

PRFPMI Noise Budget Report for Commissioning Meeting on Mar 17, 2020

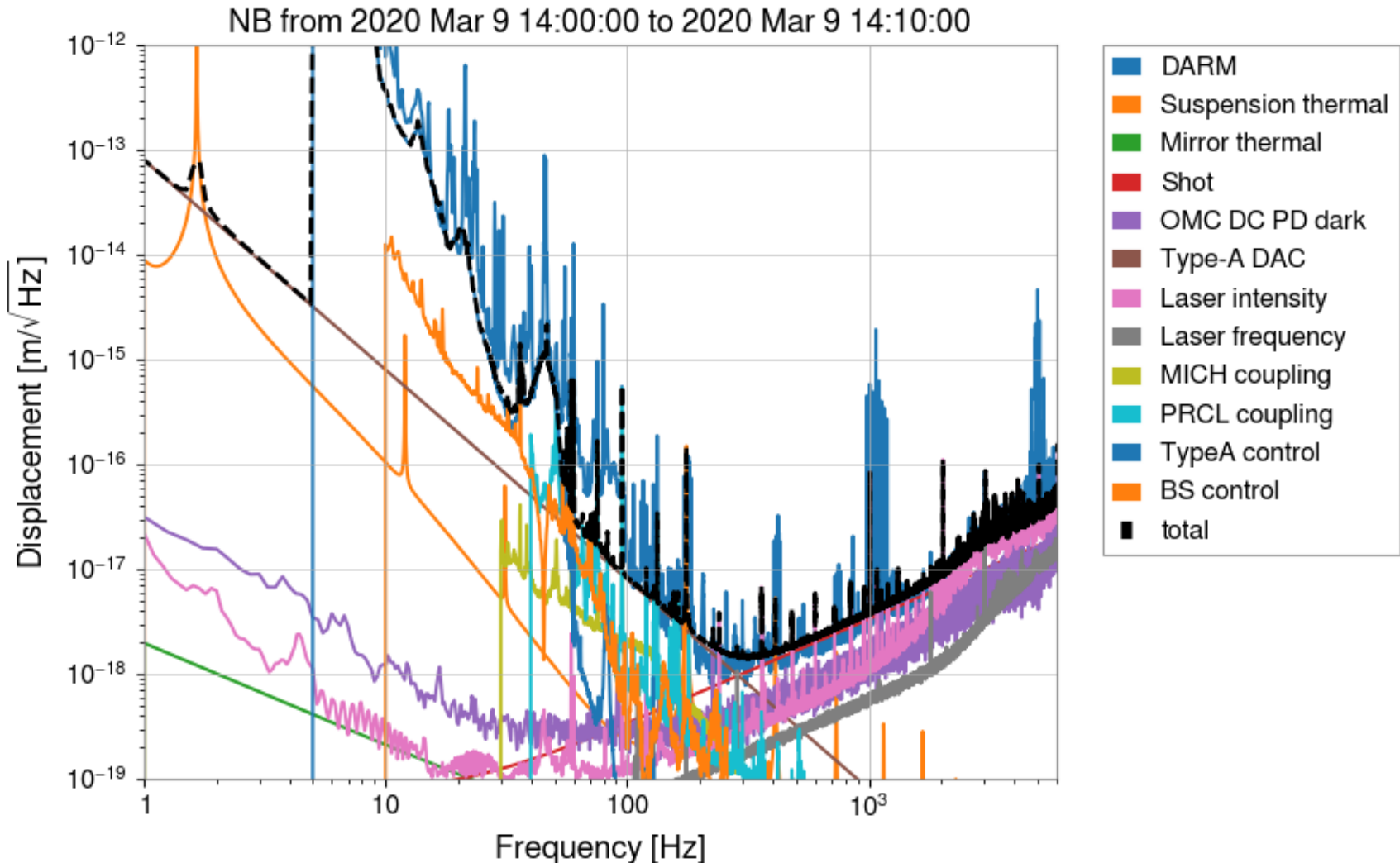
Yuta Michimura

Noise Budget

- Made with NoiseBudgetter
<http://10.68.10.57:8000/NoiseBudgetter/> (ICRR network)
- Configuration files and data live in
</kagra/Dropbox/Subsystems/MIF/NoiseBudget/PRF/PMI/>
(see [README.txt](#) for details of each configuration file)
- Latest NB configuration file for Mar 9, 2020 14:00 (UTC) sensitivity is [NPconf_20200316_1040.csv](#)
- Configuration file is also commented and NoiseBudgetter is pretty self-explained

Latest Noise Budget

- See klogs [#13481](#) and [#13560](#) and [#13600](#)

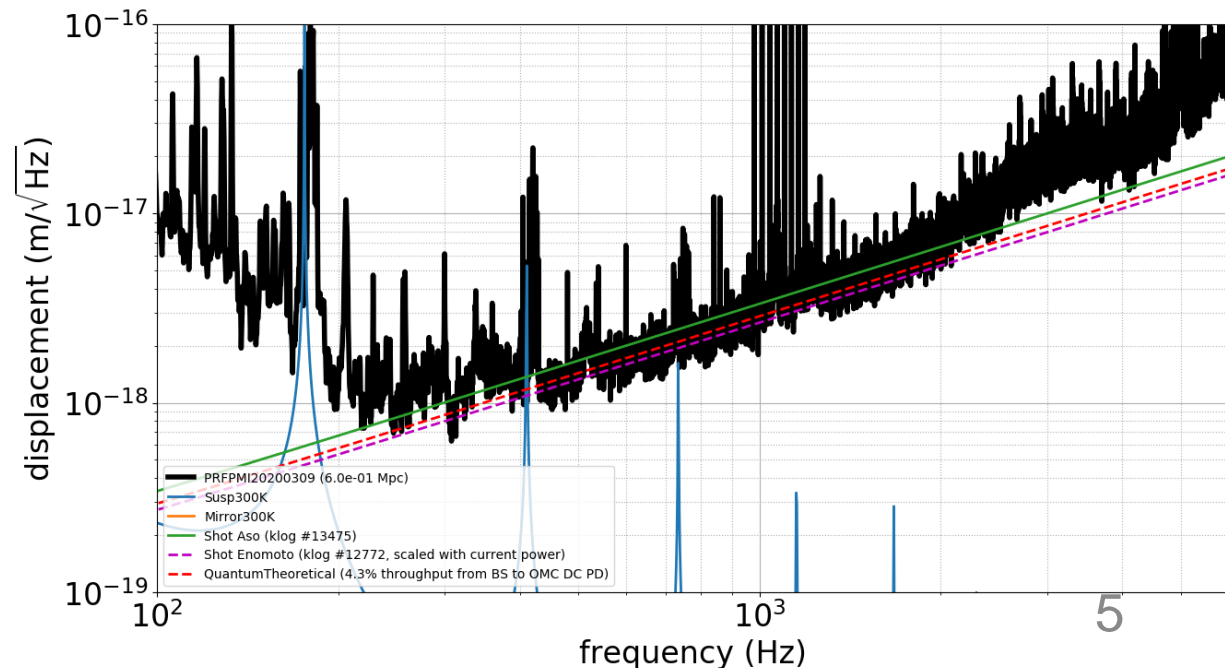


Thermal Noises

- Suspension thermal noise and mirror thermal noises are theoretical curves for 300 K Sapphire from Somiya-san's calculation (300Knew.nb)

Shot Noise

- Estimated by Aso-san (see klog [#13475](#))
- Confirmed that Aso-san's estimation agrees within ~30% with estimation based on Enomoto-kun's previous estimation and my theoretical calculation based on BS to OMC DC throughput of 4.3 % (there is unidentified ~60% loss !)
- Izumi-san also independently confirmed the calculation (klog [#13580](#))



OMC DC PD Dark Noise

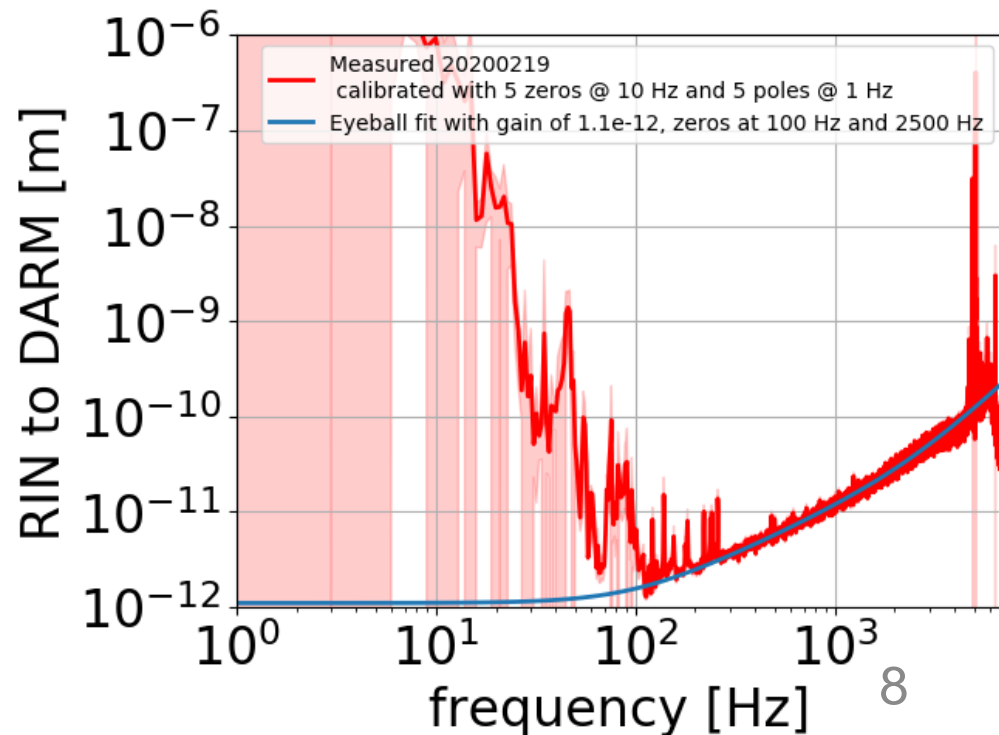
- Dark noise of OMC DC PD dark noise measured at K1:CAL-CS_PROC_DARM_DISPLACEMENT_DQ
- I'm not sure the details, but DARMsens.xml says it is measured on Feb.11 with 1stage wh. [Calibration still OK?]

Laser Frequency Noise

- Witness channel:
K1:LSC-CARM_RESIDUAL_OUT_DQ
- Coupling:
3e-14
- I took these from DARMsens.xml but I'm not sure where is this 3e-14 from (DARMsens.xml says based on 2020 Feb 14). [Who measured this?]

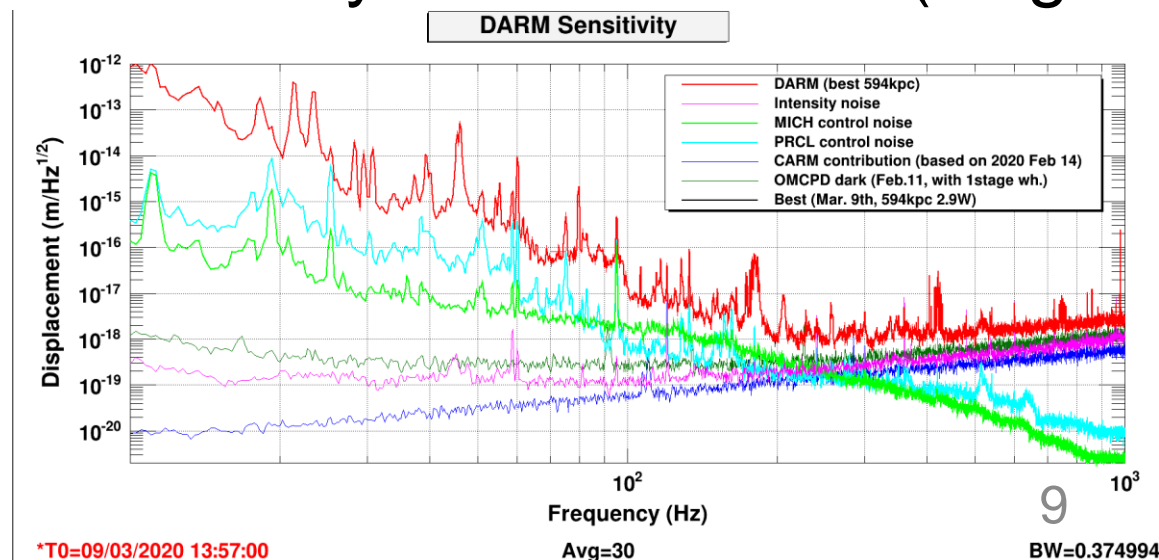
Laser Intensity Noise

- Witness channel:
K1:PSL-
ISS_FIRST_SERVO_PDA_RIN_OUT_DQ
- Coupling:
DC gain of $1.1e-12$ m and zeros at 100 Hz, 2500 Hz
- Coupling TF was measured when ISS is off, and eye-ball fitted with two poles (see klog [#13028](#))



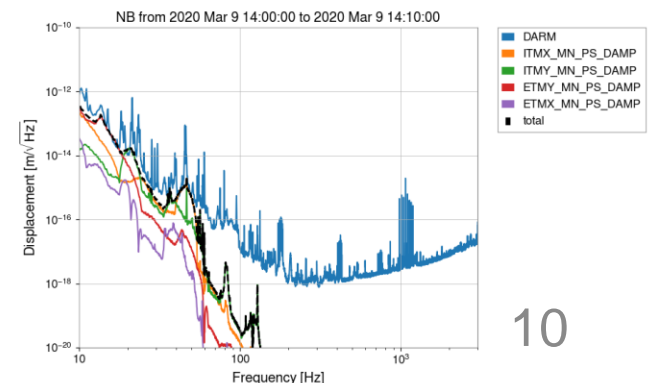
MICH and PRCL Coupling

- Witness channel:
K1:LSC-MICH_IN1_DQ
K1:LSC-PRCL_IN1_DQ
- Coupling:
./Couplings/TF_MICH_DARM_200312_mag.txt
./Couplings/TF_PRCL_DARM_200312_mag.txt
- Based on measurements by Yokozawa-san (klog [#13518](#))
- With FF on ?



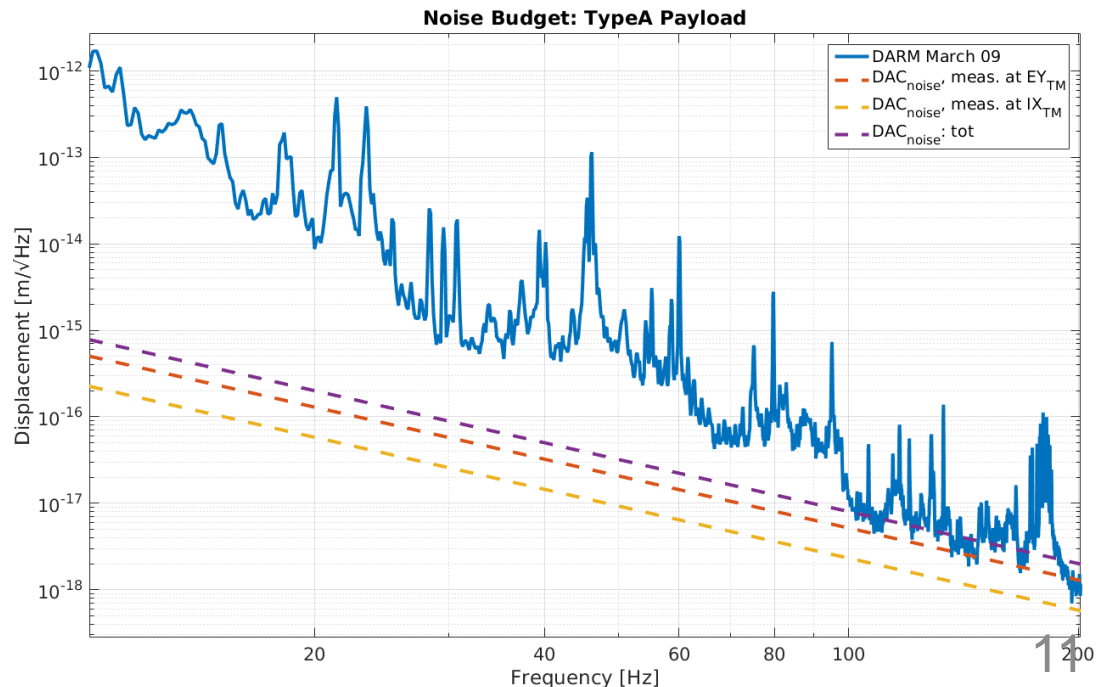
Type-A Controls Noise

- Witness channel:
K1:VIS-(E|I)TM(X|Y)_MN_PSDAMP_L_OUT_DQ
- Coupling:
/kagra/Dropbox/Subsystems/VIS/AutoMeasurement/
TypeA/(E|I)TM(X|Y)/TF/Measurements/20200312/
TF_MNL_DARM.xml
- Feedback signals of the local damping loops are projected to DARM using the TFs measured from local damping feed back point to DARM (klog [#13590](#))
- Basically gives you local sensor noise injected above UGF of local damping



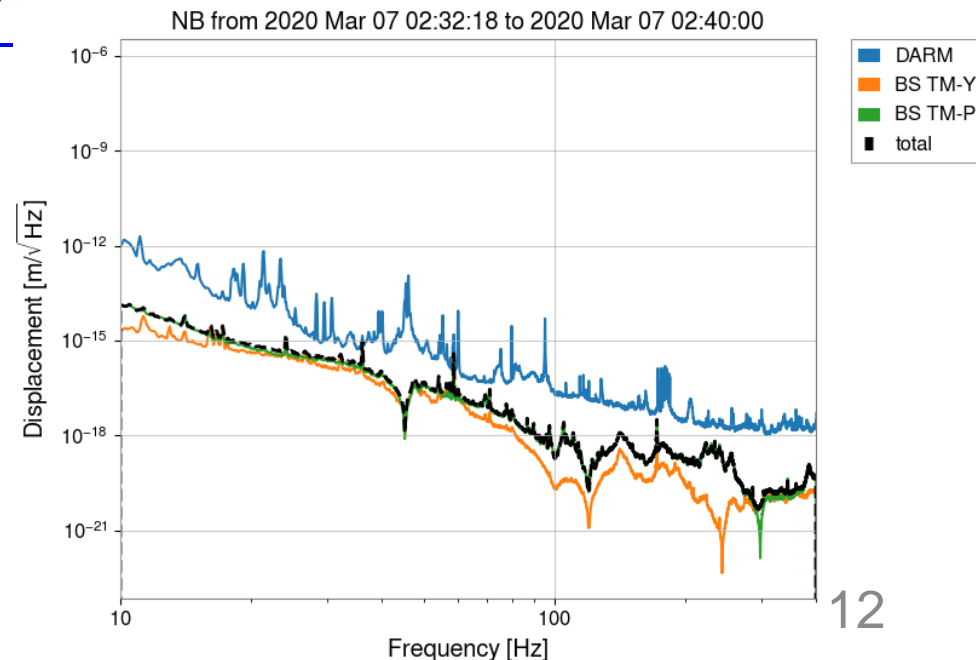
Type-A DAC noise

- Based on klog [#13589](#)
- Modeled with $8e-18/\text{freq}^{**2}$
- Sum of all IX, IY, EX and EY?
- Overestimated by a factor of 2?
(DAC noise pushes TM incoherently)



BS Control Noise

- Witness channel:
K1:VIS-BS_TM_DAMP_(P|Y)_OUT_DQ
- Coupling:
/kagra/Dropbox/Subsystems/MIF/NoiseBudget/PRFPMI/
VIS/BS/TF_BS_TM(P|Y)exc_DARM_20200311.xml
- Based on klog [#13587](#)



Other Noises to Add?

- Actuator noises (coil driver and DAC noises)
- Type-Bp and Type-B local control noises
 - I recognize there are some measurements, but I cannot follow them all
 - If witness channel and TFs (or projected noise) are provided, I can help including them in the NoiseBudgetter
- PEM channels
 - If you have some PEM channels coherent to DARM and if you have their coupling functions to DARM, let me know.