Texte zu EU-Regelungen zur umweltgerechten Produktgestaltung und zur Energieverbrauchskennzeichnung in der Beleuchtung – Zusammenstellung [1] des Umweltbundesamtes (UBA), Deutschland

Diskussion über künftige Änderungsverordnungen (Produktgestaltung und -information)

Diskussionstext der EU-Kommission vom 10. Juni 2020:

Stellungnahme des Herstellerverbandes LE [2] vom 12. Juni 2020

– 2. Teil : Zu SVM-Höchstwert und -Toleranz –

Hinweis: Bitte beachten Sie, daß der angehängte Text nur in Englisch verfaßt ist.

EN: Information on EU Lighting Regulations – Ecodesign and Energy Labelling – Compilation [1] of the Federal Environment Agency (UBA), Germany

Discussion of future amending regulations (Product Design and Product Information)

The EU Commission's discussion text as of 10 June 2020: Comments by the Industry Association LE [2] as of 12 June 2020

– 2nd Part: on SVM maximum value and tolerance –

FR: Informations sur réglementations de l'UE concernant l'éclairage – l'écoconception et l'étiquetage énergétique – Compilation [1] de l'Agence Fédérale de l'Environnement (UBA), Allemagne

Discussion sur les futurs règlements modificatifs (Conception des produits et informations relatives aux produits)

Texte de discussion de la Commission européenne du 10 juin 2020 : Commentaires de l'association de producteurs LE [2] de 12 juin 2020

– Seconde partie : La valeur maximale et la tolérance du SVM –

Indication : Veuillez noter que le présent texte n'est disponible qu'en anglais.

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

[2] LE = Lighting Europe; http://www.lightingeurope.org/

DE: ↓ **EN**: → page III **FR** : → page IV

Texte im Offenen Forum (**abc** = vorliegender Text)

- **Bestehende EG- und EU-Regelungen**
- **Studien der EU-Kommission**
- **Regelungsentwürfe**
  - Frühere Entwürfe
  - **Änderungsverordnungen**
    - Vorlauf: ◦ Vorab-Stellungnahmen, Hintergrundinformationen und Diskussionstexte ◦ Informelles Interessensgruppentreffen am 19. Februar 2020 ◦ EK-Entwürfe vom Mai 2020 (Produktgestaltung und -information) ◦ Konsultationsforum am 4. Juni 2020
    - **EK-Entwürfe vom Juni 2020 (Produktgestaltung und -information)**
      - Texte der EU-Kommission (10. Juni 2020)
      - Arbeitshilfen/Diskussionstexte
      - **Stellungnahmen**
        - Mitgliedstaaten
        - **Andere Interessensvertretungen**
          - **Stellungnahme des Herstellerverbandes Lighting Europe**
            - Zu verschiedenen Themen (12. Juni 2020) [EN]
            - Zu verschiedenen Themen (30. Juni 2020) [EN]
            - **Zu SVM-Höchstwert und -Toleranz (12. Juni 2020) [EN]**
          - Andere: ◦ Unterhaltungssektor ◦ Prof. Linow, Hochschule Darmstadt, DE ◦ Umweltorganisationen
- **Öffentliche Konsultationen auf EU-Ebene**
- **Diskussion im Offenen Forum**
- **Weitere Dokumente**

Abkürzungen: ● EG = Europäische Gemeinschaft ● EK = EU-Kommission ● EU = Europäische Union ● SVM : Maß für die Sichtbarkeit des Stroboskopeffektes

EN

Documents in the Open Forum (**abc** = text at hand)

- **Existing EC and EU Regulations**
- **Studies of the European Commission**
- **Draft regulations**
  - Earlier drafts
  - **Amending Regulations**
    - Forerun: ◦ Comments in advance, background information and discussion texts ◦ Informal stakeholder meeting on 19 February 2020 ◦ EU Commission's drafts of May 2020 (Product design and information) ◦ Consultation Forum (4 June 2020)
    - **EU Commission's drafts of June 2020 (Product design and information)**
      - Texts of the EU Commission (10 June 2020)
      - Working aids/Discussion texts
      - **Comments**
        - Member States
        - **Other interested parties**
          - **Manufacturer association Lighting Europe**
            - Comments on various issues (12 June 2020) [EN]
            - Comments on various issues (30 June 2020) [EN]
            - **Comments on SVM maximum value and tolerance (12 June 2020) [EN]**
          - Others: ◦ Entertainment sector ◦ Prof. Linow, University of applied sciences Darmstadt, DE ◦ Environmental organisations
- **Public Consultations at EU level**
- **Discussion in the Open Forum**
- **Further documents**

Abbreviations: ● EC = European Communities ● EU = European Union ● SVM = Stroboscopic Visibility Measure

FR

Documents dans le forum ouvert (**abc** = présent document)

- **Règlements existants de la CE et de l'EU**
- **Études de la Commission européenne**
- **Projets de règlements**
  - Projets antérieurs
  - **Règlements modificatifs**
    - Précédent : ◦ Commentaires en avance, informations de fond et textes de discussion ◦ Réunion informelle des parties prenantes le 19 février 2020 ◦ Projets de la Commission européenne du mai 2020 (Conception des produits et informations sur les produits) ◦ Forum consultatif (4 juin 2020)
    - **Projets de la Commission européenne du juin 2020 (Conception des produits et informations sur les produits)**
      - Textes de la Commission européenne (10 juin 2020)
      - Aides du travail/Textes de discussion
      - **Commentaires**
        - États membres
        - **Autres groupes d'intérêt**
          - **Association de producteurs Lighting Europe**
            - Commentaires sur des sujets variés (12 juin 2020) [EN]
            - Commentaires sur des sujets variés (30 juin 2020) [EN]
            - **Commentaires sur la valeur maximale et la tolérance du SVM (12 juin 2020) [EN]**
          - Autres : ◦ Secteur du divertissement ◦ Prof. Linow, haute école spécialisée Darmstadt, DE ◦ Organisations environnementales
- **Consultations publiques au niveau de l'UE**
- **Discussion dans le Forum Ouvert**
- **Autres documents**

Abréviations : ● CE = Communauté européenne ● SVM : mesure de la visibilité stroboscopique ● UE = Union européenne

Es folgt ein unveränderter Originaltext.

EN: The following is an unmodified original text.

FR: Ce qui suit est un texte original.

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Recommendations based on conclusions of the SVM Round-Robin Test

Ourania Georgoutsakou

Secretary General

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12/06/2020

Our recommendation to revise the SVM requirement

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Commission proposal (20 May 2020)

Stroboscopic effect for LED and OLED MLS	SVM ≤ 0,9 at full-load (except for light sources intended for use in outdoor applications, industrial applications or other applications where lighting standards allow a CRI < 80) From 1 September 2023: SVM ≤ 0,4 at full-load (except for light sources intended for use in outdoor applications, industrial applications or other applications where lighting standards allow a CRI < 80)

LightingEurope proposal (*see next slide for explanation*)

Stroboscopic effect for LED and OLED MLS	SVM ≤ ~~0,9~~**1.3** at full-load ~~(except for light sources intended for use in outdoor applications, industrial applications or other applications where lighting standards allow a CRI < 80)~~ From 1 September 2023: SVM ≤ ~~0,4~~**1.0** at full-load ~~(except for light sources intended for use in outdoor applications, industrial applications or other applications where lighting standards allow a CRI < 80)~~

Measurement tolerance (only for MSAs) for P_{st}^{LM} and SVM set at 0.1 or 10 %, whichever is higher

Why this LE proposal

LightingEurope has proposed a 3-staged approach with exemptions. Following discussions with regulators, we understand that a 2-staged approach is preferred and have adapted our recommendation based on our technical expertise and the results of the round-robin test.

A 2-stage approach for an SVM requirement ≤ 1.0 **without exemptions** (as proposed by the Commission) will impact the availability of appropriate LED retrofits (in terms of shape and size):

- LED retrofit for full-glass G9
- LED retrofits for E14 > 5 W
- LED retrofits for E27 tubular (Ø 38 mm) HL 150 W / 205 W
- LED retrofits for full-glass R7s
- LED retrofits for G5 ≥ 8 W

Not having the above light sources on the market will lead to dissatisfied consumers who will be forced to replace their otherwise functioning luminaires

LightingEurope therefore recommends to exempt full-glass G9, full-glass R7S, G5 > 8 W, E14 > 5 W, and E27 tubular lamps by setting their SVM limit at ≤ 1.6

Remarks on SVM numbers raised during the Consultation Forum of 4 June

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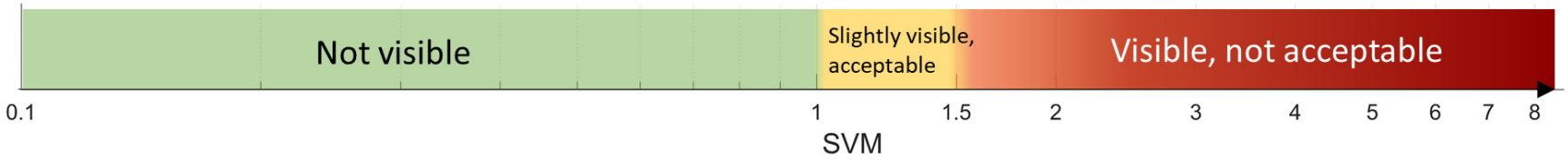
- SVM 1.0 is the scientific visibility threshold
- SVM 1.3 is proven to be acceptable and have no health effects in a long-term study
- SVM 1.6 is the recommended limit in NEMA 77:2017, the only globally available standard giving recommendations for SVM for indoor applications
- SVM 0.9 was the SVM value of one of 5 lamps tested in the Veitch/Martinsons study, which was targeted to test an SVM 1.0 lamp, but the tested lamp deviated slightly from this target value
- SVM 0.4 was the SVM value of one of 5 lamps tested in the Veitch/Martinsons study, which was targeted to test an SVM 0.5 lamp, but the tested lamp deviated slightly from this target value
- SVM 0.4 gives the same results on visibility as SVM 0, which is due to the measurement error (the same % of people detects SVM 0.4 as SVM 0, while at SVM 0 there **is no** effect)
- The Veitch/Martinsons study did not study any health impacts: acceptability between SVM 0 and SVM 3.0 was statistically the same

The science behind SVM

- **SVM** is a measure predicting the **visibility** of **stroboscopic effect** in laboratory conditions (**worst case realistic scenario**): for an informed (sensitised) observer, with high contrast moving stimulus and without daylight or other light sources
- **SVM is not designed to predict health concerns**: no study yet shows a link to health
- The Flicker limit $P_{st}^{LM} \leq 1.0$ addresses health concerns, and the lamps tested in the RRT all complied with this limit
- The **visibility threshold of SVM is 1 by definition**
- Results of multiple studies: people find some level of stroboscopic effect **acceptable**
  Links to these studies can be found on slide 8
- A limit of **SVM ≤ 1.34 already satisfies the precautionary principle**: a long-term study confirms that at SVM ≤ 1.34 **does not increase health concerns** (eyestrain, headache) (See link)



The technology behind SVM

- There is a **trade-off** between the many technical requirements for electronics for lighting: energy efficiency, SVM, EMC, harmonics, displacement factor, dimmability, size, lifetime, etc. **It is technically not possible to optimise them all at the same time**

- This results in technical problems for MLS with very small caps, full glass, dimmable, or high lumen output

- New and more stringent mandatory harmonics requirements apply to LED products between 5 W and 25 W as per 1 March 2022, and these will also require additional product redesign

The impact of the new SVM requirement – the RRT

The round-robin test (RRT) between the labs of two LightingEurope members and the Swedish and Hessian market surveillance authorities was the first opportunity to assess the impact of an SVM ≤ 1.6 requirement:

- at SVM ≤ 0.4, 50 % failed on SVM or harmonics;
- at SVM ≤ 0.9, 43 % failed on SVM or harmonics,
- at SVM ≤ 1.3, 26 % failed (4 due to harmonics, and 2 due to full-glass G9 or R7S)

Further clarifications on the outcomes of the RRT:

- The fact that **some** products pass does not mean that **all** products can pass
- The RRT clearly shows that full-glass G9, E14 >4.5 W and R7S cannot satisfy all requirements
- The RRT clearly shows problems with the measurement tolerance
- Products where it is technically feasible already have a low SVM
- Measurement uncertainty on SVM was rather high: max deviation of 0.64 and a 3sigma standard deviation of 0.24
- Conventional products tested have SVM >1

A detailed overview of the RRT measurements is available in slides 10 – 11

The SVM requirement should be set at the **upper limit**, meaning that manufacturers will target to achieve a lower **mean** number in order to stay within the **3sigma standard deviation**

Consistent and reliable SVM measurement depends not on a single device but on the **full measurement set-up based on IEC TR 63158**. Using other test methods can lead to completely different results. Market surveillance labs will be on a learning curve (c.f. max deviation of 0.64 on SVM measurement during RRT).

Studies referred to on slide 5

- M. Perz, D. Sekulovski, & P. Beeckman, *Acceptability Criteria for the Stroboscopic Effect Visibility Measure. CIE 2017 Midterm Meeting "Smarter Lighting for Better Life"* (Vienna: CIE, 2017).
- M. Perz., D. Sekulovski, & I Heynderickx, 'Modelling the visibility of the stroboscopic effect occurring in temporally modulated light systems,' *Lighting Research and Technology* 47 (13 May 2014): 281–300. < link >.
- M. Perz, D. Sekulovski, I. Vogels, & I. Heynderickx, 'Stroboscopic effect: contrast threshold function and dependence on illumination level,' *Journal of the Optical Society of America* 35/2 (2018): 309–319. < link >.
- M. Perz, 'Setting the stroboscopic visibility threshold,' *Lighting Research and Technology* Vol 52(3) (1 May 2020). < link >.
- G. Sejkora, 'Limits for Flicker and Stroboscopic Effects,' LED Professional Review Issue 77 (January / February 2020): 28 – 30.
- S. Sekulovski, S. Poort, and M. Perz, & L. Waumans, 'Effects of long-term exposure to stroboscopic effect from moderate-level modulated light,' *Lighting Research and Technology* (29 November 2019). < link >.
- J.A. Veitch & C. Martinson, 'Detection of the stroboscopic effect by young adults varying in sensitivity,' *Lighting Research & Technology* (12 February 2020). < link >.

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Background slides: Detailed outcome of the SVM Round-Robin Test

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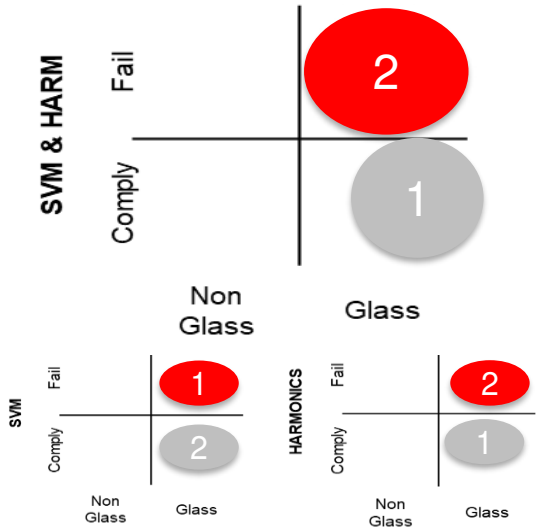
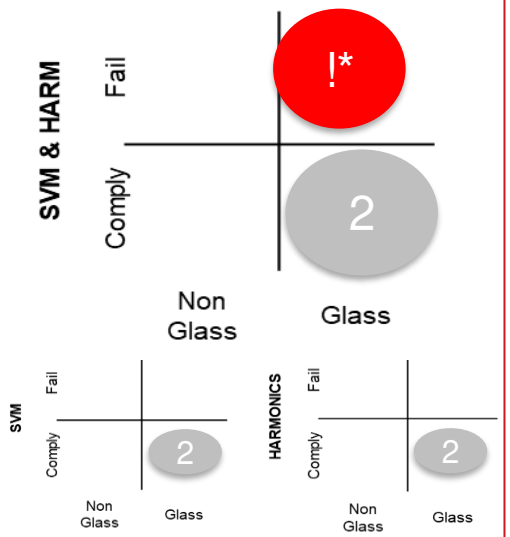
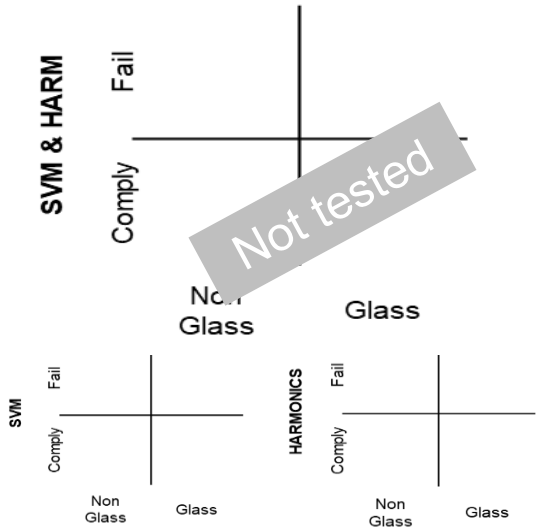
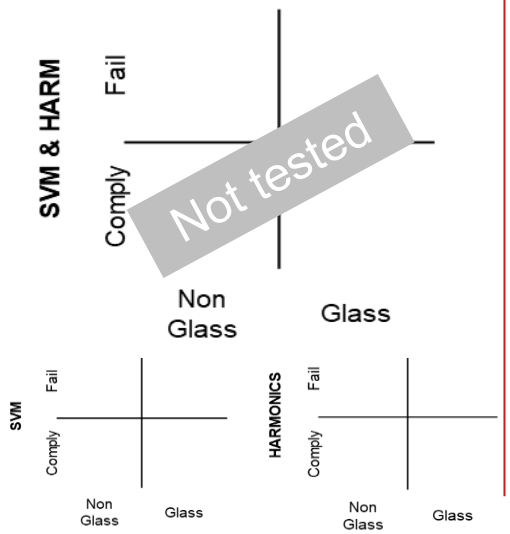
12/06/2020

RRT Test Results in Detail (1/2)

	Socket E14	G9	R7S	Outcome
P > 4,5W	 SVM & HARM: Fail 3 / Comply; Non Glass | Glass. SVM: Fail 1 / Comply 2. HARMONICS: Fail 2 / Comply 1.	 Not tested - No core application yet - Main application for low wattagges and smallest dimension to fitt	  SVM & HARM: Fail 2 1 / Comply; Non Glass | Glass. SVM: 2 1. HARMONICS: Fail 2 / Comply 1.	• All E14 > 4.5 W failed • All R7S failed • All G9 in glass failed
P < 4,5W	SVM & HARM: Fail / Comply 3; Non Glass | Glass. SVM: 3. HARMONICS.	SVM & HARM: Fail 2 1 / Comply 5; Non Glass | Glass. SVM: 2 1 / 5. HARMONICS.	Not tested - No core application yet - Main application for higher wattagges to replace thermal incandescent emitters	• Exempt G9 in glass • Exempt R7S in glass • Higher SVM needed for E14 > 4.5 W

RRT Test Results in Detail (2/2)

	Socket E27	GU10
P > 4,5W	 	 
P < 4,5W		

Outcome

- 2 out of 3 tested types for E27 failed
- 2 types complied in two labs, one failed in lab three,* no results from lab four for GU10
- G5 linear and U – shaped products not considered in RRT, due to time and breakage risk, but with high SVM values for high power shown before

- **Issue solved by 2-step approach with higher SVM limits**

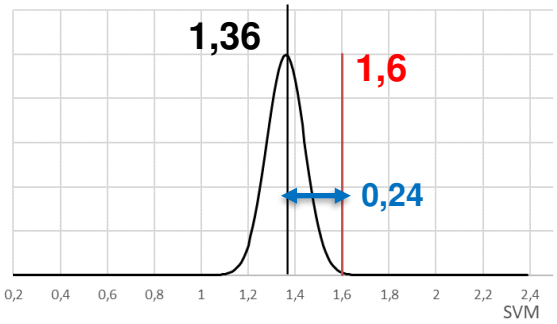
RRT Test Results in Detail

Impact of Measurement Uncertainty

		ALL	P < 5 W	P > 5 W	SVM ≤ 0,4	SVM ≤ 1,0
PST	SPAN (max-min)	0,57	0,43	0,57	0,37	0,37
	STD-Dev, 3sigma	0,25	0,28	0,22	0,17	0,18
SVM	SPAN (max-min)	0,64	0,22	**0,64**	**0,64**	**0,64**
	STD-Dev, 3sigma	0,16	0,08	**0,24**	0,13	0,13

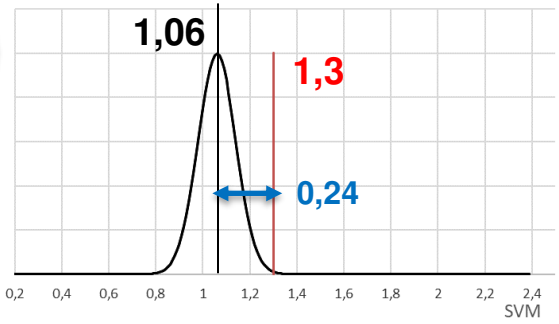
- Proper definition of upper threshold value typically based on mean value + 3sigma
- Considering the outcome of the RRT testing, for a reverse definition of the mean value to achieve for products manufactrued $\overline{SVM} = SVM_{Threshold} - 3sigma$

SVM 1,6 Treshold*



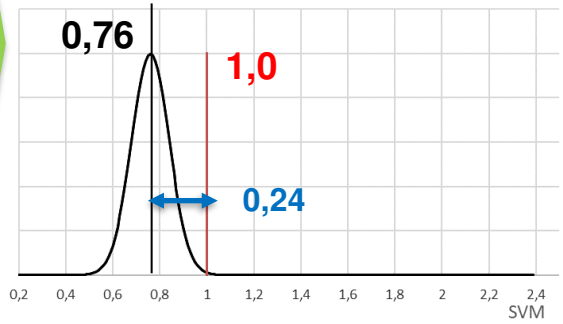
Demanding $\overline{SVM} = 1{,}36$

STEP 1
SVM 1,30 Treshold



Demanding $\overline{SVM} = 1{,}06$;
achievable with exemptions**

STEP 2
SVM 1,00 Treshold



Demanding $\overline{SVM} = 0{,}76$;
achievable with exemptions, new technology, additional time and improved measurement accuracy for labs needed

*) formerly aligned porposal for SLR, based on impact analysis
**) G9 in glass, R7S in glass, R7S in non-glass

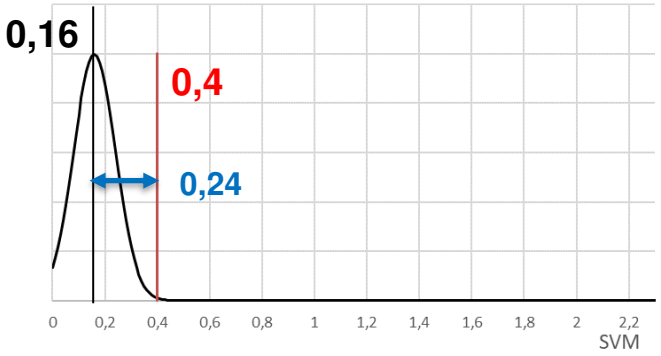
RRT Test Results in Detail

Measurement Uncertainty for upper threshold of 0,4 or 0,9 // Upper limit is not equal to the mean value

		ALL	P < 5W	P > 5W	SVM ≤ 0,4	SVM ≤ 1,0
PST	SPAN (max-min)	0,57	0,43	0,57	0,37	0,37
	STD-Dev, 3sigma	0,25	0,28	0,22	0,17	0,18
SVM	SPAN (max-min)	0,64	0,22	**0,64**	**0,64**	**0,64**
	STD-Dev, 3sigma	0,16	0,08	**0,24**	0,13	0,13

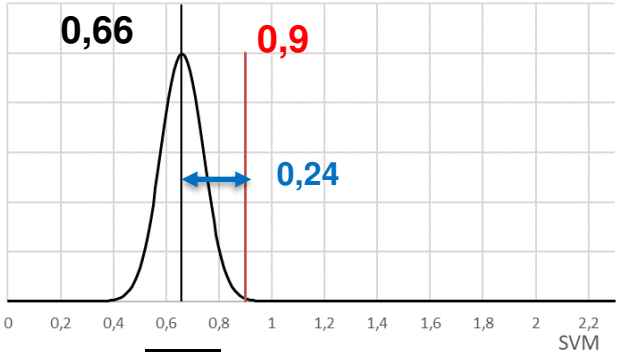
- Proper definition of upper threshold value typically based on mean value + 3sigma
- Considering the outcome of the RRT testing, for a reverse definition of the mean value to achieve for products manufactrued $\overline{SVM} = SVM_{Threshold} - 3sigma$

SVM 0,4 Treshold



Demanding $\overline{SVM} = 0{,}16$ to realise ➔ not realistic

SVM 0,9 Treshold



Demanding $\overline{SVM} = 0{,}66$ to be achieved on average ➔ not realistic

Current comission Proposal

RRT overall Pass/Fail depends on harmonics and SVM

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- The overall Pass / Fail on both SVM and harmonics outcome varies between labs
- Harmonics requirements are continuously updated and the new edition of the EN 61000-3-2 standard will introduce new requirements in the near future (1 March 2022)
- The failing of lamps is either due to SVM or to the harmonics requirement – in either case the electronics need to be redesigned and there is a clear trade-off and balancing between the two
- Failing can also be a result of high deviations among measurement devices/procedures used in the various labs - max deviation of 0.64 found in SVM

Conclusions on SVM measurement

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- The SVM measurement between Labs A, B and C is highly consistent
- Inconsistency with Lab D when comparing with labs A and B; sometimes aligned, sometimes large differences, high uncertainty (8/25 Pass,14/25 Fail, 3/25 no data)
- Big differences with Lab D on SVM – the maximum deviation of 0.64 (far above proposed SVM limit of 0.4 and allowed tolerances of 10 % of limit)
- With very low values for SVM (and also P_{st}^{LM}) there is a problem with tolerance limits (measured vs the declared value) in percentage as opposed to absolute values – tab 2 of the excel file with the SVM RRT results contains a comparison of deviations when compared to declared values

Conclusion on harmonics measurement

- The harmonics measurement between Lab A and B is reasonably consistent: 23/25 match, 2/25 differences (P8, L2)
- Lab C can only perform one of three options (option 3) of the harmonics measurements
- Lab D available results are consistent with Lab A and B
- Both Labs C and D have no capability inhouse to measure all 3 harmonics options and must rely on an external partner to check and confirm non-compliant products

Impact: harmonics requirements for mains voltage light sources

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Complying with a possible new SVM requirement has the following practical implications:

- A solution to comply with SVM requirements could be the addition of a capacitor (with a suitable capacity)
- A modification in the product circuit (for example the addition of a capacitor), would change the harmonic emission (according to EN 61000-3-2), and result in problems to comply with that latter requirement (also for MLS with power lower than 25 W)
- In the past, no harmonic tests were required for lighting equipment with an active input power of ≤ 25 W
- The problem will be more significant for light sources of small dimensions and/or for which the capacitor required would cause an increase in the lamp dimensions / a reduction of the emitting area (with lower light emission)
- The capacitor must be used in a suitable ambient temperature, so the use of light source / lamp in a luminaire could imply a reduction of the lamp power to add the capacitor

Conclusions on other measurements

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- The traditional measures wattage, lumen, CRI, and CCT contain some deviations in measurement, but these are mostly within the tolerances.
- The lamps pass on the other criteria.
- This could result in a follow-up action for the labs to compare measurement set-ups after this RRT.

Conclusions Round-Robin Test

- The 4 participating labs demonstrated great cooperation and managed to navigate the additional complexities of the COVID-19 crisis.
- This RRT only included 25 lamps – it did not cover all the thousands of products that are in scope of the Ecodesign LED / OLED MLS requirements for SVM.
- RRT demonstrates that most products above 5 W do not comply with both SVM and harmonics requirements.
- The incandescent products P10 and L6 – well-known to the market – both fail on SVM: 1.26 (25 W GLS) and 1.12 (20 W PAR halogen).

Main challenges in the SVM RRT:

- Above or below 5 W: Lamps < 5 W comply more easily with SVM because they do not have to satisfy the new harmonics requirement; Lamps > 5 W do not comply with 0.4 limit
- Full-glass: More difficult for full-glass lamps to achieve low SVM
- Size: G9, R7s and E14 have difficulties to achieve SVM limits because of their small size
- Additional constraints to ensure availability of retrofit to banned HL lamps (like those with 4000 lm, that due to their use in luminaires shall be dimmable)

In addition, the (cap up) lamp position leads in some cases, like for E27 lamps, to additional problems with heating in certain parts that are needed to comply with SVM.

NB: TLED5 not included in RRT due to breakage risk, so cannot draw any conclusions from this RRT.

Conclusions per lamp type

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Based on the outcomes of the RRT, the impact of a tiered approach towards SMV ≤ 1.0 is:

- Lamps below 5 W comply more easily with SVM because they do not have to satisfy the new harmonics requirement
- E27: redesigns seems needed to meet both harmonics and SVM. Longer term, no additional exemption is needed.
- E14: lower wattages (< 5 W) do not have to meet harmonics today and are passing more easily on SVM. The RRT did not provide lamps > 5 W with passing, both for SVM and harmonics. Therefore, exemptions will be required for E14.
- GU10: these samples are compliant. No additional exemption is needed.
- G9: all G9 are below 5 W. The non full-glass G9 (P7, H3, H4, SEA4 and SEA5) are able to reach low SVM. L4 is full glass and does not meet the SVM requirement. Apparent need for exemption for full-glass G9 (allow SVM ≤ 1.6 for full-glass G9).
- R7s: all R7s are above 5 W. All R7s have difficulty to achieve low SVM (allow SVM ≤1.6 for full-glass R7s).
- G5: TLED5 was agreed upfront not to be tested due to high breakage risks during transport.

Conclusions & recommendations on SVM measurement capabilities

- With very low values for SVM (and also P_{st}^{LM}) there is a problem with tolerance limits (measured vs the declared value) in percentage as opposed to absolute values.
- LightingEurope members have the measurement capabilities and the expertise to ensure their products comply with the new requirements.
- Further investment in measurement capabilities is needed to ensure market surveillance authorities can correctly and effectively enforce the new requirements as of 1 September 2021.
- EU can support national authorities to prepare for this new requirement – e.g., as part of EEPLiant-style projects to invest in equipment and run RRTs across national testing labs.

This investment is needed to ensure compliance and a level playing field.

LightingEurope is available to support laboratories create the right measurement set-up and procedures..

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THANK YOU

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