

Additional research of the NL

GRSP Informal Working Group on Frontal Impact

TNO | Knowledge for business



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Contents

- Frontal crash pulse analysis

Small Family Car (SFC) crash pulses are compared

- Car-to-MPDB
- Car-to-Barrier
- Car-to-Car

- Test result comparison

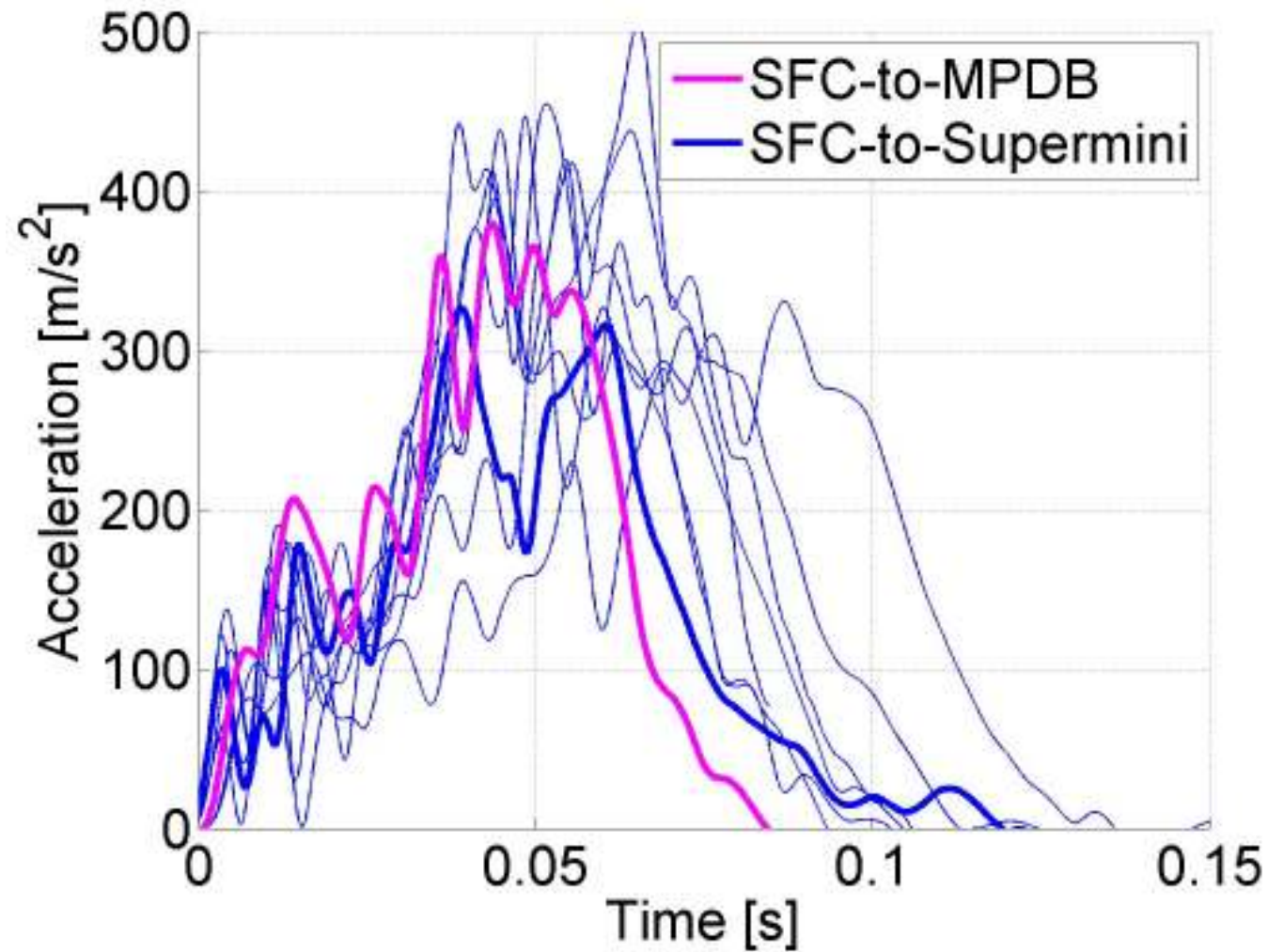
- Euro NCAP
- Car-to-MPDB
- Car-to-Car

Frontal crash pulse analysis

- Verify whether the vehicle crash pulse in a MPDB-to-car is representative for an average European car in different car-to-car collisions
- A Small Family Car is an average European car of 1500kg
- Small Family Car-to-MPDB (45/45 km/h) as reference compared to:
 - Small Family Car - to - Supermini (56/56 km/h)
 - Small Family Car - to - Small Family Car (56/56 km/h)
 - Small Family Car - to - Large SUV (56/56 km/h)
 - Small Family Car - to - Barrier (ODB: 56 km/h, PDB: 60 km/h)

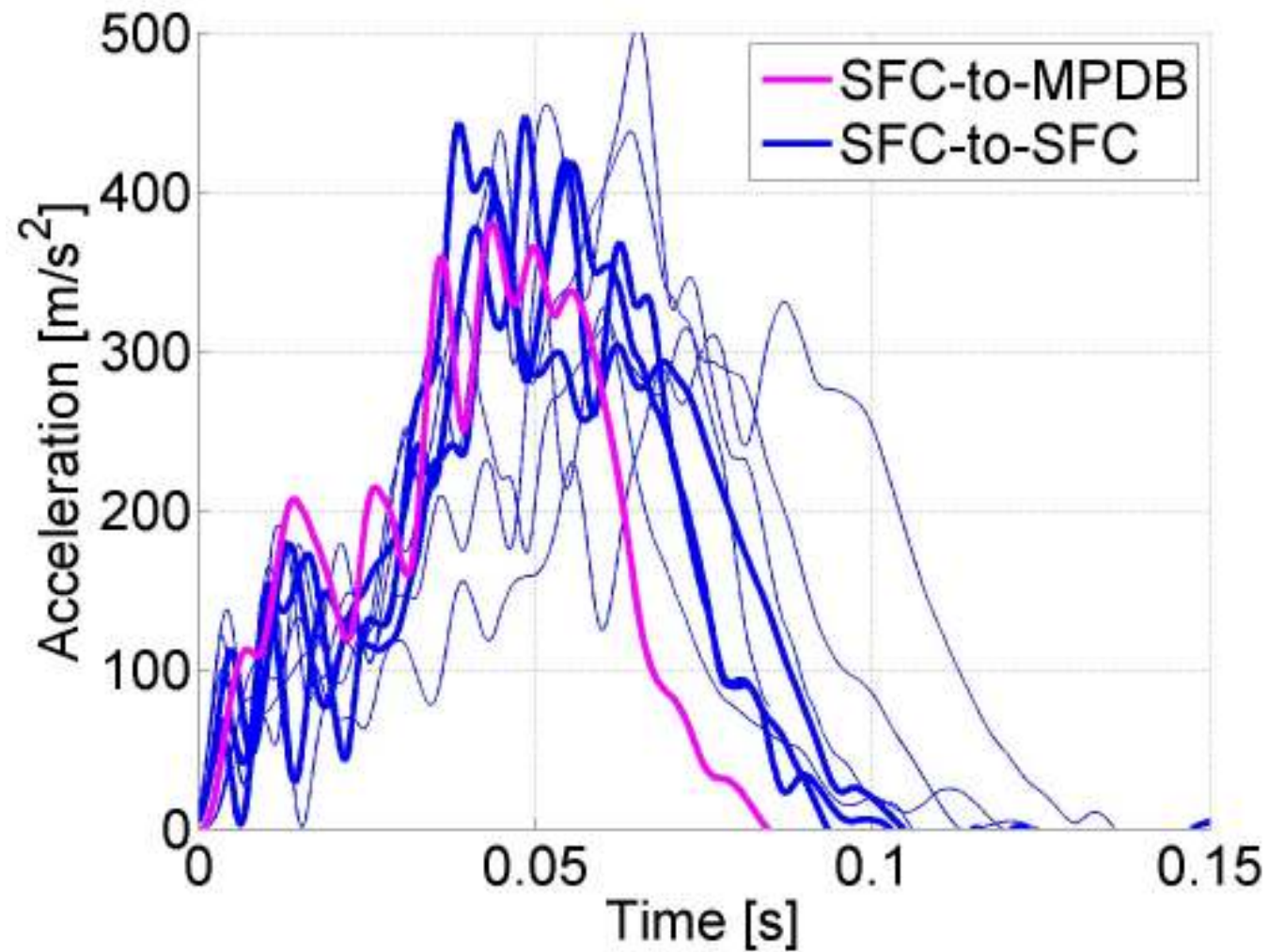
Frontal crash pulse analysis

SFC-to-MPDB and SFC-to-Supermini



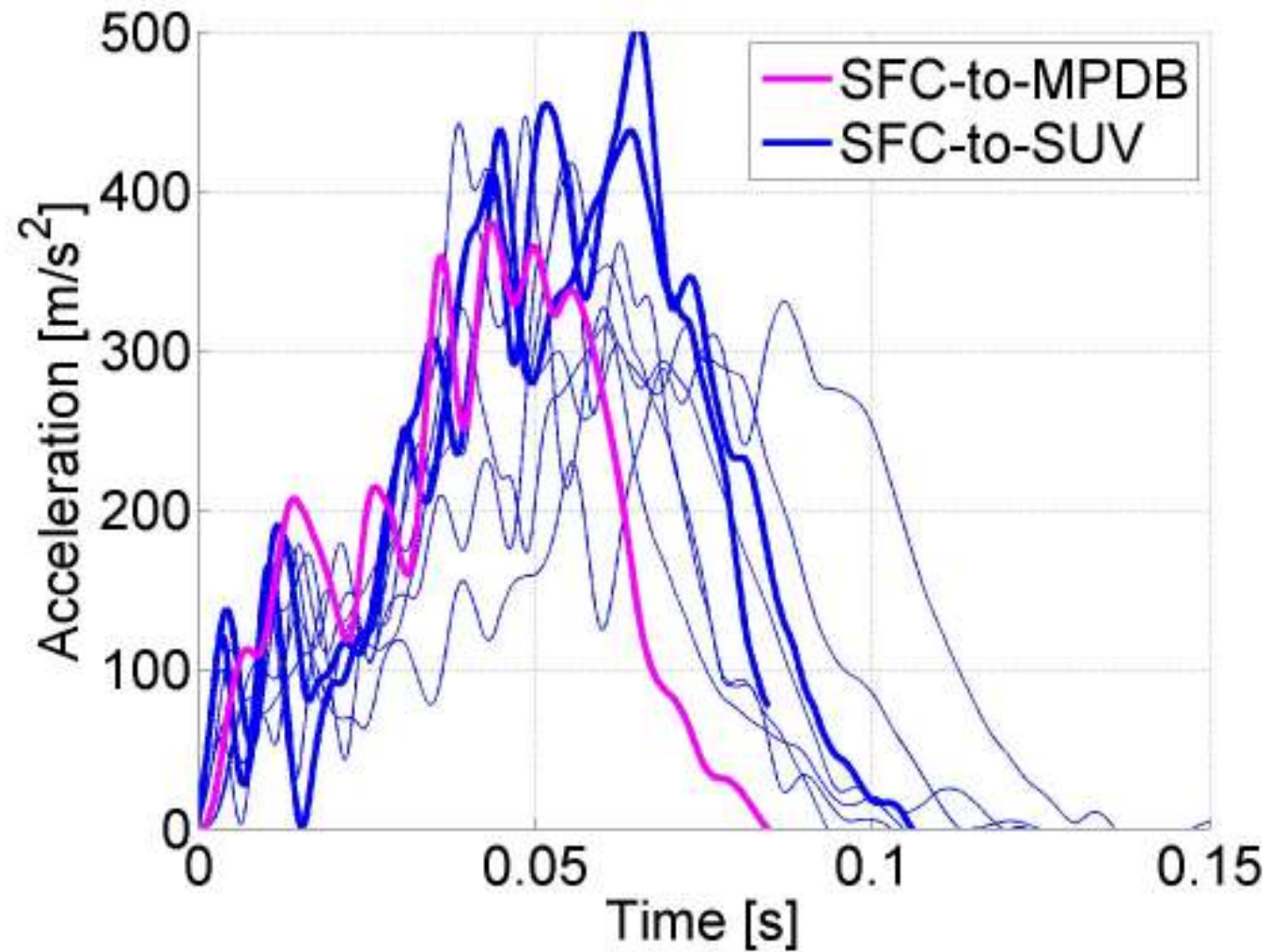
Frontal crash pulse analysis

SFC-to-MPDB and SFC-to-SFC



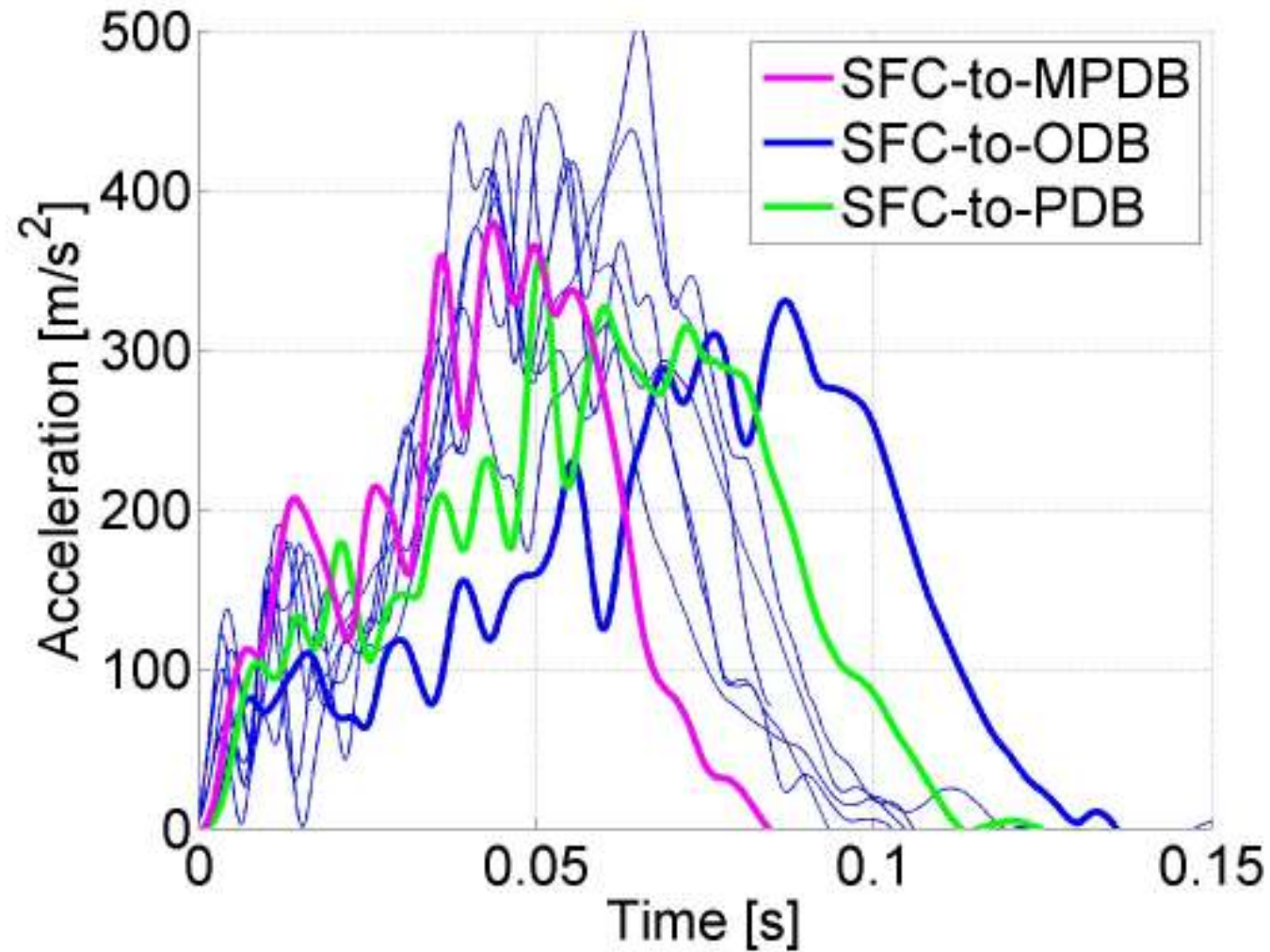
Frontal crash pulse analysis

SFC-to-MPDB and SFC-to-SUV



Frontal crash pulse analysis

SFC-to-MPDB, SFC-to-ODB and SFC-to-PDB



Frontal crash pulse analysis

Conclusions

- In the SFC-to-MPDB test, the SFC crash pulse is representative for a collision with an average European (SFC) vehicle
- The SFC-to-MPDB test shows a real car-to-car crash pulse compared to the ODB and PDB pulses

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Frontal Impact Tests

Test set-up

	Euro NCAP	MPDB-to-Car	Car-to-Car
Velocity	64 km/h	56 km/h	56 km/h
Overlap	40%	50%	50%
Weight	1191kg	1225kg	1221kg
Collision partner	ODB	MPDB	Large SUV
Velocity	0km/h	56 km/h	56 km/h
Weight	Inf	1487kg	2551kg



Test Comparison

Post crash deformation



Euro NCAP

- Little to no A-Pillar deformation
- Little to no intrusion



Car-to-MPDB

- Significant A-Pillar deformation
- Significant intrusion



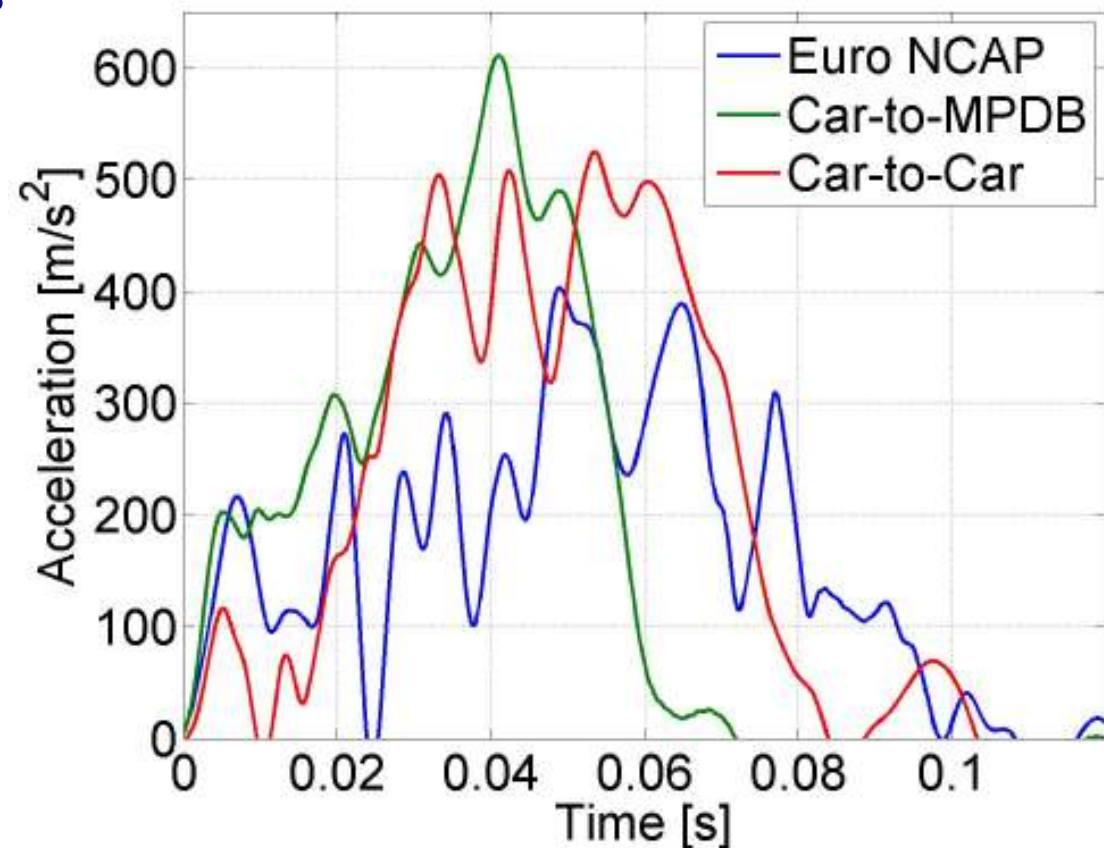
Car-to-Car

- Large A-Pillar deformation due to direct loading
- Large intrusion due to penetration

Test Comparison

Vehicle accelerations

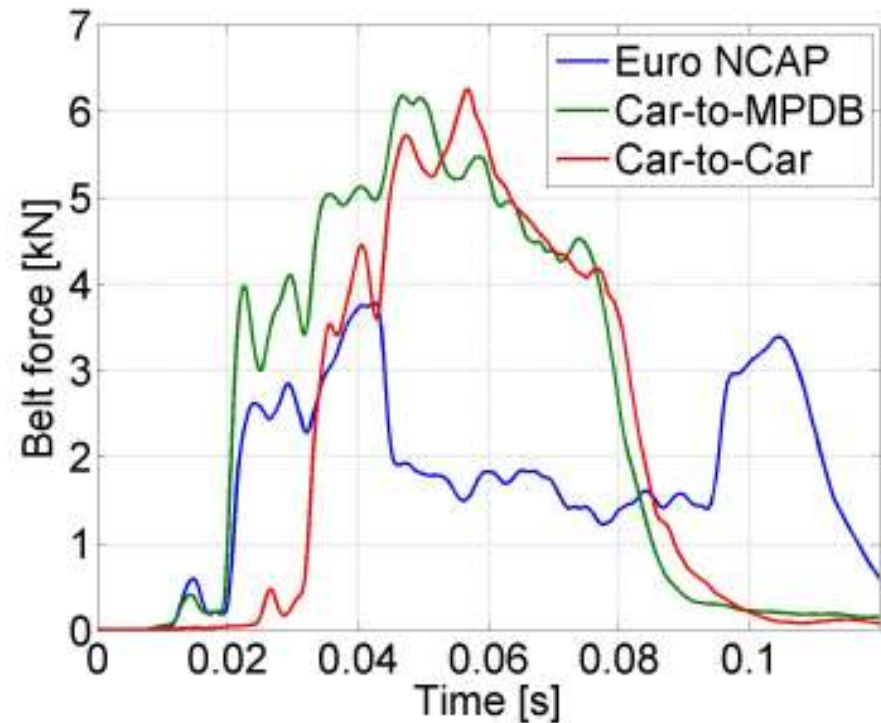
- Barrier tests show higher initial acceleration levels compared to the car-to-car due to different structural interaction
- Poor structural interaction will affect the energy absorption and the performance of the restraint system



Test Comparison

Restraint systems

- Due to the low initial acceleration level the restraint system is triggered late, leading to higher dummy loadings
- This issue will not be solved when the PDB test as proposed is adopted
- Additional criteria or tests are required to assess partner protection and avoid misuse of the PDB



	Airbag firing time
Euro NCAP	Not determined
MPDB-to-Car	~14ms
Car-to-Car	~26ms

Test Comparison

Conclusions

- A barrier is a homogeneous collision partner that guarantees good structural interaction
- Good structural interaction is crucial to ensure engagement of the energy absorbing structures and for in-time triggering of the restraint systems
- Additional assessment criteria or tests are required to assess partner protection and to avoid misuse of the PDB
- A car-to-MPDB test shows to be the best method to imitate a car-to-car collision