Report from the informal group on Camera-Monitor Systems (IGCMS-II) to GRSG

1.   Since the 107th session of GRSG the informal group met 4 times for the finalization of the proposal for amending UN Regulation No. 46 such that the conventional mirrors may be replaced by camera-monitor systems (CMS). The results are given in document ECE/TRANS/WP.29/GRSG/2015/2 as the formal proposal for amending Regulation No. 46. Informal document GRSG-108-21 reflects the latest corrections of that proposal.

   The informal group recognized that the extension of the scope of Regulation No. 46 to CMS requires further amendments of the scope of Regulations Nos. 10, 26, 61, 79, 94, 107 and 125 such that given exemptions in these regulation for mirrors will also apply to CMS. Proposals for these amendments are given in documents ECE/TRANS/WP.29/GRSG/2015/9, ECE/TRANS/WP.29/GRSG/2015/10, ECE/TRANS/WP.29/GRSG/2015/11, ECE/TRANS/WP.29/GRSG/2015/12, ECE/TRANS/WP.29/GRSG/2015/13, ECE/TRANS/WP.29/GRSG/2015/14 and ECE/TRANS/WP.29/GRSG/2015/8. The proposals for Regulations Nos. 21 and 61 should be adopted in parallel with the adoption of the proposals for Regulation No. 46.

2.   The first meeting after the previous GRSG was held on 3 and 4 November 2014 in Paris where the group continued its detailed discussions on the basis of working document IGCMS-II-05-02. After discussion of part II of the Regulation containing the installation provisions of a device in a vehicle the informal group went through the whole document for discussion of outstanding topics. Several provisions needed more consideration.
   Agreements were reached on:
   - operating readiness,
   - the deletion on provisions on overlays for component approvals,
   - blooming and lens flare,
   - colour noise and
   - many editorial corrections.

3.   The second meeting was held from 17 to 19 December 2014 in Zoetermeer (the Netherlands). The informal group could agree on several topics like:
   - diffuse sky-light exposure of the monitor,
   - grey scale rendering,
   - a general reference to the definitions, symbols and test procedures given by ISO 16505:2015; at the time of that meeting this standard was in the status of "International standard in publication",
   - inclusion of a reference to ISO16505 in case of test methods to be applied,
   - pixel faults,
   - activation of the system (intended use)
   - resolution for installation of a CMS
   - decreasing accommodation
   - influence from weather and environment,
   - safety aspects of electronic systems,
   - obstruction of the driver's view on the monitor
   - the approval markings and
   - compatibility with R26 requirements.

   The informal group took note of a preliminary report of a study performed by the German research institute Bast. In that study several test have been performed to verify the differences between a CMD and conventional mirrors with regard:
   - field of vision,
   - general day and night time performance,
   - rendering of the scene,
   - dazzle by light sources during night conditions

- reflection on and blinding by the monitor,
- adjustment of camera and monitor
- reliability of functioning,
- working under several weather conditions and
- influence of dirt.
The overall conclusion of the report is that both mirrors as CMD can provide the required indirect view to the driver.

4. The third meeting after the previous meeting of GRSG was held in Gaimersheim (Germany) on the 28th and 29th of January 2015. The informal group took note of the final report of the German Research Institute BaSt that assessed the technical characteristics for a CMS as well as the HMI-aspects. It can be concluded that the proposed technical provisions for R46 cover the points of attention expressed in the report. During that meeting the informal group concluded that the final technical proposals for GRSG including the justifications of all proposals could be agreed on by all participants.

5. The fourth meeting was held on 19 and 20 March 2015 in Sindelfingen (Germany) for a last fine-tuning of the proposals. The amendments to the formal document are given in informal document GRSG-108-21. The informal group could not find a successor for the present chairman in case further meetings are needed after the session of GRSG. Therefore, GRSG is requested to consider this in its 108th session.

6. The proposal of the informal group IGCMS-II is based on ECE/TRANS/WP.29/GRSG/2011/23/Rev.1 that has been submitted to GRSG by the first informal group, IGCMS-I. That document provided for the editorial amendments (technology neutral) needed to permit the optional replacement of conventional mirrors, while for the technical provisions it proposed a reference to an ISO standard to be developed. That standard has recently been published as ISO 16505:2015 and is available as informal document GRSG-108-20.

During the development of the ISO standard, it became clear that a one to one reference to that standard in the provisions for component type approval only would not be appropriate as:
- a differentiation between provisions for component approvals and installation approvals would be needed,
- some provisions of ISO were seen as not appropriate or not acceptable for type approval purposes and
- the ISO standard contains recommendations which could lead to different interpretations.
This meant that further modifications of the original proposal of IGCMS-I was needed.

Taking account of the guidance by WP.29 on the reference to standards of third parties like ISO, IGCMS proposes to incorporate the relevant provisions of ISO, if needed, in an amended formulation, directly into the paragraphs of Regulation No. 46. With regard to the symbols, definitions and test procedures IGCMS proposes a general statement containing a direct reference to the relevant parts of ISO 16505. Concerning the incorporation of relevant provisions from ISO into the text of Regulation No. 46 the informal group IGCMS-II took roughly the following approach:
- relevant provisions for component approval for camera-monitor devices of classes I to IV are introduced in a new paragraph 6.2.2.3.,
- relevant provisions on the installation of a camera-monitor device of classes I to IV are introduced in a new paragraph 16. that will also contain the installation provisions for classes V and VI and
- introduction of a new Annex 12 containing test methods that are not given or different than those in ISO 16505:2015.

The informal group focussed only on the provisions for the class I to IV devices for indirect vision and did not change the existing provisions for classes V and VI camera-monitor systems. As ISO 16505 does not apply to class VII mirrors, the informal group will not propose any amendments to the provisions of category L vehicles.

As there will be no need to differentiate between existing approvals and approvals granted according the proposed provisions, the proposals of IGCMS-II can be seen as a supplement to the present 04 series of amendments. For readability the proposal is written as Revision 6 of Regulation No. 46.

IGCMS-II emphasises that its proposals will be limited such that Regulation No. 46 will make the application of camera-monitor devices possible; improvements of the provisions or the introduction of further technical developments can be regulated separately as a second step. So far the general approach of the group.

7. To go into detail of the proposals derived from the ISO standard, IGCMS made provisions for the <u>component approval</u> of a CMS for the following topics:
- EMC,
- rounding off of the devices,
- glare due to high luminance of the monitor and
- functional requirements; these functional requirements are divided in:
  * luminance adjustment,
  * operating readiness and
  * image quality, where those on image quality are subdivided in:
    - Monitor isotropy
    - Luminance and contrast rendering
    - Grey scale rendering
    - Color rendering
    - Artefacts, including smear, point light sources, blooming and lens flare,
    - Sharpness and depth of field,
    - Geometric distortion,
    - Further image quality requirements, including flicker, time behaviour, system latency.

Concerning the <u>installation provisions</u> the proposals derived from the ISO standard are related to:
- intended use inclusive activation and deactivation of the system, default view, overlays, luminance and contrast rendering,
- system availability,
- magnification and resolution
- monitor arrangement,
- obstruction of the view on the monitor,
- decreasing accommodation and
- safety of electronic systems.

Finally, Annex 12 give a reference for test methods given in ISO 16505:2015 and specific test methods for flicker, point light sources and grey scale rendering. It also contains detailed provisions on the safety of electronic systems, derived from the braking regulation. All proposals from IGCMS given in the formal document are accompanied by a justification.

8. Informal document GRSG-108-21 reflects the last fine tuning of the proposal. Besides editorial corrections, the informal document amends some provisions. It amends the type definition of a CMS and reduces the requested level for EMC from Regulation No. 10/05 series to 10/04 series. The informal document also introduces the "Mirror and CMS dual function system" where class I mirrors and a monitor are combined in one devise and for which the minimum required luminance contrast according the ISO value can be accepted. On several places some text has been moved from the requirements to the justifications as they were only informative. Also these amendments from the informal document are accompanied with a justification.

9. For information to GRSG: both documents (ECE/TRANS/WP.29/GRSG/2015/2 and GRSG-108-21) are supported by the entire informal group on IGCMS.

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