Inspiral Upper Limits Detector Characterization

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IUL – Veto Determination

- Work with other UL-Detector Characterization groups – Especially Bursts
- Probably use techniques developed by Burst Det. Char.
- IUL Det. Char. – 2 teams, each using various DMT tools plus Chirp Search Tools

Gregg Harry/Julien Sylvestre

- Using Julien's TID program. Time-frequency analysis of interferometer and PEM data.
- Use LAL/LDAS "findchirp" program developed by Duncan Brown for inspiral search. Use program on PEM channels.

N. Christensen / A. Rizzi

- Examining E4 data : interferometer, mode cleaner and accelerometer.
- Rizzi code (GRASP) for chirp search
- Correlation (CorrMon – A. Ottewill) and coincident glitch (NonMon – J. Fenton) software

Inspiral UL Study

- CorrMon with E4 data: LLO
- L1:LSC-AS_Q Interferometer Out
- L1:IOO-MC_F Mode Cleaner
- L0:PEM-BSC5_ACCZ Accelerometer

  – 1 PEM Channel to simplify study of developing vetoes

IUL Study

- Also use NonMon (DMT) – looks for correlated glitches – Jacob Fenton, Reed College
- A. Rizzi's chirp detector (GRASP)

  – Concentrated on 900 s of "locked" LLO data, and 3 tools detected simultaneous interferometer and accelerometer events.

NonMon

- Jacob Fenton – Reed College undergrad
- Reads in 5 min of data to determine σ
- Specify flag threshold (i.e. event > 3.2 σ)
- Set # points/s exceeding threshold
- Output when 1 to N channels have events in same second

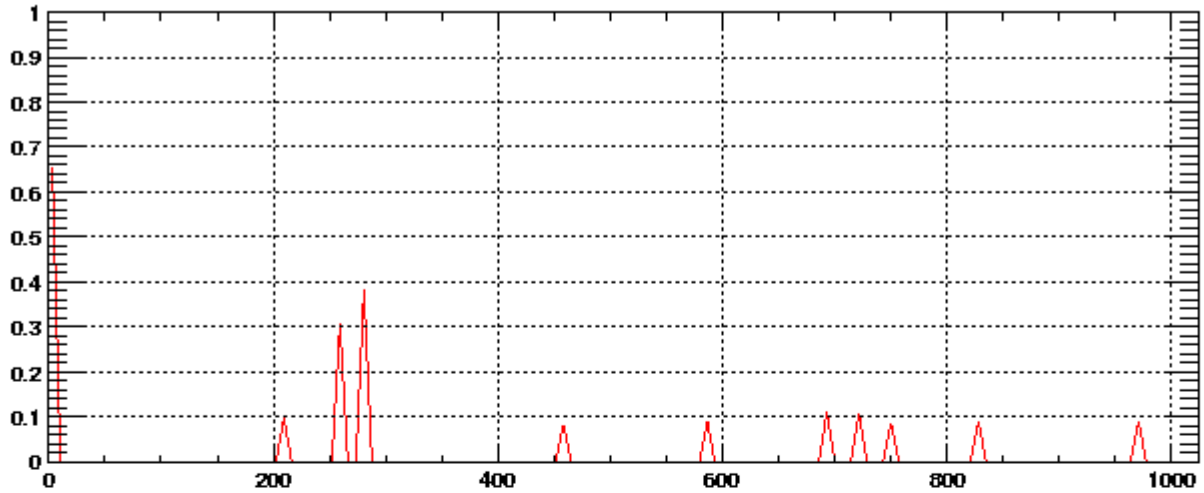
NonMon

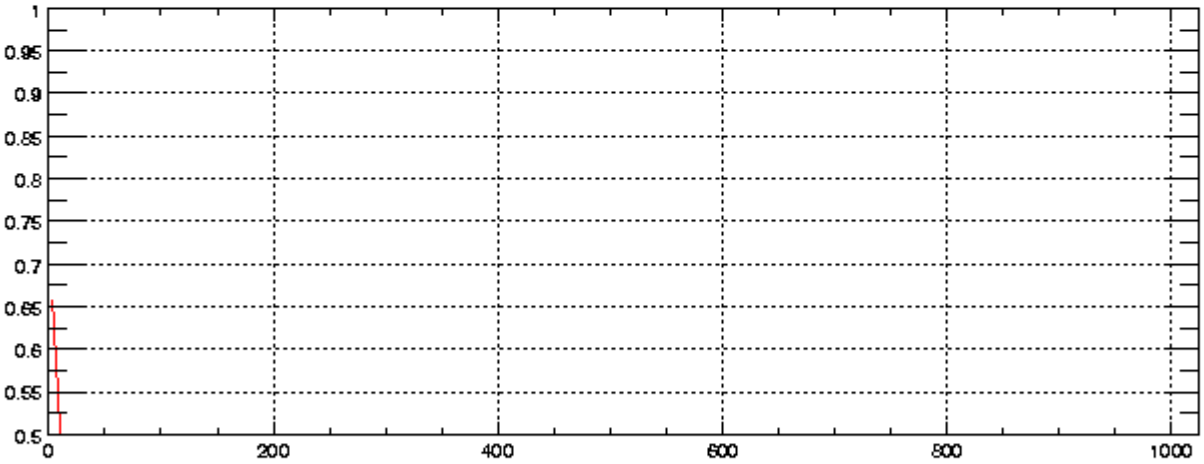
```
#The monitored channels are:
Channel L1:LSC-AS_Q 3.2 0.01
Channel L0:PEM-BSC5_ACCZ 2.2 0.01
#This file lists all seconds in which multiple monitored channels
#showed glitches.
# The start time is: May 13, 01 at 2:00:00 GMT, which is
Starttime 673754413
#The output format is:
#Glitchtime
#       <channame> <-a> <#devsamps> <trigger> (amplitude glitch)
#                  or
#       <channame> <-f> <secpowerave> <avepower> <thresholdpower> (fourier glitch)

673754719
        L1:LSC-AS_Q -a 623 164
        L0:PEM-BSC5_ACCZ -a 54 20
673754729
        L1:LSC-AS_Q -a 184 164
        L0:PEM-BSC5_ACCZ -a 61 20
673754731
        L1:LSC-AS_Q -a 256 164
        L0:PEM-BSC5_ACCZ -a 51 20
673754745
        L1:LSC-AS_Q -a 244 164
        L0:PEM-BSC5_ACCZ -a 66 20
673754761
        L1:LSC-AS_Q -a 229 164
        L0:PEM-BSC5_ACCZ -a 53 20
673754763
        L1:LSC-AS_Q -a 427 164
        L0:PEM-BSC5  ACCZ -a 64 20
```

CorrMon

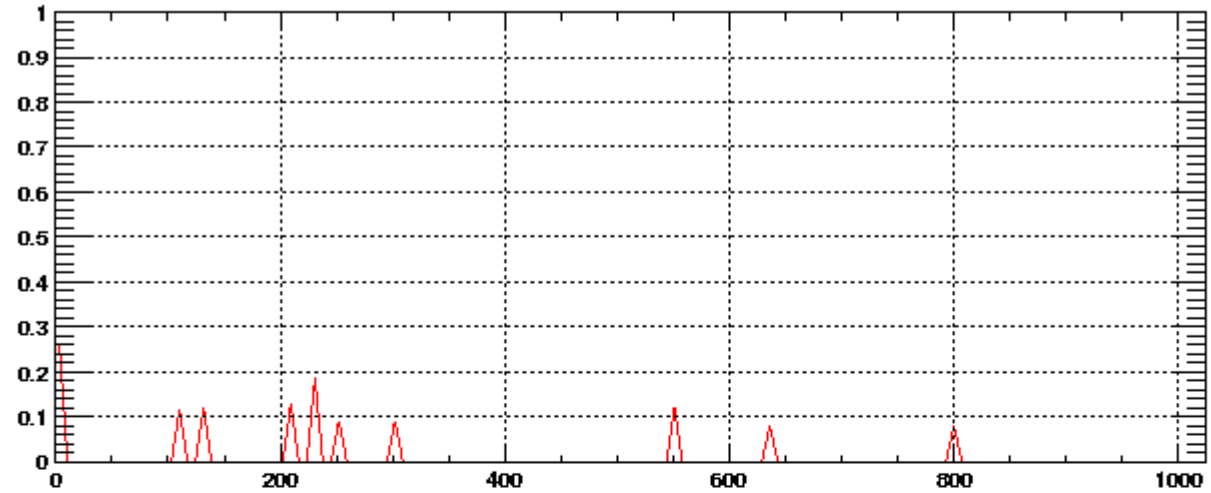
- 900 seconds
- Interferometer and accelerometer
- Calculate correlations for T=9s
- Trigger when correlation>50%

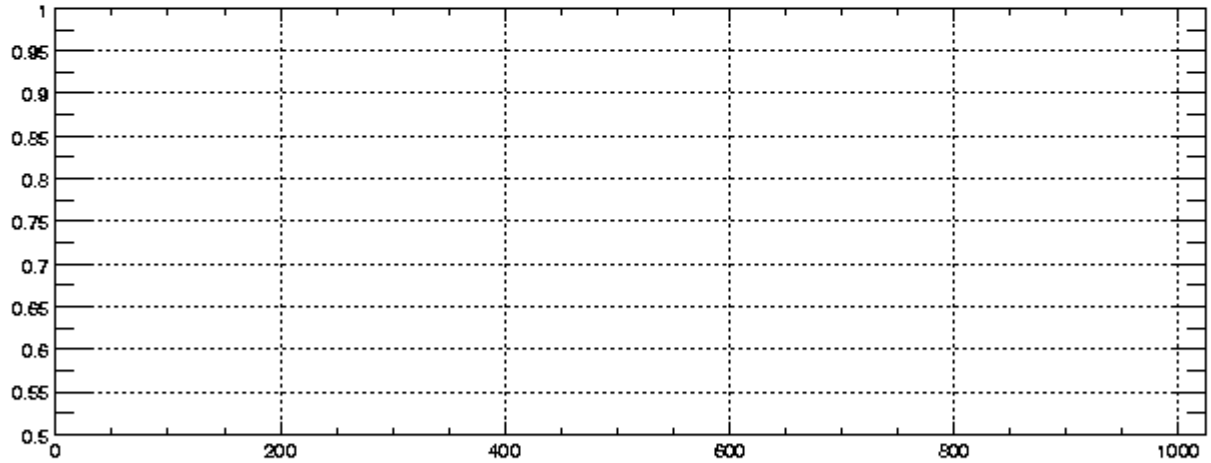




L0:PEM-BSC5_ACCZ

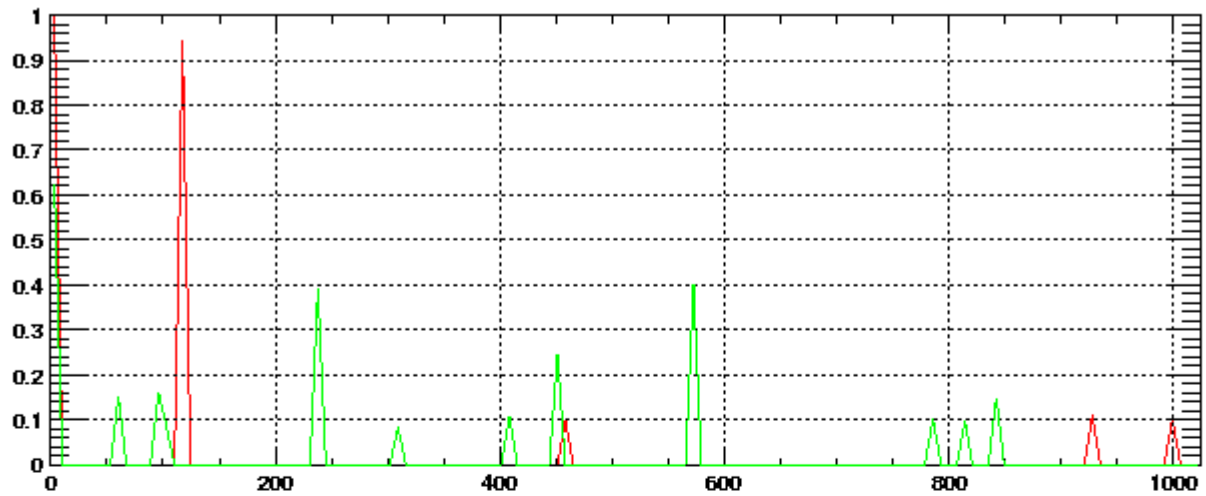
Interchannel Correlations with L1:LSC-AS_Q

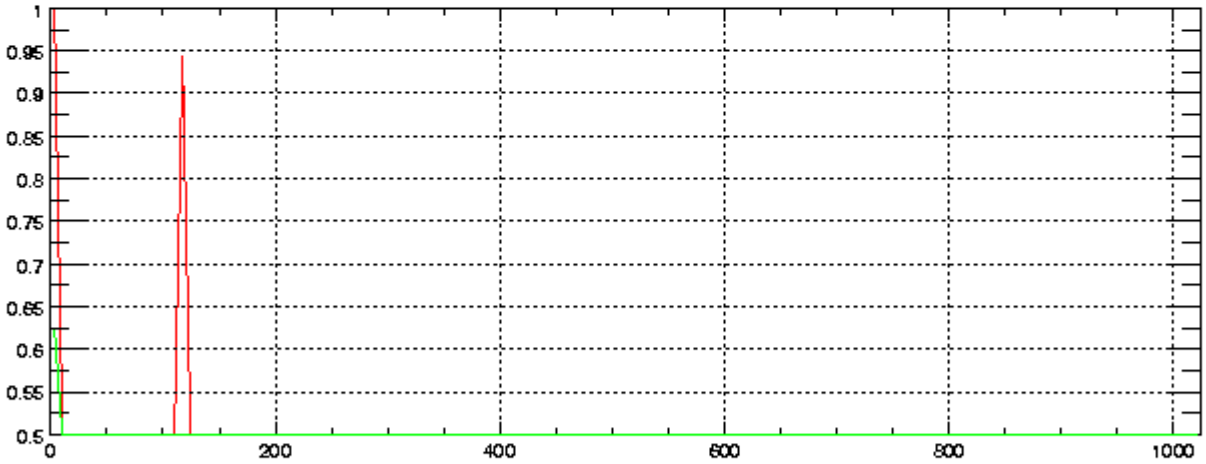




L0:PEM-BSC5_ACCZ

Interchannel Correlations with L1:LSC-AS_Q





L1:IOO-MC_F
L1:LSC-AS_Q

Interchannel Correlations with L0:PEM-BSC5 ACCZ

Chirp Finder Code

- A. Rizzi using GRASP
- Break data into 23second sections (~10s calculation time)
- Search code for chirps in sections
- Get S/N and probability of detection

S/N	Prob.	Data Section
11.7023	0.993571	signals.00023
9.91034	0.458783	signals.00004
9.84678	0.027734	signals.00011
9.12209	0.854021	signals.00015
9.06486	0.619636	signals.00034
8.8884	0.948608	signals.00017
8.59907	0.847731	signals.00002
7.57457	0.982728	signals.00036
7.39228	0.423546	signals.00024
6.61328	0.967011	signals.00005
6.21778	0.684580	signals.00027
5.30575	0.952950	signals.00003
5.26364	0.871500	signals.00028
5.19533	0.410762	signals.00007
4.42277	0.000000	signals.00020
4.22656	0.000000	signals.00035
4.06861	0.000000	signals.00031
4.05498	0.000000	signals.00013
3.94451	0.000000	signals.00026
3.90038	0.000000	signals.00014
3.70881	0.000000	signals.00000
3.63046	0.000000	signals.00019
3.60004	0.000000	signals.00001
3.54029	0.000000	signals.00029
3.47091	0.000000	signals.00012
3.41722	0.000000	signals.00022
3.32519	0.000000	signals.00021
3.26441	0.000000	signals.00033
3.0972	0.000000	signals.00008
2.98758	0.000000	signals.00032
2.91868	0.000000	signals.00016
2.91251	0.000000	signals.00009
2.90475	0.000000	signals.00006
2.88356	0.000000	signals.00010
2.87792	0.000000	signals.00025
2.79192	0.000000	signals.00018
2.72907	0.000000	signals.00030

3 Monitor “see” same events Ex: Biggest Event of 900s set

- 673754967
- Chirp: S/N=11.7, probability=0.993 measured on accelerometer channel; high S/N but low probability for interferometer
- NonMon’s biggest event in interferometer channel: 1438 data points > 3.2 σ. Accelerometer event also registered.
- CorrMon: 67% correlation @ 10 Hz

- In the 900 s of E4 data 4 coincident events L1:LSC-AS_Q and L0:PEM-BSC5_ACCZ were observed in the three monitors

Inspiral UL Det. Char. Strategy as of August 01- Vetoes for E6

- Work with Burst UL Det. Char. group
- Study and characterize E5 data
- Develop Strategy (to be used in E6) ASAP
- Choose channels & DMT tools to use - E6
- Use existing DMT tools, PLUS an LDAS chirp code to search PEM channels – to be developed
- Look at some PEMS in mock data challenge 9/01

E6 Vetoes

Study E5 data THEN create veto triggers for E6

Likely will use GlitchMon, PSLMon, TID, CorrMon and PEMChirpMon (to be developed)