LIGO

Advanced LIGO Research and Development

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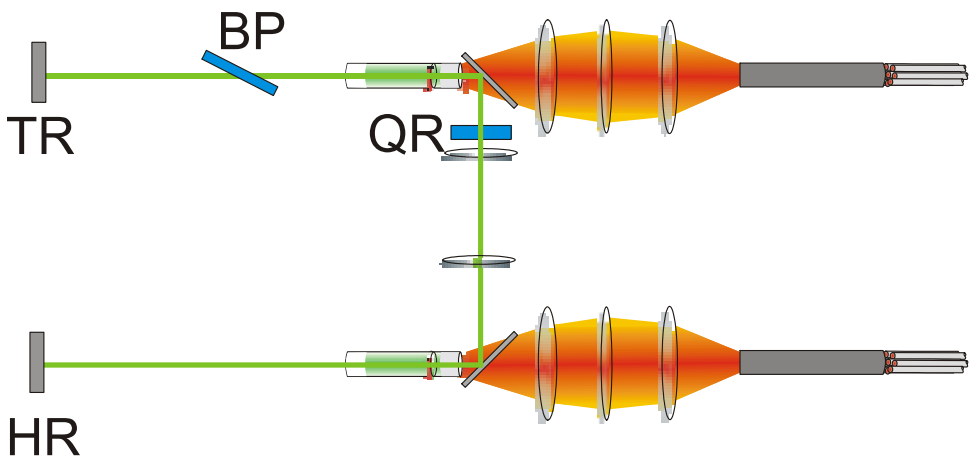
Progress since August

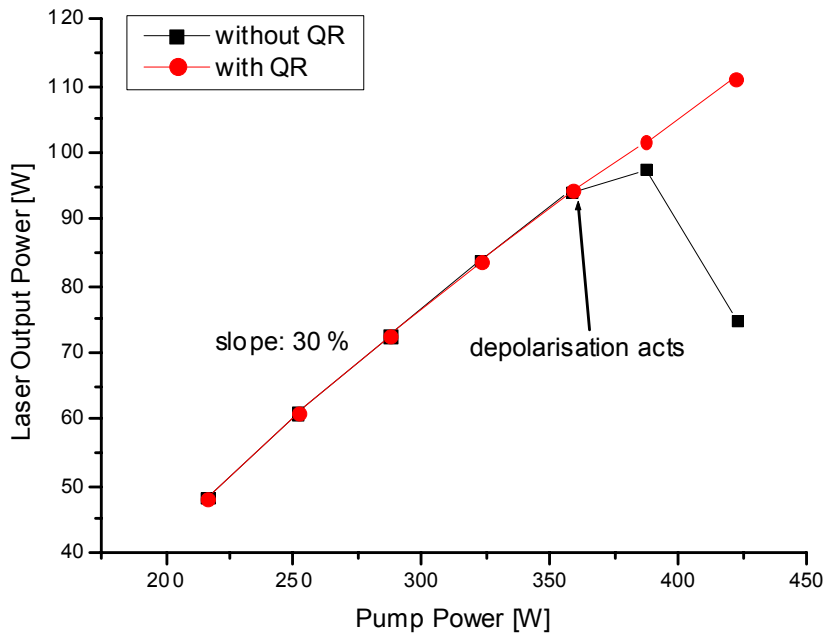
- Hannover: Good meeting, lots of research reported
- Wish only to give updates on what's happened in the interim

Pre-stabilized Laser

- LZH/MPQ studying the configuration –
- optimizing for compactness

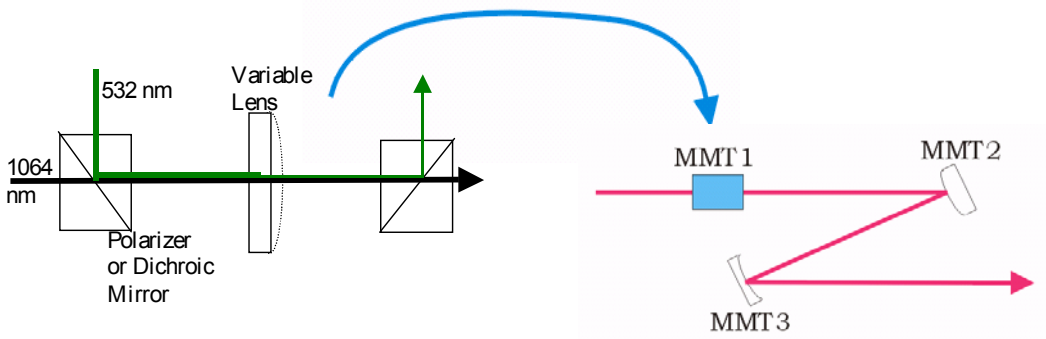


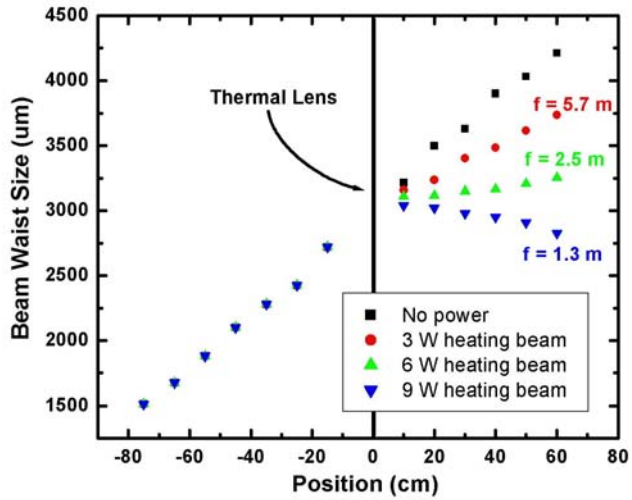
- Demonstrating efficiency of birefringence compensation



Input Optics

- Better thermal modeling of the laser adaptive telescope





- Continued testing of high power EOMs
- Starting production of 20 mm Faraday Isolators

Test Masses / Core Optics

- Setting up further diagnostics and development of sapphire:
  - » Annealing test at Crystal Systems (big) and Stanford (small)
  - » Parts for direct measurement of thermoelastic noise in Japan
  - » Test pieces to measure Q at low frequencies
  - » Absorption measurements on intermediate size pieces
- Modeling to try to extract potential anisotropic Qs giving results
  - » data not unambiguous, but poor barrel polish seems to be culprit
  - » Q measurements on intermediate size pieces in preparation
- Test of polarization 'scattering' shows negligible loss for our sapphire at AdL levels
- Annealing oven at Hobart and William Smith in commissioning
- Measurements of Q of '311SV' glass show no difference from normal 311 – good news!
- Downselect target: April 2004

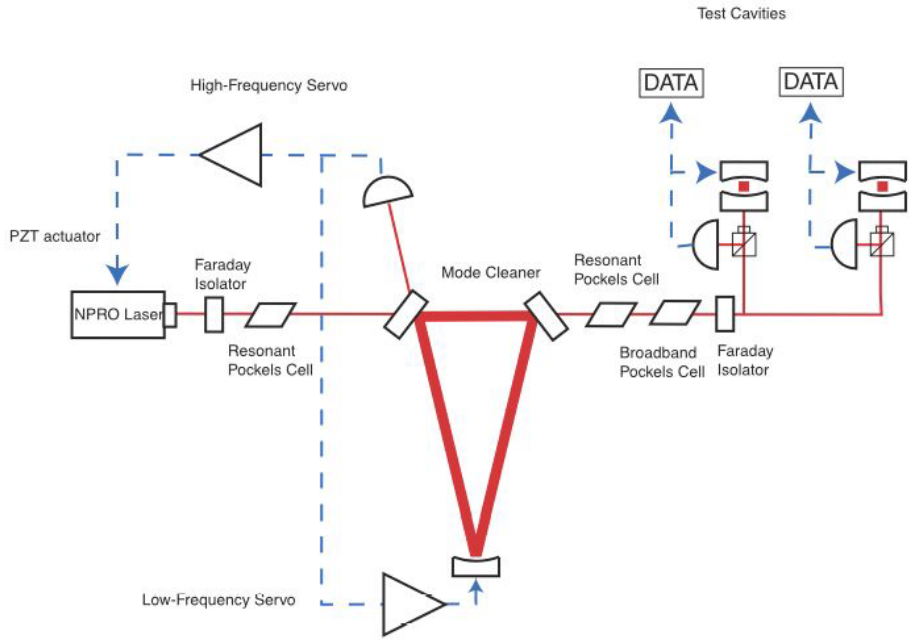
Test Mass Coatings

- Scatter measurements on initial LIGO optics
  - » Shows excess above anticipated level
  - » Contamination from cleaning? In coating? At interface?
  - » Must be pursued – for initial LIGO, for AdL

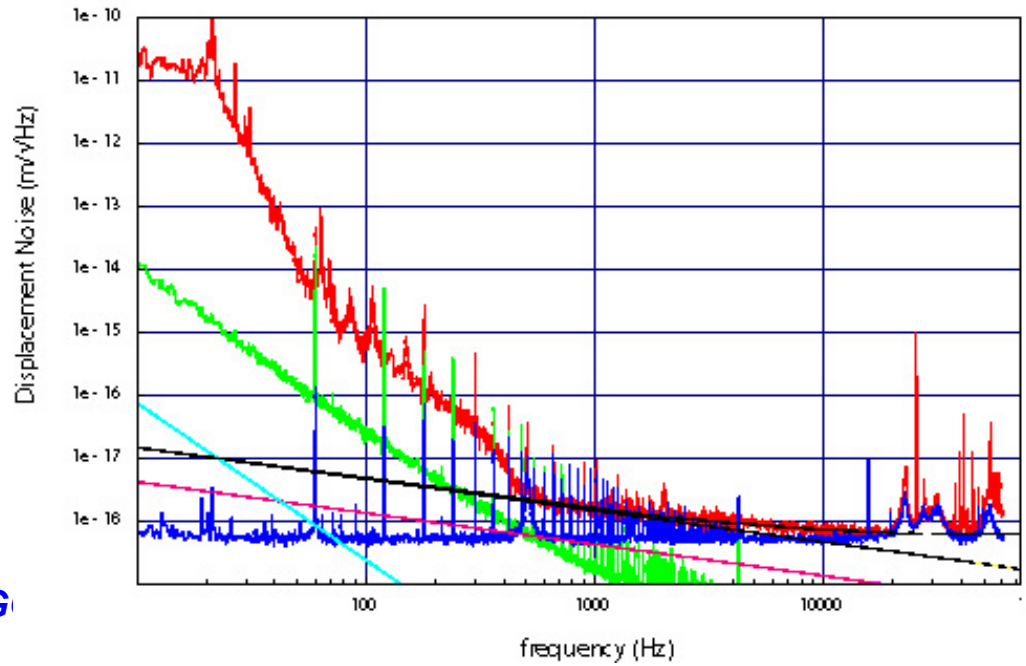
- Refined models/measurements of Coating properties
  - » Parallel/perpendicular contribution
  - » Shear (to exclude from Thermoelastic calculation)
- Detailed discussions with selected Coating Vendors CSIRO and SMA/Virgo
  - » First trial coatings agreed upon, in process

Direct measurement

- Thermal Noise Interferometer (TNI) at Caltech designed to measure coating and substrate thermal noise
- Presently set up with fused silica substrates with conventional coatings
- Recent results appear to show confirmation of models for anticipated coating losses

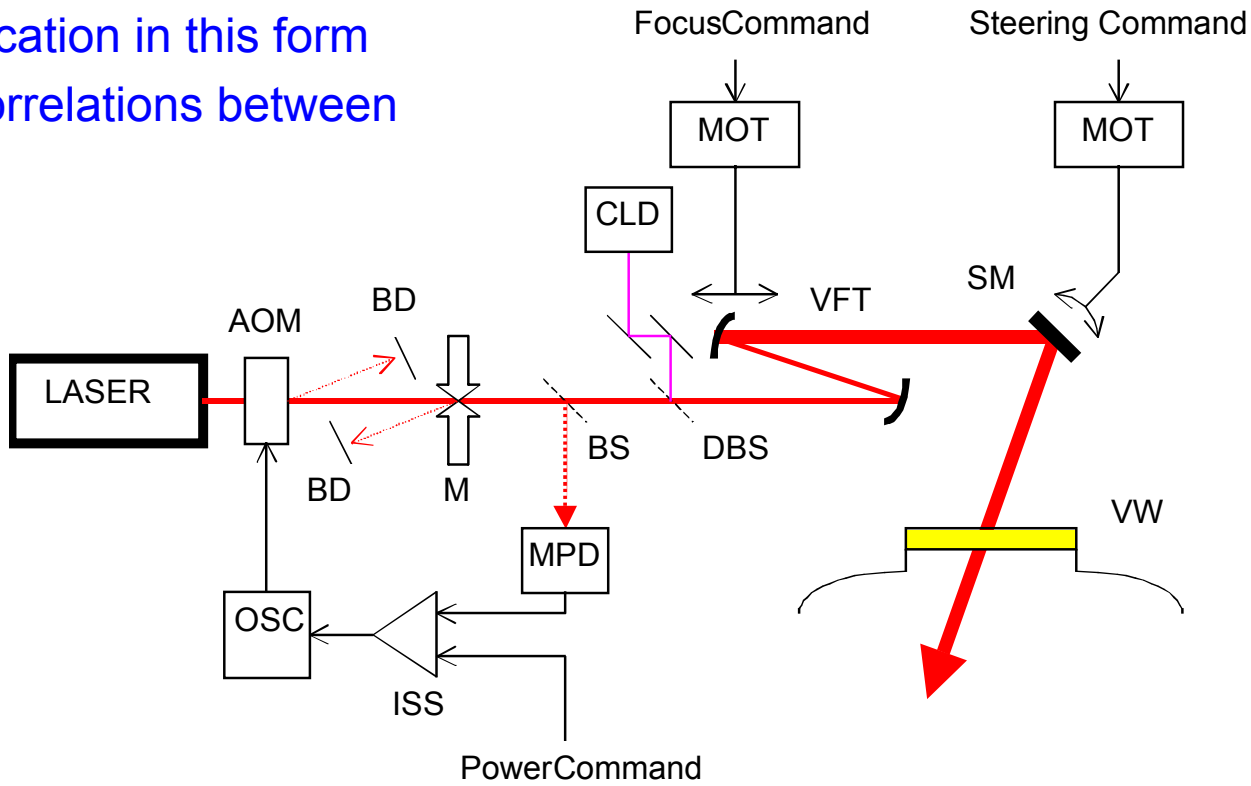


TNI noise floor 10/23/03



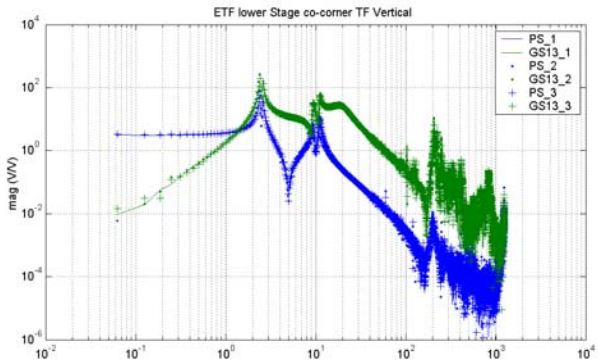
Active Thermal Compensation

- Application to initial LIGO – implementation at LHO after S3
- ‘Staring configuration’ – could also have AdL application in this form
- Reduction in correlations between H! and H2



Seismic Isolation

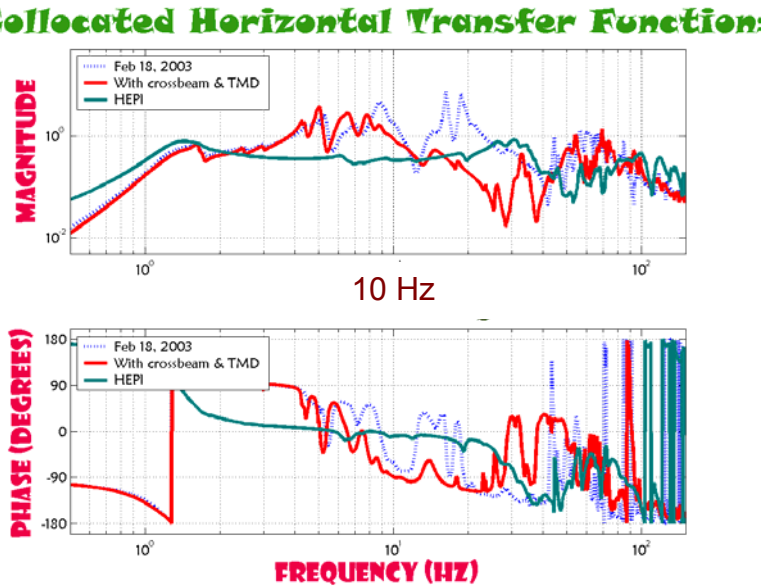
- ETF prototype showing first transfer functions
- Vendor chosen for final in-vacuum design, prototypes at LASTI



100 Hz

Hydraulic Pre-isolator moved from BSC to HAM in LASTI testing

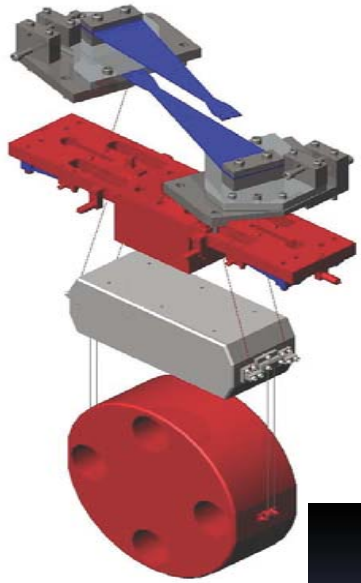
» Very clean and understandable transfer functions

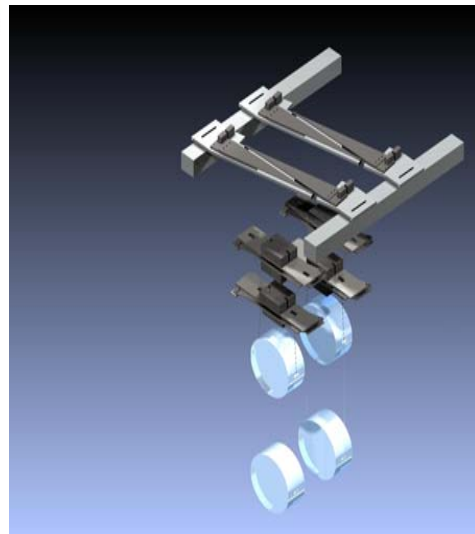


10 Hz

Suspensions

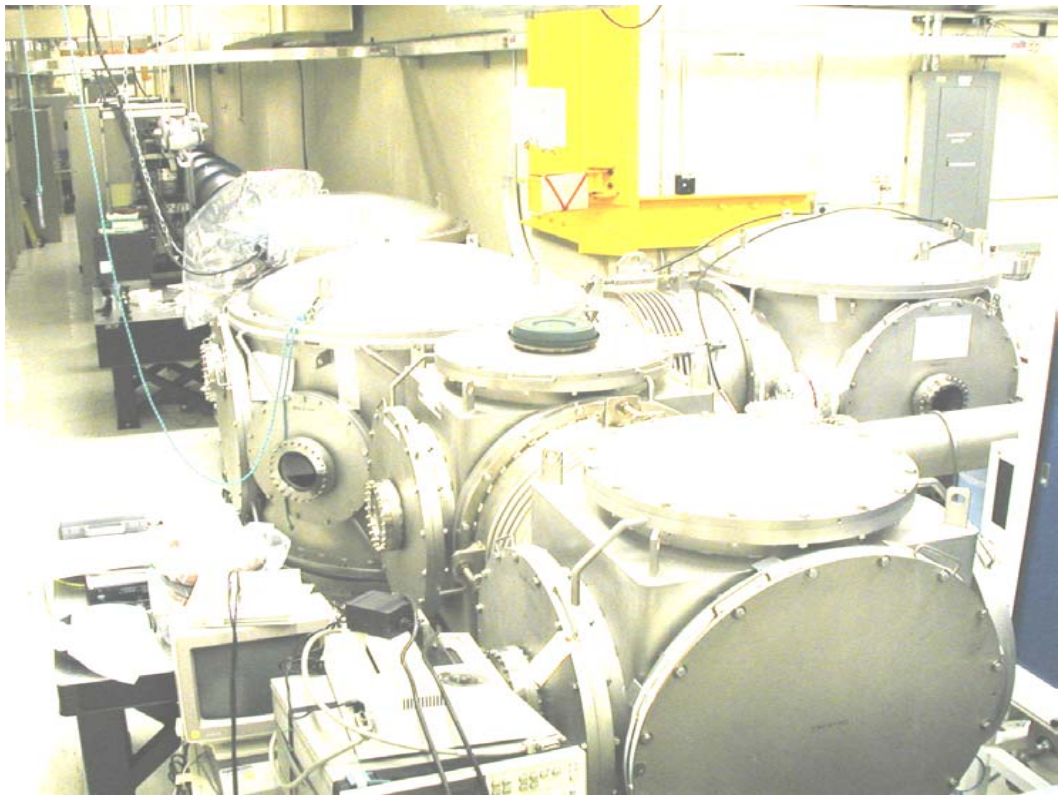
- Suspensions Workshop held at Caltech in October
  - » CIT, LHO, Univ. of Florida, Univ. of Glasgow, MIT, Stanford, RAL, Univ. of Birmingham Folk
  - » Introduced team members to Mode Cleaner controls prototypes
  - » Assembled two MCs using procedures and damped optic
  - » Made use of alignment mechanisms
  - » Learned about initial LIGO alignment tools and procedures
  - » Considered assembly and alignment of quad suspensions with reaction chains
- Achieved the workshop goal of understanding how assembly, installation and alignment impact SUS design
- Updated version of conceptual design completed (T010103-03)
- first of ribbon/fibre downselect meetings held





GW readout, Systems

- 40m: Both Arms and Michelson Locked!
- Very good contrast
- Some in-vacuum rework needed but then…
- Characterization of this phase, and then…
- Installation of recycling mirrors to follow shortly!



Advanced LIGO R&D

- Significant progress even just since the August meeting!
- Organizational stuff: getting detailed cost and schedule model updated, using to make revised R&D plan from the ground up that fits constraints, has needed flexibility
- Readying for Laboratory Annual NSF review next week – fun to trumpet the accomplishments of the Lab and LSC
- NSF studying the Advanced LIGO Proposal…meanwhile, lots of good science going on