

LIGO Hanford Observatory (LHO) Status

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April 27, 1999



Hanford Summary

- Completing infrastructure details
- Staffing efforts continue
- All beam-tube modules baked out
- Detector final construction activities have fully occupied optics, vacuum prep/assembly labs
- Installation of 2-km interferometer raging onward
- Pilot outreach program established and first preliminary proposal submitted to NSF ESIE for LIGO outreach

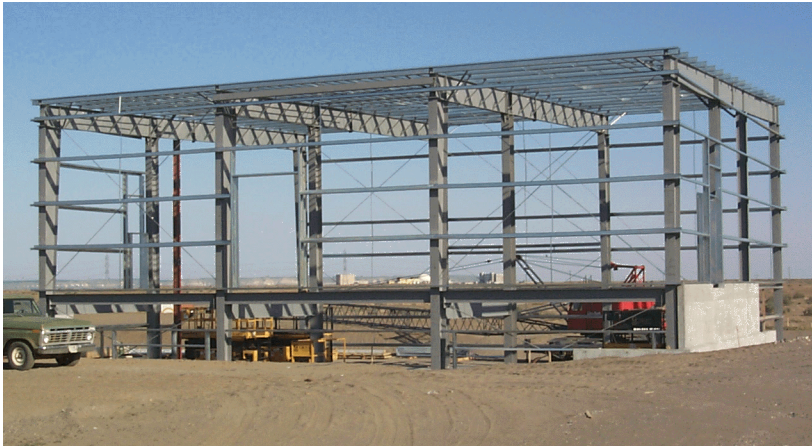
Observatory Staffing

- Available manpower currently comprised of:
 - ›› Resident Staff (~15 in operations; 2 in bakeout)
 - ›› LIGO Laboratory Visitors (avg ~10 during installation & commissioning)
 - ›› LIGO Science Collaboration (~1 members from UFI for input optics)
 - ›› Contractors for ongoing non-technical services (e.g., maintenance, grounds, janitorial)
 - ›› Temporary services for special jobs that do not carry over into steady-state operations (materials receiving/handling during installation; beam-tube bakeout; vacuum prep)
 - ›› Special “installation” contractors for trades (electricians, millwrights, etc.)
 - ›› High-school hourly students for office/engineering support
- Typically 30-40 people working on site

Resident Staff at Hanford by Task

- Management/Administration: Berry, Matherny, Raab
- Scientific Staff: Rong, Savage, Sigg, (2 offers out)
- Vacuum Systems: Ryan, Worden
- Electrical & Electronics Systems: McCarthy, Myers
- Software & Systems Administration: Barker, Patton
- Optics & Lasers: Cook, Weaver
- Seismic Systems: Gray, Radkins
- Beam -Tube Bakeout: Guenther, Lubinski

Status of Facilities



Staging Laboratory & Shops

- Additional space under construction to provide laboratory/staging space, fabrication shop, additional office and storage space and space for outreach programs
- Water system modification complete
- Working to upgrade compressors, road signage, accessibility for public

Beam-Tube Bakeout Results

	Outgassing Rate corrected to 23 °C torr liters/sec/cm ² (All except H ₂ are upper limits)					
molecule	Goal*	HY2	HY1	HX1	HX2	
H ₂	4.7	4.8	6.3	5.2		× 10 ⁻¹⁴
CH ₄	48000	< 900	< 220	< 8.8		× 10 ⁻²⁰
H ₂ O	1500	< 4	< 20	< 1.8		× 10 ⁻¹⁸
CO	650	< 14	< 9	< 5.7		× 10 ⁻¹⁸
CO ₂	2200	< 40	< 18	< 2.9		× 10 ⁻¹⁹
NO+C ₂ H ₆	7000	< 2	< 14	< 6.6		× 10 ⁻¹⁹
H _n C _p O _q	50–2 [†]	< 15	< 8.5	< 5.3		× 10 ⁻¹⁹
air leak	1000	< 20	< 10	< 3.5		× 10 ⁻¹¹ torr liter/sec

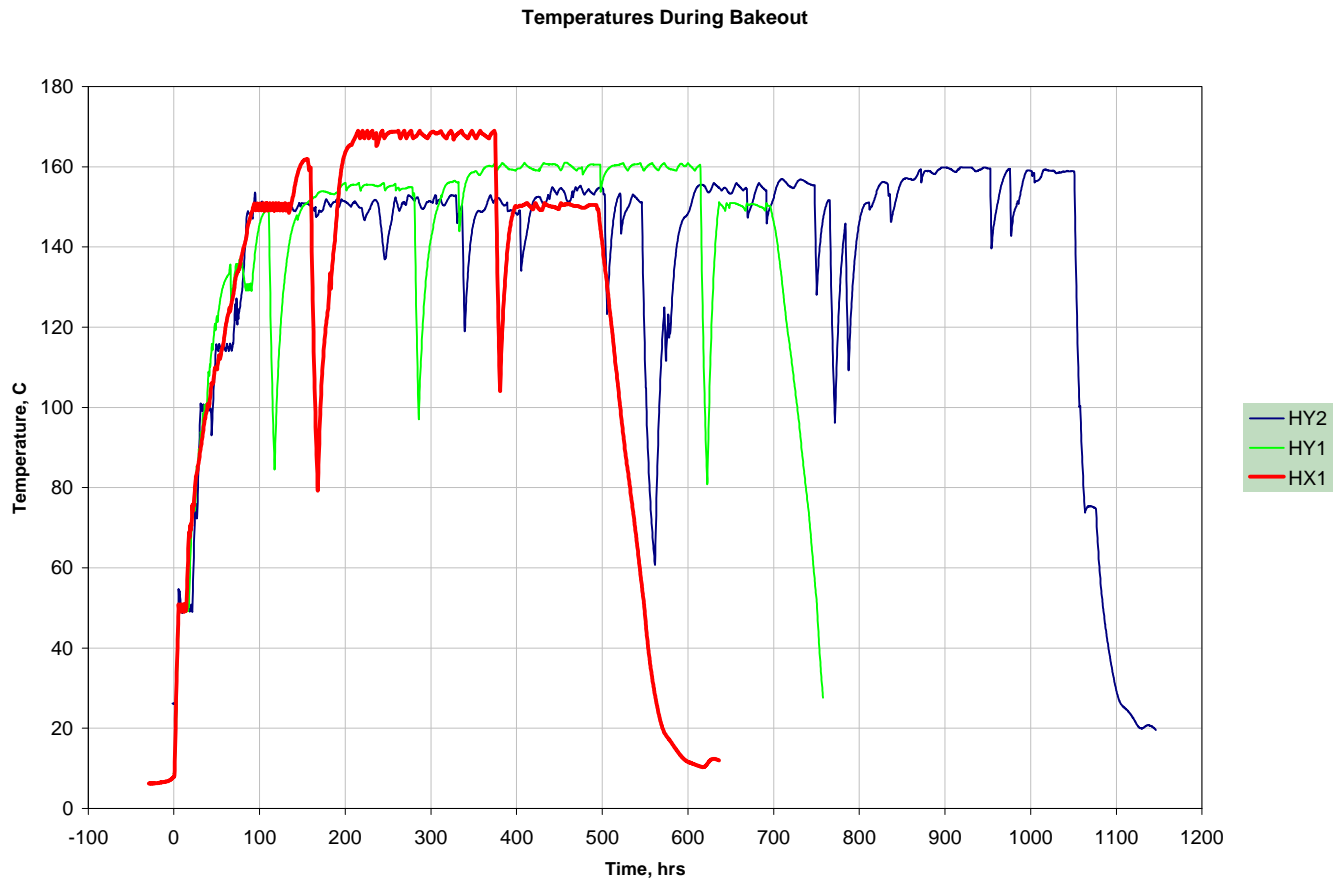
Fill in by mid-May 99

[†]Goal for hydrocarbons depends on weight of parent molecule; range given corresponds with 100–300 AMU

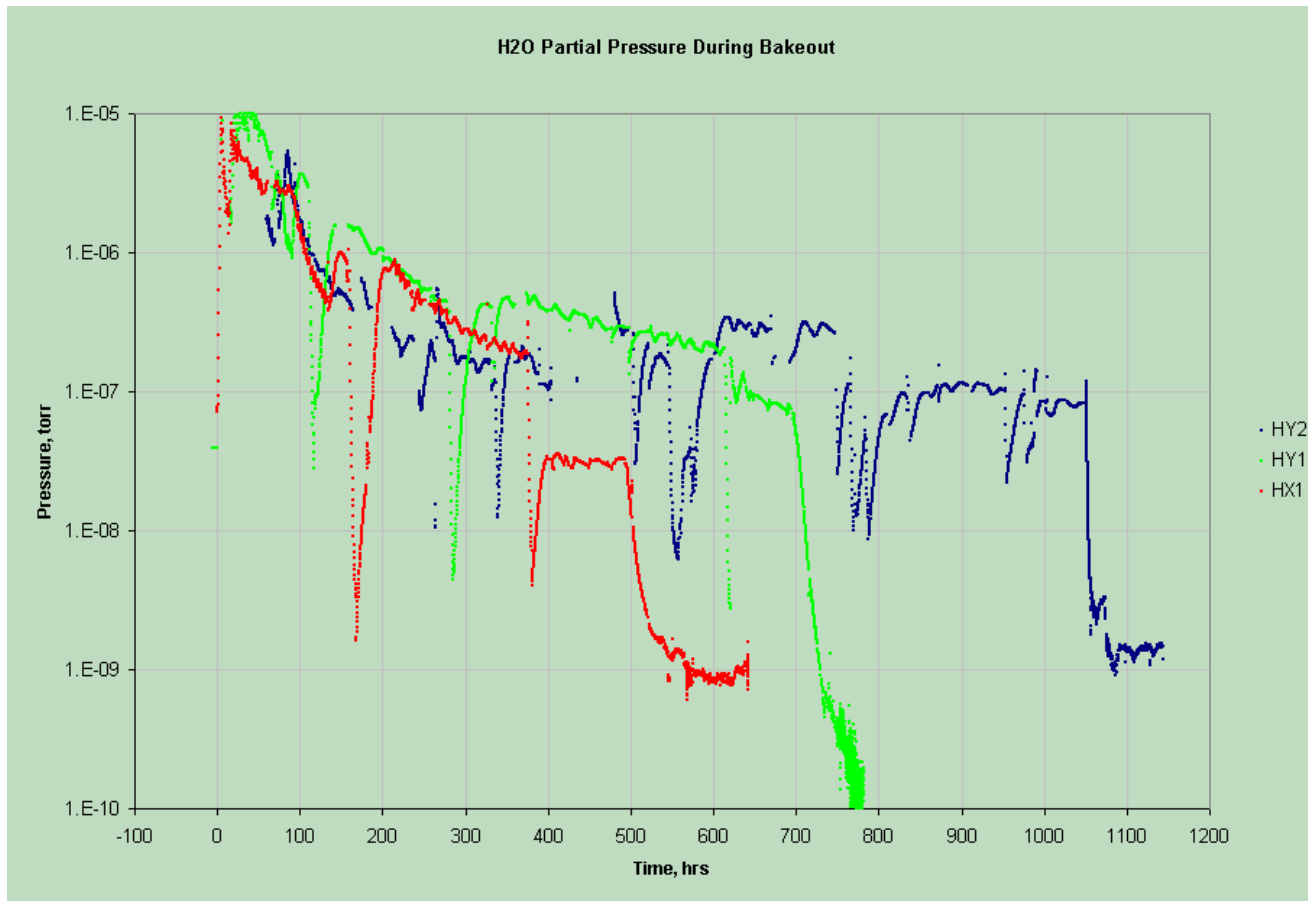
*Goal: maximum outgassing to achieve pressure equivalent to 10⁻⁹ torr H₂ using only pumps at stations



Bakeout Temperature History

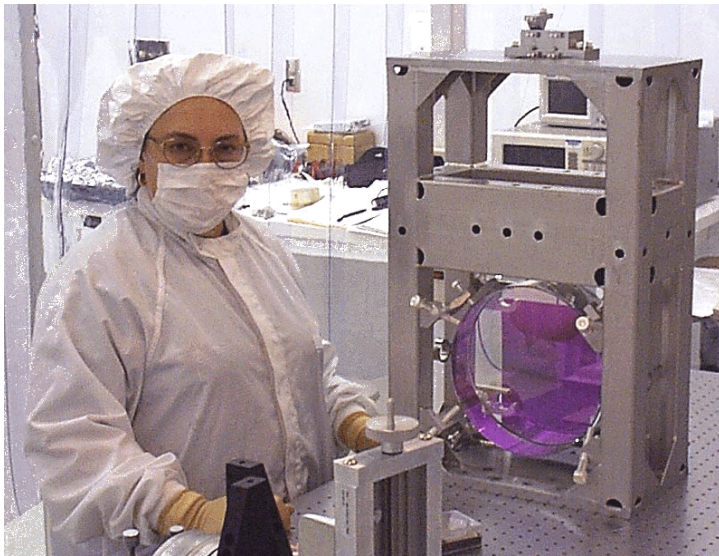


Water Behavior During Bakeout



Detector Final Construction

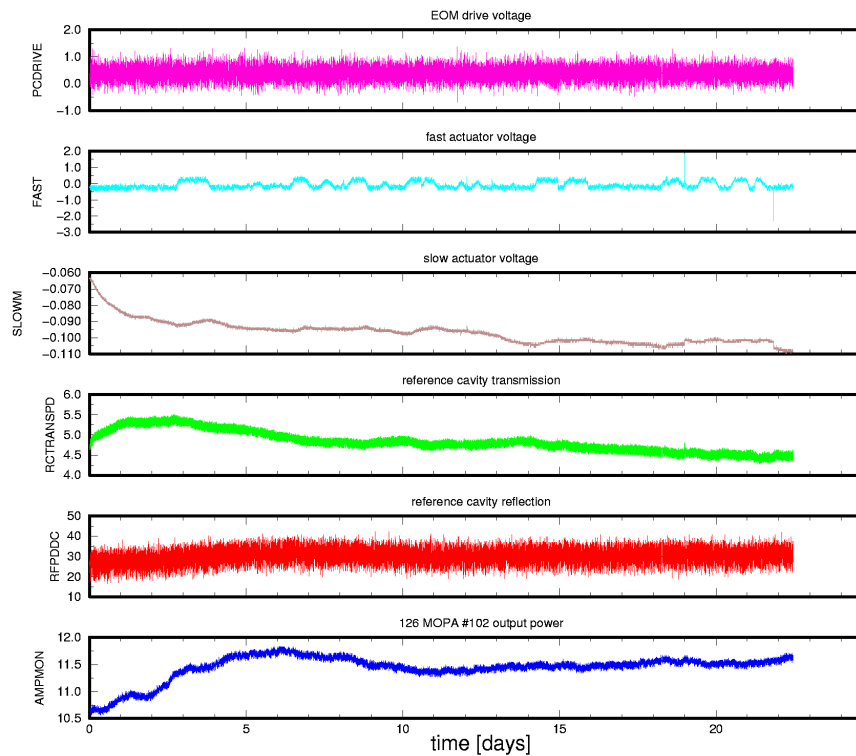
- Activities have moved to LHO Optics and Vacuum Prep and Assembly Areas



Dress for Success!

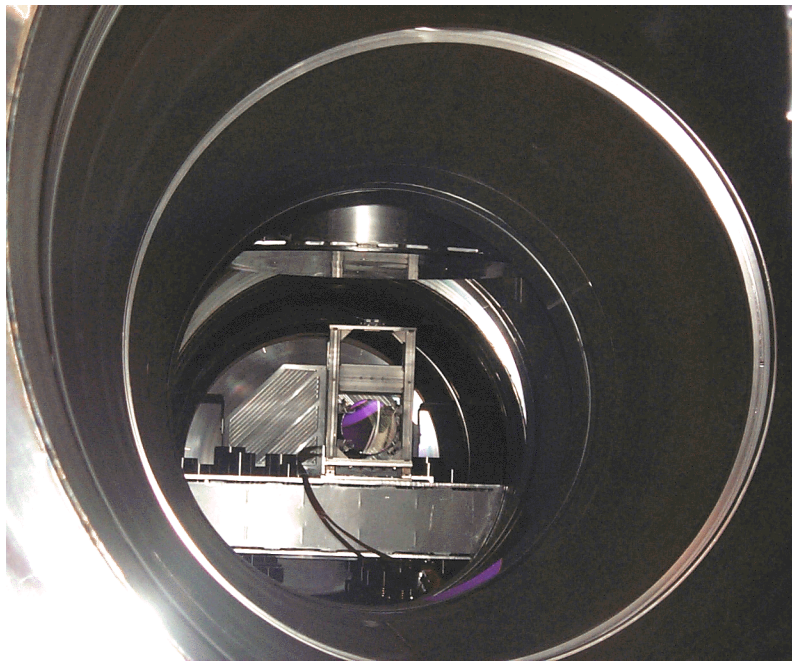
- Input and Core Optics assembly and cleaning
- Suspension assembly and balancing (to ~20 arcminutes)
- Vacuum bakeout and certification
- Full-time contract technician for hardware cleaning and bake-oven support

Laser Installed



- Optics on laser table is now in stable configuration
- Evaluating long-term behavior and learning use of data viewing tools
- Reference cavity has excellent long-term stability
- Pre-mode-cleaner needs range enhancement; acquires lock quickly
- Investigating grounding and power stability issues

HAM Seismic Isolation Tables Installed



View of RM2K in HAM

snow has been successfully tested

- All tables for 2-km interferometer input and output optics are completed
- Installation of input optics has begun
- Suspension controllers are installed and active
- Contamination monitoring program in place
- In-situ cleaning using CO₂

Installation of Critical BSC Seismic Isolation Begun



Adjusting Counterweights
on BSC8 Optical Table

- 2km input test mass chamber for Y arm completed; folding mirror installed
- 2km beam-splitter chamber almost complete
- 2km input test mass chamber for X should complete by mid May

Control Room In Business



- Currently available at consoles: vacuum controls, facility controls, suspensions & laser screens

- Data Acquisition system channels becoming available; first

data written into frames; starting testing of analysis packages (Triana, Matlab, GRASP)

- T1 WAN service now established
- E-log installed and used to distribute bakeout & installation logs to other sites
- Site of daily work-permitting meeting

Outreach Activities

- Started pilot program to create internship opportunities for area high-school teachers and students for Summer 99
 - ››goal: introduce research activities & course offerings into high school
 - ››tapping into PNNL educational expertise
 - ››produce ongoing monitoring and analyses of seismic data and evaluate mitigation for tidal, microseism and cultural-noise components
 - ››submitted pre-proposal to NSF ESIE for additional 3-yr to expand program to high schools in western US
- Working with local Educational Service District (for south-east WA) to develop joint ventures
 - ››utilize internet connectivity for LIGO-based educational programs
 - ››teacher workshops to develop curriculum/exhibit design for LIGO Visitor Ctr

Outreach Activities (cont'd)



- Developing exhibit materials for LIGO Visitor Ctr

- ›› Gravitational-wave poster set & video

- ›› Michelson Interferometer-in-a-box

- ›› Newton's Equivalence Principle hands-on demo

- Developing larger scale vision for a LIGO outreach effort representing gravitational physics

Summary



- Tremendous amount of work completed
- All beam-tube bakeout activity at Hanford will end by June 30
- Installation active on many fronts