



## **Is it Blue Light or Increased Electromagnetic Fields which Affects the Circadian Rhythm in People who Use Smartphones at Night**

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### **Dear Editor-in-Chief**

In Korea, in a dark environment at night, the circadian illuminance (CIL) values for screens of three different commercial smartphones (two LCDs and one AMOLED from different manufacturers) were greater than 41.3 biolux (1). These CIL values were linked to suppression of melatonin. Furthermore, when smartphones were used in a bright environment at night, both the circadian illuminance and the values of melatonin suppression were significantly higher. Interestingly, Korean researchers proposed a method to decrease the adverse health effects of smartphone displays by reducing the blue light emitted by smartphone displays. They stated that fine control of blue light in smartphone displays could play a basic role in reducing the adverse health effect of blue light emitted from smartphone displays at night. This intervention could lead to a decreased effect of the smartphone displays on the circadian rhythm.

Our laboratories at the Ionizing and Non-ionizing Radiation Protection Research Center (INIRPRC) have steadily conducted experiments on the biological effects of exposure of animal

models and humans to different sources of radiofrequency electromagnetic fields (RF-EMFs) such as cell phones, mobile phone base stations, mobile phone jammers, laptop computers, radars, dentistry cavitrons and MRI. Although the above-mentioned published paper (1) addresses an attractive challenging issue, it has some basic shortcomings. The first shortcoming comes from this point that the authors only focused on the visible component of the electromagnetic radiation spectrum. The rapidly growing electricity demand, ever-advancing telecommunication technologies and changes in social behavior have led to steadily increasing exposure to man-made electromagnetic fields. The effects of RF-EMFs produced by mobile phones on human health have been well-documented. Furthermore, previous reports have indicated a significant association between exposure to RF-EMFs of mobile or cordless phones and sleep problems (2, 3). The 2nd shortcoming of this paper comes from ignoring this point that electromagnetic fields may affect the level of plasma melatonin (4, 5). The third shortcoming of this paper arises from ig-

noring the very low sensitivity of the human eye to blue wavelengths. Both the scotopic and photopic eye sensitivities are wavelength-dependent. The peak eye sensitivity in the photopic vision occurs at  $5.6 \times 10^{-7}$  m (yellow-green region) and the sensitivity of the human eye for either blue or red wavelengths is markedly lower than the peak sensitivity (6).

Therefore, when the displays of smartphones emit blue light, they should increase the light intensity which can normally lead to increased electricity use and increased level of electromagnetic fields generated by displays. We hope these comments help scientists better evaluate the adverse health effects of smartphones.

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