ACOUSTICS2008/2777
Auditory temporal edge detection in human auditory cortex

Maria Chait
UCL Ear Institute, 332 Gray's Inn Road, WC1X 8EE London, UK

Auditory objects are detected if they differ acoustically from the ongoing background. In simple cases, the appearance or disappearance of an object involves a transition in power, or frequency content, of the ongoing sound. However, it is more realistic that the background and object possess substantial non-stationary statistics, and the task is then to detect a transition in the pattern of ongoing statistics. How does the system detect and process such transitions? We use magnetoencephalography (MEG) to measure early auditory cortical responses to transitions between constant tones, regularly alternating, and randomly alternating tone-pip sequences, where the dimension of change is either frequency, loudness, or spatial location. Such transitions embody key characteristics of natural auditory temporal edges. Our data demonstrate that the temporal dynamics and response polarity of the neural temporal-edge-detection processes depend in specific ways on the generalized nature of the edge (the context preceding and following the transition) and suggest that distinct neural substrates in core and non-core auditory cortex are recruited depending on the kind of computation (discovery of a violation of regularity, vs. the detection of a new regularity) required to extract the edge from the ongoing fluctuating input entering a listener's ears.