OICA

Task Force DPPS

Scope and Limitations of the PDI-2 Per Task Number 14

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Motivation Hardest To Detect Impactor

- Euro NCAP Protocol listed a block of data to be provided as pre-requisite for the assessment of deployable bonnets
- The data generation is a resource intensive activity
- The data is subject to interpretation as the Hardest To Detect is depending on the vehicle front end

Main Goal of developing the PDI-2:
- Avoid the necessity of excess data generation and interpretation discussions after finalized vehicle development

- One impactor should be developed that represents worst case for the sensor triggering and that can be used for all vehicle categories that are assessed regarding VRU safety

- Acceptance by Euro NCAP if PDI-2 is chosen as HTD, no further proof will be necessary and the numerical simulations requested in Euro NCAP test protocol are no longer required

<u>Scope</u>

PDI-2 Project Description:

- Determination of the worst case for the lower limit of the defined test frames regarding:
    - intrusion, energy, force and effective mass vs. time-characteristics
    - for three vehicle categories (Sports Car, Sedan and SUV)
    - at a relative impact speed of 20-40 [km/h]

- Physical properties of the PDI-2 have been designed to exert similar or lower intrusion-, force-, and energy- vs.-time characteristics on the vehicle frontend structures as obtained upon impact with the corresponding worst case pedestrian-dummy (Madymo) or human FE-model (THUMS-D)

- Easy assembly (no knee joint), robust and reproducible built-up at reasonable costs
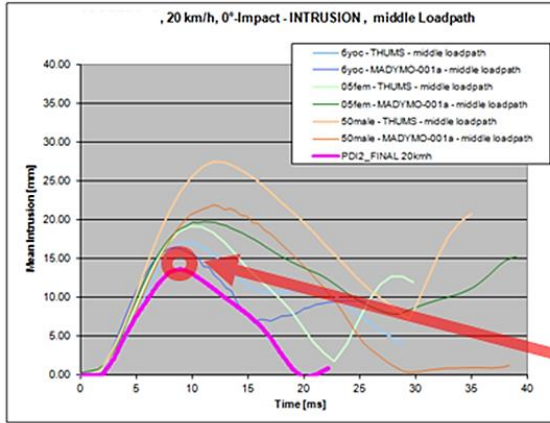
Development of the PDI-2

- During PDI-2 development phase, simulations were conducted on three (idealized) test frames (Sports Car / Sedan / SUV)

- Based on this data, PDI-2 was designed to be most challenging tool for demonstrating sensor performance

- Once the impactor was available in hardware, it was then tested against the three car shapes highlighted above

- The PDI-2 leads to a lower signal level compared to the worst case HBM simulation for all car shapes

- The intention of the impactor, to be more challenging for sensors than the 6 Year Old or 5[th%ile] female HBMs, was fulfilled
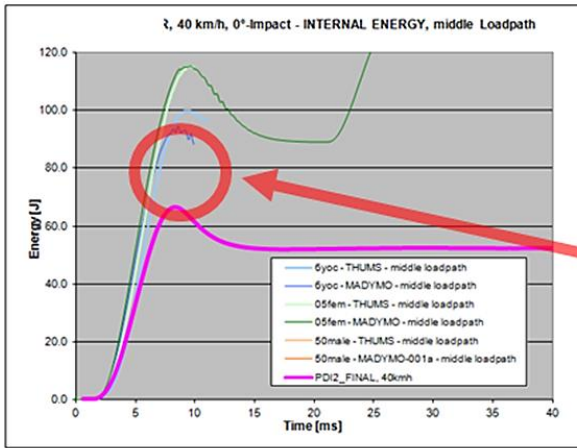
Limitations

- However, for certain car shapes PDI-2 produced significantly lower peak values than the worst case Human Body Model simulation (see next 2 pages)

- This effect has also been shown by independent research, conducted by JAMA (data previously shown at Euro NCAP ILM)

- For this case Euro NCAP provide the possibility for the OEMs to show with data, that another test tool is still appropriate as Hardest To Detect

- Application of the PDI-2 into regulation would be design restrictive to certain Front End Exterior Designs
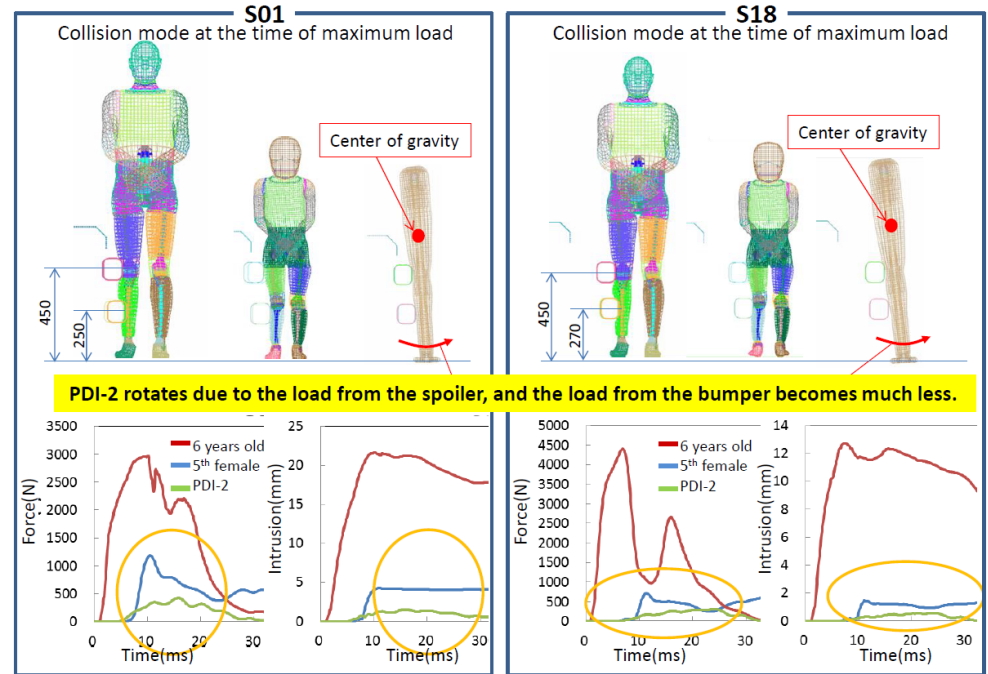
Limitations

, 20 km/h, 0°-Impact - INTRUSION , middle Loadpath

16% less intrusion!

₹, 40 km/h, 0°-Impact - INTERNAL ENERGY, middle Loadpath

29% less internal energy!

Vehicles with a Large Difference in Peak Values

S01
Collision mode at the time of maximum load

Center of gravity

S18
Collision mode at the time of maximum load

Center of gravity

PDI-2 rotates due to the load from the spoiler, and the load from the bumper becomes much less.
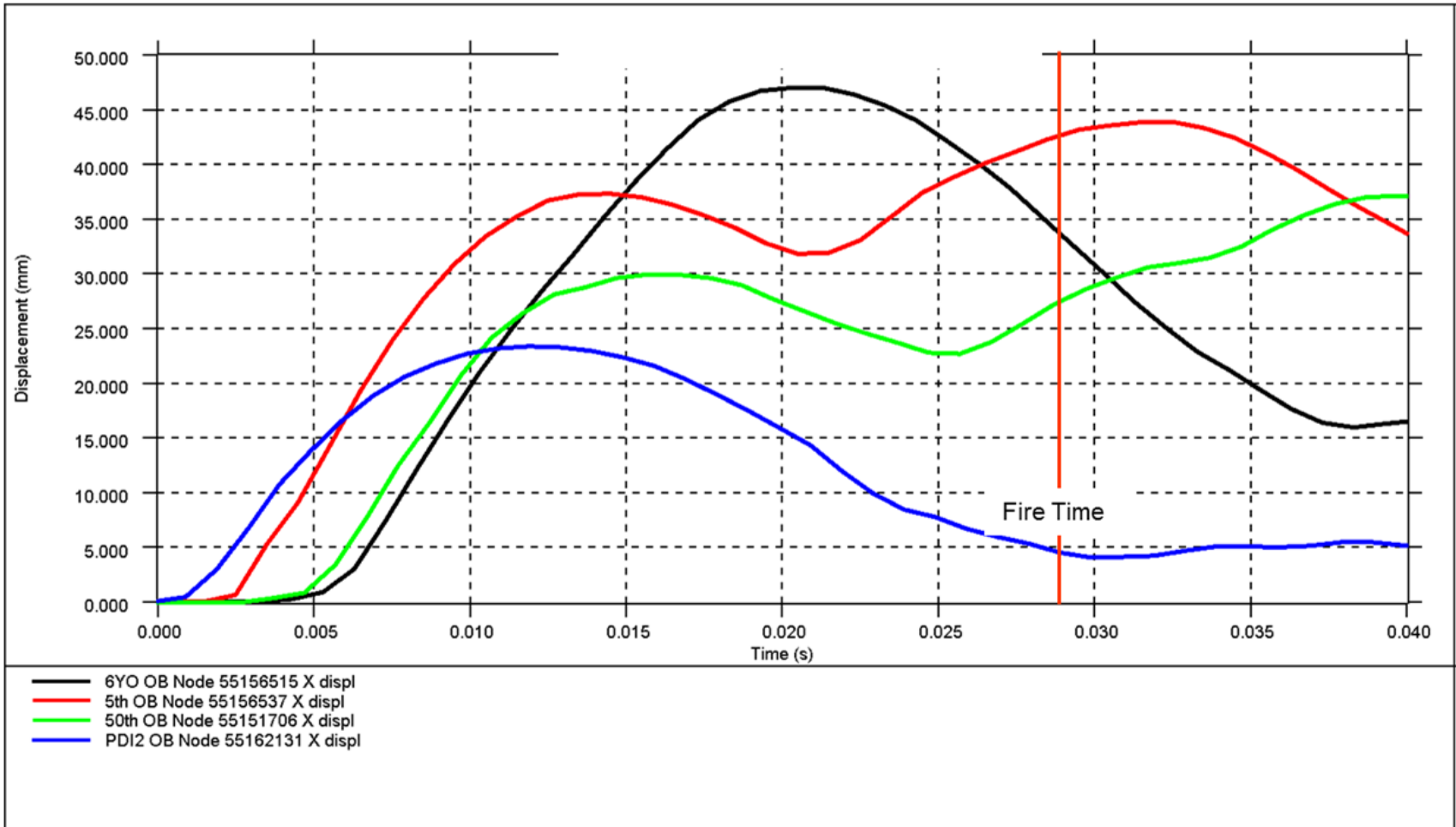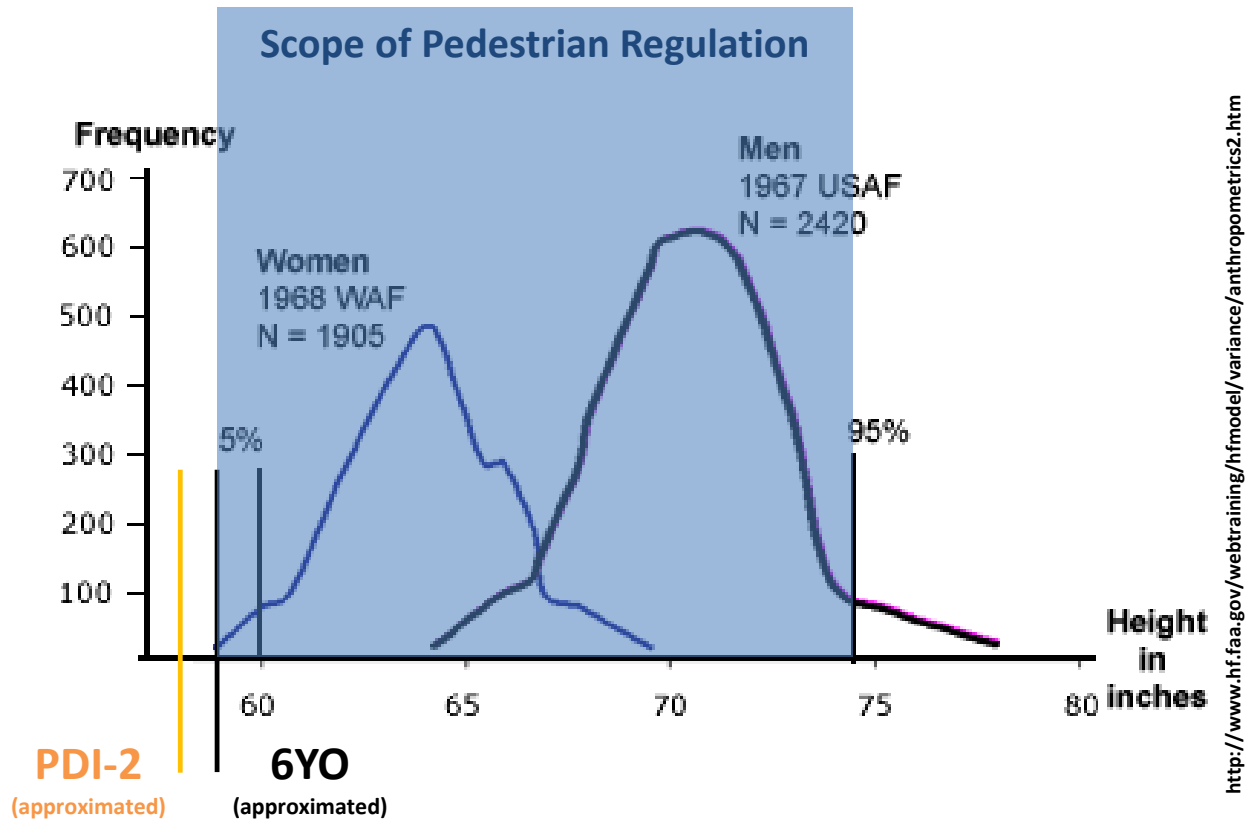

PDI-2 verification JAMA 012114.pdf
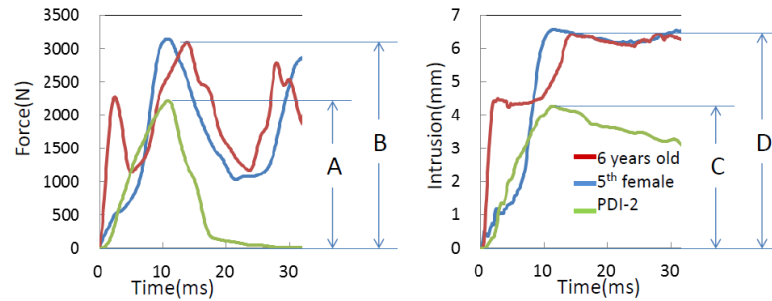
Limitations

- Significantly less displacement into a vehicle fascia by PDI-2

Limitations

- 6-Years Old, 5th%ile Female and 95th%ile Male in comparison to PDI-2

OICA Position

- Hardest To Detect would be a new regulatory requirement, extending the scope of the current legislation

- The PDI-2 is a Consumer Metrics impactor

- Regulation addresses the range of pedestrians from 6-Years Old to the 95th%ile Male (i.e. WAD1000 to WAD2100)

- PDI-2 peak values are lower than the range of pedestrians addressed by the regulation

- An extension of the application range would pose an unfair disadvantage of deployable systems over non-deployable systems

  ➢ **Industry does not accept the Hardest To Detect and PDI-2 as part of the deployable systems test procedure clarification within the mandate of the TF-DPPS**