

## **Proposal to amend UN Regulations Nos. 48 and [149] to allow Projection of driver assistance symbols**

New high resolution light technologies offer the possibility a) to improve the performance of passing and driving beam light patterns and b) to introduce novel light functions that can for example be used in order to provide information to the driver (e.g. on slippery road warning, lane keeping assist, rear-end collision warning, guidance on road construction sites) in form of the projection of certain symbols on the road ahead the vehicle.

The proposal opens the opportunity to project driver assistance symbols on the road ahead the vehicle as part of the Adaptive Driving Beam by introducing 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.

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

### **I. Proposal to amend UN Regulation No. 48**

*Add new paragraph 2.7.8. to read:*

**“2.7.8. “Driver Assistance Symbols” means a modification of the light distribution for driver assistance purposes, without causing discomfort, distraction or glare to road users.”**

*Add new paragraph 3.2.8. to read:*

**“3.2.8. Where a function is able to project driver assistance symbols on the road, a list of these symbols shall be provided by the manufacturer.”**

*Add new paragraph 6.22.9.3.2. to read:*

**“6.22.9.3.2. The adaptive main-beam may produce light projections for driver assistance symbols on the road in order to inform or warn the driver appropriately regarding special traffic situations or conditions<sup>1</sup>.**

**Examples are given, but not restricted to**

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

**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 [1875]mm. This shall be demonstrated by the manufacturer by calculation or by other means accepted by the Type Approval Authority.”**

<sup>1</sup> The symbols shall not be in conflict with pertinent traffic rules.

## II. Proposal to amend UN Regulation No. [149]

*Add new paragraph 3.1.3.4. to read:*

**“3.1.3.4. In the case of the projection of 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 new paragraph 5.3.3.8. to read:*

**“5.3.3.8. Driver assistance symbols 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 projection of these symbols 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..”**

## III. Justification

High-resolution adaptive front-lighting systems provide the possibility to adapt the beam pattern more precisely to the according traffic or ambient situation and improve the performance of the well-known AFS lighting functions of both the passing and the adaptive driving beam.

Beside these advantages, this new technology of high-resolution adaptive front-lighting systems provides the option to adapt the beam pattern by projecting pattern 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.

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. E.g. 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.

On the other side 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”.

This proposal intends to introduce the possibility of projecting driver assistance symbols on the road in front of a vehicle as part of the adaptive driving beam pattern – based on the idea not to change any current requirement in the regulations in order to keep at least the

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<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

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.