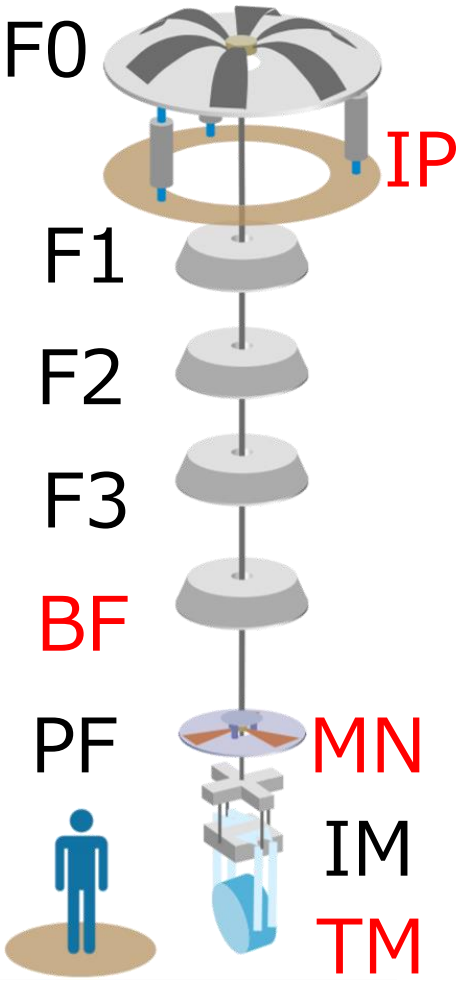
Updates on 2018.8.24 and 25th

Control DoFs and filters used for the klog5899 for P/Y damping
http://klog.icrr.u-tokyo.ac.jp/osl/?r=5899



For which resonances?

IP_LVDT(L): dc+damp ⟶ 67 mHz, IP(L), (#4)
IP_LVDT(T): dc+damp ⟶ 67 mHz, IP(T), (#3)
IP_LVDT(Y): dc+damp ⟶ 0.4 Hz, IP(Y), (#11)

BF_LVDT(L): damp ⟶ 67 mHz, IP(L), (#4)
BF_LVDT(T): damp ⟶ 30 mHz, IP(T), (#3)
BF_LVDT(Y): dc+damp ⟶ 30 mHz, whole chain, (#1)

MN_oplev(Y): damp ⟶ 0.3 Hz, TMchain(Y), (#15)
MN_PhotoSensot(Y): damp (*) ⟶ 0.3 Hz, TMchain(Y), (#15)

(*)MN_PS(Y) was closed only when we lost the oplev light

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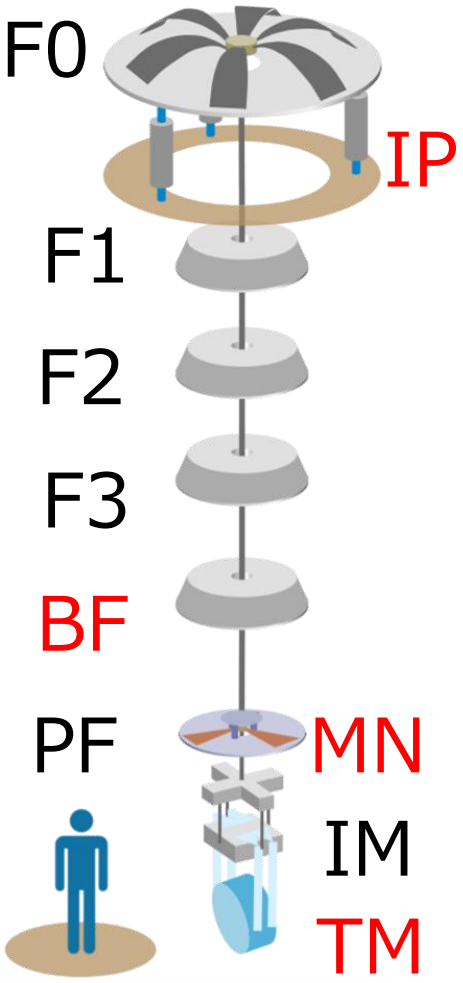


For which resonances?

TM_oplev(P): damp ⟶ 0.8Hz, Payload(P), (#31?)

TM_oplev(Y): damp ⟶ 1.68 Hz, Payload(Y), (#47)

This is under test.

The eigen modes are listed in the following. The model is to be tuned to the actual suspension though:
https://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/private/DocDB/ShowDocument?docid=7866

Notes!:

1. The decoupling between L/T and Y looked not-good. (mainly BF-LVDT's?)
   → when we closed the loop of IP(L/T), the 0.4 Hz IP(Y) peak showed up in the spectra of the IP(L/T). Also this peak was observed in TM_oplev(P) spectrum after we closed the loop. This peak *mostly* disappeared one day later from IP(L/T) though, did not from TM_oplev(P) spectrum.

2. When the MN_PS(Y) loop was closed, the 0.3 Hz resonance, which cannot be damped by BF, was damped.
   However, the motion by RMN at a few Hz, seemed to be fed back to the controls after the system calmed down, and this oscillated the main chan. Thus the loop by MN_PS(Y) looks available only when the payload is oscillating with large amplitude, i.e., available only when we lost the oplev light.

Notes!:

3. BF diagnalization should be done. Currently we observe the IP(L/T)'s 67 mHz peak in the yaw spectrum of TM_oplev, MN_oplev, etc. when the BF loops were closed.

4. IP(L/T) loops did not remove the 67 mHz peak completely from TM_oplev(Y), and then BF(L/T) loops were implemented to remove the residual peak in TM_oplev(Y).

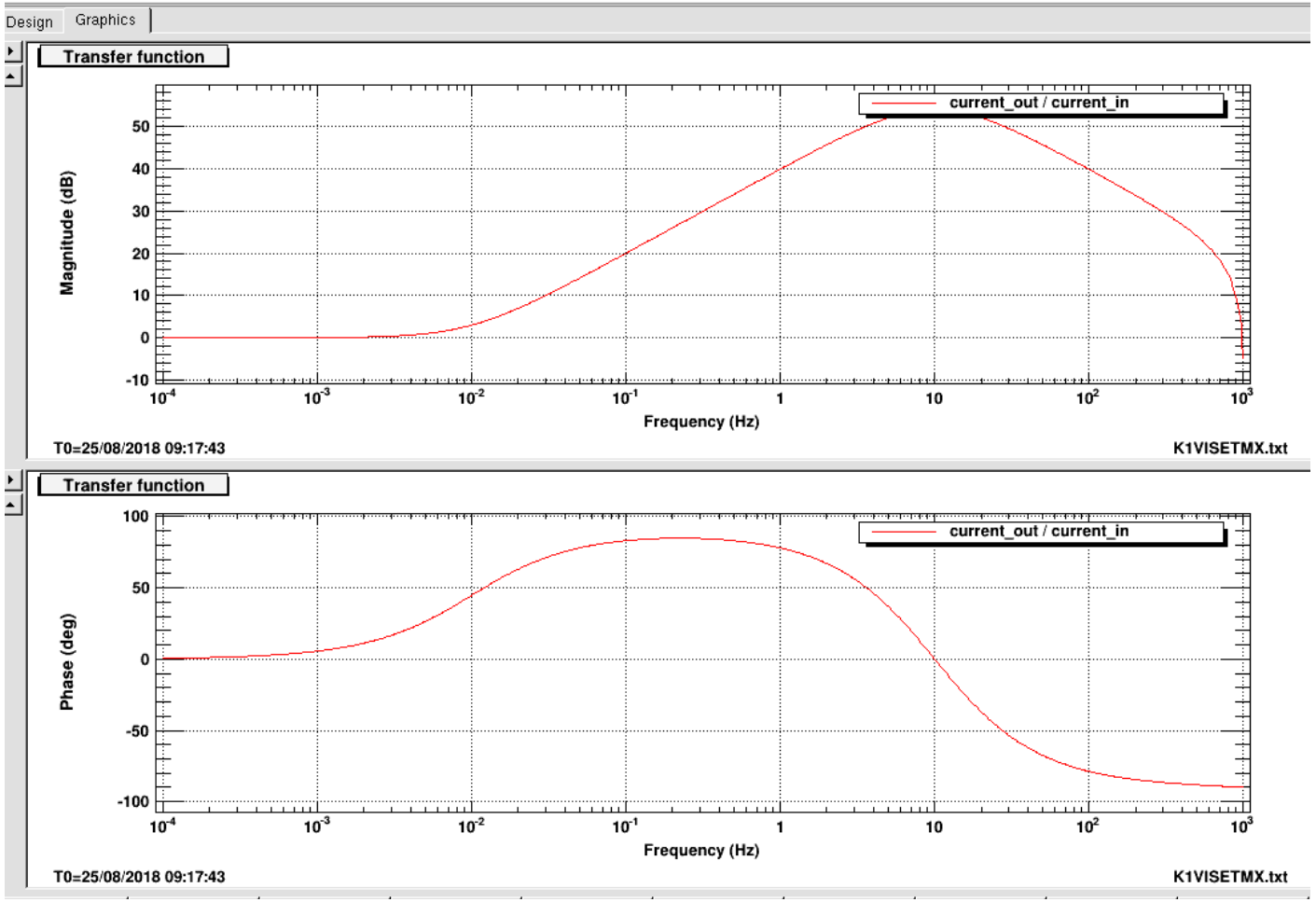
5. TM_oplev(P) loop was implemented to damp the payload mode at 0.8 Hz. This loop damped not only this mode but also the peak at 67 mHz in the TM_oplev(Y) spectrum. TM_oplev(P) loop looked damp the horizontal motion coupling in (L/T)?

6. This damping system is just one example, we can modify better later.

Backups

Filter shapes:

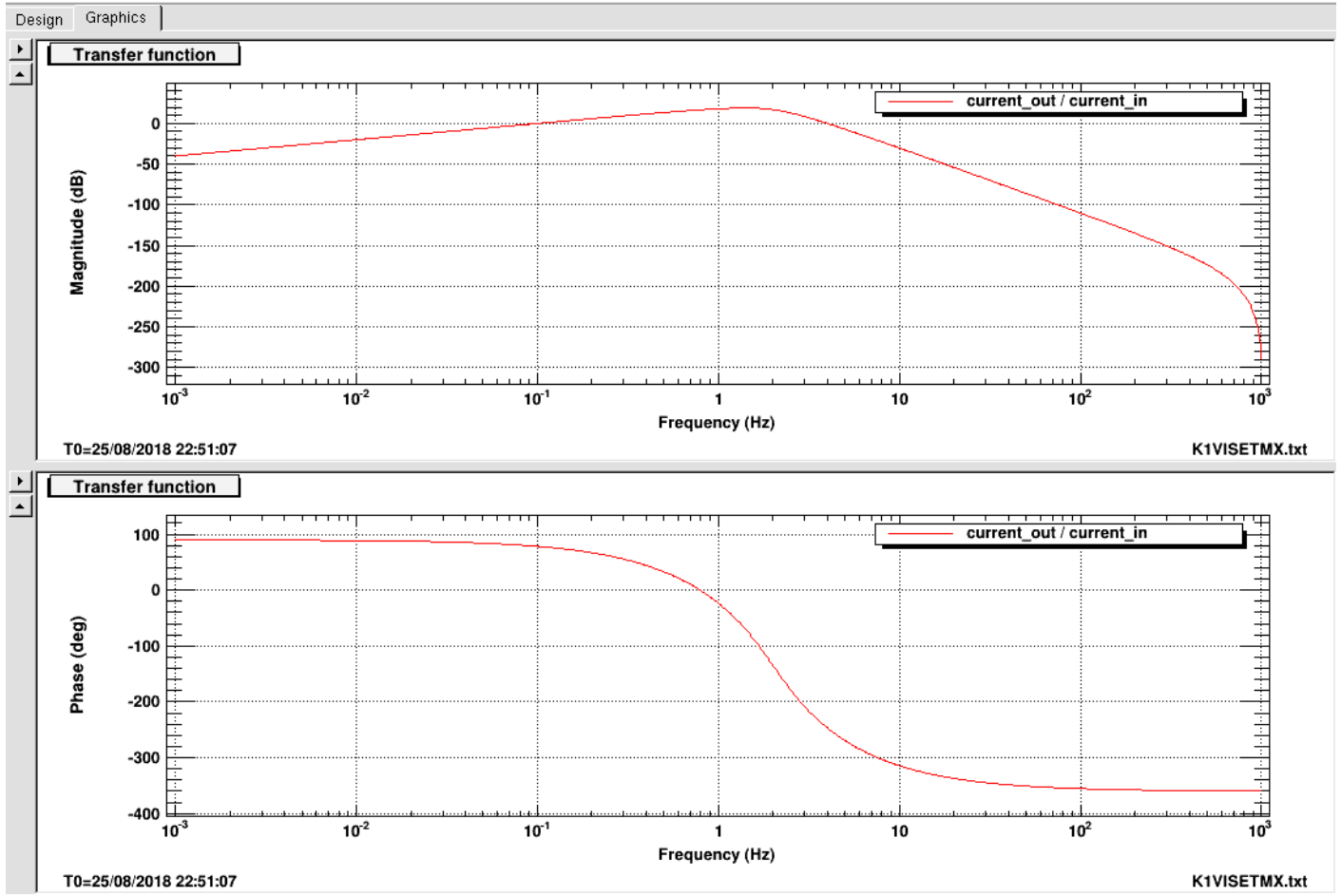
IP_LVDT(L): dc+damp
IP_LVDT(T): dc+damp
IP_LVDT(Y): dc+damp



zpk([0.01],[10;10],1, “n”)

Filter shapes:

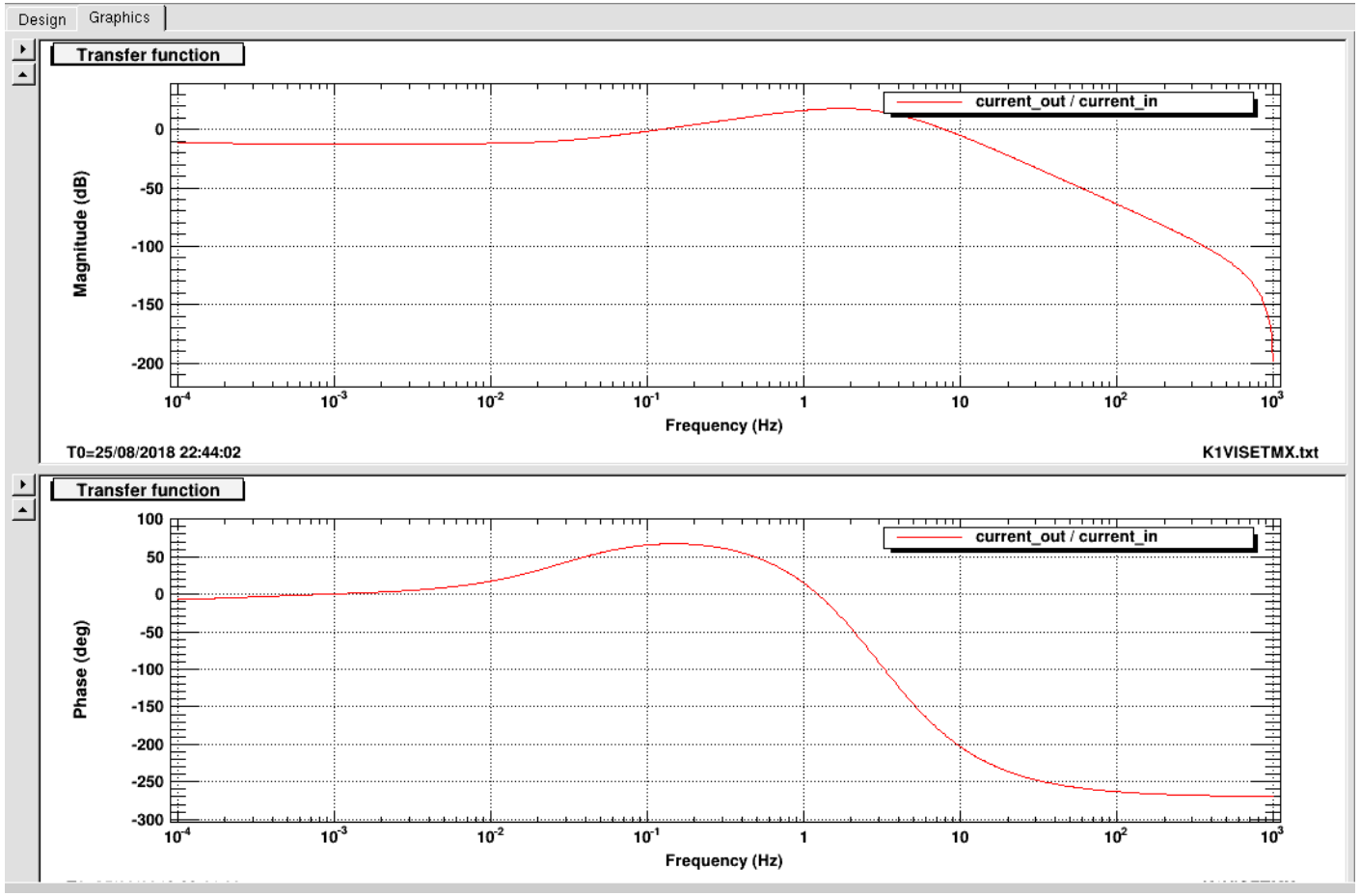
BF_LVDT(L): damp
BF_LVDT(T): damp



zpk([0],[2;2],10,"n")butter("LowPass",3,2)

Filter shapes:

BF_LVDT(Y): dc+damp

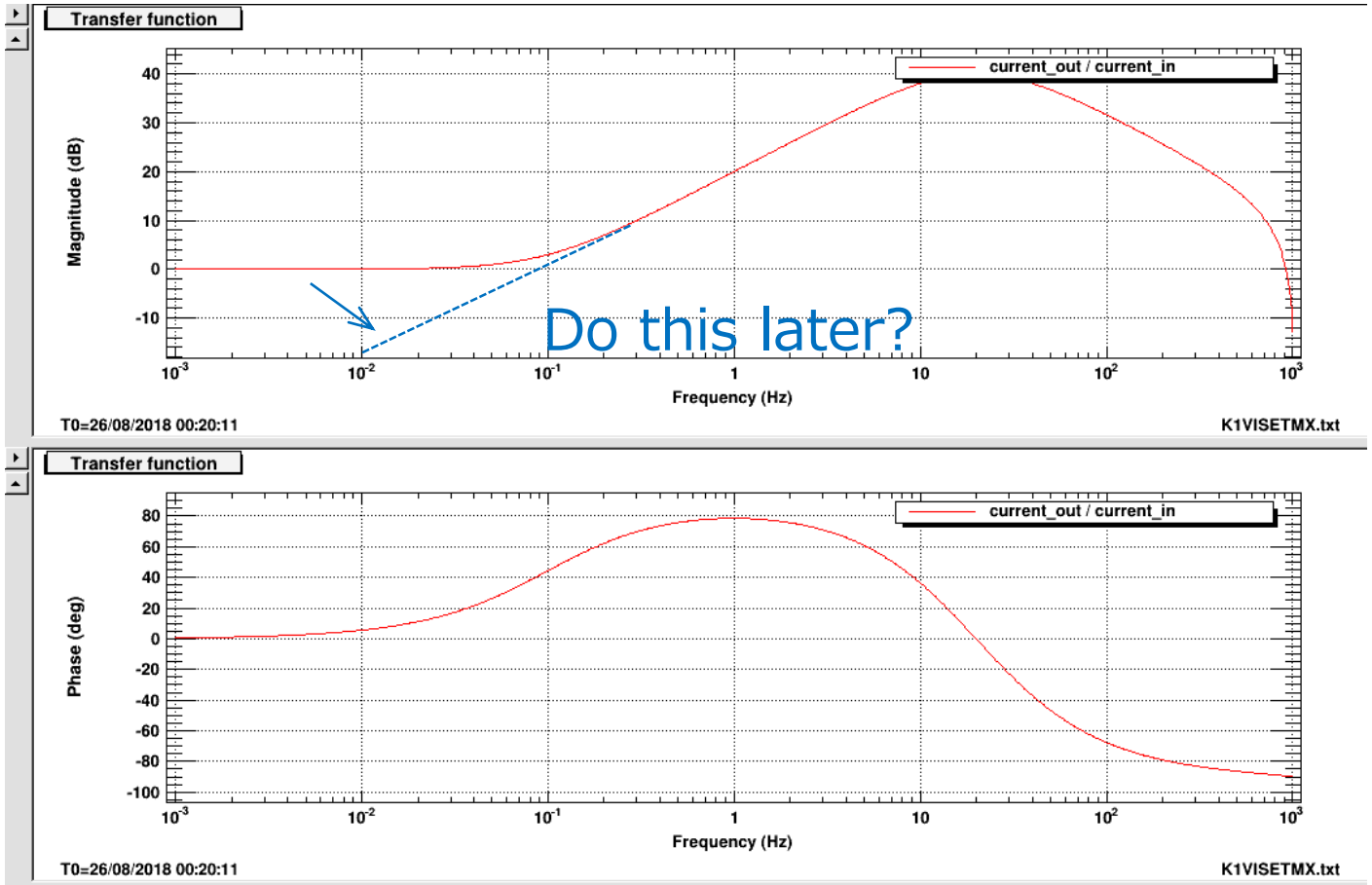


zpk([0.000125],[3;3;3;3],0.001,"n")*zpk([0.03],[0.0001],5000,"n")gain(0.059973)

Filter shapes:

MN_oplev(Y): damp
MN_PhotoSensot(Y): damp (*)

(*)MN_PS(Y) was closed only when we lost the oplev light.



zpk([0.1],[20; 20],1,"n")