



## Method and Apparatus for Assessing Electrocortical Consequences of Brain Injury

WARF: P220192W001

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### The Invention

UW researchers and collaborators have developed a method that quantifies and monitors the degree of local functional alteration in the brain after structural damage from stroke, tumor growth, or traumatic injury. The method involves briefly perturbing the patient's brain close to the location of the damage lesion using either a magnetic pulse, delivered by a Transcranial Magnetic Stimulation (TMS) device, or an electrical pulse, delivered by a transcranial or intracranial electrode, and recording the resultant electrical activity using one or more electroencephalographic (EEG) electrodes placed on the scalp or intracranially. The analysis aims at detecting the presence of pathological cortical bistability – the tendency of cortical neurons to go into a silent period after a period of activity. The researchers have developed a scoring system to quantify the cortical bistability indicative of damage to the brain (areas where cortical neuron activity is suppressed/silent) that involves combining time-frequency decomposition, changes in induced power, and phase-locking analysis from the EEG readout. The method involves performing time-frequency decomposition on the average response to ascertain whether the physiological natural frequency typical of the stimulated area is preserved or rather replaced by slower activity. Second, changes in induced power are analyzed at the single-trial level with respect to baseline to detect a significant suppression of high frequency activity, indicative of suppression of neuronal firing (i.e. OFF-period). Third, phase-locking analysis in the 8-20 Hz range is performed to quantify the interruption of local recurrent activity caused by the occurrence of the OFF-period. Finally, the three indices (deviation from the natural frequency, strength of high-frequency suppression and duration of phase-locking factor) are combined to score the degree of alteration of local cortical functionality.

### Additional Information

#### For More Information About the Inventors

- [Giulio Tononi](#)

#### Tech Fields

- [Medical Devices : Neurological devices](#)

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