Status of the LHO PSLs

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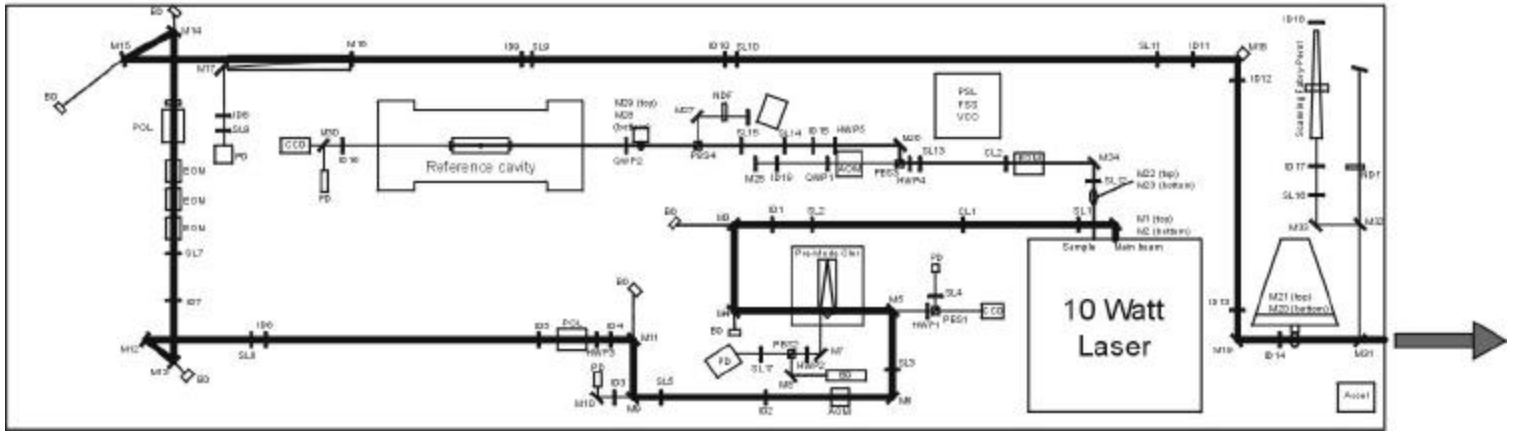
(Selected) PSL issues

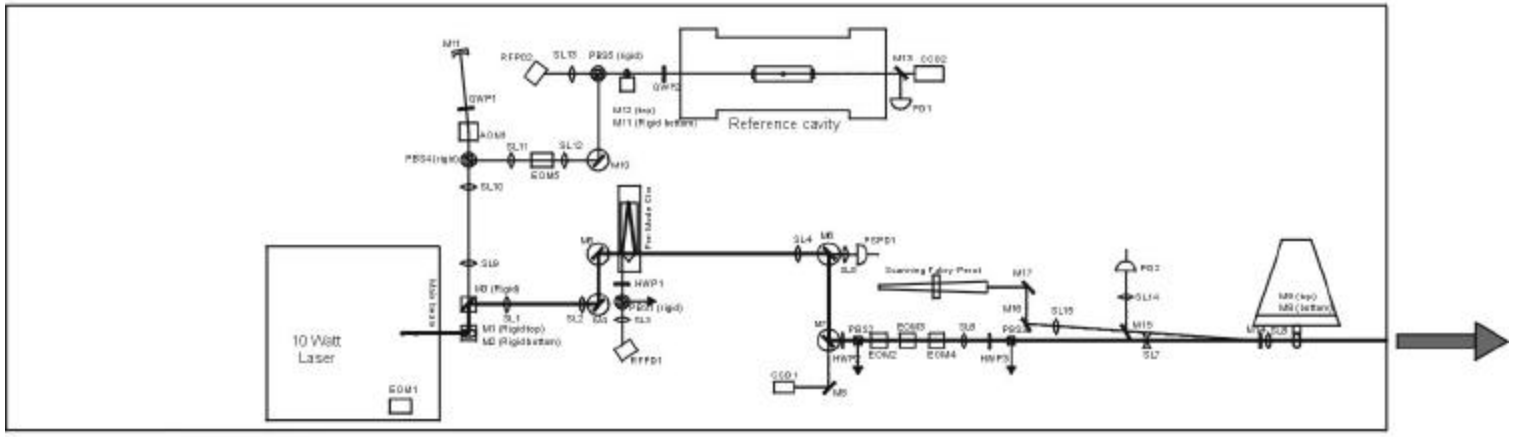
- Improved optics layout
- Optical table support legs
- NPRO frequency glitches
- Reference cavity tidal correction servo
- Intensity stabilization

Revised PSL/IOO optics layout

Washington Existing 2K PSL Table Layout

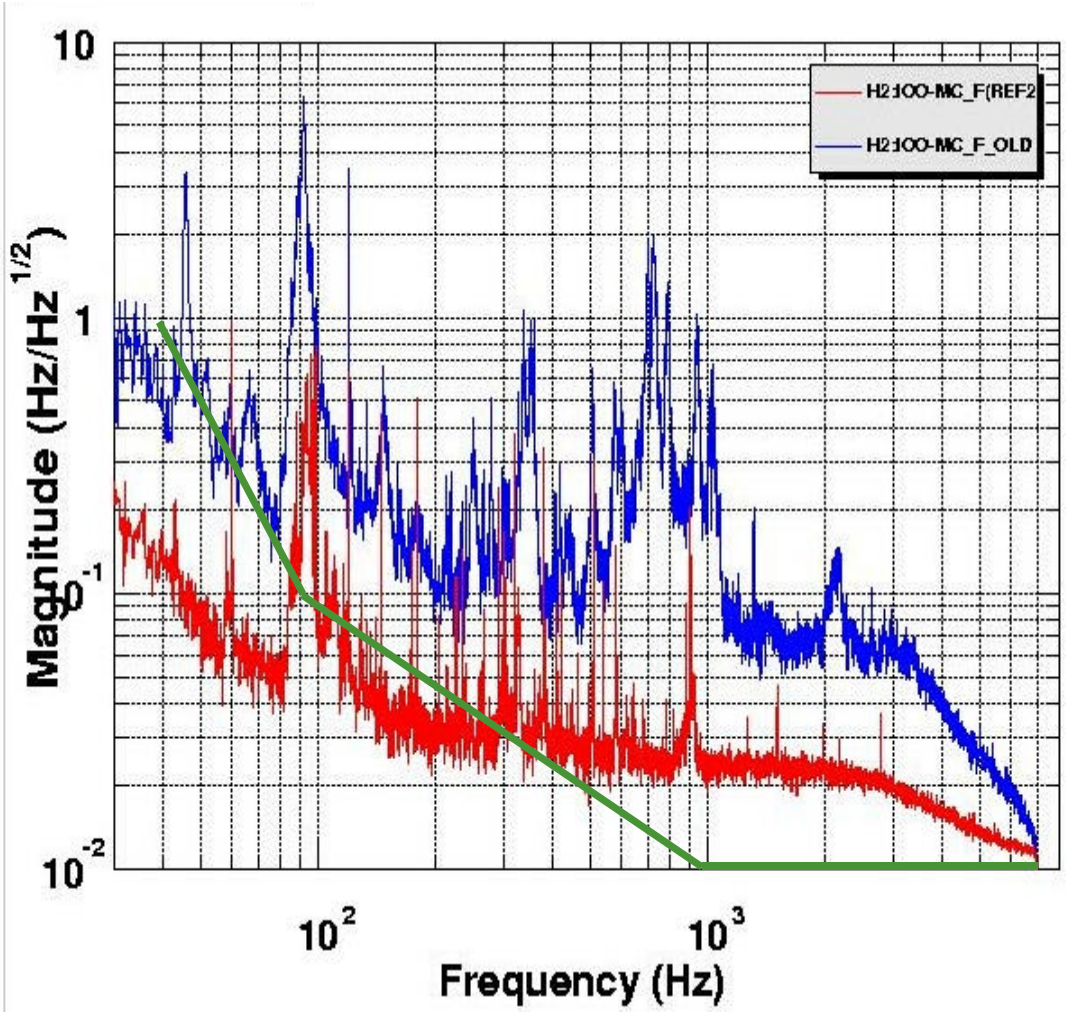


Washington 4K PSL Table Layout - DRAFT

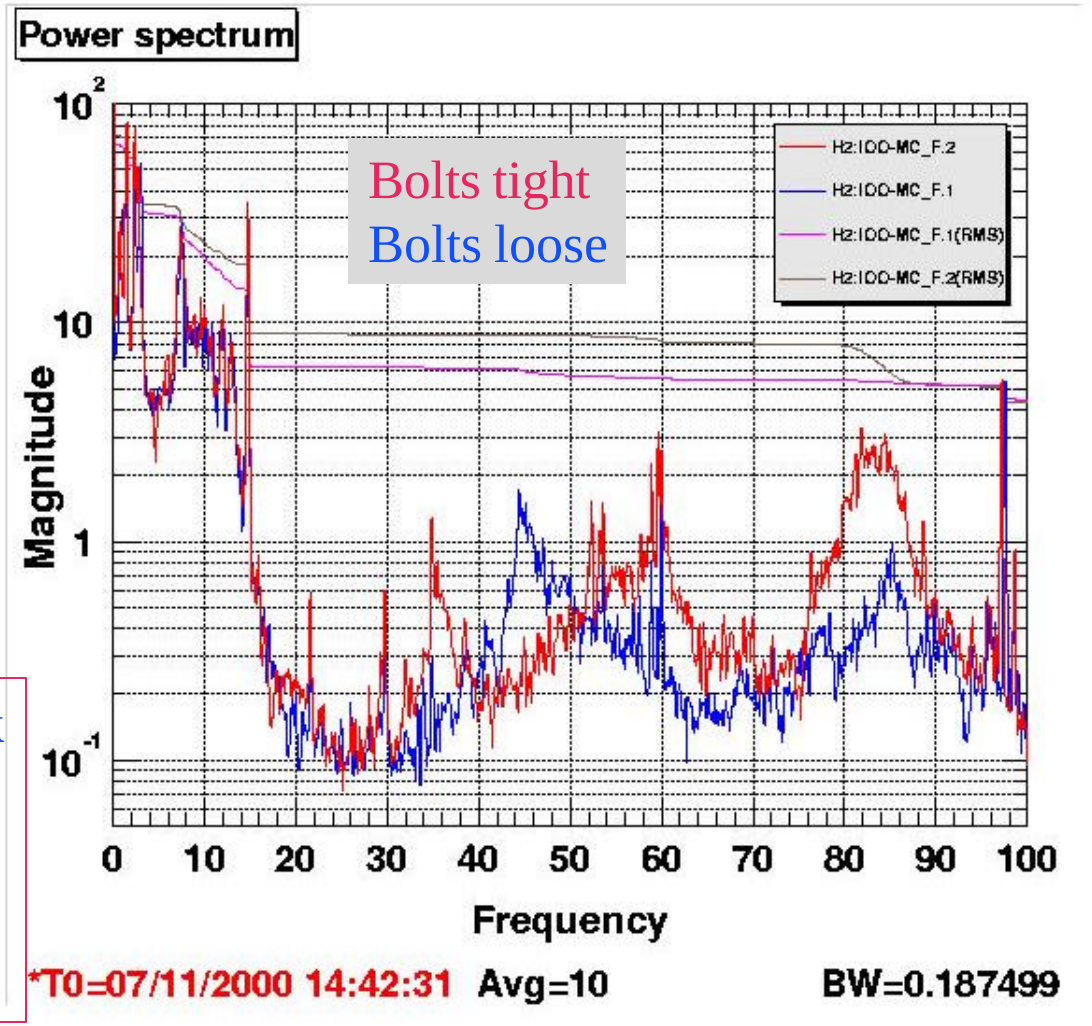


Improved frequency noise

- Number of optical components reduced
- Path lengths shortened
- Reference cavity orientation changed



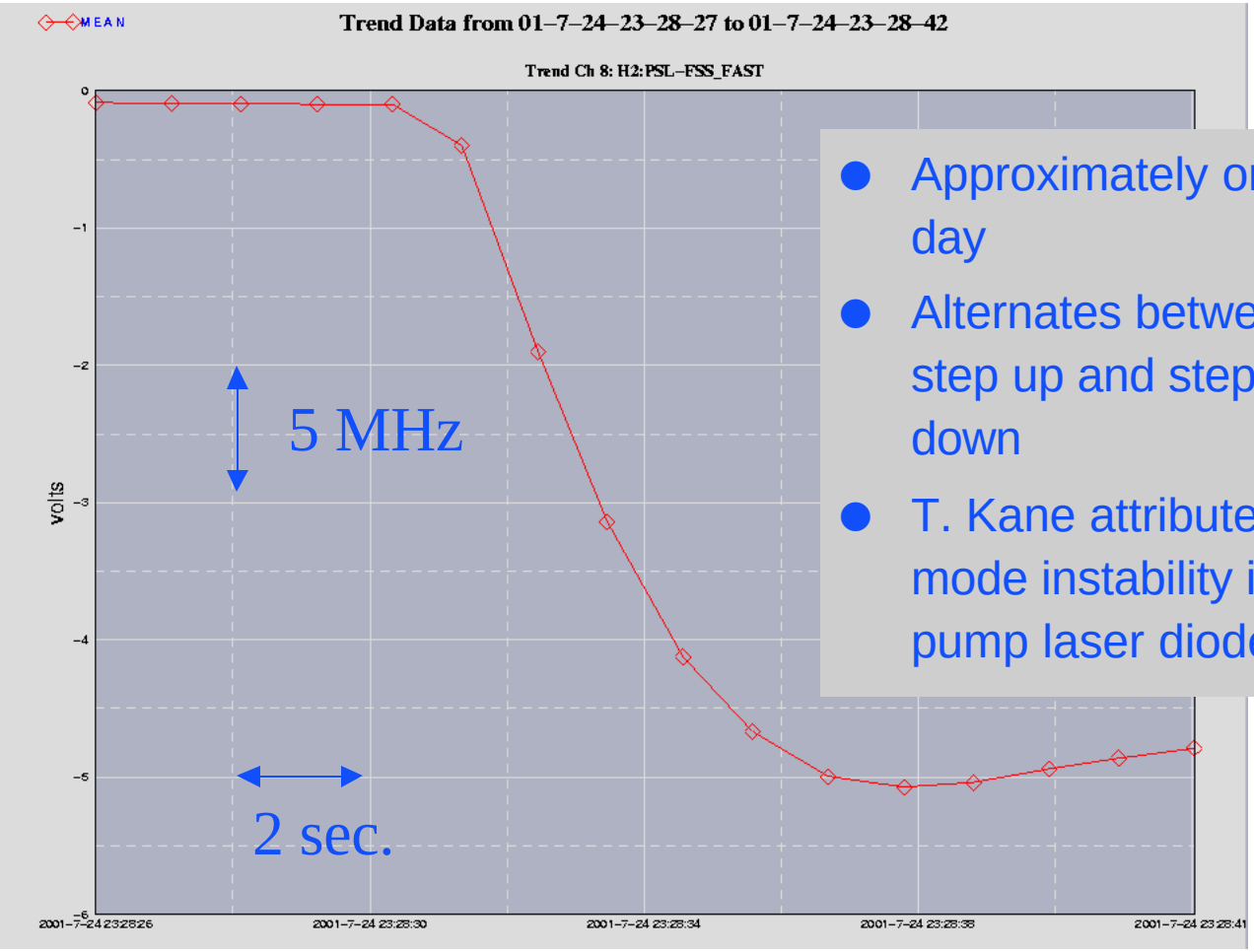
Frequency noise – table leg resonances



Stacis system did not work -electronics noise

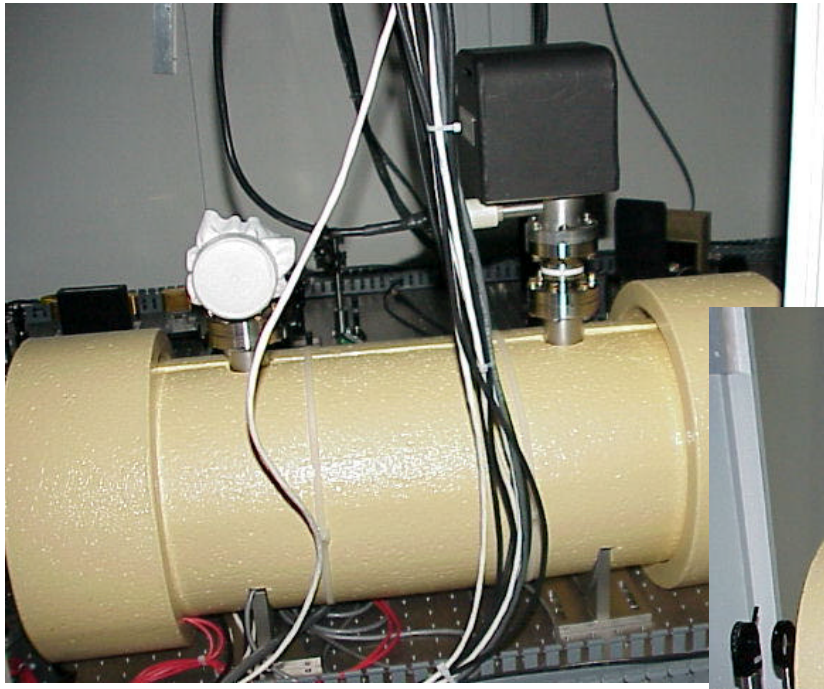
We will try PEPS system ASAP

NPRO frequency glitches

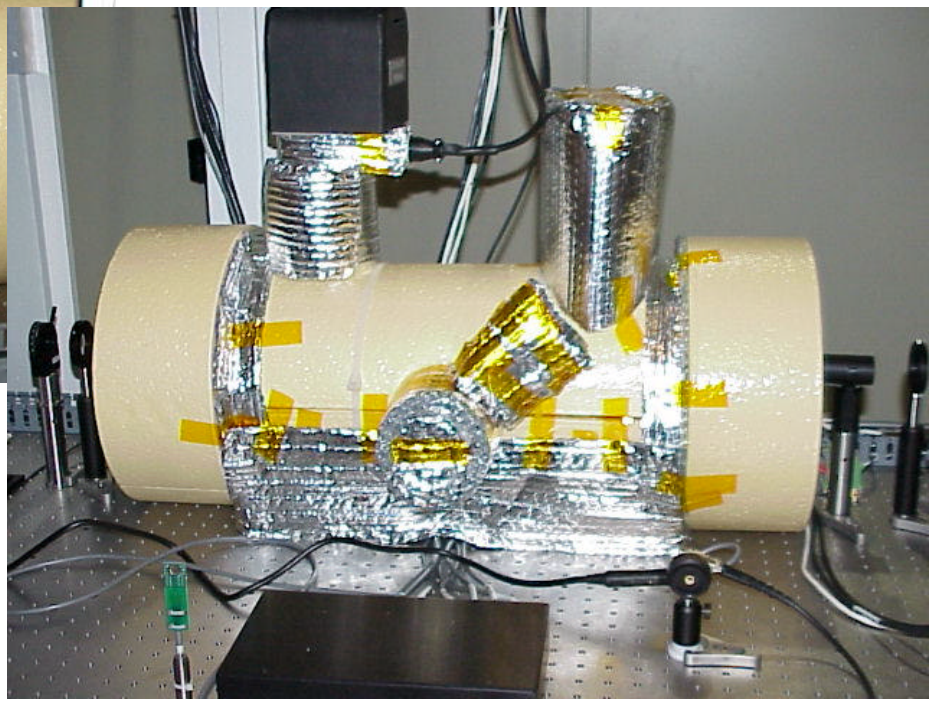


- Approximately one per day
- Alternates between step up and step down
- T. Kane attributes to mode instability in pump laser diode

Tidal corection servo

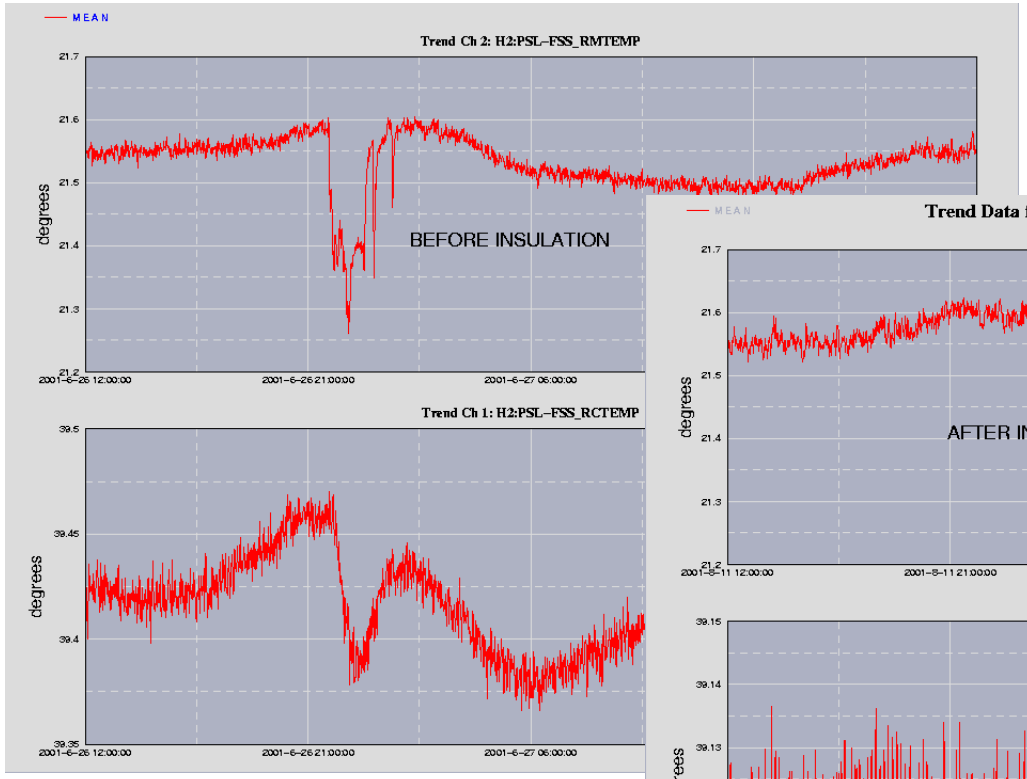


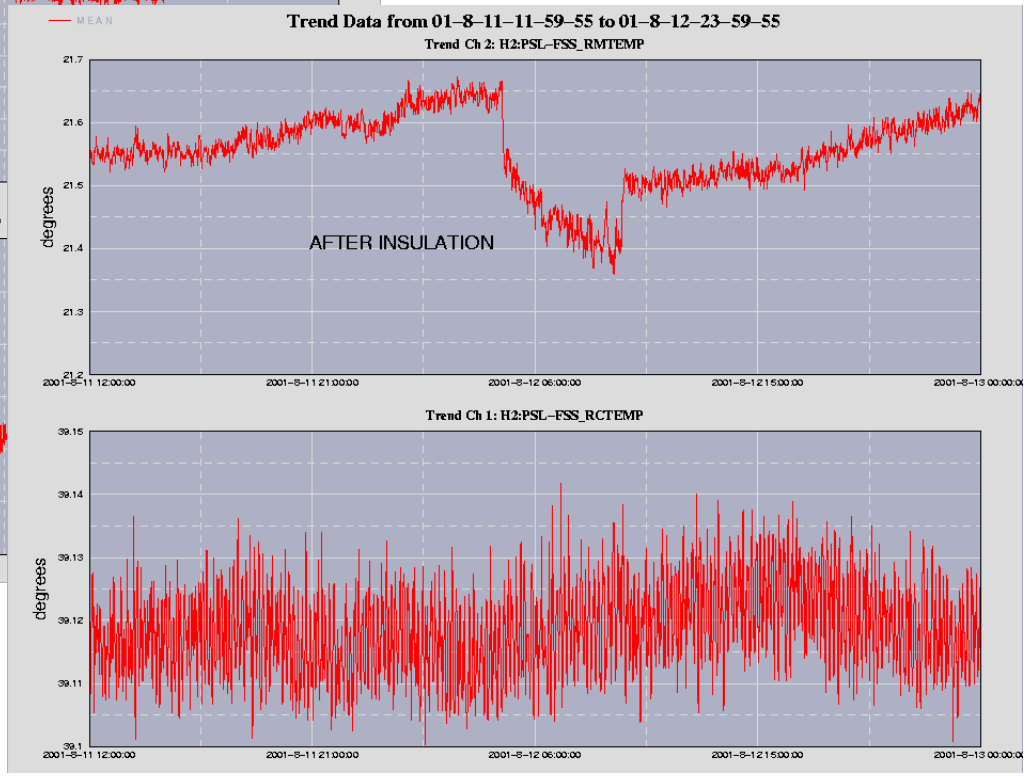
Reduce susceptibility to
room temperature fluctuations



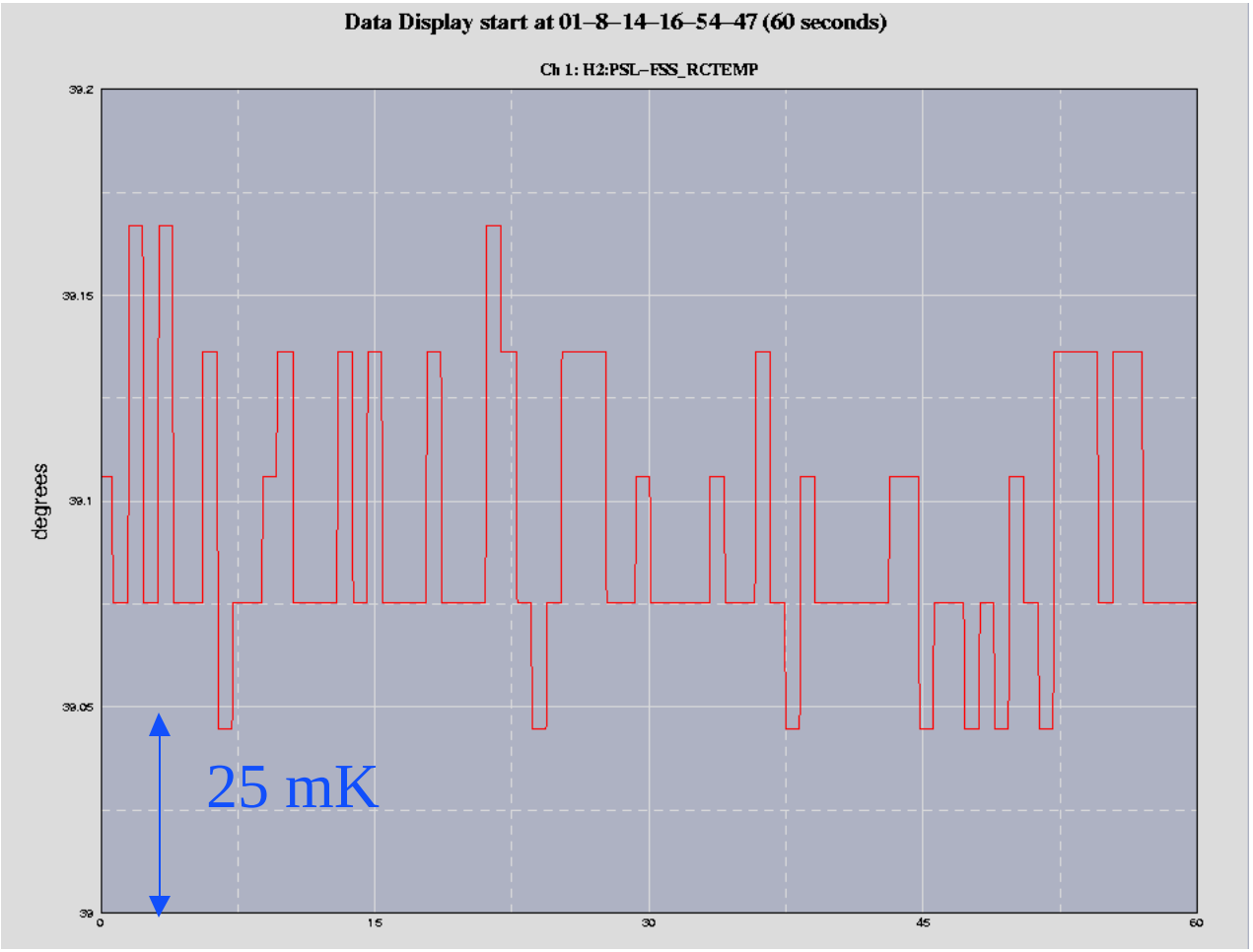
1 mK >> 1 μm
common mode arm length

Tidal servo (cont.)



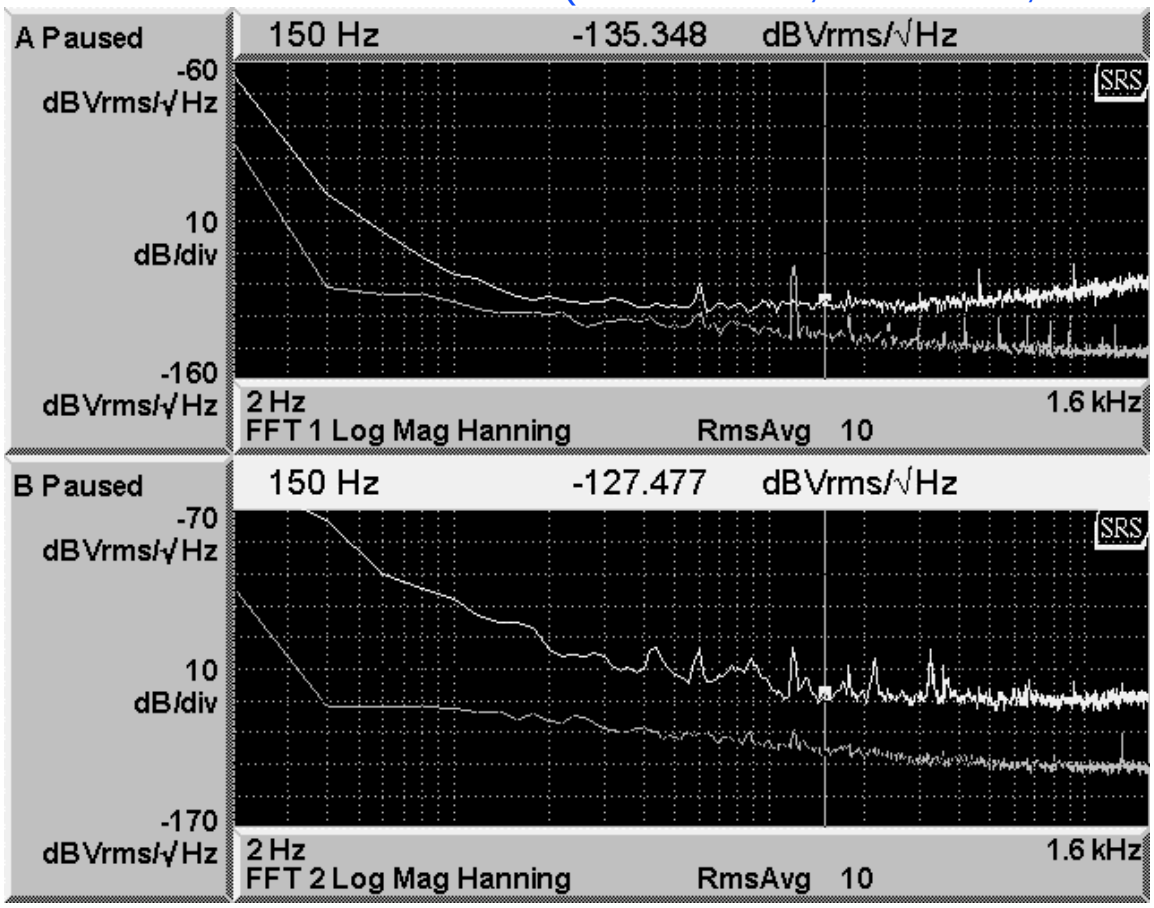


Tidal servo sensor noise



Intensity stabilization servo

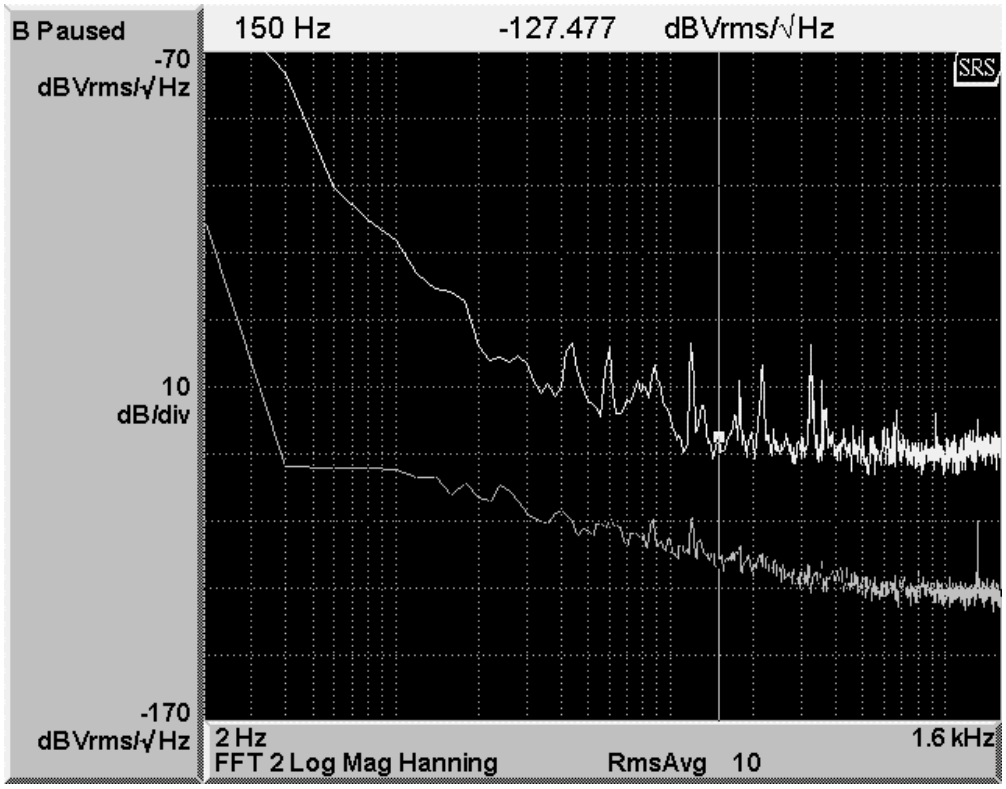
- First loop of prototype system operational on 2-km interferometer.(R. Karwoski, P. Russell, D. Ottaway)



Inside the loop after PMC

Outside the loop after MC

RIN after modecleaner



Only “inside” loop active

ΔP/P ~6.8e-8/rtHz

Detector noise floor (laser light blocked)

Light on PD = 0.5 mW >> 4.6e-8/rtHz shot noise limit