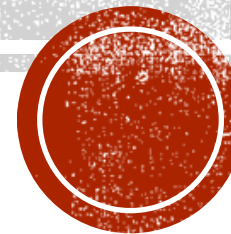


Visual inspect of cosmic muon reconstruction by fiTQun

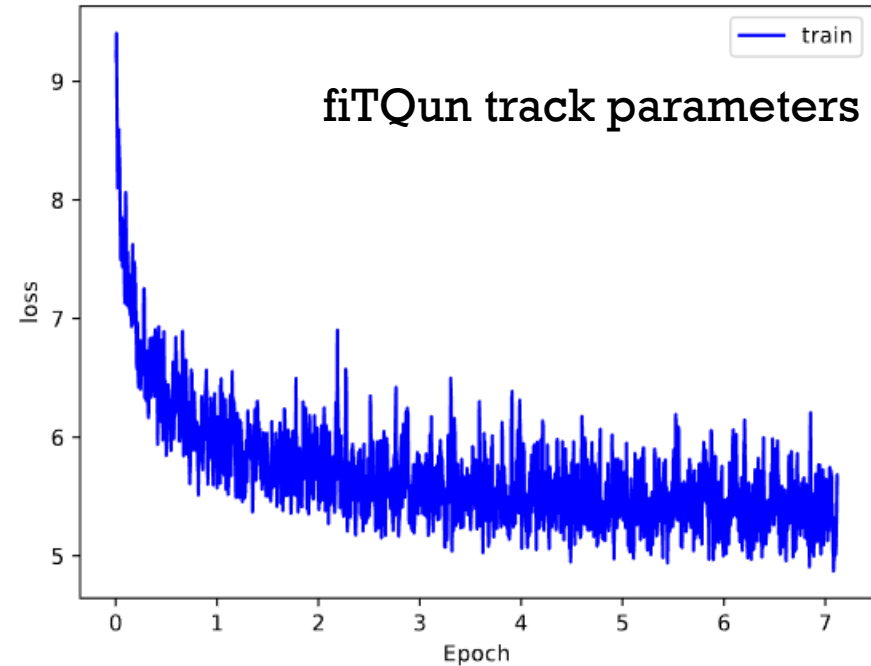
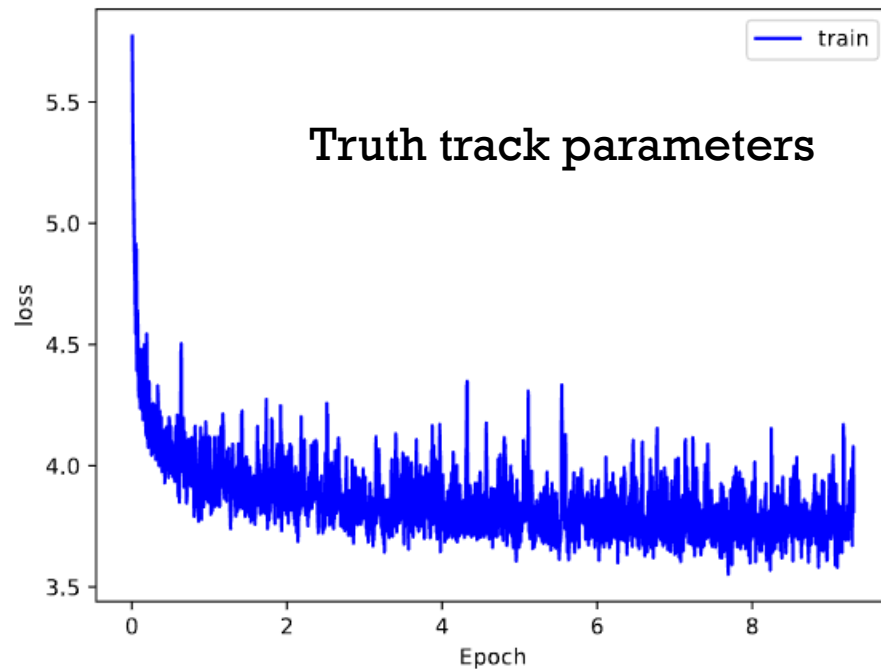
Ka Ming Tsui

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Reminder

- Previous calibration studies use truth track parameters
- If I use reconstructed (fiTQun) parameters instead
 - Significantly worse loss (performance) → need to selection for good reconstruction

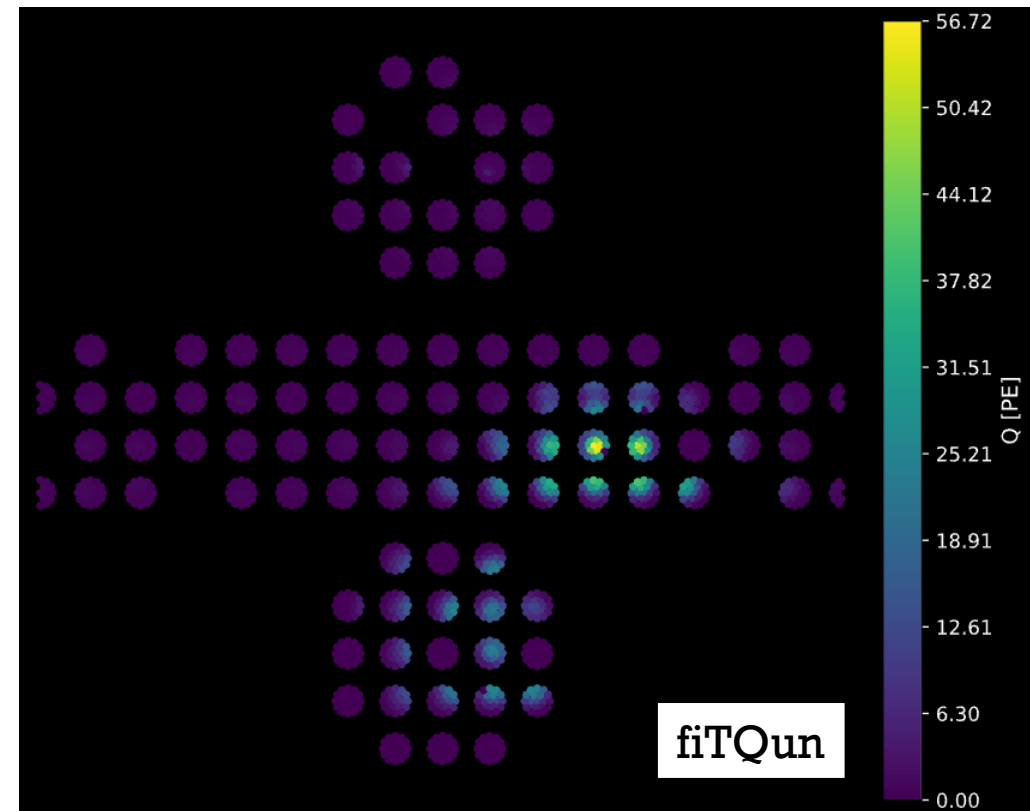
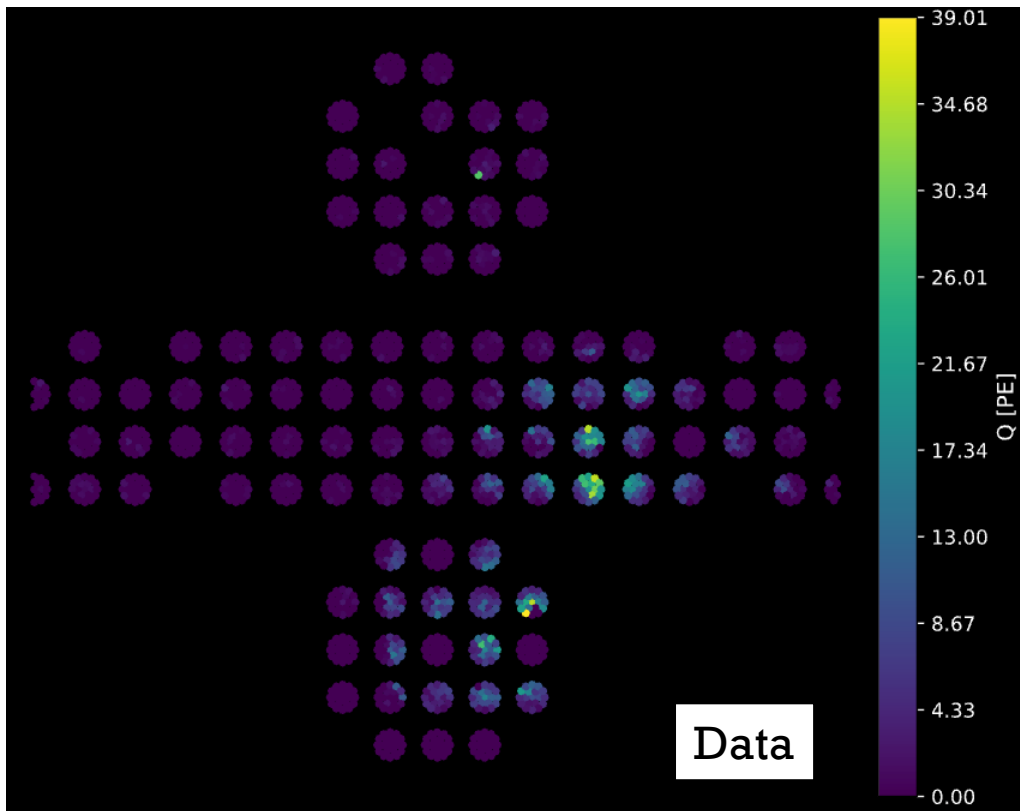
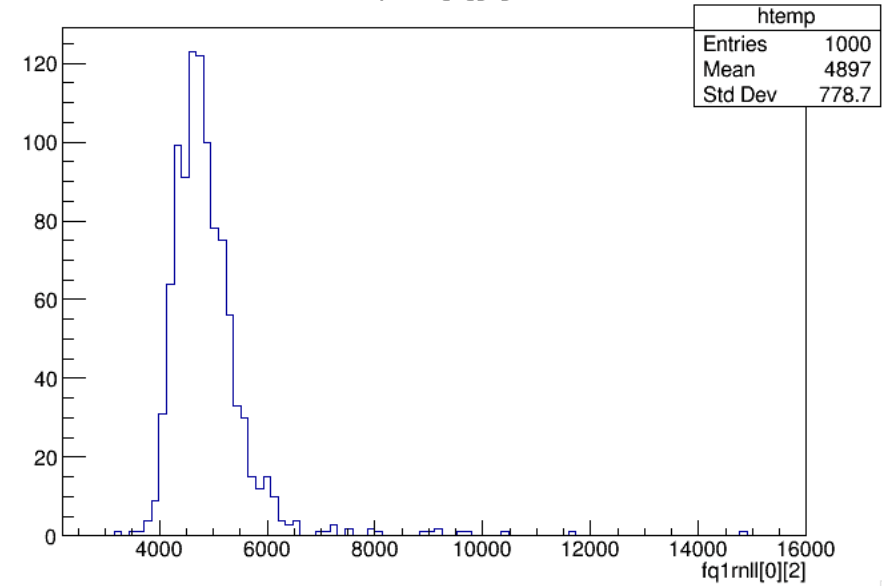


Known problems with fiTQun reconstruction

- Angular response/PMT efficiency not tuned to data yet
- No individual efficiency
- PMT waveform corrupted at high PE, giving reduced or even 0 charge
- To check how bad it is →
Visual checks on data (top-down muons) and fiTQun charge prediction
 - fiTQun didn't store PMT charges naively, so Gemini went through some explorations to compile a shared library and create standalone scripts to get them
 - Use fiTQun vertex and set momentum to 1000/MeV to generate predictions

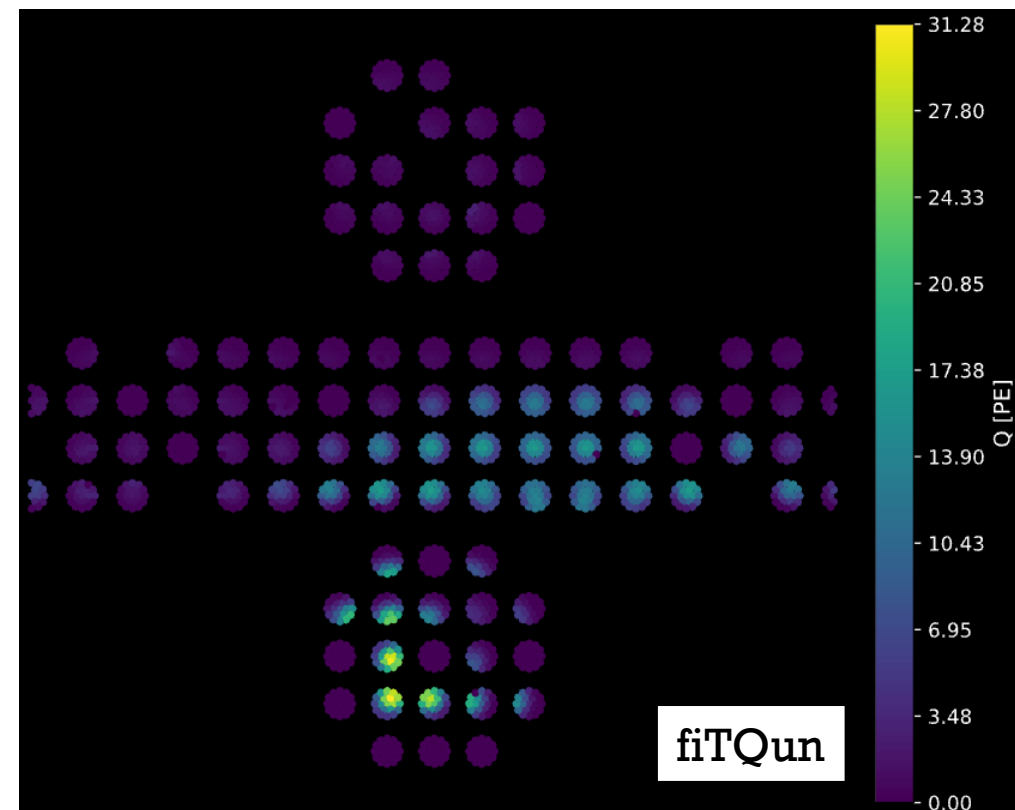
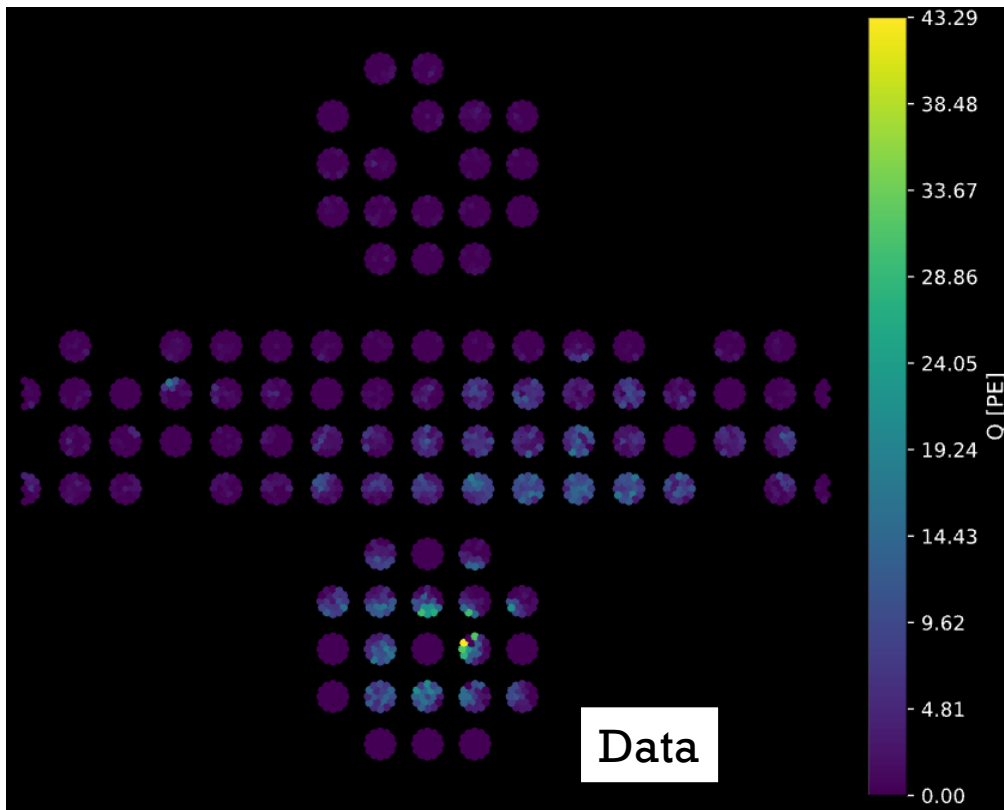
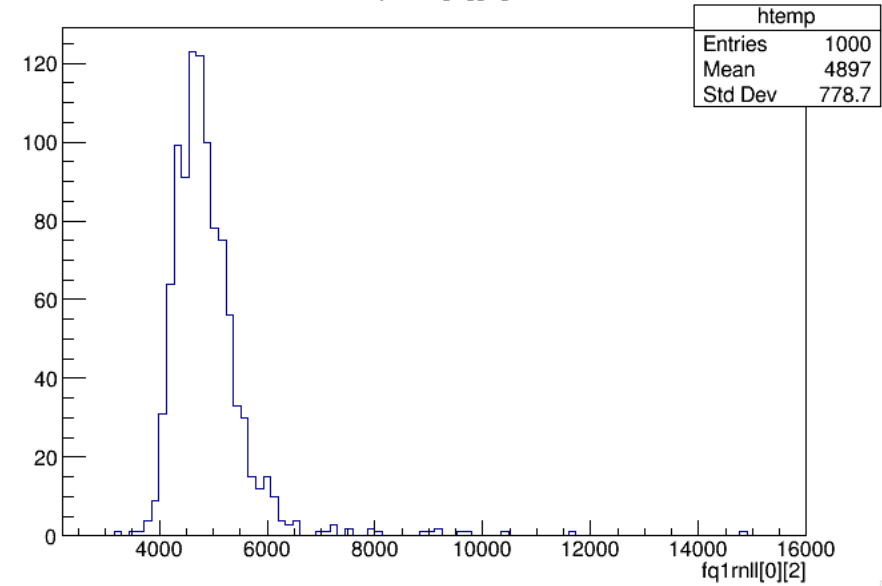
Example event displays

- $-\log L = 4139$
 - Reconstructed exit point seems to be too high



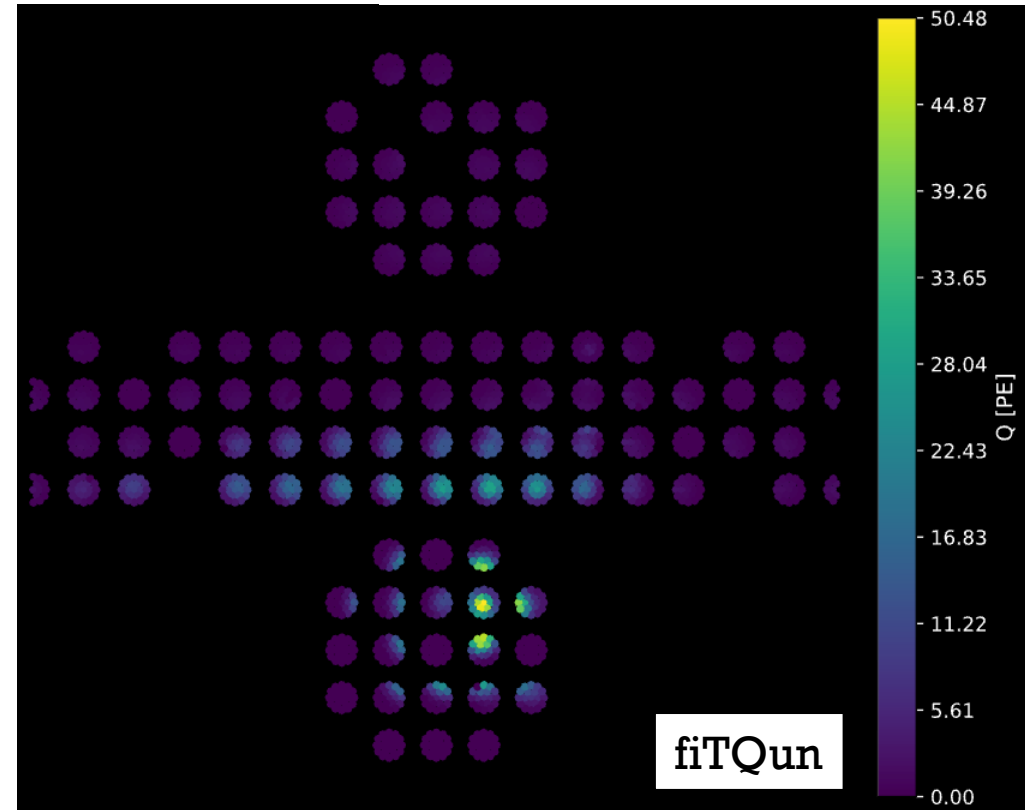
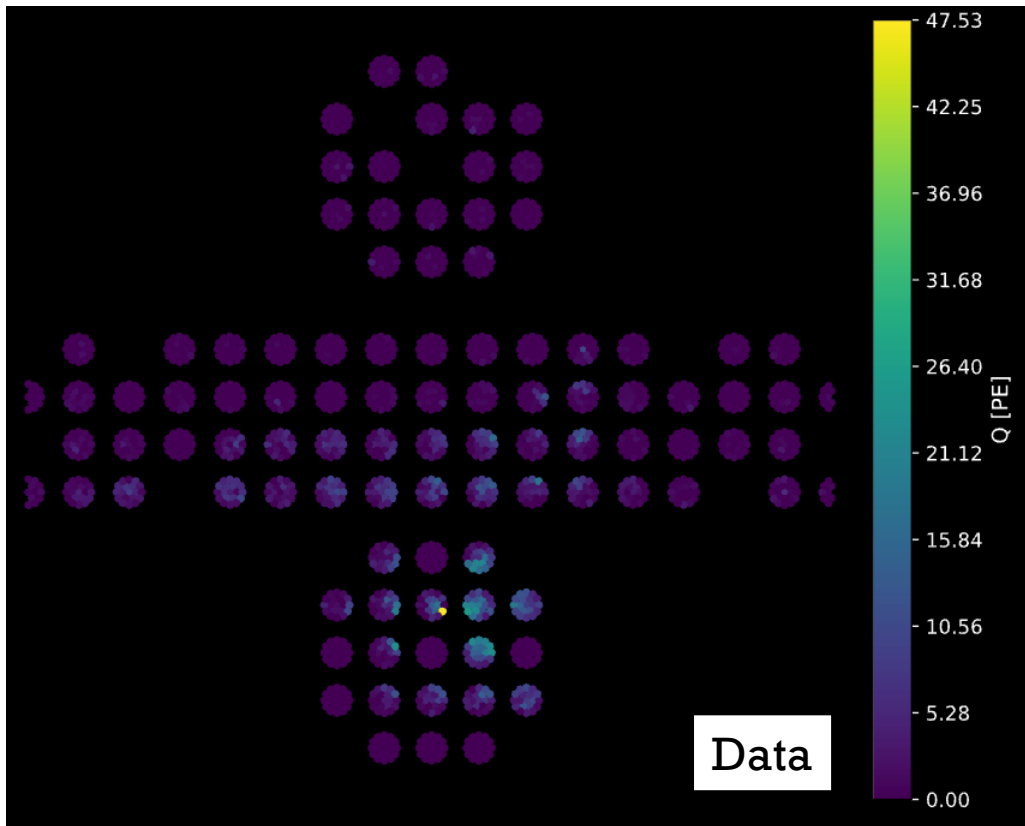
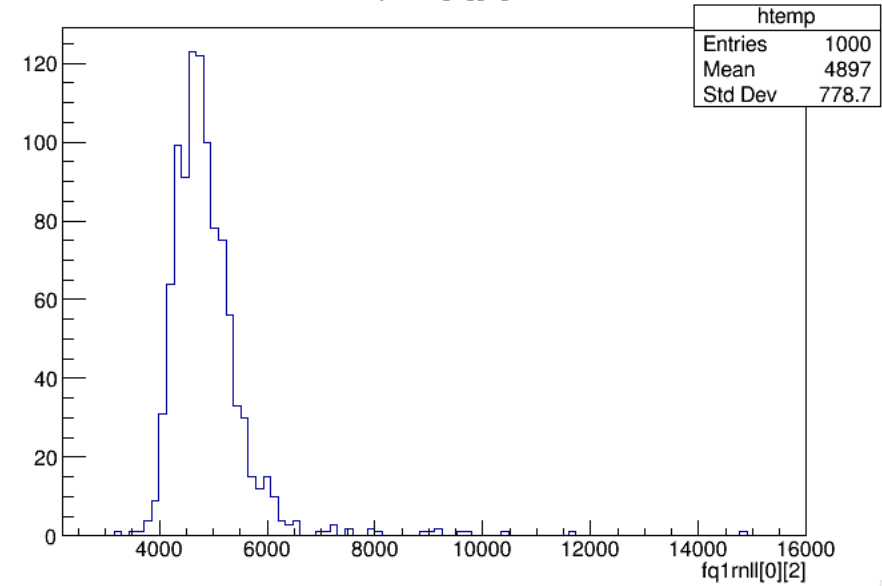
Example event displays

- $-\log L = 5190$
 - Exit point looks off by a few mPMTs



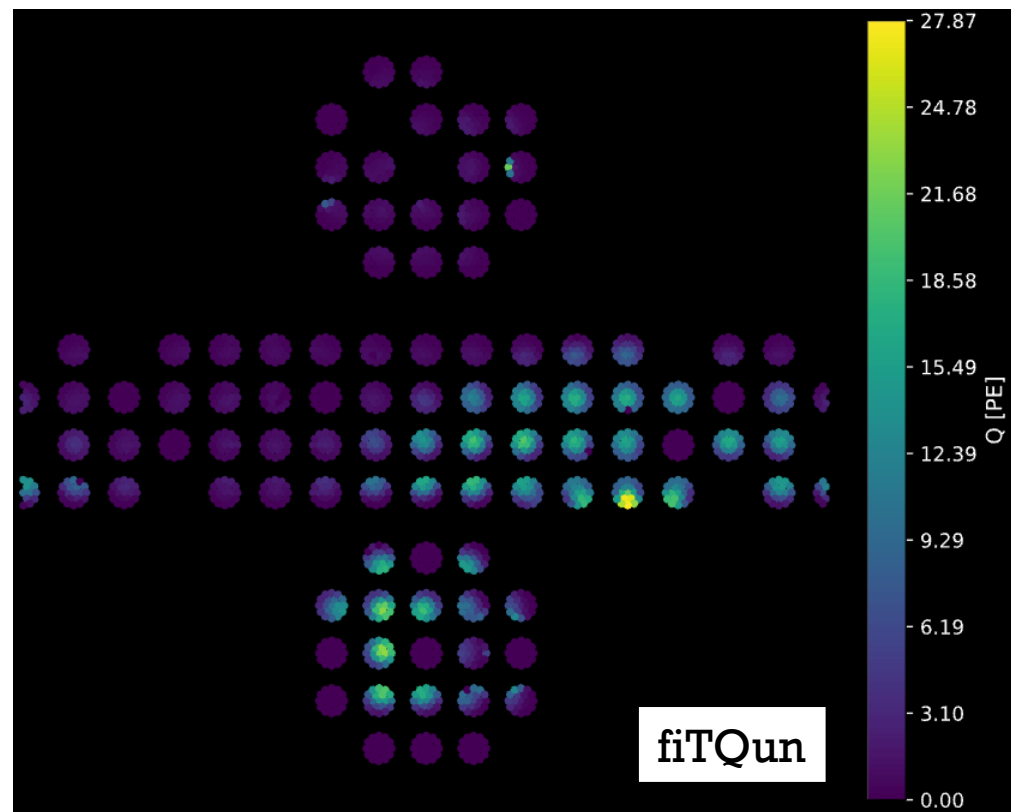
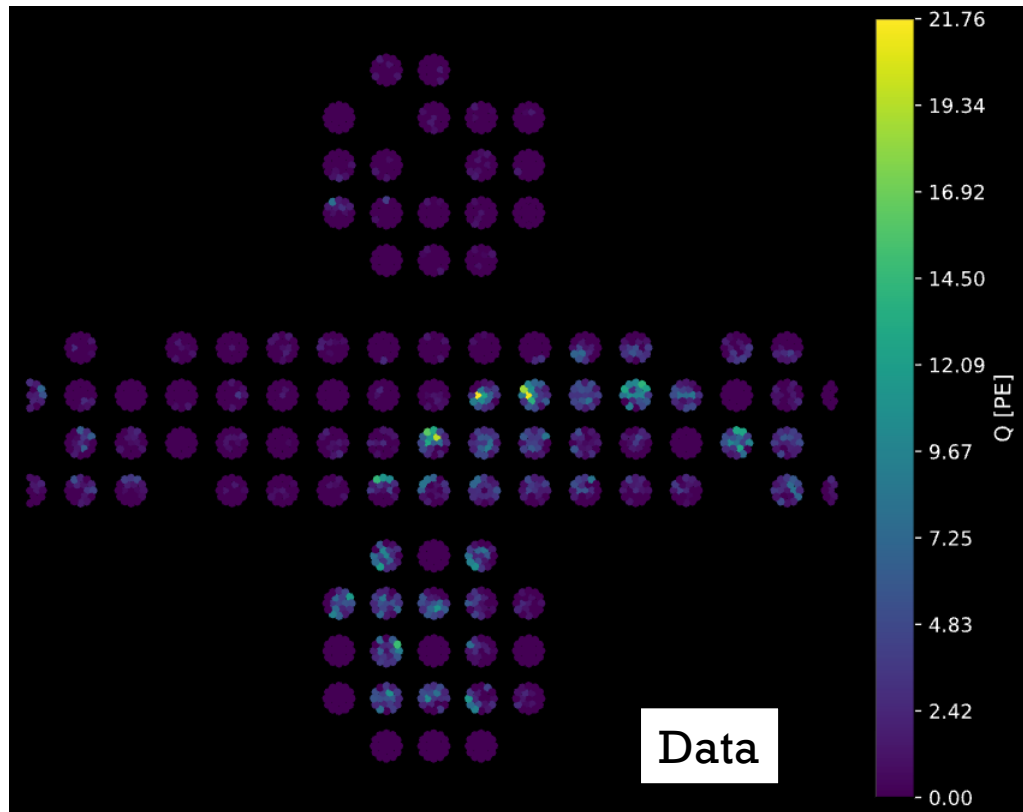
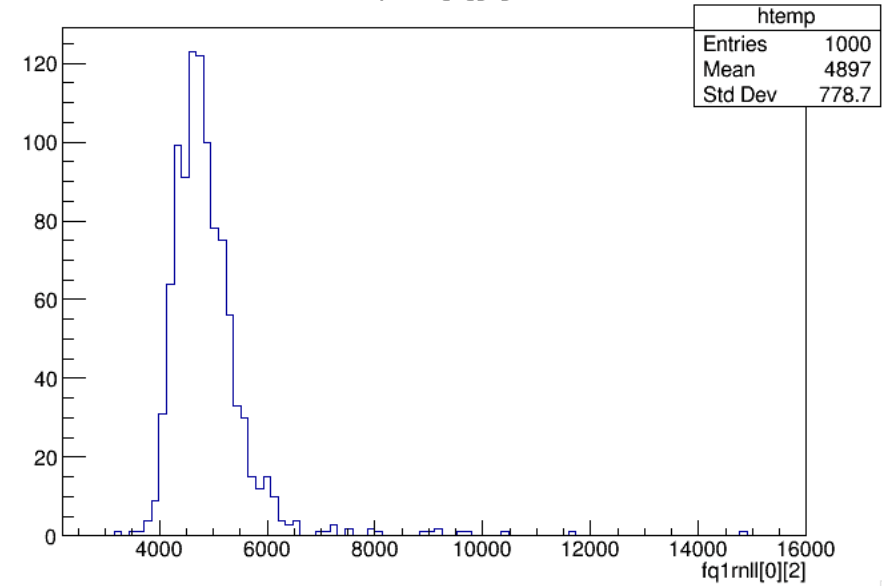
Example event displays

- $-\log L = 4149$
 - Looks quite close (maybe off by 1 mPMT)



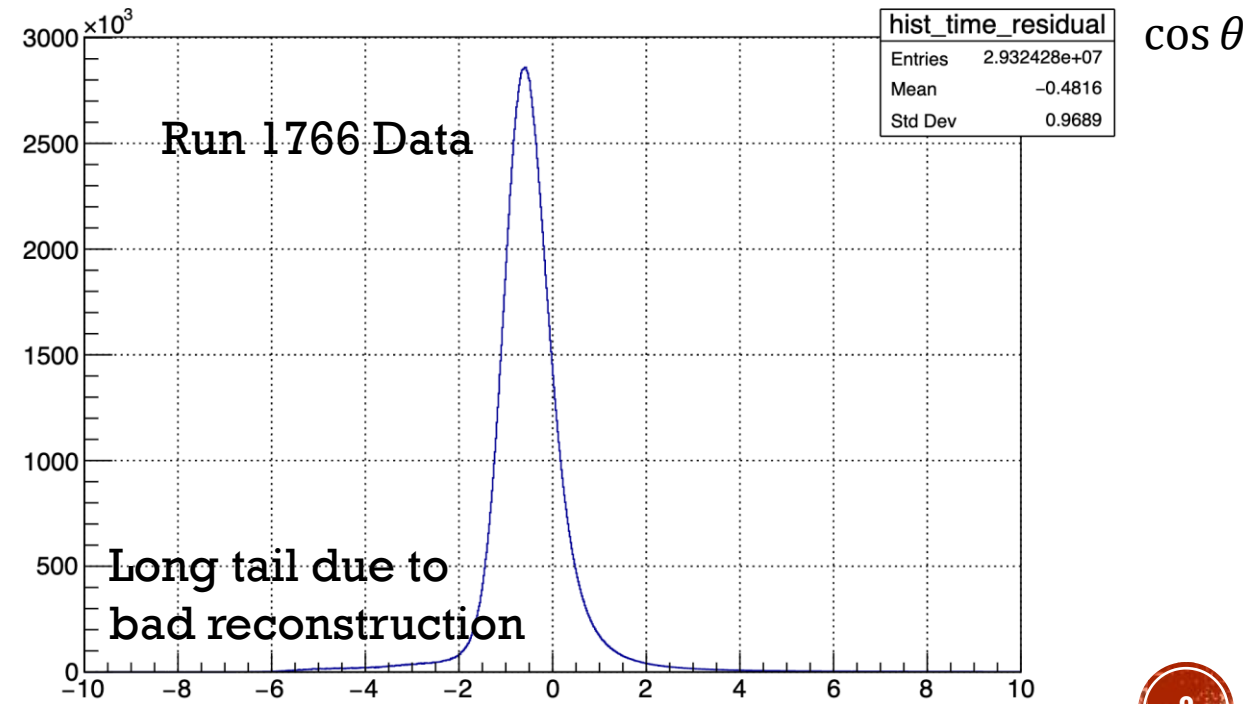
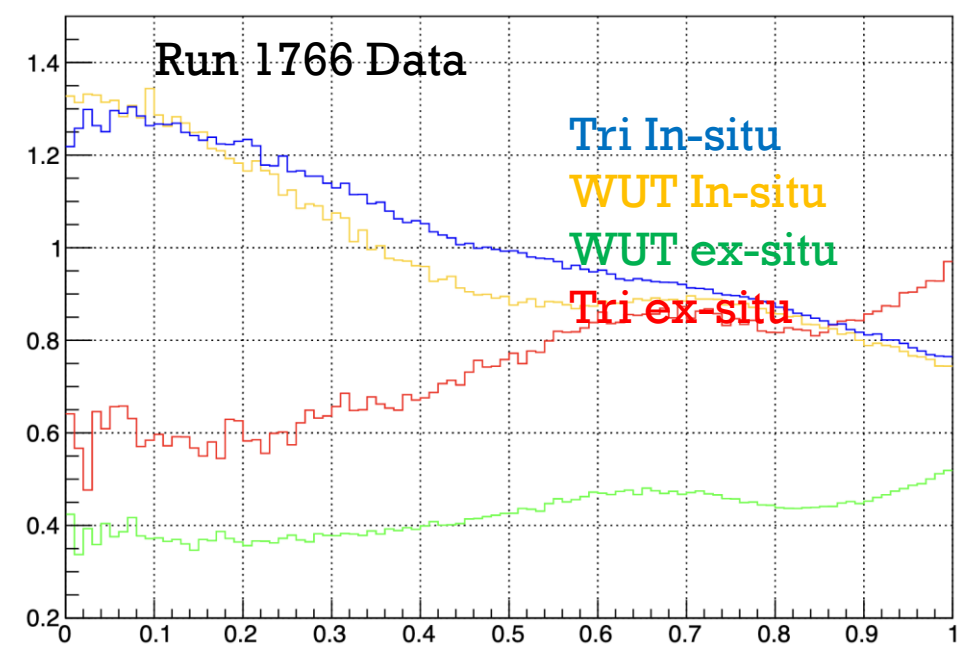
Example event displays

- $-\log L = 3925$
 - Missing hits at ring center due to waveform corruption?



Future actions

- Scale down fiTQun prediction with preliminary calibration results
- Properly define goodness criteria
 - $-\log L$
 - Compare highest charge mPMT
 - Look for suspiciously missing hits
 - Time-of-flight subtracted hit time



$$t_{res} = t_{PMT} - t_{entrance} - \left| \vec{x}_p - \vec{x}_{entrance} \right| / c - \left| \vec{x}_{PMT} - \vec{x}_p \right| \cdot n / c$$