

The beta band as the spectral signature of control signals in the DAN during attentional reorienting

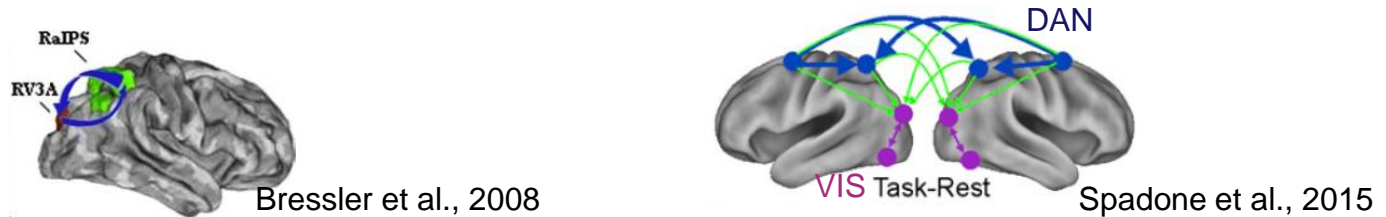
Spadone Sara

Department of Neuroscience, Imaging and Clinical Sciences
G. d'Annunzio University, Chieti-Pescara

Aims

Visuospatial attention allows to selectively process visual information through prioritization of a location in space within the visual field while irrelevant stimuli are filtered out

fMRI studies indicate that endogenous visuospatial attention is mediated by dorsal frontoparietal attention network (**DAN**) (Corbetta et al., 2002) that modulates sensory processing in visual occipital cortex (**VIS**) (Bressler et al., 2008; Spadone et al., 2015).

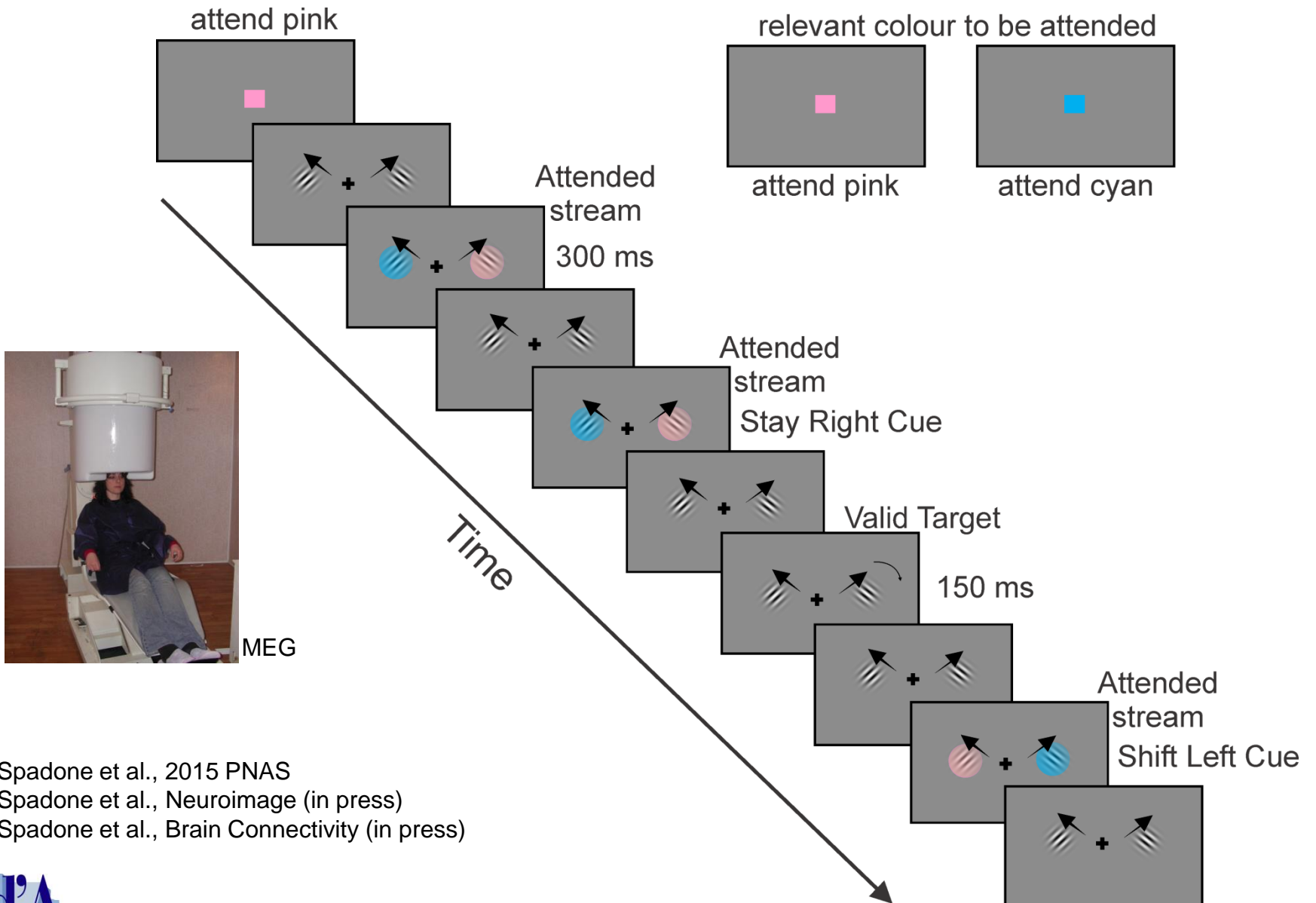


fMRI studies suggested a leading role of prefrontal regions during the orienting of attention

We **AIM** to identify using magnetoencephalography:

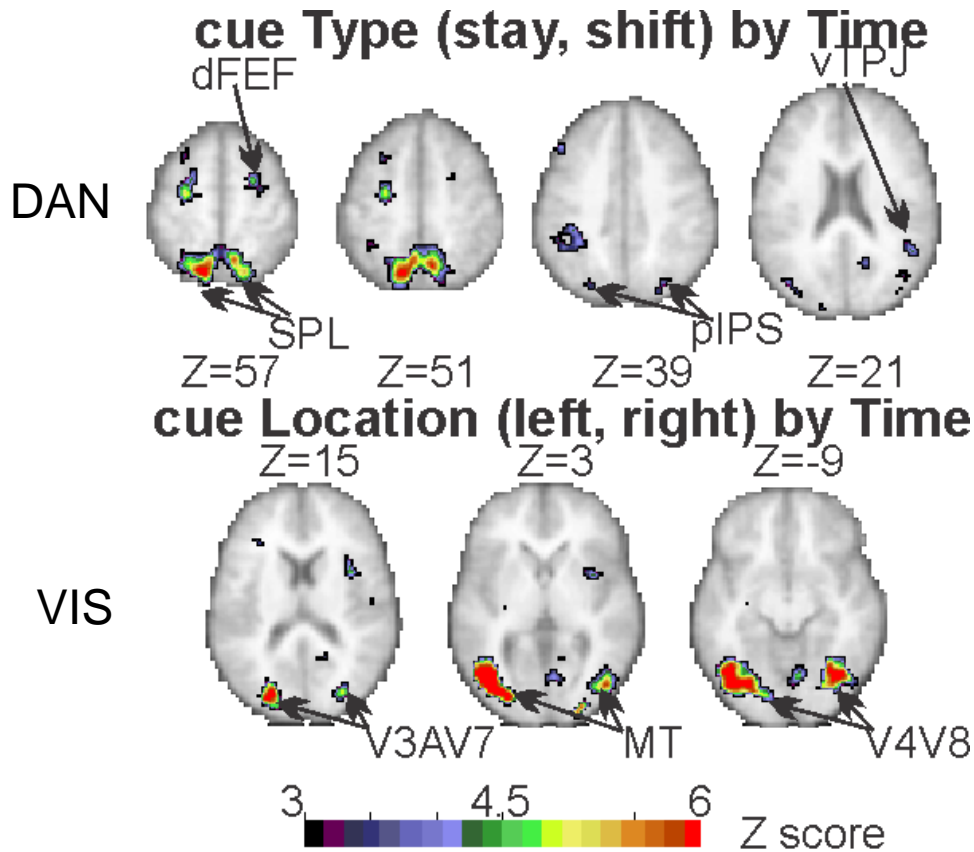
- ✓ the spectral signature associated with control signals and
- ✓ the direction of communication flow between DAN regions during endogenous attentional reorienting

The Paradigm



Spadone et al., 2015 PNAS
 Spadone et al., Neuroimage (in press)
 Spadone et al., Brain Connectivity (in press)

The ROIs



Selection of regions showing

stronger **shift-related** activity (shift > stay cues) and

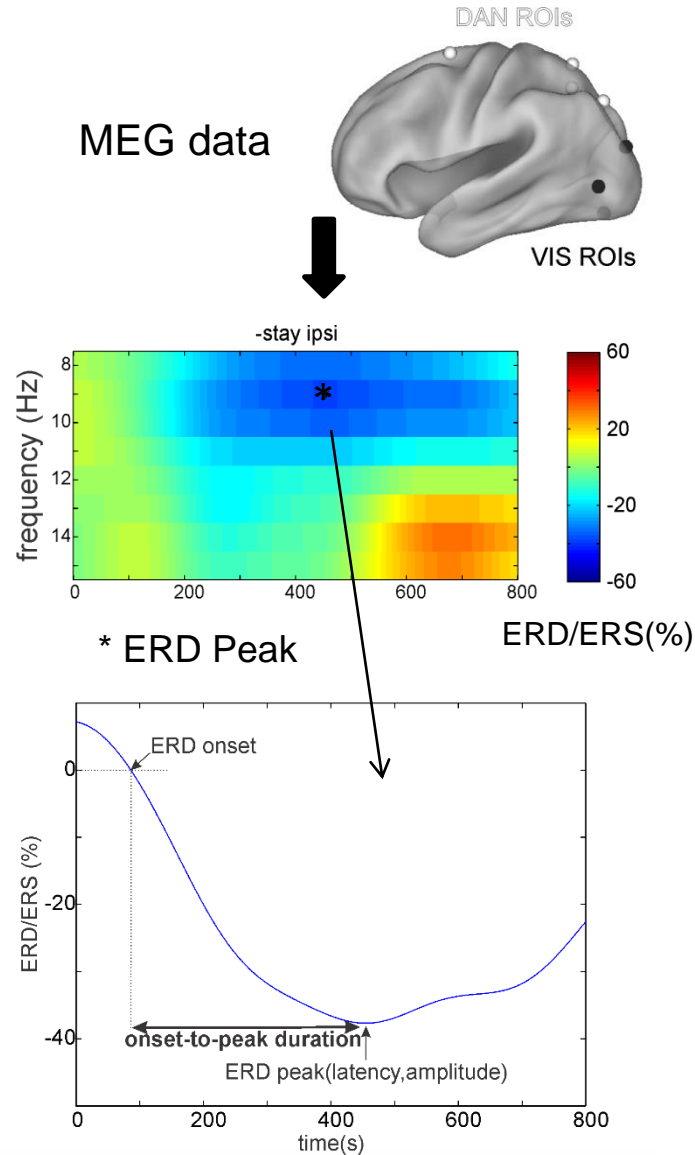
stronger **spatially-selective** activity (contralateral > ipsilateral)



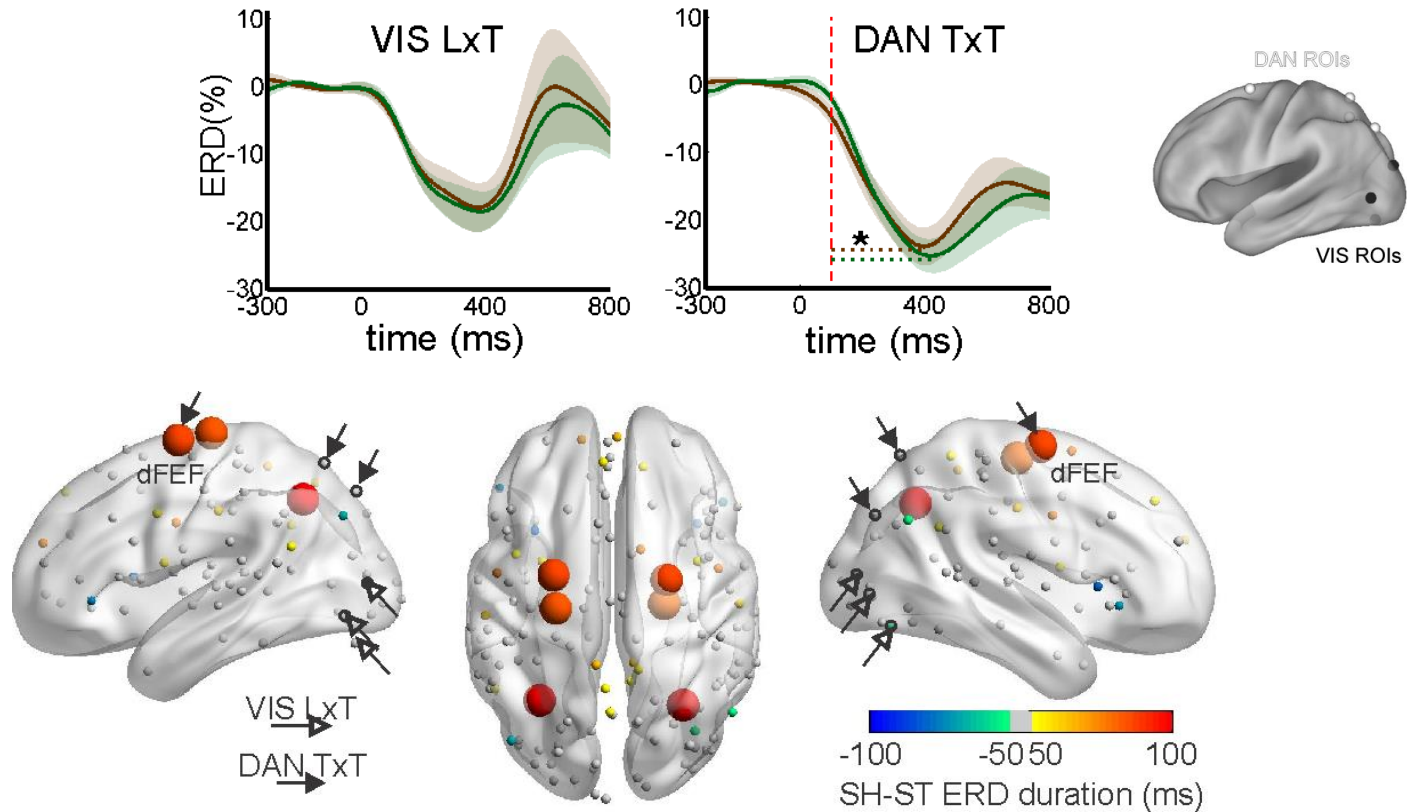
Spadone et al., 2015 PNAS

DAN regions previously localized using fMRI on the same subjects

Methods (I study)



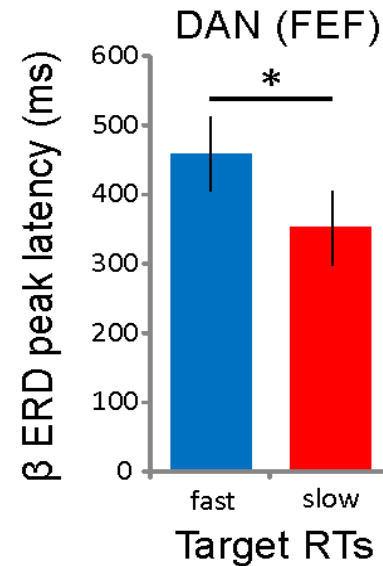
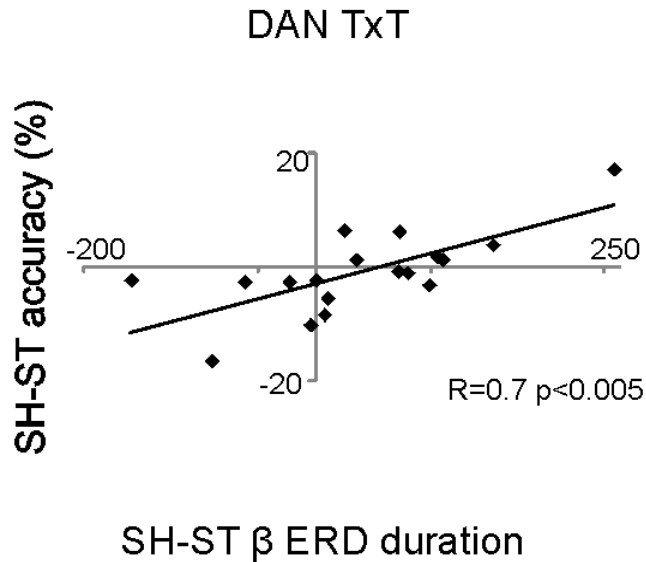
Beta band results (I study):



Reorienting, as compared to maintaining, attention induced a **more sustained desynchronization in the low- β band** that was selectively observed in the DAN, especially in the FEF.

Spadone et al., Neuroimage (in press)

Beta band results (I study):



Spadone et al., Neuroimage (in press)

This prolonged desynchronization was positively associated with task performance, in terms of both accuracy and speed of target discrimination.

WHAT ABOUT THE CAUSAL RELATIONSHIP BETWEEN THESE REGIONS?

Conclusions (I study)

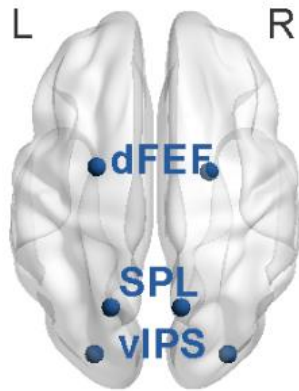
Several properties of the β band modulation observed in the DAN:

- ✓ its spatial distribution
- ✓ temporal profile
- ✓ relationship with behavioral performance



are compatible with its involvement in the **control of attentional reorienting** exerted from the DAN

Methods (II study)

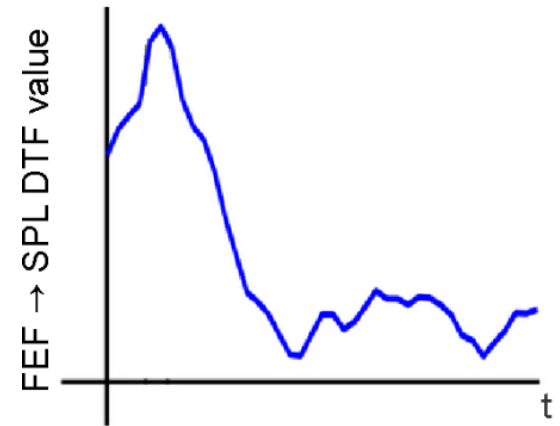


beta band

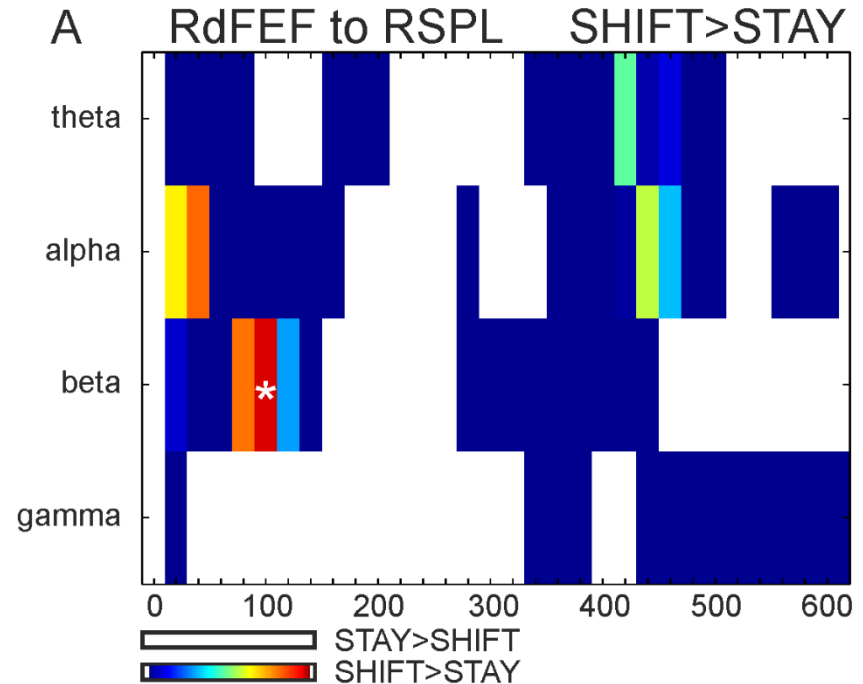
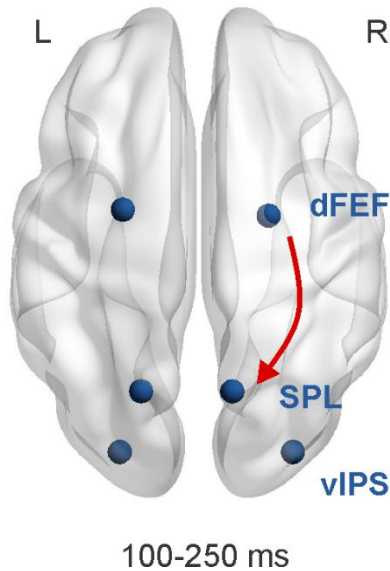


Directed Transfer Function (DTF)

based on the Granger concept and provides a measure of causal relations between signals in the frequency domain



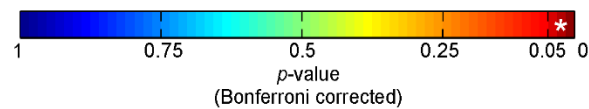
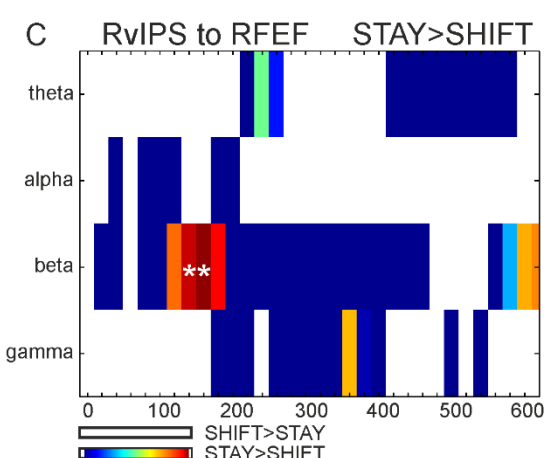
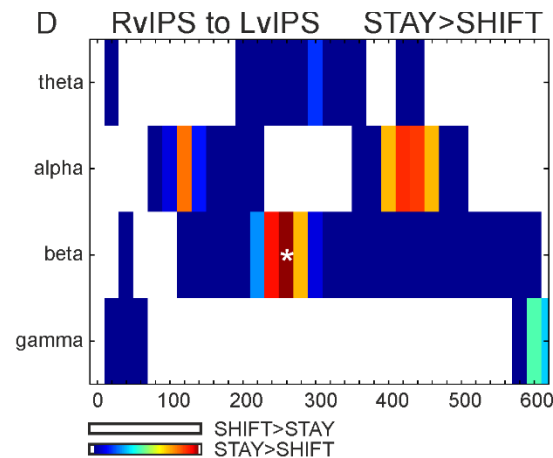
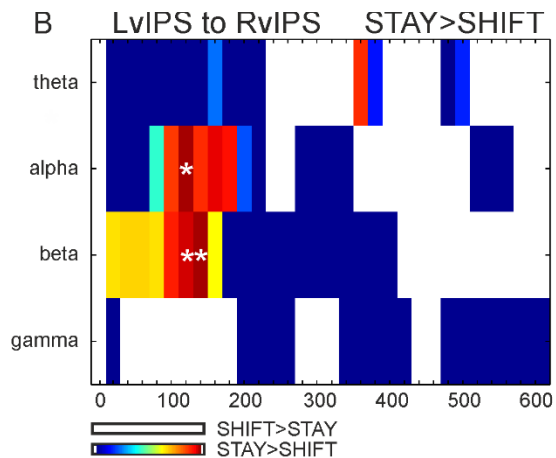
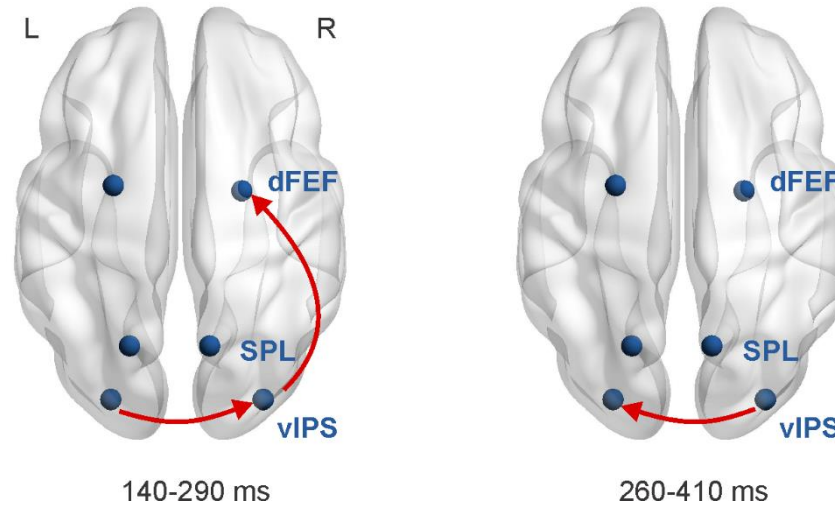
Beta band results (II study):



Shifting attention induced stronger directional interaction (DTF values) from right FEF to right SPL, in the early phase of reorienting that was specific for the β band.

Spadone et al., Brain Connectivity (in press)

Beta band results (II study):



Conclusions (II study)

first electrophysiological evidence showing the **top-down control of reorienting of attention within the DAN** exerted by the frontal region and directed towards (medial) parietal regions in the **beta band**

the shift-related fronto-parietal (i.e. from dFEF to SPL) connectivity was **frequency specific (beta)**

we speculate that the beta frequency is the communication channel between frontal and medial parietal DAN regions for the actual orienting and reorienting of the current focus of attention toward the new stream, promoting novel (sensory) representations before the target onset.

Thanks to all contributors!

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Thanks for your attention!