



# Analysis of Speech-ABR

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# Signal Decomposition Techniques

- **Timing**

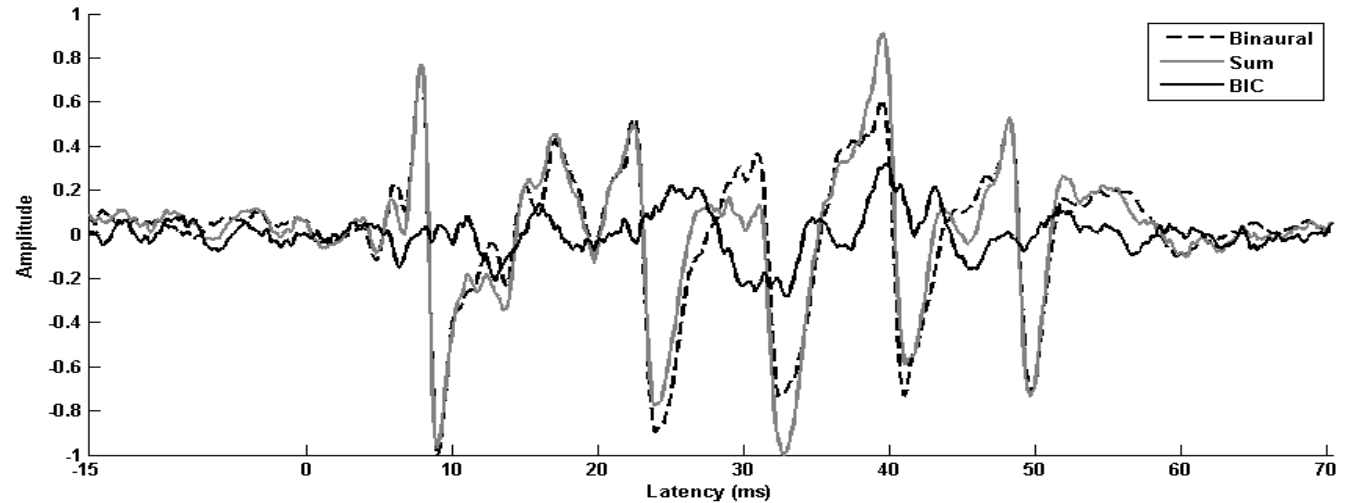
- Peak picking
- Frequency-specific timing
  - Autocorrelation
  - Phase consistency
  - Cross-phaseogram

- **Magnitude**

- Broadband
  - RMS and SNR
- Frequency-specific magnitude
  - Fast Fourier transform

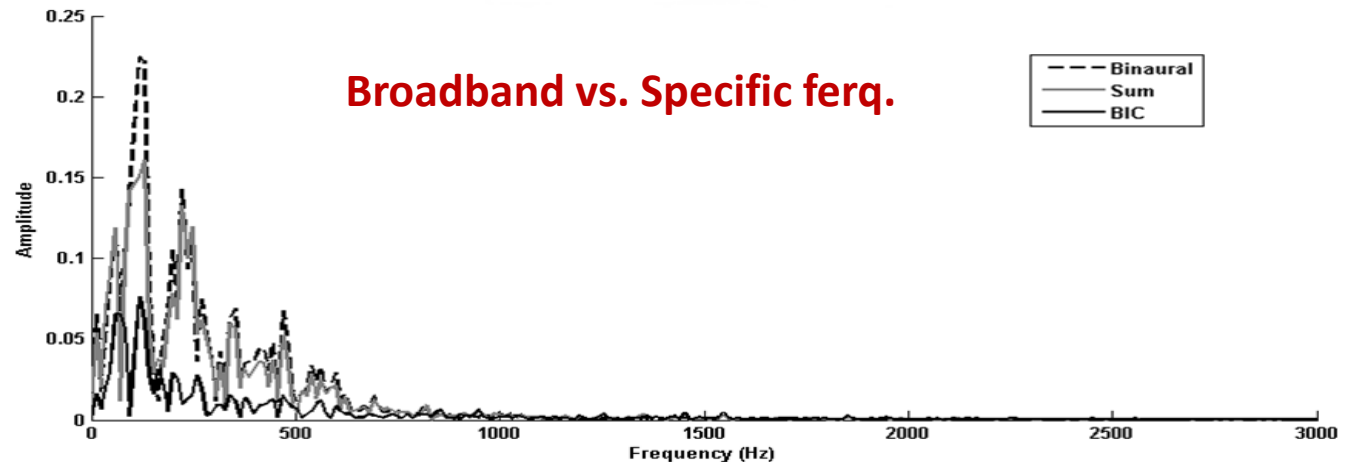
- **Fidelity**

- Stimulus-to-response correlation
- Response-response correlation
- Response consistency

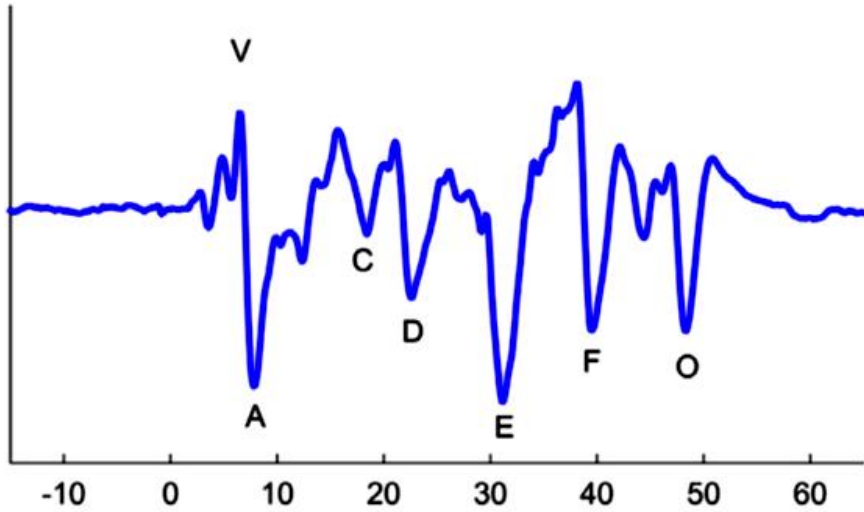


**Time vs. Frequency domains**

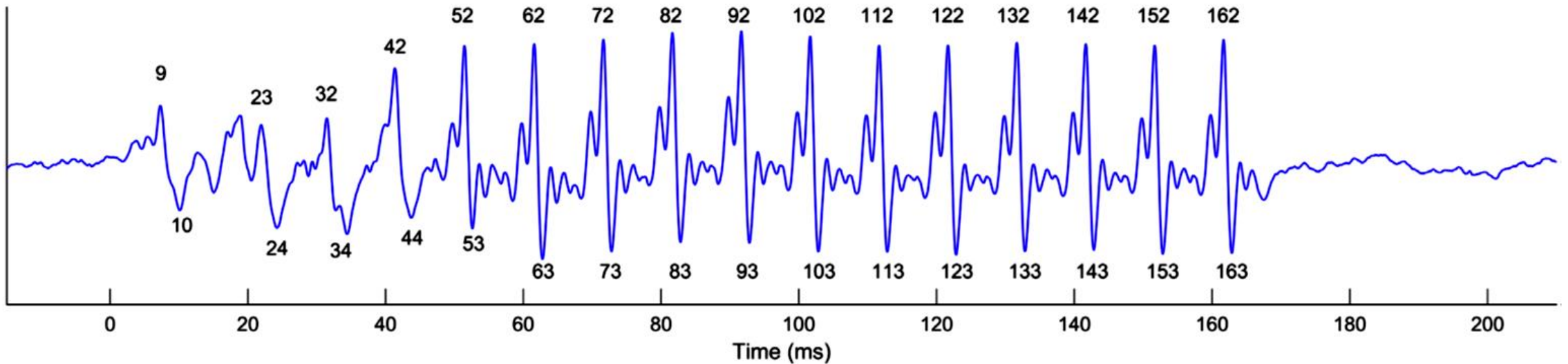
**Broadband vs. Specific ferq.**



# Timing: Peak picking



Shorter Stimuli: Manual



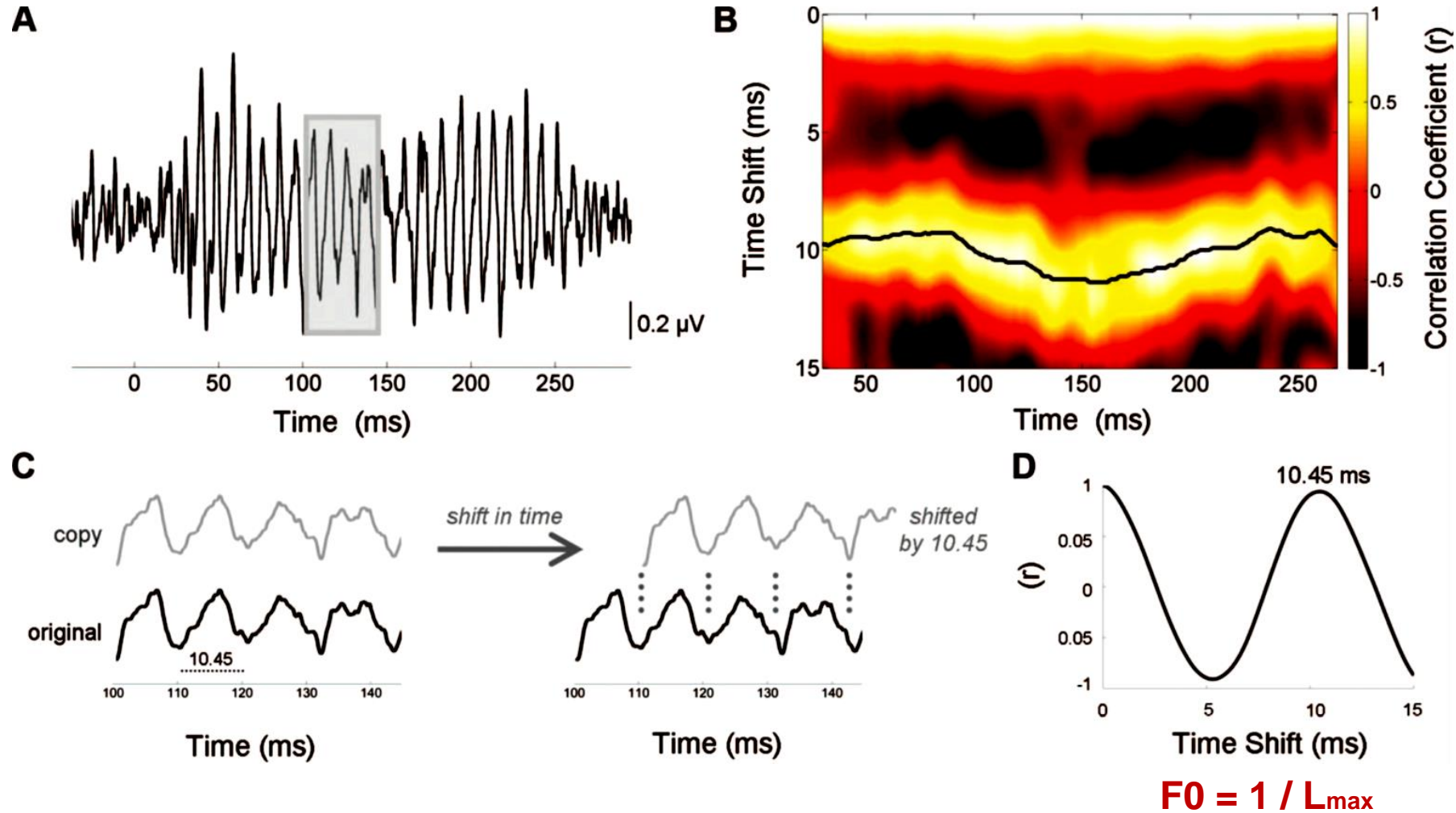
Longer Stimuli: Automatic peak-detection algorithm

**Table 2**

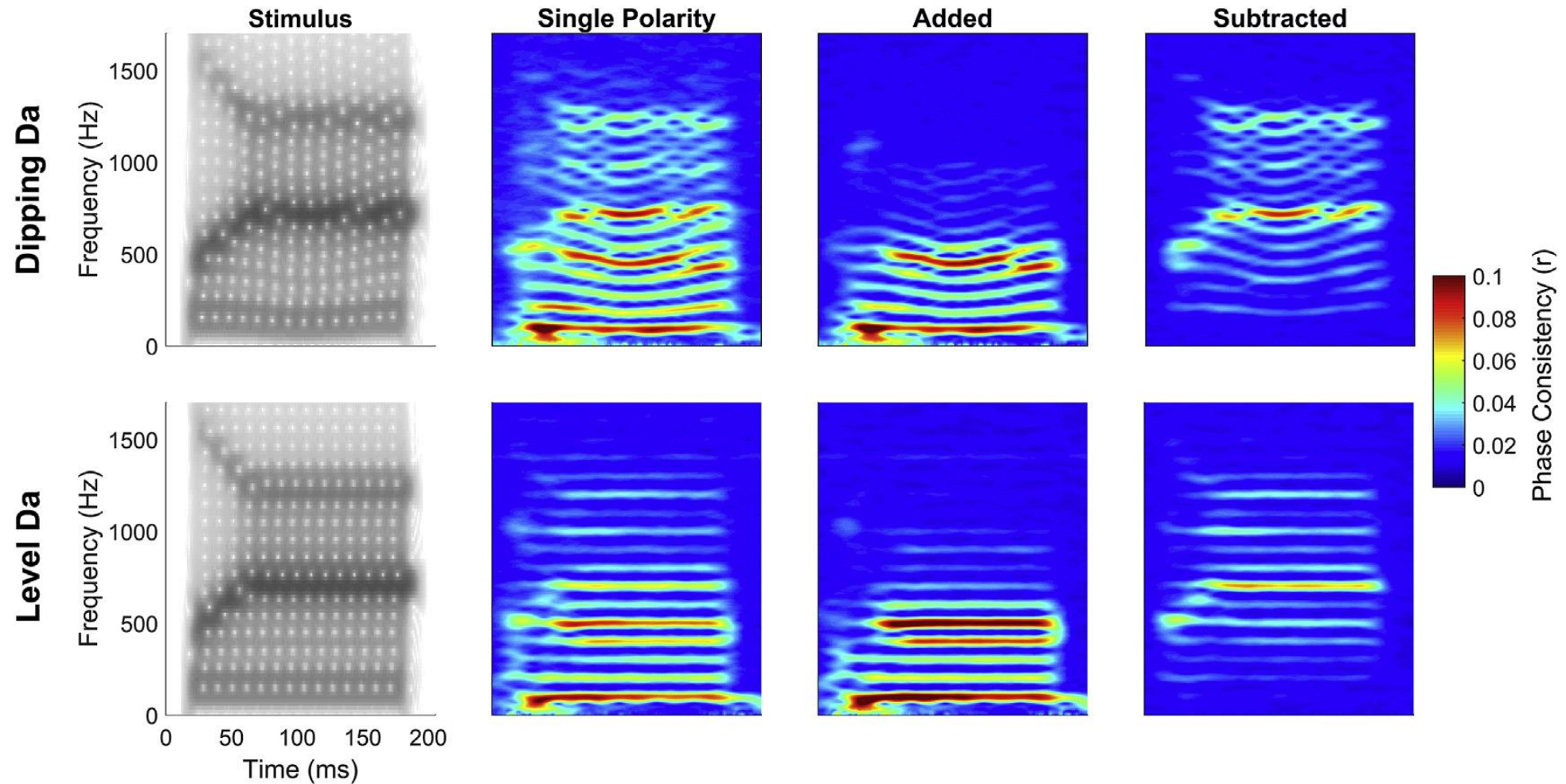
The mean and standard deviation of the latencies and amplitudes in males and females are given considering seven peaks of the Speech-ABR. Significances are indicated with asterisks.

	Female			Male			
	<i>n</i>	Mean	SD	<i>n</i>	Mean	SD	
<b>Latency (ms)</b>							
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	
<b>Amplitude (μV)</b>							
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	
<b>Composite onset measures</b>							
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	

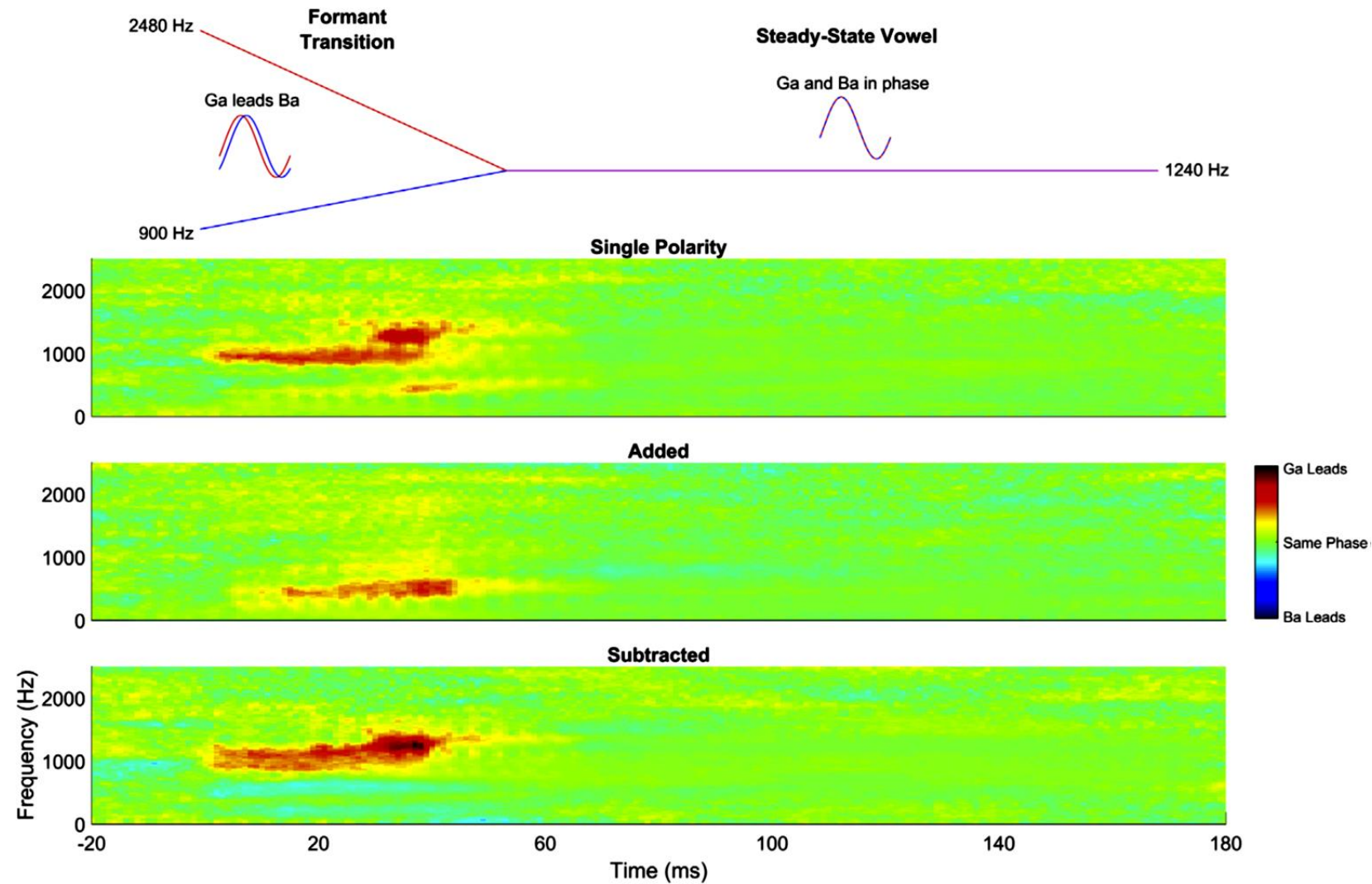
# Frequency-specific timing: Autocorrelation



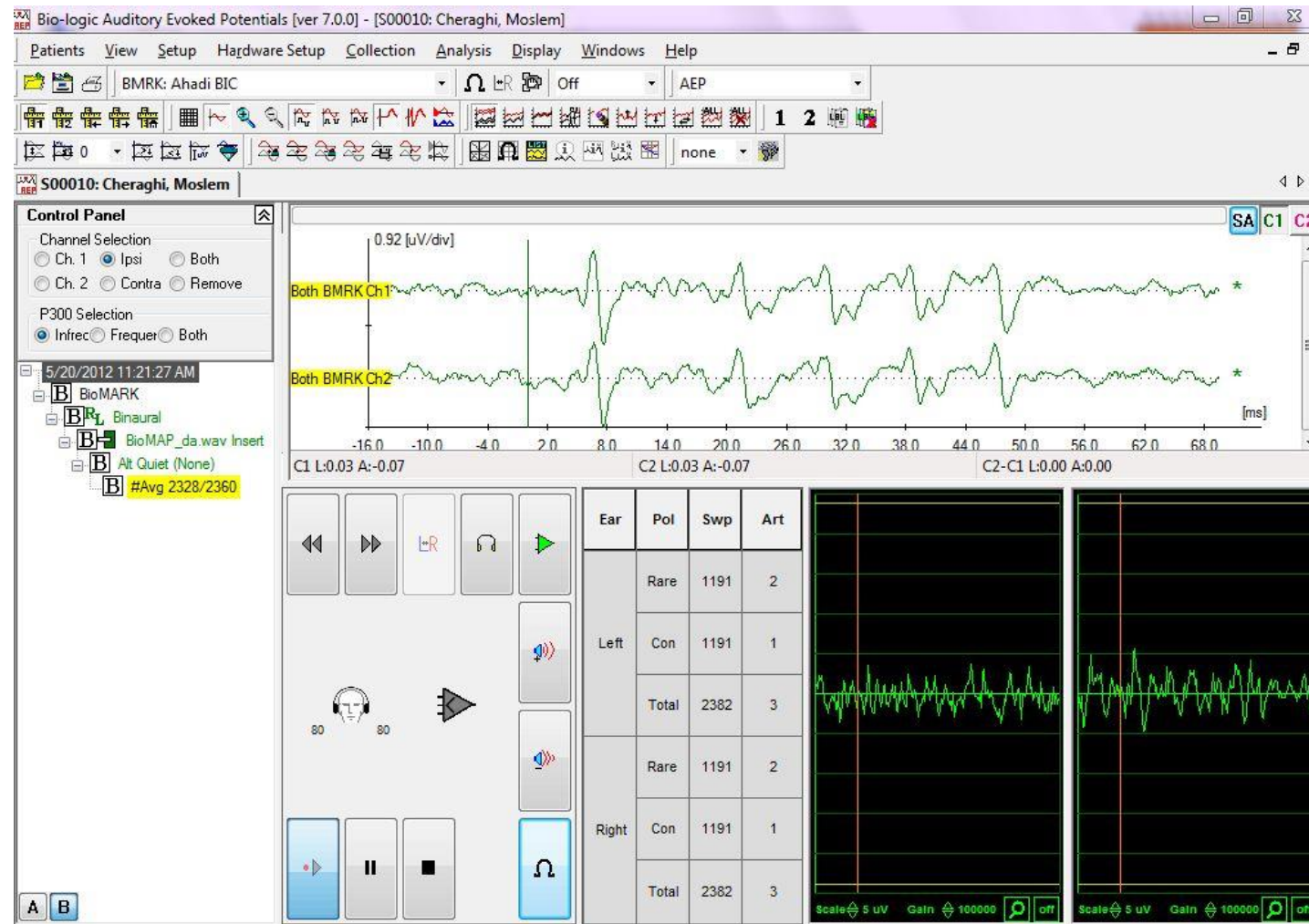
# Frequency-specific timing: Phase consistency (coherence)



# Frequency-specific timing: Cross-phaseogram

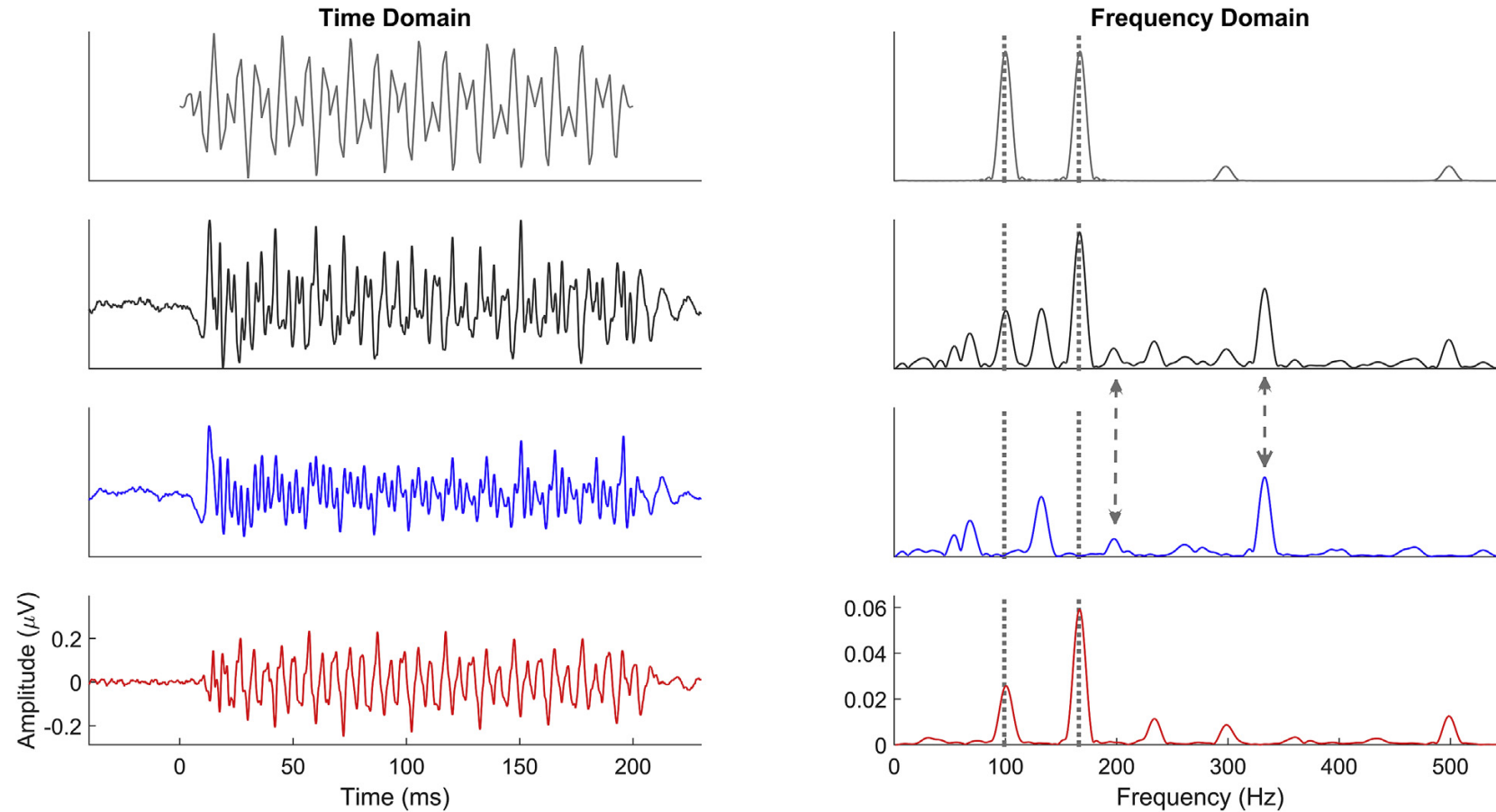


# Magnitude (Broadband): RMS and SNR

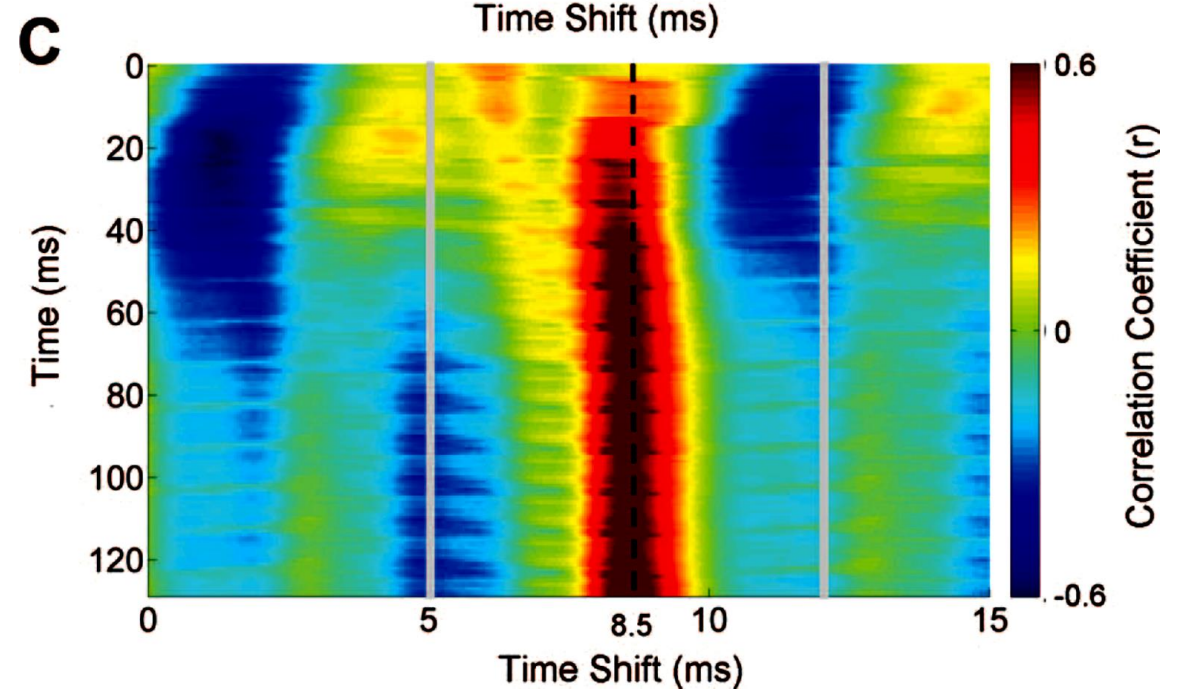
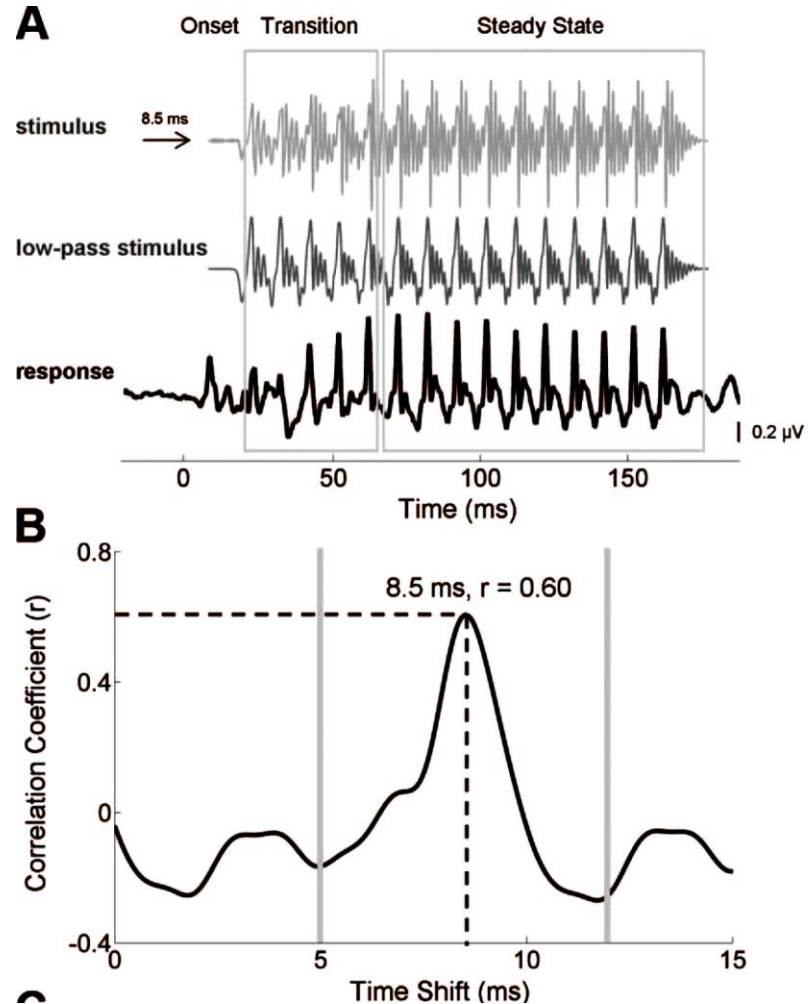




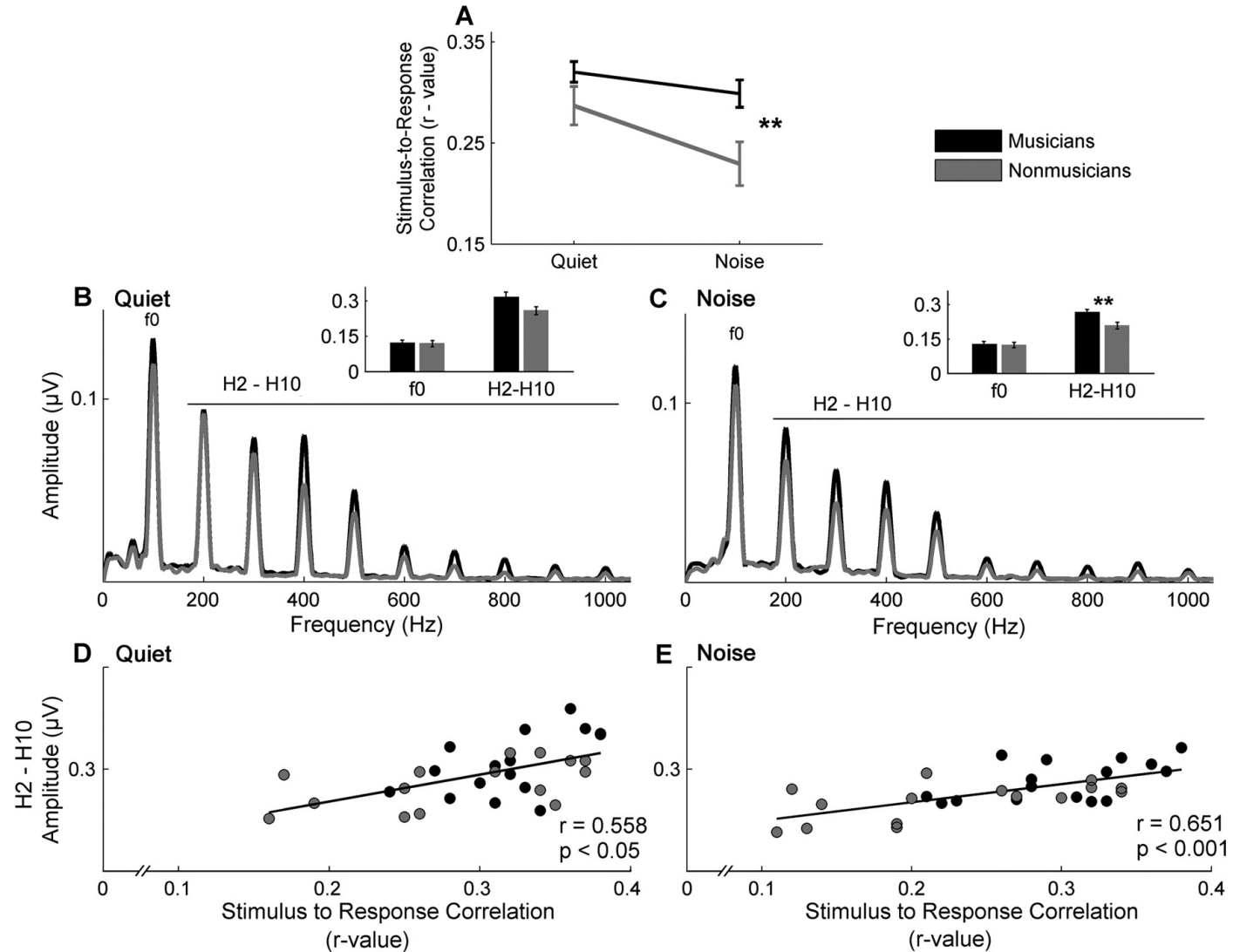
# Frequency-specific magnitude: Fast Fourier transform



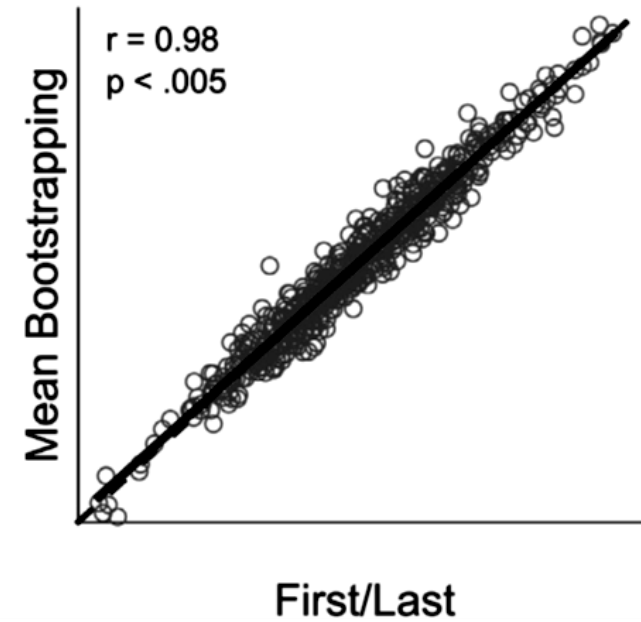
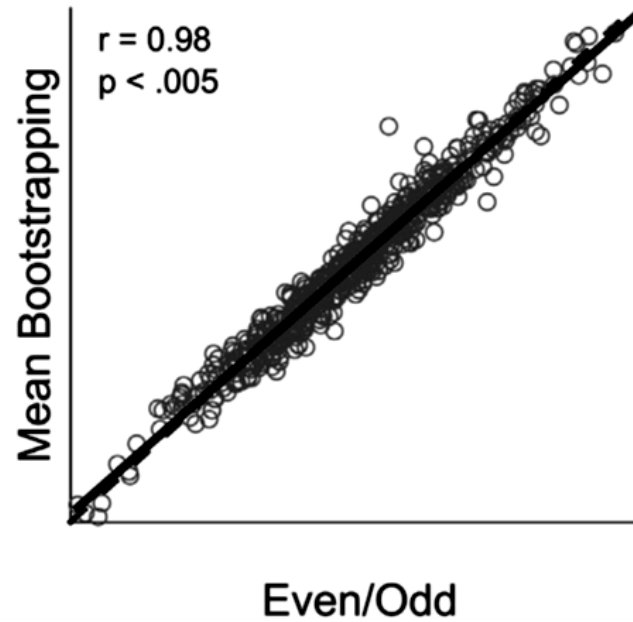
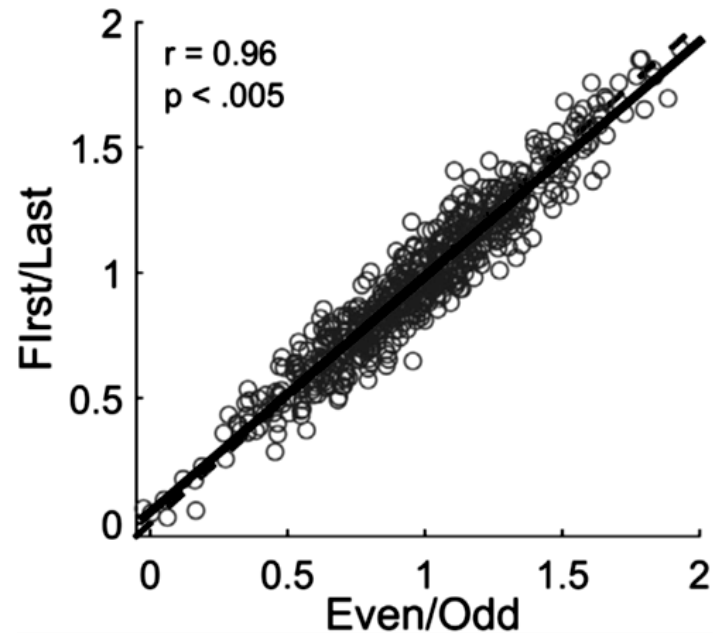
# Fidelity: Stimulus-to-response correlation



# Fidelity: Response-response correlation

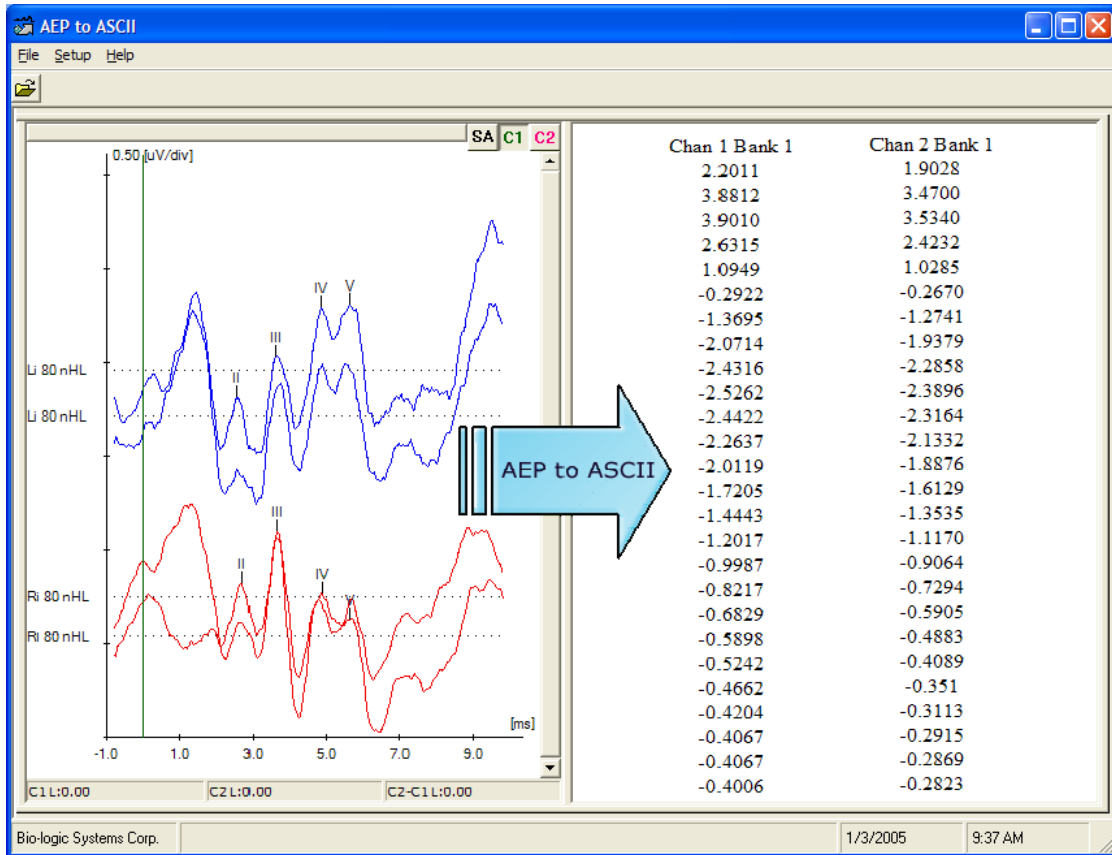


# Fidelity: Response Consistency (Stability)



# Brainstem Toolbox Freeware

## and AEP2ASCII



Brainstem Toolbox [BioMAP]

### BRAINSTEM TOOLBOX [BioMARK]

Quiet ASCII file(S):

Do you have a noise file(s)? It is required for inter-response correlations.  
  plot noise waveform?

Check if you wish to use a non-default stimulus file.  
  File used for stimulus-to-response correlations

RMS time range (ms)  
 to  Range over which RMS amplitude is calculated. FFT and correlational analyses are performed over this same range unless specified below.

Frequency ranges (Hz)  
 1.  to  Frequency ranges that will be used in assessing spectrum of response. Typical ranges are centered at the Stimulus' harmonics.  
 2.  to   
 3.  to

Scale results? Checking this box will result in meaningful amplitude units (peak  $\mu\text{V}$ ). Unchecking results in unscaled numbers that match Bio-logic BioMARK.

If different from BioMAP defaults

to  FFT time range (ms)  
 to  Interresponse correlation time range (ms)  
 to  Stim-to-response correlation time range (ms). Please enter time range of STIMULUS, not response.

Check if you wish results to be saved to an Excel file. All files will be saved to "bt\_gui\_biomark...."

updated: Feb 2010

### BRAINSTEM TOOLBOX Report

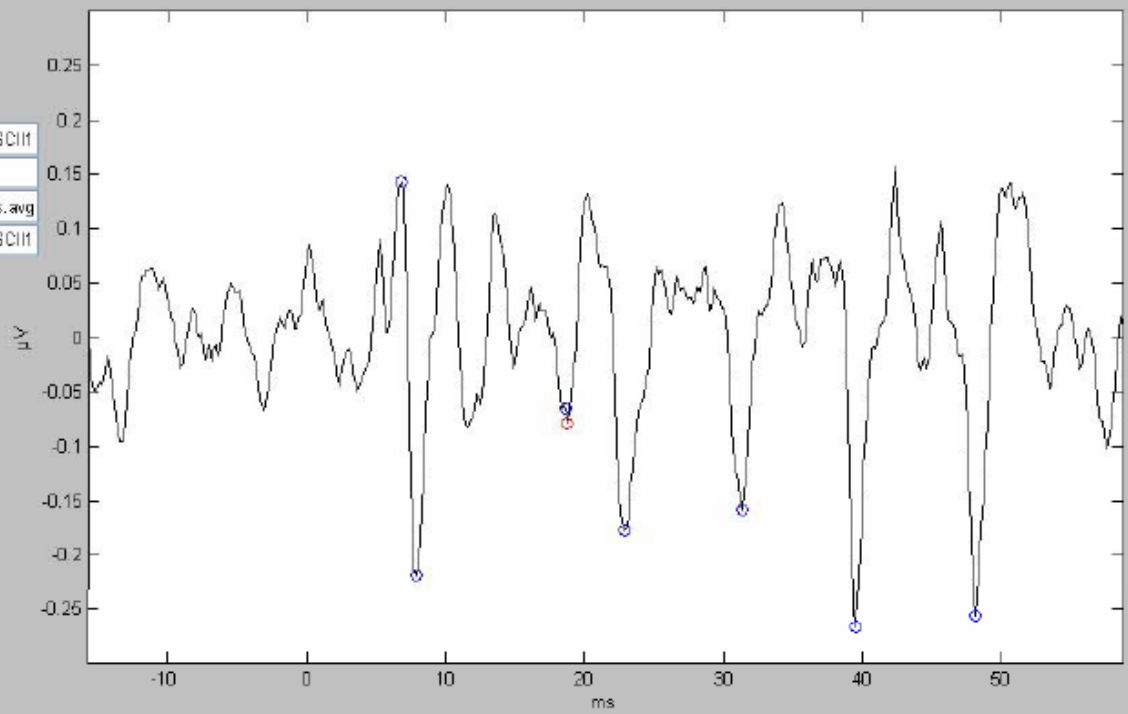
Quiet filename: sample\_BMAP\_ASCII  
 Noise filename:  
 Stimulus filename: filtered\_BioMARK\_stimulus.avg  
 Marker filename: sample\_BMAP\_ASCII

#### 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: 0.060 Signal to noise ratio: 2.05  
 Prestim RMS: 0.039

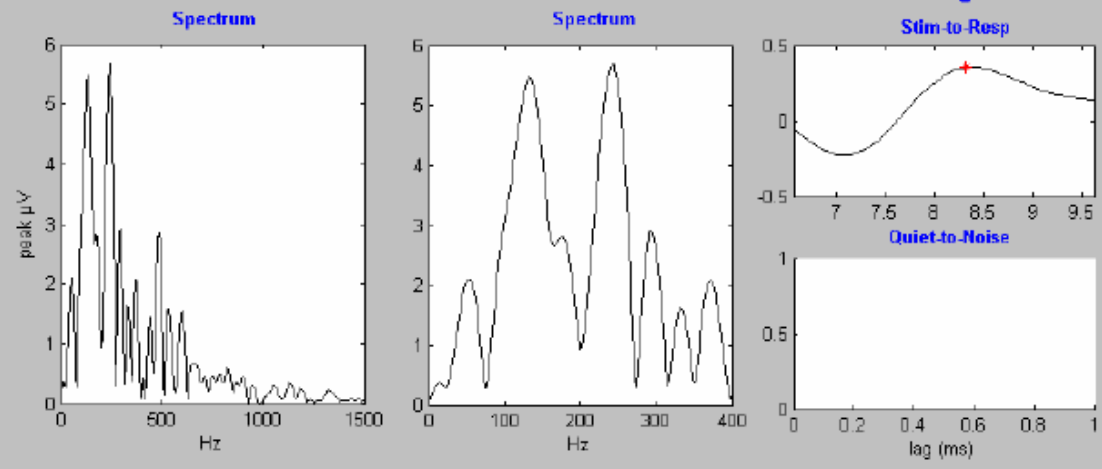
#### Frequency Analysis

	Hz.	Amp.
Range 1:	103-121	4.050
Range 2:	454-719	0.953
Range 3:	721-1155	0.275

#### Correlational Analyses

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

#### Correlograms



Wearing a mask shows...



Kindness