II BYNS
Barcelona Young
Neuroscientists Symposium

13-14th September, 2018

ABSTRACT BOOK

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Zero-delay cross-correlation analysis of brain networks at different time scale resolution.

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The study of brain connectivity and network dynamics is a major issue in neuroscience. Network structures are commonly assessed by evaluating fMRI and EEG correlate activity between cerebral volumes. Magnetoencephalography (MEG) is emerging as a complementary method that combines a high temporal resolution (~1 ms) with an acceptable spatial resolution (~1cm).

A major application of MEG to the issue of brain connectivity concerns the identification of so-called resting state networks. Several studies have suggested an optimal time scale of ~10 s to visualize these networks. However, no work has yet tackled the issue of the significance of this crucial parameter concerning brain network dynamics.

In our work, a method to study brain network structures at different time-scales is described. Quasi–zero–delay cross–correlation between power sequences belonging to different brain voxels is evaluated. Changing the width of observation sliding windows leads to different time-scale resolutions, thus providing a new tool to identify fully connected networks and to investigate their temporal dynamics.

The application of the method to a set of volume elements that are supposed to belong to the resting state network know as Default Mode Network shows that the visibility onset for connectivity occurs at a time scale of ~ 30 s, i.e. at the same order of magnitude as the time scale resulting from other methods.