Analysis of Speech-ABR

Mohsen Ahadi, PhD.

Assistant Professor of Audiology

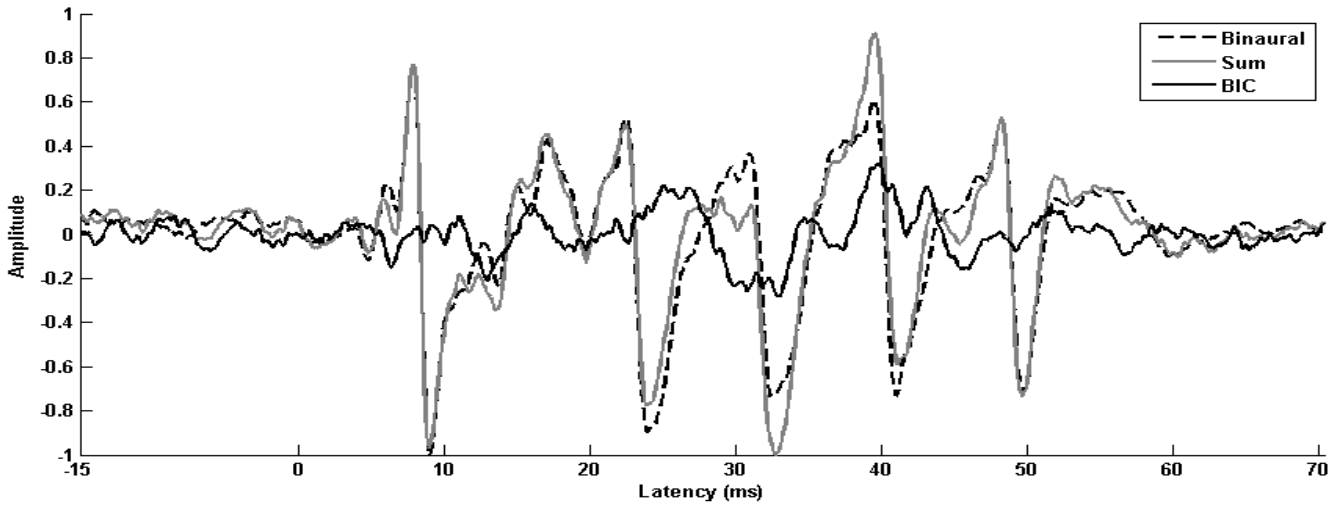
Iran University of Medical Sciences (IUMS)

Rehabilitation Research Center (RRC)

ahadi.m@iums.ac.ir

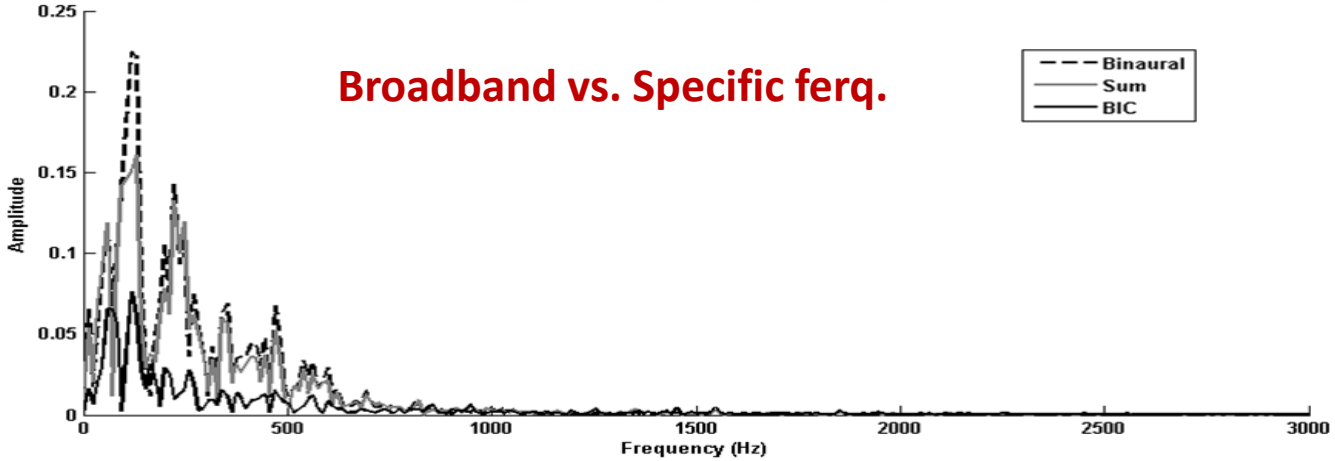
Signal Decomposition Techniques

- **Timing**
  - **Peak picking**
  - **Frequency-specific timing**
    - Autocorrelation
    - Phase consistency
    - Cross-phaseogram
- **Magnitude**
  - **Broadband**
    - RMS and SNR
  - **Frequency-specific magnitude**
    - Fast Fourier transform
- **Fidelity**
  - **Stimulus-to-response correlation**
  - **Response-response correlation**
  - **Response consistency**

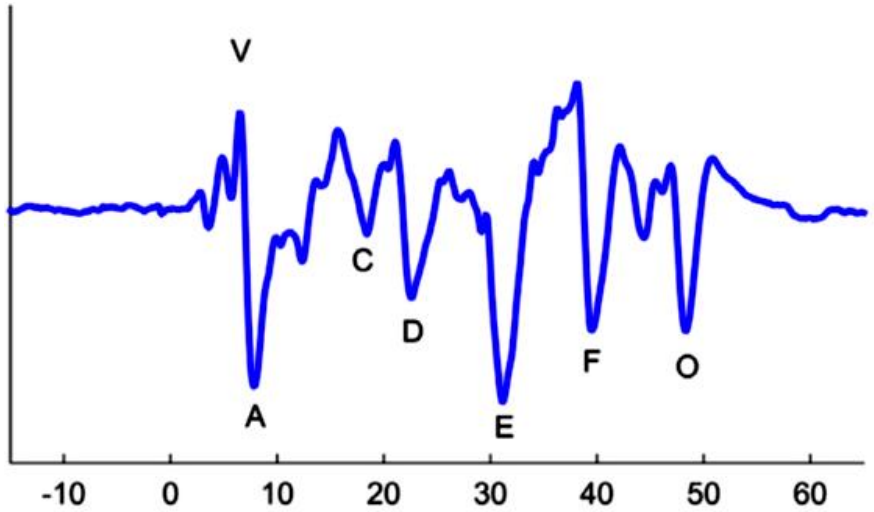


Time vs. Frequency domains

Broadband vs. Specific ferq.



Timing: Peak picking



Shorter Stimuli: Manual

Longer Stimuli: Automatic peak-detection algorithm

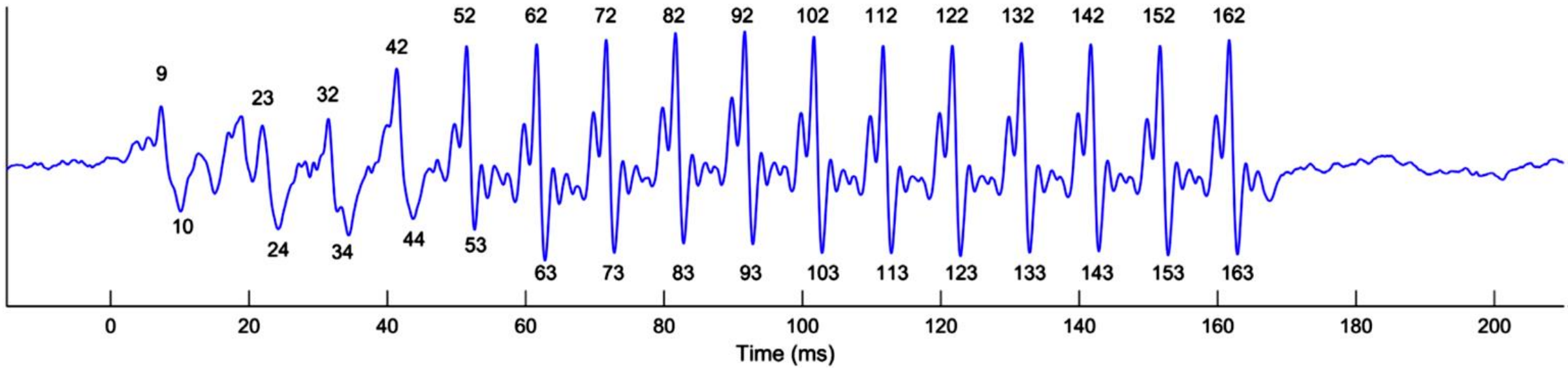
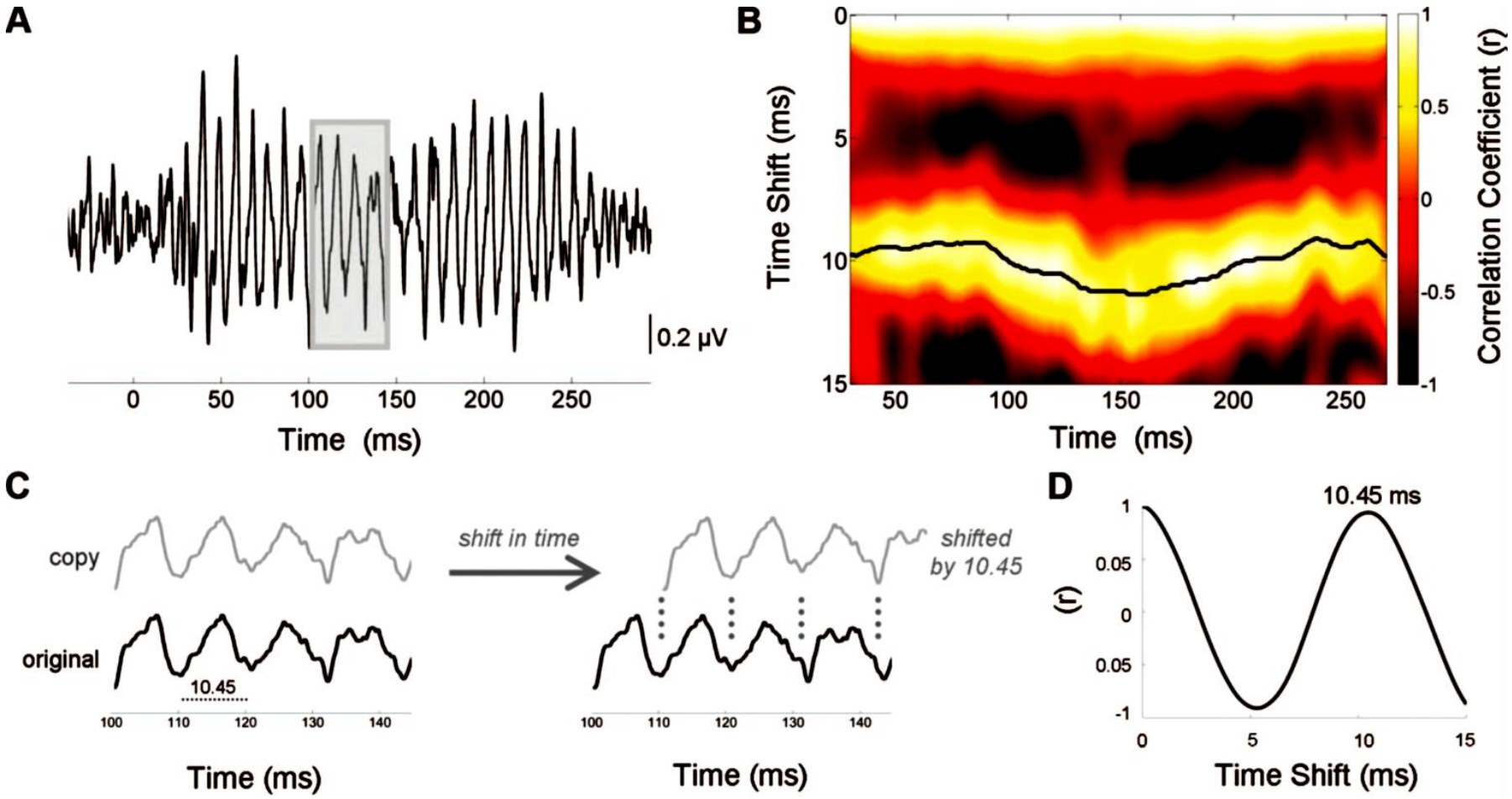


Table 2
The mean and standard deviation of the latencies and amplitudes in males and females are given considering seven peaks of the Speech-ABR. Significances are indicated with asterisks.

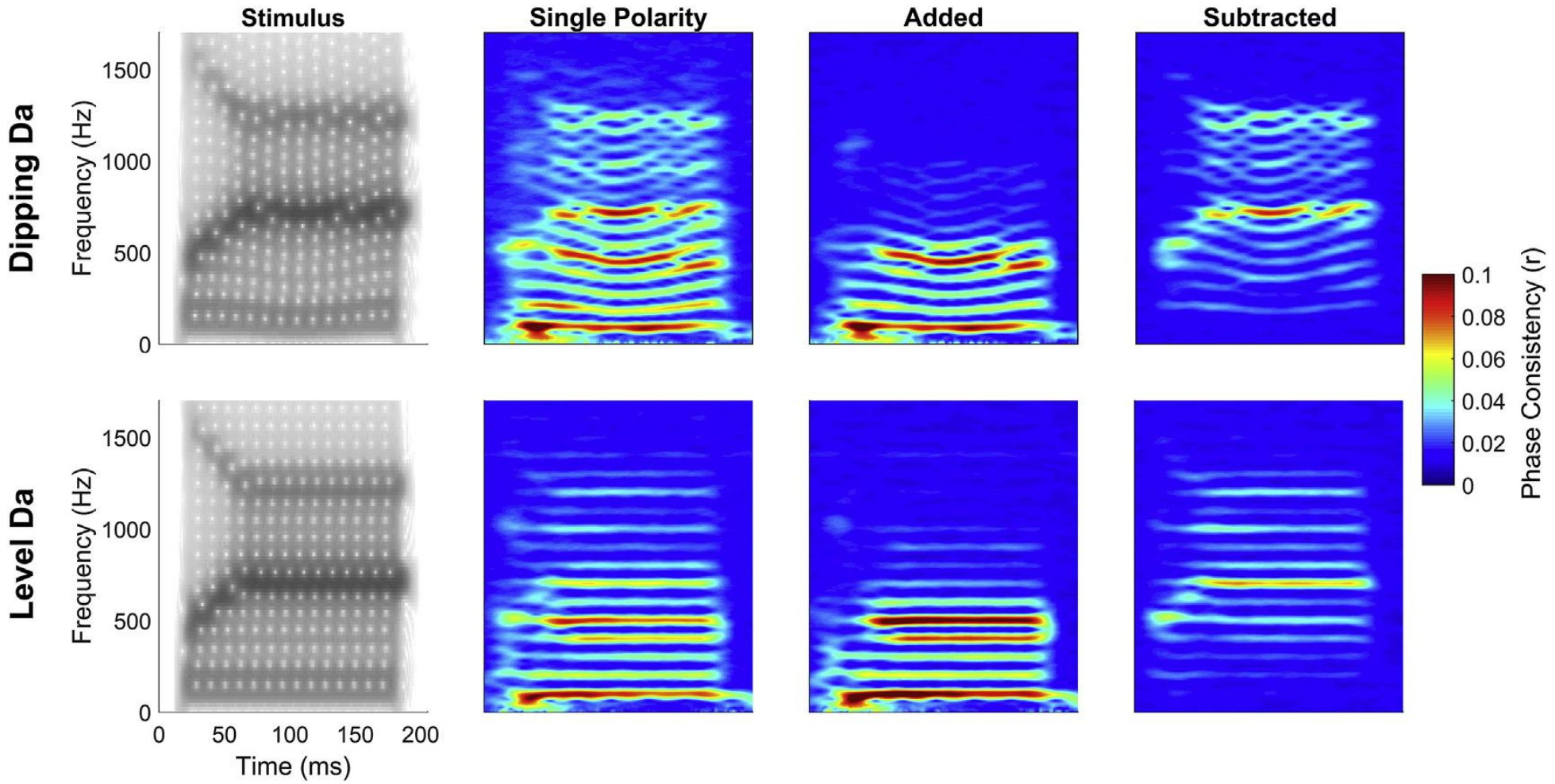
	Female			Male		
	n	Mean	SD	*n*	Mean	SD
Latency (ms)						
V*	25	6.61	0.32	23	6.89	0.42
A**	25	7.67	0.44	23	8.02	0.41
C	21	18.70	1.00	20	18.72	0.59
D	24	22.89	0.65	21	23.04	0.82
E	24	31.71	1.34	23	31.71	1.01
F	25	40.02	1.23	23	40.29	1.14
O	25	48.67	1.21	23	48.64	0.52
D–E	23	8.84	1.05	21	8.65	0.61
E–F	24	8.33	0.66	23	8.57	0.78
Amplitude (μV)						
V	25	0.26	0.08	23	0.17	0.06
A	25	−0.38	0.08	23	−0.29	0.06
C	21	−0.11	0.17	20	−0.11	0.17
D	24	−0.36	0.16	21	−0.26	0.13
E	24	−0.28	0.10	23	−0.26	0.08
F	25	−0.28	0.13	23	−0.22	0.11
O	25	−0.25	0.12	23	−0.19	0.13
SNR	25	4.33	2.45	23	3.74	1.66
Composite onset measures						
V/A duration (ms)	25	1.05	0.25	23	1.13	0.21
V/A amplitude (μV)**	25	0.65	0.14	23	0.47	0.11
V/A slope (μV/ms)**	25	−0.64	0.20	23	−0.43	0.14
V/A area (μV × ms)**	25	0.36	0.10	23	0.28	0.08

Frequency-specific timing: Autocorrelation

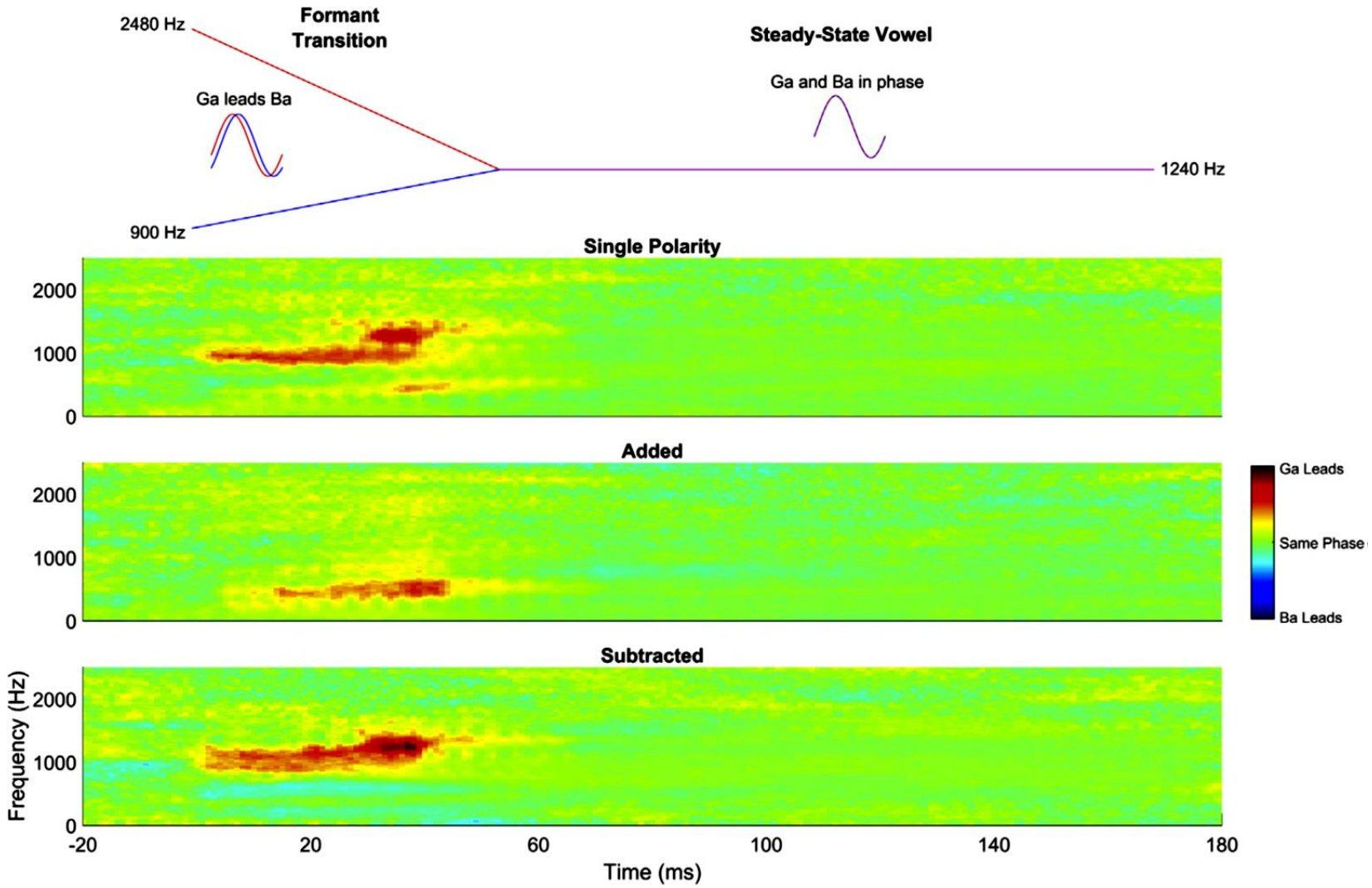


F0 = 1 / L_{max}

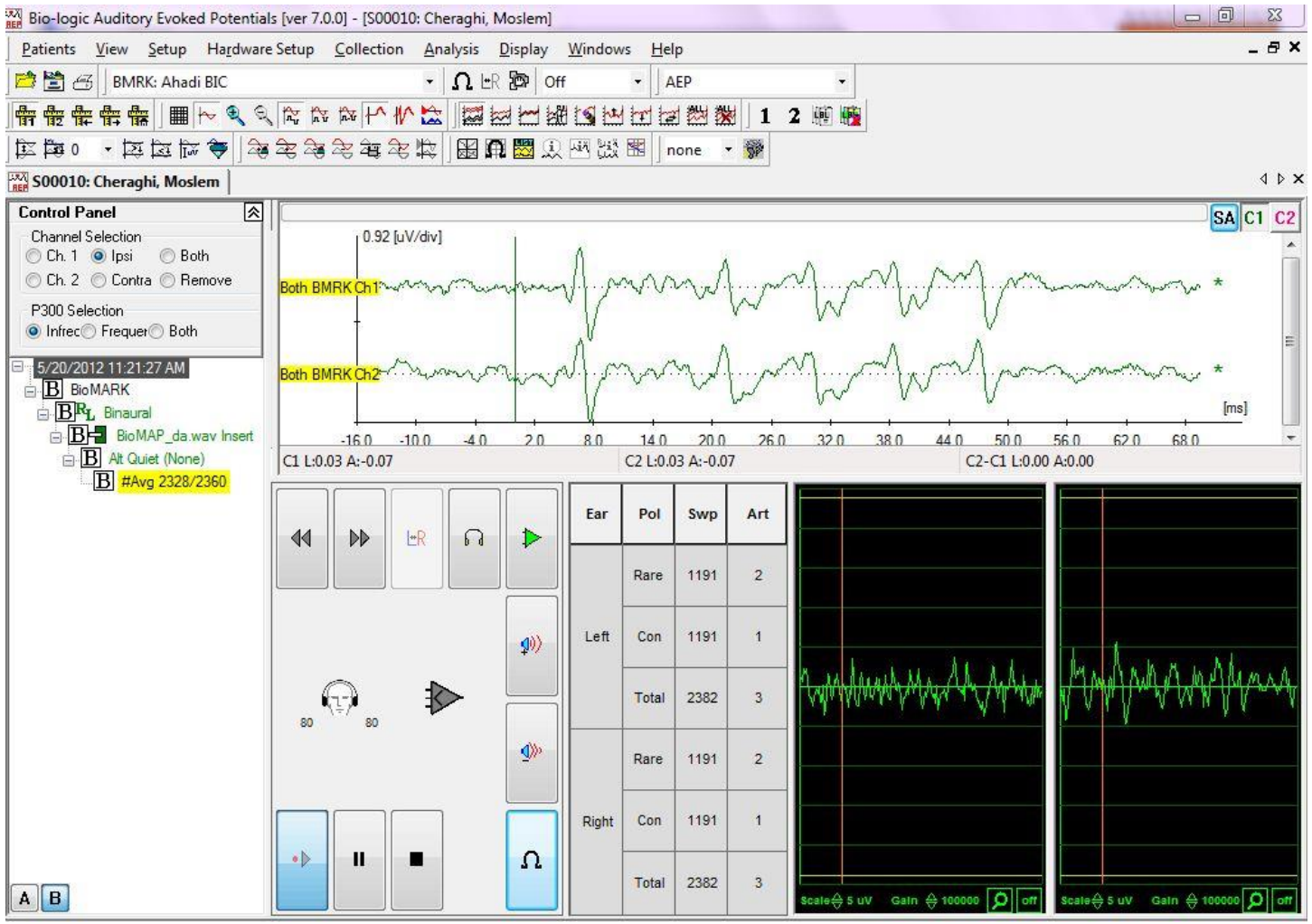
Frequency-specific timing: Phase consistency (coherence)



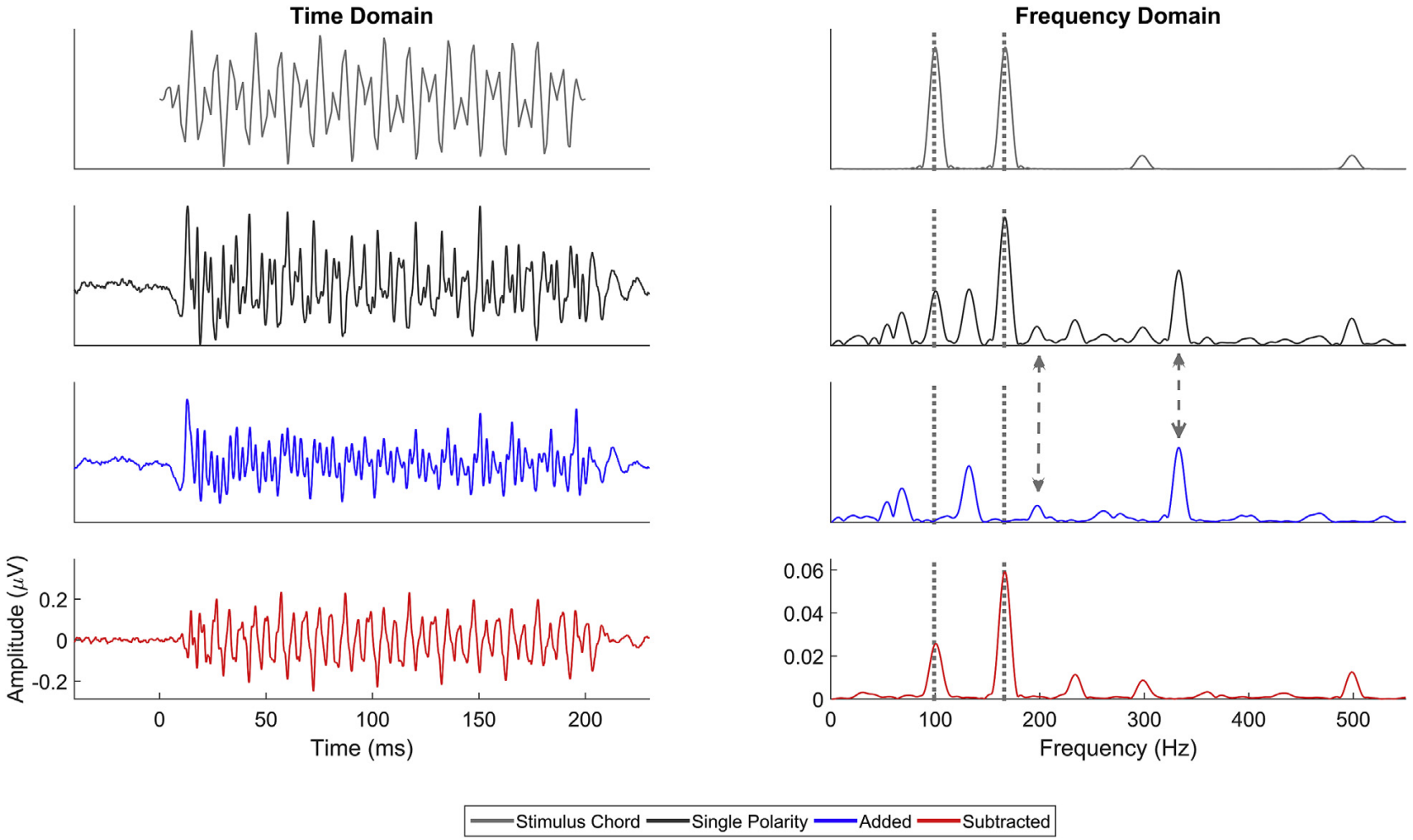
Frequency-specific timing: Cross-phaseogram



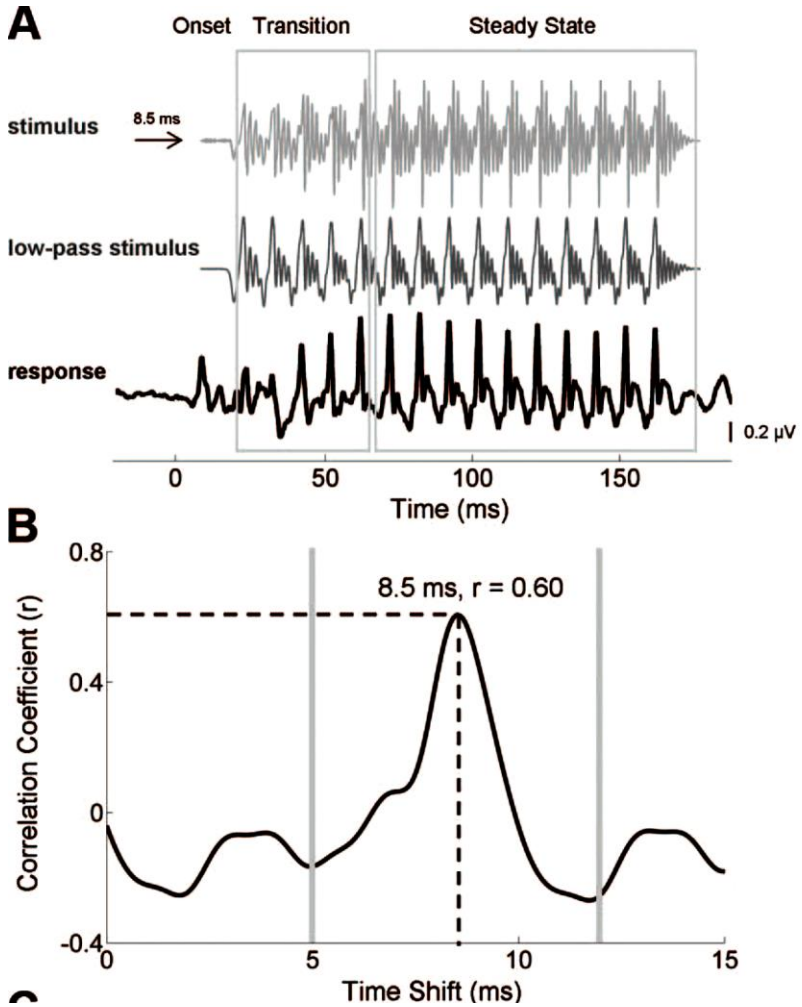
Magnitude (Broadband): RMS and SNR

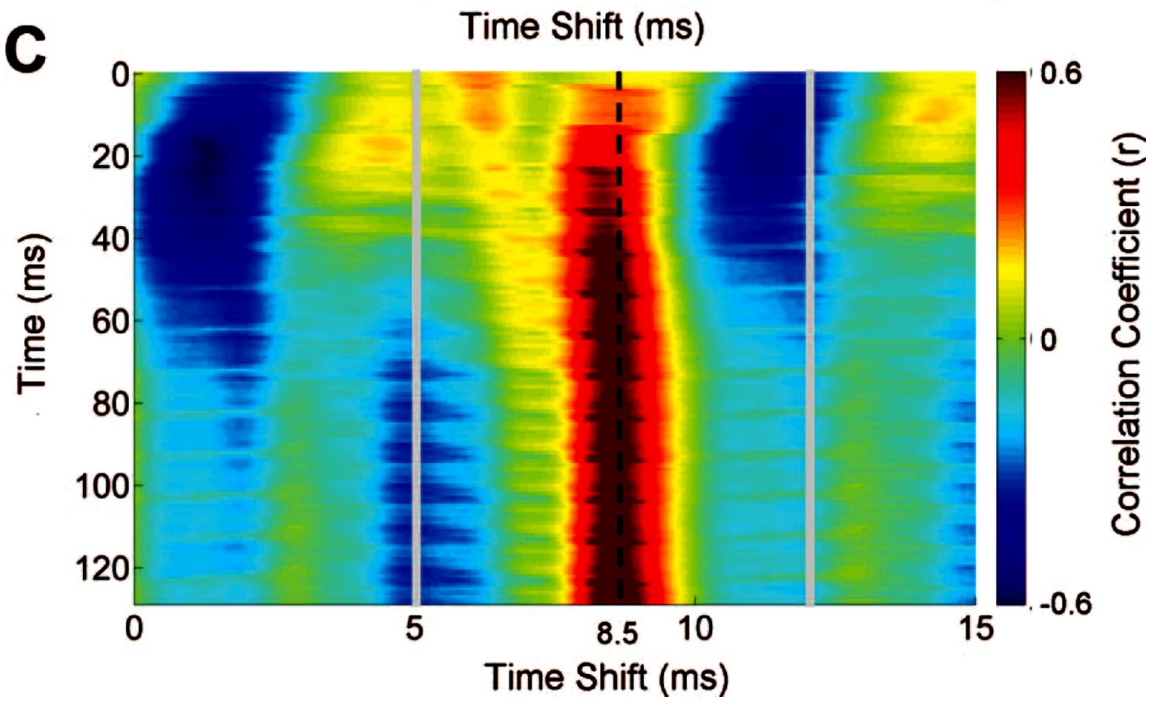


Frequency-specific magnitude: Fast Fourier transform

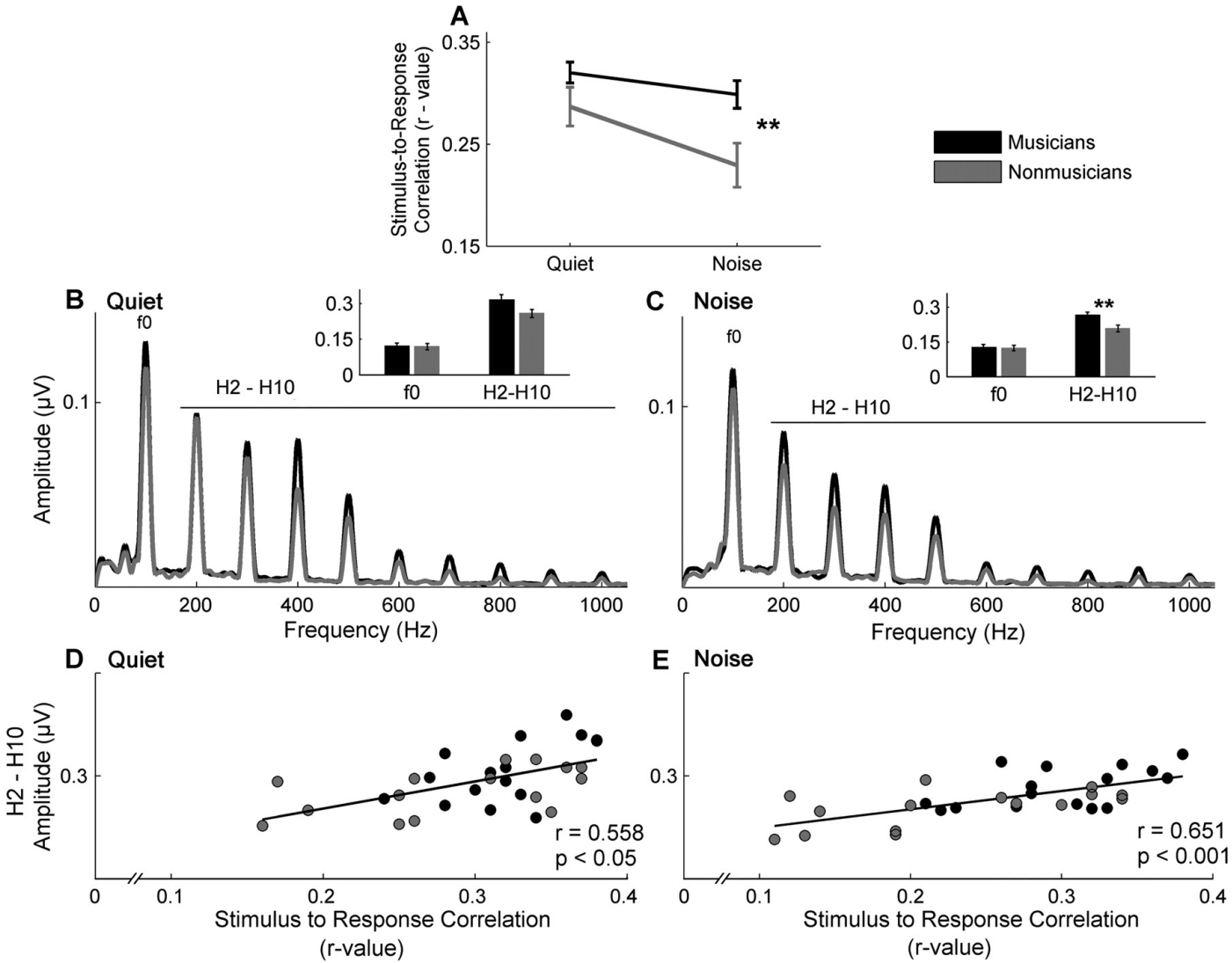


Fidelity: Stimulus-to-response correlation

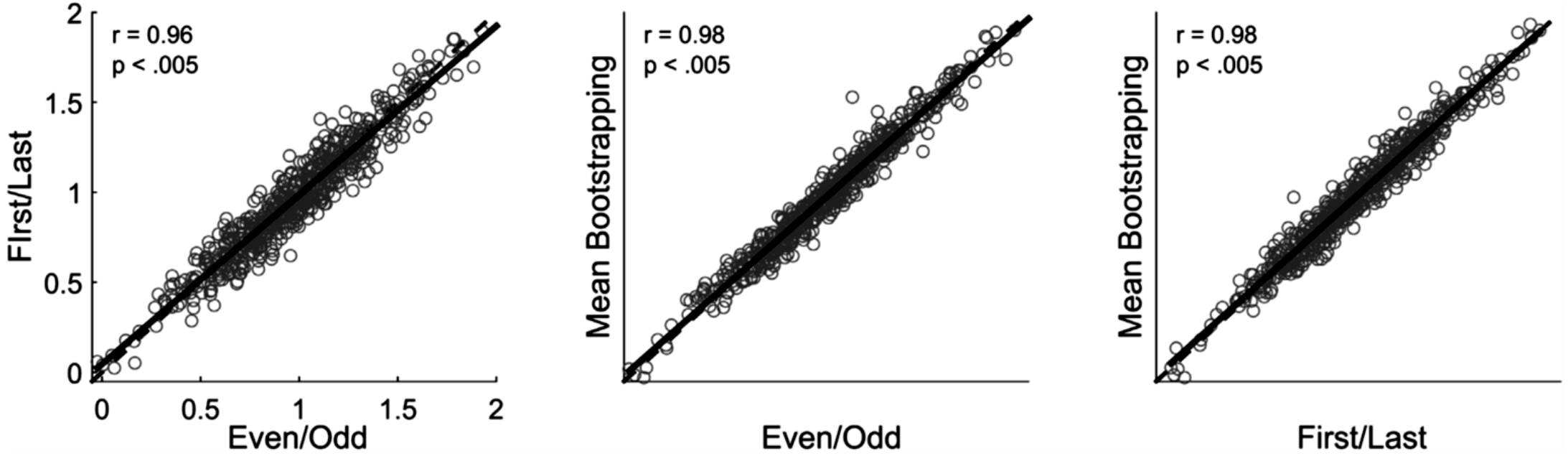




Fidelity: Response-response correlation

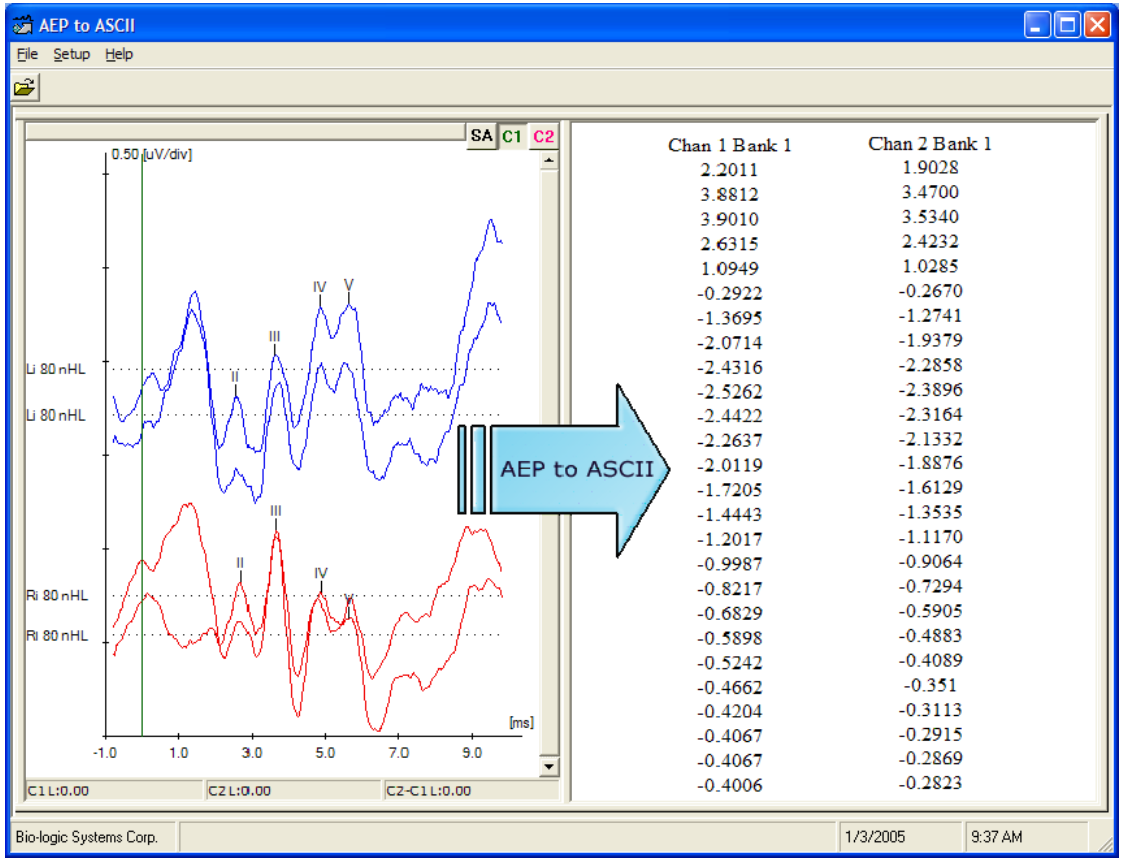


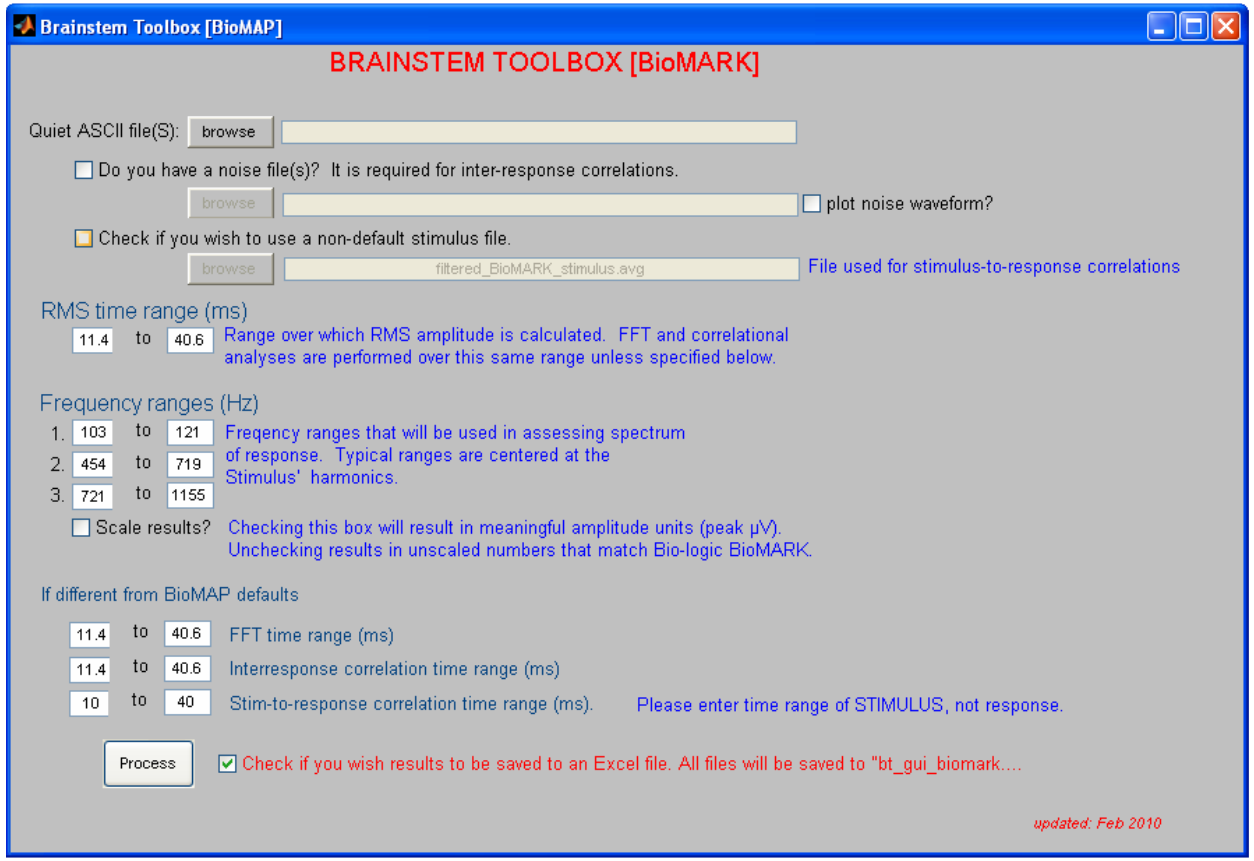
Fidelity: Response Consistency (Stability)



Brainstem Toolbox Freeware

and AEP2ASCII





Brainstem Toolbox Report

File Edit View Insert Tools Desktop Window Help

BRAINSTEM TOOLBOX
Report

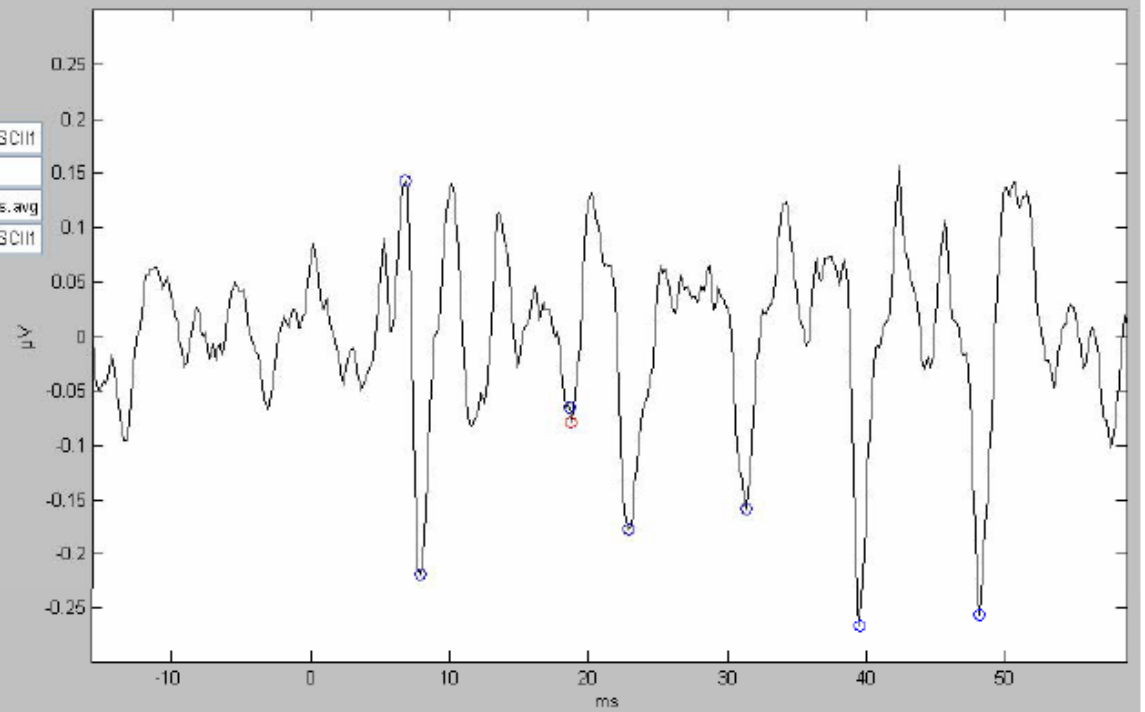
Quiet filename	sample_BMAP_ASCII1
Noise filename	
Stimulus filename	filtered_BioMARK_stimulus.avg
Marker filename	sample_BMAP_ASCII1

Marked Peak Info

	As picked		Auto-picked	
	Lat.	Amp.	Lat.	Amp.
V	6.78	0.143	NaN	NaN
A	7.83	-0.219	NaN	NaN
C	18.55	-0.064	18.70	-0.078
D	22.86	-0.177	NaN	NaN
E	31.32	-0.158	NaN	NaN
F	39.49	-0.268	NaN	NaN
O	48.09	-0.257	NaN	NaN

V/A complex

interpeak lat.	1.05	NaN
interpeak amp.	0.362	NaN
slope	-0.34	NaN
area	0.207	NaN



FFR Analysis

11.4-40.6 ms

Response RMS: 0.080

Prestim RMS: 0.039

Signal to noise ratio: 2.05

Frequency Analysis

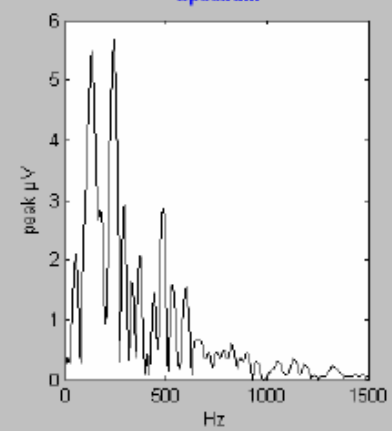
11.4-40.6 ms

	Hz.	Amp.
Range 1:	103-121	4.050
Range 2:	454-719	0.963
Range 3:	721-1155	0.275

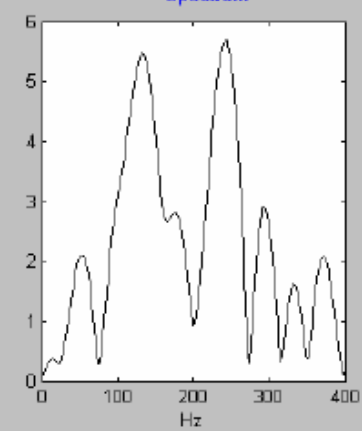
Correlational Analyses

Stim-to-Resp		Quiet-to-Noise	
time range:	10-40	time range:	
r:	0.36	Unshifted r:	
lag:	8.31	Shifted r:	
		lag:	

Spectrum

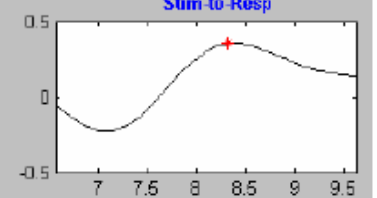


Spectrum

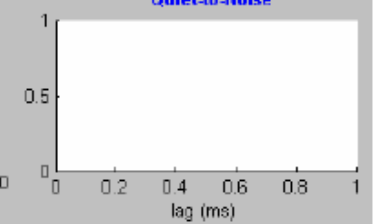


Correlograms

Stim-to-Resp



Quiet-to-Noise



Wearing a mask shows...

Kindness