**Retinotopic and orientation tuning of low and high frequency human EEG**

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Abstract: The human EEG response to visual stimulation is characterized by a decrease in low (8-25Hz, alpha/beta) and increase in high (40-80Hz, gamma) frequency band amplitude. However, the functional properties of these two distinct rhythms remains unclear. To better understand the functional specificity of the alpha/beta and gamma frequency bands in human visual cortex, we measured healthy human EEG response to retinotopic and orientation mapping stimuli, and analyzed response patterns of the two distinct frequency bands. In addition to other findings, we show that retinotopically, the gamma band response adds linearly (ie the summed gamma response to 4 separate quadrants equals the gamma response to full field) while in alpha/beta, supralinear summation occurs (ie, the summed alpha/beta response to 4 quadrants is 2-3x larger than the alpha/beta response to full field). Orientation tuning also revealed differences between alpha/beta and gamma, with gamma preferring oblique orientations, and alpha/beta preferring cardinal orientations. These results shed light on the functional specificity of alpha/beta and gamma band responses in visual cortex, and may help link non-invasive EEG measures taken from the scalp with the extensive amount of animal literature microelectrode recordings.