



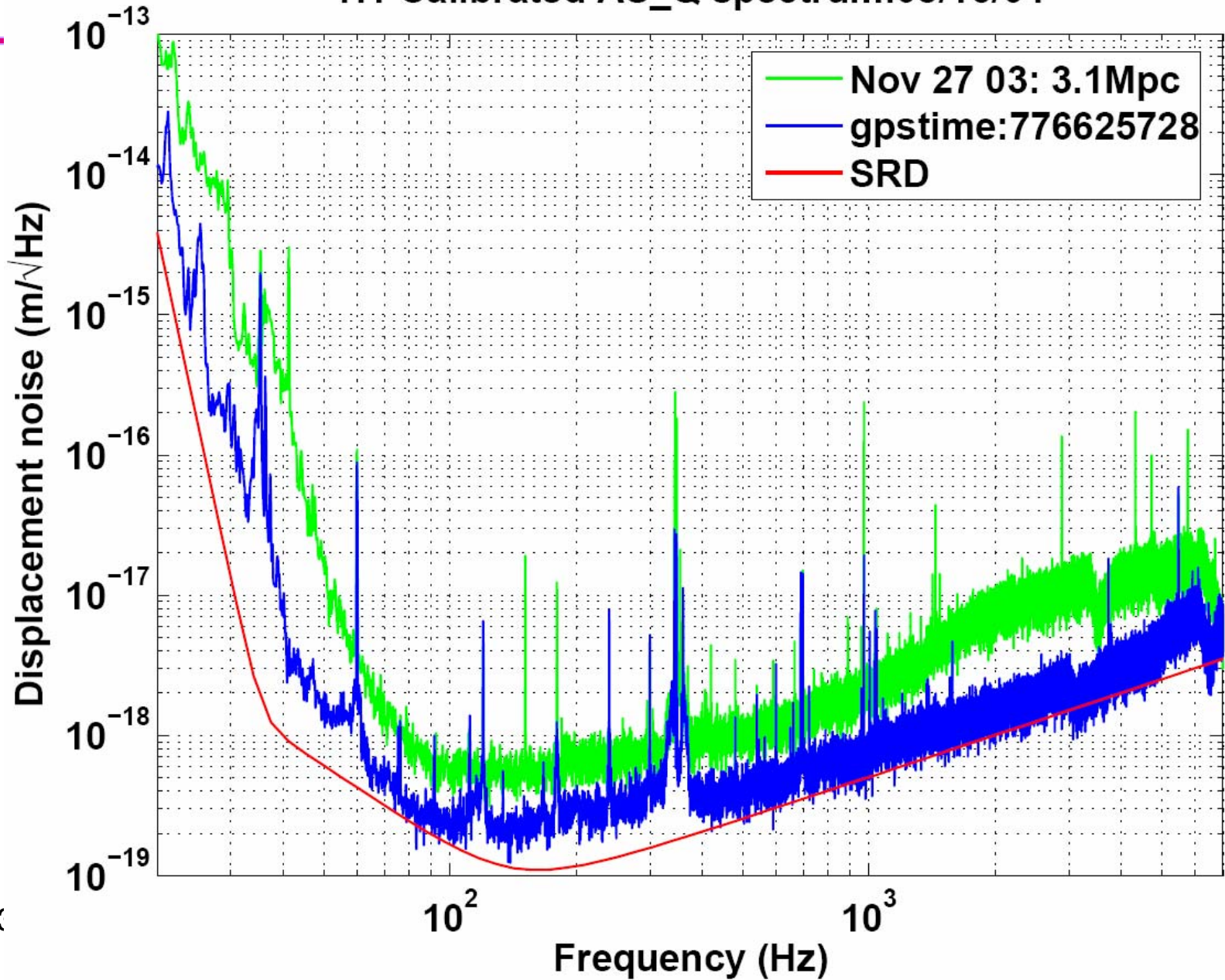
Commissioning Progress and Plans

LSC Meeting, August 17, 2004
Daniel Sigg



The Latest and Greatest

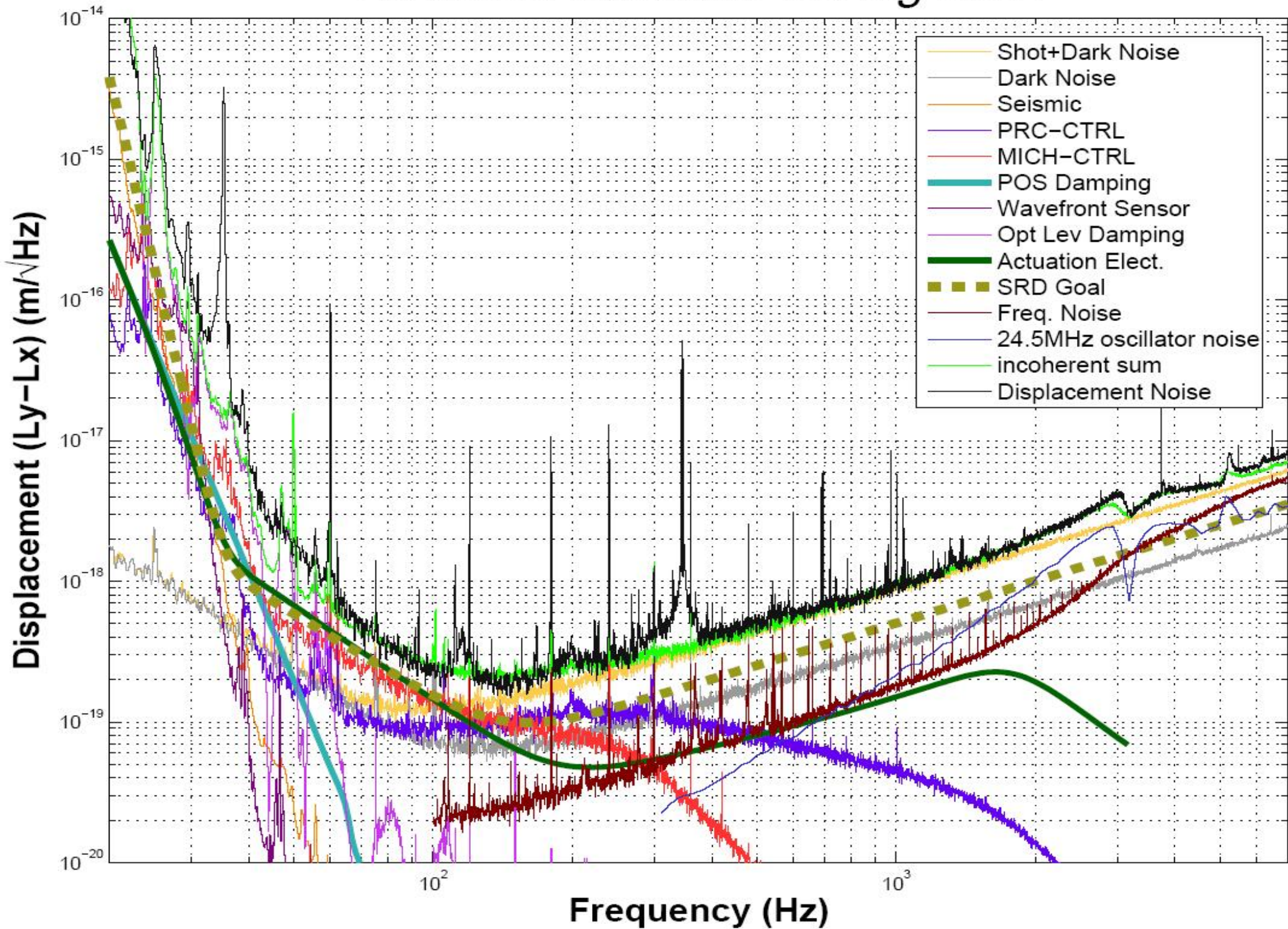
H1 Calibrated AS_Q spectrum:08/15/04



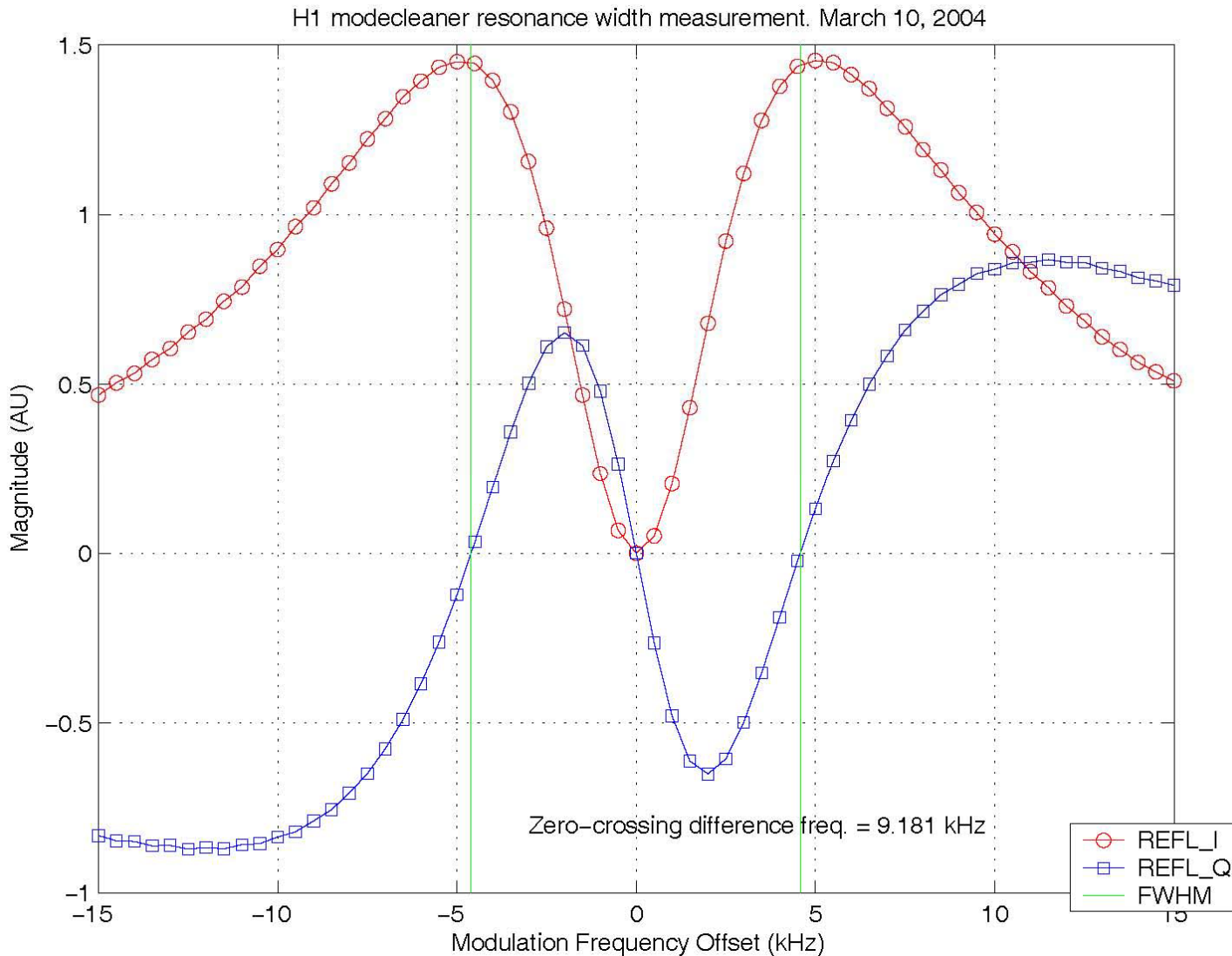
Oscillator Phase Noise

- ❑ First measured at LLO
- ❑ Coupling not understood
 - Higher order transverse modes involved (little notches)
 - Equalizer filter has little effect
 - “MC pole frequency” a factor of 2 too small
 - H2 has 20 times lower coupling than H1/L1
 - No longer due to oscillator
- ❑ Lower phase-noise oscillator reduces ASQ noise
- ❑ Differential curvature compensation reduces coupling

H1 Noise Sources: 15 Aug 2004



Mode Cleaner Length and Width



- Measure FM to AM coupling
- Resolve a fringe!
- MC FWHM to ± 0.5 Hz



Output Mode Cleaner

The Good

THANKS GEO

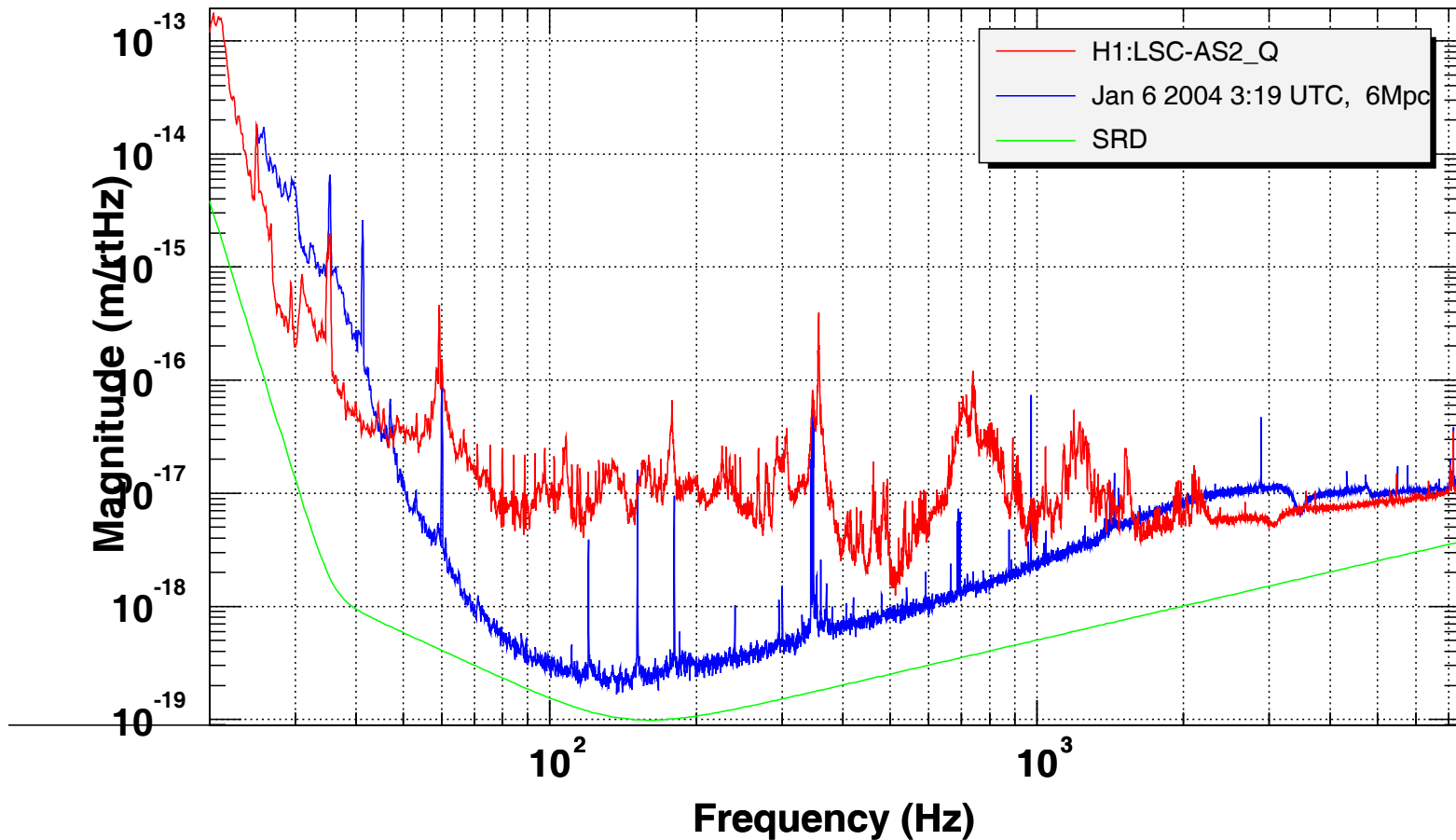
- ❑ Carrier contrast defect improves by a factor of 20
 - With OMC: carrier 2% of total power
 - Makes it possible to reduce modulation depth
- ❑ Removes offset corresponding to 10^{-12} m
 - Reduced AM noise coupling: factor of 60 at 3 kHz
 - Reduced oscillator phase noise coupling: factor of 2 at 3 kHz
- ❑ ASI signal decreases by a factor of 7
 - “ASI locking” symmetrizes RF sidebands

Would be able to operate with a single PD at AS port!



Output Mode Cleaner The Bad

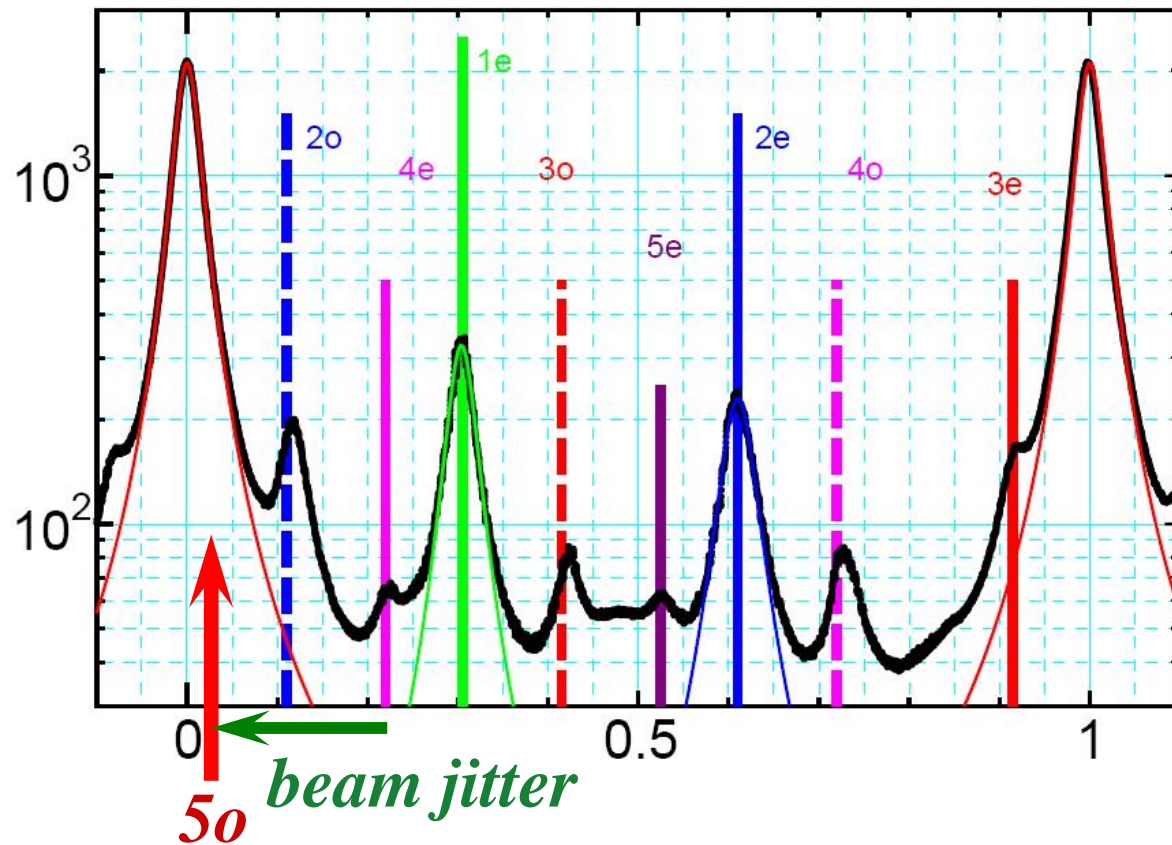
Power spectrum



Output Mode Cleaner

The Ugly

OMC transmission, Bright MICH



- Higher order modes and beam jitter generate a PDH-like signal
- Elliptical beam is a problem
- Triangular cavity geometry is a problem

H2 Faraday Replacement



Goals:

- ❑ Larger aperture
- ❑ Reduce thermally induced drift at REFL
- ❑ Get the Florida guys to visit Hanford



Major Goals and Tasks After S3

Sensitivity:	
Laser Power	PSL refurbished, new layout Additional PDs on AS port Power at ~4W
Thermal Compensation	All systems installed Compensates ITM/BS heating on H1 Minimizes oscillator phase noise
Output Mode Cleaner	Improves carrier contrast defect Reduces ASI Reduces fringe offset Acoustic coupling huge



Major Goals and Tasks After S3 (2)

Sensitivity:	
Auxiliary degrees-of-freedom	Higher gain reduces up-conversion Modest improvement in ASQ noise
Acoustic mitigation	LHO: nothing LLO: racks will be moved
Cleanup electronics	LLO: EMI retrofit Redesign of FSS, ISS, ASI servo, CM servo, MC servo, new DACs, new AI, new dewatering filters, new fast DAQ, new timing diagnostics



Major Goals and Tasks After S3 (3)

Reliability and Stability:	
Seismic retrofit at LLO	HEPI
Auto-alignment system	All degrees-of-freedom Higher bandwidth Digital IOO WFS
Address cause of lock	Thermal isolation for dewar Dust covers, HEPA blower

Plans

□ L1:

- Finish HEPI
- Finish EMI retrofit
- Get good spectrum back
- Implement improvements from H1

□ H1:

- High power operations
- OMC test version 2
- New FSS/ISS/MC/CM boards, non-resonant sideband PD on REFL
- Optimize dewhitening for new FDI DACs

□ H2:

- Implement improvements from H1