Texte zu den geplanten neuen EU-Regelungen zur umweltgerechten Produktgestaltung und zur Energieverbrauchskennzeichnung in der Beleuchtung – Zusammenstellung * des Umweltbundesamtes (UBA), Deutschland

Entwürfe der EU-Kommission vom 3. Juli 2018

Hintergrundtext:

Lichtflimmern: Zu dem von der EU-Kommission vorgeschlagenen SVM-Höchstwert

– Diskussionstext von Peter Erwin, Juli 2018 –

Hinweis: Dies ist die englischsprachige Version; die deutschsprachige kann heruntergeladen werden unter **

EN: Information on the coming EU Lighting Regulations – Ecodesign and Energy Labelling – Compilation * of the Federal Environment Agency (UBA), Germany

The EU Commission's drafts of 3 July 2018

Background information: Light flicker – on the SVM maximum value, proposed by the EU Commission

– Discussion Paper by Peter Erwin, July 2018 –

FR: Informations sur les futures réglementations de l'UE concernant l'éclairage – l'écoconception et l'étiquetage énergétique – Compilation * de l'Agence Fédérale de l'Environnement (UBA), Allemagne

Les projets de la Commission Européenne du 3 juillet 2018

Informations de fond: Scintillement – sur la valeur maximale de SVM proposée par la Commission européenne

– Document de discussion par Peter Erwin, juillet 2018 –

Indication : C'est un texte en anglais. Une version allemande peut être téléchargé sous **

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* https://www.eup-network.de/de/eup-netzwerk-deutschland/offenes-forum-eu-regelungen-beleuchtung/dokumente/texte/

** http://www.eup-network.de/fileadmin/user_upload/Lichtquellen_Diskussion_SVM_Erwin_2018_07_DE.pdf

Es folgt ein unveränderter Originaltext.

EN: The following is an unmodified original text.

FR: Ce qui suit est un texte original.

Light Modulation
SVM Limitation

In the context of the Regulatory committee
for the upcoming EU Lighting Regulations –
Ecodesign and Energy Labelling
of light sources

Submitted by

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Der Lichtpeter
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In the product design requirements, the SVM (Stroboscopic Visibility Measure) is used as a measure of stroboscopic effects. The weighting curve used in the SVM formula is based on an SVM value of 1.0 [6]. This has been estimated to represent the visibility threshold for an average observer. Accordingly, this value was also taken as a limitation requirement for the product design for general purpose LED lamps.

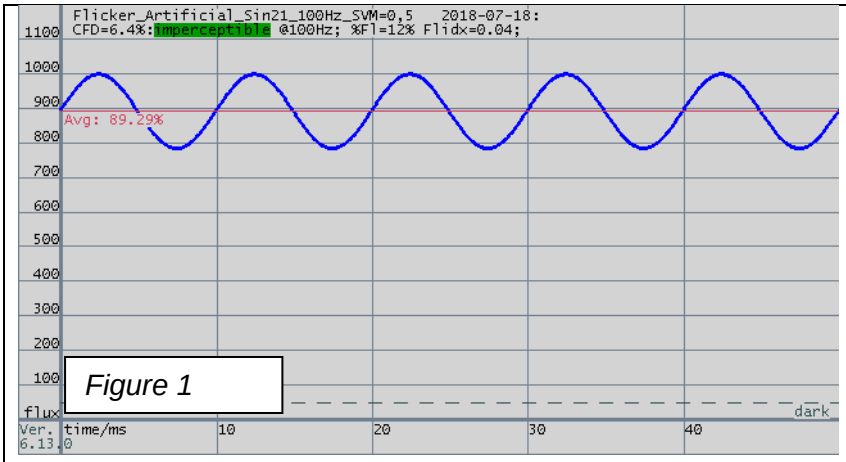
In the base paper of the EU's Lighting Regulation [4] for consultation within the next months, the SVM value for stroboscopic effects has been raised from 1.0 to 1.6 in the product design requirements. Quotes:

„The metric for the stroboscopic effect used in this Regulation is the 'SVM' (Stroboscopic Visibility Measure), as defined in standards. SVM=1 represents the visibility threshold for an average observer;
…
Table 4 – Functional requirements for light sources:
„Stroboscopic effect for LED and OLED MLS: SVM ≤ 1.6 at full-load

This was due to a submission from Sweden in February 2018 [5].

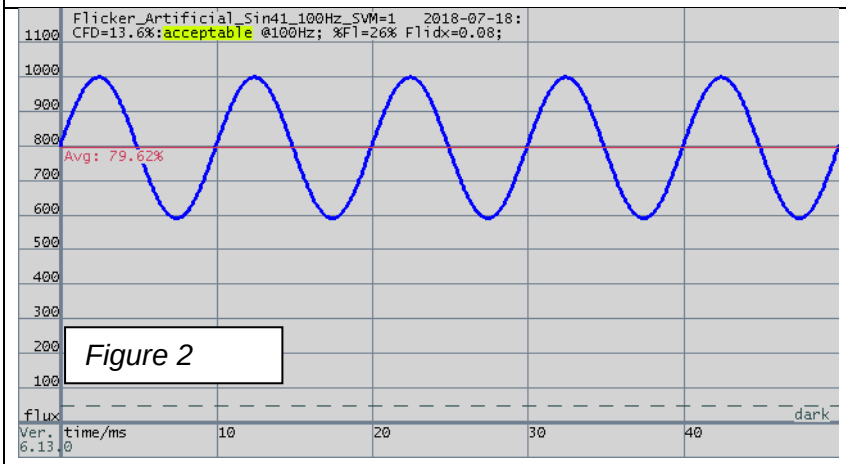
This document shows what this requirement means and what quality lamps are allowed to correspond to when the SVM value is set to 1.6.
Comparisons of SVM values of an incandescent bulb, MB fluorescent lamps, model lamps based thereon and lamps in the market with SVM = 1.6 are performed.
It is then argued that for general purpose lamps an SVM of 1.0 should be maintained and, moreover, that limits should be set application specific.

Peter Erwin, July 2018



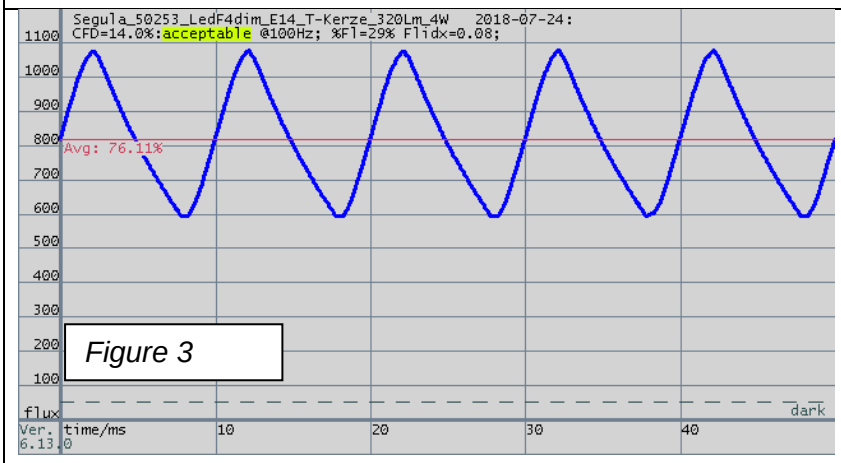
Modulation = 12.0 %
SVM = 0.47

Classic 60W incandescent or 42W halogen bulb in Europe: The light modulation of the light bulb in Europe has caused no complaints in 100 years of experience. The light modulation of the light bulb in the USA is only half as high due to the 120V operation and the resulting higher thermal inertia.



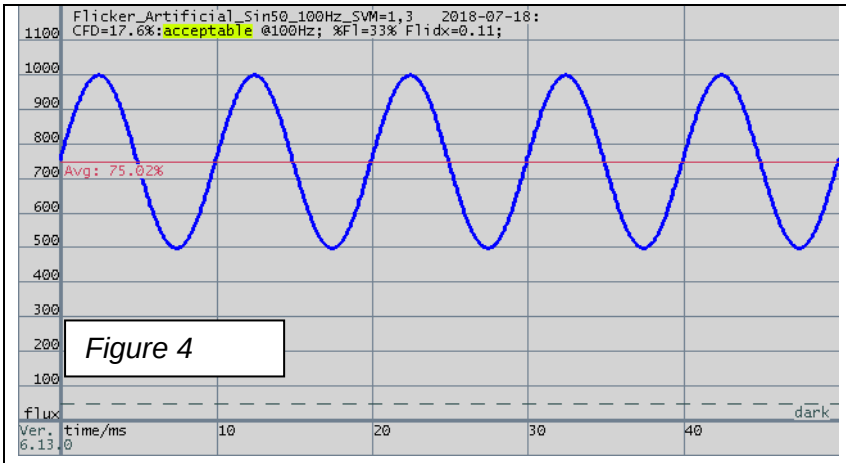
Modulation = 25.6 %
SVM = 1.0

Here is the set perceptibility threshold on which the calculation formula for SVM is based. The modulation is twice as high as that of the incandescent bulb.



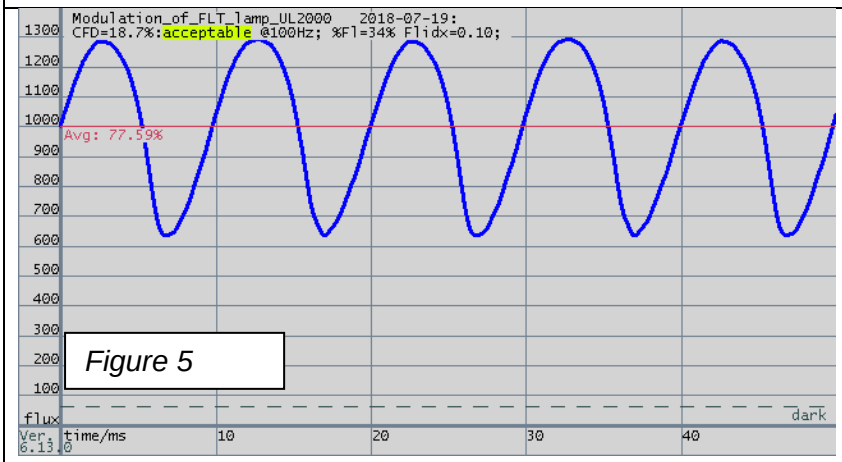
Modulation = 29.0 %
SVM = 1.0

Image of the light emission curve of an LED illuminant in the market with SVM = 1. Simple capacitor power supplies produce steeper flanks with higher frequency components, giving higher modulation at the same SVM value.



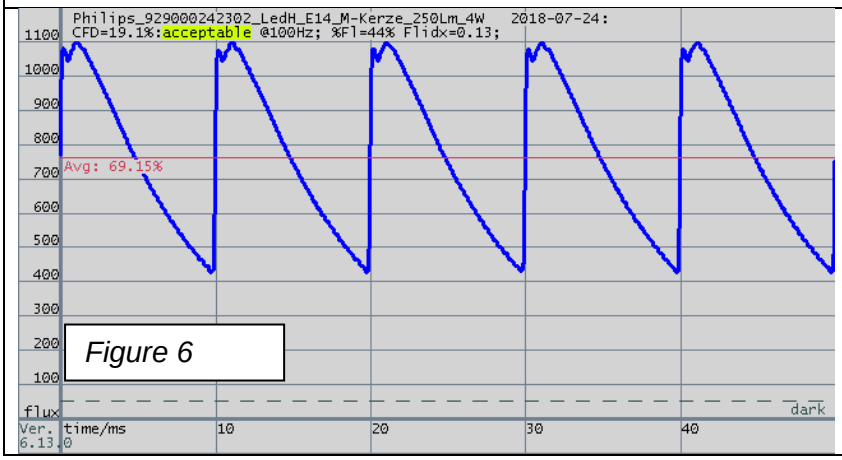
Modulation = 33 %
SVM = 1.3

Light emission of lamps with SVM = 1.3 and sinusoidal waveform.



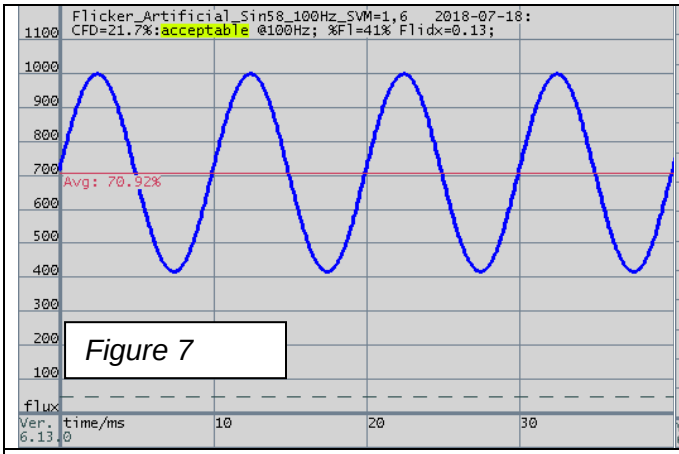
MB fluorescent lamp
Modulation = 34 %
SVM = 1.3

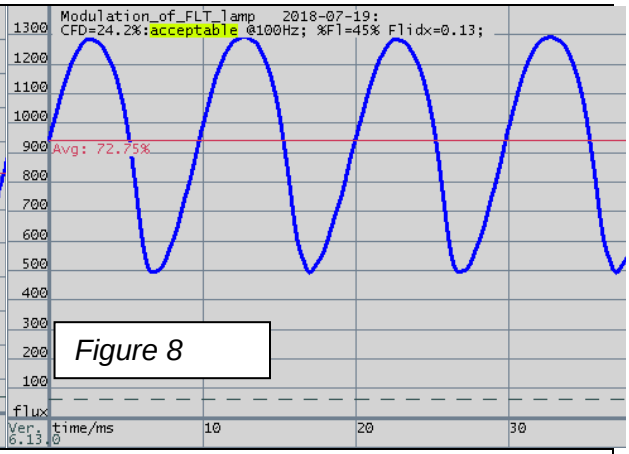
This is the light emission curve, which according to studies by Prof DPhil A. J. Wilkins leads to headaches and other discomforts [1][2]. The modulation is three times as high as that of the incandescent bulb.



Modulation = 44.2 %
SVM = 1.3

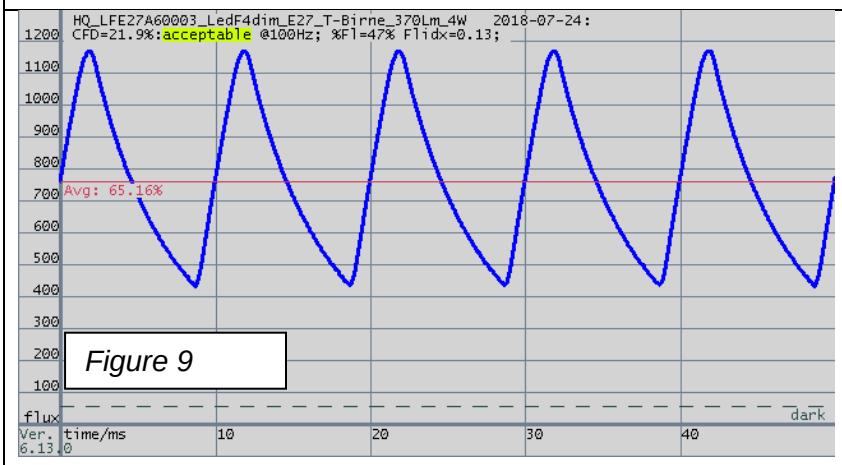
Image of the light emission curve of an LED illuminant in the market with SVM = 1.3. Simple capacitor power supplies produce steeper flanks with higher frequency components, giving higher modulation at the same SVM value.





Sine wave and MB fluorescent lamp, modulation = 41..45%

Light emission by lamps with **SVM = 1.6.**
This is the light emission curve corresponding to the SVM value planned for the requirements of LED lamps.
The modulation is 3.7 times as high as that of the incandescent bulb.



Light emission curves of LED bulbs in the market with **SVM = 1.6**.

At SVM of 1.6, capacitor power supplies have small capacities.
The modulation is 47%.

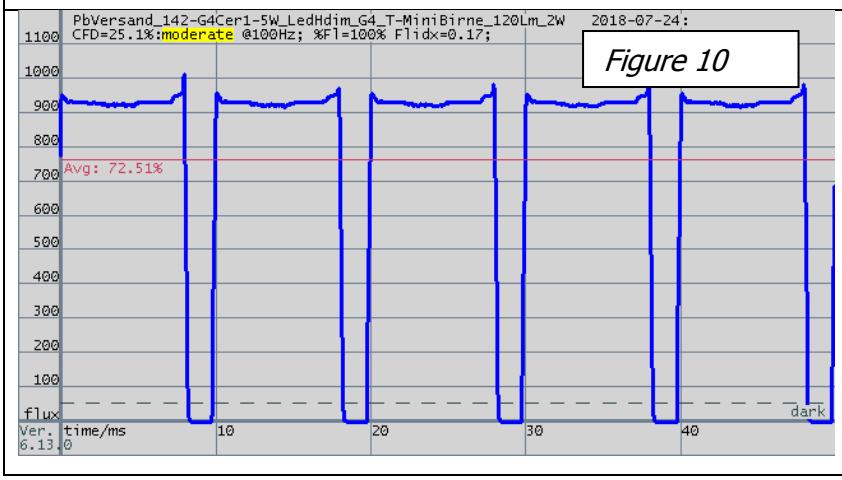


Figure 10 shows the light emission of a light source in which only semiconductors are integrated for a simple current controller, which generates no light in the zero-crossing range (with a notable width of 16%). This leads to strobe effects, the modulation is 100%.

The stroboscopic effects also result in the phantom array effect, through which objects are repeatedly seen during rapid eye movements.

Figure 10 also shows that, in contrast to the SVM, the CFD [3] takes better account of the higher frequency components in the stroboscopic light by means of a correspondingly higher measured value.

If the SVM value of 1.6 is transferred as a general limit into the visibility threshold table with limits of different measuring methods, then this is how it represents:

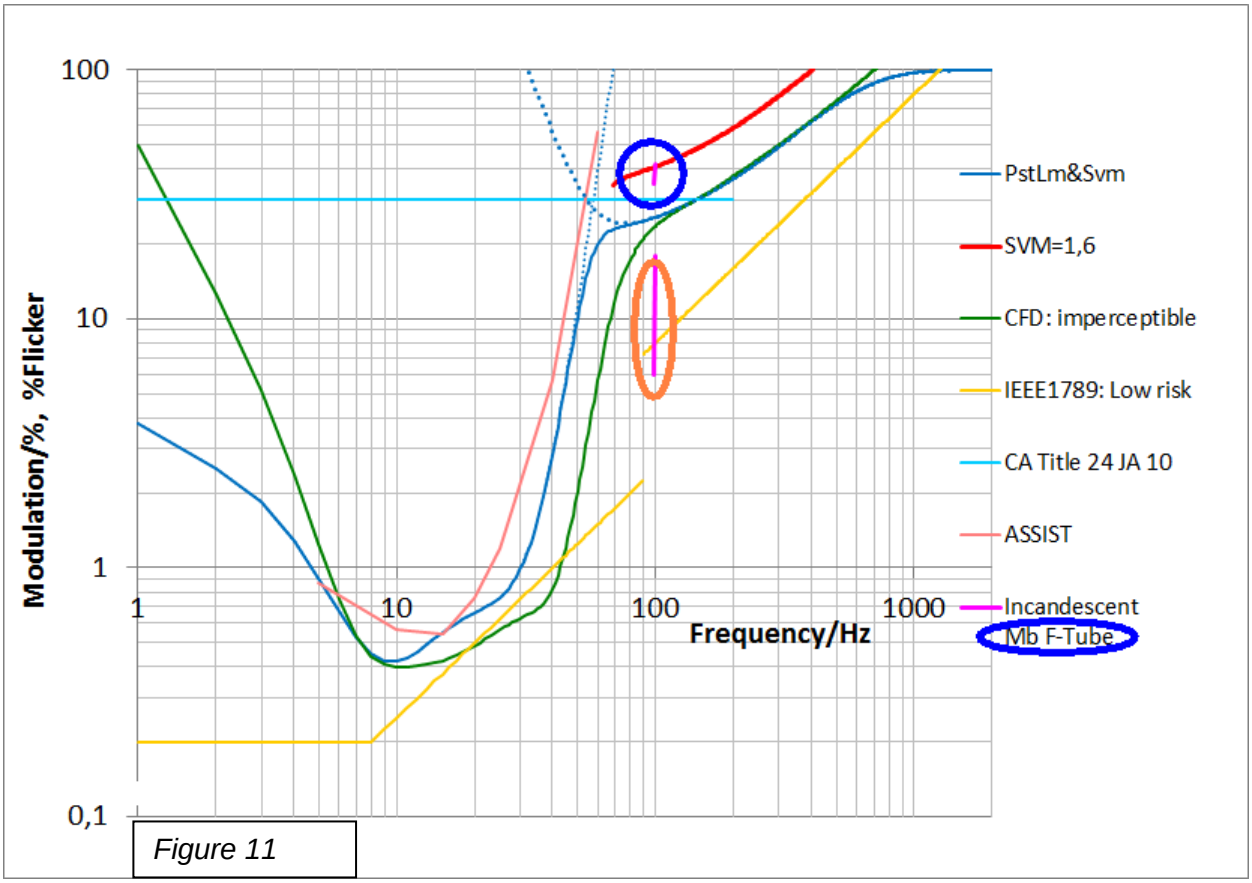


Figure 11

On the one hand, Europe argues that the US sets limits so sharply by using IEEE1789 [3] that the European classic incandescent bulb is classified as risky. The IEEE1789 method is therefore hardly accepted in Europe (orange ellipse) [3].

On the other hand, the PstLM SVM procedure from Europe is completely out of the question for the US if the SVM limit is set so high that it is 5 times higher than IEEE1789 and 1.5 times higher than CecT24Ja10 [3].
Accordingly unfavourable is the SVM limit of 1.6 (red line) compared to the former own recommendation of 1.0 (blue line "PstLm&SVM"), because it brings back the situation that already in the 50s with the large-scale introduction of the MB fluorescent tube caused discomfort for humans (blue circle).

The overall effort to measure and evaluate lamps to reduce light modulation should also provide the opportunity to be globally meaningful and accepted.

It is comprehensible that industry representatives (e.g. NEMA) have an interest in setting limit values for light modulation as high as possible, because this reduces the product costs or increases the profit (we are talking about a few cents here). The production of low light modulating products requires larger energy storage, which are, in the form of electrolytic capacitors, possibly less durable.
Nevertheless, the limits must be set to benefit humans.

In order to make sense of the measurement and evaluation using SVM and PstLM, the limit value for general purpose LED lamps should be set to 1.0.
Also A. J. Wilkins in a correspondence entirely agreed that the value of 1.0 should remain. As shown in *Figure 10*, an SVM value of 1.6 even allows stroboscopic effects which should be avoided at all costs.
The SVM limit of 1.0 should also apply to the dimmed state. The market already proves the feasibility with competitively priced products. The electronics required for this fits e.g. in an E14 socket and provides an SVM of <0.7.

The variety of applications and corresponding limits for the light modulation is so dynamic that it is not possible to set one limit for all applications. Therefore, application-specific limit values should generally be specified.

- It is easy to see that on the one hand there is a high demand for low-modulation light, for example for office space.
- On the other hand, places that can be reckoned with a short stop can certainly be equipped with lower-priced, durable products. Examples include parking garages or street lighting. Apart from that, they also have a lower illuminance and thus a less harmful influence.

Here is a suggestion [3]:

	SVM	Application
	< 0,1	Modulation-free, can be used everywhere, also good for filming (studios, sports facilities)
	0,1 ≤ 1	Low modulation (still good, limit for jobs, offices, public facilities, public places for longer stays e.g. restaurant). General purpose light.
	1 ≤ 2	Still acceptable for living spaces. For a longer stay, complaints such as headaches may occur.
	2 ≤4	Strobe light possible. Street lighting, underground garages. Only suitable for a short stay.
	>4	Generally not allowed. Stroboscopic effects caused by the mains AC voltage. Impaired physical condition (headache, malaise), unsuitable for the correct perception of movement. Dangerous for workplaces with rotating or cycling parts.

Table 1

References

[1] A. J. Wilkins; I. Nimmo-Smith; A. I. Slater; L. Bedocs, Oct 1988:
Fluorescent lighting, headaches and eyestrain

[2] A. J. Wilkins; C Clark, Jan 1990:
Modulation of light from fluorescent lamps

[3] Peter Erwin, Oct 2017:
Discussion paper: Light flicker: Determination and Assessment

[4] EU-Commission, Lighting regulation, Jul 2018:
Draft for a regulation with requirements on the design of light sources (Annex)

[5] Swedish Energy Agency, Feb 2018:
Comments by Sweden on the drafts of the EU Commission of November 13th, 2017

[6] CIE: TC 1-83, D. Sekulovski (Chair), Aug 2016
Visual Aspects of Time-Modulated Lighting Systems - Definitions and Measurement Models