The measurements of circadian radiation - challenges and possibilities

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High efficiency light sources such as LEDs, fluorescent tubes and HIDs become very popular in lighting applications today. Comparing to traditional incandescent bulbs, those new lamps have significant emission of electromagnetic radiation in between (380÷600) nm. Radiation in this range is responsible for synchronisation of natural biological clock of human being (so called: circadian cycle) [1,2,3]. Todays, lighting regulations are related only to photometrical quantities [4] (based on V_λ human eye sensitivity). But, it might be not enough for full characterisation of light as circadian active radiation can influence human body [5].

International Commission on Illumination CIE pay special attention on this topic. In 2016 it published goals for R&D for next years. Study on circadian radiation is a very important part of this document. Moreover – CIE recommends to measure this radiation also in CIE TN003-2015 [6]. According to this document melanopic sensitivity curve should be considered as starting point all further measurements. There are also other studies on this topic in well know institutes and universities, such as: LRC at Rensselaer Polytechnic USA, Helsinki University of Technology CMAMRI. Circadian radiation is also a very important for most well-known lighting manufacturers. It is also worth to mention about Human Centric Lighting Society – international organization which is lobbing for healthy lighting. In Germany, some first recommendation about circadian radiation are placed in documents: DIN SPEC 5031-100 and DIN SPEC 67600:2013. There are also special working groups to lobby for implementation circadian parameters in mandatory regulations.

As much as topic of circadian radiation is very important and hot today – there are no commercially available measurement devices. There are few kinds of experimental instruments developed for general evaluation but their accuracy might be not satisfied. Accurate measurement of circadian radiation require detailed consideration of all components on optical path (such as cosine correction element, light filters and optical detector). The paper will cover three basic methods of optical radiation measurement and possibilities of their adaptation for circadian measurements. Main sources of measurement errors will be discussed as well as ways of improvement.

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