News/ LBNC Review / Prototype News

Tom LeCompte
Argonne National Laboratory

Announcements: I&I

- Howard Budd (Rochester) will be our installation Point-Of-Contact

- Installation impacts our go/no-go date
  - If there is shaft/crane contention, we may have to start installing sooner…
  - …which means we need to start building sooner…
  - …which means we need to decide sooner.

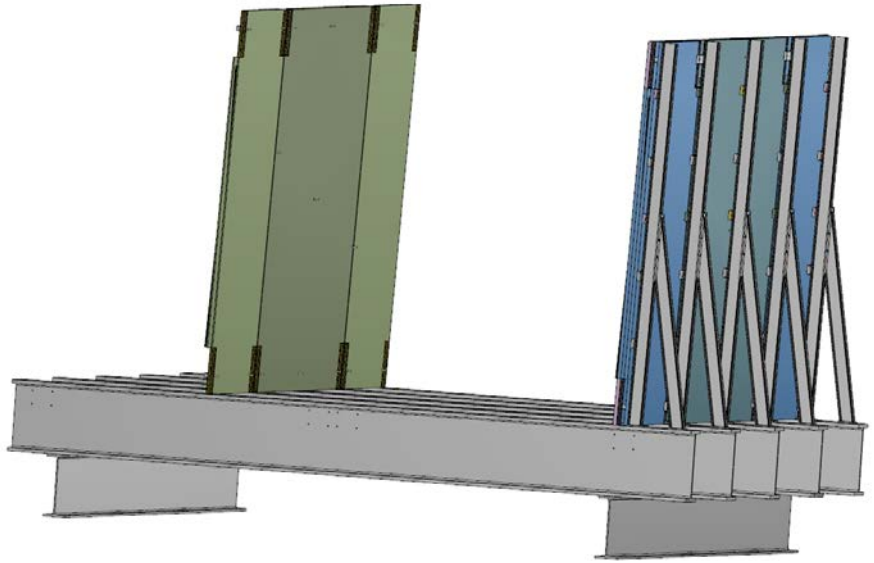
We are very fortunate to get someone of Howard's caliber working through the various I&I issues.

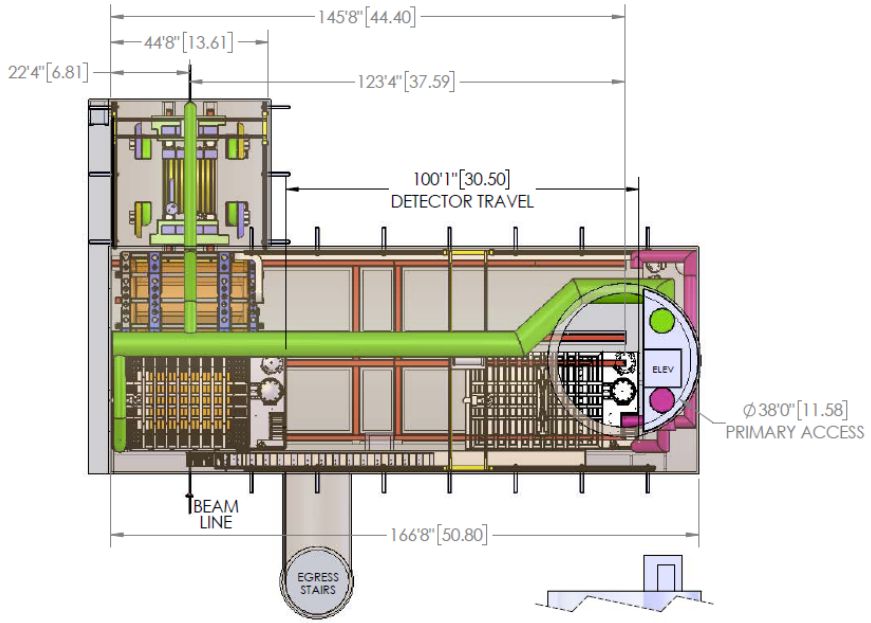
Installation in Broad Strokes

- First we build the supports (6-8 weeks)
- Then we build up the layers, back (west) to front
  - Three steel sheets + four panels per day
  - Run cosmic rays overnight before doing the next layer (it is much easier to install from the front than replace from the top)
- Then 4 weeks to install the six magnet coils

The schedule assumes there is no crane or shaft contention.

- This plan assumes we have at least a standalone DAQ available as soon as we start installing
- It may be possible to reduce the gap between plates during installation. That extra space could be brought to the front and improve our charge identification at low energy.





LBNC Review

- Reminder: we asked them for advice on the following (apart from the charge):
  - Better understanding of what our light requirements are
  - Whether we should devote one week per year of electrical engineering during the early phase
  - Whether they had any advice on whether we revert from a 4x4 SiPM array to individual SiPMs
    - Our original array is no longer in the Hamamatsu catalog. Taritree Wongjirad (Tufts) is looking into the options and will soon present here on what he learned and the various pros and cons
  - How many spares we need & do we need LED flashers
    - A past cost-cutting exercise left us at 0%; we're likely to move to 5% (7 "stinkers" per factory)
  - Thoughts on installation
  - Advice on whether we want to build a 1/3 scale working prototype sooner or later

- There was no close-out. There will be a written report soon.
  - No point in speculating too much about what will be in it.

LBNC Review II

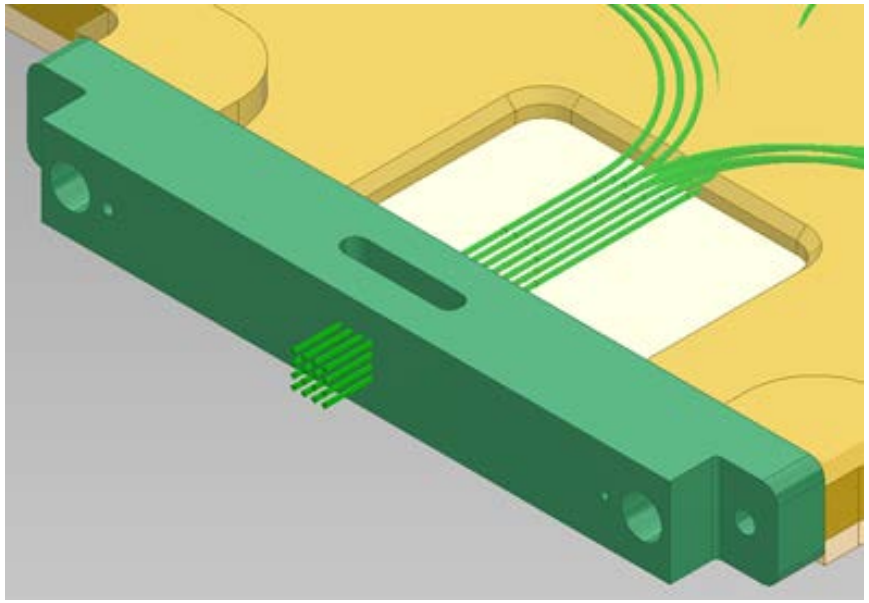
- They suggested that we build a “Module Zero” some months before the go/no-date
  - This may or may not end up in the final recommendation, but it’s a good idea and is going into the plan
  - We presently have five months of schedule contingency (“float” in the jargon). This would let us verify that five months is truly five months before the go/no-go date and if necessary adjust the date accordingly.
    - Reduces risk. Cost implications appear minimal. Requires us to freeze the electronics design ~9 months sooner.

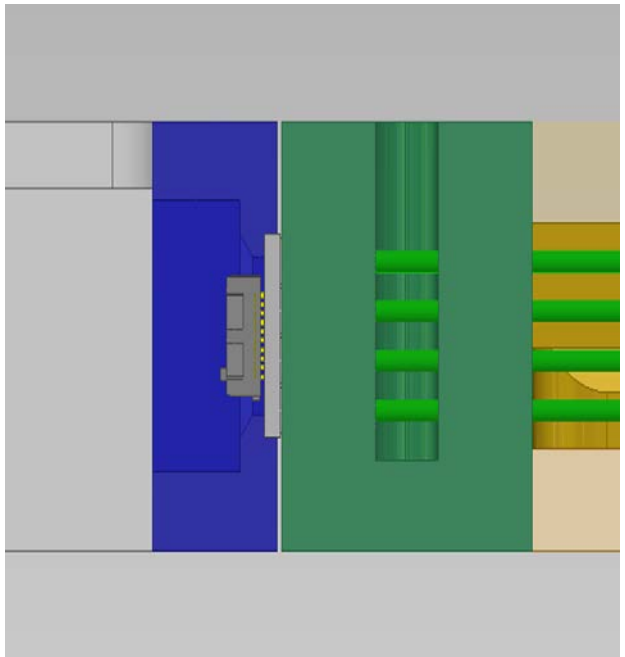
- I prefer the name “Module One”
  - This should be a device we could put in the detector if we wanted to. Not something “kinda sorta” like the real thing.

Prototype 1 (I)

We are starting by prototyping the fiber and optics separately from the scintillator. When we are satisfied with these pieces, we can combine with scintillator. (We don't have an infinite amount of scintillator)

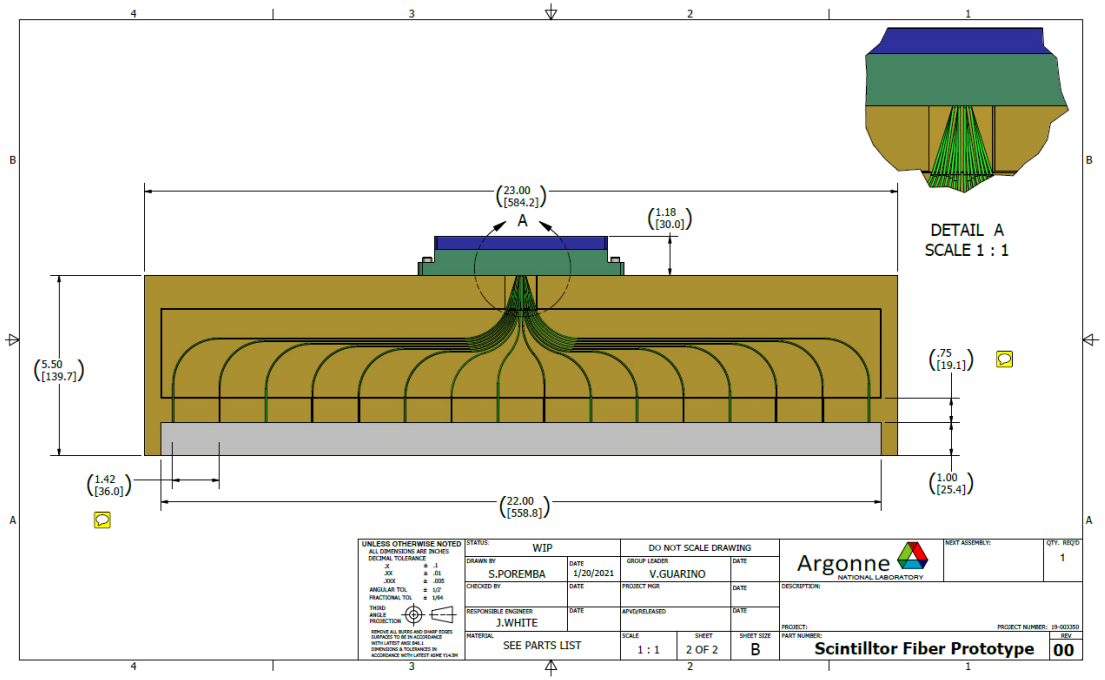
- Purely Mechanical
  - Doesn't even use scintillator: mocks it up with 1mm clear fiber (from Amazon) in a fixture
- Sixteen "channels" (one SiPM-array equivalent)
  - We may or may not stick with the 4x4 array, but for now we are assuming a 13.1 mm array (the SiPM we wanted was 9.1 mm)
- Intended to:
  - Test fiber routing (yellow piece)
  - Test Fiber Guide Bar concept (green piece)
  - Test SiPM mounting concept (blue piece + leaf springs)
  - Refine our construction time estimates

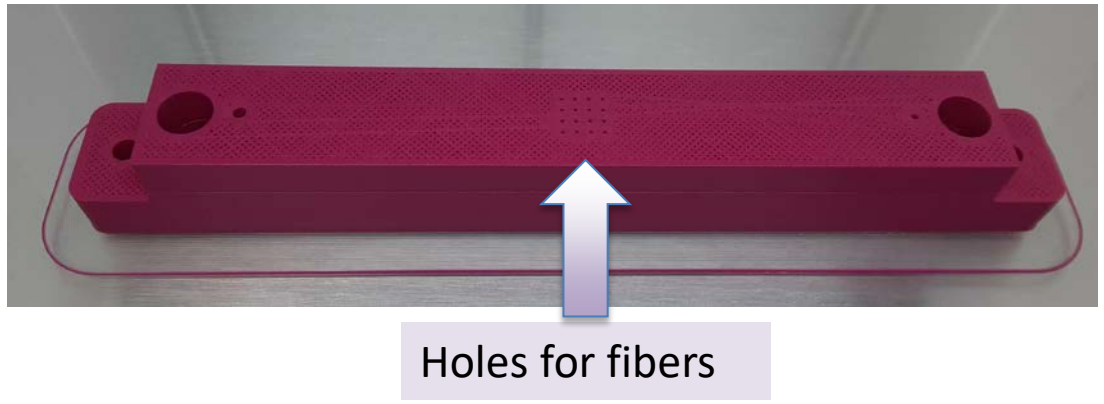




Prototype 1 (II)

- We've finally started (Many Covid delays)
  - I am now approved to get back to the Lab ½ day per week.
- The 3-D printed fuchsia piece is green in the drawing - for fast prototyping, you can't beat it.
  - Also 3-D printing lets us quickly test modifications. What if it were longer? Shorter? Taller? etc.
  - A machined Delrin piece takes 4½ hours. This is cost prohibitive for the full device. We are considering injection molding and then making the holes.

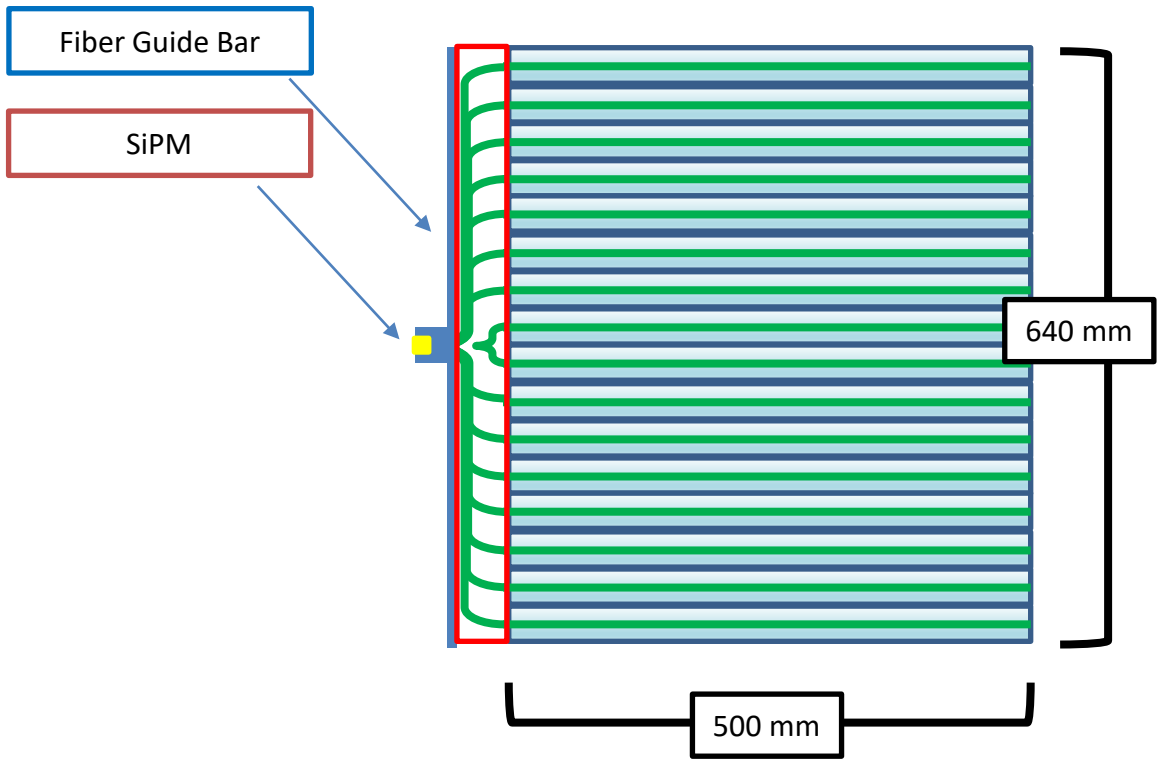




Shown in January

Working Prototypes?

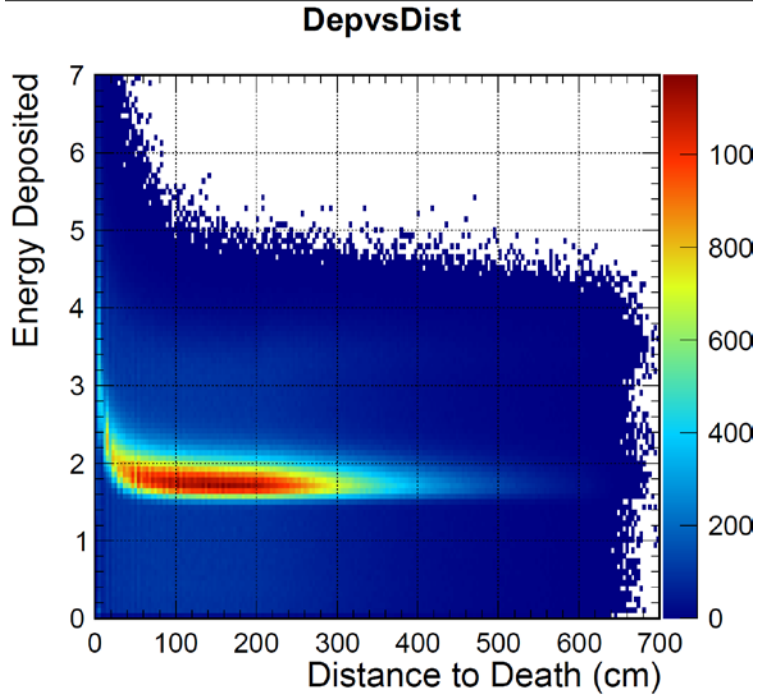
- We have the ability and the materials to build something like this.
  - 16 channels, 1/3 x 1/6 scale.
- Commercial readout exists for about $2000.
  - 20 Lemo outputs
    - 16 single channel amplified outputs
    - 4 Four-channel sums
- The 16 channels wouldn't necessarily need to be identical
  - E.g. glued vs. non-glued, groove vs. hole

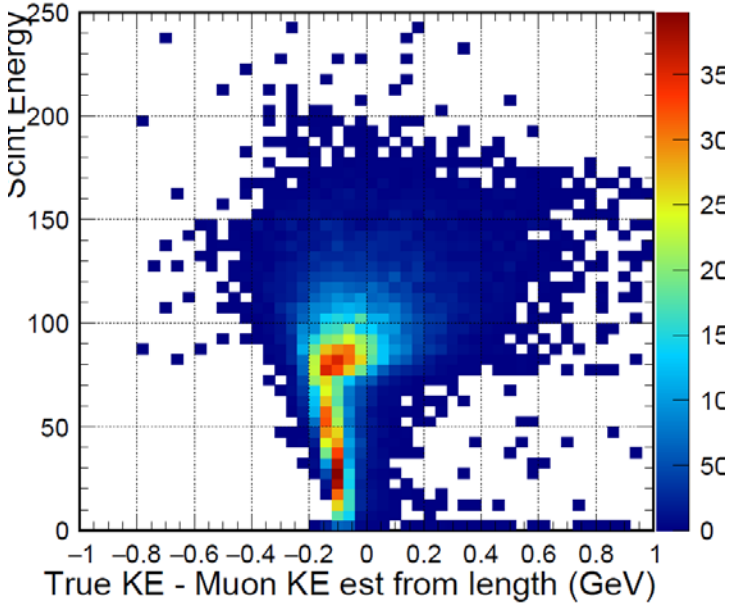


Last thought

- The DOE IPR was very interested in 2.4 MW operation and pileup.
- I don't think that is our most urgent study.
- I think our most urgent study is on light requirements.
  - Will we use the energy information *at all*? Or is this purely a position measuring device?
  - If we do use energy, how good does it have to be?

Why do I think it's more urgent? Because it affects design choices. That's more important for baselining than how well the device might perform in six years time.





From Clarence Wret

LBNF/DUNE