

ADVANCED LIGO SUSPENSIONS
LSC-Virgo Meeting
March 2008

HAM Suspensions Update

Janeen Romie on behalf of Advanced LIGO US Suspension team

<http://ilog.ligo-wa.caltech.edu:7285/advligo/Suspensions>

Advanced LIGO SUS Team

- **LIGO Caltech:** R Abbott, H Armandula, D Coyne, C Echols, J Heefner, B Kirsner, K Mailand, N Robertson (also at Glasgow), G Scarborough, S Waldman
- **LIGO MIT:** P Fritschel, A Heptonstall, R Mittleman, B Shapiro, N Smith
- **LIGO LHO:** B Bland, D. Cook, G Moreno
- **LIGO LLO:** D. Bridges, T Fricke, M Meyer, J Romie, D Sellers, G Traylor
- **University of Glasgow:** M Barton, C Craig, L Cunningham, A Cumming, G Hammond, K Haughian, J Hough, R Jones, I Martin, S Rowan, K Strain, C Torrie, M Van Veggel
- **Rutherford Appleton Laboratory (RAL) :** A Brummitt, J Greenhalgh, T Hayler, J O'Dell, I Wilmut
- **University of Birmingham:** S Aston, R Cutler, D Lodhia, A Vecchio
- **University of Strathclyde:** N Lockerbie

HAM Suspensions

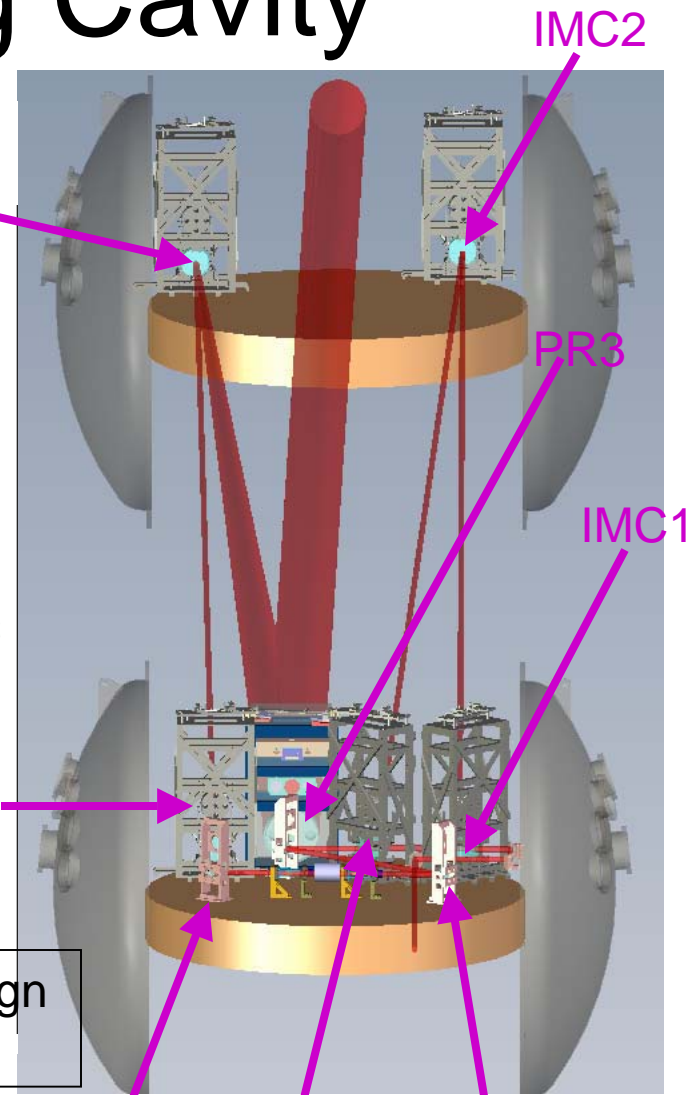
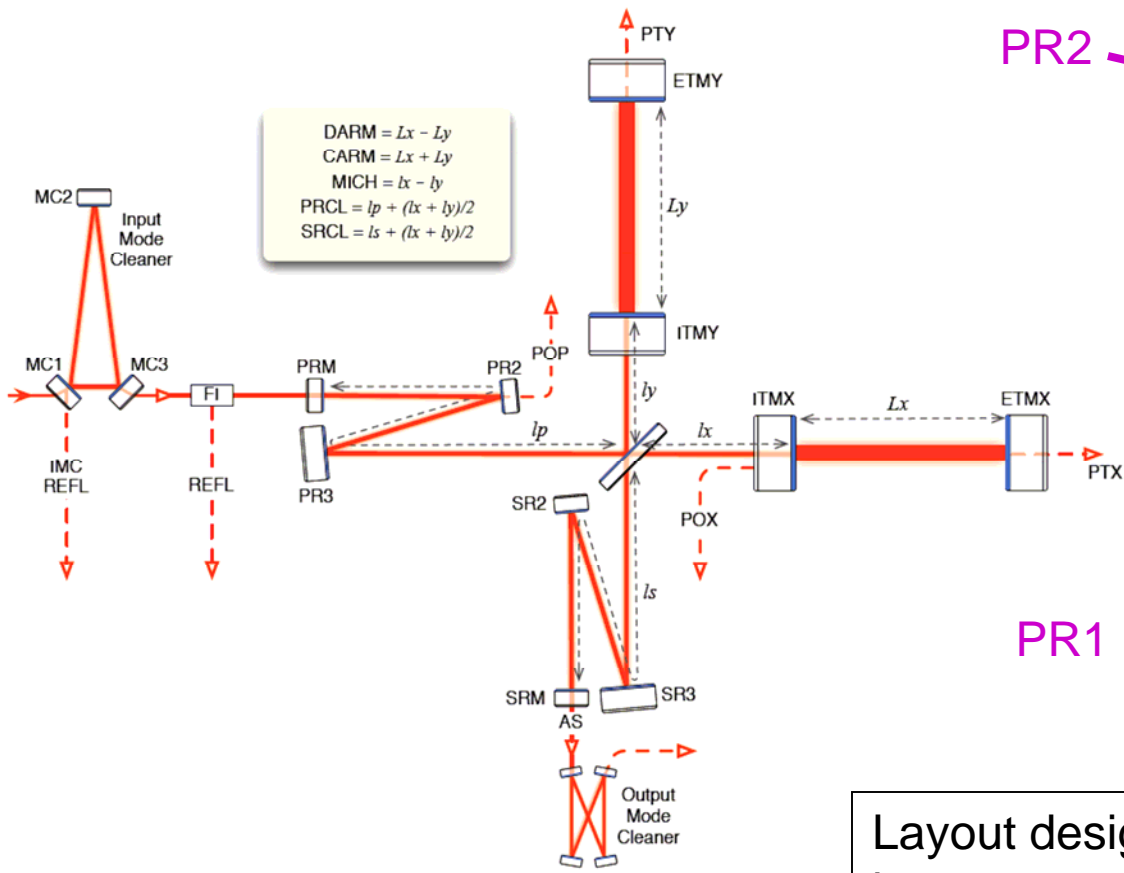
All suspensions sitting on HAM optical tables.

Decision to use stable recycling cavity design has led to change in triple suspension requirements: 3 triple pendulums in each cavity.

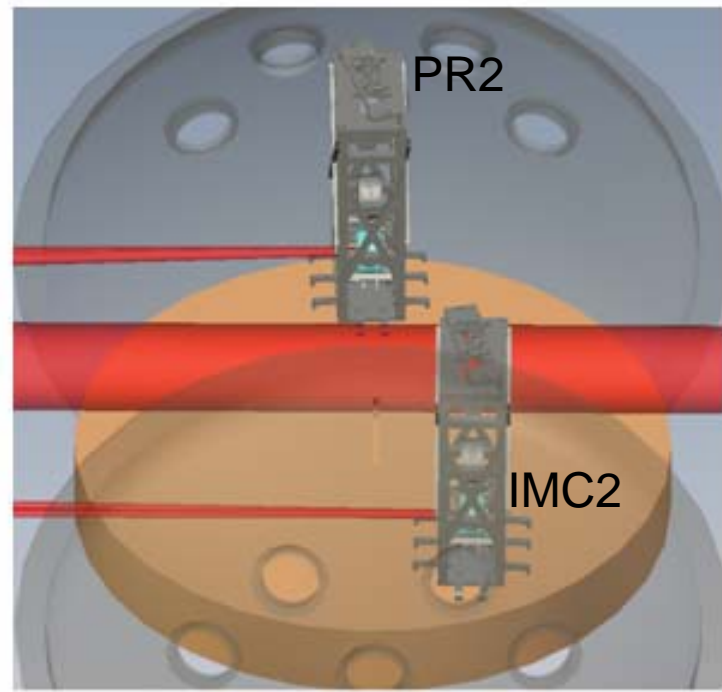
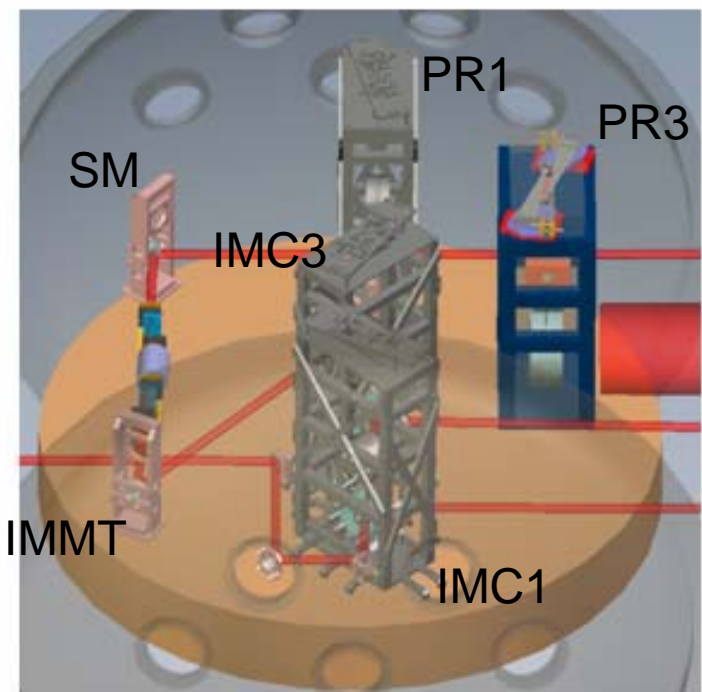
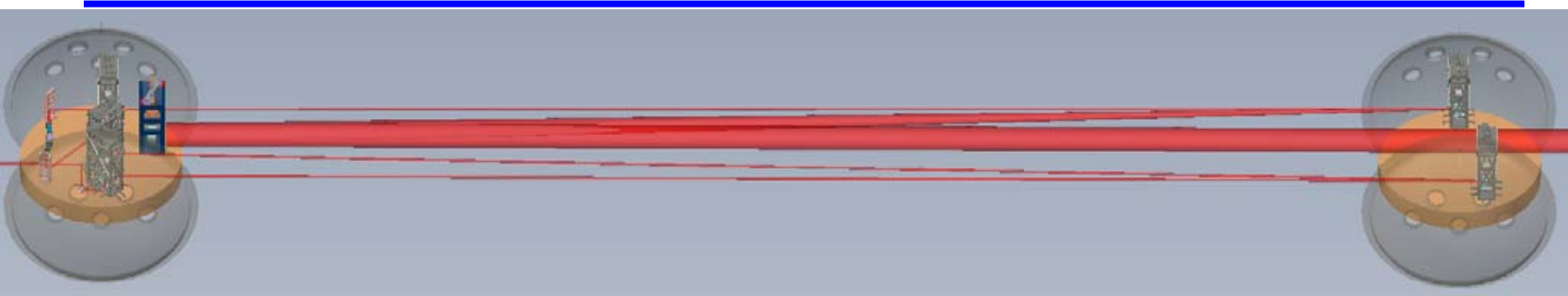
- Big Triple suspension for 265mm diameter optic
 - Power recycling cavity mirror PR3
 - Signal recycling cavity mirror SR3
- Small Triple suspension for 150mm diameter optic
 - Input mode cleaner
 - Power recycling cavity mirrors PR1*, PR2
 - Signal recycling cavity mirrors SR1*, SR2

*actual recycling mirror
- Doubles for 450mm x 150mm x 38mm optical bench
 - Output mode cleaner
- Singles for 76mm diameter optic = an initial LIGO Small Optic Suspension (SOS)
 - Input and output mode matching telescopes
 - Steering mirrors

Stable Recycling Cavity



Stable Recycling Cavity



HAM Suspensions Status

Big Triples

Prototype for **Recycling Mirror R3** suspension is being fabricated now. Preliminary testing at Caltech before going to LASTI.

- structure is stainless steel so less welding issues

Small Triples

Input Mode Cleaner (IMC) suspension prototypes fully tested at LASTI

- currently working on stiffening the structure and other small optimizations for final design

Double

LLO **Output Mode Cleaner** (OMC) is in the HAM 6 chamber

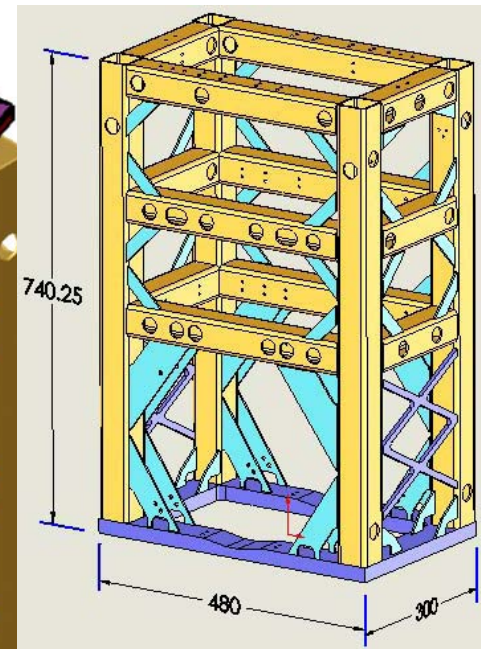
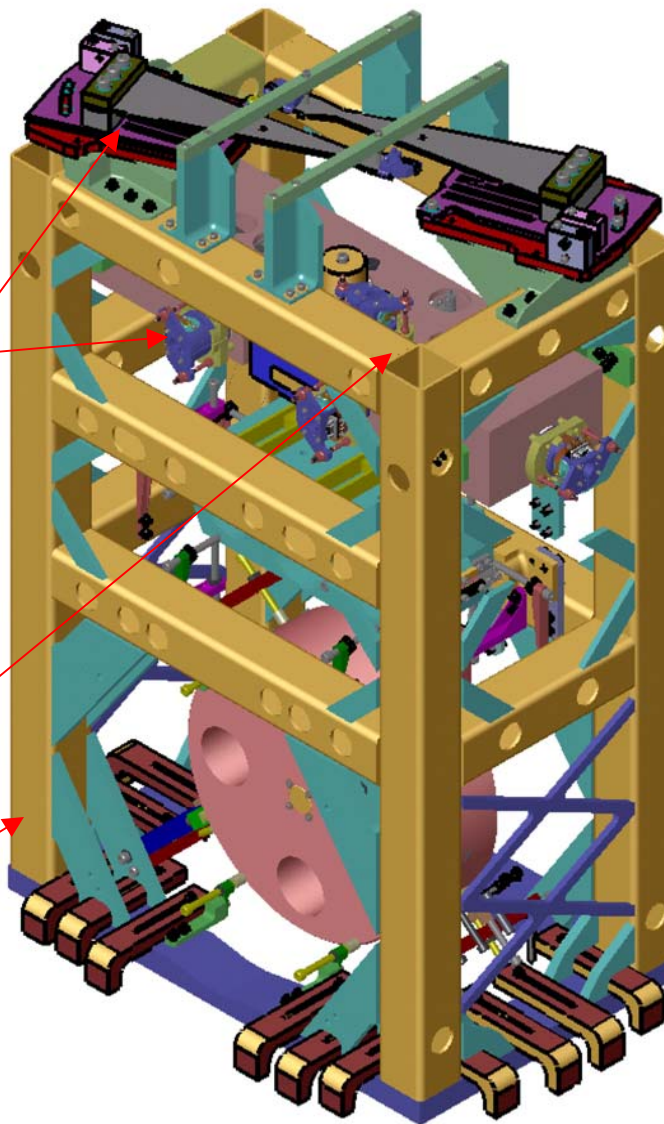
LHO **Output Mode Cleaner** is being fabricated

Singles

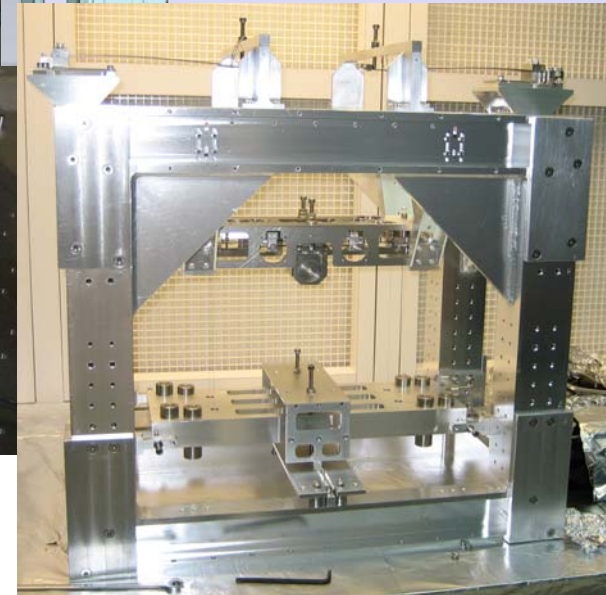
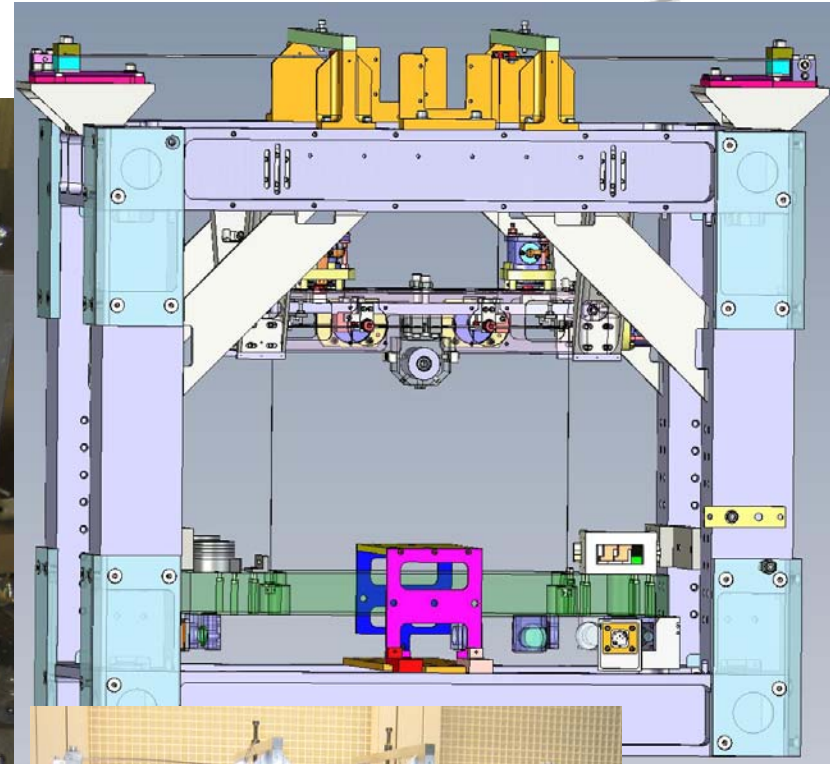
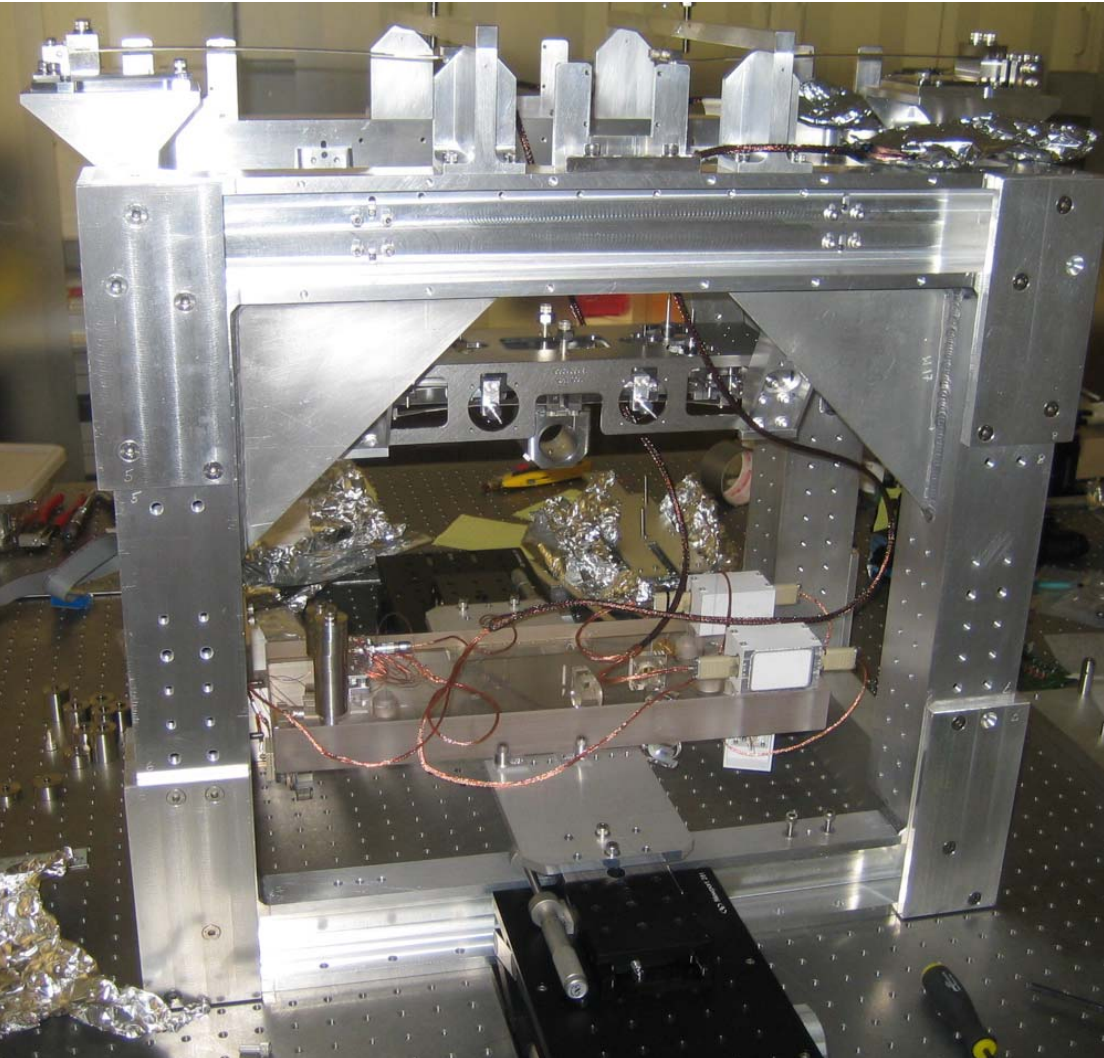
Assumed that only small updates of **SOS** required

Recycling Mirror Suspension, R3

- triple pendulum
- OSEMs @ 3 masses
 - 6 @ top mass for damping of low frequency modes
 - 4 @ intermediate mass & mirror for global control
- blades at top of suspension & at top mass
- stainless steel welded structure



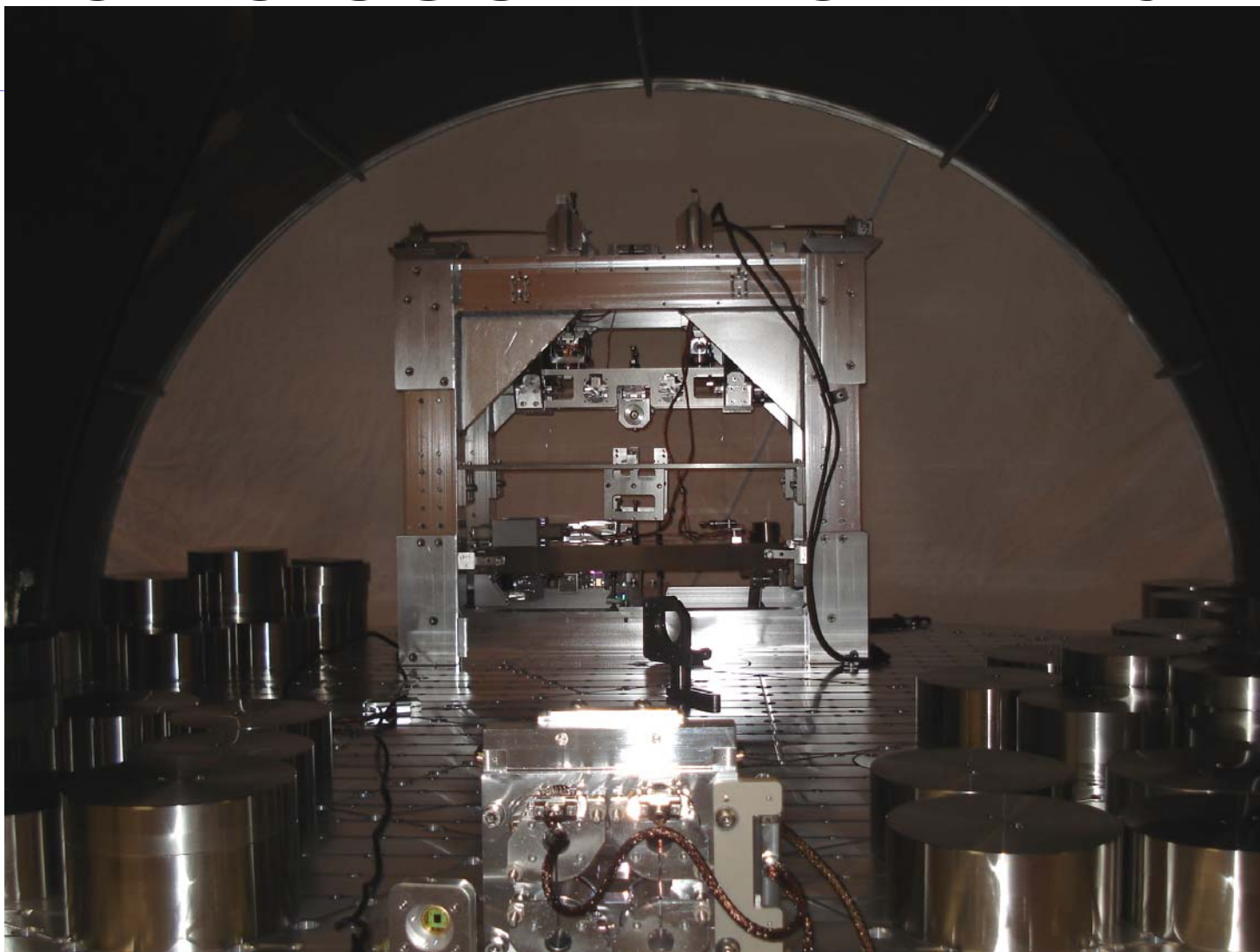
OMC SUS



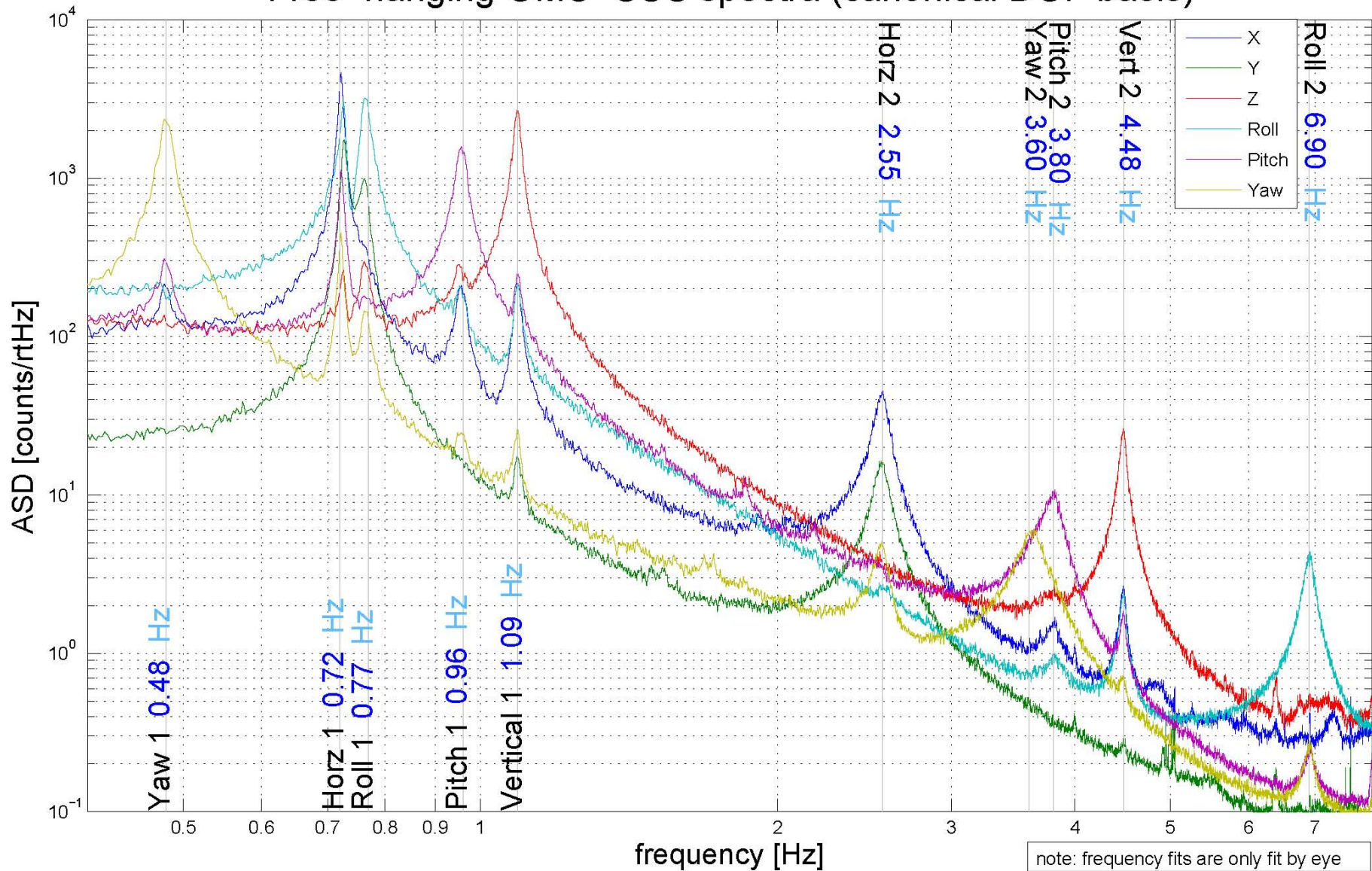
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OMC SUS in LLO HAM6



Free-hanging OMC-SUS spectra (canonical DOF basis)



Conclusions

- SUS team benefits from sharing ideas, designs & lessons learned on a weekly basis.
- A lot of progress has been made
- Still work to be done
- Drawings, drawings, drawings

