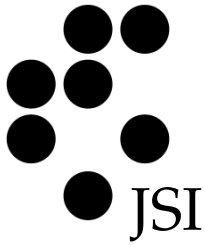


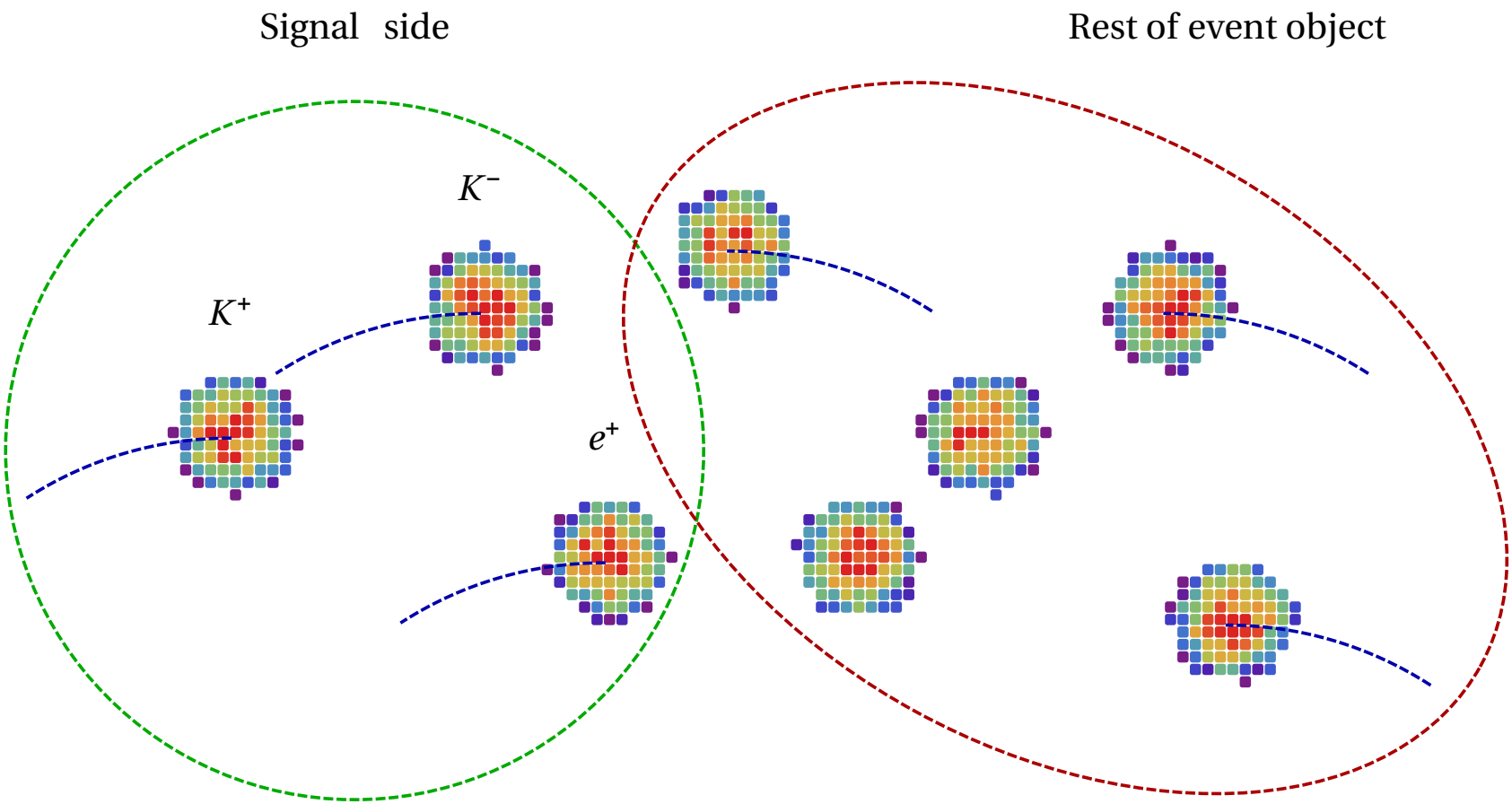

# Track duplicates in event

Matic Lubej

Weekly tracking meeting

Friday, March 18th, 2016

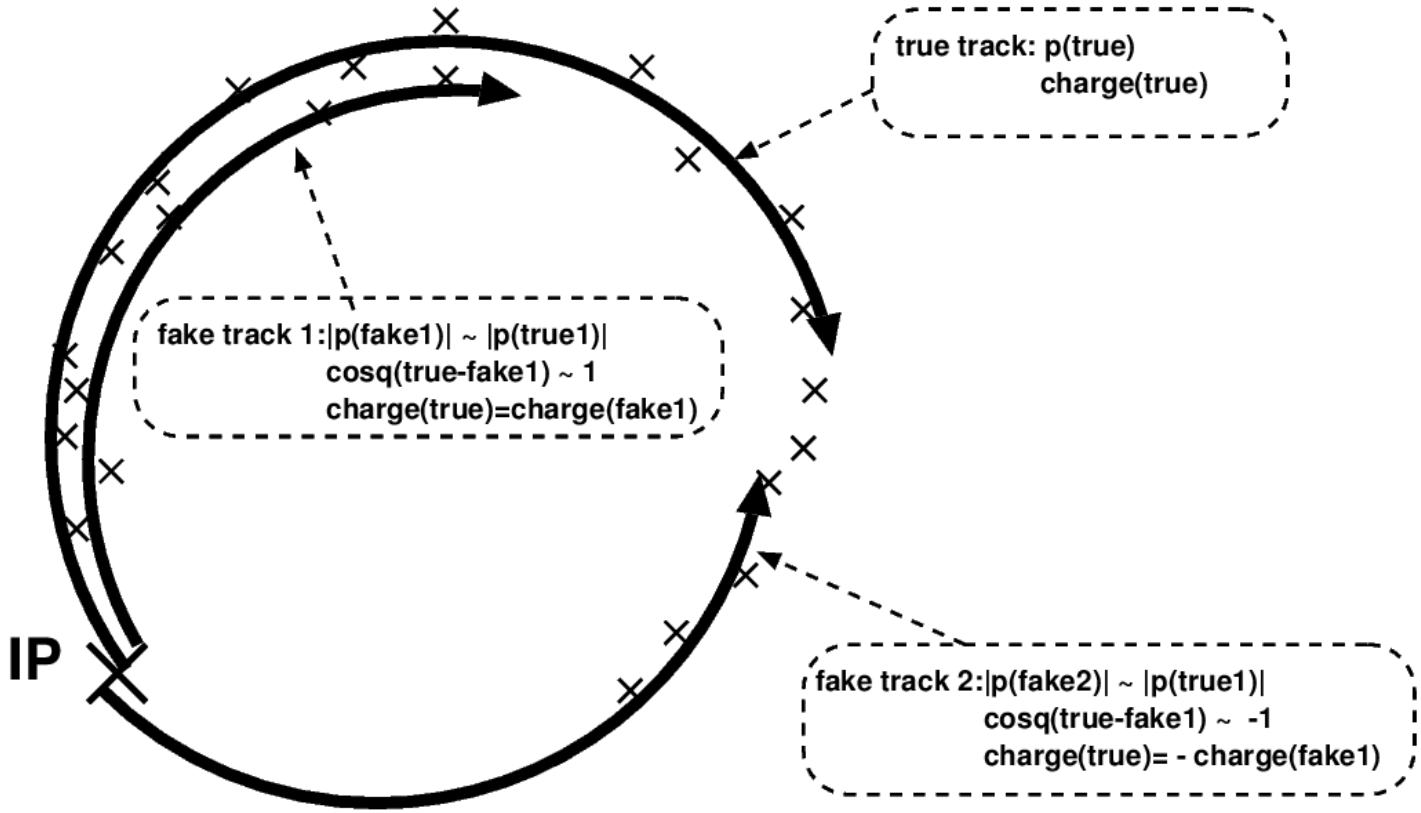
# My case:




Working with untagged method: Taking the right tracks/clusters into account is crucial

# Possible source of problems

Track duplicates can occur in events, when the track finder sometimes creates many tracks



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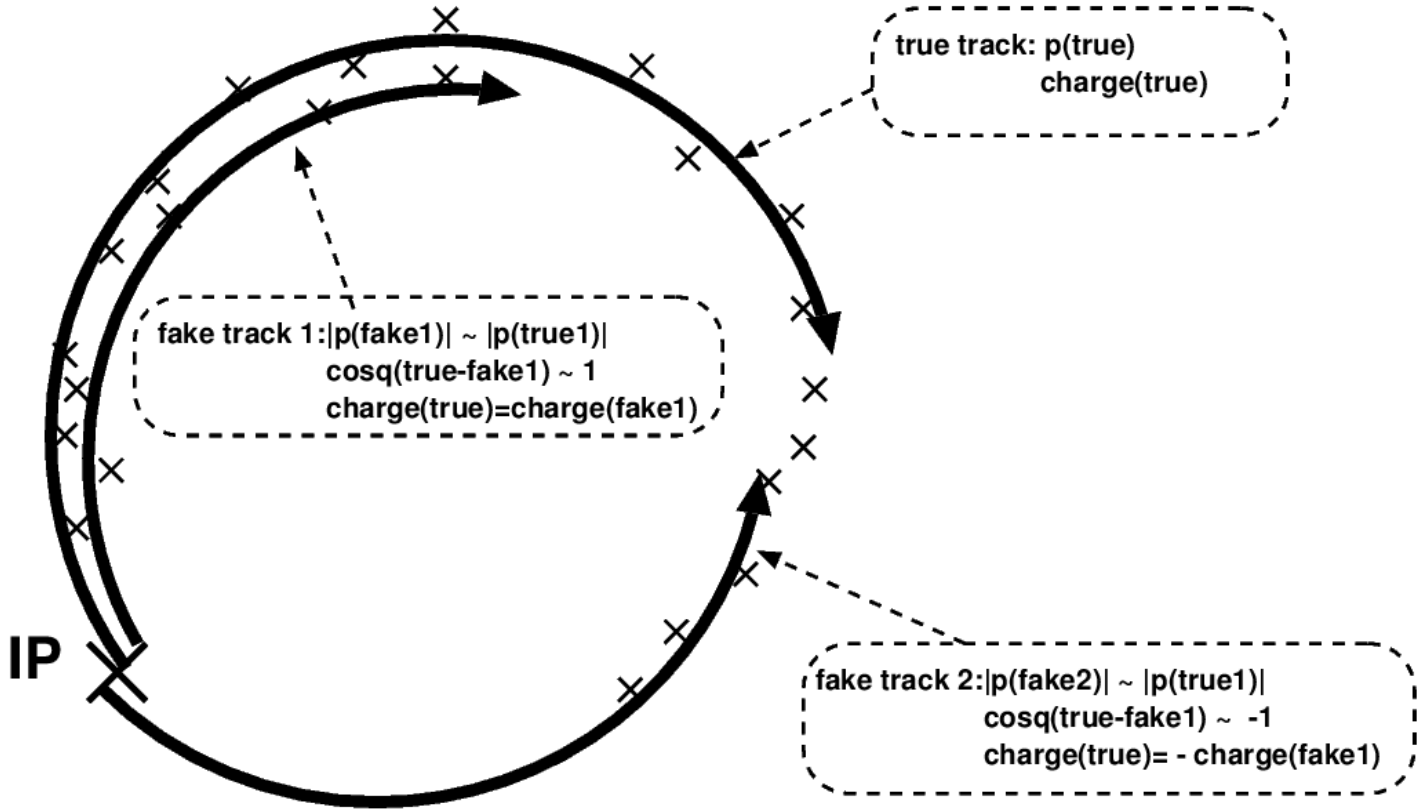


Such duplicates must be discarded, otherwise double counting of momenta occurs in the ROE side

# How to search for duplicated tracks?

## Using MC truth

- Two duplicates of the same source should be related to the same MC Particle (same source made hits)

## Not using MC truth

- Search for track pairs with low momentum , low momentum difference and angle between them close to 0° or 180°

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No such cases were found!
Perhaps a property of MC5 data? (there were recent changes regarding MC truth being used in reconstruction in the past)
Can someone confirm this?

# Similar problem - Secondary tracks

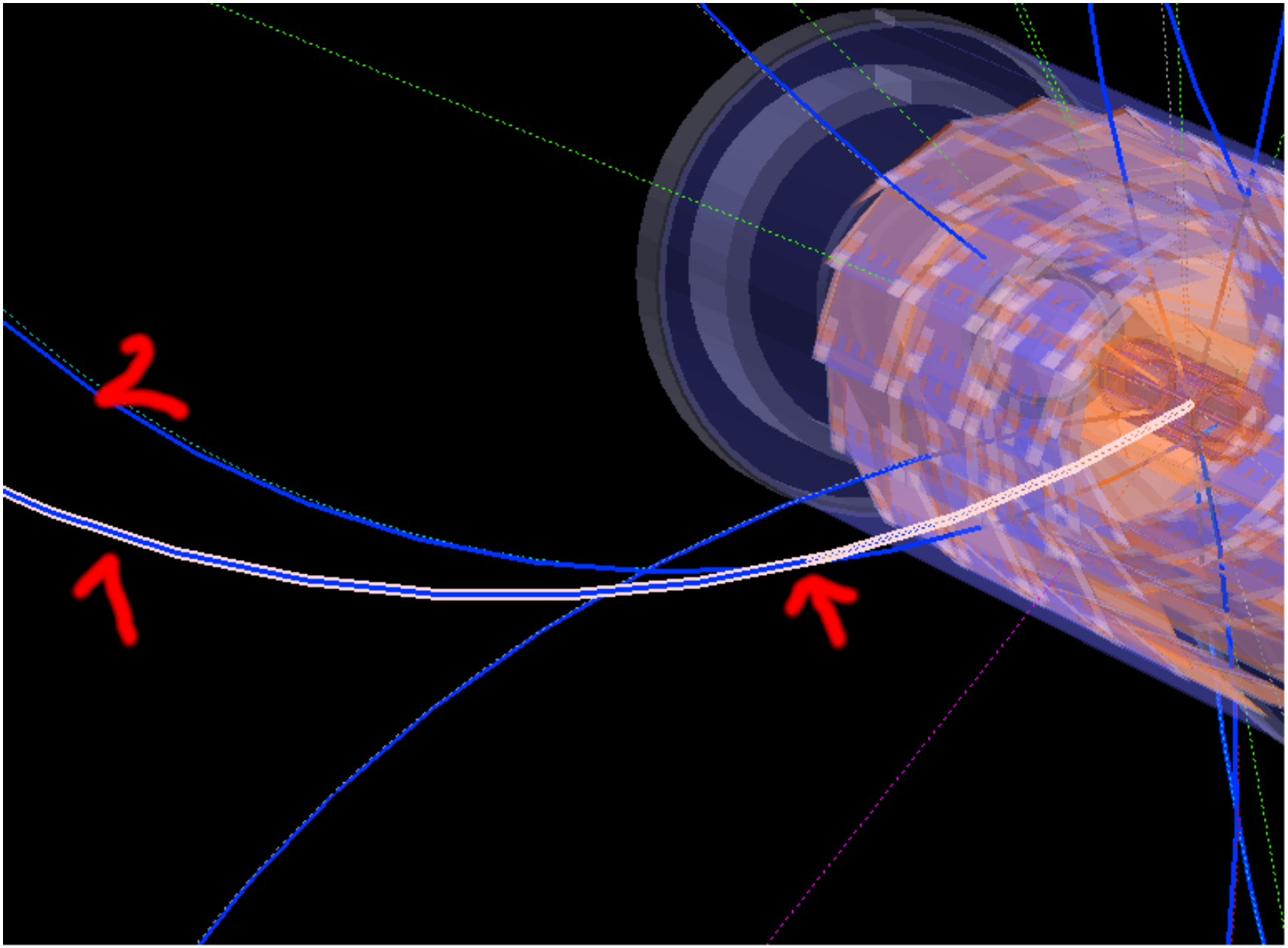
## However . . .

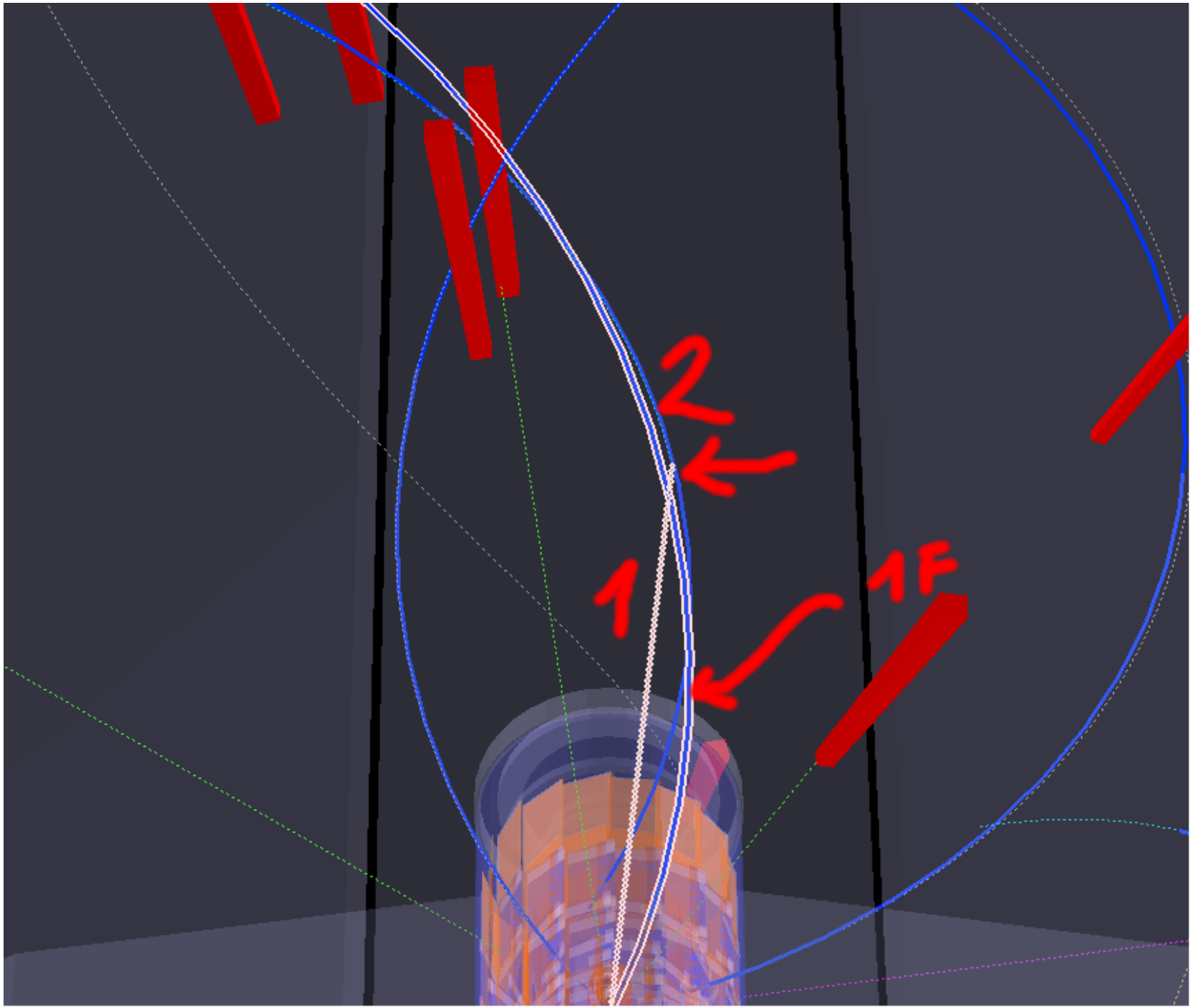
- Multiple tracks from the same source
  1. Decay in Flight: a ”break” in the trajectory occurs, both parts fitted
  2. Material hit: when particle hits the material, new charged particles shoot out and are fitted
- Nothing wrong with these, we know they exist, we just need to be able to control them on the analysis level

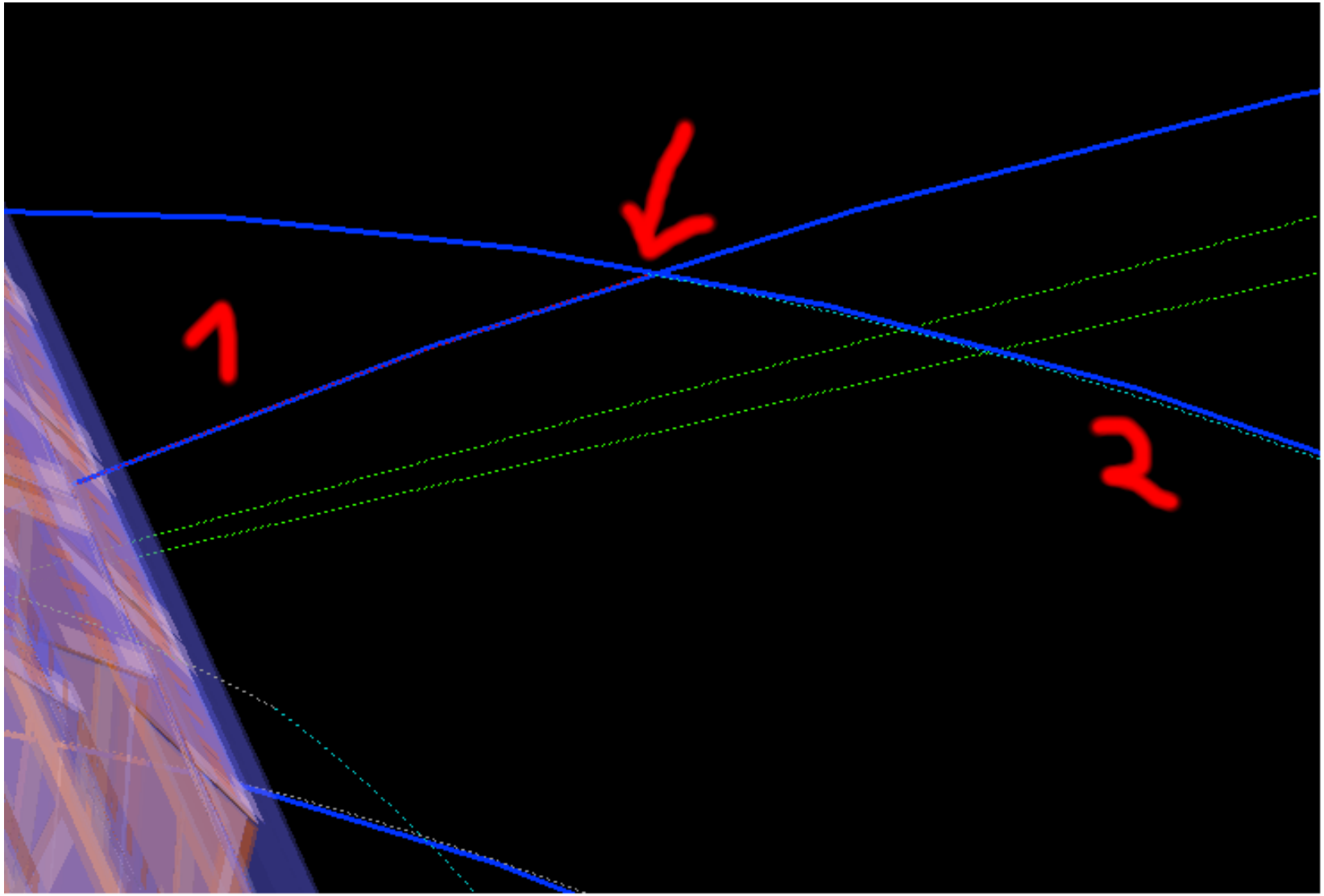
## How to find them?

- Using MC: Track duplicates related to different MC Particles (primary and secondary one or both secondary)
  - Possible to find: secondary particle matched to the primary one
- Not using MC: Try to take the same approach as before

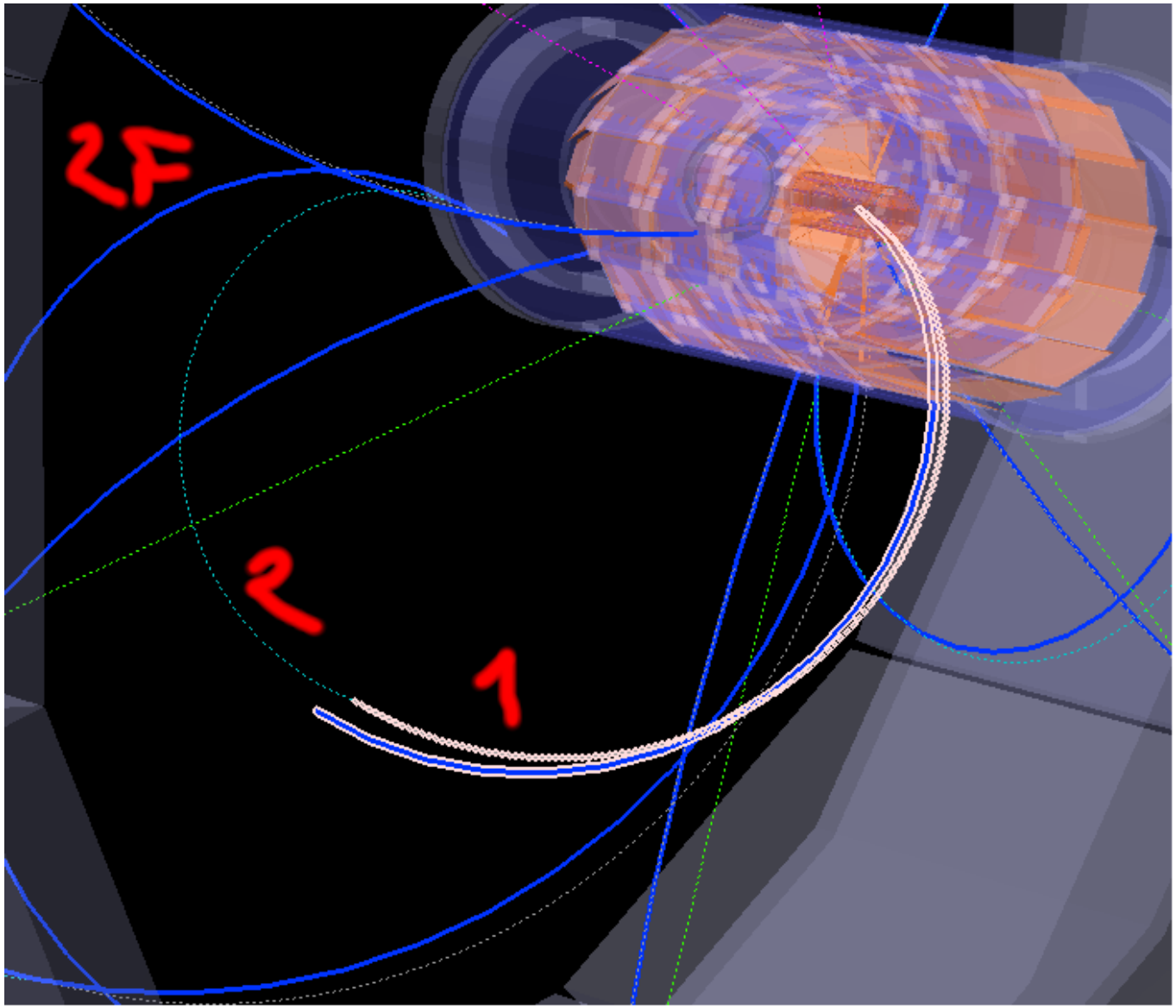
This happens in about 50 % of events (1 in 2) $\leftarrow$ counted using MC info, ran on ulnu sample with beam bkg

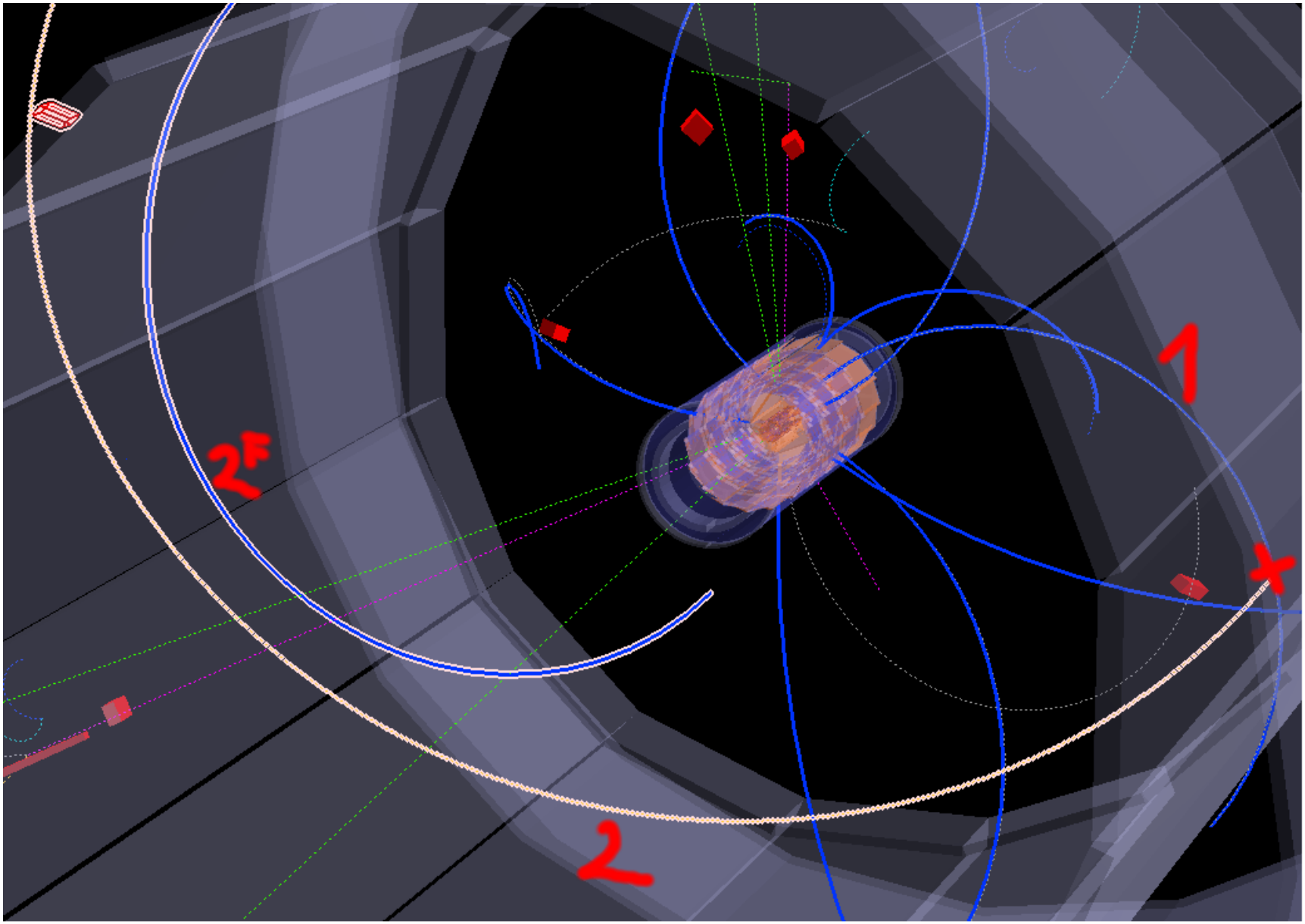

2
1

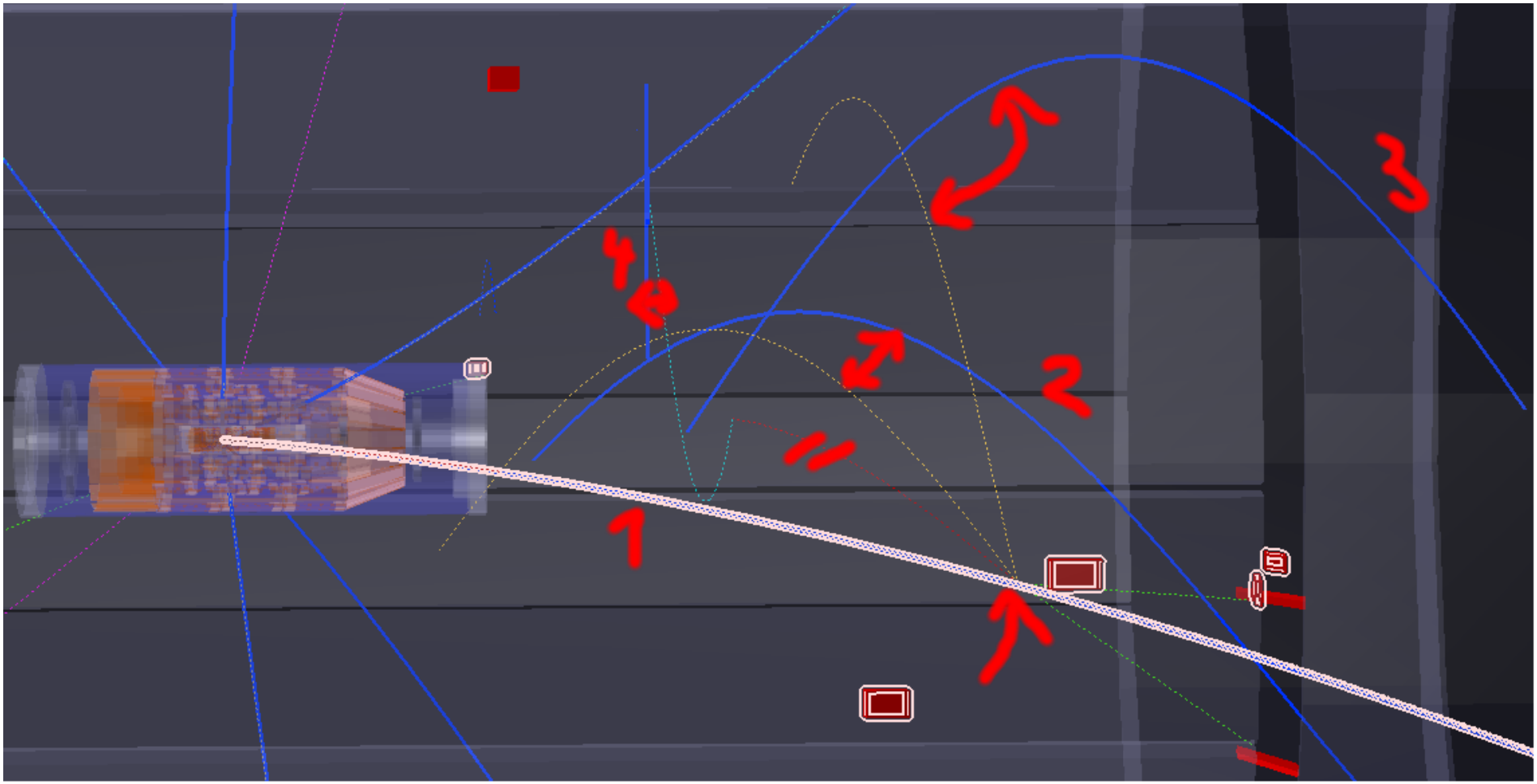

2
1
1F


1
2

# Sometimes the track fit is not so good




2F
1
2


1
2
3
4
5

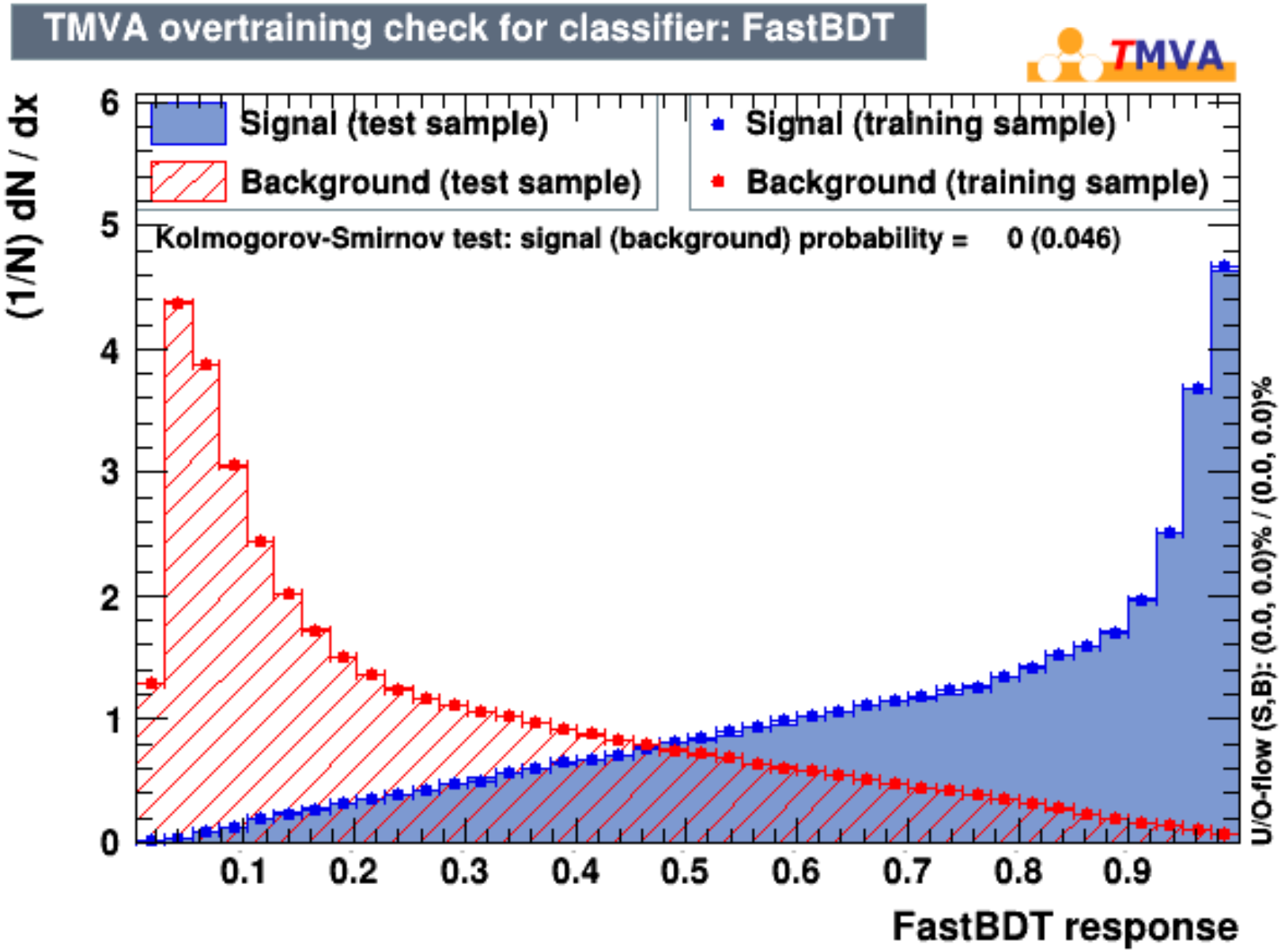
# How to handle tracks from decay in flight?

- These secondary tracks more or less don't have VXD Hits
- In most cases: $\cos\theta(\text{true} - \text{fake}) \sim 1$, but not necessarily when decay occurs further away from IP
  - If track fitted in the wrong way: $\cos\theta(\text{true} - \text{fake}) \sim -1$

- It would be better to find cases where two or more tracks share same ExtHits or ExtHits that are close together (possible at reconstruction level, but not at analysis, maybe worth looking into)

We tried to find discriminators with currently available information to distinguish these cases, but they are not easily recognized even by MVA tools (input: impact parameters, track momentum, angle, ...)

# Recognizing track pairs with secondary track: MVA



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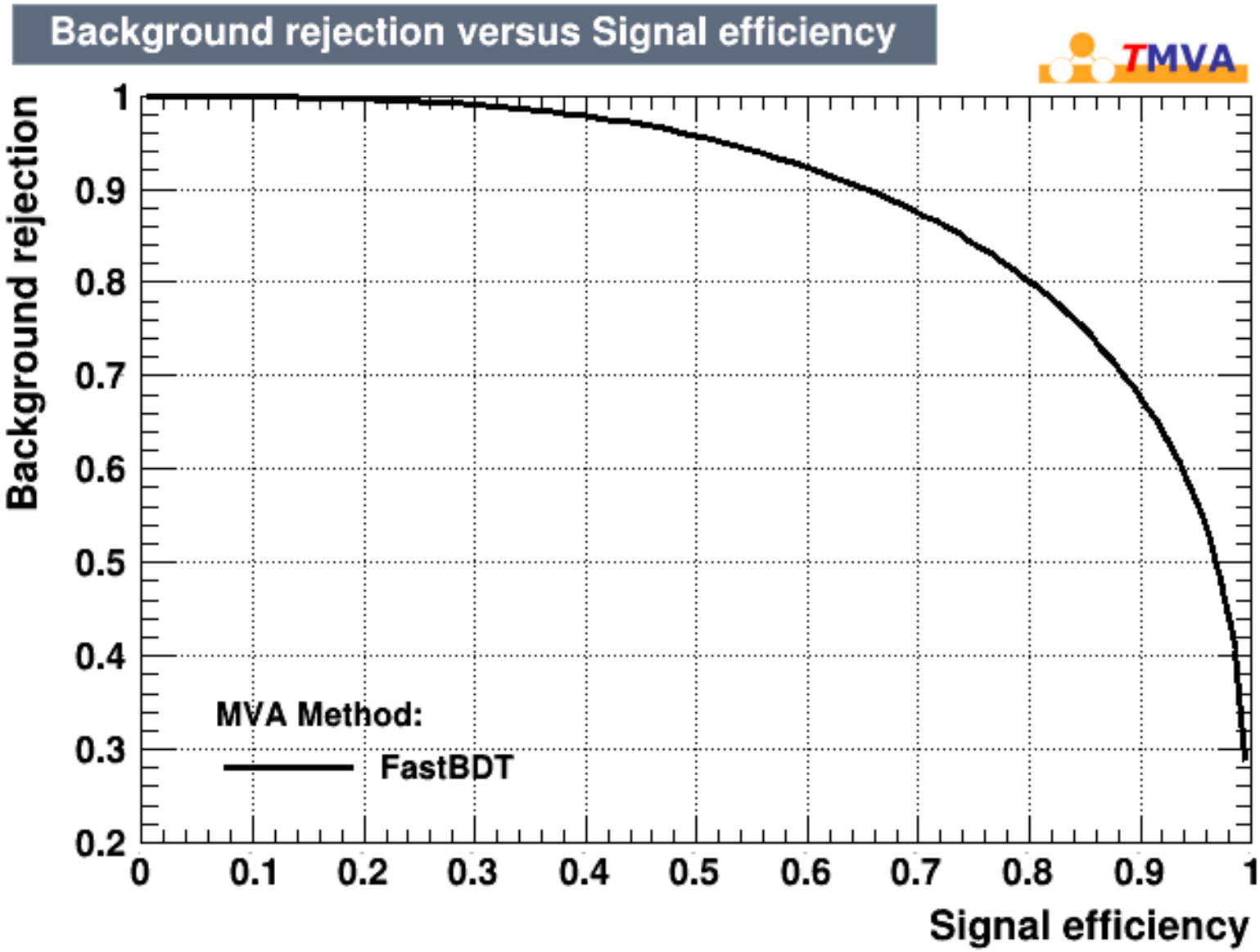

# Conclusion

- Track duplicates in the original sense not found in MC5, need confirmation that they are in head, or when will this happen
- Secondary tracks can also occur due to decays in flight or interactions with material
- I have yet to study the impact of the secondary tracks, but if happens in 1 of 2 events, this means the impact may be quite large
- If no other way to discard secondary tracks on analysis level, new information might be needed from reconstruction level.