

The amendments to the text are in bold for new text and in strikethrough for deleted text.

## I. Proposal

### UN Regulation No. 53, new Supplement to the 03 series of amendments:

*Insert a new paragraph 2.5.20., to read:*

- "2.5.20. "Adaptive Driving Beam" (or "ADB") means one of the system of AFS type-approved according to UN Regulation No. [149], which is a driving-beam system that adapts its beam pattern to the presence of oncoming and preceding vehicles in order to improve the long-range visibility for the driver without causing discomfort, distraction or glare to other road users.**
- 2.5.20.1. "ADB neutral state" means the state of the ADB when the driving-beam is in the maximum condition of activation.**
- 2.5.20.2. "ADB control signal" means the input signal to the ADB in accordance with the paragraph 6.15.7.2. of this Regulation."**

*Insert a new paragraph 3.2.6., to read:*

- "3.2.6. Where an ADB is fitted on the vehicle, the applicant shall submit a detailed description providing the following information:**
- 3.2.6.1. The related ADB control signals and their technical characteristics as defined according to UN Regulation No. [149];**
- 3.2.6.2. Special instruction, if any, for the inspection of the light sources and the visual observation of the beam;**
- 3.2.6.3. The lamps that are grouped or combined with or reciprocally incorporated in the ADB."**

*Paragraph 5.4., amend to read:*

- "5.4. In the absence of specific instructions, the height and orientation of the lamps shall be verified with the vehicle unladen and placed on a flat horizontal surface, its median longitudinal plane being vertical and the handlebars being in the position corresponding to the straight ahead movement. The tyre pressures shall be those prescribed by the manufacturer for the particular conditions of loading required in this Regulation.**

**In the case where an ADB is installed, with the system in its ADB neutral state."**

*Paragraph 5.13., amend to read:*

- "5.13. Colours of the lights**

...

**Adaptive Driving Beam (ADB): white"**

*Insert a new paragraph 5.15.7., to read:*

- "5.15.7. Adaptive Driving Beam (paragraph 6.15.)."**

*Insert a new paragraph 5.21., to read:*

**"5.21. Where an ADB is fitted, it shall be considered equivalent to the driving-beam headlamp(s)."**

*Paragraph 6.1.6., amend to read:*

"6.1.6. Electrical connections

**6.1.6.1. The passing-beam(s) may remain illuminated with the driving-beam(s).**

**6.1.6.2. The control of the driving-beam headlamp(s) may be automatic regarding their activation and deactivation, the control signals being produced by a sensor system which is capable of detecting and reacting to each of the following inputs:**

- (a) Ambient lighting conditions;**
- (b) The light emitted by the front lighting devices and front light-signalling devices of oncoming vehicles;**
- (c) The light emitted by the rear light-signalling devices of preceding vehicles.**

**Additional sensor functions to improve performance are allowed.**

**For the purpose of this paragraph, "vehicles" means vehicles of categories L, M, N, O, T, as well as bicycles, such vehicles being equipped with retro-reflectors, with lighting and light-signalling devices, which are switched ON.**

**6.1.6.3. It shall always be possible to switch the driving-beam headlamp(s) ON and OFF manually and to manually switch OFF the automatic control of the driving-beam headlamp(s). Moreover, the switching OFF, of the driving-beam headlamp(s) and of their automatic control, shall be by means of a simple and immediate manual operation; the use of submenus is not allowed."**

*Insert a new paragraph 6.1.7.3., to read:*

"6.1.7.3. If the control of the driving-beam headlamp(s) is automatic, an indication shall be provided to the driver that the automatic control of the driving-beam function is activated. This information shall remain displayed as long as the automatic operation is activated."

*Insert a new paragraph 6.1.8.3., to read:*

**"6.1.8.3. Automatic activation and deactivation of the driving-beam headlamp(s):**

**The sensor system used to control the automatic activation and deactivation of the driving beam headlamp(s) shall comply with the following requirements:**

**6.1.8.3.1. The boundaries of the minimum fields in which the sensor is able to detect light emitted from other vehicles defined in paragraph 6.1.6.2. above are defined by the angles indicated below.**

**6.1.8.3.1.1. Horizontal angles: 15 degrees to the left and 15 degrees to the right.**

**Vertical angles: The upward angle is 5 degrees mounting height of the sensor (centre of the sensor aperture above the ground) is less than 2 m downward angle is 2 degrees.**

**These angles are measured from the centre of the sensor aperture relative to a horizontal straight line through its centre and parallel to the longitudinal median plane of the vehicle.**

**6.1.8.3.1.2. The sensor system shall be able to detect on a straight level road:**

- (a) An oncoming power driven vehicle at a distance extending to at least 400 m;
- (b) A preceding power driven vehicle or a vehicle-trailers combination at a distance extending to at least 100 m;
- (c) An oncoming bicycle at a distance extending to at least 75 m, its illumination represented by a white lamp with a luminous intensity of 150 cd with a light emitting area of  $10 \pm 3 \text{ cm}^2$  and a height above a ground of 0.8 m.

To verify compliance with (a) and (b) above, the oncoming and preceding power driven vehicle (or vehicle-trailer combination) shall have position lamps (if applicable) and passing-beam headlamp(s) switched ON.

- 6.1.8.3.2. The transition from driving-beam to passing-beam and vice versa may be performed automatically and shall not cause discomfort, distraction or glare.
- 6.1.8.3.3. The overall performance of the automatic control shall be verified by:
  - 6.1.8.3.3.1. Means of simulation or other means of verification accepted by the Type Approval Authority, as provided by the applicant.
  - 6.1.8.3.3.2. A test drive according to paragraph 1 in Annex 7. The performance of the automatic control shall be documented and checked against the applicant's description. Any obvious malfunctioning shall be contested (e. g. excessive angular movement or flicker).
- 6.1.8.3.4. The control of the driving-beam headlamp(s) may be such that the driving-beam headlamp(s) are switched ON automatically only when:
  - (a) No vehicles, as mentioned in paragraph 6.1.6.2. above, are detected within the fields and distances according to paragraphs 6.1.8.3.1.1. and 6.1.8.3.1.2.; and
  - (b) The detected ambient lighting levels are as prescribed in paragraph 6.1.8.3.5. below.
- 6.1.8.3.5. In the case where driving-beam headlamp(s) are switched ON automatically, they shall be switched OFF automatically when oncoming or preceding vehicles, as mentioned in paragraph 6.1.6.2. above, are detected within the fields and distances according to paragraphs 6.1.8.3.1.1. and 6.1.8.3.1.2.

Moreover, they shall be switched OFF automatically when the illuminance produced by ambient lighting conditions exceeds 7000 lx.

Compliance with this requirement shall be demonstrated by the applicant, using simulation or other means of verification accepted by the Type Approval Authority. If necessary the illuminance shall be measured on a horizontal surface, with a cosine corrected sensor on the same height as the mounting position of the sensor on the vehicle. This may be demonstrated by the manufacturer by sufficient documentation or by other means accepted by the Type Approval Authority."

*Insert a new paragraph 6.15., to read:*

- "6.15. Adaptive Driving Beam (ADB) (UN Regulation No. [149])
  - Where not otherwise specified below, the requirements for driving-beam headlamp(s) (paragraph 6.1.) of this Regulation apply to the ADB.
- 6.15.1. Number
  - 6.15.1.1. One as a system.

- 6.15.1.2. Number of lighting unit shall be one or two**
- 6.15.2. Arrangement**  
No special requirements.
- 6.15.3. Position**  
The ADB shall, prior to the subsequent test procedures, be set to the ADB neutral state;
- 6.15.3.1. In width and height:**  
All dimensions refer to the nearest edge of the apparent surface(s) observed in the direction of the reference axis, of the lighting unit(s).
- 6.15.3.1.1. An independent ADB lighting unit may be fitted above or below or to one side of another front lamp: if these lamps are on top of the other the reference centre of the ADB lighting unit must be located within the median longitudinal plane of the vehicle; if these lamps are side by side their reference centre must be symmetrical in relation to the median longitudinal plane of the vehicle.**
- 6.15.3.1.2. An ADB lighting unit, that is reciprocally incorporated with another front lamp, must be fitted in such a way that its reference centre lies within the median longitudinal plane of the vehicle. However, when the vehicle is also fitted with an independent principal passing-beam headlamp, or a principal passing-beam headlamp that is reciprocally incorporated with a front position lamp alongside the ADB lighting unit, their reference centres must be symmetrical in relation to the median longitudinal plane of the vehicle.**
- 6.15.3.1.3. Two ADB lighting units of which either one or both are reciprocally incorporated with another front lamp must be fitted in such a way that their reference centres are symmetrical in relation to the median longitudinal plane of the vehicle.**
- 6.15.3.2. In length: at the front of the vehicle. This requirement is regarded as satisfied if the light emitted does not cause discomfort to the driver either directly or indirectly by means of the rear-view mirrors and/or reflective surfaces on the vehicle.**
- 6.15.3.3. In any case, the distance between the edge of the illuminating surface of any independent ADB lighting unit and the edge of that of the lamp producing the principal passing-beam must not exceed 200 mm. The distance between the edge of the illuminating surface of any independent ADB lighting unit and the ground must be from 500 mm to 1,300 mm.**
- 6.15.3.4. In the case of two ADB lighting units: the distance separating the illuminating surfaces of two ADB lighting units must not exceed 200 mm.**
- 6.15.4. Geometric visibility**  
The angles of geometric visibility specified in paragraph 6.1.4. of this Regulation, shall be met by at least one of the lighting units said function, according to the description of the applicant. Individual lighting units may be used to comply with the requirements for different angles.
- 6.15.5. Orientation**  
Towards the front.
- 6.15.6. Electrical connections**
- 6.15.6.1. For changing over from the ADB to the passing-beam all lighting units for the driving-beam shall be de-activated simultaneously.**

- 6.15.6.2.** The ADB shall be designed to be adaptive, subject to the provisions in paragraph 6.15.8.2, the control signals being produced by a sensor system which is capable of detecting and reacting to each of the following inputs:
- (a)** Ambient lighting conditions;
  - (b)** The light emitted by the front lighting devices and front light-signalling devices of oncoming vehicles;
  - (c)** The light emitted by the rear light-signalling of preceding vehicles;
- Additional sensor functions to improve performance are allowed.
- For the purpose of this paragraph, "vehicles" means vehicles of categories L, M, N, O, T, as well as bicycles, such vehicles being equipped with retro-reflectors, with lighting and light-signalling devices, which are switched ON.
- 6.15.6.3.** It shall always be possible to switch the ADB, adaptive or non-adaptive, ON and OFF manually and to manually switch OFF the automatic control.
- Moreover, the switching OFF, of the ADB and of their automatic control, shall be by means of a simple and immediate manual operation; the use of sub-menus is not allowed.
- 6.15.6.4.** The passing-beam(s) may remain switched ON at the same time as the ADB.
- 6.15.6.5.** It shall always be possible for the driver to set the ADB to the ADB neutral state and to return it to its automatic operation.
- 6.15.7.** Tell-tale:
- 6.15.7.1.** The provisions of paragraphs 6.1.7. (for the driving-beam headlamp(s)) of this Regulation apply to the respective parts of an ADB.
- 6.15.7.2.** A visual failure tell-tale for ADB is mandatory. It shall be non-flashing. It shall be activated whenever a failure is detected with respect to the ADB control signals or when a failure signal is received in accordance with paragraph 4.13. of UN Regulation No. [149]. It shall remain activated while the failure is present. It may be cancelled temporarily, but shall be repeated whenever the device which starts and stops the engine is switched ON and OFF.
- 6.15.7.3.** If the driving-beam is adaptive, a visual tell-tale shall be provided to indicate to the driver that the adaptation of the driving beam is activated. This information shall remain displayed as long as the adaptation is activated.
- 6.15.8.** Other requirements
- 6.15.8.1.** Verification of compliance with ADB automatic operating requirements
- 6.15.8.1.1.** The applicant shall demonstrate with a concise description or other means acceptable to the Type Approval Authority:
- The correspondence of the ADB control signals
- i)** To the description required in paragraph 3.2.6. of this Regulation; and
  - ii)** To the respective ADB control signals specified in the ADB type approval documents.
- 6.15.8.1.2.** The overall performance of the automatic control shall be demonstrated by the applicant by documentation or by other means accepted by the Type Approval Authority. Furthermore the manufacturer shall provide a

documentation package which gives access to the design of "the safety concept" of the system. This "safety concept" is a description of the measures designed into the system, for example within the electronic units, so as to address system integrity and thereby ensure safe operation even in the event of mechanical or electrical failure which could cause any discomfort, distraction or glare, either to the driver or to oncoming and preceding vehicles. This description shall also give a simple explanation of all the control functions of the "system" and the methods employed to achieve the objectives, including a statement of the mechanism(s) by which control is exercised.

A list of all input and sensed variables shall be provided and the working range of these shall be defined.

The functions of the system and the safety concept, as laid down by the manufacturer, shall be explained. The documentation shall be brief, yet provide evidence that the design and development has had the benefit of expertise from all the system fields which are involved.

For periodic technical inspections, the documentation shall describe how the current operational status of the "system" can be checked.

For Type Approval purposes this documentation shall be taken as the basic reference for the verification process.

**6.15.8.1.3.** To verify, that the adaptation of the driving-beam does not cause any discomfort, distraction or glare, neither to the driver nor to oncoming and preceding vehicles, the technical service shall perform a test drive according to paragraph 2. in Annex 7. This shall include any situation relevant to the system control on the basis of the applicant's description. The performance of the adaptation of the driving-beam shall be documented and checked against the applicant's description. Any obvious malfunctioning shall be contested (e.g. excessive angular movement or flicker).

**6.15.8.2.** Adaptation of the driving-beam

**6.15.8.2.1.** The sensor system used to control the adaptation of the driving-beam, as described in paragraph 6.15.6.2., shall comply with the following requirements:

**6.15.8.2.1.1.** The boundaries of the minimum fields in which the sensor is able to detect light emitted from other vehicles as defined in paragraph 6.15.6.2. above are given by the angles indicated in paragraph 6.1.8.3.1.1. of this Regulation.

**6.15.8.2.1.2.** The sensor system sensitivity shall comply with the requirements in paragraph 6.1.8.3.1.2. of this Regulation.

**6.15.8.2.1.3.** The adaptive driving-beam shall be switched OFF when the illuminance produced by ambient lighting conditions exceeds 7,000 lx.

Compliance with this requirement shall be demonstrated by the applicant, using simulation or other means of verification accepted by the Type Approval Authority. If necessary the illuminance shall be measured on a horizontal surface, with a cosine corrected sensor on the same height as the mounting position of the sensor on the vehicle. This may be demonstrated by the manufacturer by sufficient documentation or by other means accepted by the Type Approval Authority.

**6.15.8.3.** The aggregate maximum intensity of the lighting units that can be energized simultaneously to provide the driving-beam lighting or its modes, if any, shall not exceed 430,000 cd, which corresponds to a reference value of 100.

**This maximum intensity shall be obtained by adding together the individual reference marks indicated on the several installation units that are simultaneously used to provide the driving-beam."**

*Insert a new Annex 7, to read:*

**"Annex 7**

**Test drive**

- 1. Test drive specifications for the automatic control of the driving-beam headlamp(s).**
- 1.1. The test drive shall be carried out in clear atmosphere<sup>1</sup> and with clean headlamp(s).**
- 1.2. The test course shall comprise test sections with traffic conditions, at speed corresponding to the relevant type of road, as described in Table 1 below:**

**Table 1**

Test Section	Traffic conditions	Road type		
		Urban areas	Multi-lane road, e.g. motorway	Country road
	Speed	50 ± 10 km/h	100 ± 20 km/h	80 ± 20 km/h
Average percentage of the full test course length	10 per cent	20 per cent	70 per cent	
<b>A</b>	Single oncoming vehicle or single preceding vehicle in a frequency so that the driving beam will switch ON and OFF.		X	X
<b>B</b>	Combined oncoming and preceding traffic situations, in a frequency so that the driving beam will switch ON and OFF.		X	X
<b>C</b>	Active and passive overtaking manoeuvres, in a frequency so that the driving beam will switch ON and OFF.		X	X
<b>D</b>	Oncoming bicycle, as described in paragraph 6.1.8.3.1.2.			X
<b>E</b>	Combined oncoming and preceding traffic situations	X		

- 1.3. Urban areas shall comprise roads with and without illumination.**
- 1.4. Country roads shall comprise sections having two lanes and sections having four or more lanes and shall include junctions, hills and/or slopes, dips and winding roads.**
- 1.5. Multi-lane roads (e.g. motorways) and country roads shall comprise sections having straight level parts with a length of more than 600 m. Additionally they shall comprise sections having curves to the left and to the right.**
- 1.6. Dense traffic situations shall be taken into account.**
- 2. Test drive specifications for adaptive driving-beam headlamp(s)**
- 2.1. The test drive shall be carried out in clear atmosphere<sup>1</sup> and with clean headlamp(s).**

2.2. The test course shall comprise test sections with traffic conditions, at speed corresponding to the relevant type of road, as described in Table 2 below:

Table 2

Test Section	Traffic conditions	Road type		
		Urban areas	Multi-lane road, e.g. motorway	Country road
		Speed	50 ± 10 km/h	100 ± 20 km/h
	Average percentage of the full test course length	10 per cent	20 per cent	70 per cent
A	Single oncoming vehicle or single preceding vehicle in a frequency so that the adaptive driving beam will react to demonstrate the adaptation process.		X	X
B	Combined oncoming and preceding traffic situations. In a frequency so that the adaptive driving beam will react to demonstrate the adaptation process.		X	X
C	Active and passive overtaking manoeuvres, in a frequency so that the adaptive driving beam will react to demonstrate the adaptation process.		X	X
D	Oncoming bicycle, as described in paragraph 6.15.8.2.1.2.			X
E	Combined oncoming and preceding traffic situations	X		

2.3. Urban areas shall comprise roads with and without illumination.

2.4. Country roads shall comprise sections having two lanes and sections having four or more lanes and shall include junctions, hills and/or slopes, dips and winding roads.

2.5. Multi lane roads (e.g. motorways) and country roads shall comprise sections having straight level parts with a length of more than 600 m. Additionally they shall comprise of sections having curves to the left and to the right.

2.6. Dense traffic situations shall be taken into account.

2.7. For the test sections A and B in the table above the engineers conducting the tests shall evaluate and record the acceptability of the performance of the adaptation process in relation to oncoming and preceding road users. This means that the test engineers shall operate the vehicle being tested and additionally operate the oncoming and preceding vehicles.

This may be demonstrated by the manufacturer using other means accepted by the Type Approval Authority.

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<sup>1</sup> Good visibility (meteorological optical range MOR > 2,000 m defined according to WMO, Guide to Meteorological Instruments and Methods of Observation, Sixth Edition, ISBN: 92-63-16008-2, pp 1. 9. 1/ 1. 9. 11, Geneva 1996).

**UN Regulation No. [149], new Supplement to the 00 series of amendments:**

*Paragraph 1.*, amend to read:

"1. Scope

This Regulation applies to the following road illumination devices:

Headlamps emitting a driving-beam and/or an asymmetrical passing-beam for vehicles of categories L, M, N and T

Adaptive front-lighting systems (AFS) for vehicles of categories L, M and N

Headlamps emitting a driving-beam and/or a symmetrical passing-beam for vehicles of categories L and T

Front fog lamps for vehicles of categories L3, L4, L5, L7, M, N and T

Cornering lamps for vehicles of categories M, N and T."

*Paragraphs 3.2.4. and 3.2.4.1.*, amend to read:

"3.2.4. If approval is sought for an AFS or ADB which is not intended to be included as part of the approval of a vehicle type according to UN Regulation No. 48 **or UN Regulation No. 53.**

3.2.4.1. The applicant shall submit sufficient documentation to prove the capability of the system to comply with the provisions of paragraph 6.22. of UN Regulation No. 48 **or paragraph 6.15. of UN Regulation No. 53** when correctly installed, and"

*Paragraph 4.13.*, amend to read:

"4.13. If applicable, the lamp shall be so made that a failure signal in order to comply with the relevant provisions of UN Regulation No. 48 **or UN Regulation No. 53** is provided."

*Insert a new paragraph 5.3.1.1.1.*, to read:

"**5.3.1.1.1. When an ADB is designed only for vehicles of category L, the system needs to comply only with the requirement set out in paragraph 5.3.3. regardless of paragraph 5.3.1.1.**"

*Annex 1, paragraph 9.3.5.*, amend to read:

"9.3.5. Whether approval is sought for **an AFS or ADB** which is not intended to be included as part of the approval of a vehicle type according to UN Regulation No. 48 **or UN Regulation No. 53**: yes/no<sup>1</sup>"

## II. Justification

1. The proposal for amending UN Regulation No. 53 and UN Regulation No. [149] is aimed at allowing vehicles of category L3 to be equipped with Adaptive Driving Beam (ADB), which is already permitted under UN Regulation No. 48.
2. For passing beams, UN Regulation No. 53 currently allows to mount "HIAS (horizontal inclination adjustment system)" and "additional light sources for bend lighting", which have been provided to improve forward night-time visibility in case where a motorcycle is running on a curved road, but similar features currently exist for driving beams. This revision defines ADB as AFS for motorcycle driving beam and adds ADB requirements to UN Regulation No. 53, taking the wording of UN Regulation No. 48 as a reference.
3. This revision adds category L to the section of the scope of UN Regulation No. [149] regarding AFS, enabling category L to adopt AFS. For that purpose, this proposal also adds necessary requirements to UN Regulation No. [149] to meet UN Regulation No. 53.
4. By enabling ADB to be mounted, the forward visibility of the motorcycle at night time will be improved and this will contribute to safety.
5. In addition, the proposal to amend UN Regulation No. 53 is harmonized with UN Regulation No. 48 so as to permit also L3 category vehicles to mount "the device that detects the lamps of oncoming and preceding vehicles and switch passing-beam/driving-beam automatically".
6. The image below illustrates the proposed expansion of the scope of application of AFS requirements.

