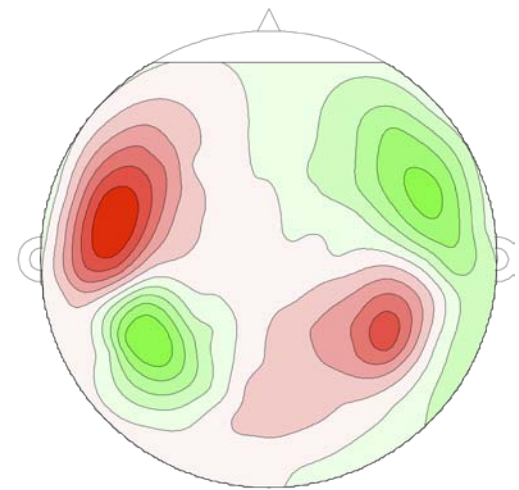


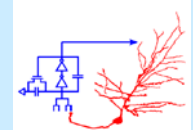
The Neural Representation of Auditory Modulations Relevant to Speech



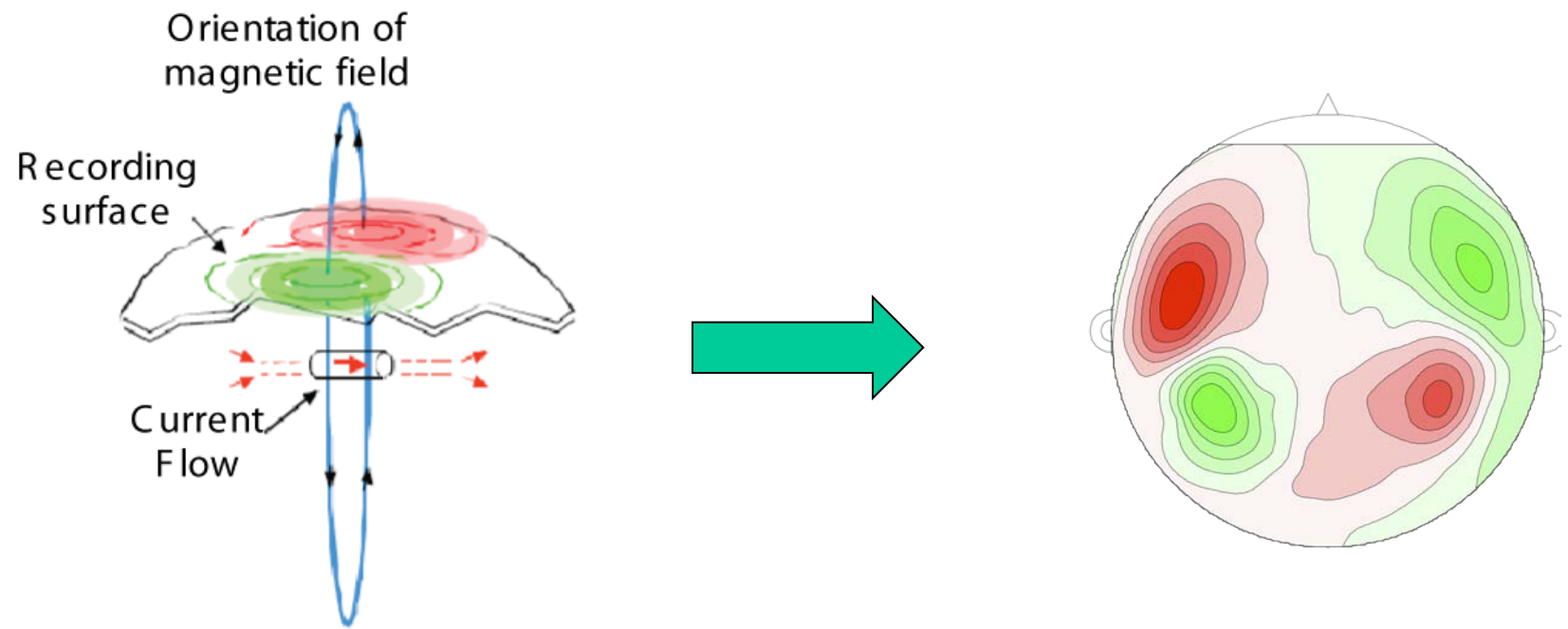
Nick Asendorf and Marisel Villafaña-Delgado

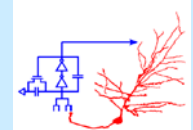
Nai Ding and Kai Sum Li

Dr. Jonathan Simon



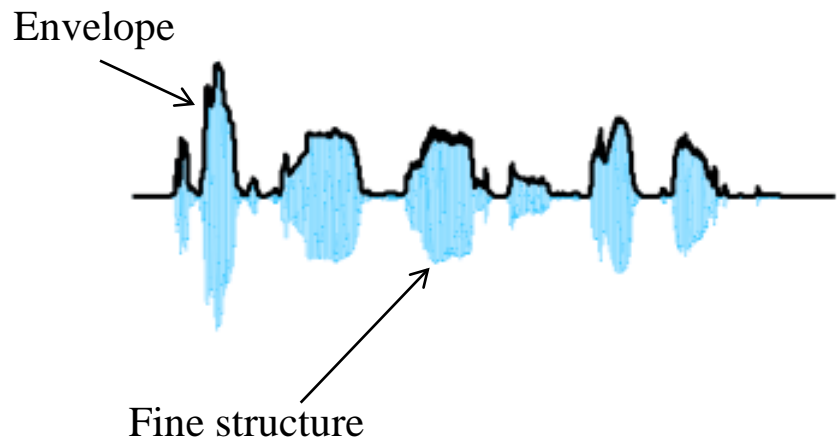
- Magnetoencephalography (MEG)
 - Records neurally-generated magnetic fields
 - Good temporal resolution



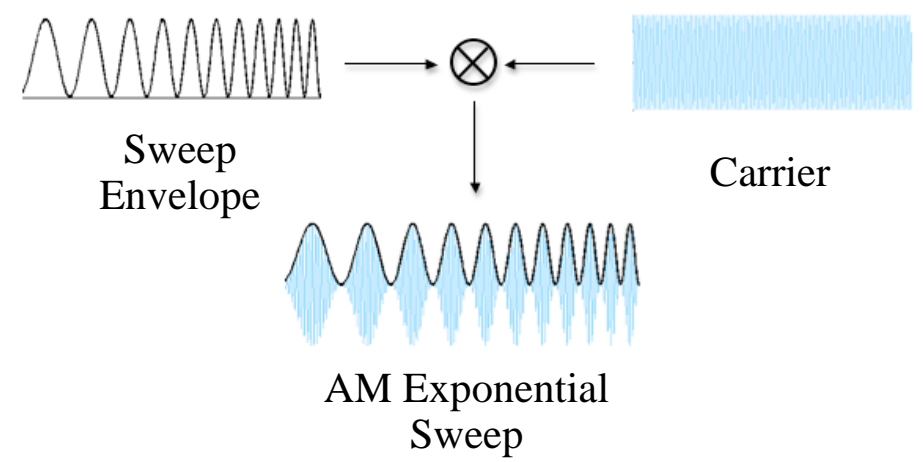


- Speech signals contain modulation rates below 15 Hz
 - Peak around rates of 3 – 4 Hz

Speech signal



Our stimuli





- Modulation Transfer Function (MTF)
 - Output: Neural response
 - Input: Stimulus Envelope

Auditory AM
Stimulus
Envelope

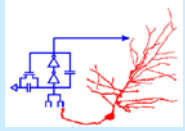


pakflower.wordpress.com

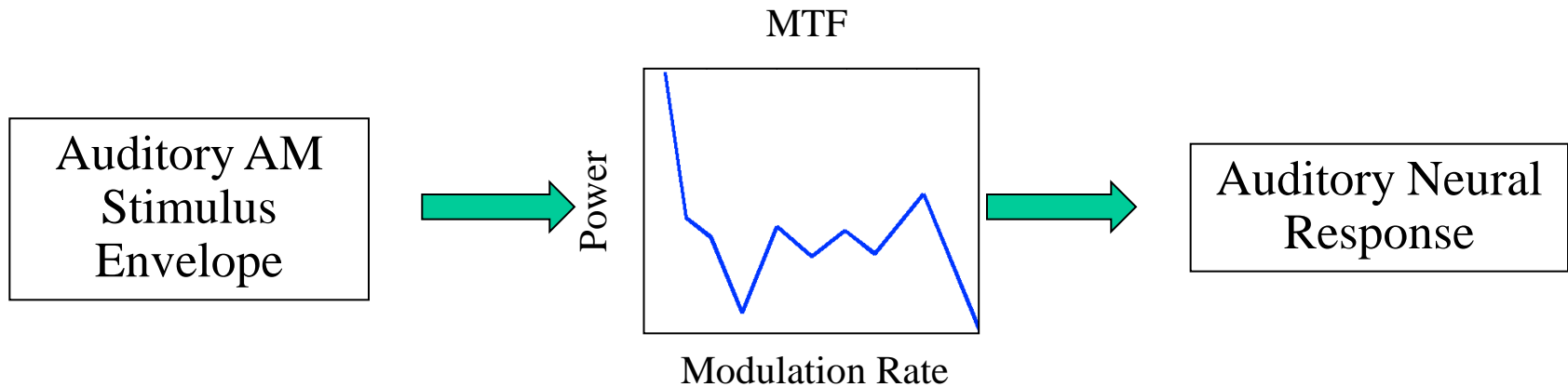
m

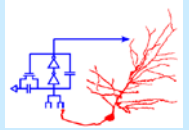


Auditory Neural
Response



- Modulation Transfer Function (MTF)
 - Output: Neural response
 - Input: Stimulus Envelope

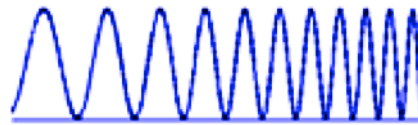




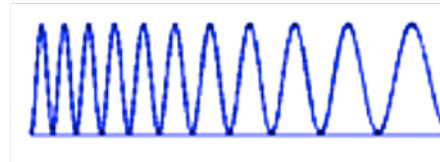
- Objective – Characterize the low-frequency MTF

Stimulus Envelope

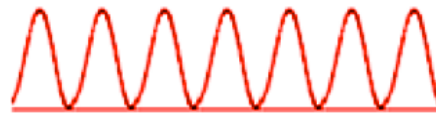
Upward sweep



Downward sweep



Constant AM

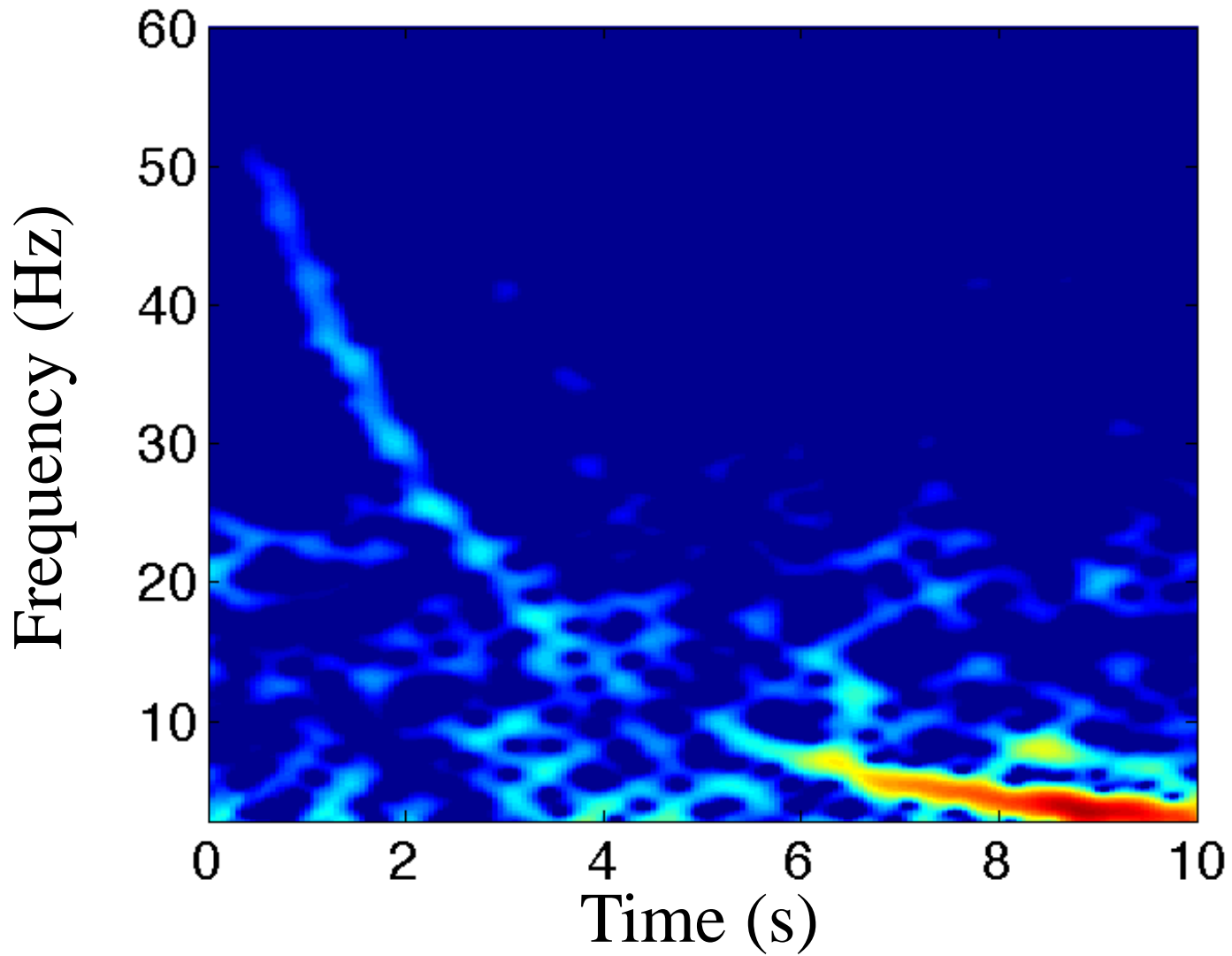
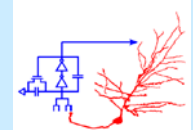




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Spectrogram of Neural Response

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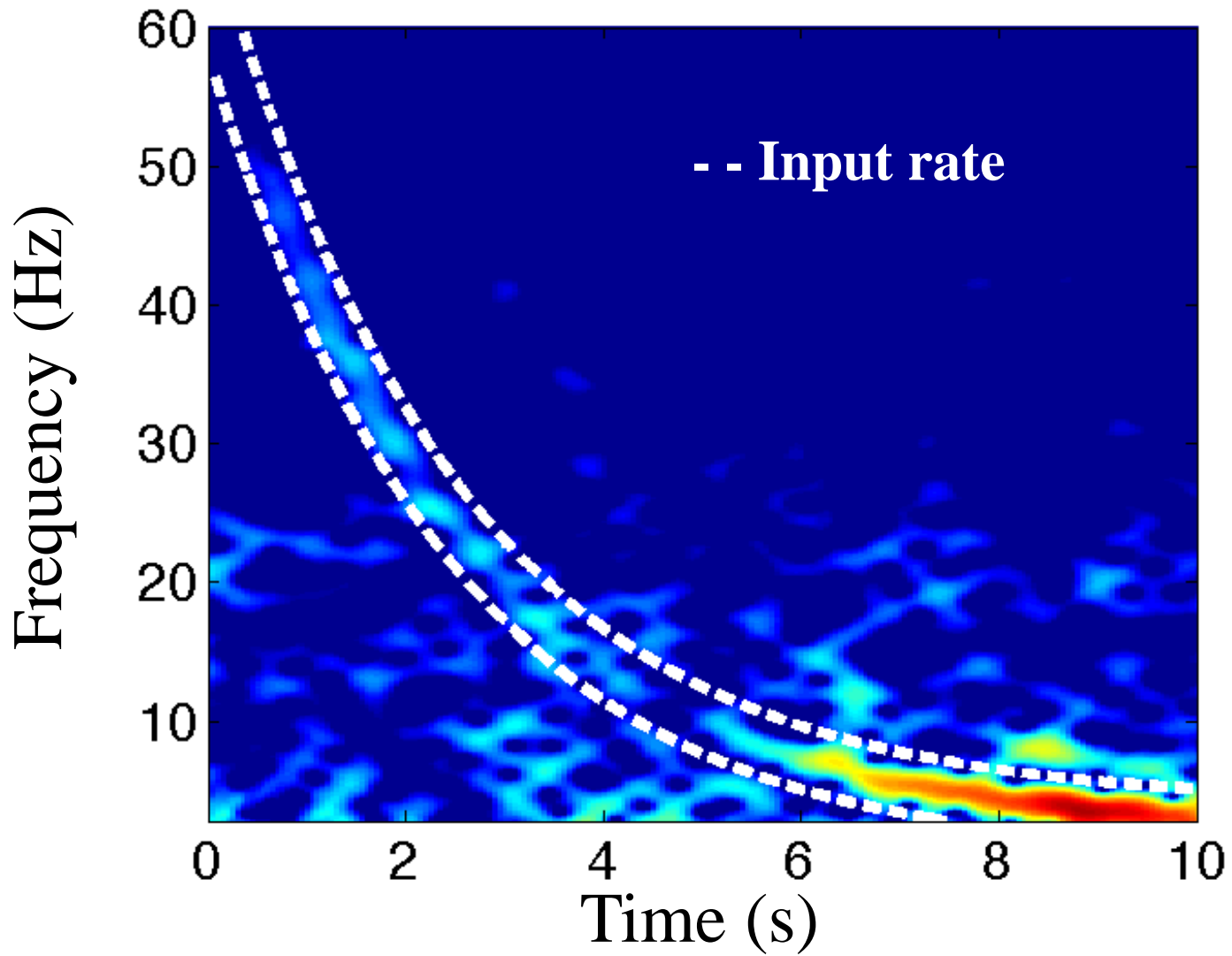
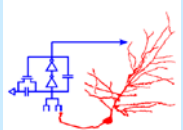




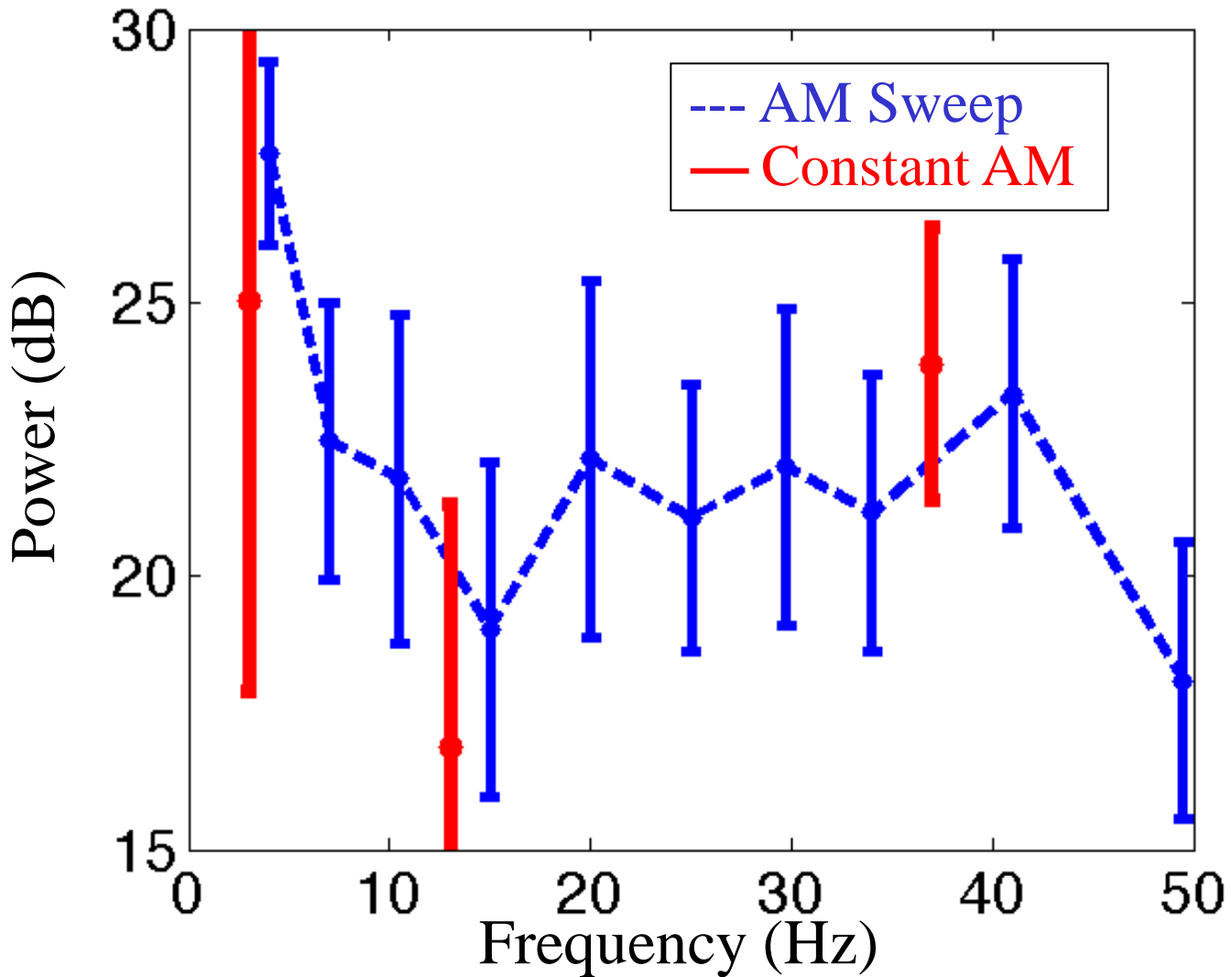
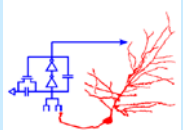
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Average Power MTF





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Conclusions

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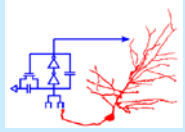
- Exponential sweep gives a successful estimate of the neural power MTF
- Brain maximally responds to low rate modulations
 - MTF shape is a low-pass filter
- Power MTF matches the power in speech modulations
- Phase of neural response is consistent with an 80 ms delay



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- Nai Ding, *Grad student*
- Kai Sum Li, *Grad student*
- MERIT program and staff
- All participants in the study
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Thank You!