

# 27. Portable EEG device for precision hearing diagnostics through auditory evoked potentials

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Cochlear synaptopathy (CS) is a recently discovered form of sensorineural hearing loss that causes reduced numbers of auditory nerve synapses after ageing or exposure to noise or ototoxic drugs. Because CS occurs before hair cell damage in the progression of sensorineural hearing damage, it might be widespread among the population. Because CS predominantly affects supra-threshold hearing performance, it cannot be diagnosed using standard clinical hearing sensitivity measures. CS thus requires novel diagnostic methods using retro-cochlear techniques such as auditory evoked potentials (AEP) and portable EEG devices that go beyond what is presently available in clinical practice.

Here, we investigated which hardware constraints are required to conduct a newly developed AEP technique for non-invasive diagnosis of CS in humans. The CochSyn test uses a rectangularly-modulated pure tone stimulus to offer a marker of CS and we compare this marker against the standard clinical auditory brainstem response on a new hardware platform we developed. We afterwards built a battery-powered, portable EEG recording device that can be used along with conventional snap-on electrodes or cEEGrid around-the-ear electrode arrays to capture evoked potentials. The prototype can record low noise auditory brainstem and envelope following responses from 8 recording channels simultaneously, at a 16 kHz sampling rate. Electrical artefact from the mains power is kept minimal by introducing a driven-right-leg circuit and data is transferred to a host computer via wireless communication. Figure 1 shows a block diagram of the portable hearing diagnostic device. We will present our prototype solution along with the first recordings, that we compared to high-end research EEG amplifiers (IHS and Biosemi systems). We believe that this new generation of portable EEG device for AEP-based precision hearing diagnostics of CS represents the first steps to go beyond standard hearing care.

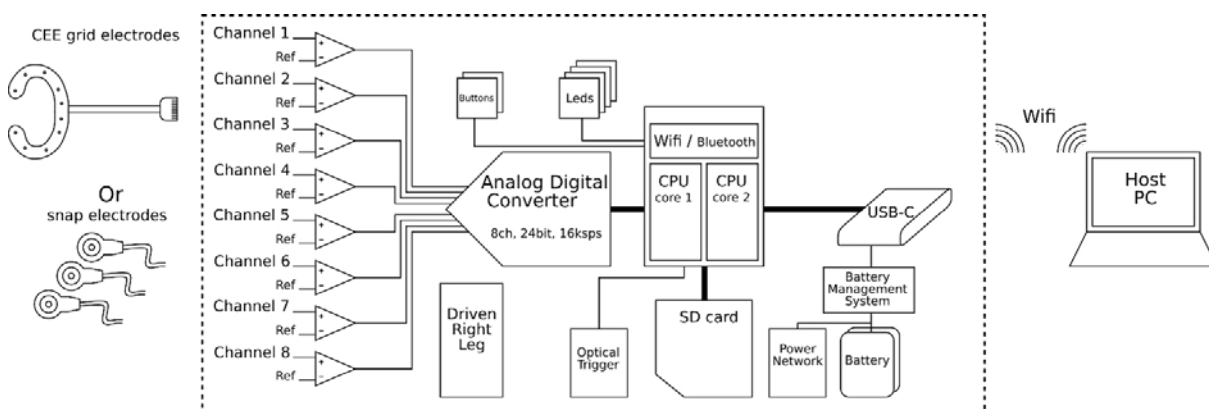


Figure 1. Block diagram of the prototype portable hearing diagnostic device.

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