Repeatability of the Deformable Element
Test series with the Reference Vehicle

GRSP IWG Frontal Impact, Brussels

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Objective

In previous research projects the repeatability of the full width deformable barrier was analyzed. It was not fully answered if the vehicle or the deformable element of the full width test with the load cell wall used caused differences.

Therefore a test series with a „reference“ vehicle attached with an PDB barrier against the FWDB was conducted.
Method and Materials

- Reference vehicle with restraint system and interior parts

- The PDB barrier produces relative low and equal distributed loads on the load cell wall

- Barriers
  - PDB-XT for the front structure of the vehicle
  - FWDB as the collision opponent on the LCW
Test Configuration

Test speed 55 kph

700 mm overlap -> 40 % of the car
Vehicle Position after Crash
Comparison of Deceleration pulses

Deceleration pulses of the three tests are comparable

![Graph showing deceleration pulses for three tests](image-url)
Comparison of Deformed Elements after Crash

No unusual differences at the deformed barriers were detected
Impact alignment was good
Row 1 and 6 are on the edge
Comparison of the maximum force in row 1 to 6
LCW Maximum Forces - RFK1SP02

Comparison of the maximum force in row 1 to 6
Comparison of the maximum force in row 1 to 6
### Maximum Values of the Row Force

<table>
<thead>
<tr>
<th>Row</th>
<th>RFK1SP01 [kN]</th>
<th>RFK1SP02 [kN]</th>
<th>RFK1SP03 [kN]</th>
<th>Average [kN]</th>
<th>Deviation in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>56.3</td>
<td>62.2</td>
<td>61.9</td>
<td>60.1</td>
<td>-9.6</td>
</tr>
<tr>
<td>5</td>
<td>63.3</td>
<td>69.1</td>
<td>66.2</td>
<td>66.2</td>
<td>-8.4</td>
</tr>
<tr>
<td>4</td>
<td>73.0</td>
<td>74.7</td>
<td>71.0</td>
<td>72.9</td>
<td>-5.0</td>
</tr>
<tr>
<td>3</td>
<td>83.0</td>
<td>83.7</td>
<td>84.7</td>
<td>83.8</td>
<td>-2.0</td>
</tr>
<tr>
<td>2</td>
<td>90.5</td>
<td>92.5</td>
<td>92.6</td>
<td>91.9</td>
<td>-2.2</td>
</tr>
<tr>
<td>1</td>
<td>61.9</td>
<td>52.2</td>
<td>51.5</td>
<td>55.2</td>
<td>-16.8</td>
</tr>
</tbody>
</table>

Calculation row forces: sum of all cells in one row at one time, then calculate maximum value.
Deviation in row 2, 3 and 4 is good; row 6 and 1 was hit only partially because they are on the edge.
Comparison of Row 3 and 4 in test 1 to 3

The forces in the main rows (row 3 and 4) were very close
The structure of the PDB leads to small uncertainties in row 5
Conclusions

• Acceptable repeatability capability of the LCW, even when two barriers were attached

• This test configuration is kind of worst case situation because
  – Low forces per load cell
  – Influence of two crash barriers
  – BASl load cell wall with uncertainties

• The results are promising if whole time period and the maximum value of the row force are considered

• Row 1 and 6 are not as good as due to the honeycomb edge effects occur and partial overlapping of the barriers
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Thank you for your attention

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