# SAFETY COMPLIANCE TESTING FOR FMVSS No. 218 MOTORCYCLE HELMETS

Brand: OUTLAW
Model: T-75
Size: M (57-58 cm)

**Prepared By**

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**25 May 2018**

**Final Report 218-ACT-18-012**

**Prepared For**

**U.S. Department of Transportation**

National Highway Traffic Safety Administration

Office of Vehicle Safety Compliance (NEF-220)

1200 New Jersey Ave., S.E.

Washington, DC 20590

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Project Manager: David Thom

Approved By: John Bogler

Approval Date: 25 May 2018

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Accepted By:

Acceptance Date: 06/12/2018

HS# 645544

**TECHNICAL REPORT STANDARD TITLE PAGE**

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|---|---|---|
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| **4. Title and Sub-Title**<br>FINAL REPORT OF FMVSS NO. 218 COMPLIANCE TESTING OF OUTLAW, MODEL T-75, SIZE M (57-58 CM) MOTORCYCLE HELMET | | **5. Report Date**<br>25 May 2018 |
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| **7. Author(s)**<br>David R. Thom, Program Manager | | **8. Performing Organization Report No.**<br>52.0912.001 |
| **9. Performing Organization Name and Address**<br>ACT Lab LLC<br>3280 East 59th Street,<br>Long Beach CA 90805 | | **10. Work Unit No.** |
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| | | **14. Sponsoring Agency Code**<br>NEF-220 |

**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: S5.1 Impact Attenuation. Peak accelerations exceeded 400g on the ambient and low temperature samples. Accelerations in excess of 200g exceeded 2.0 ms on the water immersed sample. S5.6.1 Labeling. The manufacturer's name, discrete size and month & year of manufacture, labels do not appear to be permanent.

| | |
|---|---|
| **17. Key Words**<br>Helmet<br>Compliance Testing<br>Safety Engineering<br>FMVSS No. 218 | **18. Distribution Statement**<br>Copies of this report are available from:<br>National Highway Traffic Safety Administration<br>Technical Information Services Division (NPO-120)<br>1200 New Jersey Avenue, S.E.<br>Washington, D.C. 20590 |

| | | | |
|---|---|---|---|
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Form DOT F1700.7 (8-69)

# TABLE OF CONTENTS

# 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: OUTLAW

HELMET MODEL DESIGNATION: T-75

HELMET MANUFACTURER: SHANGHAI TUNG KUANG I LIGHT INDUSTRY CO., LTD

HELMET SIZE: M (57-58 cm)

HELMET COVERAGE: Partial: X Full: _____ Complete: _____

HELMET POSITIONING INDEX: 40 mm

SHELL MATERIAL: Acrylonitrile Butadiene Styrene

LINER MATERIAL: Expanded Polystyrene

BUCKLE DESCRIPTION: Double D-Rings

| HELMET | A<br>Ambient | B<br>Low Temp | C<br>High Temp | D<br>Water Immersed | E<br>Spare |
|---|---|---|---|---|---|
| SHELL COLOR/PATTERN | Black | Black | Black | Black | Black |
| WEIGHT (grams) | 986 | 989 | 965 | 986 | 971 |
| MONTH & YEAR OF MANUFACTURE | 9/17 | 4/17 | 9/17 | 9/17 | 9/17 |

COMMENTS:

1. All helmets were received in undamaged condition and were appropriate for testing.
2. Weights listed above for helmets A-E are as tested with no attachments.
3. 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 | Fail | Fail | Pass | Fail |
| PENETRATION | Pass | Pass | Pass | Pass |
| RETENTION | Pass | Pass | Pass | Pass |

INDICATE Pass or Fail

| TEST | PASS/FAIL |
|---|---|
| PERIPHERAL VISION | Pass |
| LABELING | Fail |

COMMENTS:

1. S5.1 Impact Attenuation. (a) Peak accelerations exceeded 400g:
   Ambient sample, front location, hemi anvil, 2nd impact, 434g
   Low temperature sample, front location, hemi anvil, 2nd impact, 463g
   S5.1(b) Accelerations in excess of 200g exceeded a cumulative duration of 2.0 ms:
   Water immersed sample, rear location, flat anvil, 2nd impact, 2.3 ms

2. 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: M (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.

AVERAGE LAB TEMPERATURE : 20.7 ºC ; AVERAGE LAB HUMIDITY : 57.4 %

# 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 | 5.20 | 395.6 | 2.4 | 2.2 | Pre 1 | Crown |
| | 2 | 1.4 | 5.21 | 400.6 | 2.5 | 2.2 | Pre 2 | Crown |
| | 3 | 1.4 | 5.12 | 400.0 | 2.5 | 2.3 | Pre 3 | Crown |
| PRETEST AVERAGE | | XXXX | XXXX | 399.0 | XXX | XXX | XXXX | XXXX |
| POSTTEST | 1 | 1.4 | 5.15 | 401.6 | 2.5 | 2.2 | Post 1 | Crown |
| | 2 | 1.4 | 5.05 | 407.6 | 2.6 | 2.3 | Post 2 | Crown |
| | 3 | 1.4 | 5.10 | 391.9 | 2.5 | 2.2 | Post 3 | Crown |
| POSTTEST AVERAGE | | XXXX | XXXX | 400.0 | XXX | XXX | XXXX | XXXX |
| DIFFERENCE BETWEEN PRE-TEST AND POST-TEST AVERAGES | | | | 2.0 | 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 | 166 | 434 | 124 | 149 | 208 | 183 | 206 | 241 |
| | | ms @ 150 | 0.8 | 1.5 | 0.0 | 0.0 | 1.5 | 2.5 | 2.6 | 3.3 |
| | | ms @ 200 | 0.0 | 1.2 | 0.0 | 0.0 | 0.5 | 0.0 | 0.6 | 1.7 |
| | | Velocity m/s | 5.30 | 5.26 | 5.21 | 5.24 | 5.94 | 5.95 | 6.12 | 6.08 |
| B | Low Temperature | Anvil | Hemi | | Hemi | | Flat | | Flat | |
| | | Test Record No. | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | | Peak g | 110 | 463 | 123 | 138 | 212 | 219 | 231 | 265 |
| | | ms @ 150 | 0.0 | 1.4 | 0.0 | 0.0 | 2.5 | 2.8 | 3.6 | 3.2 |
| | | ms @ 200 | 0.0 | 1.1 | 0.0 | 0.0 | 0.5 | 1.0 | 1.1 | 1.8 |
| | | Velocity m/s | 5.26 | 5.26 | MD | MD | 5.94 | 6.08 | 6.14 | 6.11 |
| C | High Temperature | Anvil | Hemi | | Hemi | | Flat | | Flat | |
| | | Test Record No. | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| | | Peak g | 121 | 320 | 110 | 138 | 184 | 189 | 220 | 254 |
| | | ms @ 150 | 0.0 | 1.5 | 0.0 | 0.0 | 1.2 | 2.7 | 3.5 | 3.3 |
| | | ms @ 200 | 0.0 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.8 |
| | | Velocity m/s | 5.30 | 5.25 | 5.19 | 5.24 | 5.95 | 6.03 | 6.09 | 6.09 |
| D | Water Immersed | Anvil | Hemi | | Hemi | | Flat | | Flat | |
| | | Test Record No. | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
| | | Peak g | 75 | 270 | 103 | 113 | 233 | 250 | 228 | 276 |
| | | ms @ 150 | 0.0 | 1.3 | 0.0 | 0.0 | 3.8 | 3.6 | 3.4 | 3.3 |
| | | ms @ 200 | 0.0 | 1.1 | 0.0 | 0.0 | 0.7 | 1.1 | 1.3 | 2.3 |
| | | Velocity m/s | 5.30 | 5.29 | 5.24 | 5.24 | 5.95 | 6.03 | 6.09 | 6.06 |

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

Contract File No.: 52.0912 Technician: George Stetina
Test File: 001
Control Document Rev.11 Official ACT NHTSA DOT TP-07 Report Template USA 4 May 2018 Test Date: 25 May 2018

## 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 | 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 | 0.51 | 1.44 | 0.93 |
| B | LOW TEMPERATURE | 0.57 | 1.61 | 1.04 |
| C | HIGH TEMPERATURE | 0.42 | 1.44 | 1.02 |
| D | WATER IMMERSED | 0.43 | 1.44 | 1.01 |

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 | 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: The manufacturer's name, discrete size and month and 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.

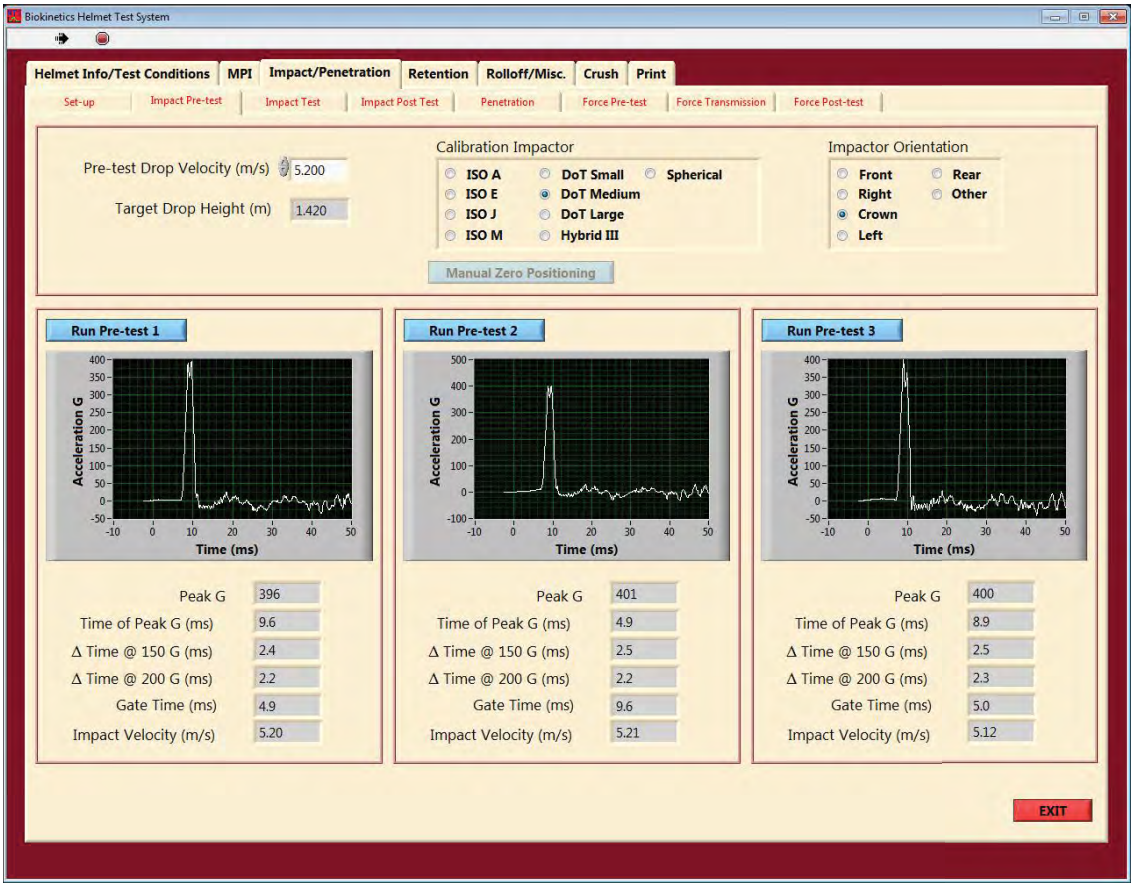
## LABELING

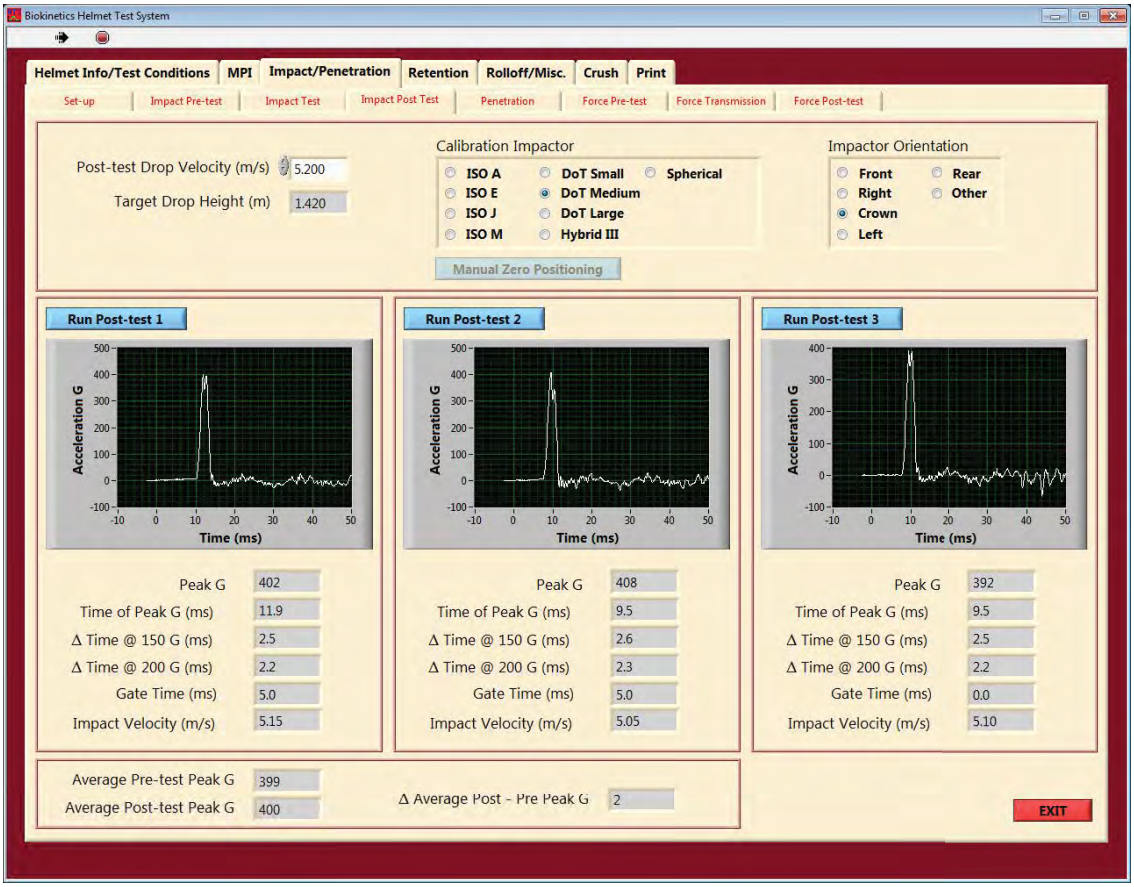
S5.6.2 Certification. Each helmet shall be labeled permanently and legibly with a label, constituting the manufacturer's certification that the helmet conforms to the applicable Federal motor vehicle safety standards, that is separate from the label(s) used to comply with S5.6.1, and complies with paragraphs (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: Labels were determined to be both easily read and permanent based on the TP-218-07, Section 12.5.4.

# TEST DATA


Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Pre-test Drop Velocity (m/s) 5.200
Target Drop Height (m) 1.420
Calibration Impactor
ISO A
ISO E
ISO J
ISO M
DoT Small
DoT Medium
DoT Large
Hybrid III
Spherical
Impactor Orientation
Front
Rear
Right
Other
Crown
Left
Manual Zero Positioning
Run Pre-test 1
Run Pre-test 2
Run Pre-test 3
Acceleration G
Time (ms)
Peak G 396 401 400
Time of Peak G (ms) 9.6 4.9 8.9
Δ Time @ 150 G (ms) 2.4 2.5 2.5
Δ Time @ 200 G (ms) 2.2 2.2 2.3
Gate Time (ms) 4.9 9.6 5.0
Impact Velocity (m/s) 5.20 5.21 5.12
EXIT


Biokinetics Helmet Test System
Helmet Info/Test Conditions
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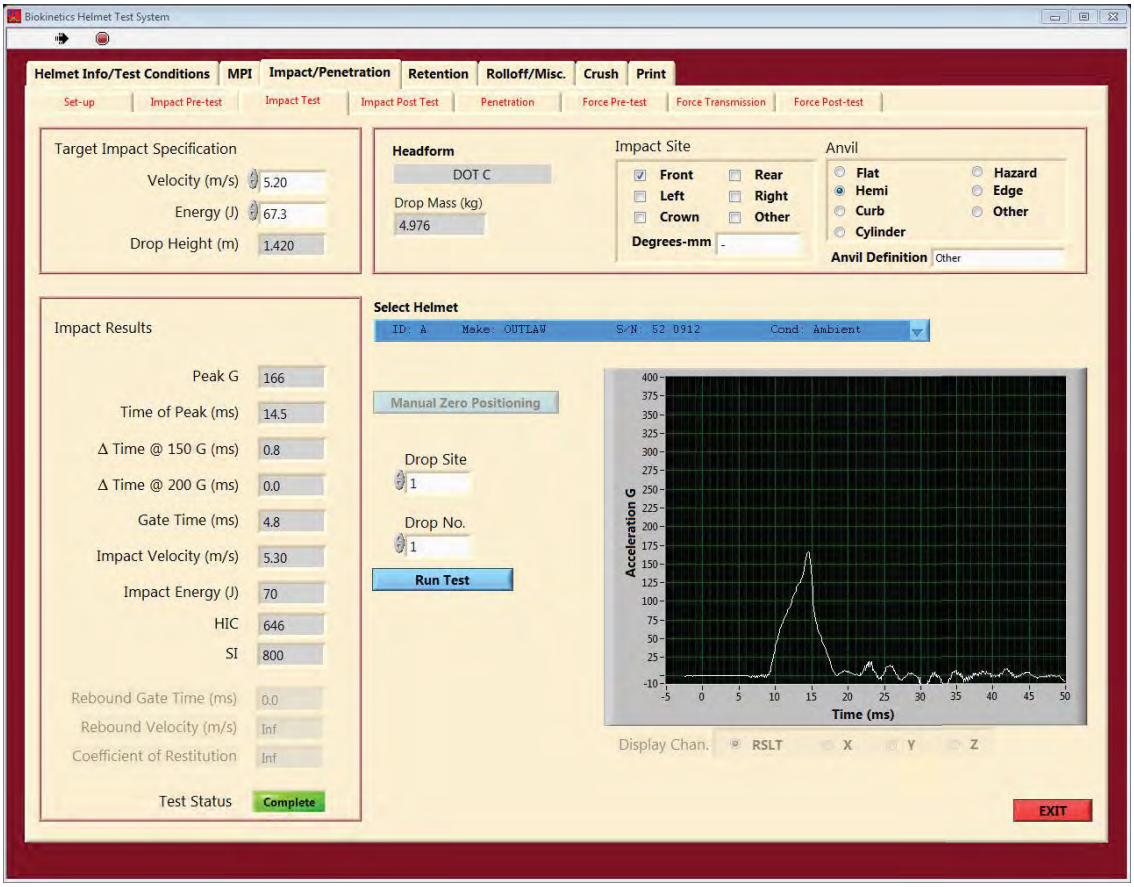
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Post-test Drop Velocity (m/s) 5.200
Target Drop Height (m) 1.420
Calibration Impactor
ISO A
ISO E
ISO J
ISO M
DoT Small
DoT Medium
DoT Large
Hybrid III
Spherical
Impactor Orientation
Front
Rear
Right
Other
Crown
Left
Manual Zero Positioning
Run Post-test 1
Run Post-test 2
Run Post-test 3
Acceleration G
Time (ms)
Peak G 402 408 392
Time of Peak G (ms) 11.9 9.5 9.5
Δ Time @ 150 G (ms) 2.5 2.6 2.5
Δ Time @ 200 G (ms) 2.2 2.3 2.2
Gate Time (ms) 5.0 5.0 0.0
Impact Velocity (m/s) 5.15 5.05 5.10
Average Pre-test Peak G 399
Average Post-test Peak G 400
Δ Average Post - Pre Peak G 2
EXIT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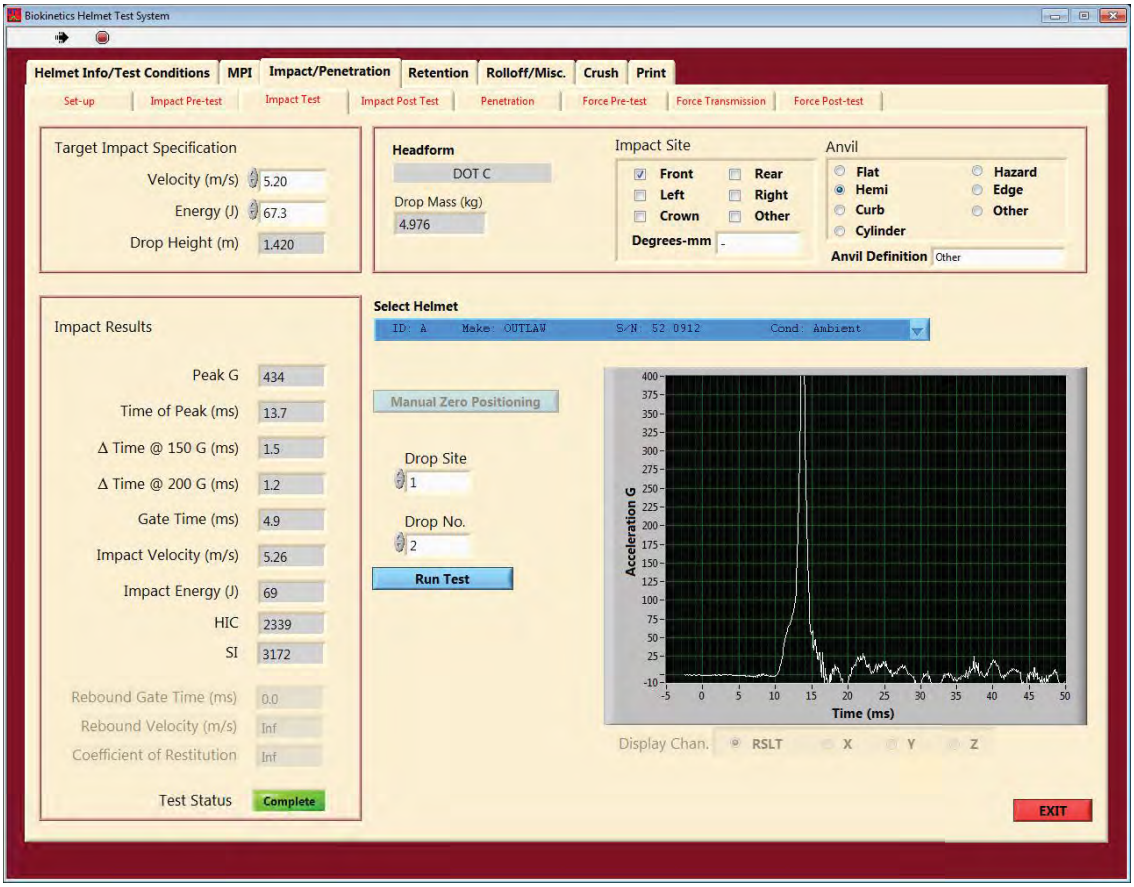
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 166
Time of Peak (ms) 14.5
Δ Time @ 150 G (ms) 0.8
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.8
Impact Velocity (m/s) 5.30
Impact Energy (J) 70
HIC 646
SI 800
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: A Make: OUTLAW S/N: 52 0912 Cond: Ambient
Manual Zero Positioning
Drop Site 1
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT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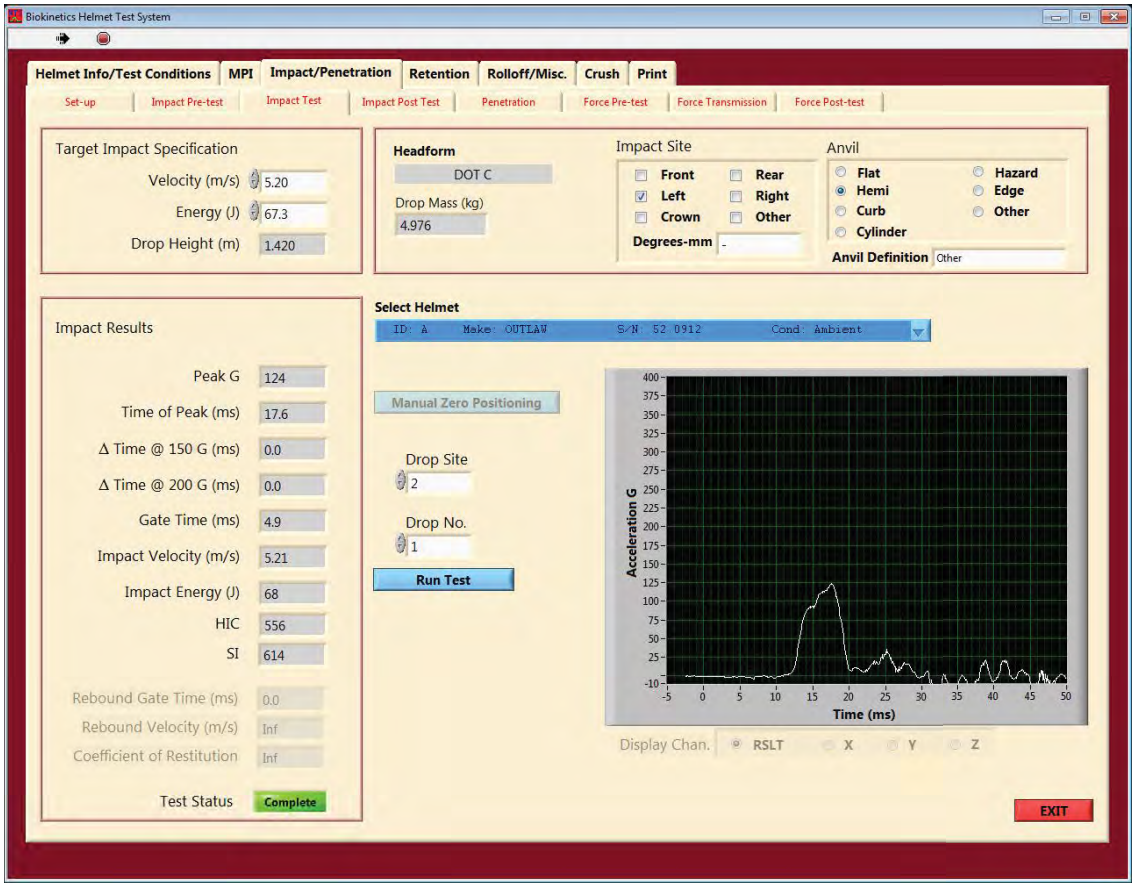
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 434
Time of Peak (ms) 13.7
Δ Time @ 150 G (ms) 1.5
Δ Time @ 200 G (ms) 1.2
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.26
Impact Energy (J) 69
HIC 2339
SI 3172
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: A Make: OUTLAW S/N: 52 0912 Cond: Ambient
Manual Zero Positioning
Drop Site 1
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT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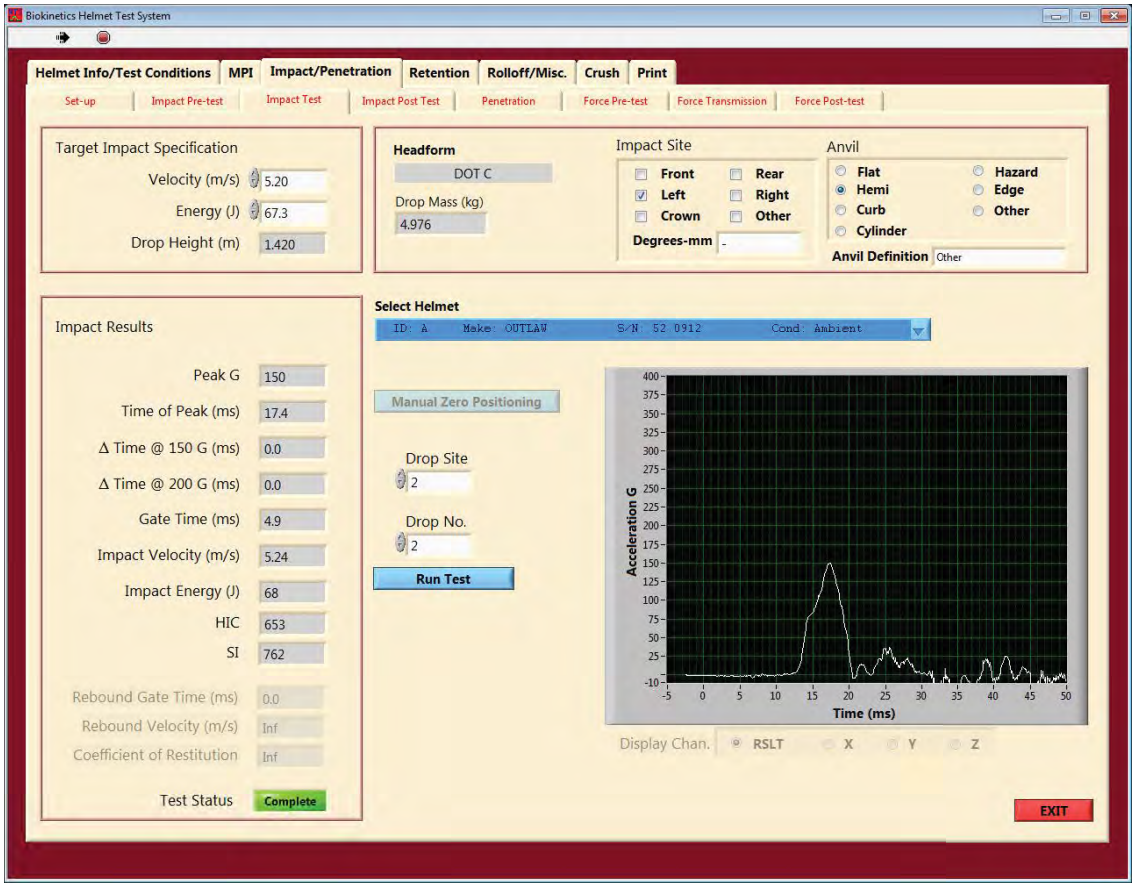
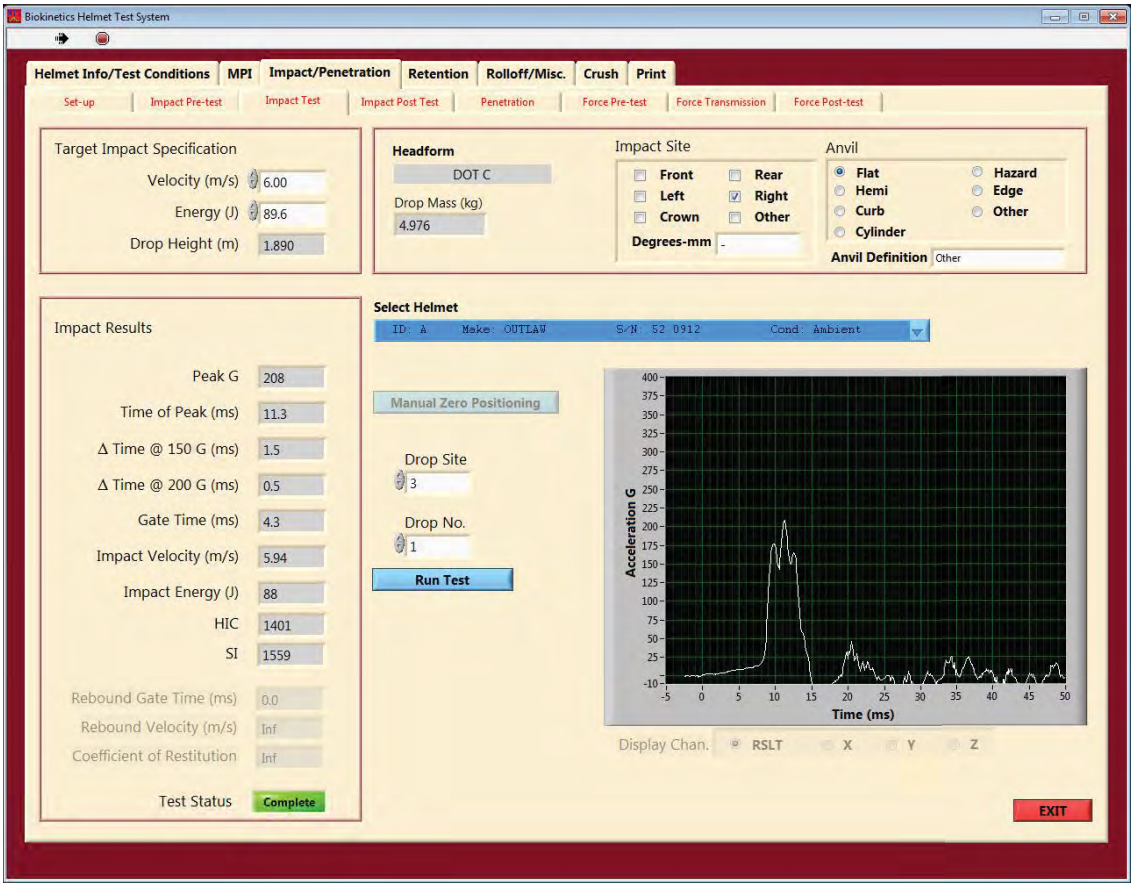
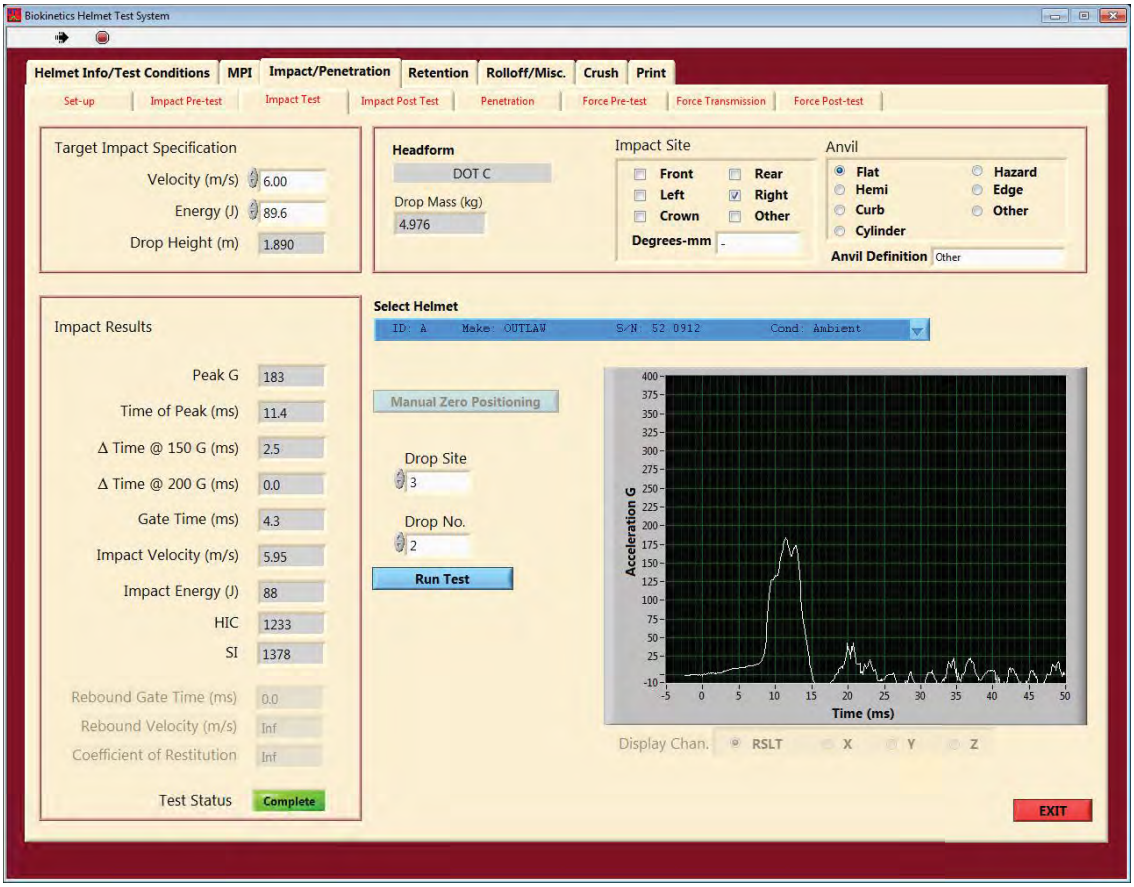
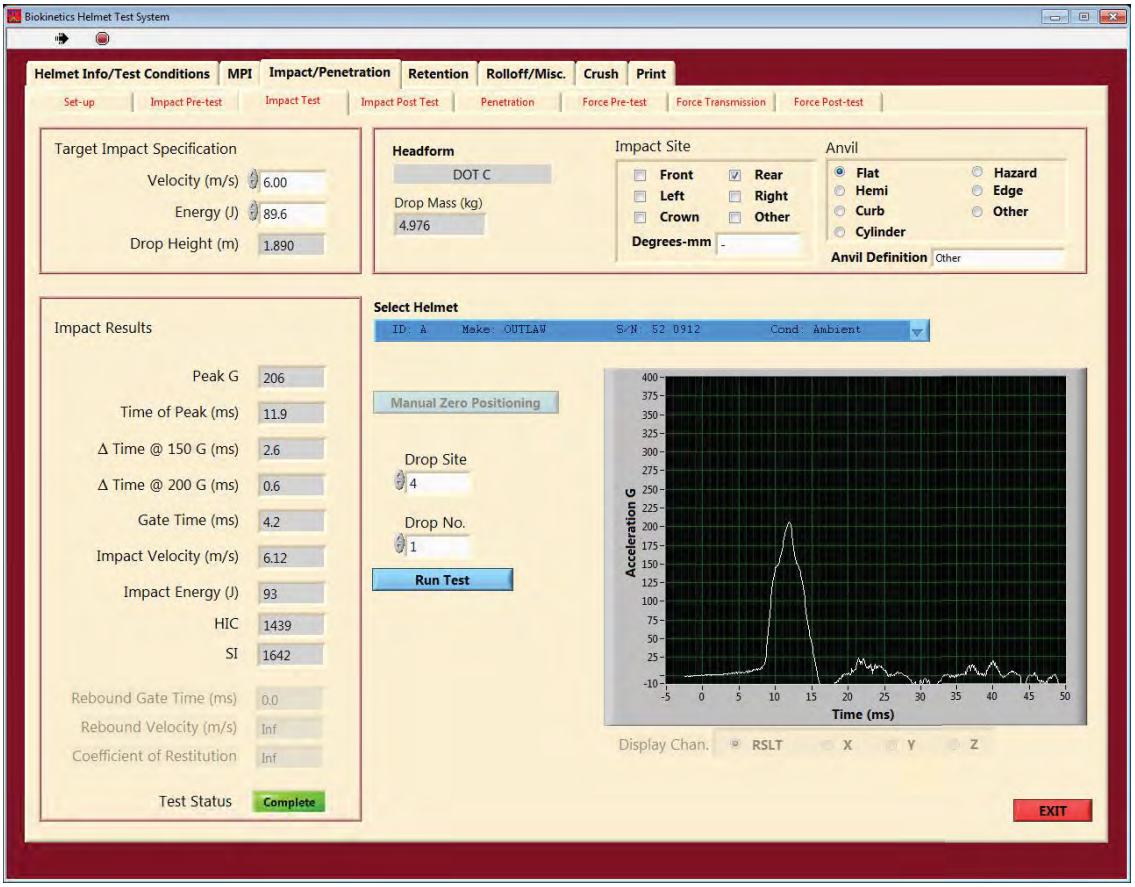
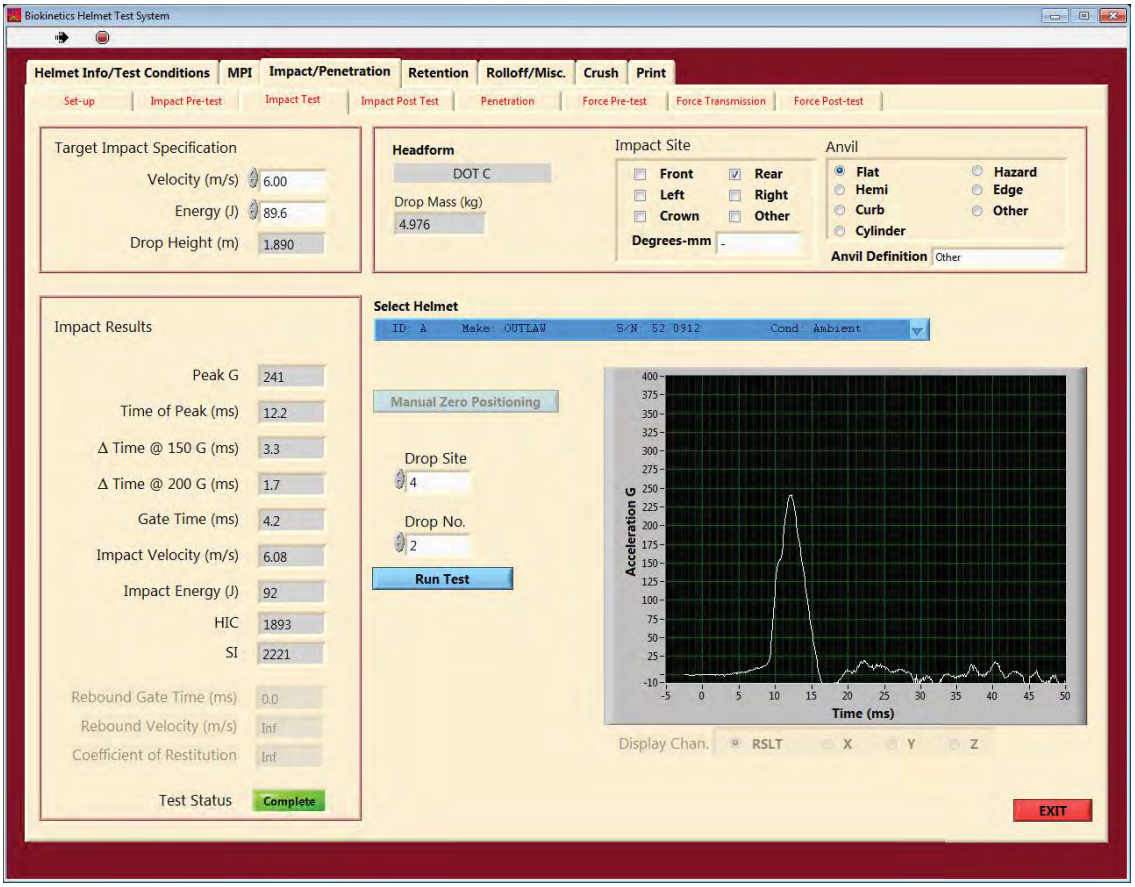
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 124
Time of Peak (ms) 17.6
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.21
Impact Energy (J) 68
HIC 556
SI 614
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: A Make: OUTLAW S/N: 52 0912 Cond: Ambient
Manual Zero Positioning
Drop Site 2
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

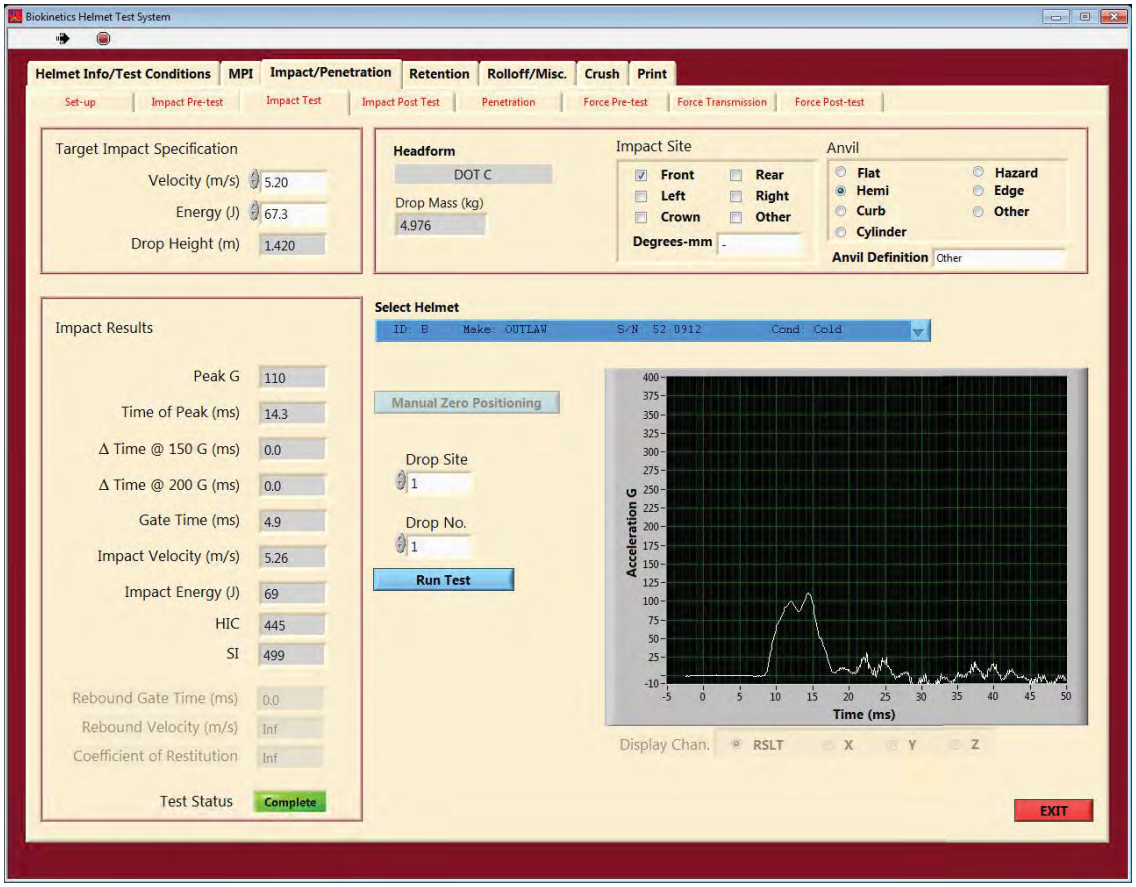

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 150
Time of Peak (ms) 17.4
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.24
Impact Energy (J) 68
HIC 653
SI 762
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: A Make: OUTLAW S/N: 52 0912 Cond: Ambient
Manual Zero Positioning
Drop Site 2
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

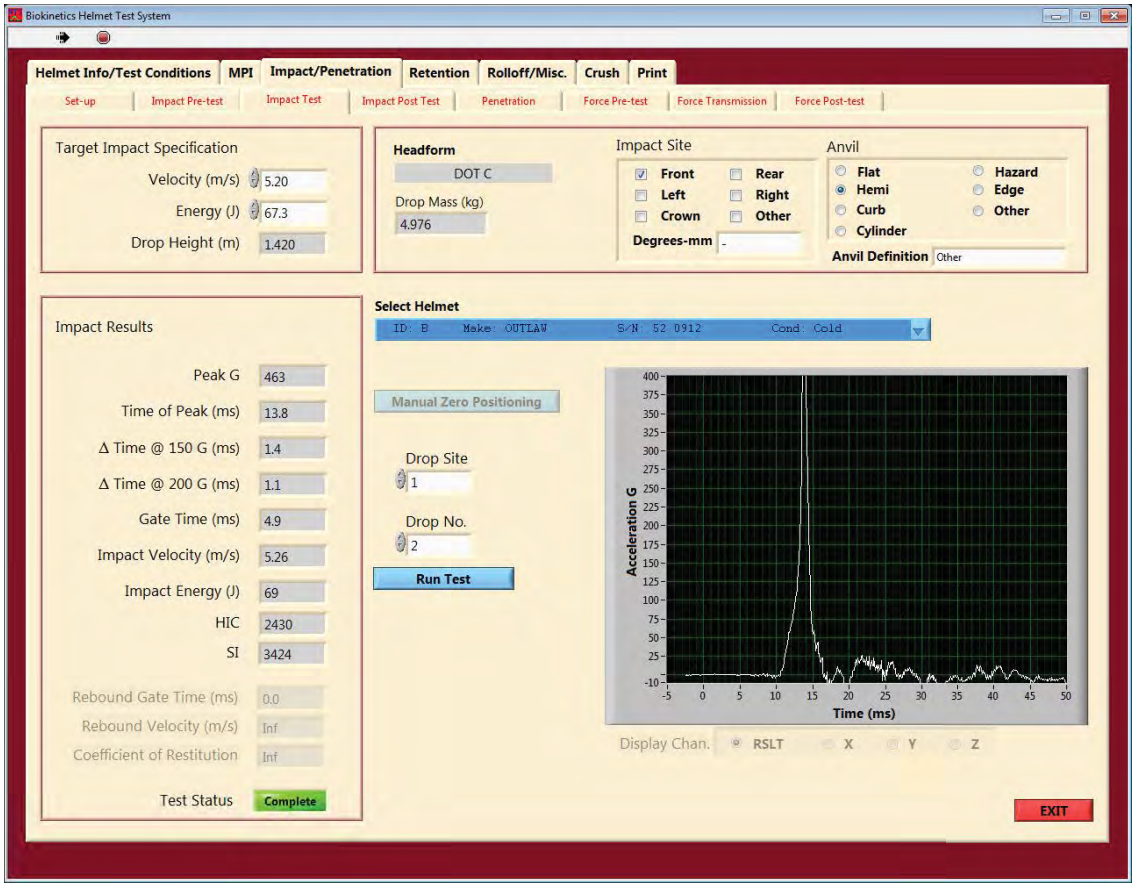

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 208
Time of Peak (ms) 11.3
Δ Time @ 150 G (ms) 1.5
Δ Time @ 200 G (ms) 0.5
Gate Time (ms) 4.3
Impact Velocity (m/s) 5.94
Impact Energy (J) 88
HIC 1401
SI 1559
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: A Make: OUTLAW S/N: 52 0912 Cond: Ambient
Manual Zero Positioning
Drop Site 3
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

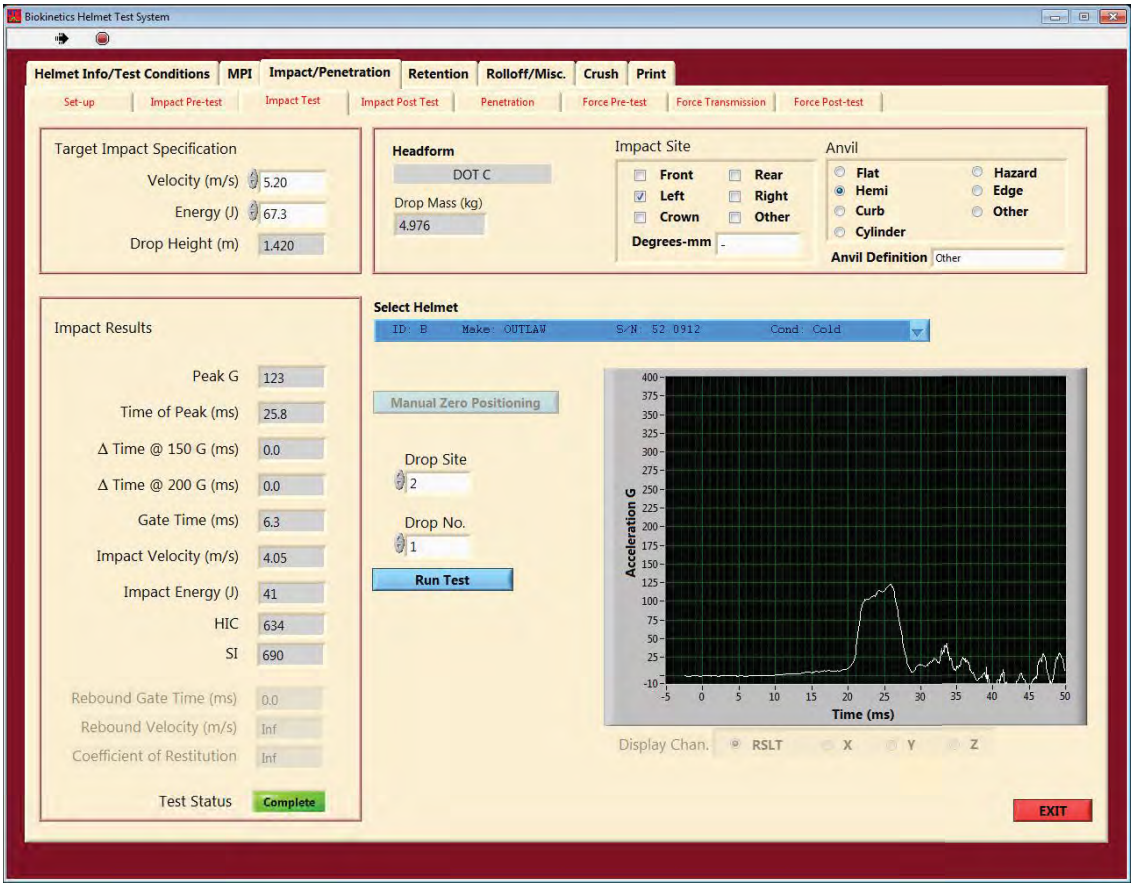

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 183
Time of Peak (ms) 11.4
Δ Time @ 150 G (ms) 2.5
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.3
Impact Velocity (m/s) 5.95
Impact Energy (J) 88
HIC 1233
SI 1378
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: A Make: OUTLAW S/N: 52 0912 Cond: Ambient
Manual Zero Positioning
Drop Site 3
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

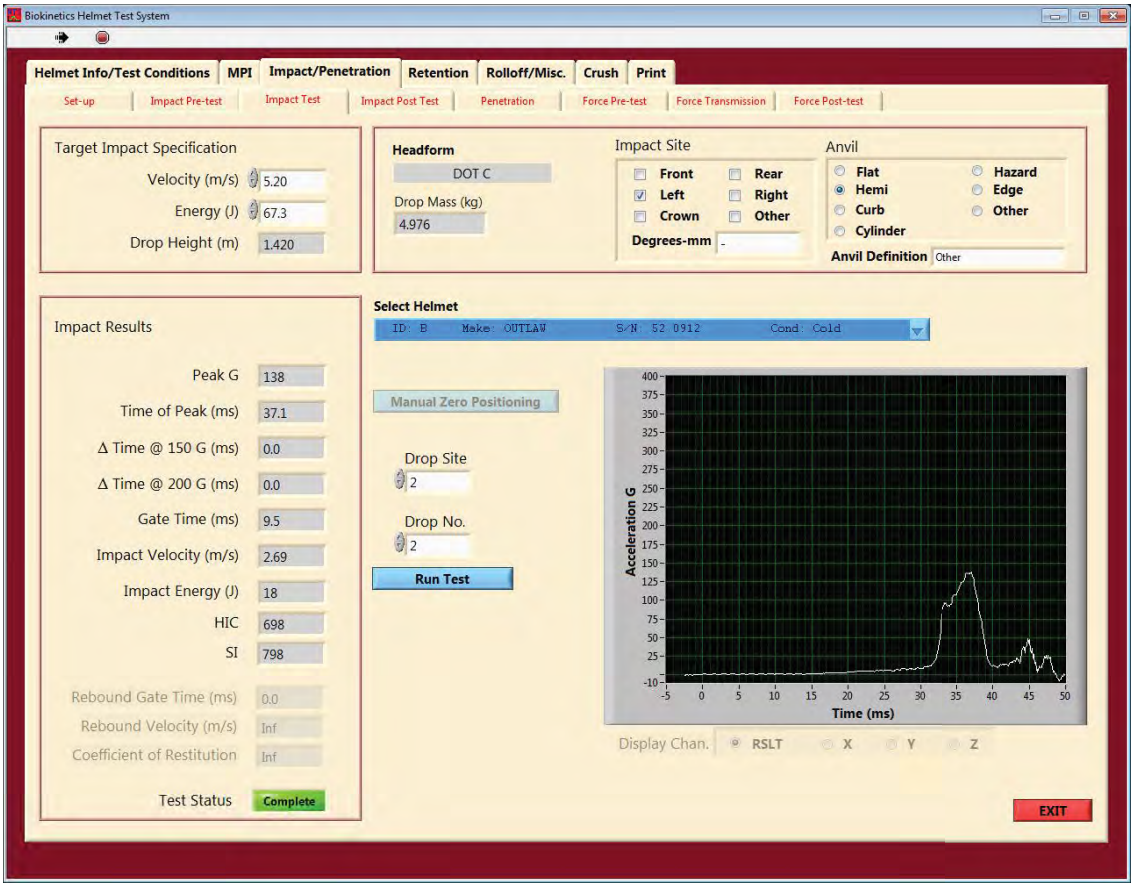

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 206
Time of Peak (ms) 11.9
Δ Time @ 150 G (ms) 2.6
Δ Time @ 200 G (ms) 0.6
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.12
Impact Energy (J) 93
HIC 1439
SI 1642
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: A Make: OUTLAW S/N: 52 0912 Cond: Ambient
Manual Zero Positioning
Drop Site 4
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

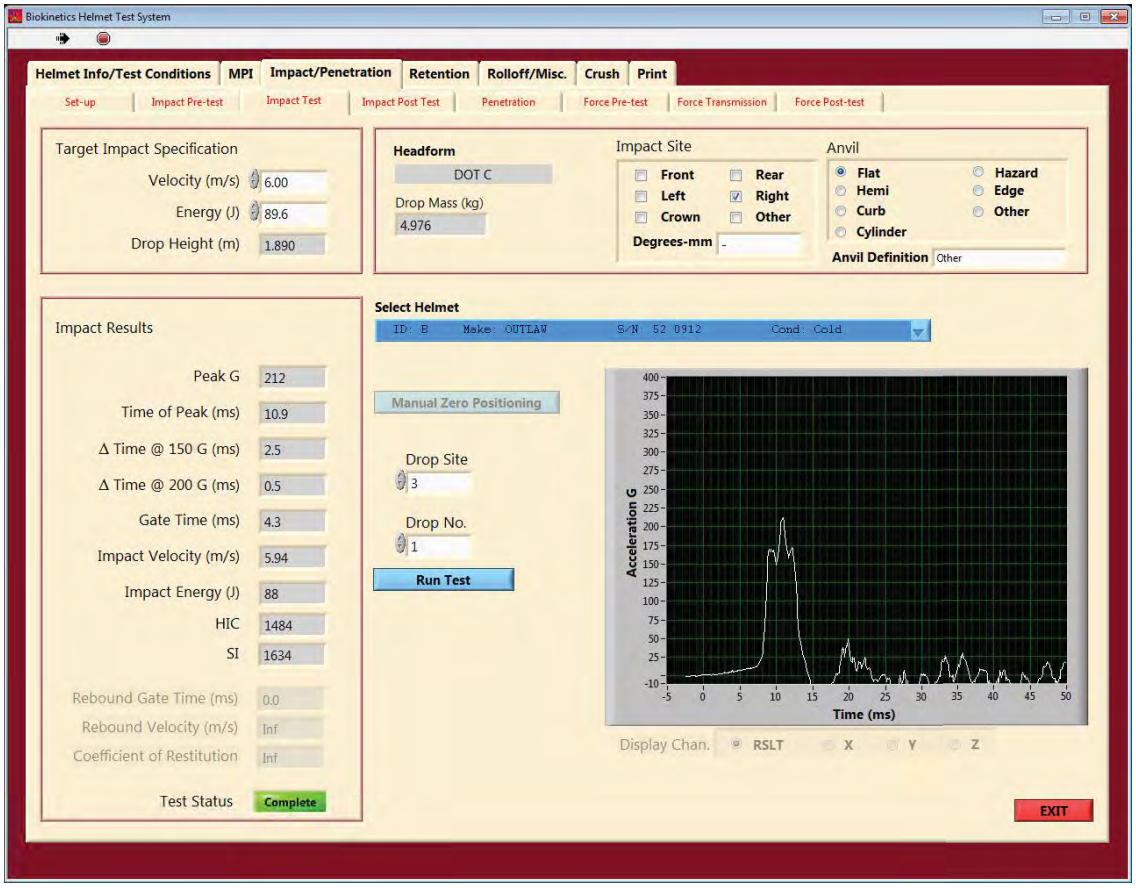

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 241
Time of Peak (ms) 12.2
Δ Time @ 150 G (ms) 3.3
Δ Time @ 200 G (ms) 1.7
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.08
Impact Energy (J) 92
HIC 1893
SI 2221
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: A Make: OUTLAW S/N: 52 0912 Cond: Ambient
Manual Zero Positioning
Drop Site 4
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

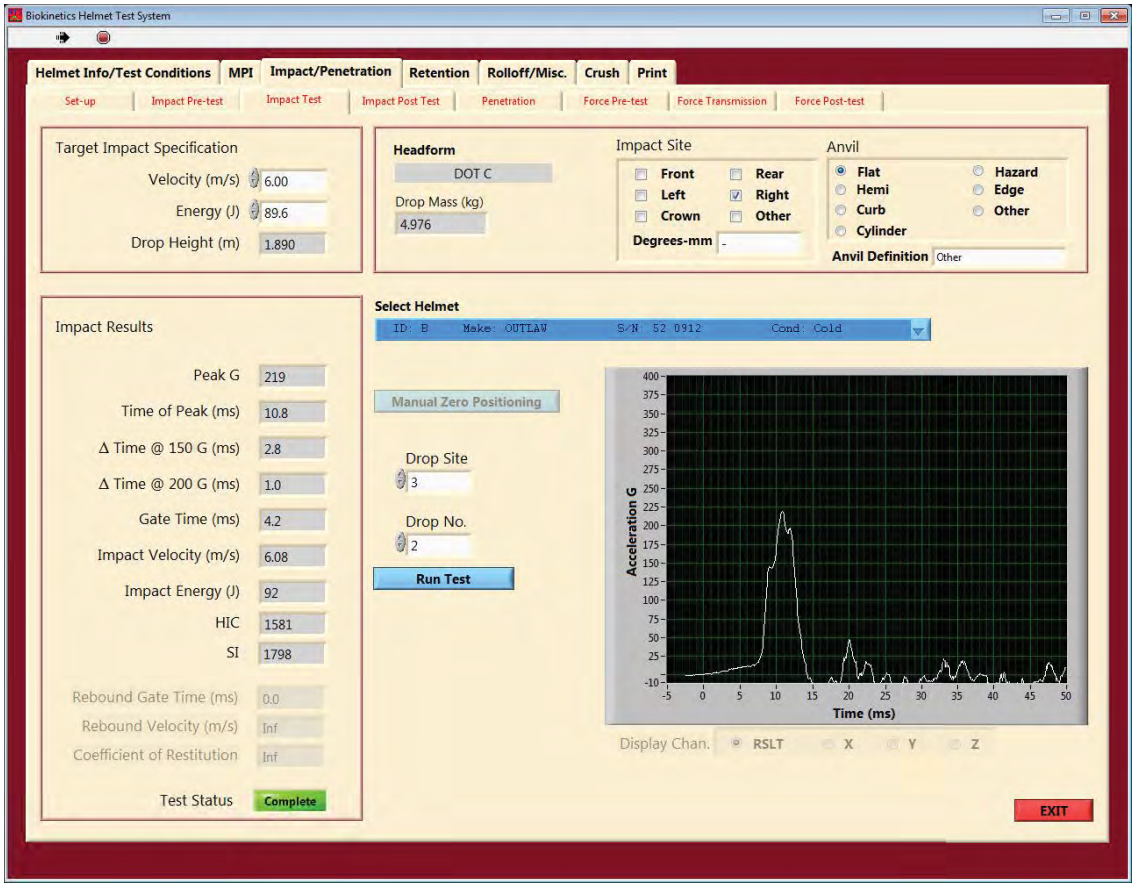

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 110
Time of Peak (ms) 14.3
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.26
Impact Energy (J) 69
HIC 445
SI 499
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: B Make: OUTLAW S/N: 52 0912 Cond: Cold
Manual Zero Positioning
Drop Site 1
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

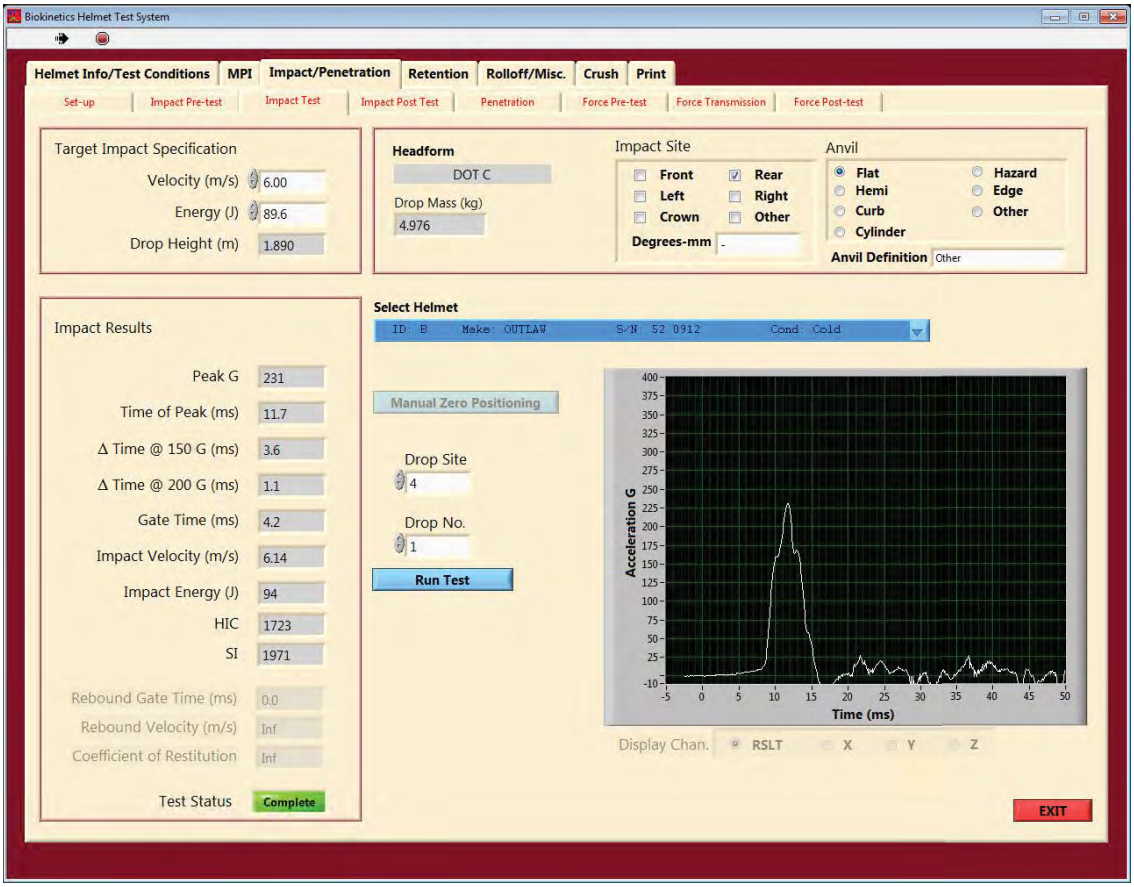

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 463
Time of Peak (ms) 13.8
Δ Time @ 150 G (ms) 1.4
Δ Time @ 200 G (ms) 1.1
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.26
Impact Energy (J) 69
HIC 2430
SI 3424
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: B Make: OUTLAW S/N: 52 0912 Cond: Cold
Manual Zero Positioning
Drop Site 1
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

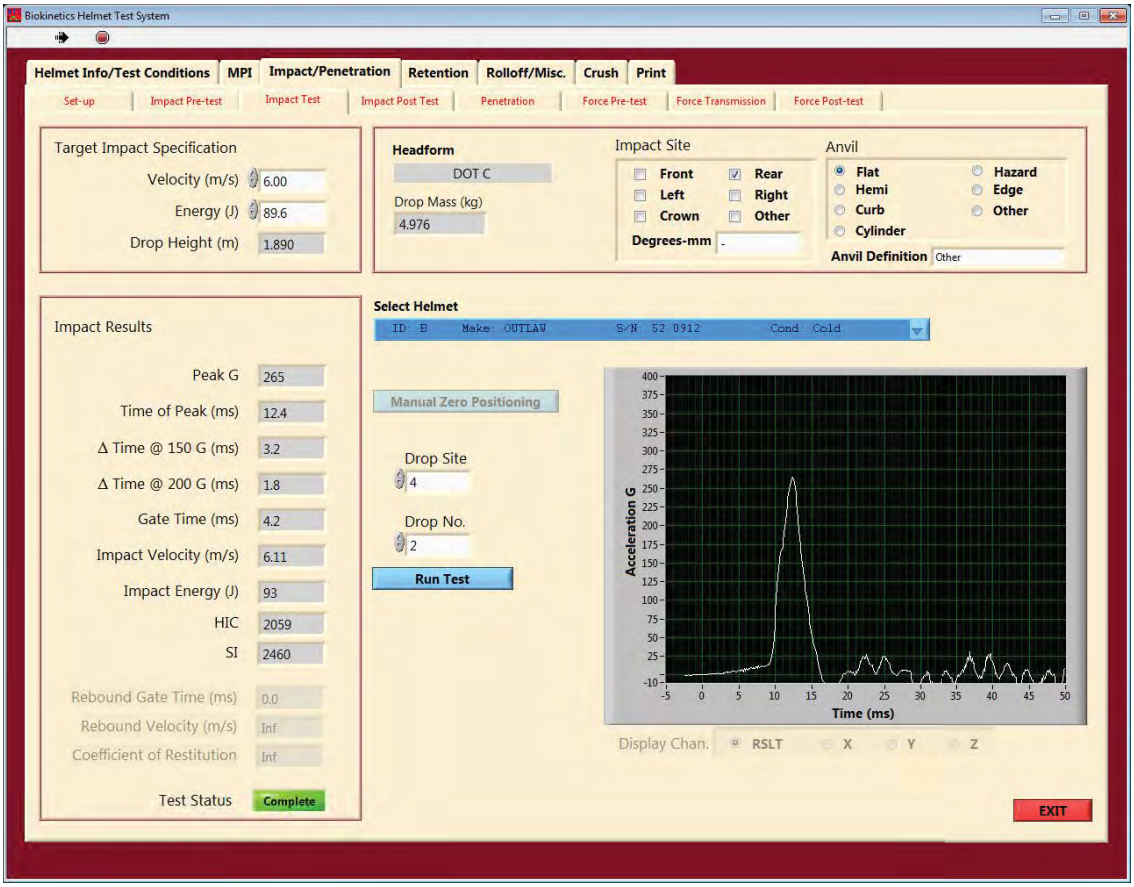

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 123
Time of Peak (ms) 25.8
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 6.3
Impact Velocity (m/s) 4.05
Impact Energy (J) 41
HIC 634
SI 690
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: B Make: OUTLAW S/N: 52 0912 Cond: Cold
Manual Zero Positioning
Drop Site 2
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

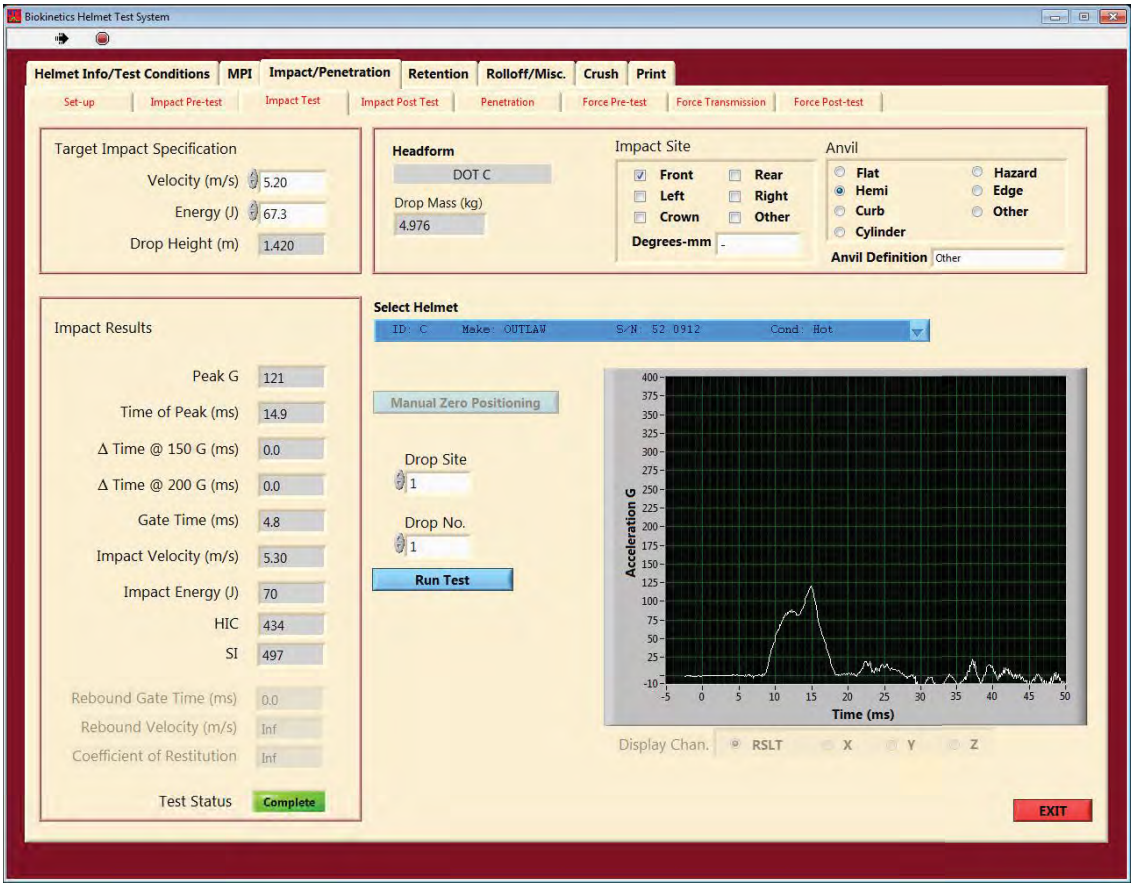

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 138
Time of Peak (ms) 37.1
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 9.5
Impact Velocity (m/s) 2.69
Impact Energy (J) 18
HIC 698
SI 798
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: B Make: OUTLAW S/N: 52 0912 Cond: Cold
Manual Zero Positioning
Drop Site 2
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

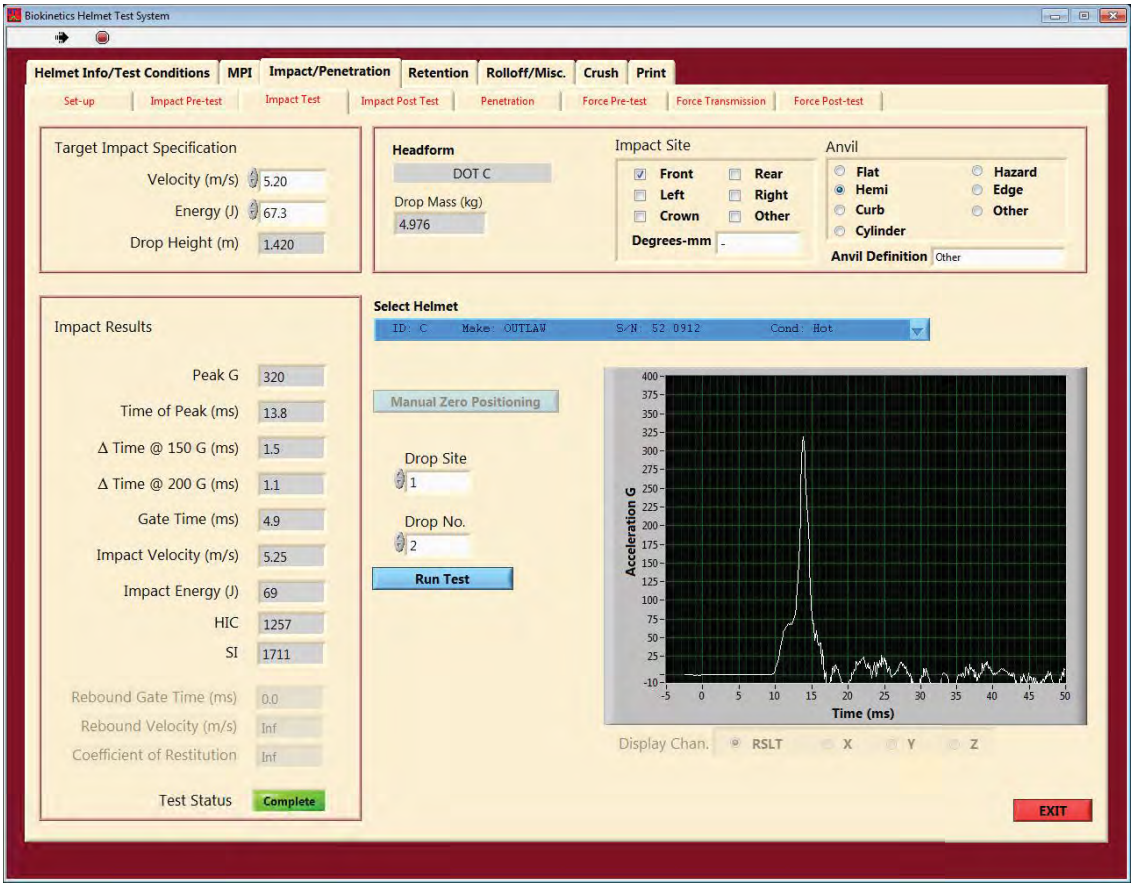

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 212
Time of Peak (ms) 10.9
Δ Time @ 150 G (ms) 2.5
Δ Time @ 200 G (ms) 0.5
Gate Time (ms) 4.3
Impact Velocity (m/s) 5.94
Impact Energy (J) 88
HIC 1484
SI 1634
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: B Make: OUTLAW S/N: 52 0912 Cond: Cold
Manual Zero Positioning
Drop Site 3
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

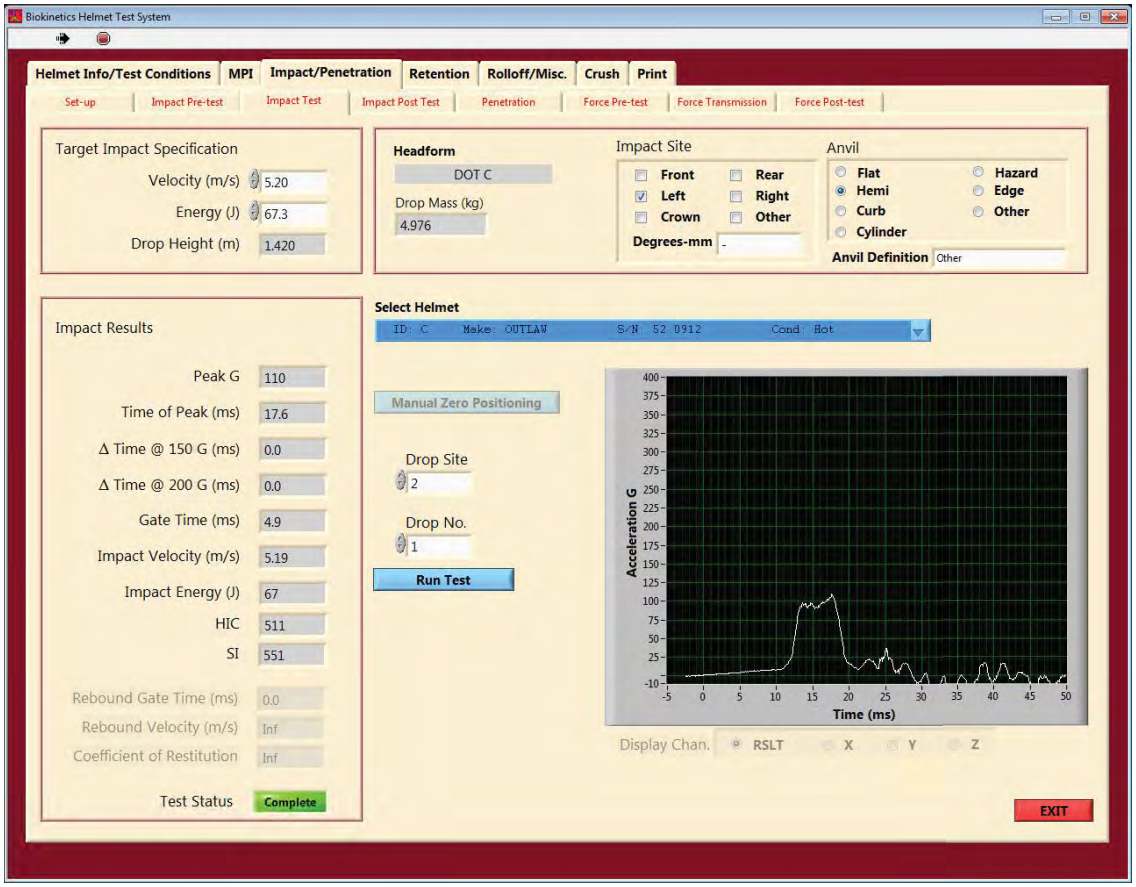

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 219
Time of Peak (ms) 10.8
Δ Time @ 150 G (ms) 2.8
Δ Time @ 200 G (ms) 1.0
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.08
Impact Energy (J) 92
HIC 1581
SI 1798
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: B Make: OUTLAW S/N: 52 0912 Cond: Cold
Manual Zero Positioning
Drop Site 3
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

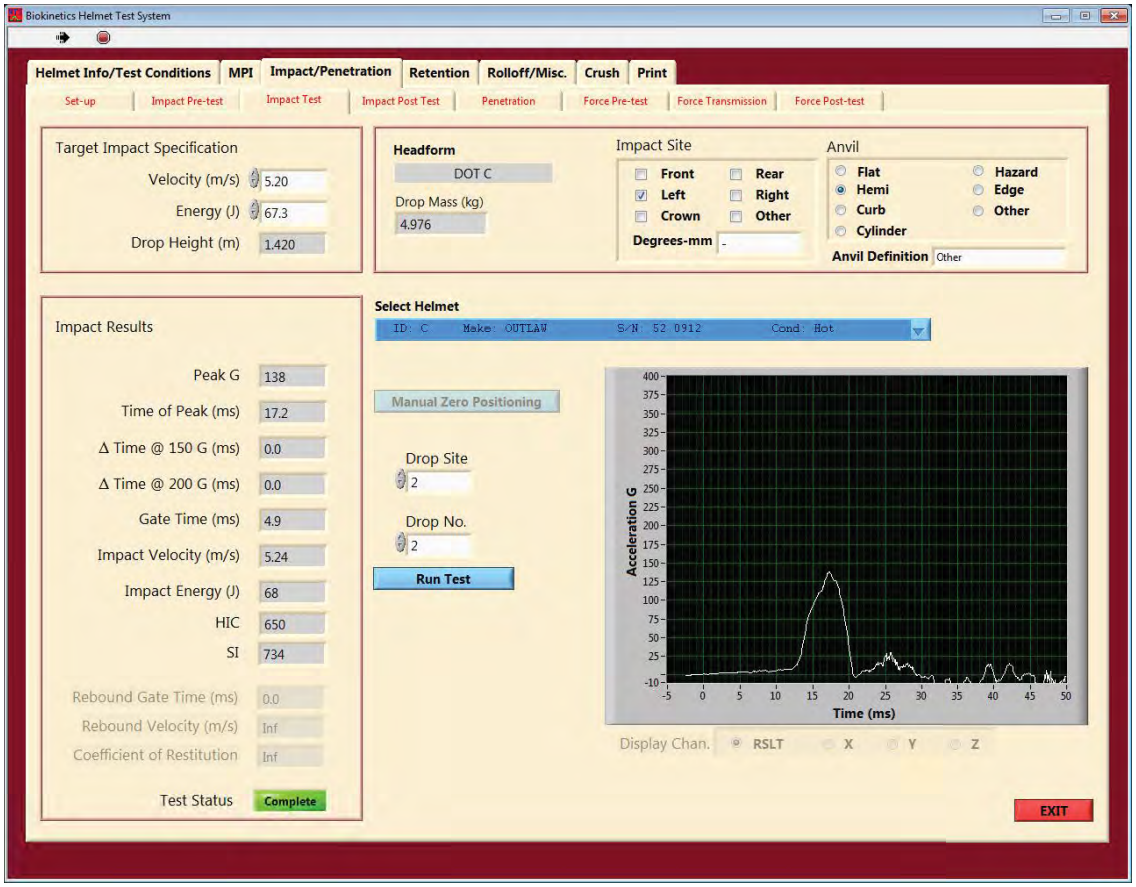

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 231
Time of Peak (ms) 11.7
Δ Time @ 150 G (ms) 3.6
Δ Time @ 200 G (ms) 1.1
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.14
Impact Energy (J) 94
HIC 1723
SI 1971
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: B Make: OUTLAW S/N: 52 0912 Cond: Cold
Manual Zero Positioning
Drop Site 4
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

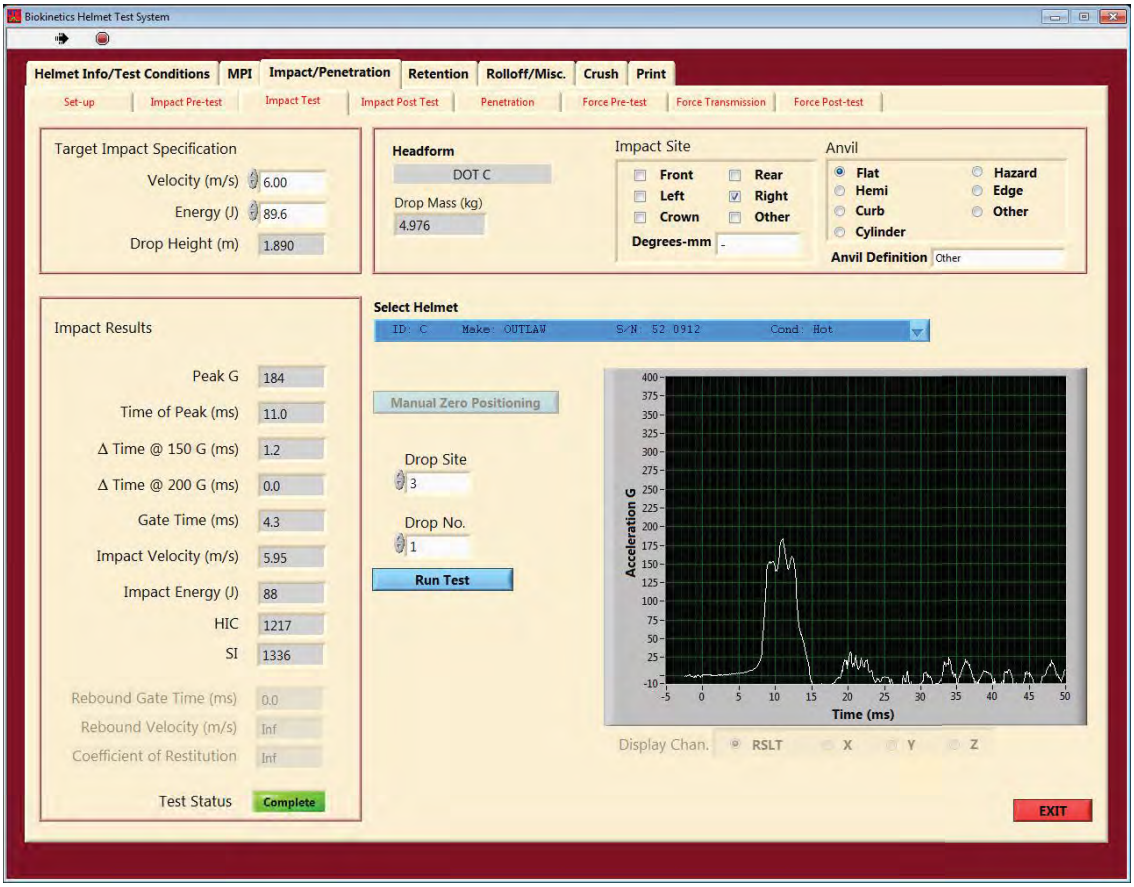

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 265
Time of Peak (ms) 12.4
Δ Time @ 150 G (ms) 3.2
Δ Time @ 200 G (ms) 1.8
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.11
Impact Energy (J) 93
HIC 2059
SI 2460
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: B Make: OUTLAW S/N: 52 0912 Cond: Cold
Manual Zero Positioning
Drop Site 4
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

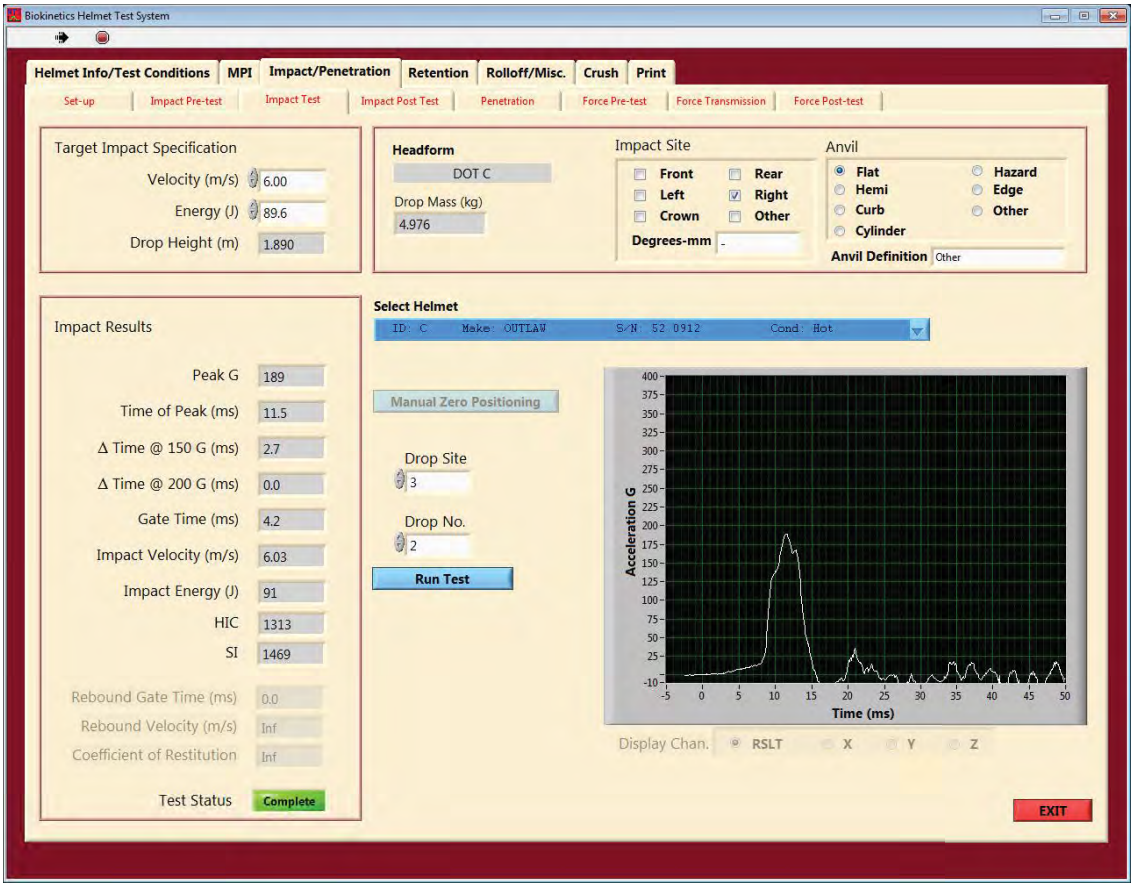

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 121
Time of Peak (ms) 14.9
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.8
Impact Velocity (m/s) 5.30
Impact Energy (J) 70
HIC 434
SI 497
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: C Make: OUTLAW S/N: 52 0912 Cond: Hot
Manual Zero Positioning
Drop Site 1
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

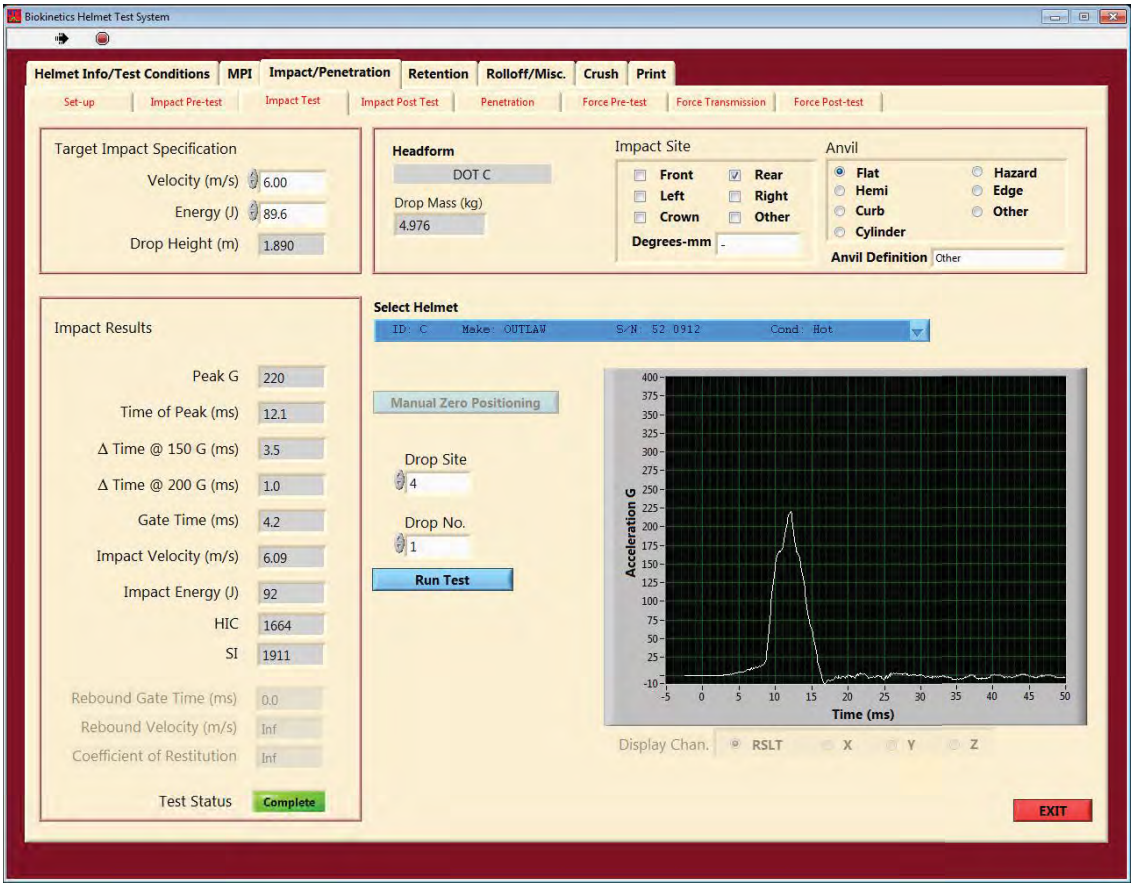

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 320
Time of Peak (ms) 13.8
Δ Time @ 150 G (ms) 1.5
Δ Time @ 200 G (ms) 1.1
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.25
Impact Energy (J) 69
HIC 1257
SI 1711
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: C Make: OUTLAW S/N: 52 0912 Cond: Hot
Manual Zero Positioning
Drop Site 1
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

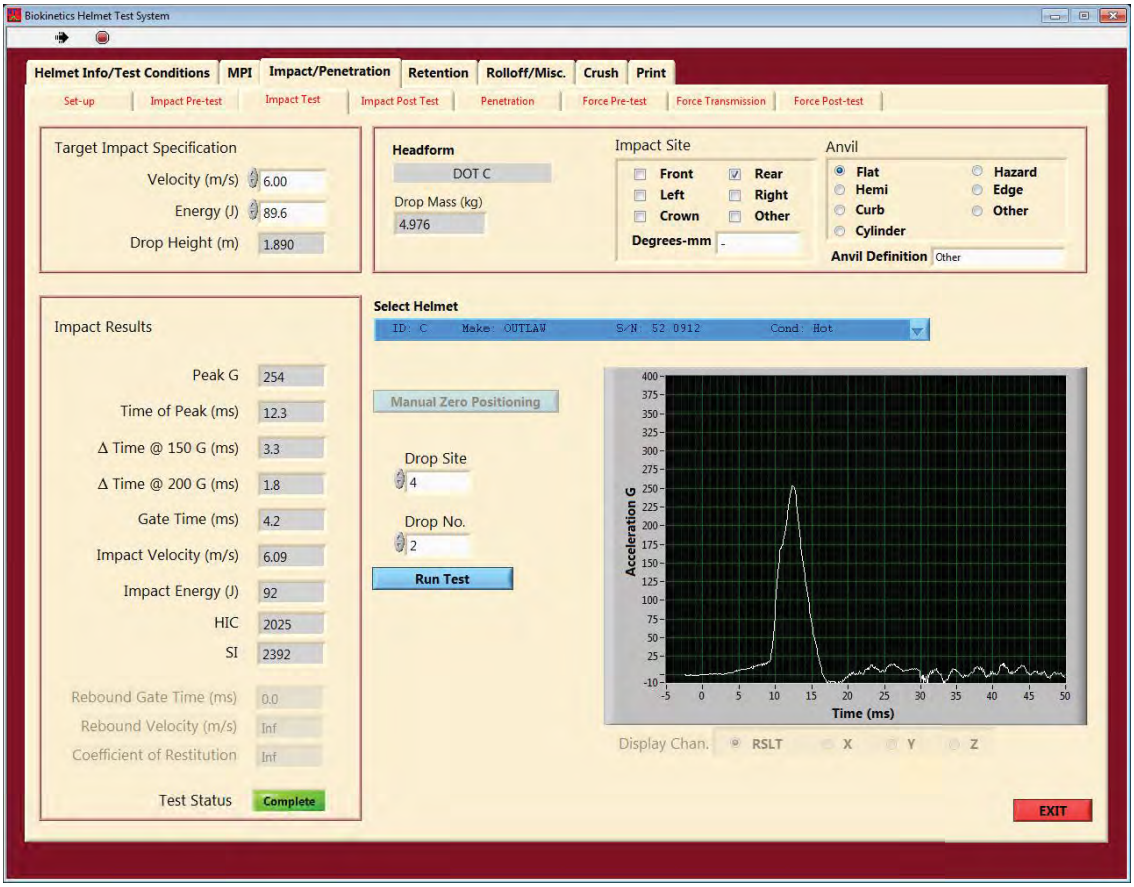

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 110
Time of Peak (ms) 17.6
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.19
Impact Energy (J) 67
HIC 511
SI 551
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: C Make: OUTLAW S/N: 52 0912 Cond: Hot
Manual Zero Positioning
Drop Site 2
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

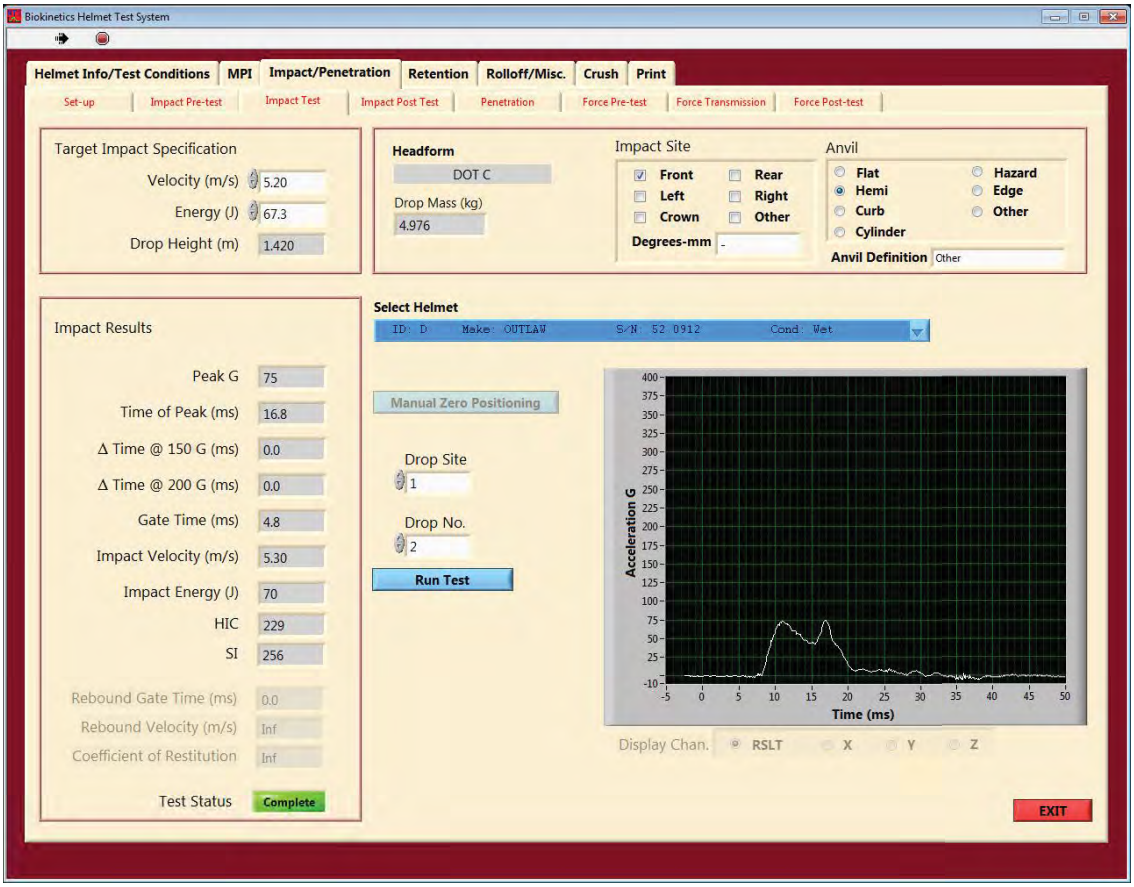

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 138
Time of Peak (ms) 17.2
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.24
Impact Energy (J) 68
HIC 650
SI 734
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: C Make: OUTLAW S/N: 52 0912 Cond: Hot
Manual Zero Positioning
Drop Site 2
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

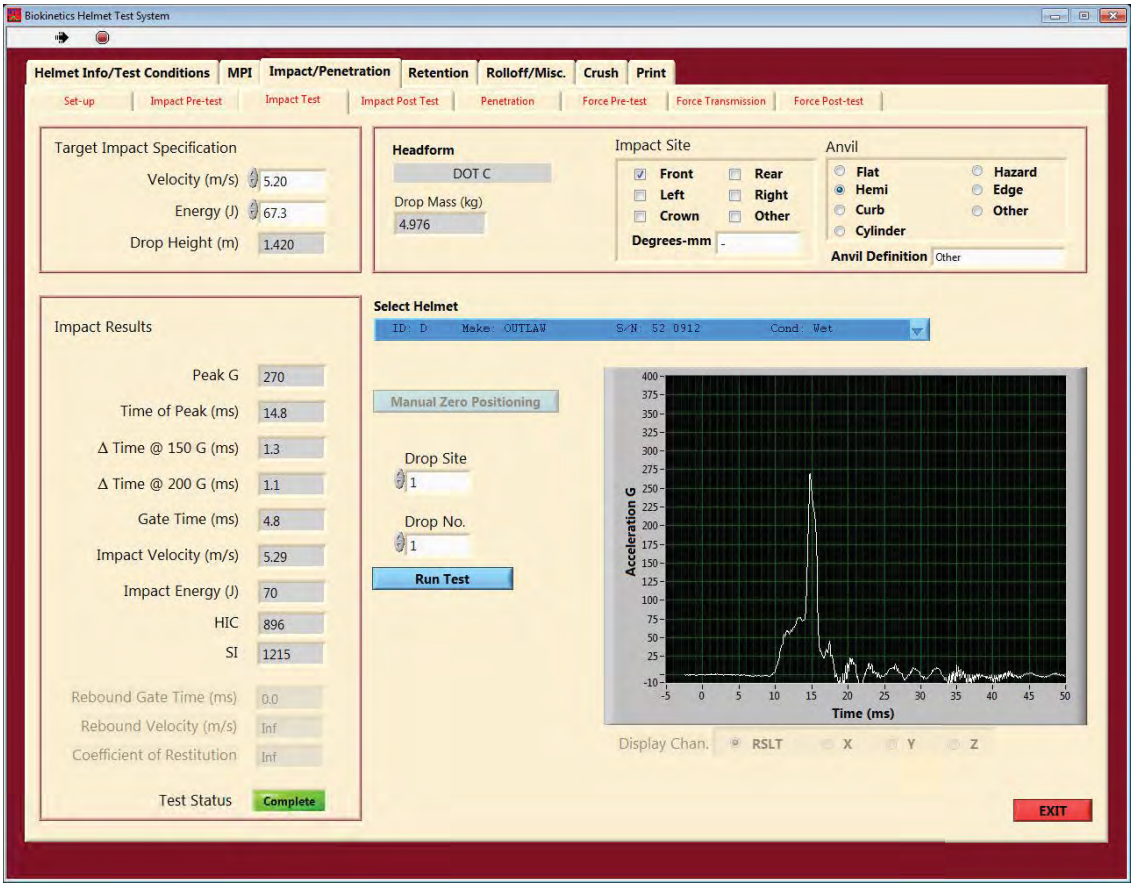

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 184
Time of Peak (ms) 11.0
Δ Time @ 150 G (ms) 1.2
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.3
Impact Velocity (m/s) 5.95
Impact Energy (J) 88
HIC 1217
SI 1336
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: C Make: OUTLAW S/N: 52 0912 Cond: Hot
Manual Zero Positioning
Drop Site 3
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

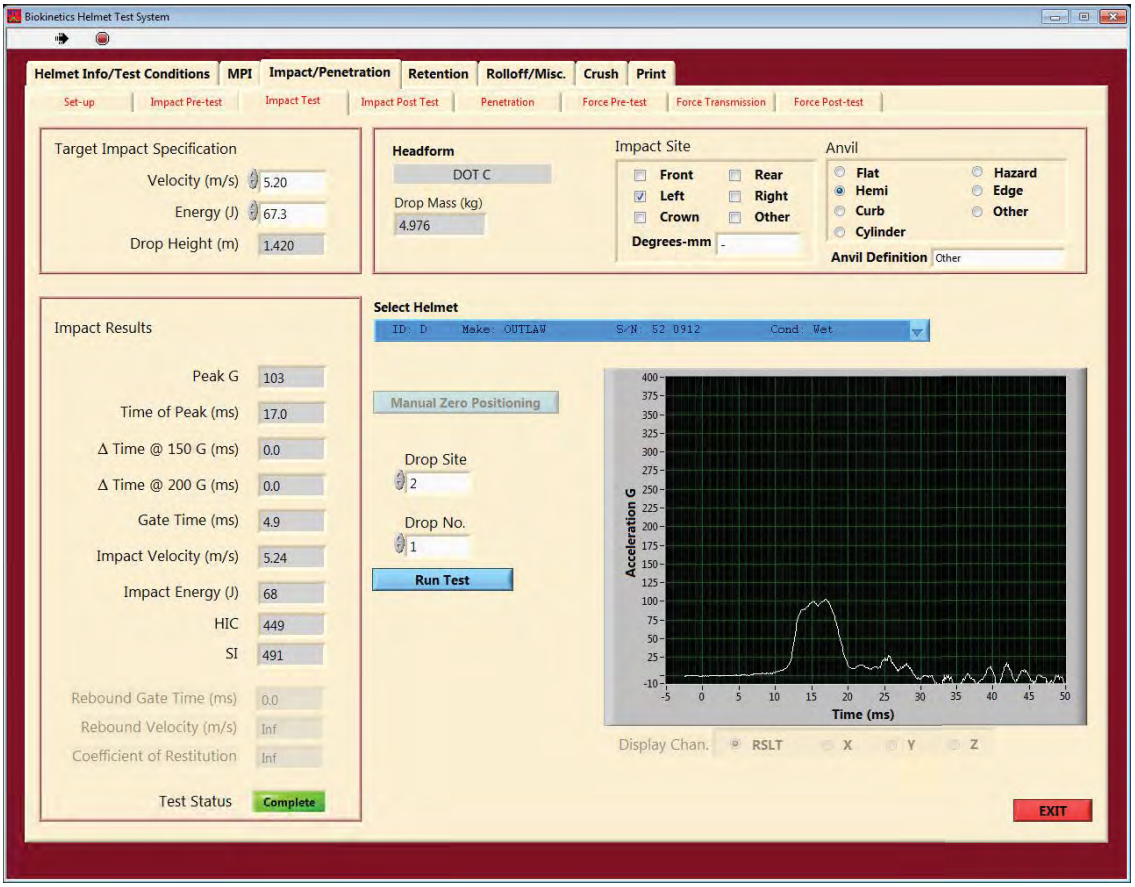

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 189
Time of Peak (ms) 11.5
Δ Time @ 150 G (ms) 2.7
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.03
Impact Energy (J) 91
HIC 1313
SI 1469
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: C Make: OUTLAW S/N: 52 0912 Cond: Hot
Manual Zero Positioning
Drop Site 3
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

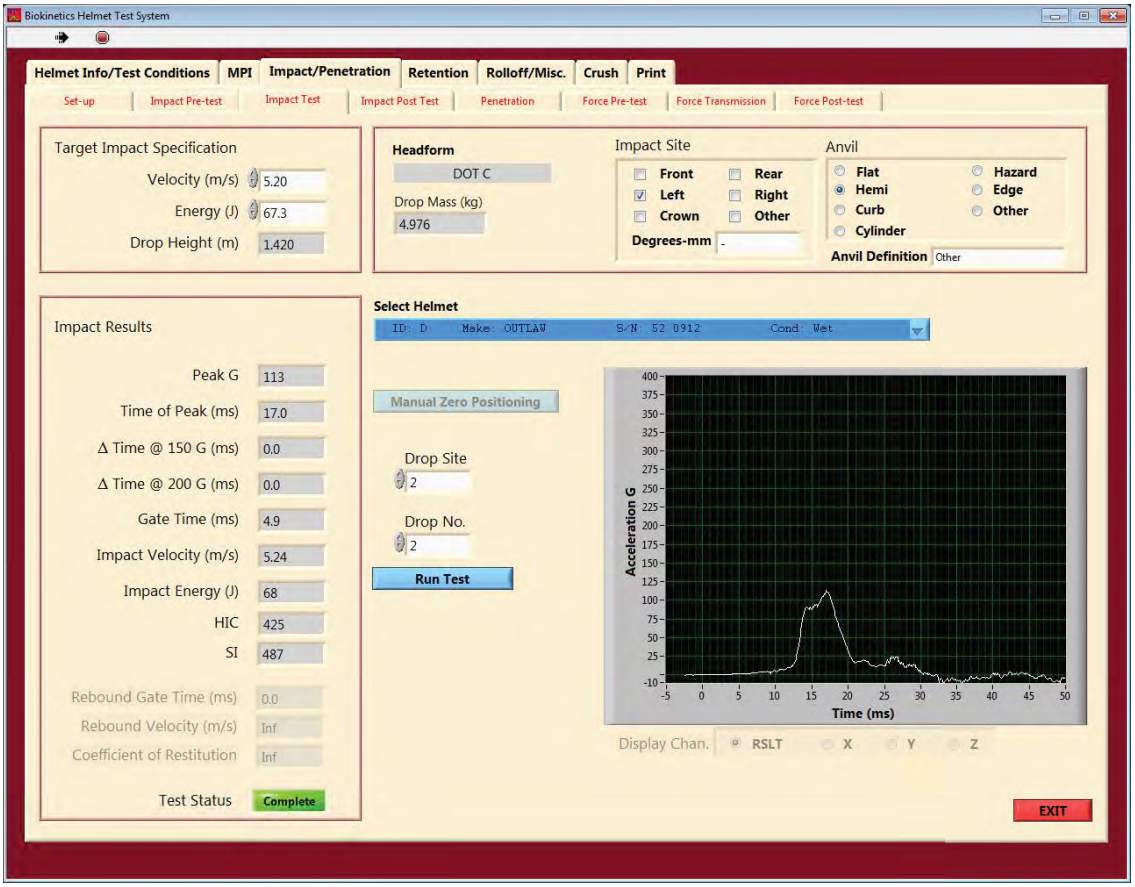

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 220
Time of Peak (ms) 12.1
Δ Time @ 150 G (ms) 3.5
Δ Time @ 200 G (ms) 1.0
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.09
Impact Energy (J) 92
HIC 1664
SI 1911
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: C Make: OUTLAW S/N: 52 0912 Cond: Hot
Manual Zero Positioning
Drop Site 4
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

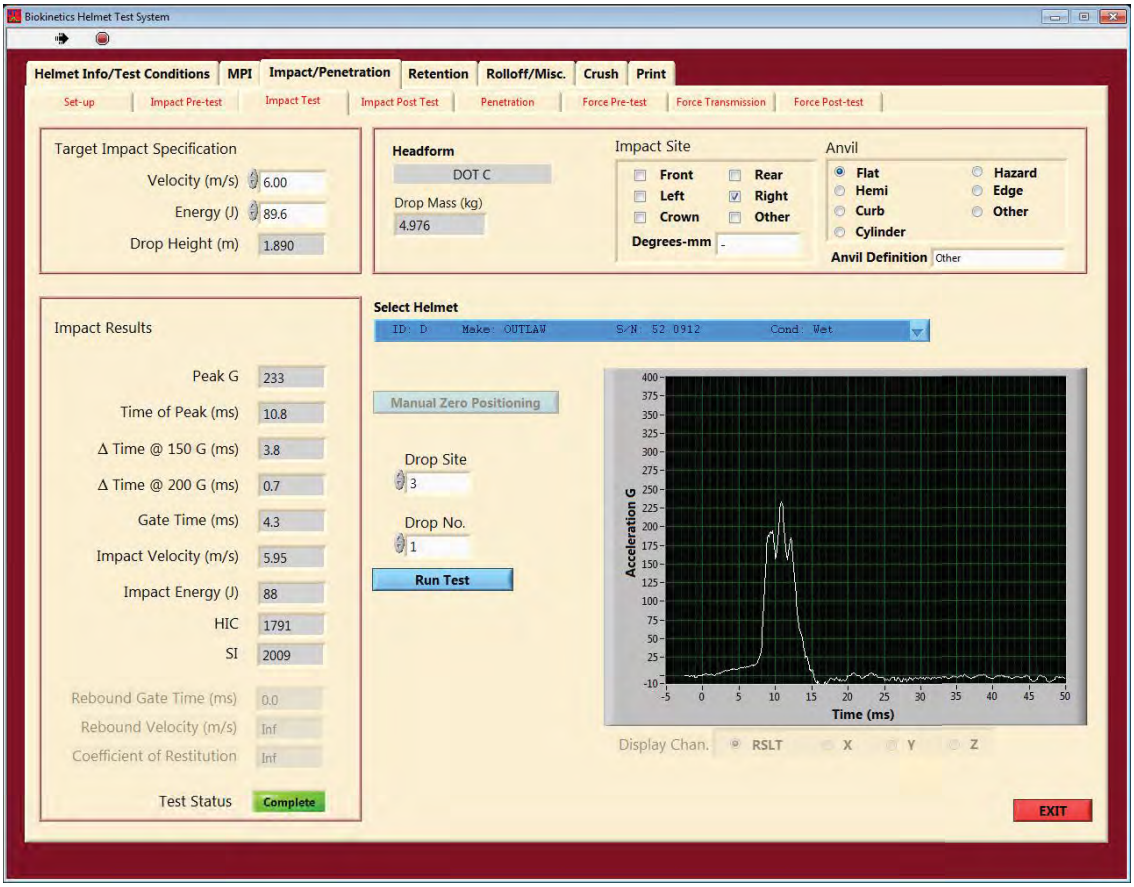

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 254
Time of Peak (ms) 12.3
Δ Time @ 150 G (ms) 3.3
Δ Time @ 200 G (ms) 1.8
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.09
Impact Energy (J) 92
HIC 2025
SI 2392
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: C Make: OUTLAW S/N: 52 0912 Cond: Hot
Manual Zero Positioning
Drop Site 4
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

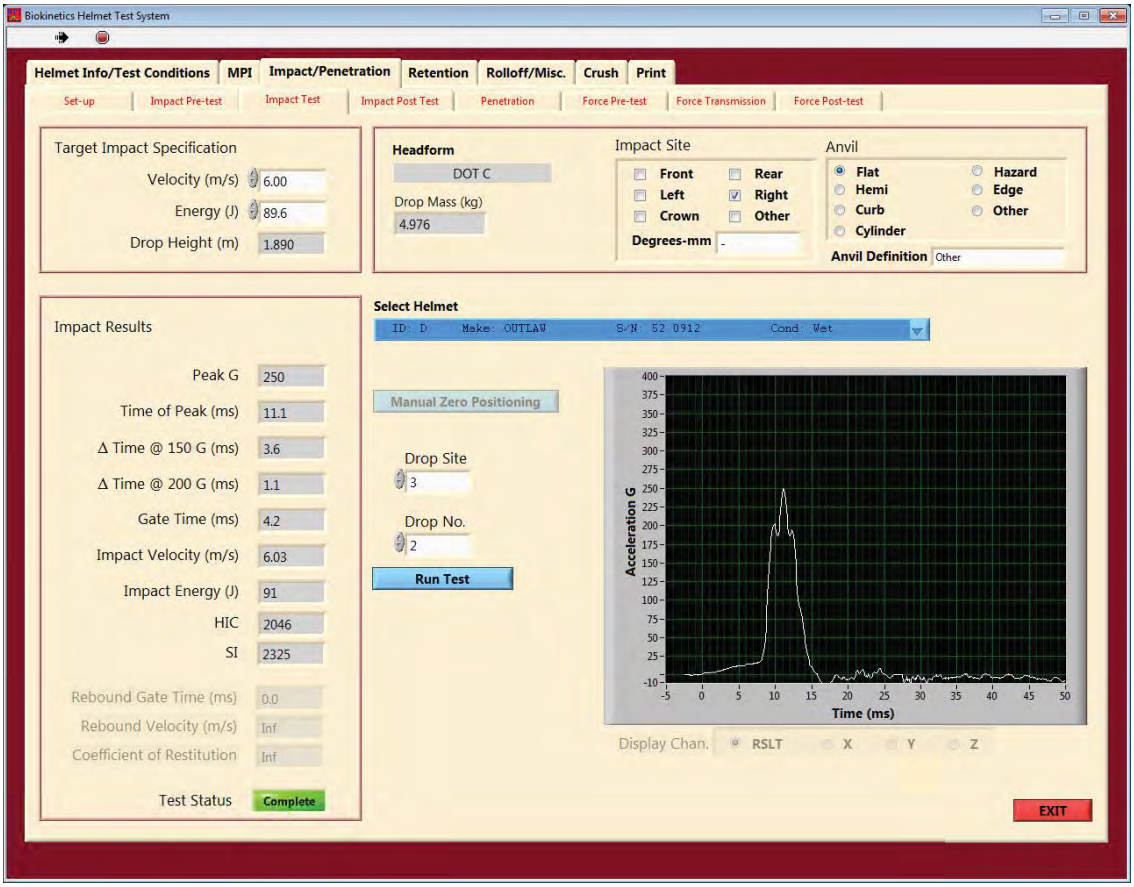

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 75
Time of Peak (ms) 16.8
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.8
Impact Velocity (m/s) 5.30
Impact Energy (J) 70
HIC 229
SI 256
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: D Make: OUTLAW S/N: 52 0912 Cond: Wet
Manual Zero Positioning
Drop Site 1
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

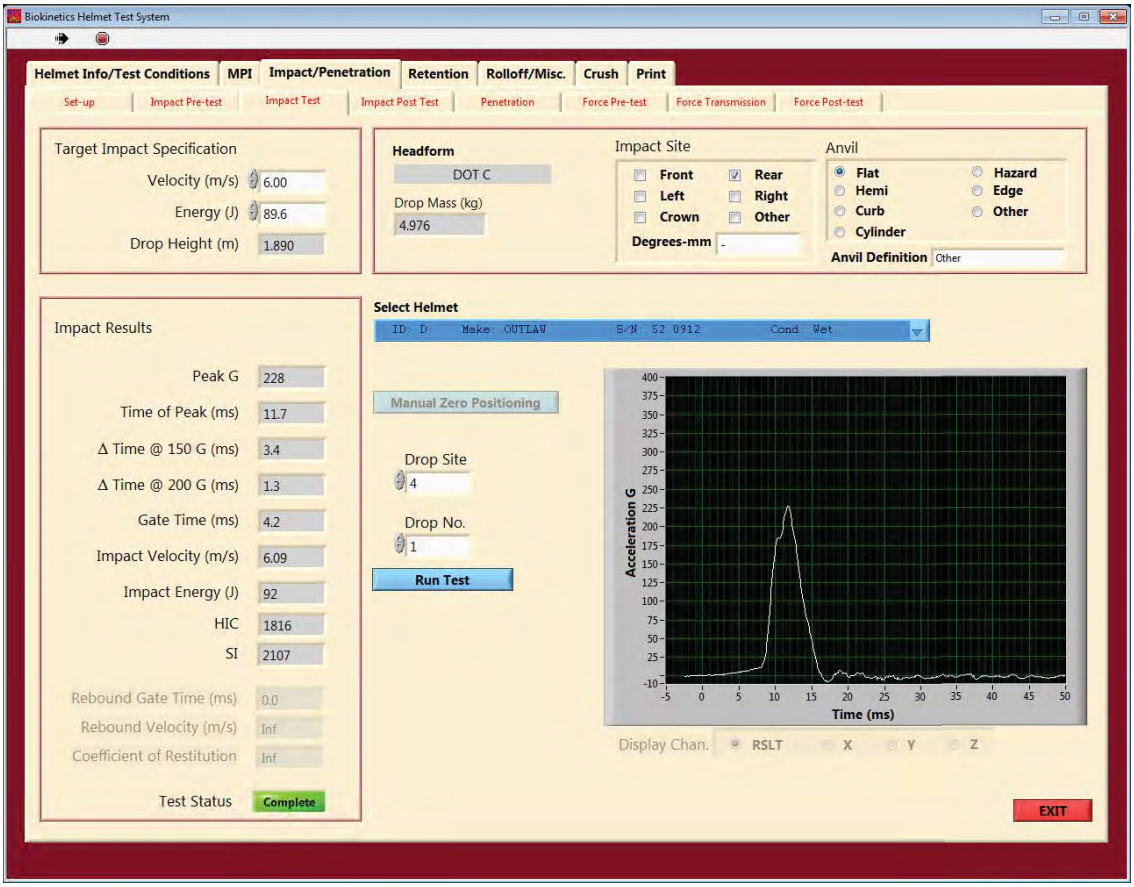

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 270
Time of Peak (ms) 14.8
Δ Time @ 150 G (ms) 1.3
Δ Time @ 200 G (ms) 1.1
Gate Time (ms) 4.8
Impact Velocity (m/s) 5.29
Impact Energy (J) 70
HIC 896
SI 1215
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: D Make: OUTLAW S/N: 52 0912 Cond: Wet
Manual Zero Positioning
Drop Site 1
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

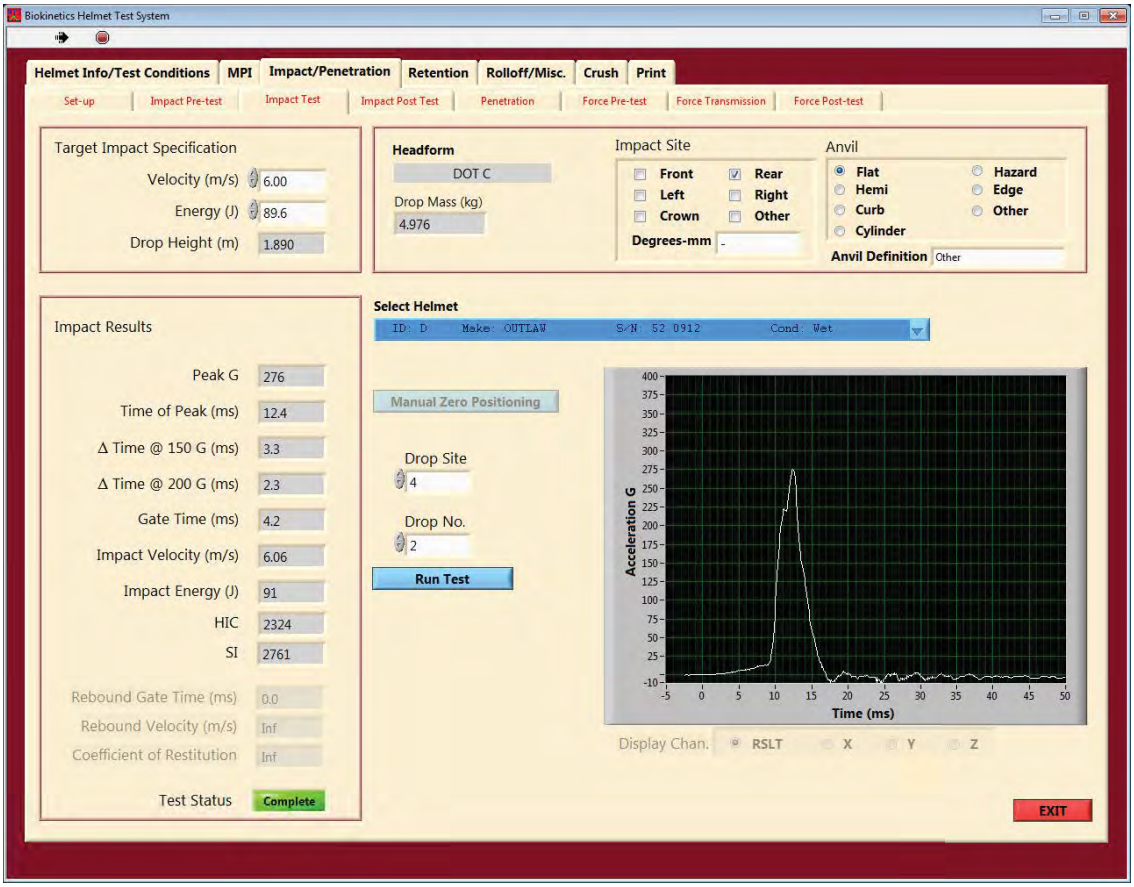

Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 103
Time of Peak (ms) 17.0
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.24
Impact Energy (J) 68
HIC 449
SI 491
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: D Make: OUTLAW S/N: 52 0912 Cond: Wet
Manual Zero Positioning
Drop Site 2
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT


Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 5.20
Energy (J) 67.3
Drop Height (m) 1.420
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition Other
Impact Results
Peak G 113
Time of Peak (ms) 17.0
Δ Time @ 150 G (ms) 0.0
Δ Time @ 200 G (ms) 0.0
Gate Time (ms) 4.9
Impact Velocity (m/s) 5.24
Impact Energy (J) 68
HIC 425
SI 487
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: D Make: OUTLAW S/N: 52 0912 Cond: Wet
Manual Zero Positioning
Drop Site 2
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT


Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 233
Time of Peak (ms) 10.8
Δ Time @ 150 G (ms) 3.8
Δ Time @ 200 G (ms) 0.7
Gate Time (ms) 4.3
Impact Velocity (m/s) 5.95
Impact Energy (J) 88
HIC 1791
SI 2009
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: D Make: OUTLAW S/N: 52 0912 Cond: Wet
Manual Zero Positioning
Drop Site 3
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT


Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 250
Time of Peak (ms) 11.1
Δ Time @ 150 G (ms) 3.6
Δ Time @ 200 G (ms) 1.1
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.03
Impact Energy (J) 91
HIC 2046
SI 2325
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: D Make: OUTLAW S/N: 52 0912 Cond: Wet
Manual Zero Positioning
Drop Site 3
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT


Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 228
Time of Peak (ms) 11.7
Δ Time @ 150 G (ms) 3.4
Δ Time @ 200 G (ms) 1.3
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.09
Impact Energy (J) 92
HIC 1816
SI 2107
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: D Make: OUTLAW S/N: 52 0912 Cond: Wet
Manual Zero Positioning
Drop Site 4
Drop No. 1
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT


Biokinetics Helmet Test System
Helmet Info/Test Conditions
MPI
Impact/Penetration
Retention
Rolloff/Misc.
Crush
Print
Set-up
Impact Pre-test
Impact Test
Impact Post Test
Penetration
Force Pre-test
Force Transmission
Force Post-test
Target Impact Specification
Velocity (m/s) 6.00
Energy (J) 89.6
Drop Height (m) 1.890
Headform
DOT C
Drop Mass (kg)
4.976
Impact Site
Front
Rear
Left
Right
Crown
Other
Degrees-mm
Anvil
Flat
Hazard
Hemi
Edge
Curb
Other
Cylinder
Anvil Definition
Other
Impact Results
Peak G 276
Time of Peak (ms) 12.4
Δ Time @ 150 G (ms) 3.3
Δ Time @ 200 G (ms) 2.3
Gate Time (ms) 4.2
Impact Velocity (m/s) 6.06
Impact Energy (J) 91
HIC 2324
SI 2761
Rebound Gate Time (ms) 0.0
Rebound Velocity (m/s) Inf
Coefficient of Restitution Inf
Test Status Complete
Select Helmet
ID: D Make: OUTLAW S/N: 52 0912 Cond: Wet
Manual Zero Positioning
Drop Site 4
Drop No. 2
Run Test
Acceleration G
Time (ms)
Display Chan. RSLT X Y Z
EXIT

ACT DOT Strap Retention Acquistion
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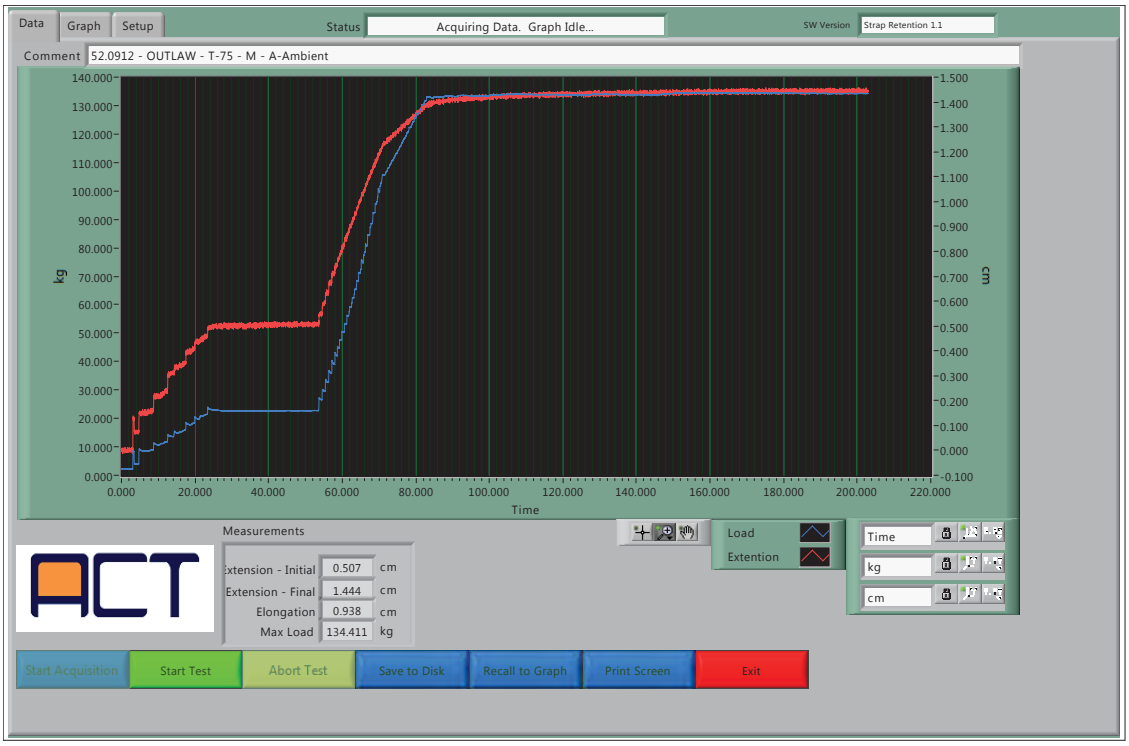
Last modified on 10/1/2017 at 4:36 PM
Printed on 5/25/2018 at 12:18 PM






ACT DOT Strap Retention Acquistion
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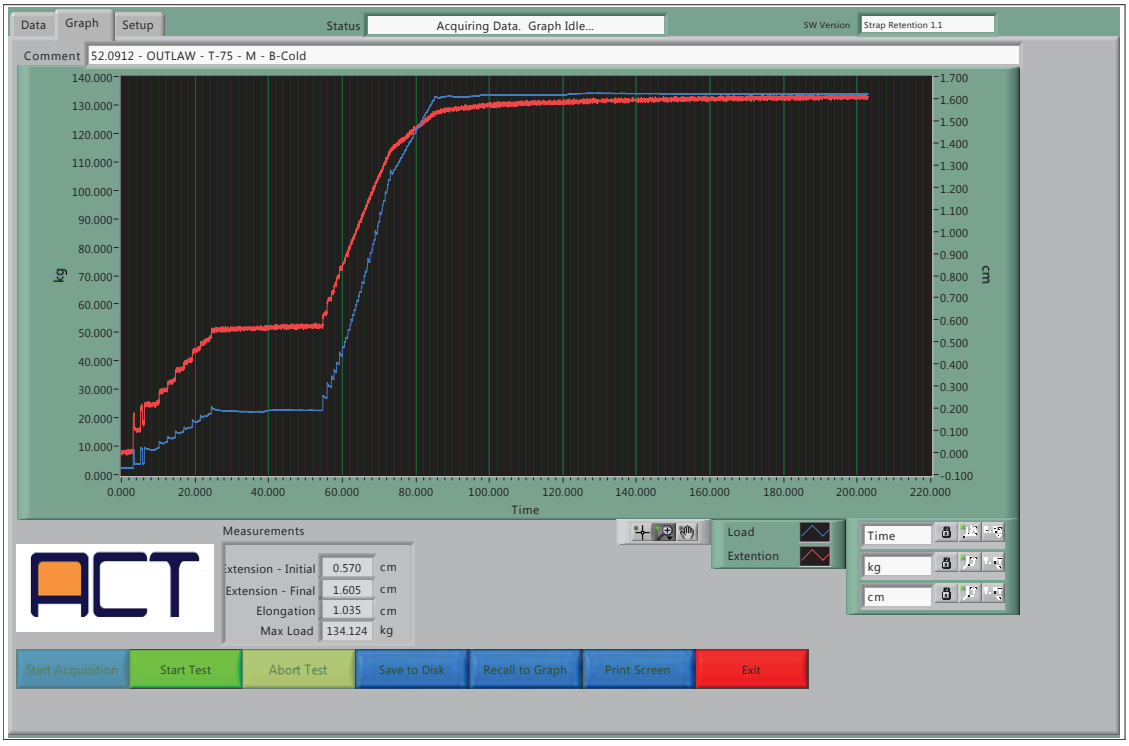
Last modified on 10/1/2017 at 4:36 PM
Printed on 5/25/2018 at 12:24 PM



ACT DOT Strap Retention Acquistion
C:\DAQ\DAQ_ADMIN\Strap Retention\Strap_Retention.exe\Strap Retention - Main.vi
Last modified on 10/1/2017 at 4:36 PM
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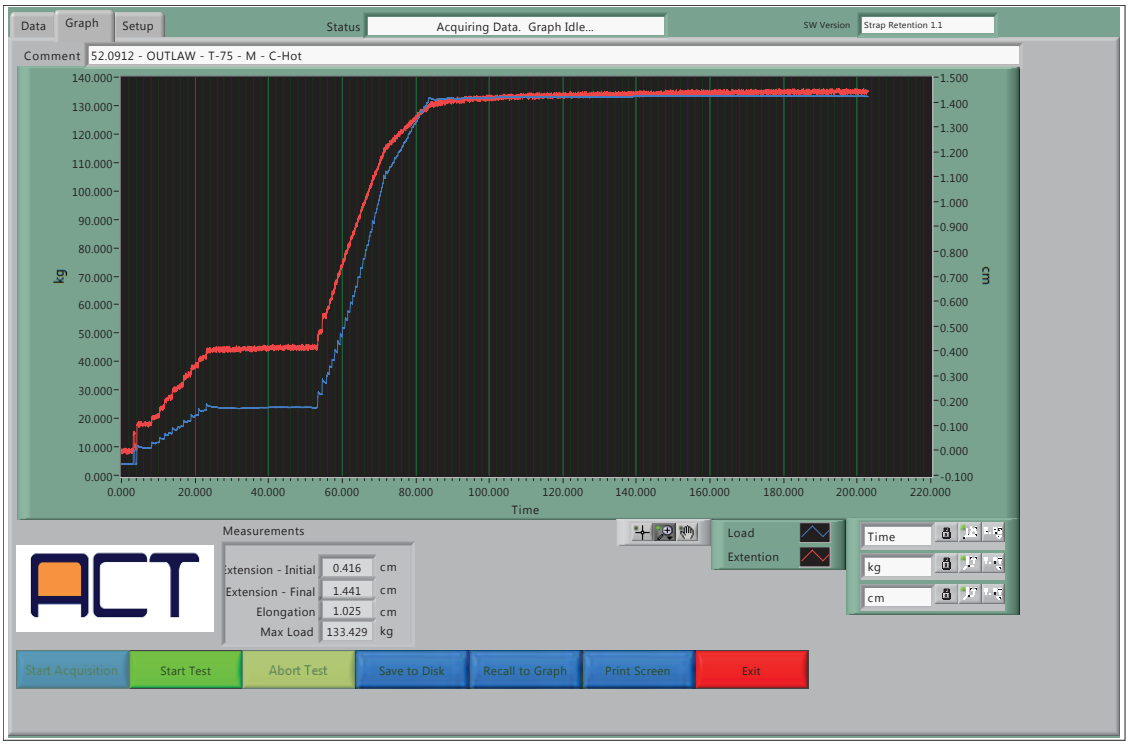




ACT DOT Strap Retention Acquistion
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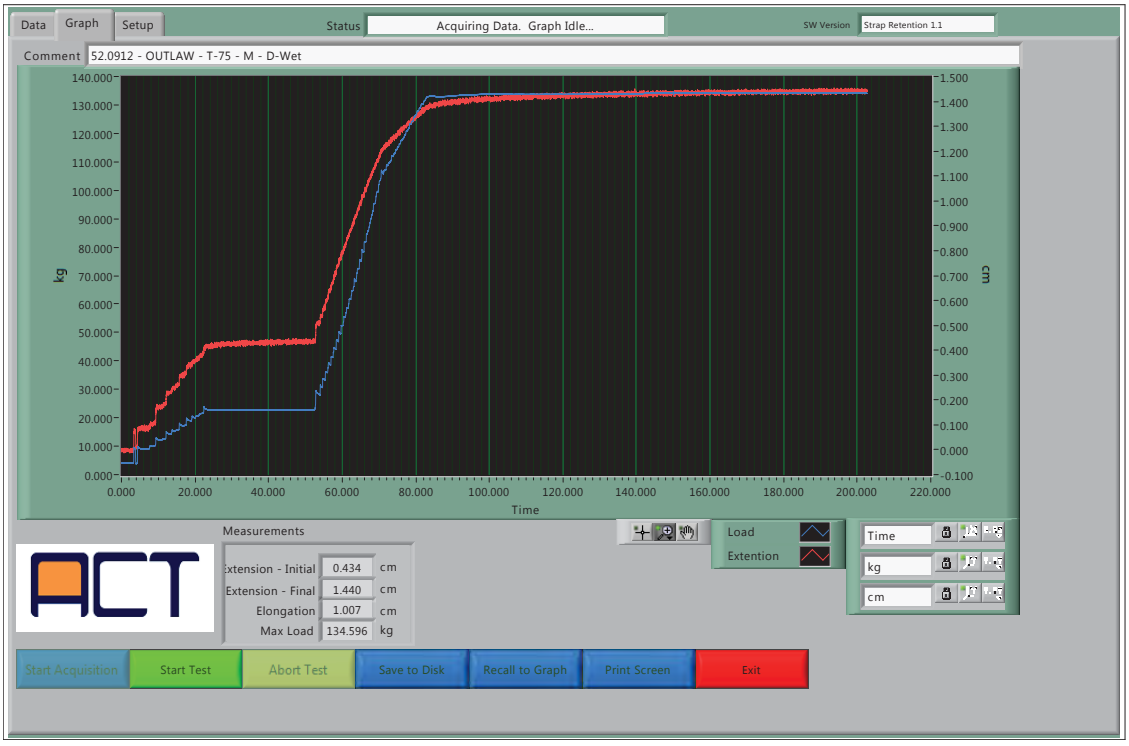
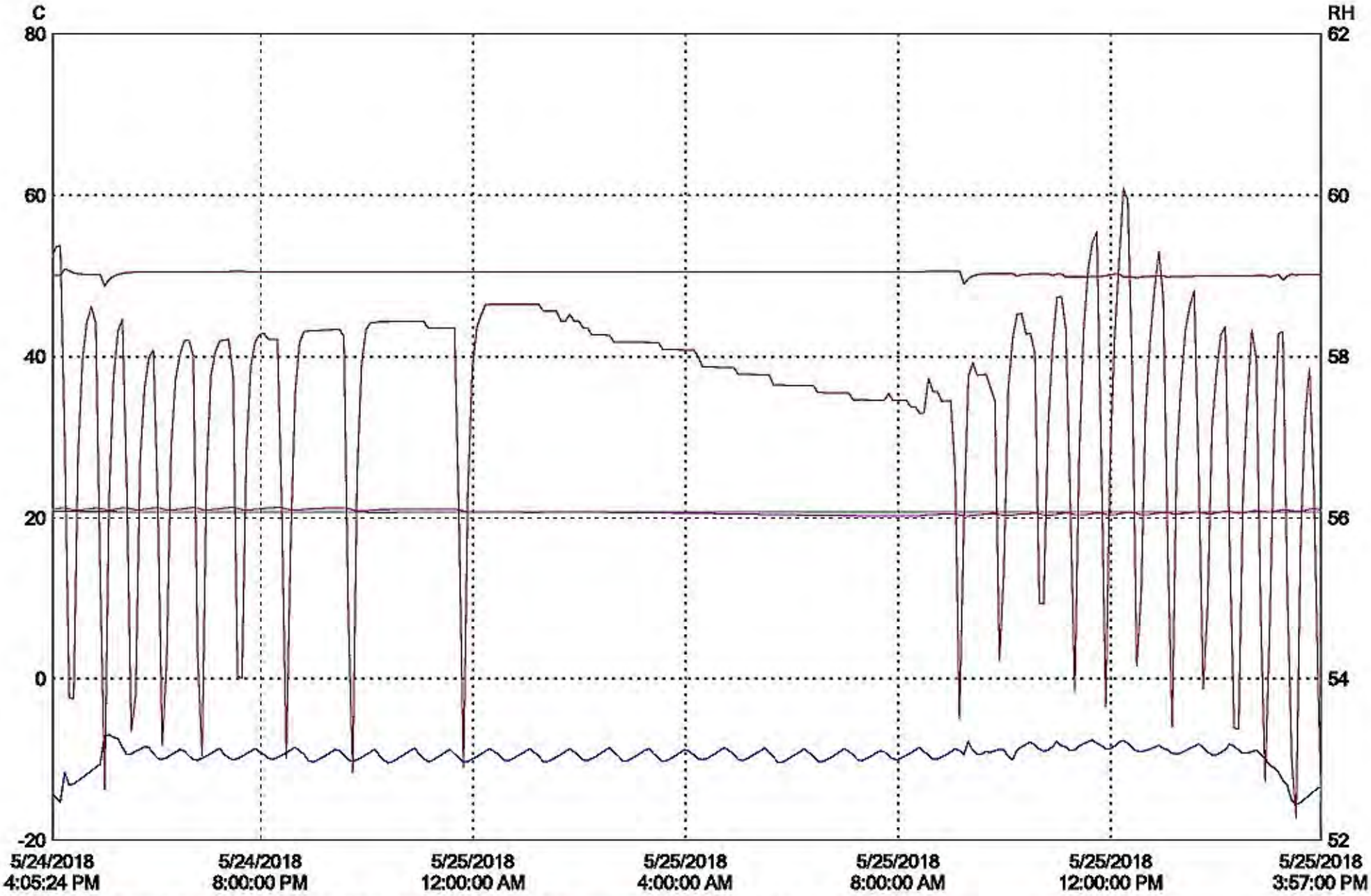





| LN | Serial # | Description | CH | Value | Maximum | Average | Minimum | Units | CH description | Logger file |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 09021116 | Oven/Water | 1 | | 50.84 | 50.35 | 48.75 | C | Oven | Oven_Water-09021116-2018-05-31 08-28-37.spl |
| 2 | 09021116 | Oven/Water | 2 | | 20.78 | 20.72 | 20.66 | C | Water | Oven_Water-09021116-2018-05-31 08-28-37.spl |
| 3 | 08071106 | Freezer | 1 | | -6.97 | -9.55 | -15.57 | C | Freezer | Freezer-08071106-2018-05-31 08-28-28.spl |
| 4 | 08052076 | LAB TEMP/RH | 1 | | 21.31 | 20.72 | 20.22 | C | Lab Temp. | LAB TEMP_RH-08052076-2018-05-31 08-28-33.spl |
| 5 | 08052076 | LAB TEMP/RH | 2 | | 60.1 | 57.4 | 52.3 | RH | Humidity | LAB TEMP_RH-08052076-2018-05-31 08-28-33.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

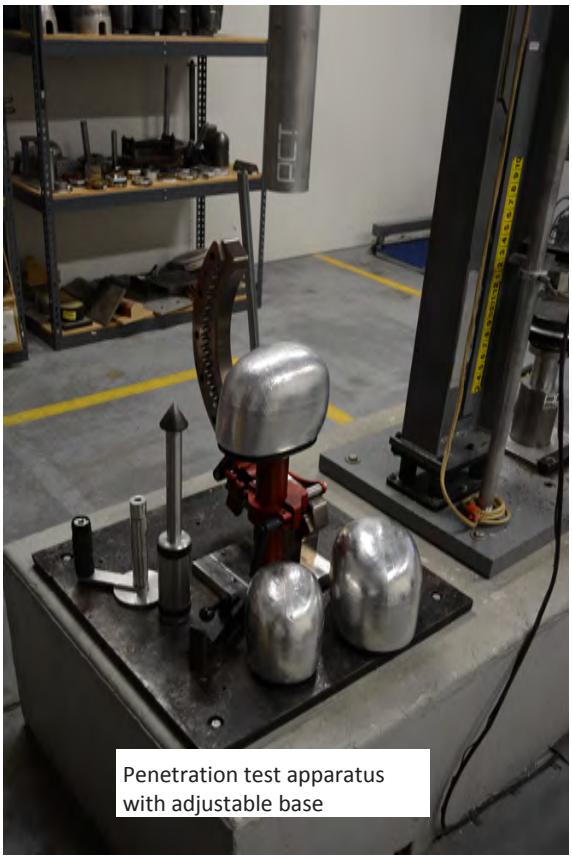
| Equipment List | | | | | |
|---|---|---|---|---|---|
| **ACT ID** | **Description** | **Make/Model** | **S/N** | **Dimensional Check** | **Next** |
| H0079 | Monorail | US Testing | NA | 12/8/2017 | 12/8/2018 |
| H0004 | DOT Small Headform | Controlled Casting | NA | 12/8/2017 | 12/8/2018 |
| H0005 | 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 |

| 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 |

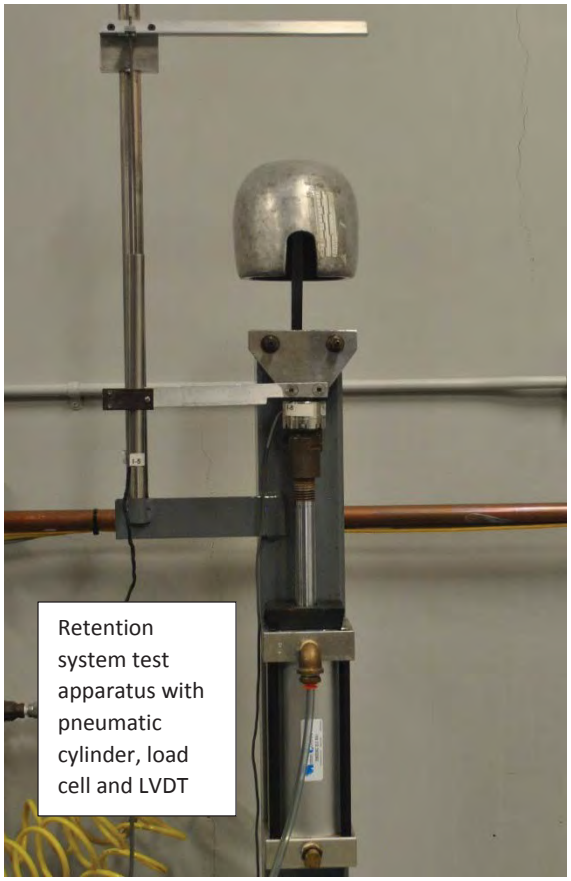
# APPENDIX C

# PHOTOGRAPHS

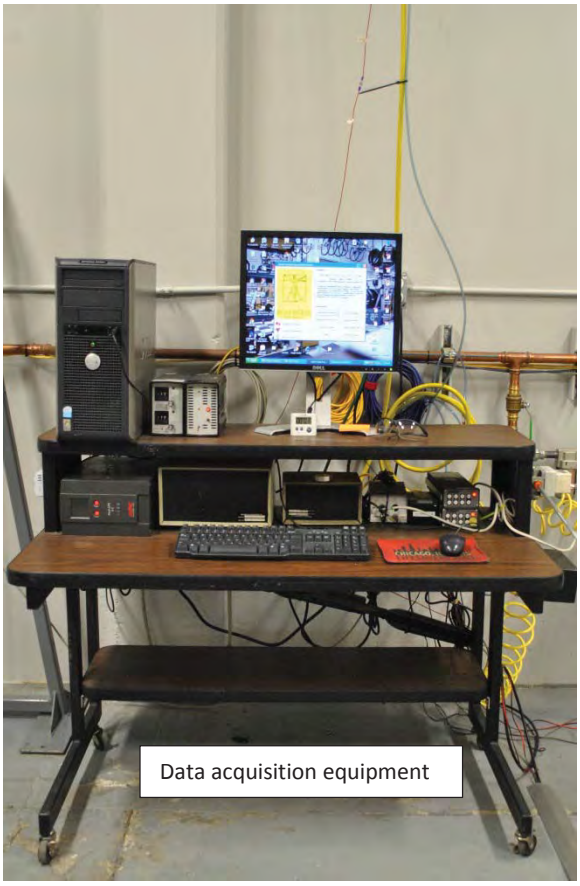
Impact attenuation test apparatus with three headforms (S, M, L), flat, hemi and MEP anvils



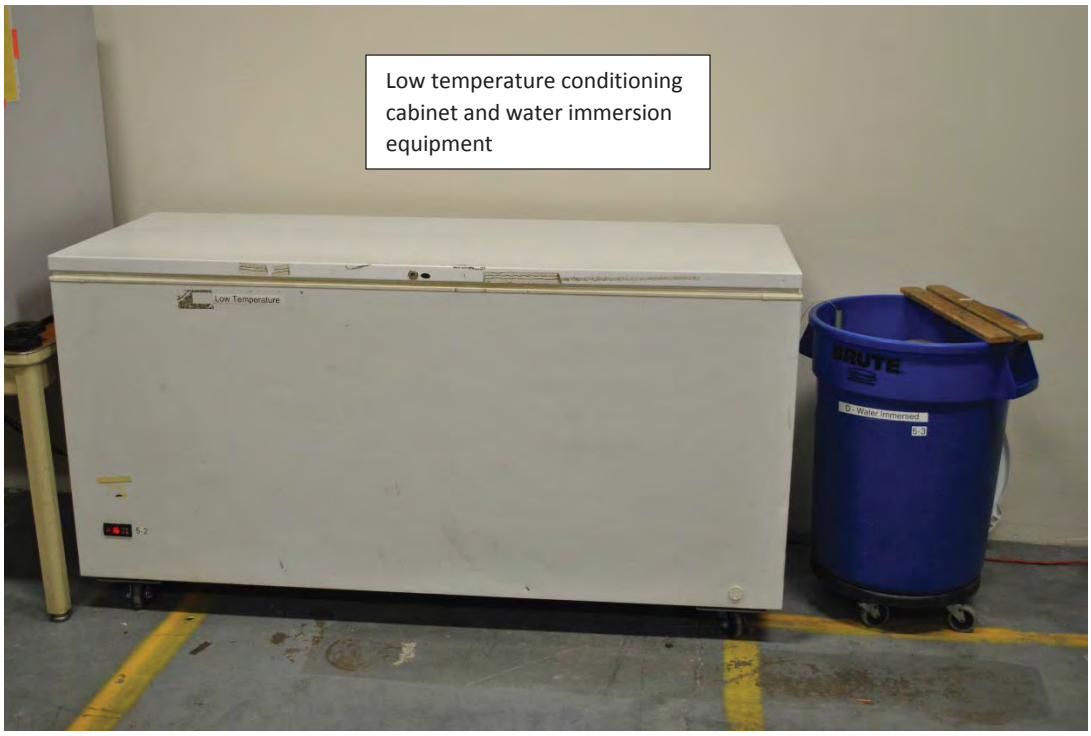
Penetration test apparatus with adjustable base



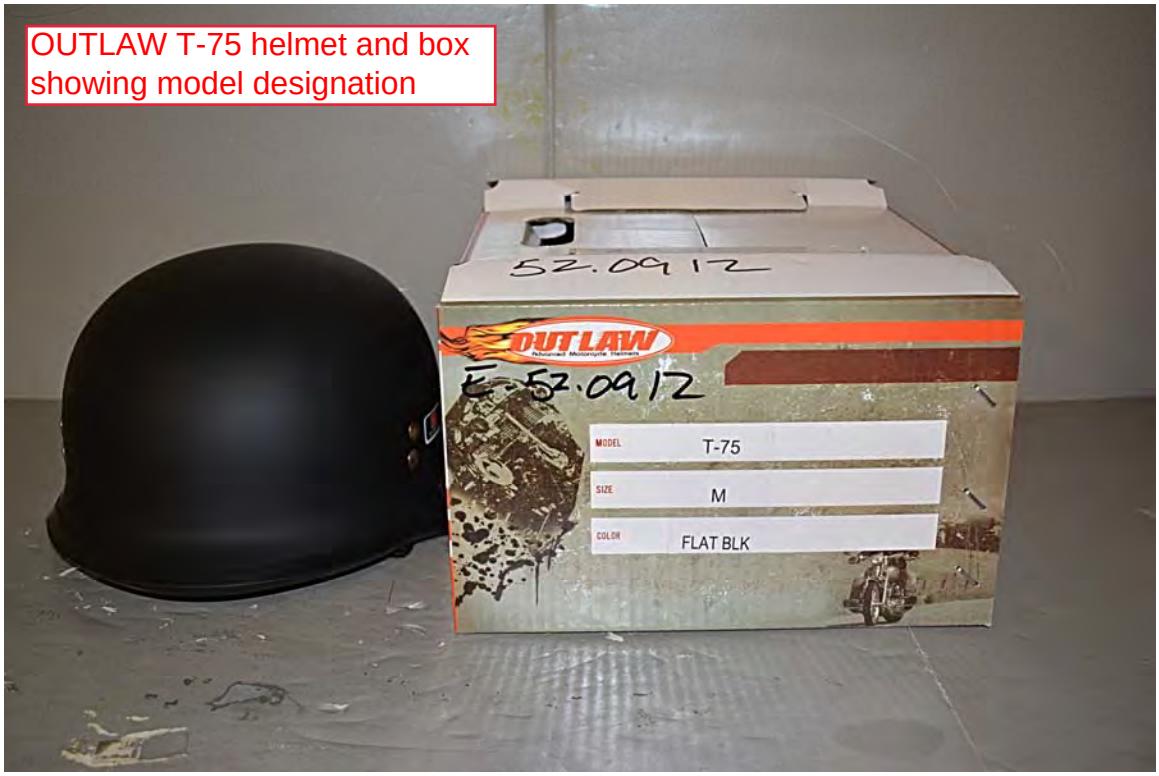
Retention system test apparatus with pneumatic cylinder, load cell and LVDT



Data acquisition equipment


Low temperature conditioning cabinet and water immersion equipment
Low Temperature
BRUTE


High temperature chamber


OUTLAW T-75 helmet and box showing model designation
52.0912
OUTLAW
E-52.0912
MODEL
T-75
SIZE
M
COLOR
FLAT BLK

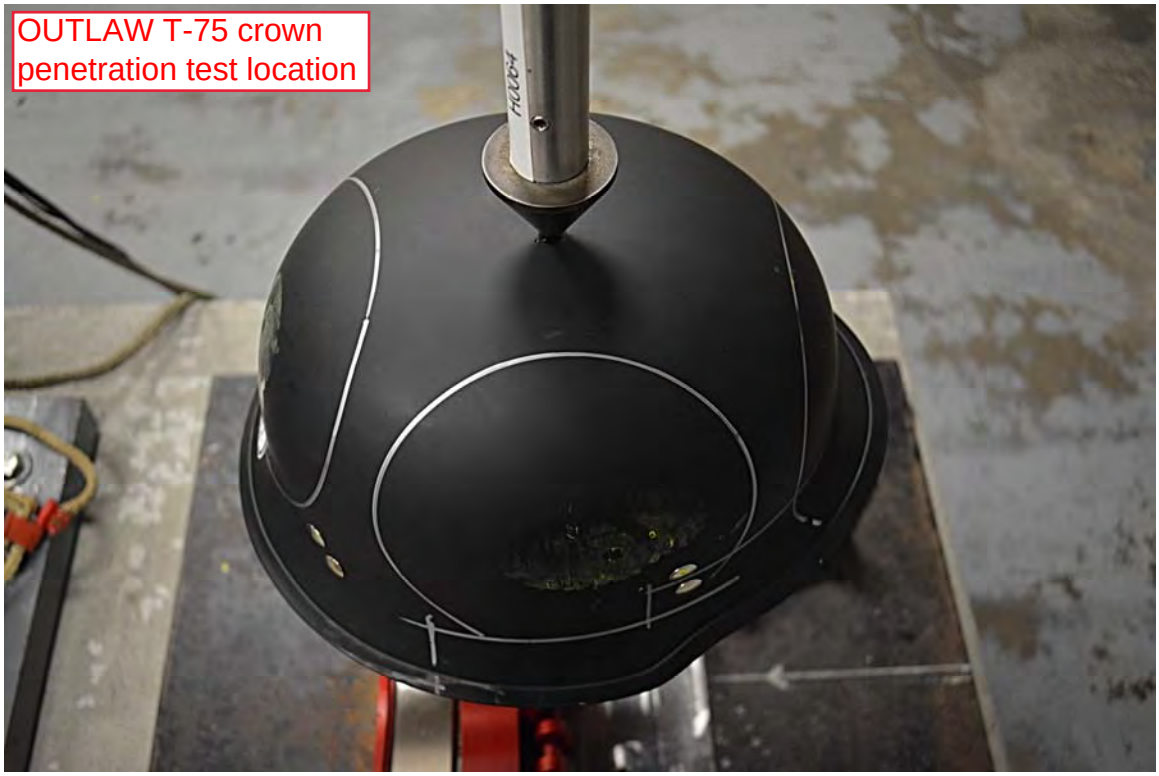

OUTLAW T-75 with test line, front left view


OUTLAW T-75 with test line, rear left view
OUTLAW
OUTLAW
T-75
DOT
FMVSS No.218
CERTIFIED


OUTLAW T-75 interior view

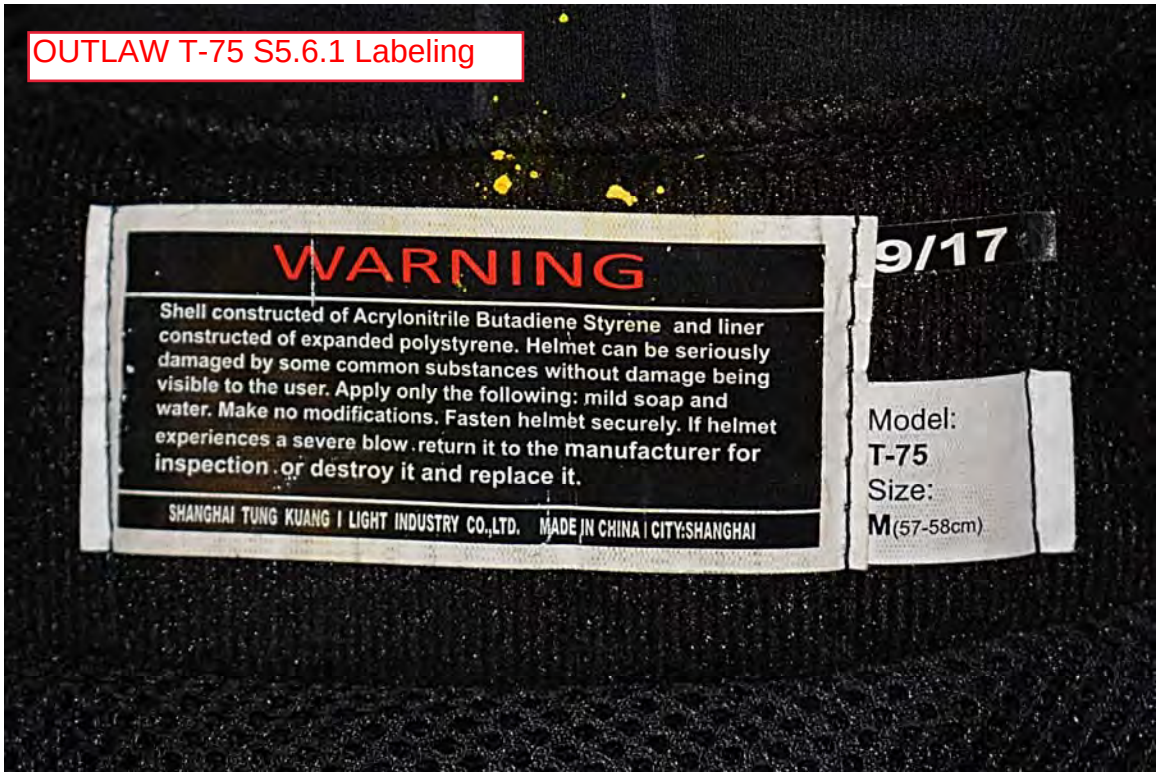

OUTLAW T-75 front and left side hemispherical anvil impact locations


OUTLAW T-75 right side and rear flat anvil impact locations
OUTLAW
DOT


OUTLAW T-75 crown
penetration test location


OUTLAW T-75 rear right
penetration test location

OUTLAW T-75 S5.6.1 Labeling




OUTLAW T-75 S5.6.2 Certification Label


OUTLAW T-75 S5.6.1 Labeling Permanency Failure
A.52.0912.001
WARNING