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Titel des Beitrags: Criticism of the Current Assessment Approaches for Frontal Crash Compatibility Regarding the Evaluation of Structural Interaction
Abstract: The assessment of structural interaction has been identified as the main challenge of the unresolved problem of frontal crash compatibility. With this background, two questions are raised: Does a better structural interaction correspond with higher safety and crash compatibility? Are current test approaches able to evaluate structural properties? Considering the structural mechanics of collisions, it is hypothesized that a poor structural interaction does not necessarily result in lower safety and should be considered together with compartment strength and restraint systems. This hypothesis is confirmed by reviewing some crash results from other studies. A spring-mass vehicle model is also used to verify the hypothesis. Finally, a comprehensive simulation study is conducted to find the answers to the two questions. For this study three different variations of a vehicle model are created, which represent different structural properties of the passenger car fleet. The crash performance of these models is analyzed in different car-to-car...
and car-to-barrier tests. Results of the car-to-car tests show that better structural interaction often makes the vehicle more aggressive. Generally, better structural interaction increases crash pulse and reduces intrusions. Depending on vehicle design and crash configuration, the intrusions or the crash pulse become more important as to why good or poor structural interaction cannot be overall related to more crash compatibility or occupant safety. The authors' criticism of the current assessment approaches for frontal crash compatibility is the establishment of a direct link between good structural interaction and higher safety. These approaches do not consider the effect of higher crash pulses due to the better structural interaction. The authors' recommendation is to assess the partner protection through metrics about intrusions and crash pulse of the partner, without direct assessment of the structural interaction. Instead, the test configuration should be able to reflect structural properties in intrusions or crash pulse. Results of the car-to-barrier tests show that the Progressive Deformable Barrier can reflect structural issues correctly. However, the developed metrics for this barrier result in incomprehensive interpretations. Results of the tests with other barriers are inconsistent with the structural properties of the vehicles. Finally, an exemplary test concept with the Advanced European Mobile Deformable Barrier is presented as an alternative assessment approach. Simulation results of the proposed assessment approach show good consistency with the crash performance of the vehicles in the car-to-car tests. Combination of this test concept with the Full-Width Rigid Barrier test can be used to assess the safety and crash compatibility of passenger cars.

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