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SPECTROSCOPIC STUDIES OF COMMERCIAL LED LIGHTS – BLUE LIGHT HAZARD

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ABSTRACT:Light-emitting diodes (LEDs) have been used to provide illumination in industrial and commercial environments. LEDs are also used in TVs, computers, smart phones, and tablets. Although the light emitted by most LEDs appears white, LEDs have peak emission in the blue light range (400–490 nm). The accumulating experimental evidence has indicated that exposure to blue light can affect many physiologic functions, and it can be used to treat circadian and sleep dysfunctions. However, blue light can also induce photoreceptor damage. Thus, it is important to consider the spectral output of LED-based light sources to minimize the danger that may be associated with blue light exposure. In this review, we summarize the current knowledge of the effects of blue light on the regulation of physiologic functions and the possible effects of blue light exposure on ocular health.

KEYWORDS: Light-emitting diodes, spectral output, illumination

I. INTRODUCTION

LED devices have set a new trend in the technology market today, their use is increasing exponentially because they are easy to manufacture, cost effective and power efficient. Use of LEDs can be seen from the balcony bulb of a ban glow to the bulb on a street vendor's vegetable cart, wrist watches and mobile phones etc. [1,2,3]. White light, with color temperature around 5000 K, is preferred especially in Asian countries over conventional incandescent lamps. This is the reason for surge in commercial value for white LED's. White LED Bulbs are also available in many shades, from cool white (5500 K and higher) and warm white day light (2700 K to 3500 K) range. It is a known fact that by the use of different materials such as GaAs, GaP, GaAsP etc white light can be obtained[4,5].
These white LEDs bulbs have many advantages but they suffer from some critical problems. In cool white LEDs, substantial amount of energy is present in blue region of spectra ie, wavelengths between 400-500 nm. This is known as blue hazard whereas in daylight LEDs wavelengths in blue region are very feebly present. "Blue light hazard" causes retinal injury created by photochemical reaction by electromagnetic exposure of radiation at wavelength between 400-500 nm[6]. A permanent damage to pigment epithelial cells of retina may be caused by the continuous exposure of LED light of shorter blue band spectrum. Moreover longer use of such devices may cause fatigue in eyes and create skin problems [7, 8, 9].

Physical pain some people feel from high intensity discharge (HID) car headlights and particularly intense blue LEDs seems to be a combination of these focus and scatter effects, together with a third. We have a particularly strong aversion reaction to bright blue light sources, including bluish-white light. "Pupilary reflex is down in the blue [part of the spectrum]. The strongest signal to the muscles in the iris to close down comes from the blue," says Dr. Sliney.

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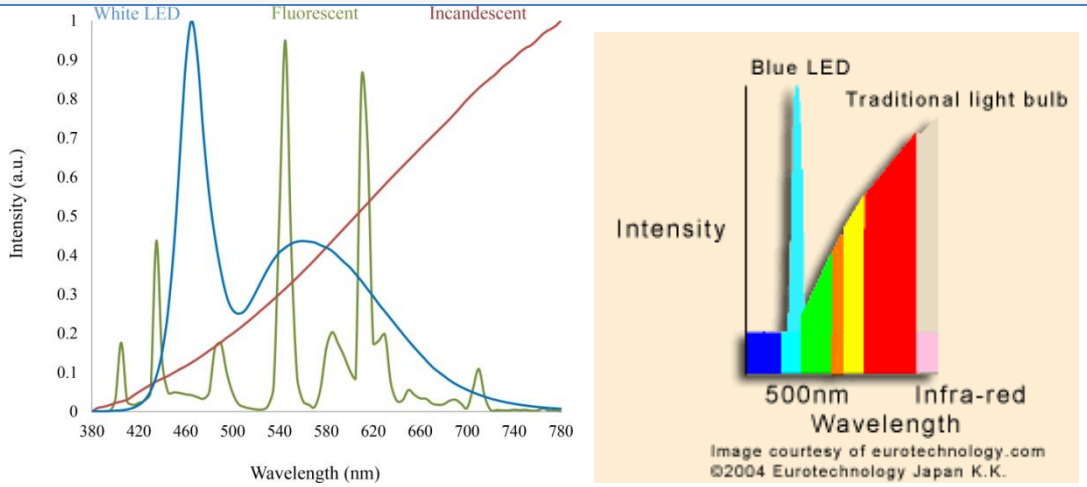

Fig1 Intensity of blue light

Blue light at night reduces our bodies' melatonin levels, which can disturb sleep – this is generally accepted. What is far less certain is a link between low levels of melatonin, a weakened immune system, and cancer.

Melatonin has been shown to slow or stop tumor growth in animal and test tube studies. However, in humans, the evidence is much less clear cut. Surveys showing that night shift workers are particularly prone to colo-rectal and breast cancer appear to be the strongest circumstantial evidence for this theory.

Intense blue light can cause long-term photochemical damage to the retina. Now, nobody is claiming that you're likely to suffer this kind of injury from a normal blue LED (unless you stare fixedly at it from a few millimetres for an hour). However, it is theorized that this may be the evolutionary driving force behind the immediate feeling of pain we get from bright light with a very strong blue component.

II. Materials & Methods

The spectrometer setup The measurement unit consists of a micro-spectrometer (Ocean Optics - S2000) coupled with an optical fiber and a cosinus corrector at its tip. The spectrometer software (Ocean Optics Spectra Suite) and Origin 8.0 were used for collecting and processing of the measured data respectively (Figures 2).

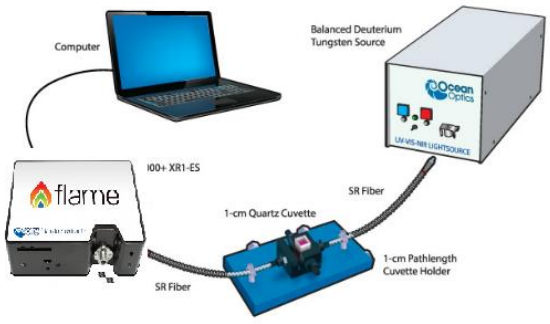

Fig2. Spectrometer

A primary tungsten halogen light source (Ocean Optics - LS-1) was used to calibrate the spectrometer, while the total emitted light intensity of the individual screens was measured by

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a calibrated power meter (Newport ST 851-UV). For the transmission measurements through the lenses an integrated sphere was used in combination with a balance tungsten light source (Ocean Optics DH-2000-BAL, FOIS-1) Results Determining the amount of blue light radiation The intensity of the emitted radiation in the blue region from mobile screens, tablets and personal computers was determined by spectroscopic measurements as shown in the following spectra, where one can see how the relative intensities of various origins are formed in respect to each other. Figure 3 shows the spectrum of the emitted radiation of a PC LCD monitor, as captured by the spectrometer. In addition, intensity measurements of total emitted radiation at user distance from the monitor were taken by a calibrated power meter and found to be 100 uW/cm2 .

The biological effect of blue light includes the fatigue areas (400-420 nm), macular damage (400-440 nm) and sleep fluctuations (460-484 nm).

How exposure to blue light affects your brain and body

• The disruption to your sleep schedule might leave you distracted and impair your MEMORY the next day. • By disrupting melatonin, smartphone light ruins sleep schedules. This leads to all kinds of health problems. • A poor night's sleep caused by smartphone light can make it HARDER TO LEARN

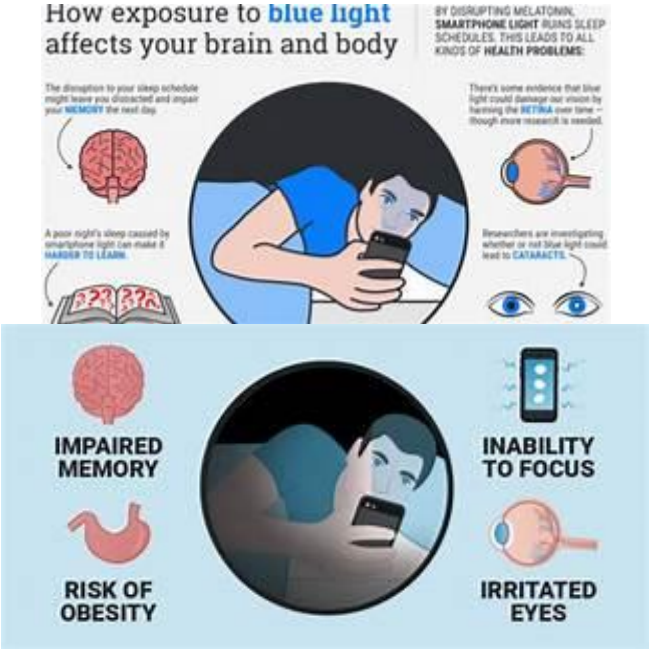

Fig 3 blue light affect brain and body

People whose melatonin levels are suppressed and whose body clocks are thrown off by light exposure are more prone to DEPRESSION. • There's some evidence that blue light could damage our vision by harming the RETINA over time —though more research is needed. • Researchers are investigating whether or not blue light could lead to CATARACTS. • There's a connection between light exposure at night and the disturbed sleep that come with it and an increased risk of breast and prostate CANCERS. • By disrupting melatonin and sleep, smartphone light can also mess with the hormones that control hunger, potentially increasing OBESITY RISK.

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Conclusion

The results of our measurements reinforce the common sense that the blue light radiation originating from contemporary light sources, such as screens of tablets, mobile phones, monitors of personal computers and TVs, dramatically dominates the spectrum. The disproportionally high value of blue light radiation intensity from LED-based lighting devices affects the human physiology and also could be dangerous to ocular health.

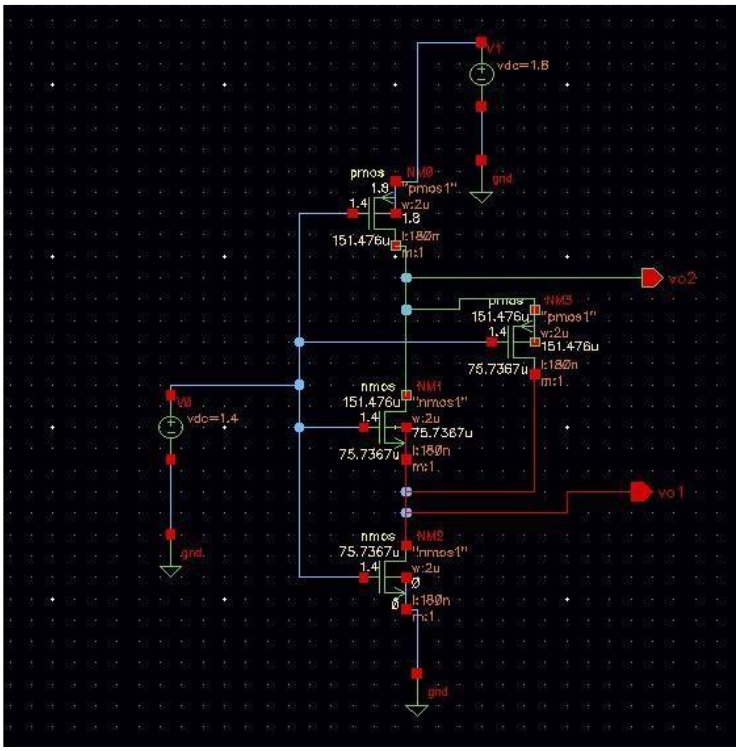

Fig 3. Modified analog circuit using CNTFETs

V. RESULT & SIMULATION

FIG 4. POWER DISSIPATION OF CIRCUIT

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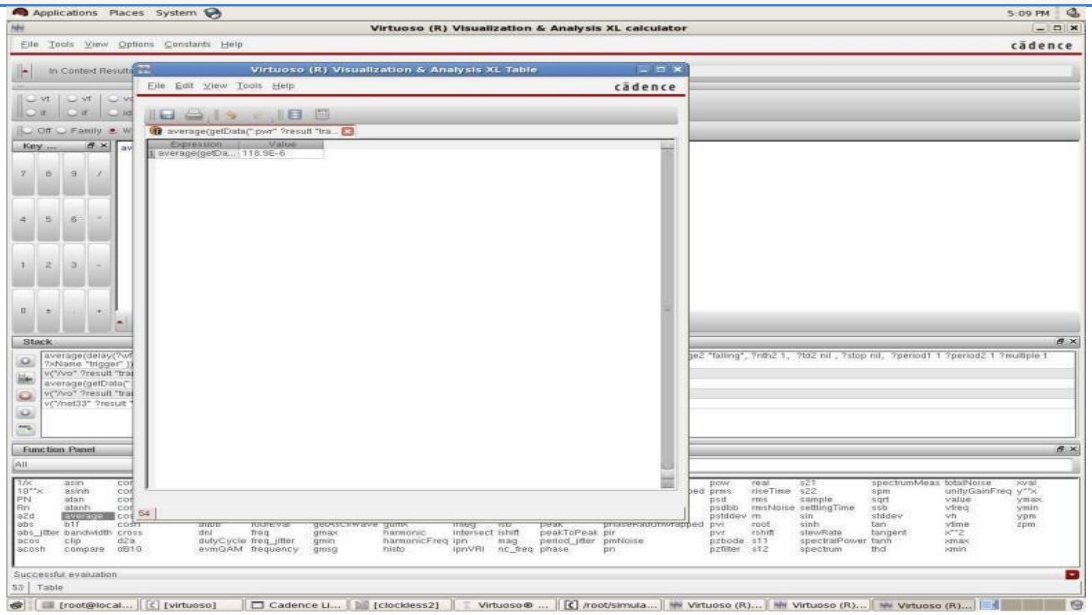

Fig 5 Power estimation of CNTFET based analog circuit

VI. CONCLUSION

Today we are using CMOS technology in every field, but further scaling of silicon based transistors will not be possible at advanced stages thus CNTs will be of great use. In this paper multi stable analog circuit using 180nm technology is replaced by CNTFET based analog circuit and calculation of power estimation is done using CADENCE software tool.

REFERENCES

[1] Bugeja, A.R.; Bang-Sup Song, ”A self-trimming 14-b 100-MS/s CMOS DAC,”IEEE Journal of Solid-State Circuits, vol.35, no.12, pp.1841,1852, Dec.2000
[2] K. Navi, M.H. Moaiyeri, R. FaghihMirzaee, O. Hashemipour, B. Mazloom-Nezhad, “Two new low-power full adders based on majority-not gates”, Micro- electronics Journal (Elsevier), 40,126130.
[3] R. Zimmermann, W. Fichtner, Low-power logic styles: CMOS versus pass-transistor logic, IEEE Journal of Solid- State Circuits 32 (1997) 10791090.
[4] Cilingiroglu, U.; Ozelci, Y., ”Multiple-valued static CMOS memory cell,” Circuits and Systems II: IEEE Transactions on Analog and Digital Signal Processing, vol.48, no.3, pp.282,290, Mar 2001.
[5] Cadence, Virtuoso user guide, Version 6.2.4, March 2008 .
[6] Marani R., Gelao G., Perri A.G.; (2012) Comparison of ABM SPICE library with Verilog-A for
Compact CNTFET model implementation, *Current Nanoscience*, vol. 8, n. 4, pp. 556-565.
[7] Marani R., Gelao G., Perri A.G.; (2013) Modelling of Carbon Nanotube Field Effect Transistors
oriented to SPICE software for A/D circuit design, *Microelectronics Journal*, DOI:10.1016/j.mejo.2011.07.012, 33-39.
[8] Madriz F.R., Jameson J.R., Krishnan S., Sun X., Yang C.Y.; (2009) Circuit Modeling of High-Frequency Electrical Conduction in Carbon Nanofibers, *IEEE Transactions on Electron Devices*, vol.56, n. 8, pp. 1557- 1561.