

Introduction to DTT

Brian O'Reilly
LIGO Livingston Observatory

What is DTT?

- LIGO-T990013-B-D: D.Sigg, P. Fritschel
- “Provides diagnostic test capability for performing stimulus response tests”
 - Sine response tests
 - Swept sine response (Transfer Functions)
 - FFT tools (Power Spectra, Cross-correlations)
 - Time series measurements
 - Pseudo-random stimulus response

DTT

- Two interfaces: GUI and command line.
- This talk will concentrate on the GUI.
- Test results can be stored in LIGO lightweight data format, basically an XML file.
- If you want gory details of algorithms or implementation look in the document.
- This talk will concentrate on how we use DTT.

Casual User's Guide

- Find a template file that someone else made previously.
- Copy it to your own area.
- Modify it to suit your needs.
- Take data.
- Spend some time making the output look good (readable!).
- **You should calibrate whenever possible.**

Prep. Work

- On Hanford GC computers:
 - Grab `/home/boreilly/dtt_templates.tar.gz`
 - Do `“tar -xvzf dtt_templates.tar.gz”`
 - Check that your `DISPLAY` environment is set correctly. `“printenv DISPLAY”`
 - To start DTT type `“dtt”`

A Power Spectrum Example

- From PEM injections Dec. 3rd 2003. See Robert Schofield's talk later today.
- DTT example file:
 - Microphone: 3.16×10^{-5} Pa/count.
 - AS_Q: 3.157×10^{-8} , poles 0.084663 0.331621 0.74 0.74, zeros 16.7911, 113.43, 201.584, 19.1673, 19.1673 .
- Reference from before injections.

A Power Spectrum Example

- Talking points:
 - LIDAX setup, Idaspw
 - Channel Selection
 - Time Selection
 - Settings for taking data
 - Displaying the data. Traces, colors, legends, titles, scales, units.
 - Cursor, references, calibration, rms, A channels, export.

Triggered Time Series

- Takes data in the time domain.
- Allows the user to filter the data using **FOTON**.
- You can see the Bode plot and the step response of your filter, when you design it.
- Filtering DTT data is an easy way to look for effects in the data.

Triggered Time Response

- Talking Points:
 - Settings, bandwidth, dead time.
 - Filtering the data.
 - Filter design (more from D. Sigg later)
 - Plotting your filter.
 - Step response
 - Zooming in to the interesting parts.

Sine and Swept Sine Response

- Sine response can be used to check the gain of a control loop, or to tune the phase of an output (e.g. AS).
- Swept Sine Responses are a way to measure the transfer function of a loop, such as DARM.
- The golden rule when running any excitation is to be very careful with your drive amplitude.

Sine and Swept Sine Response

- Saturation can ruin your measurement.
- Overdriving could be very very bad.
- An excitation often causes real physical motion of the chambers or optics.
- <Example Swept Sine DTT file>
 - Different excitation types, filtering, A channels
 - Exporting your transfer function.