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Supplemental Data

Standing Waves and Traveling Waves Distinguish Two Circuits in Visual Cortex

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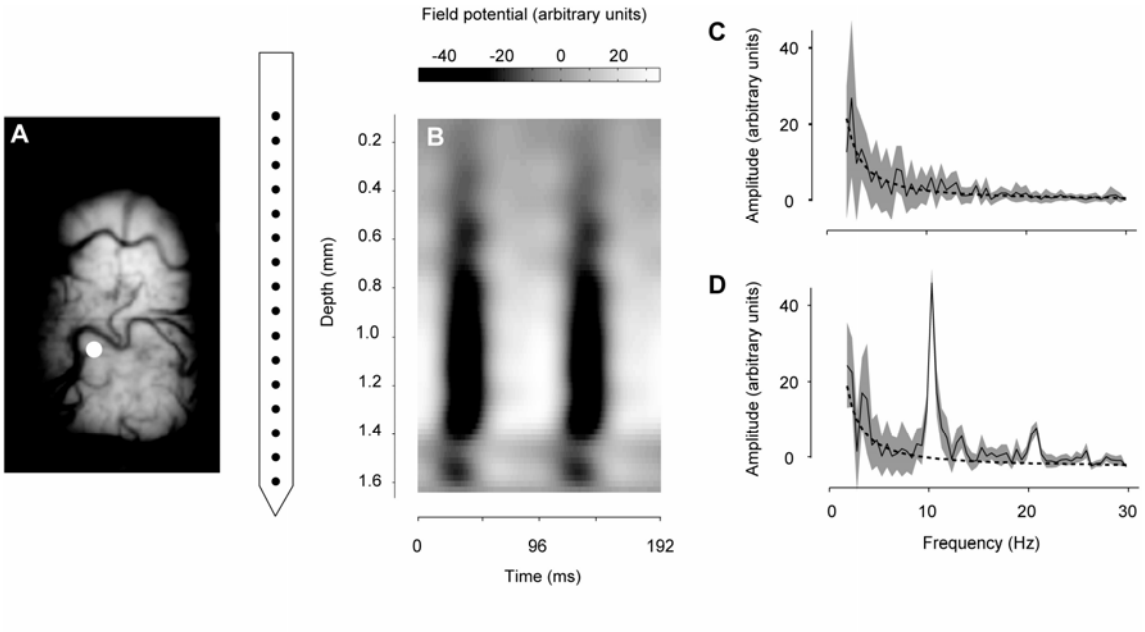
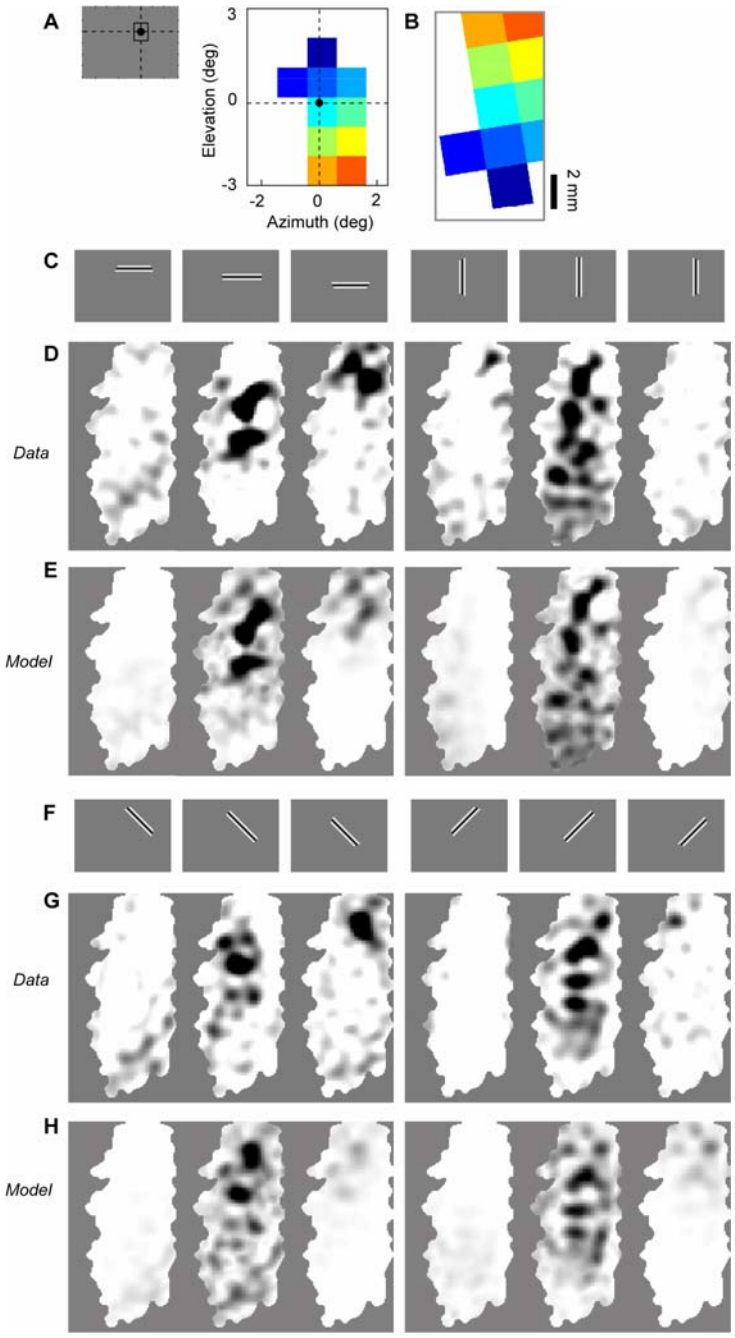
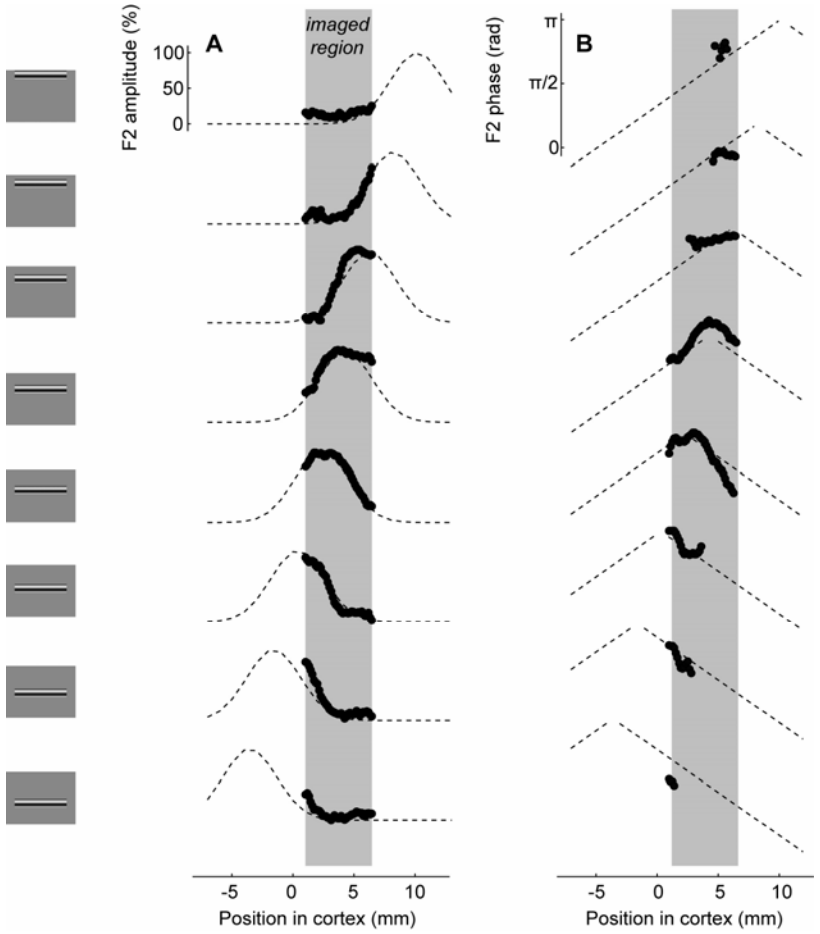


Supplementary Figure 1. Field Potential (FP) responses to flickering gratings. (A) A 16-channel polytrode (NeuroNexus, Inc) was inserted vertically in the cortical region that was previously imaged. On the right, a schematic picture of the polytrode with dots indicating recording sites. (B) Cycle-average of the FP in response to a 5 Hz contrast-reversing grating. The FP oscillates twice for each cycle of the stimulus. (C) Amplitude spectrum of the FP during the presentation of a blank stimulus. Black trace is the average amplitude for the site located at 1.1 mm depth. The gray band is a confidence interval determined by bootstrapping over 14 repeats. Dotted curve indicates 1/fx fit to the amplitude spectrum of the noise (D) Same analysis as in C, but during the presentation of a grating flickering at 5 Hz. Dotted curve is same as in C.



Supplementary Figure 2. Application of the retinotopy model to a novel stimulus. (A-B) A map of retinotopy obtained from the 2nd harmonic responses to flickering gratings windowed in horizontal or vertical rectangles (as in Figure 4). The model explained 75.8% of the variance in this data set. Experiment 70-3-2/3. (C) In a control experiment, we used a stimulus composed of grating patches varying randomly in orientation and position. Some of these stimuli were vertical and horizontal, similar to those used to estimate the model in B. (D) The responses to these stimuli depends strongly on grating position and orientation. (E) The predictions of the model resemble the actual data. (F-H) As in C-E, for additional stimuli in the control experiment. These stimuli were oblique, and thus are novel for the model. Though no similar stimuli appeared in the experiment used to obtain the model parameters, the model predictions resemble the actual responses. The model explained 51.3% of the variance in this novel data set. Experiment 70-3-8.



Supplementary Figure 3. Amplitude and phase of 2nd harmonic responses to individual stimuli. (A) Amplitude of responses as a function of stimulus position, for 8 stimulus positions (rows). These data are the same as those illustrated in Figure 5B, projected on one dimension of visual space. For each response, the corresponding Gaussian curve is shown, centered at the retinotopic location of the stimuli, as predicted by the model of retinotopy (Figure 4E,F). (B) The corresponding phases. The dotted lines are the predictions based on a traveling wave propagating at constant speed. Phases are shown only for data points with amplitude >20% (smaller responses have noisy phases). All of these responses can be aligned on the retinotopic position, and the results of this alignment are shown in Figure 6A,B. Once they are aligned, the phases become less noisy even for locations that are up to 10 mm away from the stimulated region, providing even clearer support for the traveling wave hypothesis.