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Simplification of lighting and light-signalling UN Regulations

Proposal for a Supplement to the new UN Regulation on light-signalling devices (LSD)

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 became 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

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 according annex 8 to this Regulation. In the case of the categories S2 and S4 with variable intensity, only the higher level (state) will be measured. 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.

Depending on the nature of the lamp, in particular, if it's optical construction will not cause a relevant problem regarding the sun load impact (phantom effect), the competent authorities may authorize laboratories to omit this test, subject to the express reservation that such omission must 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 according annex 8 to this Regulation. 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.

Depending on the nature of the lamp, in particular, if it's optical construction will not cause a relevant problem regarding the sun load impact (phantom effect), the competent authorities may authorize laboratories to omit this test, subject to the express reservation that such omission must be mentioned under "Remarks" (item 9.4.) in the communication form of Annex 1."

Annex 1, add a new paragraph 9.4. to read:

"9.4. Remarks

……."

Annex 5, add a new paragraph 1.5. to read:

"1.5. In the case where doubt exists in respect to compliance with the test described in paragraphs 5.5.5. or 5.6.12. of this Regulation and/or a remark in the communication form (item 9.4. of Annex 1) informs that this test was not carried out, the conformity with the requirements for the sun load impact (phantom effect) shall be checked as specified in said paragraphs."

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 with a light source of a correlated colour temperature between 4500 K and 6500K.

The light from the projector shall illuminate at least the light emitting surface of the optical unit with the illuminance E = 40 000 lx and 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°.

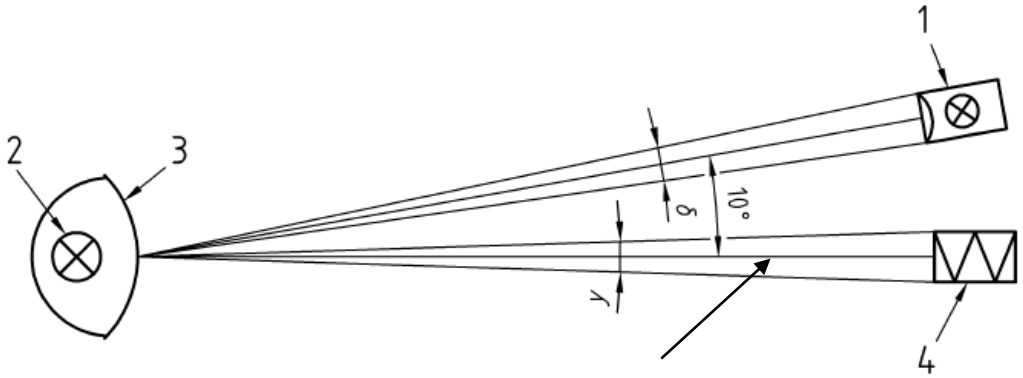
The plane formed from both axes shall be the operational vertical plane. The arrangement shall be in a way that the projector radiates the light as if from above the signalling lamp.

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

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

However, the illuminance E_l shall be not lower than 10000 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 to 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 to 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 to 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:

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

II. Justification

1. 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.

2. 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

becames 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.