

HAWC Calibration:

Cabling Experience from HAWC30

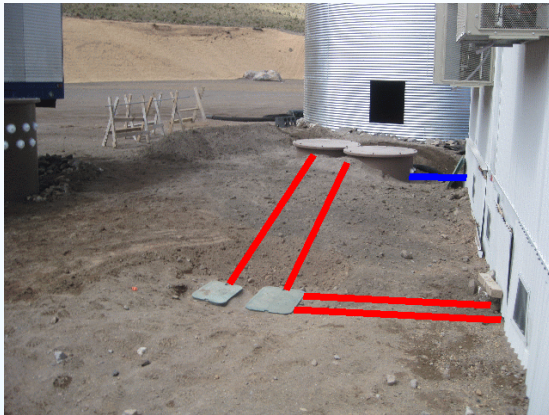
John A.J. Matthews

`johnm@phys.unm.edu`

University of New Mexico

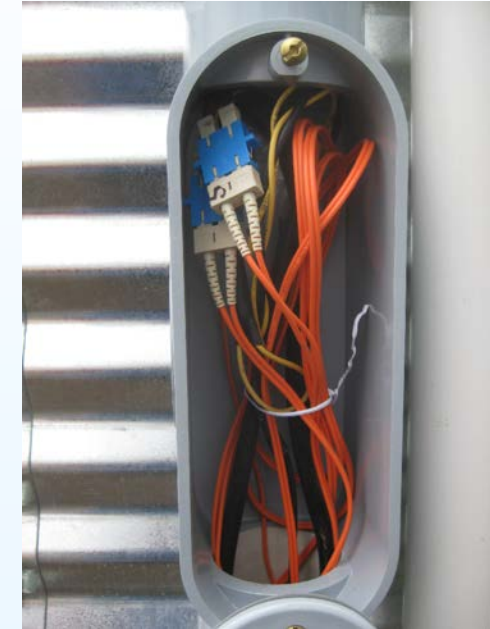
Albuquerque, NM 87131

HAWC calibration: *pulling the long fibers*



- Left: The calibration (long) optical fibers go to the field enclosures (at each tank-pair) and to the calibration room via the excess fiber storage bin(s).
- Middle: The first 5 fibers were pulled on Oct 2, 2012. Alejandro Lara reminds us to pull a new string with each set of fibers!
- Right: The fibers enter the top of the excess fiber storage bin then go through a 4" drain/conduit towards HAWC30. One 4" conduit is connected at this time ...
Beware: this conduit section (to the first concrete enclosure) may include a "Y". Do NOT use the other branch (for fibers OR for CAT5 cables)!!

Calibration system: *at the WCDs*



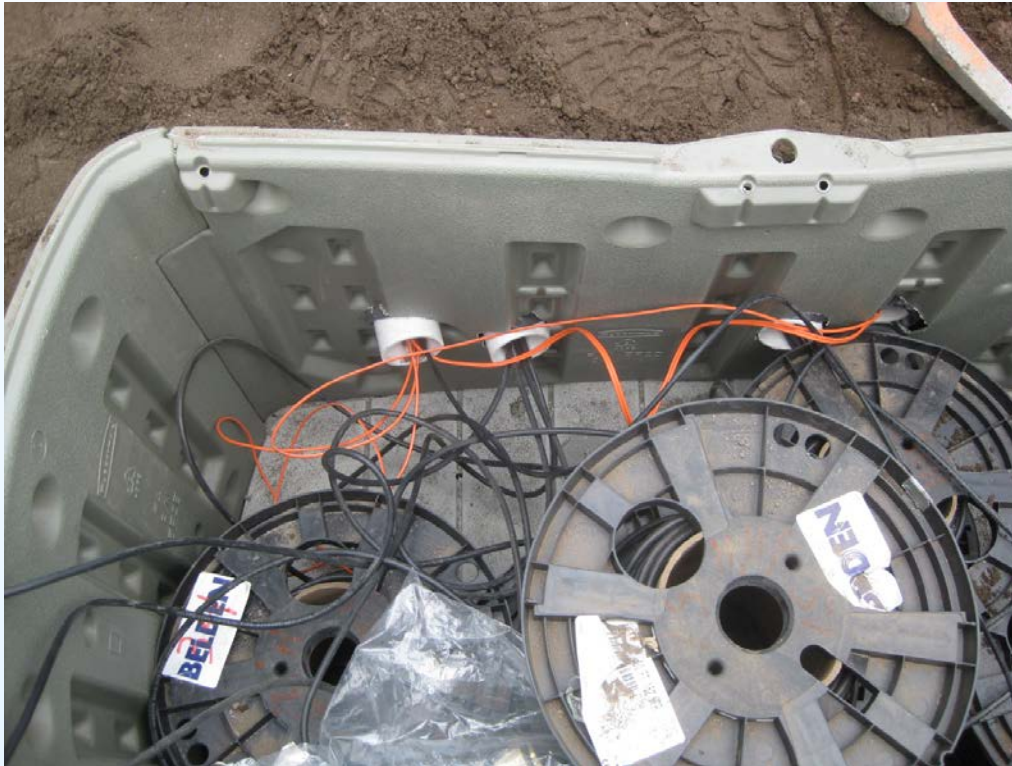
- Each long fiber has a label: in this case A-4-004 **which we record at the tank!**
- The long fiber connects to two orange 15m-duplex fibers in the 3" access box [thank you Andy!]
- One is labeled "S"=solo (light to two diffusers) and one is labeled "P"=par (round-trip-timing).

Calibration system: *fiber issues (I)*



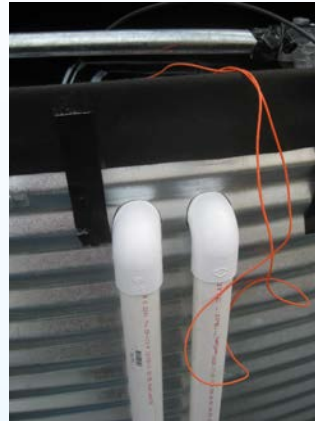
- Each long fiber breaks out into 4 fibers: labeled 1, 2, 3 and 4.
- Fibers 1 and 2 connect to the Solo 15m duplex fiber
- Fibers 3 and 4 connect to the Par 15m duplex fiber
- **Because the drain/conduit is a wet environment (hmmm) these labels tend to fall off IF/WHEN TOUCHED!**

Calibration system: *fiber issues (II)*



- The HV and fiber connections to the 2"-PVC conduits (TWO on each WCD tank: one for fibers and one for HV cables) are through the field enclosures.
- Given the relative fragility of the fibers is this wise?
- **OR should there be a small fiber-field-enclosure for the fiber connections to the 2"-PVC conduits?**
- And how do the CAT5 cables complicate this further?

HAWC calibration: *fiber issues (III)*



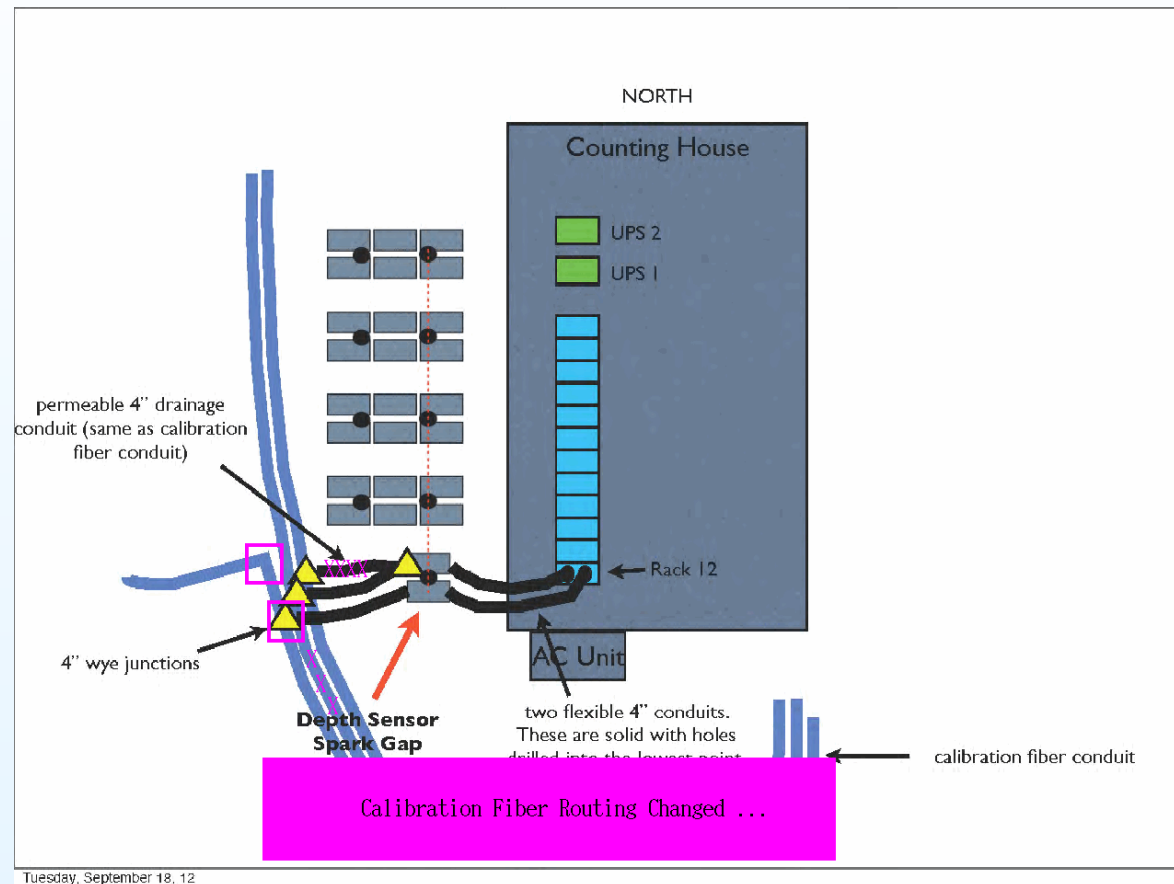
- The **current procedure** to pull the (orange) optical fibers (from the **field enclosures** to the top of the tank) is **involved and dangerous** and done 4.5m in the air on a **ladder!**
- Left: loosen the bracket securing the PVC
- Middle: remove the 90-degree elbow
- Then pull the fibers up to the top of the tank, thread them through the (loose) elbow, then into the hole in the side of the tank, then reinsert the elbow ...
- Right: **Instead replace the elbow with a 90-deg access port**, *soften* the 90-degree bend with split-loom and use the *excess space* (in the access port) to store the end of the round-trip-timing loop!

HAWC calibration: *fiber issues (IV)*



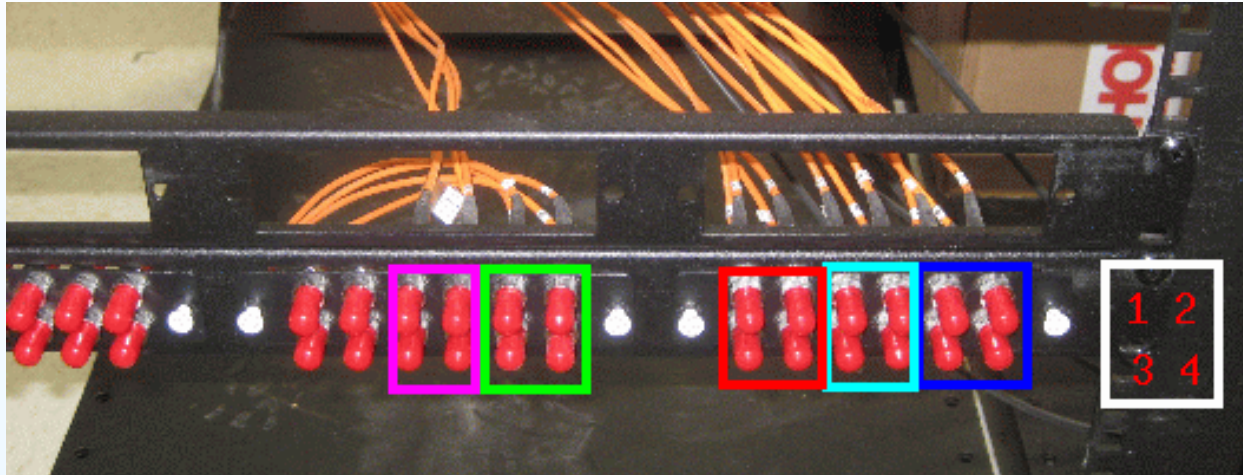
- Left: The long optical fibers **remember** that they have been coiled onto a spool ... and they do NOT like to lie flat!
- Right: Thus will the **ONE** 4"-drain/conduit pipe be adequate for HAWC100?
- And will the existing "Y"-connections be a problem? **For the future: paths with multiple cable pulls should have access boxes (at all junctions) and NOT "Y"s!**
- The 4"-drain/conduit pipes have mice! Is there a plan to add moth-balls or cats?

HAWC calibration: *fiber issues (V)*



- Use ONE of the North-going 4"-drain/conduits for optical fibers and ONE for CAT5 cables ... else likely problems with existing "Ys".
- Proposal: **in future use access boxes at all 4"-drain/conduit bends and junctions**

HAWC calibration: *fiber issues (VI)*



- The long-fibers terminate in the patch panel (racks) in the calibration room
- Each long-fiber includes 4 optical fibers: numbered 1~4 which are cabled as shown in the photo. Oct 4, 2012 photo shows 5 fibers installed.
- Fibers 1 and 2 connect to the diffusers in the tanks; fibers 3 and 4 are used to monitor the round-trip-times
- Now we need a plan to record the fiber label IDs, with the patch panel slots and with the WCD IDs!
- **Fine print: fibers 1,2 are interchangeable EXCEPT for “single tanks”. In that case connect ONE 15m simplex fiber to fiber 1 and leave fibers 2~4 unconnected.**

Additional/backup slides



Additional slides

HAWC calibration: *cosmic conjunction*



- Occasionally the pivotal players are at the same place at the same time ... and wisely stand on the shoulders of colleagues: Patrick Younk (eye nuts) and Megan Longo (first 10"-PMT to calibration diffuser connection)!
- Left: Michael shortened the length of the Kevlar loop that attaches to the PMT
- Middle: Secure the Kevlar using many (5 or 6) knots; **then add one drop of super-glue to the knot next to the loose end of the Kevlar.**
- Right: Adjust the length of the Kevlar string to the calibration diffuser to place the diffuser 3.00m above the top face of the 10"-PMT.