

Background:

Estimation of responses of the complete auditory pathway (ABR+MLR+ALR) is possible with high stimulation rate and deconvolution (mathematical and numerical problems solved)

Statistical limitations:

- High stimulation rate and long analysis window cause high condition number in the matrix to be inverted (amplification of noise, particularly at late latencies)
- High stimulation rate causes low amplitude of late components

Solutions (but with limitations):

- Reduction of the analysis window and high-pass filter (ABR+MLR)
- Many stimuli to be deconvolved (long recording session)
- Lower stimulation rate (not natural stimulation and long recording session)

Methods:

Our solution:

- Structured stimulation sequences designed for good quality early and late transient responses
- Click bursts with configurable parameters: amplitude, inter-click interval, burst duration and inter-burst interval
- Early transient to click events; late transient to burst events

This significantly alleviates the statistical limitations

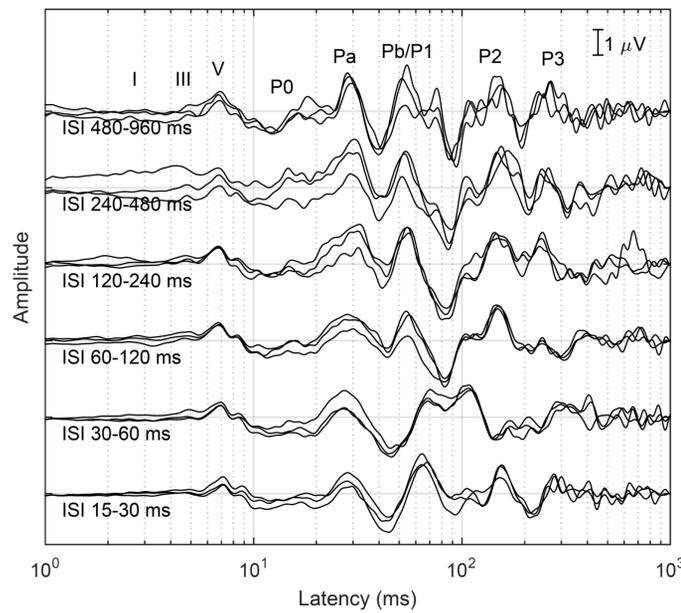
Other methodological aspects:

- Modular AEP recording system
- Multi-response deconvolution with LDF [De la Torre et al. JASA: 155, 3639–3653, 2024; 151, 3745–3757, 2022; 148, 599–613, 2020]
- Independent response models for click and burst events and for each stimulation level

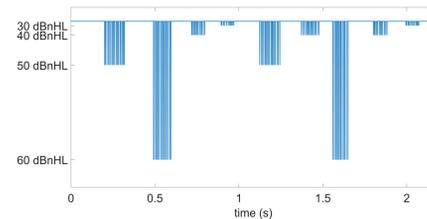
Results:

- Responses from 10 subjects (15 minutes of recording each)
- Predominance of peripheral responses to clicks / central responses to burst
- Amplitude of MLR/ALR to bursts larger
- Some dependence of ALR with attention observed (?)

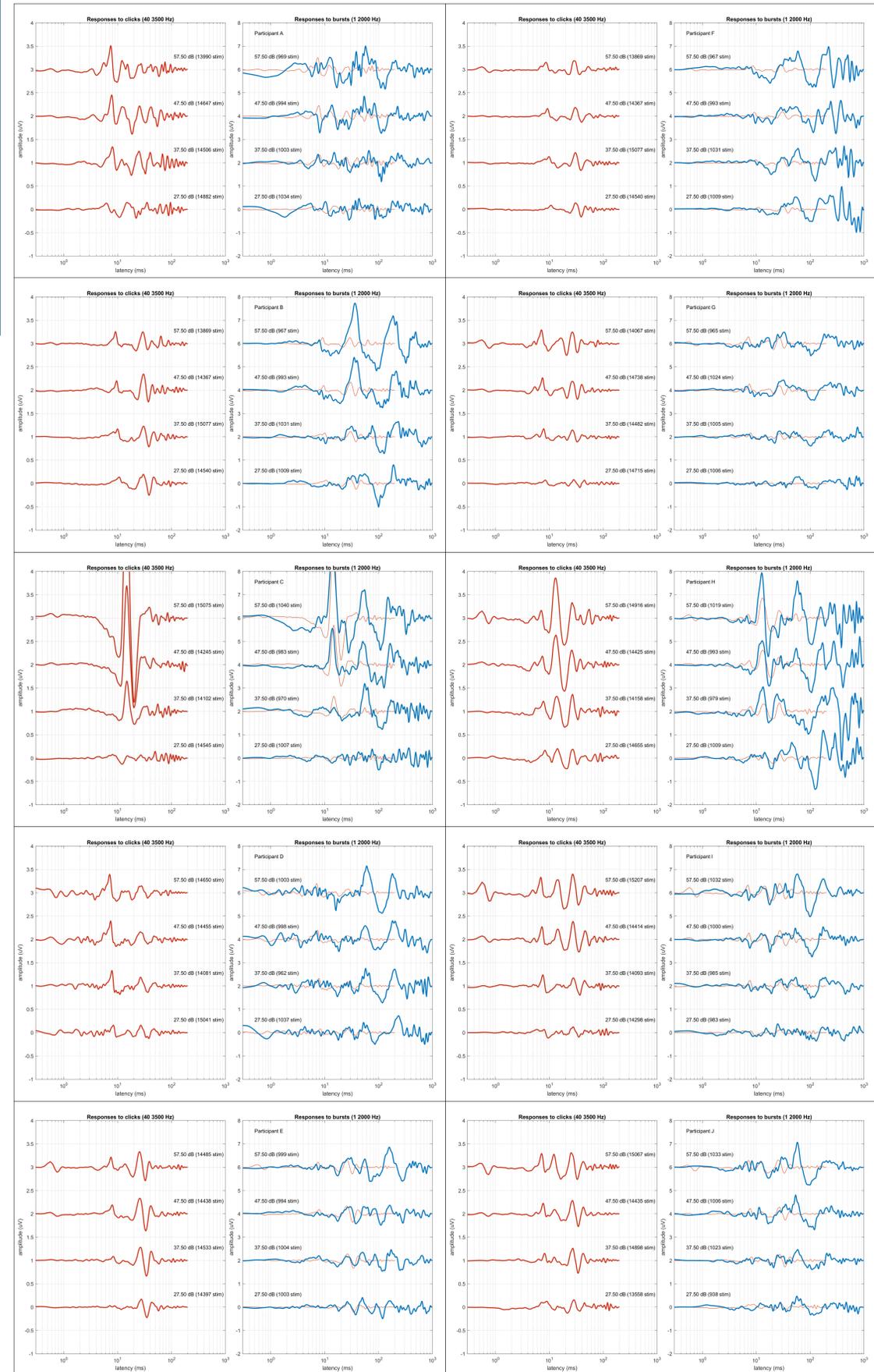
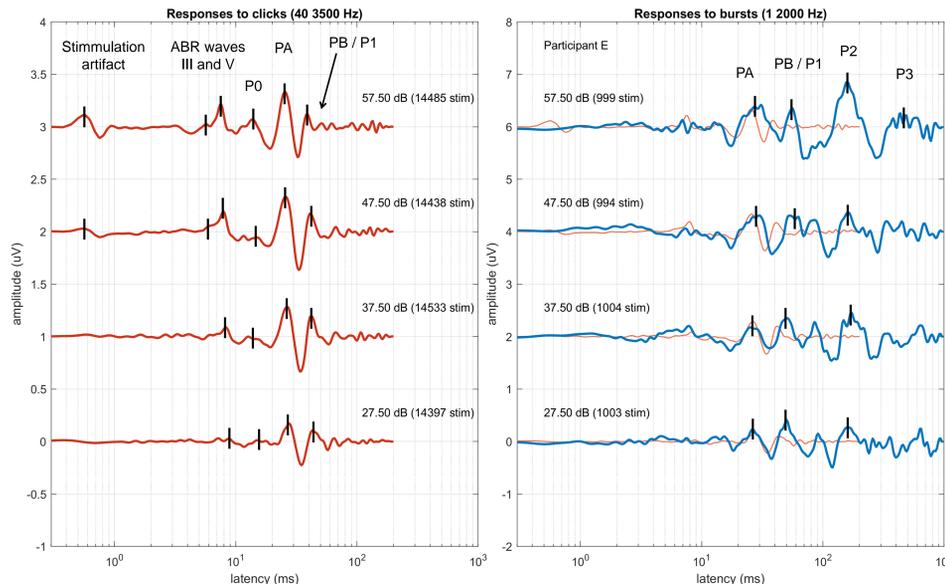
Responses of the complete auditory pathway clicks 74 dB at different stimulation rates (each condition required 11' 24" of recording). De la Torre et al. JASA 148 (2), August 2020, pp 599-613



The structured stimulation pattern



Analysis of responses to clicks and bursts events



Conclusions: The experimental results provide a better understanding of the difficulty associated to the simultaneous recording of the early and late responses, as well as a better understanding of the auditory processing at different levels of the auditory pathway.

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