

# E4 Correlations: Detector Characterization

- Nelson Christensen
- Carleton College
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# E4 Correlations

## Detector Characterization

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# Adrian's DMT Program

- CorrMon – New features
- Specify a correlation threshold value
- Trigger is generated when threshold exceeded
- Correlation value and frequency reported.

This page contains a list of the most recent 100 triggers recorded by the trigger manager. The trigger severity is indicated by color as follows:

<b>Severity</b>	<b>Meaning</b>
Information	Status information only
Warning	No effect is expected on GW data
Error	Trigger should be considered during GW analysis.
Severe	Data are not valid for GW analysis

## Trigger Log: July 18, 2001 08:16

GPS	Trigger	Sub-ID	Process	Size	Duration
679504585	TimeSliceError	MultiChannel	Slice2	1	0
673755304	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.596379	9
673755295	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.542968	9
673755286	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.62201	9
673755268	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.589421	9
673755259	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.668249	9
673755250	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.589179	9
673755241	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.586086	9
673755232	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.713146	9
673755223	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.689662	9
673755214	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.645332	9
673755205	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.537389	9
673755196	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.582299	9
673755187	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.556617	9
673755178	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.751674	9
673755169	Rho2	L0:PEM-BSC5_ACCZ	CorrMon	0.61913	9

# E4 Correlation Applications

- Upper Limits Applications
- Inspiral UL: Correlations as a tool for veto determination.
- Stochastic Background UL: PEM Intersite Correlations

# 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

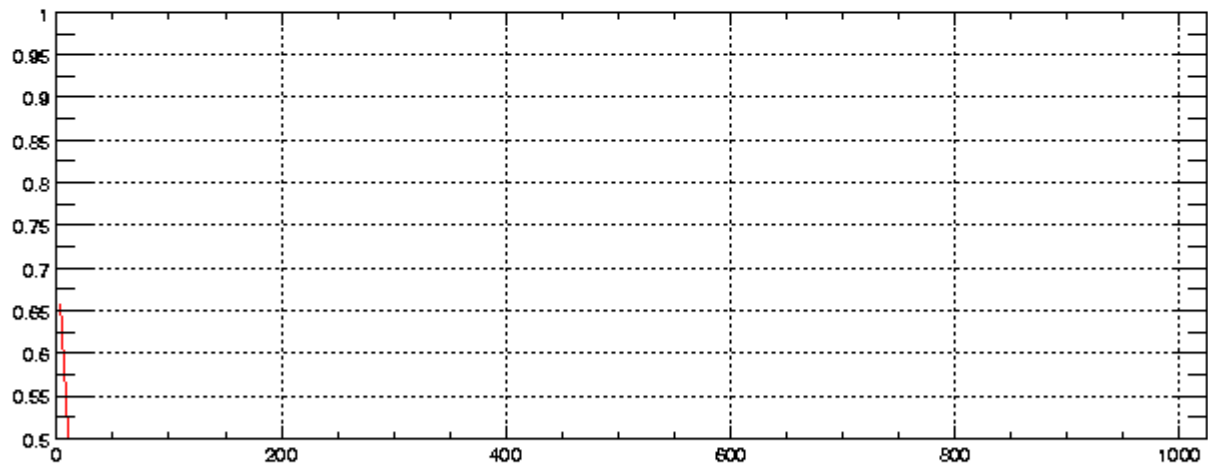
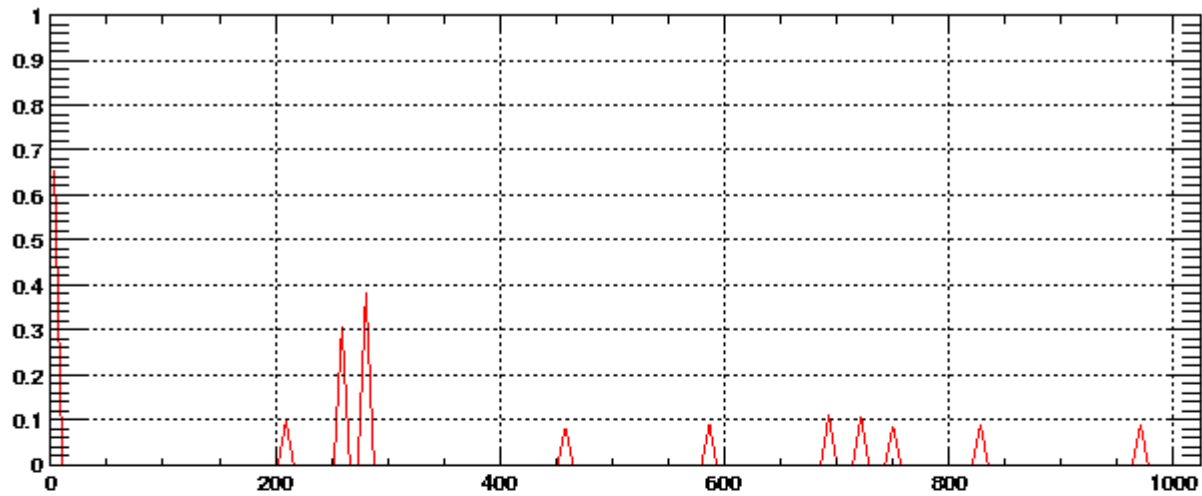
```
#The monitored channels are:
Channel L1:LSC-AS_Q 3.2 0.01
Channel L0:PEM-BSC5_ACCZ 2.2 0.01
#This file lists all seconds in which multiple monitored channels
#showed glitches.
# The start time is: May 13, 01 at 2:00:00 GMT, which is
Starttime 673754413
#The output format is:
#Glitchtime
#   <channname>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



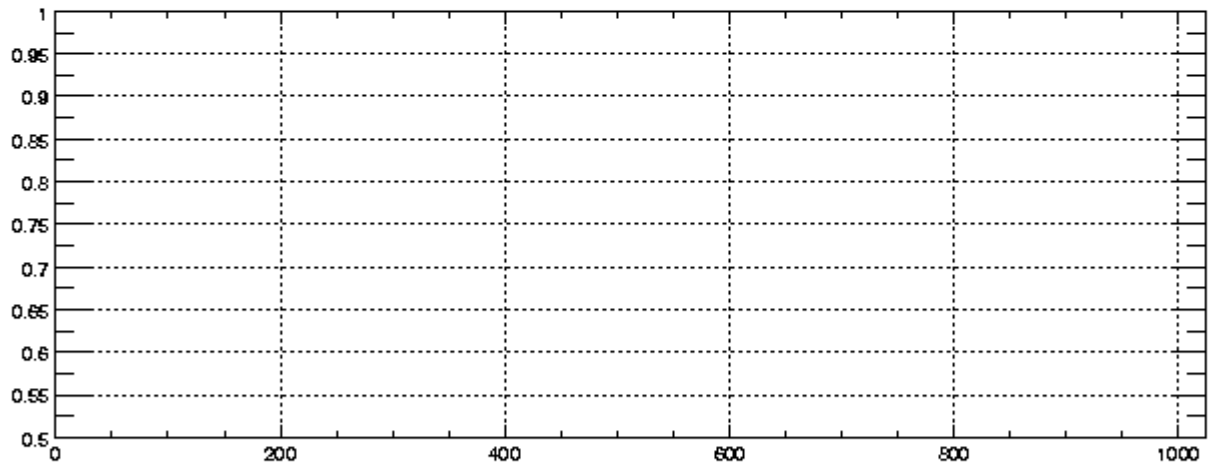
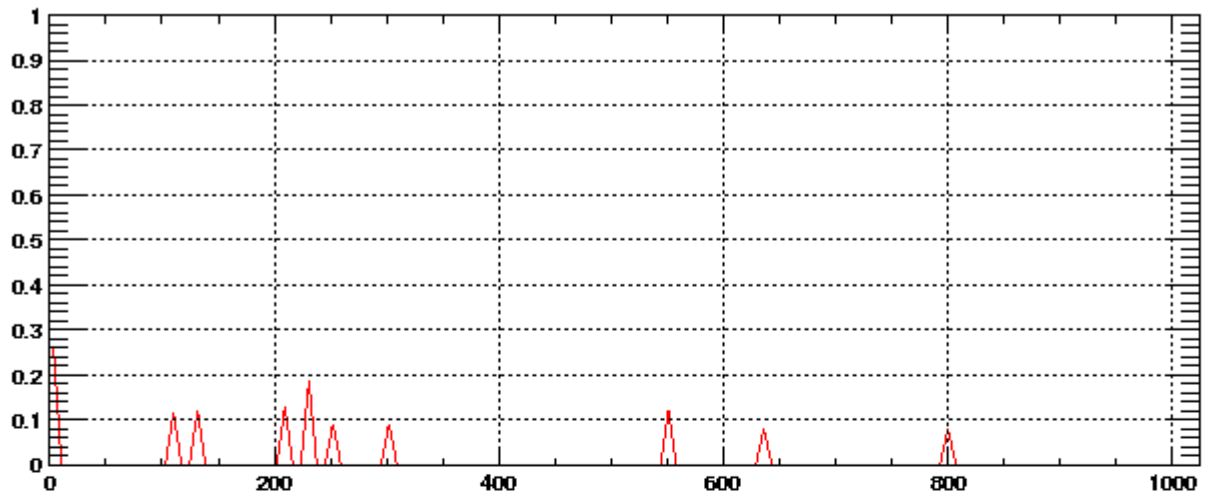
# CorrMon

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



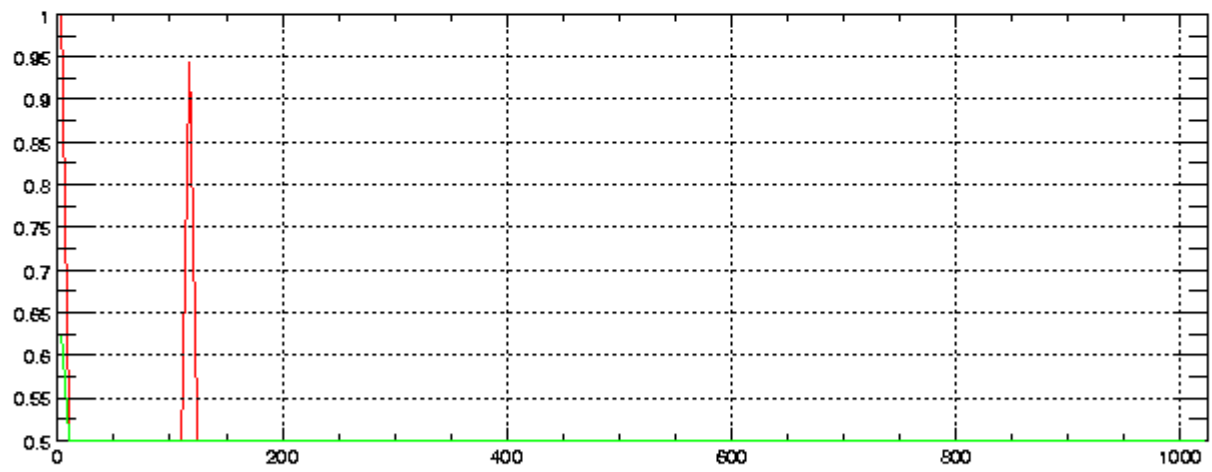
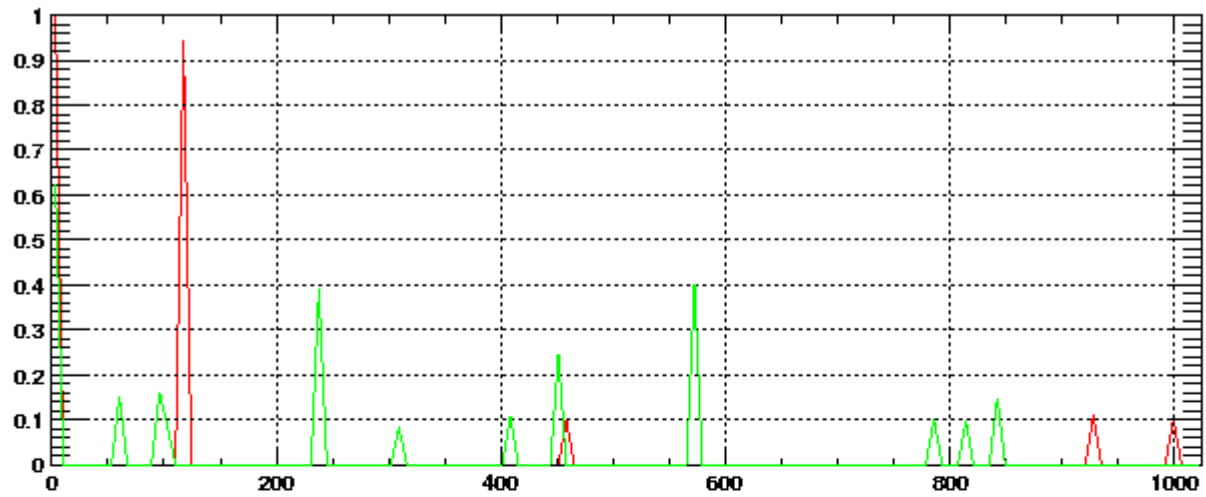
L0:PEM-BSC5\_ACCZ

**Interchannel Correlations with L1:LSC-AS Q**



L0:PEM-BSC5\_ACCZ

**Interchannel Correlations with L1:LSC-AS Q**



L1:100-MC\_F

L1:LSC-AS\_Q

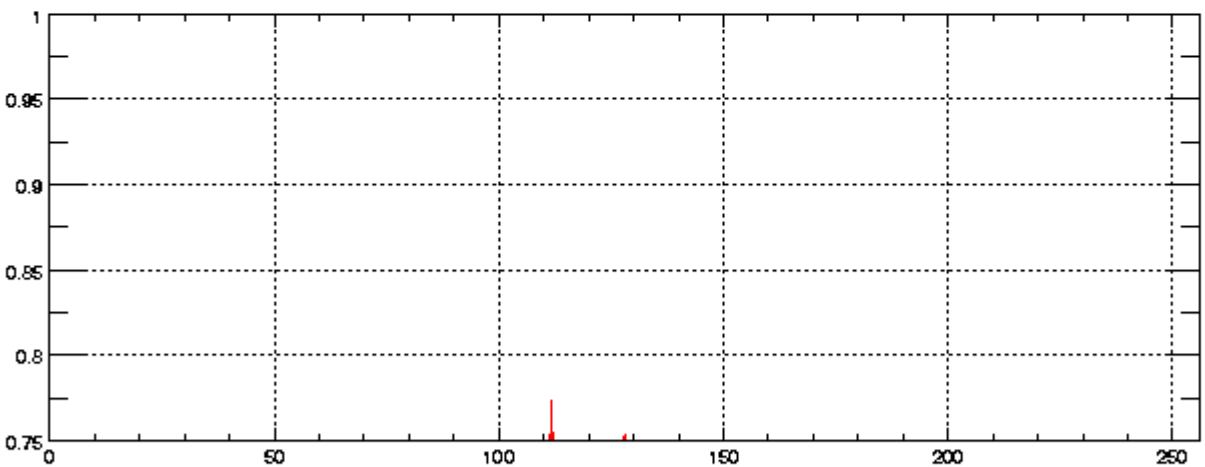
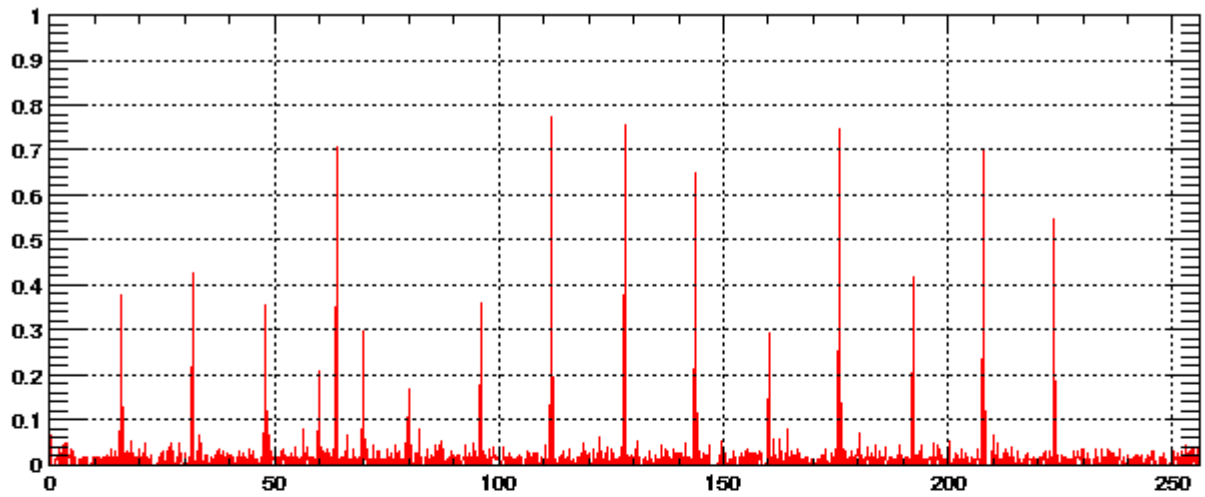
**Interchannel Correlations with L0:PEM-BSC5 ACCZ**

# Stochastic UL

- Intersite Correlation studies
- Magnetometers primary focus.
- See correlations at 70 Hz (computer monitors)
- Also correlations at 16 Hz and harmonics (DAQ Buffering rates???)

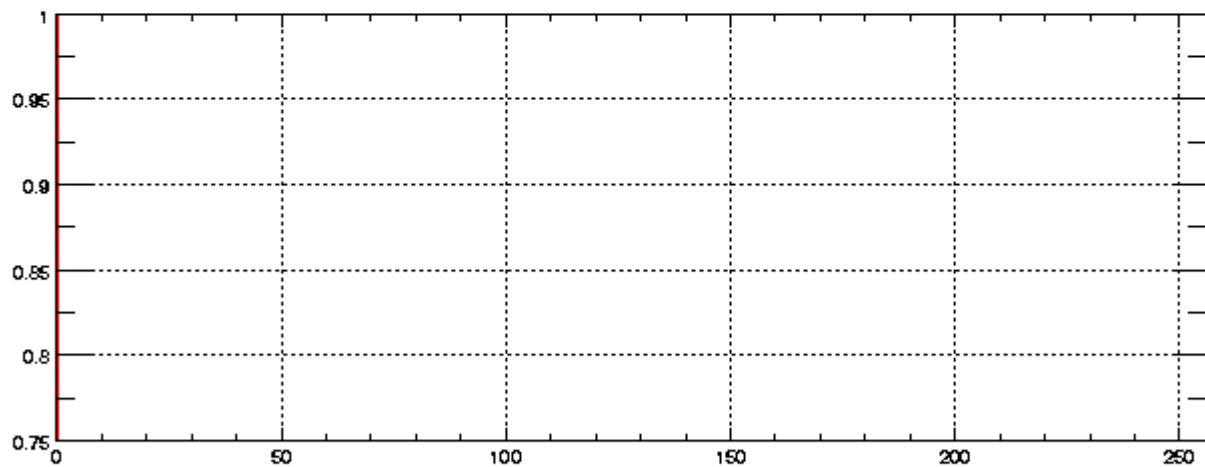
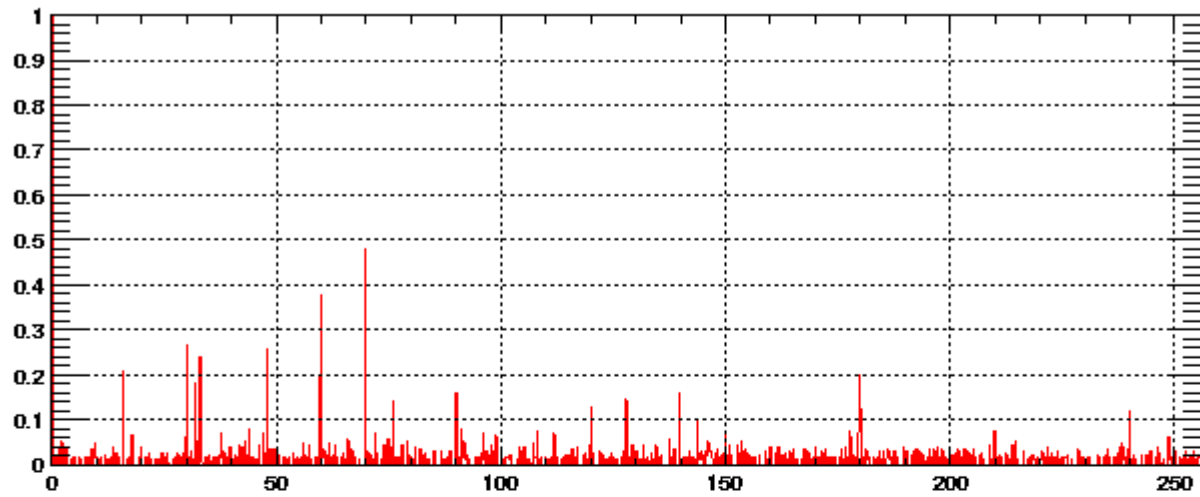
# Eliminate powers of 2

- 341 s of data per correlation, but averaged 7 times ( $341 \times 7 = 2387$  s)
- Frequency bins averaged over 55 bins
- Hanning window applied



L0:PEM-EX\_MAG1X

**Interchannel Correlations with H0:PEM-BSC1\_MAG1Y**



Lo:PEM-EX\_MAG1X

**Interchannel Correlations with H0:PEM-BSC1\_MAG1Y**



# LLO-LHO Correlations – Lightning(?)

- Some simultaneous events observed in LHO and LLO coils.
- Will examine these events as well.
- Use CorrMon and NonMon

# Steve Penn – Bilinear Couplings

- See Penn's report