

# S1 and S2 Inter-Channel Correlations Report

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LSC Detector Characterization Working Group Session  
3-19-03 Session I

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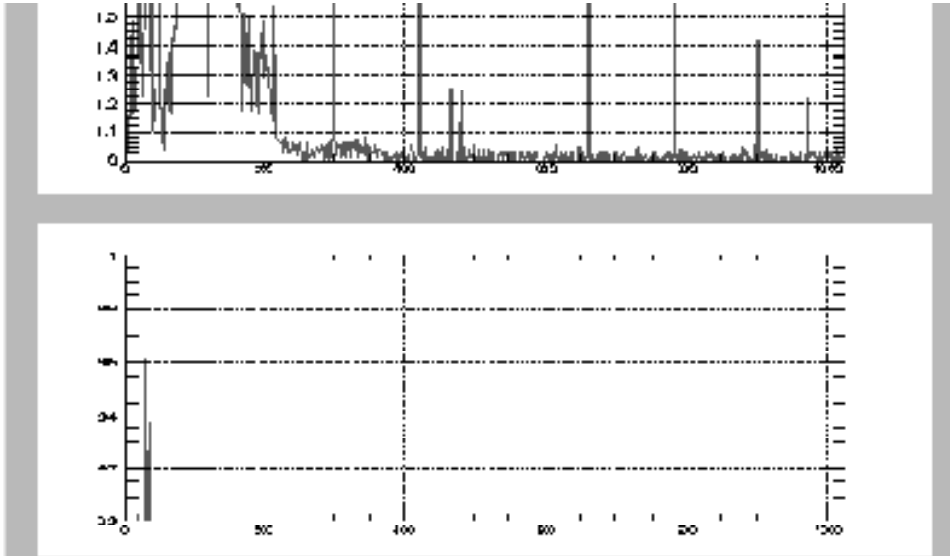
# S1 Analysis and Glitches

Inspiral Veto Study Influenced the Examination of Correlations with AS\_Q

Looked at Correlations between AS\_Q and

AS\_I  
AS\_DC  
REFL\_I  
REFL\_Q  
POB\_Q  
PRC\_CTRL  
IOO-MC\_F

Results for these and various PEMs posted at  
<http://physics.carleton.edu/Faculty/Nelson/S1Corr/S1Corr.htm>



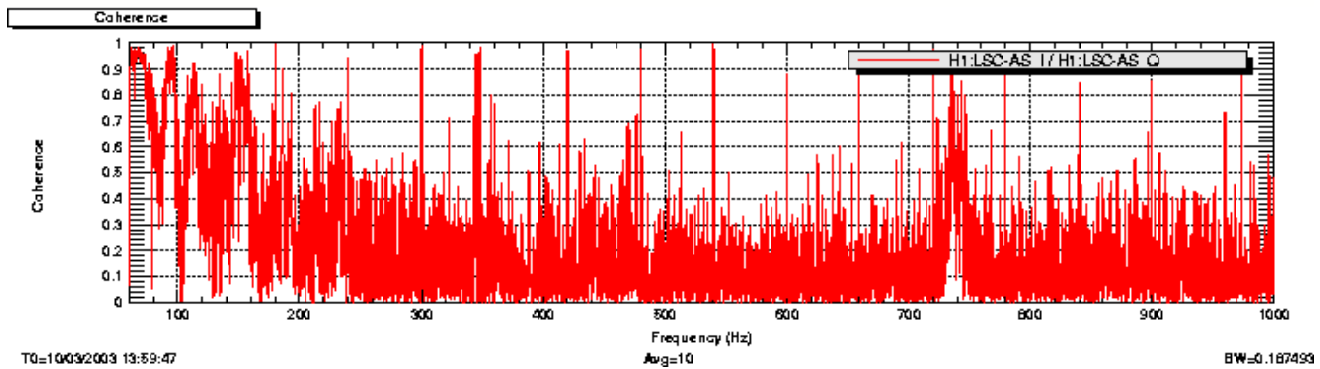
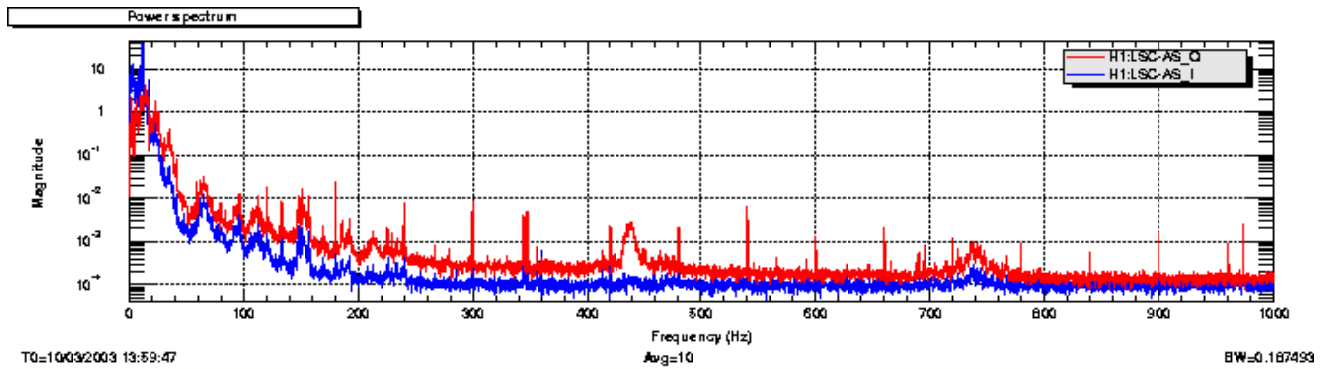
H1:L3 AB1

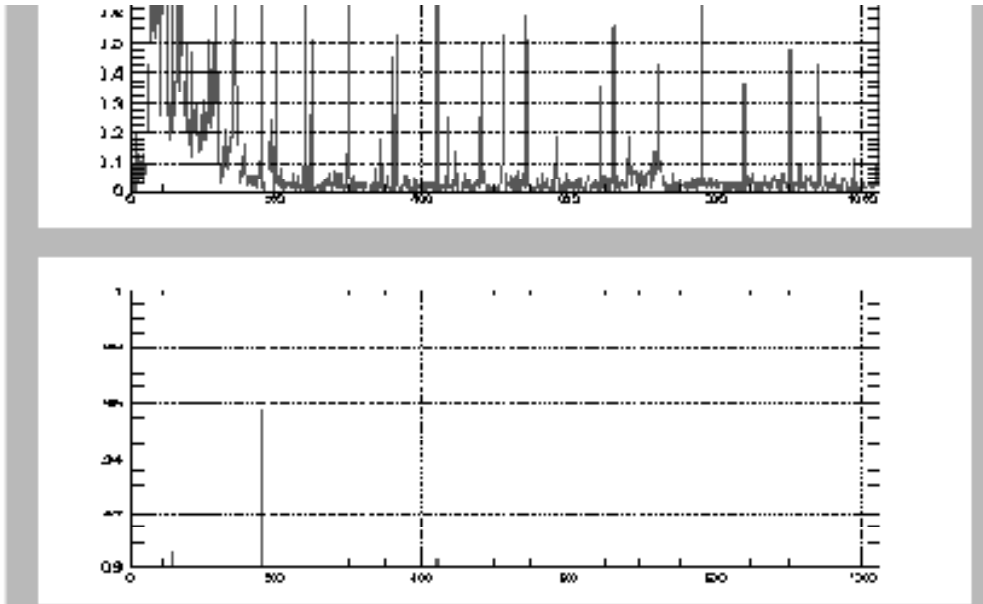
Initial and Correlations with H1.L39-AB

AS\_Q  
 AS\_I  
 H1S1

Strong correlations below 200 Hz

# S2 AS\_Q AS\_I H1





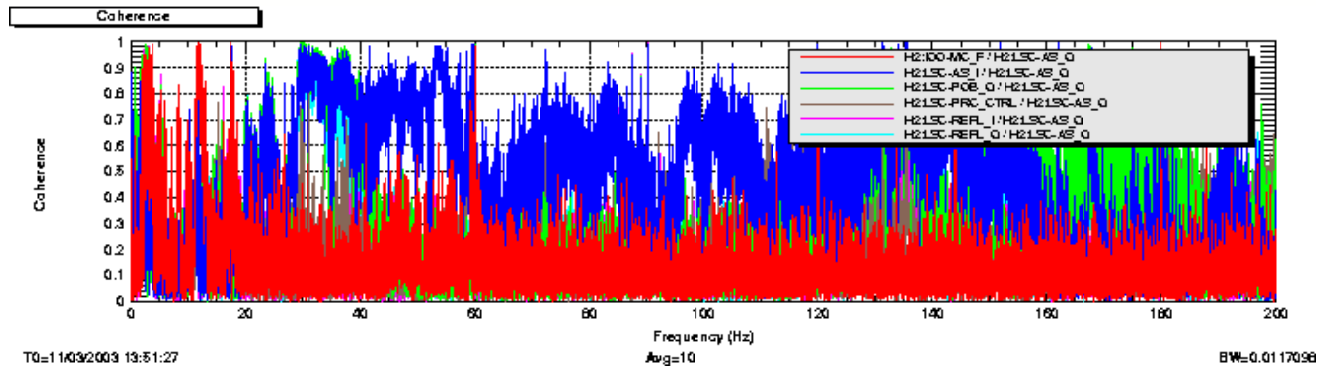
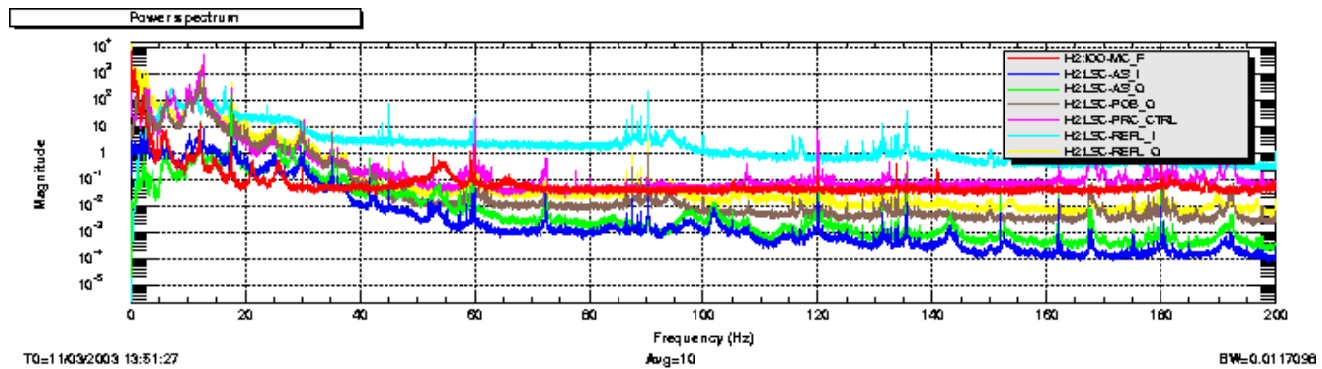
H2:L3 AB1

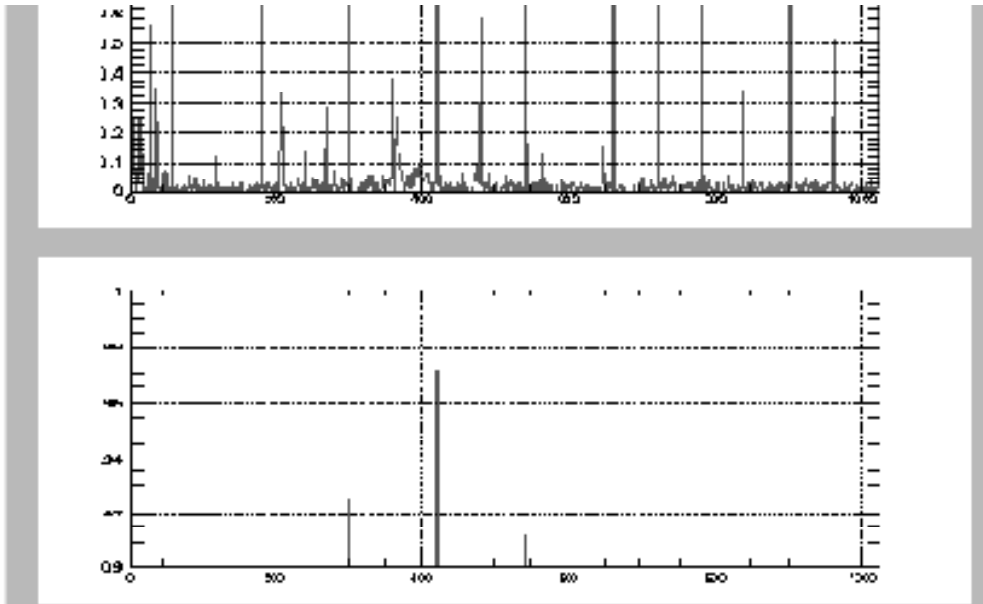
**Intermittent Correlations with H2.L3G-AB**

S1 H2  
AS\_Q  
AS\_I

Strong  
Correlations  
below 200  
HZ

# S2 H2 AS\_Q AS\_I



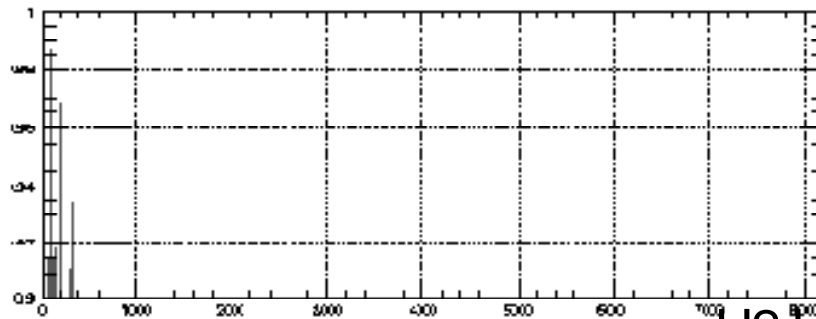
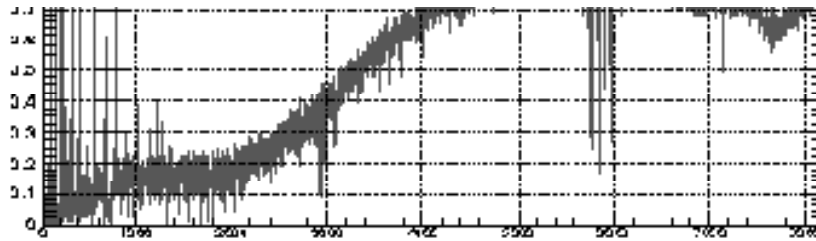


H1:L3 REF. I

**Intermediate Oscillations with 117.136-AD**

S1 H1  
AS\_Q  
REFL\_I

A bit of low f  
junk.



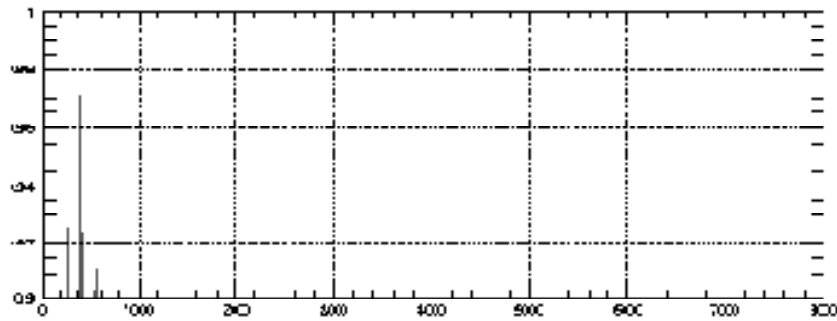
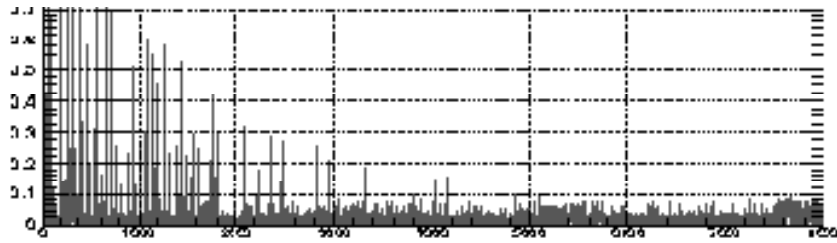
H2:LC-REF. I

S1 H2  
AS\_Q  
REFL\_I

H2:LSC-REFL\_I looks very strange.  
The correlation with H2:LSC-AS\_Q  
grows at high frequency: >50% for  
>3kHz and >80% for f>5kHz. Is this an  
indication of frequency noise?

Interchannel Correlations with H2:LSC-AS\_Q



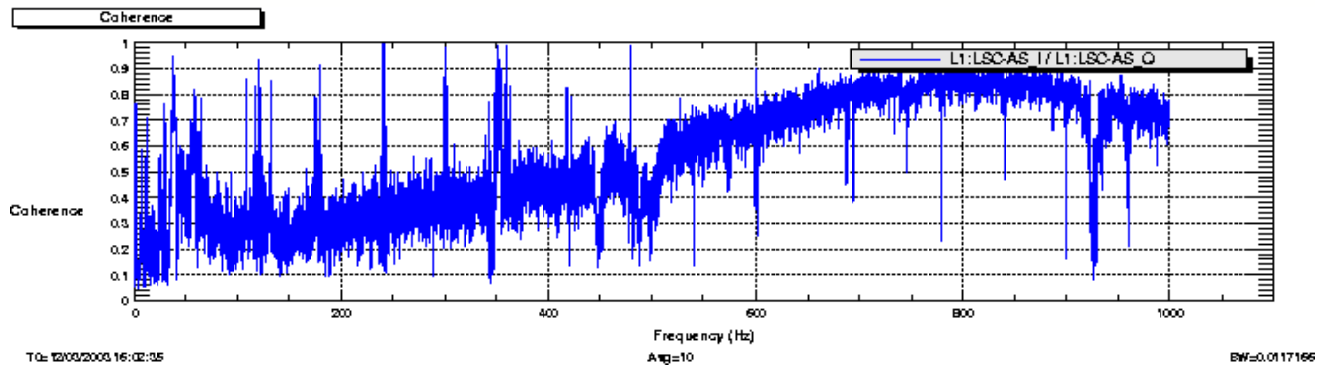
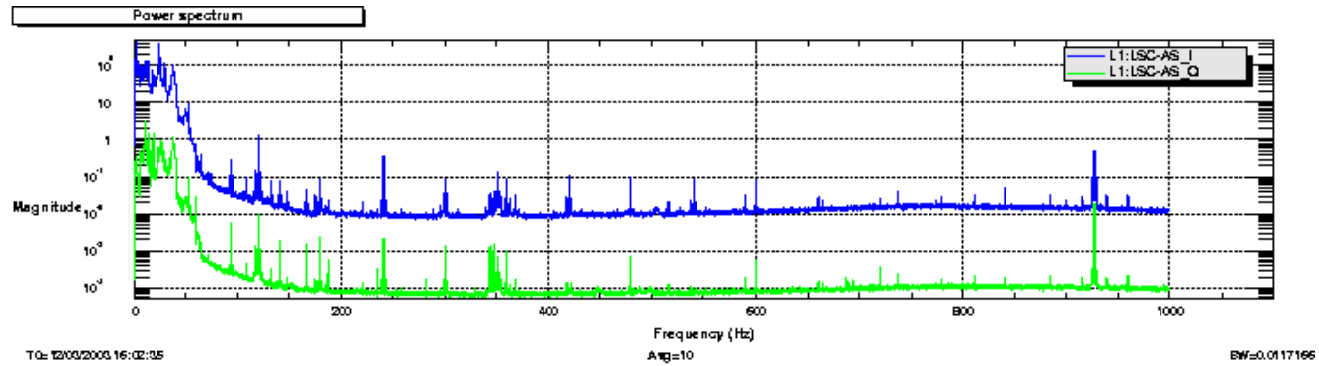


H1:LC-REF. I

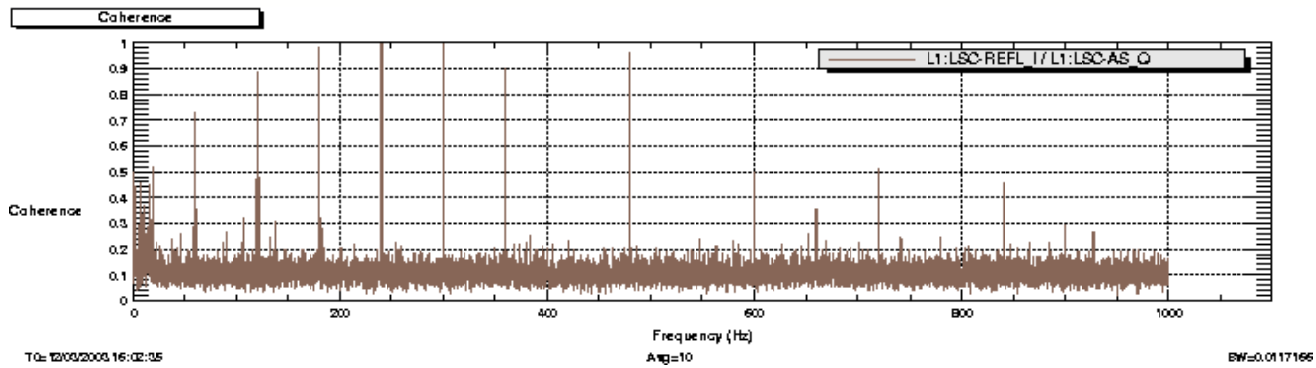
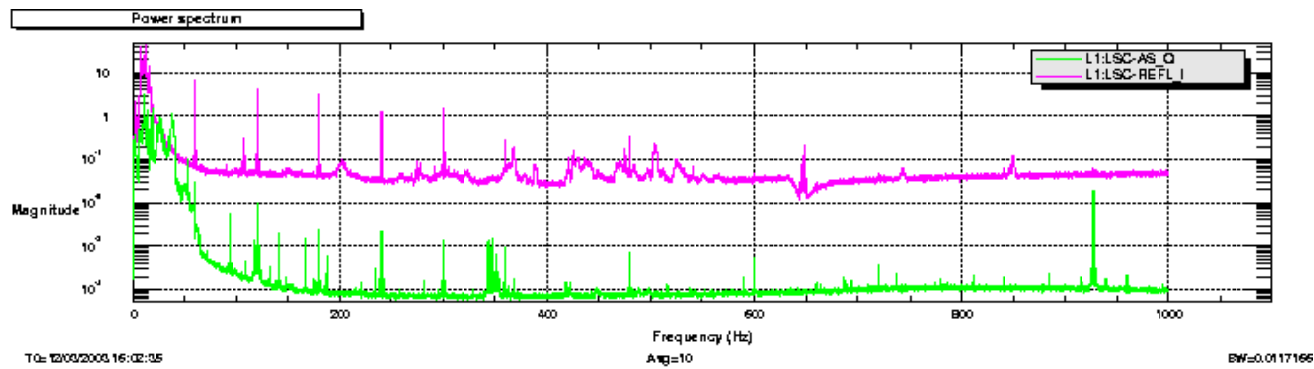
S1 H1  
AS\_Q  
REFL\_I  
High-f

**Interchannel Correlations with H1.L3C-A3**

# S2 L1 AS\_Q AS\_I



# S2 L1 AS\_Q REFL\_I



# Optical Levers Servos Show Possible Interesting Correlations

See Robert Schofield's S1 report.

Similar correlations seen in H1 during S1 are seen during S2.

During S1 Correlations with AS\_Q seen:

H1:SUS-ITMX-OPLEV_YOUT	29.35Hz
H1:SUS-ITMY-OPLEV_YOUT	29.35, 46.5 and 93 Hz
H1:SUS-ETMX-OPLEV_YOUT	17.65, 31.6 and 43 Hz
H1:SUS-ETMY-OPLEV_YOUT	43 and 53 Hz

# Comparison of S1 and S2 Optical Levers and AS\_Q Correlations

Similar correlations seen in H1 during S1 are seen during S2.

S1 and S2 Correlations with AS\_Q seen:

H1:SUS-ITMX-OPLEV\_YOUT 29.35Hz :

3-4, 17.4, 20.5, and 25.8 Hz

H1:SUS-ITMY-OPLEV\_YOUT 29.35, 46.5 and 93 Hz

2.5-3.5, 9.9-10.2, 12-17.5, 25.8, 53.6, and 59.2 Hz

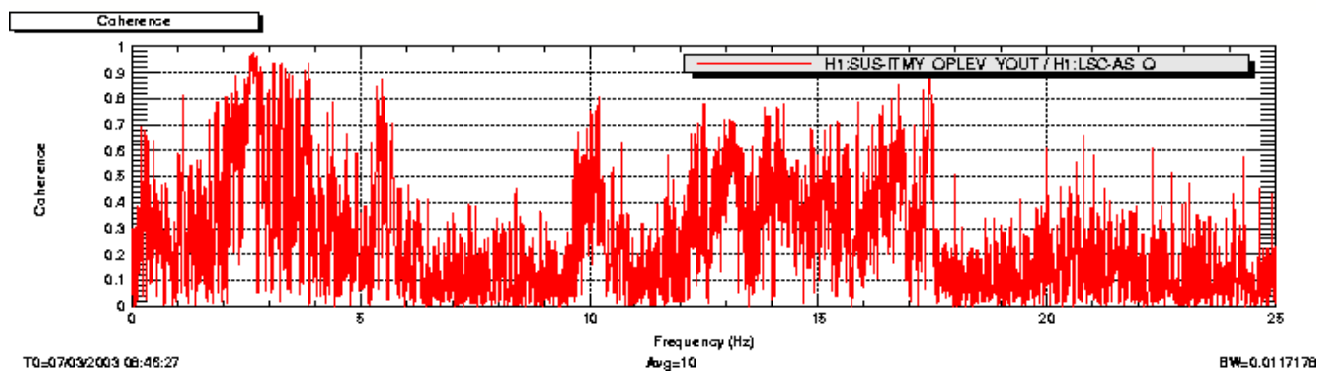
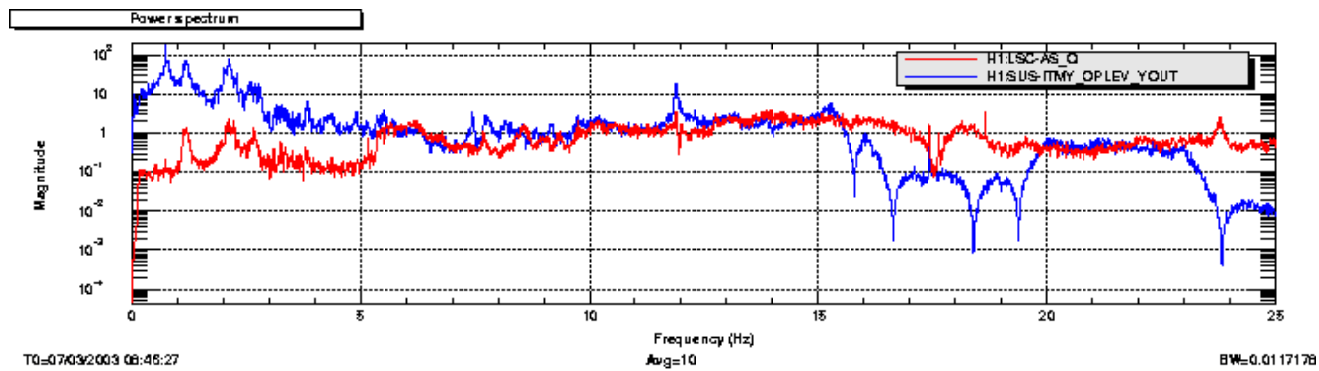
H1:SUS-ETMX-OPLEV\_YOUT 17.65, 31.6 and 43 Hz

1-3 and 18.1 Hz

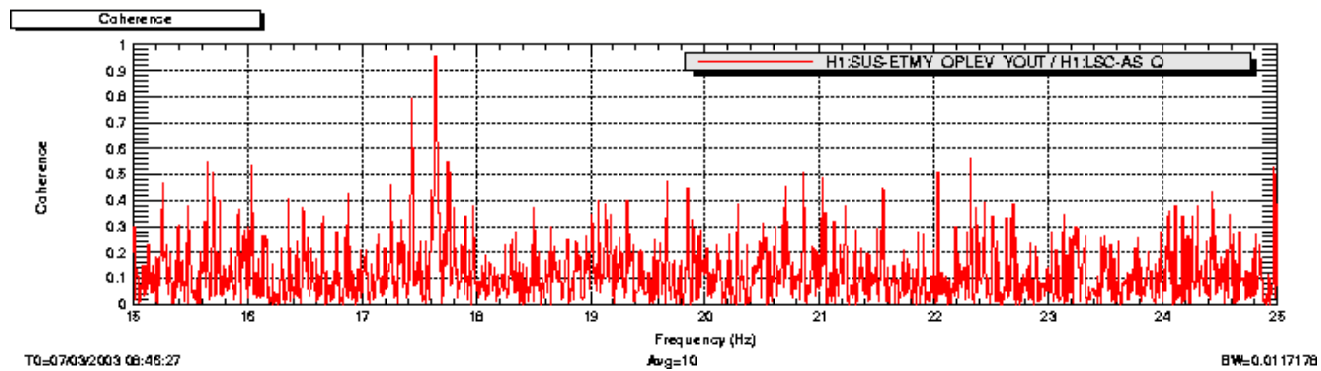
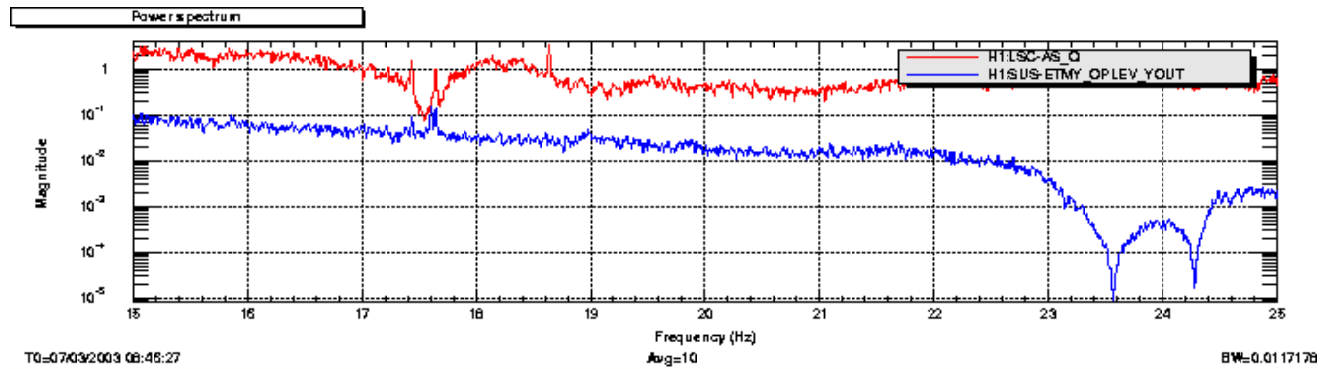
H1:SUS-ETMY-OPLEV\_YOUT 43 and 53 Hz

0.5, 2, 2.7, 8.5, 8.9, 12, 17.6, 43, 53.5

# S2 AS\_Q H1:SUS-ITMY-OPLEV\_YOUT



# S2 AS\_Q H1:SUS-ETMY-OPLEV\_YOUT

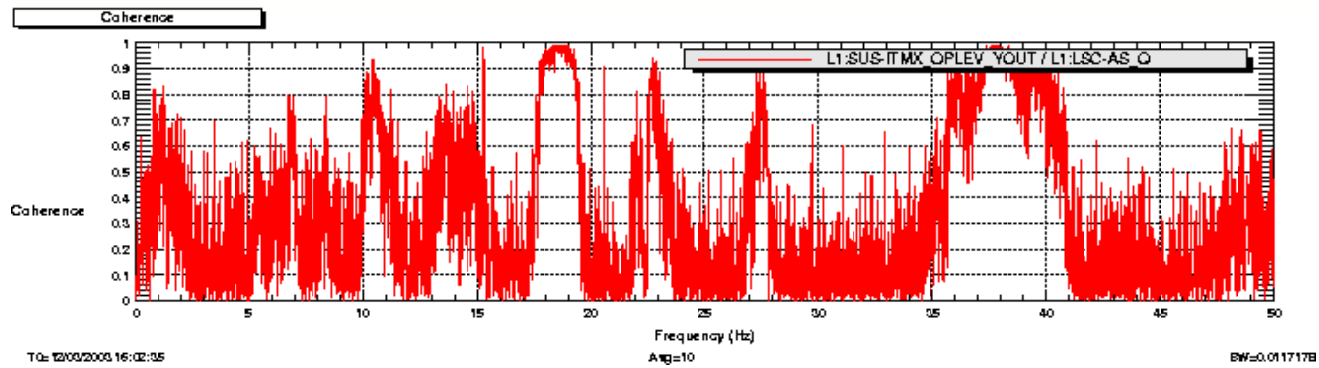
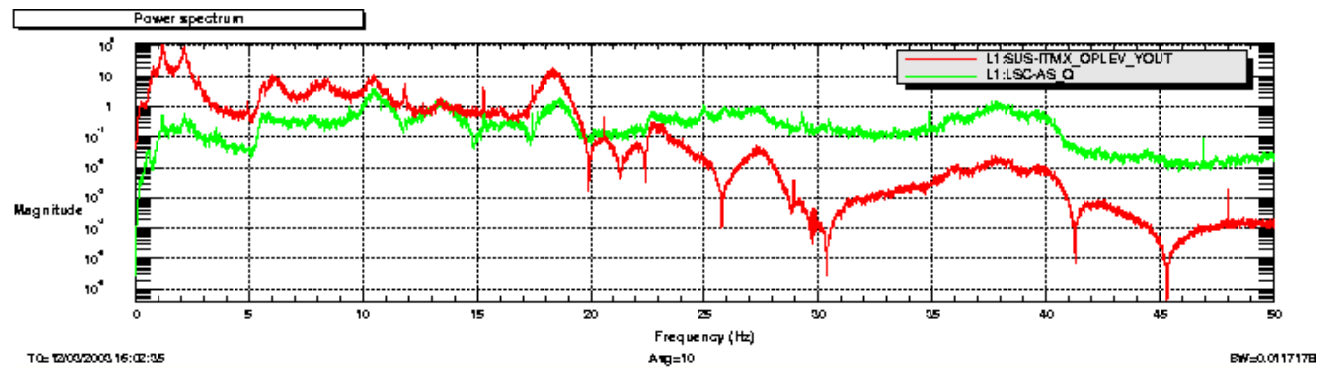


# S2 LLO AS\_Q Optical Lever Correlations

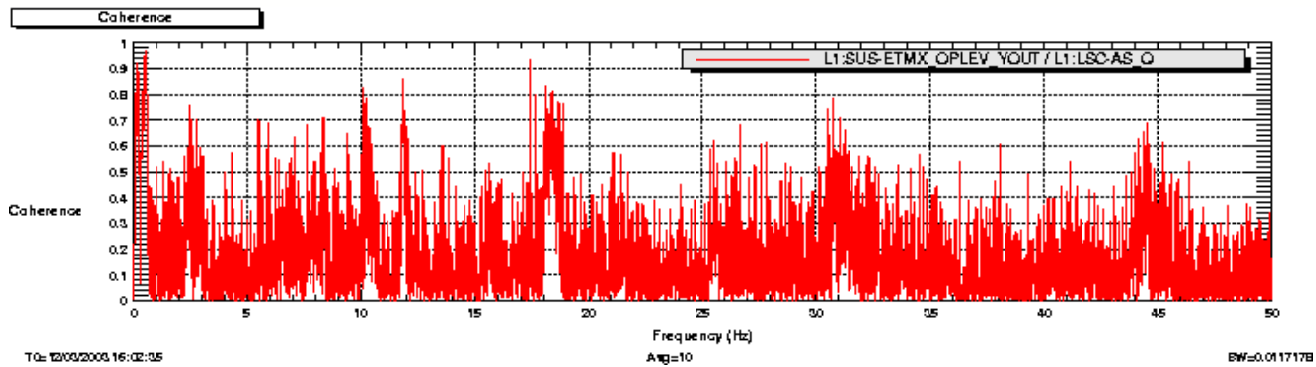
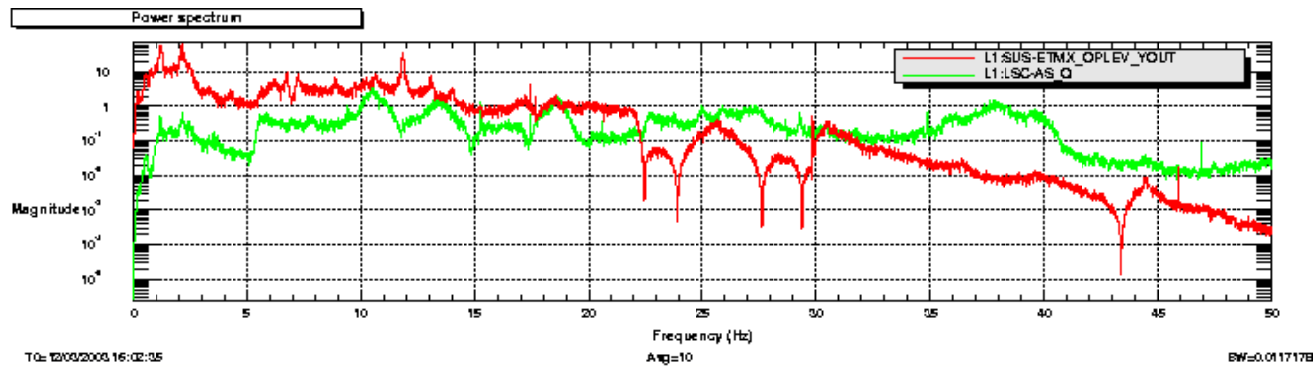
- Peaks also observed in L1
- L1:SUS-ETMX-OPLEV\_YOUT  
**2.5, 10, 18.5, 31, and 44.5 Hz**
- L1:SUS-ETMY-OPLEV\_YOUT  
**10, 18.5, 44.5 Hz**
- L1:SUS-ITMX-OPLEV\_YOUT  
**0.5-2, 10.3, 13-15, 17-19, 23, 27.2, 35-41 Hz**



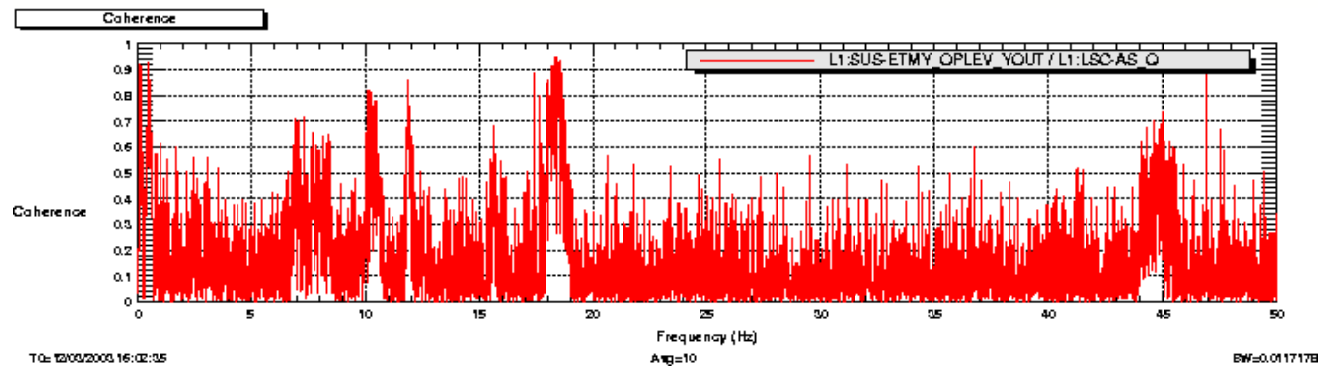
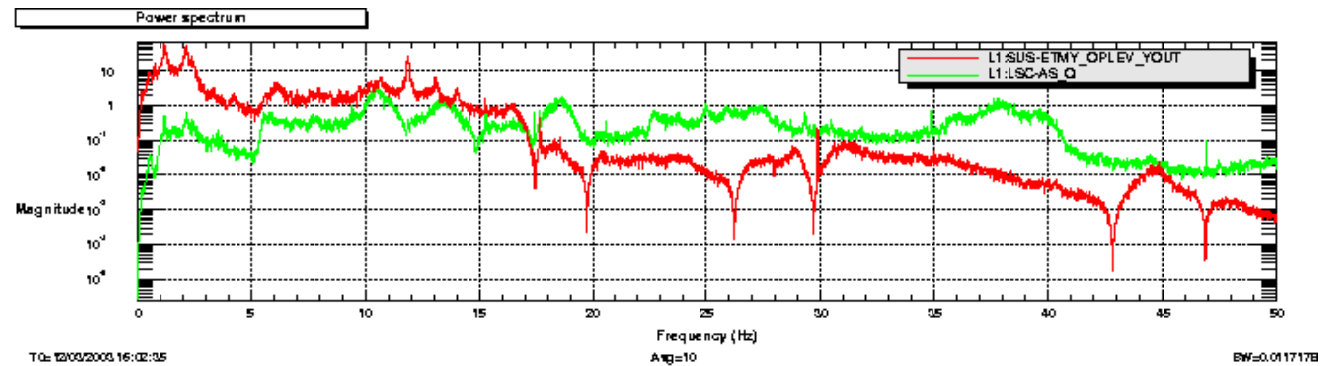
# L1:SUS-ITMX-OPLEV\_YOUT with AS\_Q for S2 at L1



# L1:SUS-ETMX-OPLV\_YOUT with AS\_Q for S2 at L1



# L1:SUS-ETMY-OPLV\_YOUT with AS\_Q for S2 at L1



# S1 INTERSITE CORRELATIONS

This study of S1 intersite correlations was stimulated by the results presented by Robert Schofield - see this report which displays some interesting correlations between LLO and LHO data.

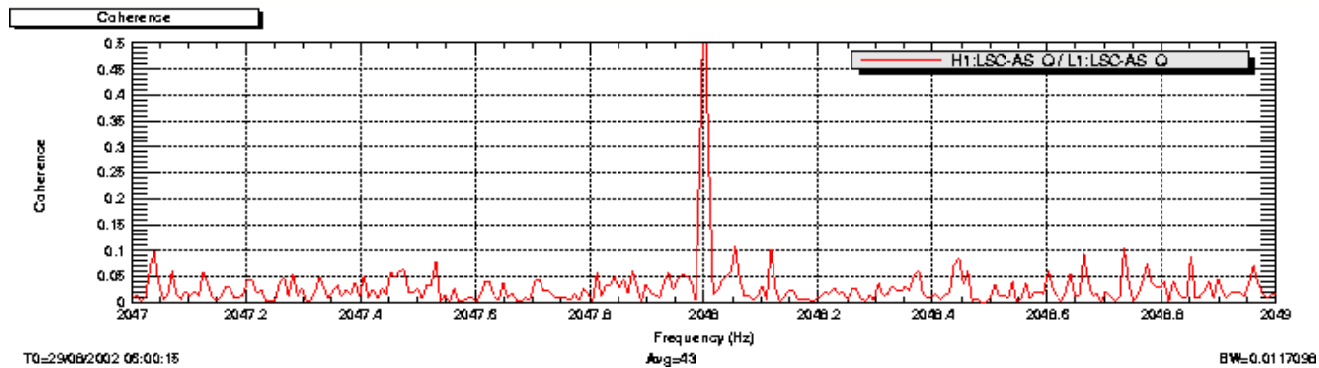
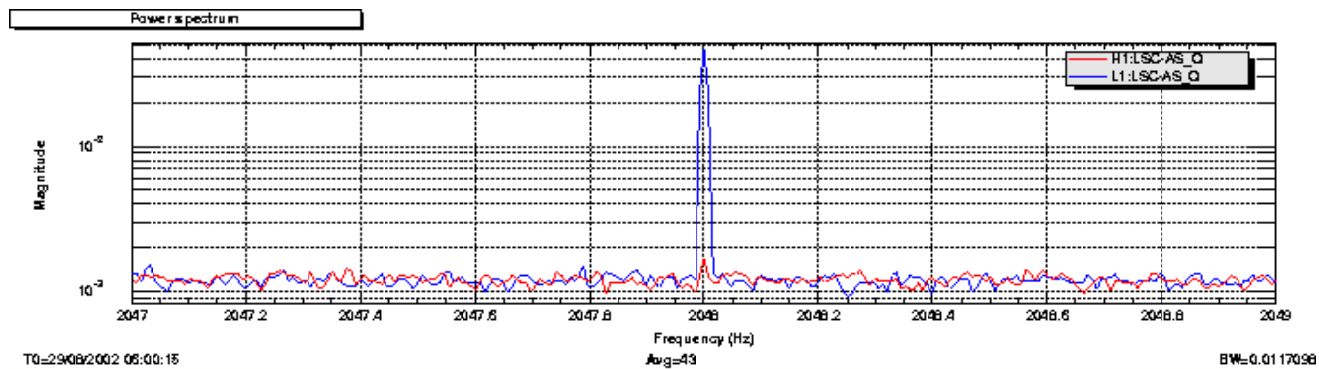
We looked at 3 different time stretches of S1 playground data during S1 in order to examine the time stability of the correlations.

The correlations below were calculated and averaged over these entire playground sections using a bandwidth of 0.01Hz.

Intersite Correlation Results are posted at  
<http://physics.carleton.edu/Faculty/Nelson/InterS1/InterCorrelations.htm>

Correlations between L1:LSC-AS\_Q and H1:LSC-AS\_Q, also L1:LSC-AS\_Q and H2:LSC-AS\_Q

There are consistent correlations to be observed at 2048, 4096 and 6144 Hz, but not 1024 Hz.



Interesting correlations at other frequencies

Most do not seem to be consistent, but a couple do.

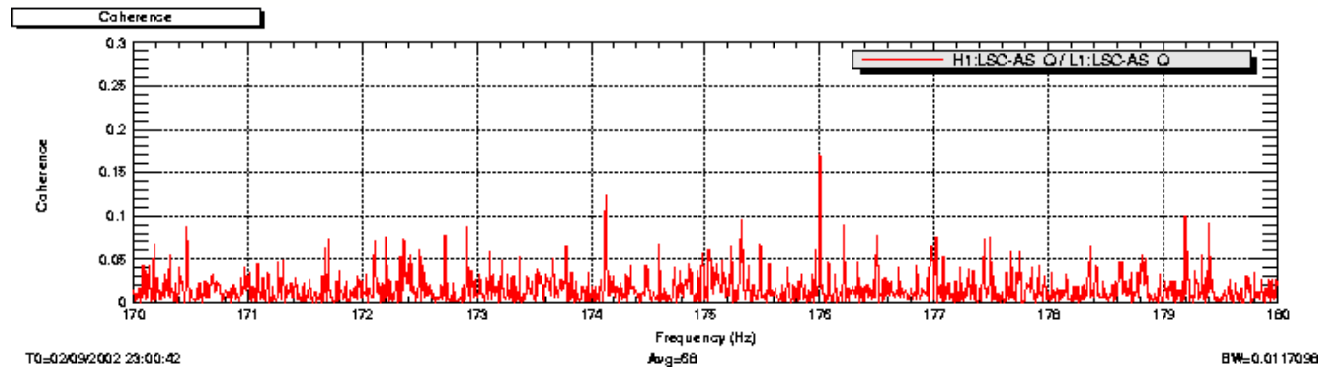
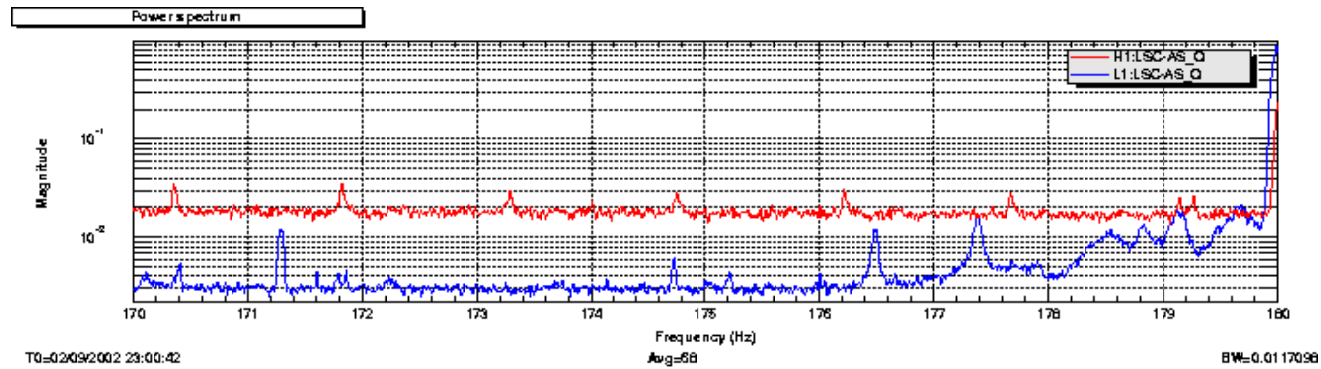
Robert's report showed an interesting H1-L1 correlation at 176 Hz.

We always observe some action between 170-180 Hz, especially at 176 Hz, and sometimes at 174.25 and 178 Hz; there is nothing at 176Hz for H2-L1.

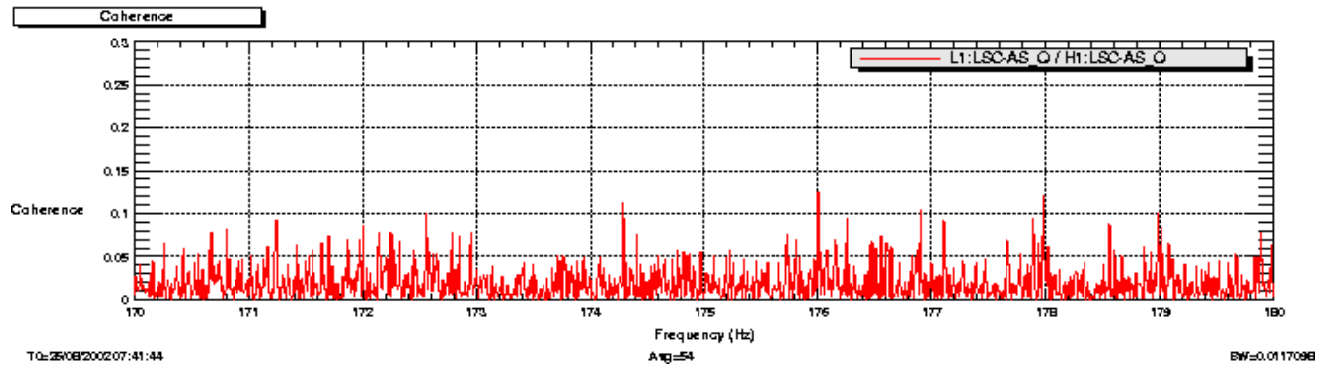
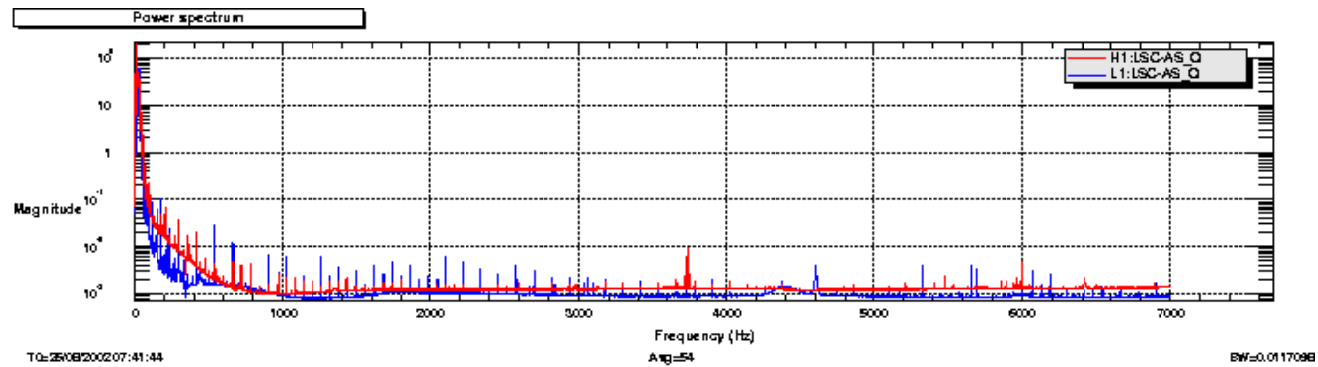
Robert saw a L1-H1 correlation at 250 Hz, but it is not apparent in the results here. It is also not to be found in the 250Hz correlation is not to be seen in L1-H2 play9.

Robert also displayed a potentially interesting correlation at 290Hz. We see nothing dramatic; maybe there is a peak at 285.5 Hz, and sometimes stuff at 289 Hz, but probably not believable at this point.

# L1:LSC-LSC-AS\_Q and H1:LSC-AS\_Q S1 playground-9 Note 174.25 and 176 Hz

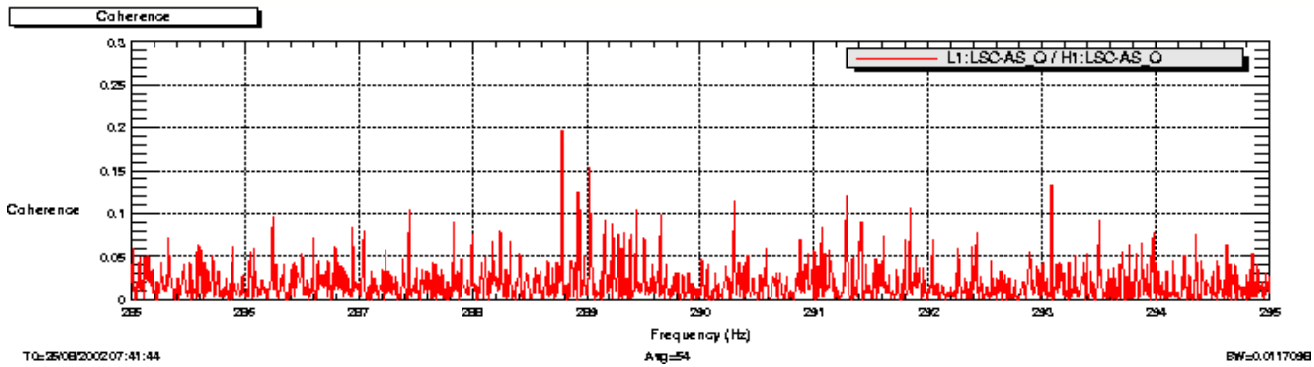
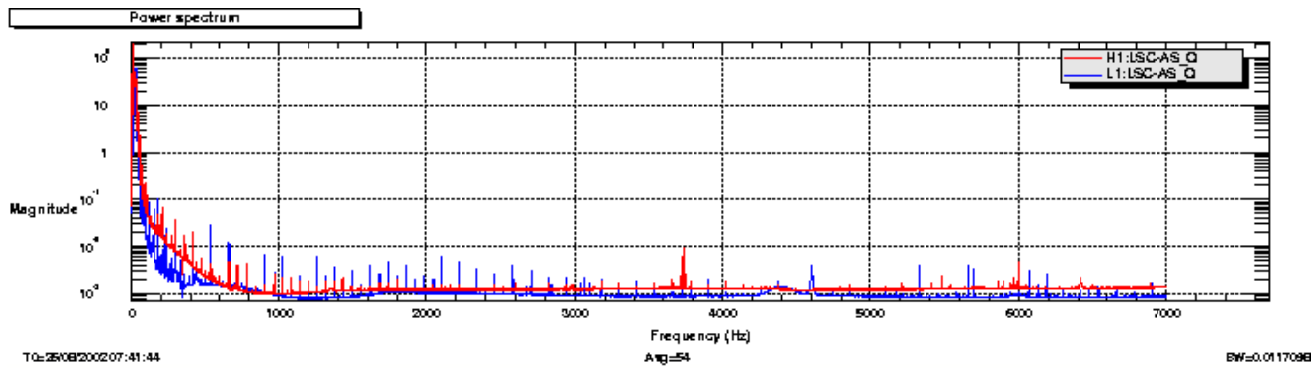


# L1:LSC-LSC-AS\_Q and H1:LSC-AS\_Q S1 playground-3 Note 174.25, 176 and 178 Hz



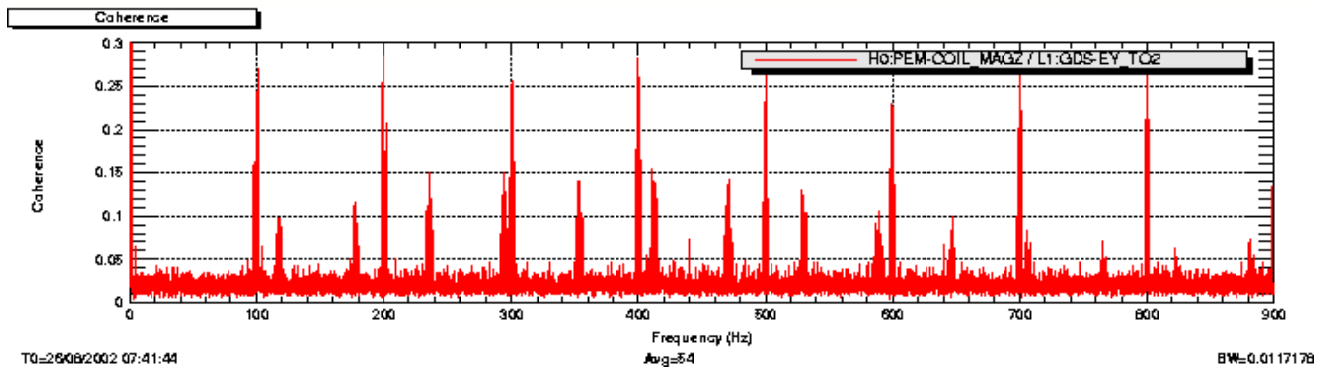
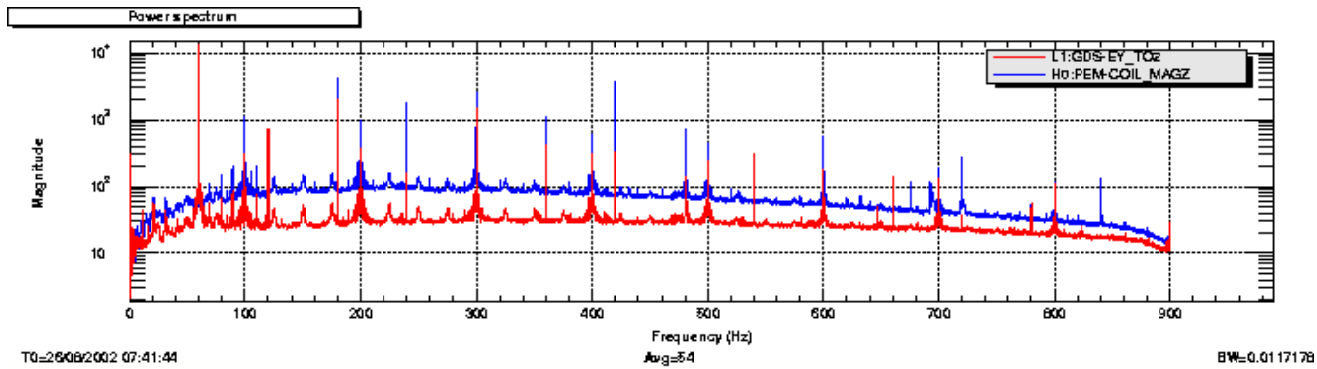


# L1:LSC-LSC-AS\_Q and H1:LSC-AS\_Q S1 playground-3 Note 289 Hz

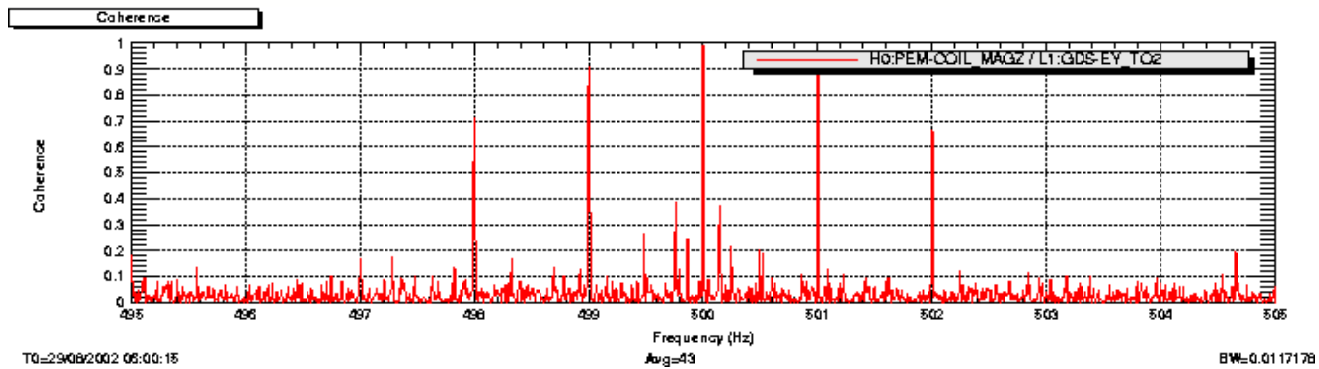
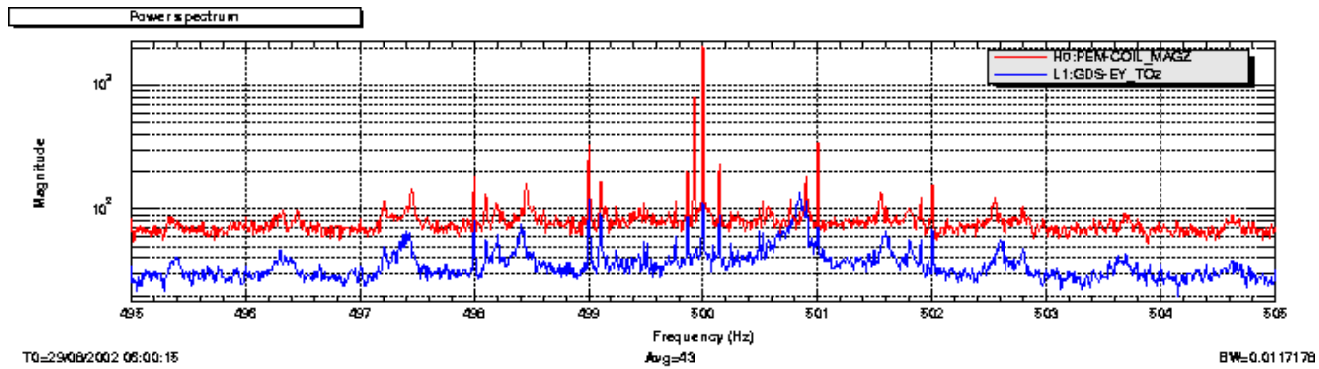


# LLO and LHO Coil Magnetometer Correlations

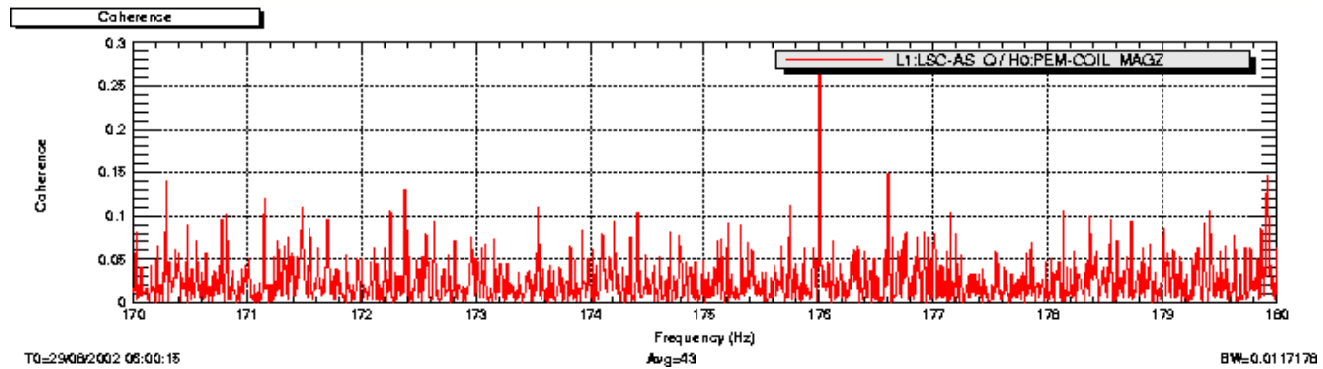
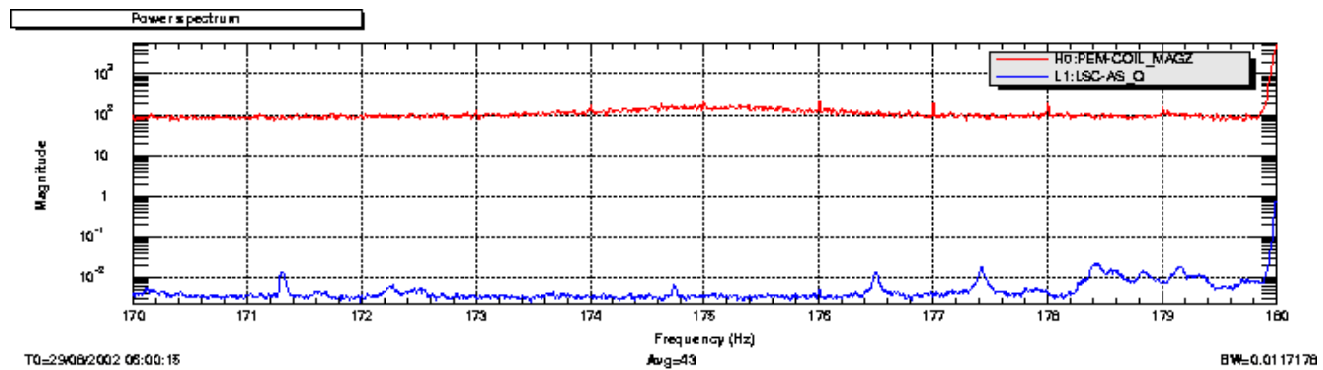
The correlations between H0:PEM-COIL\_MAGZ and L1:GDS-EY\_TO2 showed strong correlation at 100Hz and harmonics, plus the 60Hz harmonics



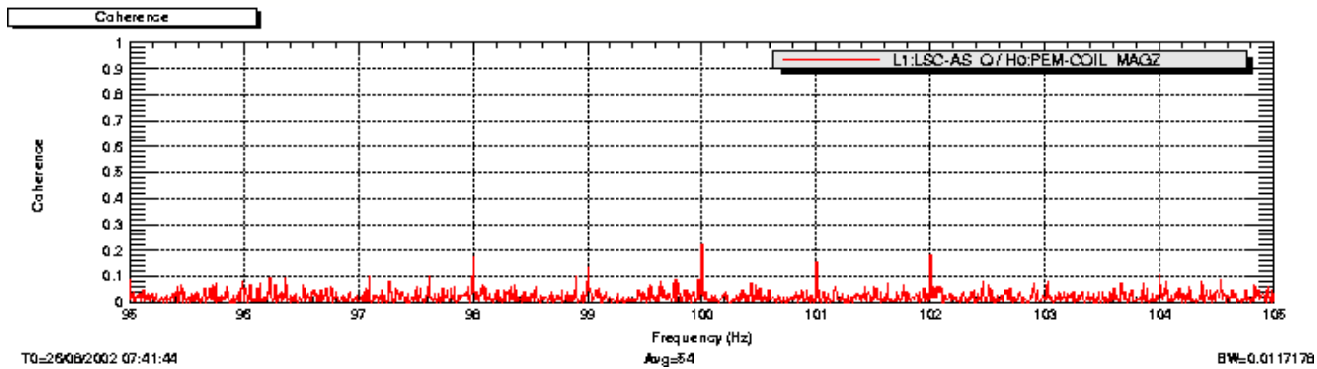
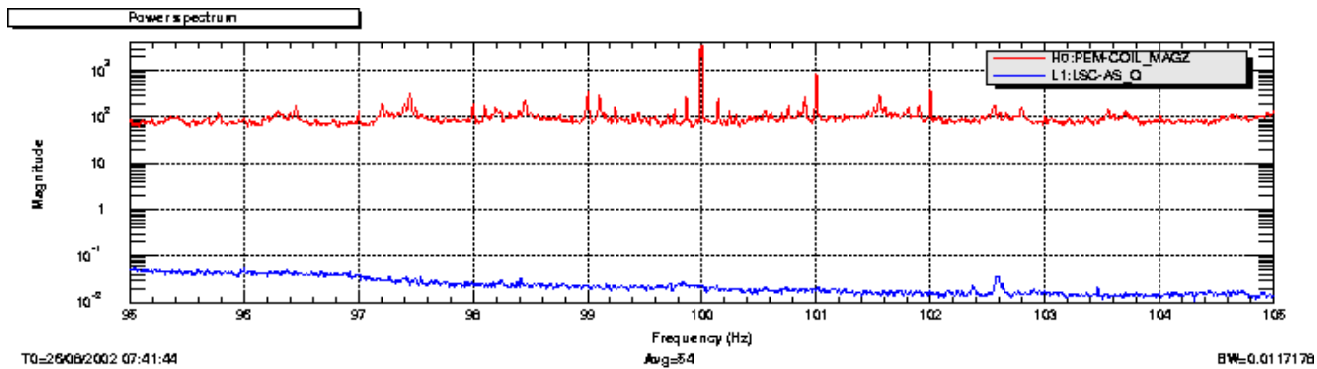
We also looked closely in the vicinity of the strong 500Hz correlation  
Strong correlations at 498Hz, 499Hz, 500Hz, 501Hz and 502Hz.



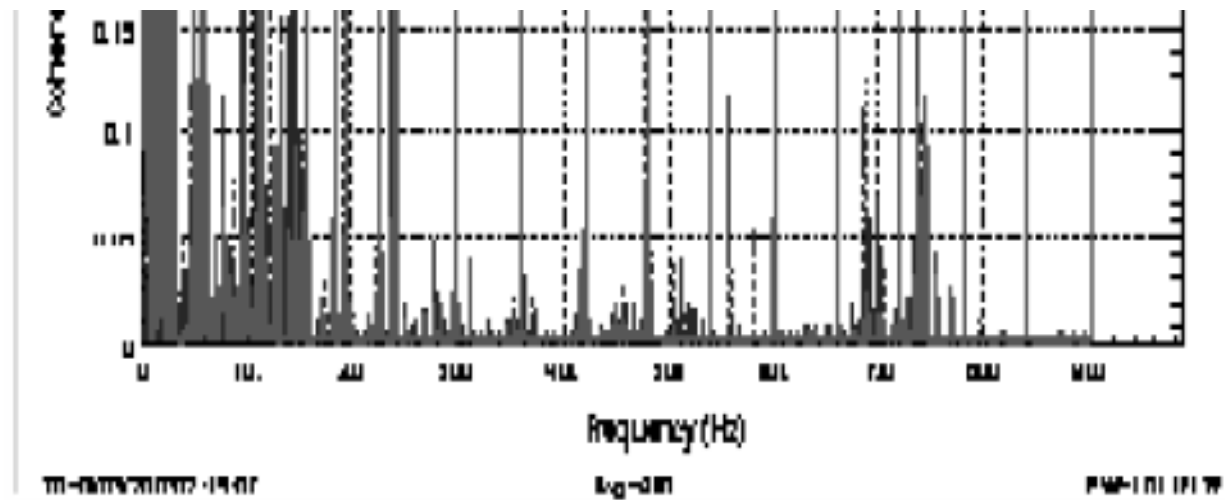
Correlations Between L1:LSC-AS\_Q and H0:PEM-COIL-MAGZ  
The were also significant correlations to be found between  
L1:LSC-AS\_Q and H0:PEM-COIL-MAGZ  
A 176Hz correlation, with a sidekick at 176.6Hz can be seen



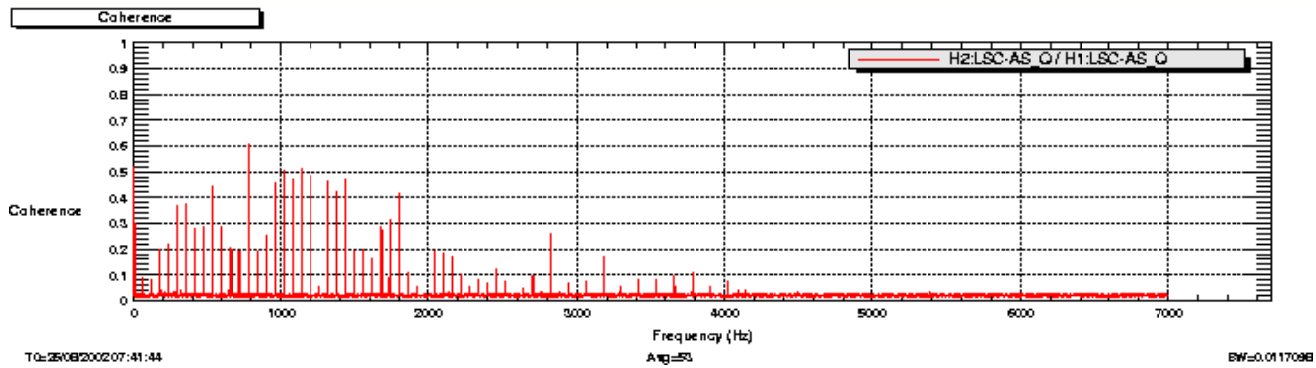
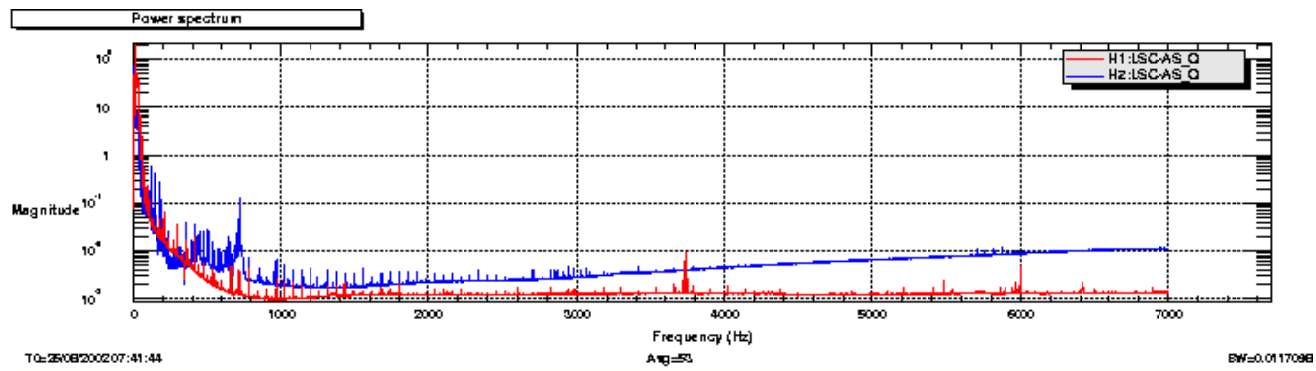
There are correlations to be seen at 98Hz, 99Hz, 100Hz, 101Hz and 102Hz. L1:LSC-AS\_Q and H0:PEM-COIL-MAGZ



# H1 - H2 Correlations from R. Schofield. 12 hours of S2



# S1 H1-H2 AS\_Q Correlation 0 to 7 kHz



# S1 H1-H2 AS\_Q Correlation 0 to 20 Hz

