Thoughts and questions on TMS reconstruction/Kalman

UNIVERSITY of ROCHESTER

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DUNE TMS meeting
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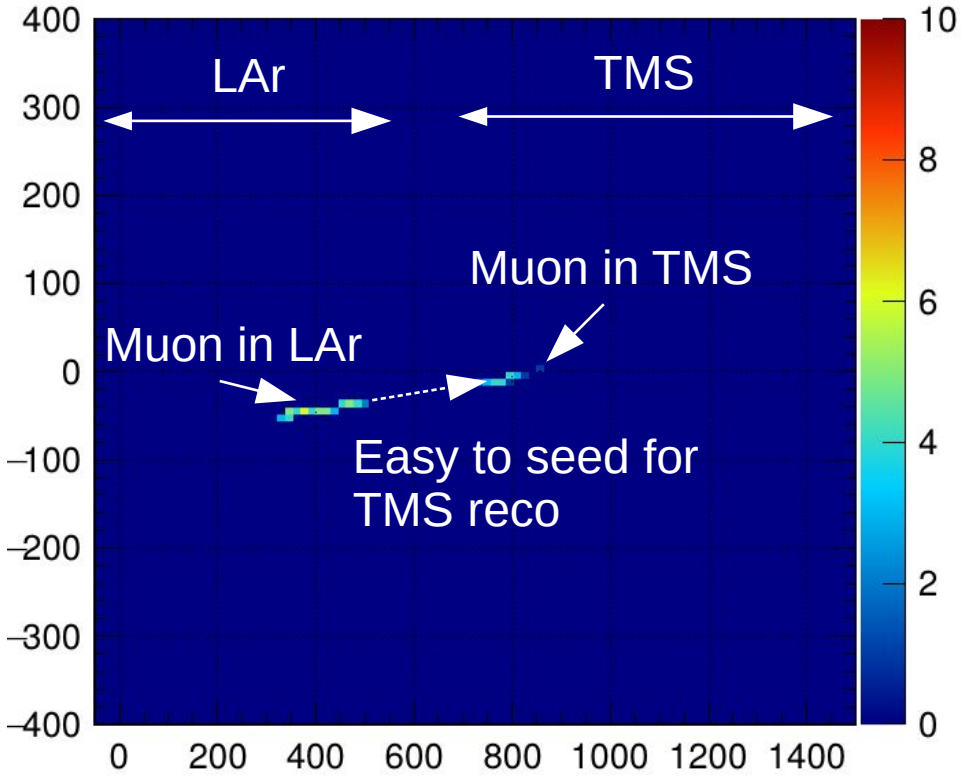
Introduction

- Tasked with developing some sort of track reconstruction for the TMS
  - Simple track algorithm, run a Kalman filter, nothing too fancy
- I have some questions and thoughts on this

Simple tracking

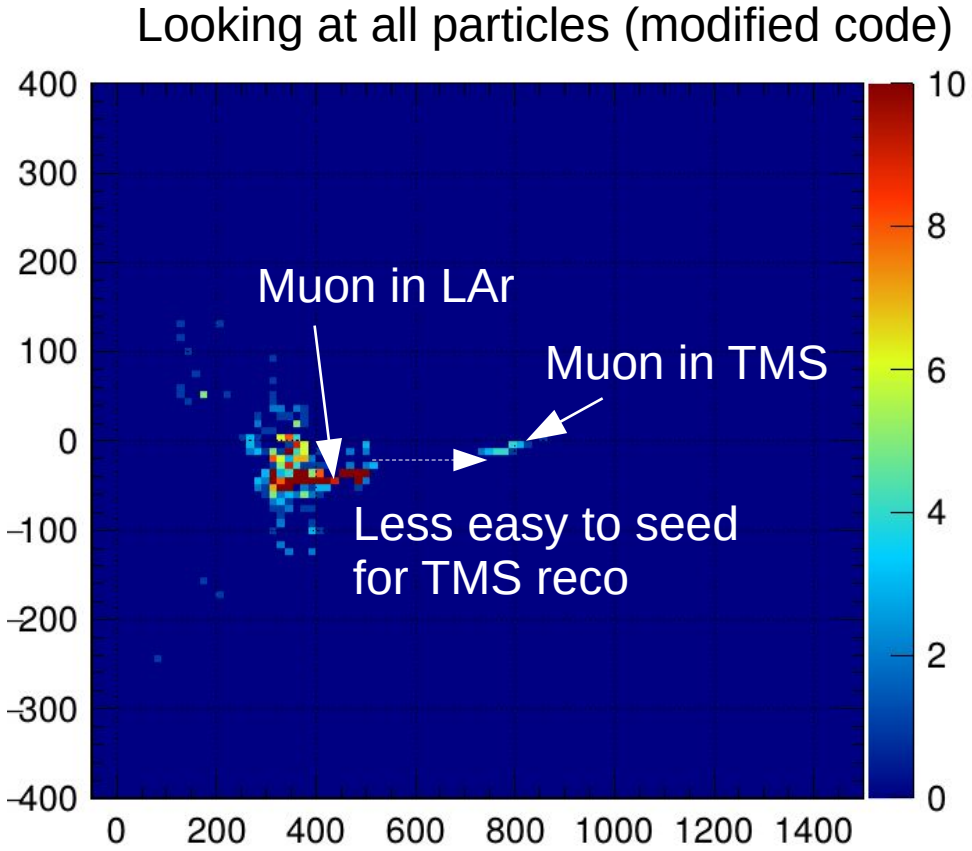
- Gavin's code finds the true muon and looks at its energy deposits in the LAr and TMS

Only looking at the true muon (Gavin's original code)



Simple tracking

- Not realistically what will happen in actual reconstruction
  - May have multiple tracks in the TMS from the LAr interaction
  - May have a poor muon track in the LAr; bad seed for the TMS track



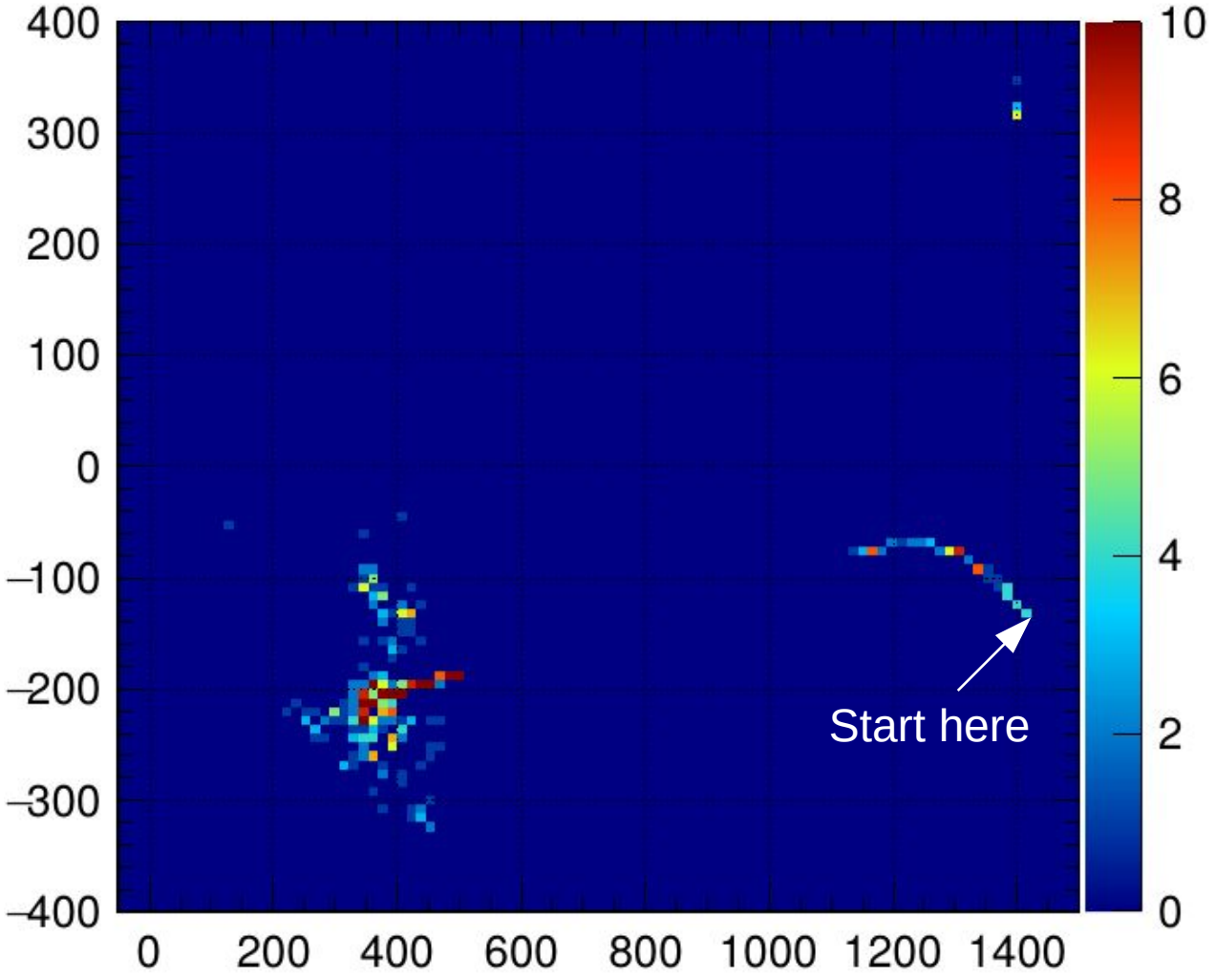
Simple tracking

- But just looking at energy deposits in LAr isn't realistic either
  - There will be some reconstruction in LAr that picks out the muon candidate track: that would be used as the seed for TMS

- What do I do in the meantime?
  - Assuming LAr perfectly finds the muon isn't realistic
  - Assuming LAr only sees energy deposits without particle hypotheses isn't realistic

Simple tracking

- Could use the most downstream energy deposits in the TMS, walk back upstream and project into the LAr



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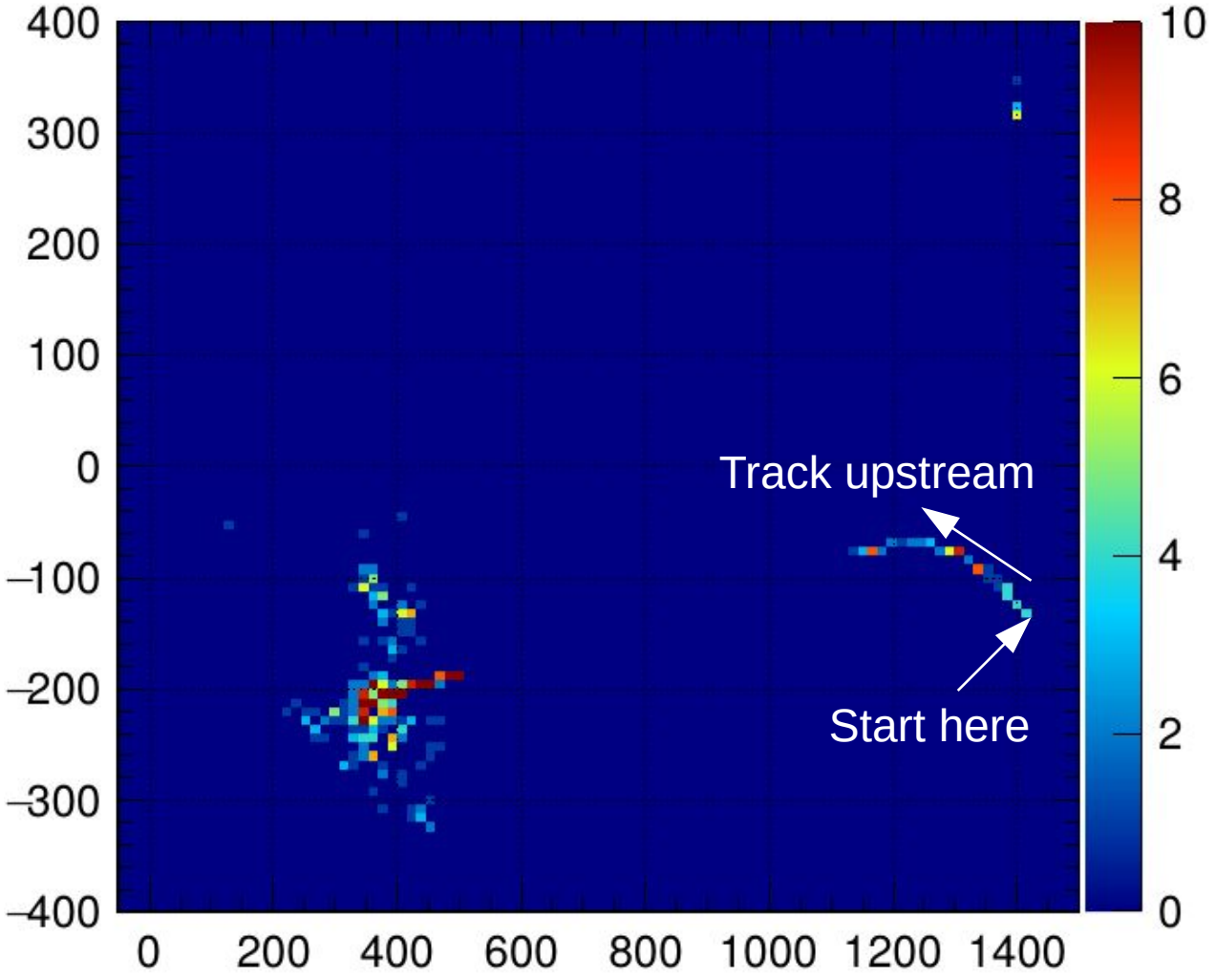

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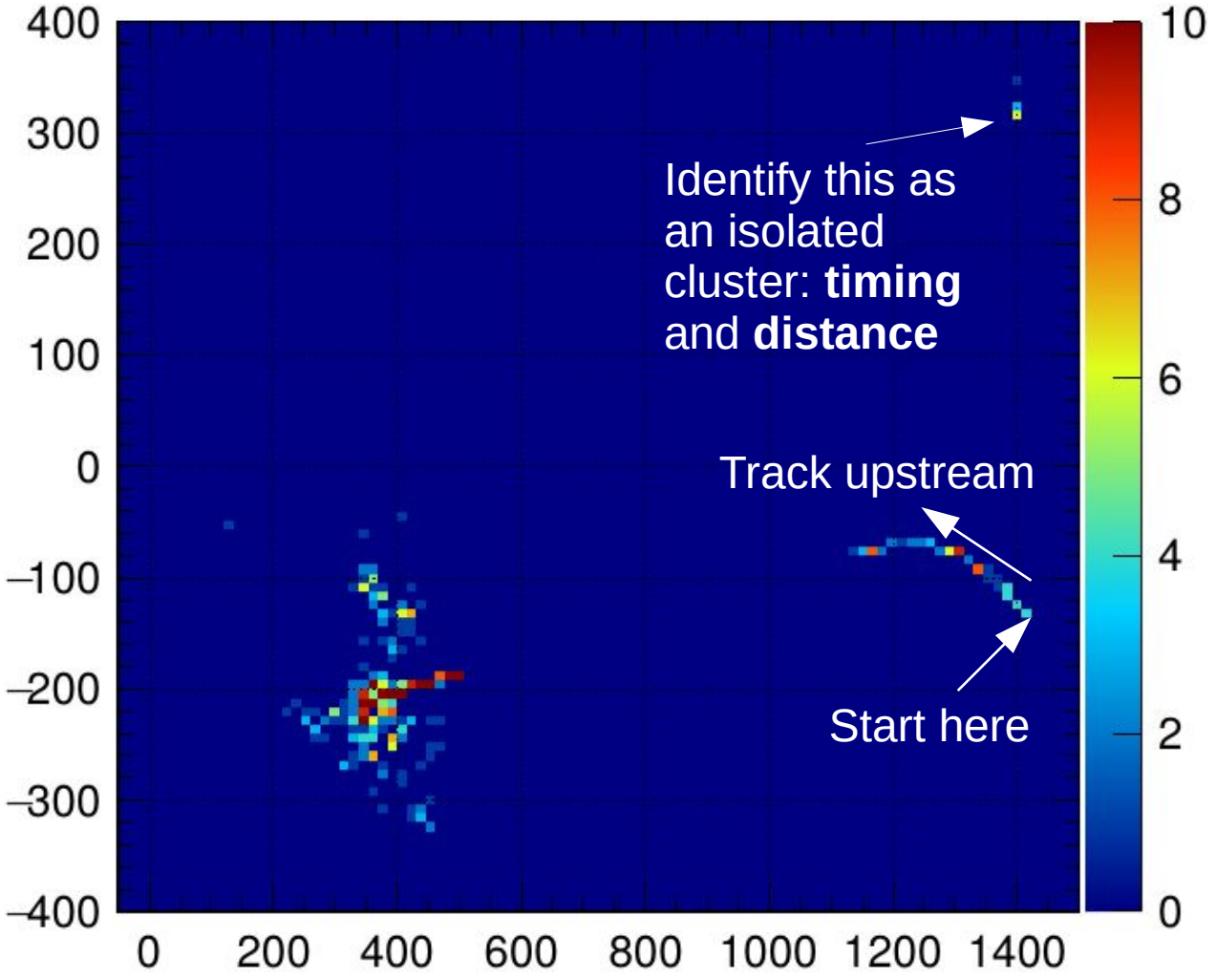

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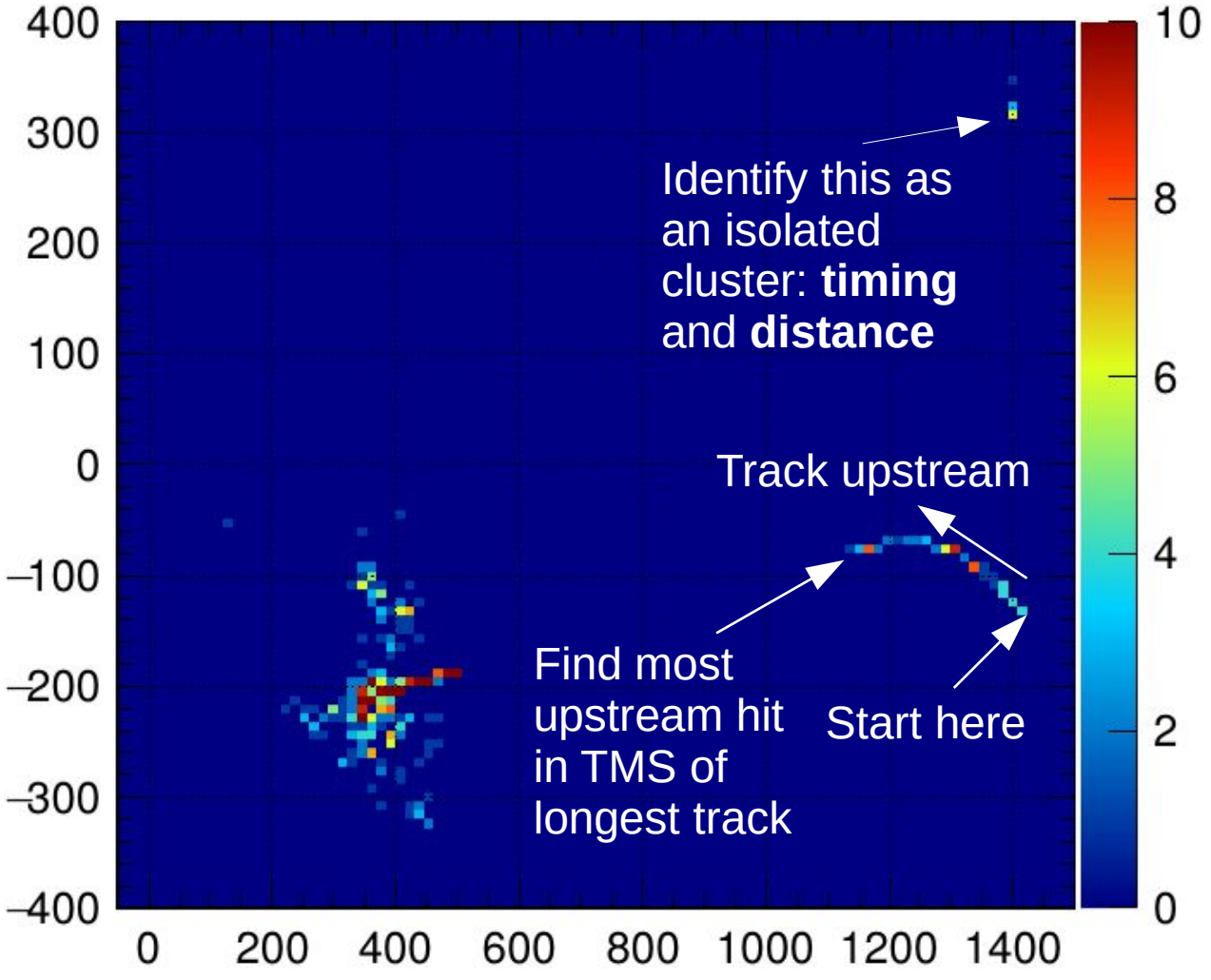

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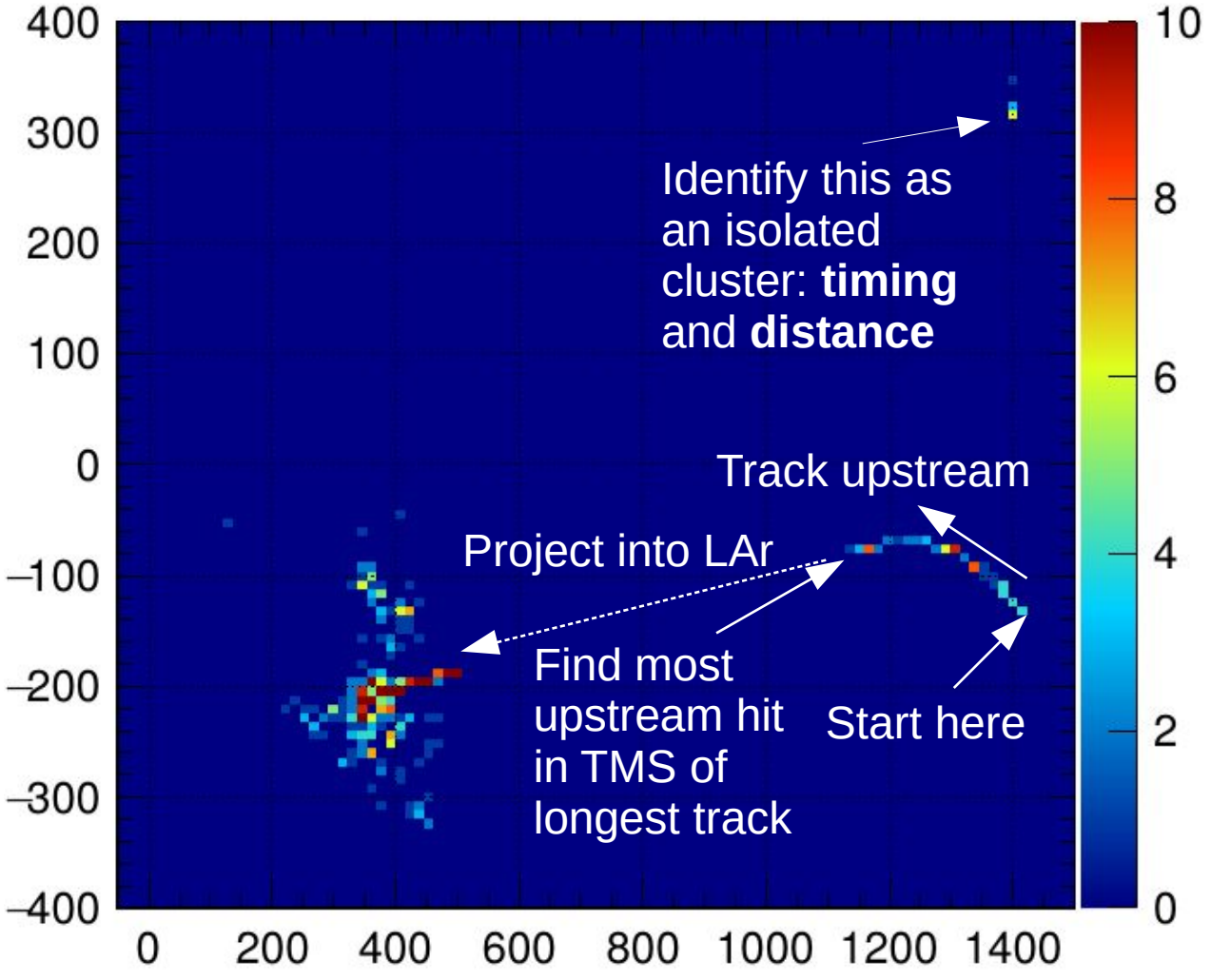

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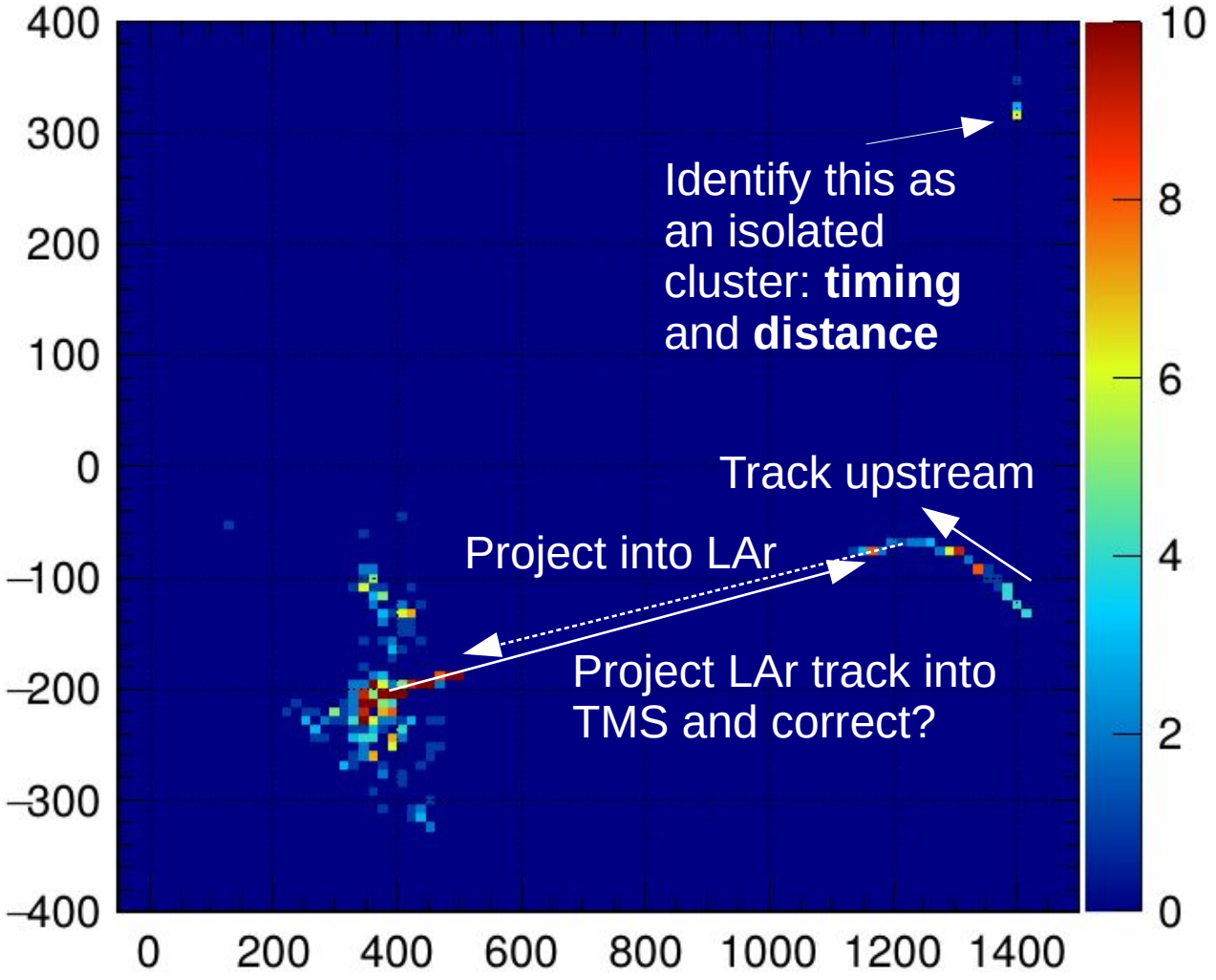


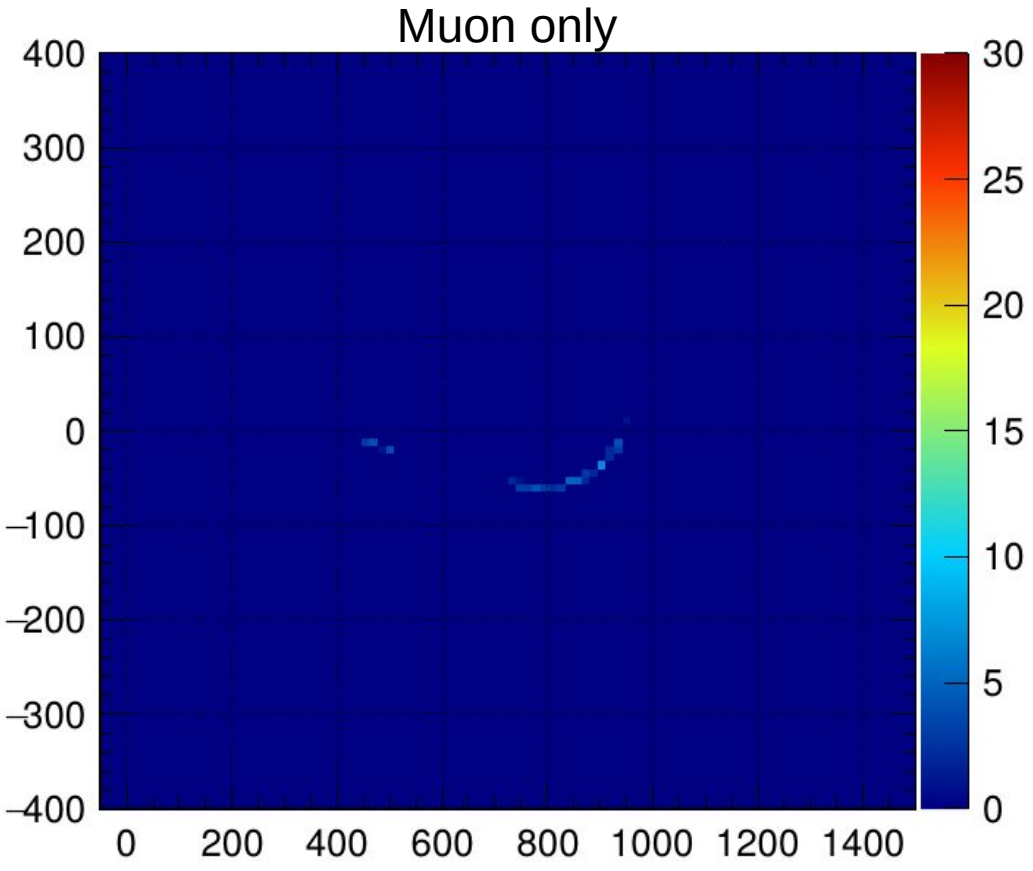
Other questions

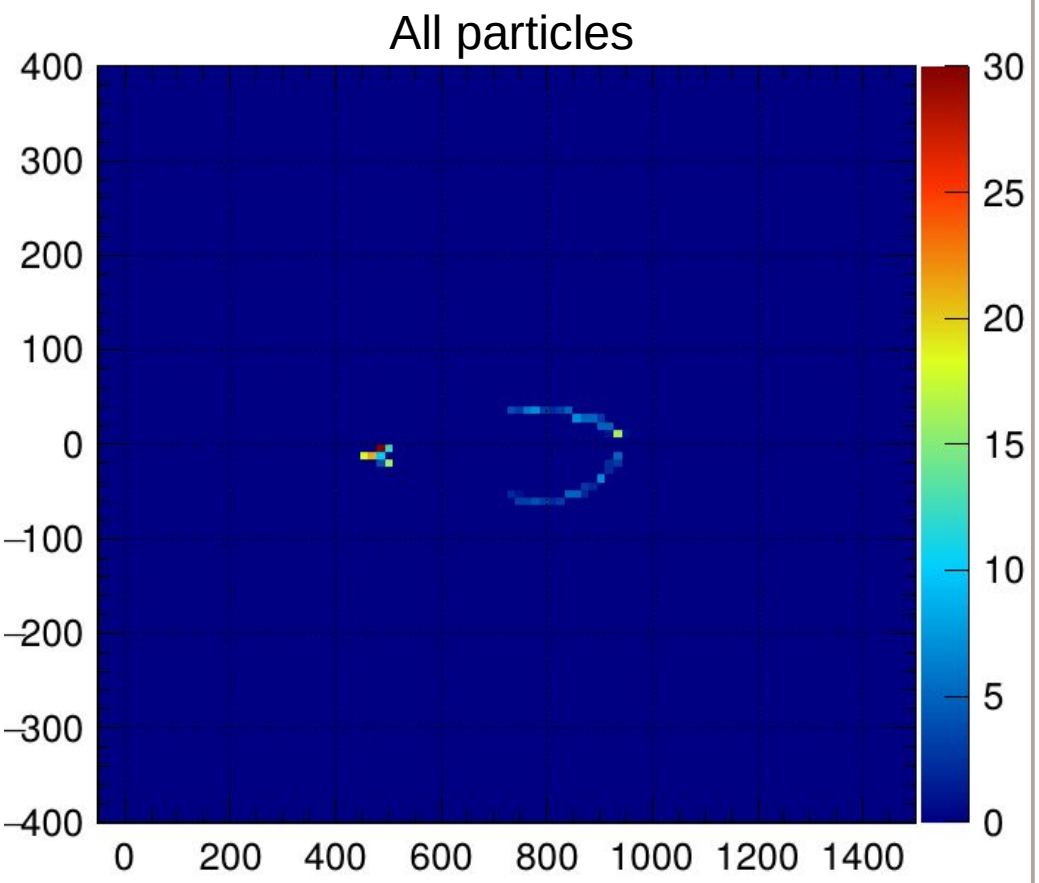
- B-field used for sign-selection currently
- Momentum from track length and energy deposited
- **Include B-field in momentum reconstruction?**
- **B-fields make Kalman filters a little interesting; any historic advice on this?**
  - Have T2K, MINERvA and MINOS documentation/code
  - Have checked with BabyMIND colleagues on T2K

- **Include any type of PID in the TMS?**
  - Vast majority of time, there's only a single track in TMS
  - Sometimes a displaced deposit, sometimes a charged pion
  - Protons/pi^0 will be most stubs/showers
  - See backups for examples

Other questions

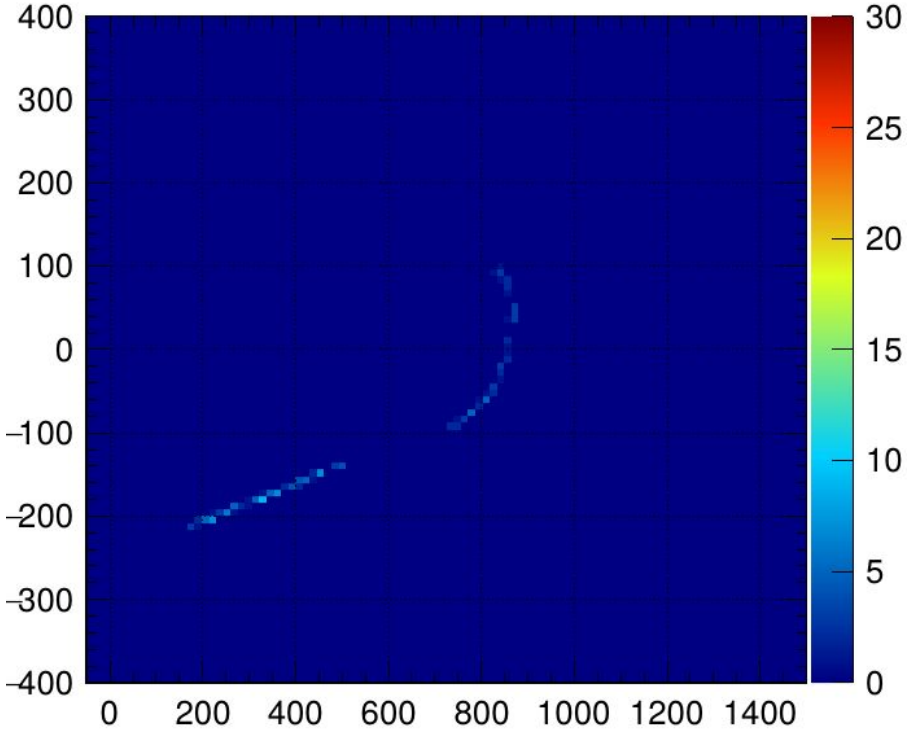
- Example of pion and muon punching through LAr to TMS

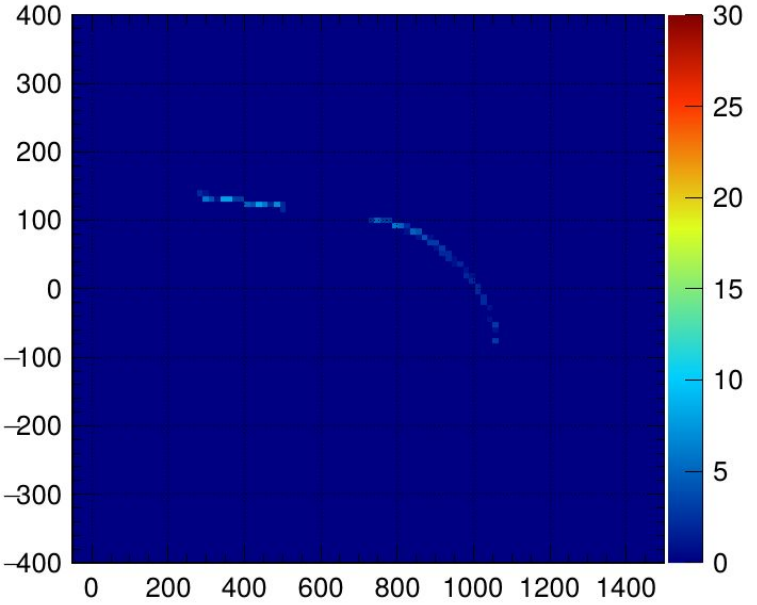


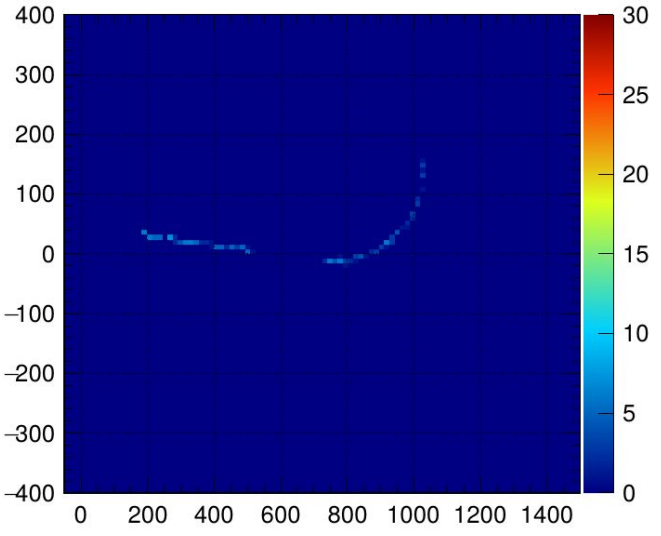


Entirely other questions

- Ran on the new no B-field files (/pnfs/dune/scratch/users/pkroy/outputs/nofield)
  - Still have bends in tracks?





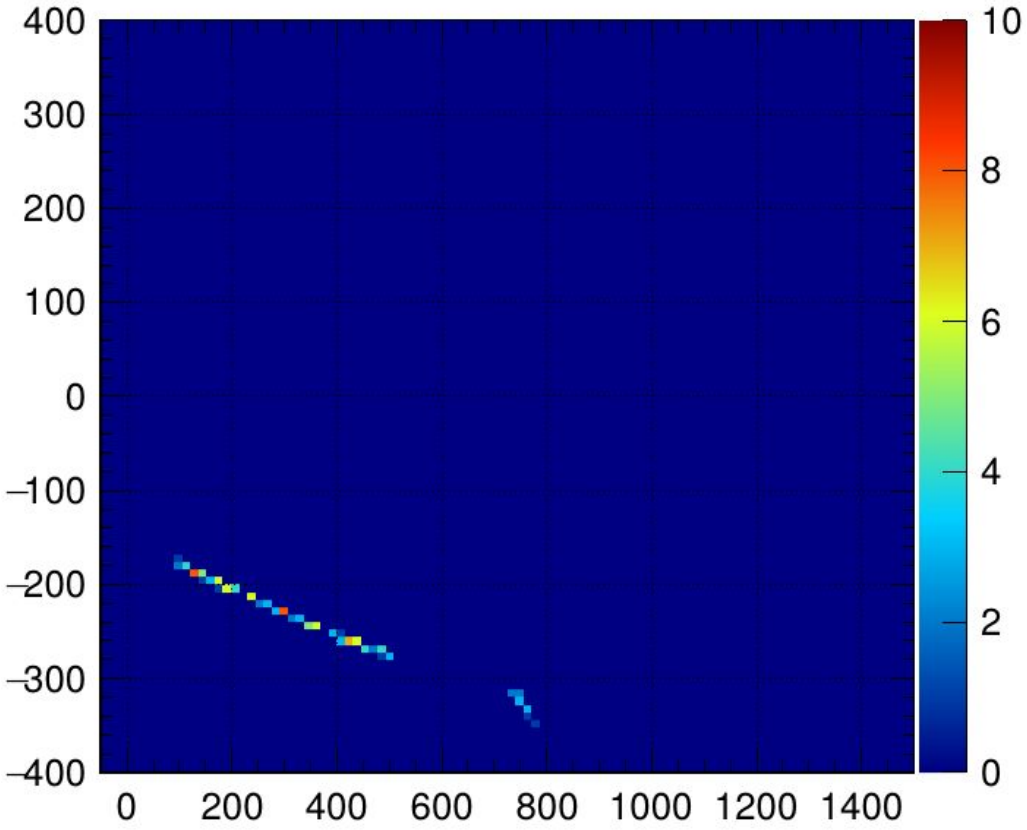


Thanks

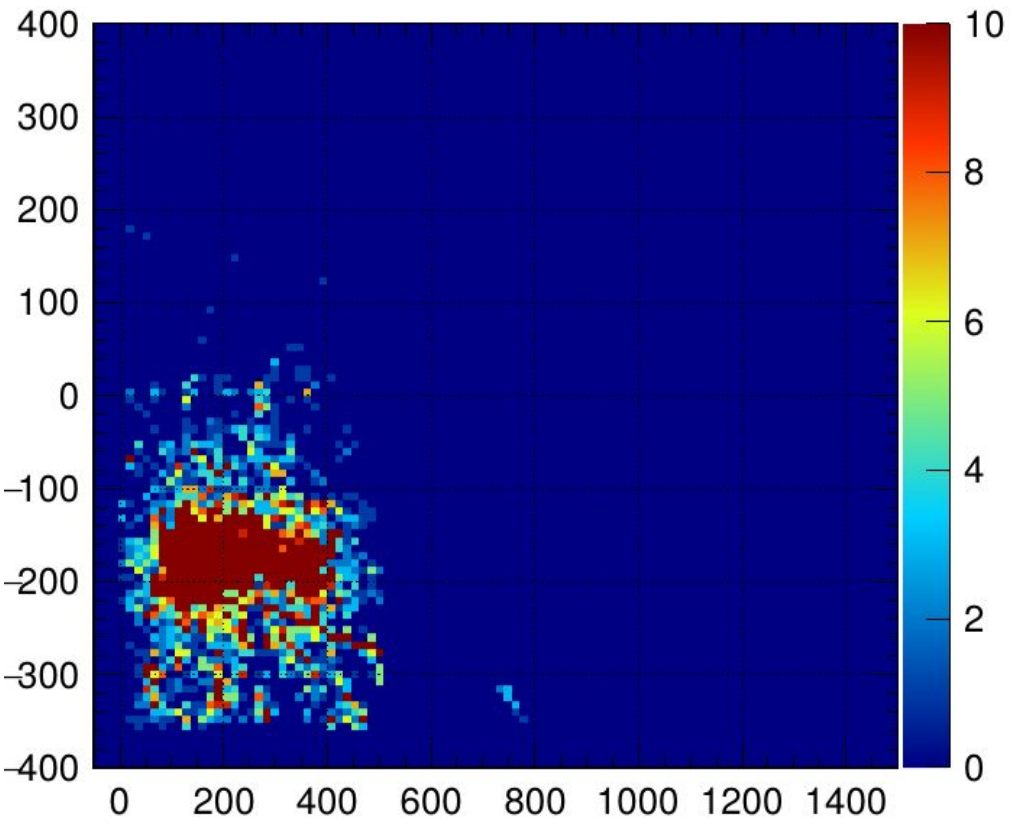
Backups

Other deposits

Muon only



All particles



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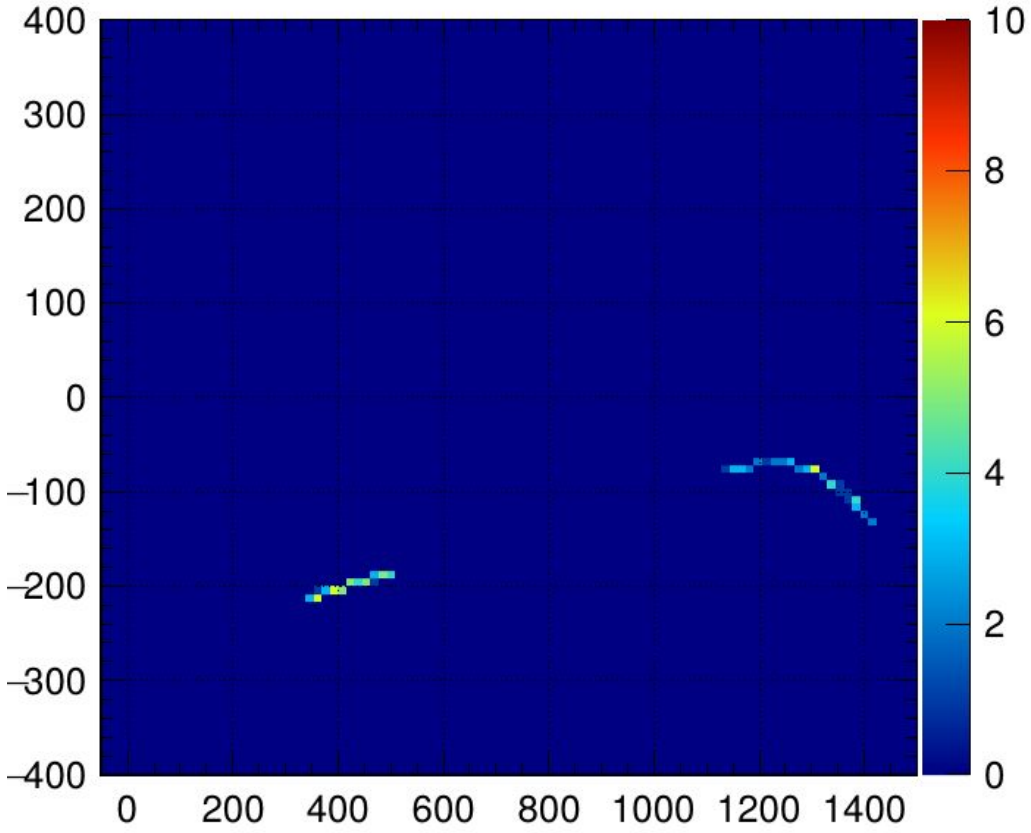

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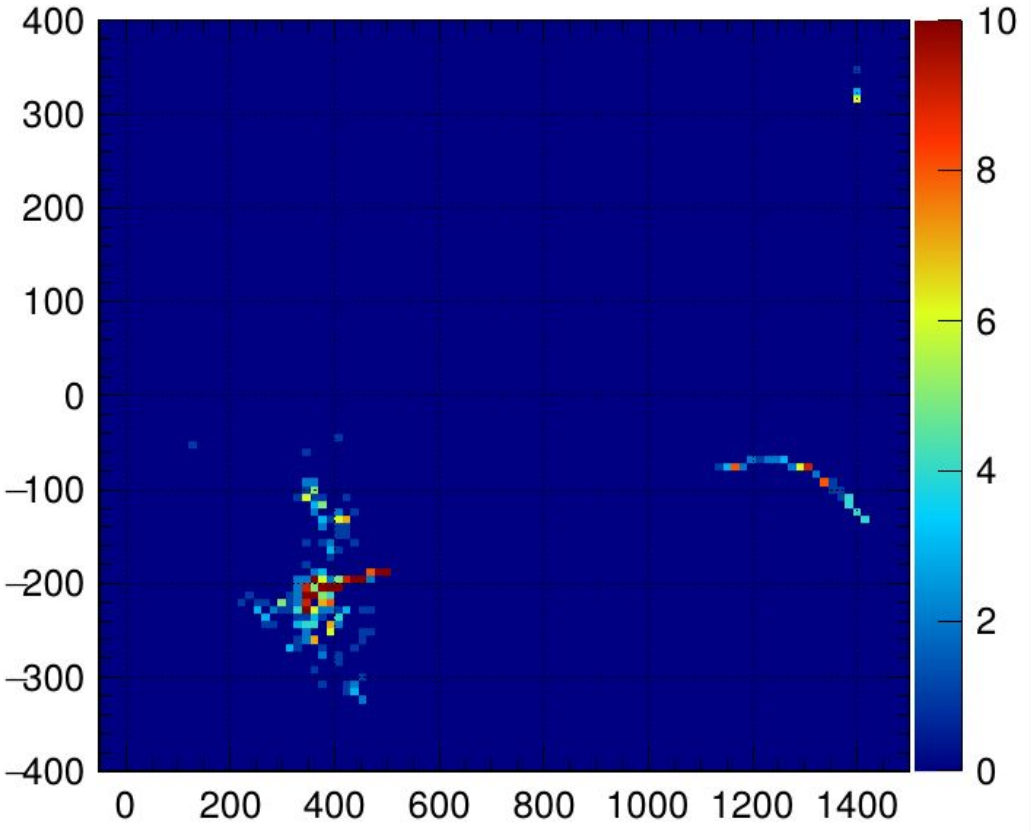

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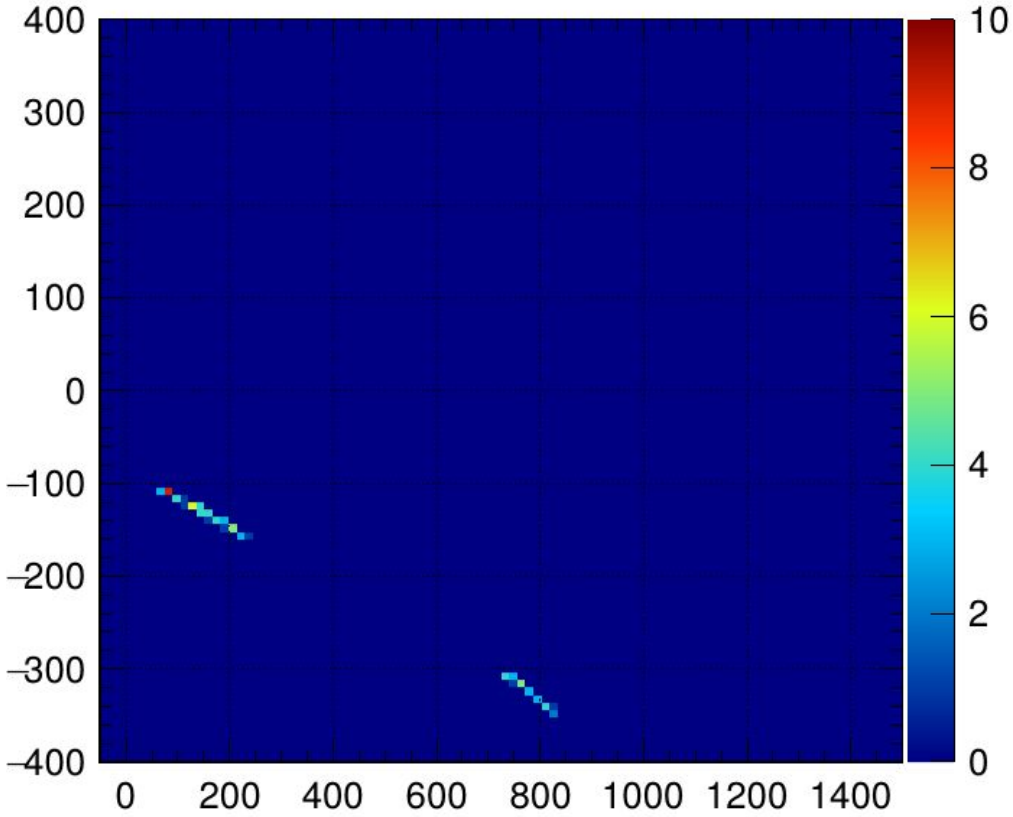

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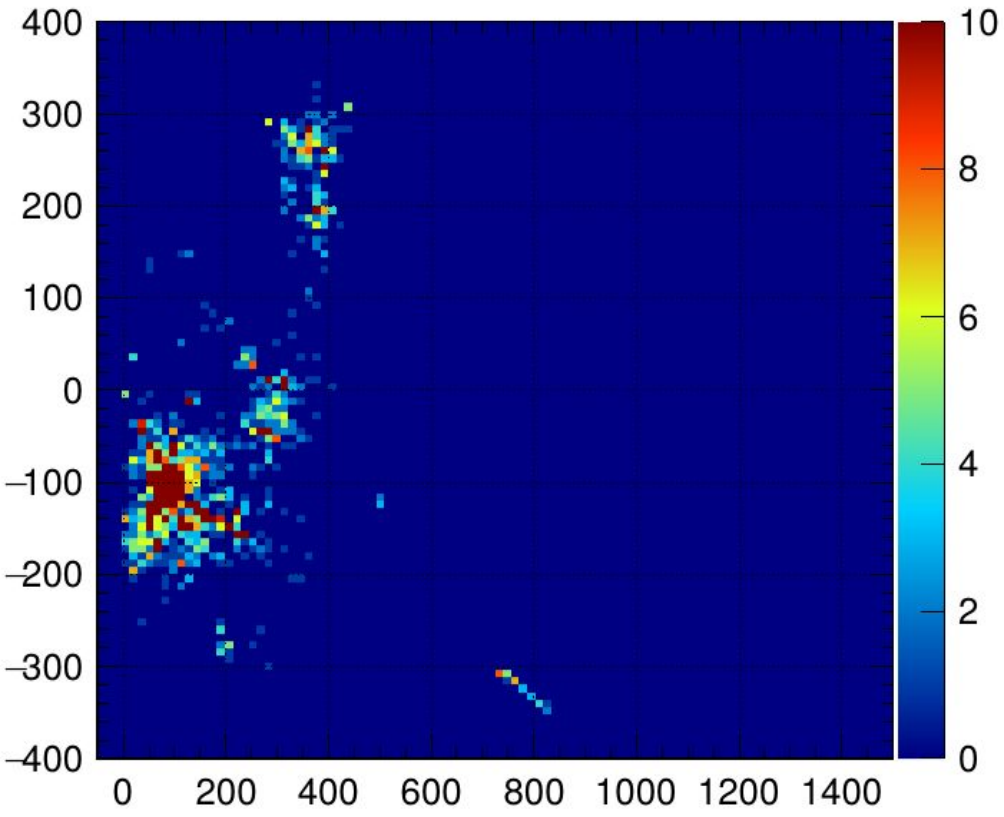

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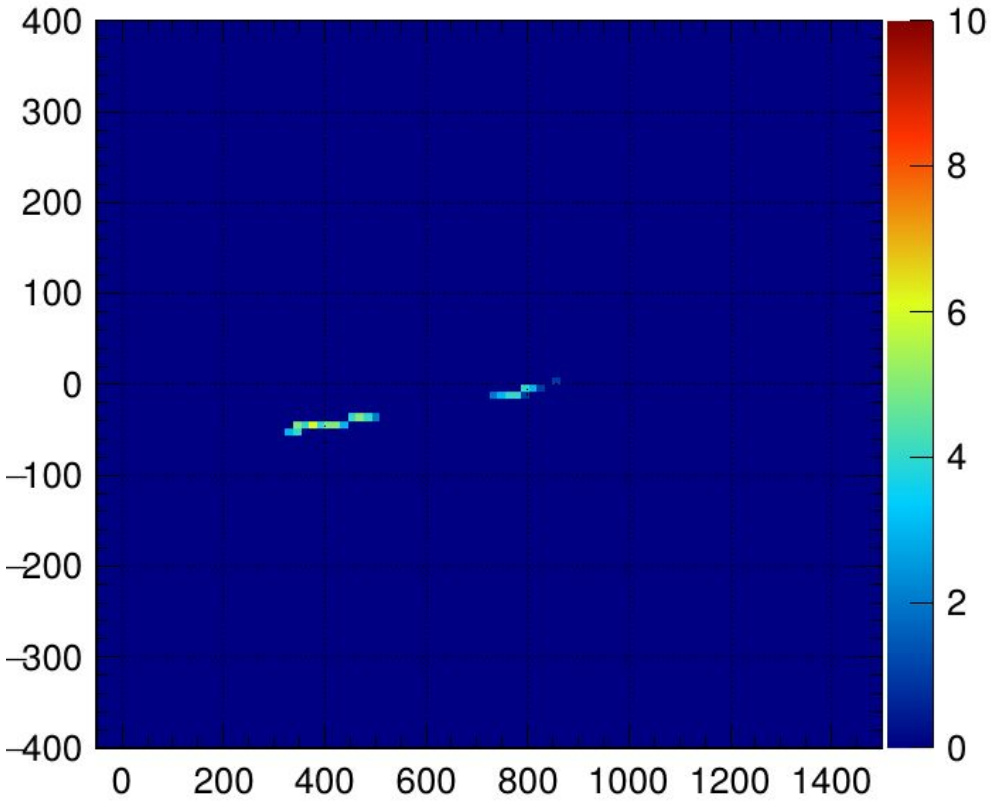

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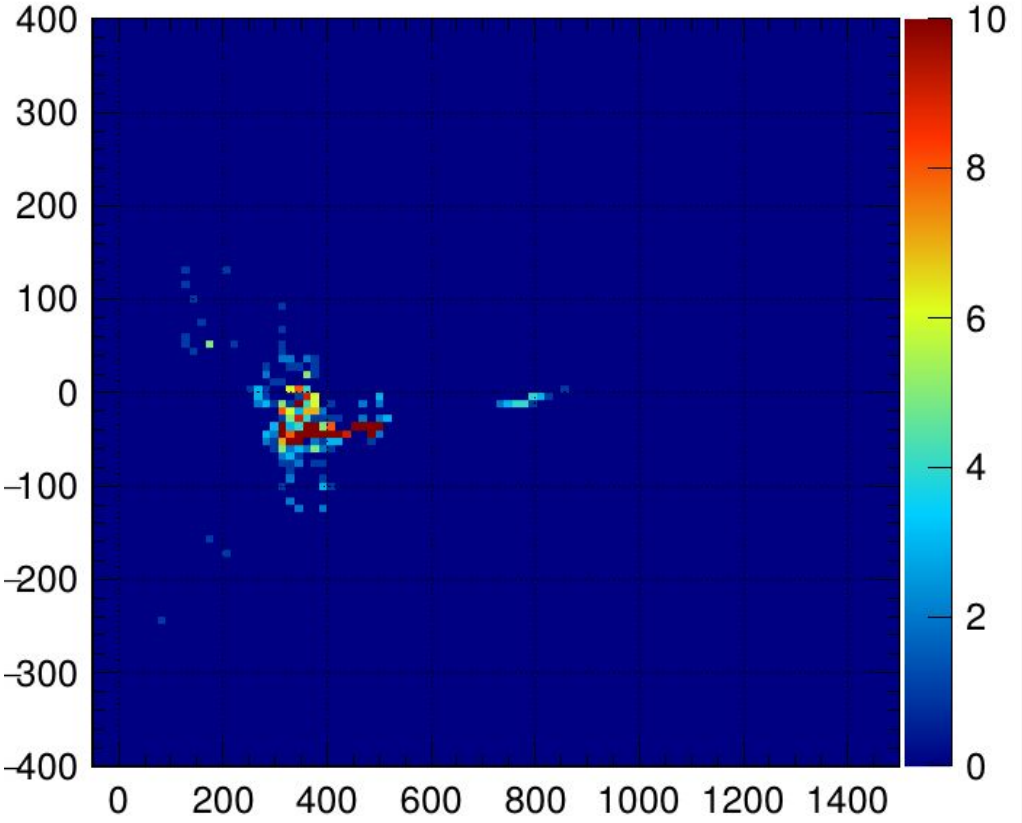

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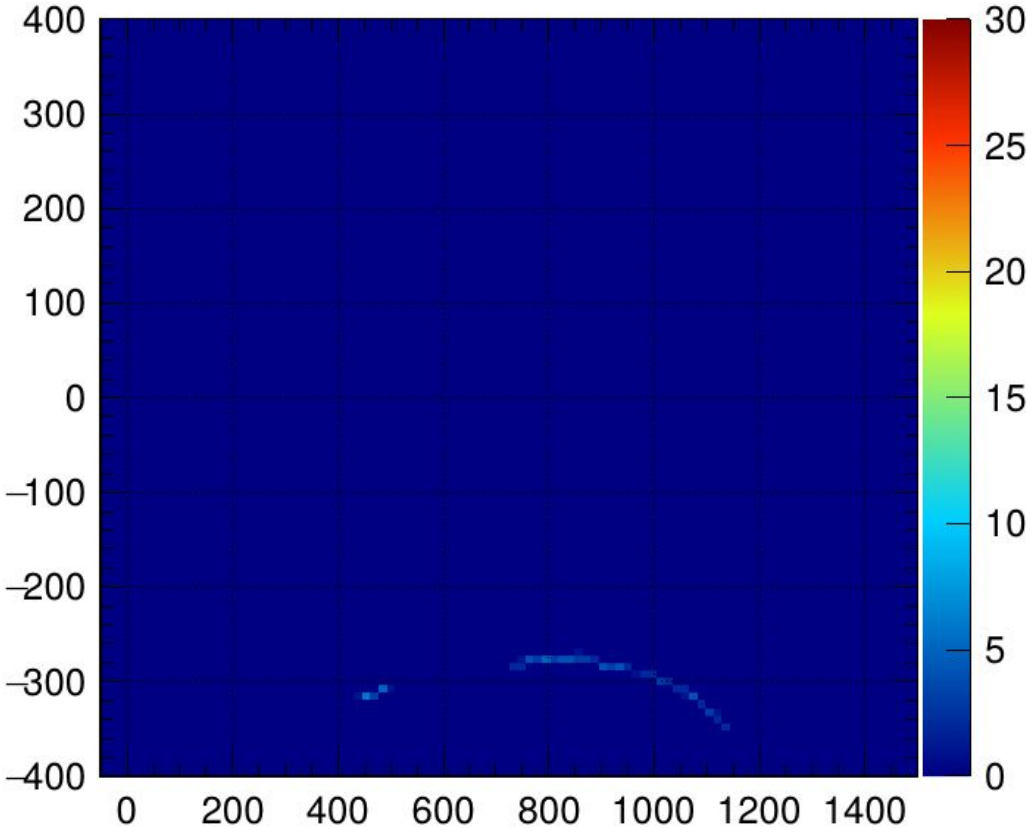

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