EXPERIMENT 2: ***Alpha Rhythm of the EEG Modulates Visual Detection Performance in Humans, Ergenoglu et al., 2004***

**Introduction**

* **Question:** how does this (the one of the experiment 1) momentary index of cortical excitability map onto visual detection performance?

**Objective**

* Study the mechanisms of how we perceive the world around us.

**Protocol**

* Stimulus: ***peri-threshold visual stimulus***, namely a laser beam which was flashed always in the same location and calibrated for each subject in order to be perceived *50%* of the times
  + *peri-threshold* means that the stimulus is around the threshold, indeed in this case it is calibrated to be perceived half of the times
* Laser parameters (duration and intensity) identical across all trials for each participant.
* In this case, differently from Experiment 1, we do not stimulate with TMS to produce a visual stimulus, but we present a real visual stimulus and simply record the oscillatory activity with EEG.

**Method**

* the experiment was tested over *twelve subjects* that, during *EEG* recording, were undergone a ***peri-threshold visual stimulus*** (definition in Protocol Section)
* The analysis consists into analyse the situations in which participants perceive or not the laser.
* The ***EEG is recorded prior to the laser delivery*** because the objective is performing a ***pre-stimulus analysis*** to understand the relationship between pre-stimulus EEG recorded activity and stimulus detection.



* oscillatory activity in theta, alpha, beta and gamma frequency bands was recorded by the *EEG* before the flash of the laser and the resulting power of these bands was calculated by means of *FFT* relatively to the electrodes placed in the *Frontal* (*F*), *Parietal* (*P*), *Central* (*C*) or *Occipital* (*O*) area.
* prestimulus *FFT* shown significant differences between *detected* (***P-yes***, indicated by the *square* in the plot) and undetected (***P-no***, indicated by the *triangle* in the plot) trials, particularly when considering *alpha band* oscillations in the *parietal* and *occipital* area

**Results**

* Again, this study proves that spontaneous fluctuations in prestimulus oscillatory alpha power determine whether we will consciously perceive or not visual stimuli on a trial by trial basis, in other words ***alpha power sets the detection threshold of a sensory system at any given point in time***
* lower alpha power prior to stimulus onset is associated with higher chance of visual detection (***low threshold***) while higher alpha power prior to stimulus onset is associated with lower chance of visual detection (***high threshold***)
* So, also in this case, as in the Experiment 1, we can see that there is an inverse relation between the power of alpha and the chance of visual detection.