

Mass distribution in the Toyota Venza<sup>1</sup>

## Why light weight design in chassis?

Mass remains a key resistance factor at constant speed or on gradients, even if the acceleration energy, inevitably lost when braking, can in part be recuperated by hybridisation of the power train. From the example of the study by Lotus Engineering in 2010 it is clear, that the chassis with brakes and wheels in its present form carries a similar part (24%) of the total weight, compared to body and drivetrain

## Alternative materials for the chassis

Especially with regards to the energy needs and the increase in range and the conservation of resources, all means available must be harnessed to make the vehicle lighter. In the chassis area substantial mass can still be saved without forfeiting safety. Fiber reinforced plastics offer themselves here to exploit the still available potential and to ensure sustainable mobility.

By the use of the new FRP material system in the chassis area, a weight saving of more than 30% compared to the steel reference can be realized.

## Development of a long short arm concept in FRP

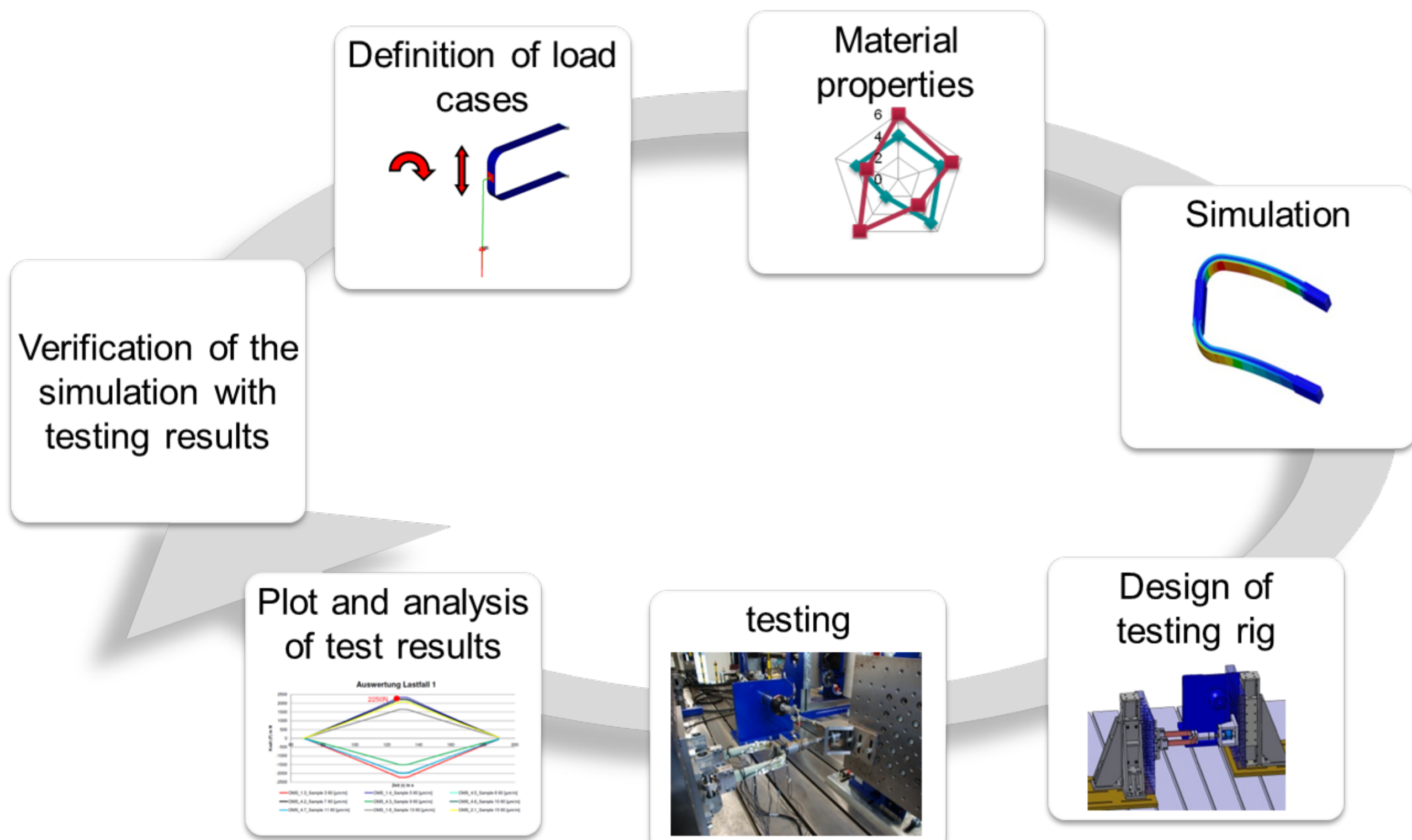
In the development of the long-short arm (sword) concept in fibre composite plastic, all degrees of freedom were first defined including the design space. Topology optimisation using the Altair Hypershape/Catia plug-in for the numeric calculation showed distinct load paths, which were then used for further conceptual designs (one shell design and two shell design). As the transfer moulding process of SMC, as well as the thermoforming of GMT are particularly economical and capable of short cycle times, the optimum materials to be used were ascertained, corresponding to their static material characteristic values. To evaluate the concepts, the models were set with different material cards for GMTex, SMC GF50 and SMC CF60 and calculated for the three most important load cases using CATIA V5 static analysis.

## Conclusions

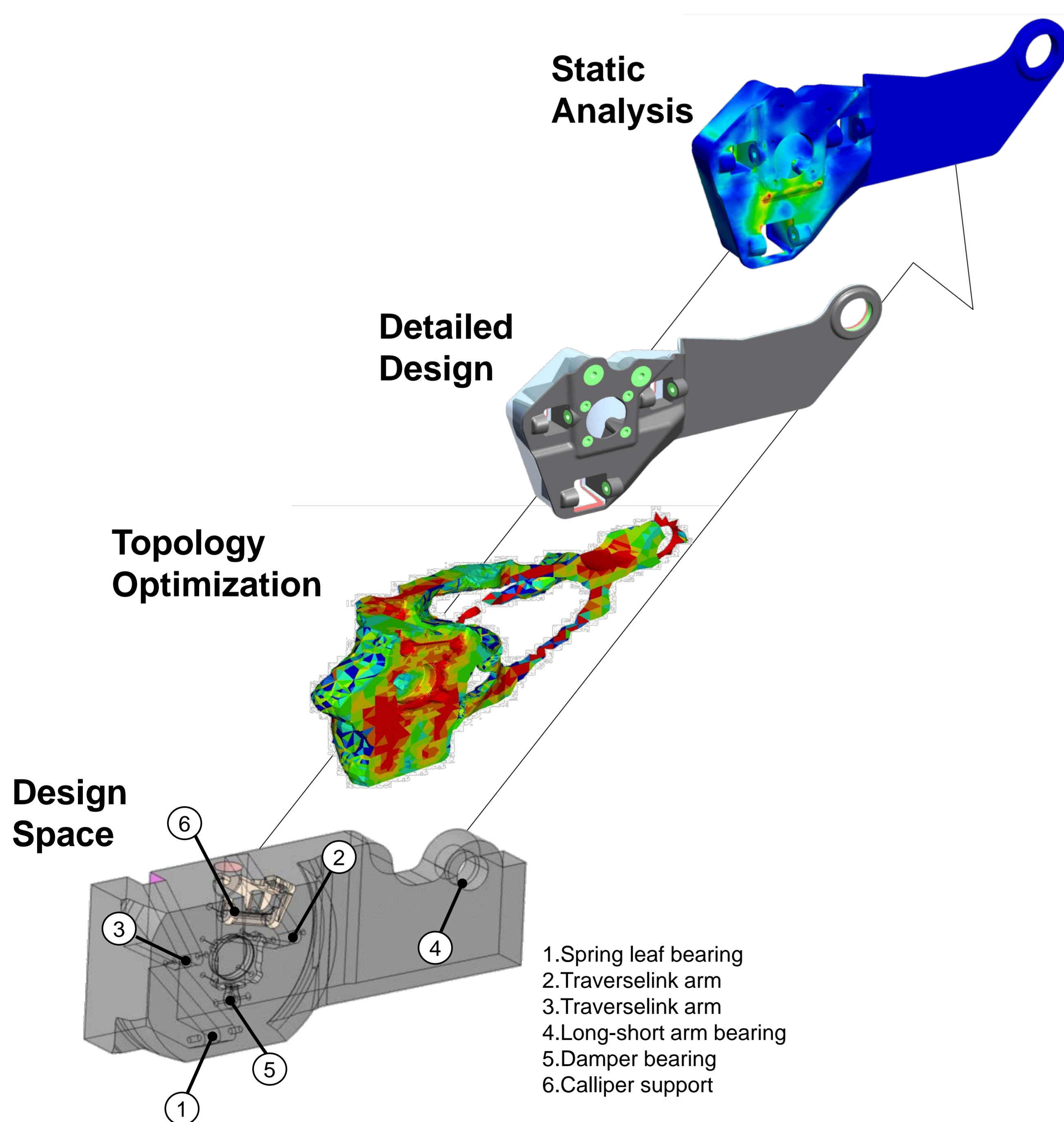
In the chassis area substantial mass can still be saved without forfeiting safety. Fiber reinforced plastics offer themselves here to exploit the still available potential of a weight saving of more than 30% and to ensure sustainable mobility.

## Main reference

1. Lotus Engineering Inc.: "An Assessment of Mass Reduction Opportunities for a 2017 – 2020 Model Year Program", 2010
2. BMBF Aktives Leichtbaufahrwerk, Förderkennzeichen: 03X3023C



Development methodology for fiber reinforced plastic components<sup>2</sup>



Development of a long short arm concept in FRP<sup>2</sup>

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