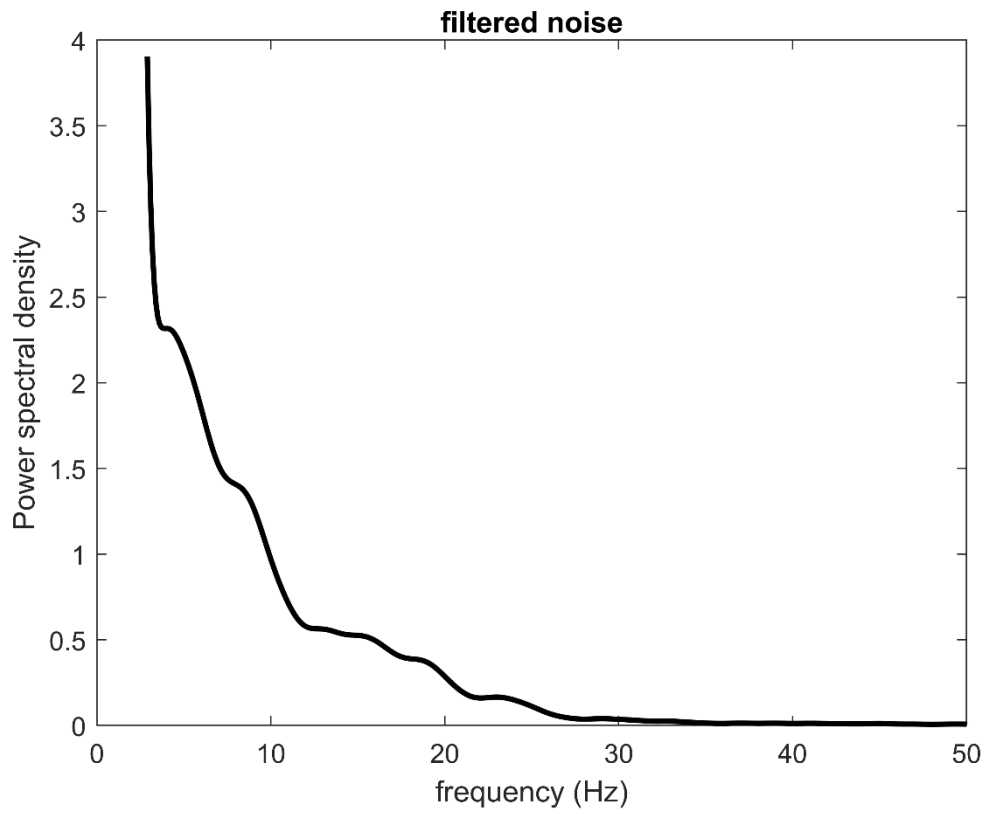


# **Supplementary Materials part 2:**

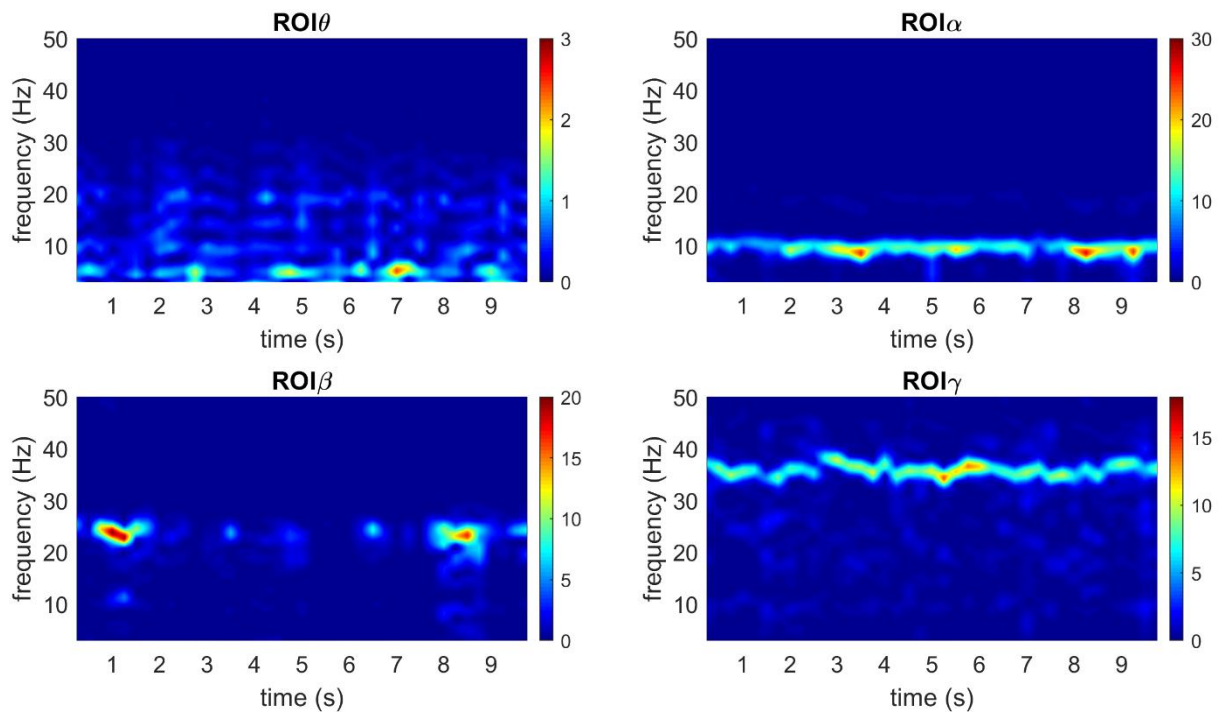
## **Further Simulation Results**

**THE RELATIONSHIP BETWEEN OSCILLATIONS IN BRAIN  
REGIONS AND FUNCTIONAL CONNECTIVITY: A CRITICAL  
ANALYSIS WITH THE AID OF NEURAL MASS MODELS**

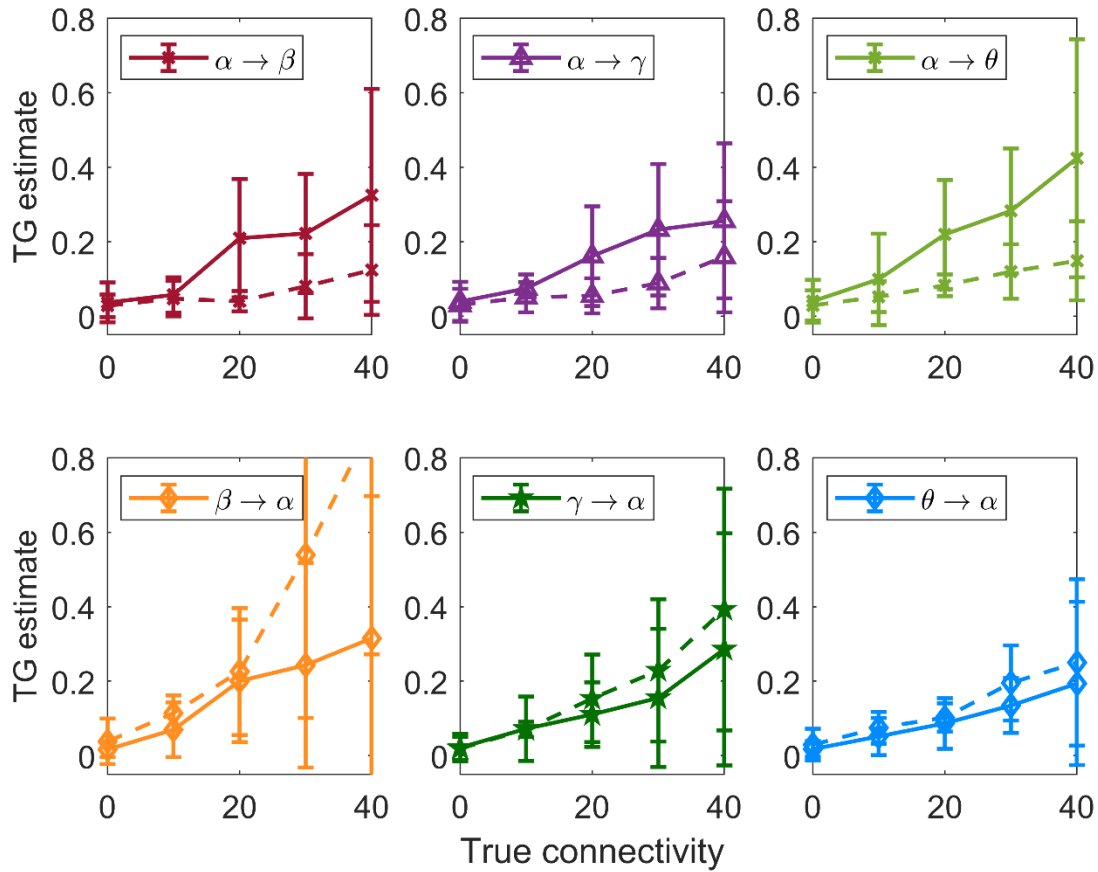
**Giulia Ricci, Elisa Magosso and Mauro Ursino\***



**Figure S1** – Power density spectrum of the noise, filtered by the dynamics of the glutamatergic synapses and multiplied by the constant  $C_{pe}$  (see also Eqs. (4), (5) and (6) in the Supplementary Materials 1).



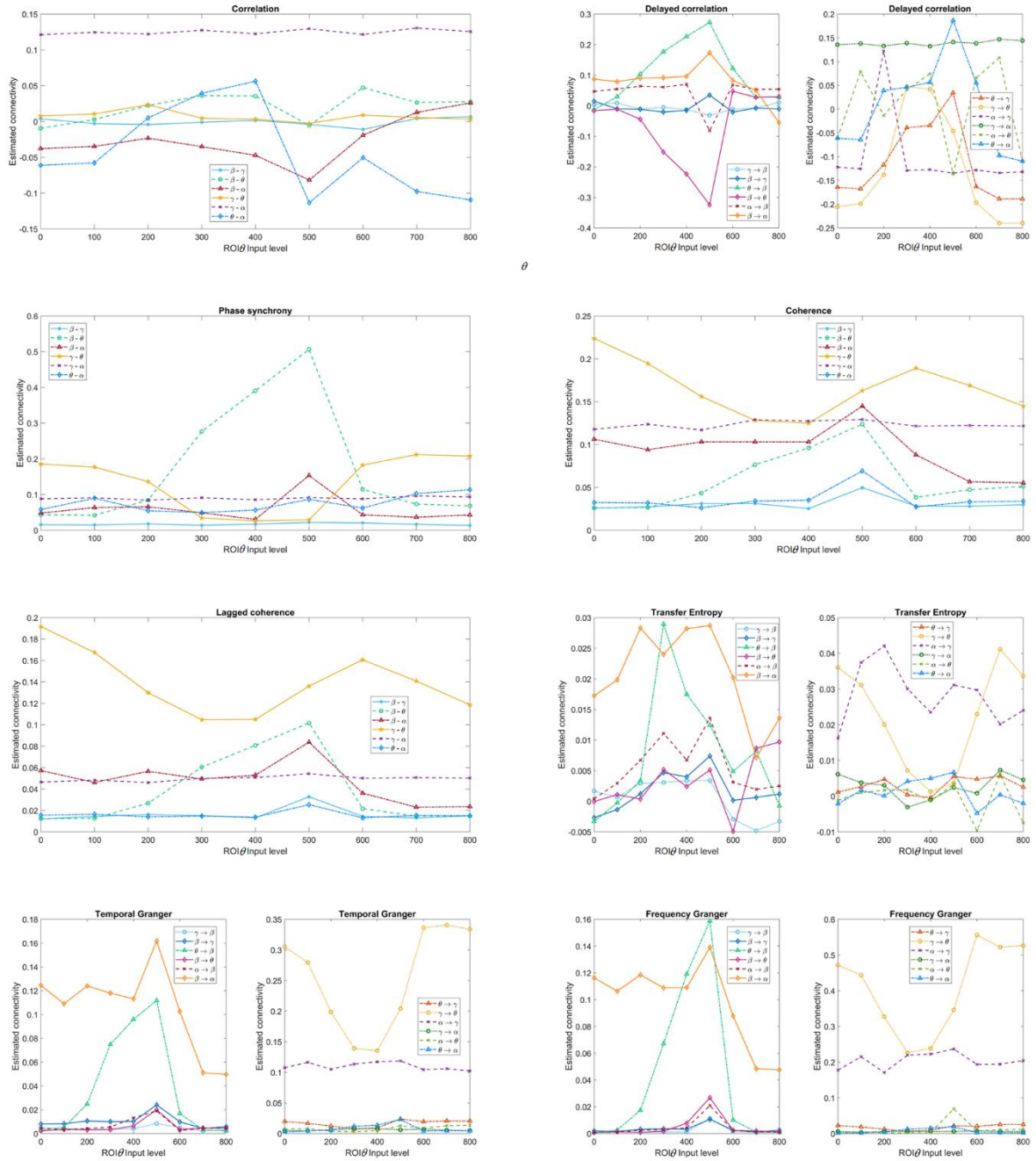
**Figure S2** – Spectrograms of the potential for the pyramidal population in the four different ROIs simulated with the connectivity as in Fig. 2a.



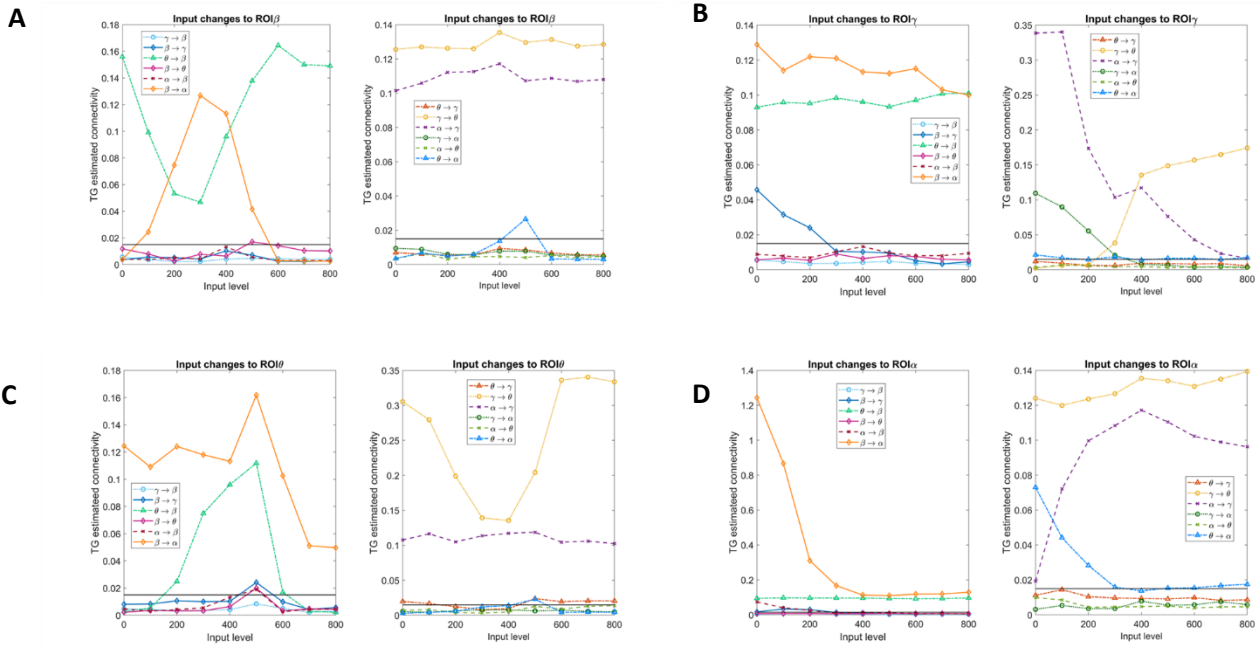
**Figure S3** – Relationship between the connectivity estimated with the Temporal Granger estimator and the true connectivity, using the data obtained from 100 randomly generated networks. The continuous lines were obtained using all inputs to the ROIs as high as 400 (the same as in the simulations in Fig. 4 and 5 in the text). The dashed lines have been obtained by reducing the input to ROI $\alpha$  down to 200, while all other inputs are unchanged. Only the connections entering into (upper panels) or exiting from (bottom panels) the ROI $\alpha$  are shown, since the others are not significantly affected. It is worth noting that a decrease in the input to a ROI reduces the estimated values of the output connectivity, and increases the entering estimated connectivity.



**Figure S4** - Values of connectivity among the ROIs estimated with the eight different FC estimators, with reference to the network in Fig. 2A, when the *input* to pyramidal neurons in ROI $\beta$  is progressively varied from 0 to 800, as in the x-axis, and all other inputs and connections are maintained at the basal value as in Fig. 2A. It is worth noting the strong effect that the input change has on the connections which involve the ROI $\beta$ . This result, although with some differences, is evident with all estimators.



**Figure S5** - Values of connectivity among the ROIs estimated with the eight different FC estimators, with reference to the network in Fig. 2B (i.e., a circular connections), when the *input* to pyramidal neurons in ROI $\theta$  is progressively varied from 0 to 800, as in the x-axis, and all other inputs and connections are maintained at the basal value as in Fig. 2B. It is worth noting the strong effect that the input change has on the connections which involve the ROI $\theta$ . This result, although with some differences, is evident with all estimators.



**Figure S6** - Values of connectivity among the ROIs estimated with the Temporal Granger Causality, with reference to the network in Fig. 2B, when the input to pyramidal neurons in ROI $\beta$  (panel A), ROI $\gamma$  (panel B), ROI $\theta$  (panel C), and ROI $\alpha$  (panel D) is progressively varied as in the x-axis, and all other inputs and connections are maintained at the basal value as in Fig. 2B. It is worth noting the strong influence that the input change has on the connections which enter into and exit from the affected ROI.