Figure 1. Onset detection method. Onset detection threshold optimization maximizes the number of onsets detected during the task period while minimizing the number of detections during the baseline. (A) Stimulus presentation. Various auditory stimuli from different stimulus categories were presented in a pseudorandom order while ECoG activity was recorded. Stimuli were 2 seconds duration with a variable 1.4-1.8 second inter-stimulus interval. Functional activity and high gamma onset times were determined in a 1.6 second processing window (800 ms before and after the stimulus). A representative single trial of the raw ECoG signal (1 Hz high-pass filtered) and the low frequency band power (10-25 Hz) is shown as an example. (B) Threshold testing. The high frequency band power (70-170 Hz) extracted from the same example trial. High frequency band power is z score corrected to the baseline of the signal. During the onset threshold optimization, a series of thresholds are tested. Black arrows indicate onsets detected during the baseline and task period. (C) Threshold optimization method. The optimal onset threshold was determined on a single channel basis. The optimal threshold was determined to be that which maximized the difference between the number of trials with task and baseline onset detections. Number of detected onsets during task - red. Number of detected onsets during baseline - blue. Difference between task and baseline onset detections - orange. Optimal threshold - green. (D) Single trial onset detection. Optimal onset detection thresholds applied to an example trial from three representative channels during the native speech task. Activity onsets were detected at 188, 295, and 460 ms for these three trials. (E) Native speech response for an example subject. Electrode locations are shown as black or colored circles. Locations with significant changes in activity are in color. Response magnitude is indicated by the size of the circles; onset latency is indicated by color from red to yellow (early to late). The earliest median response in this example was 218+/-110 ms and the latest median response was 363+/-111 ms. Electrodes that did not pass the onset distribution test are not shown.