

Subject: Re: Request for waiver (PR3)

From: Matthew Heintze <mheintze@ligo-la.caltech.edu>

Date: 3/15/2013 4:04 PM

To: Dennis Coyne <coyne@ligo.caltech.edu>

CC: Calum Torrie <ctorrie@ligo.caltech.edu>, Norna Robertson <nroberts@ligo.caltech.edu>, Janeen Romie <janeen@ligo-la.caltech.edu>, Gary Traylor <gtraylor@ligo-la.caltech.edu>, Danny Sellers <dsellers@ligo-la.caltech.edu>, "Brian O'Reilly" <irish@ligo-la.caltech.edu>

Oh yeah... in my rush I forgot to add in the email about the cleaning and roughening steps that we came up with for when we did the triple suspension repairs out of chamber. I will do these. I even have the tool cleaned and ready to go.

Sent from my iPhone

On Mar 15, 2013, at 5:54 PM, Dennis Coyne <coyne@ligo.caltech.edu> wrote:

Matt,

Waiver granted with a caveat -- please add to your procedure the following steps:

- roughen the surface areas which are to be bonded, while using a HEPA vacuum to collect generated particles, and
- perform a final cleaning of the surface areas which are to be bonded using freon (ultra-high purity, triple distilled from the FTIR kits)

Thanks

Dennis Coyne
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On 3/15/2013 2:01 PM, Matthew Heintze wrote:

Dear all

This is the request for a waiver to not use a raised temp bake of the glue to reattach two magnet/standoff assemblies in-situ in chamber to the intermediate mass of PR3. All these steps are to be done before PRM is installed.

The people doing this work will be 1-2 people (probably 2 for the actual gluing, one only needed for the other steps) being from the group of Danny, Gary and myself

The following steps are proposed:

- Lock down all three stages of the suspension.
- Place front and back lens cap protection over the optic
- Catchpan put in place ??
- Remove the magnet/standoff assemblies that have been knocked off and are currently sitting in the aOSEMs
- Remove the aOSEMs
- Prepare glue as per the new guidance (see below)

- **I. Guidance on gluing with EP30-2 -- March 14th 2013**

In addition to your existing protocols / procedures please add the following. As indicated above please add this guidance to your procedures and have procedures signed off via DCN.

1. The following applies to fresh cartridges and used cartridges that were fresh on 14th March 2013. If you have any other used cartridges currently in place then please discard as per previous guidance on one time use. Going forward cartridges can be used multiple times if the following is applied.

2. The minimum amount of glue to mix each time is 8g-10g by weight. Please weigh your mix to get a feel for how much 8g-10g of the mixed glue weighs.

3. Gun is still a viable option for mixing the glue as long as it does not get blocked, or cross contaminated. Mixing with gun followed by hand mixing with spatula, see below, will be our baseline method going forward. Important for avoiding cross contamination: After using the gun lay it flat on the table and let it sit for at least 2 hours before removing the used mixing tube. Once the mixing tube is removed, clean the end, cap the glue and store the cartridge vertically as per the manufacturers instructions. This will prevent cross contamination at the EP30 cartridge openings that would cause blockage/mixing problems for later EP30 applications. As a reminder also, discard first 1" of EP30 in gun before use.

4. Hand mix all glue after it has been through gun / cartridge mixing device. Only use metal Spatula (CIT will send some if needed). Wire and or metal pins should not be used for hand mixing as this agitates the glue causing air bubbles. Hand mix with Spatula for at least 2 minutes. Remember this is in addition to the mixing performed in #3 above. The needle/wire does not actually mix the glue well enough (in addition to agitating and causing air bubbles) thus the masterbond recommended wide metal spatulas instead. Wire/needle should still be used to apply EP30 to the prisms.

5. Prior to continuing please now perform the "wait" test. Using wire or pin put 4-5 sections of glue of a

similar size to what you will be using on a piece of Alum foil and place in a pre-heated oven at 200F for ~ 15 minutes. After the 15 minutes the glue should be removed from the oven, allowed to cool for 1 minute, and then tested. If it is smooth and hard it is a well mixed batch. The rest of the glue in the batch is now good to use for bonding. Do not bake the glue boat in the oven, only the small lines of glue. Discard glue that was in the oven.

6. Interesting note about curing: A smaller amount of EP30 will cure at a much slower rate than a large amount. The exothermic reaction of the two part epoxy releases heat which helps cure the epoxy. Smaller amounts = less heat generated = slower cure time. Glue amounts that are <1g can increase the room temperature cure time to 5-7 days. (Up from 1-2 days at room temp that is says on their data sheet)

7. In terms of moving and install the following is required. No glued item should be moved for 1 day following bonding. No glued item should be installed (including pump down) for 5-7 days again especially if bonding is air cured only via a waiver. Please note for all glued items we must wait 7 days between applying the epoxy and pumping the chamber. Any deviation from this should get a waiver from systems.

- Check polarisation of magnet orientated the correct way
- Use eLIGO OSEM and PAM screw to hold new magnet/standoff assembly.
- Using a homemade "needle" that has been cleaned and baked apply a little bit of glue to end of standoff.
- Place eLIGO OSEM in aOSEM collar and screw PAM screw until standoff touches intermediate mass
 - (this has been done before. See for example <https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=5684>)
- Leave in place for 24 hours
- Gently draw back PAM screw
- Do "razor blade" test on magnet to see if firmly attached.
- Repeat above steps for the other magnet/standoff (and again wait another 24 hours after glued))
- Once satisfied both have cured successfully put aOSEMs back in place, remove protection, unlock suspension and center aOSEMs

Once the waiver is authorised I will write a work permit. Note we still need to procure an oven and do a couple other bits and pieces first before attempting this.

I am guessing tuesday sometime will be when we start trying to glue the first one.

Matt

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