Recent Work in Vibration Measurements at BNL

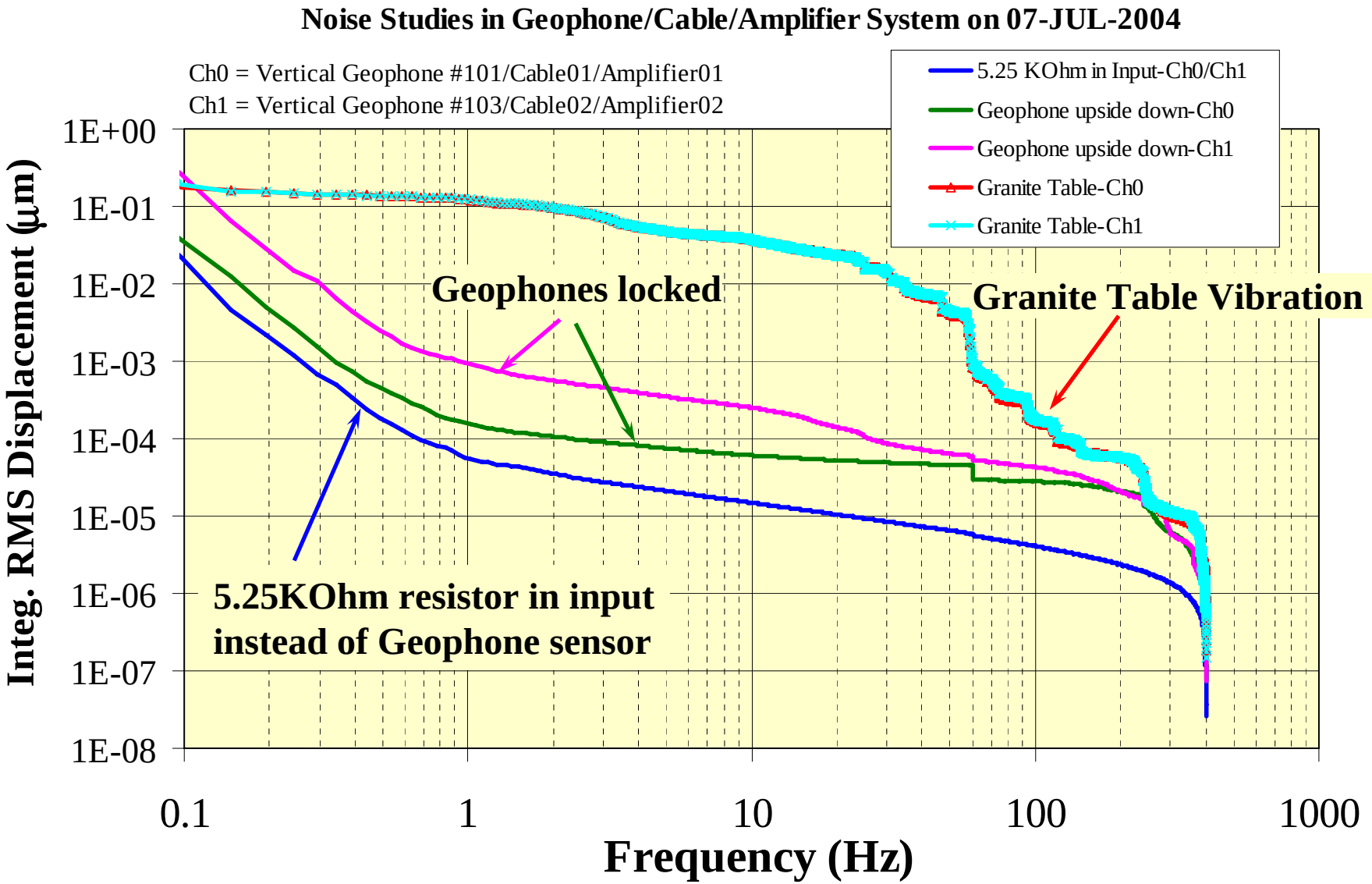
Superconducting Magnet Division, BNL

BNL-SLAC TeleConference: Sept. 14, 2004

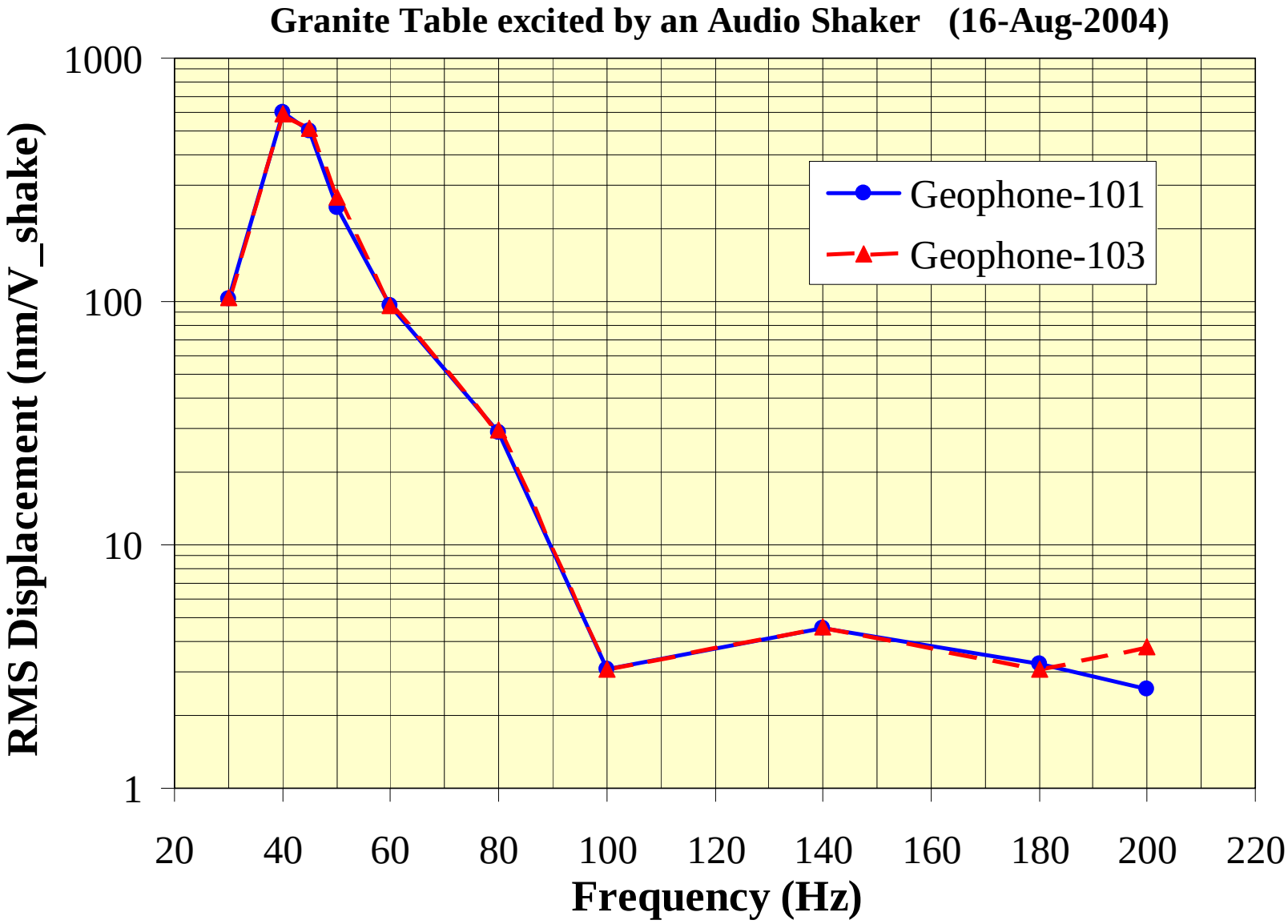
Recent Activities

- Noise study of Geophone system (Andrei's question at the last meeting).
- Comparison of two geophones and geophone with Kistler accelerometer as a function of frequency.
- Warm measurements on the CQS have been repeated with the new geophones and compared with the February 2004 data.
- Simultaneous measurements with the geophones and the laser system have been done in the tent area and CQS stand (Aug.24, 2004)

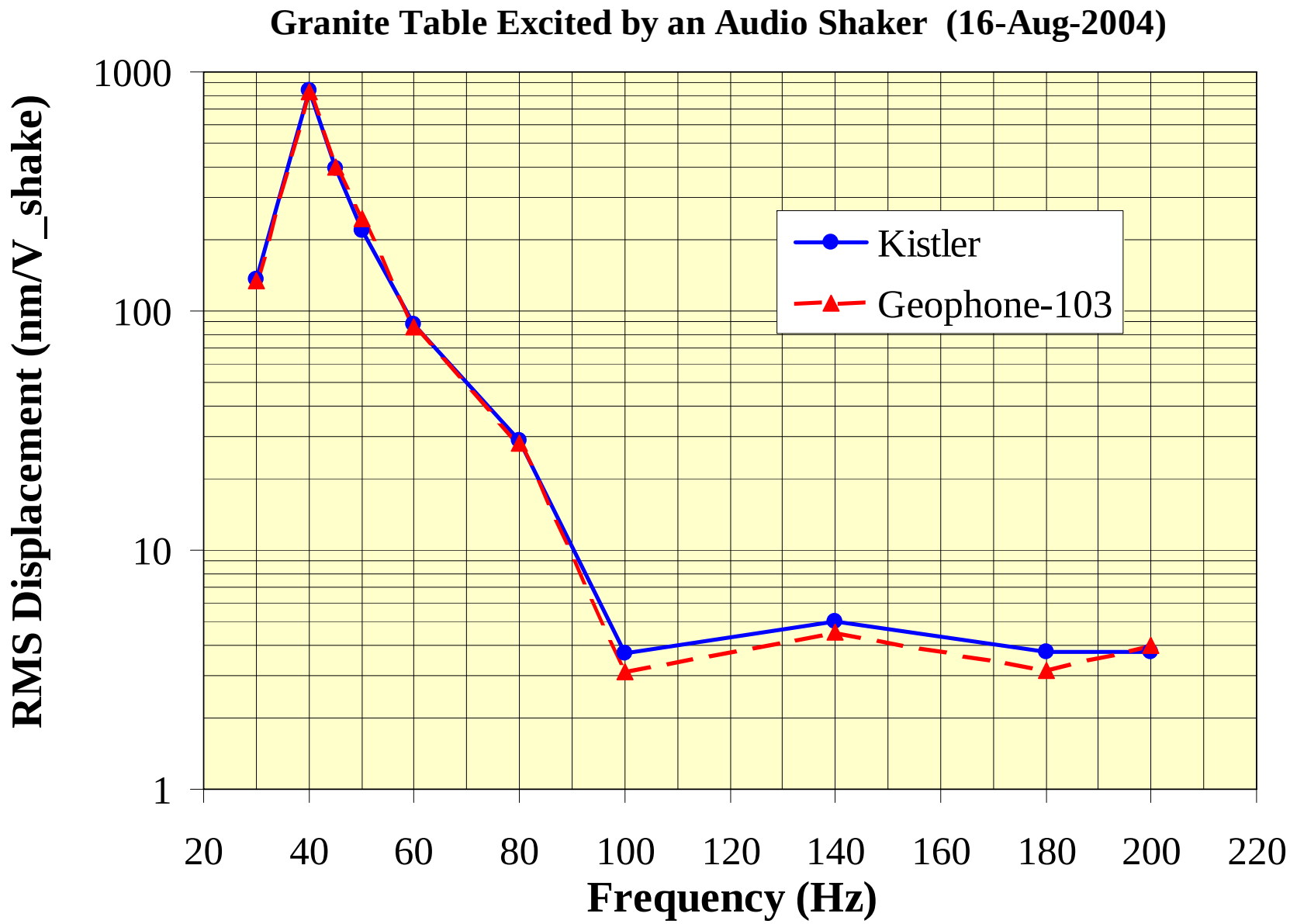
Noise Level of Geophone Sensors



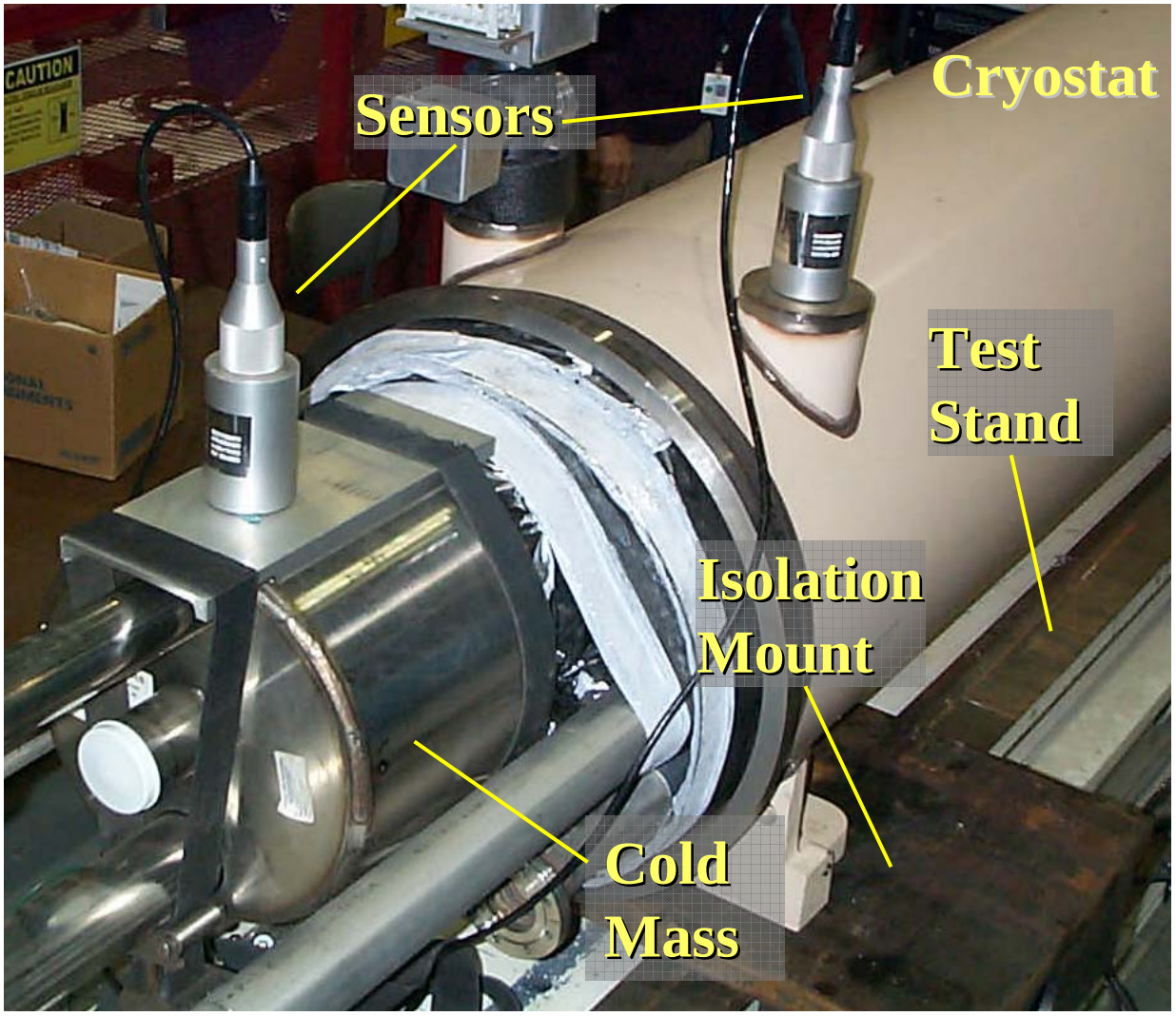
Two Geophones vs Frequency



Geophone Vs Kistler Accelerometer

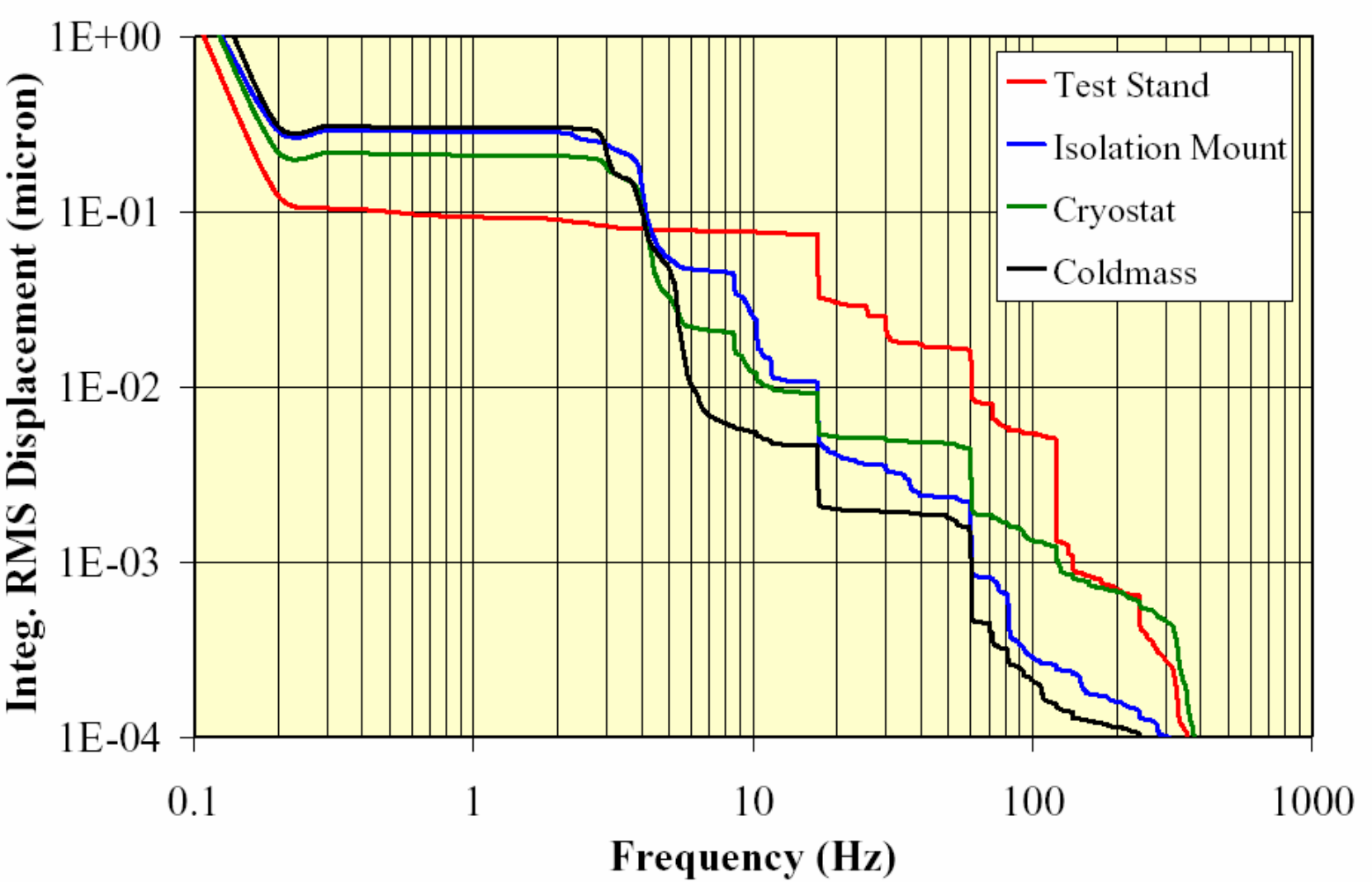


CQS Vibration Measurements (Feb'04)

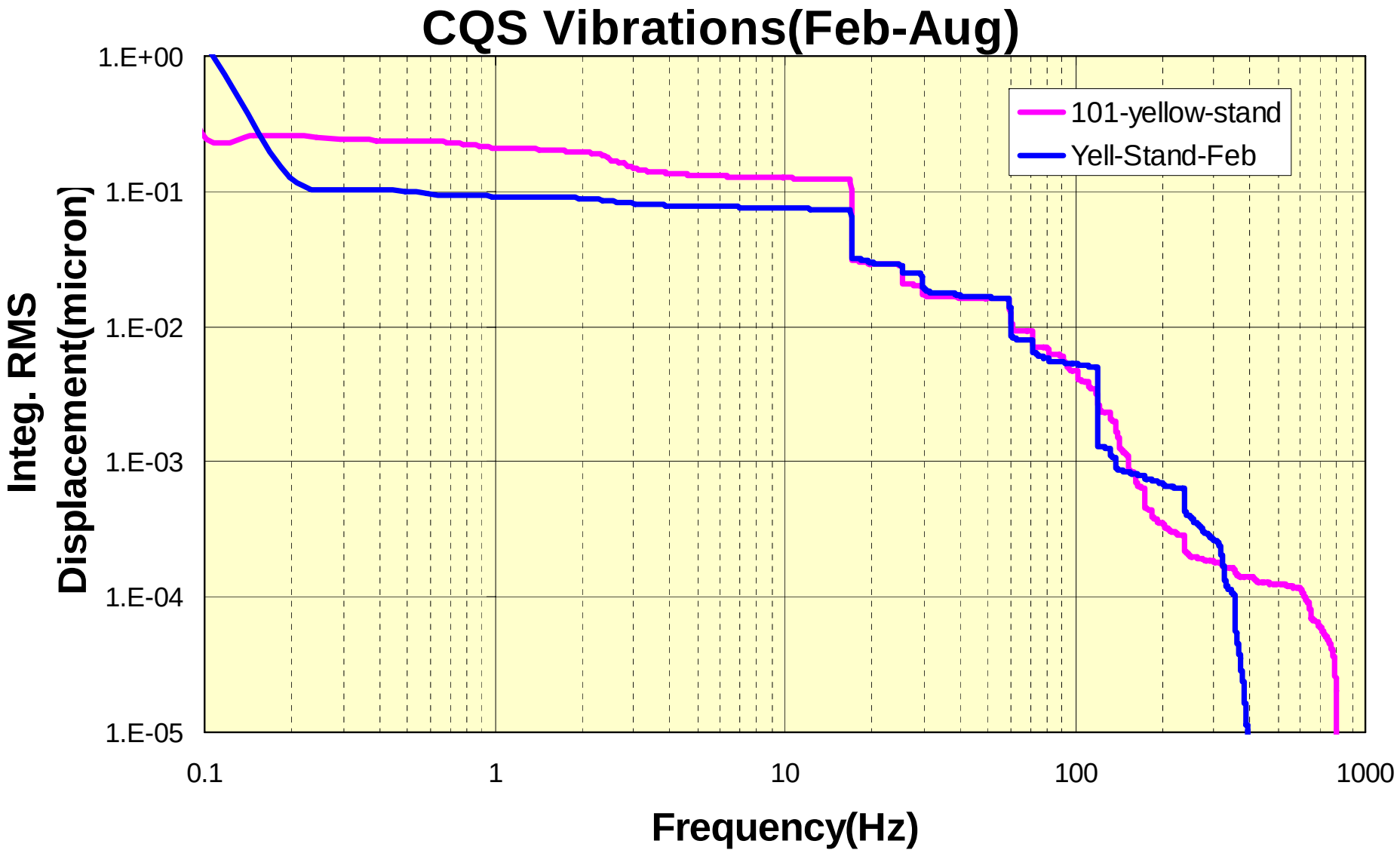


CQS Vibrations along Vertical Axis(Feb'04)

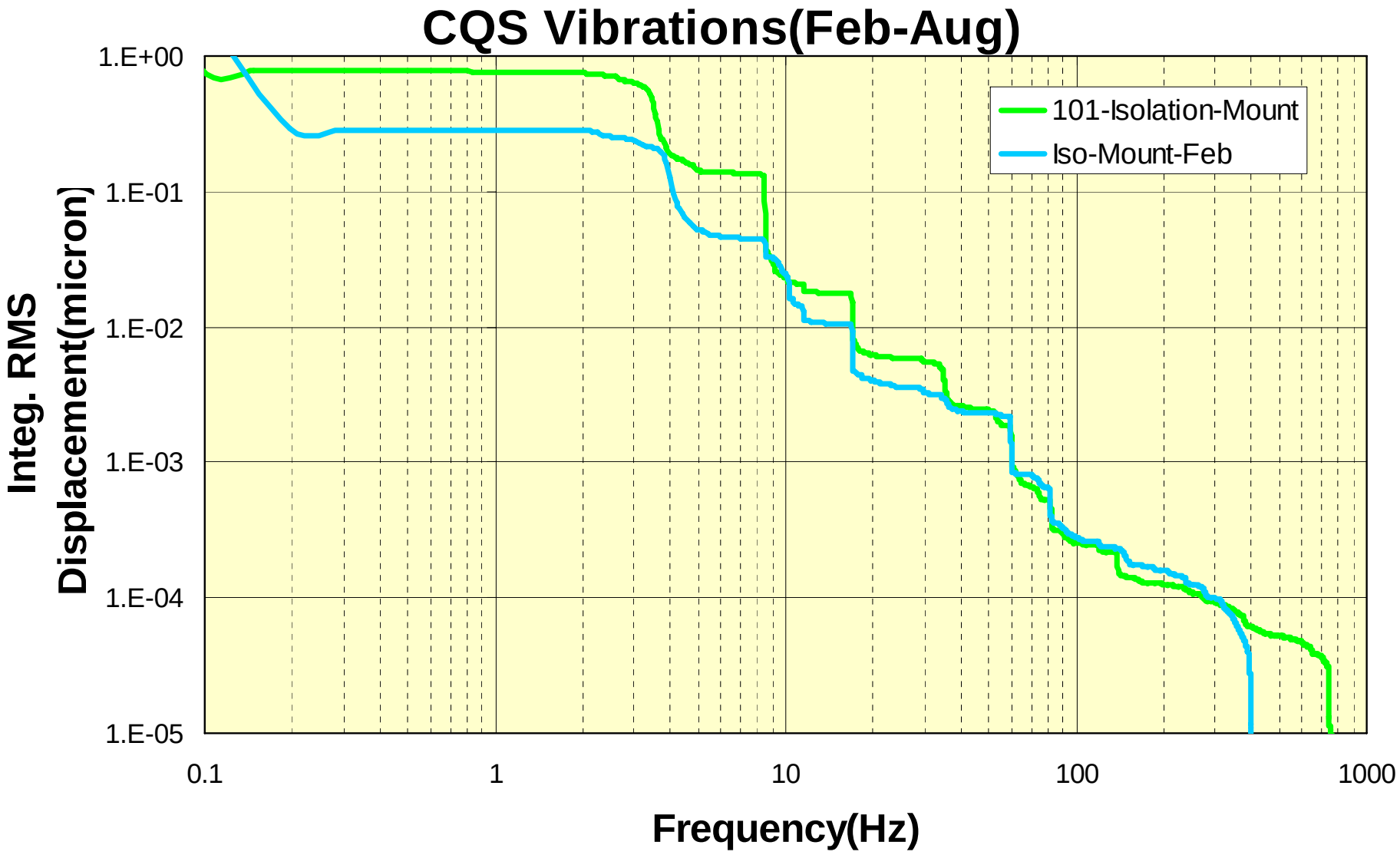
(Measurements on a warm CQS)



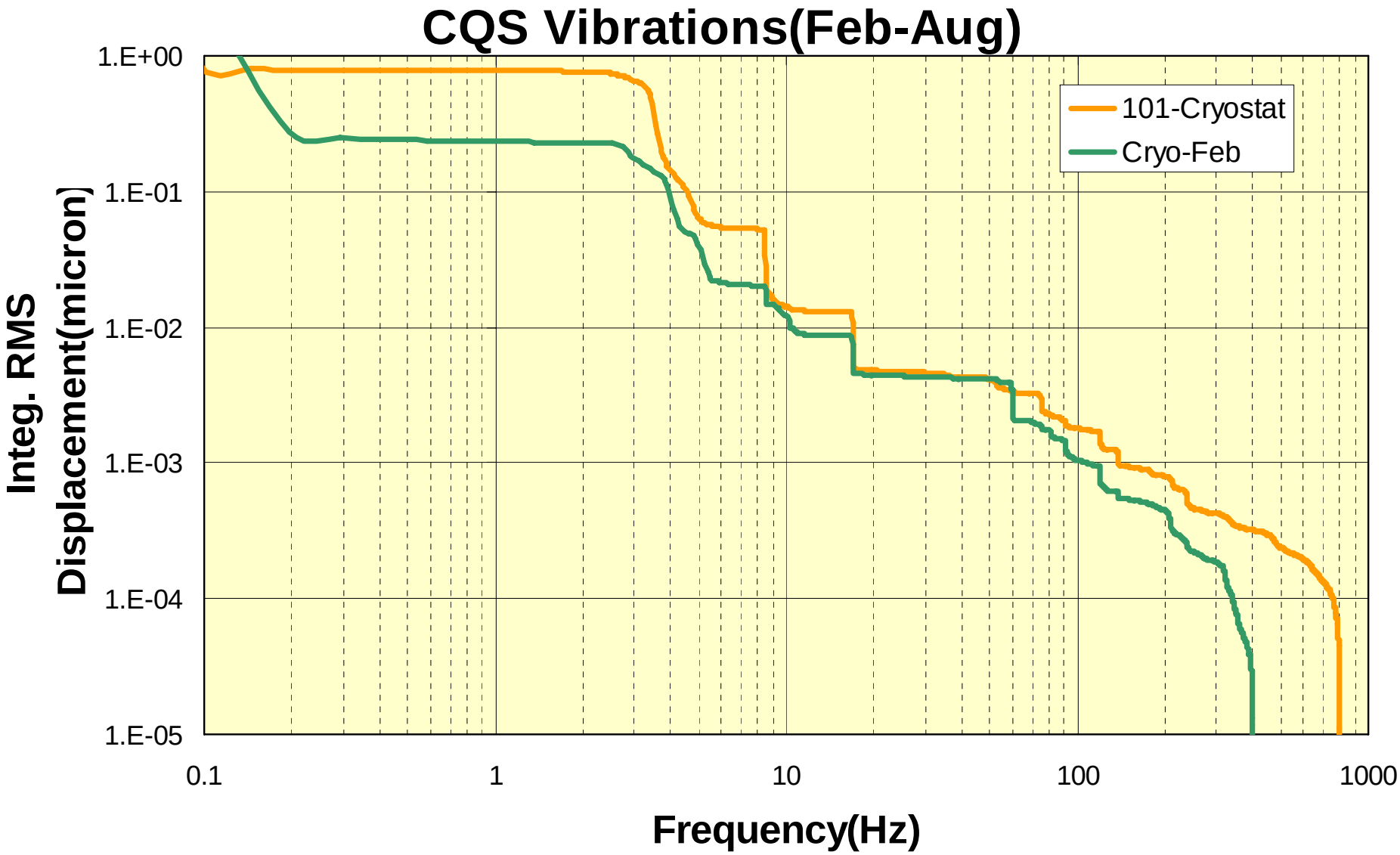
CQS Vibration on the Yellow Stand



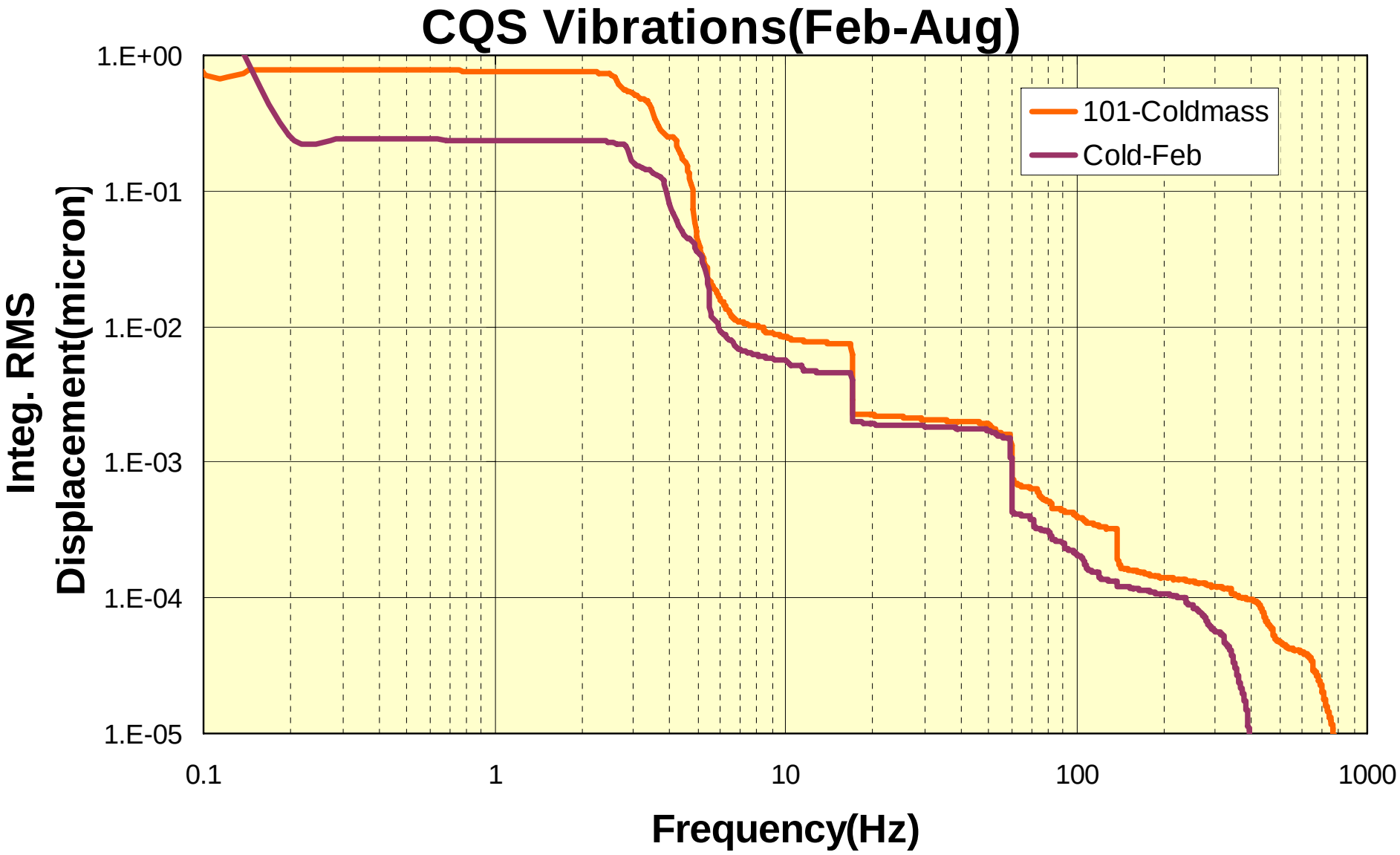
CQS Vibration on the Isolation-Mount



CQS Vibration on the Cryostat



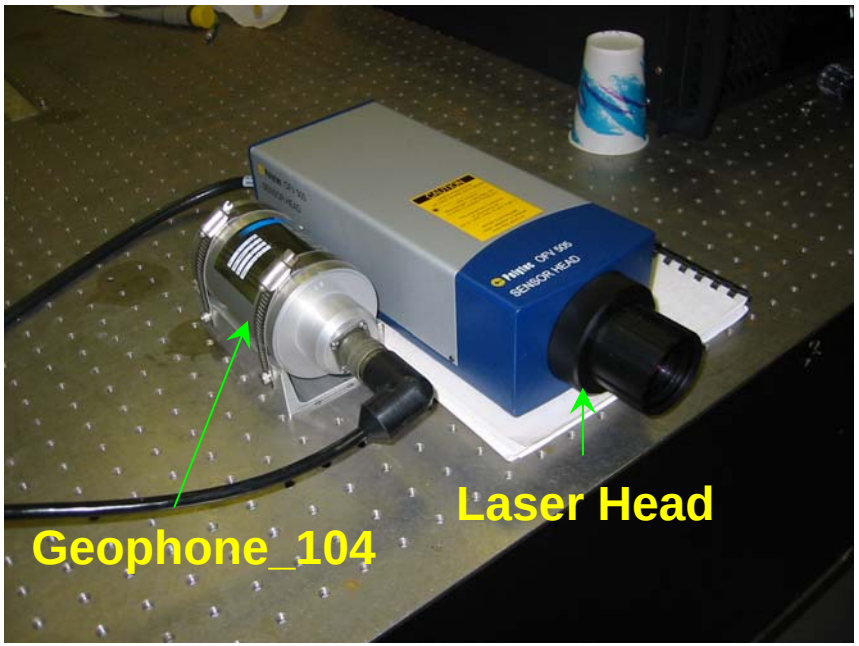
CQS Vibration on the Coldmass



Laser Vibrometer & Geophone Measurements Done Simultaneously (Courtesy PolyTec, Inc.)

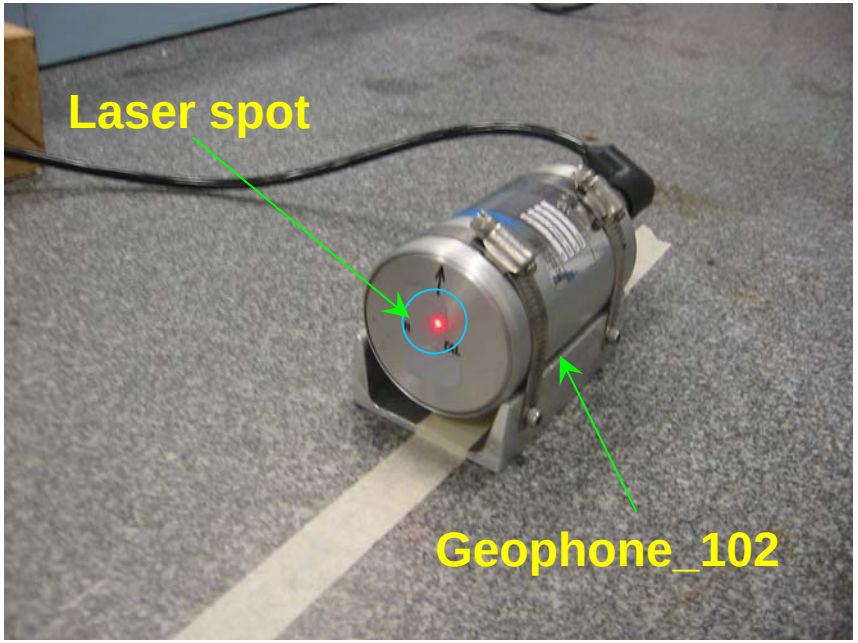
- **Test in Tent Area**
  - Laser Head on Optical Table
  - Laser Head on Tripod
- **Demo run results on CQS stand**
  - Laser Head on Tripod without Geophone
  - Laser Head on Tripod with Geophone

PolyTec LDV Demo August 24, 2004



Optical Table

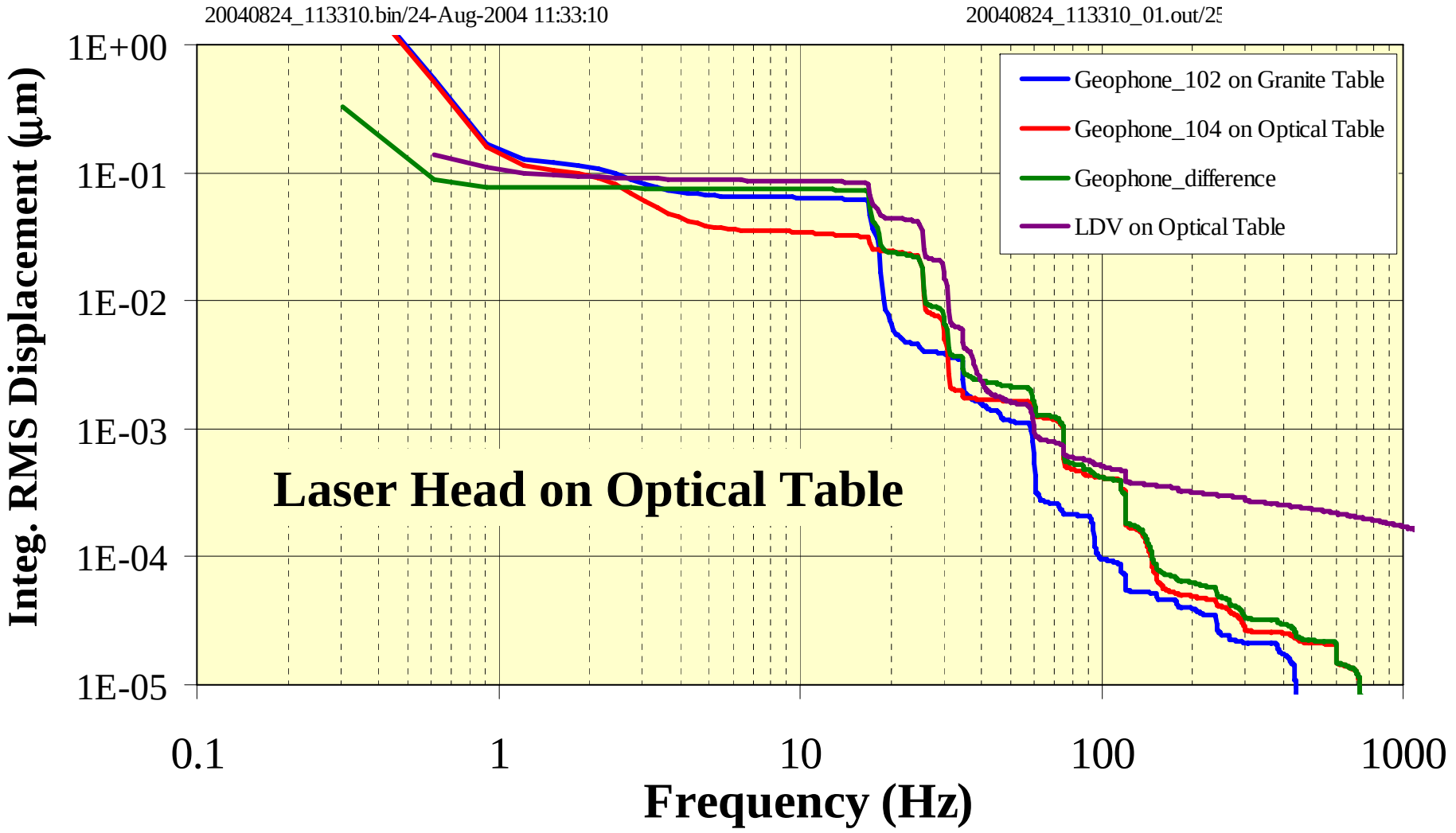
Granite Table
(Object to be measured)



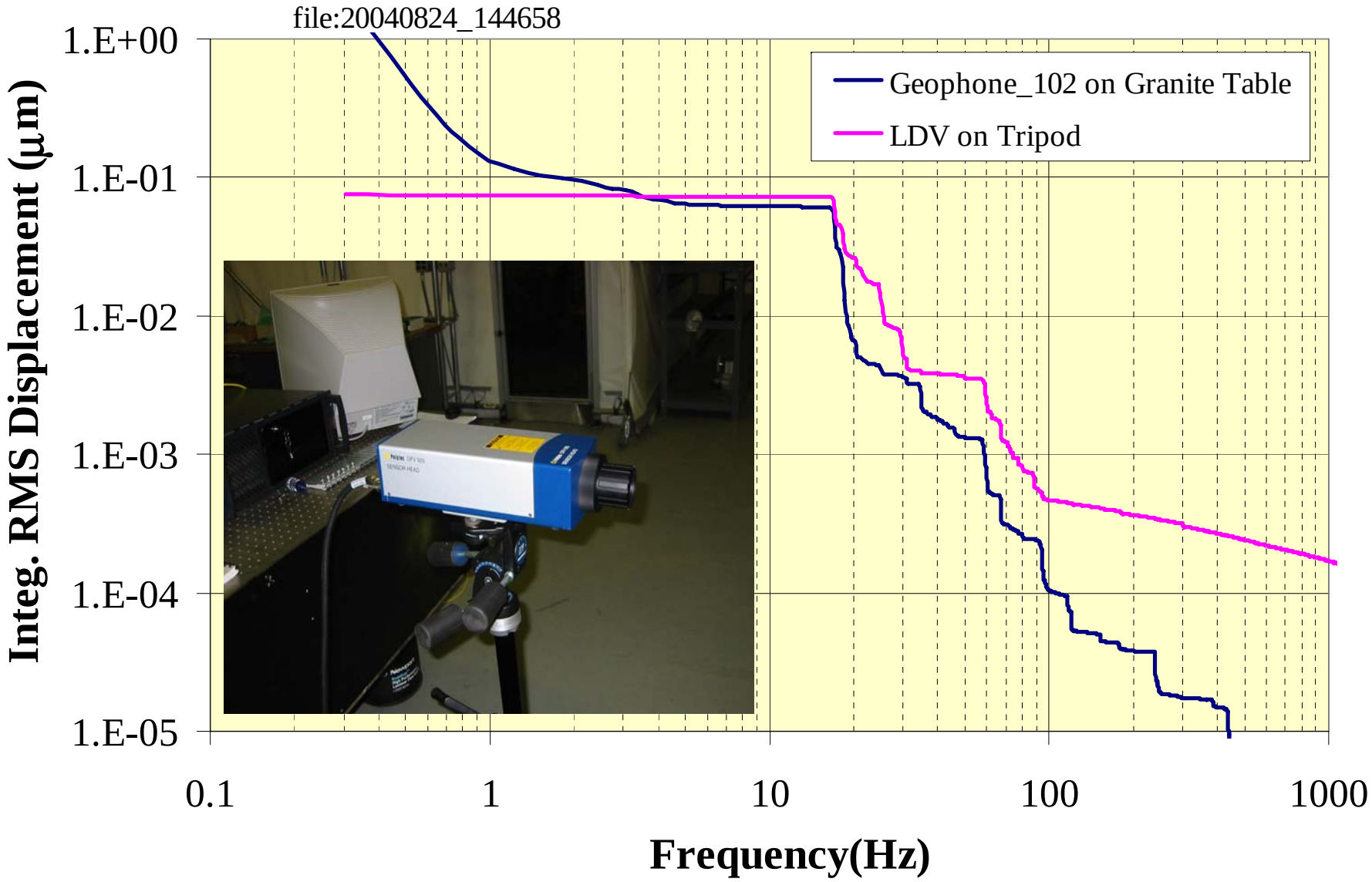
- OFV-3100 Controller
- OFV-505 Sensor Head
- VD-01/02 Velocity decoder
- DD-200 Displacement decoder

Data acquired using BNL
LabView program on Laptop

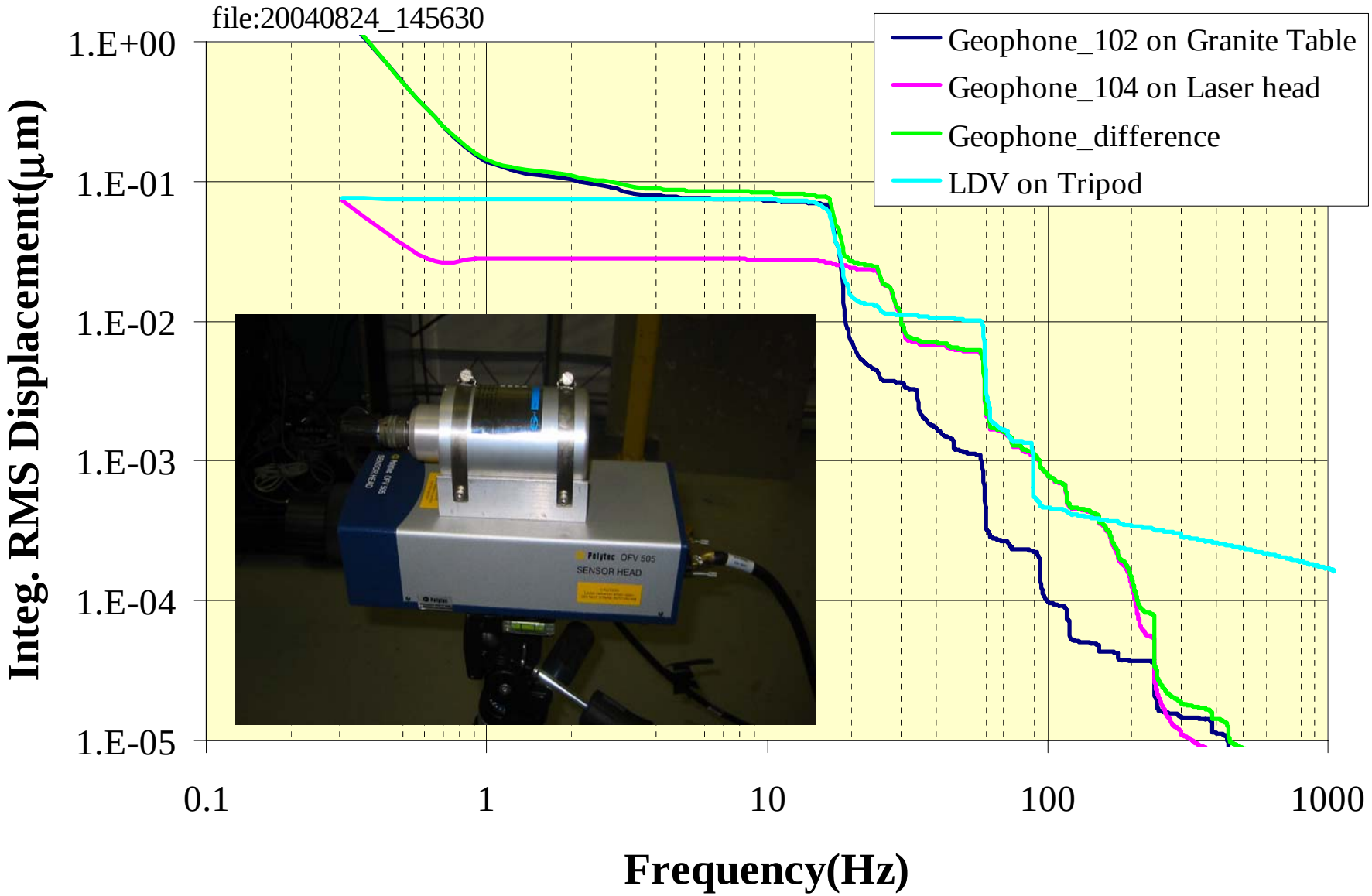
Polytec Laser Vibrometer System; Test run - Laser shining on 102; 102 on granite table; 104 on optical table with laser head; Ch0 = 102; Ch1 = 104; Ch2=Laser #199 at 1 mm/s per Volt with 26X Amp(=gain 52)



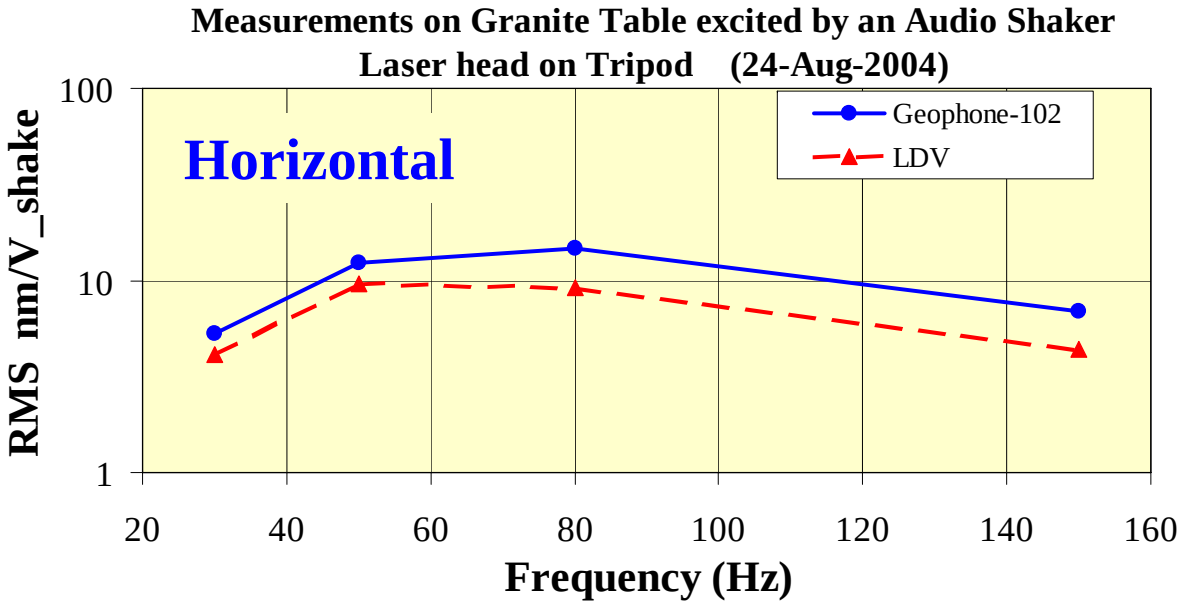
LDV on Tripod (no Geophone on Laser Head)

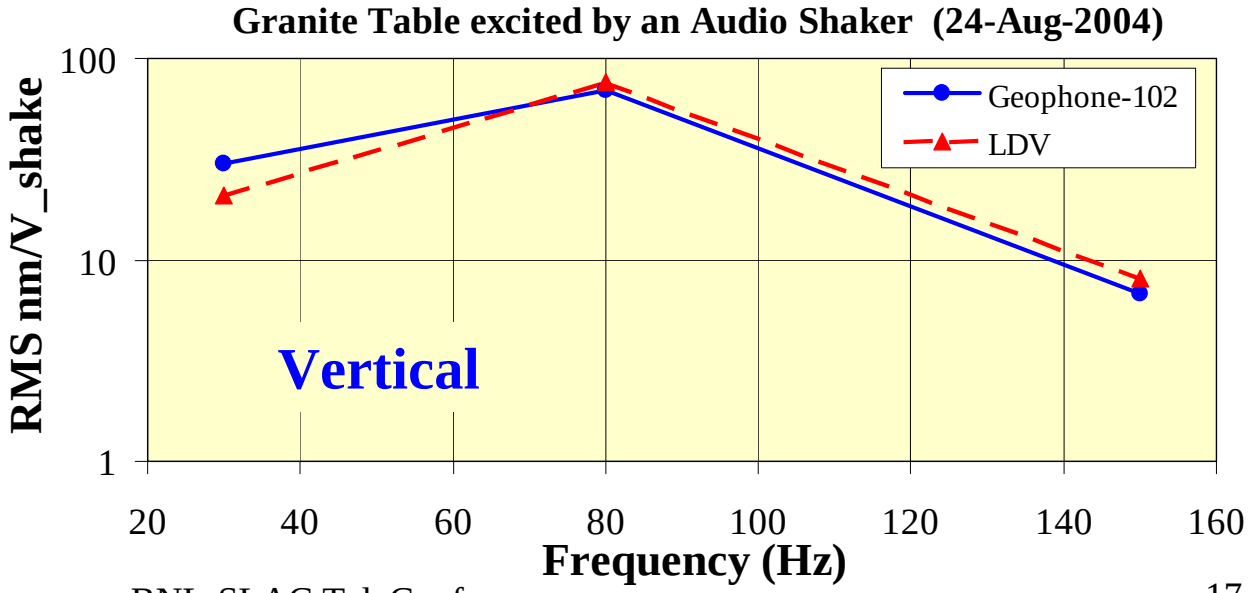


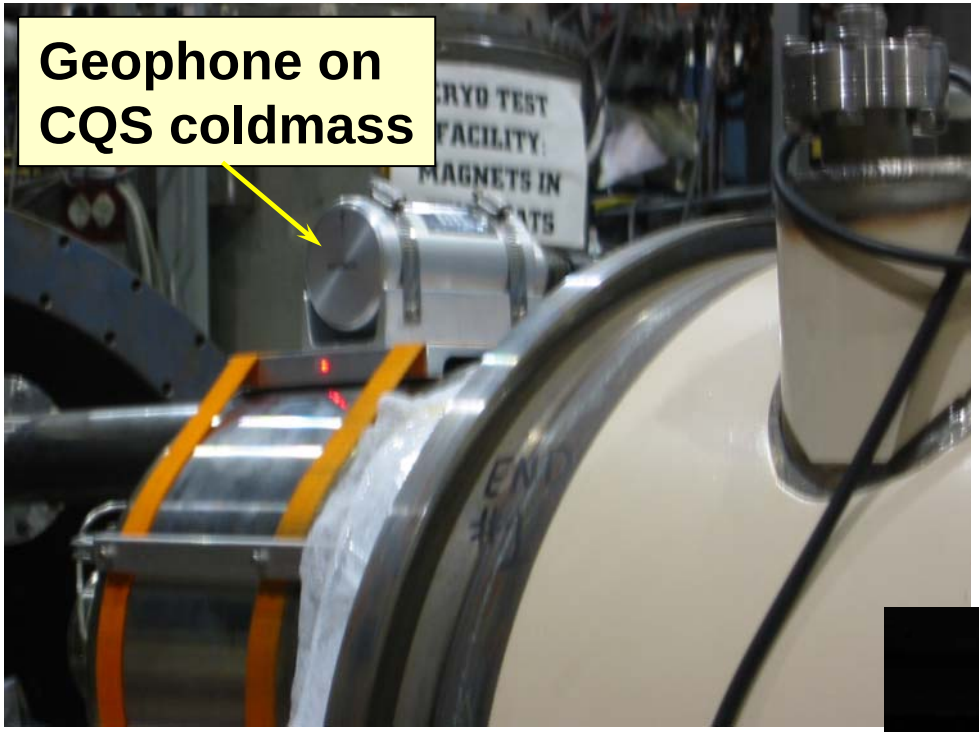
LDV on Tripod (Geophone_104 on Laser Head)

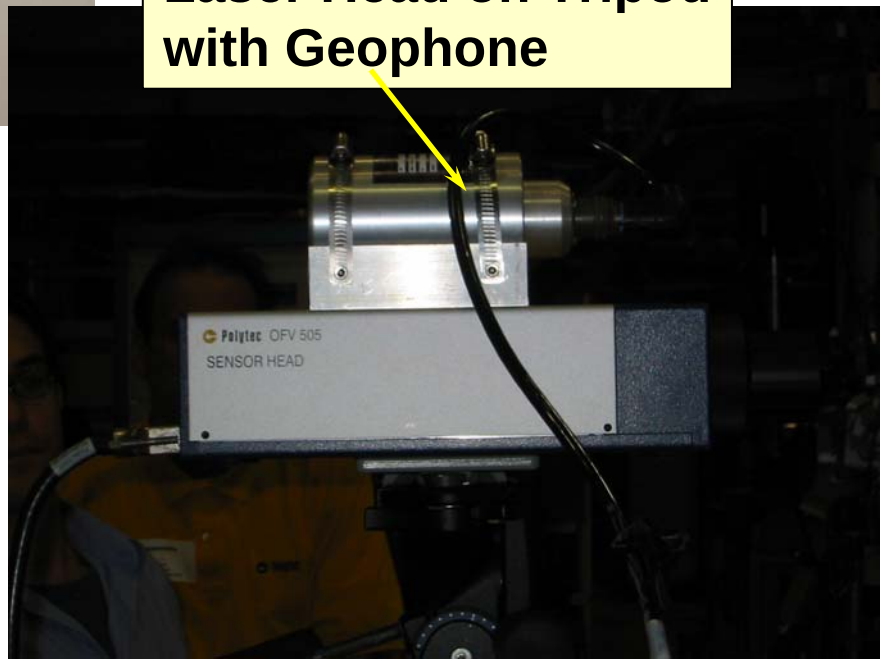


LDV and Geophone vs Frequency

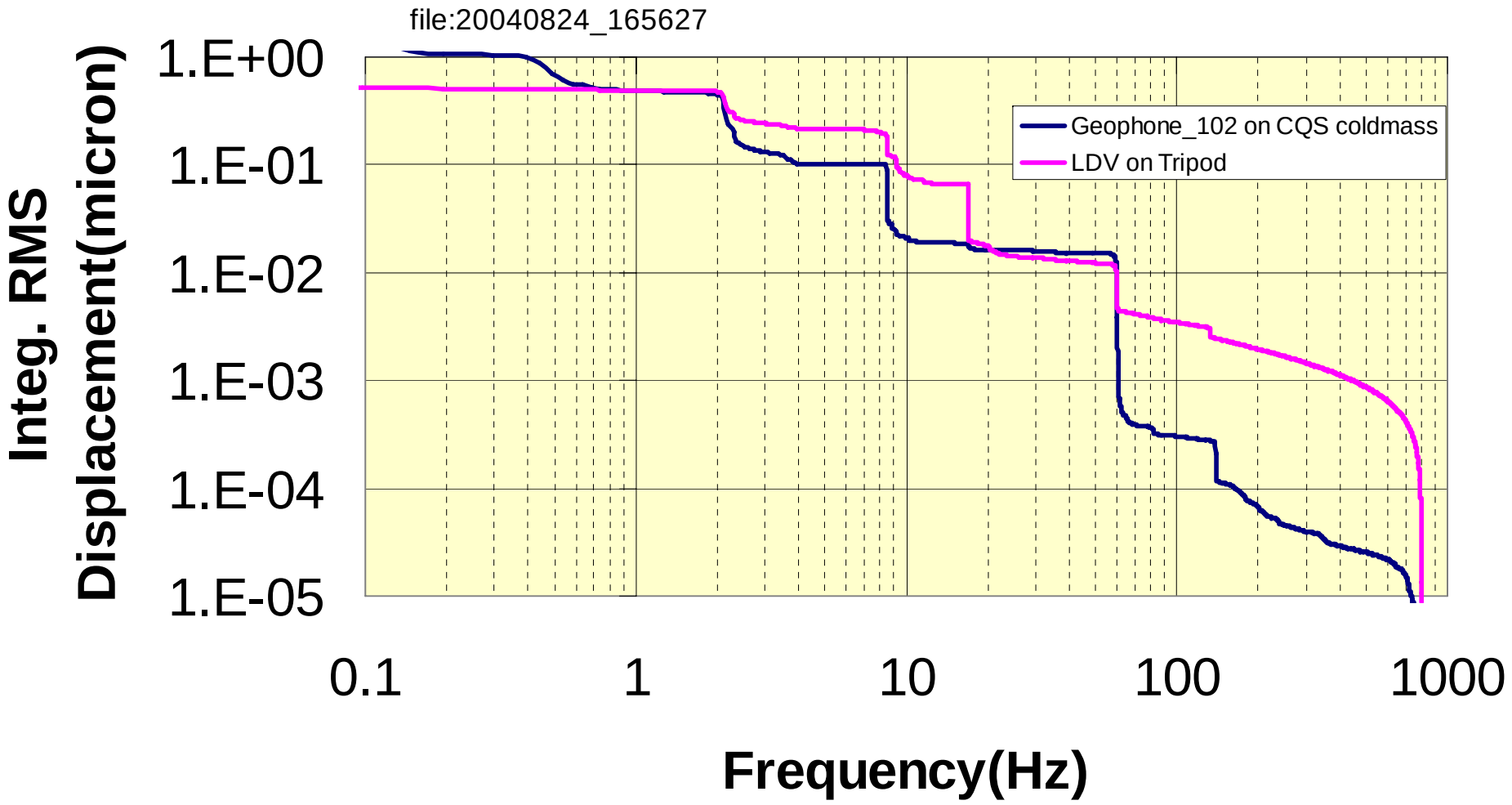




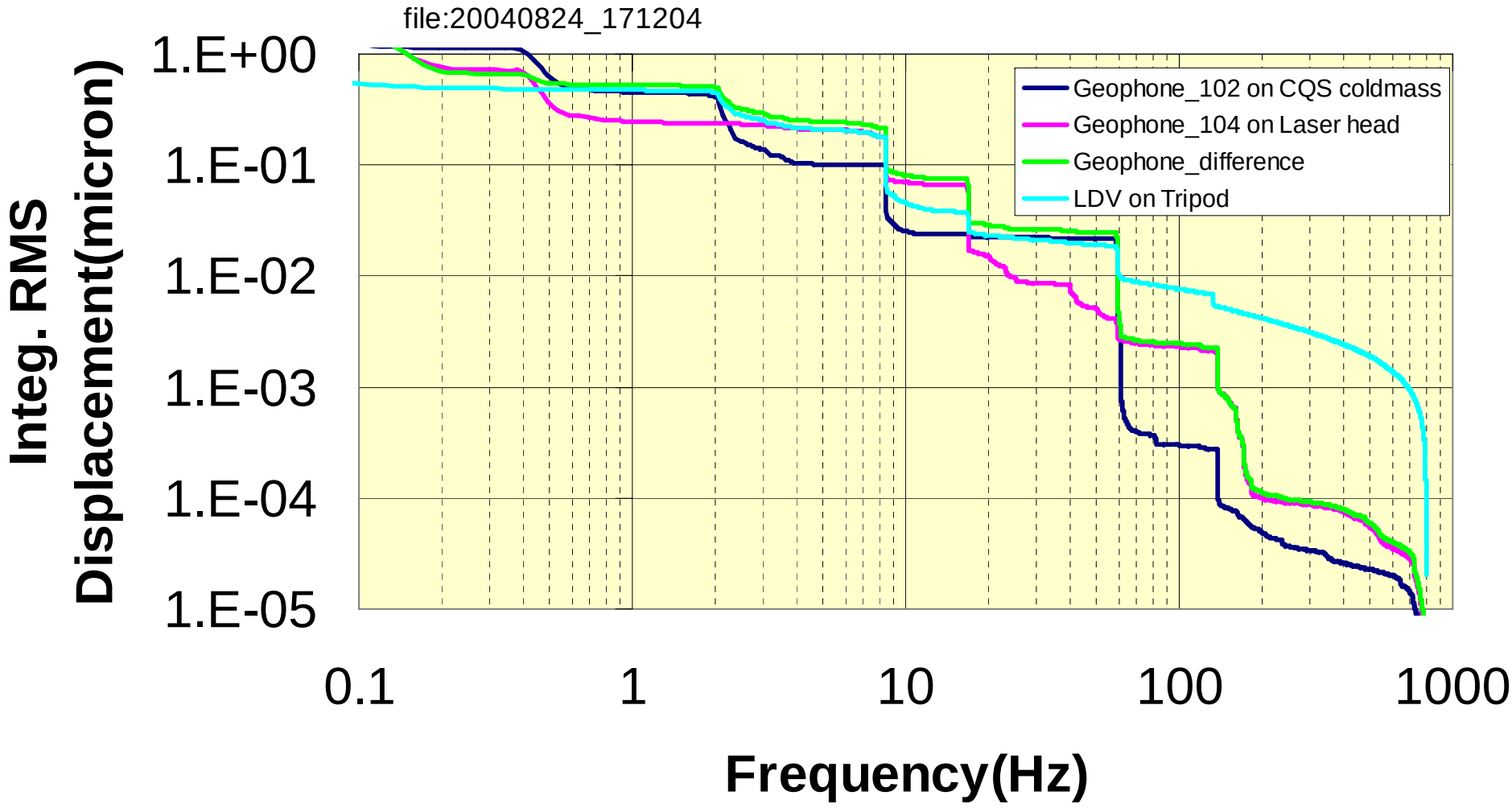

Geophone on
CQS coldmass


Laser Head on Tripod
with Geophone
Polytec OFV 505
SENSOR HEAD

LDV on Tripod (no Geophone on Laser Head)



LDV on Tripod (Geophone_104 on Laser Head)



Summary of LDV Demo Run

Recent LDV Demo Run Shows…

- Laser head motion is of concern.
- Using a geophone to compensate for the laser head motion can get slightly better results.
- From ~1 to 200 Hz, LDV results are consistent with the geophone, but LDV has higher noise floor in the high frequency range.

Next step…

- Proceed with the plan to use LDV.
- When Polytec, Inc. gets OFV-5000 Controller, VD-06 Velocity and DD-500 Displacement decoders, perhaps we need a final test (may be at Polytec, Inc.)

Future Plans

- Build more amplifiers so that all the 4 geophones may be used simultaneously.
- Install view ports in the cold test bench fixtures to do laser measurements cold.
- Provide suitable stable mount for the laser in the CQS cold test area.

  Five anti-reflection coated view ports have been purchased and delivered to BNL in August.