Visualize the EEG output from the PREP processing pipeline.

Table of Contents

Calling directly: prepPipelineReport

This helper reporting script expects that EEG will be in the base workspace with an EEG.etc.noiseDetection structure containing the report. It also expects the following variables in the base workspace:

- summaryFile - variable containing the open file descriptor for summary
- consoleID - variable with open file descriptor for console (usually 1 unless the output is redirected).
- relativeReportLocation report location relative to summary

The reporting function appends a summary to the summary report.

Usually the prepPipelineReport script is called through the function:

```
publishPrepPipelineReport
```

It is not a function itself, to allow the MATLAB publish to dump a nice output.

Write data status and report header

```
EEGvep_01.set[70 channels, 313856 frames]
Error status: unprocessed
Versions:
 Detrend:v0.50 GlobalTrend:v0.50 LineNoise:v0.50 Resampling:v0.50 Referenc
Sampling rate: 512Hz
Events: 821, Original events: 821
Unique event types: 9
Bad channels interpolated for reference: []
```

Line noise removal step

```
Version v0.50
Sampling frequency Fs: 512 Hz
Line noise frequencies:
  [ 60 120 180 240 ]
Maximum iterations: 10
Significant frequency p-value: 0.01
+/- frequency BW for significant peaks (fScanBandWidth): 2
Taper bandwidth: 2 Hz
Taper window size (seconds): 4
Taper step size (seconds): 1
Sigmoidal smoothing factor (tau): 100
Spectral pad factor: 0
Analysis frequency interval(fPassBand): [ 0, 256 ] Hz
Taper template: [ 1, 4, 1 ]
Line noise channels (64 channels):
  [ 1 2 3 4 5 6 7 8 9 10
  11 12 13 14 15 16 17 18 19 20
  21 22 23 24 25 26 27 28 29 30
  31 32 33 34 35 36 37 38 39 40
  41 42 43 44 45 46 47 48 49 50
  51 52 53 54 55 56 57 58 59 60
  61 62 63 64 ]
```

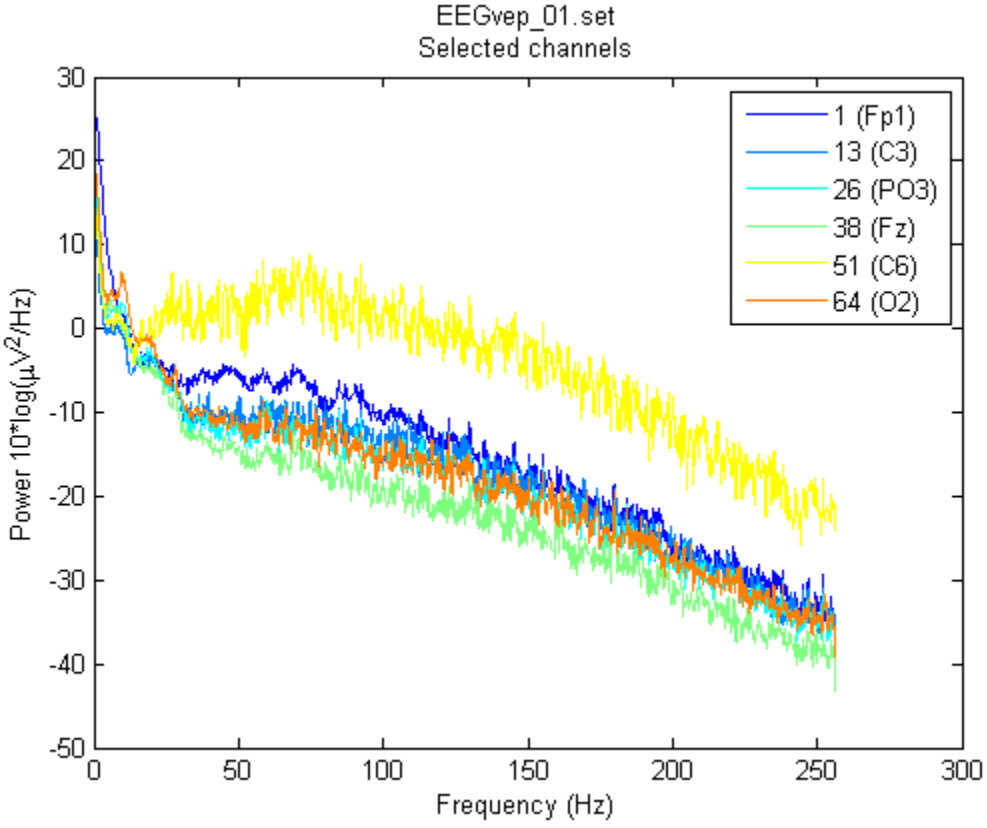
Initial detrend for reference calculation

```
Detrend version v0.50
Detrend cutoff: 1 Hz
Detrend type: High Pass
Detrend step size: 2.000000e-02
```

```
Detrend command:
EEG1 = pop_eegfiltnew(EEG1, [], 1, 1690, true, [], 0);
Detrended channels (64 channels):
  [ 1 2 3 4 5 6 7 8 9 10
  11 12 13 14 15 16 17 18 19 20
  21 22 23 24 25 26 27 28 29 30
  31 32 33 34 35 36 37 38 39 40
  41 42 43 44 45 46 47 48 49 50
  51 52 53 54 55 56 57 58 59 60
  61 62 63 64 ]
```

Spectrum after line noise and detrend

```
pop_eegfiltnew() - performing 1691 point highpass filtering.

pop_eegfiltnew() - transition band width: 1 Hz
pop_eegfiltnew() - passband edge(s): 1 Hz
pop_eegfiltnew() - cutoff frequency(ies) (-6 dB): 0.5 Hz
pop_eegfiltnew() - filtering the data (zero-phase)
firfilt(): |====================| 100%, ETE 00:00
```



Report referencing step

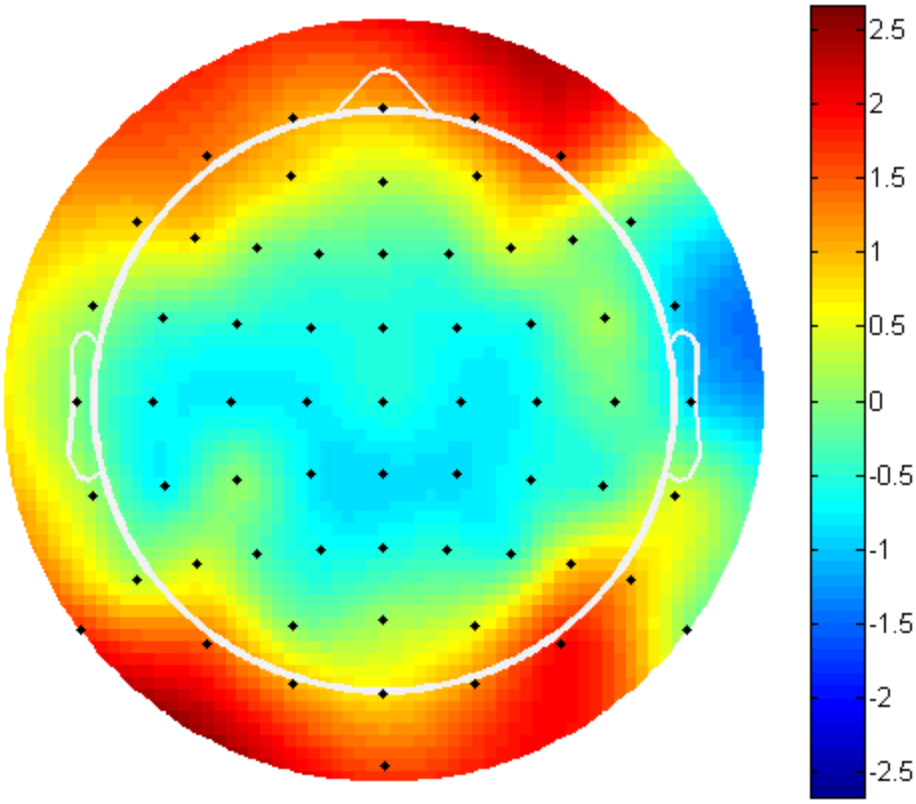
```
prepPipeline failed postProcess: Reference to non-existent field 'referenc

Referencing version v0.50
```

```
Reference type Robust
Interpolation order Post-reference

Reference channels (64 channels):
  [ 1 2 3 4 5 6 7 8 9 10
  11 12 13 14 15 16 17 18 19 20
  21 22 23 24 25 26 27 28 29 30
  31 32 33 34 35 36 37 38 39 40
  41 42 43 44 45 46 47 48 49 50
  51 52 53 54 55 56 57 58 59 60
  61 62 63 64 ]

Evaluation channels (64 channels):
  [ 1 2 3 4 5 6 7 8 9 10
  11 12 13 14 15 16 17 18 19 20
  21 22 23 24 25 26 27 28 29 30
  31 32 33 34 35 36 37 38 39 40
  41 42 43 44 45 46 47 48 49 50
  51 52 53 54 55 56 57 58 59 60
  61 62 63 64 ]

RereferencedChannels (64 channels):
  [ 1 2 3 4 5 6 7 8 9 10
  11 12 13 14 15 16 17 18 19 20
  21 22 23 24 25 26 27 28 29 30
  31 32 33 34 35 36 37 38 39 40
  41 42 43 44 45 46 47 48 49 50
  51 52 53 54 55 56 57 58 59 60
  61 62 63 64 ]
Noisy channel detection parameters:
  Robust deviation threshold (z score): 5
  High frequency noise threshold (ratio): 5
  Correlation window size (in seconds): 1
  Correlation threshold (with any channel): 0.4
  Bad correlation threshold: 0.01
    (fraction of time with low correlation or dropout)
  Ransac off (if 1 Ransac turned off) : 0
  Ransac sample size : 50
    (number channels to use for interpolated estimate)
  Ransac channel fraction (for ransac sample size): 0.25
  RansacCorrelationThreshold: 0.75
  RansacUnbrokenTime (input parameter): 0.4
  RansacWindowSeconds (in seconds): 5
  RansacPerformed (if 1, Ransac on and enough channels): 1
  Maximum reference iterations: 4
  Actual reference iterations: 2


Bad channels interpolated:
   [ 42(F8) 43(FT8) 52(T8) 61(P10) ]
Bad because of NaN:
  [ ]
Bad because data is constant:
  [ ]
```

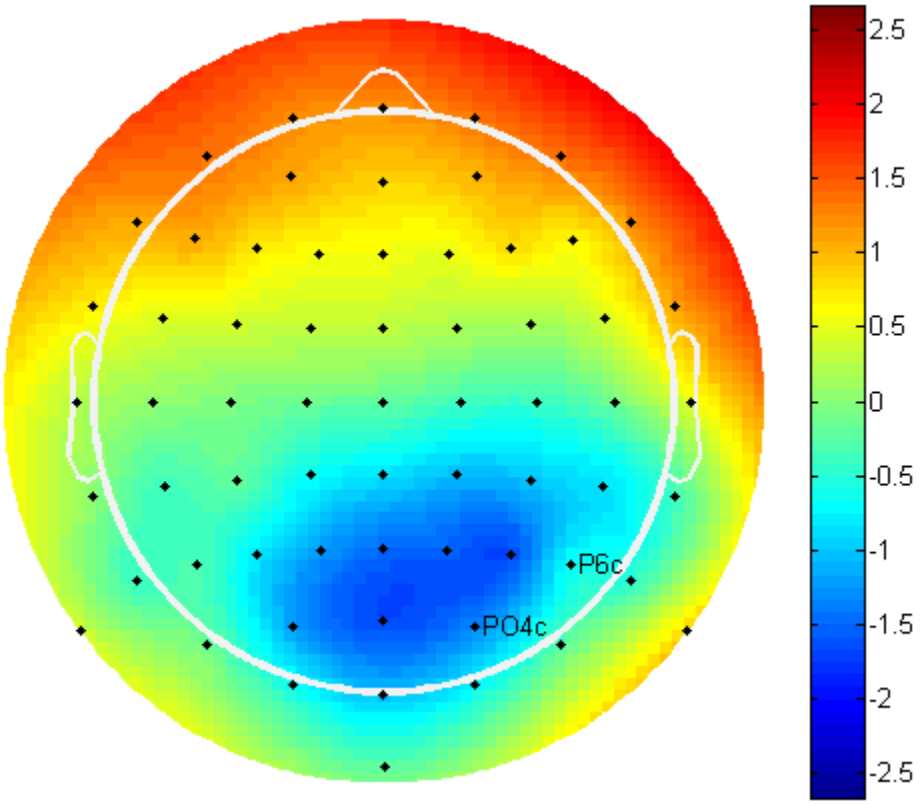
```
Bad because of low SNR:
  [ 42(F8) 43(FT8) 52(T8) ]
Bad because of drop outs:
  [ ]
Bad because of poor max correlation:
  [ 42(F8) 43(FT8) 52(T8) 61(P10) ]
Bad because of large deviation:
  [ ]
Bad because of HF noise:
  [ 42(F8) 43(FT8) 52(T8) ]
Bad because of poor Ransac predictability :
  [ ]

Bad channels after interpolation+referencing:
   [ ]
Bad because of NaN:
  [ ]
Bad because data is constant:
  [ ]
Bad because of low SNR:
  [ ]
Bad because of drop outs:
  [ ]
Bad because of poor max correlation:
  [ ]
Bad because of large deviation:
  [ ]
Bad because of HF noise:
  [ ]
Bad because of poor Ransac predictability :
  [ ]

Actual interpolation iterations: 2
```

Robust channel deviation (referenced)

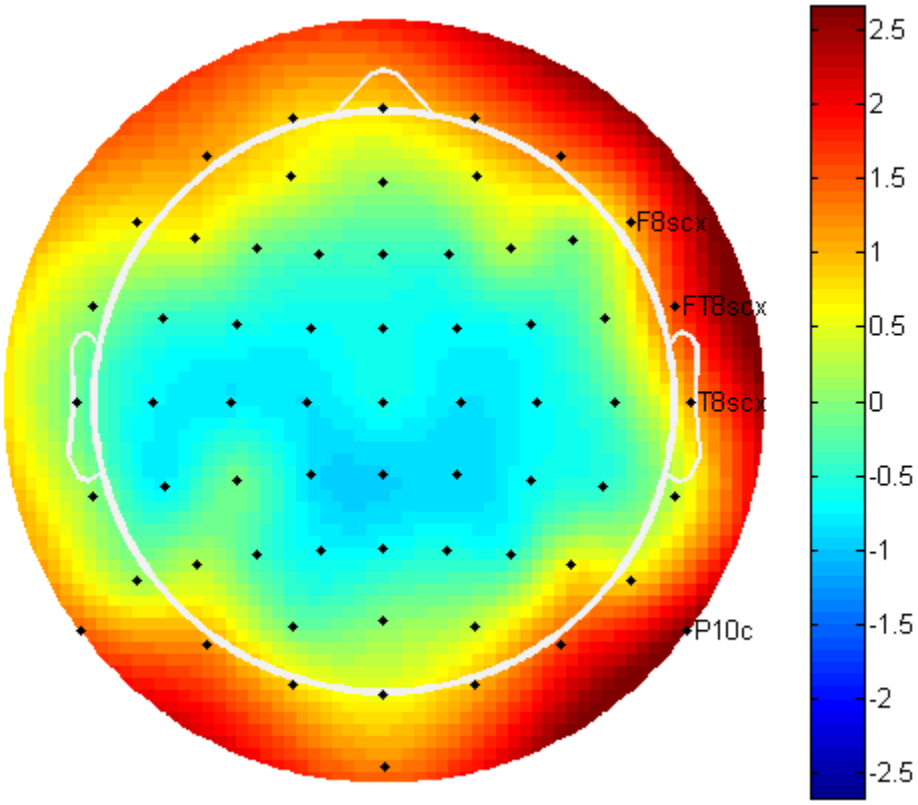
```
Noisy channel legend: NaN: n
NoData: z
LowSNR: s
Corr: c
Amp: +
Noise: x
Ran: ?
```


2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5

Robust channel deviation (original)

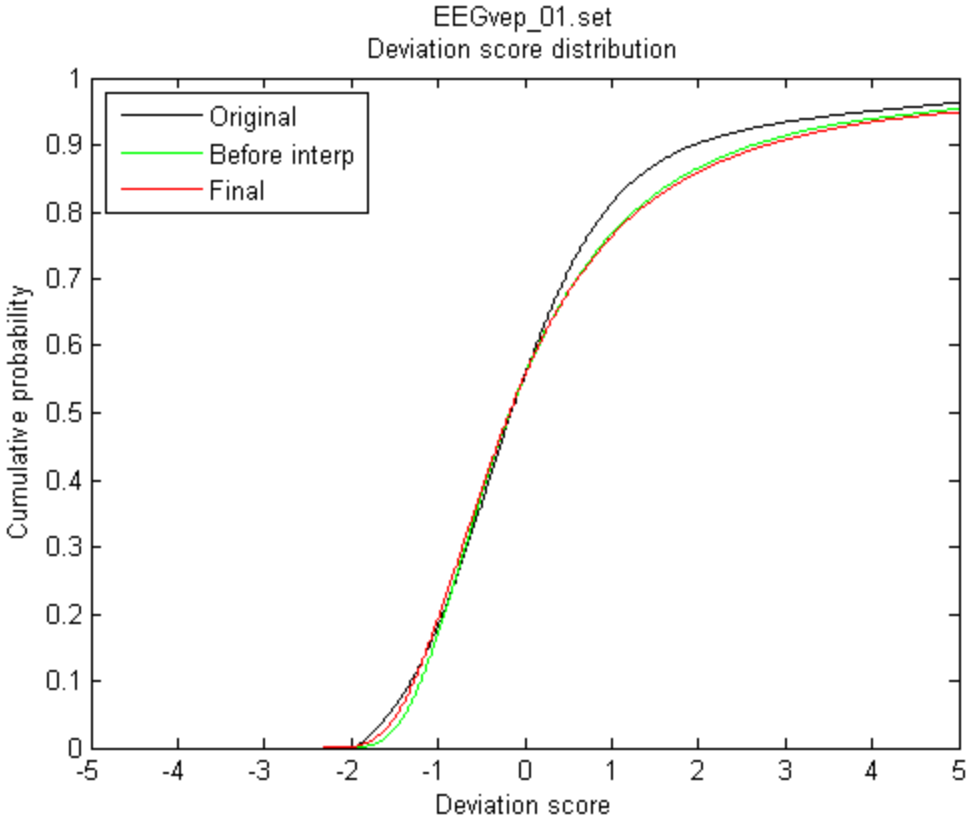


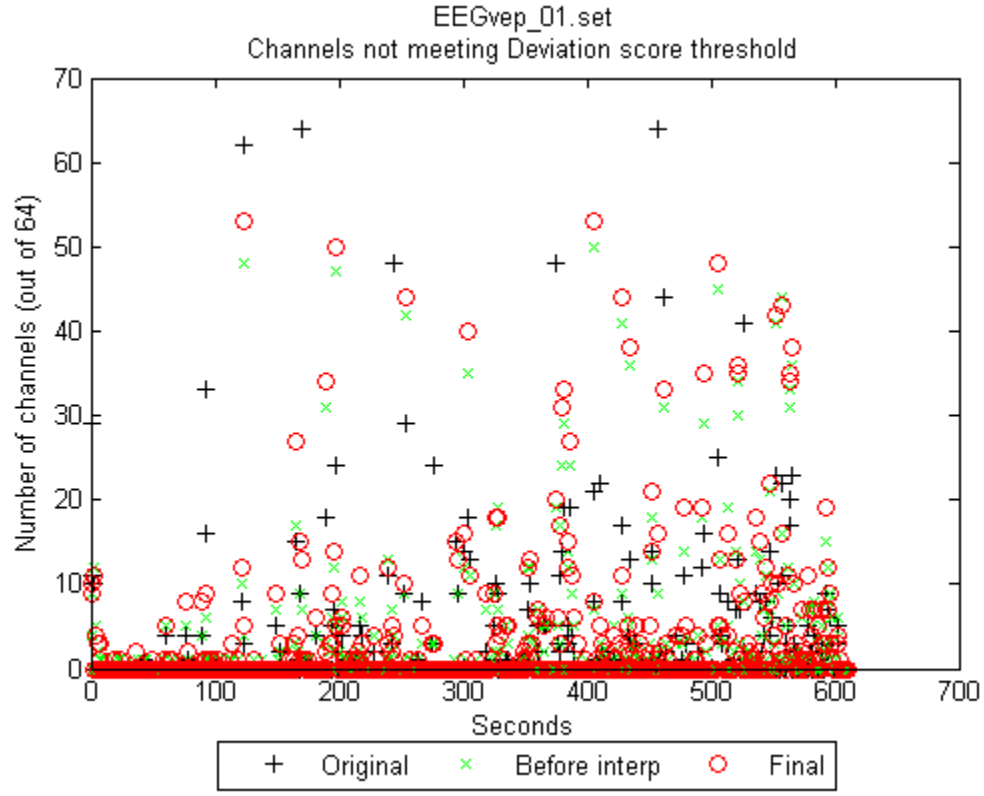
Robust channel deviation (marking interpolated)



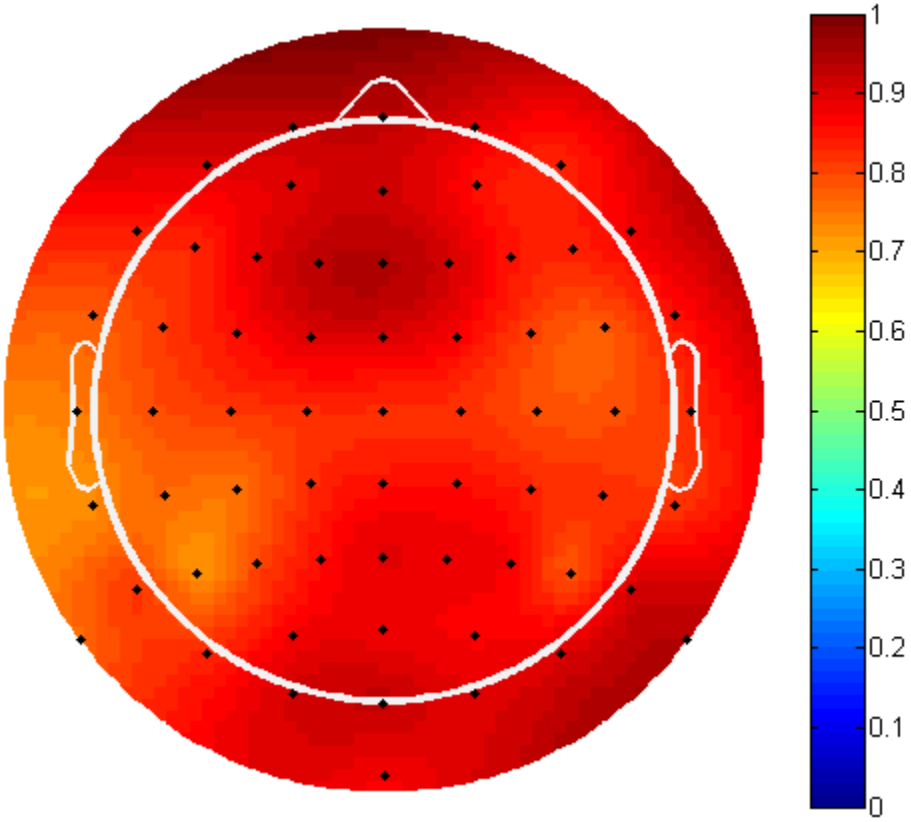
Robust deviation window statistics

```
Deviation window statistics (over 612 windows):
Large deviation channel fraction:
   [before=0.036994, after=0.051139]
Median channel deviation: [before=9.3914, after=6.6001]
SD channel deviation: [before=3.7347, after=1.9683]
Max raw deviation level [before=369.4832, after=331.0379]
Average fraction 0.036994 (2.3676 channels)
   not meeting threshold before in each window
Average fraction 0.051139 (3.2729 channels)
   not meeting threshold after in each window
Windows with > 1/4 deviation channels:
  [before=25, after=32]
Windows with > 1/2 deviation channels:
  [before=8, after=19]
Median window deviations: [before=8.7919, after=6.2454]
SD window deviations: [before=3.9293, after=2.3229]
Channels with dropouts: None
```

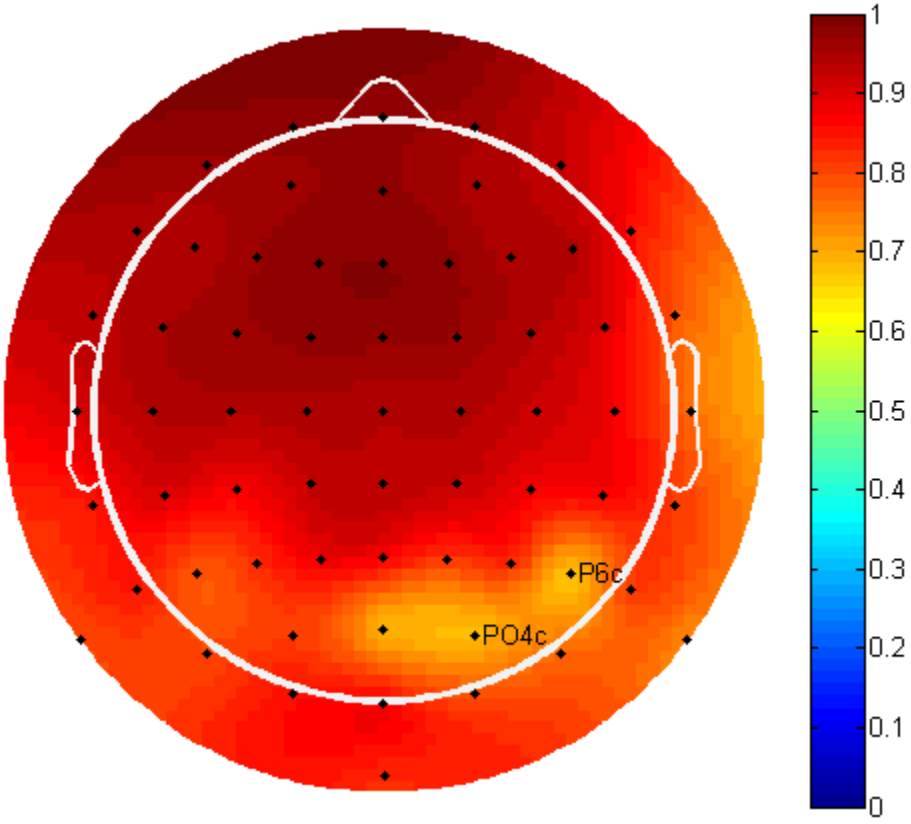

EEGvep_01.set
Deviation score distribution
Original
Before interp
Final
Cumulative probability
Deviation score


EEGvep_01.set
Channels not meeting Deviation score threshold
Number of channels (out of 64)
Seconds
Original
Before interp
Final

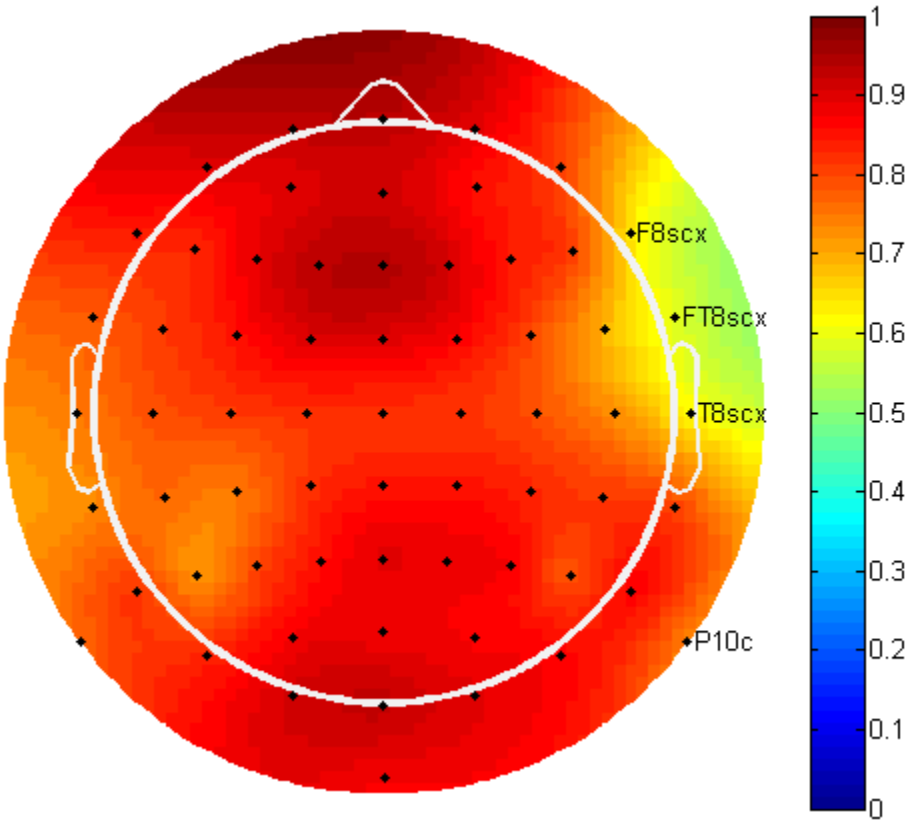
Median max abs correlation (referenced)



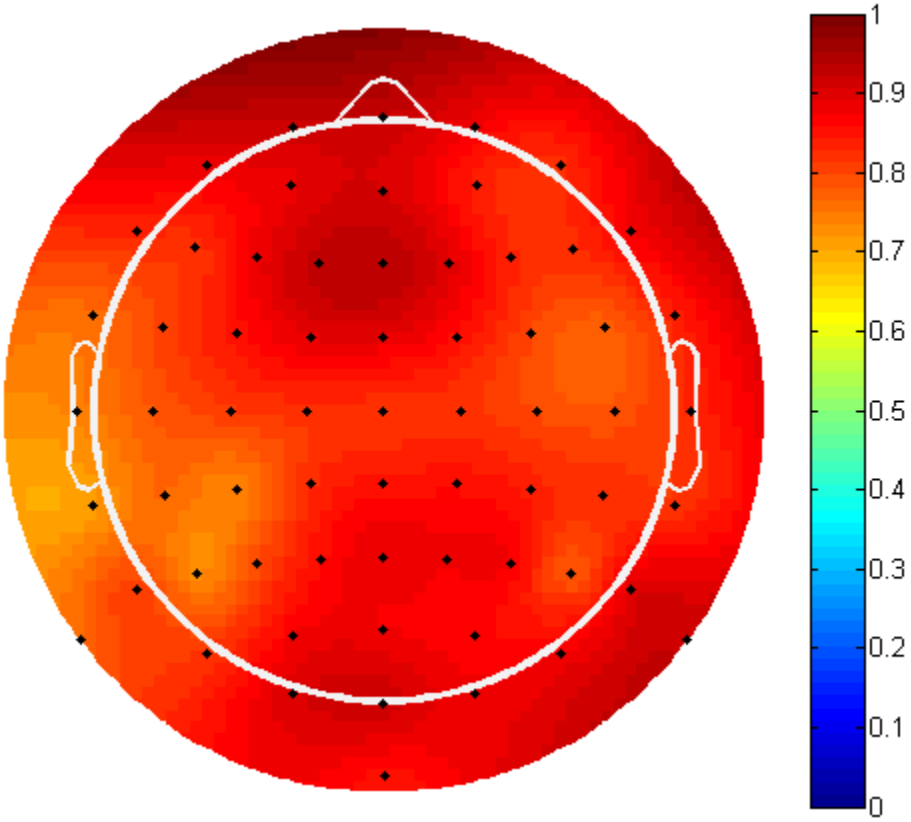
Median max abs correlation (original)



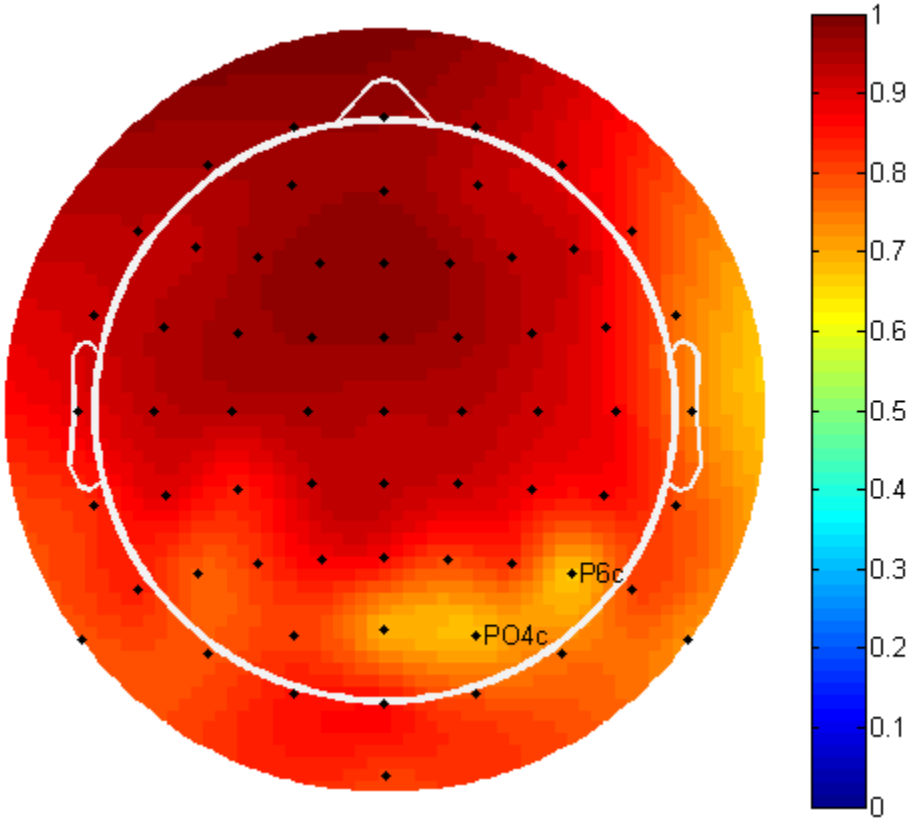
Median max abs correlation (marking interpolated)



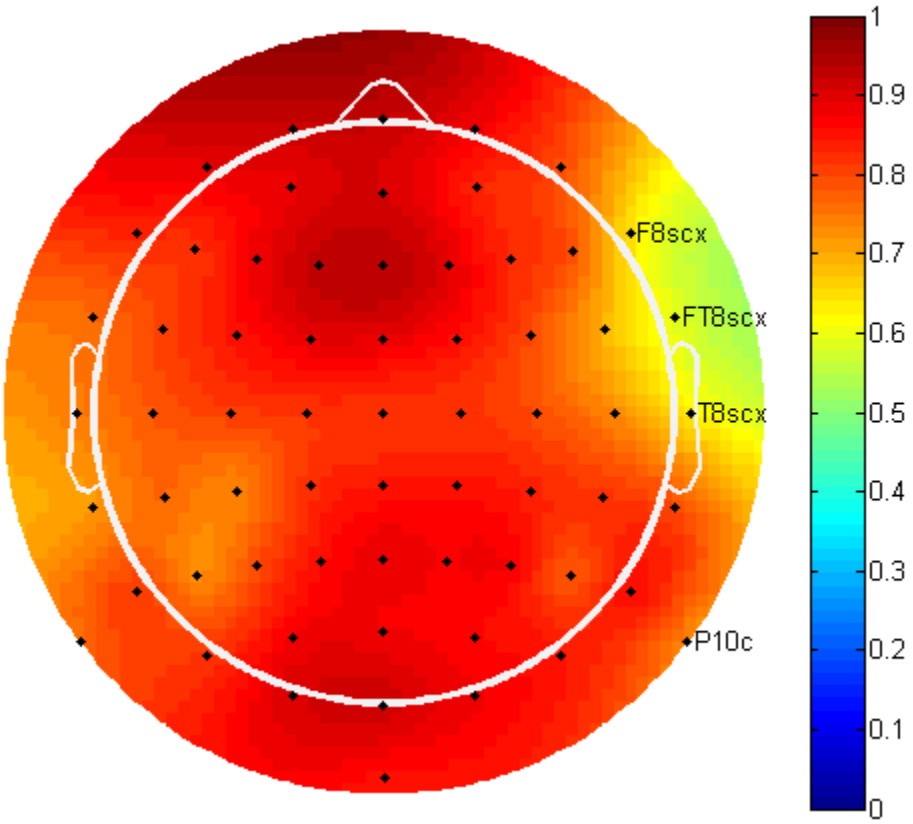
Mean max abs correlation (referenced)



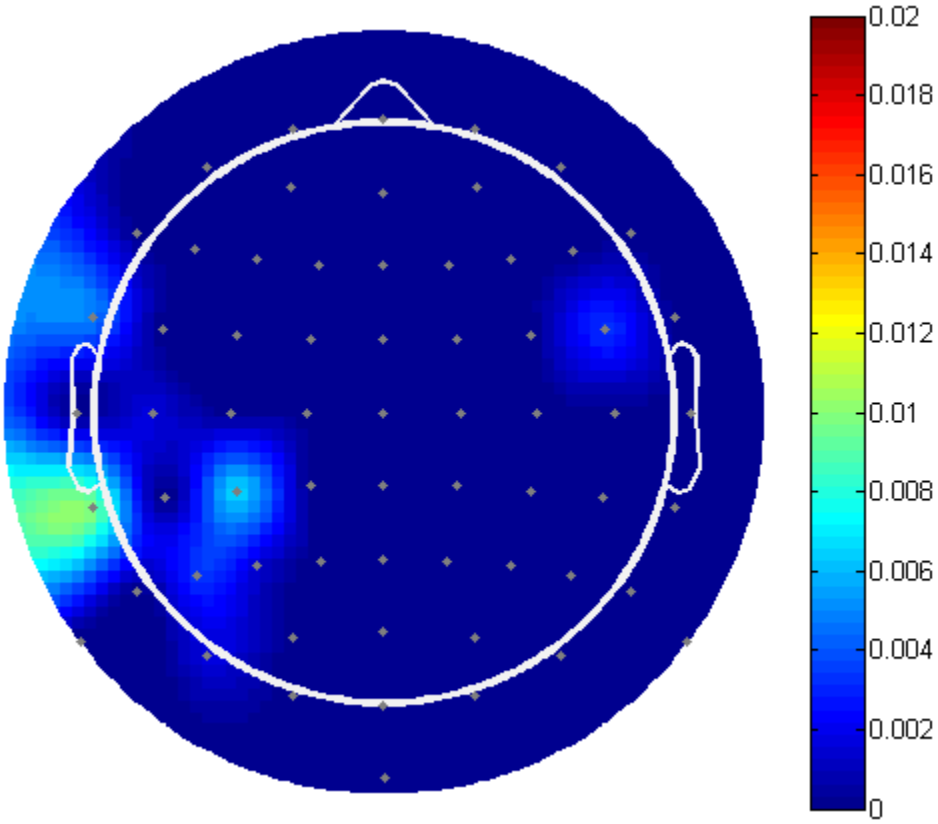
Mean max abs correlation (original)



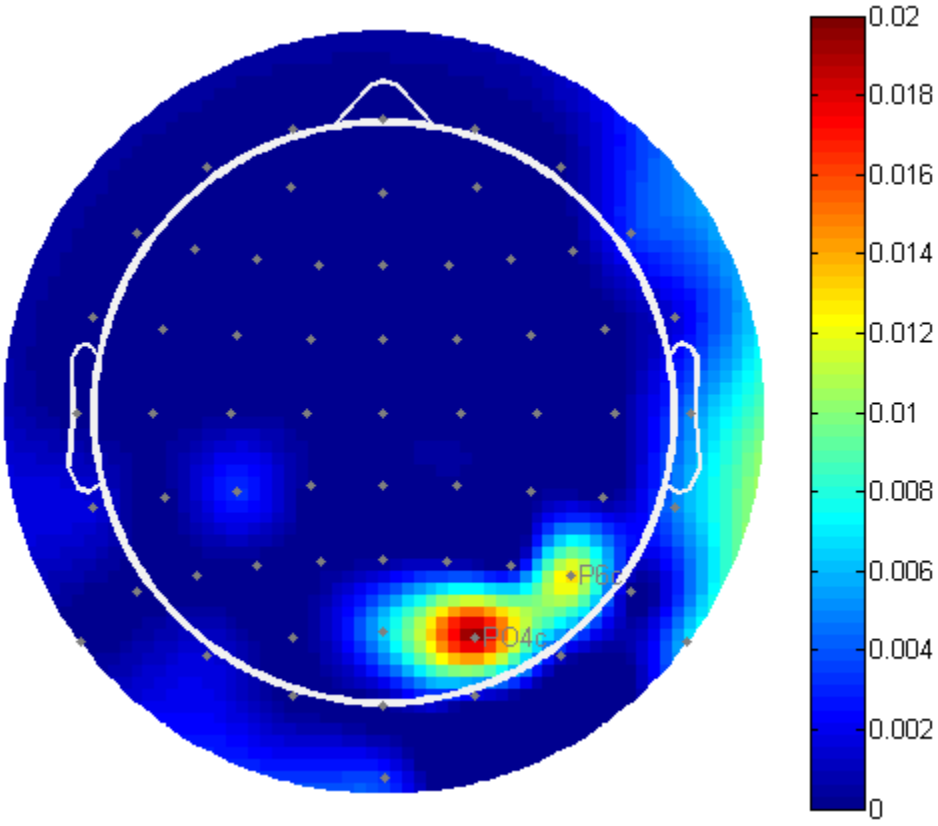
Mean max abs correlation (marking interpolated)



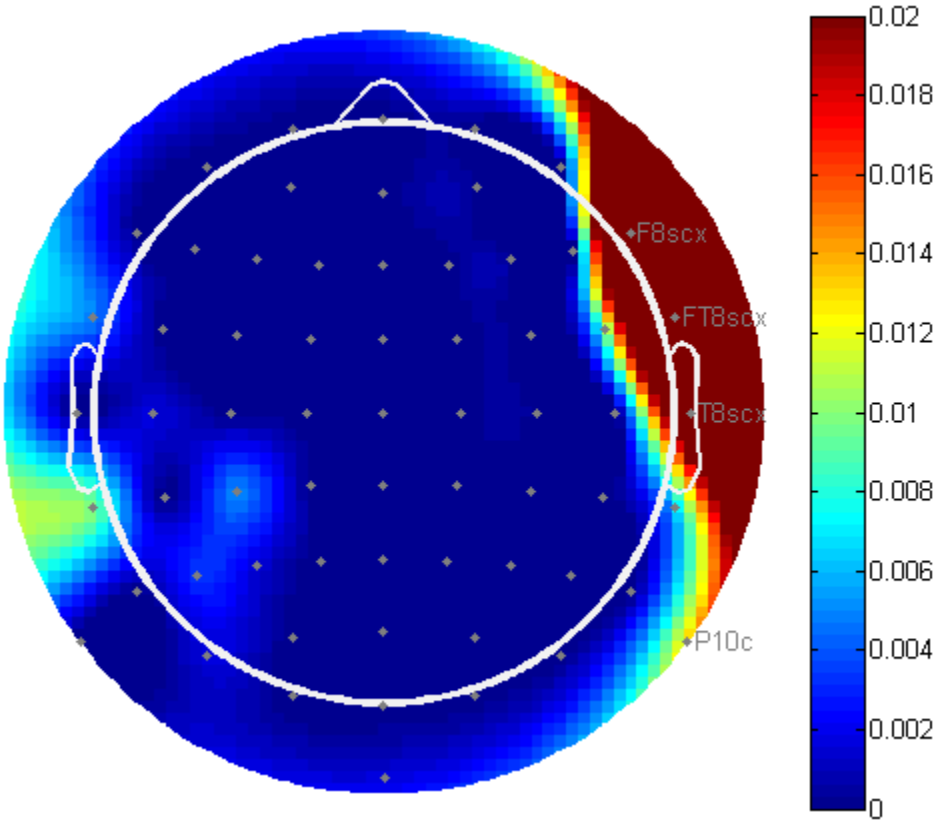
Bad min max correlation fraction (referenced)



Bad min max correlation fraction(original)

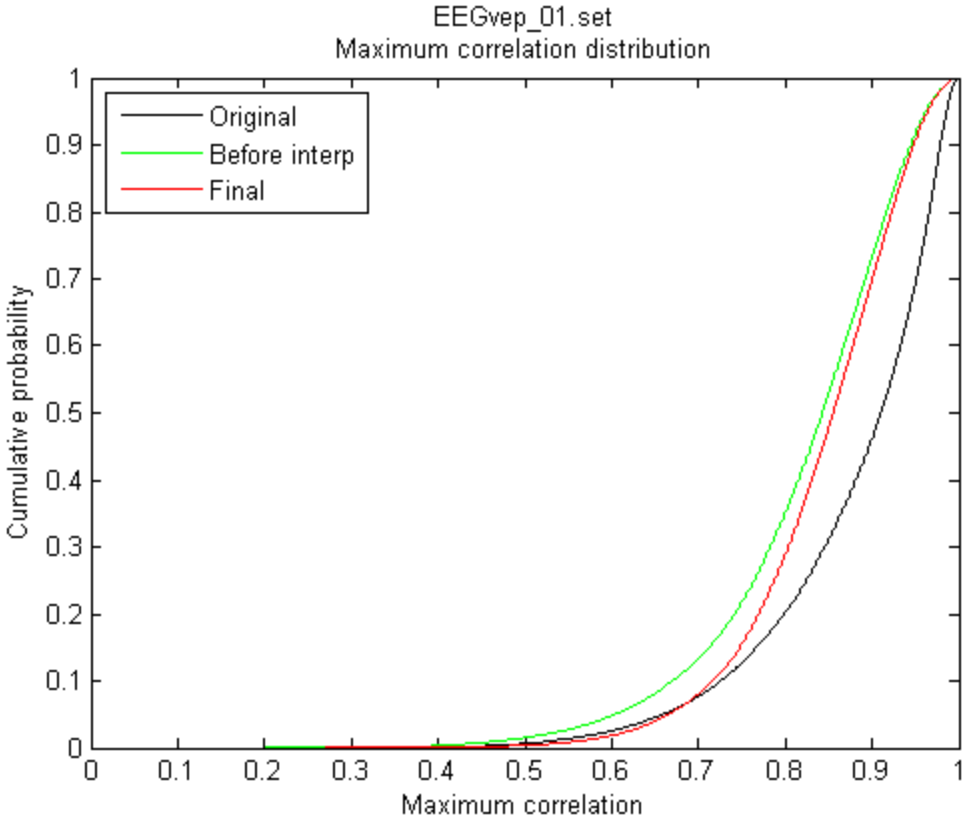


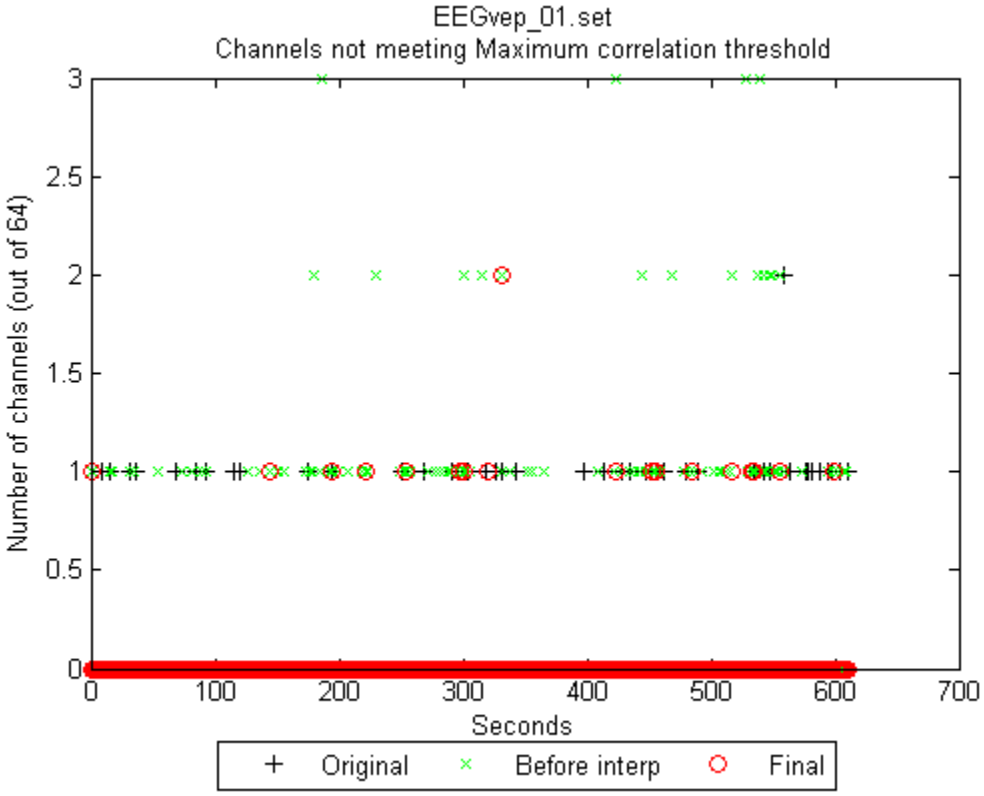
Bad min max correlation fraction (marking interpolated)



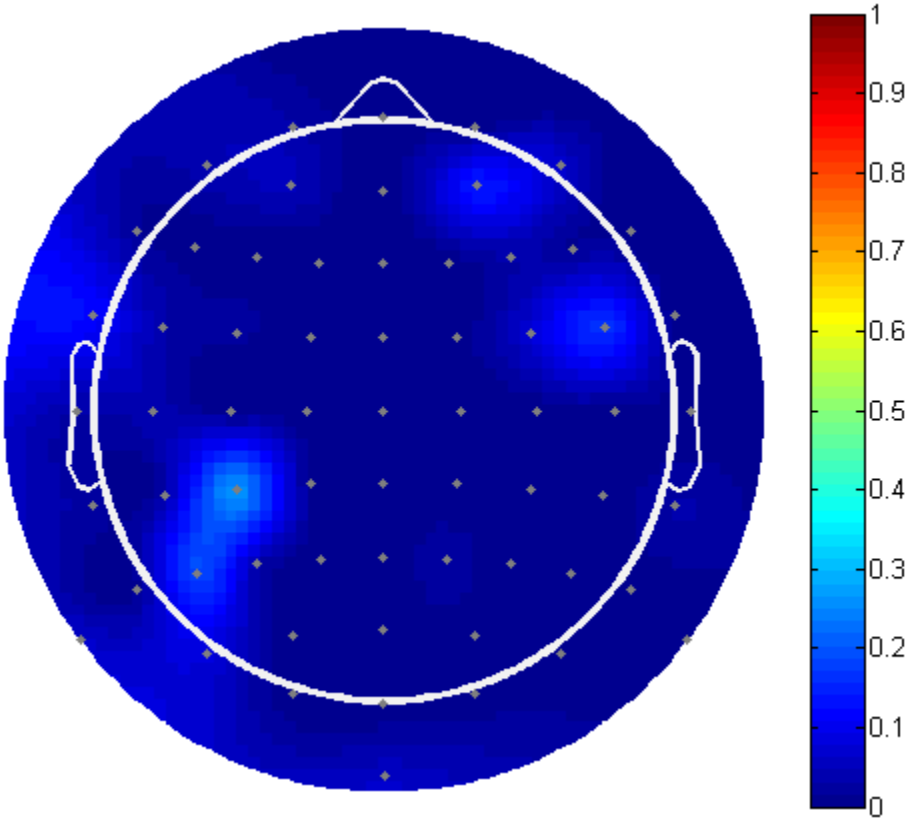
Correlation window statistics

```
Max correlation window statistics (over 612 windows):
Overall median maximum correlation [before=0.92347, after=0.85641]
Low max correlation fraction [before=0.0011489, after=0.00051062]
Minimum max correlation level [before=0.26055, after=0.27081]
Average fraction 0.0011489 (0.073529 channels):
   not meeting threshold before in each window
Average fraction 0.00051062 (0.03268 channels):
   not meeting threshold after in each window
Windows with > 1/4 bad channels: [before=0, after=0]
Windows with > 1/2 bad channels: [before=0, after=0]
```

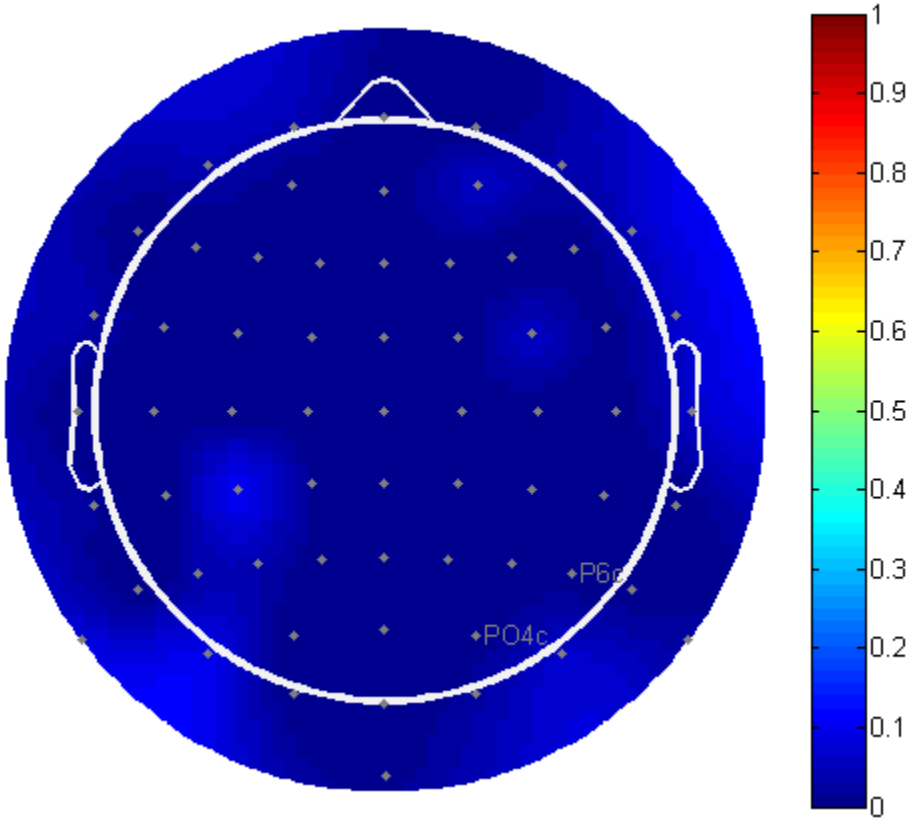

EEGvep_01.set
Maximum correlation distribution
Original
Before interp
Final
Cumulative probability
Maximum correlation
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


EEGvep_01.set
Channels not meeting Maximum correlation threshold
Number of channels (out of 64)
Seconds
0
100
200
300
400
500
600
700
0.5
1
1.5
2
2.5
3
Original
Before interp
Final

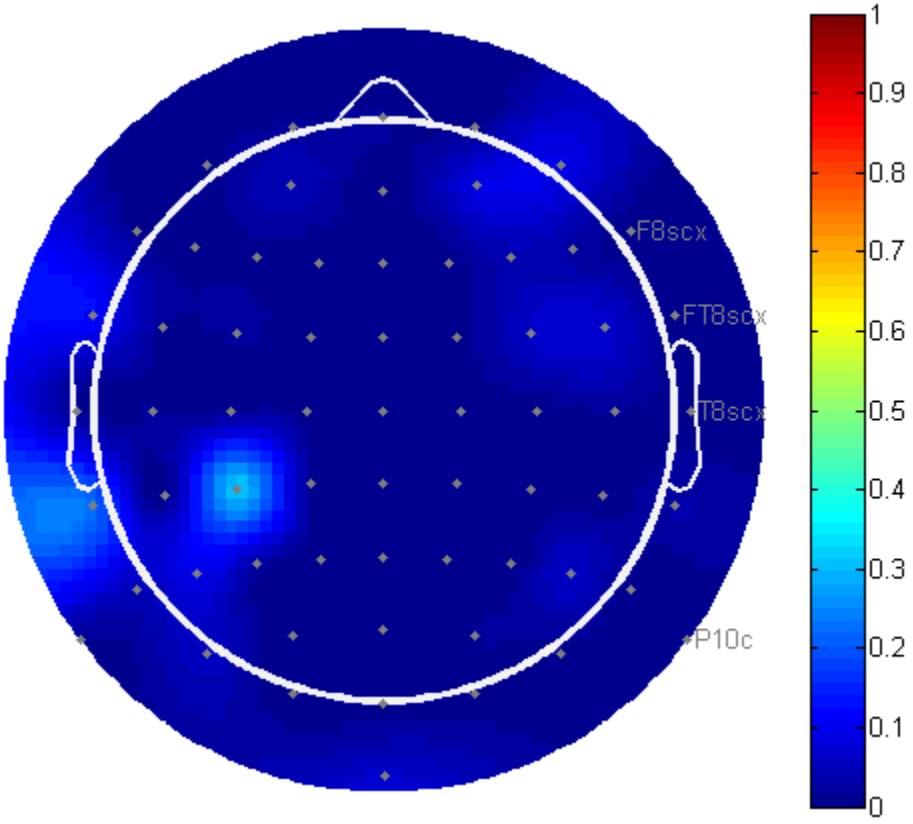
Bad ransac fraction (referenced)



Bad ransac fraction (original)

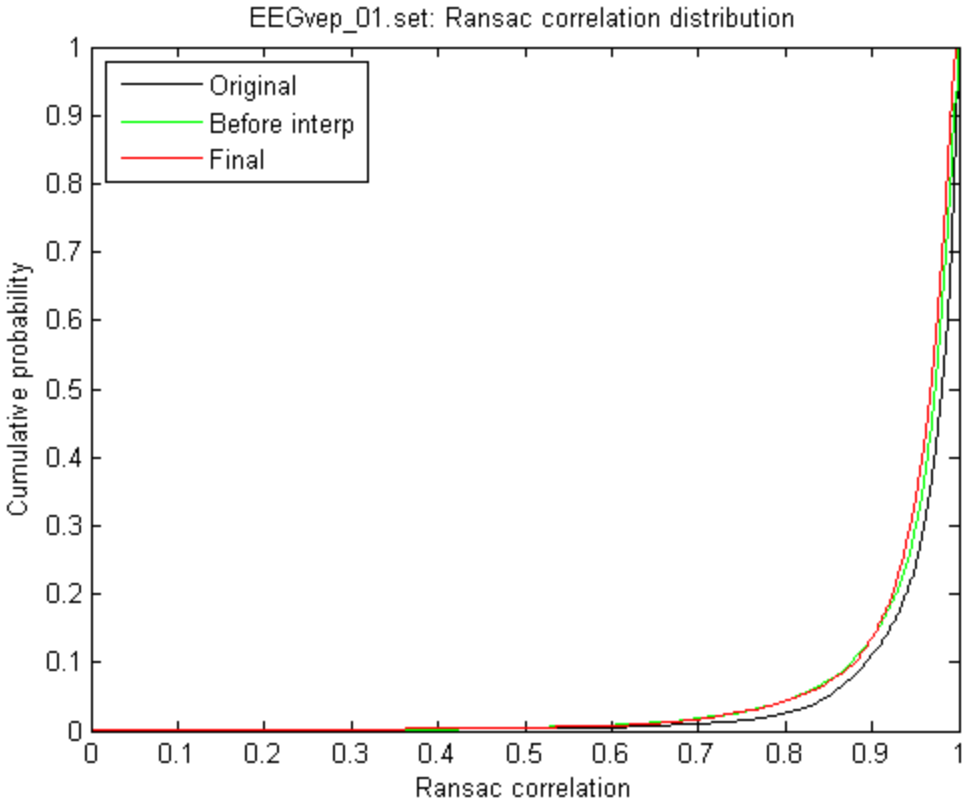


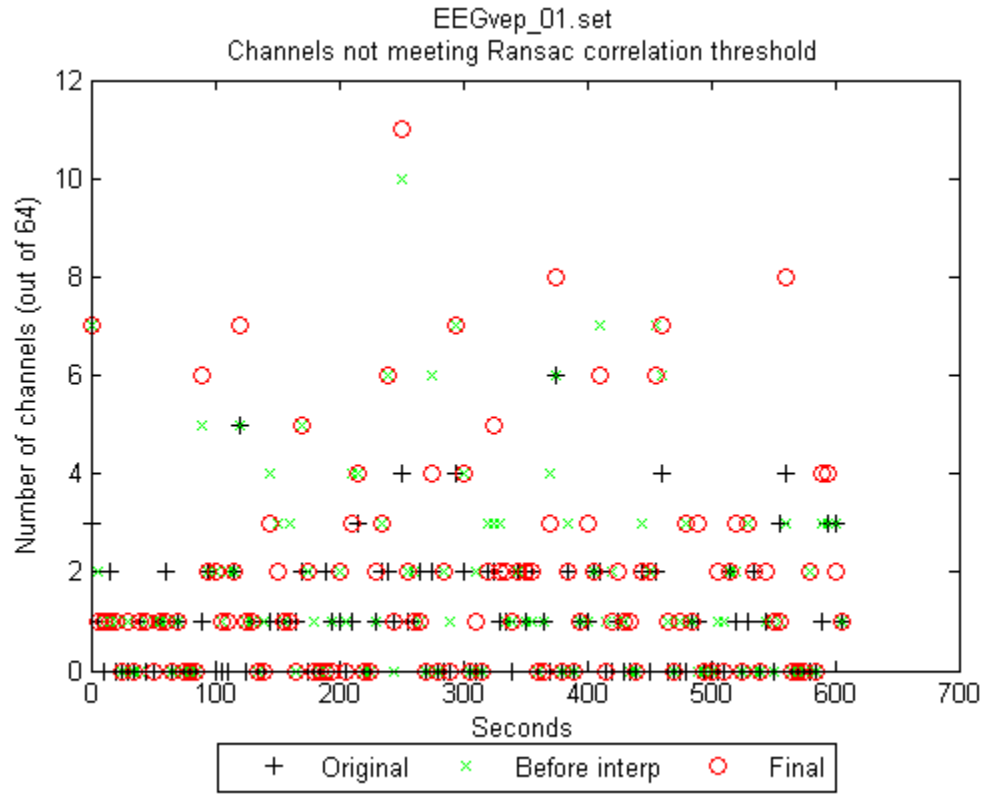
Bad ransac fraction (marking interpolated)



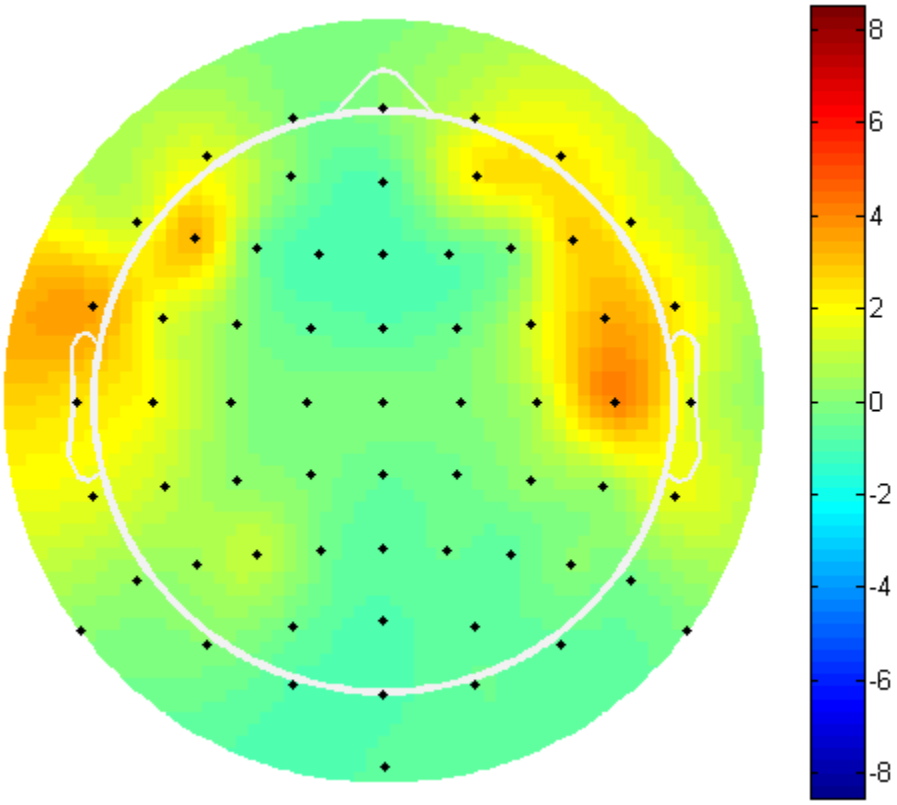
Channels with poor ransac correlations

```
Ransac window statistics (over 122 windows):
Low ransac channel fraction [before=0.015113, after=0.028048]
Minimum ransac correlation [before=-0.38565, after=-0.2409]
Average fraction 0.015113 (0.96721 channels):
   not meeting threshold before in each window
Average fraction 0.028048 (1.7951 channels):
   not meeting threshold after in each window
Windows with > 1/4 bad ransac channels: [before=0, after=0]
Windows with > 1/2 bad ransac channels: [before=0, after=0]
```

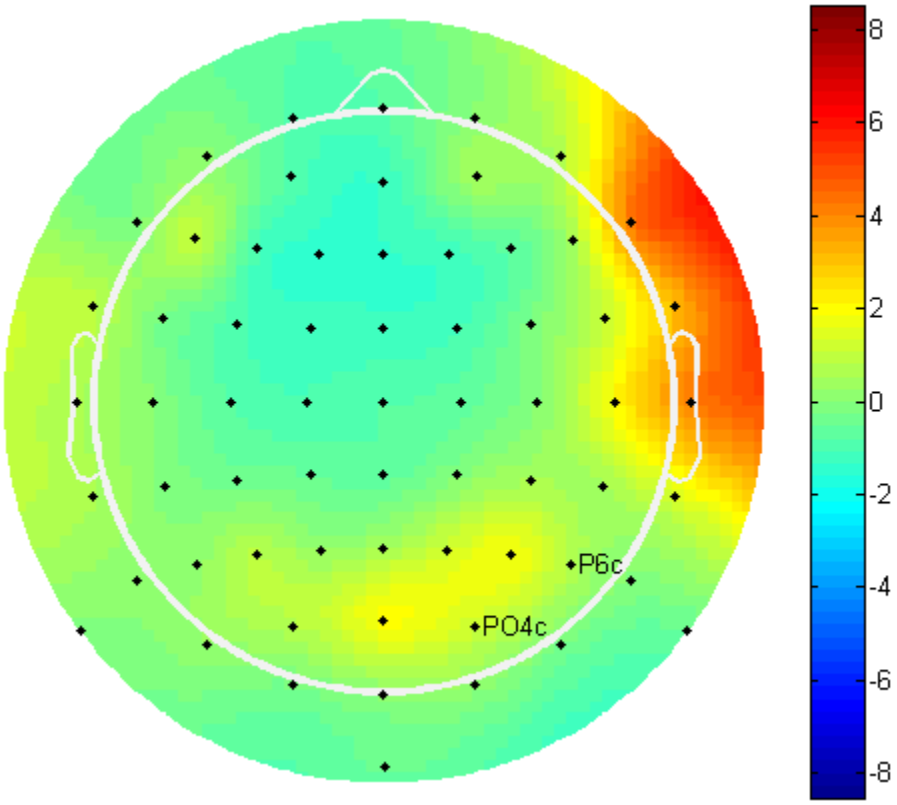

EEGvep_01.set: Ransac correlation distribution
Original
Before interp
Final
Cumulative probability
Ransac correlation
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


EEGvep_01.set
Channels not meeting Ransac correlation threshold
Number of channels (out of 64)
Seconds
0
100
200
300
400
500
600
700
2
4
6
8
10
12
Original
Before interp
Final

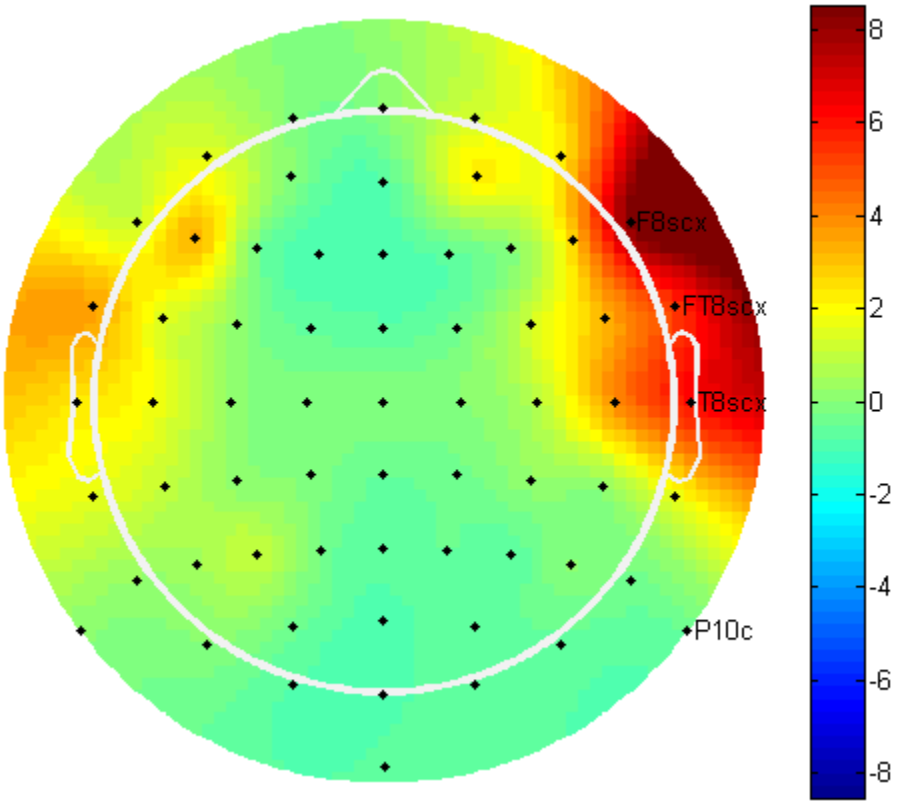
HF noise Z-score (referenced)



HF noise Z-score (original)

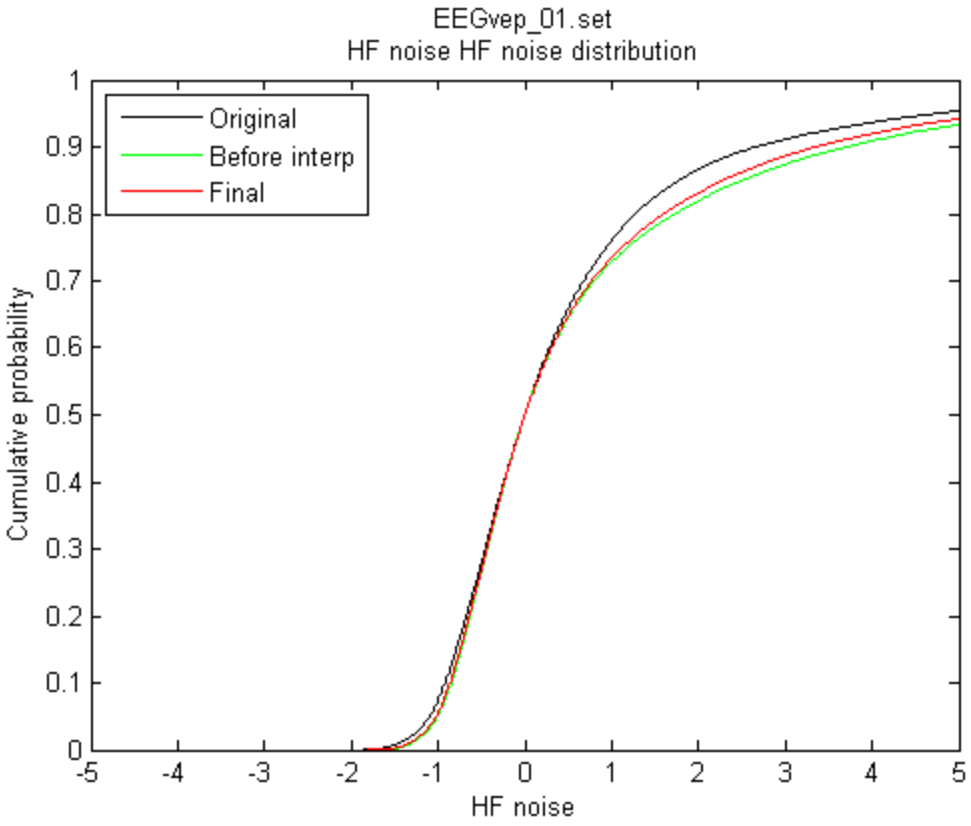


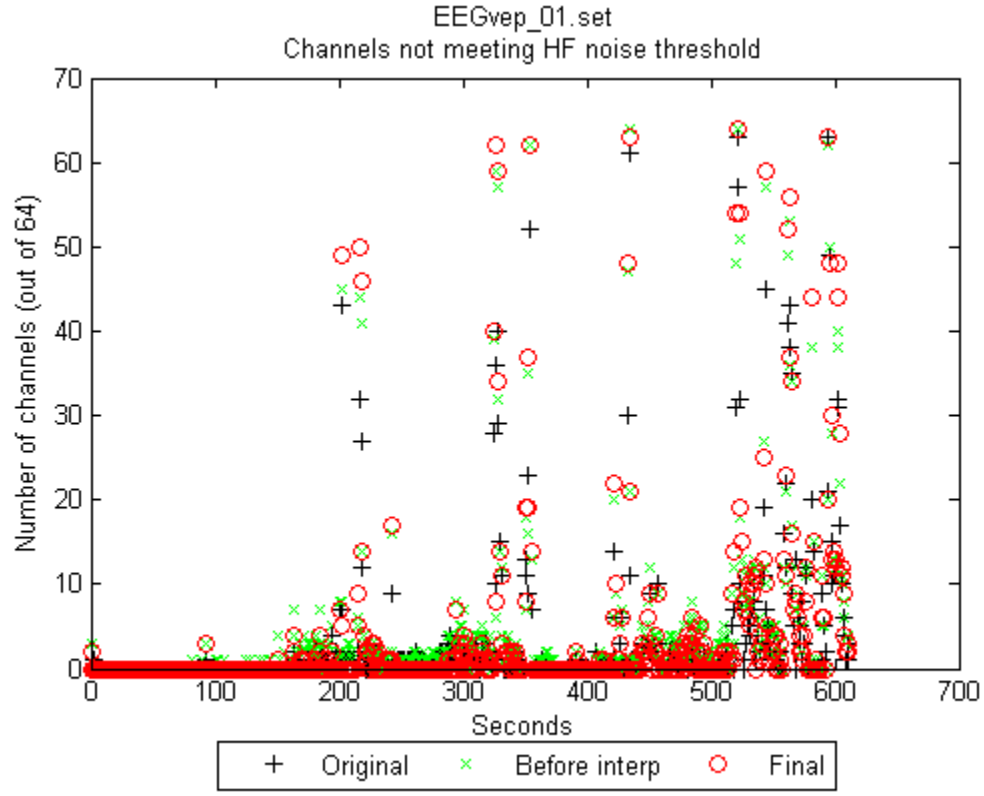
HF noise Z-score (marking interpolated)



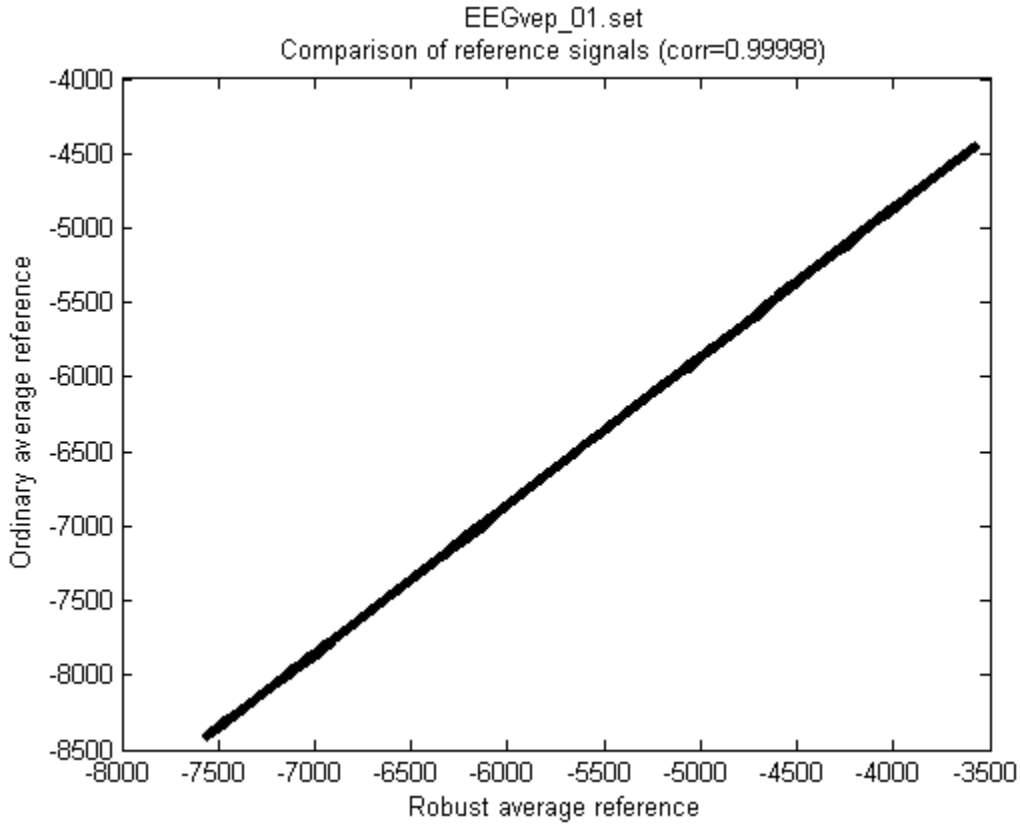
HF noise window stats

```
Noise window statistics (over 612 windows):
Channel fraction with HF noise:
  [before=0.046594, after=0.058517]
Median noisiness: [before=0.1567, after=0.15098]
SD noisiness: [before=0.042956, after=0.039796]
Max HF noise levels [before=2.6309, after=3.5256]
Average fraction 0.046594 (2.982 channels):
   not meeting threshold before in each window
Average fraction 0.058517 (3.7451 channels):
   not meeting threshold after in each window
   not meeting threshold after relative to before in each window
Windows with > 1/4 HF channels:
  [before=29, after=36]
Windows with > 1/2 HF channels:
  [before=14, after=25]
Median window HF: [before=0.16046, after=0.16293]
SD window HF: [before=0.081197, after=0.085545]
```

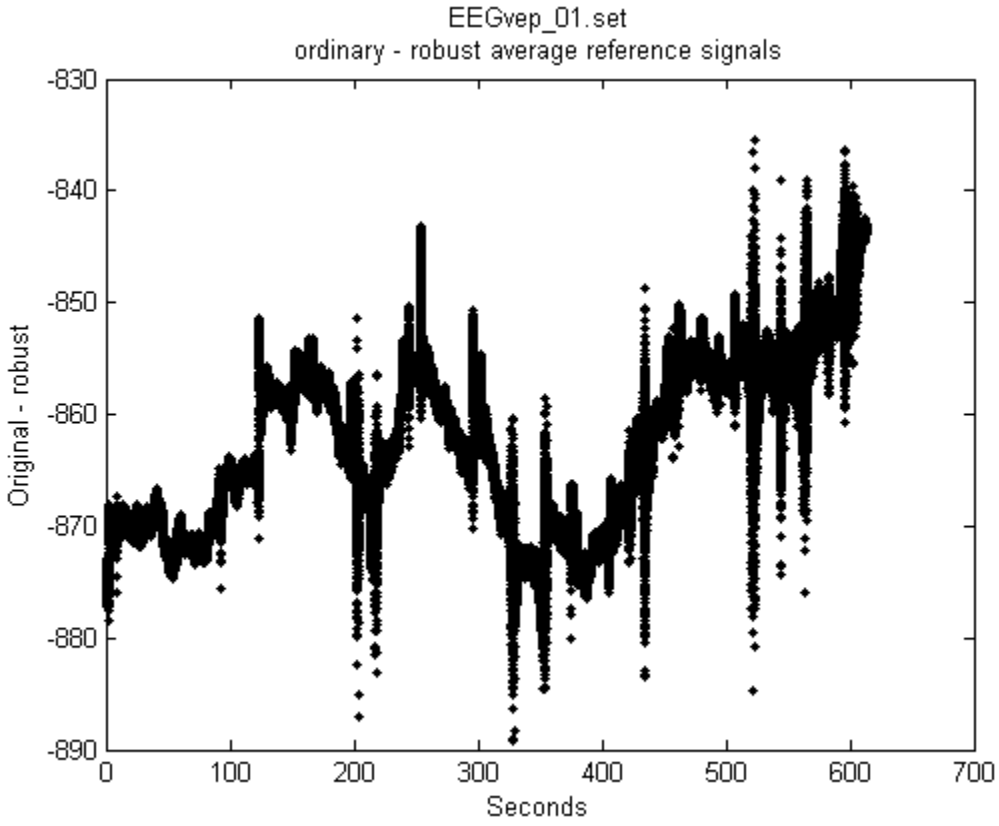

EEGvep_01.set
HF noise HF noise distribution
Original
Before interp
Final
Cumulative probability
HF noise


EEGvep_01.set
Channels not meeting HF noise threshold
Number of channels (out of 64)
Seconds
Original
Before interp
Final

Noisy average reference vs robust average reference

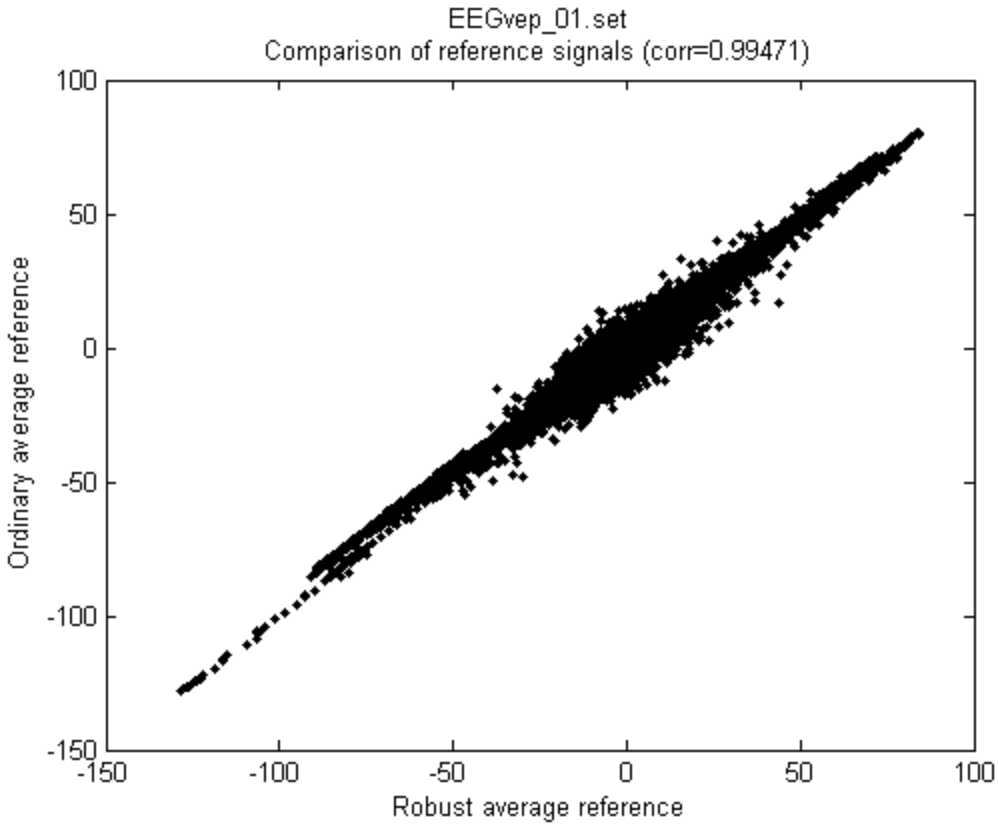


Noisy average reference - robust average reference by time

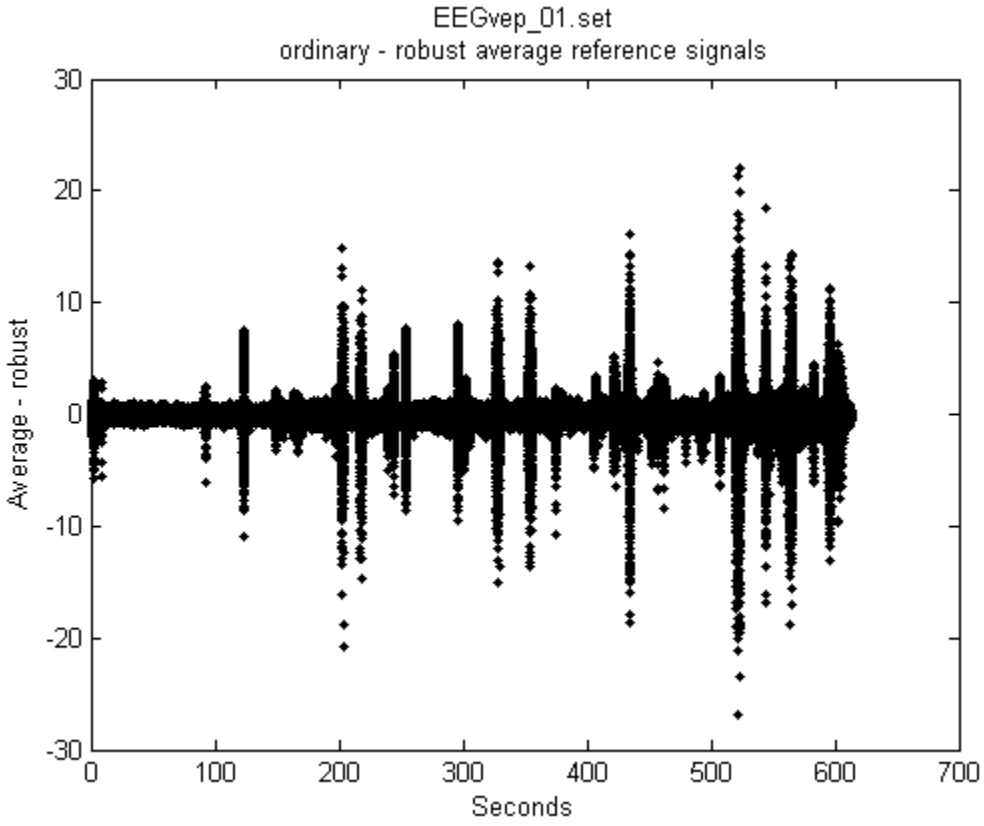


Noisy average reference vs robust average reference (filtered)

```
pop_eegfiltnew() - performing 1691 point highpass filtering.
pop_eegfiltnew() - transition band width: 1 Hz
pop_eegfiltnew() - passband edge(s): 1 Hz
pop_eegfiltnew() - cutoff frequency(ies) (-6 dB): 0.5 Hz
pop_eegfiltnew() - filtering the data (zero-phase)
firfilt(): |====================| 100%, ETE 00:00
```


EEGvep_01.set
Comparison of reference signals (corr=0.99471)
Ordinary average reference
Robust average reference
100
50
0
-50
-100
-150
-150
-100
-50
0
50
100

Noisy average reference - robust average reference by time



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