

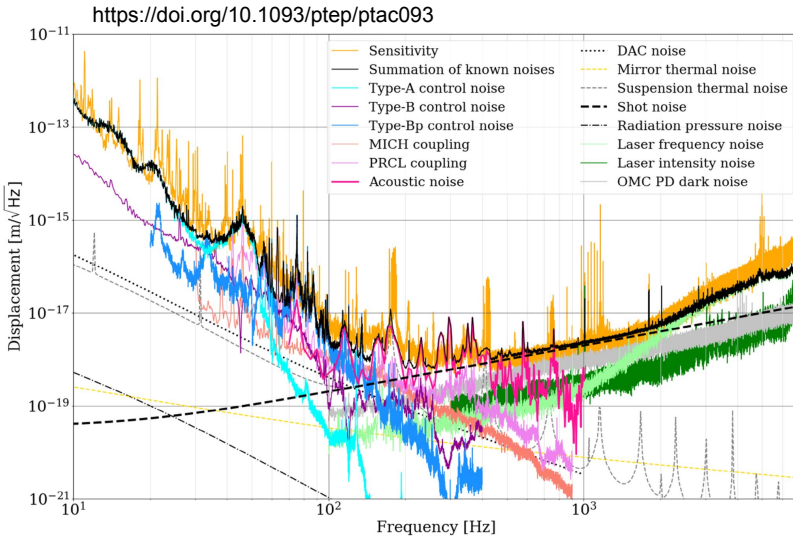
KAGRA status

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The road to O4

Noise sources in the KAGRA detector during the O3GK observing run



Key strategies for overhauling interferometer:

Low Frequency



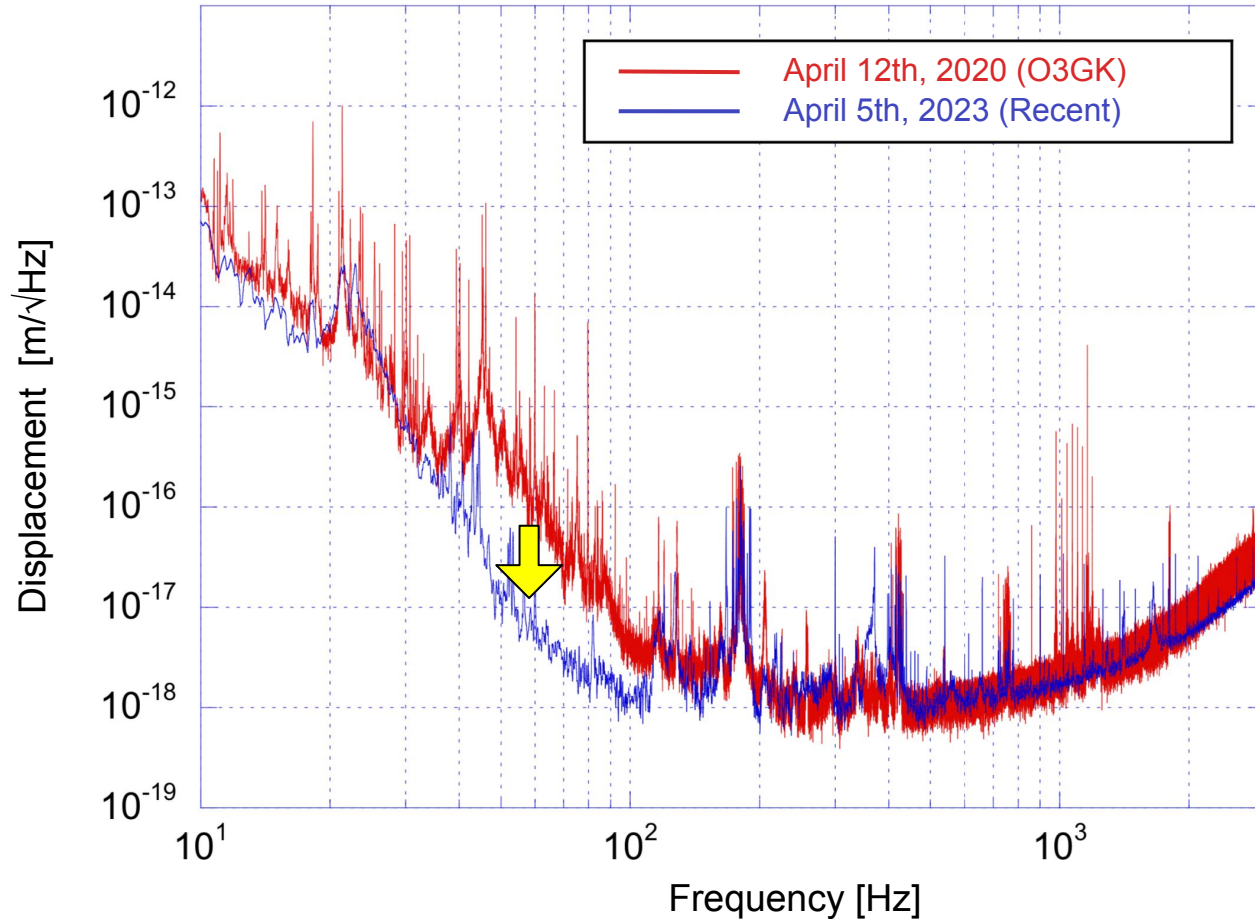
High Frequency

- Refining/Repairing vibration isolation system.
 - Installing more accelerometers.
 - Installing optical levers to monitor the motion of type-A marionette and platform.
 - Replacing the magnets controlling the mirrors
 - Fully “health checking.”
- Reducing control noises by filter optimization & tuning
- Shielding stray lights by the installation of baffles
- Removing environmental noises with more sensors and injection tests
- Reducing shot noise by
 - Replacing SRM with a transparent wedged optical plate
 - Introducing high-power laser (60W; 120W in future)
- Reducing laser frequency and intensity noises with high-power laser

Strategy for cryogenic issue:

- Improving the cooling procedure to prevent frosting of mirror surfaces.

Noise curve of recent days.



- Significant improvement has been realized in 40-100 Hz.
- Joining O4a with our modest target sensitivity is now very feasible.
- The commissioning on the remaining pre-O4 day will further increase the sensitivity and stability of detector operation.
- Completion of the health check for suspensions has improved the reliability of the equipment and deepened our understanding of the equipment, then improved the quality of the commissioning.

Schedule for O4

- KAGRA will start O4a observing run together with LV on May 24 just for four weeks (~ June 21) with a sensitivity of 1-3 Mpc.
- We then resume commissioning and cooling the mirrors.
- KAGRA will rejoin the observing run for three months in spring 2024 with a sensitivity of 10Mpc approx.
- After that, we will further improve sensitivity toward the end of O4 for our first detection of the signal with LV.
- IFO configuration throughout O4: PRFPMI
- Cryocooler operation for test mass mirrors
 - O4a: 80 K (@EX), 250 K (@IX,IY,EY)
 - mid-/late-O4: < 100 K for all mirrors.

