Pre-stabilized Laser Subsystem
WA-2k Interferometer Installation

- Groundwork
  - ›› laser table installation (16 ft. x 5 ft. x 2 ft. thick)
  - ›› laser table enclosure installation
  - ›› Standard Operating Procedures for LIGO 10-W Laser in LVEA
  - ›› laser area enclosure fabrication and installation
- 9/98 - Begin installation - P. King, R. Abbott
- 12/98 - Subsystem operational
  - ›› most performance parameters at or near specified levels
    - — thermal controller for reference cavity (tidal actuator) inoperable
    - — output power ~ 1 W below spec.
    - — pre-modecleaner jumping longitudinal modes ~ every 1-5 days
    - — measurements at Caltech indicate that intensity noise filtering by PMC not sufficient
    - — intensity stabilization acoustic optic modulator not functioning as advertised by manufacturer - limiting servo performance at high freq.
  - ›› automated lock acquisition demonstrated for both FSS and PMC

2k PSL Installation (cont.)

- 2/99 - Begin work on end-to-end model for PSL
- 3/99 - Laser power supply failure (4000 hrs)
- 4/99 Begin Livingston PSL installation
  - ›› WA-4k PSL installation scheduled for 1/00
- 5/99 - System upgrades
  - ›› voltage-controlled oscillator for Wideband Input upgraded
    - — now accommodates differential signal from IOO phase margin improved by 10 deg. at 100 kHz (still 10 deg. short of requirement).
  - ›› Data Acquisition System cabling interface card installed
    - — enable proper connection of PSL "fast channels"
- 5/99 - Five months of continuous operation
  - ›› system has operated without intervention
    - — frequency stabilization servo has never fallen out of lock
    - —PMC re-acquires automatically

2k PSL Installation (cont. 2)

›› output power has degraded to 6.9 W (from 7.5 W)

— only current to power amplifier increased

— increase in master oscillator current causes drastic reduction in beam quality - realignment required

— alignment to reference cavity degraded - mechanical mount drifted

›› source of diurnal variations traced to laser chiller enclosure temperature fluctuations

›› optical interface with IOO subsystem refined

- To Do

›› operate Tidal Servo

›› upgrade PMC

›› upgrade AOM?

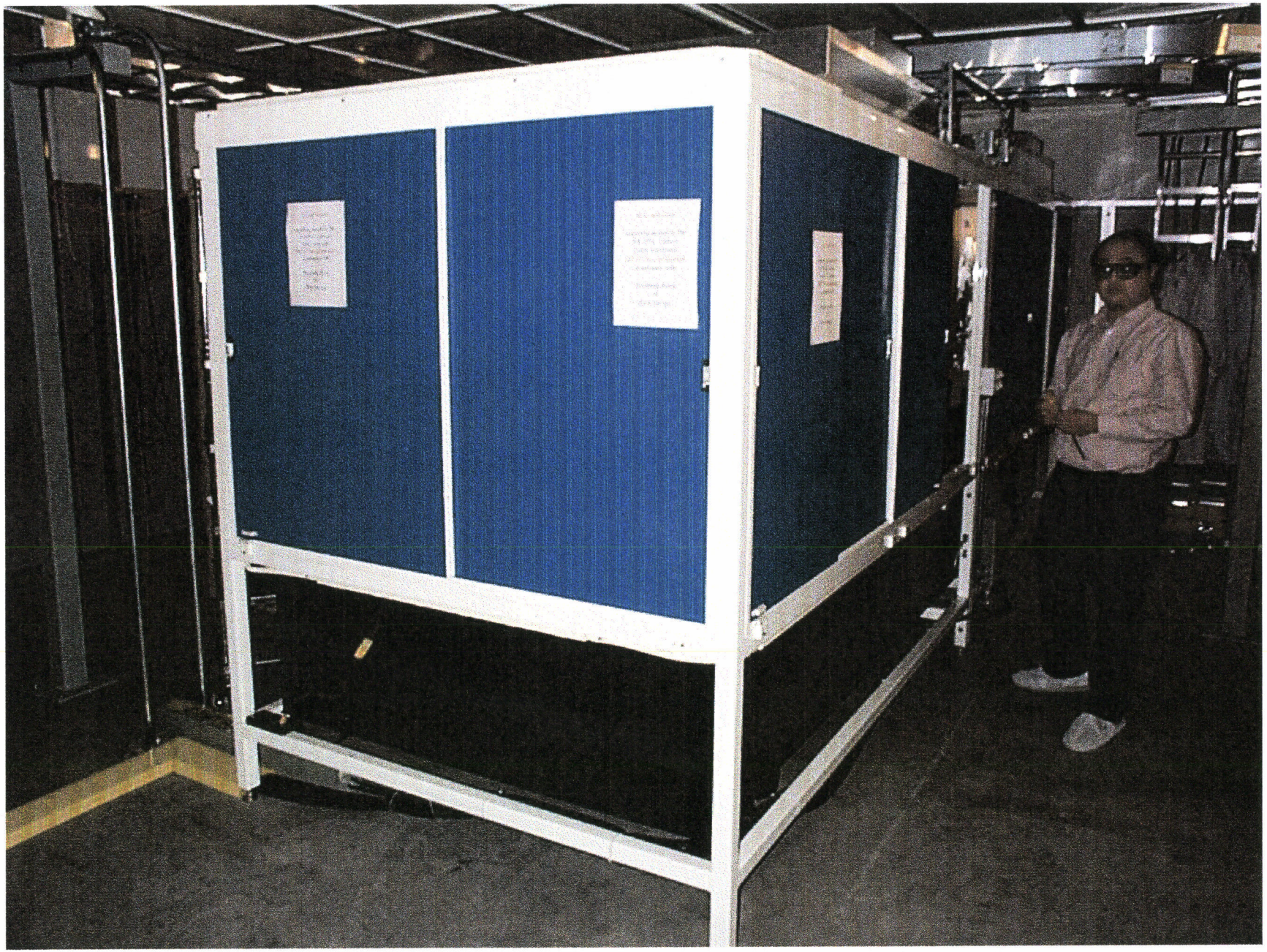
›› cabling for "fast channels" - 6/99

— whitening filters and preamps?

— analyze high frequency performance over long periods

2k PSL Installation (cont. 3)

- complete PSL end-to-end model - target 7/99
- integrate PSL with IOO - 7/99



LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
- LIGO -
CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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Standard Operating Procedure **LIGO 10-W Laser for the 2k Interferometer** **Operating in the LVEA (with Laser Area Enclosure)**		
SPONSOR R. Savage		

Distribution of this draft:

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February 26, 1999

REGISTERED LASER PERSONNEL

LIGO 10-W Laser for the 2k Interferometer Operating in the LVEA (with Laser Area Enclosure)
LIGO-M980046-C-W

Lightwave Model 126 Laser Operating Inside a Laser Area Enclosure in the LVEA
LIGO-M980050-B-W

1. R. Abbott
2. D. Barker
3. J. Berry
4. S. Bevans
5. L. Cardenas
6. D. Cook
7. D. Coyne
8. P. Csatorday
9. R. Galpin
10. L. Garrelts
11. J. Giaime
12. C. Gray
13. M. Guenther
14. B. Halloway
15. J. Heefner
16. J. Henricks
17. R. Houtrouw
18. L. Jones
19. P. King
20. C. Lomax
21. M. Lubinski
22. A. Marin
23. O. Matherny
24. R. McCarthy
25. J. Myers
26. T. Neasham
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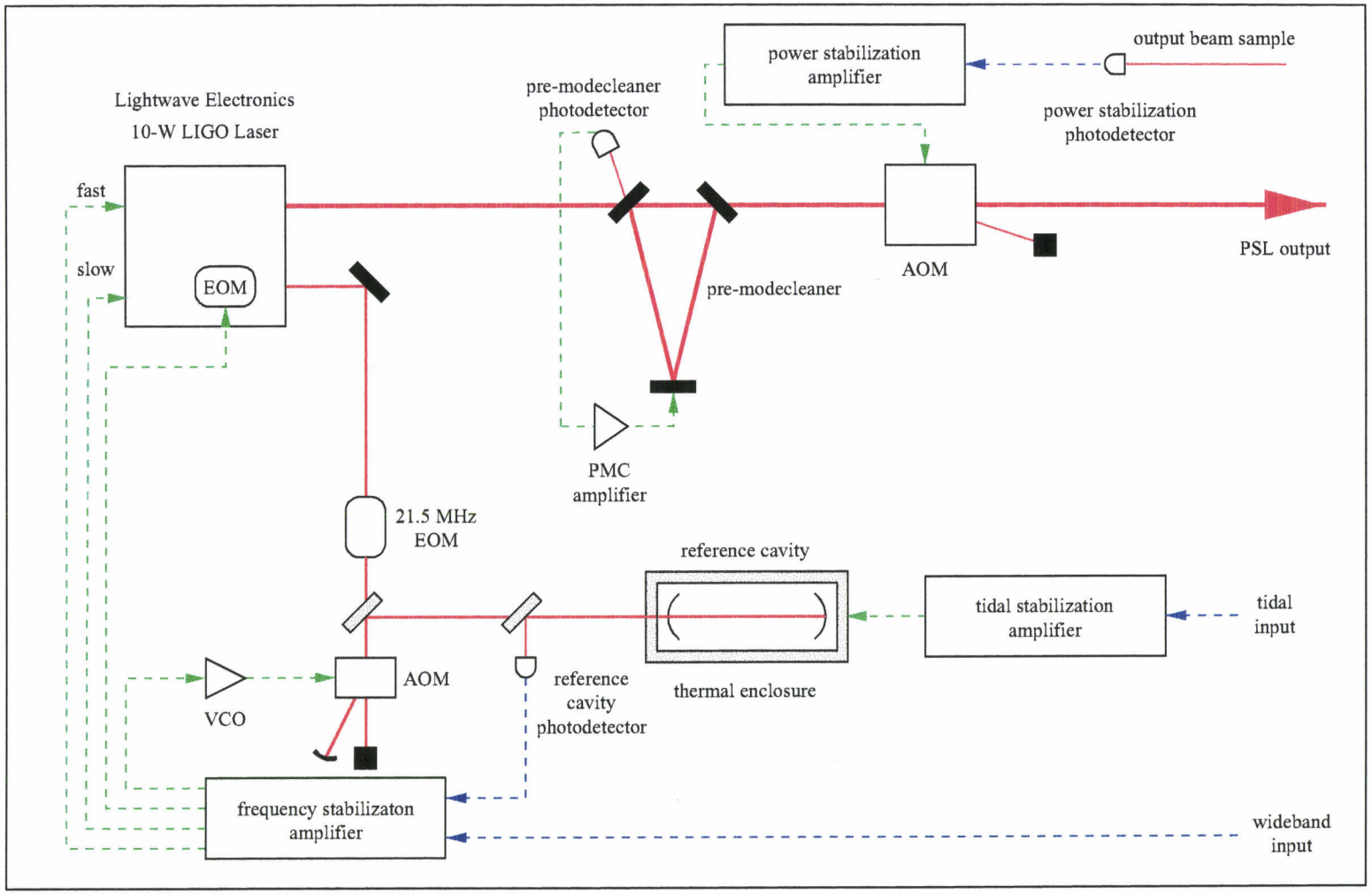
28. C. Patton
29. B. Peterson
30. F. Raab
31. M. Rachmanov
32. H. Radkins
33. D. Reitze
34. R. Reynolds
35. M. Roach
36. H. Rong
37. P. Russell
38. K. Ryan
39. G. Sanders
40. T. Santini
41. R. Savage
42. R. Schofield
43. D. Shoemaker
44. Q. Shu
45. D. Sigg
46. M. Smith
47. B. Weaver
48. S. Whitcomb
49. J. Worden
50. S. Yoshida

Please see R. Savage or D. Cook regarding Registered Laser Personnel status.

Schematic of Pre-stabilized Laser System



February 26, 1999

REGISTERED LASER PERSONNEL

LIGO 10-W Laser for the 2k Interferometer
Operating in the LVEA
(with Laser Area Enclosure)
LIGO-M980046-C-W

Lightwave Model 126 Laser Operating
Inside a Laser Area Enclosure in the LVEA
LIGO-M980050-B-W

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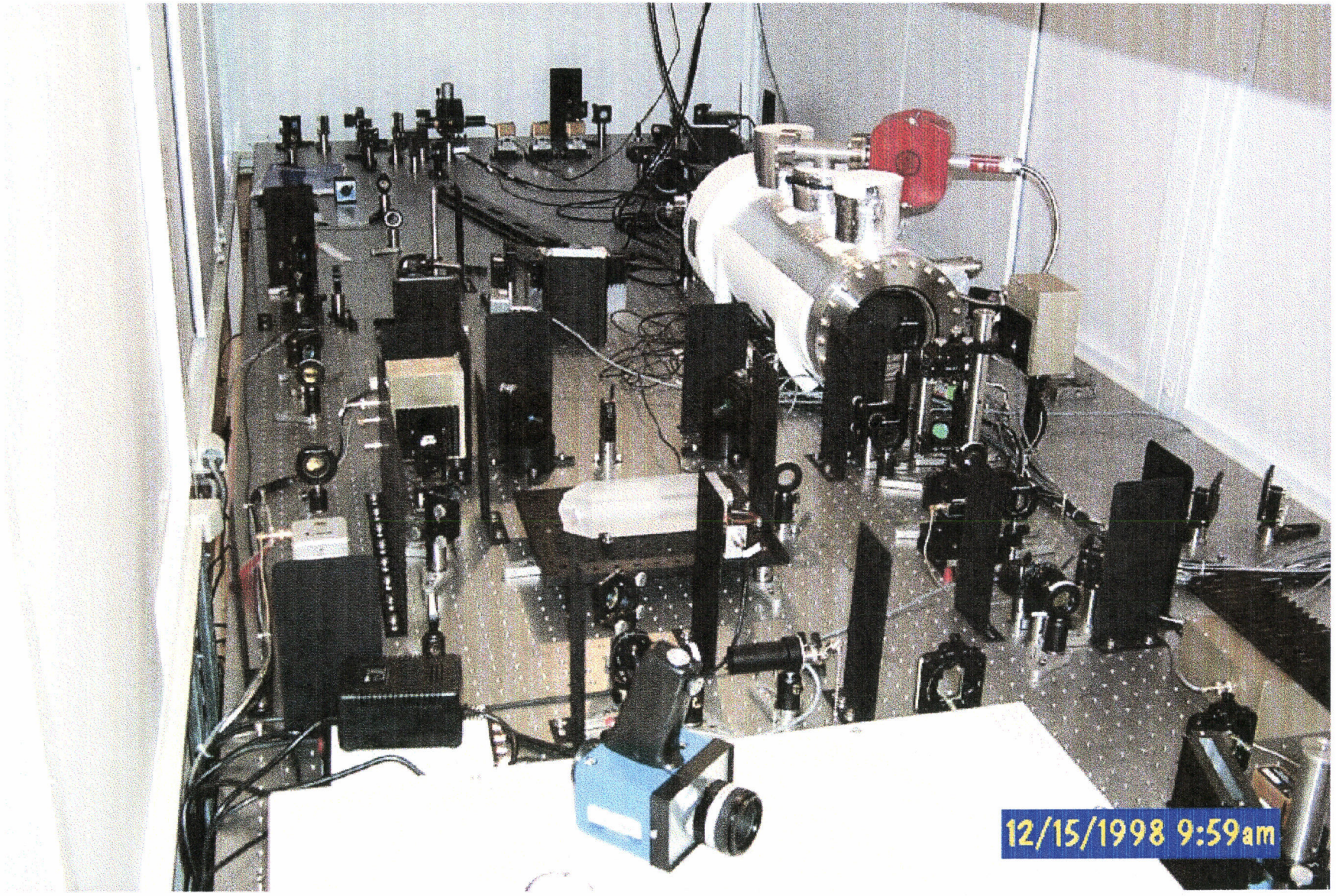
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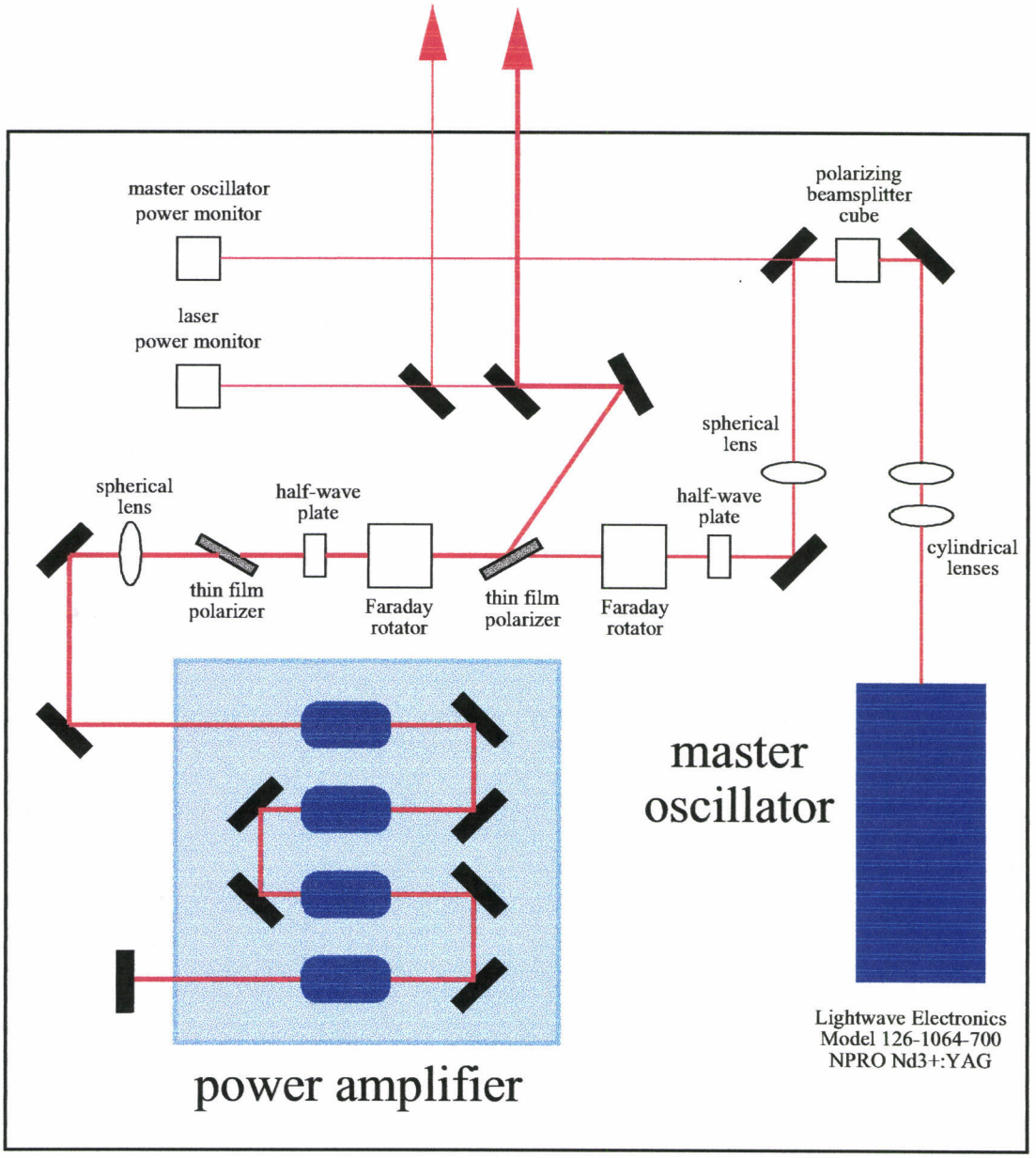
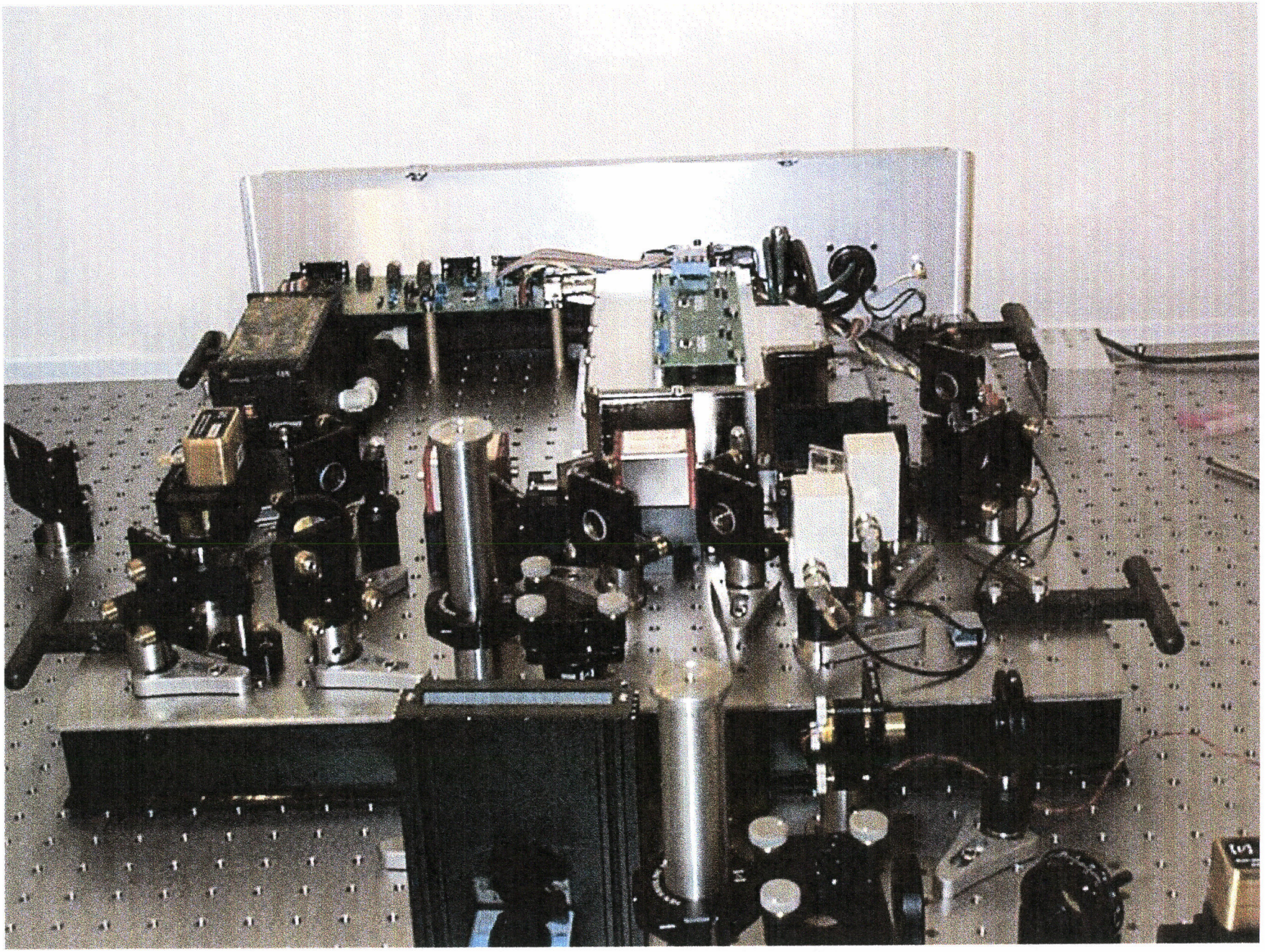
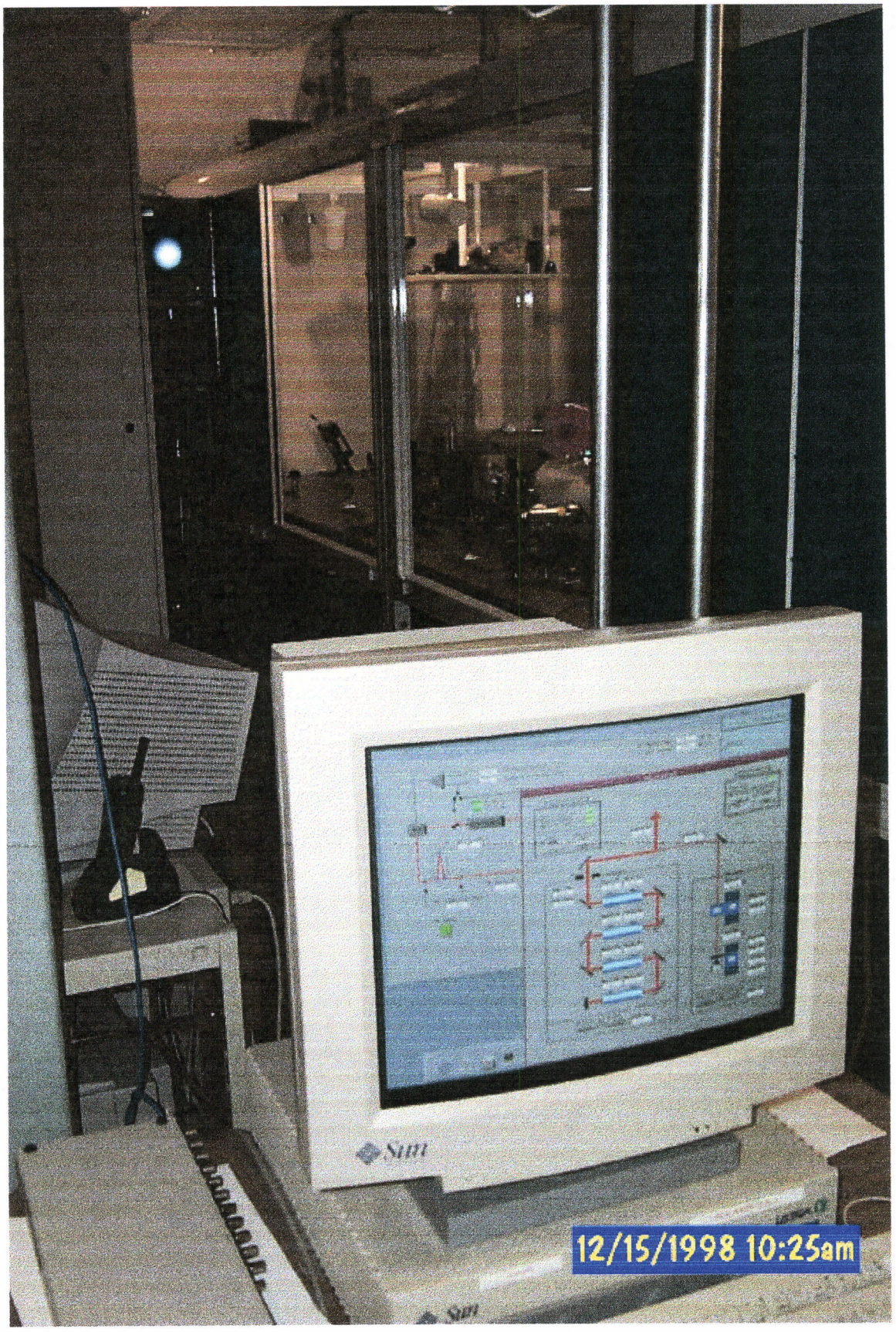
Schematic of LIGO 10-W Laser



LIGO

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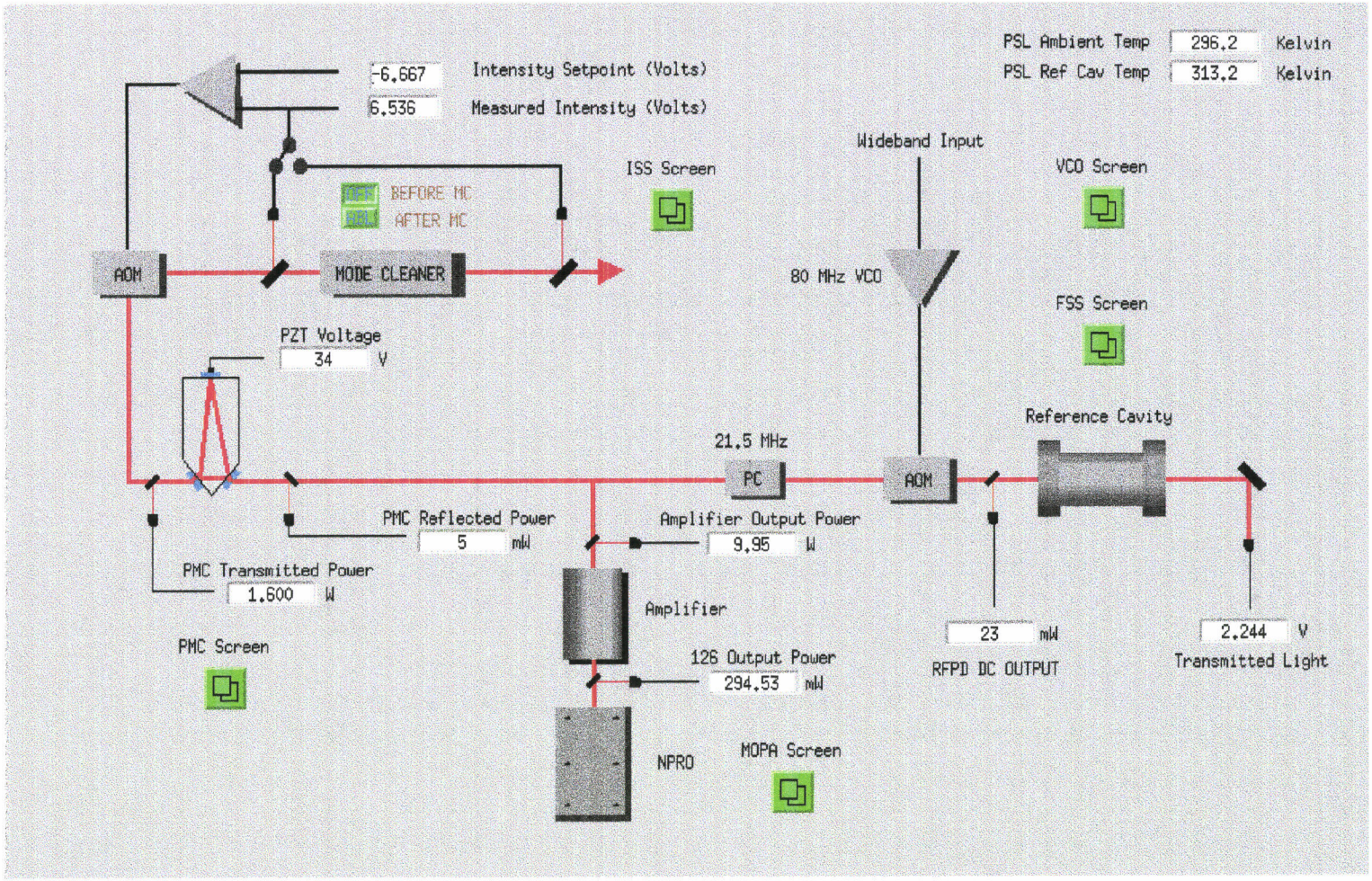
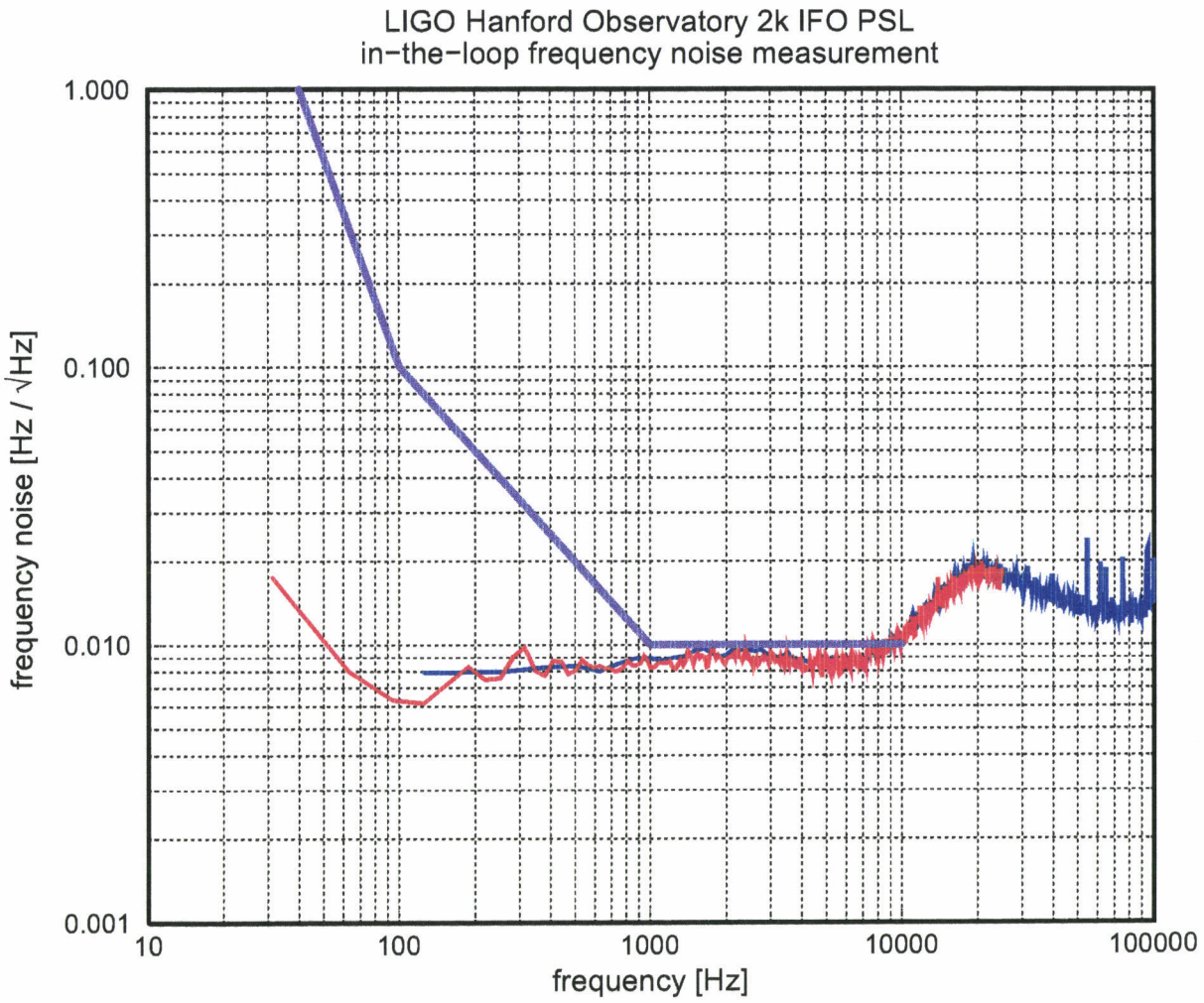
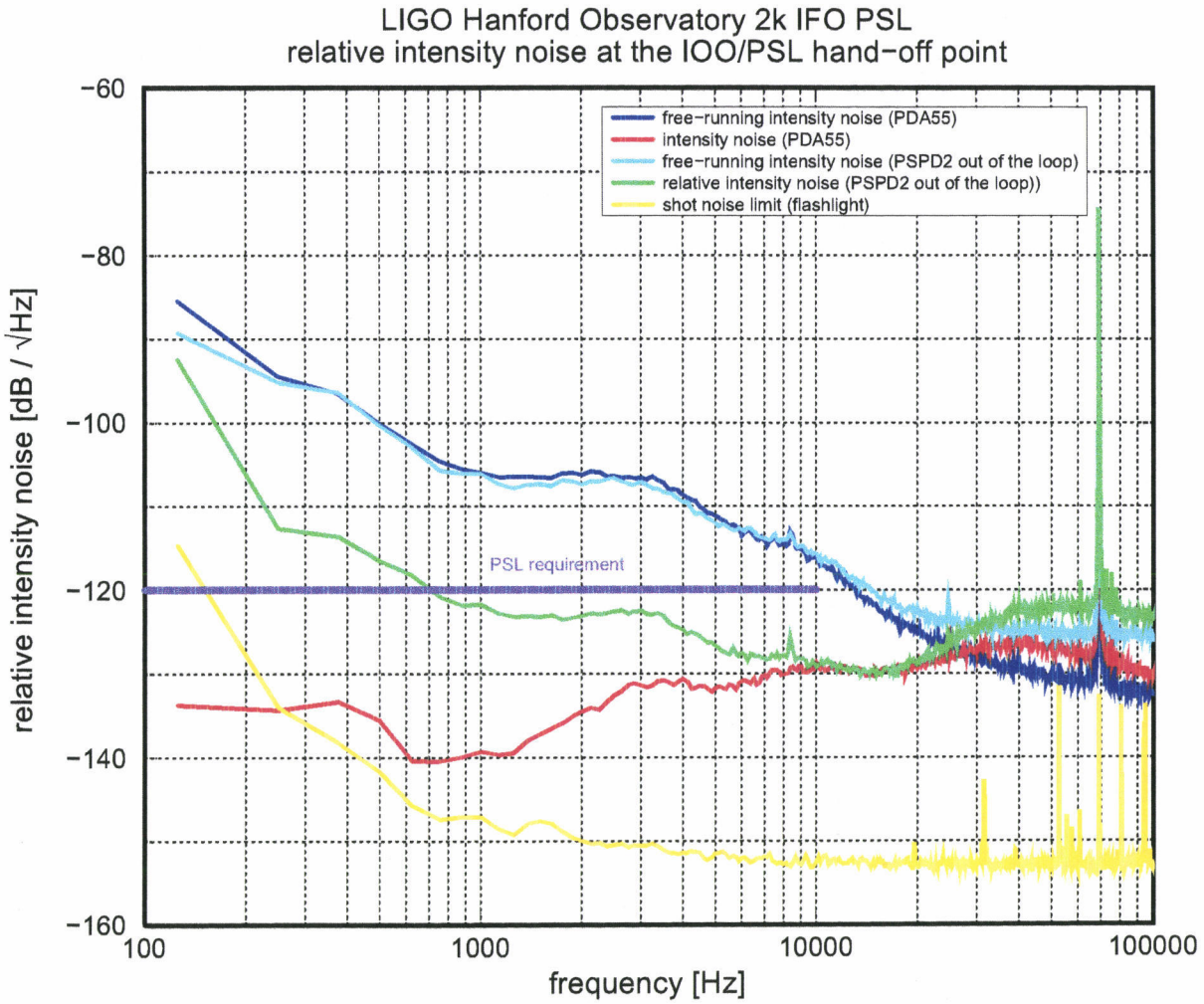
Master PSL Control Screen



PSL In-the-loop Frequency Noise 12/98

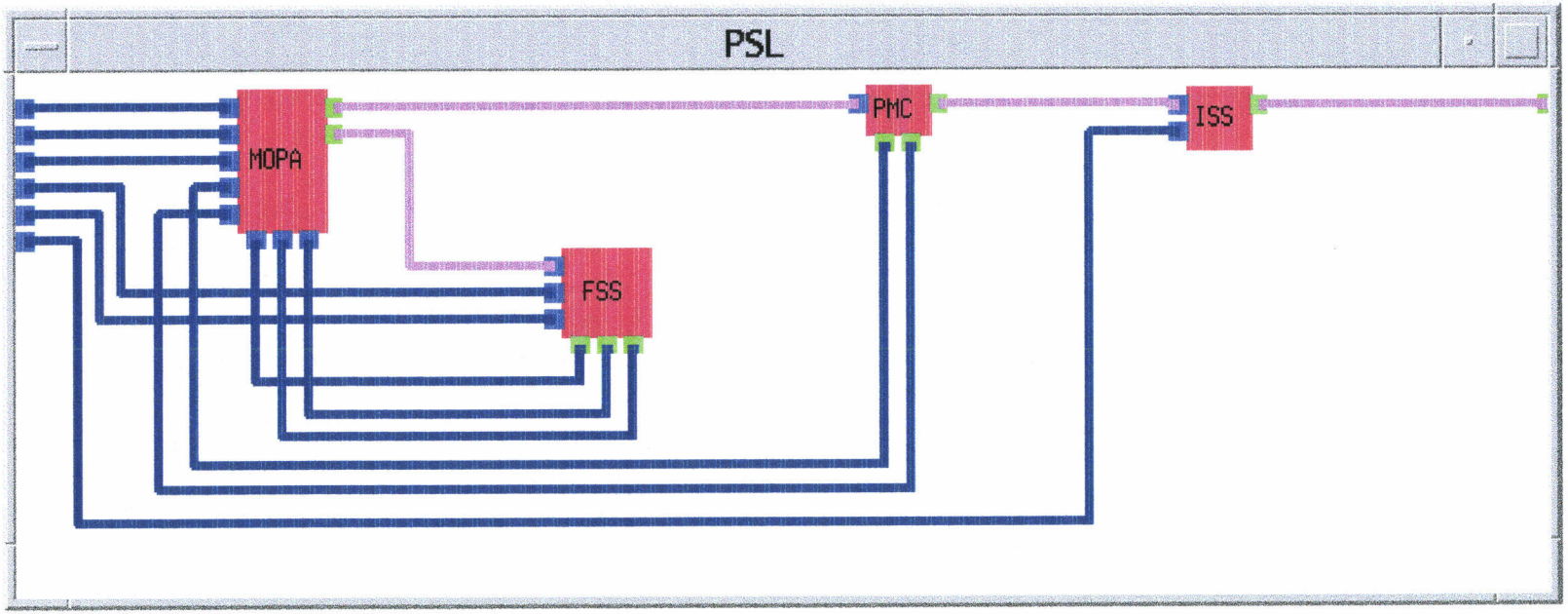


PSL Relative Intensity Noise 12/98



LIGO

psl_box Internal View



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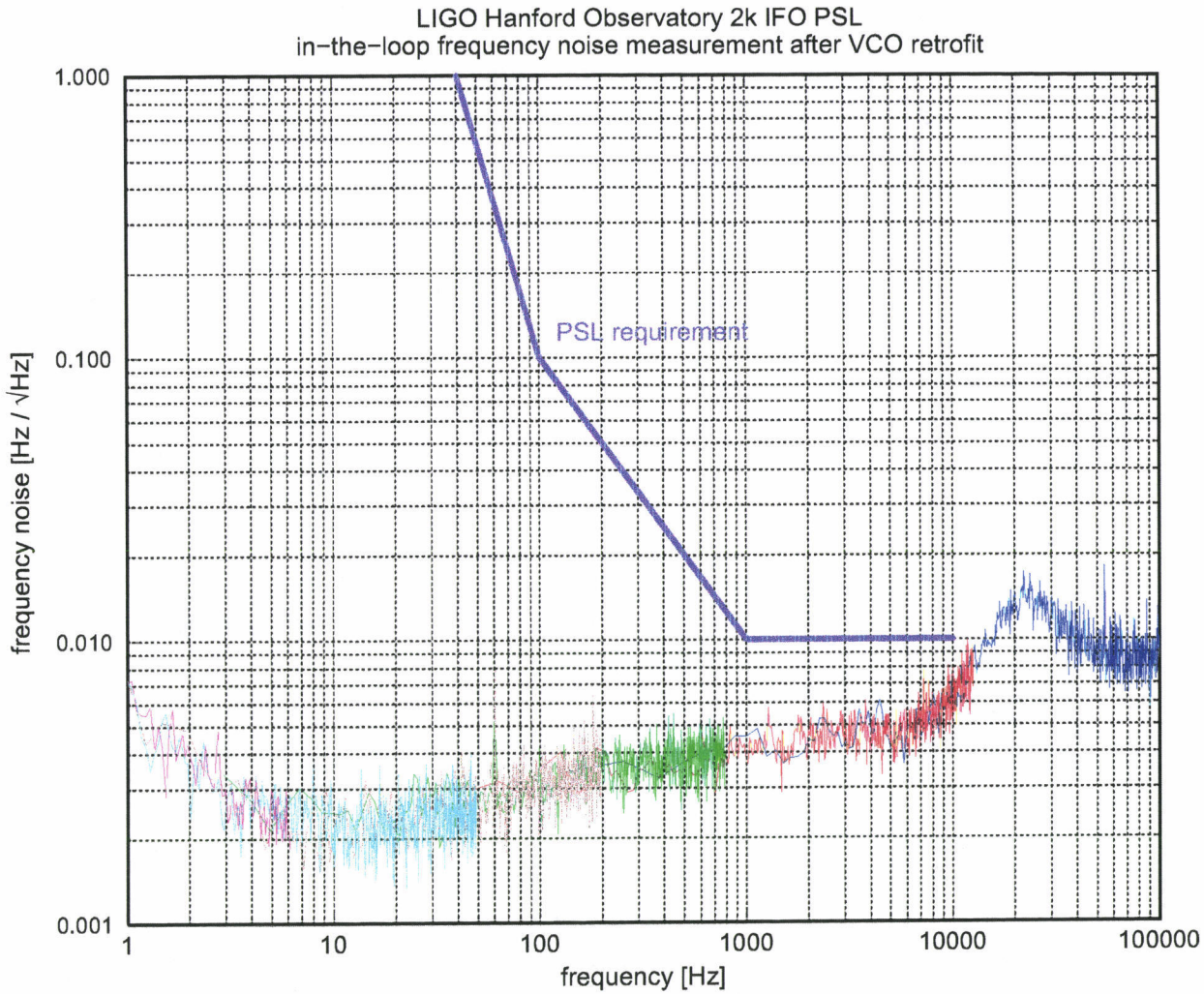
PSL In-the-loop Frequency Noise 05/99



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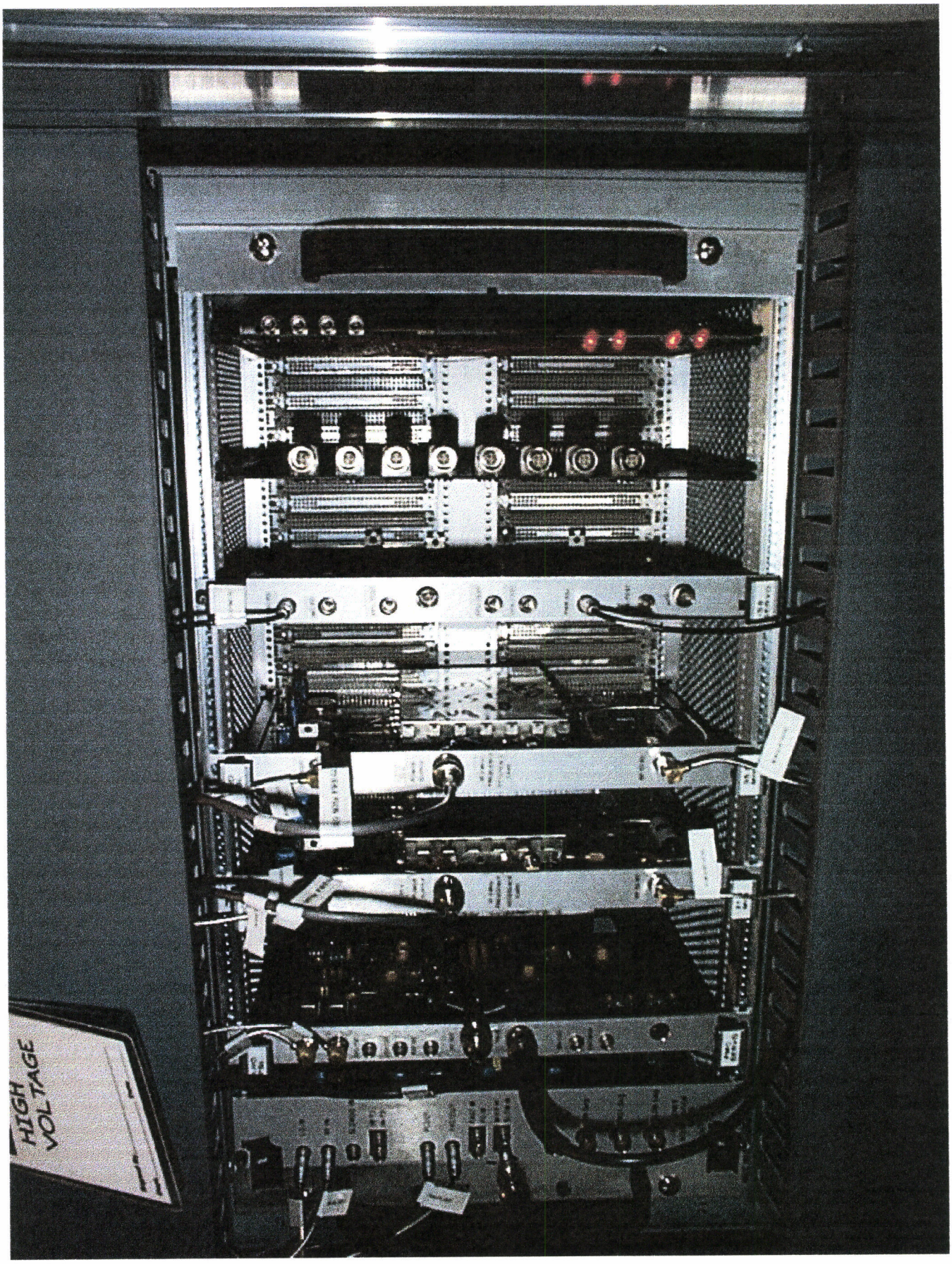
HIGH
VOLTAGE

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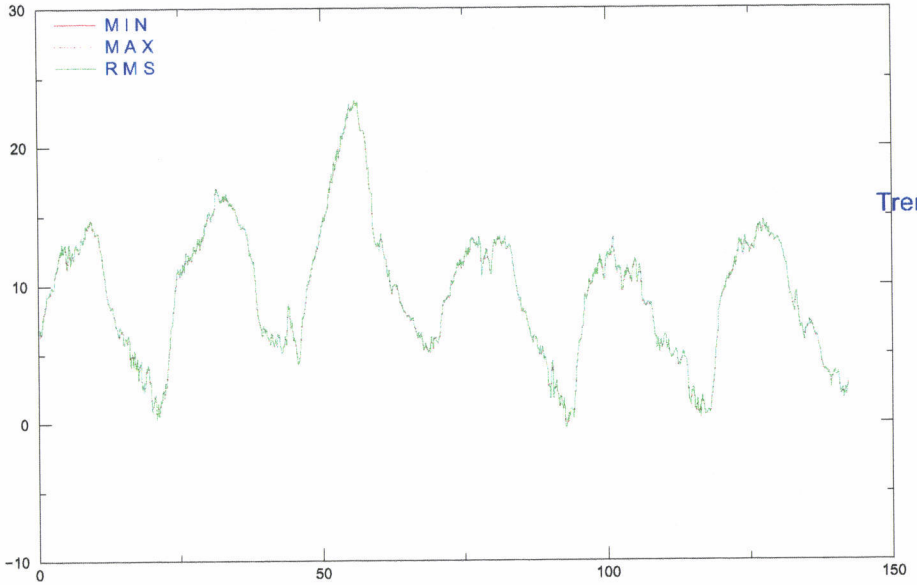
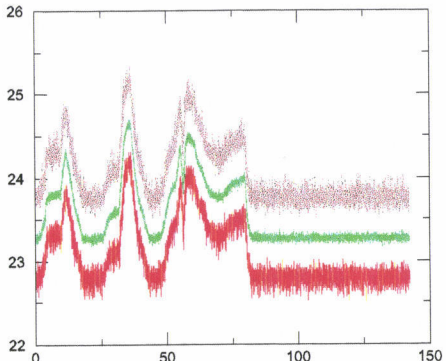
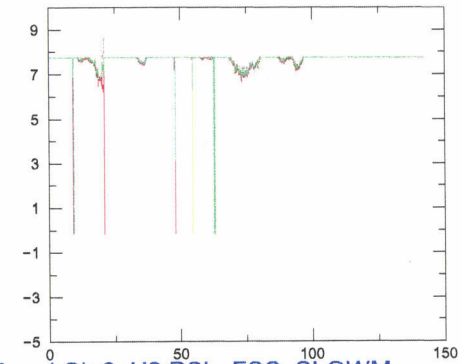


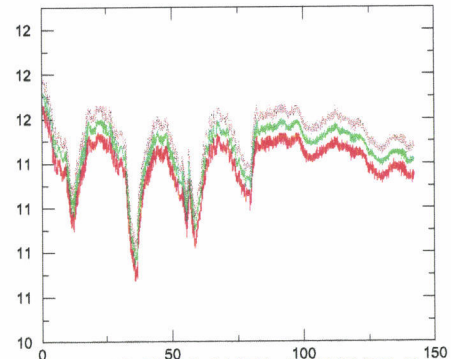
Trend Ch 7: H2:PSL-126MOPA_HTEMP



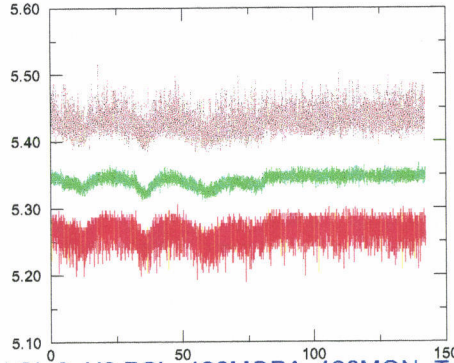
Trend Ch 10: H2:PSL-ISS_ISERR



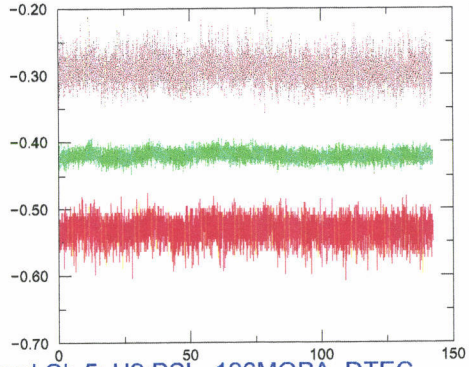
Trend Ch 2: H2:PSL-126MOPA_AMPMON



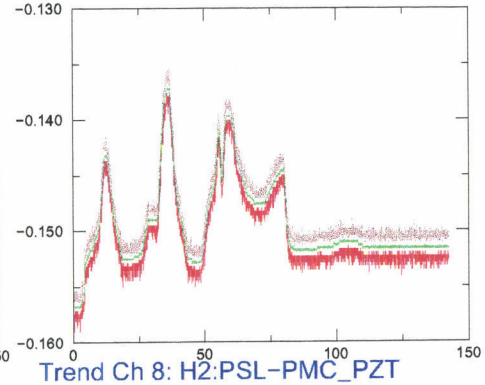
Trend Ch 4: H2:PSL-126MOPA_126PWR



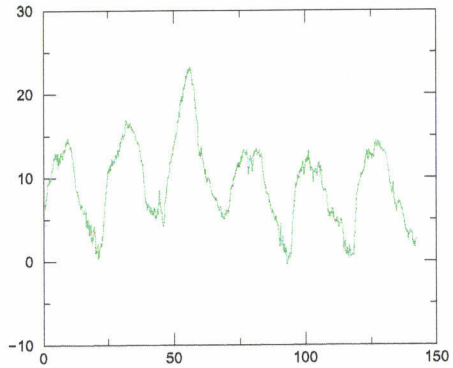
Trend Ch 6: H2:PSL-126MOPA_LTEC



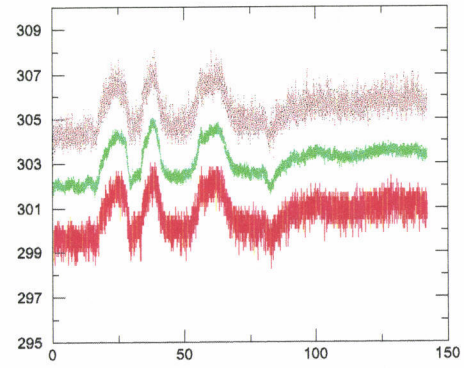
Trend Ch 9: H2:PSL-FSS_SLOWM



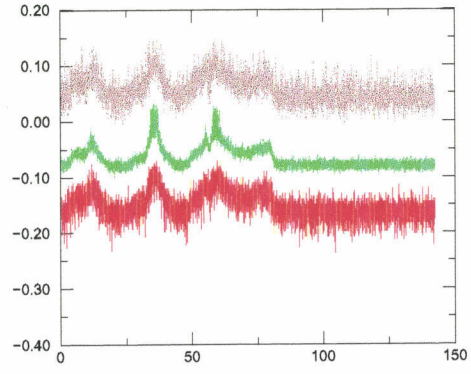
Trend Ch 1: H0:PEM-LVEA_TEMPO5



Trend Ch 3: H2:PSL-126MOPA_126MON



Trend Ch 5: H2:PSL-126MOPA_DTEC



Trend Ch 8: H2:PSL-PMC_PZT