PHYSIOLOGICAL DELINEATION OF PRIMARY AUDITORY CORTEX IN THE ALERT RHESUS MACAQUE. B.H. Scott*, B.J. Malone and M.N. Semple. Center for Neural Science, New York University, New York, NY 10003.

Current models of rhesus auditory cortical organization, based primarily on anatomical studies, suggest a central core of two or three tonotopic subregions, surrounded by a belt of tissue with matching frequency organization. Physiological correlates of these anatomical parcellations are not well defined. In this study, we establish physiological criteria for the distinction of primary auditory cortex (AI) from the rostral field (R) of the core, and the surrounding belt. Single cells in the auditory cortices of two awake *Macaca mulatta* were characterized using a variety of stimuli presented in the closed field: pure tones, band-passed noise, sinusoidal amplitude- and frequency- modulated tones (SAM and SFM), and binaural beats. Topographic mapping of response properties reveals a central region defined by a reliable tonotopic gradient (from low frequencies rostrolaterally to high frequencies caudomedially), short response latencies (often <15ms), robust responses to tones, and tight synchrony to the envelope of SAM and SFM. These characteristics break down markedly at the lateral and medial margins of the area studied, and degrade more gradually in the rostral and caudal directions. The rostral boundary of AI is better characterized by a strong population response to binaural beats than by the hypothesized reversal of tonotopy. Sharp tuning to low frequencies predominates in R, whereas caudal neurons are generally broadly tuned to high frequencies. The distinctions drawn between AI and surrounding areas are consistent with a serial hierarchical processing scheme, in which core neurons respond earlier, more synchronously and more robustly than do neurons in the belt.