

# Fixing missing hits issue

2023-12-14

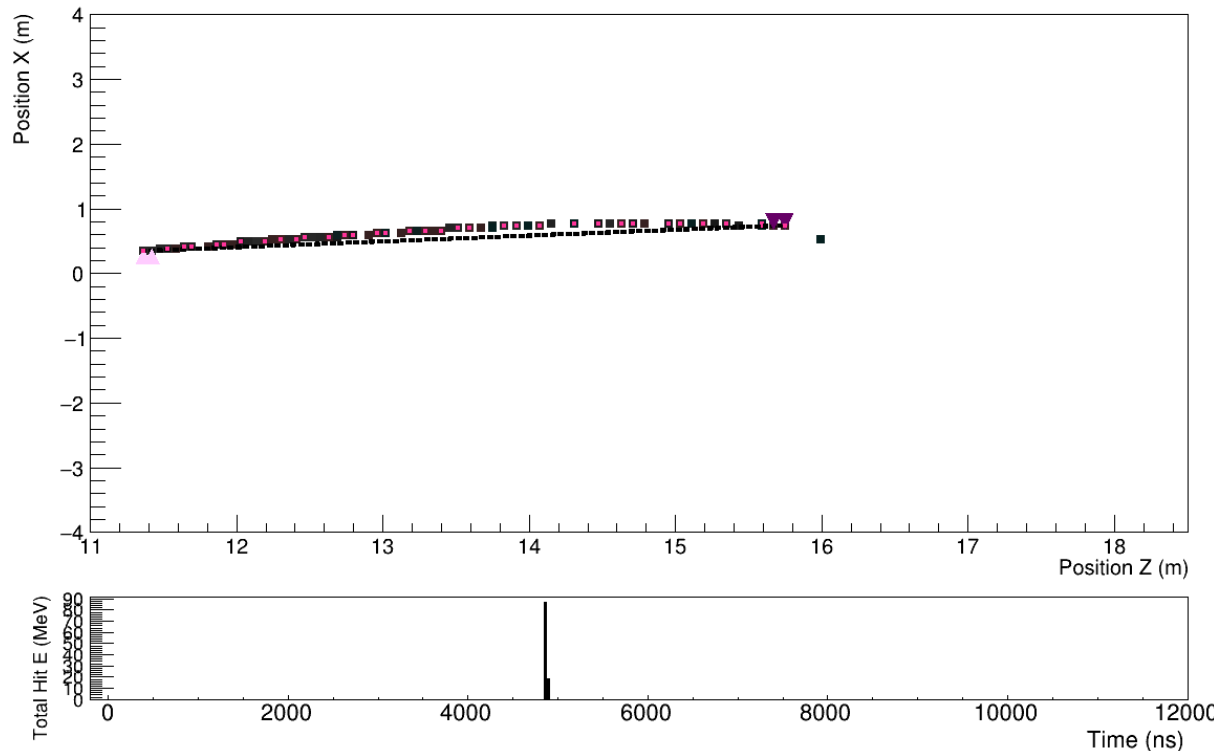
Asa Nehm





# Reminder: What is/was the issue?

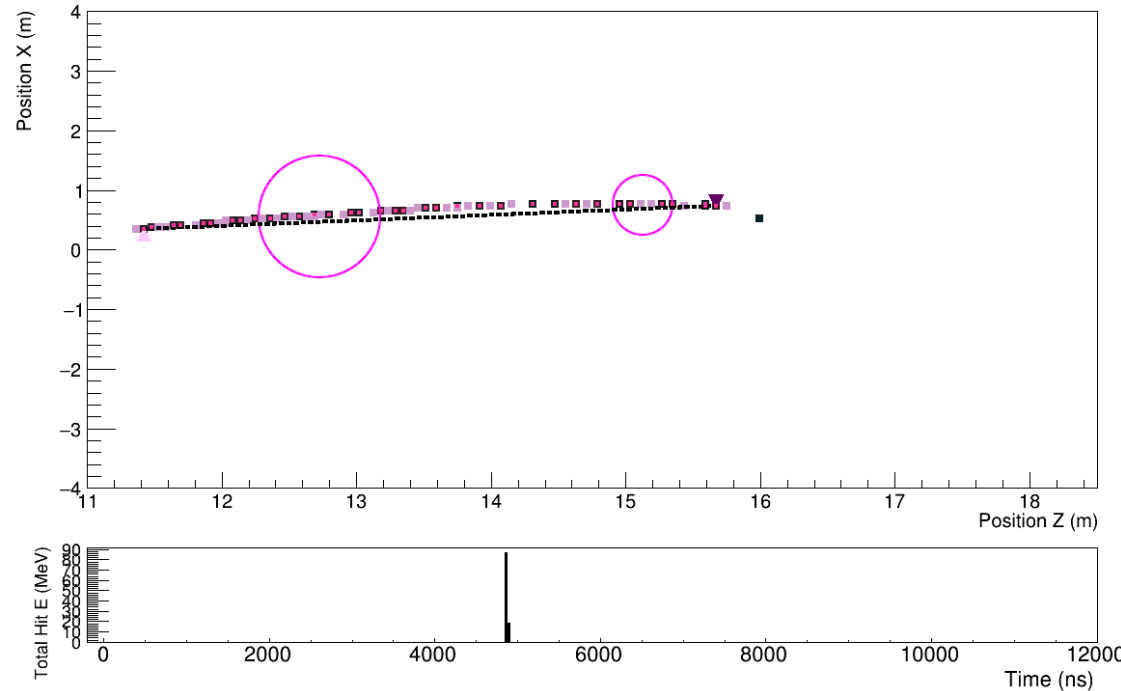
- Many missing hits in track
  - These hits are on Hough line  
→ they really should be in track
  - Timing doesn't play a role  
(Time slicer turned off)





# Attempts to solve this issue

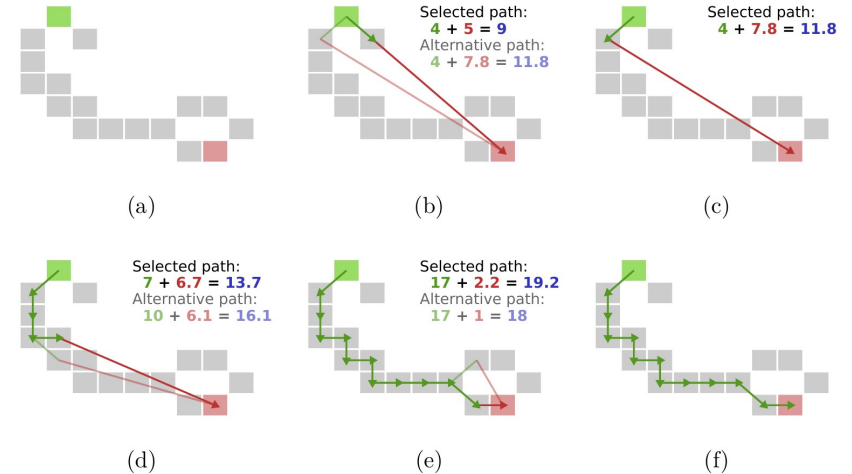
- Turn on MergeTracks flag in config/TMS\_Default... [Recon.Hough]
  - This helped with the missing hits, but moved them into **cluster(s)** instead of into the **track**
- Follow the hits through the reconstruction
  - The hits are used in Hough transform
  - Issue appears during A\* algorithm





# Quick insert: A\* algorithm

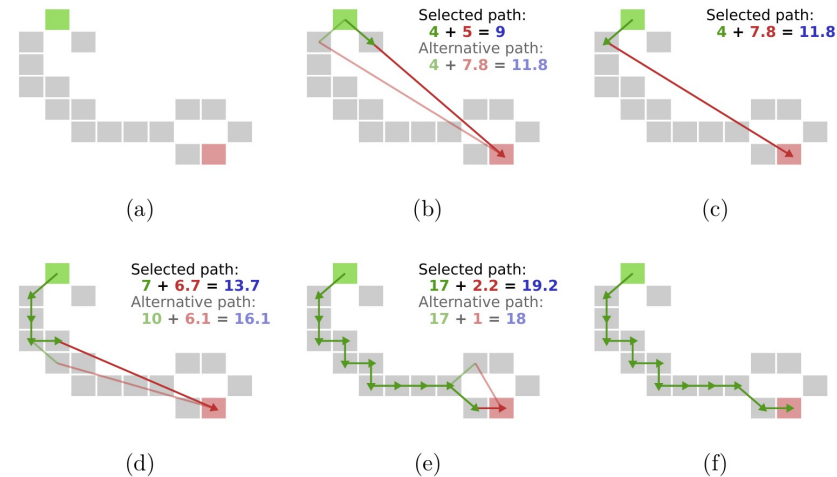
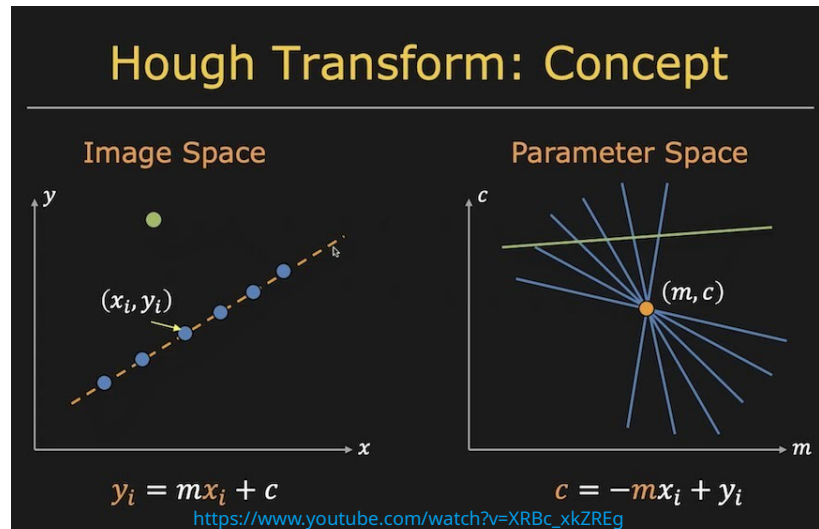
- Two costs to determine most efficient path from start to end
  - **Heuristic cost:** 'how far is end away?'
  - **Connection/Ground cost:** 'how far is next potential cell away?'
- Each cell has inherent heuristic cost
- For each connection the connection/ground cost is calculated
- Choose connection with lowest **sum of both costs**



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# Difference Hough trafo and A\* algorithm



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## Hough Transform

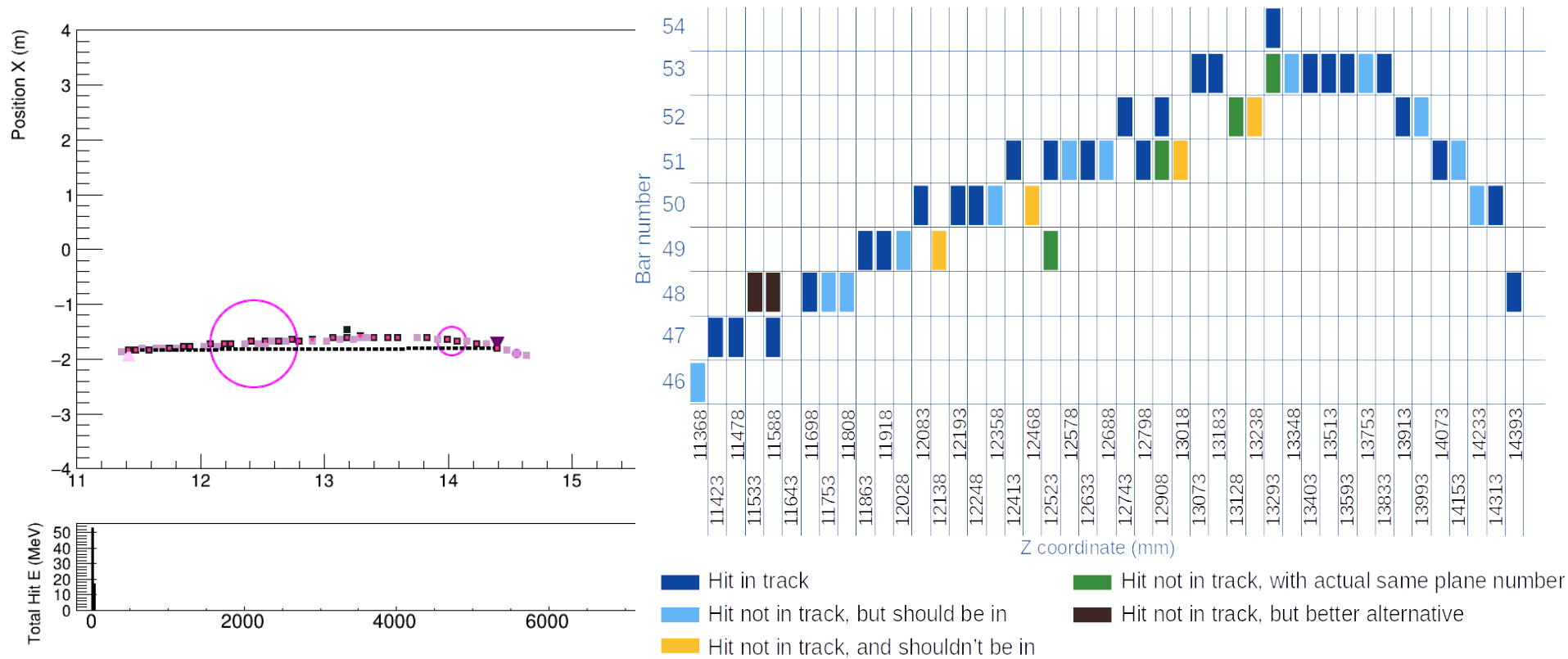
- Uses **coordinates** of hit position (x and z)
- Coordinates also used in plotting of events/spills

## A\* algorithm

- Uses **nodes** indicated by bar (x) and plane (z) number of hit
- Bar number and plane number determined by geometry files



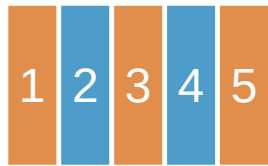
# Example event in detail



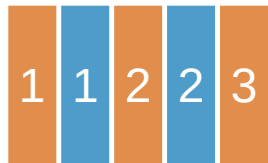


# What about the plane numbers?

- Plane numbers idea in reconstruction so far



- But actually implemented in geometry is

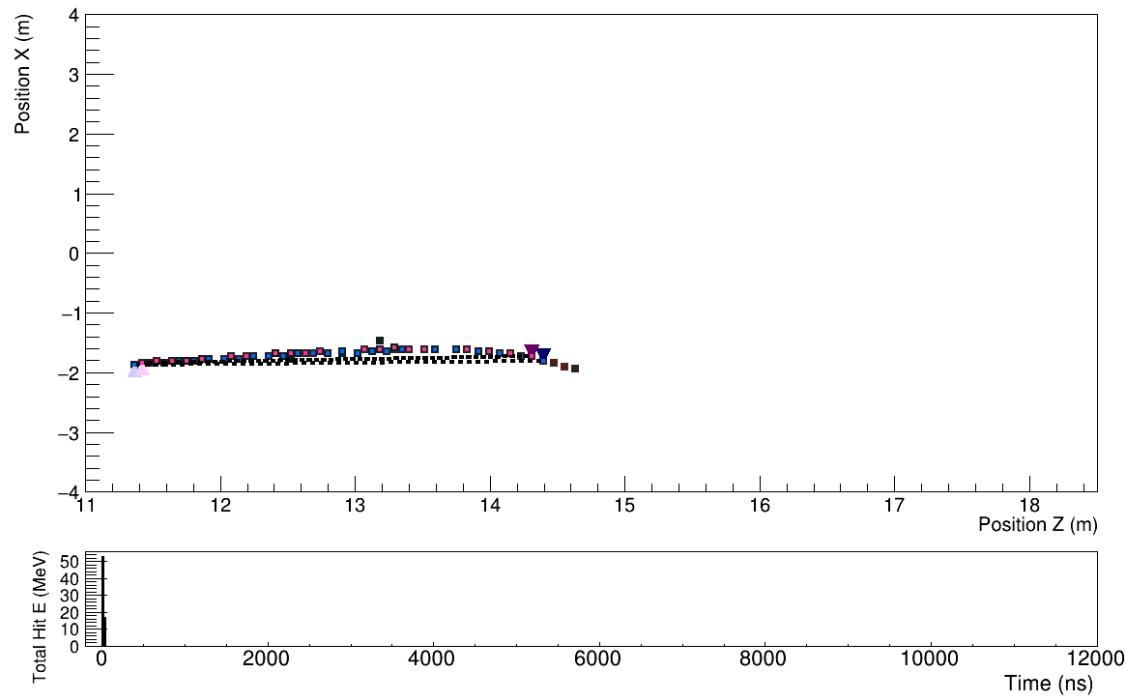


- With additional information about orientation of plane (y or v)
- A\* uses only plane number as z coordinate and therefore leaves out hits, that are seemingly only neighbors /adjacent hits → change this



# Solving the issue

- Implement separation not relying on plane number but orientation
- Adapt ProjectHits function to deal with more than one orientation







## Side notes

- Also changed the cost calculation of the connection/ground cost and heuristic cost
  - As well as path cost in total was calculated
- Don't use DBSCAN first!
- The MergeTracks mode is still not good. Some maintenance work on this would be really good
- Make sure that you know how the geometry is implemented if you want to do some reconstruction