

# Steady State Somatosensory Evoked Potentials in S1 and S2 of Anesthetized Cats

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## Background

For oscillatory sensory inputs, the output can be measured in the frequency domain (steady state evoked potential, SSEP).

The presence of frequencies other than the original stimulus indicates non-linear processing. Examples include harmonics (i.e. multiples of the input frequencies) and intermodulatory frequencies (linear combinations of input frequencies).

In cats, rapidly adapting (RA) cells respond to low frequency vibratory stimuli (20-40 Hz); Pacinian corpuscles (PC) respond to higher frequencies (100-300 Hz). These afferent inputs are processed by the primary (S1) and secondary (S2) somatosensory cortices.

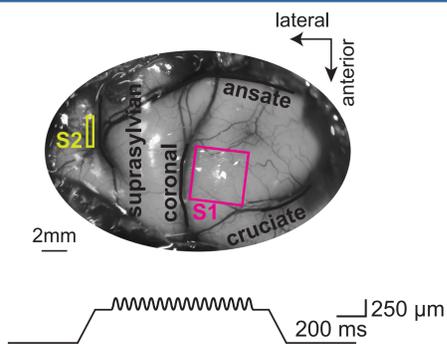
Here, we analyzed SSEP in S1 and S2 to characterise their neurophysical properties and to test convergence of RA and PC pathways in S1 and S2.

## Methods

9 anaesthetised cats stimulated on paw with 3 or 5 levels of 23 (F1) and 200 (F2) Hz vibration.

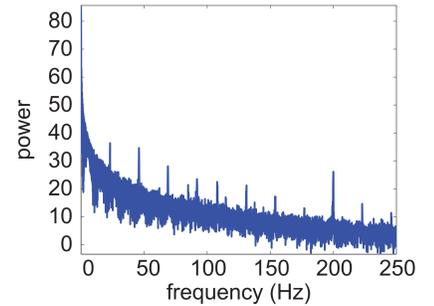
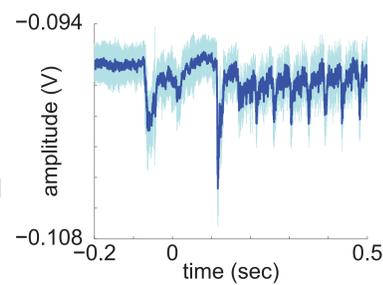
10x10 planar electrode array in S1, 8x8 linear electrodes in S2.

Channels bipolar re-referenced.

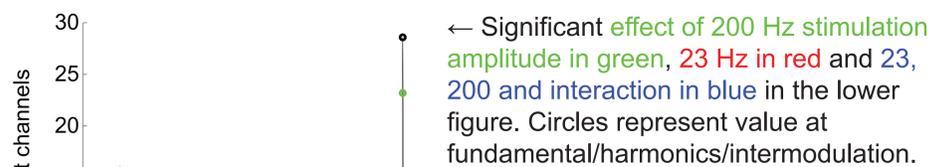
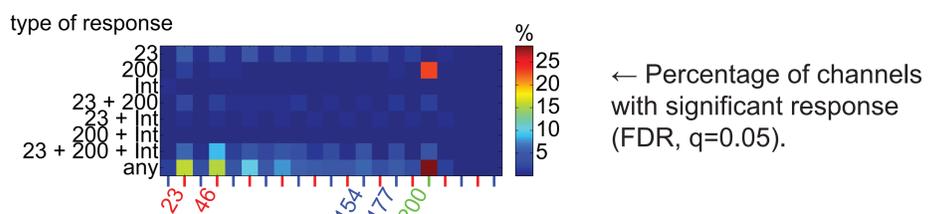


Local field potential (LFP) power analysed by 2-way ANOVA against effect of stimulation amplitude.

Particular attention paid to F1, F2, n\*F1 (harmonics) and F2 - n\*F1 (intermodulation).



Channels separated depending on ANOVA results: main effect of 23/200 Hz stimulation amplitude and/or interaction.



Examples for three classes shown in panels on the right.

Key: 200 Hz stimulus amplitude (μm)

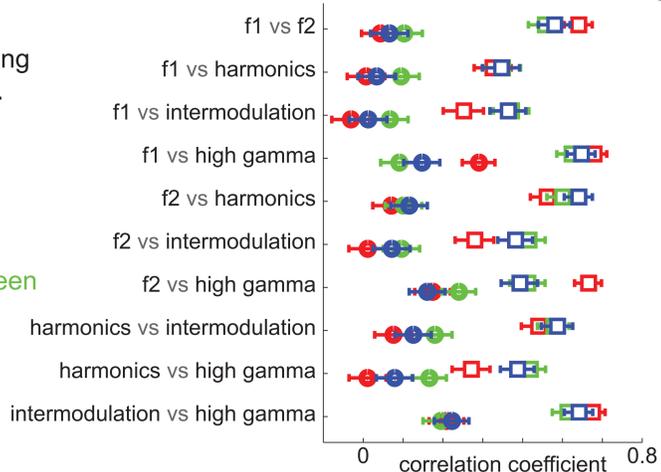
23 Hz stimulus amplitude (μm)	0	4	7	16
0				
40				
79				
159				

## Spatial Pattern Analysis

Correlation between different responses using f-statistic from ANOVA.

S1: circle ●  
S2: square □

23 Hz main effect: red  
200 Hz main effect: green  
interaction: blue



## Conclusion

Spatial patterns of fundamentals (f1, f2), harmonics, intermodulation, HGB, are highly distinctive between S1 and S2.

HGB only found in S2.

