

# Type B Installation Status

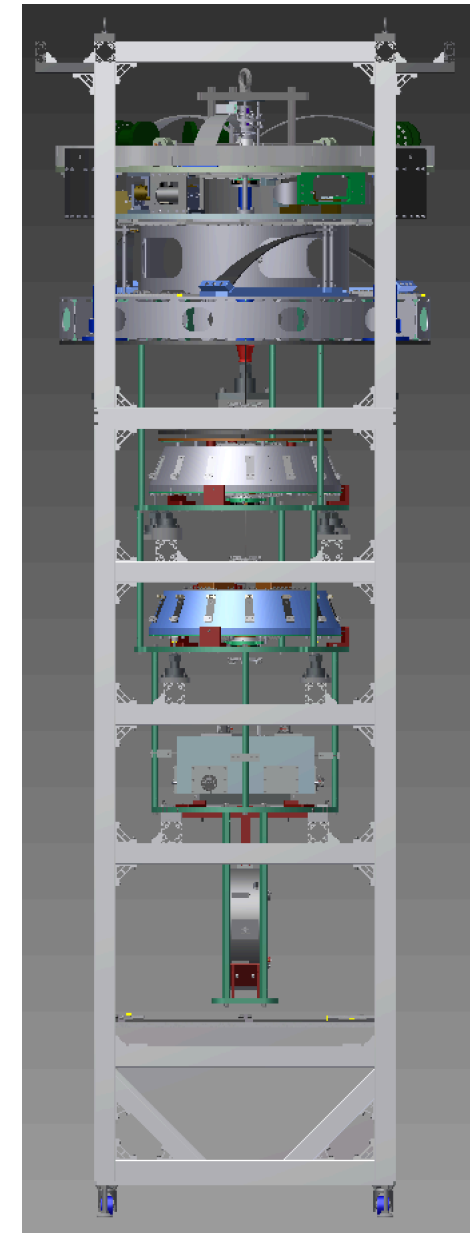
Mark Barton

KAGRA Extended Chiefs Meeting, 12/19/2016

JGW-G1605970-v1

# Scope

- One BS suspension
- Three SR suspensions (SR2, SR3, SRM)
- Each has
  - Preisolator (PI) with Inverted Pendulum table (IP) and GAS filter (F0)
  - Standard Filter (SF) and damper ring
  - Bottom Filter (BF)
  - Intermediate Mass (IM) and Intermediate Recoil Mass (IRM)
  - Optic (TM) and Recoil Mass (IM)
  - Lower breadboard, blade springs, and damper rings.
- SRx payload (TM/RM/IM/IRM) is similar to PRx – BS payload is unique



(BS)

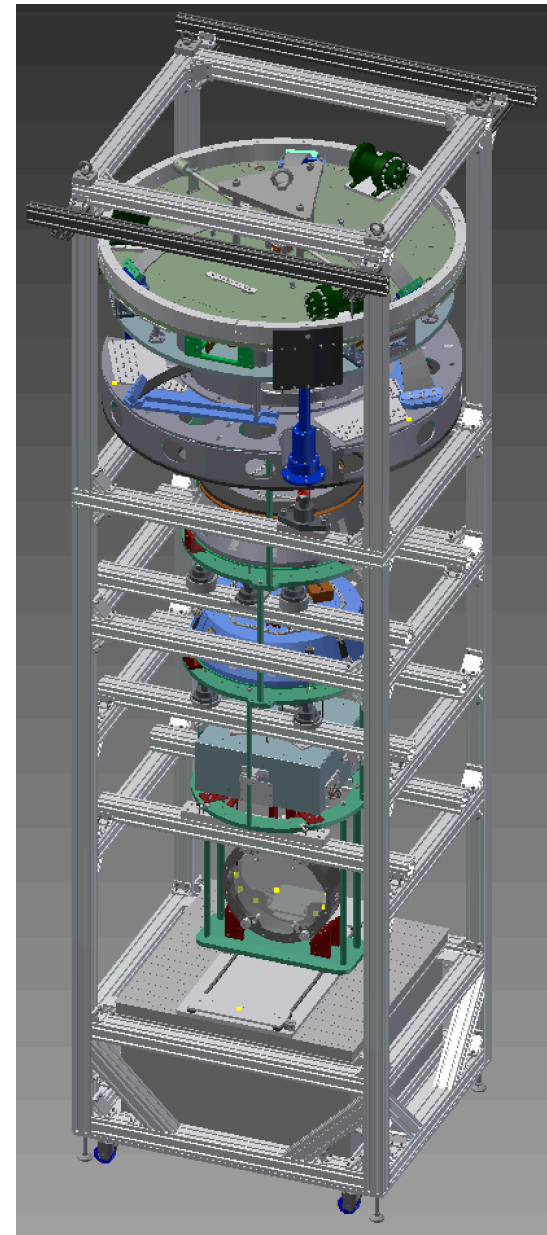


# Team

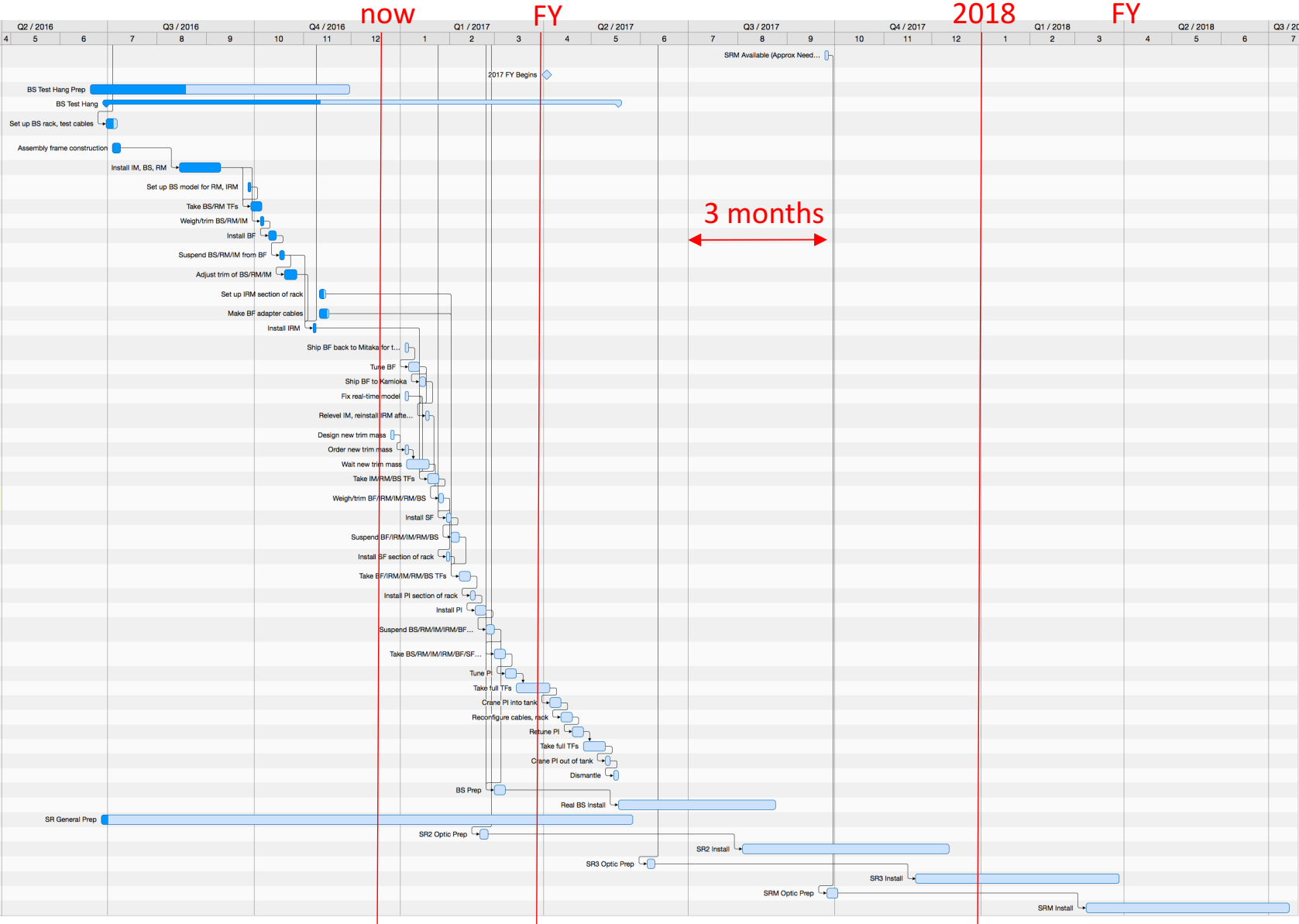
- Core team
  - Mark Barton – leader, NAOJ, physicist
  - Fabian Peña-Arellano – NAOJ, physicist
  - Naoatsu Hirata – NAOJ, engineer
- Additional help from
  - Yuhang Zhao – Beijing Normal U via ICRR
  - Kazuya Yokogawa – Toyama U
  - Yuya Kuwahara – U Tokyo
  - Yingtang Liu - ICRR
  - Ryutaro Takahashi – NAOJ, large purchases
  - Naohisa Sato – NAOJ, PI testing
  - Enzo Tapia – NAOJ, on loan from Type Bb team.

# Installation Procedure

- Assembly frame based on versions for TAMA Type B test and PR3 test.
- Even more use of jacks to raise and lower sections independently (for hooking of maraging rods) without galling of screws in security structure.
- IM is now supported from main frame while BS and RM are hung from it – no separate hanging frame.
- Frame has extensions to hold cloth cover clear of PI.
- Frame has been constructed on the +Y side of the BS tank.
- SRx version will be near-identical.
- Documents:
  - E1605505 - BS mirror gluing
  - E1604817 - BS payload
  - E1504235 – BS main procedure

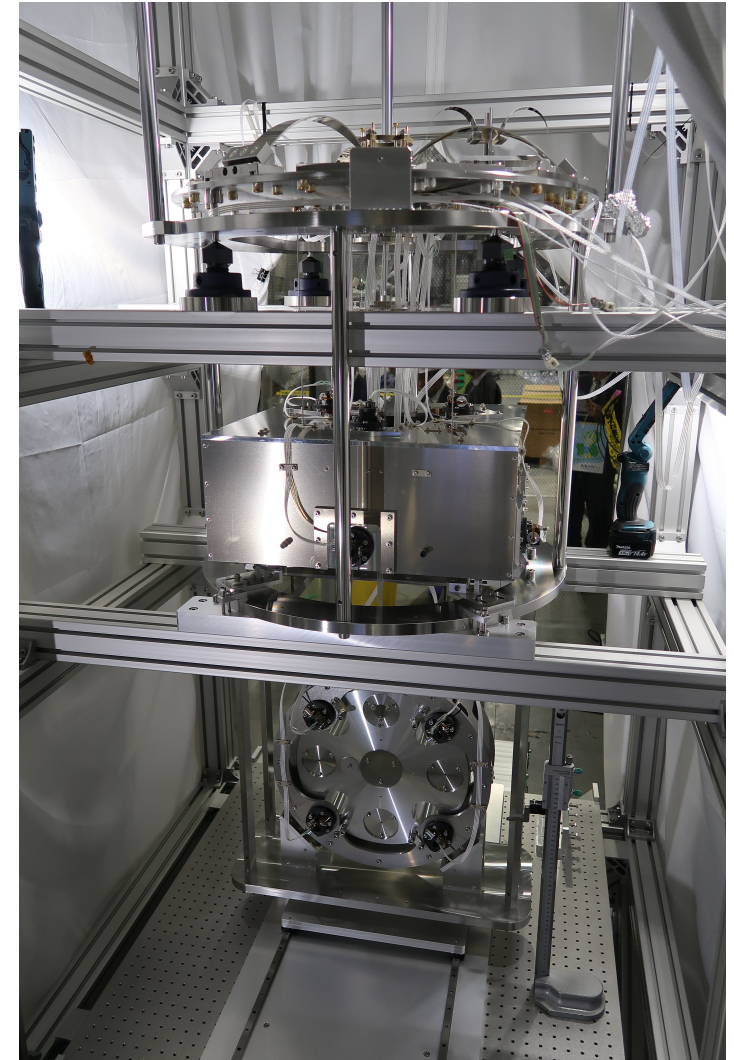


# Schedule



# Current Status - BS

- We have essentially all parts and fasteners for BS except:
  - A few in-vacuum cables (being ordered).
  - A few additional ballast masses (being designed).
- Test hang with dummy BS is underway.
- BS and RM have been hung from the IM.
- IM/RM/BS section has been hung from the BF.
- IRM has been hung around the IM.
- BF/IRM/ has been suspended temporarily for weighing and balance check.
- Some issues found with BF – may require tune-up and/or blade swap of GAS filter.

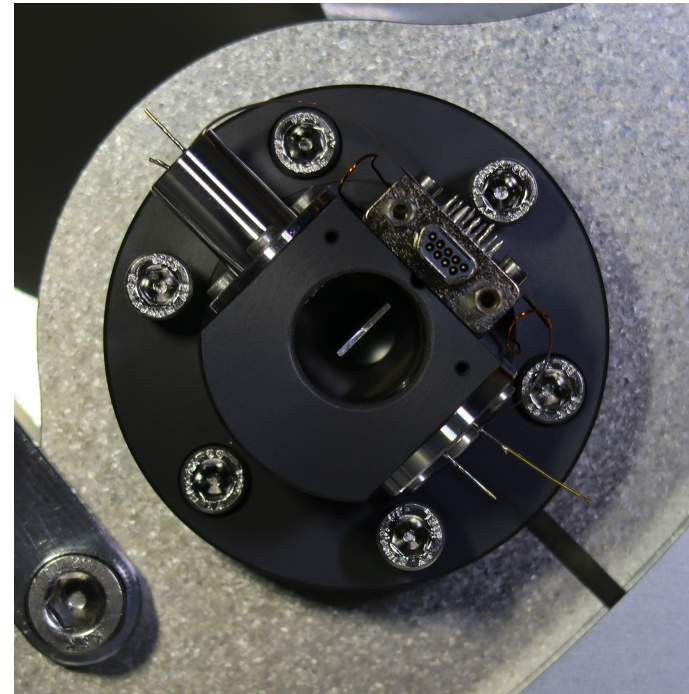
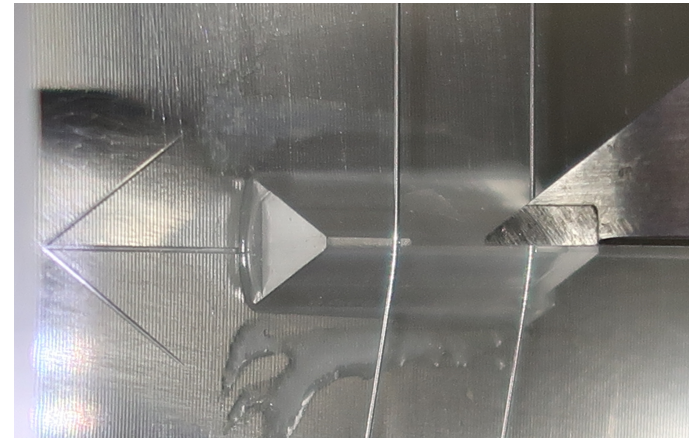


# Current Status - SRx

- Have 3D CAD assemblies of SR suspensions in tanks with optical layout.
- Have first-draft 2D assembly drawings, and payload part/fastener lists.
- SF and BFs are pre-assembled.
- PI stages are arriving from Nikhef – getting help from Sato-san of Type A group for setup/testing.
- Have parts for SR2 and SR3 payloads (i.e., the ones originally intended for iKAGRA).
- Preparing orders to go out by end of this year, or very early next year:
  - Some additional machining based on lessons learned from PR3.
  - Payload parts for SRM (and PRM – jointly with Type Bp).
  - Fasteners for three SRx (and PRM).
  - Additional in-vacuum cables and OSEMs.
  - Additional sapphire prisms as for BS.
  - Cleaning of some security structure parts.
  - Second assembly frame (very similar to the one for BS).
- Additional RMs will be ordered in next financial year.

# Solved Technical Issues (i)

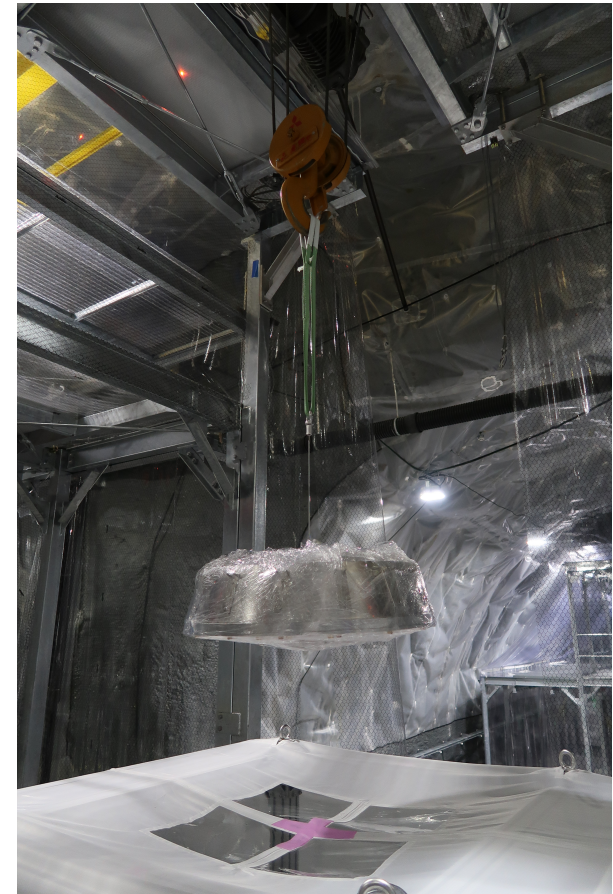
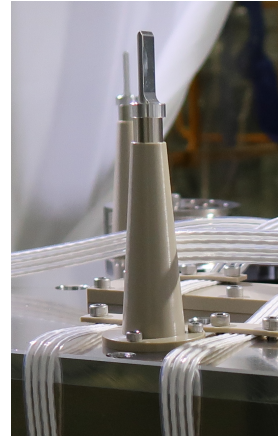
- New larger, differently made sapphire prisms seem to work well – no cracking or chipping.
- New wide-mouthed OSEMs work well to reduce risk of damage to flags (stub flags are now baseline, but using full flags is an option if any issue with length sensing optical lever).





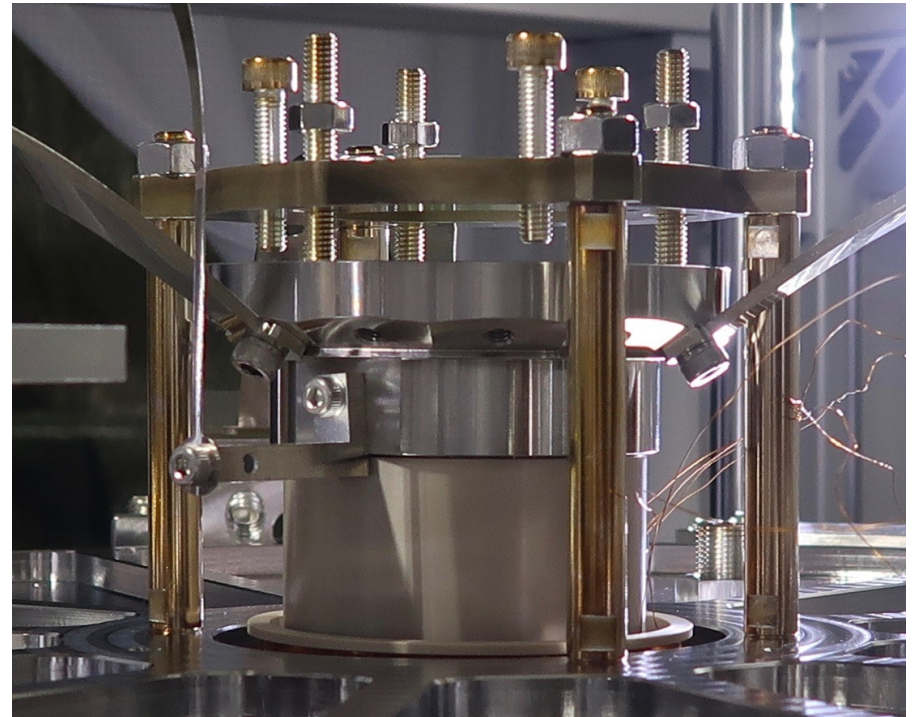
# Solved Technical Issues (ii)

- New magnetically self-assembling IM flags also work well to reduce damage to flags.
- Crane issue solved by cutting an access slot.



# BS Bottom Filter Issues (i)

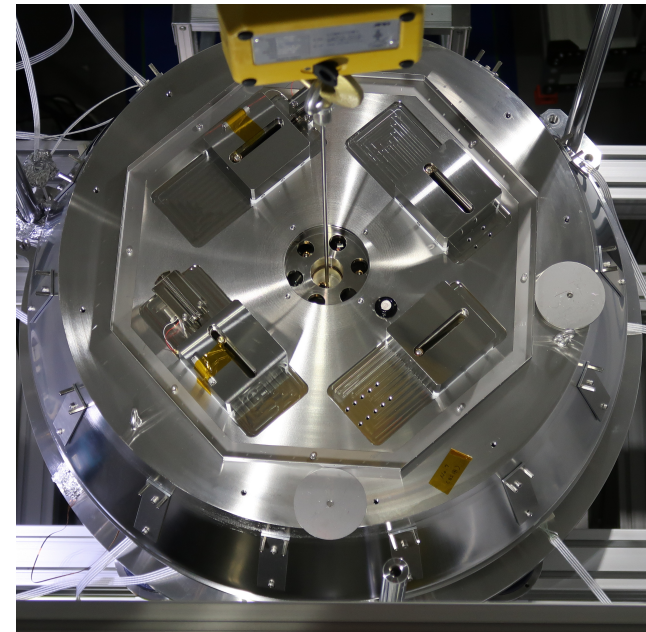
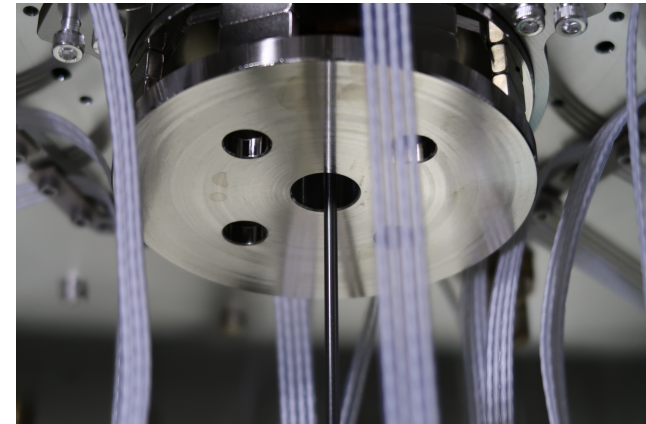
- Compared to when measured at Mitaka, BF has slightly lower load capacity and considerably higher spring constant.
  - Noticed when suspending IM/RM/BS section.
  - Removing ballast fixes load capacity issue.
  - No fix for spring constant issue - degrades frequency and vibration isolation.
- Also, perhaps due to uneven blade strengths, the BF keystone sits at a slight angle.





# BS Bottom Filter Issues (ii)

- Keystone angle caused rubbing between bottom of keystone and magnet yoke (fixed by moving yoke).
- Also causes offset of rod supporting IM, which in turn causes
  - Misalignment of IM and IRM – some EQ stop screws cannot be used and all the adjustment range of the IM OSEMs is used up.
  - Imbalance of the BF when suspended – all the range of the built-in trim masses (and then some) is used up.



# BS Bottom Filter Issues (iii)

- We are considering pausing the BS test hang to attempt to fix the BF issues.
- The performance will be degraded by the spring constant issue, and not being able to use the EQ stop screws is a damage risk.
- The load capacity and spring constant issues can probably be fixed with a tune-up.
- The keystone tilt issue might be able to be solved by swapping in the spare blade.
- The keystone tilt issue might be able to be worked around by adjusting the blade bases asymmetrically, so that at least the rod support point was centered.

# Schedule/Manpower Issues

- SR Procurement/Preambly
  - *Lots* of SR procurement still to do, but now actively being worked on.
  - Lots of SR preassembly still to do – Pls, RM, IM, IRM, optics
  - Lots of SR documentation still to do
  - Hirata-san now working near-full-time on SR procurement – probably continuing for another month or two.
  - Could use more students or other help in near term for BS Test Hang.