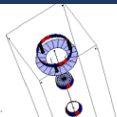
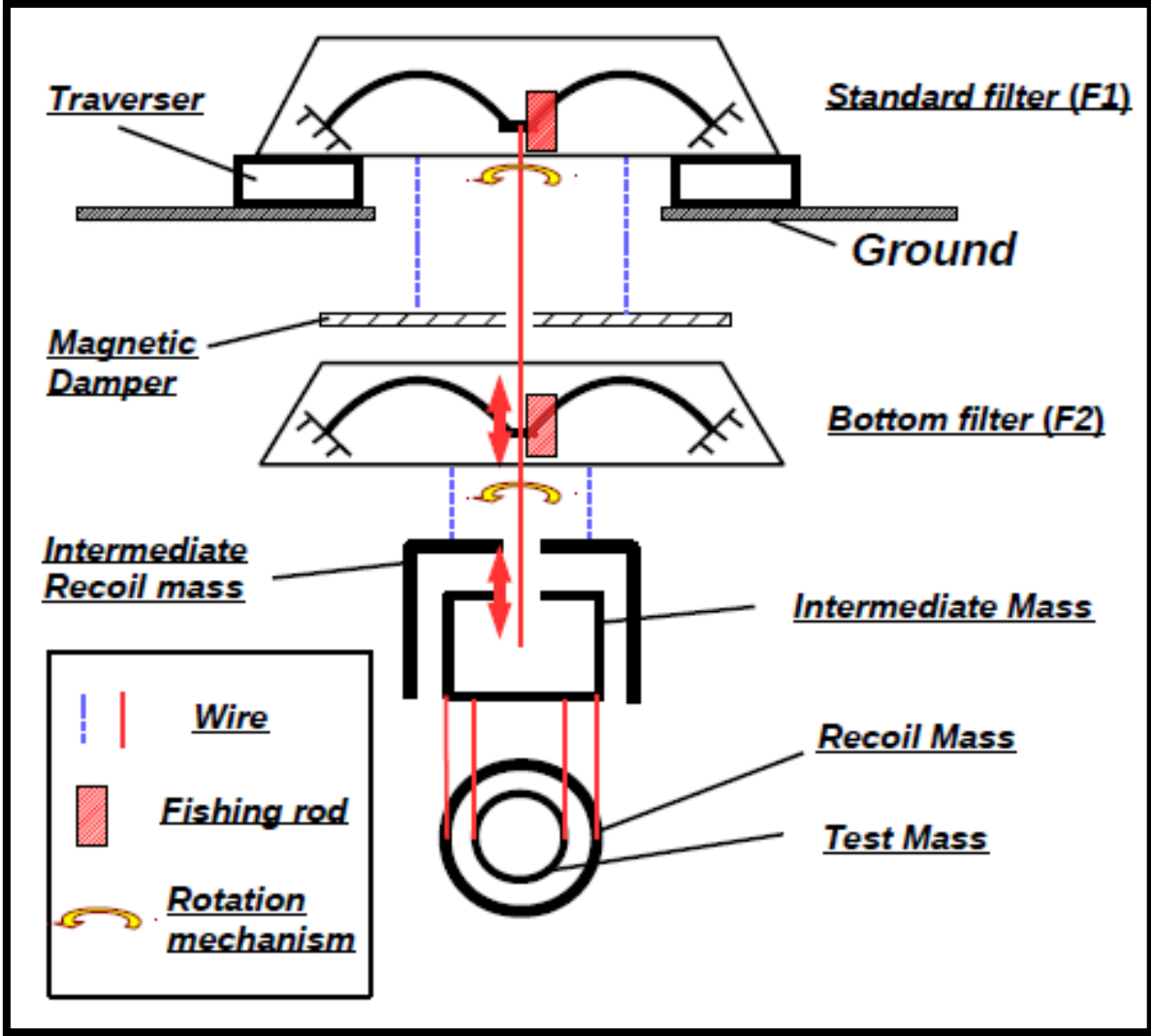


TypeBp with MD



Mechanical response

Calculated by SUMCON (and Simulink)

SUMCON in *Mathematica*
sension odel structor

SUMCON Version:1.32
About SUMCON Version Info Refresh

New Model Load Model Save Model typeBp_wMD160110.m

Model Construction Calculation Result Export Model

TypeBp with MD 160110

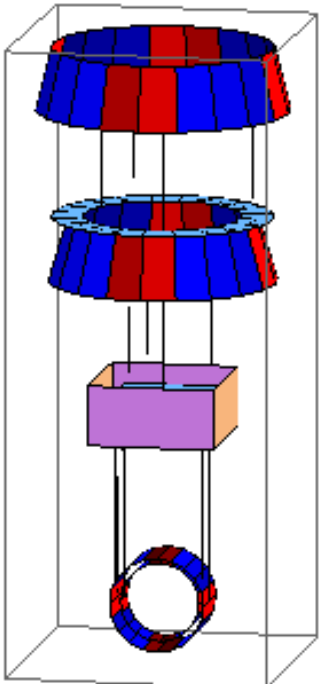
Model Basic Information

Degrees of Freedom:
 36 State Variables
 6 Input Variables
 2 Float Variables

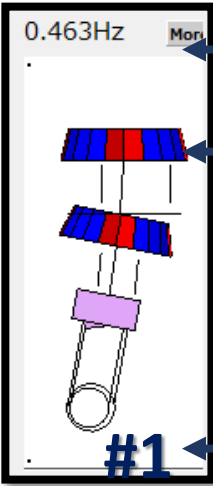
Ground Position:
 $x_{F1} \rightarrow 0.$ $y_{F1} \rightarrow 0.$ $z_{F1} \rightarrow 0.$ $pitch_{F1} \rightarrow 0.$ $yaw_{F1} \rightarrow 0.$ $roll_{F1} \rightarrow 0.$

Equilibrium Point:

$x_{F2} \rightarrow 0.$	$y_{F2} \rightarrow -0.5435$	$z_{F2} \rightarrow 0.$	$pitch_{F2} \rightarrow 0.$	$yaw_{F2} \rightarrow 0.$	$roll_{F2} \rightarrow 0.$
$x_{IR} \rightarrow 0.$	$y_{IR} \rightarrow -1.0461$	$z_{IR} \rightarrow 0.$	$pitch_{IR} \rightarrow 0.$	$yaw_{IR} \rightarrow 0.$	$roll_{IR} \rightarrow 0.$
$x_{IM} \rightarrow 0.$	$y_{IM} \rightarrow -1.0762$	$z_{IM} \rightarrow 0.$	$pitch_{IM} \rightarrow 0.$	$yaw_{IM} \rightarrow 0.$	$roll_{IM} \rightarrow 0.$
$x_{RM} \rightarrow 0.$	$y_{RM} \rightarrow -1.6632$	$z_{RM} \rightarrow 0.$	$pitch_{RM} \rightarrow 0.$	$yaw_{RM} \rightarrow 0.$	$roll_{RM} \rightarrow 0.$
$x_{TM} \rightarrow 0.$	$y_{TM} \rightarrow -1.6632$	$z_{TM} \rightarrow 0.$	$pitch_{TM} \rightarrow 0.$	$yaw_{TM} \rightarrow 0.$	$roll_{TM} \rightarrow 0.$
$x_{MD} \rightarrow 0.$	$y_{MD} \rightarrow -0.44$	$z_{MD} \rightarrow 0.$	$pitch_{MD} \rightarrow 0.$	$yaw_{MD} \rightarrow 0.$	$roll_{MD} \rightarrow 0.$
$h_{GAS2} \rightarrow 0.046$	$h_{GAS1} \rightarrow 0.0099$				



Eigen Mode List



Resonance frequency

Eigen mode shape

RIM Sensing / Excitation point

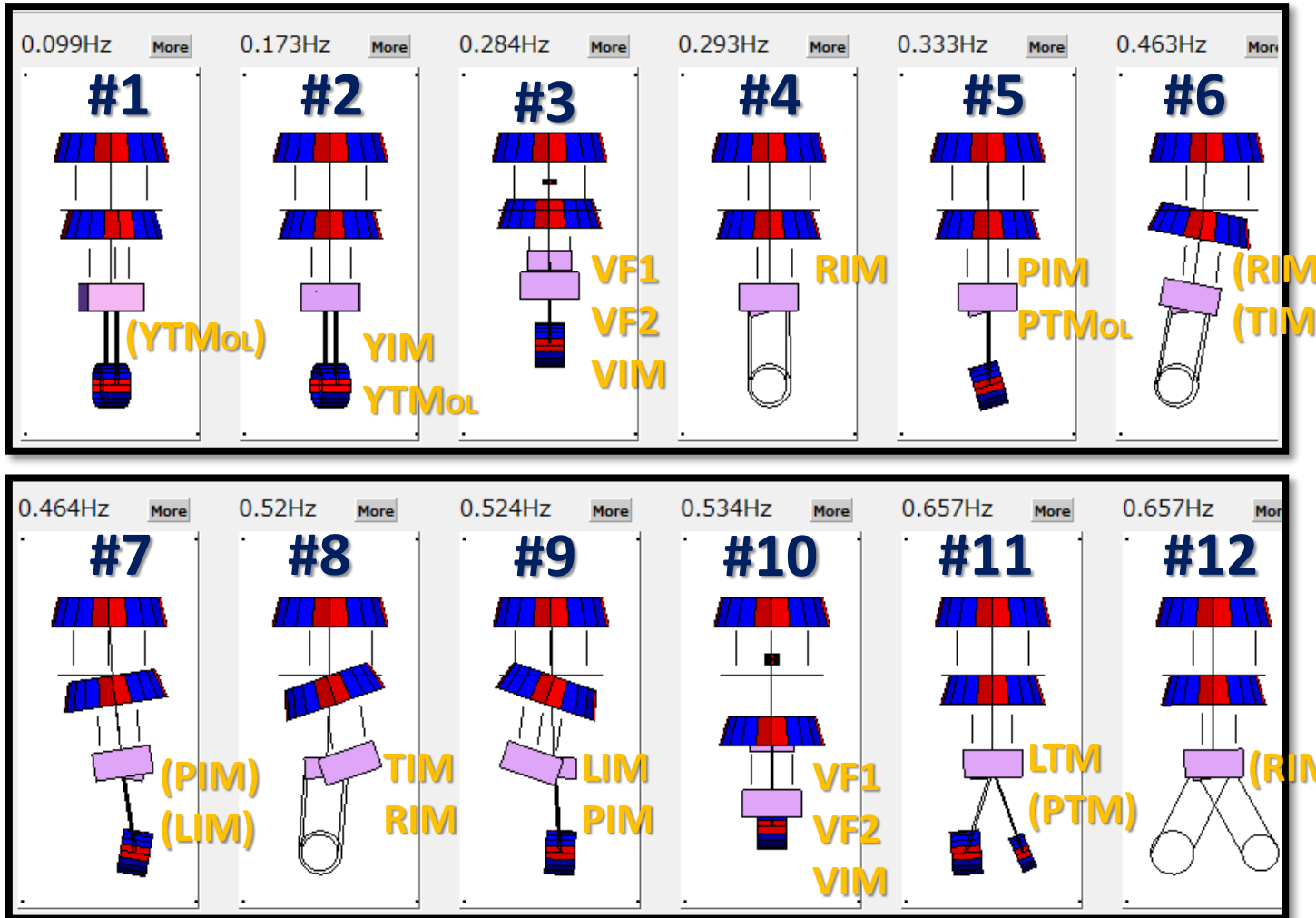
() Hardly seen/excited

x Cannot be seen/excited

Eigen mode number



Eigen Mode Shape



#1 : YWholeChain #7 : LPendulum

#2 : YPayload #8 : RF2

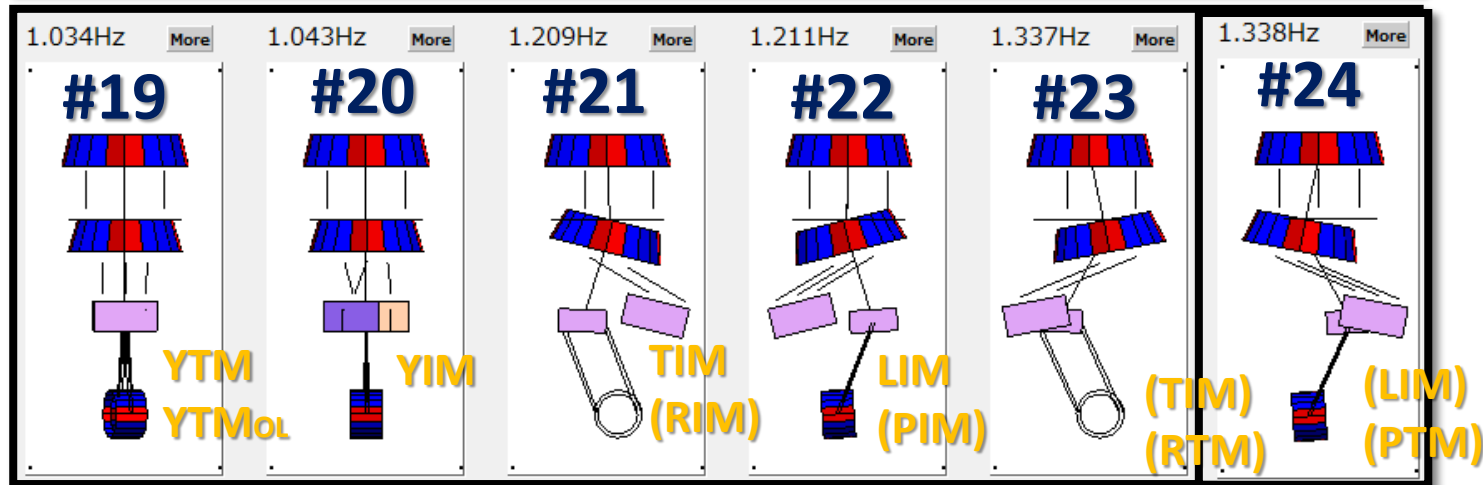
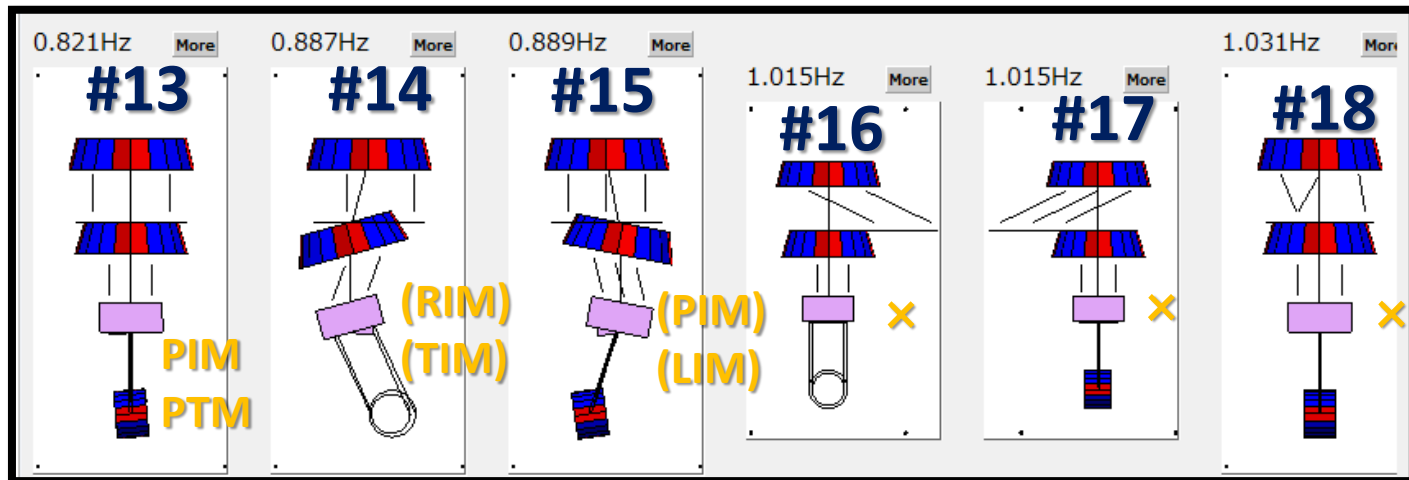
#3 : VPaylaod #9 : PF2

#4 : RPaylaod #10 : GAS

#5 : PPayload #11 : LTM

#6 : TPendulum #12 : TTM

Eigen Mode Shape



#13 : PTM

#14 : Pendulum

#15 : Pendulum

#16 : TMD

#17 : LMD

#18 : YMD

#19 : YTM
(YTN, -YRM)

#20 : YIR

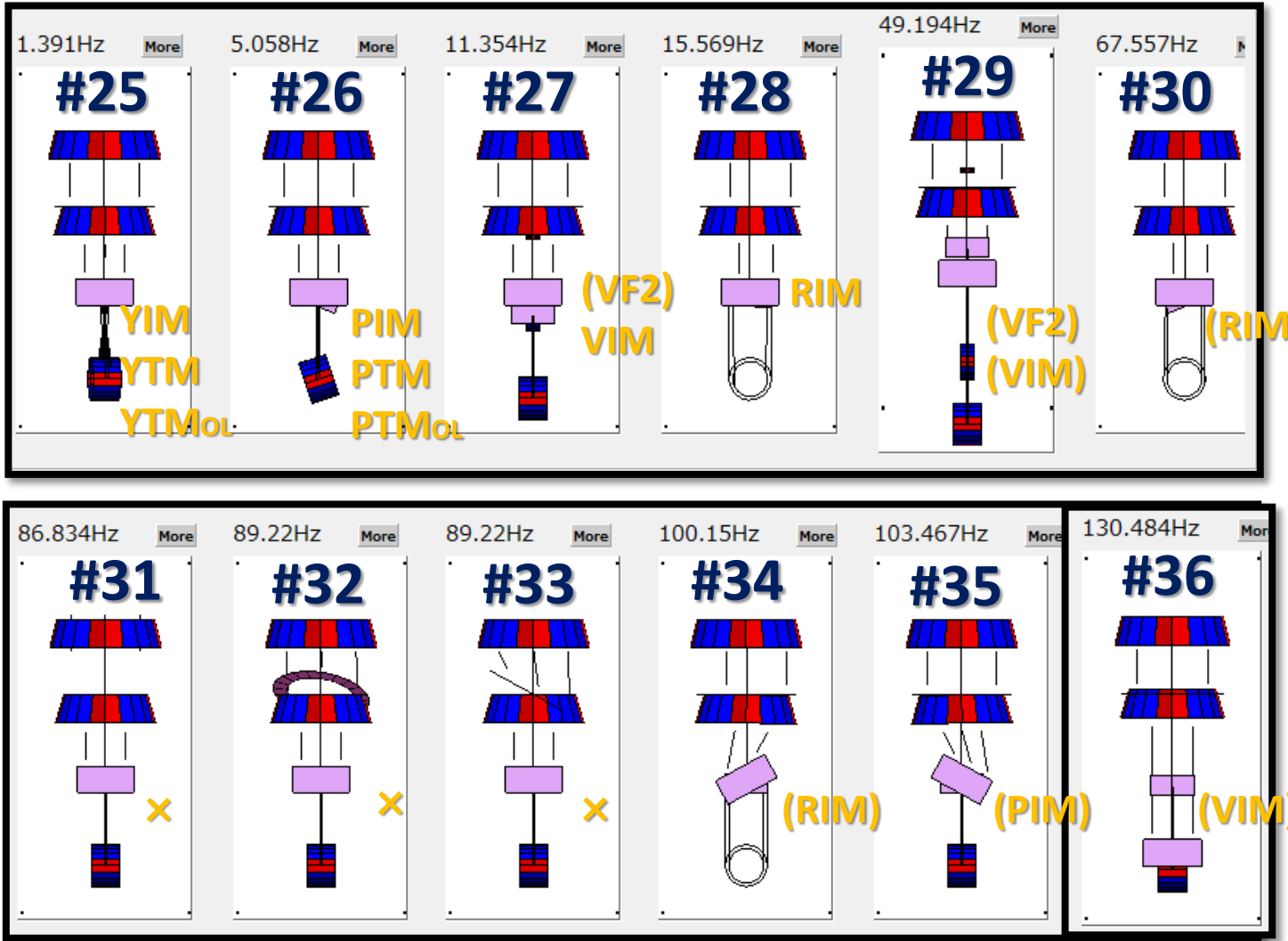
#21 : TIR

#22 : LIR

#23 : TPendulum

#24 : LPendulum

Eigen Mode Shape



#25 : YTM

#26 : PRM
(PIM, -PRM)

#27 : VTM

#28 : RTM

#29 : VRM

#30 : RIM
(RIM, -RRM)

#31 : VMD

#32 : RMD

#33 : PMD

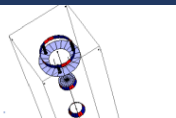
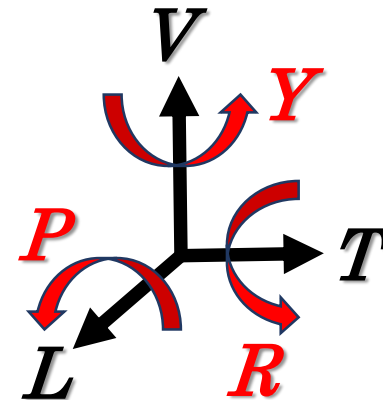
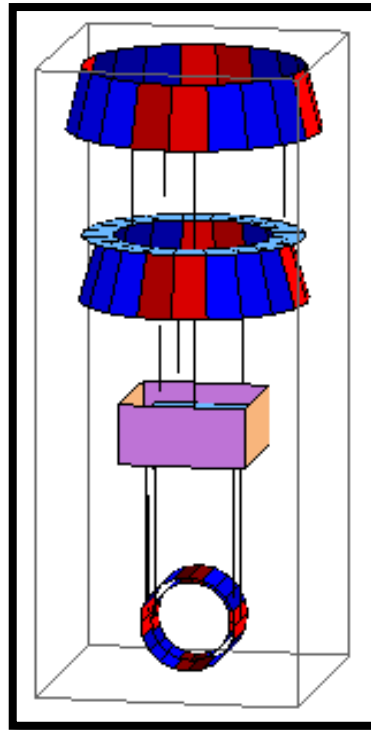
#34 : RIR

#35 : PIR

#36 : VIR

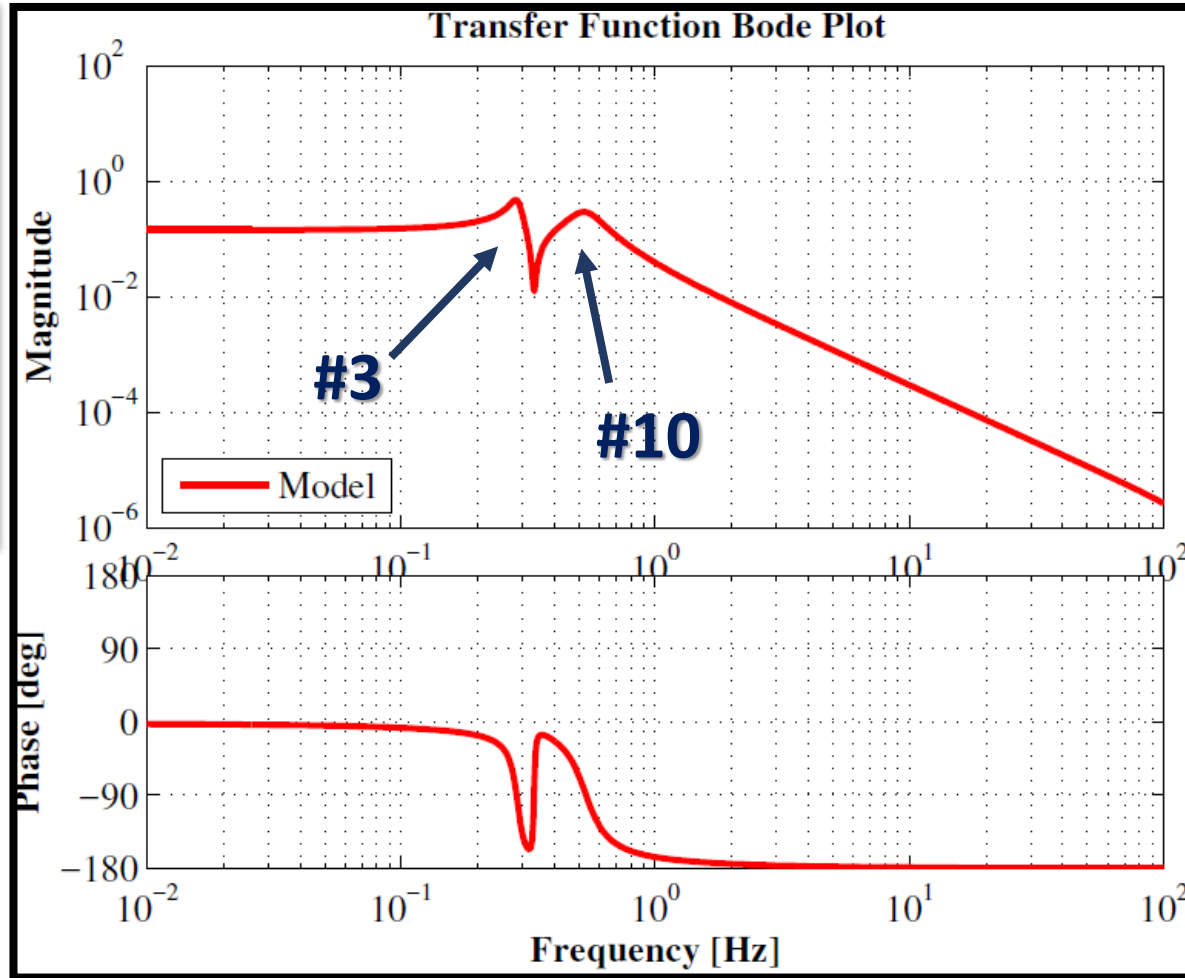
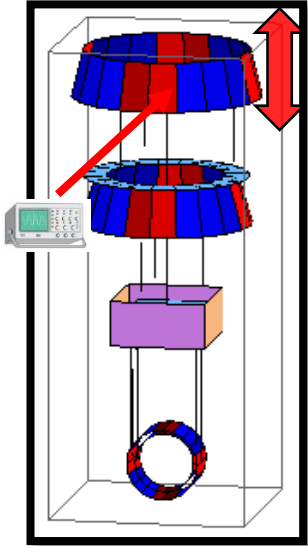
Force Transfer Functions

(, which can be measured, with No ctrl)



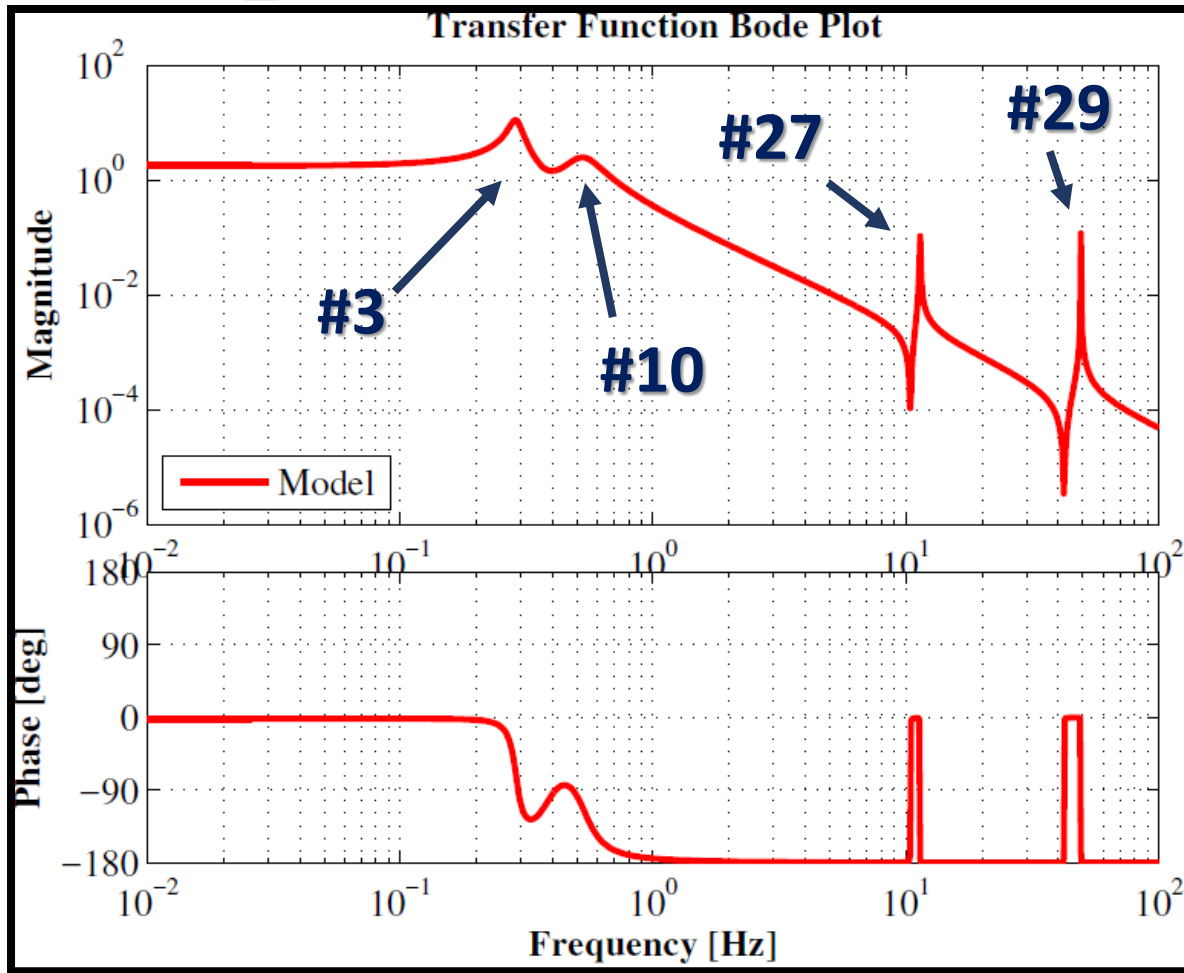
Force Transfer Function

LVDT_VF1 / actVF1



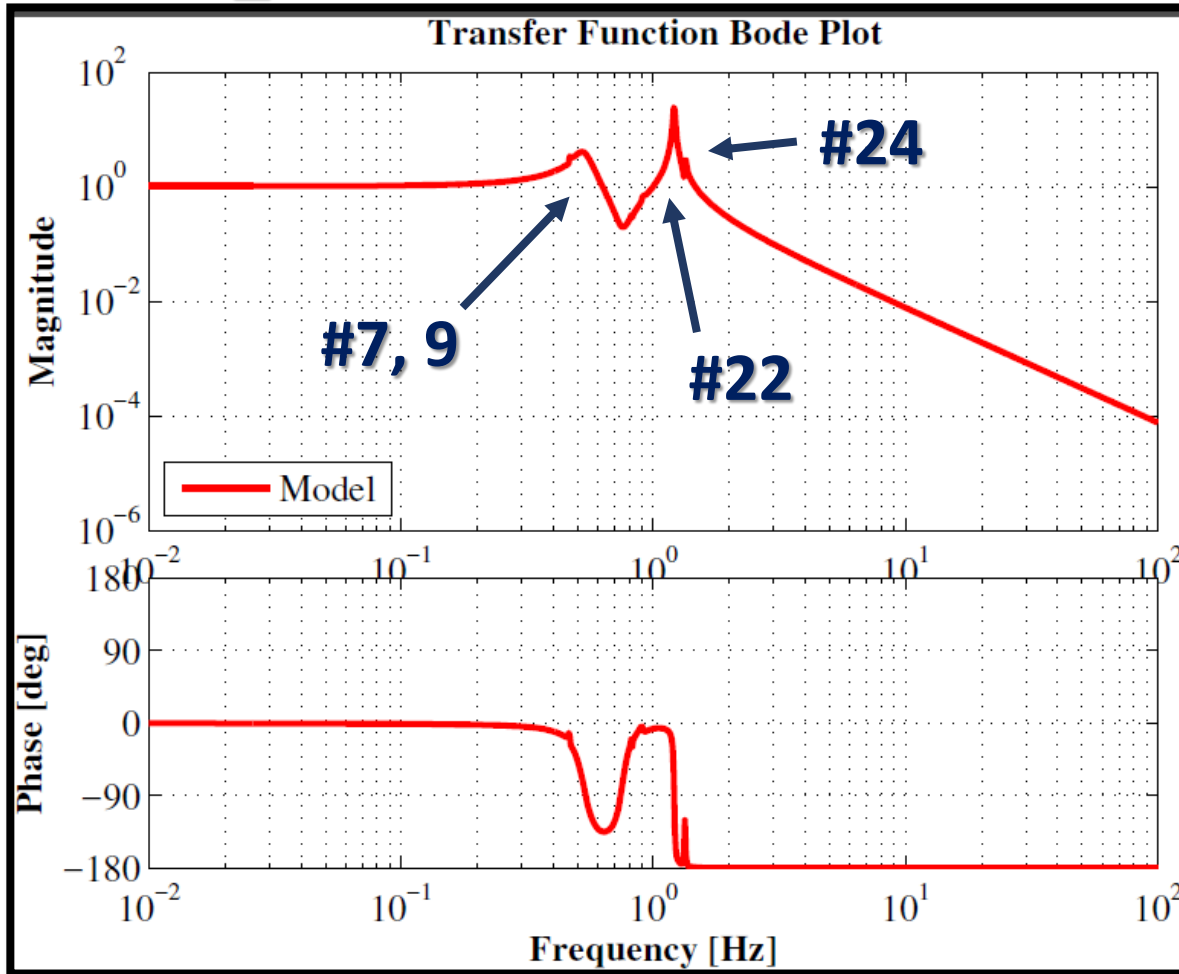
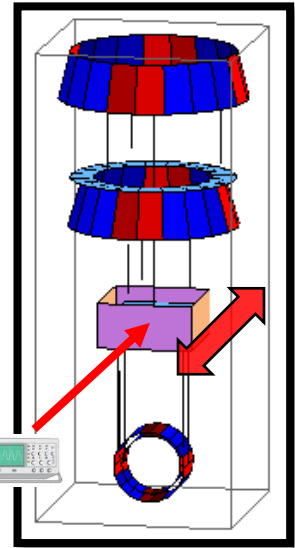
Force Transfer Function

LVDT_VF2 / actVF2



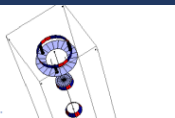
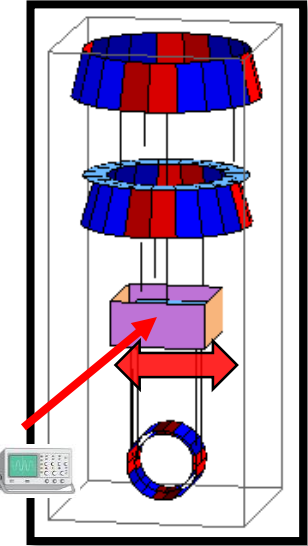
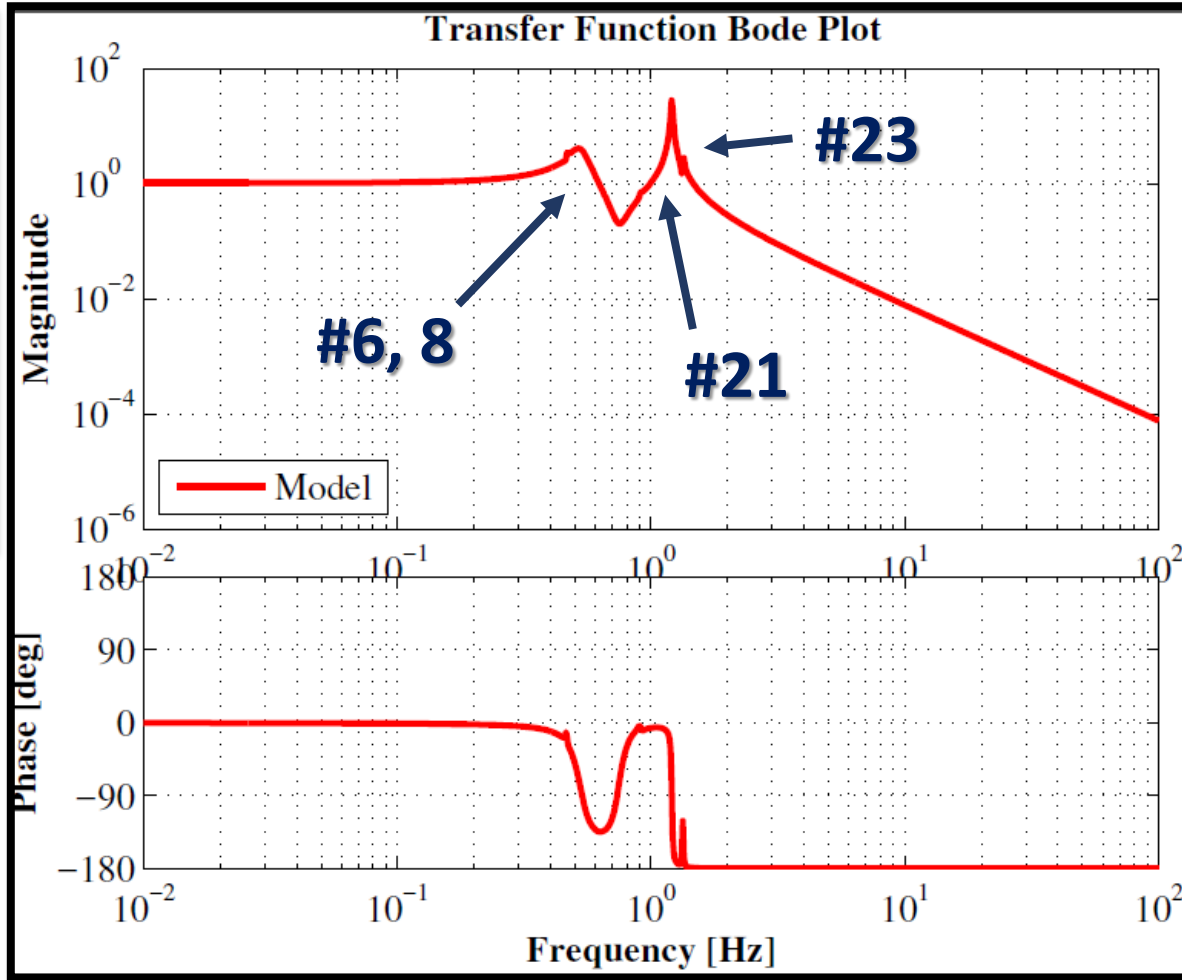
Force Transfer Function

OSEM_LIM / actLIM



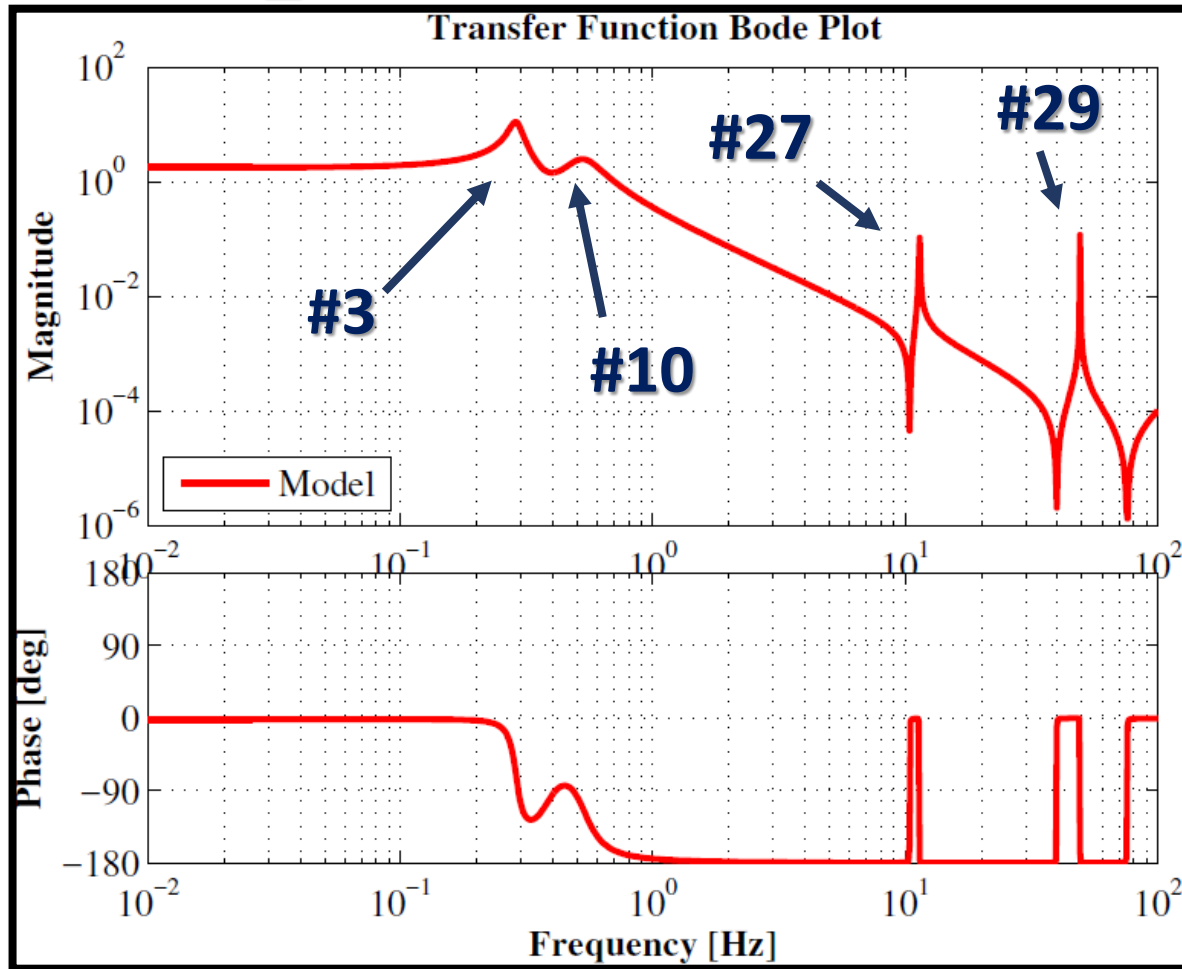
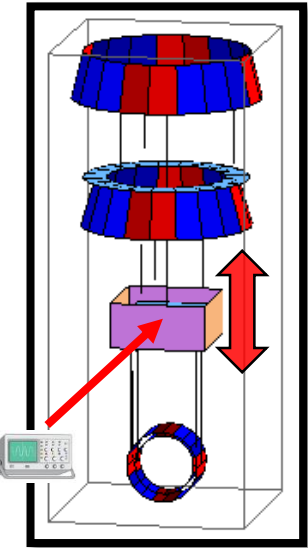
Force Transfer Function

OSEM_TIM / actTIM



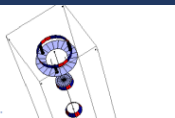
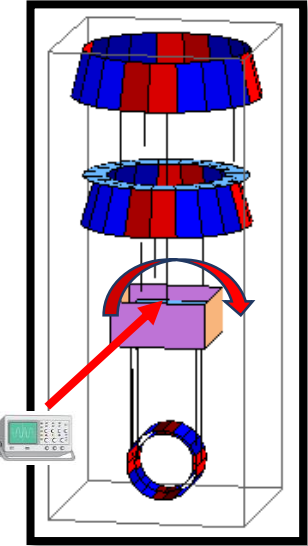
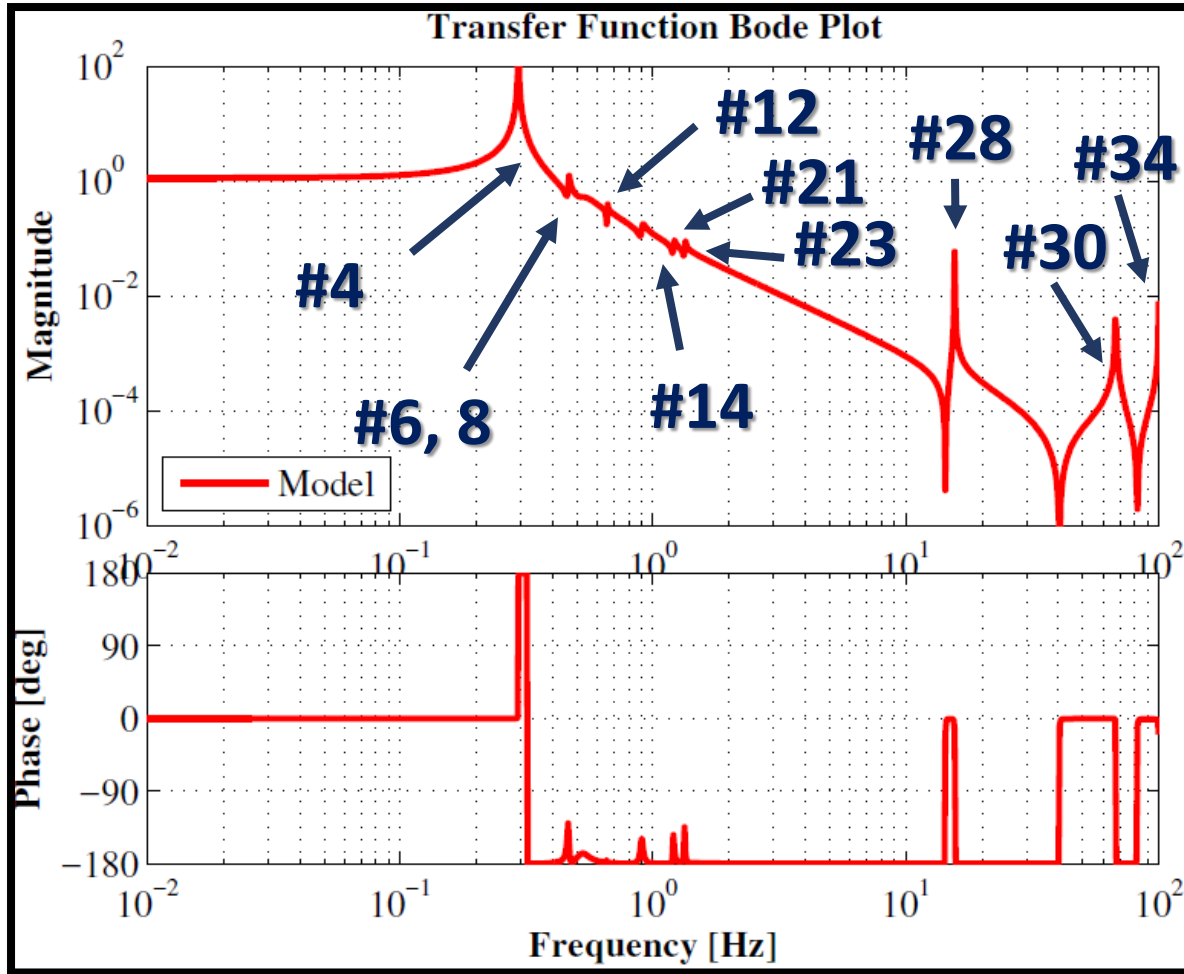
Force Transfer Function

OSEM_VIM / actVIM



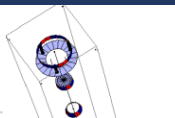
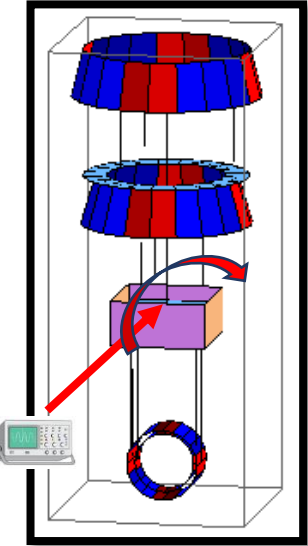
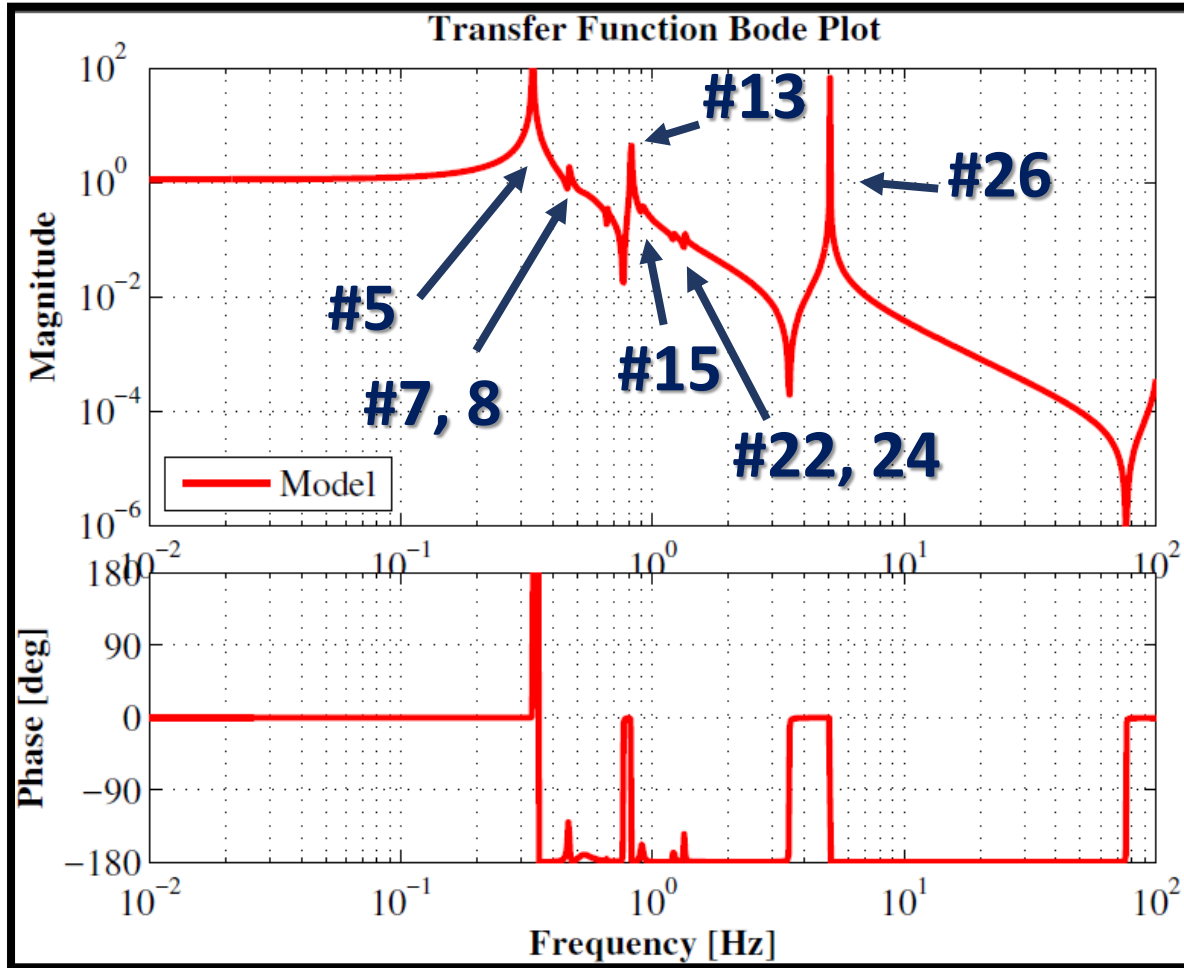
Force Transfer Function

OSEM_RIM / actRIM



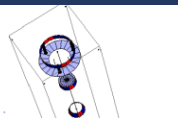
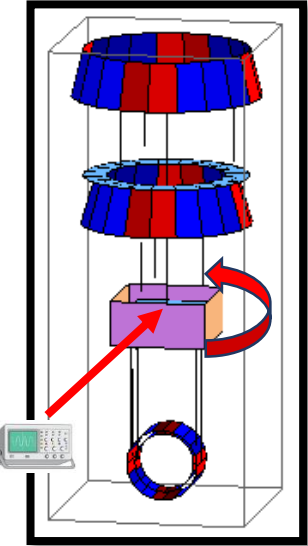
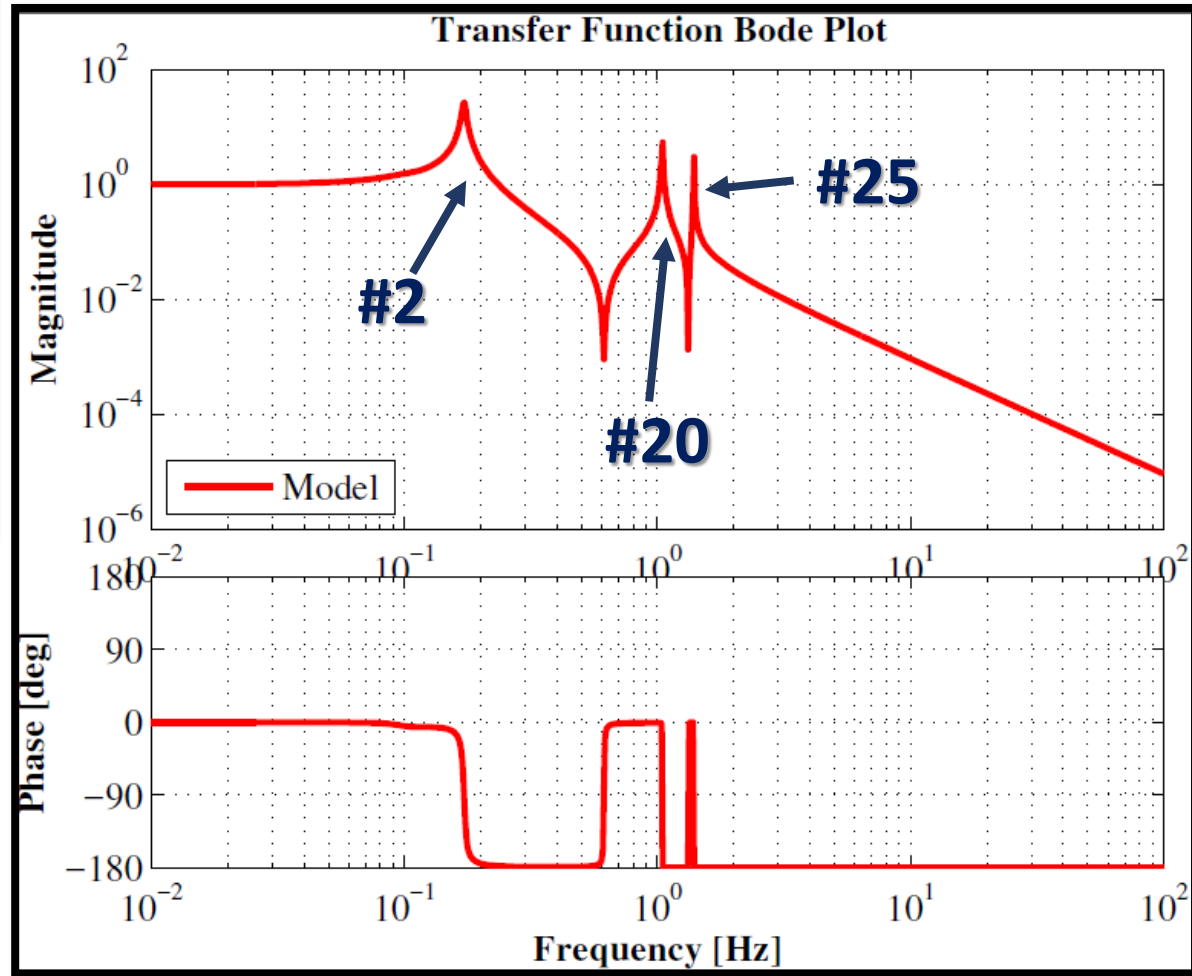
Force Transfer Function

OSEM_PIM / actPIM



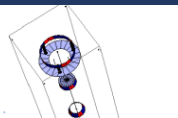
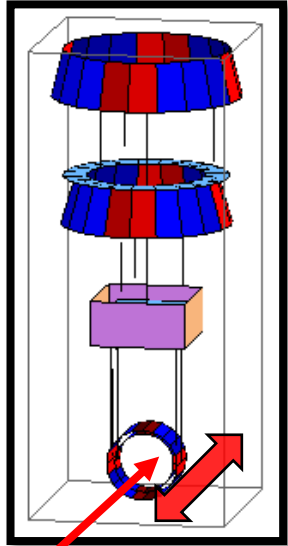
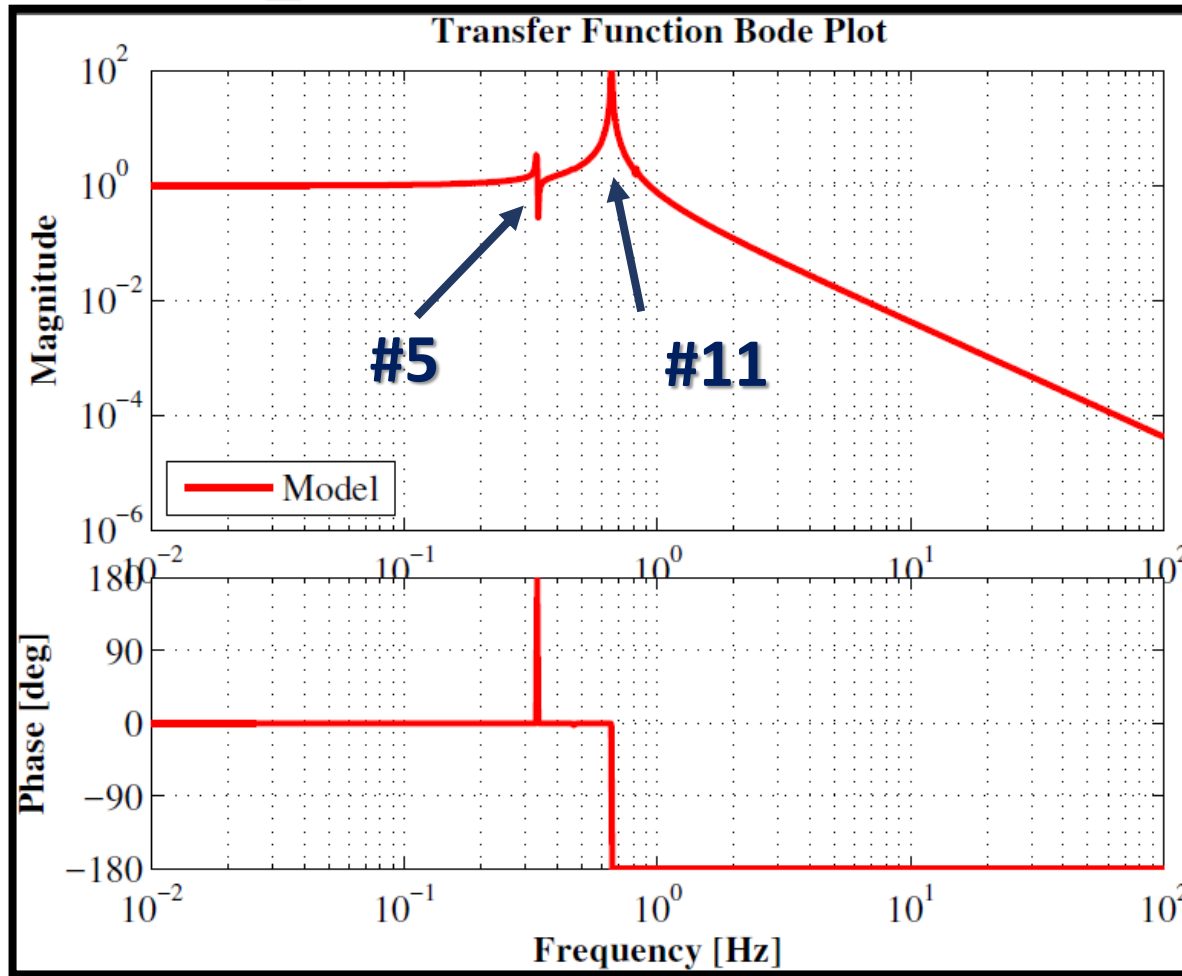
Force Transfer Function

OSEM_YIM / actYIM



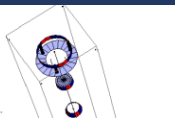
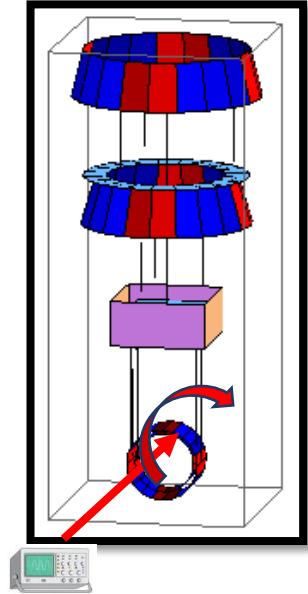
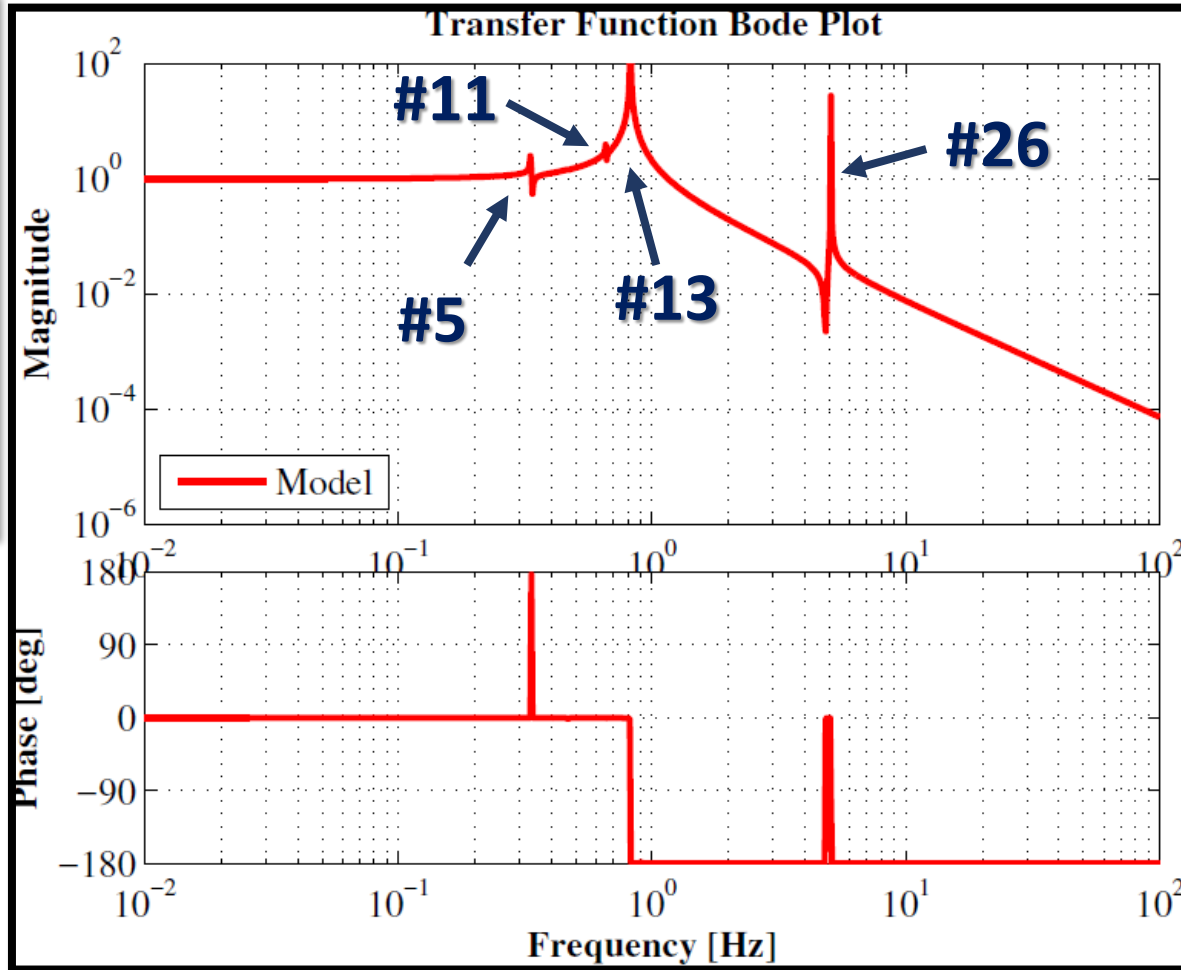
Force Transfer Function

OSEM_LTM / actLTM



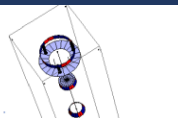
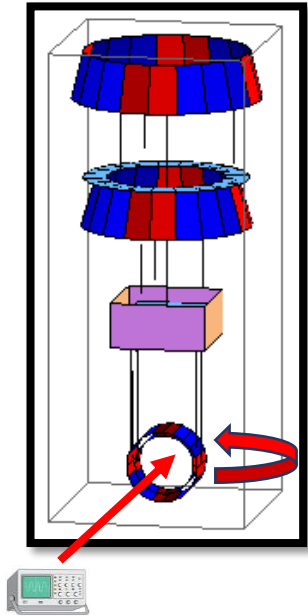
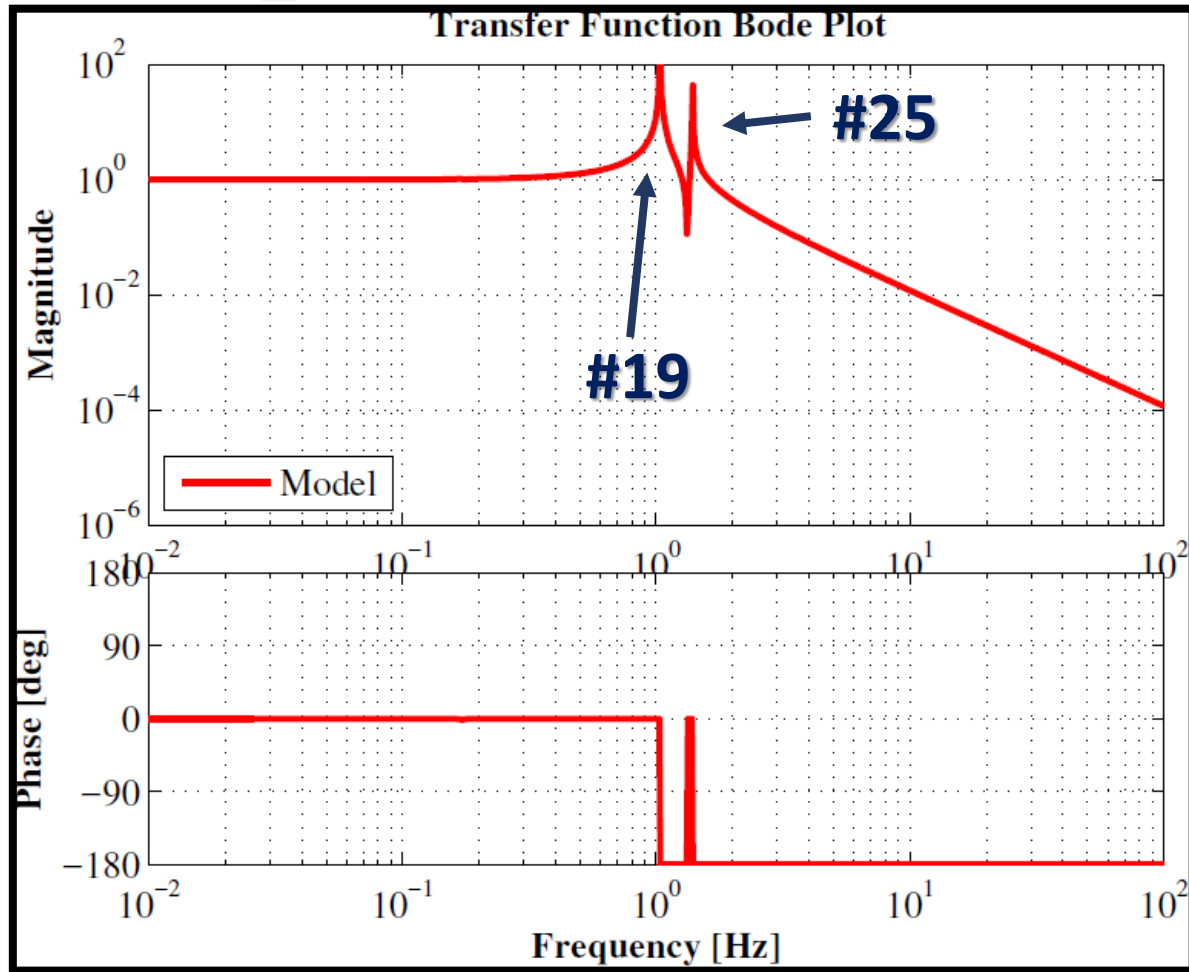
Force Transfer Function

OSEM_PTМ / actPTM



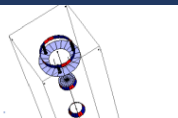
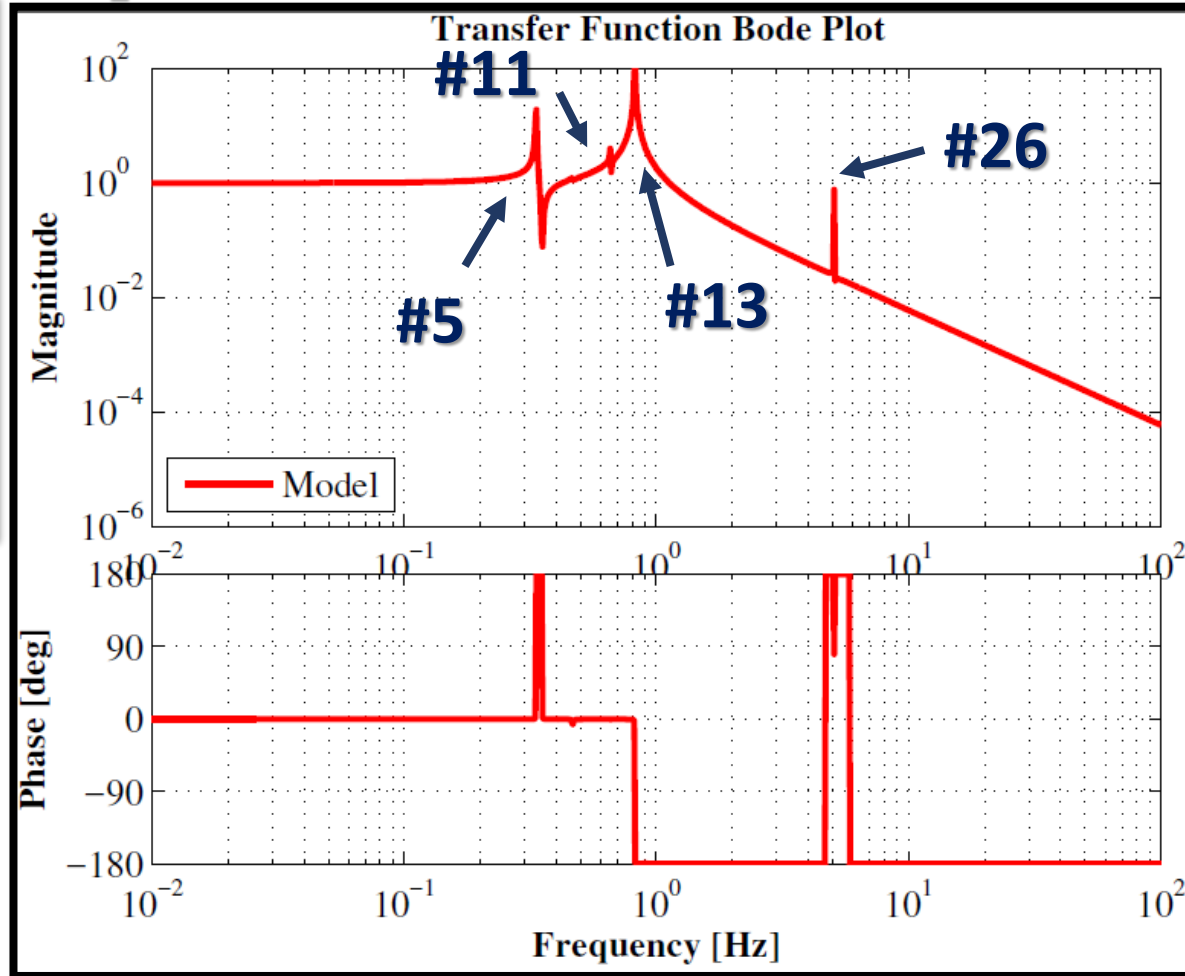
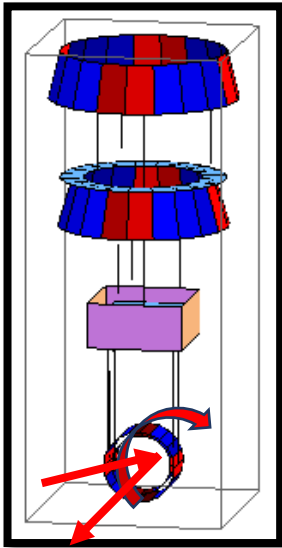
Force Transfer Function

OSEM_YTM / actYTM



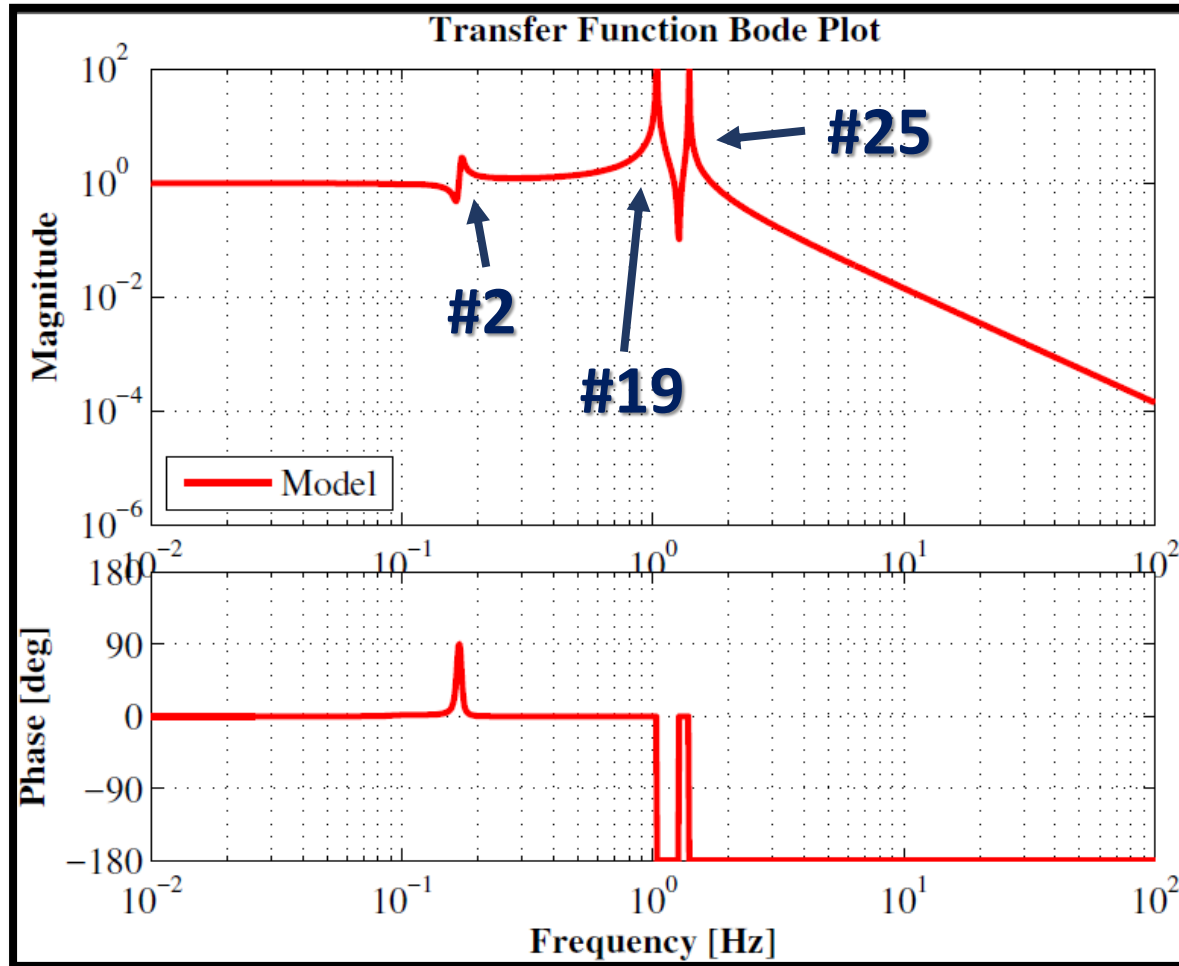
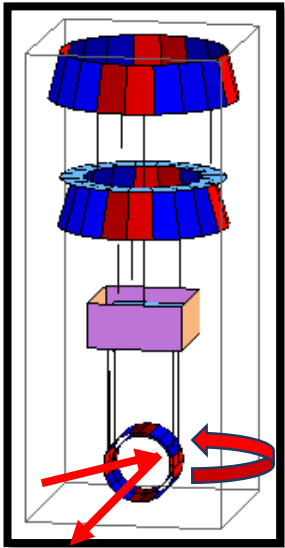
Force Transfer Function

OpLev_PTMM / actPTM



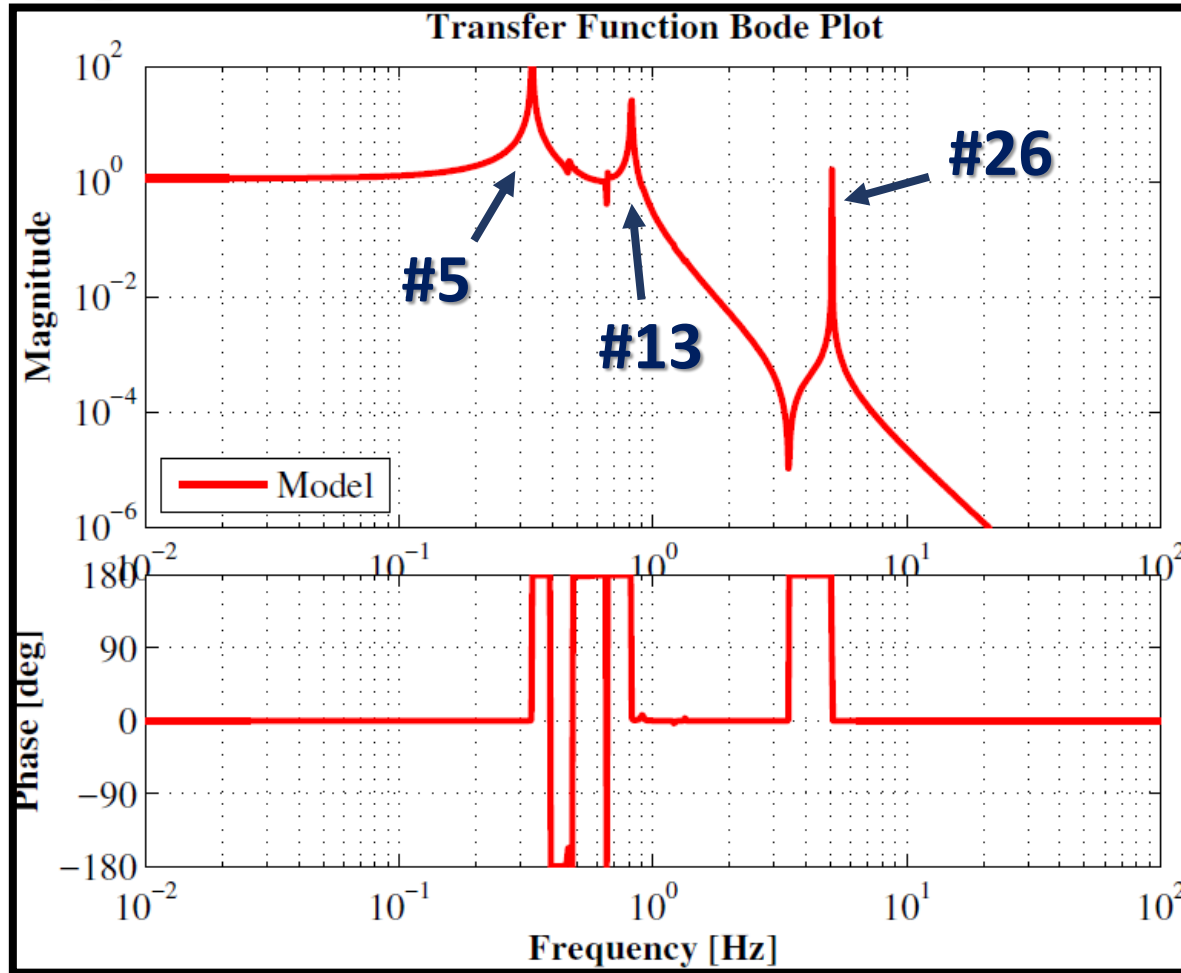
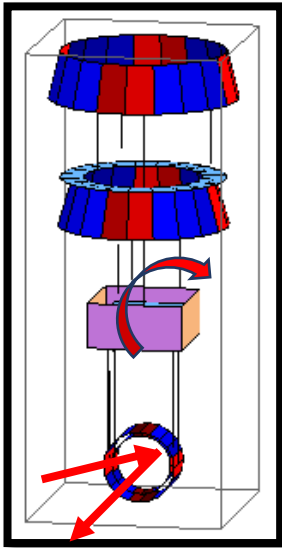
Force Transfer Function

OpLev_YTM / actYTM



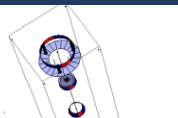
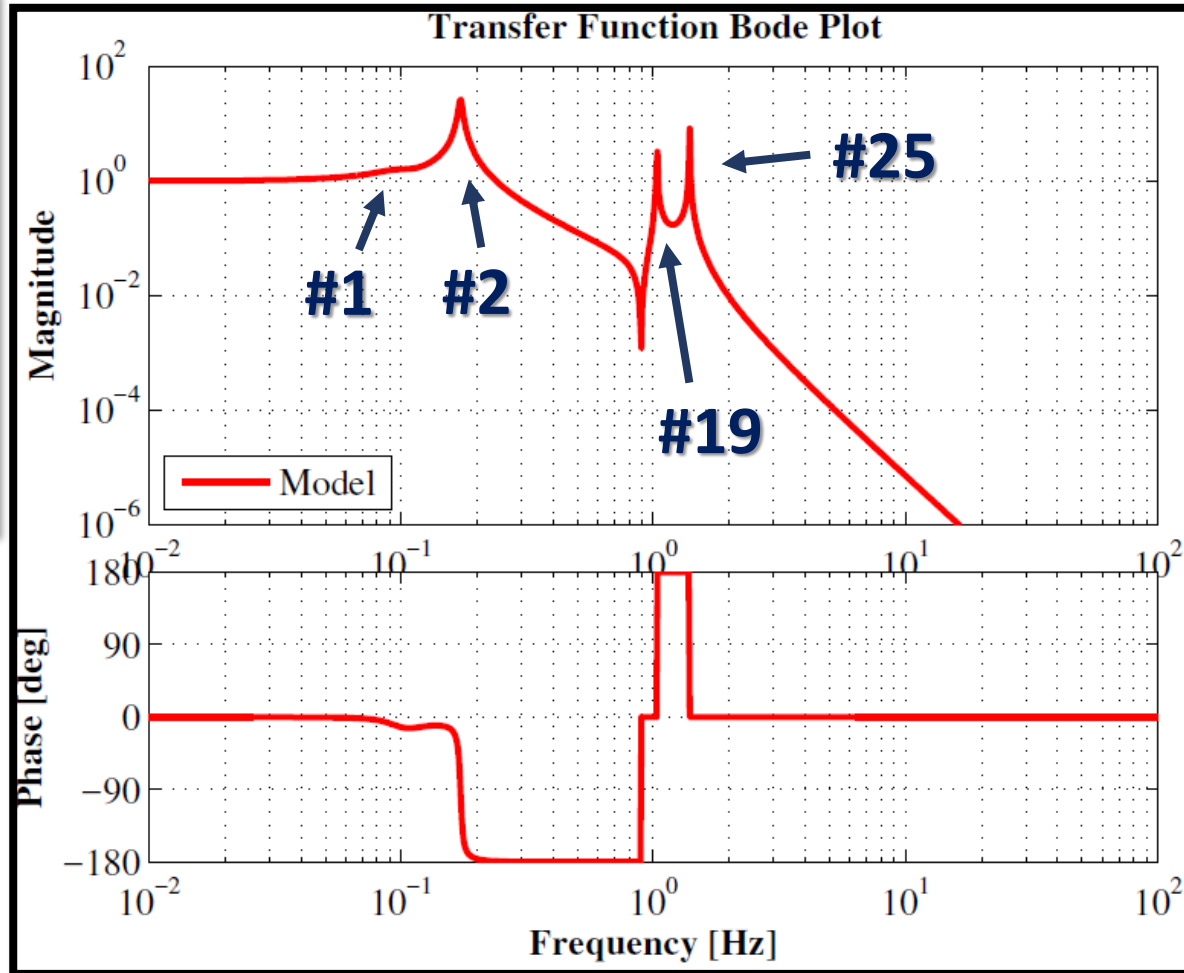
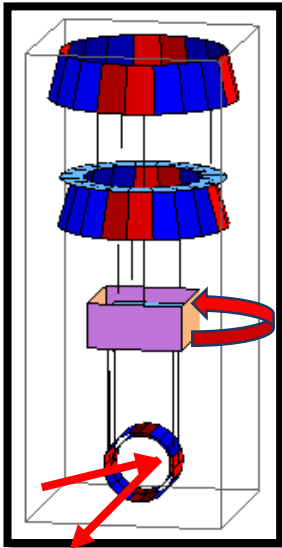
Force Transfer Function

OpLev_PTМ / actPIM



Force Transfer Function

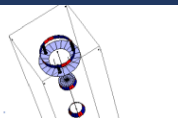
OpLev_YTM / actYIM



Spectra

without 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.

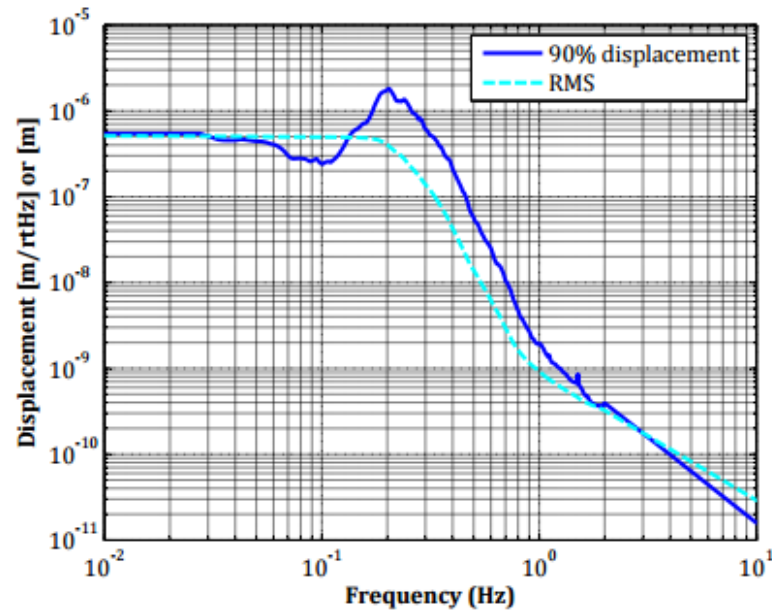


Figure 1: The high-level seismic displacement in Kamioka.

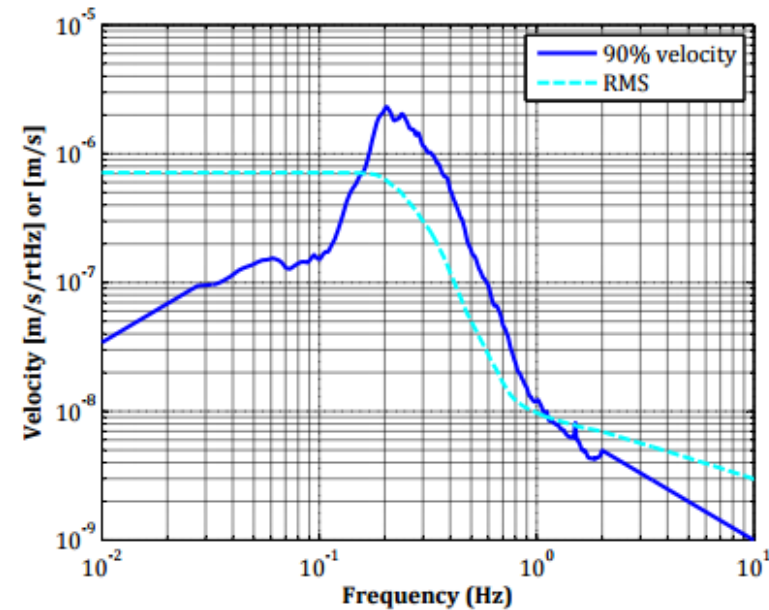
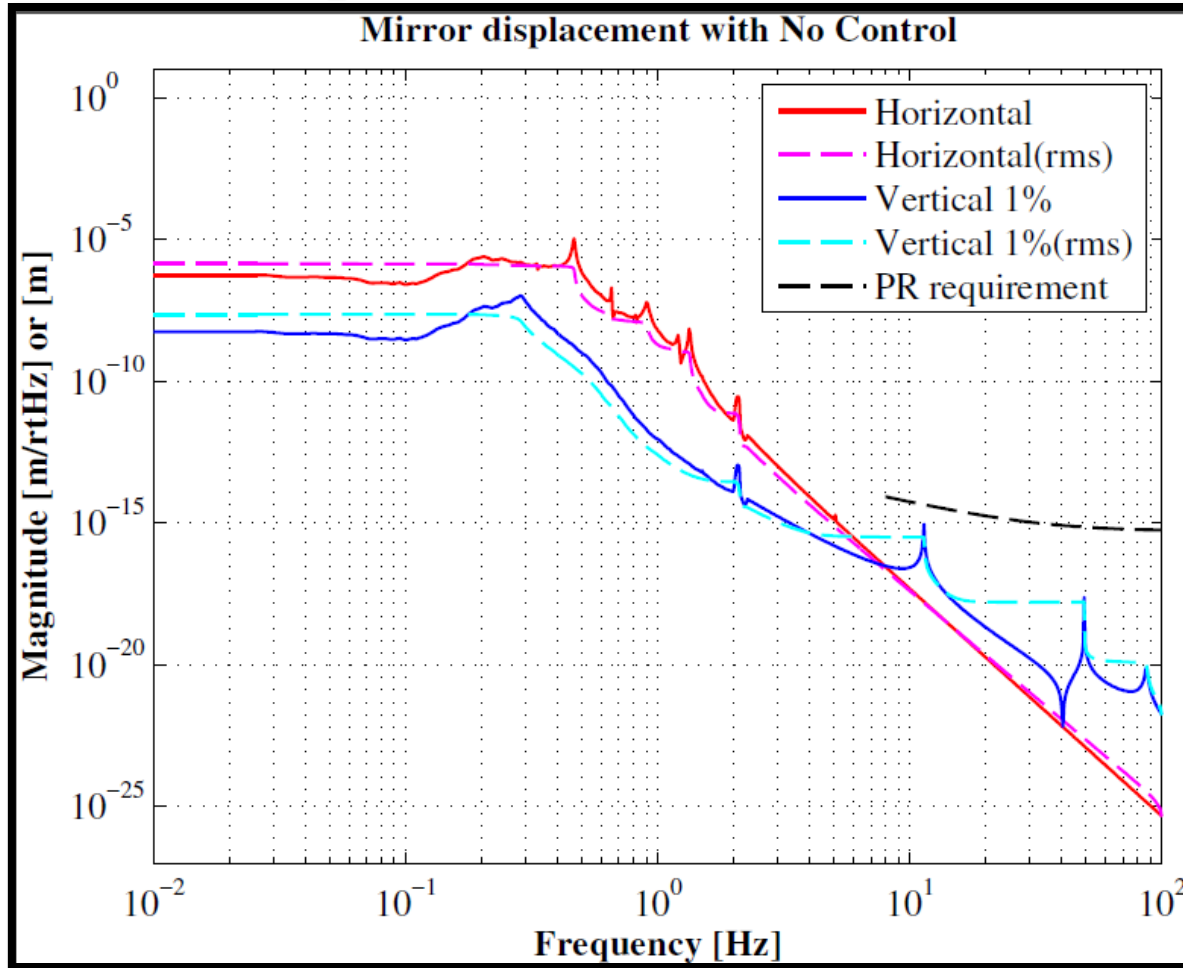


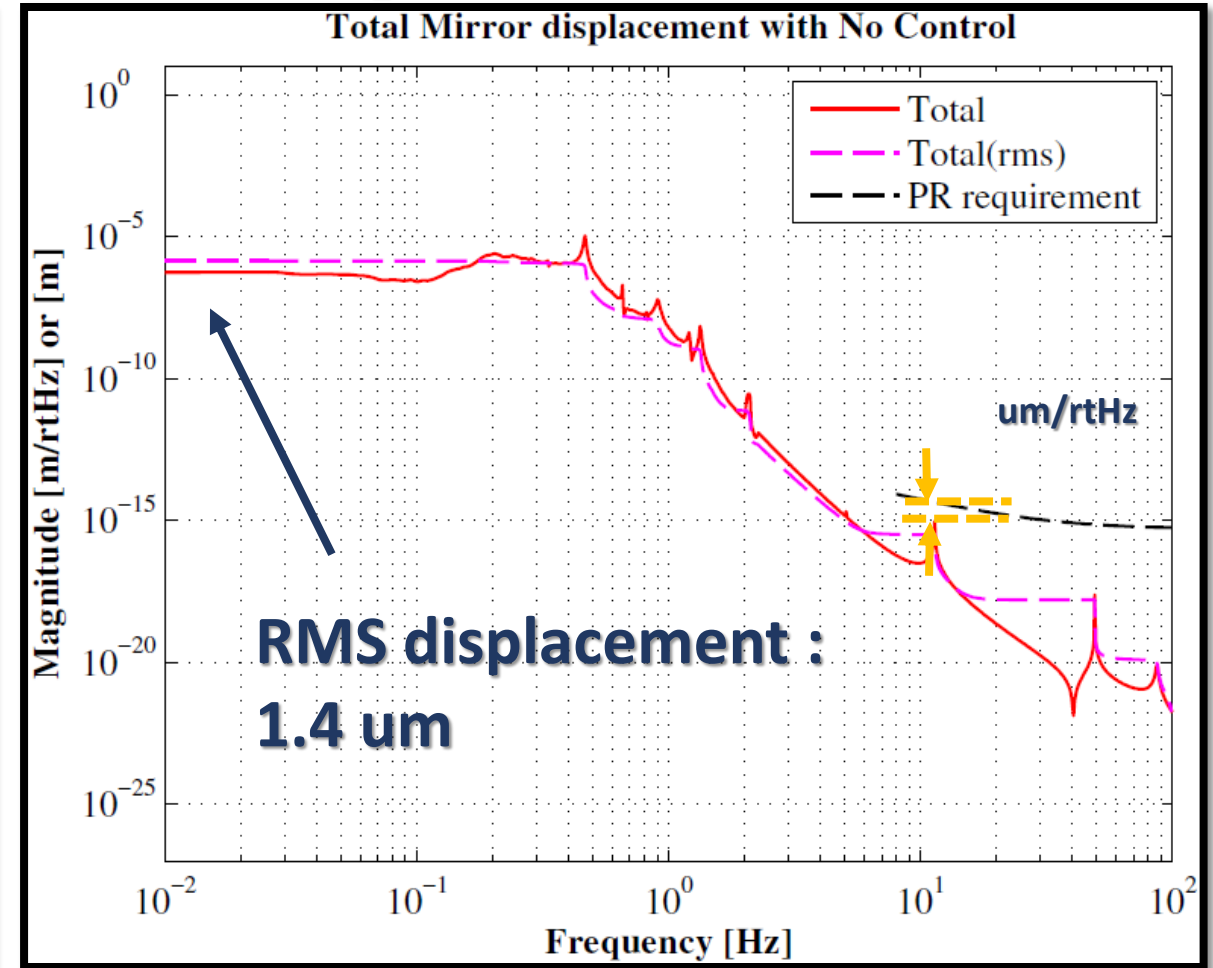
Figure 2: The high-level seismic velocity in Kamioka.

Spectra without ctrl

TM displacement : H and V 1%

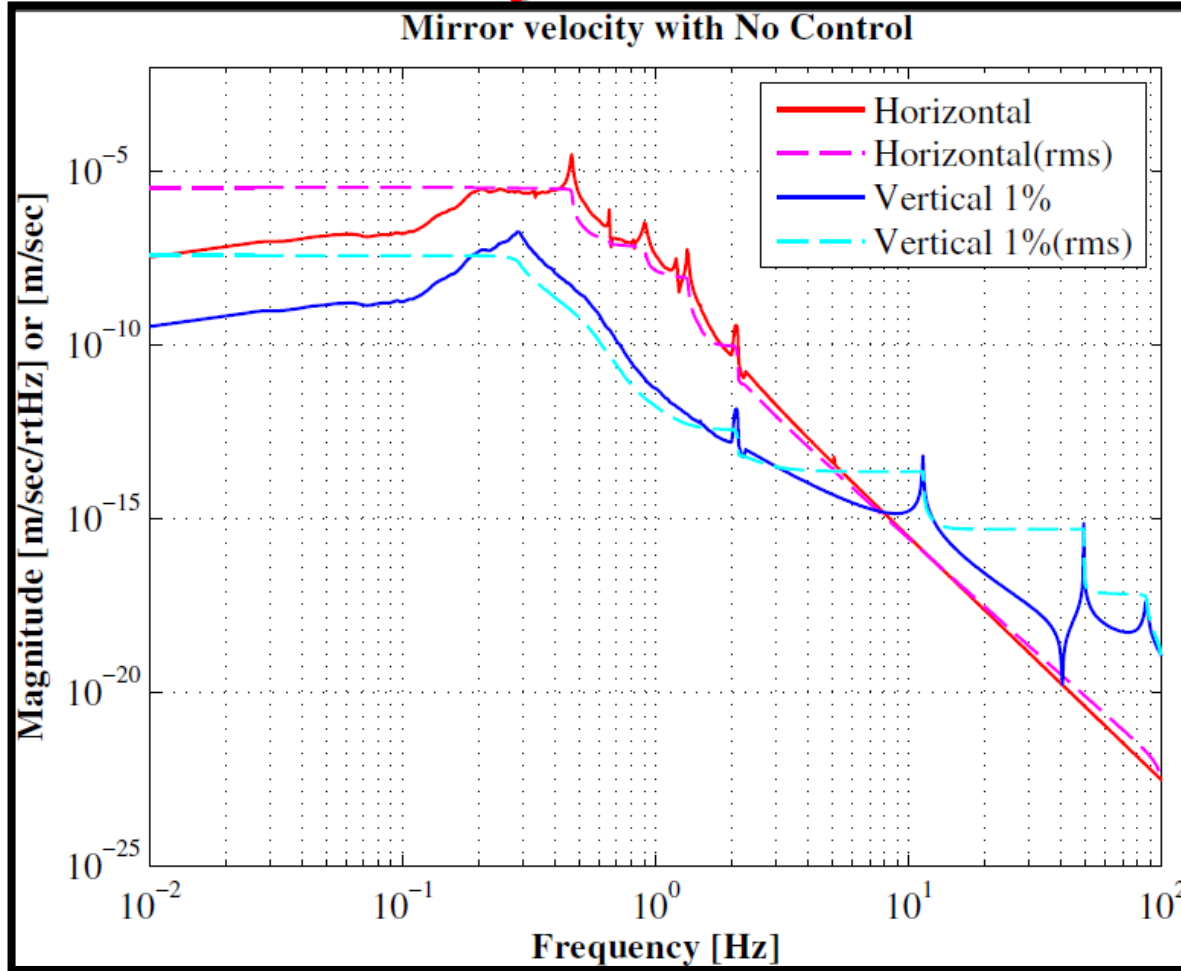


TM displacement : H + V 1%

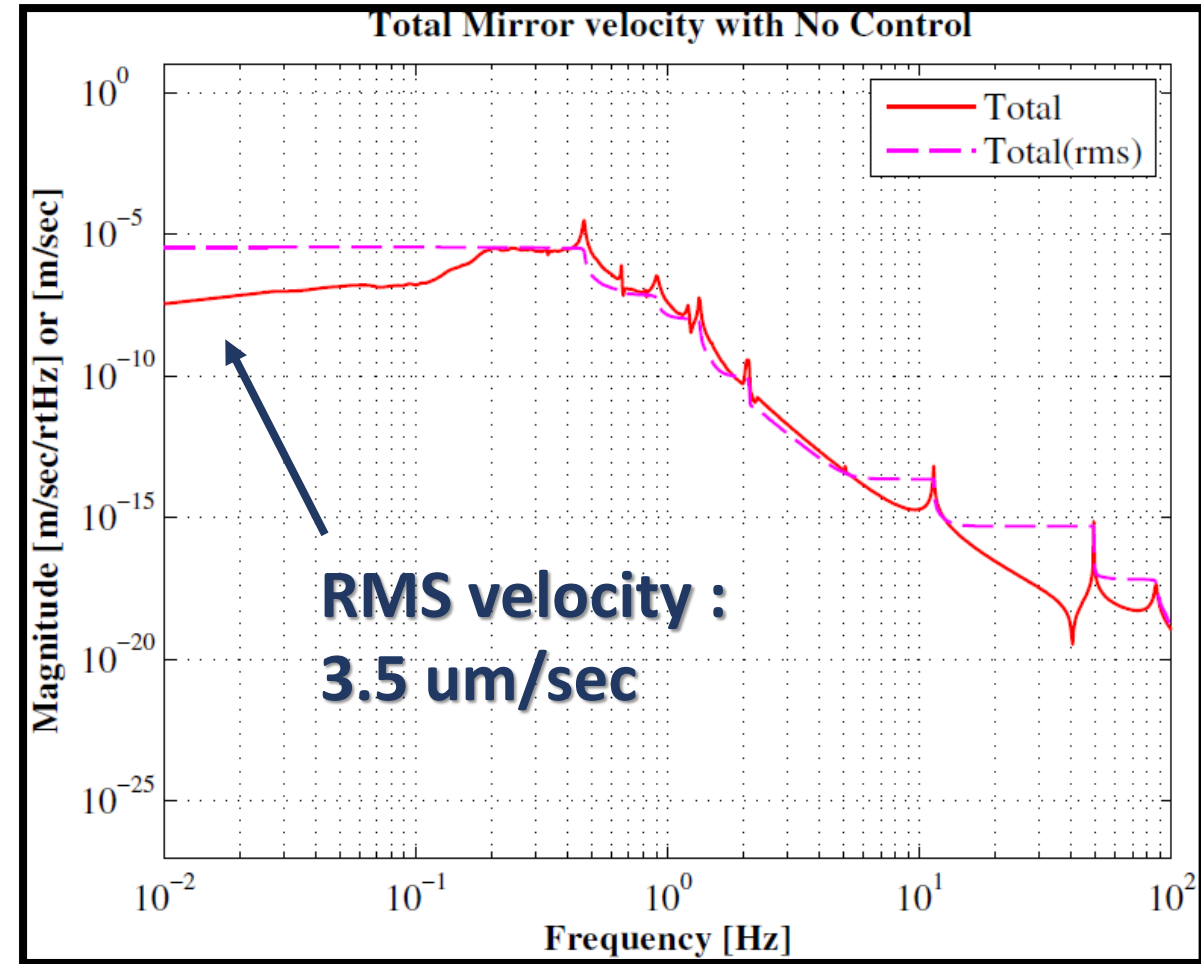


Spectra without ctrl

TM velocity : H and V 1%

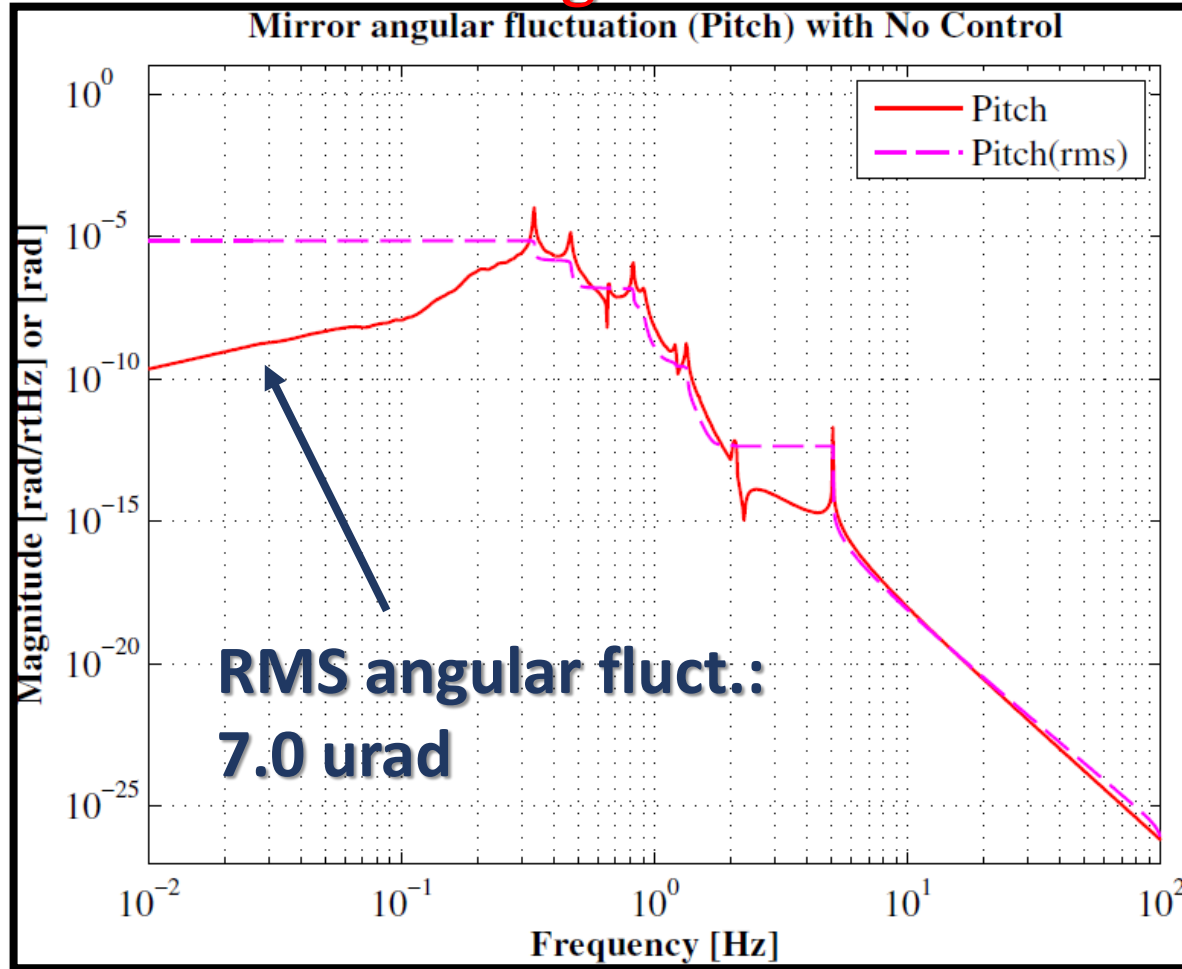


TM velocity : H + V 1%



Spectra without ctrl

TM Pitch Angular fluctuation

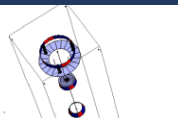


TM **Pitch** fluctuation
excited by **Longitudinal** GND motion

Spectra without ctrl



Control Simulation Results

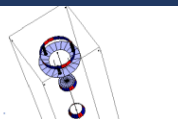


Filter shape

OLTF

CLTF

Q factor in damping control



Impulse response