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Economic Commission for Europe**Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on Lighting and Light-Signalling****Eighty-second session**

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Item 4 of the provisional agenda

Simplification of lighting and light-signalling UN Regulations**Proposal for Supplements to the new UN Regulation
No. [148] and to the 06 and [07] series of amendments to UN
Regulation No. 48****Submitted by the expert from Germany***

The text reproduced below was prepared by the expert from Germany with the aim to introduce requirements for testing the sun load impact, which can delay the perception of a signal in such a way that it may become a serious safety issue, if the sun load impact goes above a defined ratio. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21/Add.1, cluster 3.1), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate

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I. Proposal

A. Proposal for a Supplement to UN Regulation No. [148]

Add a new paragraph 5.5.5. to read:

"5.5.5. The sun load impact (phantom effect) for stop lamps of the category S1 to S4 shall be measured in accordance with annex 8 to this Regulation, in the case where the outer lens is designed as clear lens and the transmission of this lens is larger than 40 %. In the case of the categories S2 and S4 with variable intensity, only the higher level (state) will be measured. In the case of a category S3 or S4 stop lamp, which is intended to be mounted inside the vehicle, the transmission of the rear window may be taken into account too. The ratio F_{ph} , determined in sequence as described in paragraph 2 of Annex 8 in the light emitting surface of the function, shall be not smaller than 3.

The transmission of the outer lens and if the lamp is intended to be mounted inside the vehicle also in addition the transmission of the rear window, shall be demonstrated by the applicant, using simulation or other means of verification accepted by the Type Approval Authority.

The execution of this measurement and the correlated colour temperature of the projector used shall be mentioned under "Remarks" (item 9.4.) in the communication form of Annex 1."

Add a new paragraph 5.6.12. to read:

"5.6.12. The sun load impact (phantom effect) for direction indicator lamps of the category 2a and 2b shall be measured in accordance with annex 8 to this Regulation, in the case where the outer lens is designed as clear lens and the transmission of this lens is larger than 70%. In the case of the category 2b with variable intensity, only the higher level (state) will be measured. The ratio F_{ph} , determined in the light emitting surface of the function, shall be not smaller than 3.

The transmission of the outer lens shall be demonstrated by the applicant, using simulation or other means of verification accepted by the Type Approval Authority.

The execution of this measurement and the correlated colour temperature of the projector used shall be mentioned under "Remarks" (item 9.4.) in the communication form of Annex 1.

Add a new Annex 8 to read:

"Annex 8

Measurement of the sun load impact

1. Measurement conditions:

To evaluate of sun load impact (phantom effect) the measurements of the lamp shall be carried out with its light source as required in paragraph 4.7. to this Regulation.

The light source generating a sun load impact according to Figure 1 below is a projector either with a light source of a correlated colour temperature between 4500 K and 6500K or with a light source of a correlated colour temperature at 2856 K corresponding to the CIE Standard Illuminant A (ISO 11664-2:2007(E)/CIE S 014-2/E:2006).

The light from the projector shall illuminate at least the light emitting surface of the optical unit with the illuminance $E = 40\,000\text{ lx}$ and a uniformity (inside the area of the light emitting surface) of 10 %.

The reference axis of the lamp and the axis of the projector shall form a vertical angle of 10° .

The plane formed from both axes shall be the operational vertical plane. The arrangement shall be in a way that the projector radiates the light as if from above the signalling lamp.

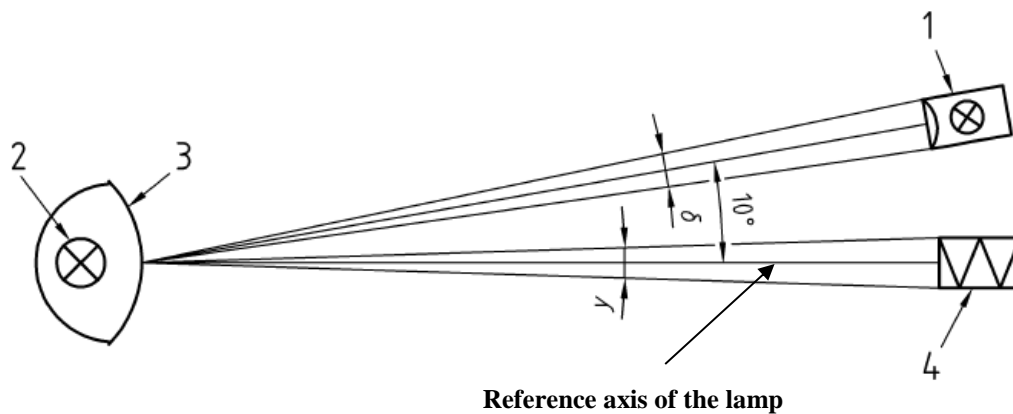
If the illuminance E_1 on the light emitting surface of the lamp cannot achieve the illuminance of $E = 40\,000\text{ lx}$ for the sun load impact (phantom effect), the luminance L_{ph} can also be calculated for the lower illuminance E_1 from the measured lower luminance L_{phl} :

$$L_{ph} = L_{phl} \times \frac{40000\text{lx}}{E_1}$$

However, the illuminance E_1 shall be not lower than $10\,000\text{ lx}$.

Figure 1

Typical arrangement for the measurement of the luminance produced by the sun load impact (phantom effect).



Key

1 projector

2 signalling lamp

3 the light emitting surface

4 measuring head

Measurements of sun load impact (phantom effect) depends strongly on the geometry of measurement. The recommended distance for measurements for obtaining comparable results is 10m.

A shorter distance is allowed as long the required uniformity of the illumination by the projector as well as all other required parameters as specified in this Annex are met and the use instruction of the measuring head allows it.

The measuring head to determine the luminance shall be placed so that the reference axis of the lamp and the axis of the measuring head coincide.

2. The measurements shall be carried out in the following sequence:
 - 2.1. First determination of the light emitting surface of the function to be measured,
 - with the lamp (function) is switched on
 - and shall be measured while the projector is switched off.
 - 2.2. Second, the mean luminance L_s shall be determined in the light emitting surface of the function to be measured as determined in paragraph 2.1.,
 - with switched on lamp
 - and shall be measured while the projector is switched off.
 - 2.3. Third, the mean luminance L_{ph} shall be determined in the light emitting surface of the function to be measured as determined in paragraph 2.1.,
 - with switched on projector
 - and shall be measured while the lamp is switched off.
 - 2.4. In the last two cases (paragraphs 2.2. and 2.3.), it shall be noted, that the measuring head or respectively the measuring system to determine the mean luminance catch the complete light emitting area of the lamp to be measured.
 - 2.5. The ratio F_{ph} between the luminance L_s of the real signal and the luminance L_{ph} of the sun load impact is given as:

$$F_{Ph} = \frac{L_S}{L_{Ph}}$$

B. Proposal a Supplement to the 06 and [07] series of amendments to UN Regulation No. 48

Add a new paragraph 2.8.4. to read:

- "2.8.4. "Clear lens" or "clear lens design" means a lamp with an outer lens at which the required colour for the specific function will be generated by the light source itself or by internal filters. This lens must not be necessarily colourless."

II. Justification

1. This document is based on document ECE/TRANS/WP.29/GRE/2019/7 and covers a number of comments made at the eighty-first session of GRE. In particular, the following changes have been made:

- Introduction of a definition for “Clear lens” or “clear lens design” in UN Regulation No. 48;
- The test limitation for lamps in the case where the outer lens is designed as clear lens;
- Adding the required transmission limit (as a key parameter) to decide whether the test necessary or not, because such a clear lens is not necessarily colourless;
- Allowing of two different illuminants for the test projector (sun simulator);
- Deletion of “in case of doubts procedures”;
- Deletion of specific conformity of production (CoP) requirements, because they are covered by paragraph 3.5.1.

2. GRE started a discussion on this question several years ago, and the International Automotive Lighting and Light Signalling Expert Group (GTB) GTB requested its Working Group Photometry to find a solution. At the beginning, the GTB Working Group Safety and Visual Performance was also involved to investigate the scientific background and to find a basis for a requirement.

3. This proposal is based on a number of investigations made by the test house LTIK, partly supported by the National Traffic Safety and Environment Laboratory, for example, as presented at the sixty-first session of GRE (GRE-61-01) as well as on the follow-up discussions of these results in the Working Group Photometry. These tests give an indication about the sun load impact, which can delay the perception of a signal in such a way that it becomes a serious safety problem. The threshold value for F_{ph} is set on the basis of these investigations with a number of observers and the proposed value is a pragmatic approach to solve this issue and to keep the design freedom for industry by prohibiting inappropriate lamp constructions. Further investigations were carried out as reported at the seventy-fifth session of GRE (GRE-75-16) and have now been finally evaluated. The only open value was the Factor F_{ph} for which we propose $F_{ph}=3$, e. g. for traffic signs is this value in the relevant Standard $F_{ph}=5$.