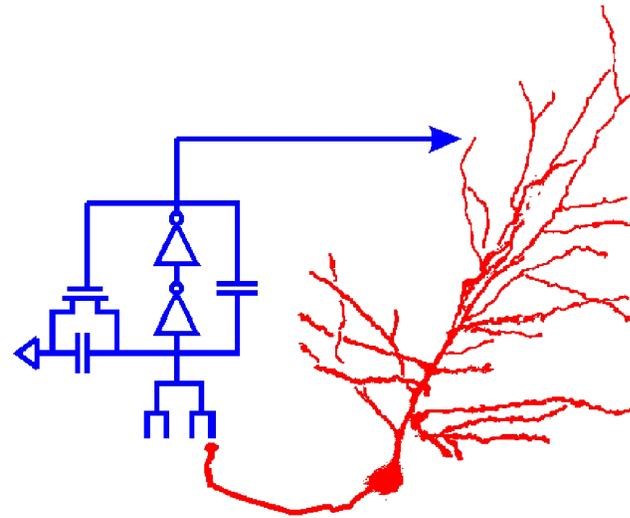


Computational Sensorimotor Systems Laboratory



Timothy Horiuchi

Jonathan Z. Simon

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Rock Shi

Hisham Abdalla

Kaushik Ghose

Shiva Sinha

Murat Aytekin

Victor Grau

Galen Wilkerson

Raul Rodriguez

Ahmad Gheith

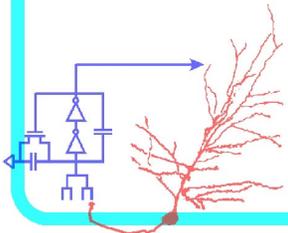
Nikos Kanlis

Ray Shantanu (Manager)

Computational Methods in Auditory Neuroscience

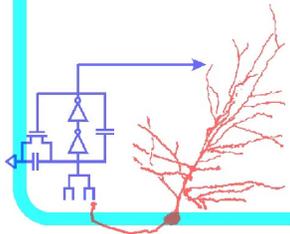
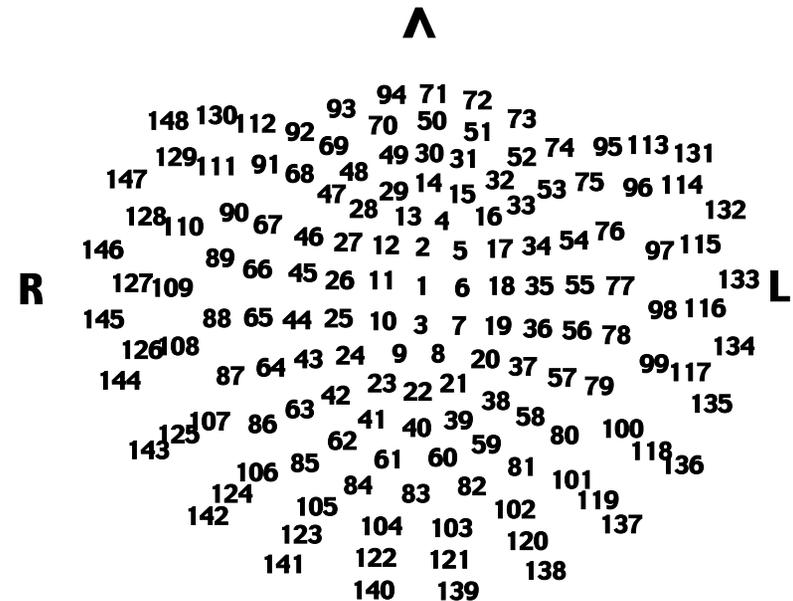
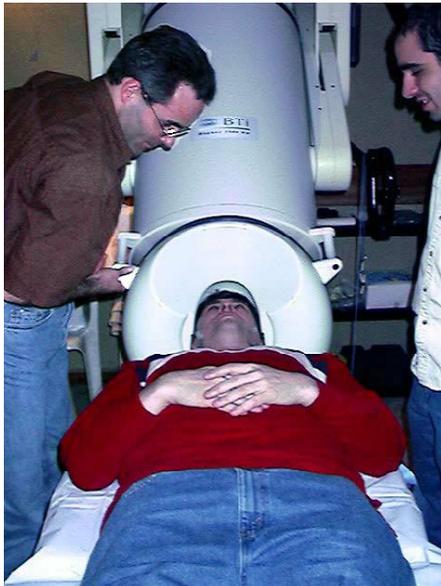
- Single Cell Modeling of Coincidence Detection
- MEG Analysis Methods
- Neural Coding in Auditory Cortex

Temporal aspects of neural processing

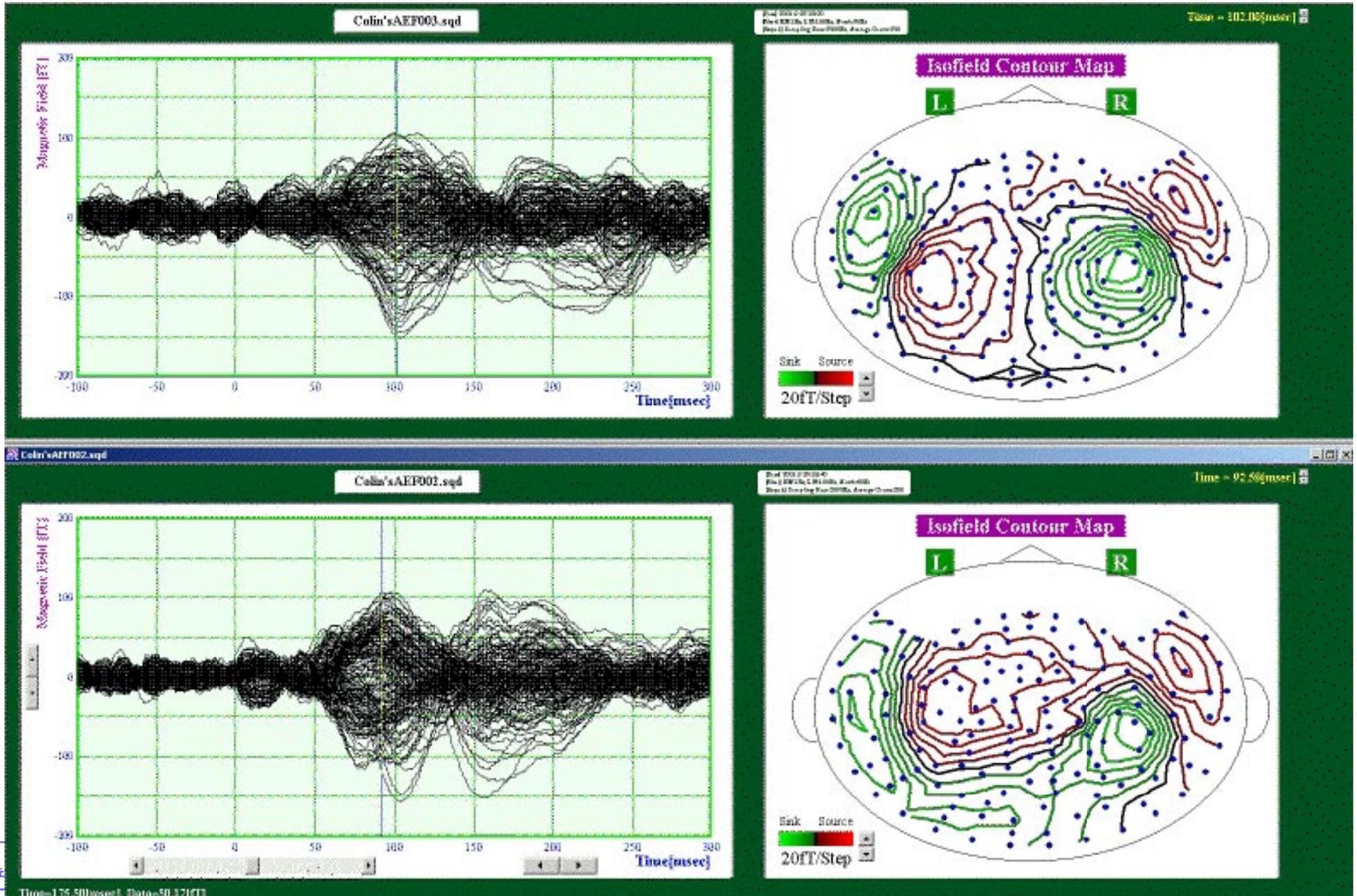


MEG – Magnetoencephalography

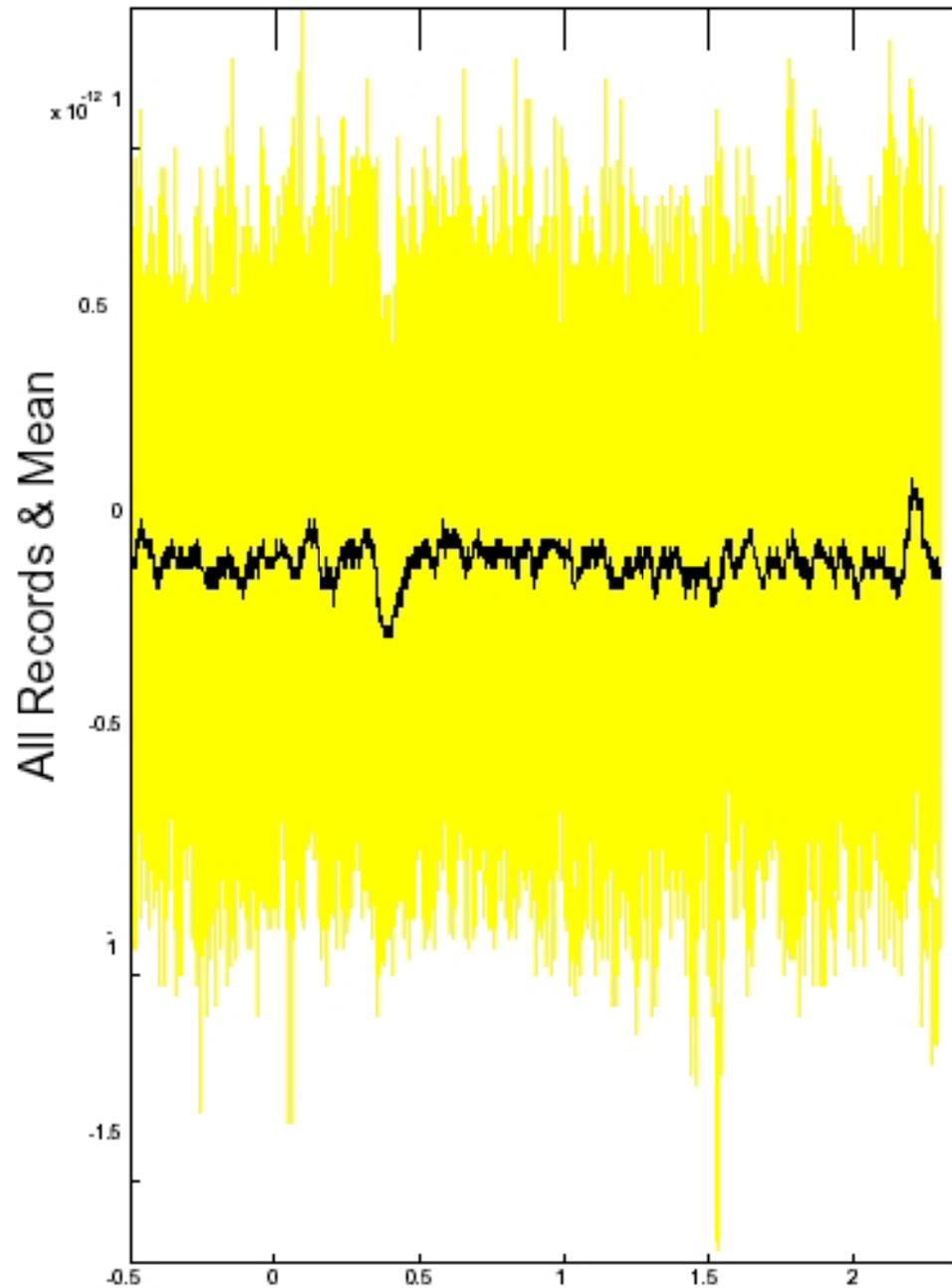
- Non-invasive technique
- Simultaneous Whole Head recordings (~200)
- Sensitive ~100 fT (10^{-13} Tesla) ~ 10^4 neurons
- Temporal Resolution ~ 1 ms



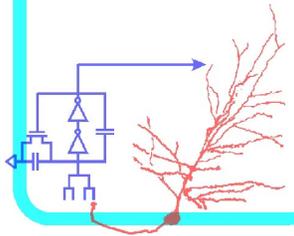
MEG @ UMCP



MEG Variability

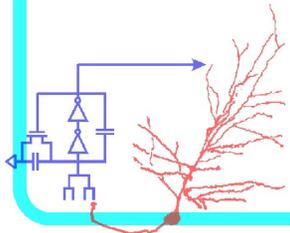
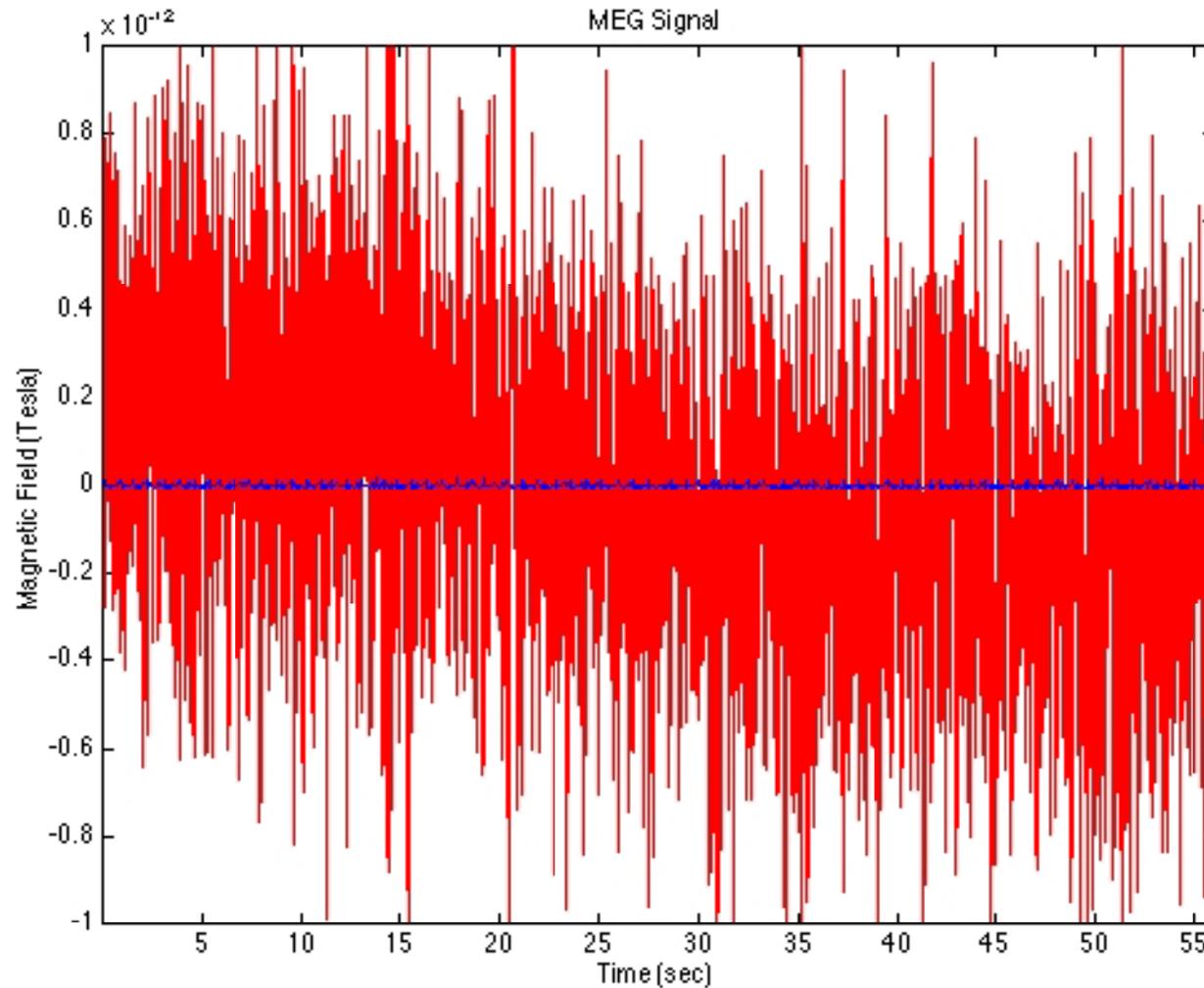


dp4_500_R2_2-2_no_A108.par



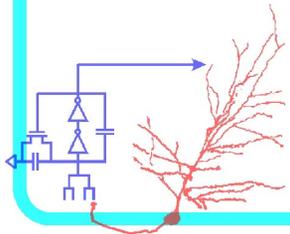
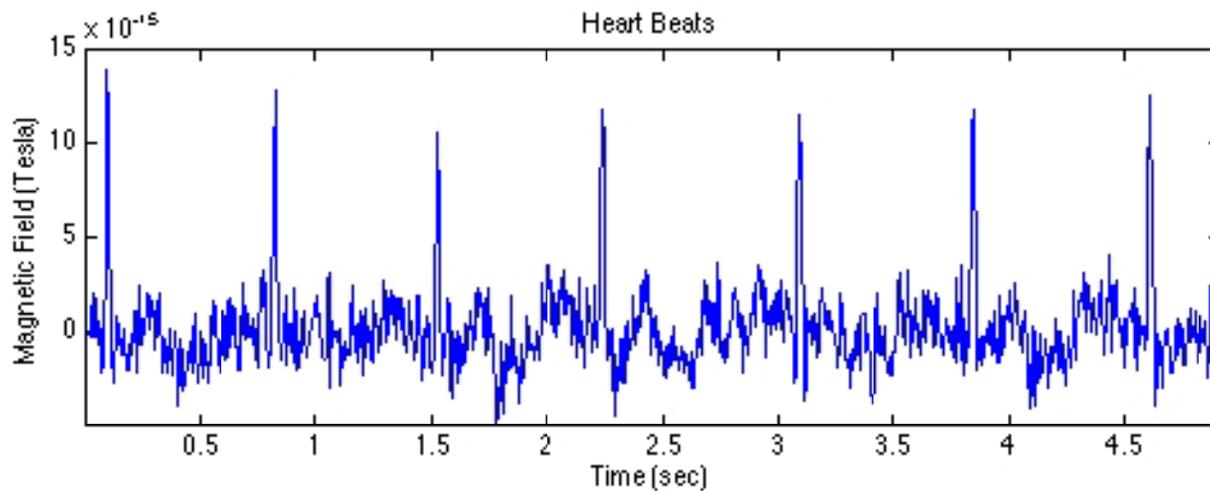
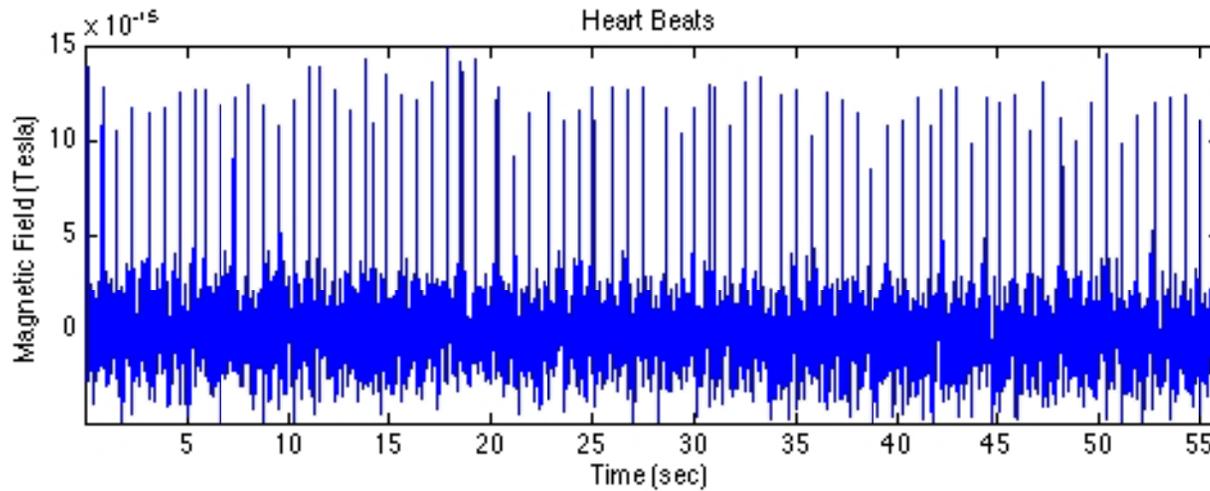
MEG Waveform & ICA

Independent Component Analysis



Analysis by Ahmad Gheith and Nikos Kanlis

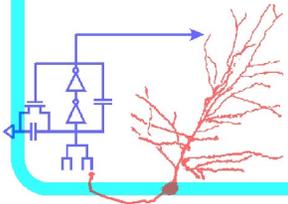
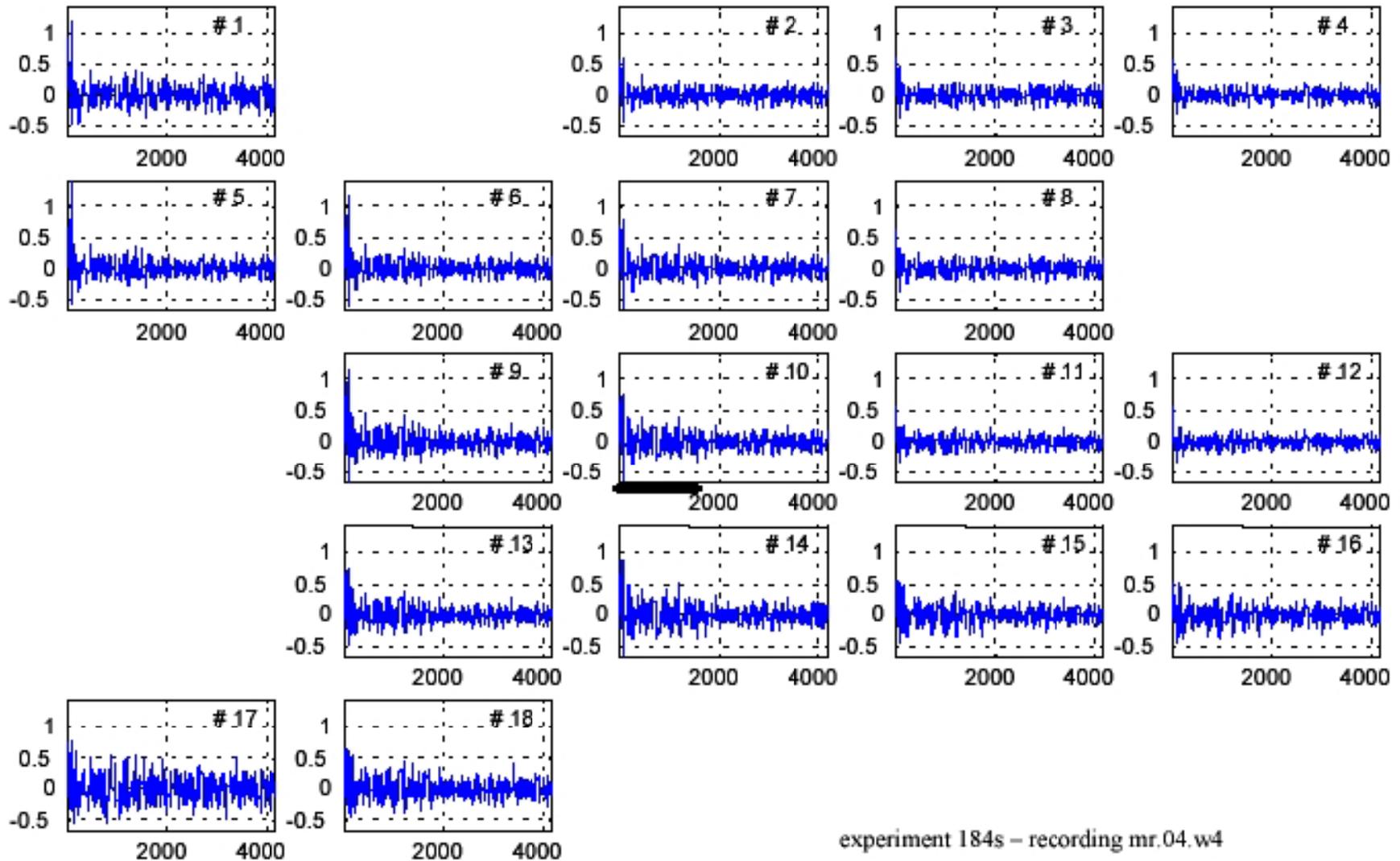
Independent Component Analysis



Analysis by Ahmad Gheith and Nikos Kanlis

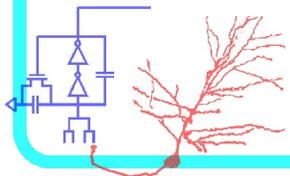
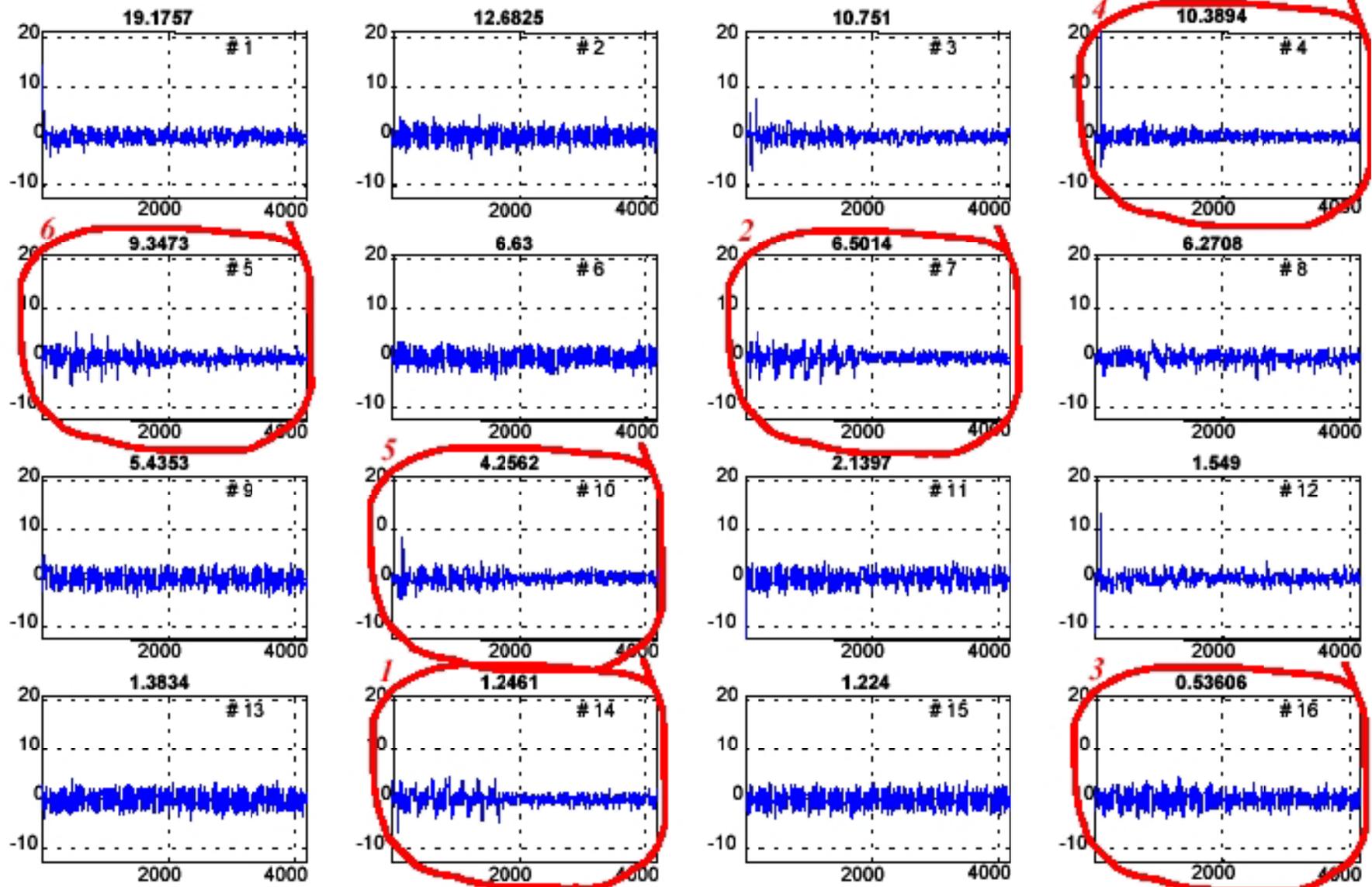
Cortical Surface EEG Before ICA

Moving Ripple: $w = 4\text{Hz}$, $\Omega = 0.4$ cycles/octave



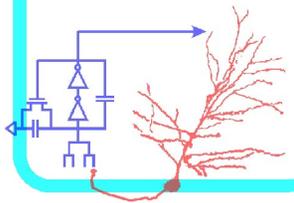
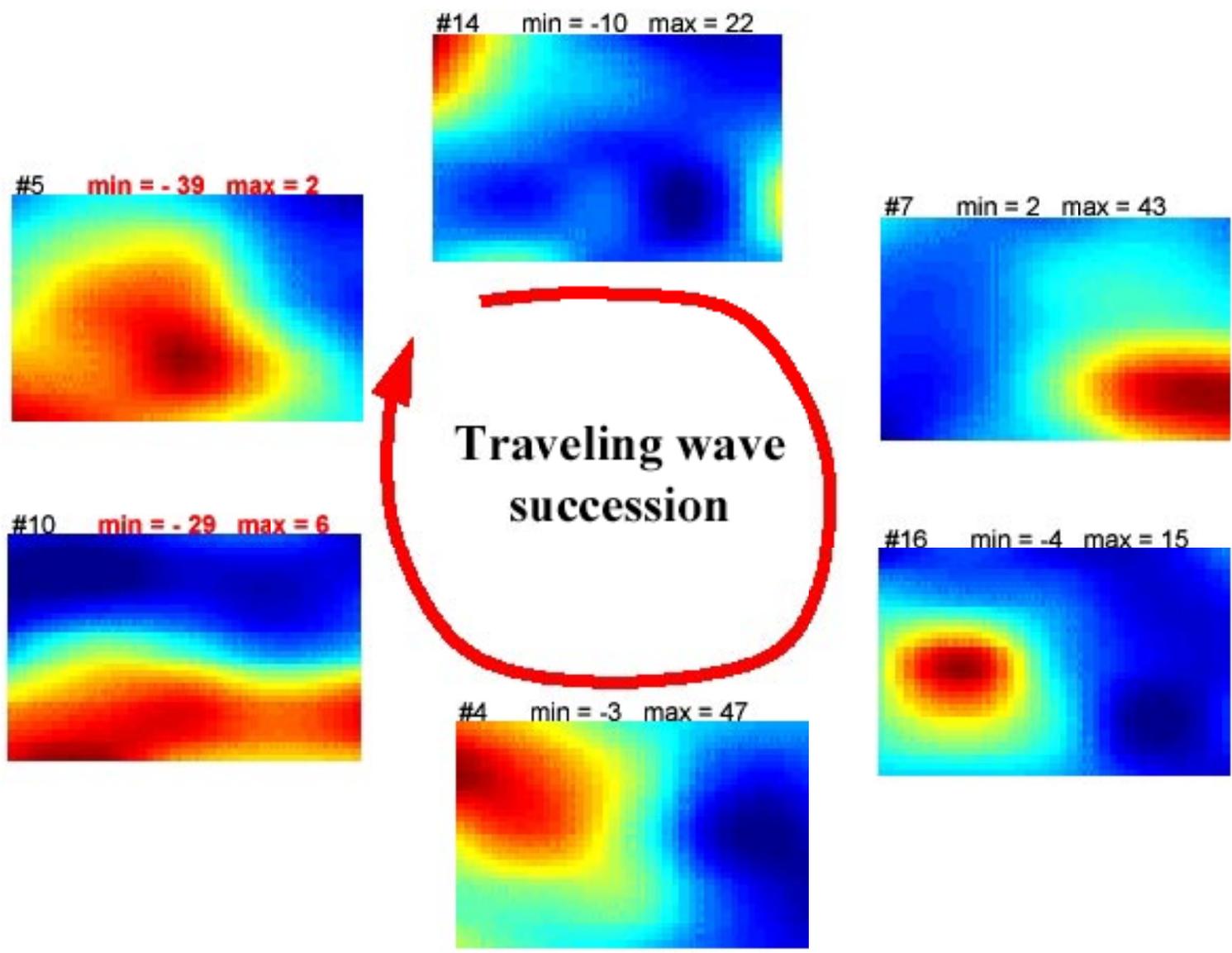
Analysis by Nikos Karlis

ICA & Cortical Surface EEG



Analysis by Nikos Karlis

ICA Reveals Cortical Traveling Wave



Analysis by Nikos Karlis

MEG/EEG Methods

- Potentially Poor Signal to Noise Ratio (Neural Variability)

BUT...

- Access to Signal available via clever methods
 - Independent Component Analysis
 - Spectral and Spectro-Temporal Methods
 - Phase Correlational Methods
 - ???
- All methods require knowledge of underlying biology and neuroscience

