Type B Status

Mark Barton KAGRA f2f Meeting, 3/29/2017 JGW-G1706384-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 (a.k.a., 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



Team

- Core team
 - Mark Barton leader, NAOJ, physicist
 - Fabian Peña-Arellano NAOJ, physicist
 - Naoatsu Hirata NAOJ, engineer
 - Enzo Tapia San Martin NAOJ, electrical engineer
- Additional help from
 - Yuhang Zhao Beijing Normal U via ICRR
 - Kazuya Yokogawa Toyama U
 - Yuya Kuwahara U Tokyo
 - Yingtang Liu ICRR
 - Perry Forsyth ANU
 - Koki Okutomi, Keiko Kokeyama, real time model
 - Ryutaro Takahashi NAOJ, large purchases
 - Naohisa Sato NAOJ, PI testing

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

- All parts are in hand except:
 - Final BF/SF ballast masses (being designed).
 - New stub flags for BS and matching OSEMs (being redesigned).
 - Some new OSEM cables (better lengths).
 - Geophone cables (vacuum compatible version).
- Test hang with dummy BS is ongoing.
- Considerable delays due to technical issues with BF and IM, now believed solved.
- SF now installed, with BF/IRM/IM/RM/BS hanging from it.
- Rack and in-air cabling done.
- PI preparation well underway.
- PI is to be moved to second floor of cleanbooth in week of 4/2, and installed shortly thereafter.



Current Status - SRx

- Have parts for SR2 and SR3 payloads (i.e., the ones originally intended for iKAGRA).
- Ready to order in new financial year:
 - Payload parts for SRM (being ordered jointly with PRM Type Bp)
 - Fasteners for three SRx.
 - Modifications of some parts based on lessons learned from BS/PR3.
 - Two new RM.
- Being prepared for ordering:
 - Second assembly frame.
 - Additional in-vacuum cables, OSEMs, and pico and stepper drivers.
- SF and BFs are pre-assembled.
- PI stages are on order from Nikhef but need setup/testing Sato-san of Type A group is helping.

Technical Issues 1 – BF Keystone Tilt

- BF keystone was tilted by ≈10-15 mrad.
- Caused the BF-IM maraging rod to be offcenter, making the BF hang with a large pitch.
- Caused interference at the LVDT yoke.
- Thought to be due to uneven blade strength in combination with low number of blades (3) in custom design for BS.
- Bounce frequency also high (0.6 Hz) relative to measurement at Mitaka (0.4 Hz).
- Fixed by
 - Adjusting blades in/out to put top of keystone off-center but rod suspension point more central.
 - Tilting yoke to match keystone (and LVDT coil)
- Target bounce frequency (<0.4 Hz) was also recovered.
- Ugly, but good enough for real BS install.



Technical Issues 2 – IM instability

- IM was hard to keep balanced.
 - Trimming of IM in pitch and roll was possible but difficult.
 - Pitch/roll would change by large amounts when IM was set down and picked up again.
 - IRM had to be partly disassembled to re-trim the IM.
 - Much time wasted.
 - IM turned out to be stable only in a narrow range of pitch/roll where the COM was over the head of the BF-IM maraging rod.
 - Moved large disk ballast masses from top to bottom to lower COM and make IM unconditionally stable



Improvements 1 – New EQ Stops for RM

- Original design had nothing to stop the RM/BS from toppling over in pitch
- Fabian designed additions to the security structure to fix this.





Improvements 2 – New stub flags

- Original flags had long tips for shadow sensor.
- High risk of damage to flag/OSEM/BS with original OSEMs.
- Long flags do work adequately with wide-mouthed OSEMs but plan is to use a stub flag (actuation only) for additional protection.
- Aso-san has done a design, including OSEM, flag and gluing jig.
- Will be used in the final BS installation.
- Similar design underway for SR.





Schedule/Manpower Issues

- Four people just barely enough.
 - Hirata-san has done a big chunk of SR procurement (quotes for third payload etc thanks!) but *lots* still to do.
 - Lots of SR preassembly still to do PIs, RM, IM, IRM, optics.
 - Lots of SR documentation still to do.
 - Hirata-san has been able to come to the site recently, but will soon be occupied with SR procurement.
 - Schedule assumes significant help from Type A team in construction and testing of PIs.
 - Aso-san has arranged for students to help: Zhao, Yokogawa, Kuwahara, Liu, Forsyth, but manpower is still limiting.