

Cosmic Ray Tagger Simulation Update

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ProtoDUNE DRA Meeting on

May 30, 2018

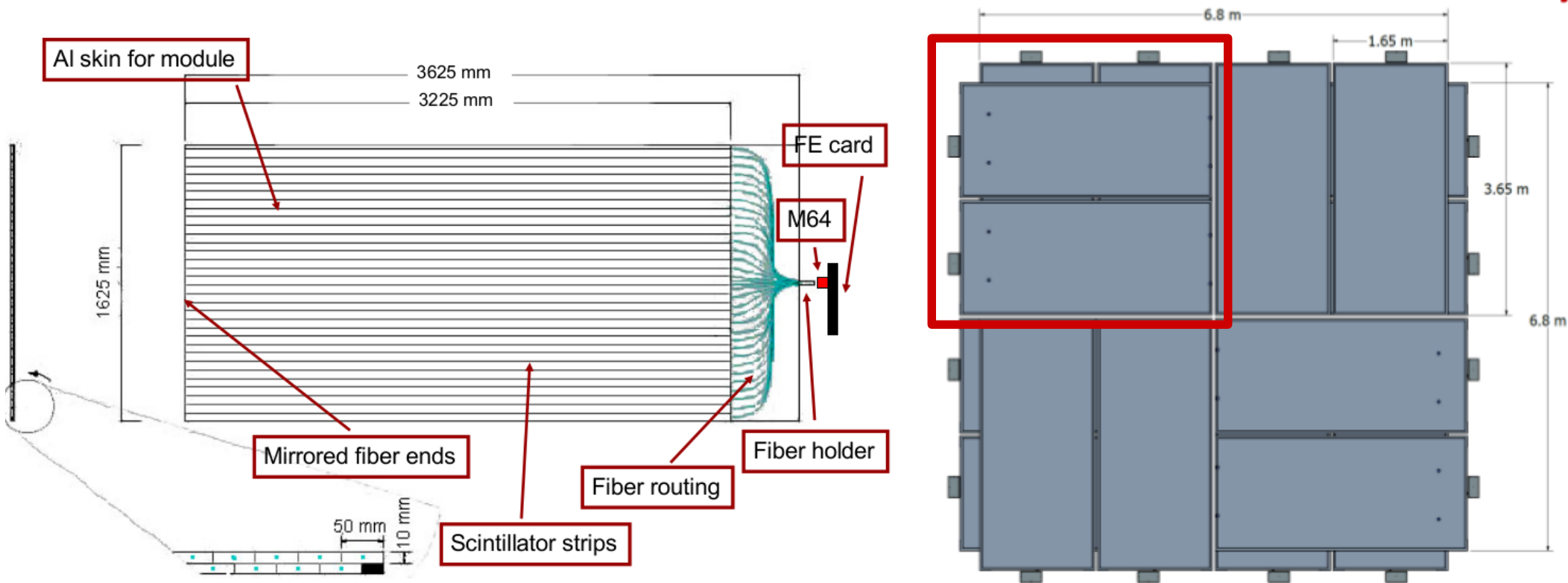


CRT Simulation Plan

- Energy Deposits: Andrew Olivier
 - Communicate geometry to framework
 - Use largeant if possible
 - Birks' Law for scintillator?
- Simulation → CRT hits: Matt Worcester?
 - CRT might be read out as ADC channels
 - Makes detector simulation more complicated than 35t-like hits?
- Matching CRT hits to TPC Tracks: Matt Worcester
- CRT Hit Matching Coverage: Arbin Timilsina
 - Several presentations already using true trajectories to study parameterized CRT matching



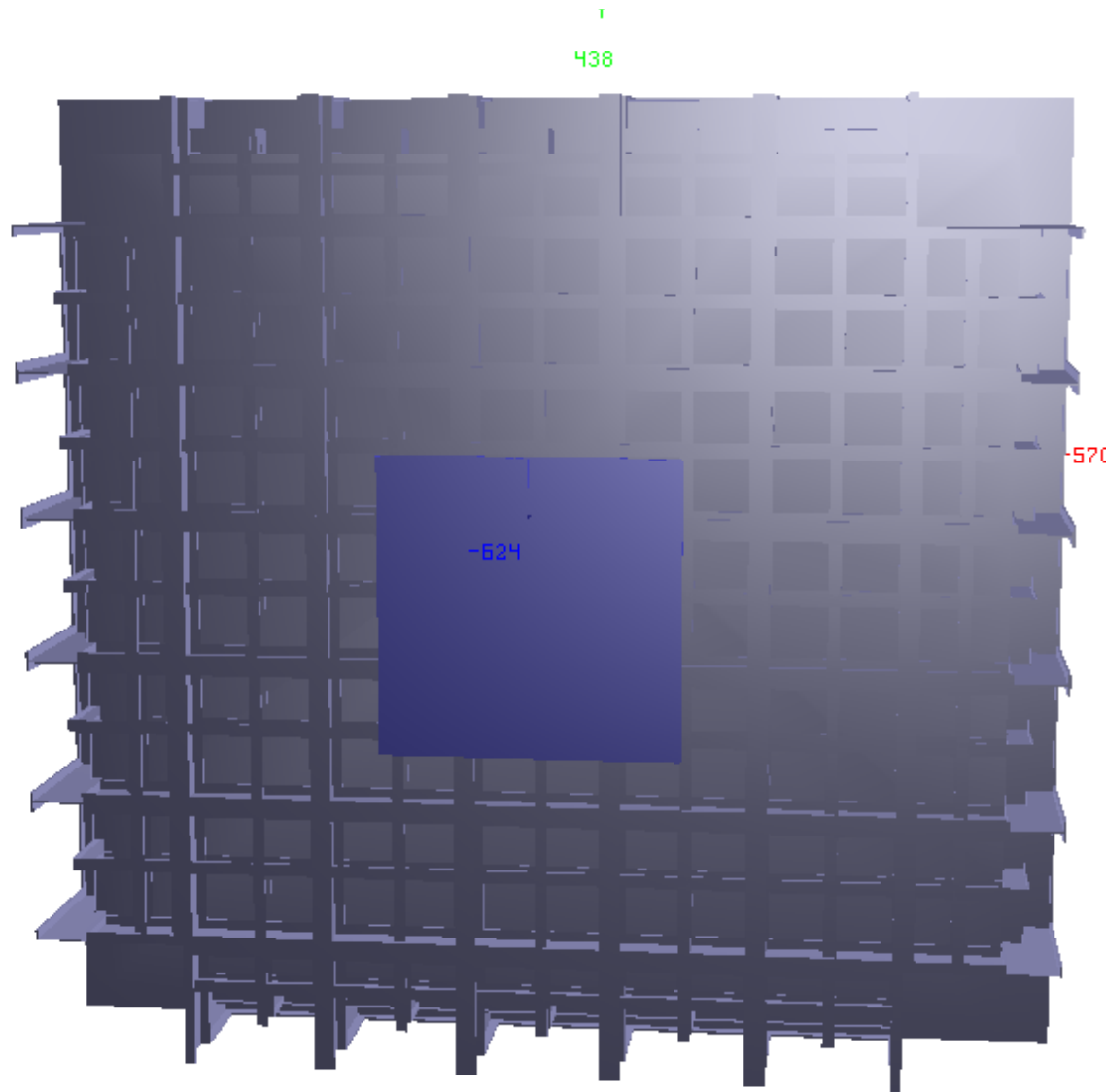
Overview of CRT Hardware



From Ed Blucher's Collaboration Meeting slides

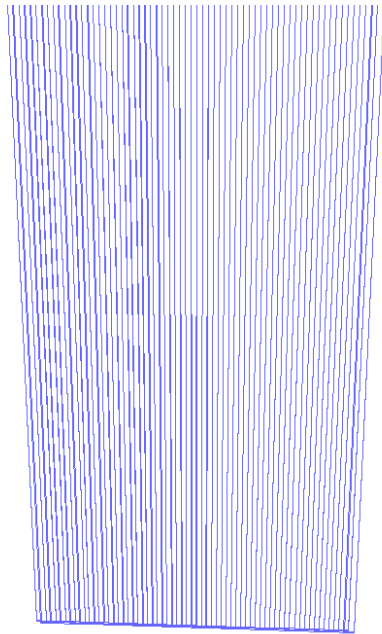
- Left: 2 layers of 32 channels that are offset by ~ 25 mm
- Right: 4 frames with 4 modules each on front and back of cryostat

CRT in the GDML File



- dunetpc
v06_76_00
- Single frame on front and back of cryostat → Need 4
- Modules' dimensions look correct

CRT Module Geometry



- Correct number of strips
- Thickness correct
- Future: planes are correctly offset?

largeant Simulates the CRT

- Geometry service list of CRT volumes agrees with GDML
- No custom ChannelMapAlg needed
- Handful of 2GeV pion particle gun events
 - Getting some AuxDetSimChannels with energy deposits (IDEs)
 - Got energy deposits of $O(10 \text{ keV})$, but MIP dE/dx in Acrylic is close to 2MeV/cm
 - Visualization \rightarrow pions starting downstream of CRT!
- 2GeV muons straight down Z axis from 5000mm upstream
 - Energy deposits of about 2MeV in 1cm CRT
 - Next, I want to make sure positions make sense



First Look at CRT Simulation



- Energy deposits look roughly right for 2GeV muon
- Not sure how to interpret truth channel numbers



Next Steps

- Confirm that energy deposit positions make sense
- Check any remaining geometry parameters
- Check new geometry with all 8 frames
- Look for Birks' Law for scintillator in largeant
- Begin integrating detector simulation into LArSoft
 - Needs to match data format
 - Detector simulation?



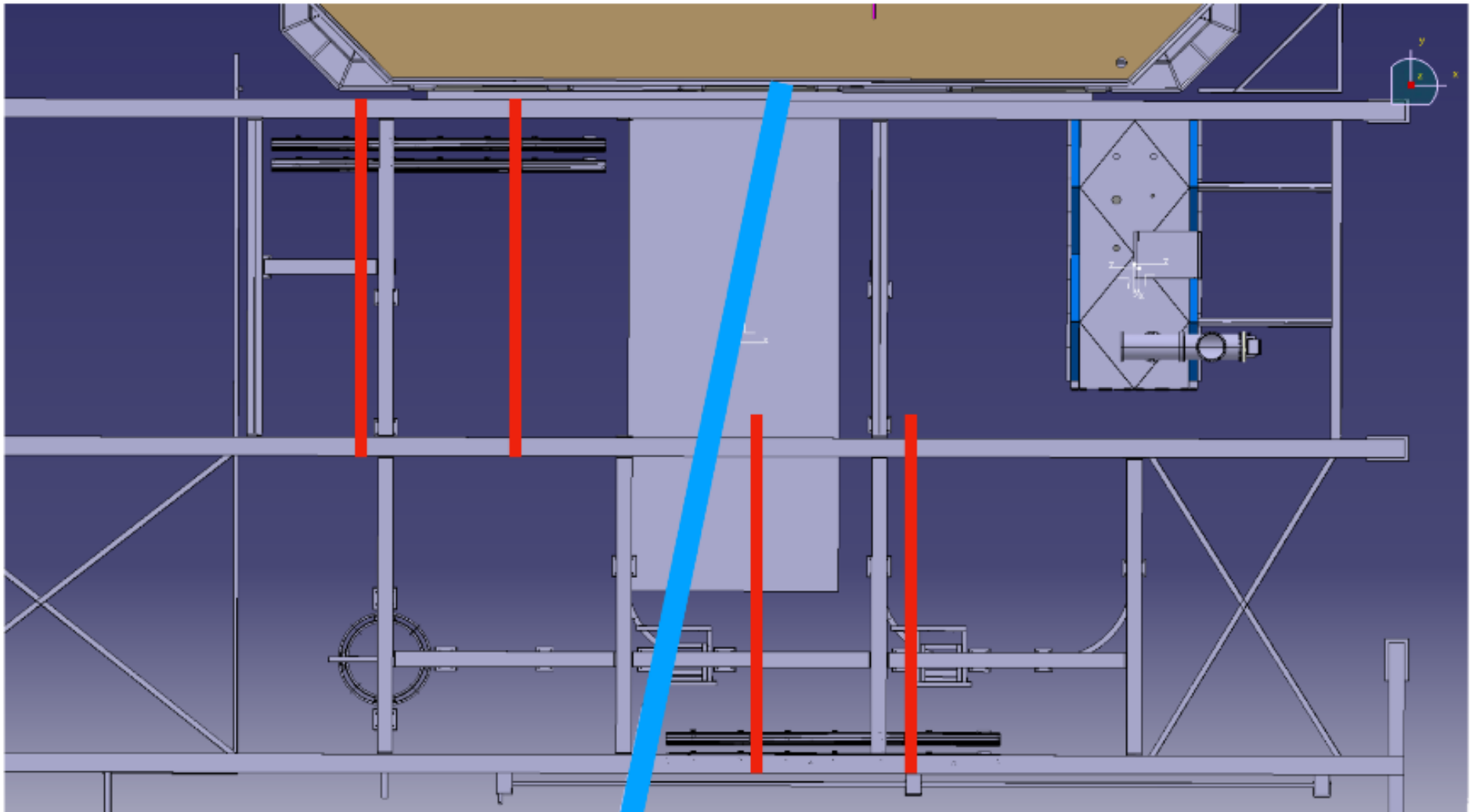
Backup: A CRT Frame



From Ed Blucher's Collaboration Meeting slides



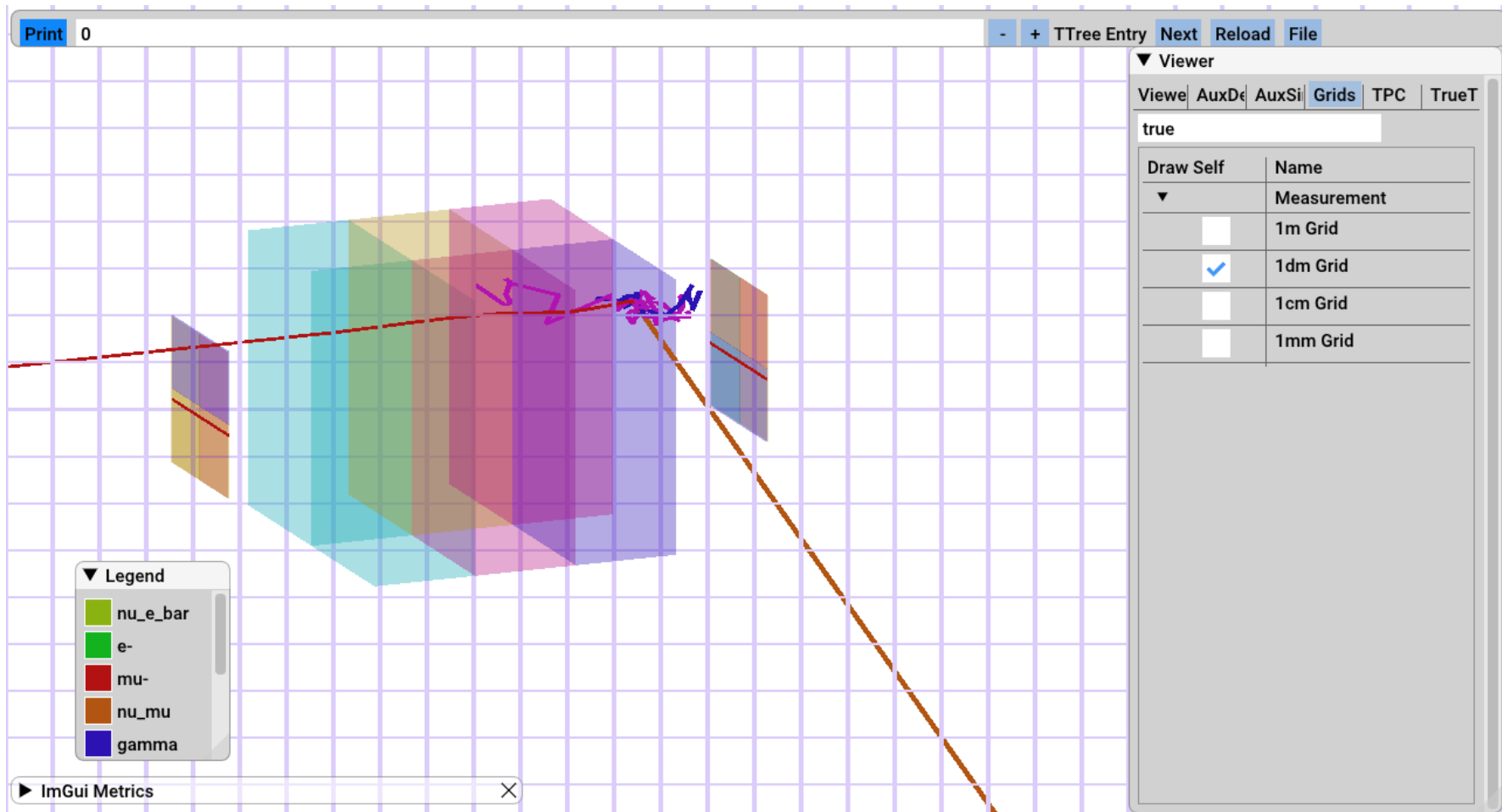
Backup: Preliminary CRT Positions



From Ed Blucher's Collaboration Meeting slides



Backup: Visualization of CRT



- Short red strips are my interpretation of CRT simulation channels
- Want to map channel to position and look energy and timing