# S2 and S3 Correlation Studies

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Detector Characterization Session
LSC Meeting
August 19, 2004

LIGO-G040404-00-Z

# A Usefulness for LSC Meetings

- S2-S3 Correlation study presented at March 2004 LSC meeting: see G040148-00-Z
- Feedback from the talk: It could be very useful to have a catalog of observed and known correlations with AS_Q.
- Especially useful for CW search

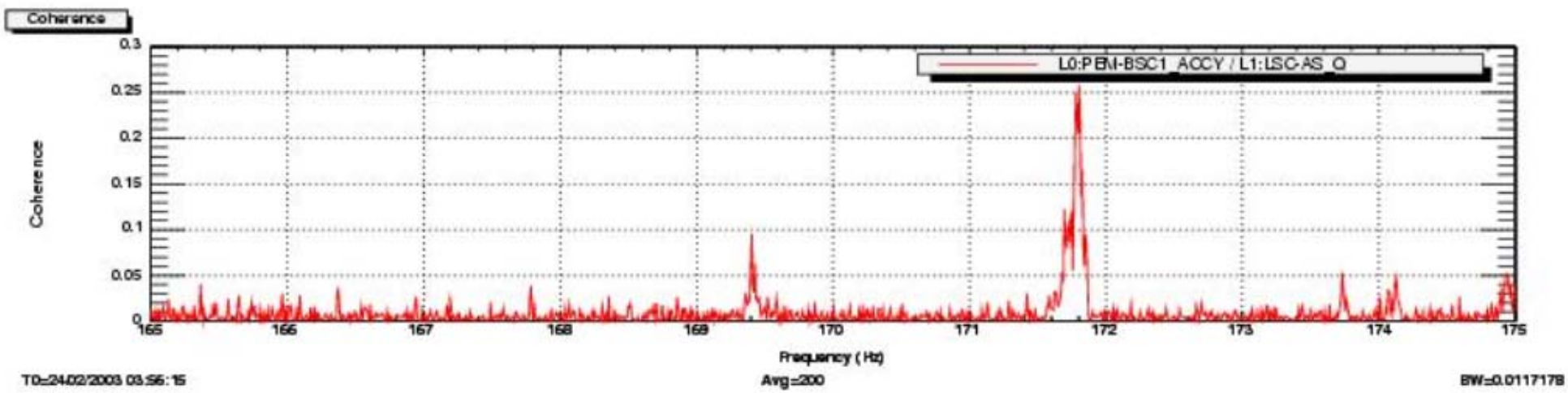
# S2-S3 Correlation Catalog

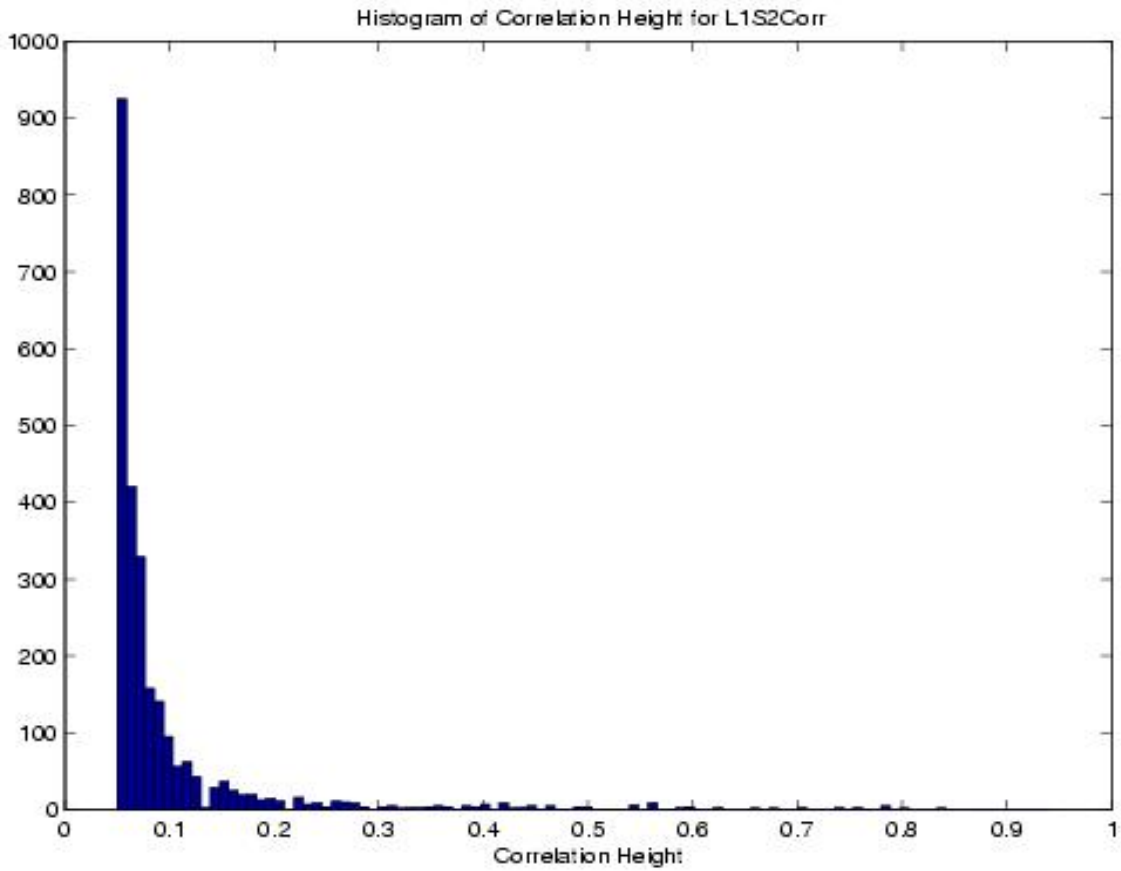
- Webpage based catalog of correlations
- http://ligo.physics.carleton.edu/results/S2S3Correlations.html
- LSC-AS_Q Correlations with PEMs
- S3 and S3: H1, H2, L1
- Correlations ordered by channel, and also by frequency
- Formats: html and txt
- Columns are: Channel Frequency(Hz) Height Width(Hz)

# S2 S3 Correlation Measurements

- 200 averages
- 0.01 Hz Bandwidth
- Threshold of detection is correlation of 0.05
- Lowest frequency (for now) reported in 50 Hz
- Measurements made by undergradMon
- Examples of how values were determined are given
- Histograms of number of occurrences vs. correlation height also given
- Exclude 60 Hz and harmonics

Within this range, we found three peaks - one at 169.4 Hz with a maximum correlation height of 0.095 and a width of 0.15 Hz, one at 171.8 Hz with a maximum correlation height of 0.26 and a width of 0.3 Hz, and one at 173.75 Hz with a maximum correlation height of 0.054 and a width of 0.1 Hz.

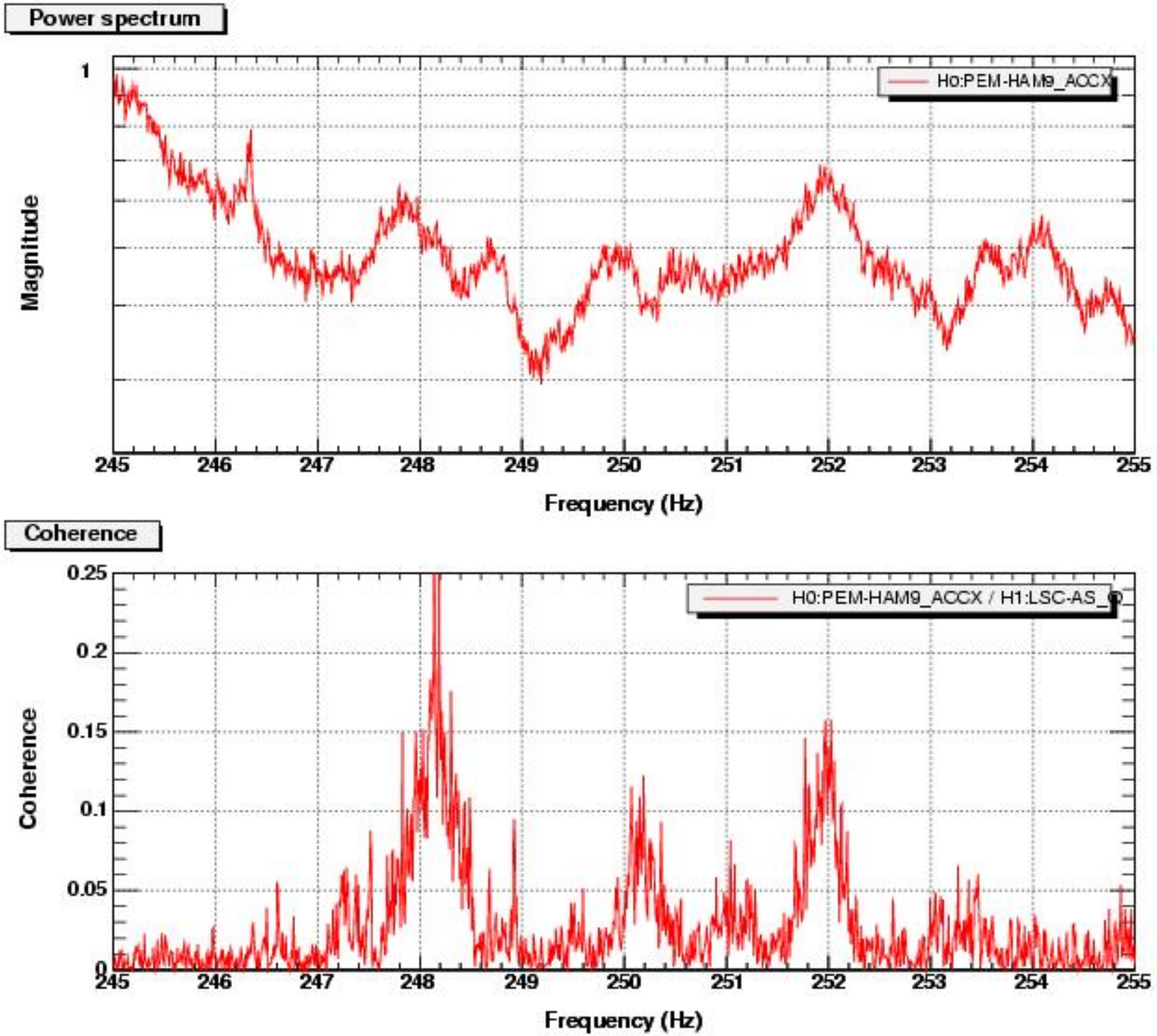




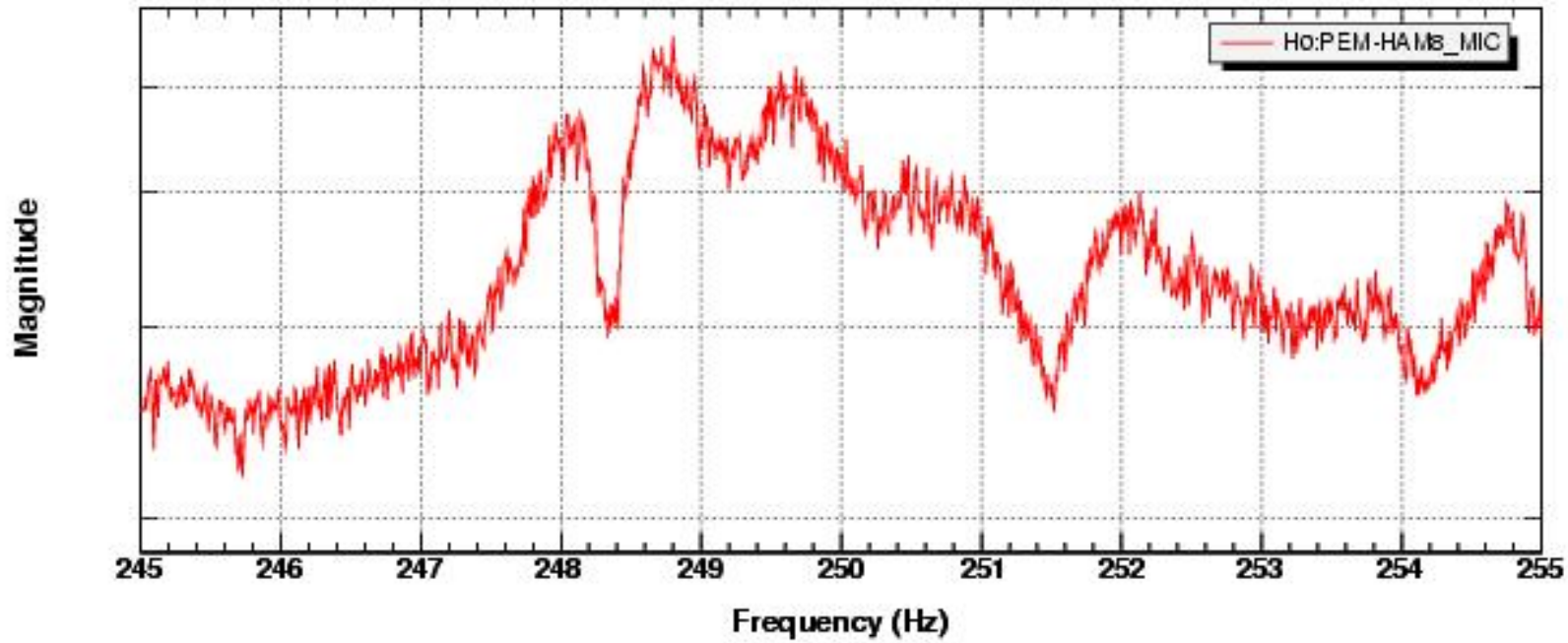

Example of histogram of correlation height distribution

# Hunting for Unknown Correlations

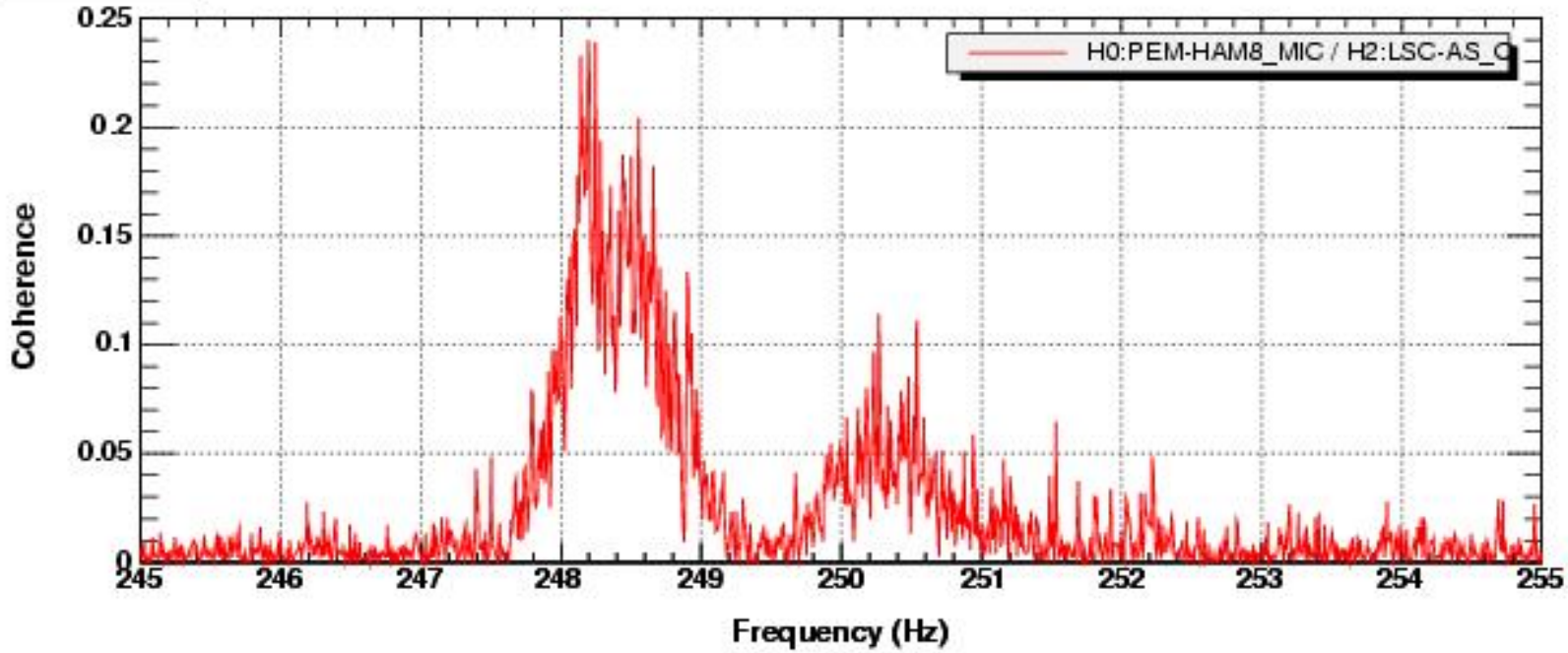
- 250 Hz mystery line: S2 LHO noise seen in CW and stochastic analysis
- http://ligo.physics.carleton.edu/results/S2-LHO-250Hz.html
- 250 Hz correlations with H1:LSC-AS_Q and H2:LSC-AS_Q seen in H0:PEM-HAM3_ACC, HAM9_ACC, HAM7_MIC, HAM8_MIC, HAM10_MIC
- Szabi's List


Power spectrum
H0:PEM-HAM9_ACCX
Magnitude
1
245
246
247
248
249
250
251
252
253
254
255
Frequency (Hz)
Coherence
H0:PEM-HAM9_ACCX / H1:LSC-AS_Q
Coherence
0.25
0.2
0.15
0.1
0.05
0
245
246
247
248
249
250
251
252
253
254
255
Frequency (Hz)
T0=16/02/2003 04:26:27
Avg=200
BW=0.0117178

Power spectrum

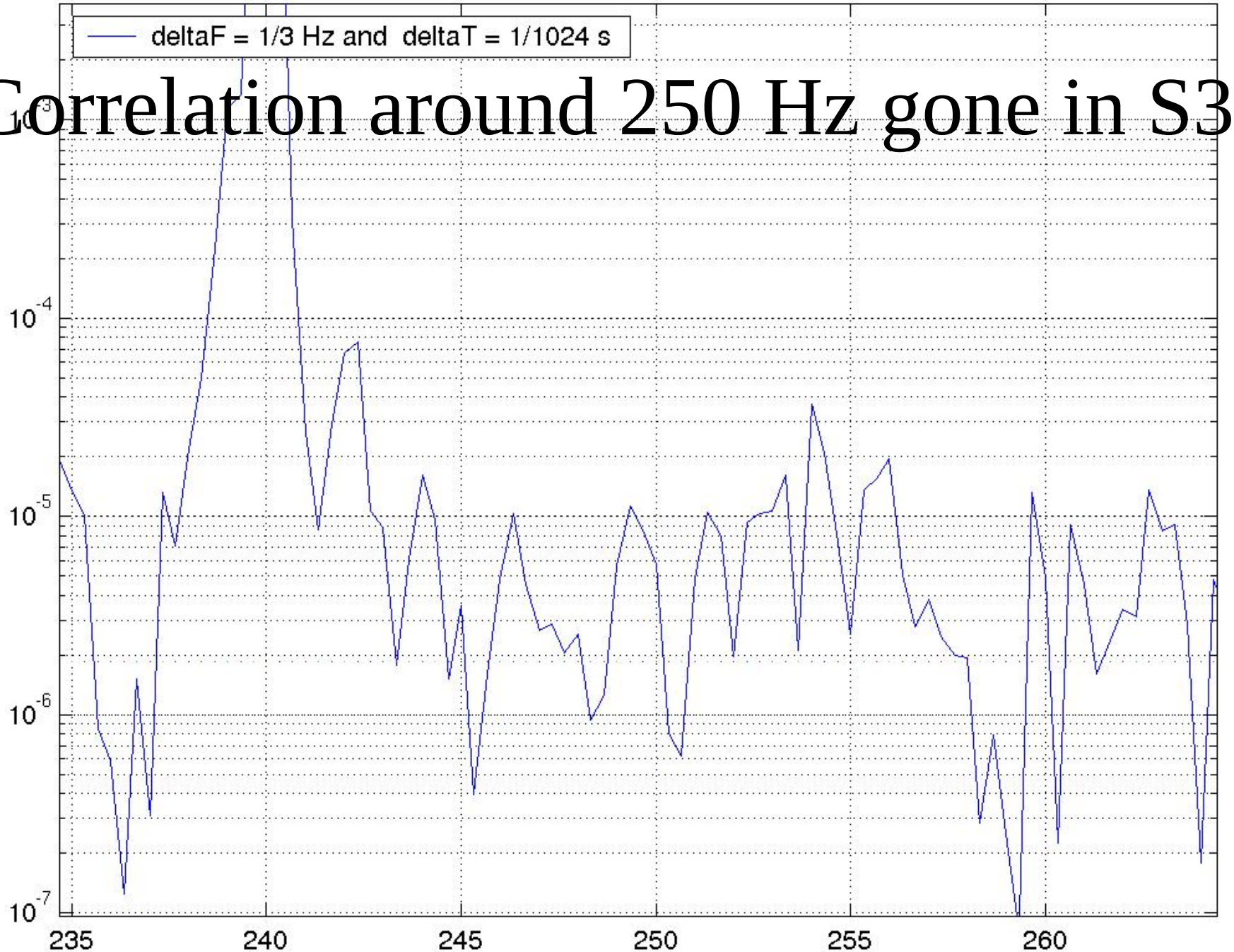



Coherence




T0=16/02/2003 04:26:27 Avg=200 BW=0.0117178

# Correlation around 250 Hz gone in S3



Szabi's List

| | | | | |
|---|---|---|---|---|
| H2S3 | H0:PEM-RADIO_LVEA | 118.61 (118.625) | 0.5 | 0.16 |
| | H0:PEM-RADIO_LVEA | 118.96 (118.90625) | 0.084 | 0.1 |
| | H0:PEM-RADIO_LVEA | 119.2 (119.234375) | 0.4 | 0.26 |
| | H0:PEM-LVEA_MIC | 142.96 (143.09375) | 0.072 | 0.11 |
| | H0:PEM-RADIO_LVEA | 142.96 (143.09375) | 0.12 | 0.12 |
| | H0:PEM-ISCT10_MIC | 142.97 (143.09375) | 0.27 | 0.14 |
| | HO:PEM-RADIO_LVEA | 121.39 (121.40625) | 0.4 | 0.28 |
| | H0:PEM-LVEA_MAGZ | 224.16 (224.140625) | 0.05 | 0.12 |
| | H0:PEM-BSC10_MIC | 780.38 (780.390625) | 0.052 | 0.02 |
| H1S2 | H0:PEM-HAM8_MIC | 72 (72.109375) | 0.4 | 4 |
| | H0:PEM-HAM7_MIC | 72 (72.109375) | 0.33 | 8 |
| | H0:PEM-HAM10_MIC | 143 (143.09375) | 0.07 | 0.2 |
| | H0:PEM-PSL1_MIC | 192 (191.9375) | 0.05 | 0.15 |
| | H0:PEM-HAM8_MIC | 192 (191.9375) | 0.2 | 1.5 |
| | H0:PEM-HAM7_MIC | 192 (191.9375) | 0.2 | 5 |

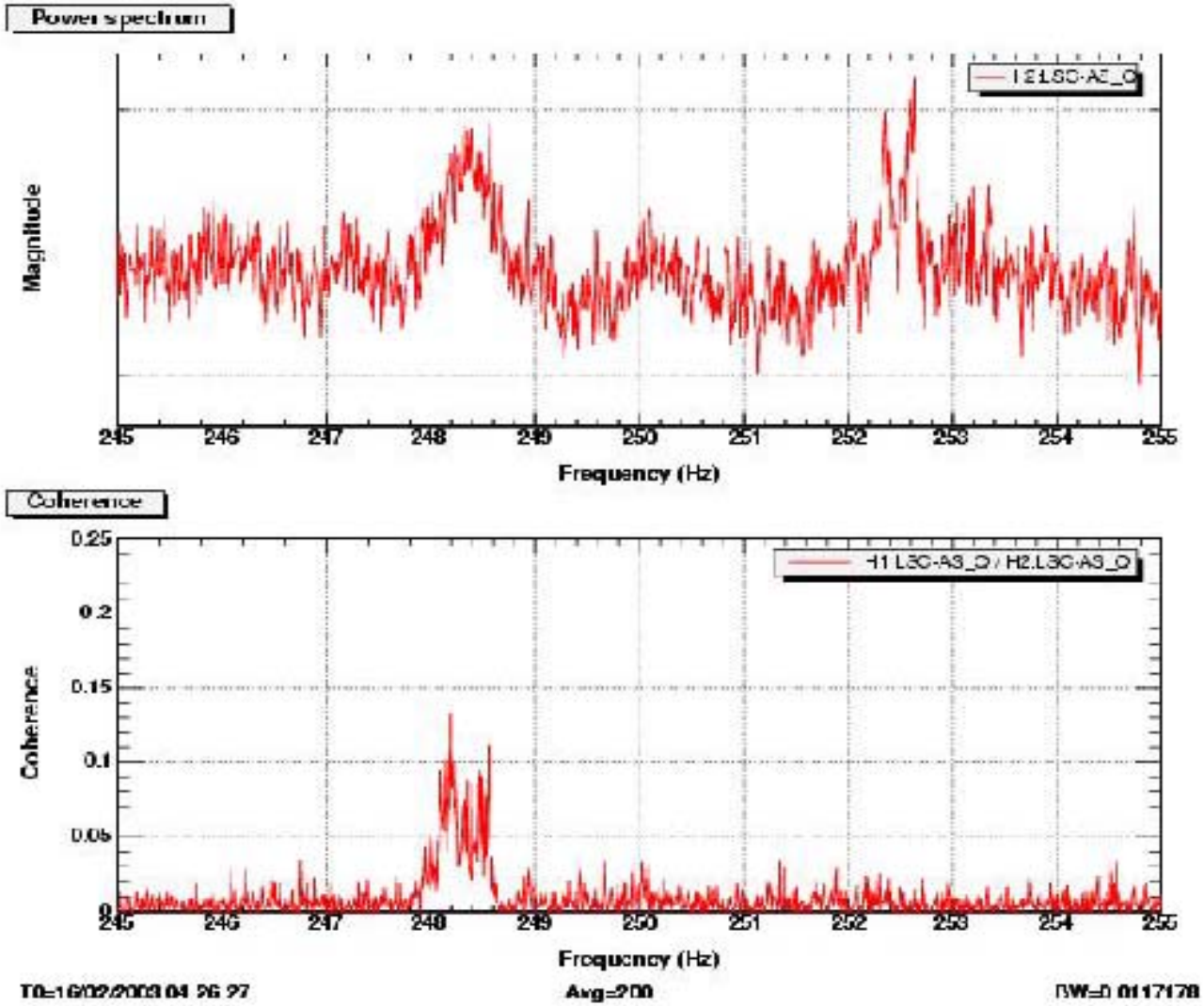
# H1  H2 Correlations

The immediate emphasis of our correlation studies will be common noise in H1 and H2.

Look for long time correlations, and also coincident “bursts” of noise.

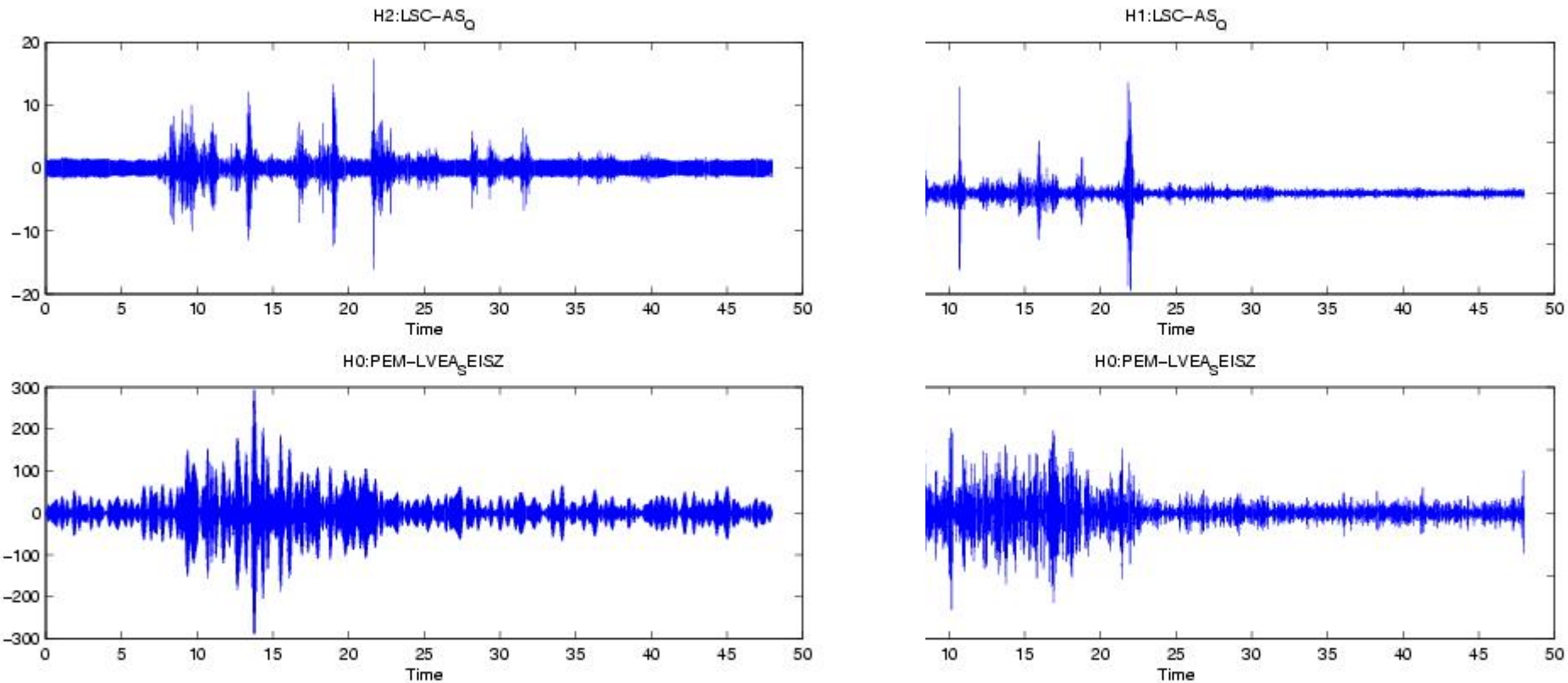
# Examples of Common H1 and H2 Correlations

- H0:PEM-ISCT4_MIC 59.28 Hz
- H0:PEM-ISCT1_MIC 105 Hz
- H0:PEM-PSL1_MIC 210.5 Hz, 216 Hz
- H0:PEM-LVEA_MIC 266.3 Hz




Example of
H1- H2
Correlation and
H1:LSC-AS_Q
power spectral density

# Big Seismic Events at LHO




Same event, but different filters on H0:PEM-LVEA_SEISZ