

Presentation for GTR 7 OSRP BioRID Testing

December 5, 2011



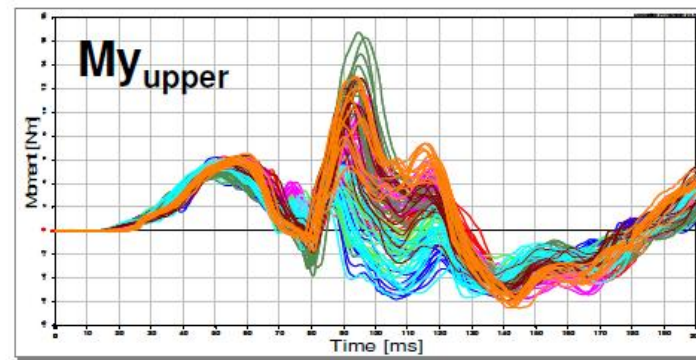
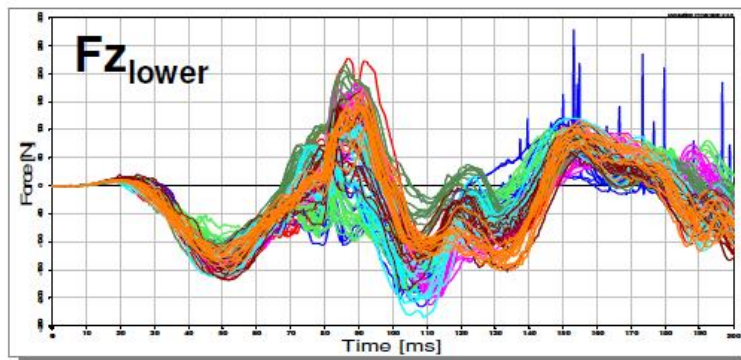
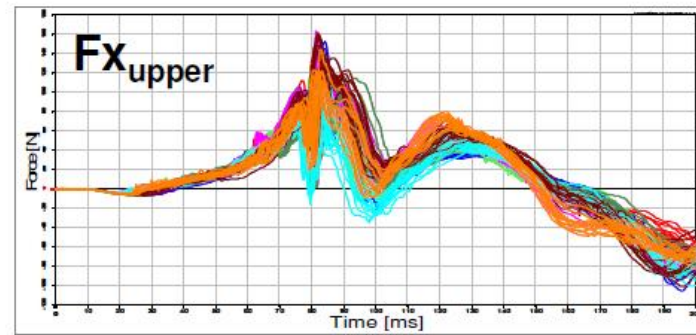
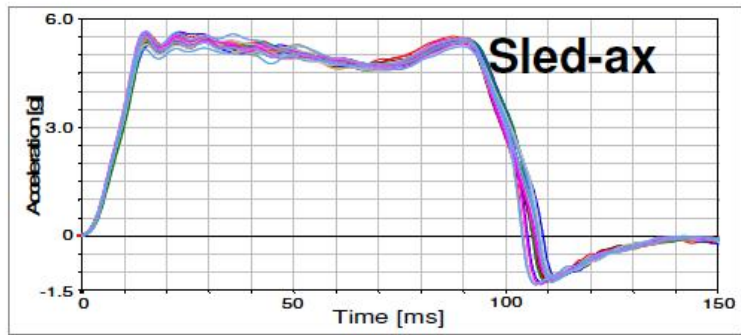
Background and Objectives

- At the last GTR 7 (Phase II) Informal Group Meeting (Washington DC), OSRP agreed to conduct sled tests on BioRID dummies owned by PDB.
- The purpose of these tests was to determine if the upper neck response differences observed between the PDB dummies could be repeated and identify the sources
- The set up was nominally matched as closely as possible to the tests conducted in Germany.



Results

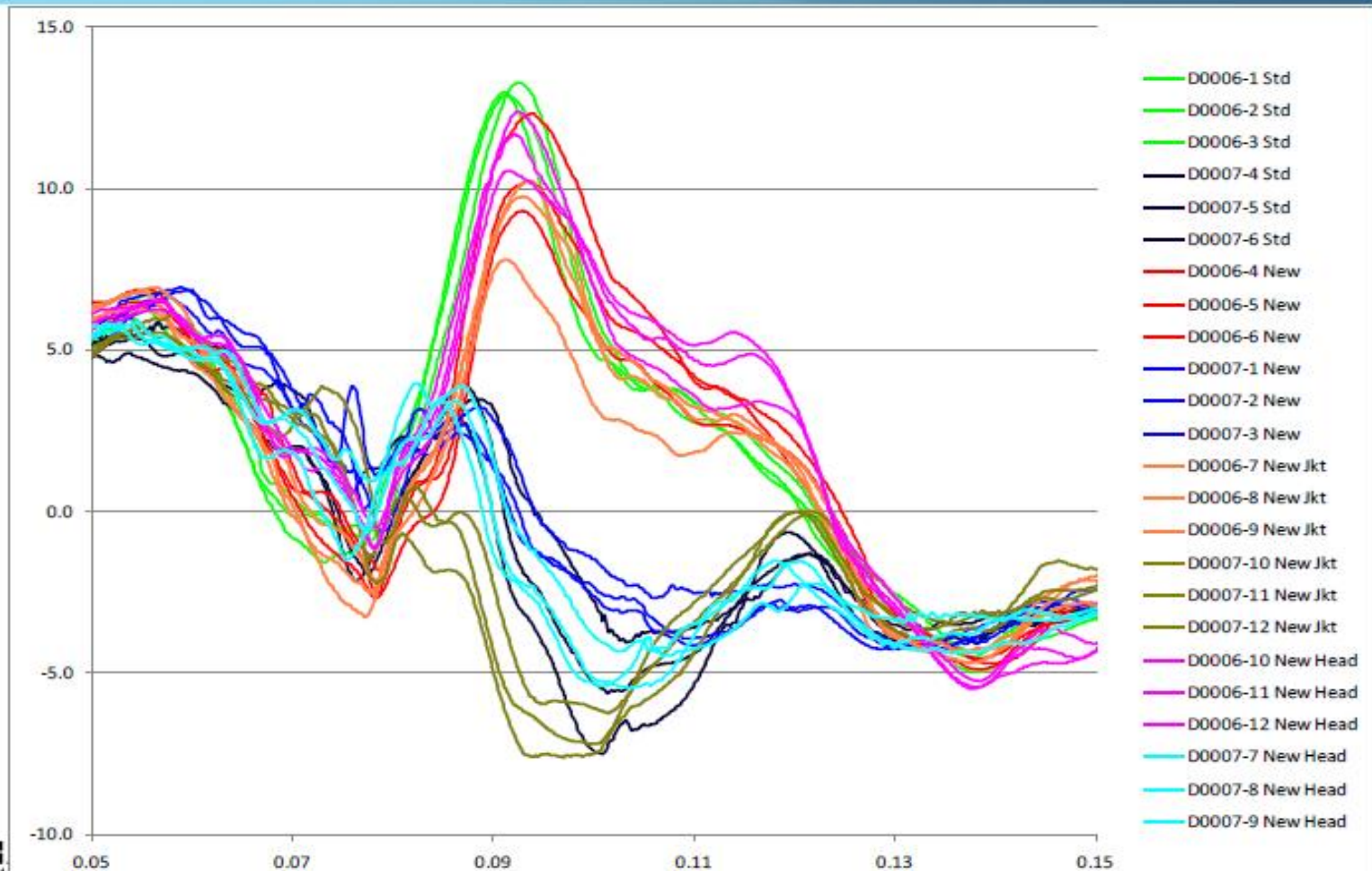
- Dynamic measurements:



➔ **High variances despite accurate test conditions**



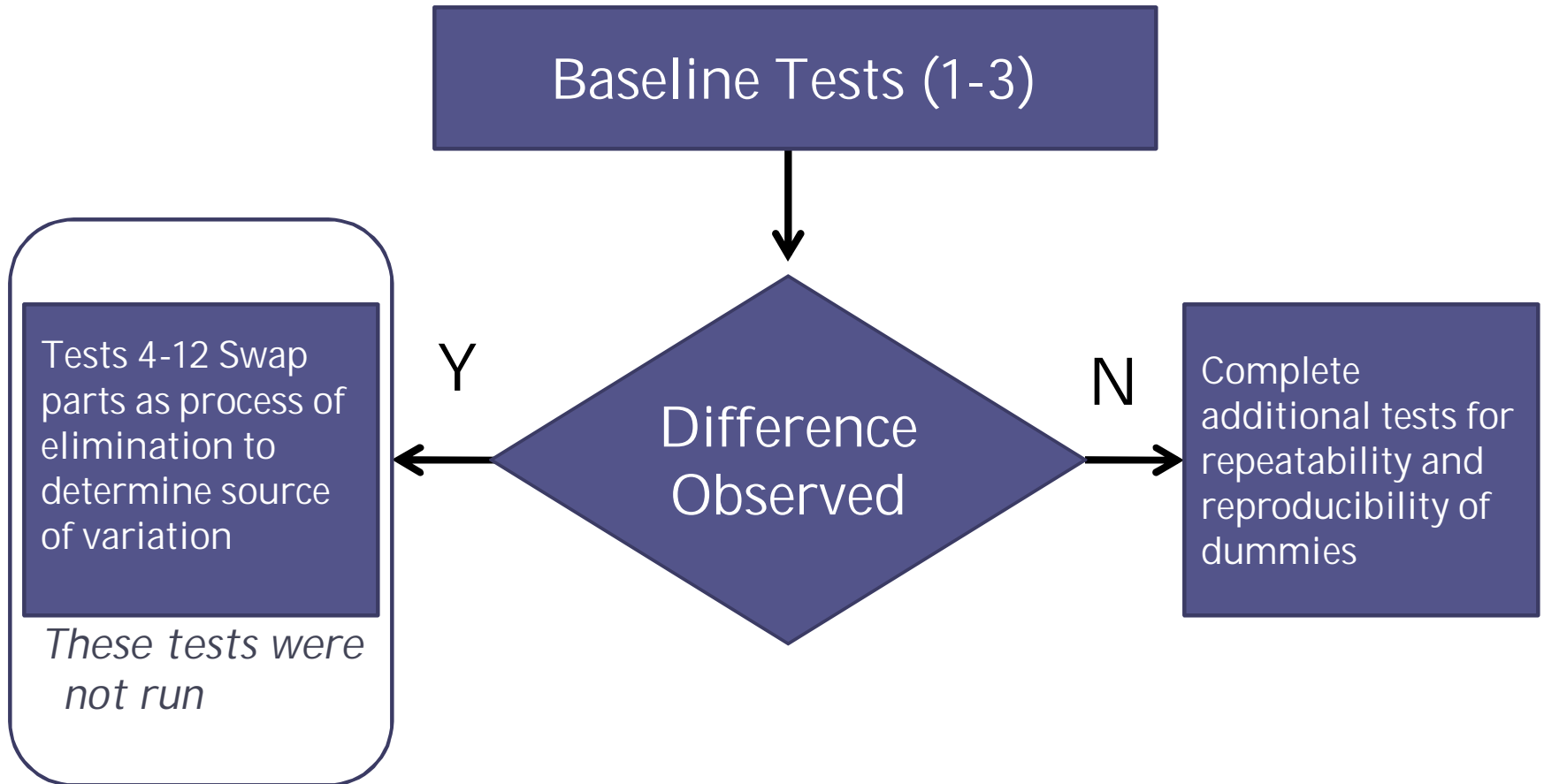
PDB Testing, Upper My zoomed



(Graphic Complements of Humanetics)



Test Matrix

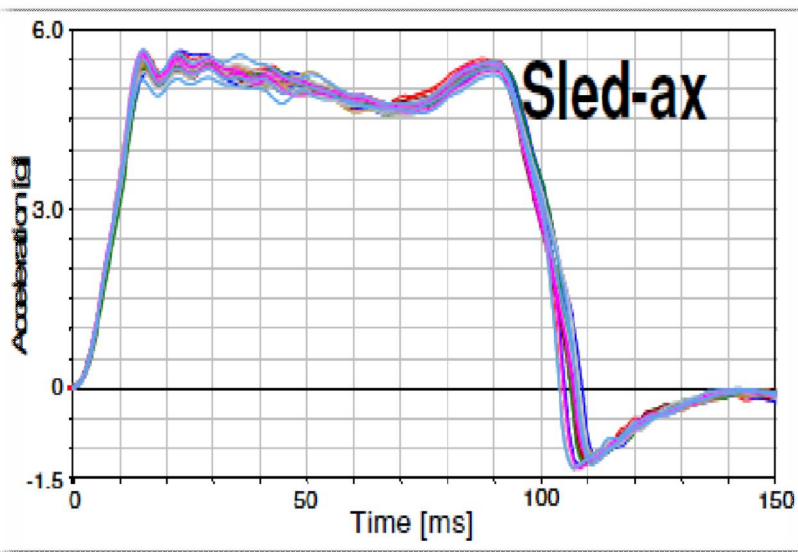




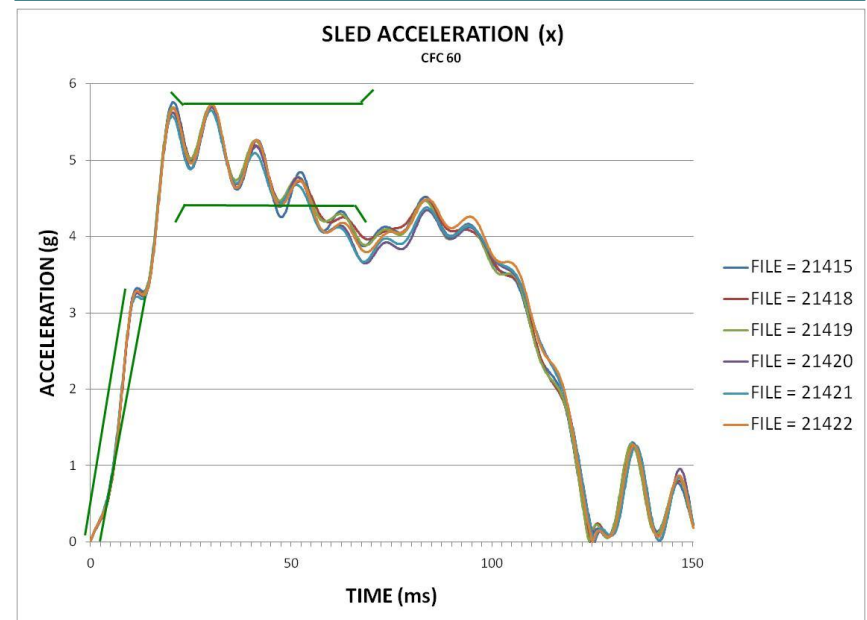
Sled Pulse

Preliminary analysis, used for comparison only

PDB Sled Pulse



OSRP Sled Pulse



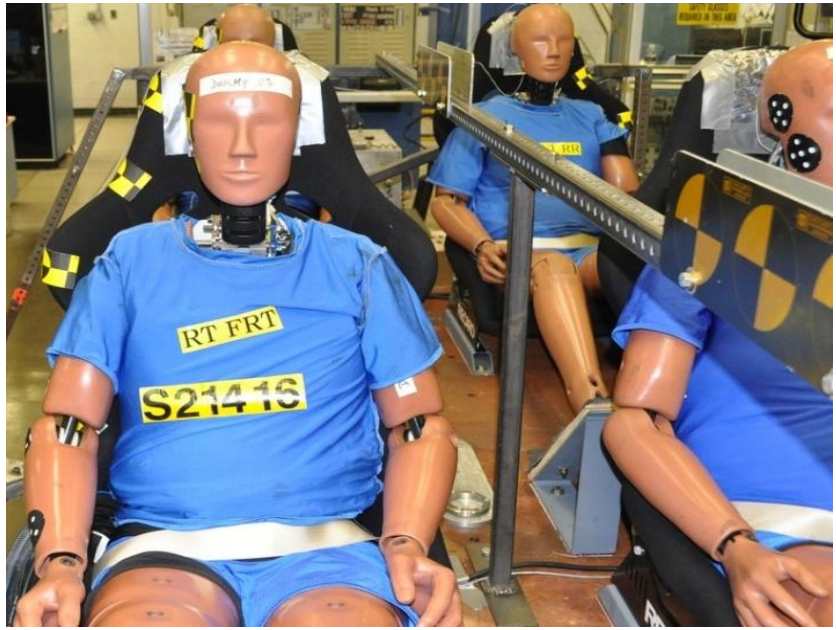
The sled pulses were different, but had the same $\Delta = 16.1 \pm 0.8$ km/h



Sled Set Up Photo

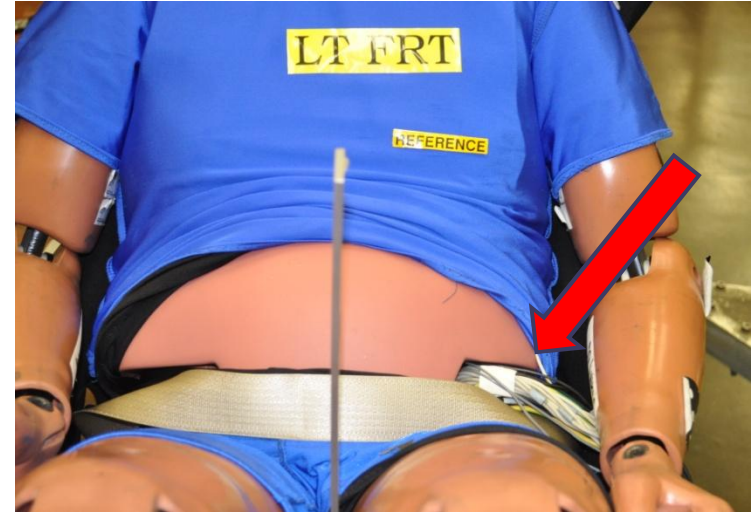
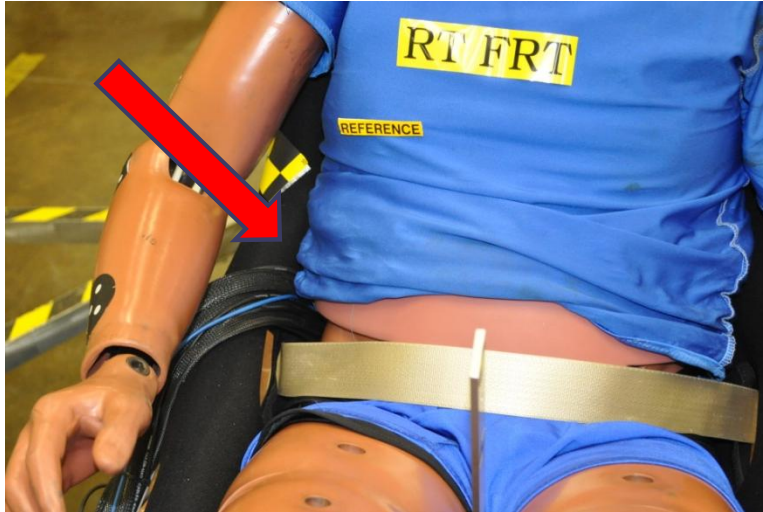
PDB Test

OSRP Test





Additional Set Up Notes



- Cable routing differences
- H-point tool could not be positioned in the hole



Seating Repeatability

All BioRID ATDs

Preliminary analysis, used for comparison only

Location	Target	S21419				Range S21419	Range All Tests
		Left Front (PDB #6)	Right Front (PDB #7)	Left Rear (GM)	Right Rear (Ford)		
Head CG (mm)	X=693	675.2	684.4	679.4	685.3	10.1	17.34
	Z=848	839.3	835.1	851.9	855.1	20.0	27.3
Back set (mm)	n/a	54.9	53.6	53.6	53.0	1.9	4.73
T1 Pin (mm)	X=681	674.3	672.9	670	670.4	3.9	11.3
	Z=675	668.3	663	676.7	676.0	13.7	21.4
Knee (mm)	X=1245	1248.6	1247.2	1245.4	1244.2	4.4	5.9
	Z=283	285	282.2	282.7	284.8	2.8	23.4
Pelvis Angle (°)	Y=29.77	30.2	29.8	30.1	30.3	0.5	1.2

- Rear ATDs sat higher than PDB ATDs



Seating Repeatability

Each ATD Test to Test

Preliminary analysis, used for comparison only

Location	Target	Range Test to Test			
		Left Front (PDB #6)	Right Front (PDB #7)	Left Rear (GM)	Right Rear (Ford)
Head CG (mm)	X	3.2	5.4	0.9	5.0
	Z	2.7	9.5	1.7	4.7
Back set (mm)	X	2.4	3.2	0.9	4.5
T1 Pin (mm)	X	5.0	4.0	3.4	4.3
	Z	2.8	11.0	0.8	5.5
Knee (mm)	X	4.7	5.6	1.9	1.5
	Z	6.0	3.4	3.7	3.0
Pelvis Angle (°)	Y	0.6	0.8	0.6	0.7

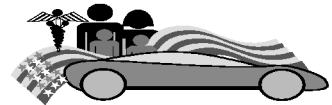
- Range is difference between maximum and minimum CMM points

Data Overlays

Head Ax, Az

Upper Neck My, Fz, Fx

Lower Neck My, Fz, Fx



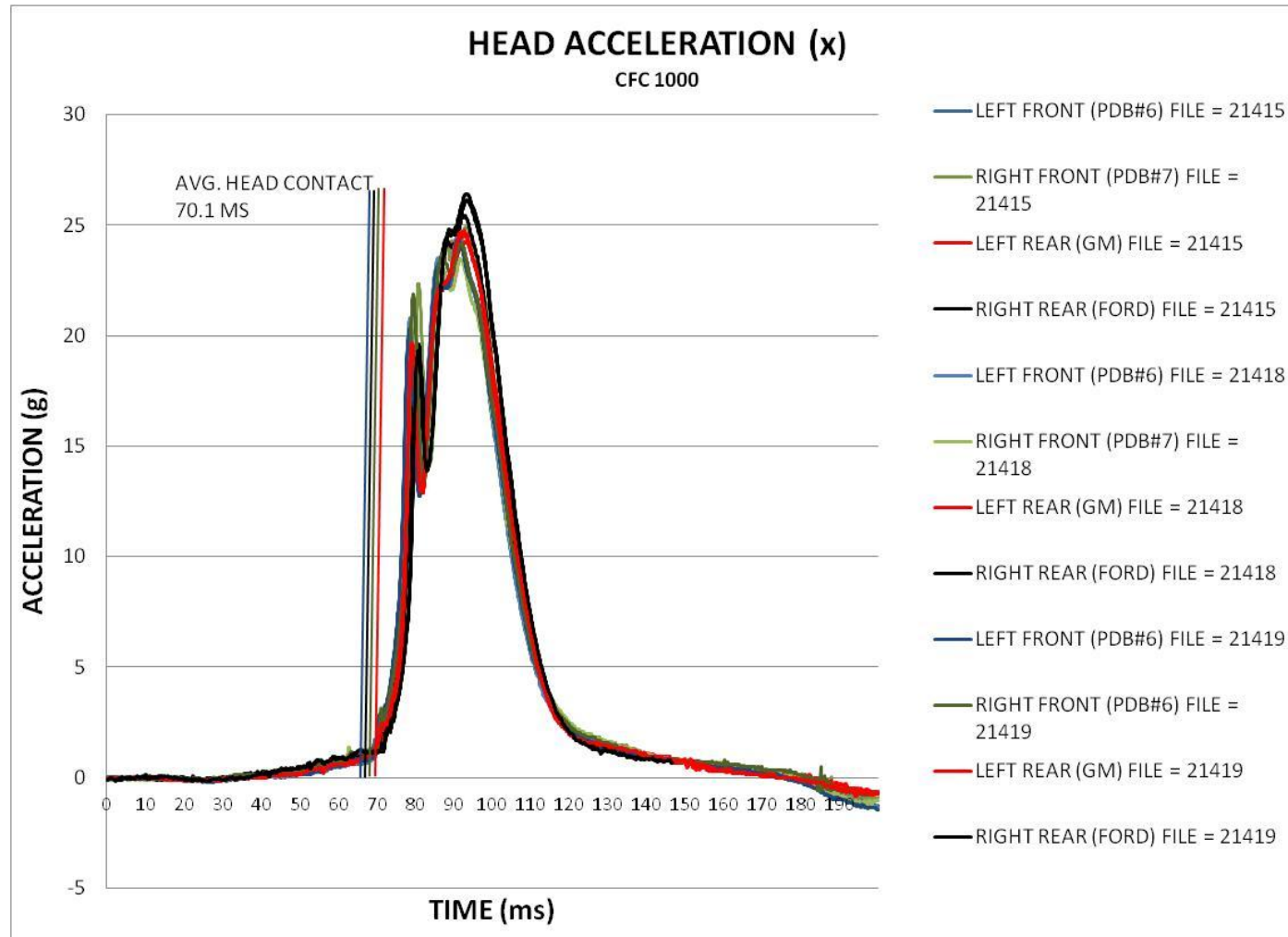
Disclaimer: The data analysis is not completed.

The following overlays and analysis is based on preliminary reviews of critical data for comparison purposes.



Head Acceleration (x) Baseline Tests (1-3)

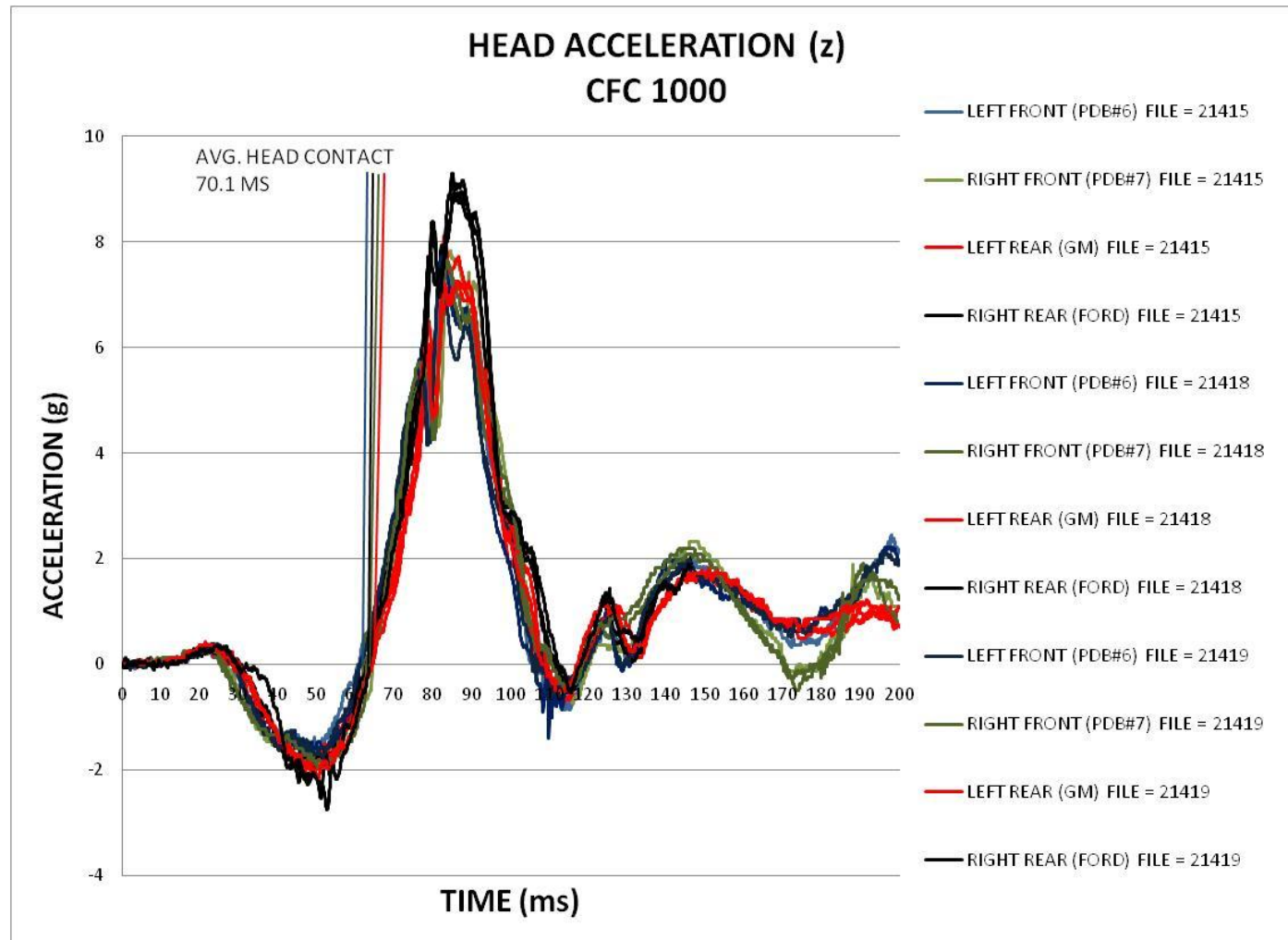
*Preliminary analysis, used for
comparison only*





Head Acceleration (z) Baseline Tests (1-3)

*Preliminary analysis, used for
comparison only*

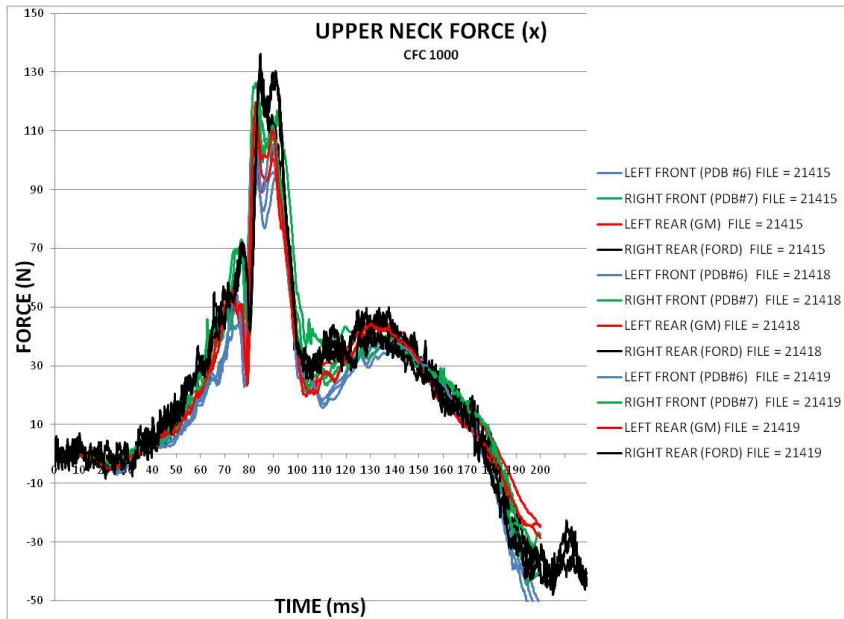




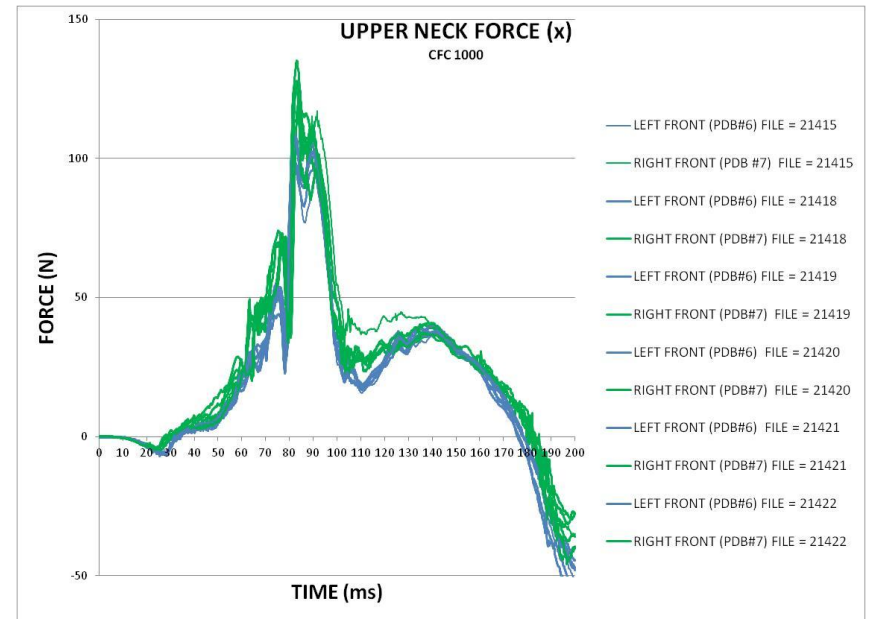
Upper Neck Force (x)

Preliminary analysis, used for comparison only

All ATDs Baseline Tests



PDB ATDs Only

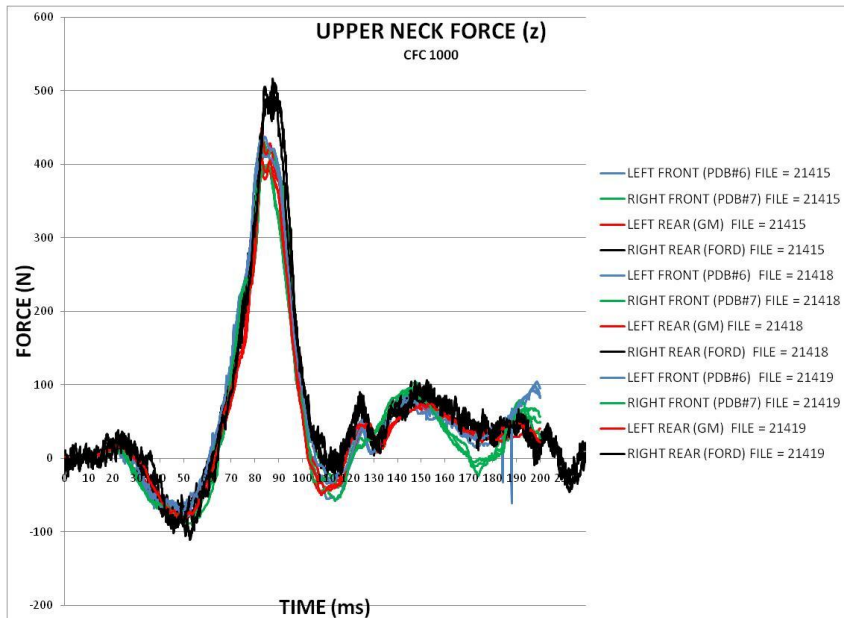




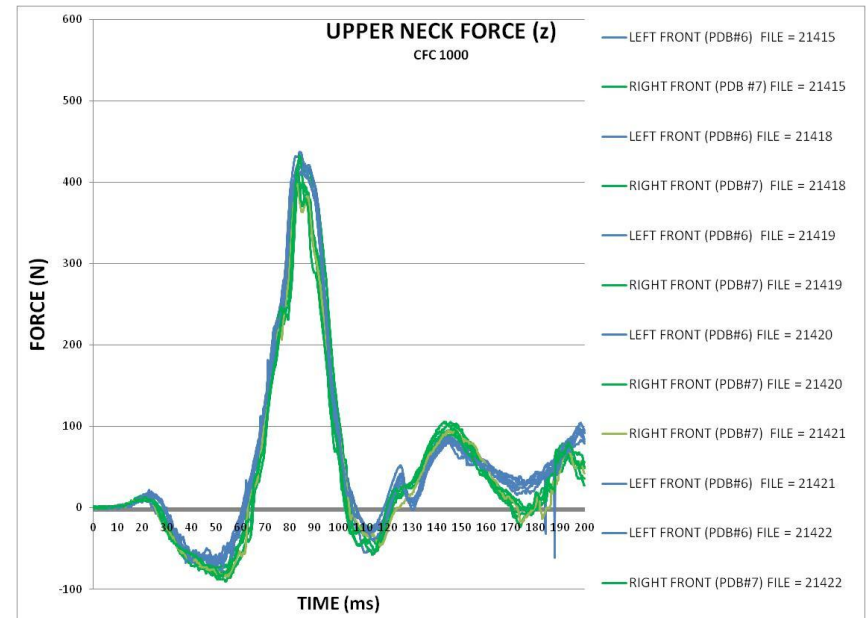
Upper Neck Force (z)

Preliminary analysis, used for comparison only

All ATDs Baseline Tests



PDB ATDs Only

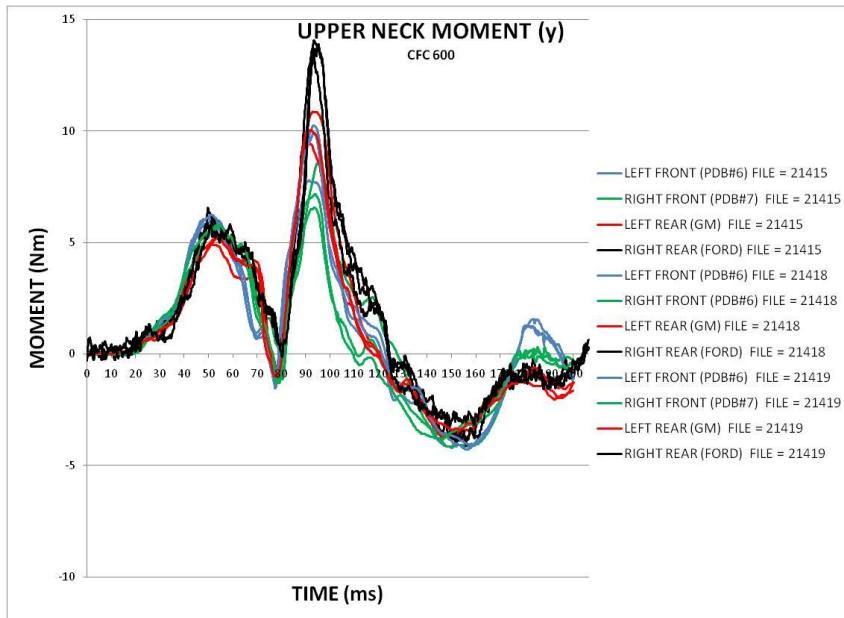




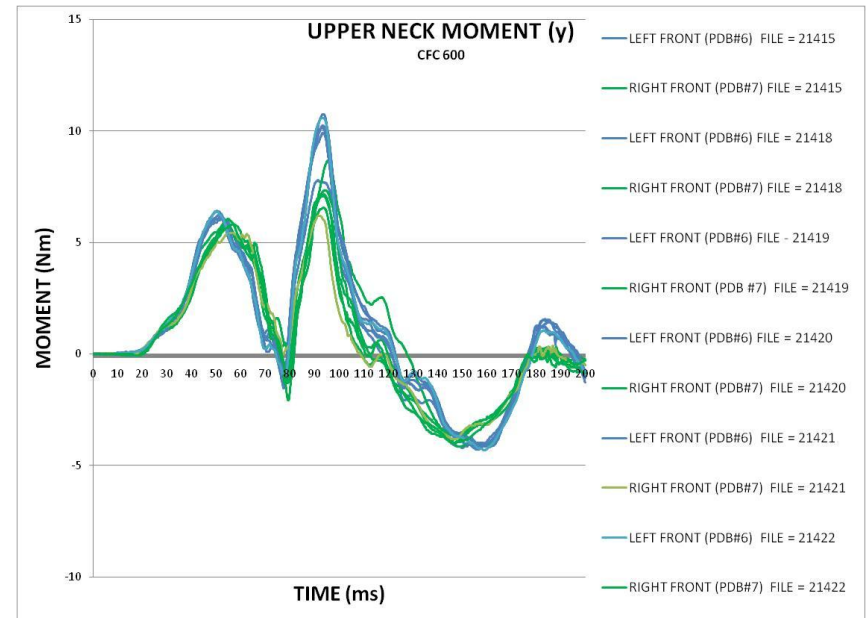
Upper Neck Moment (y)

Preliminary analysis, used for comparison only

All ATDs Baseline Tests



PDB ATDs Only



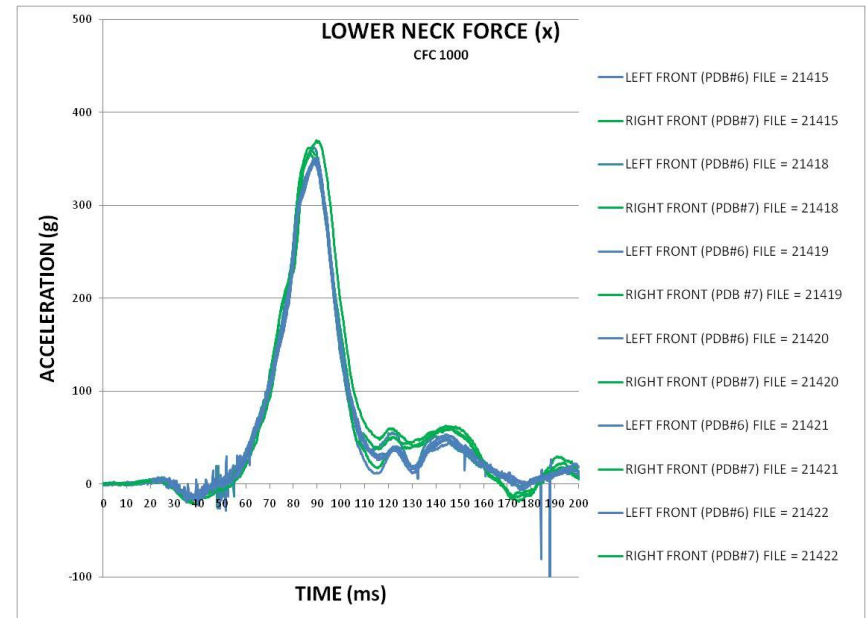
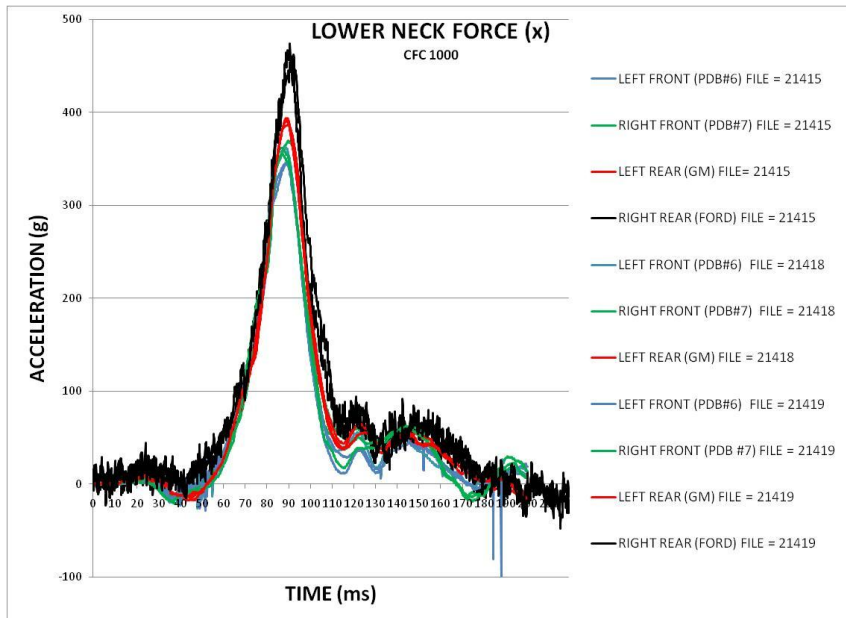


Lower Neck Force (x)

Preliminary analysis, used for comparison only

All ATDs Baseline Tests

PDB ATDs Only



Ford ATD lower neck load cell questionable for test 2

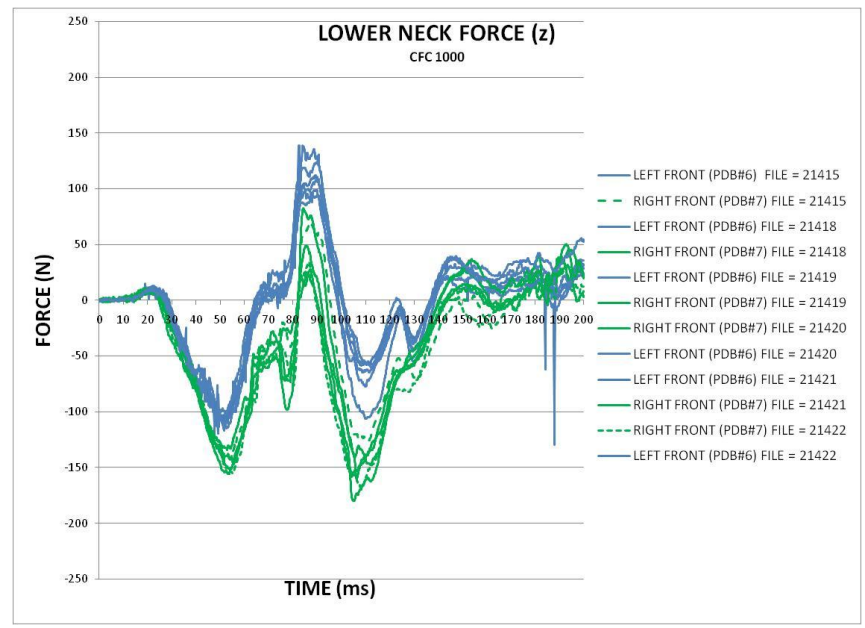
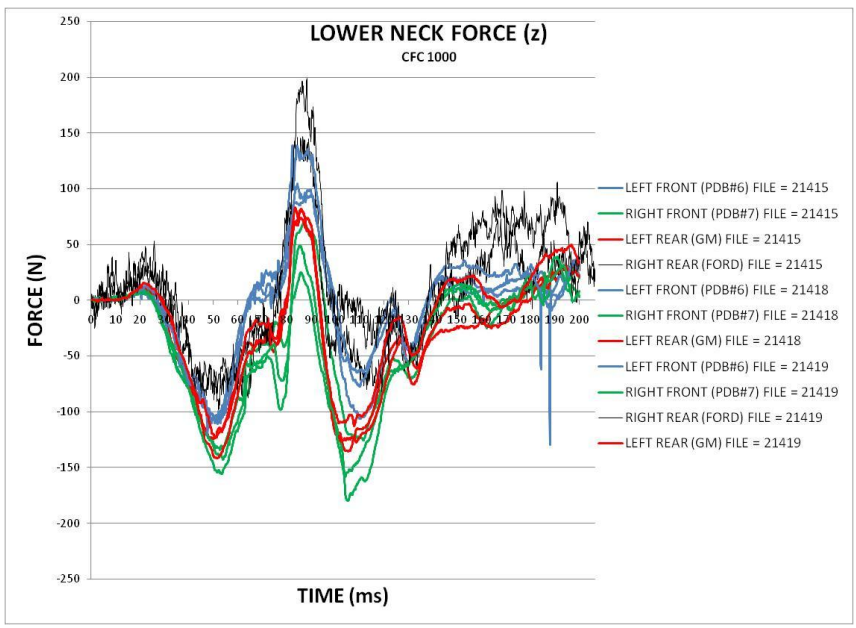


Lower Neck Force (z)

Preliminary analysis, used for comparison only

All ATDs Baseline Tests

PDB ATDs Only

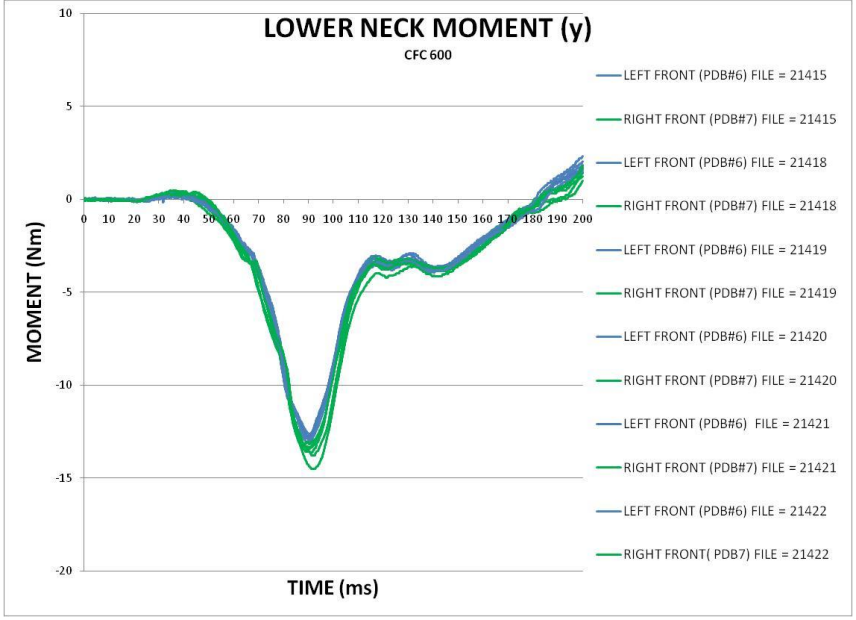
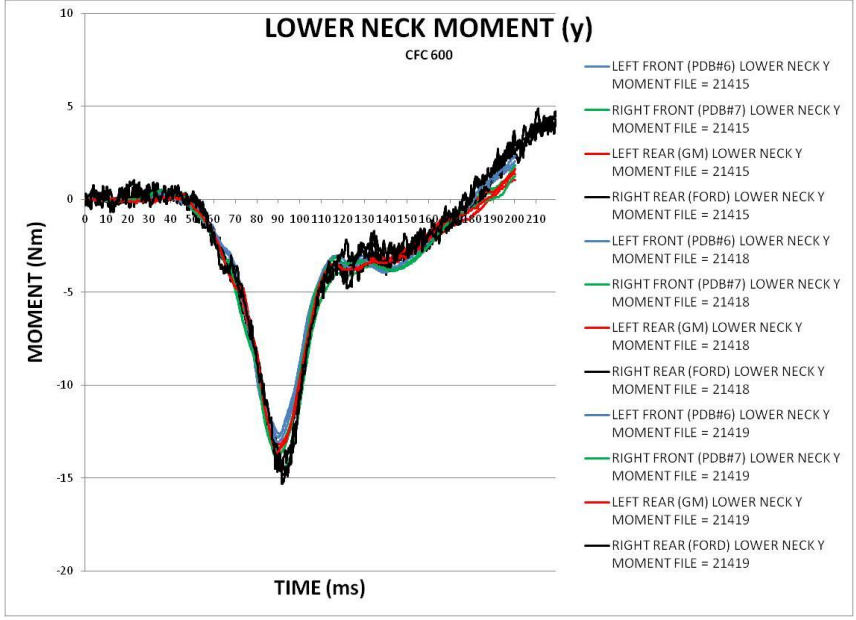




Lower Neck Moment (y) *Preliminary analysis, used for comparison only*

All ATDs Baseline Tests

PDB ATDs Only

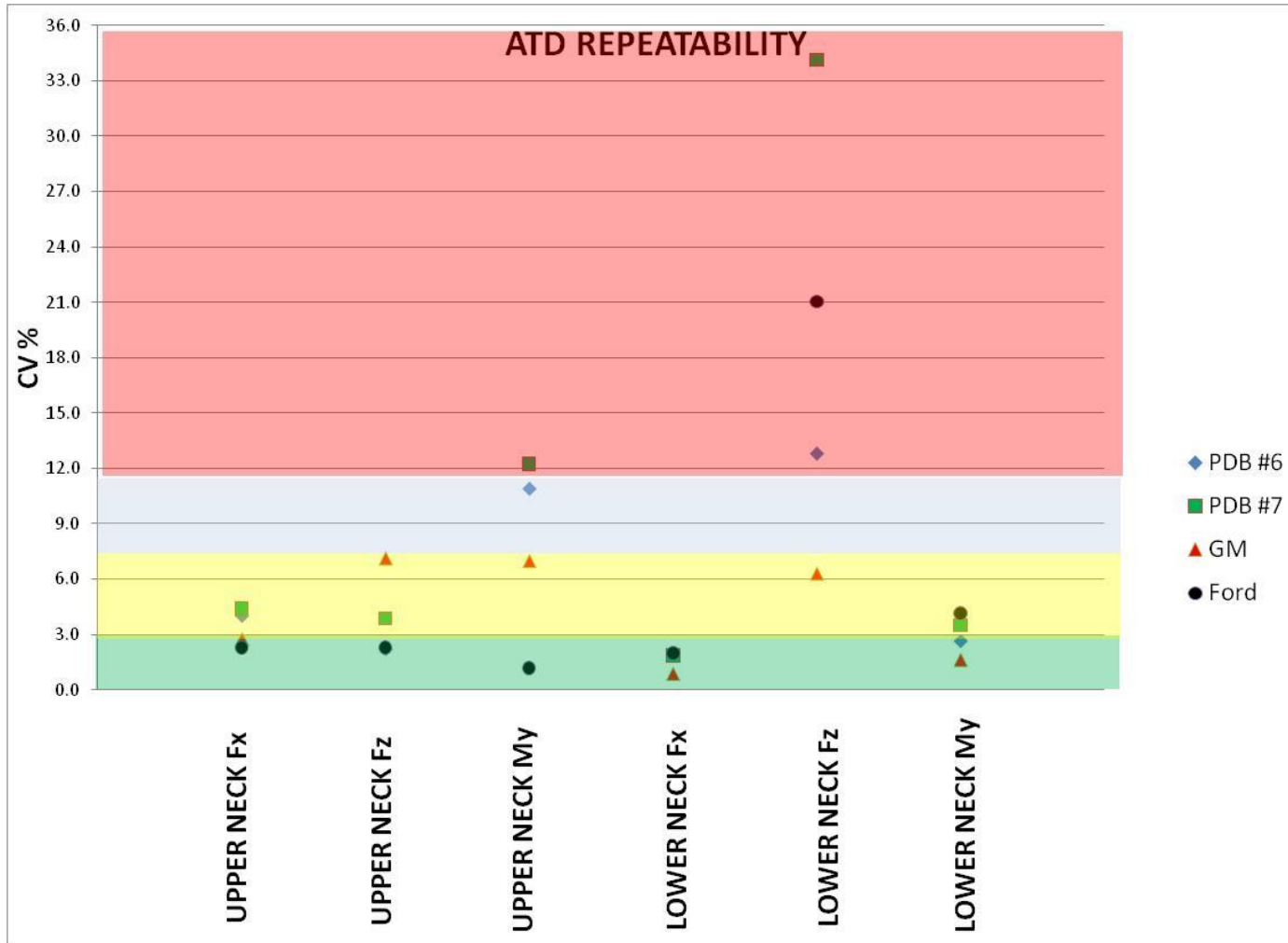




Data Analysis

Baseline Tests (1-3)

Preliminary analysis, used for comparison only



GOOD: <3%

ACCEPTABLE:
>3% & <7%

MARGINAL:
>7% & <10%

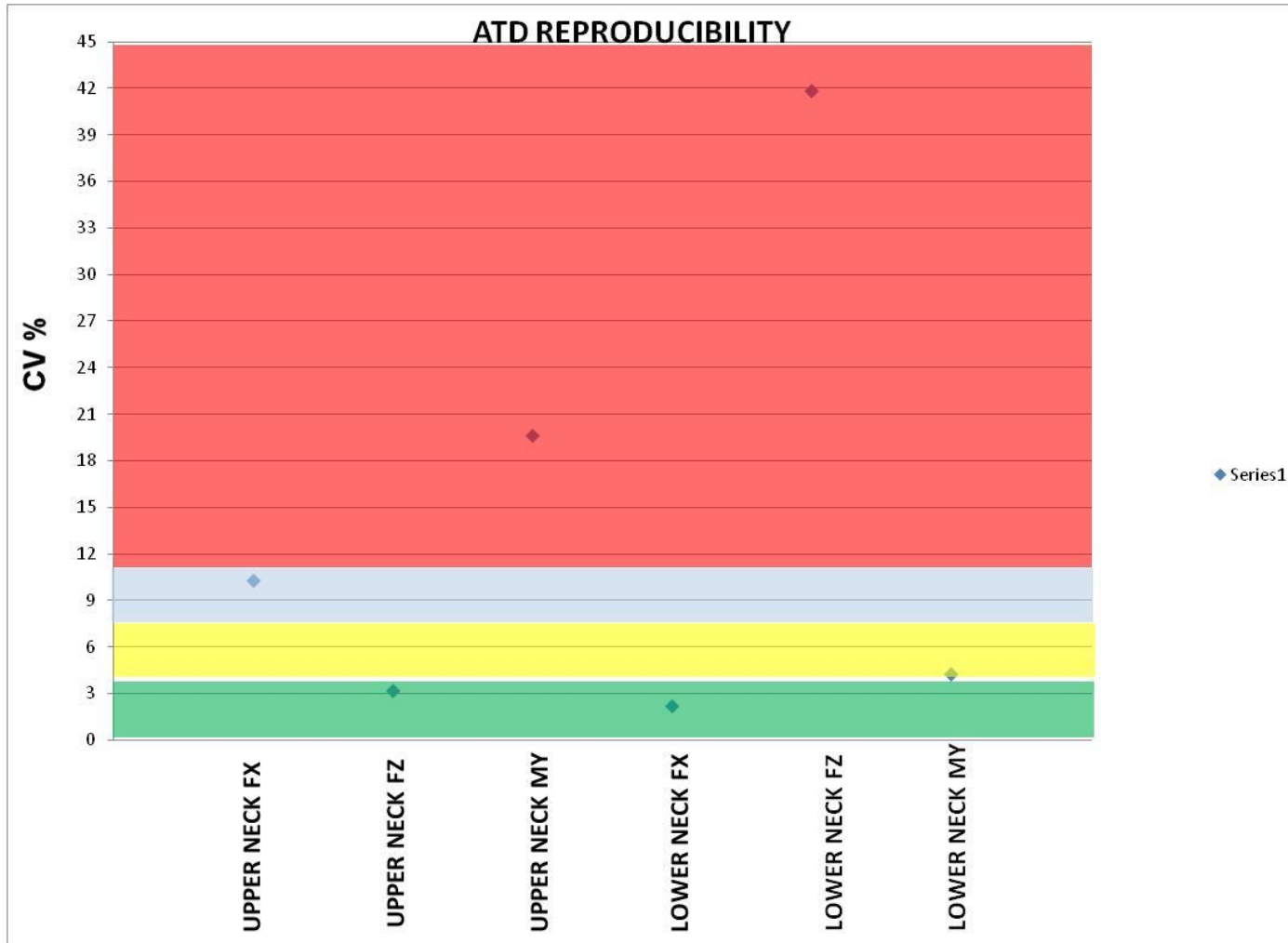
NOT
ACCEPTABLE:
>10%



Test Series Data Analysis

PDB ATDs only

Preliminary analysis, used for comparison only



GOOD: <3%

ACCEPTABLE: >3% & <7%

MARGINAL: >7% & <10%

NOT ACCEPTABLE: >10%



Conclusions of OSRP tests

- OSRP sled pulse did not match the one from German tests
- OSRP was unable to duplicate the upper neck M_y (magnitude or shift)
- In general the differences in waveforms between PDB BioRIDS observed in sled tests in Germany were similar to the ones observed in OSRP testing, with the exception of the upper neck M_y .
- OSRP testing shows that the repeatability of the upper neck M_y and lower neck F_z are not acceptable. The repeatability analysis indicated the max CV was 34% for the lower neck F_z .
- OSRP testing shows that the reproducibility of the upper neck M_y as well as the lower neck F_z are not acceptable. The reproducibility analysis indicated the max CV was 42% for the lower neck F_z .
- Disclaimer: The data analysis is not completed.