UN GRSP Informal Working Group   
on Deployable Pedestrian Protection Systems   
(IWG-DPPS)

Draft minutes IWG-DPPS/7/02

7th Meeting Minutes, 15-17 September 2020 - Web-Meeting

1. Chair welcomed all participants and thanked the HBM presenters for the detailed presentations.
2. The agenda was approved, with addition of the sensing width item.
3. The meeting minutes of the 6th meeting were approved.
4. Update of WP.29/GRSP activities: the Informal Group was granted one-year extension.
5. Follow-up discussion on open topics  
   **5.1. Defining head test area ( IWG-DPPS-7-04)**

Mr. Lee (Korea) presented different testable areas depending on test conditions.  
Mr. Lammers(Netherlands) and B. Buenger(Audi) clarified that each variant separately shall be type approved and tested on their specific test areas. H. Lammers confirmed the deployed bonnet to be the real-world situation, and therefore reflected in the marking and testing.  
CPs position:  
NL: mark in deployed position for static tests, marking in undeployed for dynamic testing.  
Germany, Korea, Japan: always marking in undeployed position  
Spain: marking in undeployed position was easier, but from a technical perspective they may also accept the deployed position if documented by the OEM.  
Other CPs (UK, France) will document their position for next session.

**5.2. HIT determination**  
**5.2.1. Simulation (human models, simulation conditions/requirements)** - **THUMS presentation (IWG-DPPS-7-06)**

Mr. Miyazaki & Hayashi (Toyota) presented a THUMS overview. THUMS model will be available for free by January 2021.

Texte de remplacement généré par une machine :
• 
• 
2-5. THUMS TB024 Summary 
Modified THUMS having size and posture changed meet TB024 certification 
requirements including impact response of THUMS AM50 and 6YO. 
Impact responses of THUMSs (AF05, AM95) can be simulated to head contact. 
Impact Response (30, 40, 50kph) 
AM50 
6YO 
AF05 
AM95 
Size and Posture 
OK 
OK 
OK 
OK 
kinematics 
OK 
OK 
Can be simulated 
Can be simulated 
HIT 
OK 
OK 
Can be simulated 
Can be simulated 
Certification (Green/OK means "Certified") 

O. Zander (Germany) asked the meaning of “kinematics and HIT can be simulated”for THUMS.

C. Klug (TU Graz): As currently there are no 5th and 95th HBM validation corridors, only kinematic and impact responses correlations between THUMS and PHMS are possible (for head, neck, pelvis and foot locations) on different types of vehicles (Sedan, SUV, minivan).

Texte de remplacement généré par une machine :
Model Description and Validation 
SUV-to-pgdestrian Impact 
nmt, 
Model Description and Validation 
Kinematics 
> Calculated of and TI 
With data. 
Model Description and Validation 
Rib and pelvis ligament Rupture 
layashi, Shigeki/# 
Model Description and Validation 
Kinematics 
>Calculated trajectories of Head and Tl showed good 
correlations With test data. 
1800 
Head 
1600 
E 
1400 
g 1200 
Coordinate Value (final) 
THUMS 
-1196 
PMHS 
1218 
1158 
THUMS 
1152 
t 137 
1000 
Gray: Test 
2 
Red: THUMS 
ankle 
-140012001000-800 -600 -400 -200 0 200 400 
X coordinate value [mm] 
Comparison of Pedestrian Full-Bodv Kinematic Histories. Schroeder et al.(2008) 
Integrated Safety 
Here is the comparison of impact kinematics between the model and the subject. 
TOYOTA 

AF05 corridors will be available in 2021. THUMS validation papers are accessible from conferences only - 56th STAPP Car Crash Conference, October 2021.

C. Klug mentioned a publicly available NHTSA paper on the HBM validation (<https://www-esv.nhtsa.dot.gov/Proceedings/22/files/22ESV-000043.pdf>​​​​​​​) and presented her TU Graz dissertation references as scientific basis for DPPS decisions on HBMs and HIT. CORA scores were suitable to judge the correlation, as well as PHMS and THUMS HITs , which were very close together (1ms).  
=> Mr. Tanaka (Japan) agreed with this combined validation basis.

**- GHBMC presentation (IWG-DPPS-7-08)**

Mr. Chin-Hsu Lin (GM) and Scott Gayzik (Wake Forest) & C. Untaroiu (Virginia Tech) presented the Global Human Body Model Consortium (GHBMC) model overview, founded for automotive crash simulations, also used in aviation and supported by NHTSA. The models have been generated using upright MRI and depicting live people with statures of interest, from live to CAD to CAE. MRI scans and specimen derived CAD were compared and match well. All detailed kinematics validation was elaborated on 50th percentile male PHMS.

Texte de remplacement généré par une machine :
Results: M50-P Certification 
Pre — Post Simulation Check 
50th male certification 
Kinematic response corridors 
Time of head impact (HIT) 
— Force monitored for stability 
All sizes to be simulated for HIT assessn 
FCR 50 kph 
-1000 
-500 
HC 
2000 
1500 
and stability 
2 
1000 
500 
500 
Corridors 
Corridors created 
from response data 
from 18 proposed 
HBMs for the study 
Tolerance : 50 mm 
HIT tolerance interval 
of +3.5% and -7% of 
mean target 
100 
125 
-1500 
200 
180 
160 
140 
120 
E 
100 
60 
40 
20 
Local X-Coordinate (mm) 
25 
20 
â 15 
10 
5 
0 
0 
Scott Gayzik 
rest 
School of Medicine 
25 
FCR 50 kph 
50 
75 
Time (ms) 
• 
HBM 
Mean Target 
Tolerance 
Decker et al. 2019, Traffic Inj Prev 
.çOy, 

Texte de remplacement généré par une machine :
GHBMC Pedestrian Validations (1) 
I. Thigh Dynamic 3-point Bending 
5. Lateral Shoulder Impact at 4.5 m/s 
9. Abdomen Impact 4.8 m/s 
13. Thorax Impact at 6,5 m/s 
Scott Gayzik 
rest 
School of Medicine 
2. Leg Dynamic 3-point Bending 
6. Lateral Shoulder Impact at 6.8 m/s 
10. Abdomen Impact at 6.8 m/s 
14. Thorax Impact at 9.5 m/s 
o 
3. Pelvis Acetabulum 
. Lateral Pelvis 
mpact at 5.2 rn/s 
4. Pelvis Iliac Wing Lateral 
8. Lateral Pelvis Impact at 9.8 m/s 
12. Thorax Impact at 4.4 m/s 
11. Abdomen Impact 9.4 m/s 
15.4 Point Knee Bending 
16. 
+31 
O 
Lateral Impact: Sedan 40km/hr 
Costin (VT) (Guest) 

**Action (Chair):** CPs to check presentations for the next January meeting and use the references in the preamble of the DPPS amendment regarding the use of CAE HBMs.

**- Others: EuroNCAP generic vehicle model usage, human model certification, simulation requirement/procedure) (IWG-DPPS-7-08) (IWG-DPPS-7-11)**

C. Klug presented a summary of HBM certification for Euro NCAP.

Euro NCAP and TU Graz accept to share the generic vehicle model (GVM) usage. However, CAE model maintenance (versions update) conditions should be clarified. And current generic models are open source, so they can be modified (tbd in regulation).

Another option would be to provide model specifications in the Mutual Resolution 1, but detailed specifications and validation of individually built GVMs would be needed, and Mutual Resolution No.1 amendment requires a revised scope of DPPS by WP.29.

P. Broertjes (EC) mentioned challenges in implementing CAE models for VRU Proxy virtual testing, preferring a basic boundary conditions HIT database (as previously proposed by Dirk Gehring), which would be more suitable for market surveillance and self-certification. B. Buenger mentioned that HIT generation is just a supporting value and not directly related to the regulation thresholds, and A. Besch stated that a certification description would be more neutral. An Annex in the Amendment could enable the use of the HBM.

**Action CPs & OEMs:** review and confirm that TB024 content and the HBM validation documents are ok until the January meeting.

OICA confirmed that all OEMs use the Euro NCAP TB 024 for HBM positioning.  
  
**Action:** Chair will arrange the HBM certification and HIT determination procedure by simulation based on the TB024 and communication with experts and propose it this year.

**5.2.2. Physical testing (IWG-DPPS-7-03)**Mr. Lee (Korea) presented a comparison of static and dynamic tests, where the HIC from the dynamic test was higher (+58%, but well below the threshold), on a still rising hood.

In comparison, Japan’s simulation study was related to overshooting time, shown to be uncritical.  
G. Maurer (BMW) proposed to check the height of the hood on videos, to better understand the differences between the two physical tests.

**Action:** Mr. Lee (KATRI) will share more specified data about the injury difference between dynamic and static headform tests after more tests to be conducted.

**5.2.2. Physical dummy testing:** for HIT determination: Ped 50% dummy : advancement status.

Japan’s opinion is to keep physical dummies to determine HIT in the amendment as an alternative.

Chair mentions that 6yo or AF5th are needed to determine HIT: next IG discussion item.

**Conclusion**: keep the **General text of the test procedure** with 50th % male in the amendment - until all physical dummies’ statures are available – to keep open this alternative.

**5.3. Verification Impactor (IWG-DPPS-7-09)**O. Zander (Germany) presented an advancement status of the Flex-PLi study as Sensing Impactor for DPPS GTR9. Intrusion and energy, due to lower velocities, were investigated through an inverse certification test, where a honeycomb was attached to the moving ram. Acceleration sensors in the leg were impacted and signals recorded. Double acceleration integral calculation was used to generate the resulting intrusion values to assess the vehicle impact. First tests indicate a good contact biofidelity and repeatability of the FlexPLI impactors tested. **Action**: More impactors will be tested to confirm the study result.

Note: This study assesses if the FlexPLI is repeatable in terms of intrusion, without any unexpected mechanical behavior even for low speed conditions (as the impactor was not designed for). This is a one-time verification study only, to be used as background in the preamble.

**5.4. Others  
5.4.1 Proposal Korea (IWG-DPPS-7-05):**Korea presented the amendment proposal structure. Members requested the amendment draft proposal. Japan asked Korea to use the draft document that OICA and Japan proposed, when sharing it later.

**Action**: Korea will present a draft proposal, based on this organization plan.

Texte de remplacement généré par une machine :
Proposal for composition of Amendment 
<The present amendment> 
Annex 1. 
TEST PROCEDURE FOR DEPLOYABLE 
PEDESTRIAN 
PROTECTION SYSTEMS (DPPS) 
0. manufacturer submission data 
a) the system specification 
b) the HIT information, TRT(ST+DT) information 
1. Requirement for Deployed Position 
2. Activation Test to CertiW Sensing Area 
3. Test at the Lowest Speed of Activation 
4. Determination of Headform Test Procedure 
5. Static Headform Test Procedure 
6. Dynamic Headform Test Procedure 
7. Test Procedure to Measure the Sensor Time(ST) 
8. Simulation model 
<A proposa' amendment> 
Annex 1. 
TEST PROCEDURE FOR DEPLOYABLE 
PEDESTRIAN 
PROTECTION SYSTEMS (DPPS) 
0. manufacturer submission data 
a) the system specification 
b) the HIT information > Açgpr4(nqto Annex 2. 
c) TRT(ST+DT) information 
1. Requirement for Deployed Position 
2. Verification test 
- TRT measurement test(ST+DT) 
- Activation Test to CertiW Sensing Area 
- Activation Test at the Lowest speed 
3. HeadformTest at the Lowest Speed 
4. Headform Test 
Determination of headform test method (HIT vs TRT) 
- Static Headform Test Procedure 
- Dynamic Headform Test Procedure 
Annex 2. 
HIT DETERMINATION PROCEDURE 

**5.4.2 “Sensing Width” ( IWG-DPPS-7-10)**D. Gehring (BGS) presented a proposal on the Detection Area Width:

- independent from the DPPS width or structural parts under the vehicle outer surface. “Detection Area” and “Relevant Vehicle Width” definitions were introduced, related to the pedestrian impact to the vehicle front.

The width of the Detection Area shall be as a minimum of the Relevant Vehicle Width – 12.5% on each side (but not more than -250mm on each side).  
Different vehicle examples shown highlight the adequate coverage of the vehicle front by the proposal. The idea was to include everything with the axle just being the reference for the longitudinal measurement.

H. Lammers(Netherlands) proposed to include the maximum in front of a vertical transversal plane located at the front axle point. Cameras in the proposal were meant to address cameras replacing the Outside Rear View Mirrors and should be called “Camera Monitoring Systems”. Mr. Lee (Korea) supported the NL’s proposal.  
Mr. Tanaka (Japan) requires until next January to assess this proposal on several vehicles.

**Action (Japan):** Provide feedback on more vehicles and comment on the proposal: Jan. 2021

1. **Date and place of the next meeting** (web meeting)

* **8th meeting: 18 Nov 2020**, **9:00-11:00h (CET)**: Teams invitation : 1 point :
* detection impactor (Flex-PLI study tb finished)
* **IWG-DPPS 9th meeting: 20-21 January (EU morning)**