LIGO Project Status

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LIGO PAC Meeting

November 16-17, 1998

This Talk

- Technical Status
- Status of LIGO Organization
  - » LIGO Scientific Collaboration
  - » Gravitational Wave International Committee (GWIC)
  - » LIGO Laboratory
    - – Both observatories are functioning as operating organizations
  - » LIGO Program Advisory Committee
- Cost/Schedule Status

LIGO Construction is 90% complete!

Status of the Project

- Project performance close to baseline cost/schedule
- Facility construction, including vacuum systems, near completion at both sites
- Buildings accepted, occupied and in use
- Detector design is essentially complete
- Detector fabrication in full swing with major bid jeopardy passed and many items being delivered for installation
- Installation of detector at Hanford is underway
- Data analysis and modeling systems being implemented

Picture of the Month: Installing Detector in the Vacuum System

Technical Highlights - Livingston Observatory

- Beam Tube Fabrication and Installation complete
  - » X arm vacuum performance accepted, Y arm essentially accepted

  Vacuum equipment installation essentially complete

  Commissioning of vacuum system volumes is underway
  - » Right end station accepted, others in progress
  - » Gate valve inspection and rework/repairs underway
- All buildings in use and undergoing shakedown
  - » Electrical substation provided by DEMCO cured power instability
  - » Punchlist and building QA items being worked or reworked
- Preparations begun for early ‘99 detector installation

Livingston Aerial View

Livingston Corner Station

Technical Highlights - Hanford Observatory

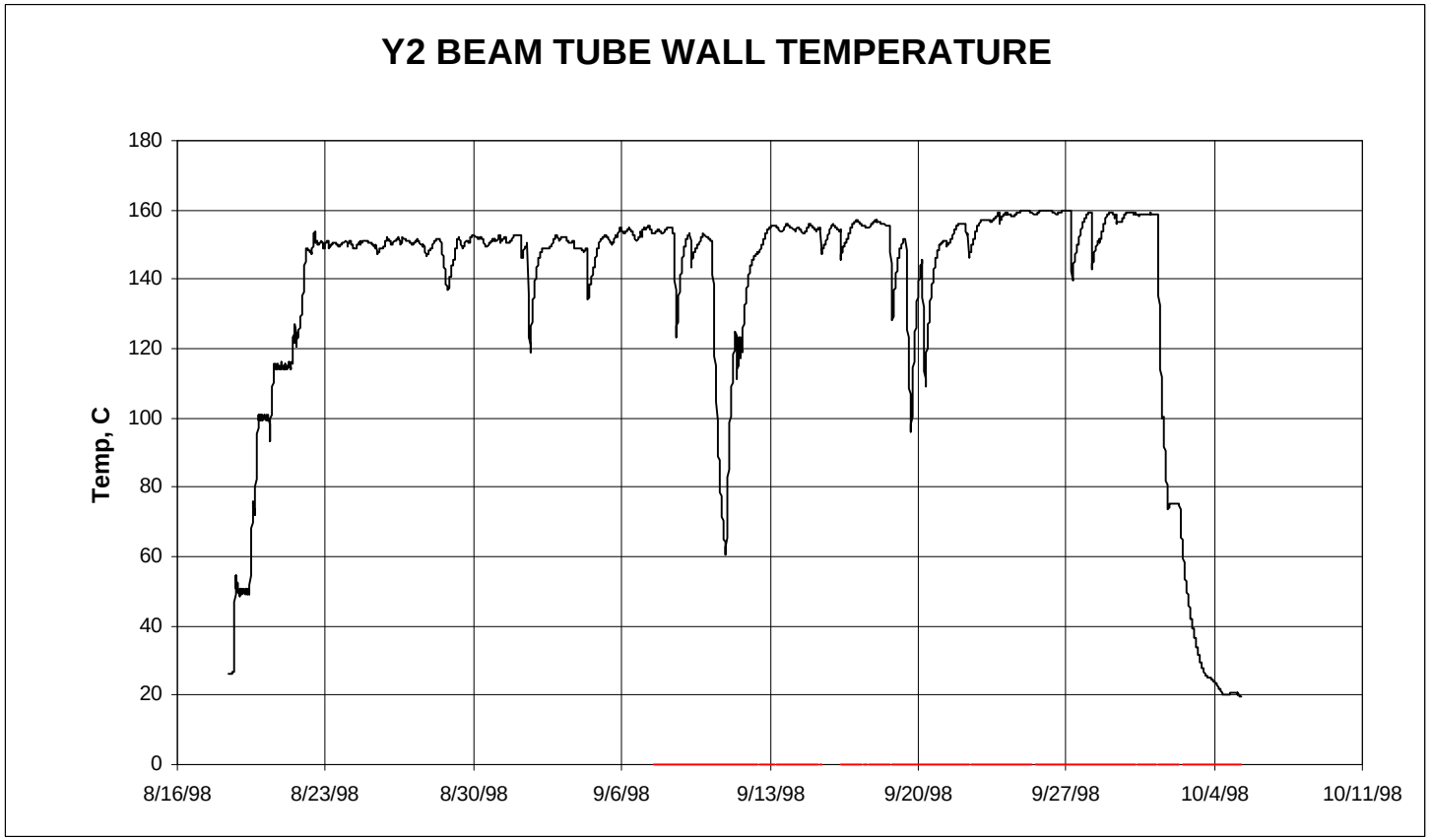
- Buildings and vacuum systems essentially complete
- About 50% staff on board

  Technical site characterization underway
- First beam tube module successfully baked

  Detector installation is underway

LIGO Hanford Observatory has transitioned from a construction site to a Laboratory!

First Module Bakeout



Technical Highlights - R&D

- Construction related R&D
  - » MIT Phase Noise Interferometer
    - – Phase Noise experiment successfully completed
    - – Completed digital loop test of suspension controller
    - – Carried out prototype diagnostics testing
  - » Caltech 40 Meter Interferometer
    - – Has successfully achieved stable lock in power recycled configuration
    - – Detailed characterization underway
    - – Data taking planned by year end
- Advanced R&D activities initiated
  - » Resonant Sideband Extraction, sapphire, thermal noise, vertical isolation studies already underway
  - » Multiyear funding just received to initiate other activities

Resonant Sideband Extraction

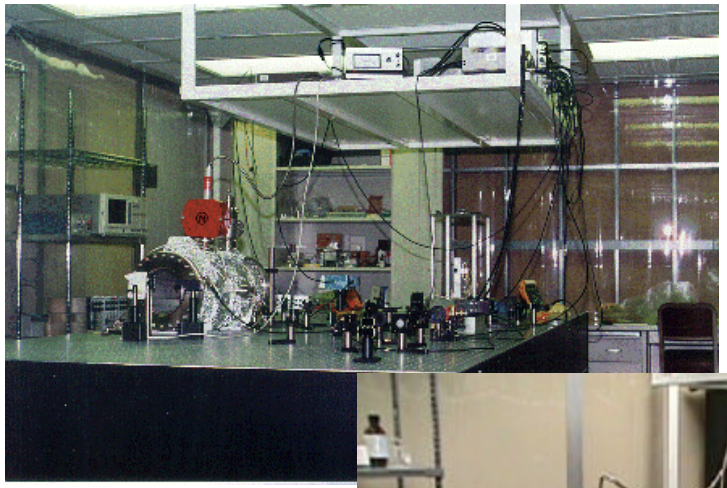
- Part of two thrust tabletop program
  - » Univ. of Florida - signal recycling
  - » LIGO Lab - resonant sideband extraction (Jim Mason thesis)
- Modeling is complete
- Lab is set up, mirror mounts/actuators are built, controls designed, built, tested
- 3-mirror cavities locked, more components being added
- February, ‘00 completion planned

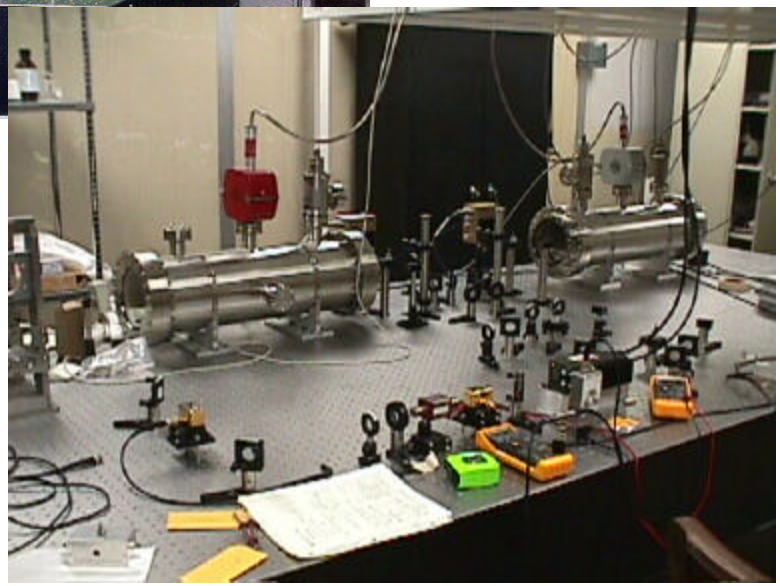
  40 Meter Interferometer suspended experiment follows with selected design

Sapphire Core Optics

- Goal is higher Q, heavier
- Materials procured from Crystal Systems and from China Institute of Optics
- Losses still at 100 ppm but better materials now used
- 15 cm piece polished, but bulk faults affect figure
- Q seen > 1 x 10^7 and worse

Thermal Noise Interferometer



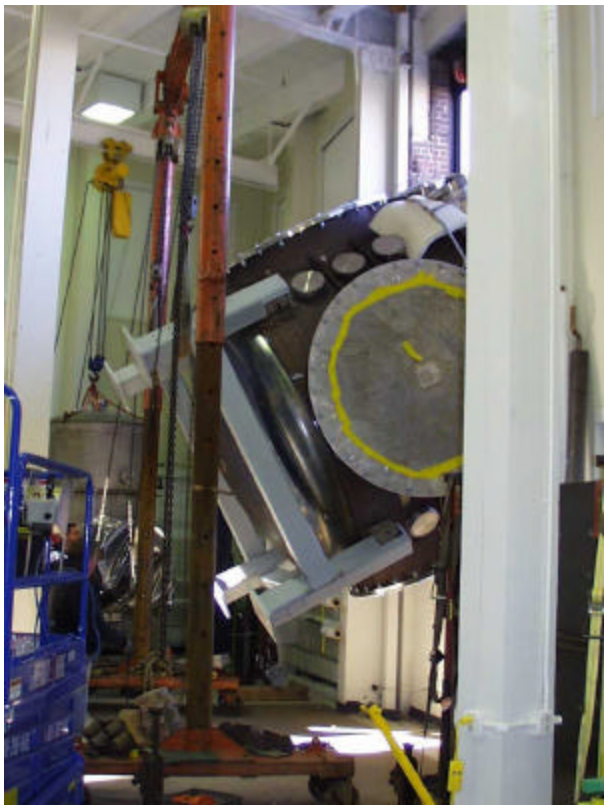


- Goal is direct measure of thermal and excess noise in suspension
- PSL tested with second cavity
- MIT PNI vacuum chamber and stack are being added
- Suspension and controls being constructed
- Data soon

Vertical Isolation Research

- Tests of advanced isolation based upon Virgo approach with early focus on vertical isolation
- First prototype tested
- New prototype in preparation

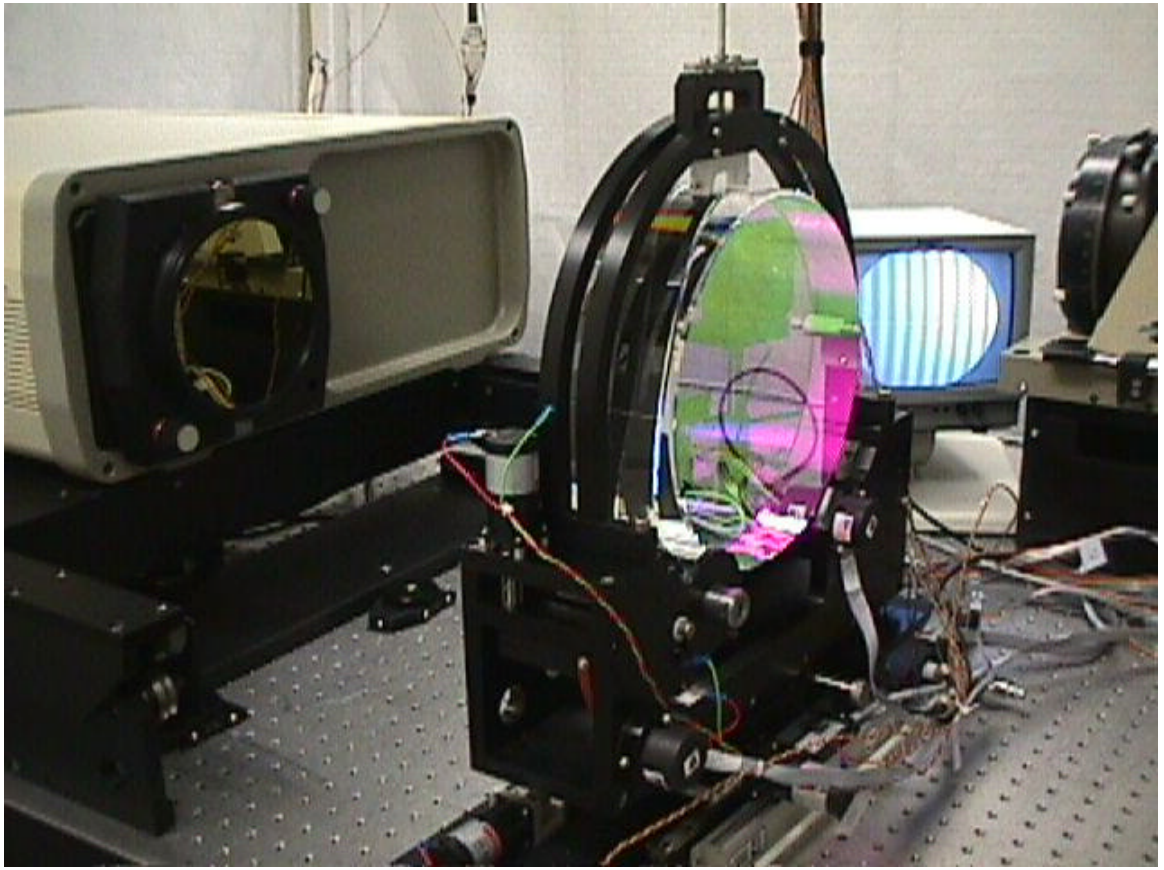
Suspensions - LAST at MIT



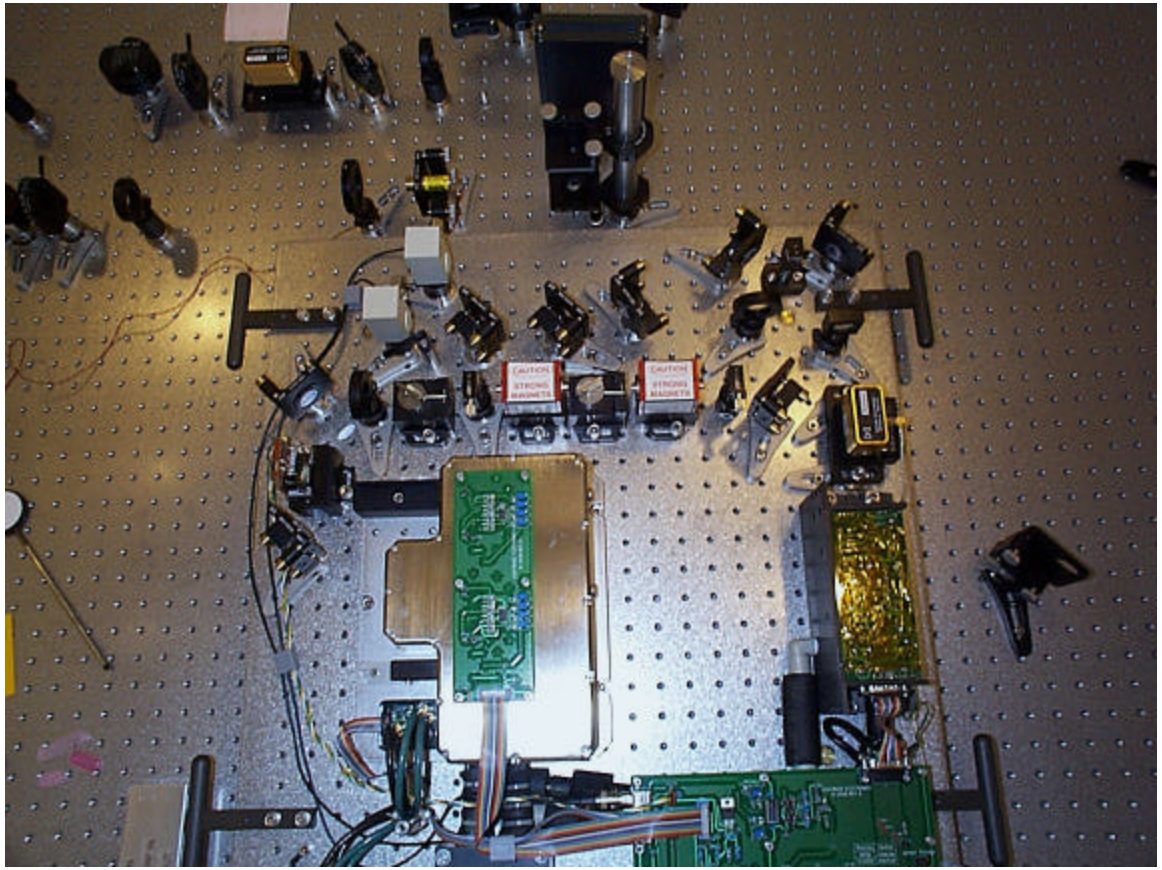
Technical Highlights - Detector Design and Fabrication

- 2 km IFO Prestabilized Laser installing at Hanford
  - » other lasers are being delivered
- Input Optics installation in early stages
- CDS DAQ/backbone/networks running at Hanford
- Core Optics nearly all fabricated
- Core Optics Support systems essentially designed
- Alignment Sensing system in use on prototypes
- Large Optics Suspension in production
- Seismic System first article tests successful and real installation is underway

IR Interferometer at Caltech Is In Use



Hanford 2 km IFO PSL



CDS Starts Up in the Control Room

HAM First Article Test at Hanford

Detector Status

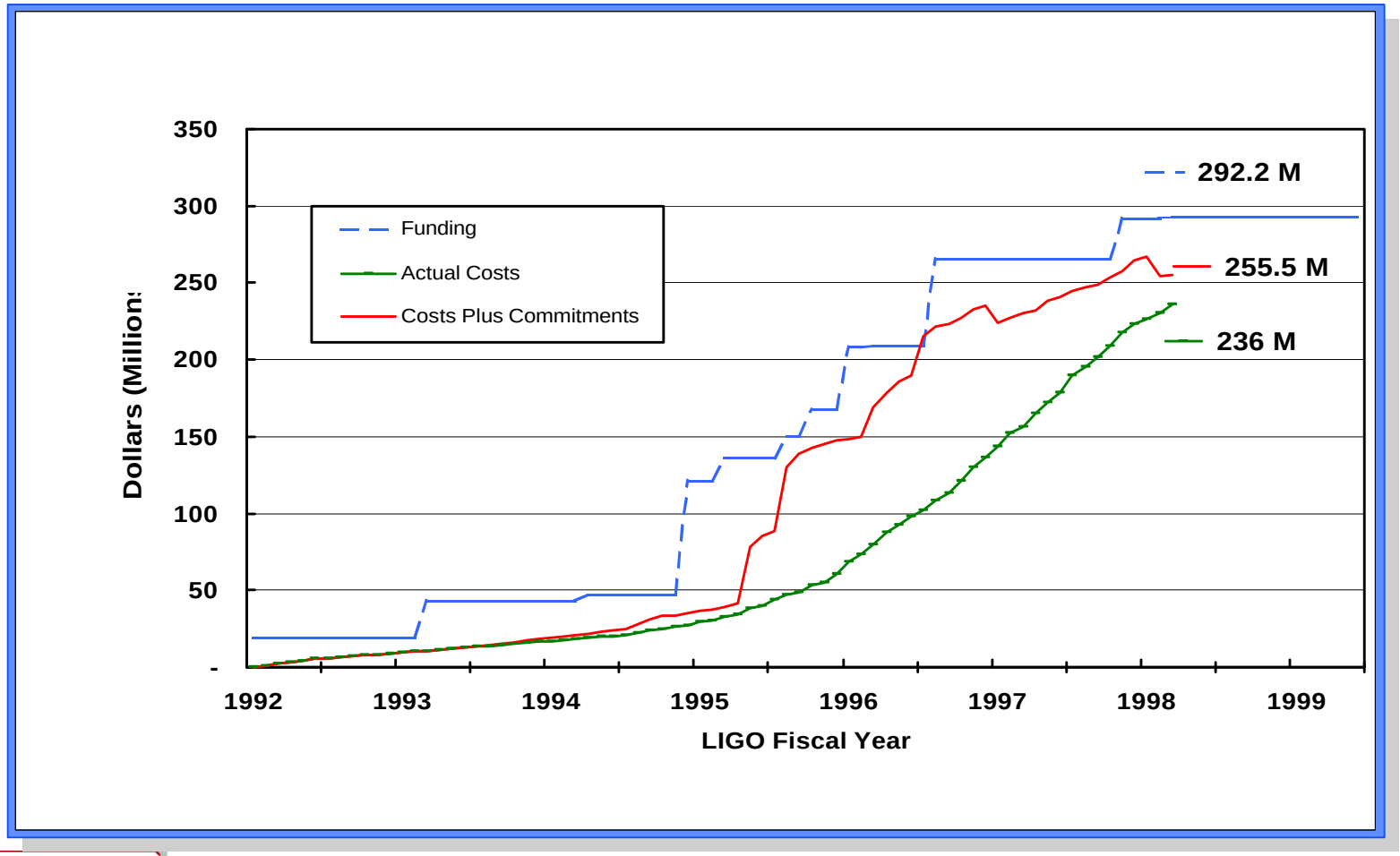
- Detector installation is underway and buildup of effort is following our plan
- Detector delivery and implementation has not slipped significantly since the 2 - 3 month delay presented at the Spring 1998 review
  - » Seismic design and fabrication is still the pacing item
    - – Some delay caused by beam tube valve difficulties and this delay was applied to completing first article tests
  - » Core optics coating failures fall within our plan
  - » IR interferometer procurement has followed its recovery plan with a second vendor

Status of LIGO Organization

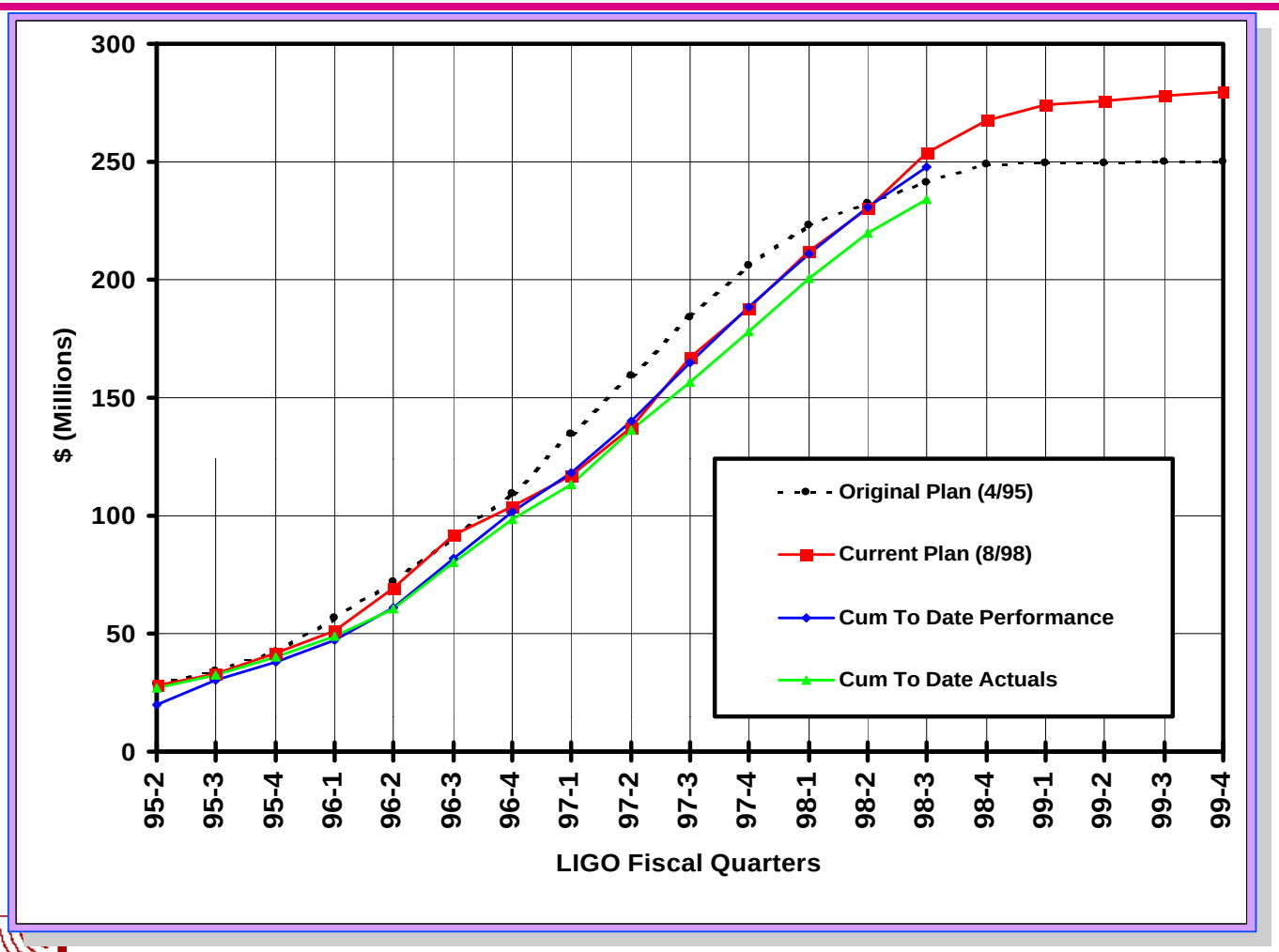
- LIGO Scientific Collaboration is now an autonomous organization
  - » Boulder meeting in August
  - » Recent White Paper draft issued to describe R&D program of LSC

  Gravitational Wave International Committee (GWIC)
  - » GWIC #2 April 1998 in Livingston
  - » GWIC #3 December in Paris
- LIGO Laboratory observatories are functioning
- Program Advisory Committee
  - » next meeting in November
- Education and Outreach programs being established

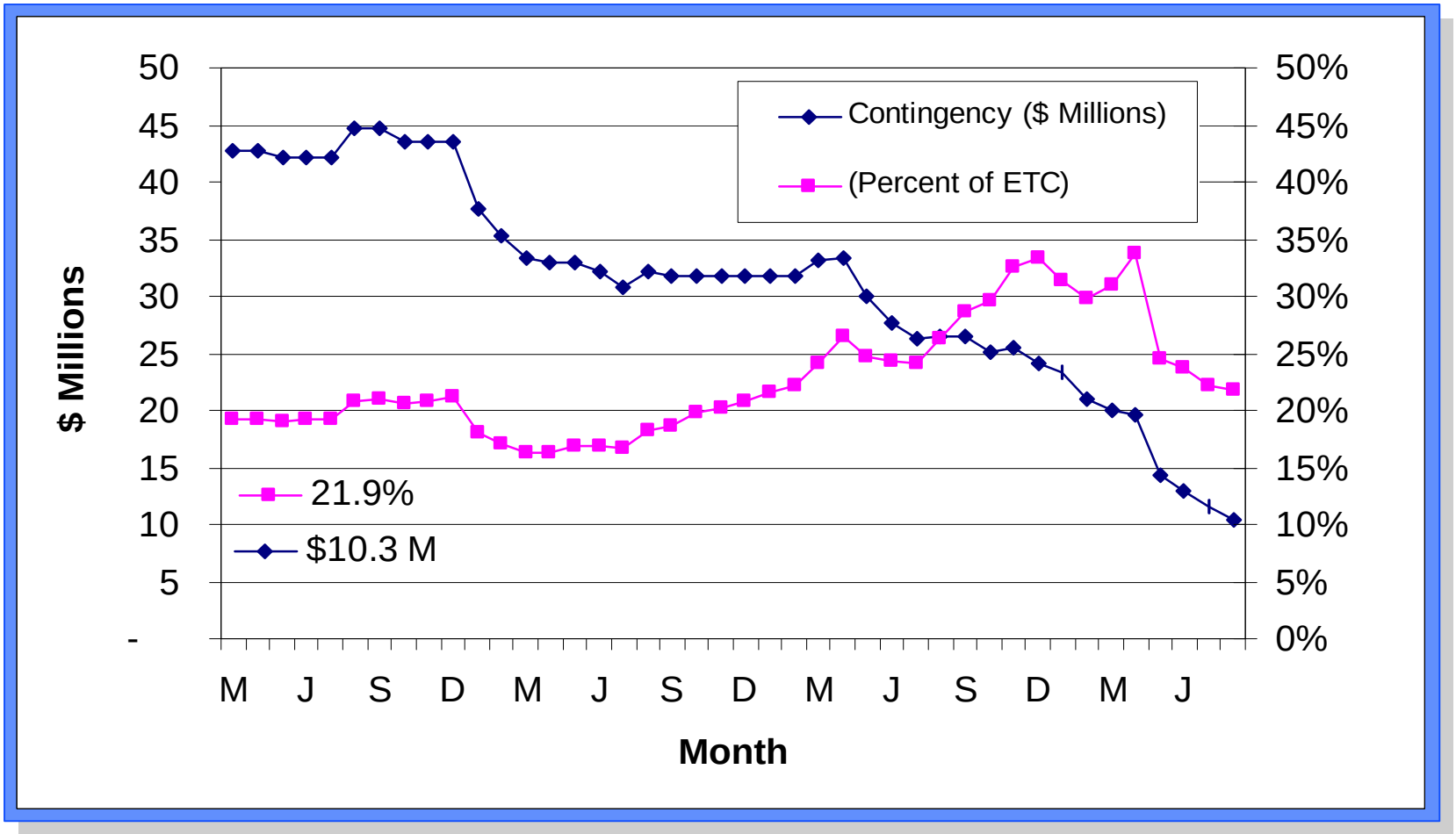
Costs and Commitments As a Function of Time



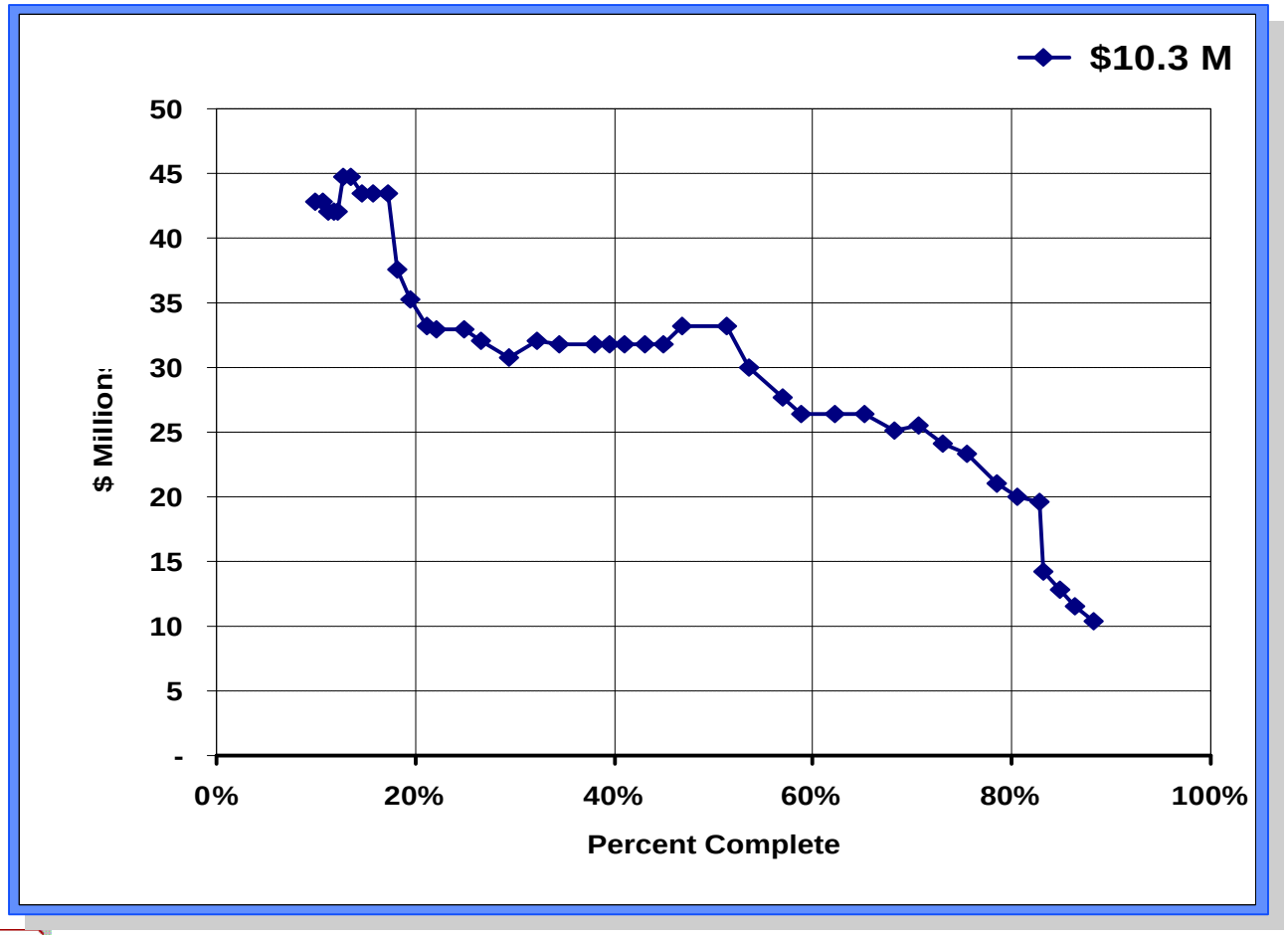
Top Level (WBS 1.0) Performance Chart (End Aug 98)



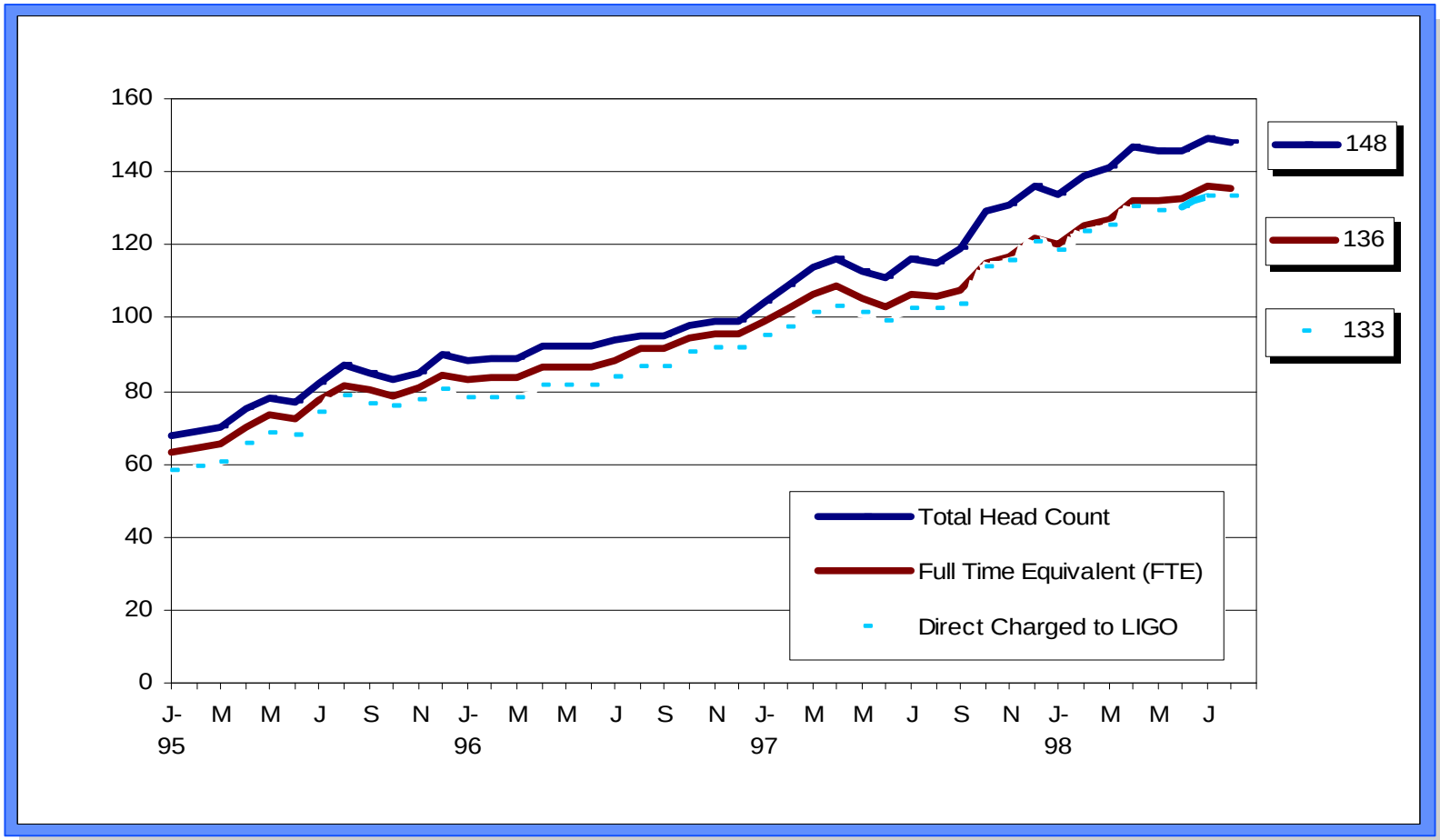
Project Contingency as a Function of Time



Project Contingency vs. Percent Complete



Staffing Chart



Staffing Summary

As of the end of August 1998
(Excluding Undergraduates)

		Caltech	MIT	Washington	Louisiana	Total
Direct	Headcount	65.0	20.0	17.0	8.0	110.0
	FTEs	55.0	18.0	17.0	8.0	98.0
Contract	Headcount	38.0				38.0
	FTEs	38.0				38.0
Total Headcount		103.0	20.0	17.0	8.0	148.0
Total FTEs		93.0	18.0	17.0	8.0	136.0

Graduate Students	Headcount	7.0	6.0	-	-	13.0
(included above)	FTEs	7.0	6.0	-	-	13.0