

Proposal for revising paragraph 2.2.1 of Annex 6 to Regulation No. 112 (Uniform provisions concerning the approval of motor vehicle headlamps emitting an asymmetrical passing beam or a driving beam or both and equipped with filament lamps and/or light-emitting diode (LED) modules) to improve the test of resistance to atmospheric agents to the automotive lamps' lenses or lenses material.

The text reproduced below was prepared by the experts from China in order to improve the test of resistance to atmospheric agents to the automotive lamps' lenses or lenses material. The modifications to Regulation No 112 are shown in **bold** type.

A. Proposal

Paragraph 2.2.1 of Annex 6 (page 46), amend to read:

2.2.1 Resistance to atmospheric agents

Three new samples (lenses or samples of material) shall be exposed to radiation from a source having a spectral energy distribution similar to ~~that of a black body at a temperature between 5,500 K and 6,000 K.~~ **daylight spectral energy distribution described in CIE Publication No. 85:1989, Table 4.** Appropriate filters shall be placed between the source and the samples so as to reduce as far as possible radiations with wave lengths smaller than 295 nm and greater than 2,500 nm, **and the minimum and maximum levels of the relative spectral irradiance in the UV wavelength range are given in Table 1.** The samples shall be exposed to ~~an energetic illumination of $1,200 \text{ W/m}^2 \pm 200 \text{ W/m}^2$~~ **an light source with irradiance of 0.68 W/m^2 at 340nm,** for a period such that ~~the luminous energy that they receive is equal to $4,500 \text{ MJ/m}^2 \pm 200 \text{ MJ/m}^2$~~ **the radiation energy that the they receive is equal to $2,550 \text{ kJ/m}^2$.** Within the enclosure, the temperature measured on the black panel placed on a level with the samples shall be $50 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$. In order to ensure a regular exposure, ~~the samples shall revolve around the source of radiation at a speed between 1 and 5 r/min~~ **the irradiance at any position in the area used for specimen exposure shall be at least 80 % of the maximum irradiance.**

The samples shall be sprayed with distilled water of conductivity lower than 1 mS/m at a temperature of $23^\circ\text{C} \pm 5^\circ\text{C}$, in accordance with the following cycle:

spraying: 5 minutes; drying: 25 minutes.

Table 1 – Relative spectral irradiance of xenon-arc lamps with daylight filters

Spectral passband (λ =wavelength in nm)	Minimum %	CIE No. 85:1989, Table 4 %	Maximum %
$\lambda < 290$			0.15
$290 \leq \lambda < 320$	2.6	5.4	7.9
$320 < \lambda \leq 360$	28.2	38.2	39.8
$360 < \lambda \leq 400$	54.2	56.4	67.5

B. Justification

The original description of this part of ECE R112 is based on old technique, the technique on weathering test has improved a lot within the latest 10 years:

- 1) As the spectral energy distribution of sun light has been accurately described in CIE Publication No. 85:1989, Table 4^[1], which is much more accurate than that described with Black body temperature. So we recommend to use '**daylight spectral energy distribution described in CIE Publication No. 85:1989, Table 4**' to replace 'that of a black body at a temperature between 5,500 K and 6,000 K' to describe spectral energy distribution.
- 2) As to the degradation of polymer material, the influence of UV range of sunlight with short wavelength is much severer than visible and IR range of sunlight with long wavelength. It is general to describe only the shortest and longest wave length of light source, So we recommend to include the UV table into the regulation which is from 'CIE Publication No. 85:1989, Table 4' with minimum and maximum range, which similar to ISO 4892-2:2006^[2].
- 3) As to the irradiance description, since short UV is more severe than visible and IR light, exposure of the sample under 50 W/m² of UV or IR light for 1000 hours will have totally different result. It will be more accurate to set the irradiance of the light source base on UV version instead of total irradiance/illumination, so we recommend to set "irradiance of 0.68W/m² at 340nm" and modify the description of exposure period "4,500 MJ/m² ± 200 MJ/m²" to "2,550 kJ/m²" accordingly.
- 4) We recommend to delete "In order to ensure a regular exposure, the samples shall revolve around the source of radiation at a speed between 1 and 5 r/min", since it is a hardware based description, and it sets a limit of test equipment . So we recommend to use a performance based description, which is also accepted by ISO 4892-2:2006^[2]: '**The irradiance at any position in the area used for specimen exposure shall be at least 80 % of the maximum irradiance.**' There are several international standard related with auto and plastic have also changed from hardware based to performance based description in same way, for example, ISO 4892-2:2006, SAE J2527-2004(which replaced SAE J1960-2004^[4]) has deleted the specification on sample rotation in according old standards ISO 4892-2:1994^[3], SAE J1960-2004^[4].

Reference:

[1] CIE Publication No. 85:1989, Table 4

[2] ISO 4892-2:2006 Plastics - Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps

[3] ISO 4892-2:1994 Plastics - Methods of exposure to laboratory light sources – Part 2: Xenon-arc sources

[4] SAE J1960 Accelerated exposure of automotive exterior materials using a controlled irradiance water-cooled xenon arc apparatus

[5] SAE J2527 Performance based standard for accelerated exposure of automotive exterior materials using a controlled irradiance xenon-arc apparatus
