Informal Group on GTR9 Phase 2
(IG GTR9-PH2)
6th Meeting
– Validation of Flex-GTR model –

March 12, 2013
Japan Automobile Standards Internationalization Center (JASIC)
Outline

1. Background
2. Validation matrix
1. Background

- At the 5th IG GTR9-PH2 meeting, BASt proposed to revise the current "Flex-GTR injury threshold values" because of the difference between the output values of “Flex-GTR-prototype” and “Flex-GTR master legs” under dynamic certification test conditions as well as car test conditions (see details: GTR9-5-20).
- However, the current "Flex-GTR injury threshold values" were obtained by converting "Human injury threshold values" into "Flex-GTR injury threshold values" using "transfer functions" which were obtained from the relationships between the output values of “Human model” and “Flex-GTR model” (see details: GTR9-5-27). Therefore, the output values of “Flex-GTR-prototype” were not used to determine “Flex-GTR injury threshold values”.
- On the other hand, the output values of “Flex-GTR model” were used to determine “Flex-GTR injury threshold values”, therefore, we decided to validate the "Flex-GTR model" against the latest certification test methods/corridors which were set by using the output values of "Flex-GTR master legs", to clarify whether or not the revision of the threshold values is necessary.
1. Background, contd.

Threshold Determination Process (ref. GTR9-5-27)

- Biomechanical Data Scaled to the Size of the Legform
- Survival Model using Weibull Distribution
- Human Injury Probability Functions
- Transfer Functions (Human → FlexPLI)
- FlexPLI Injury Probability Functions
- FlexPLI Injury Thresholds

Correlation of FlexPLI Model Response with Human Model Response

All the details provided in GTR9-1-06r1
## 2. Validation matrix

- We are conducting "Flex-GTR model" validation using following validation matrix.

<table>
<thead>
<tr>
<th>1.</th>
<th>Tibia/Femur bone core 3-point bending</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Tibia/Femur assy 3-point bending</td>
</tr>
<tr>
<td>3.</td>
<td>Knee assy 3-point bending</td>
</tr>
</tbody>
</table>

### 4. Pendulum

- Dynamic Certification Test Rig (Pendulum type)
- Knee joint centerline
- Stopper bar
- Pin joint
- Additional Mass
- Mass: 5.0 kg ± 0.05 (with screws)
- Inertia: 0.0061 ± 0.0006 kgm²
- 540 ± 2 Center of gravity of additional mass
- Impactor side
- R6 ± 1
- Release the FlexPLI within 10 ms after the moving ram impact

### 5. Inverse

- Moving ram guide
- Moving ram: Width (w) 200 ± 5 mm, Depth (d) 60 ± 2 mm, Length (l) 160 ± 5 mm
- Crash strength: 75 ± 10% psi
- Impact face
- Y axis
- Z axis
- X axis
- Moving ram guide
- Impact face
- Honeycomb
- Width: 800 ± 5 mm
- Length: 160 ± 5 mm
- Crash strength: 75 ± 10% psi
2. Validation matrix, contd.

- We propose NOT to include "Flex-GTR model" validation against car test into the validation matrix because:
  - A "car model" validity also affects the validation results. (can NOT conduct a pure validation of "Flex-GTR model")
  - To obtain car test data using "Flex-GTR master leg", we need to get one of the "Flex-GTR master legs" back to Japan which are currently used in Europe and USA. That will affect the progress of the Europe and/or USA round robin test or other activities (i.e. activities such as testing or in-depth drawing check may need to be suspended)
Thank you for your attention