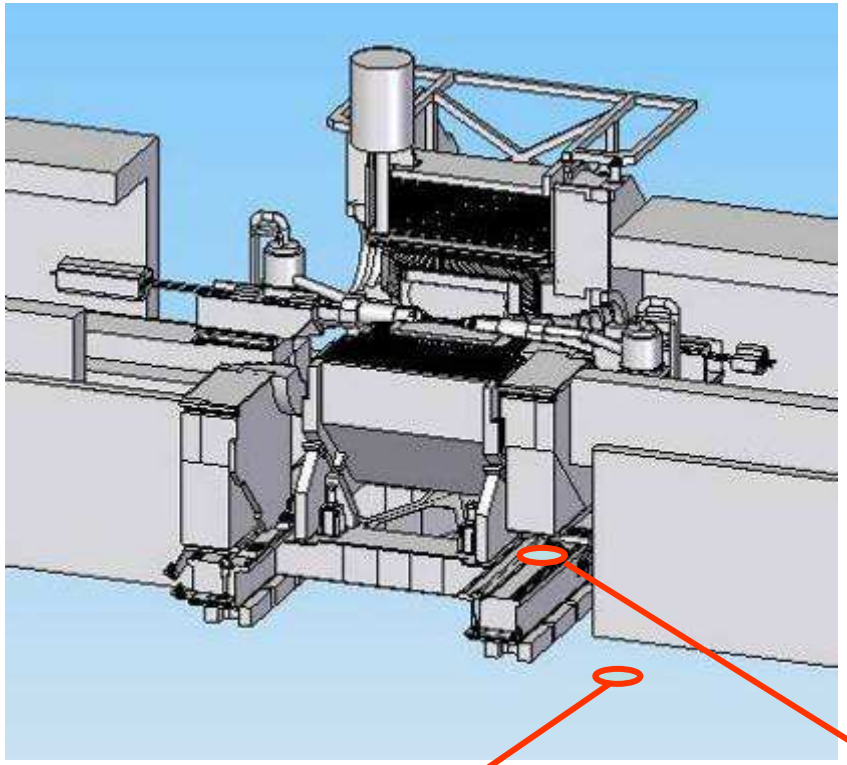
GM measurement at Tsukuba exp. hall in KEK (Preliminary!!)

July 2nd ,'09
KEK H. Yamaoka

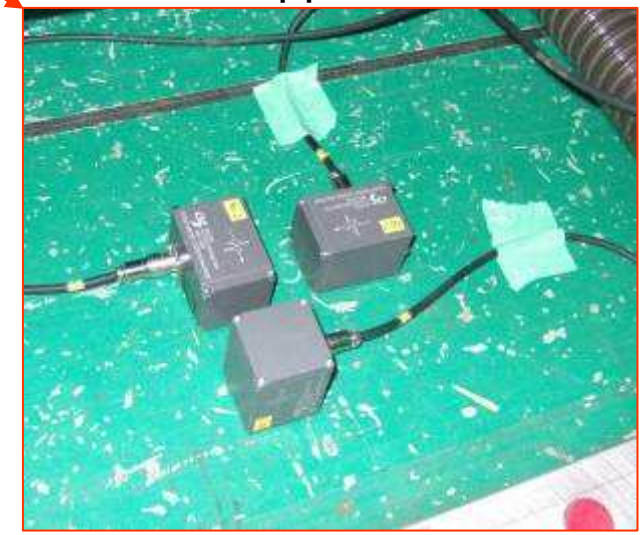


Servo Accelerometer MG−102 **Tokkyokiki Corp.**

Size	40×40×50mm
Max. input	±2G
Resolution	1／10^6G

Acc. 0.1～400Hz
Acc. 60dB = 1gal/V

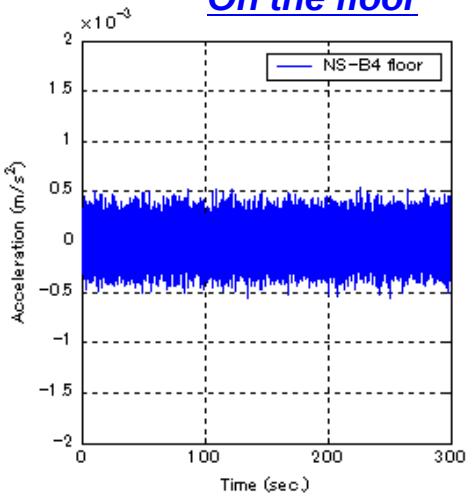
On the support stand

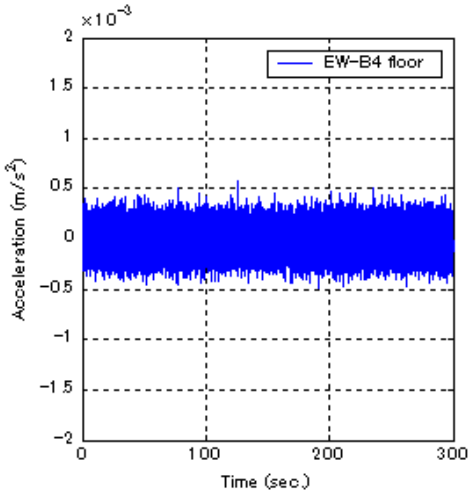


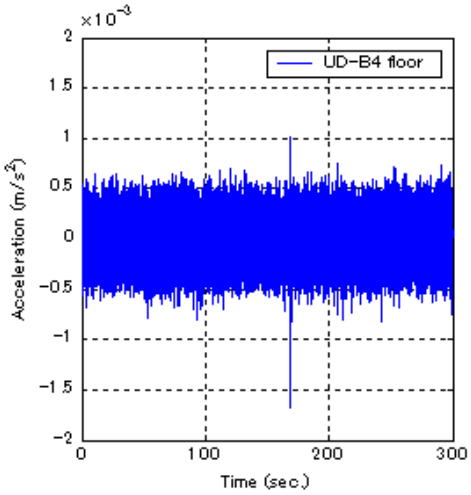
On the floor

Time history

On the floor







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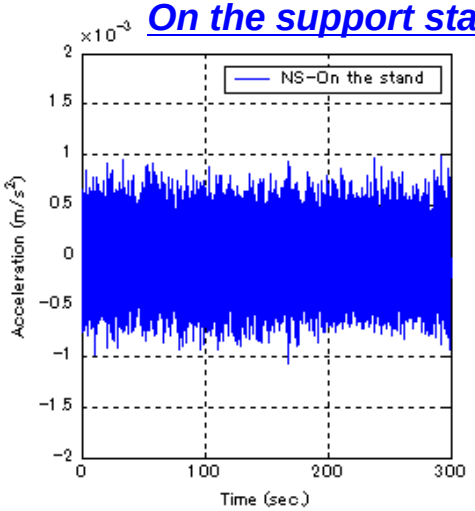
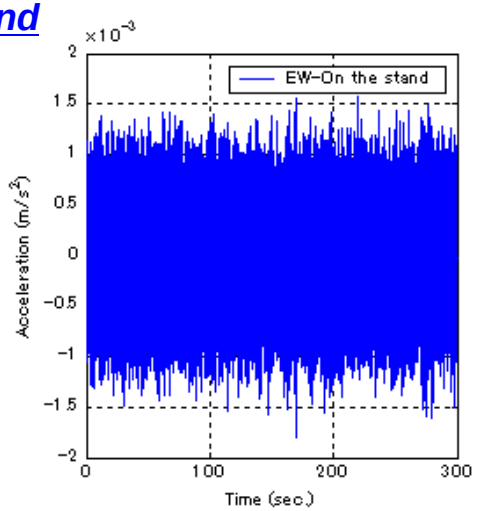
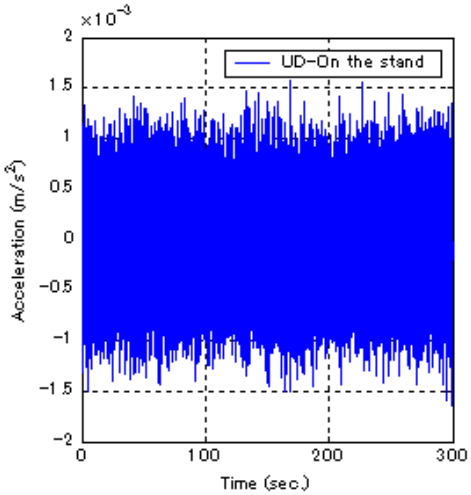
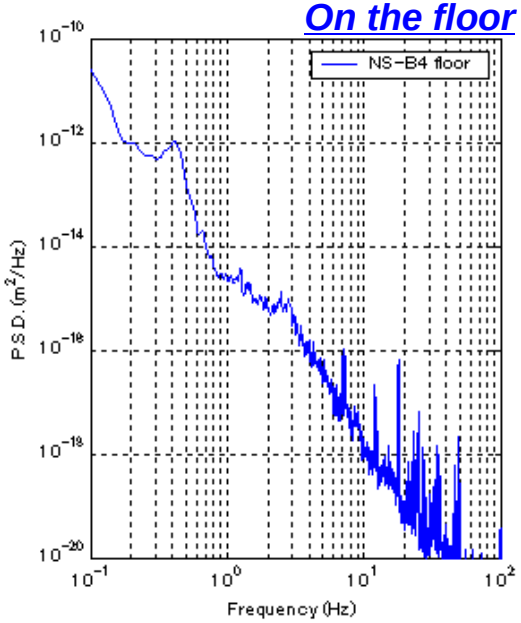


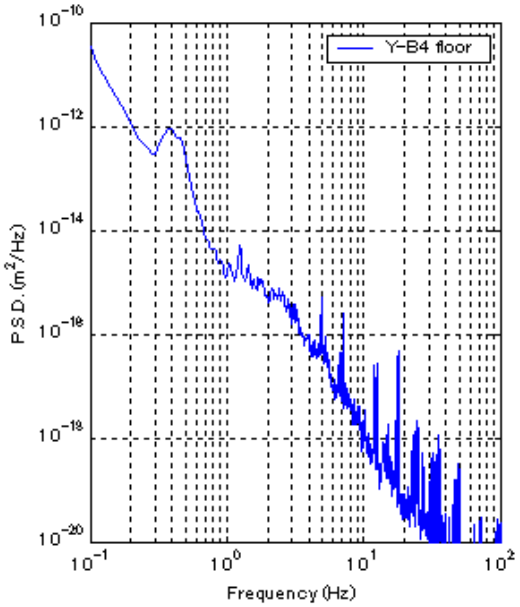


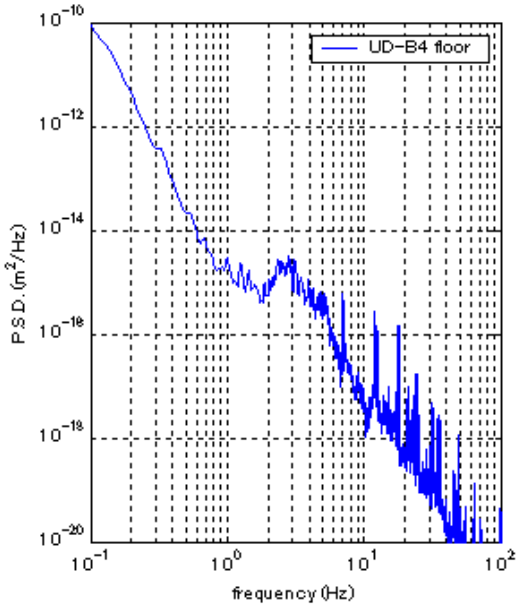


P.S.D.

On the floor







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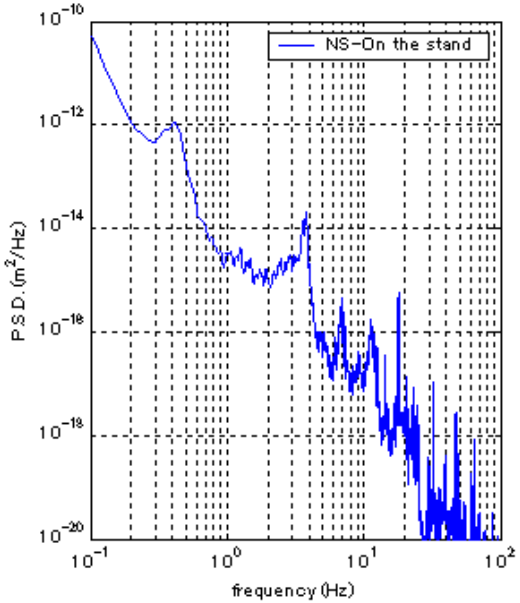
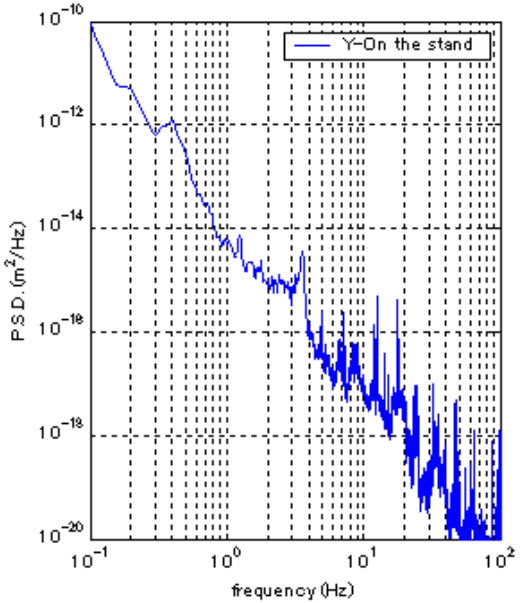
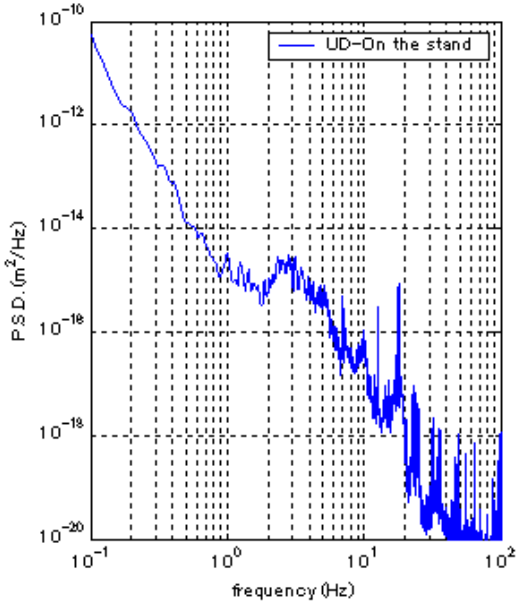
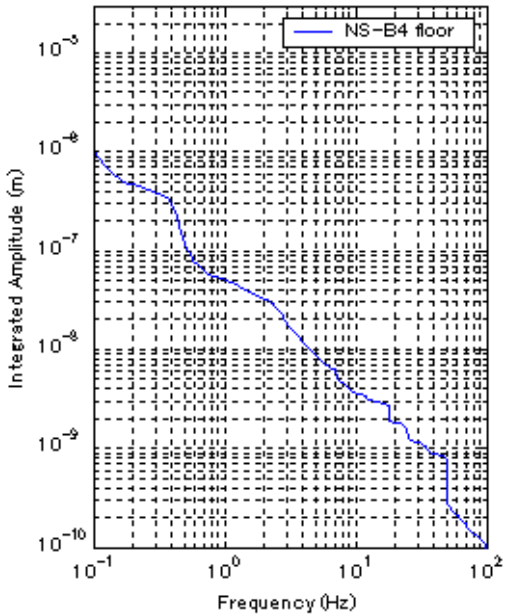


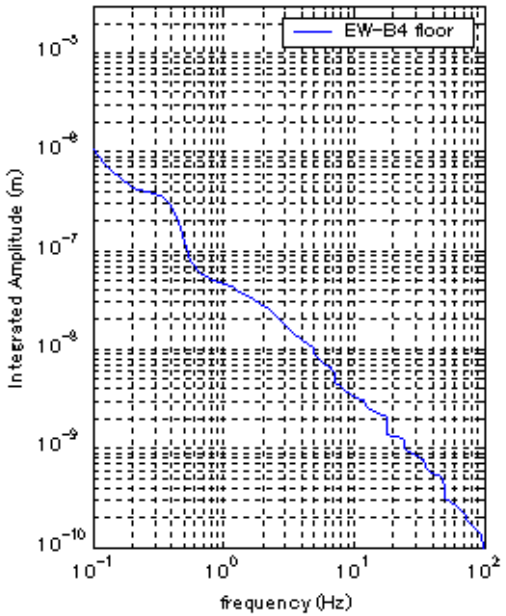


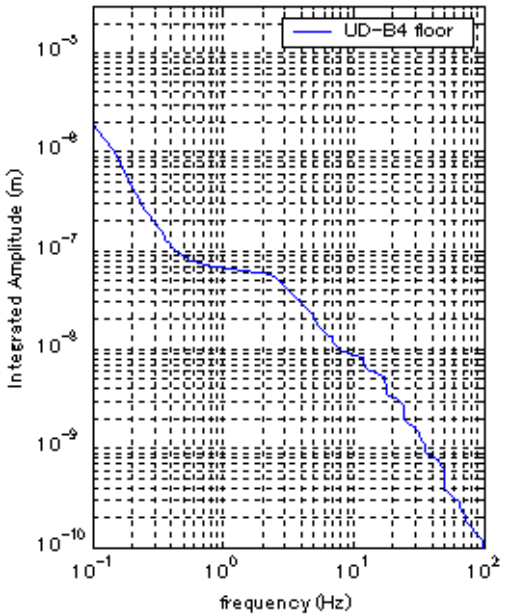


Integrated Amplitude

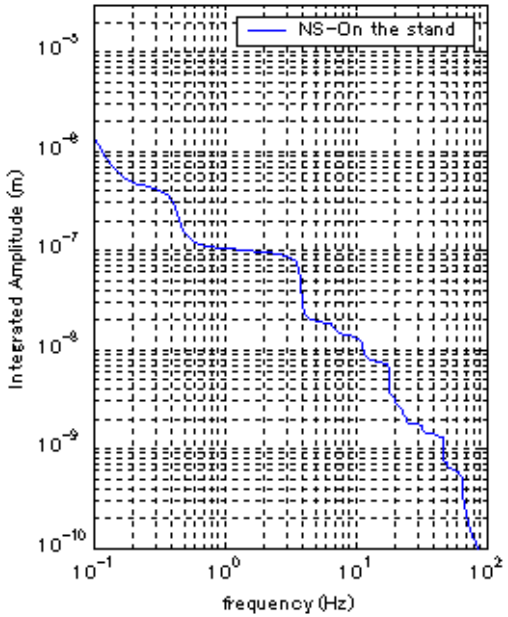
On the floor

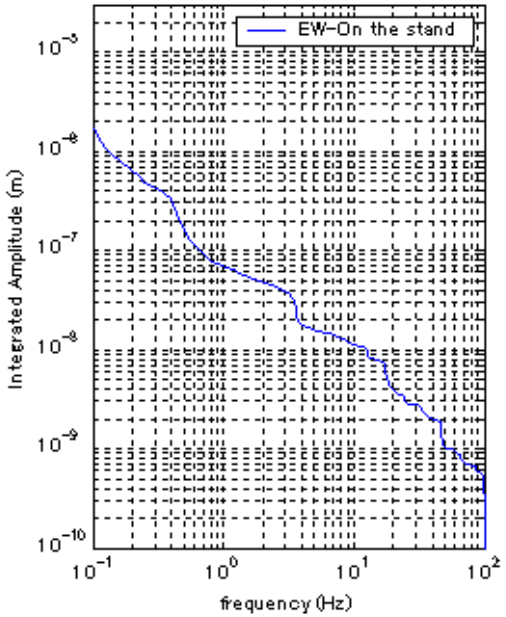


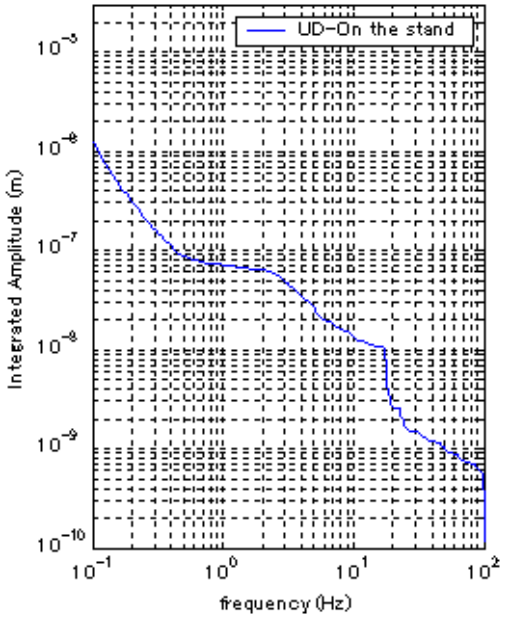




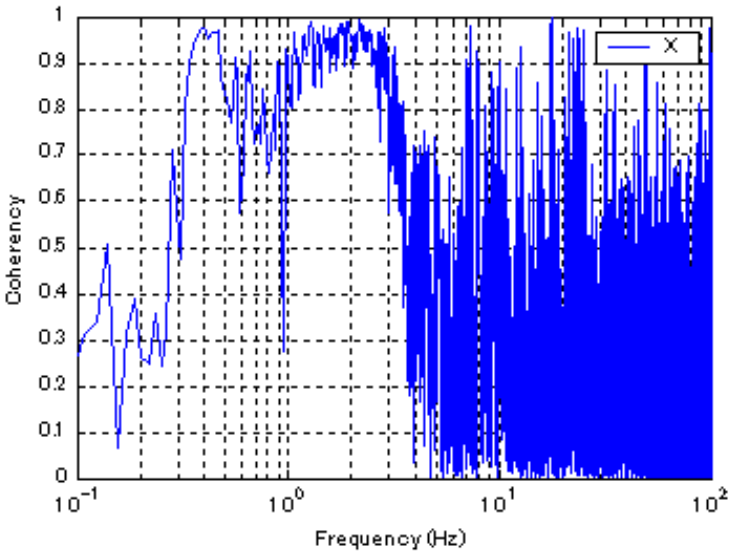
On the support stand

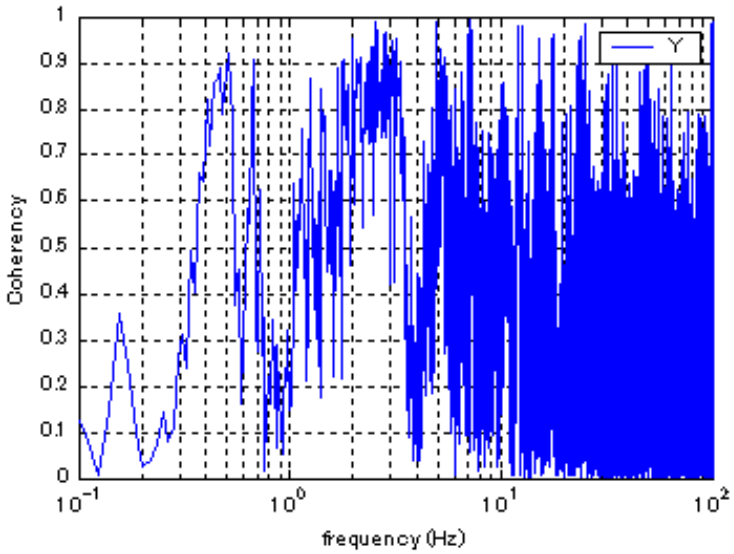


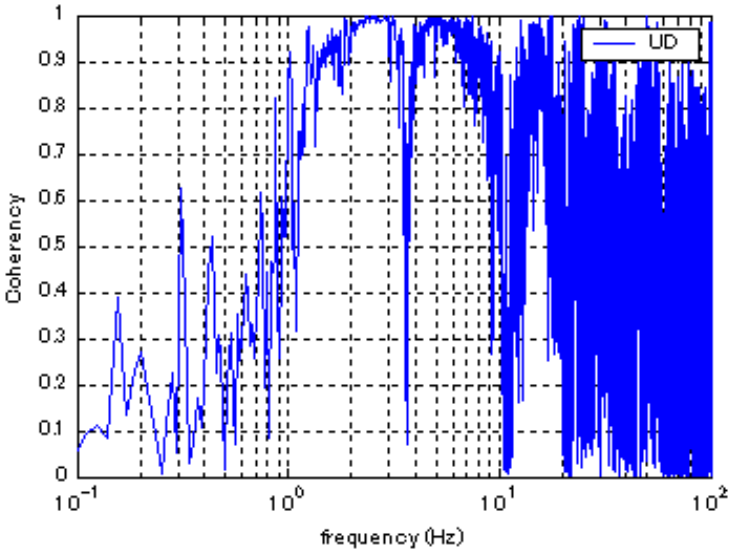




Coherency

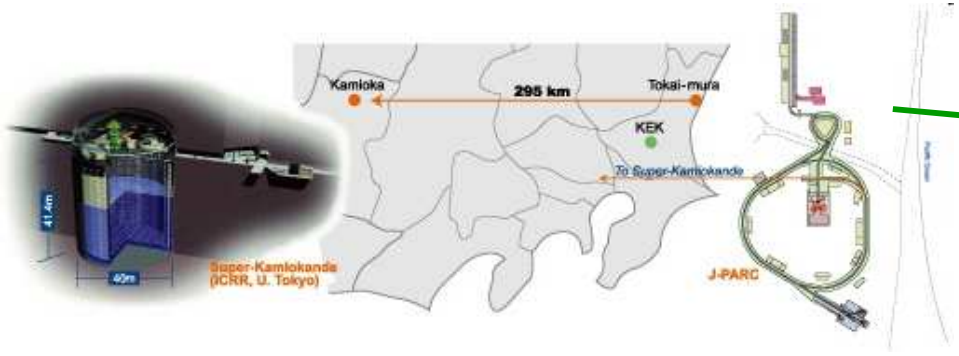

X
Coherency
Frequency (Hz)


Y
Coherency
frequency (Hz)

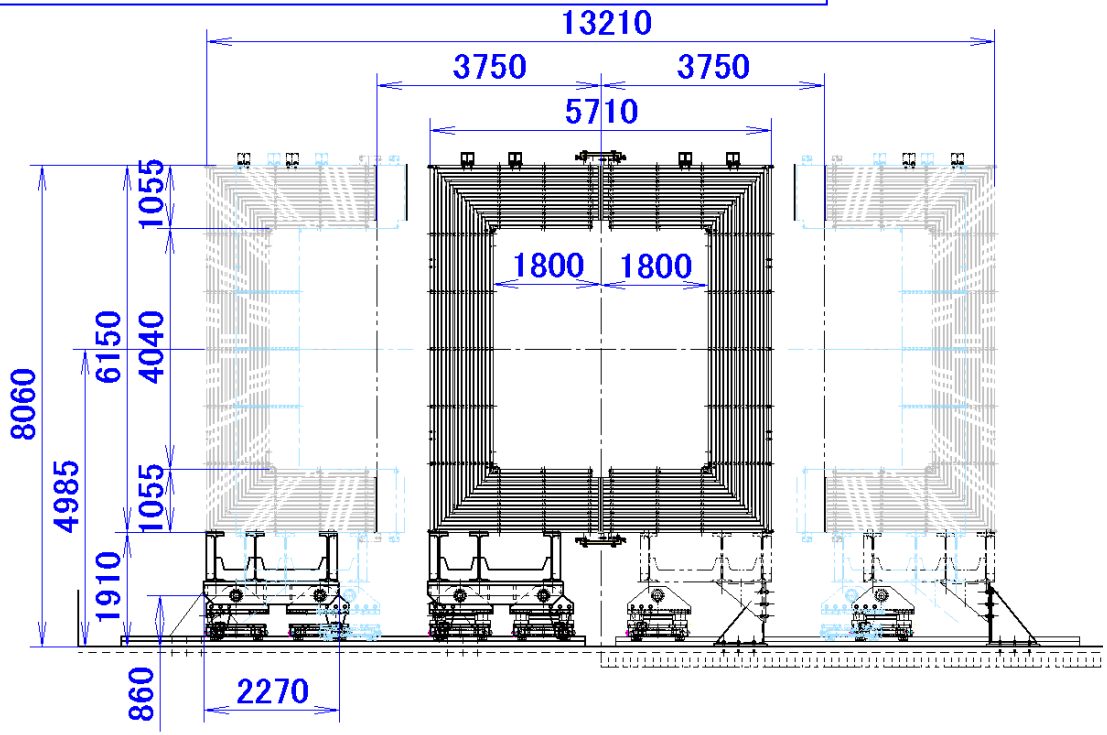

UD
Coherency
frequency (Hz)

Introduction

(Neutrino Facility @J-Parc)



ND280 detector (Total: 1100tonnes)



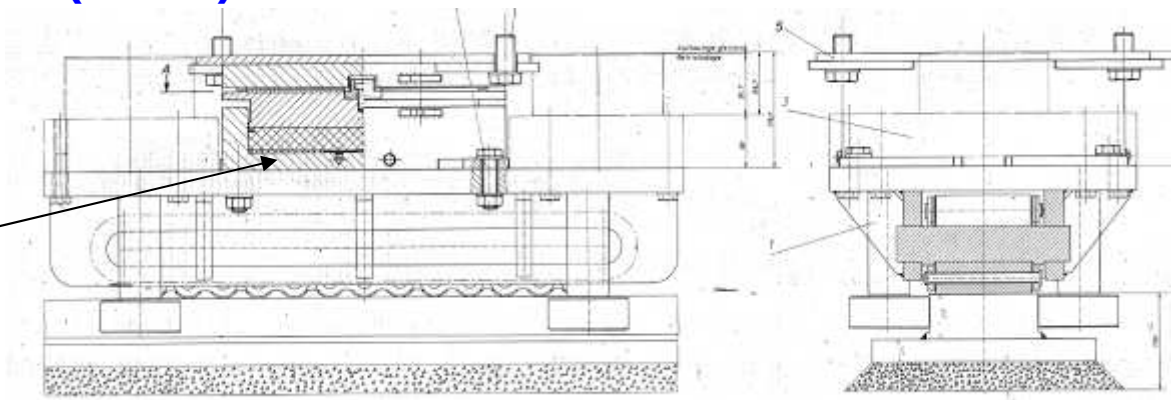
(Closed position)

(Open position)

Magnet Moving System

(Roller)

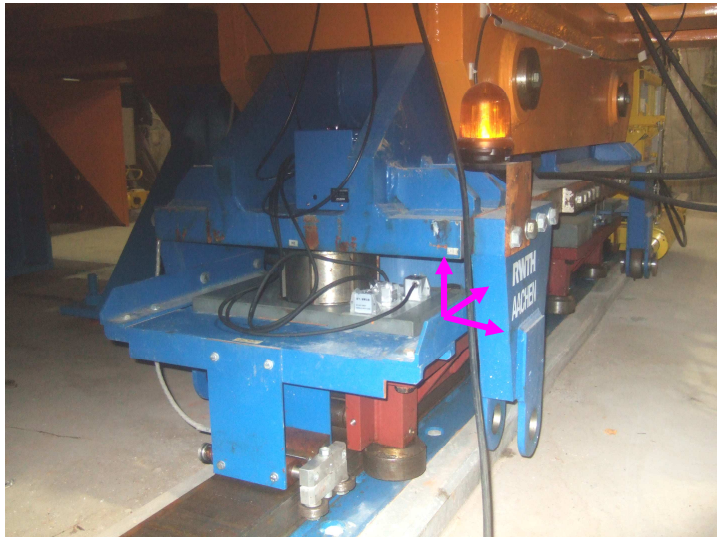
Oil Damper



Vibration Measurement

(South-side yoke, Jan. 15, 2009)

NP3560B
Piezo tri-axial acc. sensor
1mV=1m/s^2
2~5kHz
This sensor was stuck on the support stand.

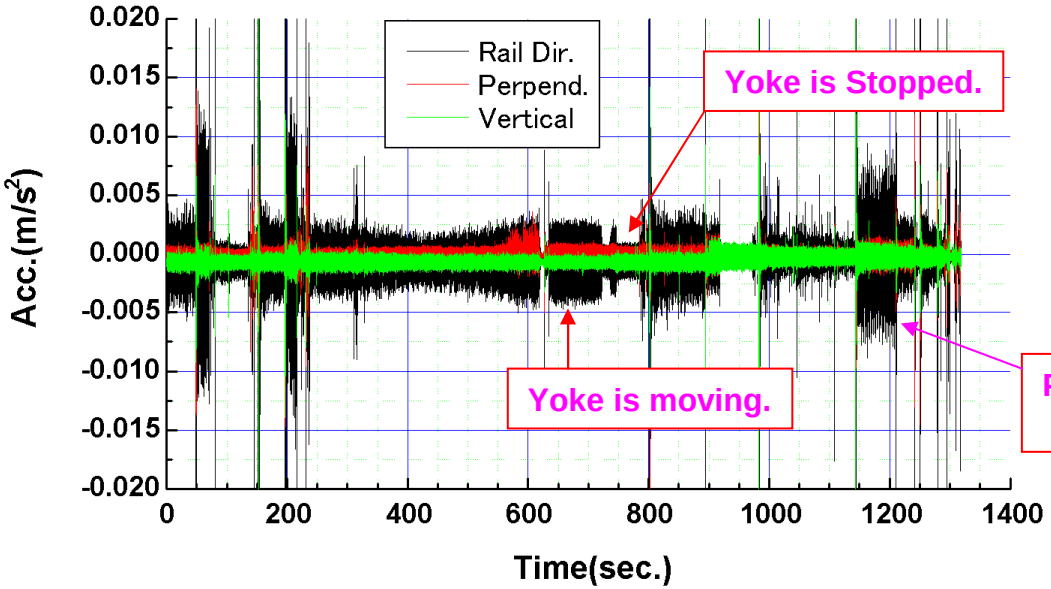


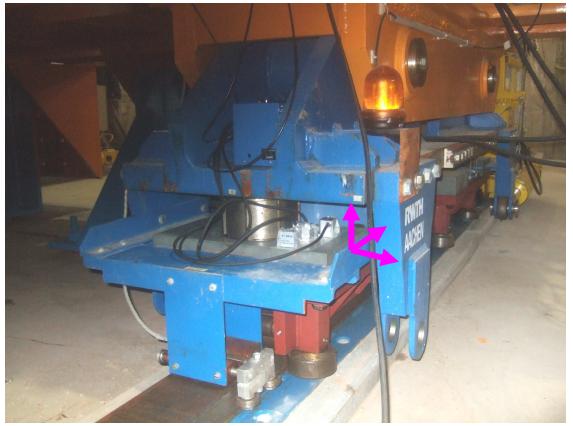
LION LS10C
Servo accelerometer
0.3V=1m/s^2
DC~40Hz
<10^{-5}m/s^2

(North-side yoke, Jan. 16, 2009)

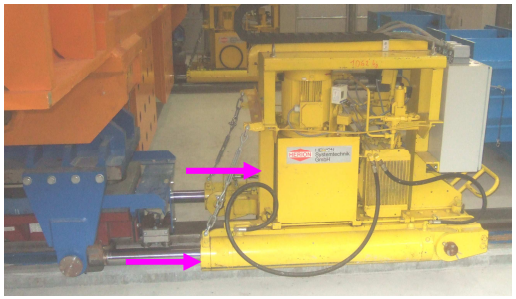
Measurement results

Time data- On the roller (@South yoke)

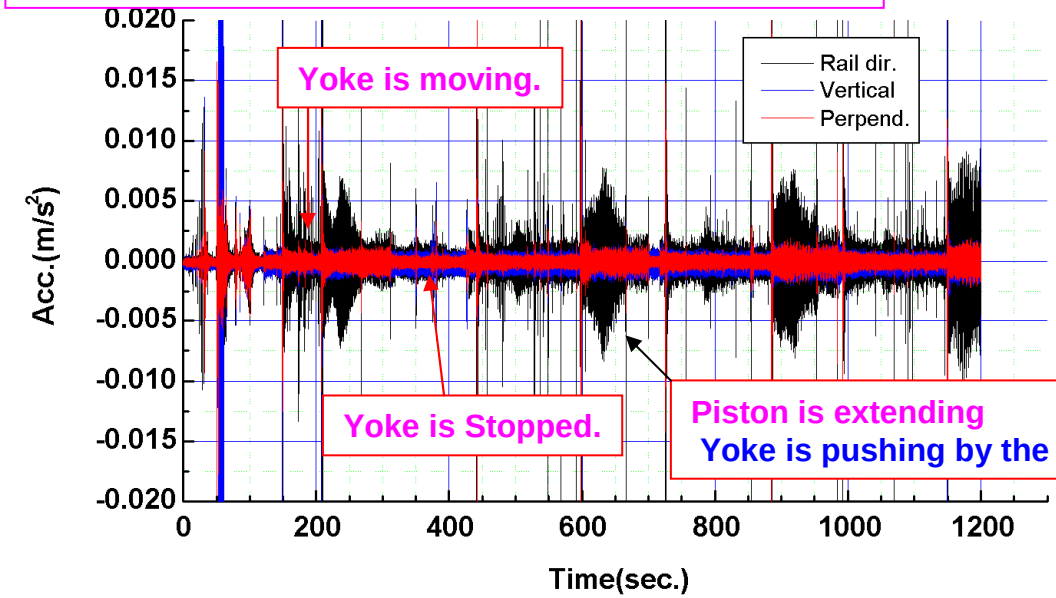




Piston is extending
Yoke is pushing by the mover.

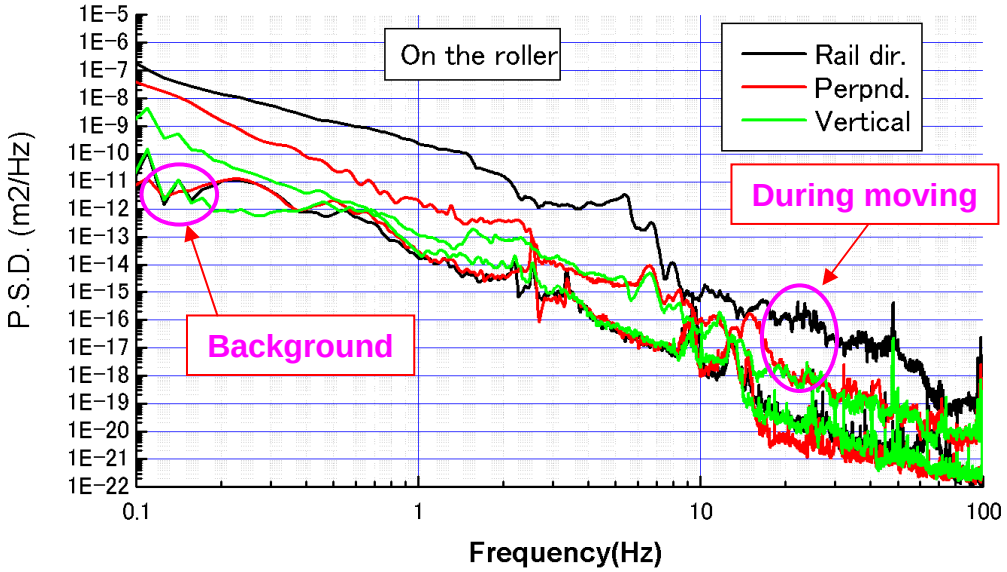


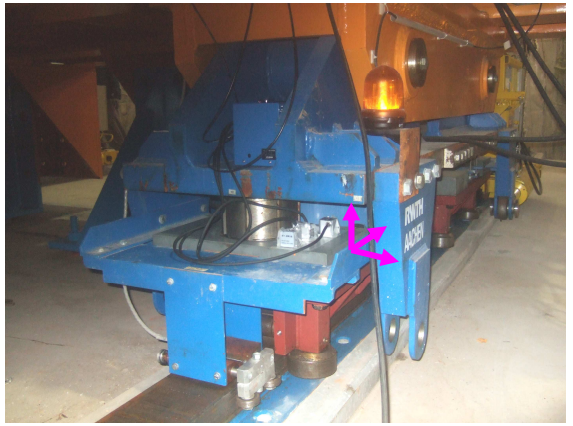
Time data- On the support stand (@North yoke)



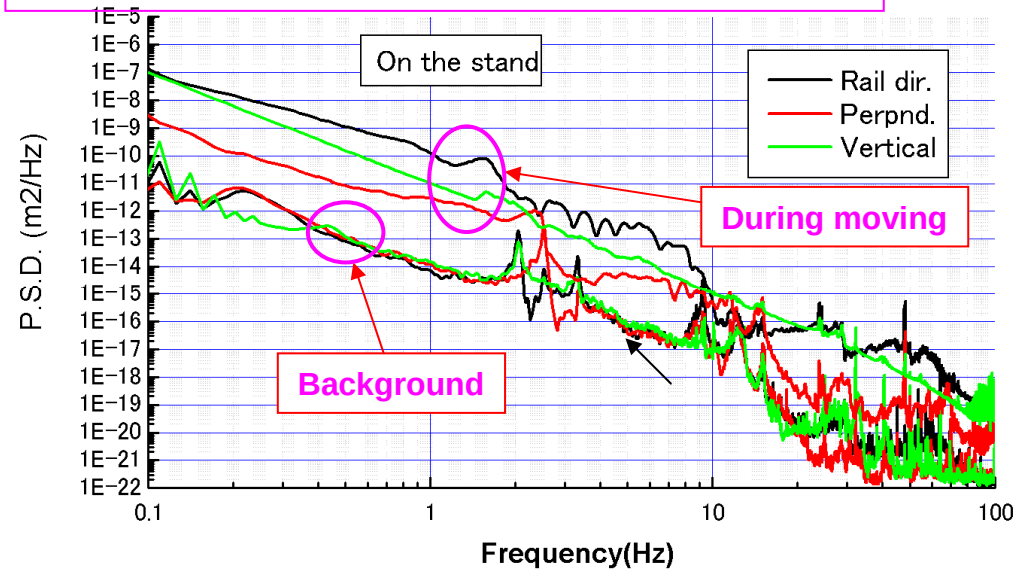
- Piezo-sensor couldn't detect these vibrations.

Time data- On the roller (@South yoke)

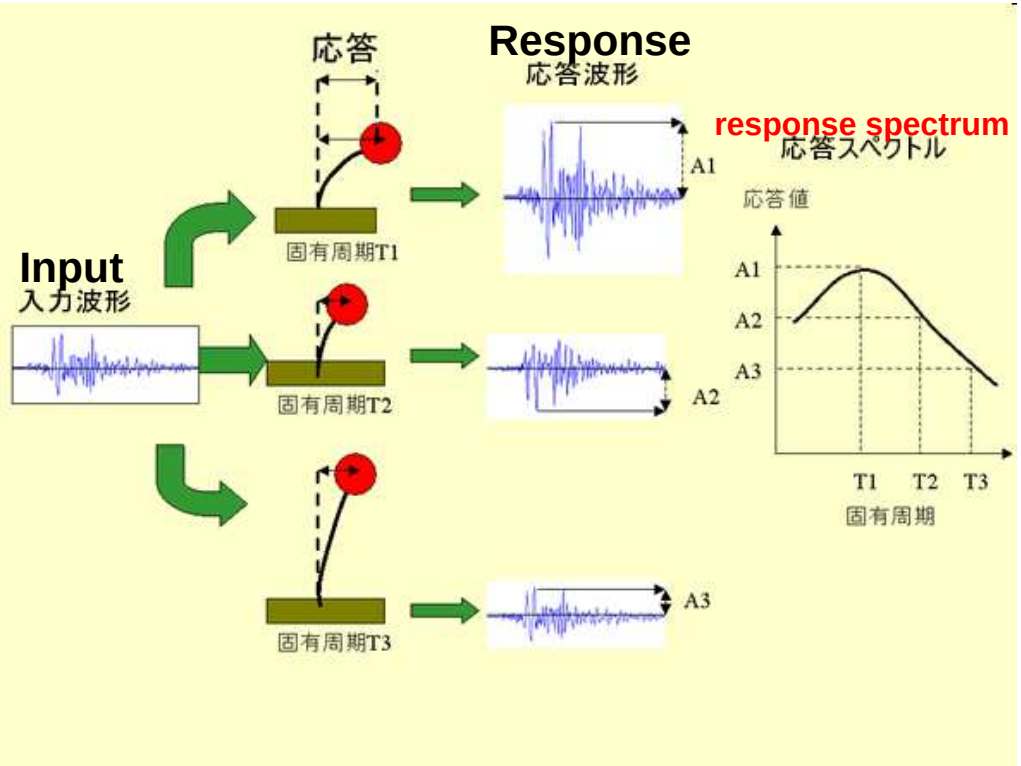




Time data- On the support stand (@North yoke)



Calculations of response spectrum



$$m\ddot{x}_i + c\dot{x}_i + kx_i = -m\ddot{z}_i$$

$$m\ddot{x}_{i+1} + c\dot{x}_{i+1} + kx_{i+1} = -m\ddot{z}_{i+1}$$

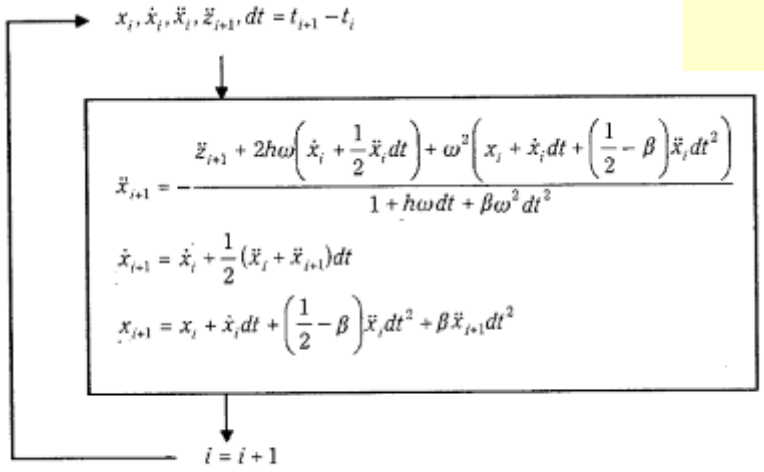


図4.22　Newmarkの β 法

From Wikipedia, the free encyclopedia

A **response spectrum** is simply a plot of the peak or steady-state response (displacement, velocity or acceleration) of a series of oscillators of varying natural frequency, that are forced into motion by the same base vibration or shock. The resulting plot can then be used to pick off the response of any linear system, given its natural frequency of oscillation. The science of strong ground motion may use some values from the ground response spectrum.

Damping must be present, or else the response will be infinite. For transient input (such as seismic ground motion), the peak response is reported. Some level of damping is generally assumed.

For example..

(Kobe earthquake)

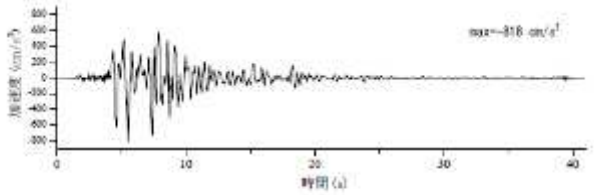


図１　1995 年兵庫県南部地震のときに神戸海洋気象台で観測された南北方向の地動加速度

Response: Acc.

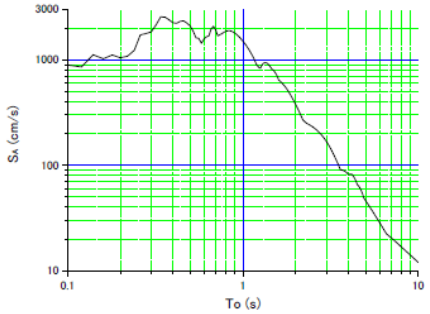


図４　加速度応答スペクトル（h＝0.05）

Response: Velo.

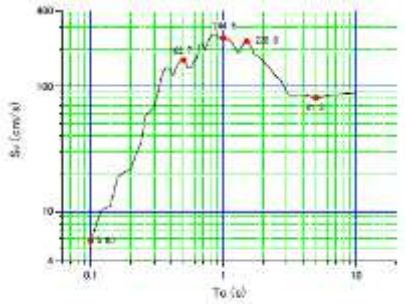


図３　速度応答スペクトル（h＝0.05）

Response: Amp.

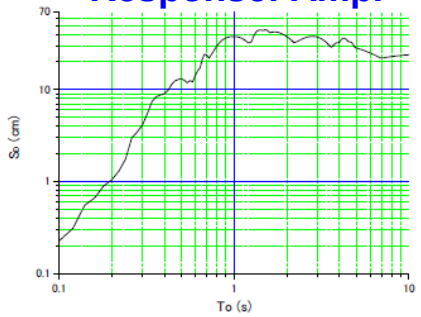
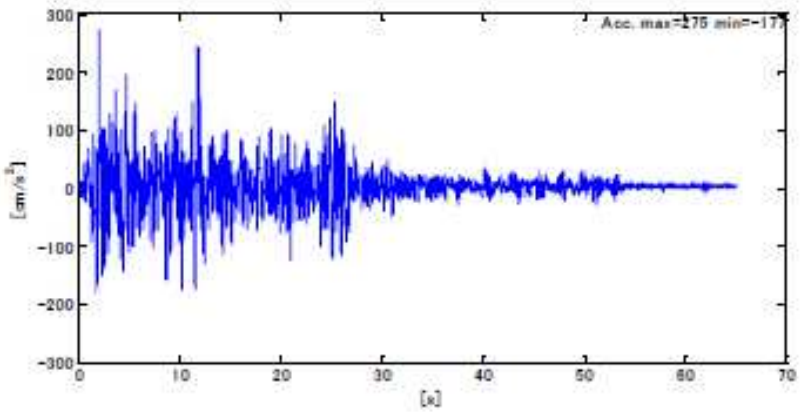
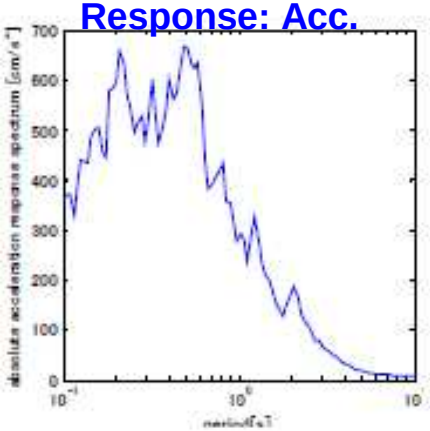


図５　変位応答スペクトル（h＝0.05）

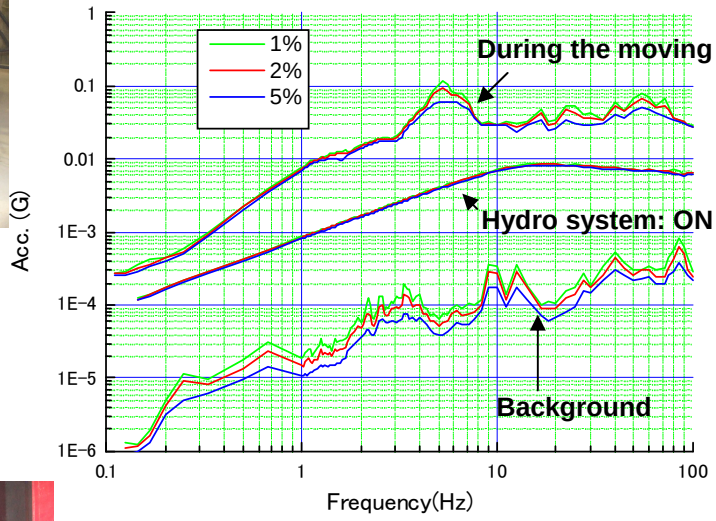
(Elcentro earthquake)



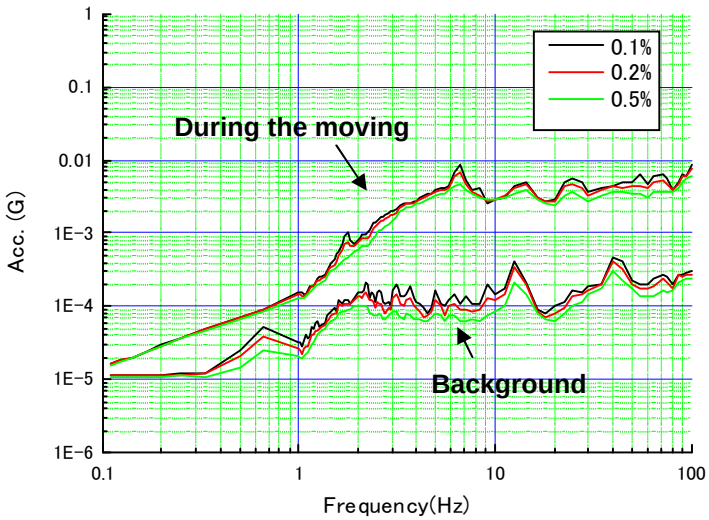


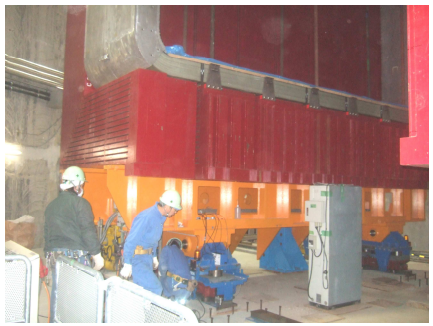
Measurement results

On the roller: Rail dir.

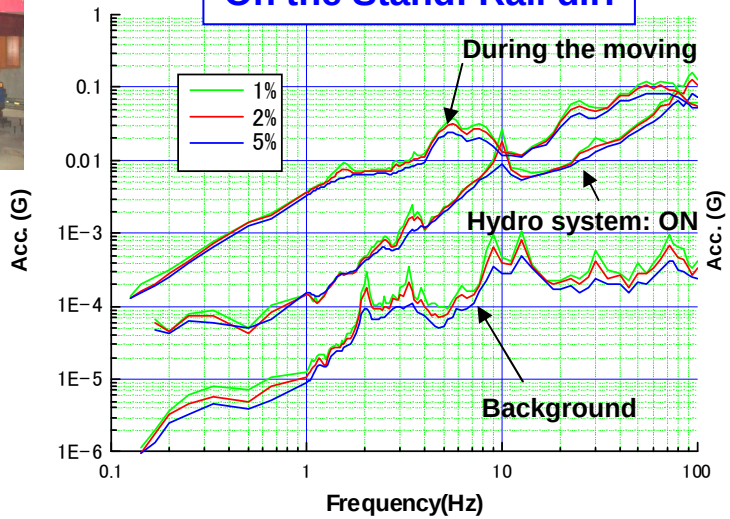


On the roller: Vertical

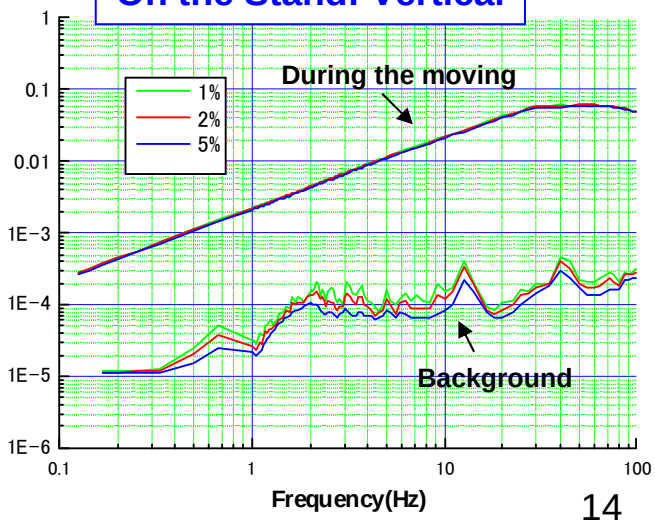




On the Stand: Rail dir.



On the Stand: Vertical



Conclusion

Results

Vibration measurement during the moving on the rail was carried out.

- **Neutrino detector at J-Parc**
- **Weight is 1100t total consists of two iron yokes.**
- **4-rollers in one yoke used for moving.**

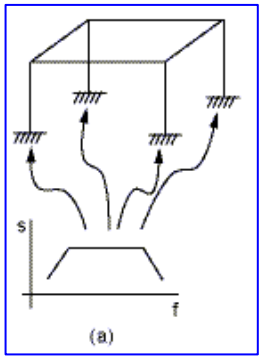
➔ **Peak frequency was measured to 10Hz - 50Hz.**

➔ **Response acceleration was measured to 0.1G in rail direction, 0.01G in vertical.**

Next step

Perform Single-Point Response Spectrum (SPRS) with ANSYS.

➔ **To estimate deformation, stress of each point of structure.**



END