First look at Cosmic runs

For a Xenon attenuation study

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Study purpose

- Previous study done by Bryan Ramson on pure LAr
- Has been extended to Nitrogen runs and will be performed on Xenon runs
- Look into Rayleigh scattering length of Ar, Xe
  - Insight into uniformity in presence of Xenon
  - Will inform choice to add Xenon to DUNE Far Detector modules
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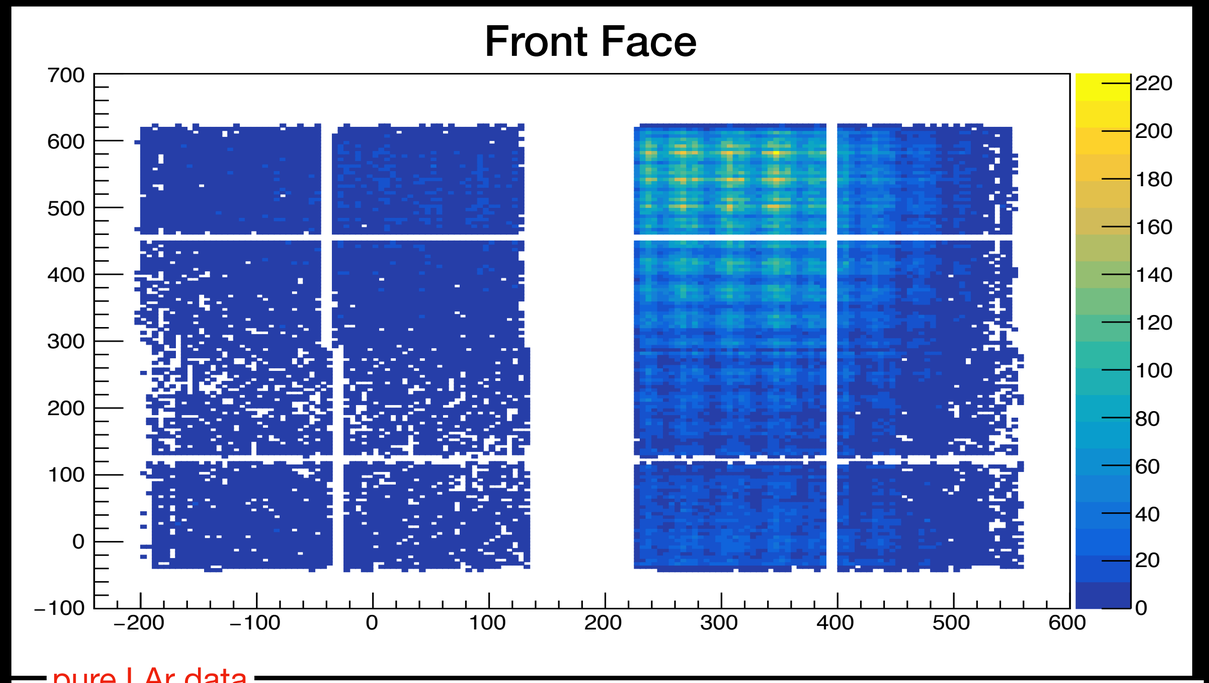
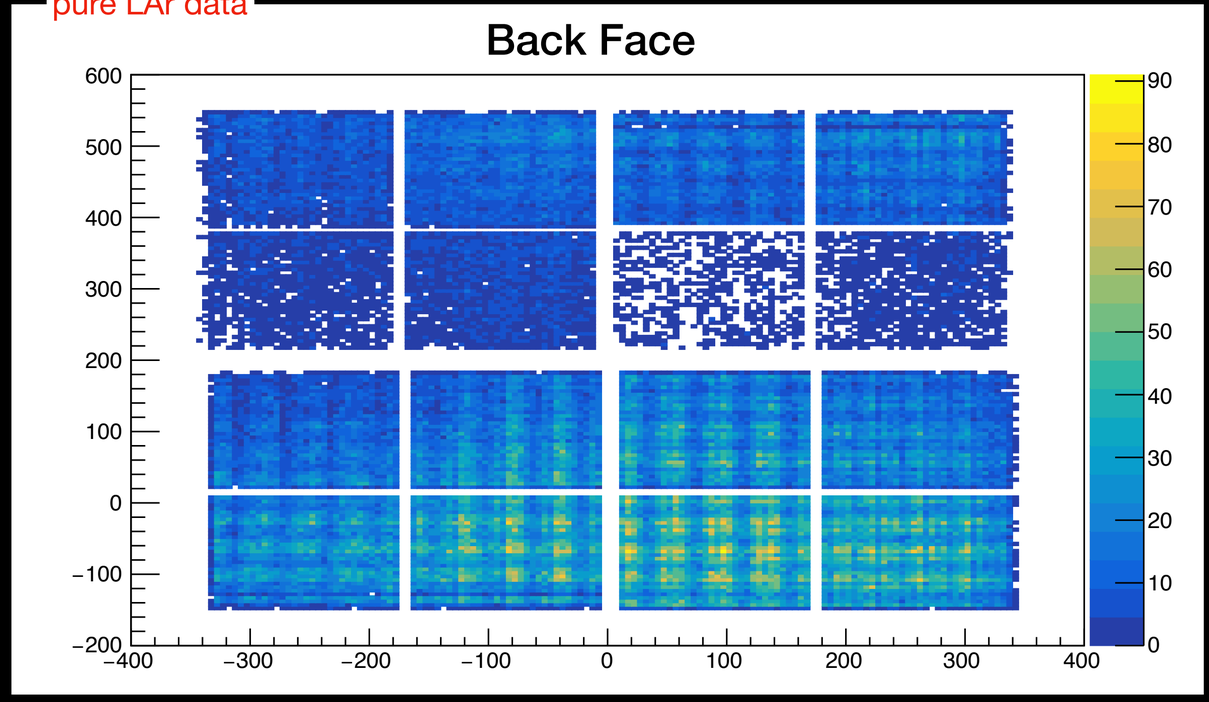
Special data runs

- Layout of incident cosmics from pure LAr runs (post selection)
- Can be seen that most tracks are:
  - Non-beam side
  - Not traveling near-horizontally
  - Far (relatively) from PDS
- Plan to take general cosmic runs
- Also take specific CRT runs
  - Triggering on selected CRT pixel pairs



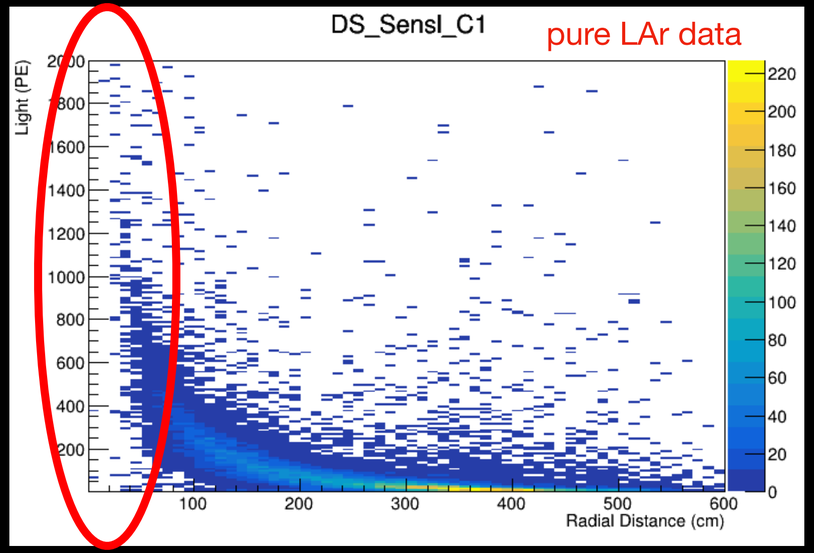
pure LAr data



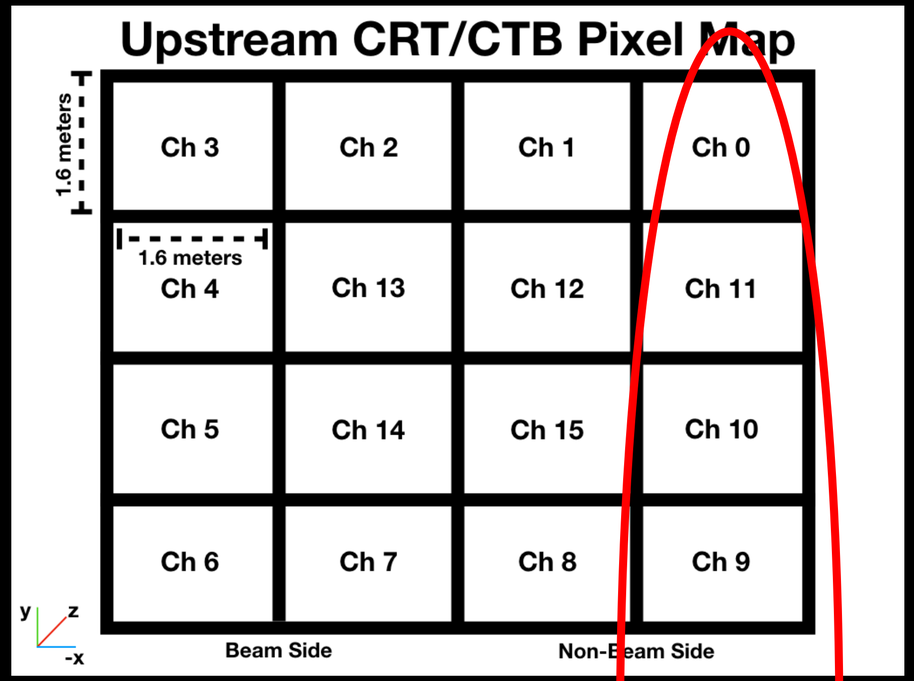
Special data runs

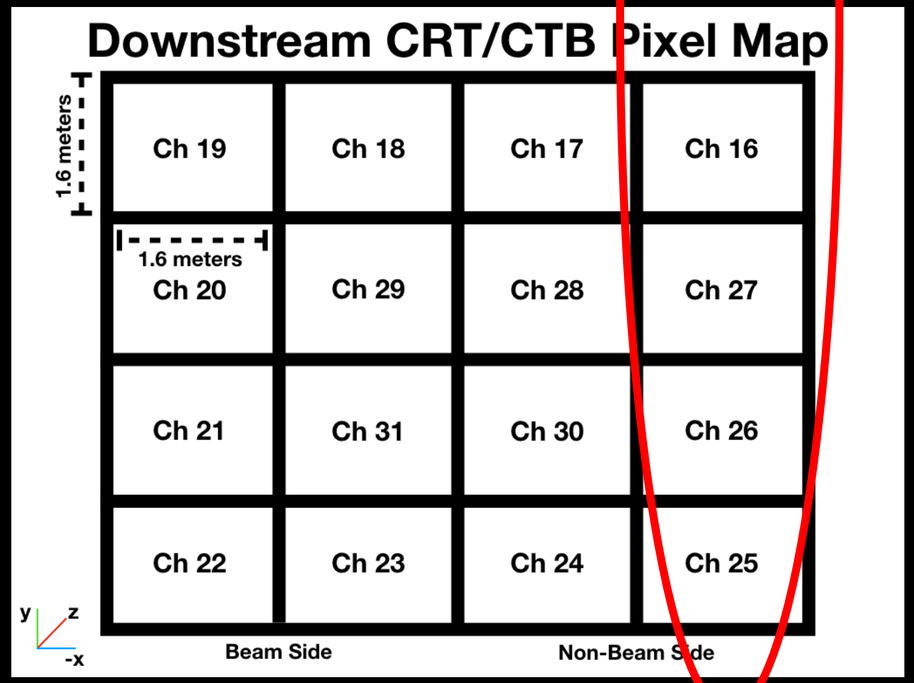
- Pick pairs of CRT Pixels to trigger on
- Pre-select tracks traveling nearly horizontally near the PDS system

Inform this region



see here



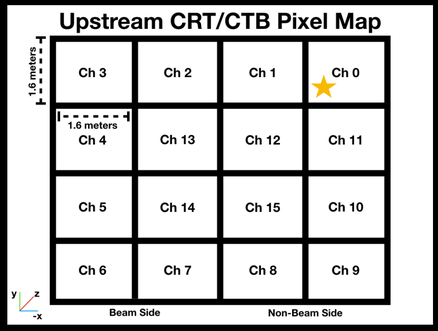


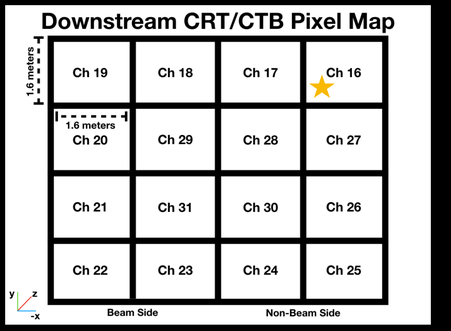
Looking at CRT hits for Pair Triggers

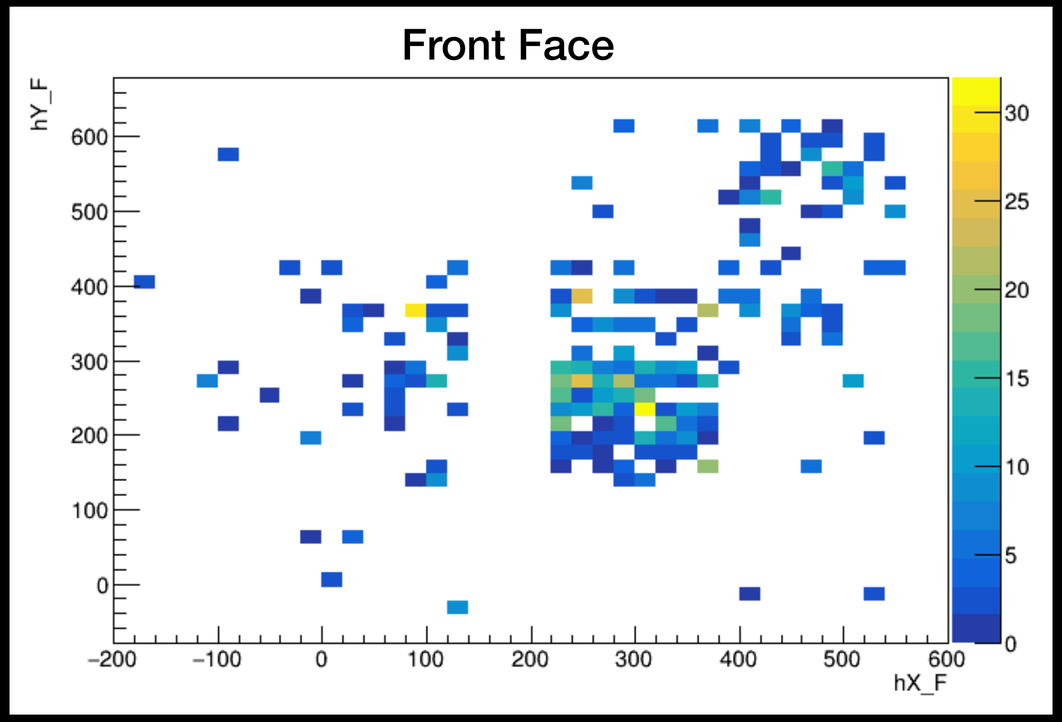
- Will show CRT hits for triggers in 5 configurations
- First pass of runs were all ~1.5hr
  - Some longer runs have now been taken wit certain configurations
- Presence of CRT noise hits on plots
  - could be ruled out by matching to PDS/TPC
- Get general idea of rate
- Check accuracy of trigger configuration and choice

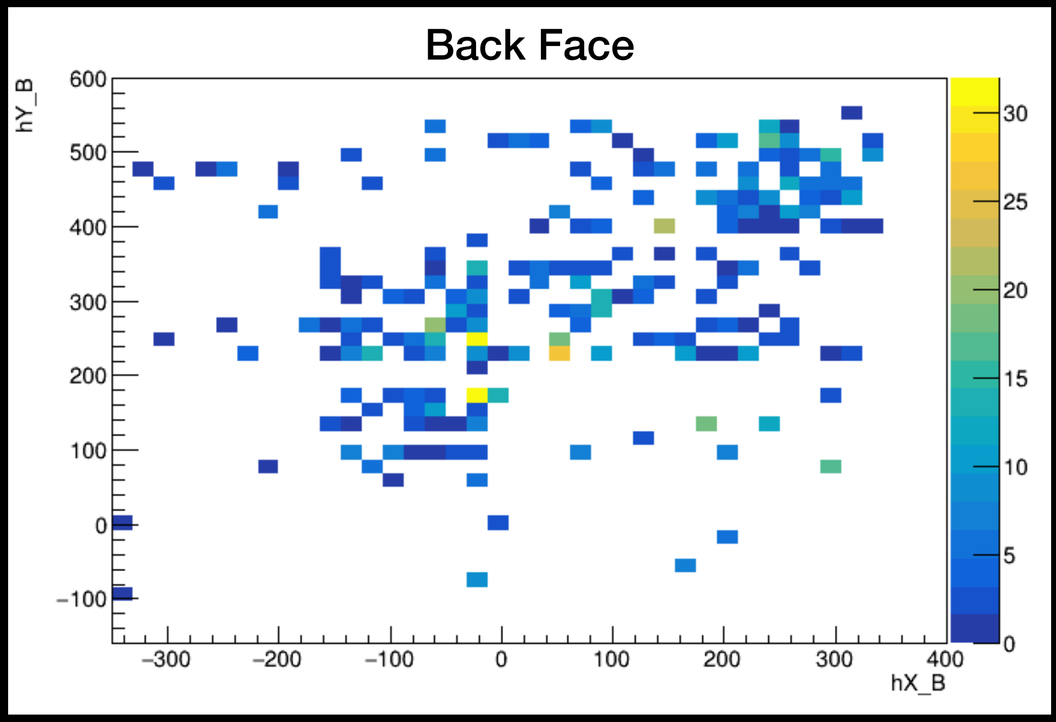
CRT Pair 0,16 ~1.5hr run

Incident CRT hits







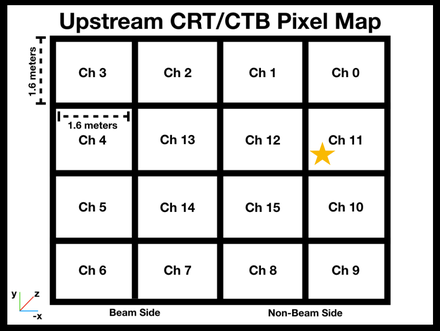


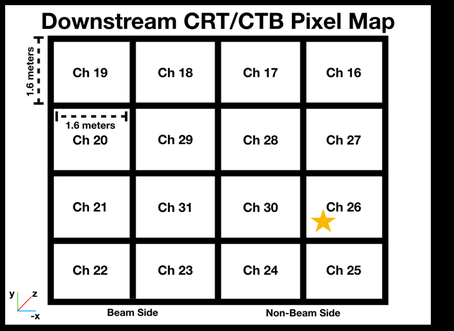
I apologize for the shifting axis ranges - will fix and update plots

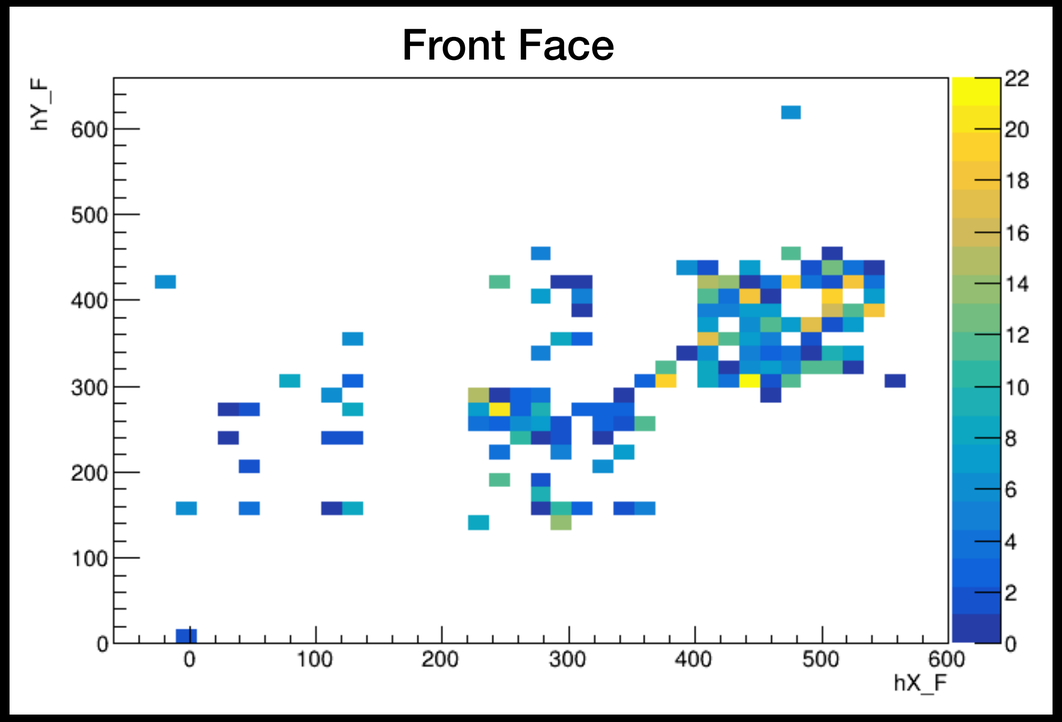
CRT Pair 11,26 ~1.5hr run

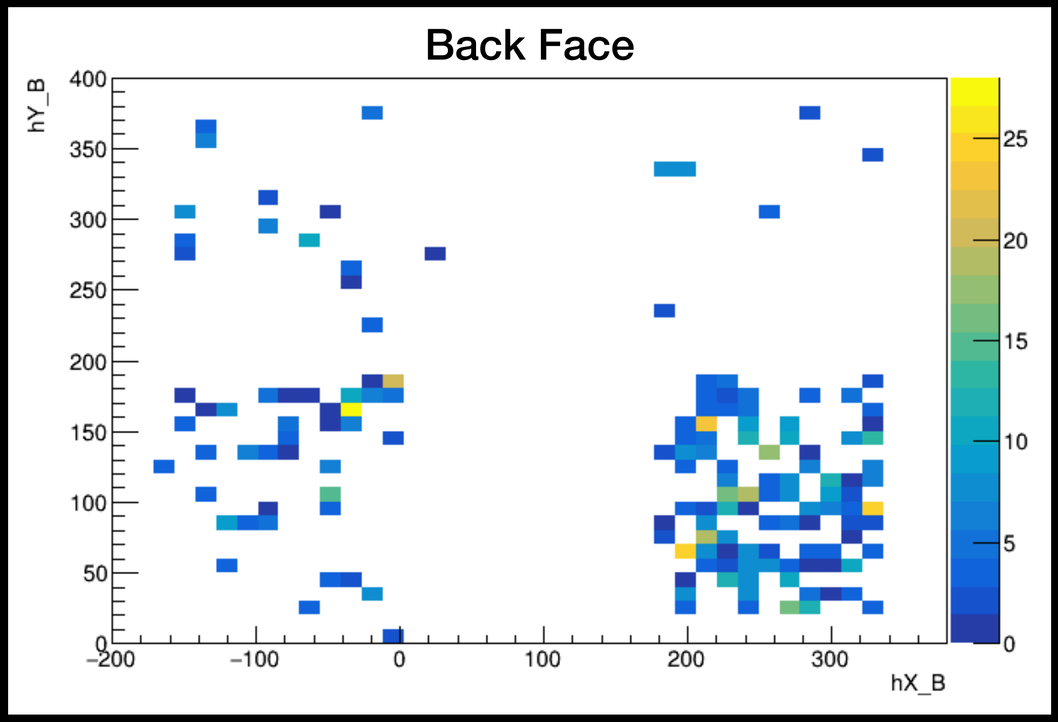
Incident CRT hits

CRT Pixel 27 does not function properly









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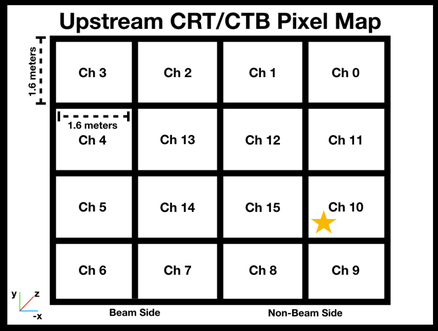
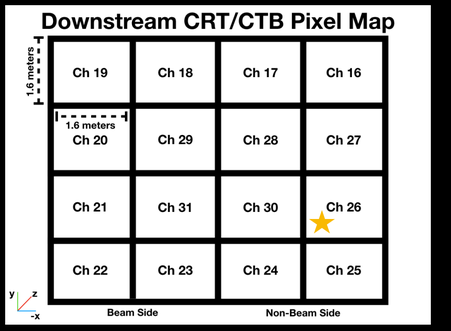
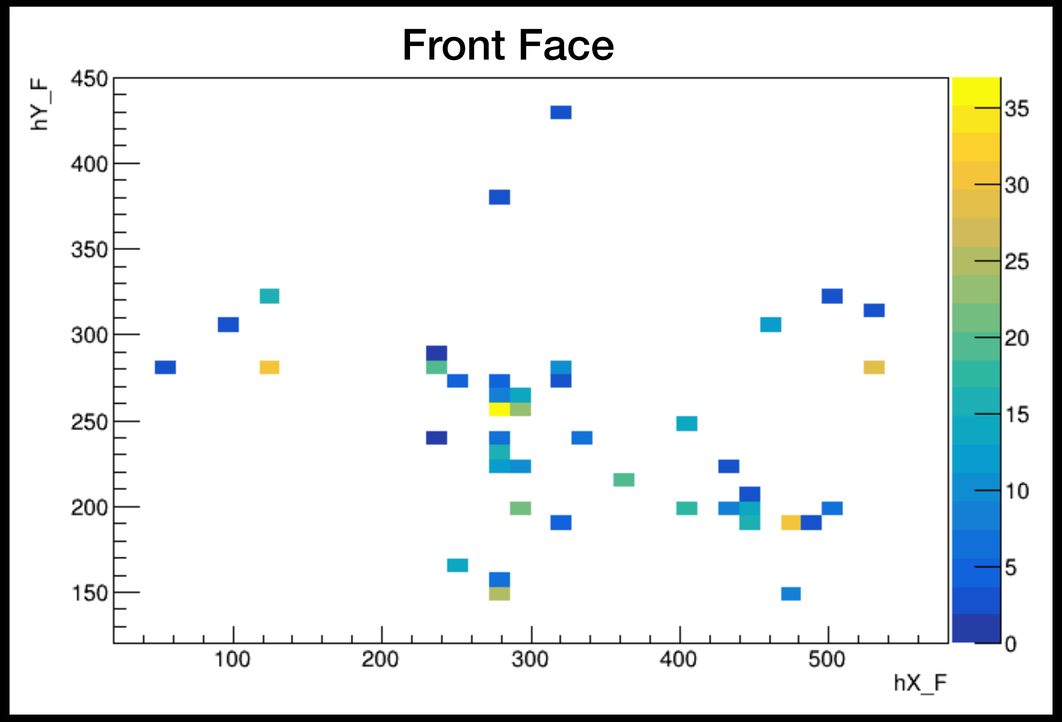
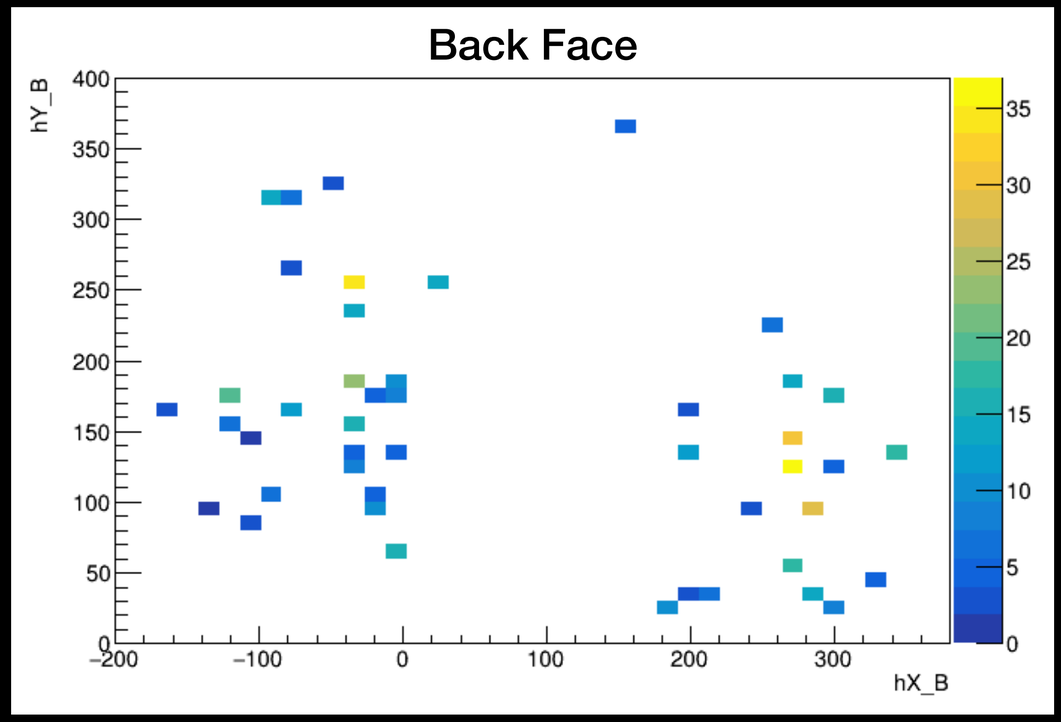
CRT Pair 10,26 ~1.5 hr run

Incident CRT hits









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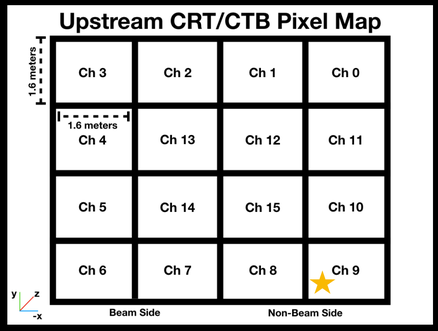
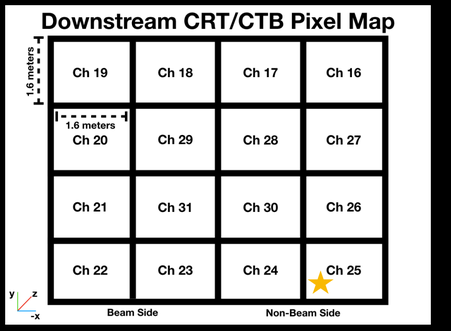
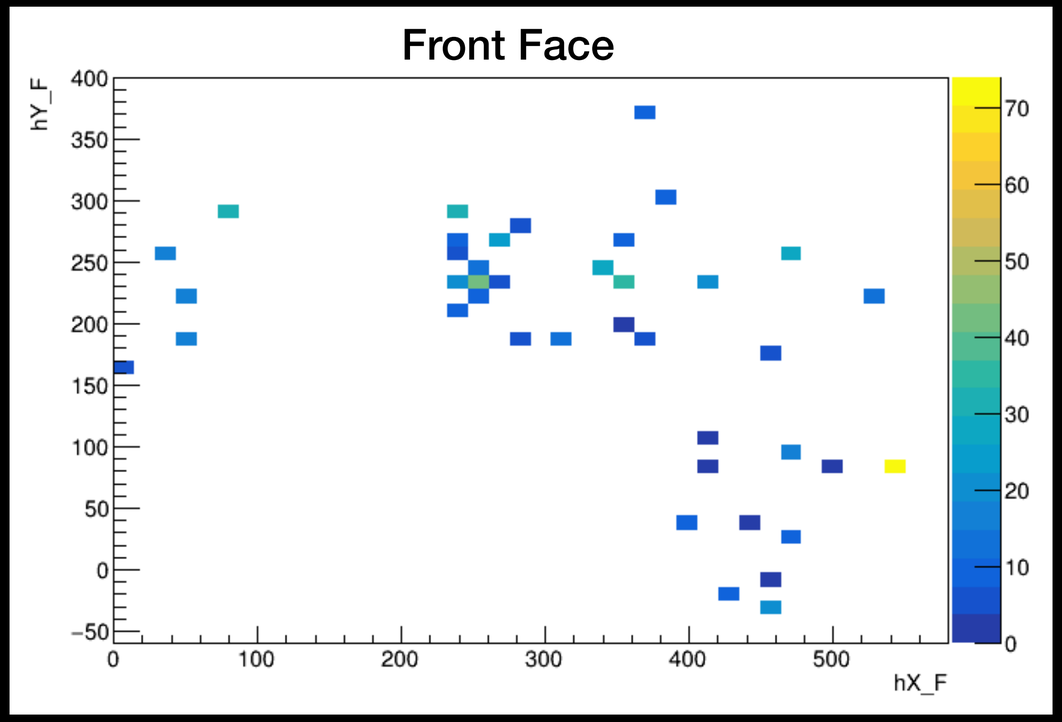
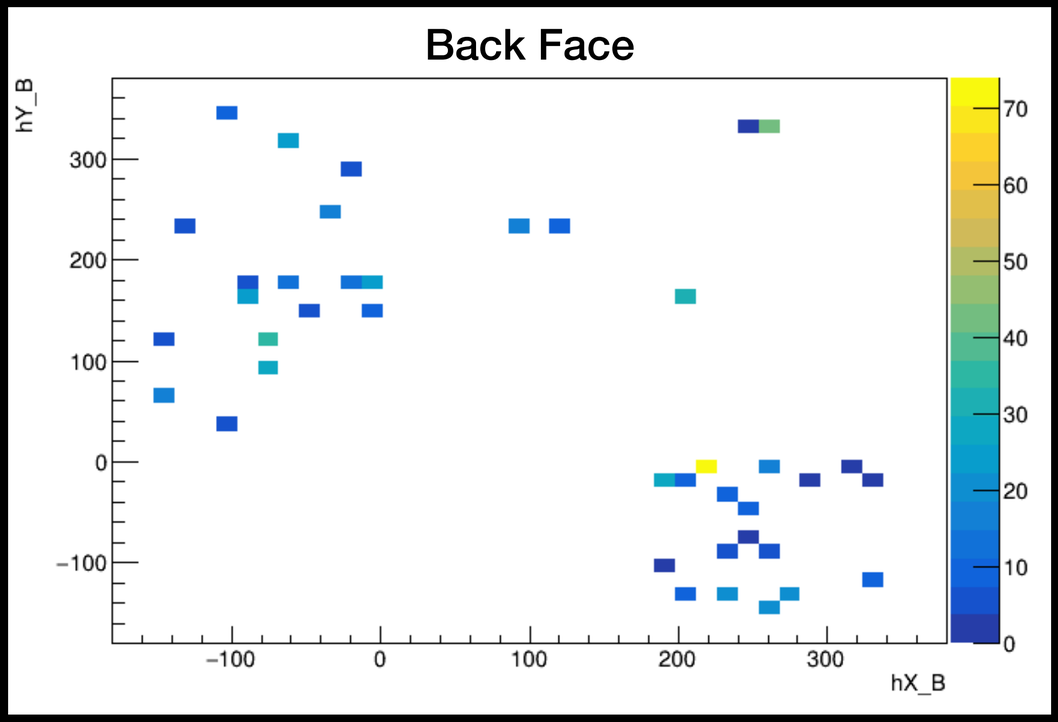
CRT Pair 9,25 ~1.5 hr run

Incident CRT hits









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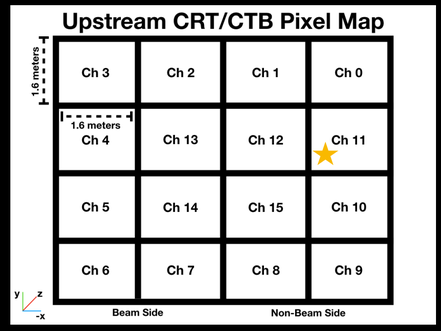
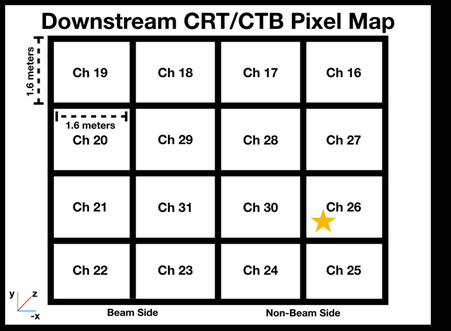
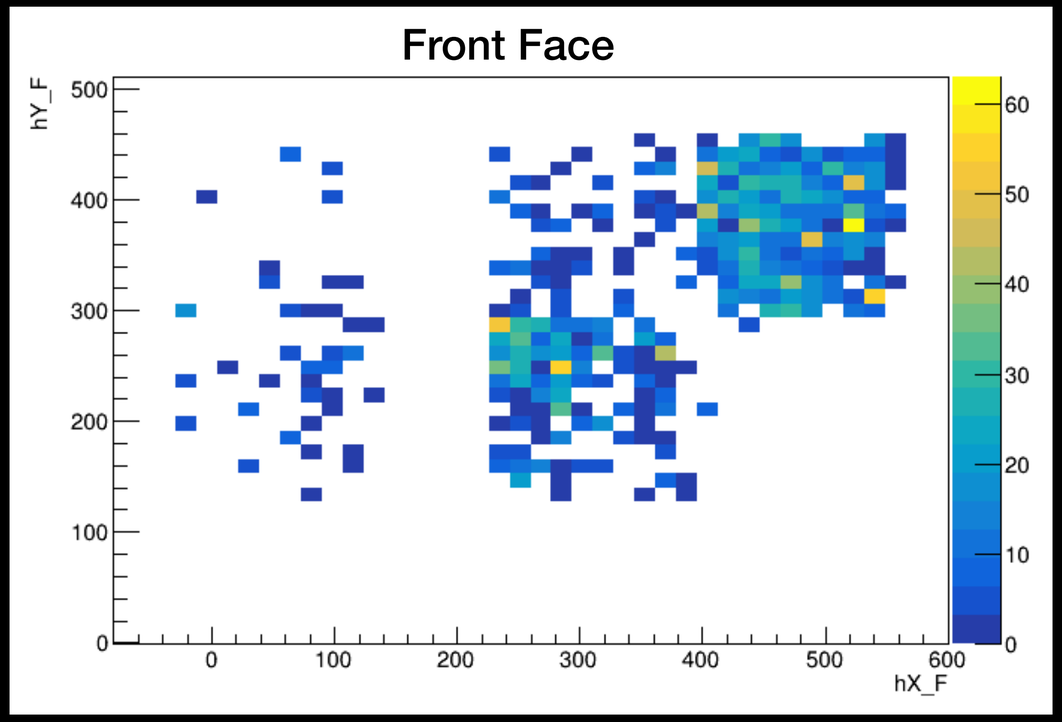
CRT Pair 11,26 ~7hr run

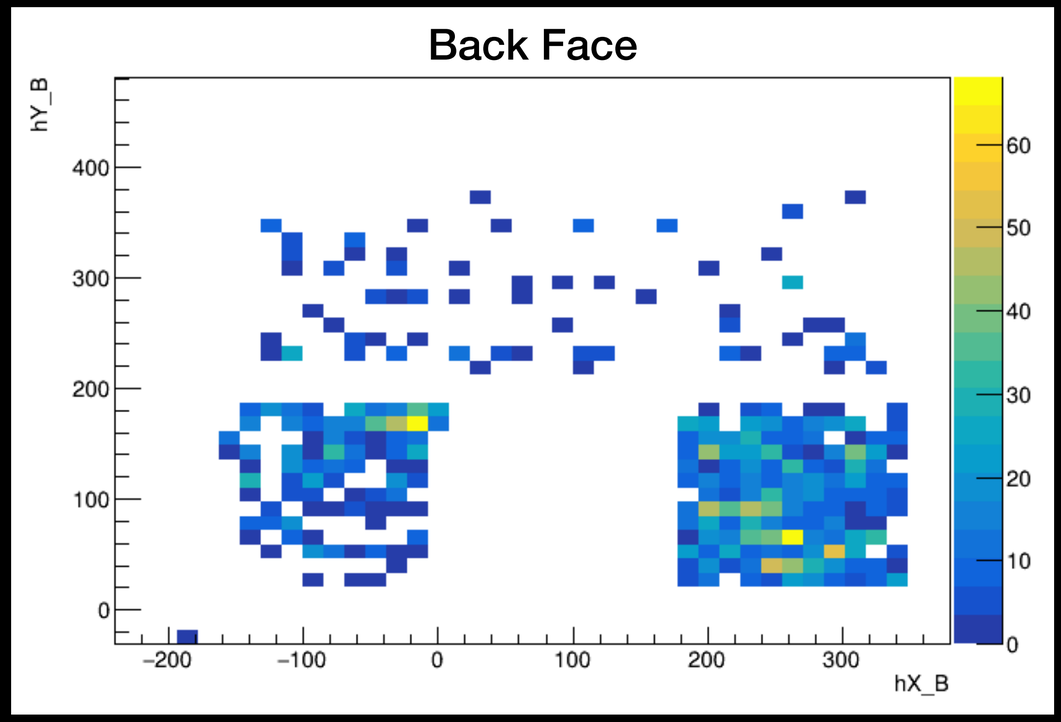
Incident CRT hits

CRT Pixel 27 does not function properly









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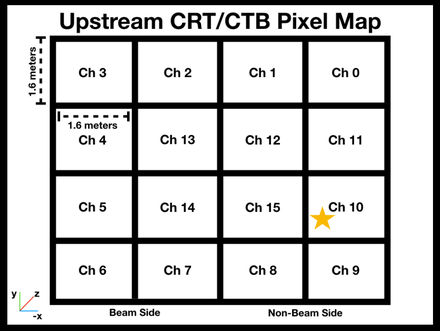
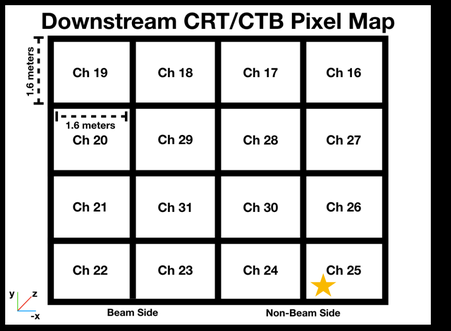
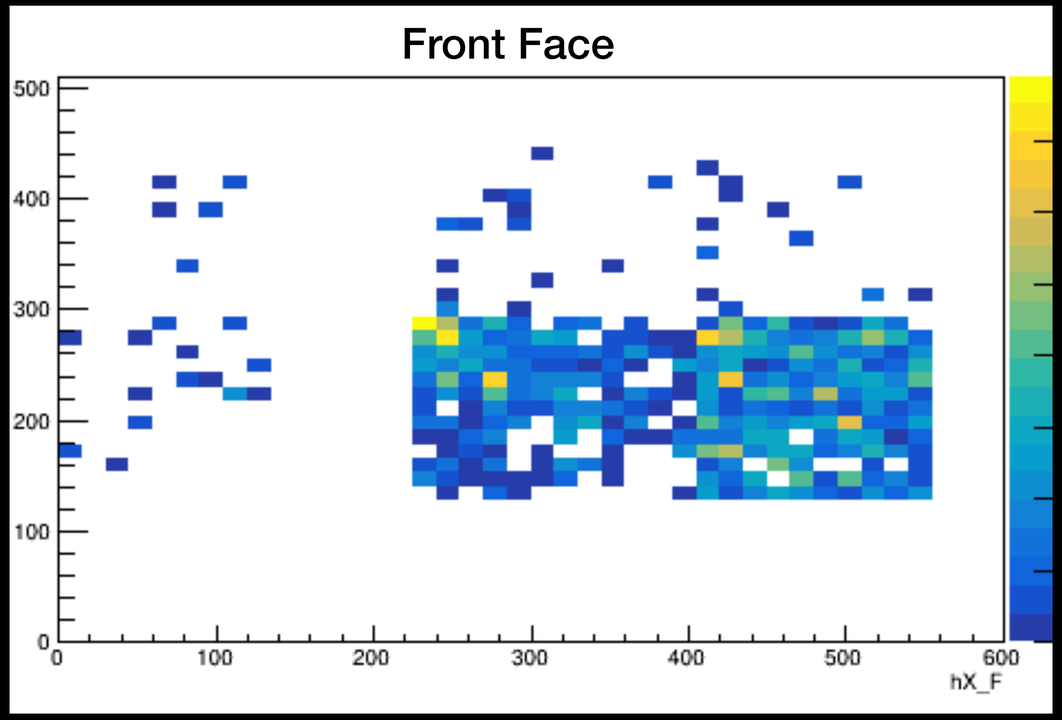
CRT Pair 11,26 ~7hr run

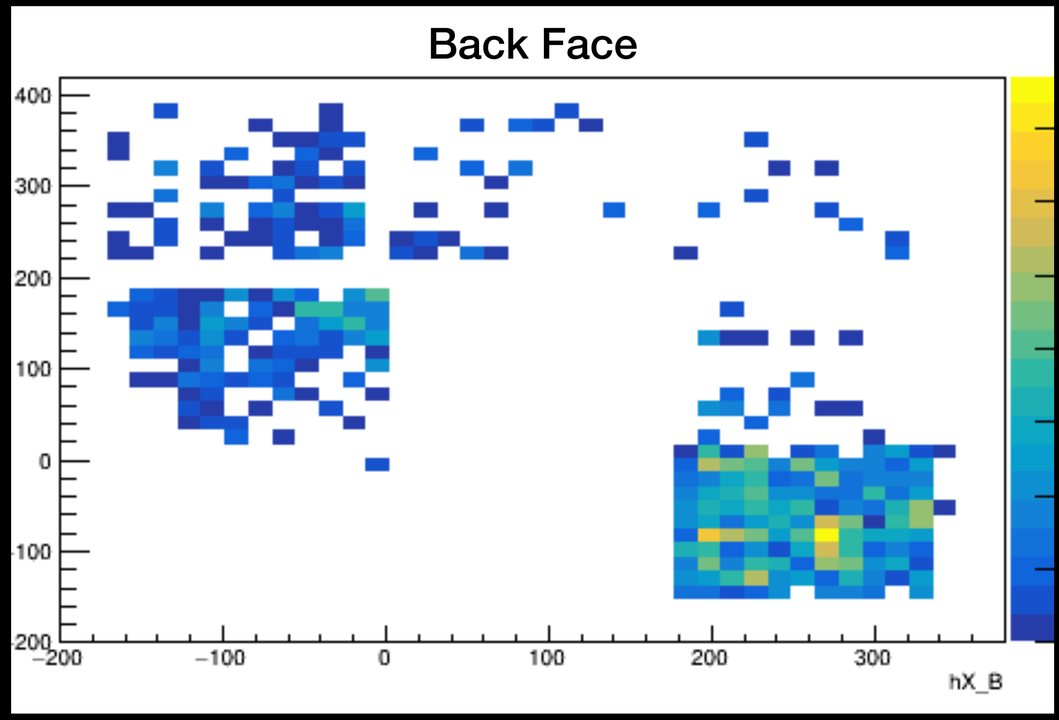
Incident CRT hits

Decided to implement a slightly downward pair for CRT 10,25 based on population of 11,26 pair









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Summary

- First pass over data shows good behavior
  - Trigger rates are workable
  - will collect as much data at time allows at ProtoDUNE
- Big question is still track match rate
  - Waiting on reconstruction of files
- Will probably still need to take general configuration CRT runs still alsO
  - Also waiting on reconstruction to check this data sample