

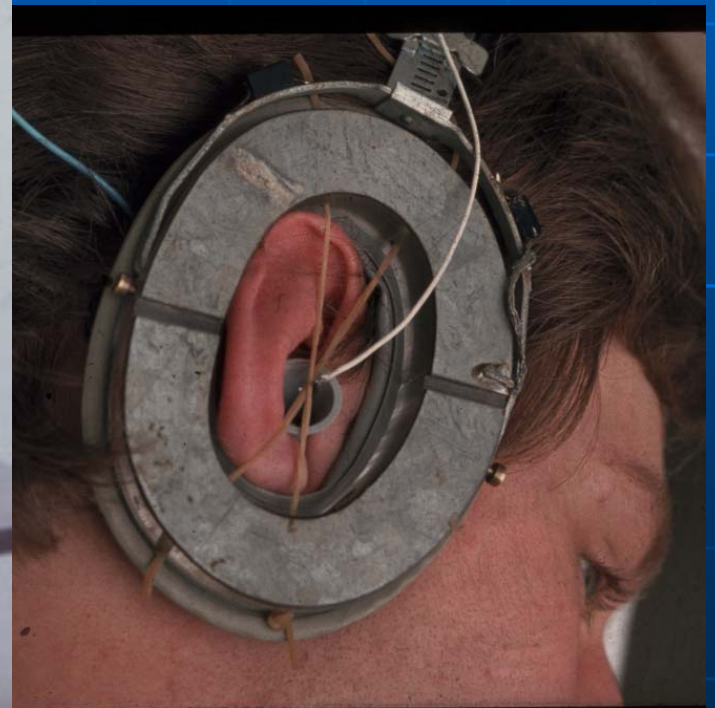
20 years of cochlear implants

Guido F. Smoorenburg

University Medical Center Utrecht NL



Pre-operative electrostimulation



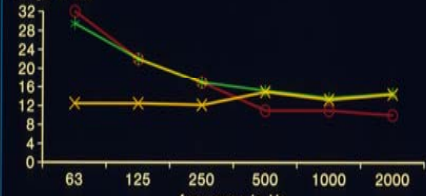
House-3M with 1 electrode



dynamic range

patient 3

range in dB



at rw

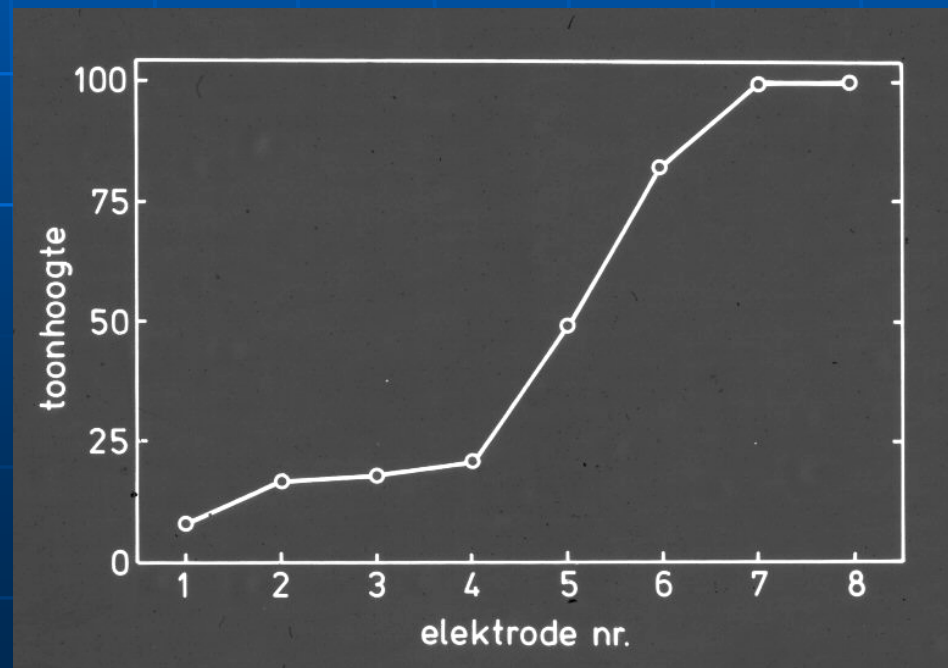
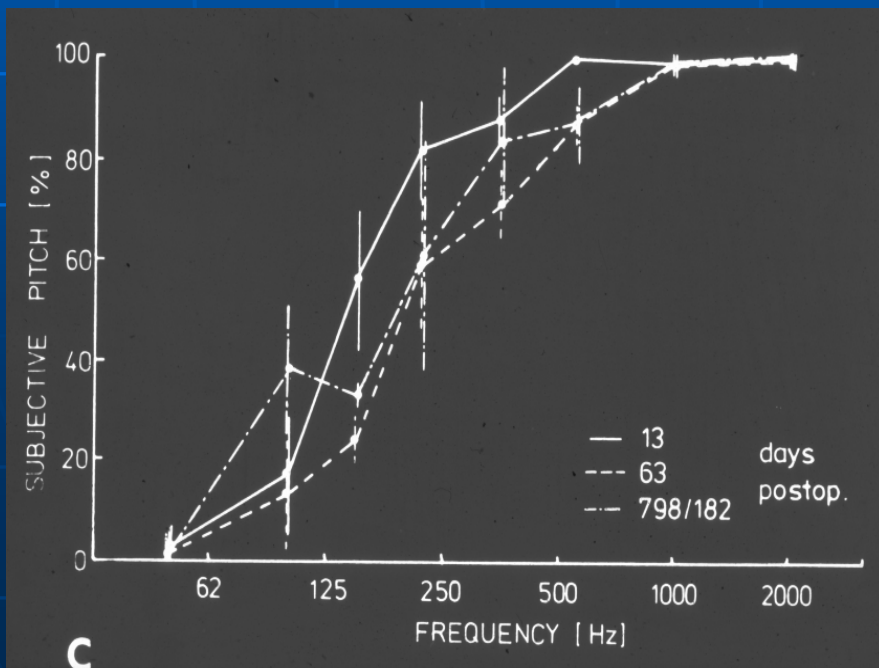
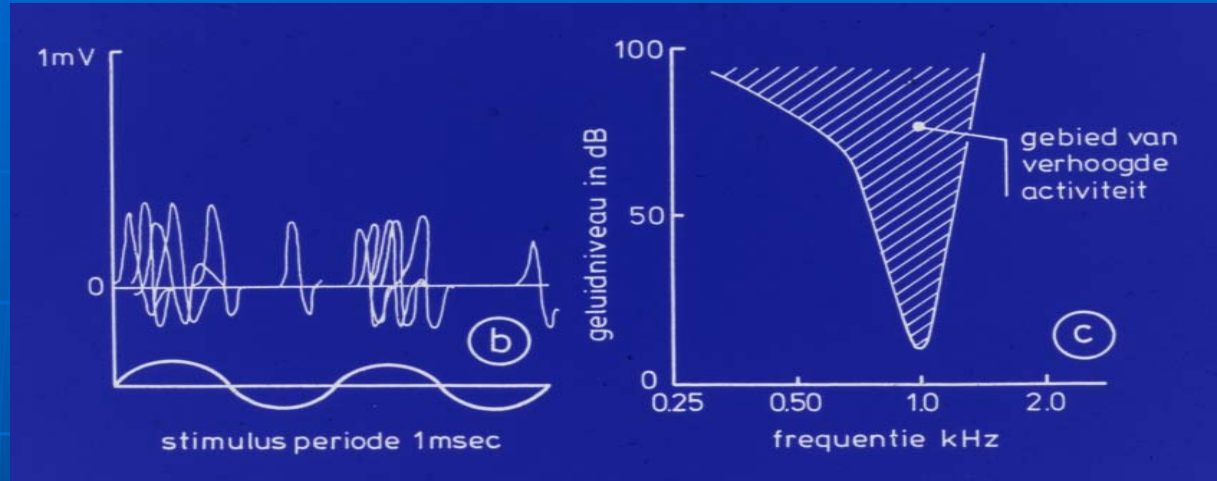
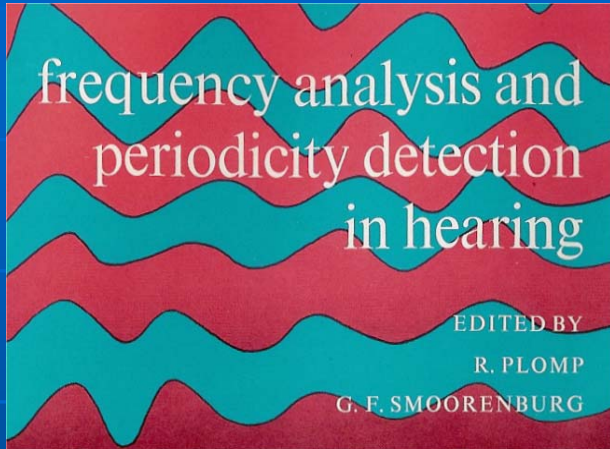
pre-op post-op 3M post-op AZU



Present issues in CI

- Binaural hearing
- **Response stochasticity**
- Soft surgery, electro-acoustic stimulation
- Directional microphones; S/N improvement
- Links to the communication world, Hearcom
- Brainstem implants
- Modiolus hugging
- Music perception
- Smart processor fitting
- Neuron regeneration, revitalization

Place vs. temporal coding



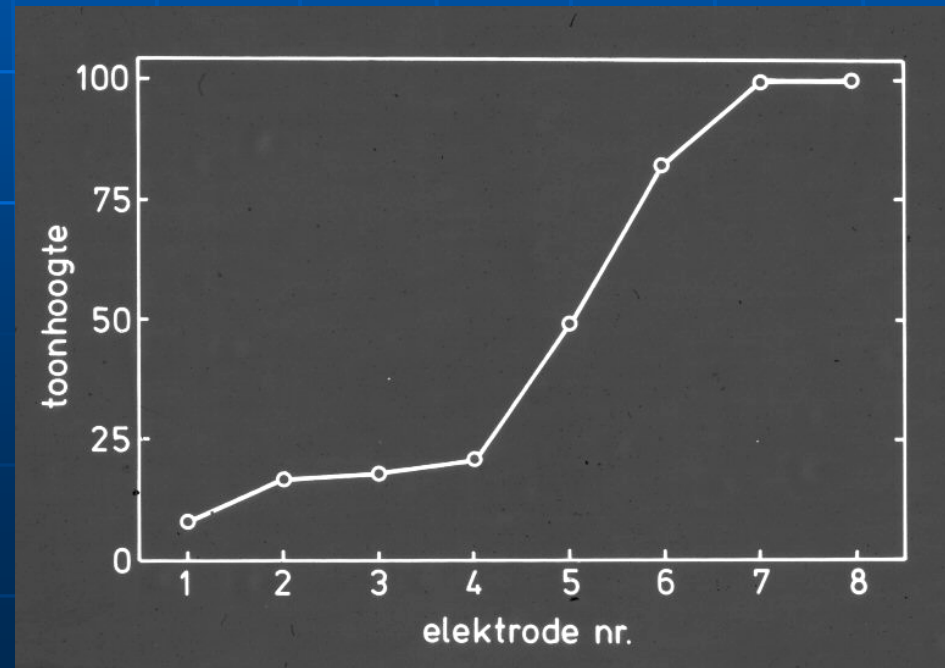
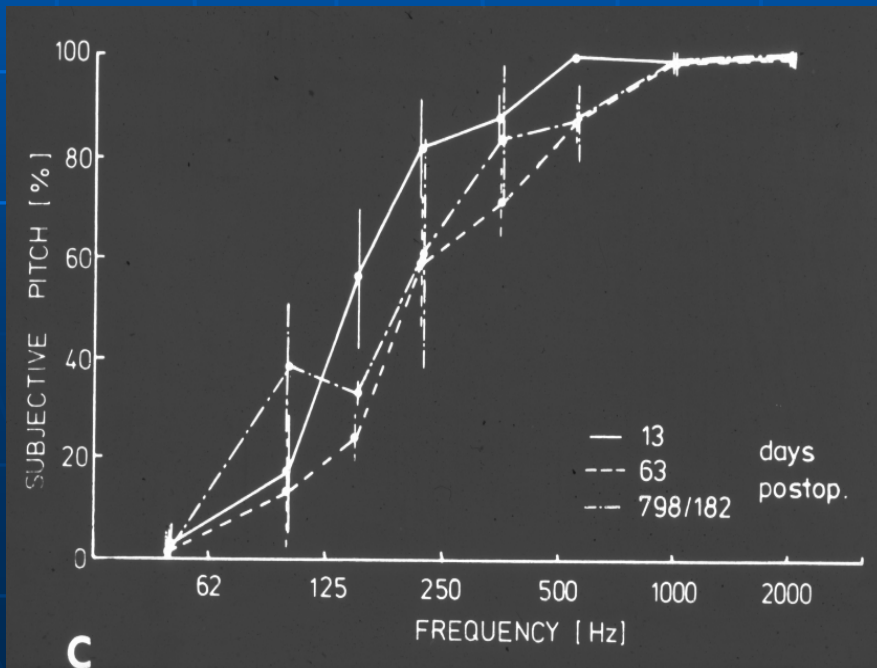
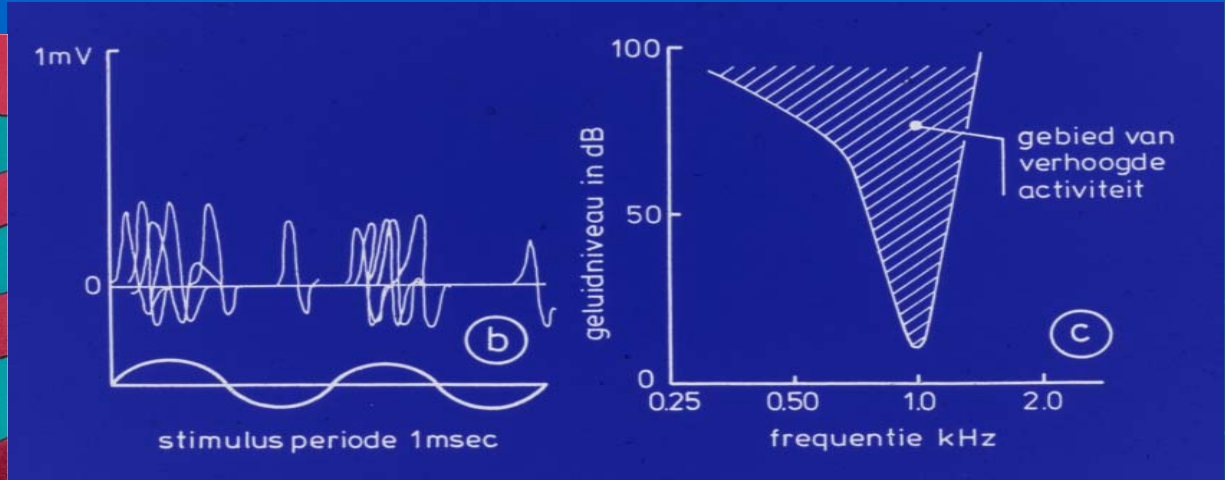
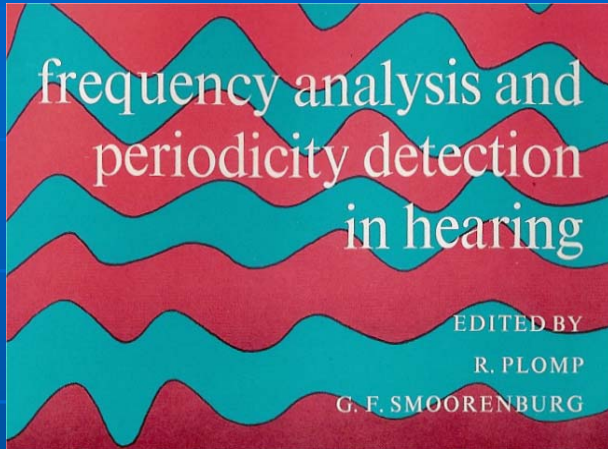
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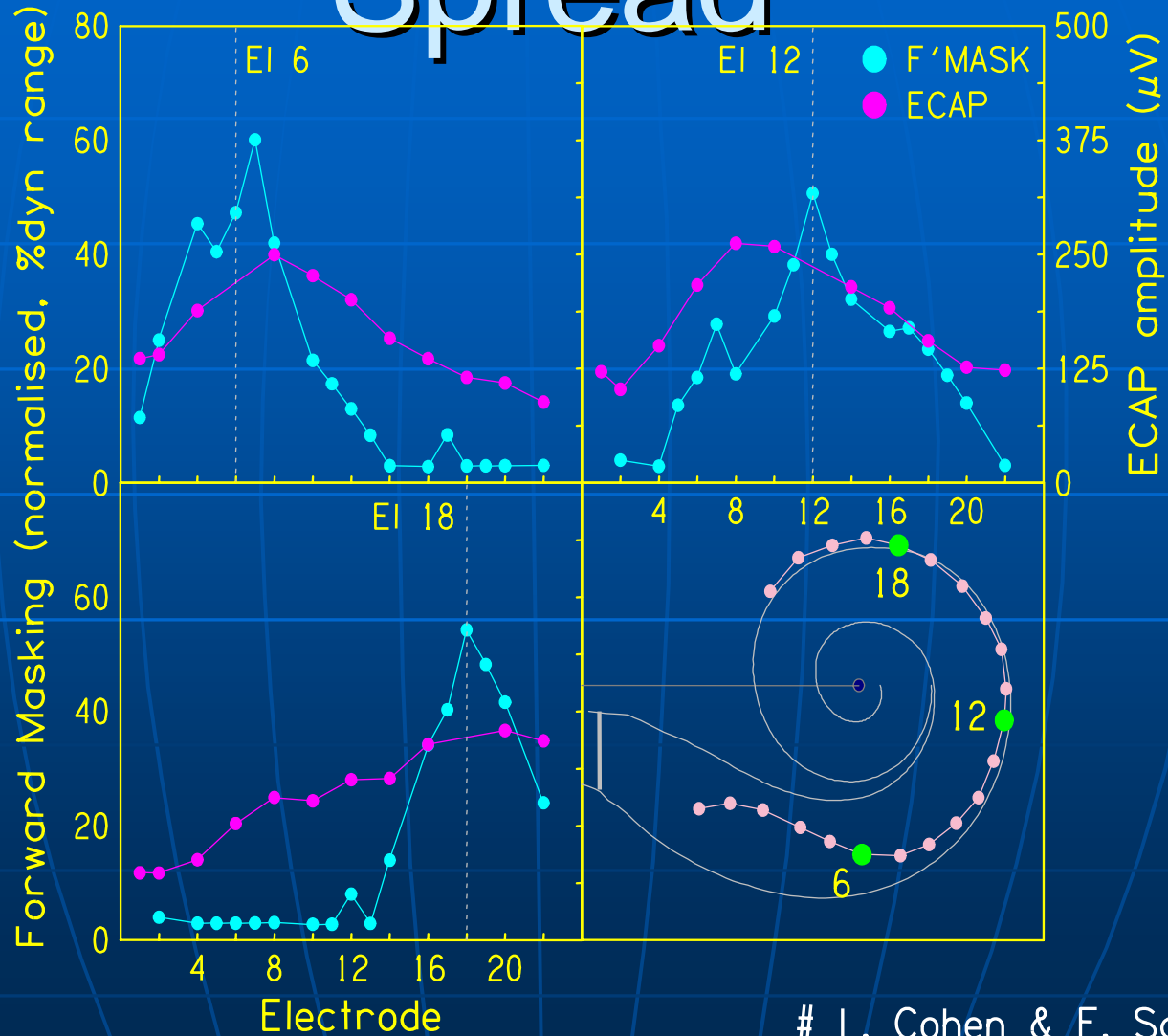
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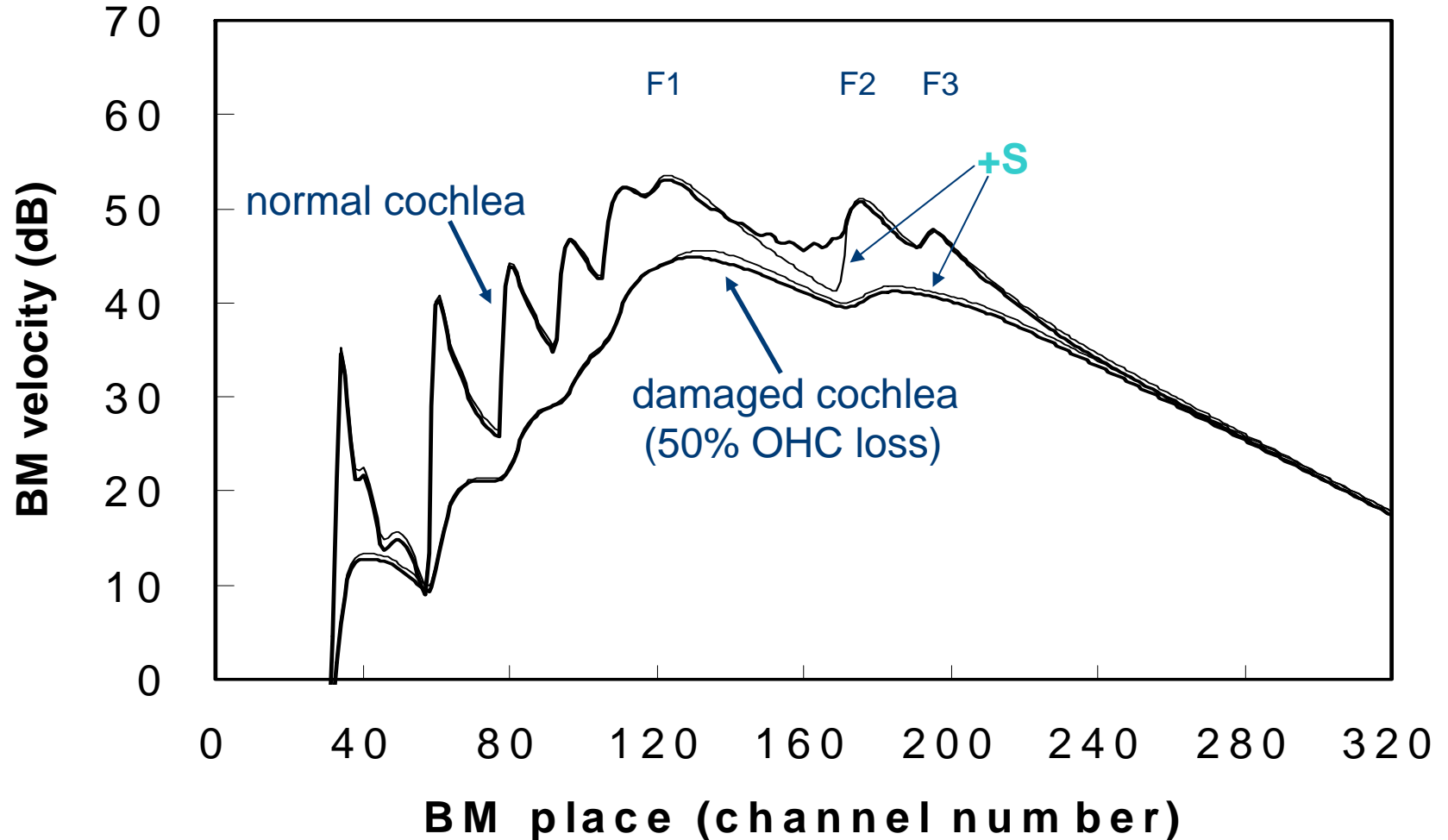
Place vs. temporal coding



Forward Masking & ECAP Spread



/ae/ 55 dB SPL



+S: Spectral enhancement = 8 harmonics retained
(F0, 2F0, 3F0, 4F0, 5F0, 6F0, 14F0, 19F0)

Nucleus 24 Contour

- Self-curling electrode array
- 22 half-band electrodes
- Adjacent to the inner wall of the cochlea
- Cast *pre-curved* to regain pre-designed shape & size



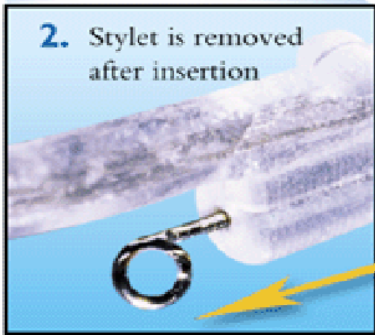
Contoured for Safety

The electrode array is easily inserted with the help of a malleable stylet, as shown below:

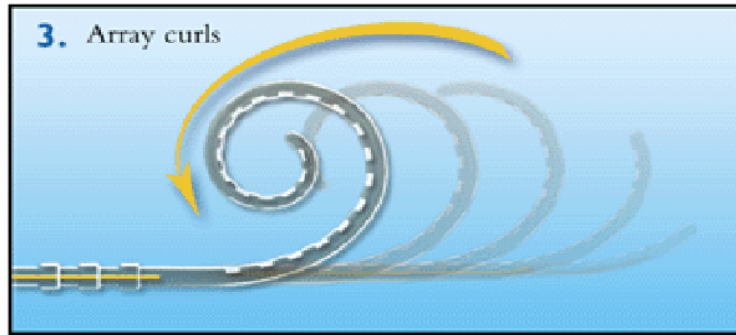
1. Stylet holds the array straight prior to insertion.



2. Stylet is removed after insertion



3. Array curls



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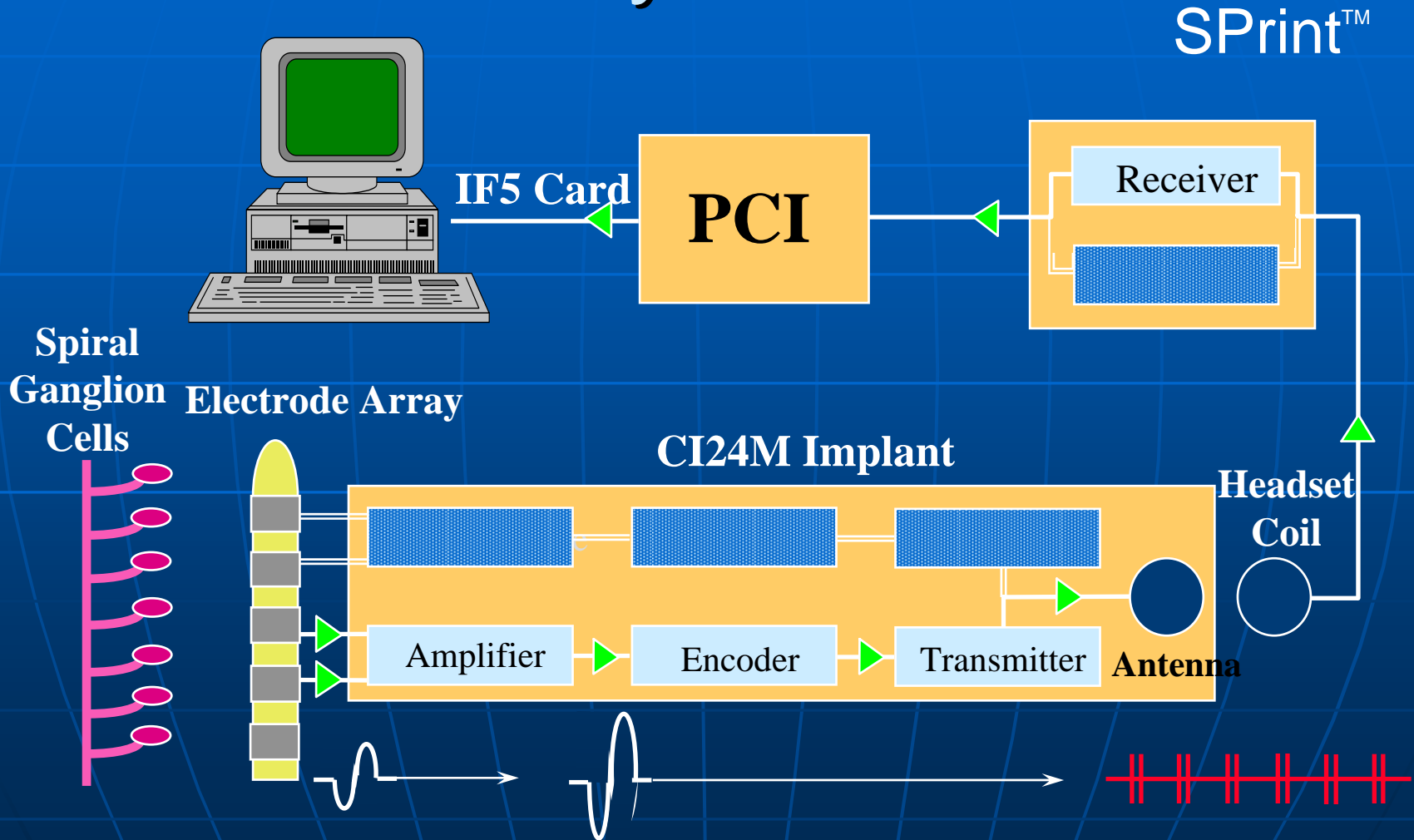
Partial Insertion



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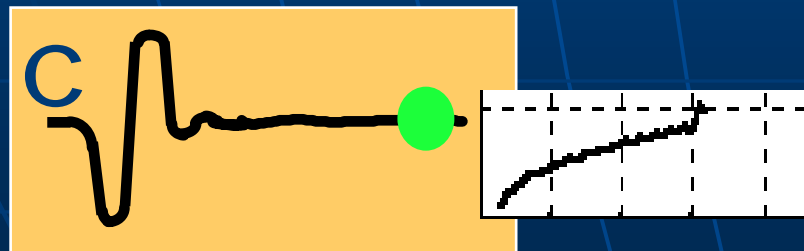
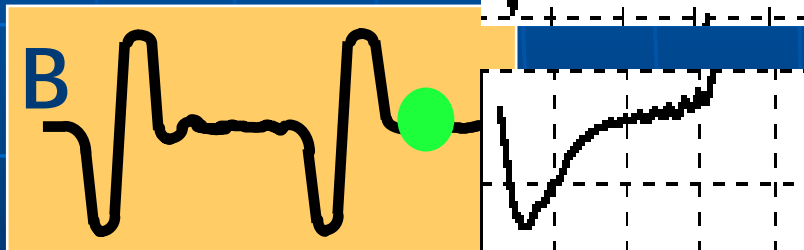
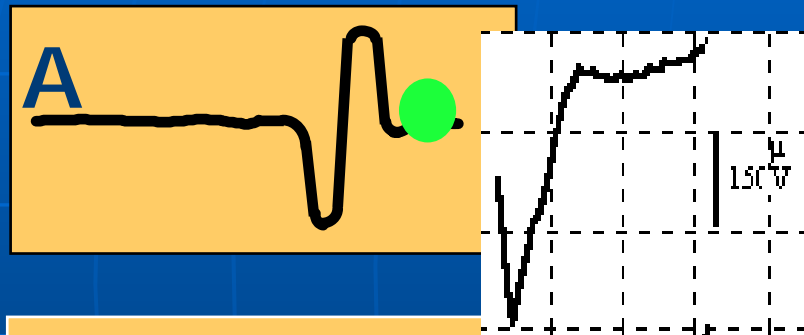
Neural Response Telemetry System



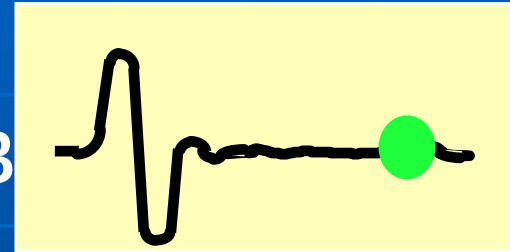
Stimulus Artefact Suppression

Recorded Response

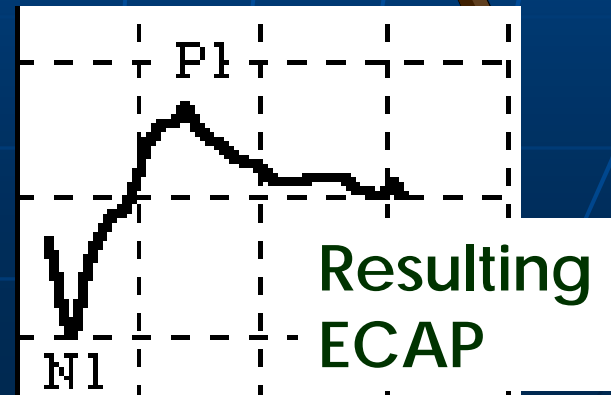
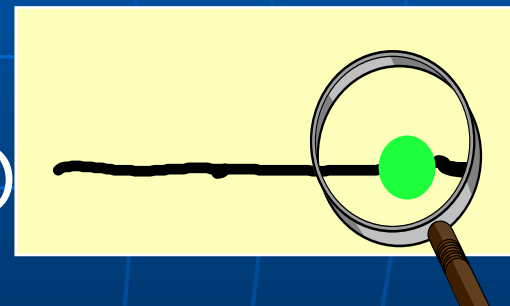
Subtraction Algorithm



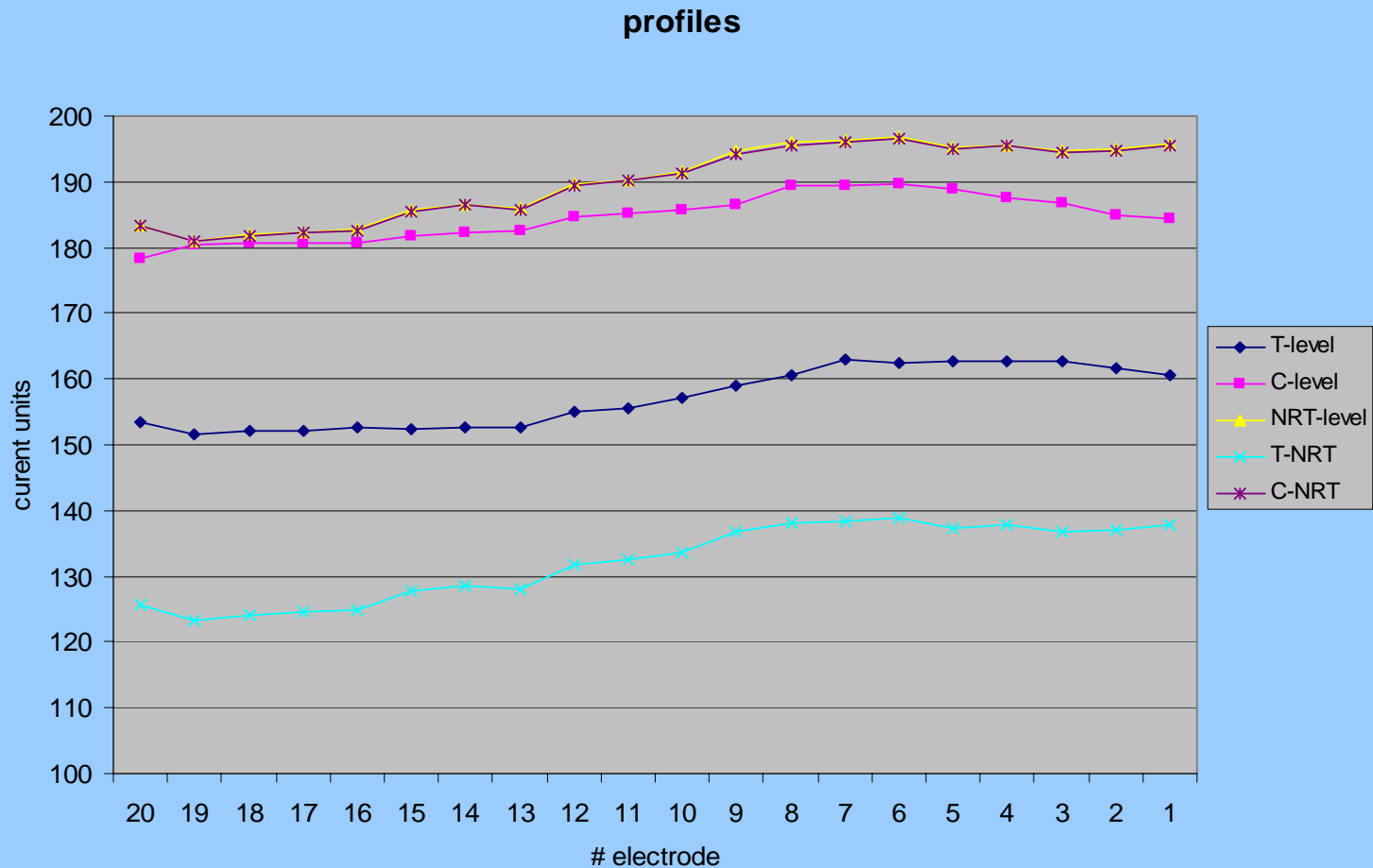
$A - B$



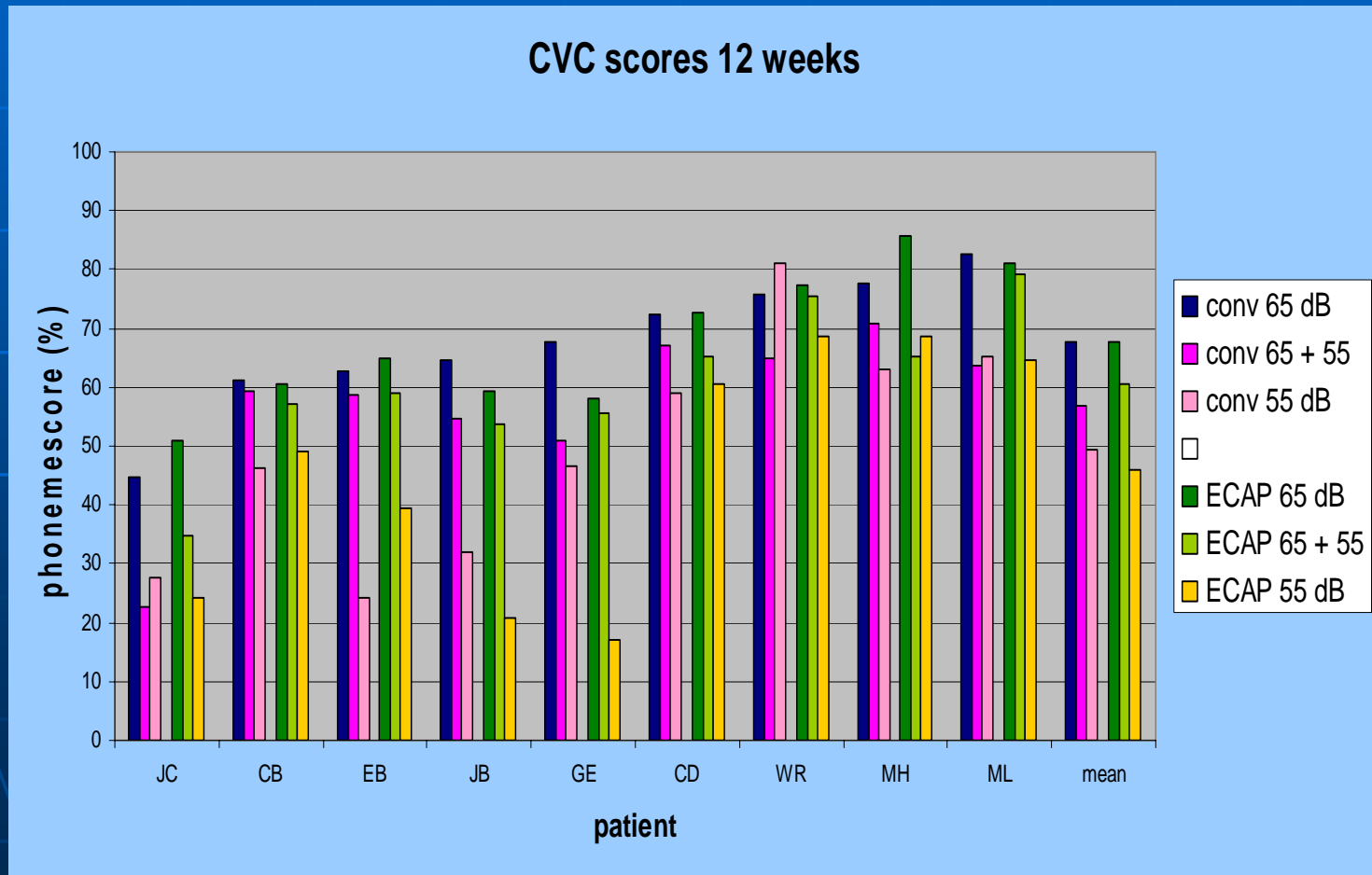
$(A - B) + C$



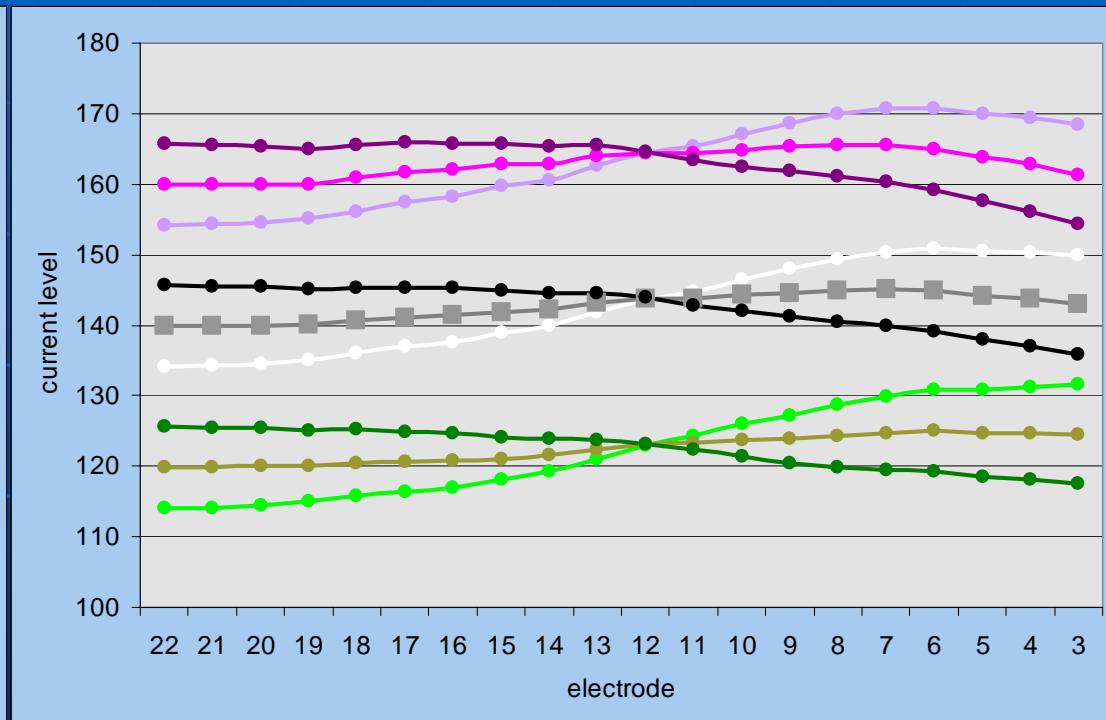
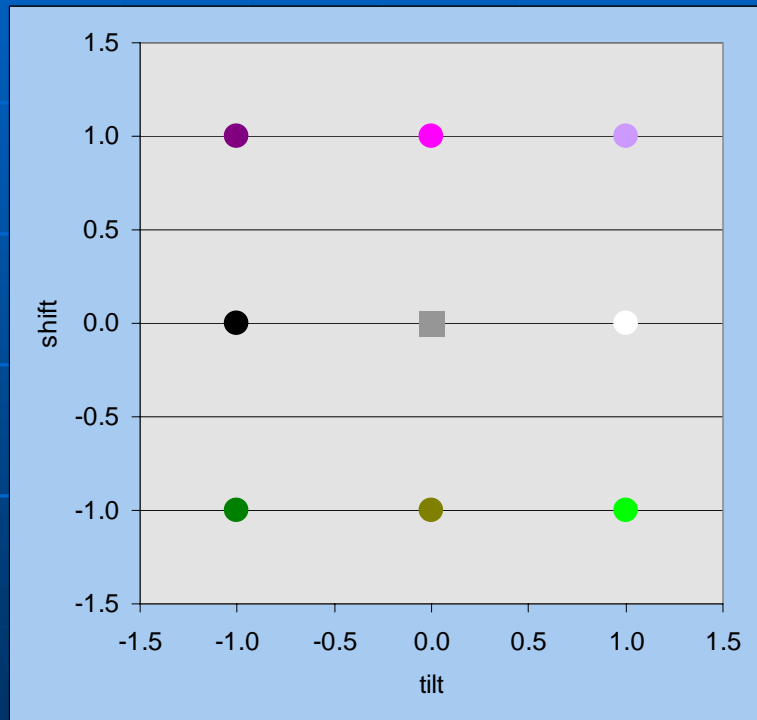
Comparison of ECAP to T-C MAP



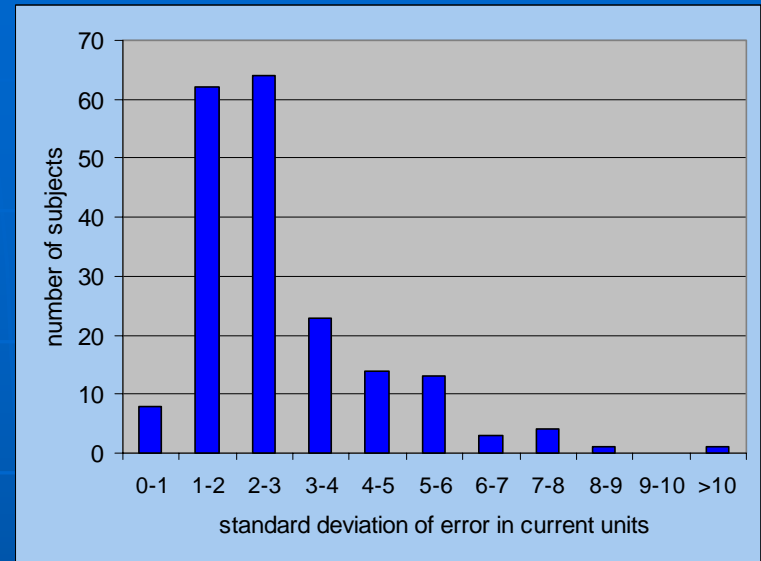
CVC scores for T-C and ECAP-based MAPS



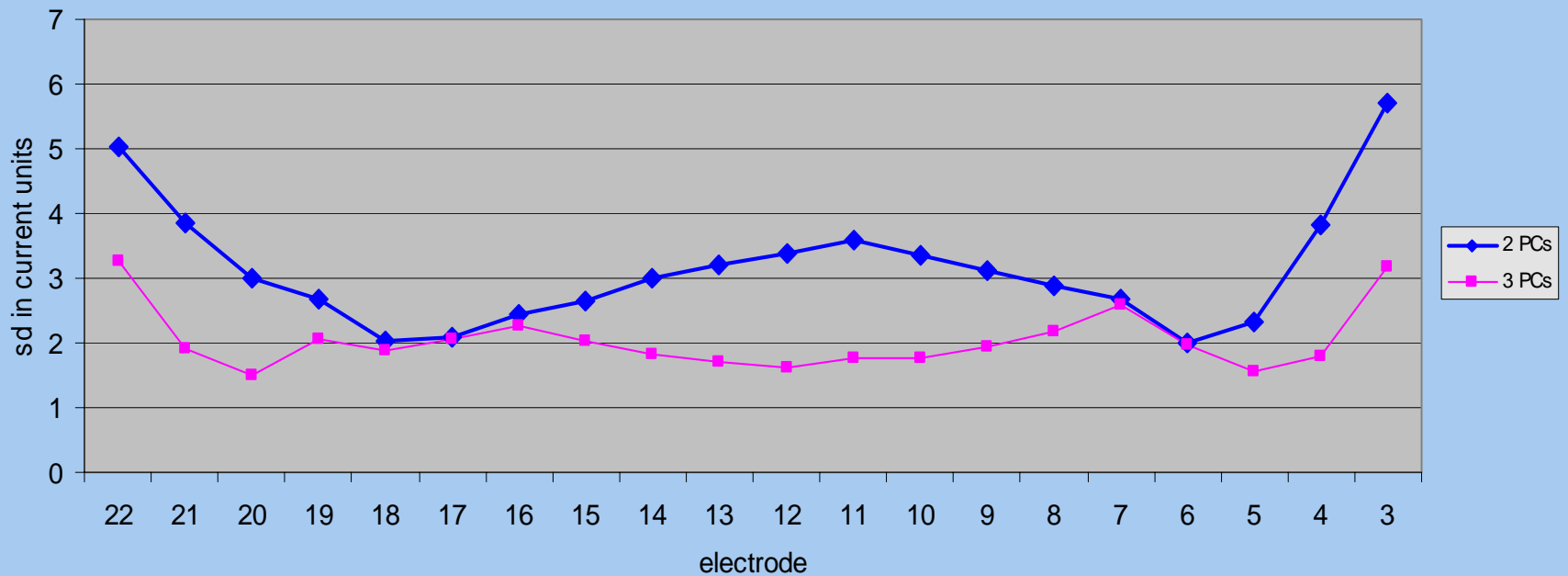
Generating profiles by shift and tilt controls



Error in generating C-levels



C-levels measured-predicted



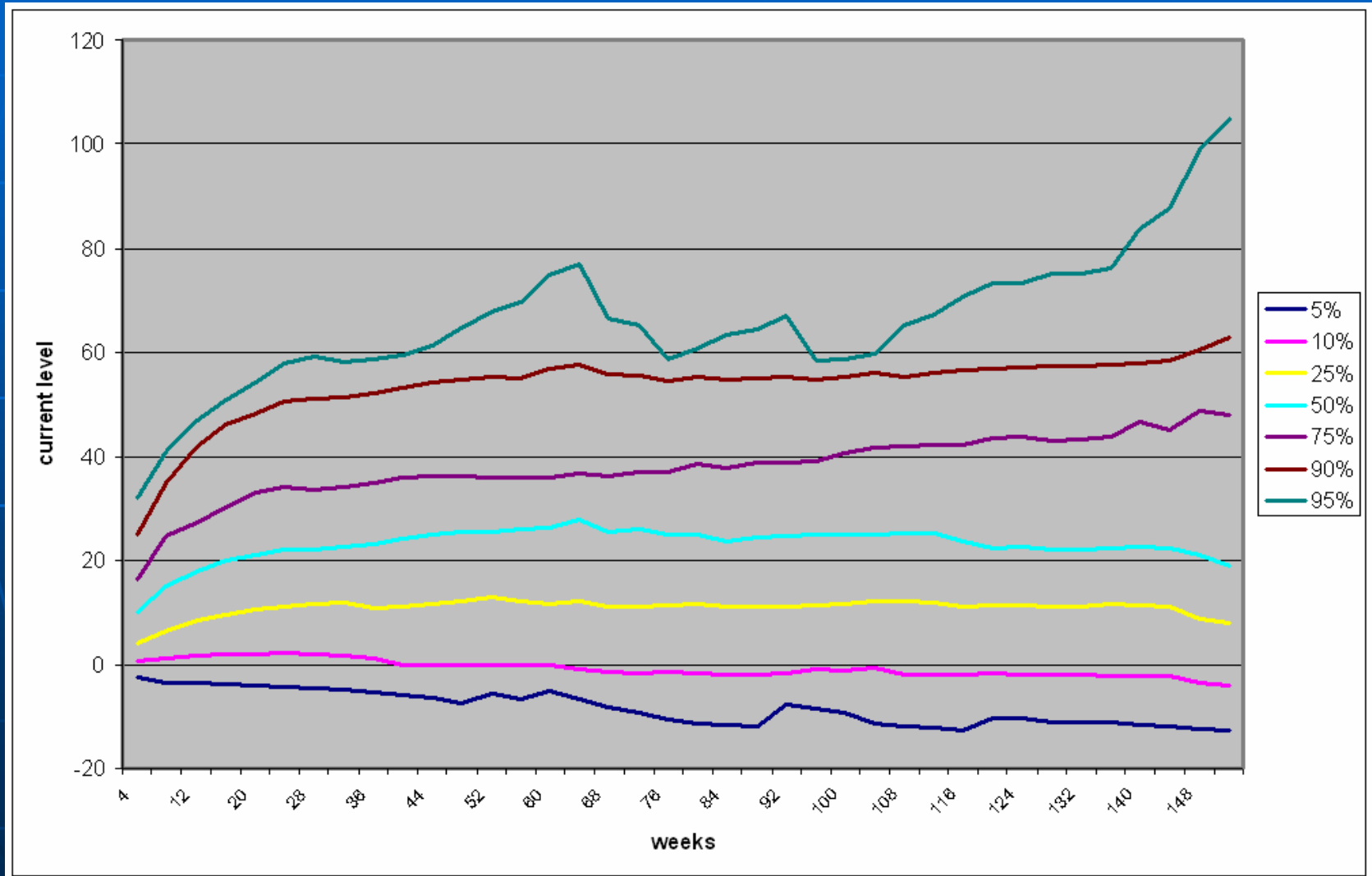
Exp. 3. Recipient self fitting

- Experimental processor developed at Cochlear Technical Centre (CTC), Mechelen, Belgium
- Bas van Dijk, CTC
- René Roos, Technical University Eindhoven

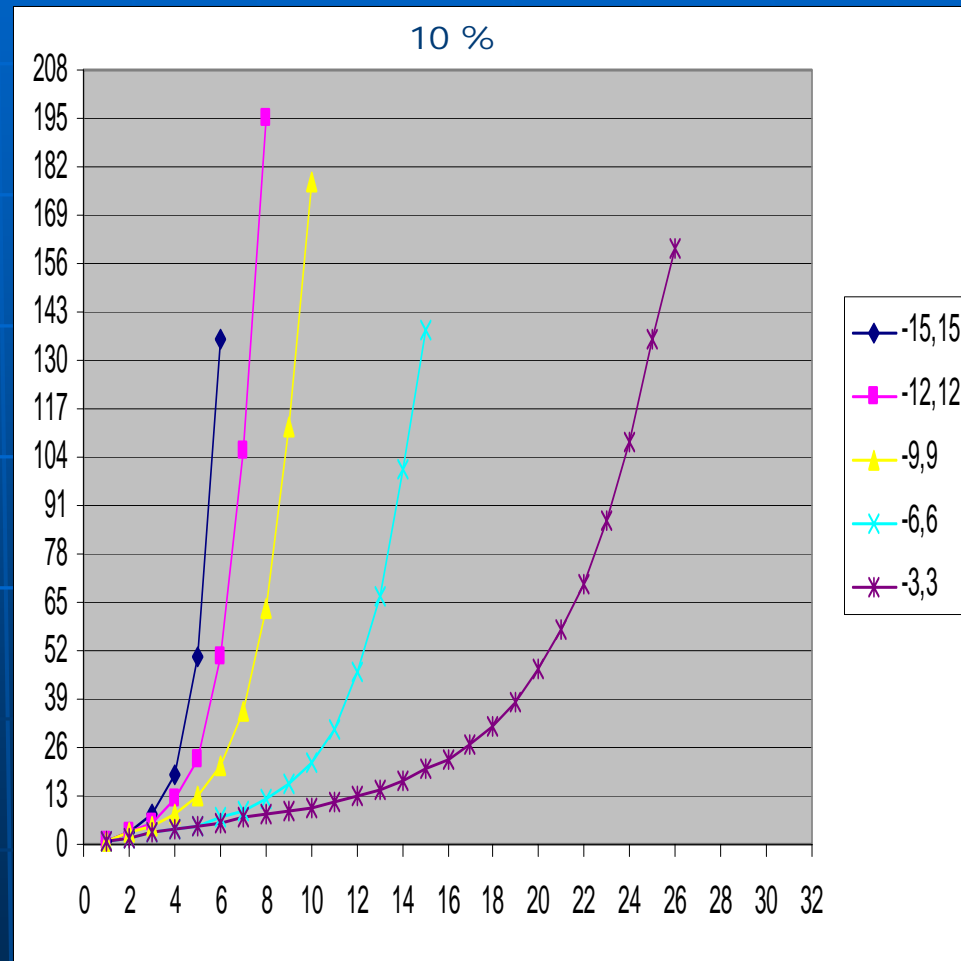
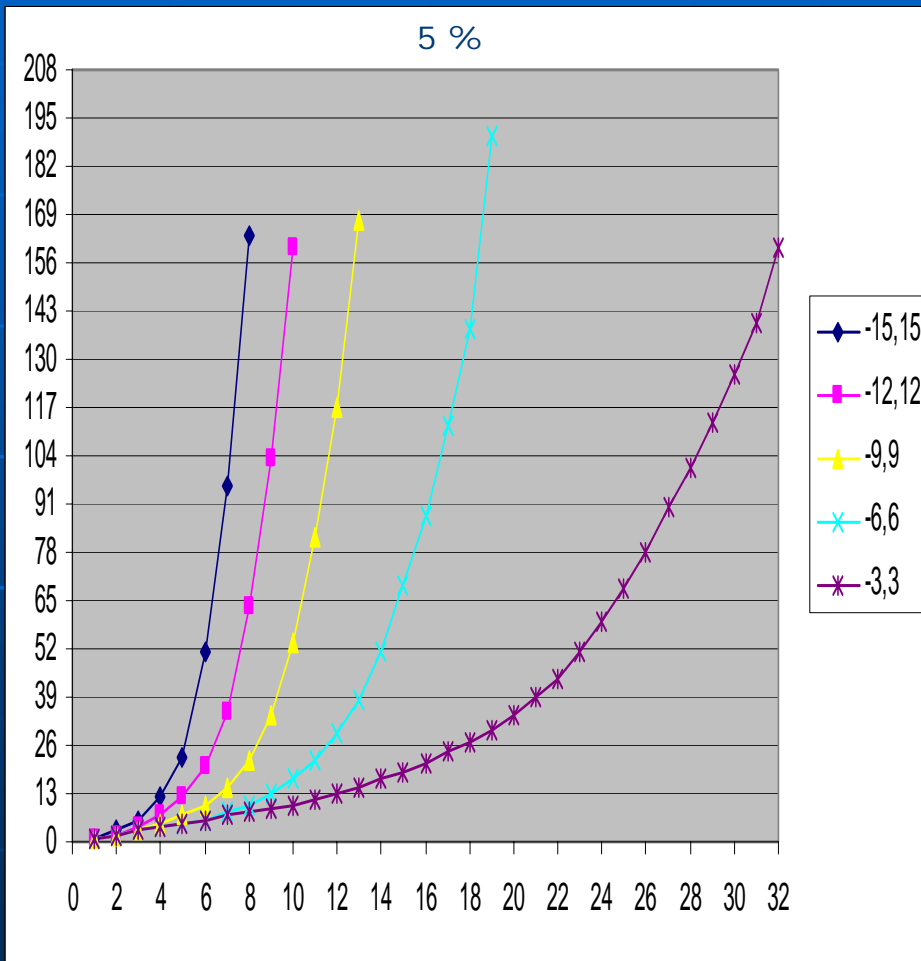


- Processor allows for shift and tilt adjustment of T- and C-profile

Loudness comfort level (time)



Refitting schedule C-levels



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