Introduction : the functional specificity of human EEG gamma is unclear. Perhaps gamma reflects the low spatial frequency tuning of human visual cortex (ref).

Orientation preference of gamma similar across site (jia). MUA-Gamma tuning different due to shared spatial preference of gamma. Spiking activity suppressed by large gratings. When driven by large gratings, gamma has a similar tuning across space and distinct from local mua, when driven by small gratings, gamma is dissimilar across space and similar to MUA. Two components of gamma power have been noted, the broadband spatially specific and the narrow band spatially shared. The gamma bump grows with stimulus size, and presumably shared orientation tuning. Large gratings reduce firing rates but noise gratings do not (from large). Enhanced coherence for large gratings was strongest for the preferred orientation. Global gamma is extremely adaptable, shifting to an orientation 45 degrees from the preferred orientation after adaptation. Gamma had spatial and temporal tuning while mua did not. Relative weight of broadband increases and the spectral bump must be interpreted when comparing gamma power. Feedback connections may play a role in the global gamma rhythm. Alternatively, the gamma rhythm may be an emergent rhythm, involving coordination of local generators through mechanisms such as long range lateral connections or gap-junction coupling among inhibitory neurons. Gamma may simply be a resonant frequency arising from the interaction between excitation and inhibition, reflecting a large spatial ensemble.

More papers to read: gamma involves feedback connections (bair 2003, angelucci and bressloff, 2006). Gamma is an emergent rhythm (Traub 1996, Gibson 1999, Buzsaki 2006, Tisesinga and sejnowski 2009). Gamma is a resonant frequency arising from the interaction between excitation and inhibition (Burns 2010, Ray and Maunsell 2010).

An adaptable bias underlies the preference of the global gamma rhythm?

Traub: gamma arises when pools of interneurons receive a tonic or slowly varying excitation. The frequency of the oscillation depends on input strength and the parameters regulating the inhibitory coupling between interneurons. The interneurone network output is then imposed upon pyramidal neurons in the form of dynamic synchronized IPSPs. Gamma oscillations might be elicited under certain conditions of synchronized pyramidal cell firing. Increasing driving current fromr 0.1 to 0.5 nA increased the mean frequency from 25 to 70Hz. increasing tauGABAA ialso decreases the peak frequency. The minimum network frequency is determined by tauGABAA. In the CA1 region of rat hippocampal slices, interneurone network gamme did not require phasic synaptic input from pyramidal cell neurons, that interneuron network gaba could be evoked by metabotropic glutamate receptor activation, and suppressed by GABAb receptor activation.

Gray: multiunit activity and lfp was recorded from single electrodes in the striate of anesthetized and paralyzed cats. Using autocorrelation and spectral analysis, they discovered that a significant fraction of the recorded signals displayed an irregular oscillation from 30-60Hz, readily apparent on single trials. They were stimulus selective but not time-locked to the stimulus onset. Analysis at the single unit level revealed that these period firing patterns consisted of sequences of repetitive burst discharges. The frequency of the oscillatory discharge was found to increase with increasing stimulus velocity.

Global gamma tuning underlies low spatial frequency BOLD orientation tuning

Global tuning properties of neurophysiological and hemodynamic orientation tuning signals in visual cortex have been demonstrated both in human using BOLD and macaque using gamma LFP. However, the electrophysiological basis of global orientation tuning in the human has yet to be examined. To address this, we performed EEG orientation tuning experiments on nine (9) healthy humans. We find that the human EEG signal is tuned to orientation in higher frequency (30+Hz, gamma) bands, but that lower frequencies such as alpha and beta display weak to no orientation tuning. We find also that the human EEG global gamma signal prefers oblique orientations over cardinal orientations, especially in the low gamma (30Hz) frequency range. In contrast to other studies examining human EEG gamma power, we find that 8/9 subjects studied here had a robust “low” gamma response, resulting in a “double peak” phenomenon in the gamma range. This, combined with results from a previous experiment involving plaids