Test of temporal light modulation in street luminaires

Summary

Street luminaries are often only tested at 100% setting, but when they are installed, they are often dimmed to lower light output. Dimming has been linked to increased risk of problematic temporal light modulation as well as deceased efficiency.

Measurements will be done on five different street lighting luminaires, they will be tested at different dimming settings, 100, 50 and 25% and their different figures of merit will calculated.

The results for the measurements shows that the is no noticeable flicker on the five luminaires measured.

Laboratory	DOLL Quality Lab
Operation conditions	Tested at 230 VAC, at different dimming levels
Seasoning	NONE

Test Laboratory

DOLL Quality Lab- DTU Electro
Risø campus, Building 128
Frederiksborgvej 399, 4000 Roskilde

The test has been performed by: And supervised by:

Dennis Corell, Research Engineer *Carsten Dam-Hansen, Senior Scientist*

Digitally signed by Carsten Dam-Hansen
Date: 2023.11.20 10:24:45 +01'00'

Test of temporal light modulation in street luminaires

Summary of results

The main results from the five tested luminaires will be presented in this section.

L32224	Anonymous					
Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	66.2	0.96	0.01	5.6	**0.134**	**0.017**
50 %	29.7	0.87	0.01	7.7	**0.125**	**0.48**
25 %	16.6	0.73	0.01	9.3	**0.176**	**0.40**
L32229	Anonymous					
Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	48.1	0.98	0.0	0.4	**0.003**	**0.0032**
50 %	24.8	0.95	0.0	0.8	**0.0092**	**0.0060**
25 %	12.6	0.82	0.0038	2.24	**0.0279**	**0.0154**
L322264	Anonymous					
Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	43.9	0.96	0.0067	2.6	**0.0837**	**0.0963**
50 %	21.7	0.87	0.0052	2.2	**0.0621**	**0.1437**
25 %	10.4	0.59	0.0043	2.5	**0.0484**	**0.1882**
L32265	Anonymous					
Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	115	0.99	0.0022	1.3	**0.0257**	**0.0604**
50 %	58.4	0.97	0.0019	2.5	**0.0136**	**0.0925**
25 %	29.5	0.88	0.0068	4.33	**0.0820**	**0.1860**
L32266	Anonymous					
Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	66.8	0.99	0.0	0.3	**0.0045**	**0.0058**
50 %	33.7	0.97	0.0	0.7	**0.0094**	**0.0411**
25 %	16.4	0.88	0.001	1.9	**0.0058**	**0.0086**

*) note: The intensity setting have been adjusted to the power.

Test of temporal light modulation in street luminaires

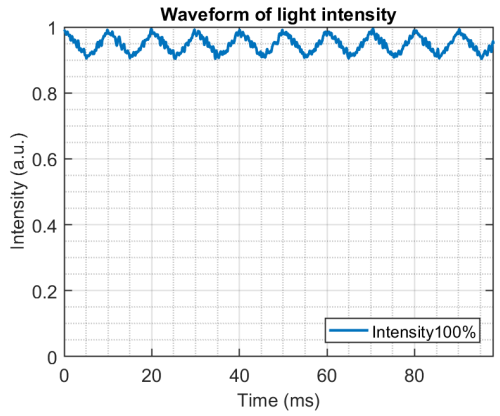
Results

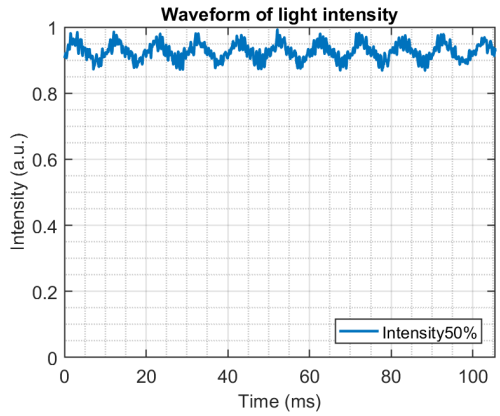
Device ID L32224

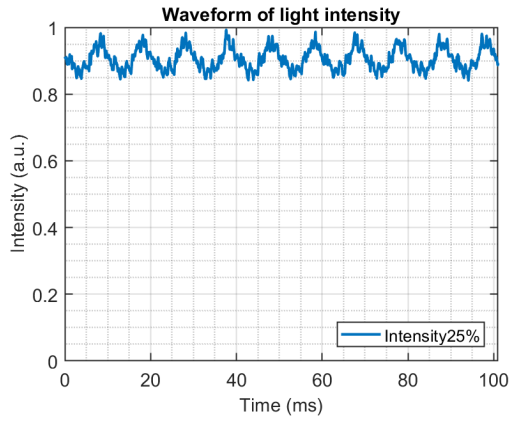
Temporal light modulation results / flicker

Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	66.2	0.96	0.01	5.6	0.134	0.017
50 %	29.7	0.87	0.01	7.7	0.125	0.48
25 %	16.6	0.73	0.01	9.3	0.176	0.40

Waveform

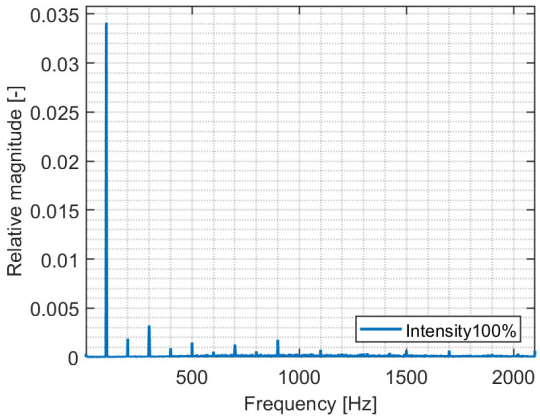


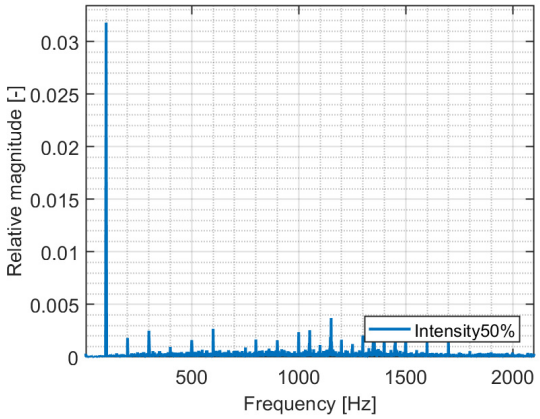


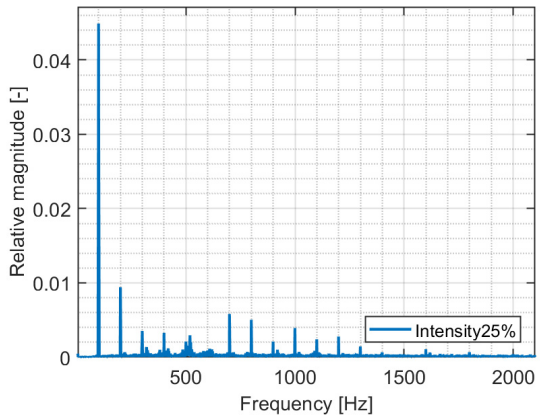


Test of temporal light modulation in street luminaires

Frequency spectrum







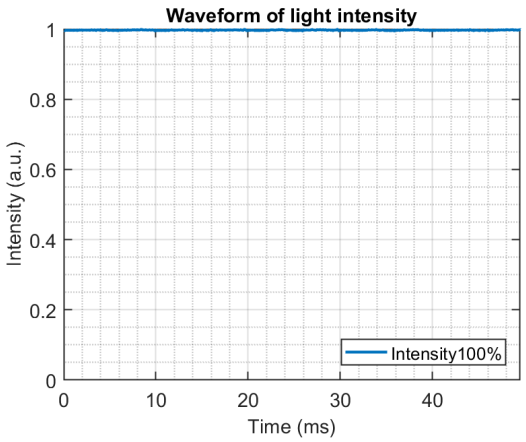
Test of temporal light modulation in street luminaires

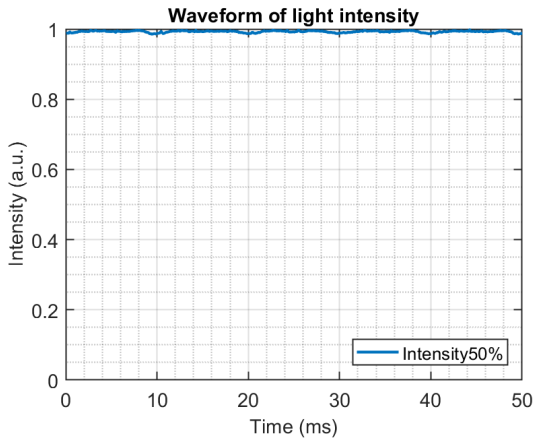
Device ID L32229

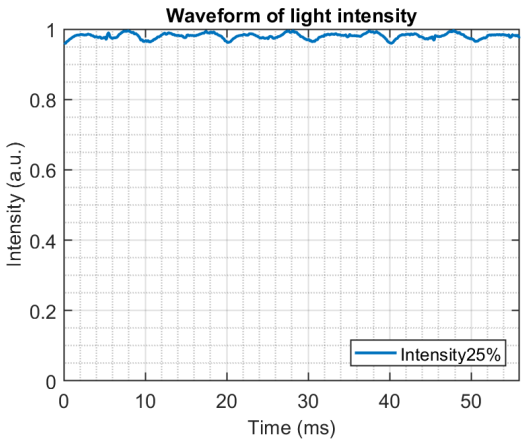
Temporal light modulation results / flicker

Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	48.1	0.98	0.0	0.4	0.003	0.0032
50 %	24.8	0.95	0.0	0.8	0.0092	0.0060
25 %	12.6	0.82	0.0038	2.24	0.0279	0.0154

Waveform

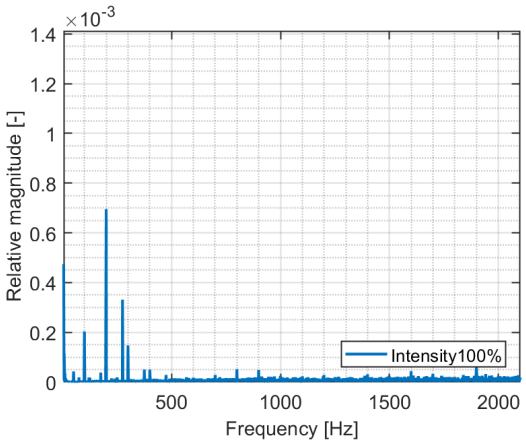


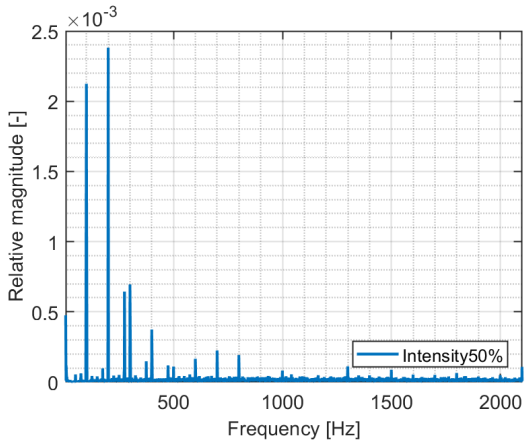


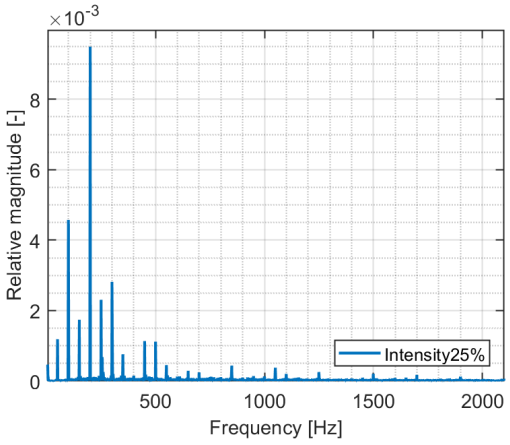


Test of temporal light modulation in street luminaires

Frequency spectrum







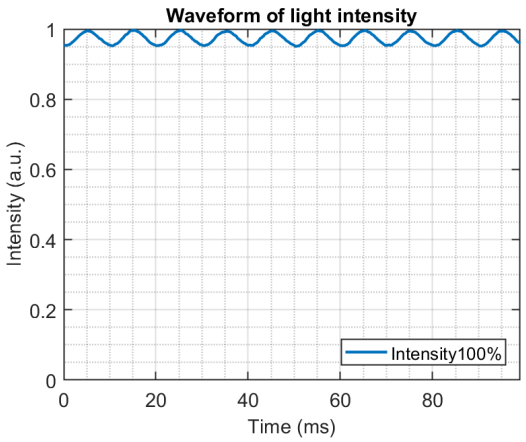
Test of temporal light modulation in street luminaires

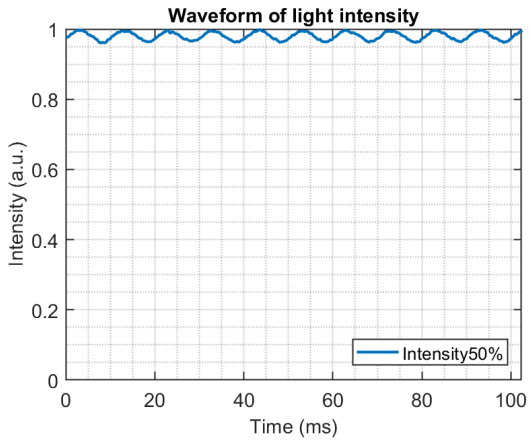
Device ID L32264

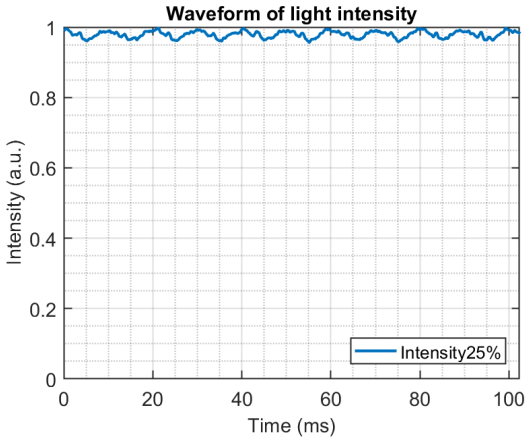
Temporal light modulation results / flicker

Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	43.9	0.96	0.0067	2.6	0.0837	0.0963
50 %	21.7	0.87	0.0052	2.2	0.0621	0.1437
25 %	10.4	0.59	0.0043	2.5	0.0484	0.1882

Waveform

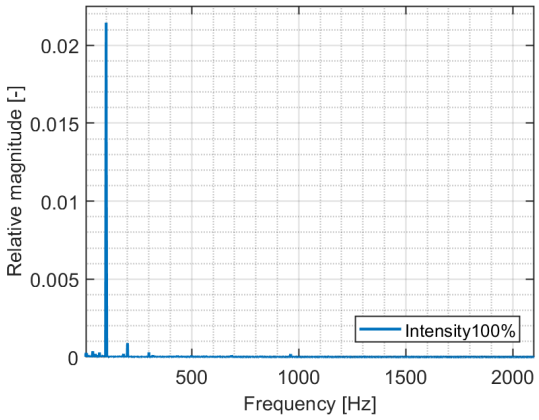


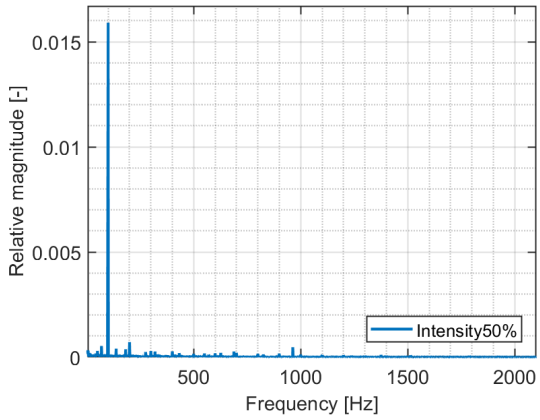


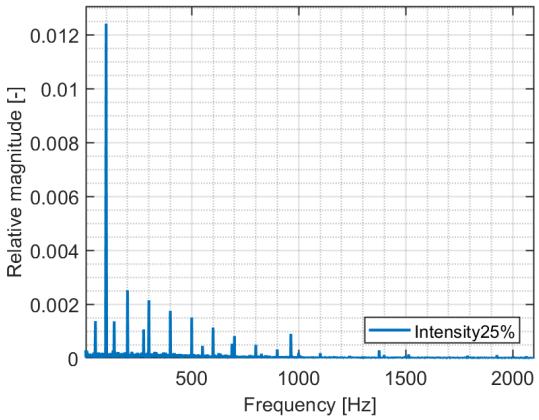


Test of temporal light modulation in street luminaires

Frequency spectrum





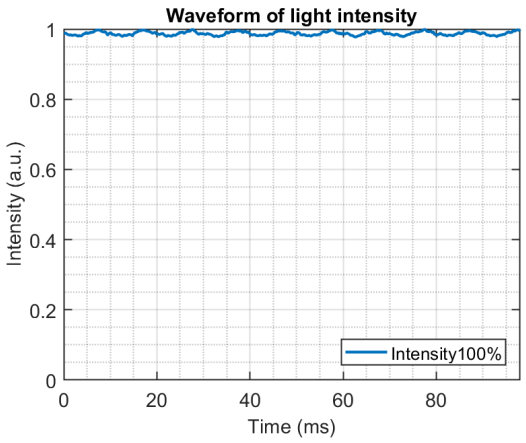


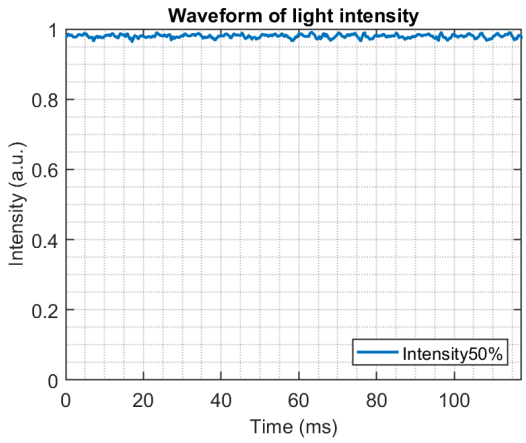
Test of temporal light modulation in street luminaires

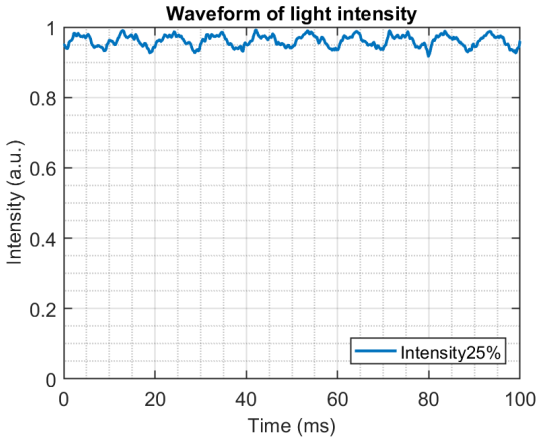
Device ID L32265

Temporal light modulation results / flicker						
Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	115	0.99	0.0022	1.3	0.0257	0.0604
50 %	58.4	0.97	0.0019	2.5	0.0136	0.0925
25 %	29.5	0.88	0.0068	4.33	0.0820	0.1860

Waveform

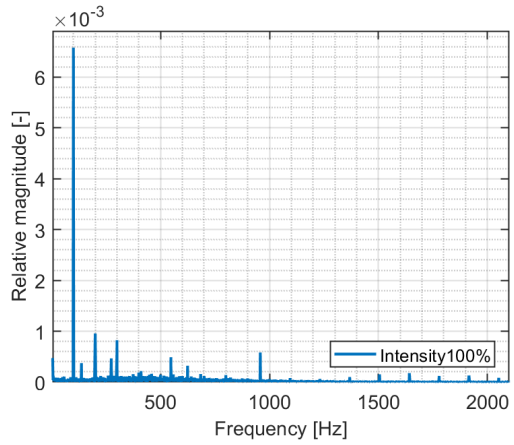


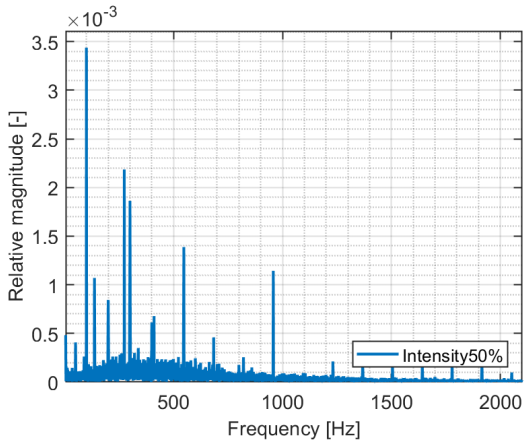


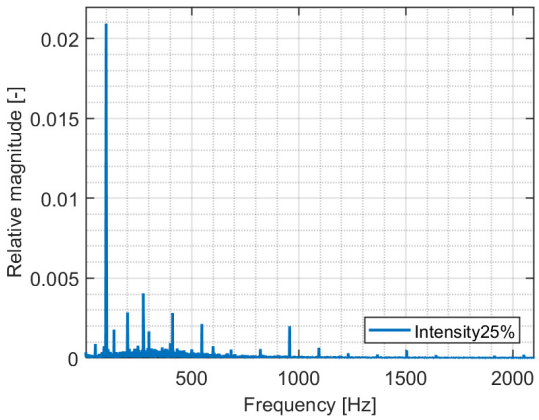


Test of temporal light modulation in street luminaires

Frequency spectrum





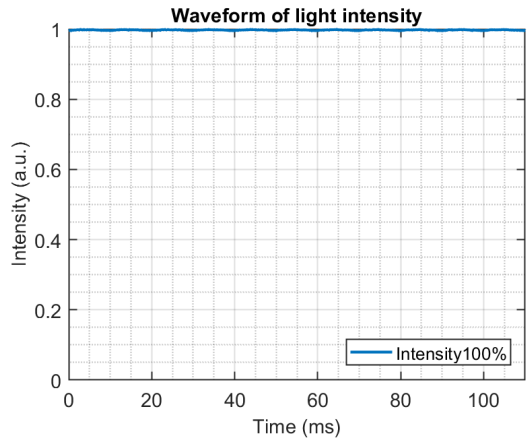


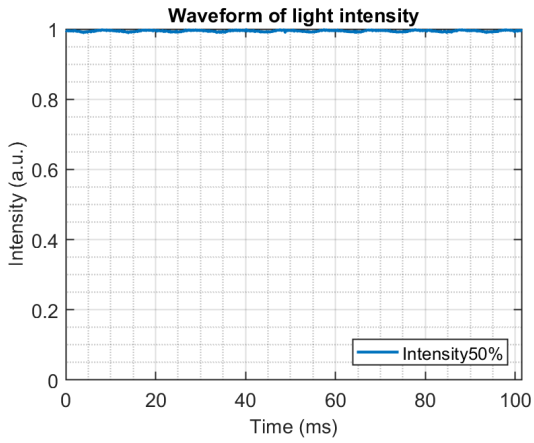
Test of temporal light modulation in street luminaires

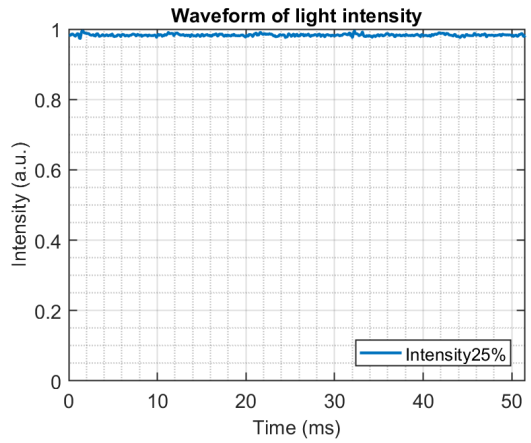
Device ID L32266

Temporal light modulation results / flicker						
Intensity *)	Power [W]	PF [-]	Flicker Index [-]	Modulation Depth [%]	SVM [-]	PstLM [-]
100 %	66.8	0.99	0.0	0.3	0.0045	0.0058
50 %	33.7	0.97	0.0	0.7	0.0094	0.0411
25 %	16.4	0.88	0.001	1.9	0.0058	0.0086

Waveform

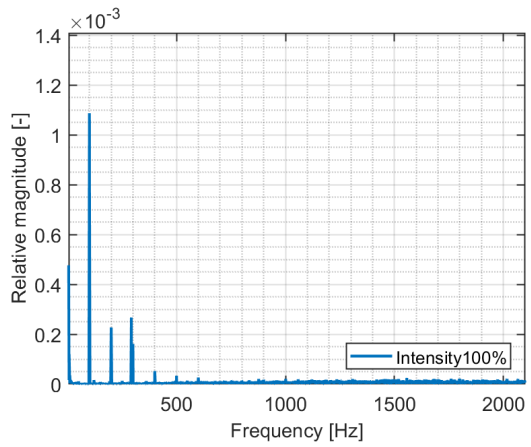


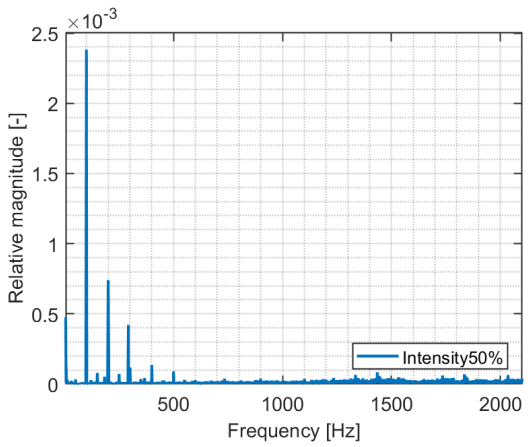


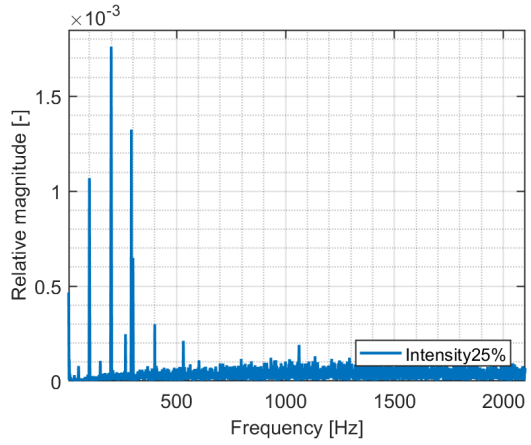


Test of temporal light modulation in street luminaires

Frequency spectrum







Test of temporal light modulation in street luminaires

Measurement references:
[1] CIE TN 006:2016: Visual Aspects of Time-Modulated Lighting Systems – Definitions and Measurement Models. (2016). http://files.cie.co.at/883_CIE_TN_006-2016.pdf [2] BS PD IEC/TR 63158:2018 “Equipment for general lighting purposes. Objective test method for stroboscopic effects of lighting equipment” [3] BS PD IEC TR 61547-1:2020 Equipment for general lighting purposes. EMC immunity requirement

Measurement conditions:
Laboratory ambient temperature: 25.5 °C. Electrical operation conditions: 230 VAC, 50 Hz

Measurement uncertainties:
The measurement uncertainties in the 350-830 nm range is approximately ± 4 %

Equipment:	
Type	**Device name**
Flicker meter	Viso LabFlicker, E30125