
B	Low Temperature	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	9	10	11	12	13	14	15	16
		Peak g	91	103	112	131	162	185	160	189
		ms @ 150	0.0	0.0	0.0	0.0	1.4	2.7	0.9	1.5
		ms @ 200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Velocity m/s	5.32	5.24	5.24	5.24	5.99	6.10	6.09	6.09
C	High Temperature	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	17	18	19	20	21	22	23	24
		Peak g	82	109	106	123	171	195	144	145
		ms @ 150	0.0	0.0	0.0	0.0	0.9	2.4	0.0	0.0
		ms @ 200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Velocity m/s	5.24	5.31	5.33	5.24	6.10	6.10	6.10	5.99
D	Water Immersed	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	25	26	27	28	29	30	31	32
		Peak g	95	111	118	128	174	165	137	121
		ms @ 150	0.0	0.0	0.0	0.0	2.6	1.3	0.0	0.0
		ms @ 200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Velocity m/s	5.31	5.32	5.24	5.23	6.10	5.99	6.10	6.10

COMMENTS: 1. The actual drop heights were: flat anvil 193 cm, hemi anvil 145 cm.
2. Values reported in the above tables are rounded.

PENETRATION

Paragraph S5.2 and S7.2

WEIGHT OF STRIKER: 2.95 to 3.06 kg (6 pounds, 8 ounces to 6 pounds, 12 ounces)

POINT OF STRIKER: Radius = 0.5 ± 0.1 mm (0.02 ± 0.004 in.), included angle of 60º ± 0.5°, hardness minimum of 60 Rockwell "C" Scale and a cone height of not less than 3.8 ± 0.038 cm (1.5 ± 0.015 in.).

HEIGHT OF FALL: 300 cm ± 1.5 cm, measured from the tip of the striker point to the outer surface of the mounted protective headgear.

FAILURE CRITERION: When tested, the protective headgear shall be failed if the penetrator has made an indentation in the headform.

TEST	HELMET	TEST LOCATION	PASS	FAIL	CONDITIONS
1	A	Crown	X		AMBIENT
2	A	Front Left	X		AMBIENT
3	B	Crown	X		LOW TEMPERATURE
4	B	Front Left		X	LOW TEMPERATURE
5	C	Crown	X		HIGH TEMPERATURE
6	C	Front Left	X		HIGH TEMPERATURE
7	D	Crown	X		WATER IMMERSED
8	D	Front Left	X		WATER IMMERSED

COMMENTS: Photographs of penetration test locations are found in Appendix C.

RETENTION SYSTEM

Paragraph S5.3 and S7.3

AMBIENT TEMPERATURE: 21 ºC ; AMBIENT HUMIDITY: 38 %

REQUIREMENTS:

READING	APPLIED LOAD
INITIAL	22.68 kg, + 4.54 kg, - 0 kg (50.0 Lbs, + 10 Lbs, - 0 Lbs)
FINAL	136 kg, + 0 kg, - 2.3 kg (300.0 Lbs, + 0 Lbs, - 5 Lbs)

ELONGATION NOT TO EXCEED 2.5 cm (1.0 INCH) AFTER LOAD INCREASE

HELMET	CONDITIONS	INITIAL READING (cm)	FINAL READING (cm)	ELONGATION (cm)
A	AMBIENT	0.7	2.3	1.6
B	LOW TEMPERATURE	1.2	2.9	1.7
C	HIGH TEMPERATURE	0.5	2.0	1.5
D	WATER IMMERSED	0.5	1.9	1.4

CONFIGURATION - Paragraph S5.4 - Helmet shall provide a minimum peripheral vision of 105º to each side of the midsagittal plane. The brow opening shall be at least 2.54 cm (1 inch) above all points in the basic plane that are within the angles of peripheral vision.

	REQUIREMENTS	TEST RESULTS
PERIPHERAL VISION	> 105º	Pass
BROW OPENING	> 2.5 cm (1 inch)	Pass

COMMENT: Values in the above tables are rounded.

LABELING

S5.6.1 *Labeling* - Each helmet shall be permanently and legibly labeled, in a manner such that the label(s) can be easily read without removing padding or any other permanent part, with the following:

Required Information	Pass/Fail	Permanent
Manufacturer's name	Pass	Pass
Discrete size	Pass	Pass
Month and year of manufacture	Pass	Pass
Instructions to the purchaser as follows:	--------	--------
"Shell and liner constructed of (identify type(s) of materials)."	Pass	Pass
"Helmet can be seriously damaged by some common substances without damage being visible to the user."	Pass	Pass
"Apply only the following: (Recommended cleaning agents, paints, adhesives, etc., as appropriate."	Pass	Pass
"Make no modifications."	Pass	Pass
"Fasten helmet securely."	Pass	Pass
"If helmet experiences a severe blow, return it to the manufacturer for inspection, or destroy it and replace it."	Pass	Pass

COMMENT: Labels were determined to be both easily read and permanent based on the TP-218-07, Section 12.5.4.

LABELING

S5.6.2 Certification. Each helmet shall be labeled permanently and legibly with a label, constituting the manufacturer's certification that the helmet conforms to the applicable Federal motor vehicle safety standards, that is separate from the label(s) used to comply with S5.6.1, and complies with paragraphs (a) through (c) of this section.
(a) Content, format, and appearance. The label required by paragraph S5.6.2 shall have the following content, format, and appearance:

Required Certification Information	Pass/Fail	Permanent
The symbol ''DOT,'' horizontally centered on the label, in letters not less than 0.38 inch (1.0 cm) high.	Pass	Pass
The term ''FMVSS No. 218,'' horizontally centered beneath the symbol DOT, in letters not less than 0.09 inches (0.23 cm) high.	Pass	
The word "'CERTIFIED,'' horizontally centered beneath the term ''FMVSS No. 218,'' in letters not less than 0.09 inches (0.23 cm) high.	Pass	
The precise model designation horizontally centered above the symbol DOT, in letters and/or numerals not less than 0.09 inch (0.23 cm) high.	Pass	
The manufacturer's name and/or brand, horizontally centered above the model designation, in letters and/or numerals not less than 0.09 inch (0.23 cm) high.	Pass	
All symbols, letters and numerals shall be in a color that contrasts with the background of the label.	Pass	
No information, other than the information specified in subparagraph (a), shall appear on the label.	Pass	
The label shall appear on the outer surface of the helmet and be placed so that it is centered laterally with the horizontal centerline of the DOT symbol located a minimum of 1 inch (2.5 cm) and a maximum of 3 inches (7.6 cm) from the bottom edge of the posterior portion of the helmet.	Pass	

COMMENT(S): Labels were determined to be both easily read and permanent based on the TP-218-07, Section 12.5.4.

TEST DATA

CALCULATE BIAS

Bias (mV): #1: 4.86 #2: 0.0 #3: 0.0 #4: 0.0 #5: 0.0

Present Limit Value (mV): 150.0

PERFORM PRETEST: DROP #: 1

Drop Height (m): 1.4

Peak G's: 394.62

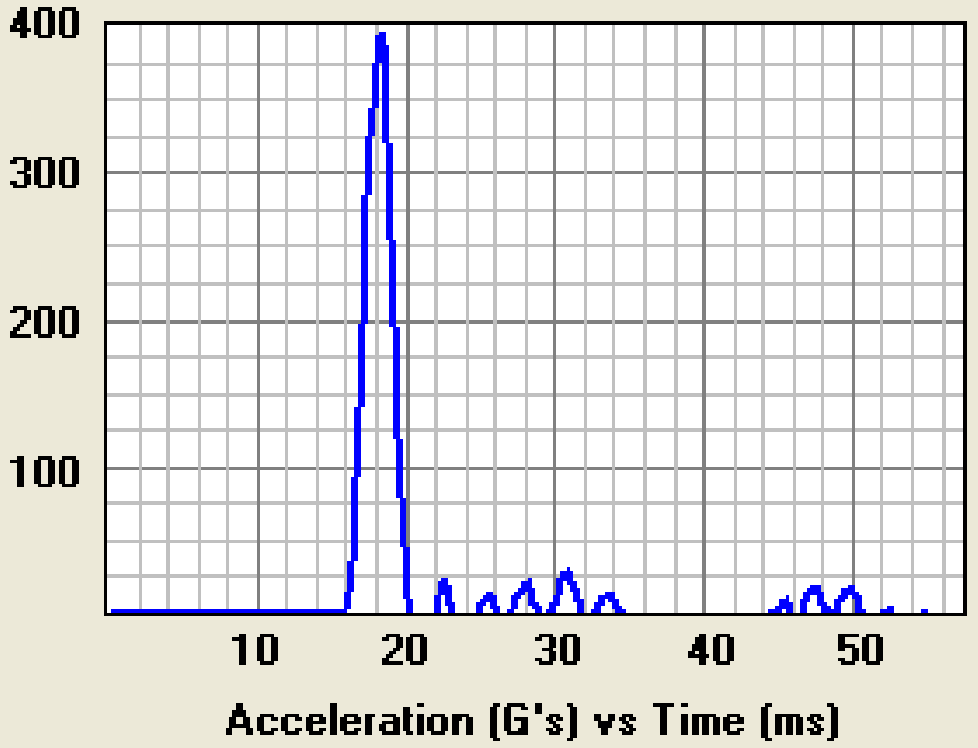
Peak Time (ms): 18.5

Δ Time @ 150 G (ms): 2.4

Δ Time @ 200 G (ms): 2.0

Gate Time (ms): 4.98

Impact Velocity (m/s): 5.09



HEADFORM POSITION

- ○ Front
- ○ Left
- ○ Right
- ○ Rear
- ◉ Crown
- ○ Other

HEADFORM SIZE

- ○ Size A
- ◉ Size C
- ○ Size D
- ○ Size E
- ○ Size J
- ○ Size M
- ○ Hybrid-3
- ○ Other

CALCULATE BIAS

Bias (mV): #1: 4.86 #2: 0.0 #3: 0.0 #4: 0.0 #5: 0.0

Present Limit Value (mV): 150.0

PERFORM PRETEST: DROP #: 2

Drop Height (m): 1.4

Peak G's: 396.91

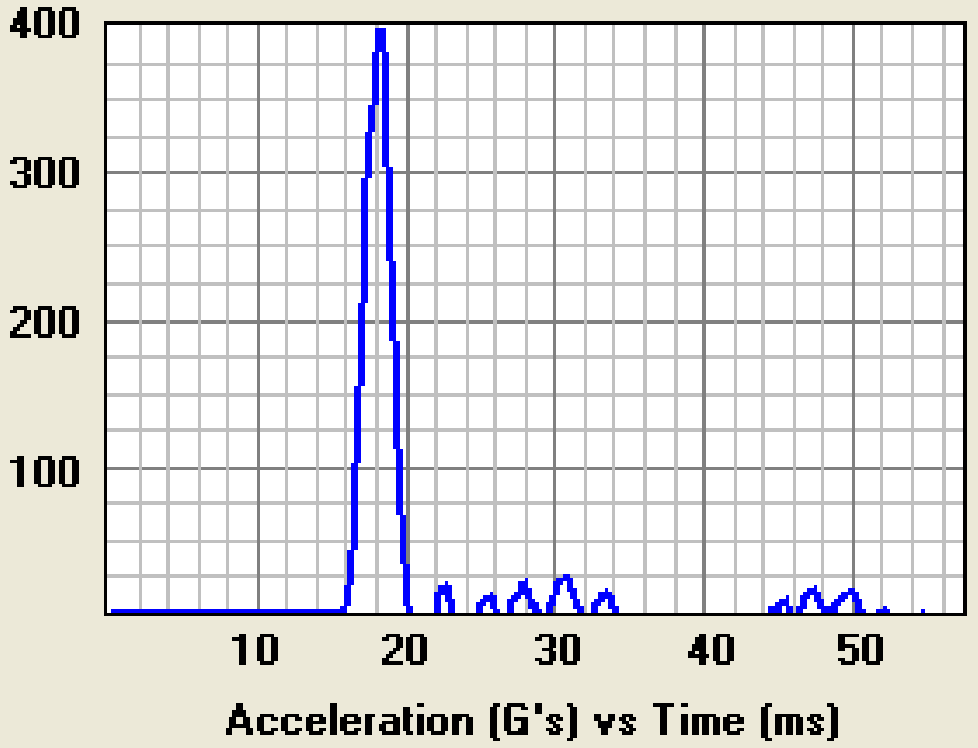
Peak Time (ms): 18.4

Δ Time @ 150 G (ms): 2.5

Δ Time @ 200 G (ms): 2.1

Gate Time (ms): 4.91

Impact Velocity (m/s): 5.16



HEADFORM POSITION

- ○ Front
- ○ Left
- ○ Right
- ○ Rear
- ◉ Crown
- ○ Other

HEADFORM SIZE

- ○ Size A
- ◉ Size C
- ○ Size D
- ○ Size E
- ○ Size J
- ○ Size M
- ○ Hybrid-3
- ○ Other

CALCULATE BIAS

Bias (mV): #1: 4.86 #2: 0.0 #3: 0.0 #4: 0.0 #5: 0.0

Present Limit Value (mV): 150.0

PERFORM PRETEST: DROP #: 3

Drop Height (m): 1.4

Peak G's: 398.89

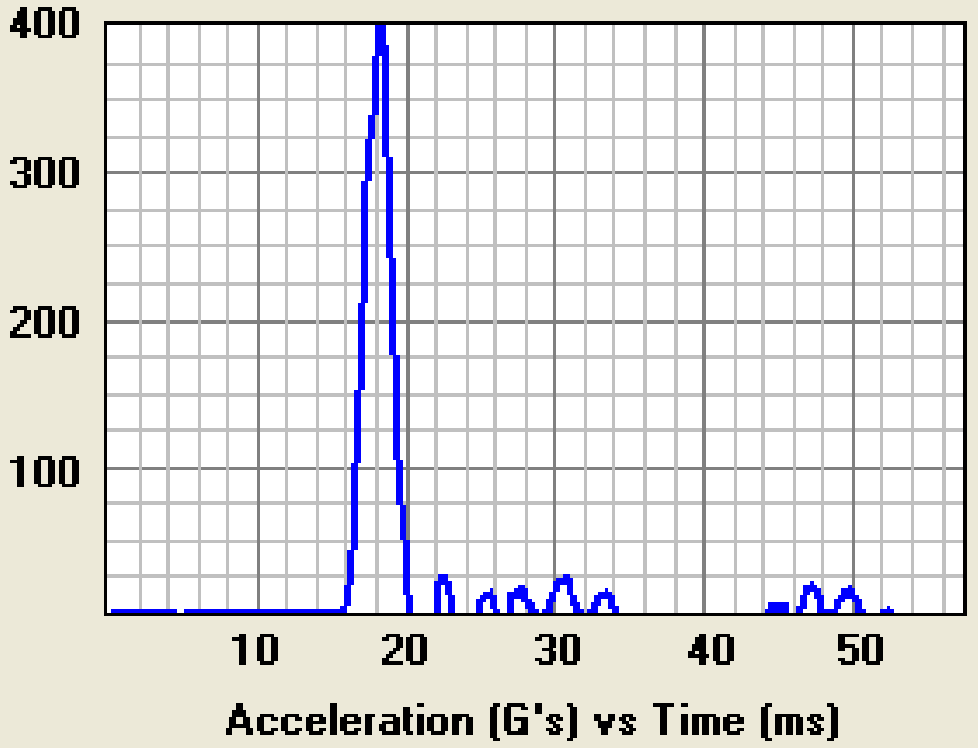
Peak Time (ms): 18.4

Δ Time @ 150 G (ms): 2.5

Δ Time @ 200 G (ms): 2.1

Gate Time (ms): 4.91

Impact Velocity (m/s): 5.16



HEADFORM POSITION

- ○ Front
- ○ Left
- ○ Right
- ○ Rear
- ◉ Crown
- ○ Other

HEADFORM SIZE

- ○ Size A
- ◉ Size C
- ○ Size D
- ○ Size E
- ○ Size J
- ○ Size M
- ○ Hybrid-3
- ○ Other

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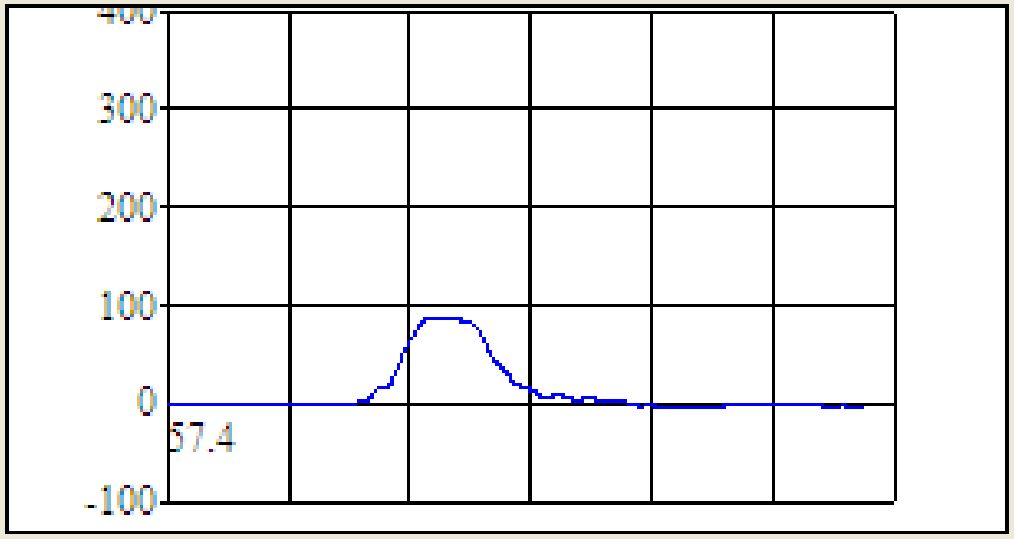

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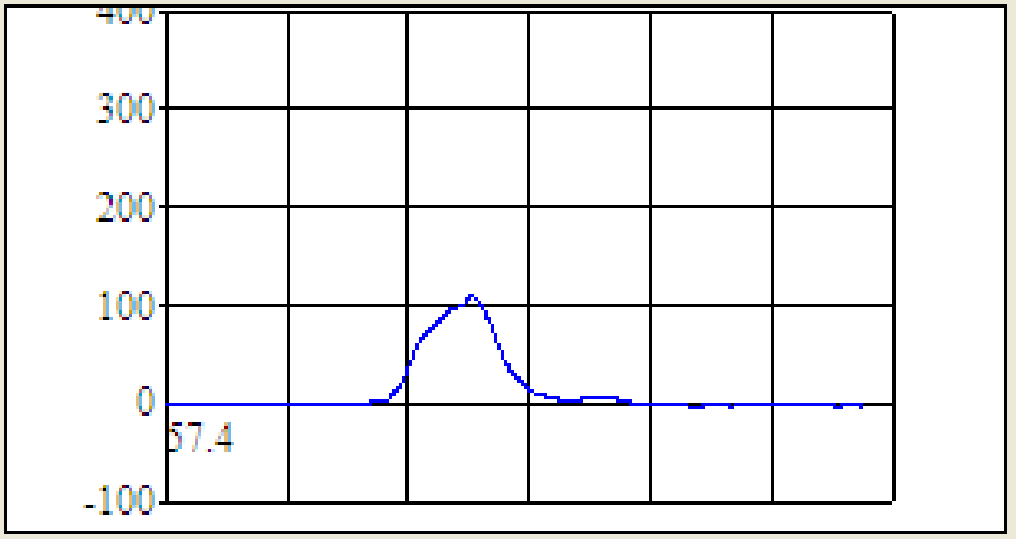

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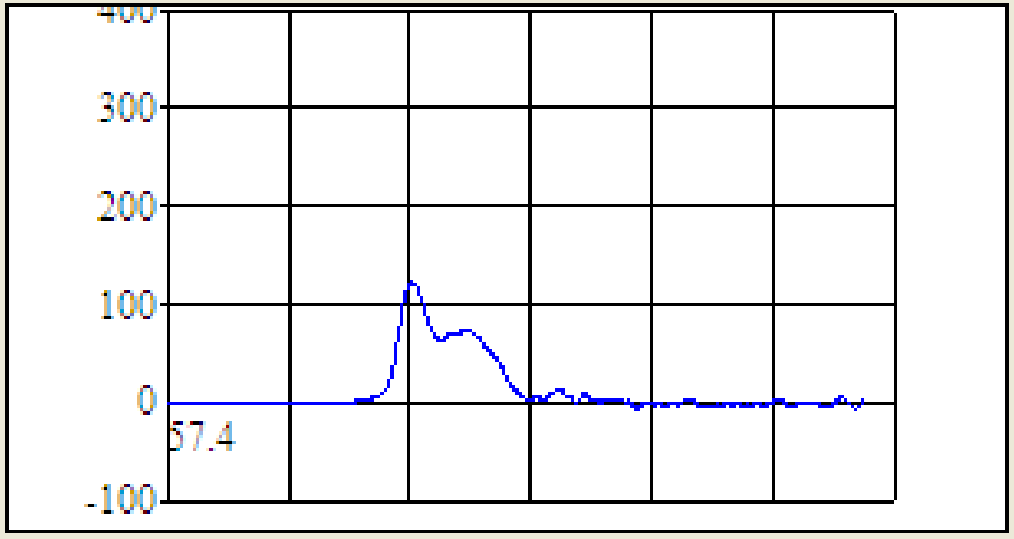

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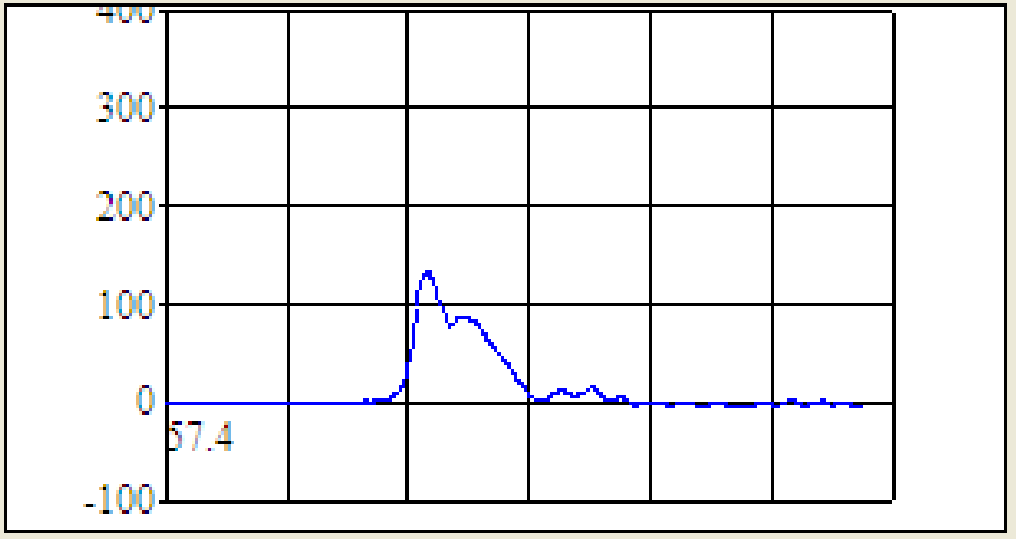

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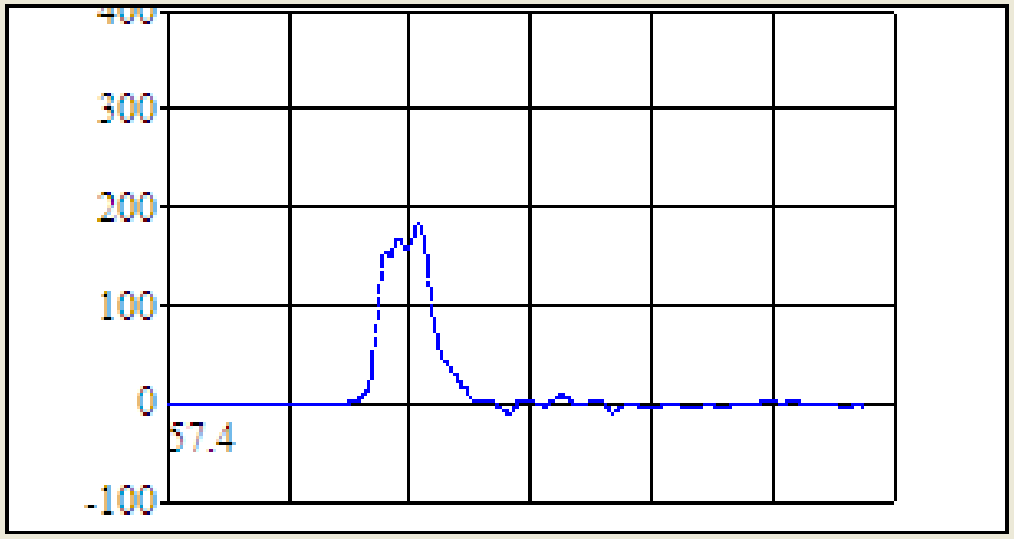

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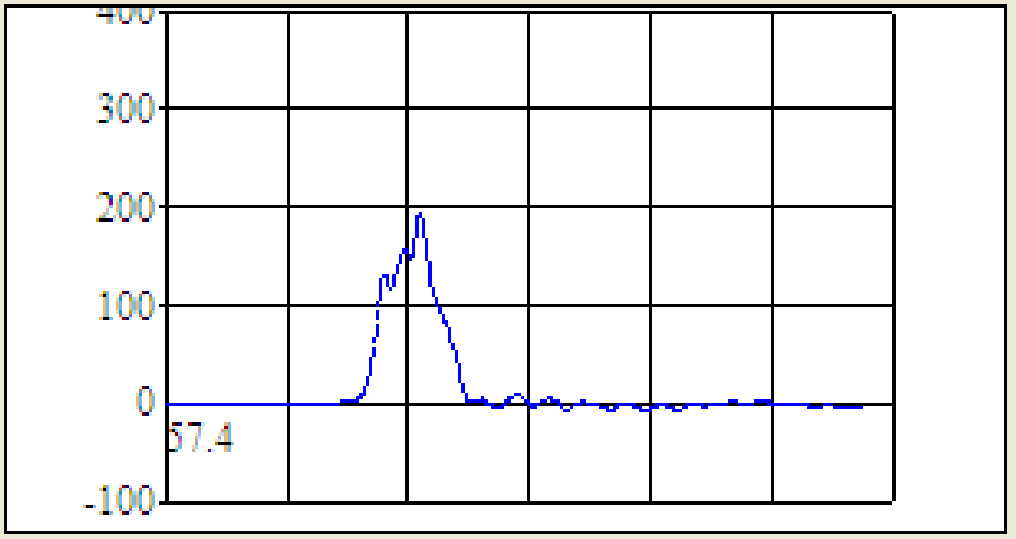

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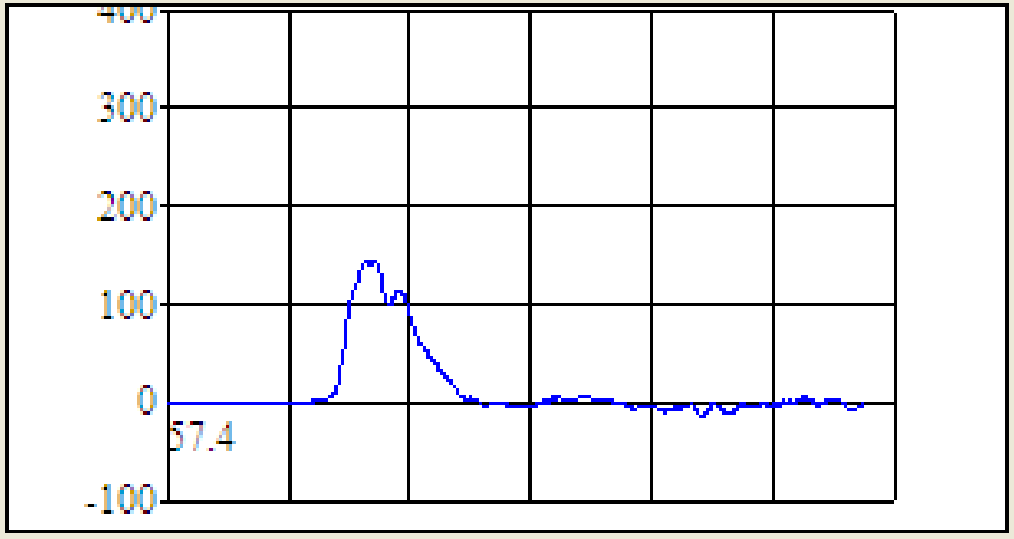

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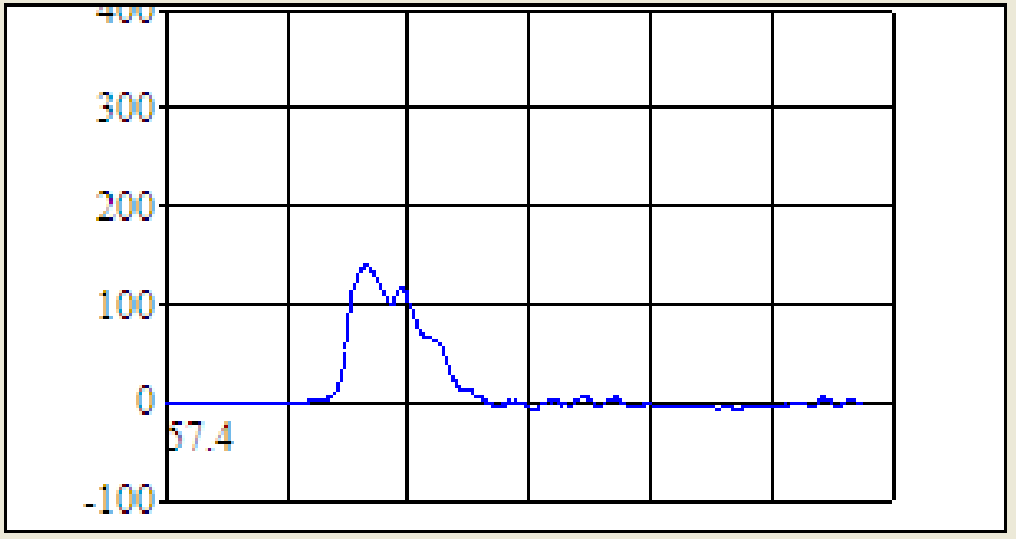

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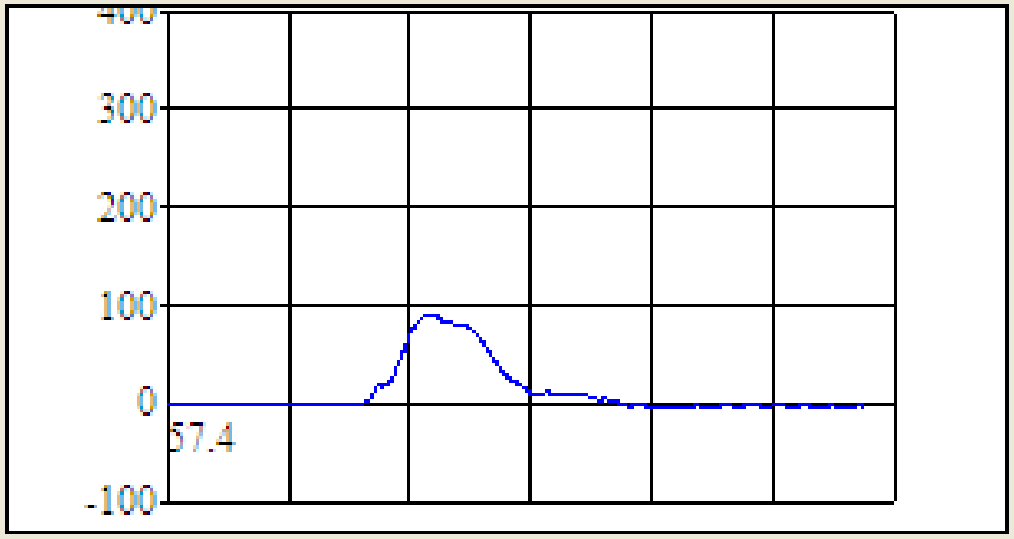

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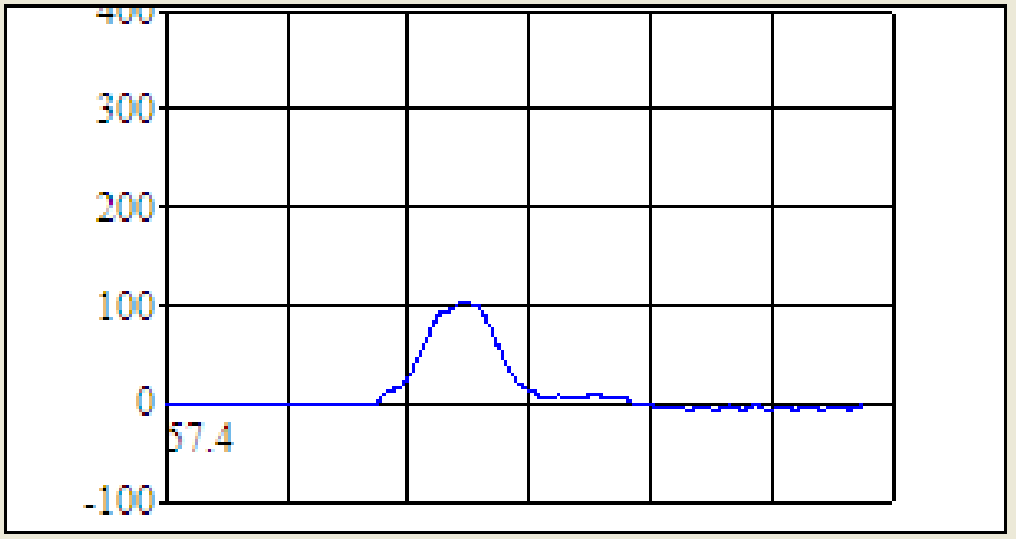

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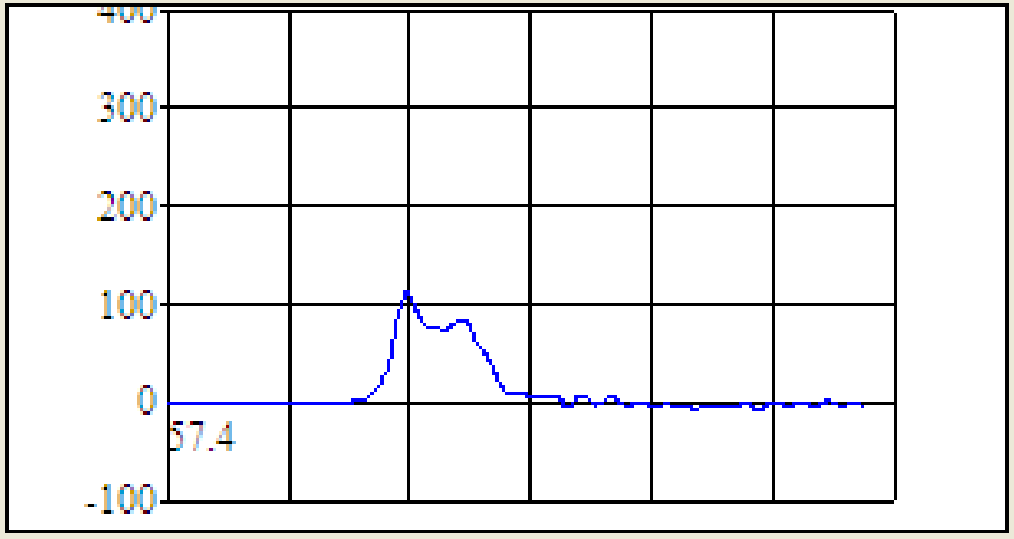

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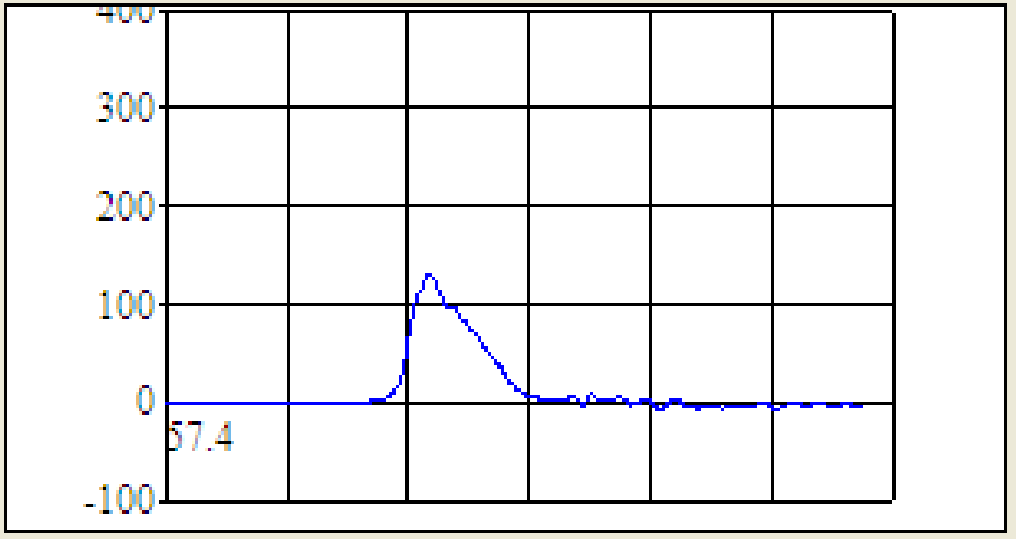

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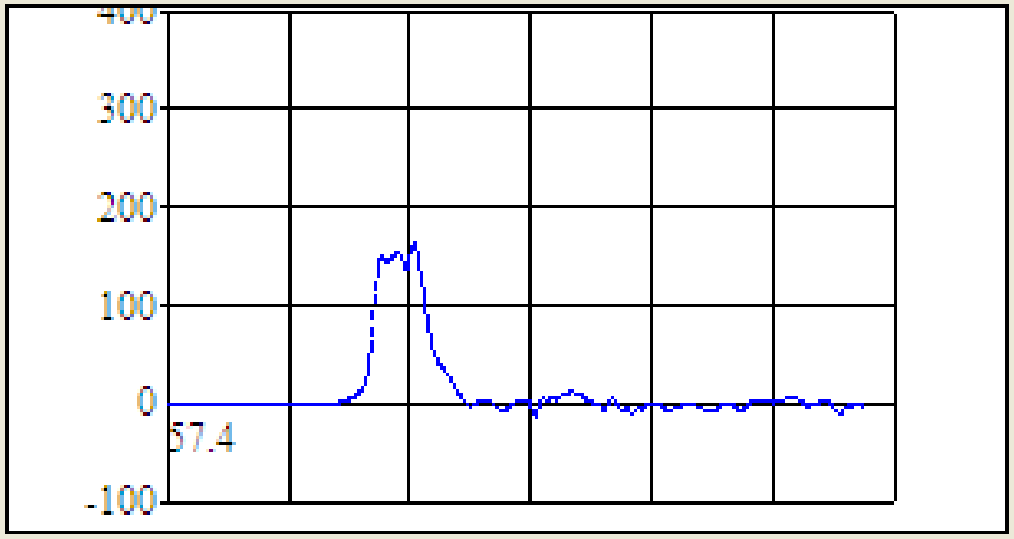

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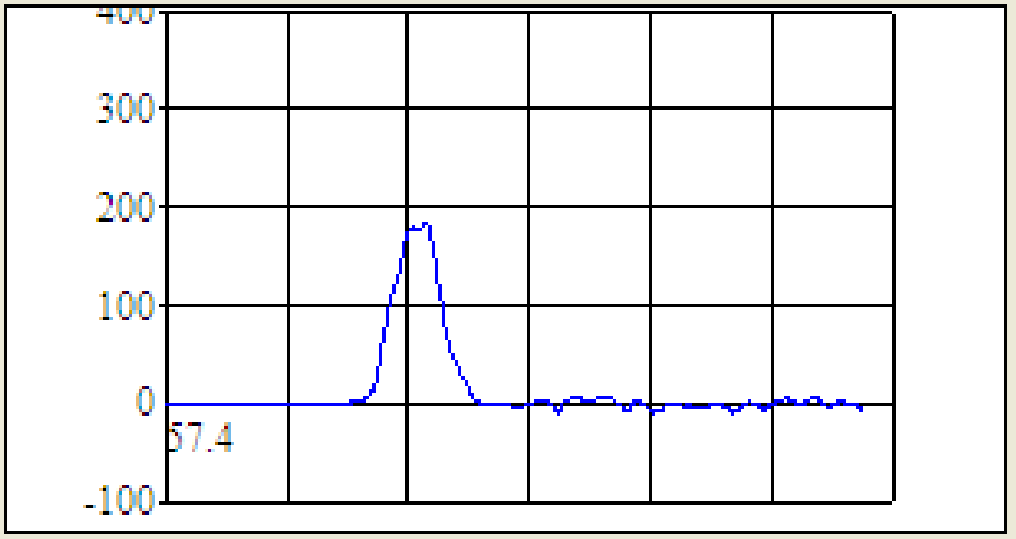

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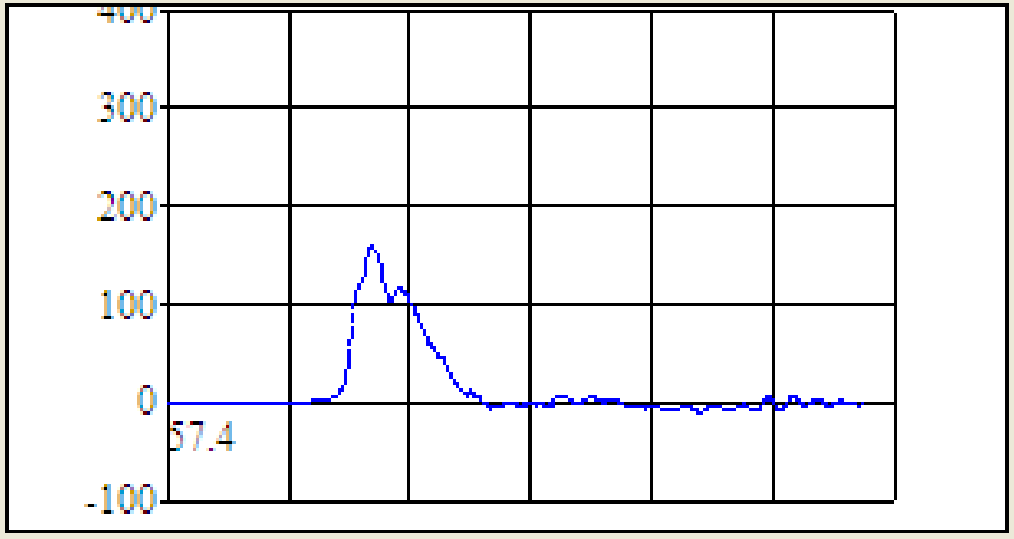

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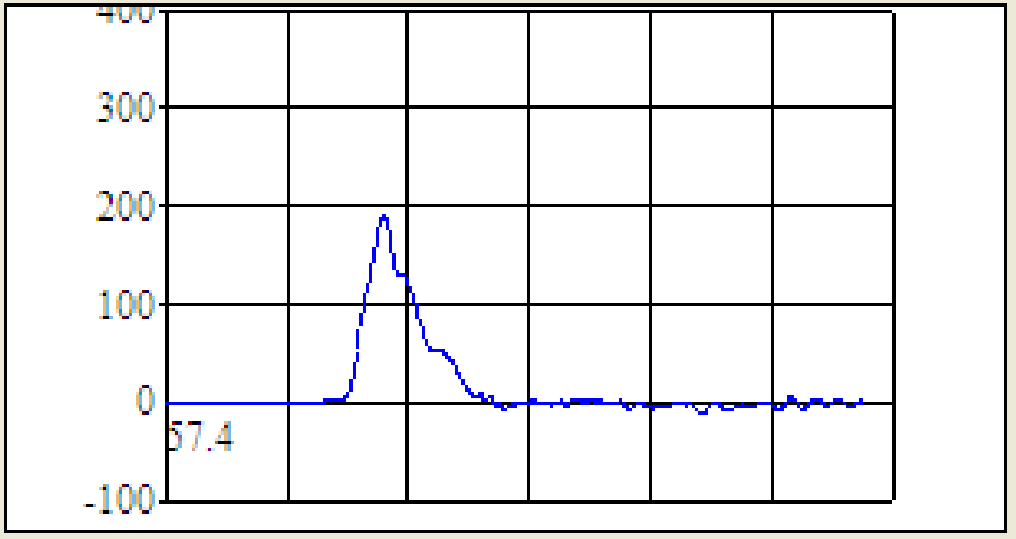
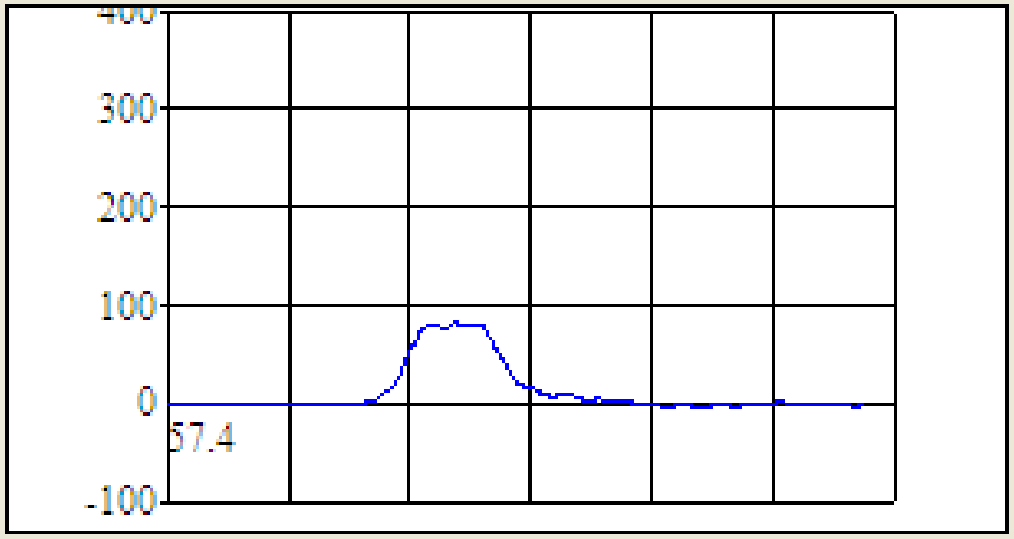
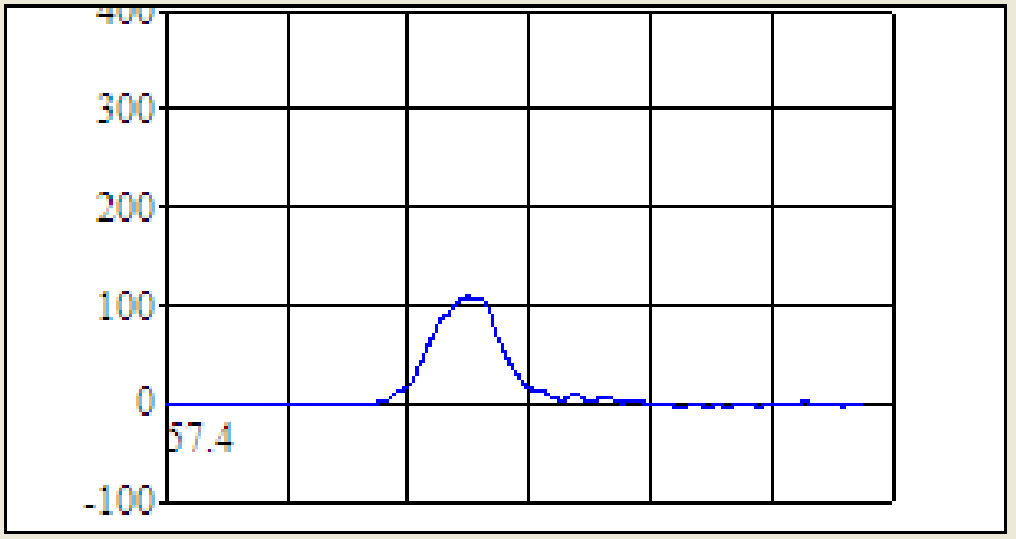


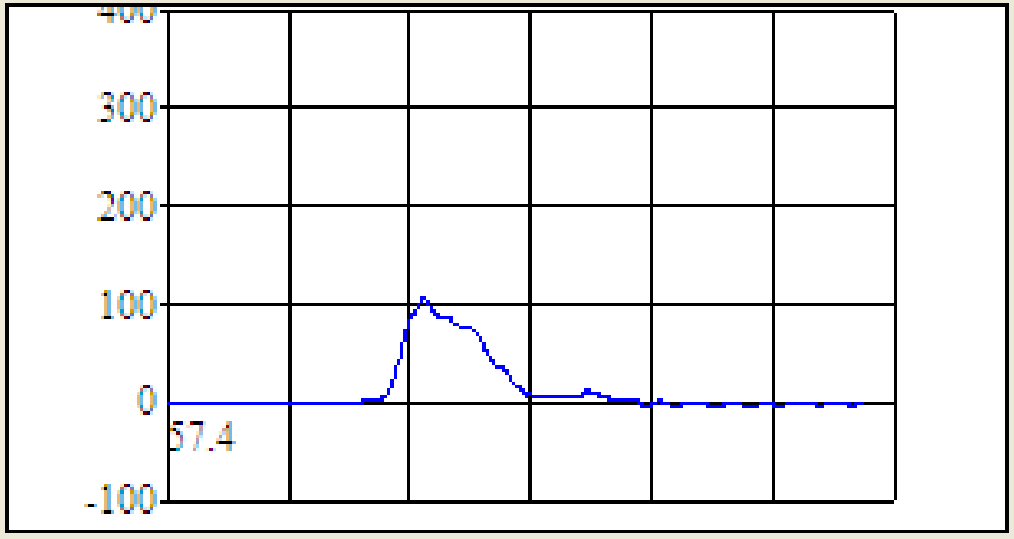
B2530311.TR1-Medium -Hot -FR -HEMI



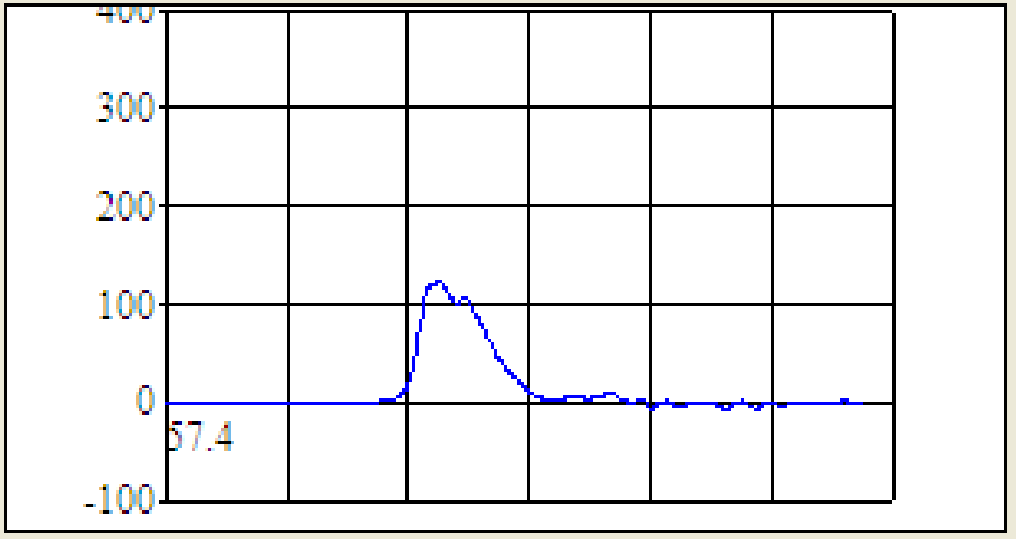
B2530311.TR2-Medium -Hot -FR -HEMI



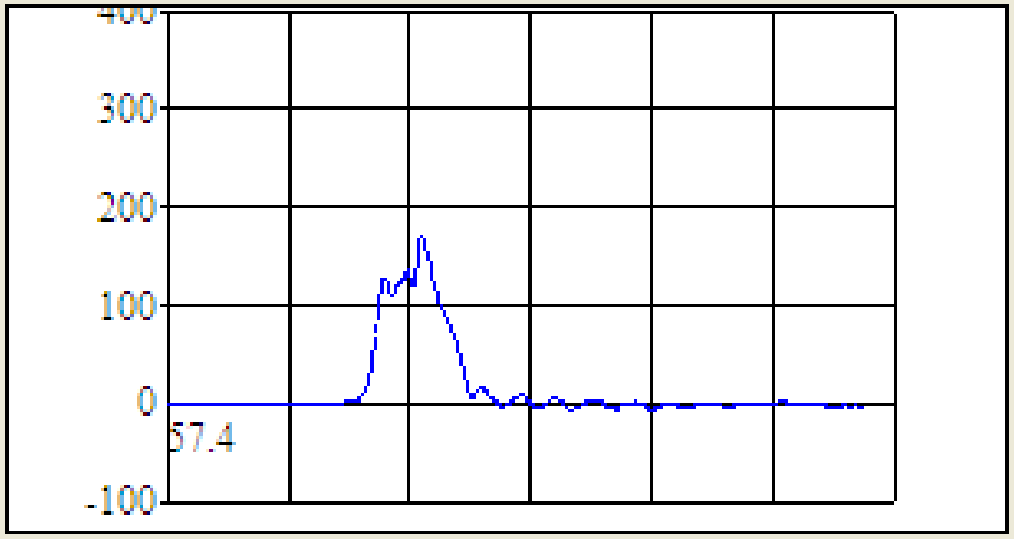
B2530312.TR1-Medium -Hot -LF -HEMI



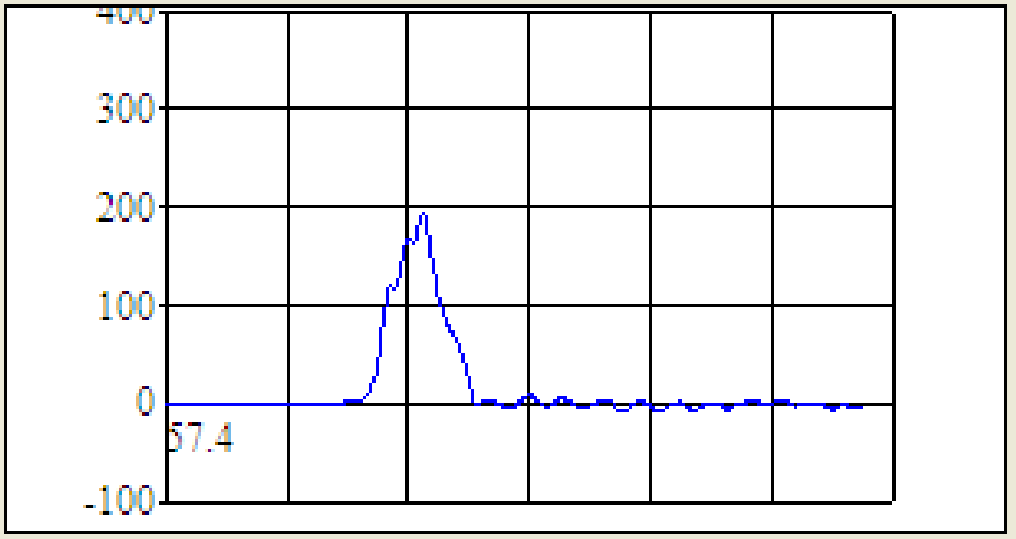
B2530312.TR2-Medium -Hot -LF -HEMI



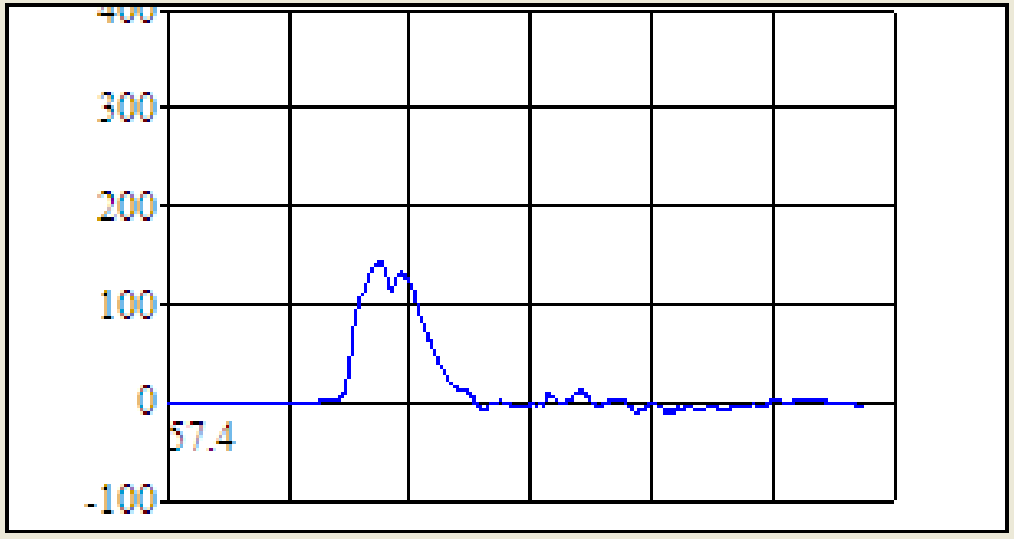
B2530313.TR1-Medium -Hot -RG -FLAT



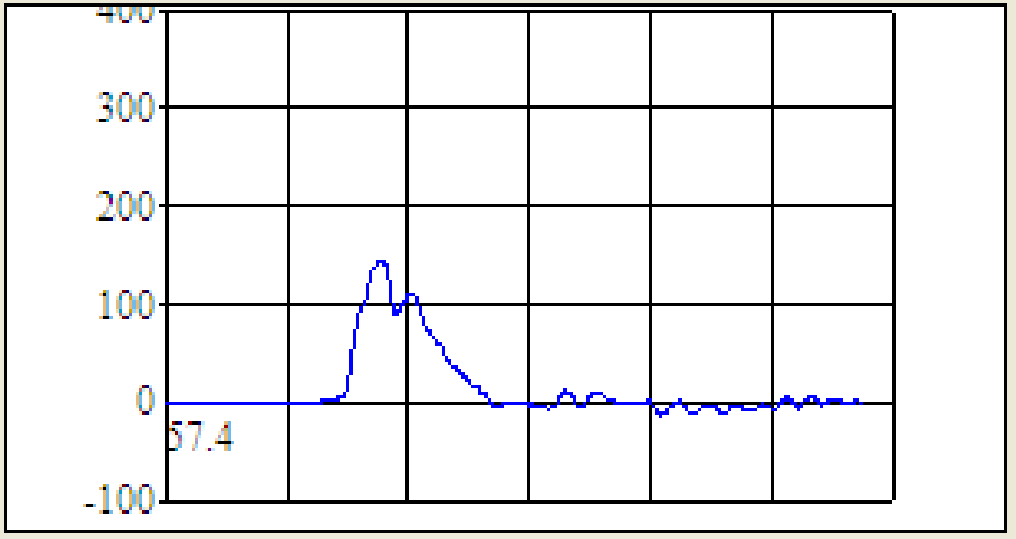
B2530313.TR2-Medium -Hot -RG -FLAT



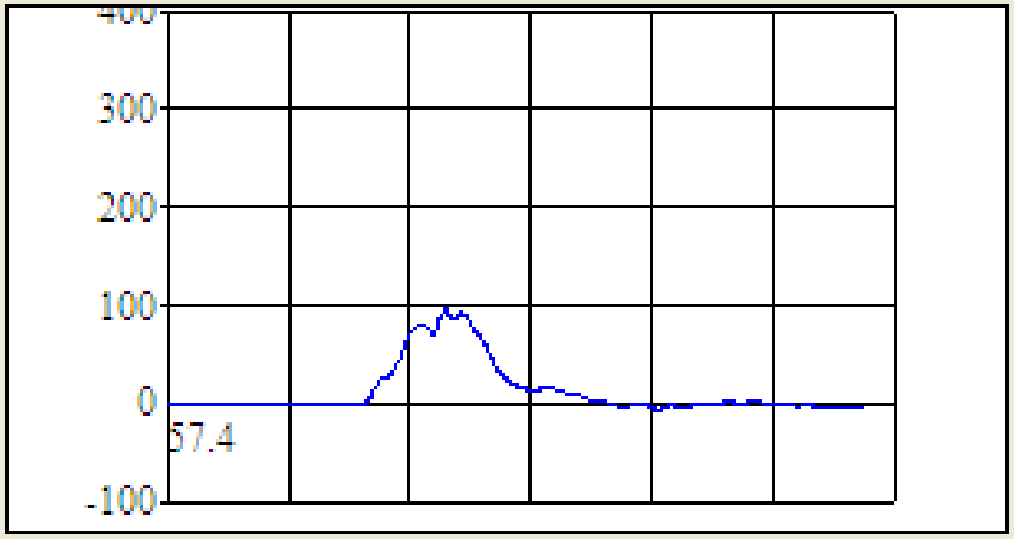
B2530314.TR1-Medium -Hot -RR -FLAT



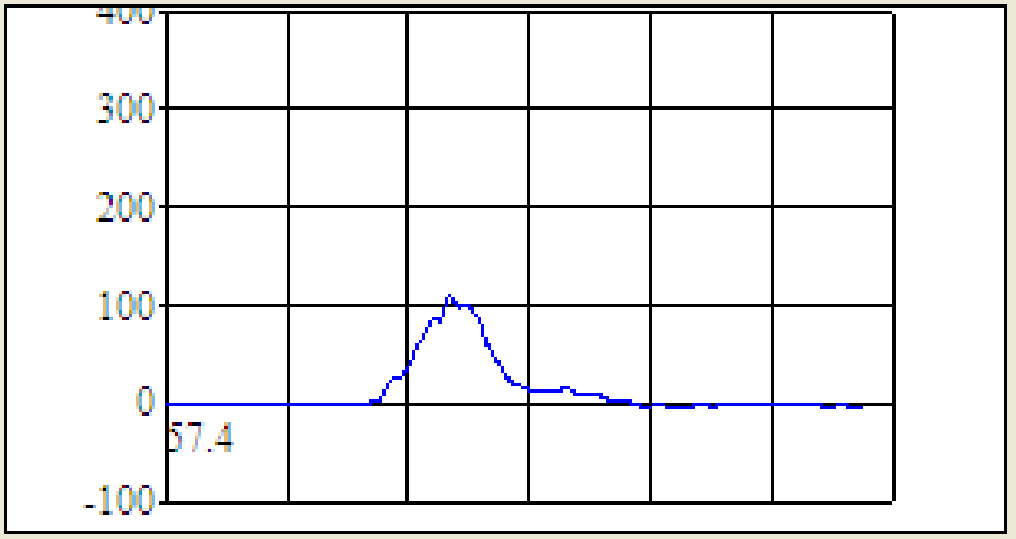
B2530314.TR2-Medium -Hot -RR -FLAT



B2530411.TR1-Medium -Wet -FR -HEMI



B2530411.TR2-Medium -Wet -FR -HEMI



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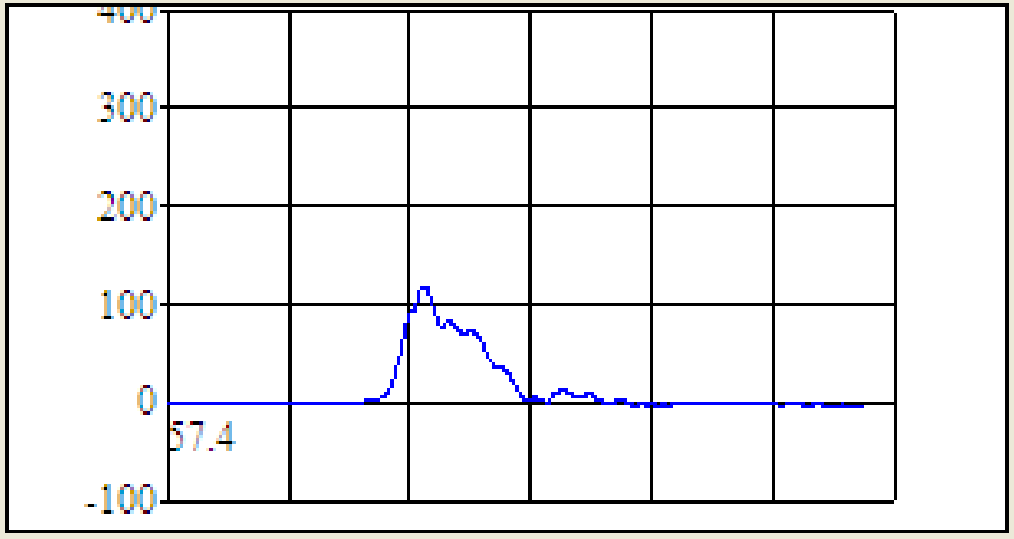
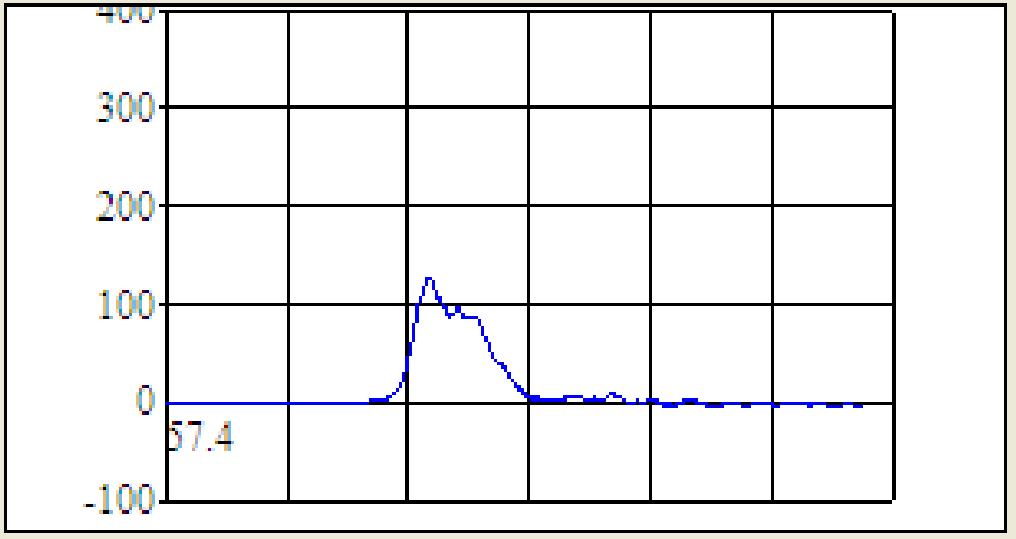
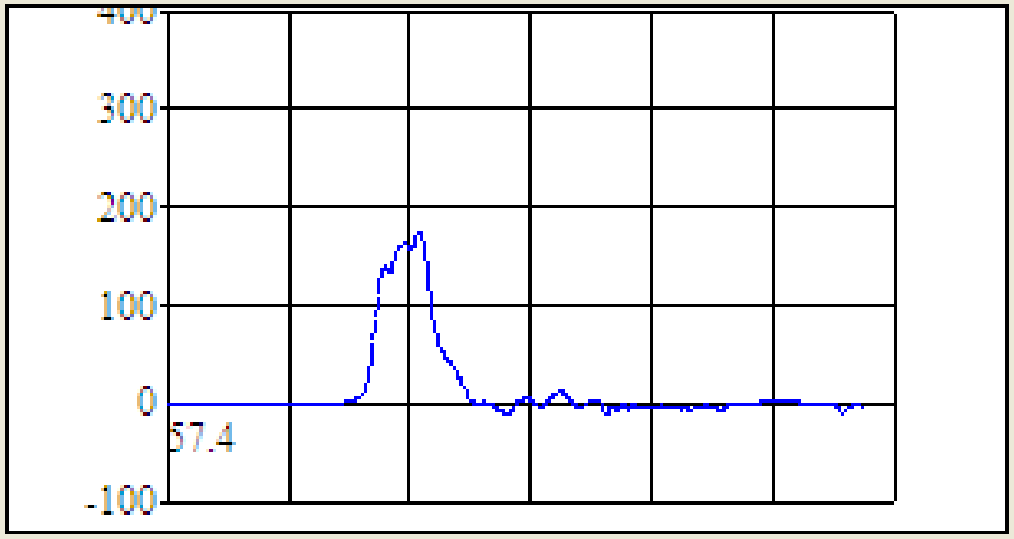


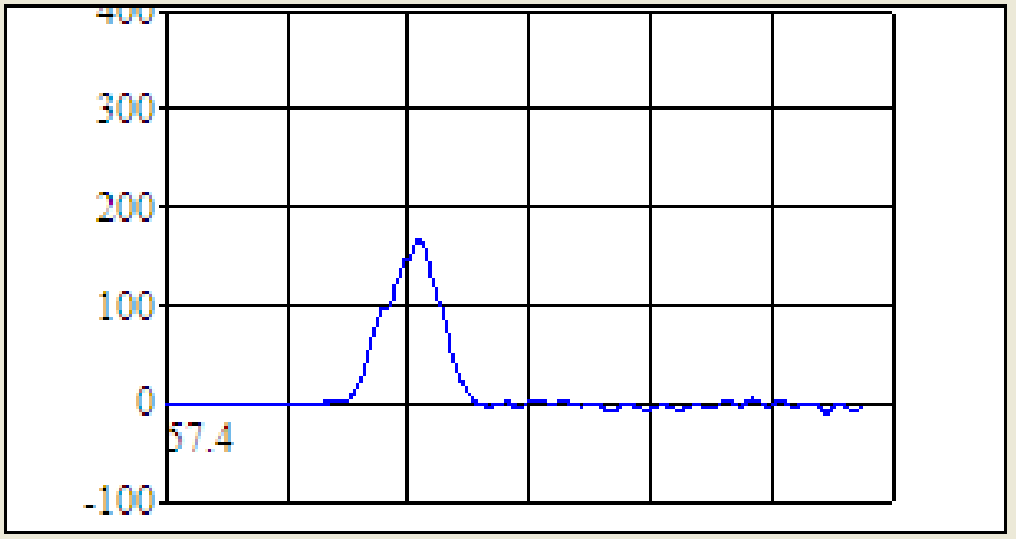
B2530412.TR2-Medium -Wet -LF -HEMI



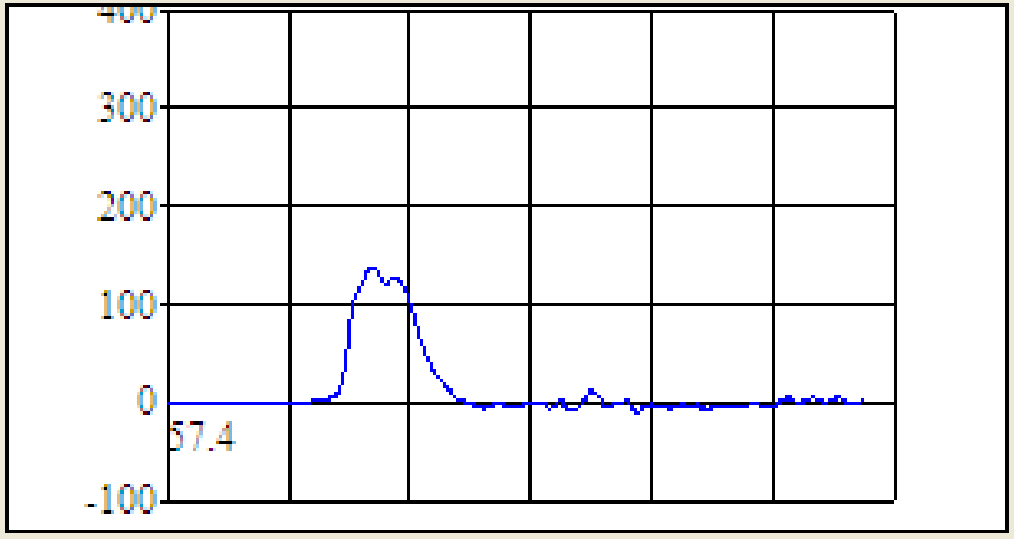
B2530413.TR1-Medium -Wet -RG -FLAT



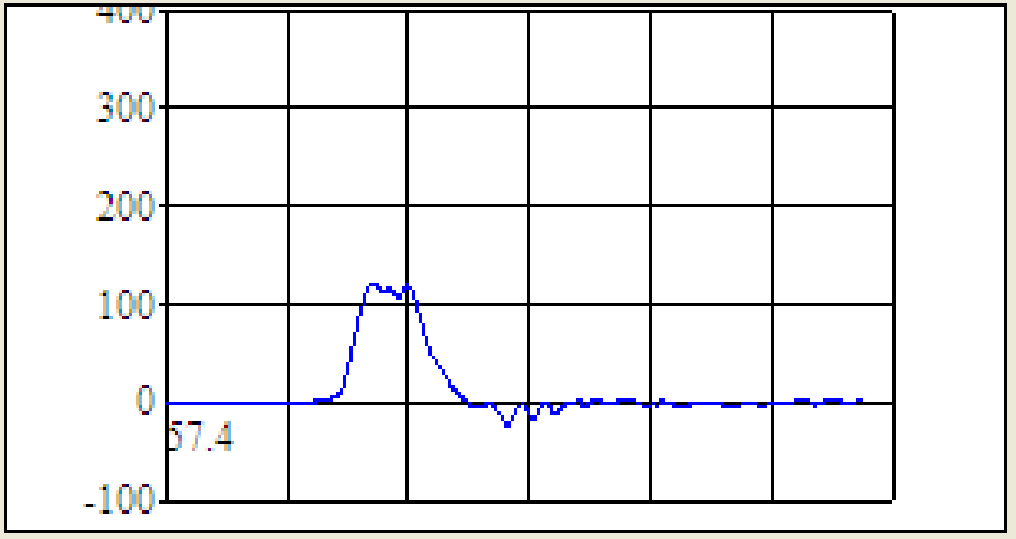
B2530413.TR2-Medium -Wet -RG -FLAT



B2530414.TR1-Medium -Wet -RR -FLAT



B2530414.TR2-Medium -Wet -RR -FLAT



CALCULATE BIAS

Bias (mV): #1: 4.88 #2: 0.0 #3: 0.0 #4: 0.0 #5: 0.0

Present Limit Value (mV): 150.0

PERFORM POSTTEST: DROP #: 1

Drop Height (m): 1.4

Peak G's: 388.95

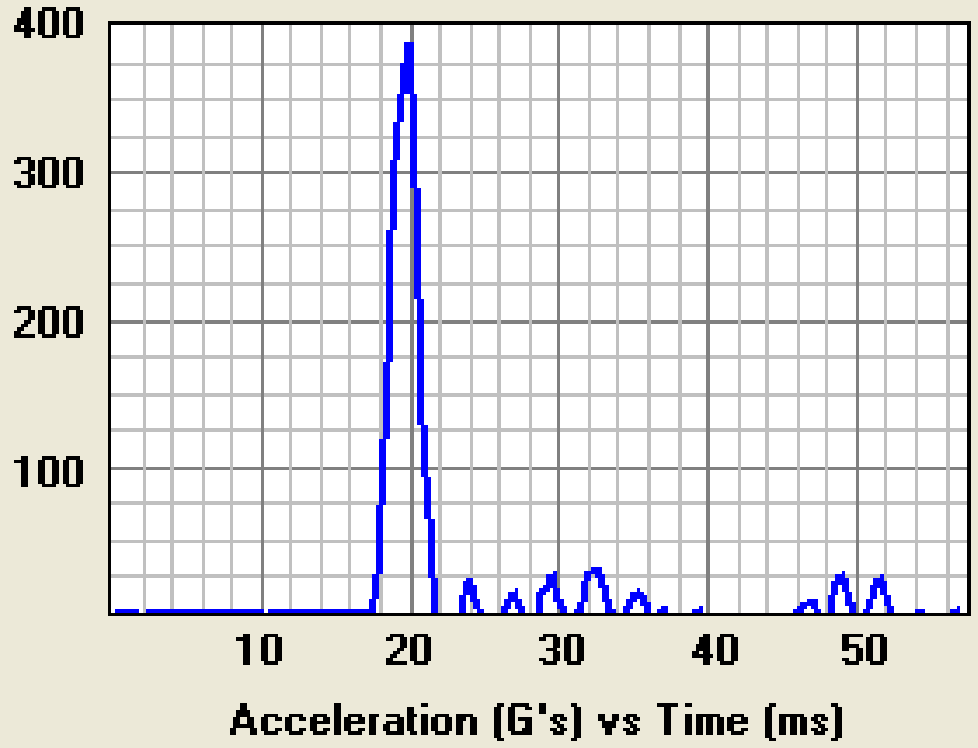
Peak Time (ms): 20.0

Δ Time @ 150 G (ms): 2.4

Δ Time @ 200 G (ms): 2.1

Gate Time (ms): 4.98

Impact Velocity (m/s): 5.09



HEADFORM POSITION

- ○ Front
- ○ Left
- ○ Right
- ○ Rear
- ◉ Crown
- ○ Other

HEADFORM SIZE

- ○ Size A
- ◉ Size C
- ○ Size D
- ○ Size E
- ○ Size J
- ○ Size M
- ○ Hybrid-3
- ○ Other

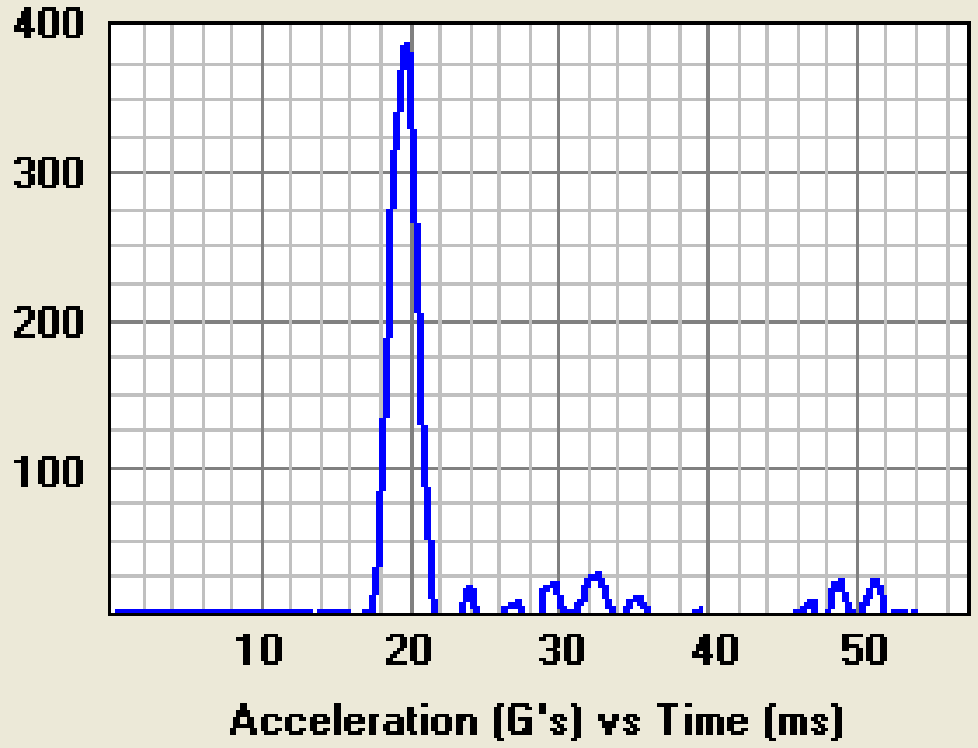
CALCULATE BIAS

Bias (mV): #1: 4.88 #2: 0.0 #3: 0.0 #4: 0.0 #5: 0.0

Present Limit Value (mV): 150.0

PERFORM POSTTEST: DROP #: 2

Drop Height (m):	1.4
Peak G's:	387.69
Peak Time (ms):	19.9
Δ Time @ 150 G (ms):	2.5
Δ Time @ 200 G (ms):	2.1
Gate Time (ms):	4.91
Impact Velocity (m/s):	5.16



HEADFORM POSITION

- ○ Front ○ Left
- ○ Right ○ Rear
- ◉ Crown
- ○ Other

HEADFORM SIZE

- ○ Size A ◉ Size C
- ○ Size D ○ Size E
- ○ Size J ○ Size M
- ○ Hybrid-3 ○ Other

CALCULATE BIAS

Bias (mV): #1: 4.88 #2: 0.0 #3: 0.0 #4: 0.0 #5: 0.0

Present Limit Value (mV): 150.0

PERFORM POSTTEST: DROP #: 3

Drop Height (m): 1.4

Peak G's: 385.26

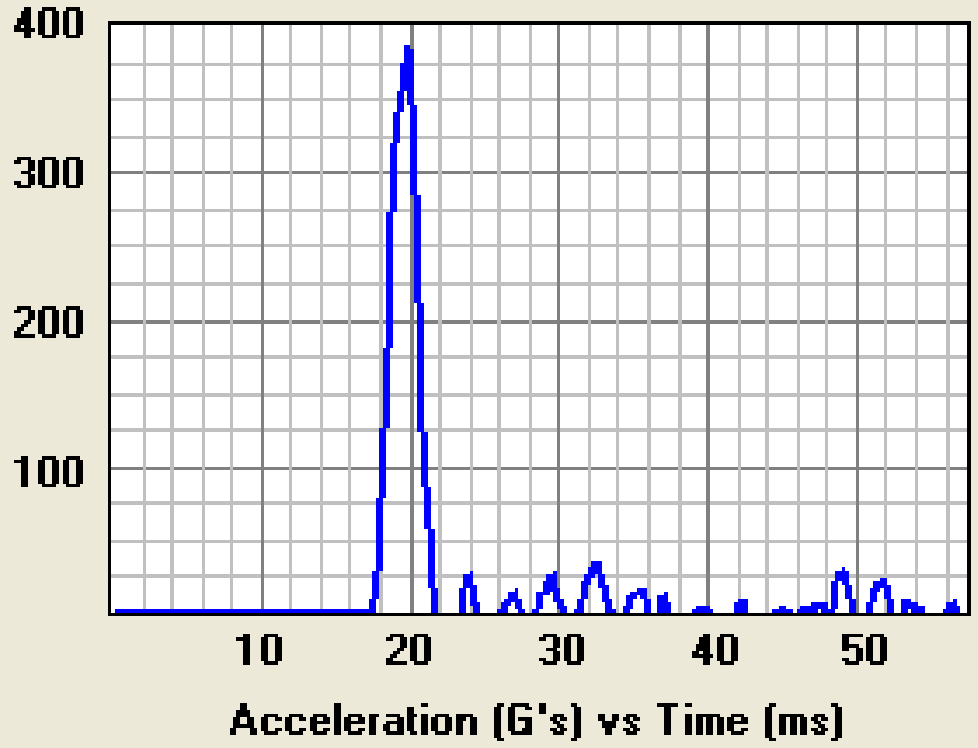
Peak Time (ms): 20.0

Δ Time @ 150 G (ms): 2.5

Δ Time @ 200 G (ms): 2.1

Gate Time (ms): 4.91

Impact Velocity (m/s): 5.16



HEADFORM POSITION

- ○ Front
- ○ Left
- ○ Right
- ○ Rear
- ◉ Crown
- ○ Other

HEADFORM SIZE

- ○ Size A
- ◉ Size C
- ○ Size D
- ○ Size E
- ○ Size J
- ○ Size M
- ○ Hybrid-3
- ○ Other

ACT DOT Strap Retention Acquistion
C:\DAQ\DAQ_ADMIN\Strap Retention\Strap_Retention.exe\Strap Retention - Main.vi
Last modified on 1/21/2013 at 7:38 PM
Printed on 1/22/2015 at 2:51 PM

ACT DOT Strap Retention Acquistion
C:\DAQ\DAQ_ADMIN\Strap Retention\Strap_Retention.exe\Strap Retention - Main.vi
Last modified on 1/21/2013 at 7:38 PM
Printed on 1/22/2015 at 3:33 PM

ACT DOT Strap Retention Acquistion
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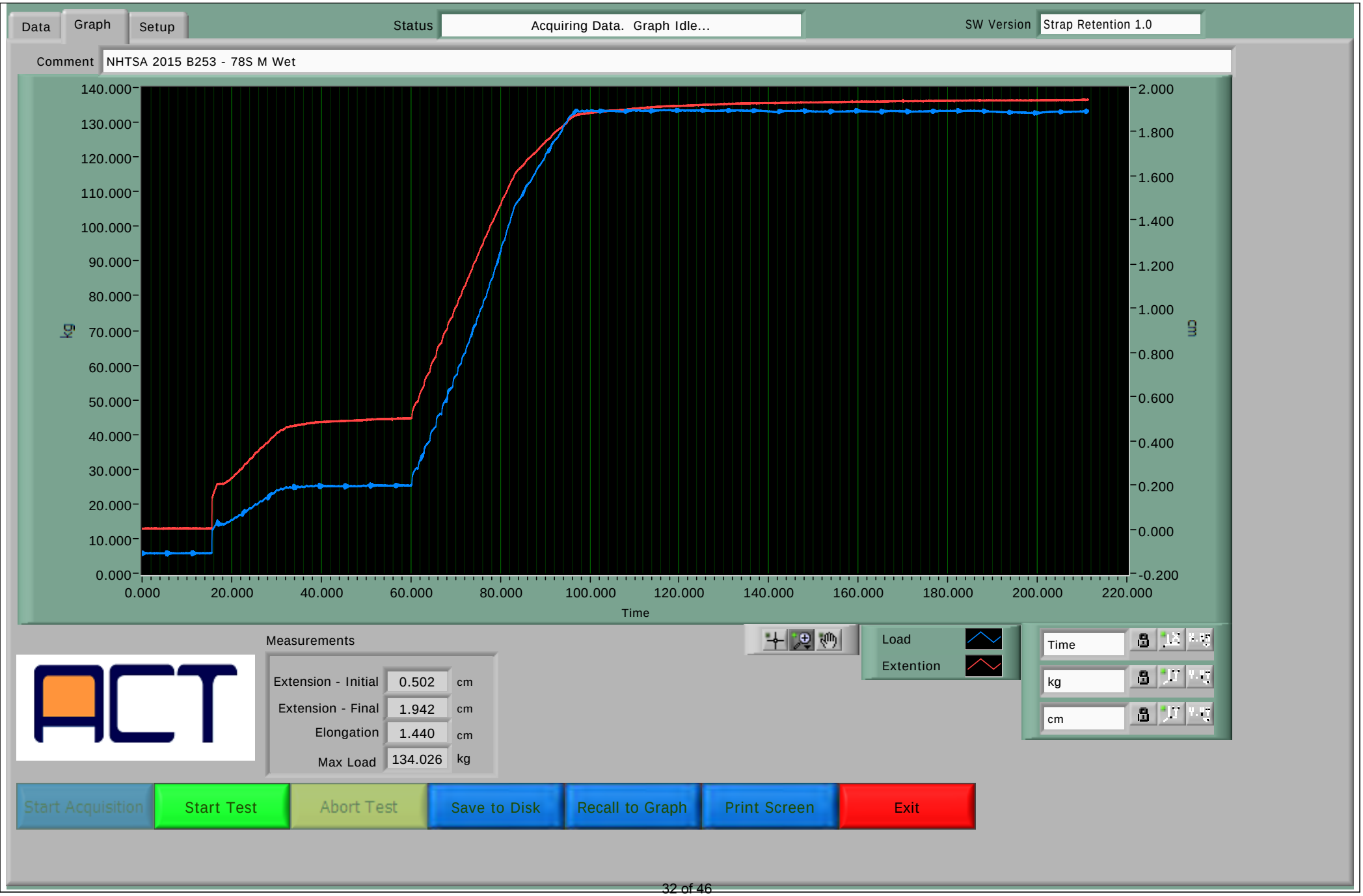
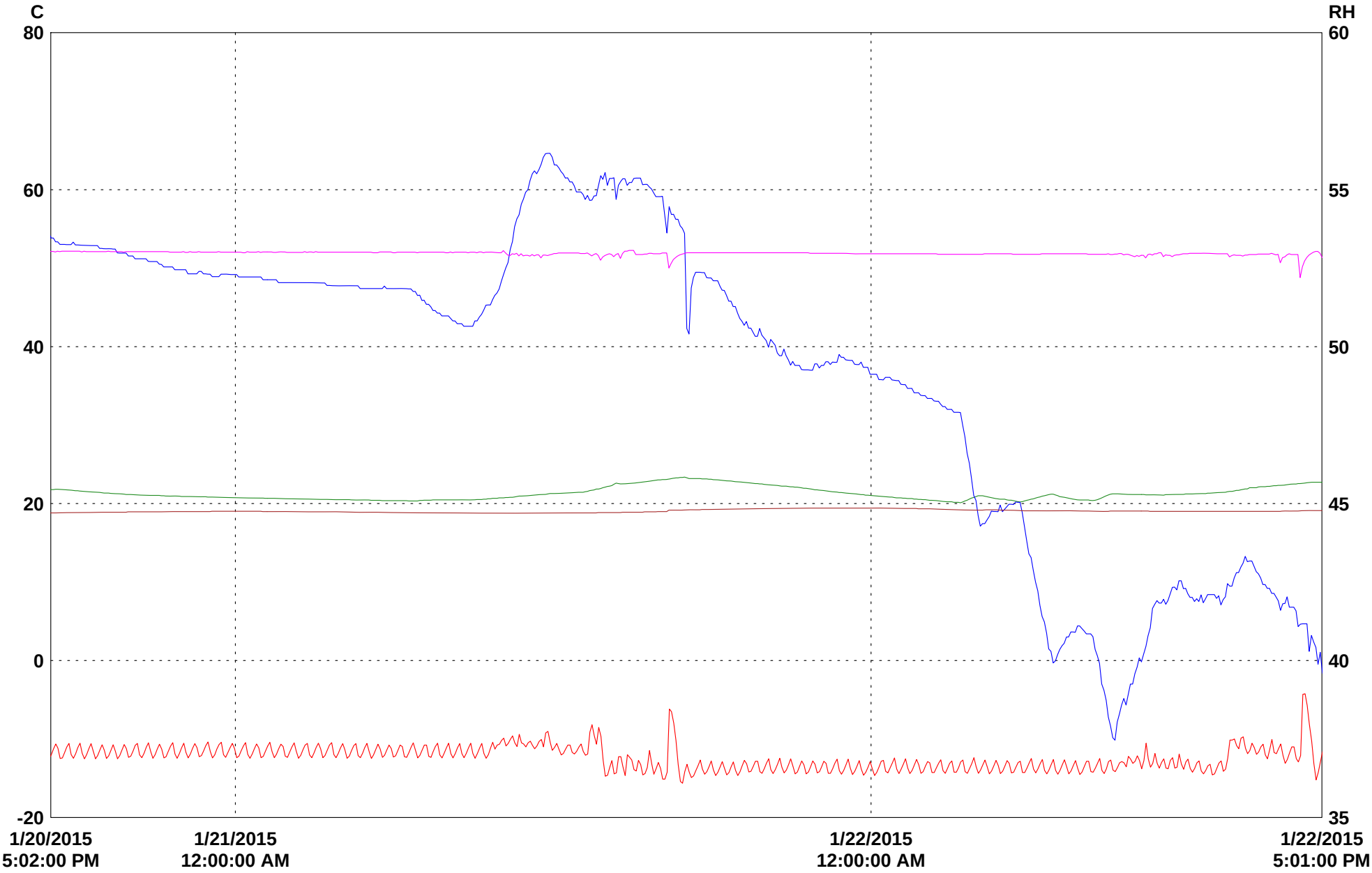




1 day/div 1 day 23:59:00 (M/d/yyyy h:mm:ss tt) Graph file: Unsaved

LN	Serial #	CH	Units	Description	Logger file	Logger des
1	08071106	1	C	Freezer	C:\Program Files\Veriteq Instruments\viewLinc 3.4\transfers\2015\logger 2-08071106-2015-01-29 15-46-48.spl	logger 2
2	08052076	1	C	Lab Temp.	C:\Program Files\Veriteq Instruments\viewLinc 3.4\transfers\2015\Logger 1-08052076-2015-01-29 15-50-11.spl	Logger 1
3	08052076	2	RH	Humidity	C:\Program Files\Veriteq Instruments\viewLinc 3.4\transfers\2015\Logger 1-08052076-2015-01-29 15-50-11.spl	Logger 1
4	09021116	1	C	Oven	C:\Program Files\Veriteq Instruments\viewLinc 3.4\transfers\2015\Logger 3-09021116-2015-01-29 09-42-02.spl	Logger 3
5	09021116	2	C	Water	C:\Program Files\Veriteq Instruments\viewLinc 3.4\transfers\2015\Logger 3-09021116-2015-01-29 09-42-02.spl	Logger 3

APPENDIX A

INTERPRETATIONS OR DEVIATIONS FROM FMVSS 218

None

APPENDIX B

EQUIPMENT LIST AND CALIBRATION SCHEDULES

DOT Fixtures						
Label	*Description*	*Manufacturer*	*Model*	*S/N*	*Dimensional Check*	*Next*
1-1	Monorail	US Testing	Tespac 800	None	17-November-14	17-November-15
1-5	Penetrator Tube	La Cienega Manufacturing	None	None	17-November-14	17-November-15
1-6	Penetrator Dart	Cadex	ONE 7-10-7	4324	17-November-14	17-November-15
1-7	Penetrator Tube Spacer	La Cienega Manufacturing	None	None	17-November-14	17-November-15
3-7	DOT Small Headform	Controlled Casting	None	None	17-November-14	17-November-15
3-8	DOT Medium Headform	Controlled Casting	None	None	17-November-14	17-November-15
3-9	DOT Large Headform	Controlled Casting	None	None	17-November-14	17-November-15
3-10	Reference Head form	Hong Jin Crown	DOT-Small	None	17-November-14	17-November-15
3-11	Reference Head form	Hong Jin Crown	DOT-Medium	None	17-November-14	17-November-15
3-12	Reference Head form	Hong Jin Crown	DOT-Large	None	17-November-14	17-November-15
4-3	MEP	Cadex	Flat, 1.0 inch	16100801	17-November-14	17-November-15
4-5	Anvil	Cadex	Flat	None	17-November-14	17-November-15
4-6	Anvil	Cadex	Hemispherical	None	17-November-14	17-November-15
5-1	High Temp. Cabinet	Barnstead International	OV116040 – LC-8	116005-0891414	17-November-14	17-November-15
5-2	Low Temp. Cabinet	Scientemp	34-25	S8001170	17-November-14	17-November-15
5-3	Water Conditioning Container	Rubbermaid	32 gallon	None	17-November-14	17-November-15
6-1	Retention Strength Tester	La Cienega Manufacturing	D&K 250	None	17-November-14	17-November-15
7-12	Laser Level	Ryobi	ELL0006	N/A	17-November-14	17-November-15
2-6	Computer	Dell	Optiplex GX 520	67G5891	17-November-14	17-November-15
2-7	I-O Board	National Instruments	PCI-6023E	None	17-November-14	17-November-15

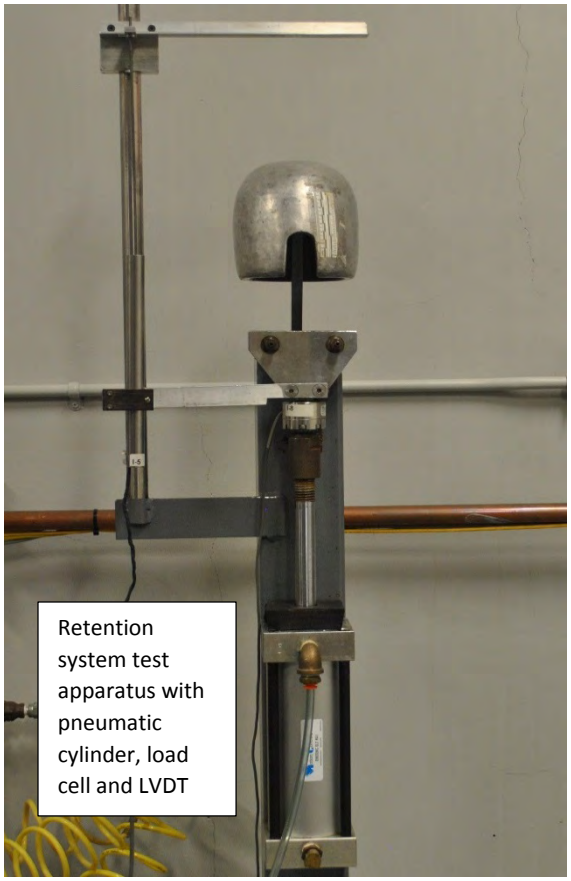
DOT Calibrated Measurement Equipment											
						Accuracy from Cal. Certs	Calibration			Maintenance	
Label	*Description*	*Manufacturer*	*Model*	*S/N*	*Range*		*Last*	*Next*	*by*	*Last*	*Next*
1-4	Velocity Gate Flag	Cadex Inc.	Cadex Inc.	None	25.33 mm	1.01 mm	2-Dec-14	2-Dec-15	ACT	2-Dec-14	2-Dec-15
2-1	Accelerometer	Endevco	7702A-50	GE557	2000g	2.71%	15-Nov-14	15-Nov-15	Precision Labs	15-Nov-14	15-Nov-15
2-2	Power Supply	Endevco	109	AP23	-		15-Nov-14	15-Nov-15	Precision Labs	15-Nov-14	15-Nov-15
2-3	Charge Amplifier	Endevco	104	AK27	-		15-Nov-14	15-Nov-15	Precision Labs	15-Nov-14	15-Nov-15
2-4	Analog Filter	Endevco	in 104	None	-		15-Nov-14	15-Nov-15	Precision Labs	15-Nov-14	15-Nov-15
2-5	Velocity Gate	Biokinetics	001-2-186 9404	9411-005	-	0.16 ms	2-Dec-14	2-Dec-15	ACT	2-Dec-14	2-Dec-15
7-1	Environmental Monitoring	Veriteq	SP-2000-20R, Temp. & RH	8052076	-40 To +95C, 0-100% RH	0.03 C .6% RH	15-May-14	15-May-15	Veriteq	15-May-14	15-May-15
7-2	Environmental Monitoring	Veriteq	SP-1000-22N, Temp.	08071106	-40 To +95C	.02 C	15-May-14	15-May-15	Veriteq	15-May-14	15-May-15
7-3	Environmental Monitoring	Veriteq	SP-1000-22N, Temp. (2 channels)	921116	-40 To +95C	.02 C .02 C	15-May-14	15-May-15	Veriteq	15-May-14	15-May-15
7-4	Scale	O'Haus	Scout PRO	None	0-6000 gm	0.067 g	17-Nov-14	17-Nov-15	A-CAL	17-Nov-14	17-Nov-15
7-5	Load Cell	Transducer Techniques	DSM 2000	245639	0-2000 lbf	0.012 V	17-Nov-14	19-Nov-15	A-CAL	17-Nov-14	19-Nov-15
7-6	LVDT	Schaevitz	2000HR	16071	two inch	0.06 mm	17-Nov-14	17-Nov-15	A-CAL	17-Nov-14	17-Nov-15
7-7	Peripheral Vision Apparatus	La Cienega Manufacturing	D&K 125	None	180 degrees	0.7 degree	17-Nov-14	17-Nov-15	A-CAL	17-Nov-14	17-Nov-15
7-9	Digital Height Gauge	Starrett	D34-16	None	300 cm	0.05 in	17-Nov-14	17-Nov-15	A-CAL	17-Nov-14	17-Nov-15
7-10	Digital Caliper	Mitutoyo	CD-6"CSX	08158285	6 inch	0.04 in	17-Nov-14	17-Nov-15	A-CAL	17-Nov-14	17-Nov-15
7-11	Height Gauge	Mitutoyo	unknown	3121016	12 inch	0.002 in	17-Nov-14	17-Nov-15	A-CAL	17-Nov-14	17-Nov-15

APPENDIX C

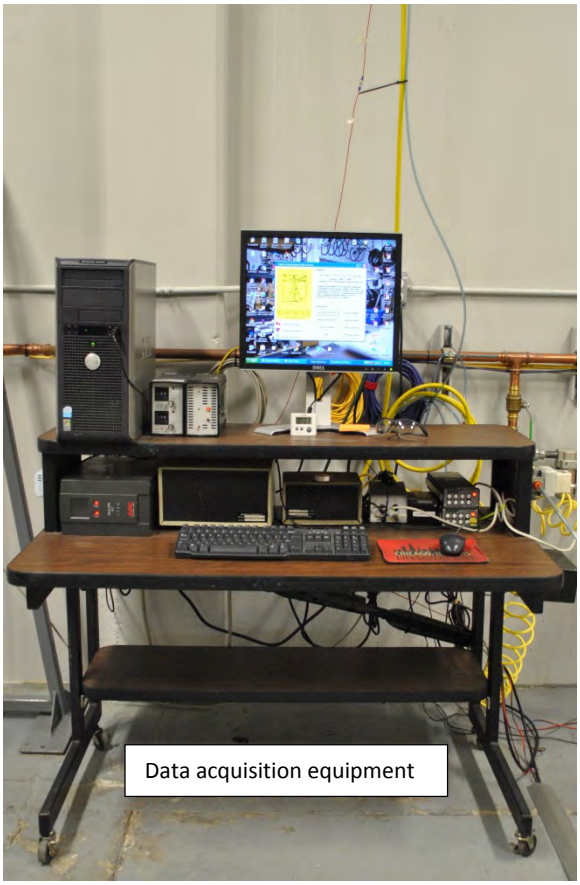
PHOTOGRAPHS

Impact attenuation test apparatus with three headforms (S, M, L), flat, hemi and MEP anvils

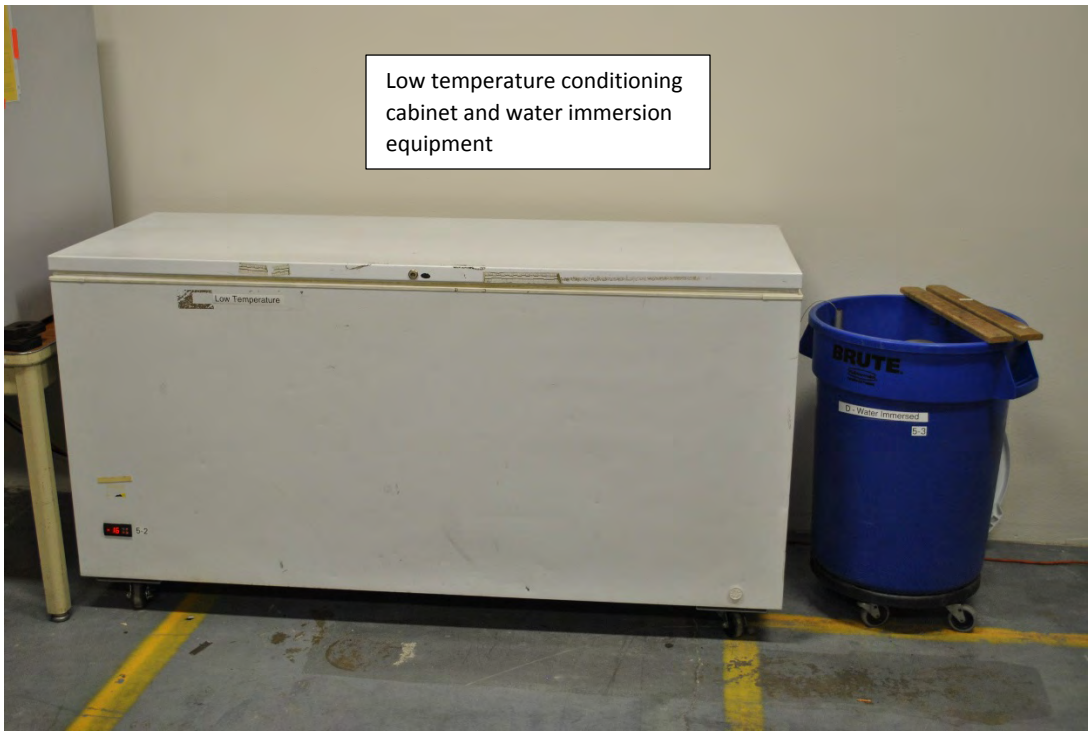
Penetration test apparatus with adjustable base



Retention system test apparatus with pneumatic cylinder, load cell and LVDT



Data acquisition equipment



Low temperature conditioning cabinet and water immersion equipment

High temperature chamber

Gmax 78S helmet and box showing model designation

Gmax 78S helmet with test line, front left view

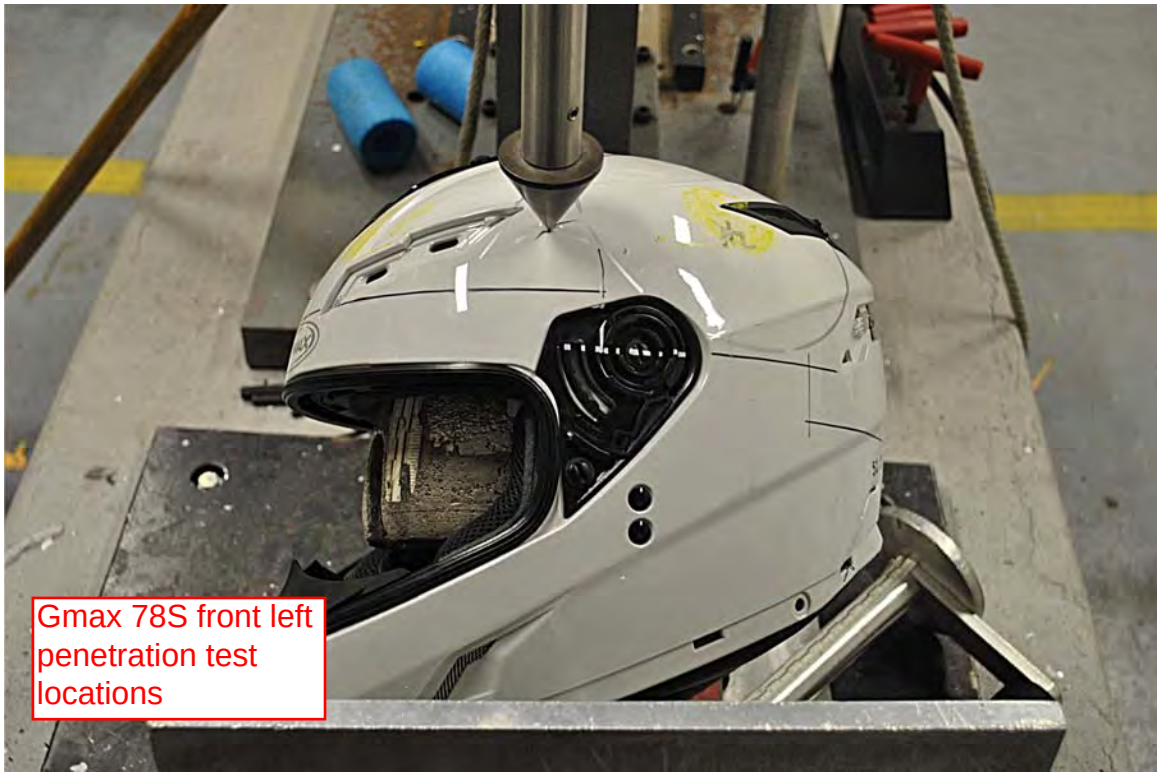
Gmax 78S helmet with test line, rear left view

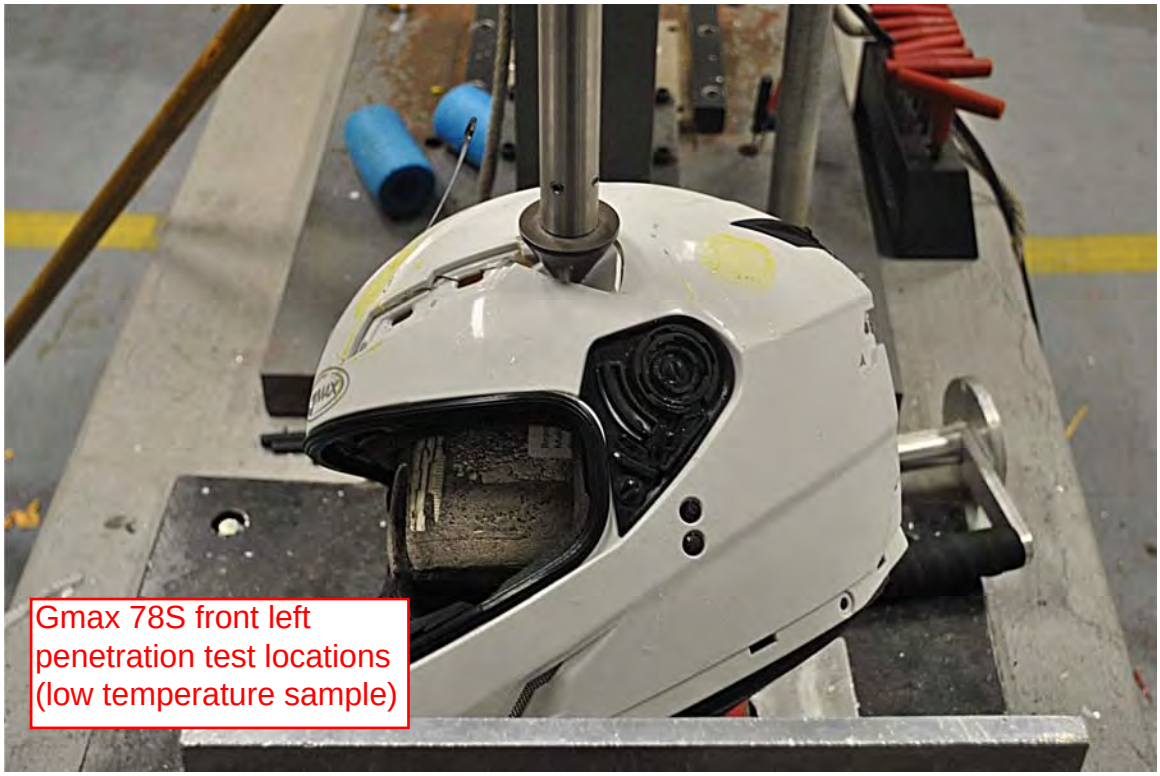
Gmax 78S helmet interior view

Gmax 78S front and left side hemispherical anvil impact locations

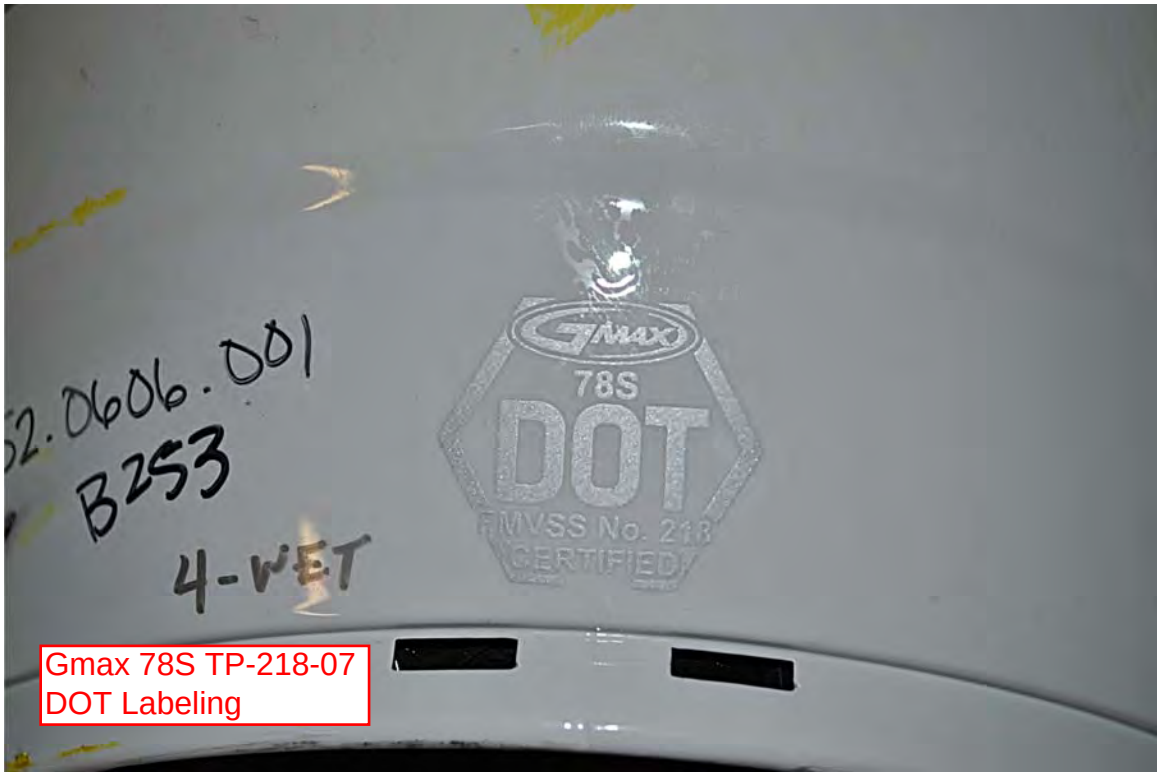
Gmax 78S right side and rear flat anvil impact locations


Gmax 78S crown penetration test locations


Gmax 78S front left penetration test locations



Gmax 78S front left penetration test locations (low temperature sample)

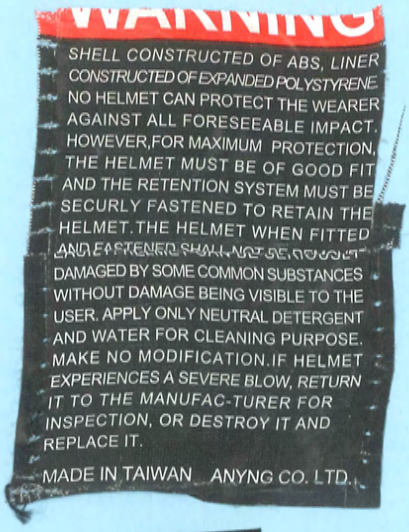


Gmax 78S TP-218-07 DOT Labeling

Report No: B253 52.0606.001
Make & Model: Gmax 78S
Condition: Cold
Location: FR LF

Gmax 78S penetration witness tape

Gmax 78S motorcycle helmet labels



permanent size label sewn into the helmet comfort liner