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World Forum for Harmonization of Vehicle Regulations (WP.29)

Working Party on Lighting and Light-Signalling (GRE)
(Fifty-sixth session, 4-7 April 2006,
agenda item 12.)

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 112

(Headlamps emitting an asymmetrical passing beam)

Transmitted by the expert from the Working Party "Brussels 1952" (GTB)

Note: The text reproduced below was prepared by the expert from GTB, in order to incorporate in the Regulation the specifications for the definition and sharpness of the cut-off for dipped-beam headlamps. The text is a consequence of the discussion on harmonized beam pattern and cut-off line at the fifty-fourth GRE session (TRANS/WP.29/GRE/54, paras. 57 to 60 and 65) and it is developed from TRANS/WP.29/GRE/2005/20 and TRANS/WP.29/GRE/2003/24 and its Add.1. The modifications to the existing text (up to Supplement 5 to the Regulation) are marked in **bold** characters.

Note: This document is distributed to the Experts on Lighting and Light-Signalling only.

A. PROPOSAL

Table of contents, annexes, amend to read:

" ….
Annex 8 - Overview of operational periods concerning tests for stability of photometric performance

Annex 9 - Instrumental verification of the "cut-off" for dipped beam headlamps"

Part B,

Paragraph 6.1.2., amend to read:

"6.1.2. The illumination produced by the headlamp shall be determined by means of a **flat** vertical screen set up 25 m forward of the **headlamp, at** right angles to its axes as shown in Annex 3 to this Regulation; **the test screen shall be sufficiently wide to allow examination and adjustment of the "cut-off" of the dipped beam over at least 5° on either side of the V-V line**."

Paragraphs 6.2.1. to 6.2.2.3., amend to read:

"**6.2.1. The luminous intensity distribution of the passing beam headlamp shall incorporate a "cut-off" (see Figure 1 below), which enables the headlamp to be adjusted correctly for the photometric measurements and for the aiming on the vehicle.**

The "cut-off" shall provide:

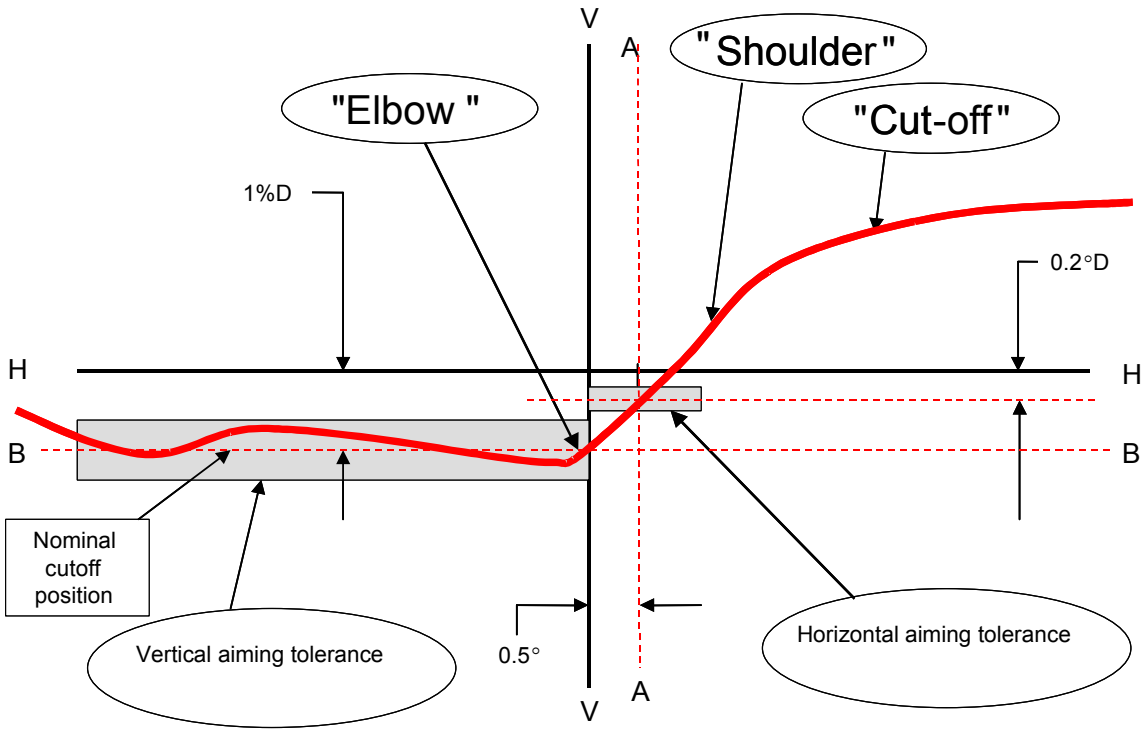
(a) For right hand traffic beams:
(i) a straight "horizontal part" towards the left;
(ii) a raised "elbow - shoulder" part towards the right.

(b) For left hand traffic beams:
(i) a straight "horizontal part" towards the right;
(ii) a raised "elbow - shoulder" part towards the left.

In each case the "elbow-shoulder" part shall have a sharp edge.

6.2.2. The headlamp shall be visually aimed by means of the "cut-off" (see Figure 1 above) as follows:

6.2.2.1. for vertical adjustment: the horizontal part of the "cut-off" is moved upward from below line B and adjusted to its nominal position one per cent (25 cm) below the H-H line;



Note: **The scales are different for vertical and horizontal lines.**

Figure 1

6.2.2.2. **for horizontal adjustment: the "elbow – shoulder" part of the "cut-off" shall be moved:**

- **for right hand traffic from right to left and shall be horizontally positioned after its movement so that:**
- **above the line 0.2° D its "shoulder" shall not exceed the line A to the left and**
- **on the the line 0.2° D or below its "shoulder" should cross the line A and**
- **the kink of the"elbow" should be primarily on the V-V line;**

or

for left hand traffic from left to right and shall be horizontally positioned after its movement so that:

- **above the line 0.2° D its "shoulder" shall not exceed the line A to the right and**

- **on the the line 0.2° D or below its "shoulder" should cross the line A and**

- **the kink of "elbow" should be primarily on the V-V line.**

6.2.2.3. **Where a headlamp so aimed does not meet the requirements set out in paragraphs 6.2.5. to 6.2.7. and 6.3., its alignment may be changed, provided that the axis of the beam is not displaced:**

Horizontally from line A by more than:

- **0.5° to the left or 0.75° to the right, for right hand traffic or**

- **0.5° to the right or 0.75° to the left, for left hand traffic and**

Vertically not more than 0.25° up or down from line B.

6.2.2.4. **If, however, vertical adjustment cannot be performed repeatedly to the required position within the tolerances described in paragraph 6.2.2.3. above, the instrumental method of Annex 9, paragraphs 2. and 3. shall be applied to test compliance with the required minimum quality of the "cut-off" and to perform the vertical and horizontal adjustment of the beam."**

Paragraph 6.2.2.3. (former), footnote 9/, should be deleted.

Paragraph 6.2.3., amend to read (including the reference to footnote 8/ and renumbering of footnote 10/ (former) as footnote 8/):

"6.2.3. When so aimed, the headlamp need, if its approval is sought solely for provision of a passing beam, **8/** comply only with the requirements set out in paragraphs **6.2.4. to 6.2.6**. below; if it is intended to provide both a passing beam and a driving beam, it shall comply with the requirements set out in paragraphs **6.2.4. to 6.2.6.** and 6.3."

Paragraph 6.2.4., should be deleted (including the reference to footnote 11/ and footnote 11/).

Paragraphs 6.2.5. and 6.2.6., renumber as paragraphs 6.2.4. and 6.2.5. accordingly.

Paragraph 6.2.7., renumber as paragraph 6.2.6. (the reference to footnote 12/ and footnote 12/ renumber as footnote 9/).

Paragraph 6.2.8., renumber as paragraph 6.2.7.

Paragraph 6.2.9. (former), renumber as paragraph 6.2.8. and amend to read:

"6.2.8. The requirements in paragraph **6.2.4.** above shall also apply to headlamps designed to provide bend lighting and/or that include the additional light source referred to in paragraph **6.2.9.2.**"

Paragraphs 6.2.9.1. to 6.2.9.1.3., renumber as paragraphs 6.2.8.1. to 6.2.8.1.3.

Paragraphs 6.2.10. to 6.2.10.3., renumber as paragraphs 6.2.9. to 6.2.9.3. accordingly.

Paragraph 6.3.1., amend to read:

"6.3.1. In the case of a headlamp designed to provide a driving beam and a passing beam, measurements of the illumination produced on the screen by the driving beam shall be taken with the same headlamp alignment as for measurements under paragraphs **6.2.4. to 6.2.6.** above; in the case of a headlamp providing a driving beam only, it shall be so adjusted that the area of maximum illumination is centred on the point of intersection of lines HH and VV; such a headlamp need meet only the requirements referred to in paragraph 6.3. Where more than one light source is used to provide the driving beam, the combined functions shall be used to determine the maximum value of the illumination (EM)."

Paragraph 6.5., amend to read:

"6.5. The screen illumination values mentioned in paragraphs **6.2.4**. to 6.2.7. and 6.3. above shall be measured by means of a photo receptor, the effective area of which shall be contained within a square of 65 mm side."

Paragraph 8, the reference to footnote 13/ and footnote 13/, renumber as footnote 10/.

Annex 1,

Item 9., amend to read:

"9. Brief description:

Category as described by the relevant marking: 3/ ……..
….....…….....……...

Number and category (ies) of filament lamp(s): ….....
…….....…….....…….....

The adjustment of the cut-off has been determined at: 10 m / 25 m 2/.

The determination of the minimum sharpness of the "cut-off" has been carried out at: 10 m / 25 m 2/."

Annex 5,

Insert a new paragraph 1.4., to read:

"**1.4. If, however, vertical adjustment cannot be performed repeatedly within the tolerances described in paragraph 6.2.2.3. of this Regulation, one sample shall be tested according to the procedure described in paragraphs 2. and 3. of Annex 9.**"

Annex 7,

Insert a new paragraph 1.3., to read:

"**1.3. If, however, vertical adjustment cannot be performed repeatedly to the required position within the tolerances described in paragraph 6.2.2.3. of this Regulation, one sample shall be tested according to the procedure described in paragraphs 2. and 3. of Annex 9.**"

Insert a new Annex 9, to read:

"**Annex 9**

INSTRUMENTAL VERIFICATION OF THE "CUT-OFF" FOR DIPPED BEAM HEADLAMPS

1. GENERAL

In the case where paragraph 6.2.2.4. of this Regulation applies, the quality of the "cut-off" shall be tested according to the requirements set out in paragraph 2. below and the instrumental vertical and horizontal adjustment of the beam shall be performed according to the requirements set out in paragraph 3. below.

Before carrying out the measurement of the quality of "cut-off" and the instrumental aiming procedure, a visual pre-aim in accordance with paragraphs 6.2.2.1. and 6.2.2.2. of this Regulation is required.

2. MEASUREMENT OF THE QUALITY OF THE "CUT-OFF"

To determine the minimum sharpness, measurements shall be performed by vertically scanning through the horizontal part of the "cut-off" in angular steps of 0.05° at either a measurement distance of:

- **10 m with a detector having a diameter of approximately 10 mm or**
- **25 m with a detector having a diameter of approximately 30 mm.**

The measuring distance at which the test was carried out shall be recorded in item 9. of the communication form (see Annex 1 of this Regulation).

To determine the maximum sharpness, measurements shall be performed by vertically scanning through the horizontal part of the "cut-off" in angular steps of 0.05° exclusively at a measurement distance of 25 m and with a detector having a diameter of approximately 30 mm.

The "cut-off" quality shall be considered acceptable if the requirements of paragraph 2.1. to 2.3. below comply with at least one set of measurements.

2.1. Not more than one "cut-off" shall be visible. 1/

2.2. Sharpness of "cut-off"

The sharpness factor G is determined by scanning vertically through the horizontal part of the "cut-off" at 2.5° from the V-V where:

$G = (\log E_{\beta} - \log E_{(\beta + 0.1°)})$ where β = the vertical position in degrees.

The value of G shall not be less than 0.13 (minimum sharpness) and not greater than 0.40 (maximum sharpness).

2.3. Linearity

The part of the horizontal "cut-off" that serves for vertical adjustment shall be horizontal between 1.5° and 3.5° from the V-V line (see Figure 1 below).

- **The inflection points of the "cut-off" gradient at the vertical lines at 1.5°, 2.5° and 3.5° shall be determined by the equation:**

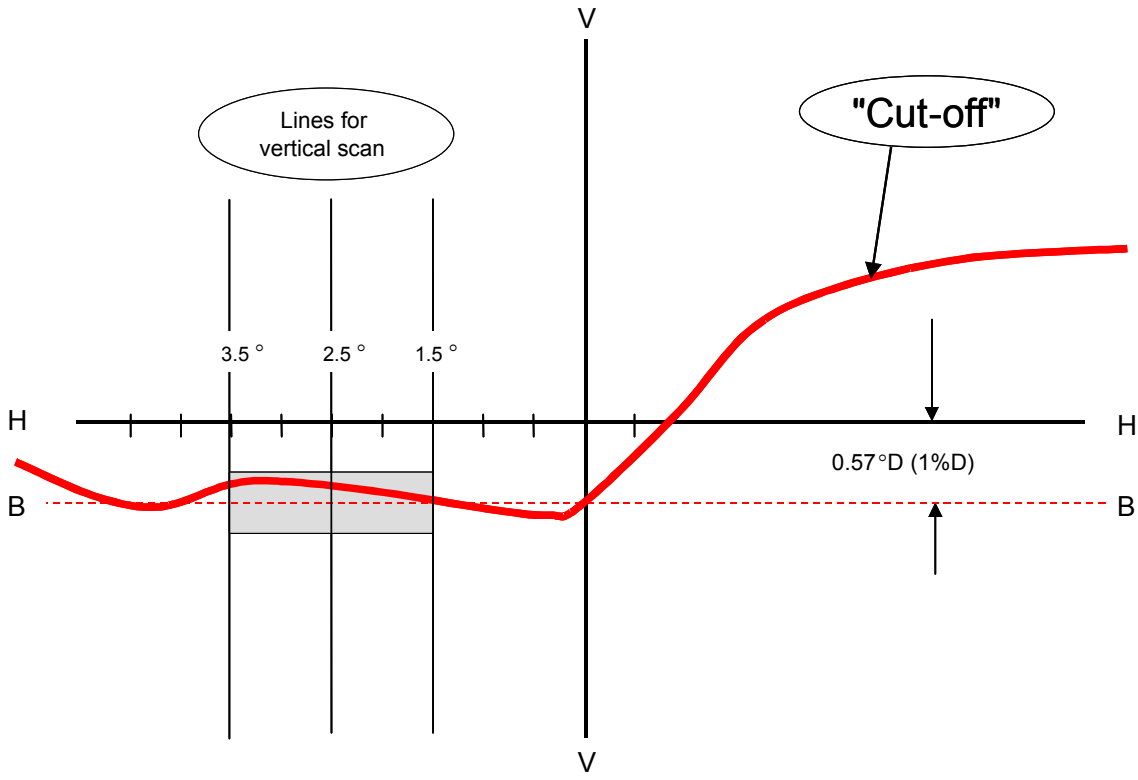
$$(d^2 (\log E) / d\beta^2 = 0).$$

- **The maximum vertical distance between the inflection points determined shall not exceed 0.2 °.**

1/ This paragraph should be amended when an objective test method is available.

3. VERTICAL AND HORIZONTAL ADJUSTMENT

If the "cut-off" complies with the quality requirements of paragraph 2. of this annex, the beam adjustment may be performed instrumentally.



Note: **The scales are different for vertical and horizontal lines.**

Figure 1: Measurement of "cut-off" quality

3.1. Vertical adjustment

Moving upward from below the line B (see Figure 2 below), a vertical scan is carried out through the horizontal part of the "cut-off" at 2.5° from V-V. The inflection point (where d^2 (log E) / dv^2 = 0) is determined and positioned on the line B situated one per cent below H-H.

3.2. Horizontal adjustment

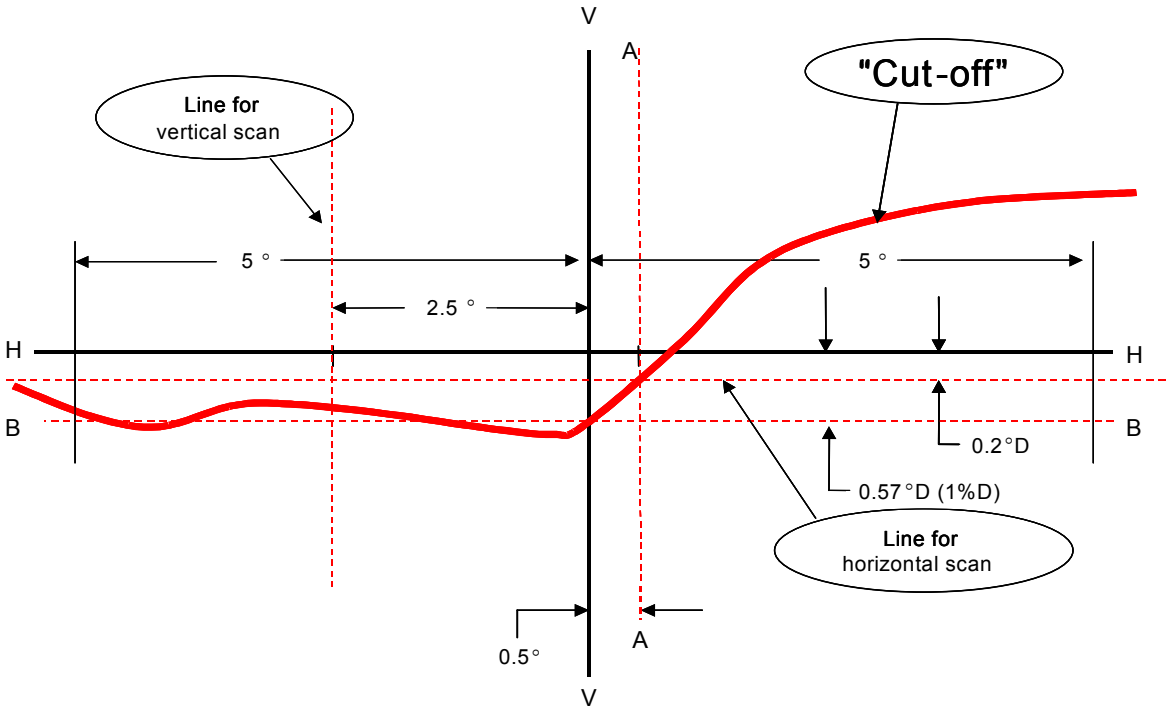
The applicant shall specify one of the following horizontal aim methods:

(a) The "0.2 D line" method (see Figure 2 below).

A single horizontal line at 0.2° D shall be scanned from 5° left to 5° right after the lamp has been aimed vertically. The maximum gradient "G"

determined using the formula $G = (\log E_{\beta} - \log E_{(\beta + 0.1°)})$ where β is the horizontal position in degrees, shall not be less than 0.08.

The inflection point found on the 0.2 D line shall be positioned on the line A.



Note: **The scales are different for vertical and horizontal lines.**

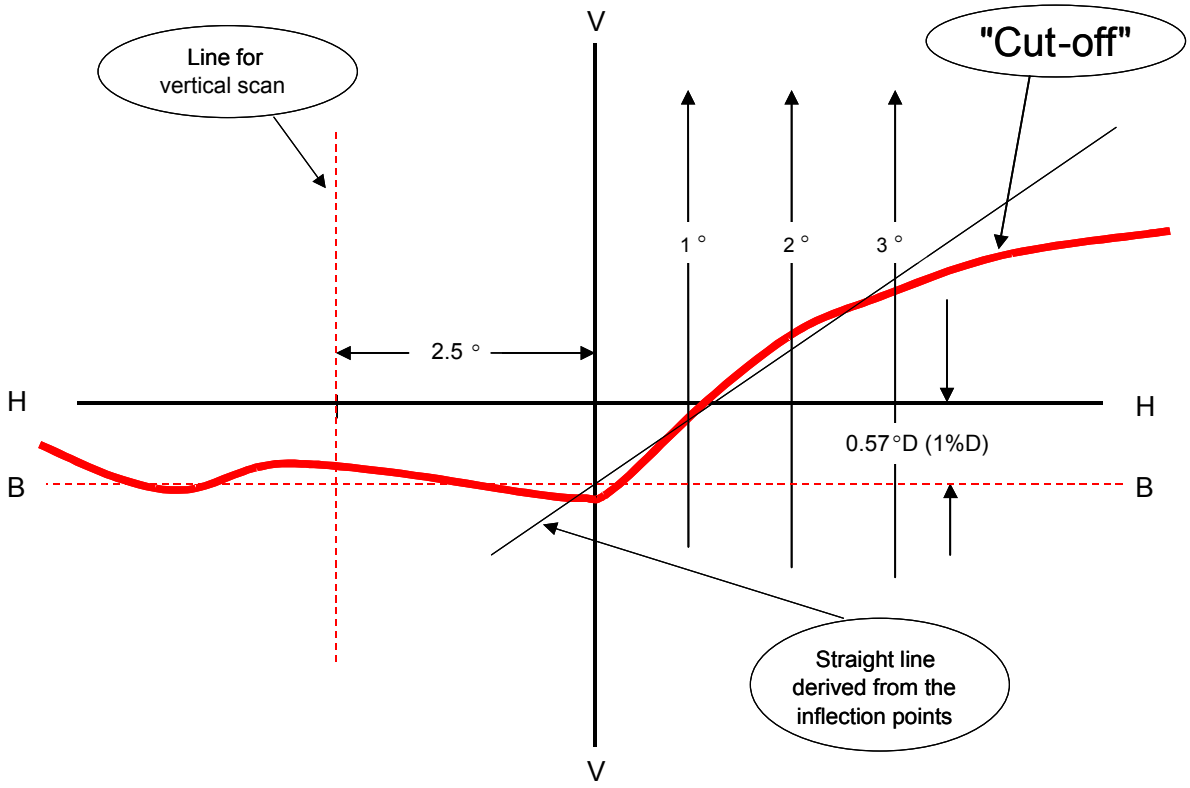
Figure 2: Instrumental vertical and horizontal adjustment- horizontal line scan method

(b) The "3 line" method (see Figure 3 below)

Three vertical lines shall be scanned from 2° D to 2° U at 1°R, 2°R, and 3°R after the lamp has been aimed vertically. The respective maximum gradients "G" determined using the formula:

$$G = (\log E_{\beta} - \log E_{(\beta + 0.1°)})$$

where β is the vertical position in degrees, shall not be less than 0.08. The inflection points found on the three lines shall be used to derive a straight line. The intersection of this line and the line B found while performing vertical aim shall be placed on the V line.



Note: **The scales are different for vertical and horizontal lines.**

Figure 3: Instrumental vertical and horizontal adjustment-three line scan method

B. JUSTIFICATION

The GTB experts have developed a method for the numeric definition and measurement of "cut-off" sharpness and position. This can be used to determine whether the "cut-off" of a passing beam headlamp yields sufficient sharpness to ensure proper aiming, and can also be used for the instrumental adjustment of the beam.

Annex

Bibliography

(ENGLISH ONLY)

The main background and references are given in the following publications:

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Note: This document is distributed to the Experts on Lighting and Light-Signalling only.

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