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EEG demonstration: recording evoked potentials beyond the laboratory

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Long term objectives with AEPs

- **New methods:**
 - deconvolution, multi-response deconvolution
- **New experiments:**
 - more natural, conditioning the auditory system
- **New applications:**
 - hearing research, clinical applications
- **New audience:**
 - audiologists, ENT specialists, engineers, education (university, high school, primary), society

AEP recording out of the laboratory (problem 1)

- The noise
 - Low noise instrumentation amplifier
 - Number of stimuli to be averaged
 - Minimize external interference
 - Minimize myogenic activity
- EM interference from 50 (60) Hz power line
 - Shielded booth: laboratory or special room

AEP recording out of the laboratory (solution 1)

- Interference from power line is a common-mode noise
- We estimate both, the differential signal (contaminated with CM) and the CM signal
- We process both signals in order to estimate a clean differential signal (i.e. a clean EEG)
- This alleviates the need of shielded booth

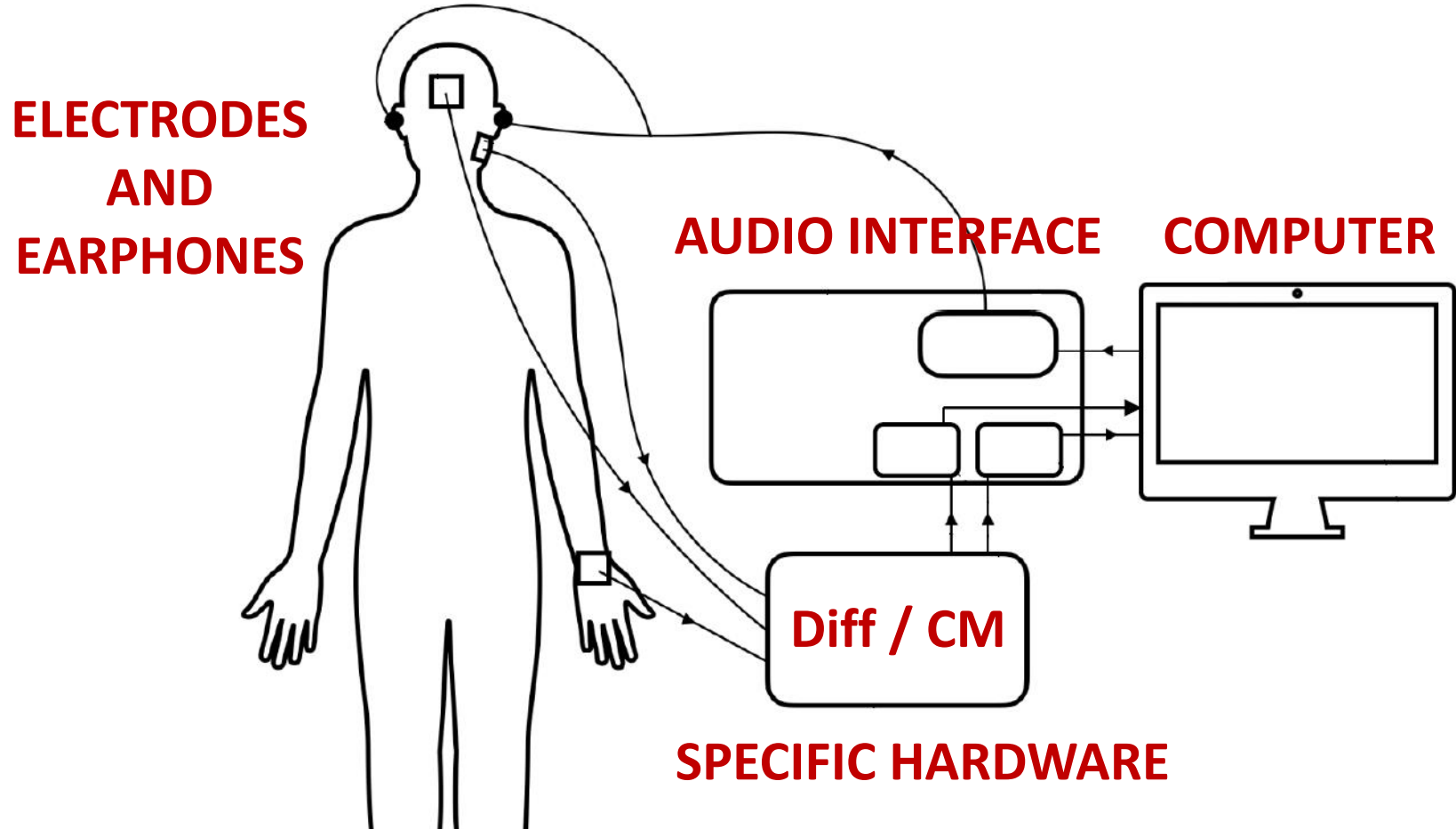
AEP recording out of the laboratory (problem 2)

- AEP recording systems are usually expensive
- Open AEP recording systems are necessary for interesting experiments, but difficult to be used

AEP recording out of the laboratory (solution 2)

- Let's develop our own AEP recording system:
 - Minimum specific hardware
 - Rest of the hardware: consumer electronics
- Let's develop our own (open) code / methods
 - Functions for efficient deconvolutions
 - Scripts (for recording and analysis) for specific experiments

The AEP recording system



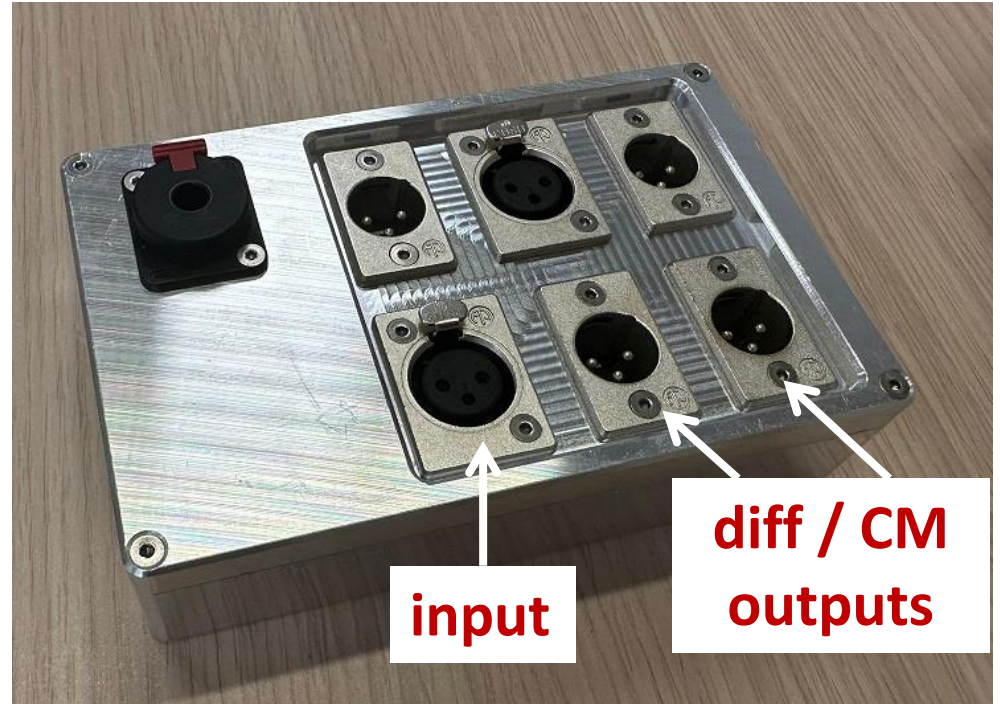
The AEP recording system



The specific hardware

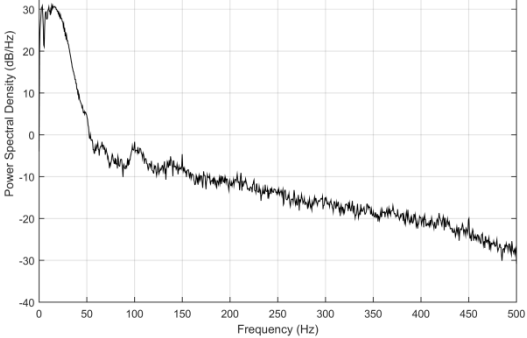
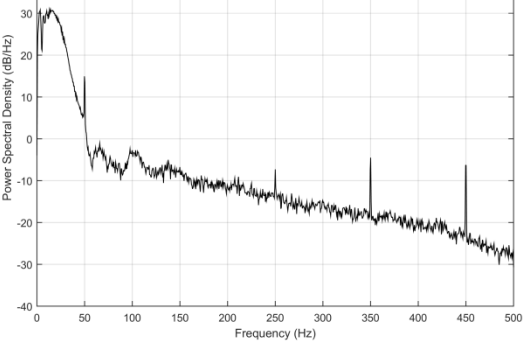
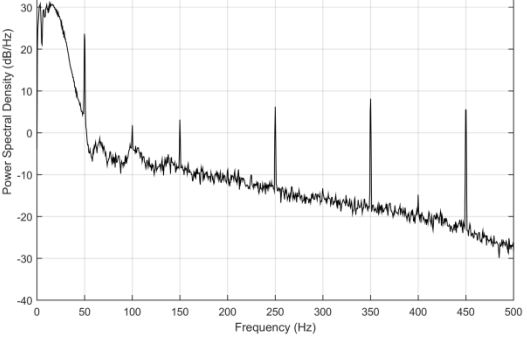
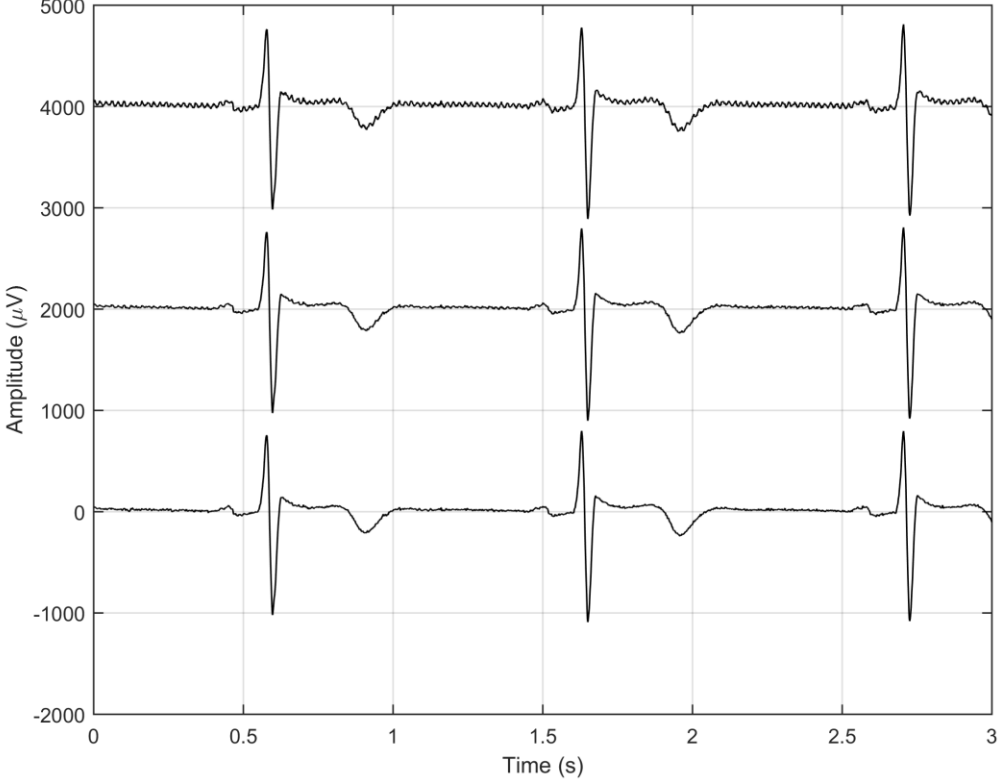


FIRST PROTOTYPE



SECOND PROTOTYPE

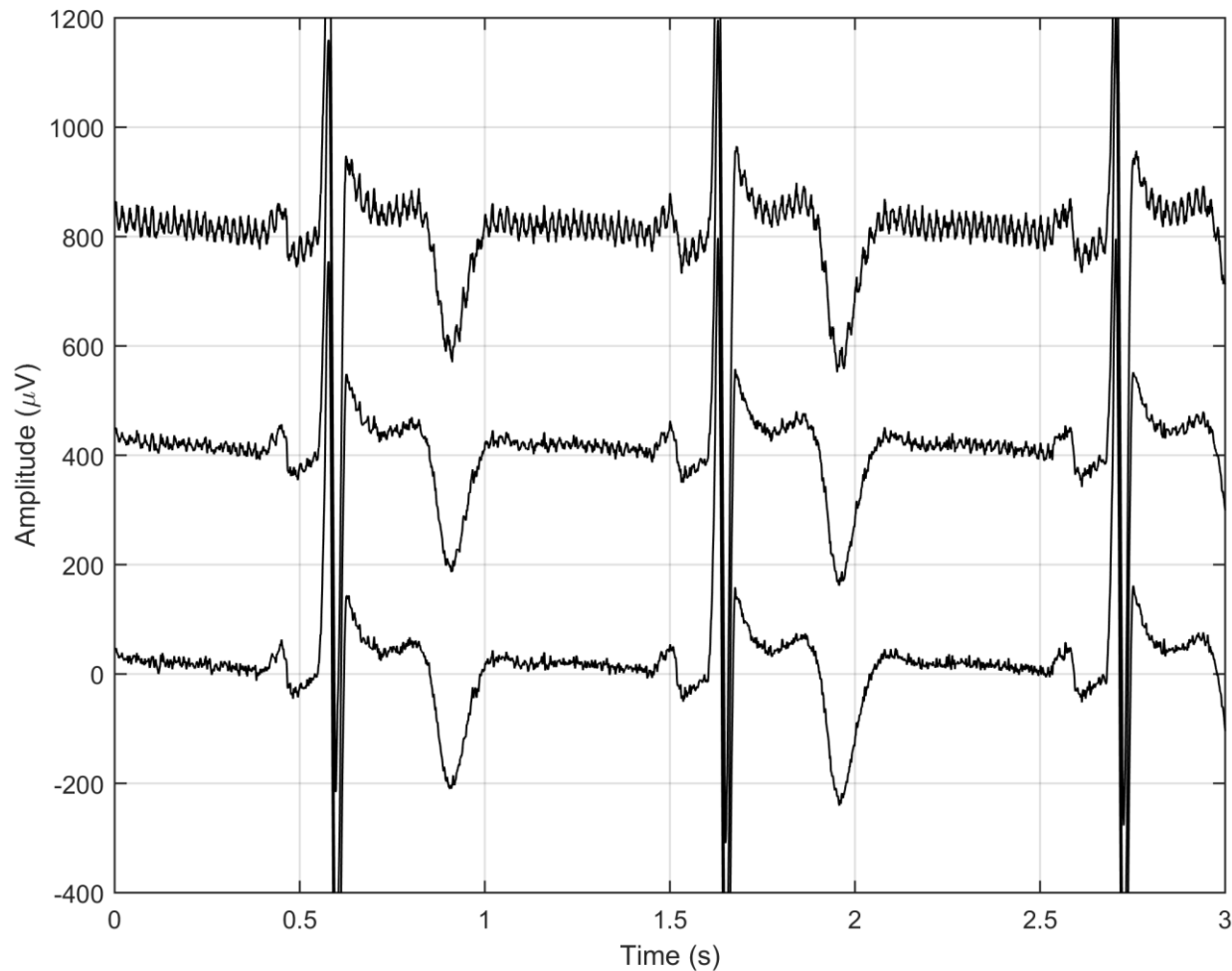
ECG recording (out of laboratory)



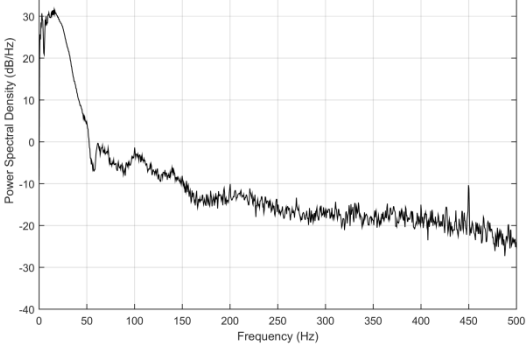
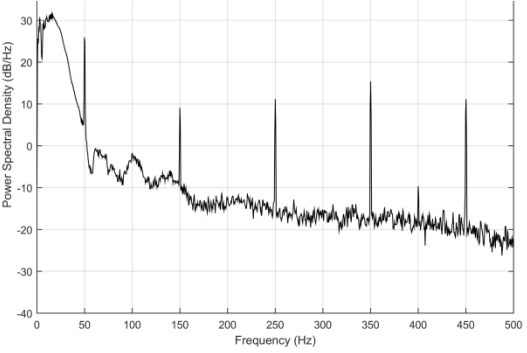
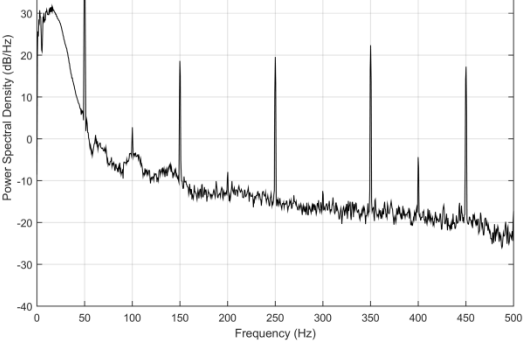
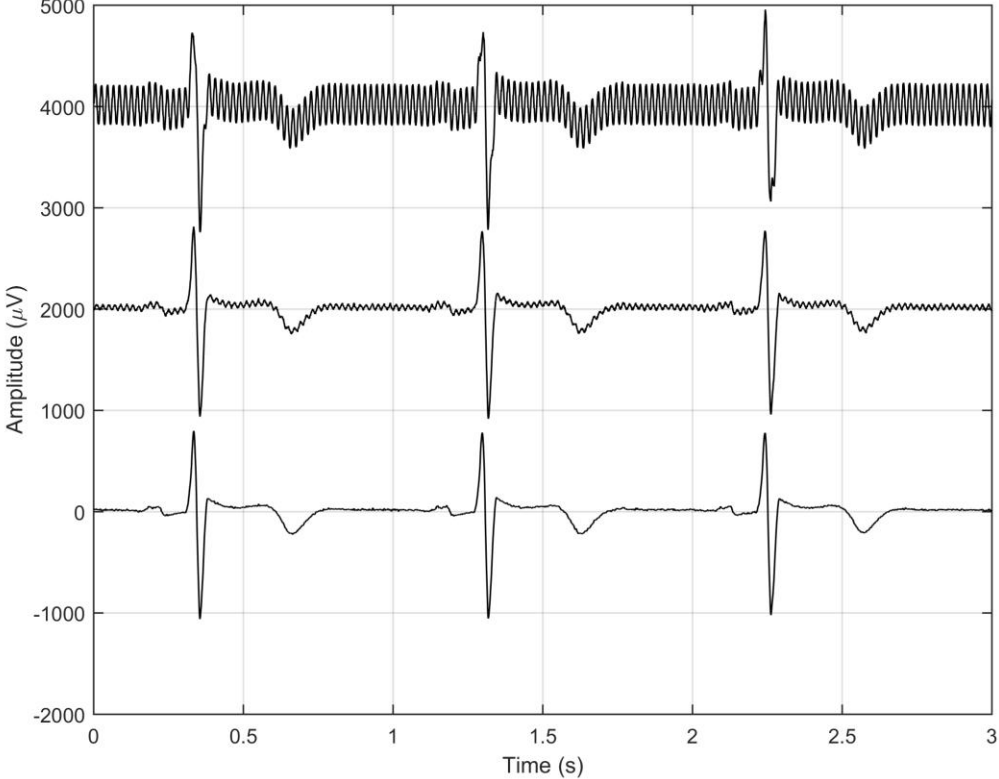
**Without
CM-removing**

**CM-removing
basic**

**CM-removing
advanced**



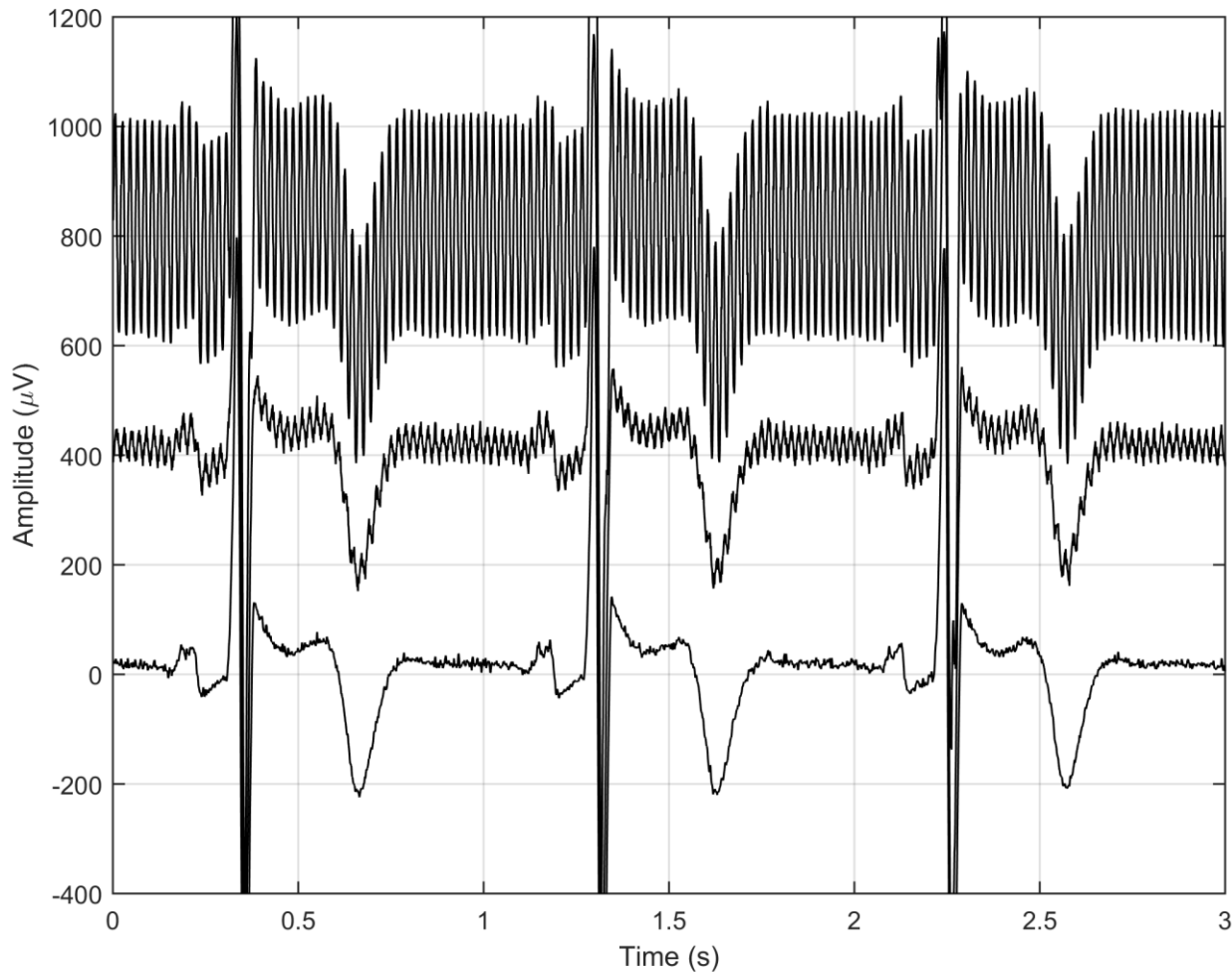
ECG recording (out of laboratory)



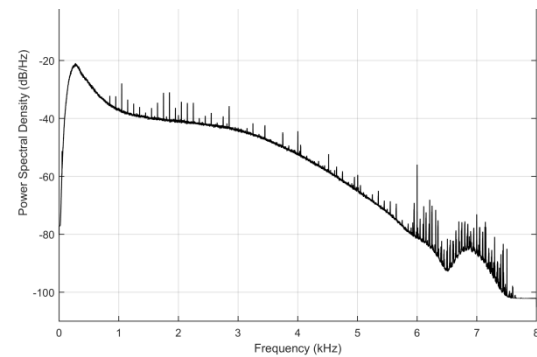
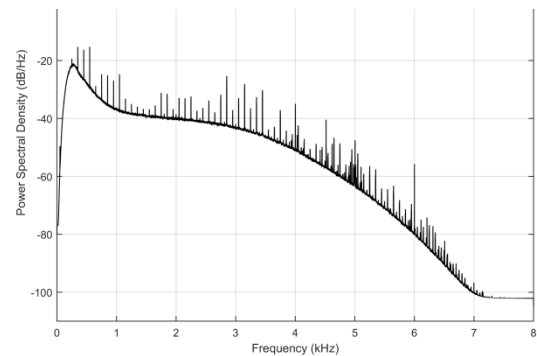
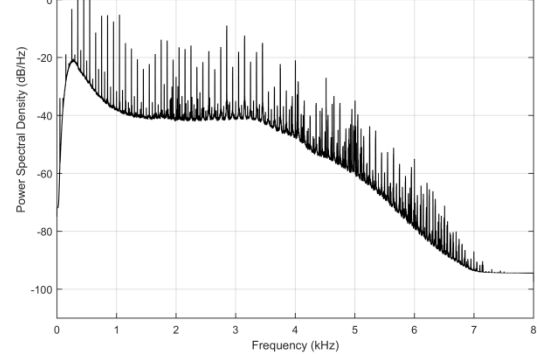
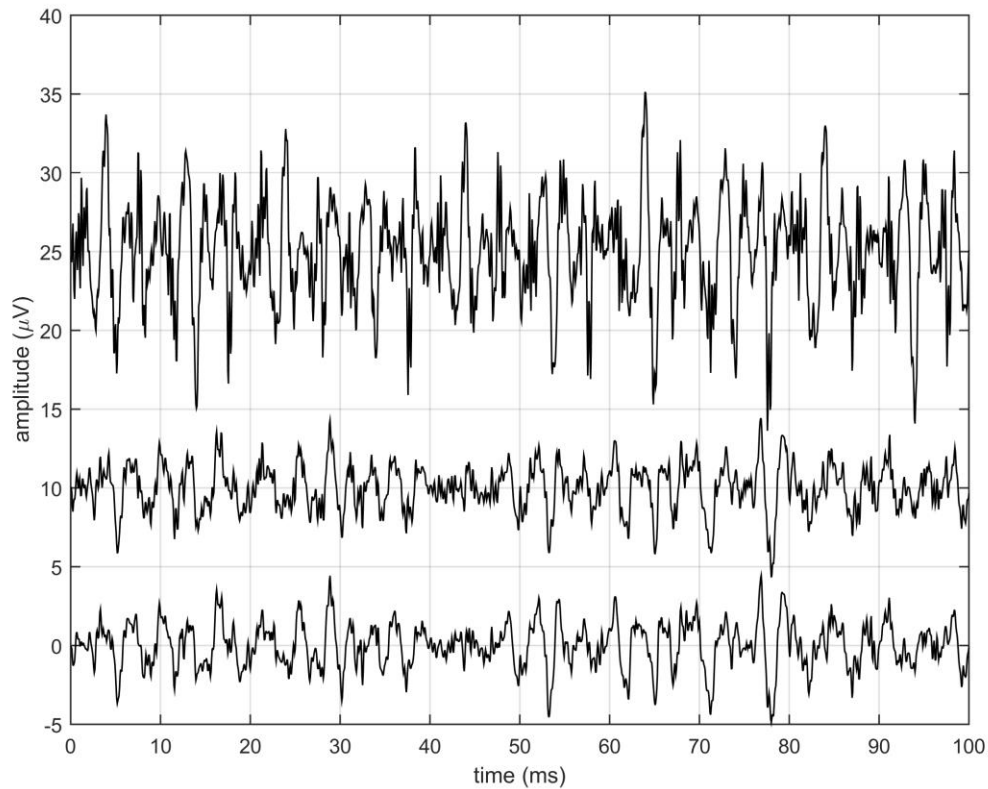
**Without
CM-removing**

**CM-removing
basic**

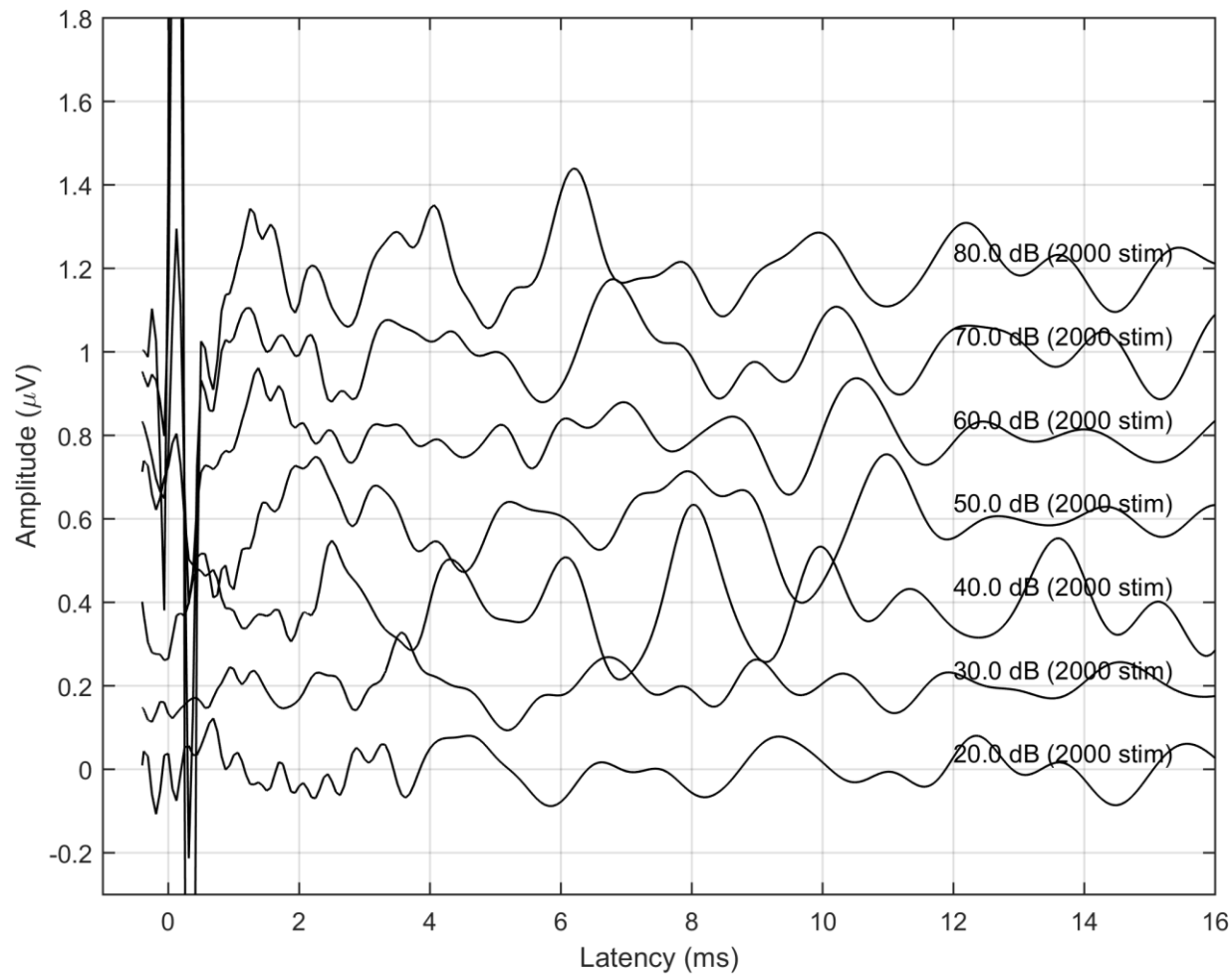
**CM-removing
advanced**



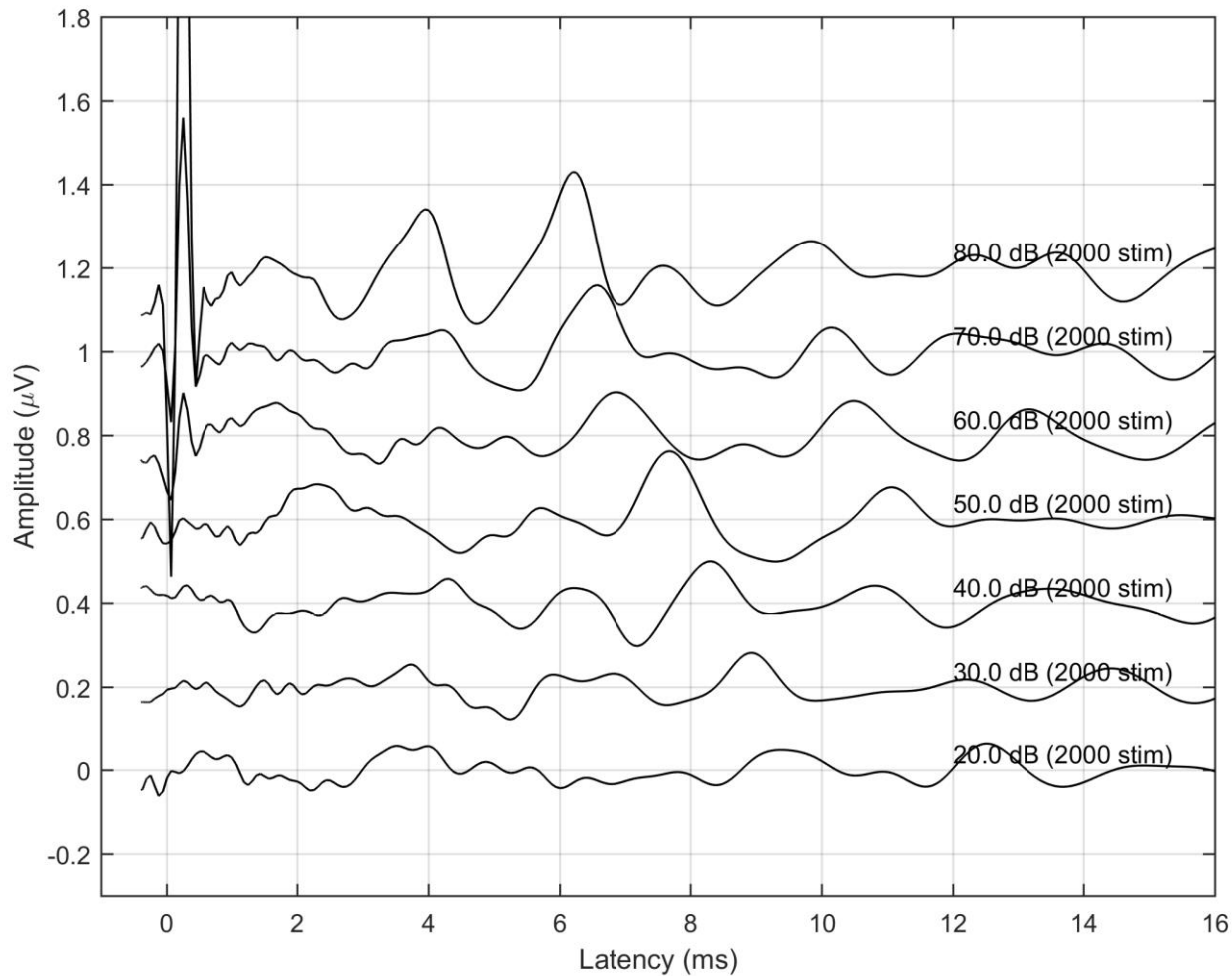
AEP recording (out of laboratory)



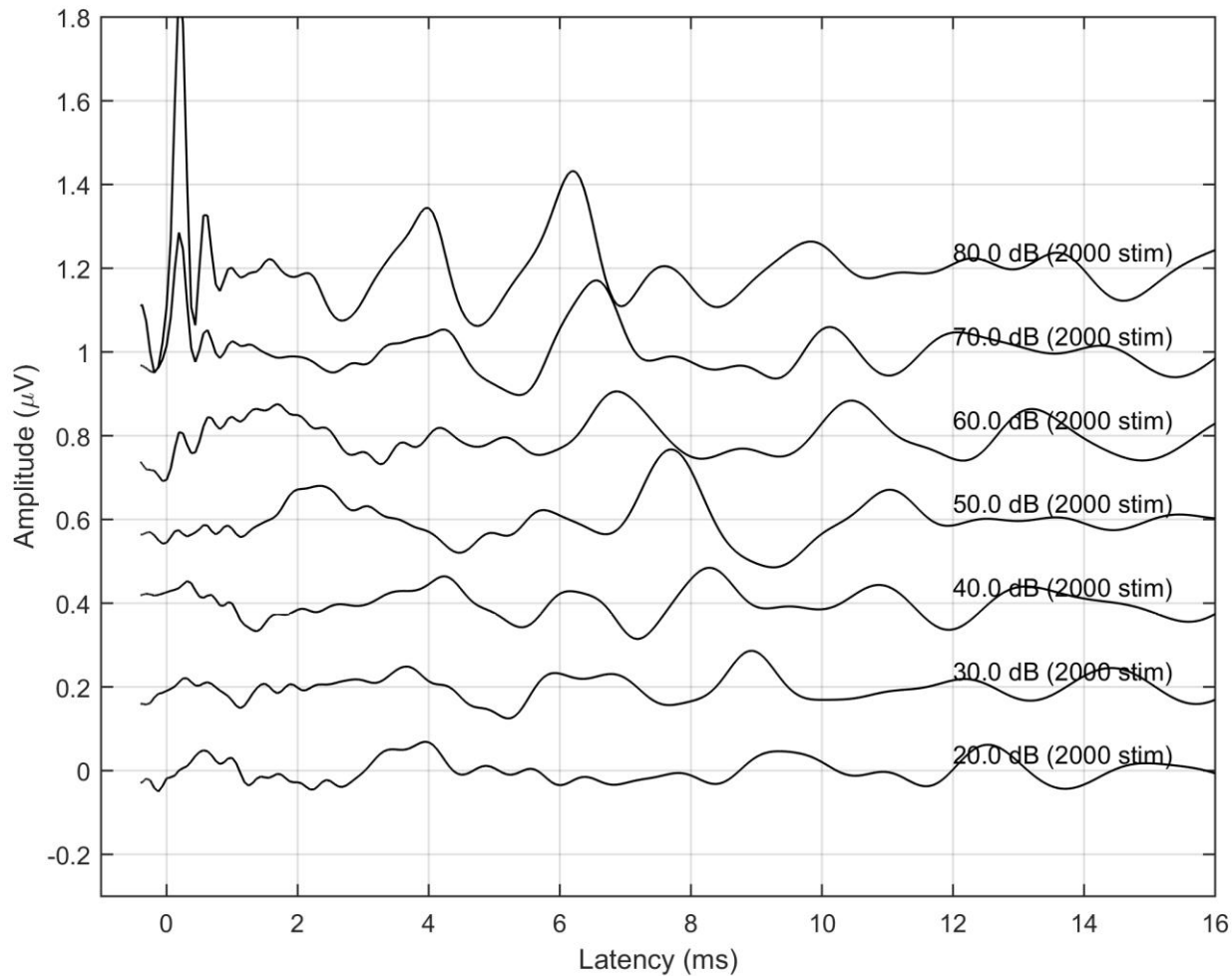
**ABRs
without
CM-removing**



ABRs
CM-removing
basic



ABRs CM-removing advanced



Signal Processing in Audiology Research Team



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