Commissioning in phase 1

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FOR THE COMMISSIONING TEAM (IT'S YOU ALL!)
KAGRA F2F AT OSAKA CITY UNIV. (MAY 18TH 2018)

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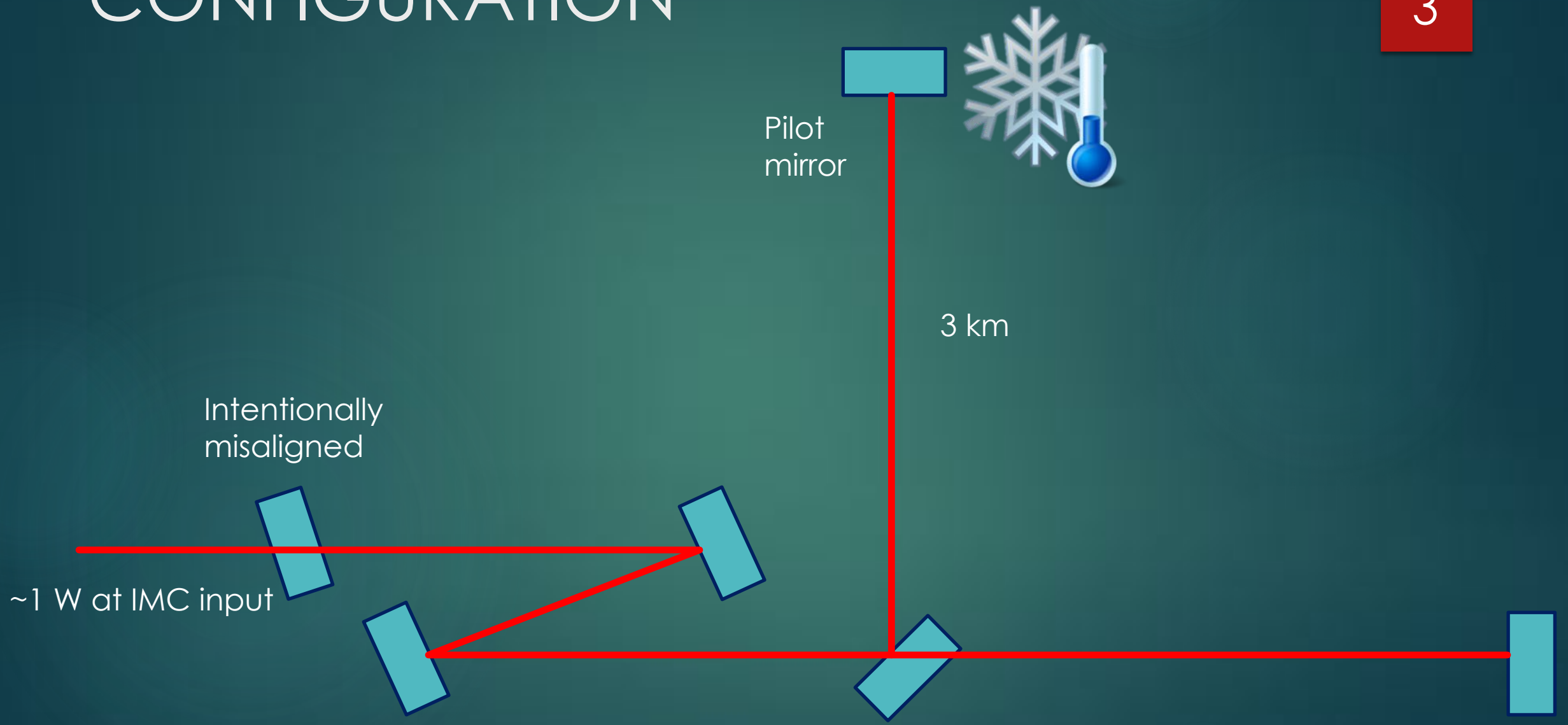
- Review of the interferometer control
- Issues that are identified
- Future

CONFIGURATION

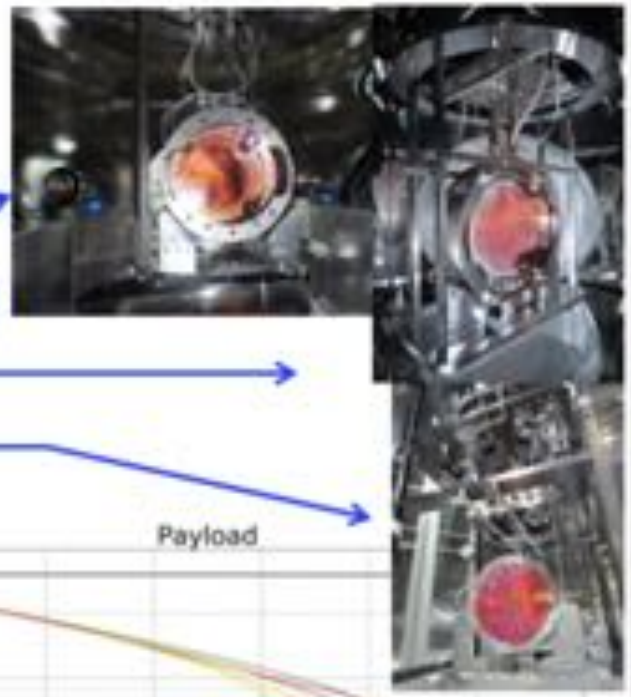


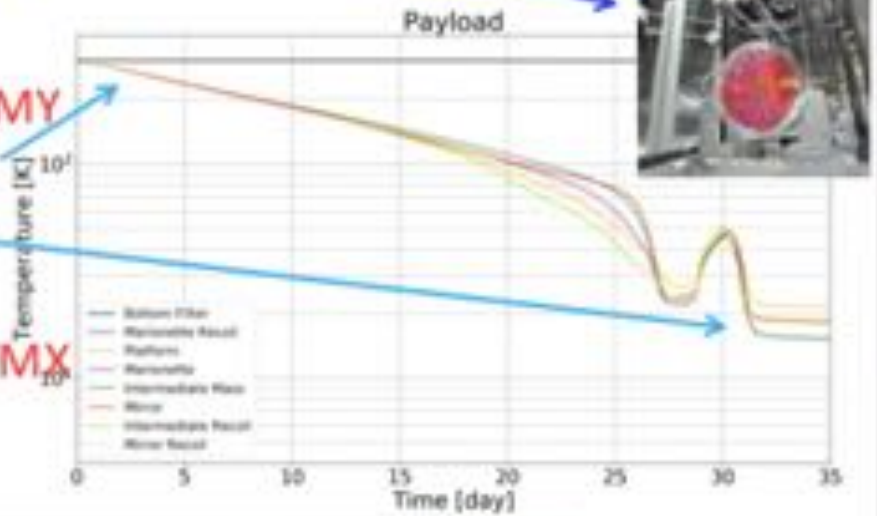
Phase 1 Overview

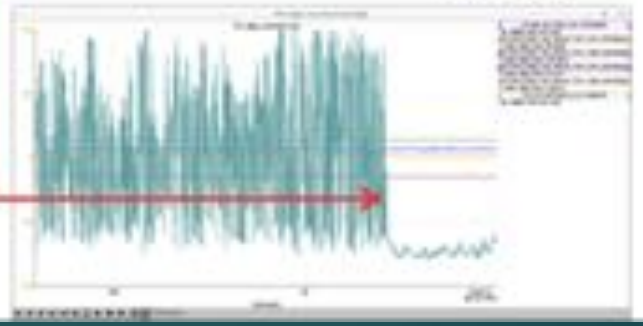
Milestones

Suspension
Cryogenic
Interferometer

* Sept 19 2017: All PR suspension installation completed
* Sept 21 2017: BS suspension installed
* Oct 19 2017: Main beam reached X end
* Oct 26 2017: Main beam reached Y end
* Dec 1 2017: ETMY suspension installed
* Dec 19 2017: Main beam returned from ETMY
* Feb 7 2018: Cooling down of ETMY started
* Mar 11 2018: ETMY reached 20 K
* Mar 23 2018: ETMX suspension installed
* Mar 29 2018: Main beam returned from ETMX
* Apr 10 2018: Michelson fringe observed
* Apr 20 2018: Michelson locked
* Apr 28 2018: **Phase 1 Operation started**

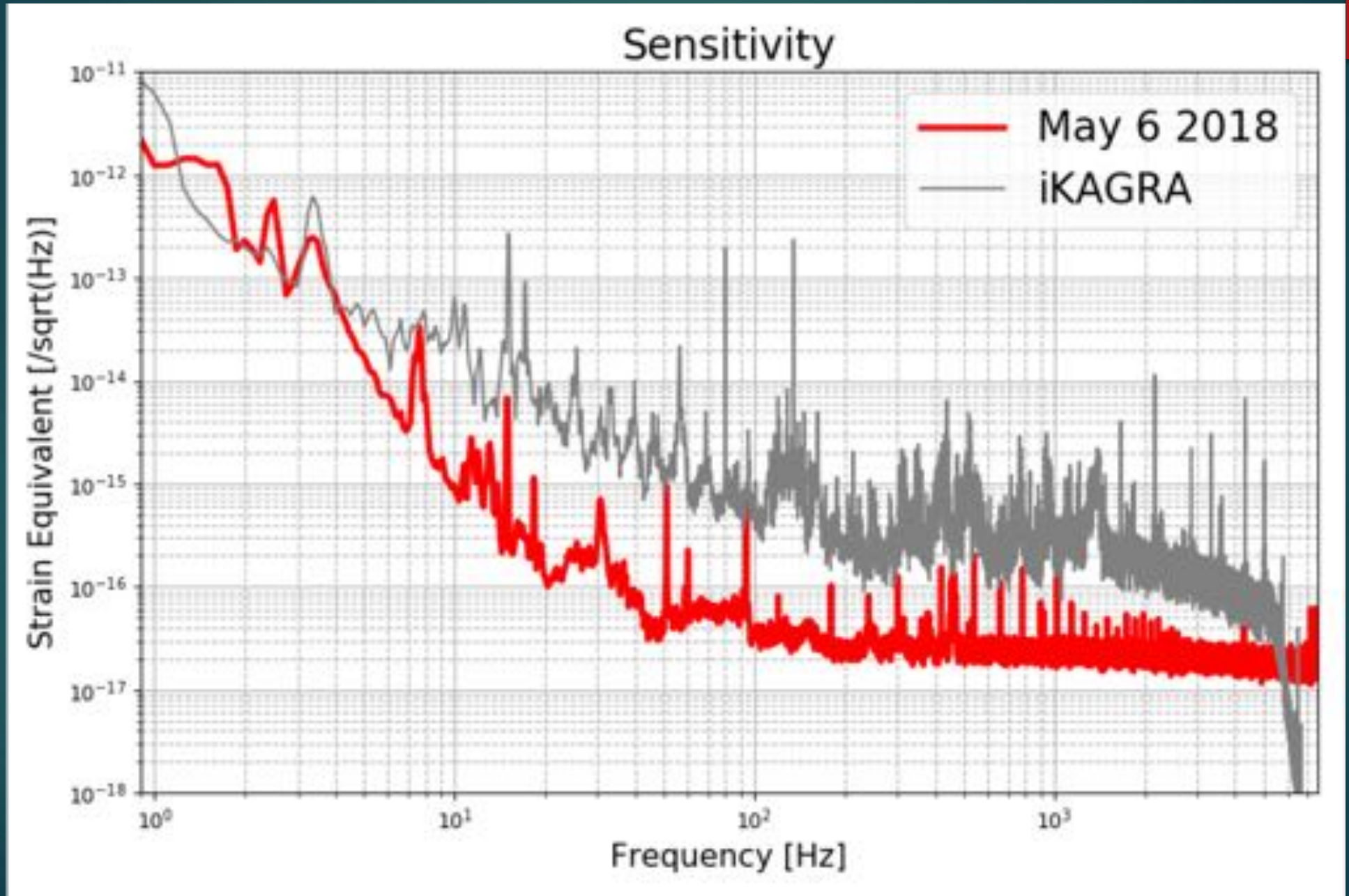






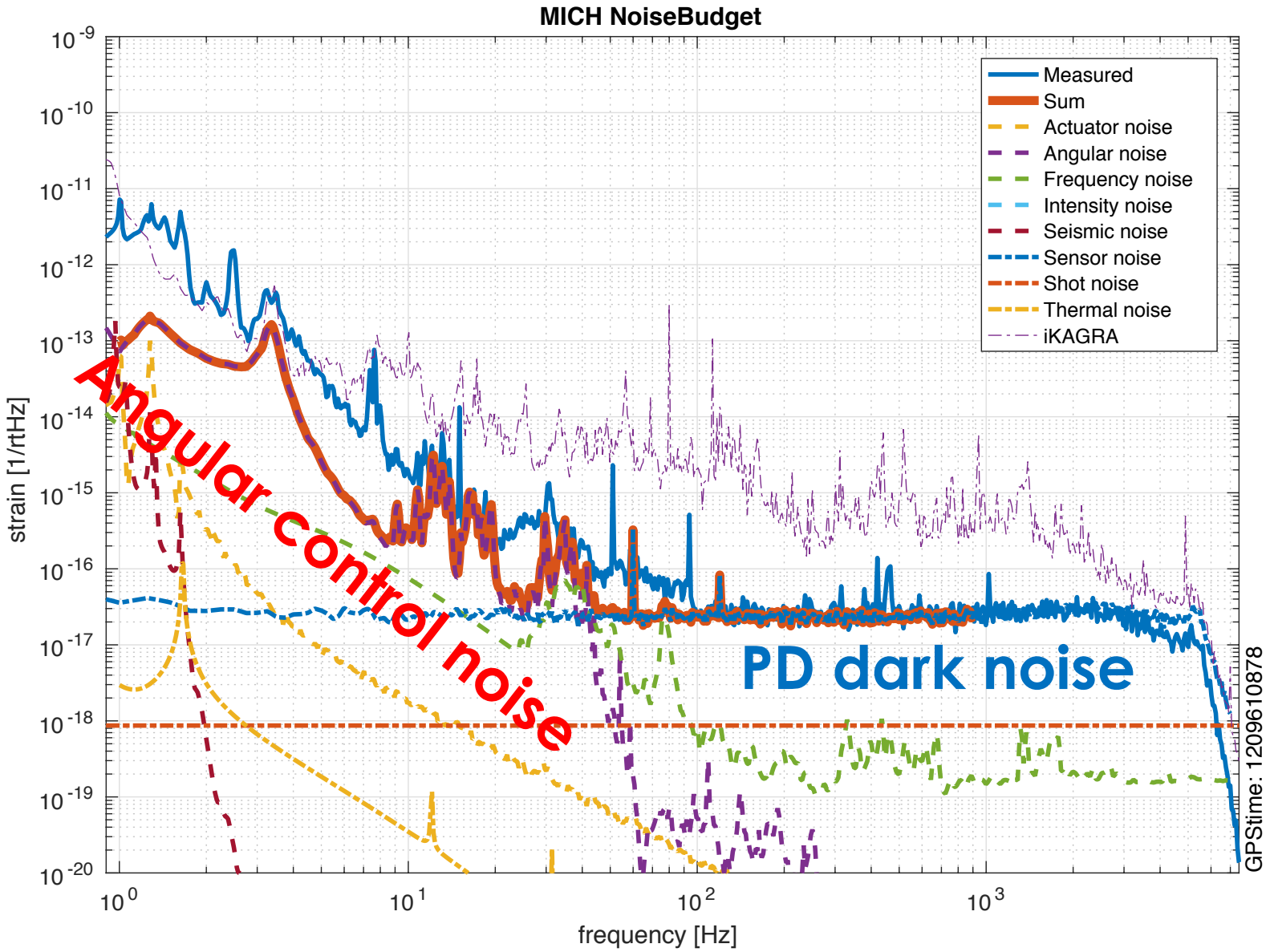
Slide by
Y. Enomoto
JGW-G1808217

NOISE



Plot by
Y. Enomoto

NOISE BUDGET

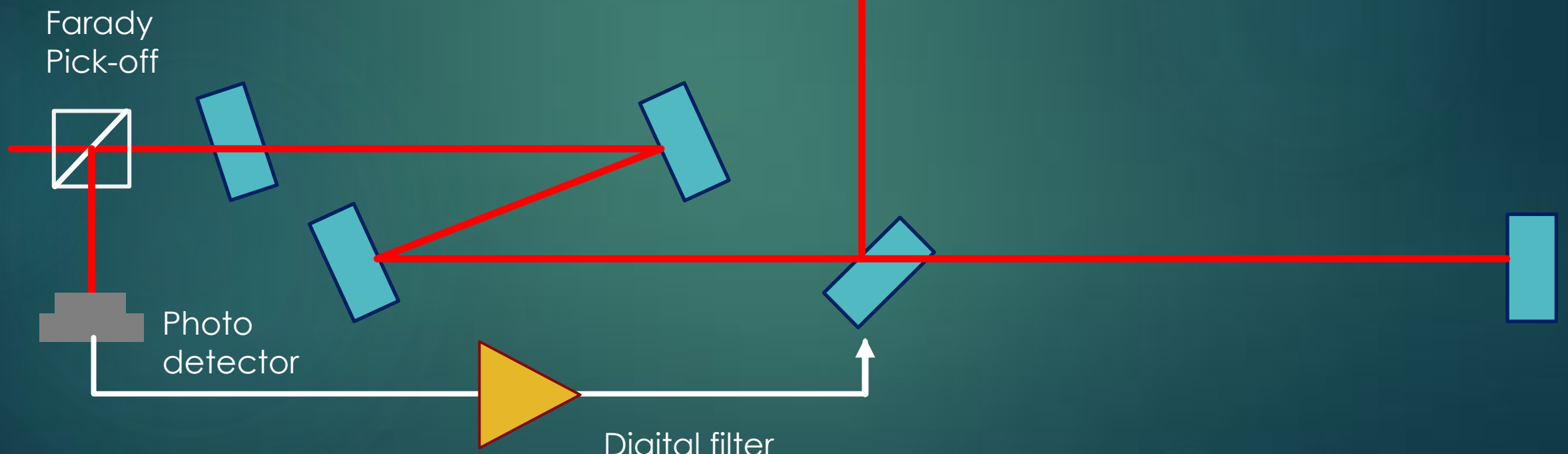


CHACTERISTICS

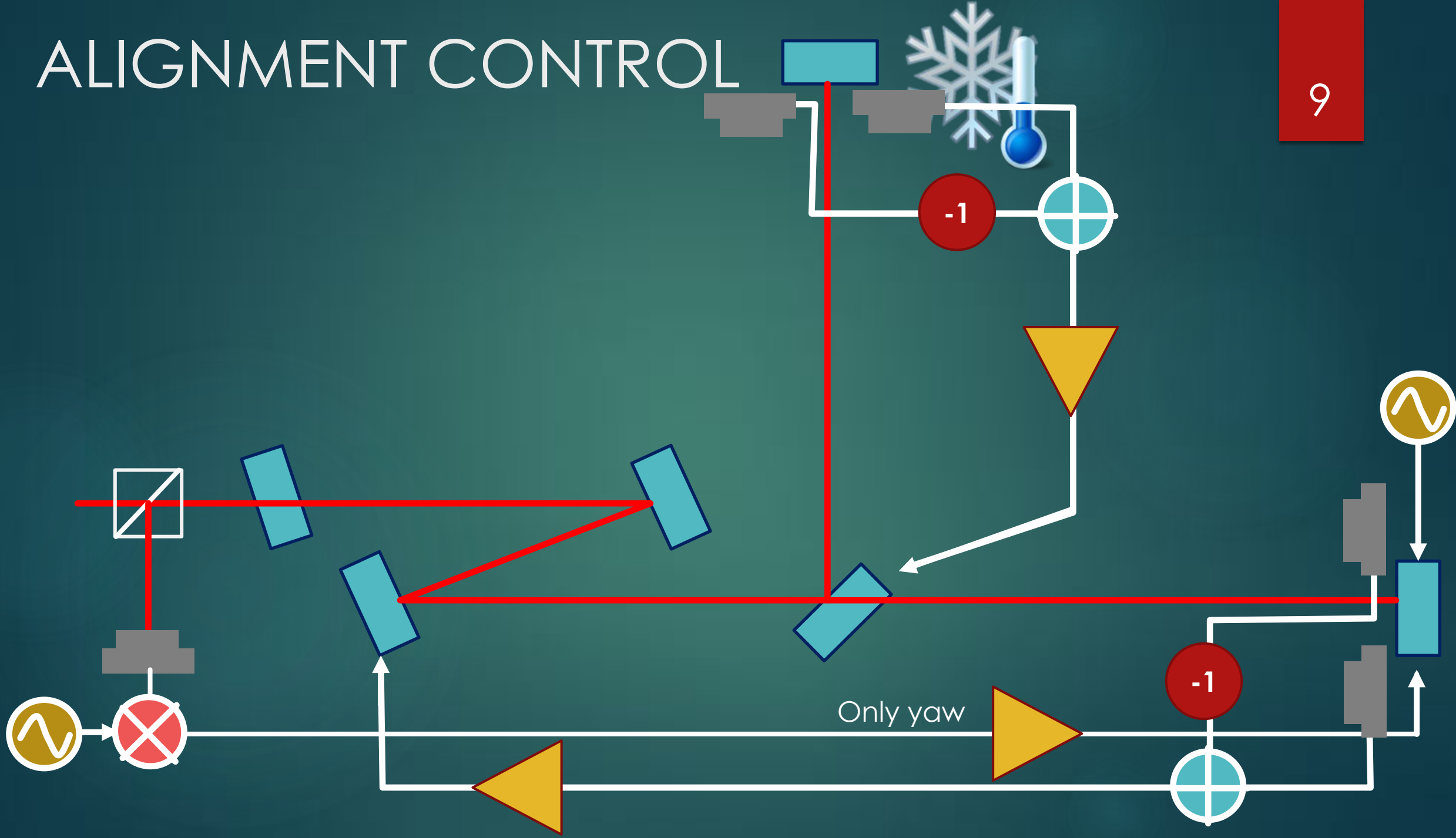
- High visibility (~ 99%, klog 4775)
  - ETMs are balanced in their properties i.e., curvature and reflectivities including the BS's splitting ratio.
- ETM position asymmetry not well quantified (klog 4960)
  - Measured to be 3.4(5) – 4.5(7) m while design = 3.3 m
  - Needs to assess severity from P.O.V. of interferometer control.
- F1 modulation depth (klog 4876)

LENGTH CONTROL

UGF ~ 50 Hz.
Feedback to BS TM and IM stages with xover at ~ 0.1 Hz



ALIGNMENT CONTROL



ALIGNMENT CONTROL (contn'd)

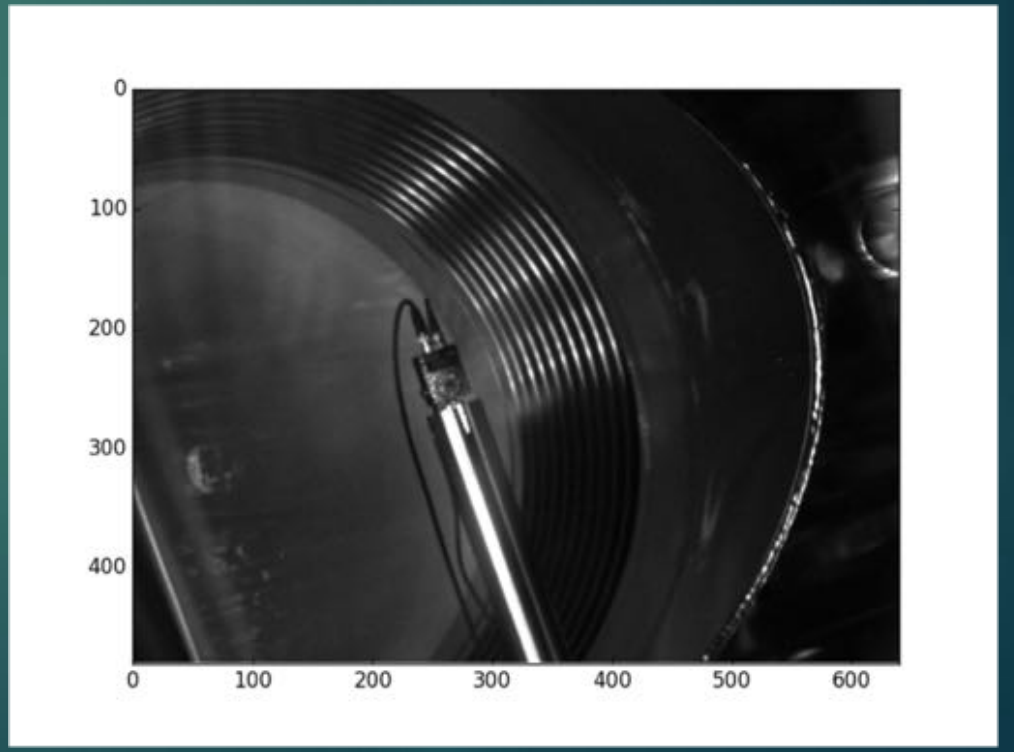
- Manual fine adjustment ~ every half a day
- No global control on ETMY angle
  - Optical level local control was good enough
- ETMX needed a global control
  - Servoing to optical lever had a long term drift issue (~ a day)
  - Global control lets ETMX follow ETMY
  - Seemingly worked fine

QUALITATIVE ARG. ON ALIGNMENT

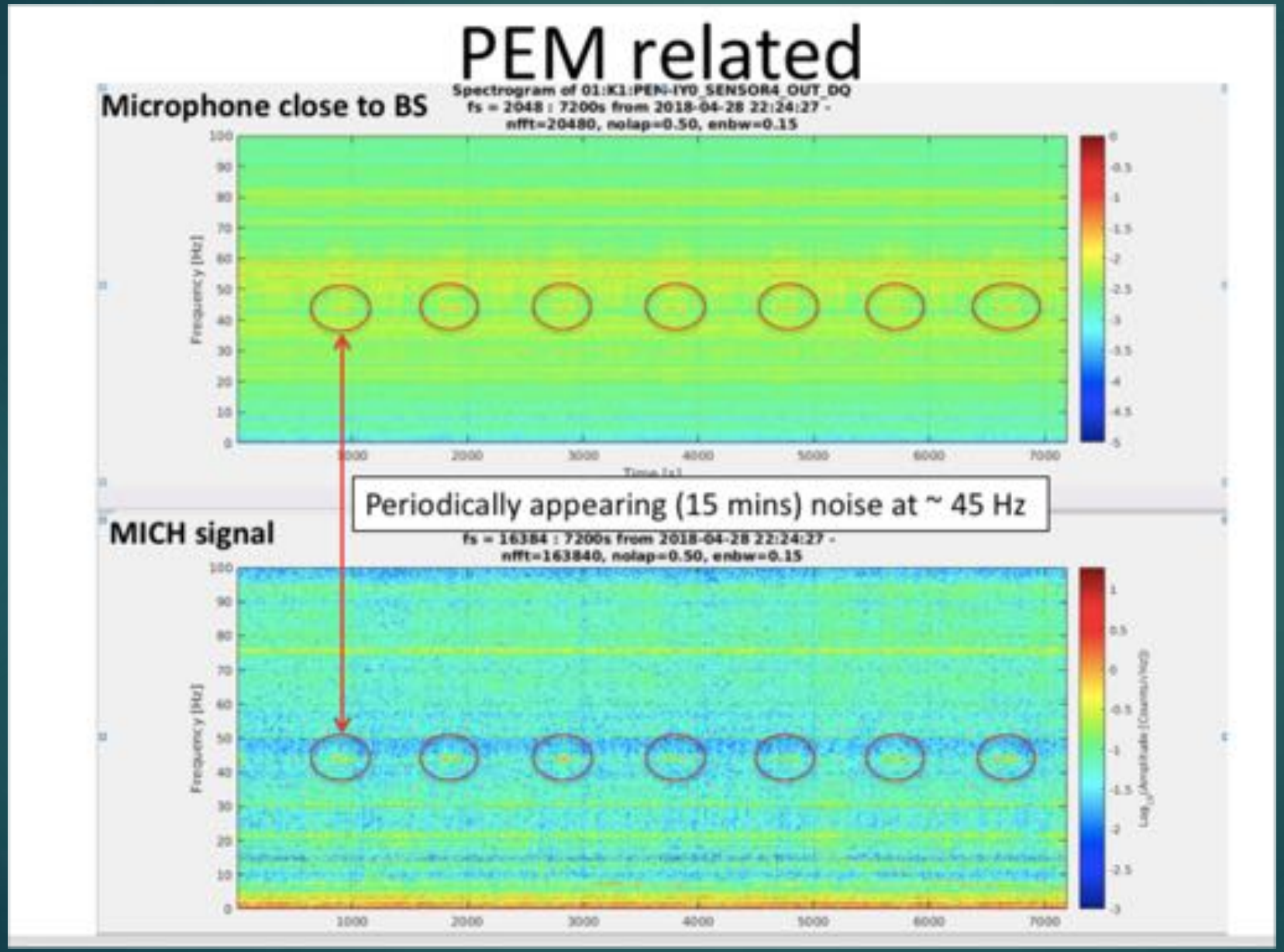
- Things became stable once under vacuum.
  - Smaller number of manual adjustment for suspension alignment

- Several different sensors helped us understanding the alignment condition.
  - VIS local sensors, optical levers, Tcams, gigE-cams and baffle PDs.

EXA temporary PD as seen by gigE cam



HUNTING SOME NOISE



Slide by
Y. Enomoto
JGW-G1808217

ISSUES THAT ARE IDENTIFIED

PR3 SLIPPING

- See logs 3634 and 3780.
- PR3 found to be off in angle in pitch by 10 mrad.
- Associated with a power-down of IO chassis.
  - Best guess is a jolt onto the mirror bringing the mirror to another stable point.
- Temporarily circumvented it by mechanically locking the mirror to its recoil mass.
- No indication of another slippage so far.

PR3 SLIPPING (contn'd)

- Similar events was observed with PR2 which remained no issues since Nov. 2017
- See also JGW-G1707405 by Shoda-san.
- VIS group is incorporating Virgo's technique to address this issue for SRs.

DAC GLITCHES

- Observed in ETMY, PRs 2 and 3, and BS controllers.

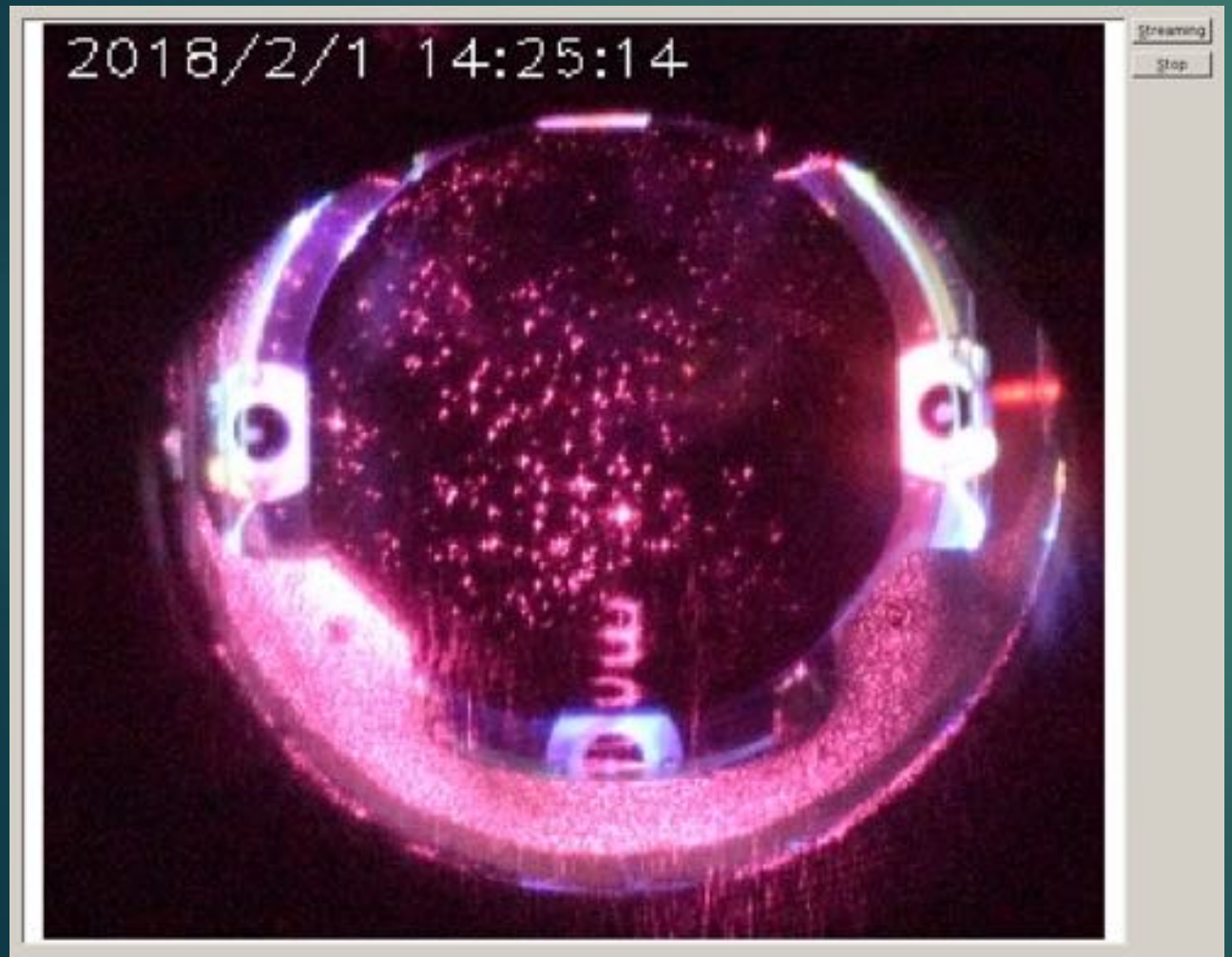
Klog 4254

DAC GLITCHES (contn'd)

- No real solution so far.
- Reducing the sampling rate (16 -> 2 kHz) reduced the glitch rate to an OK-level.

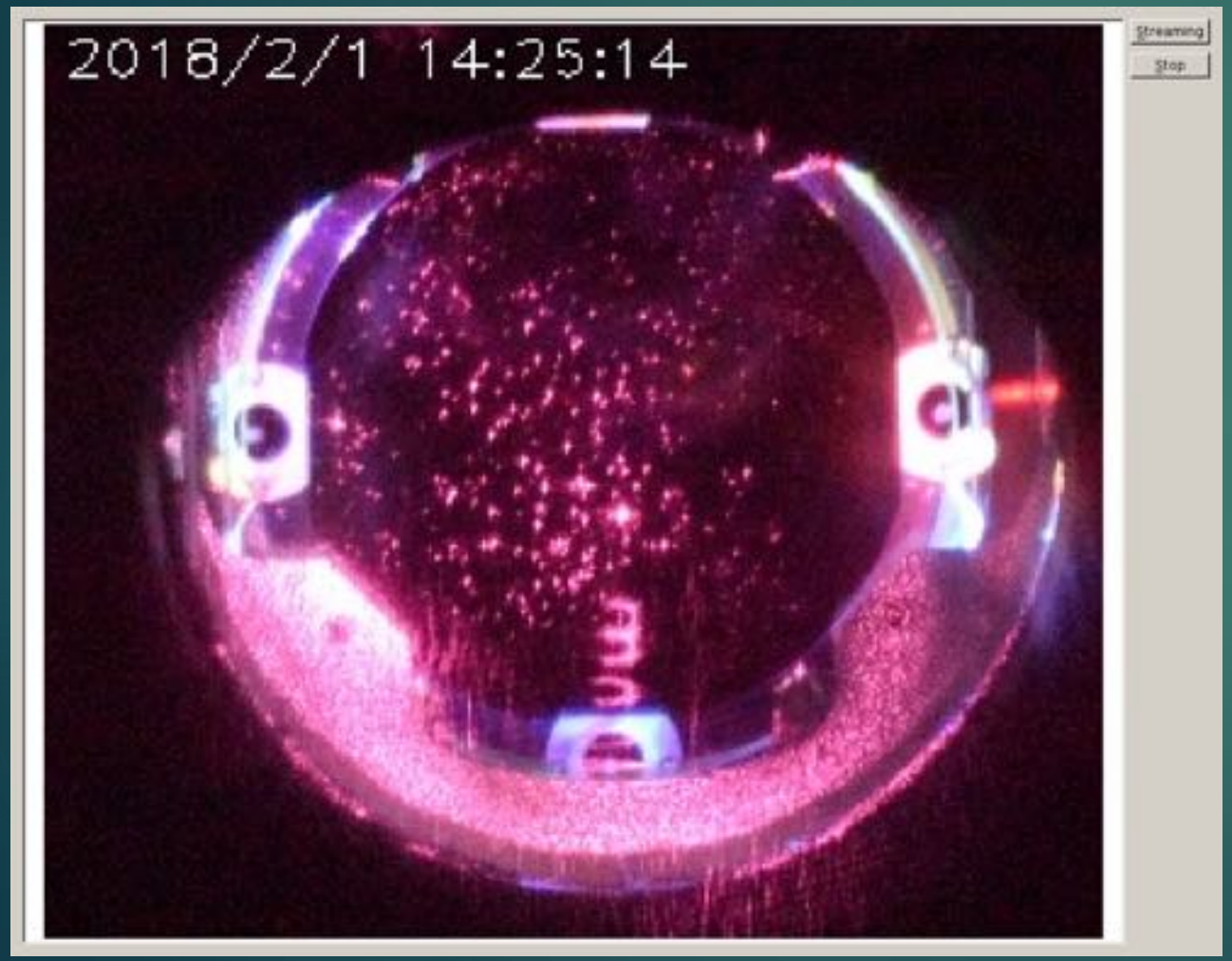
BRIGHT SPOTS

ETMY Tcam image



ETMX Tcam image, klog 4767

ETMY BAFFLE PDs



- Unable to bring the interferometer beam to the upper two PDs.
- Needs to assess what went wrong.

OTHER ISSUES

- PR3 optical lever glitches.
- Lots of challenges in ETMY local control
- Brute-force coherence (BRUCO) not ready in time
- How do we spot anomalous suspension drift and glitches?
- etc.

FUTURE

REMOTE PARTICIPATION

- A number of us actually reside afar
  - VIS experts at Mitaka, MIF experts at Hongo, Detchar experts all around Asia…
- Their remote participation for commissioning activities is a key to increase our productivity
- High demand for rapid communication with the crew on site.
- Aso-san is addressing the communication part of it by introducing remote participation systems.
  - Zoom remote system, TeamSpeak, …

By N.Kijbunchoo

SUMMARY

- Overall, commissioning was successful.
- A number of issues are identified.
- Remote participation seems another key.