

State of the LIGO Lab



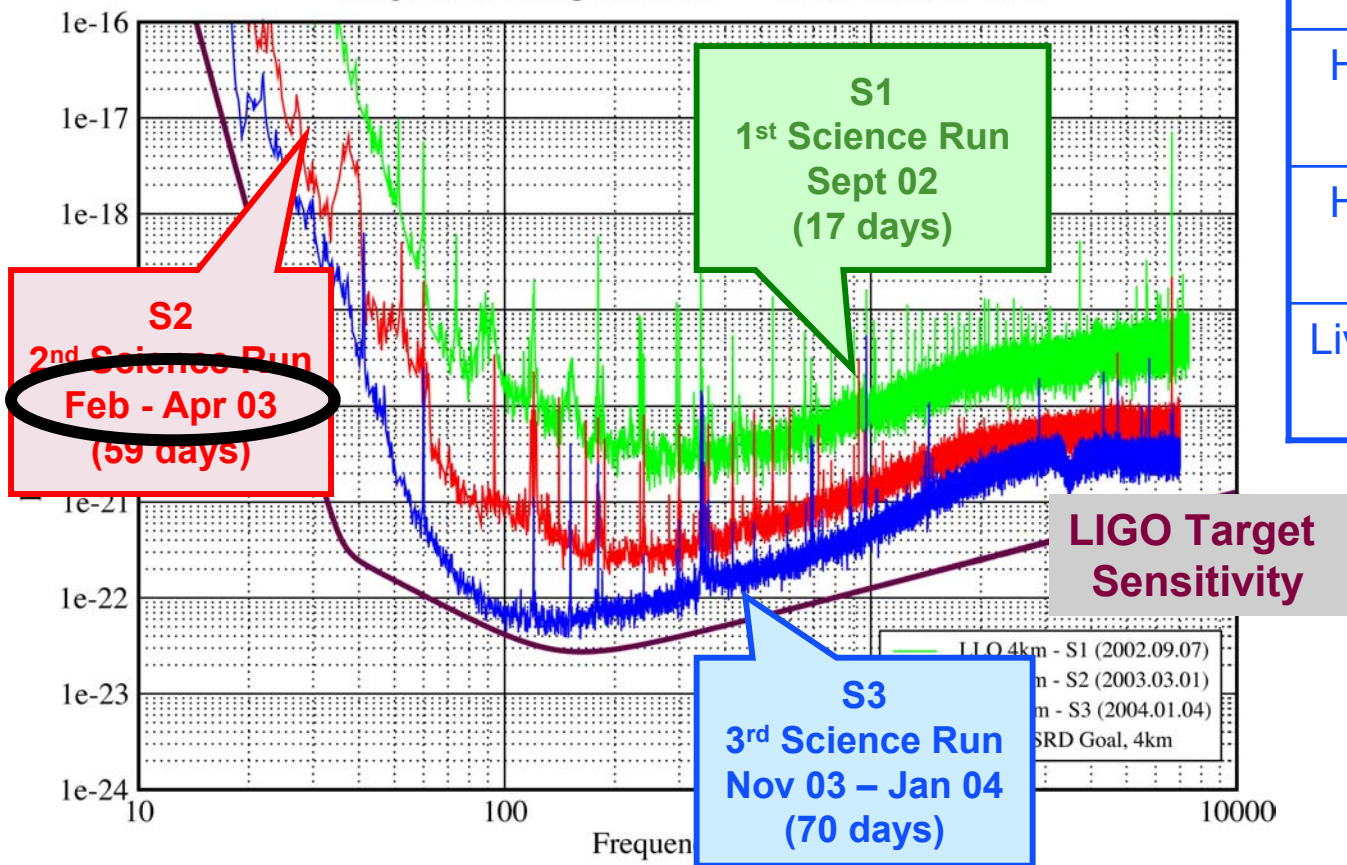
Stan Whitcomb

LSC meeting
Hanford

17 August 2004

Best Strain Sensivities for the LIGO Interferometers

Comparisons among S1, S2, S3 LIGO-G030548-02-E



S3 Duty Cycle

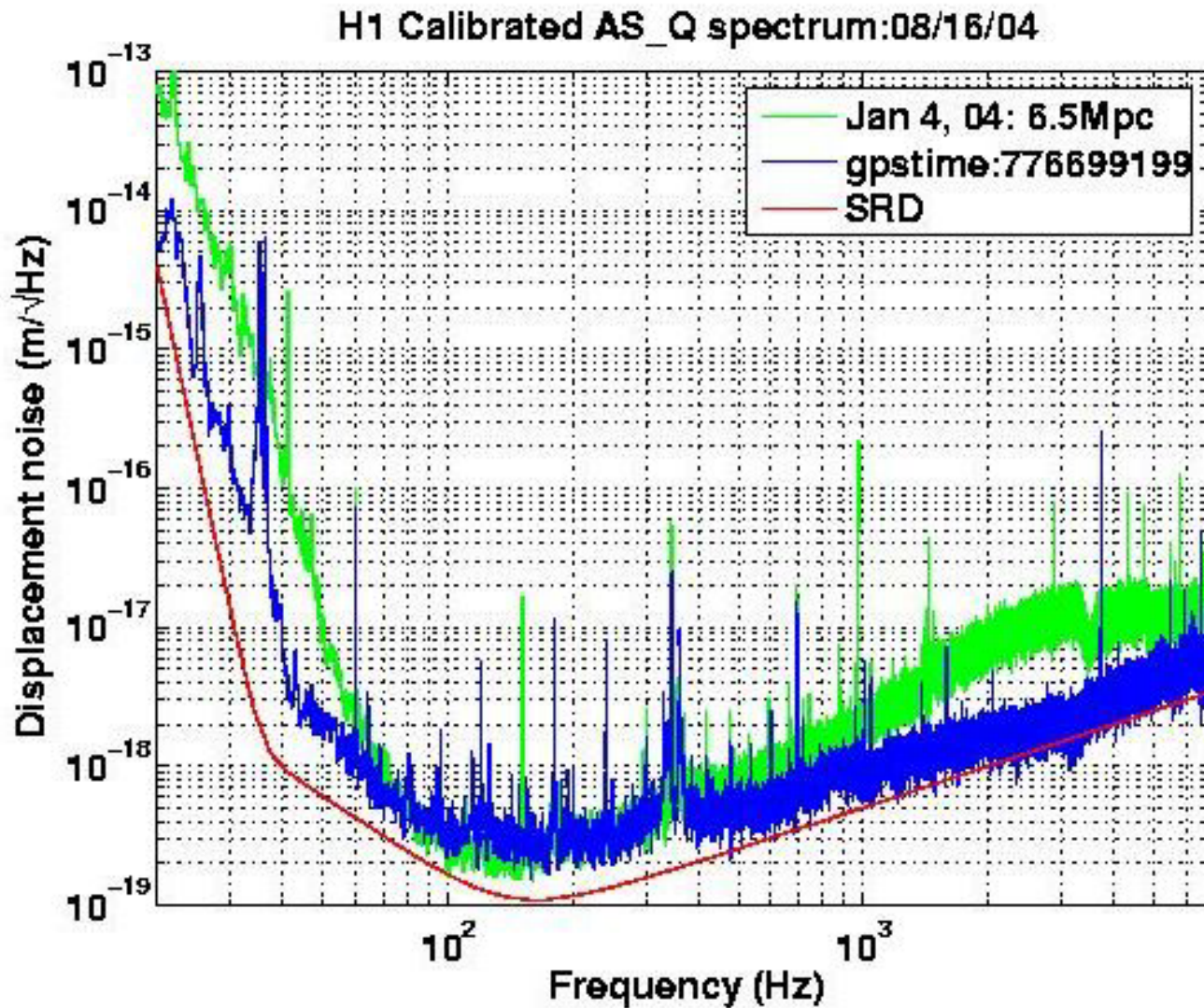
Hanford 4km	69%
Hanford 2km	63%
Livingston 4 km	22%*

Summary Science Run Metrics

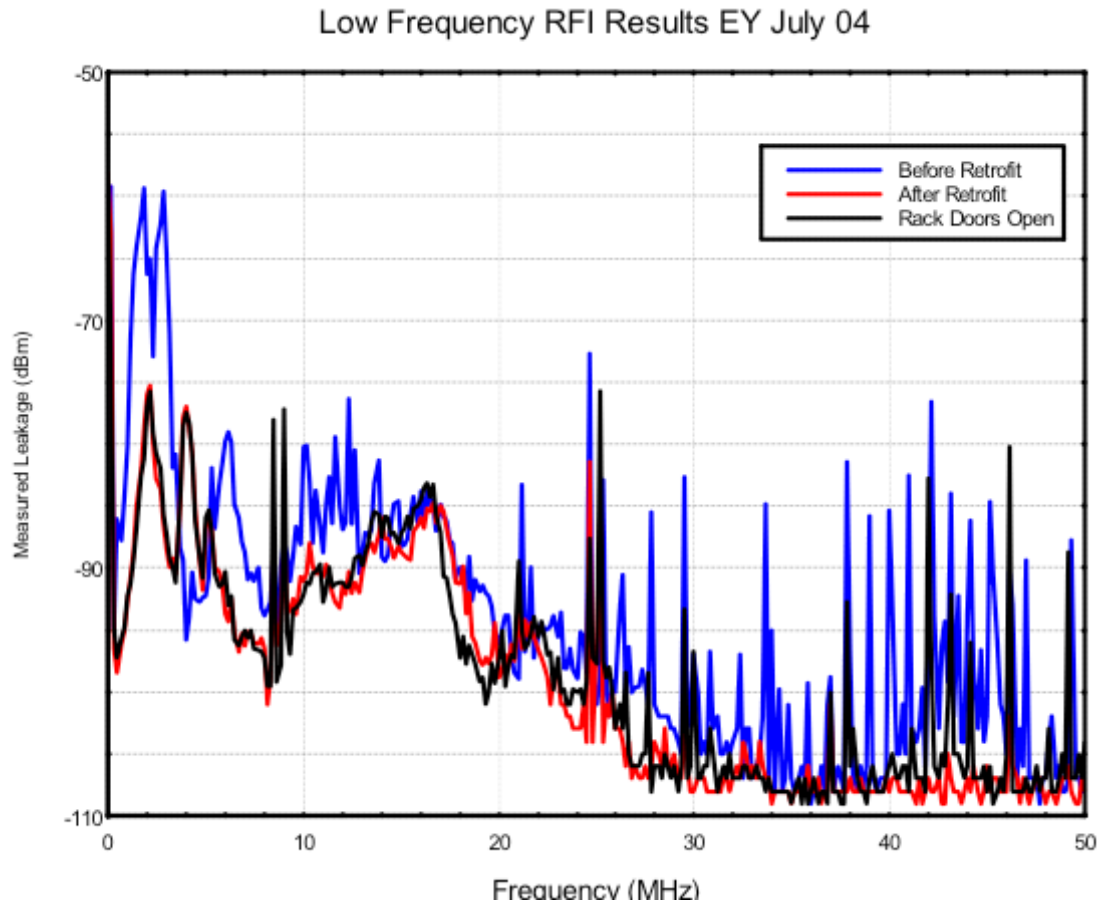
RUN⇒	S1		S2		S3	
IFO ↓	BNS RANGE (kpc)	DUTY FACTOR (%)	BNS RANGE (kpc)	DUTY FACTOR (%)	BNS RANGE (kpc)	DUTY FACTOR (%)
L1	~150	43%	900	37%	800- 1500	22%
H1	~30	59%	350	74%	1500- 5000	69%
H2	~40	73%	200	58%	600- 1100	63%
3-way		24%		22%		16%

- Coordinated improvements in several areas
 - » Increase laser power (refurbish lasers after years of service)
 - » Thermal compensation system for ITMs
 - » Added photodiodes to share power
 - » Develop sequencing to get to high power operation

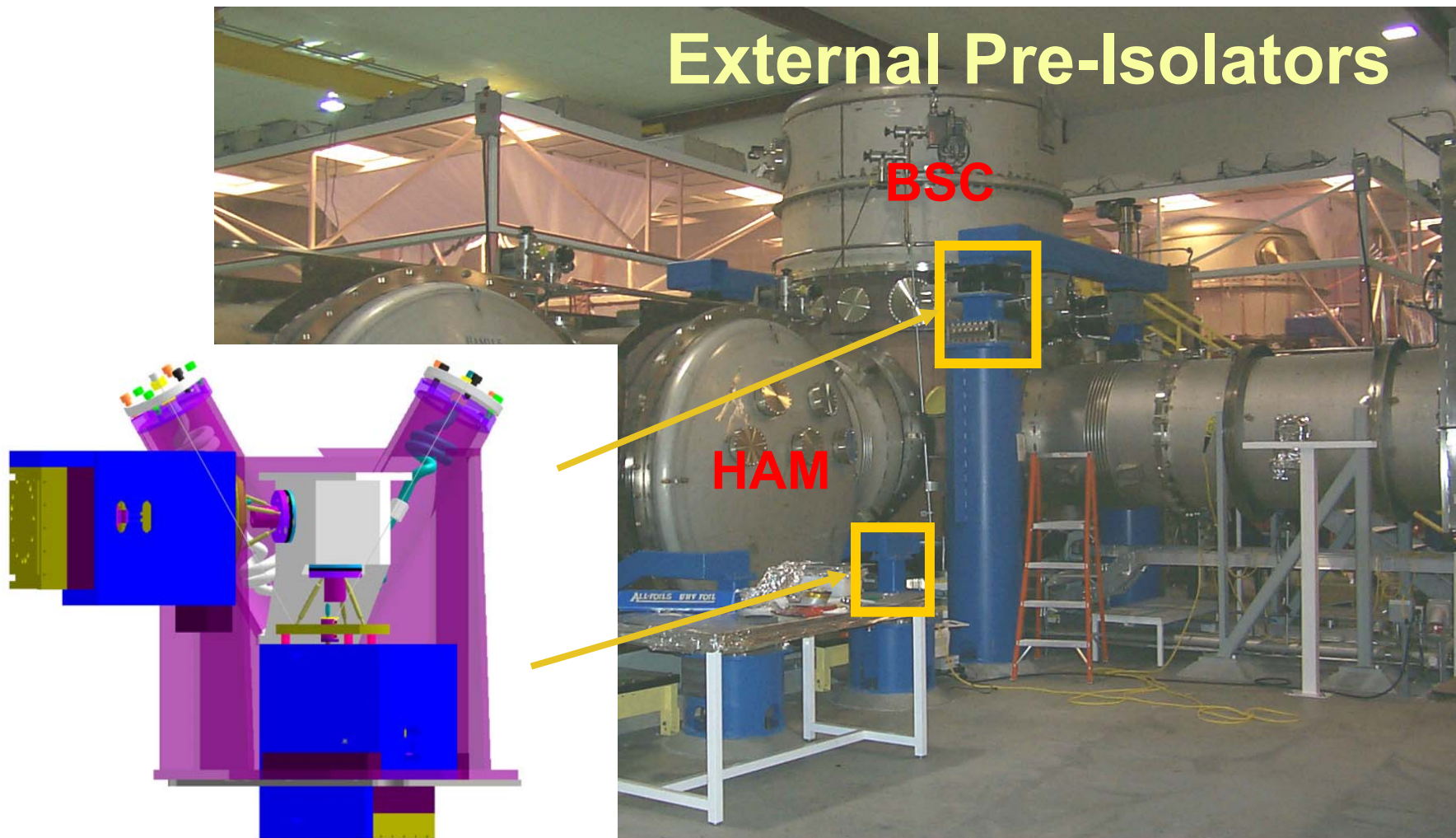
Noise Improvements at LHO



- EMC & acoustics retrofit in progress, end stations complete & working (also in commissioning)

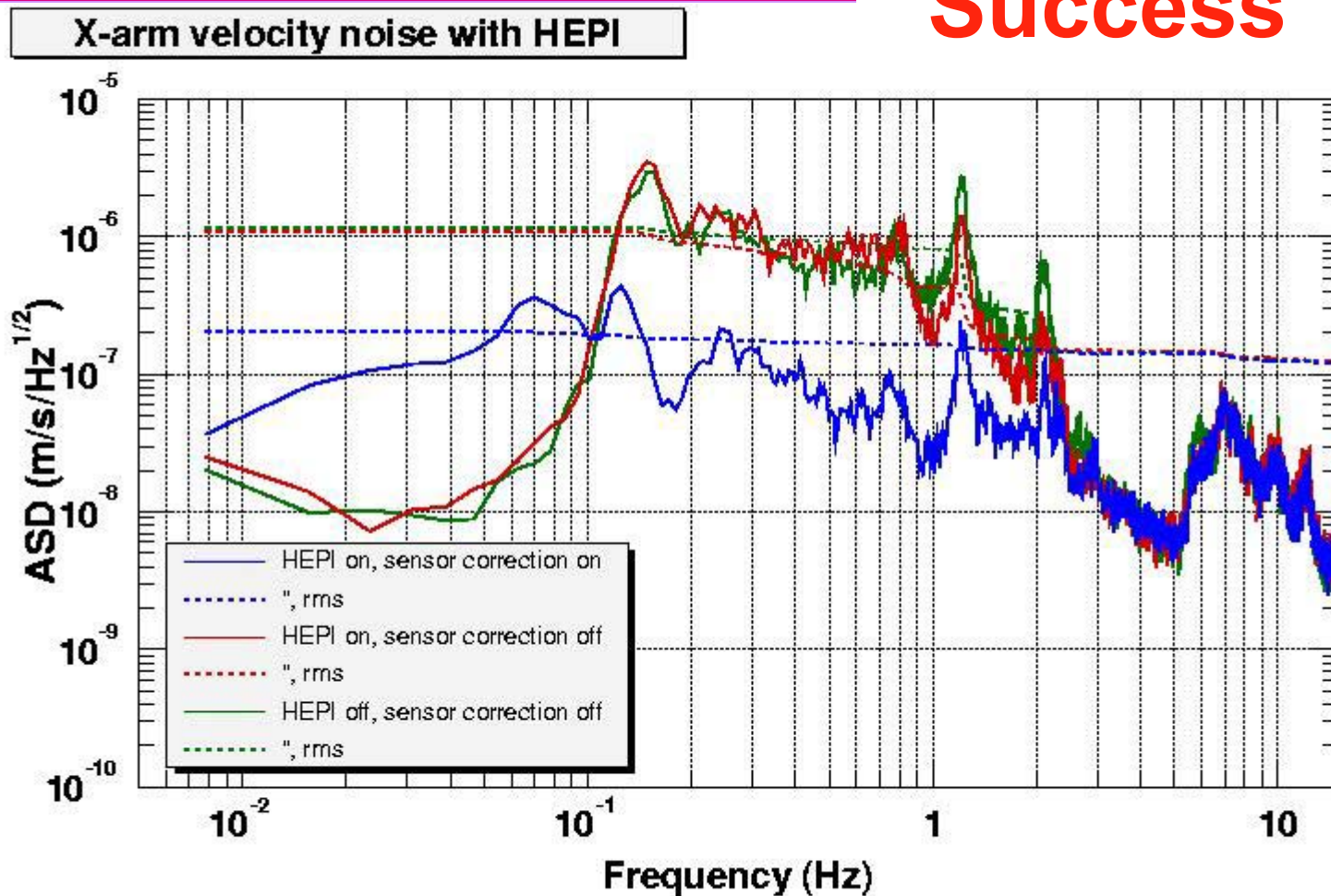


External Pre-Isolators





Success



*T0=09/08/2004 01:35:52.042968

Avg=10

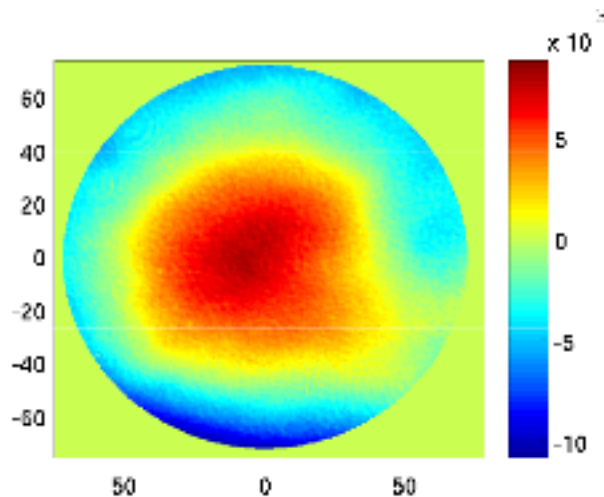
BW=0.0117187

- LDAS project integrated into DASWG activities
 - » 1.2.0 release of LDAS in late August - early September
- ITR2003 task -- TCL/Globus Integration Project
 - » Continuing to work with LBNL on combined SWIG/Globus Project which unifies TCL and Python steering language extensions
 - » <http://tclglobus.ligo.caltech.edu>
- S4 Preparation
 - » Enhance RDS generation code to support longer file sizes
 - » Upgrade to newest DB2 database server
 - » Support for faster commercial compilers
 - » Support for file types other than .gwf (frame files) in diskCacheAPI

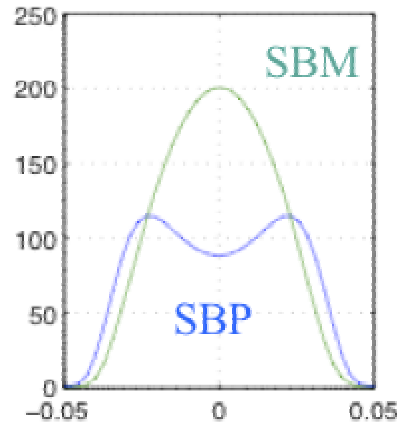
- All 4 Lab clusters: CIT, LHO, LLO, and MIT are now running Grid as well as LDAS jobs.
 - » 2.2THz of CPU cycles
 - » Current usage can be monitored from the LSC Data Grid web page along with the LSC clusters:
<http://www.lsc-group.phys.uwm.edu/lscdatagrid/>
 - » Allows users to make decisions on where to run their jobs
- All Science and Engineering run data has been migrated from HPSS to SAM-QFS for easier access and long-term archiving..
 - » ~ 20,000,000 frame files managed in archive
 - » Some old trend frames from between runs still remains to be migrated over the next 1-2 Months

- Measured mirror phasemaps being used with FFT model
- Allows:
 - » Evaluation/modeling of large BS curvature effect on SB imbalance
 - » Realistic beam profile simulation
 - phase camera image and error signal

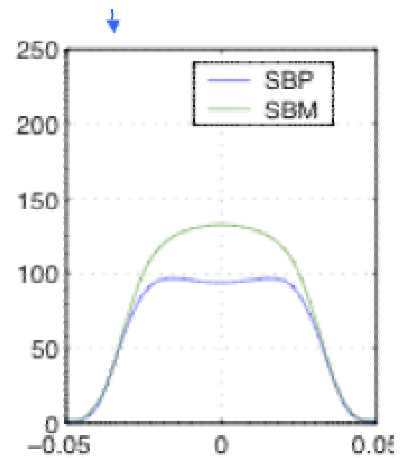
LHO4k BS ROC:200km



SB imbalance : ITMx cold, ITMy hot



Flat BS

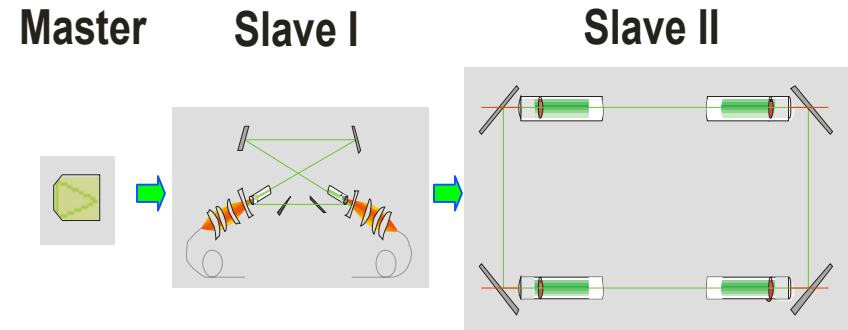


Curved BS

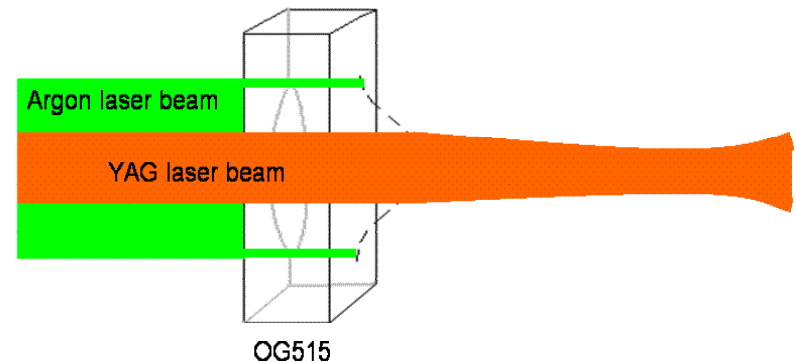
- **Seismic Isolation**
 - » Successful implementation of HEPI
 - » Further commissioning of platform at Stanford
- **Suspensions**
 - » Installation of Mode Cleaner triple suspension at LASTI
- **ISC/40m**
 - » Completed installation, locked lots of bits
 - » Found problem with locking scheme (sidebands on sidebands)...probably found solution (Mach-Zehnder)



- Pre-stabilized laser
 - » Power Stage injection locked
 - » 170 W, single frequency laser!



- Input Optics
 - » Thermal focusing/matching approach successfully prototyped



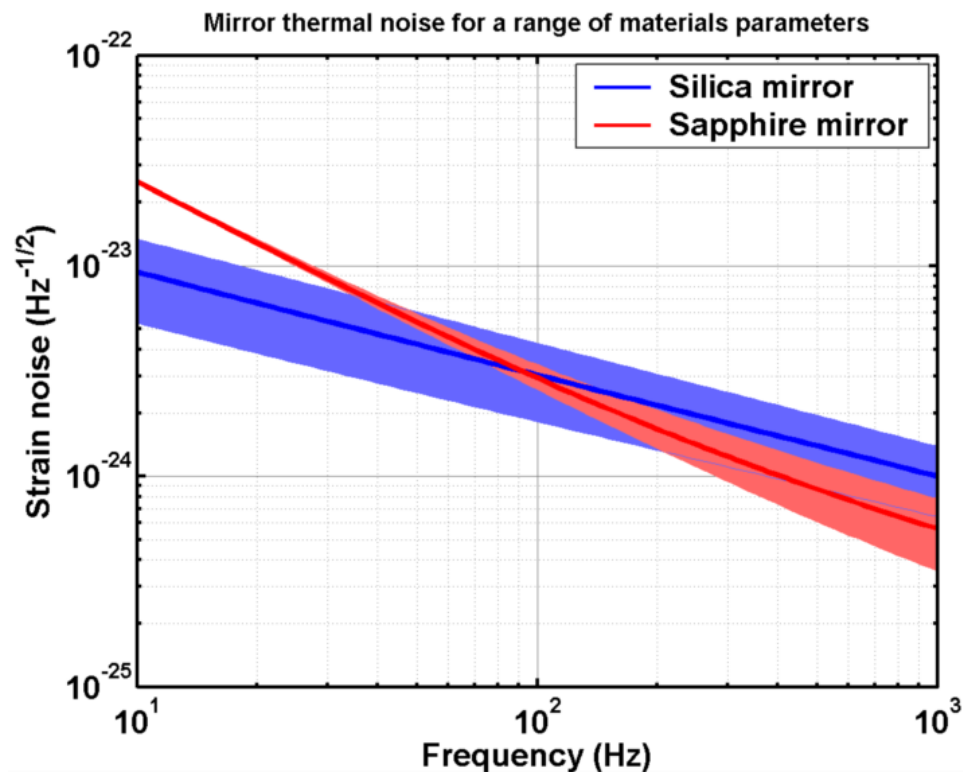
- Auxiliary Optics/Thermal compensation
 - » Successful application to initial LIGO
 - » Analysis includes inhomogeneity of coating absorption – important for substrate selection

- Coatings

- » Reductions in absorption with increasing dopant in Titania (LMA)
- » Need another factor 2-3 reduction...

- Core Optics

- » Focus on substrate selection
- » Many factors – astrophysics, implementation, risks
- » **Important to get LSC input at this meeting**



AdvLIGO Status as a Project

Advanced LIGO proposal submitted in early 2003 and was reviewed in June 2003

- Reviews very favorable
- Next step is NSB discussion/approval and scheduling in MREF account
 - Should be considered later this year (October?)
- Earliest MREF funding start FY 2007 (Oct 2006)
 - Depends critically on future funding levels for NSF
- Developing detailed project management data (cost, schedule, technical work packages)
 - Advanced LIGO organization interacts with up-coming Lab operations renewal, evolving relation between Lab and LSC

- New outreach coordinators at both observatories
 - » Dale Ingram at LHO
 - » John Thacker at LLO

School Group Tour at LLO



LIGO-G040332-00-M

National Astronomy Day at LHO



LSC Meeting -- August 2004

17

- Newly funded collaborative effort focused on Louisiana
 - » **LIGO** provides scientific motivation and constructs/operates visitor center
 - » **Exploratorium** provides hands-on exhibits, experience with interactive learning, teacher workshops
 - » **Southern University** brings LIGO science to science education, training for pre-service teachers
 - » **Louisiana Board of Regents** extends our program through public education, provides links to schools and teachers

- Other Lab-LSC collaborative efforts welcome
 - » Example: Steve Penn and Greg Baker

- Commissioning progress will be harder as we near the design goal
- Need more fire in the belly to find GWs
- Need to change our mode of operation, to accommodate longer runs
- New LIGO Lab operations contract has triggered discussions on the relationship between LSC and LIGO Lab

- Goal to have more flexibility to react to conditions as we approach and initiate the run
- Peter Fritschel chairs run planning committee
 - » Representatives from commissioning, GEO, LSC, Lab, ...
 - » Recommends timing, duration, goals for run
 - » Ability to delay or modify run if conditions warrant
- Tentative plan
 - » S4 to be held starting in January 2005, ~ 4 weeks duration
 - » Engineering run(s) approximately 1 month in advance
 - » Sensitivity goals: H1 7.5 Mpc, L1 4Mpc, H2, 2 Mpc
 - » Duty cycle goal: All Individuals 70%, triple 40%
 - » “Science content” ~ 5-10 times S3
- ~6 month commissioning interval, followed by long S5 (latter half of 2005)