ATD MODELS

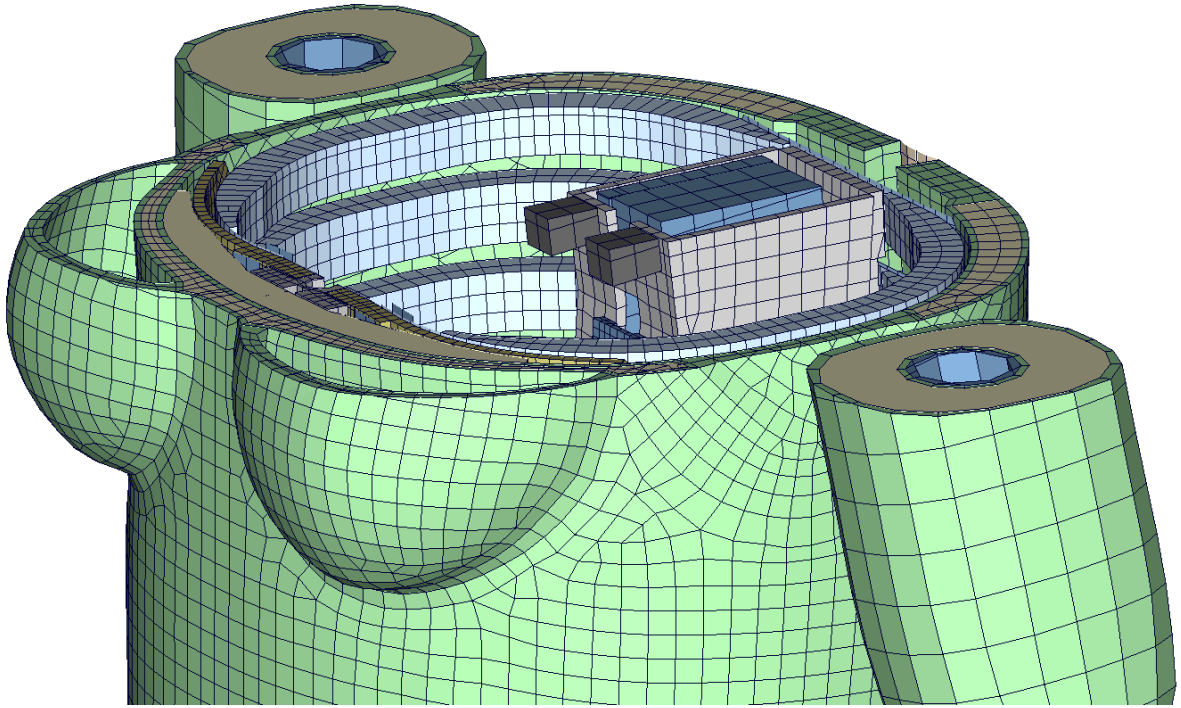
FE – Dummy Solutions

Prinzipielle Analyse des Jackenaufbaus des Hybrid-III-5% am Beispiel des ATD-H305

Contents

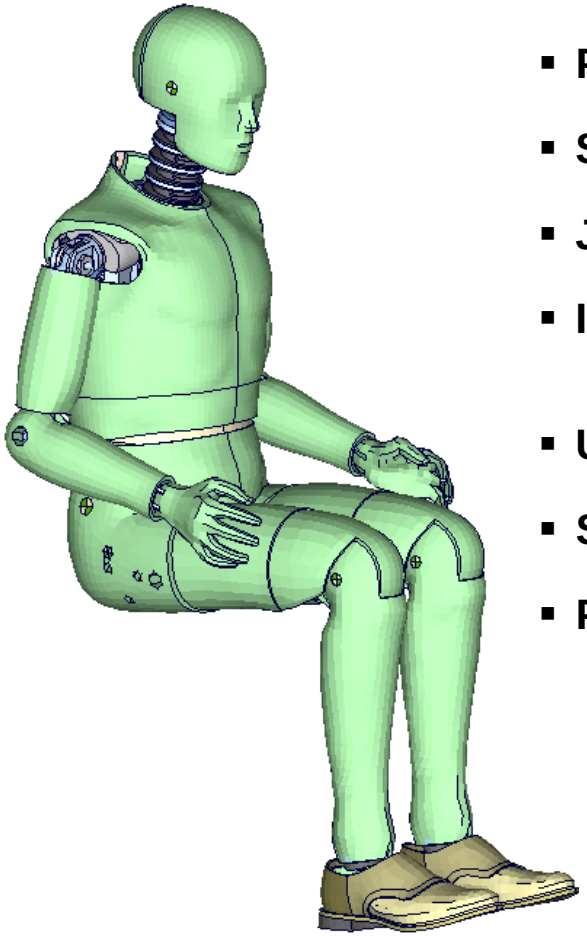
Goal: analysing impact loads on jacket deviations

- ATD-H305
  - Modelling techniques
  - Design characteristics
- Certification test: Chest deflection
- Computer tomography
  - Technology for analysing
  - Jacket deviation from normal conditions
- Results and discussion
  - Jacket configuration
- Summary, further steps and conclusion



ATD-H305

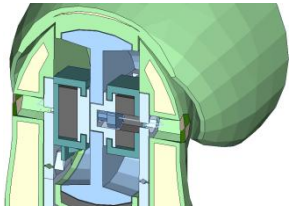
Modelling techniques similar to ATD-H350

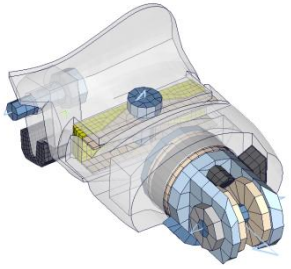


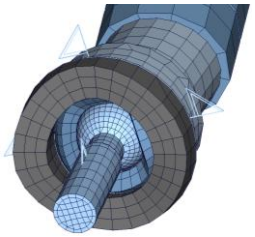
Modelling

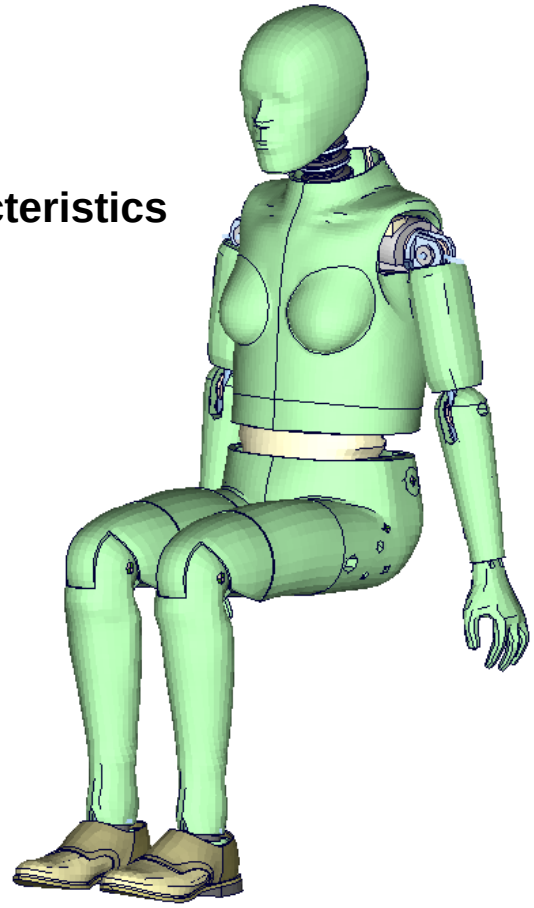
- Prestressed parts in chest and joint bumpers
- Skeleton made deformable in relevant parts
- Joint stiffness/damping by using material characteristics
- Initial stiffness of mechanical connections

- Usability
- Same Numbering scheme
- Positioning, Scripting, Postprocessing







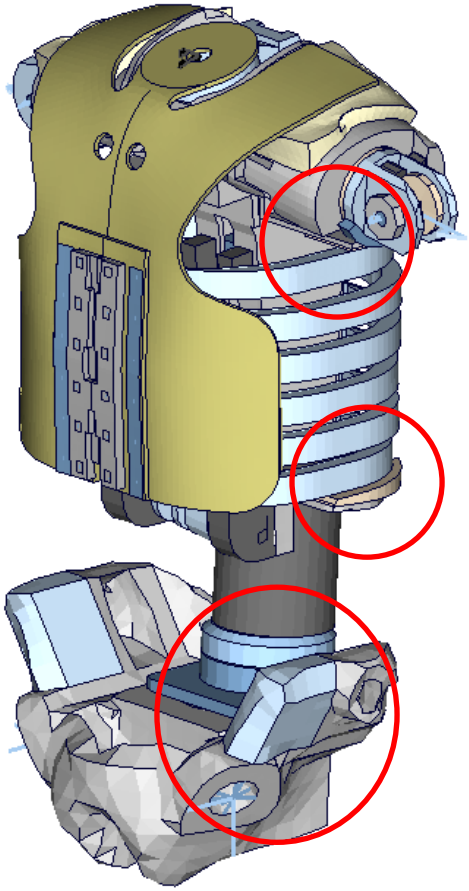


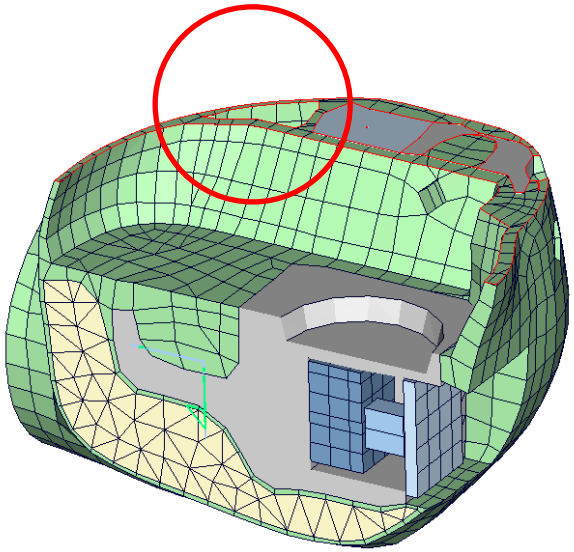
ATD-H305

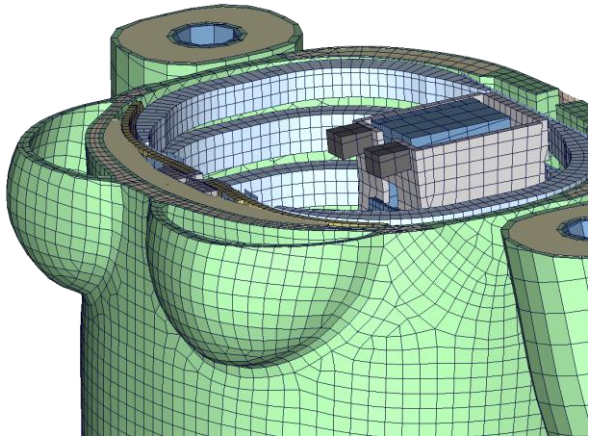
Differences to ATD-H350

In Addition to the anthropometric scaling

- **Different Thorax**
  - **Rib guides**
  - **Breasts**
- **Different Pelvis**
  - **Iliac load cell**
  - **Cavity**



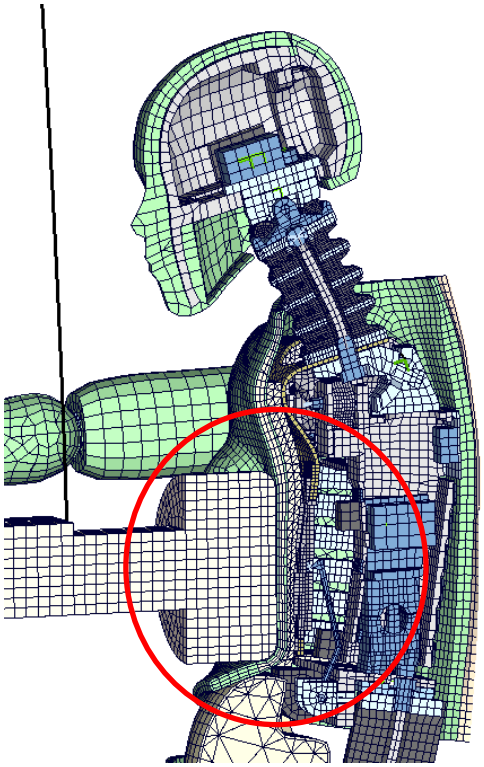


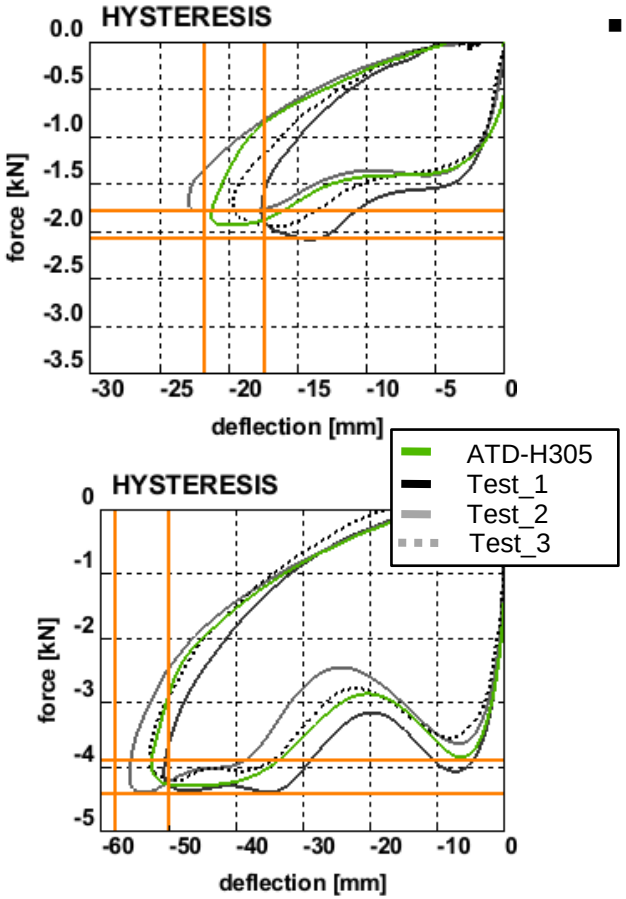


ATD-H305

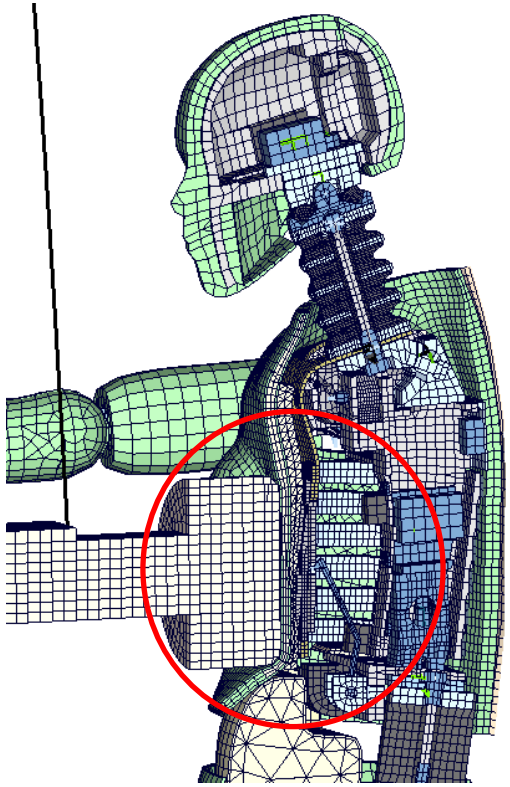
Chest - Loading conditions and certification of the dummy

- **Thorax test 6.71 m/s**
  E ~ 315 Joule



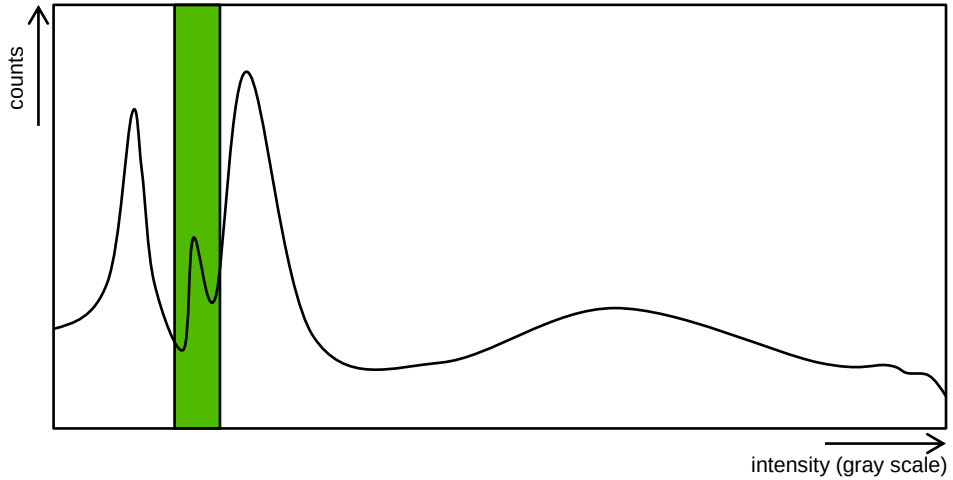


- **Thorax test 3.00m/s**
  E ~ 63 Joule

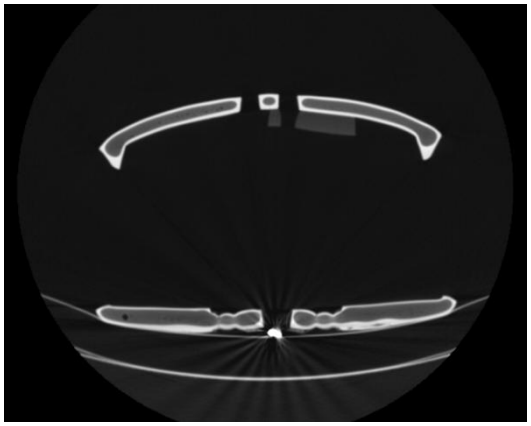


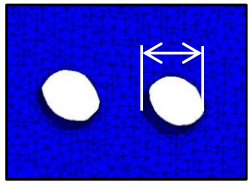
Computer tomography

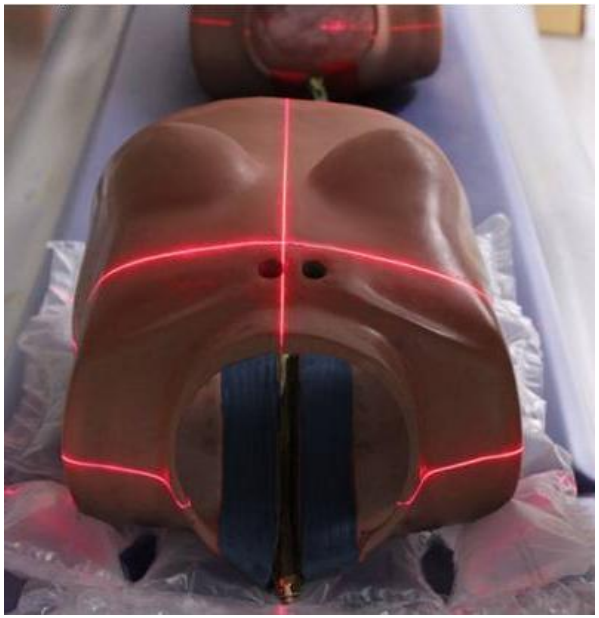
Technology for analysing



- Extraction of two densities out of original scan data
  - Vinyl
  - All other dummy materials
- Calibration by comparing distinctive thicknesses, lengths and distances measured on hardware
- Generation of surfaces (polygons) for the different volumes

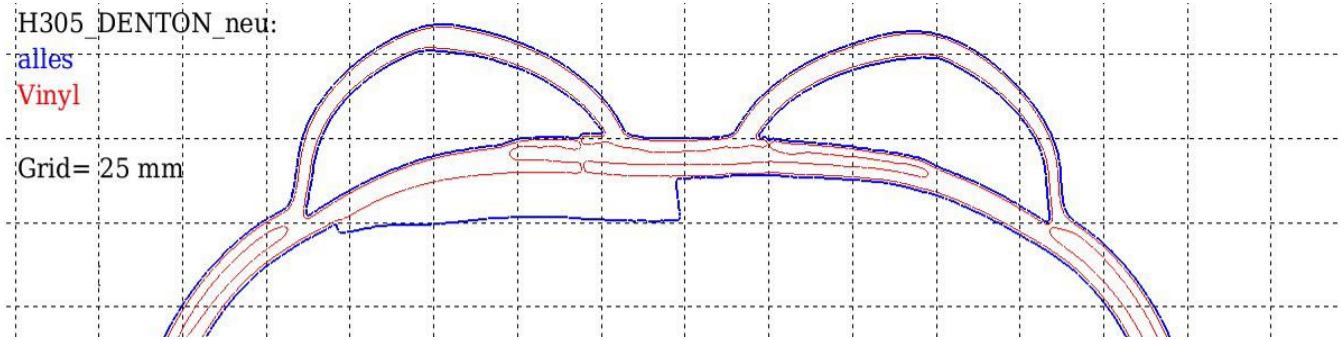


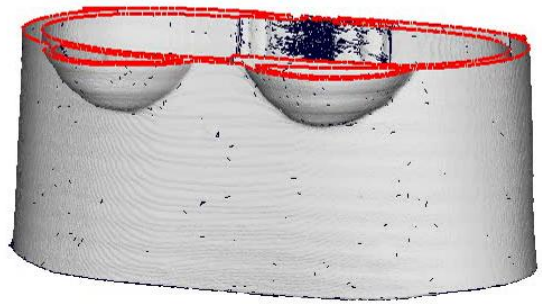




Computer tomography

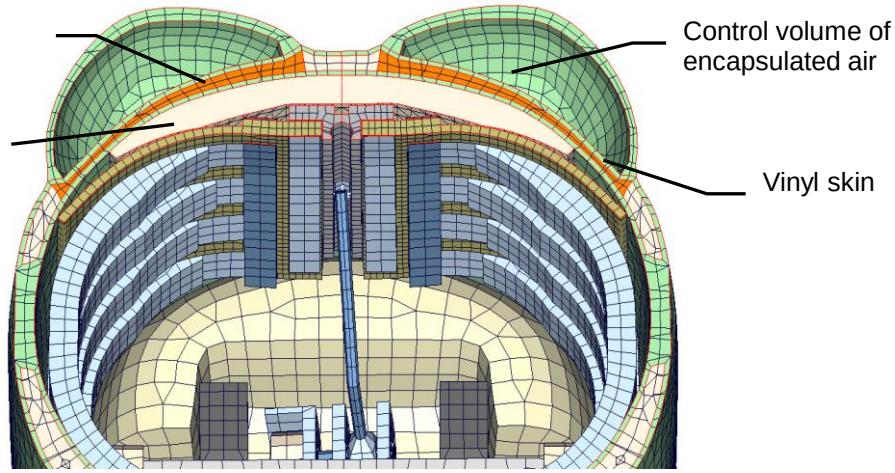
Jacket - analysis





Different models of ATD-H305 jacket set-ups to test:

a)	ATD-H305 jacket without changes	„original“
b)	Inner foam replaced by vinyl	„Vinyl“
c)	Inner foam replaced by air	„Air“
d)	without control volume inside breasts	„noCVL“



Computer tomography

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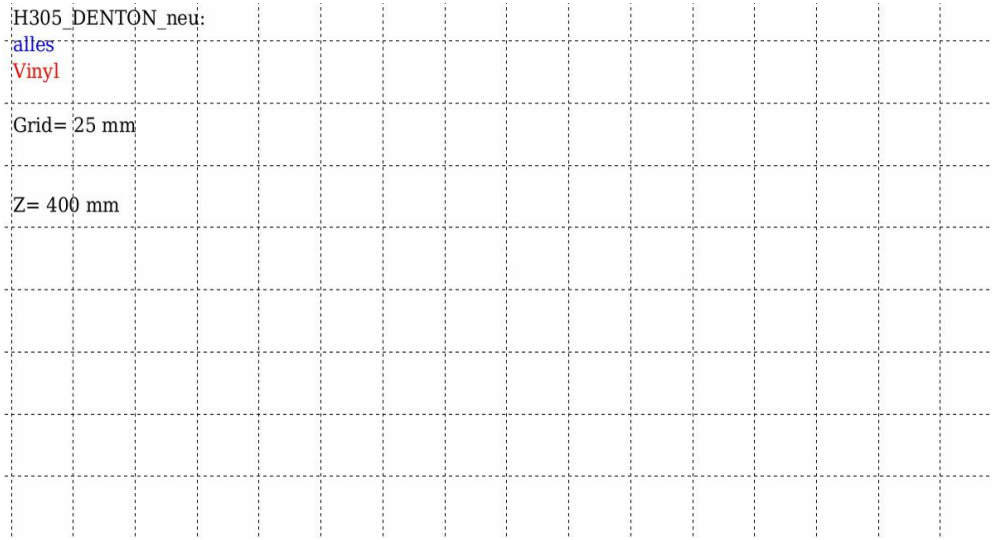
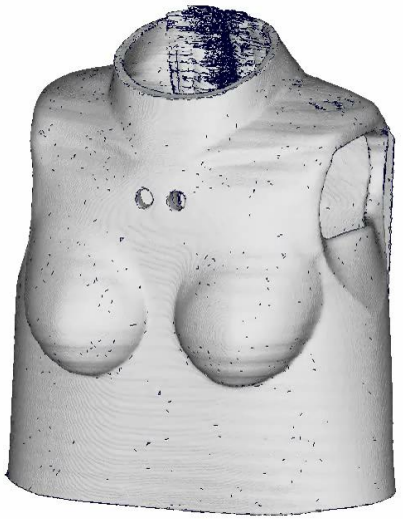
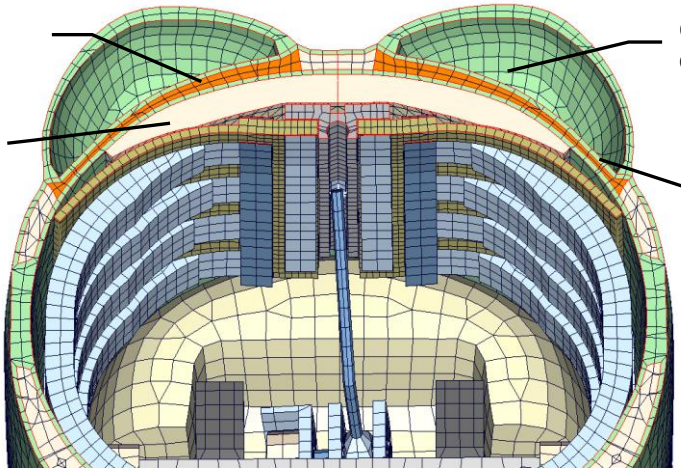




modified area of the inner foam



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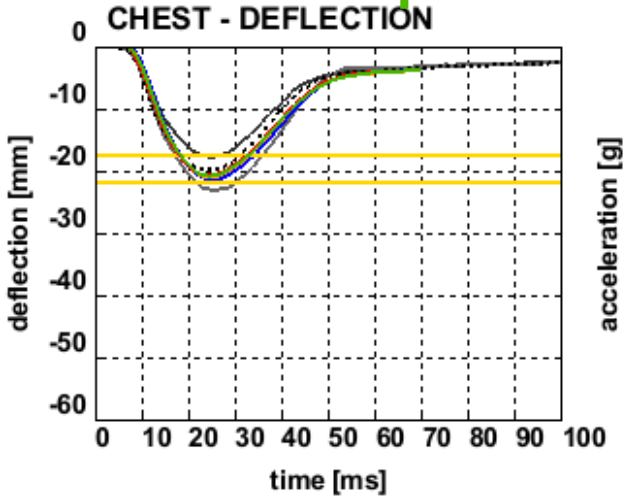
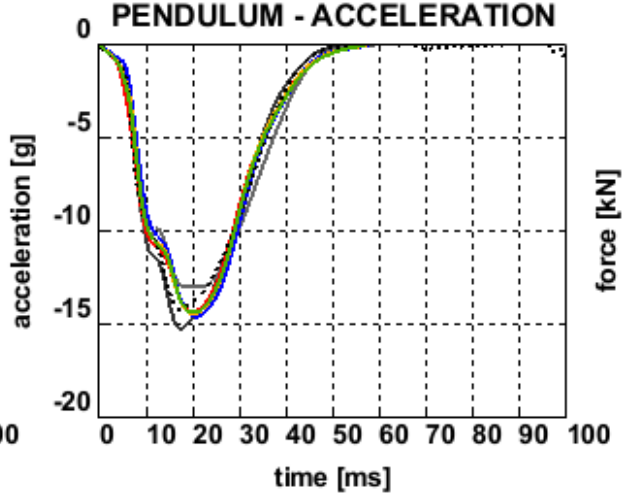
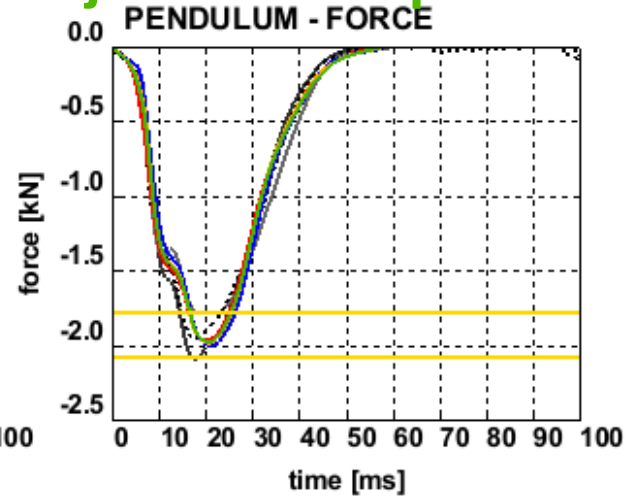
| Peter Schuster, ATD-MODELS GmbH | ED: 04.10.2012 | © 2012 Copyright by ATD-MODELS GmbH |
| 11. LS-DYNA Forum 2012, 09. - 10. Oktober 2012 in Ulm, Deutschland |

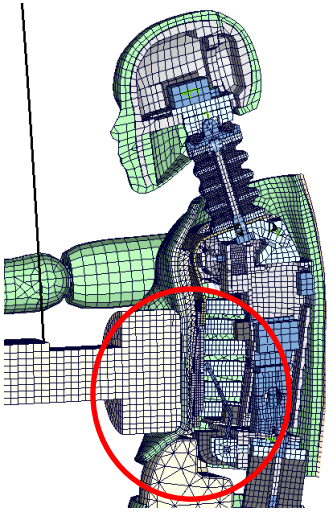
Jacket Analysis

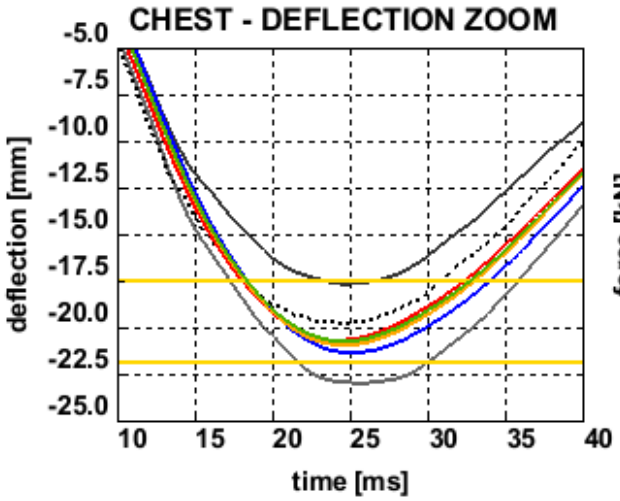
Certification pendulum 3.00 m/s – Different jacket set-ups

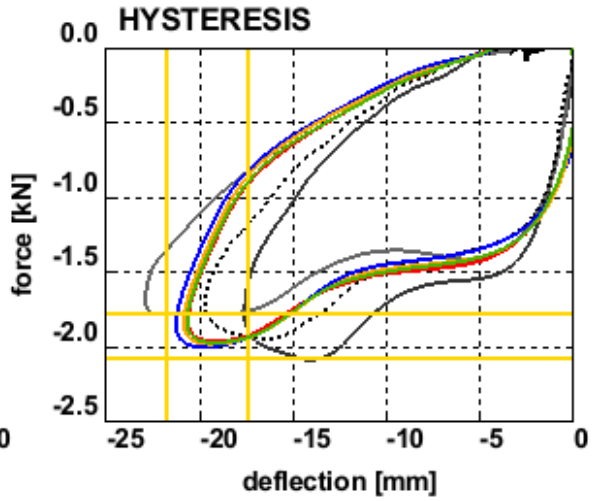


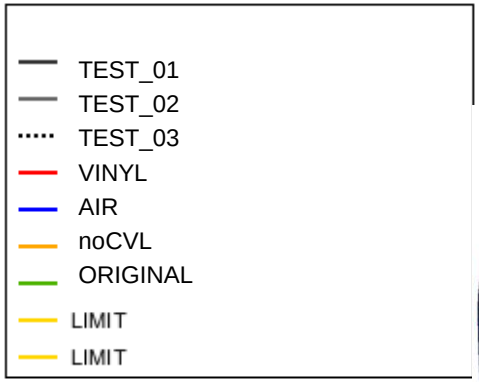


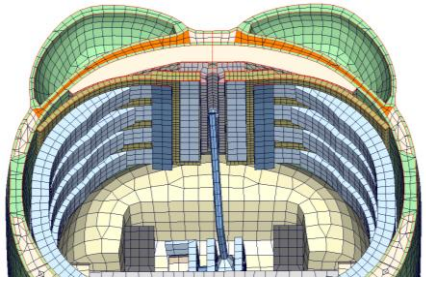






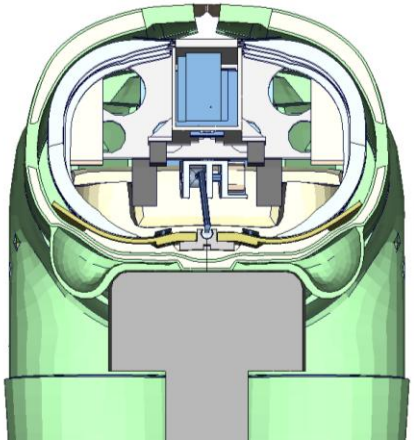




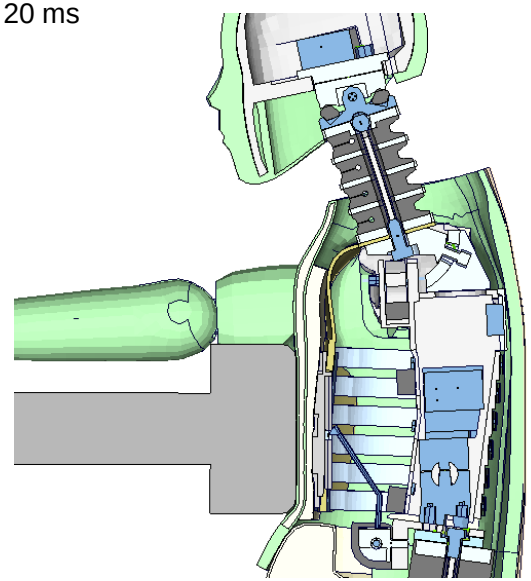


Jacket Analysis

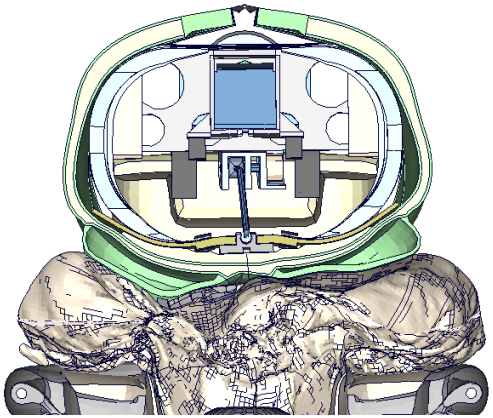
Motivation – Out of Position Tests



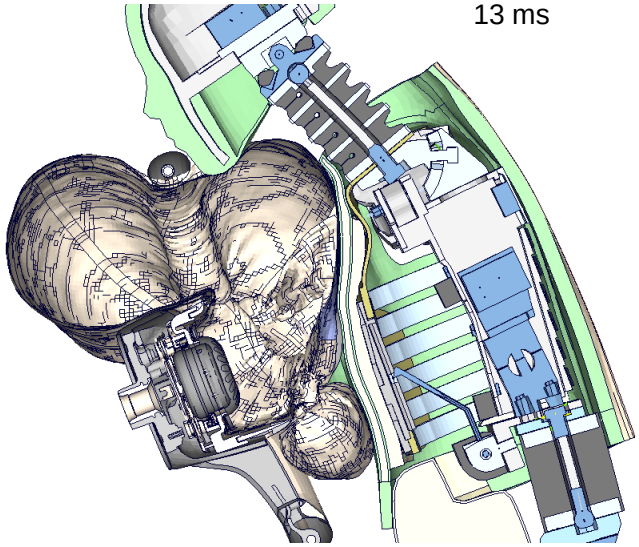
20 ms



- Primary load on chest
  - Areal load
  - Blockage
  - Airbag cover
  - Deployment
- Secondary load on neck

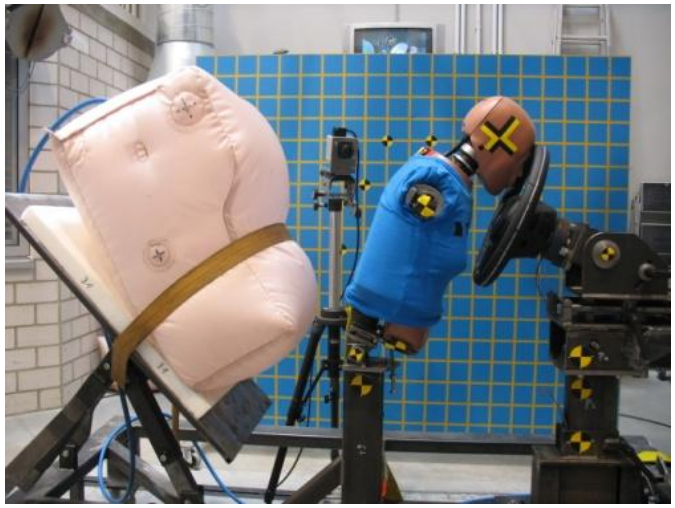


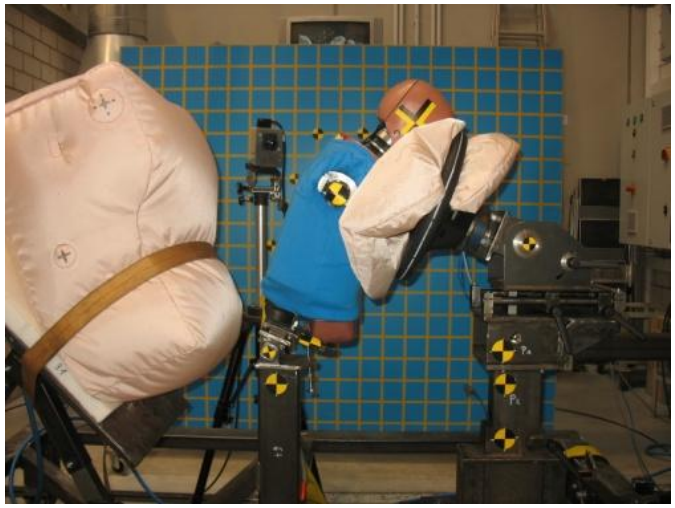
13 ms

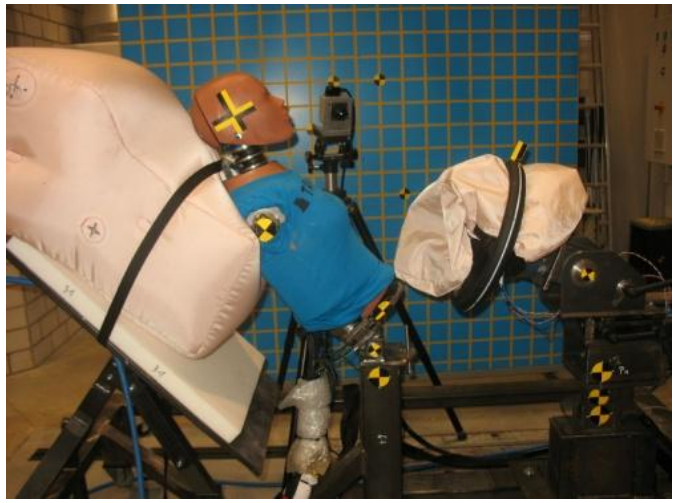


Jacket Analysis

Out of Position – simplified test set-up TAKATA



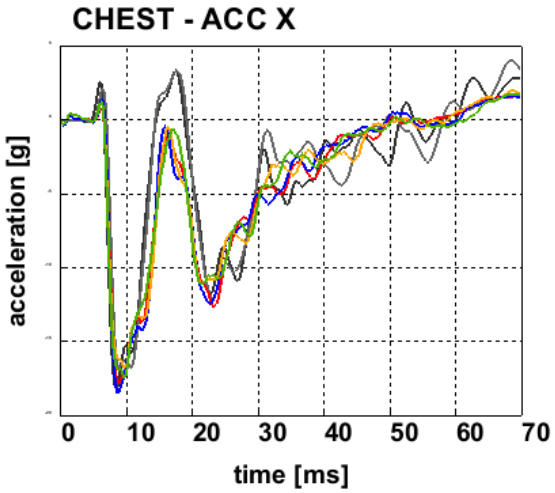


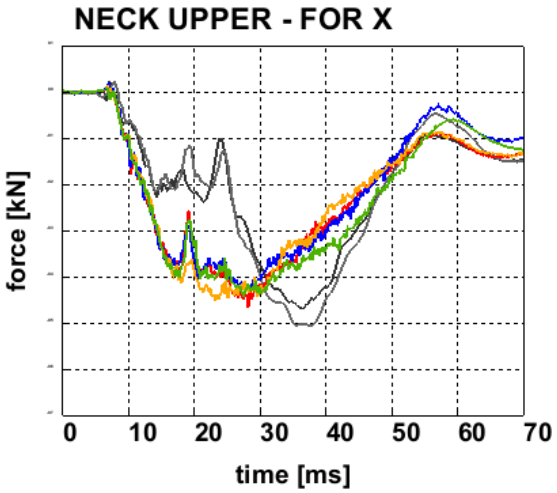


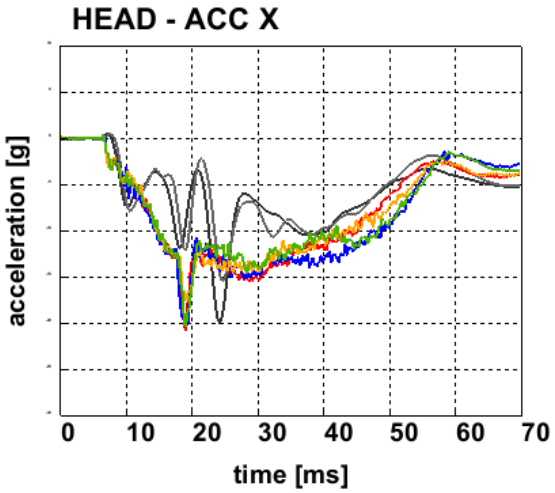
- **Positioning**
  - **Relevant dummy parts lumbar spine to head**
  - **Position analog full dummy in vehicle**
  - **Mounted on installation which rotates around same rotation axis as dummy in vehicle**

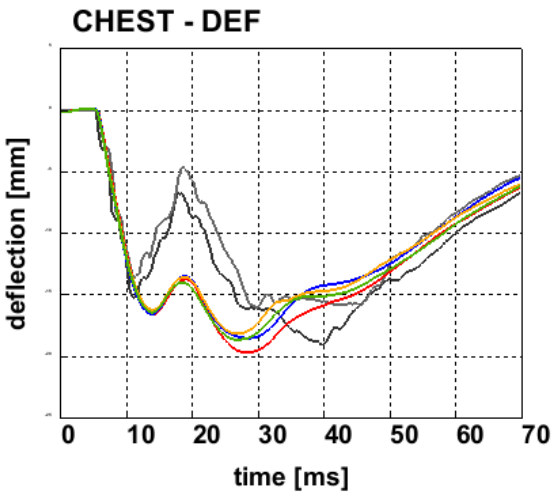
Jacket Analysis

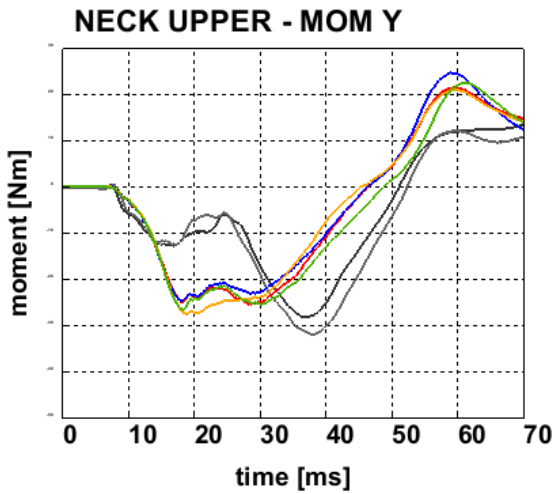
OoP: Chin on Rim - Different jacket set-ups

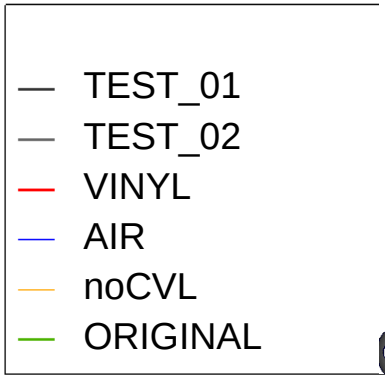


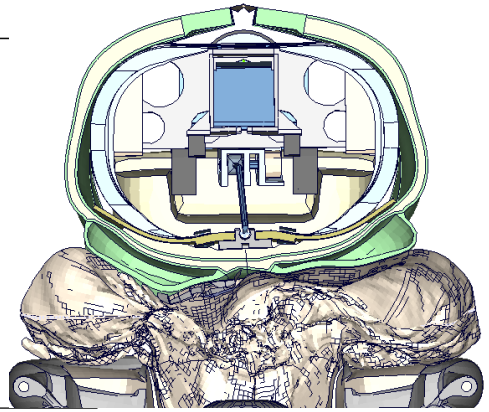






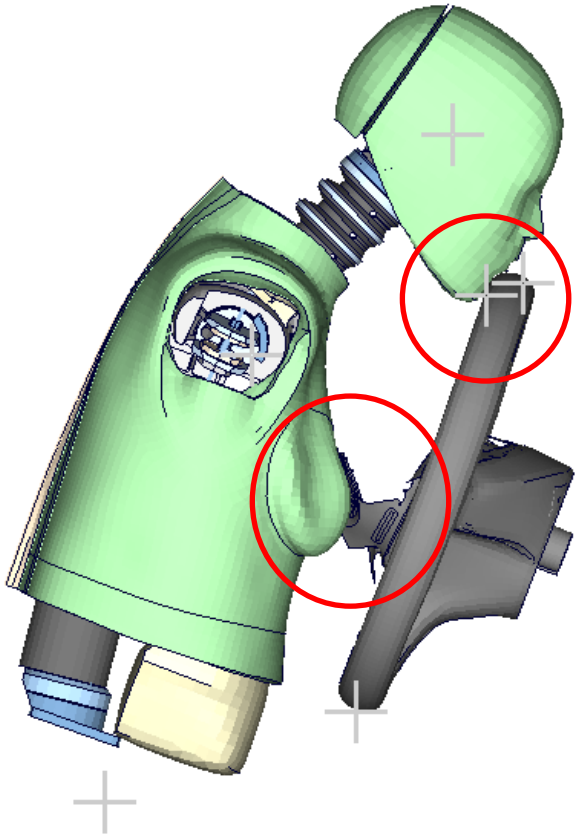


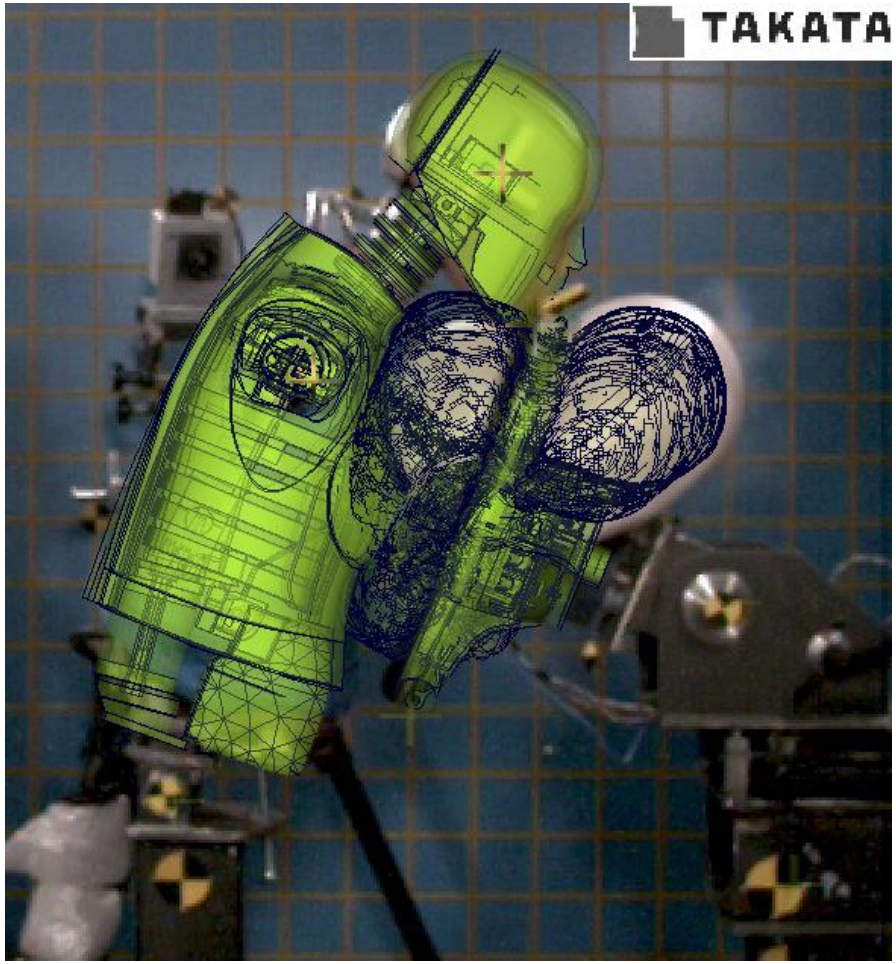




Jacket Analysis

OoP: Chin on Rim - Different jacket set-ups





- **Deployment**
  - **Blockage, cover, contact chin**

ATD-H305

Summary and outlook

- Carry over of proven and tested modelling techniques ATD-H350
- Hardware analysis of jacket in CT
- Strong jackets model variations
- Pendulum
  - All variations met certification corridor
- Out of Position
  - Quality of chest deflection differs after maximum peak
  - Differing airbag deployment causes different secondary loads on head/neck
- Further studies :
  - Jackets of different hardware manufacturers, production processes
  - Aging of vinyl and foam

ATD-H305

Acknowledgments to coauthors

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