

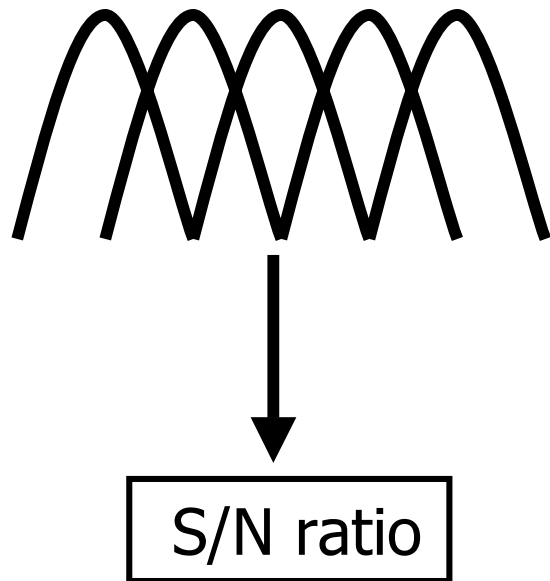
Auditory Signal Processing: Effective models and their Neural realisation

Jesko L. Verhey

Carl von Ossietzky Universität
Oldenburg

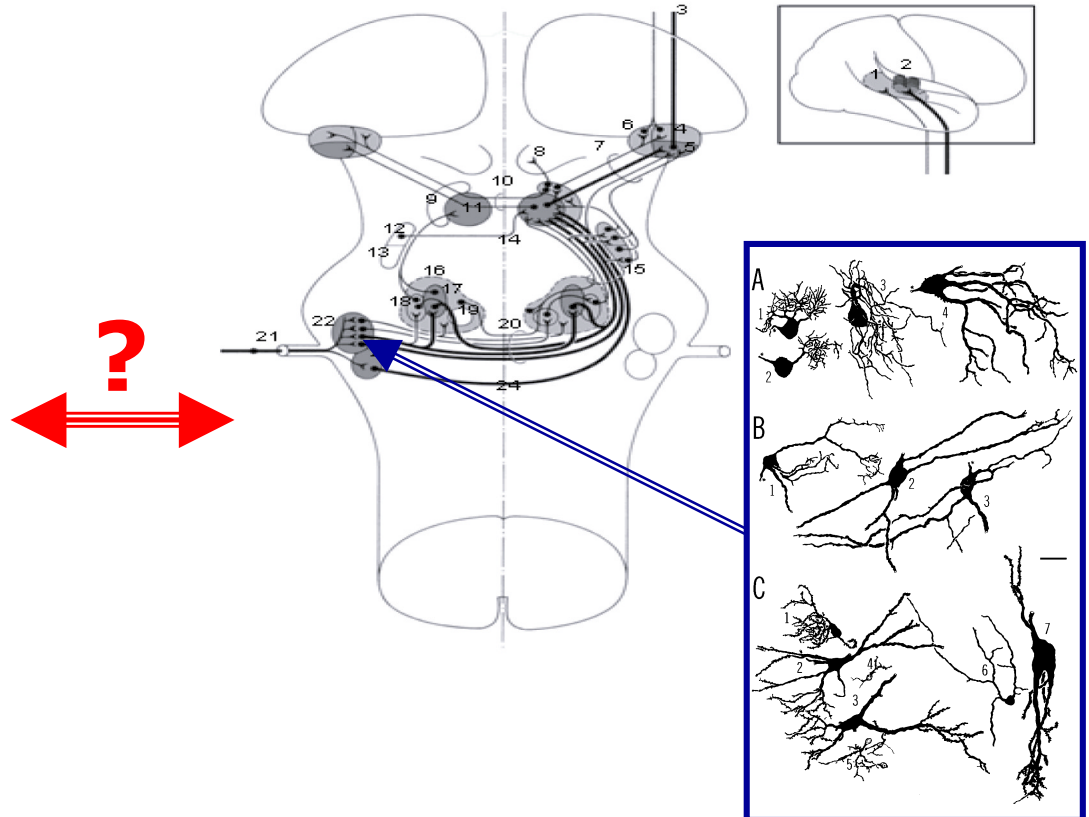
Introduction

- Psychoacoustics
 - Effective models



Power spectrum model,
Fletcher (1940)

- Anatomy & physiology
 - Neural connectivity & response



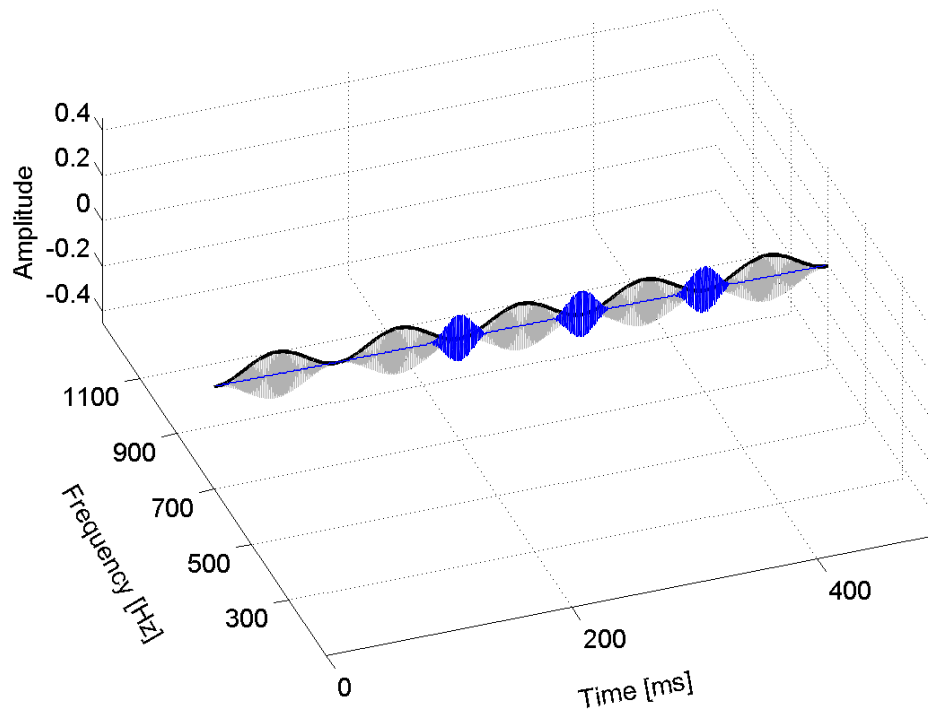
Example: Monaural object binding

Comodulation masking release (CMR)

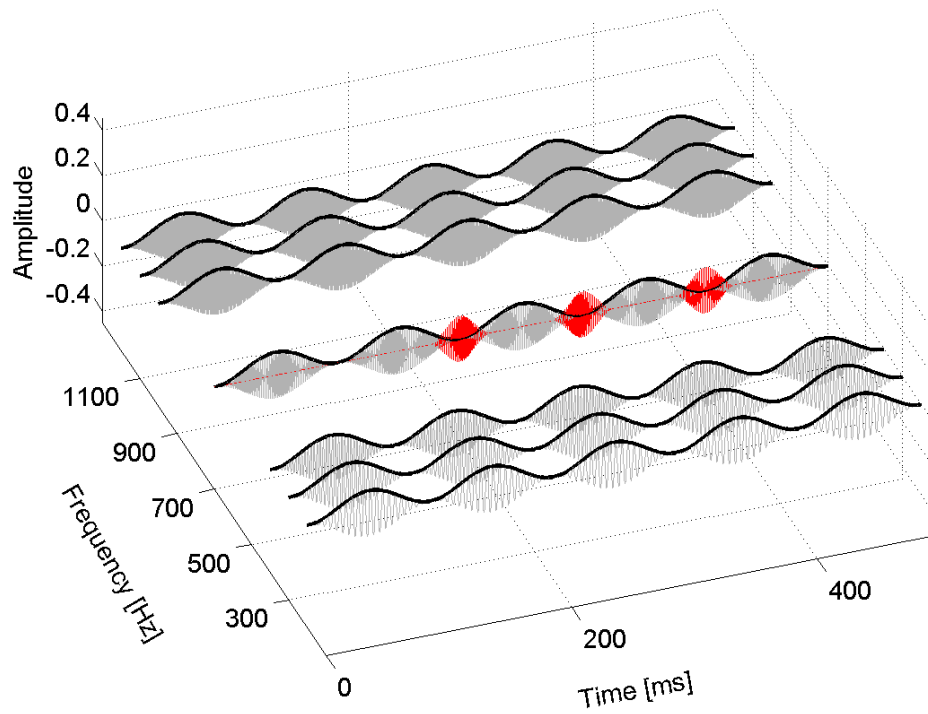
- ❖ More total masker power can cause less masking, if the masker has the same envelope across frequency, i.e., is **comodulated**.

e.g. Hall et al. (1984)

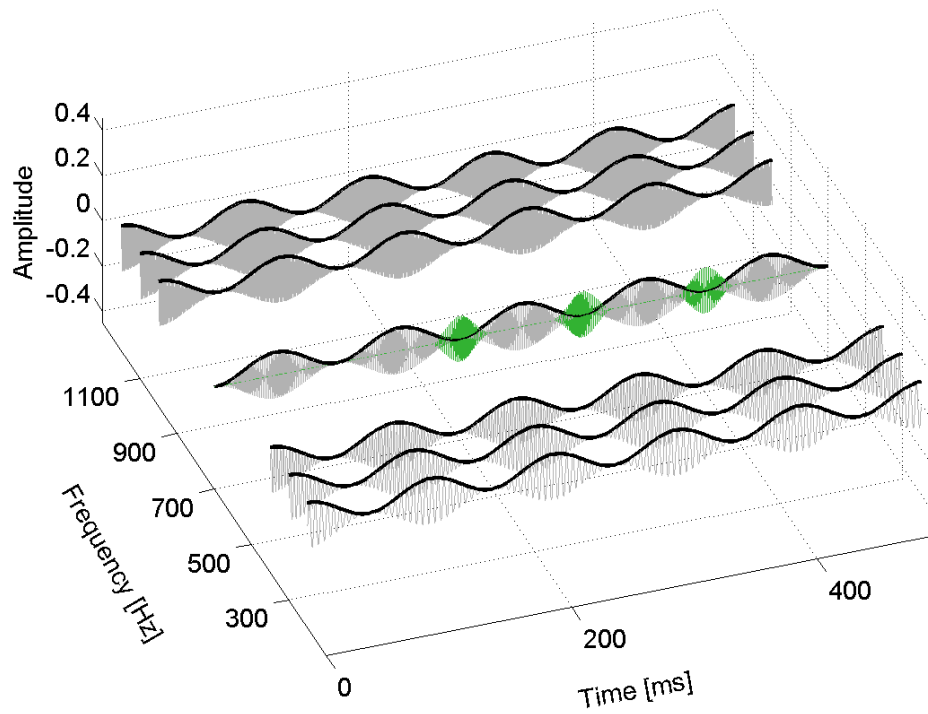
CMR stimuli: Reference (RF)



CMR stimuli: Comodulated (CM)

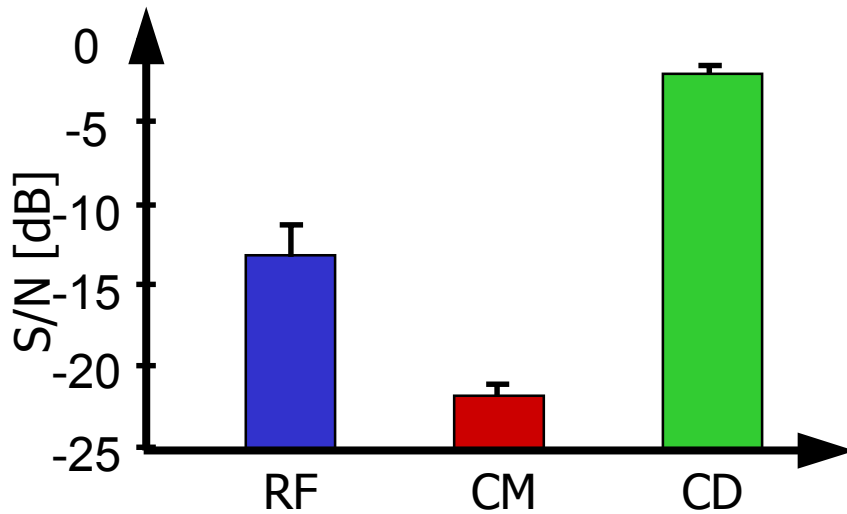


CMR stimuli: Codeviant (CD)



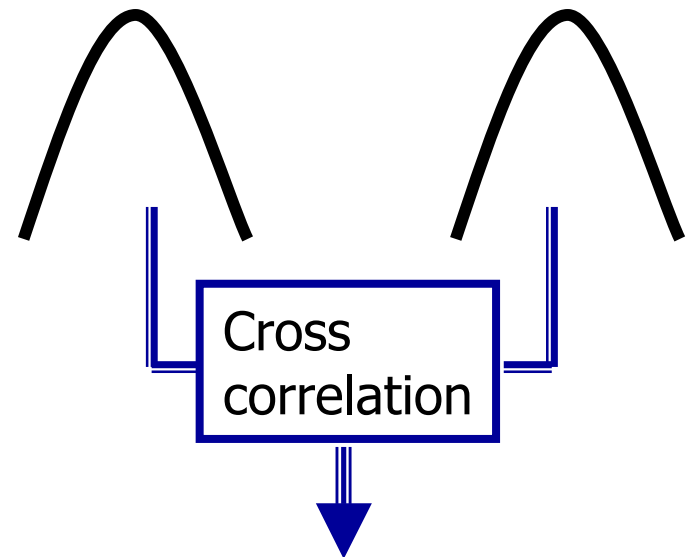
Psychophysical CMR

Data and ...



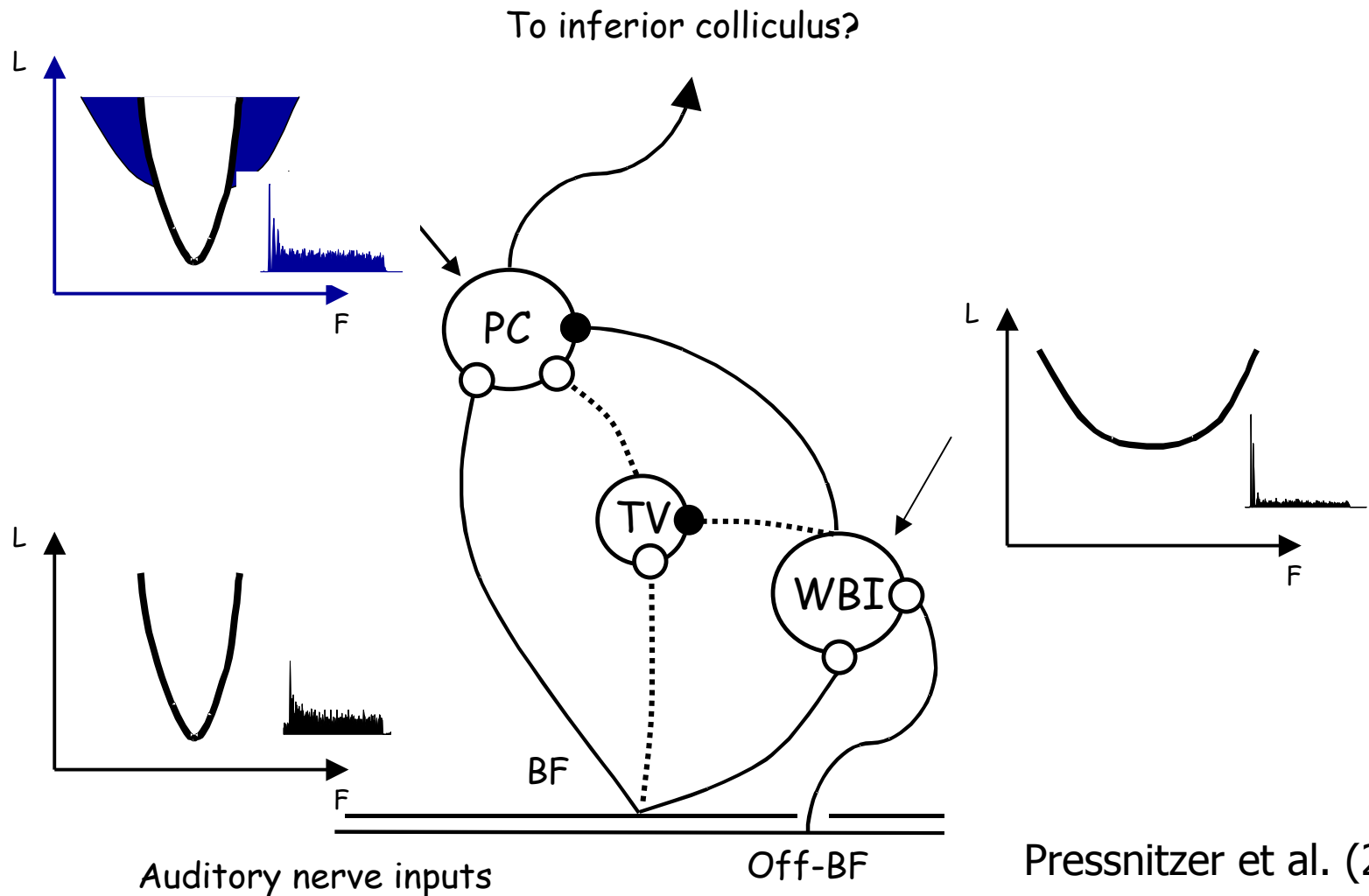
(Delahaye, 1999)

... effective modelling

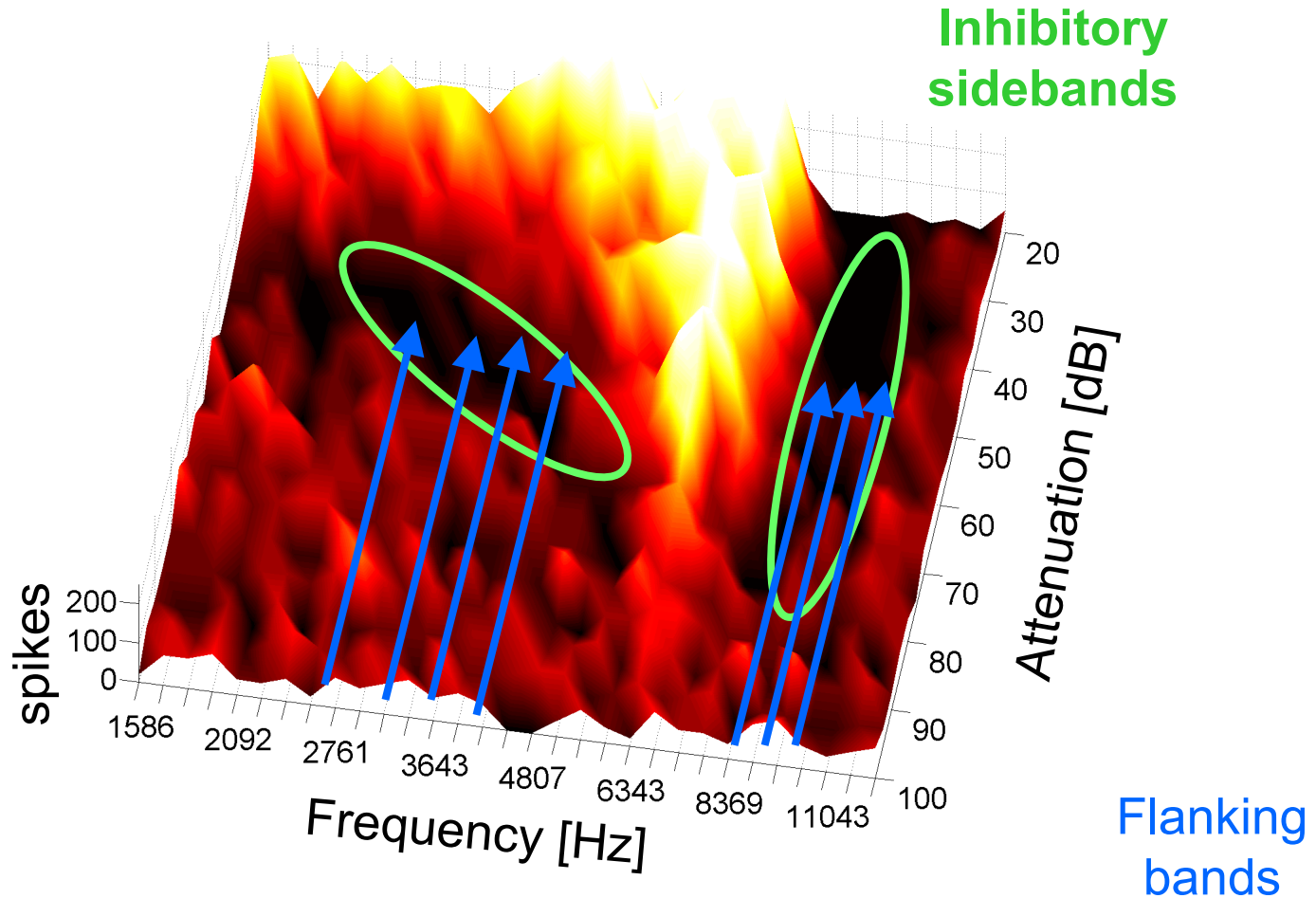


(e.g. Hall et al., 1984)

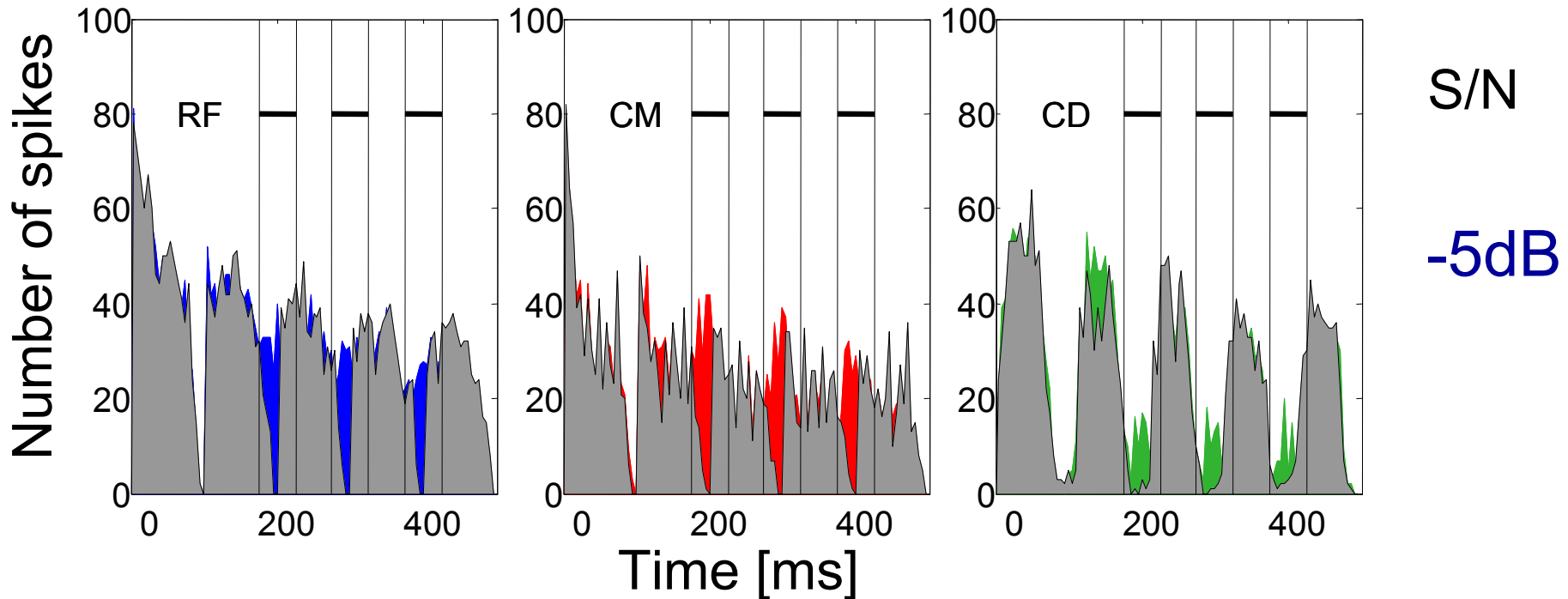
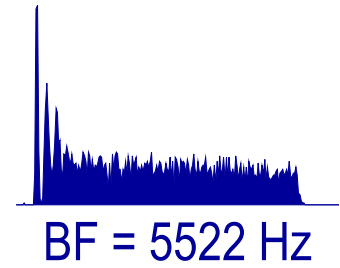
Hypothetical neural circuit to account for CMR



Response map: Chopper

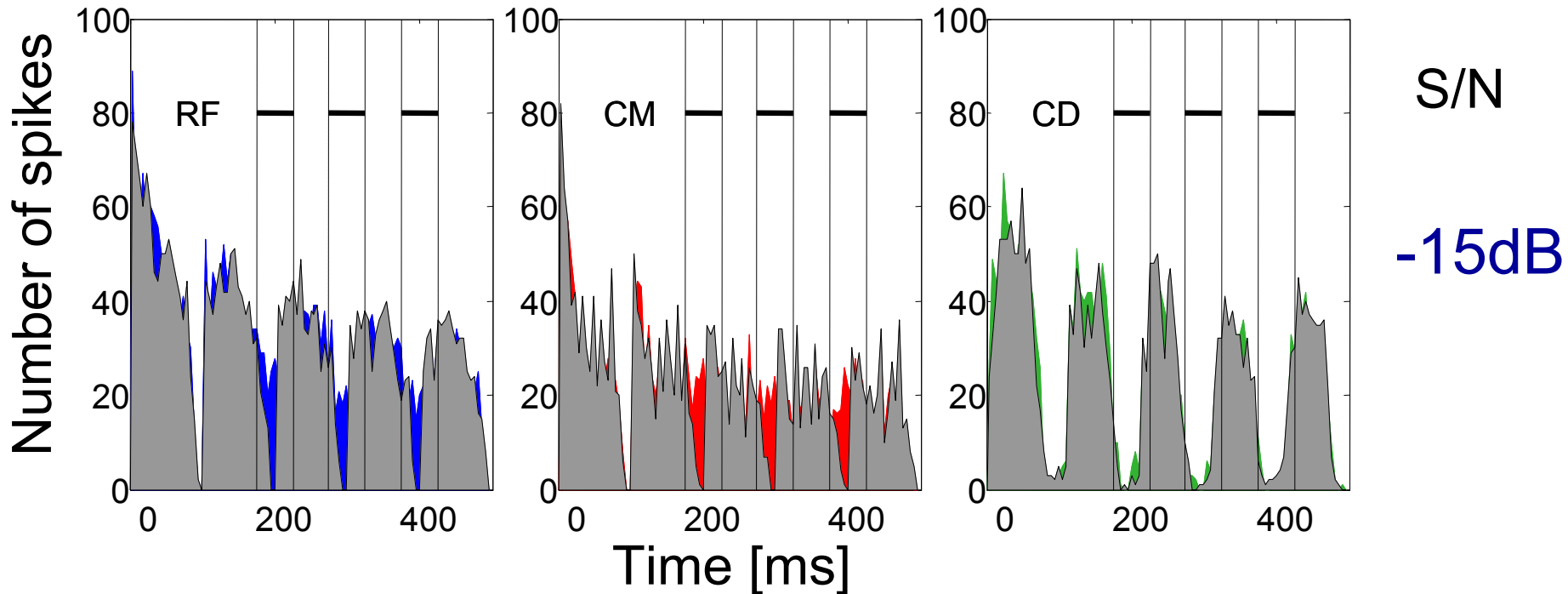
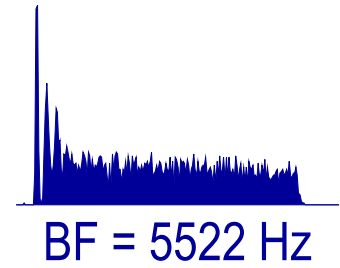


Example: Chopper Deterministic masker



Masker: 47 dB SL, 3 lower & 4 upper flanking bands, 200-Hz spacing, 2600-Hz gap

Example: Chopper Deterministic masker



Masker: 47 dB SL, 3 lower & 4 upper flanking bands, 200-Hz spacing, 2600-Hz gap

Summary and Conclusion

- Across-channel processes as observed in CMR can be accounted for by broadband inhibition
- Hypothetical circuit on the level of the cochlear nucleus proposed
- Neural models provide a better understanding of the processing in the auditory system
- Application in hearing aids?