



Introduction to RayleighMonitor

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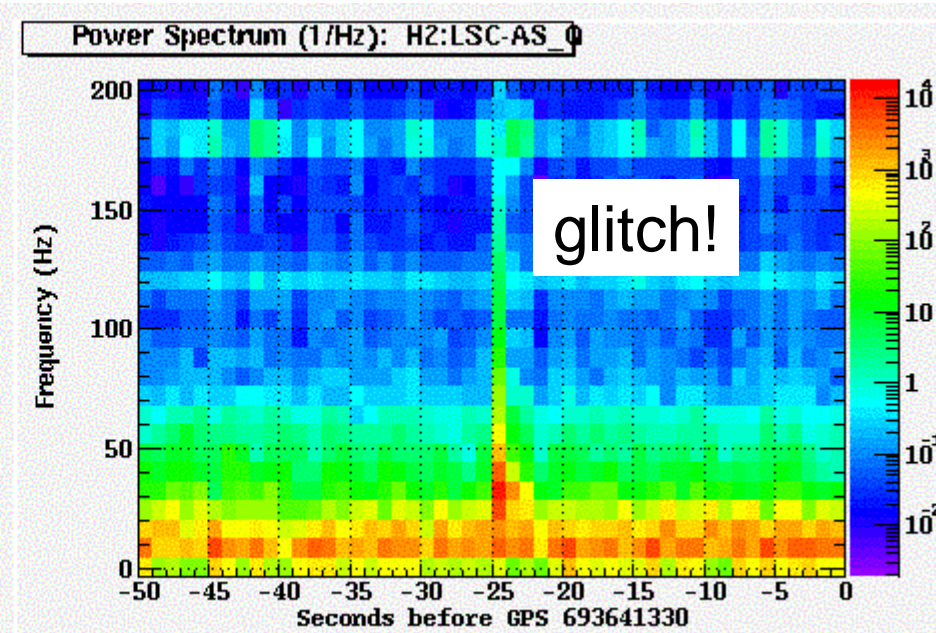
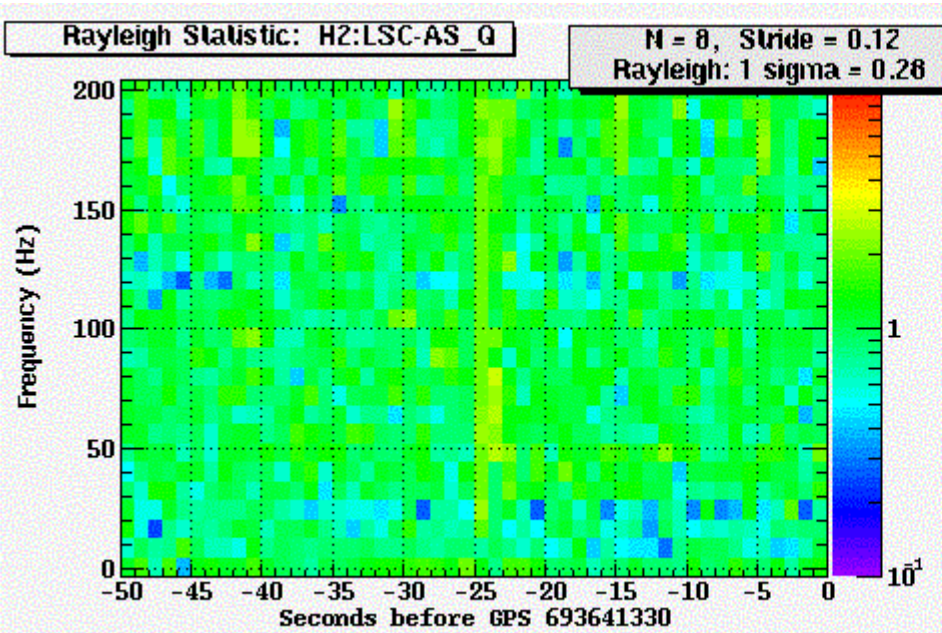


Outline of Talk

- Introduction to RayleighMonitor
- Reading Rayleighgrams
- Running RayleighMonitor

RayleighMonitor

- DMT monitor that produces scrolling time-frequency plots of the mean and variability of the power in a specified channel:



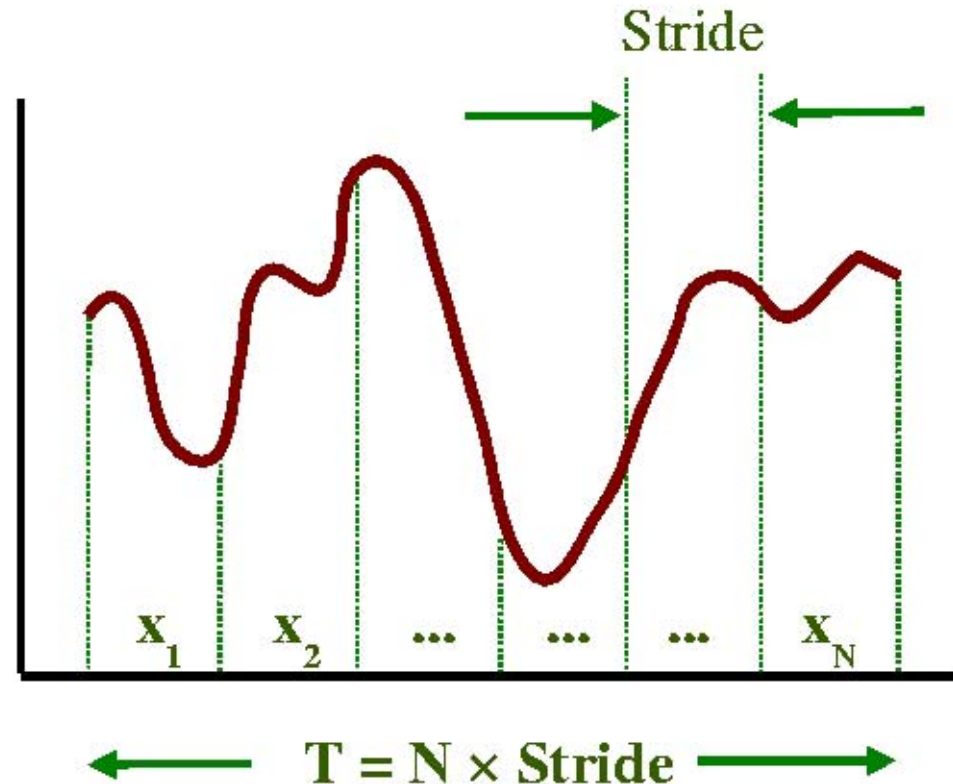
st.dev.(PSD)/mean(PSD)

mean(PSD)

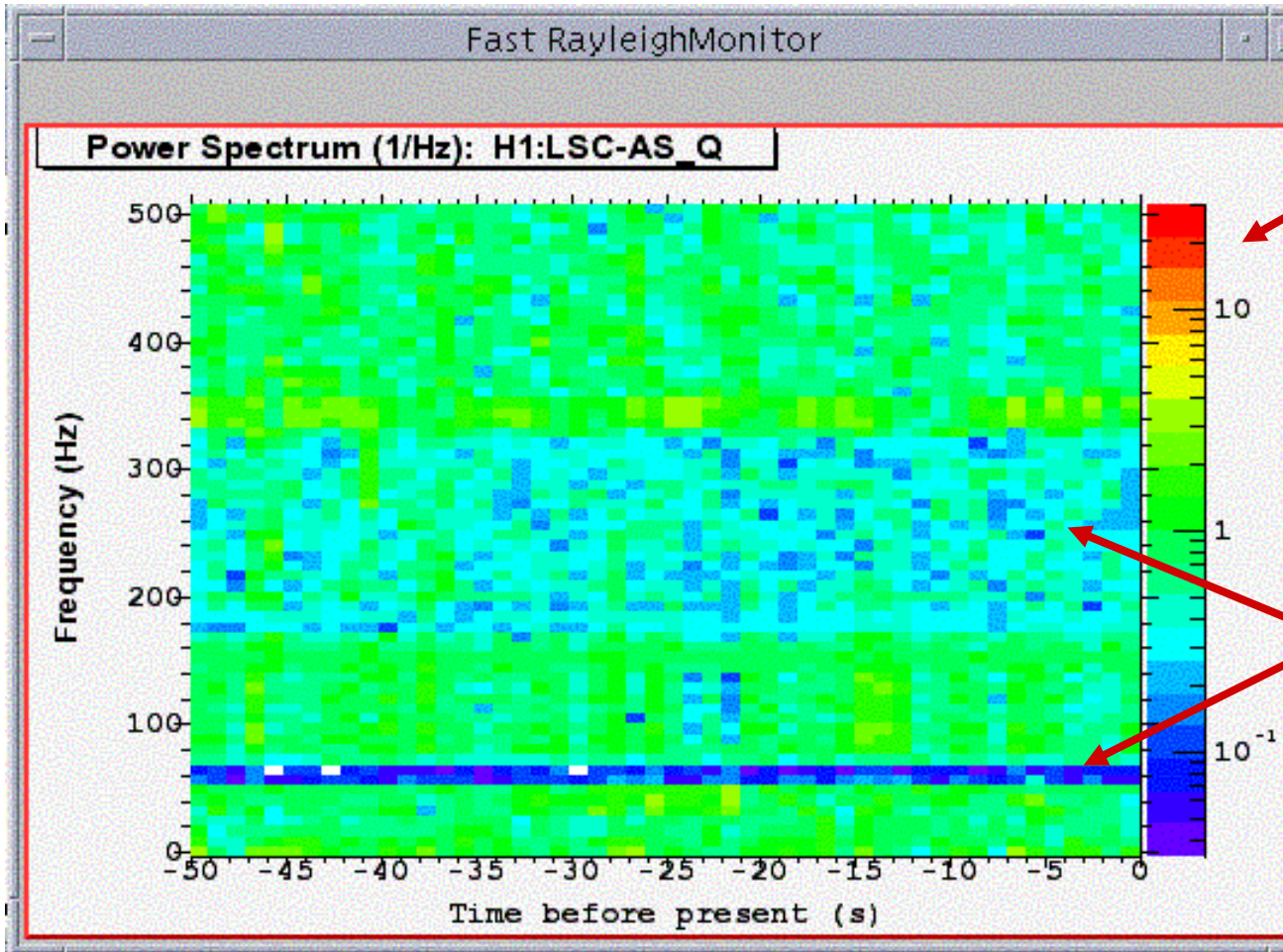
RayleighMonitor Algorithm

- Makes a set of short-time power spectra.
- Calculates the mean μ and the standard deviation σ of the power spectrum in each frequency bin.
- Ratio $R := \sigma/\mu$ is an interesting statistic:
 - » $R = 1$ is what you expect for Gaussian noise.
 - » $R < 1$ indicates coherent variation (lines).
 - » $R > 1$ indicates glitchy data.

$x(t)$



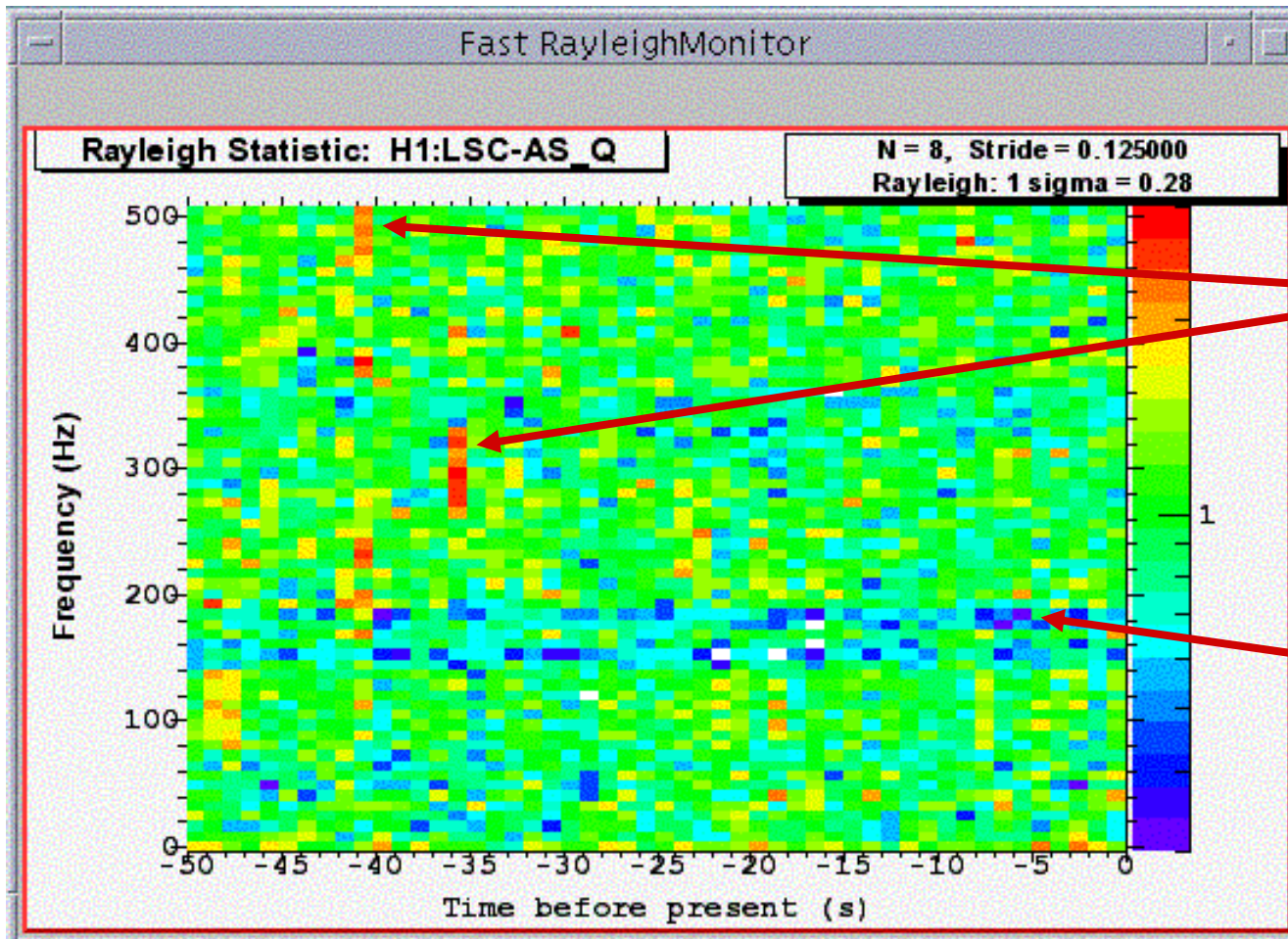
Example: Whitenened PSD



“Whitened”
power spectrum
of H1 AS_Q data
(-whiten option)

The noise power
in (200,300)Hz
and in 60Hz line
has dropped
since the
monitor started.

How to read a Rayleighgram



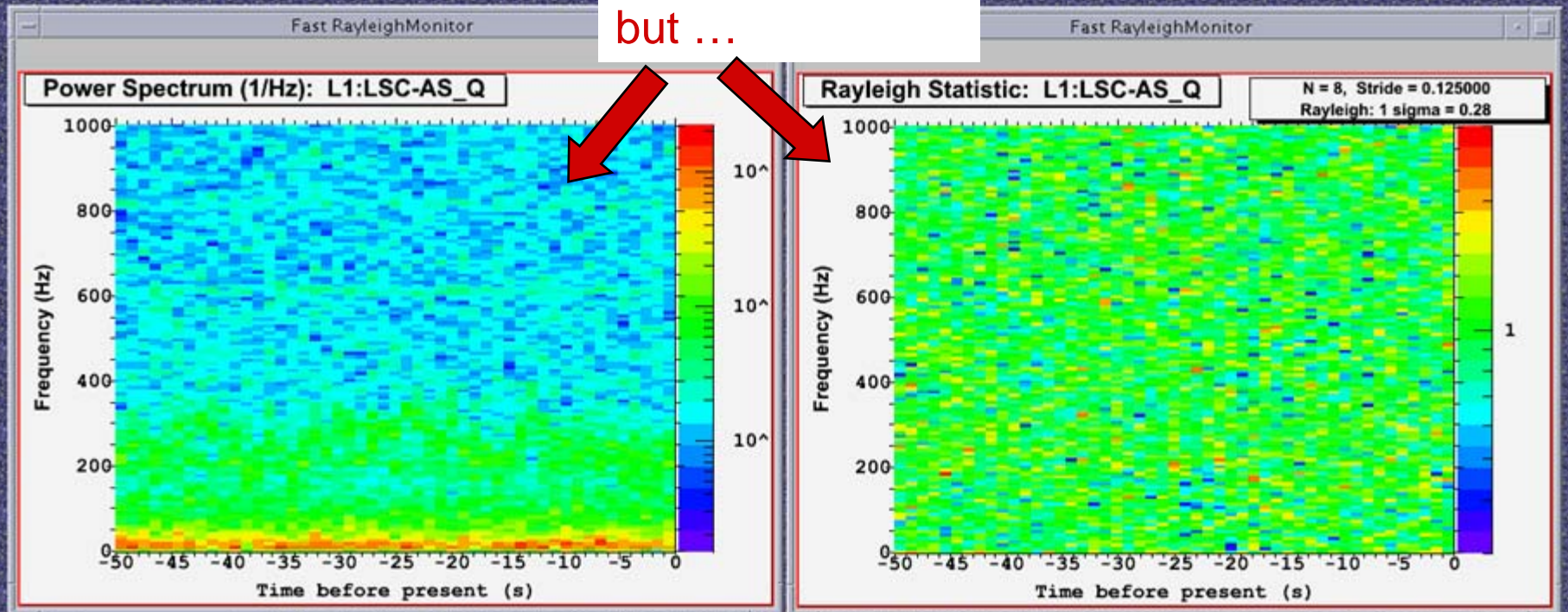
Same data,
Rayleighgram.

Sub-second
glitches (not
obvious in
power
spectrum)

Coherent
noise around
150, 180Hz.

Example: L1 in S5

look pretty clean,
but ...

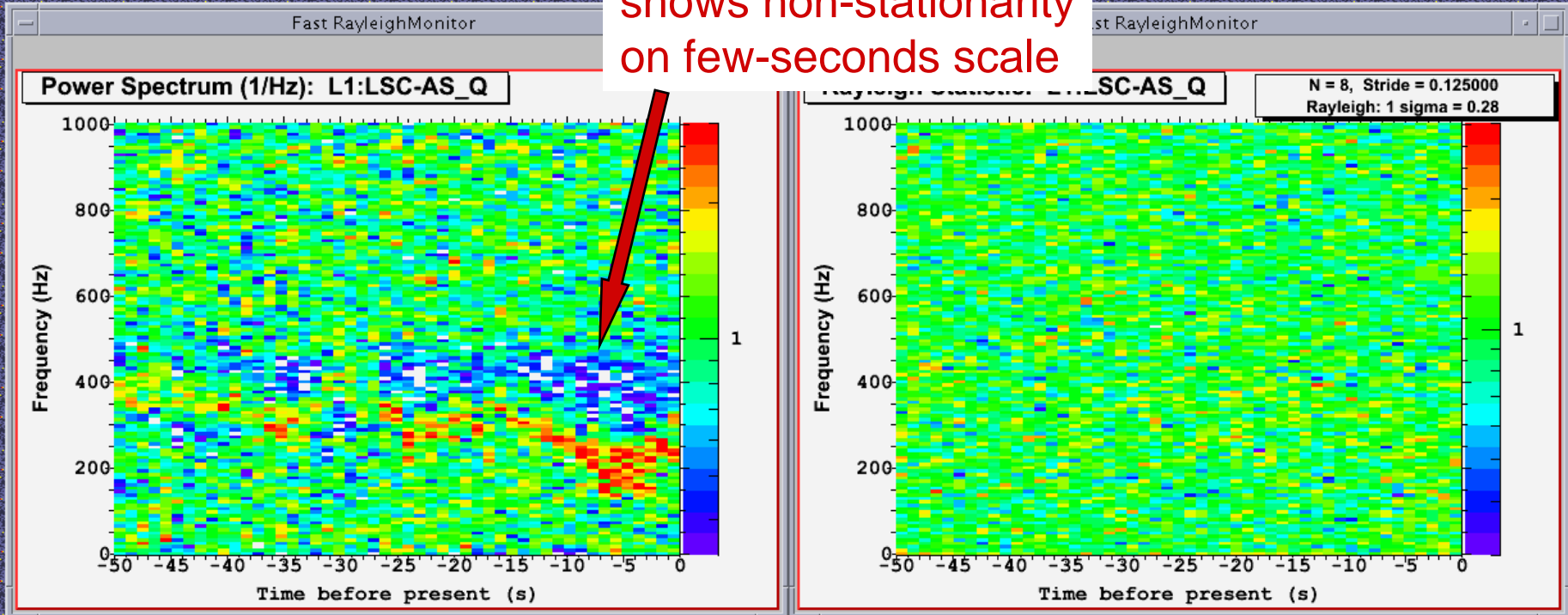


gpsclock #2
839 961 427
Aug 18 18:36:53 UTC
(local system clock)
Size... Converter

Image Viewer - Snapshot
Snap Type: Window Region Screen
Snap Delay: 0 Seconds

Example

“whitened” PSD
shows non-stationarity
on few-seconds scale



gpsclock #2

839 959 303

Aug 18 18:01:29 UTC
(local system clock)

Size... Converter

Running RayleighMonitor

- Instructions under S5 homepage
- From a control room computer at LLO:
 - » xhost +
 - » ssh gui@delaronde.ligo-la.caltech.edu
(password on back of whiteboard).
 - Once on delaronde:
 - » cd Rayleigh_L1
 - » ./start (to start RayleighMonitor)
 - » ./stop (to stop RayleighMonitor)

Editing the Configuration File

- The config files for setting parameters are simple (there's also help documentation!)

- RMconfig.txt looks like:

	←	Length of each data segment (s) = 1/ freq. resolution
0.125000	←	Number of segments to average per pixel
8	←	Run this many time steps before quitting
999999		
1		
L1:LSC-AS_Q	32.00000	512.00000
↑	↑	↑
channel	low freq.	high freq.

If you're really interested...

- RayleighMonitor would really benefit from a few additional features:
 1. Ability to automatically locate old data at the sites and run on requested GPS times. Currently, if you want to run on past data, you have to locate it yourself (this feature could be based on the `FrameCacheQuery` command).
 2. Special code for `-fast` plots is unstable. It would be great if the instability could be removed.
 3. Better yet would be speeding up the much more versatile `-slow` plotting code (in which case the beer's on me).
- Contact psutton@ligo.caltech.edu