

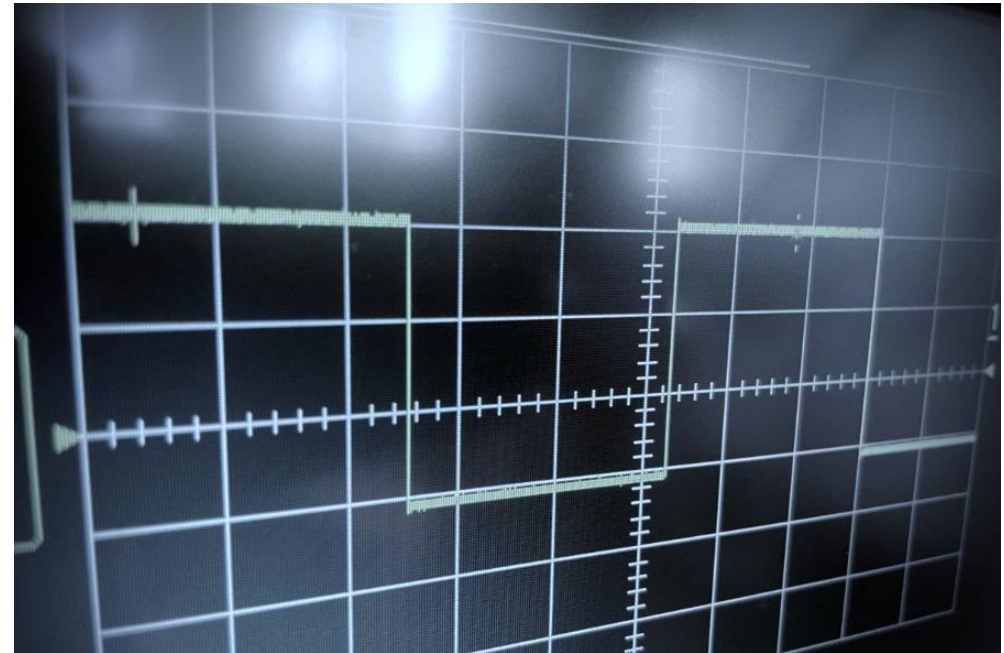
Anders Thorseth, PhD

MetTLM, Workpage Leader for *WP4 Impact*

Ongoing standardisation work

Overview

- Background
- IEC TC 34
- CIE TC 2-89
- Outlook



Background

- IEC – Flicker evaluation dating back to the 1990es
 - Fluorescent tubes
 - Magnetic ballasts (high TLM)
 - Electronic ballasts (low TLM)
 - LED drives
 - Slow pulse width modulation (High TLM)
 - Constant current (No TLM)
 - Arbitrary waveforms (Arbitrary TLM)
- SVM introduced by CIE in 2016 Technical Note (TN) 006:2016

History of IEC 61547

Date	Publication	Edition	Status
2020-03-26	IEC 61547:2020 RLV	3.0	Valid
2013-06-05	IEC 61547:2009/ISH1:2013	2.0	Revised
2010-04-21	IEC 61547:2009/COR1:2010	2.0	Revised
2009-06-25	IEC 61547:2009	2.0	Revised
2000-08-30	IEC 61547:1995/AMD1:2000	1.0	Revised
1995-09-20	IEC 61547:1995	1.0	Revised

For more background see interview with Jennifer Veitch

<https://youtu.be/3ozMUfppUk0>



Temporal Light Modulation - Researcher Interview
Jennifer Veitch

IEC TC 34 Working Group 5

- IEC TC 34 *Lighting*,
 - WG5 on *electromagnetic compatibility*
 - Responsible for IEC TR 61547-1:2020 (PstLM) and IEC TR 63158:2018 (SVM)
 - Next meeting 4/19-2024
 - SVM
 - New sensitivity curve (CIE 249:2022)
 - Questions on software implementation (CIE x049:2022)
 - Going from Technical Report to International Standard

Changes to SVM sensitivity function

- CIE 249:2022 propose a change to the SVM sensitivity curve
 - Based on more thorough scientific evidence
 - Only a suggestion at this point
 - Changes in values for high frequency
 - Under consideration by the IEC TC 34 WG 5

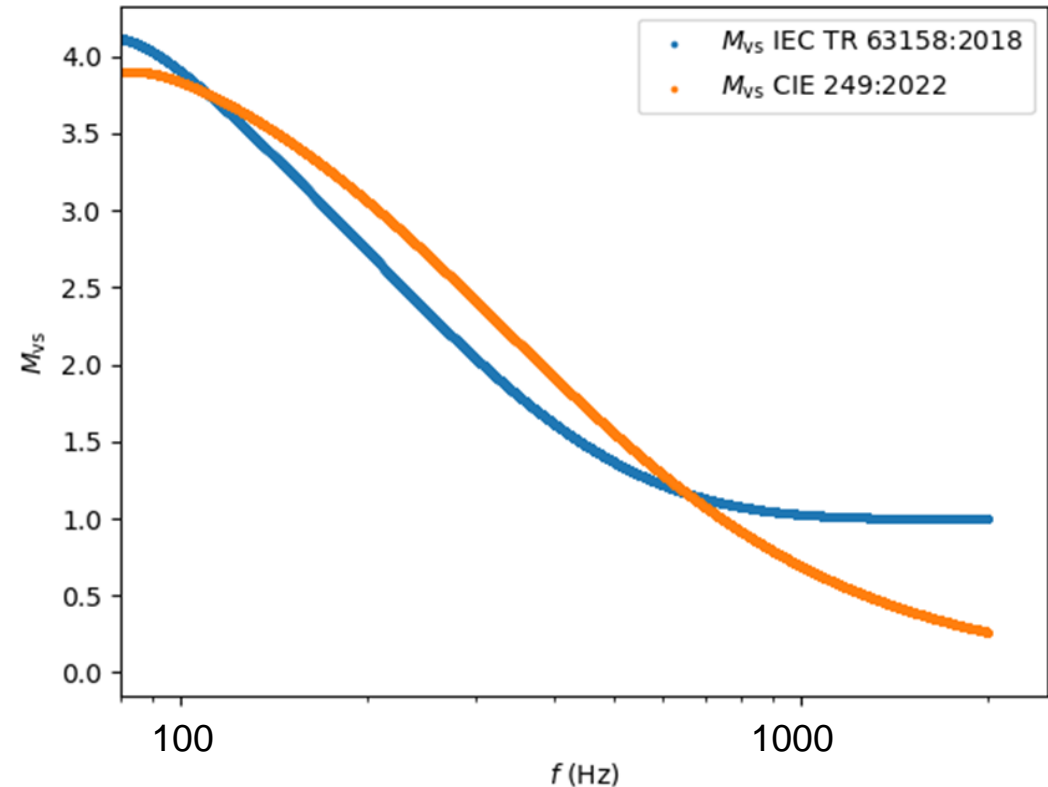


Figure: SVM of a sinusoidal waveform, with 100% modulation depth plotted as a function of frequency

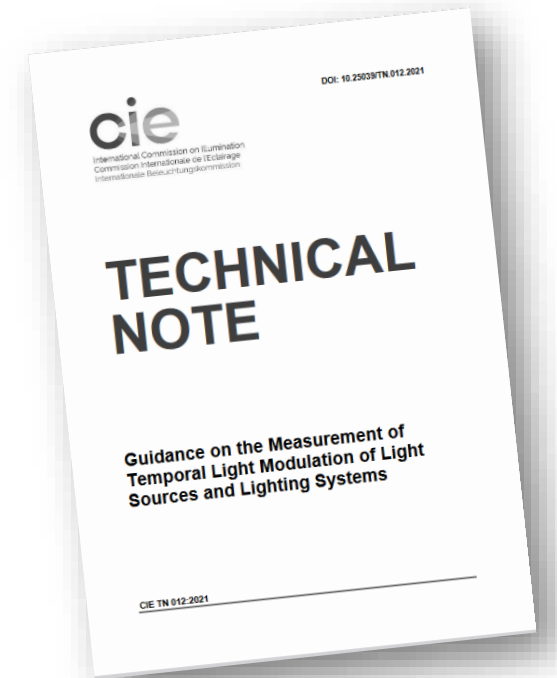
CIE TC 2-89

Chair

Qian (Cherry) Li (Everfine, China)

Terms of reference

- guidance on the measurement of TLM
 - develop a technical note CIE TN 012:2021
doi.org/10.25039/TN.012.2021
- technical report
 - reproducibility and uncertainties related to all quantities.



CIE TC 2-89

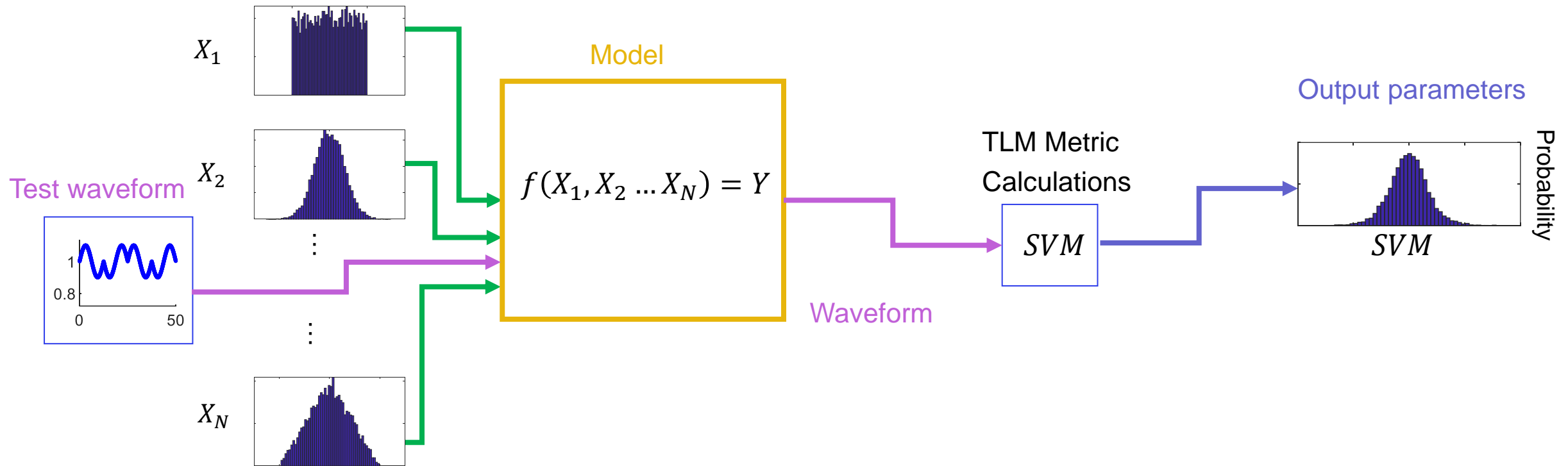
- Measurement conditions
- Measurement equipment
- Characterization of TLM measurement equipment
- Acquisition of light waveform
- Calculation of the TLM quantities
- Calibration and verification
- Measurement Uncertainty
- Presentation of Measurement Results



Calculation model for uncertainty estimation

- Estimation of uncertainty in a Monte Carlo model - probably proposed by TC 2-89

Input parameters



Conclusions

- More guidance and recommendations under way (CIE 2-89, MetTLM)
 - Calibration and characterization of measurement devices
 - Measurement methods
 - Measurement uncertainty estimation
- IEC TC 34, WG5
 - Documents under revision
 - Possibility for changes of measures

Outlook - Future questions

- **Research questions**
 - Relation between TLM visibility measures and human health
 - Relation between non-visible TLM and health and wellbeing
 - Spatial/angular significance of TLM
- **Standardization questions**
 - How strict should the
 - Is the TLM and health issues best handled by the working group on electromagnetic compatibility (IEC TC 34, WG 5)
- **Regulatory questions**
 - Selection of metrics
 - Setting up threshold values

Acknowledgments

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EMPIR



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