THE SPECTRAL RESPONSE OF SPONTANEOUS EEG OCCIPITAL ALPHA ACTIVITY

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PUBLICATIONS

Journal Articles

A.-M. Maher and P. D. Swift, *Providing a homogeneous visual field with an integrating sphere*, journal of physiological measurement (2002).

Maher A. M., Kirkup L., Swift P., Martin D., Searle A., Tran Y., and Craig A., *Effect of luminance level on electro-encephalogram alpha-wave synchronisation*, Medical & Biological Engineering & Computing, 39 (2001), pp. 672-677.

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ABSTRACT

The desynchronisation and temporal response of the spontaneous EEG occipital alpha activity in the 8–13 Hz frequency band to a range of luminances and wavelengths from spectrally characterised illumination-sources under homogeneous viewing conditions, with and without the presence of foveal perturbations were examined. Insufficient evidence in the literature to substantiate the effect on occipital alpha to varying luminance conditions and the necessity of such knowledge for the operation of an environmental control system (ECS) provided the impetus for the work. A series of experiments were conducted in uniformly illuminated unpatterned visual fields provided by a sheet of white paper and an integrating sphere. Luminances in the range 2.6×10^{-5}-900 cd/m^2 and peak wavelengths of 454 nm, 529 nm, 600 nm and 658 nm, for narrow band sources and white light were investigated. Results show that, (i) ECS operation based on the increased amplitude of alpha activity on eye closure is viable in the luminance range 2.6×10^{-4}-900 cd/m^2, (ii) Occipital alpha activity, in terms of maximum frequency, maximum amplitude and the frequency integrated amplitude, during the first 20 s of homogeneous visual stimulation or on fixation on a foveal perturbation in the field is equivalent to viewing in a typical patterned environment and (iii) Chromatic homogeneous stimulation effects ongoing alpha activity with respect to a wavelength dependency and a decrease in alpha amplitude on eye closure. The homogeneity of the visual field provides strong evidence of the occipital alpha wave behaviour in a such a visual field. The findings are at variance with previous reports because it is shown, (i) that the alpha amplitude in a homogeneous visual field does not increase to the amplitude observed on eye closure, (ii) that alpha behaviour is dependent on wavelength and (iii) that attenuation of alpha activity is observed on eye closure under red green and blue homogenous visual stimulation.