

Dummy Model Developments in Preparation of Euro NCAP 2015

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Motivation

09. Mai 2012 SafetyUpdate Aschaffenburg

“Das neue Euro NCAP Rating 2013-2017”

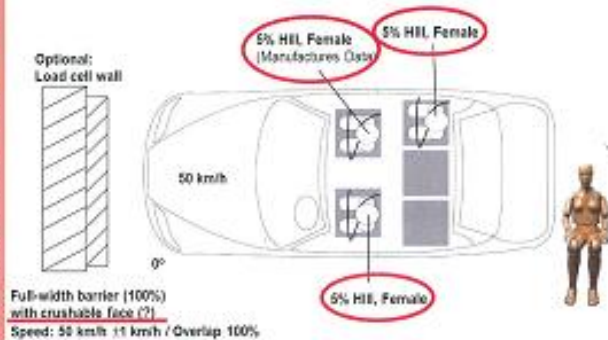
Direktor und Professor **Andre Seeck**
Bundesanstalt für Straßenwesen

4 Euro NCAP – Rating Scheme 2013-2017



Full-width Frontal Impact (2015)

- New!



- H35 (female 5th %ile)
- 51 channels (extended chest measurements)
- Calibration: head, neck, chest, spine, femur and tibia

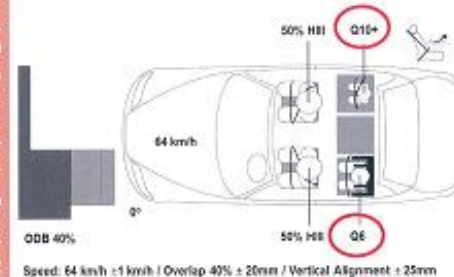


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4 Euro NCAP – Rating Scheme 2013-2017



ODB Frontal Impact (2015)



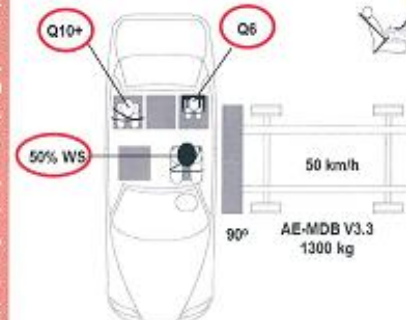
- Q10+
- 36 channels
- Calibration: head, neck, chest, shoulder, spine, abdomen, pelvis
- Q6
- 51 channels
- Calibration: head, neck, chest, shoulder, spine, abdomen, pelvis

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4 Euro NCAP – Rating Scheme 2013-2017



Side Barriere Impact (2015)



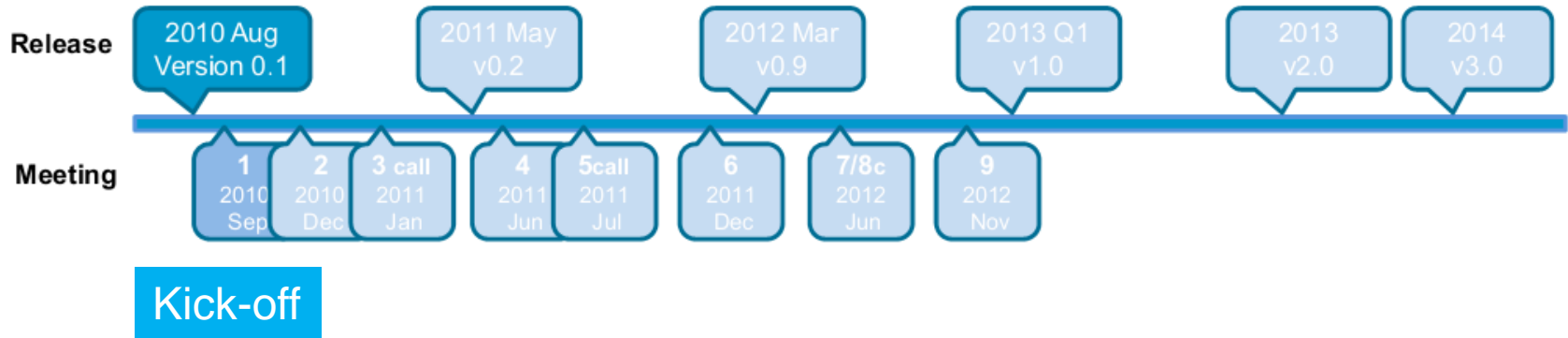
- WS50 (male 50th %ile)
- 64 channels
- Calibration: head, neck, shoulder, ribs, abdomen, spine, pelvis
- Q10+
- 36 channels
- Calibration: head, neck, chest, shoulder, spine, abdomen, pelvis

Speed: 50 km/h ± 1 km/h / Alignment with R-Point ± 25 mm / Vertical Alignment ± 25 mm
50% World SID with F60 seating procedure

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Q6 Project start

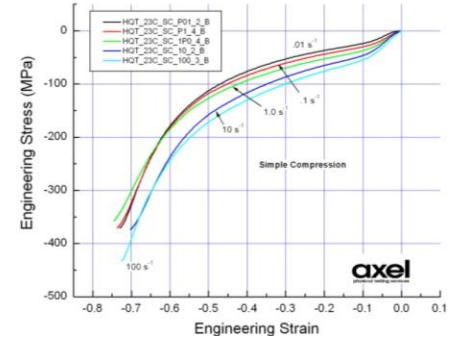
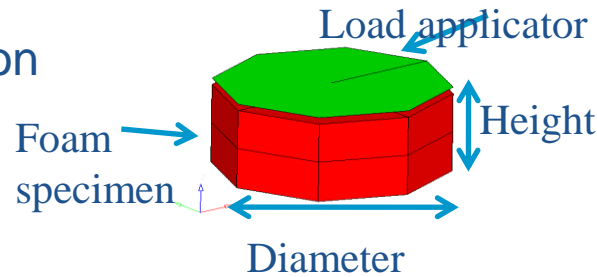


- review of existing Q6 model v0.1
- definition of project targets
- exchange experiences on hardware behaviour by OEMs
- project schedule
- model quality requirements specification

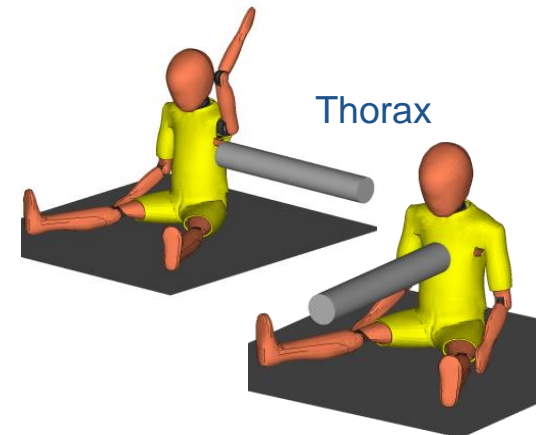
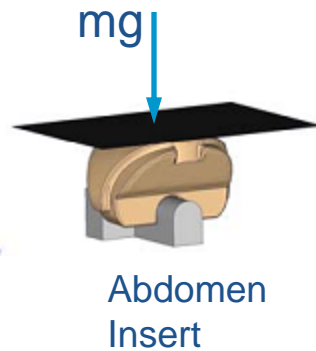
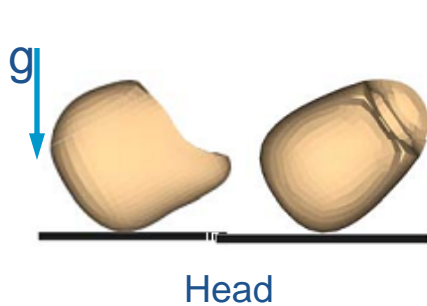
Q6 Project



- Material model parameter calibration



- Model Validation based on hardware certification tests



Q6 Definition of Loads

Contribution of consortium partners

(based on OEMs tests so far):

	OPEL	BMW	AUDI
Head ACX	140ms	105ms	130ms
Head ACZ	105ms	105ms	105ms
Neck Upper FOX	@ 130ms	@ 120ms	@ 130ms
Neck Upper FOZ	105ms	105ms	@ 105ms
Neck Upper MOY	@ 135ms	@ 130ms	@ 135ms
Thoracic Spine ACX	95ms	85ms	90ms
Thoracic Spine ACZ	105ms	110ms	115ms
Chest DSX	@ 105ms	@ 90ms	
Pelvis ACX	90ms	80ms	
Pelvis ACZ	85ms	90ms	105ms
SeatBeltFo B3	@ 105ms	@ 95ms	@ 100ms
SeatBeltFo B6	@ 90ms	@ 80ms	@ 95ms

Reference Test

TU Berlin
June 2011



TUB LC Front 01

30...50g @ 110ms

60g @ 110ms

0.5kN @ 130ms

1.9kN @ 110ms

35Nm @ 110ms

50g @ 65ms

25g @ 70ms

33mm @ 80ms

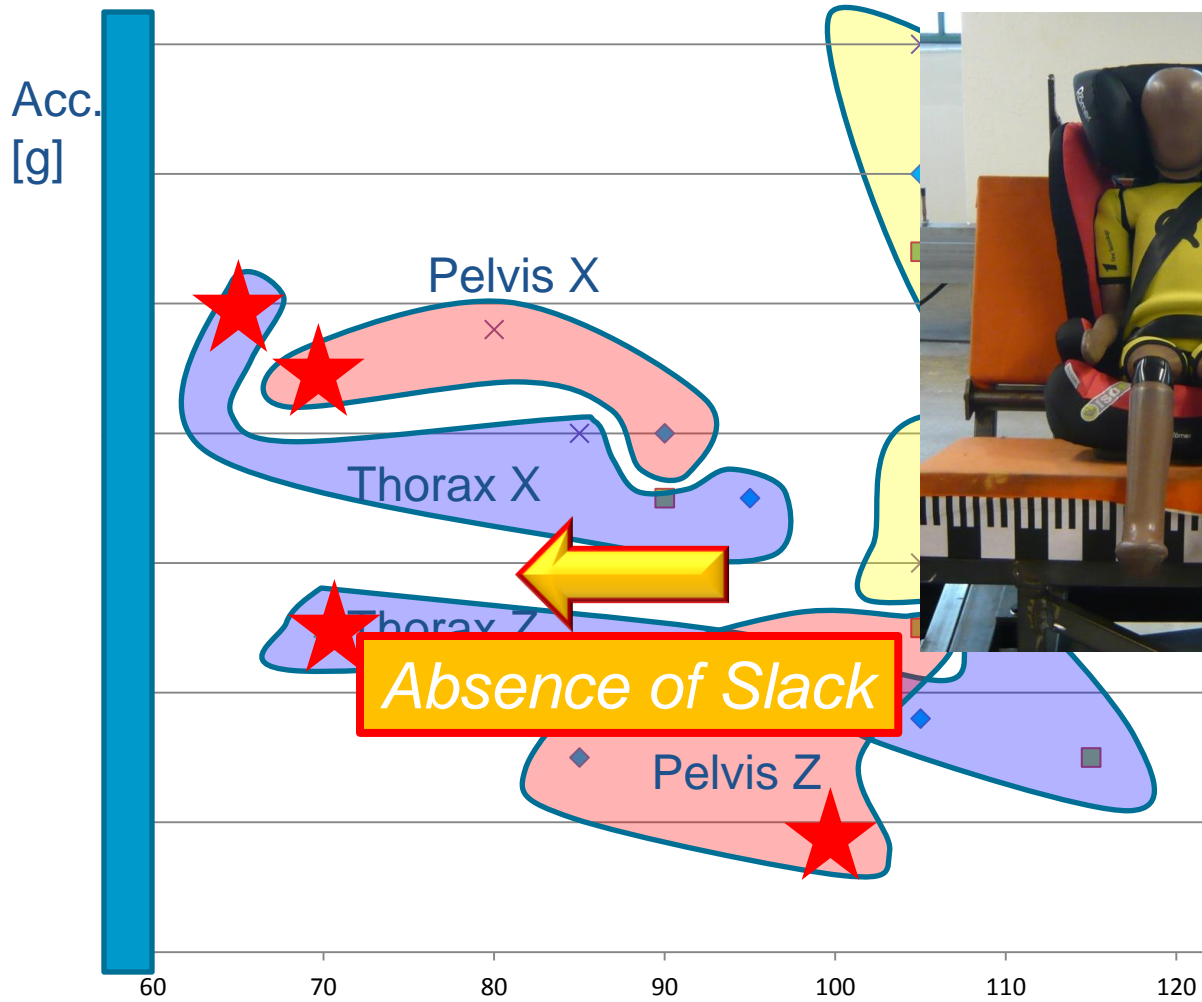
45g @ 70ms

10g @ 100ms

6kN @ 80ms

3...5Kn @ 70ms

Q6 Accelerations (overview)

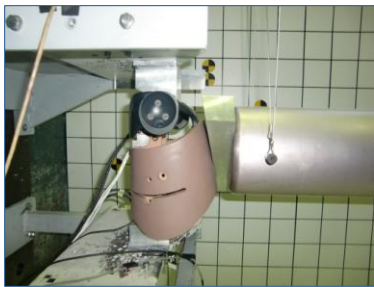


Project Progress

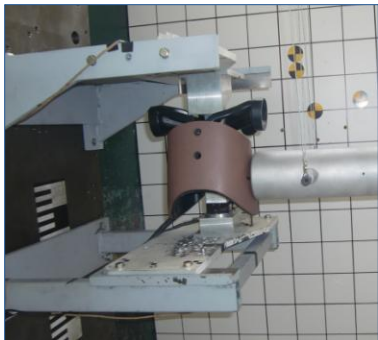


Component Validation

Rib Cage

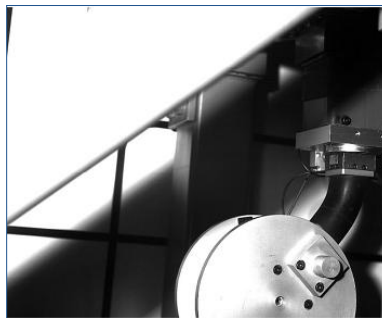


Frontal
low+high
speed

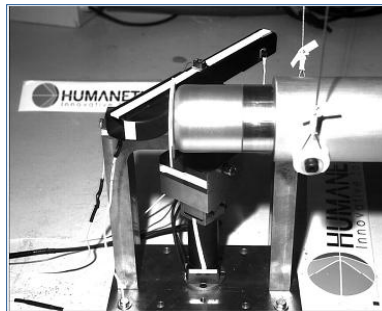


Lateral
low+high
speed

Lumbar Spine

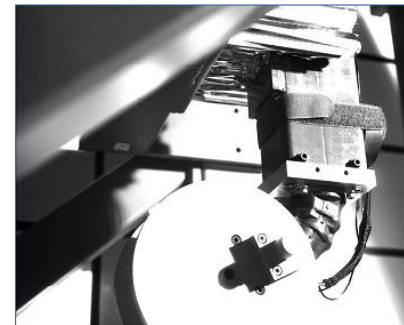


Bending
low+high
speed



Torsion
low+
middle+
high
speed

Neck



Bending
frontal
low+high
speed

lateral
low+high
speed



QS Tension
with+w/o
cable

Project Progress



Sled Test Validation

- Frontal (based on Euro NCAP 64 km/h ODB 40%)
 - LC1: behind driver (P04)
 - LC2: behind passenger (P06)
 - LC3: straight (lower severity)
- Lateral
 - LC4: near side (P04), barrier impact test
 - LC5: far side (P06), „fixed pelvis“ test
 - LC6: far side (P06) „fixed pelvis“ without abdomen insert

4 hardware dummies to capture the variability

Project Progress

Sled Test Validation

- Frontal (based on Euro NCAP 64 km/h ODB 40%)
 - LC1: behind driver (P04)



Project Progress

Sled Test Validation

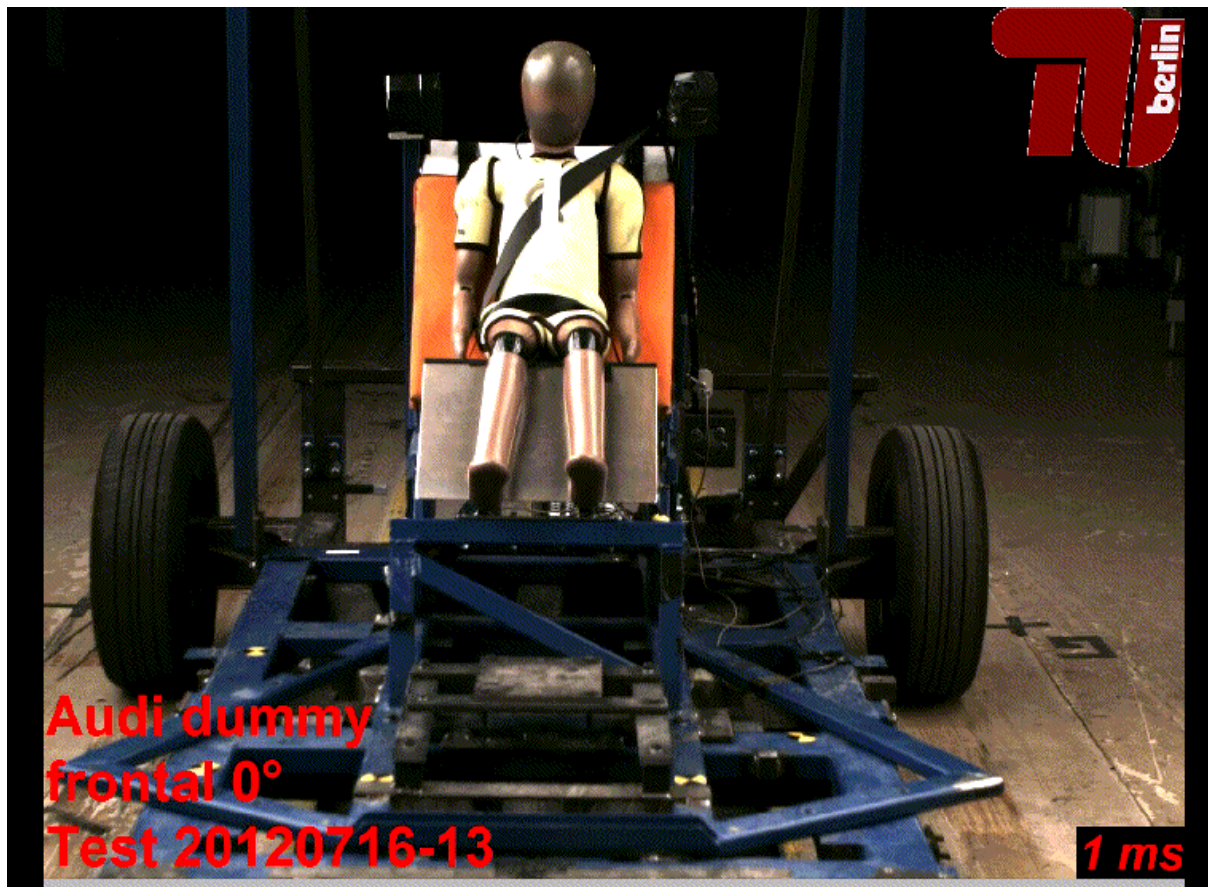
- Frontal (based on Euro NCAP 64 km/h ODB 40%)
 - LC2: behind passenger (P06)



Project Progress

Sled Test Validation

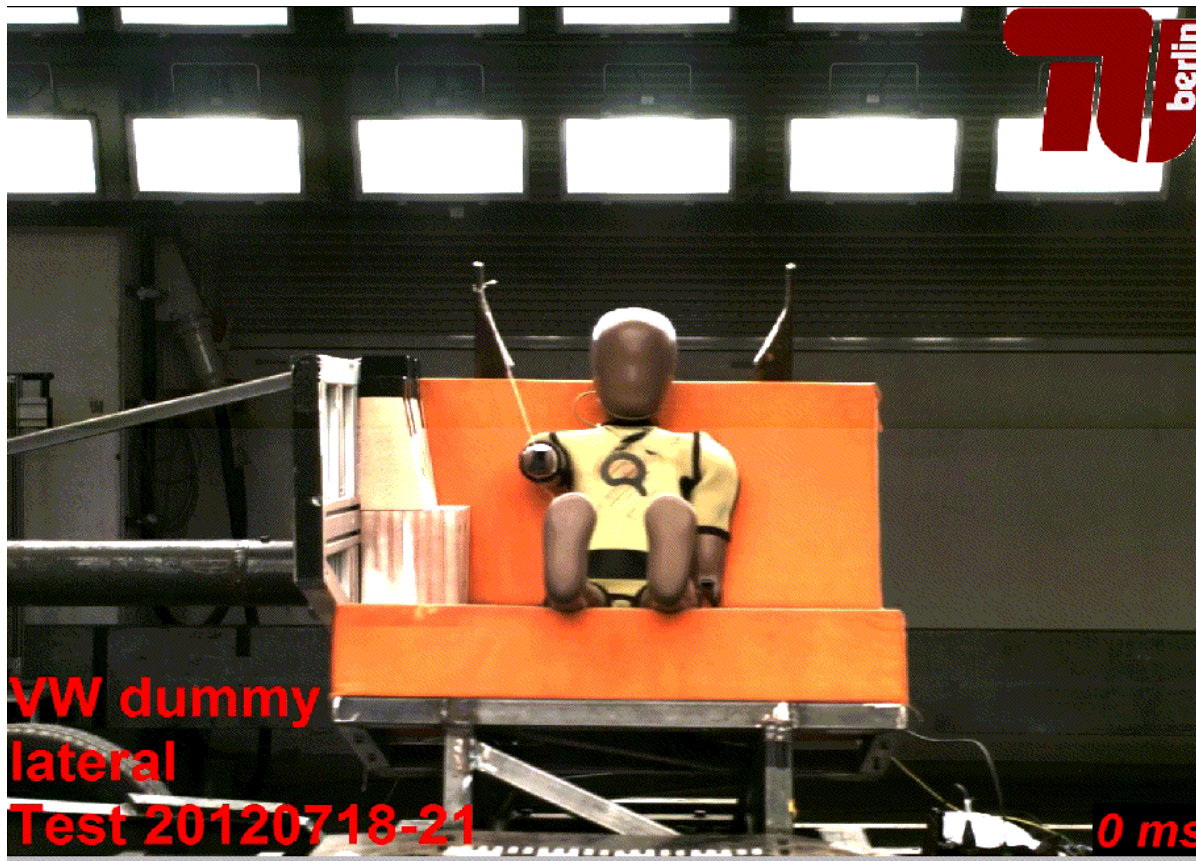
- Frontal (based on Euro NCAP 64 km/h ODB 40%)
 - LC3: straight (lower severity)



Project Progress

Sled Test Validation

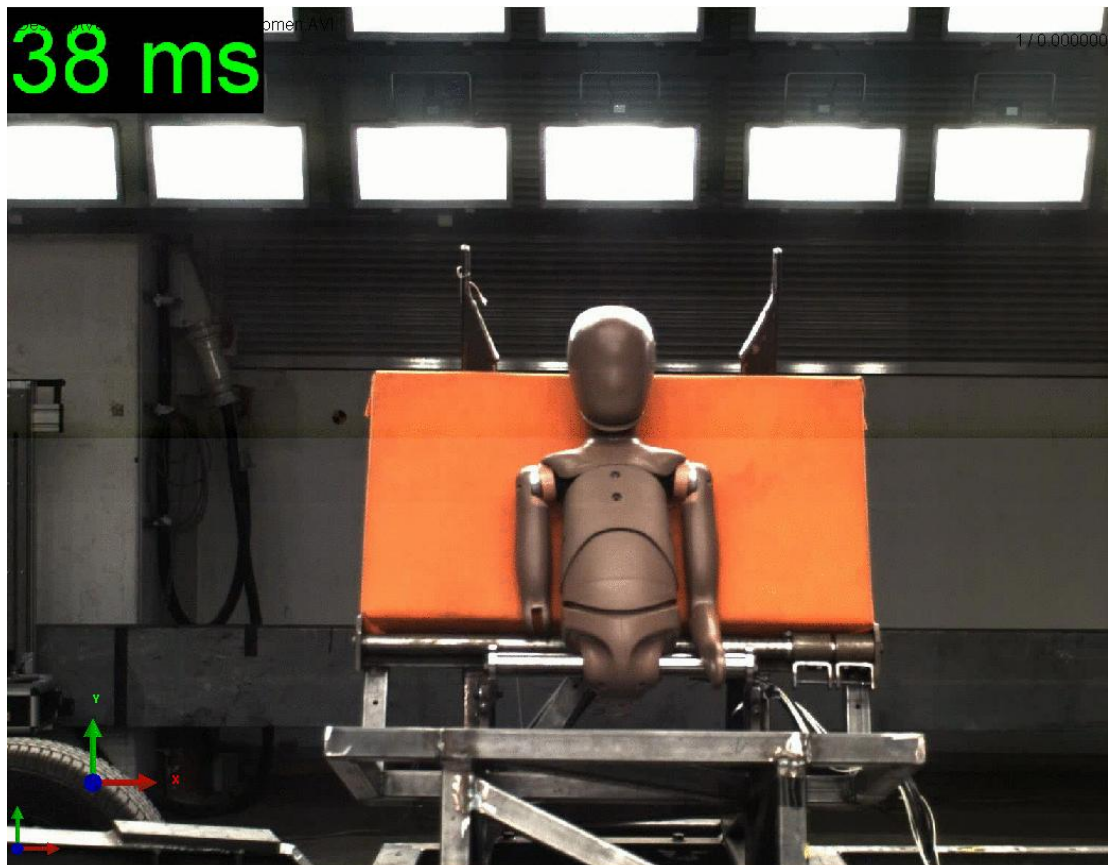
- Lateral
 - LC4: near side (P04), barrier impact test



Project Progress

Sled Test Validation

- Lateral
 - LC5: far side (P06), „fixed pelvis“ test

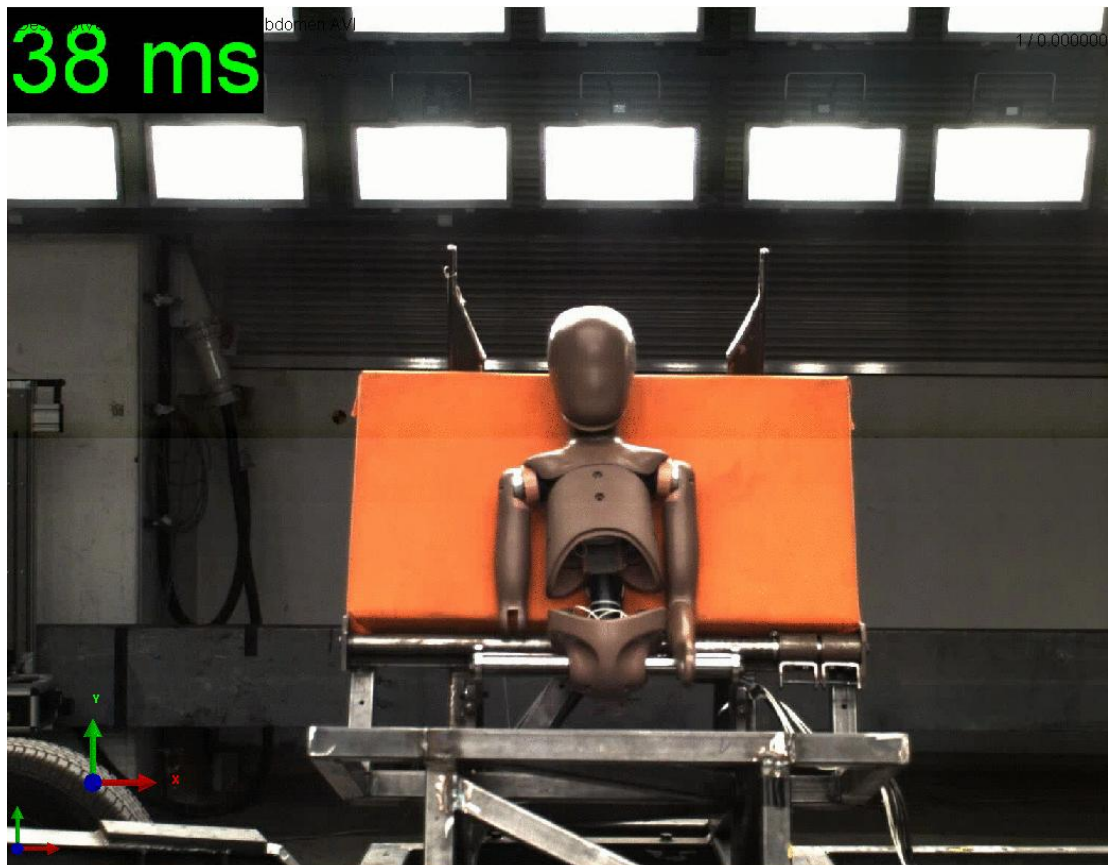


Project Progress

Sled Test Validation

- Lateral

- LC6: far side (P06), „fixed pelvis“ test without abdomen insert

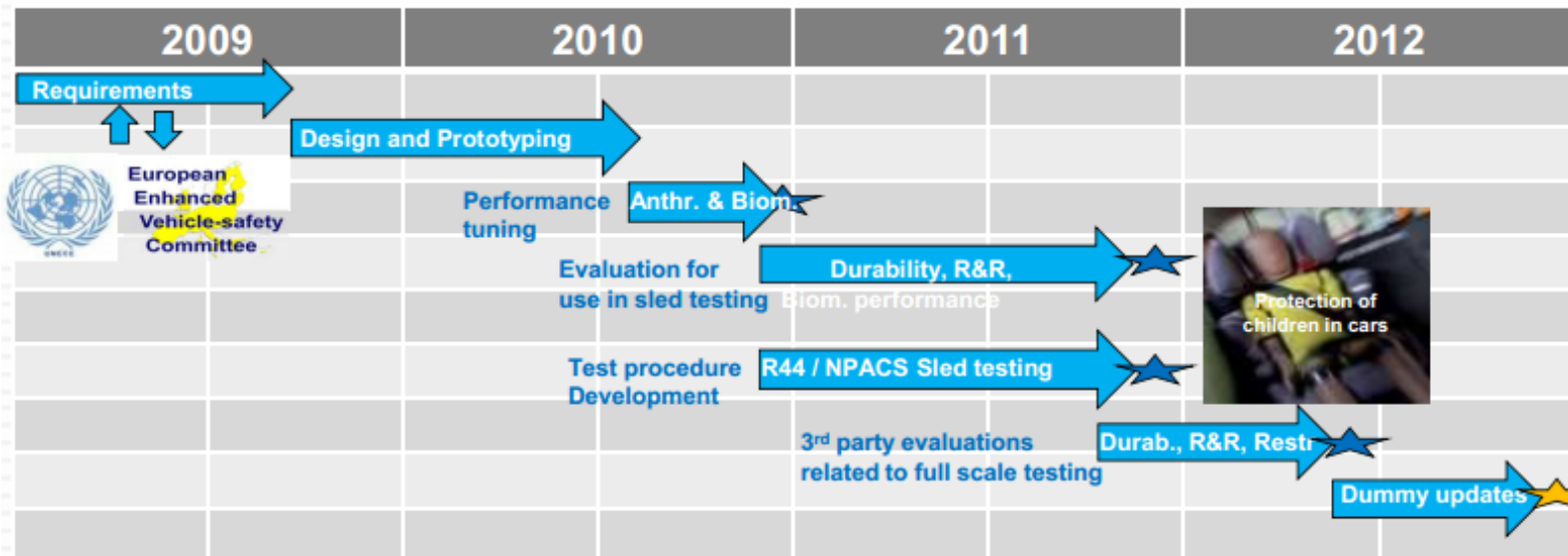


Q10 Hardware Status

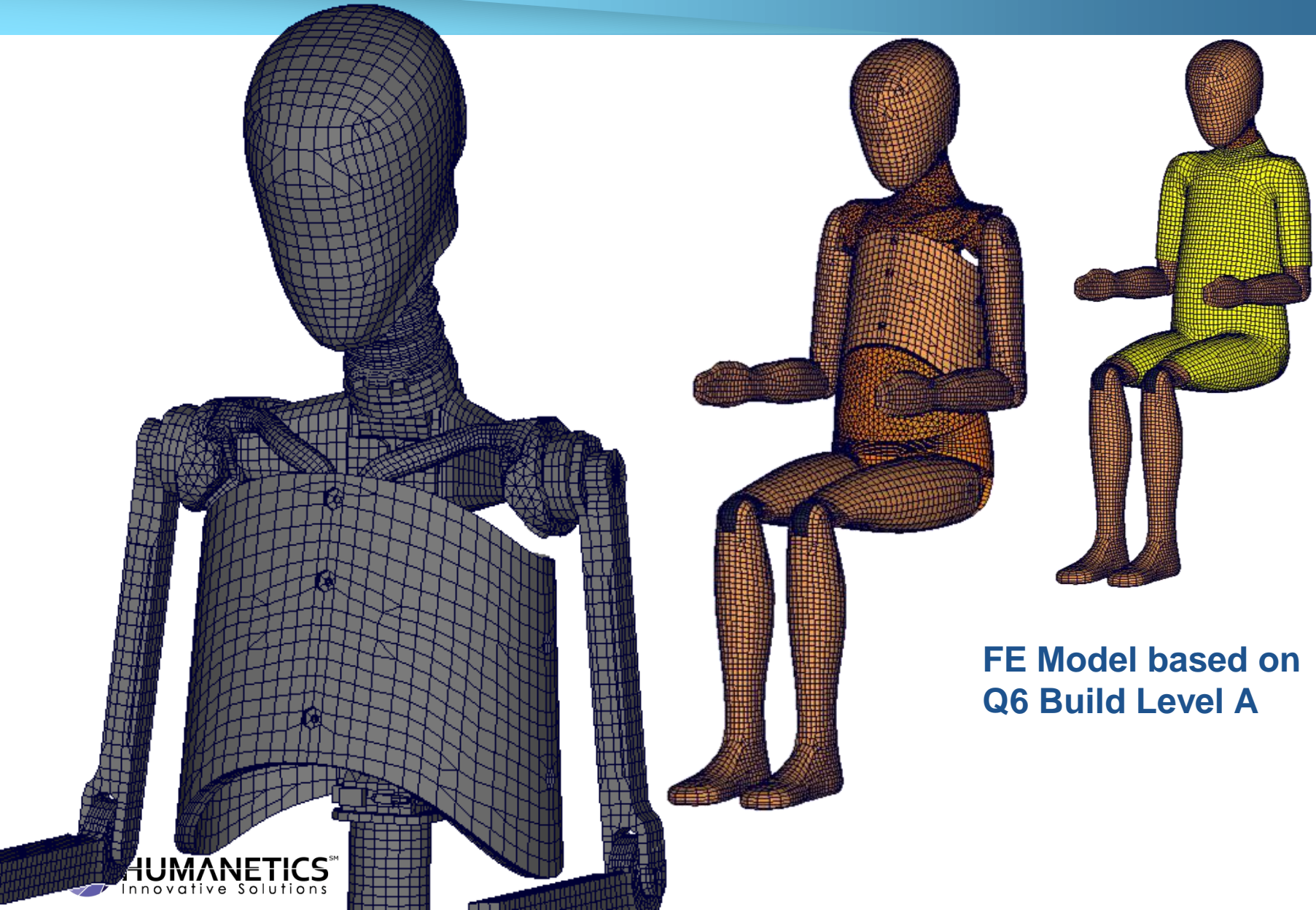


EPOCH Project Dissemination – Protection of Children in Cars Conference 2011

Development & Evaluation timeline

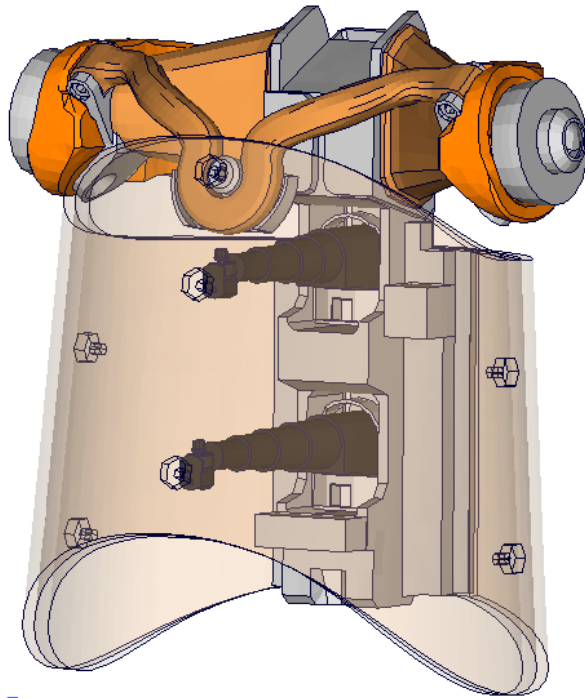


Q10 Dummy Mesh

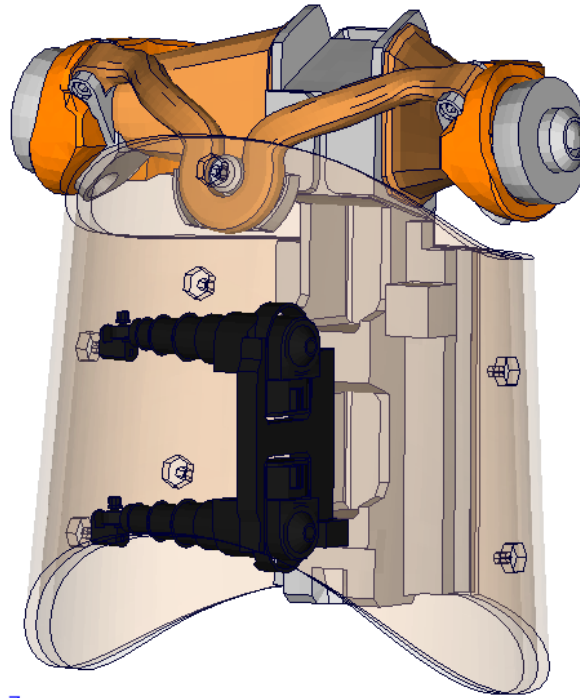


**FE Model based on
Q6 Build Level A**

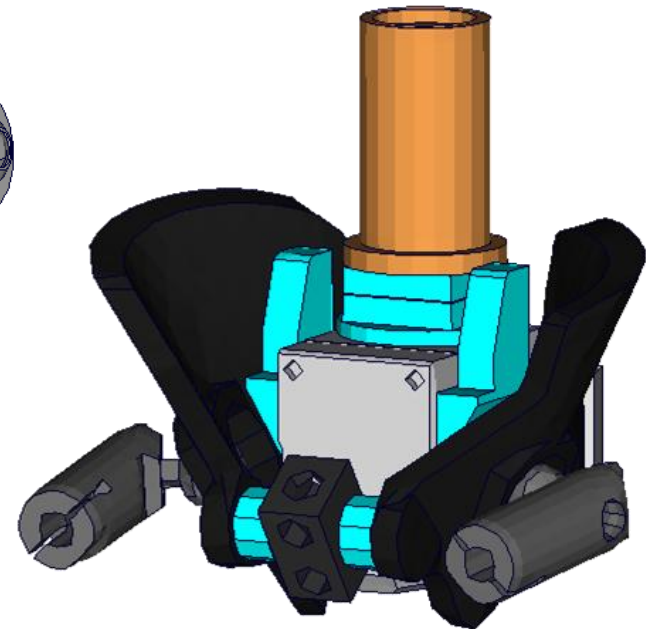
Q10 Dummy Mesh details



Q10 dummy chest with
Frontal IR-TRACC
mechanism



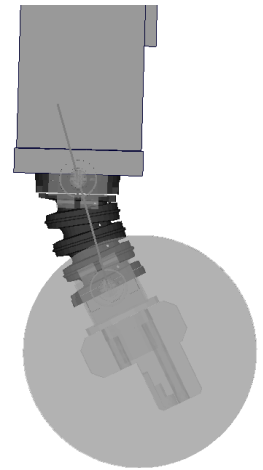
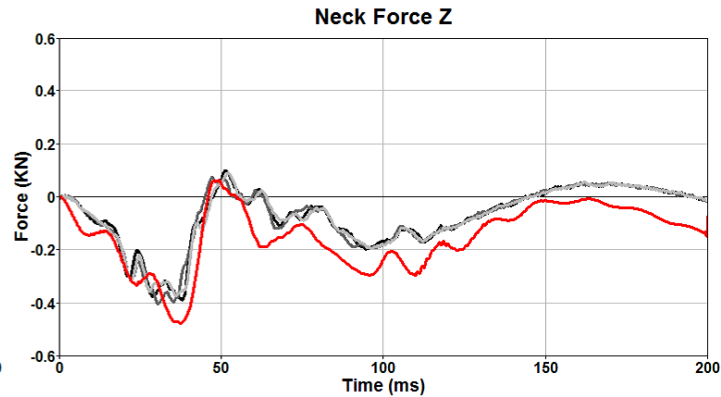
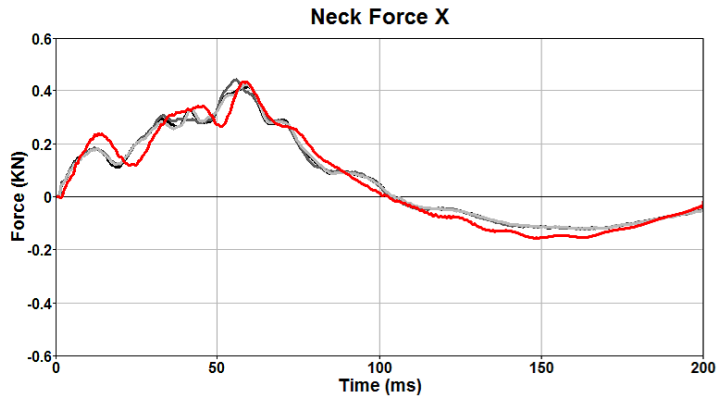
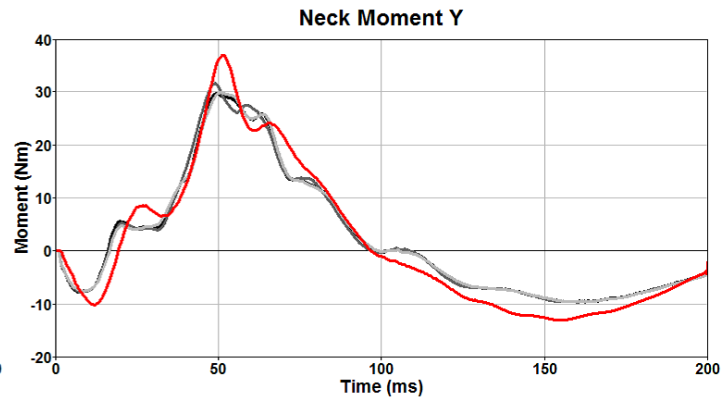
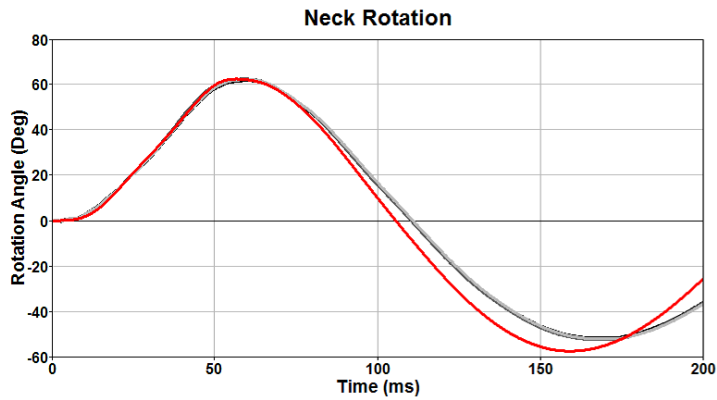
Q10 dummy chest with
Lateral IR-TRACC
mechanism



Q10 Dummy Pelvis -World
SID like construction

Q10 Neck Certification Test

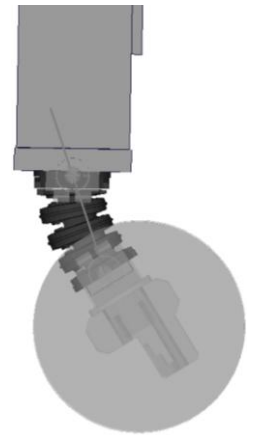
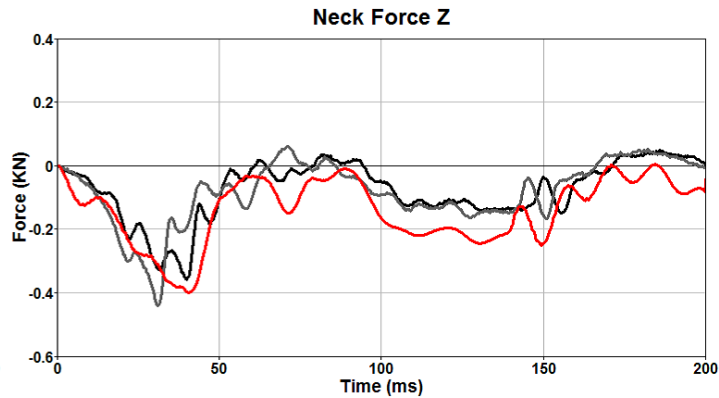
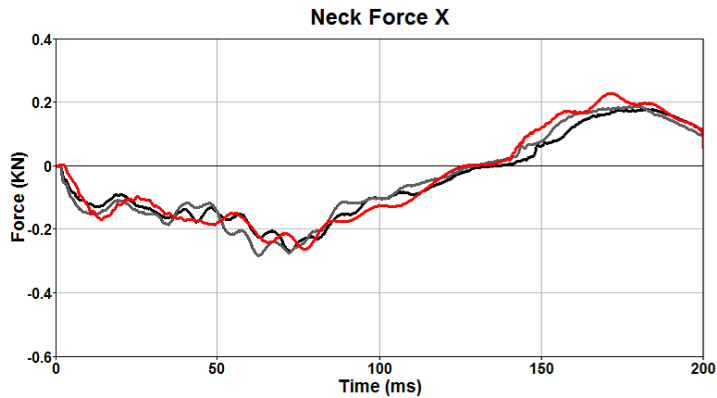
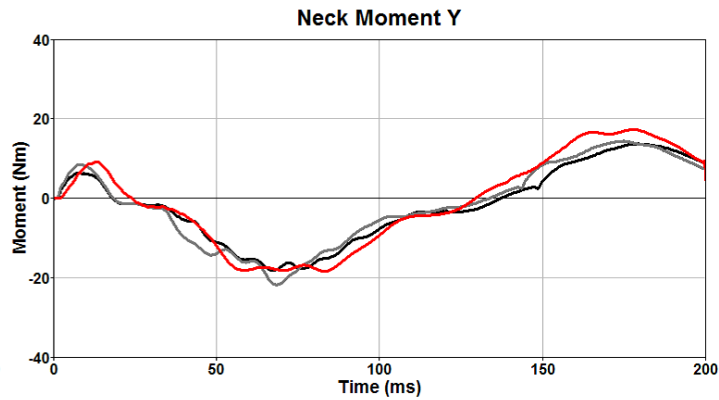
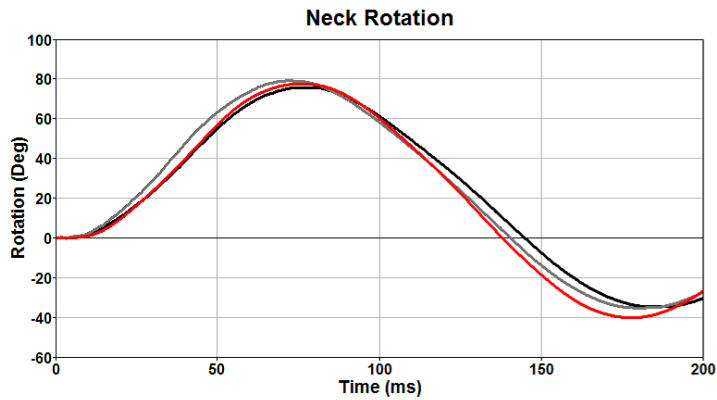
- **Flexion** Test - Frontal



— Test
— Test
— Test
— FEA v1.0

Q10 Neck Certification Test

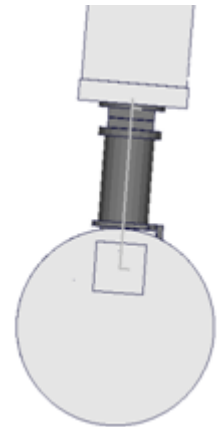
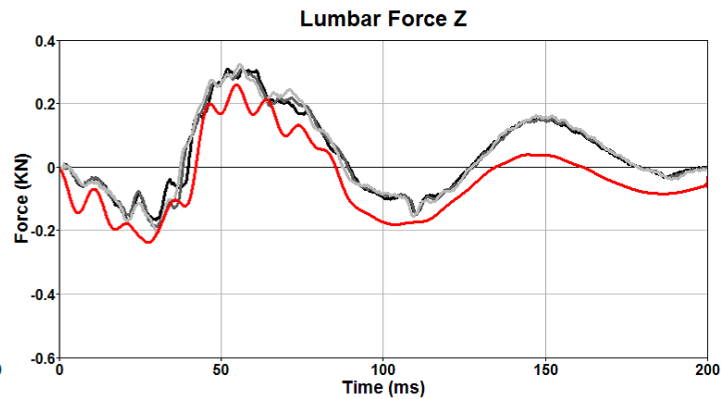
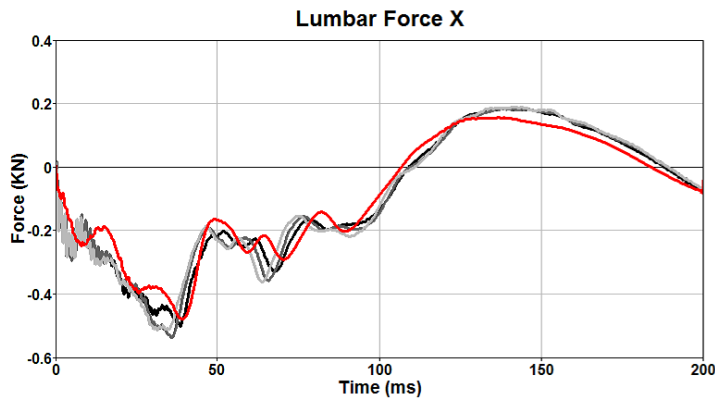
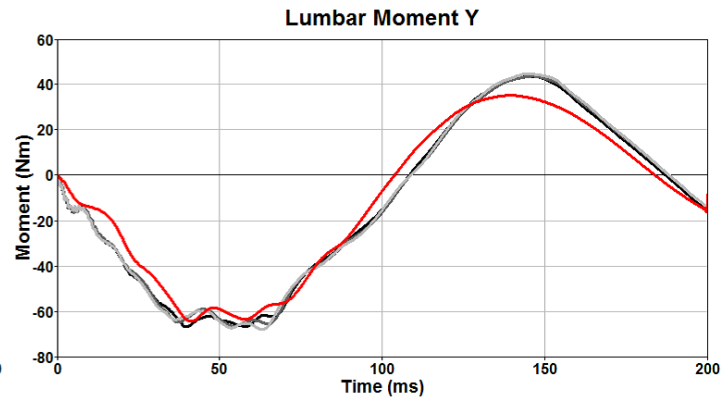
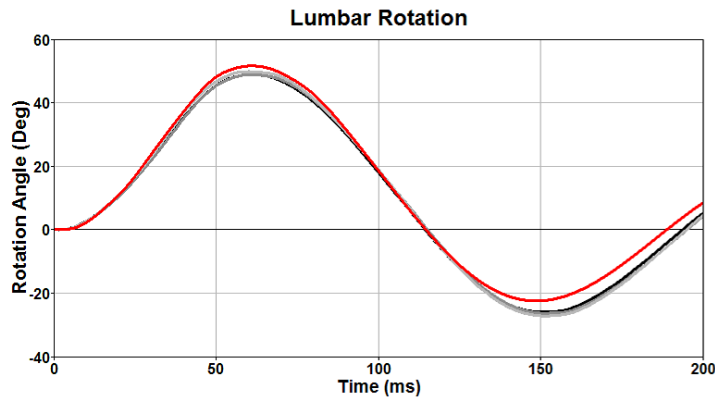
- **Extension** Test - Frontal



— Test
— Test
— FEA v1.0

Q10 Lumbar Spine Certification Test

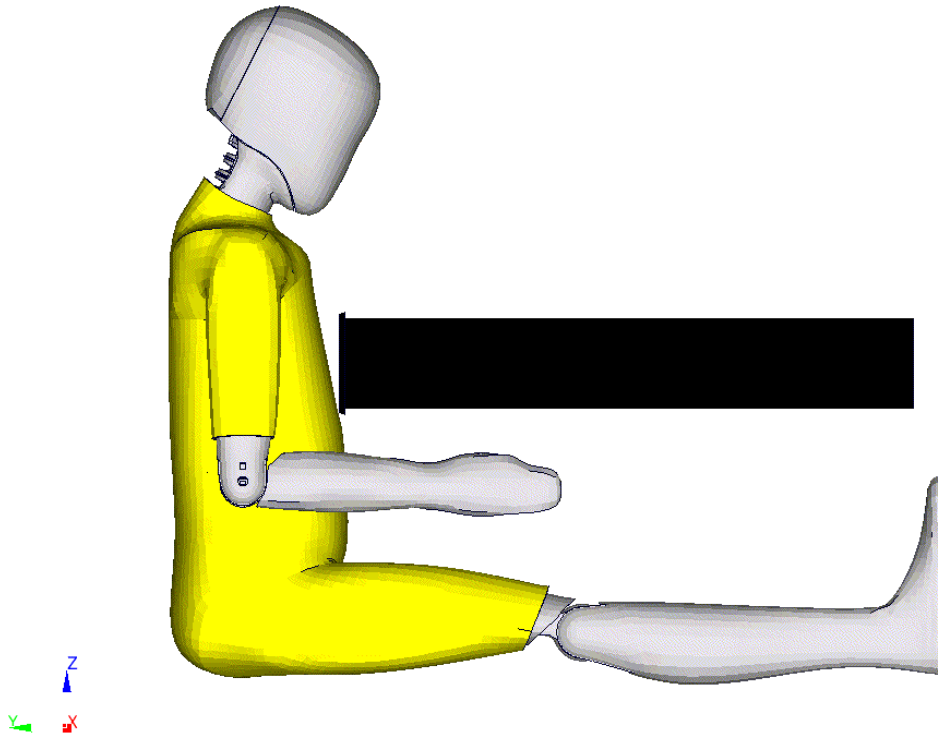
- Frontal**



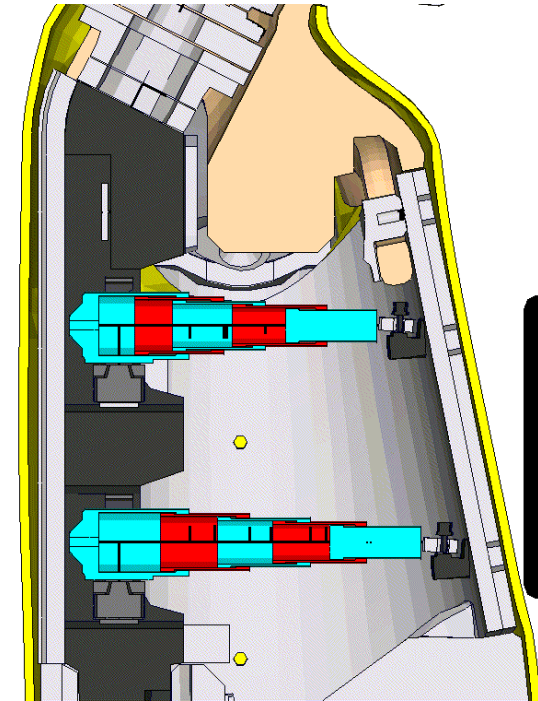
— Test
— Test
— Test
— FEA v1.0

Q10 Dummy Assemblies-IR-TRACC

- Furthermore, the functioning of this mechanism is tested in the full dummy thorax impact tests.

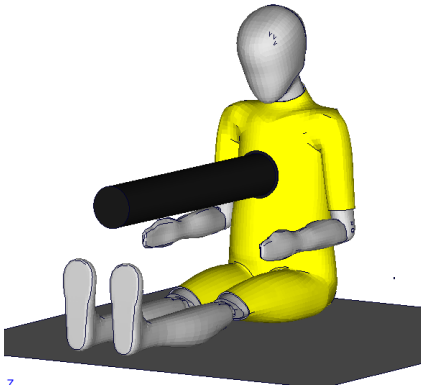


Q10 IR-TRACC-User defined view

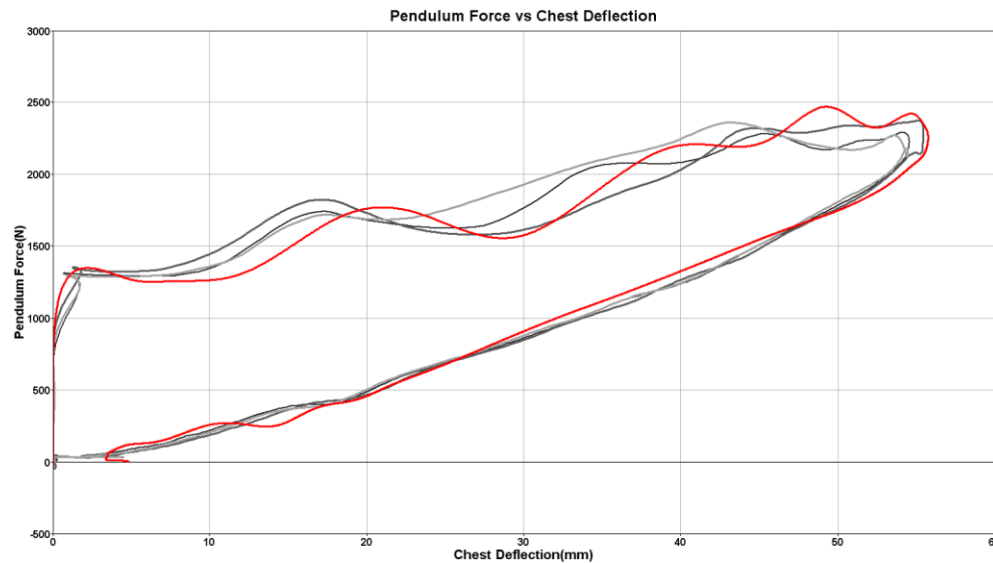
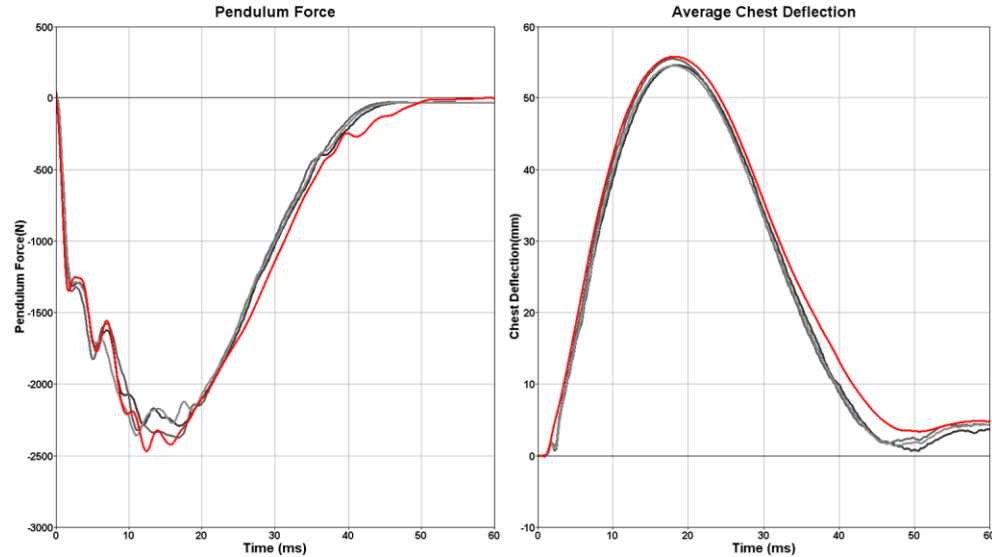


Q10 IR-TRACC-Left view cross-section added

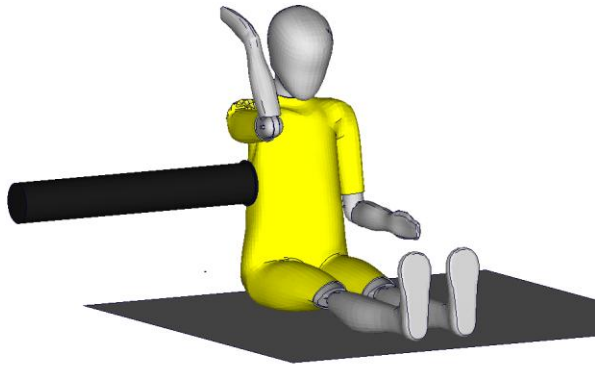
Q10 Frontal Impact **Thorax** Certification Test



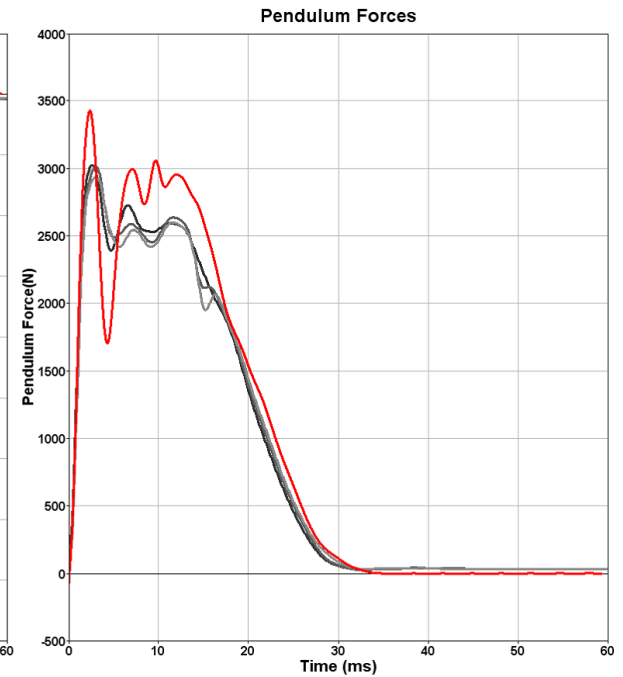
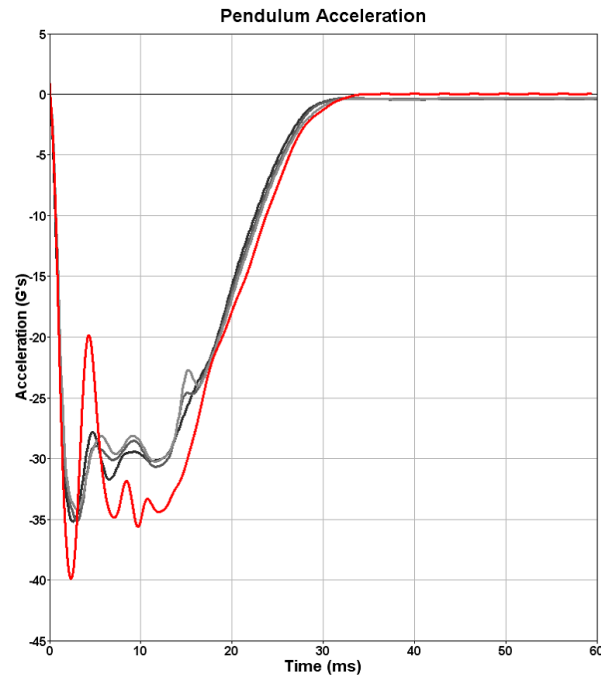
- Test - Frontal 6.71 m/s



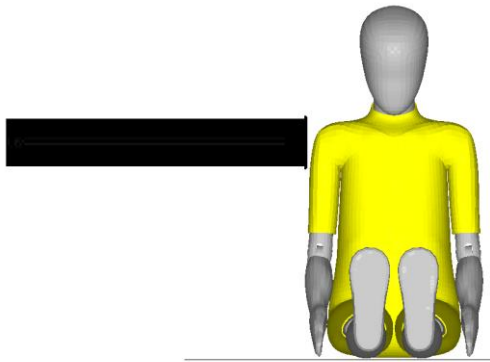
Q10 Lateral Impact **Thorax** Certification Test



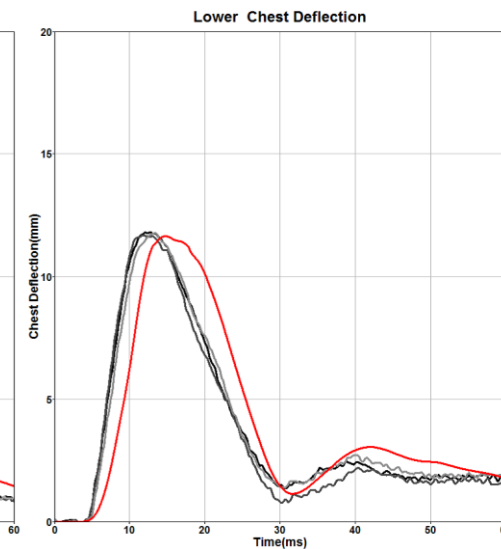
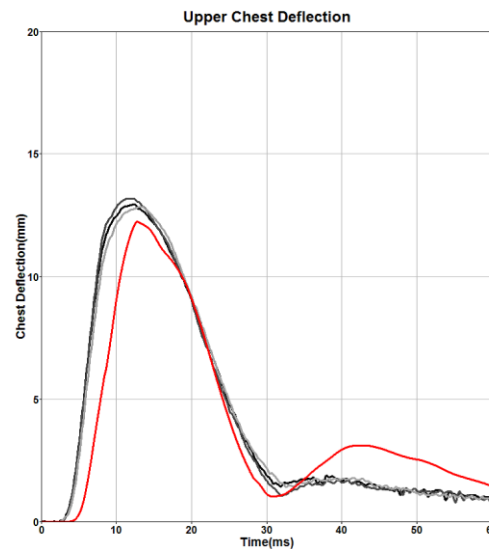
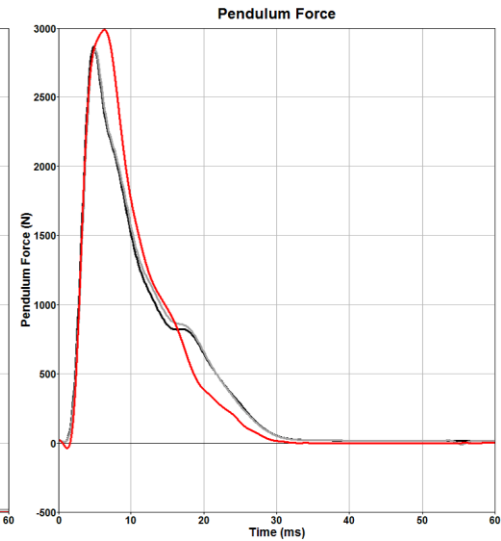
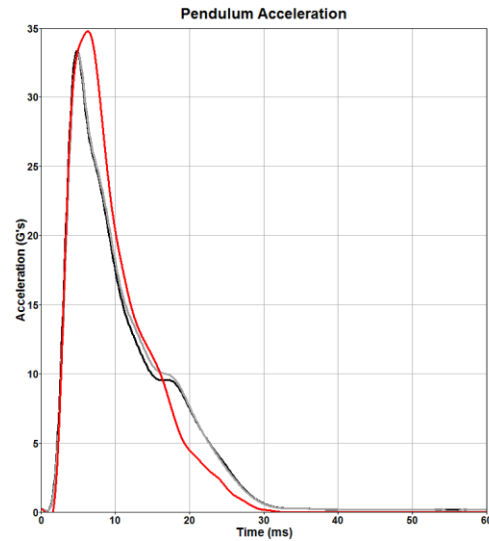
- Test - Lateral 6.71 m/s



Q10 Lateral Impact **Shoulder** Certification Test



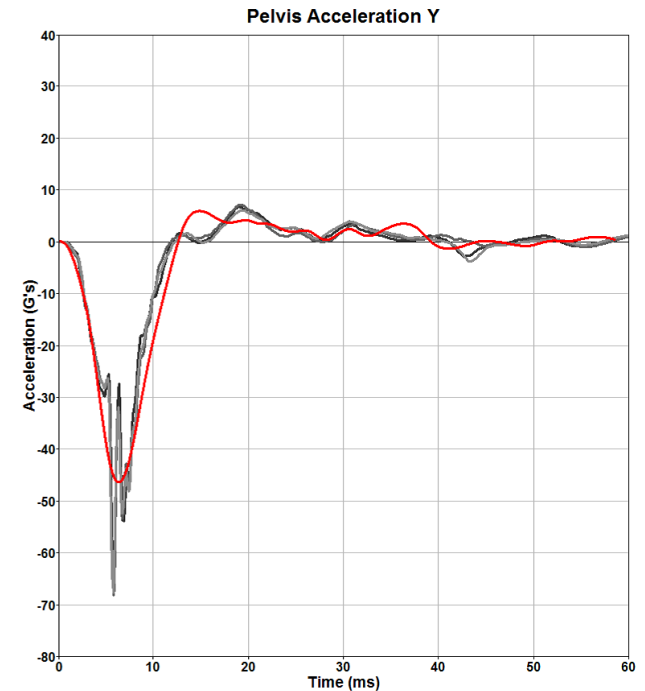
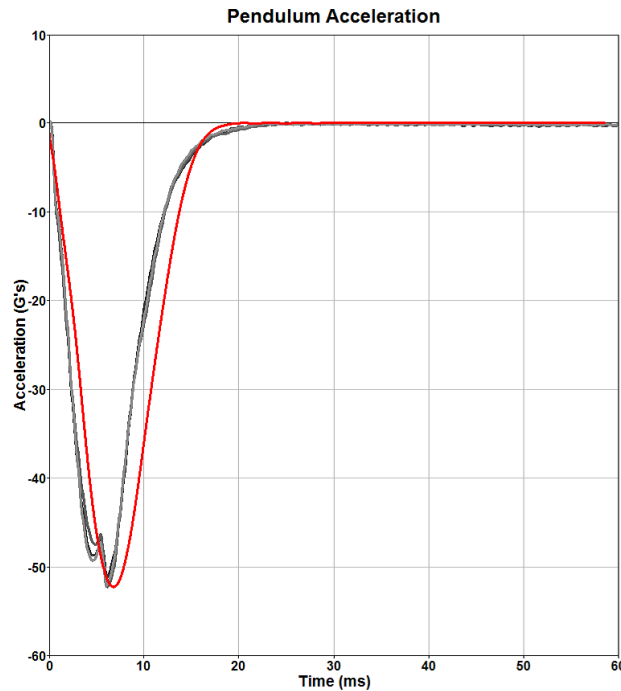
- Test - Lateral 4.5 m/s



Q10 Lateral Impact Pelvis Certification Test

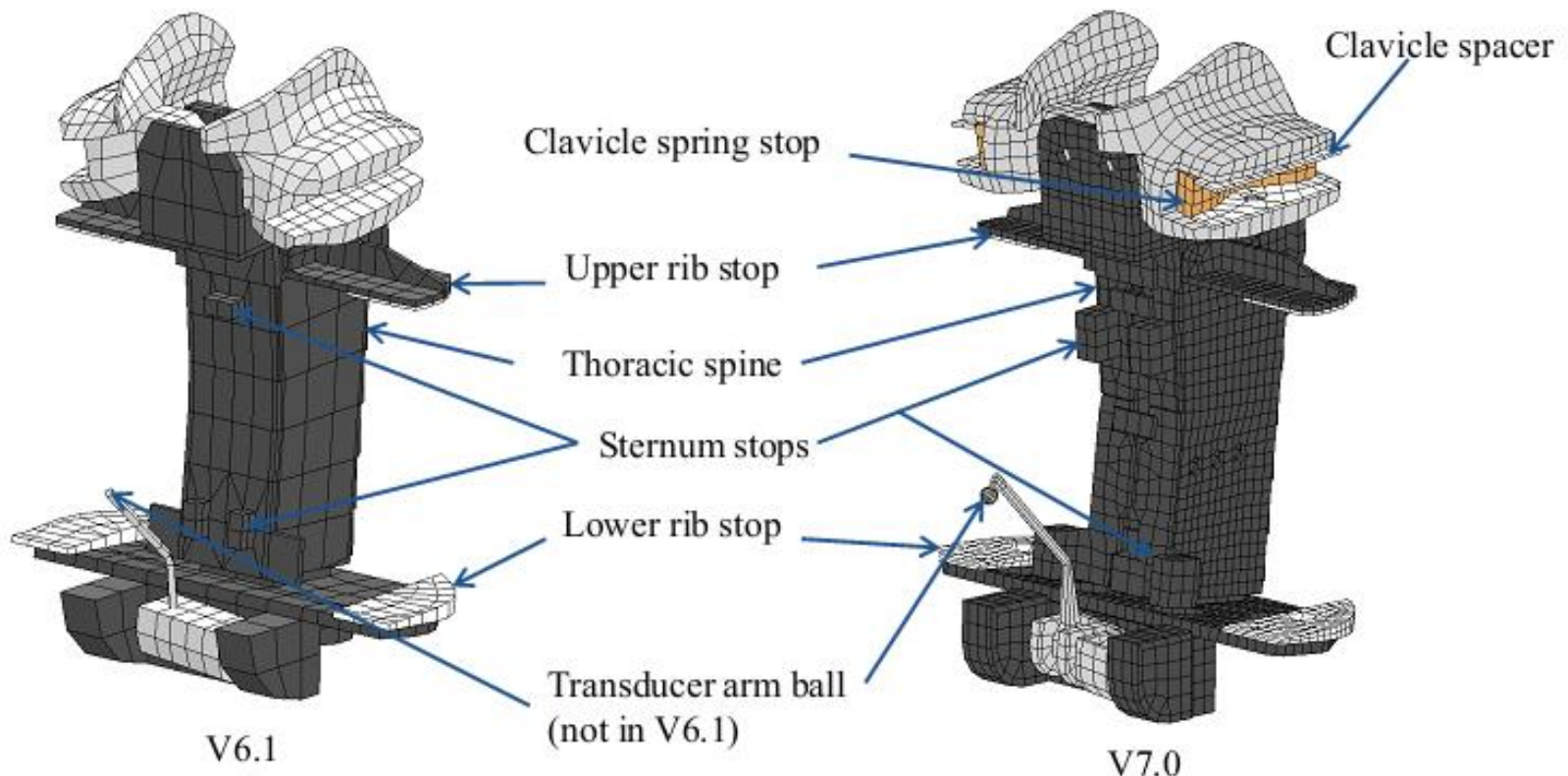


- Test - Lateral 4.5 m/s



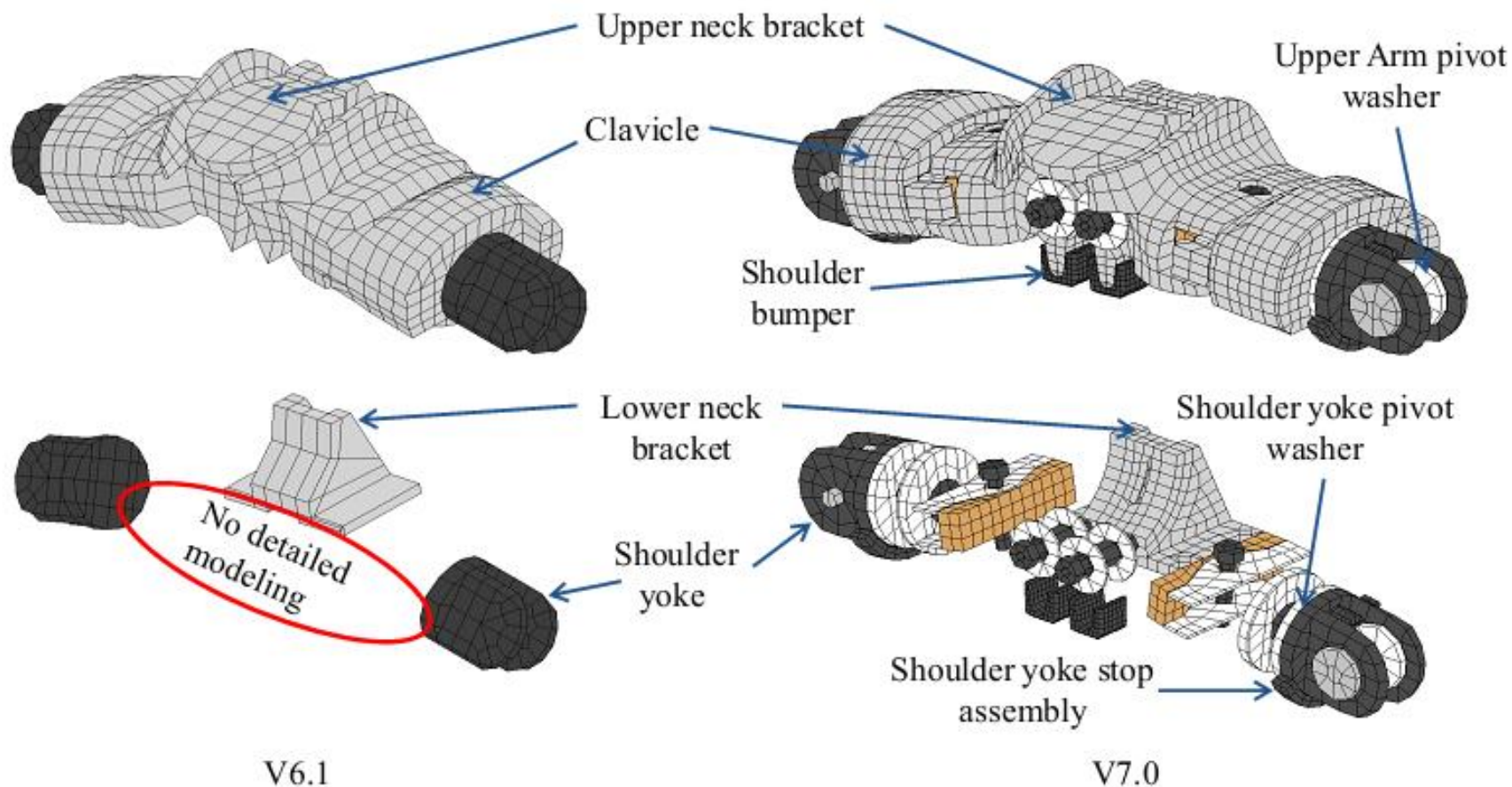
HII 5th Mesh and Geometry

- Thorax geometry updated and re-meshed to match physical measurement
- Chest deflection transducer geometry improved
- Inclusion of clavicle spring stop and clavicle spacers
- Improved representation of the sternum stops



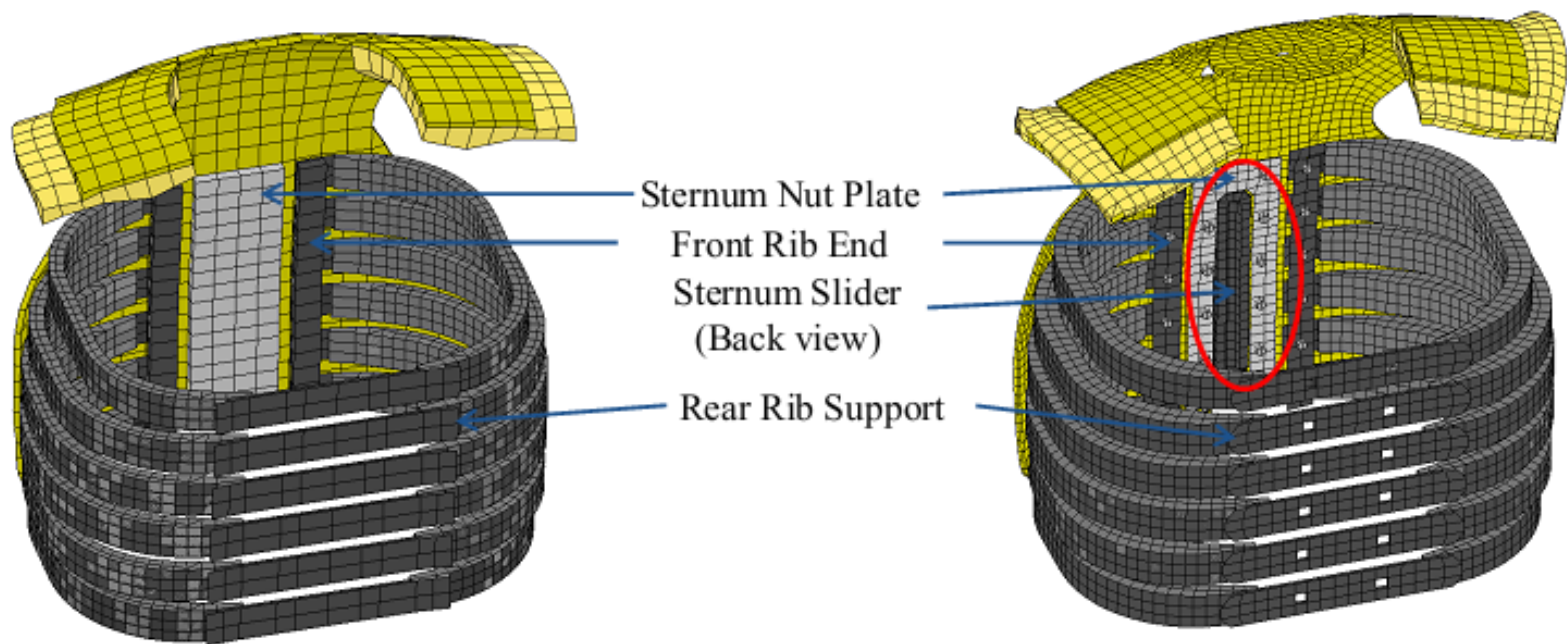
HII 5th Mesh and Geometry

- Detailed modeling of Shoulder assembly



HIII 5th Mesh and Geometry

- Detailed modeling and re-meshing of the ribcage assembly
- In the sternum slider geometry, the opening (red ellipse) to include the transducer arm ball movement during torso drop and PDB test is captured which is a realistic representation of the physical assembly.



V6.1

V7.0

HIII 5th v7.0 Performance

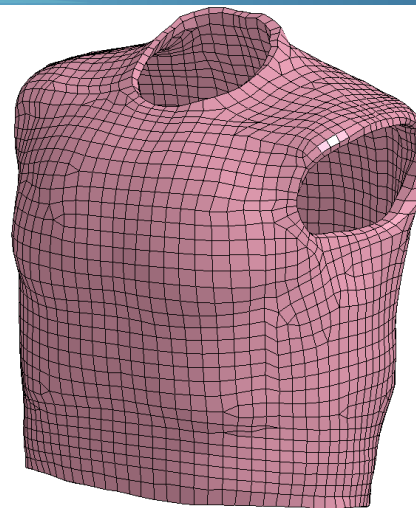
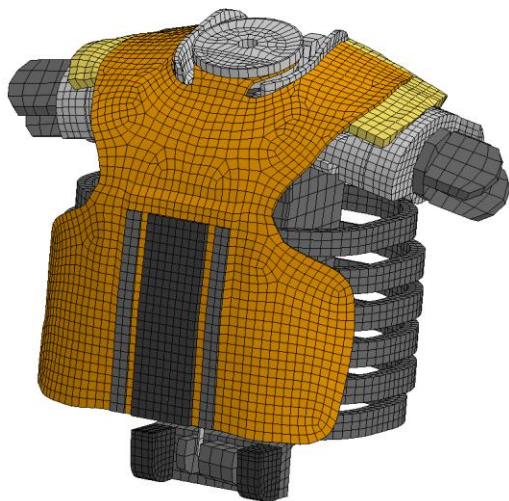


Rating:

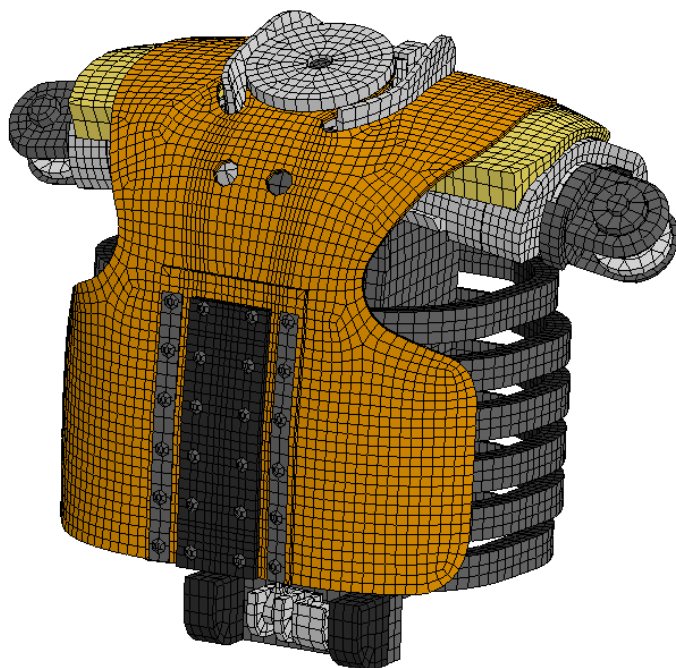
No.	Description	Rating		Weight
		V6.1	V7.0	
1	Restraint Signals	0.931	0.958	0.5
2	ATD Signals	0.778	0.865	0.5
Total Rating of Load Case		0.855	0.911	1.0

HII50th Mesh and Geometry

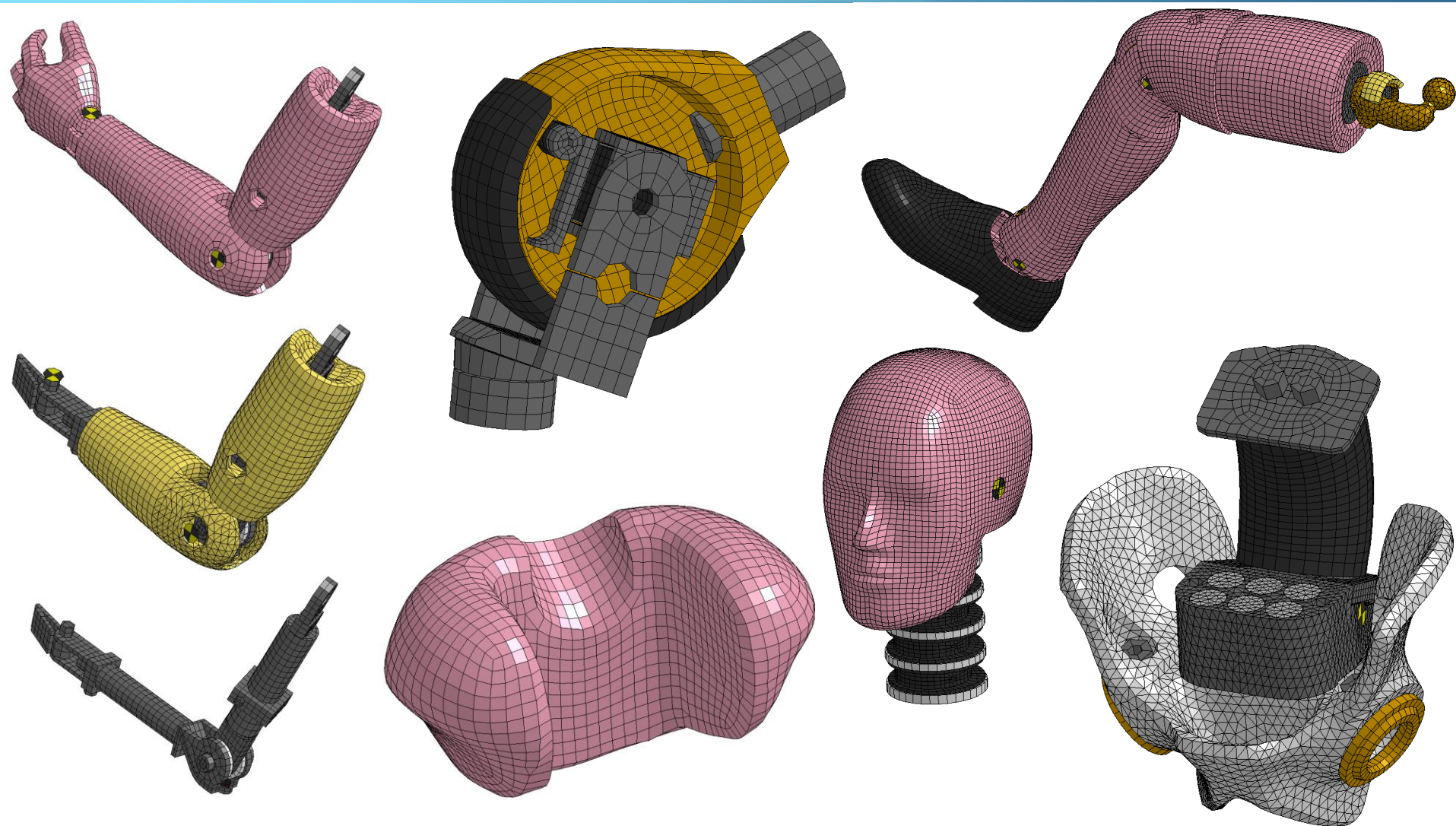
V7.1



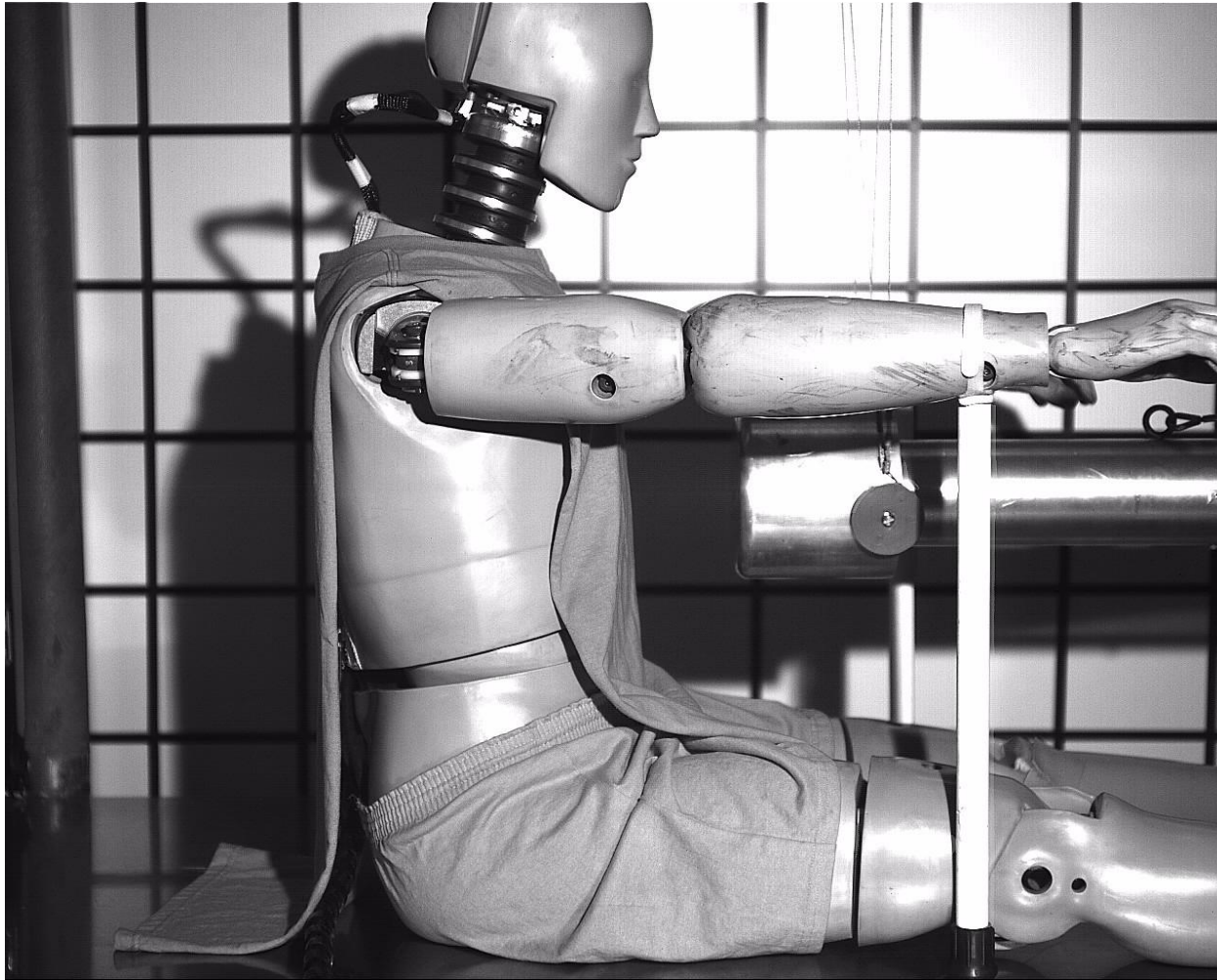
V8.0



HII50th Mesh and Geometry

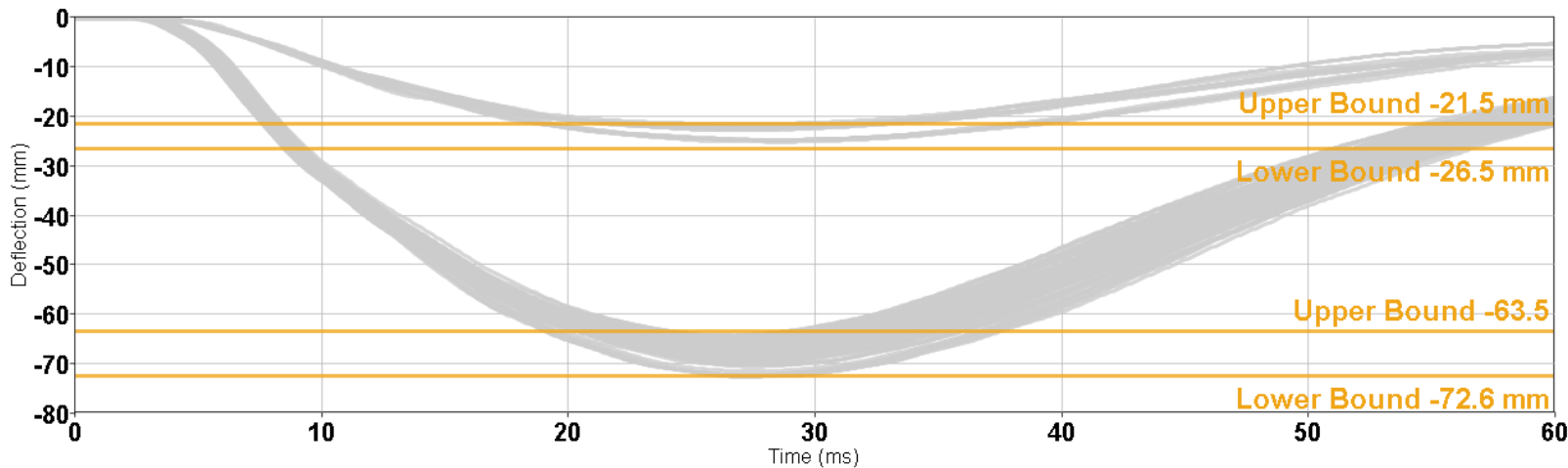


HII50th Thorax Certification

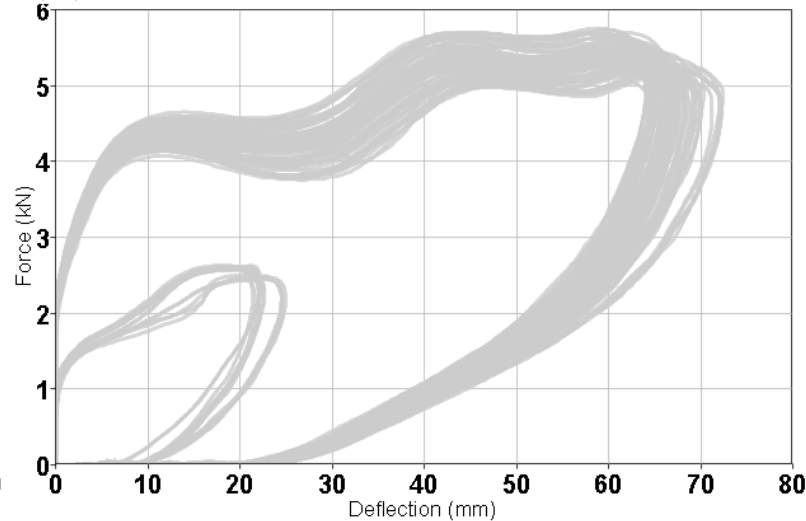
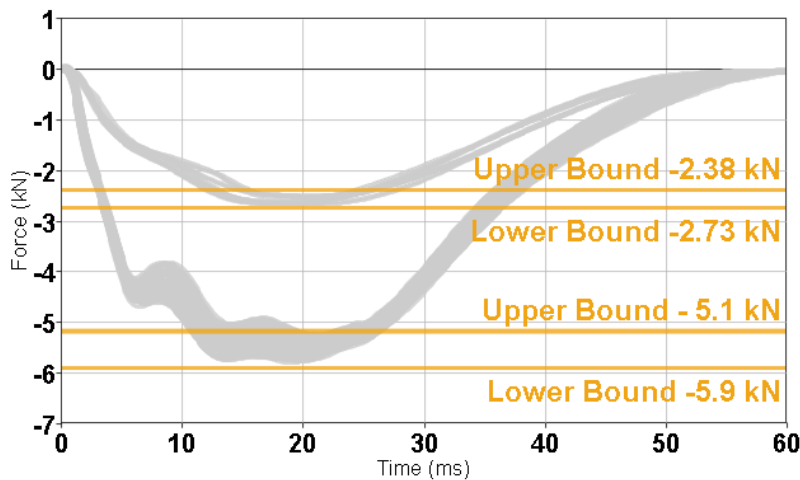


HII50th Thorax Certification

Chest Deflection

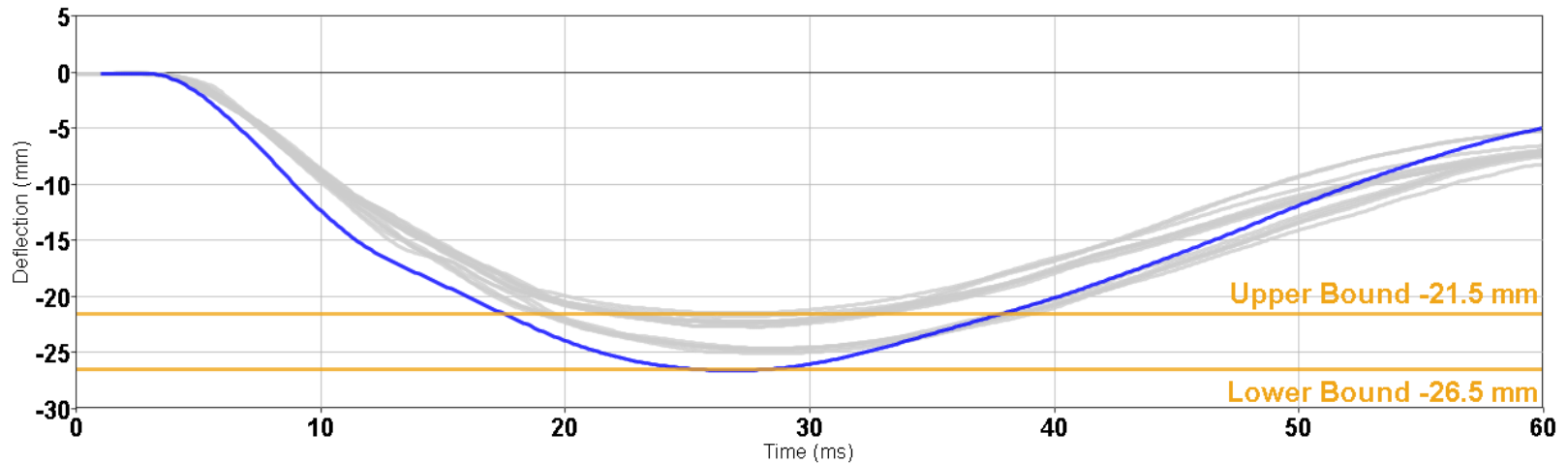


Pendulum Force

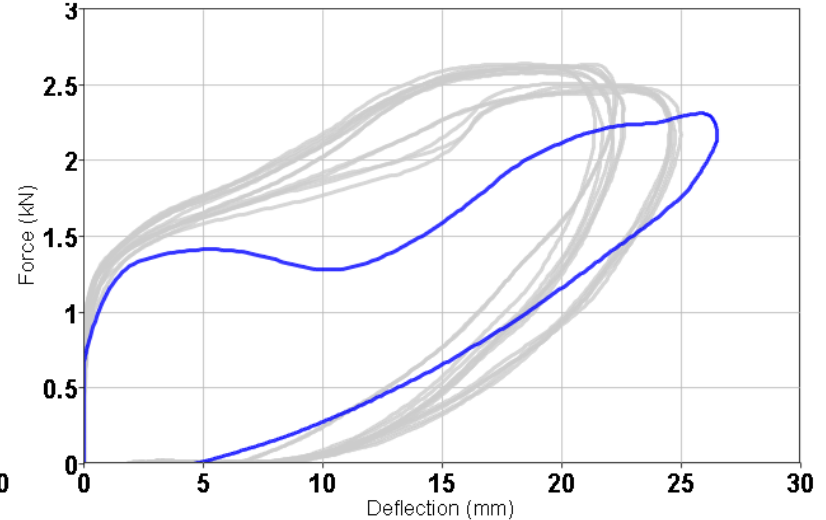
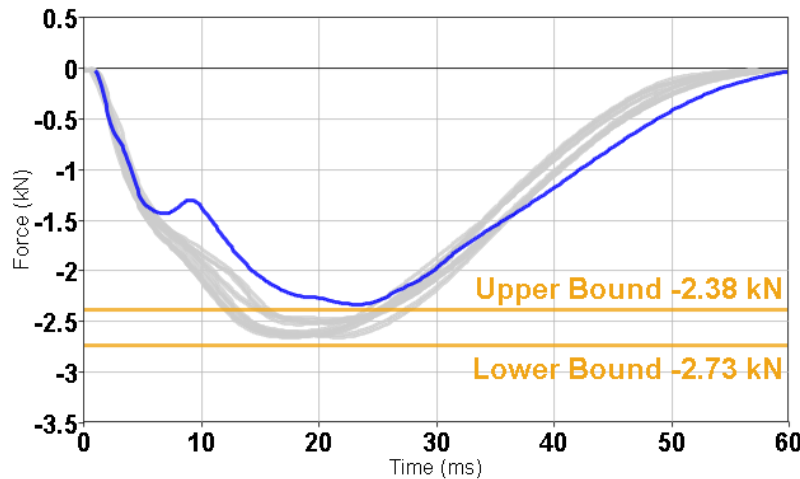


Thorax Pendulum v 7.1 3m/sec

Chest Deflection

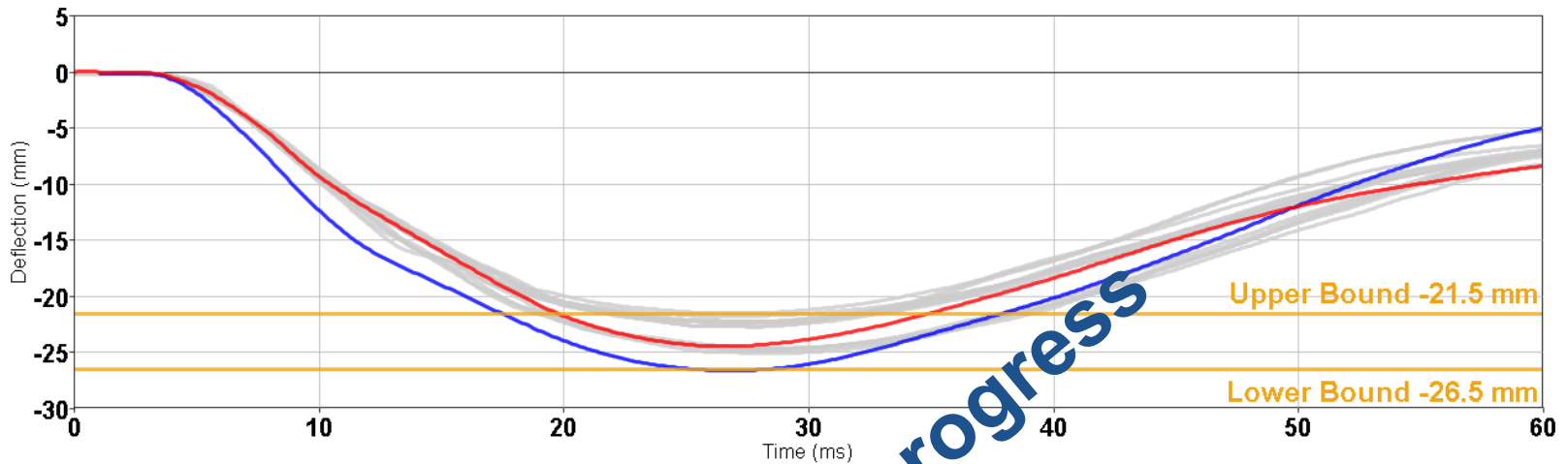


Pendulum Force

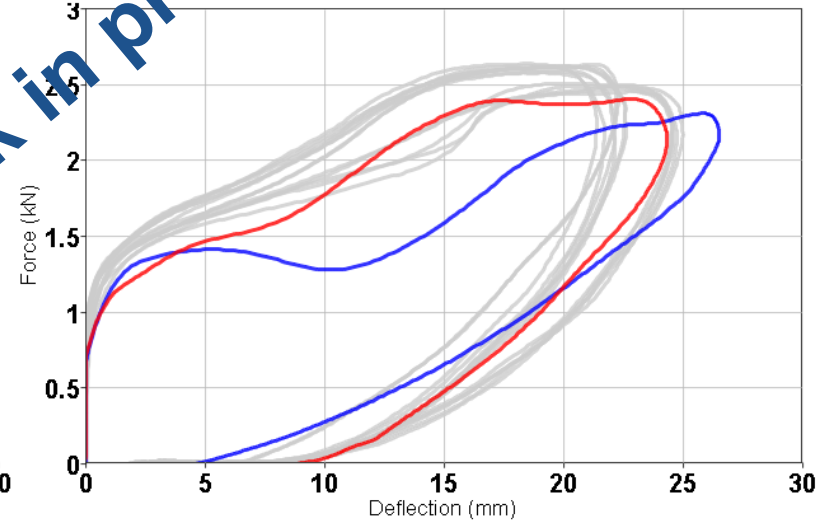
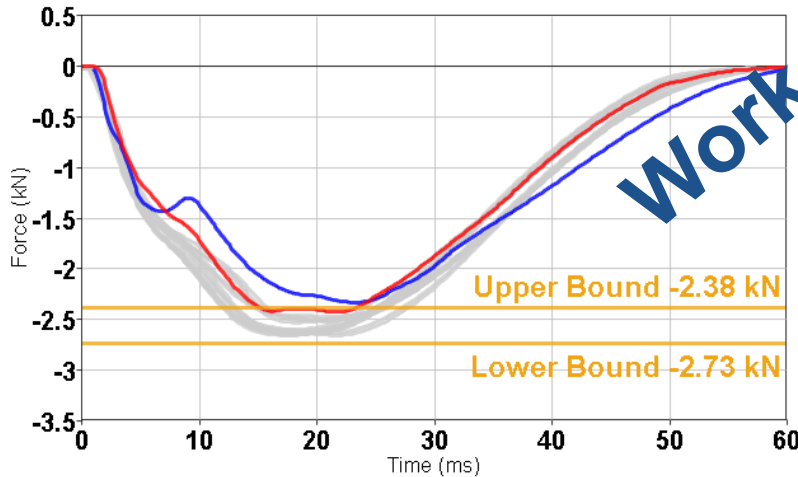


Thorax Pendulum v8.0 3m/sec

Chest Deflection

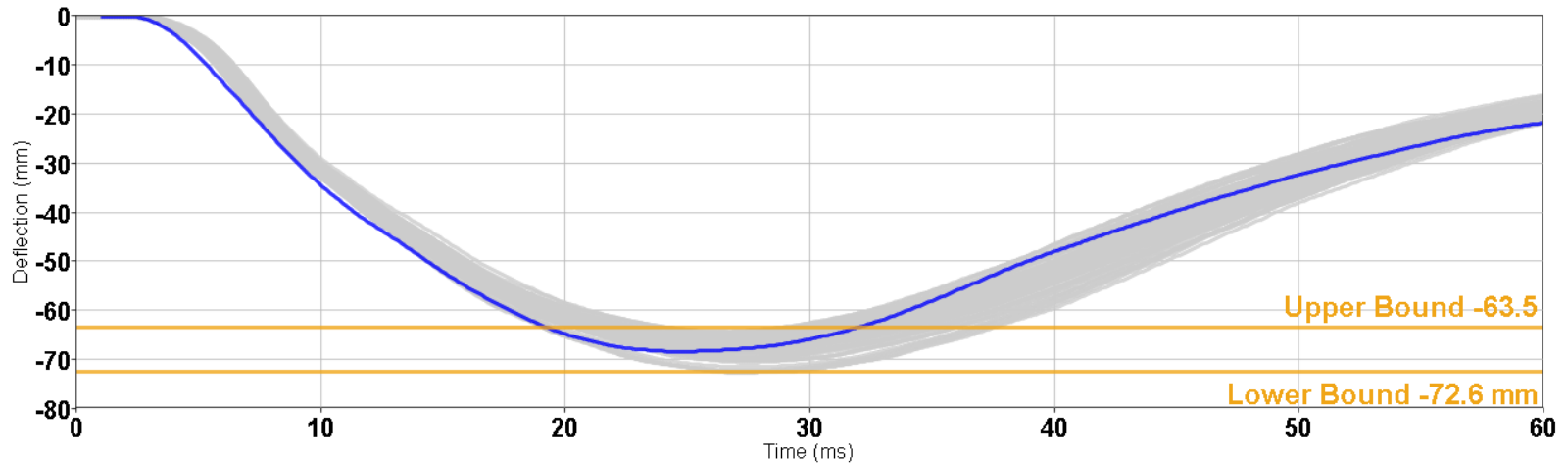


Pendulum Force

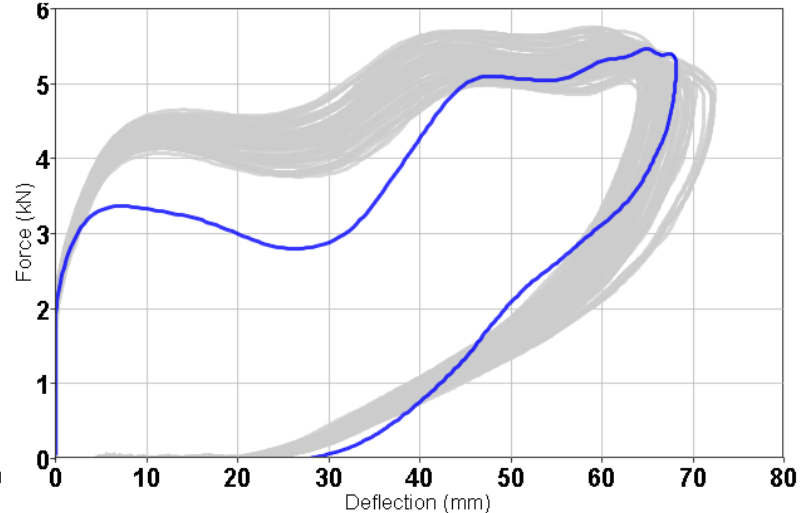
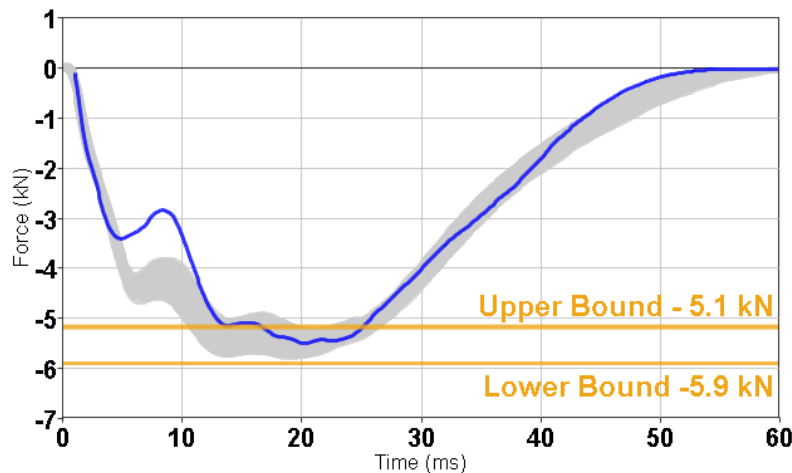


Thorax Pendulum v7.1 6.7m/sec

Chest Deflection

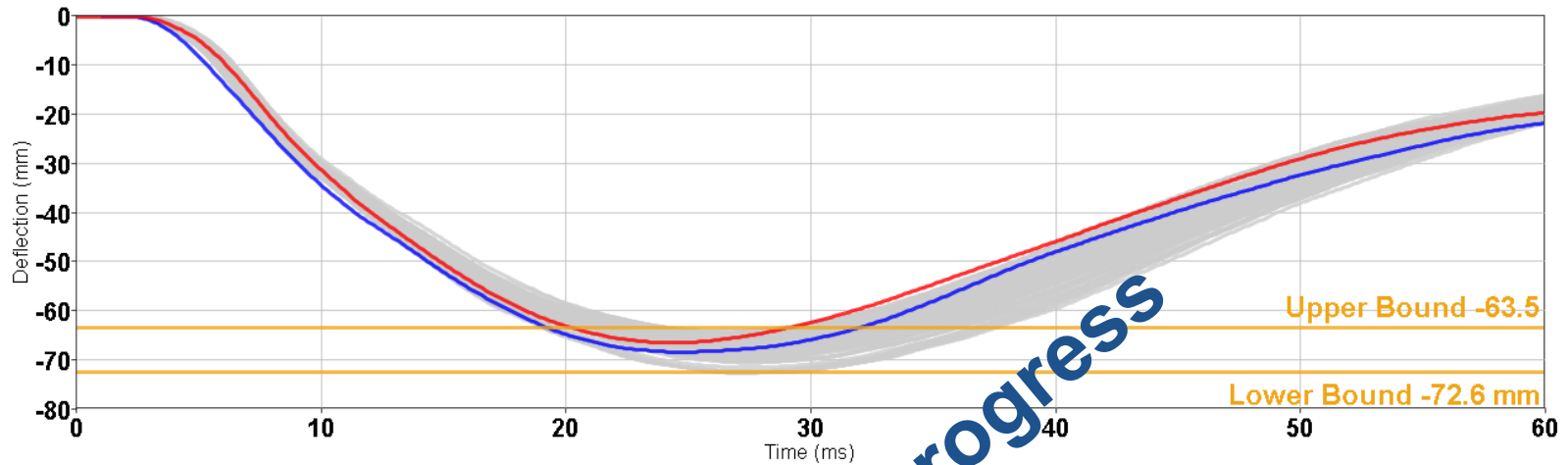


Pendulum Force

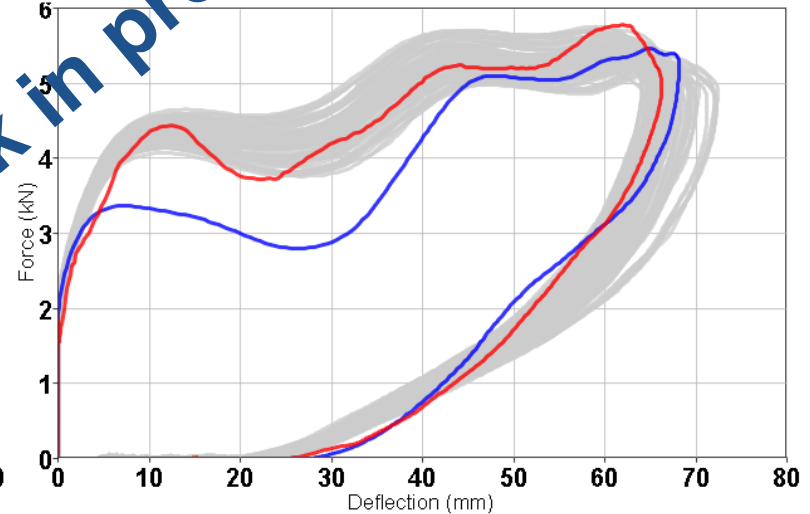
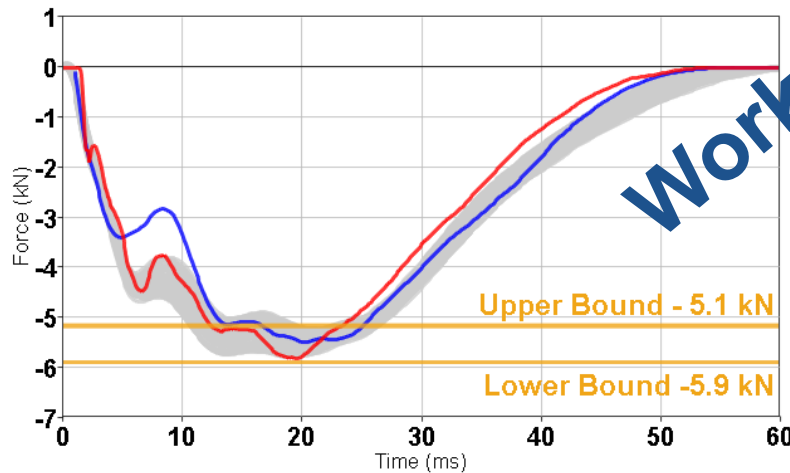


Thorax Pendulum V8.0 6.7m/sec

Chest Deflection



Pendulum Force



Work in progress

Summary

- Q6 FE model is available and being further developed within OEM consortium project
- First version of Q10 prototype is available now
- new HIII 5th model available since March 2012
- new HIII 50th being finalized for release

**Thanks
for your attention !**

