BEYOND EINSTEIN: From the Big Bang to Black Holes

Constellation-X

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Gordon Garmire Celebration
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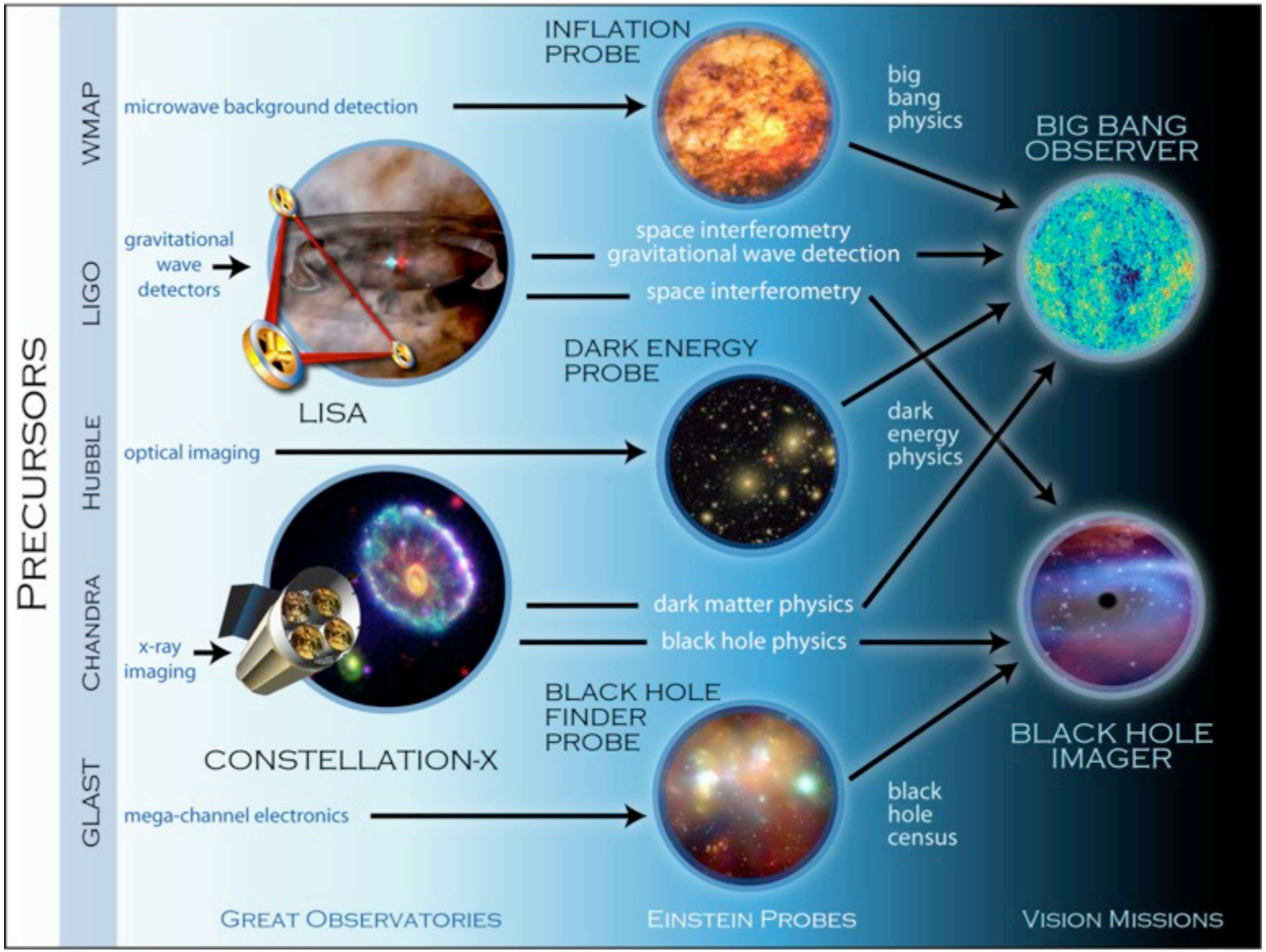
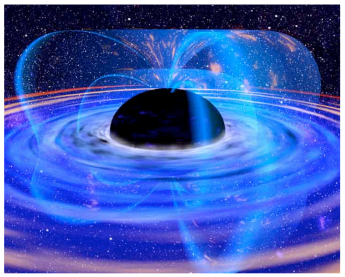
Unlocking the mysteries of Black Holes, Dark Matter and Dark Energy

Beyond Einstein Program



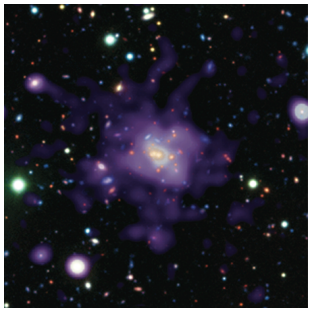
Driving Science Objectives

Black Holes



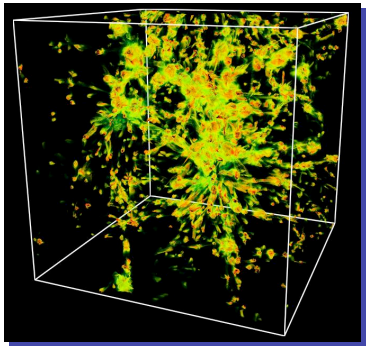
- Use black holes to test General Relativity and measure black hole spin

Dark Energy (and Dark Matter)



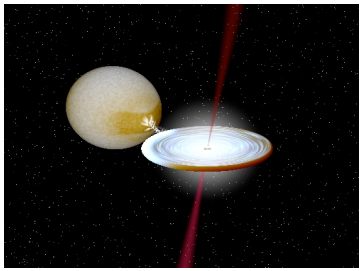
- Use Galaxy Clusters to provide factor of ten improvement in key Dark Energy (DE) parameters

Missing Baryons



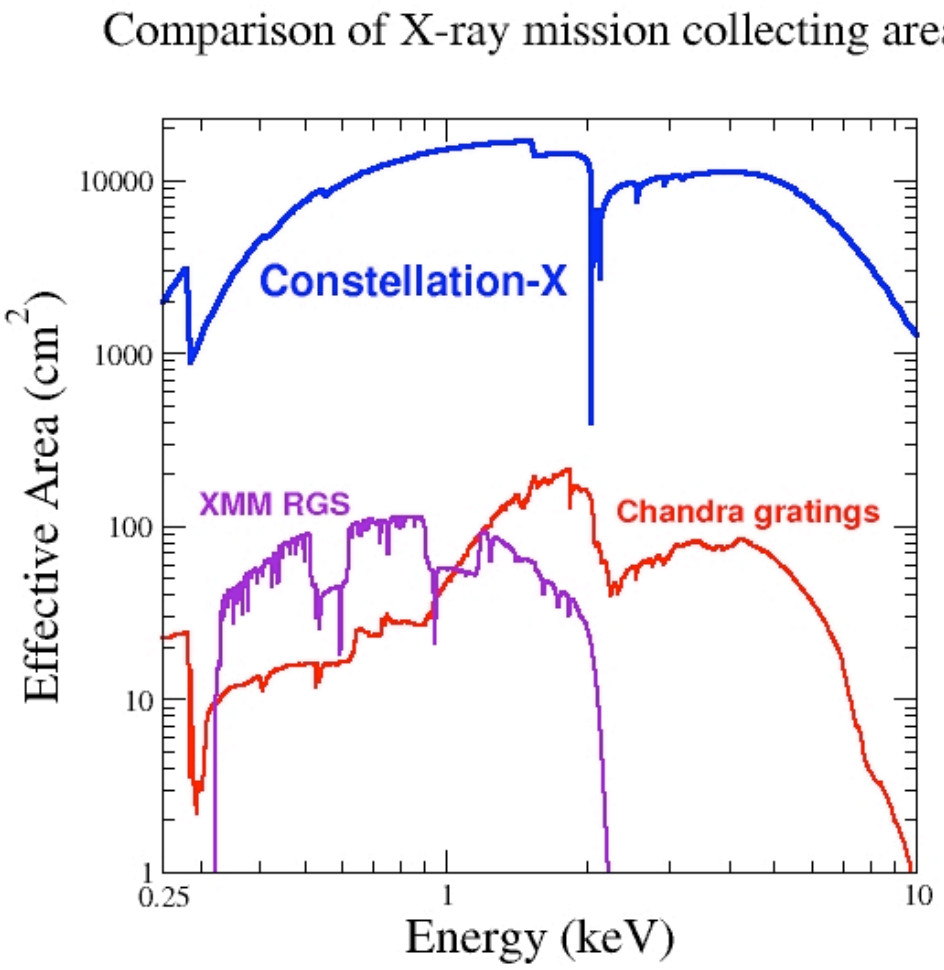
- Unambiguous detection of the hot phase of the Warm-Hot Intergalactic Medium (WHIM) at z>0

Neutron Star Equation of State



- Measuring the mass-radius relation of neutron stars to determine the Equation of State (EOS) of ultra-dense matter

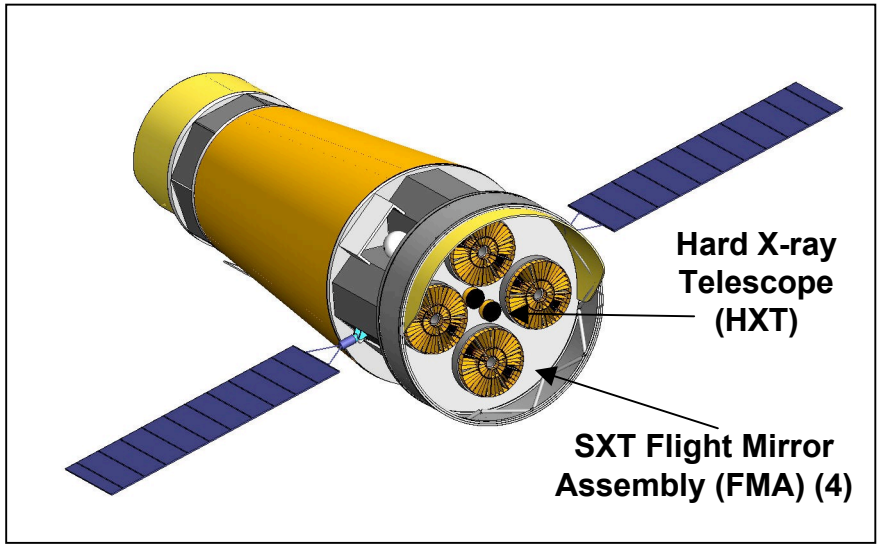
Key Constellation-X Capabilities

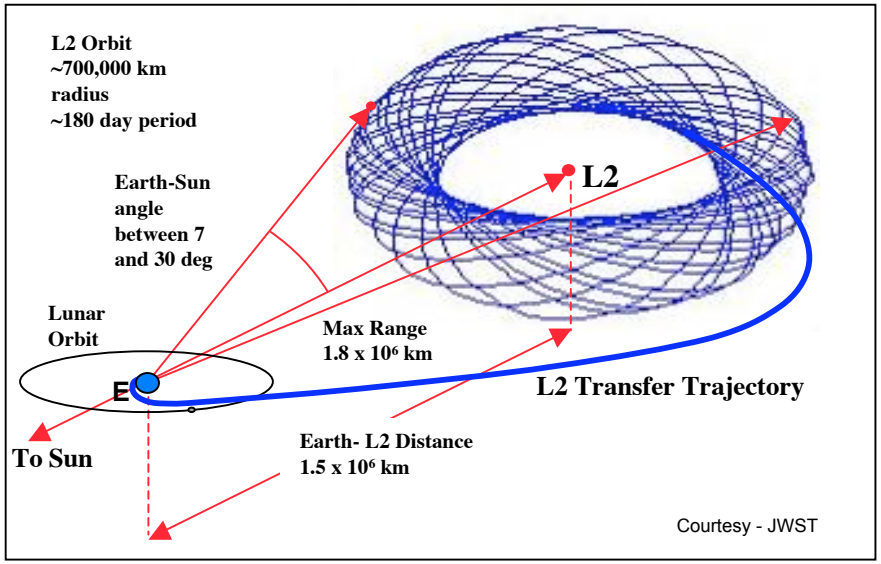


- A factor of ~100 increased area for high resolution X-ray spectroscopy
- Angular resolution requirement of 15 arc sec (goal of 5 arc sec HPD)
- Field of View 5 x 5 arc min (goal of 10 x 10 arc min FOV)

Mission Approach

- High throughput achieved with 4 telescope systems on a single satellite
  - Complemented by low and high energy instruments
- L2 Orbit; 700,000 km radius halo orbit
  - High operational efficiency
  - Uninterrupted viewing
  - Stable temperature
- 5 year life; 10 years on consumables



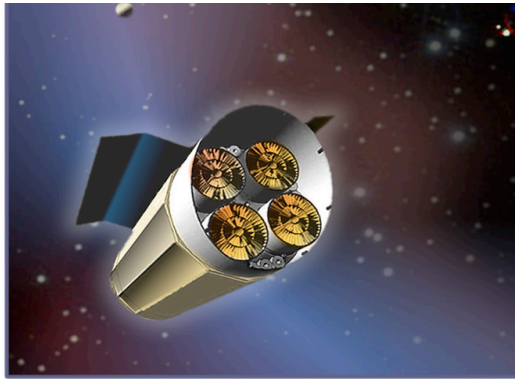


Constellation-X Mission Configuration Evolution

2000 - 2004

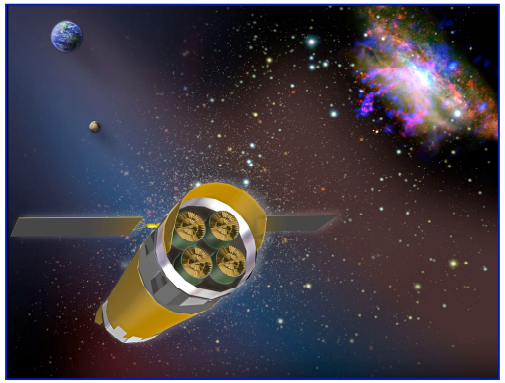
Two Atlas V 551

2005



Delta IV H

2006



Atlas V 551

The Constellation-X design has evolved as pre-phase A mission studies have matured and in response to increased costs in the launcher market, while at the same time maintaining the core science capabilities

Beyond Einstein Program Status

Challenges in overall NASA budget (Columbia loss, complete ISS, replace Shuttle, HST servicing delayed, etc) has slowed the start of Beyond Einstein

Beyond Einstein program consists of five missions: Constellation-X, LISA, Joint Dark Energy Mission (JDEM), Inflation Probe and Black Hole Finder

Decision to be made by Fall 2007 as to which the Beyond Einstein mission will be the first to start via a National Academy of Sciences Beyond Einstein Program Assessment Committee (BEPAC)

Funding wedge for new start in 2009, and if Constellation-X is selected allows a launch in mid-2017