

Correlation Study: S2

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Looking at Correlations between AS_Q and a
number of Environmental channels-
Optical Lever Signals

Monitored Numerous Channels (L1 and H1 too)

L1:LSC-AS_Q

L1:SUS-ITMX_OPLEV_YOUT

L1:SUS-ITMY_OPLEV_YOUT

L1:SUS-ETMX_OPLEV_YOUT

L1:SUS-ETMY_OPLEV_YOUT

L1:SUS-RM_OPLEV_YOUT

L1:SUS-BS_OPLEV_YOUT

L1:SUS-MMT3_OPLEV_YOUT

L0:PEM-BSC2_ACCX

L0:PEM-PSL1_MIC

L1:SEI-LVEA_SEIS_Y

L1:SEI-EX_SEIS_Y

L1:SUS-ITMX_OPLEV_POUT

L1:SUS-ITMY_OPLEV_POUT

L1:SUS-ETMX_OPLEV_POUT

L1:SUS-ETMY_OPLEV_POUT

L1:SUS-RM_OPLEV_POUT

L1:SUS-BS_OPLEV_POUT

L1:SUS-MMT3_OPLEV_POUT

L0:PEM-PSL1_ACCX

L0:PEM-BSC2_ACCY

L1:SEI-LVEA_SEIS_X

L1:SEI-EX_SEIS_X

ITMs-OPLEV_YOUT and POUT

Not part of servos

Coincident Glitches between these and AS_Q

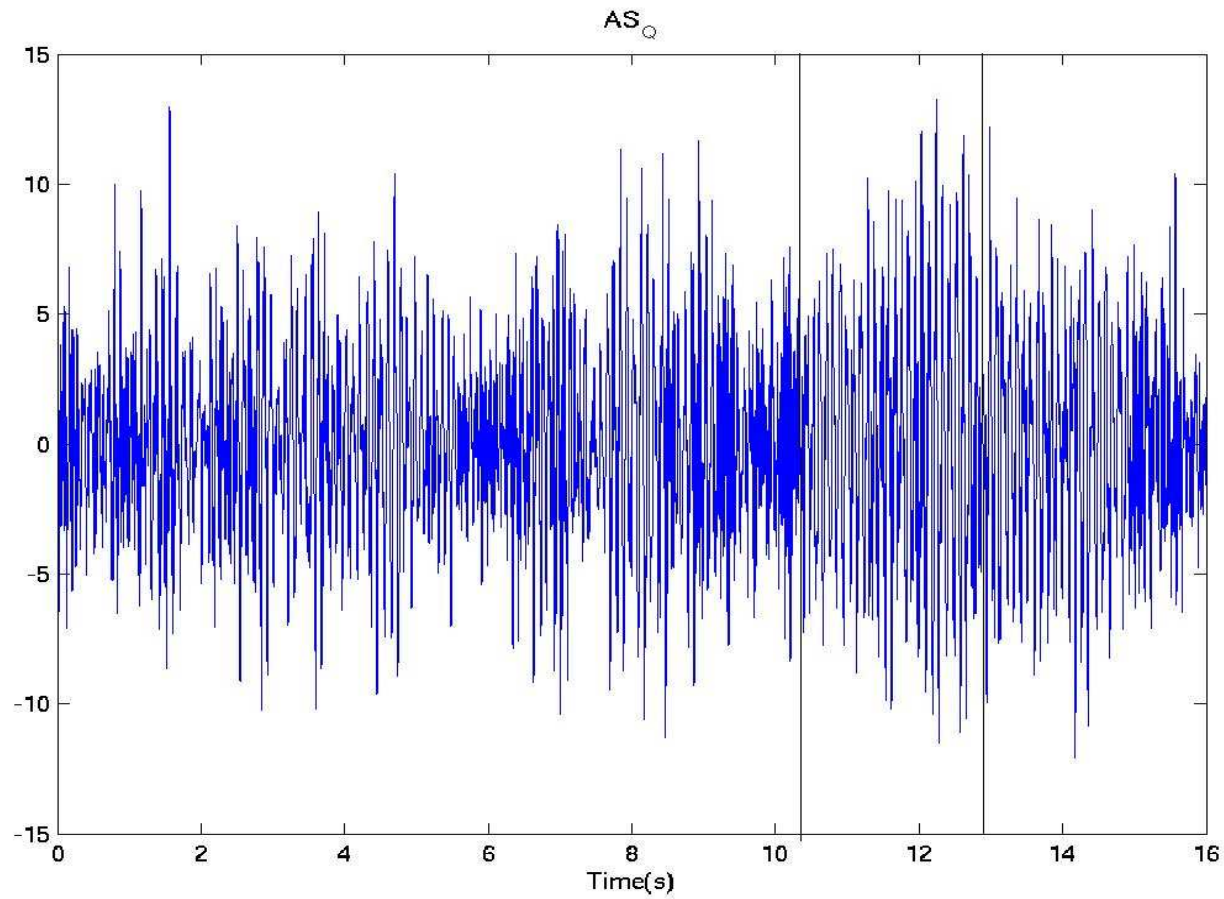
Observe Increase in coherence during the glitch (50 Hz to 200 Hz) Range

Also observe coherence increase during hardware injections!!!

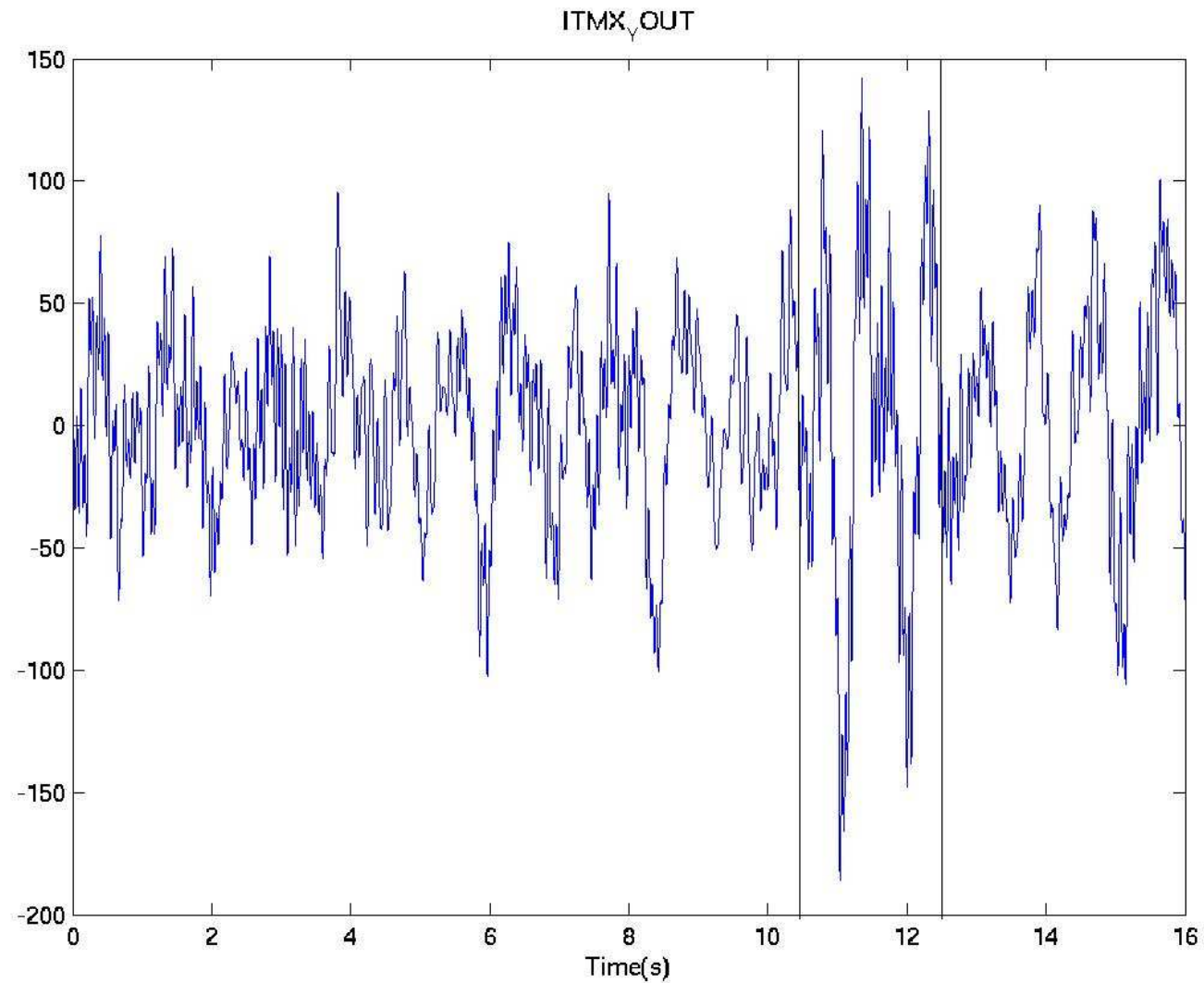
All results are posted at:

<http://physics.carleton.edu/Research/ligo/7-10/S2noiseb.html>

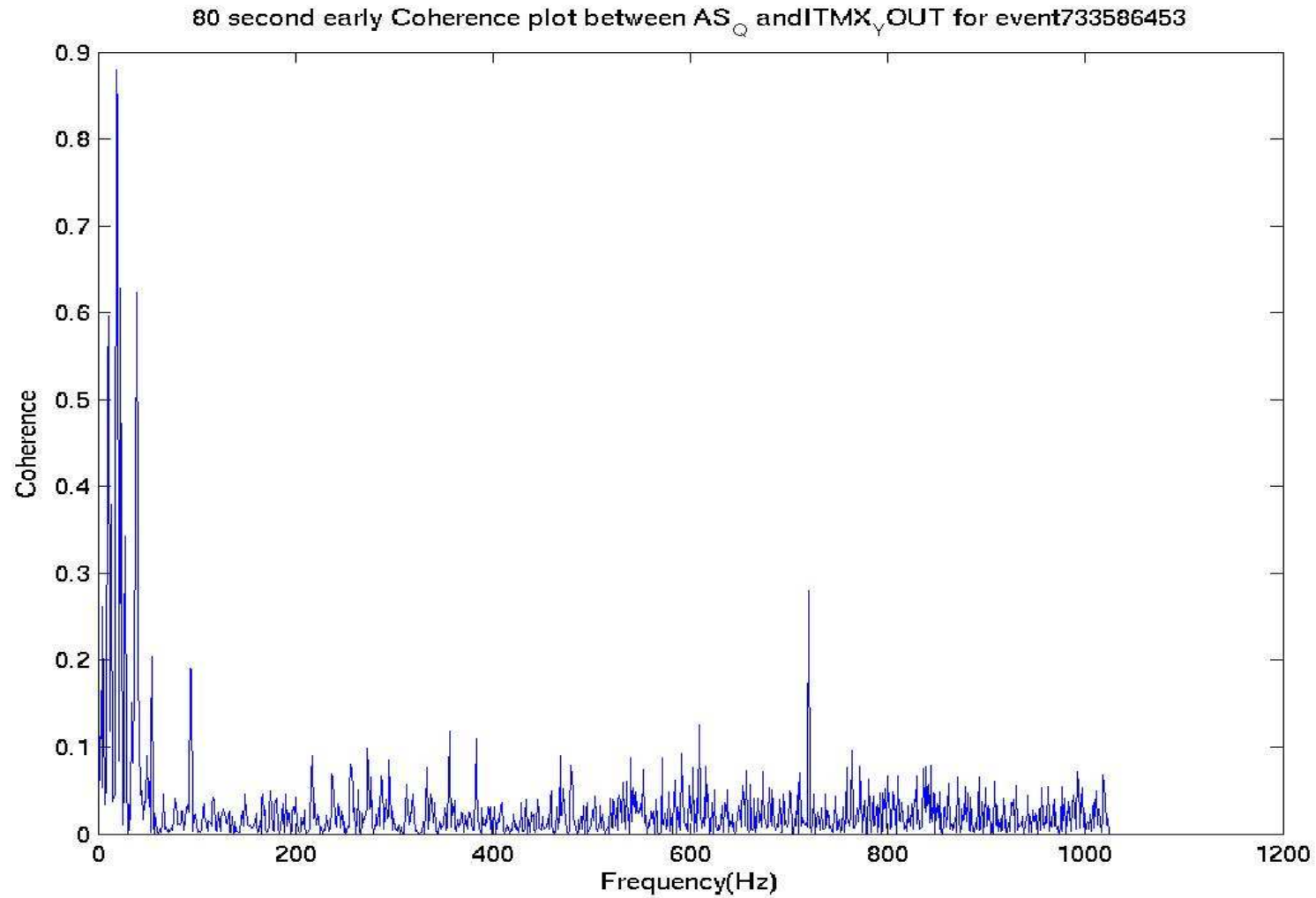
“Inspirational Event” in S2 Playground



Event in ITMX_OPLEV_YOUT

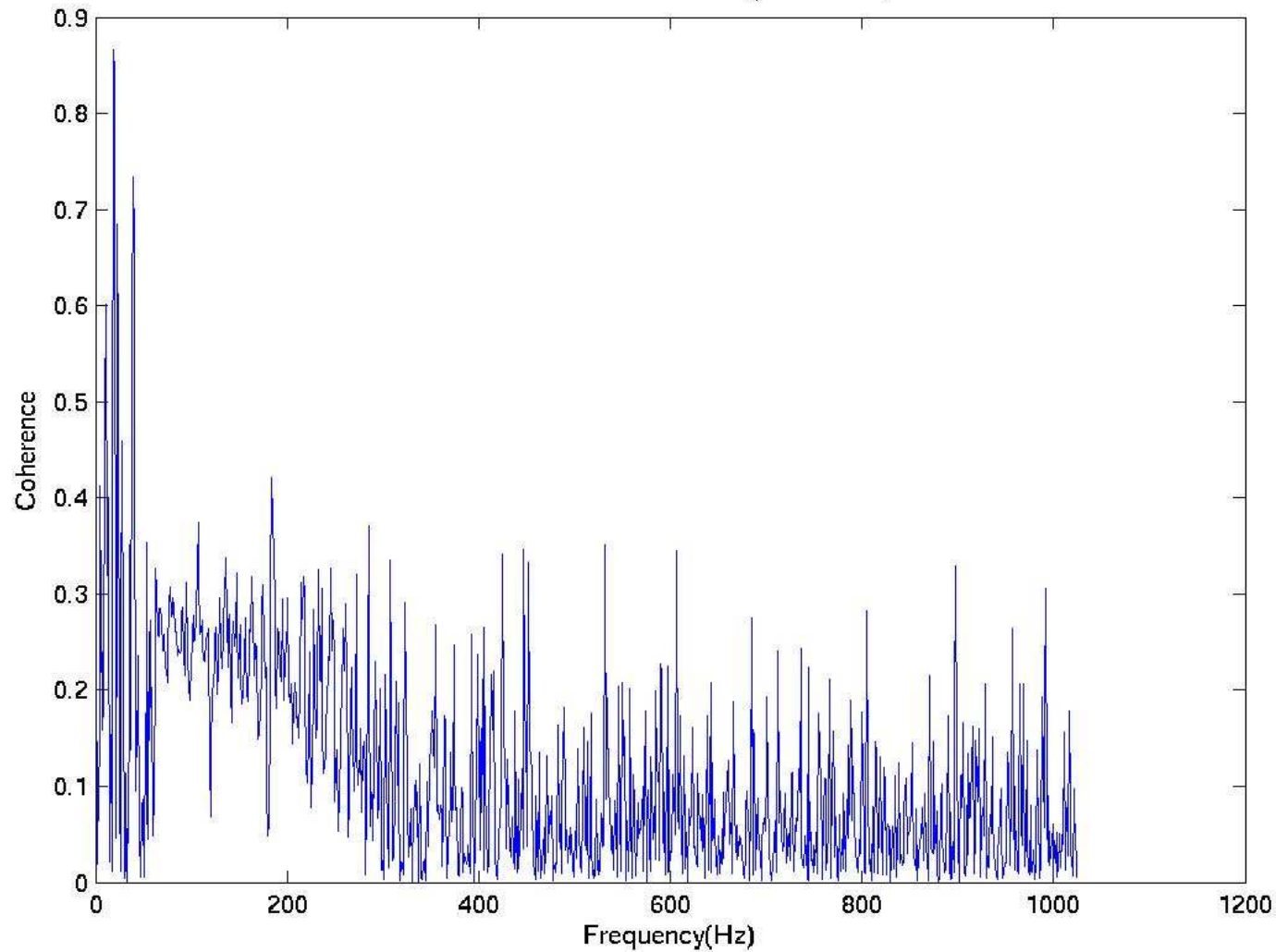


Coherence before Glitch



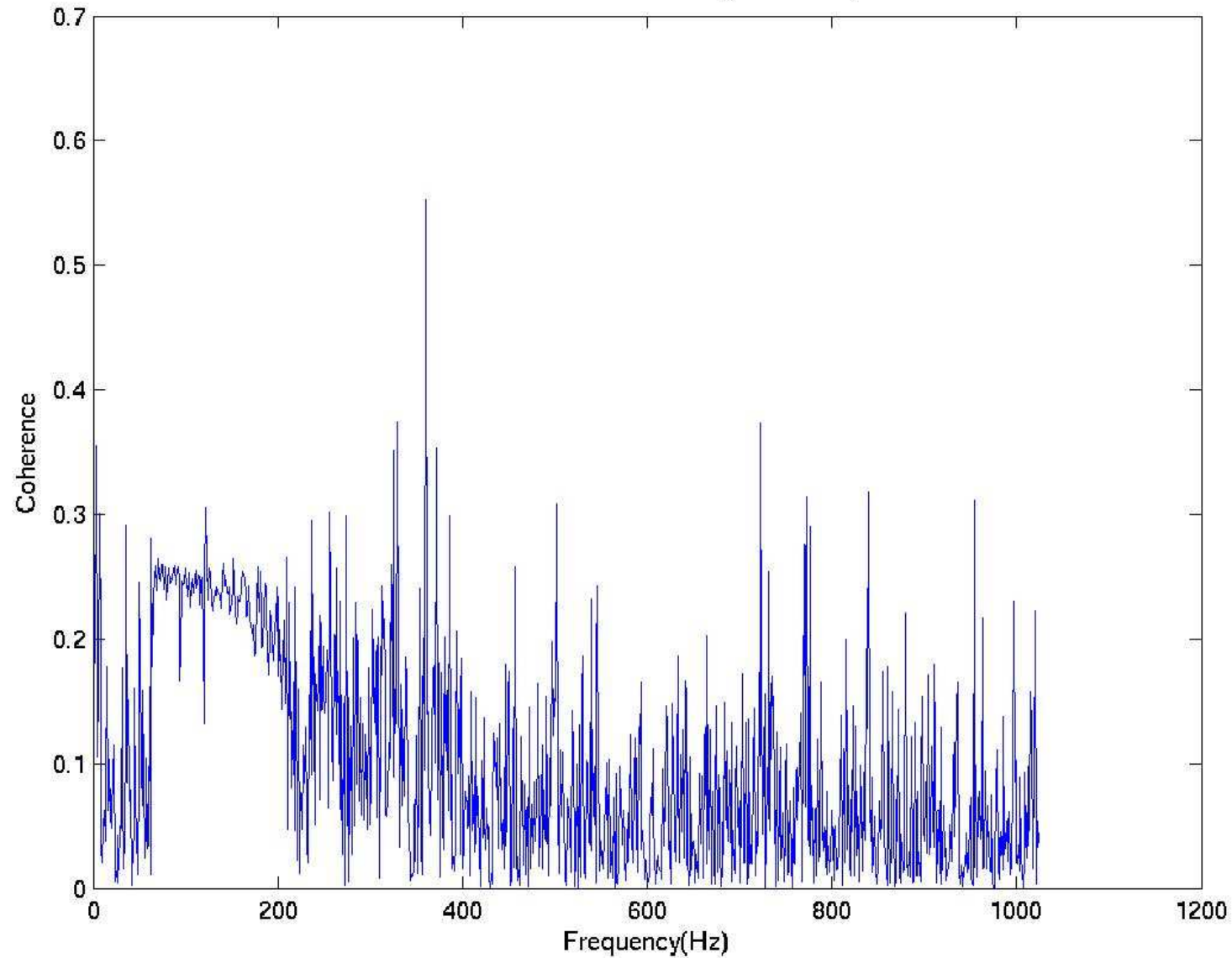
Coherence During Glitch

16 second Coherence plot over glitch between AS_Q and ITMX_YOUT for event733586453

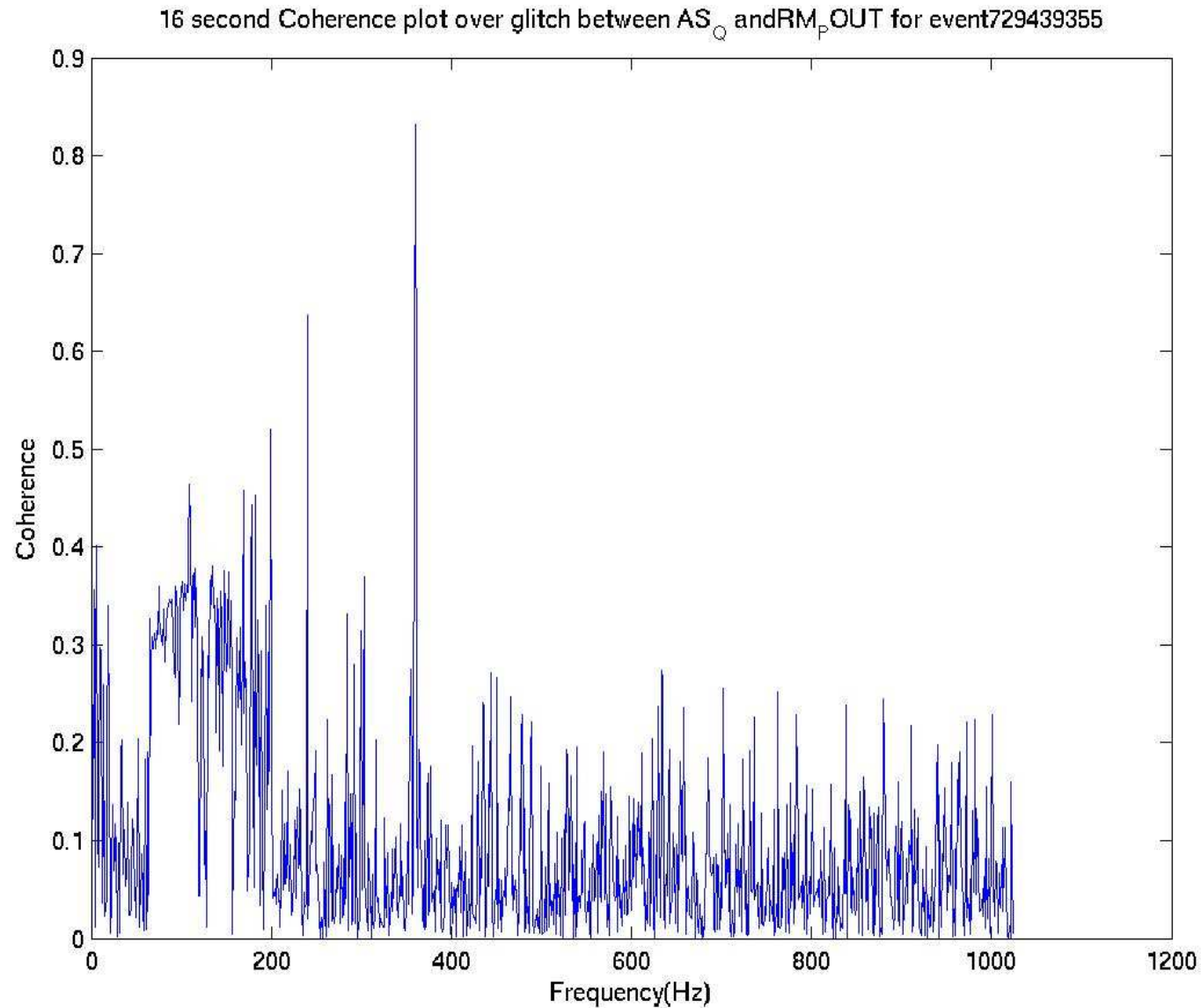


Another Glitch (AS_Q & ITMY)

16 second Coherence plot over glitch between AS_Q and ITMY_P OUT for event 730885394

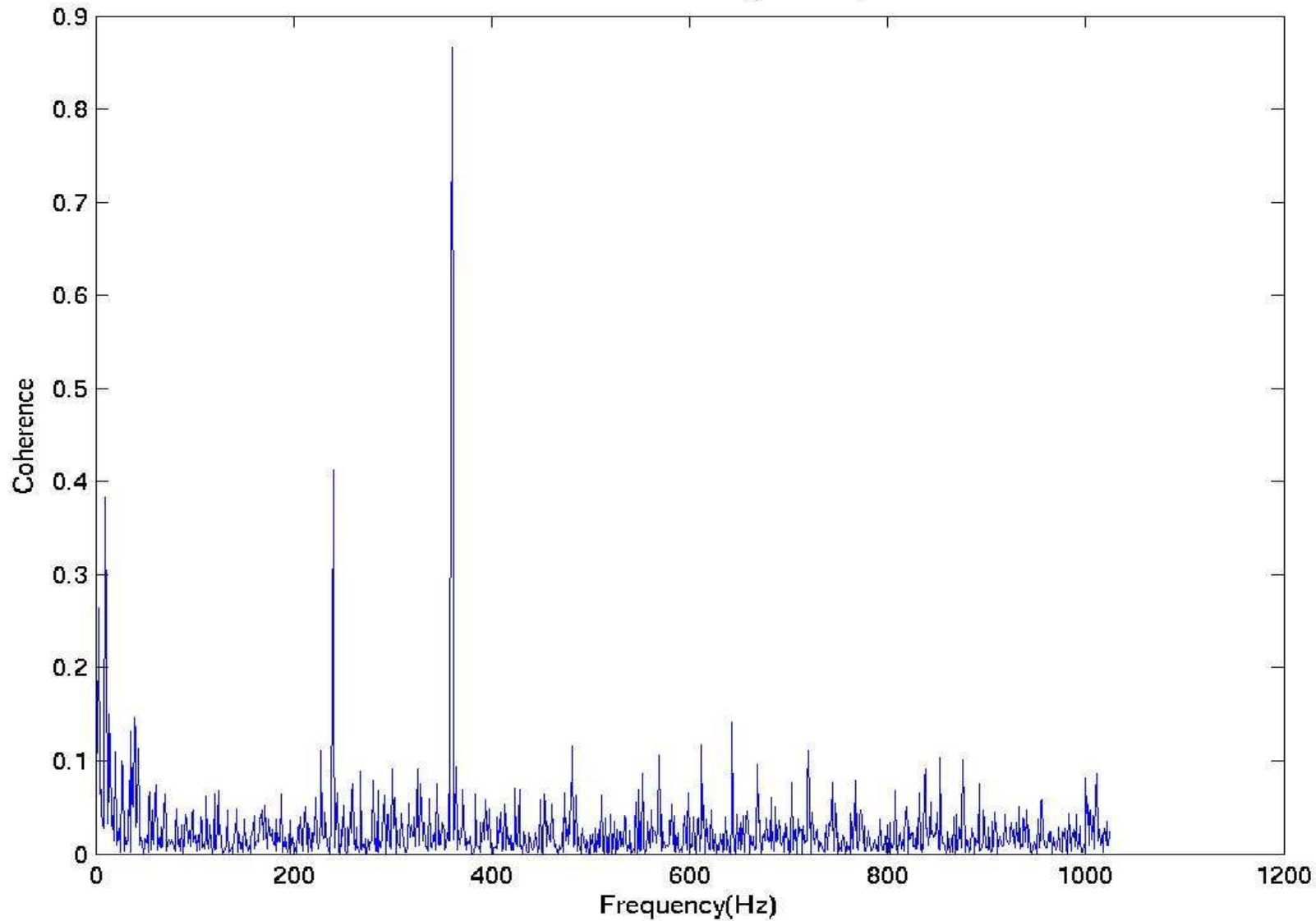


Coherence During Glitch AS_Q and RM_OPLEV_POUT

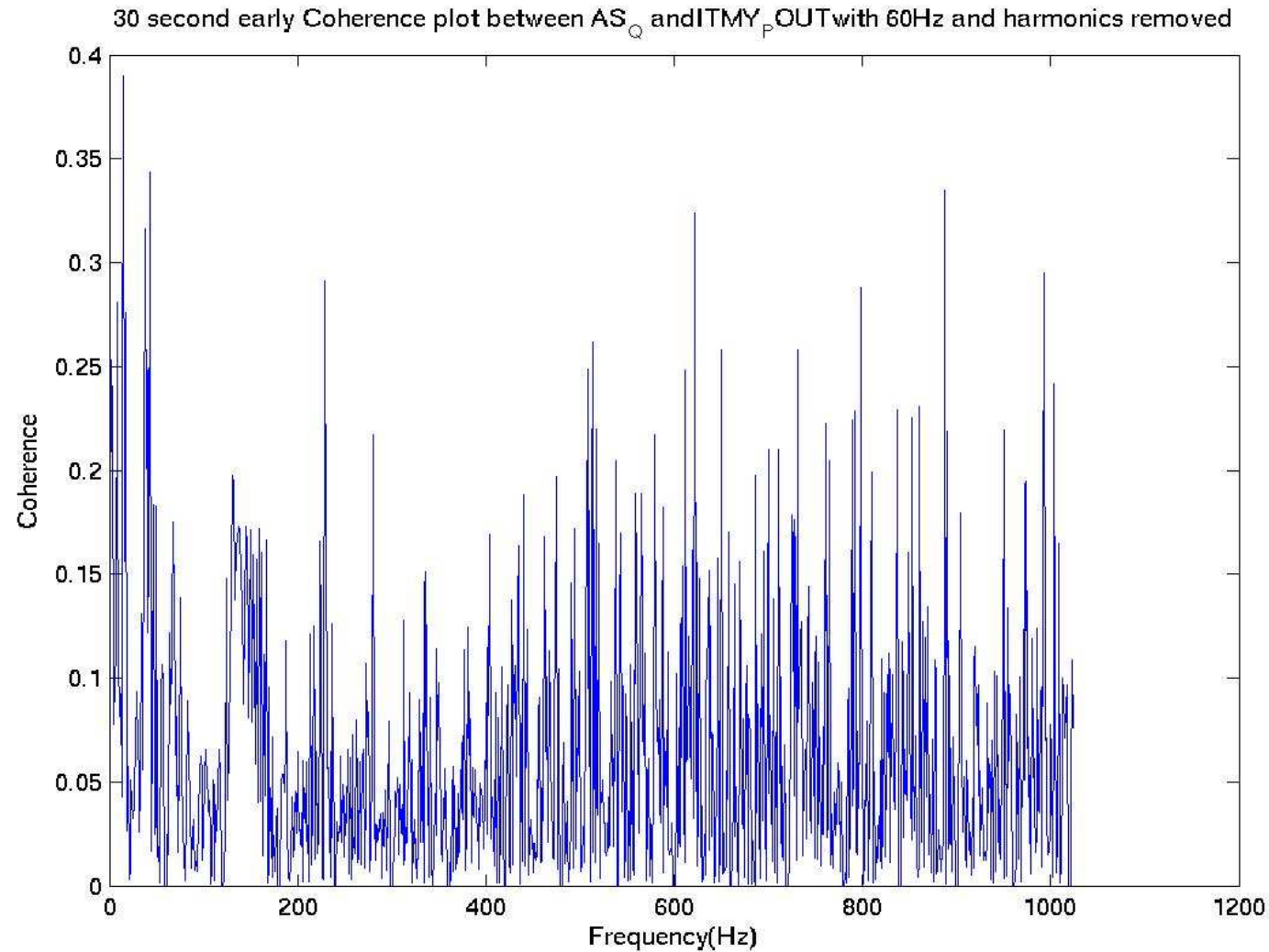


Baseline AS_Q RM_OPLEV_POUT

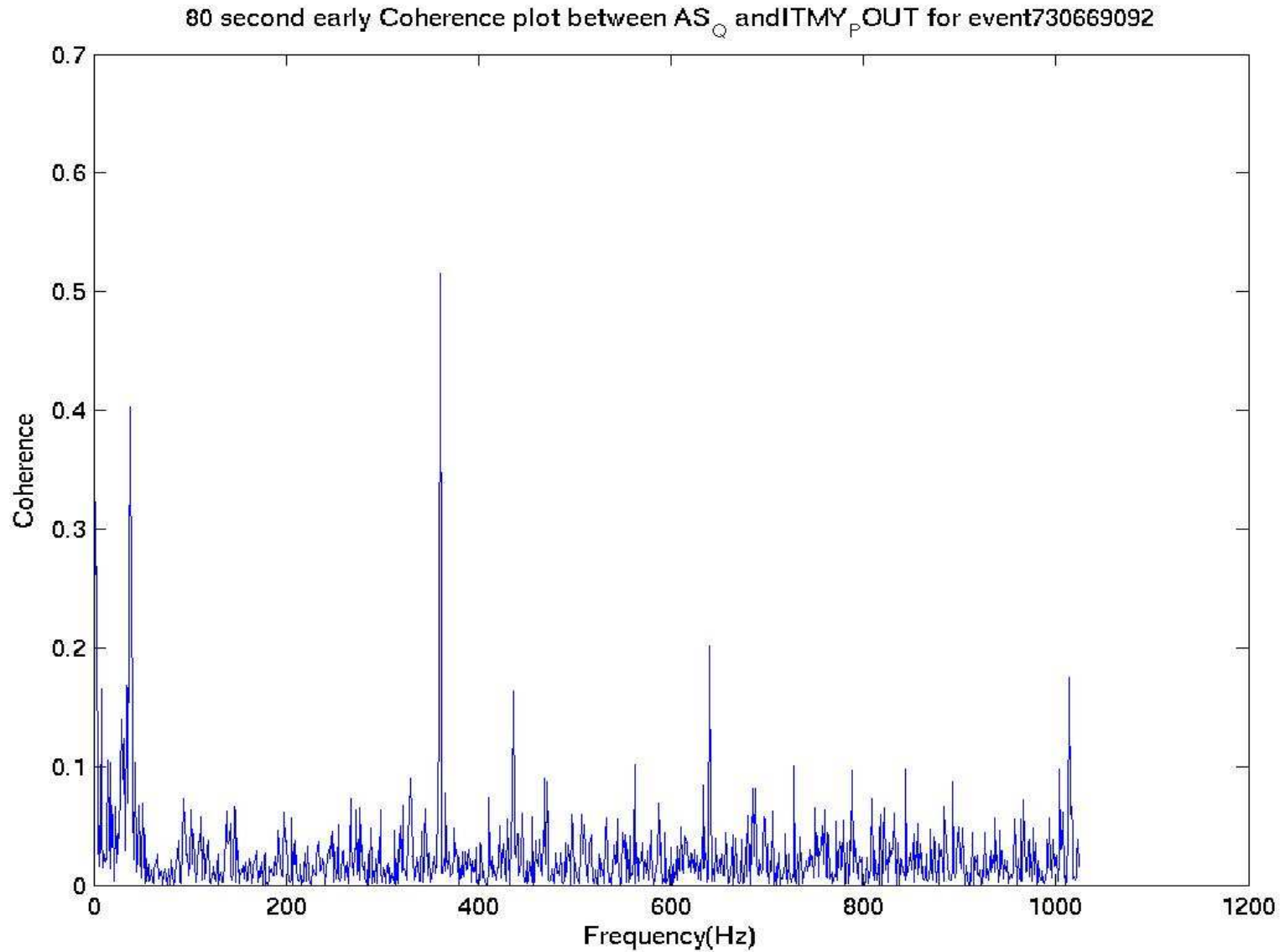
80 second early Coherence plot between AS_Q and RM_POUT for event729439355



Coherence During Injected Signal –

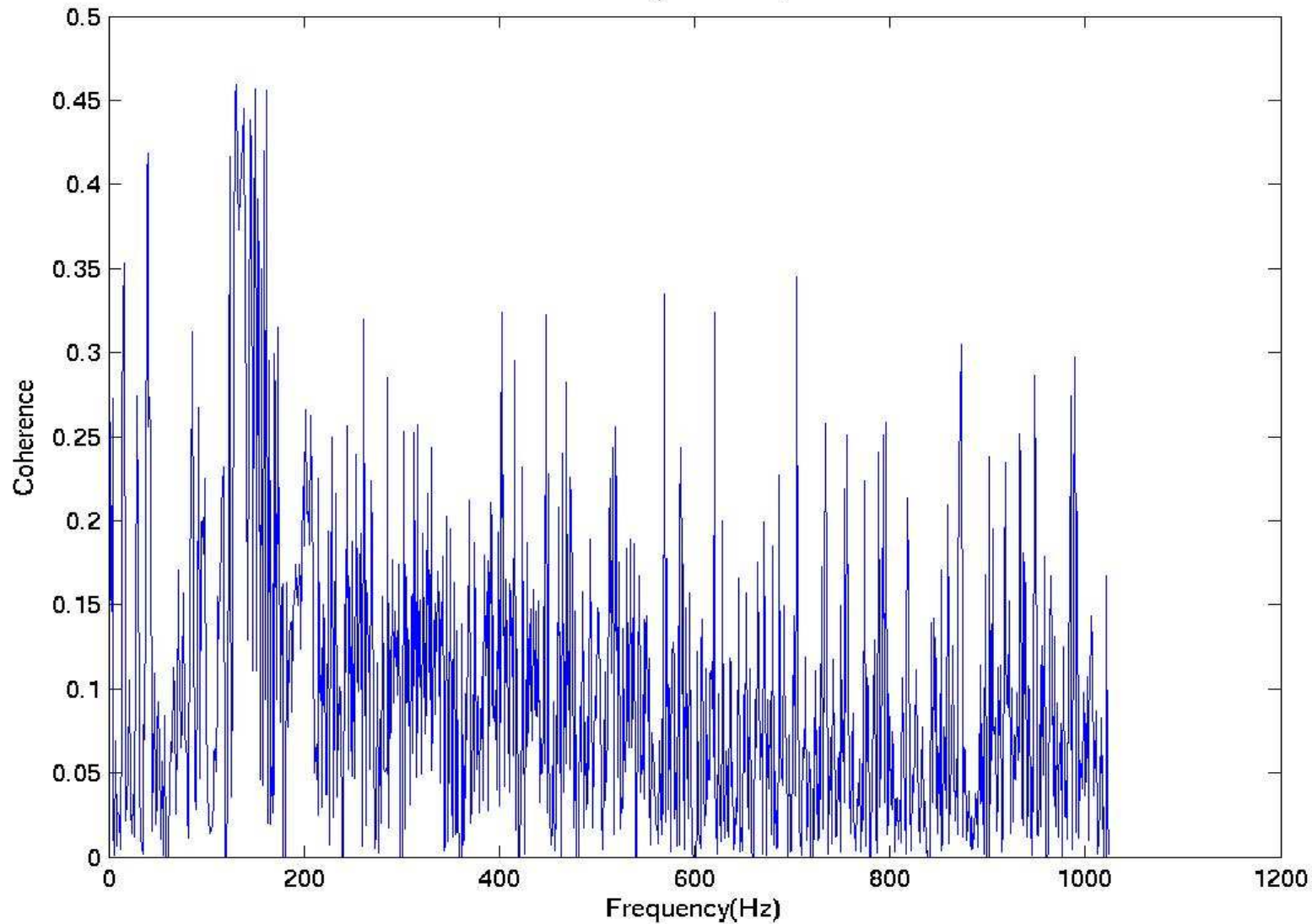


Baseline IMTY_OPLEV_POUT



Coherence During Injected Event

30 second early Coherence plot between AS_Q and $ITMY_P$ OUT with 60Hz and harmonics removed



LLO ITMs_OPLEV_Y(P)OUT Show Strong and Consistent AS_Q Correlations

Coherence > 20%

2 Hz

7 Hz

8 Hz

11 Hz

13 Hz

19 Hz

21 Hz

22 Hz

28 Hz

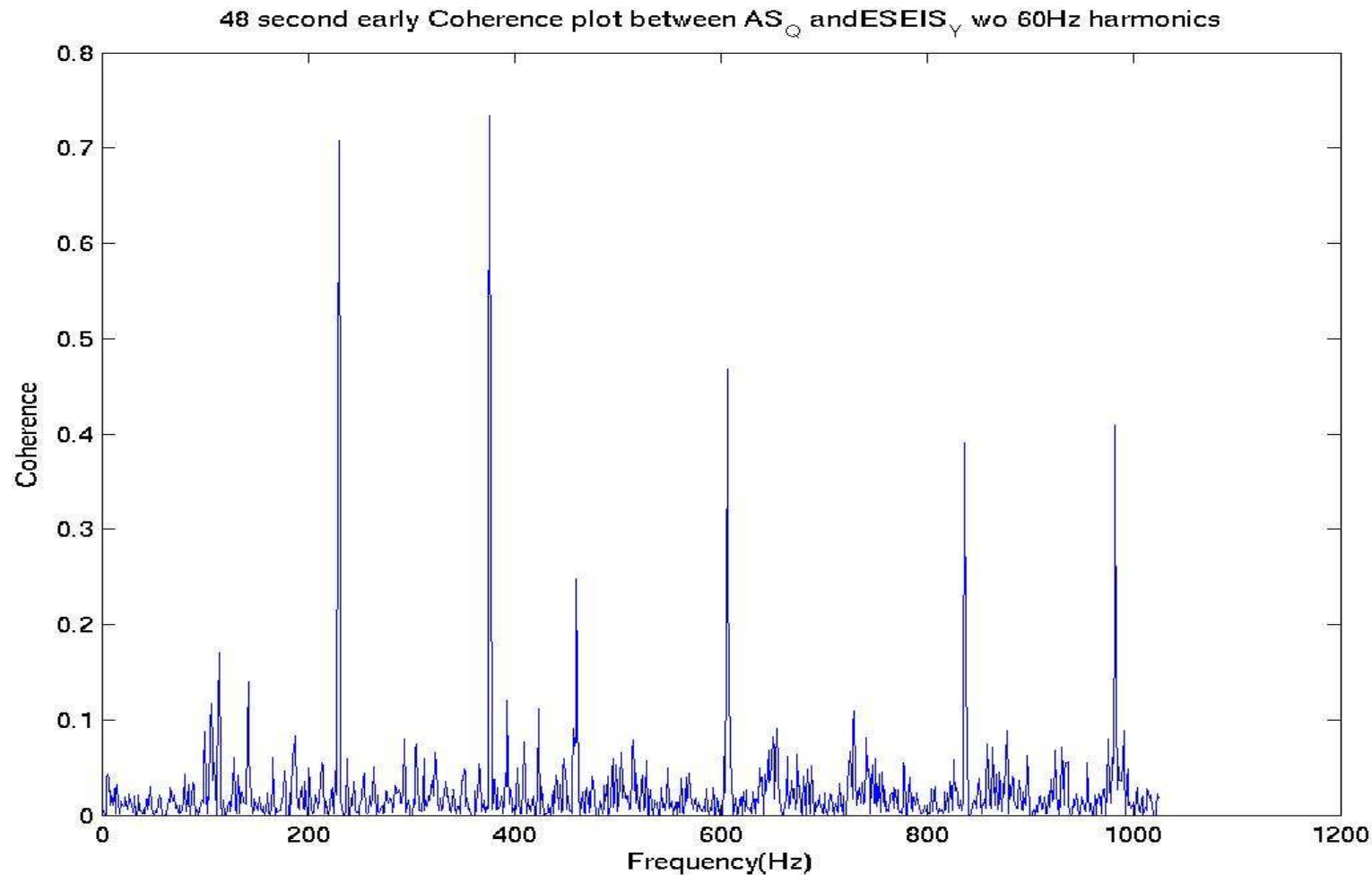
38 Hz (90% coherence here)

Consistent Correlations with L1 AS_Q

- L0:PEM-PSL1_ACC 8 and 15 Hz
- L0:PEM-BSC2_ACC 8, 13, 15, 38, 48 Hz
- L1:SEI-LVEA_SEIS 4, 6, 7 16, 28, 38 44 Hz
- L1:SEI-EX_SEIS 4, 3, 5, 6, 9, 21 Hz

H1: Strong AS_Q and H1:SEI-EX_SEIS_Y Correlations

230 Hz (0.708), 376 Hz (0.734), 606 Hz (0.468)



ITMs and Glitches at LHO H1

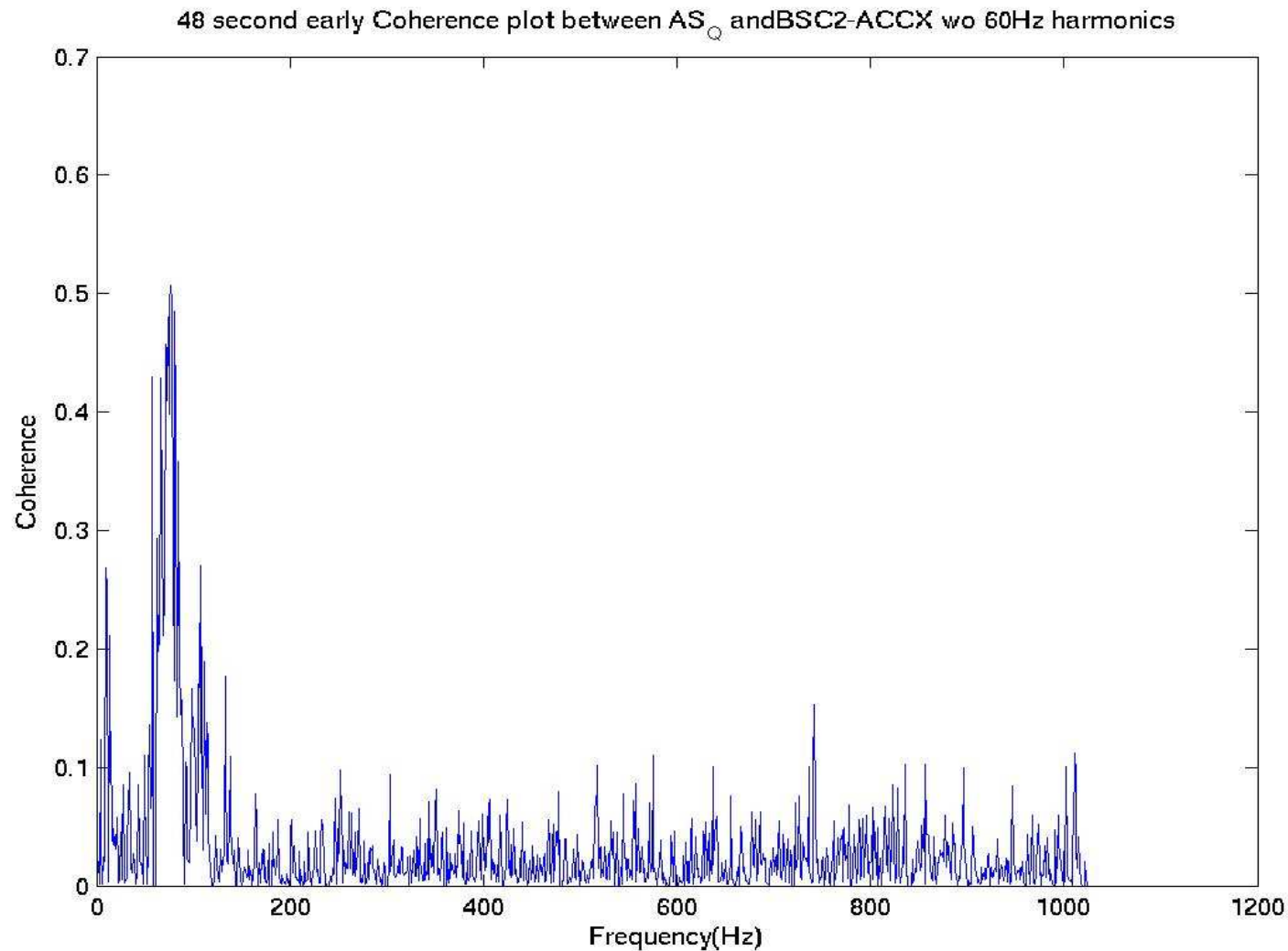
- Do not see major changes in ITMX(Y)_OPLEV_YOUT AS_Q correlations for H1 during glitches, ALTHOUGH
- ITMX(Y)_OPLEV_Y(P)OUT often show a noticeable increase in coherence between 14-16 Hz and 26 Hz during a “glitch”
- Can't “see” coincident glitches by eye in data (can with LLO)

Consistent H1 AS_Q Correlations

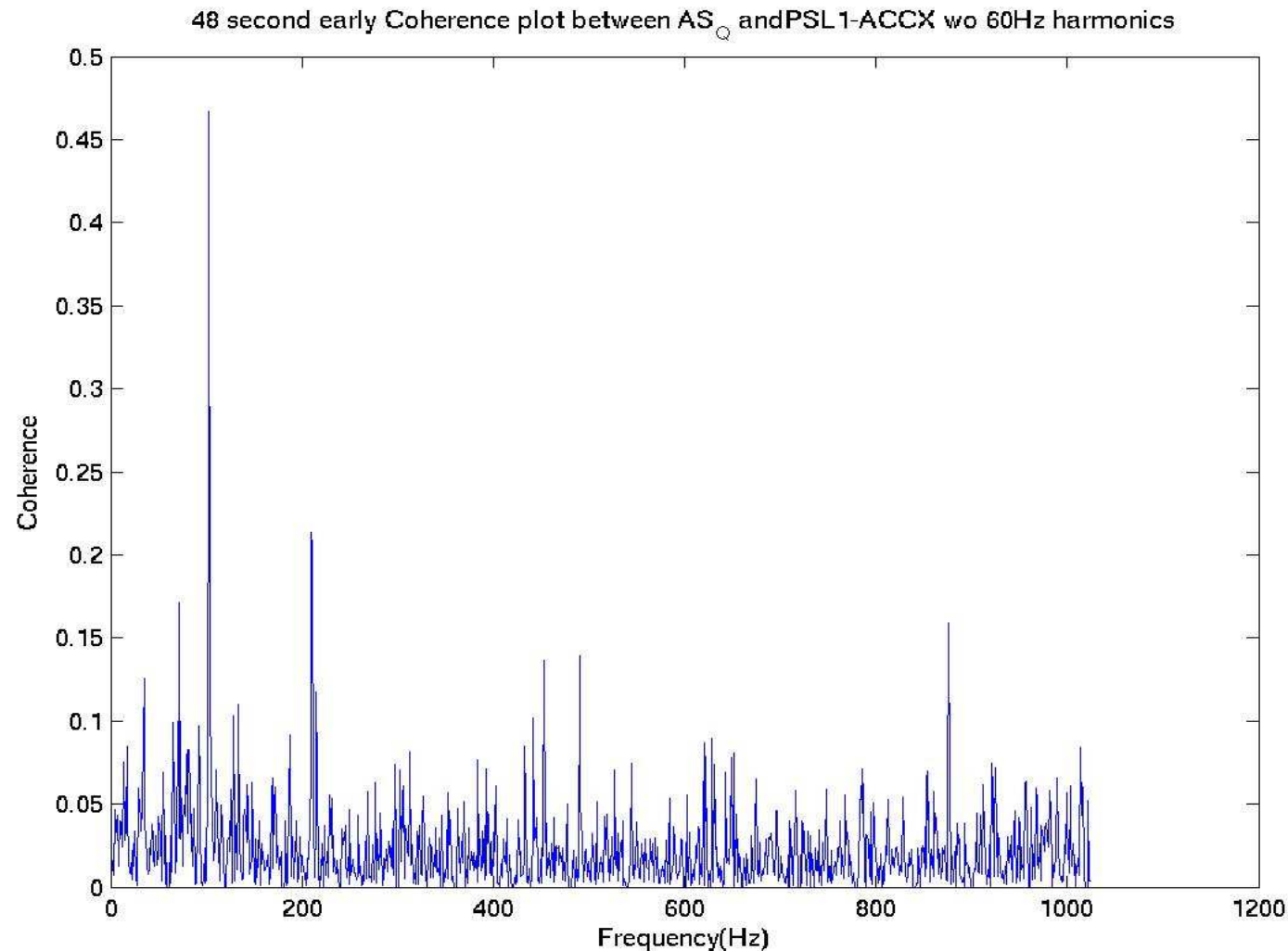
- ITMX(Y)_OPLEV_Y(P)OUT 3, 21, 56
Hz
-

Lot of 58-85 Hz correlation between H1 AS_Q and BSC2_ACC

“Quiet time”

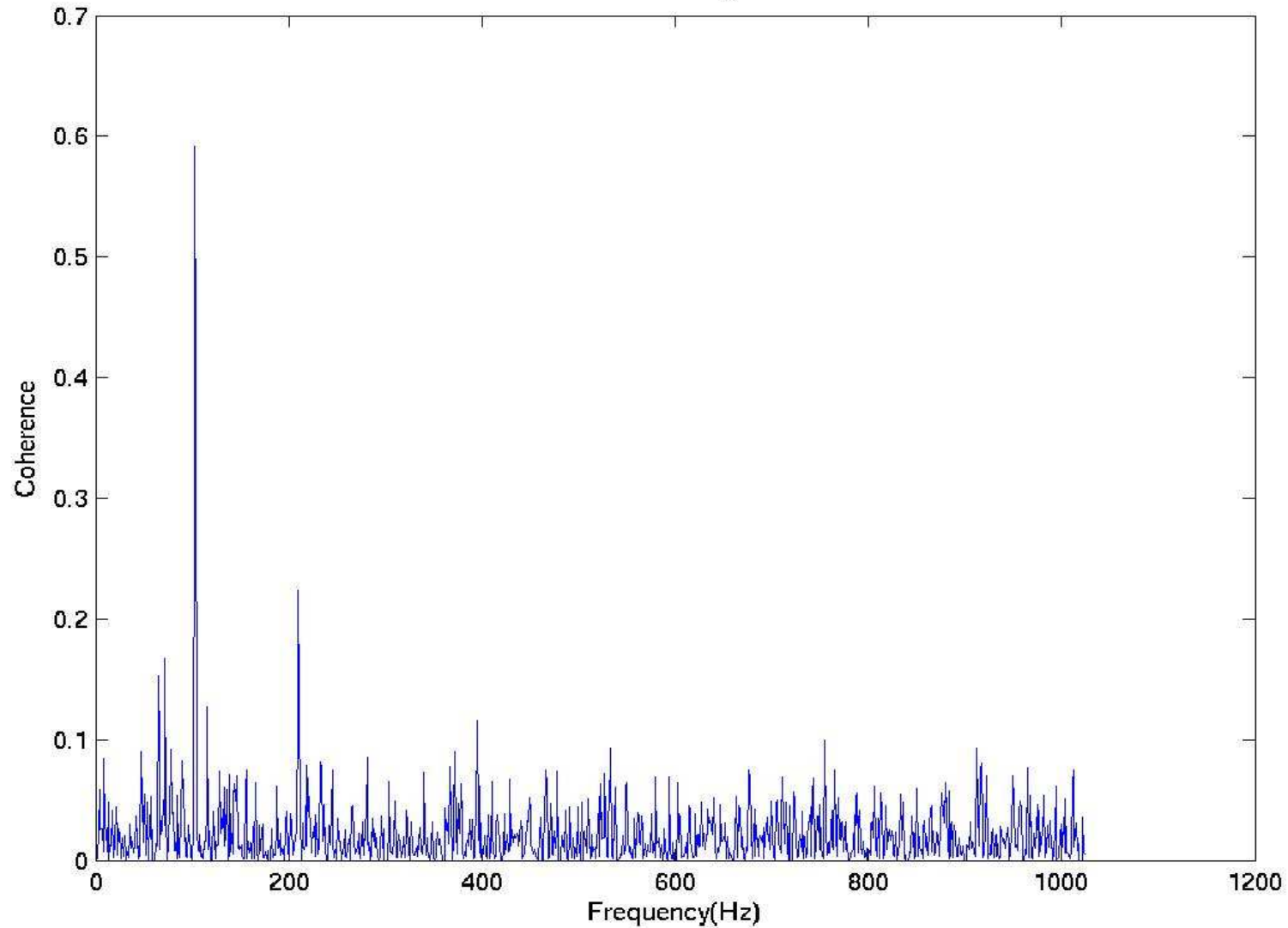


Strong ~ 100 and ~ 200 Hz Correlation between H1 AS_Q PSL1_ACCX; they drift and are not harmonics

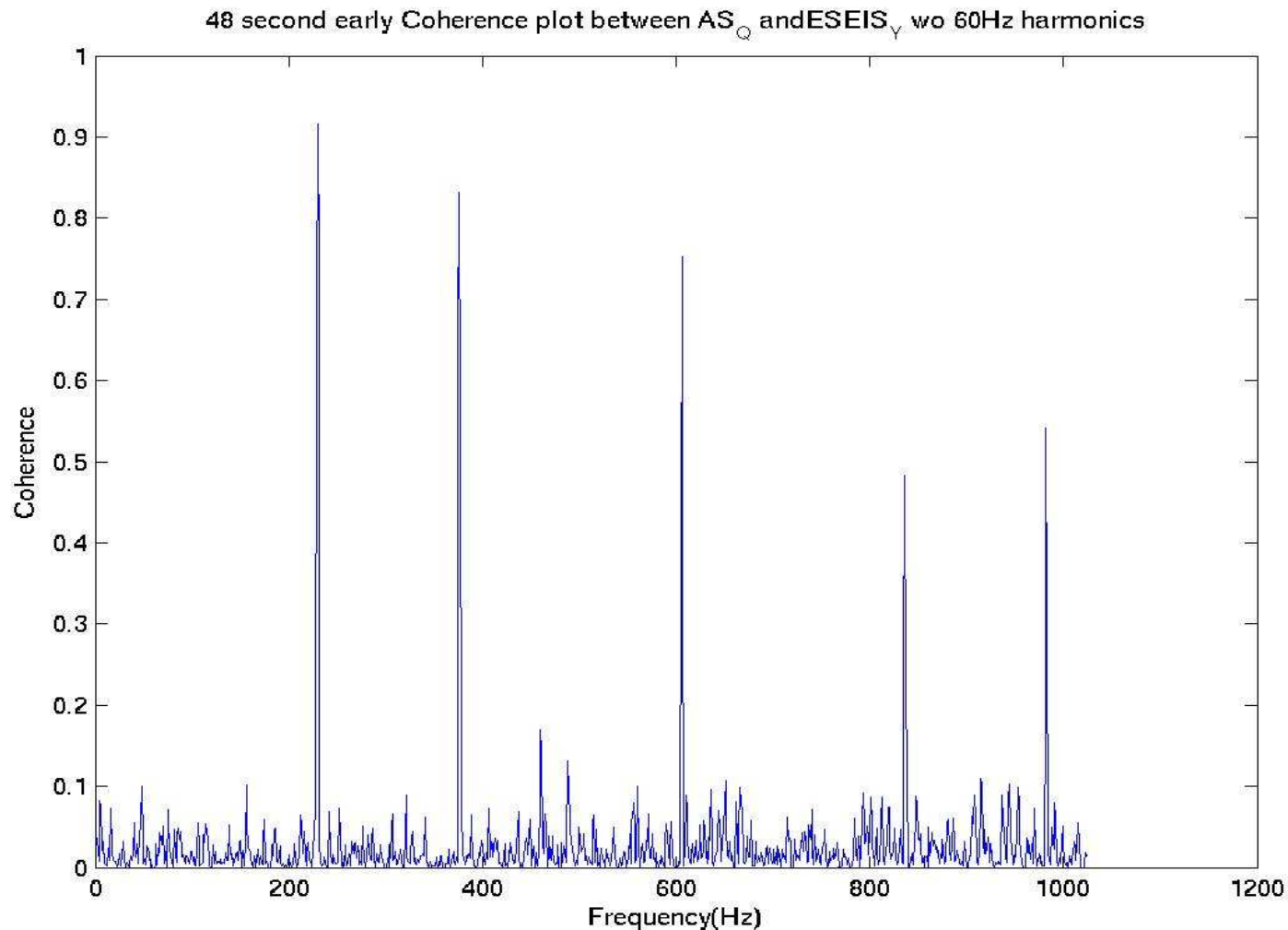


Also see 103 Hz correlation in PSL1_MIC with H1 AS_Q

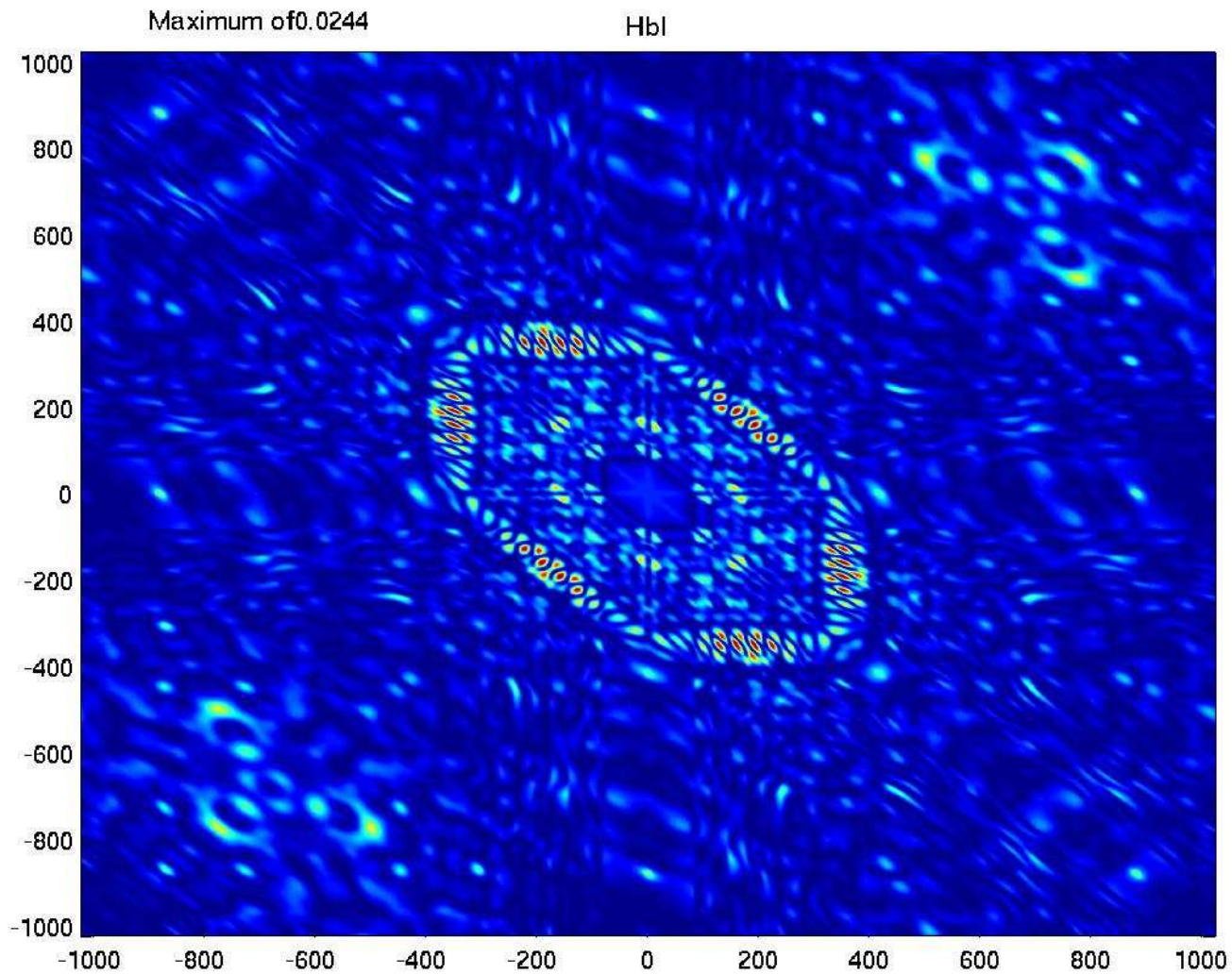
48 second early Coherence plot between AS_Q and PSL1-MIC wo 60Hz harmonics



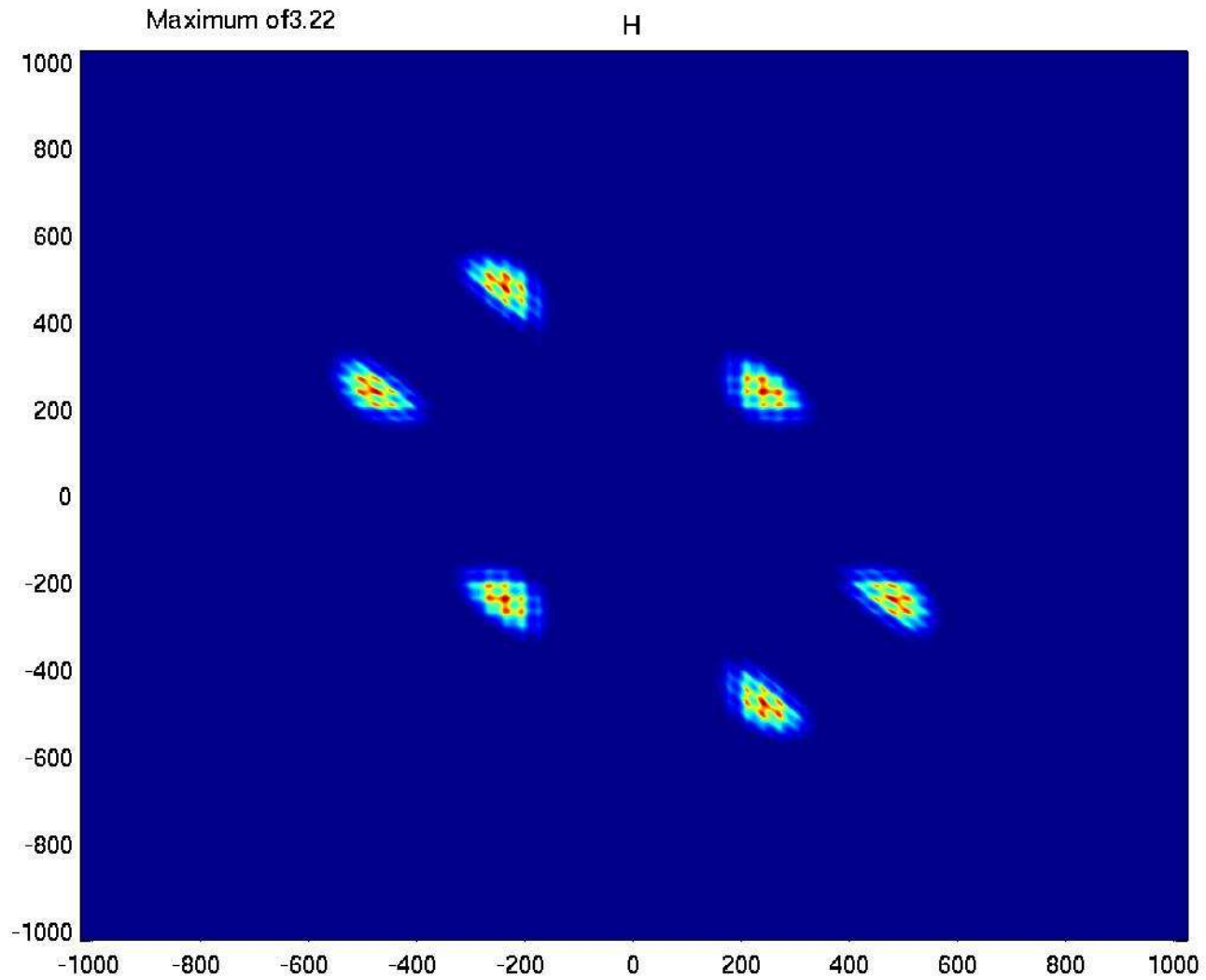
H1 AS_Q and SEI-EX_SEIS_X Consistent Correlations at 230, 376, 606, 836 and 982 Hz (60 Hz removed here)



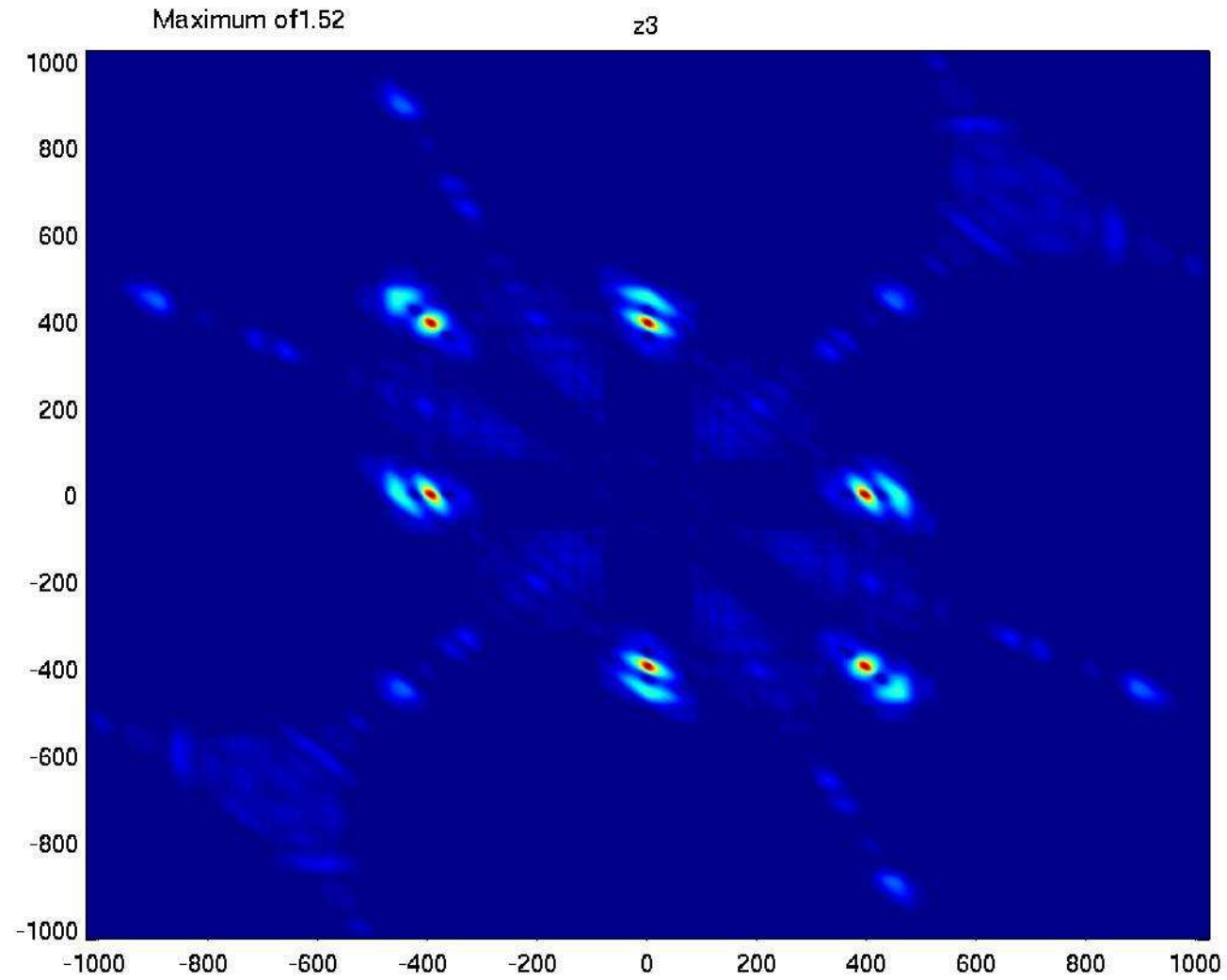
Bicoherence as a Tool: LLO AS_Q Pre-Glitch



During “Inspiral” Glitch

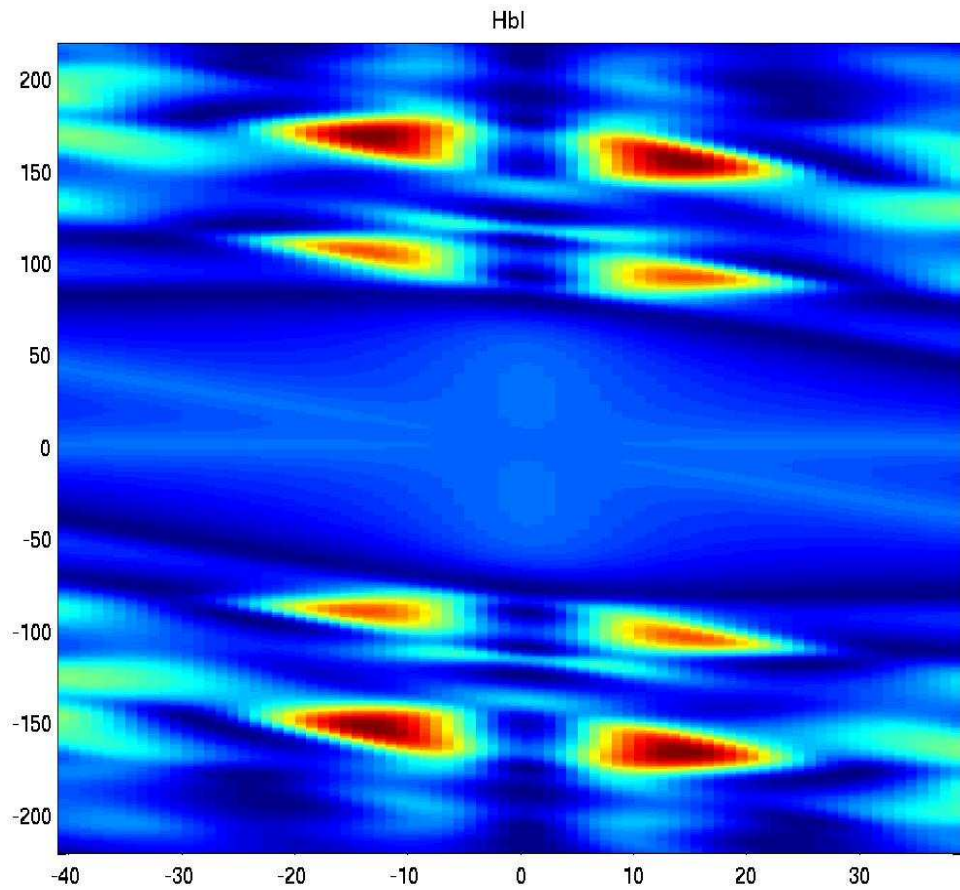


Hardware Injected Event

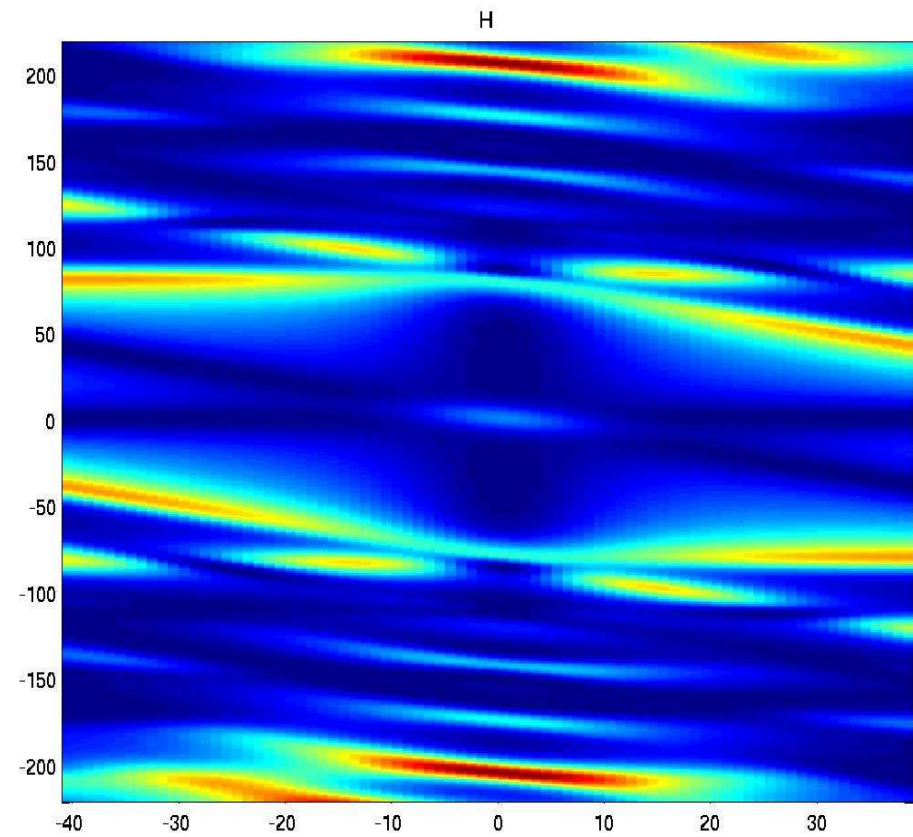


Zoom-In of LLO Glitch

Pre- Glitch



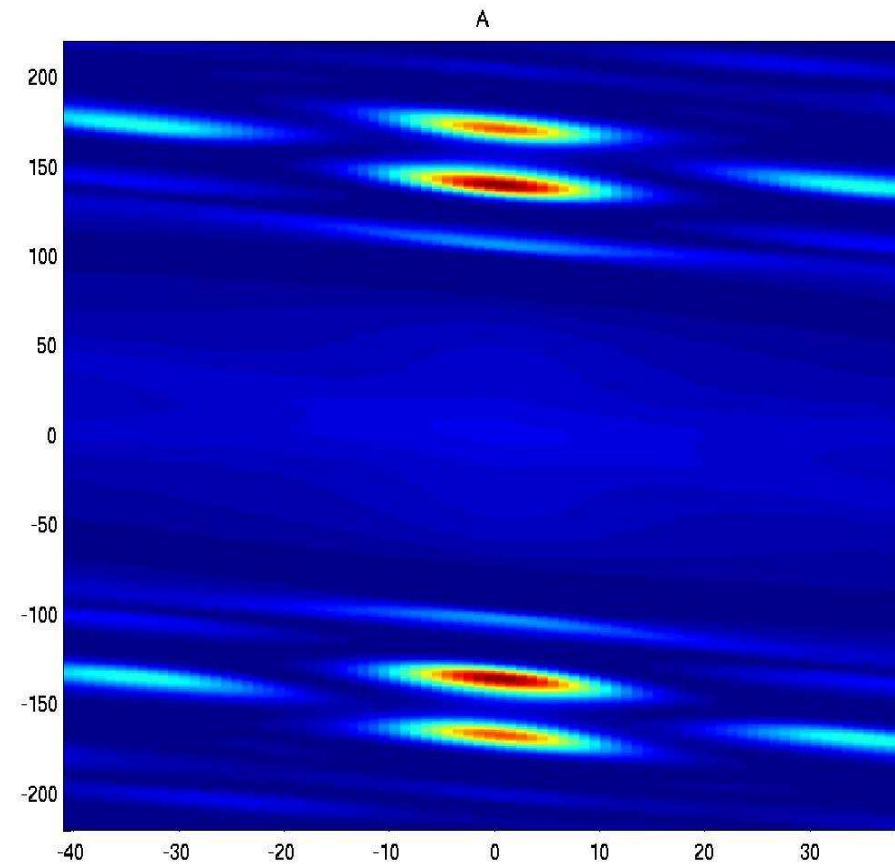
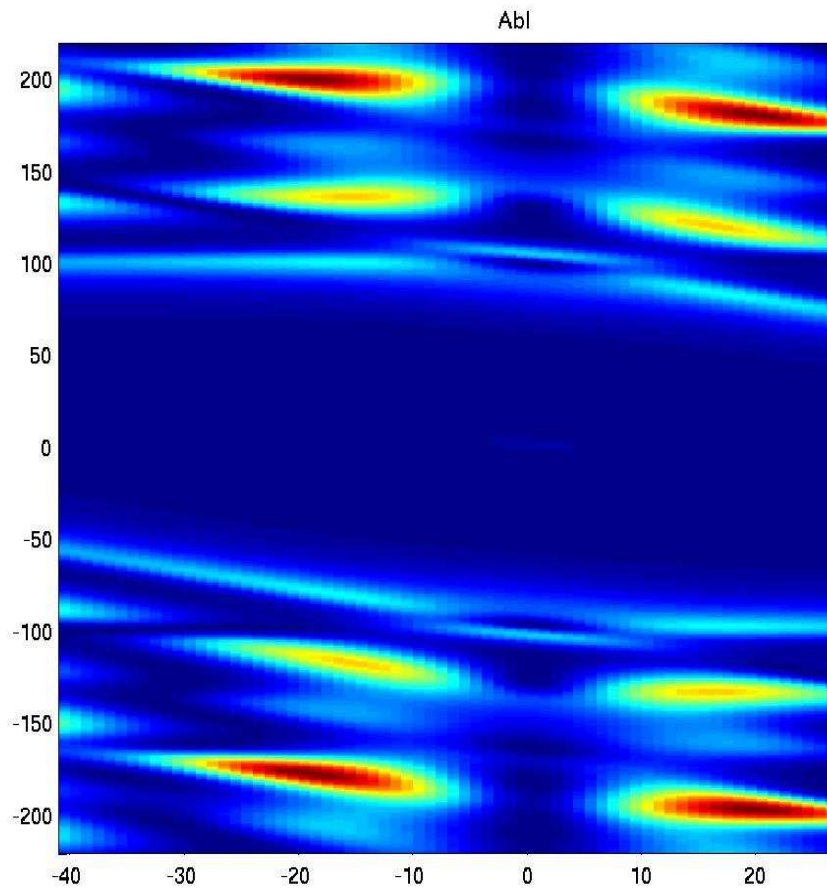
During Glitch



Another LLO Glitch

Pre-Glitch

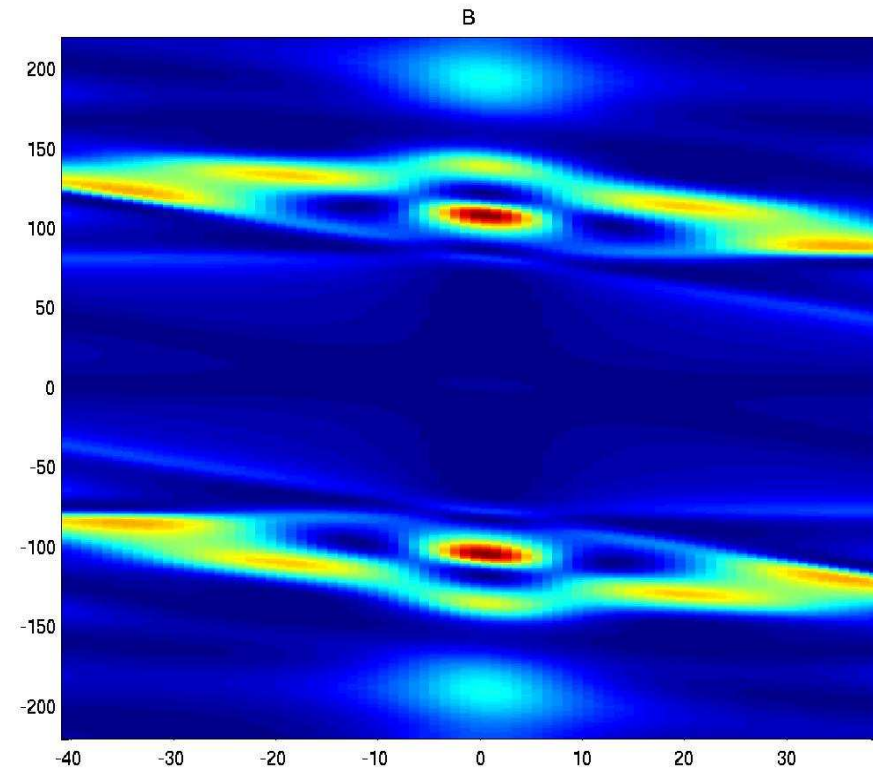
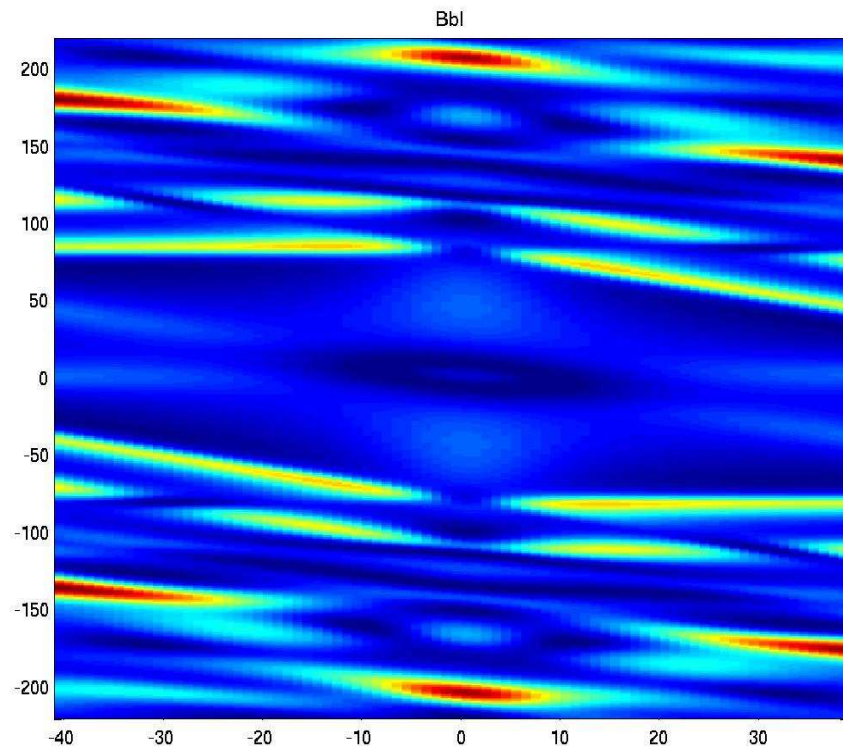
During Glitch



Similar Study for H1 Glitches

Pre-Glitch

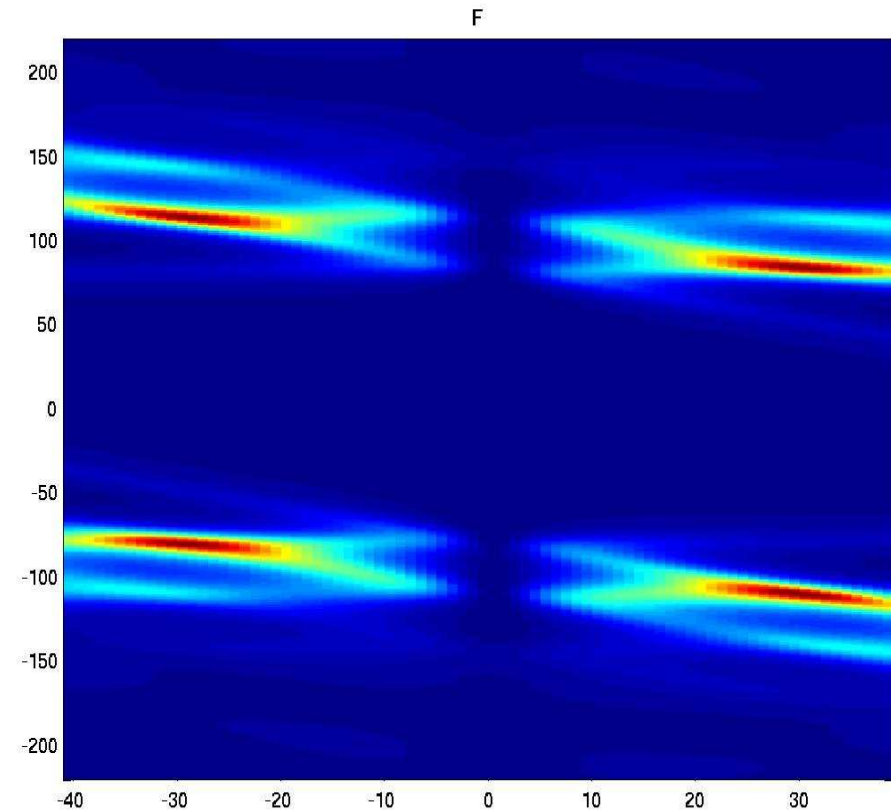
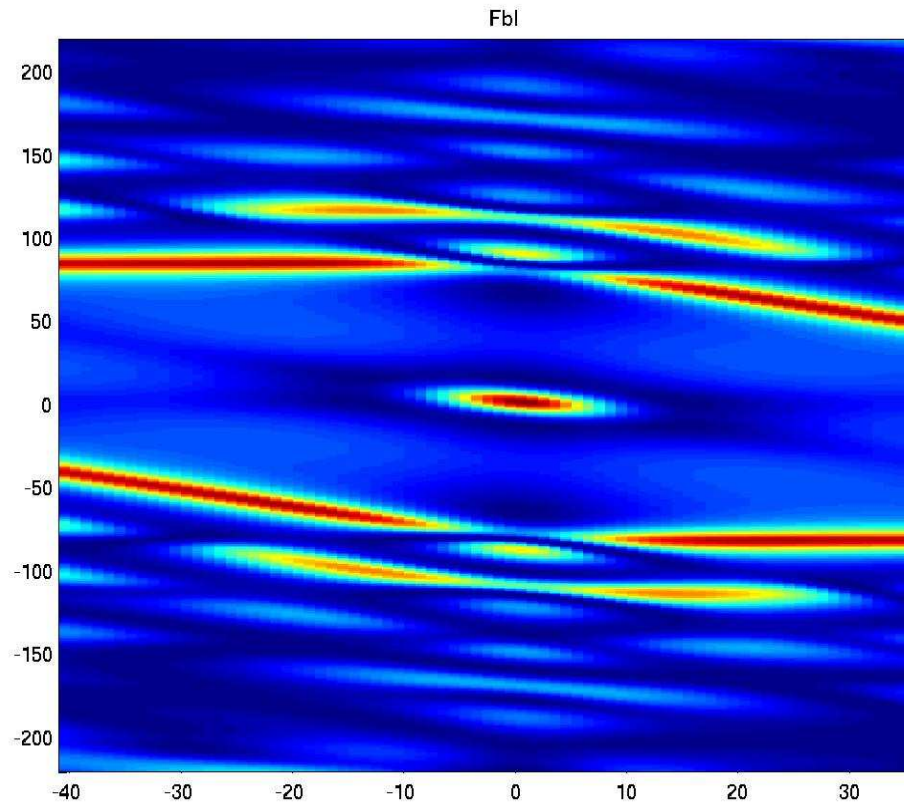
Glitch



And Another H1 Glitch

Pre-Glitch

Glitch



Bispectra : Not Normalized : Useful Event 729439355

