IHRA/PS/310
27 Sep. 2004

# IHRA/PS Decisions for the IHRA/PS Legform Test Procedures

IHRA/PS Working Group

## Physical Properties

IHRA/PS/119R2, 309

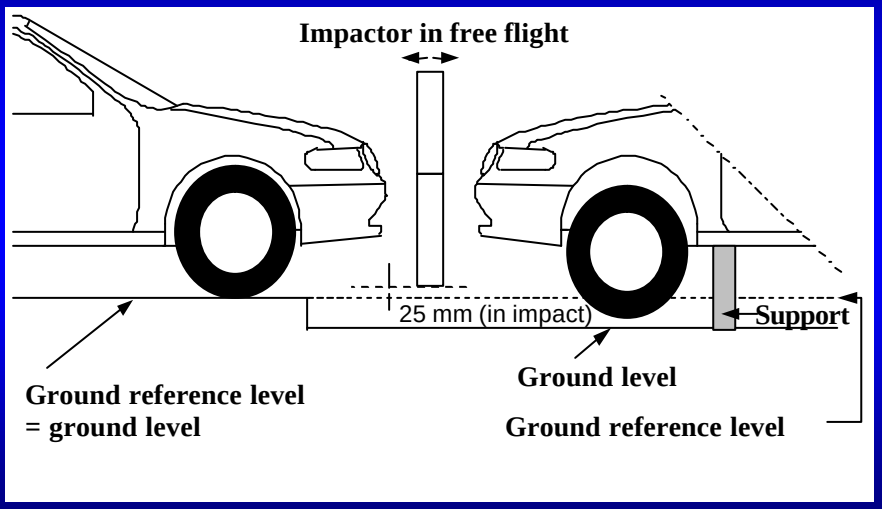
- Physical properties are based on 50th percentile of male

| Physical Properties | IHRA/PS/119R2 |
|---|---|
| **Length** | |
| 1) Leg length between the bottom and the knee joint center (mm) | 493 +/- 5 |
| 2) Thigh length between the knee joint center and the top (mm) | 428 +/- 5 |
| **Center of gravity** | |
| 1) Center of gravity of leg from the knee joint center | 233 +/- 10 |
| 2) Center of gravity of thigh from the knee joint center (mm) | 218 +/- 10 |
| **Mass** | |
| 1) Total leg form impactor mass (kg) | 13.4 +/- 0.1 |
| 2) Leg mass including skin and foam (kg) | 4.8 +/- 0.1 |
| 3) Thigh mass including skin and foam (kg) | 8.6 +/- 0.1 |
| **Moment of inertia** | |
| 1) Moment of inertia around y axis of leg (kg-m^2) | 0.120 +/- 0.001 |
| 2) Moment of inertia around y axis of thigh (kg-m^2) | 0.127 +/- 0.001 |

# Test Method

IHRA/PS/295

- The impact height for the legform impactor was decided tentatively 25 mm above the ground reference level.

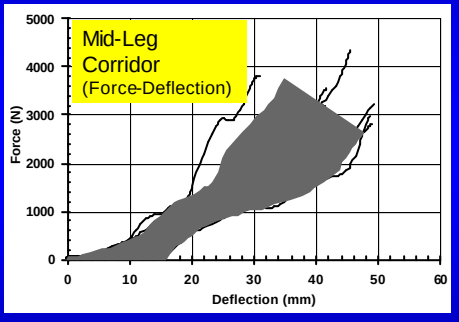


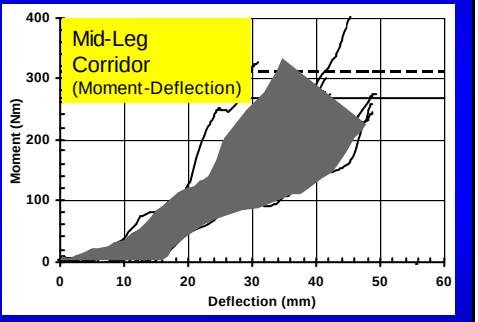

# Response Corridor for Leg

IHRA/PS/296, 309

- UVA Dynamic Leg bending test corridor is adapted.

Leg Bending Corridor



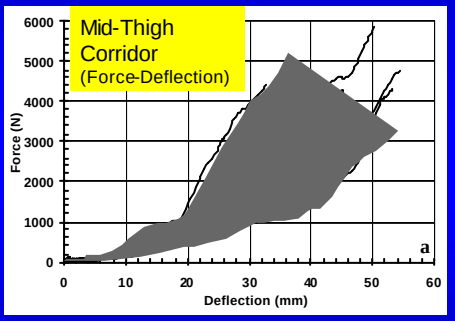



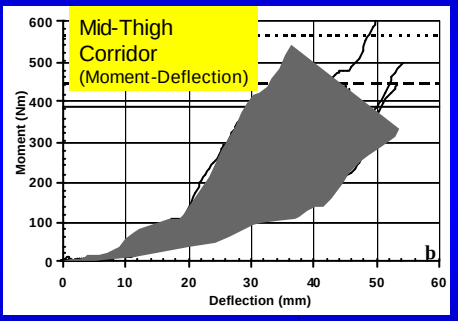
# Response Corridor for Thigh

IHRA/PS/296, 309

- UVA Dynamic Thigh bending test corridor is adapted.

Thigh Bending Corridor



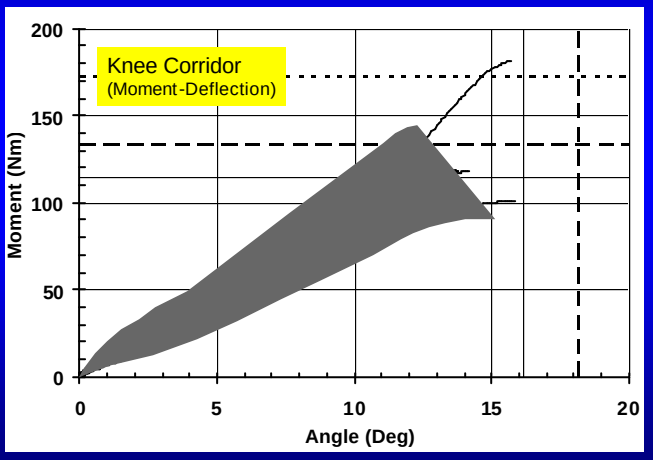




# Response Corridor for Knee (1)

IHRA/PS/296, 309

- UVA Dynamic Knee bending test corridor is adapted.
- Muscle effect will be considered when the effect is clear.

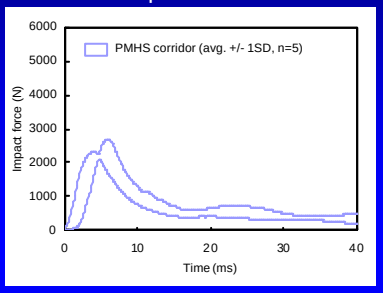
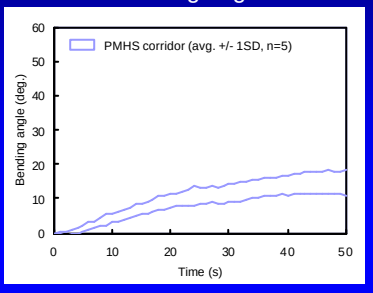
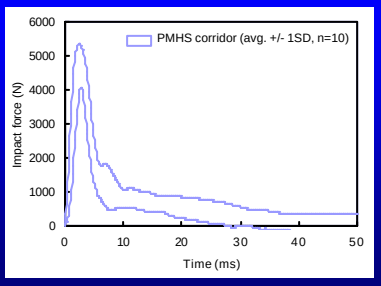
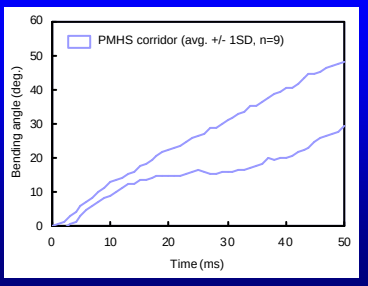
Knee Bending Corridor



# Response Corridor for Knee (2)

IHRA/PS/300, 309

- Hanover Dynamic Knee bending test corridor is adapted.

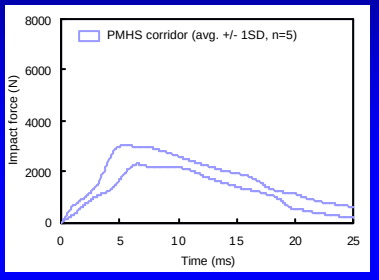
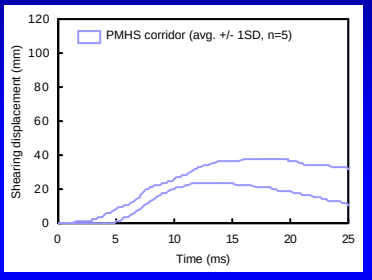
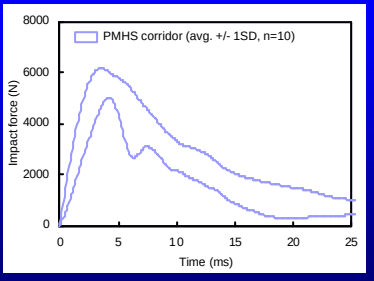
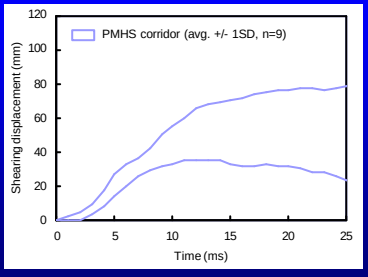
| | Impact force | Bending angle* |
|---|---|---|
| V=20km/h |  |  |
| V=40km/h |  |  |

* obtained from target marks on the long bone

# Response Corridor for Knee (3)

IHRA/PS/300, 309

- Hanover Dynamic Knee shearing test corridor is adapted.

| | Impact force | Shearing displacement* |
|---|---|---|
| V=20km/h |  |  |
| V=40km/h |  |  |

* obtained from target marks on the long bone

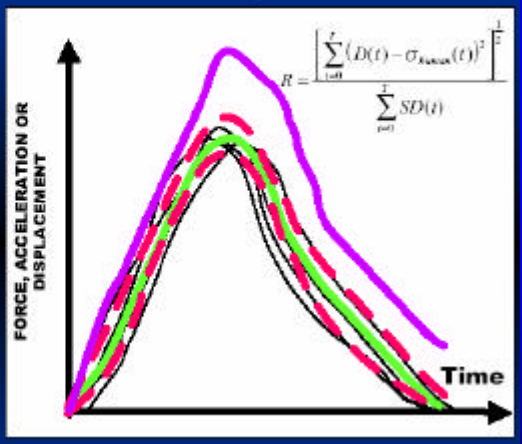
## Impactor Evaluation Method

IHRA/PS/290, 295, 304

- Bio-Rating Method of Maltese M. R. (NHTSA) is adapted.

### Dummy-to-Human Comparison

- Human surrogate and dummy response signals are overlayed
- The dummy response (D), surrogate mean (• ), and standard deviation (SD) are then combined to quantify (R) how well the dummy matches the cadaver.



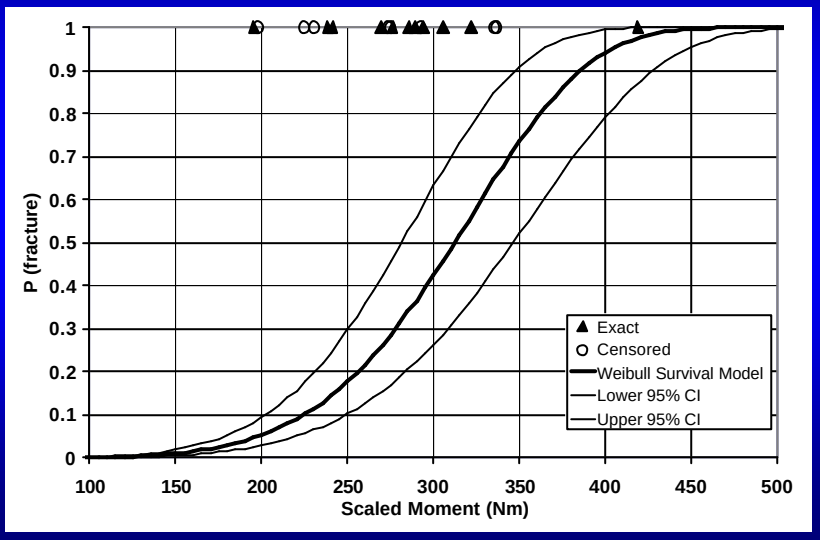

Maltese M. R. (NHTSA)

## Injury Risk Curve for Leg

IHRA/PS/301, 309

- UVA Injury Risk Curve for Leg is adapted.

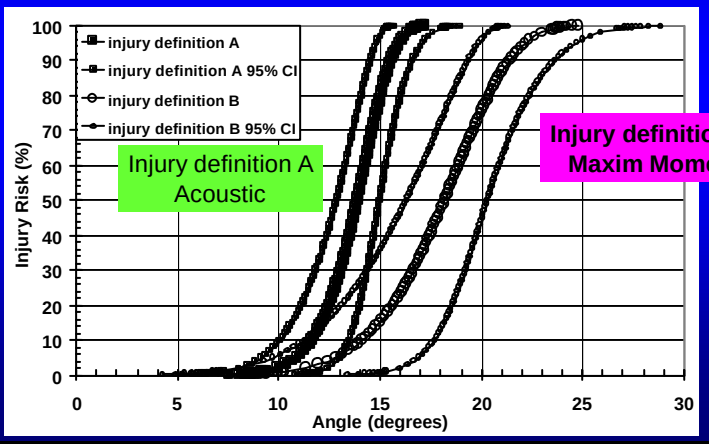
Injury Risk Curve for Mid-Leg



## Injury Risk Curve for Knee

IHRA/PS/301, 309

- UVA Injury Risk Curve for Knee is adapted, and decide to adapt the injury definition B for IHRA/PS.
- However, the UVA 2D knee bending conditions may be more sever than those of 3-D knee bending. Acceptance level of knee bending angle may be much higher in 3-D condition.




## Limitations

The current IHRA/PS legform test procedure should apply to vehicles providing on initial contact point to the legform impactor at 513mm above the ground or less (i.e. at knee level or below impact).

## New work items

Develop an IHRA/PS legform test method for vehicles providing on initial contact point to the legform impactor over 513 mm above the ground (i.e. at thigh impact) considering upper body mass effects, etc.

Thank you for your attention.