

Mechanical response

Calculated by SUMCON (and Simulink)

① Measurement vs. SUMCON : TypeBpp_iKAGRA

Model Construction Calculation Result Export Model

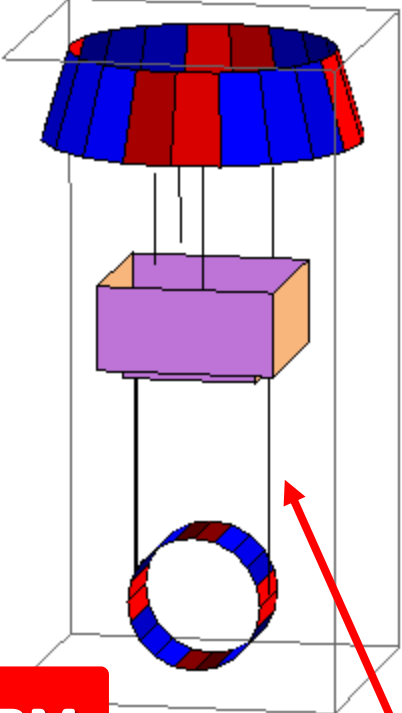
Model Basic Information

Degrees of Freedom:
18 State Variables
6 Input Variables
1 Float Variables

Ground Position:
xF2 → 0. yF2 → 0. zF2 → 0. pitchF2 → 0. yawF2 → 0. rollF2 → 0.

Equilibrium Point:
xIR → 0. yIR → -0.5026 zIR → 0. pitchIR → 0. yawIR → 0. rollIR → 0.
xIM → 0. yIM → -0.5519 zIM → 0. pitchIM → 0. yawIM → 0. rollIM → 0.
xRM → 0. yRM → -1.139 zRM → 0. pitchRM → 0. yawRM → 0. rollRM → 0.
hGAS2 → 0.0269

TypeBpp_iKAGRA

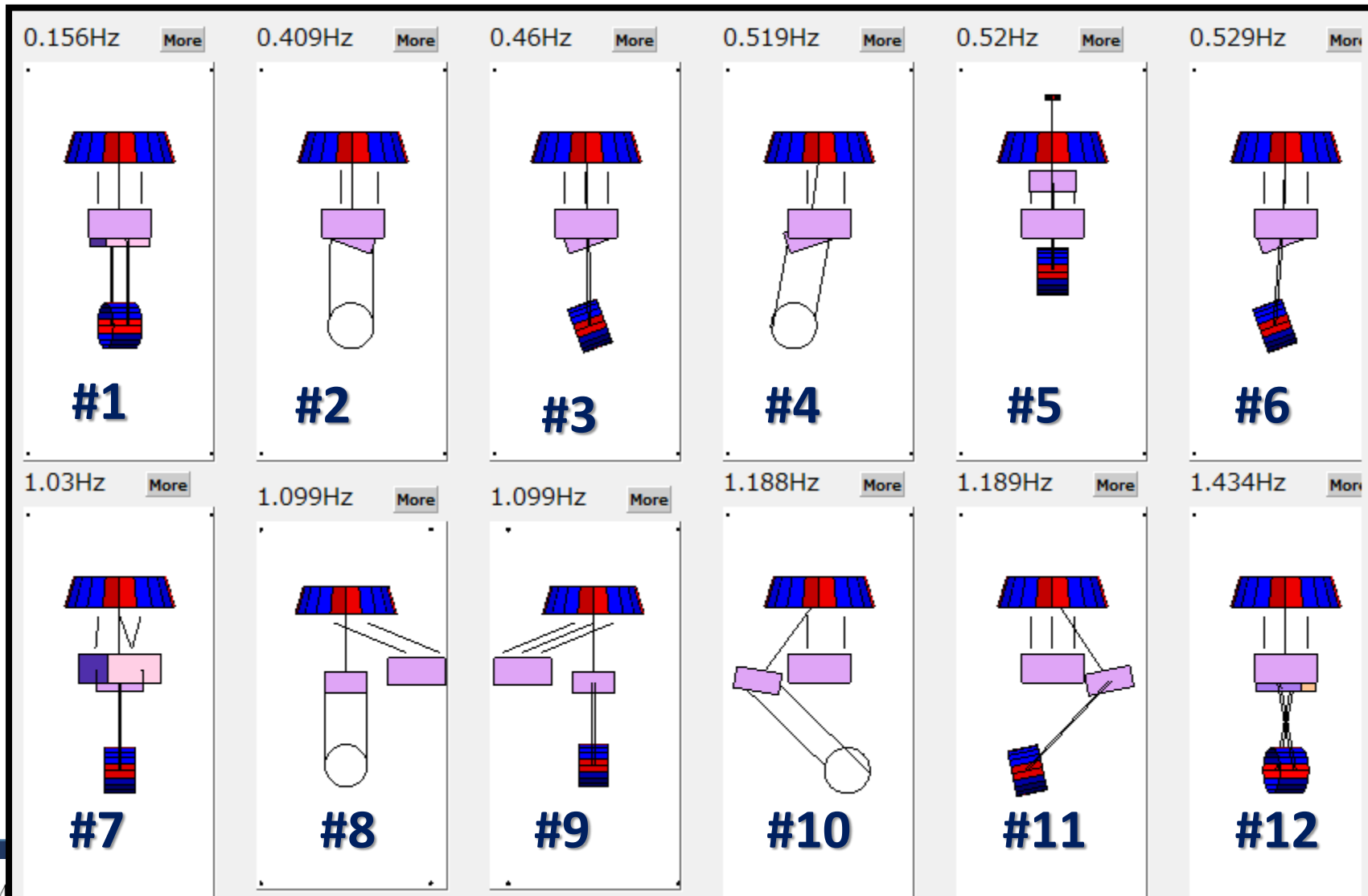


The PR TM fixed to the RM

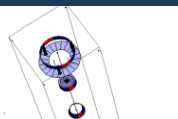
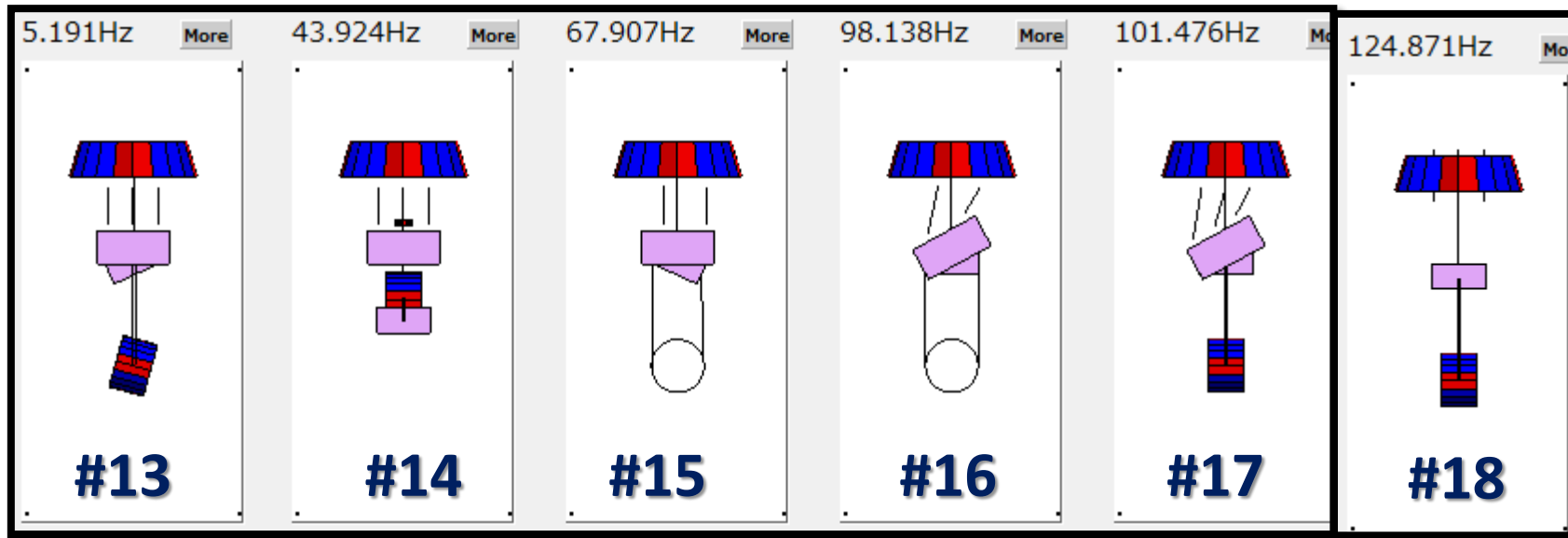
RM is suspended by 4 wires

Eigen Mode List

Eigen Mode Shape



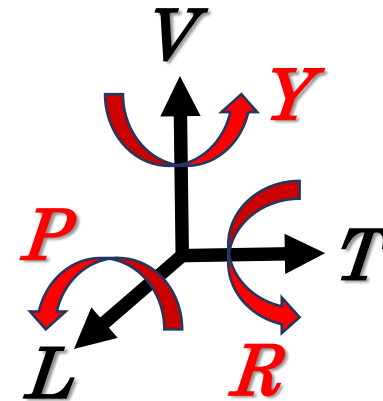
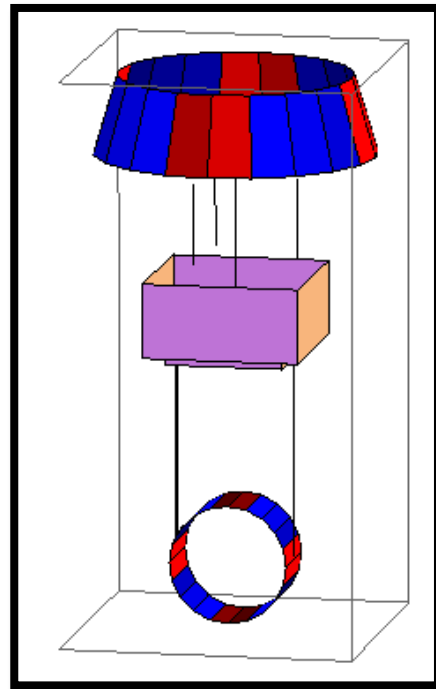
Eigen Mode Shape



From 160301 measurement:

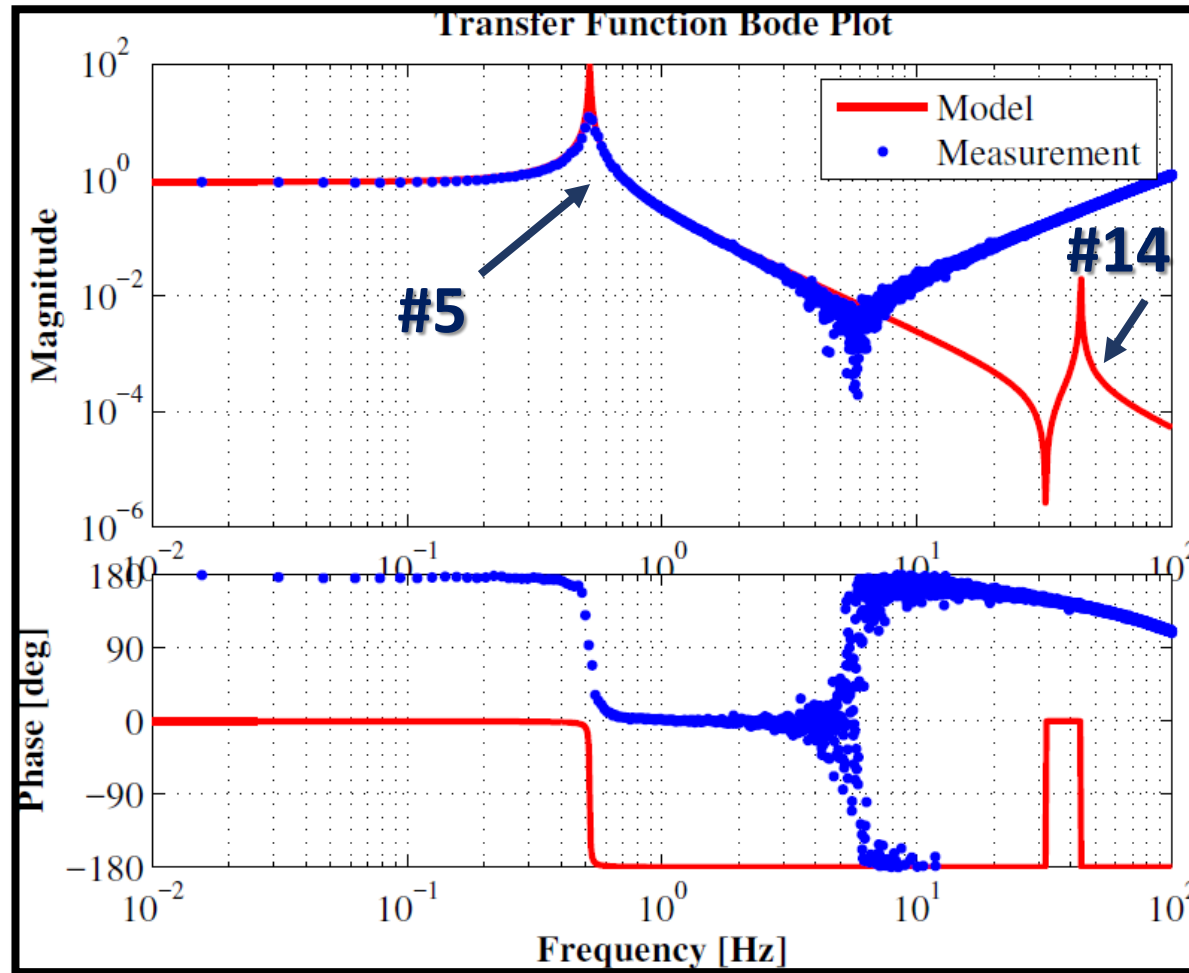
Force Transfer Functions with No Ctrl

(, which can be measured and actuated.)

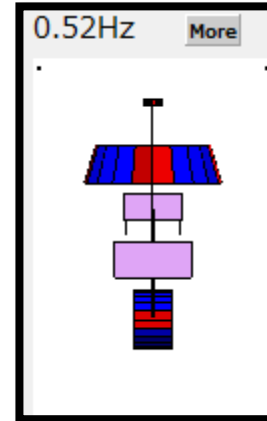


Force Transfer Function

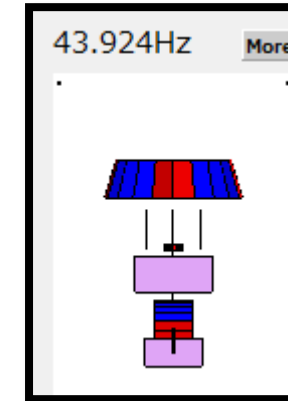
LVDT_VBF / actVBF



#5 : GAS

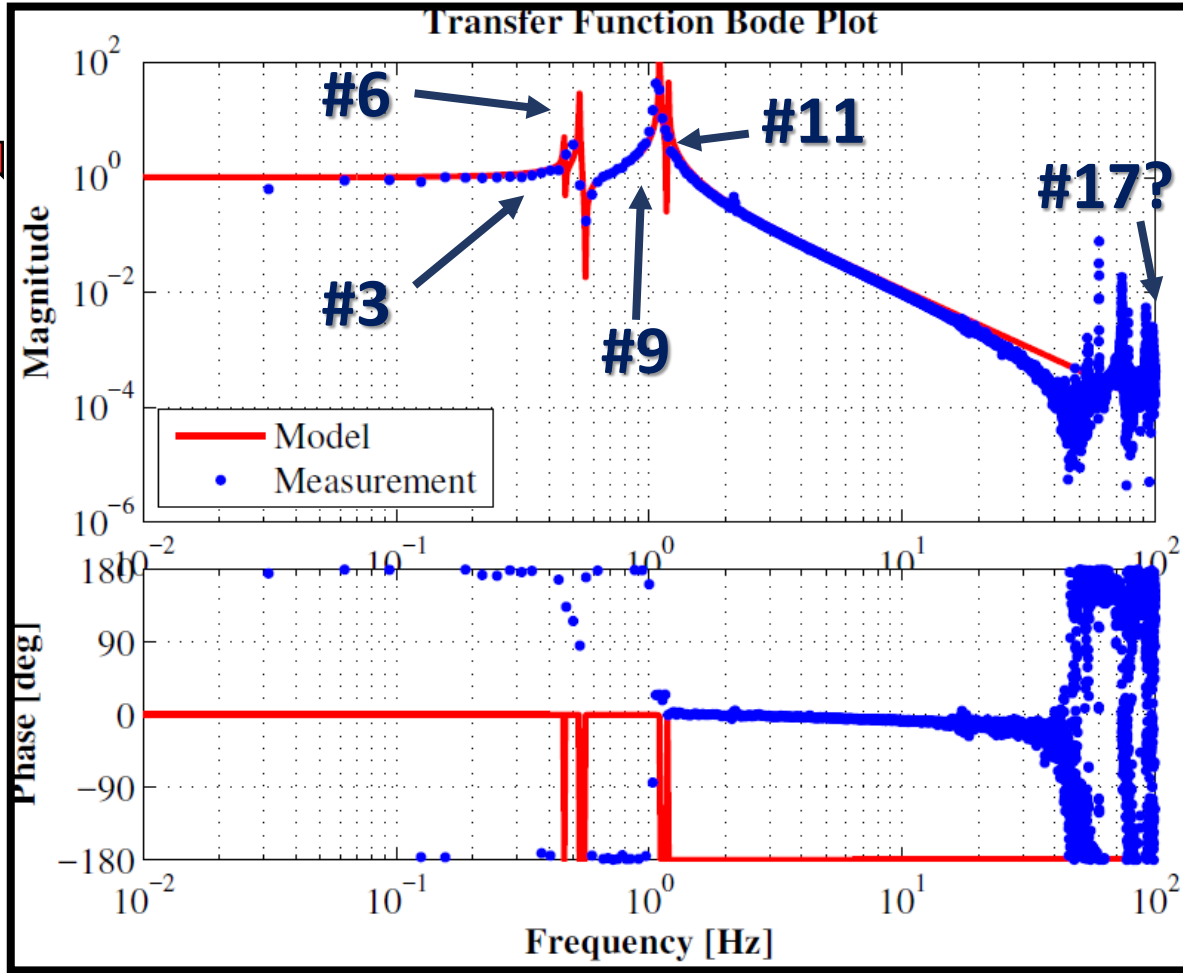


#14 : VRM

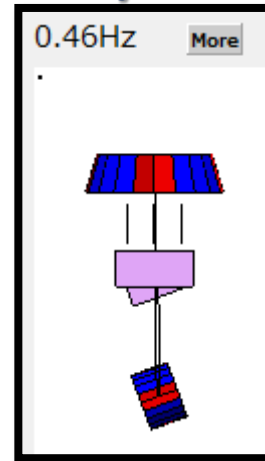


Force Transfer Function

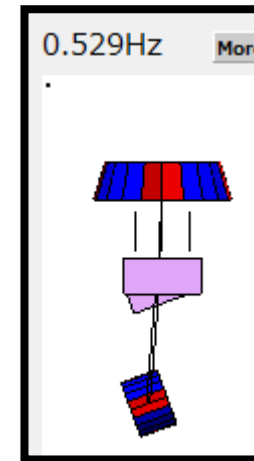
OSEM_LIM / actLIM



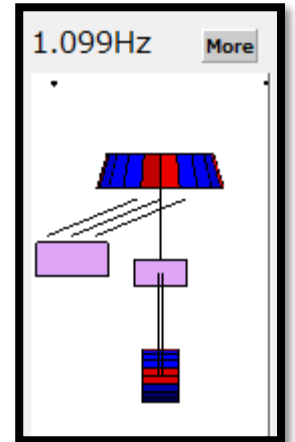
#3 : PIM /PRM



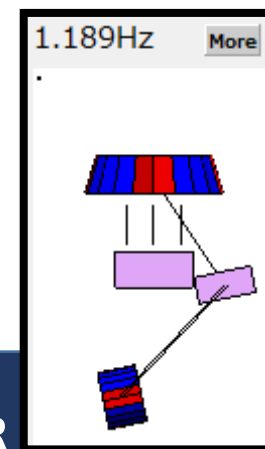
#6 : PIM /PRM



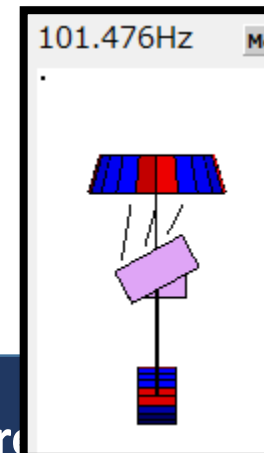
#9 : LIR



#11 : LIM

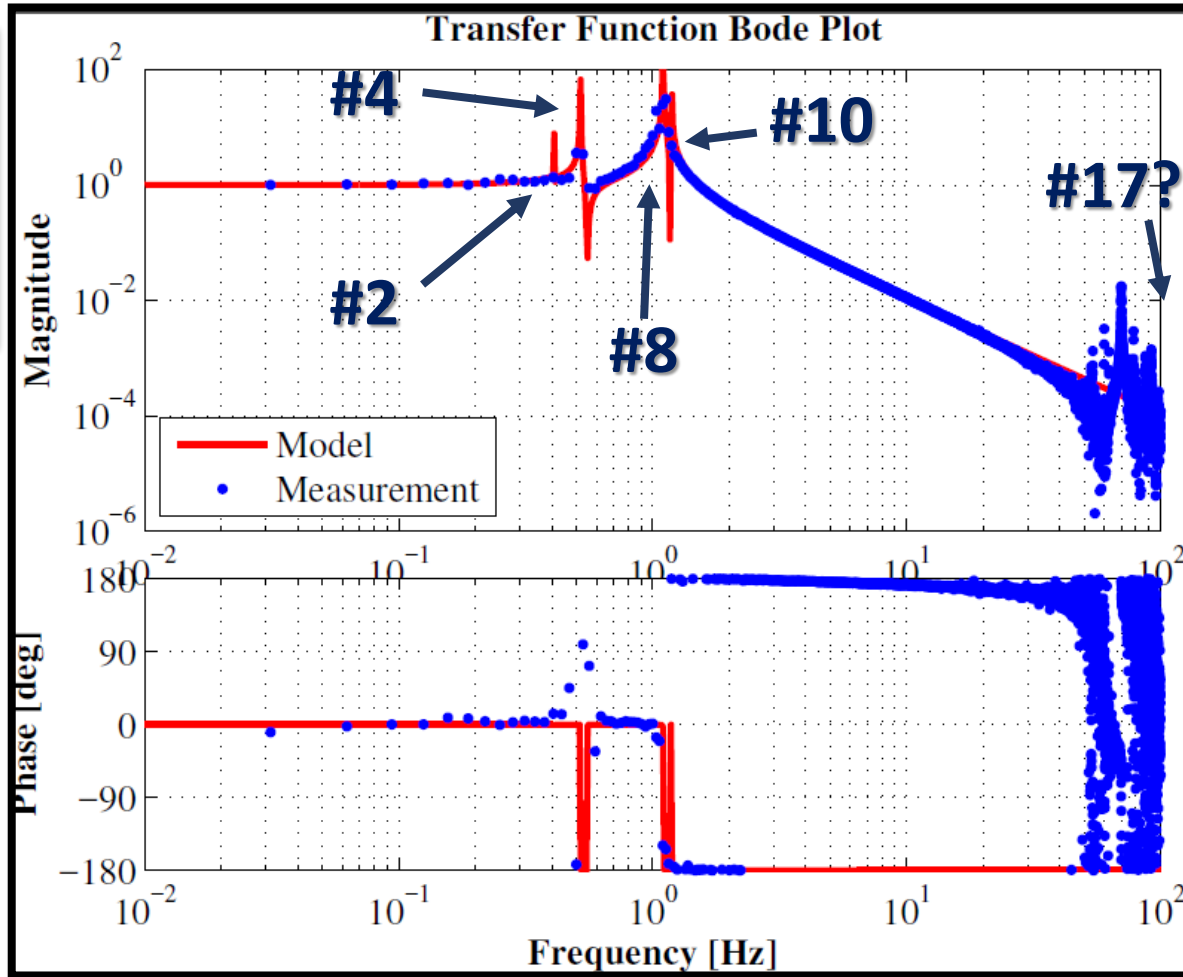


#17 : RIR ?

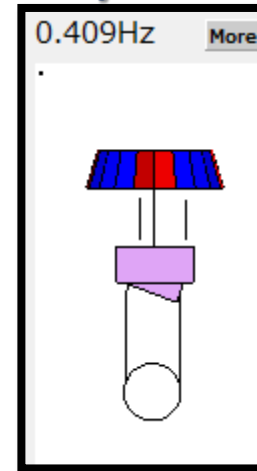


Force Transfer Function

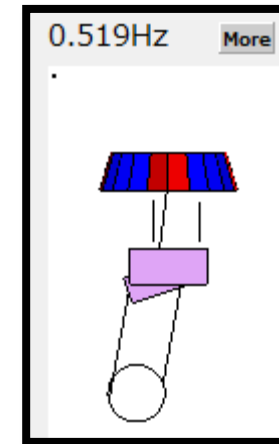
OSEM_TIM / actTIM



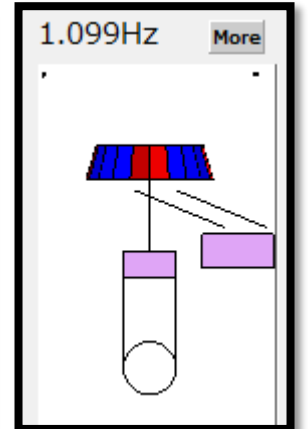
#2 : RIM /RRM



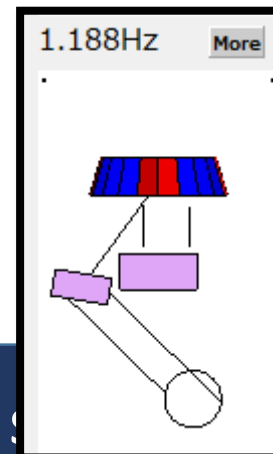
#4 : RIM /RRM



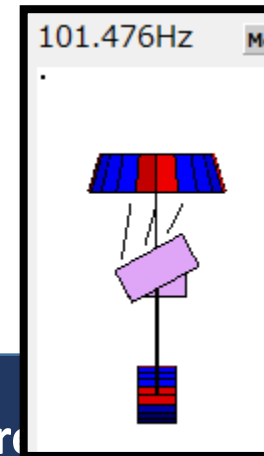
#8 : TIR



#10 : TIM

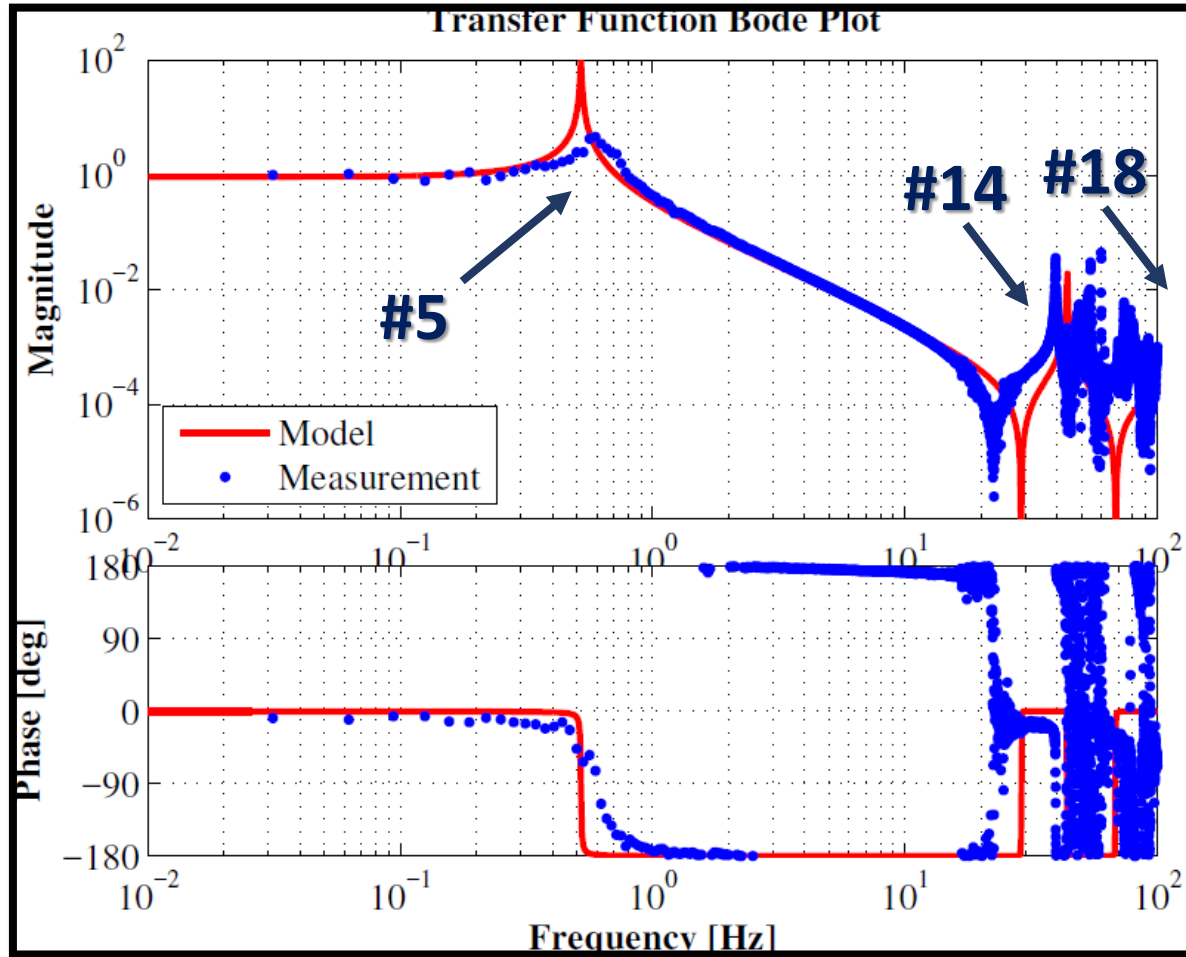


#17 : RIR ?

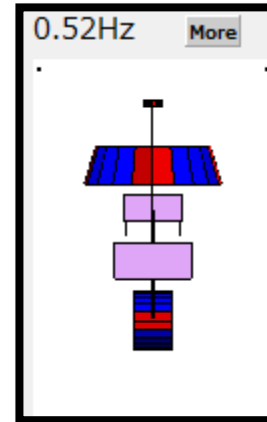


Force Transfer Function

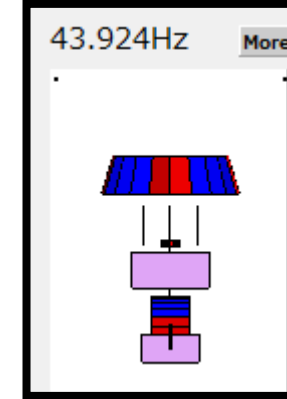
OSEM_VIM / actVIM



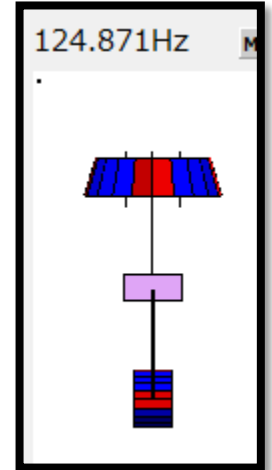
#5 : GAS



#14 : VRM

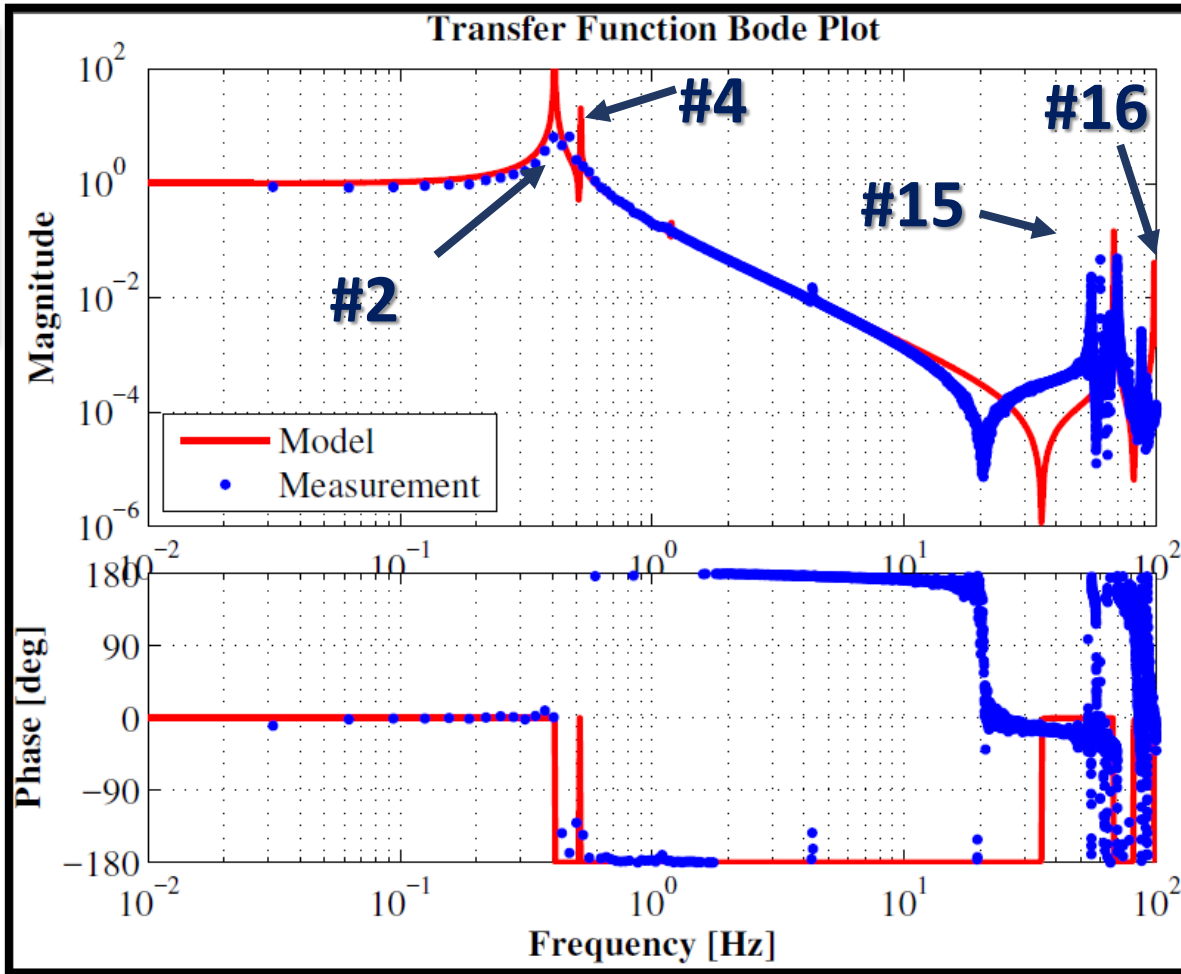


#18 : VIR

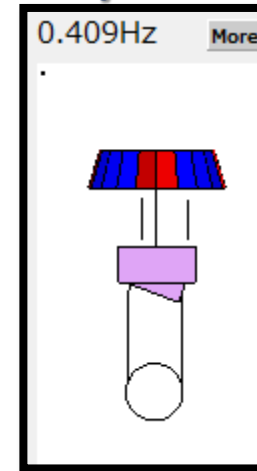


Force Transfer Function

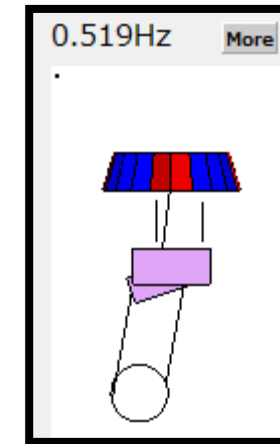
OSEM_RIM / actRIM



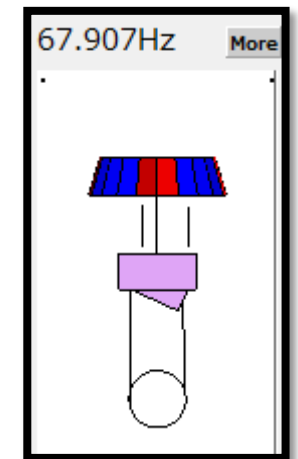
#2 : RIM
/RRM



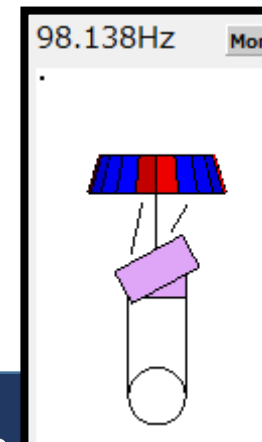
#4 : RIM
/RRM



#15 : RIM



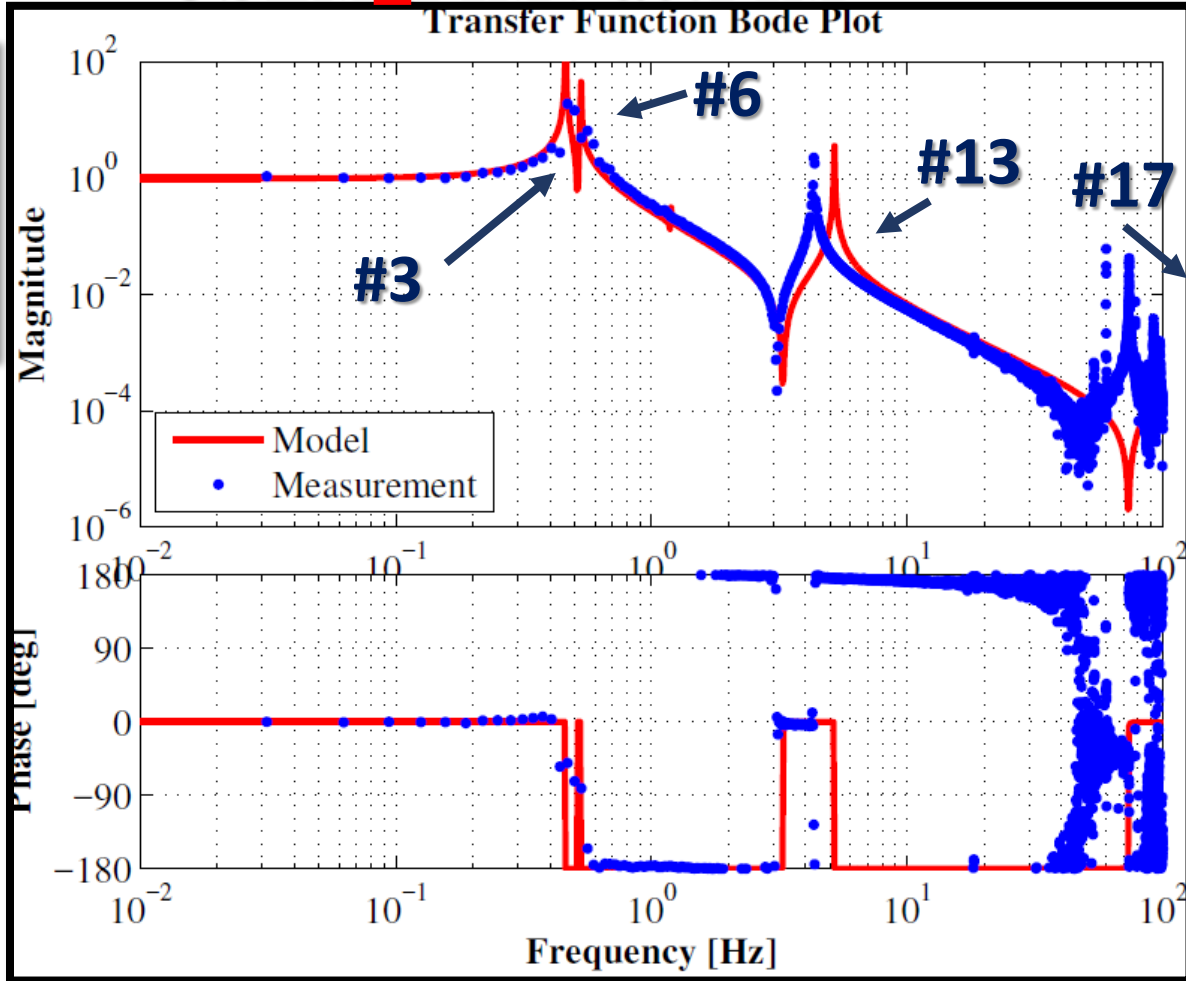
#16 : RIR



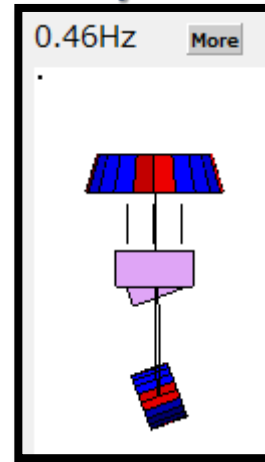
Force Transfer Function

OSEM_PIM / actPIM

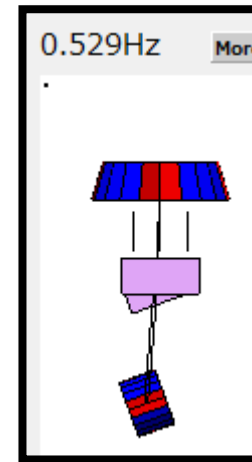
Transfer Function Bode Plot



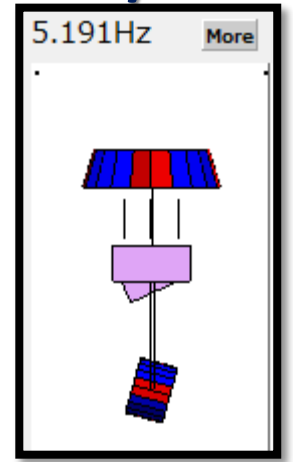
#3 : PIM /PRM



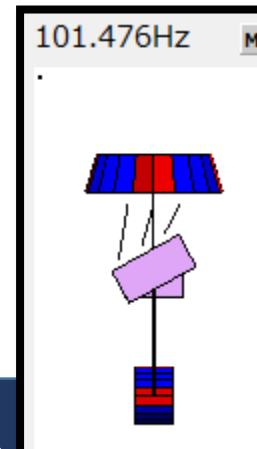
#6 : PIM /PRM



#13 : PIM /PRM



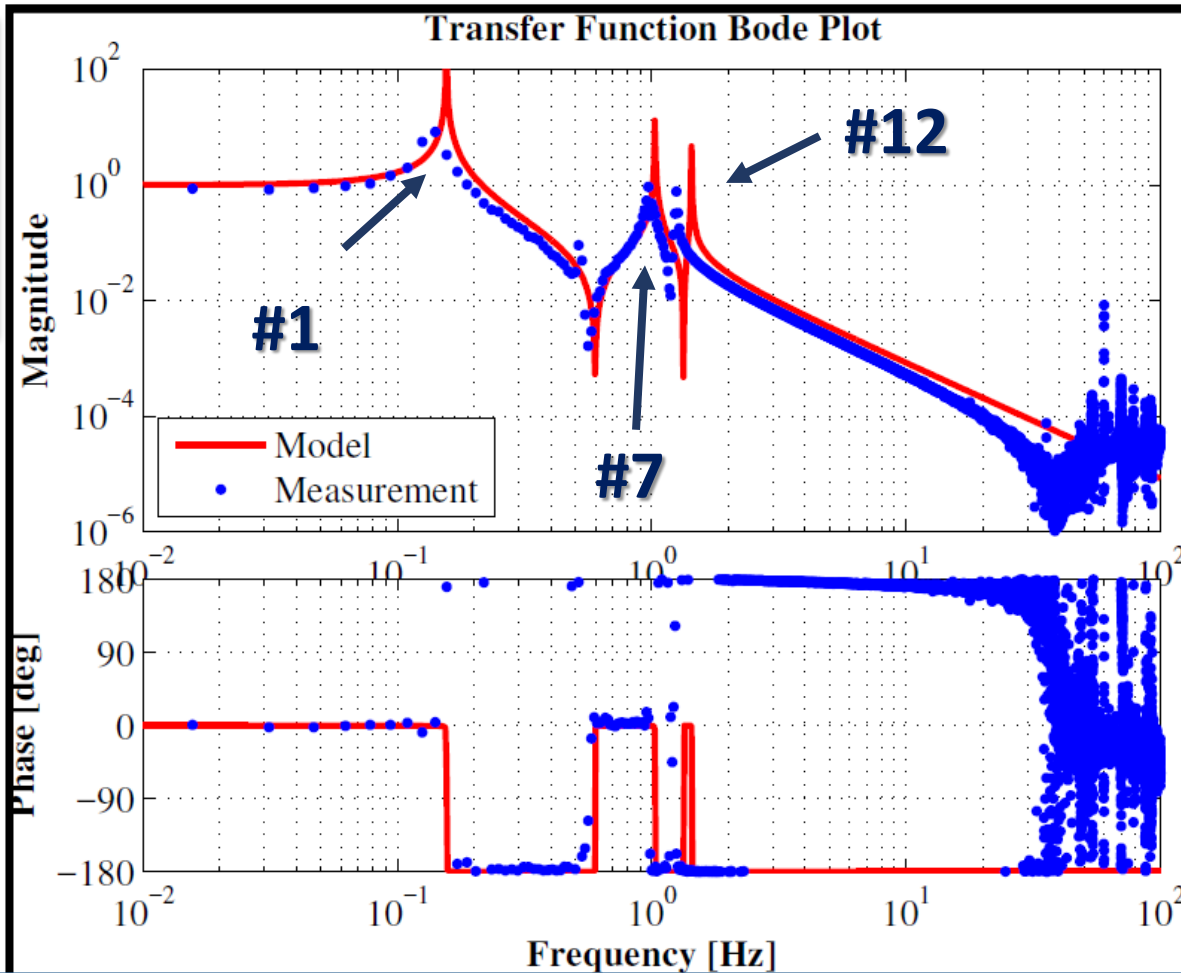
#17 : PIR



PR SAS Model for real iKAGRA PR3

Force Transfer Function

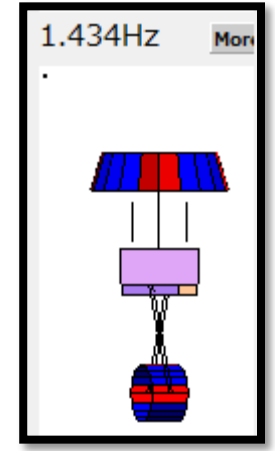
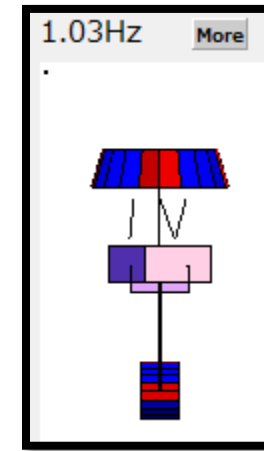
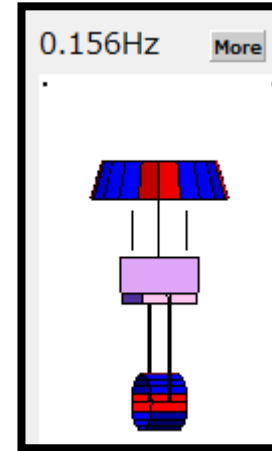
OSEM_YIM / actYIM



#1 : Whole chain

#7 : YIR

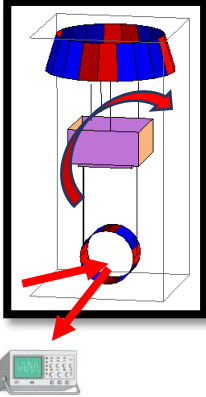
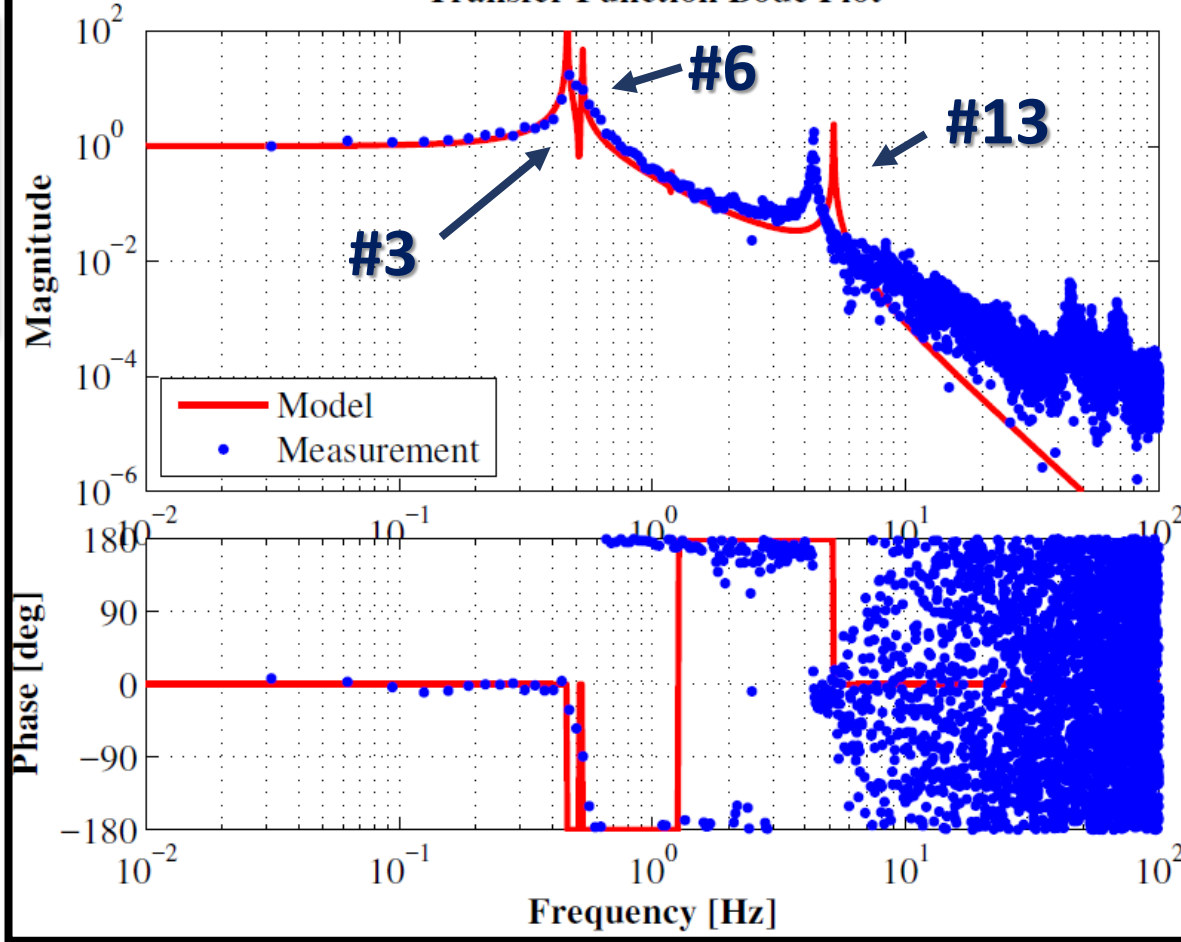
#12 : YIM /YIR



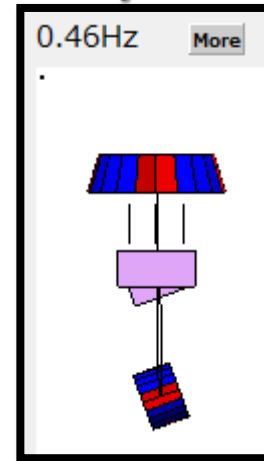
Force Transfer Function

Oplev PTM / actPIM

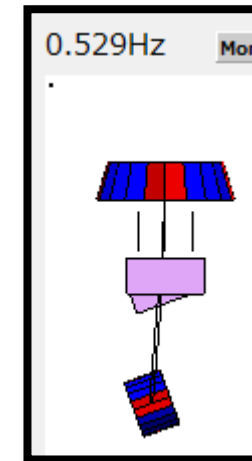
Transfer Function Bode Plot



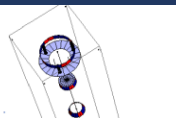
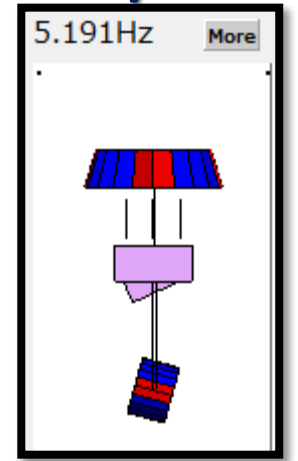
#3 : PIM /PRM



#6 : PIM /PRM

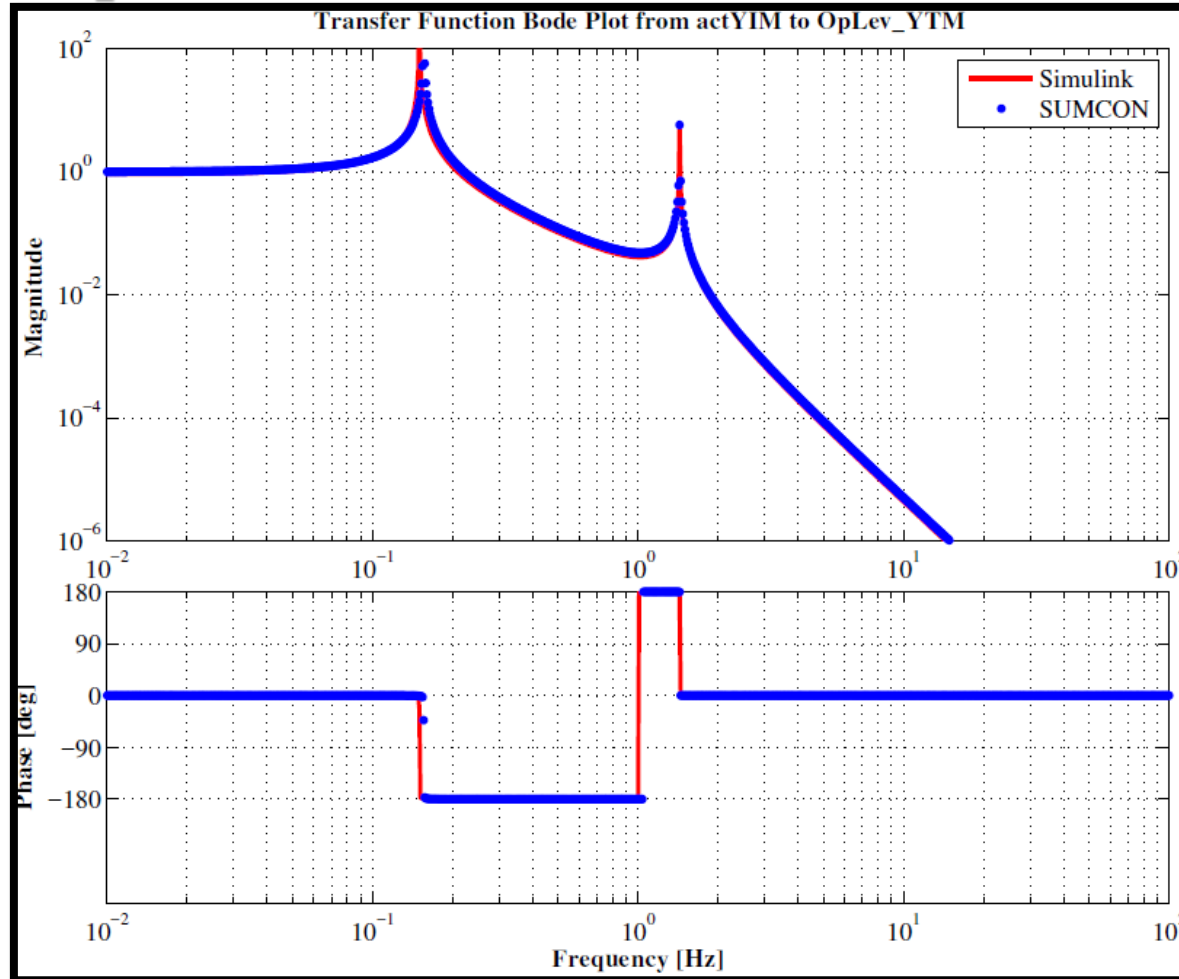


#13 : PIM /PRM



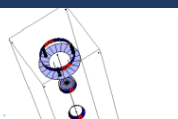
Force Transfer Function

OpLev_YTM / actYIM



Not measured

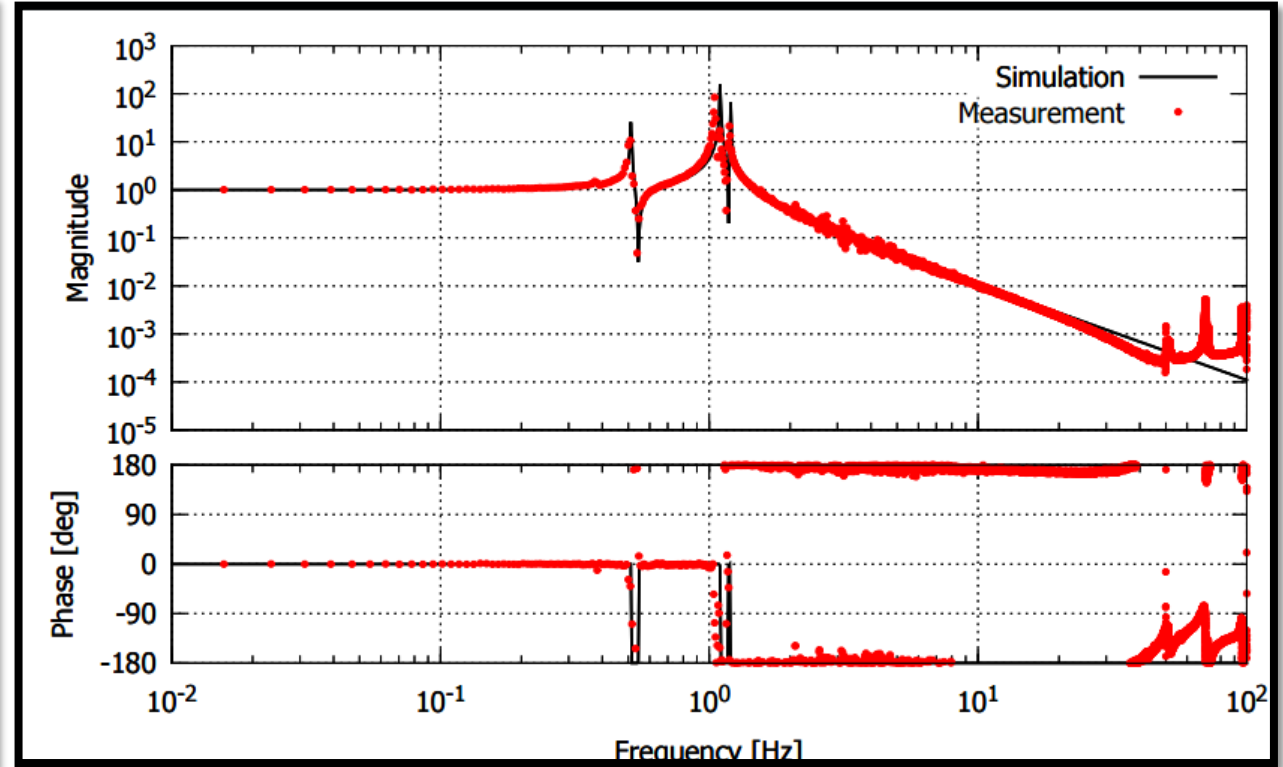
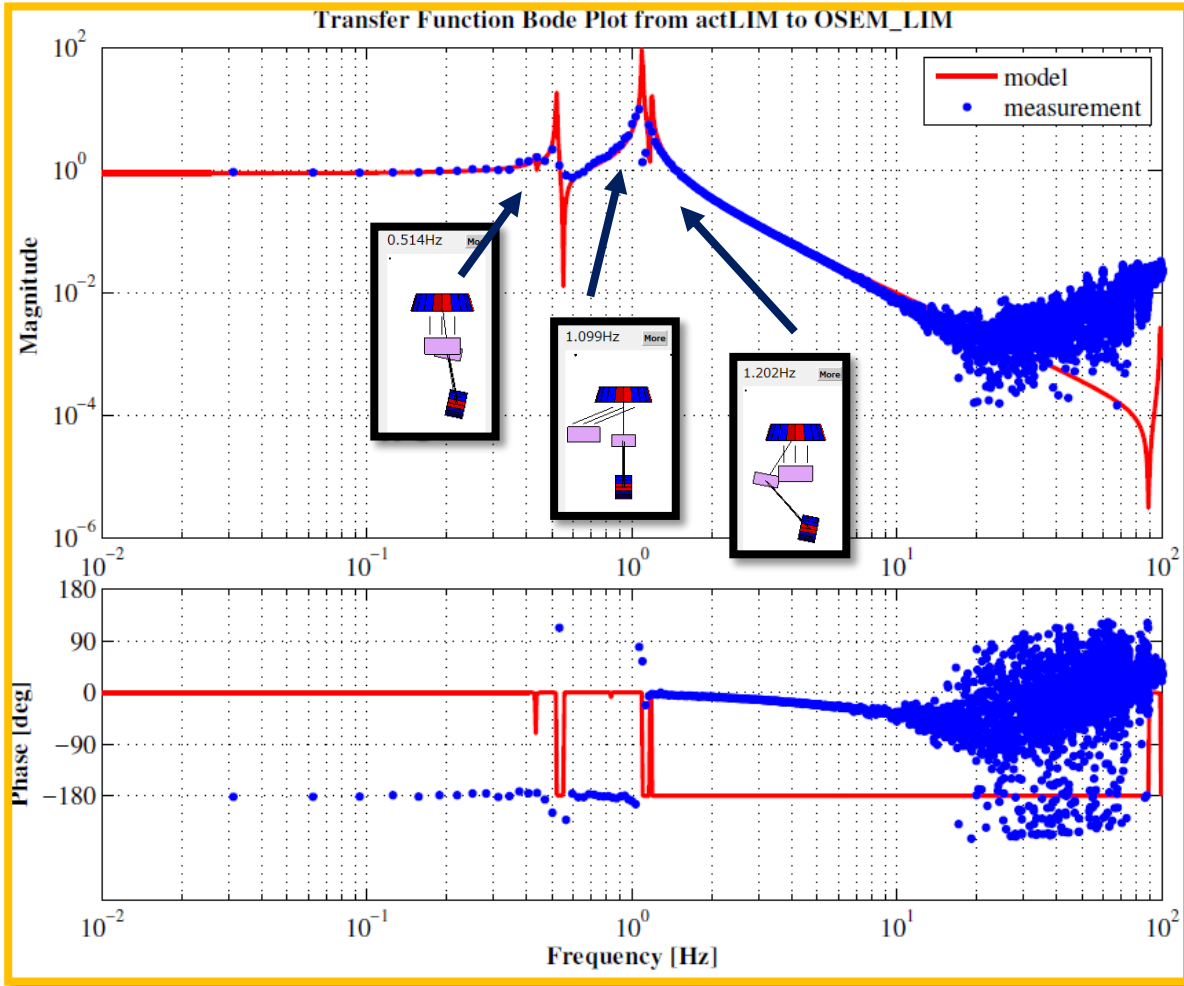
③ Installation test vs. SUMCON : TypeBpp_iKAGRA



Investigation of TypeBpp Frequency response

LIM (OSEM) TF

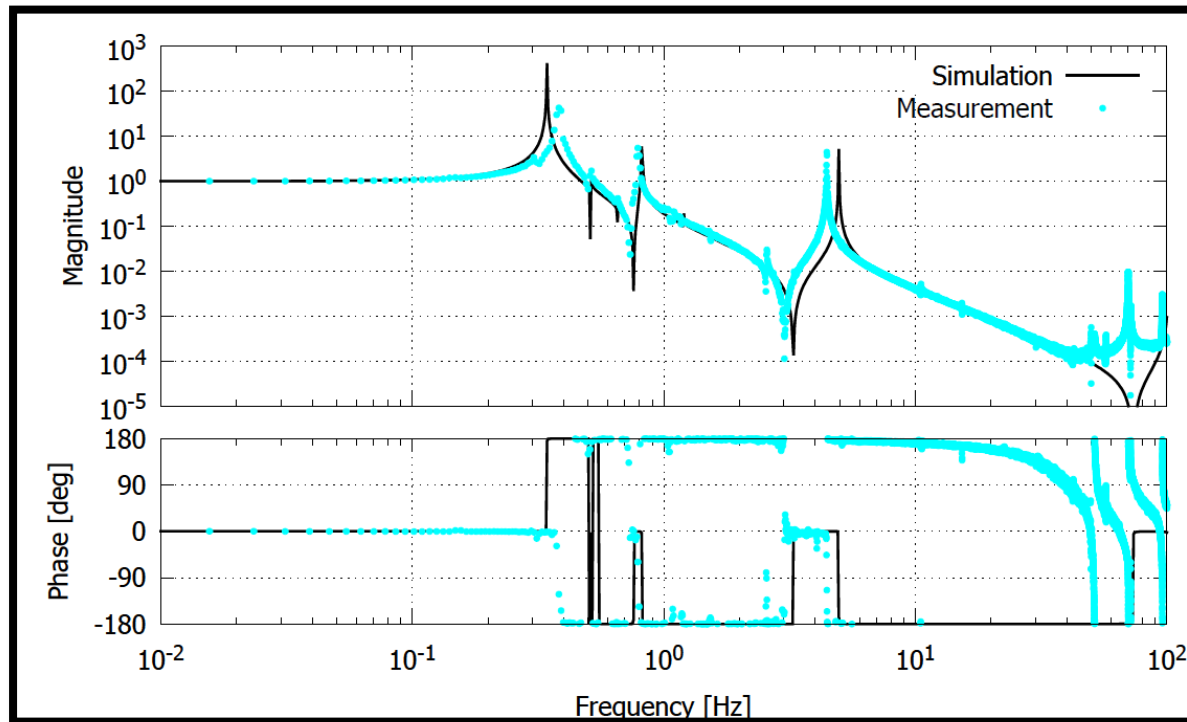
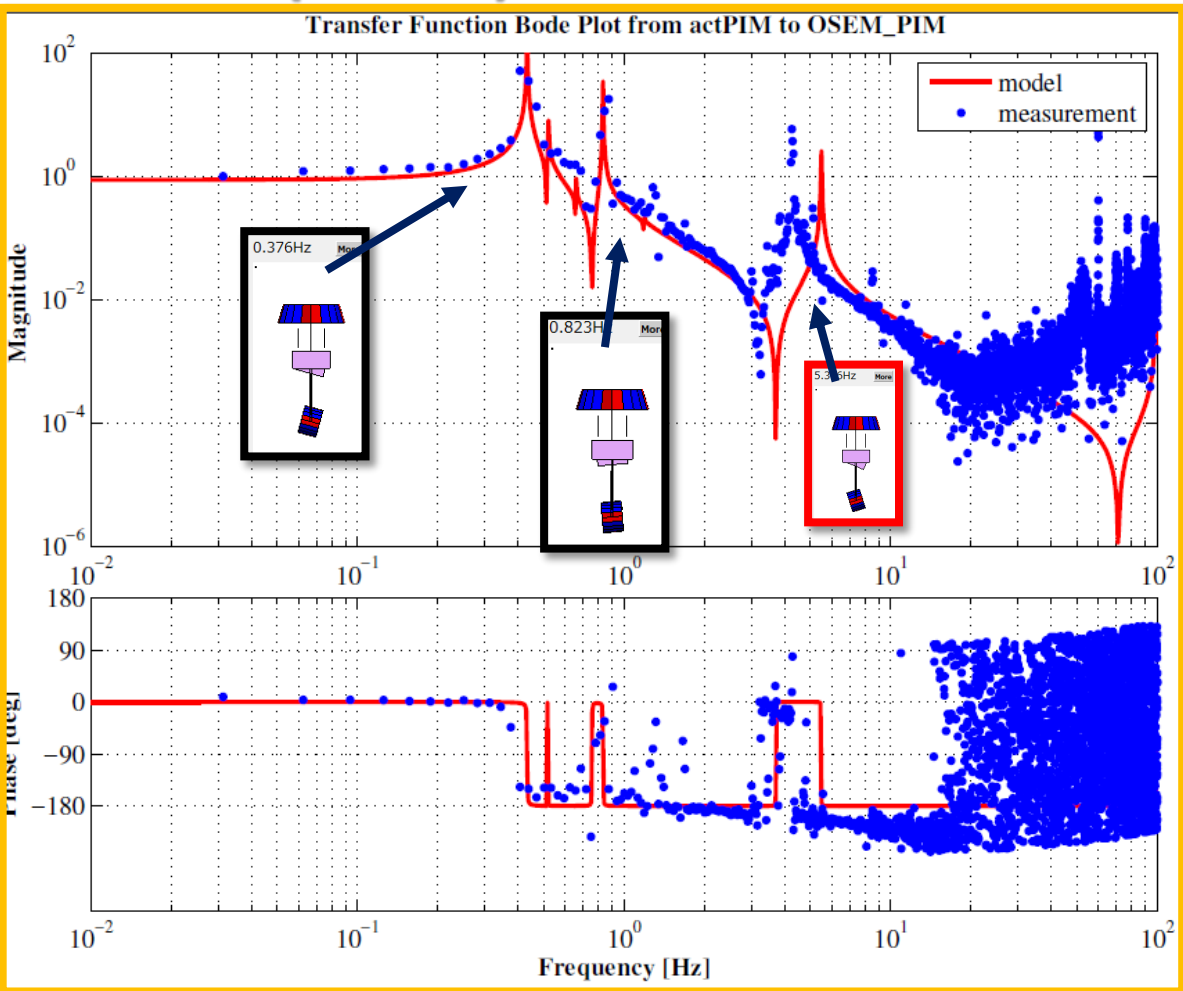
REF : LIM (OSEM) TF of 20 m SAS



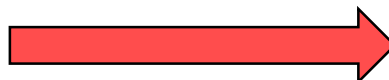
Investigation of TypeBpp Frequency response

PIM (OSEM) TF

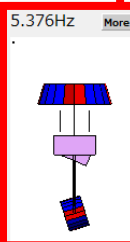
REF : PIM (OSEM) TF of 20 m SAS



Resonance frequency is lower than its prediction by around 1 Hz.



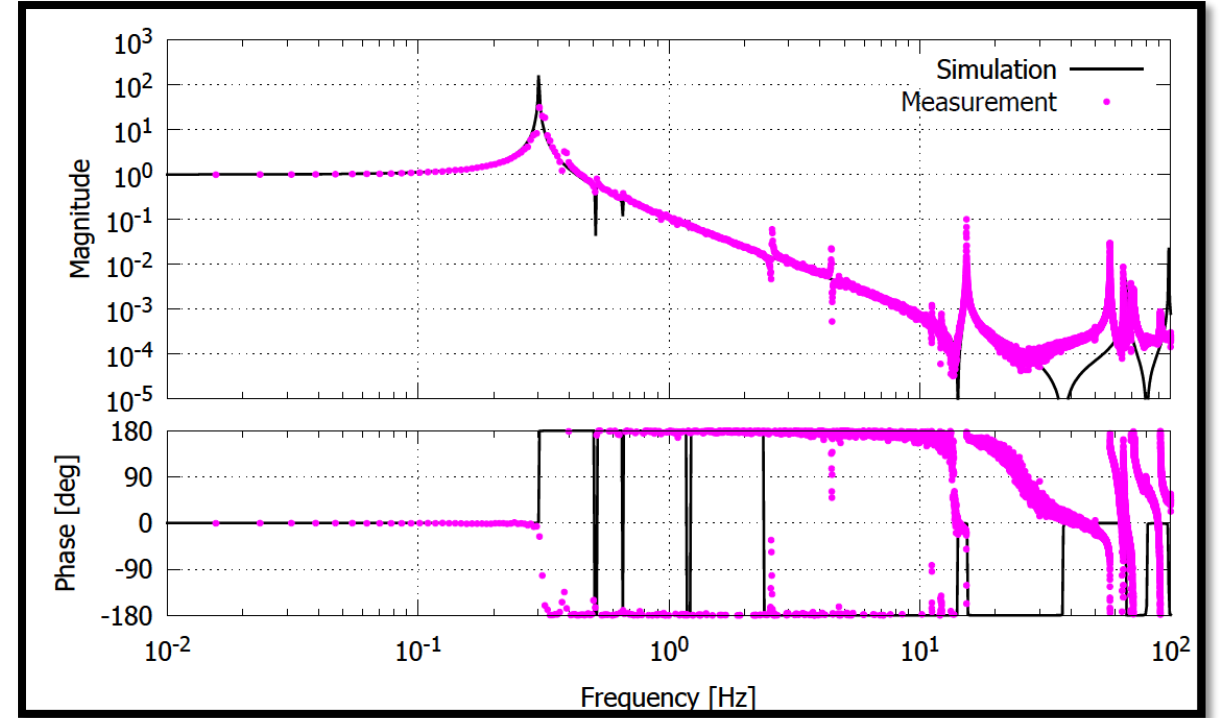
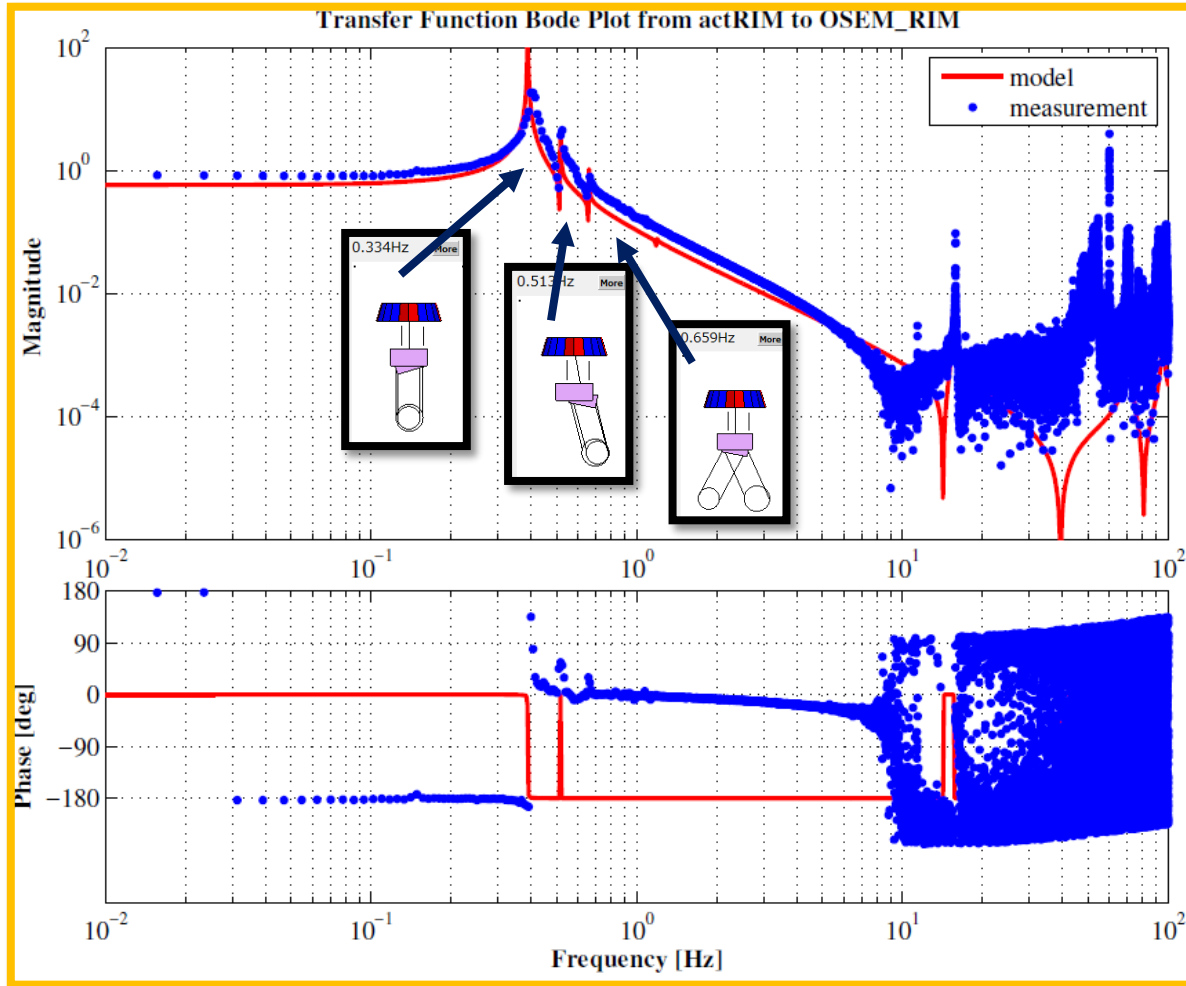
To be investigated.



Investigation of TypeBpp Frequency response

RIM (OSEM) TF

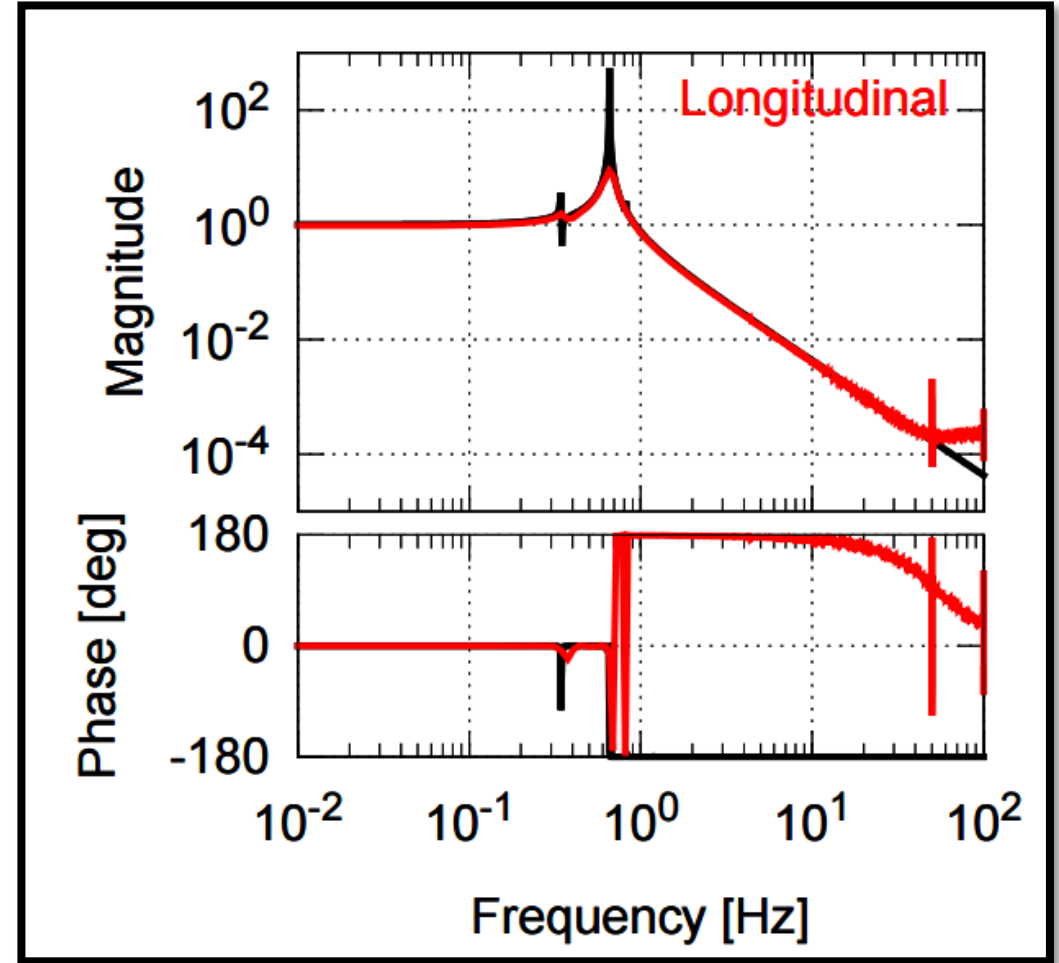
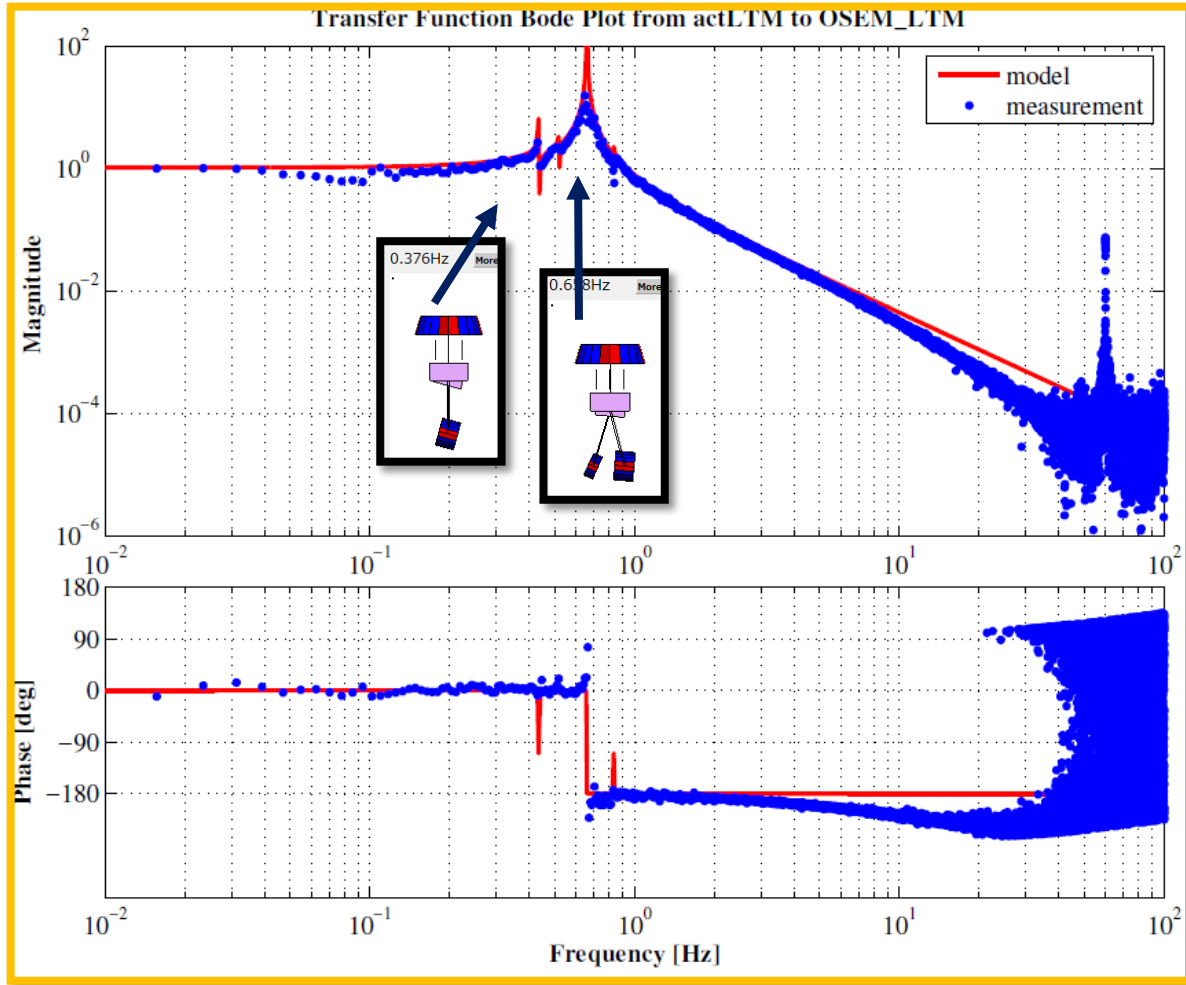
REF : RIM (OSEM) TF of 20 m SAS



Investigation of TypeBpp Frequency response

LTM (OSEM) TF

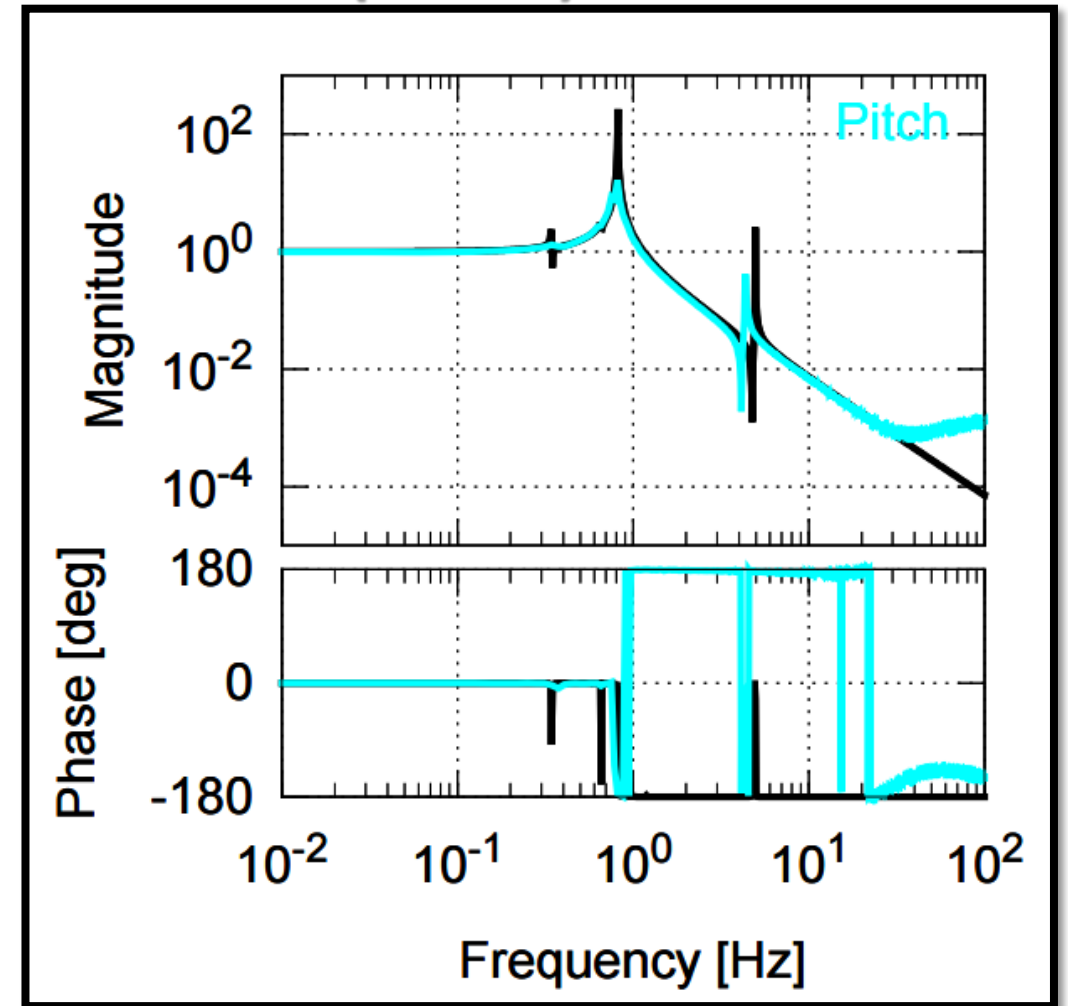
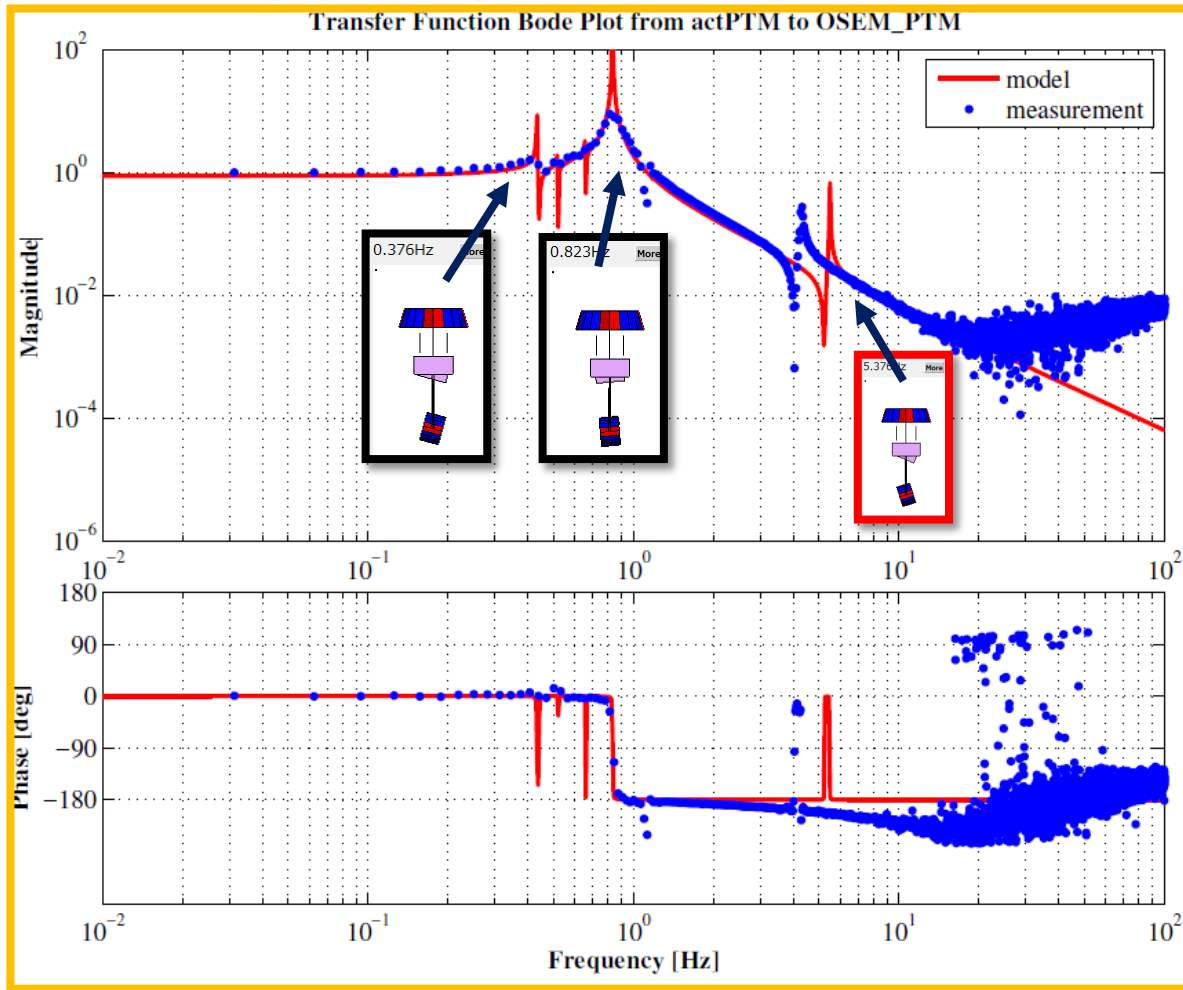
REF : LTM (OSEM) TF of 20 m SAS



Investigation of TypeBpp Frequency response

PTM (OSEM) TF

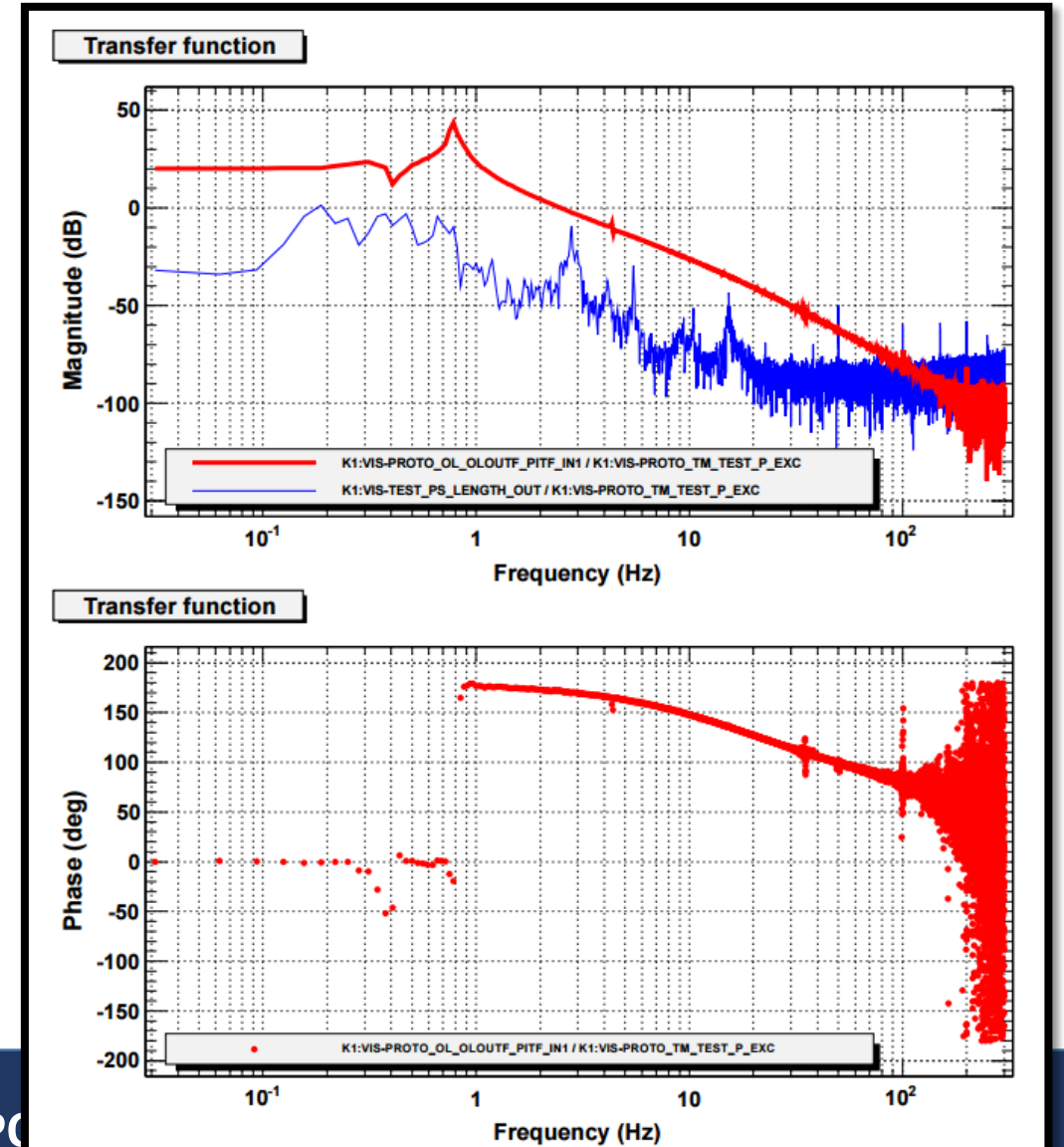
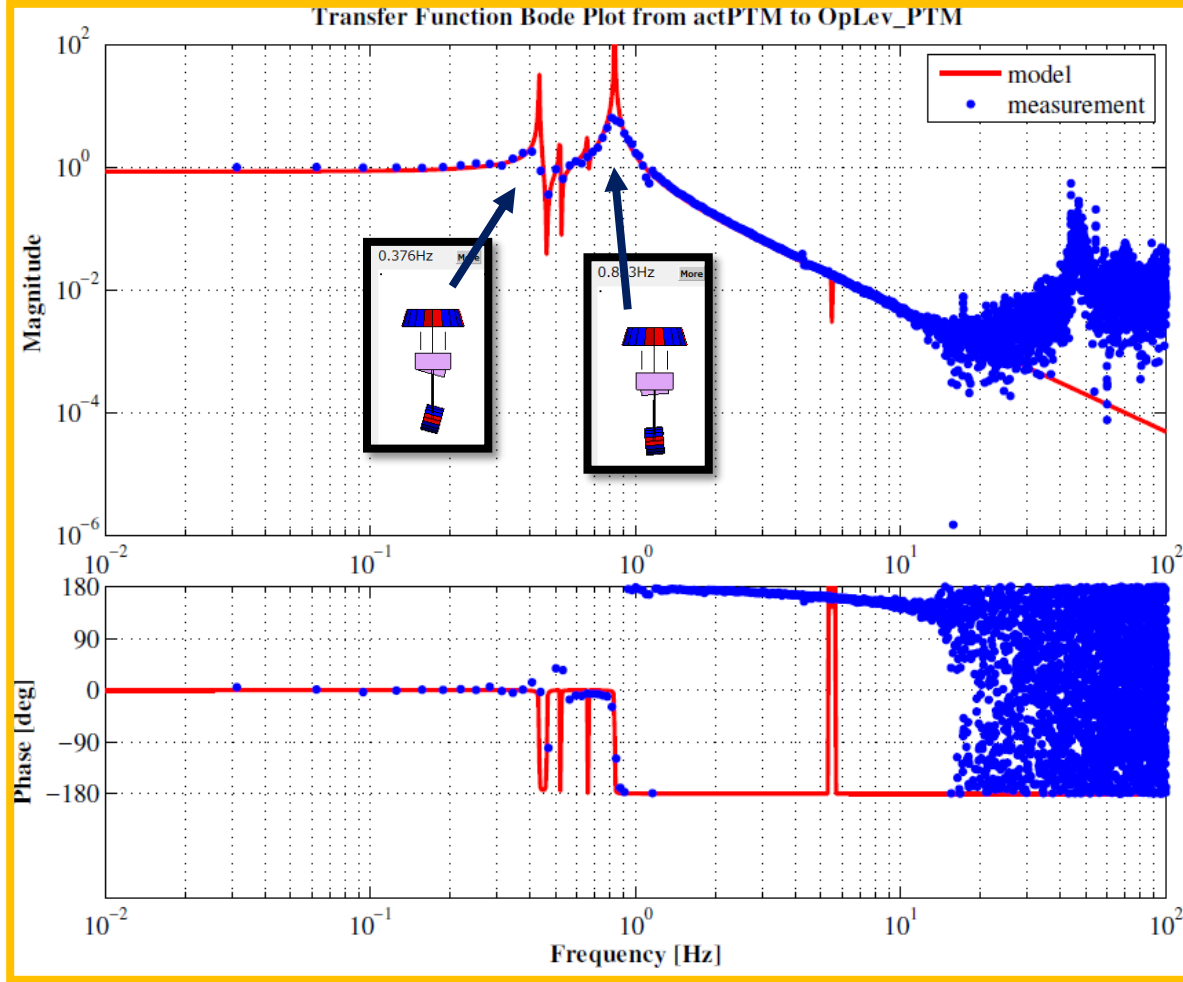
REF : PTM (OSEM) TF in 20 m SAS



Investigation of TypeBpp Frequency response

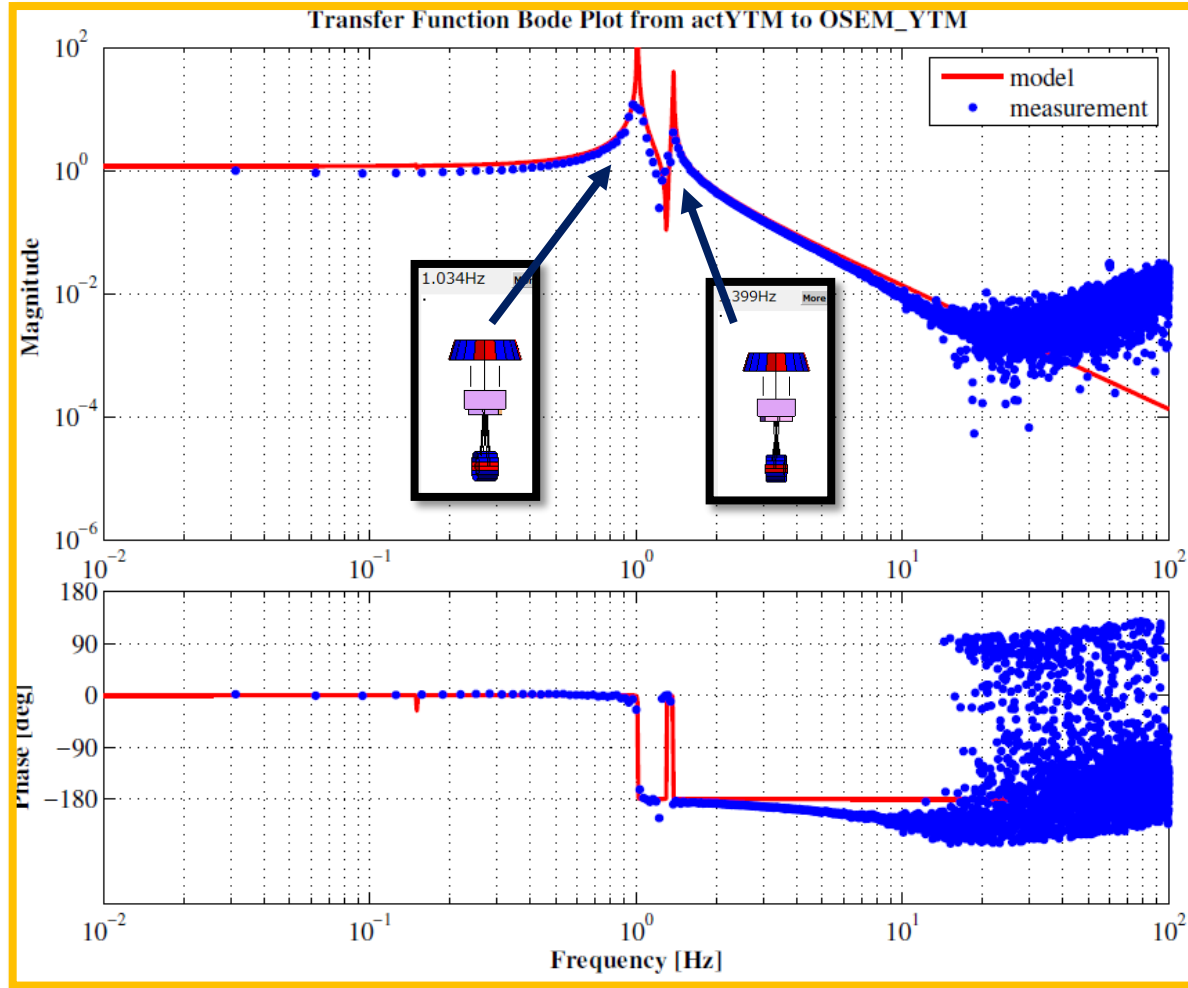
PTM (Oplev) TF

REF : PTM (Oplev) TF of Type B1

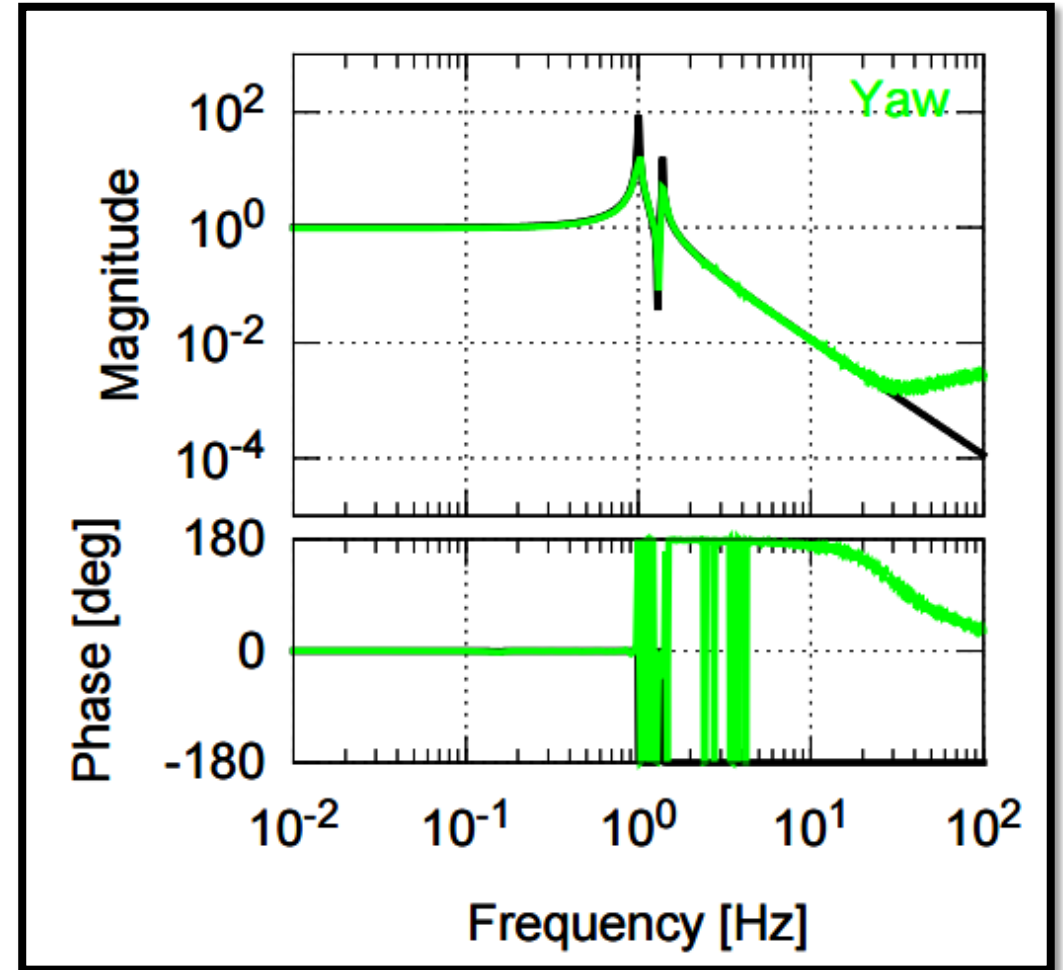


Investigation of TypeBpp Frequency response

YTM (OSEM) TF

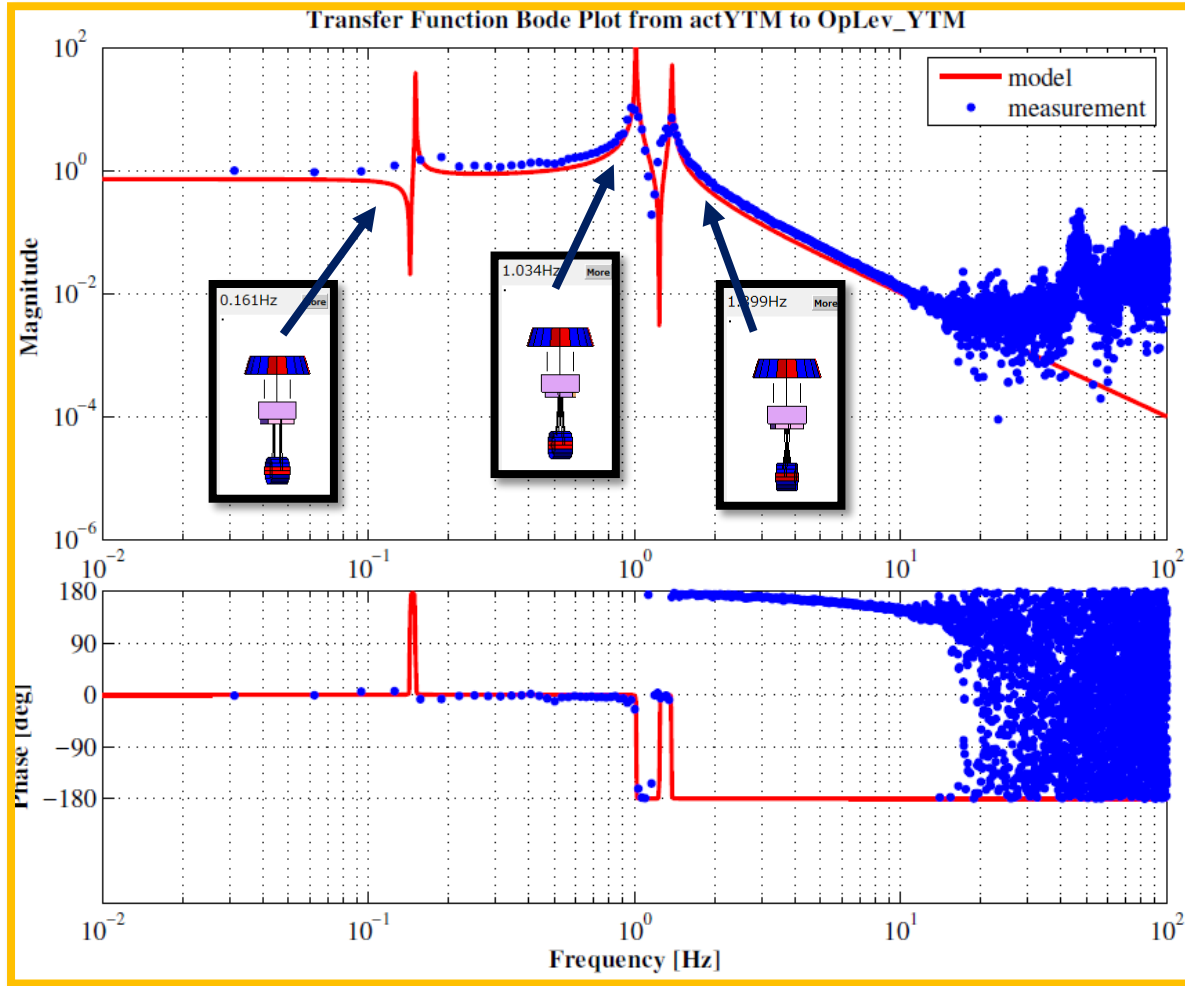


REF : LTM (OSEM) TF of 20 m SAS

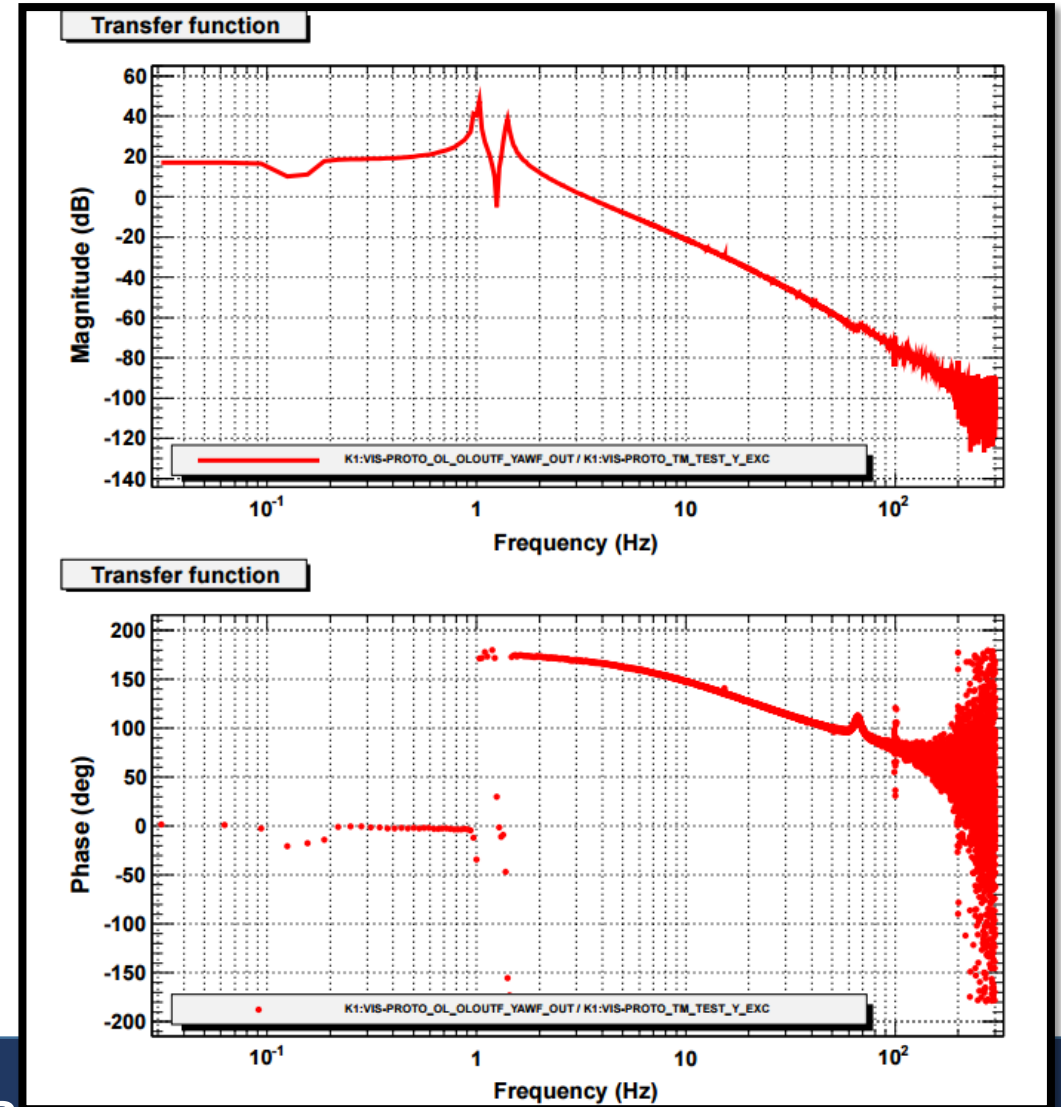


Investigation of TypeBpp Frequency response

YTM (Oplev) TF



REF : YTM (Oplev) TF of Type B1



Spectra

with No Control
using 90 percentile seismic noise



2 Seismic noise level at the Kamioka site

The seismic displacement and velocity we used is shown in Fig.2 and ??[2]. This is the one called high-noise model. The seismic displacement in Kamioka is below this level for 90 % of time.

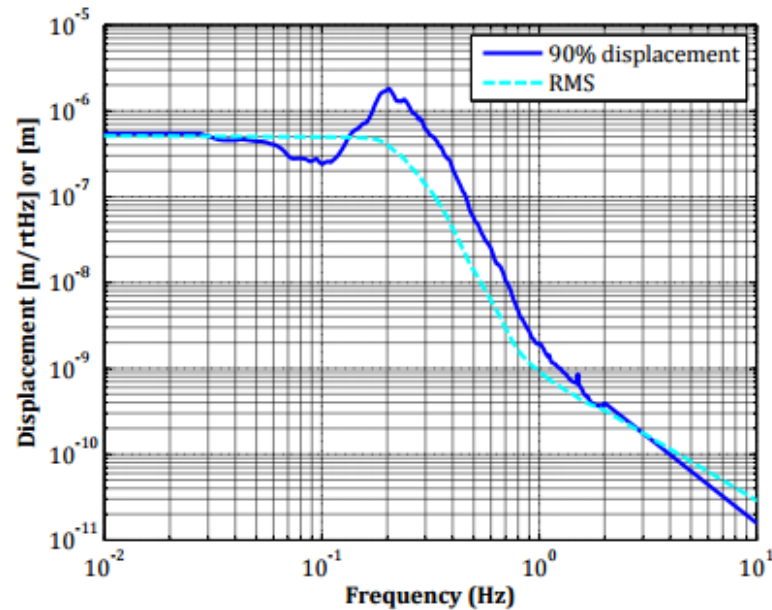


Figure 1: The high-level seismic displacement in Kamioka.

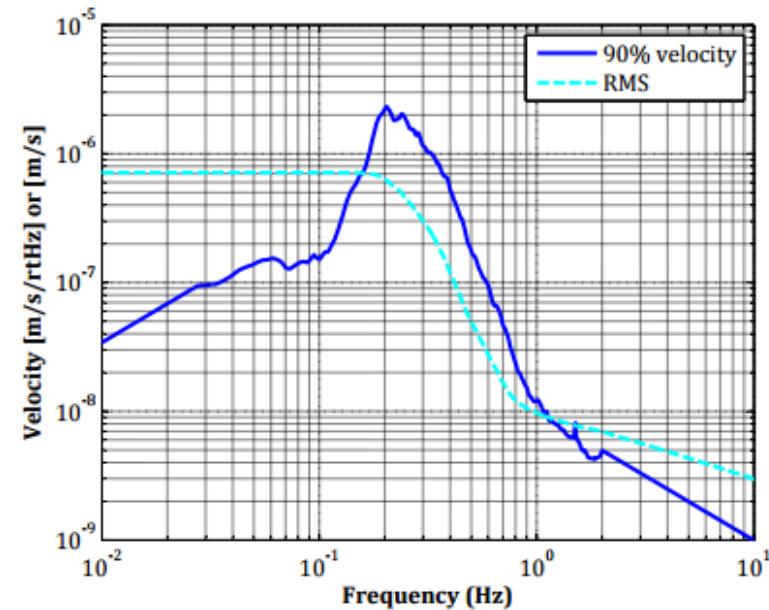
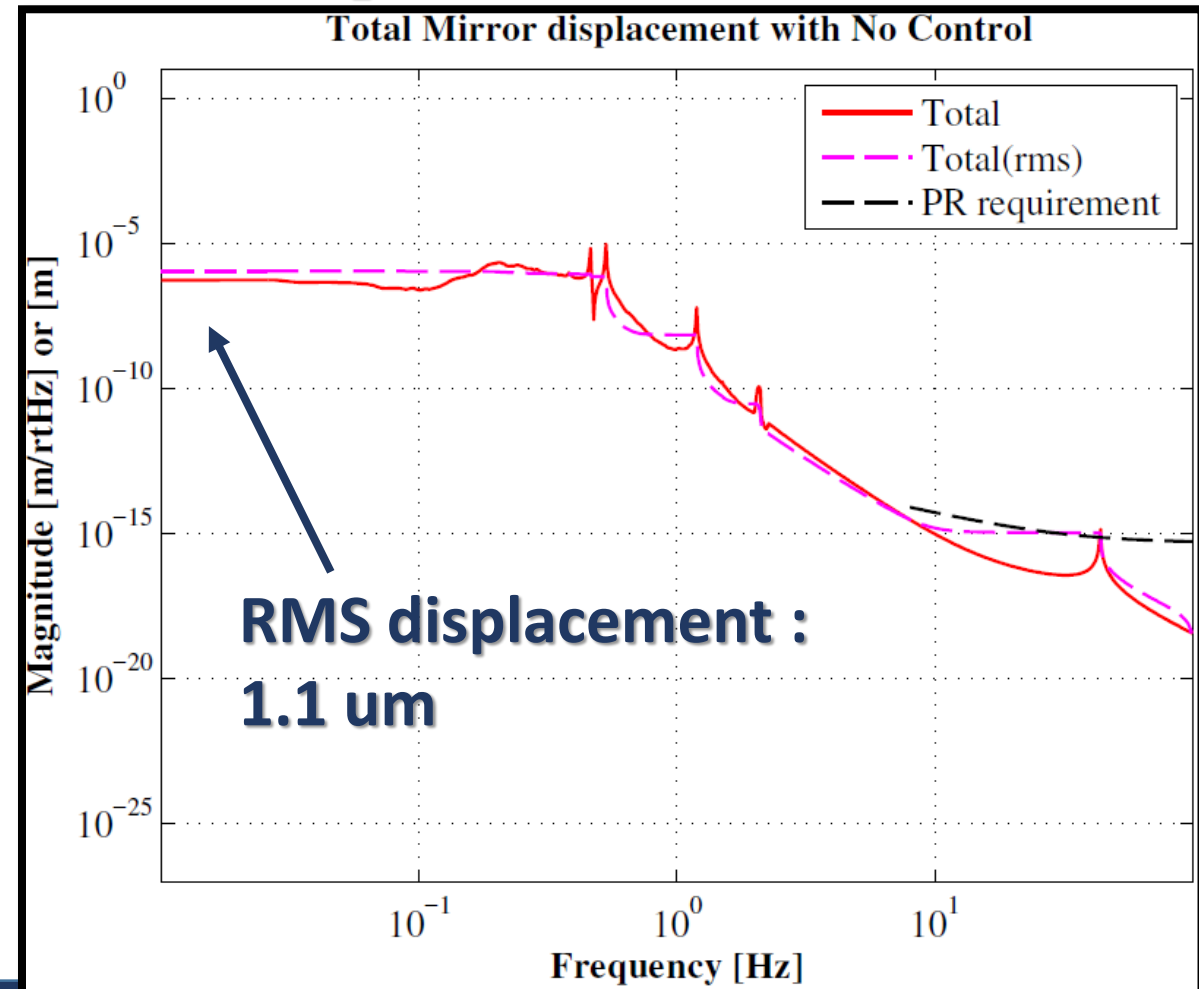
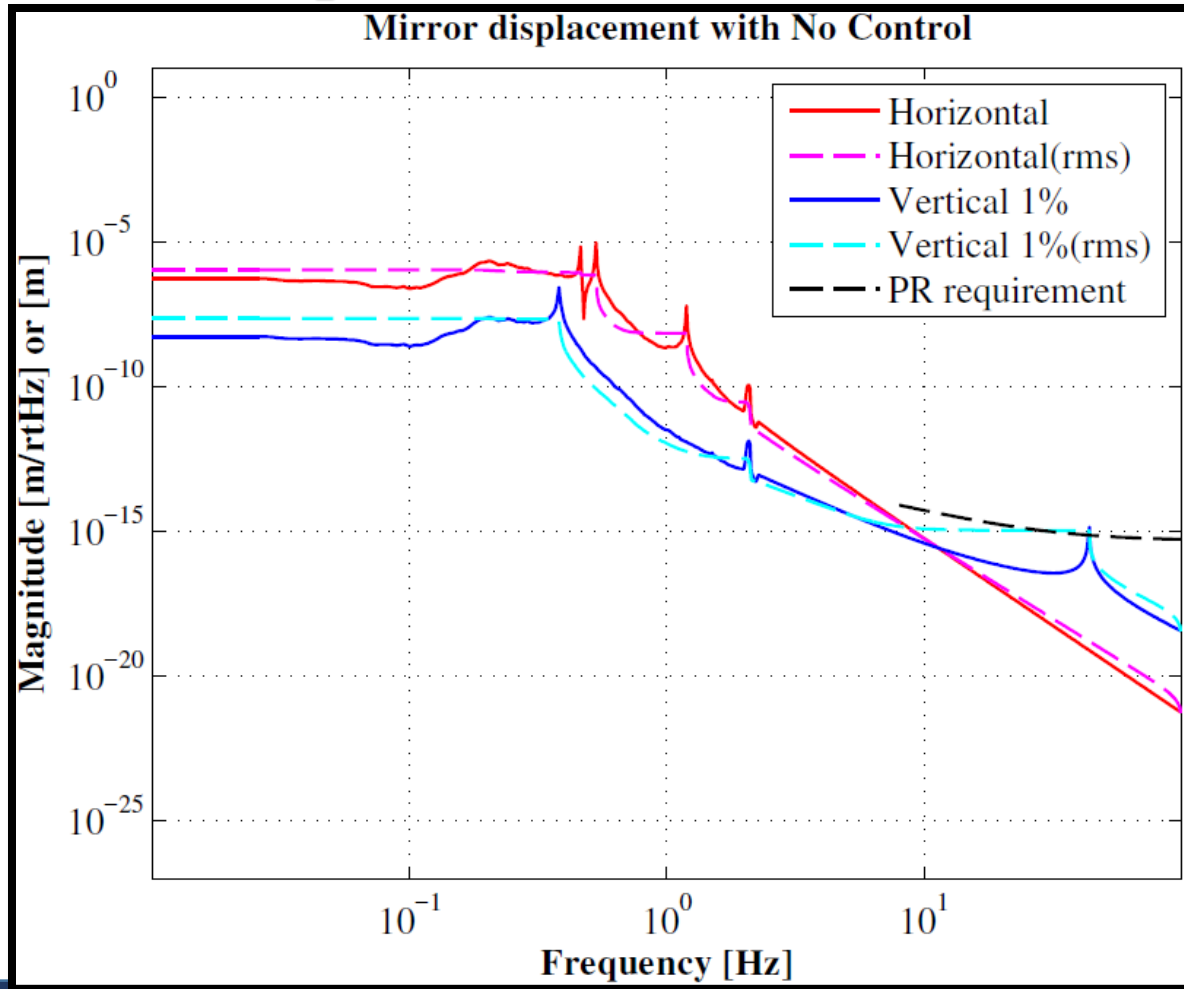


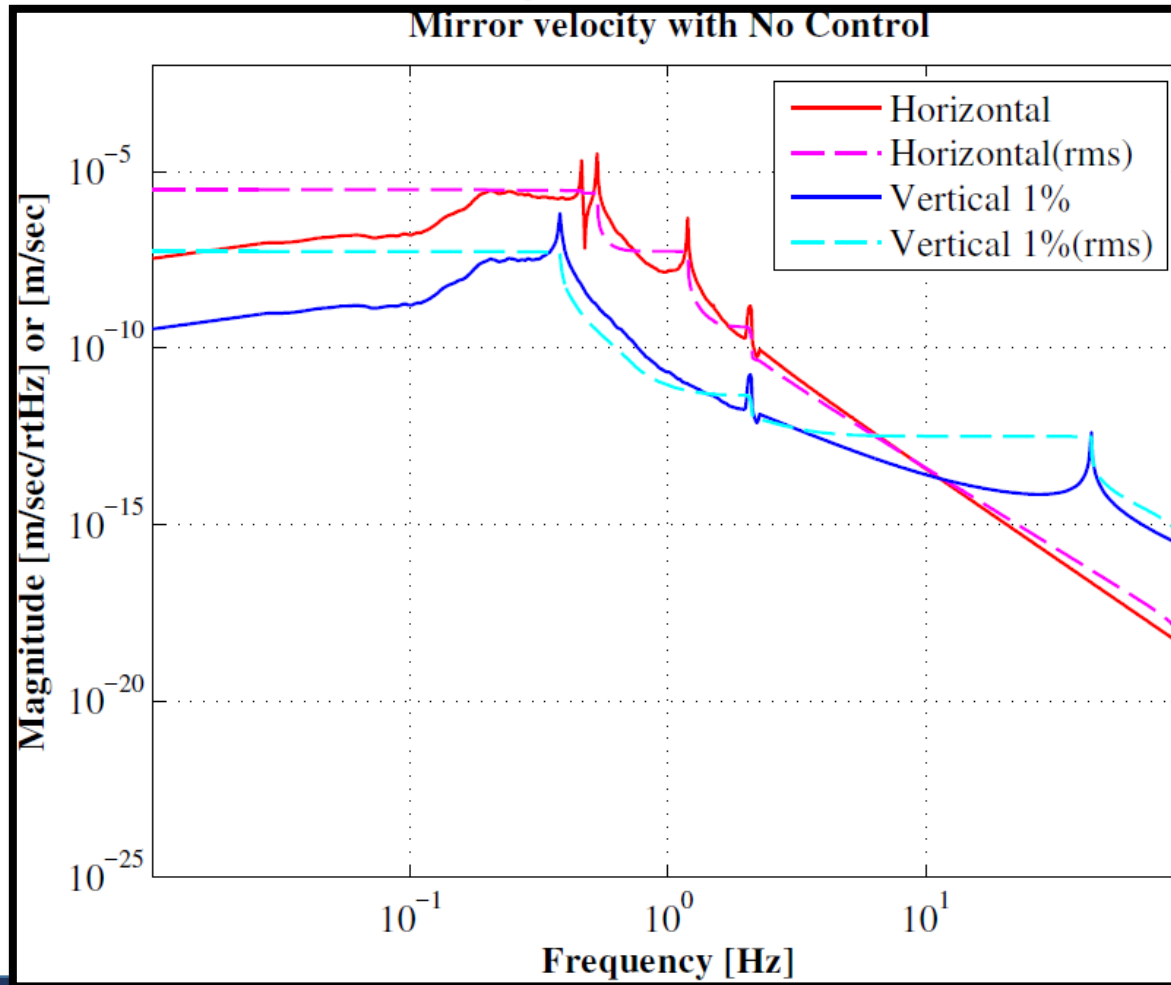
Figure 2: The high-level seismic velocity in Kamioka.

TM displacement : H and V 1%

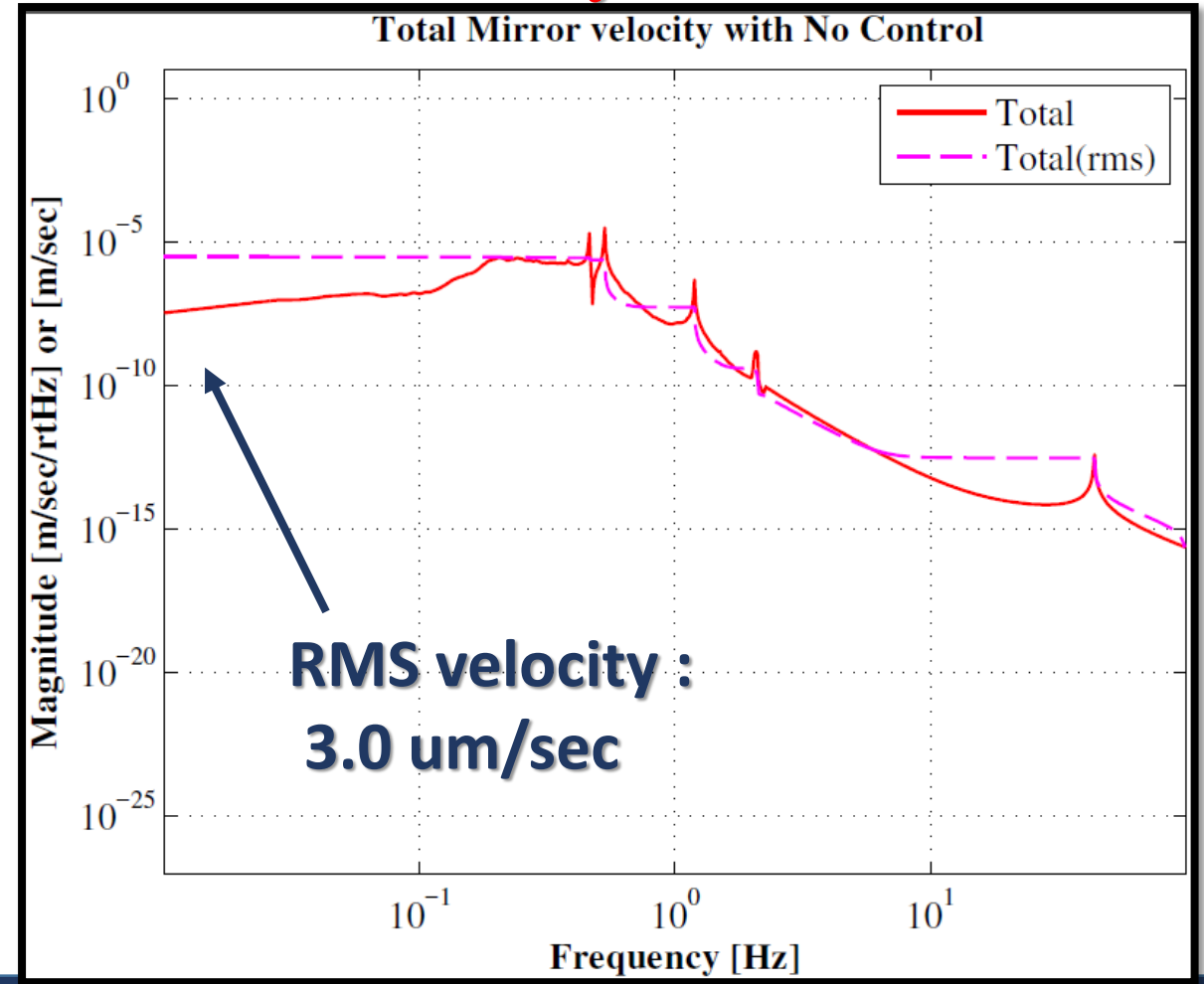
TM displacement : H + V 1%



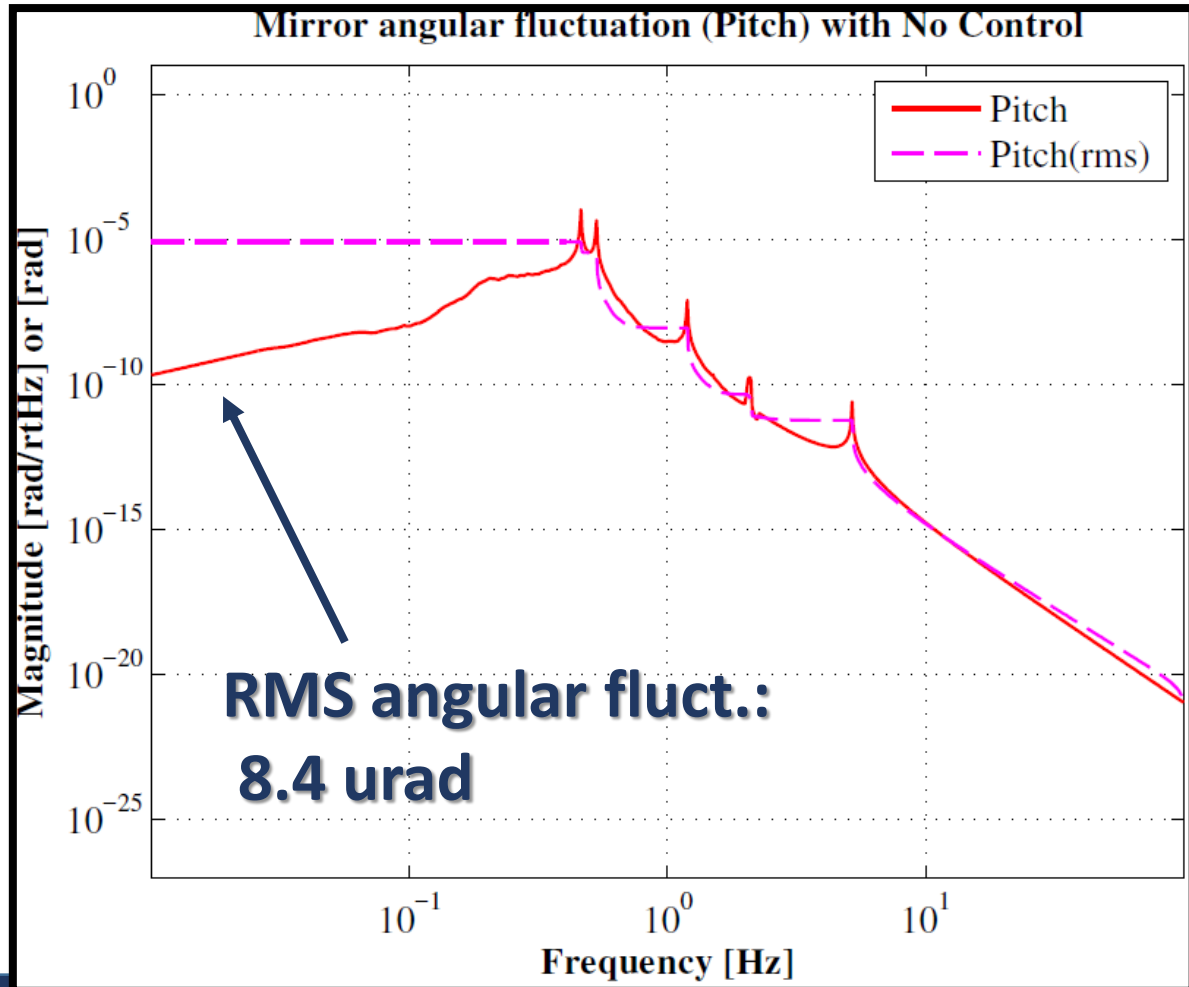
TM velocity : H and V 1%



TM velocity : H + V 1%



TM Angular fluctuation : LGND >> Pitch



Control Simulation

Calculated by Simulink tool

