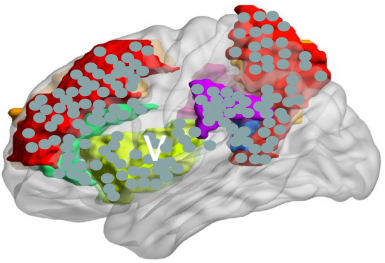
Cite this as: Yan HE, Zhiqiang YAN, Wenjia ZHANG, Jie DONG, Hao YAN. Network controllability analysis of awake and asleep conditions in the brain[J]. Journal of Zhejiang University Science B, 2023, 24(5): 458-462.
http://doi.org/10.1631/jzus.B2200393

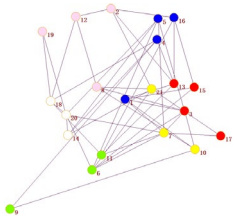
Network controllability analysis of awake and asleep conditions in the brain

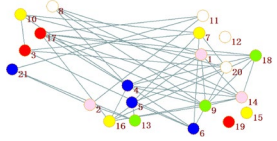
Key words: **intracranial stereo-Electroencephalography; Phase-locking value; Neural oscillation; Functional connectivity; Network controllability**

Research Summary

This research mainly focused on the working mechanisms of EEG oscillations under awake and asleep. The proposed pipelines detects their differences by way of network controllability metrics and time varying brain networks. It seems that frequency components play key roles in the brain via network control strategy:



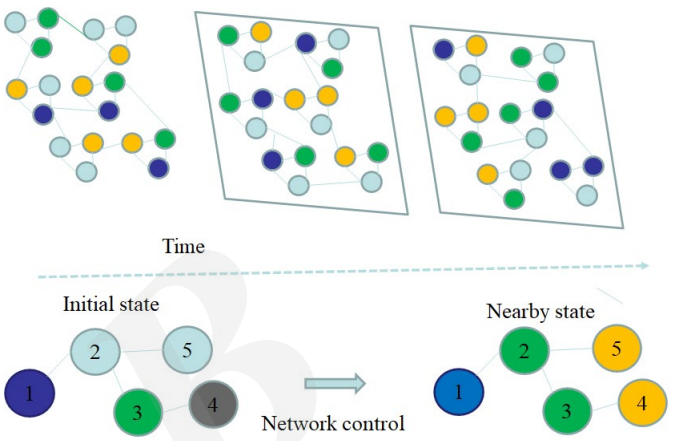




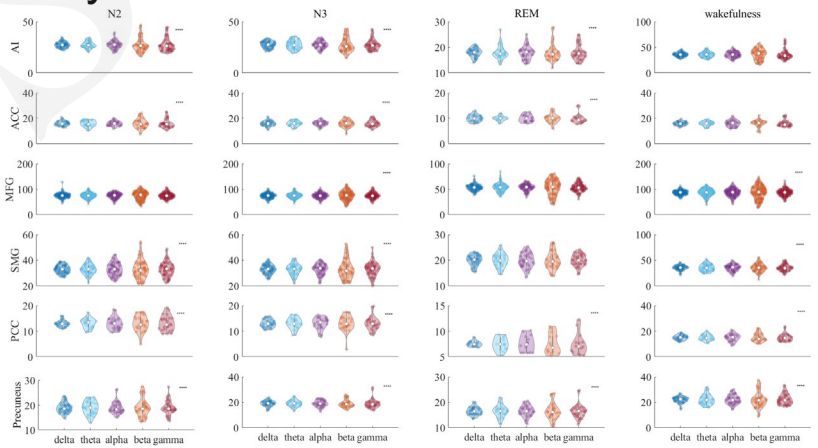
- **Significant differences exist in all frequency components in FPN, SN, DMN**
- **Modal controllability correlates with and average controllability metrics**
- **Frequency dependent network controllability demonstrates spatial**

Innovation points

- **Introduction of the network controllability metrics to awake and asleep conditions by way of intracranial stereo-Electroencephalography.**
- **Proposal of the average and modal controllability metrics on time varying brain networks via non-overlapping sliding time windows.**
- **Emphasis of the frequency components in EEG recordings in saliency network, default mode network and frontal-parietal network.**



(a) Network controllability refers to its capability to handle with new situations in the brain system



(b) Average network controllability evaluation of 5 sub-band EEG oscillations under awake and asleep conditions