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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-fourth session**

Geneva, 26-30 April 2021

Item 6 (a) of the provisional agenda

**UN Regulation No. 48 (Installation of lighting and light-signalling devices):****Proposals for amendments to the latest series of amendments****Proposal for Supplements to UN Regulation No. 149 and to the 06 and 07 series of amendments to UN Regulation No. 48****Submitted by the expert from the International Automotive Lighting and Light Signalling Expert Group\***

This document was prepared by the experts from the International Automotive Lighting and Light Signalling Expert Group (GTB) with the aim to allow driver assistance projections, on the road ahead of the vehicle, as part of the Adaptive Driving Beam (ADB).

This proposal is based on ECE/TRANS/WP.29/GRE/2020/4 merged with the editorial improvements of informal document GRE-83-30. Further improvements have been made to the text, addressing the comments made at the eighty-third session of the Working Party on Lighting and Light-Signalling (GRE) and at a special session with interested contracting parties and GTB on 15 January 2021 for collecting additional feedback.

The proposed modifications to the current text of the UN Regulations are marked in bold for new or strikethrough for deleted characters.

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\* In accordance with the programme of work of the Inland Transport Committee for 2021 as outlined in proposed programme budget for 2021 (A/75/6 (Sect.20), para 20.51), 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.

## I. Proposal

### A. New Supplement to the 06 and 07 series of amendments to UN Regulation No. 48

*Add a new paragraph 2.7.8. to read:*

**“2.7.8. “Driver Assistance Projection” means a modification of the light distribution for driver assistance purposes, exclusively as patterns (simple geometric shapes such as lines, rectangles, triangles, etc. without any complex combination of all of them, and easily/intuitively understandable by the driver) and/or simple symbols, without causing discomfort, distraction or glare to road users and without causing distraction to the driver.”**

*Add a new paragraph 3.2.9. to read:*

**“3.2.9. Where a function is able to provide driver assistance projections on the road, a list of these patterns or symbols shall be provided by the manufacturer.”**

*Add a new paragraph 6.22.9.3.2. and its subparagraph to read:*

**“6.22.9.3.2. The adaptive main-beam may produce driver assistance projections as patterns or symbols on the road in order to inform or warn the driver appropriately regarding special traffic situations or conditions.**

**Symbols that may be used for driver assistance projections are listed in Annex [16].**

**6.22.9.3.2.1. The lateral distance from the outer edges of the driver assistance projections on the road with respect to the trajectory of the centre of gravity of the vehicle shall not be more than 1,875 mm. This shall be demonstrated by the manufacturer by calculation or by other means accepted by the Type Approval Authority.”**

*Add a new Annex [16] to read:*

#### **Symbols for the use as driver assistance projections**

##### **1. Symbol for slippery road warning**



##### **2. Symbol for collision warning**



## B. New Supplement to UN Regulation No. 149

Add a new paragraph 3.1.3.4. to read:

**“3.1.3.4. In the case of driver assistance projections; it shall specify the size (horizontal and vertical angular limits) of the zone used for performing said projections.”**

Renumber existing paragraphs 3.1.3.4. to 3.1.3.7. accordingly.

Add a new paragraph 5.3.3.8. and its subparagraph to read:

**“5.3.3.8. Driver assistance projections according to UN Regulation No. 48, paragraph 6.22.9.3.2., may be part of the driving-beam light distribution within a zone limited by the following angles:**

**vertically: - 1° and below**

**horizontally: ± 25°**

**The projections may be produced by modifying the beam pattern in the zone defined above, where the luminous intensity in any point of the entire driving beam shall not exceed the maximum value (IM) according to paragraph 5.1.3.5.**

**5.3.3.8.1. The colour of the driver assistance projections shall be white.”**

## II. Justification

1. High-resolution adaptive front-lighting systems (AFS) provide the possibility to adapt the beam pattern more precisely to the according traffic or ambient situation and to improve the performance of the well-known AFS lighting functions of both the passing and the adaptive driving beams. All current AFS requirements on the safety concept including failure provisions as described in UN Regulation No. 48 shall be fulfilled by the proposed functionality.

2. Beside these advantages, this new technology of high-resolution adaptive front-lighting systems provides the option to adapt the beam pattern by projecting patterns or symbols on the road surface, in order to assist the driver in handling and solving special and potentially critical traffic situations or conditions. The information is given directly in the field of view of the driver, such that no further eye adaption or focusing to the instruments in the vehicle’s interior is necessary.

3. Several studies – one carried out and published by Karlsruhe Institute of Technology<sup>1</sup> – clearly show that projections on the road have a big potential of being used in broad traffic as assistance systems in order to avoid accidents in dangerous situations at night. For example, projections showing the width of the vehicle (when passing narrow construction zone lanes) reduce the steering wheel and gas pedal corrections. They give warning information to the driver via road projections and allow a higher reactivity compared to the use of head-up displays.

4. On the other side, the studies from Technical University Darmstadt<sup>2</sup> prove that “The investigated assistance projections have no significant influence on the viewing behaviour of other drivers and did not lead to distraction”. Similarly, further recent studies from University of Hannover (GRE-83-34) show that in traffic situation with long duration exposure of other road users to the driver assistance projections, other road users were hardly noticing the driver

<sup>1</sup> Marina Budanow, Cornelius Neumann; Karlsruhe Institute for Technology, Light Technology Institute: “Road projections as a new and intuitively understandable human-machine-interface”; Advanced Optical Technologies October 2018

<sup>2</sup> Dimitrij Polin, Tran Quoc Khanh; Technical University Darmstadt: “Research into headlamps with high resolution projection modules”; ATZ – Automobiltechnische Zeitschrift 11/2018

assistance projections, regardless whether static or flashing. Even when informed about the driver assistance projections, most of the other road users could not recognize the symbols.

5. This proposal intends to introduce the possibility of projecting driver assistance projections patterns or symbols on the road in front of a vehicle as part of the adaptive driving beam – based on the idea not to change any current requirement in the regulations in order to keep at least the level of safety for all participants in public traffic. The extensive type-approval test procedure for the adaptive driving beam, including the test drive for the verification that no discomfort, distraction or glare is caused, ensures a safe operation of this new technology. The proposed maximum lateral distance from the outer edge of the symbols or patterns on the road to the trajectory of the centre of gravity of the vehicle is limited in consideration of a typical lane width.

6. Driver assistance patterns are defined in this proposal as simple geometric shapes that will be documented by the manufacturer in the technical description and checked by the technical service during the test drive according to UN Regulation No. 48.

7. Driver assistance symbols are proposed to be standardized in a new Annex [16] to UN Regulation No. 48. Two standardized symbols are proposed to be defined, one for slippery road warning and the other for collision warning; both intend to enhance traffic safety by assisting the driver and preventing accidents resulting from according road conditions and traffic situations. These proposed two symbols are derived from the international standard ISO 2575:2010, such that an easy understanding and clear identification of their underlying meaning is ensured.

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