LIGO

Advanced LIGO and further

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on behalf of the LIGO Scientific Collaboration

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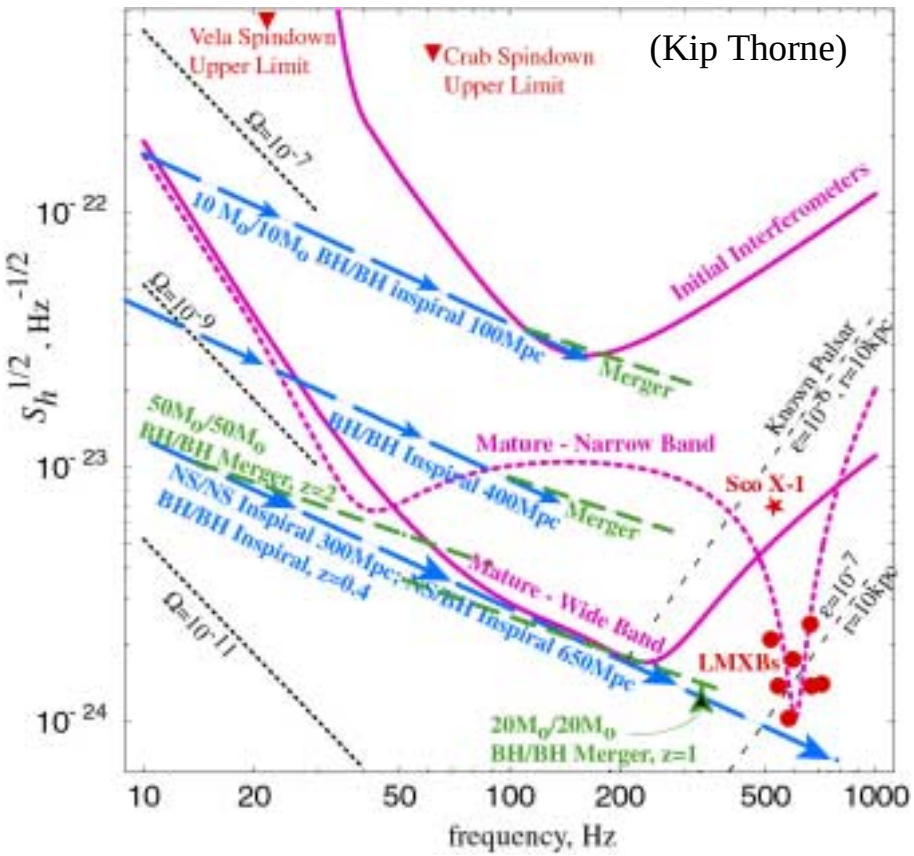
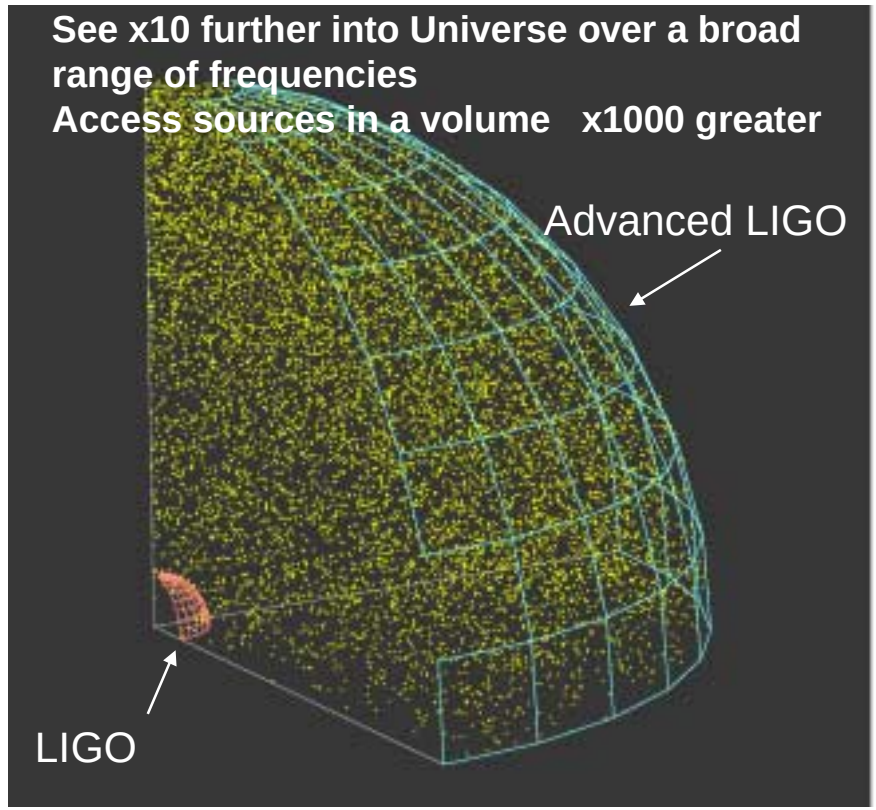
LIGO-G030183-00-Z

From LIGO to Advanced LIGO

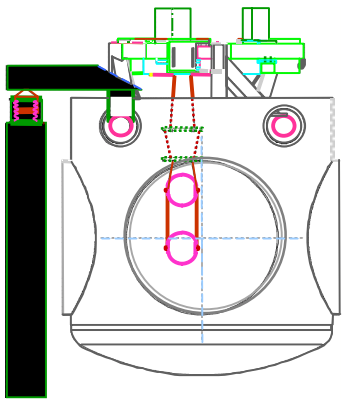




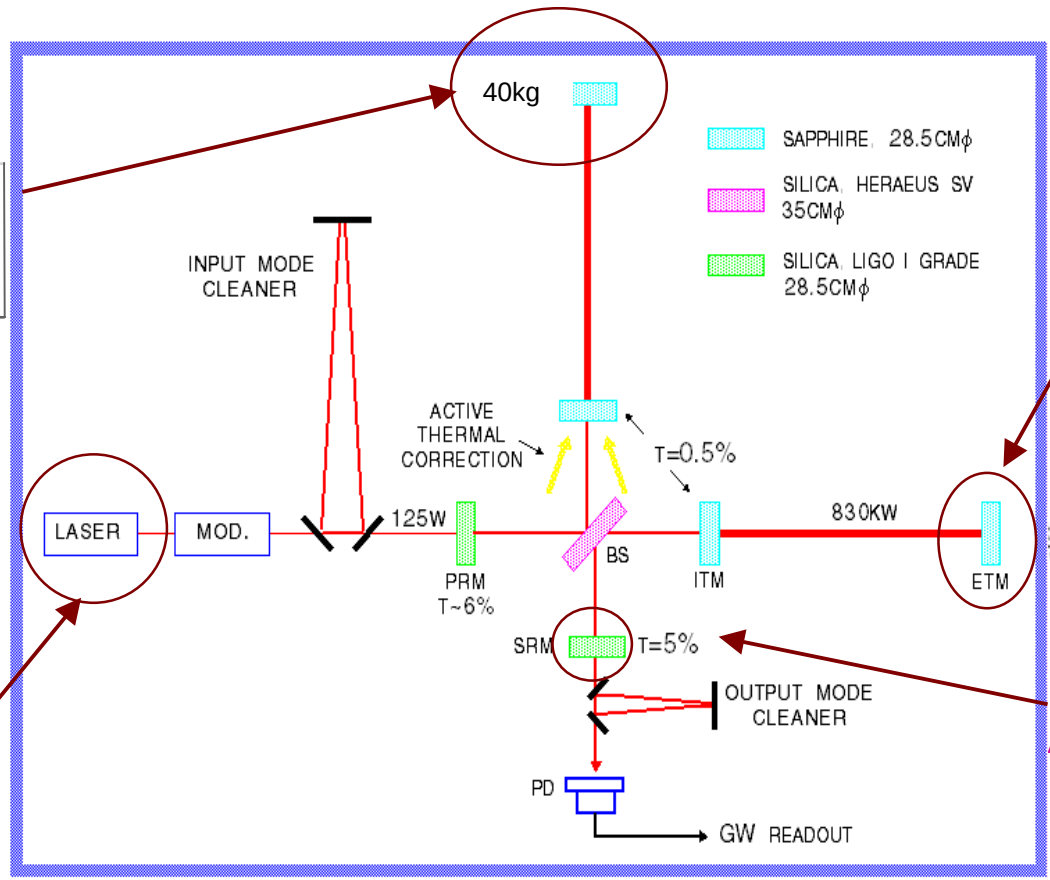
- Initial LIGO observation 2002 – 2006
  - » One complete year of data by 2007
  - » A few hours of observing with Advanced LIGO equivalent to 1 year observation with initial LIGO
- Advanced LIGO: Move from gravitational wave detection to GW astronomy
- Start coincident observations with Advanced LIGO detectors in 2009

What is ‘Advanced LIGO’?

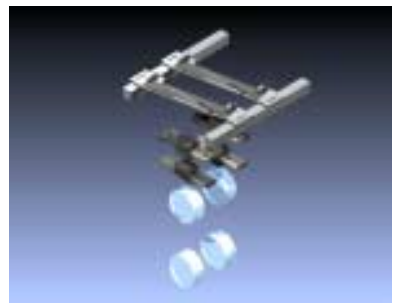
Major technological differences between LIGO and Advanced LIGO



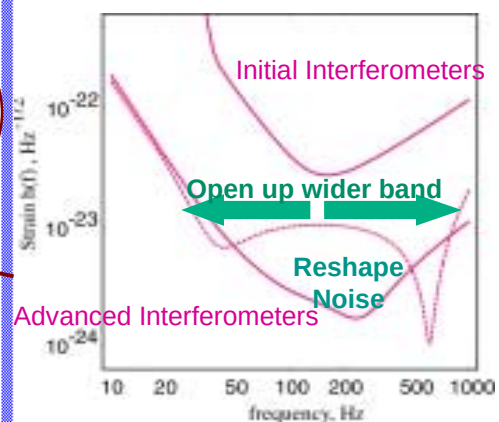
Active vibration isolation systems



High power laser (180W)

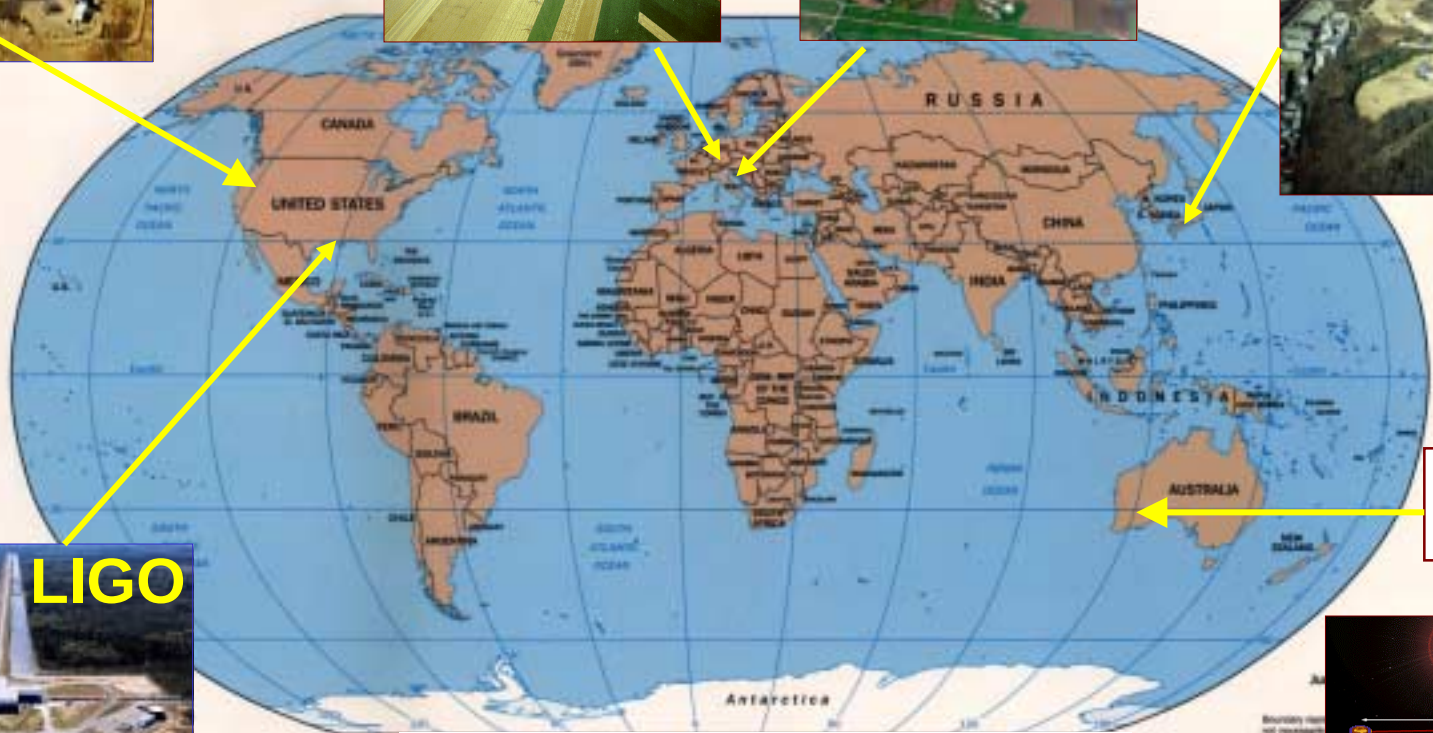


Quadruple pendulum
Sapphire optics
Silica suspension fibers



Advanced interferometry
Signal recycling

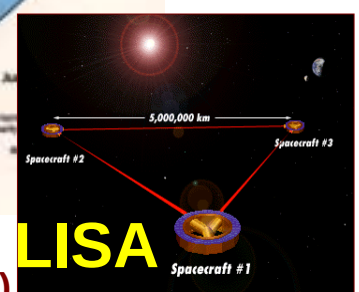
LIGO Advanced LIGO in the worldwide network



AIGO

- **Detection confidence**
- **Source polarization**
- **Sky location**

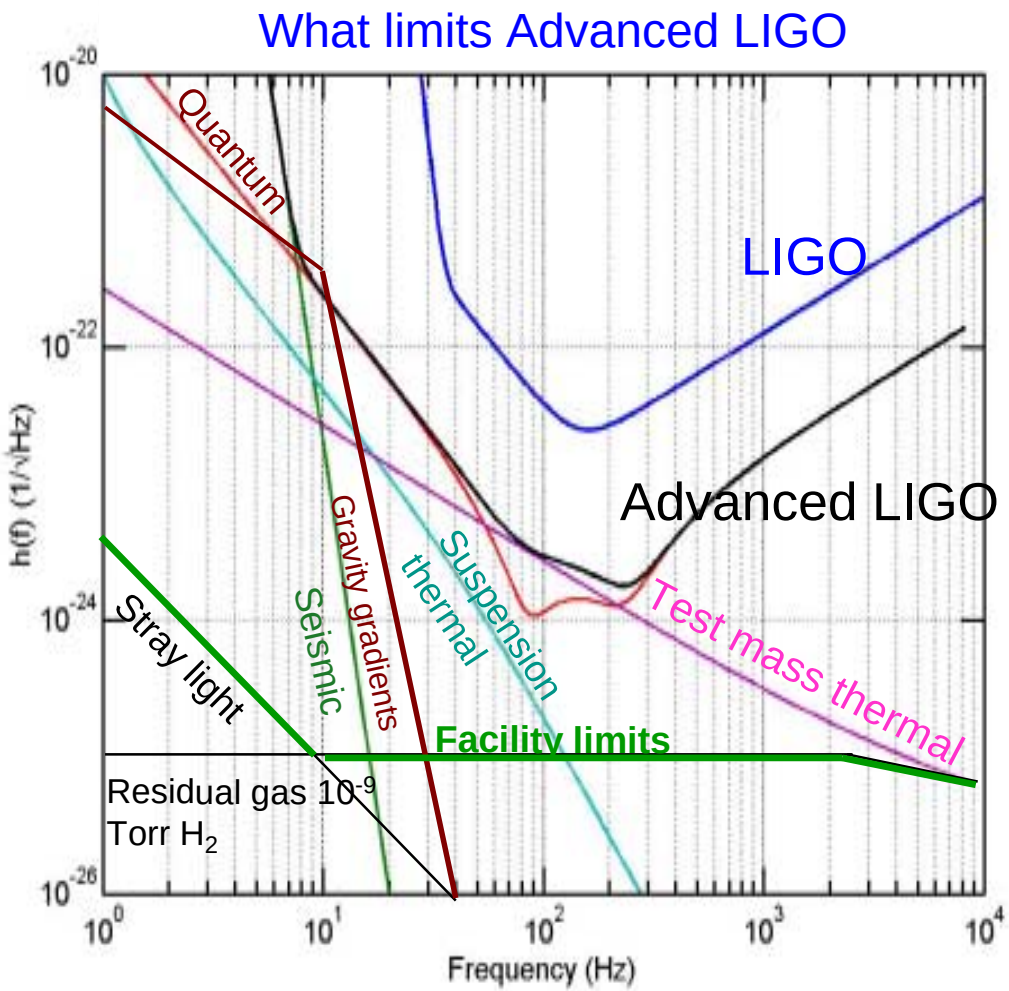
(Sources <<10Hz)



Technologies for the future

- Techniques to bypass Heisenberg
  - » squeezed light
  - » ‘speed-meters’
- Subtracting effects of gravity gradients
- Cryogenics
  - » cooling of test masses and suspensions
- Diffractive optics
  - » alternative topologies
- New materials
  - » silicon

6” silicon mirror



- Research on these technologies starting now so that they are mature on the timescales needed (2010+)