A new stimulation mode: the Virtual Tripole

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Current Steering

- Increases “sites” of stimulation in the cochlea (Firszt et al., 2007; Koch et al., 2007; Luo et al., 2010).

- **BUT:** Spread of excitation similar to MP (monopolar) stimulation = **Same Channel Interaction!** (Hughes et al., 2013; Busby et al., 2008; Miyoshi et al., 1996)
Current Focusing

- Reduces spread of excitation = reduces channel interaction (Landsberger et al., 2012; Fielden et al., 2013).
- Improves spectral resolution (Berenstein et al., 2008)
- Improves Speech in Noise (Srinivasan et al., 2013).

**BUT**: Limited to “physical” electrodes
VTP (Virtual Tripole)

- Current steering + current focusing:
  - Increase stimulation sites.
  - Reduce channel interaction.
Method: Spread of Excitation

- Forward masking (2IFC task - probe detection in presence of a masker):
  - **Masker:** Monopolar Virtual Channel or Virtual Tripolar (El. 8.5)
  - **Probe:** Always Virtual Tripolar (Els. 6.5, 7.5, 8.5, 9.5 and 10.5).
Result: Spread of Excitation
Methods: Spectral Resolution

- Experimental maps (AB research processors):
  - **Exp-MPVC**: Steered strategy (AB Fidelity 120 tight implementation).
  - **Exp-VTP**: Exactly the same + focusing.

- Spectral resolution task (SMRT- Aronoff & Landsberger, 2013).
  - **Three sounds**: Which one is different?
Result: Spectral Resolution

Steered + Focused:
✓ Almost everyone Improved
Presumably VTP (Virtual Tripole) stimulation brings improvements for ‘some’ people in:

- Channel interaction.
- Speech in Noise.
- Ease of listening.

What about children?

- Less channel interaction compared to adults?
- Better use of spectral information?
- Could this new strategy lead to better/faster language development for pre-lingually deaf children implanted with a CI?