Measuring and Comparing Waveforms of Temporal Light Modulation

This paper presents a comparison of measurements of the waveforms of temporal light modulation (TLM) from 8 light sources performed by two different laboratories. The study focuses on the methodology of extracting relevant numerical differences between the measured waveforms. The methodology involves frequency matching, duration matching, selection of sampling interval, phase matching, normalization and results of the use of the methodology are presented. The results show that for some waveforms the comparison method can be used to practically explore equivalency of measurements.

Assessment of filament led bulbs with respect to temporal light artefacts

Temporal light artefacts, abbreviated TLAs (including flicker, stroboscopic effect and phantom arrays), i.e. undesired time modulation in luminance from a light source, has shown to be a threat to wider SSL adoption especially related to dimming functions and low-quality LED products. This is due to the effects that both noticeable and unperceivable TLAs have on human perception and wellbeing. In the present work a number of filament LED bulbs, currently available on the market, are assessed primarily with respect to TLAs, but also with respect to photometric, colorimetric and efficiency properties. The investigation shows that only one of the 10 investigated lamps can be considered flicker free. The rest of the lamps the TLAs are of such a magnitude that none of them fulfill the suggested recommendations currently available.
Designing high efficient solar powered lighting systems

Some major challenges in the development of L2L products is the lack of efficient converter electronics, modelling tools for dimensioning and furthermore, characterization facilities to support the successful development of the products. We report the development of 2 Three-Port-Converters respectively for 1-10Wp and 10-50 Wp with a peak efficiency of 97% at 1.8 W of PV power for the 10 Wp version. Furthermore, a modelling tool for L2L products has been developed and a laboratory for feeding in component data not available in the datasheets to the model is described.

General information
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Organisations: Department of Photonics Engineering, Photovoltaic Materials and Systems, Diode Lasers and LED Systems, Department of Electrical Engineering, Electronics, Out-sider A/S, Technical University of Denmark
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A comparison of goniophotometric measurement facilities.

In this paper, we present the preliminary results of a comparison between widely different goniophotometric and goniospectroradiometric measurement facilities. The objective of the comparison is to increase consistency and clarify the capabilities among Danish test laboratories. The study will seek to find the degree of equivalence between the various facilities and methods. The collected data is compared by using a three-way variation of principal component analysis, which is well suited for modelling large sets of correlated data. This method drastically decreases the number of numerical values needed to represent the data. The model shows good agreement with data, while also highlighting the differences between the measurements. We conclude that the method could be useful for comparing large sets of goniophotometric data.

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Organisations: Department of Photonics Engineering, Diode Lasers and LED Systems
Contributors: Thorseth, A., Lindén, J., Dam-Hansen, C.
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Design, characterization and modelling of high efficient solar powered lighting systems

General information
Designing high efficient solar powered lighting systems

Some major challenges in the development of L2L products is the lack of efficient converter electronics, modelling tools for dimensioning and furthermore, characterization facilities to support the successful development of the products. We report the development of 2 Three-Port-Converters respectively for 1-10Wp with a peak efficiency of 97% at 1.8 W of PV power for the 10 Wp version. Furthermore, a modelling tool for L2L products has been developed and a laboratory for feeding in component data not available in the datasheets to the model is described.

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Designing high efficient solar powered lighting systems

Some major challenges in the development of L2L products is the lack of efficient converter electronics, modelling tools for dimensioning and furthermore, characterization facilities to support the successful development of the products. We report the development of 2 Three-Port-Converters respectively for 1-10Wp and 10-50 Wp with a peak efficiency of 97% at 1.8 W of PV power for the 10 Wp version. Furthermore, a modelling tool for L2L products has been developed and a laboratory for feeding in component data not available in the datasheets to the model is described.

Analysis of compact and portable goniospectrometer system for test of LED lamps

An experimental investigation of a compact and portable goniospectrometer system is described. Measurements are performed in two very different conditions, in a normal office environment and in a photometry laboratory under standard environmental conditions and both are compared to reference measurements in a near-field goniophotometer. A collection of six different types of directional and non-directional integrated LED lamps with three samples of each were used as test devices. It is shown that the main uncertainty comes from the inadequate thermal stabilisation of the LED lamps. With pre-heating relative differences for total luminous flux of ±2.5% were obtained. Reliable photometric data can be obtained for use in market monitoring to identify probable non-compliance LED lamps and hence as an improved method for selecting LED lamps for accredited verification testing.
Goniometric characterization of LED based greenhouse lighting

This paper describes a demonstration of goniospectroradiometry for characterizations of new light emitting diode (LED) based luminaries for enhanced photosynthesis in greenhouses. It highlights the differences between measurement of the traditional high pressure sodium (HPS) luminaries and the LED based luminaries. The LED based luminaries are compared to traditional HPS luminaries; in terms of energy efficiency with regard to the photosynthetic photon flux, and the LED luminaries were found to be more effective than the HPS luminaries.

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Organisations: Department of Photonics Engineering, Diode Lasers and LED Systems
Contributors: Thorseth, A., Lindén, J., Corell, D. D., Dam-Hansen, C.
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PV LED ENGINE characterization lab for stand alone light-to-light systems

PV-powered lighting systems, light-to-light systems (L2L), offer outdoor lighting where it is elsewhere cumbersome to enable lighting. Application of these systems at high latitudes, where the difference in day length between summer and winter is large and the solar energy is low requires smart dimming functions for reliable lighting. A barrier for exploiting use of standalone solar lighting for the urban environment seem to be lack of knowledge and lack of available tools for proper dimensioning. In this work the development of powerful dimensioning tool is described and initial measurements are presented. Furthermore, a laboratory has been built to characterize these systems up to 200 Wp from "nose to tail" in great details to support improvement of the systems and to make accurate field performance predictions by the dimensioning tool.

General information
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Organisations: Department of Photonics Engineering, Diode Lasers and LED Systems
Contributors: Poulsen, P. B., Thorsteinsson, S., Lindén, J.
Number of pages: 6
Publication date: 2015
Comparison of stray light in spectrometer systems using a low cost monochromatic light source
We present an experimental setup that is under development for automated stray light characterization of spectrometers. The setup uses a tunable monochromator which enables this characterization on relatively cost low equipment. We present the measured line spread functions for two spectrometers, one low-end and one mid-range.

PV led engine characterization lab for standalone light to light systems
PV-powered lighting systems, light-to-light systems (L2L), offer outdoor lighting where it is else where cumbersome to enable lighting. Application of these systems at high latitudes, where the difference in day length between summer and winter is large and the solar energy is low requires smart dimming functions for reliable lighting. In this work we have built a laboratory to characterize these systems up to 200 Wp from "nose to tail" in great details to support improvement of the systems and to make accurate field performance predictions.
A mathematical model has been developed for the energy system of the hybrid street lighting making it possible to simulate a given configuration (solar panel performance data, size and orientation - wind turbine performance data, projected area and height - battery data) over a year in an urban environment of a given configuration based on measured wind/solar/temperature data from nearby meteorological station or other relevant weather data. The simulation can show if it is possible to cover the consumption by the light source over the year. The model can be used to evaluate both commercial hybrid systems and to dimension new systems for use in given environments where the weather data are known. Since weather and day/night length are varying a lot around the world the systems should be dimensioned very differently depending on the place of use. By using the simulation tool it is shown that it is possible to create a hybrid street lighting for an urban environment with a maximum of 2 floor height buildings which governs >70% of the luminaires in Copenhagen (the Capital of Denmark) fulfilling the requirements of 2.5 lux on the street over the year. Furthermore the tool is powerful to evaluate hybrid systems on the market (if all the technical data is known) for use in a given urban placement.

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Publication date: 2013

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Source-ID: u::9384
Research output: Chapter in Book/Report/Conference proceeding Article in proceedings – Annual report year: 2013 Research peer-review

Simulation Tool for Designing off-Grid PV Applications for the Urban Environments
A barrier for exploiting use of standalone solar lighting for the urban environment seem to be lack of knowledge and lack of available tools for proper dimensioning. In this work, the first part of the development of powerful dimensioning tool is described and initial measurements are presented.

General information
Publication status: Published
Number of pages: 3
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Publication date: 2013

Host publication information
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Research output: Chapter in Book/Report/Conference proceeding Article in proceedings – Annual report year: 2013 Research peer-review

Projects:

OLED Academy: OLED Academy - prospects for energy saving and design
The project will, through training in and testing of OLEDs (organic light-emitting diodes) prepare the ground for a development where the OLED can be a driver for energy savings from innovative design solutions created by Danish lighting technology companies. OLED Academy kick-starts the exploration of the possibilities the OLED technology brings
SpotLASE: Energy Efficient Laser Enhancement of Stage Spotlights
The project aims at bringing novel energy efficient laser lighting technology to the entertainment lighting industry by developing and demonstrating two new types of laser based light engines. They are designed to replace high intensity discharge (HID) lamps used in high power stage spot lamps, leading to significant reductions in energy consumption and dramatic increase in lamp lifetime and reduction of the environmental impact. This cannot be achieved using Light emitting diode (LED) technology alone, due to the limited luminance of LEDs.

The project team unifies all the necessary competences and experimental facilities to the project work from laser diode and LED systems, spectroradiometric testing, materials handling, thermal management, product design and production, electronic control to market/user knowledge within the entertainment lighting industry.

The project will bring the two companies in front within laser lighting technology and many new applications are anticipated within the lighting industry. The general perspectives and results of the development work will be made publically available, e.g. to the scientific and industrial communities.

EMPIR 15SIB07 PhotoLED, Future photometry based on solid-state lighting products
Solid-state lighting, which uses light-emitting diodes (LEDs), is globally replacing traditional incandescent lighting, due to lower power consumption and greater durability. Photometers are used to measure the performance of lights, and are calibrated using standard lamps to ensure the accuracy and consistency of measurements. However, the standard lamps used for calibration are currently based on incandescent lights, not LEDs. This project will develop new standard lamps based on LEDs and new measurement techniques for defining the properties of solid-state lights. The results will be used by National Measurement Institutes and test laboratories to accurately calibrate solid-state light photometers and will give European industry an advantage in the development of new commercial standard lamps. These outputs will result in a more reliable classification of the energy efficiency of solid-state lighting, increasing consumer confidence in this new greener technology.

LEDMET: Center for LED metrology
The project aims at bringing novel energy efficient laser lighting technology to the entertainment lighting industry by developing and demonstrating two new types of laser based light engines. They are designed to replace high intensity discharge (HID) lamps used in high power stage spot lamps, leading to significant reductions in energy consumption and dramatic increase in lamp lifetime and reduction of the environmental impact. This cannot be achieved using Light emitting diode (LED) technology alone, due to the limited luminance of LEDs.

The project team unifies all the necessary competences and experimental facilities to the project work from laser diode and LED systems, spectroradiometric testing, materials handling, thermal management, product design and production, electronic control to market/user knowledge within the entertainment lighting industry.

The project will bring the two companies in front within laser lighting technology and many new applications are anticipated within the lighting industry. The general perspectives and results of the development work will be made publically available, e.g. to the scientific and industrial communities.
The PV LED Engine – a new generation of intelligent solar powered LED lighting

The objective of the project is to realize the most intelligent high-end platform seen on the market today for autonomous solar energy powered lighting application.

Activities:

IEA 4E SSL Annex 2017 Interlaboratory Comparison of Goniophotometer Measurements (IC 2017)

Period: 30 Jun 2018 → 10 Aug 2018

Carsten Dam-Hansen (Other)
Anders Thorseth (Other)
Dennis Dan Corell (Other)
Johannes Lindén (Other)

Department of Photonics Engineering
Diode Lasers and LED Systems

Degree of recognition: International

Links:

Related event

IEA 4E SSL Annex 2017 Interlaboratory Comparison of Goniophotometer Measurements (IC 2017)
30/06/2017 → 01/09/2018
Activity: Other

Vejbelysningsdagen 2017

Period: 31 May 2017

Anders Thorseth (Organizer)
Dennis Dan Corell (Organizer)
Johannes Lindén (Organizer)

Department of Photonics Engineering
Diode Lasers and LED Systems

Description
DOLL exhibition of measurement facilities

Degree of recognition: National

Related event

Vejbelysningsdagen 2017
31/05/2017 → 31/05/2017
Odense, Denmark
Training in luminance imaging
Period: 5 Apr 2017 → 6 Apr 2017
Anders Thorseth (Organizer)
Dennis Dan Corell (Participant)
Mekbib Wubishet Amdemeskel (Participant)
Johannes Lindén (Participant)
Thierry Silvio Claude Soreze (Participant)
Carsten Dam-Hansen (Participant)

Department of Photonics Engineering
Diode Lasers and LED Systems

Description
Course lecturer: Tobias Porsch
Degree of recognition: Local

Related event
Training in luminance imaging
05/04/2017 → 06/04/2017
Roskilde, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.