

НАЦИОНАЛЕН КОМИТЕТ ПО ОСВЕТЛЕНИЕ

Balkan Light 2015

The 6th Balkan Conference on Lighting

16-19 September 2015, Athens, Greece

**ЕНЕРГИЙНО-ЕФЕКТИВНИ РЕШЕНИЯ
ВЪВ ИНТЕРИОРНОТО И УЛИЧНОТО
ОСВЕТЛЕНИЕ**

Димитър Павлов

Session: Lighting Technology

Национален комитет по осветление в България (НКО)
(ЕИК: 131339544)

With LEDs toward biologically active lighting

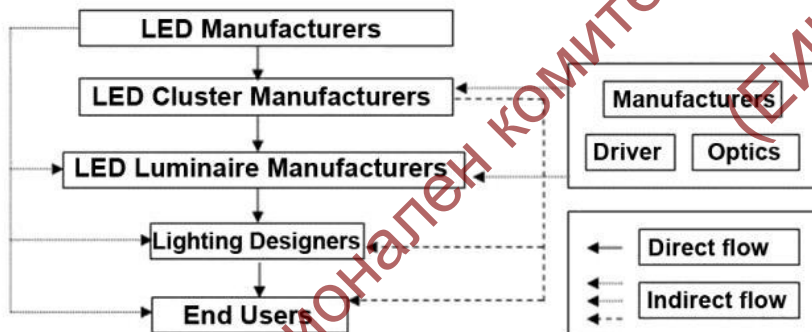
P74

Grega Bizjak and Matej B. Kobav

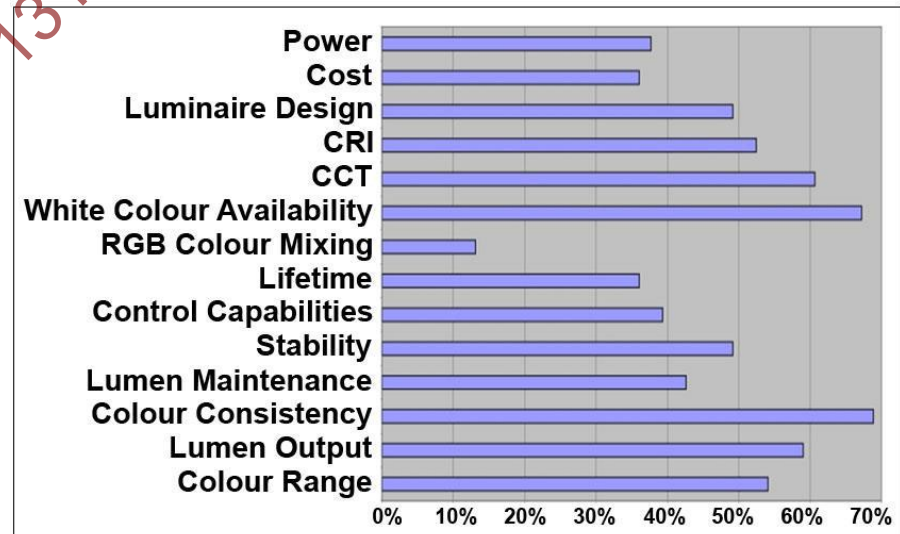
Abstract - Today we know that the lighting based on current standards will allow our vision to work properly and will save as much energy as possible. But still, this lighting is biologically inactive as it does not help us (or our body) to synchronize to the sun's daily cycle and so to maintain the circadian rhythm running (e.g. with melatonin regulation). Recent research show, that for biologically active lighting we need much higher vertical illuminance levels and/or correlated colour temperatures (CCT) of light. Beside that, the illuminance as well as the CCT needs to be controllable. This was very difficult to achieve with the classical light sources like incandescent and fluorescent lamps. On the other hand, the LEDs look almost perfect for that purpose. The question is so, how to build a biologically active lighting with LEDs.



Abstract- LEDs are currently being used in advanced lighting designs, due to their technological advantages. Nevertheless, there have been key problems related to the adoption of LEDs, including photometry and colorimetry, limited available standards, inadequacy of uniform definitions, and lack or inconsistency of data in the LED Supply Chain. In light of the above, the paper describes the Supply Chain and its major players. In addition, the paper identifies the information that lighting designers expect from the other groups in the LED Supply Chain. In turn, it compares this information against the information that is actually available in the market, and against standards. Finally, the paper discusses the implications of lighting design with the use of LEDs, and it provides guidelines on how to design with LEDs.



Information of very high importance

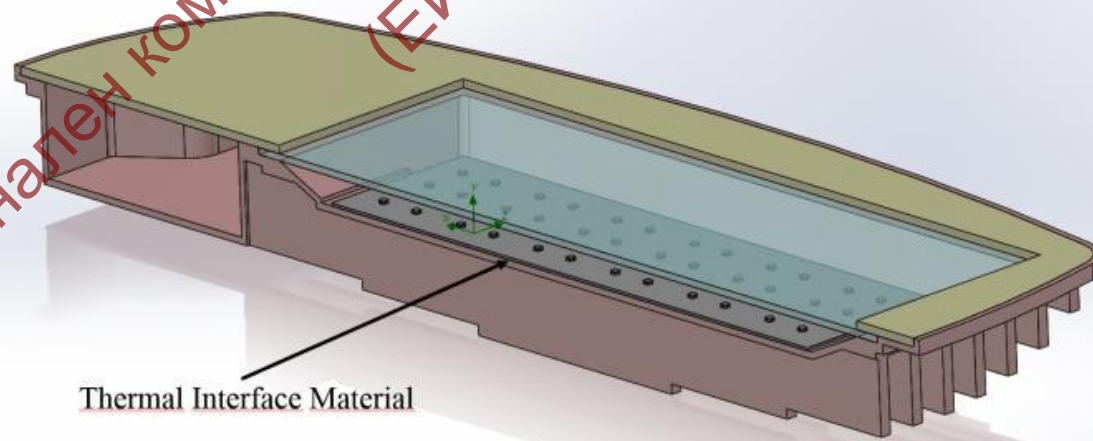


Investigation of the Effects of Thermal Interface Materials on the Thermal Performance of Luminaires with High-Power LEDs

M. Berker Yurtseven, Sermin Onaygi

P37

Abstract - It is known by heart that as the junction temperature increases, the key characteristics of the LEDs like the luminous flux, efficacy factor, efficiency and lifetime decrease and the color properties of the LEDs are affected from temperature. The luminaire body and the ambient conditions determine the junction temperature of a LED chip. In this study the effect of Thermal Interface Materials (TIM) on an example high power LED luminaire is analyzed using a commercial Computational Fluid Dynamics (CFD) software. Different scenarios for different TIM and LED thermal powers are evaluated. In order to evaluate the different thermal interface materials, the thermal power of LEDs should be measured and whole system be simulated. As the LED thermal power increases, the junction temperature increases and the need for high performance TIMs increases, too. In order to overcome the bottleneck created by low performance TIMs, the designers should select and evaluate materials carefully.

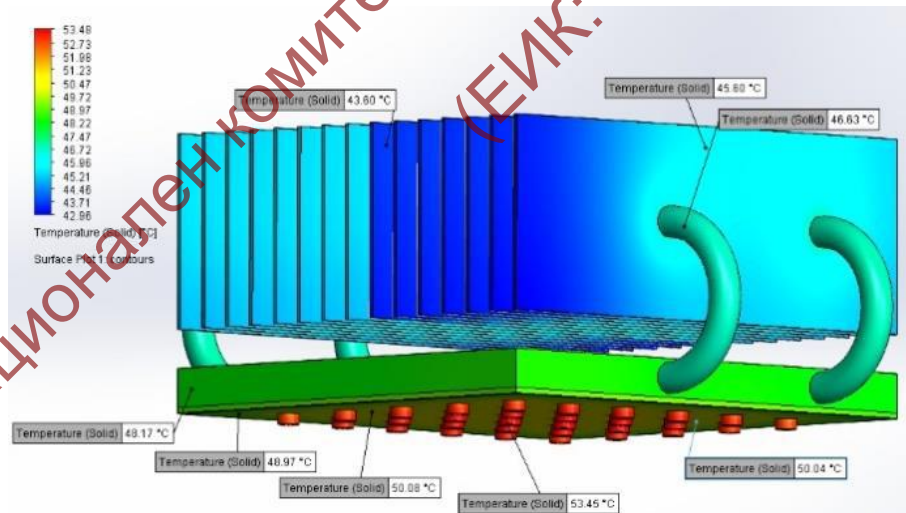


Investigation of the effects of different passive cooling systems on the performance of high power LEDs

Seher Mete, M. Berker Yurtseven, and Sermin Onaygil

P36

Abstract – High operating temperatures affect the key parameters of high power LEDs such as luminous flux, efficacy factor, efficiency etc. In this study the effects of temperature on the parameters of two samples of same LED chip obtained from market were measured with the temperature controlled Ulbricht Sphere. According to the measurement results, a LED based basic prototype and three different cooling systems for this were designed. Heat pipes with different array arrangements were used for two of these and only plate fins were used for the other. The thermal performances of these cooling systems were evaluated and compared with each other according to maximum temperatures in the structure which were obtained by the thermal simulations. Thermal simulation results show that cooling systems with heat pipe can be good alternatives to only fin based passive cooling systems, especially for high power luminaires.



Session: Human Aspects of lighting

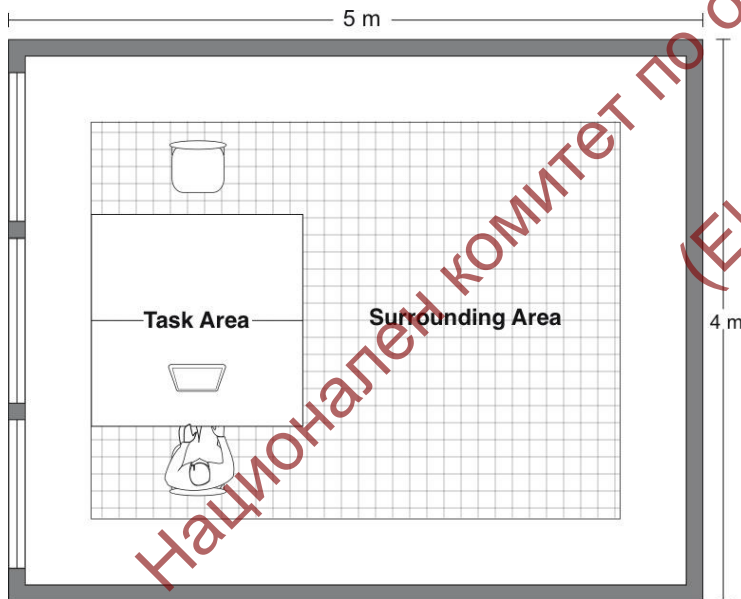
Национален комитет по осветление в България (НКО)
(ЕИК: 131339544)

The Importance of Vertical Luminances in Office Lighting Design

Raphael M. Kirsch

P61

Abstract - This work investigates the impact of different photometric parameters on the perception of lightness and attractiveness of cell offices. In an experiment taking place in a highly configurable office lighting simulator participants rated different lighting situations. Results showed a strong dependency of the lightness and pleasantness of the space on the average luminances on walls and ceiling. A weaker effect was found when surrounding area illuminance was manipulated. The effect was only significant for the perception of lightness. Overall attractiveness was not affected. The results can lead to a better understanding of how lighting designs beyond current lighting standards influence visual appearance at the workplace for office workers.



Setting and definition of surrounding area



Experimental space with backlit walls and ceiling

Session: Lighting Calculations and measurements

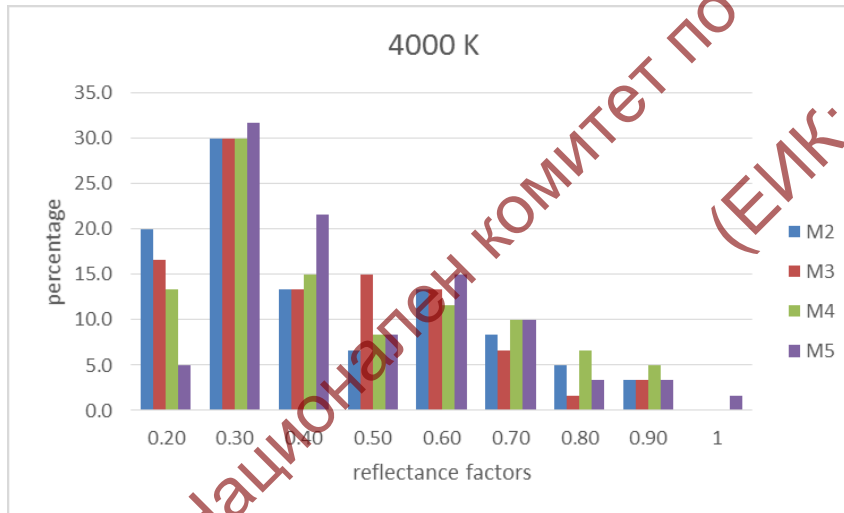
Национален комитет по осветление в България (НКО)
(ЕИК: 131339544)

Visibility Concept in Road Lighting and Analysis of the Critical Object

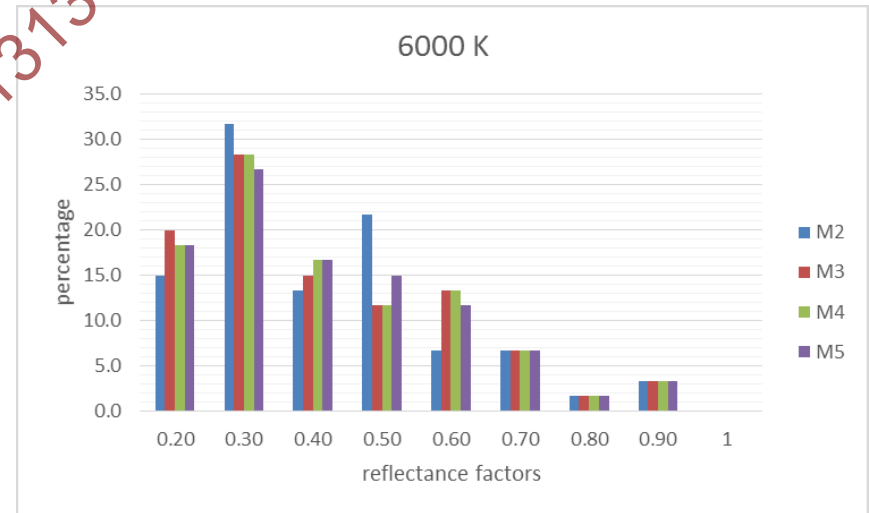
P71

B. Büyükkınacı, S. Onaygil, O. Guler, M.B. Yurtseven

Abstract-Before determining the automation strategies and applications, tests on real road conditions, surveys with real road users and more research about driving safety must be carried out, as much as possible. For this purpose a test road is established in Istanbul Technical University (ITU) Ayazaga Campus where different conditions and scenarios can be practiced in order to assess and measure the visual performance of drivers. The first step of measuring and evaluating the visual performance of drivers is to define the critical object reflectance factor. Studies for determining the critical reflectance factors of the object which will be used in the future experiments is described in this paper.



Percentage distribution of reflectance factor of critical object for 4000K



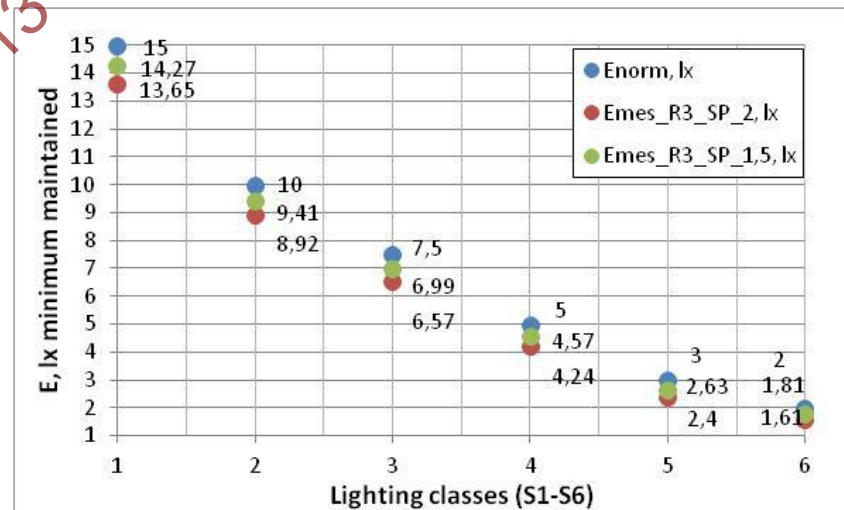
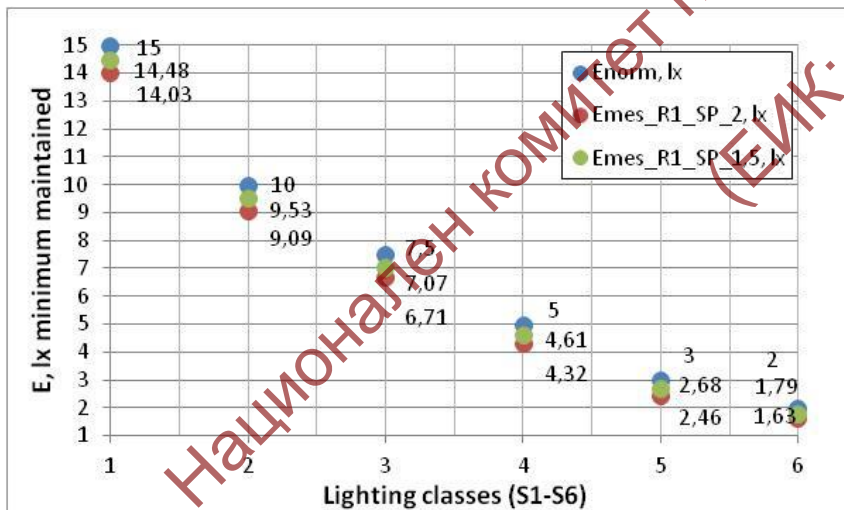
Percentage distribution of reflectance factor of critical object for 6000K

Mesopic Light Levels in Street and Park Lighting

Angel Pachamanov, Dimitar Pavlov, Konstantin Hristov

P47

Abstract - Assessing the lighting class of the streets according to standard EN 13201-1 after 11 p.m., most streets are classified as of class S5-S7. Applying mesopic luminance design at appropriately selected illuminance levels, expenses for lighting of servicing streets are significantly reduced. The link between mesopic levels of luminance and illuminance is a function of the geometry of the system, the S/P parameter of the luminaire, the type of the road surface and the light distribution of the luminaire used. Based on the method of CIE 191: 2010 for transition from standard levels of photopic luminance to mesopic luminance levels the report offers norms for mesopic illuminance levels, concerning the basic categories of streets for two types of road surface (R1, R3) and light sources with correlated color temperature from 3500 K (S/P=1,5) to 6500 K (S/P=2).

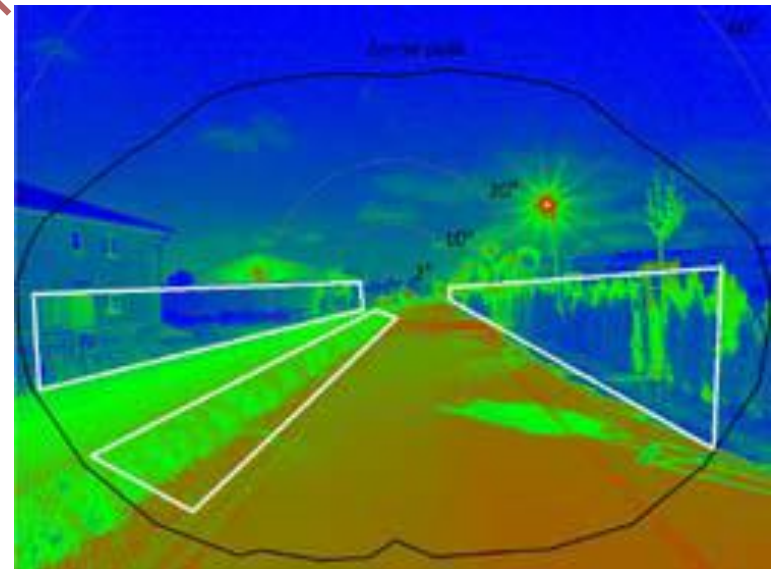
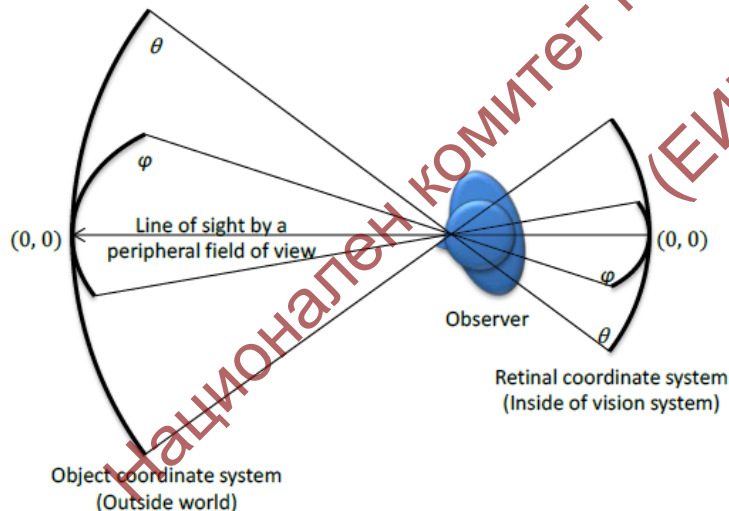


Method of visual field analysis for investigation of mesopic vision conditions

P75

Dubnicka Roman, Gasparovsky Dionyz, Lipnický Lukas, Raditschova Jana

Abstract - In the year 2010 at the CIE organisation (Commission Internationale de l'Eclairage) was released document which describes recommended system for mesopic photometry based on visual performance CIE 191:2010 Recommended System for Photometry Based on Visual Performance. The paper deals with various situations which occur on the road under public lighting to investigate of possibility of assessment of adaptation luminance from images provided by the measurement with the image photometer. From the images have been depicted particular zones which influence statement of the adaptation luminance. It analyses various situations in the public lighting based on luminance distributions and provides information how they can be treated for adaptation luminance determination under mesopic vision conditions.



Photobiological hazard from artificial optical radiation in arc welding for occupational exposure assessment

C. A. Bourousis, F. V. Topalis, M. E. Kazasidis

P51

Occupational Safety and Health (OSH) is a crucial social, economic and cultural issue. OSH is involved with photobiological hazard from artificial optical radiation (AOR) that is visible light, UV and IR, emitted during various activities and legally covered by European Directive 2006/25/EC. Among the enormous amount of sources emitting optical radiation the most important non-coherent ones, to consider for health effects to the whole optical range, are arcs created during metal welding. In this survey, we made an effort to assess the complicated limits stated by the Directive in the controlled environment of a welding laboratory. Sensors covering the UV and blue light range were set, reproducing and measuring typical welding procedures. Initial results, apart from apparently justifying the use of Personal Protective Equipment (PPE), also set the basis to evaluate PPE's properties and support an integrated risk assessment of the complex welding environment.

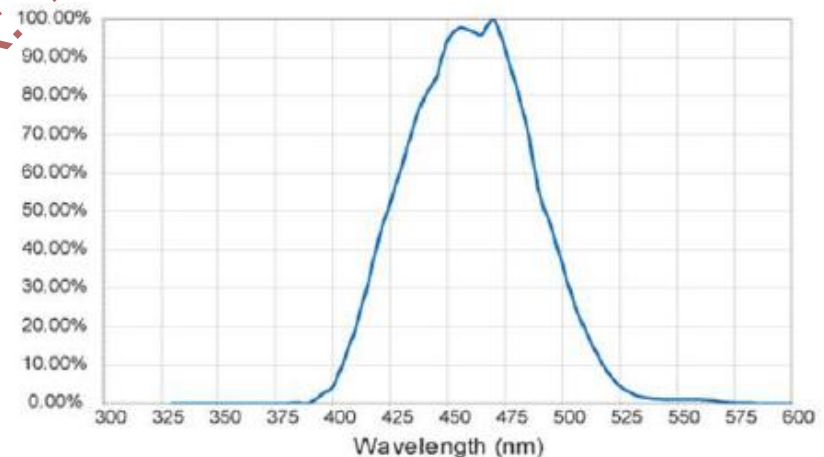


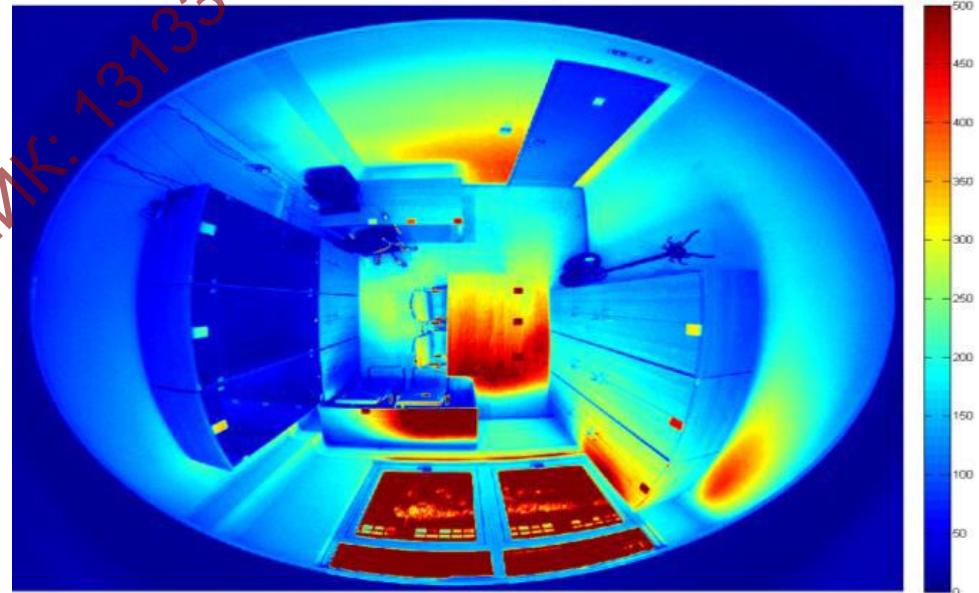
Fig. 9. Spectral sensitivity of Sensor-3 (Blue Light, 400-510nm).

Interior lighting control by daylight harvesting using a smart imaging sensor

C. A. Bouroussis, P. A. Kontaxis, F. V. Topalis

P35

Abstract – The use of lighting control and daylight harvesting or lumen maintenance using photosensors is the most common energy savings technology that can be increase the energy efficiency in interior lighting. This paper describes a new proposed system for controlling the artificial lighting using an imaging sensor that adds more flexibility by adding multiple control areas and individual signaling for each luminaire. The paper describes the development process of the system, the core technology and presents some preliminary data derived by using the system in real conditions.

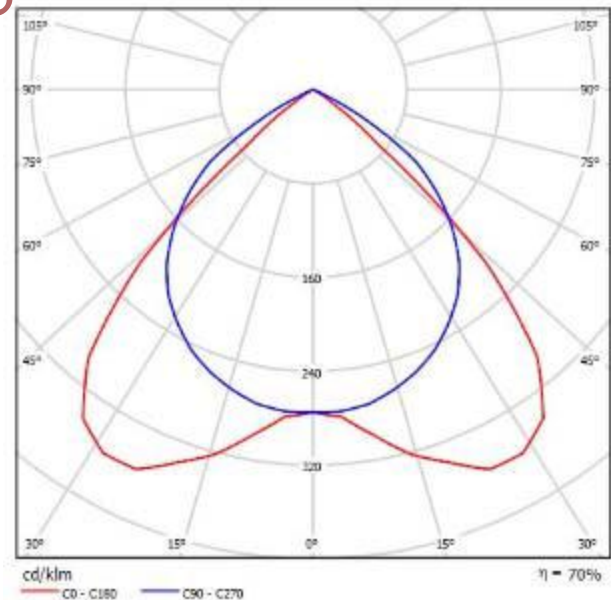
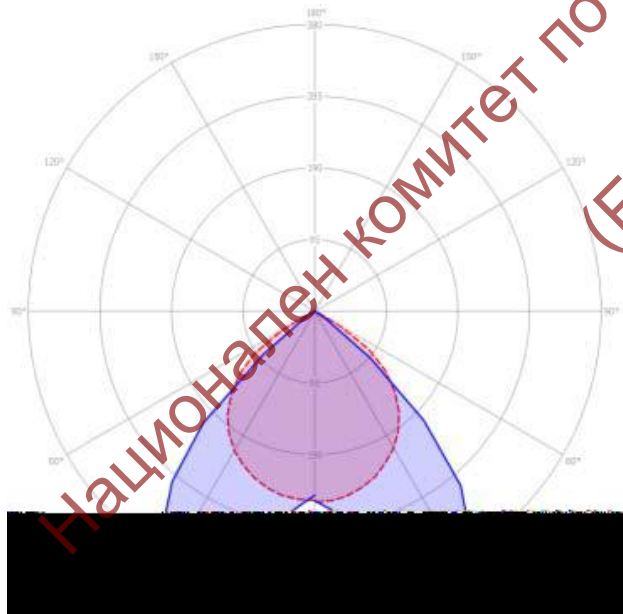


Disparity of photometric parameters of identical luminaires

Dubnicka Roman, Gasparovsky Dionyz

P76

Abstract - The design of real lighting systems are performed by calculation methods which are performed at the present very often by the software computation tool e.g. Dialux, Relux etc. In the calculation are based on different calculation methods depending on software. As input data are photometric parameters of luminaire to be installed in the lighting system provided from testing photometric laboratory by means of the photometric files e.g. LDT, IES etc. In the photometric file are listed all important parameters used by software at calculation. Therefore appropriate testing of luminaires should be ensured to provide reasonable results computed by software tool in comparison with the real measurement.



Session: Interior lighting

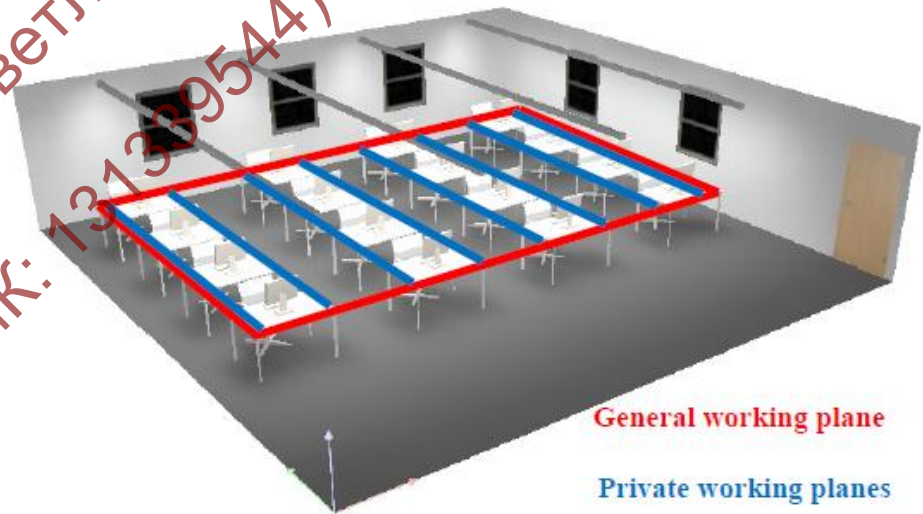
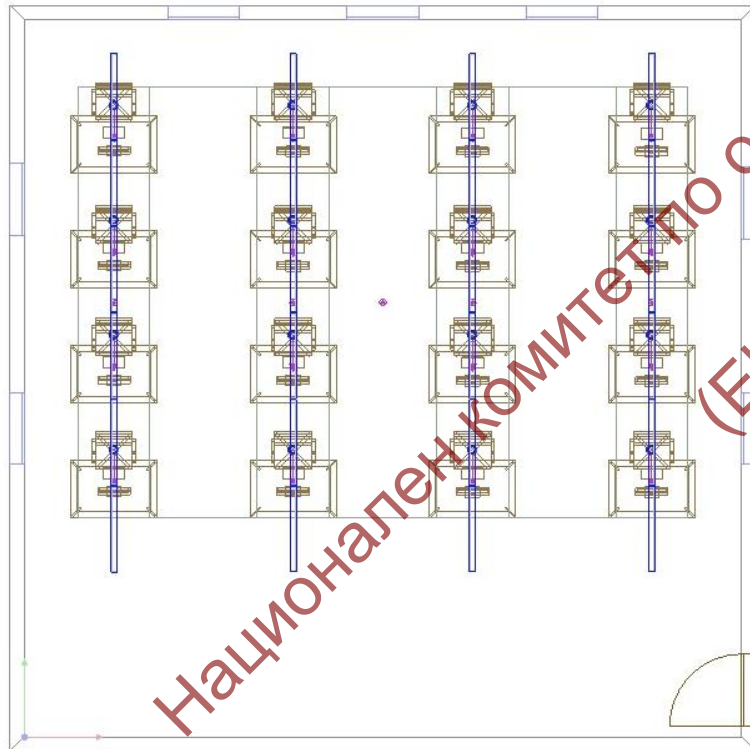
Национален комитет по осветление в България (НКО)
(ЕИК: 131339544)

A Study on LED Lighting for Offices

R. Ünver, K. Çelik, and E. Küçükılıç Özcan

P4

Abstract - In this paper, various LED luminaires, which have different light distributions and luminous intensity curves, have been examined in terms of illuminance, illuminance uniformity, glare and energy usage, on the case of an open plan office. The methodology and results of the study will be present the beneficial data for the lighting designers for use of LED luminaires.



Национален комитет по осветление България (НКО)
(ЕИК: 131309544)

Session: Energy efficiency

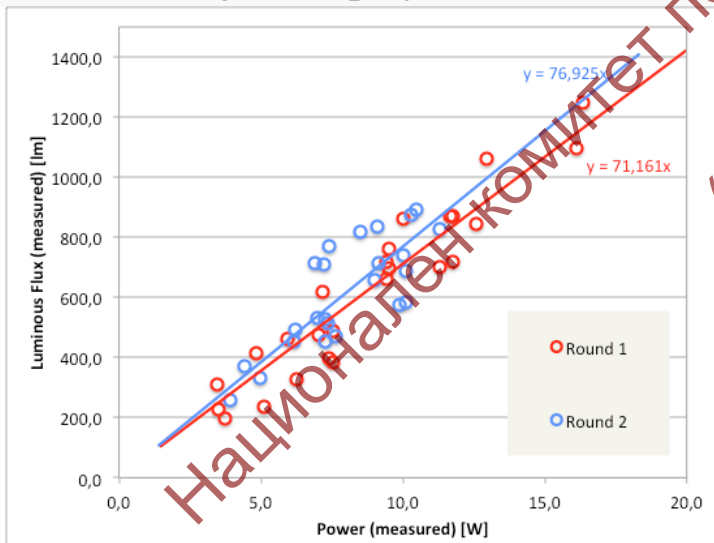
Национален комитет по осветление в България (НКО)
(ЕИК: 131339544)

Developing Quality Assurance Tool for LED lamps in Residential Lighting sector

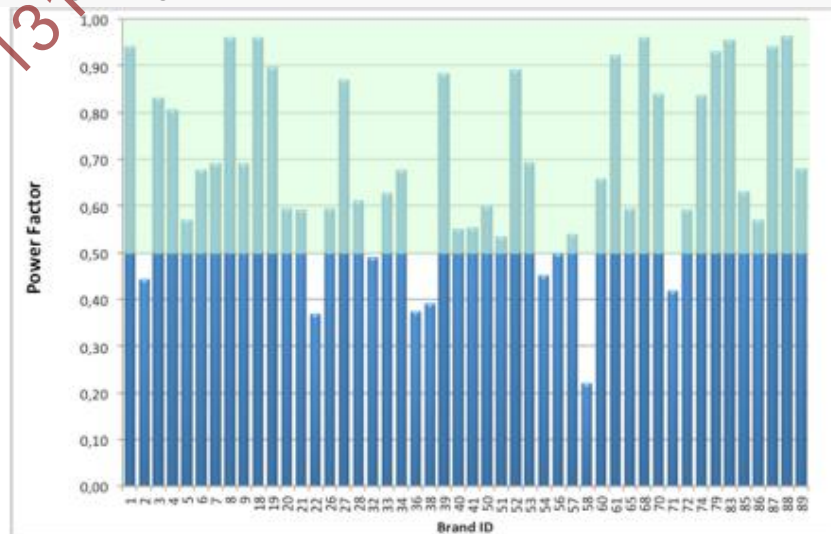
Georges Zissis

P21

Abstract - Solid State Lighting (SSL) is currently revolutionizing the field of lighting and its practices. In the long term, inorganic and organic light emitting diodes (LEDs) will become the most widely used light sources. White LEDs have shown a steady growth of their luminous efficacy for more than fifteen years; promising to make significant energy savings as they replace older lighting technologies. However, in order to achieve considerable savings from lighting, a coherent strategy is required to transform the lighting market in both International and National levels. The quality of lighting products introduced in our markets is the key issue for establishing these strategies. The paper emphasizes the importance of taking a holistic view in the development of an internationally accepted quality metrics for lighting systems and exposes the efforts achieved within Premium Light EU project and IEA 4E-Solid State Lighting Annex.



Measured luminous flux (lm) versus measured electrical power (W) for LED omnidirectional lamps



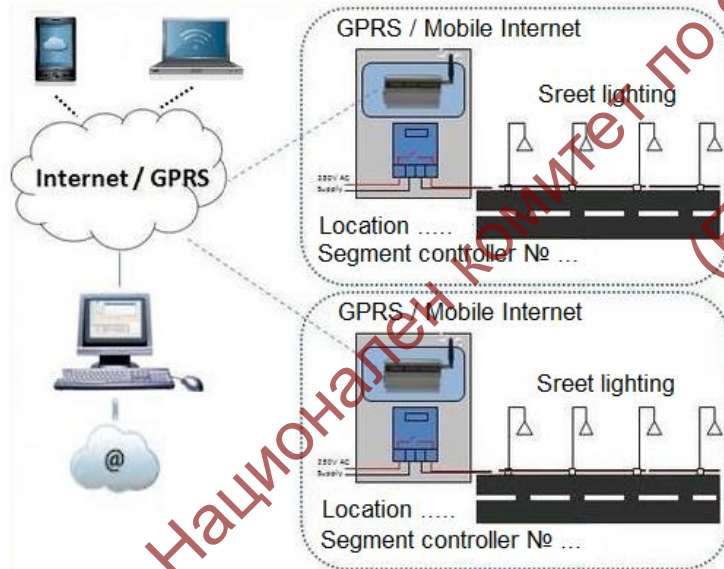
Measured Power Factor for omnidirectional LED lamps

A System for Remote Control for Public Lighting in Small Settlements using "Cloud Computing"

Angel Pachamanov, Nikolay Matanov, Kiril Kassev and Petar Stoev

P5

The paper describes a system for remote control of public lighting in small settlements, designed and implemented by the authors. The system is implemented on reconstructed lighting systems and provides basic functionality at low cost and easy operation. The client (the Municipality) does not support specialized equipment, but it is possible economy to be realized in the expenses for electric power, maintenance services and qualified staff through direct control of the public lighting. The system provides access and possibility for short time turning on and off the lighting during the night period with the help of a mobile handset. The current expenses for the system are the fees for mobile Internet at the street light cabinets and subscription fee for a monthly report concerning the operating parameters of the lighting system. The application software provides basic functionalities, such as: supports webbased user interface to control the current state of the lighting systems at the street light cabinets level; sends commands to turn on and off lights; visualizes the history of the operation of the system and displays in graphical form various reports; maintains a database for the operation of the system during previous periods; periodically archives the database in the "Cloud".



Implementation of nanotechnology in optical parts of luminaires

Dubnicka Roman, Gasparovsky Dionyz, Lipnický Lukas, Raditschova Jana, Macha Marek,

P32

Abstract - The optical part of luminaires is very important to ensure appropriate distribution of luminous flux from the light sources into the space to be illuminated. At the present the nanotechnology is undoubtedly increasingly implemented in production over all sectors of industry. Also usage of nano materials in lighting technology applications is not avoided. Very often engineers are using opto-mechanical nanostructures for designing of new types of luminaires especially their optical parts. Integrated optics deals with the incorporation of these components into optical surface structures. The nanotechnology slowly replaces old approach of design of optical parts of luminaires providing more flexibility to control distribution of luminous flux from light source i.e. luminous intensity distribution curve (LIDC). This new production approach of optical part of luminaires in combination with innovative LED technology provides future vision into the optical design.

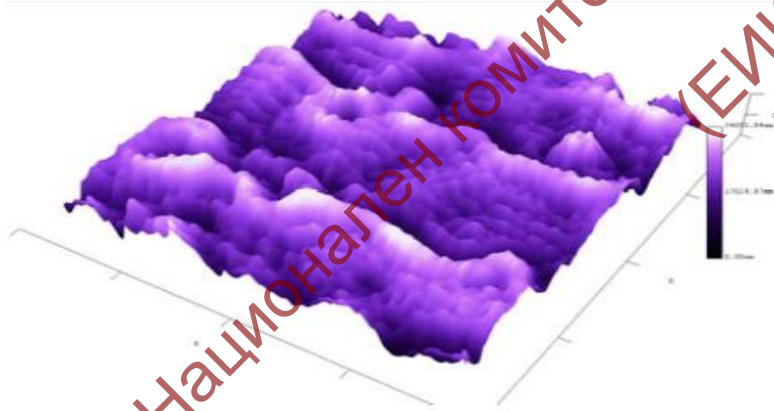
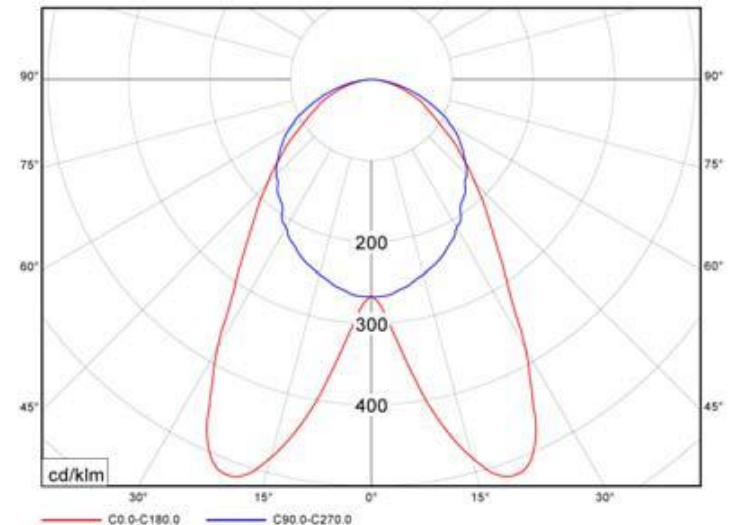


Fig. 3 Opto-mechanical structures – diffractive Fresnel lens



Session: Utilization of daylight

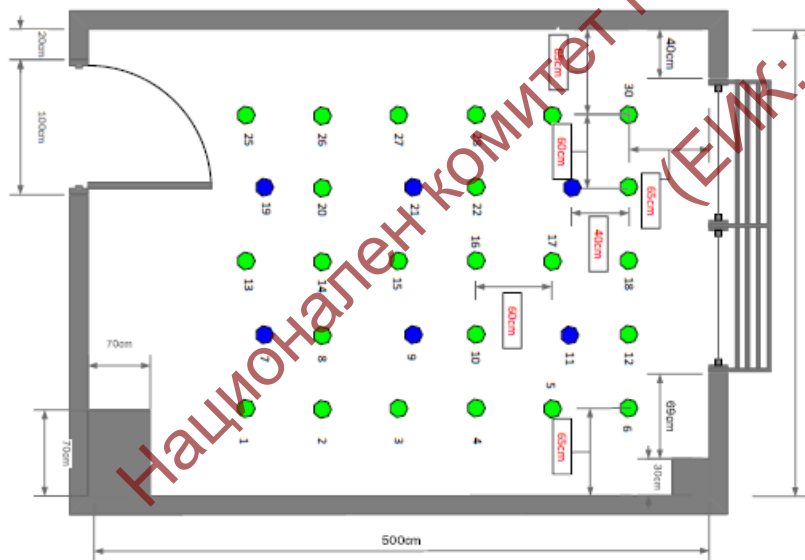
Национален комитет по осветление в България (НКО)
(ЕИК: 131339544)

Energy saving and visual comfort by optimizing photosensor position

P. F. Topali, P. A. Kontaxis, L. T. Doulos, E-N. D. Madias¹ and F. V. Topalis

P26

The object of this research is the optimization of the sensor position in a room with lighting control for utilization of daylight. PROMETHE II method, based on multicriteria analysis is used for the selection of the optimum position of the sensor. According to the method, a consistent set of criteria comprised of the selected features is specified for each alternative photosensor position (energy saving, visual comfort and correlation coefficient). A specific weight for each criterion is determined. A transfer function is applied (to each criterion) and the preference and indifference thresholds are found. The next steps are the calculation of the preference index and the calculations of outgoing and incoming flows for each alternative. The final step is the ranking of the alternatives by a total preorder through the calculation of the net flows.



The role of dimmable LED luminaires to daylight harvesting

L.T. Doulos, P.A.Kontaxis, E.-N. D.Madias, C.A.Bouroussis, A. Tsangrassoulis⁴ and F.V.Topalis

P64

Abstract – With the advent of LED technology the importance of a proper dimming procedure of luminaires became crucial. The greater luminous efficacy of LEDs in comparison with other light sources in interior spaces can offer increased energy savings. Furthermore using lighting control technics such as daylight harvesting or lumen maintenance using photosensors, energy savings can be increased even more. However, the proper selection of luminaire is needed, since the differences in energy savings achieved can be significant between various LED luminaires.

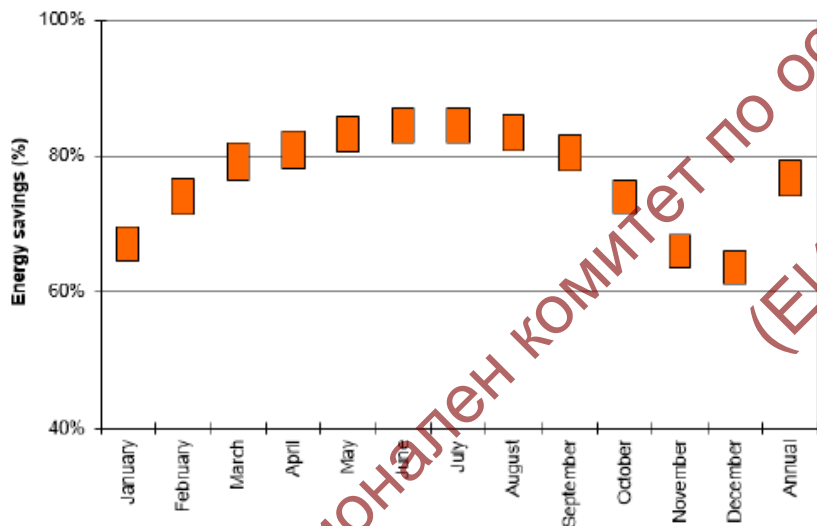


Fig. 7. Monthly and annual differences in energy savings between the dimmable LED luminaires for the closed loop algorithm

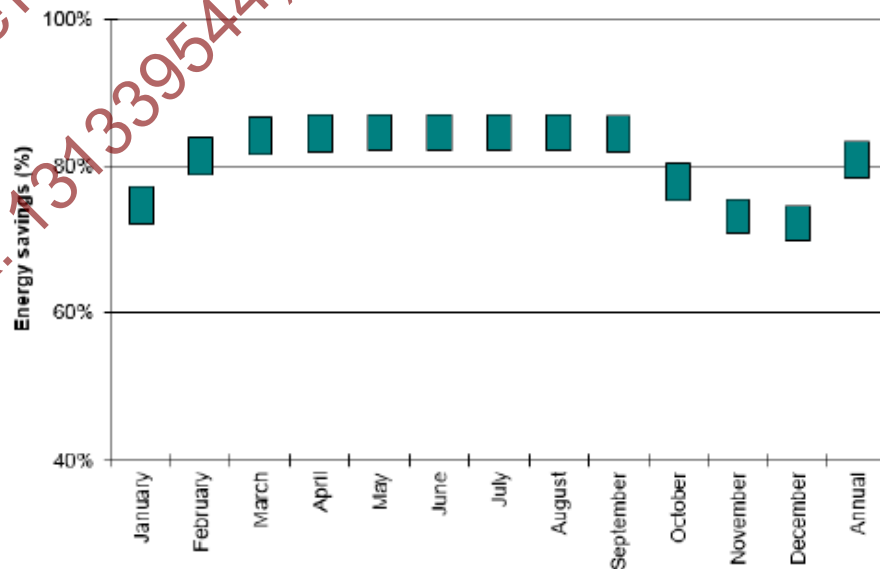


Fig. 8. Monthly and annual differences in energy savings between dimmable LED luminaires for the integral reset algorithm

**Thank You For
Your Attention!**

Национален комитет по осветление в България (НКО)
(ЕИК: 131309544)