

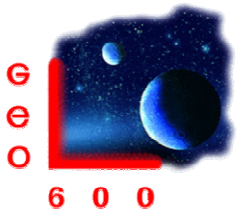


Status of GEO600

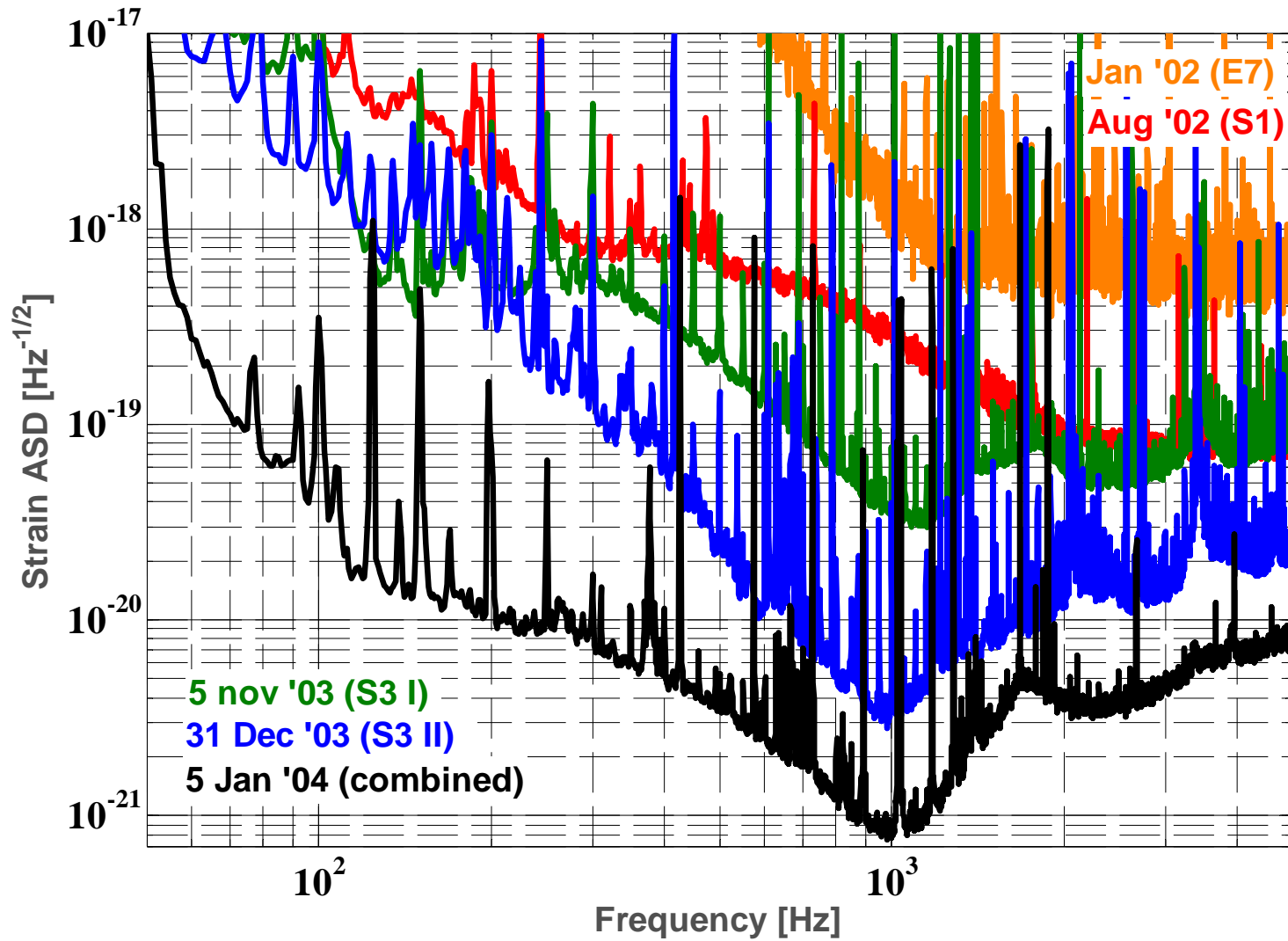
Benno Willke
for the GEO600 team

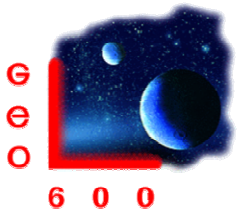
Aspen Meeting
Aspen CO, January 2005

LIGO-G050030-00-Z



Sensitivity Improvements

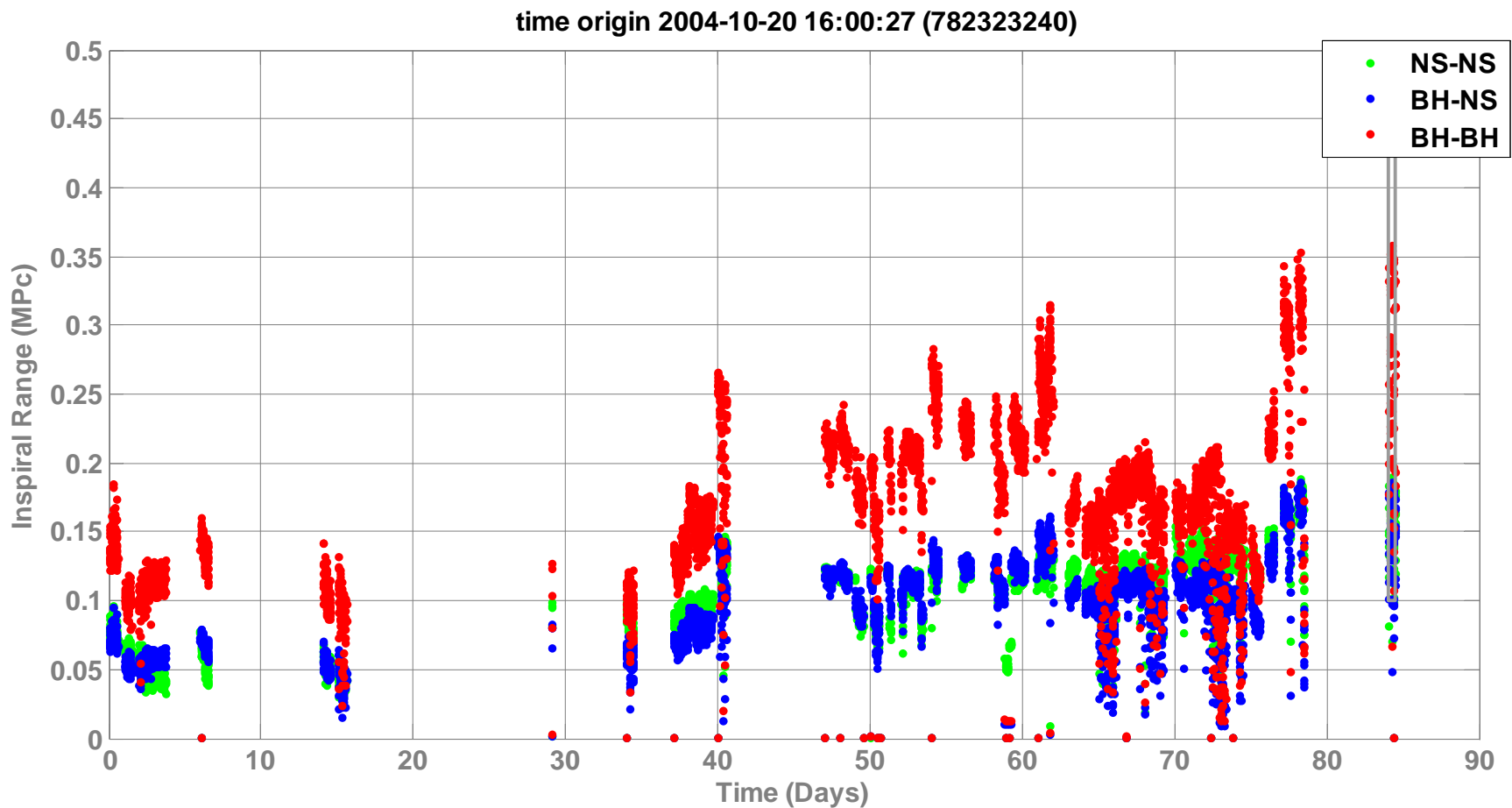




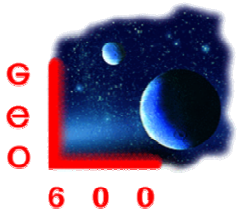
Transition Commissioning - Observing



overnight runs Aug04 – Jan05: 1405h (duty cycle: 93.7%)

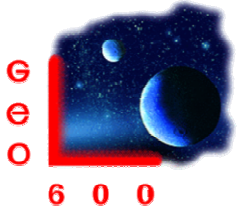




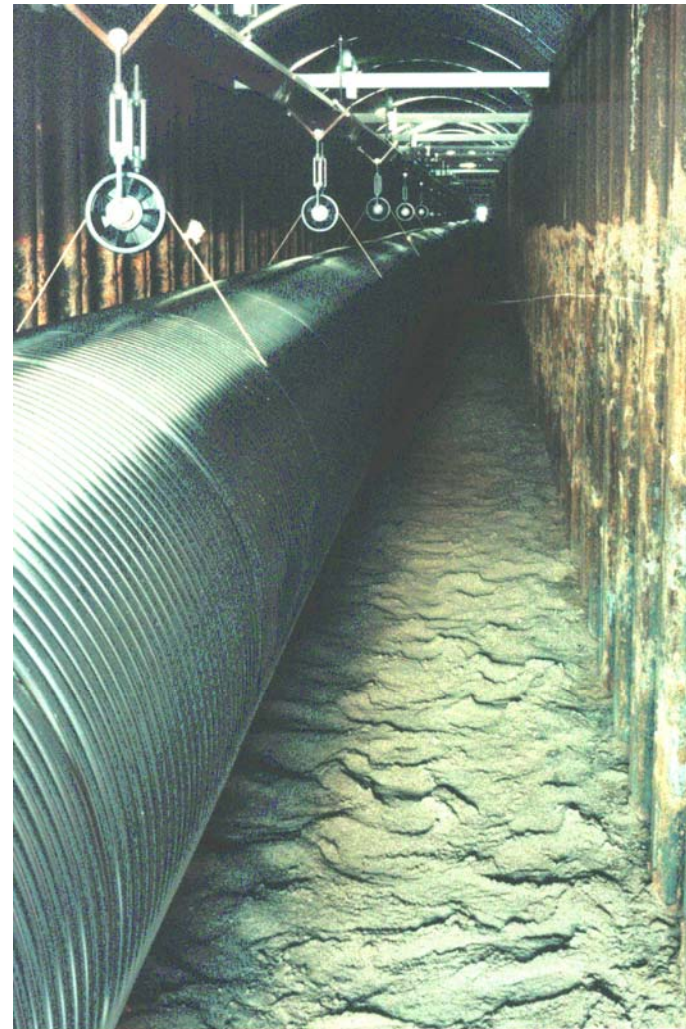


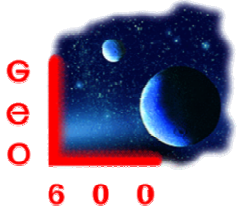
Central Building





Tube / Trench

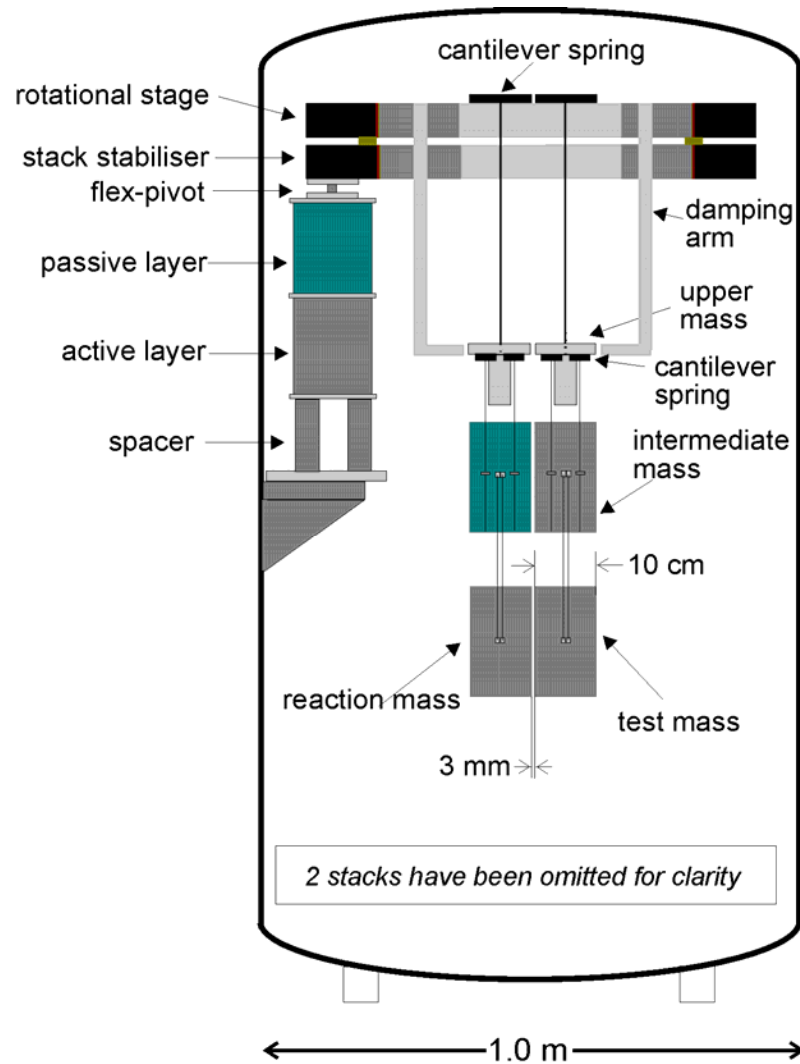
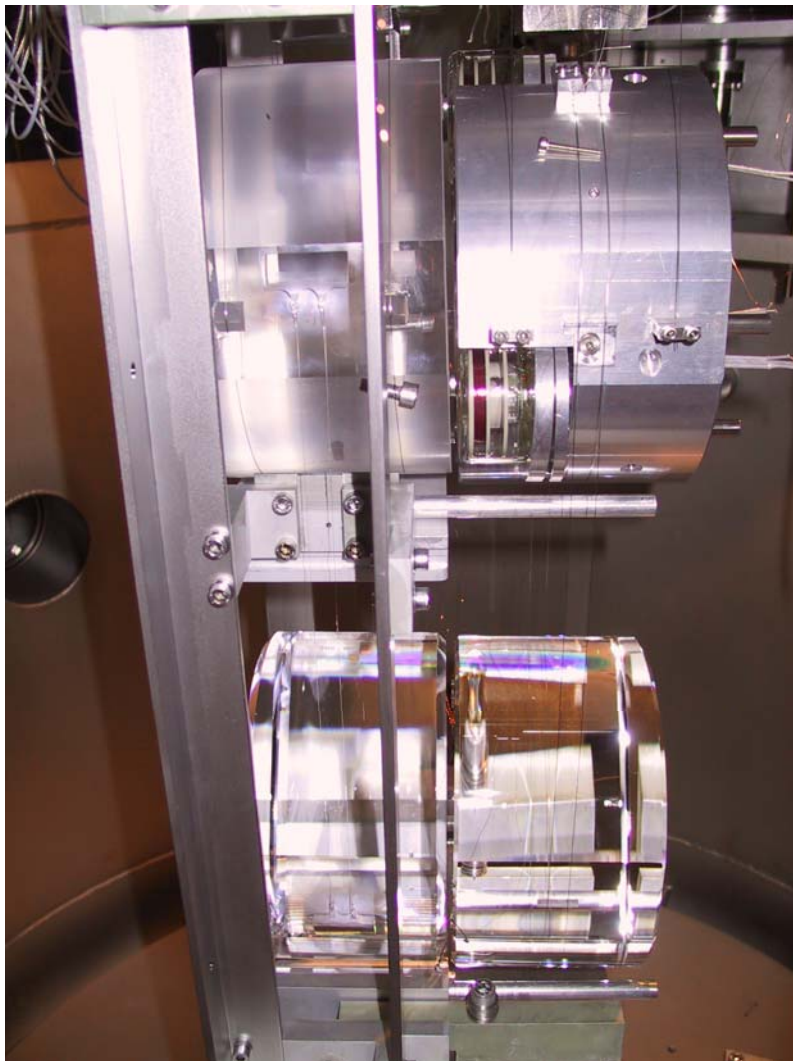




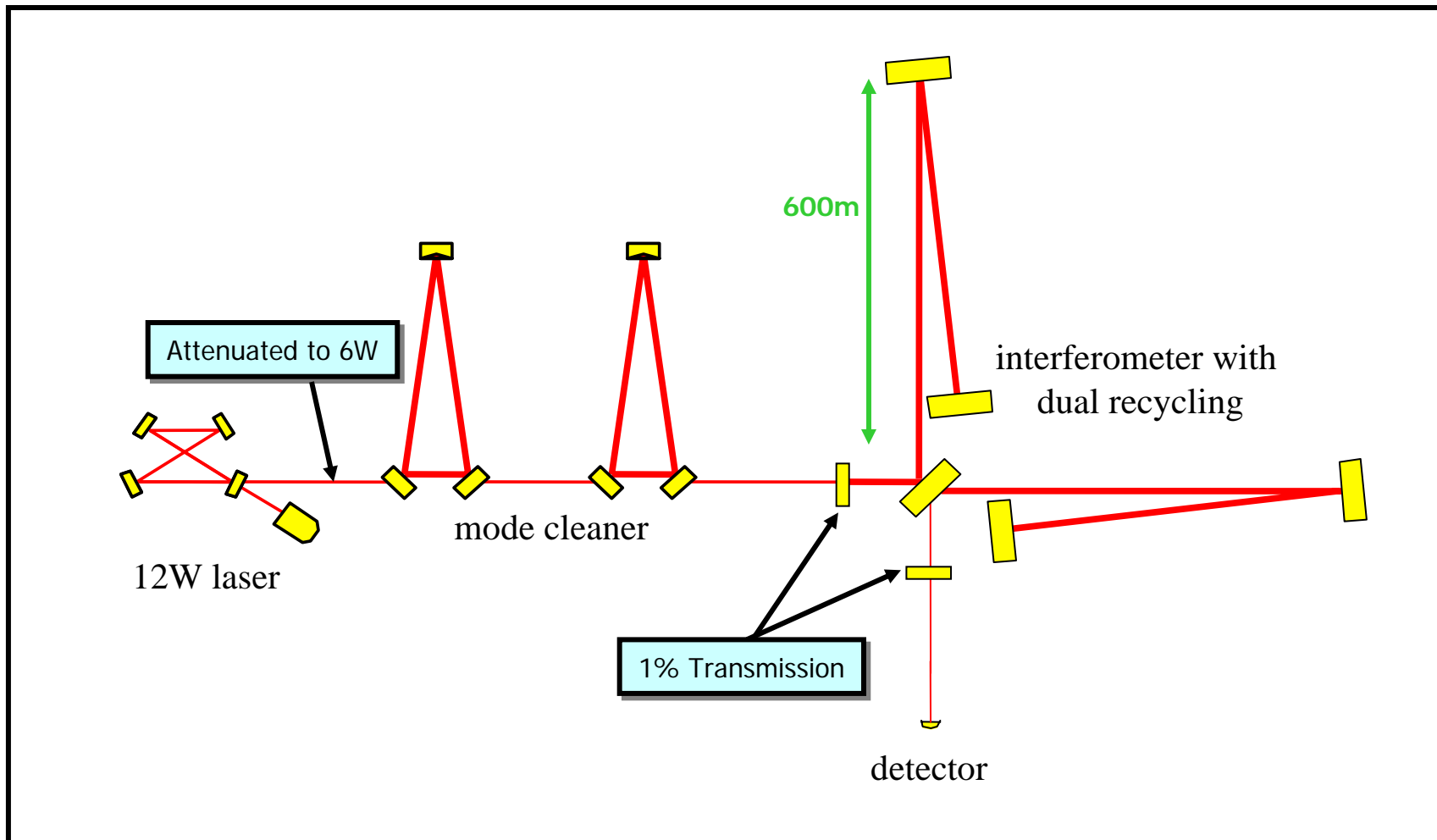
Clean Room / Control Room

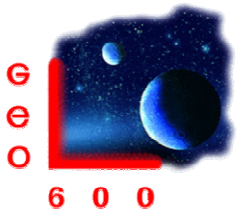


Reaction Pendulum

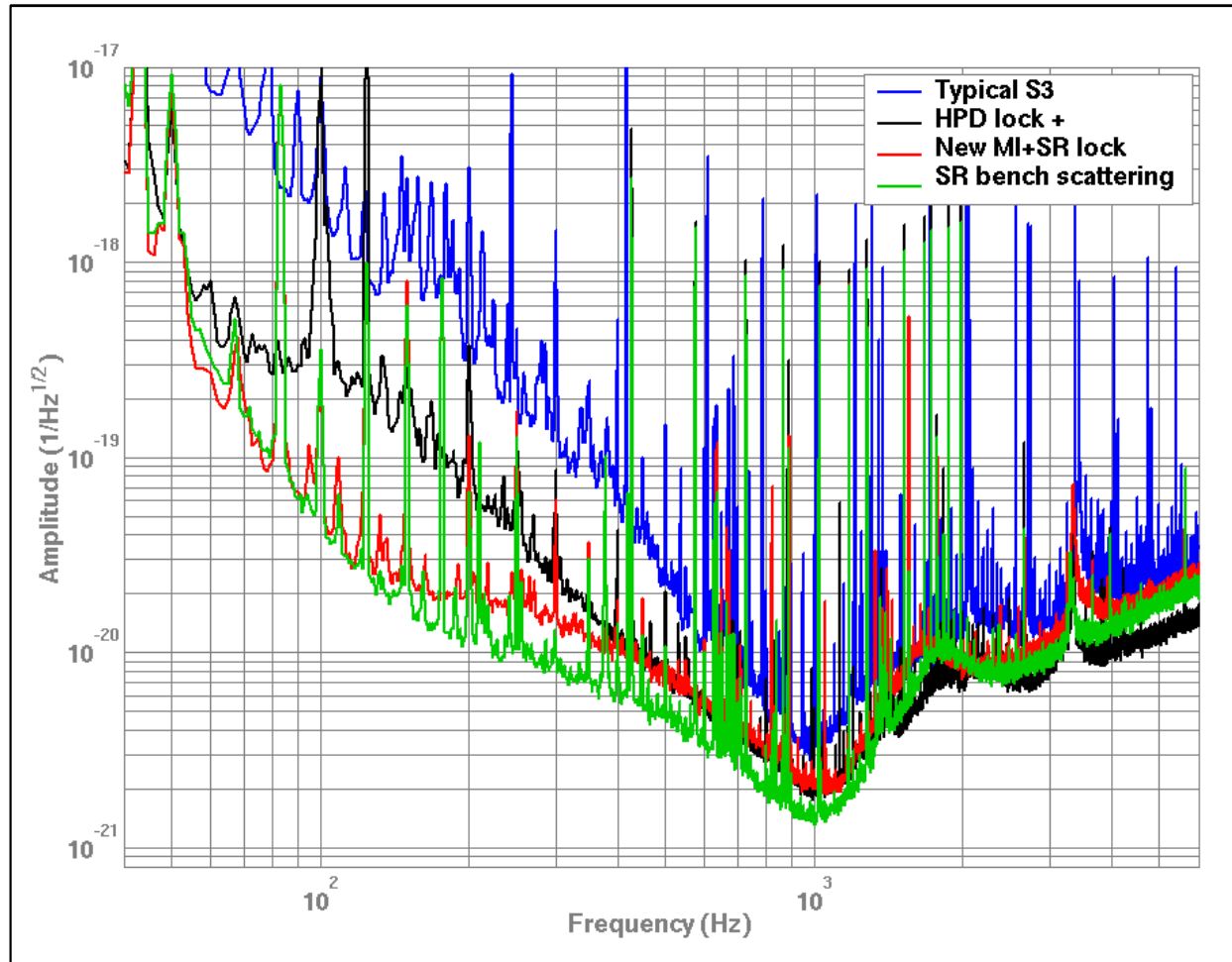


GEO600 optical layout





Sensitivity progress (highlights)



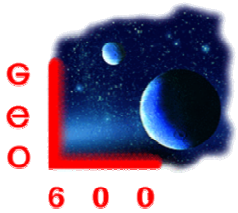
Typical S3

HPD lock +

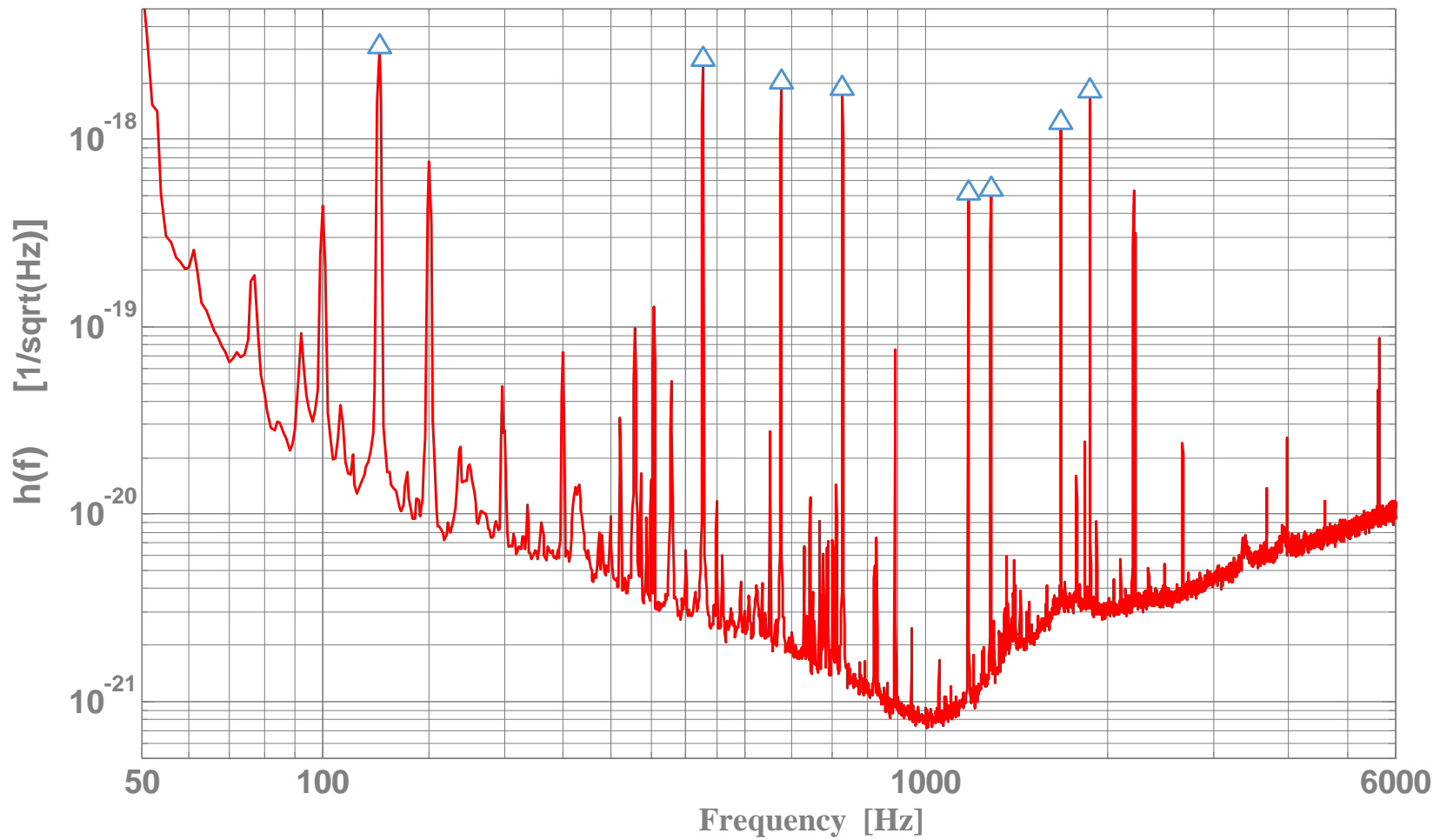
New MI+SR
servo

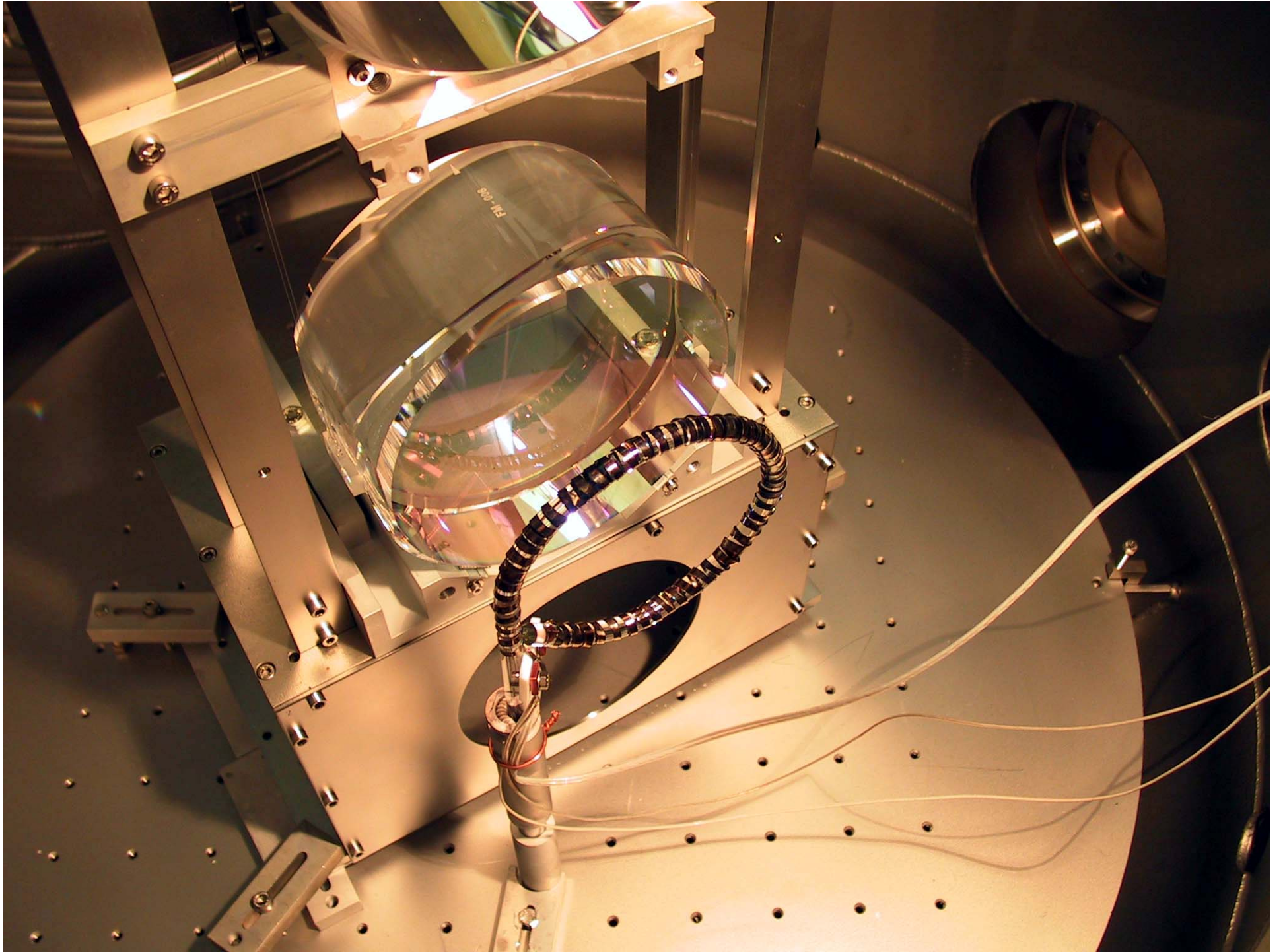
SR bench
scattering





Sensitivity – Jan 2005



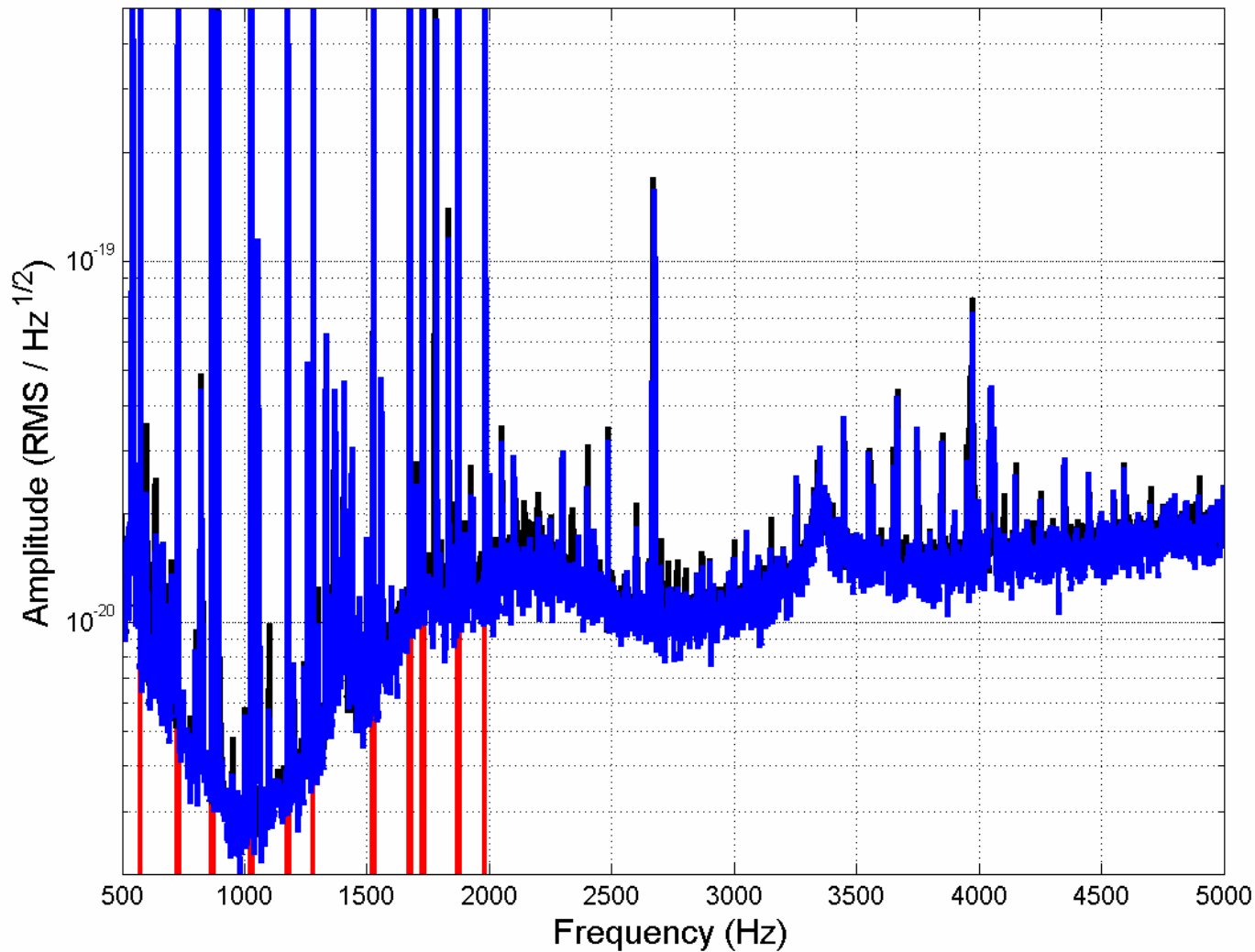


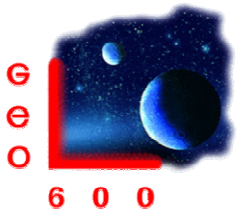


Sensitivity Change with Heater Power

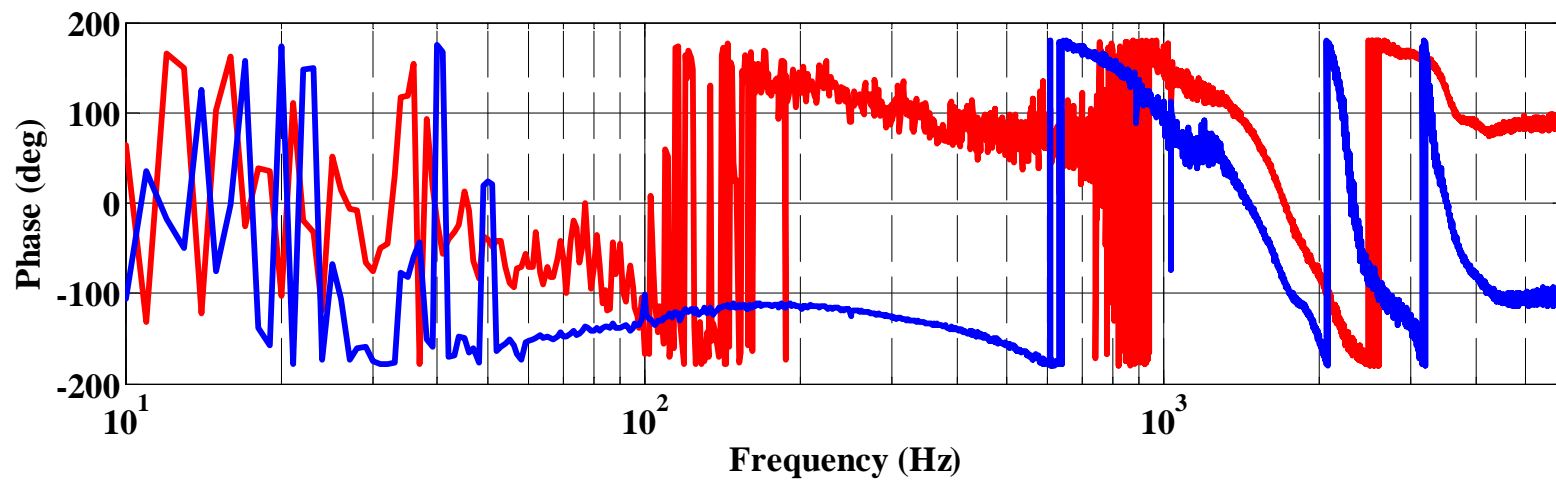
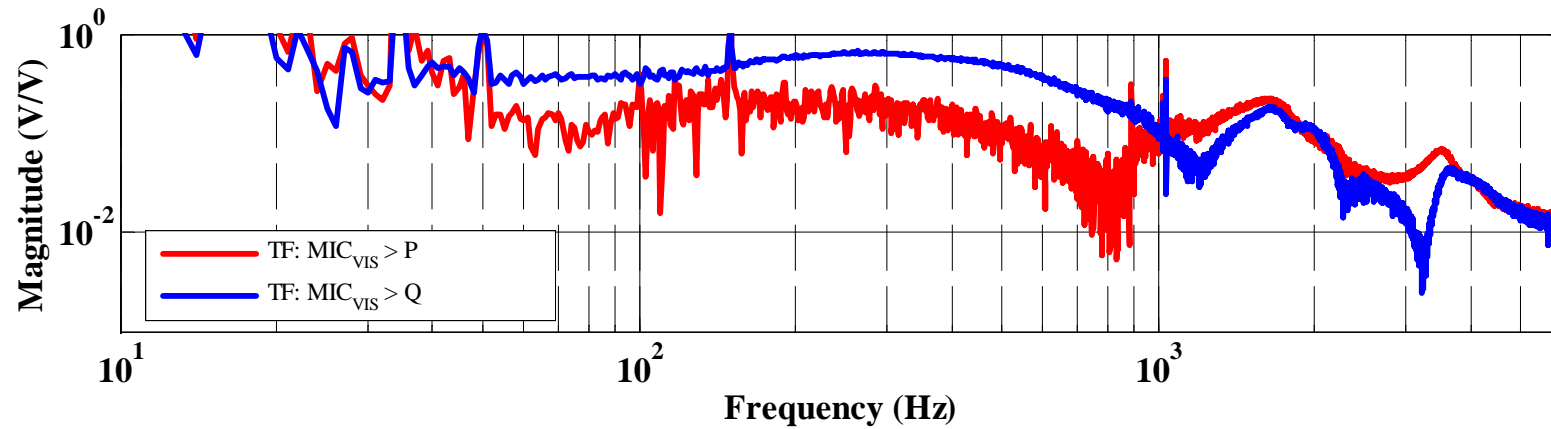


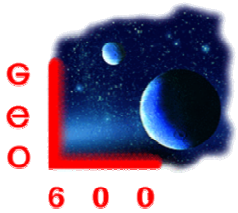
GPS start = 777890713 UTC start = 2004-08-30 08:45:00 nsecs = 30 avgs = 30 ENBW = 1.500



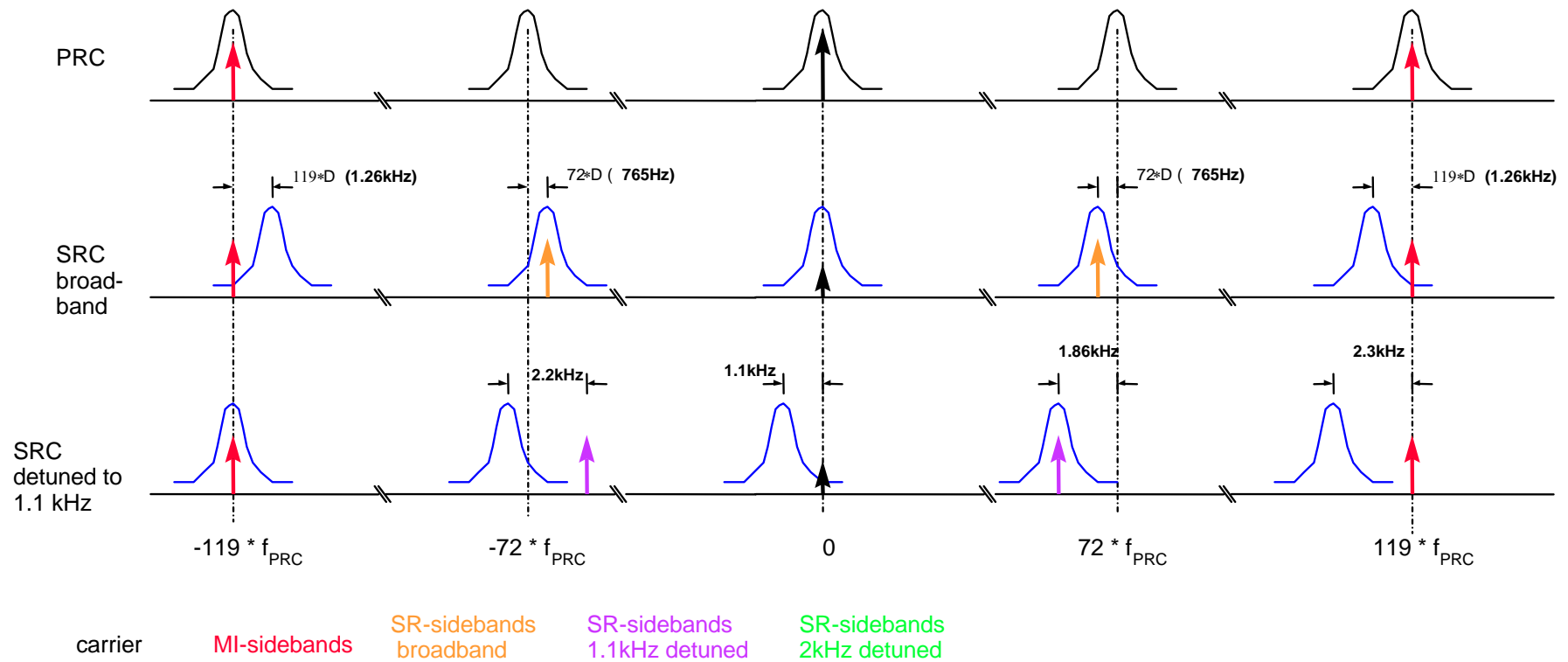


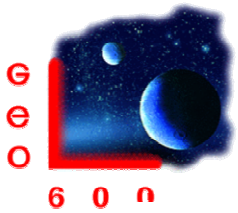
Amplitude Noise Coupling



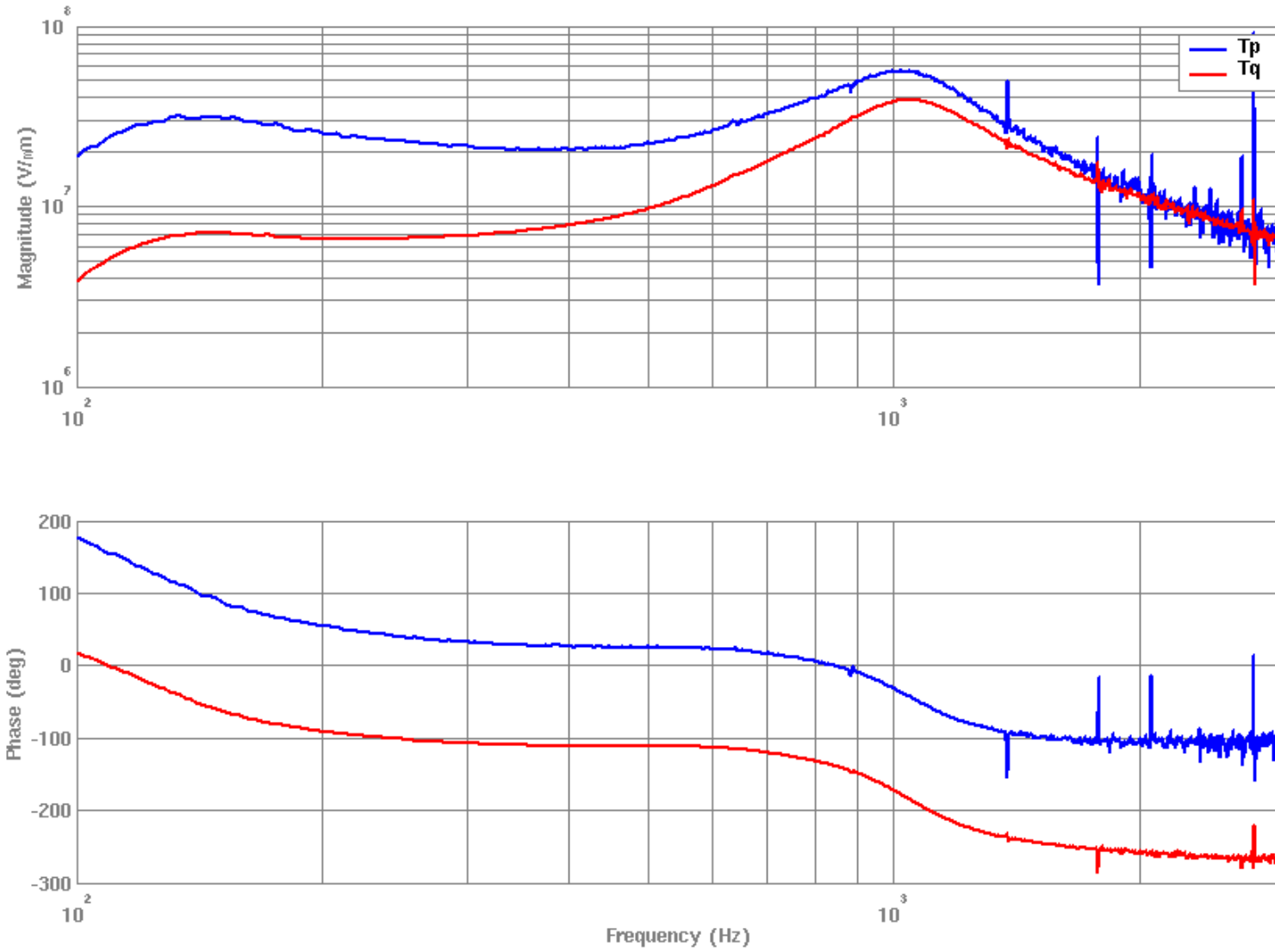


Unbalanced Sidebands

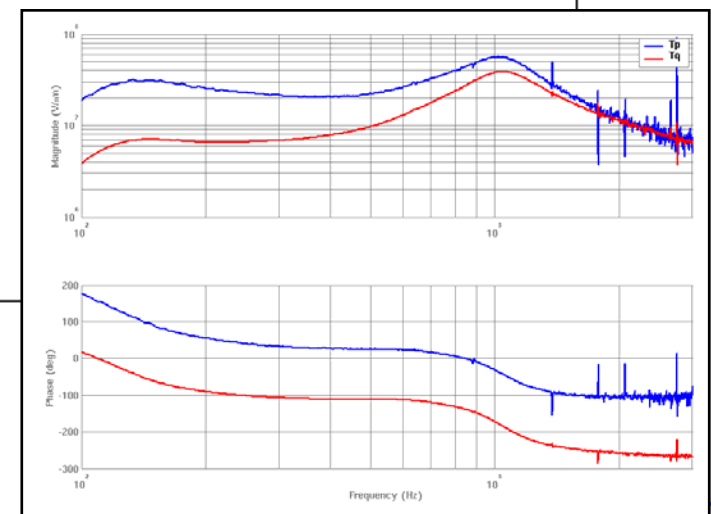
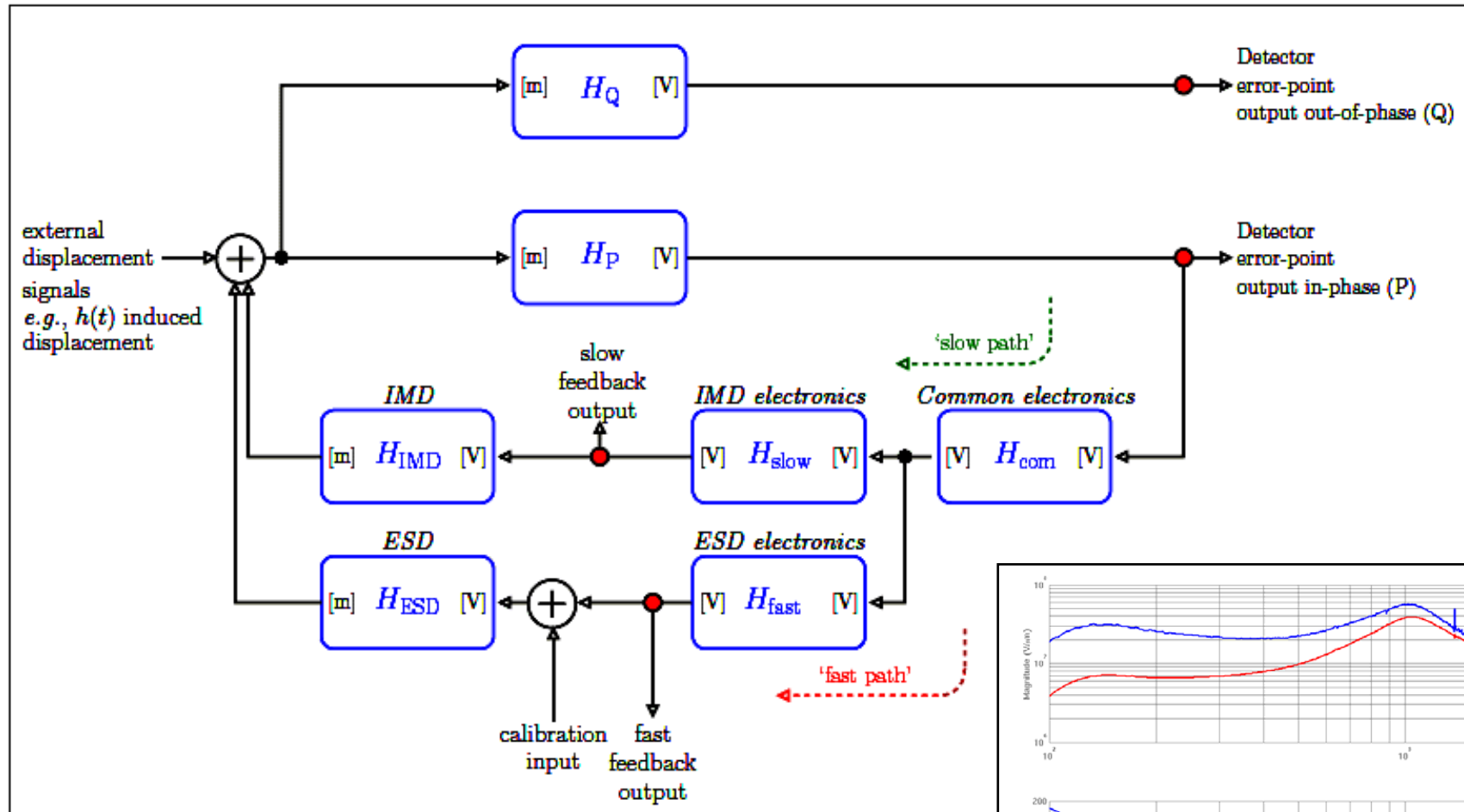


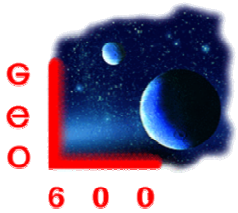


Optical Gain

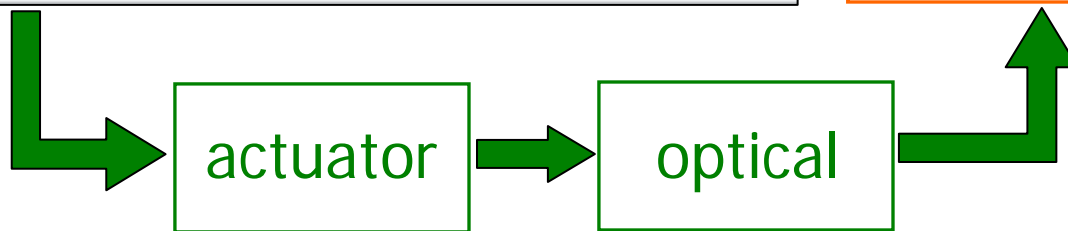
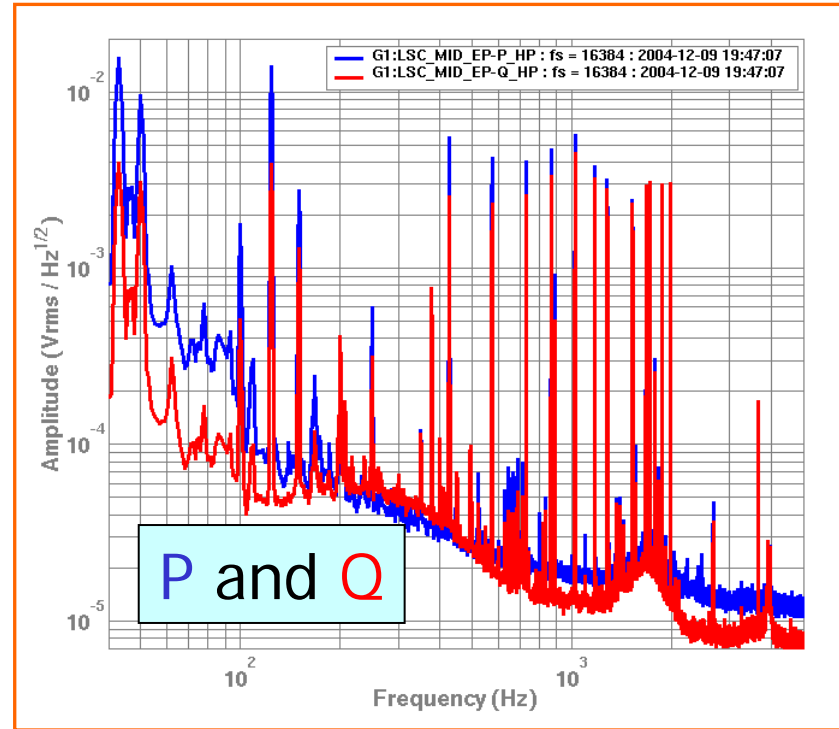
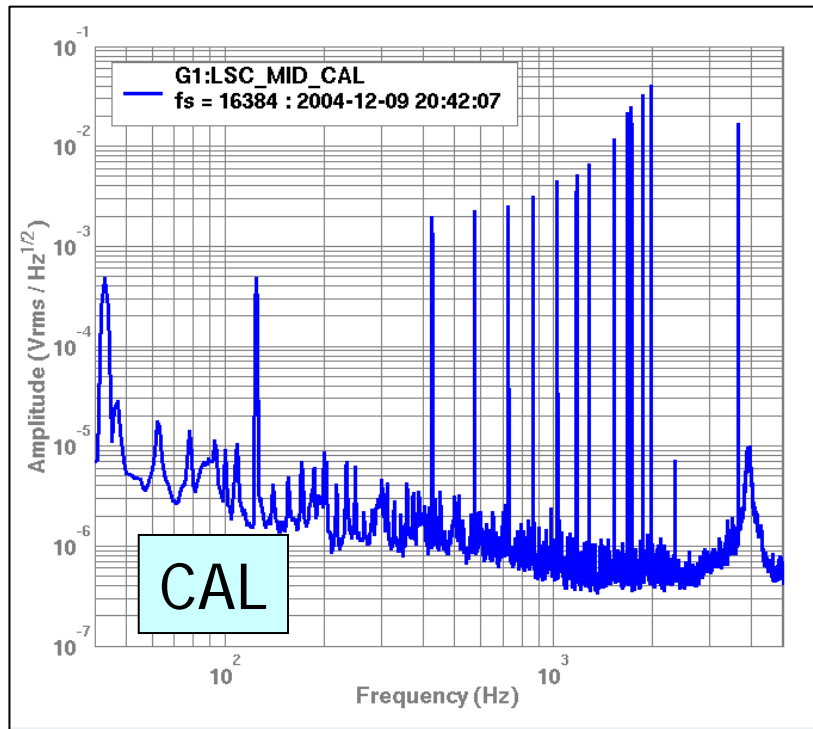


Calibration



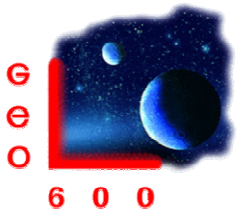


On-line optical TF measurements



$$T_{\text{measured } f} = \frac{\vec{P}_f}{\vec{C}_f E \vec{S} D_f},$$



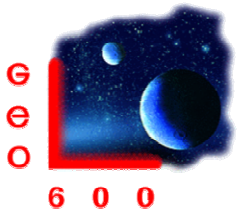


Calibration progress

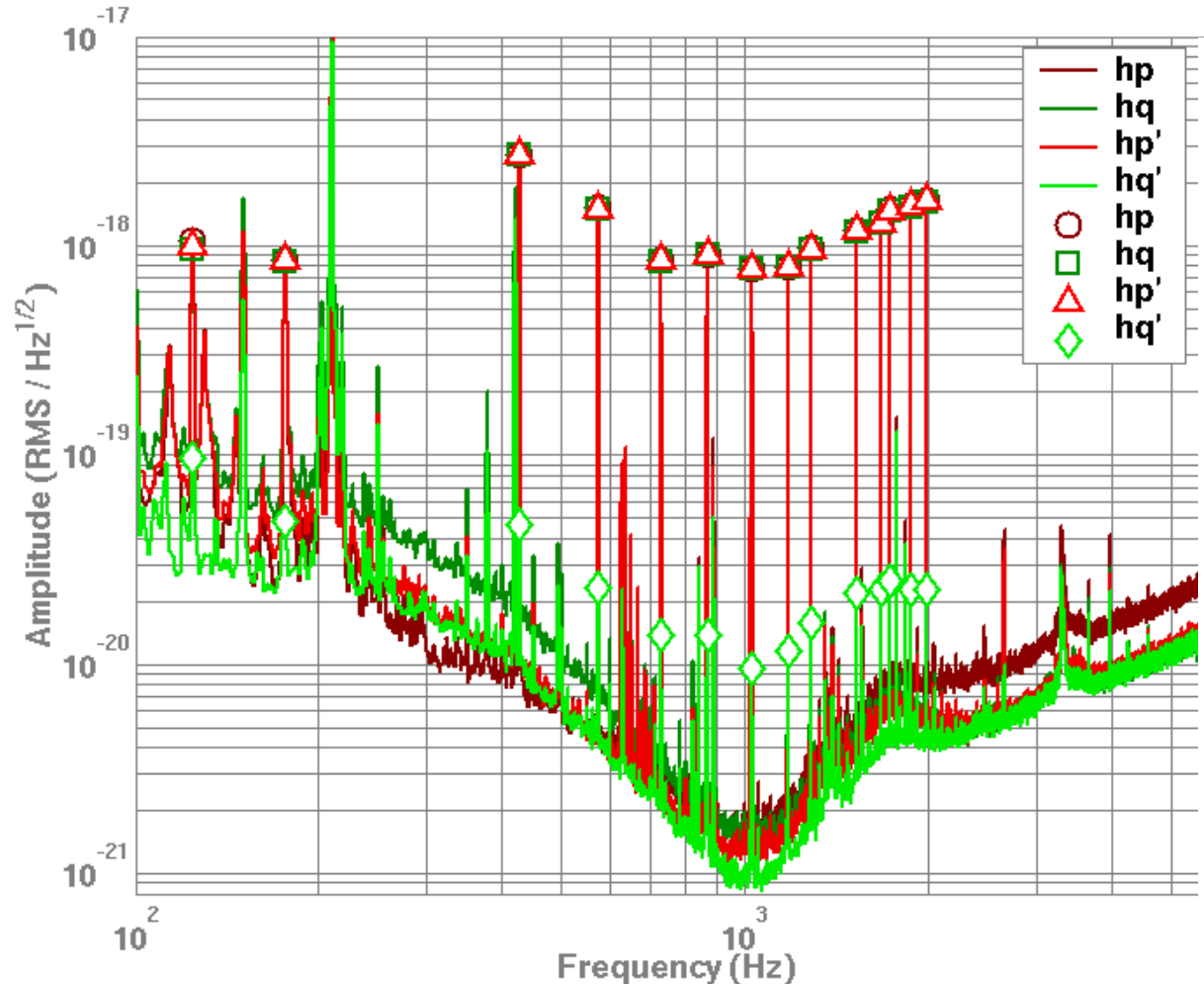


- On-line calibration of both output quadratures
HP and **HQ**
- Work on optimal combination is underway
- Estimation of optical parameters in real-time in control room
- On-line calibration leads to **overnight runs**



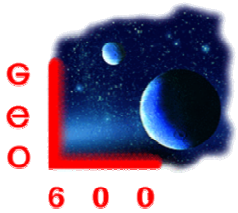


Combining HP and HQ - result

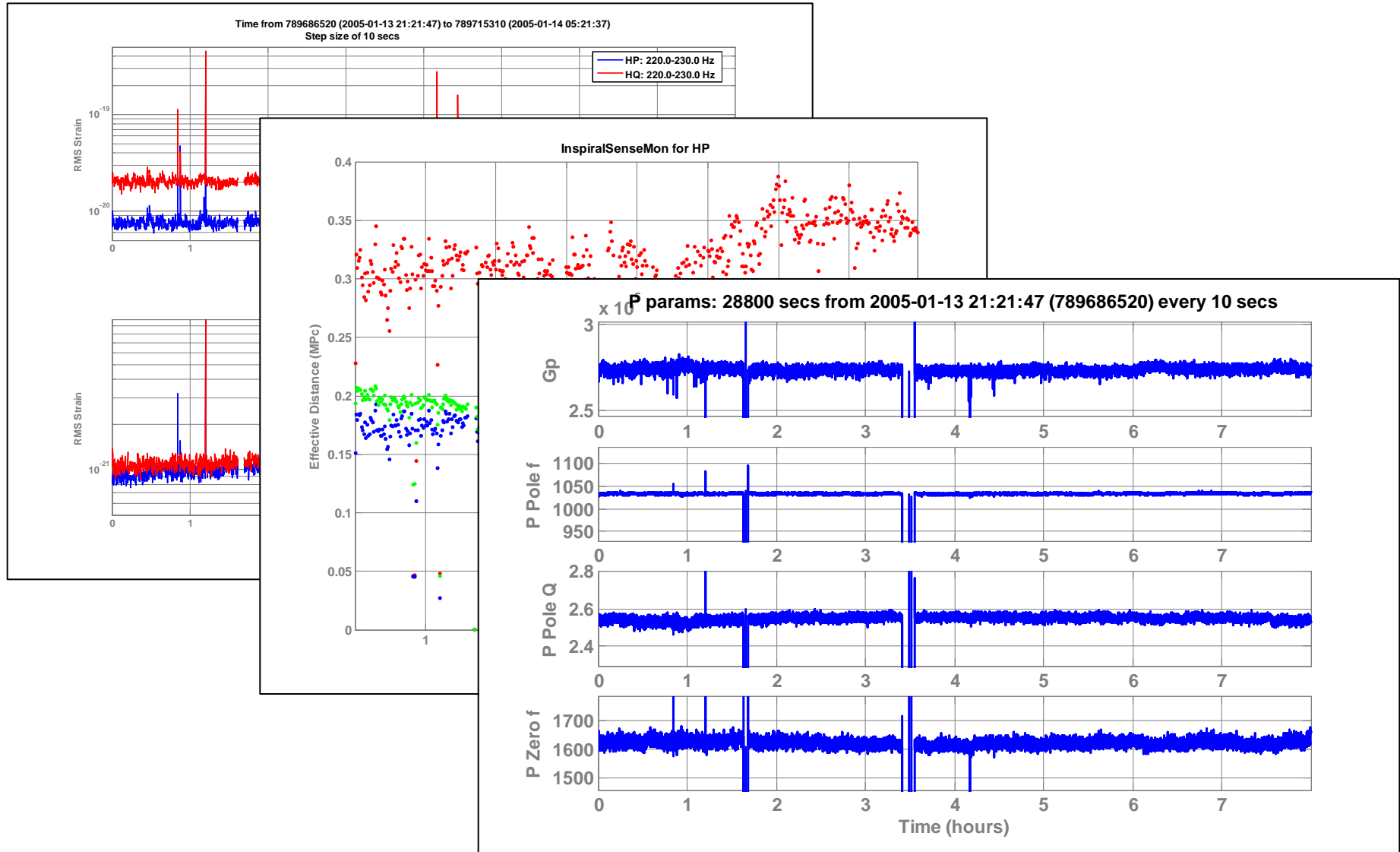


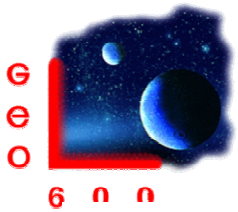
- HQ' contains almost no signal compared to HP'
- Where noise behaves like cal lines, we have apparent displacement
- Useful diagnostic for noise hunting (?)





Overnight Runs – Jan 14th

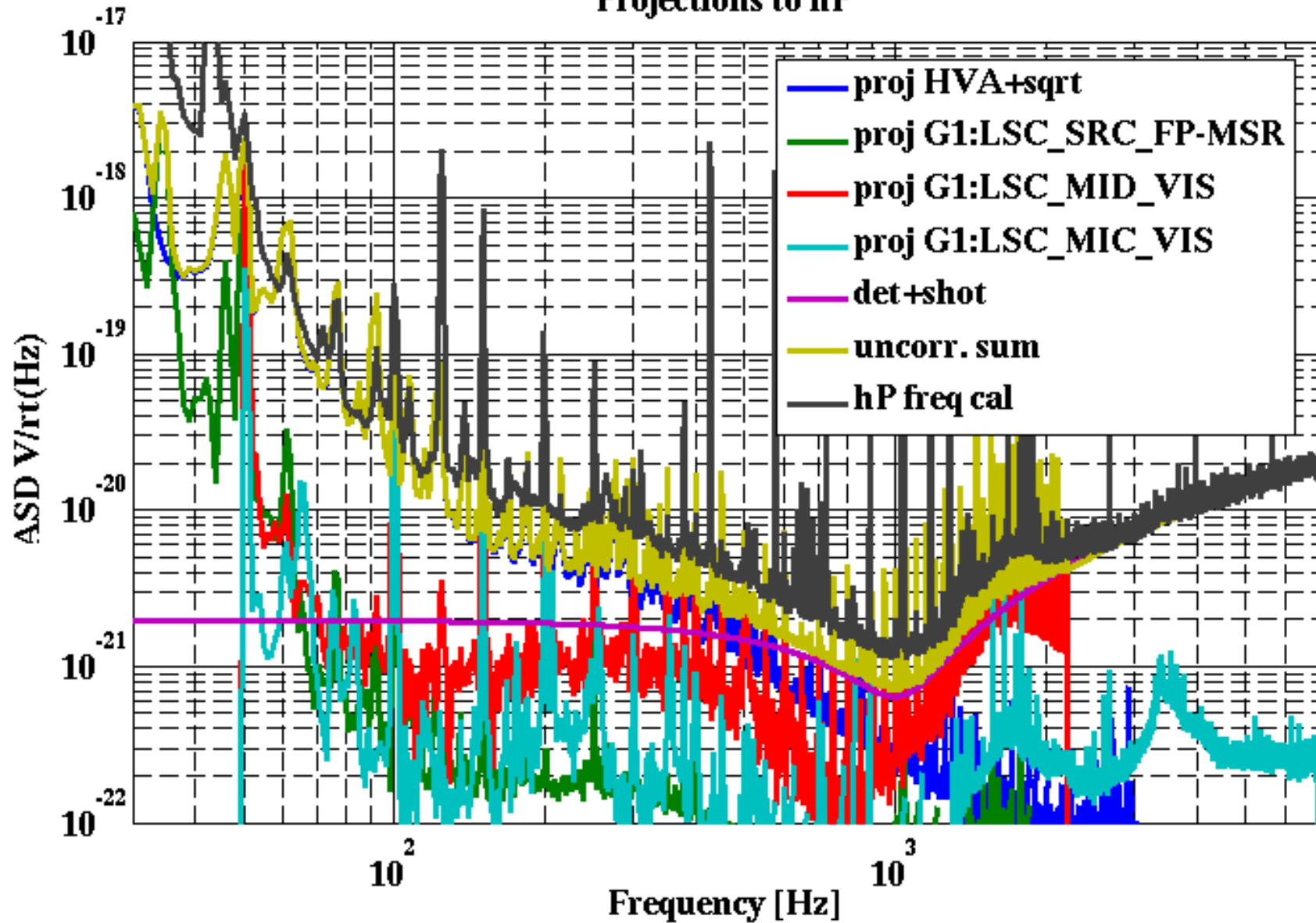


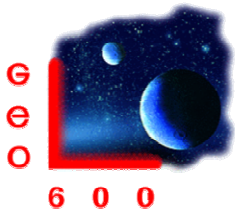


Noise Projections



Projections to hP





Summary & Outlook



- GEO600 runs with **dual-recycling** on large baseline detector including calibration
- **sensitivity improved** by two orders of magnitude since S3-I
- data taking over night and on weekends with high duty cycle
- next steps:
 - LSC–S4 science run
 - increase injected **power**
 - increase power recycling gain
 - improve noise models and **increase sensitivity**
 - convert GEO into **observatory**
- GEO-HF



