



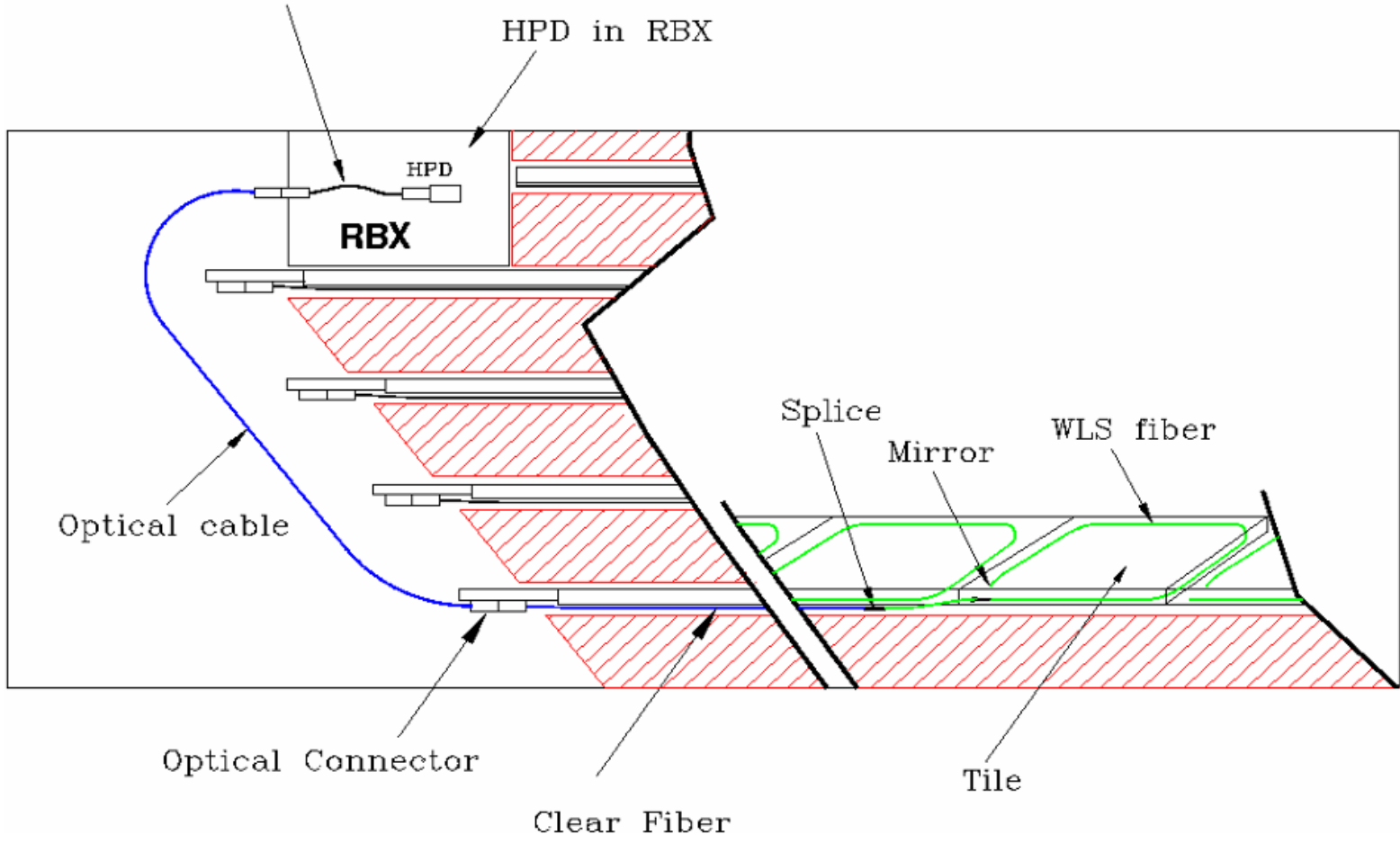
Managed by Fermi Research Alliance, LLC for the U.S. Department of Energy Office of Science

CMS Optical Cables and Connectors

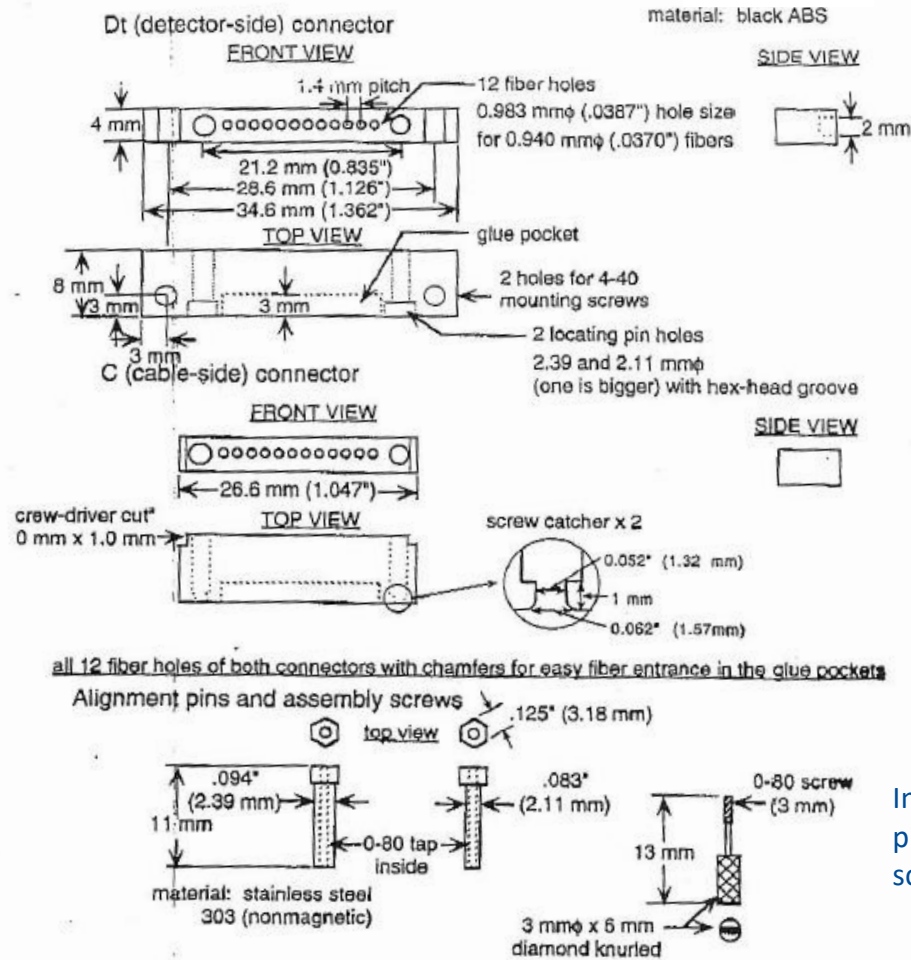
Jim Freeman

CMS HCAL Optical Design – 5K cables – 20K connectors

Layer to Tower Decoding Fiber

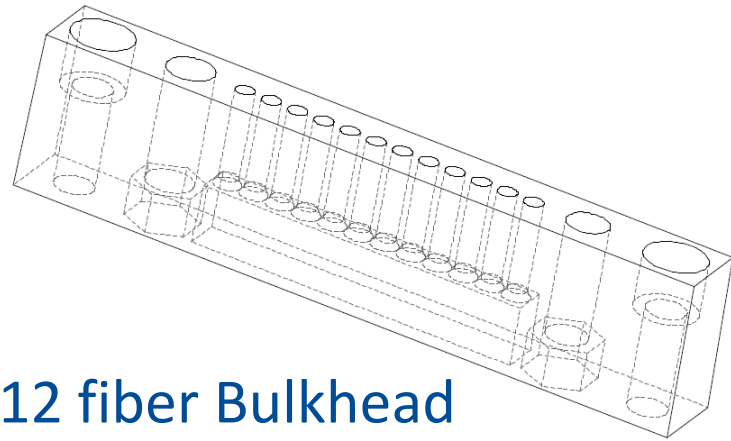


General concept of CMS HCAL optical connector

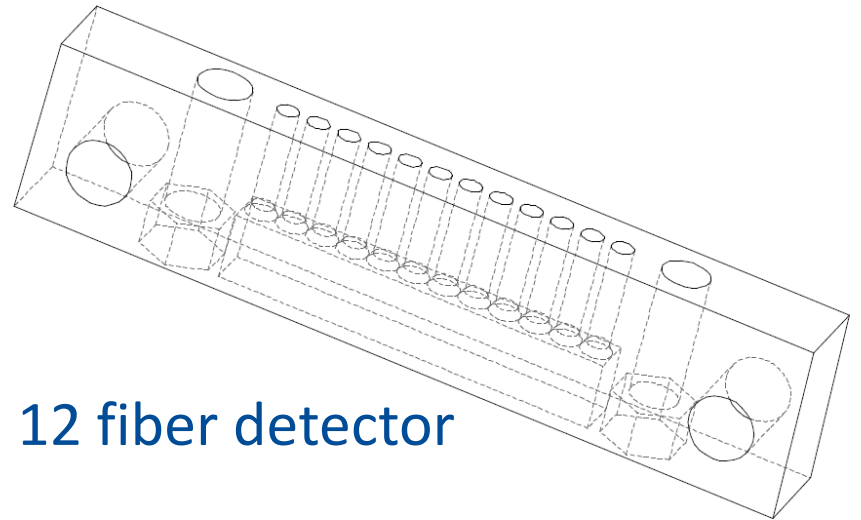


Interior-threaded dowel pin for alignment, small screw to attach

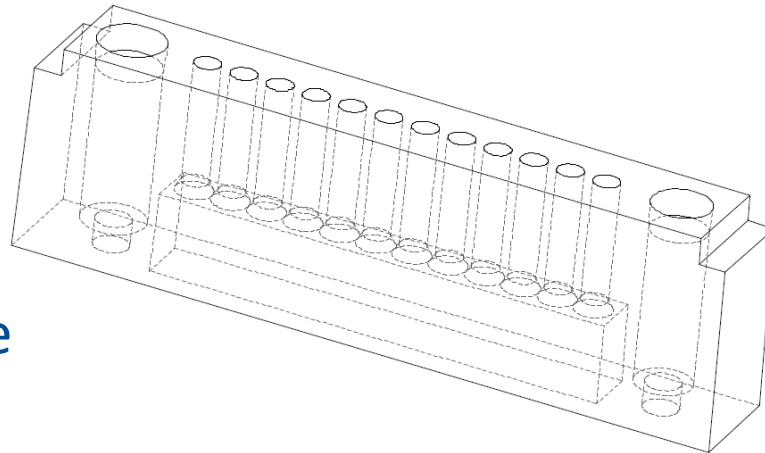
6 types of connectors -- 12 fiber, 18 fiber: cable, detector, bulkhead



12 fiber Bulkhead

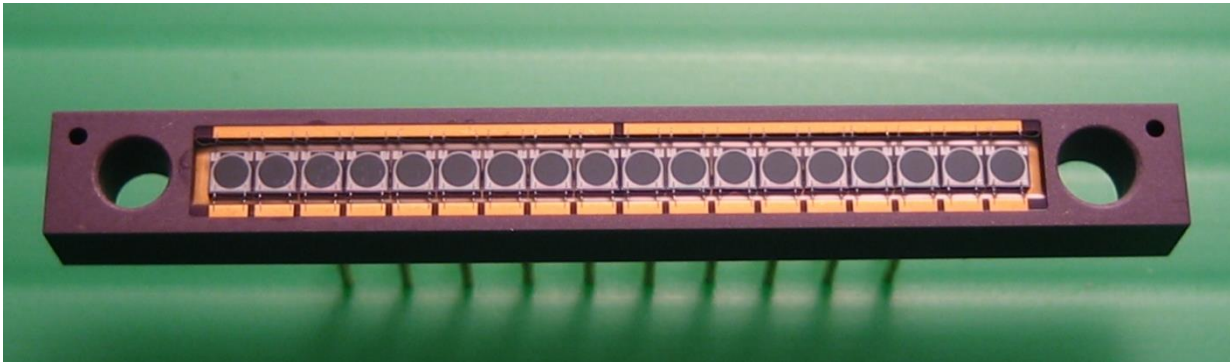
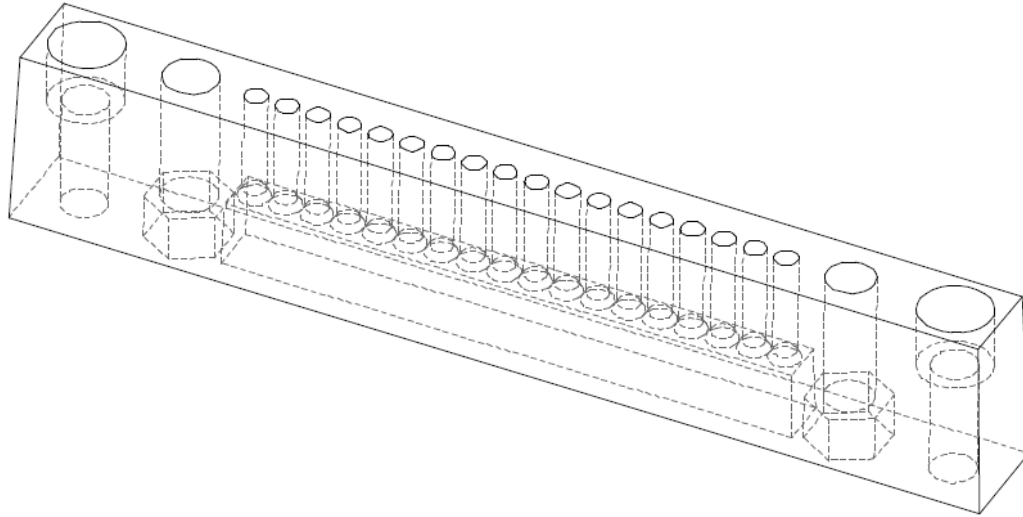


12 fiber detector



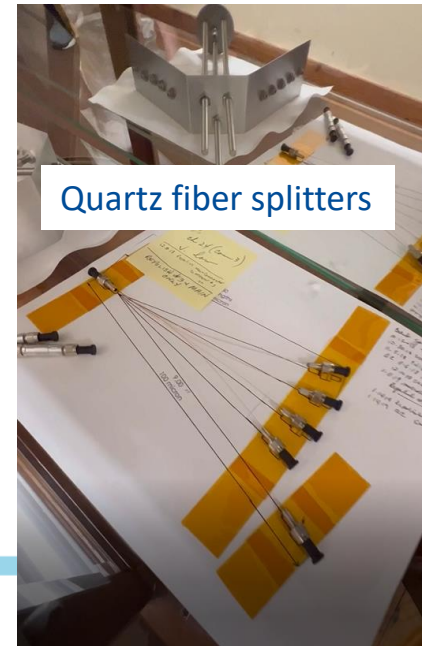
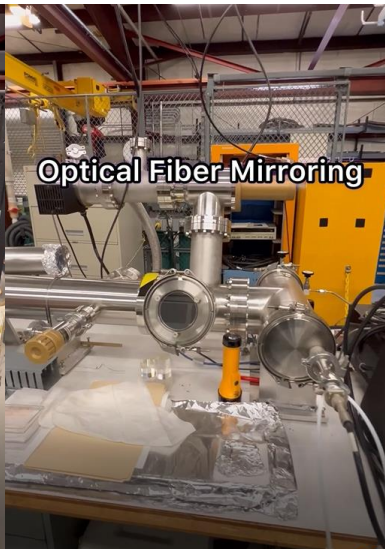
12 fiber cable

18 fiber bulkhead connector



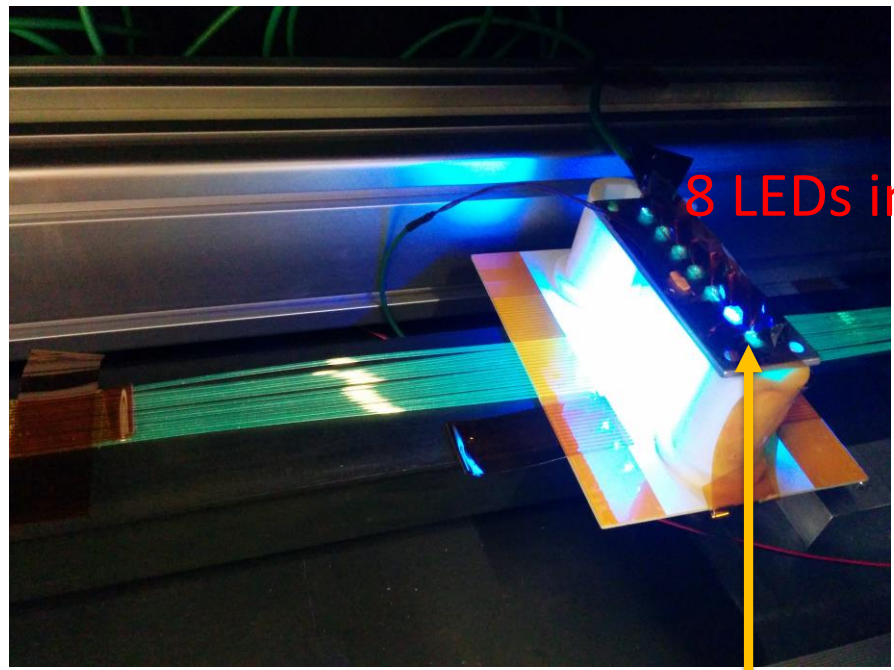
18 SIPM
package

Fiber polishing: 2 air-bed diamond fly cutters, fixtures



Optical Cable Tester at FNAL: Cable tester light source, DC light 470nm

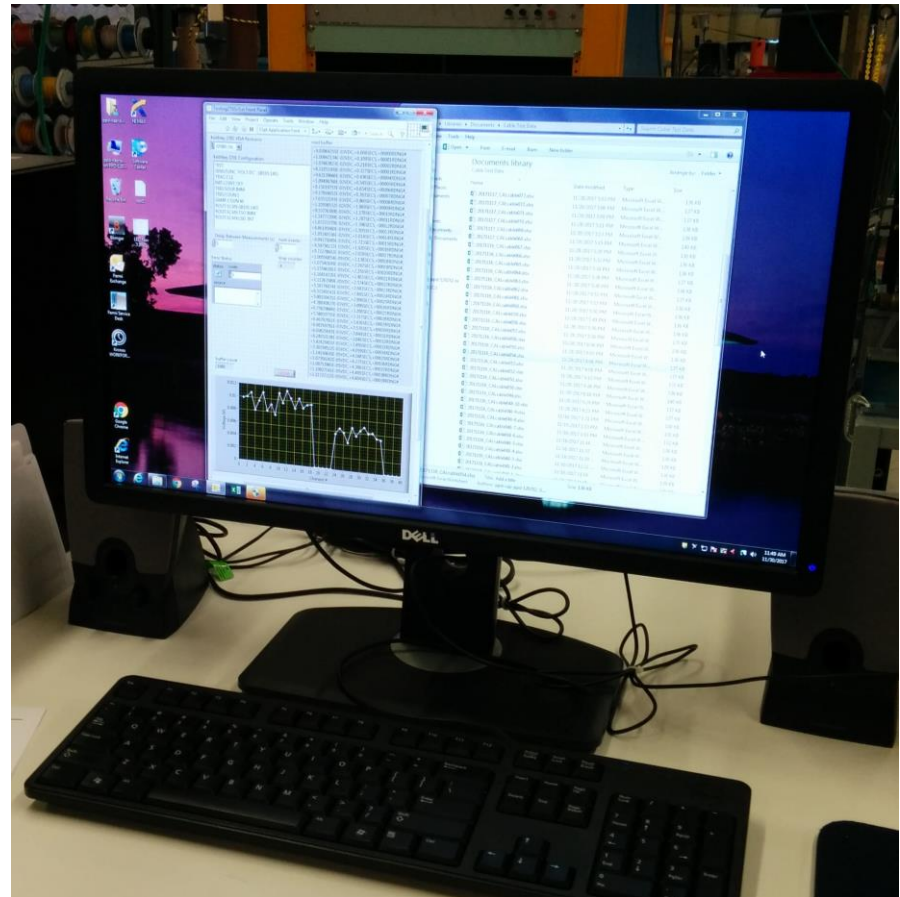
6 meter long



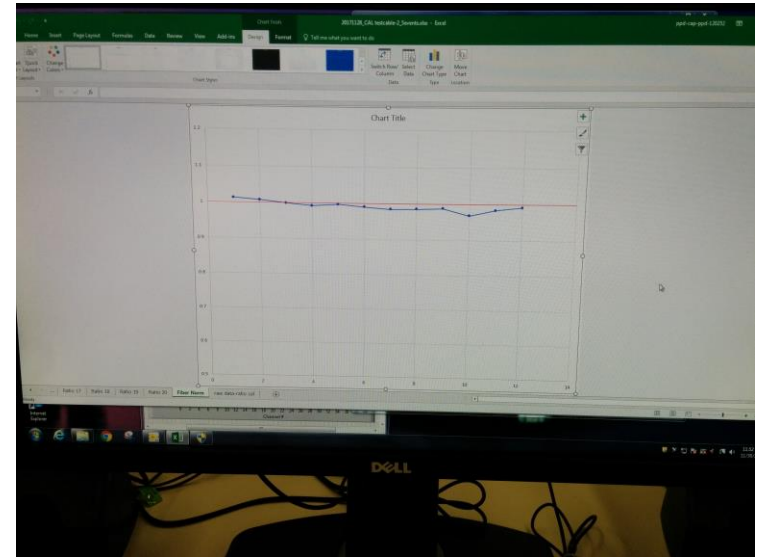
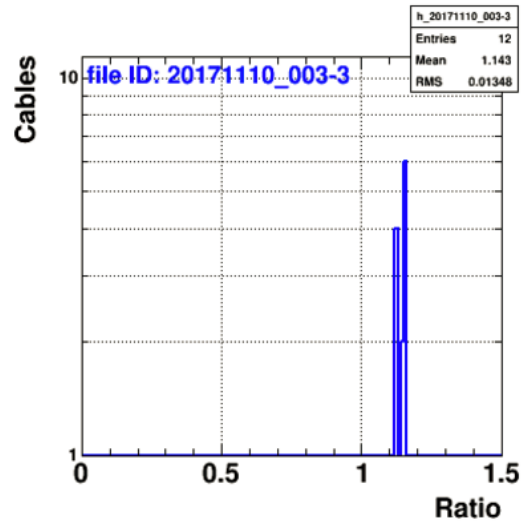
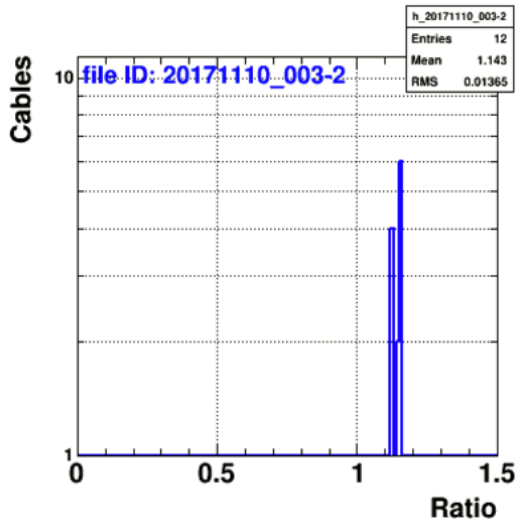
Temperature
readout of cooling
plate

Cable tester LabView interface

Loops over 40 channels,
repeated readout of set
of diodes. Short term
repeatability parts per
ten-thousand
Cable retest repeatability
a few percent.



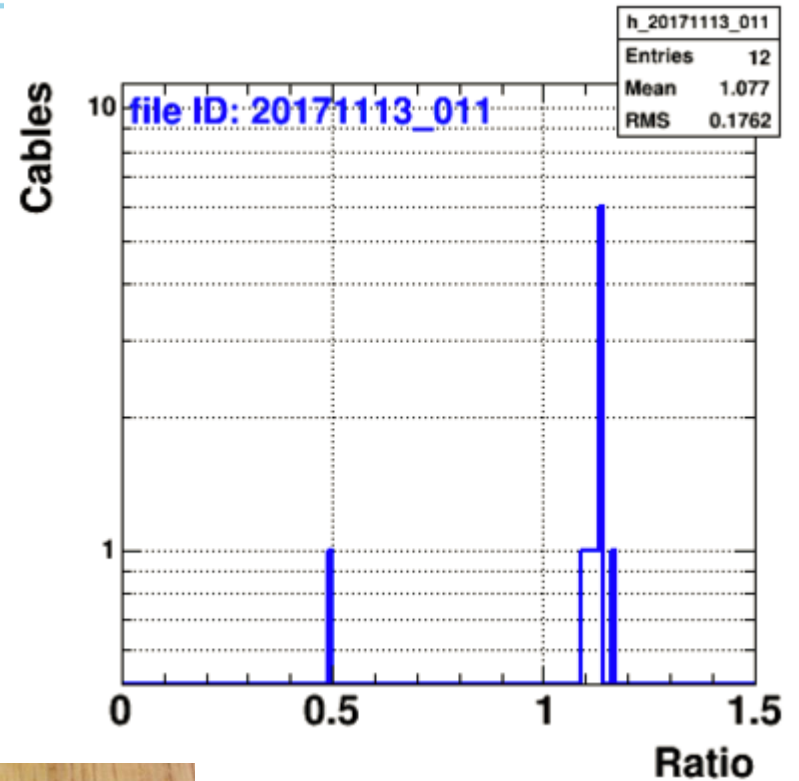
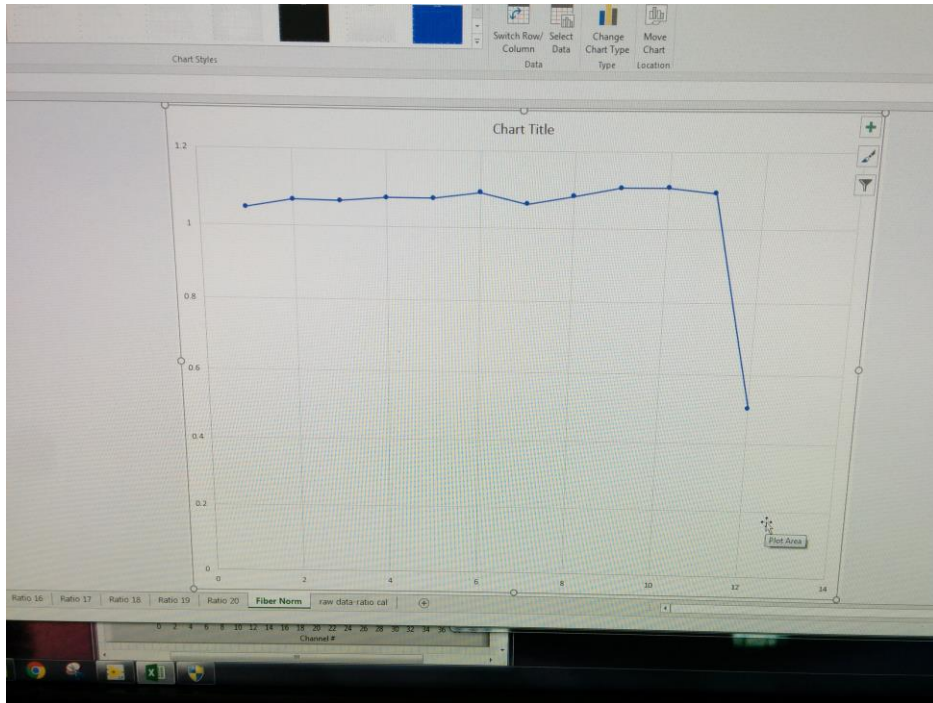
Cable tester results : Good cables



Root analysis of cable test data. RMS of good cables \sim 1% to 1.5%

Online display for good cable, 12 fibers (normalized to average fiber)

Bad cable: Broken fiber



Broken end
fiber, easy to
see, harder to
take pic.



Completed Optical Cables

- CMS HCAL ~ 5000 cables, ~ 100K fibers

