

3<sup>rd</sup> Global

# Pediatric Ophthalmology Congress

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*Kaptsov Valery Alexandrovich<sup>1</sup> and V N Deynego<sup>2</sup>*

<sup>1</sup>All-Russian Scientific & Research Institute of Railway Hygiene, Russia

<sup>2</sup>ELTAN, Close corporate society

## Analytical review: Light-biological safety and risks of eye diseases among school child in classrooms with led light sources

A modern person spends most of the day in an artificial light environment. The massive introduction of LED lighting and LED backlighting of information display devices exacerbated the problems of light-biological safety, and increased the risk of developing eye disease in the early stages of child development. This reduces the professional potential of an adult and safety of work, especially in transport. Eye diseases occur and develop during his training (work activity), which occurs in a light environment formed by artificial light sources general lighting and backlighting of display devices. Hygienists, studying the spectrum of light and the effect of its photon flux on the eyes and human health, have established that the spectrum of sunlight with hygienically safe color temperature causes an adequate response of human organs and systems. A biologically adequate spectrum of radiation is a collection of photon fluxes that forms a response matrix that ensures the harmonious functioning of the functional elements (cells) of the visual analyzer and the human hormonal system. Biologically adequate light environment is a light environment created by semiconductor sources of white light with a biologically adequate spectrum to minimize the risks of damage to human health at all stages of its life. We conducted a comparative analysis of the spectra of LED and sunlight. All modern artificial light sources are characterized by an increased radiation dose of blue light in the 450-460 nm regions, which exceeds the dose of blue in sunlight at the same color temperature and illumination level, and a dip in the blue-turquoise 480 nm area. The dip in the field of blue-turquoise light of 480 nm in the spectrum of LED light leads to an increase in the diameter of the pupil of the eye more than in sunlight. The analysis of the features of the spectrum of LED light and their negative impact on the incidence of eye and human health made it possible to formulate the theoretical basis for the development of a new generation of semiconductor white light sources to create a healthy light environment. During the implementation of the work development of industrial technology for the production of energy efficient LED white light sources with a biologically adequate spectrum of radiation, ELTAN specialists synthesized a spectrum of white light with no emission in the region of 460 nm and dips in the region of 480 nm, which corresponds to a continuous spectrum of sunlight with a hygienically safe light temperature. The wide introduction of semiconductor white light sources with a biologically adequate spectrum of radiation to illuminate educational and medical institutions and illuminate the displays of information display devices will create a healthy light environment for children and adults, which meets the new requirements of green technologies in construction.

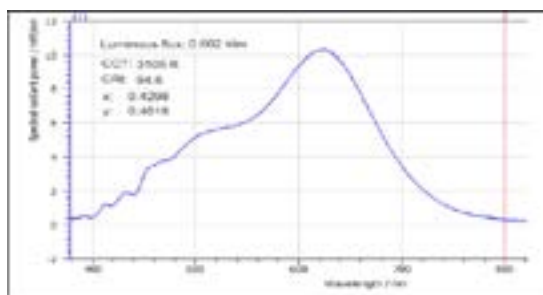


Fig. 1: The light spectrum of a semiconductor white light source with a biologically adequate spectrum of -3105 K, developed at ELTAN, close corporate society.

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## Recent Publications

1. Deinego V N, Kaptsov V A, L I Balashevich L I, Svetlova O V, Makarov F N, Guseva M G and Kositc I N (2016) Prevention of eye diseases in children and adolescents in educational facilities with LED light sources of the first generation. *Russian Children's Ophthalmology* 2:57-73.
2. Kaptsov V A, Deinego V N, Soschin N P and Ulasyuk V N (2017) Hygiene and spectral-energy pattern of light. *J. Hygiene and Sanitation* 2:98.
3. Sliney David H (2010) Influence of new lighting devices on human health and safety. *Lighting Engineering* 4:49-51.
4. Deinego V N, Kaptsov V A and Soroka A I (2014) Influence of light and physical fields on the risk of dis-harmonization of the synthesis of melatonin in the pineal gland. *Health Risk Analysis* 2:30-41.
5. Kaptsov V A and Deinego V N (2014) The risks of light from LED panels on the health of the operator. *Health Risk Analysis* 37-46.

[kapcovva39@mail.ru](mailto:kapcovva39@mail.ru)