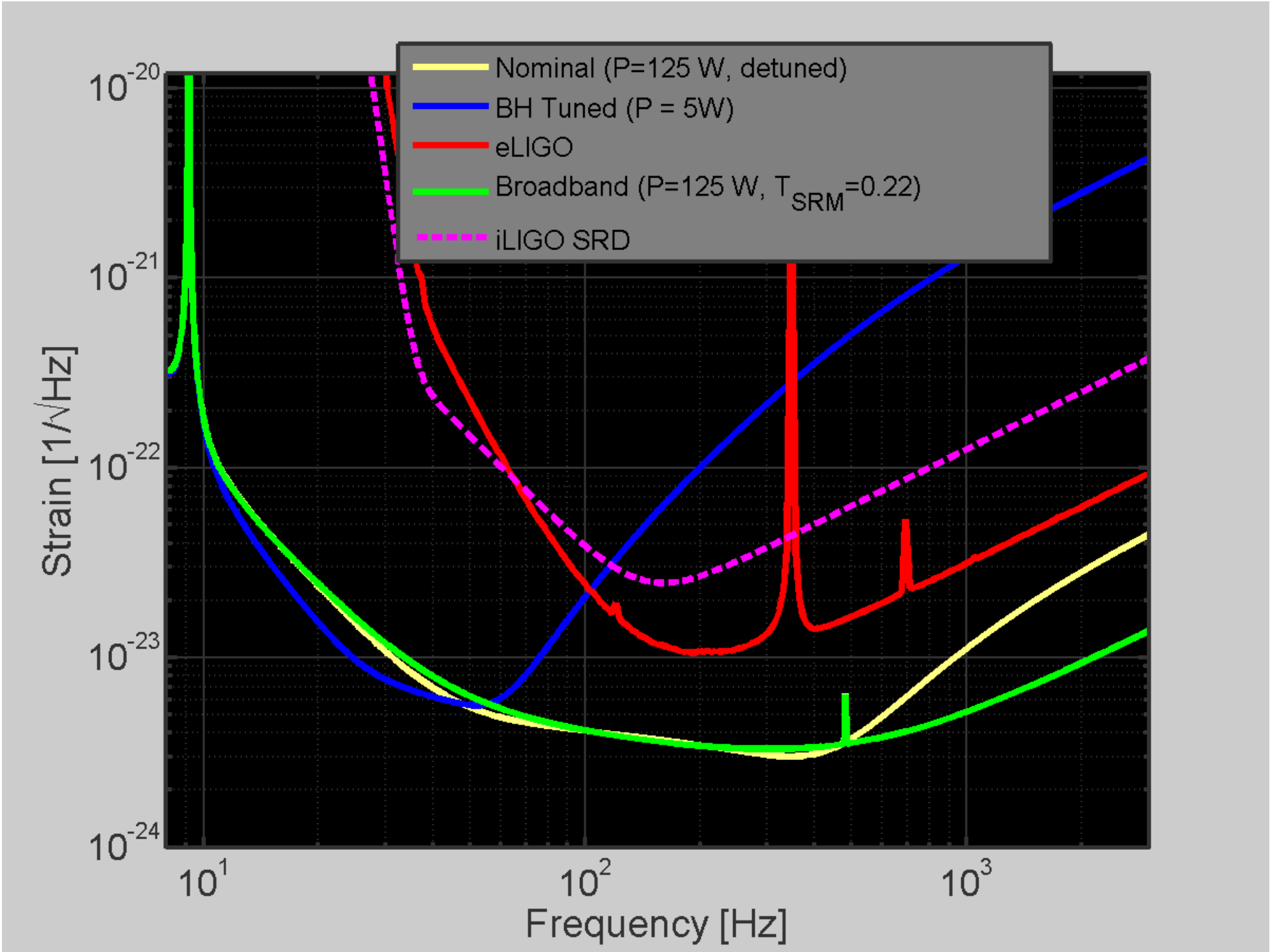
Enhanced LIGO Update

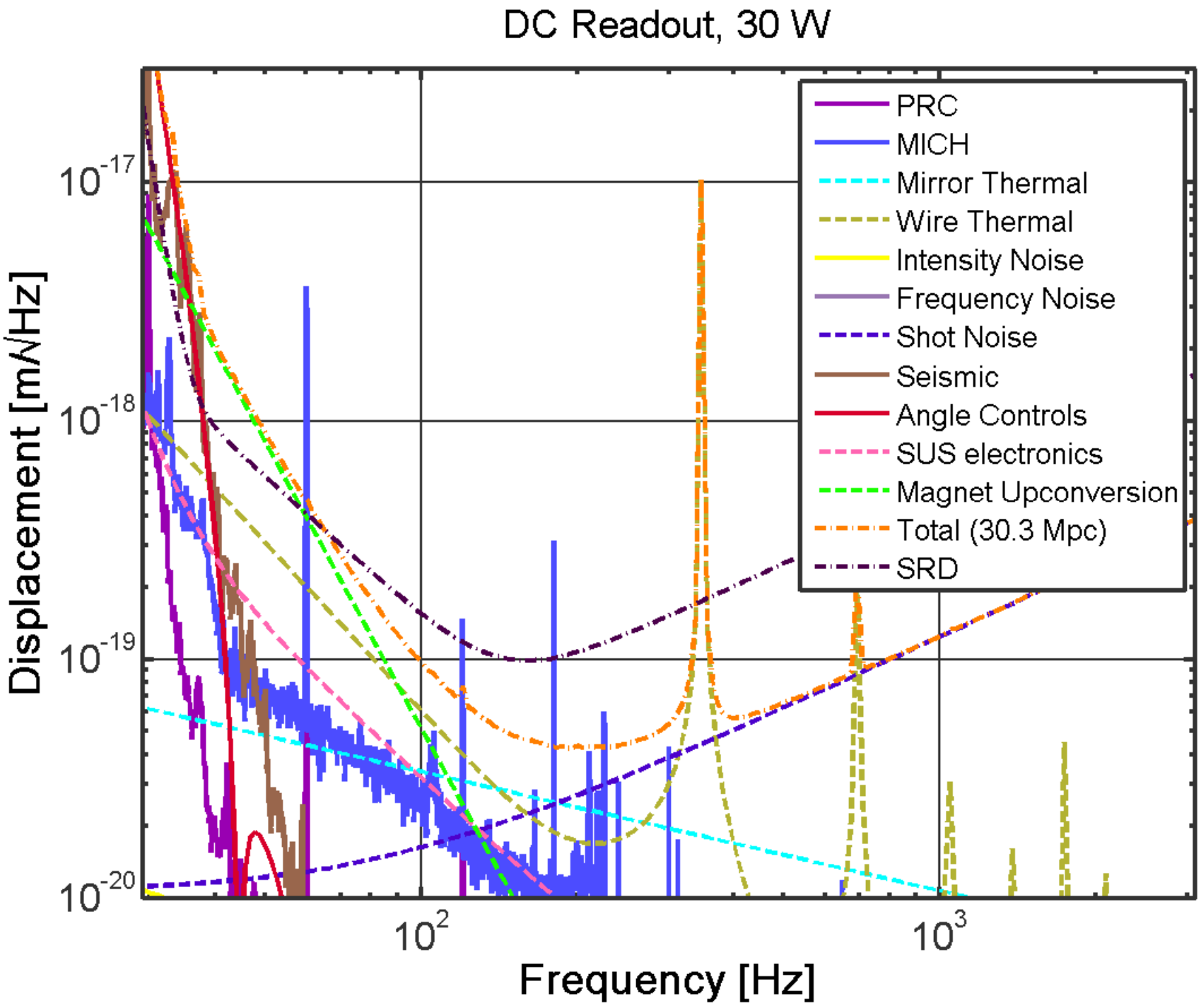
http://ilog.ligo-wa.caltech.edu:7285/mLIGO

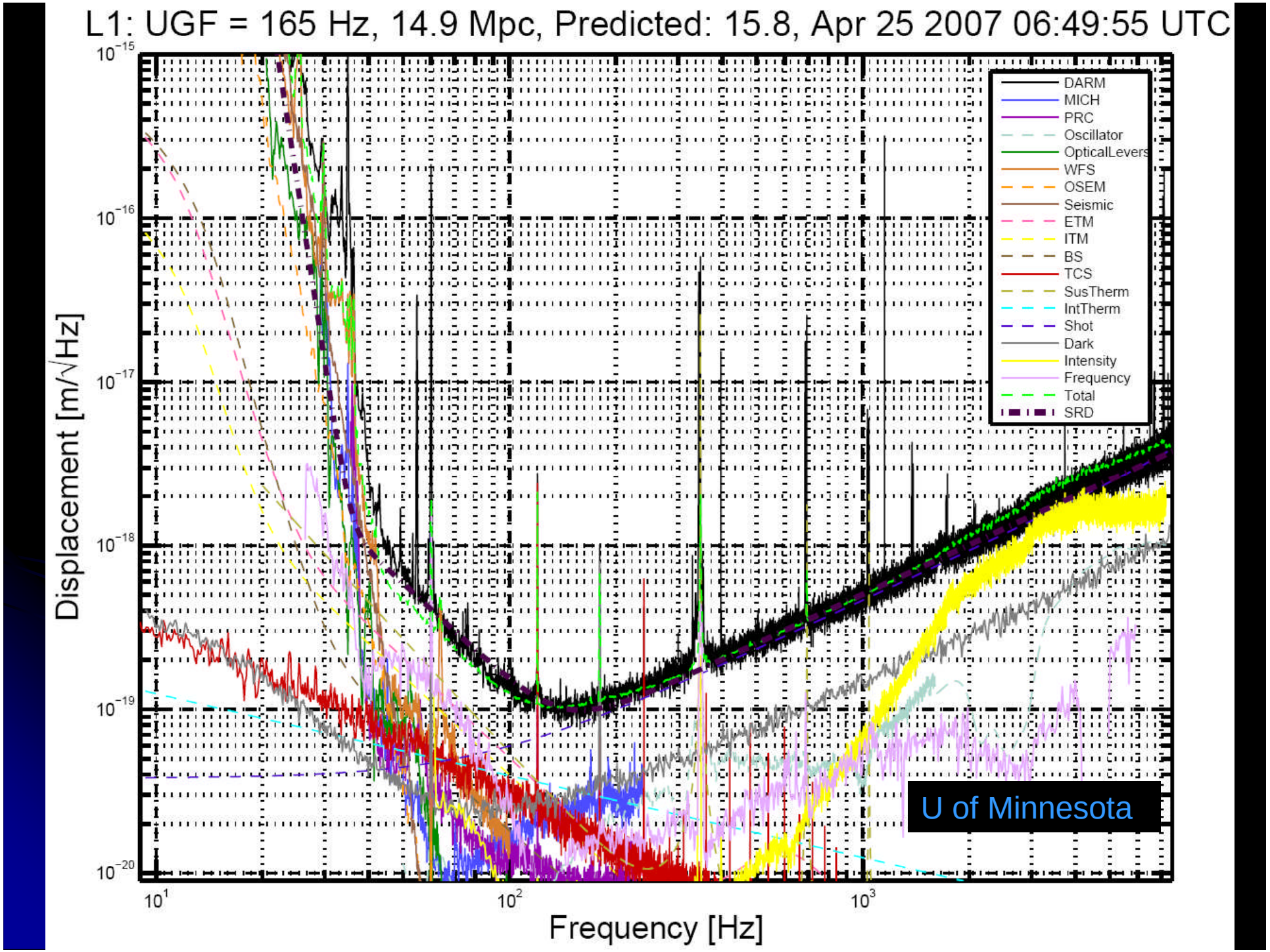
Rana Adhikari

July ’07 LSC Meeting

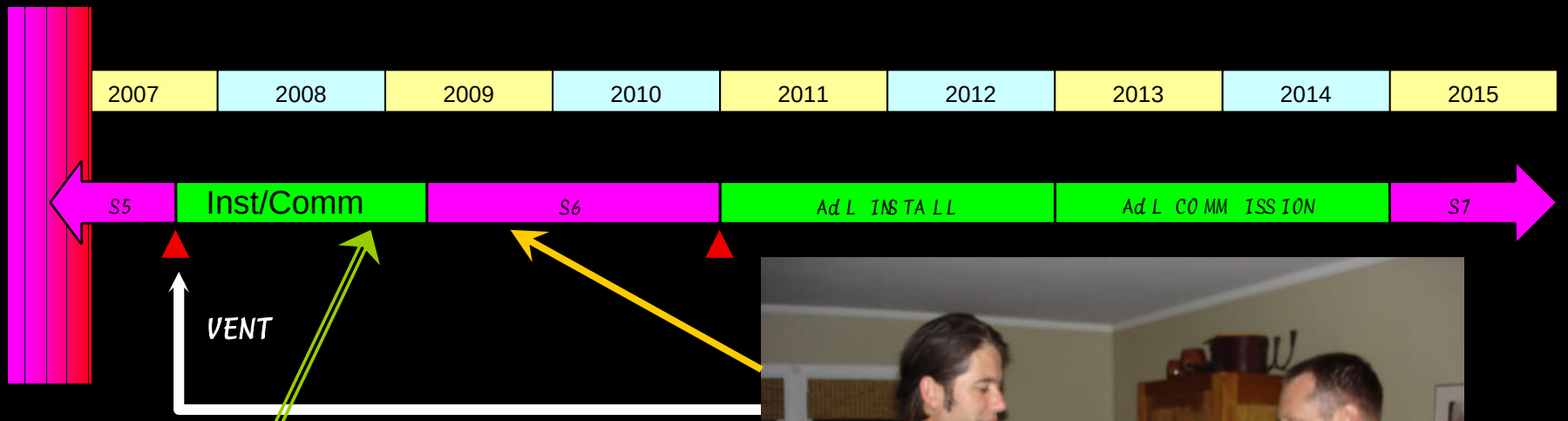
G070550-00-I

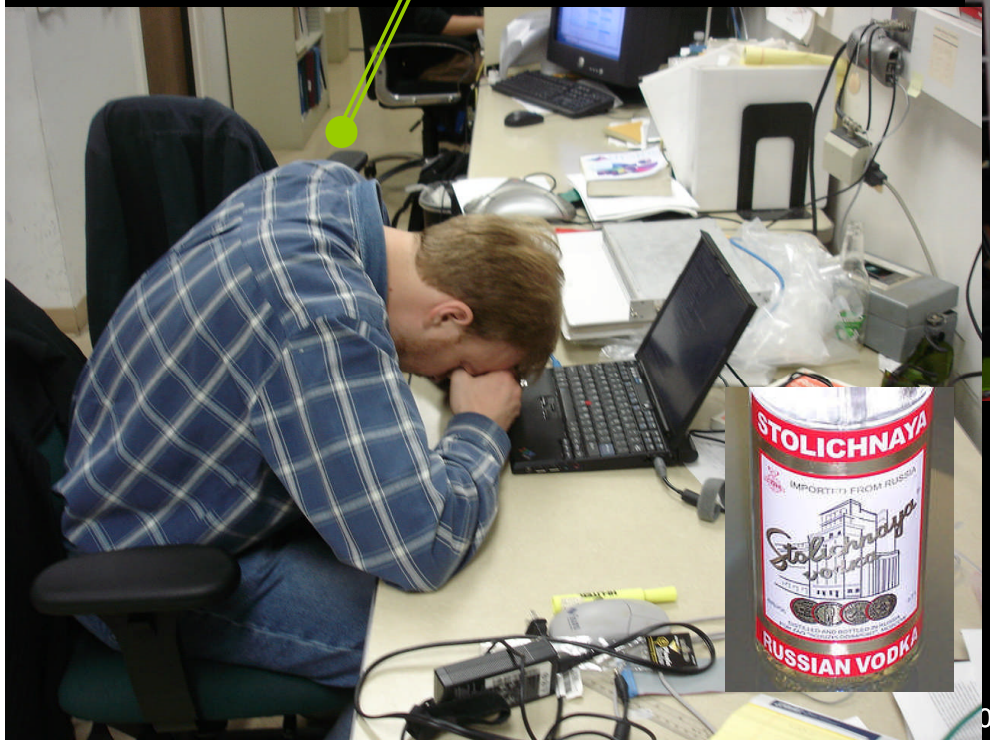

Nominal (P=125 W, detuned)
BH Tuned (P = 5W)
eLIGO
Broadband (P=125 W, T_SRM=0.22)
iLIGO SRD
10^-20
10^-21
10^-22
10^-23
10^-24
Strain [1/√Hz]
10^1
10^2
10^3
Frequency [Hz]


DC Readout, 30 W
Displacement [m/√Hz]
Frequency [Hz]
10^-17
10^-18
10^-19
10^-20
10^2
10^3
PRC
MICH
Mirror Thermal
Wire Thermal
Intensity Noise
Frequency Noise
Shot Noise
Seismic
Angle Controls
SUS electronics
Magnet Upconversion
Total (30.3 Mpc)
SRD


L1: UGF = 165 Hz, 14.9 Mpc, Predicted: 15.8, Apr 25 2007 06:49:55 UTC
Displacement [m/√Hz]
Frequency [Hz]
DARM
MICH
PRC
Oscillator
OpticalLevers
WFS
OSEM
Seismic
ETM
ITM
BS
TCS
SusTherm
IntTherm
Shot
Dark
Intensity
Frequency
Total
SRD
U of Minnesota

Timeline





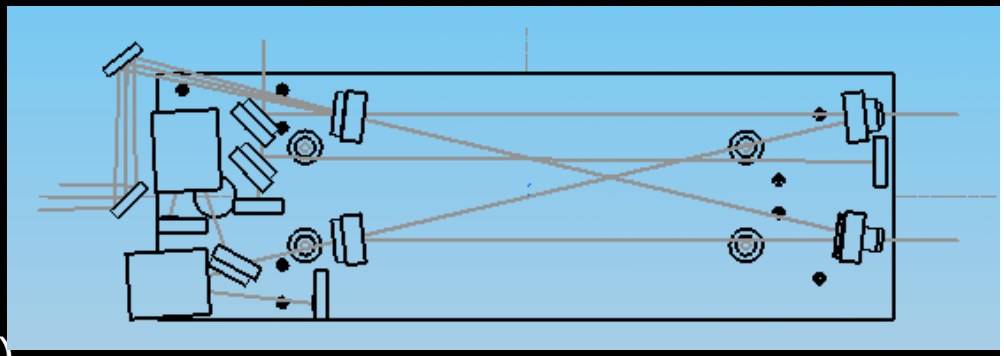
, L1
hase'

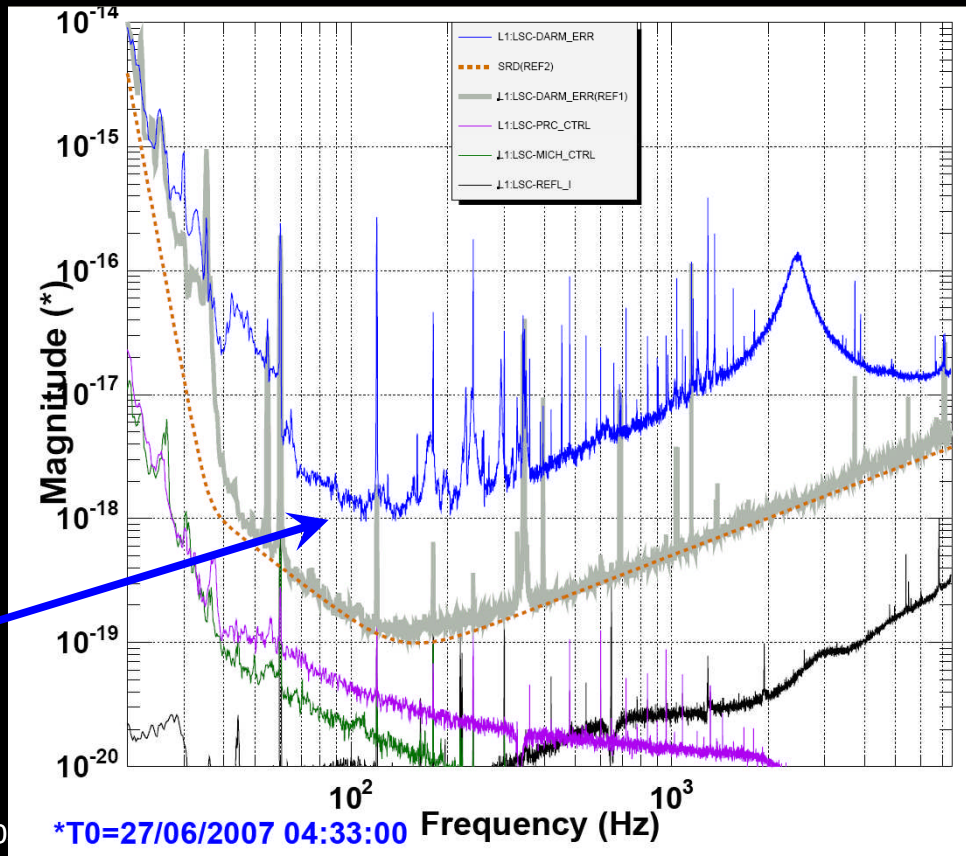
est
hase'

- Continue leapfrog commissioning w/both instruments completed to reach design sensitivity

DC Readout

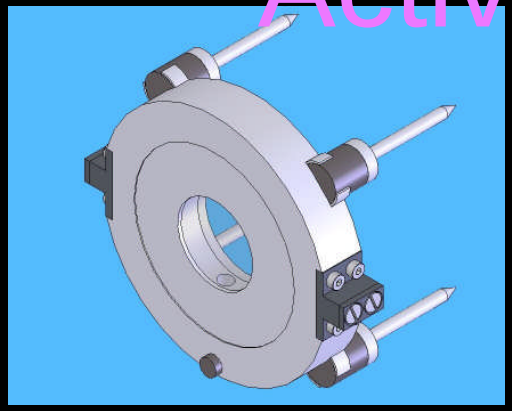
- In-vac, DC detectors. No RF demodulation for GW. No more AS_Q.
- Hardware
  - **DC PDs** (Rich Abbott)
  - **O**utput **M**ode **C**leaner (Sam W.)
  - Active Beam Stabilization (Bram S.)
  - OMC Suspension (Norna, Janeen, Chris, etc.)
  - **S**tiff **HAM** (B. Lantz, ...)
  - Diode Testing (Nick Smith, Jamie Rollins)
- New AdvLIGO controls architecture (CDS)
- DC Readout Experiments
  - Caltech 40m (Rob Ward)
  - LLO (Rupal Amin, Valera, Sam, Rob)

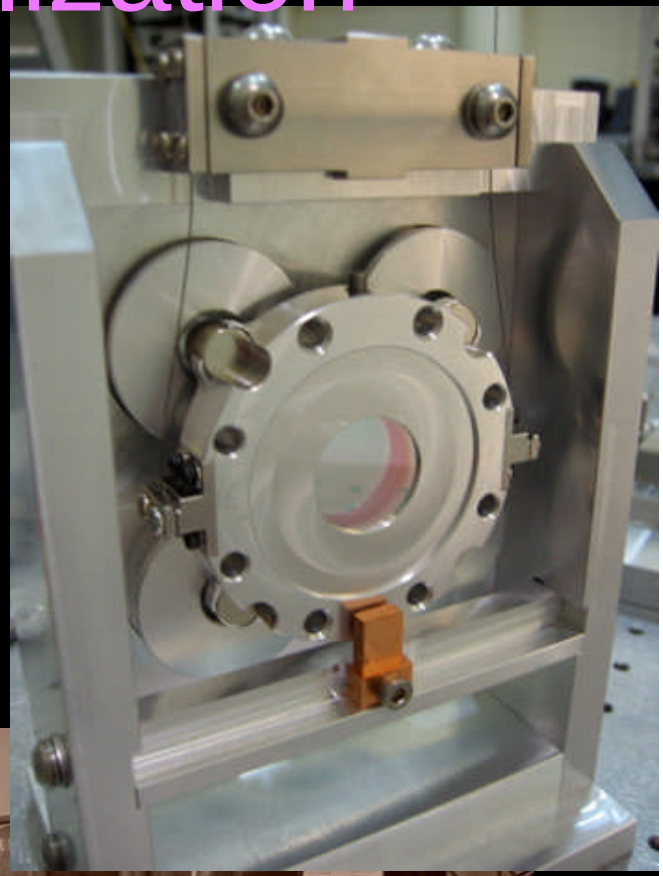




G070

Active Beam Stabilization

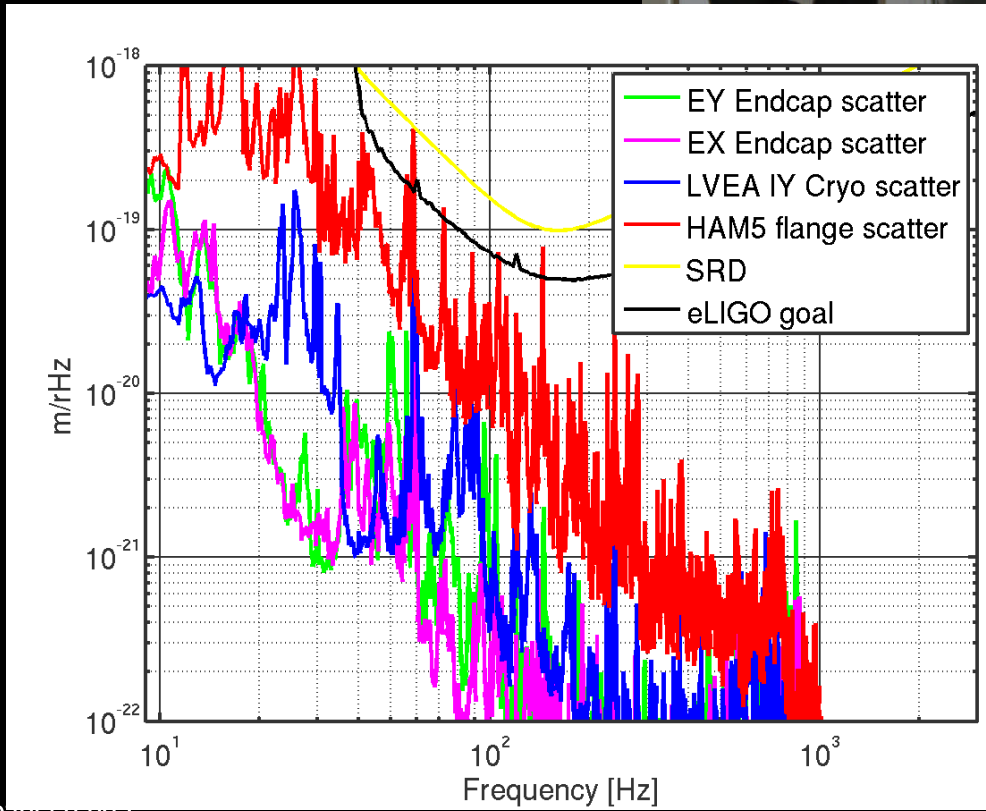




- Need serious jitter control to have good noise performance: in-vac, reliable -> ABS
- Like a iLIGO SOS but smaller and tougher
- Led by Bram Johannes Jozef Slagmolen @ ANU
- Pendulum freqs ~few Hz; passive isolation
- Large Range (> 10 mrad & ~1 N/A)
- Enables dither lock of IFO beam to suspended OMC
- Dither software tested at 40m

Scattered Light

- iLIGO baffles were never installed, holes are incompatible (TCS, P-Cal)
- Schofield/O'Reilly measurements show coupling from VE (10^{-11}-10^{-9} m/m)
- Design/Fab/Install new baffles in all potential hot spots (aim for 100x clearance)



Misc

- 35 W Laser from LZH/AEI is arriving at CIT soon – integration with iLIGO servos
- TCS (Tobin Fricke, Phil Willems) – ultra-low noise ISS pre-amp, servo electronics from MIT, 'Axicons' for making donut beams. Will have to retire the LHO Quiet Chillers and find room for the new ones.
- Earthquake Stops – New glass-top stops being developed at MIT to reduce earthquake induced charge buildup.
- SUS Electronics Noise reduction – bias modules, coil drivers, careful LOS alignment plan
- MC Loss – absorption measured at LLO by SURF, scatter loss still a problem.

Summary

- So far so good: no large schedule mishaps or technical walls.
- Enhanced Grad Students (Nick Smith, Rupal Amin, Tobin Fricke,...)