



The LIGO Detectors Controls

ICALEPCS07,
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(for the LIGO Scientific Collaboration)

Arial View of the LIGO Sites



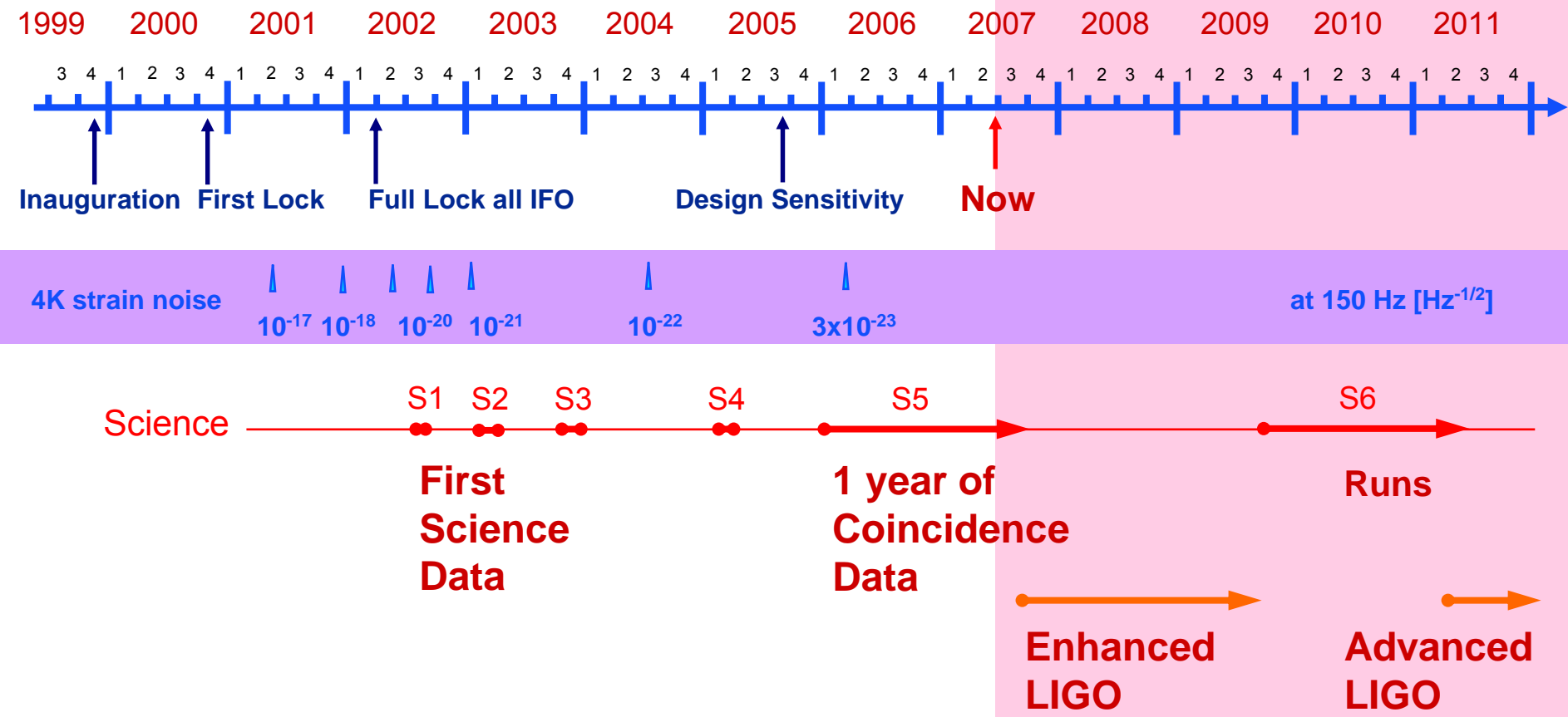
LIGO Hanford Observatory

LIGO Livingston Observatory

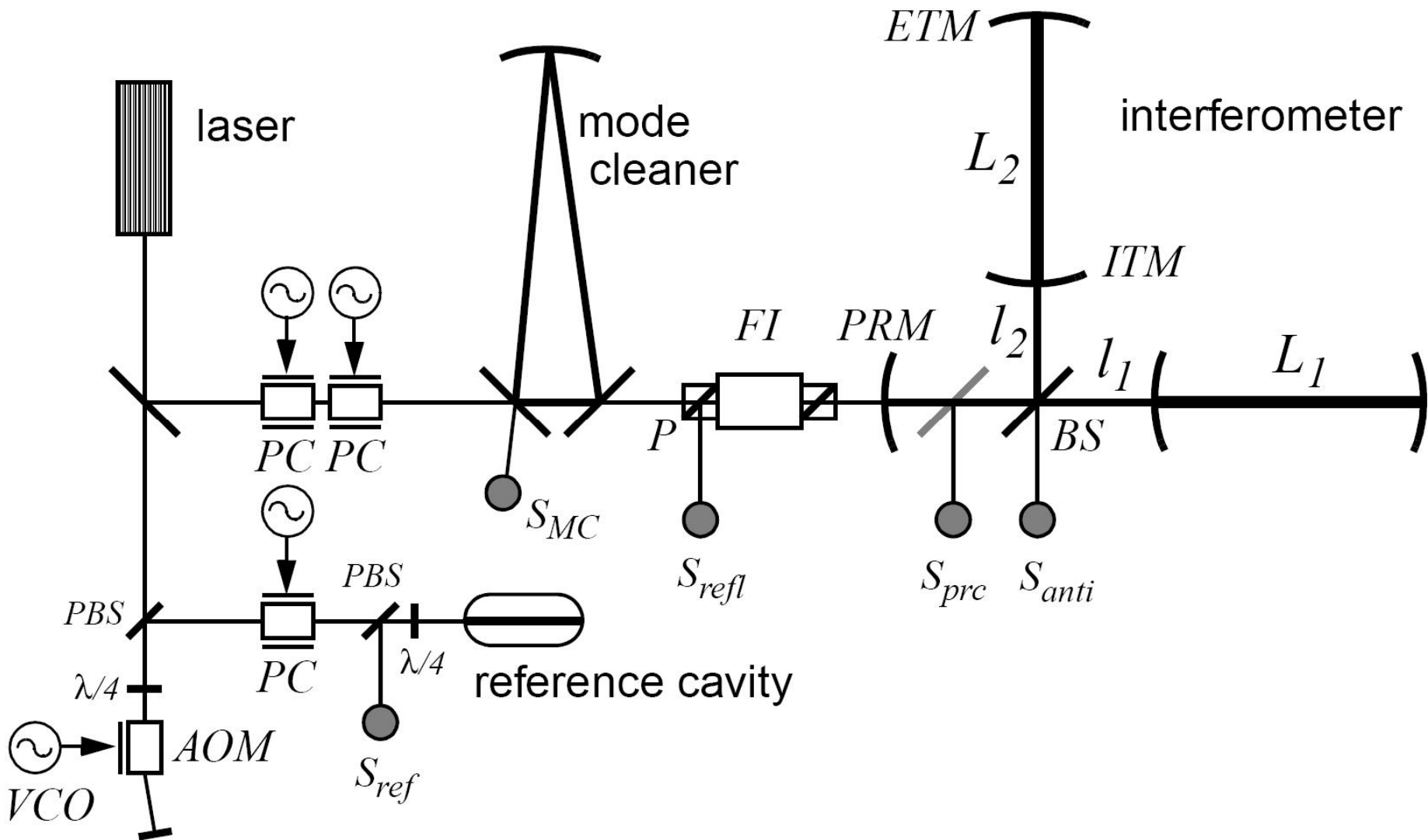




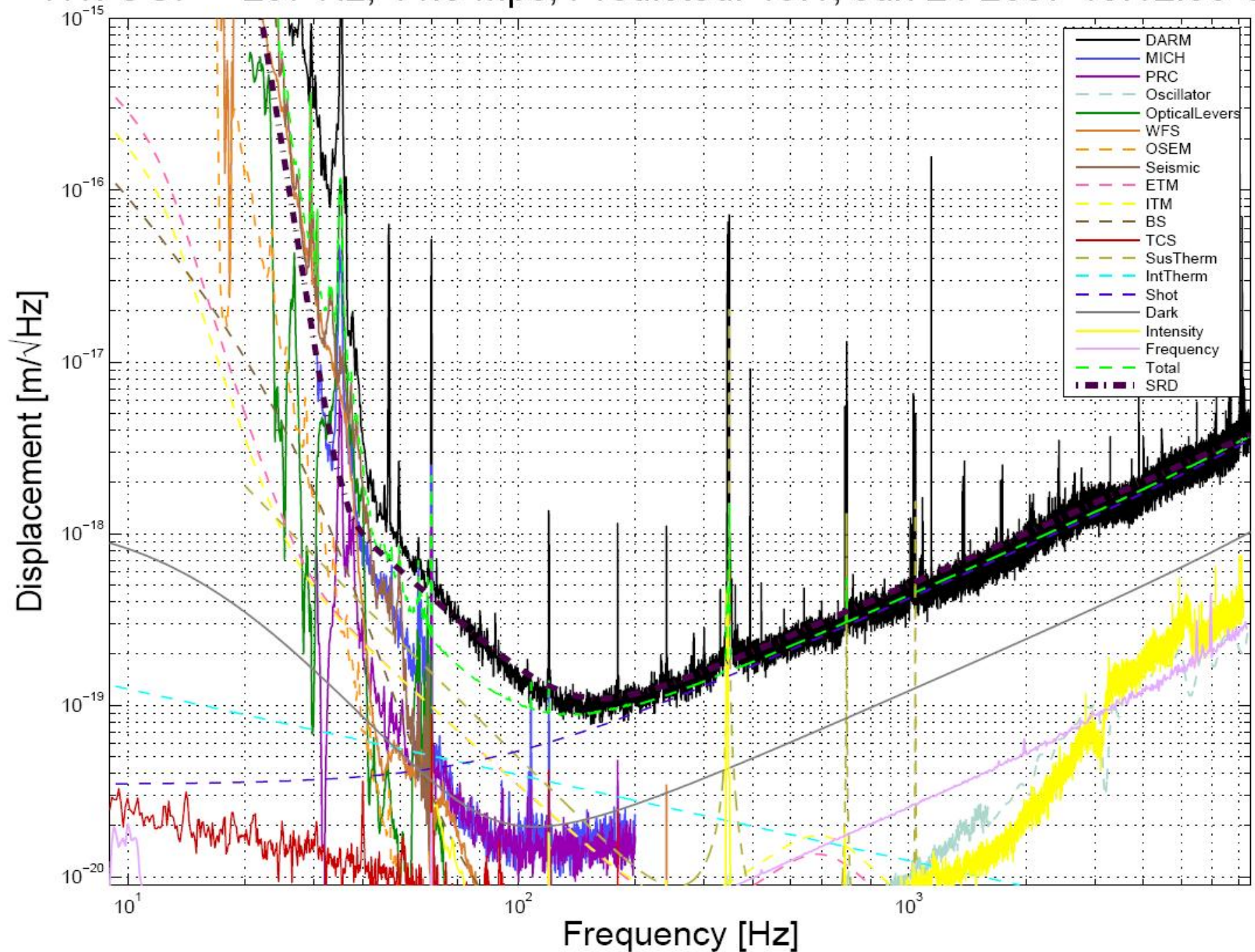
Time Line



Schematic View



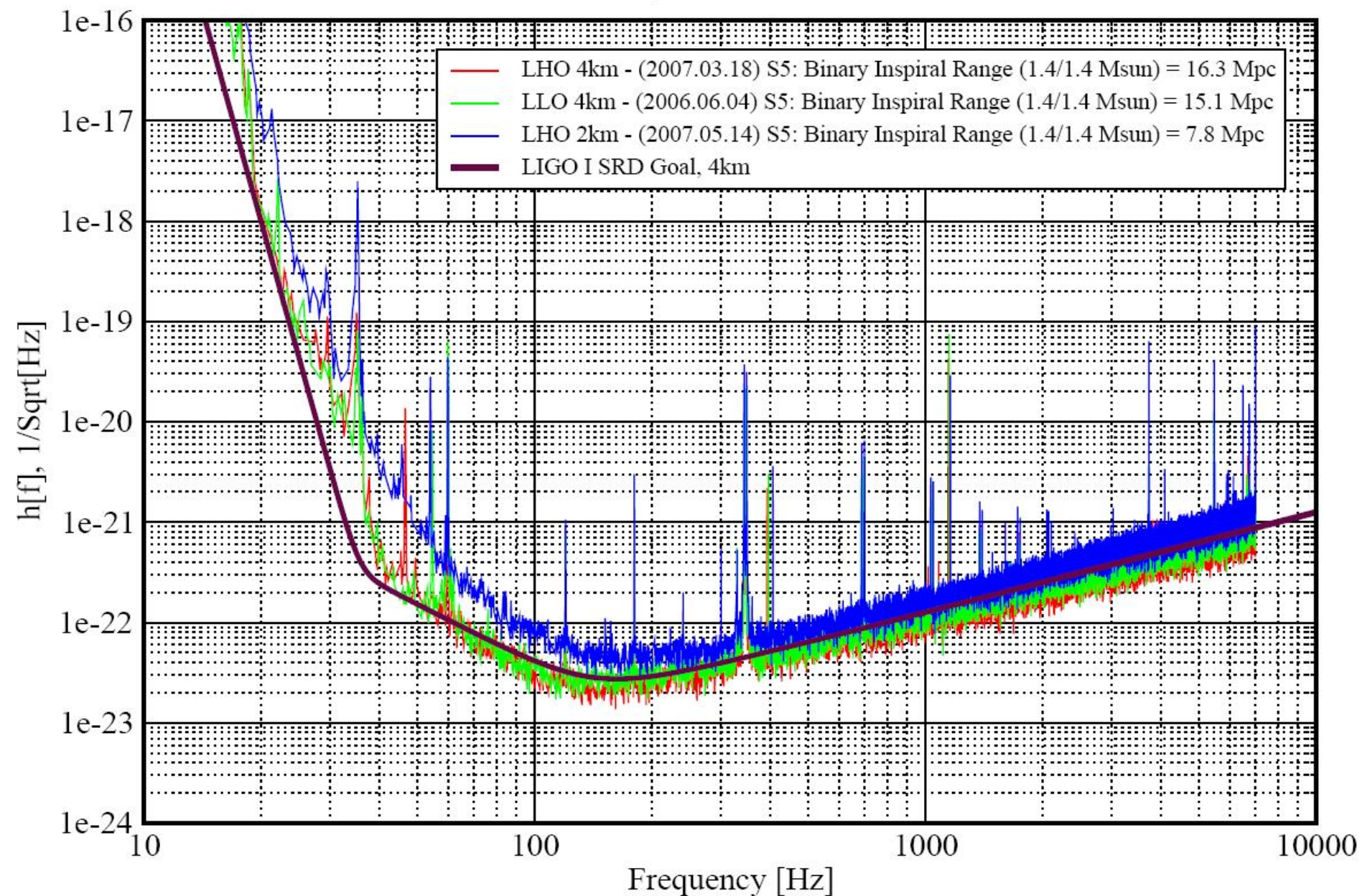
H1: UGF = 207 Hz, 14.8 Mpc, Predicted: 19.1, Jun 21 2007 10:12:35 UTC



Strain Sensitivity of the LIGO Interferometers

S5 Performance - May 2007

LIGO-G070366-00-E



Most Recent Published Results up to the 4th Science Run

- ❑ Binary inspirals (S3/S4):
 - Neutron star binary ($1-3 M_{\odot}$): rate $\leq 1.2/y/L_{10}$ (90% CL, Milky Way $\sim 1.6 L_{10}$)
 - Black hole binary ($3-40/80 M_{\odot}$): rate $\leq 0.5/y/L_{10}$ (90% CL)
 - Primordial black hole binary ($0.35-1 M_{\odot}$): rate $\leq 4.9/y/L_{10}$ (90% CL)
- ❑ Pulsars (S3/S4):
 - Limits on 78 pulsars
 - Upper limits on h as low as 3.2×10^{-25} (95% CL) and as low as 1×10^{-6} on the eccentricity
- ❑ Stochastic background (S4):
 - Energy limit as fraction of closure density: $\Omega_{\text{GW}} \leq 6.5 \times 10^{-5}$ (90% CL) for a frequency independent GW spectrum between 51 Hz and 150 Hz
- ❑ Burst (S4):
 - Sensitivity: $h_{\text{rssi}} \sim 10^{-21} - 10^{-20}/\sqrt{\text{Hz}}$, rate $\leq 0.15/\text{day}$ (90% CL) corresponds to $\sim 8 \times 10^{-8} M_{\odot}$ at a distance of 10 kpc (150Hz/Q=9 SG)
 - SGR1806-20 hyperflare on 12/27/04: $h_{\text{rssi}} \leq 4.5 \times 10^{-22}/\sqrt{\text{Hz}}$ and $< 4.3 \times 10^{-8} M_{\odot}$

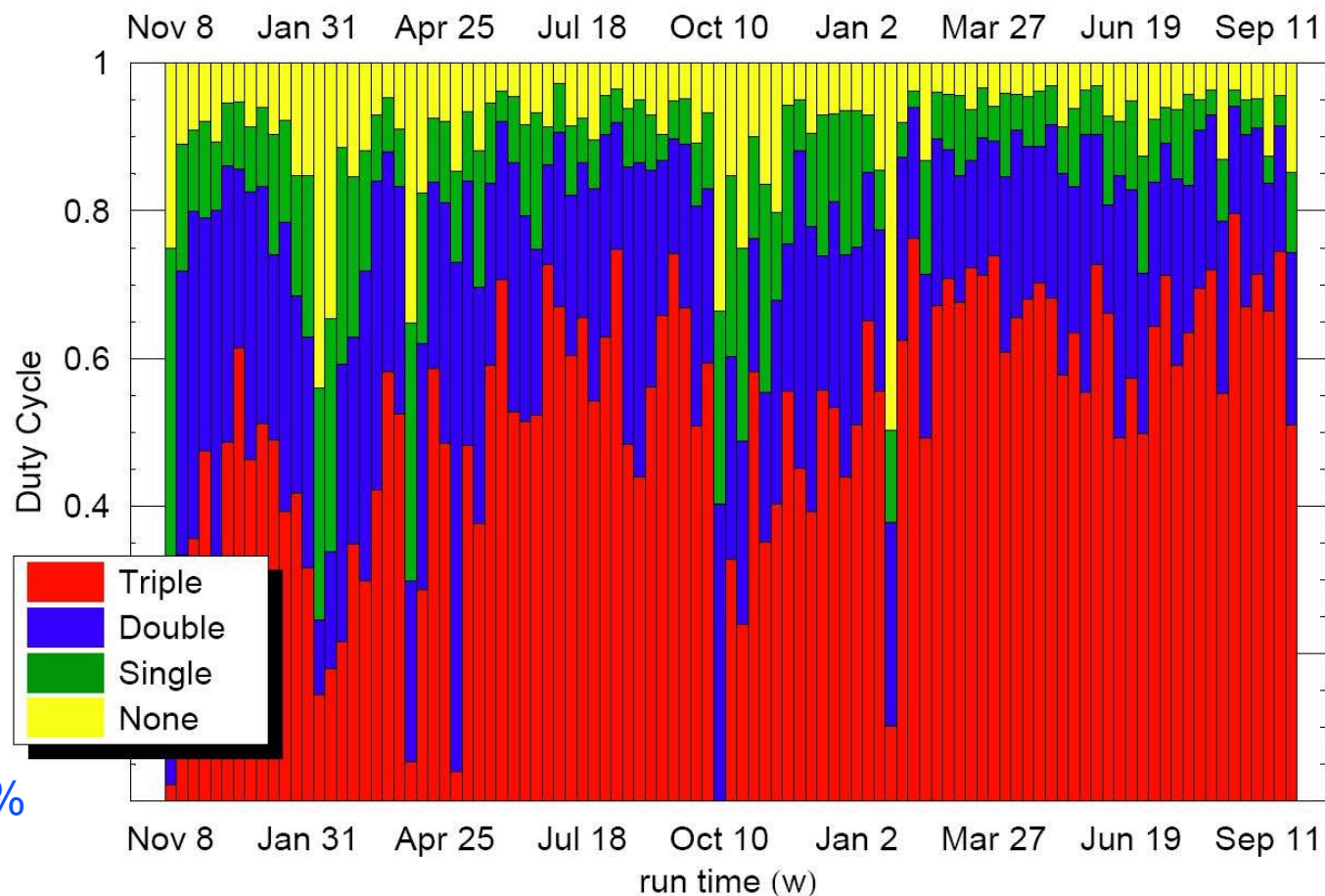
The 5th Science Run

□ Dates

- Nov '05 to Sep '07

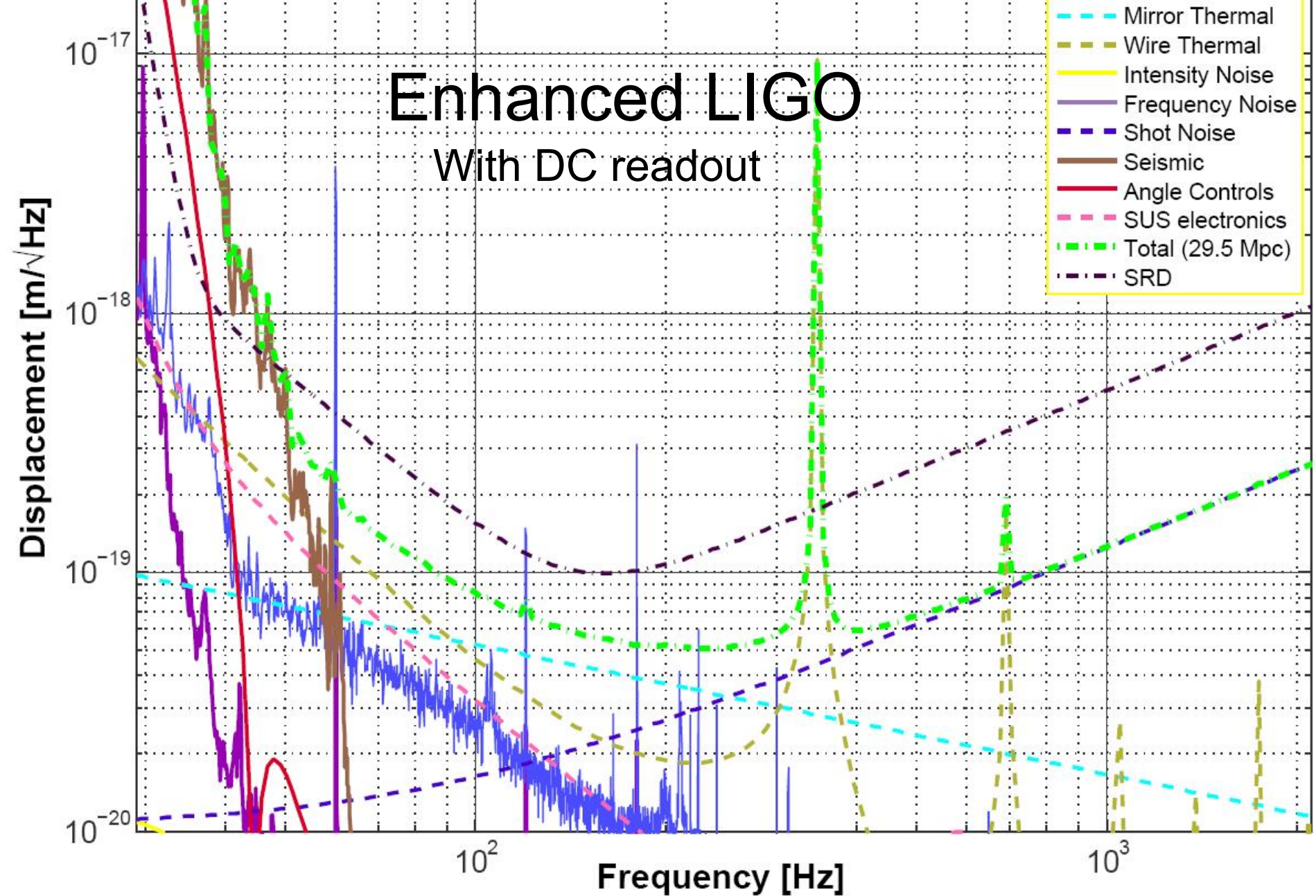
□ Duty cycle:

- H1: 78%
- L1: 66%
- H2: 78%
- 3-coinc.: 53%
- HL-coinc.: 60%



Enhanced LIGO

With DC readout



Summary

- ❑ All LIGO interferometers are at design sensitivity over most of the frequency range
- ❑ For sources like binary neutron star and black hole coalescence we can see well into the Virgo cluster
- ❑ S5 done with 1 year of coincidence data
- ❑ Enhanced LIGO is around the corner
- ❑ Advanced LIGO will hopefully be funded for next year