PulsarMon Update

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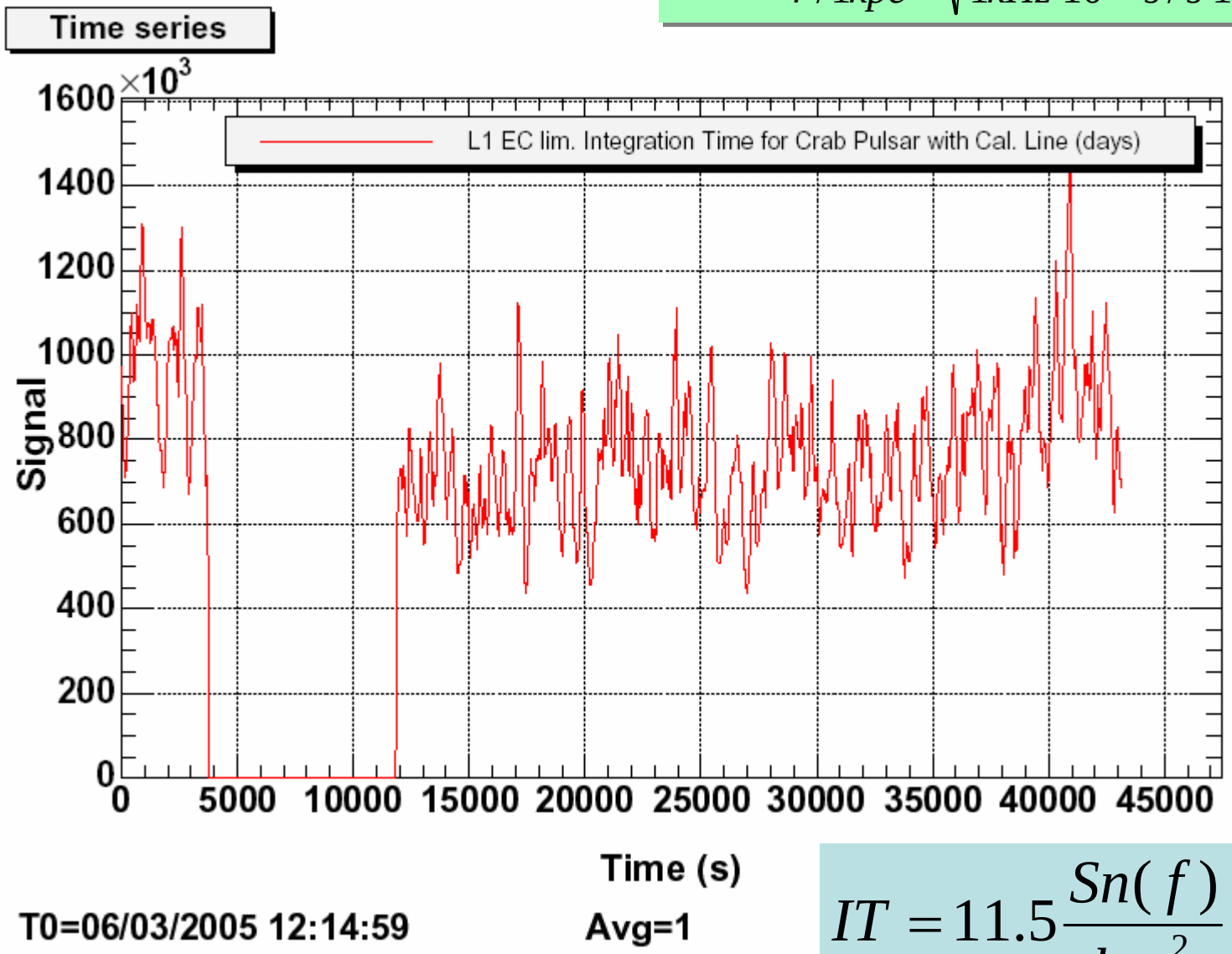
Detector Monitor for Pulsar Search

- Figure of Merit (FOM) in terms of parameters relevant to Pulsar Search
- Main FOM is the Integration Time (IT) for the Crab (fs=58.6)
- The complete list of FOMs is
- **Time Series:** IT for Crab, Ellipticity at 500 Hz, 1kpc distance
- **Power Spectra**: Noise Spectrum normalized to I year IT, Ellipticity for test pulsar 1 kpc vs. frequency
- **Scatter Plots:** hEC for known pulsars, IT for known pulsars, Ellipticity for known pulsars vs. frequency

Crab parameters: fs=59.6 Hz Fdot= 3.86e-10 s^-2, distance 2kpc

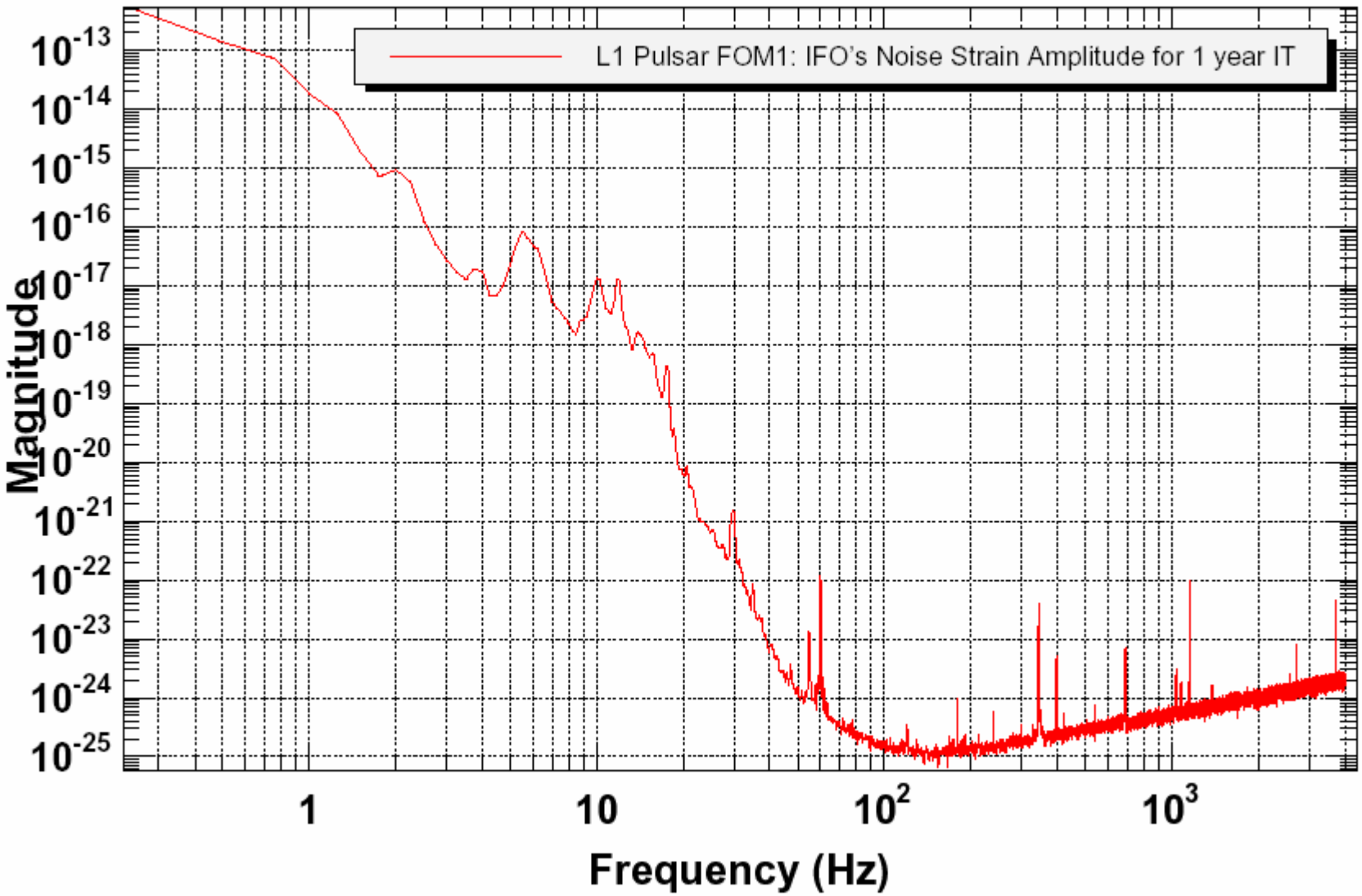
$$h_{EC} = \frac{5.7\times10^{-24}}{r/1kpc}\sqrt{\frac{f_s}{1kHz}\frac{\dot{f}}{10^{-13}s/s^2}\frac{I}{10^{45}gcm^2}}$$



$$IT = 11.5\frac{Sn(f)}{h_{EC}^{\ 2}}$$

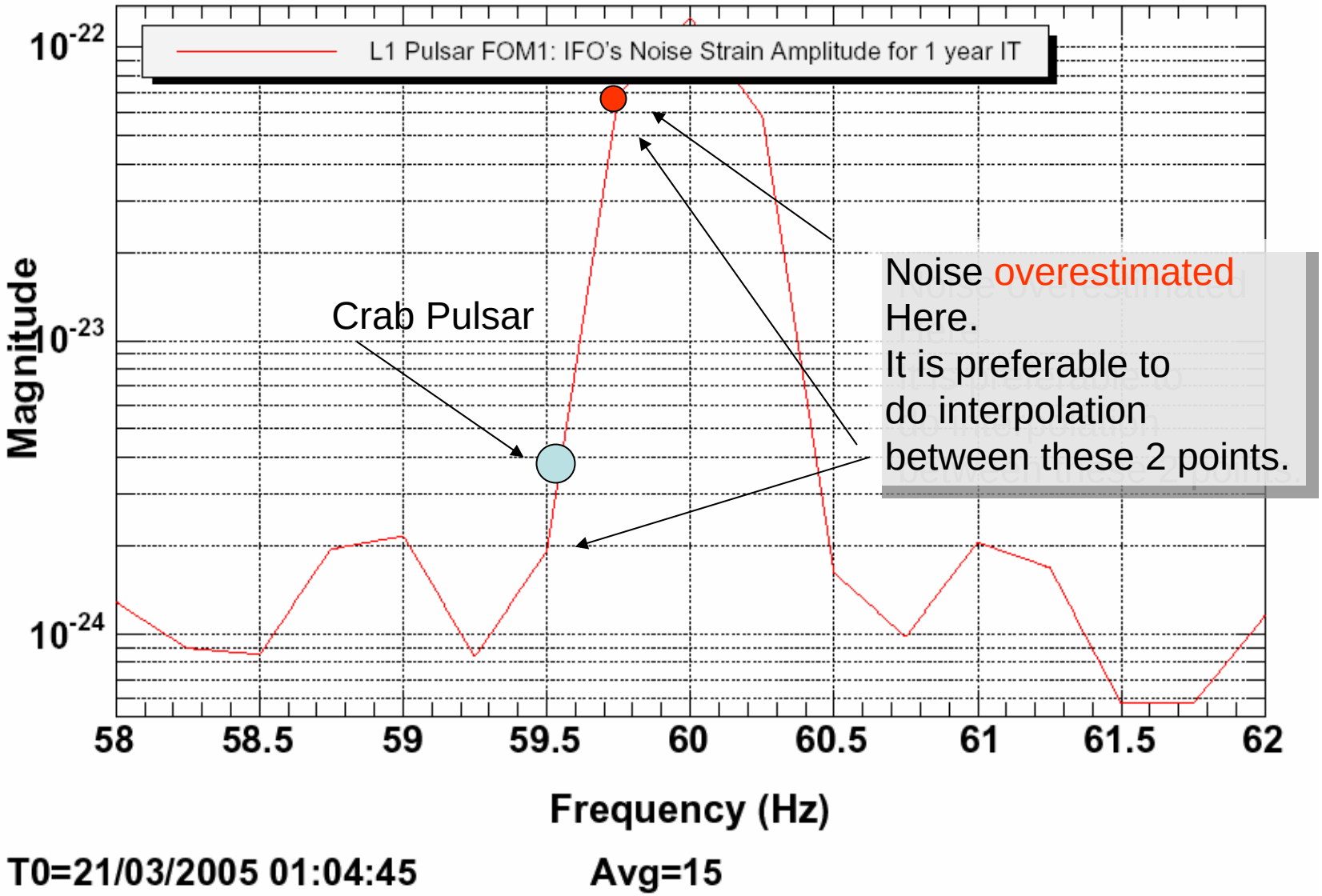
Power spectrum

$$h(f) = \sqrt{Sn(f)/T}$$

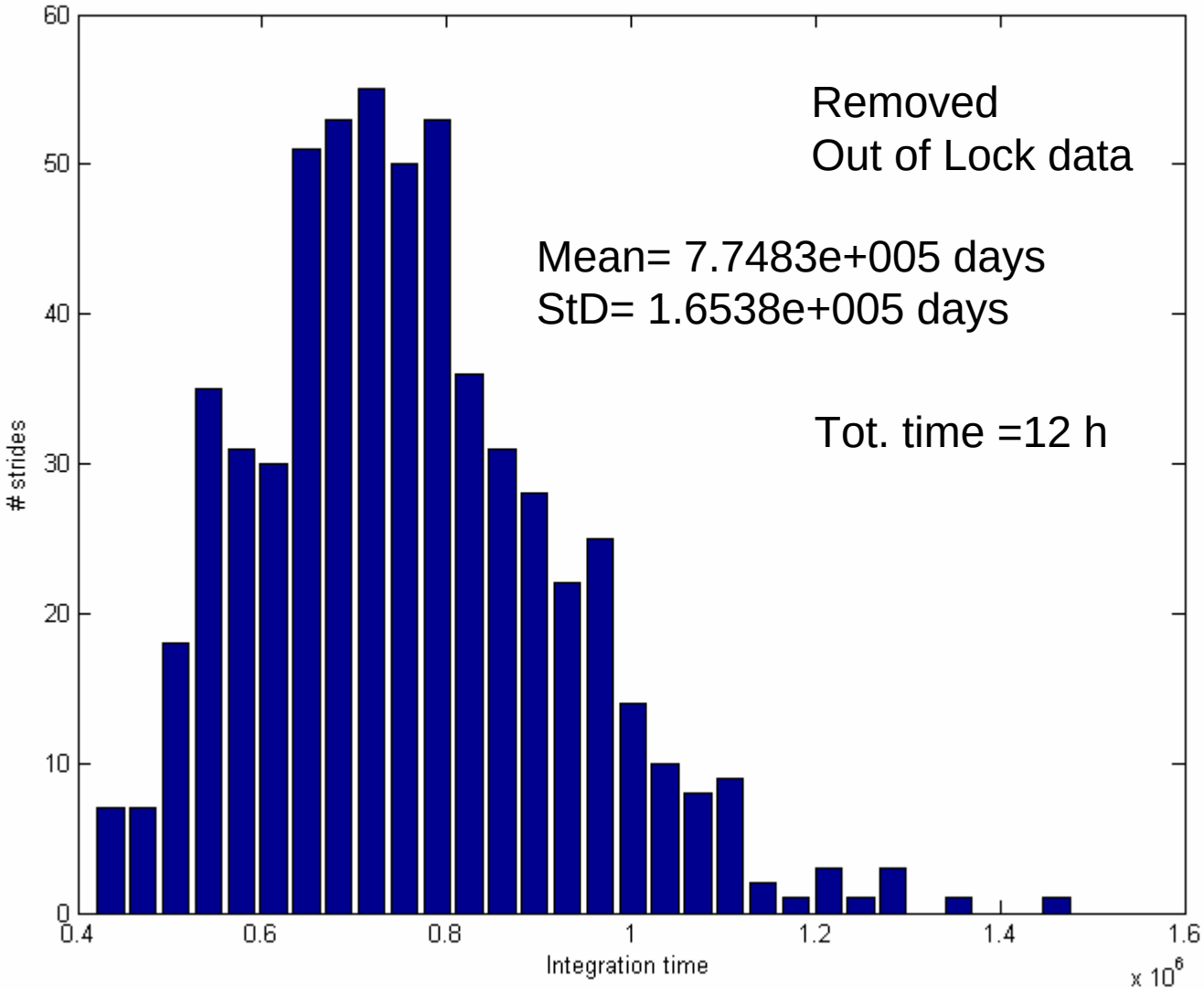


T0=21/03/2005 01:01:45 Avg=15

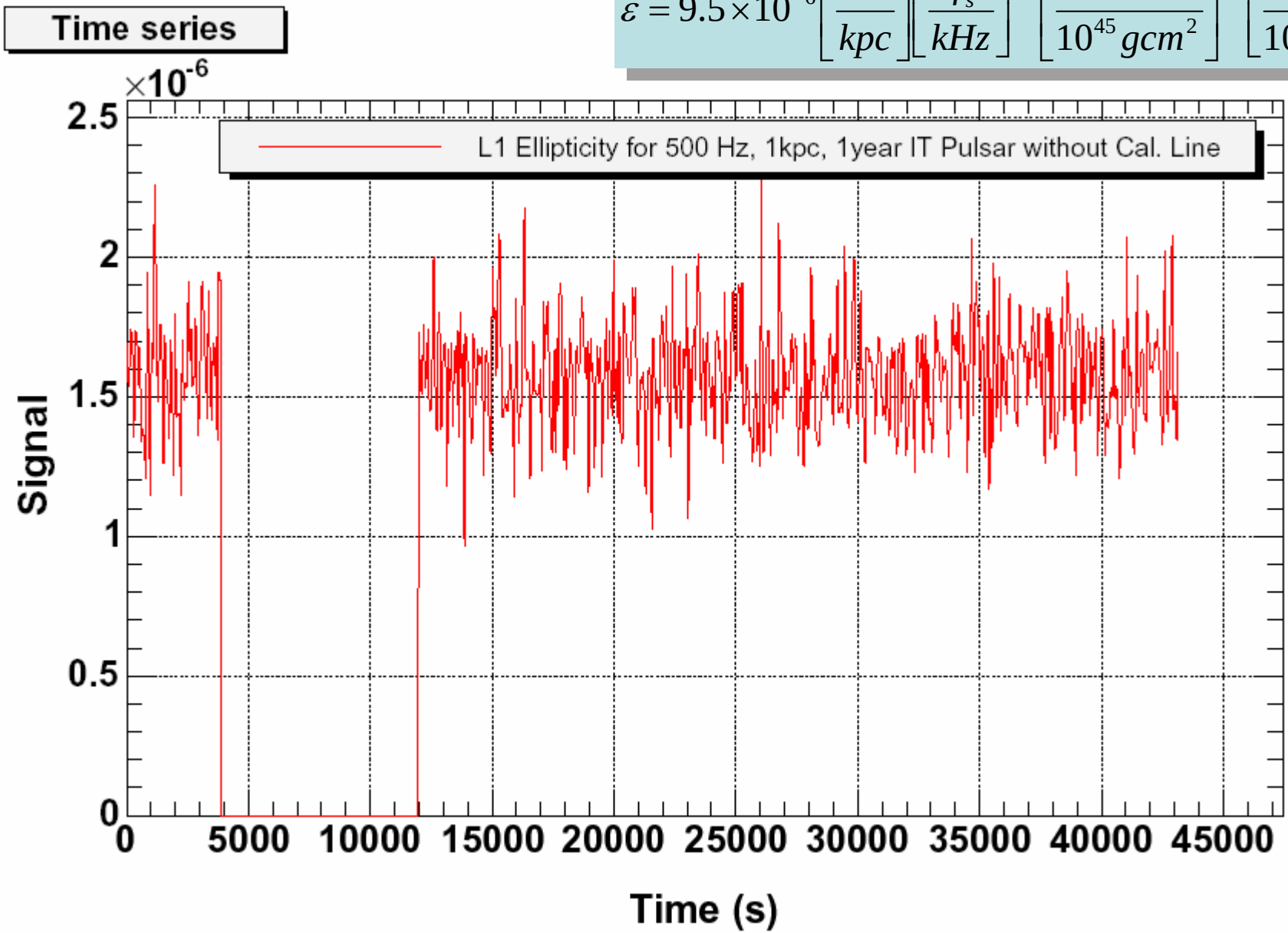
Power spectrum

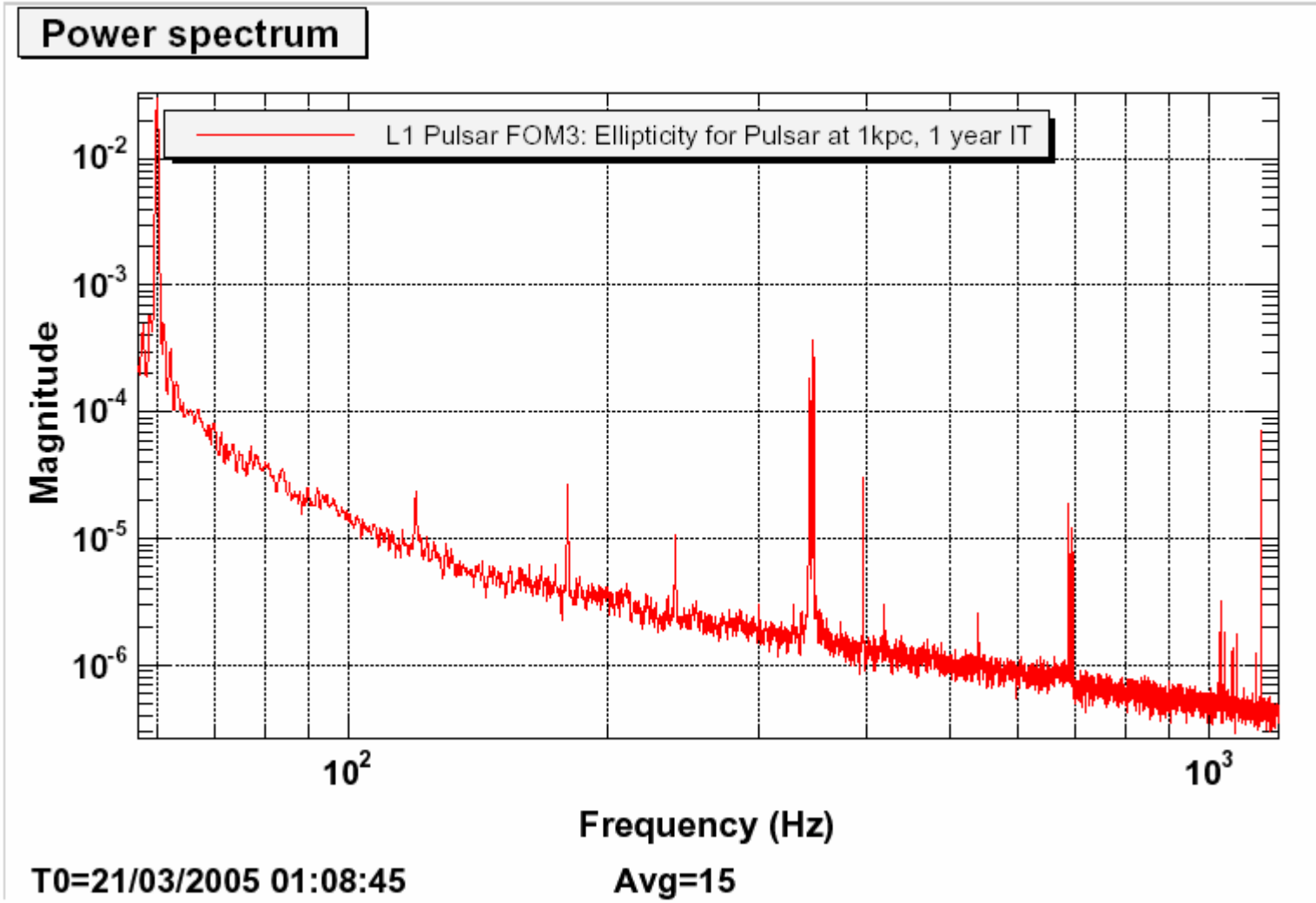


IT for Crab Statistics (03/06/2005)

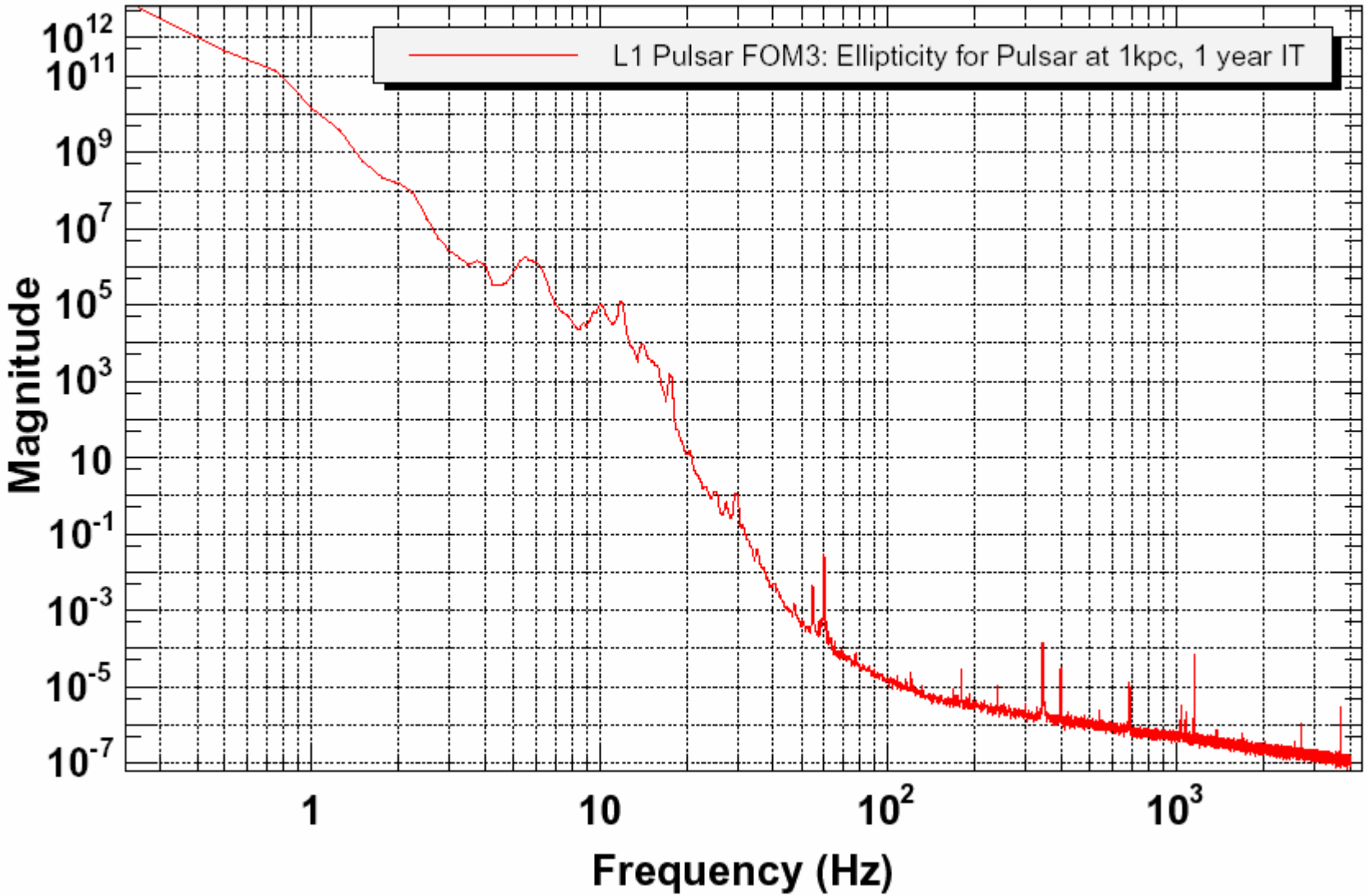


$$\varepsilon = 9.5\times10^{-6}\left[\frac{r}{kpc}\right]\left[\frac{f_s}{kHz}\right]^{-2}\left[\frac{I}{10^{45}\,gcm^2}\right]^{-1}\left[\frac{h_0}{10^{-23}}\right]$$




Power spectrum
L1 Pulsar FOM3: Ellipticity for Pulsar at 1kpc, 1 year IT
Magnitude
10-2
10-3
10-4
10-5
10-6
10^2
10^3
Frequency (Hz)
T0=21/03/2005 01:08:45
Avg=15

Power spectrum



T0=21/03/2005 00:59:45 Avg=15

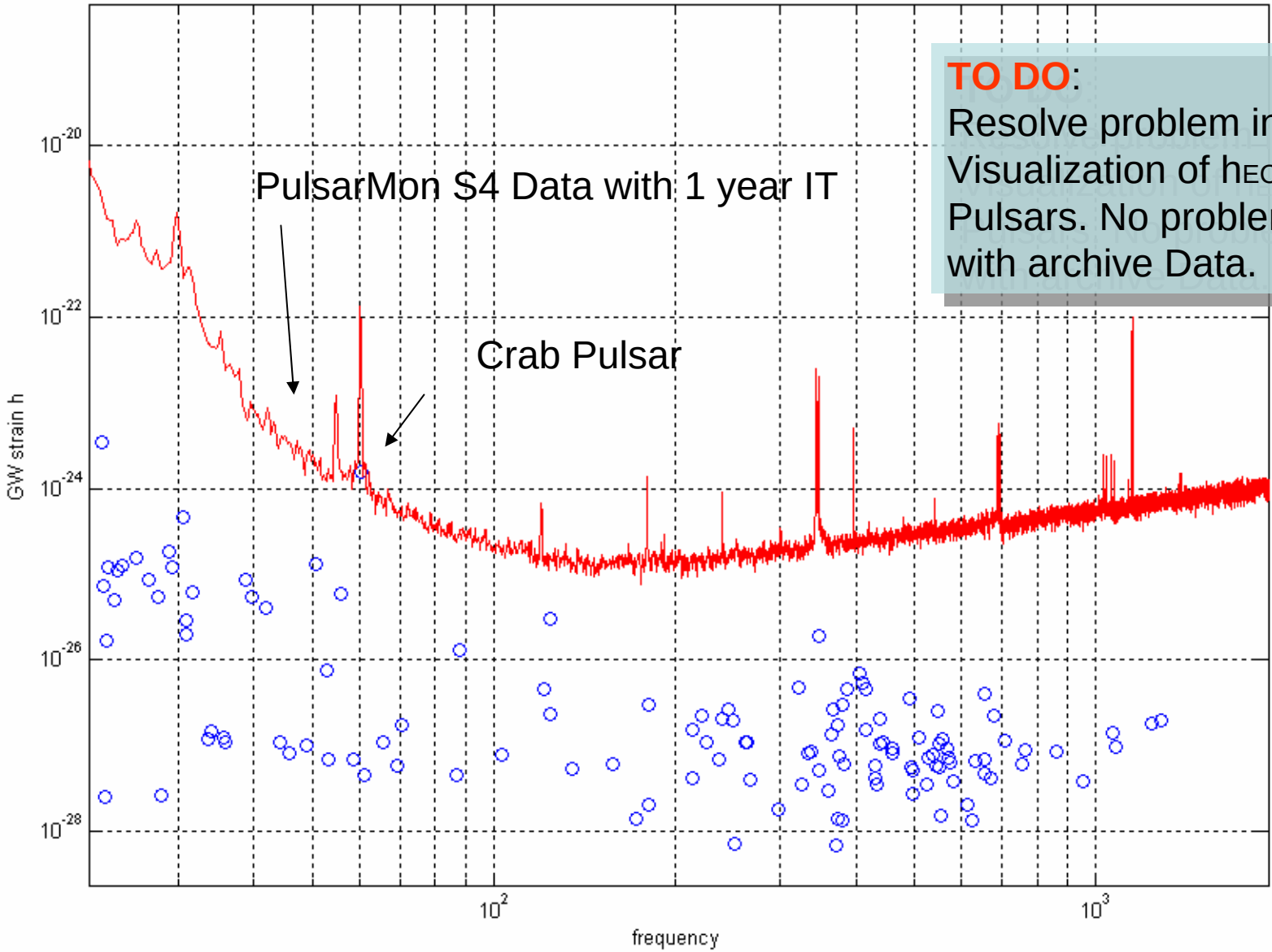
To Do:

- Fix Visualizations Problems with Scattered Plots (FOM2: IT for known Pulsars, FOM3: Ellipticity)
- Use the EasyCalibrate calibration code

(this is already done but PulsarMon EasyCalibrate version is trapped in Alvar, that is not responding right now)

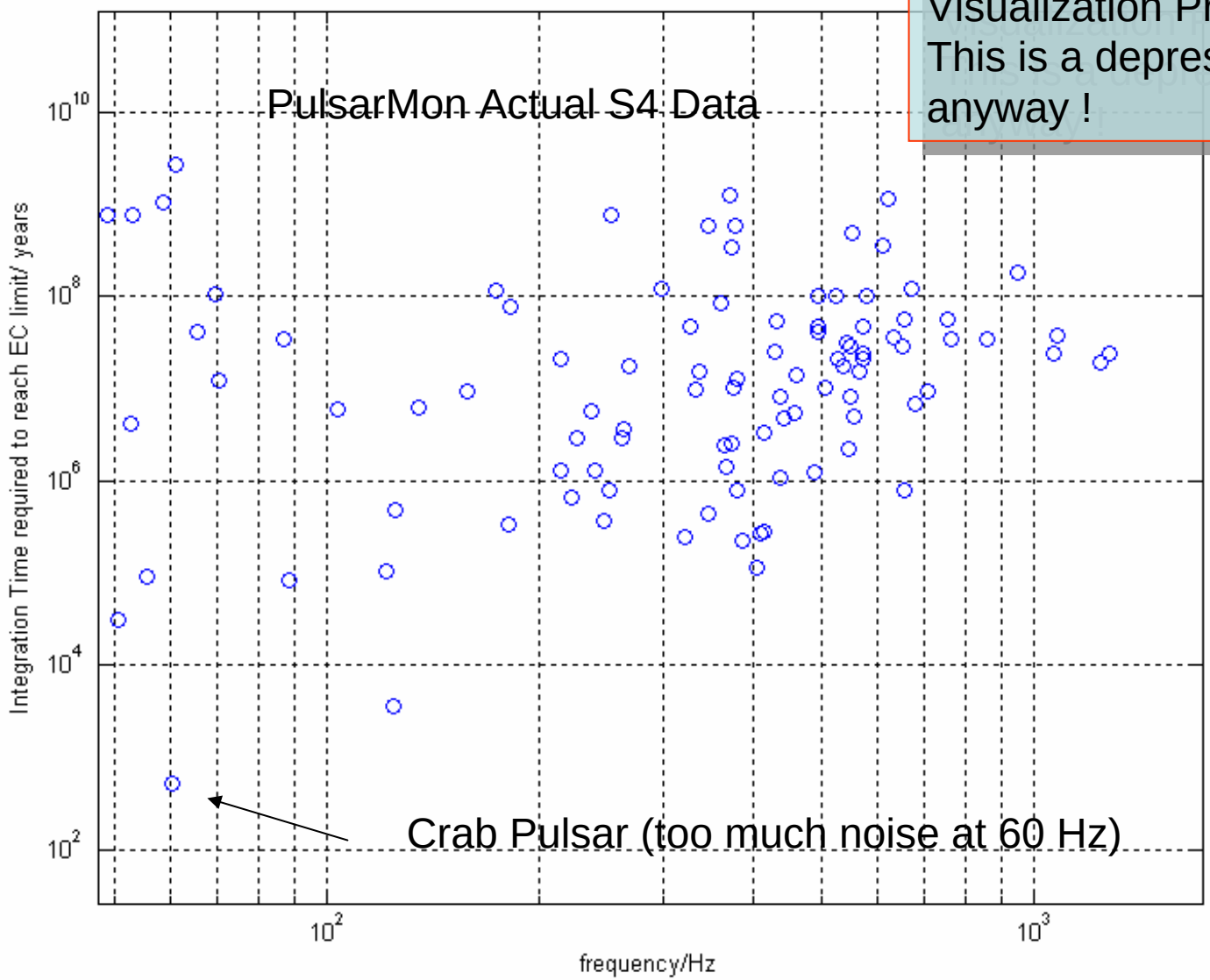
- Interpolate value of h_{noise} for Crab (use two close frequencies near f_{crab})
- Independent Tests and Checks
- New FOMs ???

FOM 1: Strain Sensitivity & know Pulsars h_{EC}

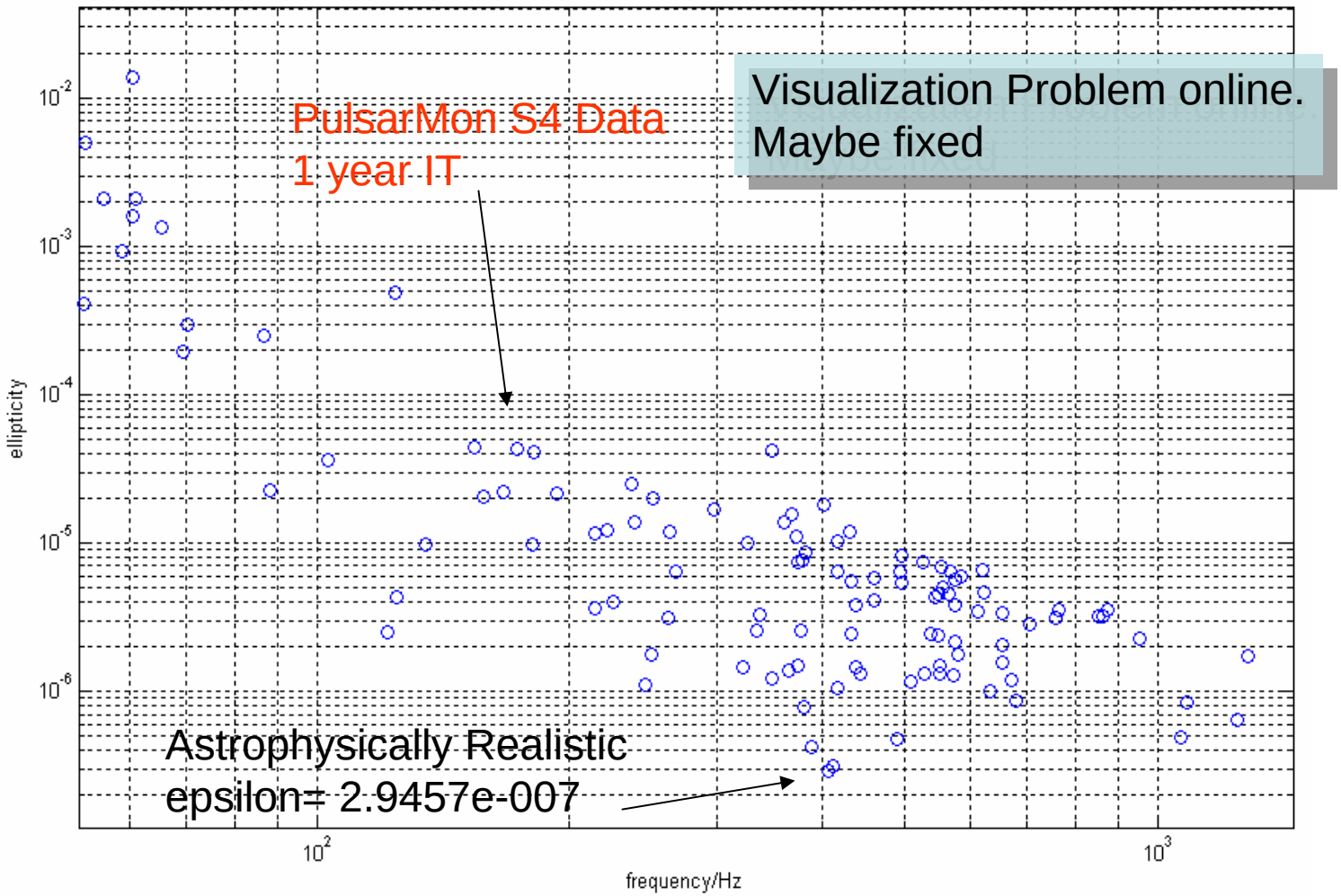


TO DO:
Resolve problem in Visualization of h_{EC} of Pulsars. No problem with archive Data.

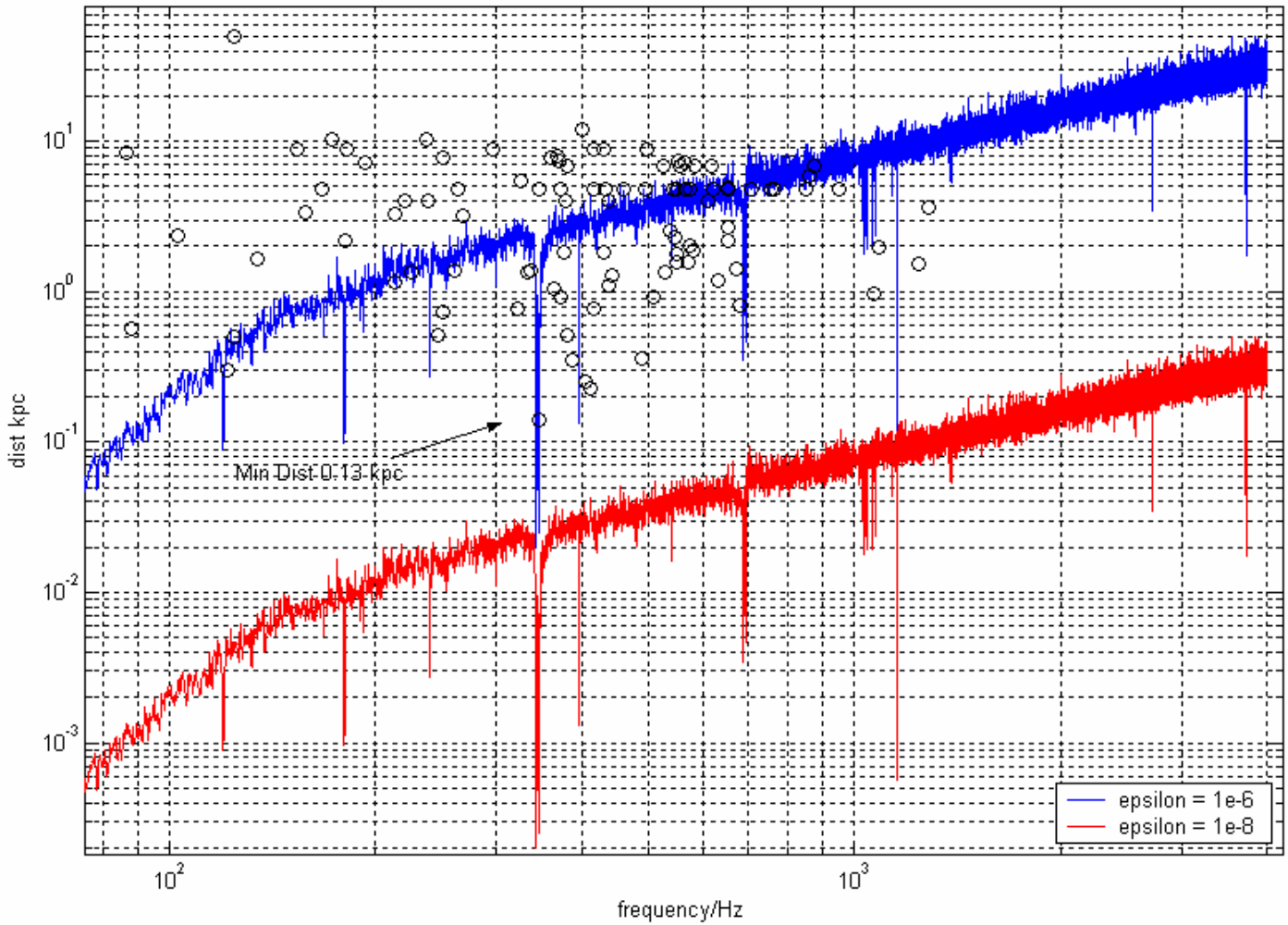
FOM 2: Integration needed to reach EC limit



FOM3: Ellipticity Sensitivity for known Pulsars



FOM 5: Range for Given Ellipticity ??



Conclusions:

- PulsarMon is producing time series and continuous Power Spectra (Crab IT, Ellipticity for 500 Hz, 1kpc pulsar, Noise Strain for 1 IT, Ellipticity vs. Frequency For unknown pulsars at 1kpc)
  without any major problems (still some bothering memory leaks)
- Works to be done for Scattered Plots (FOM1: h_{EC} for known pulsars,
  FOM 2: IT for known pulsars, FOM3: elliptcity for known pulsars)
- EasyCalibrate Implementation
- Interpolation of h_{noise} for Crab
- New FOMs ??

Thanks to Keith, John and Patrick for advise and guidance !