

# **SAFETY COMPLIANCE TESTING FOR FMVSS No. 218 MOTORCYCLE HELMETS**

Brand: AGV  
Model: OF32 (RP60)  
Size: L (59-60 cm)

Prepared By

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**18 April 2018**

**Final Report 218-ACT-18-001**

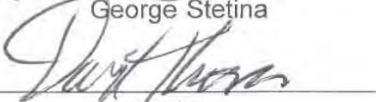
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<b>16. Abstract</b> Compliance tests were conducted on the subject model motorcycle helmet in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-218-07. Test failures identified were as follows: S5.1 Impact Attenuation. Accelerations in excess of 200g exceeded 2.0 ms on the low temperature sample. S5.6.1 Labeling. The manufacturer's name, discrete size and month & year of manufacture labels do not appear to be permanent.					
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## **TABLE OF CONTENTS**

<b>Section I</b>	<b>Purpose of Compliance Test</b>
<b>Section II</b>	<b>Compliance Test Data Summary</b>
<b>Section III</b>	<b>Test Data</b>
<b>Section IV</b>	<b>Test Failure Details</b>
<b>Appendix A</b>	<b>Interpretations or Deviations from FMVSS No. 218</b>
<b>Appendix B</b>	<b>Test Equipment and Calibration</b>
<b>Appendix C</b>	<b>Photographs</b>

# 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"<sup>1</sup> 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<sup>2</sup>, as governed by the contract.

## 2. TEST PROCEDURE

The ACT Lab Helmet Testing Manual, Part I – Motorcycle Helmets<sup>3</sup> 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.

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<sup>1</sup> 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.

<sup>2</sup> NHTSA, TP-218-07, Laboratory Test Procedure for FMVSS 218, Motorcycle Helmets, 13 May 2011.

<sup>3</sup> ACT Lab Helmet Test Manual, Version 4.2 – Motorcycle Helmets in accordance with FMVSS No. 218, 22 July 2013.

## HELMET DATA

HELMET BRAND NAME: AGV

HELMET MODEL DESIGNATION: OF32 (RP60)

HELMET MANUFACTURE: AGV

HELMET SIZE: L (59-60 cm)

HELMET COVERAGE: Partial: \_\_\_\_\_ Full: X Complete: \_\_\_\_\_

HELMET POSITIONING INDEX: 58 mm

SHELL MATERIAL: Composite Fiber Material

LINER MATERIAL: Polystyrene

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)	1063	1097	1099	1096	1118
MONTH & YEAR OF MANUFACTURE	06/2016	06/2016	07/2015	07/2015	06/2017

### 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 visor 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 IMMERSSED
IMPACT	Pass	Fail	Pass	Pass
PENETRATION	Pass	Pass	Pass	Pass
RETENTION	Pass	Pass	Pass	Pass

INDICATE Pass or Fail

TEST	PASS/FAIL
PERIPHERAL VISION	Pass
LABELING	Fail

### COMMENTS:

- S5.1 Impact attenuation. (b) Accelerations in excess of 200g exceeded a cumulative duration of 2.0 ms: Low temperature sample, right location, flat anvil, 2<sup>nd</sup> impact, 2.1 ms.
- S5.6.1 Labeling. The manufacturer's name, discrete size and month & year of manufacture labels do not appear to be permanent.

## 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:  
L 59-60 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 (61°F to 79°F); 30% to 70% Relative Humidity
Low Temperature	-15°C to -5°C (5°F to 23°F)
High Temperature	45°C to 55°C (113°F to 131°F)
Water Immersion	16°C to 26°C (61°F to 79°F)

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.

AVERAGE LAB TEMPERATURE : 21.0 °C ; AVERAGE LAB HUMIDITY : 50.7 %



## 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	5.16	402.5	2.5	2.1	Pre 1	Crown
	2	1.4	5.18	400.3	2.5	2.1	Pre 2	Crown
	3	1.4	5.17	403.6	2.5	2.1	Pre 3	Crown
PRETEST AVERAGE		XXXX	XXXX	402.0	XXX	XXX	XXXX	XXXX
POSTTEST	1	1.4	5.16	402.1	2.5	2.1	Post 1	Crown
	2	1.4	5.14	407.9	2.5	2.1	Post 2	Crown
	3	1.4	5.13	407.4	2.4	2.1	Post 3	Crown
POSTTEST AVERAGE		XXXX	XXXX	406.0	XXX	XXX	XXXX	XXXX
DIFFERENCE BETWEEN PRE-TEST AND POST-TEST AVERAGES				4.0	DIFFERENCE NOT TO EXCEED 15 g			

Helmet Designation	Helmet Condition	Impact Location	Front		Left		Right		Rear	
			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	107	130	107	113	212	236	204	226
		ms @ 150	0.0	0.0	0.0	0.0	2.7	2.8	2.7	2.9
		ms @ 200	0.0	0.0	0.0	0.0	0.8	2.0	0.7	1.3
		Velocity m/s	5.21	5.21	5.23	5.23	6.02	6.03	6.03	6.05
B	Low Temperature	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	9	10	11	12	13	14	15	16
		Peak g	113	132	110	141	229	245	204	241
		ms @ 150	0.0	0.0	0.0	0.0	3.0	2.8	2.8	3.0
		ms @ 200	0.0	0.0	0.0	0.0	1.8	2.1	0.9	2.0
		Velocity m/s	5.23	5.23	5.23	5.22	6.03	6.05	6.05	6.06
C	High Temperature	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	17	18	19	20	21	22	23	24
		Peak g	113	134	108	130	218	242	203	234
		ms @ 150	0.0	0.0	0.0	0.0	2.8	2.5	3.0	3.1
		ms @ 200	0.0	0.0	0.0	0.0	0.8	1.8	0.2	1.6
		Velocity m/s	5.23	5.22	5.22	5.22	6.05	6.03	6.06	6.06
D	Water Immersed	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	25	26	27	28	29	30	31	32
		Peak g	127	147	113	123	212	238	209	228
		ms @ 150	0.0	0.0	0.0	0.0	2.8	2.7	3.0	3.2
		ms @ 200	0.0	0.0	0.0	0.0	0.8	2.0	0.8	1.7
		Velocity m/s	5.23	5.22	5.21	5.22	6.05	6.05	6.05	6.05

COMMENTS: 1. The actual drop heights were: flat anvil 189 cm, hemi anvil 142 cm.  
 2. Values reported in the above tables are rounded.

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## 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 =  $0.5 \pm 0.1$  mm ( $0.02 \pm 0.004$  in.), included angle of  $60^\circ \pm 0.5^\circ$ , hardness minimum of 60 Rockwell "C" Scale and a cone height of not less than  $3.8 \pm 0.038$  cm ( $1.5 \pm 0.015$  in.).

**HEIGHT OF FALL:**  $300 \text{ cm} \pm 1.5 \text{ cm}$ , 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	Rear Right	X		AMBIENT
3	B	Crown	X		LOW TEMPERATURE
4	B	Rear Right	X		LOW TEMPERATURE
5	C	Crown	X		HIGH TEMPERATURE
6	C	Rear Right	X		HIGH TEMPERATURE
7	D	Crown	X		WATER IMMERSED
8	D	Rear Right	X		WATER IMMERSED

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

## RETENTION SYSTEM

Paragraph S5.3 and S7.3

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	1.13	2.74	1.61
B	LOW TEMPERATURE	0.91	2.43	1.52
C	HIGH TEMPERATURE	0.64	2.07	1.43
D	WATER IMMERSED	0.85	2.68	1.83

CONFIGURATION - Paragraph S5.4 - Helmet shall provide a minimum peripheral vision of 105° 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	> 105°	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	Content/Format	Permanent
Manufacturer's name	Pass	Fail
Discrete size	Pass	Fail
Month and year of manufacture	Pass	Fail
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:**

1. The manufacturer's name, discrete size and month & year of manufacture labels do not appear to be permanent since they can be removed intact from the helmet leaving little or no trace on the helmet.

## 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	Content/ Format	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:**

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

## TEST DATA

Contract File No.: 52.0901

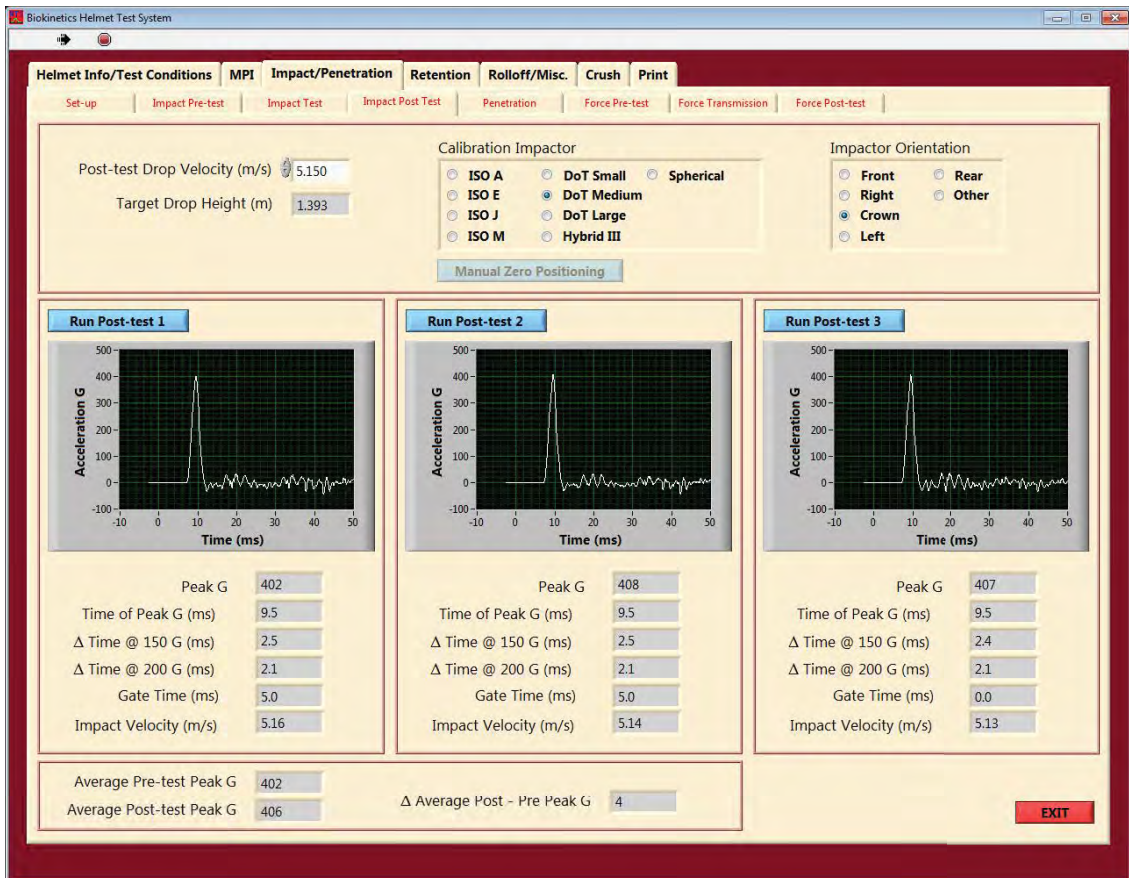
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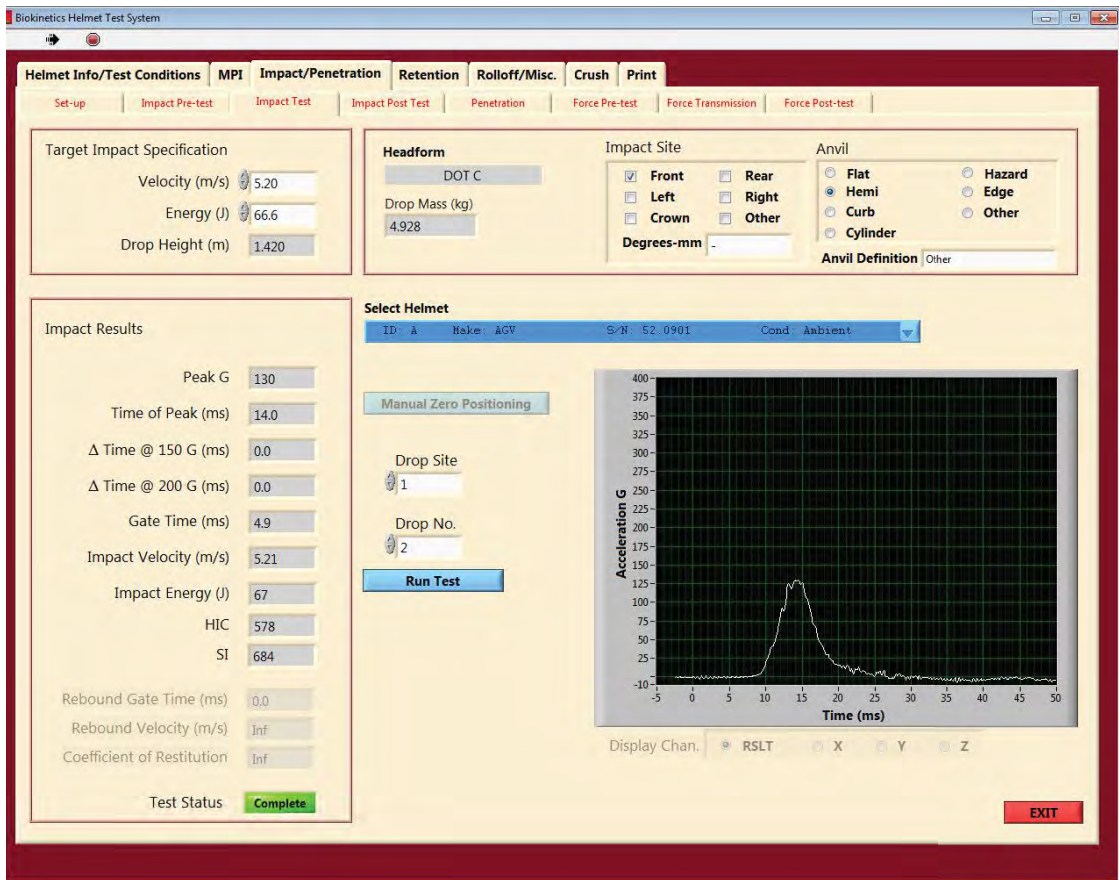
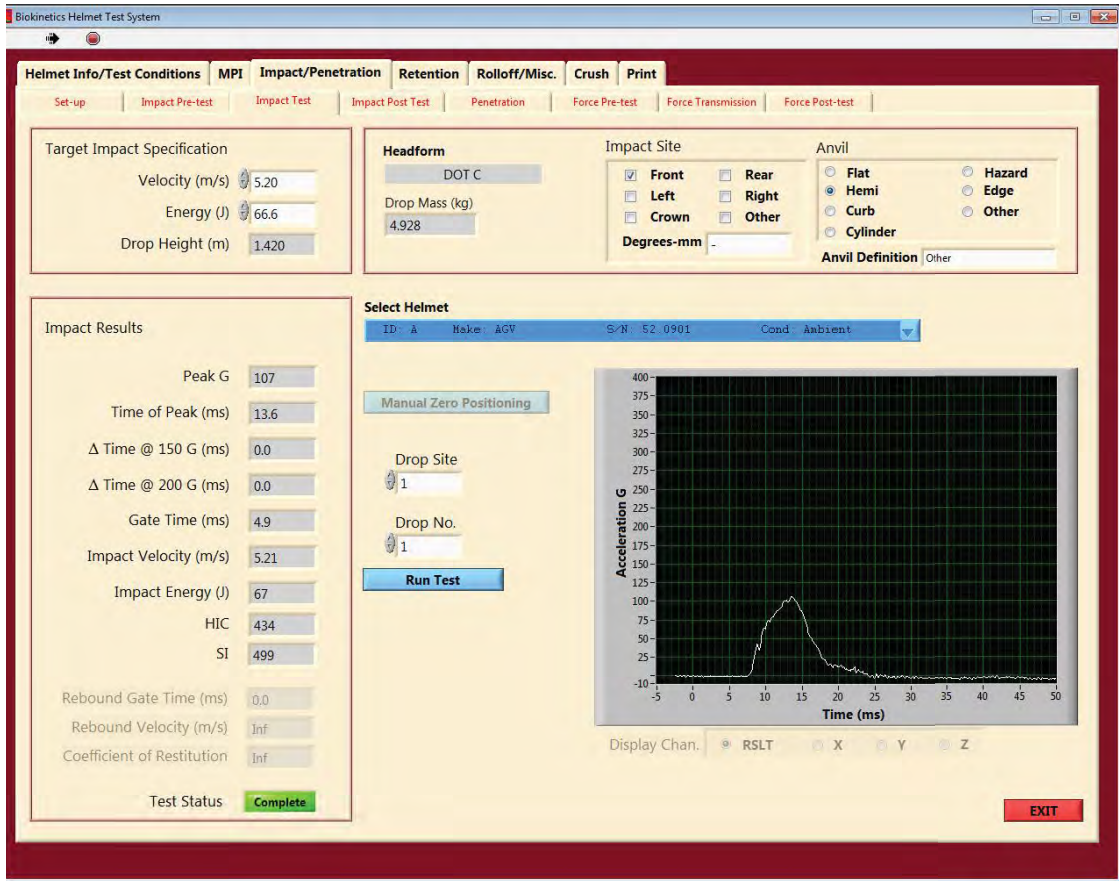
Control Document Rev.10 Official ACT NHTSA DOT TP-07 Report Template USA 18 April 2018

14 of 46

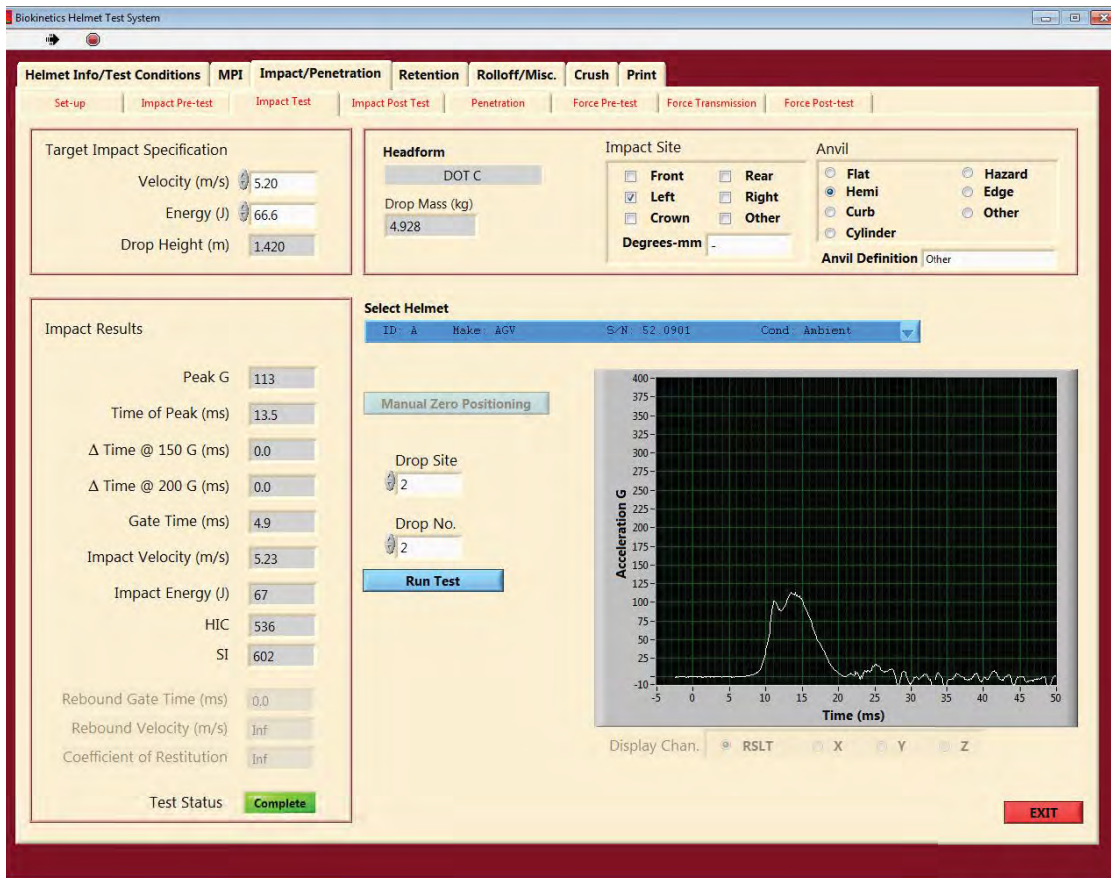
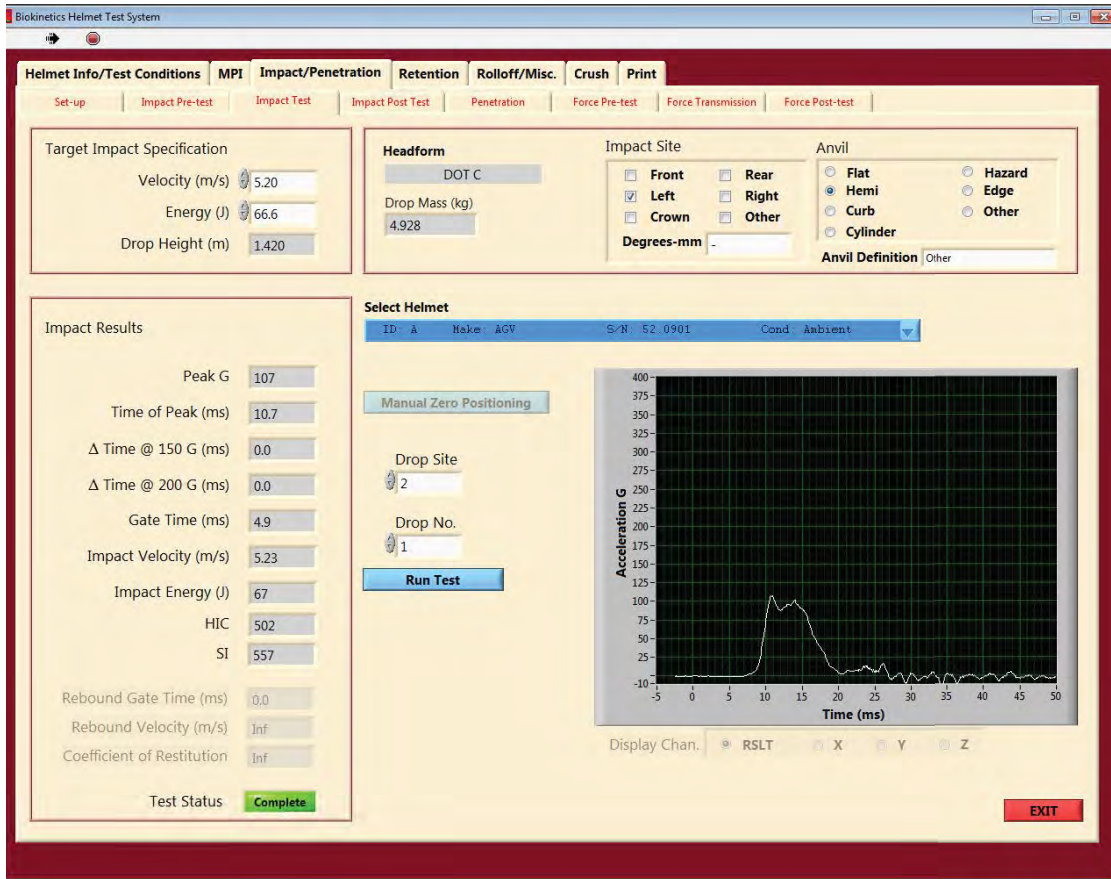
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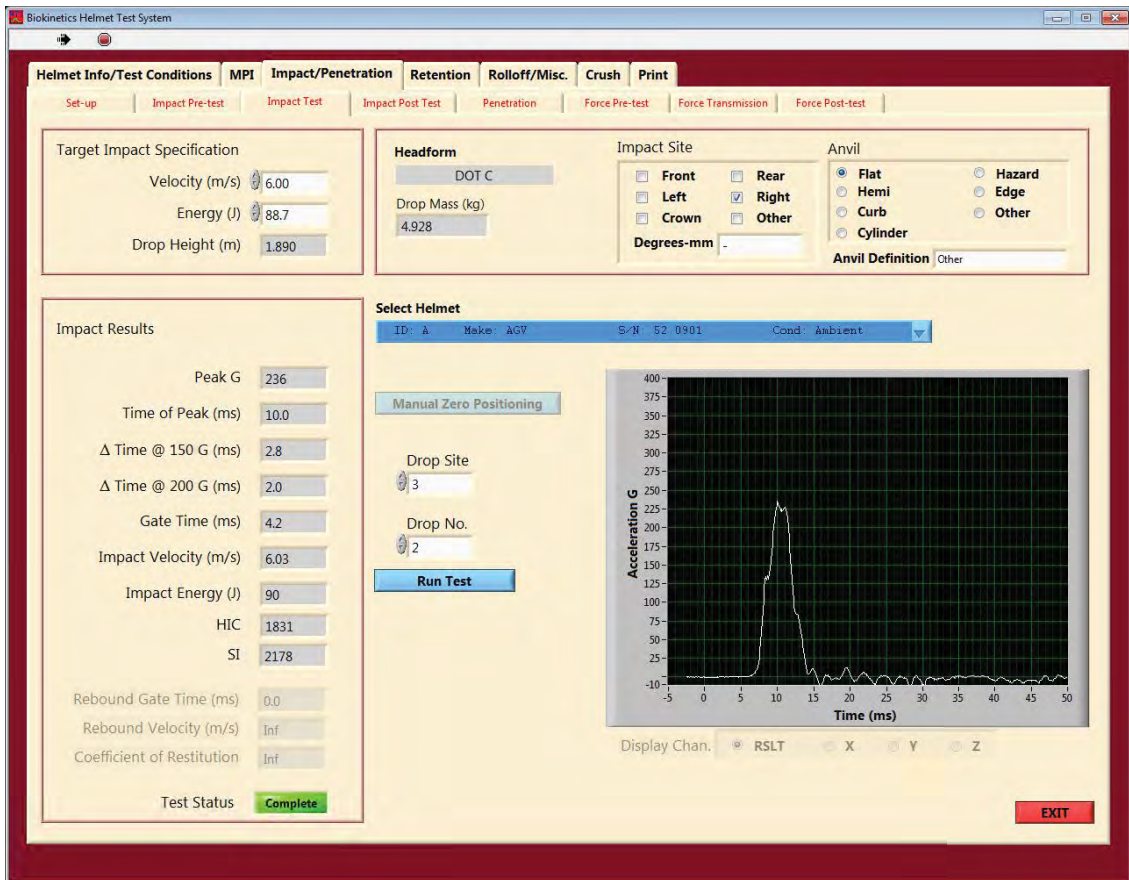
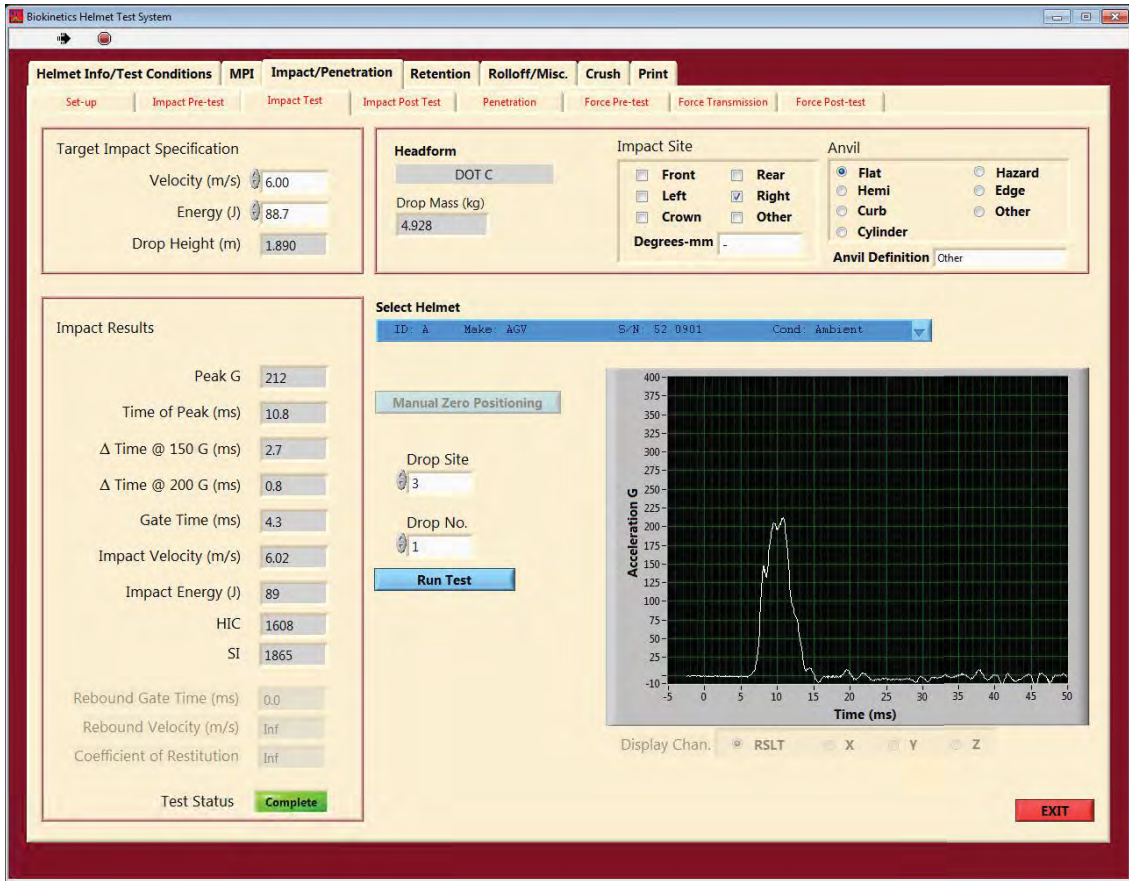
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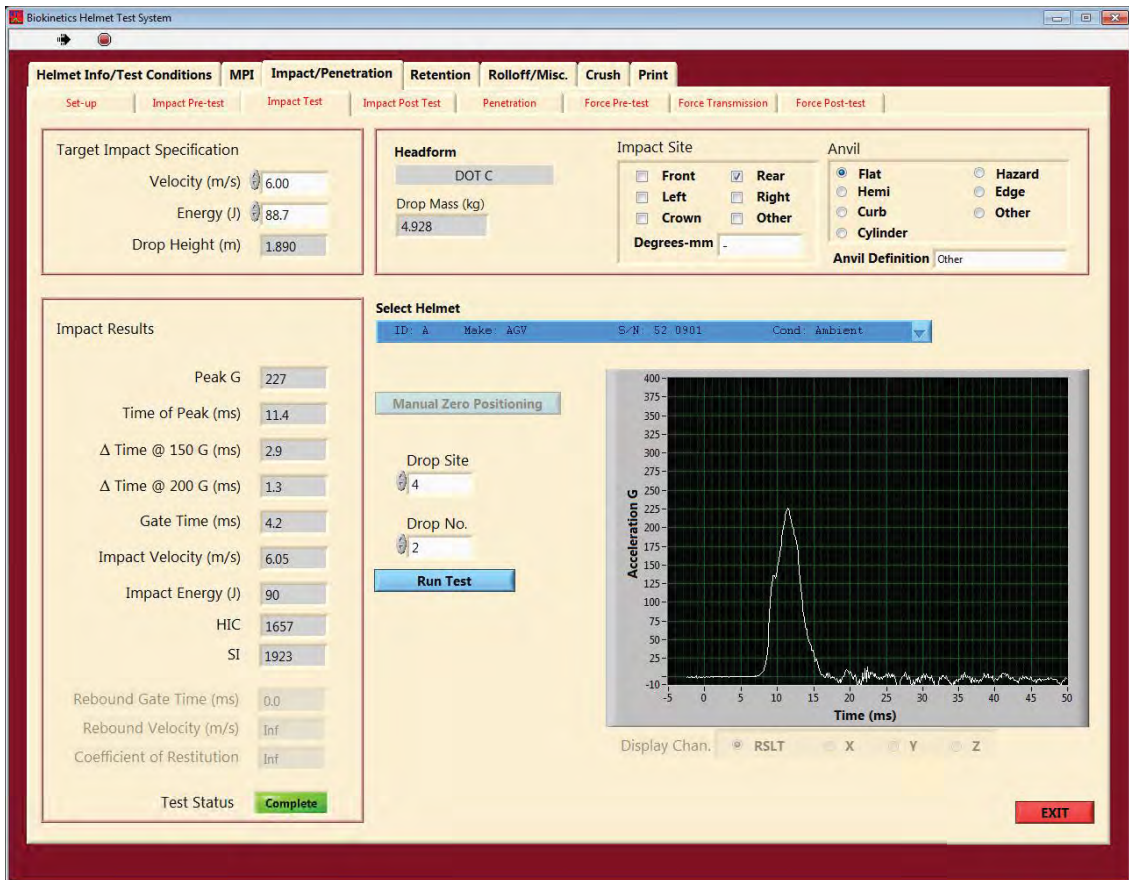
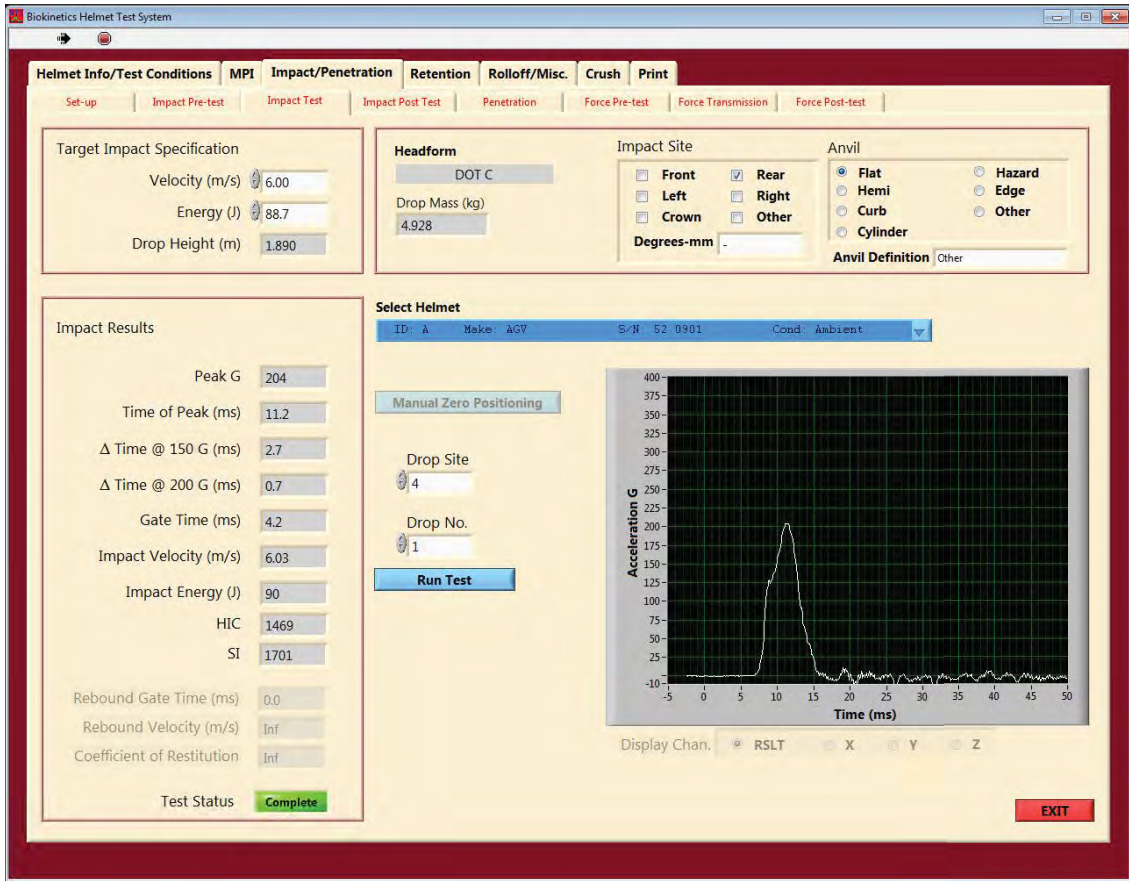


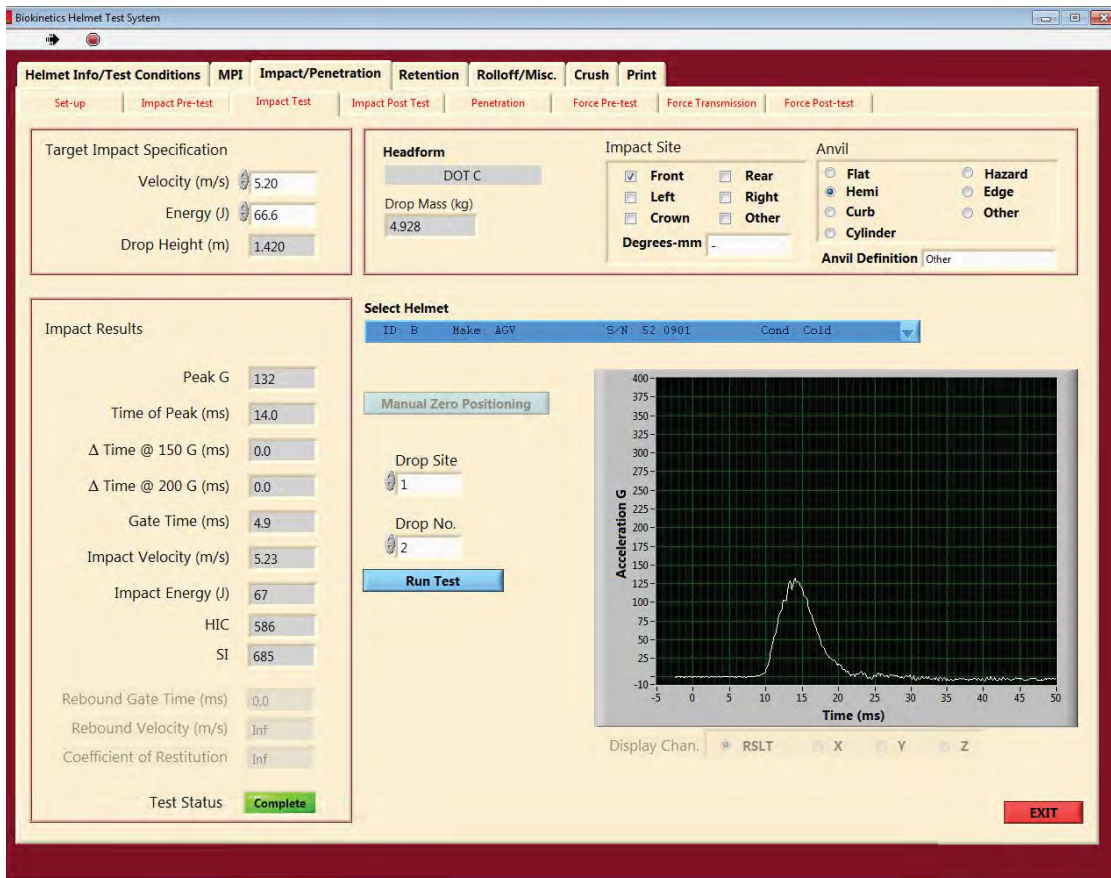
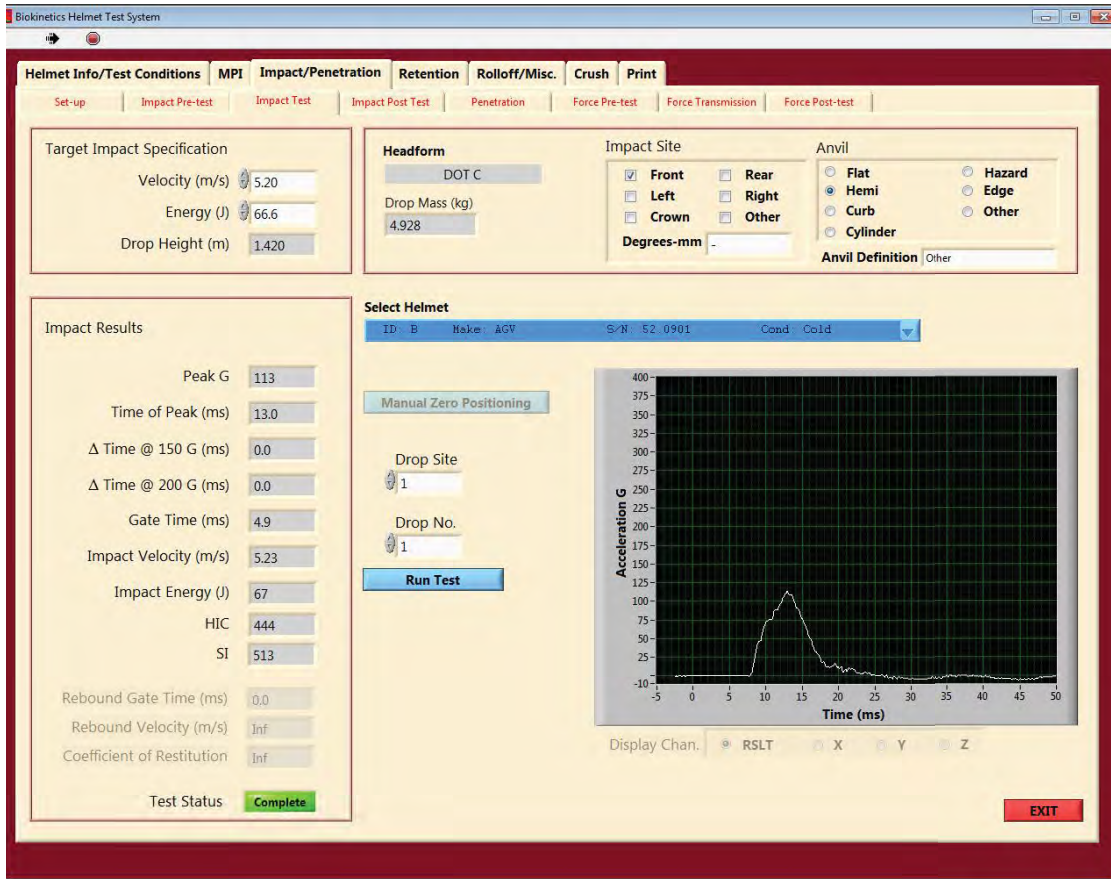


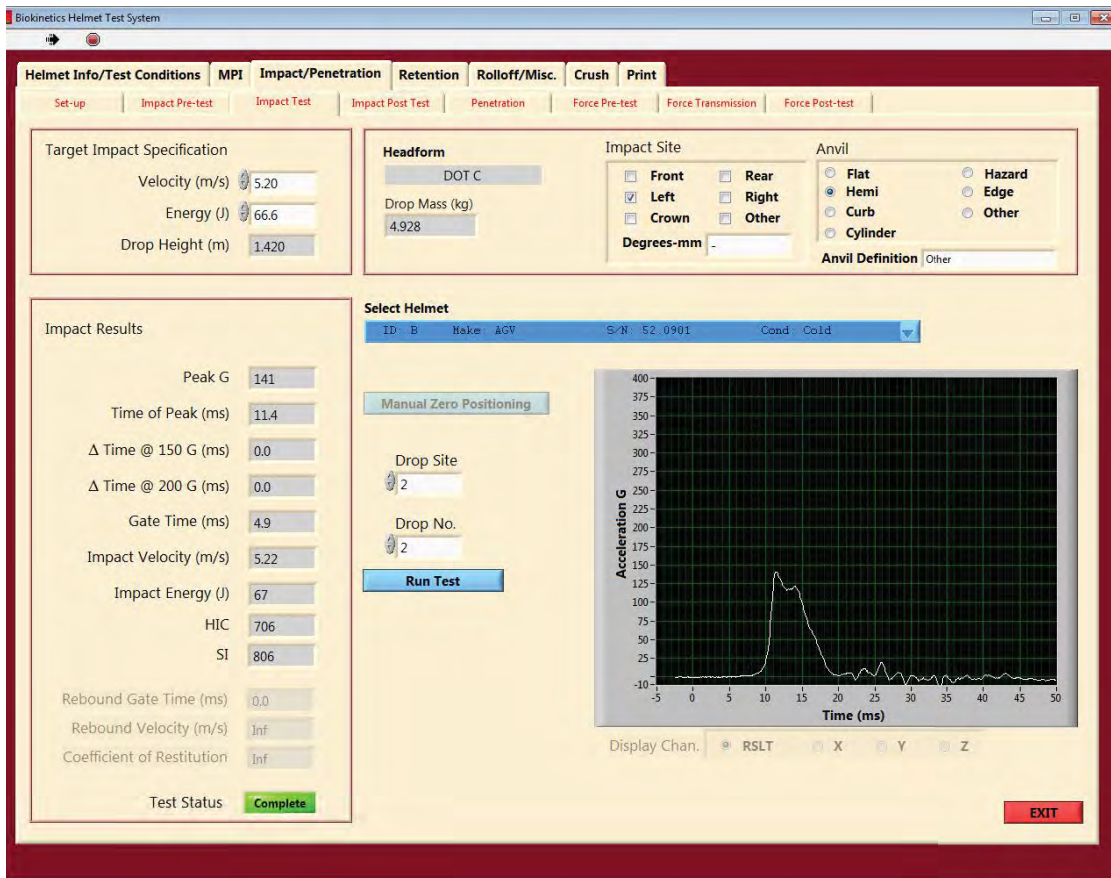
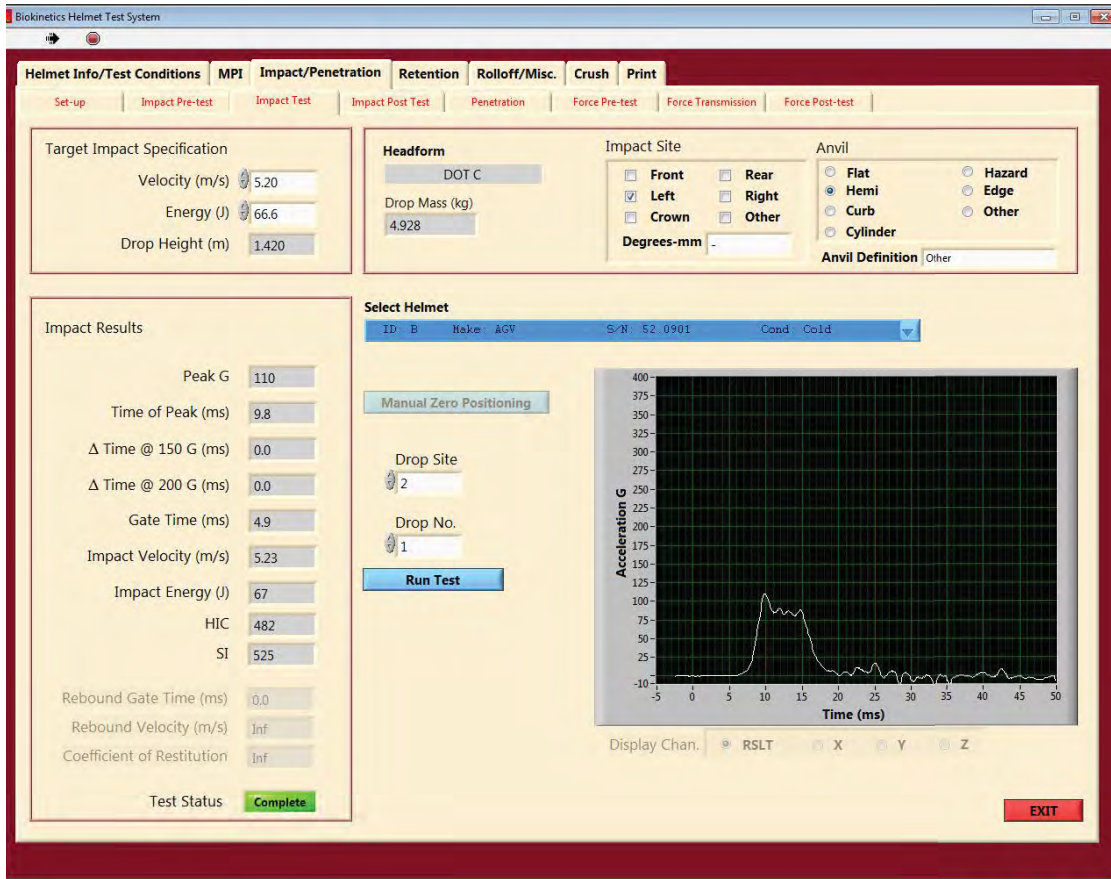


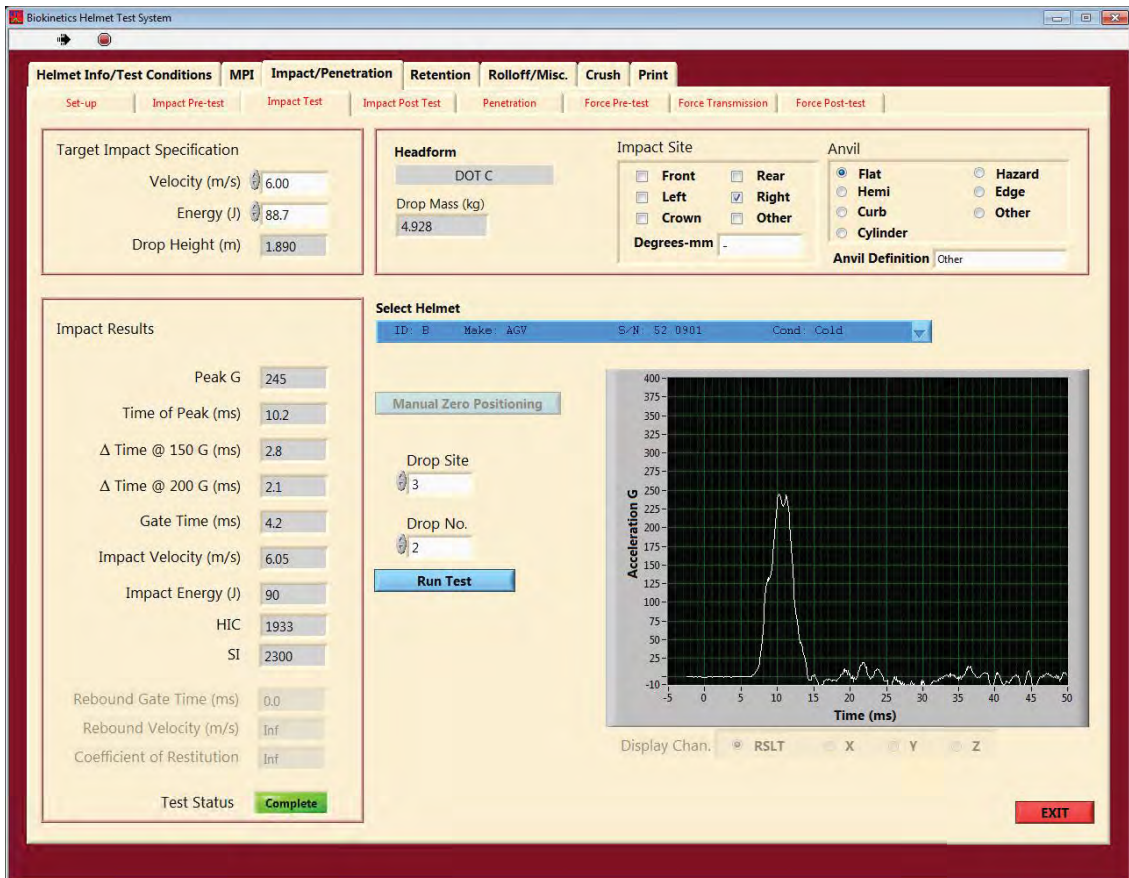
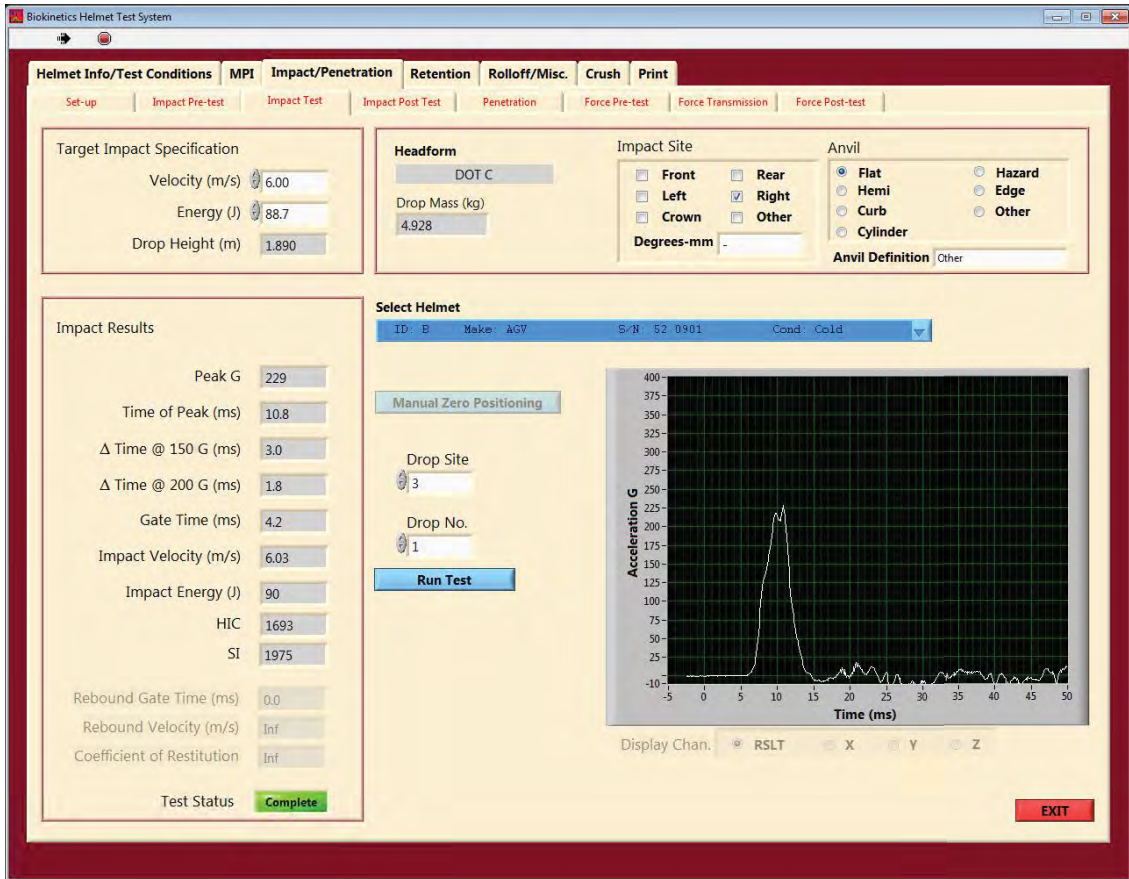


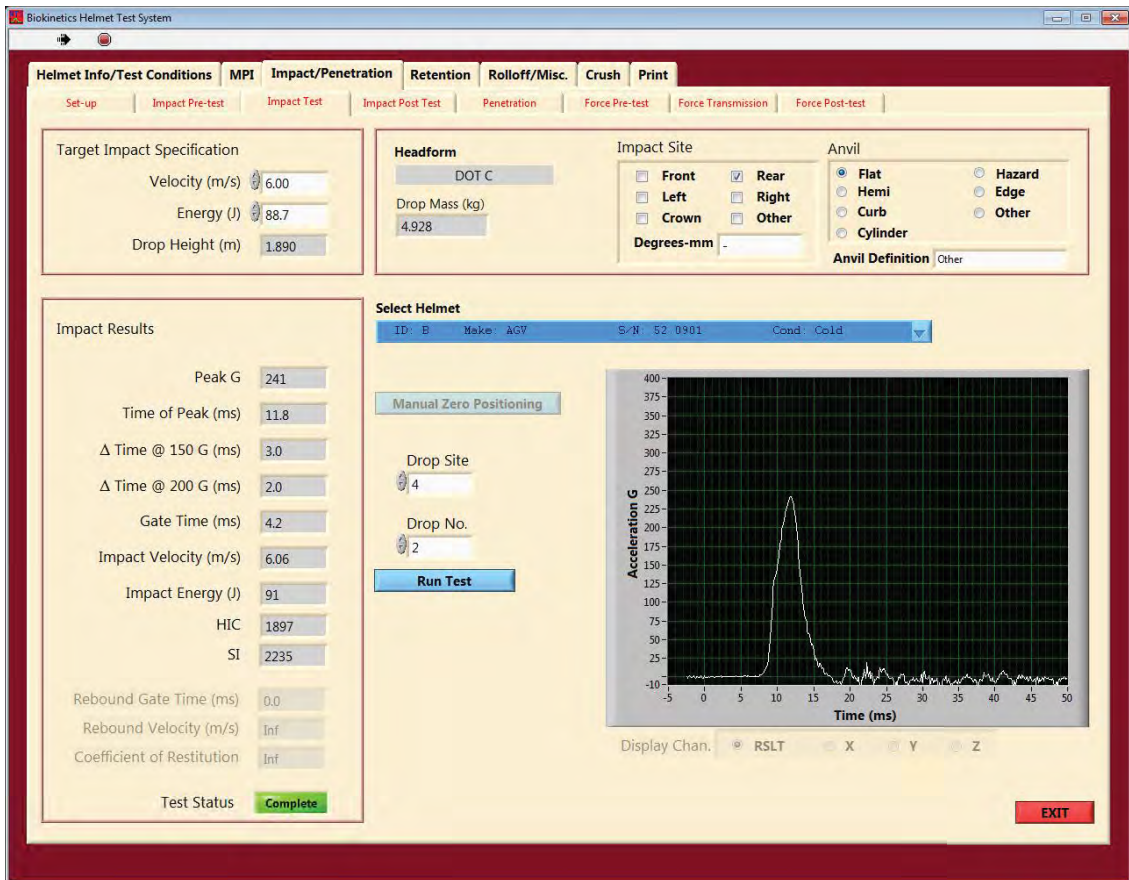
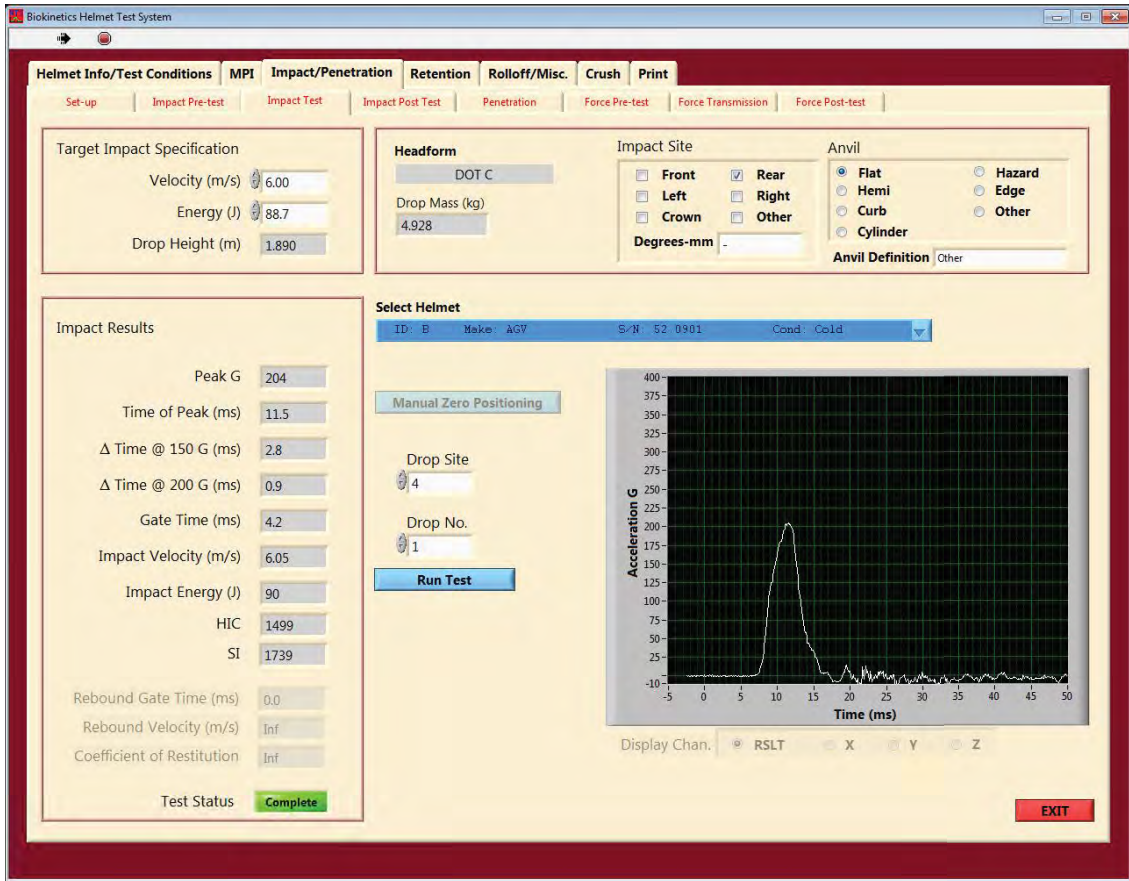


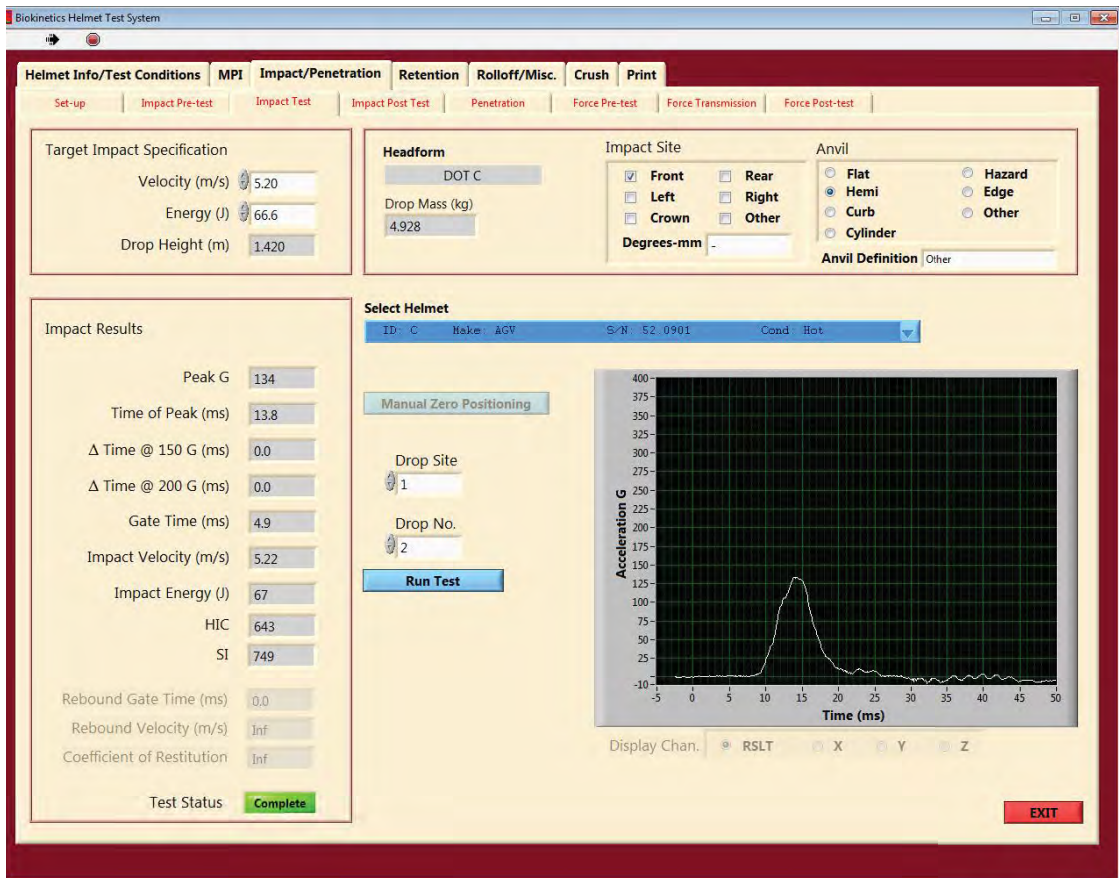
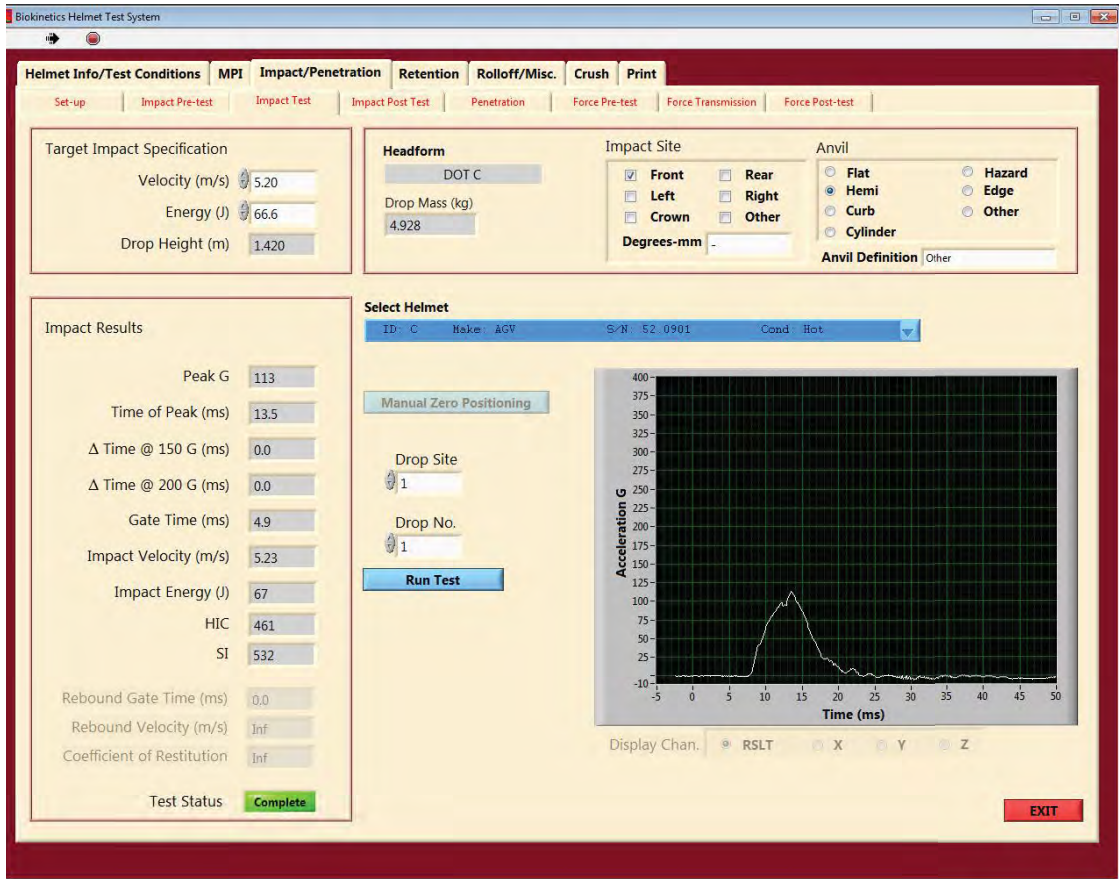




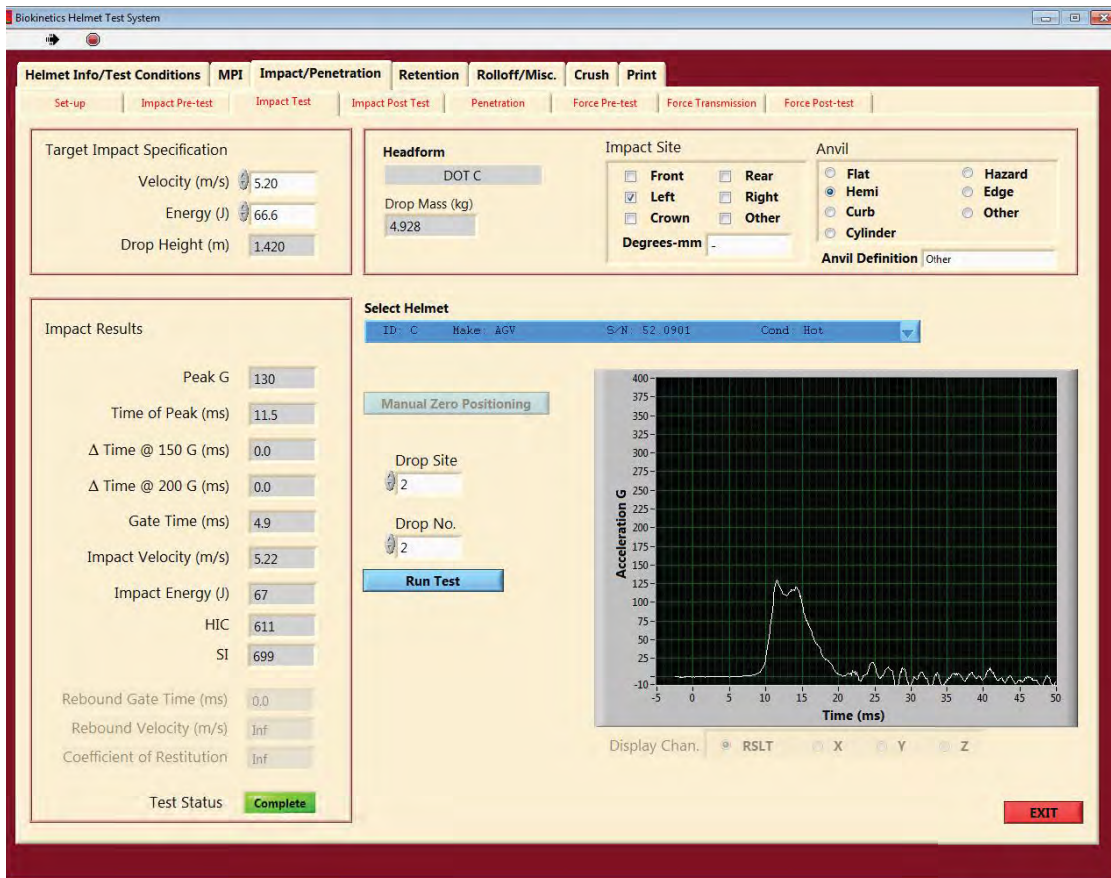
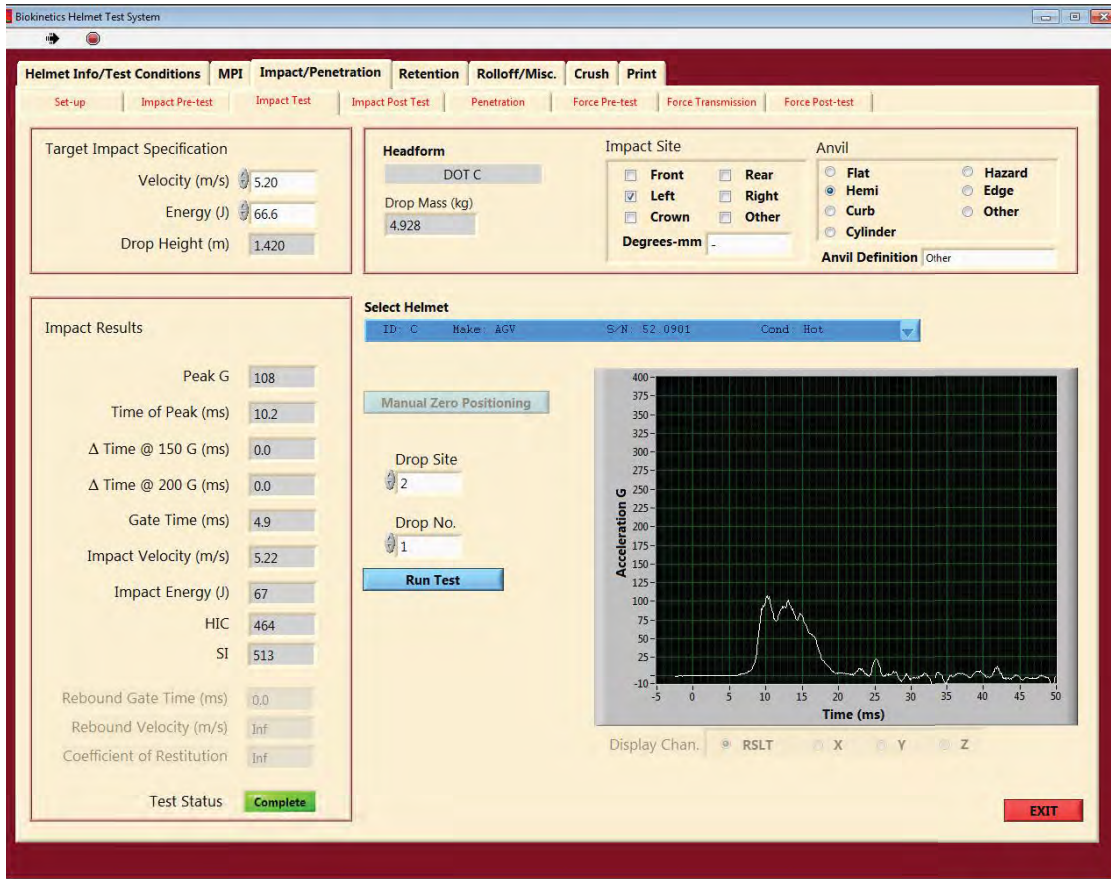


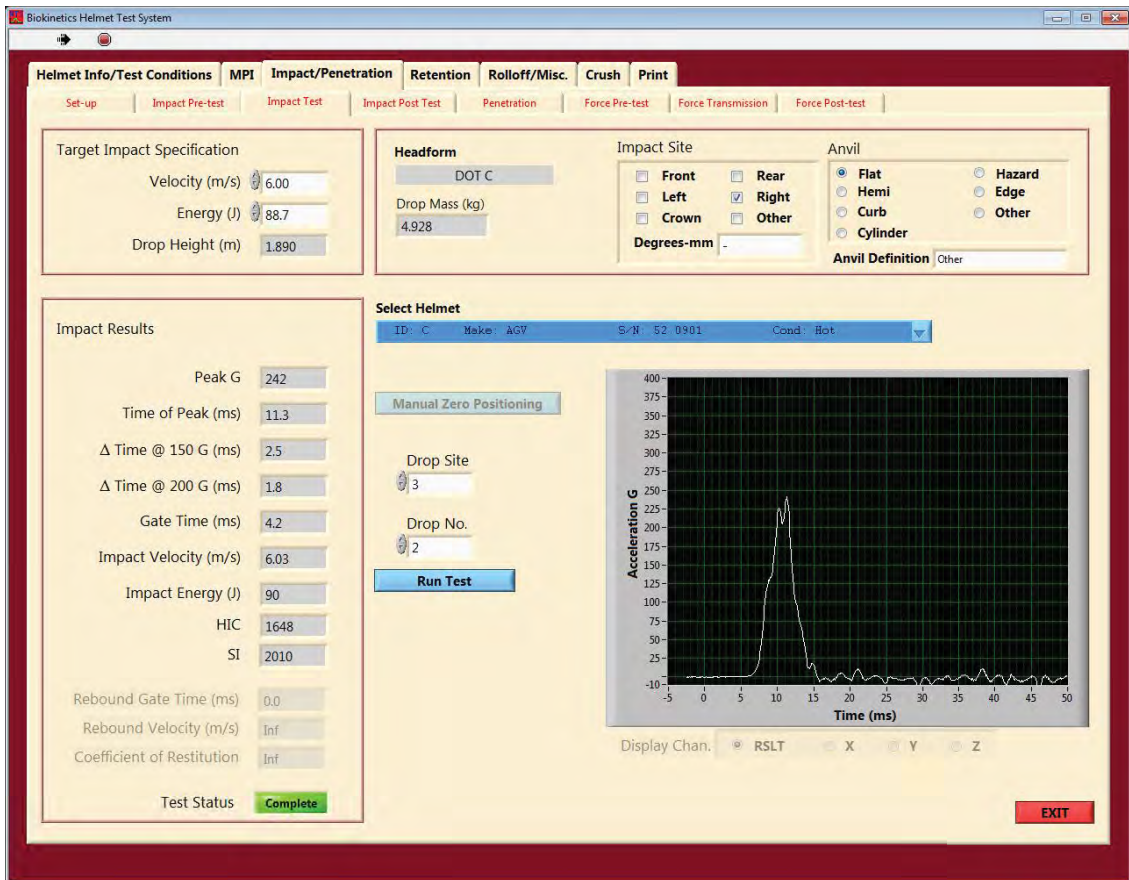
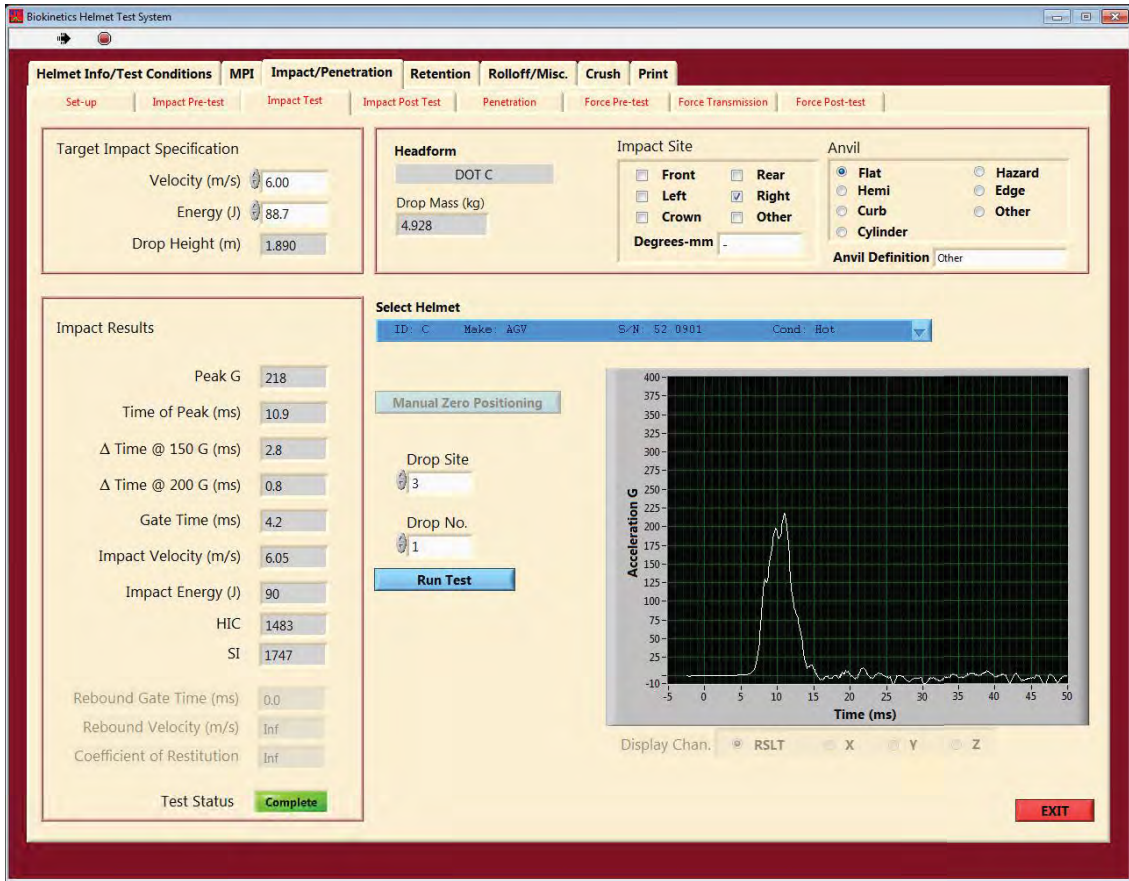


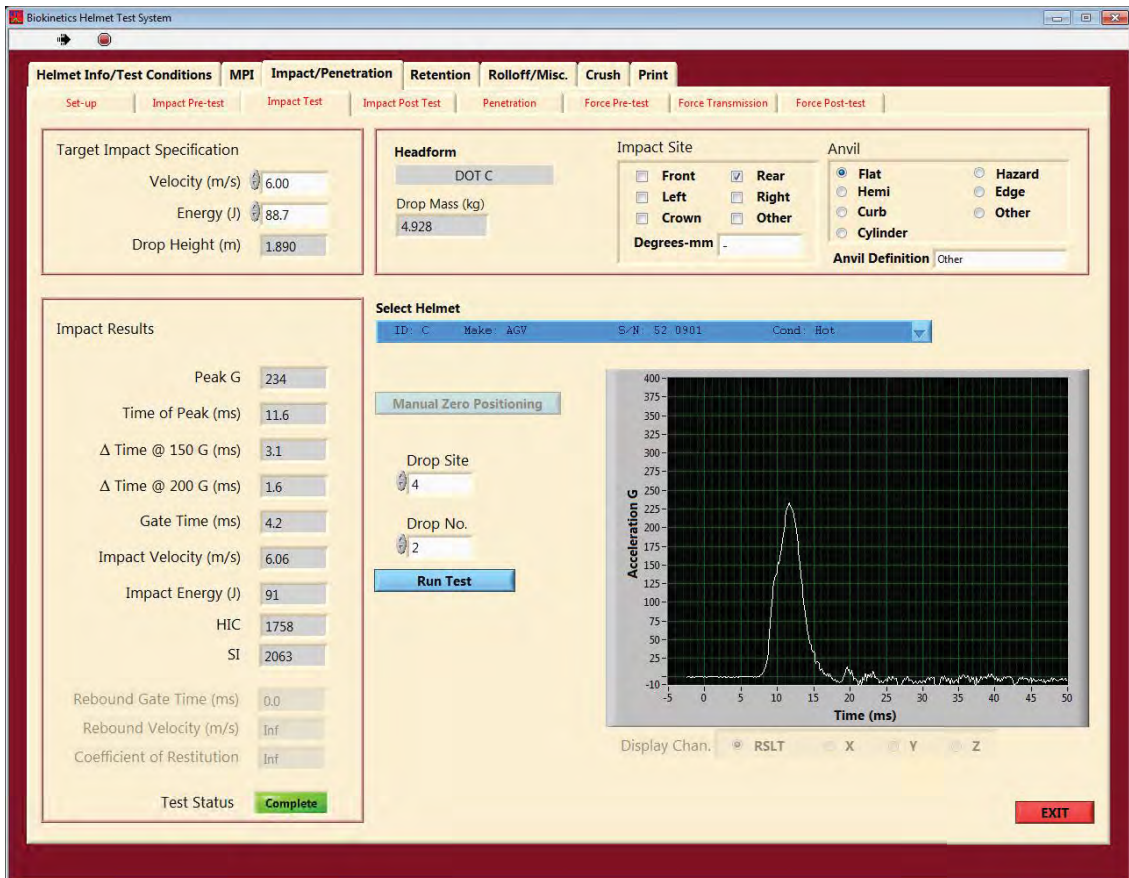
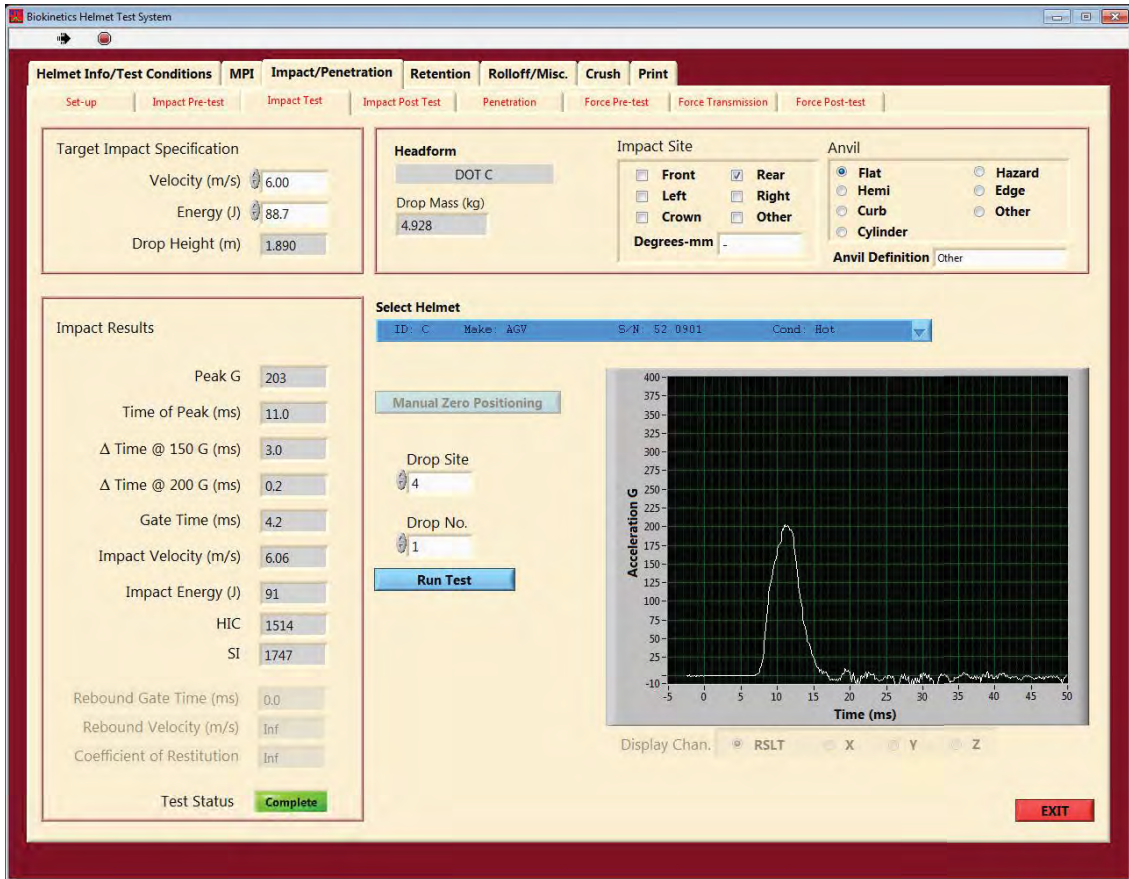


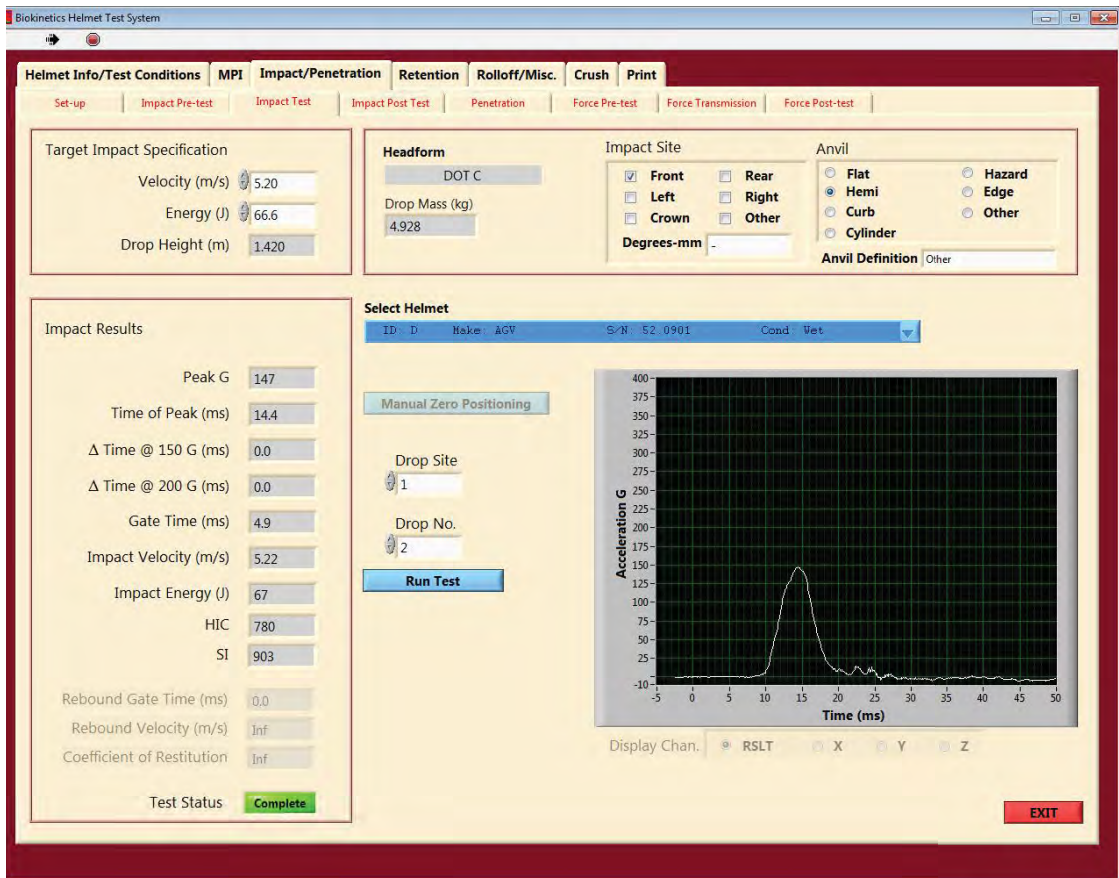
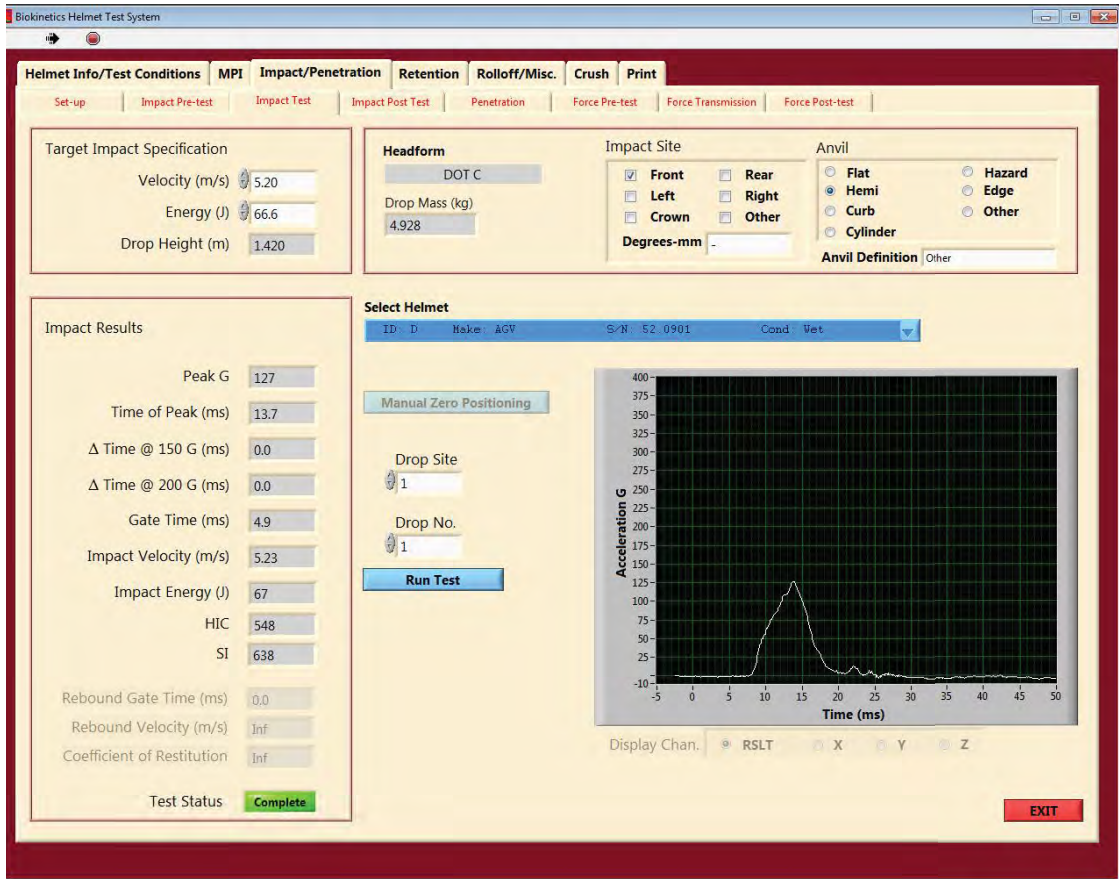


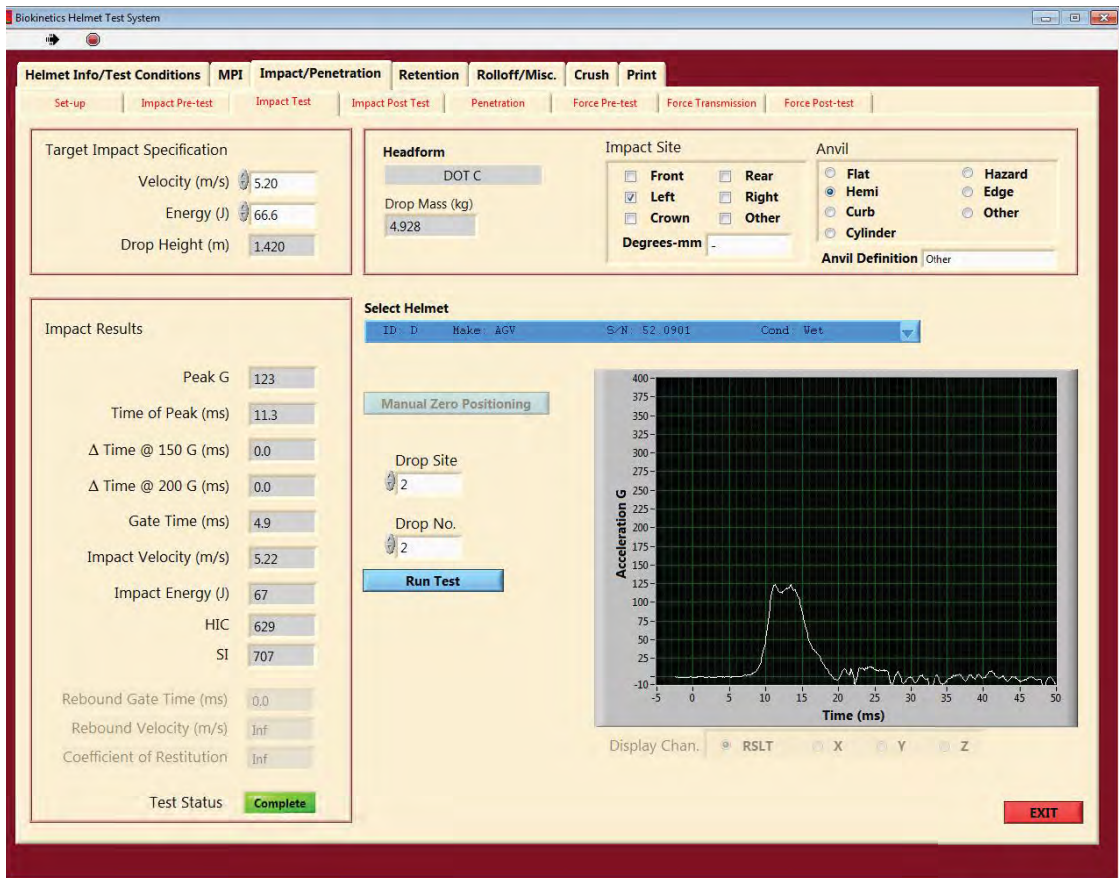
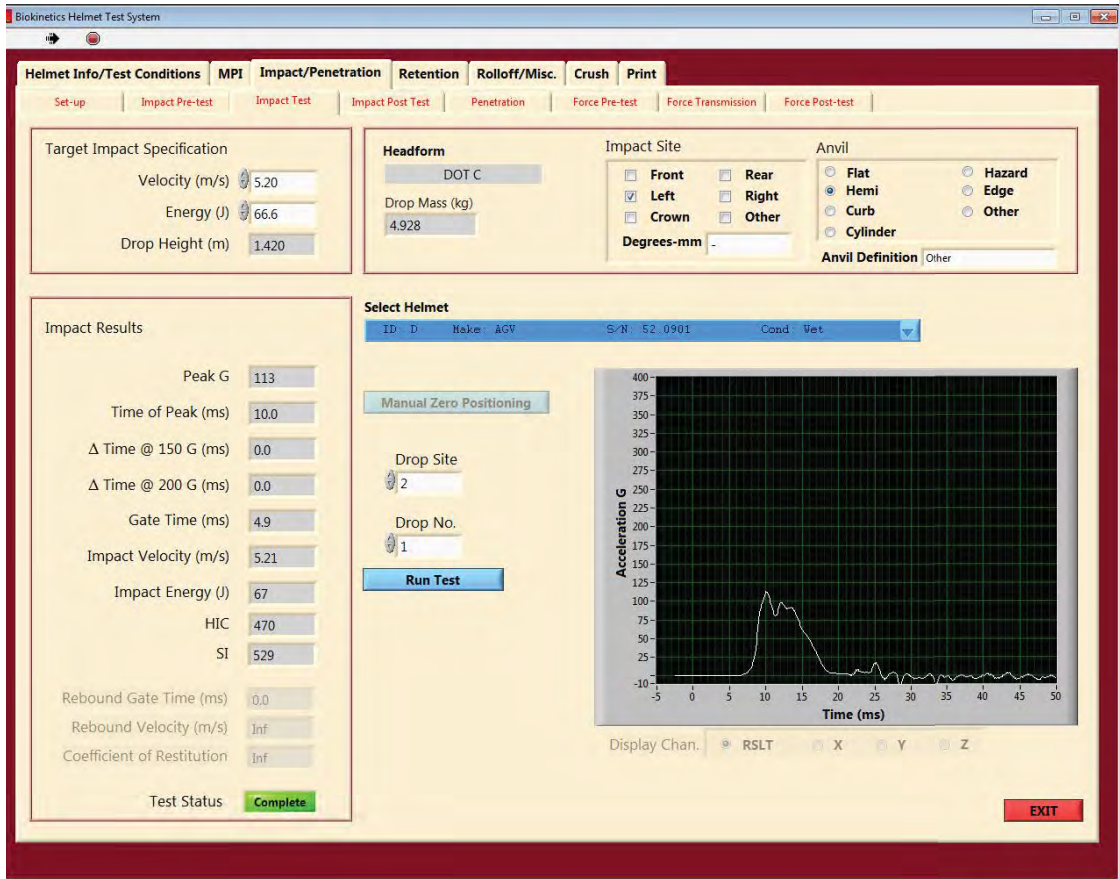


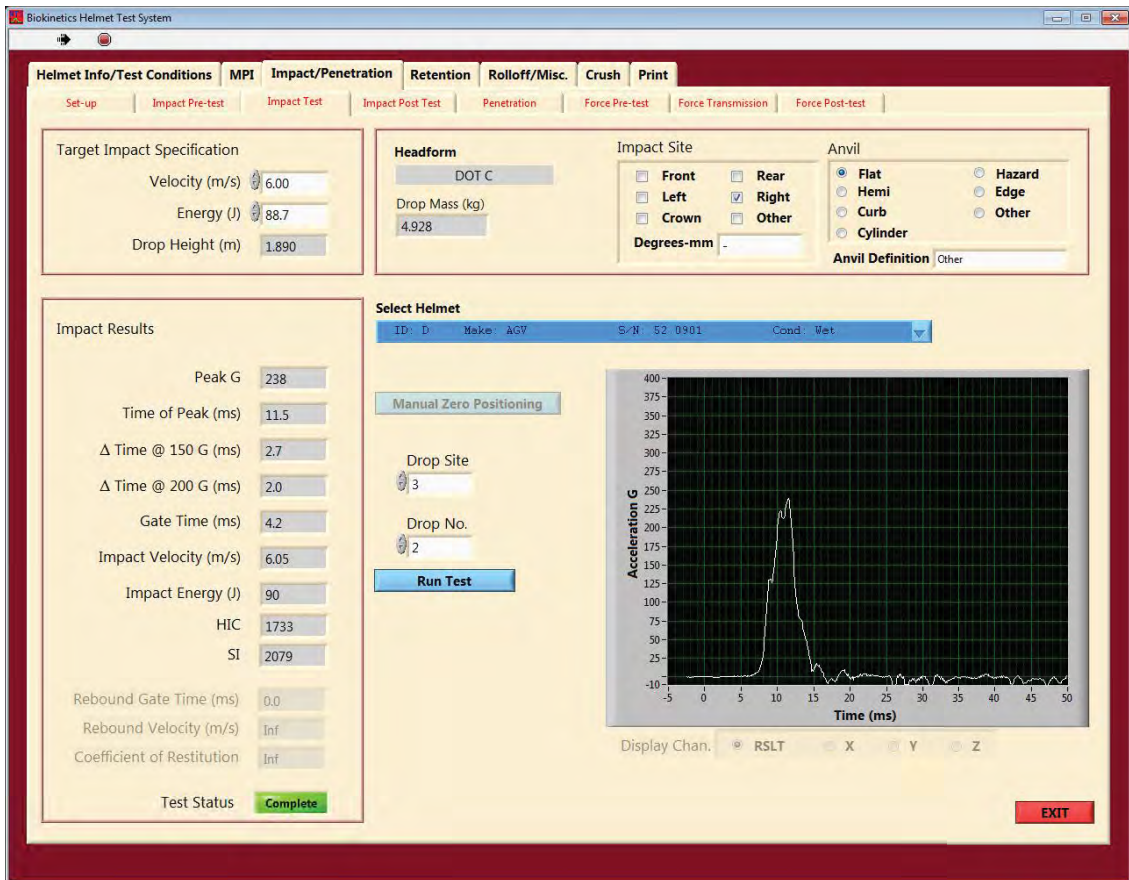
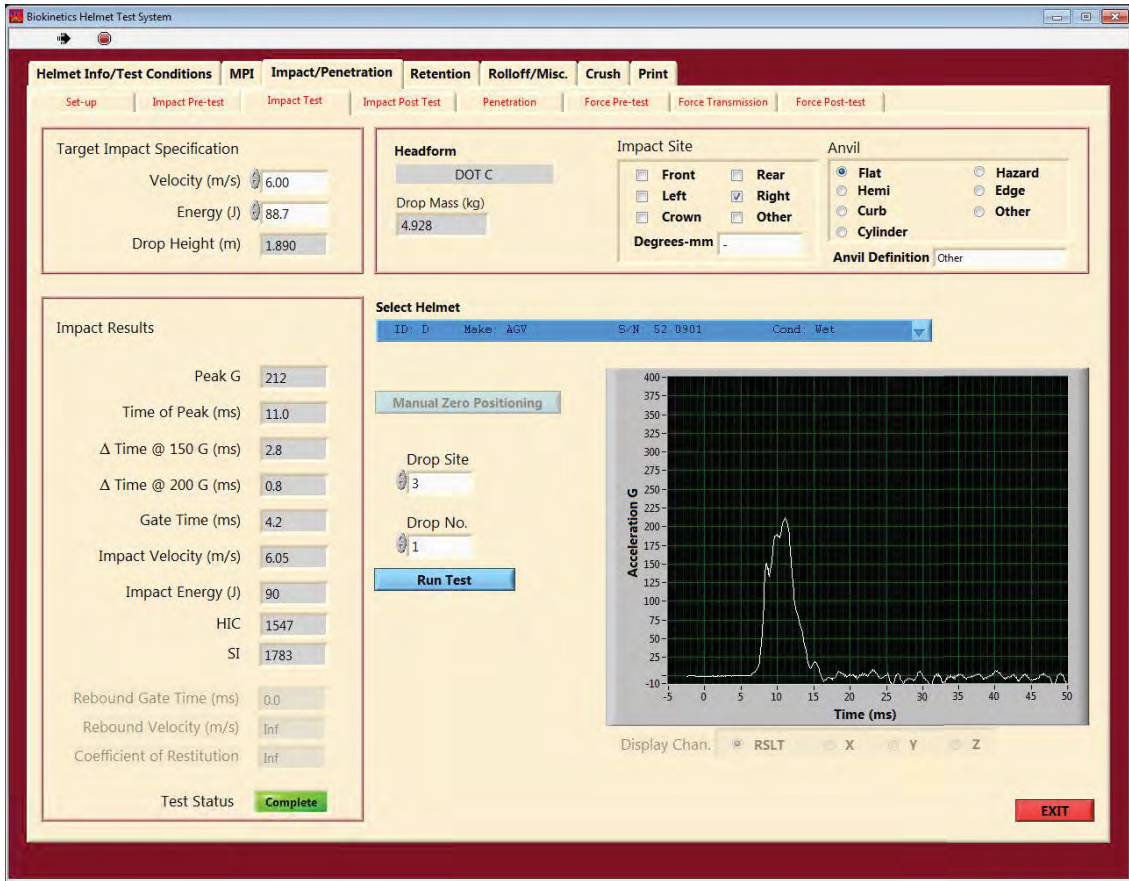


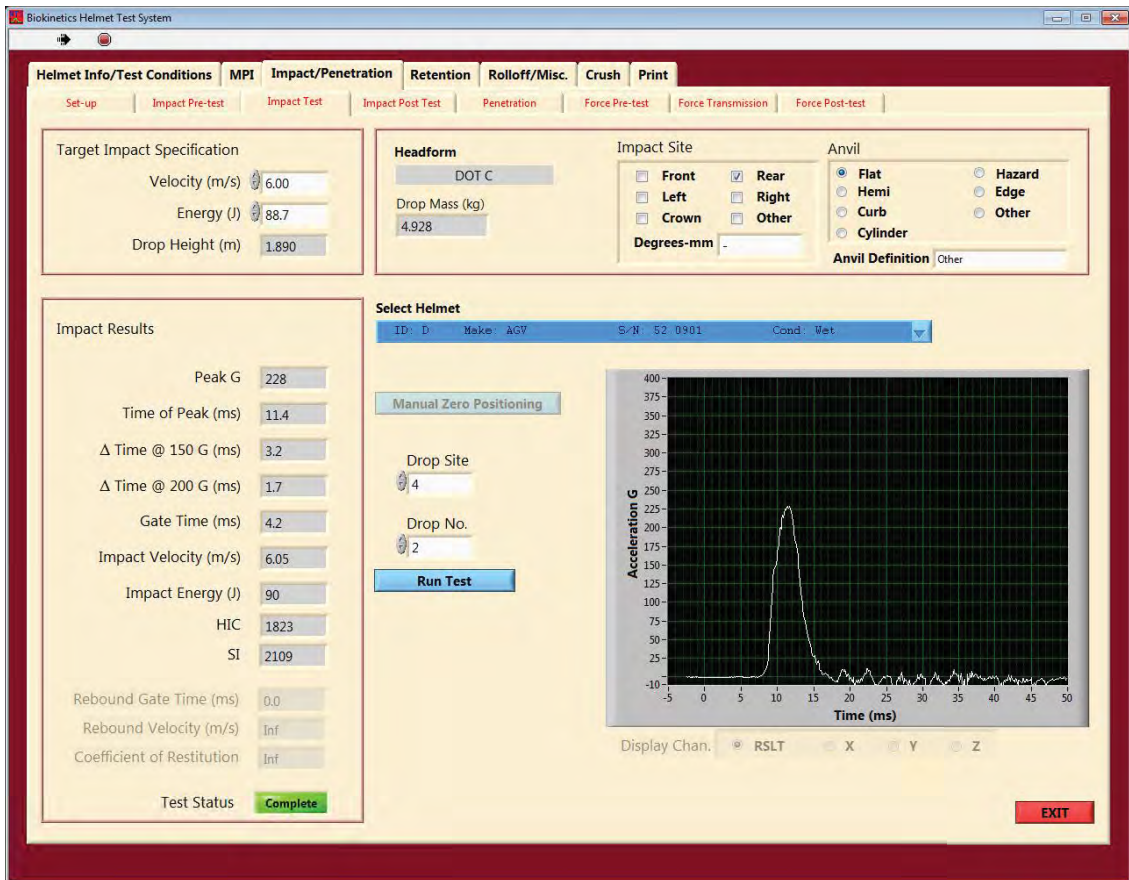
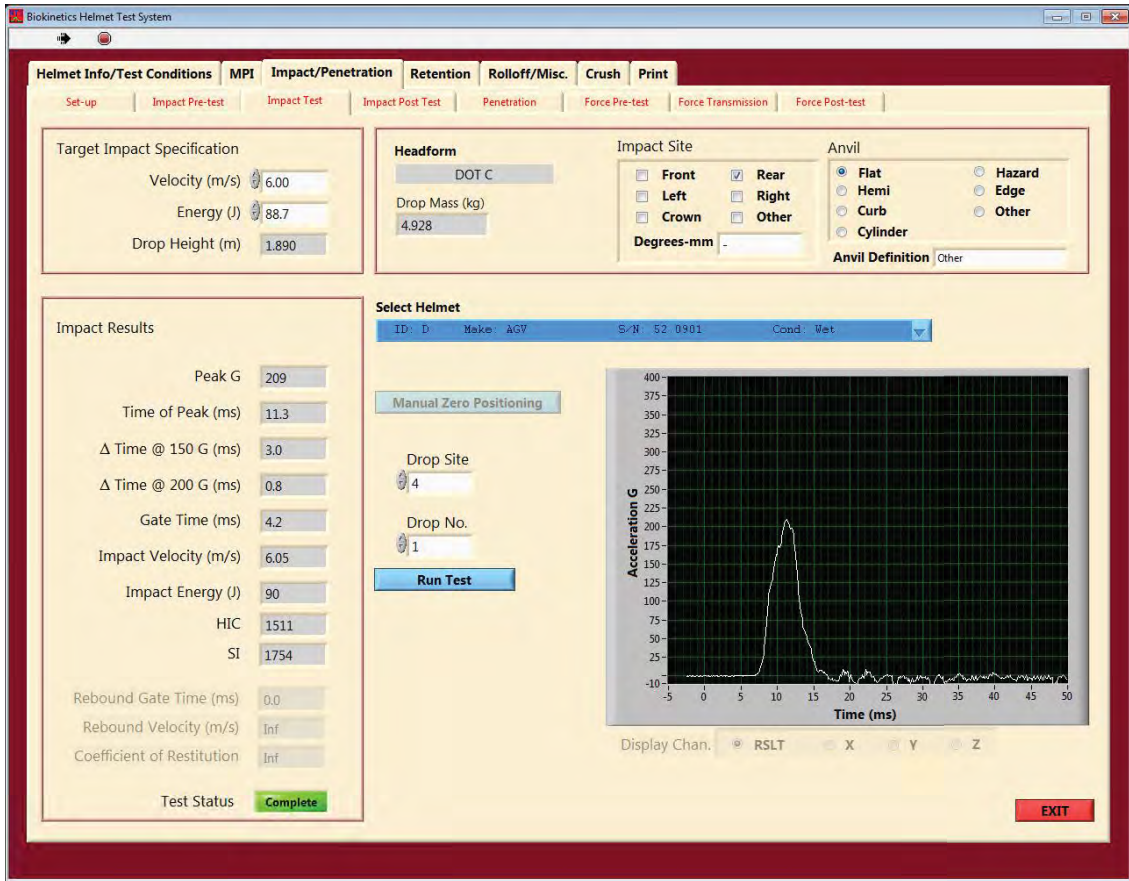




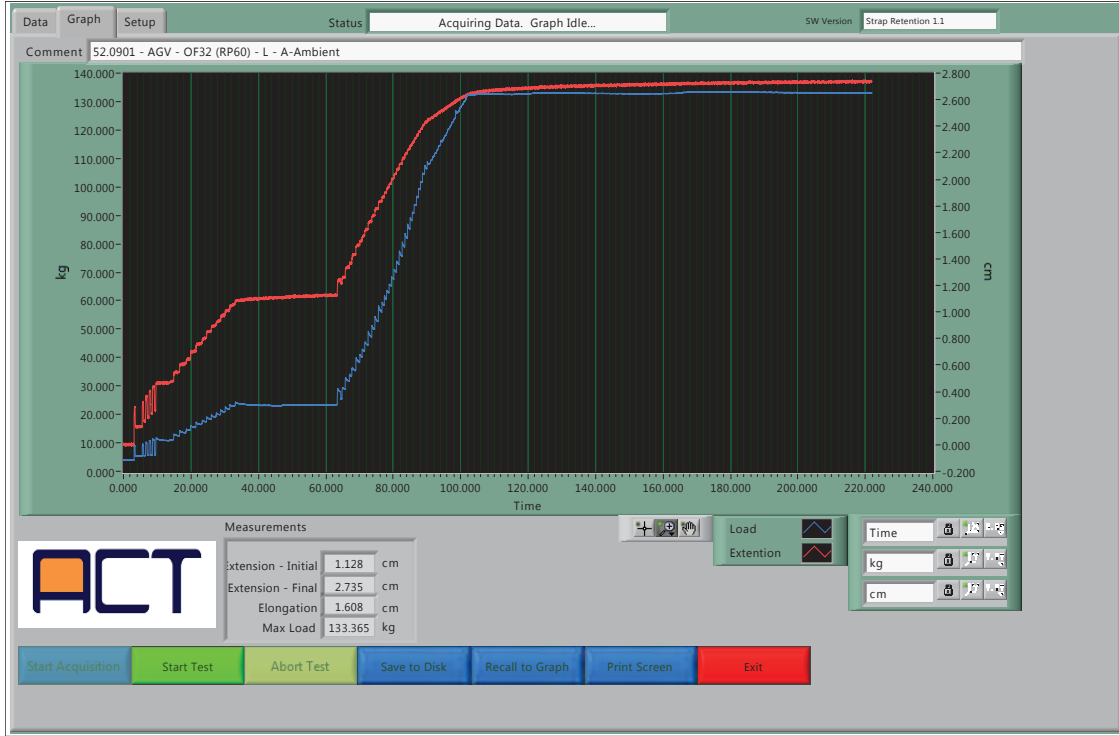




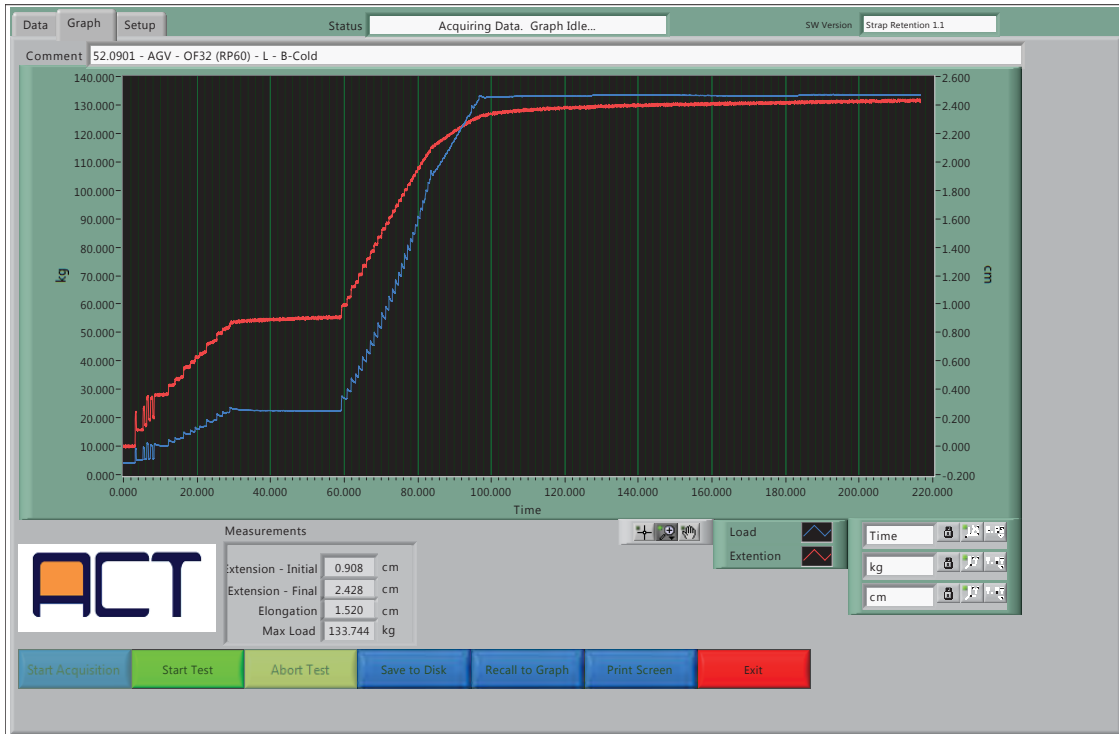




ACT DOT Strap Retention Acquisition  
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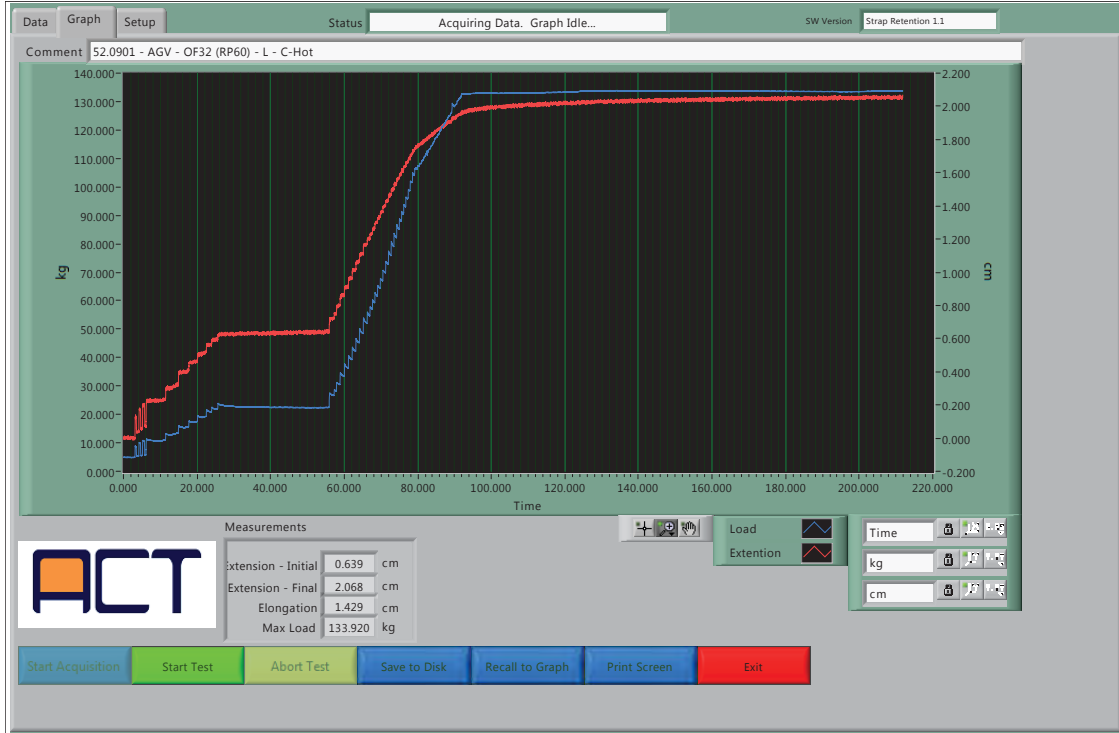


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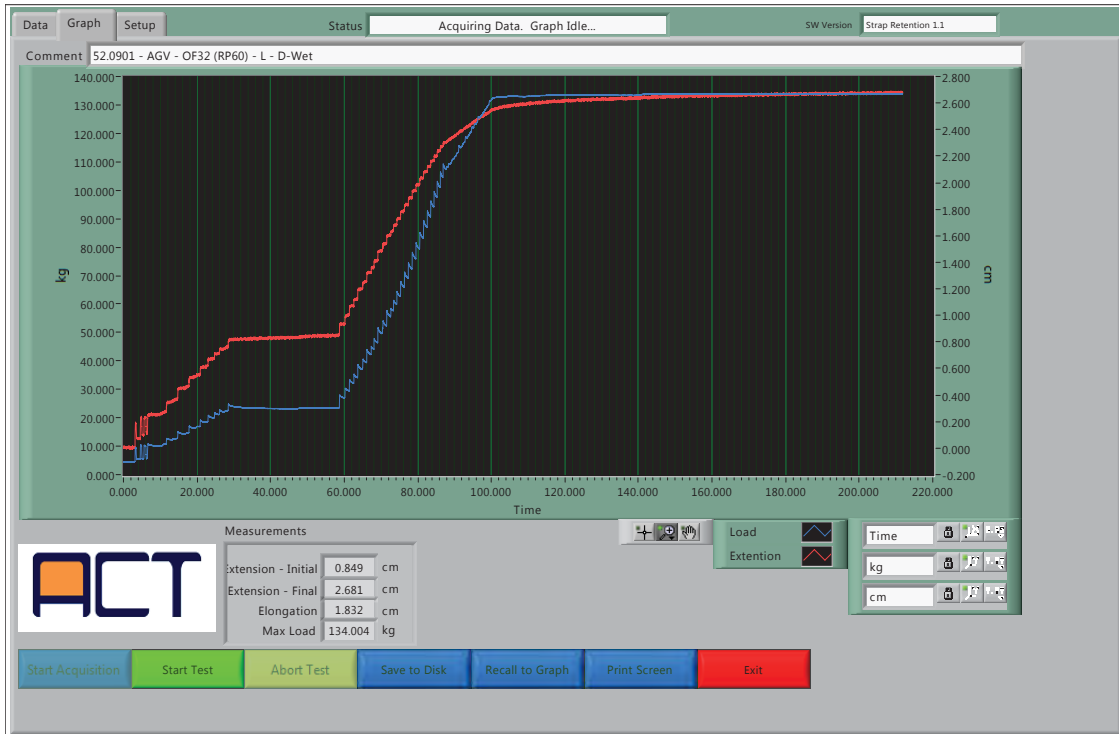


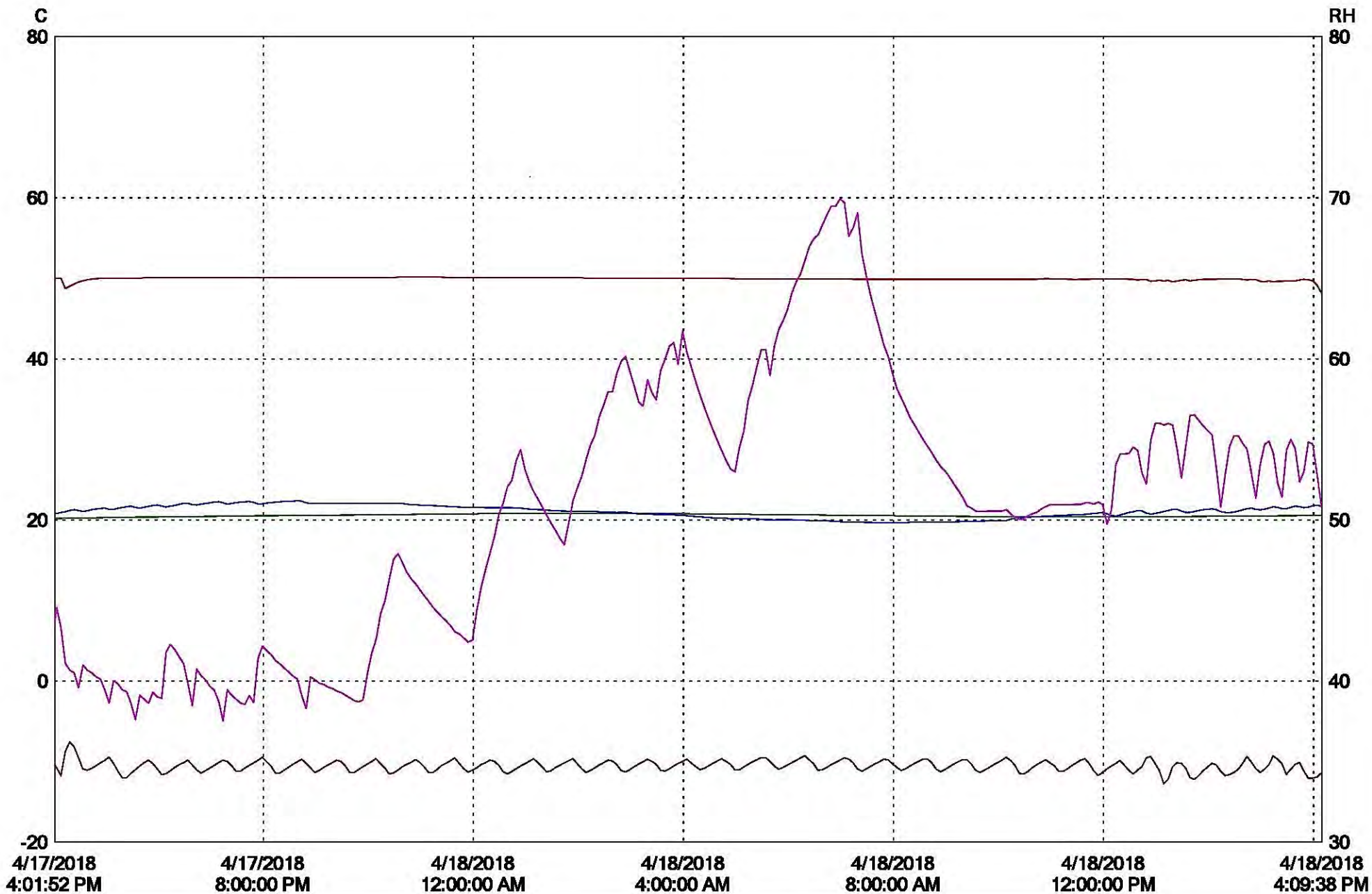


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LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	09021116	Oven/Water	1	50.13	49.94	48.20	C	Oven	Oven_Water-09021116-2018-04-18 16-11-49.spl	
2	09021116	Oven/Water	2	20.80	20.56	20.18	C	Water	Oven_Water-09021116-2018-04-18 16-11-49.spl	
3	08052076	LAB TEMP/RH	1	22.37	21.01	19.66	C	Lab Temp.	LAB_TEMP_RH-08052076-2018-04-18 16-11-53.spl	
4	08052076	LAB TEMP/RH	2	69.9	50.7	37.5	RH	Humidity	LAB_TEMP_RH-08052076-2018-04-18 16-11-53.spl	
5	08071106	Freezer	1	-7.58	-10.54	-12.76	C	Freezer	Freezer-08071106-2018-04-18 16-11-44.spl	

## APPENDIX A

### INTERPRETATIONS OR DEVIATIONS FROM FMVSS No. 218

Excess water on the water immersed sample was allowed to drip off before testing to prevent water damage to test equipment.

**APPENDIX B  
EQUIPMENT LIST AND CALIBRATION SCHEDULES**

<b>Equipment List</b>					
<b>ACT ID</b>	<b>Description</b>	<b>Make/Model</b>	<b>S/N</b>	<b>Dimensional Check</b>	<b>Next</b>
H0079	Monorail	US Testing	NA	12/8/2017	12/8/2018
H0004	DOT Small Headform	Controlled Casting	NA	12/8/2017	12/8/2018
H0005	DOT Medium Headform	Controlled Casting	NA	12/8/2017	12/8/2018
H0006	DOT Large Headform	Controlled Casting	NA	12/8/2017	12/8/2018
H0028	Anvil	Hemispherical	C070911-01	12/8/2017	12/8/2018
H0029	Anvil	Flat	C310811-02	12/8/2017	12/8/2018
H0078	Anvil	MEP	16100801	12/8/2017	12/8/2018
H0088	Penetration Height Spacer	La Cienega Manufacturing	NA	12/8/2017	12/8/2018
H0064	Penetration Striker	Cadex	4324	12/8/2017	12/8/2018
H0111	Peripheral Vision	1 inch Block	NA	12/8/2017	12/8/2018
H0059	Drop Carriage Assembly	Cadex	NA	12/8/2017	12/8/2018
H0117	DOT Penetration Headform - Small	Cadex	7293	12/8/2017	12/8/2018
H0118	DOT Penetration Headform - Medium	Cadex	7294	12/8/2017	12/8/2018
H0119	DOT Penetration Headform - Large	Cadex	7296	12/8/2017	12/8/2018
H0080	Penetrator Tube	La Cienega Manufacturing	NA	NA	NA
H0120	Penetration Headform Mount	Cadex	NA	NA	NA
H0082	Retention Strength Tester	La Cienega Manufacturing	NA	NA	NA
H0090	High Temperature Chamber	Thermolyne	116005-0891414	NA	NA
H0091	Low Temperature Chamber	Scientemp	S8001170	NA	NA
H0092	Water Immersion Container	Rubbermaid	NA	NA	NA
H0114	Laser Level	Ryobi	NA	NA	NA
H0115	Computer	Dell	67G5891	NA	NA
H0116	I-O Board	National Instruments	PCI-6023E	NA	NA

Contract File No.: 52.0901

Test File: 001

Control Document Rev.10 Official ACT NHTSA DOT TP-07 Report Template USA 18 April 2018

36 of 46

Technician: George Stetina

Test Date: 18 April 2018

Calibrated Measurement Equipment								
ACT ID	Description	Make/Model	S/N	Range	Accuracy from Cal. Certs	Last Calibration	Next Calibration	Calibration By:
H0102	Velocity Gate	Biok-Gate 9304	9304-001	--	0.16 ms	12/8/2017	12/8/2018	ACT
H0097	Accelerometer/ Amplifier/Filter	2279/104/109	ANTP2/AK/A P23	2000 g	±2.60%	8/22/2017	8/22/2018	Precision Labs
H0114	Peripheral Vision protractor	D&K 125	NA	0-180 °	0.7 °	11/30/2017	11/30/2018	Micro Quality Calibration
H0098	LVDT - Retention	Schaevitz 2000-HR	16071	2 in	±0.06 mm	11/30/2017	11/30/2018	Micro Quality Calibration
H0099	Load Cell - Retention	LSB350	490706	500 lbs	±0.2%	11/28/2017	11/28/2018	Micro Quality Calibration
H0103	Ohaus Scale	Scout Pro SP6000	7126321419	0-6000 gm	±1 g	10/16/2017	10/16/2018	Micro Quality Calibration
H0124	Digital Measuring Tape	Etape	-	16.5 ft	±0.0625 in	7/10/2017	7/10/2018	Micro Quality Calibration
H0105	Height Gage	Mitutoyo	3121016	12 in	±0.002 in	11/29/2017	11/29/2018	Micro Quality Calibration
H0106	Environmental Data Logger	Veriteq SP-2000-20R	8052076	-40 To +95C, 0-100% RH	±0.03 °C	7/10/2017	7/10/2018	Veriteq
H0107	Environmental Data Logger	Veriteq SP-1000-22N	8071106	-40 To +95 °C	±0.02 °C	7/10/2017	7/10/2018	Veriteq
H0108	Environmental Data Logger	Veriteq SP-1000-22N	9021116	-40 To +95 °C	±0.02 °C	7/10/2017	7/10/2018	Veriteq
H0130	Timer	Traceable 5017	181009252	0-99hrs/59 mins/59 sec	±0.01%	02/07/2018	02/07/2019	Control Company

Contract File No.: 52.0901

Test File: 001

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Technician: George Stetina

Test Date: 18 April 2018

**APPENDIX C**  
**PHOTOGRAPHS**

Contract File No.: 52.0901  
Test File: 001

Control Document Rev.10 Official ACT NHTSA DOT TP-07 Report Template USA 18 April 2018  
38 of 46

Technician: George Stetina

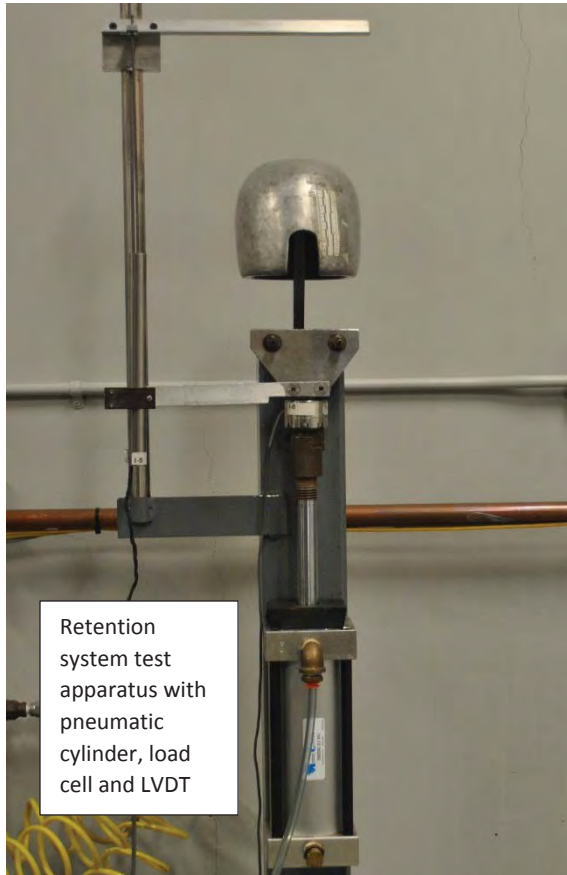
Test Date: 18 April 2018



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



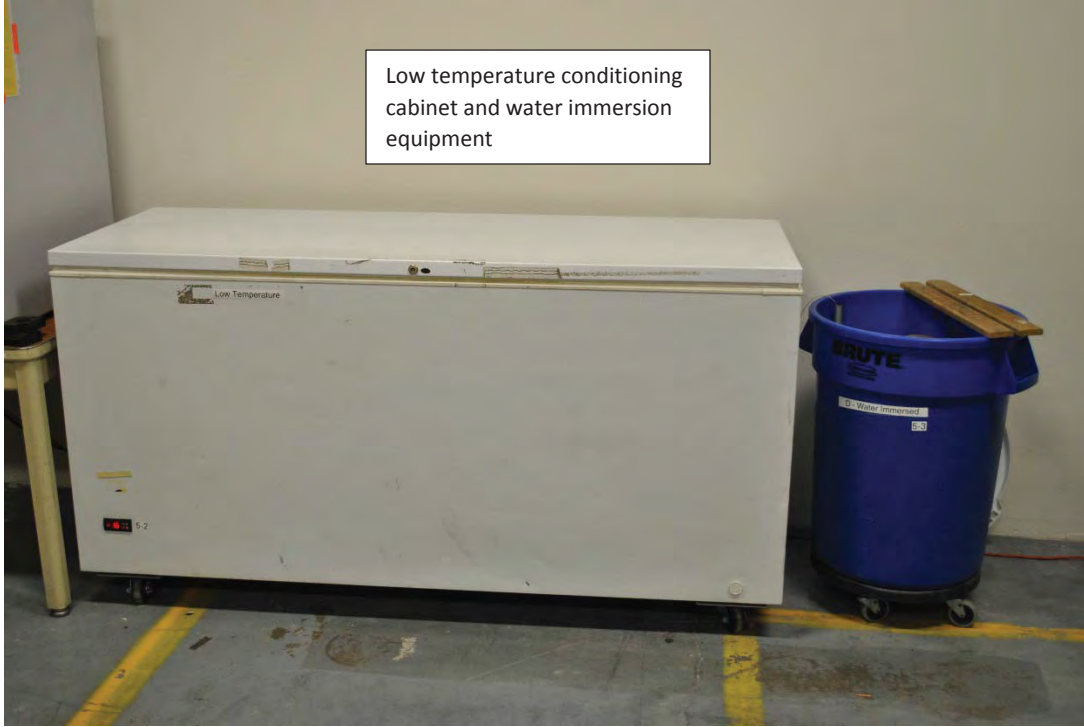
Penetration test apparatus with adjustable base



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



Data acquisition equipment



Low temperature conditioning cabinet and water immersion equipment



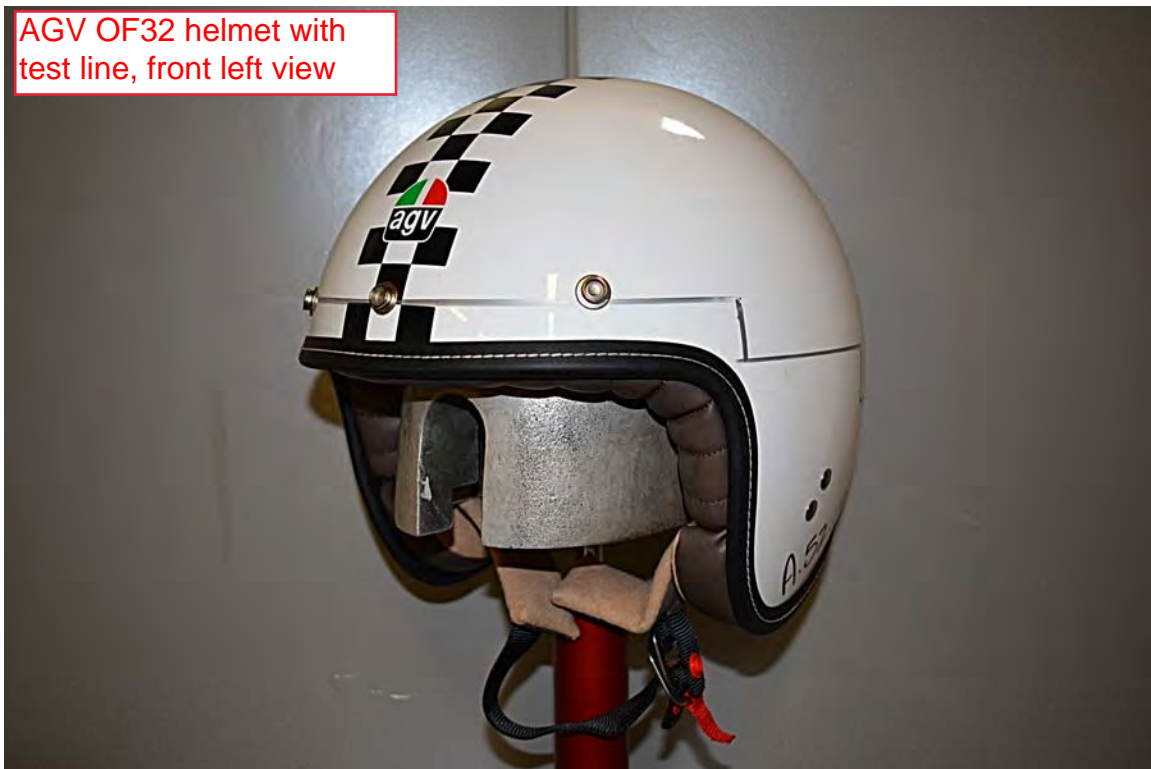
High temperature chamber



AGV OF32 helmet and box showing model designation



AGV OF32 helmet with test line, front left view



AGV OF32 helmet with test line, rear left view



AGV OF32 helmet interior view



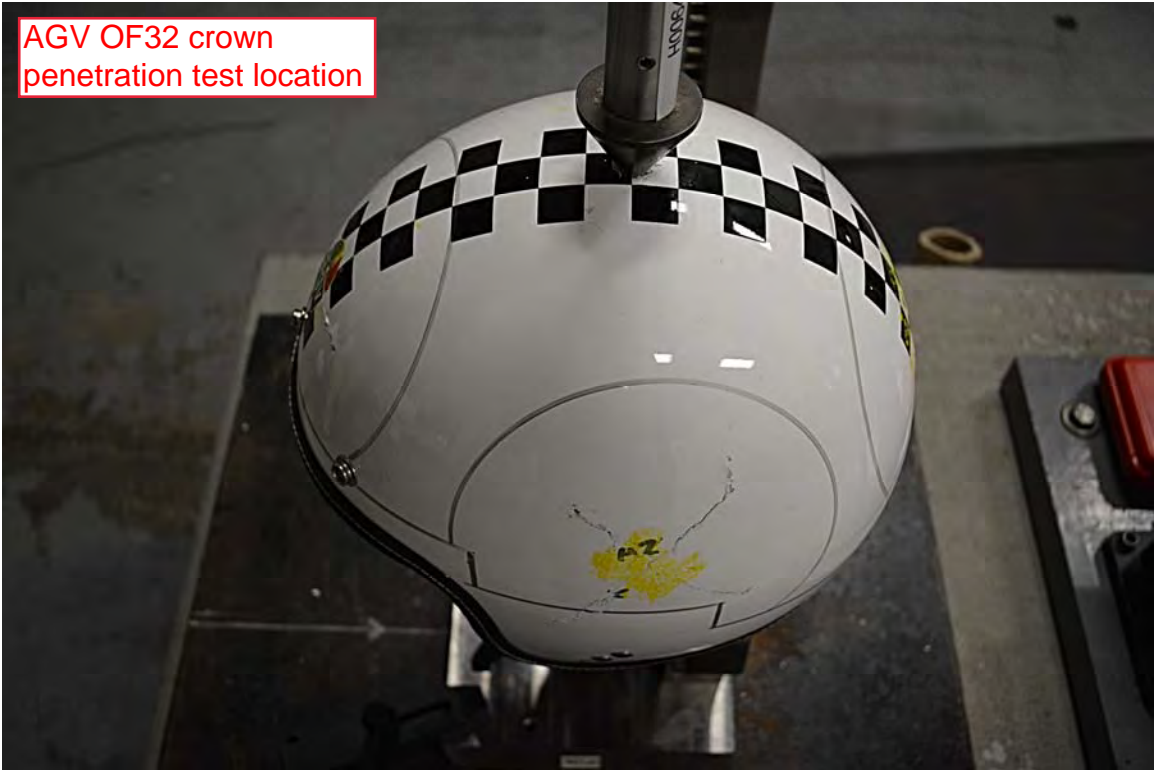
AGV OF32 front and left side hemispherical anvil impact locations



AGV OF32 right side and rear flat anvil impact locations



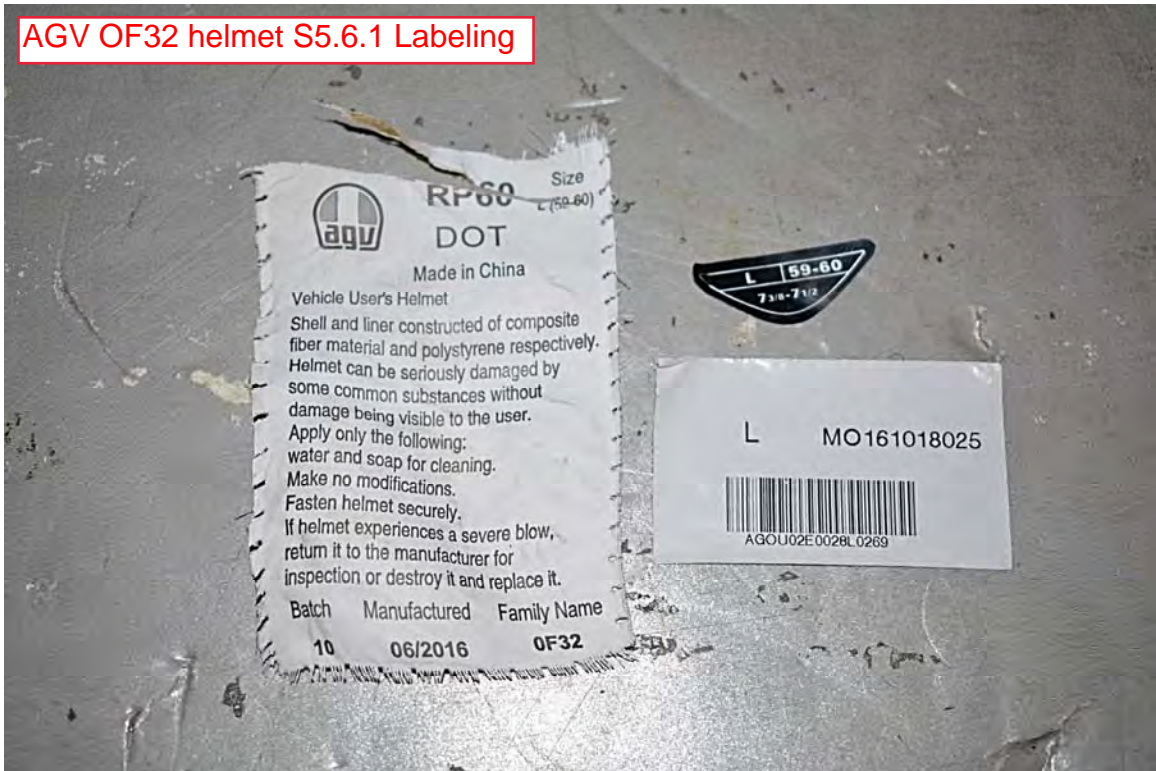
AGV OF32 crown  
penetration test location



AGV OF32 rear right  
penetration test location



AGV OF32 helmet S5.6.1 Labeling



AGV OF32 helmet S5.6.2 Certification Label



AGV OF32 helmet S5.6.1  
Labeling permanency failure

