

# Vibration measurement of FFTB movers

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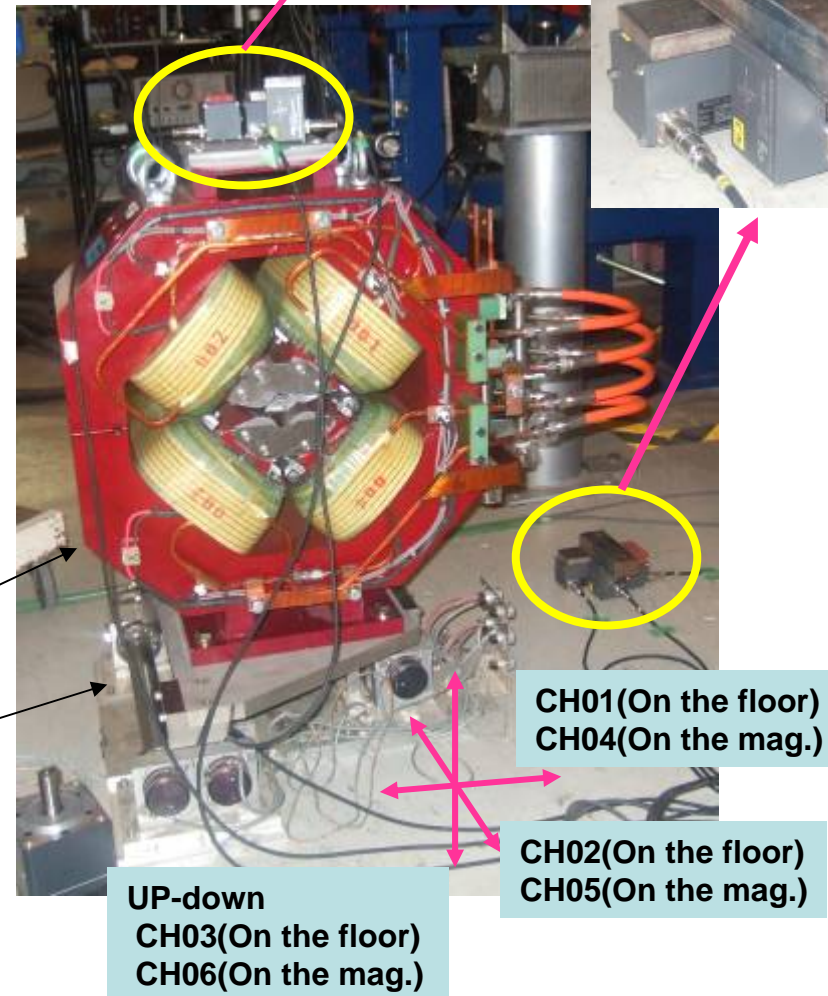
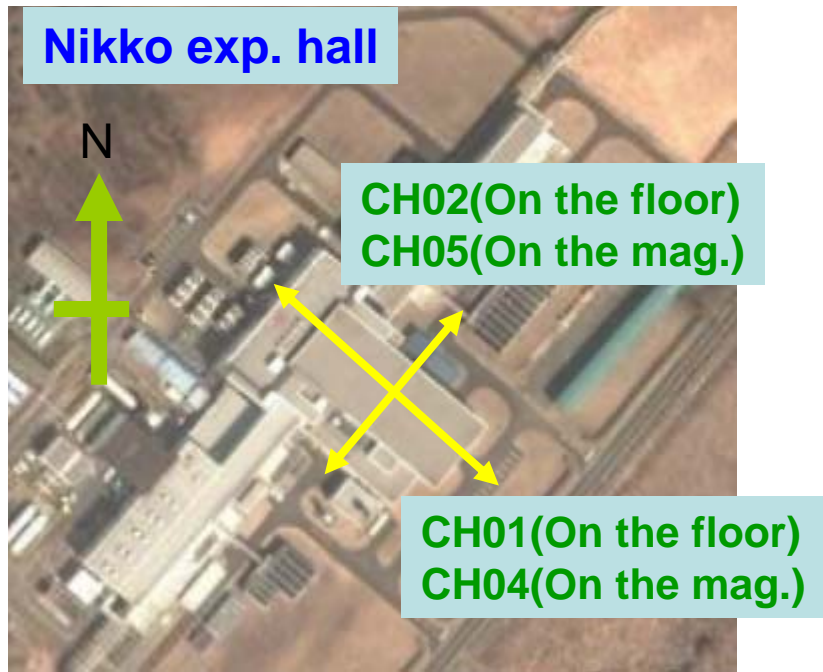
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# Introduction



**Servo Accelerometer  
MG-102**

**Tokkyokiki Corp.**

**Size** 40 × 40 × 50mm

**Max. input** ±2G

**Resolution** 1 / 10<sup>6</sup>G



Acc. 0.1 ~ 400Hz

Acc. 60dB = 1gal/V

**Measurements**

**Freq range=100Hz; T=5min**

**1. The QEA magnet is mounted on the mover**

**(1.1) Sensor #1-3=on the floor**

**Sensor #4-6=on the magnet**

**(1.2) Excitation by stepping motor**

**Sensor #1-3=on the floor**

**Sensor #4-6=on the magnet**

**(1.3) Sensor #1-3=on the floor**

**Sensor #4-6=on the mover**

**(1.4) Excitation by stepping motor**

**Sensor #1-3=on the floor**

**Sensor #4-6=on the mover**

**2. Un-mounting the magnet from mover.**

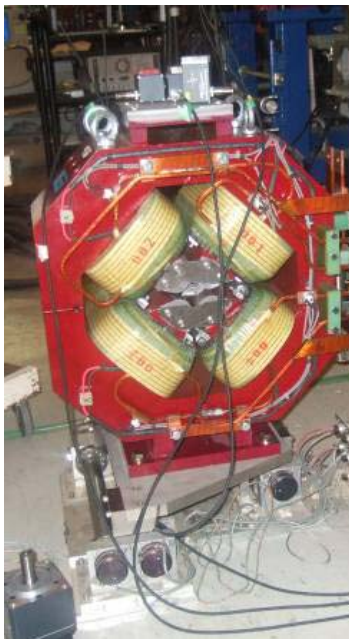
**(2.1) Sensor #1-3=on the floor**

**Sensor #4-6=on the magnet**

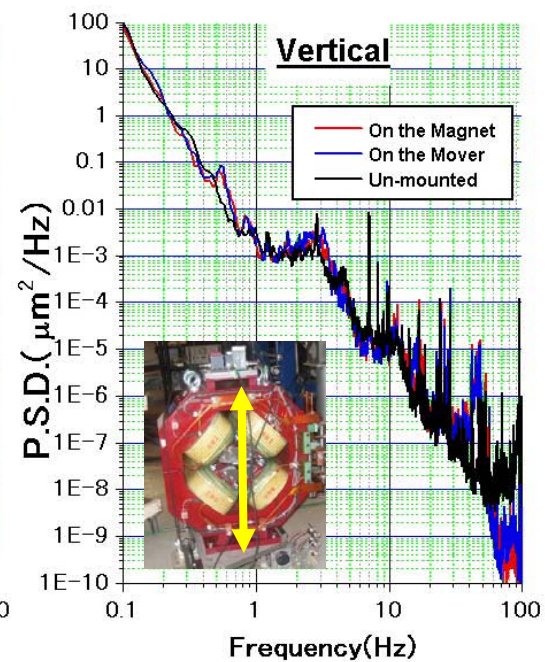
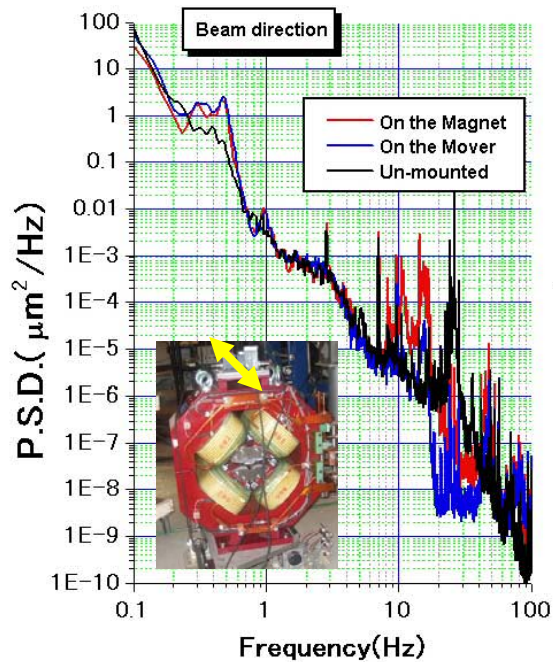
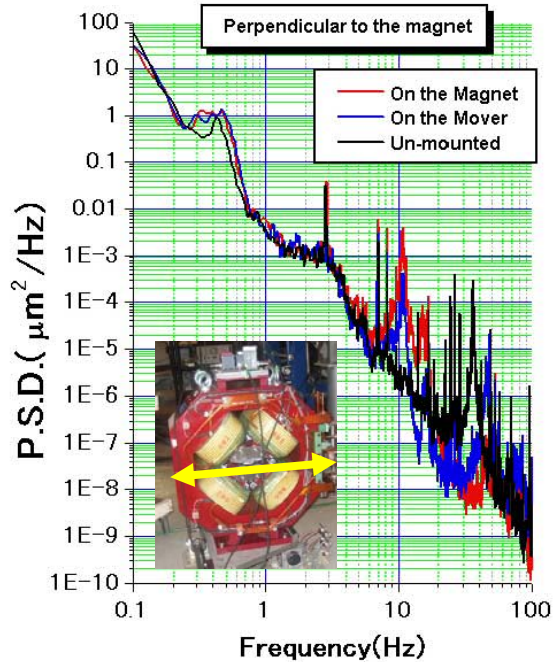
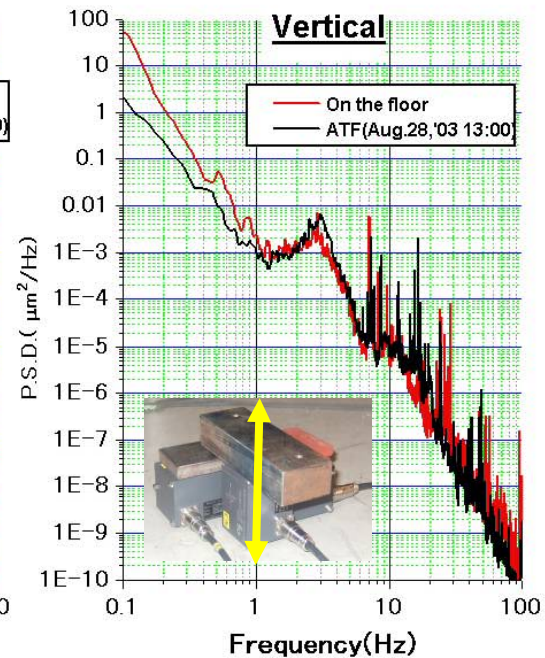
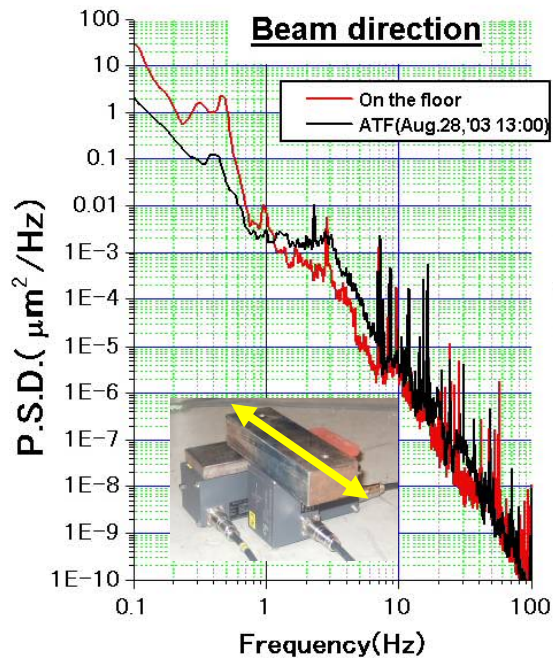
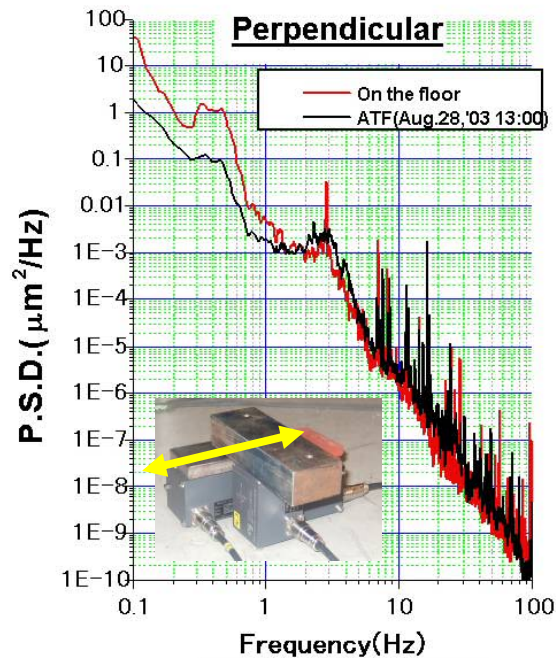
**(2.2) Excitation by stepping motor**

**Sensor #1-3=on the floor**

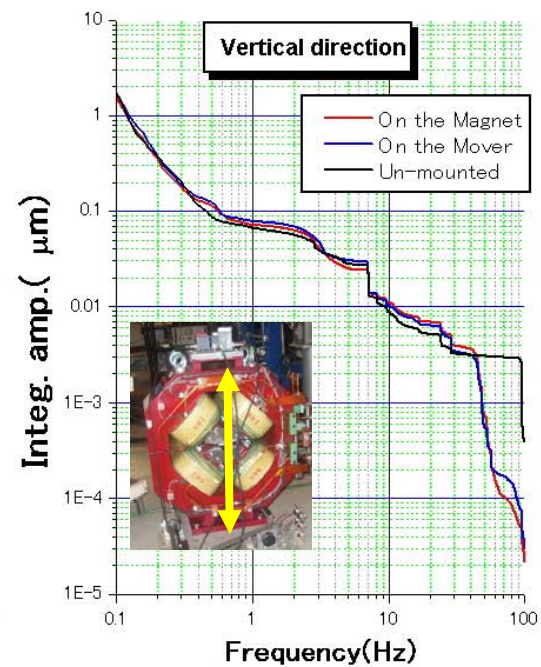
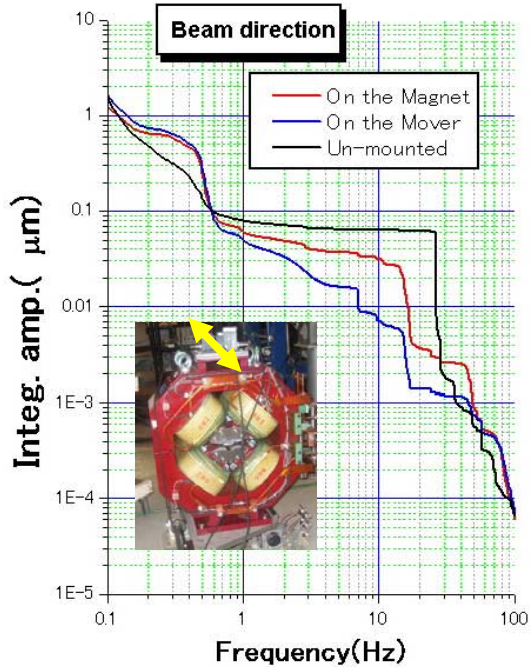
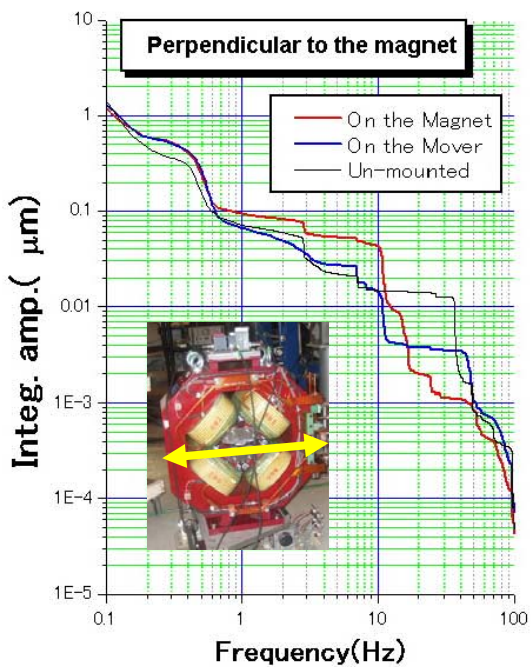
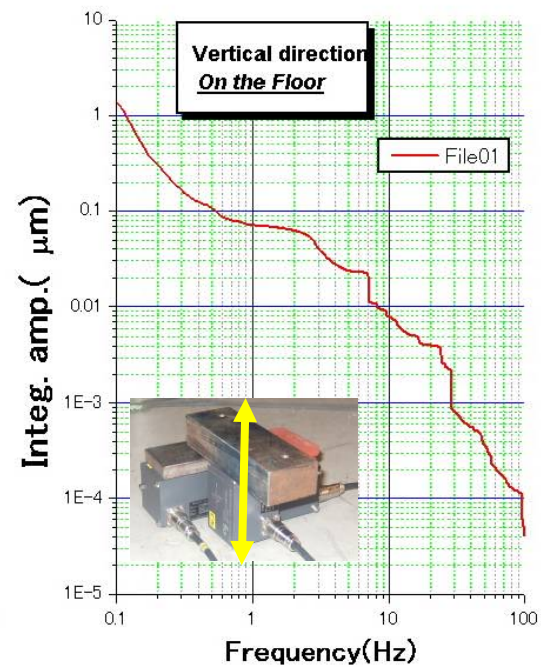
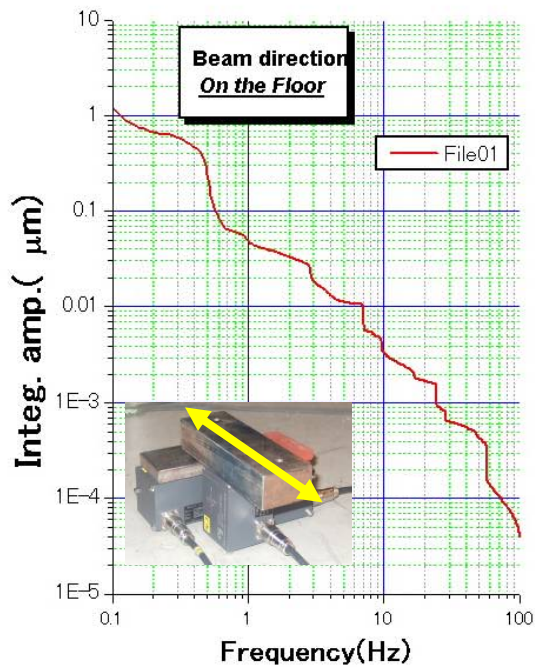
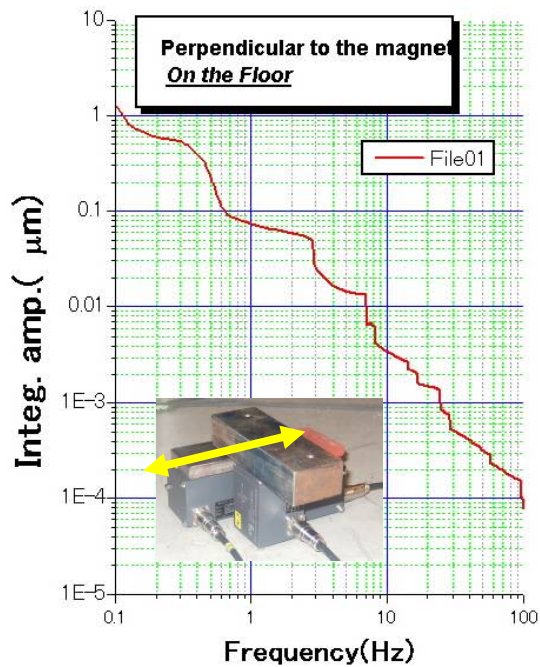
**Sensor #4-6=on the magnet**



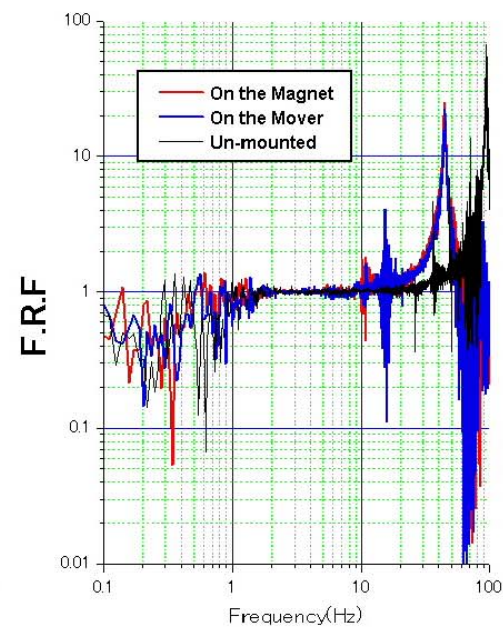
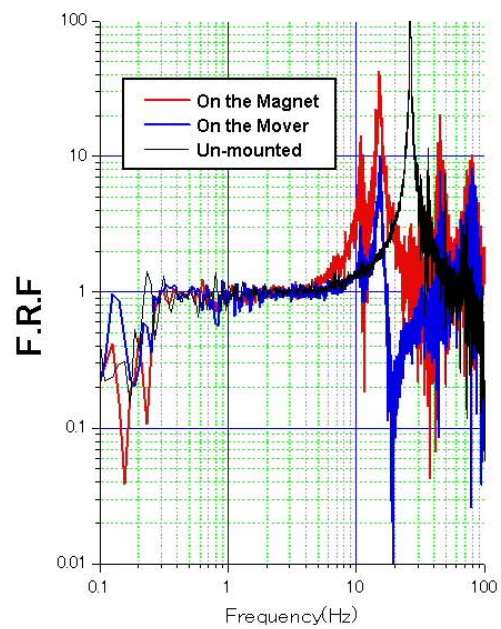
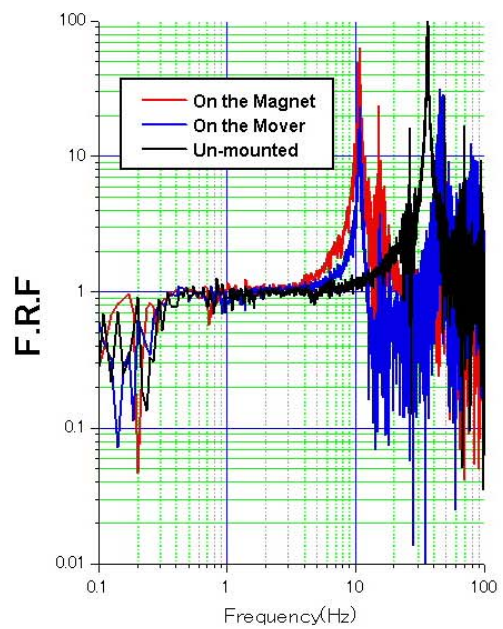
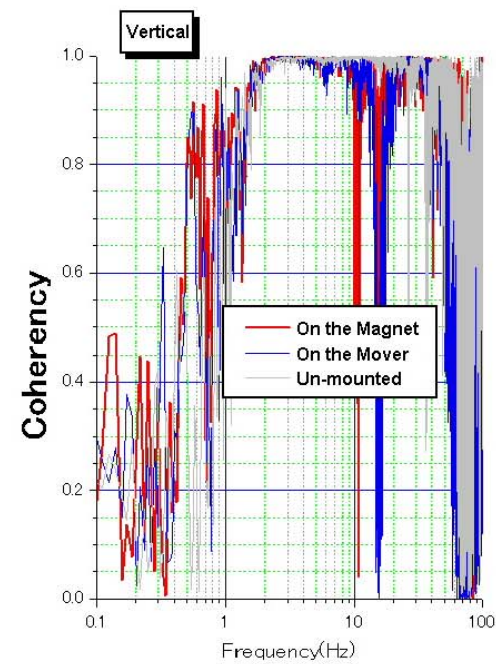
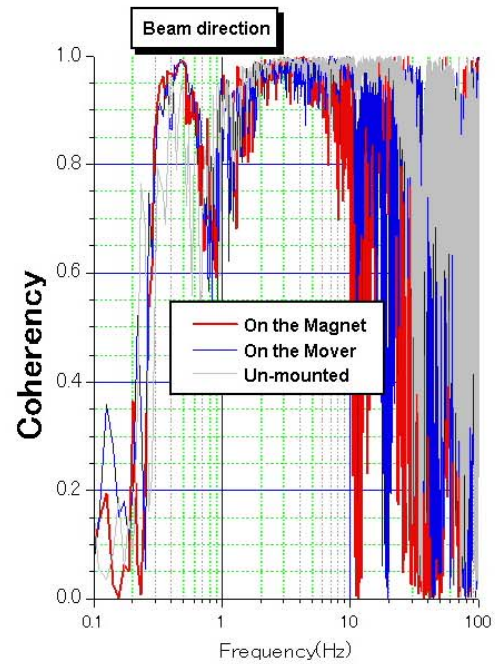
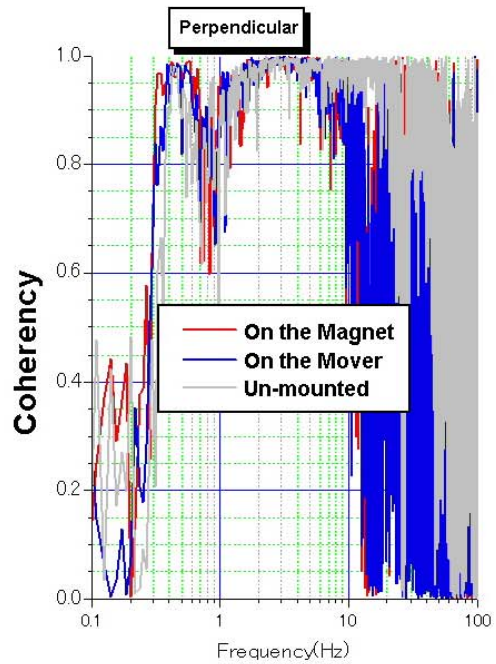












## Comparison with the SLAC data

LCC-0036

### QUADRUPOLE VIBRATION MEASUREMENTS FOR QM1B AND QC3 IN THE FINAL FOCUS TEST BEAM at SLAC

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*Stanford Linear Accelerator Center, Stanford University, Stanford, CA 94309 USA*

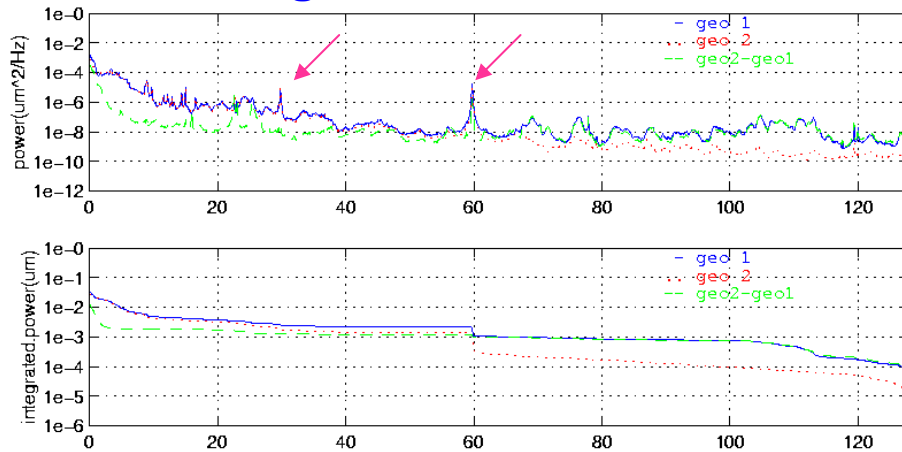


#### ABSTRACT

We have taken vibration measurements of quadrupoles QM1B and QC3 in the Final Focus Test Beam (FFTB) tunnel at SLAC. We present results for power spectra and integrated power spectra of the vibrations in the frequency range 1 –128Hz. For QM1B, we find 2nm rms vertical motion with respect to the FFTB tunnel floor for  $f > 3\text{Hz}$ . The relevance of this data to NLC performance is discussed. In particular, we estimate a 4% luminosity loss if an IR quadrupole were to have similar vibrations as QM1B.

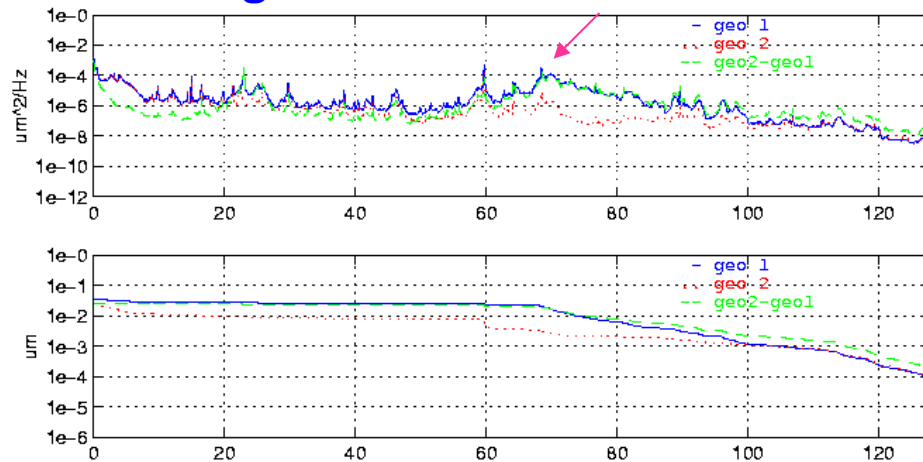
## Vertical direction

### QM1B magnet on the anocast steel blocks



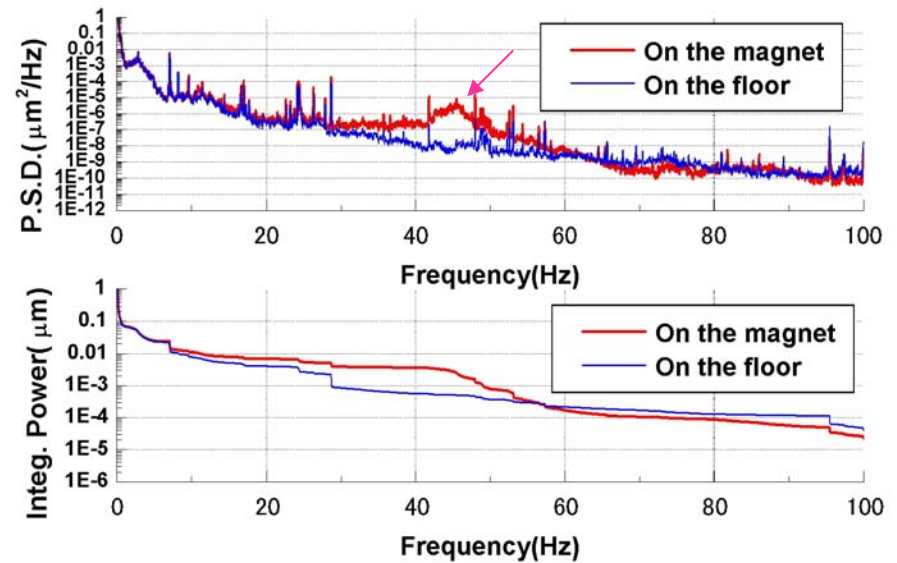
Noise peaks: 60Hz, 30Hz.  
 At 3Hz, IPS for QM1B is 18nm.  
 The difference, QM1B-floor, is 2.0nm.

### QC3 magnet on the sandstone



Noise peak: 70Hz.  
 At 3Hz, IPS for QM1B is 25nm.

### QEA magnet on the SLAC movers

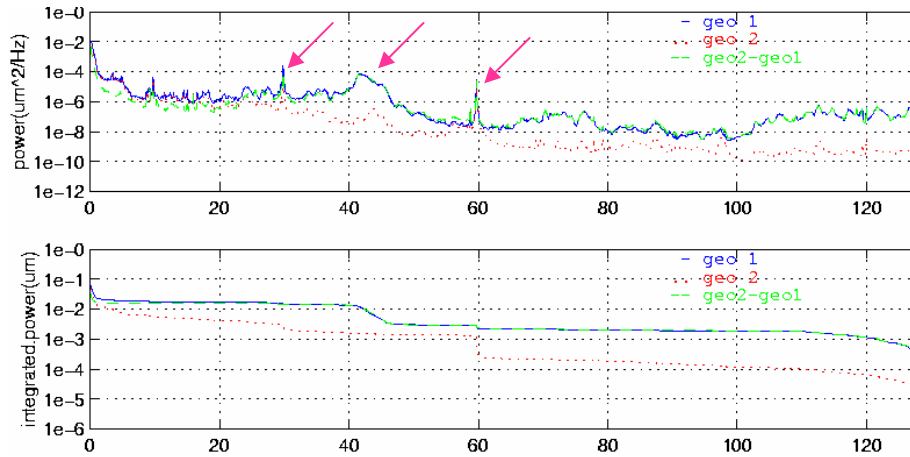


Noise peaks at 45 Hz is observed.  
 At 3Hz, the IPS for QEA is 43nm  
 The difference at 3Hz, QEA-floor, is 10nm.



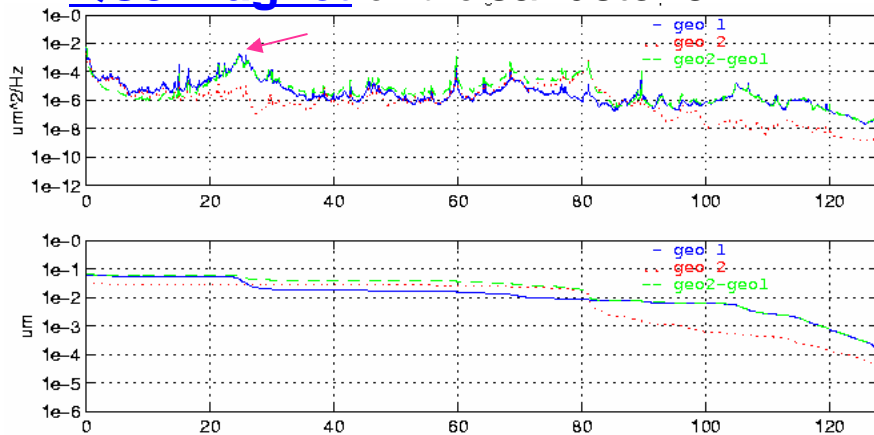
## Horizontal direction

### QM1B magnet on the anocast steel blocks



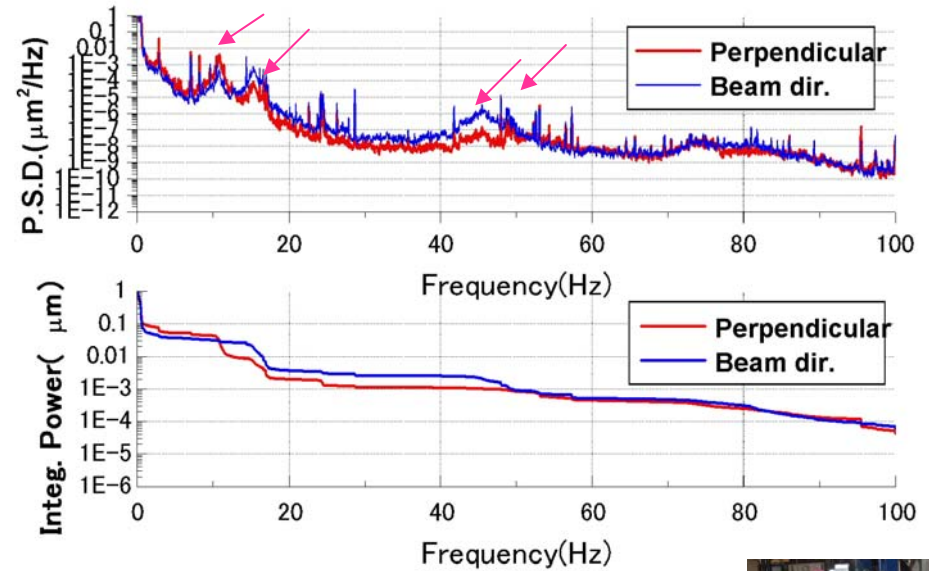
Noise peaks: 60Hz, 30Hz.  
 Broad resonance near 45 Hz.  
 At 3 Hz, the difference is 16nm.

### QC3 magnet on the sandstone



Noise peak: 25Hz.  
 At 3 Hz, the difference is 64nm.

## QEA magnet on the SLAC movers



### Perpendicular:

Noise peaks at 50 Hz and 10 Hz.  
 At 3 Hz, the difference is 33nm.



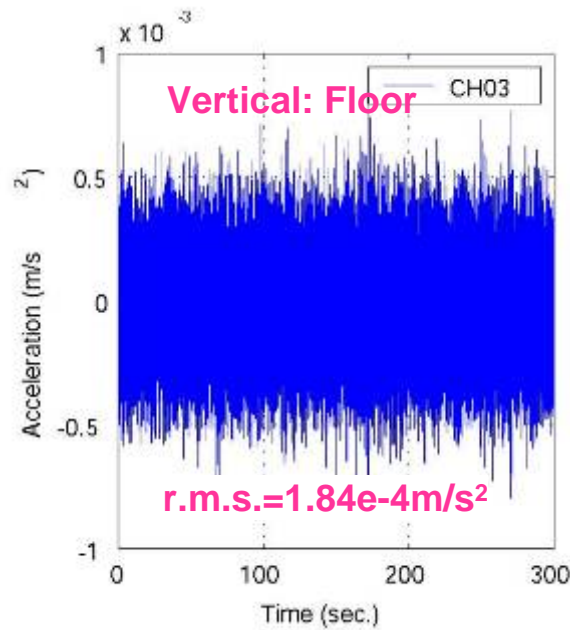
### Beam dir.:

Noise peaks at 80Hz, 45 Hz and 15 Hz.  
 At 3 Hz, 20nm in beam direction.

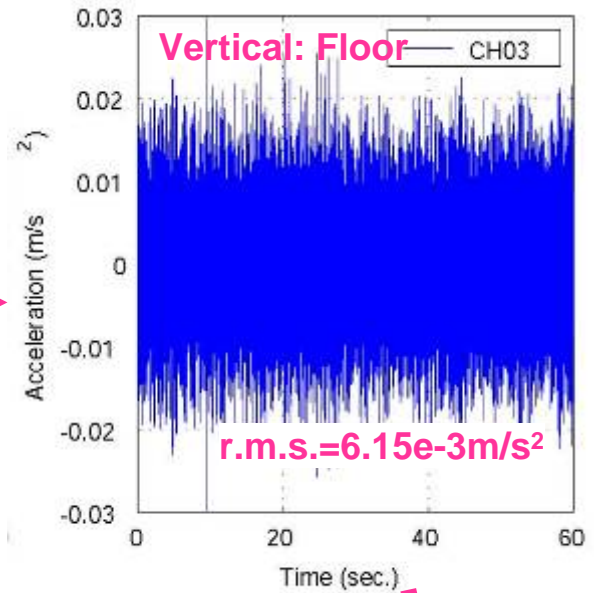




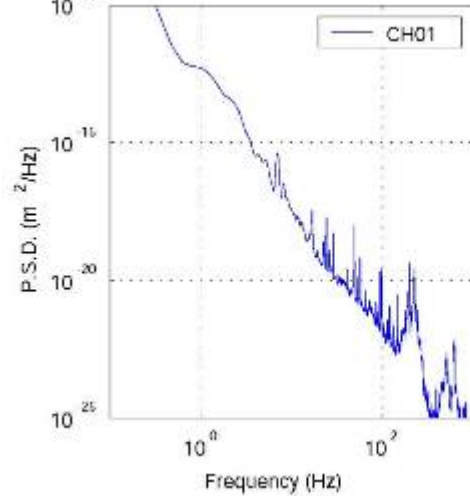
**Freq. range: 100Hz**



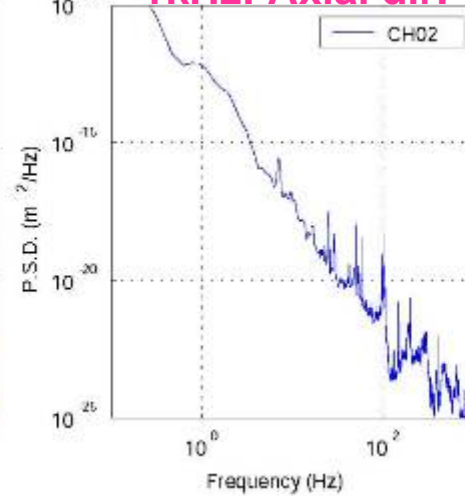
**Freq. range: 1kHz**



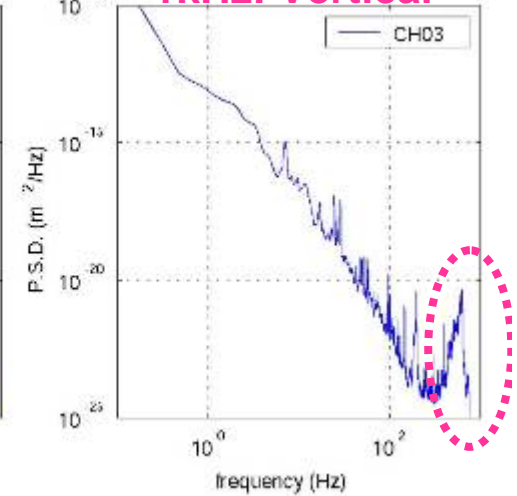
**1kHz: Perpendicular**



**1kHz: Axial dir.**



**1kHz: Vertical**





## Conclusion

- Vibration level in Nikko exp. Hall: Same level as ATF beam line.
- Resonant frequency (QEA magnet):
  - (On the Magnet, mover)
    - Around 10Hz, 50Hz peak in horizontal direction
    - Around 35Hz peak in vertical direction
  - (Un-mounting from the mover)
    - Around 35Hz in horizontal direction
    - Higher than 50Hz in vertical direction
- Integrated amplitude (QEA magnet, at 3Hz):
  - (On the Magnet)
    - Amplitude difference is 20nm in beam direction.
    - 33nm in perpendicular direction.
    - Amplitude difference is 10nm in vertical direction.
- Strong acceleration around 600Hz was observed (In vertical dir.).
  - But amplitude level is small.