Recent Activities of the AOS

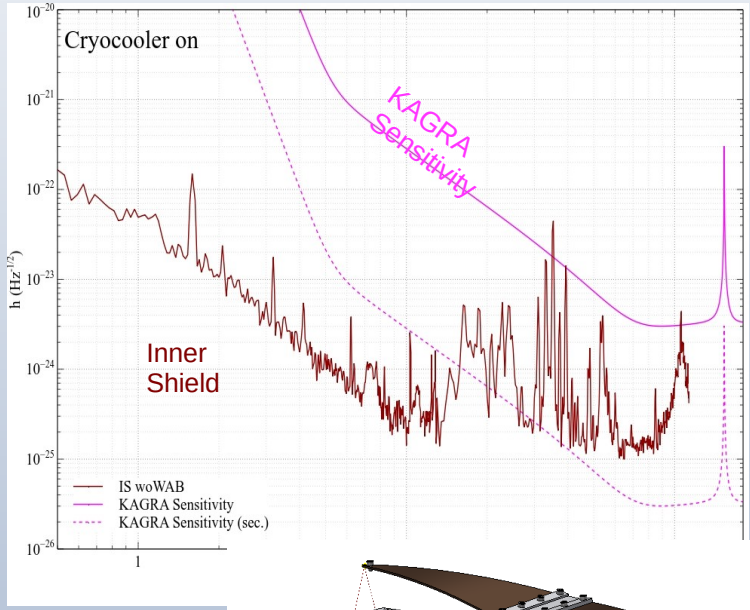
Wide-Angle-Baffle and Narrow-Angle-Baffle

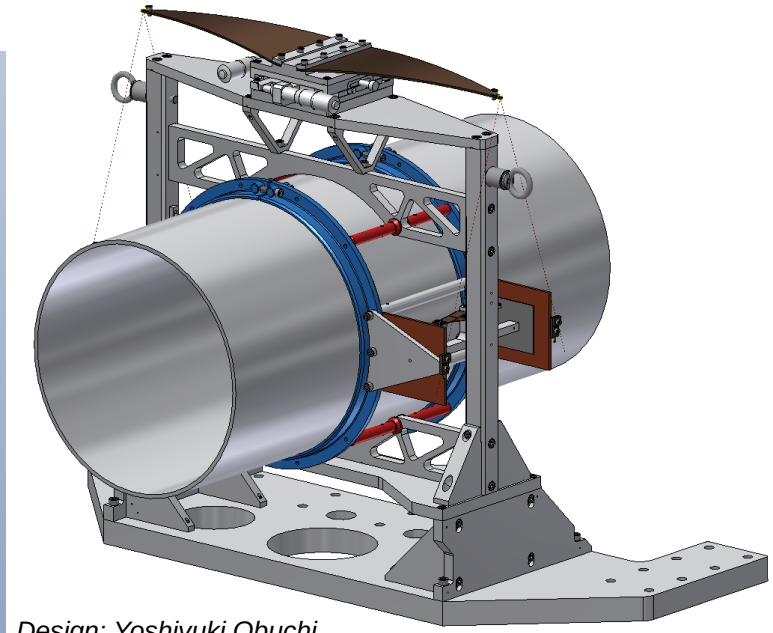
Simon ZEIDLER*, Tomotada AKUTSU

Wide-Angle-Baffle

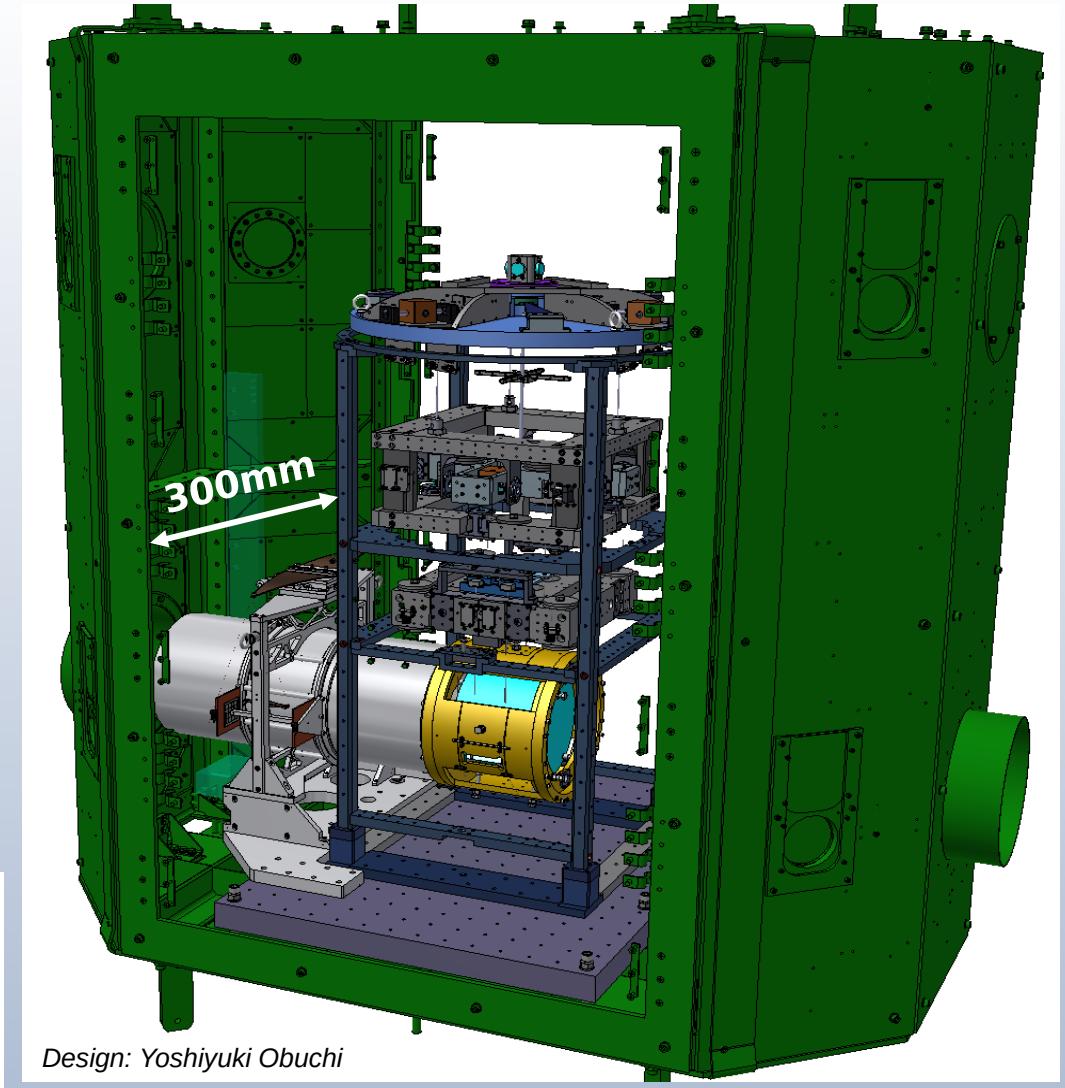
Wide-Angle-Baffle

- Block scattering coming from the Saphire test masses
- Scattering may harm goal sensitivity without WAB

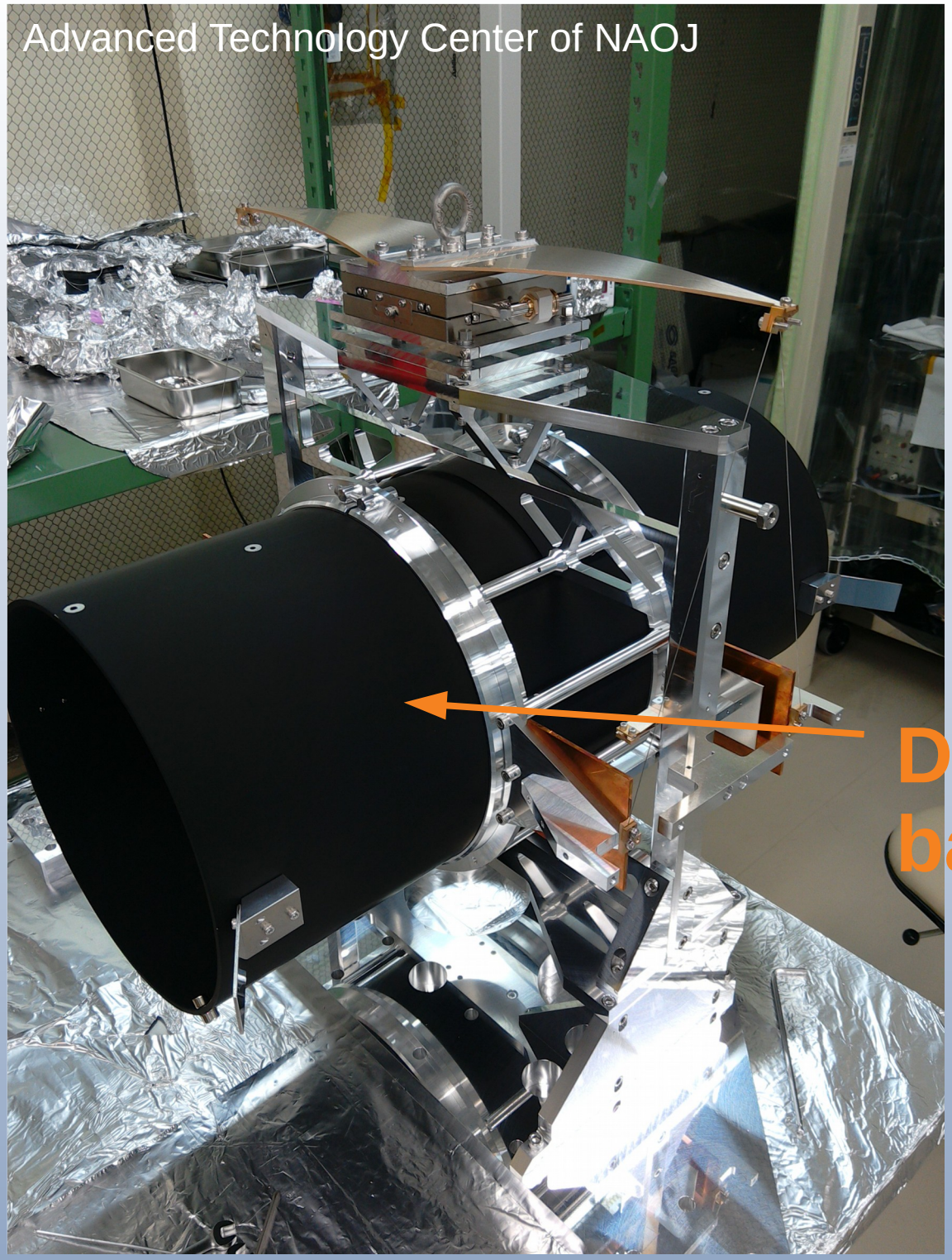




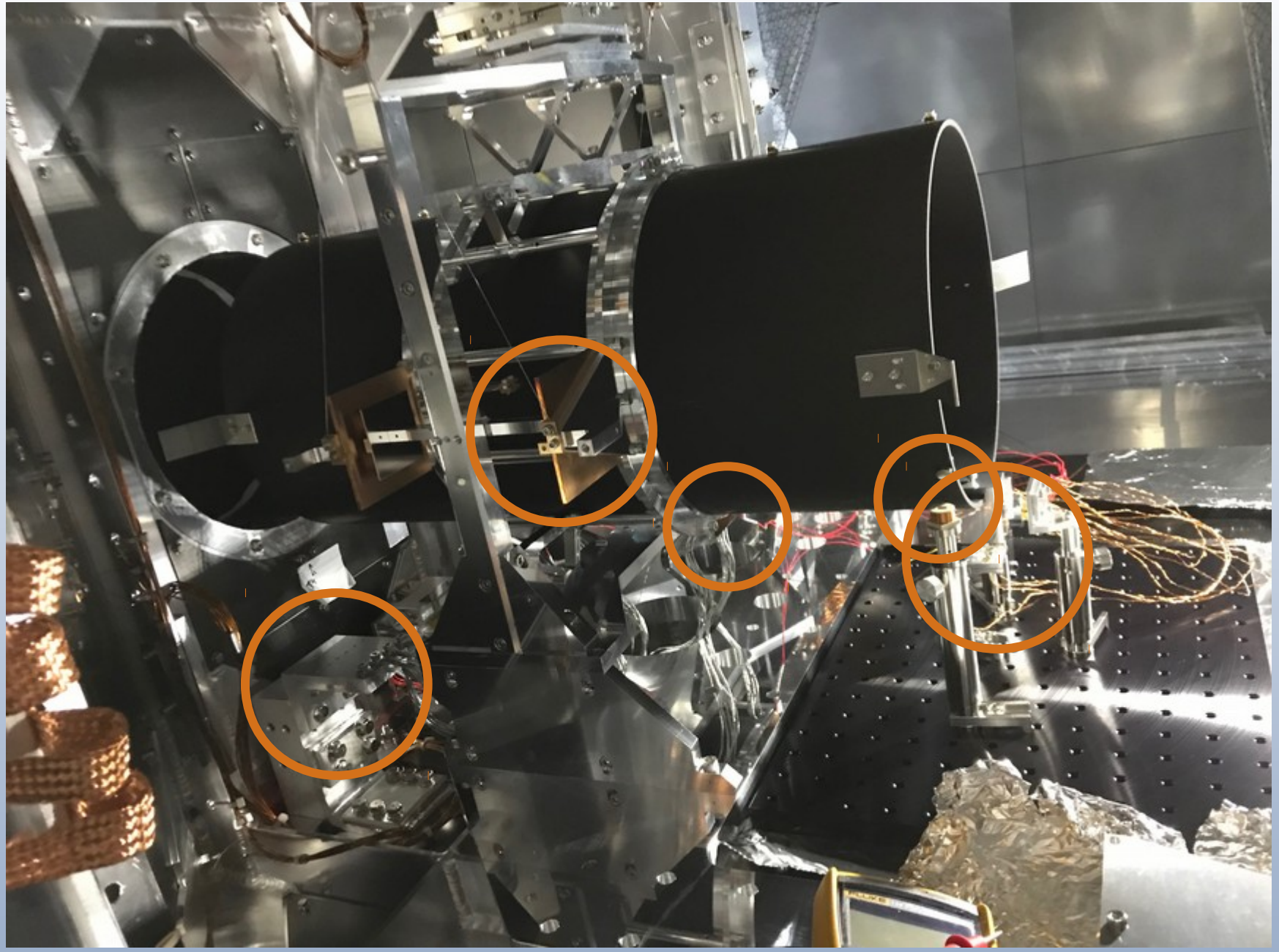
Design: Yoshiyuki Obuchi



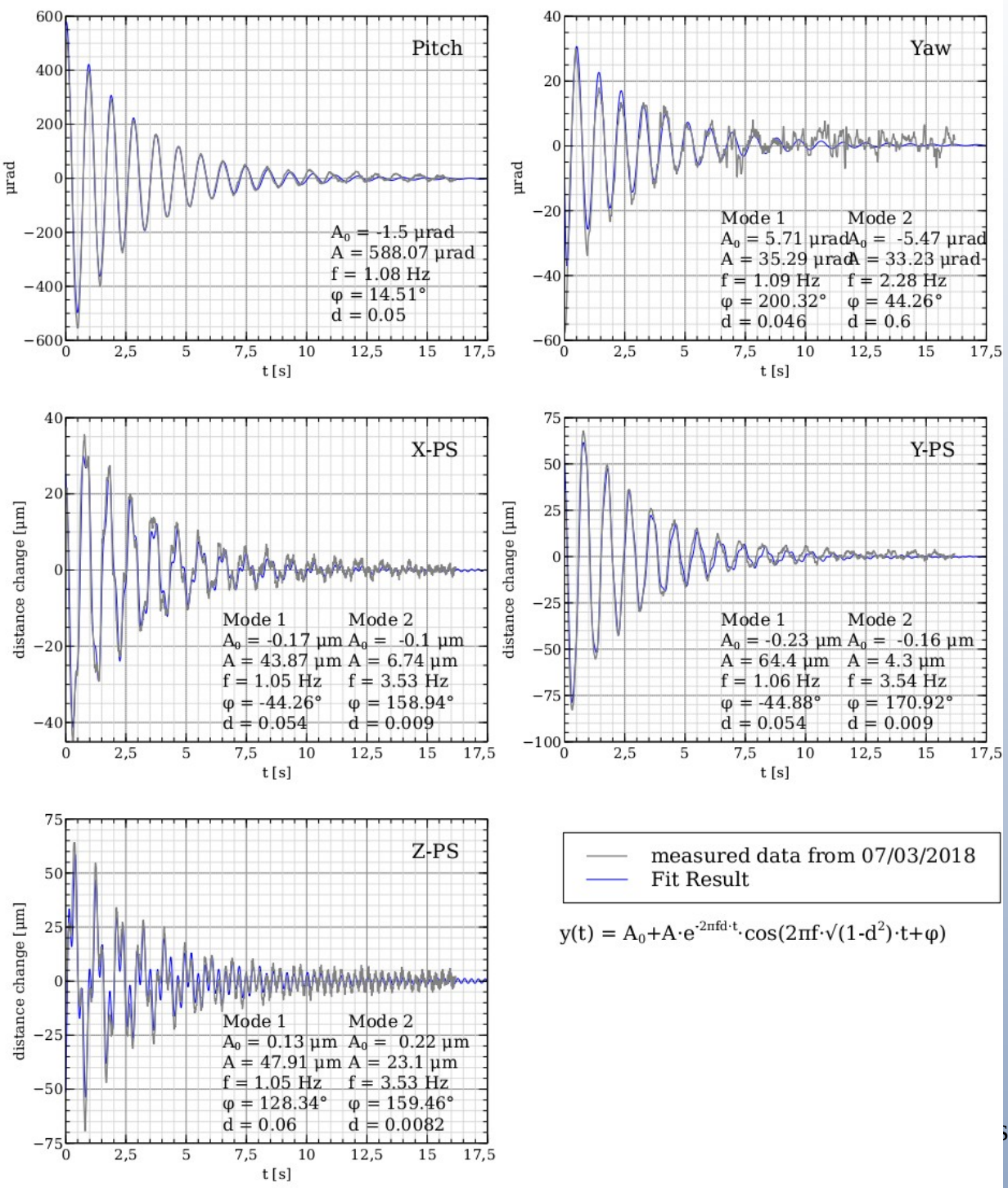
Design: Yoshiyuki Obuchi


Advanced Technology Center of NAOJ
Dummy baffle

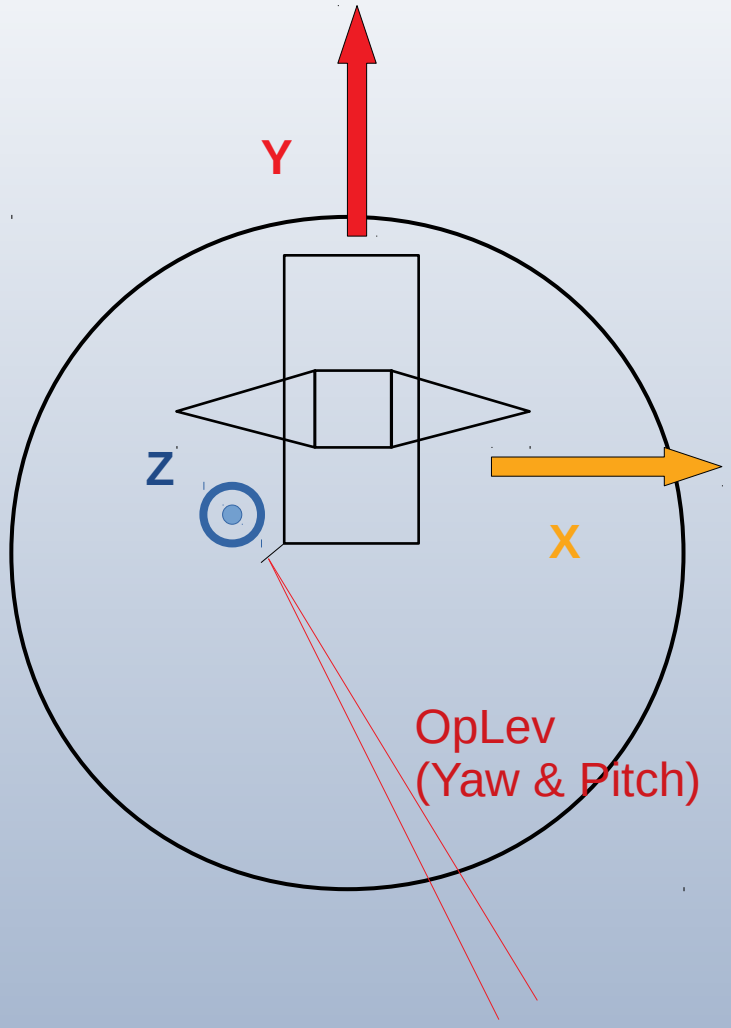
IYC → 03/22 – 04/28



Wide-Angle-Baffle Cooling-Test



Room-temperature actuation test

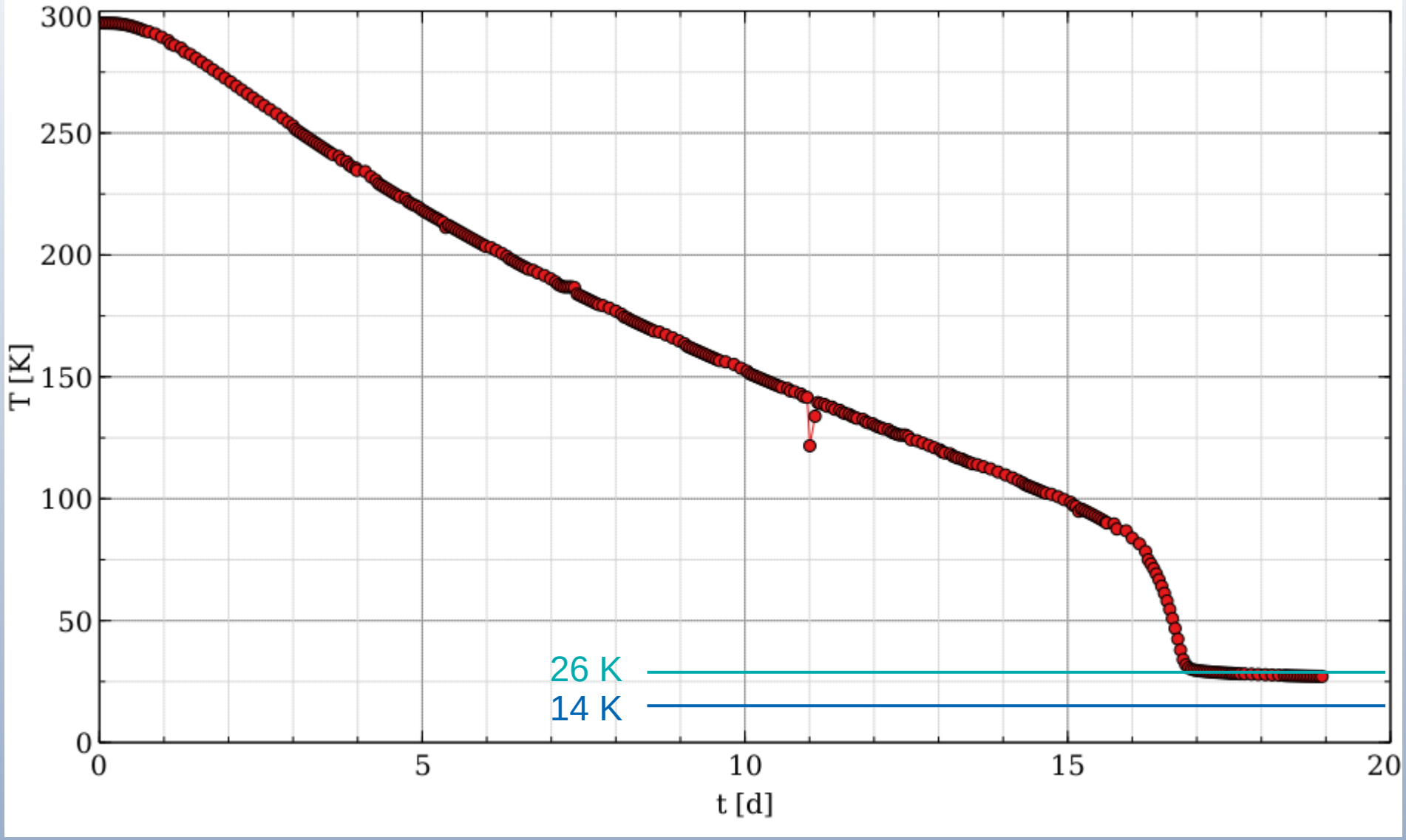


$$f_{pendulum\,X} \approx f_{pendulum\,Y} = 1.05\,Hz$$
$$f_{bending\,Z} = 3.53\,Hz$$

$$Q_{X,Y} \approx 20$$
$$Q_{Z} \approx 120$$

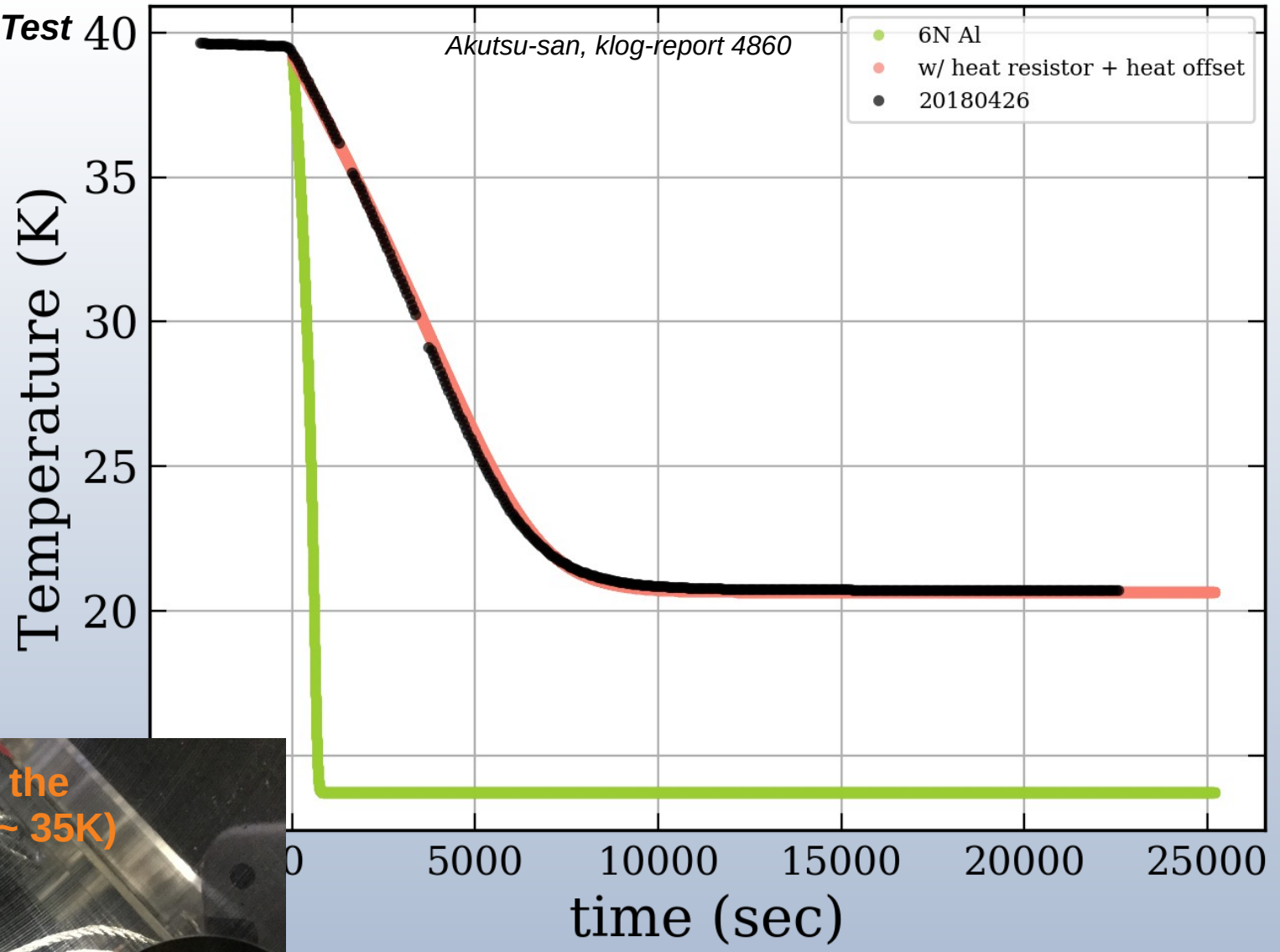
Wide-Angle-Baffle Cooling-Test

- Cool-down reached equilibrium after ~17 days
- Failed to reach the temperature of the cooler-head

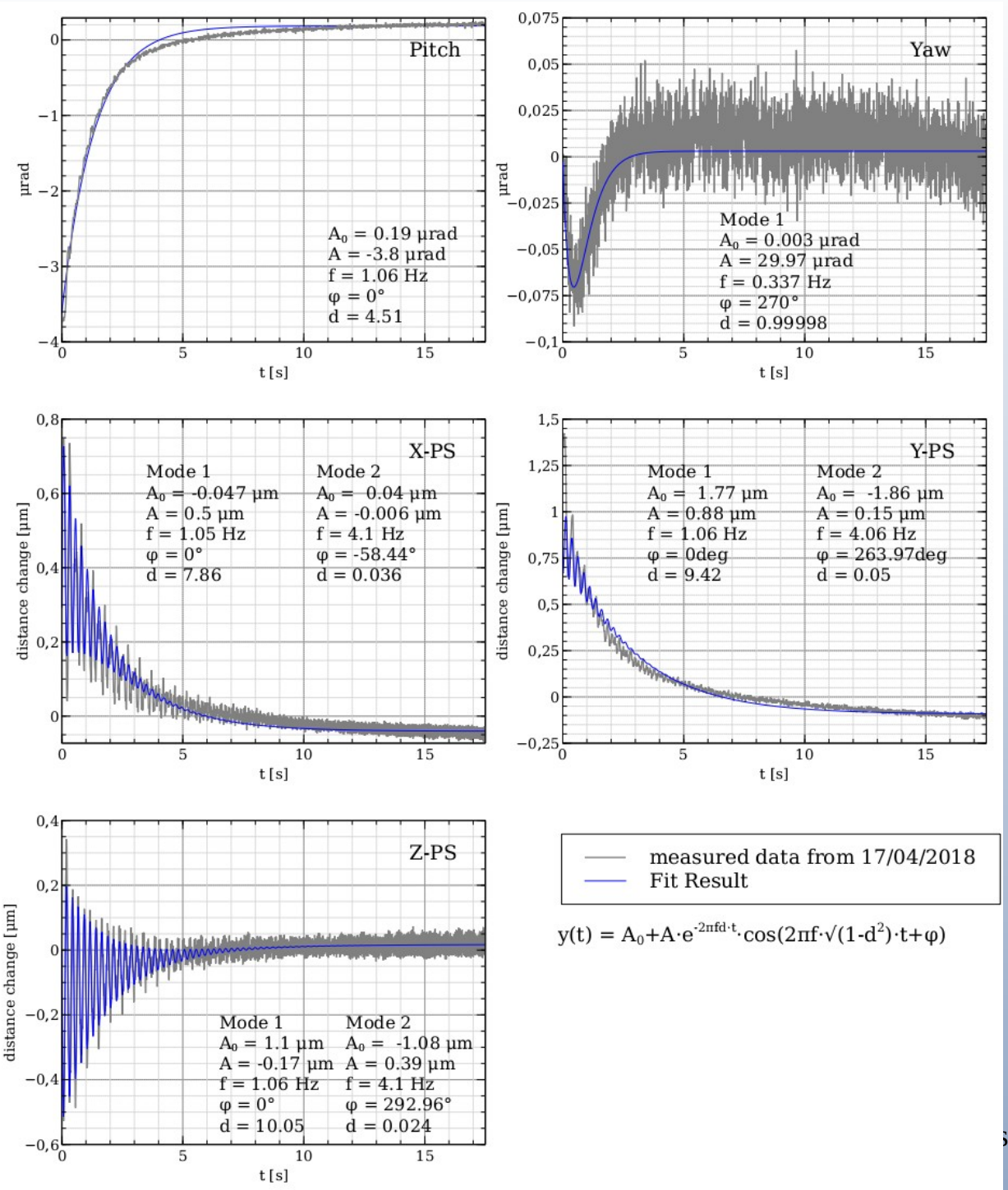


Wide-Angle-Baffle Cooling-Test

- Even after repair of cryocooler for one duct, equilibrium stuck at ~21K
- Fits show: additional heat-resistor + heat-flow required to understand cooling-down



Wide-Angle-Baffle Cooling-Test



Actuation @ 26K

→ overdamping...

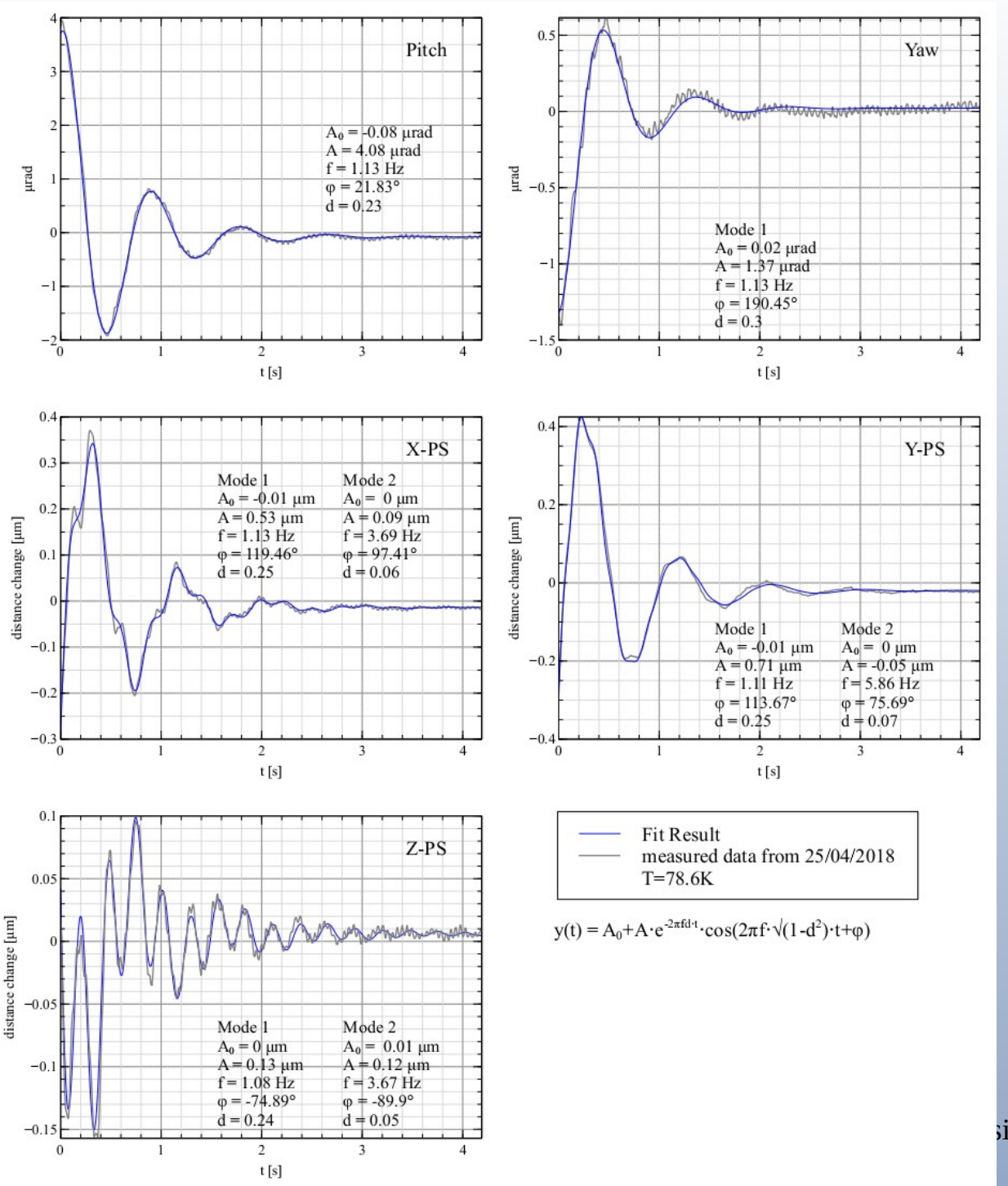
$$f_{pendulum\,X} \approx f_{pendulum\,Y} = 1.05\,Hz \Rightarrow ?$$
$$f_{bending\,Z} = 3.53\,Hz \Rightarrow 4.1\,Hz$$

$$Q_{X,Y} \approx 20 \Rightarrow \sim 0.1$$
$$Q_{Z} \approx 120 \Rightarrow 42$$

Cu-plates are too pure!

→ electric conductivity increases higher than expected

Wide-Angle-Baffle Cooling-Test



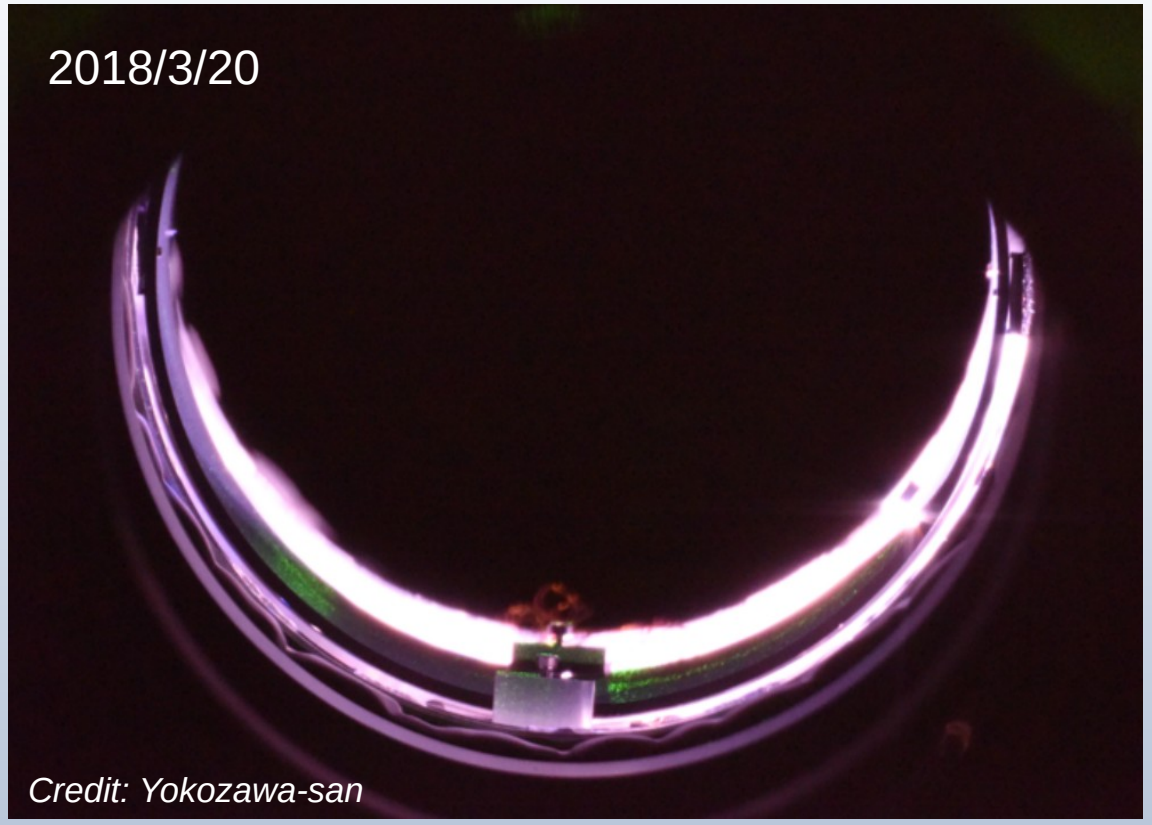
Actuation @ 77K

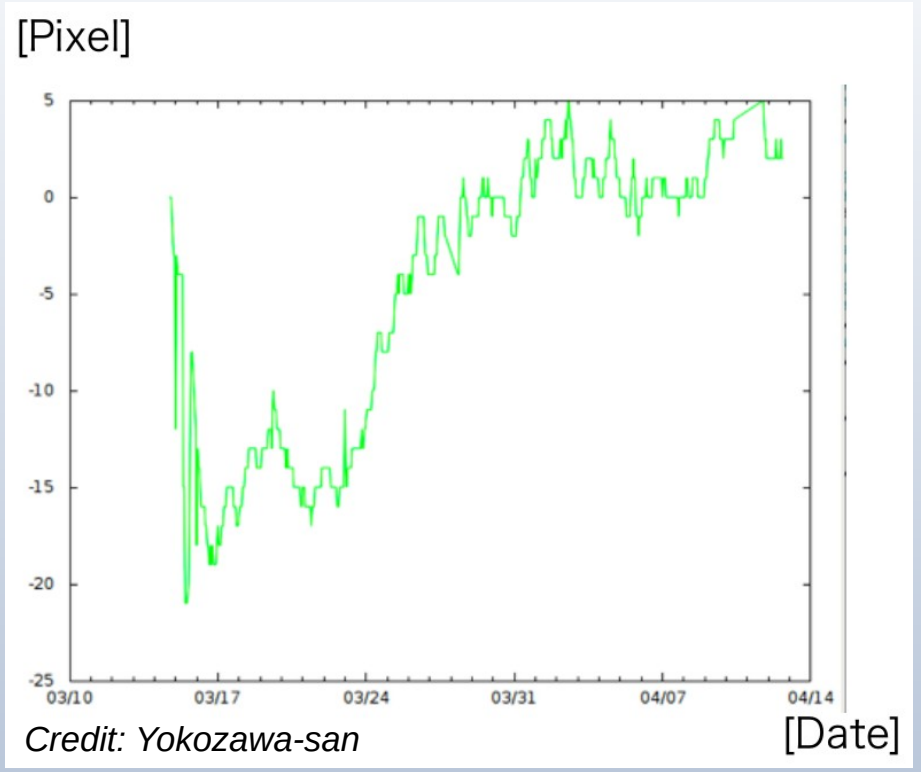
→ damping comes back

$$f_{pendulum\,X} \approx f_{pendulum\,Y} = 1.05\,Hz \Rightarrow 1.13$$
$$f_{bending\,Z} = 3.53\,Hz \Rightarrow 3.67\,Hz$$

$$Q_{X,Y} \approx 20 \Rightarrow \sim 4$$
$$Q_{Z} \approx 120 \Rightarrow 20$$

Wide-Angle-Baffle Cooling-Test





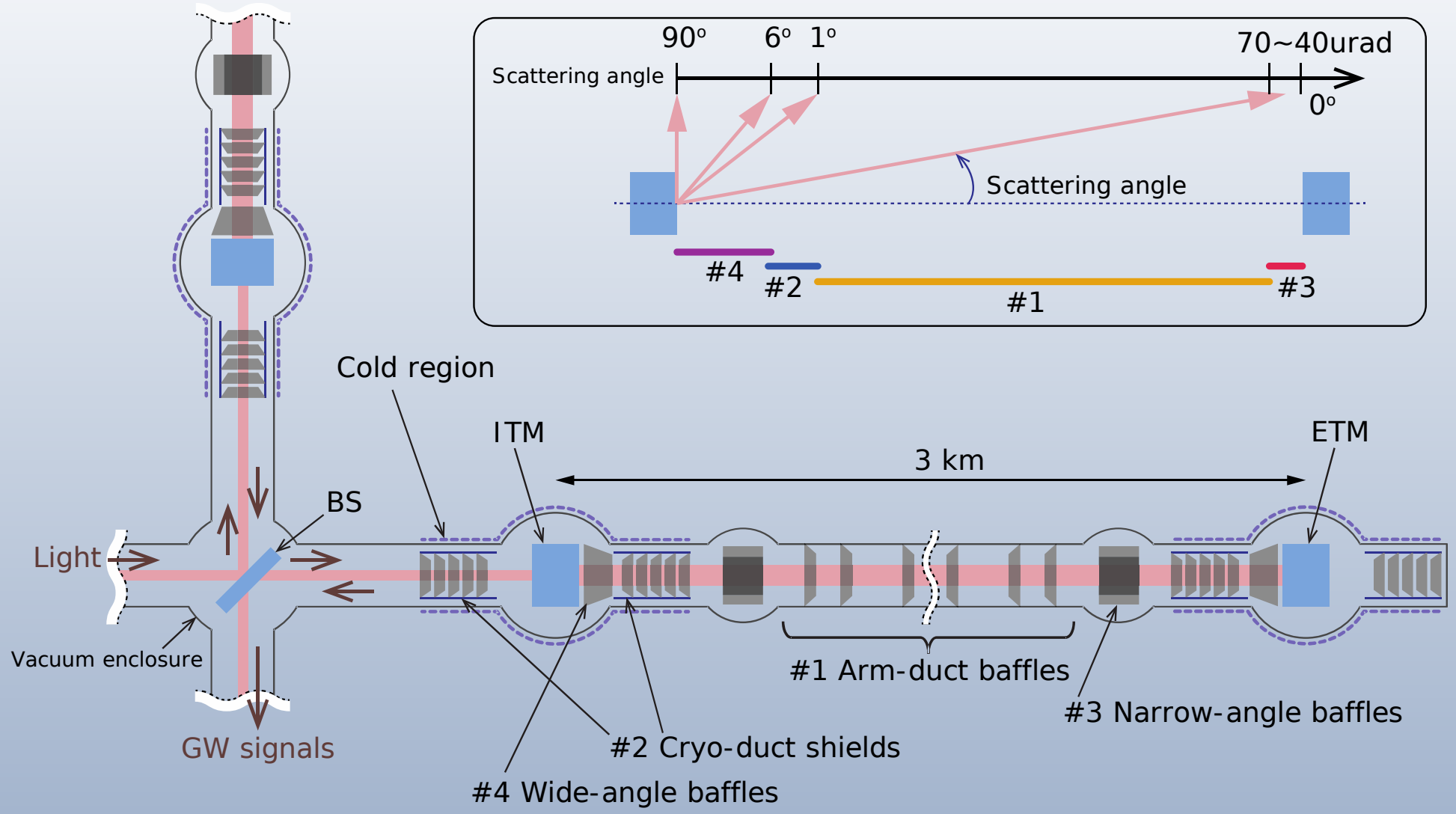
Vertical Drift of WAB during cool-down:

→ 20 – 30 pixel (estimated from Tcam)
→ corresponds to 1.4 – 2.1 mm lifting

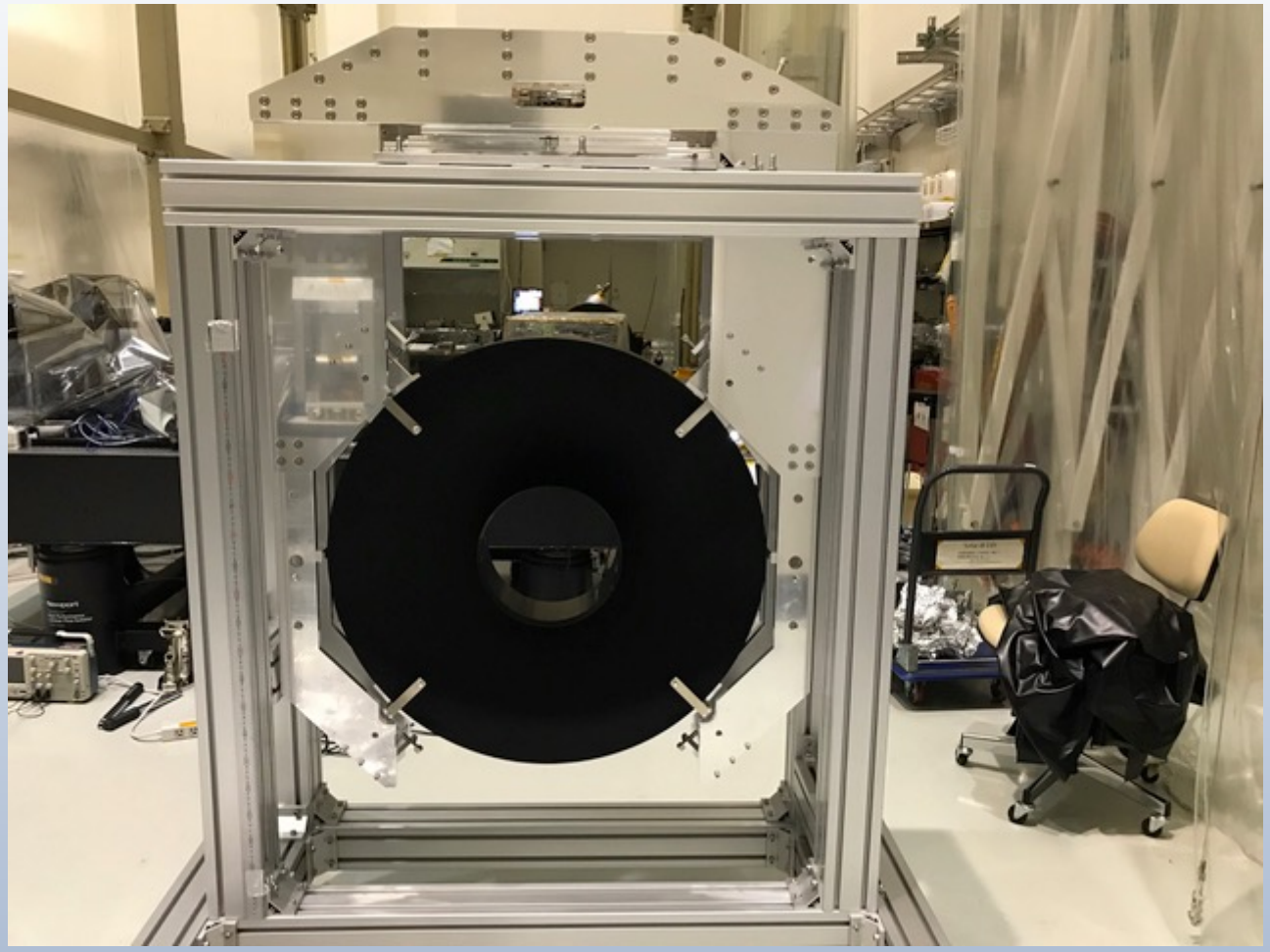
Is in expected range!

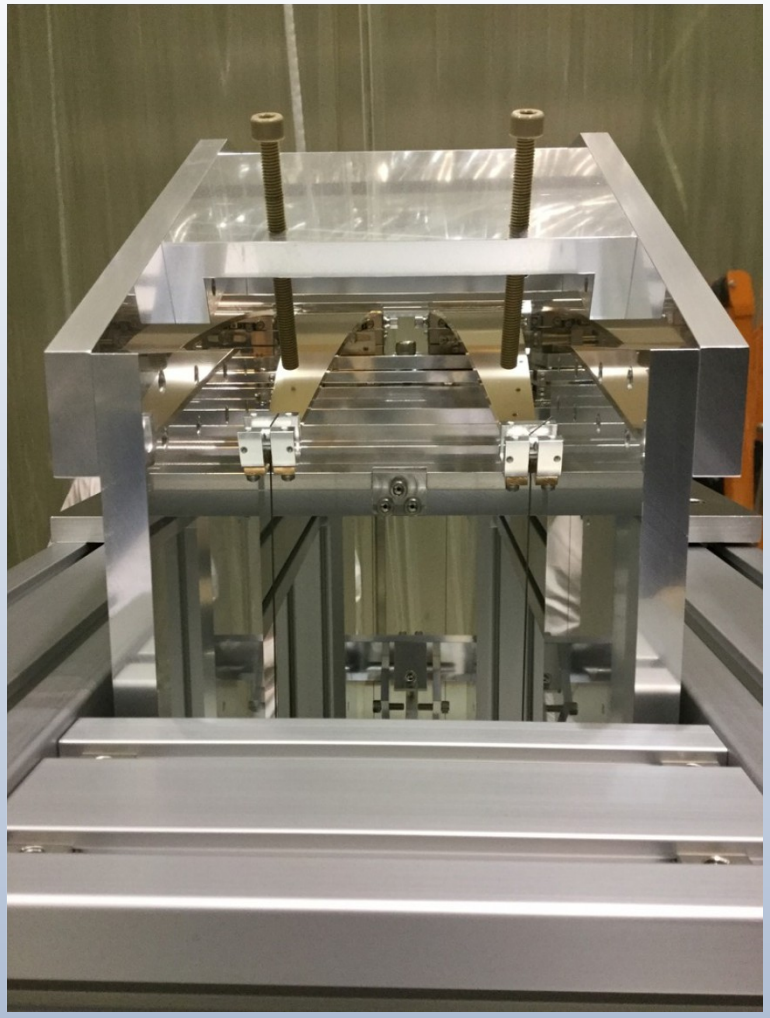
Narrow-Angle-Baffle

Narrow-Angle-Baffle Assembly



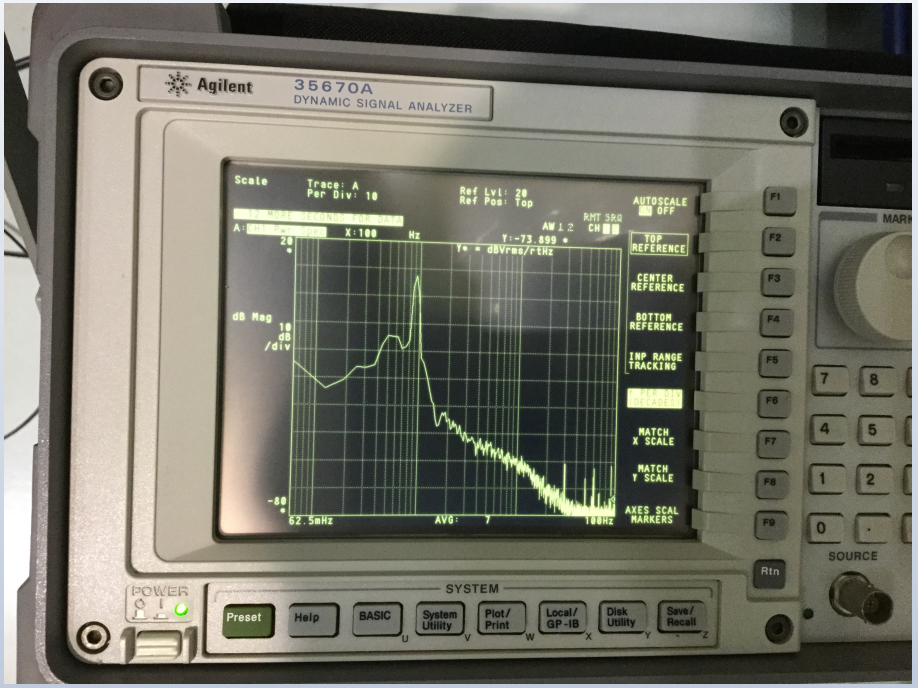
Narrow-Angle-Baffle Assembly





- Assembly taking place in the Advanced Technology Center of NAOJ
- Design: Bungo IKENOUE (NAOJ)

Installation into IXA: **until beginning of July!**



OpLev measurements of eigenmodes:

→ $f_{pendulum}$ ~ 0.5 Hz (design: 0.6 Hz)
→ f_{yaw} ~ 0.9 Hz

Next step: activate passive-damping system! (attach magnets!)

Summary

WAB:

- Cooling-test finished!
- Equilibrium temperature and cool-down time higher than expected
  → Additional thermal resistance and heat-sources (?)
- Damping in cryogenic much higher than expected!
  → Change Cu-plates for Eddy-current to Al-plates (much better predictability)
- Vertical drift of ~2*mm* due to stiffening of blade-springs and wire length-changing
- Shipment back to NAOJ next week → “Real” baffle, smaller changes

NAB:

- Assembly of first NAB mainly finished!
- Will install magnets for the damping system and calibrate quality factor (fortunately, its not cooled!)

Thank you for your attention!