

ISI update

March '08 LSC meeting,
- Brian Lantz for the SEI team

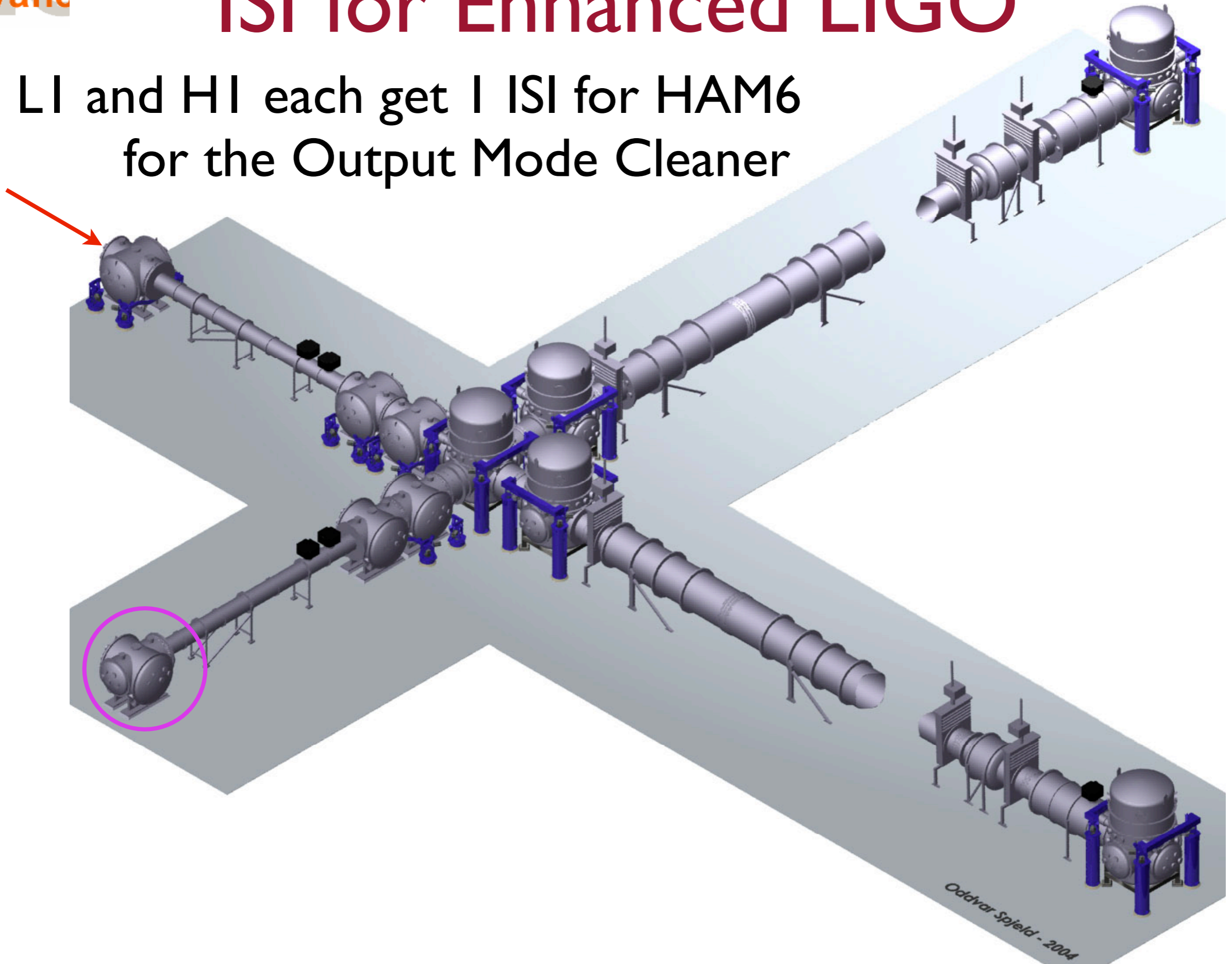
Hugh, Corey, Mike L., the other Brian, Jeff, Joe H.,
Danny, Lisa, Ken, Rich, Andy, Fabrice, Pradeep, Myron,
Stephany, Bob L., Ben A., Alex, Rolf, Jay, Dan C., Hyun
Oh, HPD, the vacuum cleaning crew,
and anyone else we can convince to tighten bolts...

It's been a bit busy...

- 2 stage BSC-ISI at LASTI has a quad attached, and the 12 DOF damping loops are running.
- Two new HAM-ISI systems fabricated for Enhanced LIGO.
- Hanford system air-tested at HPD.
- Livingston system air tested and installed (but not yet commissioned).
- First Observatory installation of new Advanced LIGO control computer (Borkspace)
- Controller development, code tools, and classes ongoing at Stanford.

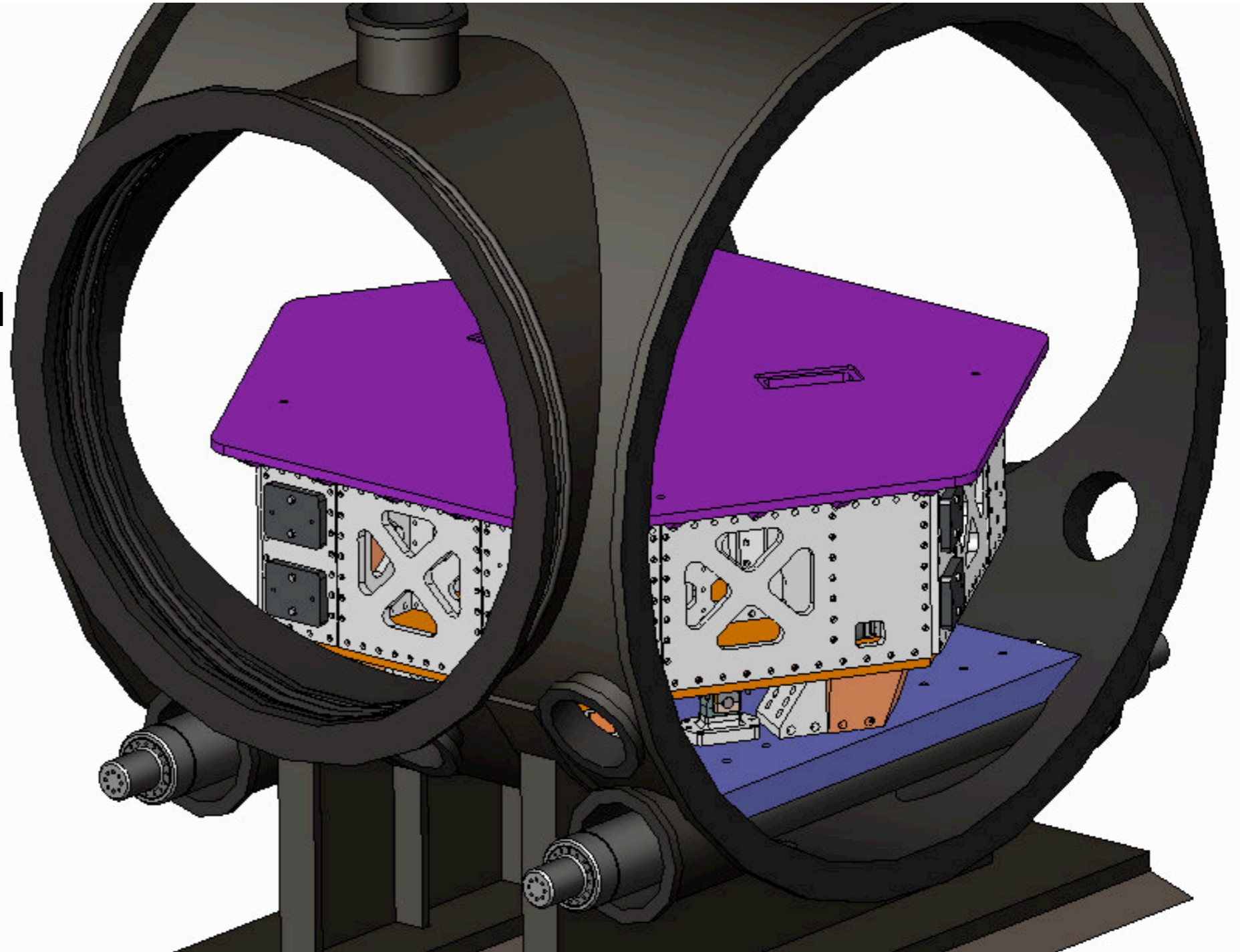
ISI for Enhanced LIGO

LI and HI each get 1 ISI for HAM6
for the Output Mode Cleaner

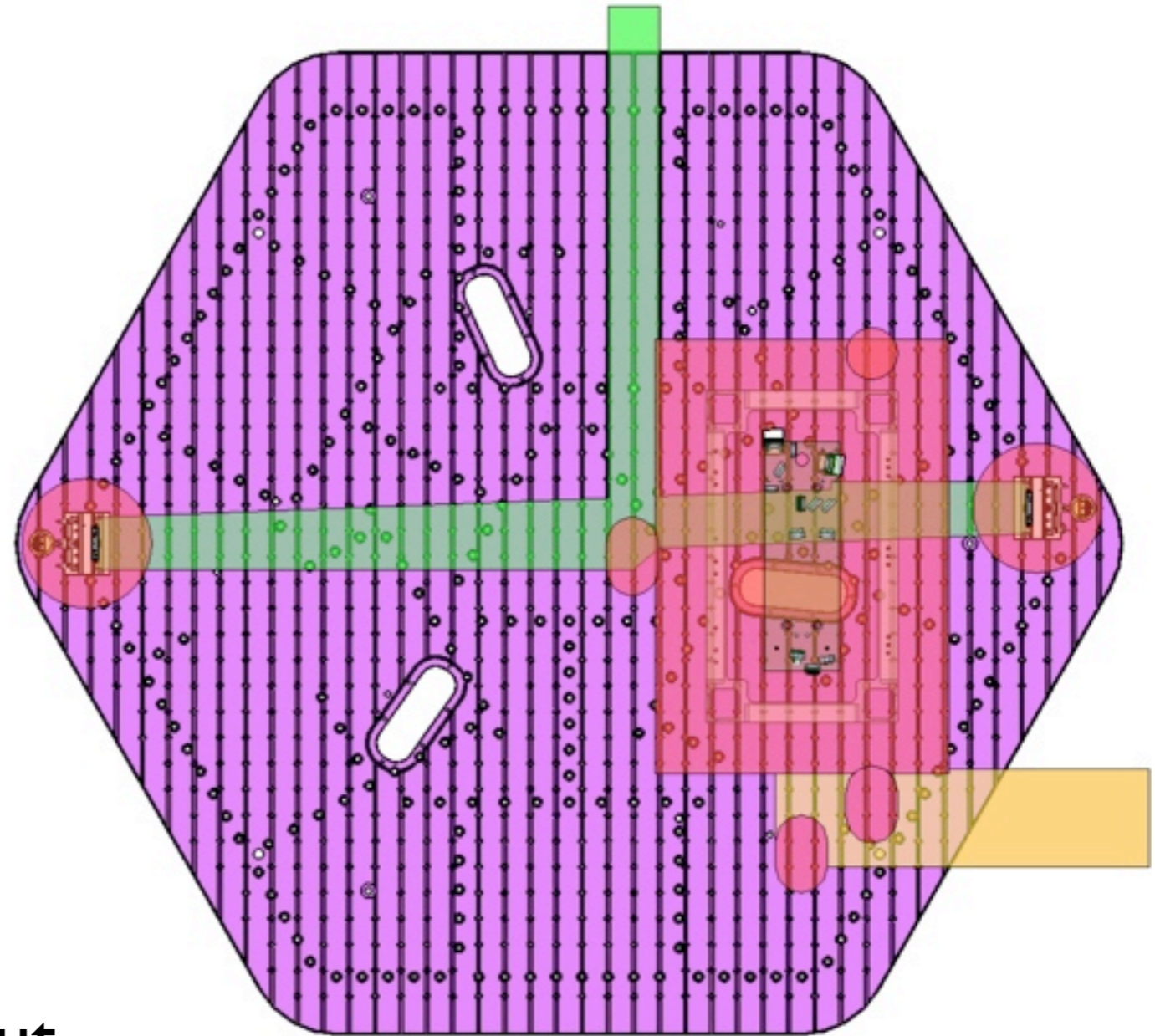
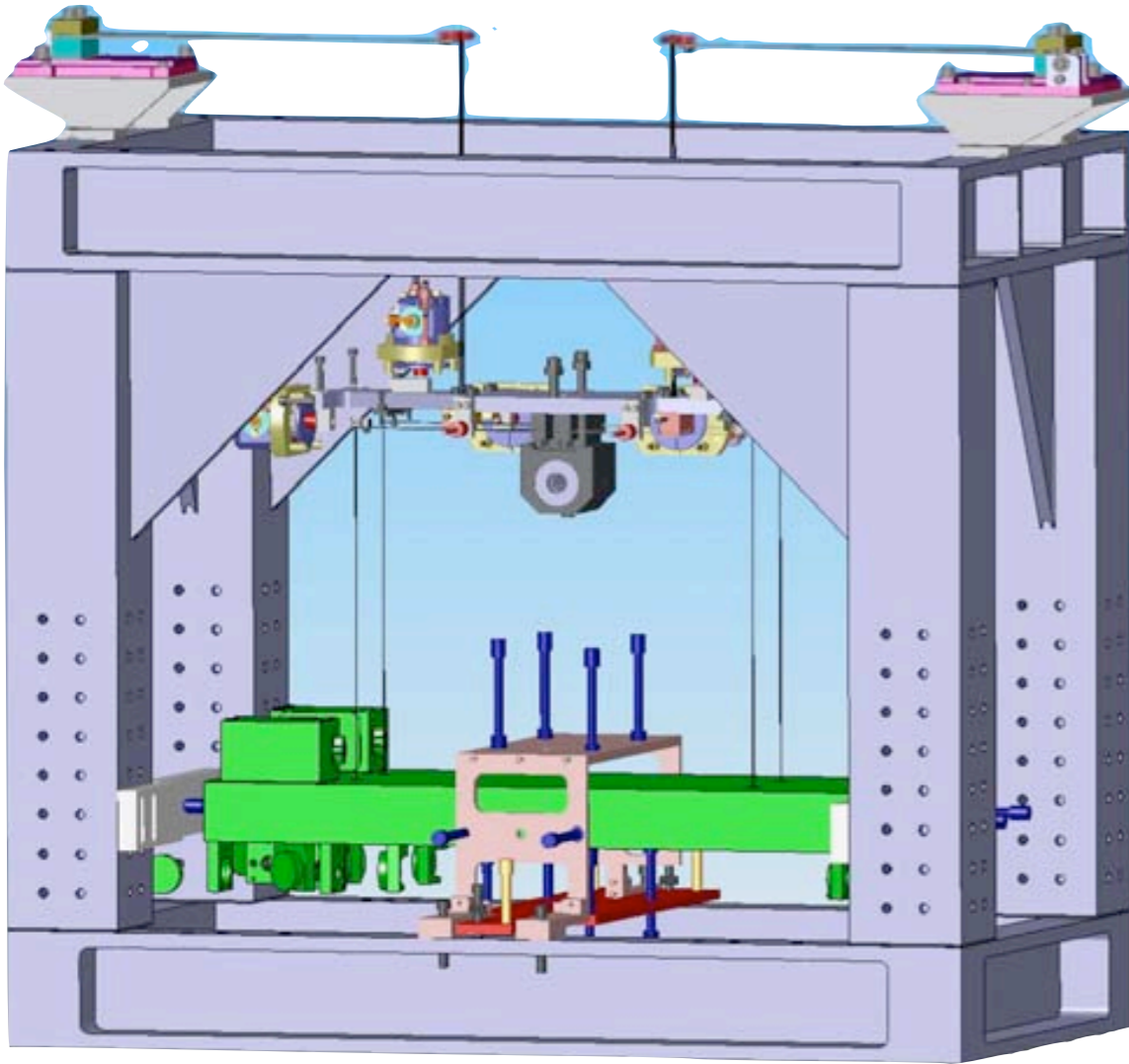


HAM Design

- Bolted aluminum structure
Suspended by 3 blade springs & “wires”
- mass:
stage I ~ 1500 kg
plus 510 kg of payload
- Natural freq’s
(measured at HPD)
x & y: 1.28 Hz
z: 1.78 Hz
tip/tilt: 1.01 Hz
yaw: 0.8 Hz
- first bending mode:
~ 260 Hz
- assume servos with
unity gain of 27 Hz

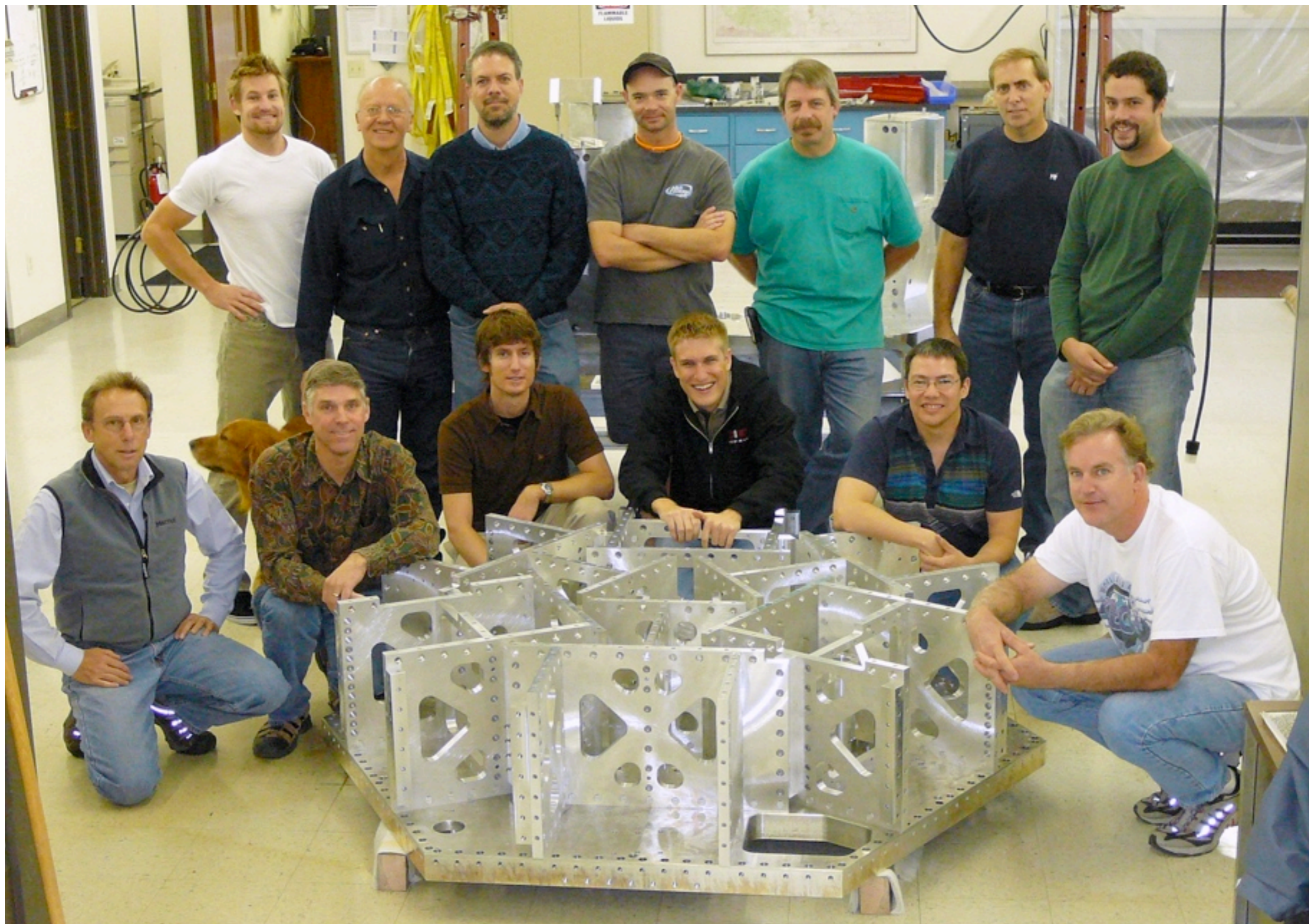


Output Mode Cleaner in HAM6



small cavity to “clean up” the output beam of the main interferometer

Air testing at HPD



Air testing at HPD

Oct & Nov 2007

Trial assembly and test of basic mechanical function

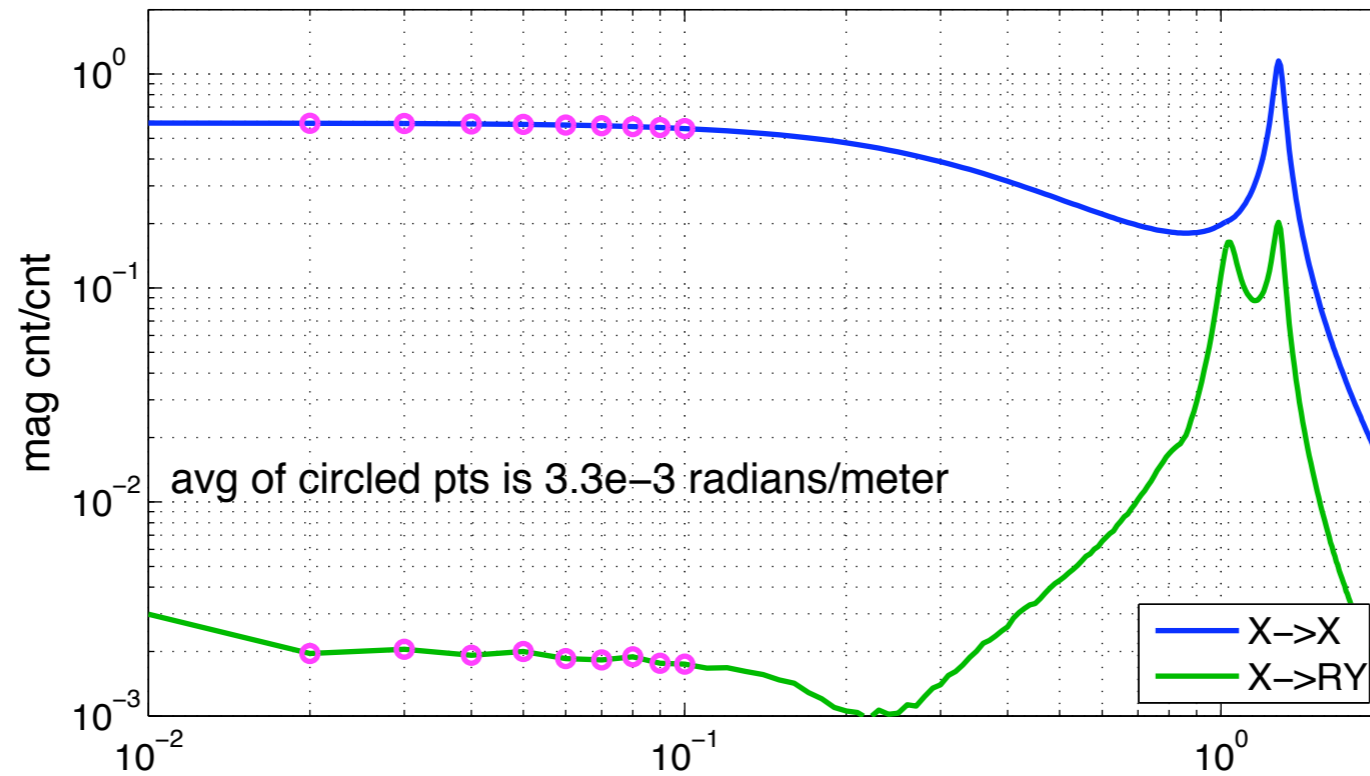


HPD testing

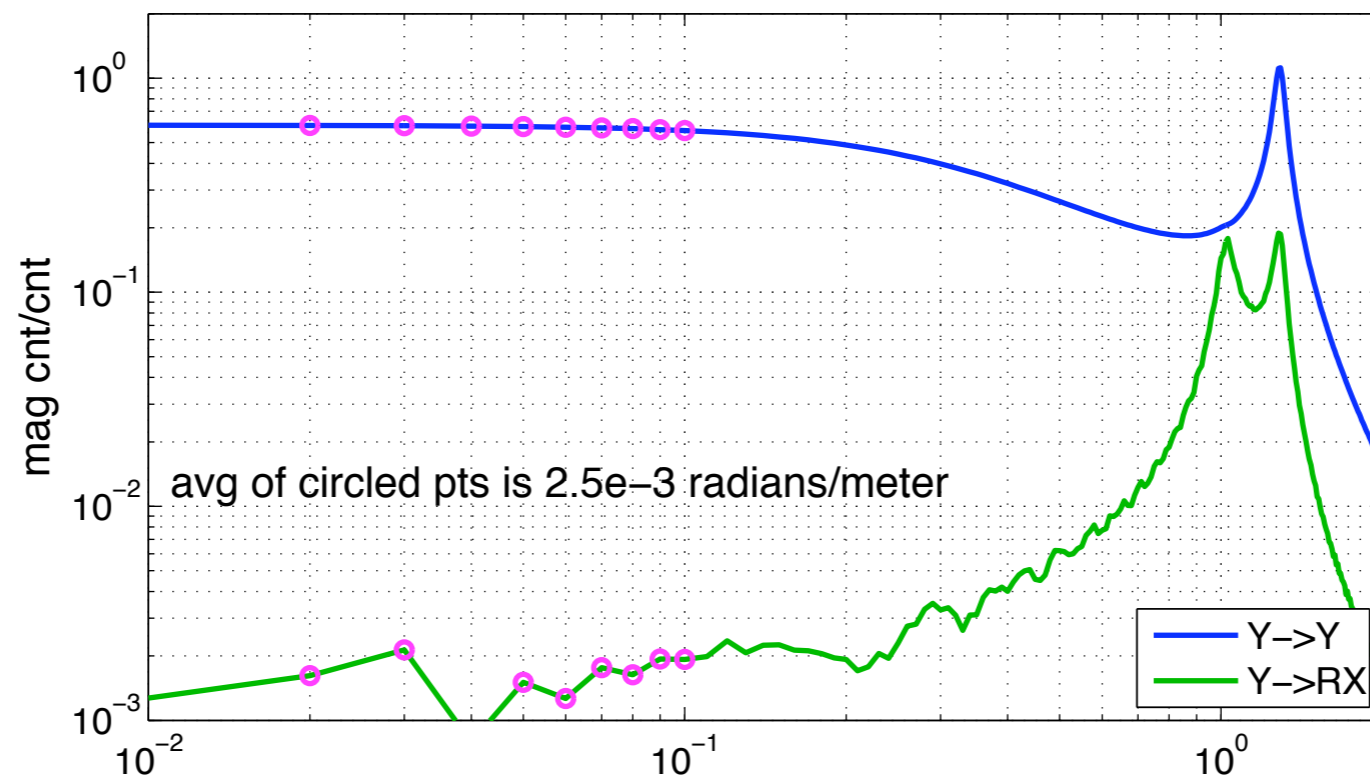
- Make sure it works -

- 1) Make sure it goes together.
- 2) Measure table flatness, hoping for p-v of 10 mil.
 - inside walls, ≤ 2 mil (50 micron) is typical, 3 mil in a few places, 5 mil at one corner.
- 3) Test the lockers/ limiters
 - protect all the delicate bits.
 - hold location to ~ 12 microns, repeatable to about 12 microns
- 4) Demonstrate loading/ balancing of table (goal 200 microrad)
 - we were doing about 1.5 microns vertical, 6 microrad tilt
- 5) Demonstrate free motion - looks good
 - Make a system that is Easy to Control -
- 6) Measure natural frequencies/ spring rates of the table (\sim as expected)
- 7) Measure alignment of the Lower Zero Moment Plane with the horizontal actuators (within 1 mm), and other cross couplings.
- 8) Measure bending mode of table (should be >250 Hz, saw 260 Hz)

Tilt coupling at HPD

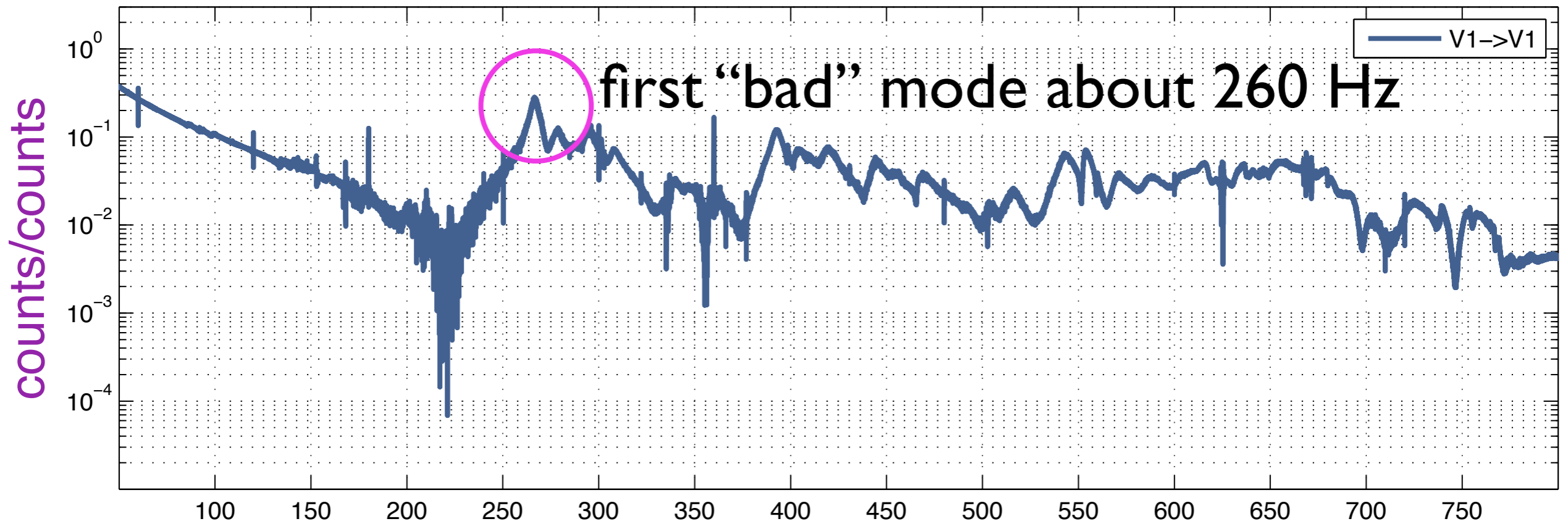


Y drive terms coupling



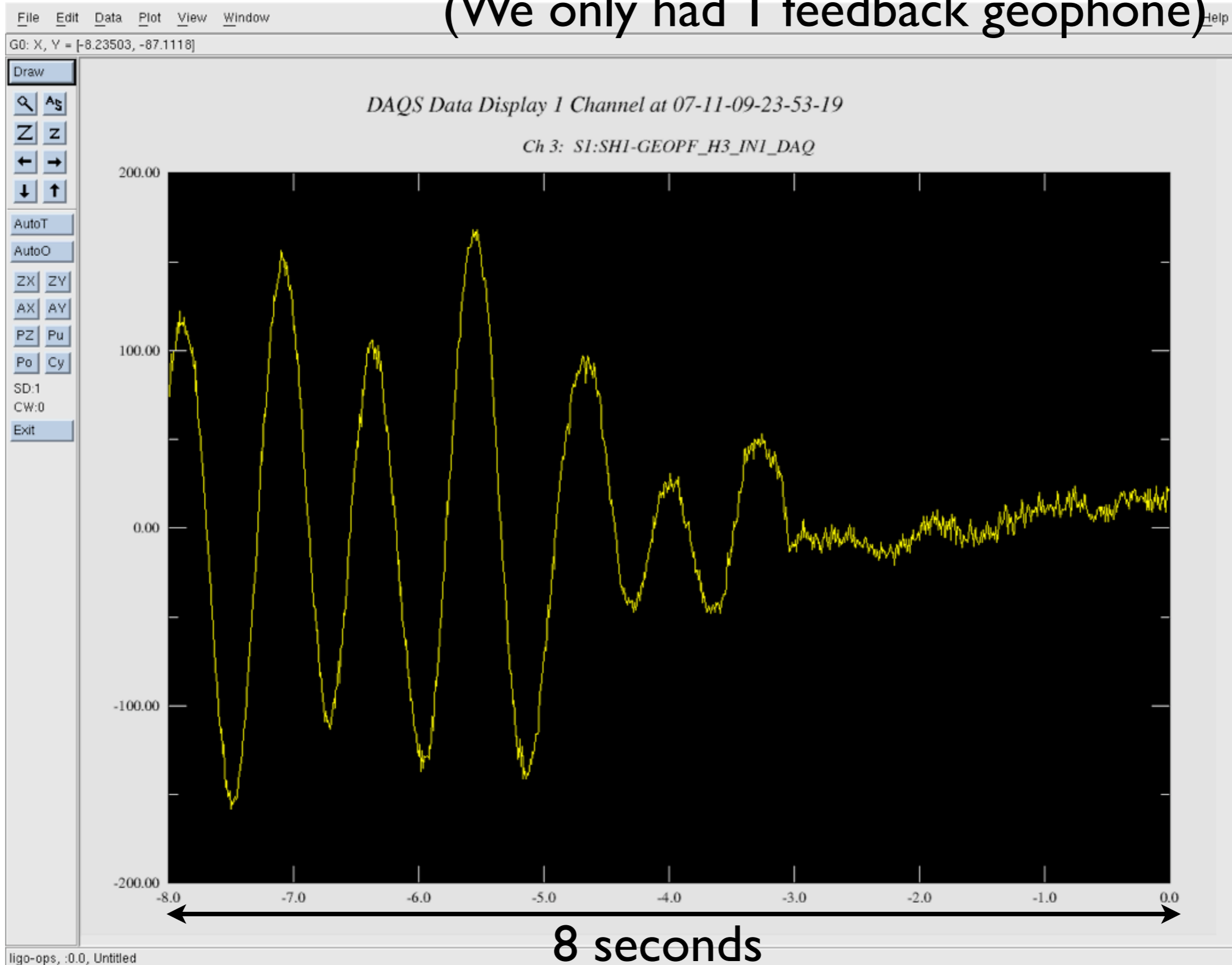
Bending modes at HPD

Vert. V1 drive to V1 response



First damping loop

(We only had 1 feedback geophone)



Assembly at LLO

How to build a HAM ISI
in a few easy steps!

pictures by Jeff Kissel, et. al.

Assembly at LLO

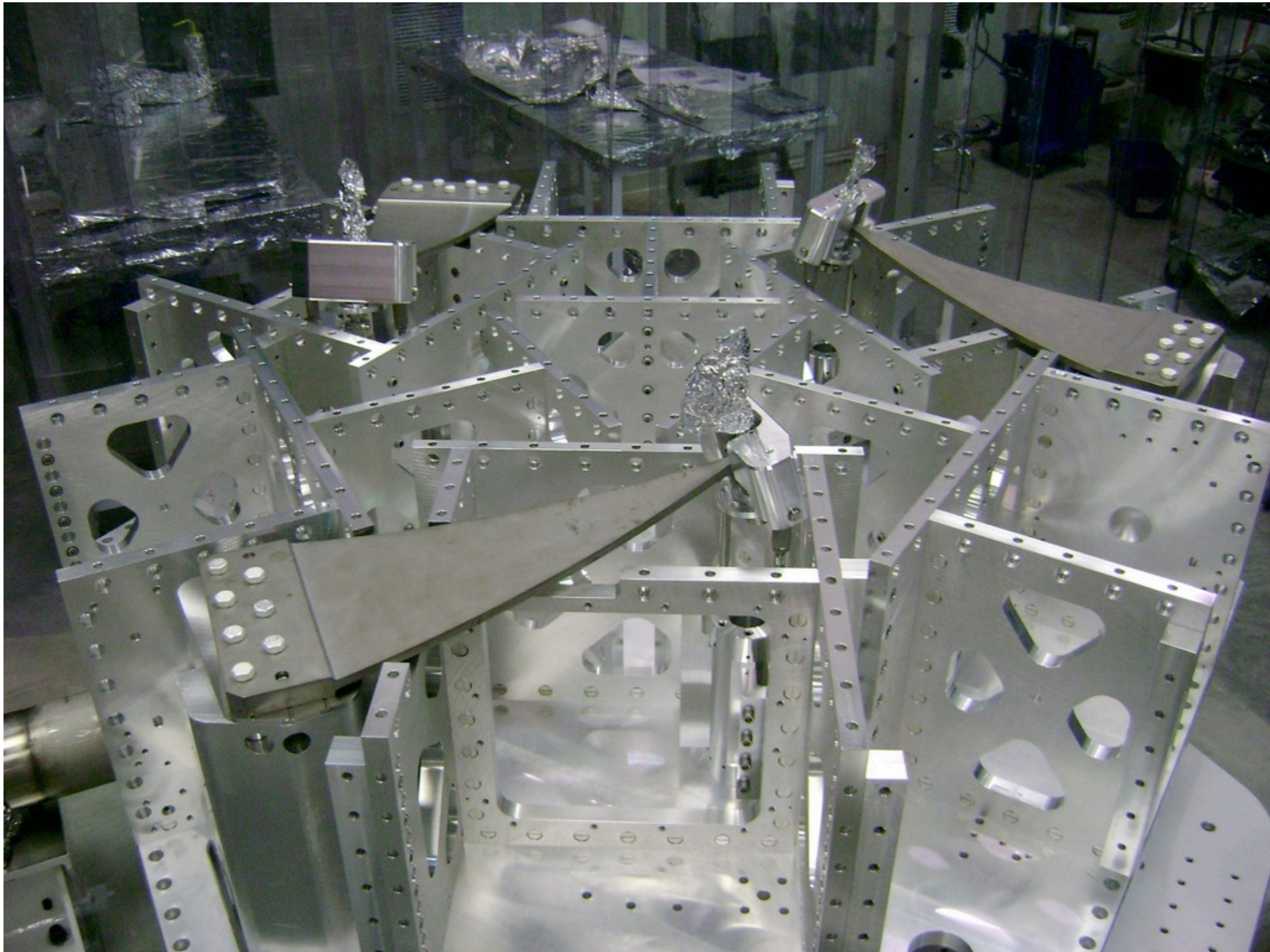


Assembly at LLO

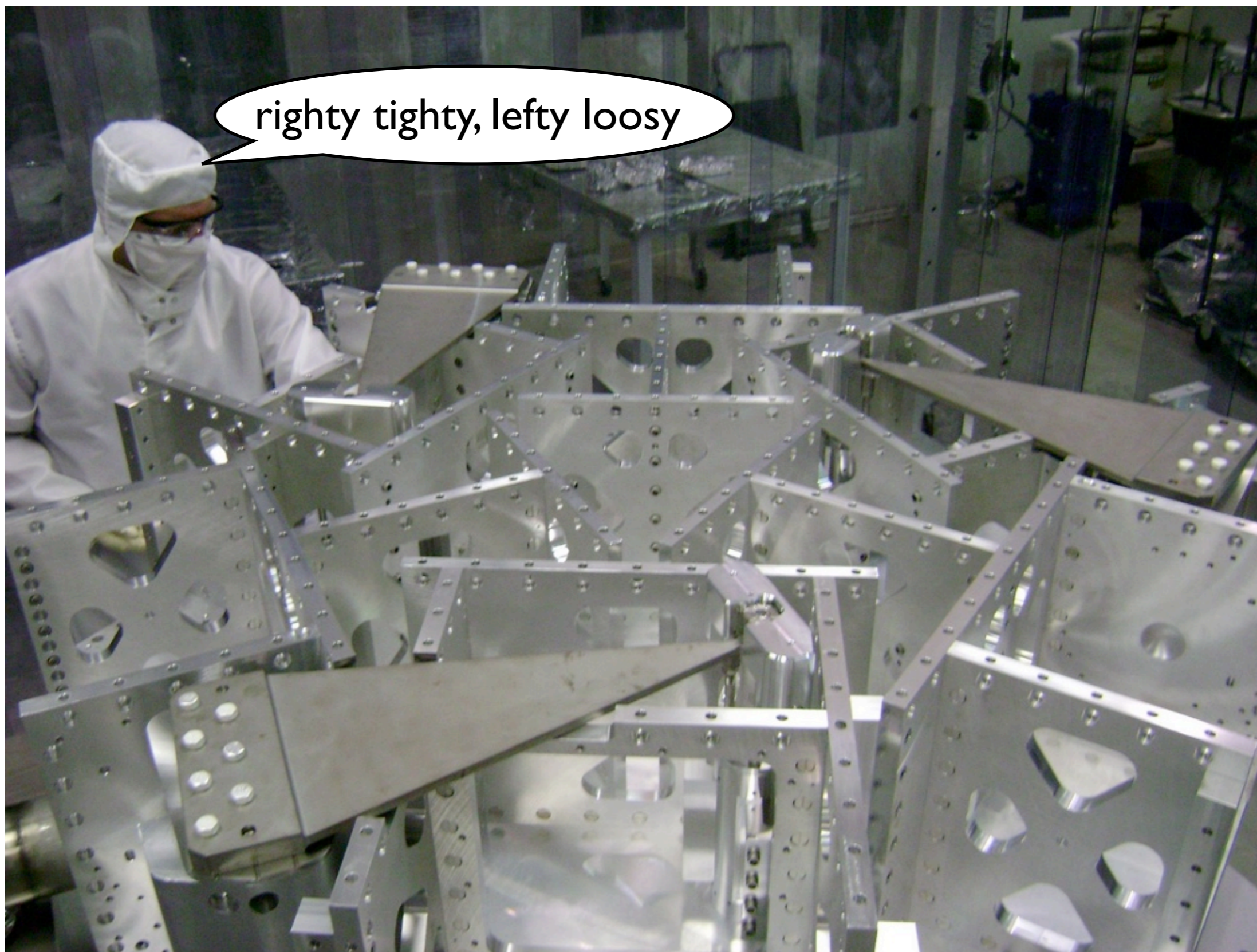
Oh my god, it fits!



Assembly at LLO

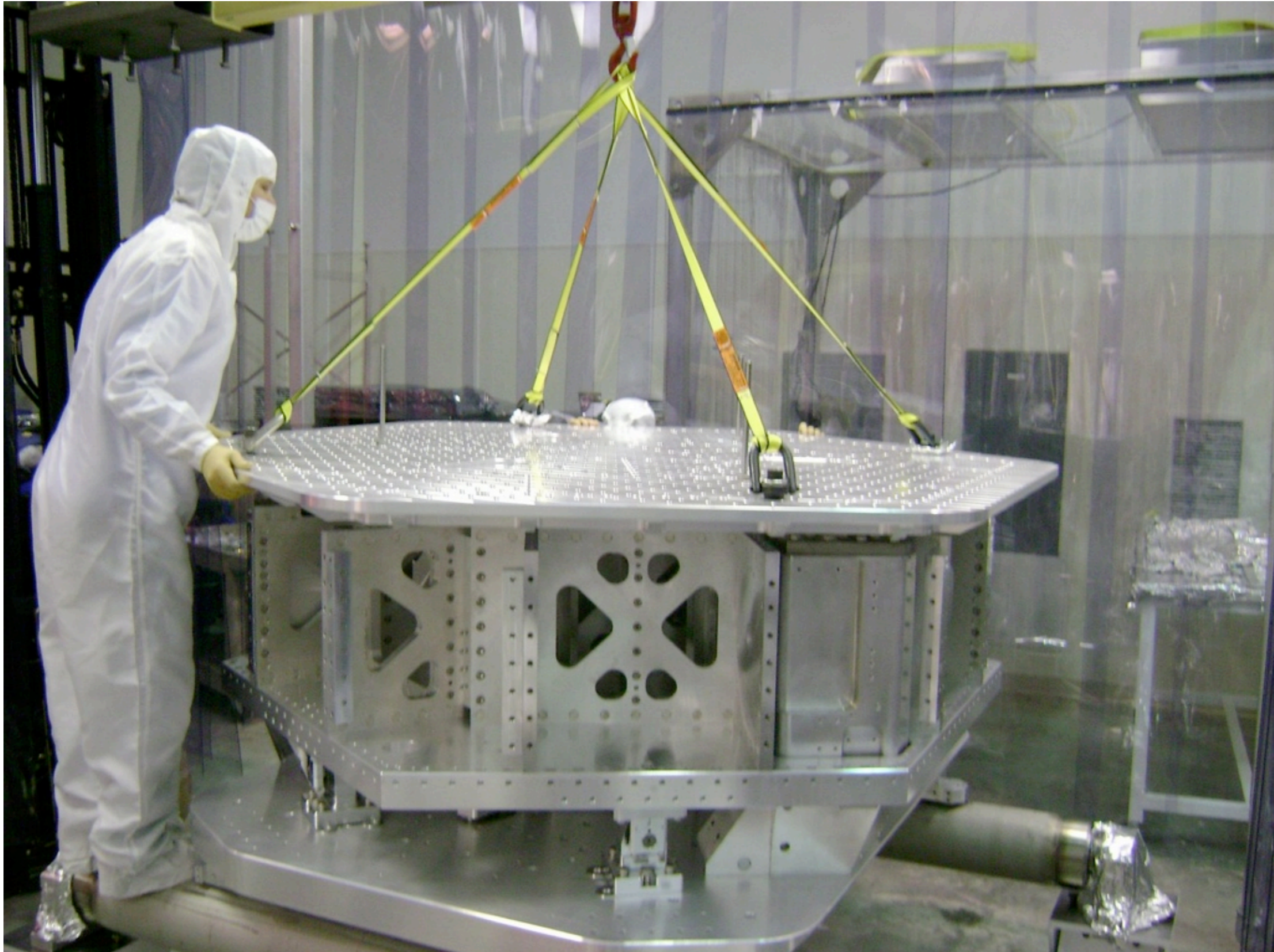


Assembly at LLO

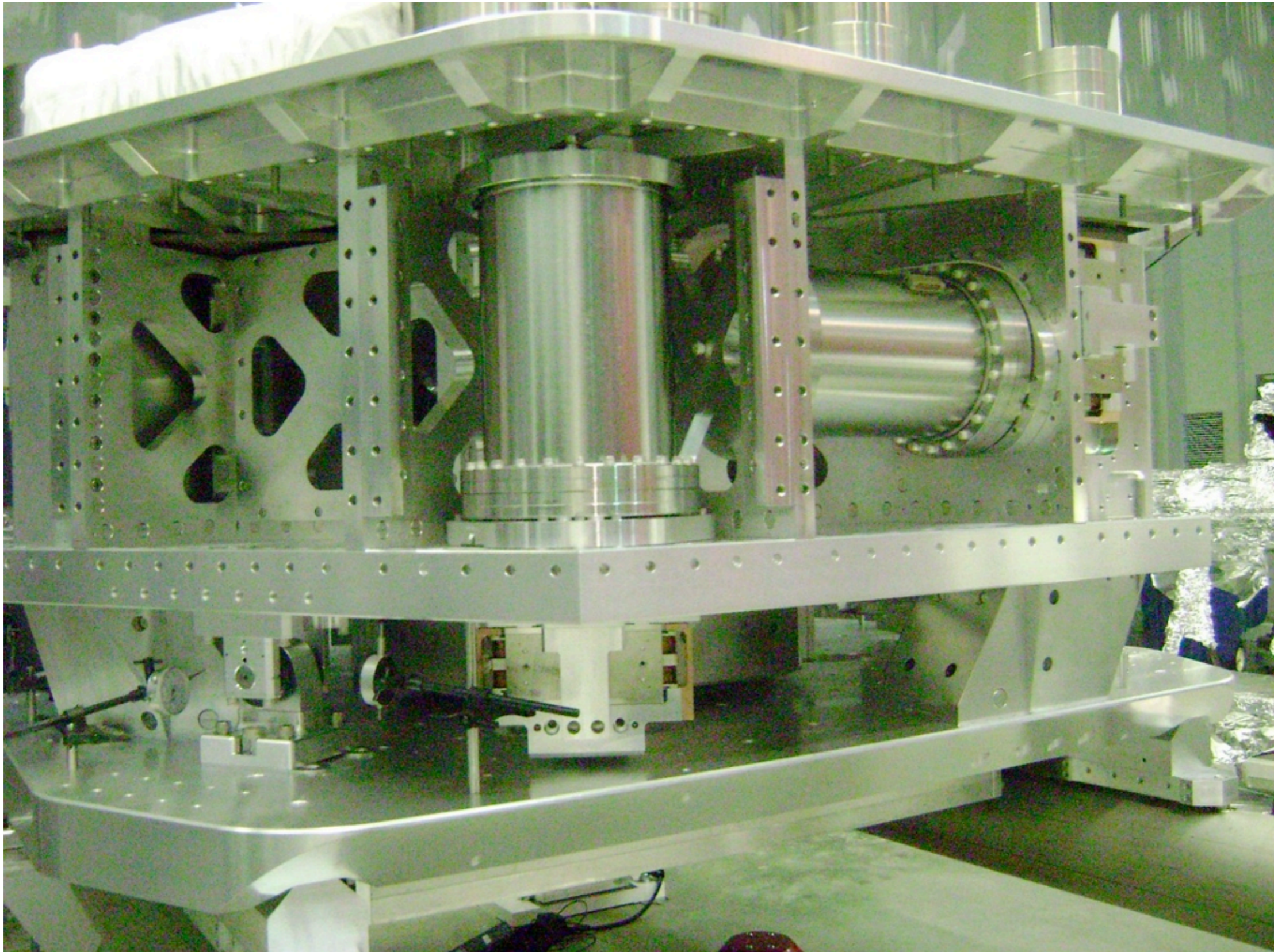


righty tighty, lefty loosy

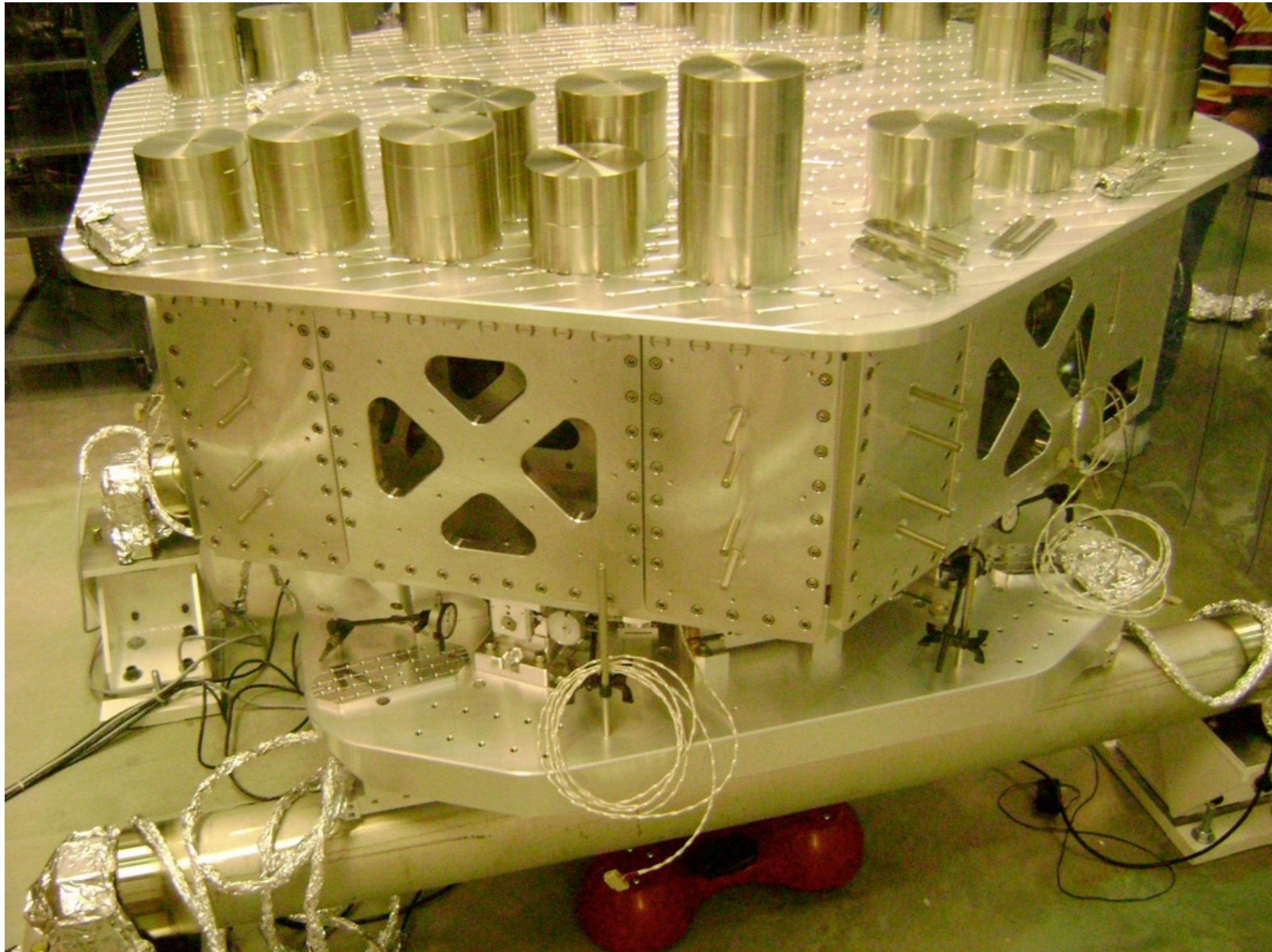
Assembly at LLO



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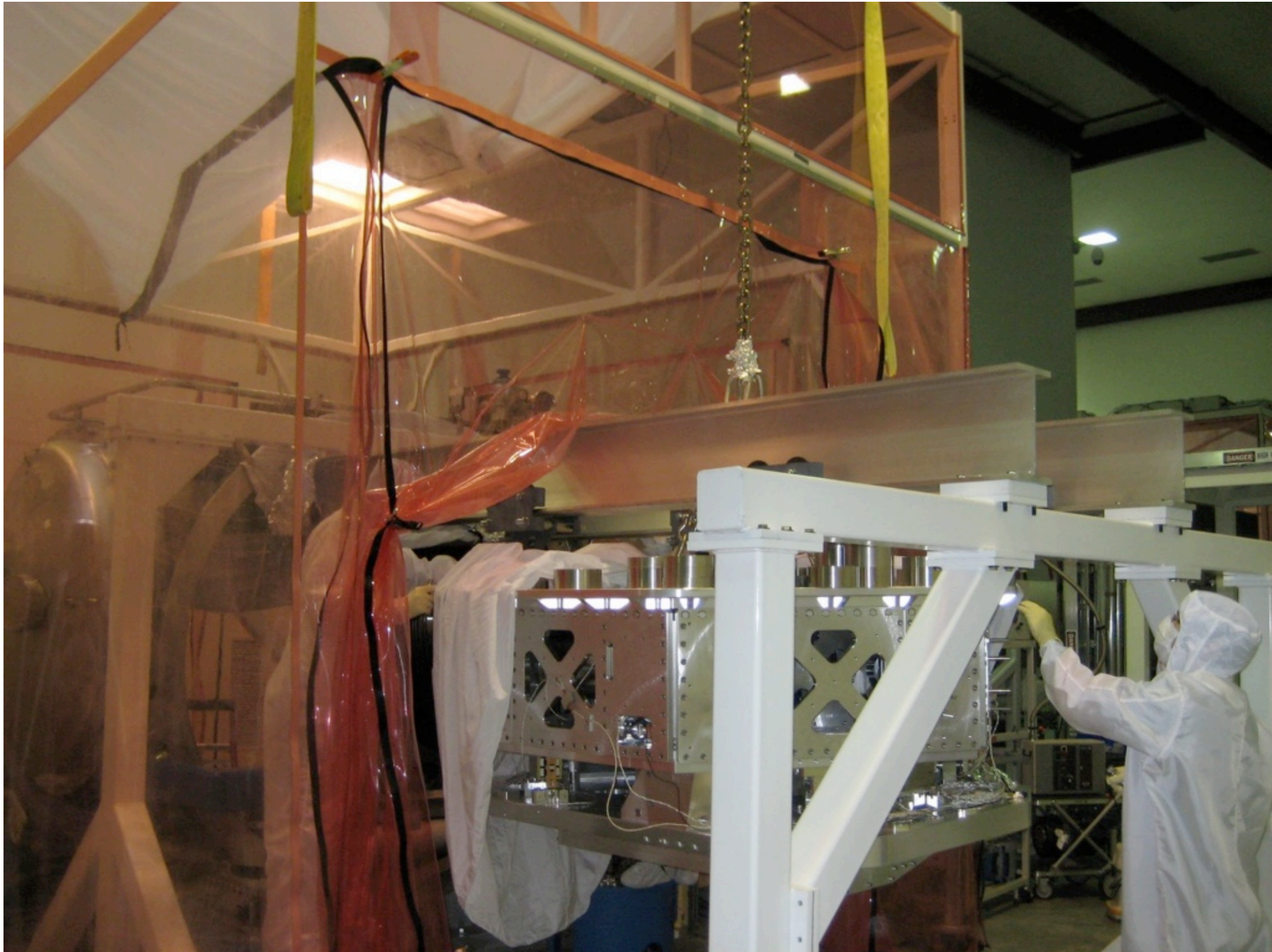


Assembly at LLO



There's a cookie inside for you...

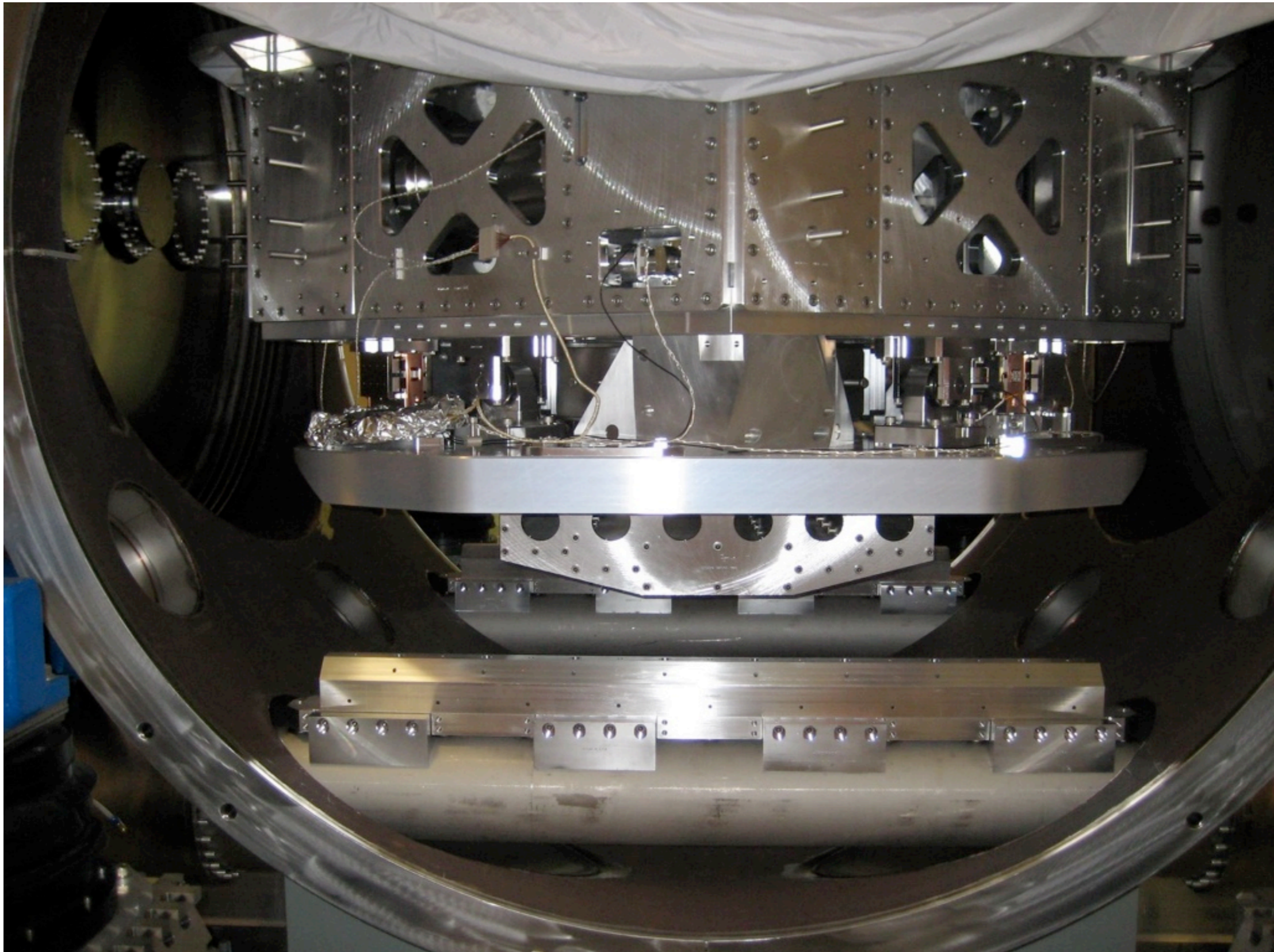
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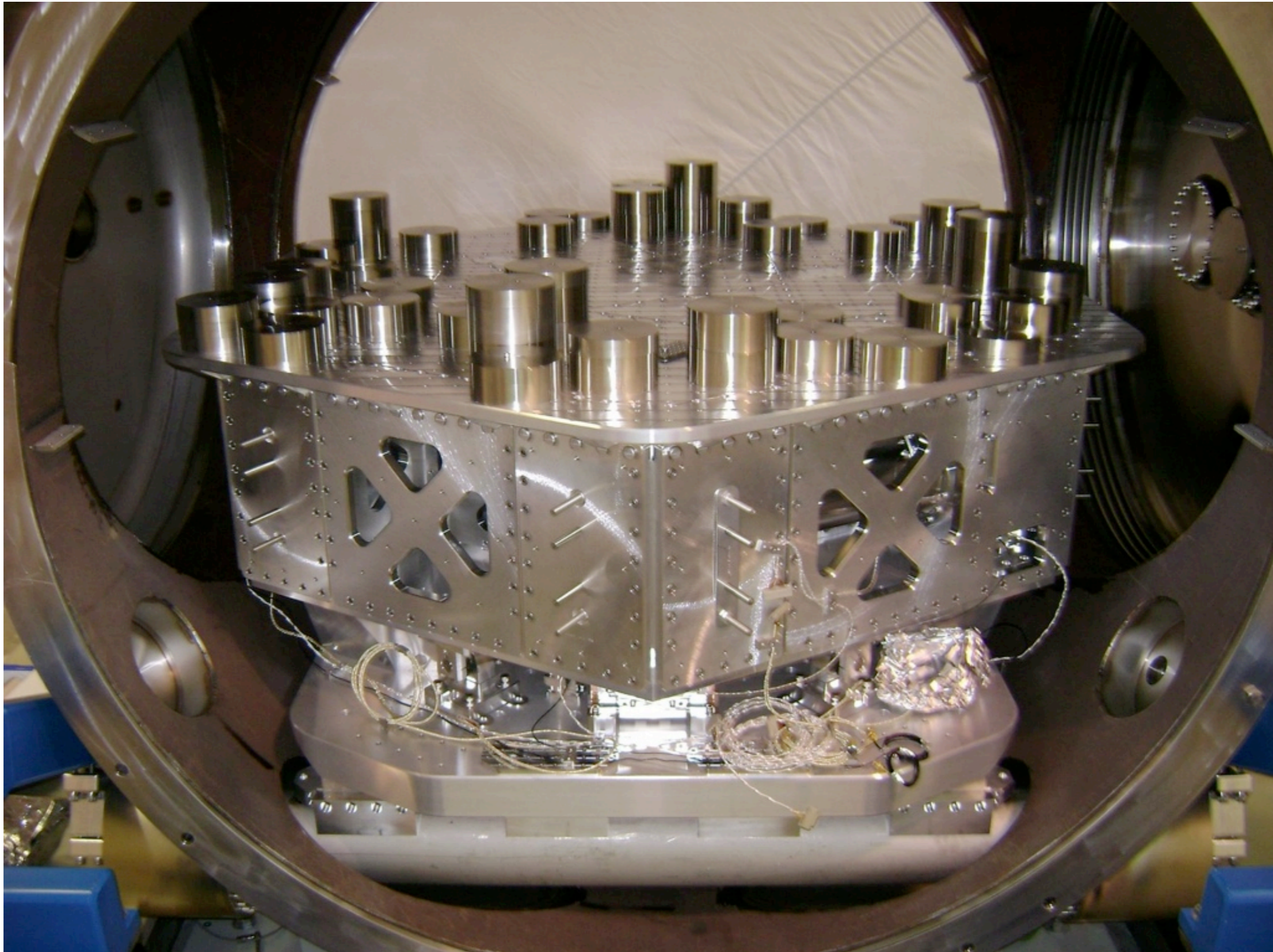
Assembly at LLO



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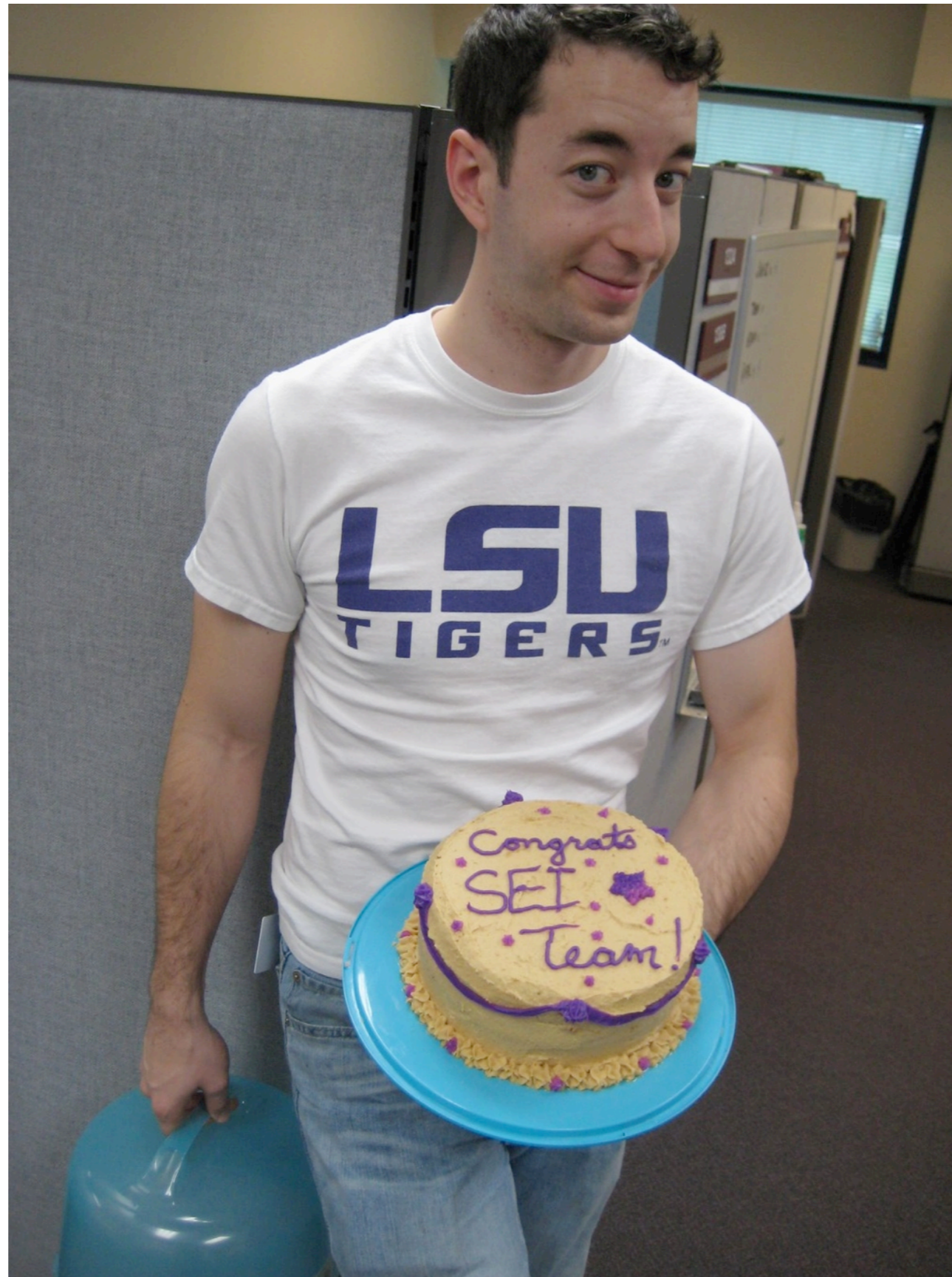
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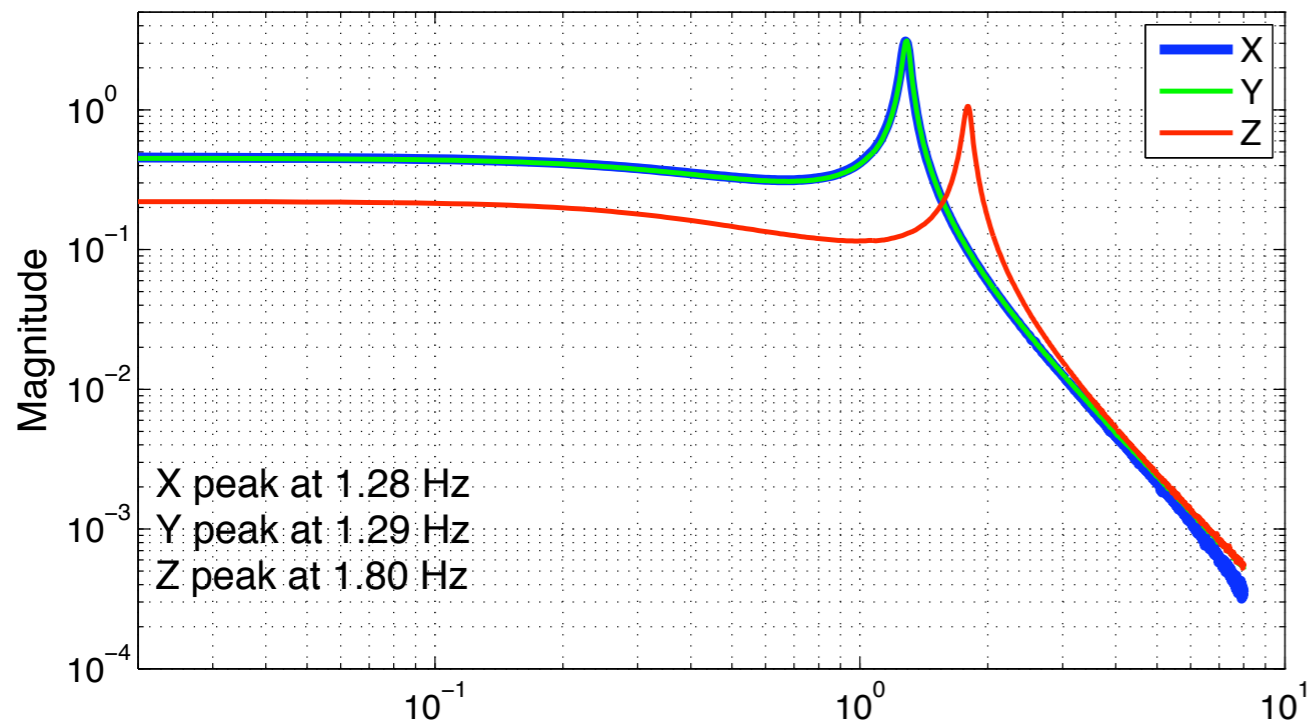
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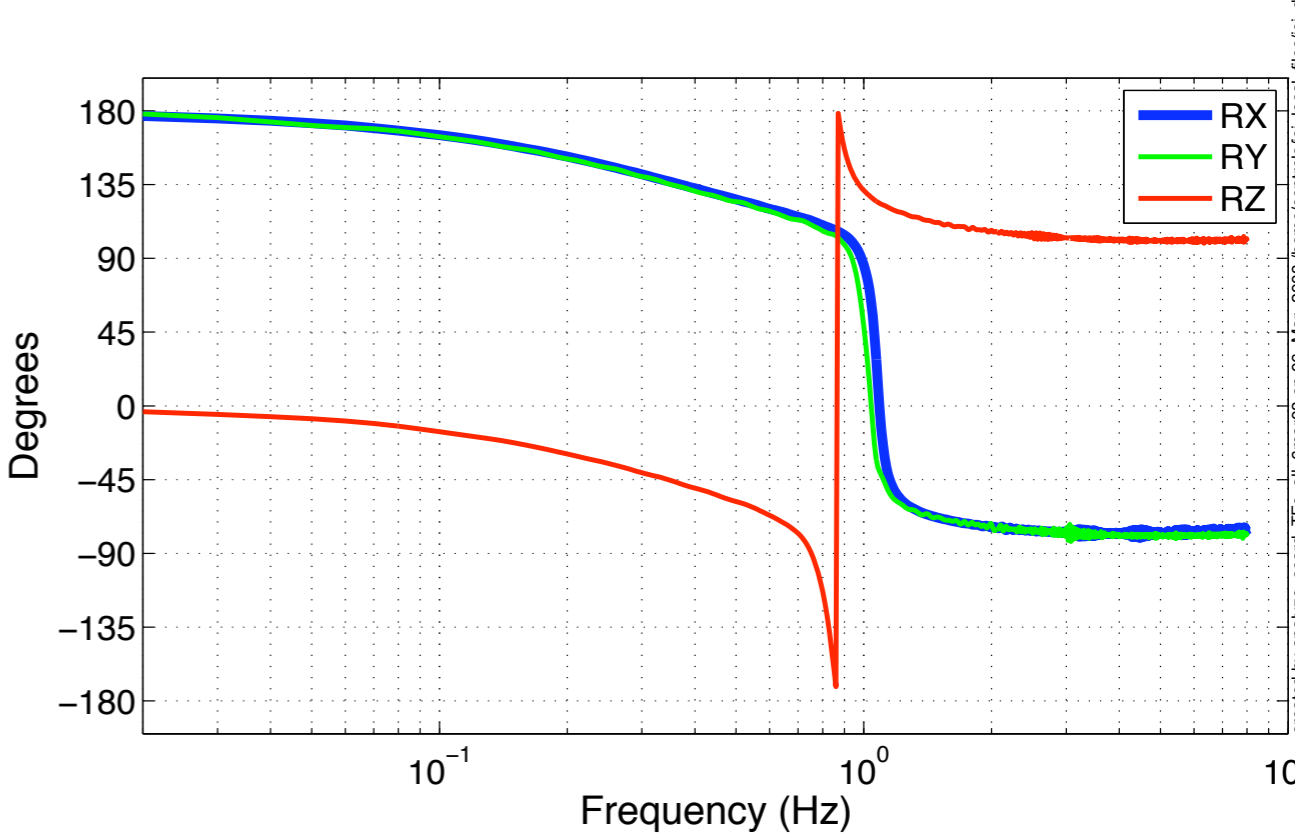
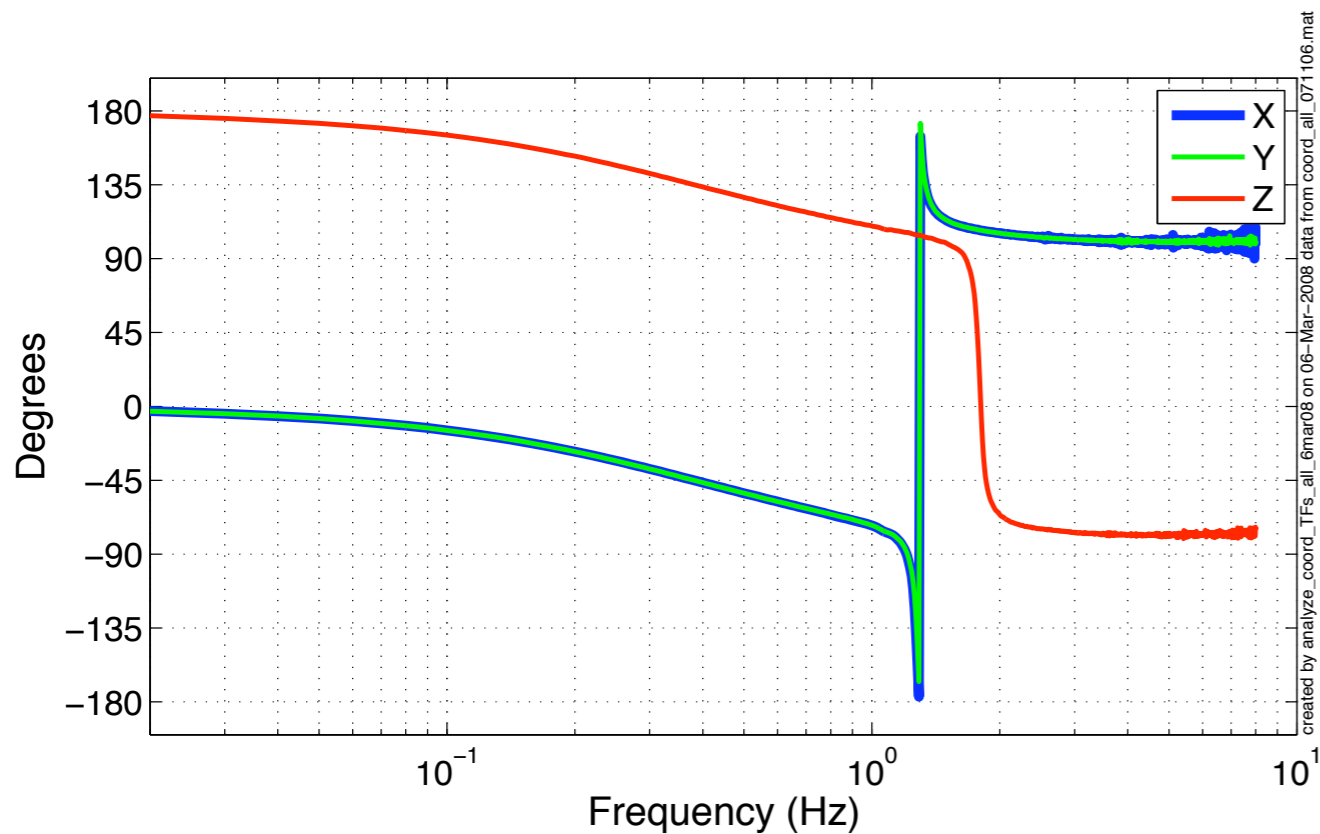
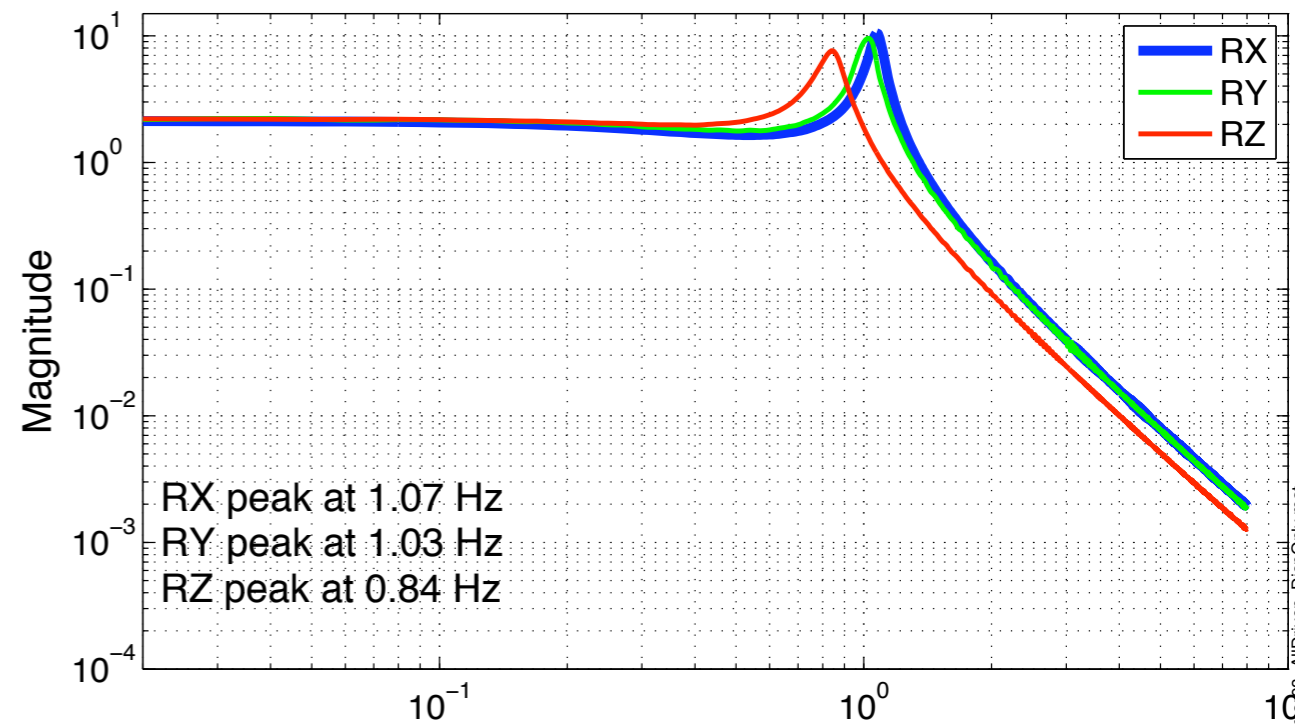
Assembly at LLO



Drive to Displacement

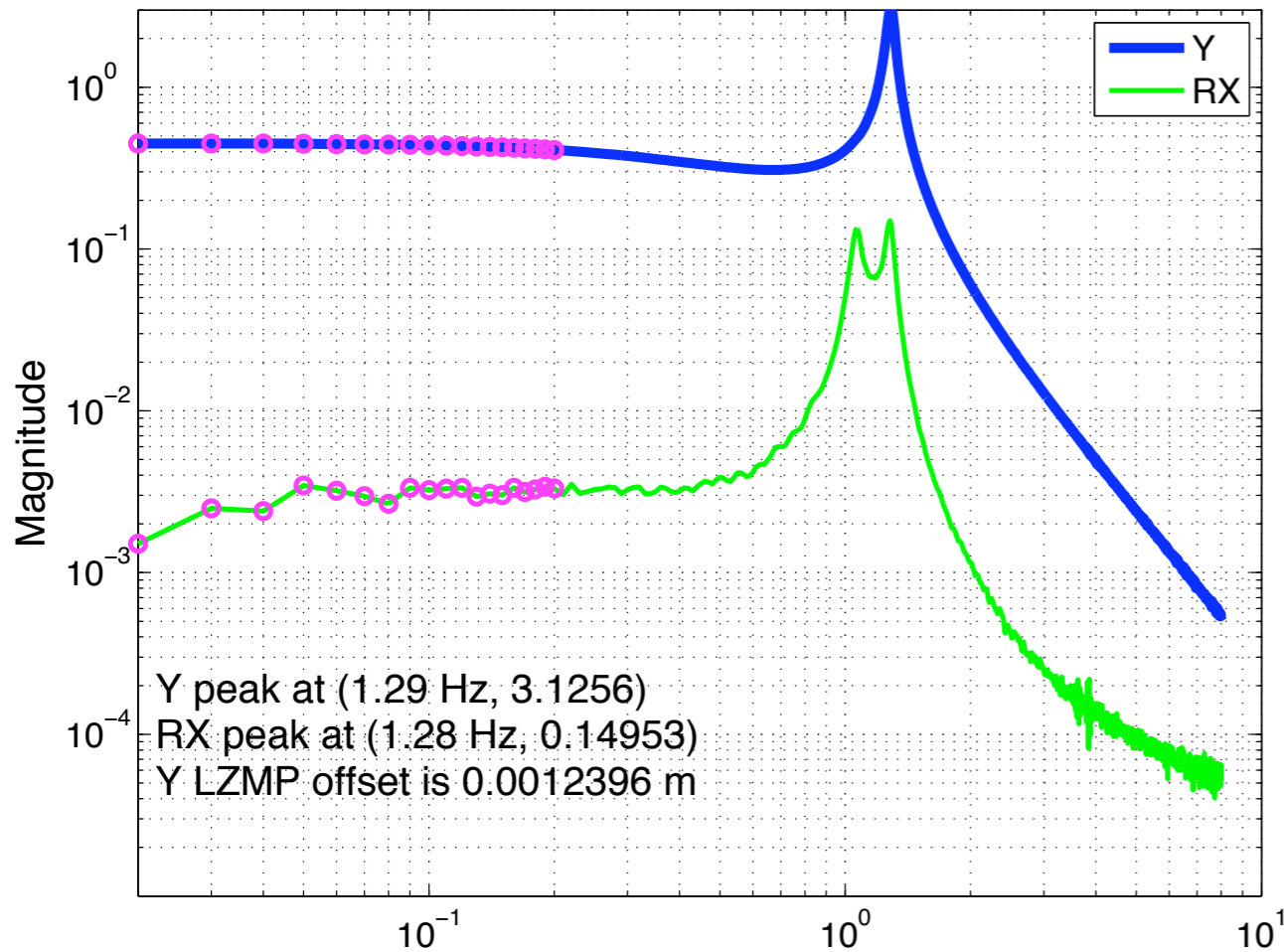


Drive to Displacement

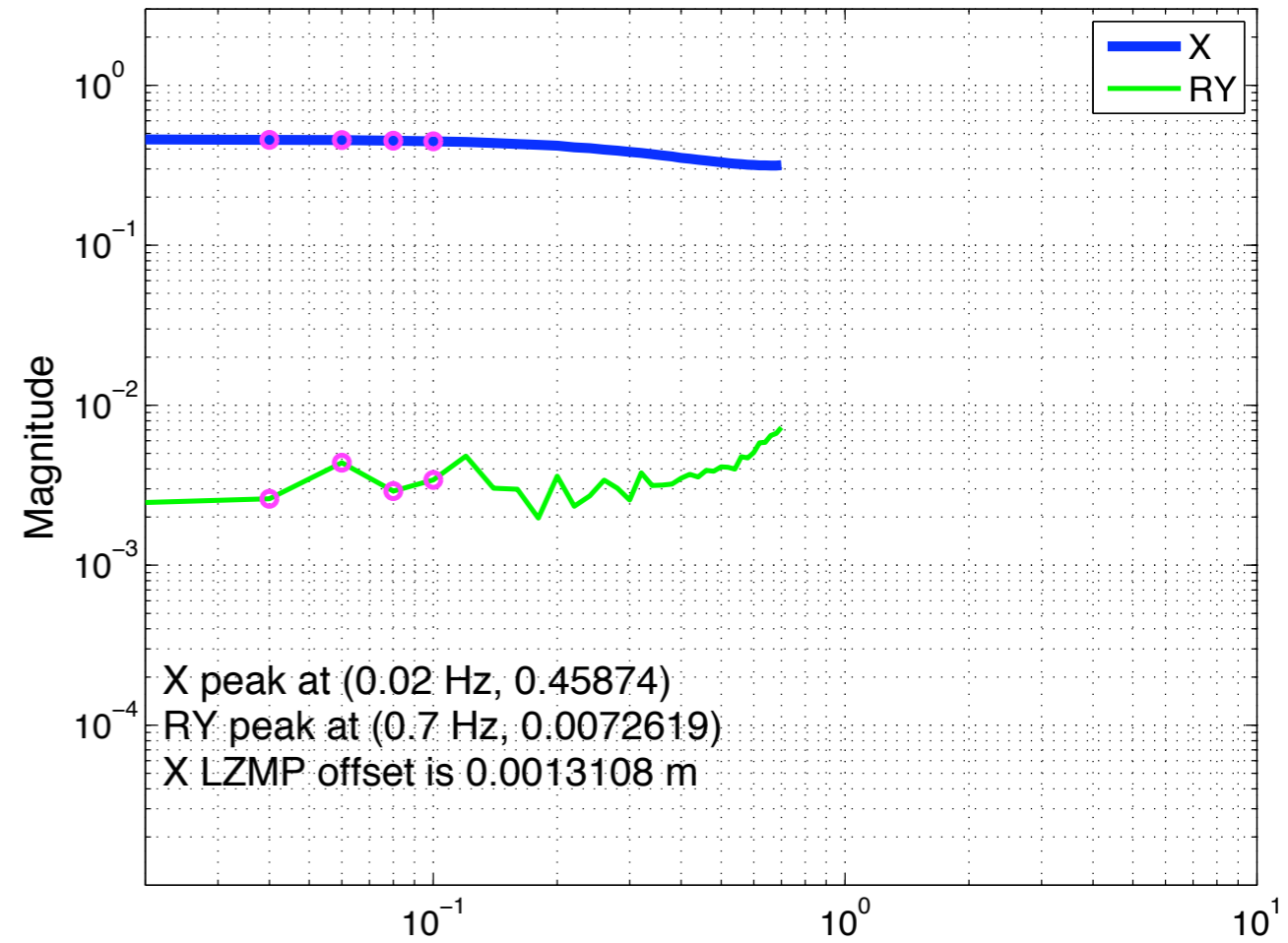


LLO system measurements

Y → Y and Y → RX, Drive to Displacement



X → X and X → RY, drive to disp



LHO is next

- Large plates arrived at LLO yesterday for (second, unscheduled) air bake, should be at LHO soon.
- Next - assemble and commission the isolation loops at Hanford.
- Then, commission the Livingston system.

Questions?

