

REPORT NUMBER: NCAPCHILD-MGA-2005-003

**NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST**

**Evenflo Vanguard 5
Turbo Booster Graco**

NHTSA NUMBER: M55102

**PREPARED BY:
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5000 WARREN ROAD
BURLINGTON, WI 53105**



Test Date: September 21, 2004

Report Date: October 20, 2004

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
400 SEVENTH STREET, SW, ROOM 5311
WASHINGTON, D.C. 20590**

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Date of Acceptance

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16. Abstract The subjects CRS Evenflo Vanguard 5 and Turbo Booster Graco were tested in conjunction with a Frontal NCAP test in support of research in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the determination of CRS crashworthiness. This test was conducted at MGA Research Corporation in Burlington, Wisconsin on September 21, 2004, in conjunction with frontal NCAP.																					
<table border="1"> <thead> <tr> <th>Measurement Description</th> <th>Units</th> <th>Pos. 3 ATD</th> <th>Pos. 4 ATD</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC36)</td> <td>N/A</td> <td>929</td> <td>1621</td> </tr> <tr> <td>Head Injury Criteria (HIC15)</td> <td>N/A</td> <td>546</td> <td>1237</td> </tr> <tr> <td>Max. Thorax Accel. (3msec Clip)</td> <td>G's</td> <td>81</td> <td>66</td> </tr> </tbody> </table>						Measurement Description	Units	Pos. 3 ATD	Pos. 4 ATD	Head Injury Criteria (HIC36)	N/A	929	1621	Head Injury Criteria (HIC15)	N/A	546	1237	Max. Thorax Accel. (3msec Clip)	G's	81	66
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

The purpose of this test was to obtain CRS performance data in a frontal impact NCAP condition.

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-01-D-12005.

SUMMARY

Both child dummies were instrumented with head, chest, and pelvic triaxial accelerometers. In addition, both dummies had six upper axial neck force and moment sensors.

The right rear (Position 3) child dummy (S/N 42) and left rear (Position 4) child dummy (S/N 144) were calibrated previous to this test. Child dummy certification information is found in Appendix C.

The right rear child dummy's HIC36 was 929.2; maximum chest deceleration over 3 msec was 66.1 g's. The left rear child dummy's HIC36 was 1620.8. The maximum chest deceleration over 3 msec was 80.6 g's. Position 3 and Position 4 were forward facing. Position 3 used the vehicle LATCH and top tether for attachments. Position 4 (booster seat) used vehicle seat belts.

SECTION 2

DATA SHEET NO. 1 CRASH TEST SUMMARY

TEST DUMMY INFORMATION

Description	Position 3 CRS	Position 4 CRS
Dummy Type / Serial No.	HIII 3 Year Old / 42	HIII 6 Year Old / 144
Number of Data Channels	20	27
Restraint System	Evenflo Vanguard 5 (Forward Facing)	Turbo Booster Graco (Booster)

16 MM CAMERA COVERAGE

Real Time	1
High Speed Film Cameras	7
High Speed Digital Cameras	8
Total	16

POST TEST DOOR OPENING

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were unlocked	Doors were unlocked
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None
Glazing Damage	The windshield cracked	

POST TEST SEAT DATA

Location	Seat Movement (mm)	Seat Back Failure
P1 (Left Front)	0	None
P2 (Right Front)	0	None
P3 (Right Rear)	0	None
P4 (Left Rear)	0	None

VISIBLE DUMMY CONTACT POINTS

Description	Position 3 CRS (S/N 42)	Position 4 CRS (S/N 144)
Head Contact	Back of head to CRS	Back of head to CRS
Upper Torso Contact	None	None
Lower Torso Contact	None	None
Left Foot Contact	Passenger seat back	Driver seat back
Right Foot Contact	Passenger seat back	Driver seat back

SECTION 2... (continued)**DATA SHEET NO. 2
CRS PARAMETER DATA**

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Turbo Booster Graco (Forward Facing)
NHTSA No.	M55102

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1272.8
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	49.9
Calculated Vehicle Target Weight (TVTW)	kg	1478.7

TEST VEHICLE WEIGHTS

	Units	As Tested (ATW) (Axle)		
		Front	Rear	Total
Left	kg	435.0	316.2	
Right	kg	401.0	319.8	
Ratio	%	56.8	43.2	
Totals	kg	836.0	636.0	1472.0

As tested weight of vehicle includes two 50th percentile ATDs, one 3 year old with CRS, one 6 year old with CRS, cargo, equipment and instrumentation.

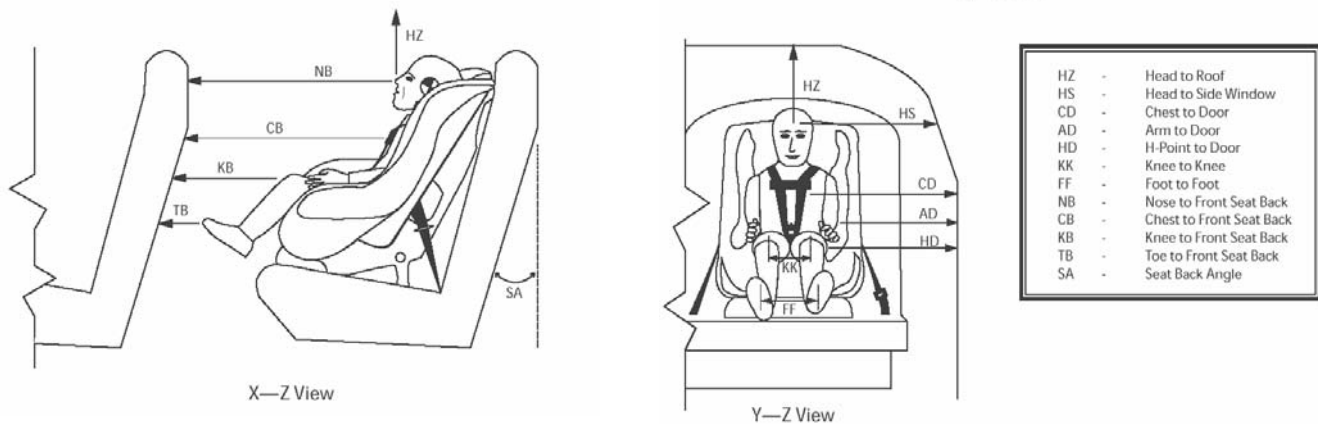
CHEST CLIP DISPLACEMENT

	Units	Left	Right
Right Child Dummy	mm	111	99
Left Child Dummy	mm		

SECTION 2... (continued)
DATA SHEET NO. 3
CHILD DUMMY POSITIONING IN VEHICLE

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
NHTSA No.	M55102

Dummy Measurements for CRS Passengers



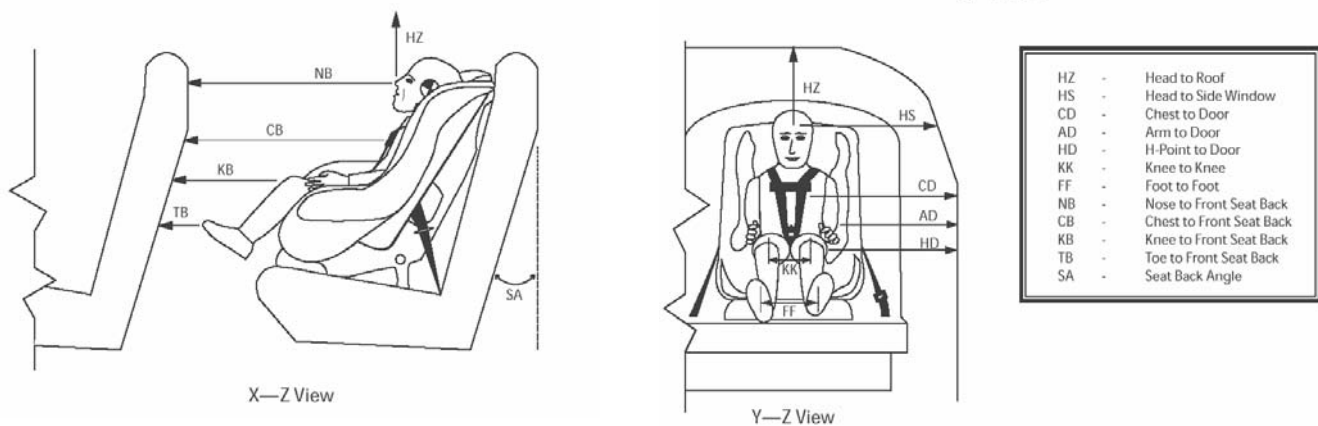
Measurement	Pre-Test (mm)	Post-Test (mm)
	P3 CRS (42)	P3 CRS (42)
SA (deg)	26.2	26.2
HS	394	380
CD	352	322
AD	232	230
HD	294	229
HZ	377	385
NB	585	589
CB	573	623
KK	170	169
FF	142	152
KB - LEFT	390	381
KB - RIGHT	392	403
TB - LEFT	109	99
TB - RIGHT	112	105

All dimensions in mm (unless noted)
P3 – Right Rear Passenger (Forward Facing)

SECTION 2... (continued)
DATA SHEET NO. 3
CHILD DUMMY POSITIONING IN VEHICLE

Child Restraint System (Position 4)	Turbo Booster Graco (Forward Facing)
NHTSA No.	M55102

Dummy Measurements for CRS Passengers



Measurement	Pre-Test (mm)	Post-Test (mm)
	P4 CRS (144)	P4 CRS (144)
SA (deg)	25.7	25.7
HS	372	411
CD	337	311
AD	181	35
HD	208	126
HZ	355	380
NB	562	560
CB	545	577
KK	165	168
FF	124	95
KB - LEFT	294	391
KB - RIGHT	290	370
TB - LEFT	68	81
TB - RIGHT	67	95

All dimensions in mm (unless noted)
P4 – Left Rear Passenger (Forward facing)

DATA SHEET NO. 4
CHILD DUMMY INJURY CRITERIA VALUES

Child Restraint System (Position 3)	Evenflo Vanguard 5
Child Restraint System (Position 4)	Turbo Booster Graco
NHTSA No.	M55102

HEAD PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	58.8	212	-47.8	110	1.2	300	-111.6	117
Head CG	Y	G's	16.1	110	-14.7	118	3.1	60	-16.6	118
Head CG	Z	G's	69.1	94	-2.2	45	106.5	117	-2.9	42
Resultant	N/A	G's	72.3	94			153.9	117		

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	N	1180	119	-26.2	265	55	43	-1011	79
Neck Force	Y	N	78	91	-68	218	54	143	-334	101
Neck Force	Z	N	1855	93	-264	218	3325	85	-498	118
Resultant	N/A	N	1912	93			3432	85		
Neck Moment	X	N•m	3.9	144	-6.2	127	11.9	74	-20.6	88
Neck Moment	Y	N•m	1.8	261	-18.2	222	32.7	120	-58.5	77
Neck Moment	Z	N•m	2.4	112	-3.5	93	6.7	107	-10.5	89
Resultant	N/A	N•m	18.2	222			59.0	76		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	4.9	223	-69.0	80	2.4	245	-70.7	74
Chest CG	Y	G's	6.9	95	-4.1	119	11.3	87	-18.8	75
Chest CG	Z	G's	16.5	217	-48.6	80	17.3	67	-14.6	95
Resultant	N/A	G's	84.4	80			73.2	74		

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest	X	mm			-16.0	120			-36.7	95

SECTION 2... (continued)

DATA SHEET NO. 4... (continued)
CHILD DUMMY INJURY CRITERIA VALUES

Child Restraint System (Position 3)	Evenflo Vanguard 5
Child Restraint System (Position 4)	Turbo Booster Graco
NHTSA No.	M55102

TETHER FORCE

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Tether Force	N/A	N								
Right Tether Force	N/A	N	1737	90						

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	23.7	126	-96.7	78	26.9	119	-66.3	66
Pelvis	Y	G's	11.1	73	-7.8	115	8.0	121	-30.6	75
Pelvis	Z	G's	19.1	218	-46.5	71	19.7	98	-16.4	71
Resultant	N/A	G's	100.7	78			72.0	65		

FEMUR FORCES

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	N/A	N					869	82	-124	123
Right Femur	N/A	N					1032	120	-1288	118

BELT FORCES

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Shoulder Belt	N/A	N					6742	83		
Lap Belt	N/A	N					4452	66		

SECTION 2... (continued)

DATA SHEET NO. 4... (continued)
CHILD DUMMY INJURY CRITERIA VALUES

Child Restraint System (Position 3)	Evenflo Vanguard 5
Child Restraint System (Position 4)	Turbo Booster Graco
NHTSA No.	M55102

HEAD INJURY CRITERIA (HIC36)

Location	HIC	T ¹ (msec)	T ² (msec)	Average Acceleration (G's)
Position 3 - Right	929.2	83.1	119.1	58.2
Position 4 – Left	1620.8	73.2	103.2	78.2

HIC is as defined in FMVSS 208. The maximum time interval from t1 to t2 is 36 milliseconds.

HEAD INJURY CRITERIA (HIC15)

Location	HIC	T ¹ (msec)	T ² (msec)	Average Acceleration (G's)
Position 3 - Right	546.2	86.6	101.6	66.8
Position 4 – Left	1236.5	75.6	90.6	92.6

HIC is as defined in FMVSS 208. The maximum time interval from t1 to t2 is 15 milliseconds.

CLIP SUMMARY

Location	CLIP	T ¹ (msec)	T ² (msec)
Position 3 - Right	66.1	72.6	75.6
Position 4 – Left	80.6	78.1	81.1

The maximum chest resultant acceleration is defined as the maximum acceleration, which exceeds 0.003 seconds in duration.

SECTION 2... (continued)

**DATA SHEET NO. 5
CRS PERFORMANCE DATA**

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Turbo Booster Graco (Forward Facing)
NHTSA No.	M55102

POSITION 3 CRS POST-TEST INSPECTION

Location	Damage	Remarks
Upper Tether Strap	None	
Upper Tether Buckle	None	
Upper Tether Hook	None	
Vehicle Upper Tether Anchor	None	
Lower Anchor Strap	None	
Lower Anchor Buckle	None	
Lower Anchor Hooks	None	
Vehicle Lower CRS Anchors	None	
Five Point Harness Connections	None	
Cracks on CRS	None	
Fabric Tears on CRS	None	
Vehicle Seat Structure	None	
Vehicle Seat Fabric Tears	None	
Child Dummy	None	

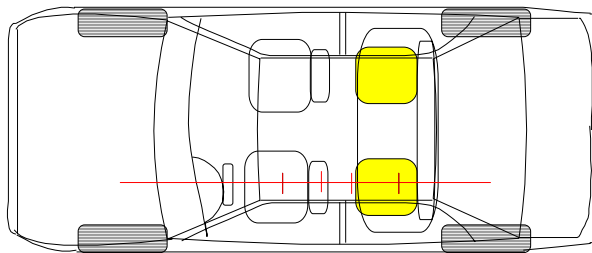
POSITION 4 CRS POST-TEST INSPECTION

Location	Damage	Remarks
Upper Tether Strap	None	
Upper Tether Buckle	None	
Upper Tether Hook	None	
Vehicle Upper Tether Anchor	None	
Lower Anchor Strap	None	
Lower Anchor Buckle	None	
Lower Anchor Hooks	None	
Vehicle Lower CRS Anchors	None	
Five Point Harness Connections	None	
Cracks on CRS	None	
Fabric Tears on CRS	None	
Vehicle Seat Structure	None	
Vehicle Seat Fabric Tears	None	
Child Dummy	None	

SECTION 2... (continued)

DATA SHEET NO. 6 CRS CAMERA DATA

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Turbo Booster Graco (Forward Facing)
NHTSA No.	M55102



No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Left Rear Dummy Closeup	2555	-4660	1960	50	1000

*COORDINATES:

- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = above ground level

APPENDIX A
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A-1.



Close-up View of Position 3 CRS Label

A-2.



Pre-Test Front View of Position 3 CRS



Post-Test Front View of Position 3 CRS

A-4.



Pre-Test Rear View of Position 3 CRS



Post-Test Rear View of Position 3 CRS



Pre-Test Left Side View of Position 3 CRS



Post-Test Left Side View of Position 3 CRS

A-8.



Pre-Test Right Side View of Position 3 CRS

A-9.



Post-Test Right Side View of Position 3 CRS

• Pueden entre 40 y 100 libras (18 y 45 kg) y
• Pueden entre 40 y 57 pulgadas (101 y 145 cm) de altura y
• cuyos oídos se encuentran debajo de la parte de arriba del
almohadonamiento del asiento del vehículo/apoyacabeza
**CONSULTE EL MANUAL DEL PROPIETARIO PARA OBTENER LAS
INSTRUCCIONES COMPLETAS.**

Este sistema de seguridad infantil cumple con todas las normas federales
de seguridad para automóviles aplicables. Este asiento está certificado
para su uso en automóviles. Este asiento no está certificado para su uso
en aeronaves.

Los asientos infantiles podrán quedar sujetos a retiradas por razones de
seguridad. Debe registrar este asiento para recibir información sobre
retiradas. Envíe su nombre, dirección y el número de modelo y la fecha de
fabricación del asiento a Graco Children's Products Inc., 150 Oaklands Blvd.,
Exton, PA 19341 EE.UU. o llame al 1-800-345-4109.
Para información sobre retiradas, llame a la línea de información sobre
seguridad automotriz del gobierno de EE.UU. al 1-800-424-9393
(202-366-0123 en el Distrito de Columbia).

LAPB0095A

MODEL 8495LAD NAME: TurboBooster
SERIAL JJ 0802041606702
Manufactured in 080204
GRACO CHILDREN'S PRODUCTS, INC.
EXTON, PA 19341 1-888-224-6549
Made in China

LAPZ0004B

Close-up View of Position 4 CRS Label

A-11.



Pre-Test Front View of Position 4 CRS



Post-Test Front View of Position 4 CRS



Pre-Test Rear View of Position 4 CRS

A-14.



Post-Test Rear View of Position 4 CRS



Pre-Test Left Side View of Position 4 CRS



Post-Test Left Side View of Position 4 CRS

A-17.



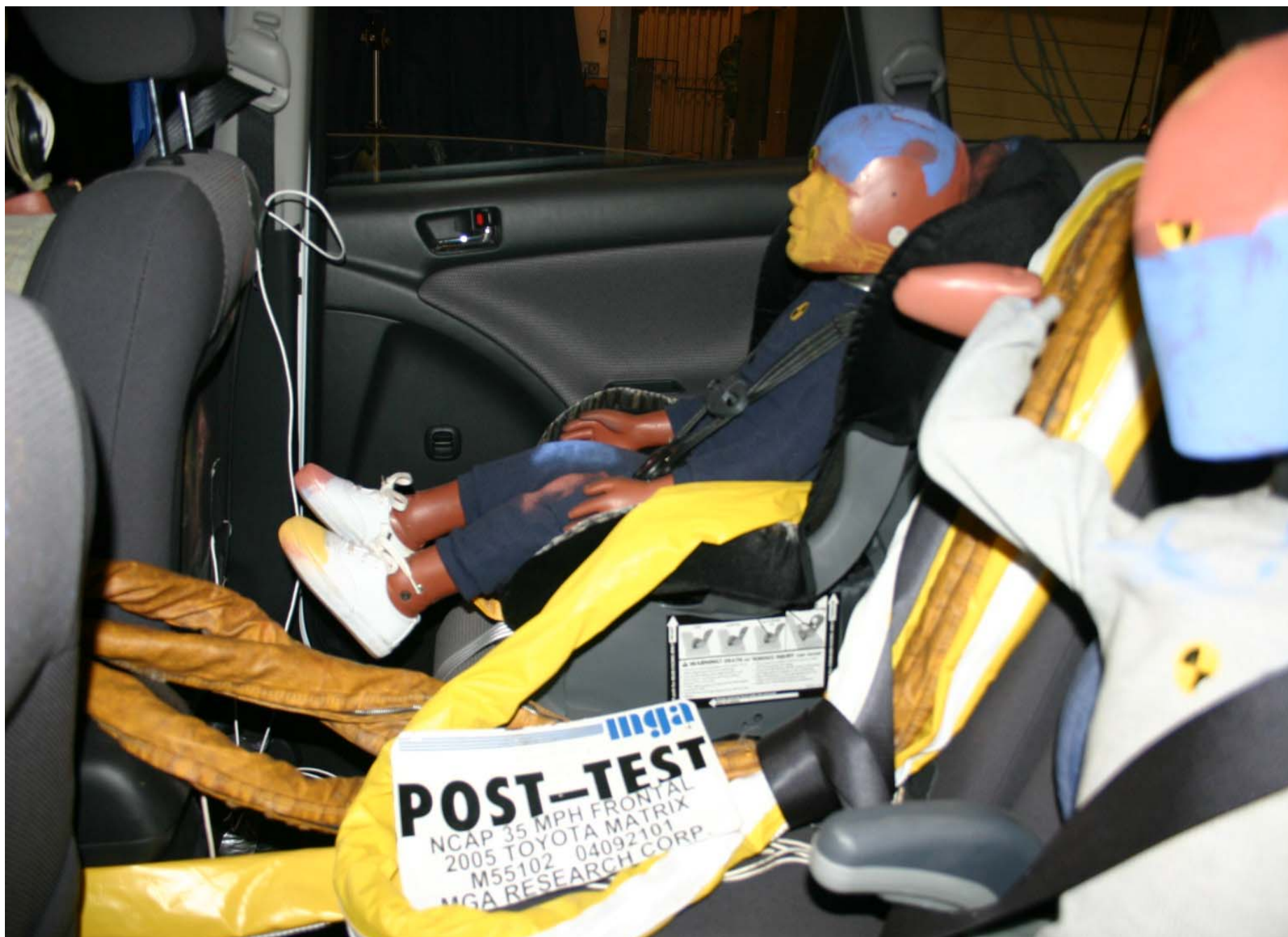
Pre-Test Right Side View of Position 4 CRS



Post-Test Right Side View of Position 4 CRS



Pre-Test Position 3 Left Side View



Post-Test Position 3 Left Side View



Pre-Test Position 4 Left Side View



Post-Test Position 4 Left Side View



Pre-Test Position 3 Right Side View



Post-Test Position 3 Right Side View



Pre-Test Position 4 Right Side View



Post-Test Position 4 Right Side View



Pre-Test Position 3 Rear View



Pre-Test Position 4 Rear View



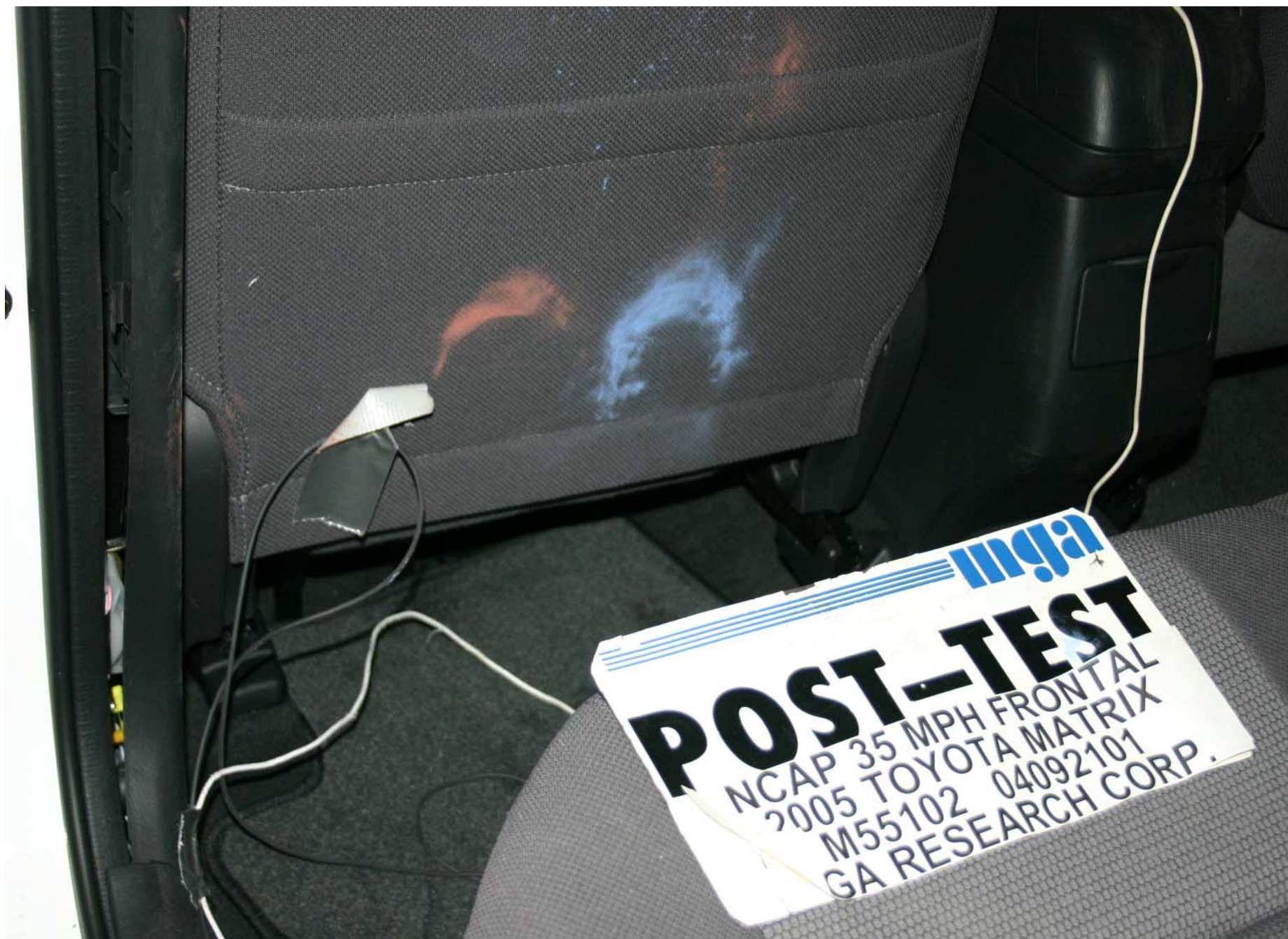
Post-Test Position 3 Front $\frac{3}{4}$ View



Post-Test Position 4 Front 3/4 View



Post-Test Position 3 Feet Contact



Post-Test Position 4 Feet Contact

APPENDIX B

CHILD DUMMY RESPONSE DATA TRACES

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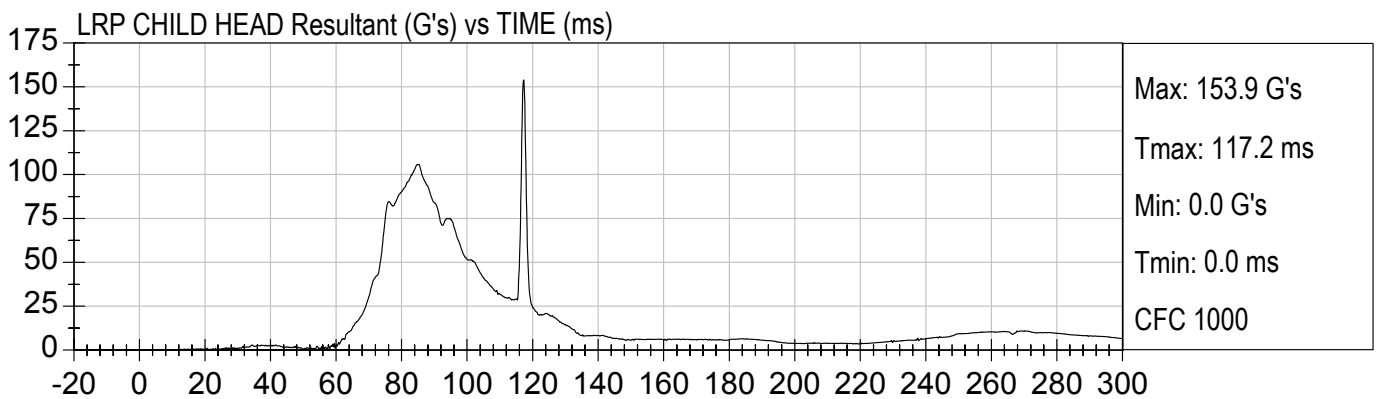
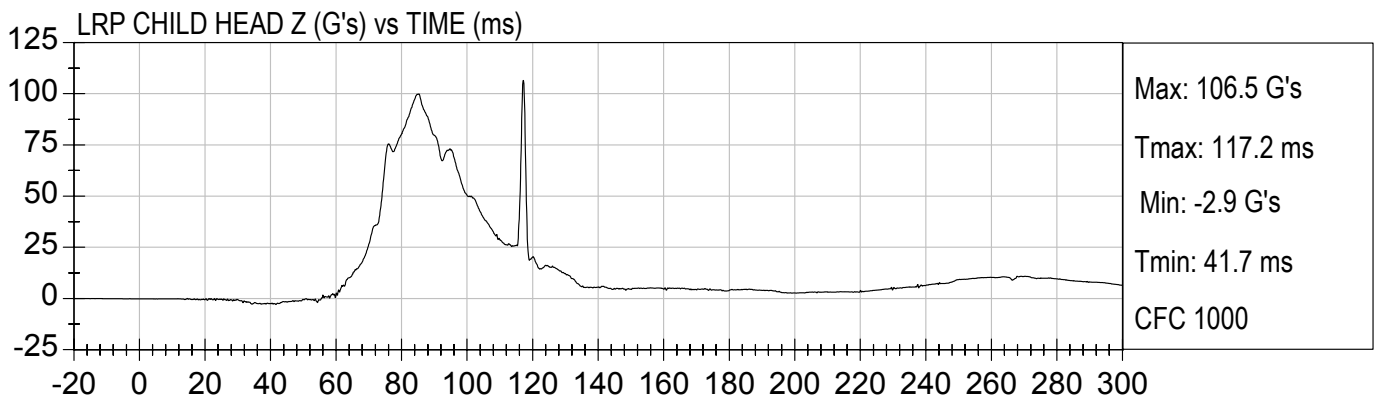
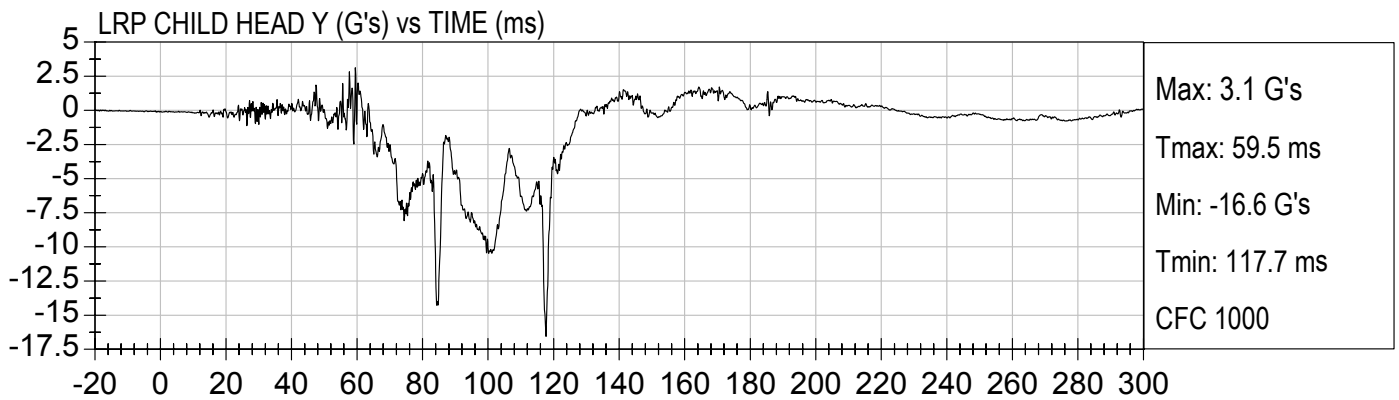
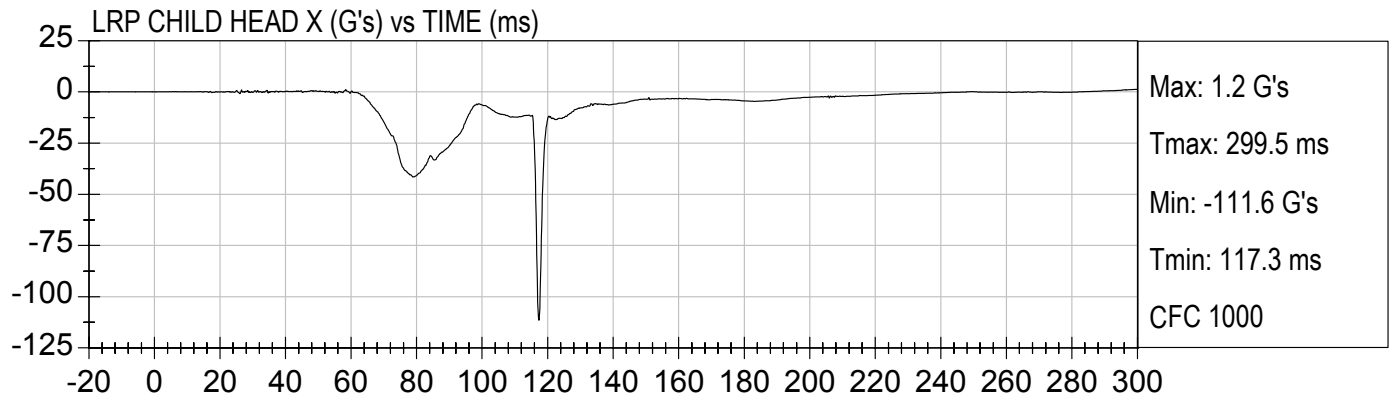
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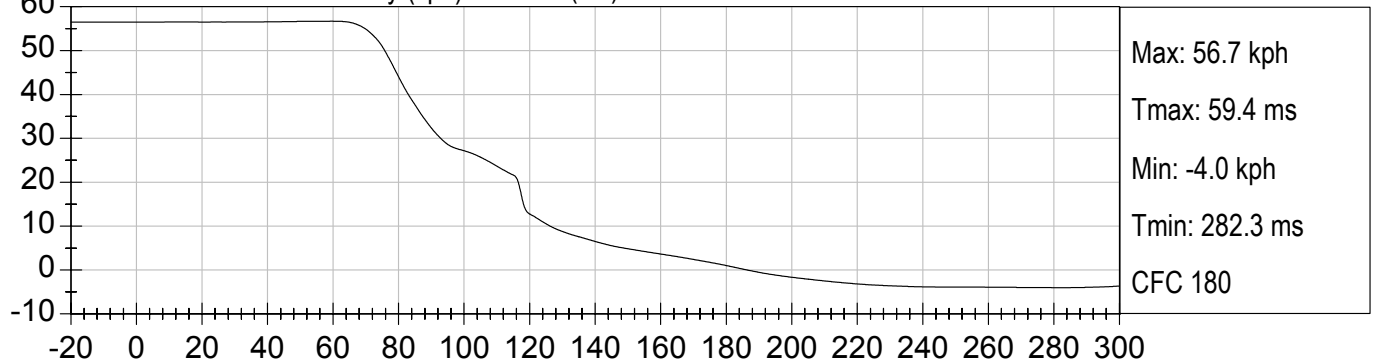
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

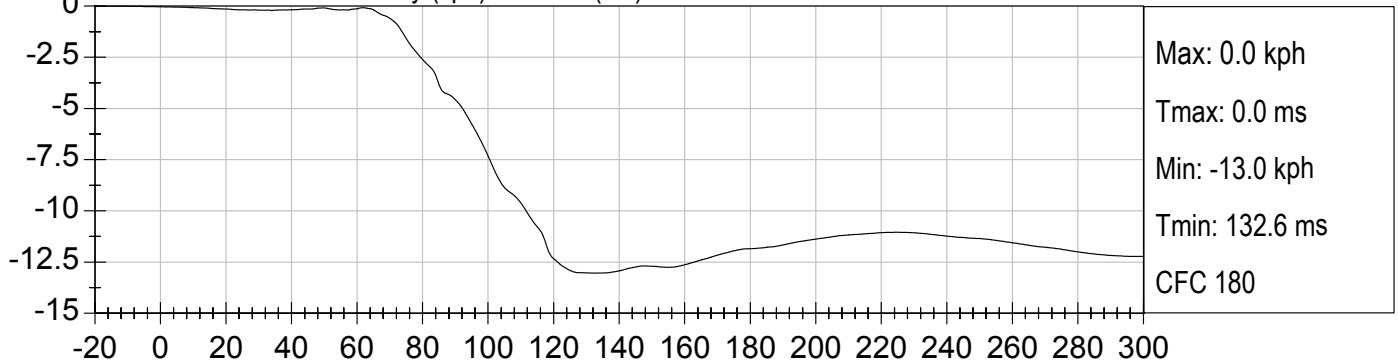




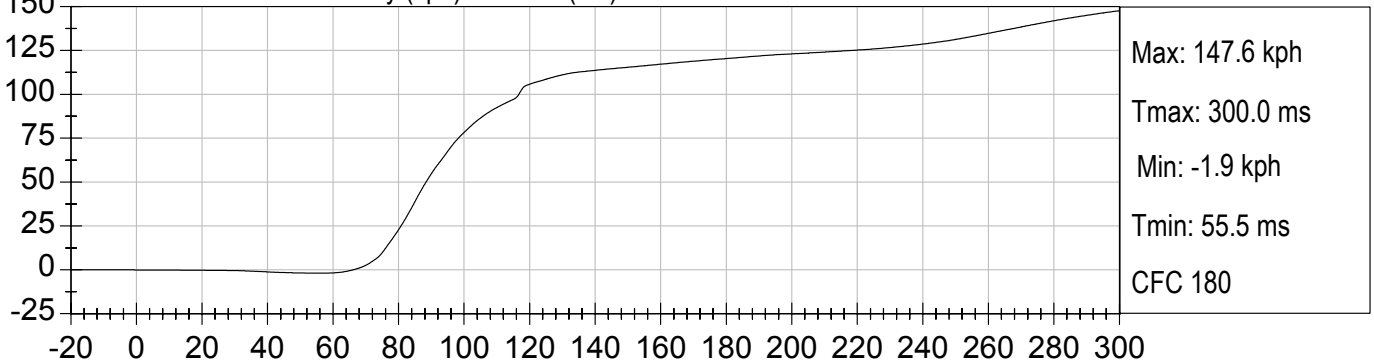
LRP CHILD HEAD X Velocity (kph) vs TIME (ms)

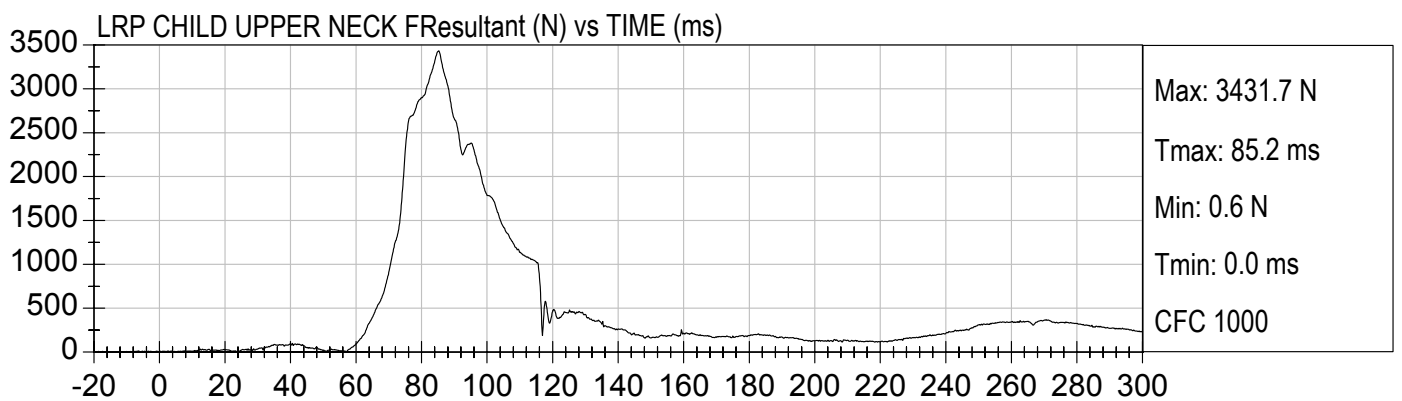
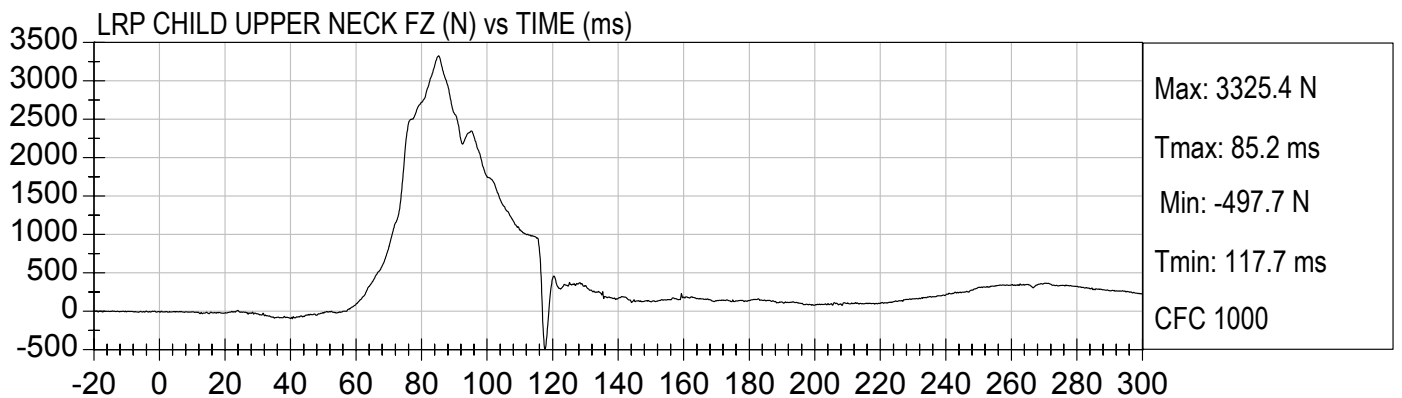
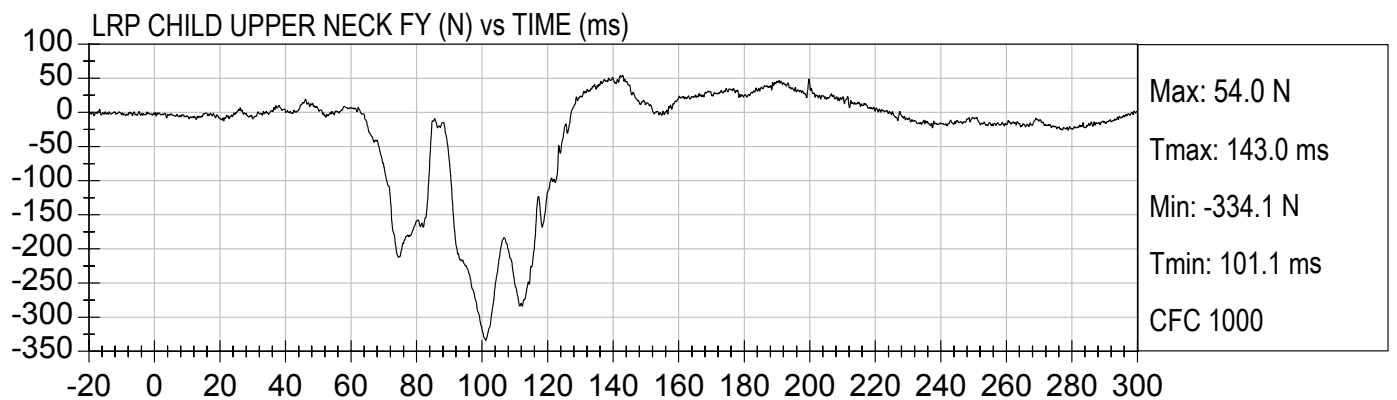
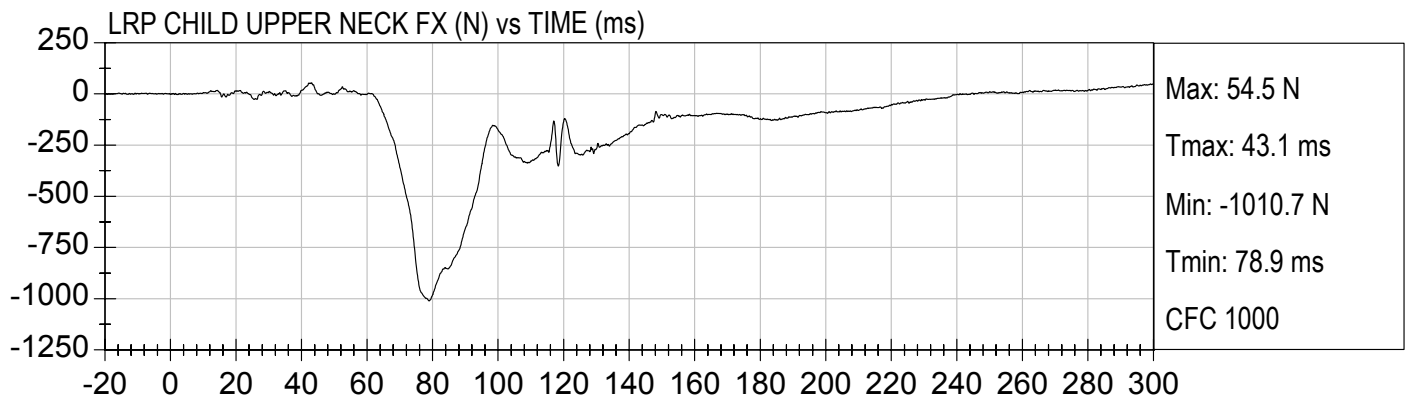


LRP CHILD HEAD Y Velocity (kph) vs TIME (ms)



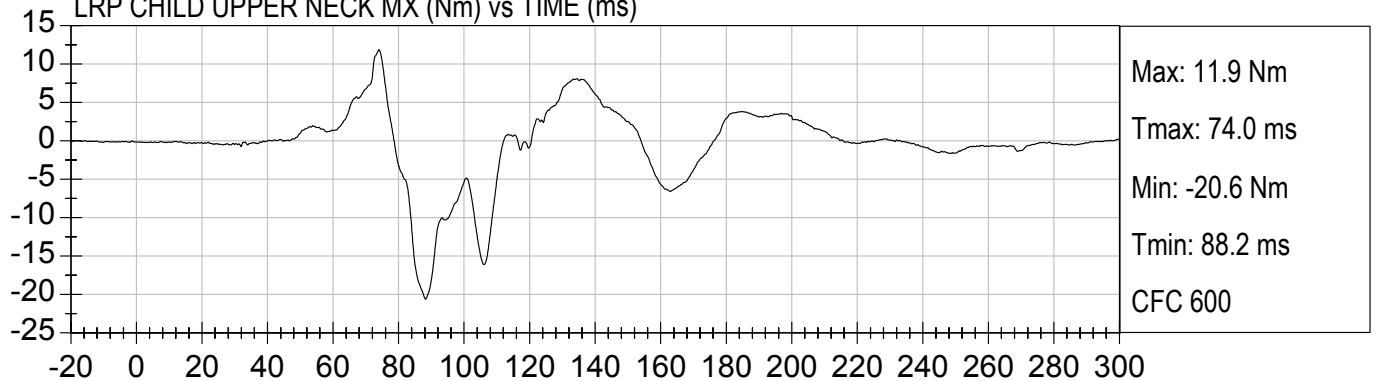
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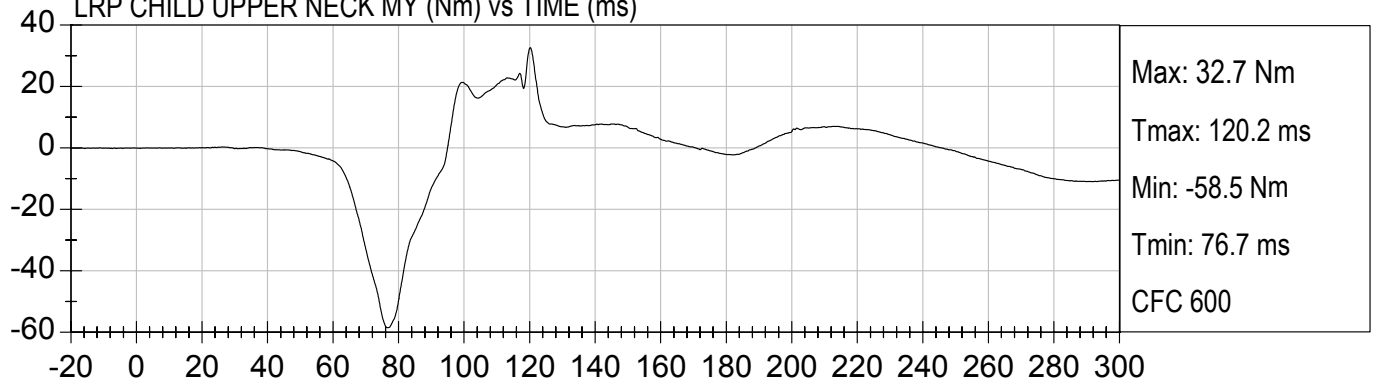




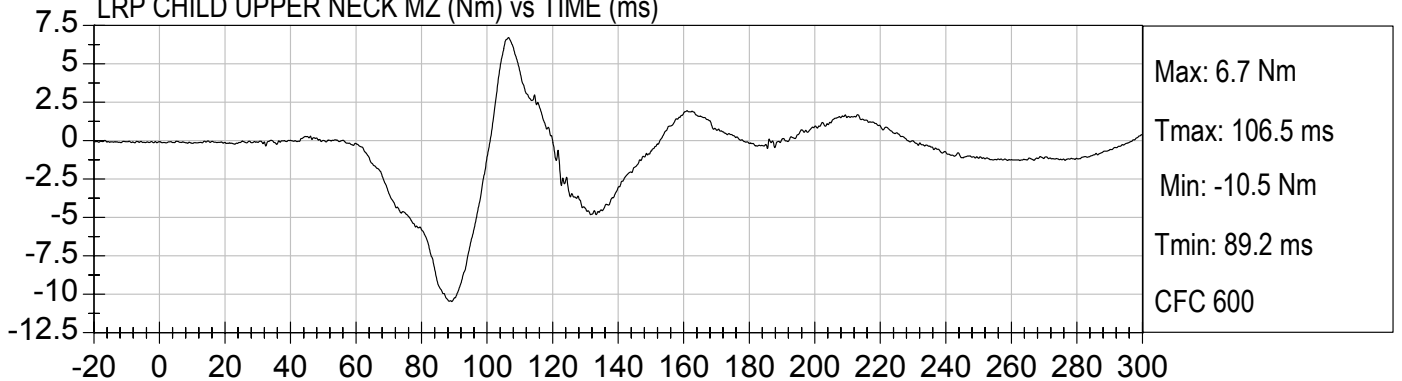
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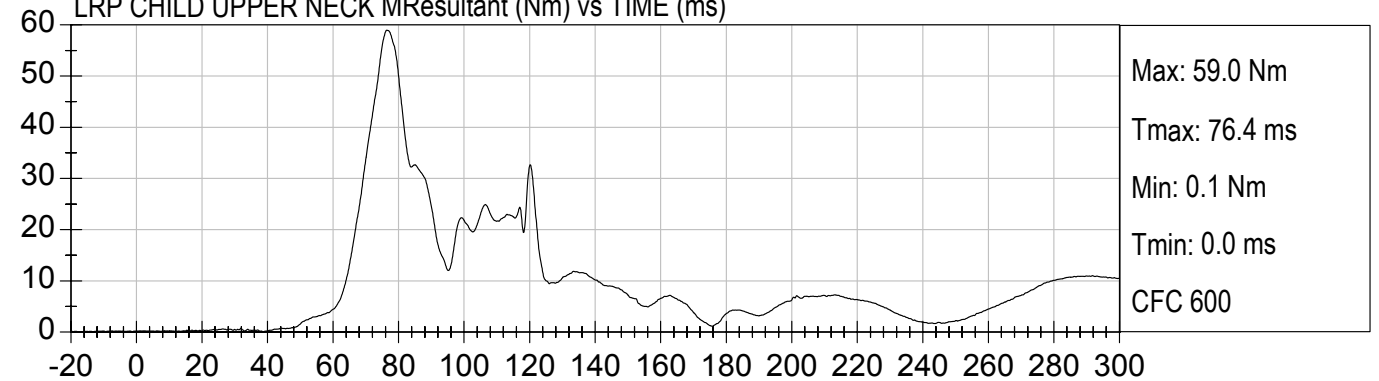
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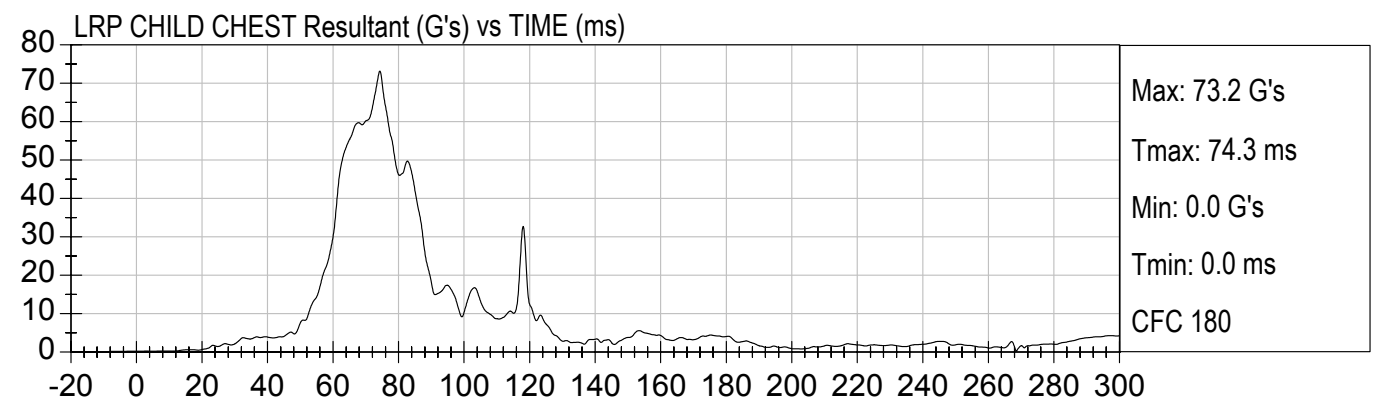
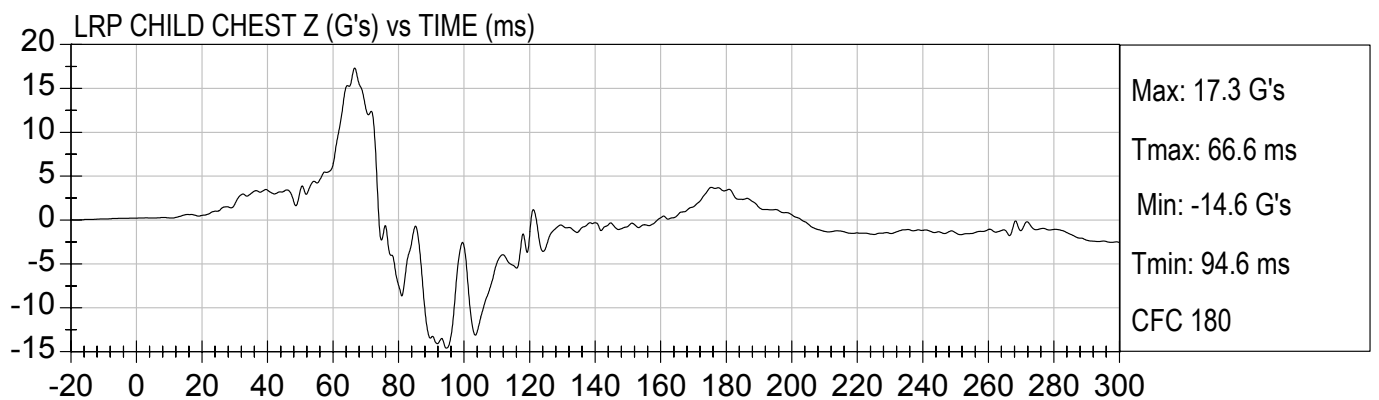
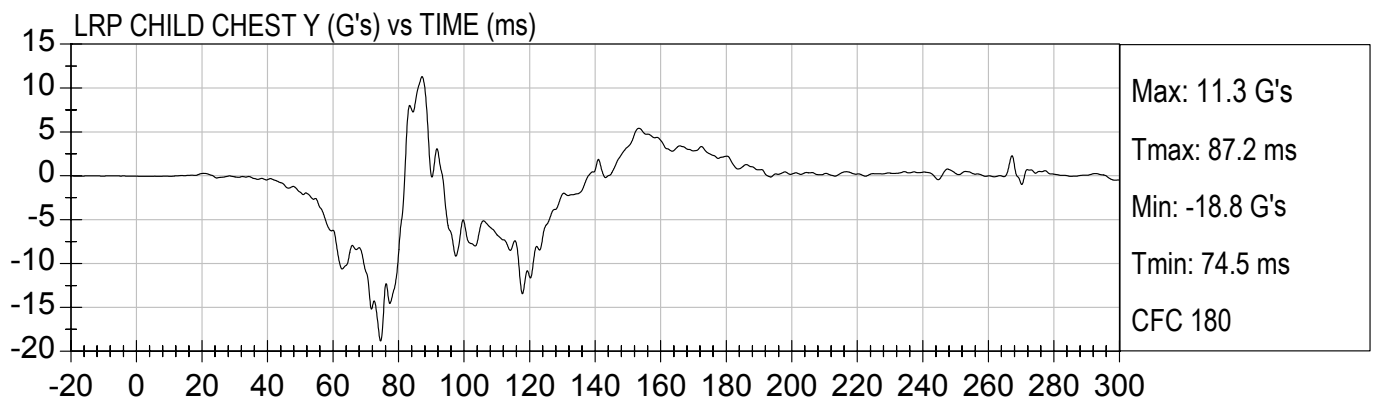
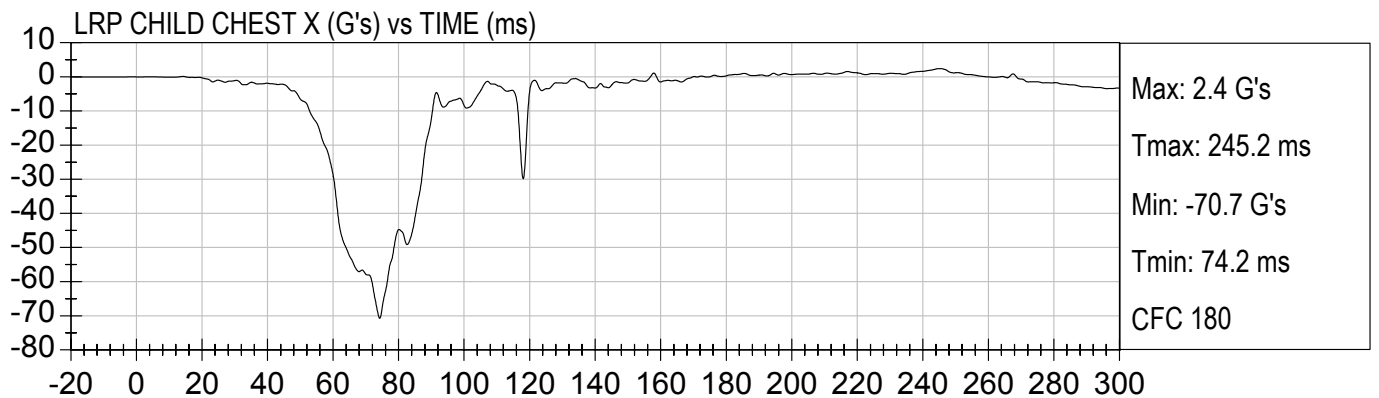


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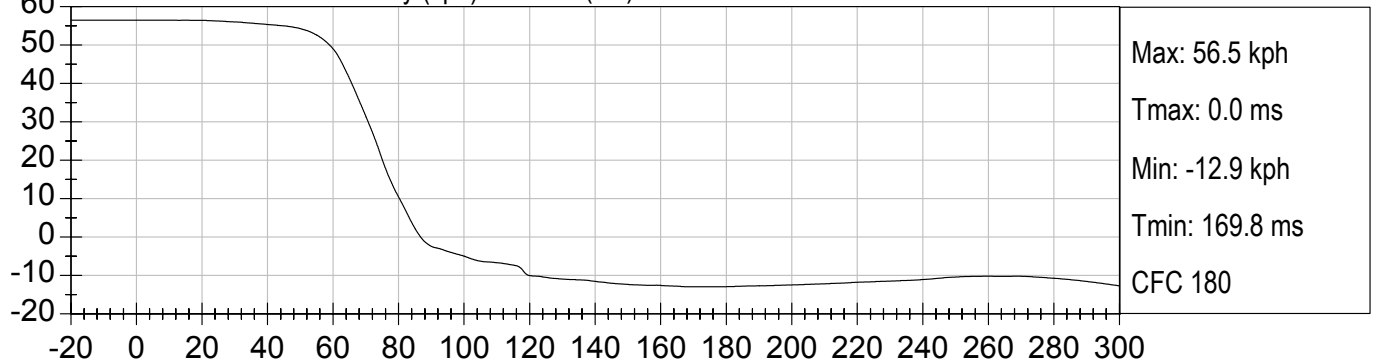
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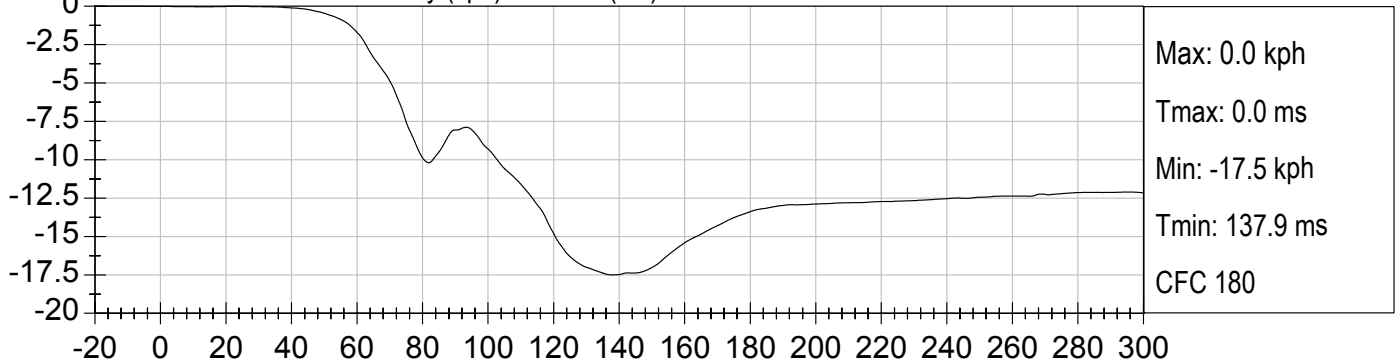




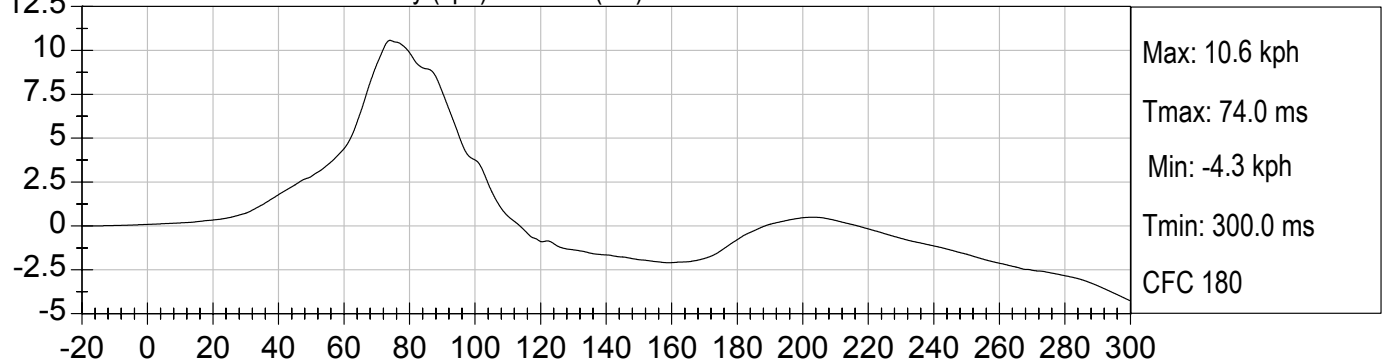
LRP CHILD CHEST X Velocity (kph) vs TIME (ms)



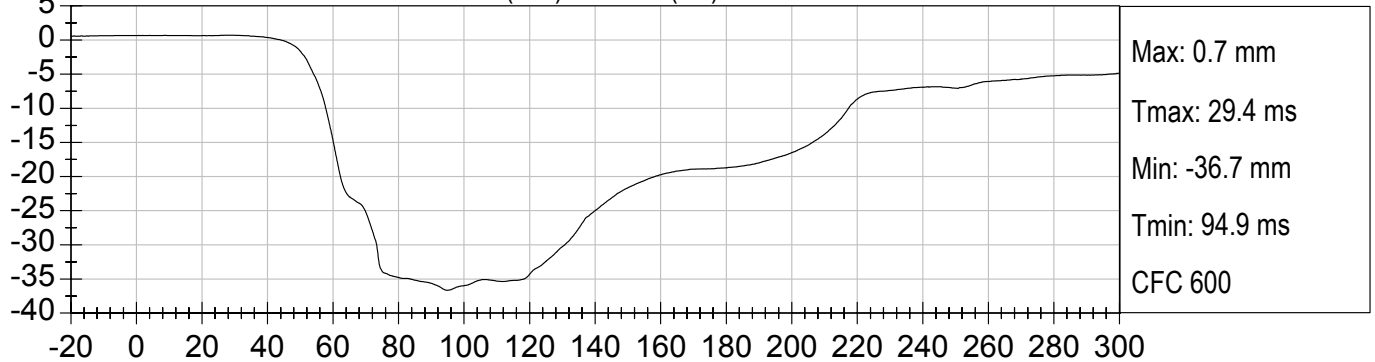
LRP CHILD CHEST Y Velocity (kph) vs TIME (ms)



LRP CHILD CHEST Z Velocity (kph) vs TIME (ms)



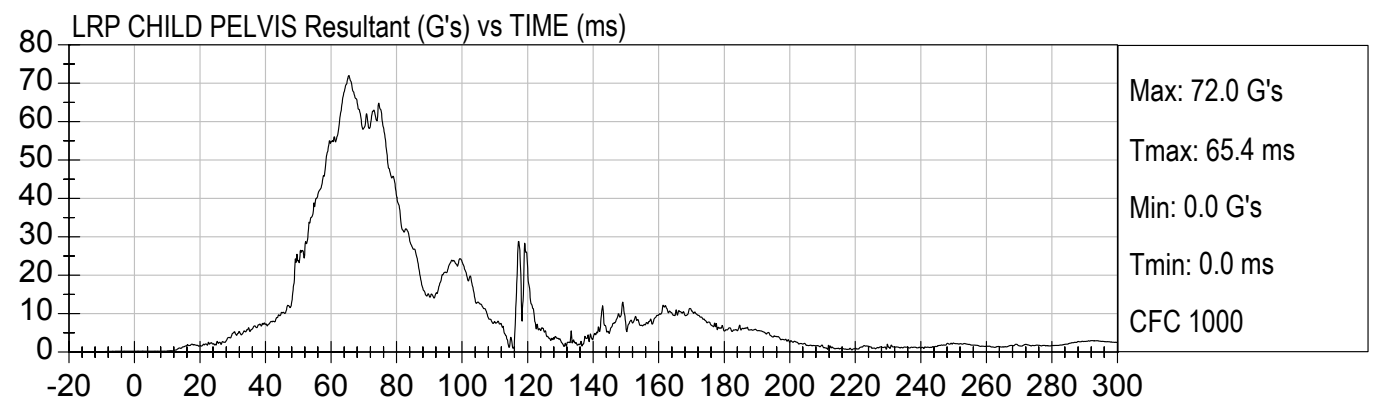
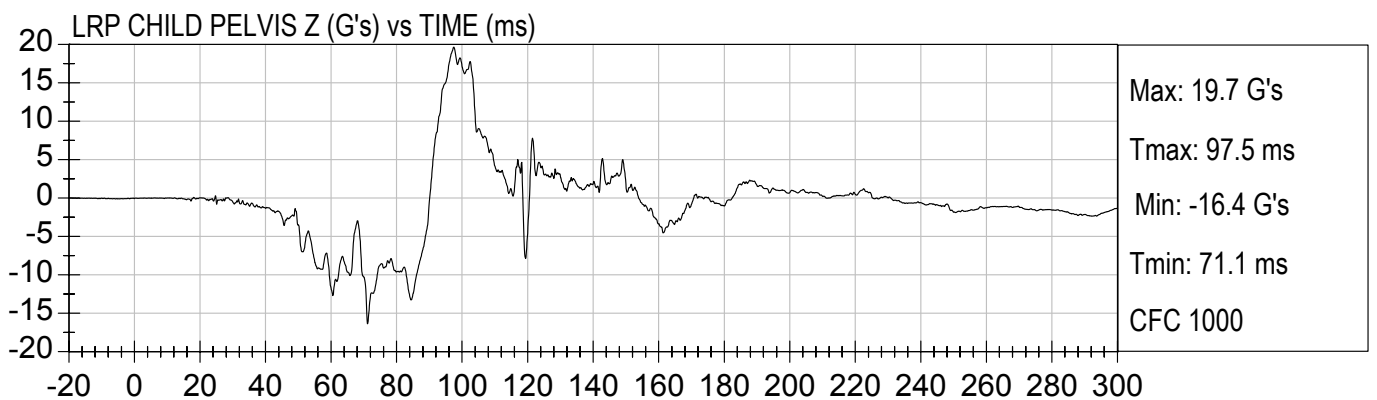
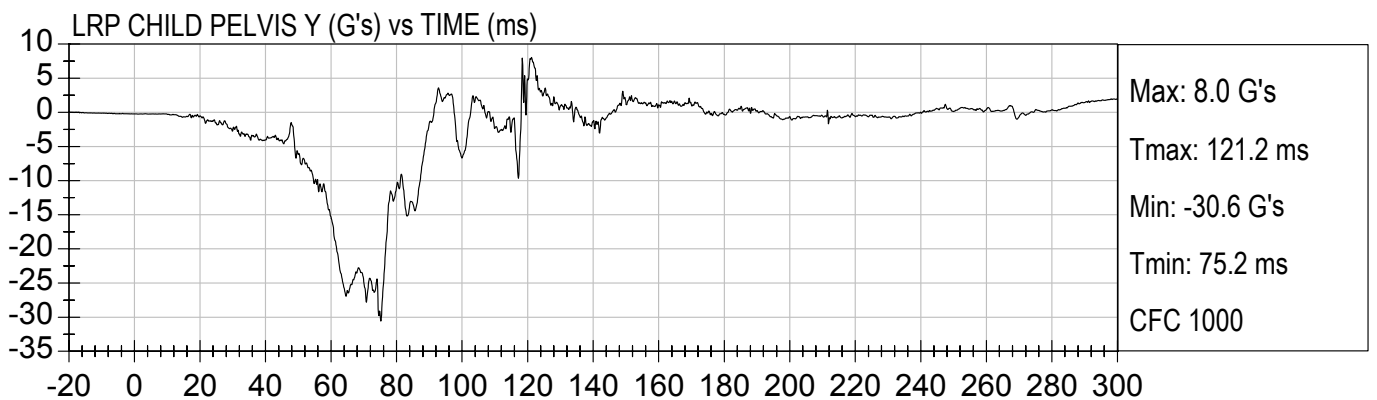
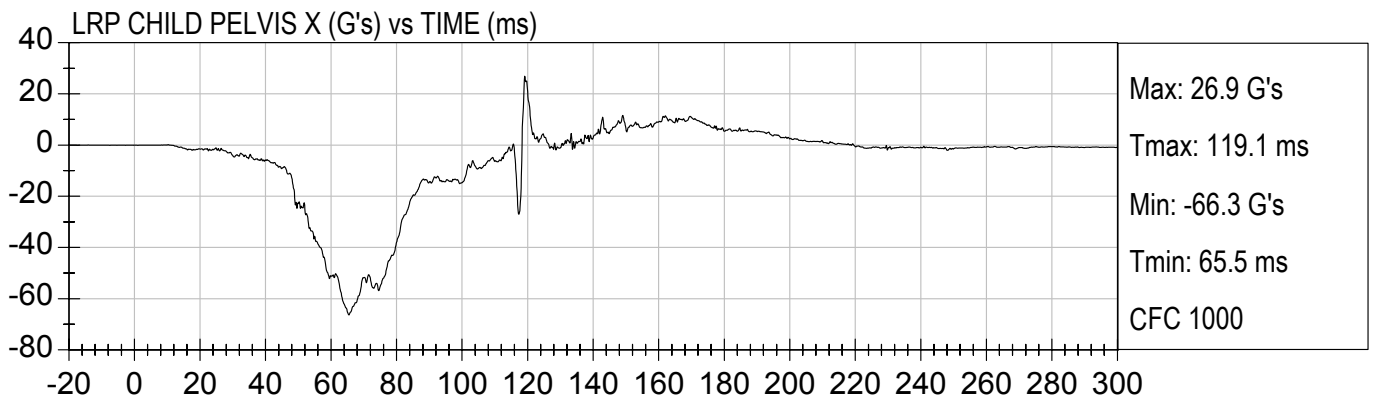
LRP CHILD CHEST DISPLACEMENT (mm) vs TIME (ms)





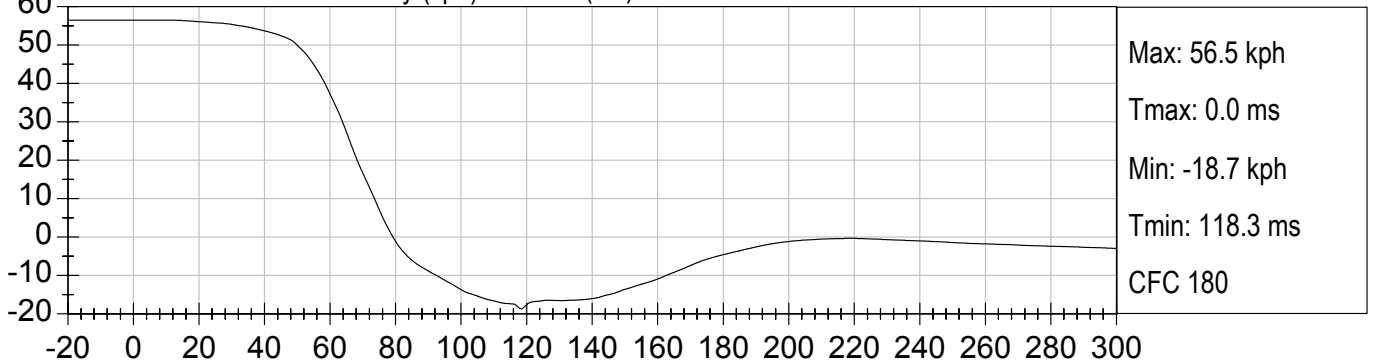
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

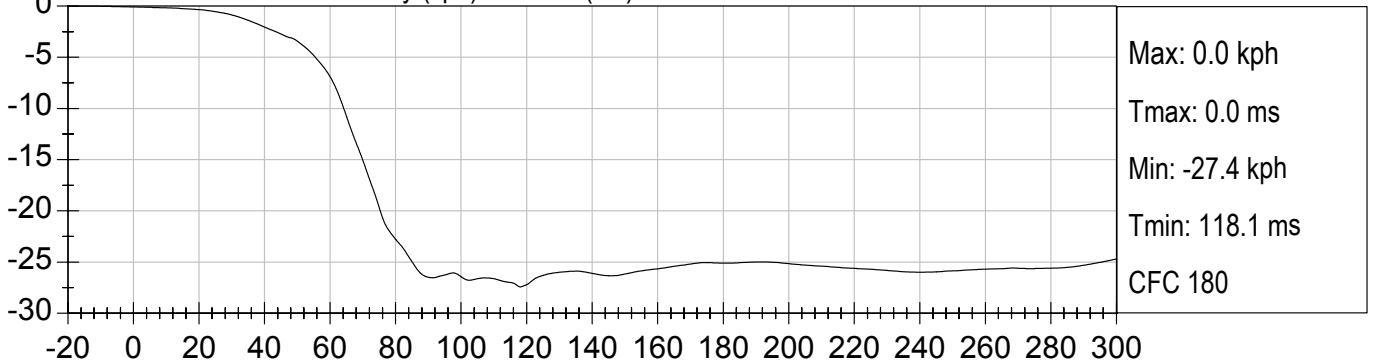




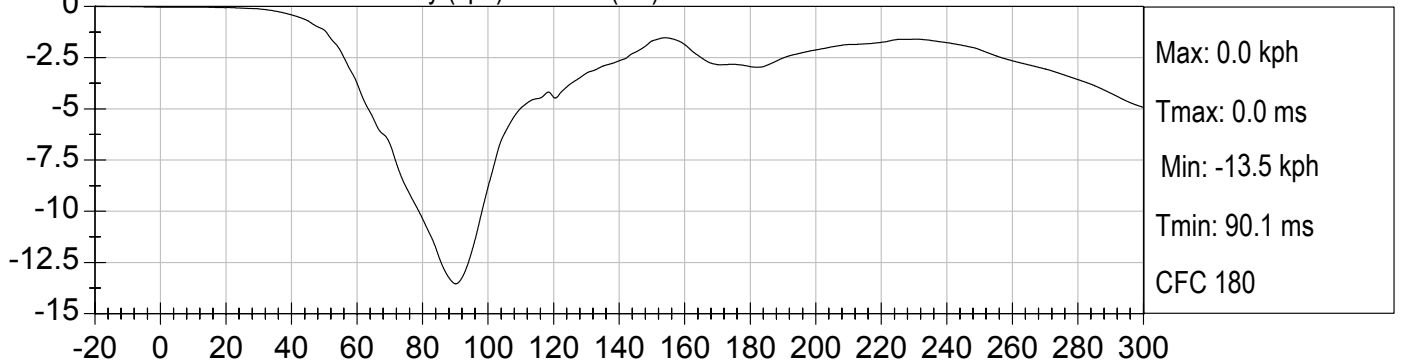
LRP CHILD PELVIS X Velocity (kph) vs TIME (ms)



LRP CHILD PELVIS Y Velocity (kph) vs TIME (ms)



LRP CHILD PELVIS Z Velocity (kph) vs TIME (ms)

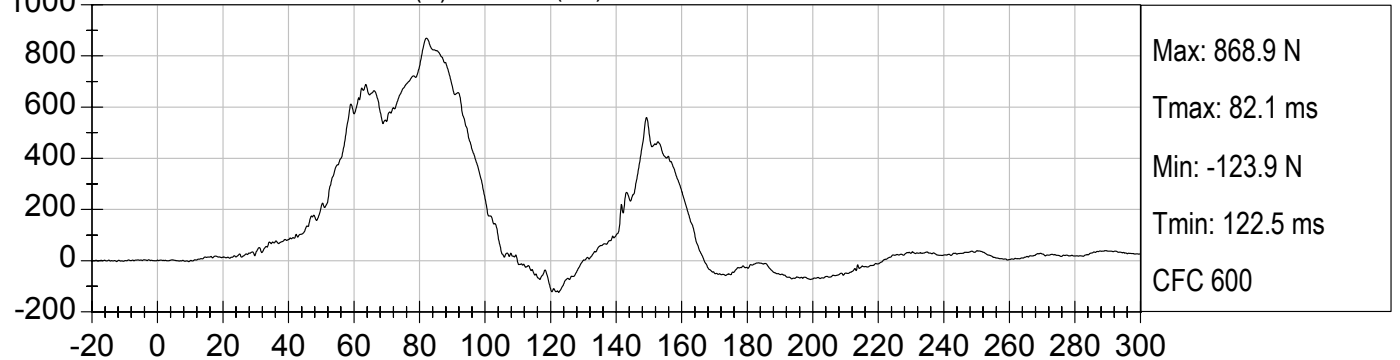




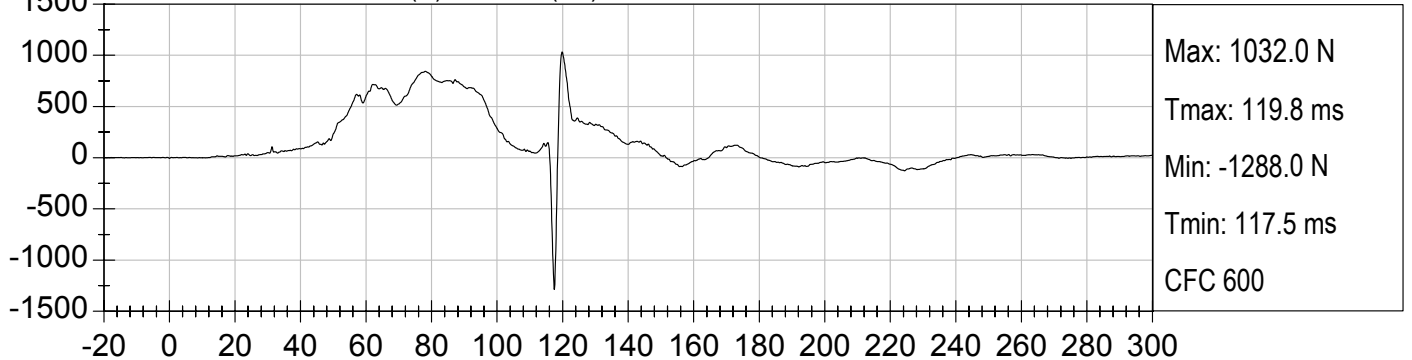
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

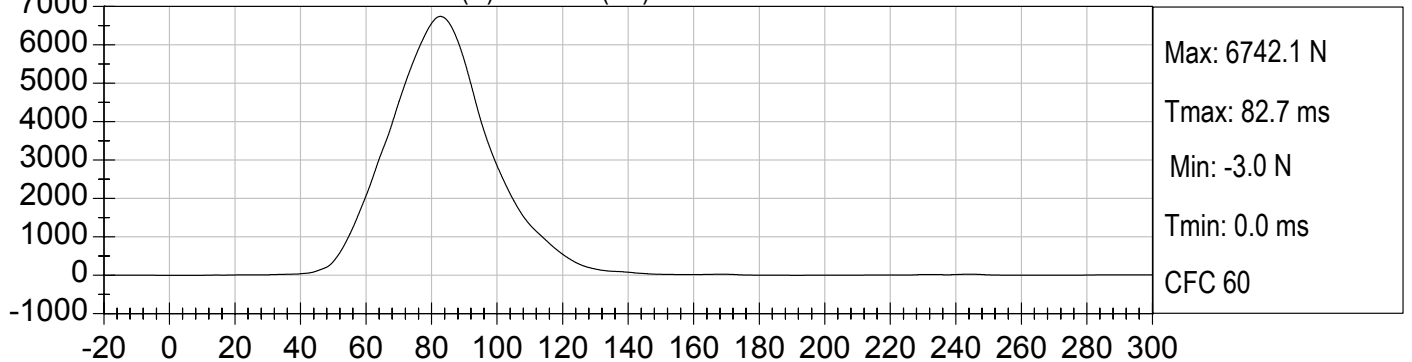
LRP CHILD RIGHT FEMUR (N) vs TIME (ms)



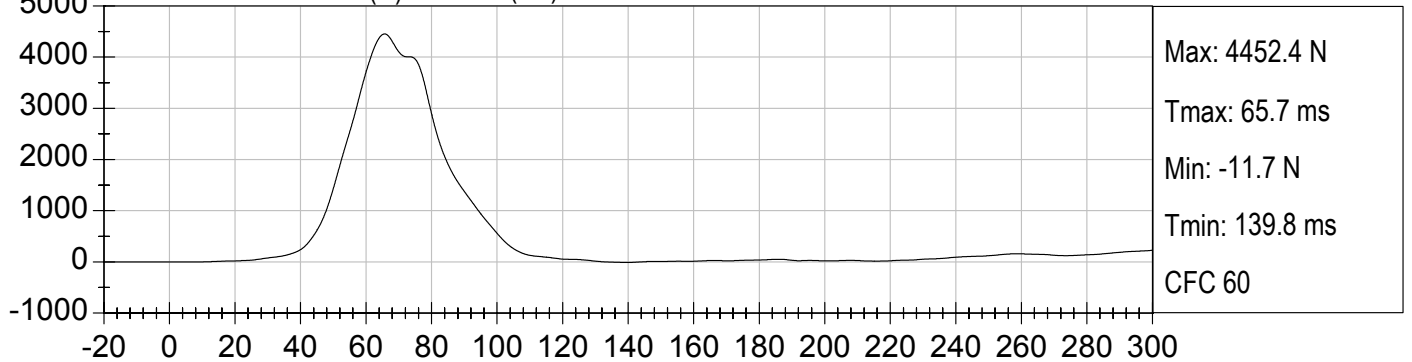
LRP CHILD LEFT FEMUR (N) vs TIME (ms)



LRP CHILD SHOULDER BELT (N) vs TIME (ms)



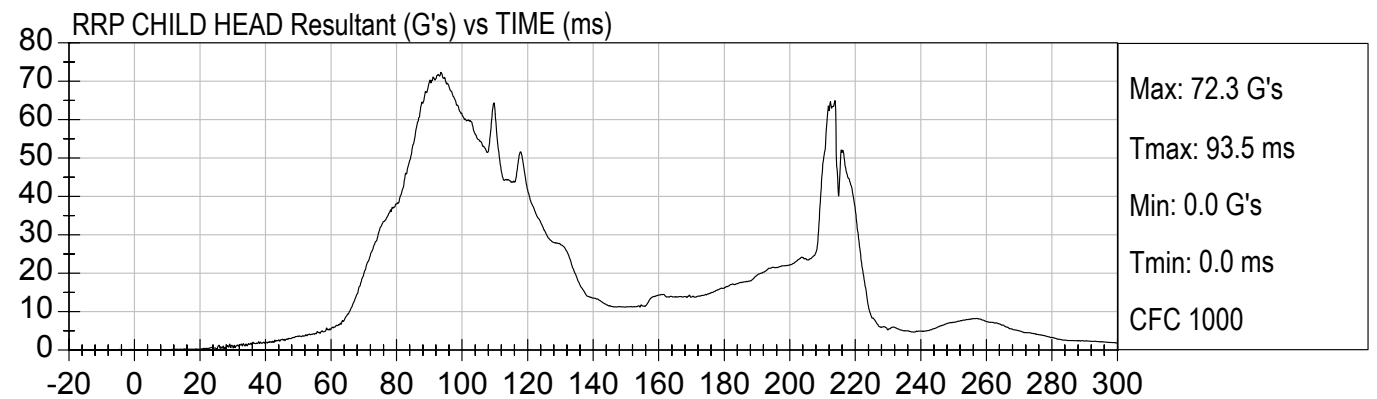
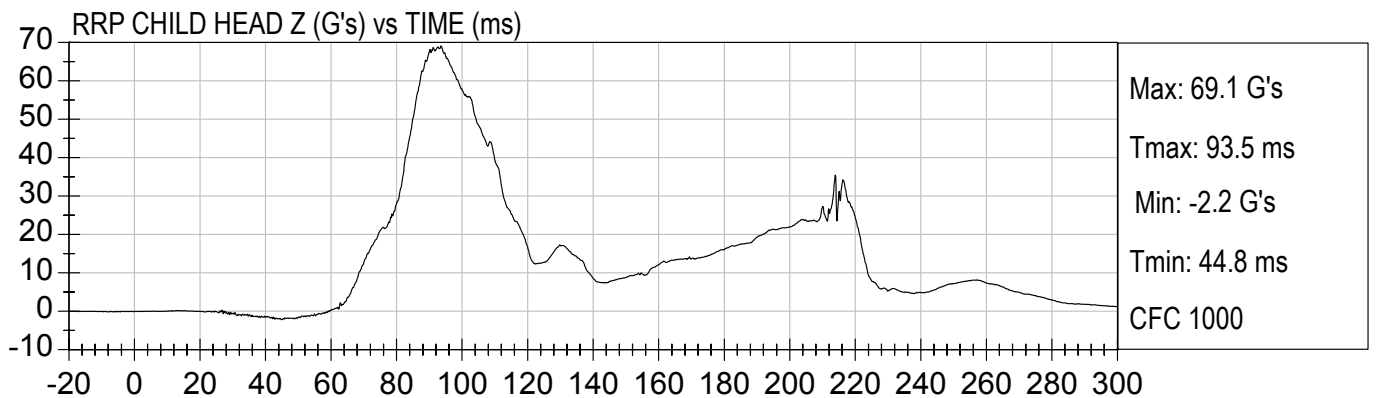
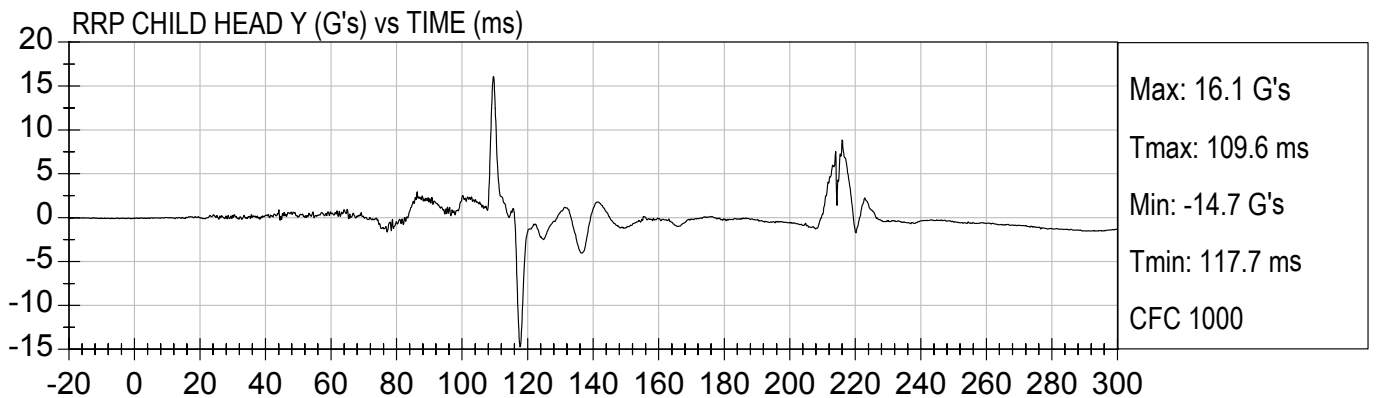
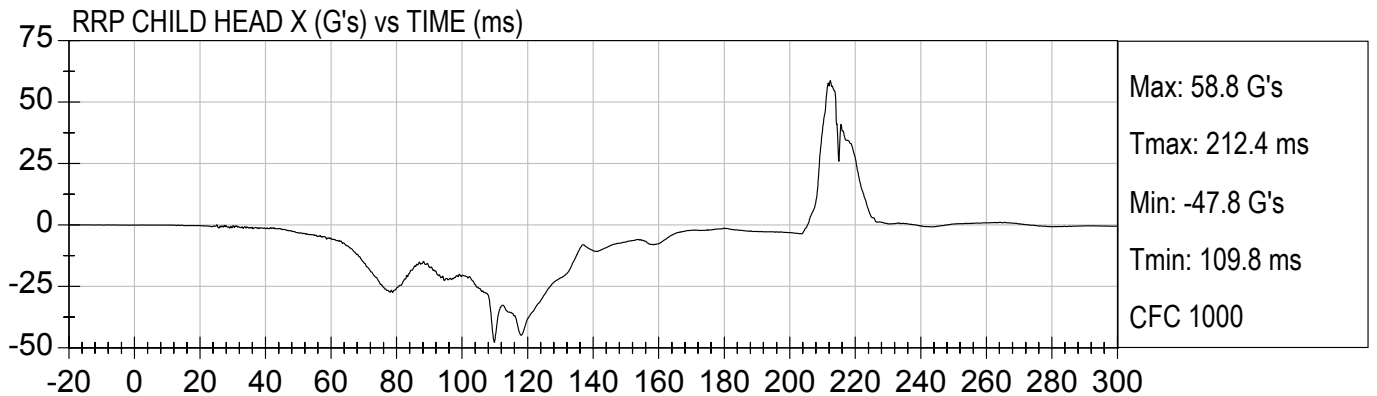
LRP CHILD LAP BELT (N) vs TIME (ms)

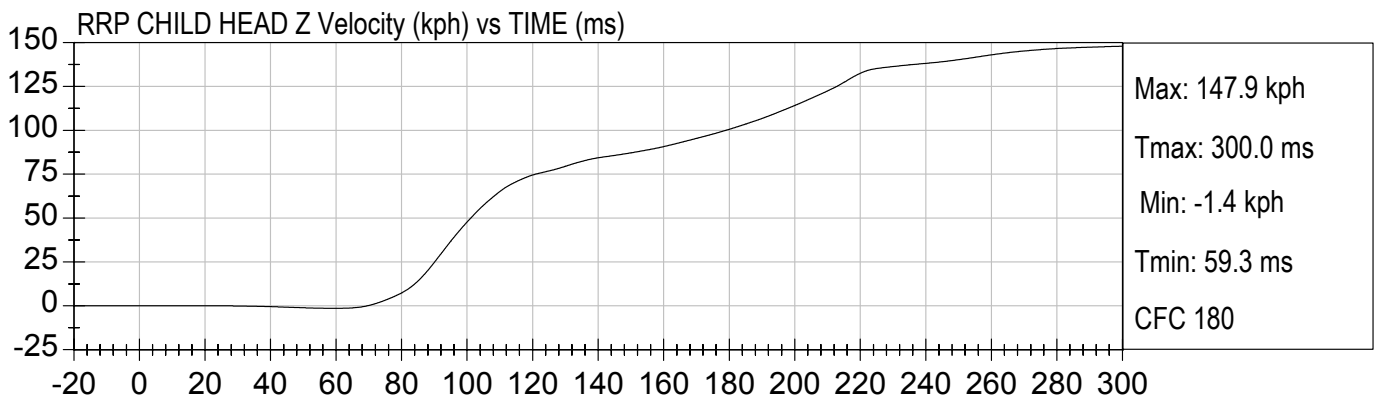
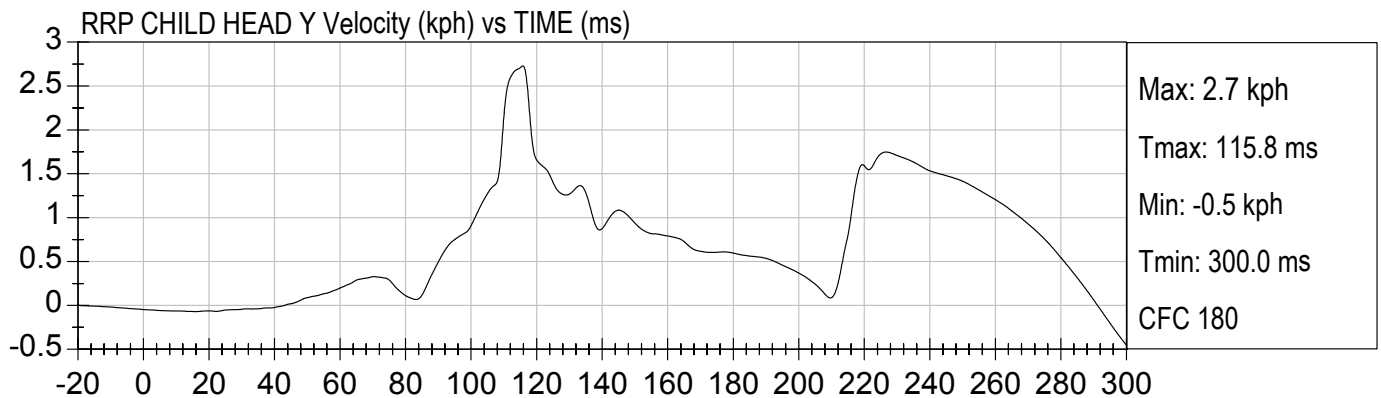
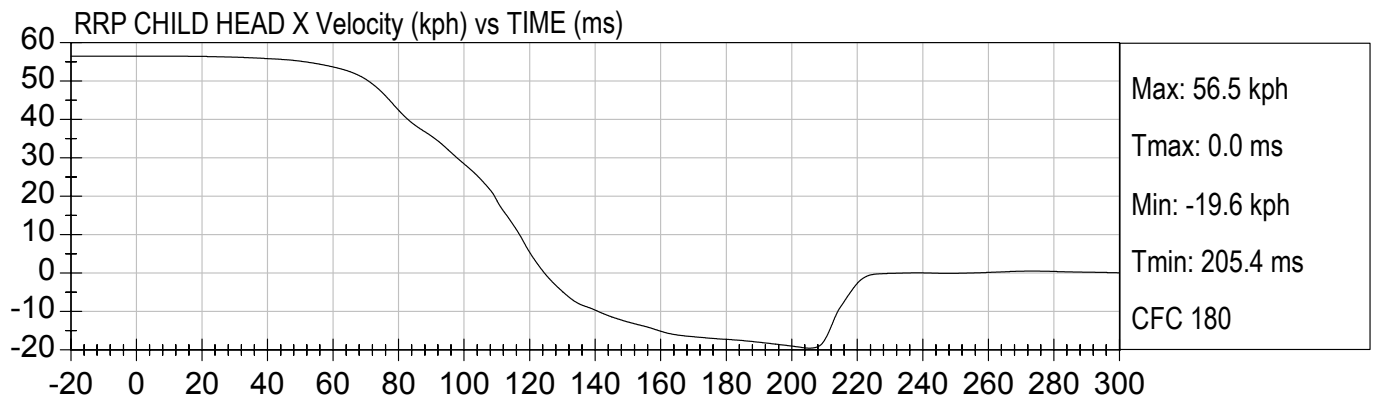




35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)



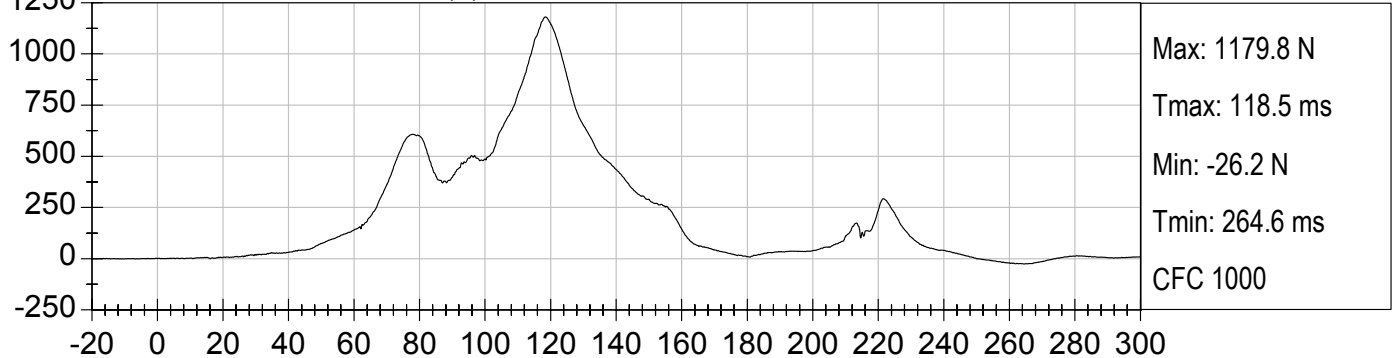




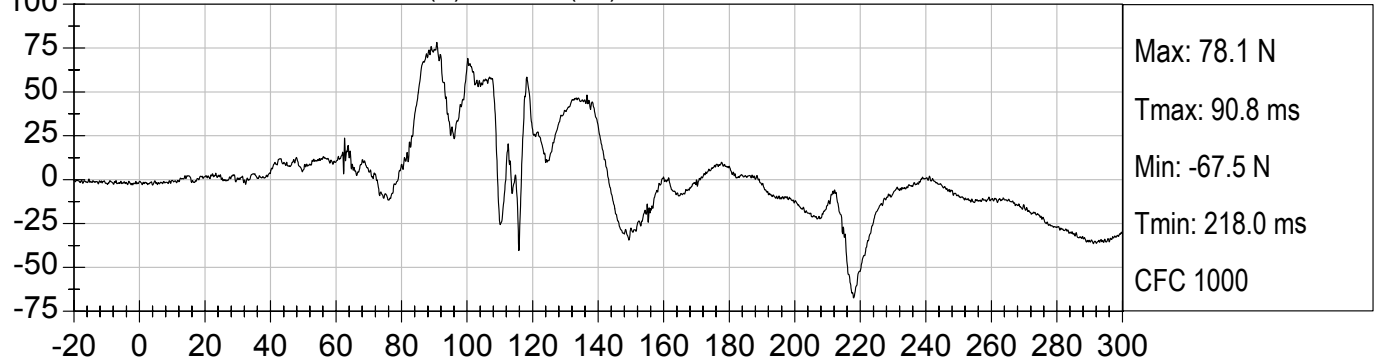
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

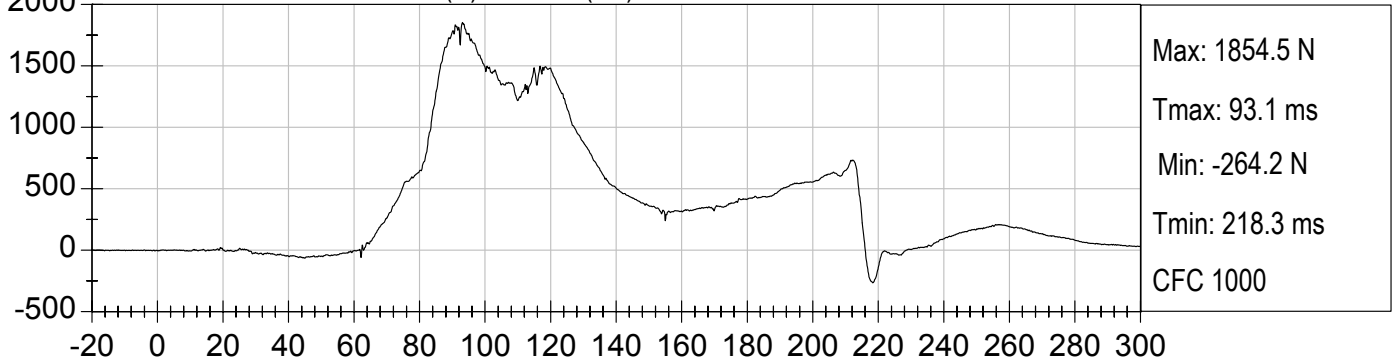
RRP CHILD UPPER NECK FX (N) vs TIME (ms)



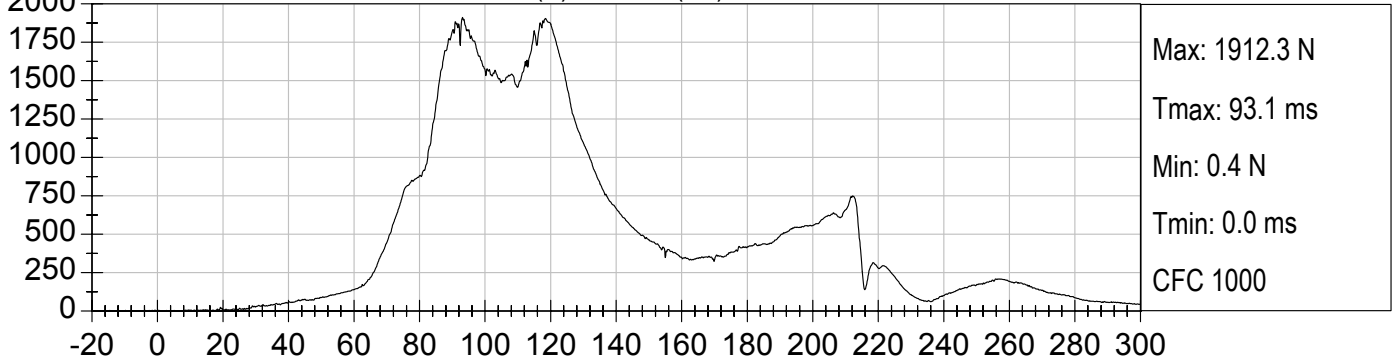
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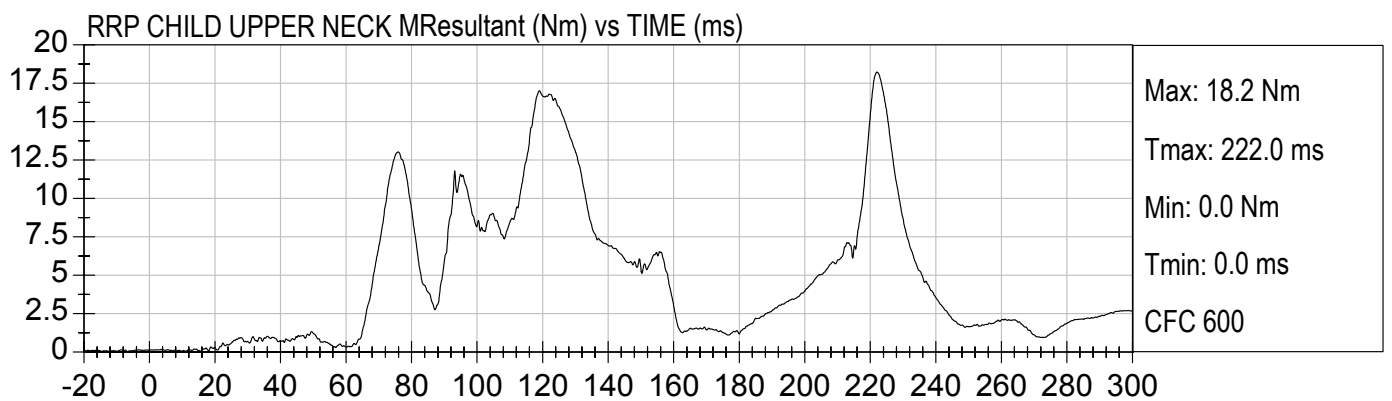
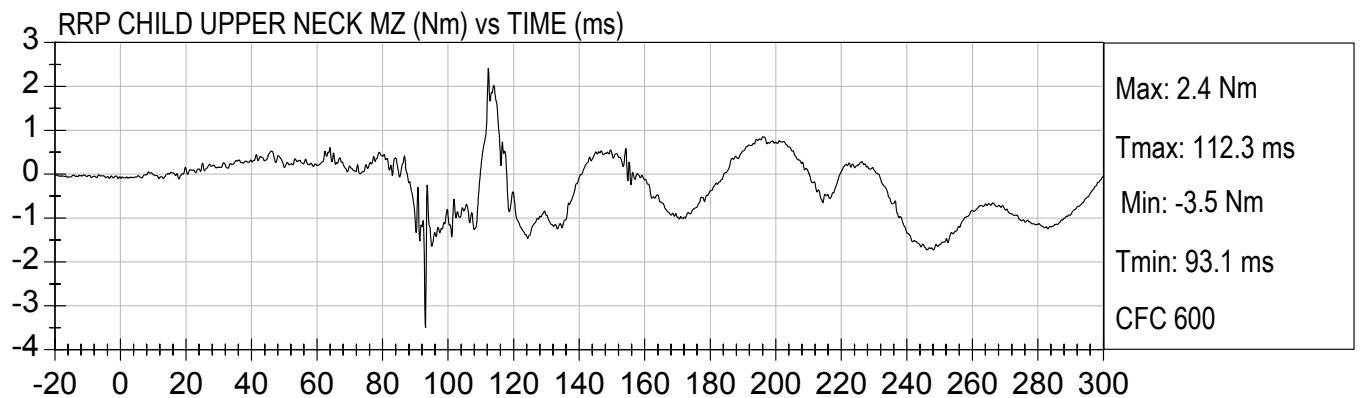
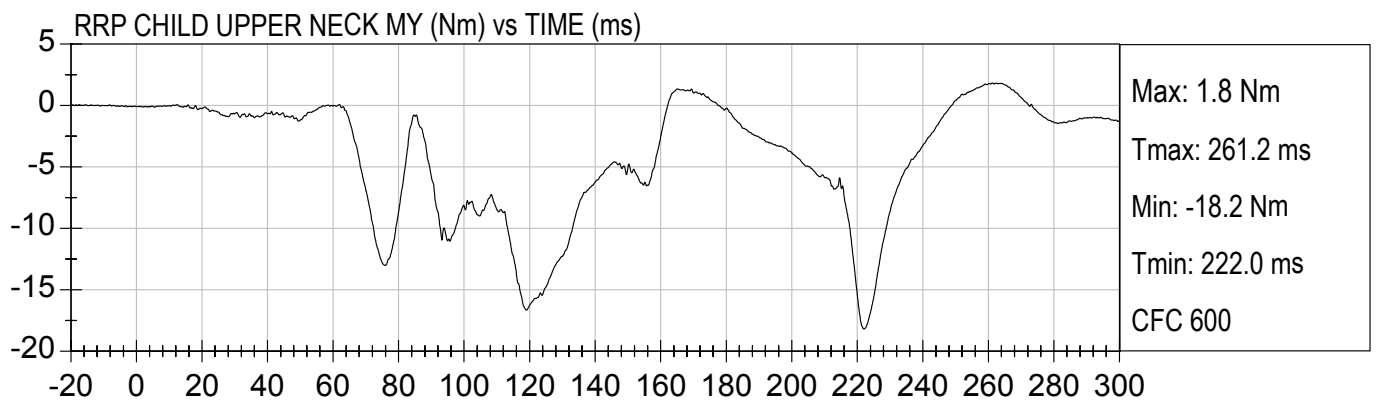
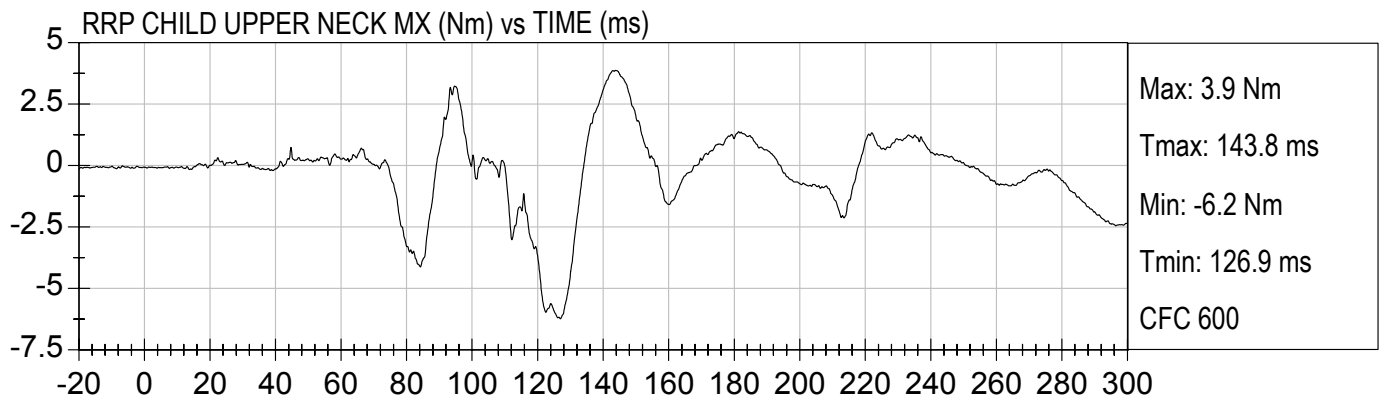


RRP CHILD UPPER NECK FZ (N) vs TIME (ms)



RRP CHILD UPPER NECK FResultant (N) vs TIME (ms)

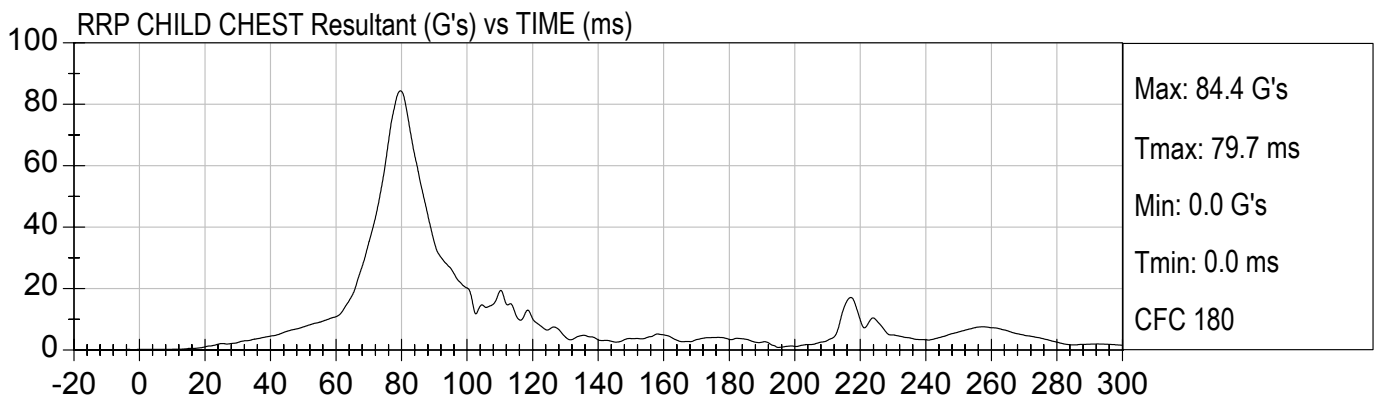
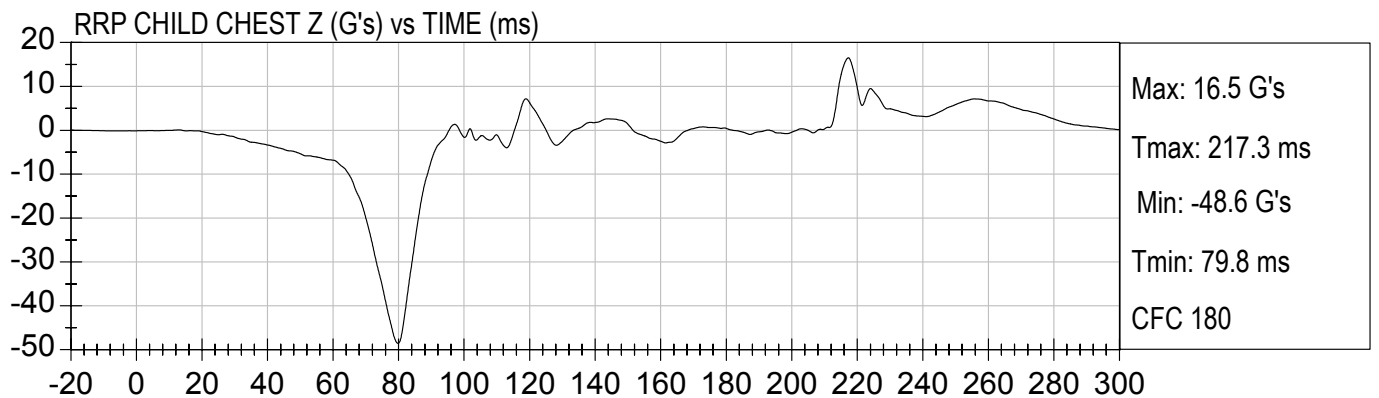
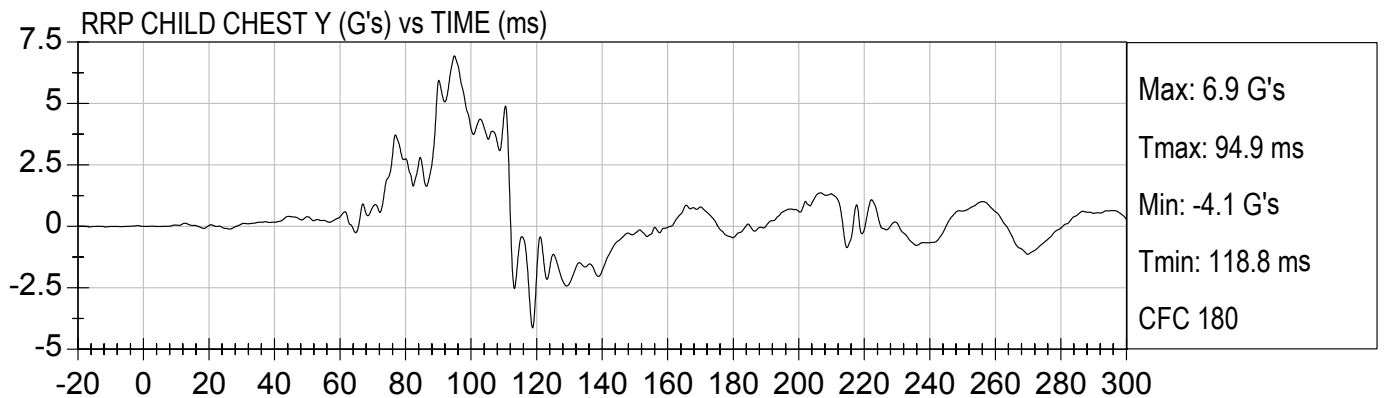
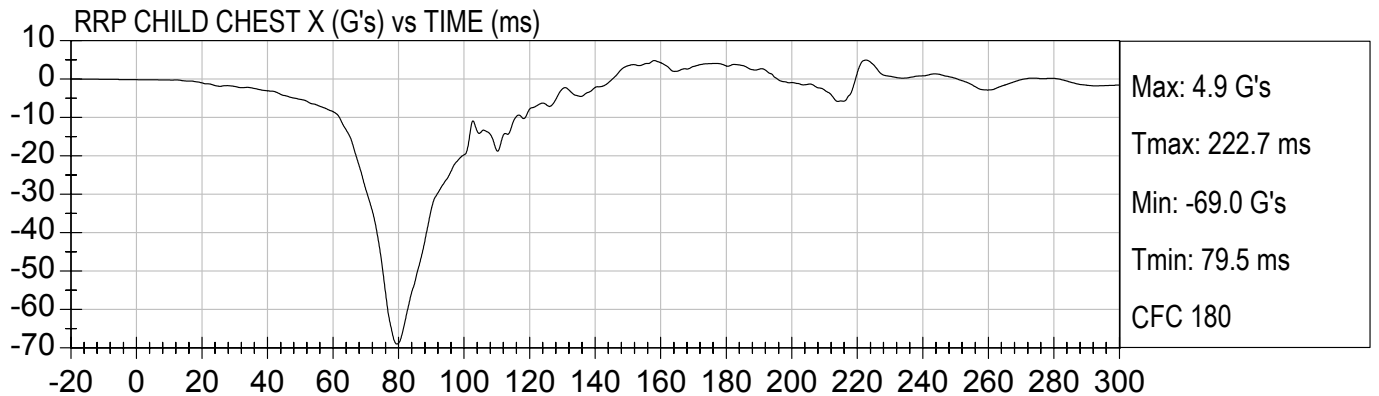






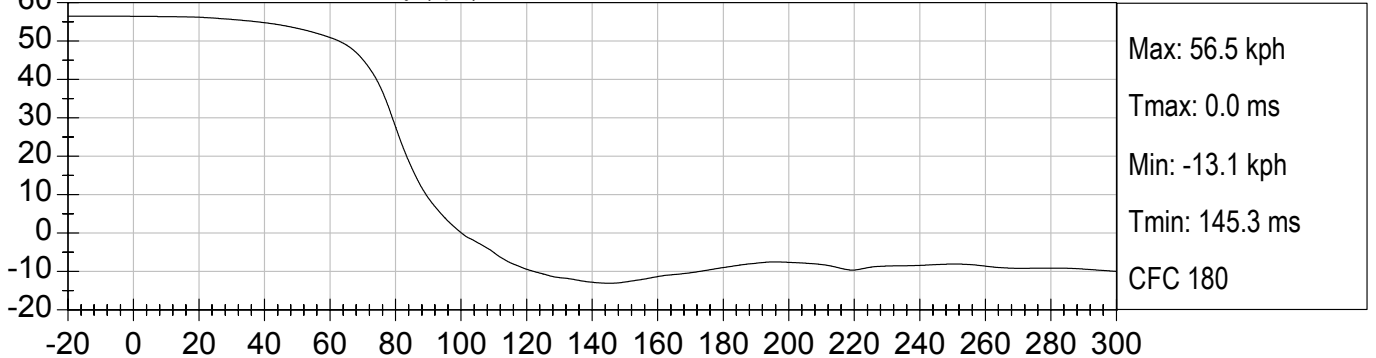
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

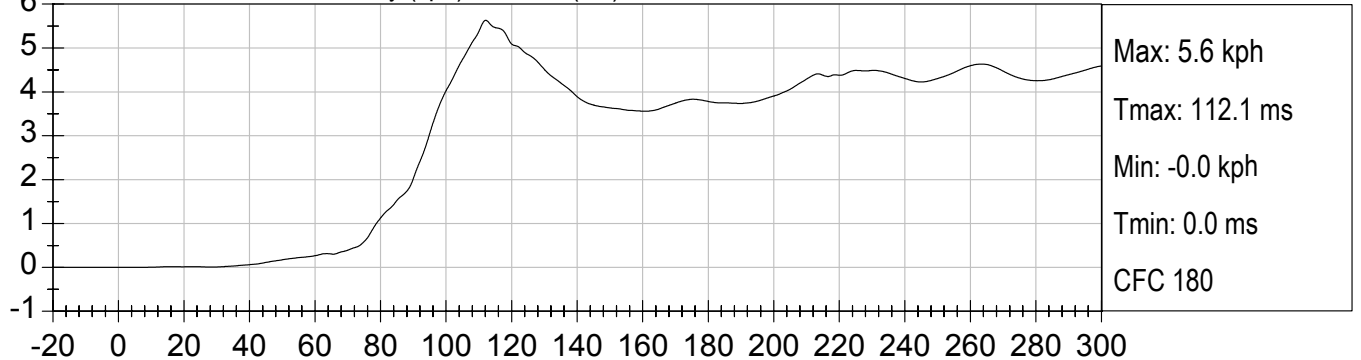




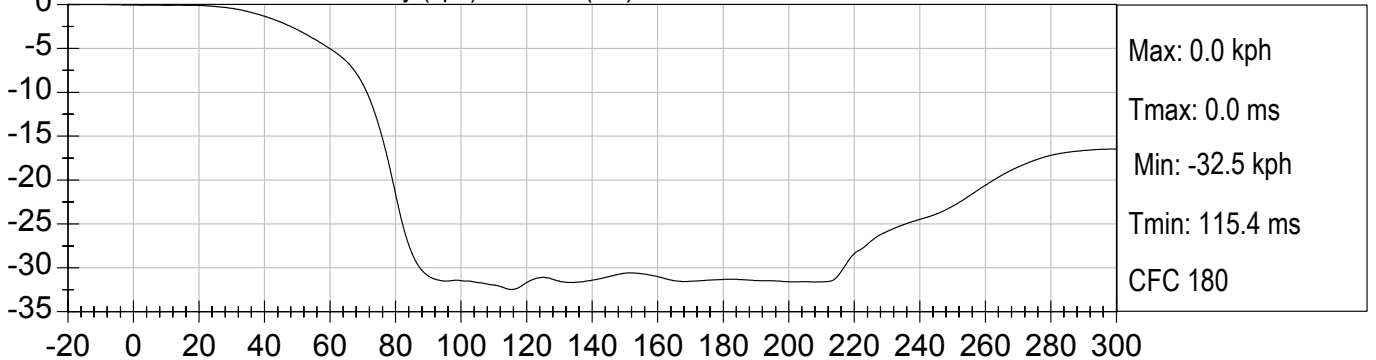
RRP CHILD CHEST X Velocity (kph) vs TIME (ms)



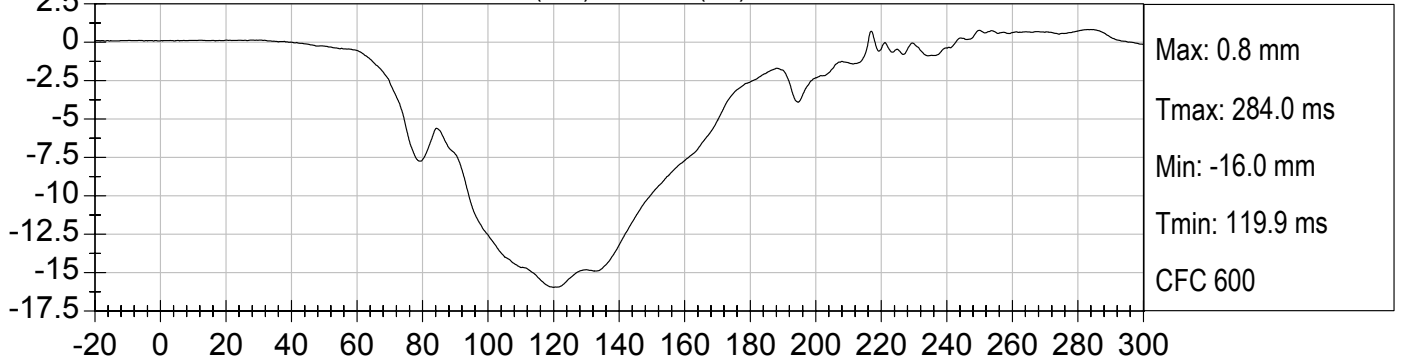
RRP CHILD CHEST Y Velocity (kph) vs TIME (ms)



RRP CHILD CHEST Z Velocity (kph) vs TIME (ms)



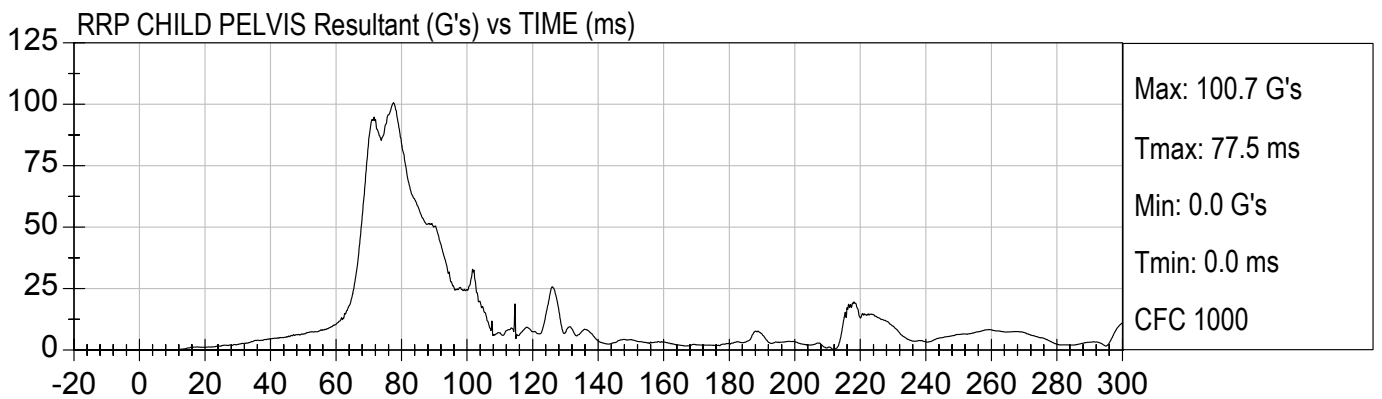
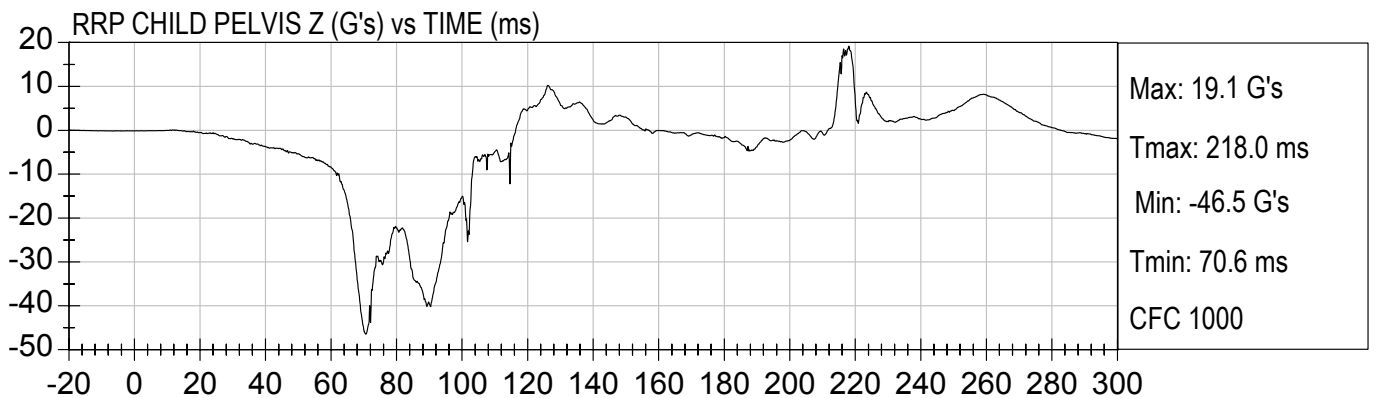
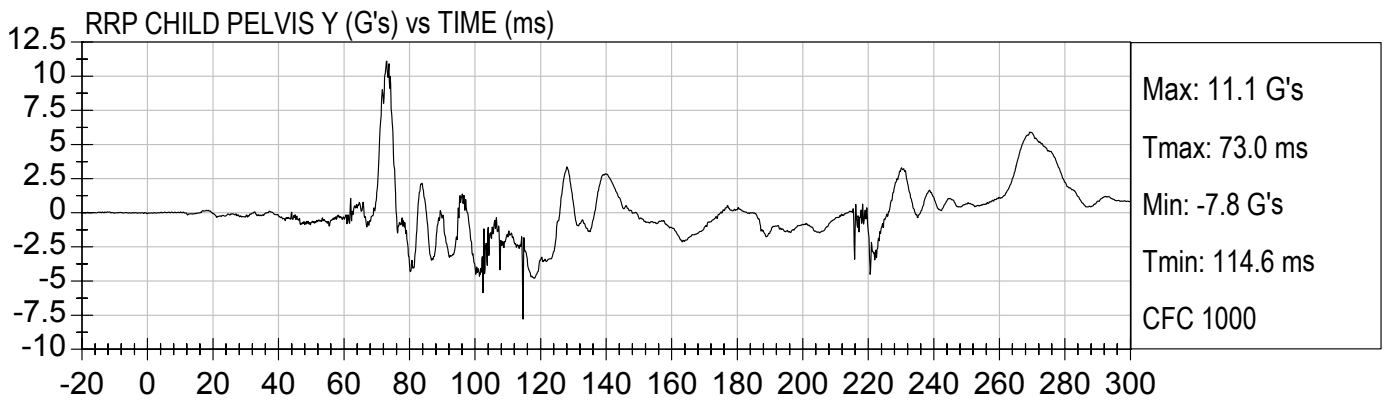
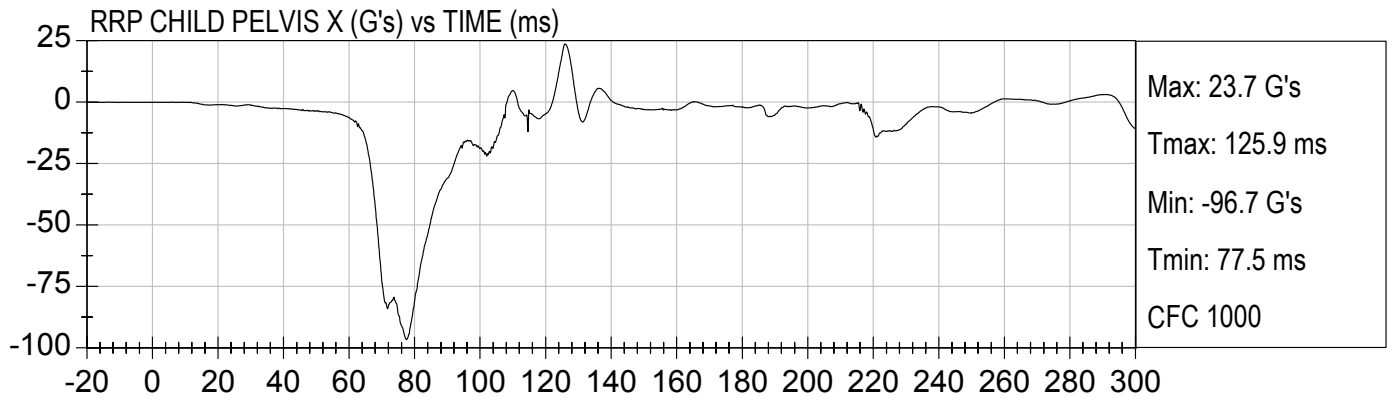
RRP CHILD CHEST DISPLACEMENT (mm) vs TIME (ms)

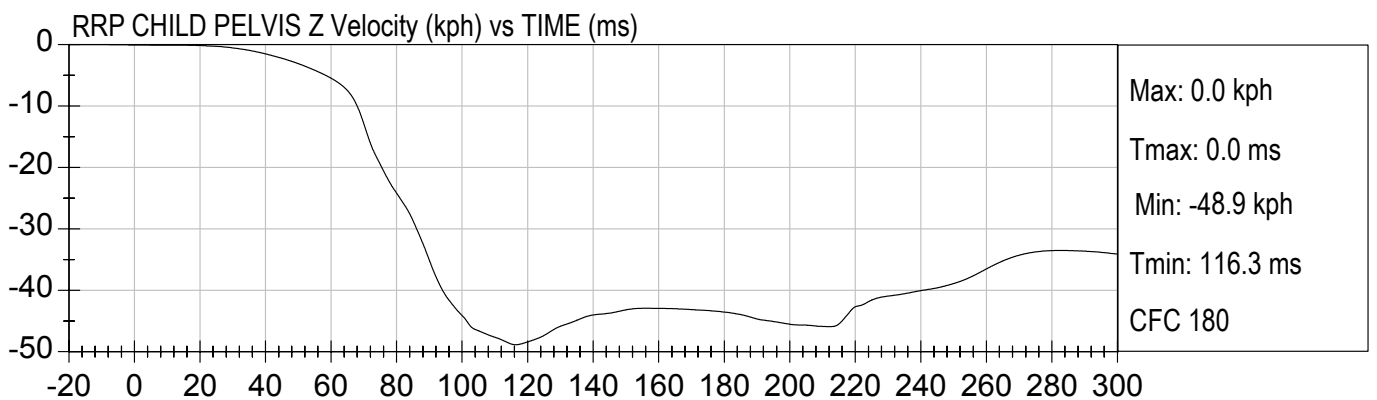
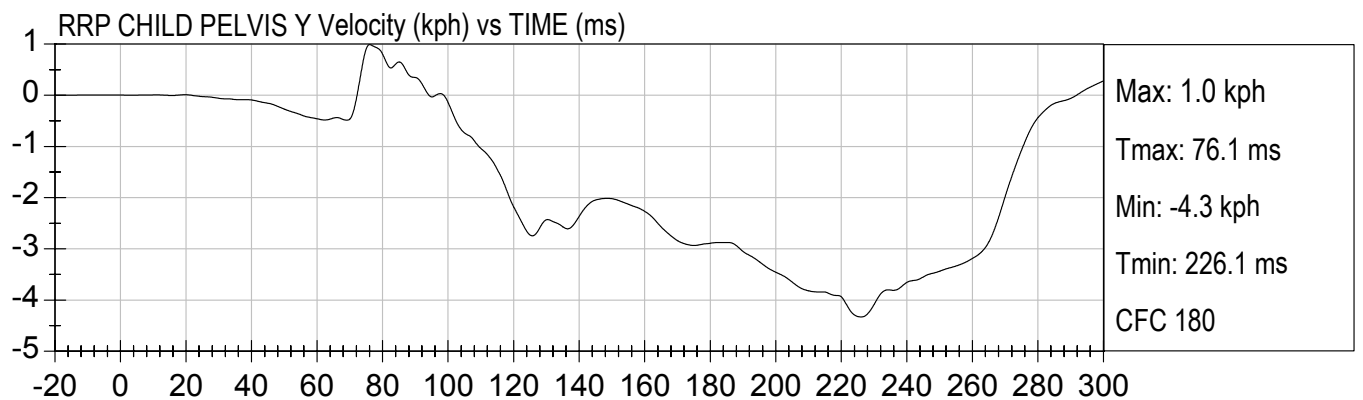
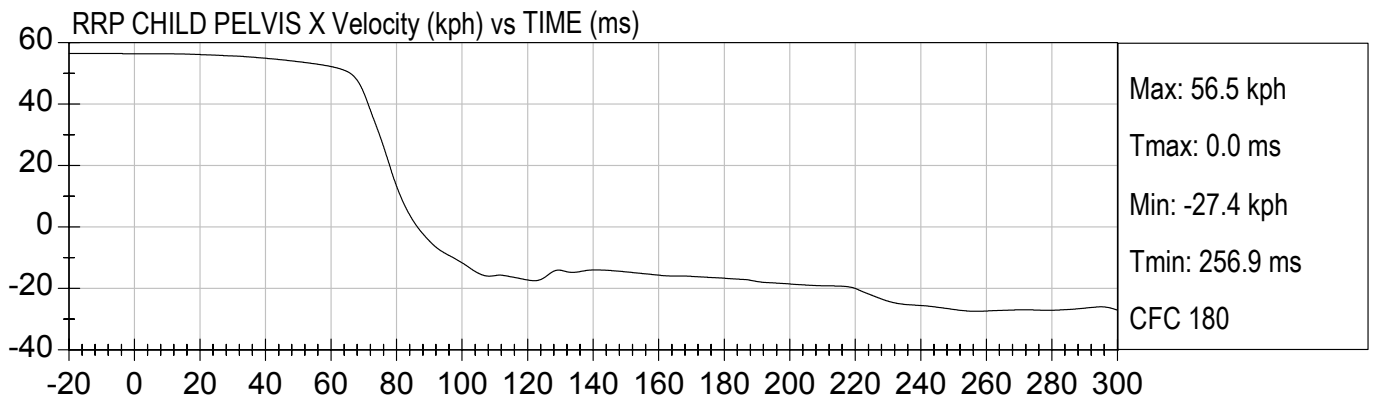




35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

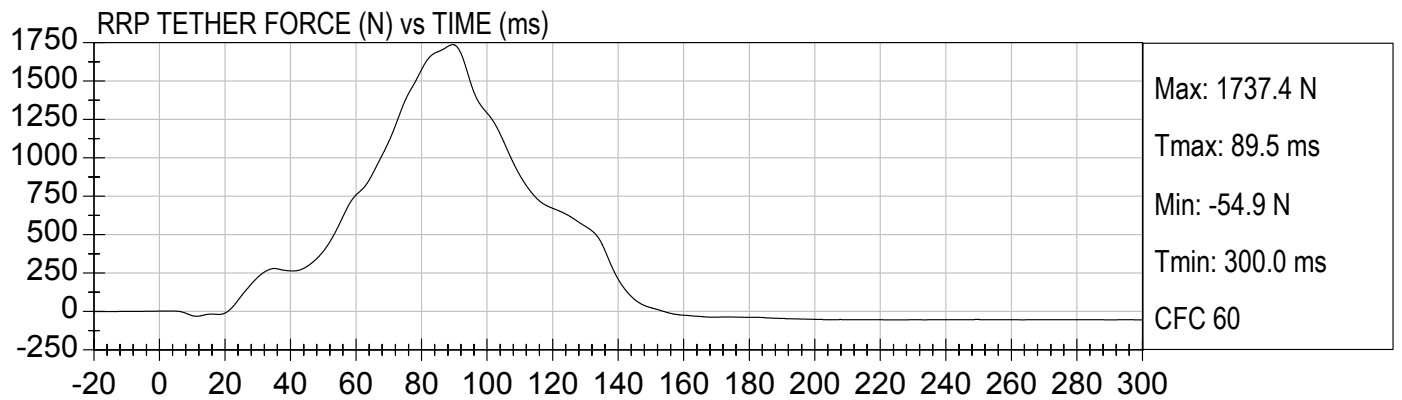


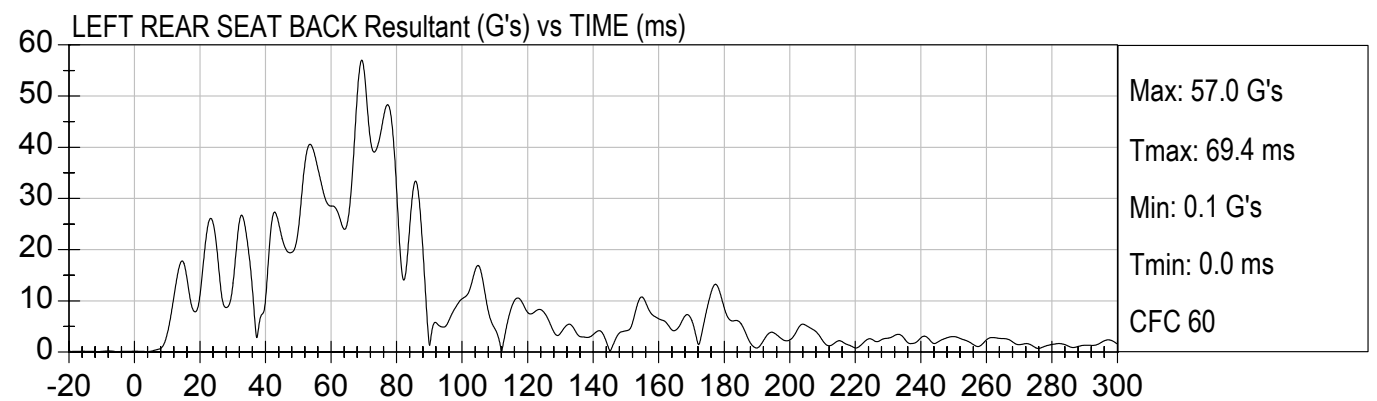
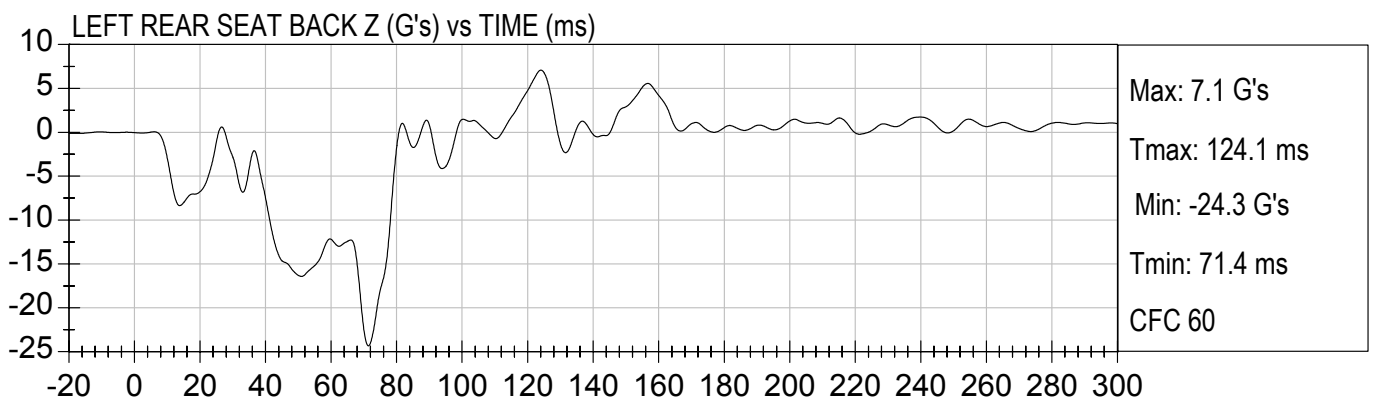
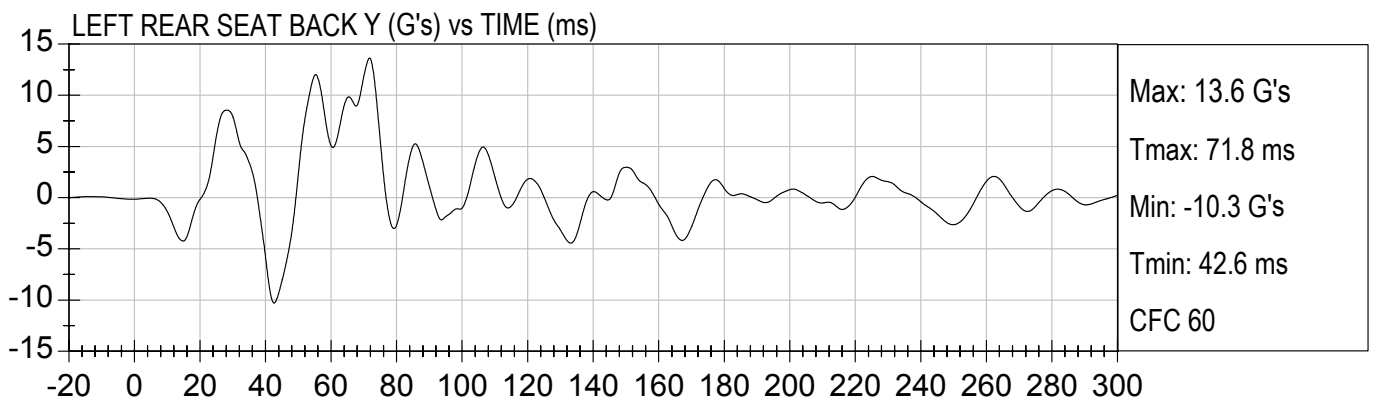
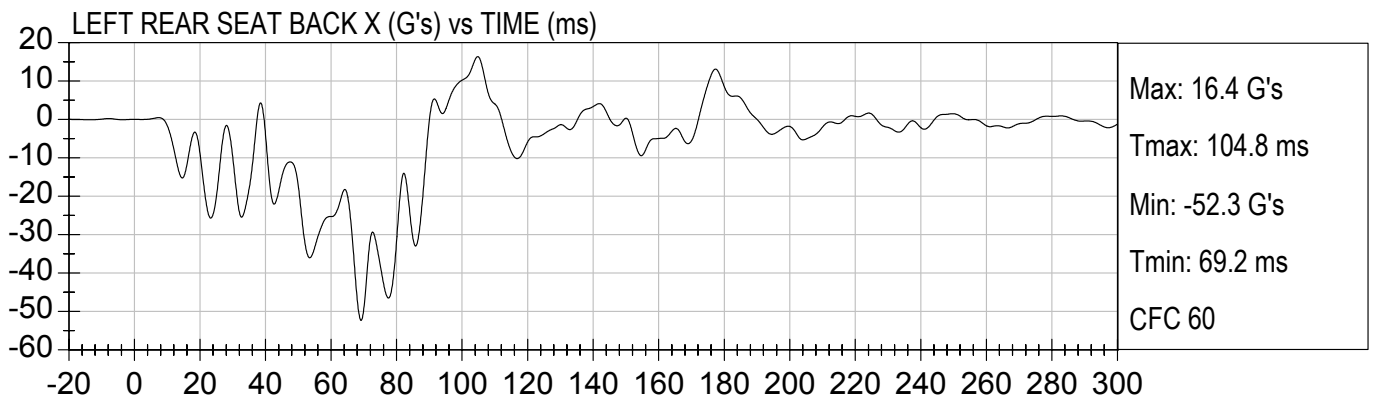


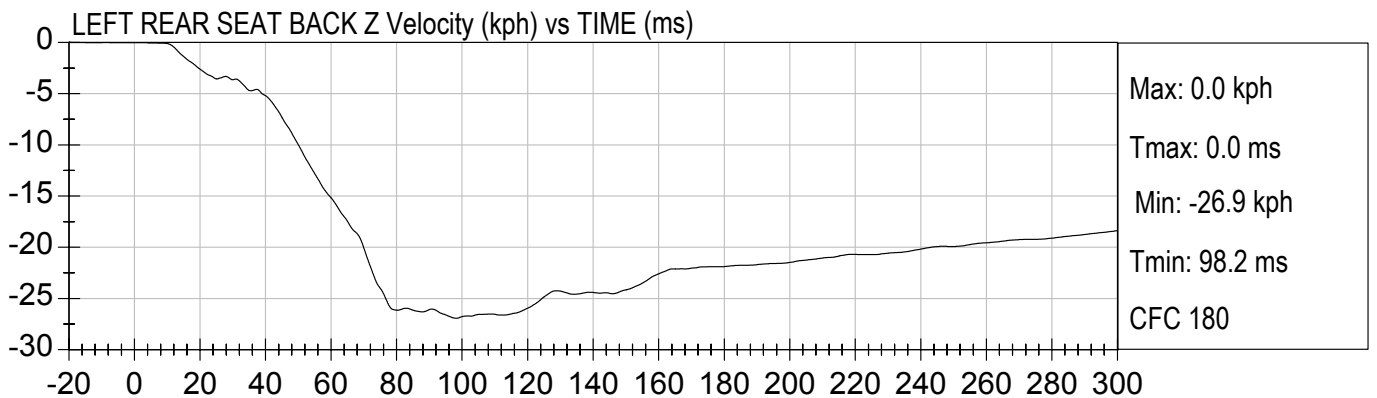
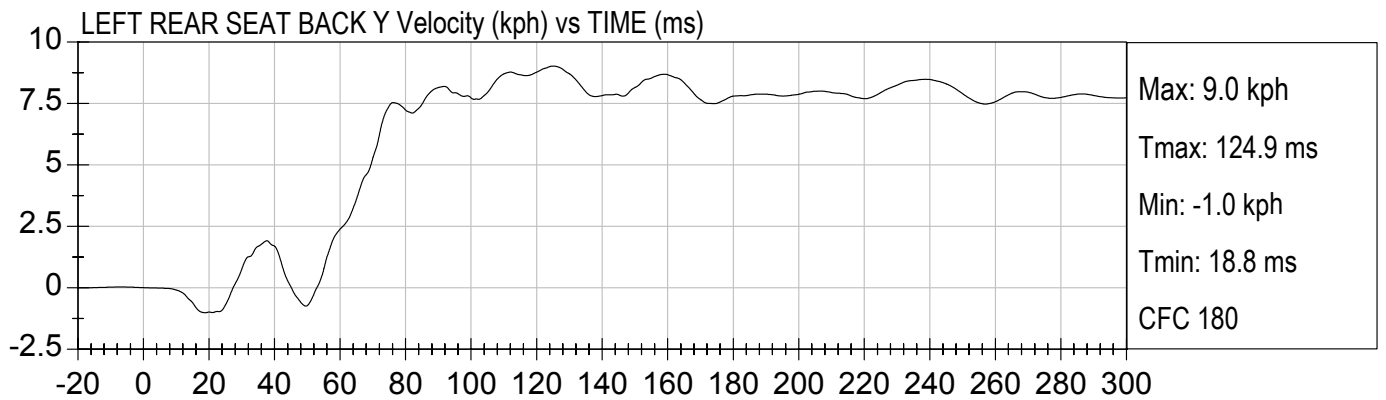
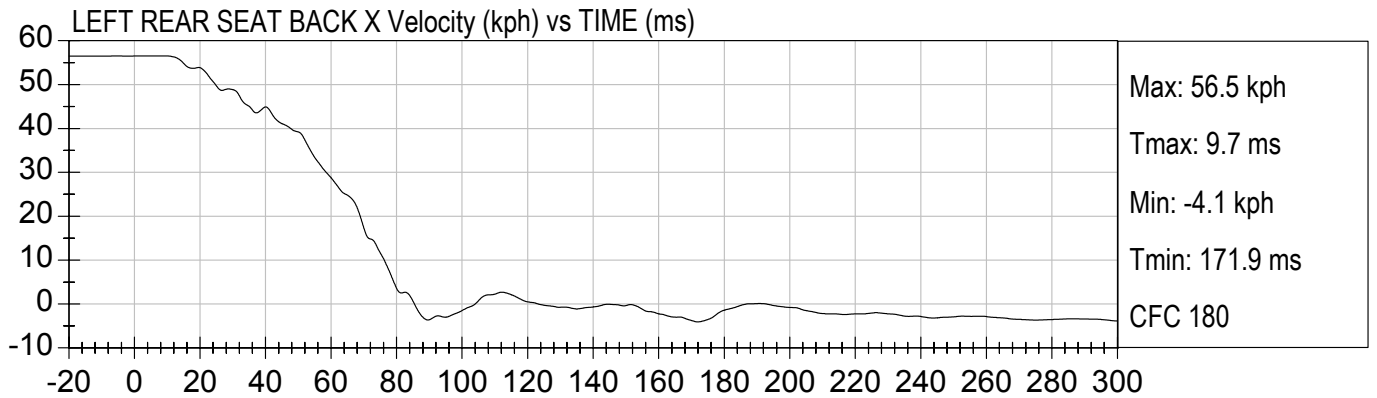


35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)



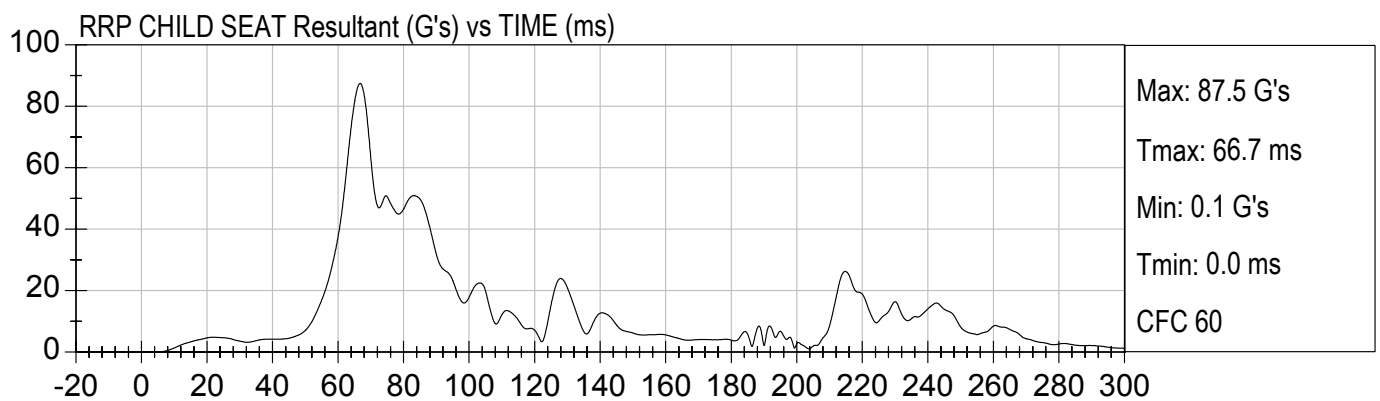
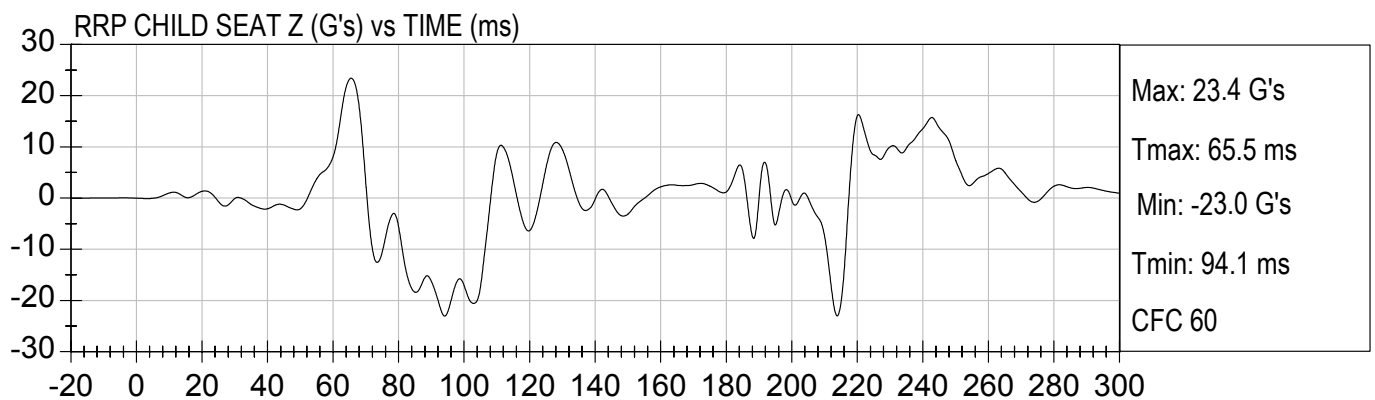
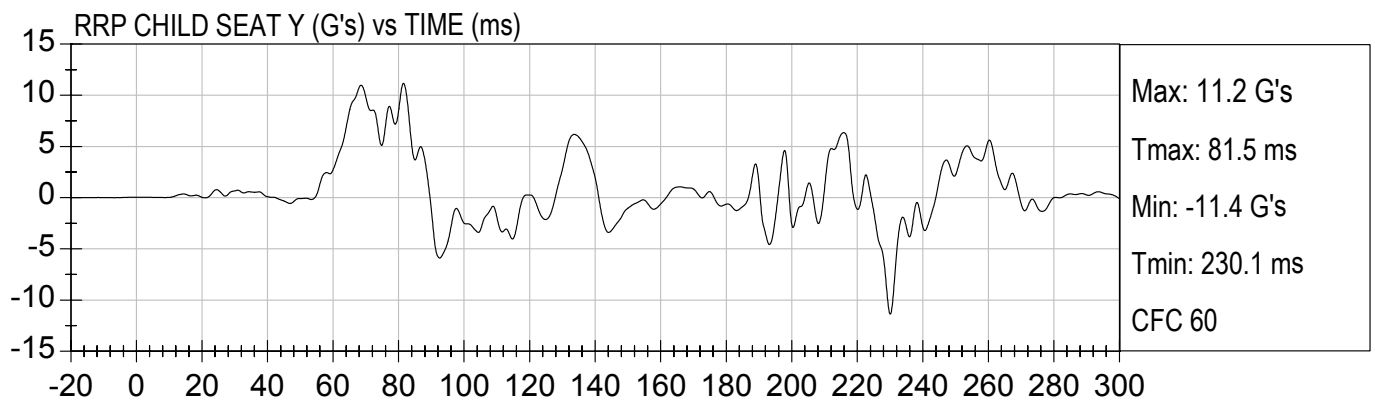
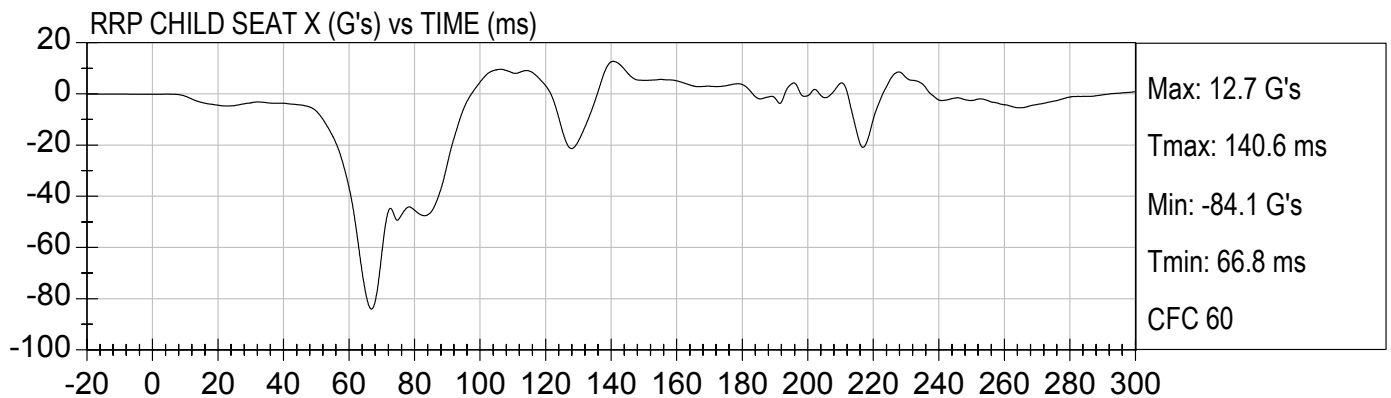






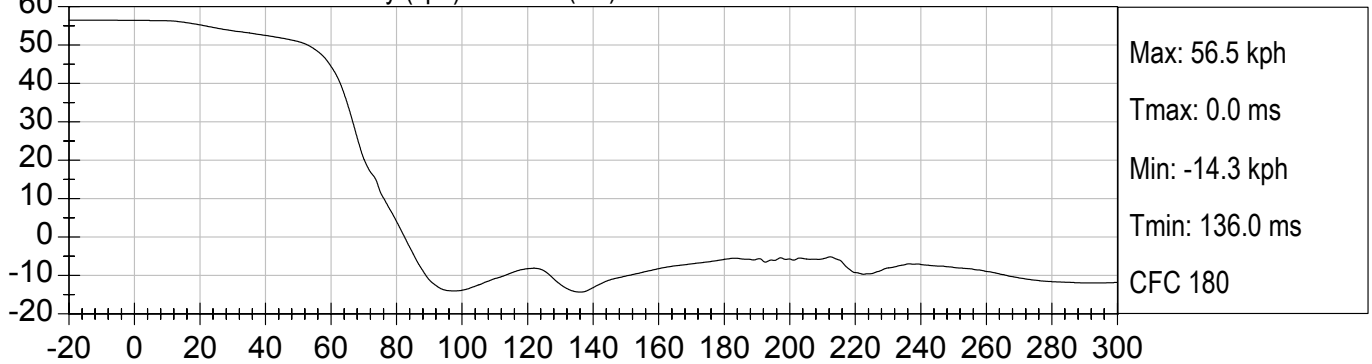
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

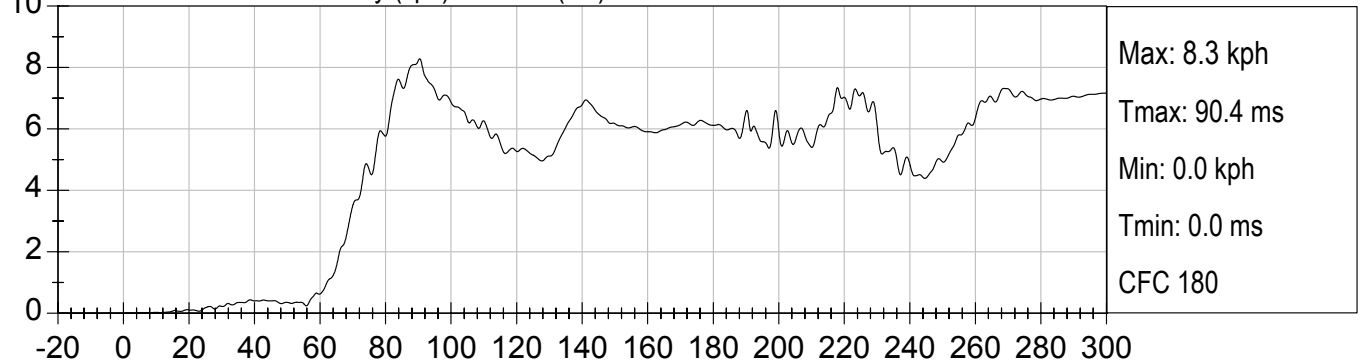




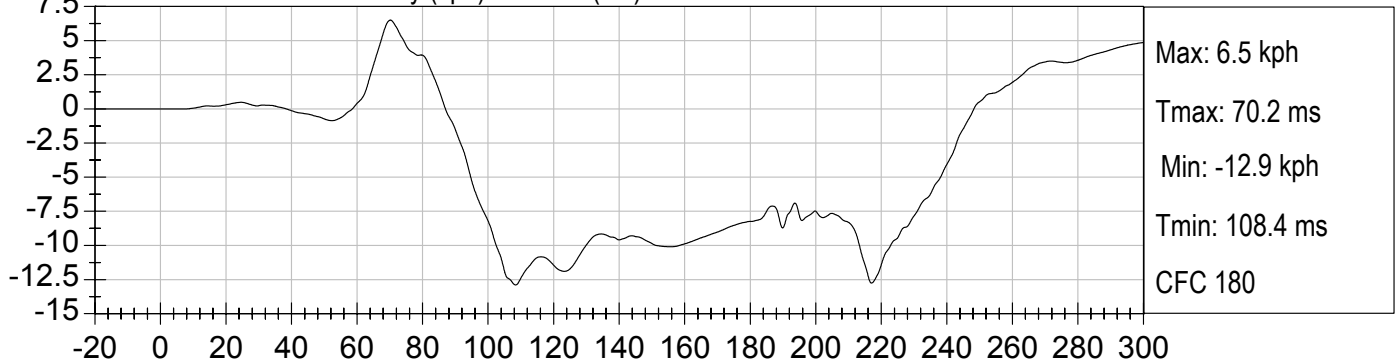
RRP CHILD SEAT X Velocity (kph) vs TIME (ms)

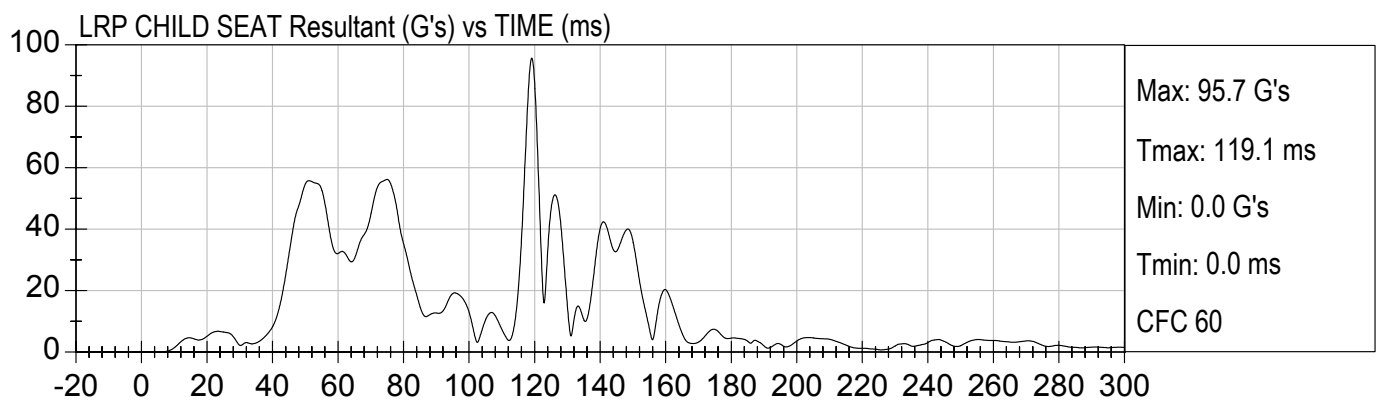
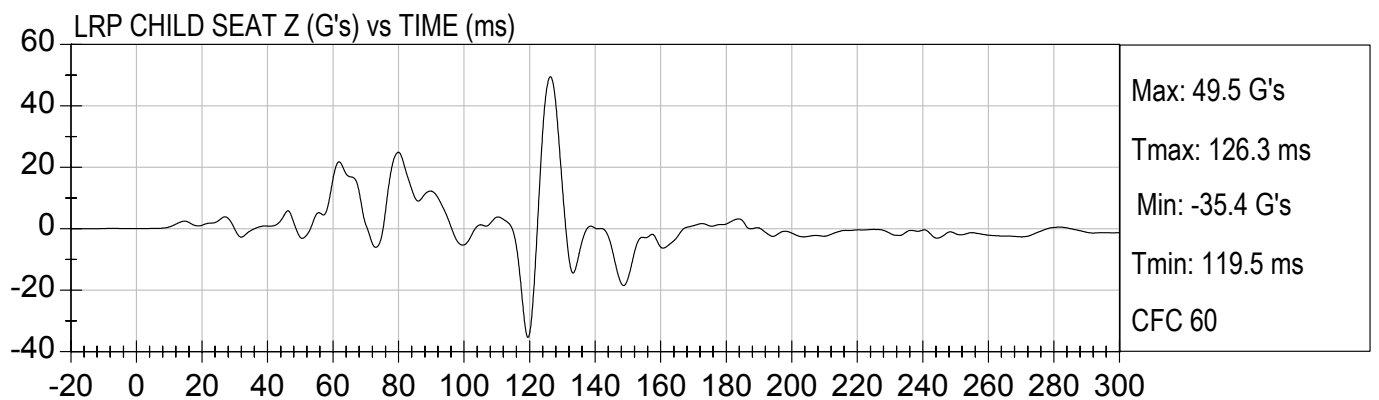
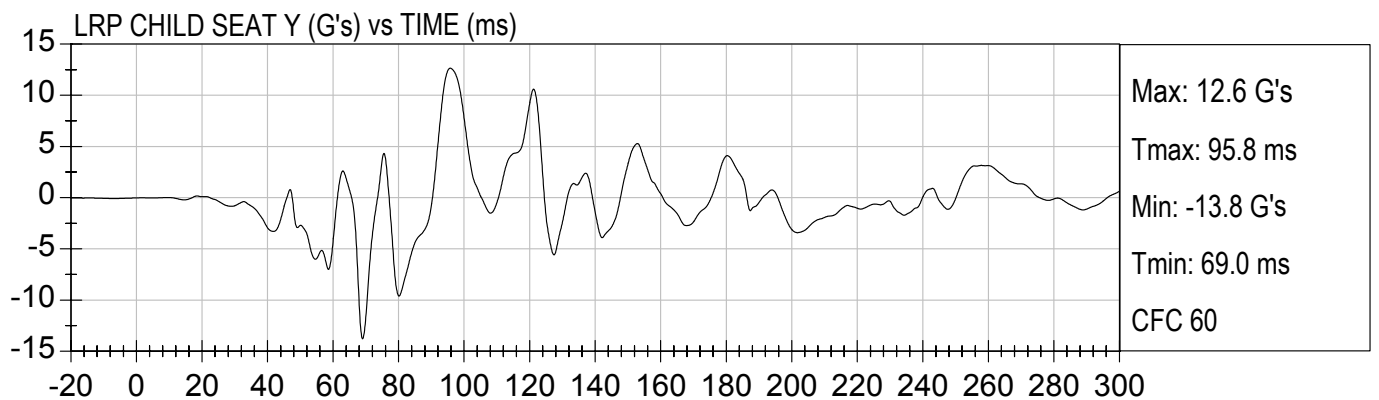
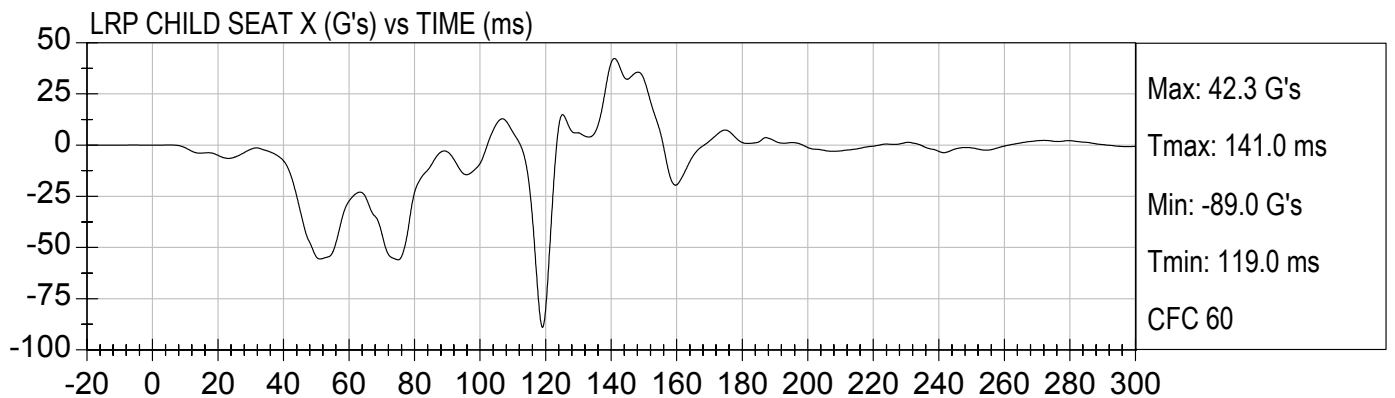


RRP CHILD SEAT Y Velocity (kph) vs TIME (ms)



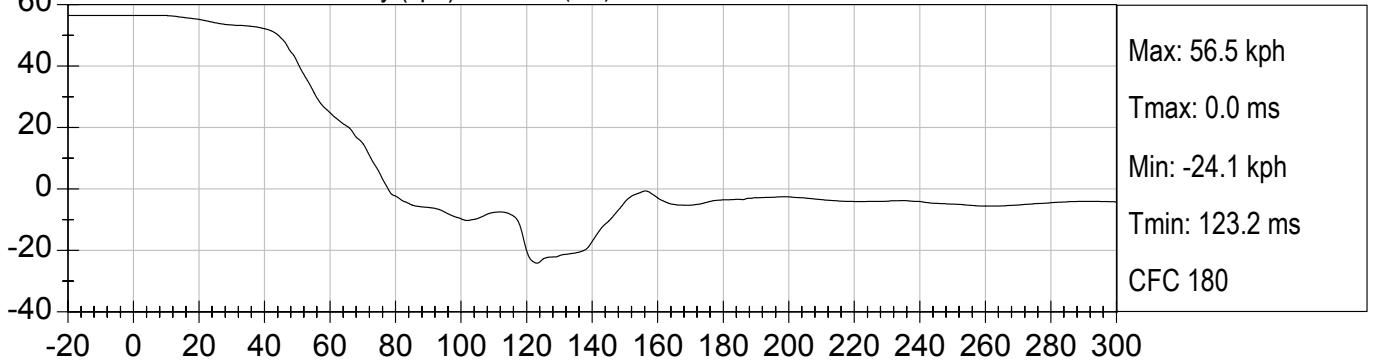
RRP CHILD SEAT Z Velocity (kph) vs TIME (ms)



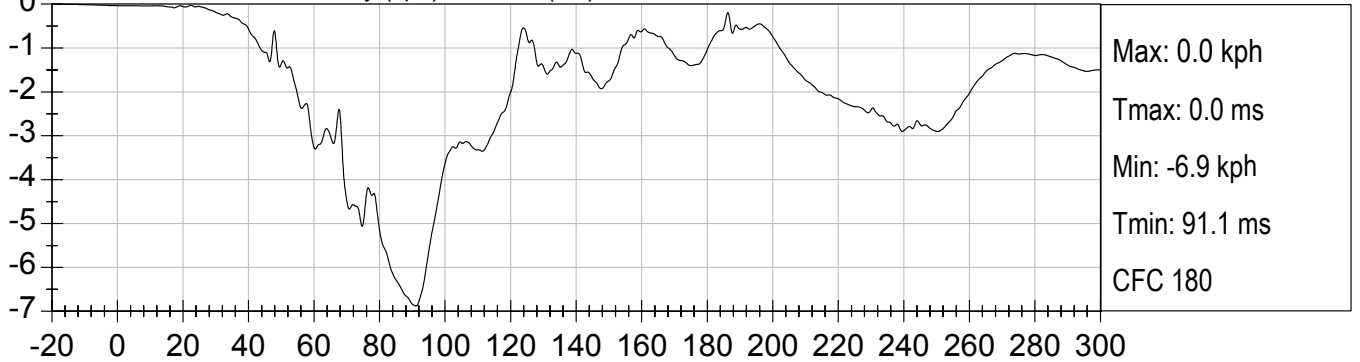




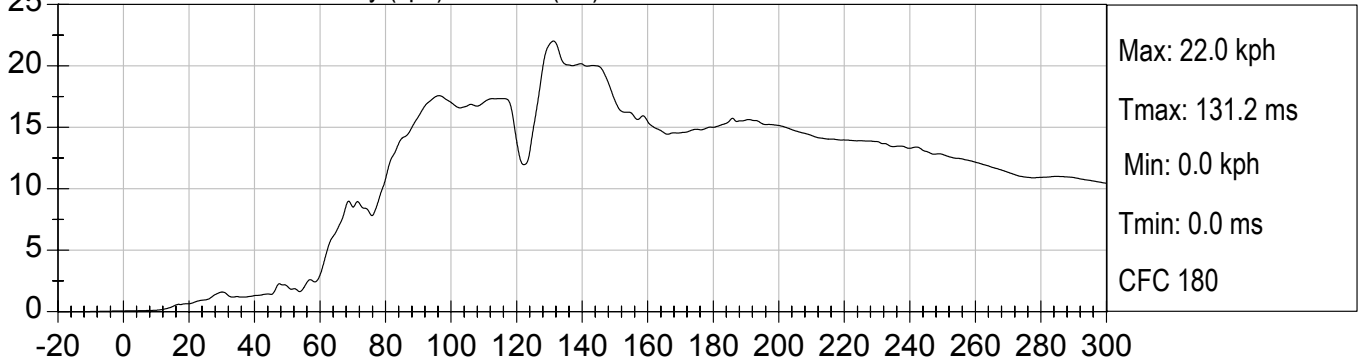
LRP CHILD SEAT X Velocity (kph) vs TIME (ms)



LRP CHILD SEAT Y Velocity (kph) vs TIME (ms)



LRP CHILD SEAT Z Velocity (kph) vs TIME (ms)



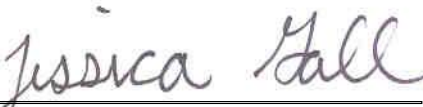
APPENDIX C
CHILD DUMMY CALIBRATION INFORMATION

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

ATD Serial No: 042

Test I.D: D041811

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	268.4	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-11.5	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

08/06/2004
Test Date



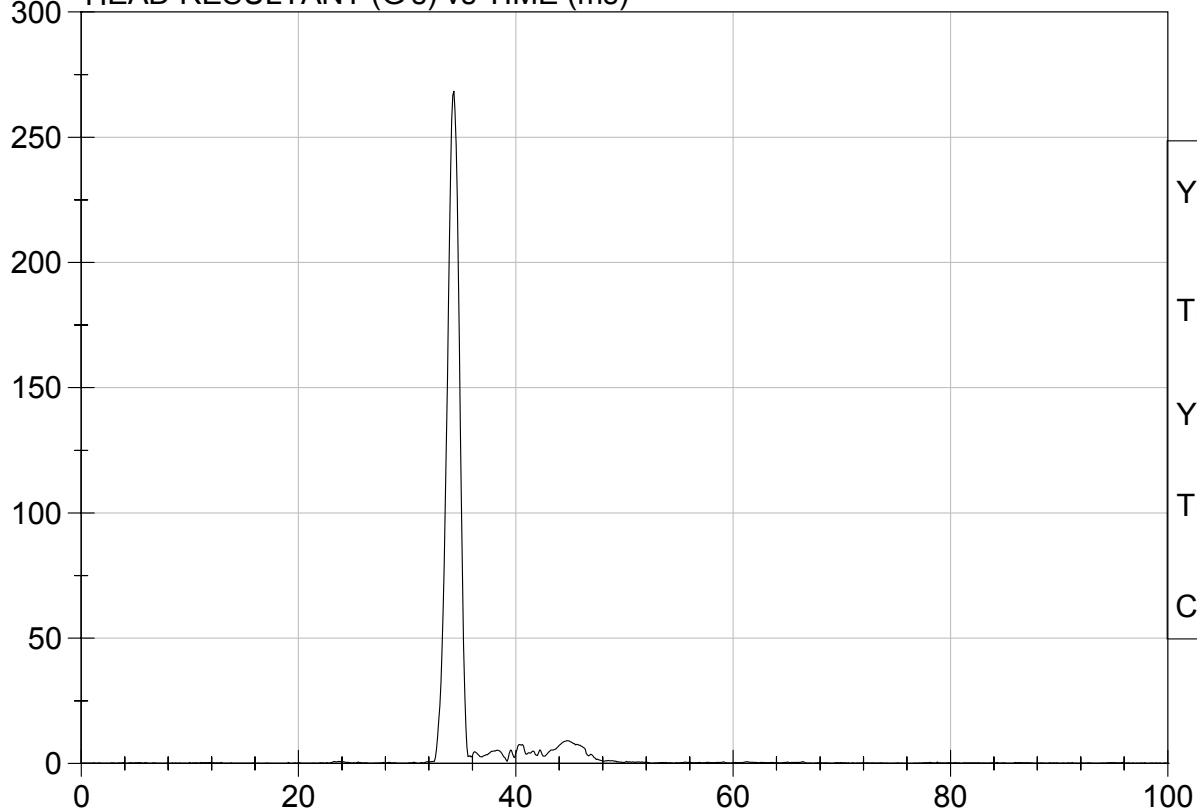
Test Description: Head Drop

Test Date: 08/06/2004

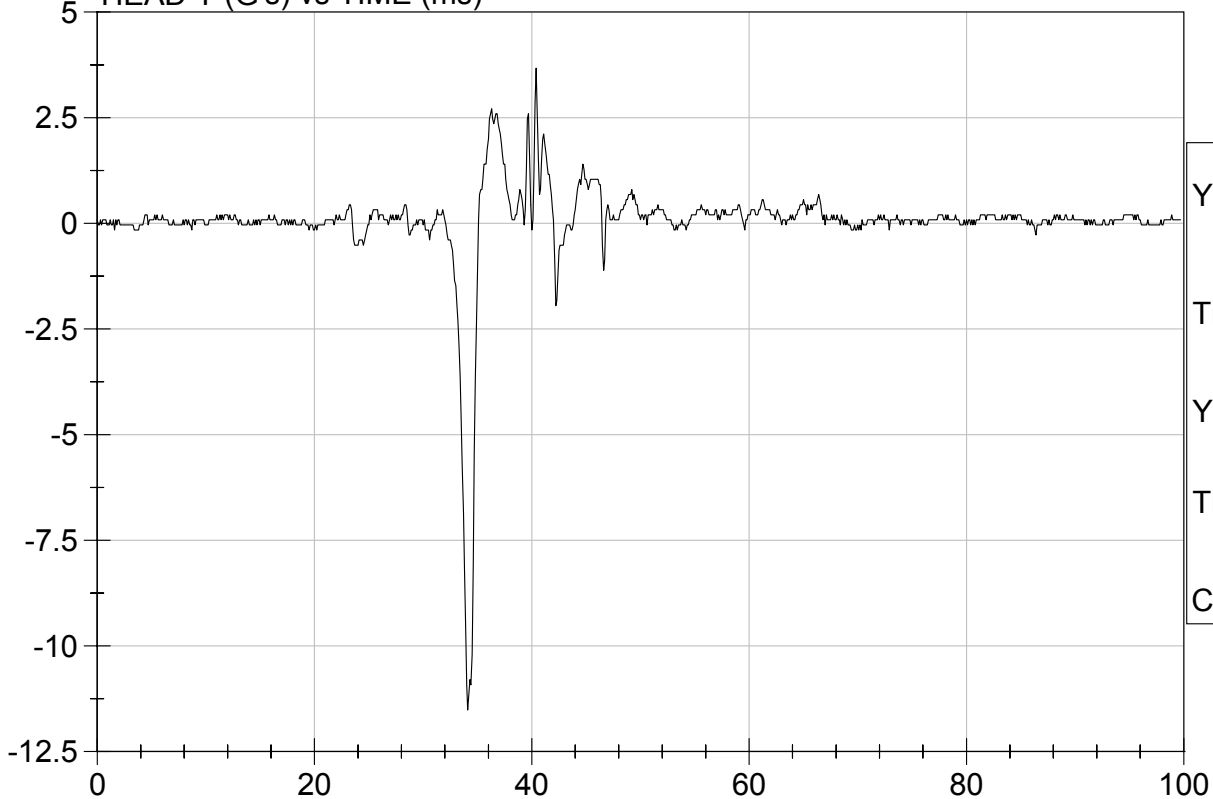
Component: D041811

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



HEAD Y (G's) vs TIME (ms)

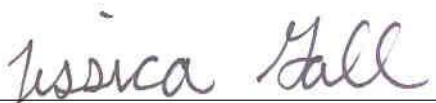


Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 042

Test I.D: D041812

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.5	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.3	Pass
	15 msec	m/s	3.0 - 4.0	3.3	Pass
	20 msec	m/s	4.0 - 5.1	4.5	Pass
D Plane Rotation		deg	70 - 82	81	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	43.8	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	71.5	Pass
Overall Test Results					Pass


 Laboratory Technician

08/06/2004

Test Date


 Approved By

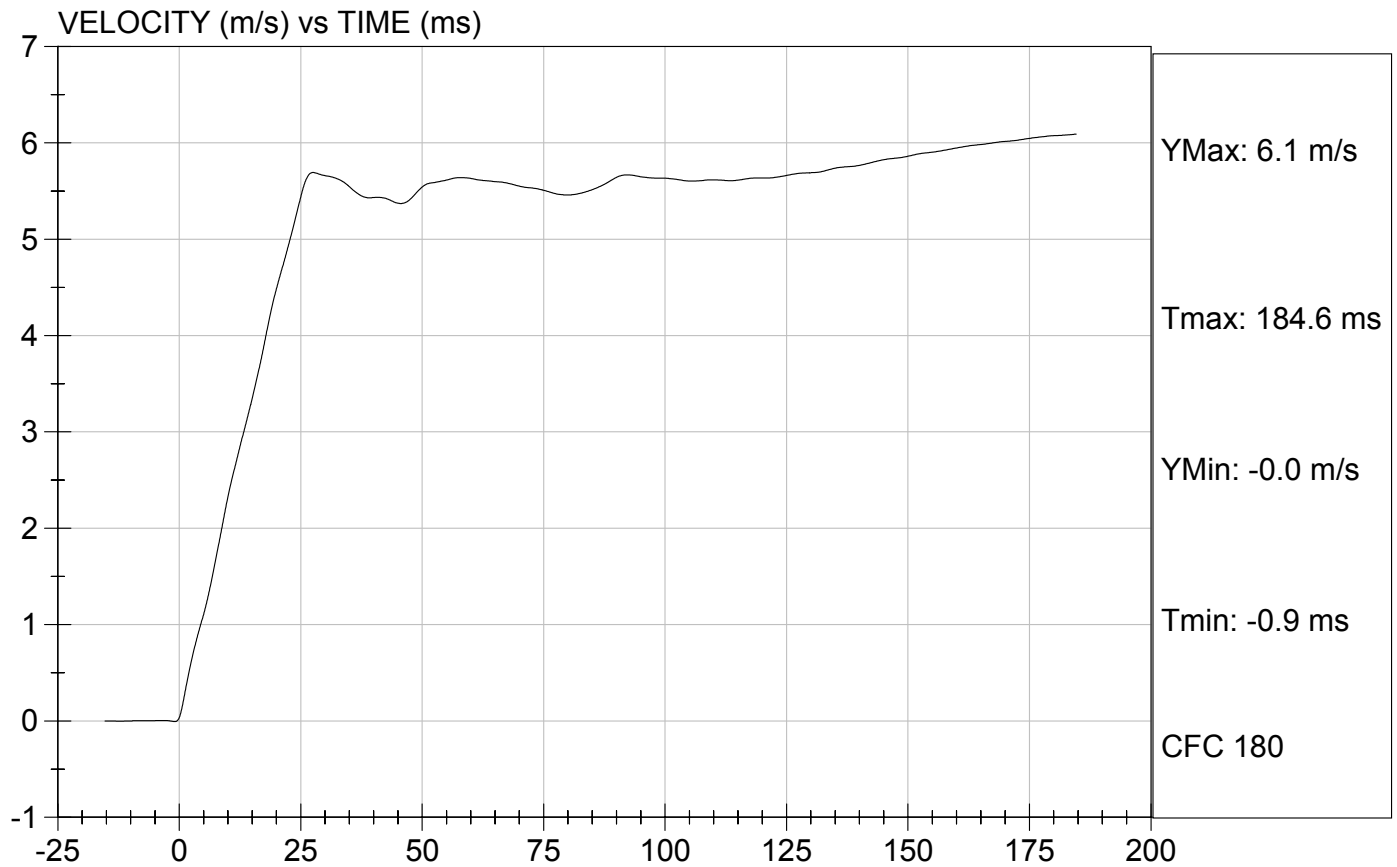


Test Description: Neck Flexion

Test Date: 08/06/2004

Component: D041812

Speed: 17.98 ft/sec, 5.48 m/sec





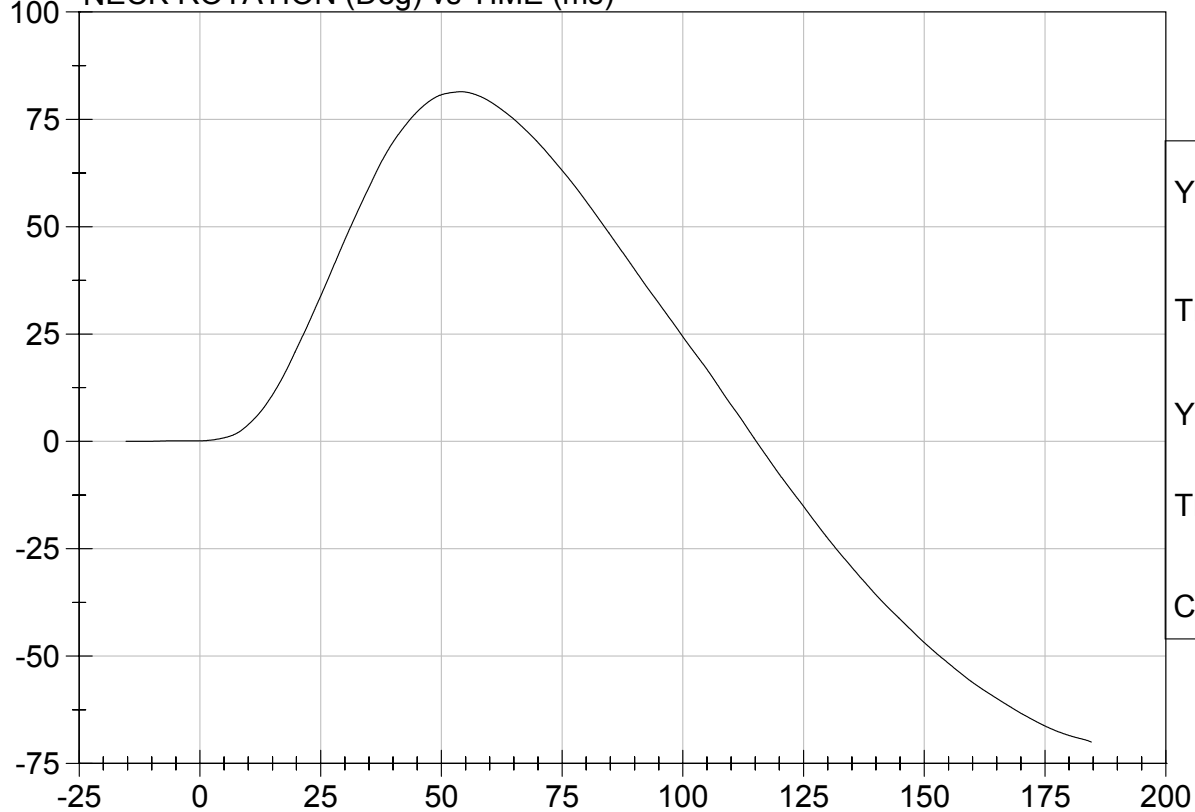
Test Description: Neck Flexion

Test Date: 08/06/2004

Component: D041812

Speed: 17.98 ft/s, 5.48 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 81.4 Deg

Tmax: 54.1 ms

YMin: -70.0 Deg

Tmin: 184.6 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 43.8 Nm

Tmax: 47.5 ms

YMin: -16.0 Nm

Tmin: 11.4 ms

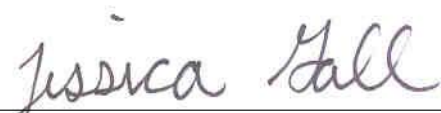
CFC 600

Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

ATD Serial No: 042

Test I.D: D041813

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.75	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.3	Pass
	10 msec	m/s	1.9 - 2.5	2.2	Pass
	14 msec	m/s	2.8 - 3.5	2.9	Pass
D Plane Rotation		deg	83 - 93	85	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-45.9	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	69.1	Pass
Overall Test Results					Pass


 Laboratory Technician

08/06/2004
 Test Date

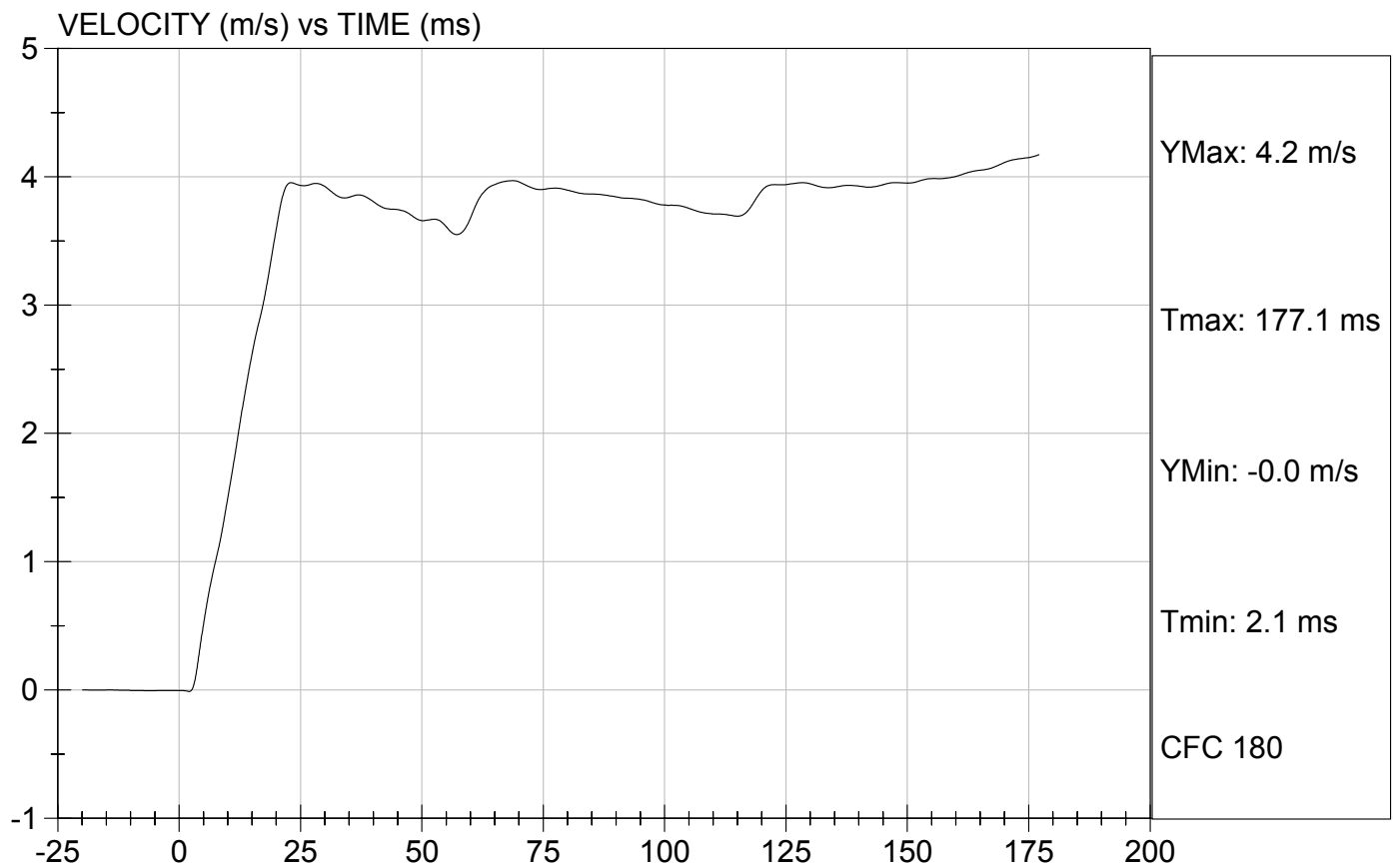

 Approved By



Test Description: Neck Extension Test Date: 08/06/2004

Component: D041813

Speed: 12.29 ft/sec, 3.75 m/sec



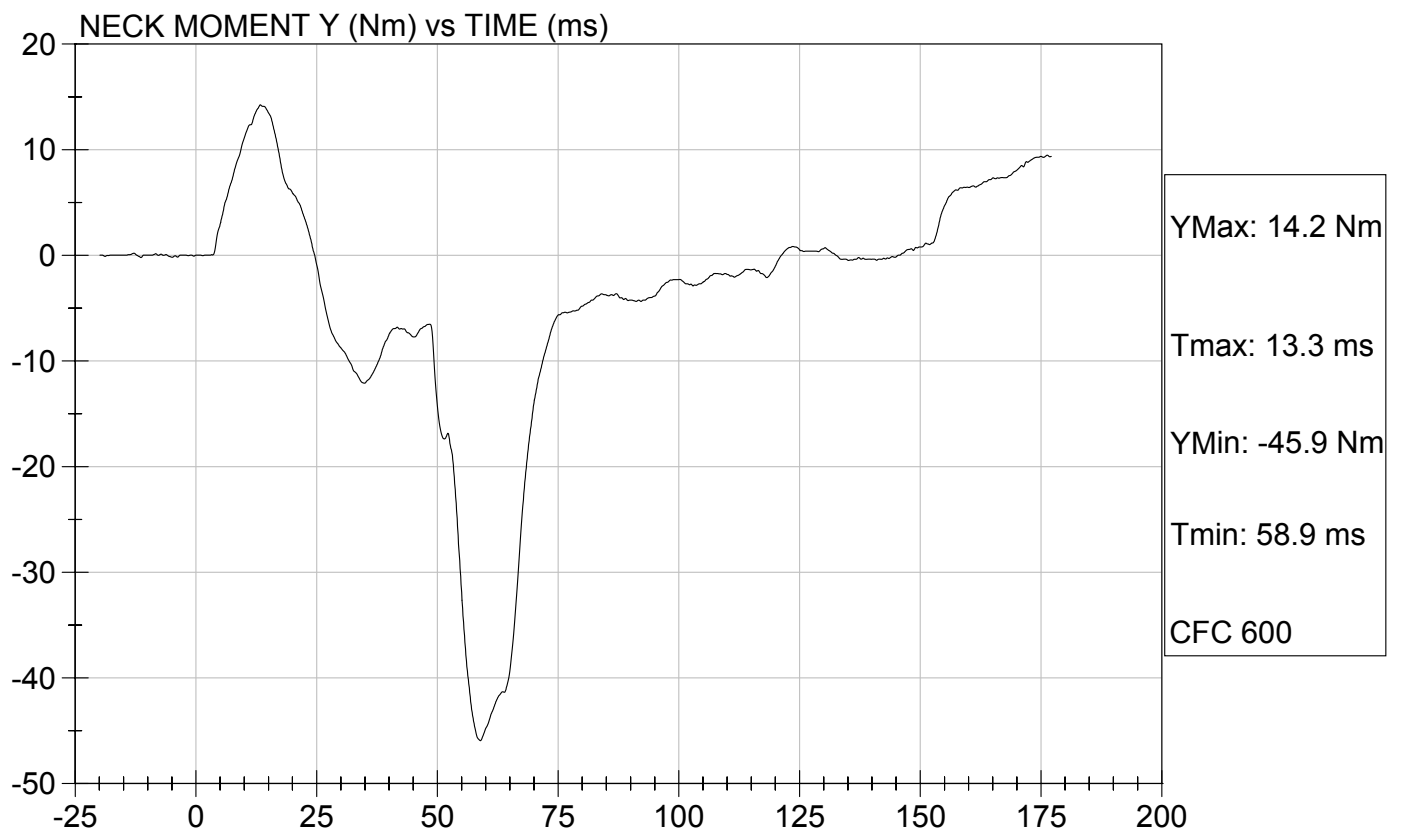
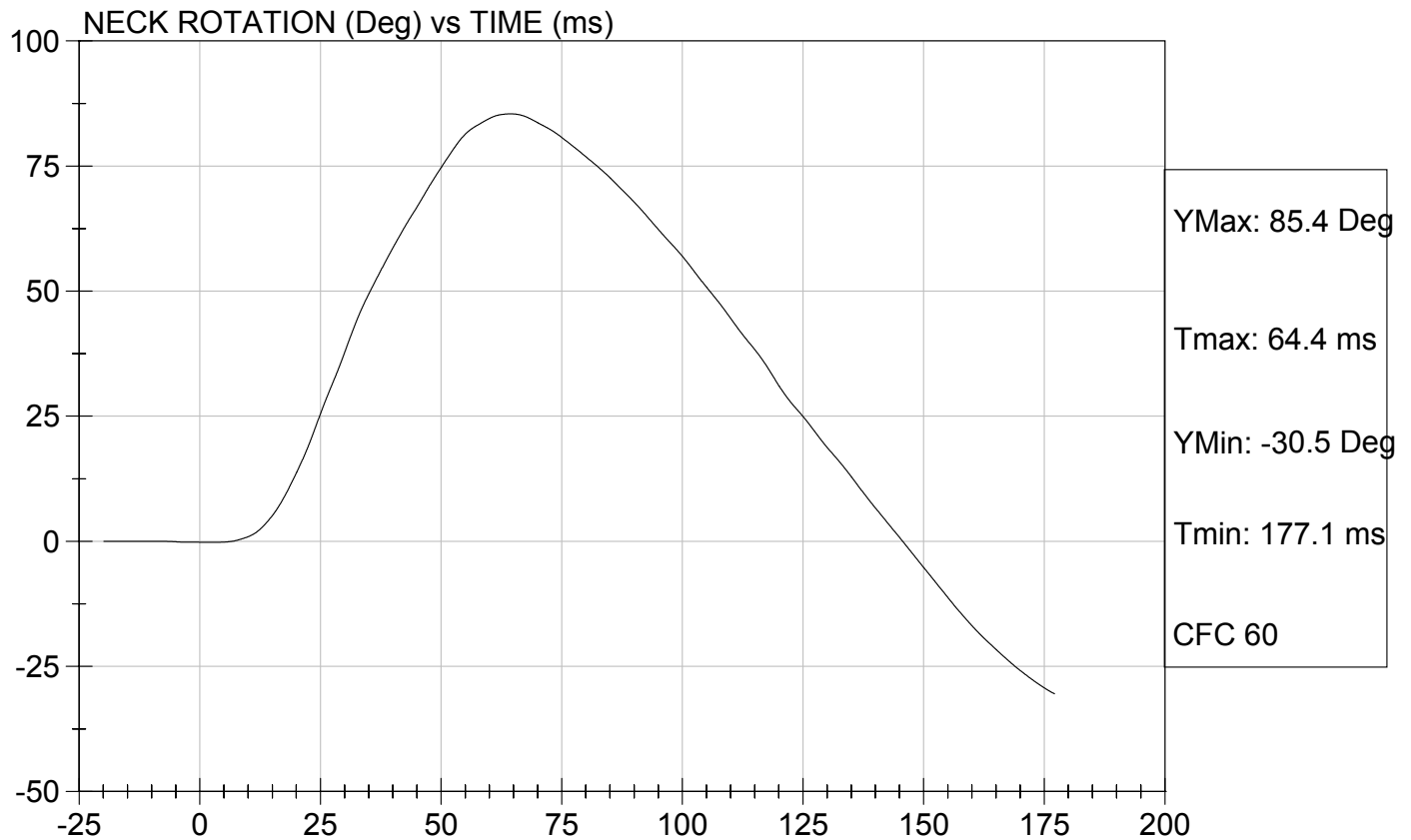


Test Description: Neck Extension

Test Date: 08/06/2004

Component: D041813

Speed: 12.29 ft/s, 3.75 m/s

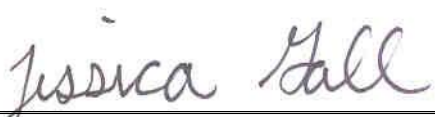


Hybrid III Calibration Data Sheet
3 Year Old
Thorax Impact Test

ATD Serial No: 042

Test I.D: D041814

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	5.9 to 6.1	5.9	Pass
Peak Deflection	mm	32 - 38	37	Pass
Peak Force w/in Deflection Corridor	kN	0.68 - 0.81	0.74	Pass
Internal Hysteresis	%	65 to 85	69	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.48	Pass
Overall Test Results				Pass


Laboratory Technician

08/06/2004
Test Date


Approved By

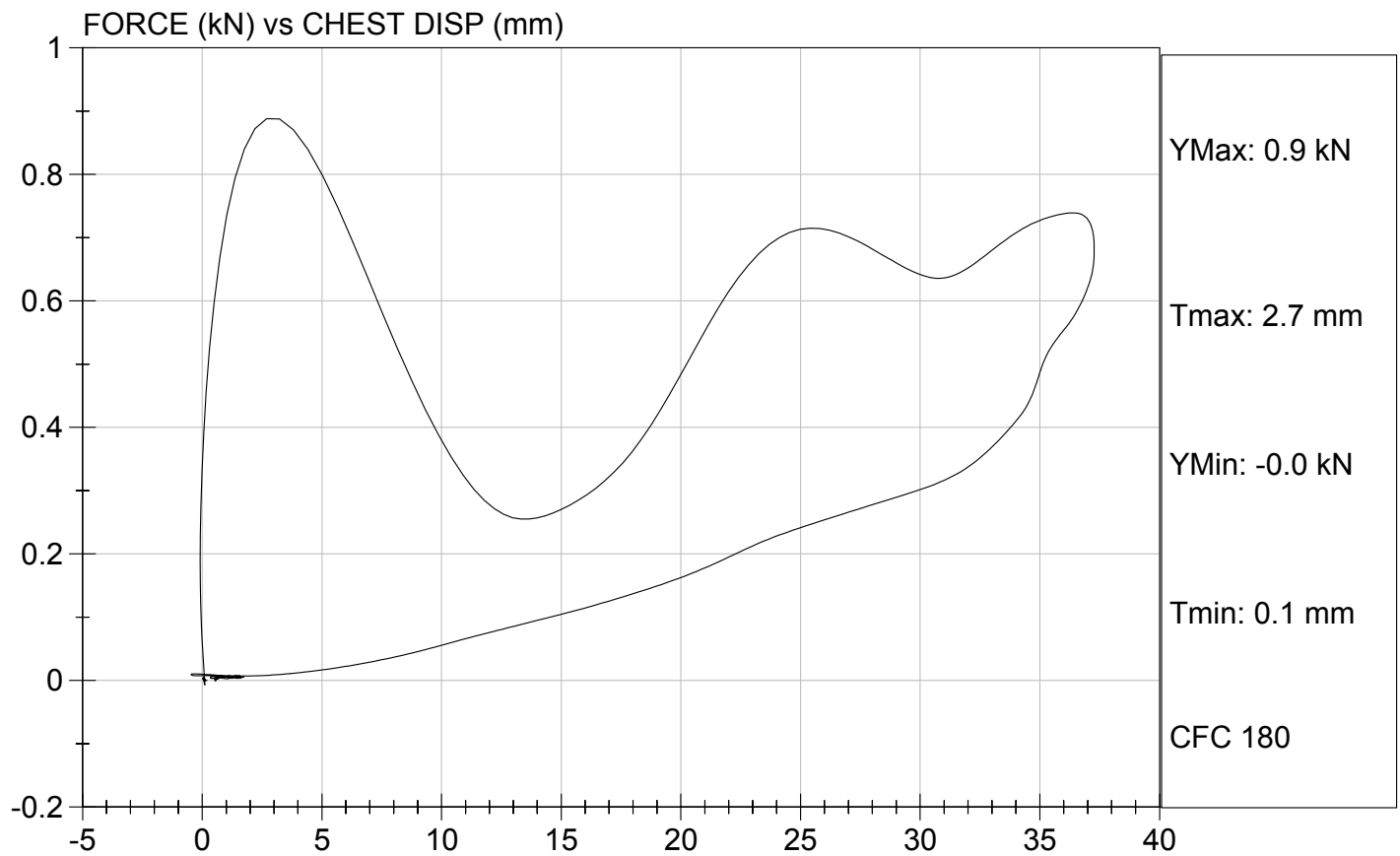


Test Description: Thorax Impact

Test Date: 08/06/2004

Component: D041814

Speed: 19.42 ft/sec, 5.92 m/sec

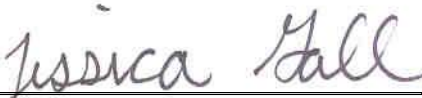


Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

ATD Serial No: 042

Test I.D: D041817

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Force At 45 deg.	N	130 - 180	172	Pass
Initial Angle	deg	0 - 15	4	Pass
Return Angle	deg	0 - 10	4	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

08/06/2004
Test Date

Transportation Research Center Inc.

ATD Calibration Report

for

VRTC

**HIII 6 Year Old Serial No. 144
Calibration No. 05**



Transportation Research Center Inc.
P.O. Box B-67
10820 St. Rt. 347
East Liberty, OH 43319-0367

Transportation Research Center Inc.
572N HIII 6 Year Old Dummy
External Dimensions
Serial No. 144 Calibration No. 05

Test Parameter	Dimension	Specification	Results	Pass
Total Sitting Height	A	622.3 - 647.7 mm	643 mm	Yes
Shoulder Pivot Height	B	348.0 - 363.2 mm	358 mm	Yes
Hip Pivot Height	C	63.5 - 73.7 mm	73 mm	Yes
Hip Pivot from Backline	D	88.9 - 99.1 mm	98 mm	Yes
Shoulder Pivot from Backline	E	53.3 - 63.5 mm	57 mm	Yes
Thigh Clearance	F	88.9 - 104.1 mm	95 mm	Yes
Back of Elbow to Wrist Pivot	G	182.9 - 198.1 mm	189 mm	Yes
Head Back to Backline	H	17.8 - 22.8 mm	22 mm	Yes
Shoulder to Elbow Length	I	215.9 - 231.1 mm	225 mm	Yes
Elbow Rest Height	J	157.4 - 177.8 mm	172 mm	Yes
Buttock to Knee Length	K	370.8 - 391.2 mm	375 mm	Yes
Popliteal Height	L	269.2 - 289.6 mm	276 mm	Yes
Knee to Floor Height	M	307.4 - 322.6 mm	313 mm	Yes
Buttock Popliteal Height	N	320.0 - 340.4 mm	332 mm	Yes
Chest Depth without Jacket	O	129.6 - 144.8 mm	138 mm	Yes
Foot Length	P	170.2 - 184.6 mm	175 mm	Yes
Buttock to Knee Pivot Length	R	342.9 - 363.2 mm	354 mm	Yes
Head Breadth	S	137.1 - 147.3 mm	139 mm	Yes
Head Depth	T	167.6 - 177.8 mm	170 mm	Yes
Hip Breadth	U	208.3 - 223.5 mm	215 mm	Yes
Shoulder Breadth	V	259.1 - 274.3 mm	270 mm	Yes
Foot Breadth	W	62.3 - 77.5 mm	66 mm	Yes
Head Circumference	X	510.5 - 530.9 mm	519 mm	Yes
Chest Circumference with Jacket	Y	596.9 - 622.3 mm	613 mm	Yes
Waist Circumference	Z	558.8 - 584.2 mm	571 mm	Yes
Reference Location for Chest Circumference	AA	325.1 - 335.3 mm	330 mm	Yes
Reference Location for Waist Circumference	BB	153.7 - 163.9 mm	158 mm	Yes

Technician



Approved





Transportation Research Center Inc.

572N Head Drop Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

Test Date 07/23/2004

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	51 %	Yes
Peak Resultant Acceleration	245 - 300 g	299.8 g	Yes
Peak Lateral Acceleration	15 g Max	4.9 g	Yes
Is Acceleration Curve Unimodal?	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician



Approved



07.23.2004 16:03:07 614

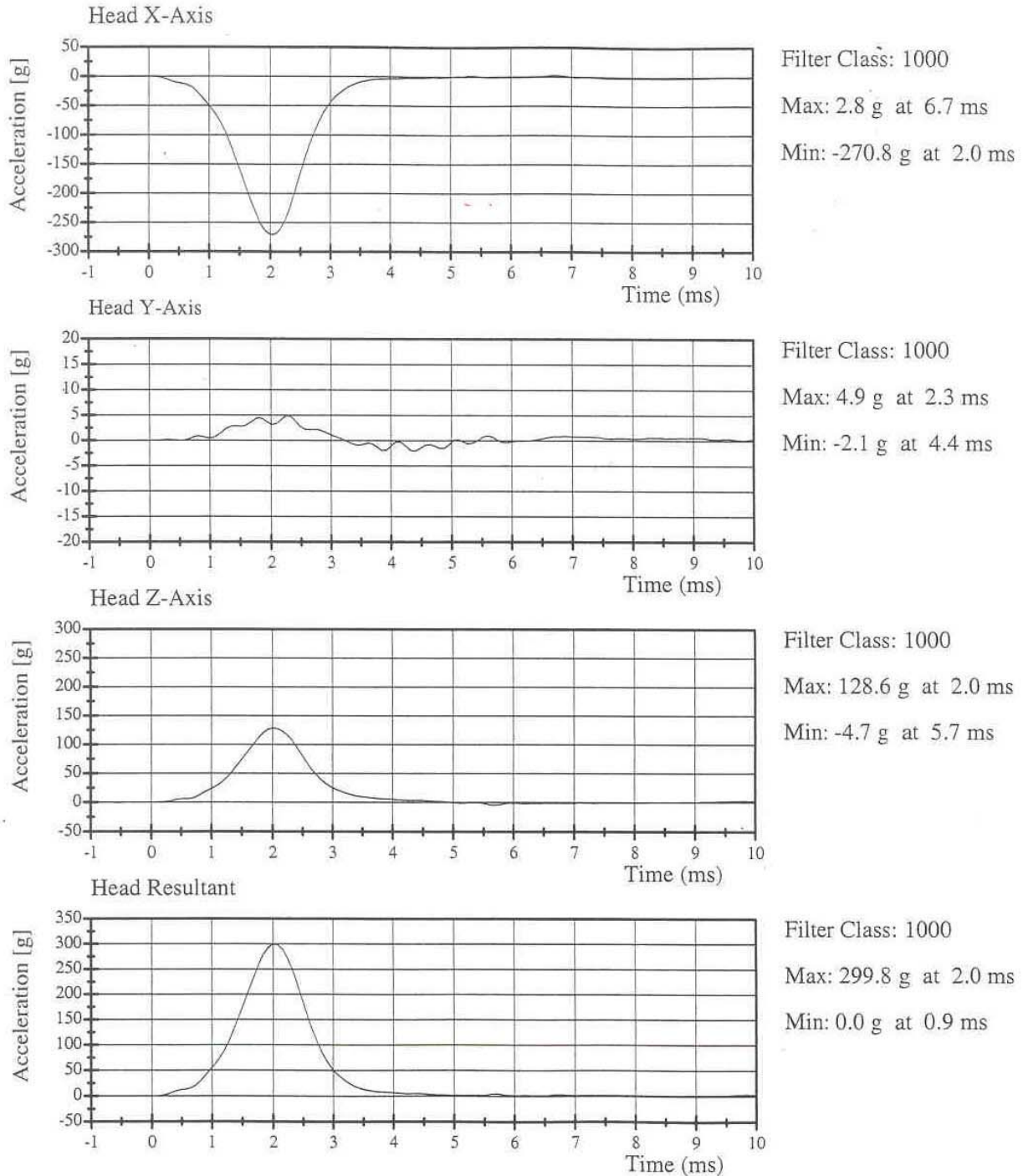


Transportation Research Center Inc.

572N Head Drop Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

Test Date 07/23/2004



07.23.2004 16:03:09 614



Transportation Research Center Inc.

572N Neck Flexion Test - 6 Channel Transducer

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

Test Date 07/26/2004

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	58 %	Yes
Impact Velocity	4.83 - 5.07 m/s	5.04 m/s	Yes
Integrated Pendulum Velocity			
10 ms	1.20 - 1.60 m/s	1.56 m/s	Yes
20 ms	2.40 - 3.40 m/s	3.00 m/s	Yes
30 ms	3.80 - 5.00 m/s	4.35 m/s	Yes
Peak D Plane Rotation	74 - 92 °	75.9 °	Yes
Peak Moment About Occipital Condyles (During time interval rotation is within specified corridors)	27.0 - 33.0 N·m	30.69 N·m	Yes
Positive Moment Decay Time To 5 N·m	103 - 123 ms	111.36 ms	Yes

Test meets specifications.

Comments:

Technician



Approved



07.26.2004 12:55:37 713



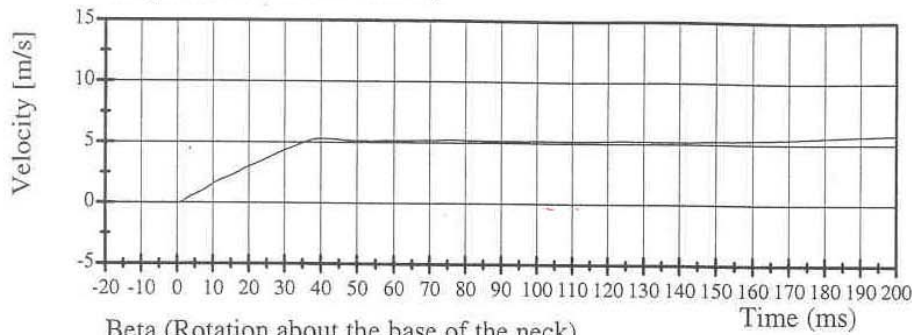
Transportation Research Center Inc.

572N Neck Flexion Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

Test Date 07/26/2004

Integrated Pendulum Velocity

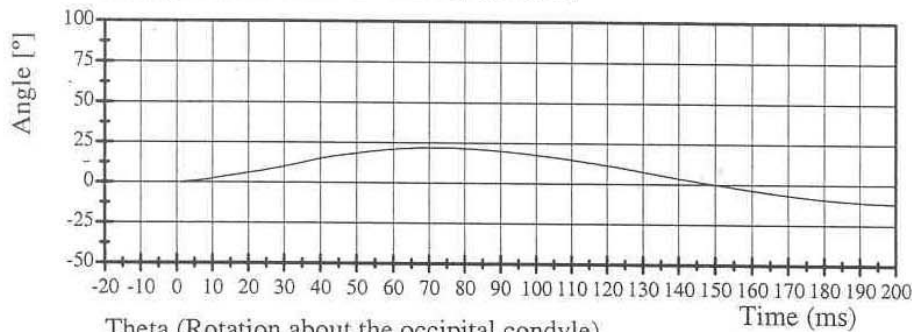


Filter Class: 180

Max: 6.3 m/s at 282.9 ms

Min: -0.0 m/s at -0.1 ms

Beta (Rotation about the base of the neck)

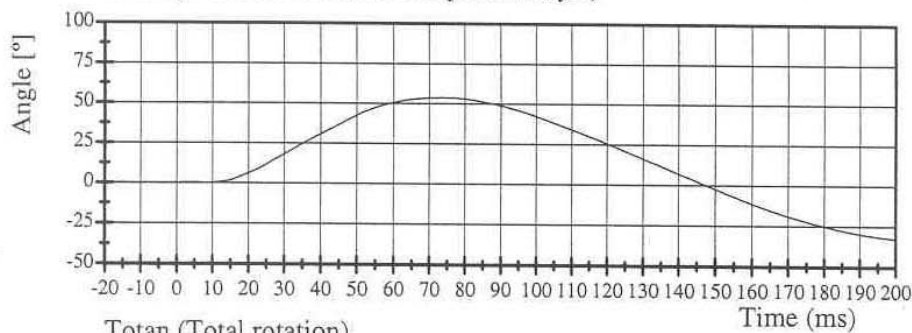


Filter Class: 60

Max: 22.1 ° at 71.1 ms

Min: -12.2 ° at 210.6 ms

Theta (Rotation about the occipital condyle)

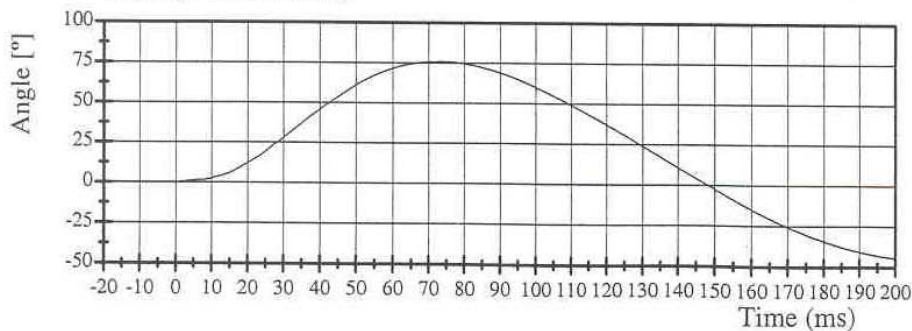


Filter Class: 60

Max: 53.8 ° at 73.7 ms

Min: -33.9 ° at 213.2 ms

Totan (Total rotation)



Filter Class: 60

Max: 75.9 ° at 73.4 ms

Min: -46.0 ° at 212.6 ms

07.26.2004 12:55:38 713

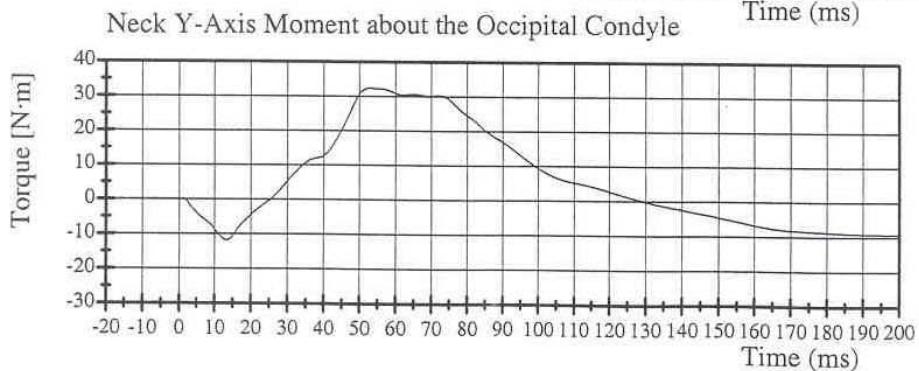
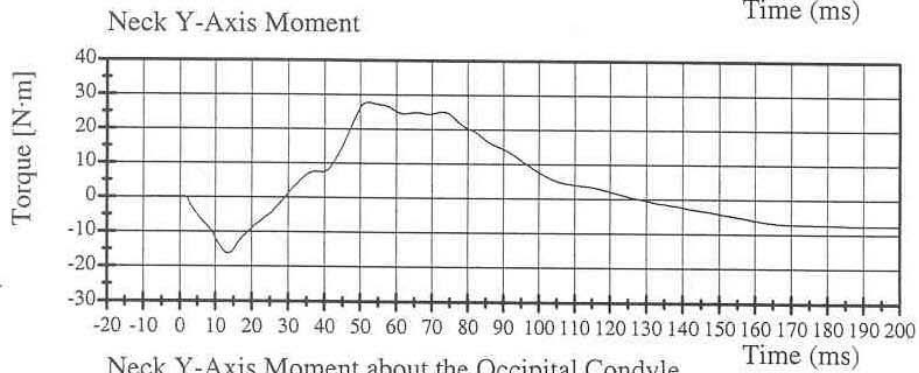
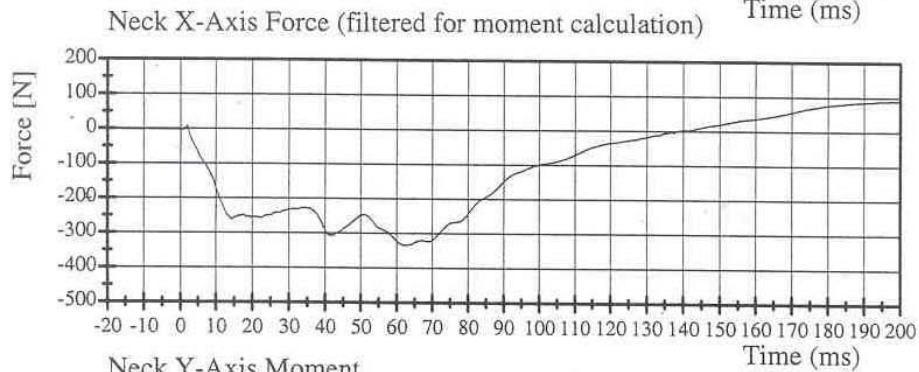
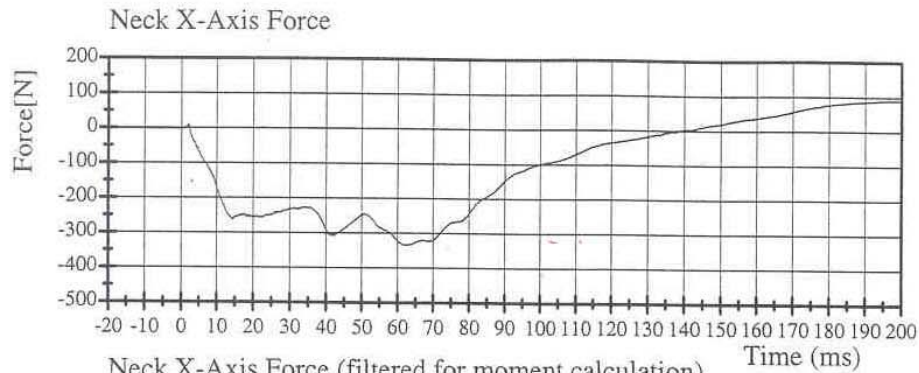


Transportation Research Center Inc.

572N Neck Flexion Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

Test Date 07/26/2004



07.26.2004 12:55:39 713



Transportation Research Center Inc.

572N Neck Extension Test - 6 Channel Transducer

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 5

Test Date 07/26/2004

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.0 °C	Yes
Relative Humidity	10 - 70 %	57 %	Yes
Impact Velocity	4.18 - 4.42 m/s	4.41 m/s	Yes
Integrated Pendulum Velocity			
10 ms	1.00 - 1.40 m/s	1.26 m/s	Yes
20 ms	2.20 - 3.00 m/s	2.36 m/s	Yes
30 ms	3.20 - 4.20 m/s	3.48 m/s	Yes
Peak D Plane Rotation	85 - 103 °	90.0 °	Yes
Peak Moment About Occipital Condyles (During time interval rotation is within specified corridors)	-24.0 - (-19.0) N·m	-22.81 N·m	Yes
Negative Moment Decay Time To -5 N·m	123 - 147 ms	134.16 ms	Yes

Test meets specifications.

Comments:

Technician



Approved



07.26.2004 16:15:00 829

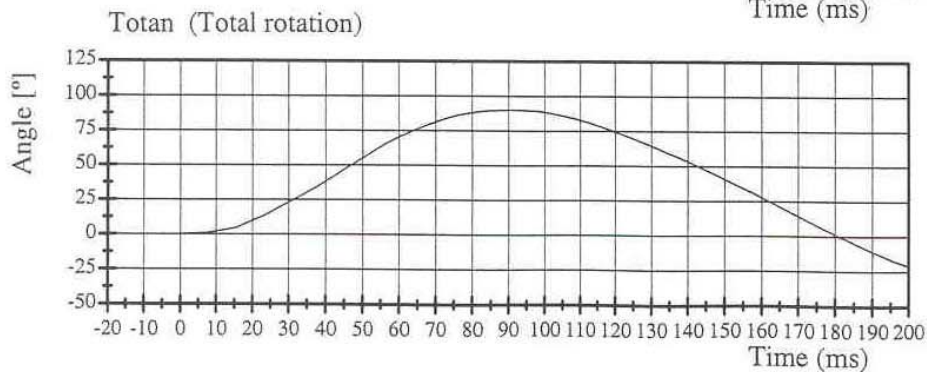
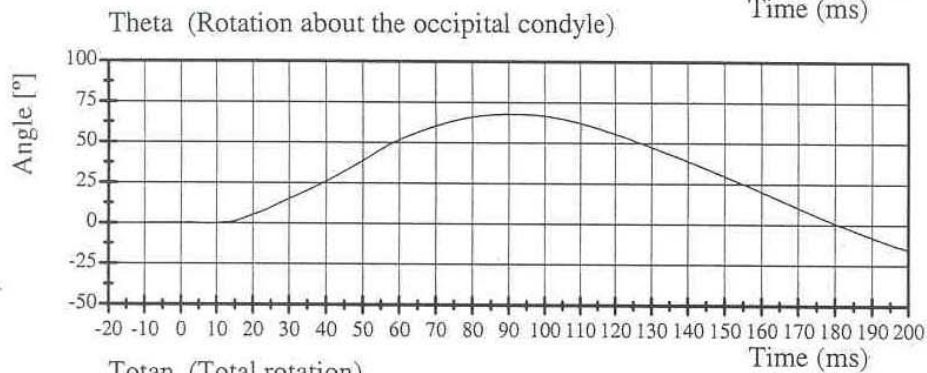
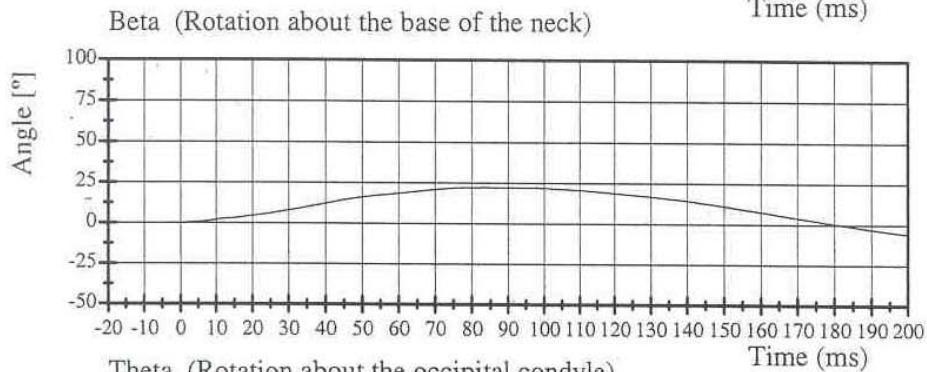
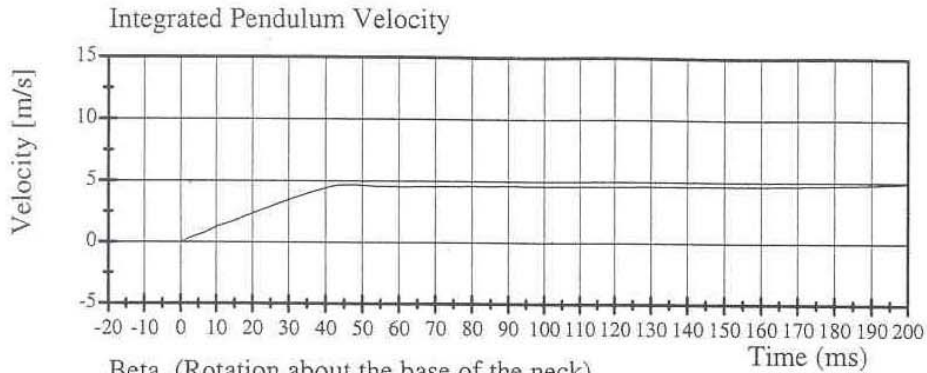


Transportation Research Center Inc.

572N Neck Extension Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 5

Test Date 07/26/2004



07.26.2004 16:15:01 829

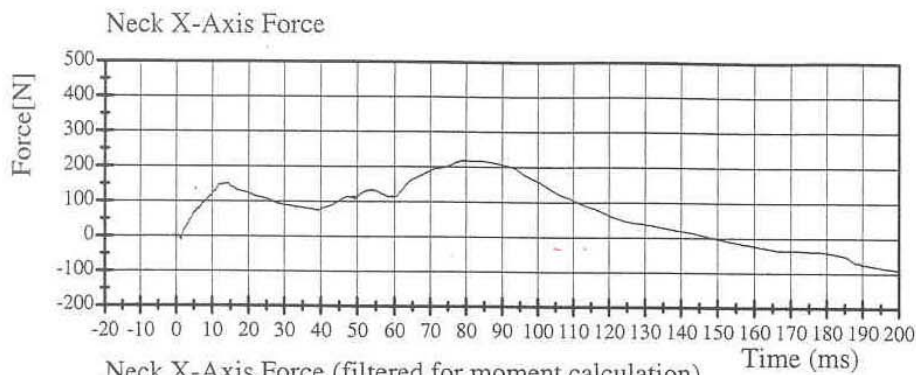


Transportation Research Center Inc.

572N Neck Extension Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 5

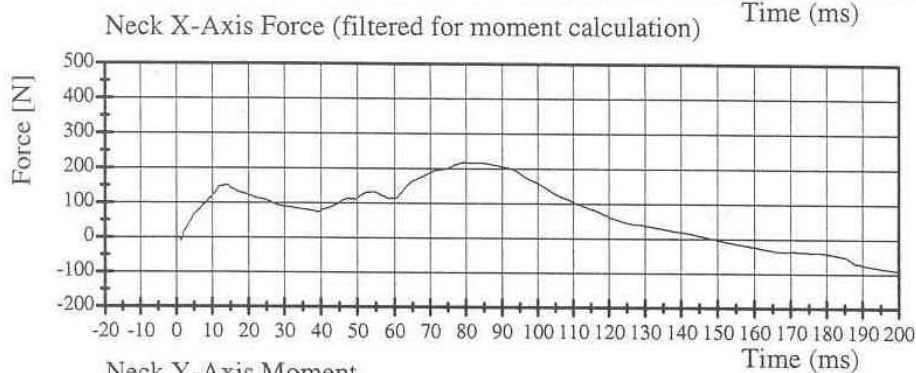
Test Date 07/26/2004



Filter Class: 1000

Max: 219.2 N at 79.5 ms

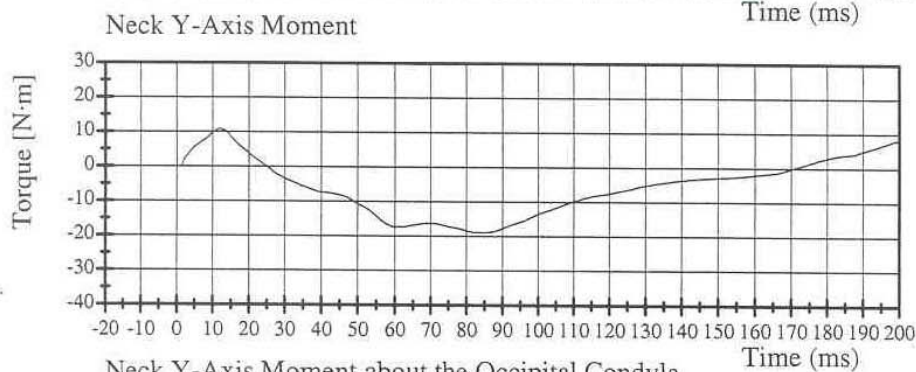
Min: -112.8 N at 221.4 ms



Filter Class: 600

Max: 218.6 N at 79.5 ms

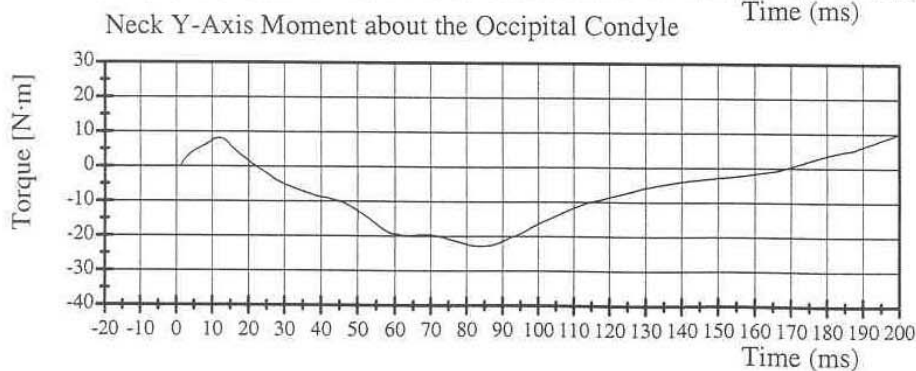
Min: -112.3 N at 221.4 ms



Filter Class: 600

Max: 11.3 N·m at 225.0 ms

Min: -18.9 N·m at 83.9 ms



Filter Class: 600

Max: 13.2 N·m at 222.5 ms

Min: -22.8 N·m at 83.9 ms

07.26.2004 16:15:02 829



Transportation Research Center Inc.

572N Thorax Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 2

Test Date 07/29/2004

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	52 %	Yes
Pendulum Velocity	6.59 - 6.83 m/s	6.61 m/s	Yes
Maximum Chest Deflection	-46.0 - (-38.0) mm	-46.0 mm	Yes
Peak Impact Probe Force Within Compression Corridor	1150 - 1380 N	1212 N	Yes
Internal Hysteresis	65 - 85 %	73 %	Yes
Maximum Force Between 12.5 mm & 38 mm Of Deflection	<= 1500	1222	Yes

Test meets specifications.

Comments:

Technician



Approved



07.29.2004 07:28:15 958

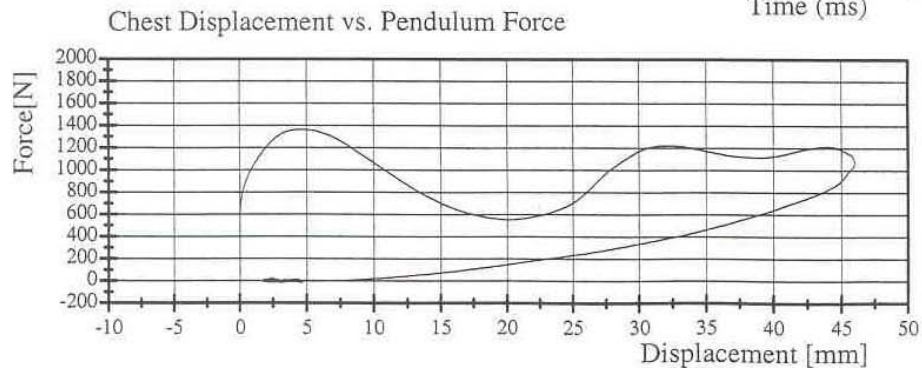
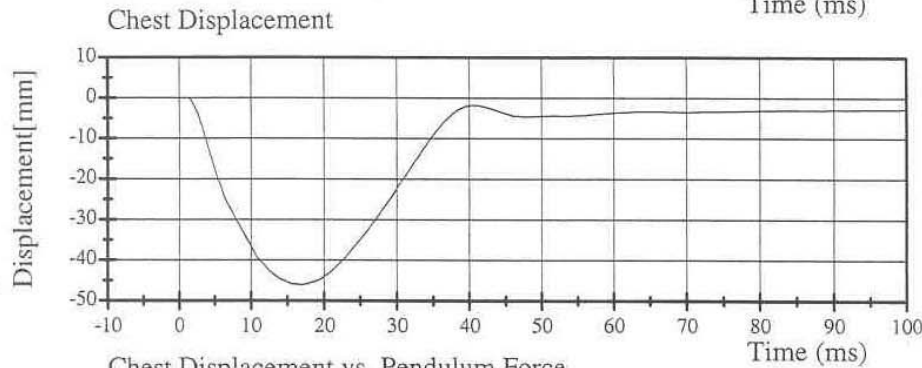
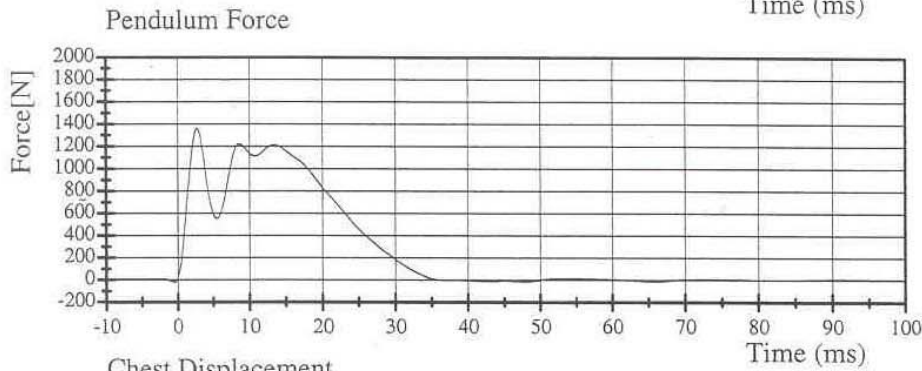
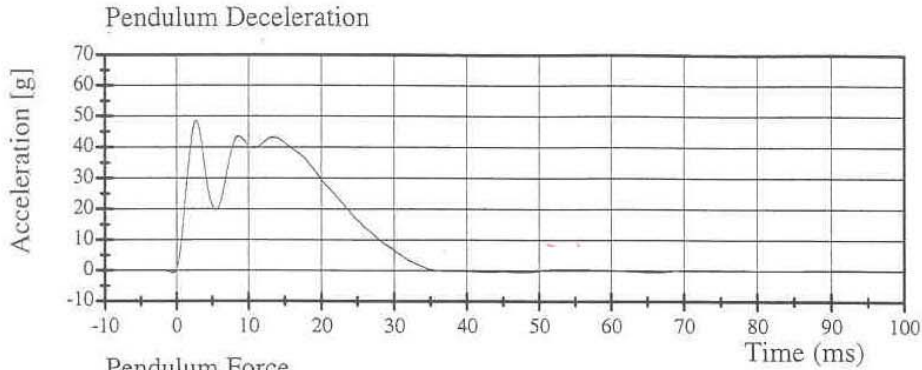


Transportation Research Center Inc.

572N Thorax Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 2

Test Date 07/29/2004



07.29.2004 07:28:16 958



TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III SIX-YEAR-OLD

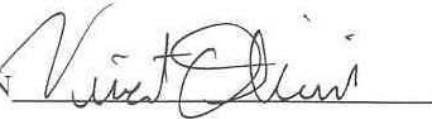
CAL DATE: 29-Jul-04

TRC, INC. TEST NO: 144C05TF2 572 N SN144 TORSO FLEX CAL 05

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6 – 22.2 DEG. C	21.3 DEG. C
RELATIVE HUMIDITY	10 – 70 %	49 %
INITIAL ANGLE OF UNSUPPORTTED DUMMY	<= 22 DEG. REFERENCED TO VERTICAL	21.1 DEG.
MAXIMUM FORCE AT 45 DEG. DURING 10 SECOND PERIOD	147 – 200 N	160.9 N
RETURN ANGLE		24.6 DEG.
DIFFERENCE BETWEEN RETURN ANGLE & INTIAL ANGLE	+/- 8 DEG. OF INTIAL ANGLE	3.5 DEG.
RATE	0.5° - 1.5°/sec	1.03 °/sec

TEST MEETS SPECIFICATIONS

TECHNICIAN



Transportation Research Center Inc.

572N Left Knee Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 1

Test Date 07/23/2004

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Pendulum Velocity	2.07 - 2.13 m/s	2.10 m/s	Yes
Maximum Pendulum Force	2000 - 3000 N	2444 N	Yes

Test meets specifications.

Comments:

Technician



Approved



07.23.2004 15:10:43 1688

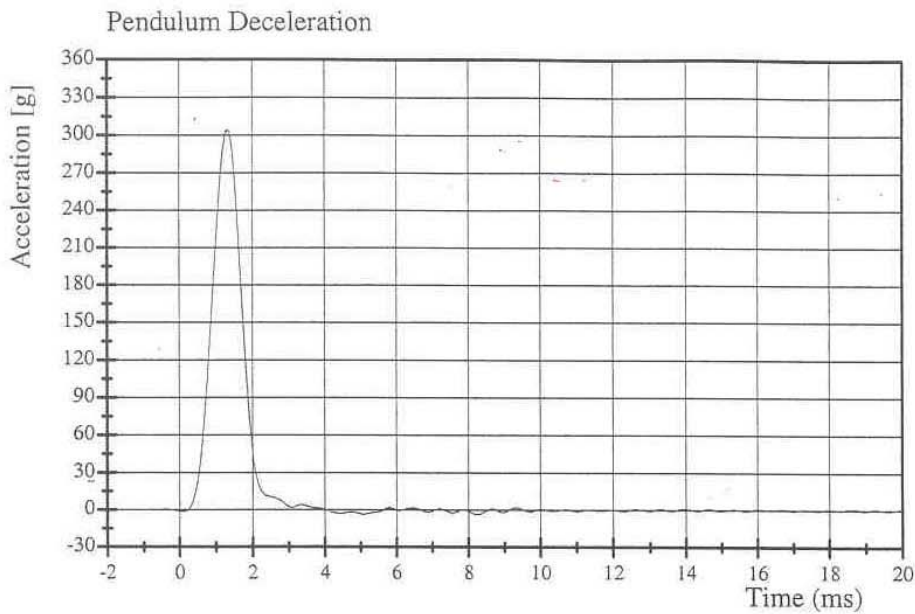


Transportation Research Center Inc.

572N Left Knee Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 1

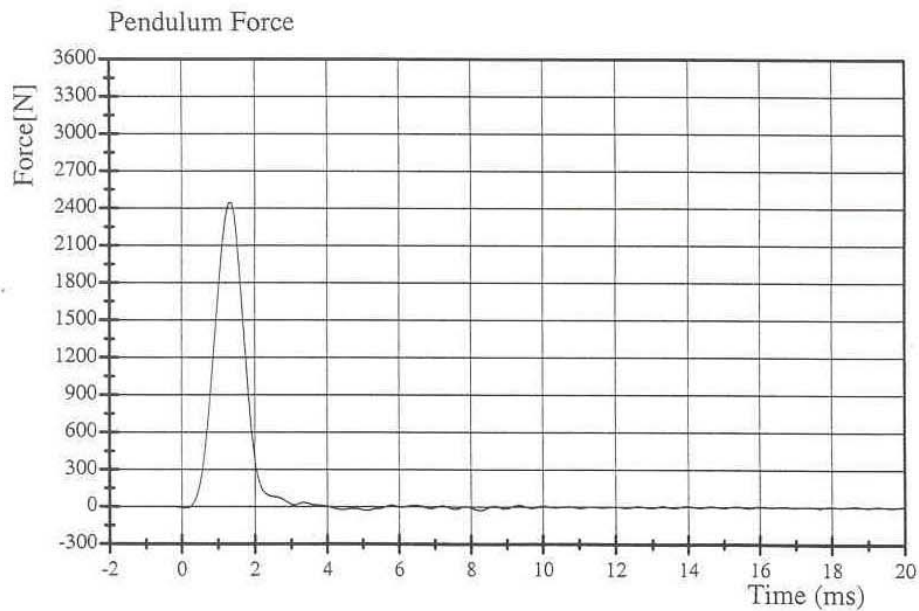
Test Date 07/23/2004



Filter Class: 600

Max: 303.9 g at 1.4 ms

Min: -3.7 g at 8.2 ms



Filter Class: 600

Max: 2444.2 N at 1.4 ms

Min: -30.0 N at 8.2 ms

07.23.2004 15:10:44 1688



Transportation Research Center Inc.

572N Right Knee Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 1

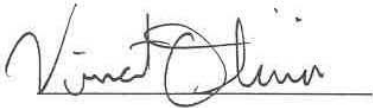
Test Date 07/23/2004

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Pendulum Velocity	2.07 - 2.13 m/s	2.11 m/s	Yes
Maximum Pendulum Force	2000 - 3000 N	2293 N	Yes

Test meets specifications.

Comments:

Technician



Approved



07.23.2004 14:58:07 1683

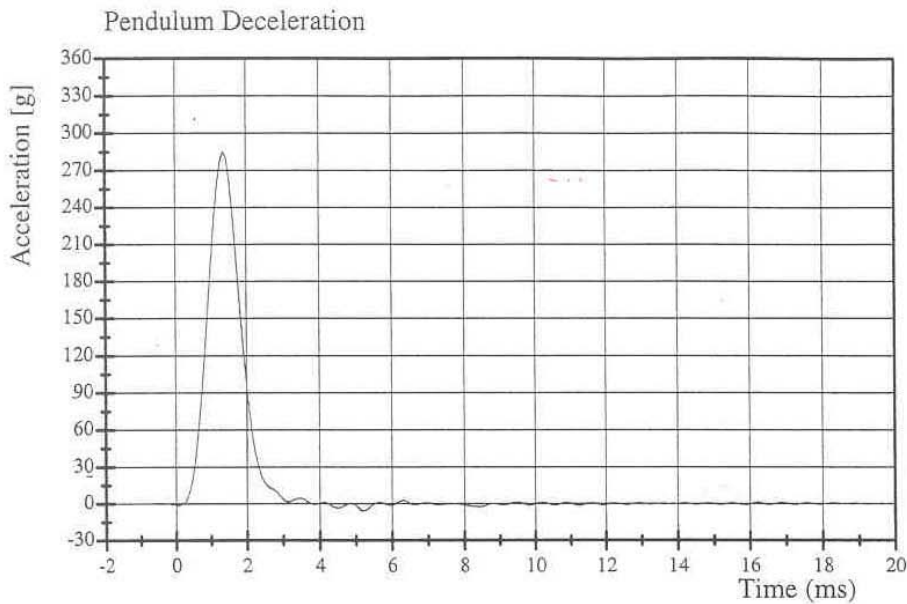


Transportation Research Center Inc.

572N Right Knee Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 1

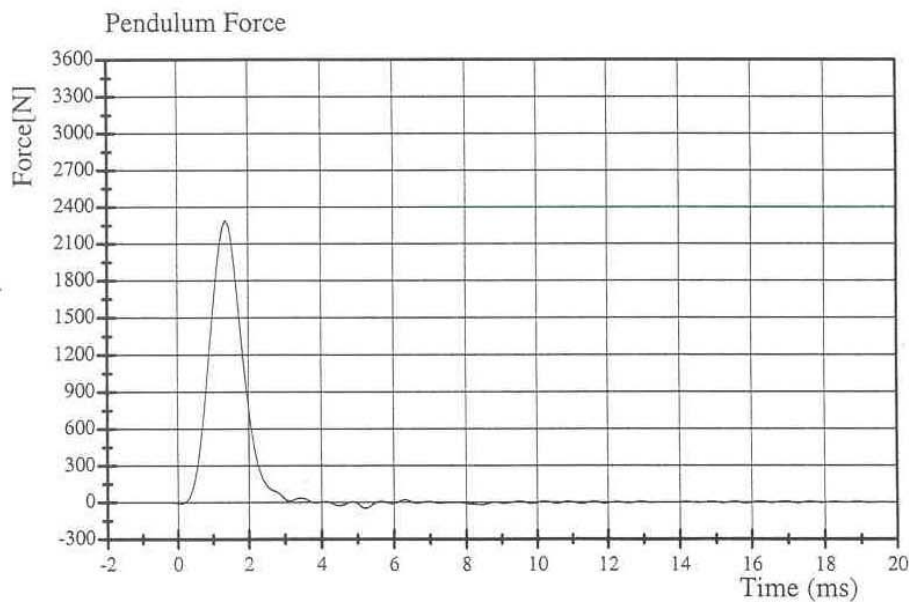
Test Date 07/23/2004



Filter Class: 600

Max: 285.2 g at 1.4 ms

Min: -6.0 g at 5.2 ms



Filter Class: 600

Max: 2293.4 N at 1.4 ms

Min: -48.0 N at 5.2 ms

07.23.2004 14:58:08 1683



APPENDIX D

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

INSTRUMENTS FOR RRP CHILD DUMMY S/N: 042

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	B05-J12	Entran	9/15/04
Head Y	B05-J19	Entran	9/15/04
Head Z	A27-Z11	Entran	9/15/04
Head X Redundant	B05-J16	Entran	9/15/04
Head Y Redundant	B10-Z23	Entran	9/15/04
Head Z Redundant	B05-J11	Entran	9/15/04
Upper Neck Load Cell	208	FTSS	5/13/04
Chest X	A27-Z23	Entran	9/15/04
Chest Y	A27-Z24	Entran	9/15/04
Chest Z	A27-Z13	Entran	9/15/04
Chest X Redundant	A12-Z06	Entran	9/15/04
Chest Y Redundant	A12-Z05	Entran	9/15/04
Chest Z Redundant	A12-Z02	Entran	9/15/04
Chest Deflection Gauge	042	Servo	8/06/04
Pelvis X	A27-Z19	Entran	9/15/04
Pelvis Y	A27-Z07	Entran	9/15/04
Pelvis Z	A27-Z16	Entran	9/15/04
Tether Force	158	FTSS	6/08/04

INSTRUMENTS FOR LRP CHILD DUMMY S/N: 144

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AH0B0	Endevco	7/23/04
Head Y	ALE80	Endevco	7/23/04
Head Z	AP1H2	Endevco	7/23/04
Head X Redundant	AGTM2	Endevco	6/28/04
Head Y Redundant	P24261	Endevco	6/28/04
Head Z Redundant	P21352	Endevco	6/28/04
Upper Neck Load Cell	1626	Denton	7/20/04
Chest X	AJ8T5	Endevco	6/01/04
Chest Y	J12439	Endevco	6/01/04
Chest Z	J20965	Endevco	6/01/04
Chest X Redundant	P22696	Endevco	6/01/04
Chest Y Redundant	AJ9D6	Endevco	6/01/04
Chest Z Redundant	J13772	Endevco	6/01/04
Chest Deflection Gauge	144	Servo	8/09/04
Pelvis X	J13653	Endevco	9/15/04
Pelvis Y	J13713	Endevco	9/15/04
Pelvis Z	J13649	Endevco	9/15/04
Right Femur	126	Denton	7/21/04
Left Femur	125	Denton	7/21/04
Shoulder Belt	167	Denton	5/21/04
Child Lap Belt	198	Denton	6/08/04
Belt Stretch	BD001	Servo	8/11/04

INTRUMENTS FOR REAR SEAT AND CHILD SEATS

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Back X	C17-J07	Entran	4/23/04
Left Rear Seat Back Y	K18-J03	Entran	7/02/04
Left Rear Seat Back Z	C15-Z18	Entran	4/23/04
RRP Child Seat X	K11-Z14	Entran	7/02/04
RRP Child Seat Y	C12-M13	Entran	7/02/04
RRP Child Seat Z	K18-D15	Entran	7/02/04
LRP Child Seat X	L18-N14	Entran	8/24/04
LRP Child Seat Y	E01-F03	Entran	8/24/04
LRP Child Seat Z	L17-Z19	Entran	8/24/04