

Development of a pre-crash system for side impact protection enhancement

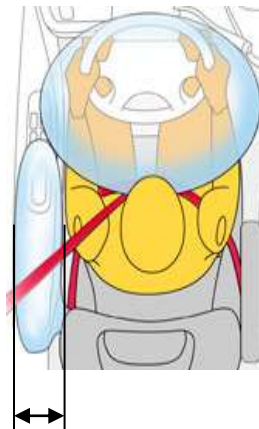
José Dias

4th European HTC 2010

Active Door Module – Motivation

Side Crash is characterised by:

- 1) reduced struck vehicle crush zone



- 2) Small available space for occupant acceleration

- 3) Small amount of occupant cushioning

airbag bottoming-down

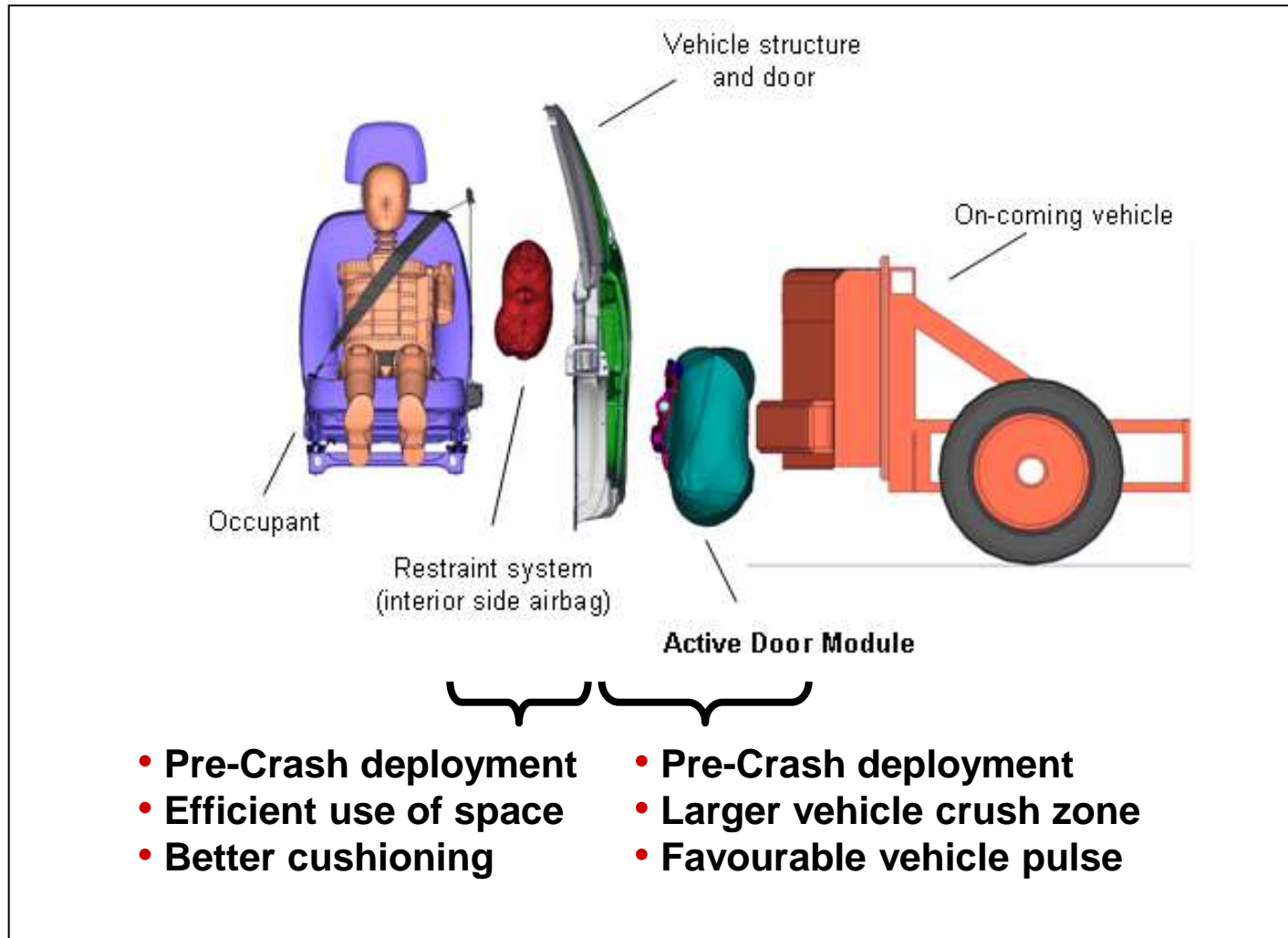
contact with hard vehicle parts

direct force transmission to occupant delicate body regions, namely to the rib case.

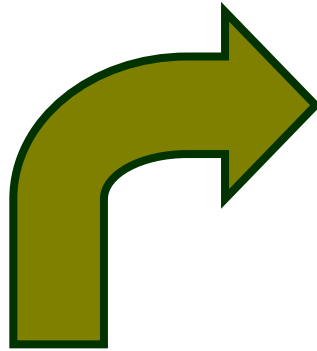


Active Door Module – System Concept

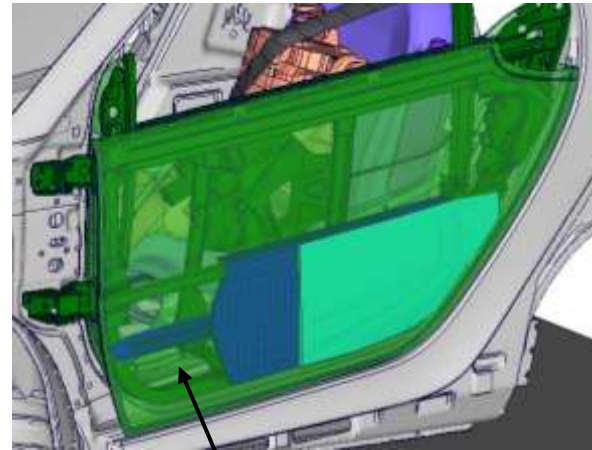
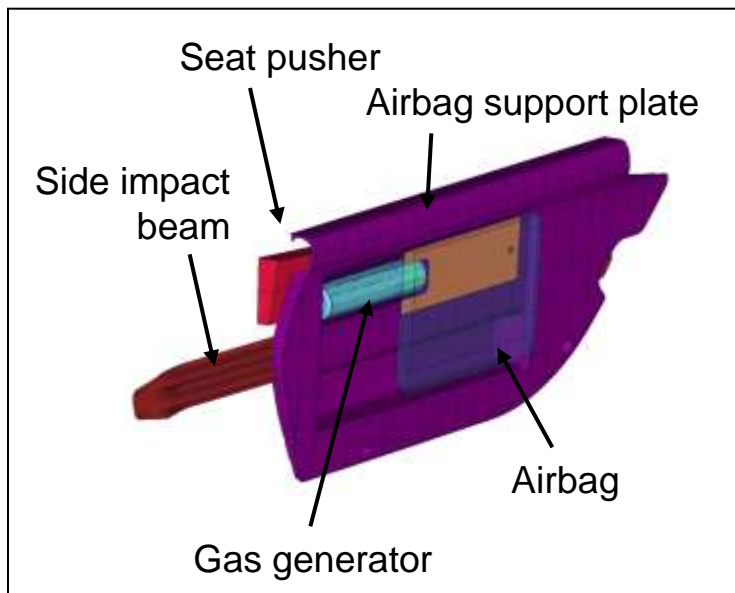
Improved occupant protection for side crash



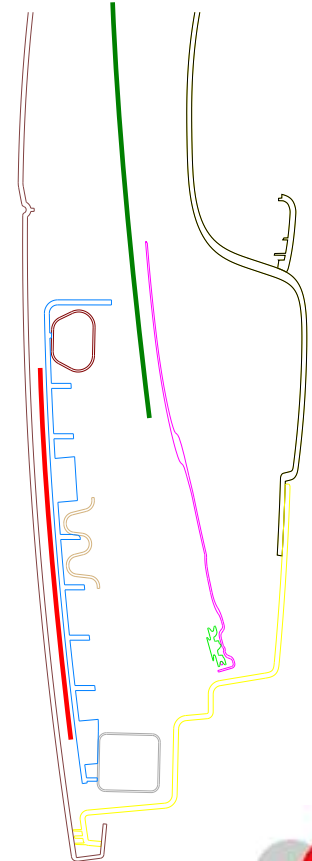
Integration in the vehicle door



Modular design



Modified door panel



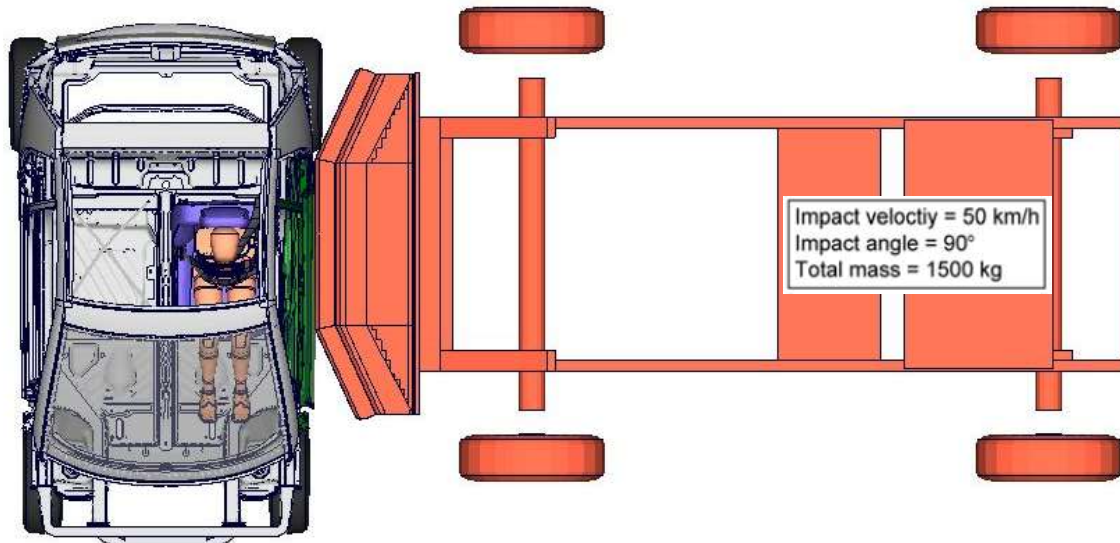
Active Door Module – Proof of Concept Trough Simulation

Scenario chosen:

- IIHS side crash test
- Small vehicle

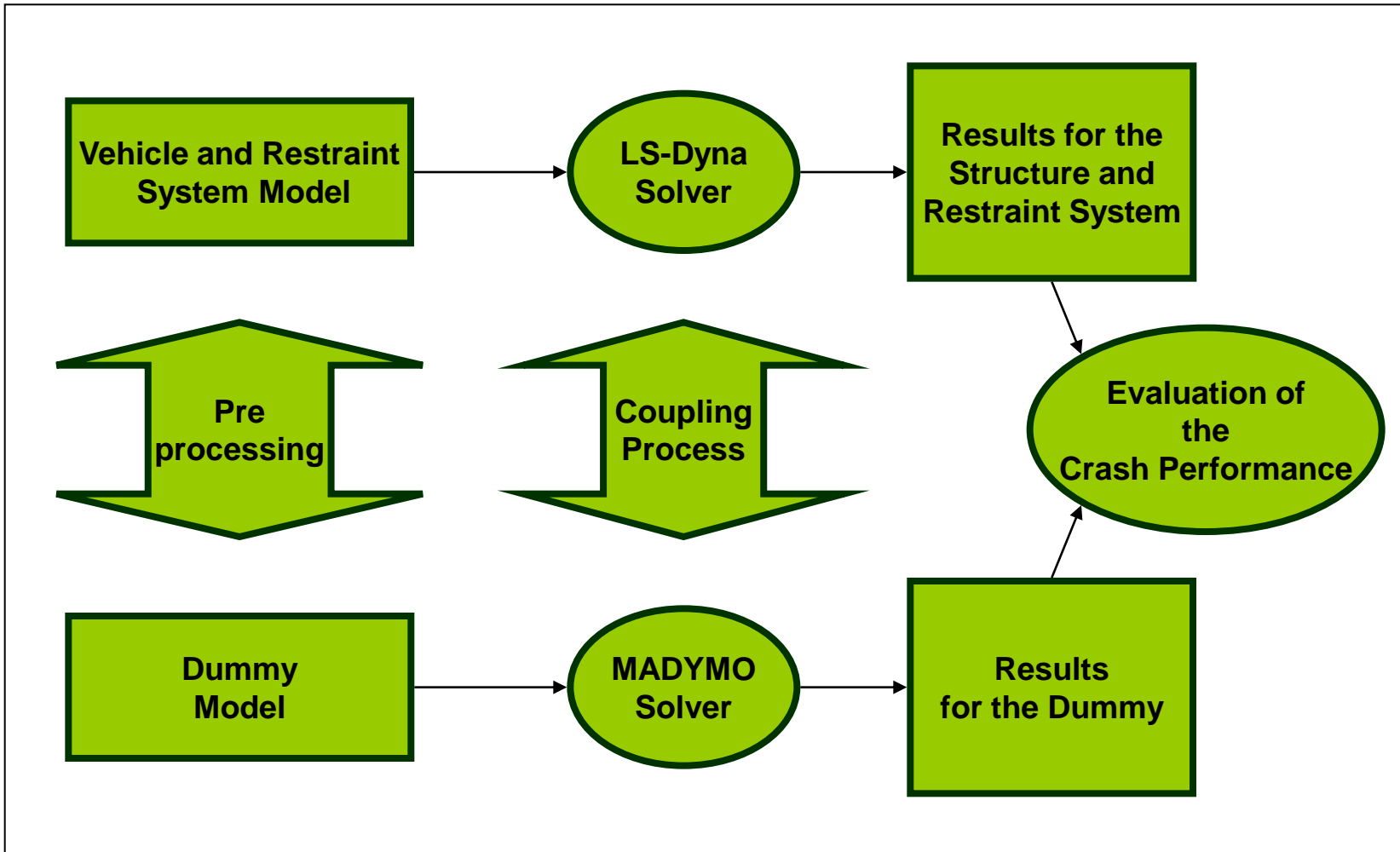
Simulation strategy:

- Coupled LS-Dyna / Madymo simulation
- LS-Dyna Version 971d R2 7600.1224
- Madymo version 7.1sp1
- Linux Suse 10.0 on Xeon Platform

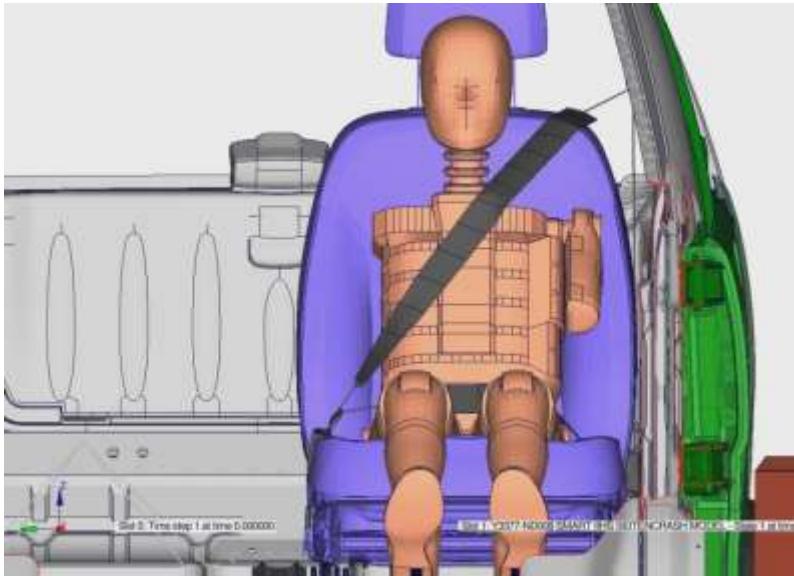


Active Door Module – Proof of Concept Trough Simulation

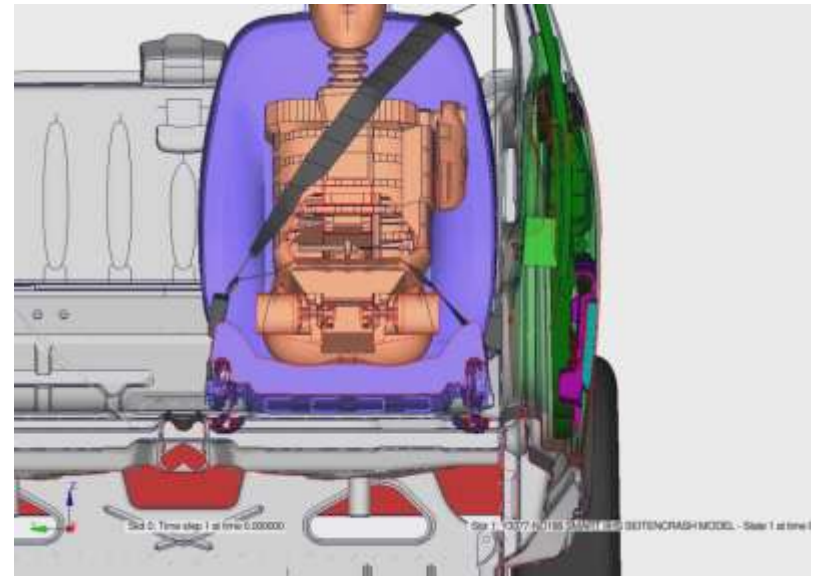
Coupled simulation details



Without Active Door Module



With Active Door Module

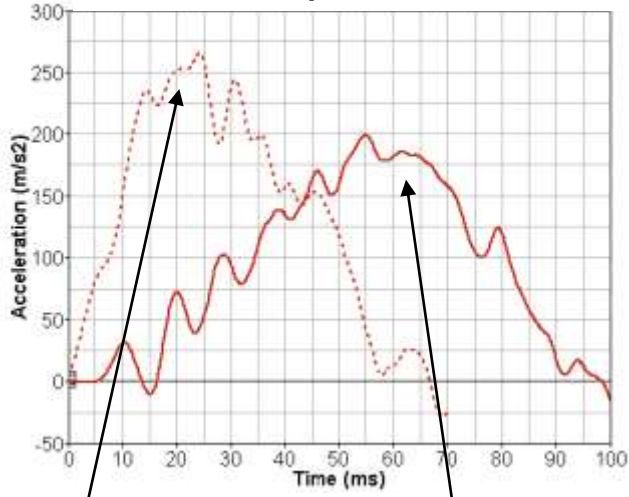


- Earlier contact between bullet and target vehicles
- Occupant is pushed away in a smother way



Active Door Module – System Performance

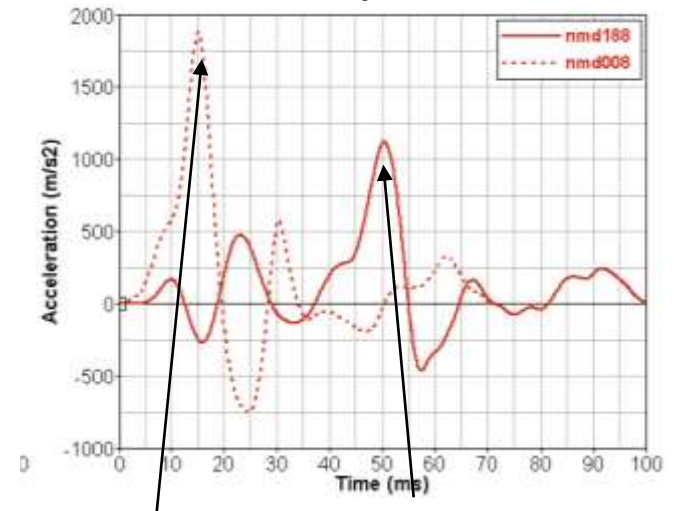
Acceleration B-pillar non struck side



Without Active Door Module

With Active Door Module

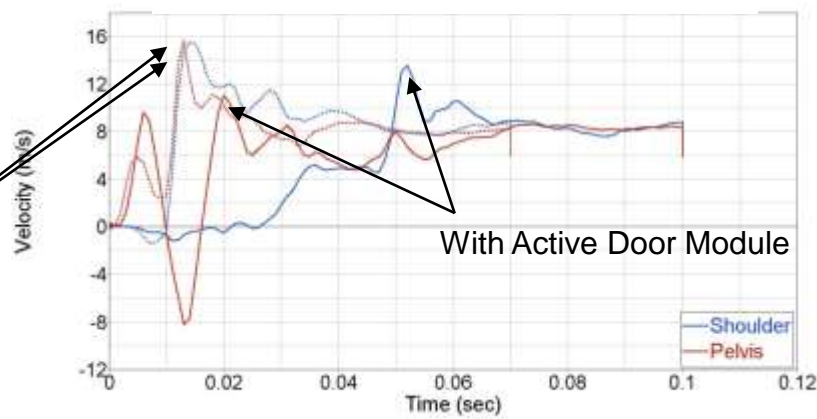
Acceleration B-pillar struck side



Without Active Door Module

With Active Door Module

Door intrusion velocities



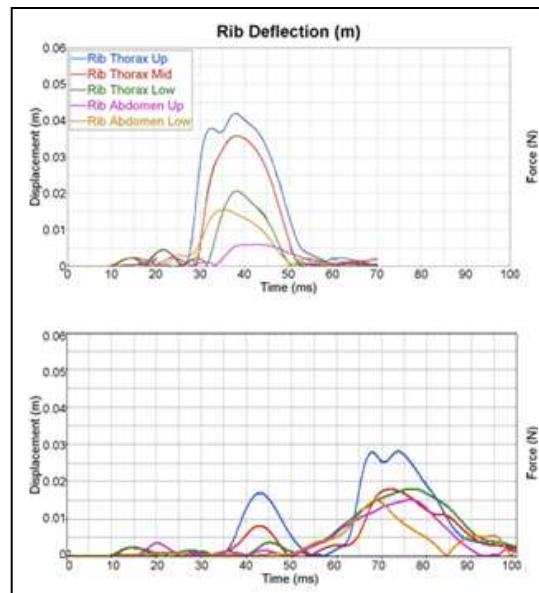
Without Active Door Module

With Active Door Module

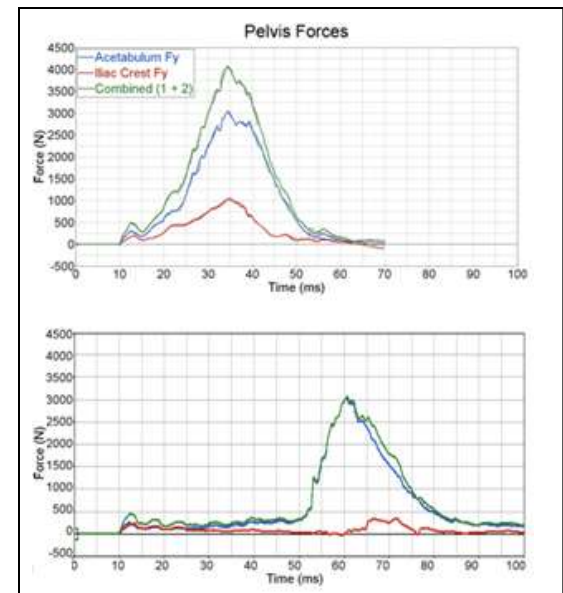


Significant reduction of the occupant loading

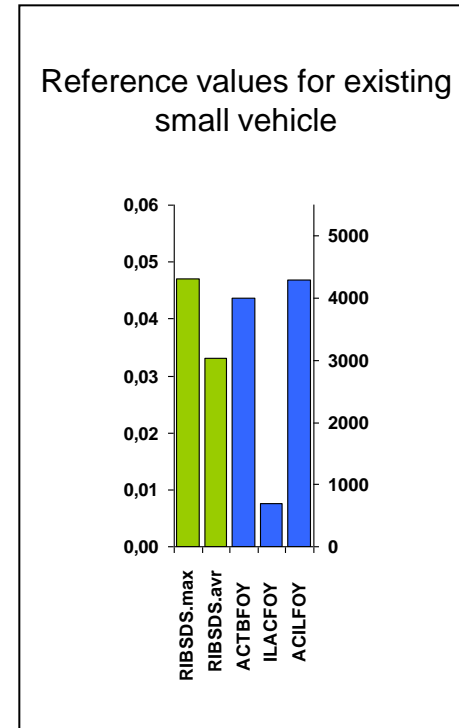
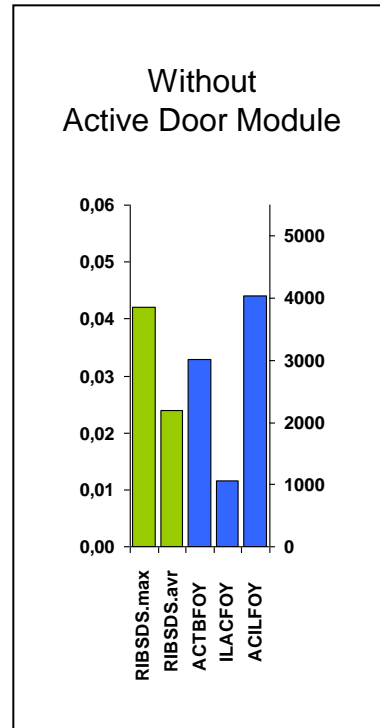
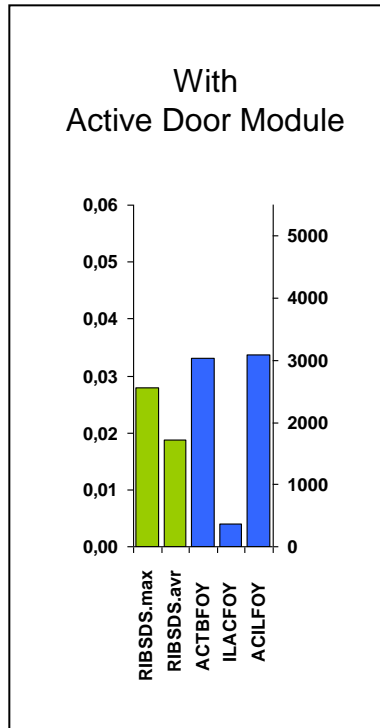
Without Active Door Module



With Active Door Module

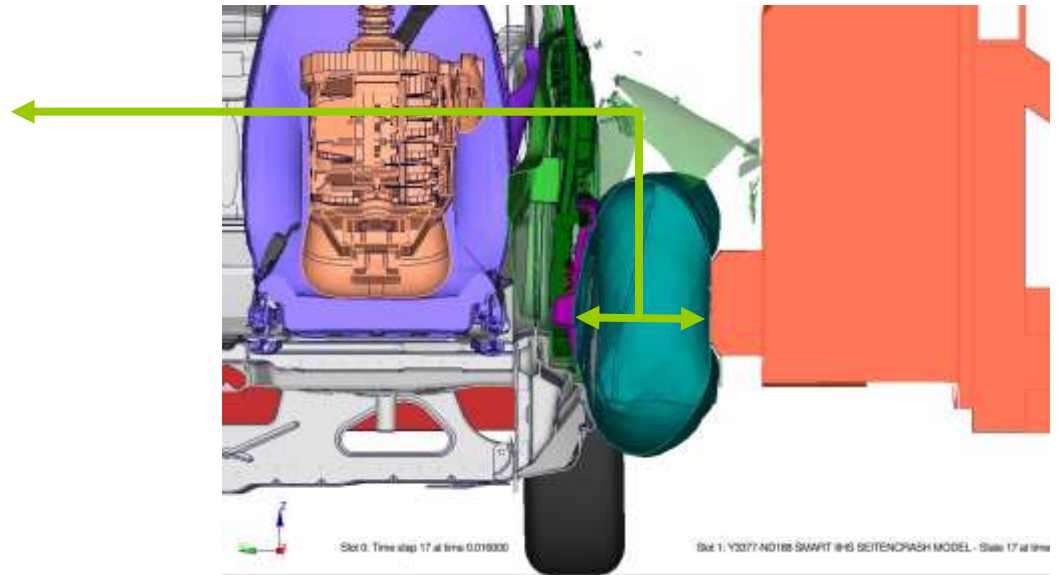


Significant reduction of the occupant loading



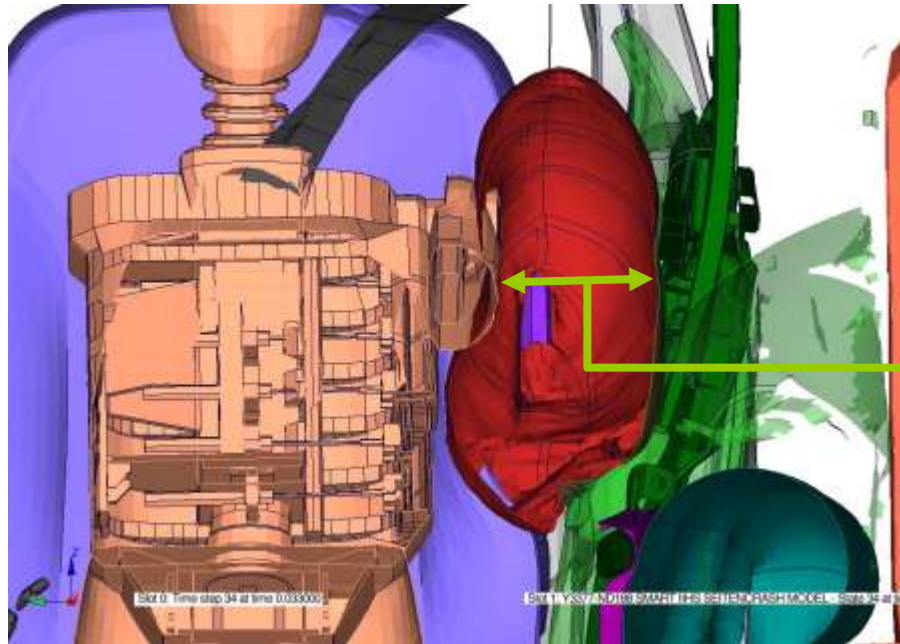
1)

Earlier contact and force transmission causing a more progressive acceleration of the struck vehicle and better intrusion velocity profile



Active Door Module – System Analysis

2)

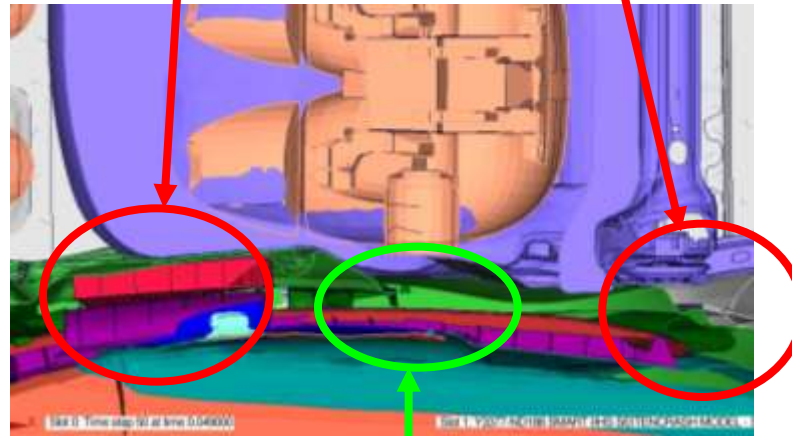


More efficient use of the interior space



3)

Block building features placed away from the occupant pelvis...



... contributing to the achievement of the correct door trim stiffness in the pelvis region



Active Door Module – Demonstration Prototype

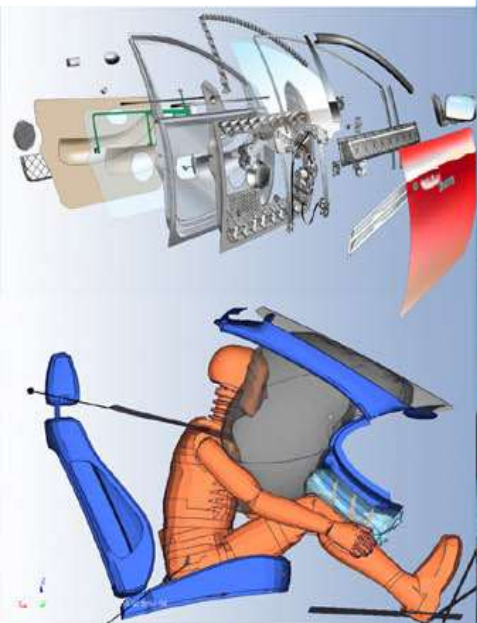


A Prototype was built in order to easily demonstrate de function of the system



- An innovative side impact pre-crash concept was developed
- The concept proof was carried out using a virtual vehicle and coupled LS-Dyna / MADYMO simulation
- 25% to 30% improvement was registered for the dummy thoracic and pelvis injury criteria





Thank you for your attention