Commissioning of the VIS system: Status

L. Trozzo on behalf of VIS team

OUTLINE

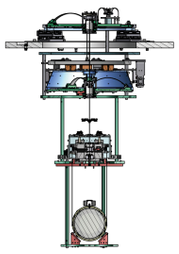
- Introduction
- Type A residual motion in FPMI configuration
- Noise budget
- Conclusion

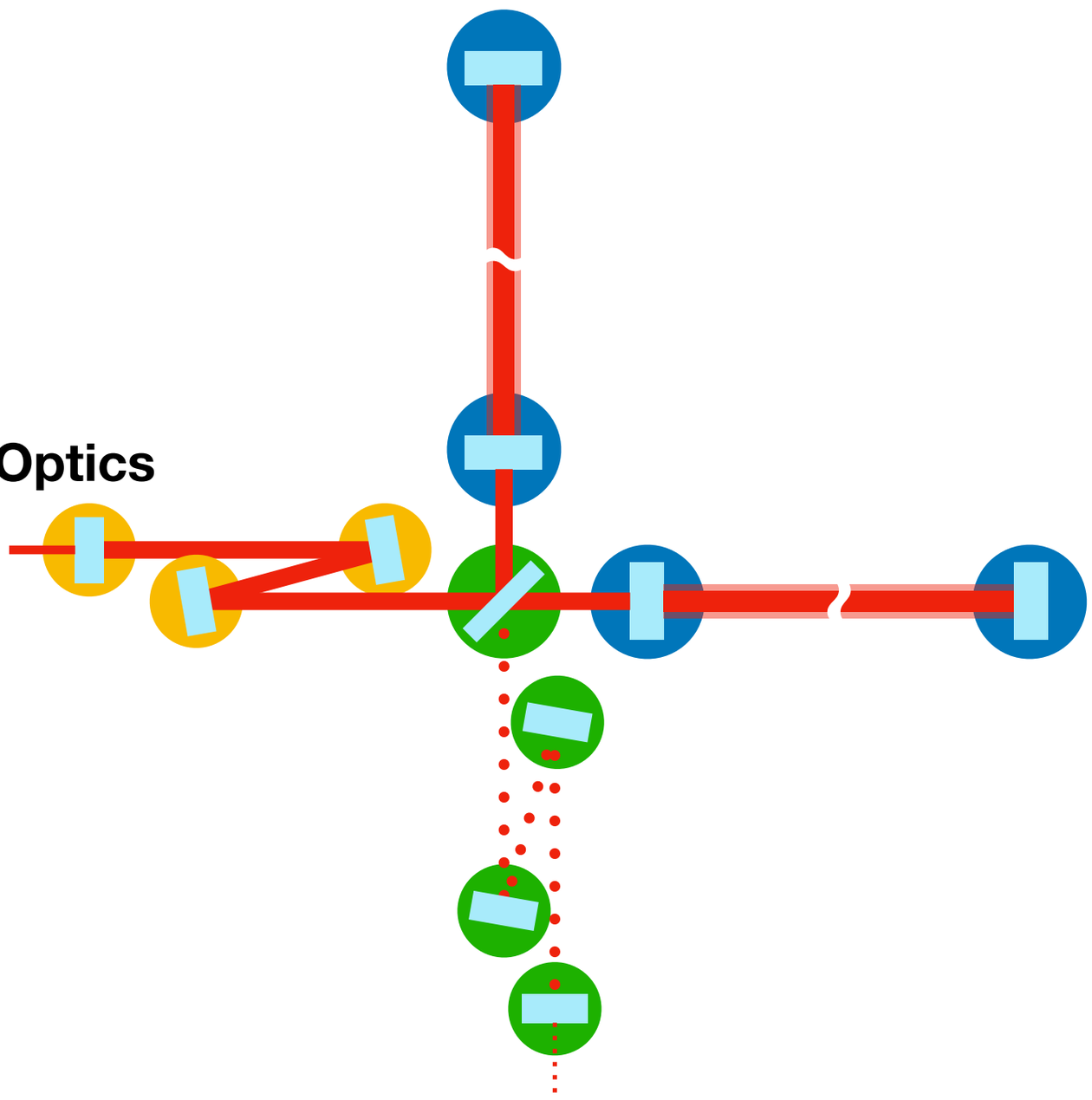
Vibration Isolation Systems in KAGRA

Type A

Type B

Type Bp





Type A suspension

- **Tower**
  - ✓ IP: sensor correction and damping filters are working properly
  - ✓ GAS Filters: damping filters on
  - ✓ BF: damping filter on (only for Yaw)
- **Payload Control working properly & 90% done**
  - ✓ Roll off broadband filters have been implemented
- **Alignement sensing control**
  - ✓ Balancing of the actuators and optimization of the local driving alignment matrix at MN stage is done
  - ✓ Works in progress for DHARD, CHARD, DSOFT, CSOFT loops

➡ **To Do**

- Tidal control to compensate the long term cavity drift (works in progress..)
- Software tuning up for the observation phase (Guardian, SDF, etc…)
- Offload the GAS filter DC control offset accumulated to compensate the thermal drifts

Type B suspension

- **Tower**

  ✓IP: damping filters are working properly (no sensor correction)

  ✓GAS filters: damping filters on

- **Payload**

  ✓Roll off of the broadband damping filters has been implemented at BS mirror stage

- **Alignement sensing and control**

  ✓Balancing of the actuators and optimization of the local driving matrix at BS IM stage is done

  ✓MICH loop has been engaged using the BS IM actuators

➡ **To Do**

- Software tuning up for the observation phase (Guardian, SDF, etc..)

Type Bp suspension

- **Tower**

  ✓ GAS filters: damping filters on

- **Payload**

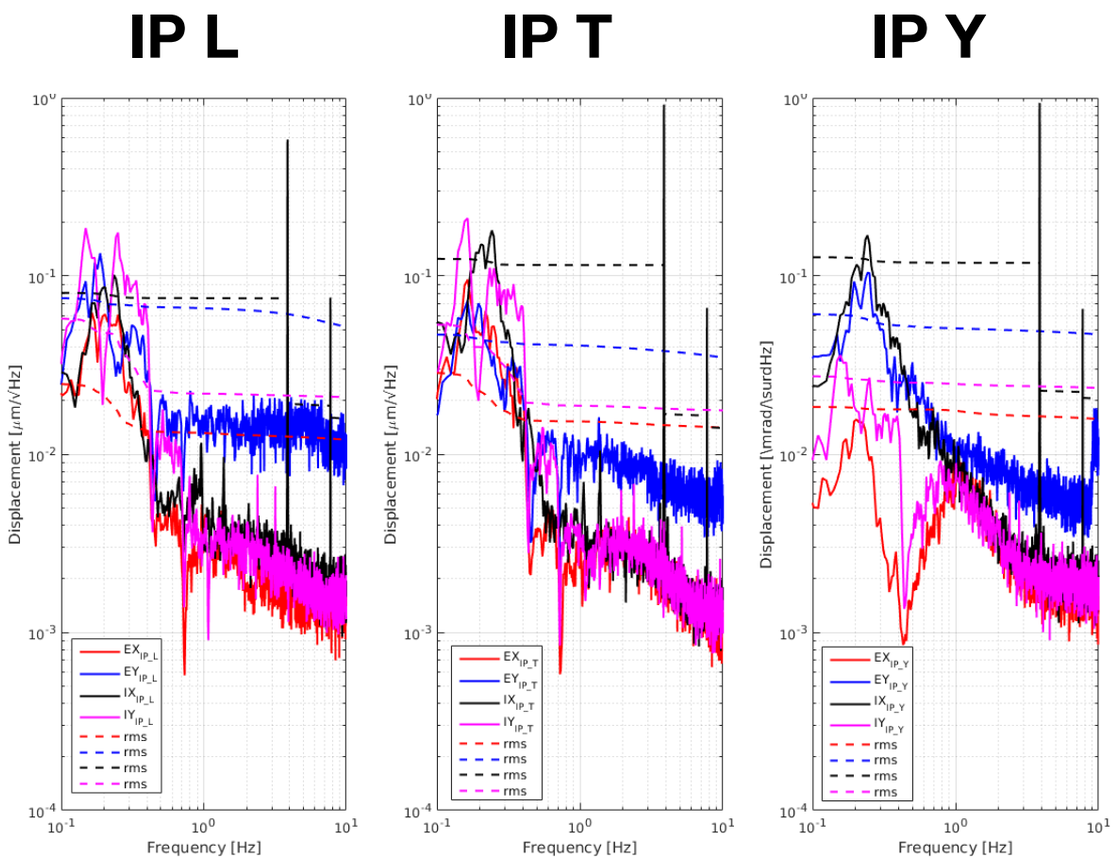
  ✓ broadband damping filters are working properly

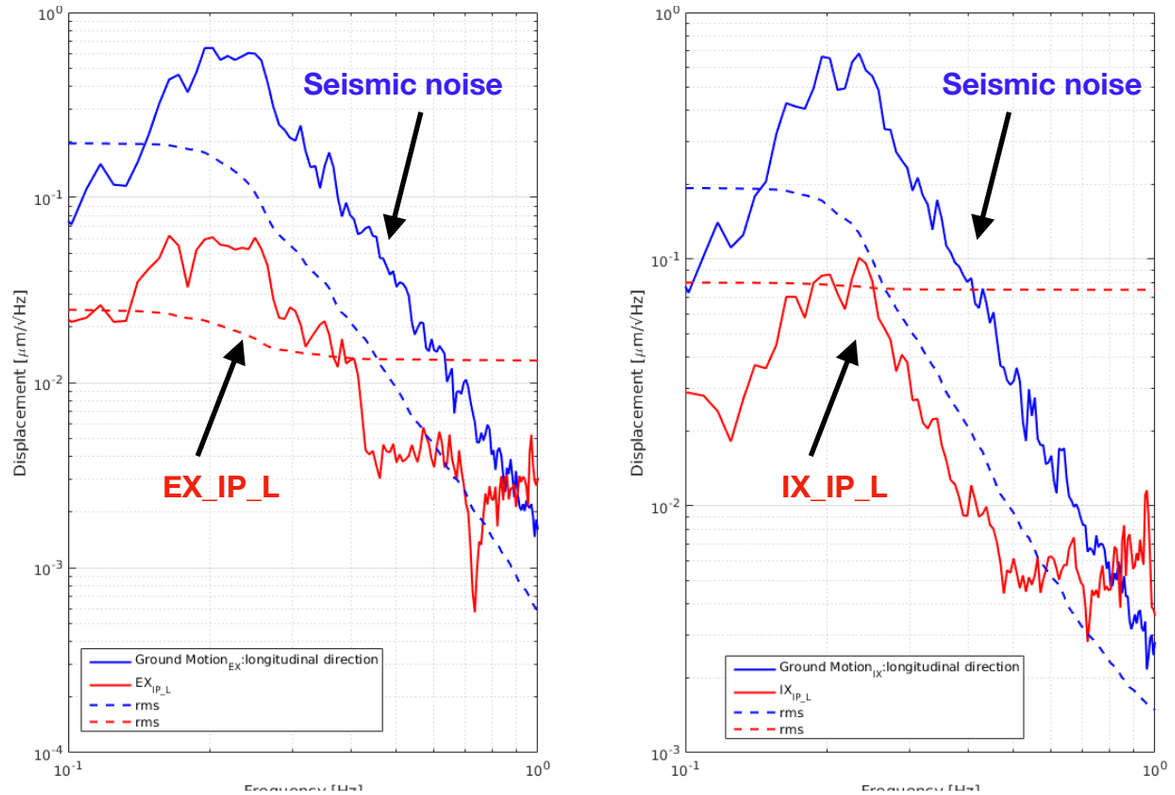
  ✓ PRM mirror has been set in misaligned mode to avoid scattered light in FPMI

➡ **To Do**

- TF measurement campaign from optics to DARM for noise budget
- Software tuning up for the observation phase (Guardian, SDF, etc..)

Type A: residual motion in FPMI configuration (I)



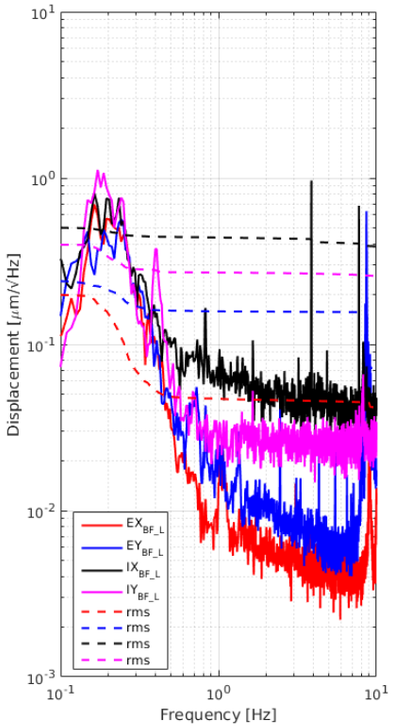


	L RMS [μm]	T RMS [μm]	Y RMS [μrad]
IX	**0.08**	**0.12**	**0.15**
EX	**0.04**	**0.04**	**0.05**
IY	**0.05**	**0.05**	**0.05**
EY	**0.05**	**0.05**	**0.05**

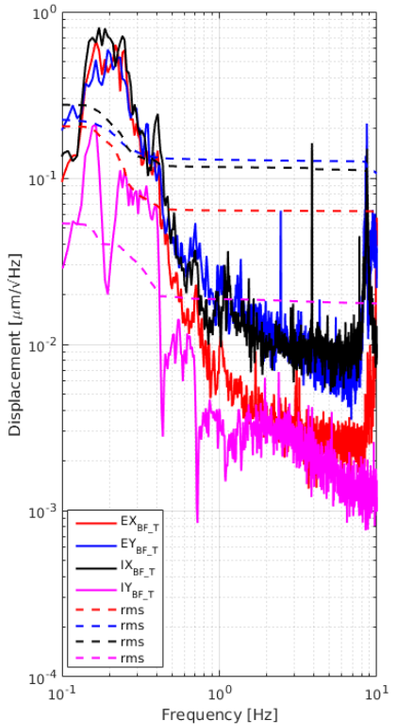
Thanks to sensor correction technique, the seismic noise is suppressed by a factor 3 @ 150 mHz

Type A: residual motion in FPMI configuration (II)

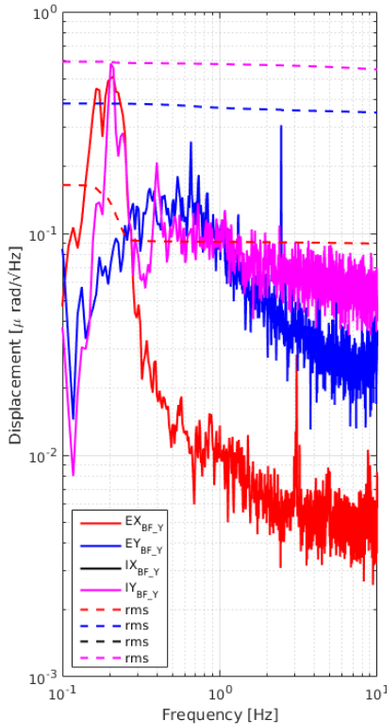
BF L



BF T



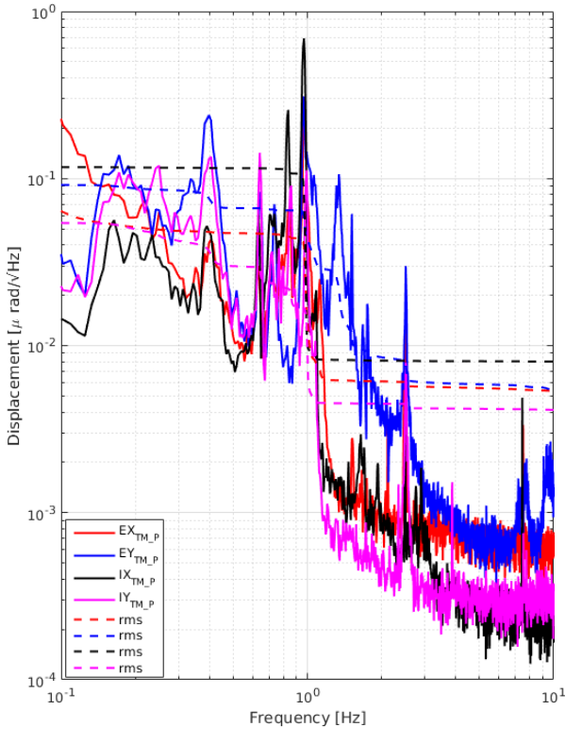
BF Y



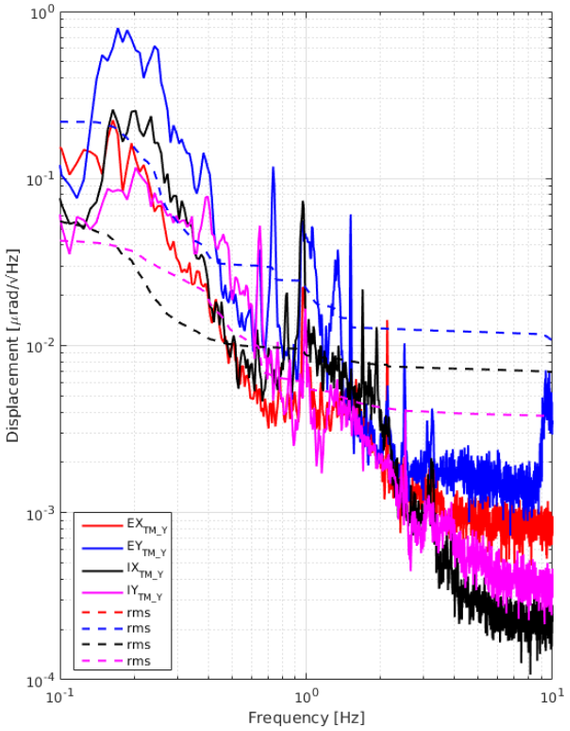
	L RMS [µm]	T RMS [µm]	Y RMS [µrad]
IX	**0.5**	**0.3**	**0.15**
EX	**0.2**	**0.2**	**0.1**
IY	**0.4**	**0.5**	**0.2**
EY	**0.4**	**0.2**	**0.2**

	P RMS [µ rad]	Y RMS [µ rad]
IX	**0.15**	**0.1**
EX	**0.05**	**0.05**
IY	**0.04**	**0.05**
EY	**0.1**	**0.09**

TM P

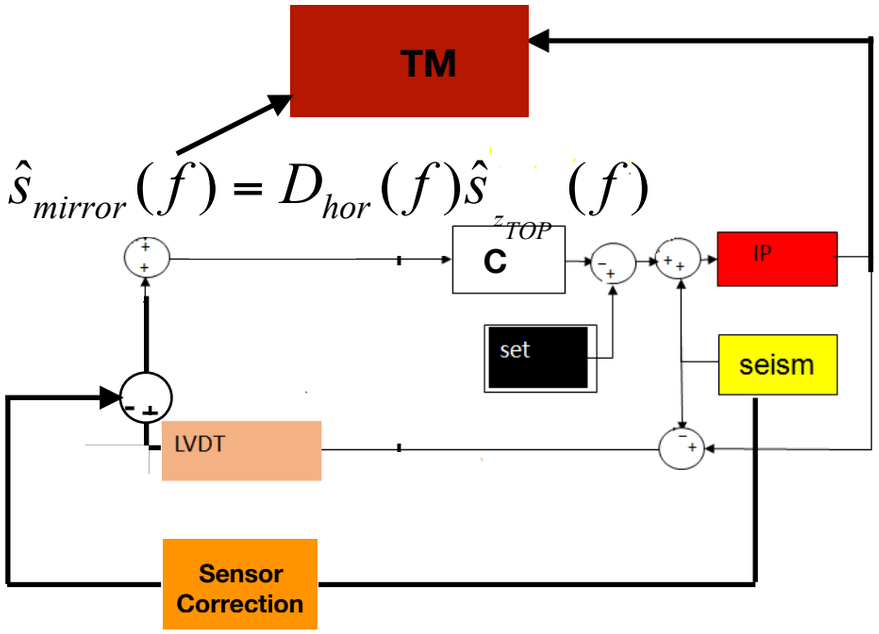


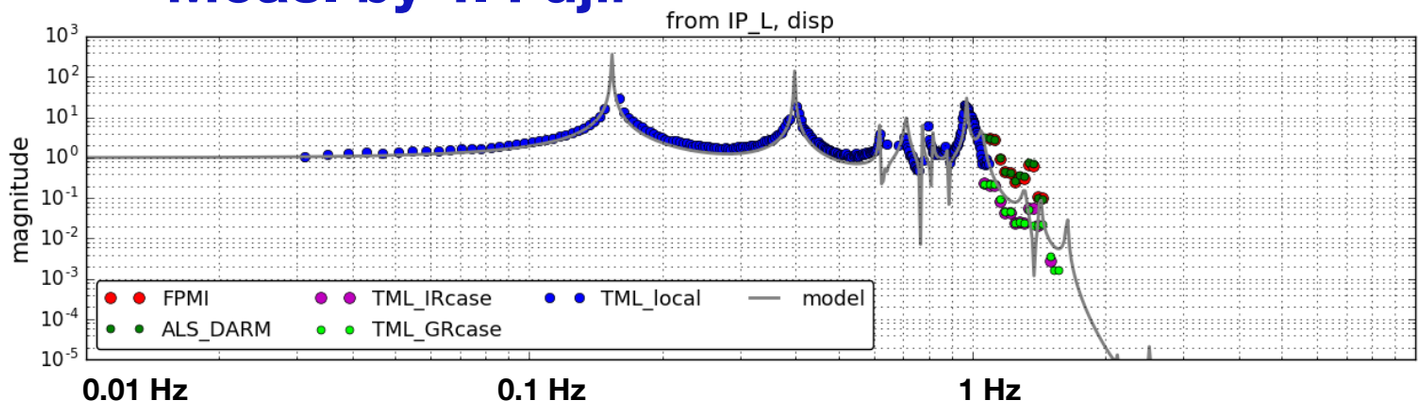
TM Y



Type A: KAGRA low frequency sensitivity in FPMI configuration

Meas. by Y. Fujii

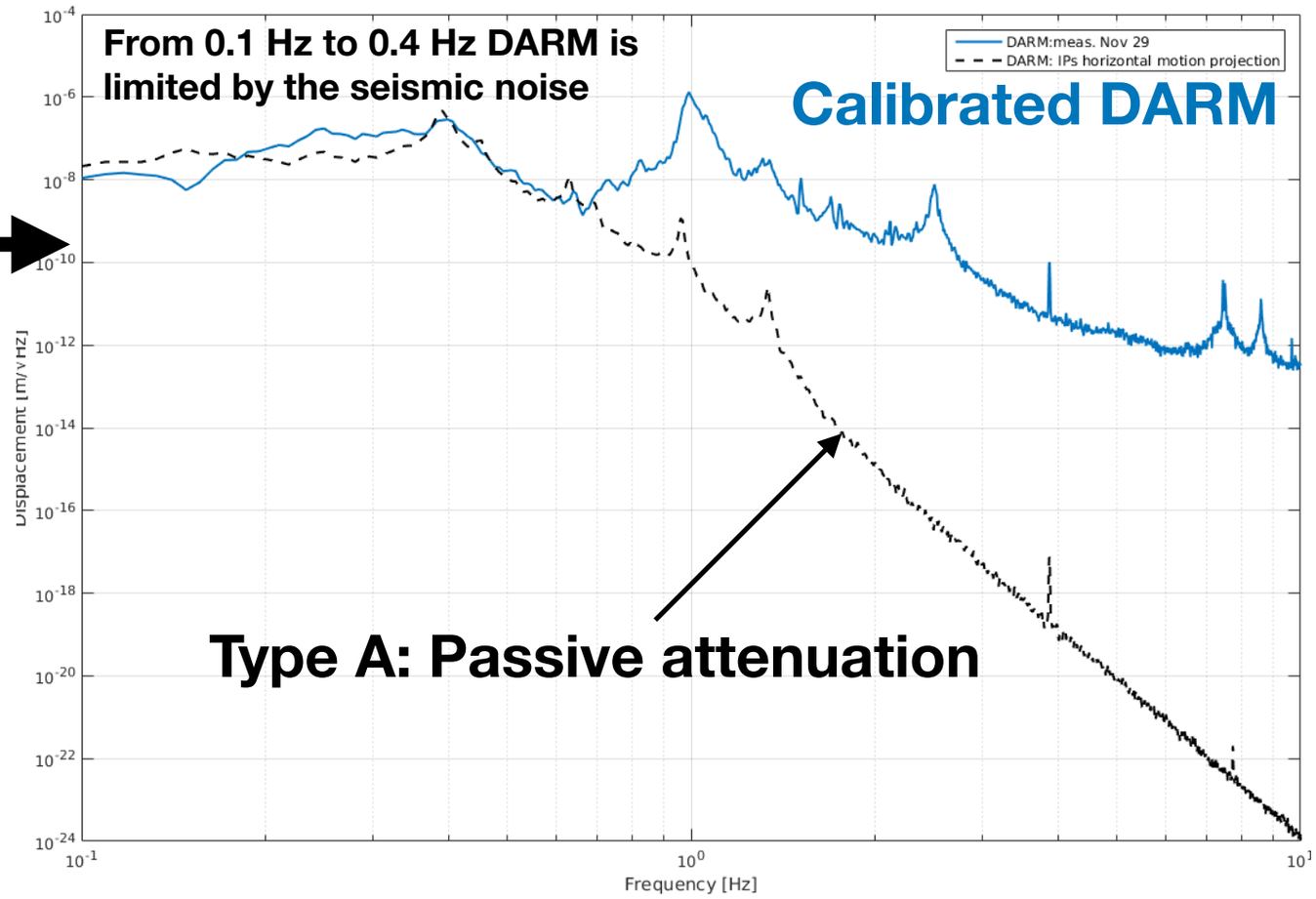




By combining the IP signals of the four Type A It is possible to estimate the low-frequency DARM sensitivity

Preliminary results

More details are discussed in Y. Fujii PhD thesis



Angular control: Noise budget

The feedback force sent through the coils on the MN or IM can re-inject angular control noise.

To estimate the contamination level of the local payload control onto DARM:

✓ We measured the TFs from MN and IM of cry-payload to DARM (P,Y,L,R,etc..)

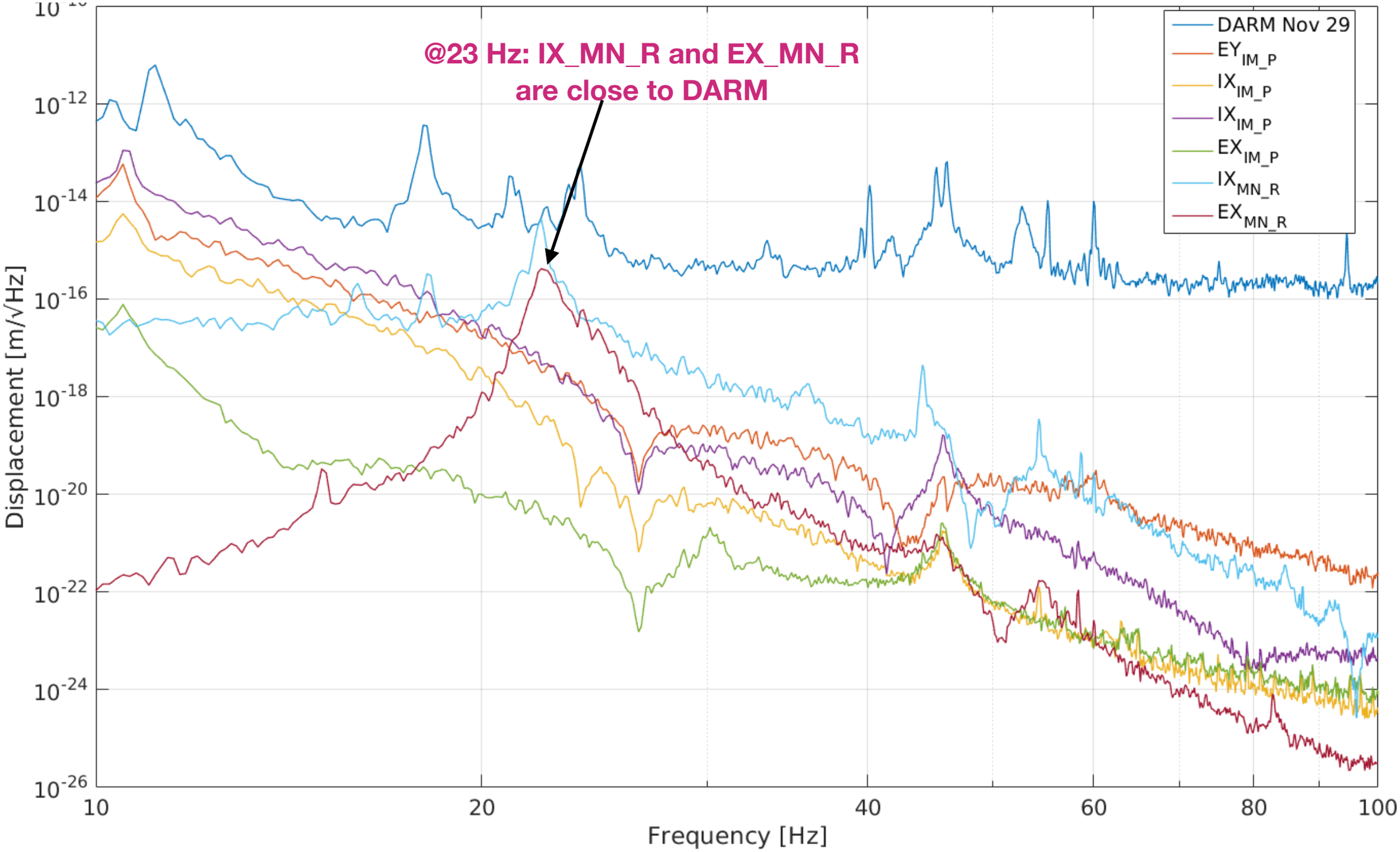
✓ We measured these TFs in Type A suspensions, BS, and PR3

✓ We projected the control noise on DARM

➡ The TF measurements campaign is still ongoing

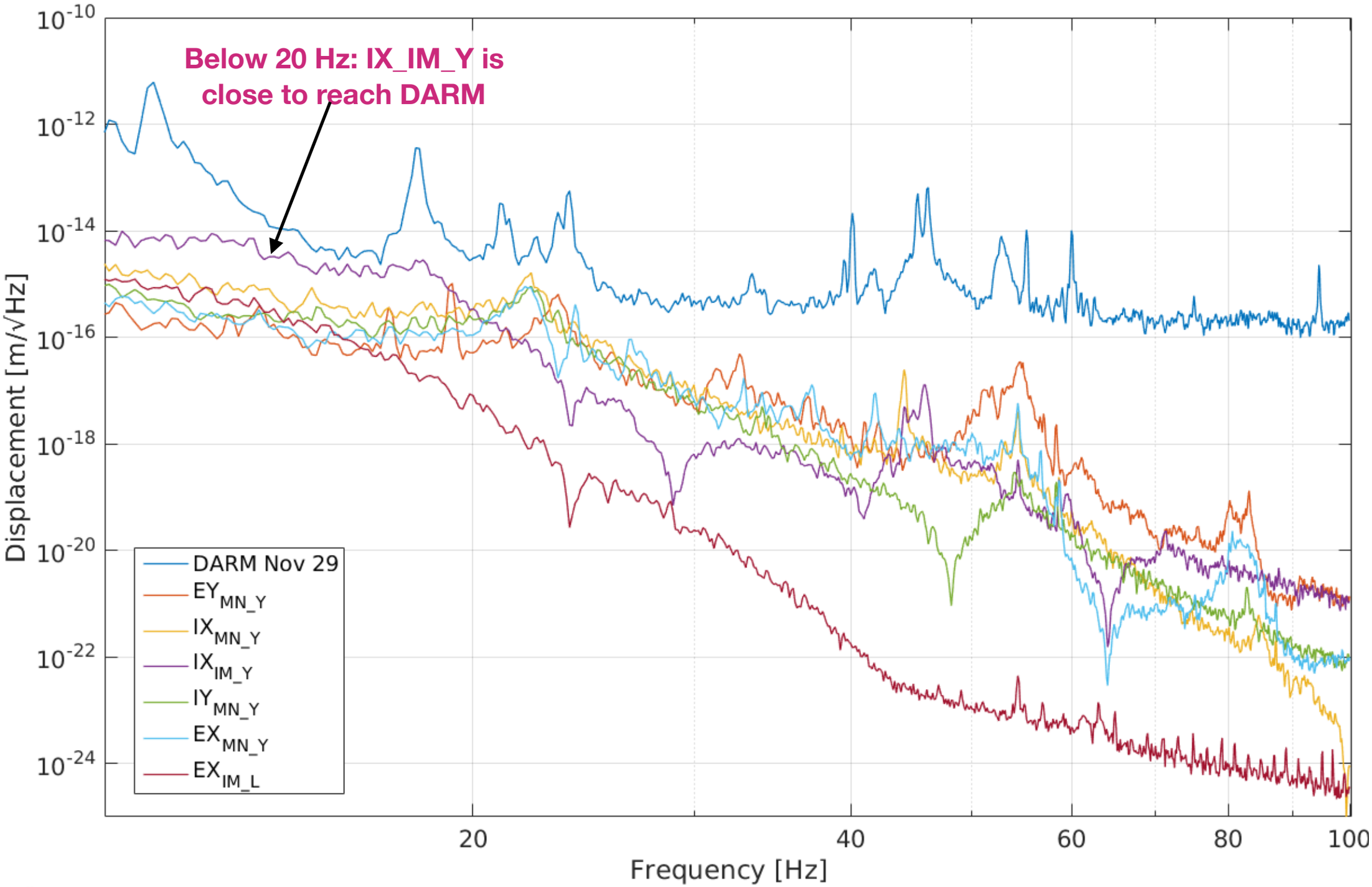
More details about the TF measurements and noise budget are discussed in T. Yamada's poster

Noise budget: preliminary results



See T. Yamada's poster

Noise budget: preliminary results



See T. Yamada's poster

Conclusions and next steps

◉ Type A

✓**Tower:** All the control loops are working properly

✓ **Tidal control:** Work in progress

✓**Payload :** Control loops are working & 90% are implemented

✓**Payload:** Some control loops have to be tuned (IX_IM_Y, EX_MN_R, IX_MN_R)

◉ Type B

✓**Tower and Payload:** All the loops are working properly

◉Type Bp

✓ All the control loops are working properly

➡ Noise budget

- Working in progress for TypeB and Type Bp
- The TFs have to be integrated into the noise budget tool developed by A. Shoda

Thanks for your attention!