



Stimulation of Beta Brainwave Rhythm using Isochronic Tones

By Ir. Assoc. Prof. Dr Mandeep Singh

Ir. Assoc. Prof. Dr Mandeep Singh is currently the Chairman in IEM Engineering Education Technical Division (E2TD).

This talk was given by Dr David from UiTM on 20 September 2016. The talk looked at the surge of electric pulses and chemical reactions in human brain produce brain waves at five distinct frequency domains between 0.5 Hz and 100 Hz that are associated with different brain activities and characterize different mental states. The cerebral brain cells, which produce the frequency patterns in accordance to the brain activity, can be synchronized at a desired frequency by externally stimulating the cells using acoustical means including binaural beats (BB) and isochronic tones (IT). The states of alertness and focus can be traced to areas within the frontal lobes of the brain at beta brainwave frequencies (~ 20Hz). BB and IT sounds signals embedded in a background audio could provide better listening comfort to the subject. Electroencephalograph (EEG) signals due to resonance of the prefrontal cortex (PFC) with the induced aural stimuli are measured on a maiden group of ten healthy male human subjects. Both types of signals showed comparable results in synchronizing the brain to the beta rhythm from the baseline EEG potentials at pre-exposition stage. The post-exposition entrainment effect is sustained up to 5 minutes after exposure by 97% and 98% for BB and IT, respectively, compared to the EEG potentials at the synchronization stage. These results indicate that IT masked in a background audio performs as good as the embedded BB. IT can be directly applied to subjects via a pair of speakers whereas BB requires supply of signals via headphones hence providing the former the added advantage of open-environment listening.



MOTIVATION

"Mental states such as relaxation, consciousness, attention and alertness could be enhanced via synchronization of brainwave to the respective frequency domains." [1,2]

What if the audio environment inside our cars helps enhance our focus and alertness? How to design such a soundscape that is effective but non-interfering and less annoying?