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World Forum for Harmonization of Vehicle Regulations**Working Party on Lighting and Light-Signalling****Eighty-third session**

Geneva, 21-24 April 2020

Item 4 (c) of the provisional agenda

Simplification of lighting and light-signalling UN Regulations:**UN Regulation No. 149 (Road illumination devices)**

Item 6 (a) of the provisional agenda

UN Regulation No. 48 (Installation of lighting and light-signalling devices):**Proposals for amendments to the 05 and 06 series of amendments****Proposal for Supplements to UN Regulation No. 149 and to the 06 series of amendments to UN Regulation No. 48****Submitted by the expert from the International Automotive Lighting and Light Signalling Expert Group***

The text reproduced below was prepared by the expert from the International Automotive Lighting and Light Signalling Expert Group (GTB) to allow the projection of driver assistance symbols, on the road ahead of the vehicle, as part of the Adaptive Driving Beam (ADB). It introduces angular limits for the placement of these projections as well as luminous intensity limits in order to guarantee a good perceptibility of the symbols for the driver at night time without distracting other road users. This revised proposal is based on Informal document GRE-82-04 and takes into accounts the comments received at the eighty-second session of the Working Party on Lighting and Light-Signalling (GRE). The proposed modifications to the existing text of the UN Regulations are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2020 as outlined in proposed programme budget for 2020 (A/74/6 (part V sect. 20) para 20.37), 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 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/or simple symbols, without causing discomfort, distraction or glare to road users and without causing distraction to the driver.”

Add a new paragraph 3.2.8. to read:

“3.2.8. 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 subparagraphs 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 conditions¹.

Examples are given, but not restricted to:

- slippery road warning;
- lane keeping assist;
- rear-end collision warning;
- guidance on road construction sites.

6.22.9.3.2.1. The lateral distance from the outer edge of the symbols or patterns 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.

6.22.9.3.2.2. If symbols are used, they shall follow the design principles laid down in ISO 2575:2010.”

¹ The symbols shall not be in conflict with pertinent traffic rules.”

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 the projection of patterns or symbols 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. 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.”

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.
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 of the system vehicle 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 is necessary.
3. Several studies – one carried out and published by Karlsruhe Institute of Technology¹ – 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, while giving warning information to the driver via road projections shows a higher reactivity compared to the use of head-up displays.
4. On the other side studies from Technical University Darmstadt² prove that “The investigated assistance projections have no significant influence on the viewing behaviour of other drivers and did not lead to distraction”.
5. This proposal intends to introduce the possibility of projecting driver assistance 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. While driver assistance patterns are defined as simple geometric shapes, driver assistance symbols are proposed to be standardized with a reference to standard ISO 2575:2010.

¹ 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

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