

Spectro–Temporal Organization of Receptive Fields in the Central Nucleus of the inferior Colliculus

ANQI QIU

Advisors: **Dr. Monty A. Escabi**
Dr. Quing Zhu
Dr. Jose–Manuel Alonso

Time and location: 2:30 pm of April 23 in Room 14 of BRC (Booth Research Center)
that is located on the level A of Homer Babbridge library.

Abstract

Spectro–temporal receptive fields (STRF) have been used to describe spectral and temporal response properties for neurons in the auditory system, however, a comprehensive description of spectral and temporal integration characteristics is currently lacking. Here, we use a singular value decomposition method to approximate auditory STRFs as a sum of time–frequency separable Gabor functions. This procedure extracts nine physiologically meaningful parameters, including the best ripple density, the best temporal modulation frequency, the center frequency, the peak latency, the bandwidth of a spectral profile, the response duration, the spectral phase, and the temporal phase. We use this technique to study spectral and temporal receptive field characteristics in the cat’s inferior colliculus. It is shown that the receptive fields (RFs) of 75% of neurons are well described by the separable Gabor model. The remaining neurons show strong obliquely oriented RFs and are therefore not properly fit by the time–frequency separable model. We then use this model to investigate binaural receptive field characteristics. We show that most RF parameters are highly correlated between the contralateral and ipsilateral ears, with the exception of the spectral and temporal phases. This suggests that activity originating from the contralateral and ipsilateral ears exhibits interleaved patterns of excitation and inhibition. Such binaural receptive field arrangements could potentially be used to decorrelate binaural contributions in the temporal discharge pattern of ICC neurons, while enabling them to simultaneously encode spectro–temporal stimulus attributes.