Submitted by the AD-HOC GROUP ON RXXX-ANNEX 9

PROPOSAL

REF.: DRAFT REGULATION NR.XXX , (WD 5-05)

A) RATIONALE

The passing beam's cut-off serves for a clearly visible separation between the (strongly) illuminating central part of the beam and its upper glare controlled part. This allows for easy and unambigous control and adjustment of the lamp during maintenance, periodical inspection, after repair or bulb replacement throughout its liftime by means of the <u>visual aiming</u>.

Other aiming processes (with optical instruments) may be applied alternatively in certain cases, if it leads to the same result.

The 'ECONOMIC COMMISSION FOR EUROPE' Regulations for passing beam headlamps require therefore a sufficiently sharp cut-off forming a clear kink.

This must apply also to AFS systems.

However, some specific provisions may be needed, in order to cover the technical configurations possibly to be applied for the purpose of adaptive frontlighting.

This may be e.g. additional lighting units providing:

- a horizontal cut-off, only
- a cut-off shoulder, but no horizontal cut-off part, or a shorter one
- a weaker or sidewards oriented lighting not providing a cut-off.

In practice several solutions may apply if the cut-off of a "partial beam" is not a complete one:

- the lighting unit is designed to be adjusted (automatically) together with another lighting unit which provides a full cut-off, or,
- ** the partial beam produced from a lighting unit is a "weak" one, or situated far outside of the central region of the passing beam; such a lighting unit may be sufficiently pre-set by design, or,
- *** the partial beam provides features which allow for a sufficient visual aiming anyhow, to be specified however by the manufacturer; (in this case the type approval test should refer also to these specifications,) or,
- **** the partial beam is so designed (e.g. uniformly) that no horizontal adjustment is necessary at all (pre-set).

The <u>"cut-off" definition</u> (section 1) describes in general the necessary elements: a horizontal "flat part" with a flatness specified numerically in terms of vertical extension and a raised "shoulder part". No definite "kink" is defined, but implicitely by the said two elements some kind of a (macroscopic) "kink" is always given anyhow.

In the second section the <u>visual aiming process</u> for a partial beam produced by a given lighting unit is specified. The line A, at the nominal position below the H-H line, is the unambiguous reference for vertical aiming. The V-V line serves as the reference for the beam's horizontal aiming, if any. Both reference elements are found in the real world of aiming equipment used in garages. Thus dependable aiming will be assured, for AFS systems, too.

Other <u>equivalent aiming methods</u> (based upon means provided by the system itself) may be introduced, specified and demonstrated by the Applicant.

GRE-AFS Working Doc No. 5- 09

5th GRE-AFS Informal meeting 28..30. October 2003, Bonn p. 2 / 6

The Adjustment of an aimable "master" lighting unit may simultaneously adjust a "slave" lighting unit; this can reduce the overall adjustemt effort in practice and may solve questions of non-complete or non-provided cut-off's.

A respective amendmend to paragraph 6.2.1. of the plain text of the draft regulation has been proposed concerning the above two items.

The initial aiming is restricted to the passing beam's neutral state. The adjustment for the other passing beam modes must be aligned automatically.

The <u>cut-off quality</u> may during type approval tests (according to a subjective appraisal), or must (e.g. in case of missing re-producibility), be tested and evaluated (paragraph 1.2.). The respective procedures is indicated in paragraph 3., which in principle are the same as going to be introduced for other headlamps (TRANS-WP29-GRE-2002-42e). Some specific items are addressed however for adaptive frontlighting systems.

The graphs in the Figures A.9-1 through A.9-3 were amended accordingly.

B) PROPOSAL

Rxxx, paragraph 6.2.1. amend to read:

- 6.2.1. for each side of the system (**vehicle**) the passing beam **in its neutral state** shall produce **at least one** "cut-off" as defined in annex 9 to this Regulation **or**,
- 6.2.1.1. the system shall provide other means, e.g. optical features or temporary auxiliary beams, allowing for unambiguous and correct aiming.

Annex 5, paragraph 1.4., and annex 7, paragraph 1.3., each amend to read:

- "... If, however, vertical adjustment, according to the provisions of paragraph 2. or 4. of annex 9 to this Regulation, cannot be performed repeatedly to the required position, one of the sampled systems shall be tested with respect to the quality of cut-off (shape and measurement of the quality of cut-off) according to the procedure described in sections 1. and 3. of annex 9 to this Regulation. "
- Annex 1, insert a new paragraph 9.7. to read:
- 3.1.1. The distance to the receiver cell and its aperture, if "cut-off" tests according to paragraph 3. of annex 9 were performed.

Annex 9 amend to read:

PASSING BEAM "CUT-OFF" AND AIMING PROVISIONS

1. <u>Cut-off definition</u>

The "cut-off", when projected on the aiming screen as defined in annex 10 to this Regulation, shall be sufficiently sharp to permit aiming; it shall comply with the following requirements.

1.1. <u>Shape</u> (see Fig. A.9-1)

The "cut-off" shall provide

- a horizontal "flat part" towards the left, and
 - a raised "shoulder part" to the right;

in addition it shall be such, that after being aimed in accordance with the provisions in paragraphs 2.1. to 2.5. below:

- 1.1.1. The "flat part" shall not deviate vertically by more than
 - 0.2 deg up or down from its horizontal median line within 0.5 deg and 4.5 deg left of V-V, and
 - 0.1 deg up or down within two thirds of said lenght.
- 1.1.2. the raised "shoulder part"
 - shall have a sufficiently defined left edge, and,
 - the line whose origin is at the intersection of line A and the V-V line to be constructed as a tangent to this edge, shall have an inclination versus the line H-H of at least 10 deg and not exceeding 60 deg (see Fig. A.9-1 below).
- 1.2. <u>"Flat part" quality evaluation</u> (see Fig. A.9-2)

If the horizontal "flat part" of the "cut-off", if any, does not provide sufficient sharpness and/or flatness and/or horizontal orientation for a sufficiently reproducible visual adjustment according to paragraph 2. below, the "cut-off" shall be tested according to the provisions of paragraph 3. below.

- 2. <u>Visual aiming procedure</u>
- 2.1. The system shall, prior to the subsequent test procedures, be set to the neutral state.

The instructions below apply to the beams of those lighting units, which are specified by the Applicant to be aimed.

- 2.2. The beam shall be <u>vertically</u> positioned so, that the "flat part" of its "cut-off" is situated at the nominal vertical position (line A) according to the respective requirements indicated in Table 2 of annex 3 to this Regulation; this shall be deemed to be fulfilled, if the horizontal median line of the "flat part" of the "cut-off" is situated at line A (see Fig. A.9-3 below);
- 2.3. The beam shall be <u>horizontally</u> positioned so, that its raised "shoulder" is situated to the right of the V-V line and touching it (see Fig. A.9-3 below);
- 2.3.1. if a partial beam provides a horizontal "cut-off" only: no special requirements for horizontal adjustment apply if not specified by the applicant.
- 2.4. Any "Cut-off" of a lighting unit not designed to be separately aimed, according to the Applicants specification, must comply with the relevant requirements.

GRE-AFS Working Doc No. 5-09

5th GRE-AFS Informal meeting 28..30. October 2003, Bonn p. 4 / 6

- 2.5. Lighting units when aimed using a method specified by the Applicant in accordance with the provisions of the paragraph 5.2. and 6.2.1.1. of this Regulation: the shape and position of the "cutoff", if any, shall comply with the respective requirements of Table 2 of annex 3 to this Regulation.
- 2.6. For each further mode of passing beam.

The shape and position of the "cut-off", if any, shall comply automatically with the respective requirements of Table 2 of annex 3. to this Regulation.

- 2.7. A separate initial aiming and/or adjustment process according to the applicant's specification, based on the provisions of paragraphs 2.1. through 2.6. above, may apply to lighting units intended to be installed separately.
- 3. <u>"Cut-off" evaluation 1/</u>
- 3.1. Measurements of the illuminance on the aiming screen, if any, are performed by vertical scanning through the horizontal "flat part" of the "cut-off" continuously or in steps being equidistant and not exceeding 0.05 deg of the vertical angle β , using a receiver cell with a diameter of one thousandth part of the measurement distance with a tolerance of \pm 25%.
- 3.1.1. The distance to the receiver cell and its aperture shall be noted in paragraph 9.7. of a form conforming to the model of annex 1 to this Regulation.
- 3.1.2. After horizontal adjustment, according to the provisions in section 2. above, the cut-off line is scanned along the vertical lines at 1.5, 2.5 and 3.5 deg to the left of V-V, and at positions in between, where the quality of the "cut-off" is visually contested.
- 3.2. When so measured, the following conditions shall be met:
- 3.2.1. <u>One "cut-off" line only per beam of a given lighting unit</u>

In case a "cut-off" is, according to the Applicants specification, intended for aiming purposes: no secondary "cut-off" (double line) shall be produced from the same lighting unit.

3.2.2. <u>Sufficient sharpness</u>

The maximum value of $(\log E_{\beta} - \log E_{(\beta_{+0.1^{\circ}})})$ is called the "sharpness factor G" of the "cut-off". It is evaluated at 2.5 deg left of V-V and at those horizontal positions between 0.5 and 4.5 deg left of V-V, where the "cut-off's" sharpness is visually contested. The value of G shall not be less than 0.13.

3.2.3. <u>Sufficient flatness</u>

the horizontal "flat part" of the "cut-off" line is deemed sufficiently flat, if the vertical positions where $d^2(\log E_\beta) / d\beta^2 = 0$ of each vertical scanning line according paragraph 3.1.2. above, are located within the bandwidth indicated in paragraph 1.1.1. above.

4. <u>Instrumental adjustment</u>

If the "cut-off" line complies with the requirements set out in paragraph 3. above, the adjustment corresponding to the procedure of paragraph 2 above may be performed instrumentally.

 $[\]underline{1}$ / For background information see CIE CONGRESS REPORT 1979, KYOTO.

Figures.

Note: The "cut-off" is shown schematically, projected on the aiming screen.



GRE-AFS Working Doc No. 5- 09 5th GRE-AFS Informal meeting 28..30. October 2003, Bonn p. 6 / 6

C) Explanatory Notes / EXAMPLE

