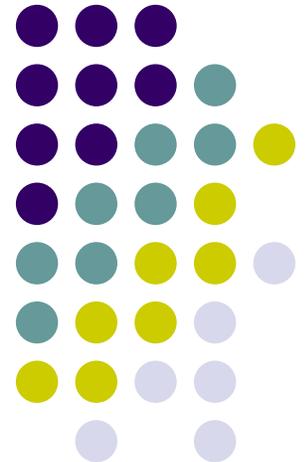


# Diamonds & R&D on Pigtails

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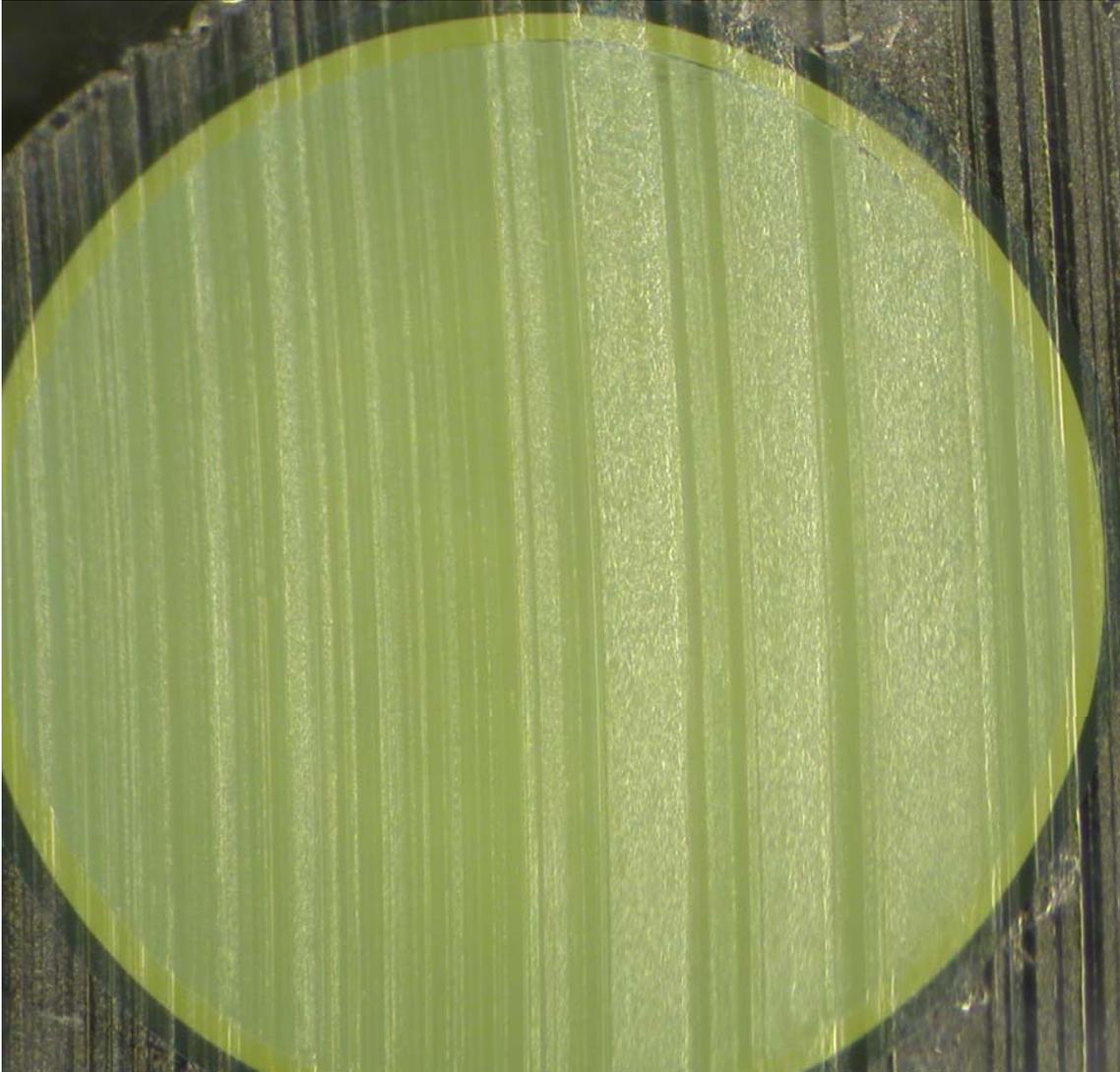




# Getting Sharp Diamonds

- On Monday (or maybe it Tuesday) Connie is supposed to contact FiberFin to purchase a new diamond
  - Paul claimed he could ship the fiber when he gets back so we might get a new fiber on Weds
- We removed the diamond and it seemed to have some gunk on it. I cleaned it with my fingernail. As described later on we also glued some fibers in some ferrules. We then polished 2 of these ferrules with the diamond and the polish looked like the polish I showed last week

# Polish epoxy



- Polish looks like previous polish so gunk on diamond is not the problem

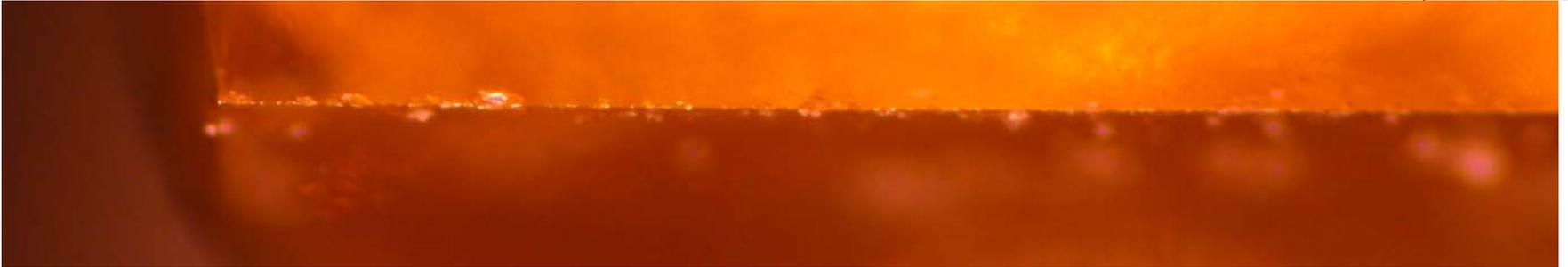
# So what's wrong with the diamond



- We removed the diamond and I looked at it with a 20 power mag glass. I saw some scratches on one of the surfaces.
- After seeing the scratches, We decided to look at it with the microscope to see if we see any problem.
- We only have 1 diamond, so we can't compare diamonds
  - But you can compare one side of the diamond to the other side of the diamond



# The Diamond, a Look at Both Sides



- In the top plot, it looks like one sees imperfections in one side of the diamond at the cutting surface.
- On the other side the cutting surface looks much better
  - Presumably these imperfections are why the polishes don't look so good



# Pigtails to a specific length

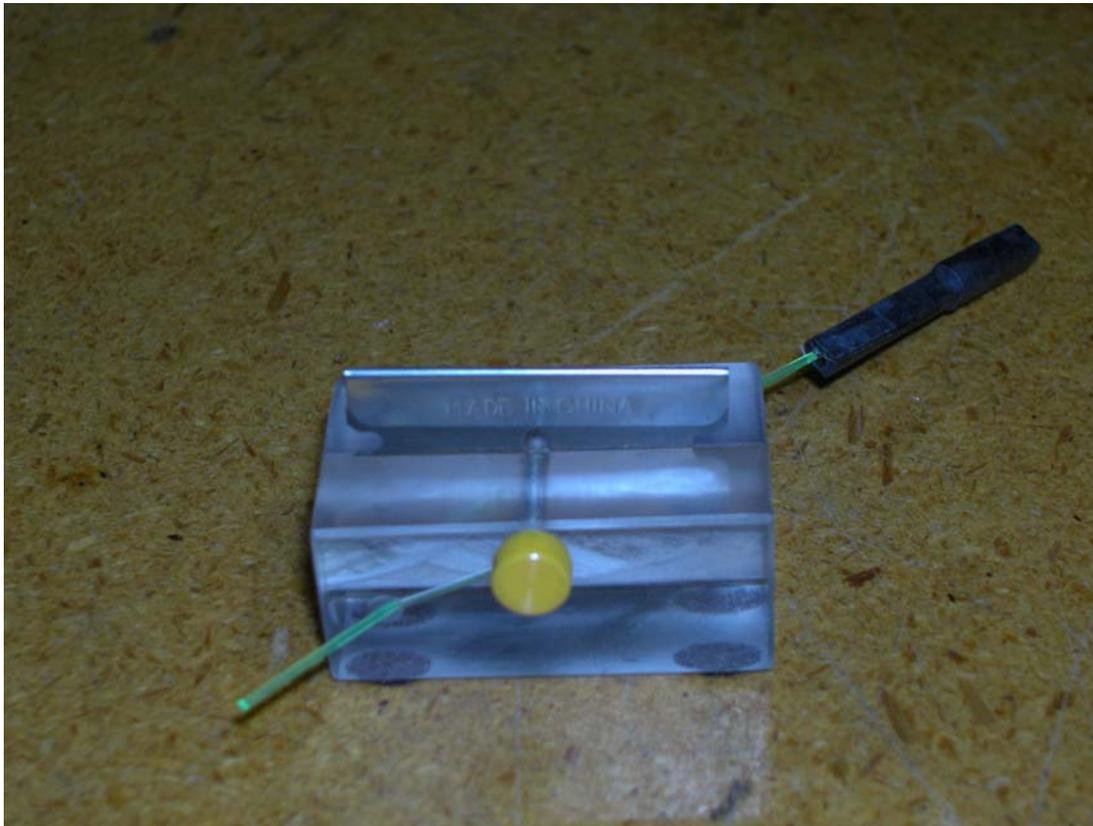
- For the R&D pigtails we are seeing how well we can create pigtail of a specific length
  - Since we don't have many connectors and we can't polish we are not attempting to create pigtails of the lengths specified
  - We are creating pigtails of longer lengths and then we can reuse the fibers for the correct pigtails by just cutting of the ferrule that has been glued on
- The idea is to cut the fiber of the correct length and then have a fixed length of fiber stick out of the ferrule after it has been glued.
  - This has the advantage that we do not have to push the polished surface up against anything to get the length correct & it will work for mirrored fiber
  - Disadvantage is the fiber can't move in the ferrule after it has been taped in position and can't move during gluing.



# Pigtail construction

- This does not mean this is the final technique or that with fixturing we can get a better technique
- We want to get started with some technique which seems to produce the pigtails requested
  - Note there could be some failure rate in the technique and at this point we could live with it.

# Preparing the End



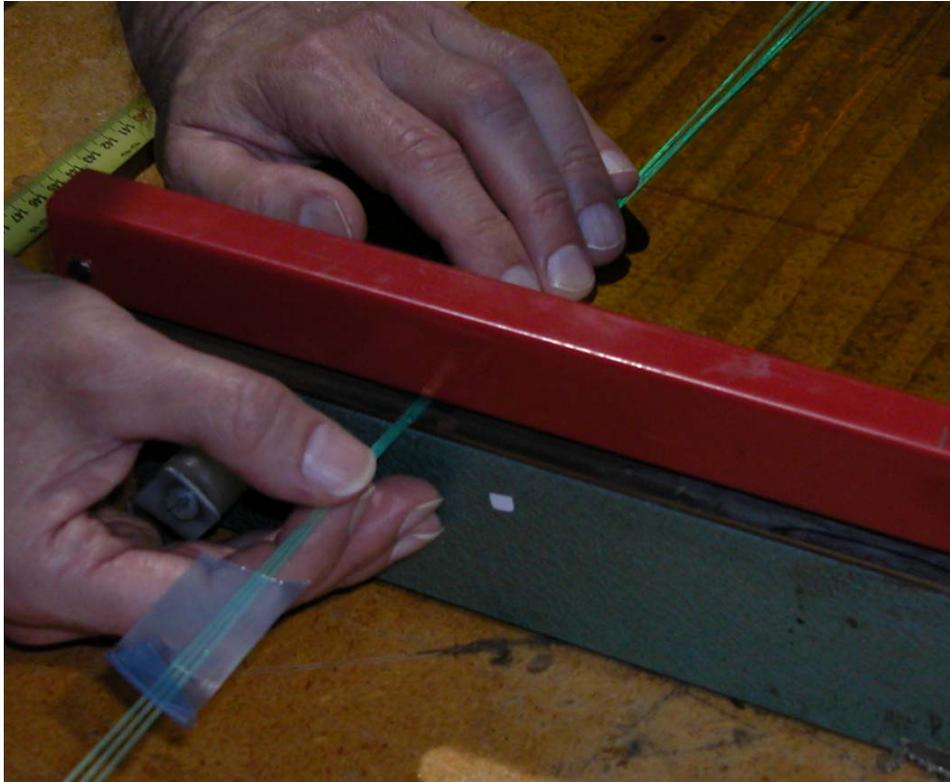
- We start by cutting the fiber off at 45 degrees and pointing the end black
- Note we do not have to get the length exactly right here

# Getting the lengths correct



- Put down a tape measure and clamp aluminum angle over the tape measure with the tape measure at 10 cm.
- We lay the fibers down and be sure the ends are against the aluminum angle.
  - This is either the mirrored or blacken end
- Next we tape them at the other end and mark the place where they should be cut with a marker
- The tape is left on

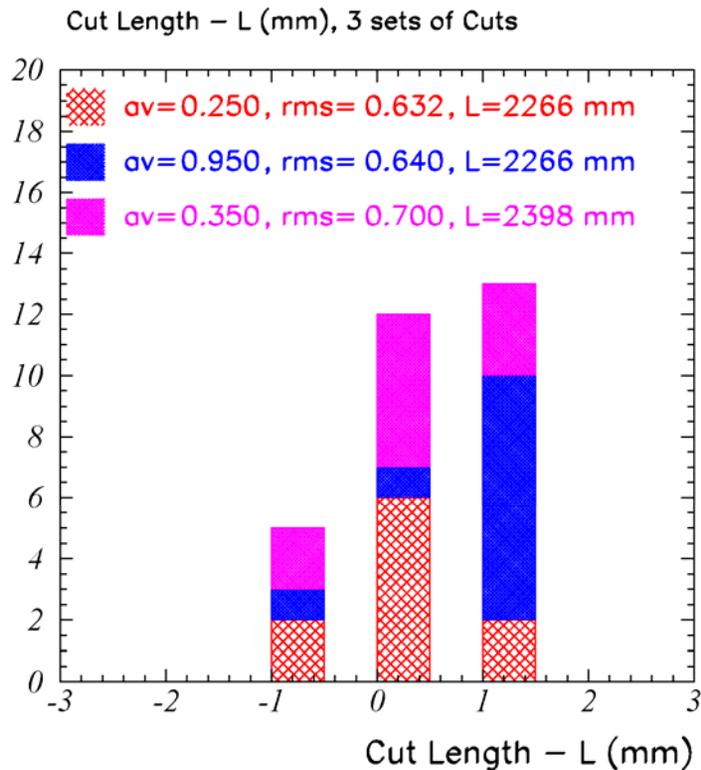
# Cutting the fibers



- Next we cut the fibers in a paper cutter at the mark
- We can then measure the fibers to be sure we are getting the correct length
  - The overall lengths can be fine tuned



# Getting the fiber lengths right



- The first 2 were 2 separate cuts in which we tried to get the length the same
- The 3d group was cut to a separate length
- This procedure looks like it does well enough for the R&D pigtailed
- The would probably be some feed back
- An aluminum stick giving the actual length would help
  - As will be shown soon this length will not be the length of the final fibers



# Getting the Pigtail Lengths Correct

- We need to get the length from the polished end to the fiber end correct
- We tried to glue the fiber so that exactly 5 mm sticks out the end of the nipple after the fiber has been glued
  - We did this for 10 short fiber (this was for another test)
  - After gluing we measured the amount sticking out
  - 8 were 5 mm and 2 were 4.5 mm
- This seemed to work fairly well



# Getting the Pigtail Lengths Correct

- We tried this with 5 2.3 m fibers
  - 4 were 5 mm and 1 was about 1 mm
    - This one which was 1 mm may not have been taped very well
    - During production we may need to feed back to get the process working better
- This process seems to work well enough that at least we have a production process for the prototype fibers
- Since there is some iteration in the process it makes sense to start this when the ferrules & diamonds arrive
  - We could start by blackening the end, but we might have to reduce it if we discover we have to get the length correct by cutting the blackened end at the correct length



# Polishing the epoxy

- We did some R&D on polishing the epoxy
- When we got the initial set of ferrules we epoxied 40 ferrules on the fibers
  - There ferrules were not cut back
  - There was good epoxy flow on the end of the nipple
  - The fibers were shaken sideways (not up and down) during epoxing



# Polishing the epoxy

- Next we epoxied 10 ferrules with short fibers
  - All of these the fibers were shaken
  - 3 of these had epoxy backflow from the tip of the nipple to the flat part where the nipple comes out
  - For these there was epoxy on the side of the nipple
- We next epoxied 10 ferrules with short fiber,  $\frac{1}{2}$  shaken and  $\frac{1}{2}$  not shaken
  - These were used for the 5 mm length test previously described
  - They all looked OK
  - No backflow and the epoxy on the nipple look the same for shaken and not shaken
    - For this it looks like shaking didn't help



# Polishing the Epoxy

- 5 long fibers as described in the 5mm length test
  - Not shaken
  - Epoxy looked OK for all
  - As previously stated the fibers stuck out 5 mm for 4 of them and retreated to 1 mm for one
- The final test is studying the polish, however as previously stated the diamond does not look good, so it is being relapped
- There does not look like there is any show stopper for this technique, but here may be some failure in which case the ferrules would have to be cut off
- At this point we are basically out of ferrules, so the R&D has stopped