

S5 Coherence Investigations

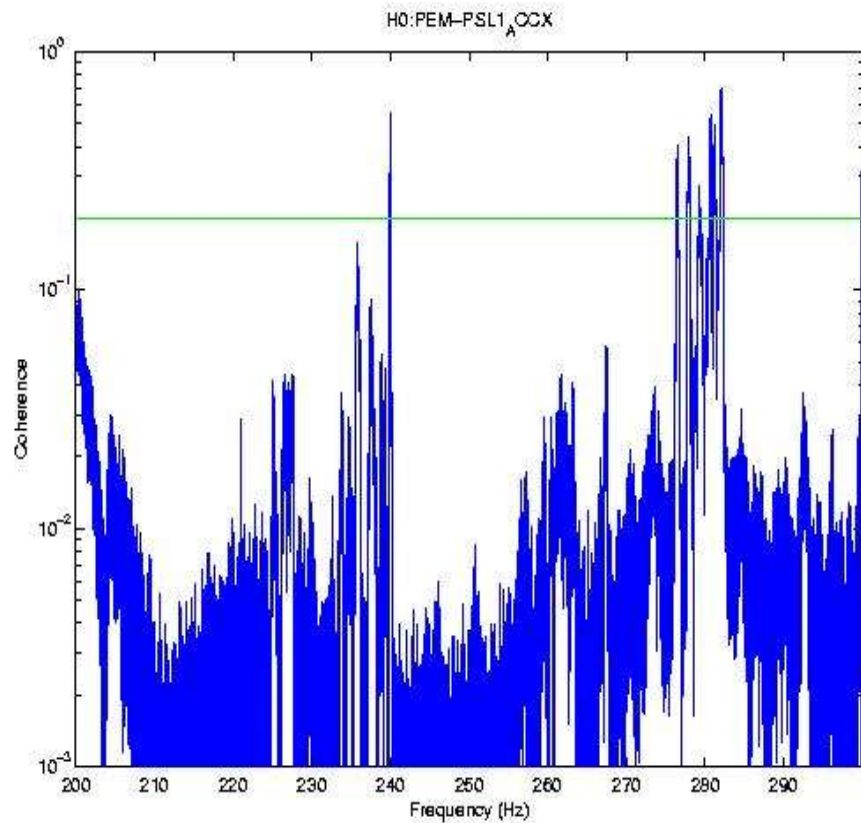
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Month by Month Coherence

- DARM_ERR – PEM coherences calculated over all S5 months, for H1, H2 and L1
- Using 1024 s segments for coherence, and about 2000 averages per month
- Main result page at:
<http://virgo.physics.carleton.edu/Hans/coherence/peaks/>
- Can download the matlab files containing all output

Month by Month Coherence

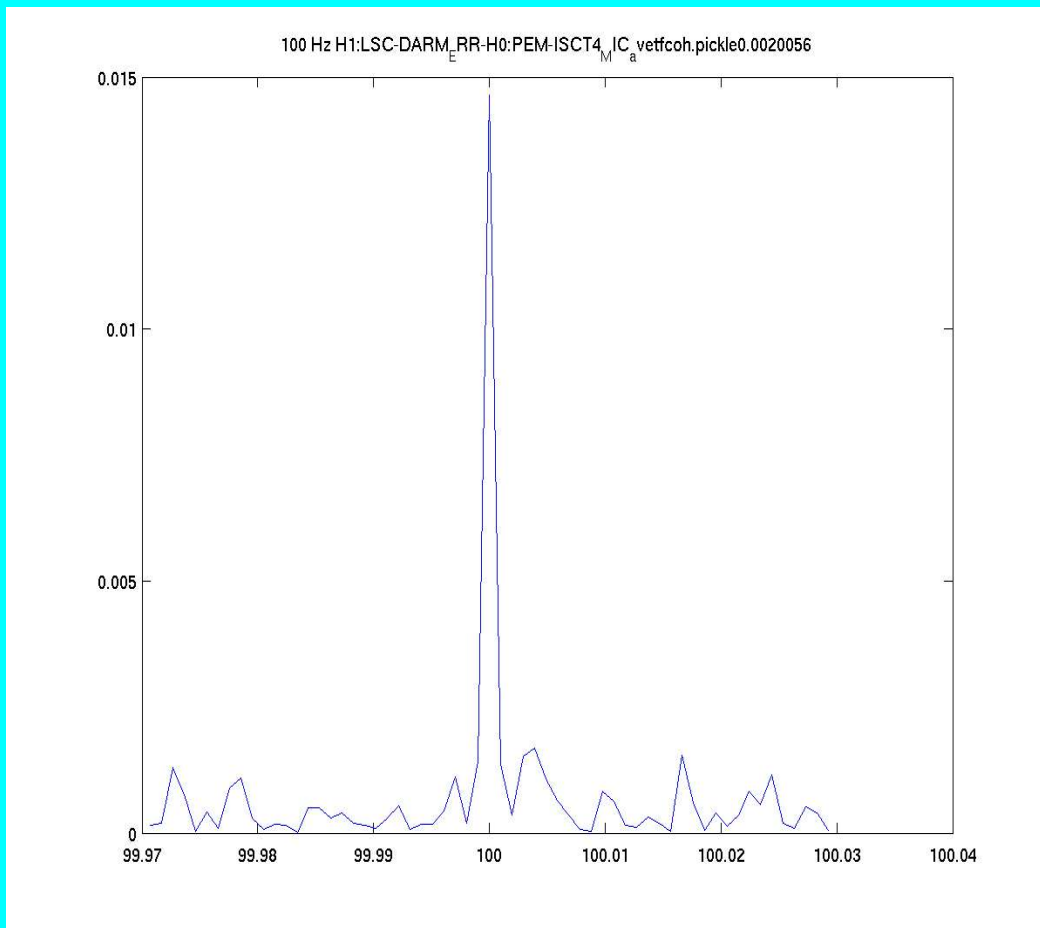


- Web page contains summary plots
- Lists of significant peaks ordered by frequency or channel.
- Matlab output files so anyone can zoom in to a frequency or channel of interest.

Finding Significant Peaks

- Webpage also has results of searches for known problematic noise lines.
- Search for source of lines reported by Keith Riles from pulsar search
- Search for Keith Thorne's “Top Ten” noise lines
- We note when lines appear, month by month, in the coherence output. 3σ threshold, calculated over 30 Hz band (excluding 60 Hz and harmonics)

An Example from H1

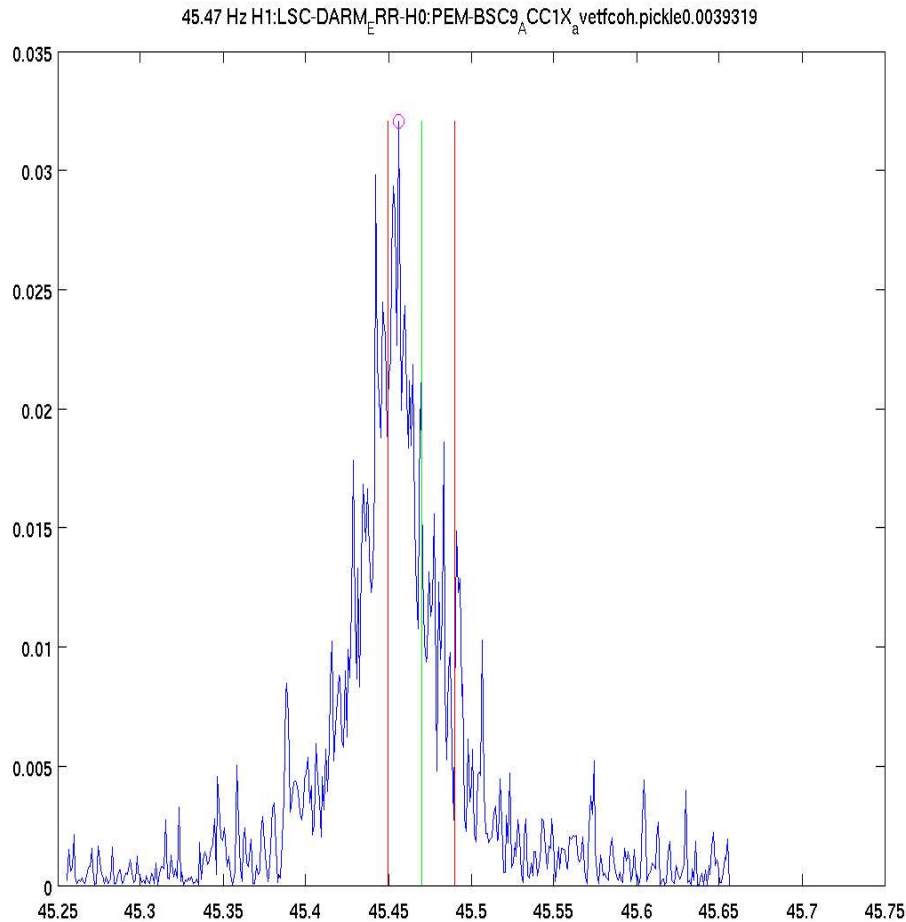


- 100 Hz line seen in coherence between microphones and DARM_ERR every month analyzed so far in S5
- Example from H0:PEM-ISCT4_MIC

“Top Ten” List of Noise Lines

- Keith Thorne provided a list of troublesome line for each interferometer
- Coherence results are mined for significant peaks at these frequencies
- Our “Top Ten” coherence results page is:
http://virgo.physics.carleton.edu/Hans/coherence/peaks/Top_Ten/index.html

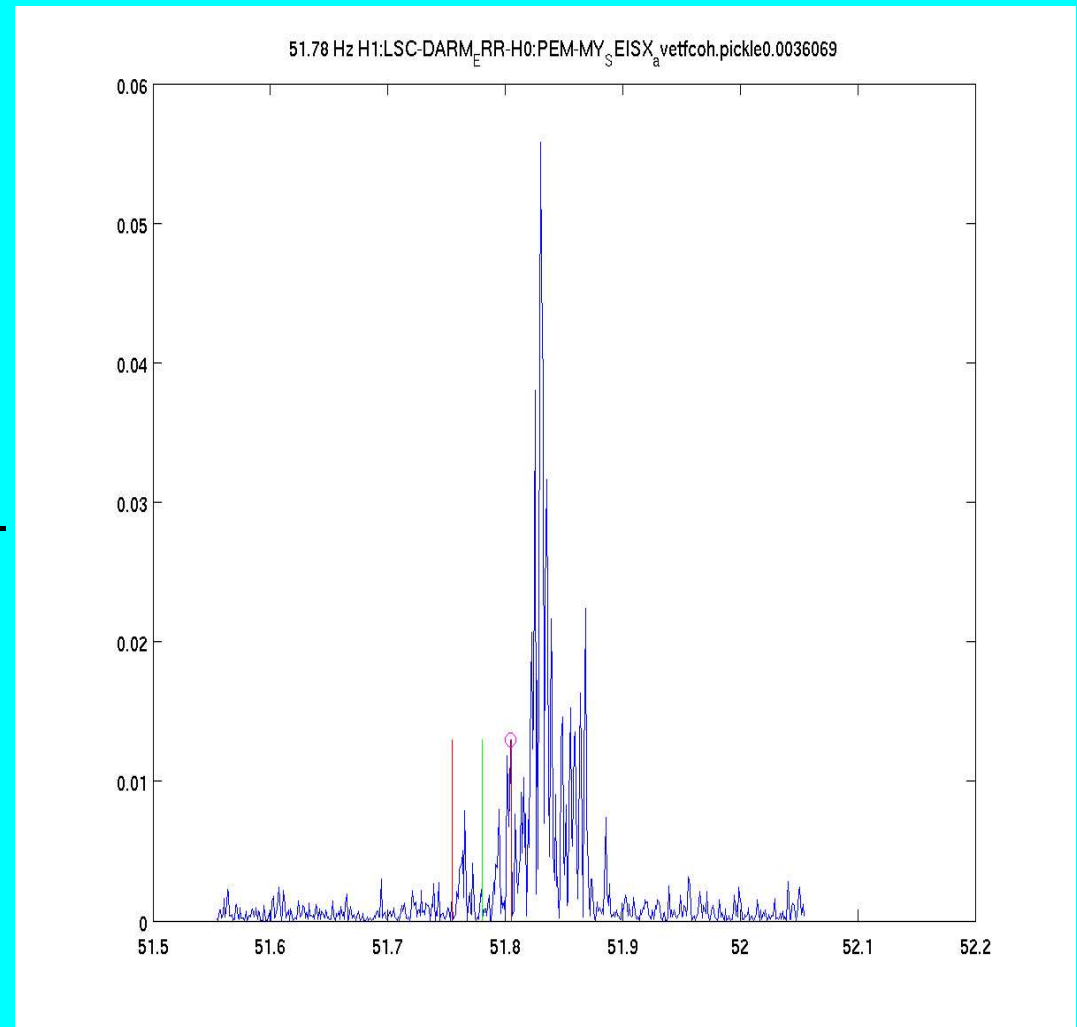
H1 45.47 Hz



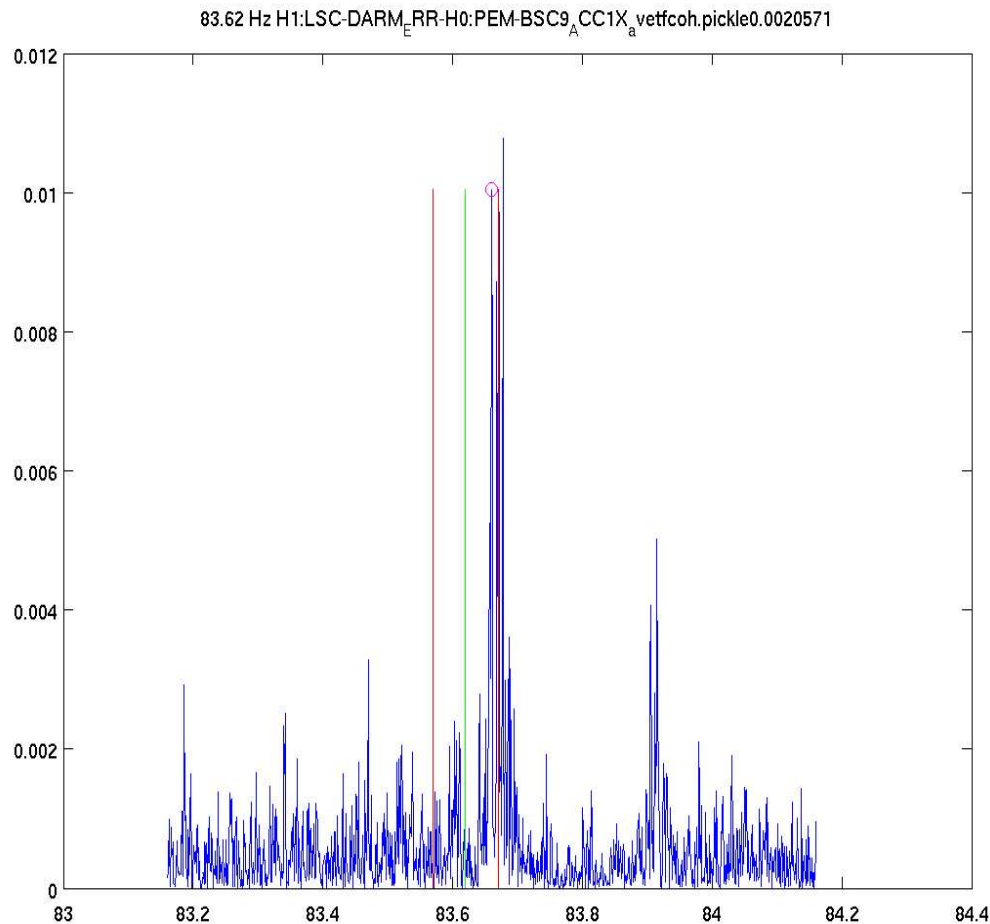
- Seen every month in BSC9_ACC1X, BSC9_MIC, and EX_SEISX(Y and Z)
- DARM_ERR
BSC9_AXX1X
coherence for August 2006 on left

H1 51.78 Hz

- Occasional match
- BSC9-ACC_Y (AUG_2006), BSC6-ACC_Y (OCT-2006), HAM1-ACC_(X,Z) (DEC-2006), MY_SEIS(X,Z) (OCT-2006)
- Right: Example of MY-SEIS_X coherence, OCT-2006



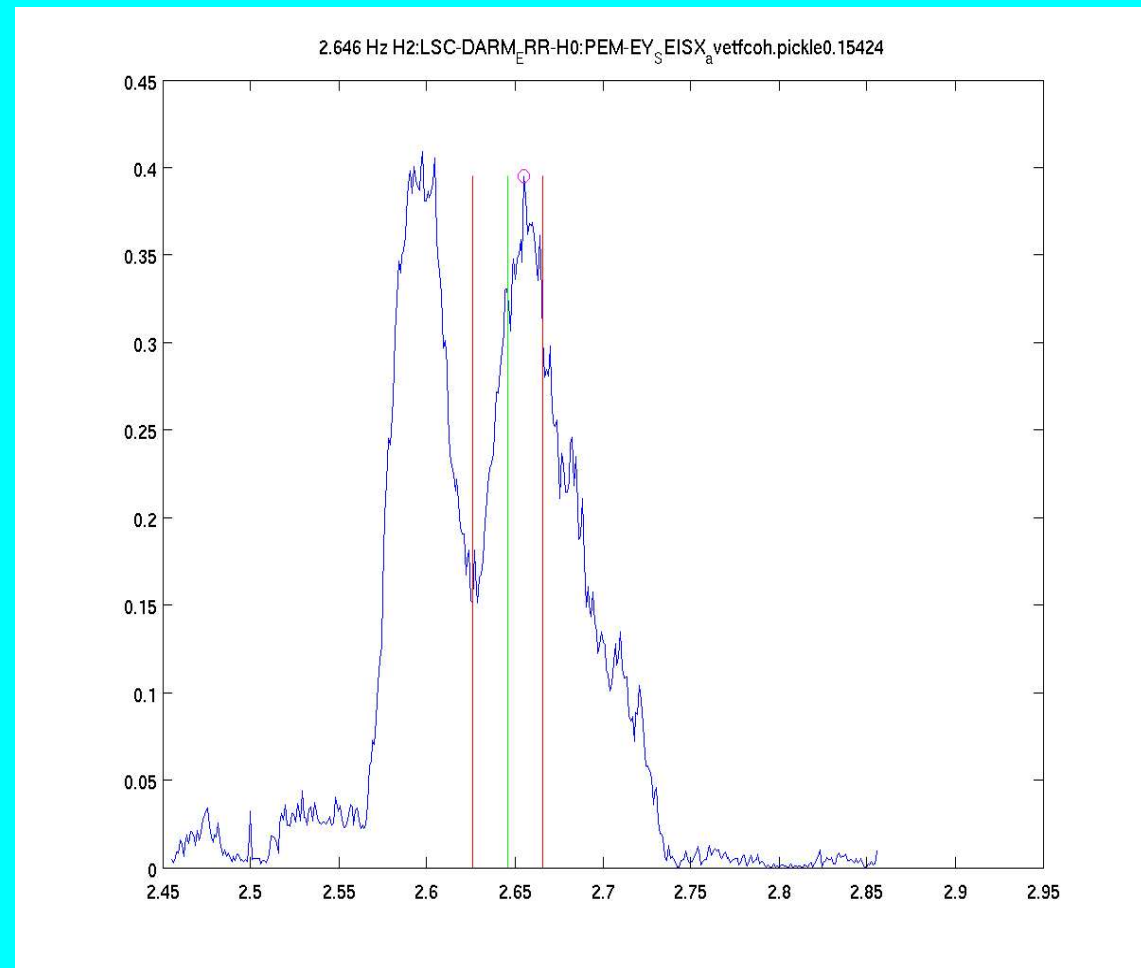
H1 83.62 Hz



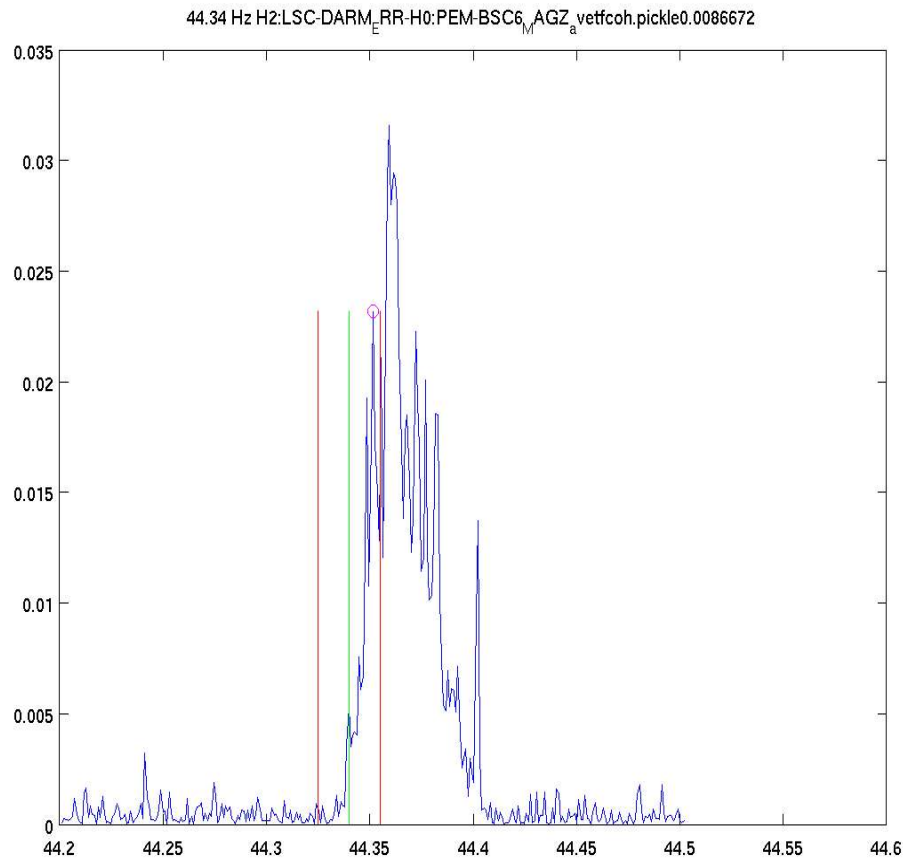
- **BSC9-ACC1_X**
Significant wide peak appears significantly in Aug_2006, and also to some degree in June 2006

H2 2.64 Hz

- This peak is part of a pair of peaks with another peak located at about 2.6 Hz, clearly seen in EX_SEIS_(Y,Z) and EY-SEIS_(X,Y,Z).
- EY_SEISX Sep-2006 to left



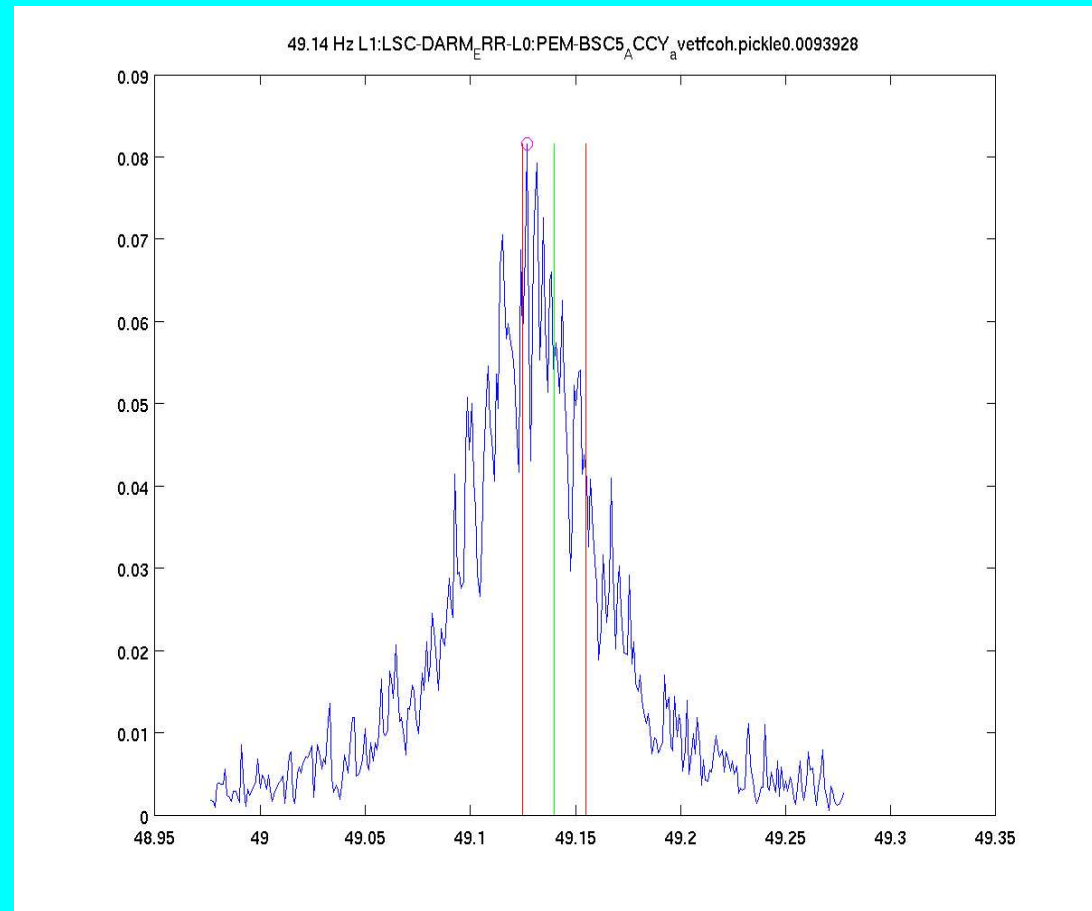
H2 44.34 Hz



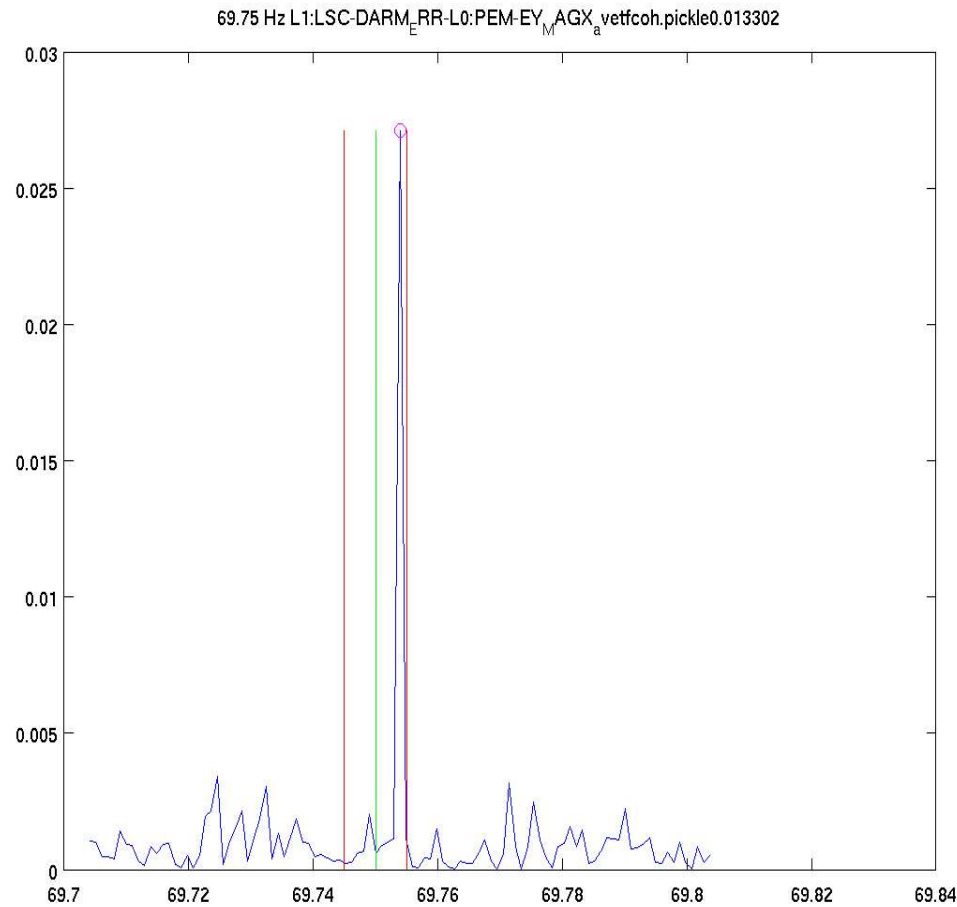
- BSC6-MAG_(X,Y,Z) fairly wide peak on all three magnetometers. The noise tends to drift significantly from month to month
- Left: Example from Sep-2006, BSC6_MAGZ

L1 49.14 Hz

- PEM-BSC5-ACC
(X,Y,Z) Wide peak
found all three channels.
Peak does not appear to
drift from month to
month.
- Right: Coherence for
BSC5-ACCY Nov-2006



L1 69.75 Hz

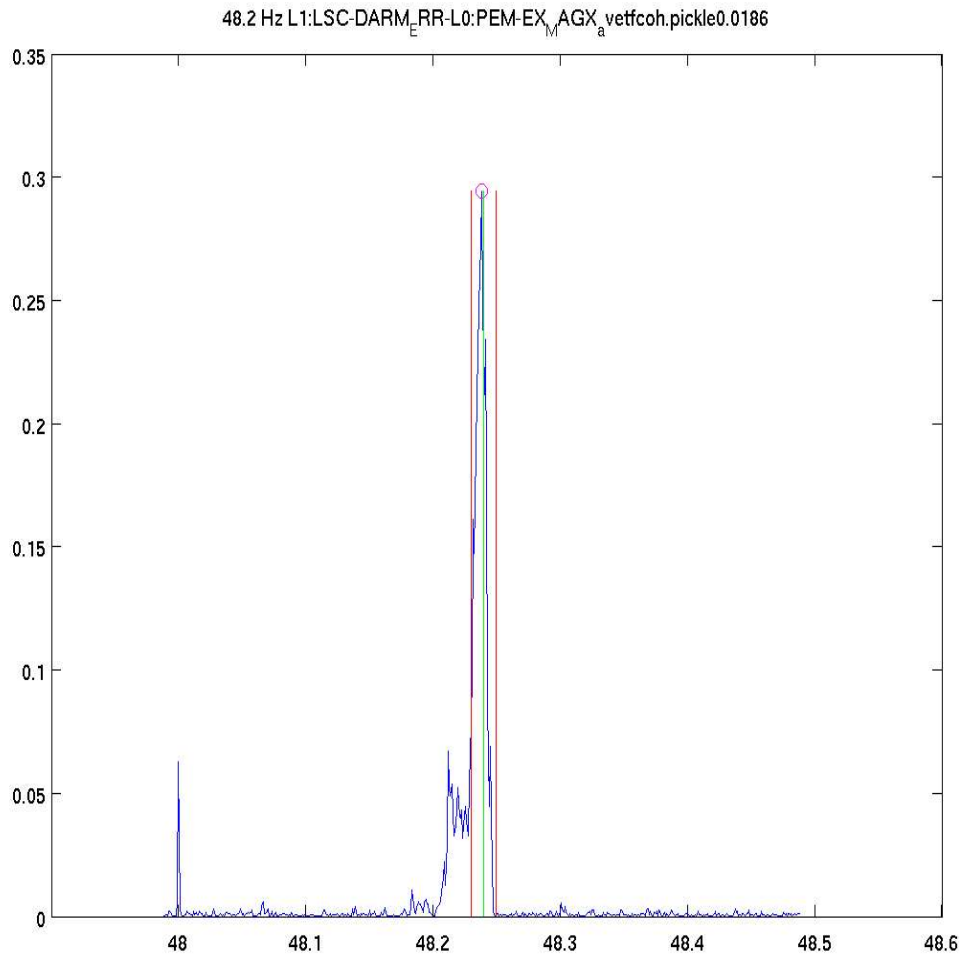


- PEM-EY_MAG (X,Y,Z). Sharp peak found in all three channels only for a single month Nov-2006
- Coherence for EY_MAGX

Wandering Lines

- Some lines are clearly moving from month to month
- Keith Thorne is also providing use with list of lines along with their frequencies each month
- The lines can also come and go, visible some months, but not in others.
- Initial results at:
http://virgo.physics.carleton.edu/Hans/coherence/peaks/L1_wander/index.html

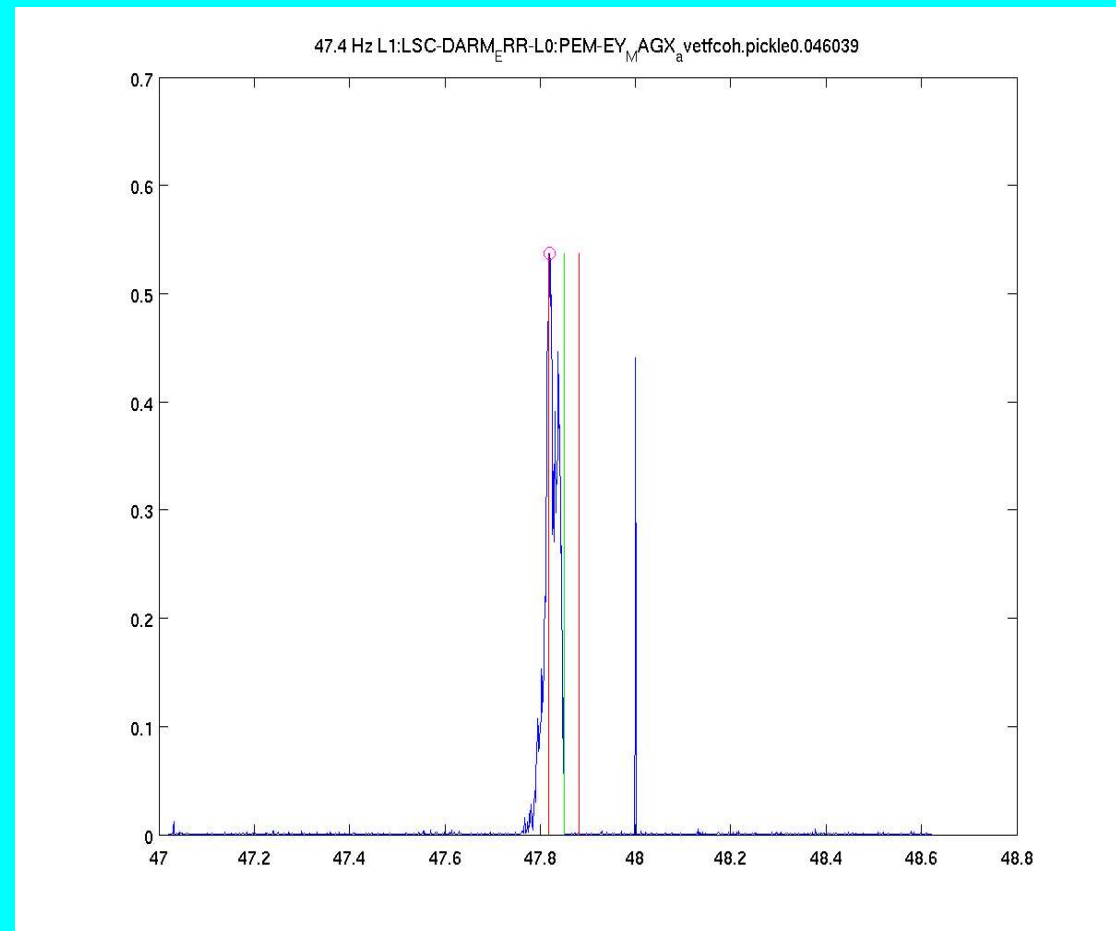
Wandering Line L1 48.2 to 48.3 Hz.



- Seen every month in L0:PEM-EX_MAG (X,Y,Z), and sometimes in BSC4_ACC(X,Y,Z)
- Noise source at X-end
- Left: EX_MAGX coherence Nov-2006

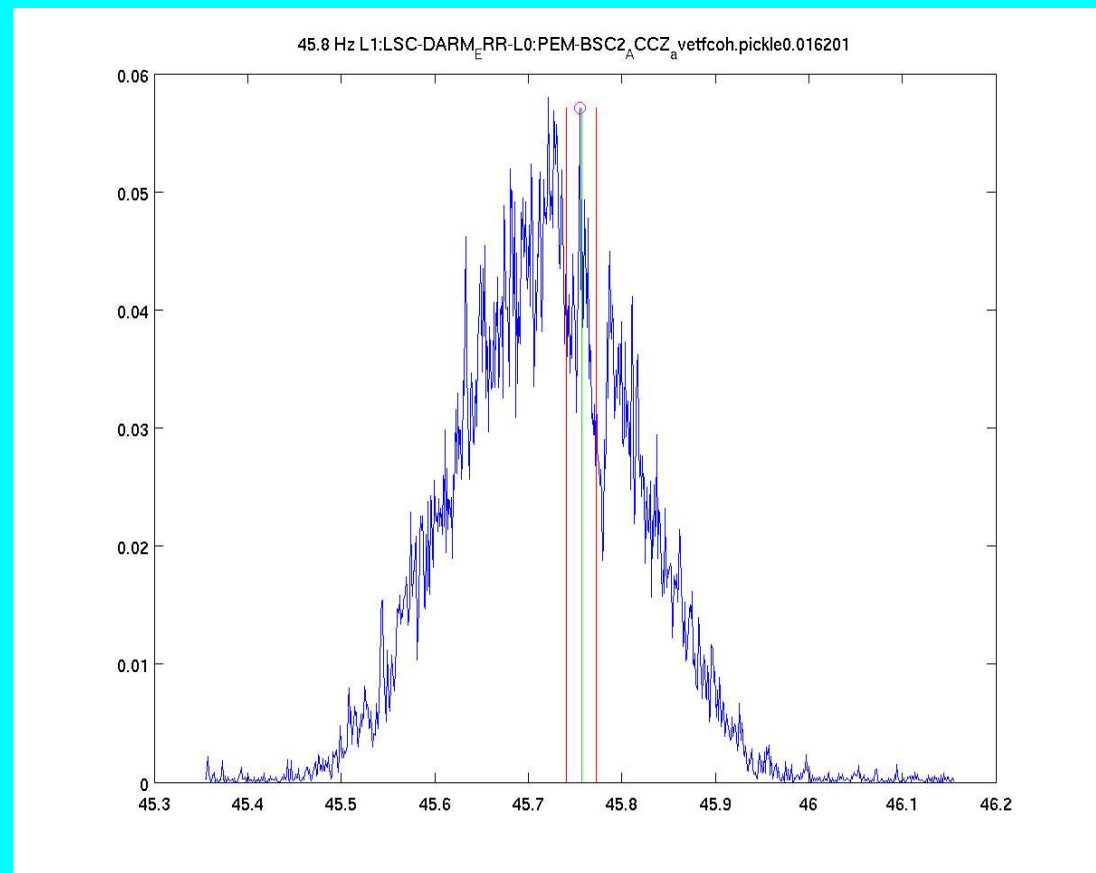
Wandering Line L1 47.4 Hz to 48.1 Hz

- Huge correlations July 06 with L0:PEM-EY_MAG (X,Y,Z) and L0:PEM-COIL_MAG(X,Z).
- Also a correlation with BSC5_ACCX in July 06.
- Y-end noise source?
- Right: Coherence EY_MAGX July 2006



Wandering Line L1 46 Hz

- Coherence sometimes seen in BSC2_ACC, HAM2_ACC, ISCT1_ACC and LVEA_SEIS.
- Right: June 2005 BSC2_ACCZ coherence



Virgo Coherence Noise Studies

- Irene Fiori at EGO
- Software being used is very similar.
- Example for VSR1 at:
<http://wwwcascina.virgo.infn.it/DataAnalysis/Noise/doc>
- Also a noise line database:
<http://wwwcascina.virgo.infn.it/DataAnalysis/Noise/doc/SR1/lines/lines.html>

Summary

- S5 DARM_ERR – PEM coherence results are being calculated month by month for all of S5
- If you have have a strange line, tell us! We will mine our results in search of the possible source.