

Procedure for rebuilding the LASSA CsI detectors

Detach CsI, light-guide, photodiode

1. Remove Mylar and reflective paper
2. Remove photodiode from light guide
 - a. Use exacto-knife to pry; joint had been made with silicon rubber
3. Heat CsI/light guide at 65°C for 2 hours
4. Twist to separate light guide and CsI; joint was made with optical cement.

Clean surfaces for gluing

1. Clean photodiode
 - a. Use exacto-knife to cut silicon rubber around edges of diode face
 - b. Peel off silicon rubber
 - c. Remove remaining silicon rubber with ethanol on a kim wipe
 - d. Test photodiode
2. Clean light guide
 - a. Wet 1000-grit sandpaper with ethanol
 - b. Using circular motions, polish the face of the light guide that was attached to the CsI. Use exacto-knife if the layer of optical cement is sufficiently thick. There is no need to polish the face that was attached to the photodiode, as all the silicon rubber comes off with the photodiode.
3. Clean CsI face
 - a. Wet 1000grit sandpaper with ethanol
 - b. Using *very* little pressure, and using circular motions, polish the face of the CsI that was attached to the light guide. This will rough up this face of the CsI.

Glue

1. Combine the Scionix RTV fluids in a 10:1 mass ratio in a plastic cup or beaker
 - a. Mix thoroughly with a stirring rod
 - b. Degas the sample twice--5 minutes each time--to remove bubbles
 - c. A 10g:1g mixture is sufficient for 4 CsI/light guide joints
 - d. The total mass of RTV for the photodiode joints will vary depending on how many are to be glued
2. Glue light-guide to CsI
 - a. Use the butt-end of a long Q-tip and swirl some RTV onto it
 - b. Apply 4-6 globs of RTV onto the center of the surface of the CsI, making sure to not introduce air bubbles
 - c. Set light guide on center of glob and work into surfaces using a soft circular motion
 - d. When no air bubbles are visible, mount the duo onto the gluing jig, and be sure not to tighten the brackets to the sides of the crystal with too much pressure because this may introduce bubbles as it sets
 - i. The corner of the bracket should be the only surface touching the crystal
 - ii. The RTV is so viscous that the duo can be set light-guide-down on the jig, but either way should work just fine

- e. Allow at least 8 hours before removing from the jig; after 24 hours, the RTV should be fully set
 - f. Use an exacto-knife to cut the RTV from the bracket/crystal interface as you are removing it from the jig; if not, you will introduce a large bubble at this spot and will become exceedingly frustrated with yourself!
 - g. Should any joints need to be reset, simply break the bond by twisting the light guide from the crystal (a large adjustable wrench used extremely carefully with padding on the light guide provides enough torque)
3. Glue photo-diode to light-guide
- a. When all crystals and light guides look reasonably bubble-free and are fully cured, you can begin joining the photodiodes to the light guides
 - b. ~20g RTV should be enough to bond 20 or so joints, and you may elect to set as many joints as you like, but be aware that as you approach 2 hours on the same batch of RTV you will notice that it cures sufficiently that you should no longer use it
 - c. The RTV application procedure is basically the same as for the CsI (5-6 Q-tip dips should suffice), but it helps greatly to create a square-shaped glob on the light guide surface that is roughly the size of the photodiode face
 - d. Set the photodiode at an angle on one end of the glob and ease it into place
 - e. You will be able to see any trapped bubbles after doing this
 - f. Set the trio crystal-side-down on the gluing jig (or a glass surface)
 - i. No reinforcement is necessary because of the RTV viscosity with respect to the photodiode mass
 - ii. Let cure for 24 hours before wrapping

Wrap

1. Wrap the light guide and photodiode with 3-4 layers of pipe thread seal tape
2. Use a template to trace the shape of the wrapping material for the CsI
 - a. The Millipore paper is protected on both sides by a transparent plastic film, so trace the shape onto a sheet (4 can fit on one square)
 - b. Cut out the shapes and wrap the CsI crystals, making sure that the paper does not protrude above the entrance surface of the crystal
 - c. Use Scotch tape to close the paper wrap on the last side
3. Pull a square of Mylar film firmly over the entrance surface, and it will statically cling to the Millipore paper; no tape is necessary to secure it
4. Now, the wrapped CsI/light guide/photodiode assemblies are ready to be mounted into the telescopes...