

IWG TF-PP3, Discussion on 2/3 and 1/3 HIC Zones

2021-11-30

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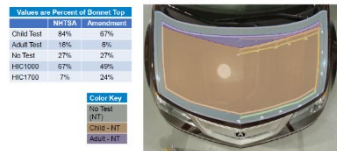
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Introduction

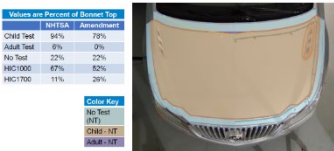
- In the process of amending the GTR No.9, different perspectives on the assessment of percentage of the bonnet test area have been presented.
- One new view is, that 2/3 of the HIC performance need to be related to all the bonnet top test area, while the performance can only be generated in the test area with the offsets of half of an impactor diameter, 82.5mm, which de facto declares the remaining zones to 1/3 performance, irrespective of their HIC value, without the offset.
- The longstanding practice in UN-R 127 relates the percentages to the test area which is aimed at, and values are assigned to the measuring point.

TFPP3-1-04

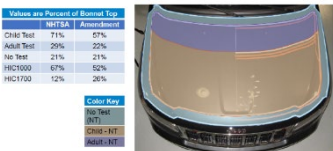
2010 Acura MDX



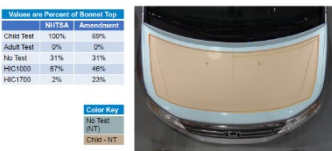
2010 Buick LaCrosse



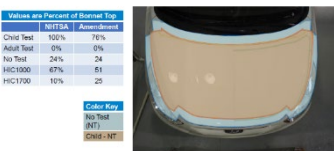
2011 Jeep Cherokee



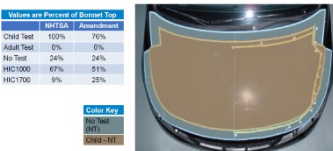
2011 Honda Odyssey



2011 Hyundai Tucson



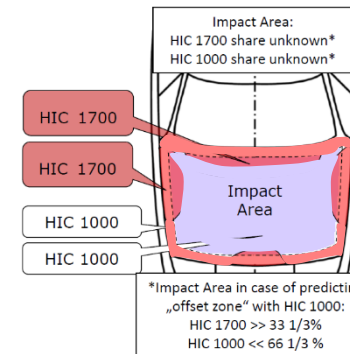
2010 Kia Forte



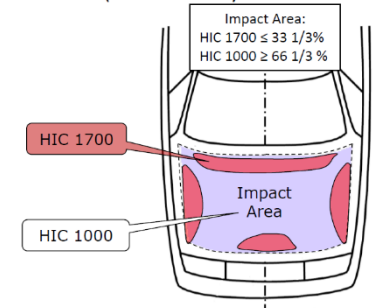
TWSG-01-06

Markup Methods

Wrong interpretation of GTR9 in its original version:



Correct interpretation of GTR9 in its original version (as clarified by Amendment 3):

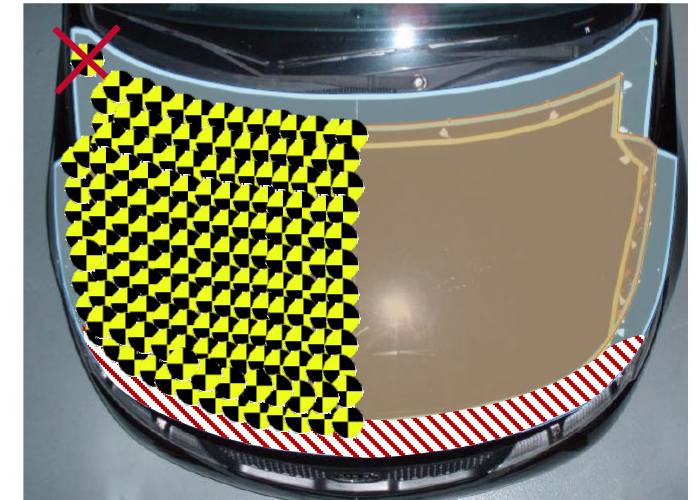


Hypothesis

- The head impact performance is only related to the area of the test as marked in the orange color.
- Large areas of the bonnet seem to be excluded from the performance assessment (grey area in the picture), as no contact point is located in these offset zones.
- 2/3 of all bonnet top test area need to meet HIC1000 within the limits of the reference line offsets, as the other zones are unassessed and therefore deemed “remaining areas” with target HIC1700.

2010 Kia Forte

Values are Percent of Bonnet Top		
	NHTSA	Amendment
Child Test	100%	76%
Adult Test	0%	0%
No Test	24%	24%
HIC1000	67%	51%
HIC1700	9%	25%



Comment:

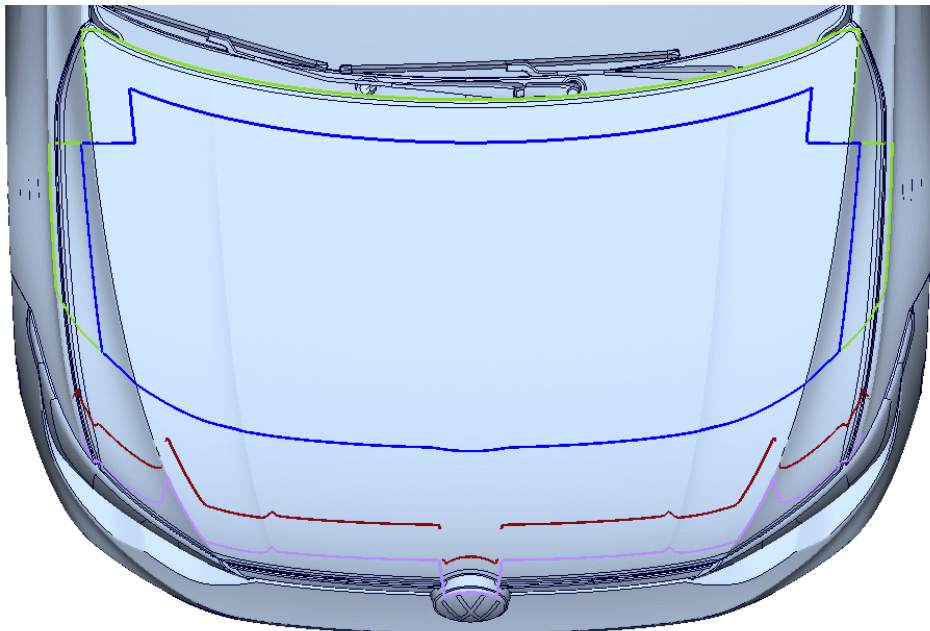
The area in front of the WAD1000 is shown in grey but is in fact no zone with an offset of 82.5mm, and shall therefore not be taken into consideration for the percentage calculation of area differences between NHTSA approach and the GTR No.9 amendment.

Color Key

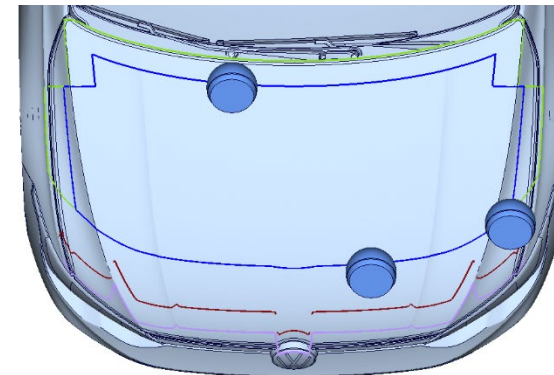
No Test (NT)
Child - NT

Hypothesis Test based on Vehicle Data

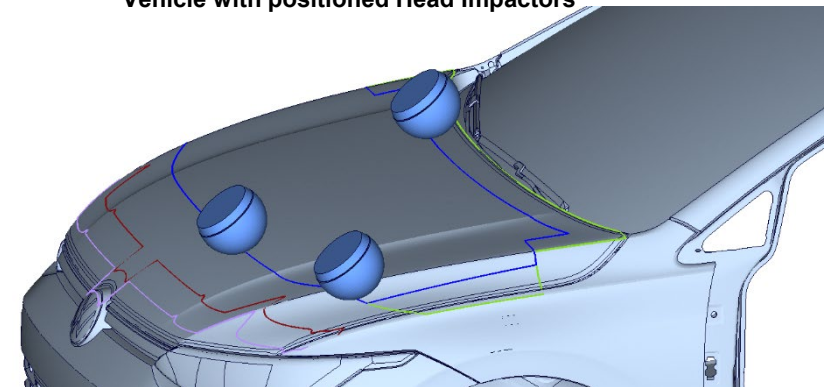
- › HIC values are directly related to deformation; every vehicle deformation contributes to the HIC performance.
- › If the hypothesis is correct, little to no deformation occurs in the offset areas, as they are deemed to be „unassessed areas“.
- › The offset zones, as well as the WAD1000 were analyzed with regard to their interaction of vehicle and impactor.
- › CAE simulations were conducted to generate section views and deformation plots to analyze the location of the deformations by the impacts on the (offset) test area boundaries.



Vehicle Top View with Head Impact Reference Lines

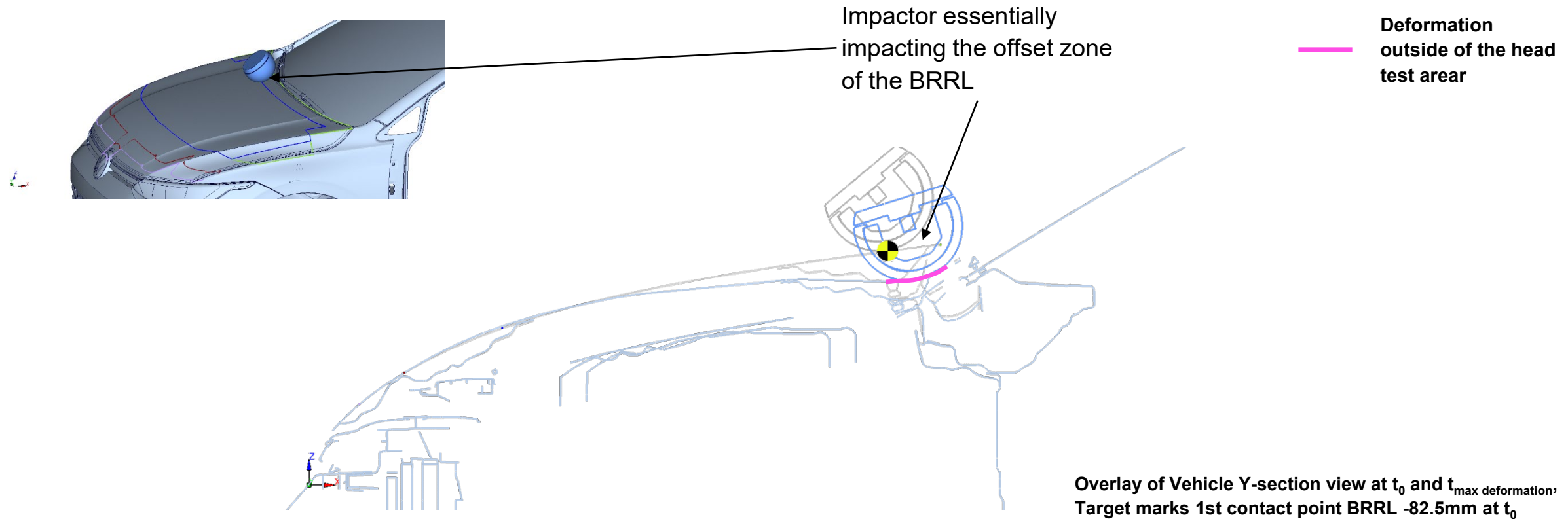


Vehicle with positioned Head Impactors



Hypothesis Test based on Vehicle Data, Sections

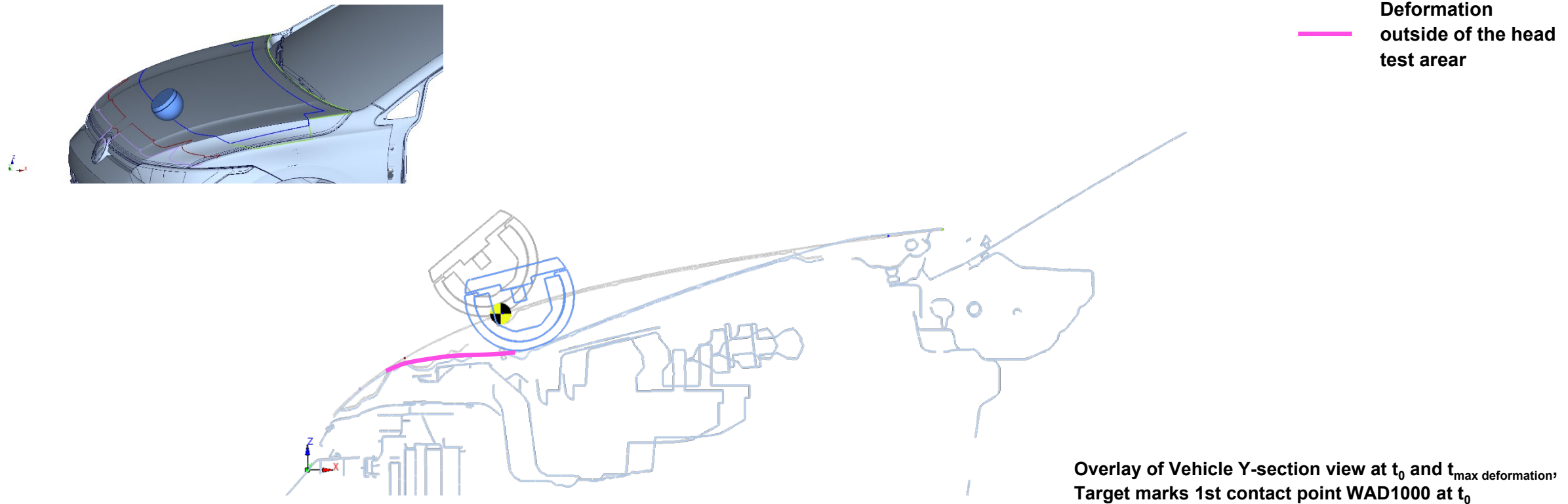
Bonnet Reference Line -82.5mm Deformation Analysis



- Large area of deformation in front of and behind BRRL -82.5mm up to end of bonnet
- Significant contribution to low HIC values by vehicle area within the offset zone

Hypothesis Test based on Vehicle Data, Sections

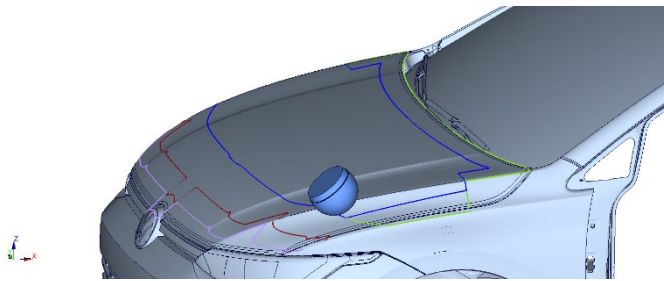
WAD1000 Deformation Analysis



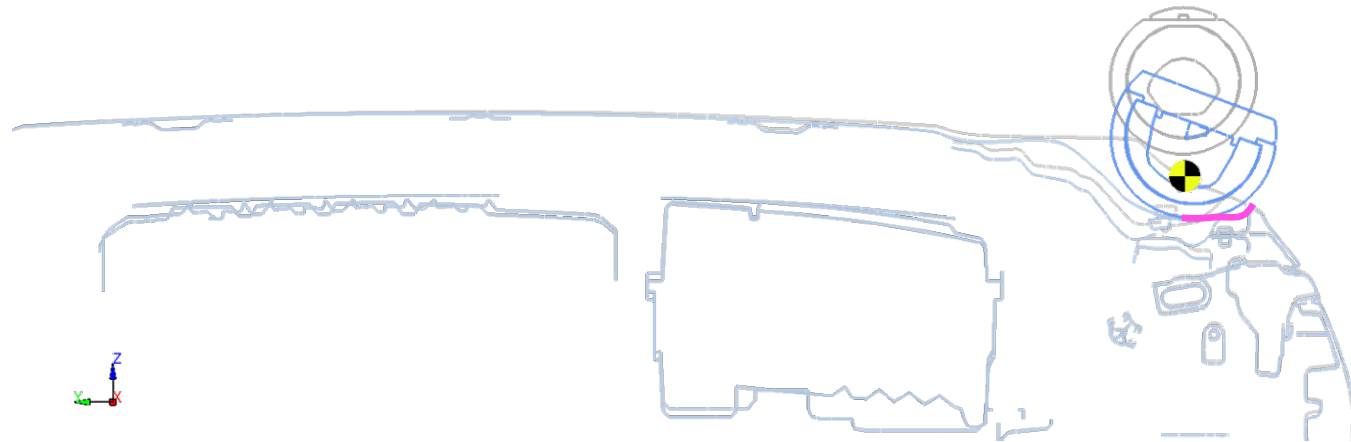
- Large area of deformation in front of WAD1000
- Significant contribution to low HIC values by vehicle area outside of reference lines

Hypothesis Test based on Vehicle Data, Sections

Side Reference Line -82.5mm Deformation Analysis



— Deformation
outside of the head
test area

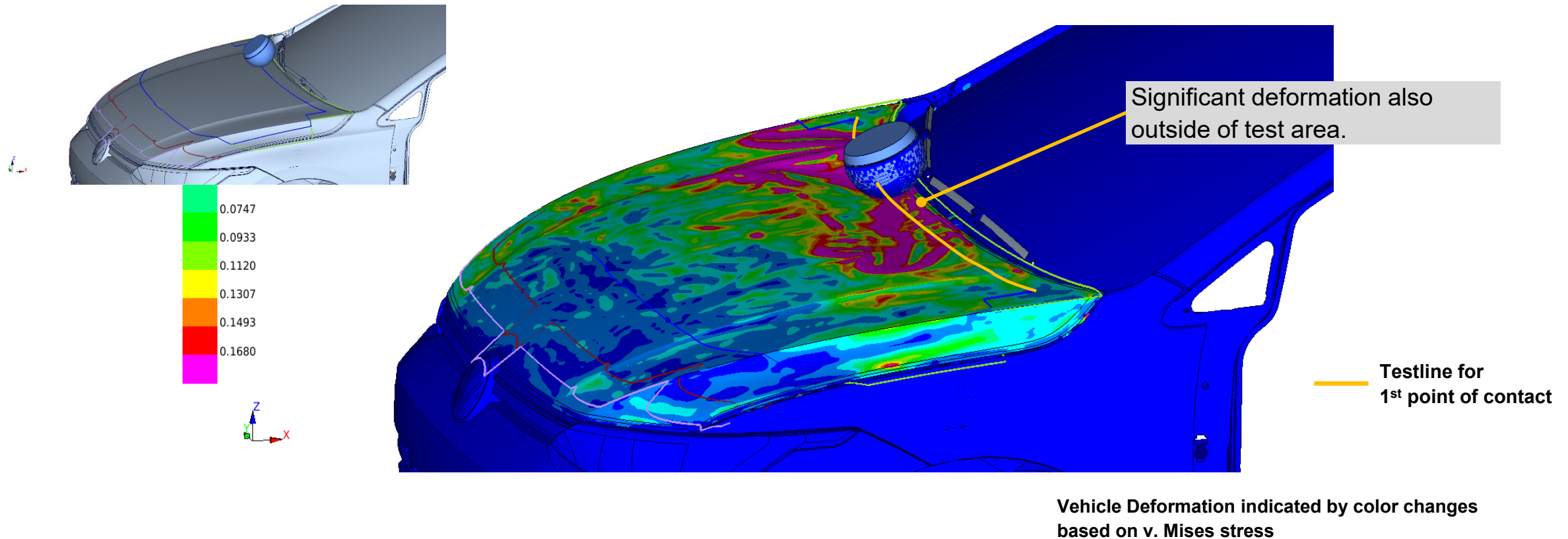


Overlay of Vehicle X-section view at t_0 and $t_{\text{max deformation}}$
Target marks 1st contact point SRL -82.5mm at t_0

- › Deformation within the offset zone, outside of Side Test Line occurs
- › Contribution to HIC value by deforming area within the offset zone

Hypothesis Test based on Vehicle Data, 3D Visualization

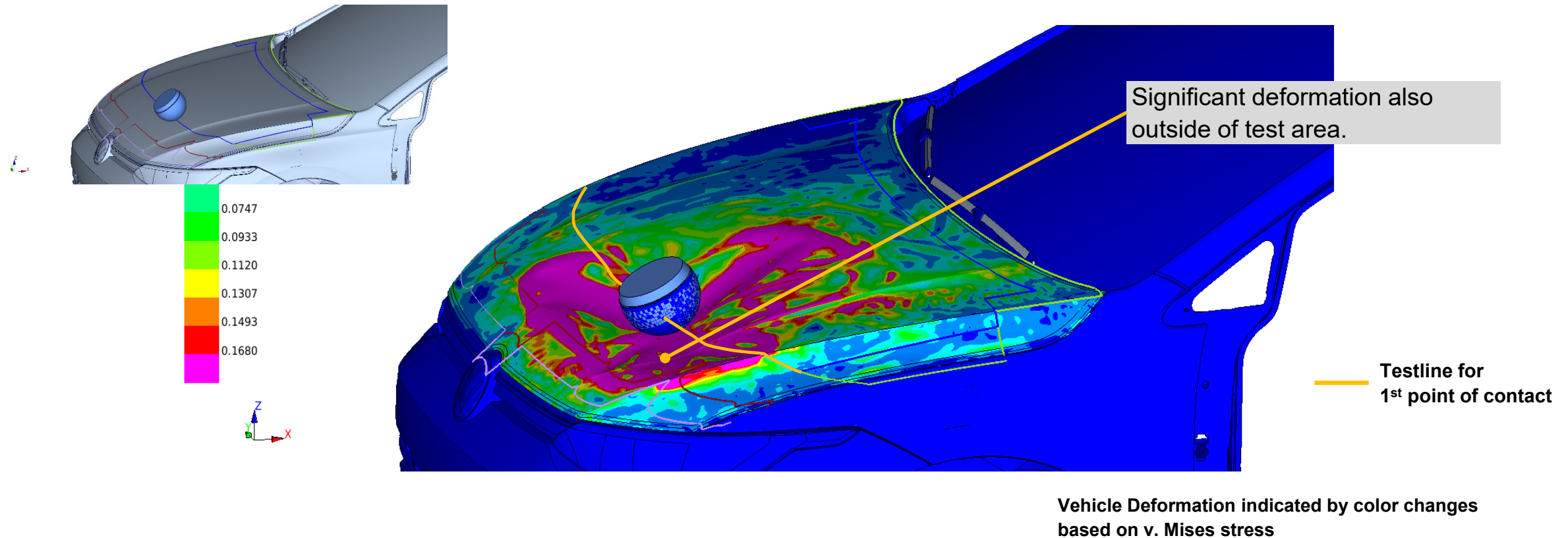
Bonnet Reference Line -82.5mm Deformation Analysis



- Large area of deformation in front of and behind BRRL -82.5mm up to end of bonnet
- Significant contribution to low HIC values by vehicle area within the offset zone

Hypothesis Test based on Vehicle Data, 3D Visualization

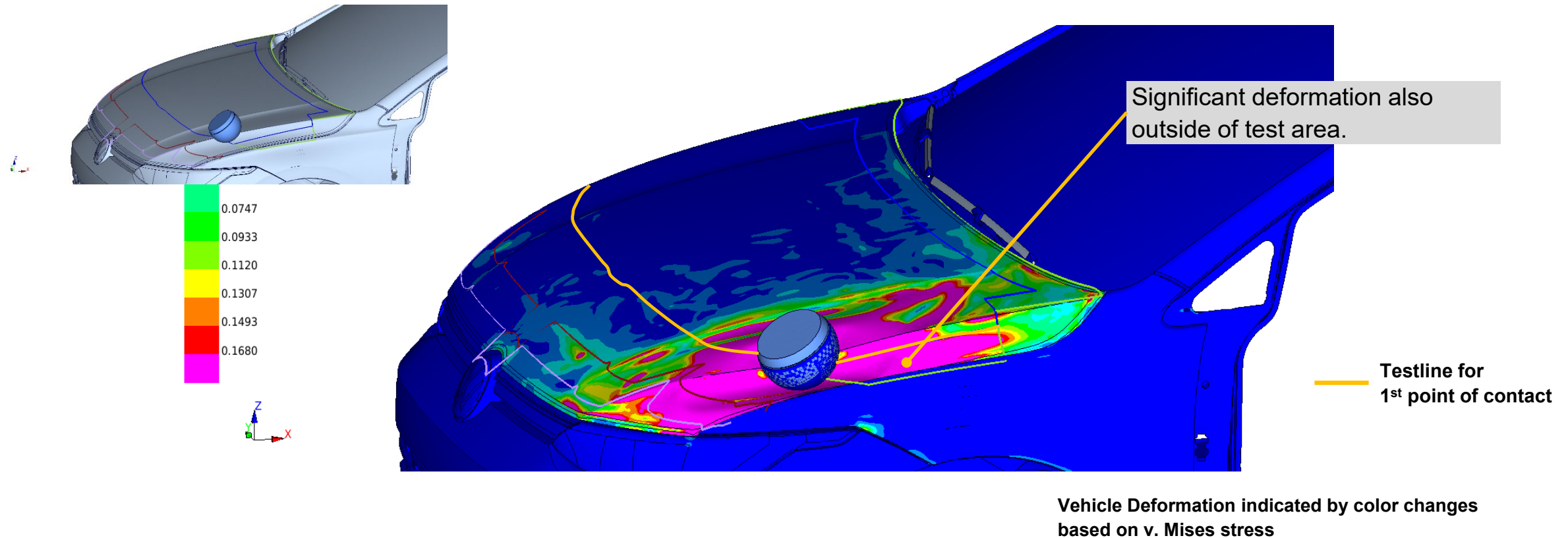
WAD1000 Deformation Analysis



- Large area of deformation around impact point
- Significant contribution to low HIC values by vehicle area outside of reference lines

Hypothesis Test based on Vehicle Data, 3D Visualization

Side Reference Line -82.5mm Deformation Analysis



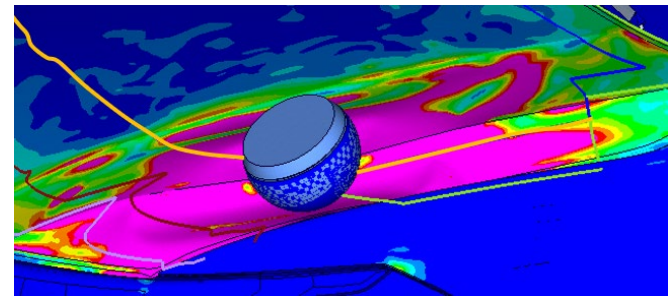
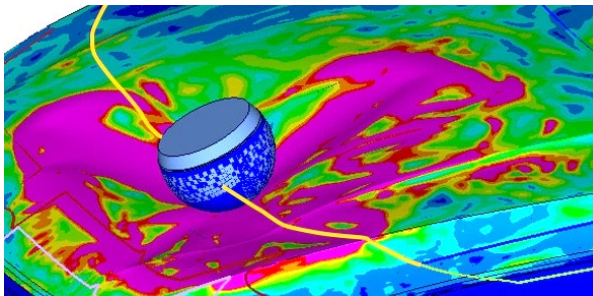
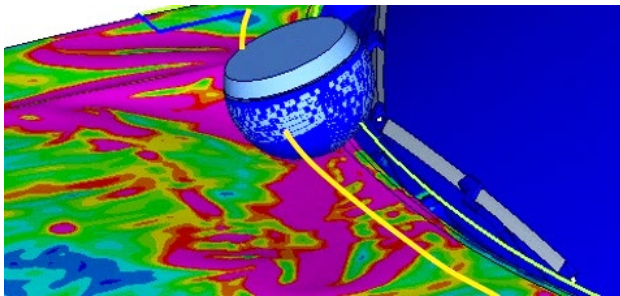
- > Deformation up to SRL occurs by impact on SRL -82.5mm (CoG impactor)
- > Contribution to HIC value by area within the offset zone and in front of test area

Discussion and Summary

- The offsets for positioning the head impactor (82.5mm, half of the head diameter) were once agreed to:
 - assure the assessment of the complete test area, up to the side reference lines while
 - avoiding glancing blows and assessing structures outside of the reference lines.

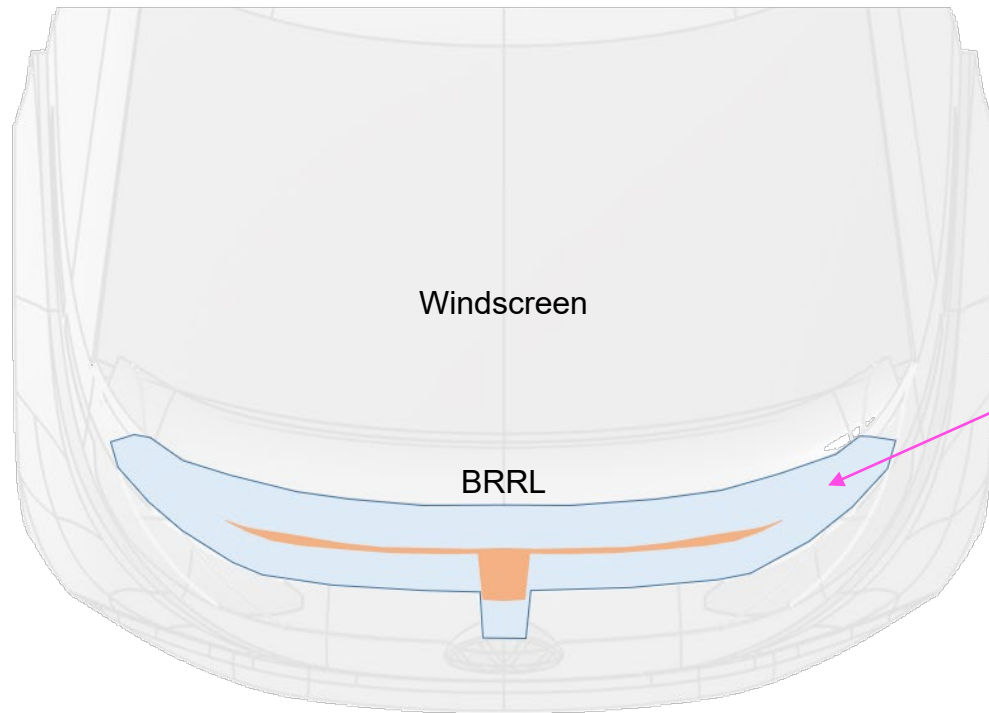
- It is widely acknowledged that an HIC performance is assigned to the impact point, not the tested area and its deformation.
- Deformations as shown in this study are typical for tests close to the reference lines, are directly related to HIC performance, which results from interaction of the impactor with the structures within the reference lines.
- Impact points within the offset zones are not foreseen and not in the spirit of the regulation.

- **Therefore, the offset areas cannot be deemed “untested areas”, as they are assessed by the impacts currently used in pedestrian regulations and have a significant contribution to HIC values when testing near the reference lines.**
- **This is reflected in the GTR No.9 amendment clarification proposal.**



› Backup

- › Example of a vehicle where there is no possibility to obtain 2/3 of all area within the impact area.
- › On such vehicles, no compliance with the NHTSA understanding would be feasible.



Head test area << 67% of bonnet top



VW ID Buzz Concept