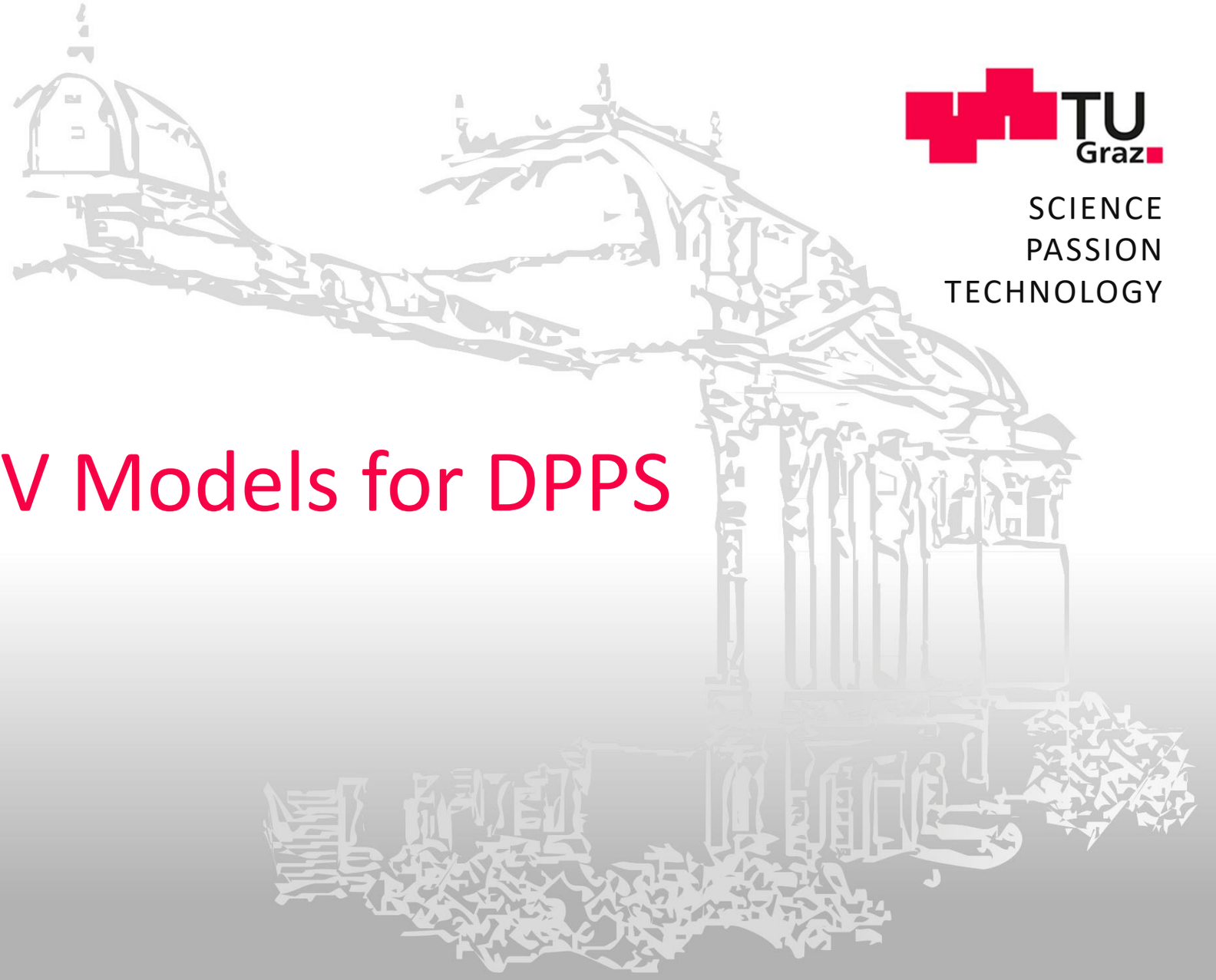
SCIENCE
PASSION
TECHNOLOGY

Open Issues on GV Models for DPPS



19.06.2023

Identified issues

1. Impactor Simulations
    1. Justification of plausibility check impactor simulation
        - Discussion ongoing

    2. Corridors for plausibility check (first 5mm)
        - Updated corridors – seems issue is solved; review by OEMs

        (originally curves have been moved to align them – now raw input data is used; updated corridors will be uploaded to https://openvt.eu/EuroNCAP/tb024/-/tree/GV-models-for-DPPS)

2. Corridors for HBMs
    - error in simulations from CM was identified; all results are now within corridors
    - proposal for small change for 6yo corridors to be reviewed

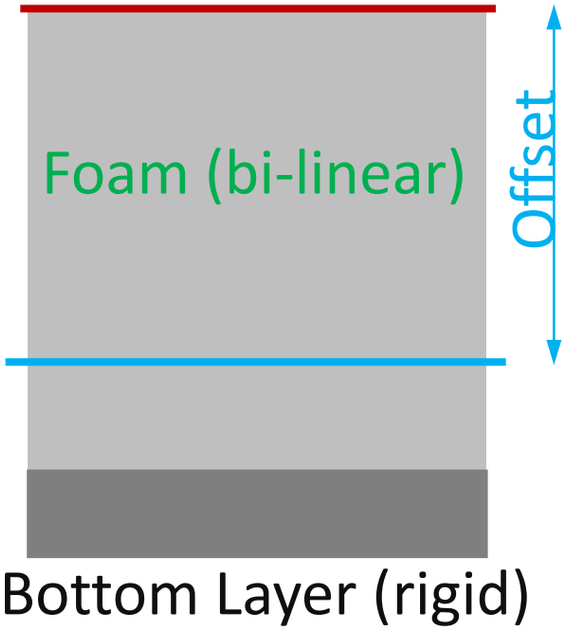
Purpose of the Impactor Simulations

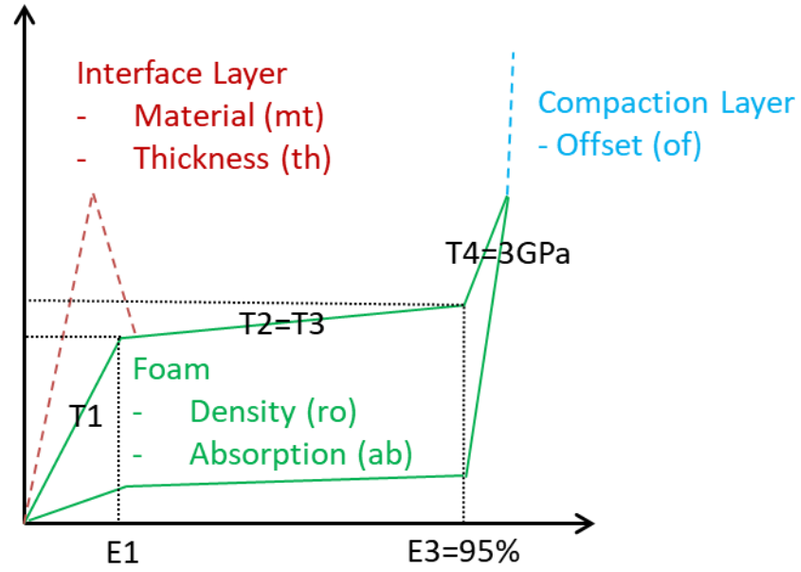
- Check plausibility of GV response in simplified conditions:
  - Do the interface layer deform plausible?
  - Do the foams deform plausible?
  - Are the internal contacts working properly?

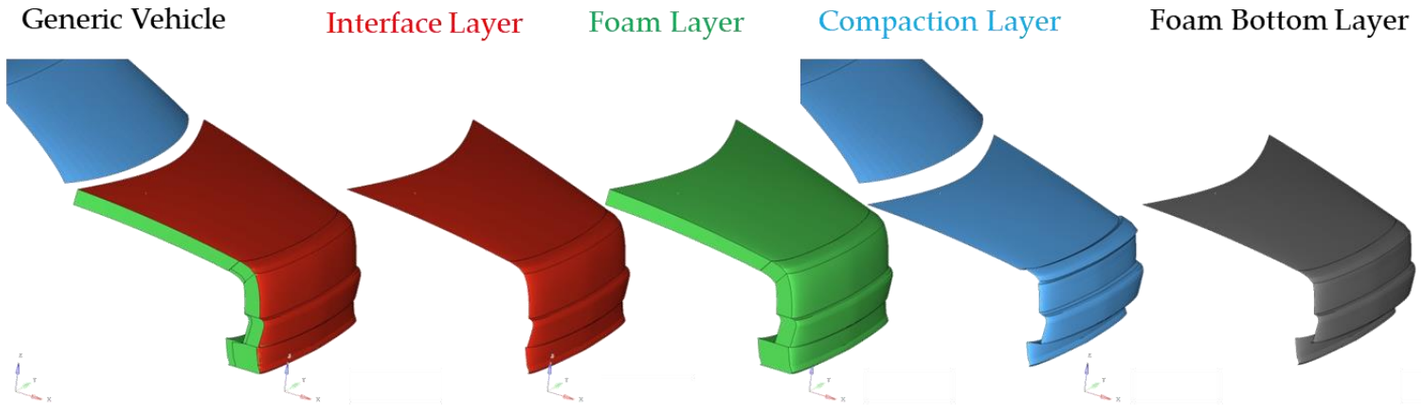
- Difference in Impact locations:
  - For spoiler and bonnet Impact only one structure deforming → see comparison of internal energies on the next slide
  - For bumper and ble impact, surrounding components are also deforming

Generic Vehicle Models

Interface Layer (elastic-plastic)

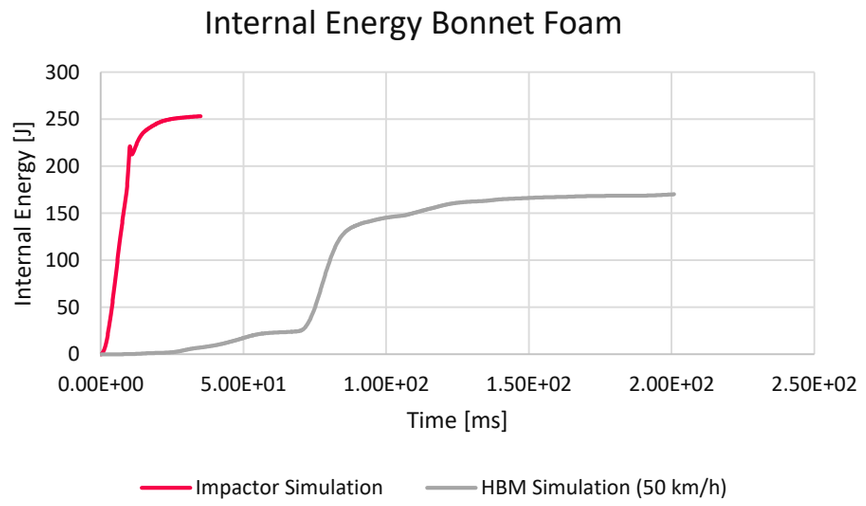






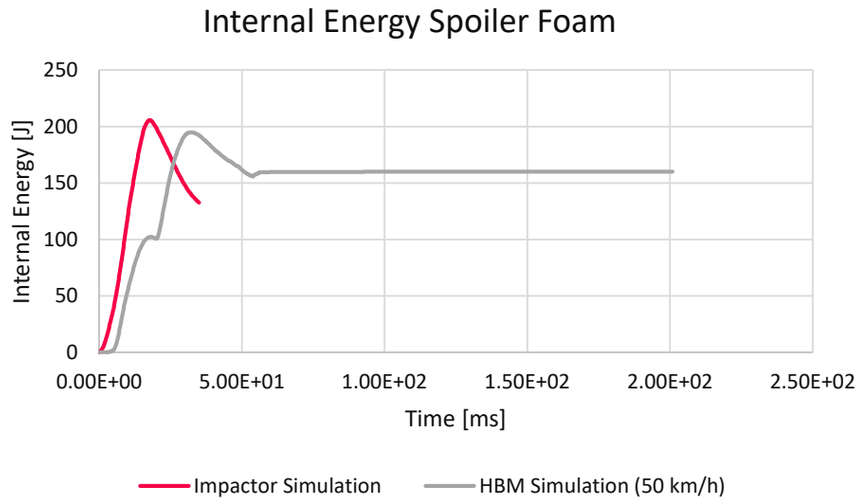
Justification of plausibility check impactor simulation

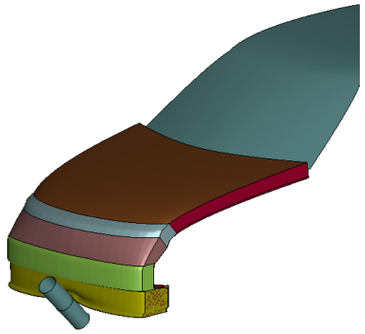
- Internal energy comparison between full HBM Simulation (FCR, 50 km/h, AM50 HBM) and Impactor Simulation for bonnet:
  - In HBM Simulation: 70% of the internal energy of the impactor simulation for bonnet foam



Justification of plausibility check impactor simulation

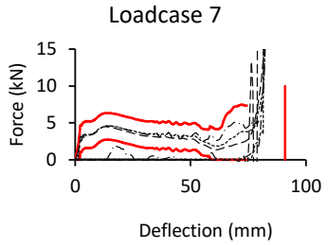
- Internal energy comparison between full HBM Simulation (FCR, 50 km/h, AM50 HBM) and Impactor Simulation for spoiler
  - In HBM Simulation: 95% of the internal energy of the impactor simulation for spoiler foam





Why is hard stop modelling for bonnet important?

The hard stop (contact between interface and compaction layer) is intended to avoid instabilities in the bonnet foam caused by centered loads (for the shoulder / ellbow)



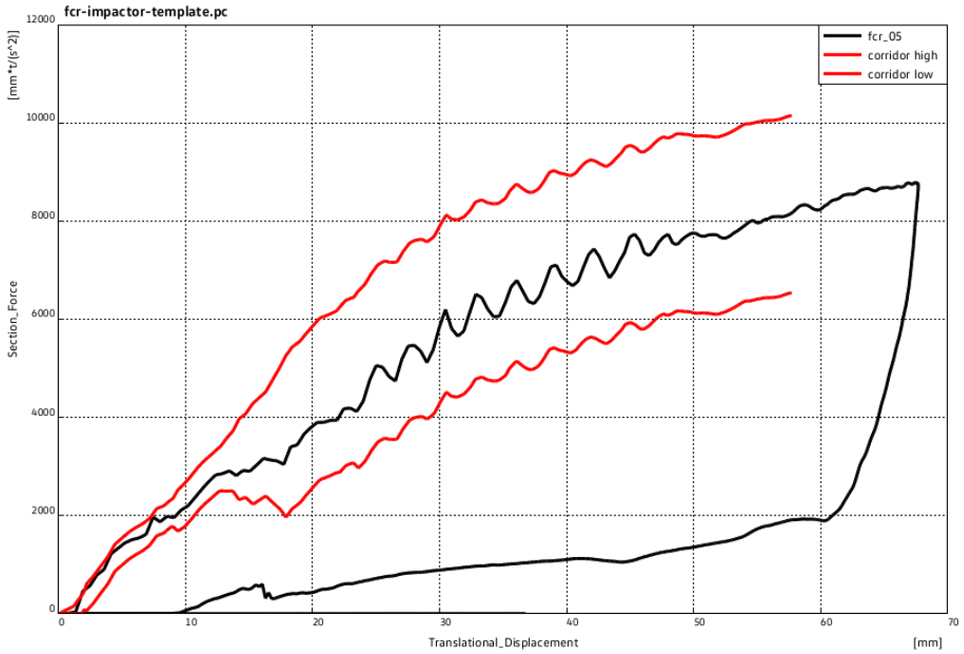
Hard stops are also present in serial cars – maximum deflection is based on median maximum deflection derived from impactor simulations with full FE vehilce models

Draft Wording for MR1 (to be refined): *„The steap increase of the force observe in Figure XX at XX mm deflection is caused by the modelling of the artifical hard stop due a contact between the interface and compaction layer at XX mm. To ensure that the GV models work robustly also in the most severe impact conditions (ellbow impact on the bonnet), the rigid impactor simulations are performed with an Energy of … J up to a hard stop. The hard stop is defined based on simulations with the same rigid impactor in full FE vehicle simulations.“*

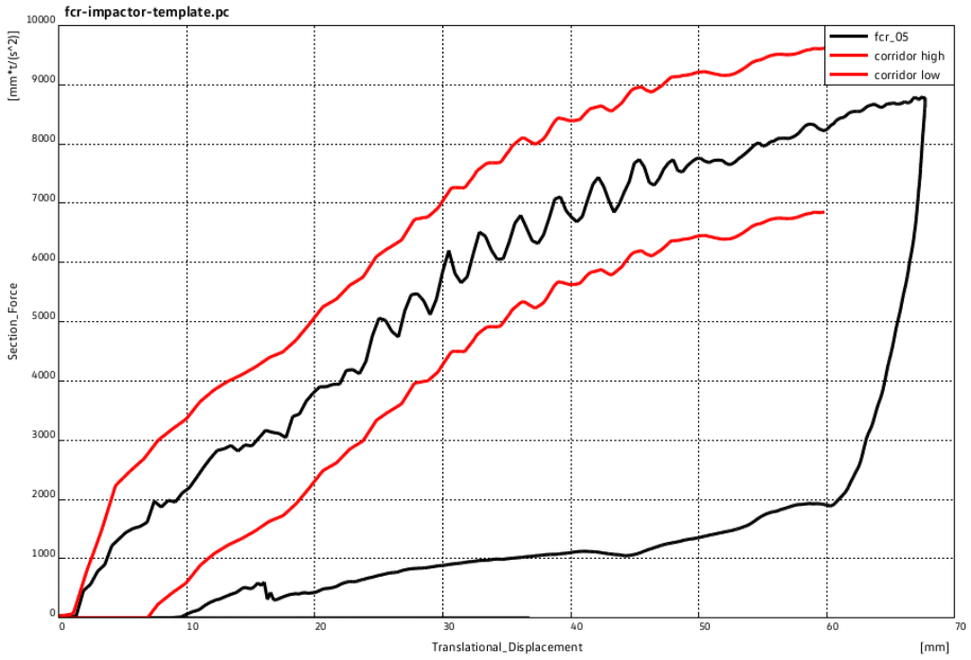
GV corridors

Old: originally curves have been moved to align them; now raw input data is used

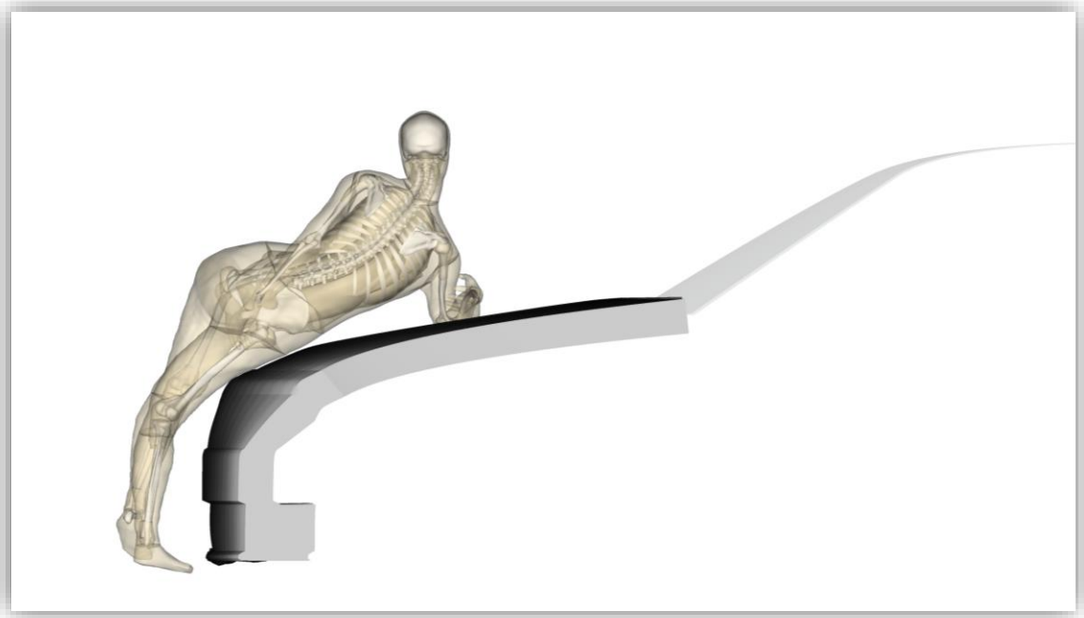
Old



New



Diagrams from check from one OEM



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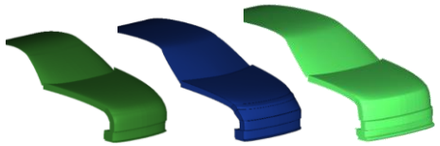
Building Blocks



Roadster Familycar SUV

Generic Vehicle Models available on UNECE website – MR1

Human Body Models (openly available or by suppliers)

Vehicle Simulation Models with DPPS of Vehicle Manufacturer

Finite Element Software

(supplied by code-houses to Industry)

1. Plausibility check

2. Human Body Model qualification

3. HIT vs. WAD determination

4. Use HIT for DPPS decision