



# S5 Calibration Status

Brian O'Reilly

For the Calibration Committee

LSC March 2008

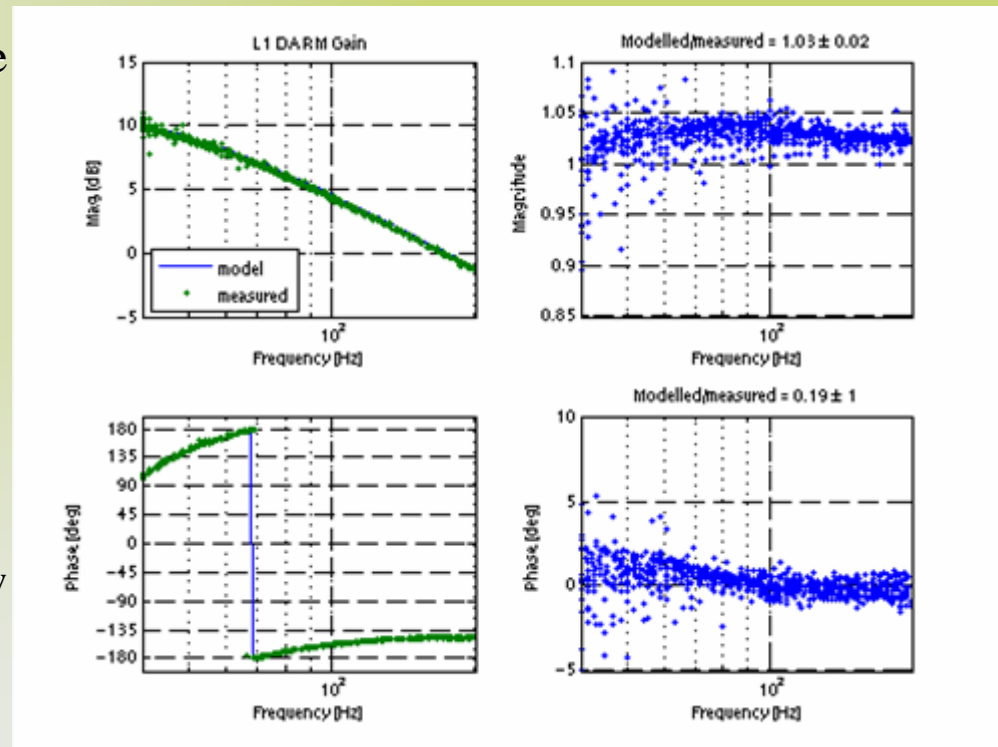


# Outline

- $h(f)$  Status
  - Validating V3 for publications
  - Status of V4, the final S5 calibration
  - Looking forward to eLIGO
- Xavier Siemens:  $h(t)$  report
  - Working hard to validate V3 and gear up for V4.
- Evan Goetz Photon Calibrators
  - Including comparisons with our current official techniques.
- Loic Rolland: Virgo Calibration Status

# V3 h(f) Calibration

- Nominally valid until January 2007 from 40-2000 Hz.
  - We examined use of V3 for the whole run. This was approved with larger error bars. In particular an added 10% systematic for H1 and H2.
- A couple of issues were resolved.
  - No Low-f trend
  - Loop Delay:
    - Confusing measurements now seem to be better understood thanks to work by N. Smith and D. Sigg **T080039-00-D**
    - Explains most of the needed delay (120/180 us).



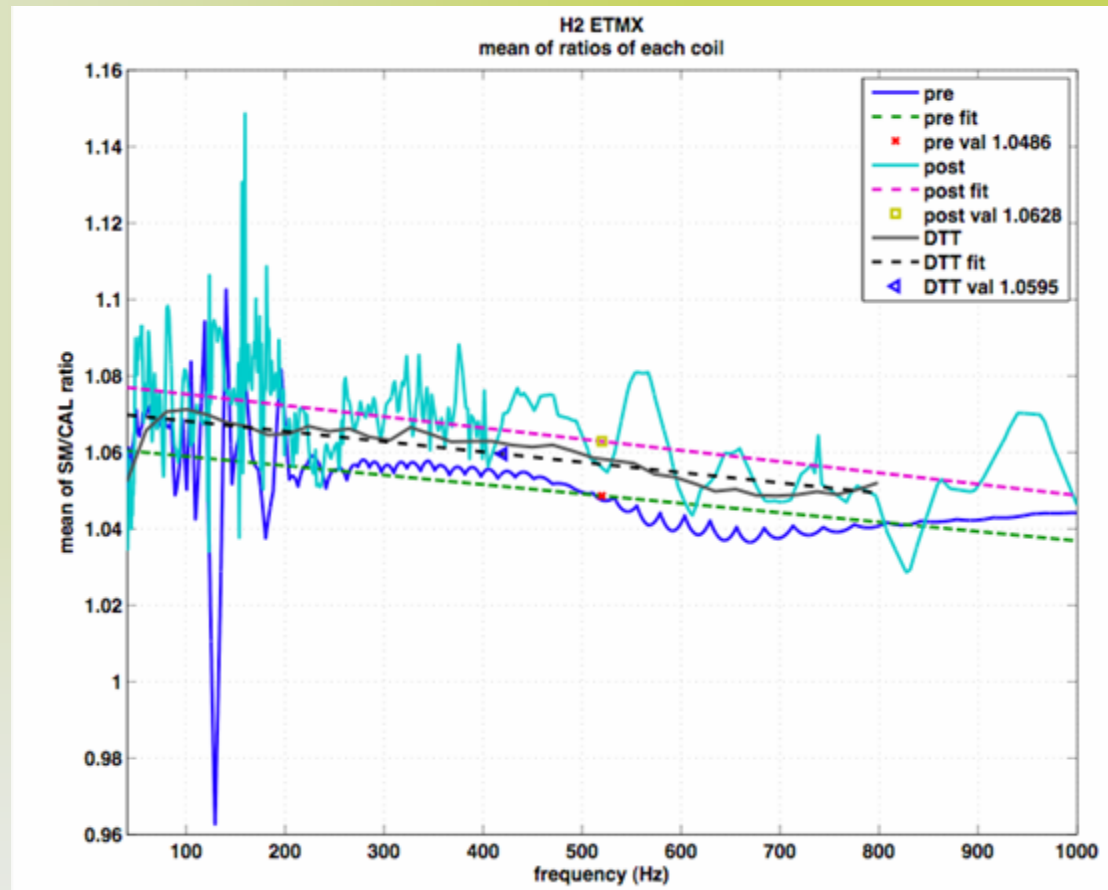
# V3 $h(t)$ Calibration

- New group working on validation. See Xavi's talk later in the detchar session.
- Expect blessed V3  $h(t)$  by end of May 2008.
- Will expedite signing off on  $h(t)$  for the Crab Pulsar frequency.

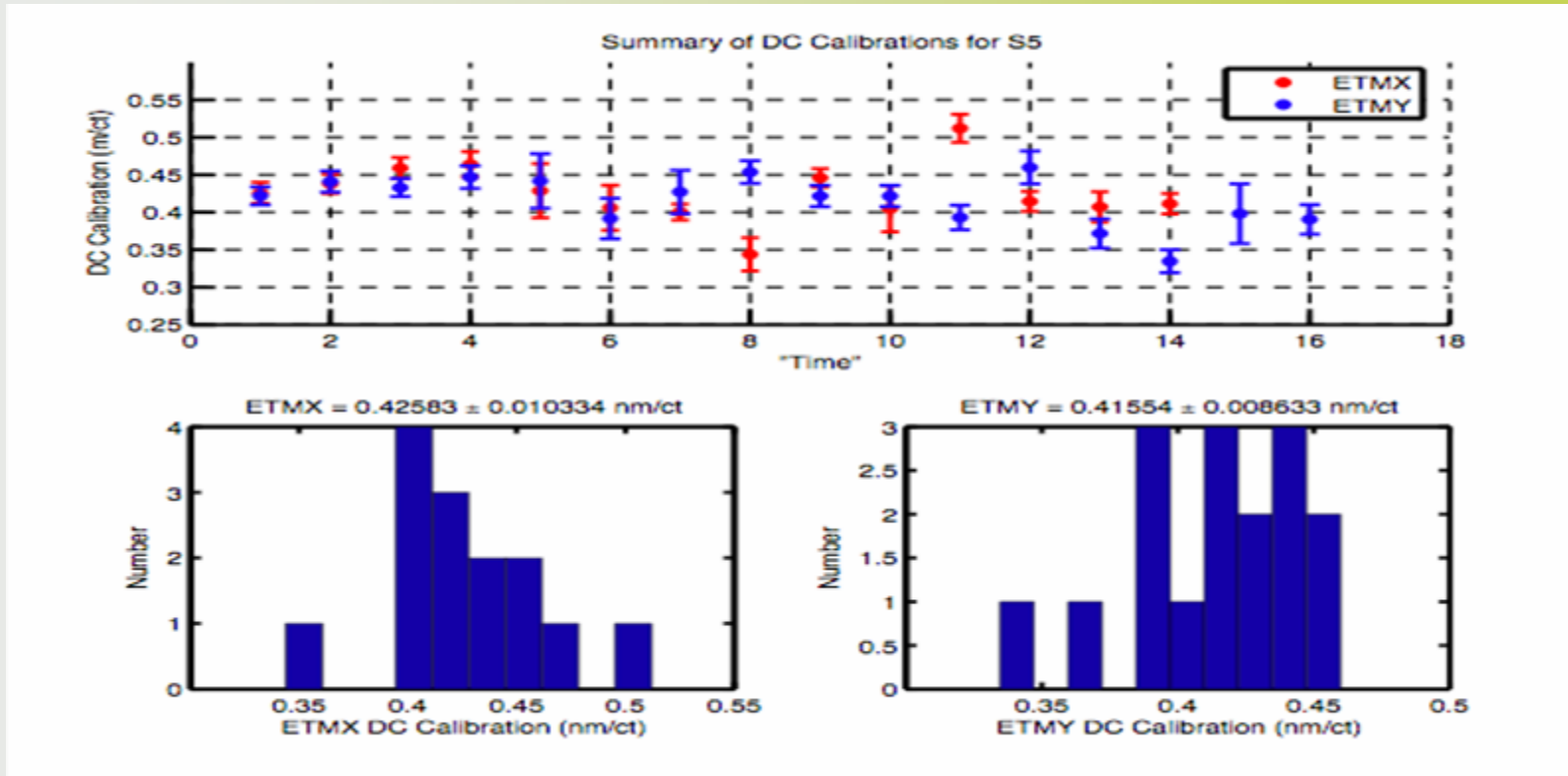


# Status of V4

- Had a calibration f2f Sunday night to hash out remaining issues:
  - Correction to DC calibrations at LHO by ~??%. This will be a loss in sensitivity
  - Decided that there was no need for any further epochs in and of the three interferometers. Based on our understanding of physics sensitivity.

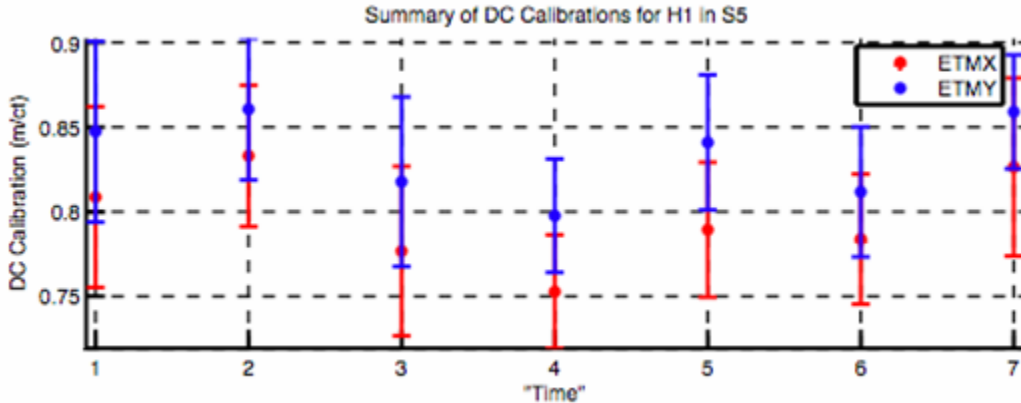


# L1 DC Calibration

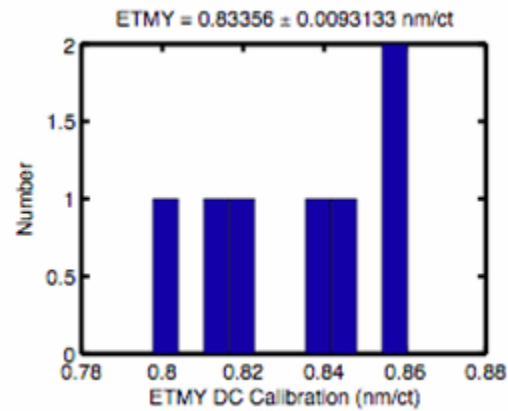
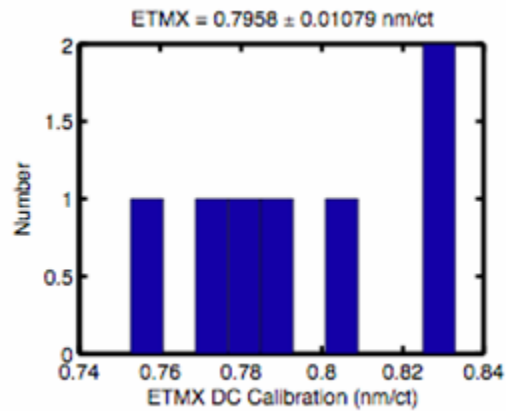


- L1 Measurements from throughout the S5 run. Using various techniques are all consistent.

# H1 DC Calibrations



Consistent but will need to be corrected for coil driver systematic.



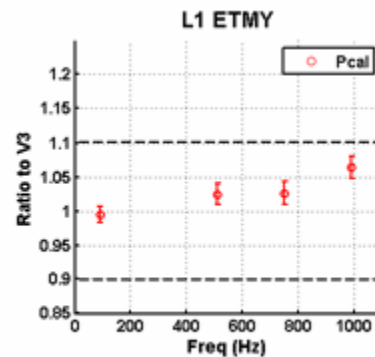
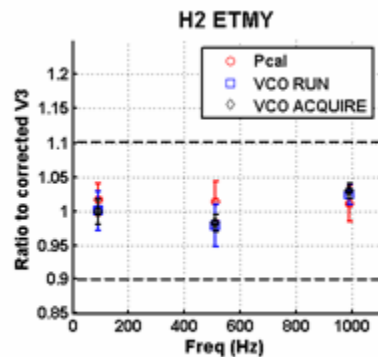
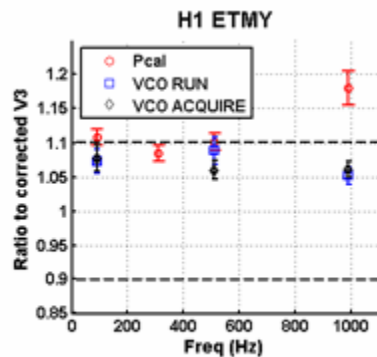
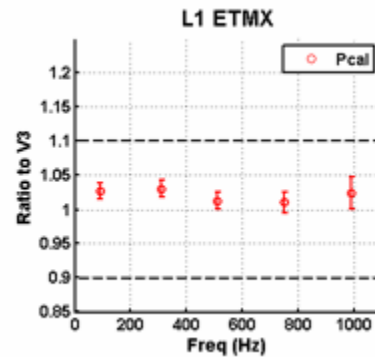
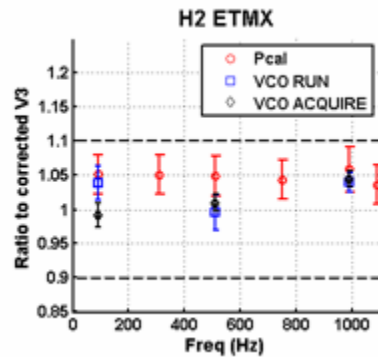
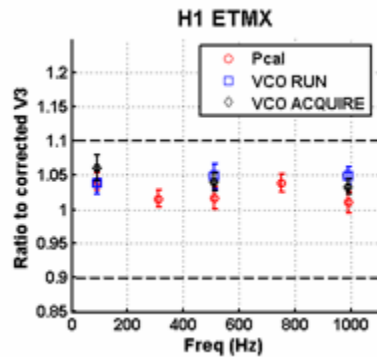
# H2 DC Calibrations





# Other DC Methods

+/- 10% from V3 Official with systematic correction for coil driver mismatch.

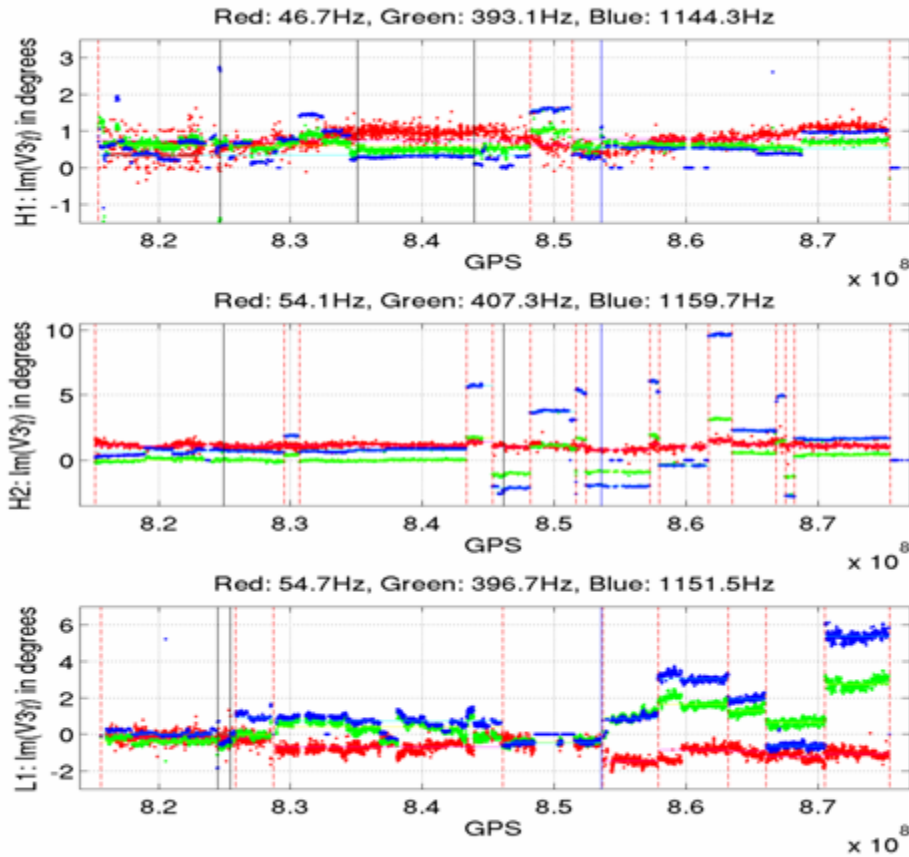


See talk by E. Goetz this afternoon.

Photon Calibrator technique is particularly attractive.

It is a direct measurement of the actuation in Science Mode

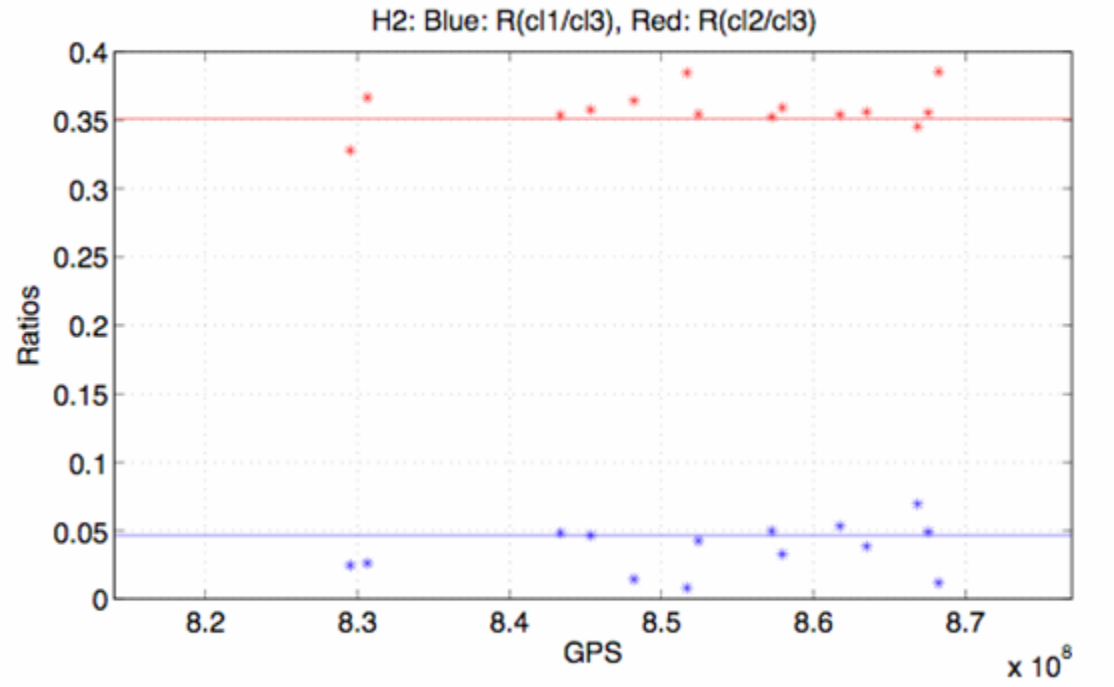
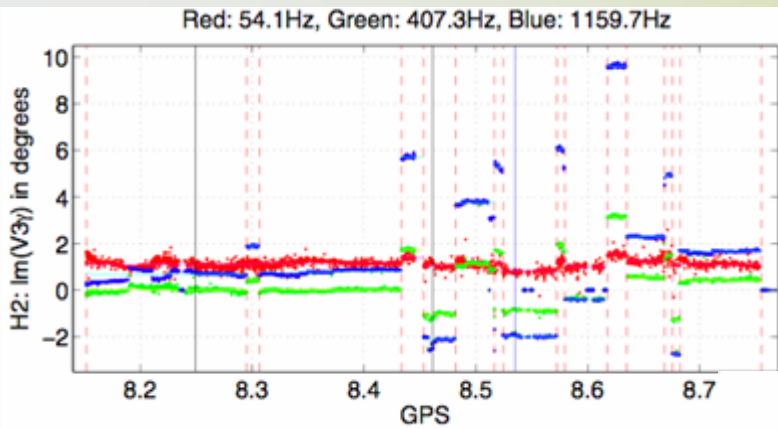
# Epochs



Changes in  $\text{Im}(\gamma)$  occur due to changes in the detector configuration or time-delay shifts.

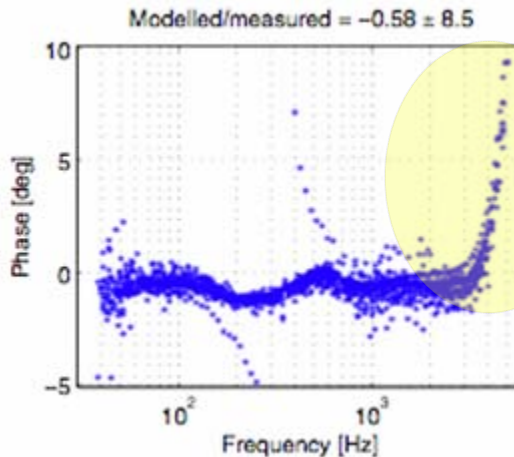
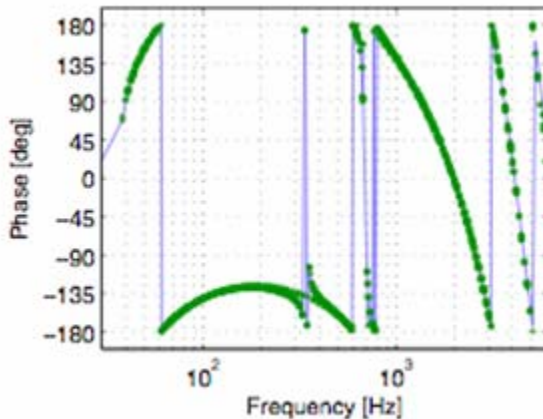
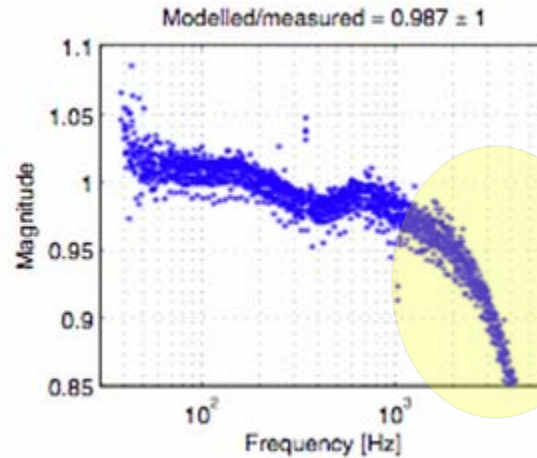
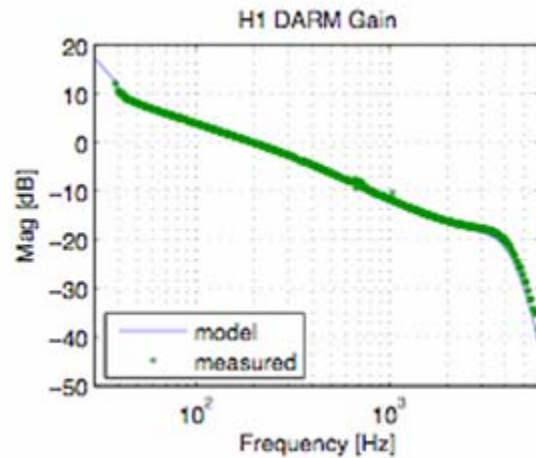
We see time-delay shifts after front-end reboots. ( $<30 \mu\text{s}$ )

# Epochs



All explained by  
time delay changes

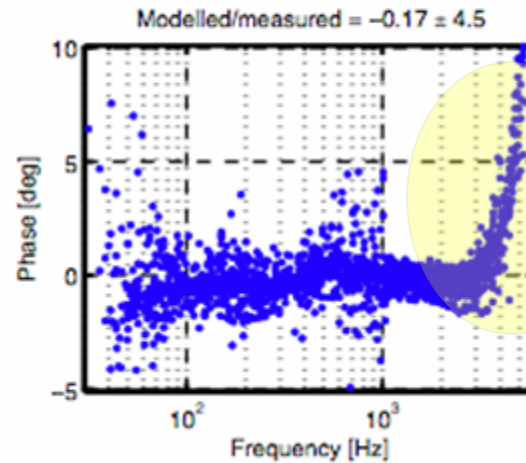
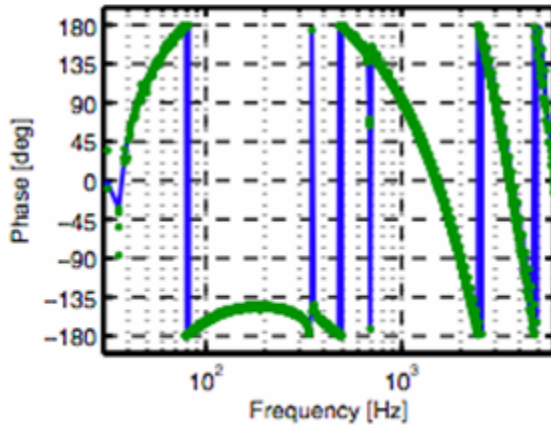
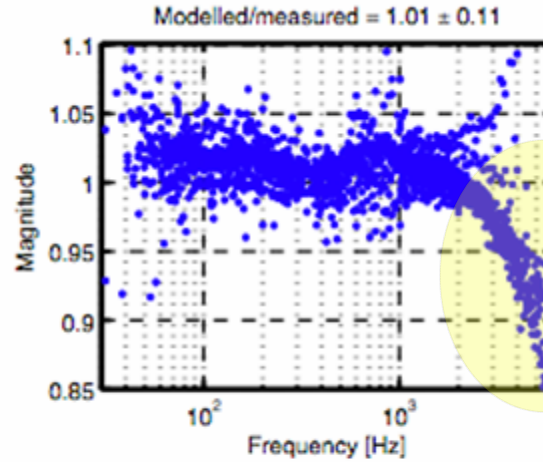
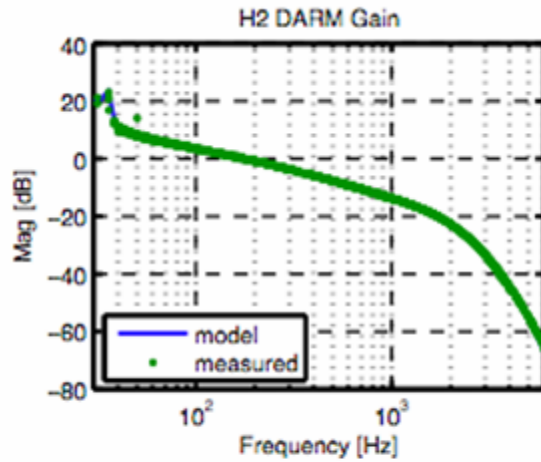
# OLG Comparisons H1



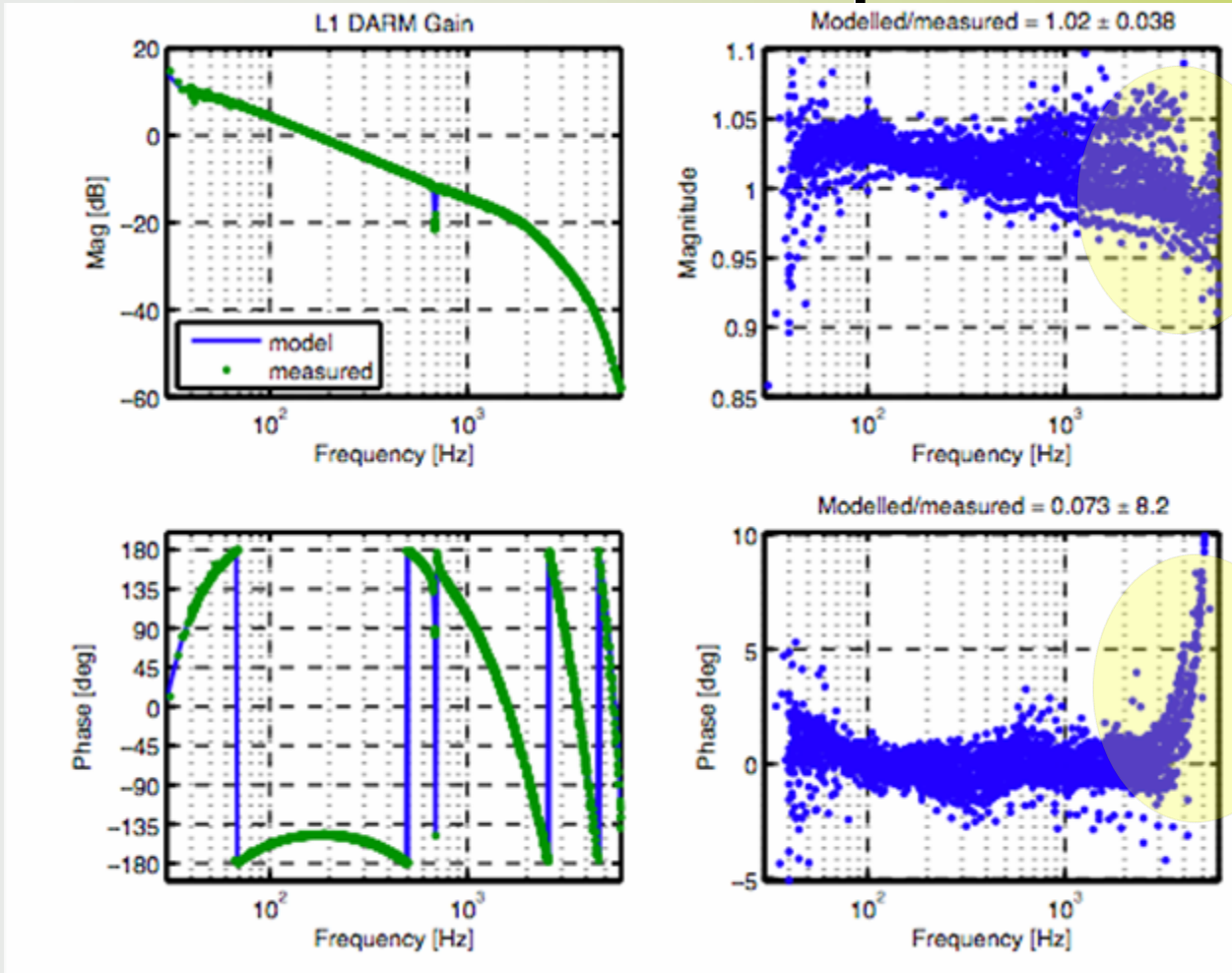
Problems at high frequency above ~ 2 kHz

This will be accommodated as a frequency dependent error.

# OLG Comparisons H2



# OLG Comparisons L1



# To Do List

- Finalize correction for H1 and H2
- Double check models.
- Produce error budget.
- Generate V4 files:
  - Should be easy since we have no new epochs.
- Release models for  $h(t)$  generation.
- Get reviewed
- Hope to close this out before June LSC meeting, maybe sooner.

# S6 and Beyond

- Our early calibrations for S5 were accurate at the level of 10%. Expect the same for S6.
- Clearly we need to move to a quicker release of finalized  $h(t)$  for searches.
- People generating the models or measuring model parameters heavily subscribed.
- Recruitment of volunteers for  $h(t)$  was successful, should do the same for  $h(f)$ .
- Probably should **change** the model of how we do things.



# Real-Time $h(t)$

- $h(t)$  generation just requires a model of the IFO response.
  - This boils down to determining a small number of parameters.
- Should generate model and hand it off for  $h(t)$  production.
- $h(t)$  production and validation occurs during the run, with perhaps a final denouement at the end.
- Would no longer generate  $h(f)$  for public consumption:
  - Model files would still be accessible
  - Factor generation would be from  $h(t)$
  - Checks of the model accuracy, re-measurement of parameters would still occur, but as part of an integrated approach.
- Will need active and continuous participation from search groups.

# Future

- Probably time for a changing of the guard on calibration.
  - The “busy” people are not going to get less busy.
- We could pioneer the new approach on Astrowatch.
  - Useful in case we have an event.
- We will of course need a continued on-site presence, but much of the work can be more widely distributed.