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Improved threshold detection in electrically evoked auditory steady state responses for the objective fitting of cochlear implants[1]

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[1]This report is available by anonymous ftp from *ftp.esat.kuleuven.ac.be* in the directory *pub/sista/hdeprez/reports/naam.ps.Z*

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Abstract

Currently, cochlear implant (CI) fitting in infants is challenging, as infants are not able to give conscious feedback on the perceived loudness of the stimuli. Electrically evoked auditory steady state responses (EASSRs) are investigated for objective CI fitting, because electrophysiological thresholds obtained with EASSRs correlate well with behavioral thresholds in bipolar mode (Hofmann and Wouters, 2012).

In this study, evoked EEG potentials in response to monopolar pulse trains at different intensities were measured in 6 subjects, by means of a 64-channel recording system. The pulse trains were amplitude-modulated with a fixed modulation depth and had a pulse rate equal to the subject's clinical rate (i.e. 900 pps). T-levels were measured for modulated pulse trains and unmodulated and modulated pulse trains were loudness balanced at the subject's C-level, to compensate for the difference in perceived loudness between both. To remove stimulation artifacts and retrieve the the underlying neural responses, a combination of the established blanking method with a new CI artifact rejection technique based on Independent Component Analysis (ICA) was used.

The results show that the proposed artifact rejection method reduces false response detections due to the stimulation artifacts and that EASSRs can be detected at stimulus intensities as low as 22% of the subject's dynamic range. For supra-threshold responses, artifact-free determination of response properties allows the determination of response growth functions for monopolar pulse trains at clinical rates. Quantitative measures illustrating the advantages of ICA based artifact rejection and the results of the behavioral loudness balancing will be presented.