

# Correlation of Power and TORTE Phase Estimation Accuracy

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## Background

- Deep brain stimulation (DBS) is shown to treat pathologic brain signals in mental disorders.
- The TORTE[1] algorithm is used to estimate the phase of brain signals for delivering stimulation
- Theta band (4-8Hz) is thought to be the signals associated with of fear/safety in the limbic circuit
- Hypothesis is that a higher power of a brain signal is correlated with phase accuracy.

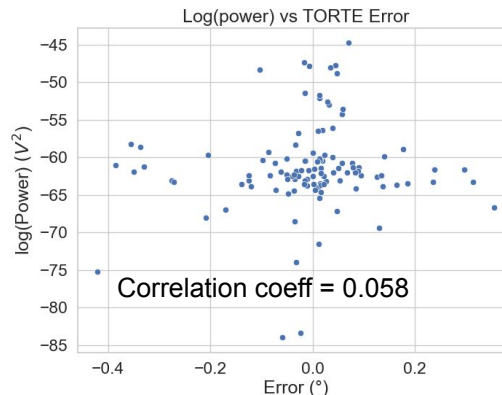
## Methods

- Data was collected from 2 rats (IDs: dev2211 and dev2214) over 14 recording days. Analysis was performed on signal from the prefrontal cortex to trigger stimulation in the amygdala.
- Power and phase accuracy was calculated for each of the 8 channels (per brain region) every day
- Power was calculated and averaged over the 5 min pre-stimulation session
- Phase estimation accuracy was calculated over the 30 min stimulation session
- The outcome measure was a linear correlation coefficient between the pre-stimulation power and phase accuracy during stimulation.

## Analysis

- Analysis performed using Python and MATLAB scripts
- TORTE bandpass filtered the signal, and applied a hilbert transform with an autoregressive function for the real-time phase calculation.
- Power calculated in Python using MNE tfr\_multitaper function
- Accuracy was calculated using the circular distance between ground truth phase and at any point TORTE was 180° during sham.
- Both power and phase estimation was averaged over their trials, resulting in two data points per recording for the statistical analysis.

## Results



Power is distributed around 0° error

## Discussion

- This correlation coefficient suggests that there is no significant linear relationship between power and phase estimation accuracy
- Lack of correlation could be due to the relatively small number of data points
- It is possible that there is a non-linear relationship between these variables

## References

- [1] Schatza et al., J Neurosci Methods. 2022 Jan 15;366:109409