Transmitted by the IWG on UN Regulation No. 22

Informal Document GRSP-66-22

(66th GRSP, 10-13 December 2019, agenda item 10)

# PROPOSAL FOR THE 06 SERIES OF AMENDMENTS OF REGULATION NO. 22 (PROTECTIVE HELMETS)

Informal Working Group on UN Regulation No. 22

# Status Report

. In December 2017 GRSP agreed on the need to update UN Regulation No. 22

. In March 2018 WP.29 gave a general support to establish the IWG on Protective Helmets

- Geneva, 14th May 2018 – 1st IWG-PH to draft Term of Reference
- Geneva, 10th December 2018 – 2nd IWG-PH to discuss the first proposal
- Milan, 25th & 26th March 2019 – 3rd IWG-PH to draft & endorse the proposal to be submitted to GRSP on its 65th session
- Geneva, 13th May 2019 – 4th IWG-PH to prepare the presentation for GRSP
- Milan, 5th & 6th September 2019 – 5th IWG-PH to draft & endorse the proposal to be submitted to GRSP on its 66th session
- Geneva, 9th December 2019 – 6th IWG-PH to prepare the presentation for GRSP and informal document to amend the doc. 2019/25

# TOR - OBJECTIVE OF THE WORKING GROUP

The objective of the IWG is to develop additional safety provisions that were either not ready for adoption of UN Regulation No. 22 and/or required additional research. The IWG will also update/clarify existing requirements and test procedures in UN Regulation No. 22 based on new data and on-road experience.

Scope of work for IWG shall include the following items. Should additional items be proposed, the IWG will decide by consensus on their inclusion

A. New test and criteria following the progress in research for head protection improvement (e.g.: Rotational Acceleration Protection);

B. Requirements for new features to take into account:
   1. Lightening equipment;
   2. Cameras
   3. Audio-phone equipment
   4. Design equipment
   5. Aeration (to improve helmet wearing)

C. New Type Approval Marking System (to prevent counterfeit and backup enforcement and police control)

# The Proposal

. The proposal for the 06 series of amendments of UN Regulation No.22 (Protective helmets) endorsed by 3rd IWG-PH is the Working Documents ECE/TRANS/WP.29/GRSP/2019/11

. The main changes from 05 series of amendments are:

- Introduction of rotational test to improve safety performance

- Update requirement to take into account actual market requests and technical innovations (i.e. modular helmet, sun shield and accessory)

# Revision to the current text

Type of helmet definitions

Minimum dimensions of the markings on the level of the chin protection and use of “Day time use only” visor

Labeling, definition of numbering, progressive and not a lot

Attribution of an specific approval number to the visor, that cannot be the same as the helmet

Reflective material, positioning …. Provided separated with instructions in box!

DD Chin strap, to define the concept of extraction of the strap from the rings

Alignment of the method B to methods A / C for the measurement of the diffused light

Clarification of the procedure for  the definition of the correct tightening of the chin strap before the test

Conditioning plastic buckles

Revision annex 12

# New considerations in ECE/ONU R 22.06

- Adjustments derived by market demands:

  Modular helmets, double code

  Sun visor, characteristics and marking

  Photochromic visors

  Visors - Adapting minimum light transmittance values (EN1938)

  Accessories

  Sizes indicated in cm and letters

- Rotational acceleration tests
- Integration of the std impact points
- High and low energy impact
- Mechanical tests visor, high-energy, high-speed
- New procedure for production qualification tests

Definition of helmet types is draft to be more clear and to introduce the new modular type also. (Procedure and test)

**2.7.3. Helmet types**

**(J) Jet: helmet without any part to cover the lower part of the face. Open face.**

**(NP) Jet: helmet with a detachable or movable part of that cover the lower part of the face that does not protect the chin**

**(P) Full face, helmet with a detachable, movable or integral (permanently fixed) part of the helmet covering the lower part of the face and intended to protect the chin**

**(P/J) Modular helmet, means a helmet, equipped with a movable or detachable protective lower face cover, that meets the requirements for both conditions of use with or without chin guard in position. Chin protection is only guaranteed with the lower face cover in position.**

Introduction of new definition of “sun shield” to indicate a particular shield that can be added to traditional visor to improve the comfort  for the driver when he/she drives with high level of lightness. (Procedure and test)

**2.8.1. "sun shield" means an additional tinted screen in combination with clear visor, as define at § 6.16.3.4, that covers the eyes.**

Introduction of new definition of «accessory» to consider whole fitment that are avalible on the market and used by rider but may effect the helmet safety perfomance when not tested. (Procedure and test)

**2.22. "accessory" means any object intended to integrate the secondary functionalities of the helmet (eg. tear off inner visor, electronic devices and their support).**

Introduction of new speeds and limits for High and Low energy impact:

**7.3.1.4. Test**

**The test shall…….**

**The impact speed shall be equal to:**

**7.5 (+ 0.15/- 0.0) m/s for both anvils specified in paragraphs 7.3.2.3.1. and 7.3.2.3.2.**

**6.0 (+ 0.15/ -0.0) m/s for tests at point S.**

**8.2 (+ 0.15/- 0.0) m/s for linear high energy. Only flat anvil**

**6.0 (+ 0.15/ -0.0) m/s for linear low energy, both anvils could be use**

**7.3.6. The absorption efficiency shall be considered sufficient where the resultant acceleration measured at the centre of gravity of the headform at no time exceeds:**

| Type of test | Acceleration | HIC |
|---|---|---|
| Std Linear Impact Std | ≤ 275 g | ≤ 2400 |
| Linear Extra Point | ≤ 275 g | ≤ 2400 |
| Linear Hi Energy | ≤ 275 g | ≤ 2880 |
| Linear Low Energy | ≤ 180 g | ≤ 1300 |

**The helmet shall not become detached from the headform**

Introduction of new headform features (Harmonization in line with EN 960) .

**7.3.3.1. The headforms used for the impact-absorption test shall be made of metal and, together with any means for their support, shall exhibit no resonance below a frequency of 2,000 Hz.**

**Full headforms shall have the following characteristics:**

**(a) the centre of gravity shall be located within a 10 mm radius of point G on the central vertical axis;**

**(b) a facility for attaching an accelerometer shall be incorporated such that, with the headform in any angular orientation, the respective sensitive axes of the accelerometer shall pass within 10 mm of point G;**

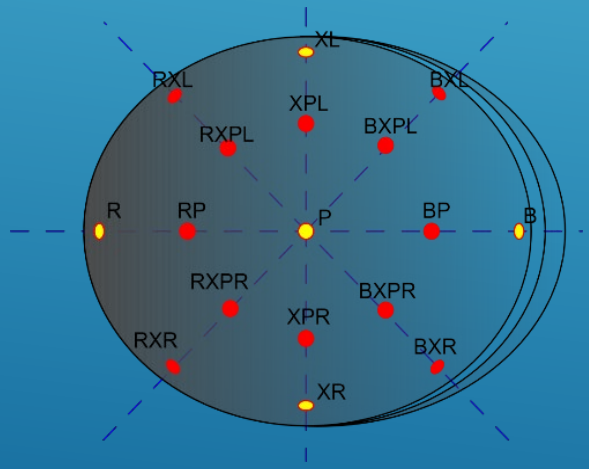
**the appropriate mass, as specified in Table below …..**

Introduction of new possible extra points of impact:

**7.3.4.2.1. Extra point**

**At least three further impact tests shall be performed on a helmet sample.**

**The impact points shall be selected among the 12 points as listed below and depicted in figure. ……**



Introduction of new «High Speed Particle test» to verify the performance of visor resist to high-speed particles and to resist to high speed particles at extremes of temperature.

**7.8.2.3. High Speed particle test**

**7.8.2.3.1. Visors shall be tested in accordance with the method specified in Annex 17 (According to EN168:2001 par.9)**

Introduction of new test to measure rotational acceleration in consideration of the huge effect of this parameter on human safety.

**7.13. Oblique impact test method of measuring rotational acceleration Helmets shall be tested in accordance with the method specified in Annex 7.**

Introduction of Oblique impact test method :

**7.13. Oblique impact test method of measuring rotational acceleration**

**7.13.1 Acceptance criteria**

**The peak of the resultant rotational acceleration ($PRA$) shall be calculated. The $PRA$ shall not exceed 10,400 rad/s2 in all impact sites on helmets.**
**The injury predictor so called as Brain Injury Criterion ($BrIC$) shall be also calculated as follows ……..**

**7.13.2 Helmets shall be tested in accordance with the method specified in Annex 7.**

(In line with the CEN TC158-WG11 proposal – Problem Headform)

# Headforms considerations

**Hybrid III**

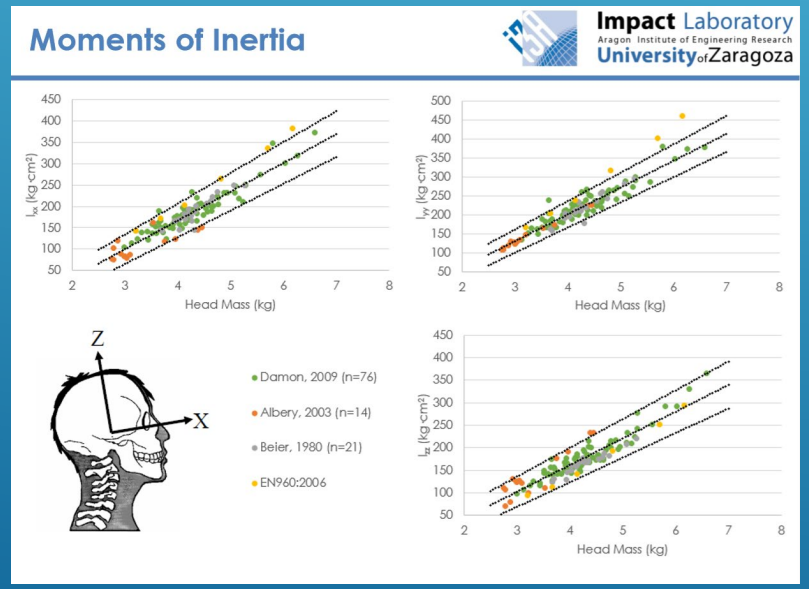
PRO . Biofidelic

CONS . Geometry and size not related to EN960
. Not validated for direct impact
. RUBBER not stable in impact management along time (manufacturer declaration)
. Coefficient of friction to 0,9 - 1 which exceeds specified value 0,3 according to TC158 WG11

## EN960

PRO . Validated and currently used in FIM test protocol
. Available for the all size range
. Possibility to tune the coefficient of friction using supplementary skin

Moment of inertia on the limit of the human head tolerances



**TC158 – WG 11**

PRO . Biofidelic
. Geometry and size related to EN960

CONS . Actual lack of evidence for:

. Resonant frequency
. Size tolerance (due to the shrinking of the molding process)
. Coefficient of friction value
. No possibility of re-tooled
. Stability along time
. Stability related to temperature
. Hardness surface value
. Validation in real tests
. Availability
. Feasibility to install sensors on the smallest sizes (495, 515, 535)

**Parametric study  on the use of different moment of inertia (MOI) and CoF.**
(Peter Halldin, Convenor CEN/TC 158/WG11 doc. N258)

Conclusions for road helmets

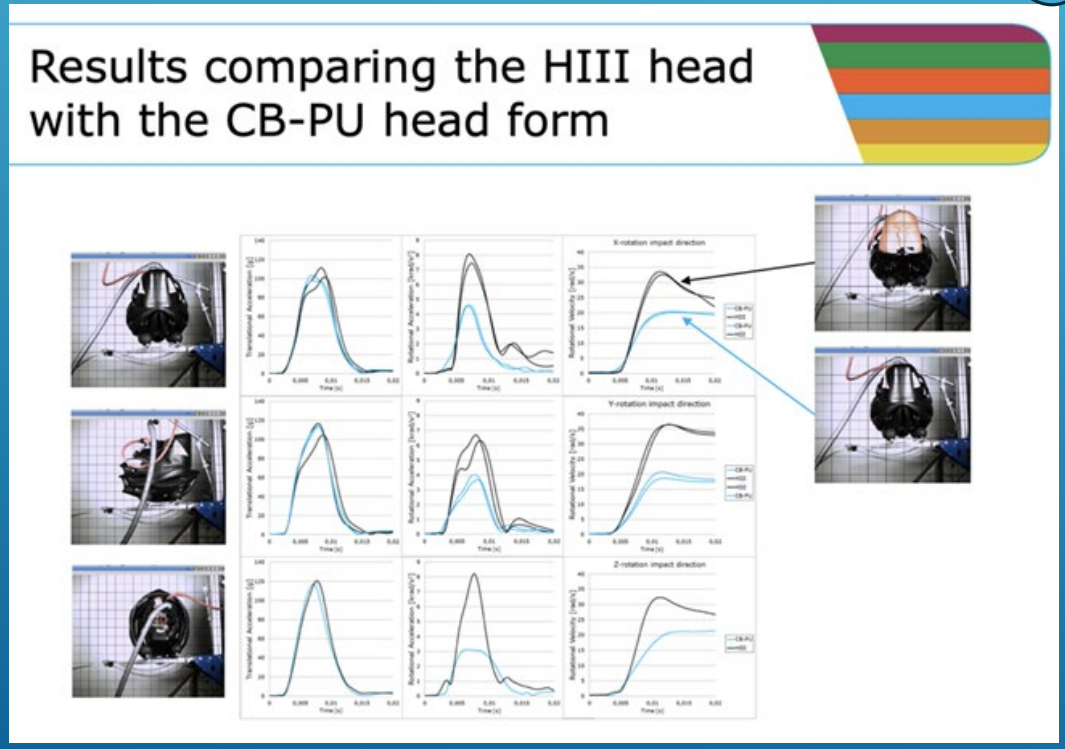
1. Increasing the MOI by 20% reduced the Angular acceleration by 3-13% and the Angular velocity by 5-10% for the Road helmet.

2. Altering the coefficient of friction between the head and the helmet showed the highest effect on the  angular velocity. Here the change from 0.5 to 0.15 was however larger than the other parameters

**Comparison on the use of different coefficient of friction (COF):**
Peter Halldin, Convenor CEN/TC 158/WG11 (Status report nov. 2017)

Comparison between rotational acceleration results obtained with headforms with coefficient of friction 0,12 vs 0,75

| Impact direction | COF 0,75 | COF 0,12 | Difference Vs 0,12 |
|---|---|---|---|
| ROT XX [krad/s2] | 7,75 | 4,5 | 72% |
| ROT YY [krad/s2] | 7,5 | 3,75 | 100% |
| ROT ZZ [krad/s2] | 8 | 3 | 167% |



## Consideration for next amendment 07 (Final raccomandation)

As a whole it has been agree by the IWG to issue studying recommendation for phase II as follows:

- Integrate novel headform as soon as ready and validate
- Add the oblique impact leading to rotation along Z axis.
- Introduce linear impacts with 6D kinematic recording
- Introduce model based brain injury criteria

*Possible test for ventilation in the helmet*
*Possible test for noisiness*
*Possible test for demist visor, dynamic method*
*Toxic materials, fabrics and metals*
*Helmet Weight limits*

*Thanks for your attention!*