

1. Introduction

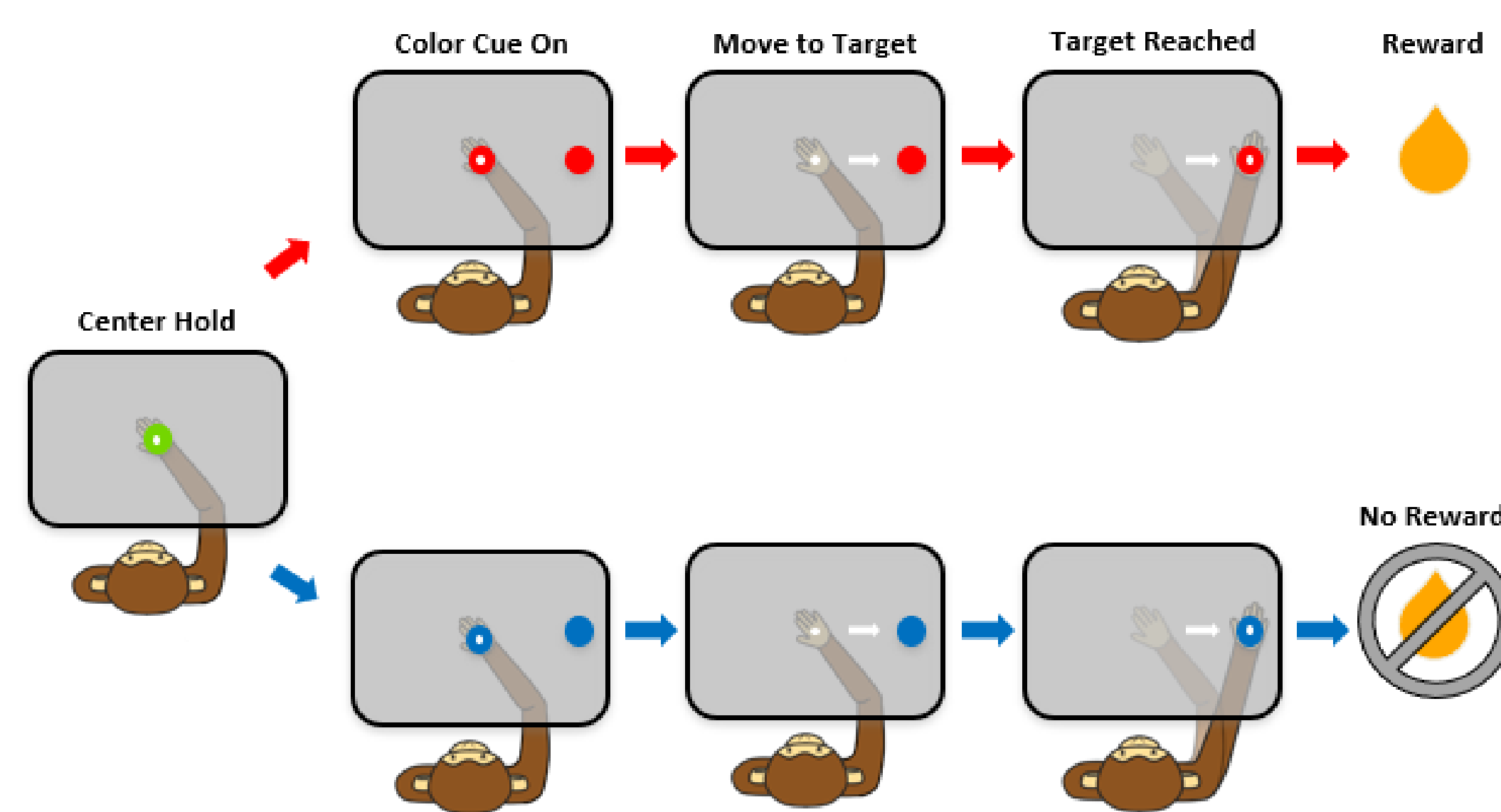
- Study multi-faceted effects of presence/absence of reward on cortical activity during center-out reaching movement *execution* or *observation*.
- Simultaneous recording of single/multi-unit activity and local field potentials from left (contralateral) and right (ipsilateral) Primary Motor Cortices (M1).

Measures :

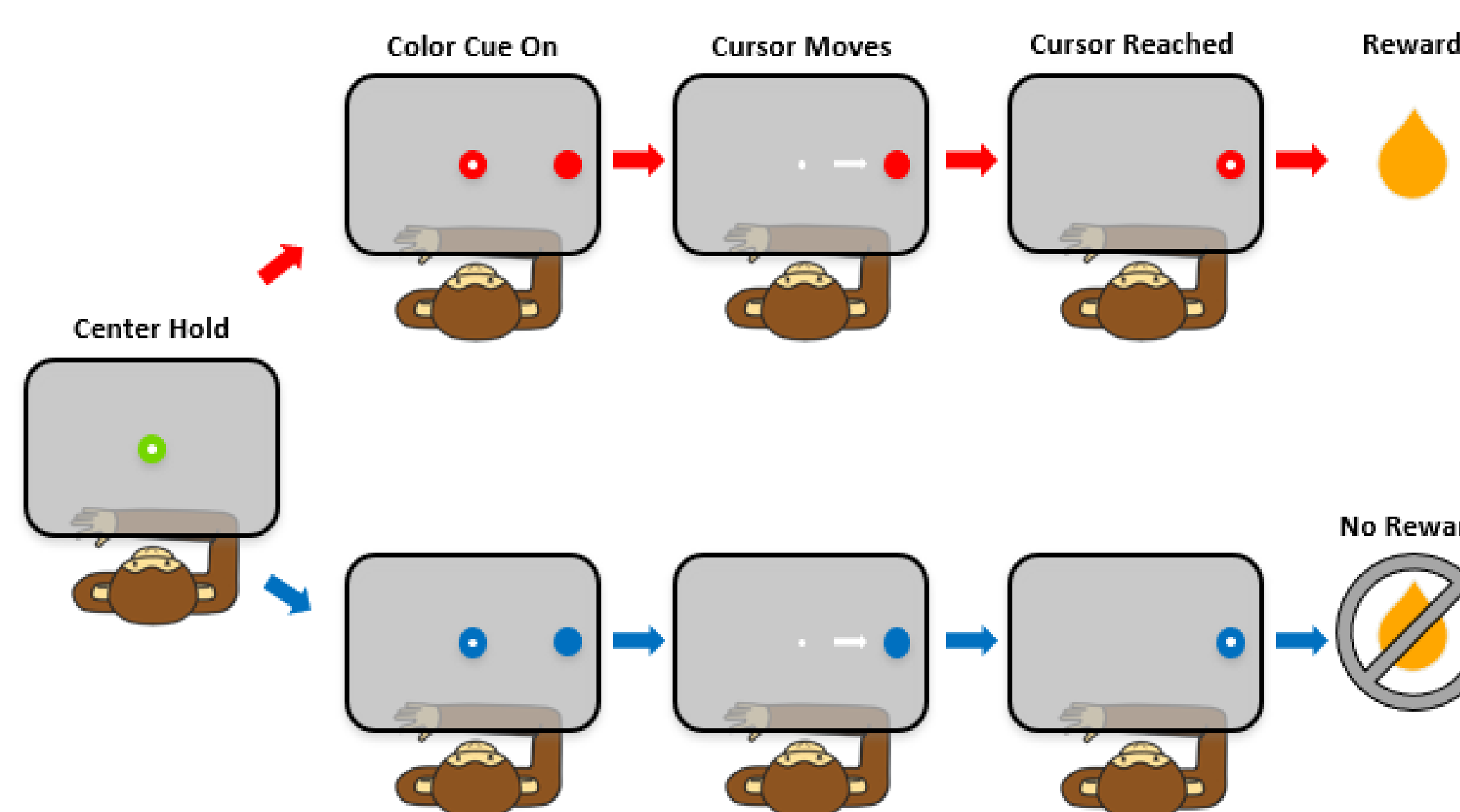
- Power Spectral Density of LFPs
- Phase-Amplitude comodulation
 - Degree to which amplitude of fast oscillations is modulated by a specific phase of slower oscillations.
- Spike-Field Coherence
 - Phase synchronization between spikes (S) and LFPs (L)
 $C_{SL} = \text{abs} (S_{SL} / \text{sqrt} (S_s * S_L))$
- Population firing rates during pre and post-cue periods (500ms and 800ms respectively)

2. Experiment design

❖ Center-out Reaching task (Manual)



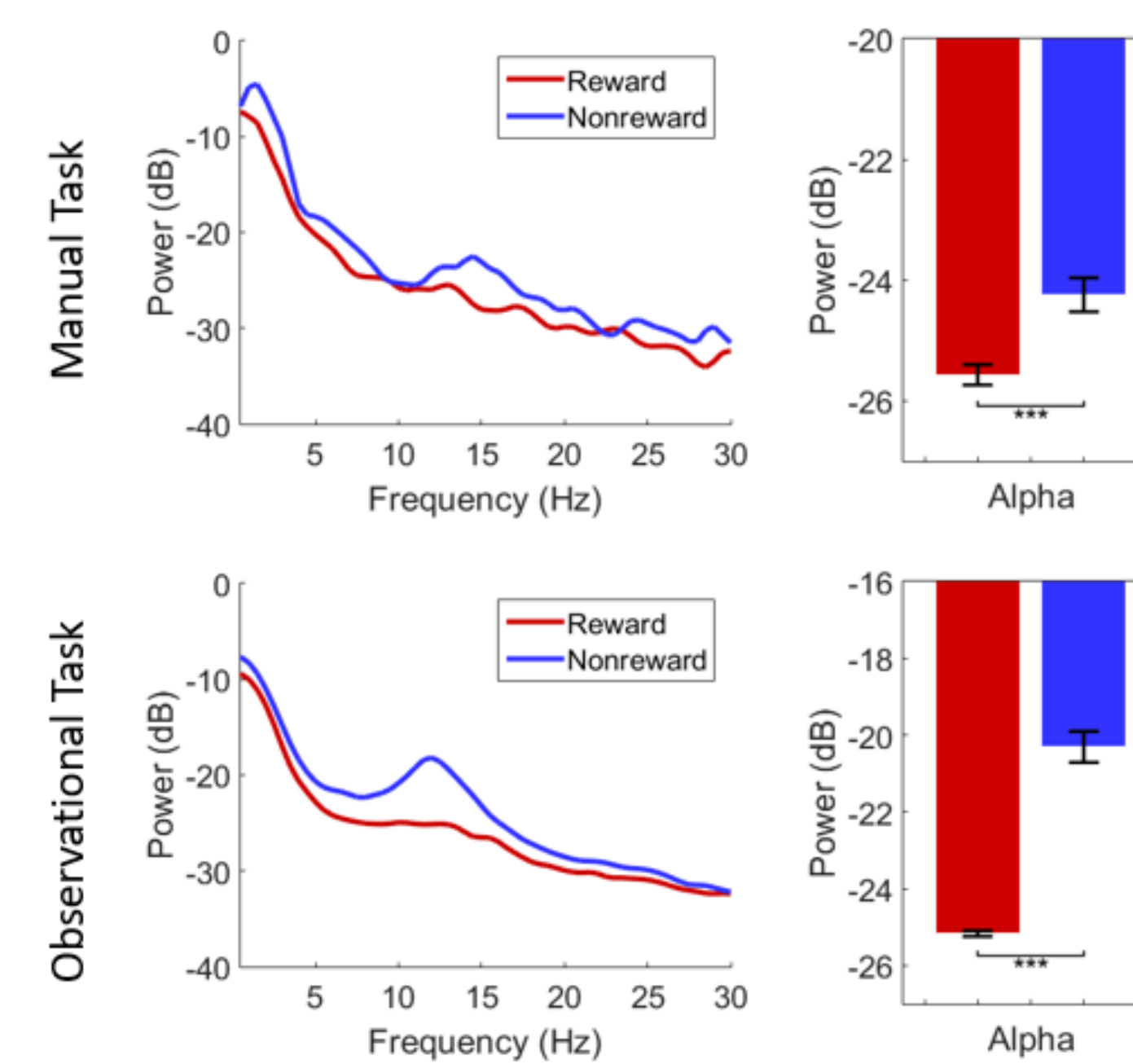
❖ Center-out Reaching task (Observational)



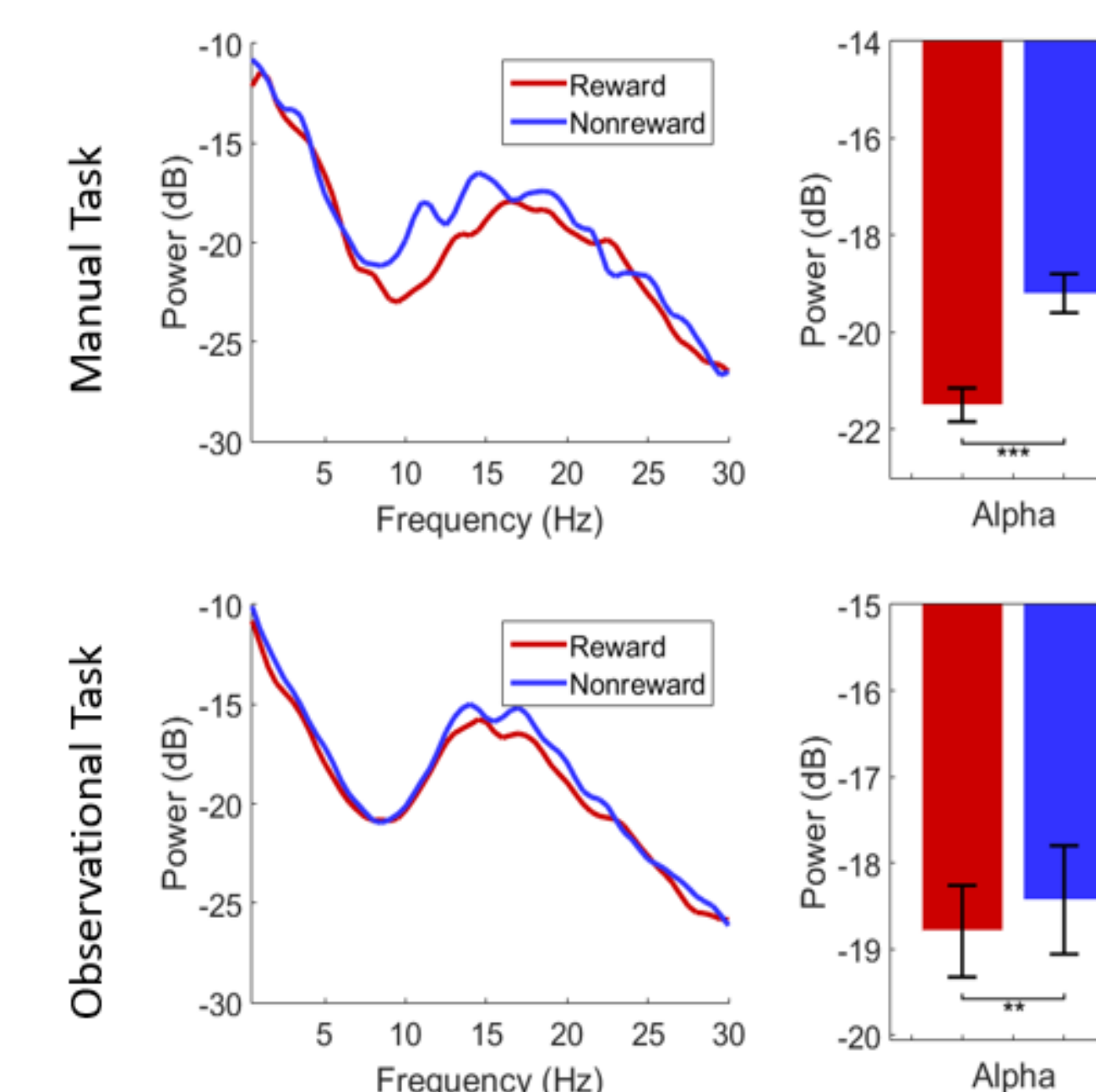
3(a). Results

❖ Power Spectral Density (PSD)

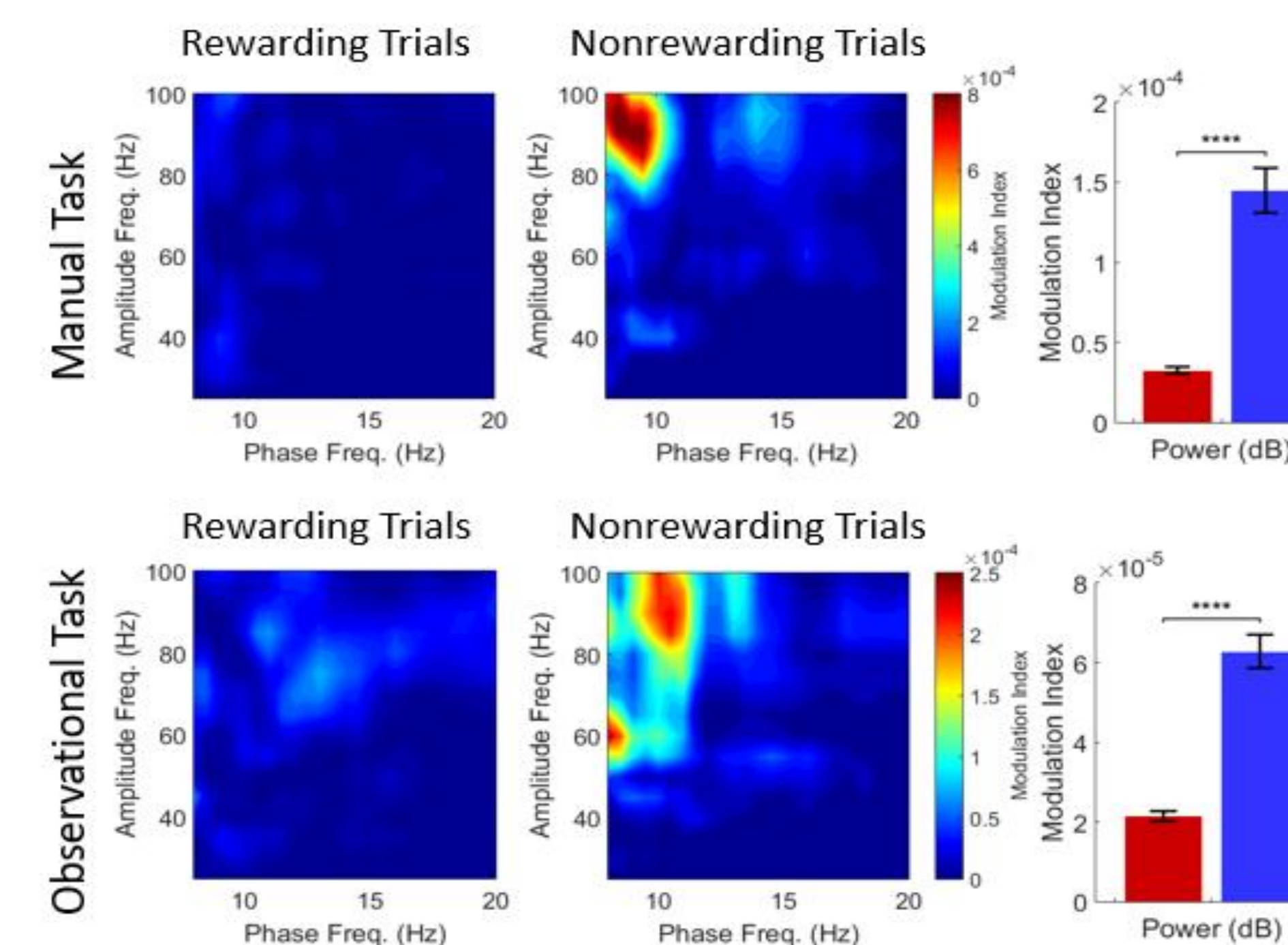
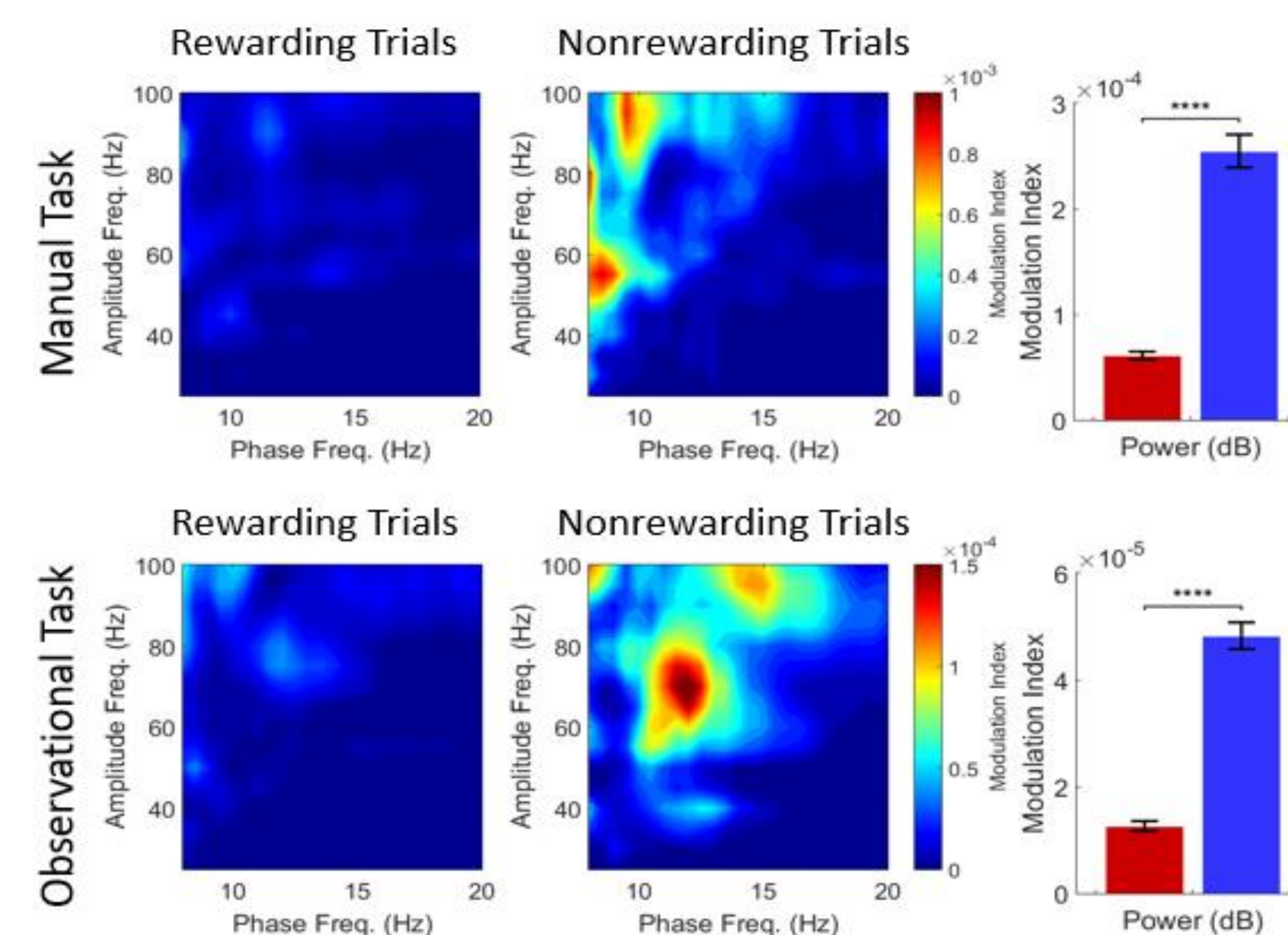
Monkey A (Contralateral M1)



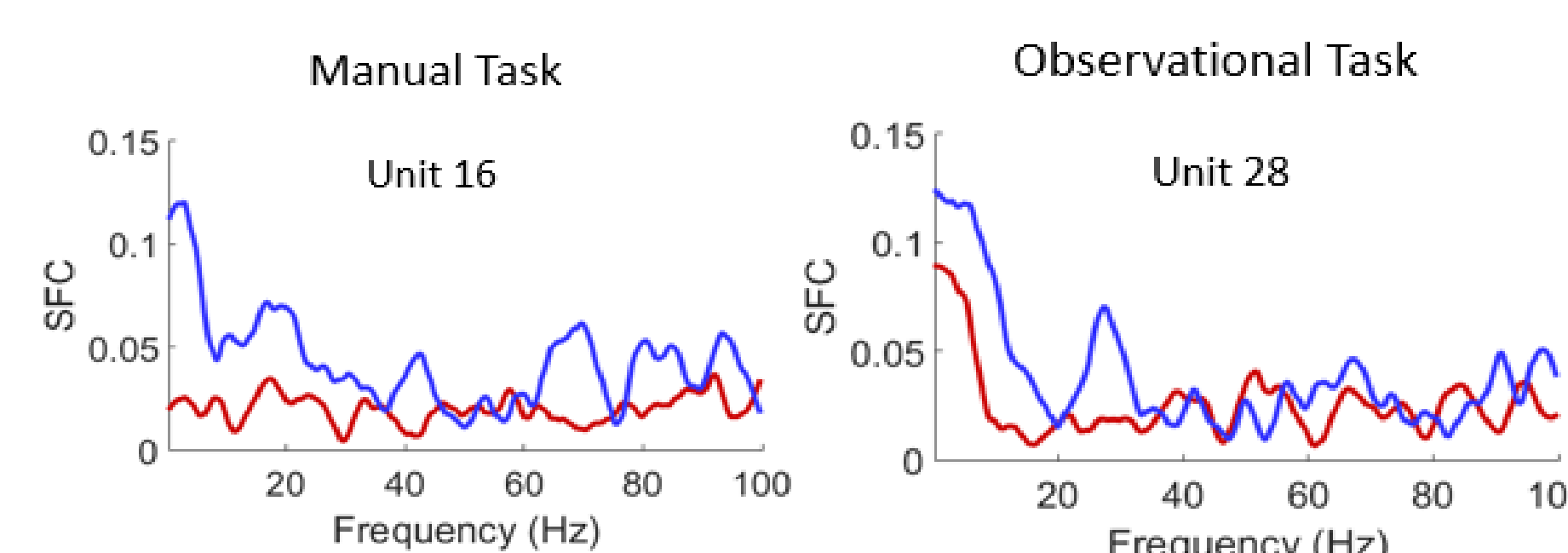
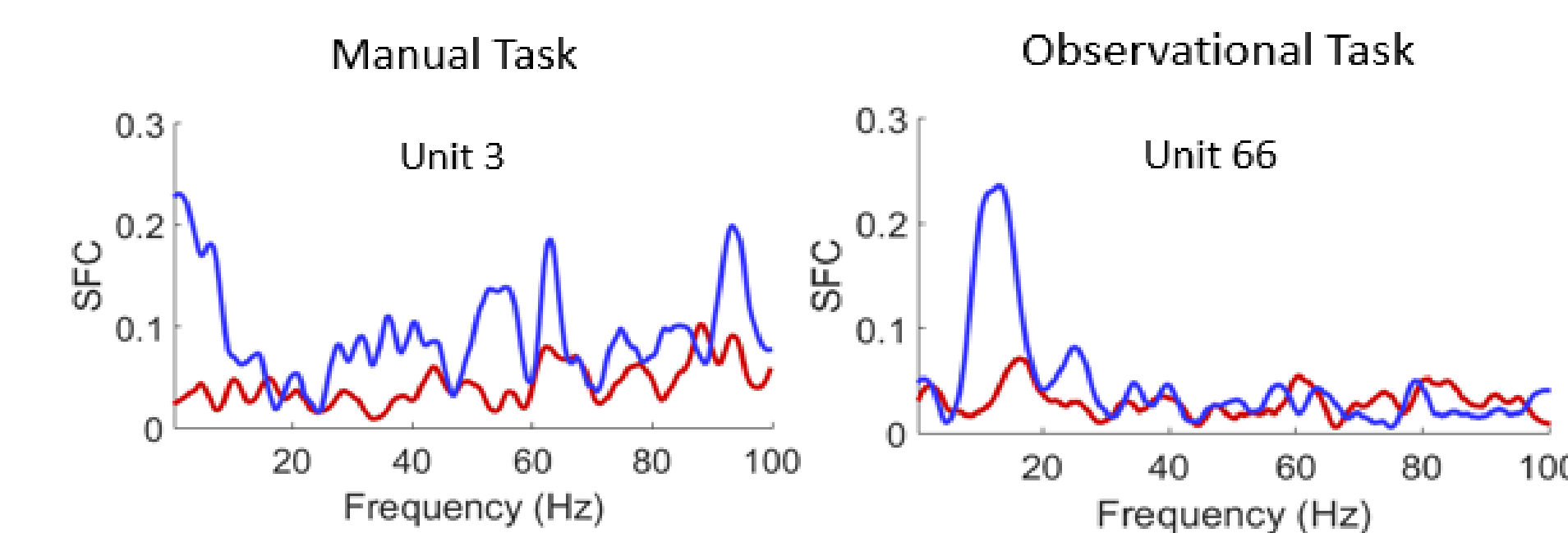
Monkey Z (Ipsilateral M1)



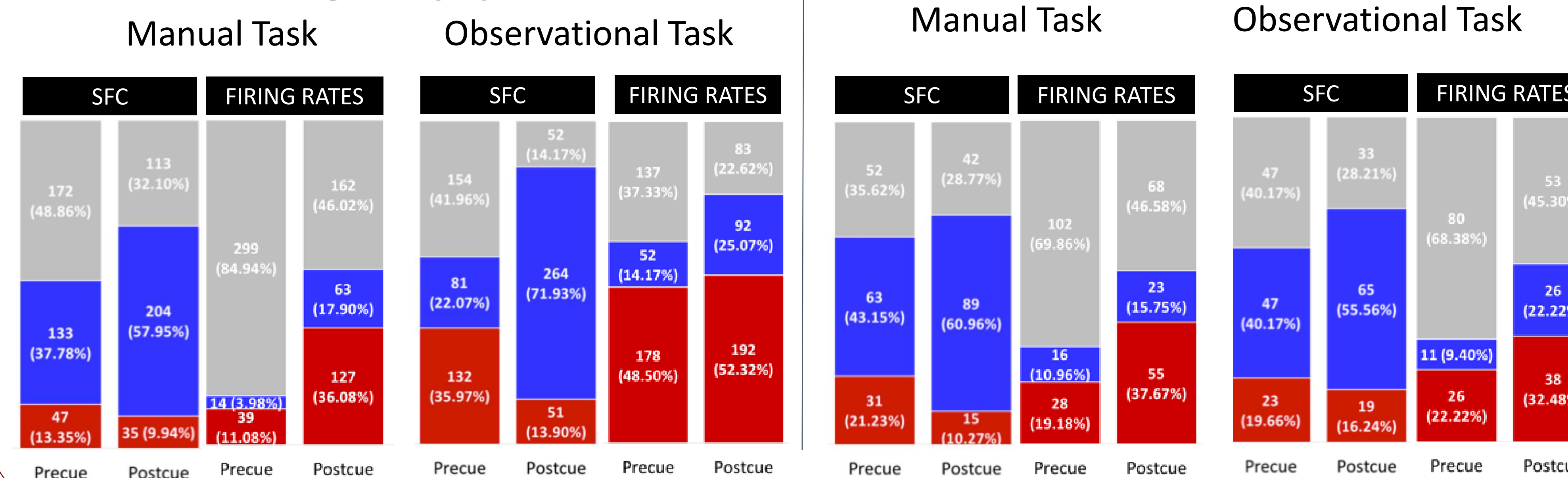
❖ Phase-Amplitude Comodulation (PAC)



❖ Spike-Field Coherence (SFC)

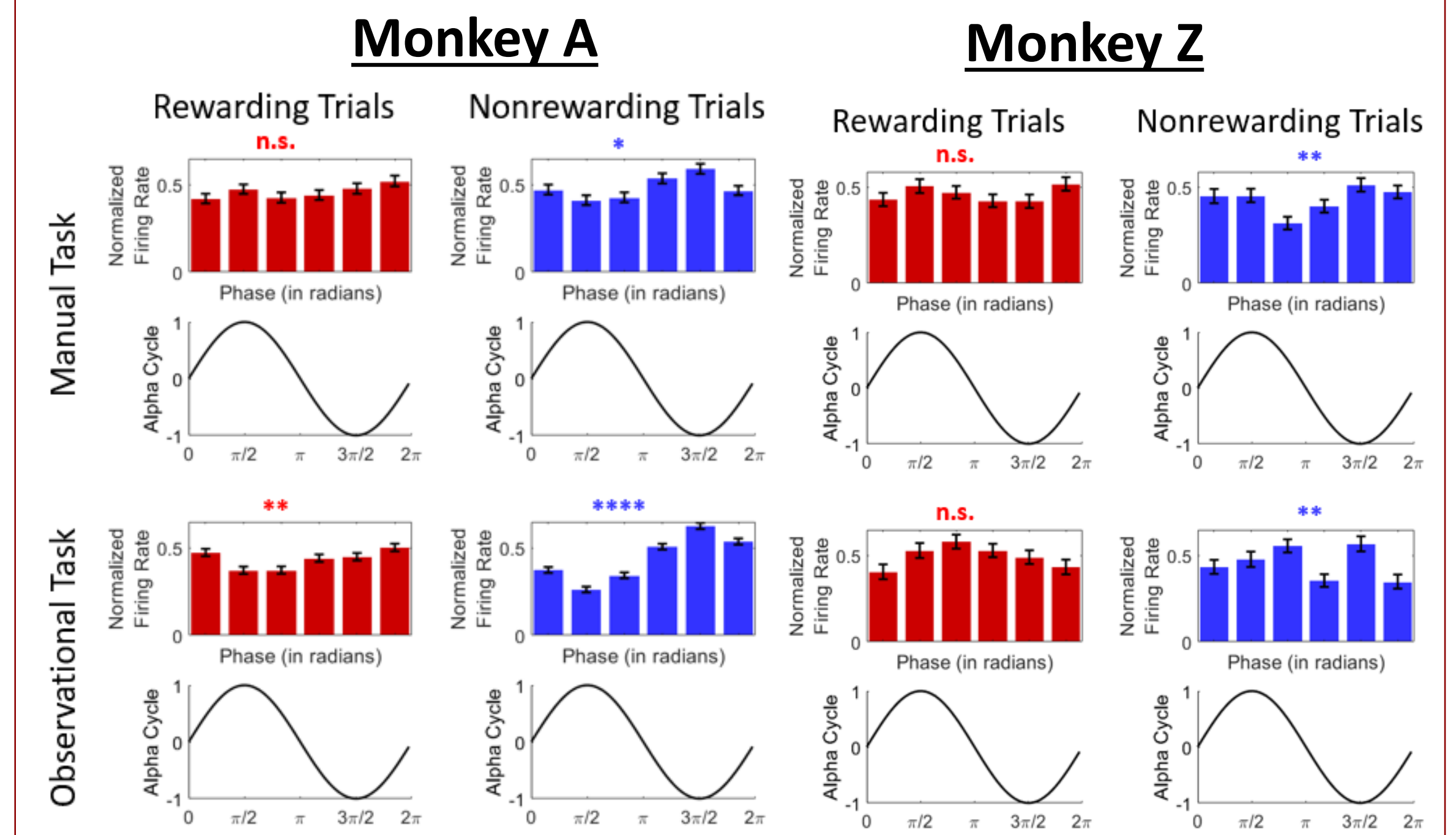


❖ SFC and Firing rate populations



3(b). Results

❖ Alpha phase and firing rate



4. Conclusions

- Suppression of LFP's alpha band (8-14 Hz) power, decreased alpha-gamma PAC and alpha band SFC, increased firing rates following reward predicting cue presentation.
- Strong phasic relationship between alpha phase and firing rates in absence of reward.
- Existence of possible relationship between dopamine, reward expectation and LFPs.
- Inhibitory function of Alpha oscillations in M1.
- Possible use of subjective value extracted via such measures as feedback to improve performance of an autonomous brain-machine interface.

Acknowledgement

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Reference

An, J. et. al, (2018). Reward Modulates Local Field Potentials, Spiking Activity and Spike-Field Coherence in the Primary Motor Cortex. *bioRxiv*, 471151.

CONTACT: jtfranci@central.uh.edu