

## **Automatic versus Visual High Frequency Oscillations Detection**

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**Rational:** The main aim of our project was to compare automatic and visual high frequency oscillations (HFOs) detection.

**Methods:** We have visually detected and marked HFOs in 3 patients undergoing invasive EEG monitoring because of drug-resistant epilepsy. HFOs were detected in 9 electrodes – 3 electrodes were localized in seizure-onset zone, 3 electrodes in irritative zone and 3 electrodes in remote area. Then results of visual and automatic detection were compared by use ROC analysis – the comparison was done separately for “raw” data and for “pre-treated data without artifacts.”

Description of system for automatic HFOs detection:

High frequency oscillations were detected by a custom made matlab detection algorithm. First, the signal in the statistical window (10 s) was filtered in a series of overlapping logarithmically spaced frequency bands. Power envelopes for each band were computed. To overcome effects of Gibb's phenomenon frequency stability between narrow band signal and broad band signal were computed for each band. HFO detections were obtained by thresholding the normalized dot product of the power envelopes and frequency stability.

**Results:** There was better correlation between visual and automatic detection for “pre-treated” data (Figure 1- blue line) than for “raw” data (Figure 1 – green line).

**Discussion:** Our automatic HFOs detection system seems to be able to detect HFOs with good accuracy, especially if data are “pre-treated for the artifacts precence.” It seems to be reasonable to prearrange data before automatic detection is started.

Figure 1: Comparison of visual and automatic HFOs detection by ROC analysis – “pre-treated” data without artifacts (blue line), “raw” data (green line)

