Type B Installation Plan

Mark Barton KAGRA f2f Meeting, 8/25/2016 JGW-G1605546-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



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

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 will be constructed on the +Y side of the BS tank from today.
- SRx version will be near-identical need to decide whether to save money (use BS frame) or time (make another).
- Documents:
 - E1605505 BS mirror gluing
 - E1604817 BS payload
 - E1504235 BS main procedure



Schedule

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Current Status - BS

- Have essentially all parts and fasteners for BS except:
 - A few in-vacuum cables (on order; should arrive in good time).
 - A few additional ballast masses (being designed).
- RM, IM, IRM, BF and SF have been preassembled.
- Dummy BS is prepared (gluing of flags, prisms).
- Assembly frame for BS is constructed.
- BS test hang with dummy BS has begun.
- IM is in place and aligned on assembly frame ready for hanging of dummy optic.



Current Status - SRx

- Have parts for SR2 and SR3 payloads (i.e., the ones intended for iKAGRA).
- Need payload parts for SRM (as well as for PRM Type Bp)
- Need fasteners for three SRx.
- Need additional in-vacuum cables and OSEMs.
- Need to modify some parts based on lessons learned from BS/PR3.
- Want to use sapphire prisms as for BS, but will need to remake two RMs. (Re-machining one RM was successful but not cost-effective.)
- SF and BFs are pre-assembled.
- PI stages are on order from Nikhef but will need setup/testing hope to get some help from Sato-san of Type A group or TBD.

Technical Issues 1 - Flag/prism gluing

- BS flag/prism gluing
 - First attempt failed.
 - We moved from Kashiwa back to Mitaka (shorter commute).
 - Tatsumi-san refined the tooling (flag holders work more smoothly, locating pins at correct height).
 - Mark and Fabian refined the technique (see E1605505).
 - Success!
 - May need further refinement for glass optic.
 - Final gluing will be done at Kashiwa.
- Prisms
 - Sapphire prisms on PR3 failed.
 - New prisms are larger, better polished and cut at a different angle to the optic axis of the sapphire, so should be stronger.
 - Sapphire prisms are being used in the test hang will know soon if there are remaining issues.
 - SR recoil masses need modifications to allow larger prisms one has been remachined; two will be remade.





Technical Issues 2 - OSEMS

- OSEMs vs. OLs for optic position sensing.
 - Flags with tips for OSEM shadow sensors are easy to break.
 - VIRGO uses OLs that sense position (accuracy low, but good enough)
 - Akutsu-san is designing a VIRGO-style OL with position sensing, and, separately, wide-mouthed OSEMs.
 - Plan is to attempt BS test hang with full flags. If OLs work well or full flags get broken, can use stub flags with magnets but no tips (impossible to break).





Technical Issues 3a

- Crane issues
 - BS and SR2 cleanbooths have non-removable bars at end of the crane slots – no craning of heavy stuff (BF, SF, PI) into the second floor!
 - SR3 and SRM cleanbooths OK, also PR2.
 - The IM was brought into the PR2 area and manhandled the rest of the way – BF and SF can probably be done similarly.





Technical Issues 3b

- Pl is a major issue.
- Forklift does not go quite high enough and is near its weight limit for PI.
- Possible solution:
 - Remove floor on –X side of SR2 tank.
 - Use SR2 crane to raise PI and place on second floor, +X side.
 - Use pallet jack and road of thick SS sheets to move PI to –Y of BS.
 - Us BS crane to place PI on assembly frame.



Schedule/Manpower Issues

- SR Procurement/Preassembly
 - Lots of SR procurement still to do extra payload, fasteners, cables
 - Lots of SR preassembly still to do PIs, RM, IM, IRM, optics
 - Lots of SR documentation still to do
 - Hirata-san has been occupied with BS procurement and filter remeasurement, and will be occupied with SR procurement.
 - Aso-san has arranged for students to help: Zhao, Yokogawa, Kuwahara, Liu
- PI Preparation
 - Schedule assumes significant help from Type A team in construction and testing of PIs.
- SR assembly frame
 - Current schedule assumes one frame.
 - A second frame has been approved, but we need to think through issues with PI testing in the BS cleanbooth and the crane issue.
 - currently assumes significant help with PI setup from Type A group.