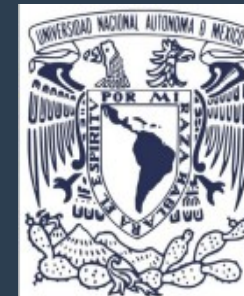


# Ghost tracks in reconstruction

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# Definitions

- **Monte Carlo (MC):**

**Loops over MC tracks**

- **Basic cuts:**

**Only primary (motherID)**

**$0.1 \text{ GeV}/c < p_T$**

**$|y| < 0.5$**

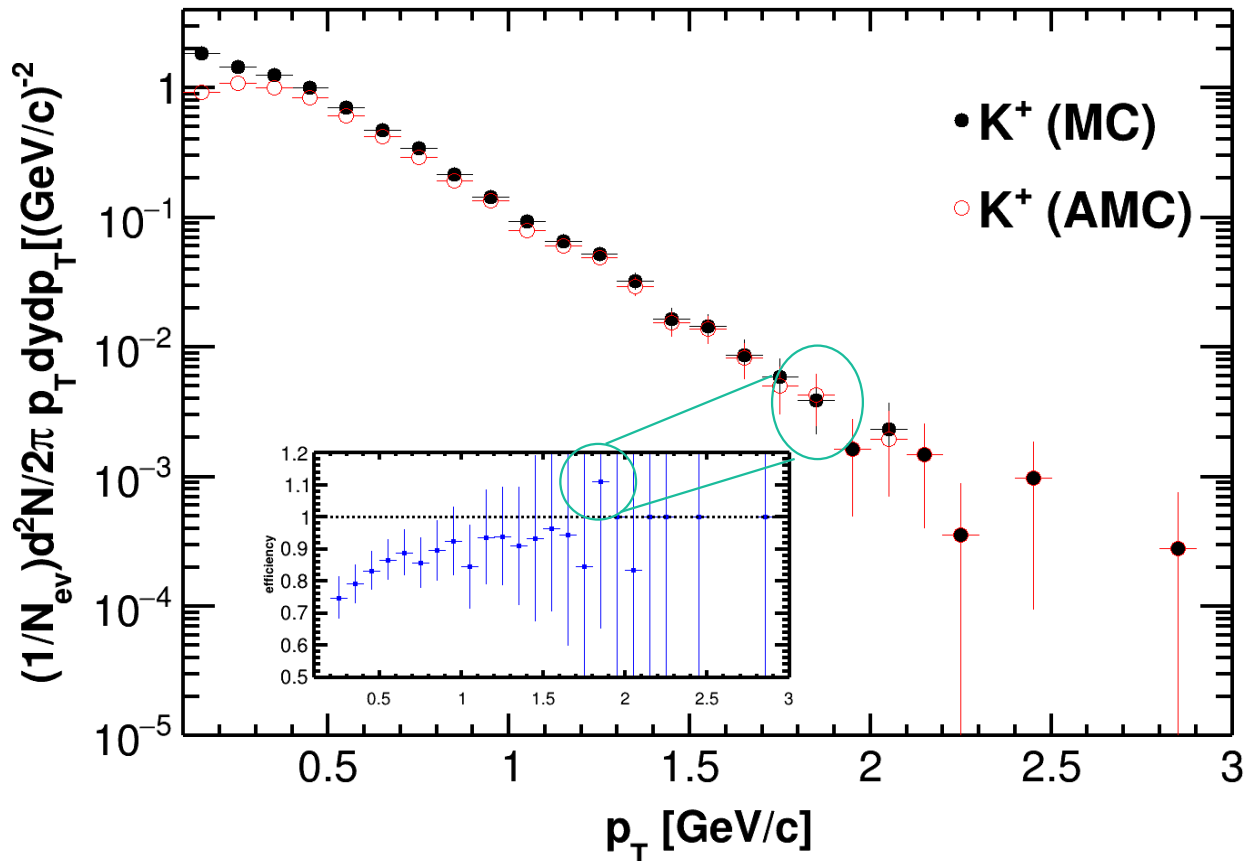
- **Associated MC (AMC):**

**Loops over reconstructed tracks**

**Association is made by the ID of the rec. track to the MC track**

```
MpdTrack *track = (MpdTrack*)fTMpdGlobalTracks->UncheckedAt(i);
Int_t ID = track->GetID();
MpdMCTrack *MCtrack = (MpdMCTrack*) fTMCTracks->UncheckedAt(ID);
Int_t pdgmc = MCtrack->GetPdgCode();
Double_t ptmc = MCtrack->GetPt();
```

# Ghost tracks



Bi+Bi at 9.2 GeV (request 25)  
2,000 events

```
pdgMC = 321  
ptMC = 1.85324  
pdgAMC = 321  
ptAMC = 1.85324  
ID ===== 1068 , 1990  
pdgAMC = 321  
ptAMC = 1.85324  
ID ===== 1068 , 1990  
pdgAMC = 321  
ptAMC = 1.85324  
ID ===== 1068 , 1990  
-----
```

1 MC

2 rep

# Ghost track definition

- **Ghost tracks appear when two or more tracks have the same ID for the same event. While typically their Number of Hits (NofH) differ**
- **The assumption is that the ghost tracks are those with the less NofH**
- **Example: Suppose 3 tracks with 18 hits, 27 hits, 10 hits**

**The track with 27 hits is considered as the “real” track and the rest are the ghost tracks (1 real + all repetitions)**

# Ghost tracks in numbers

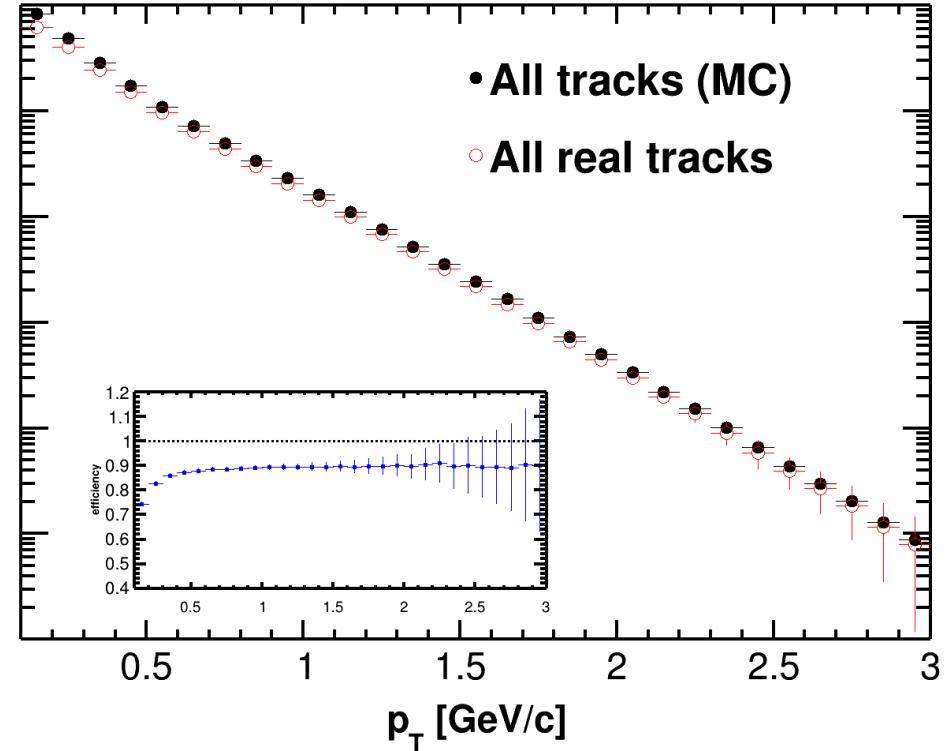
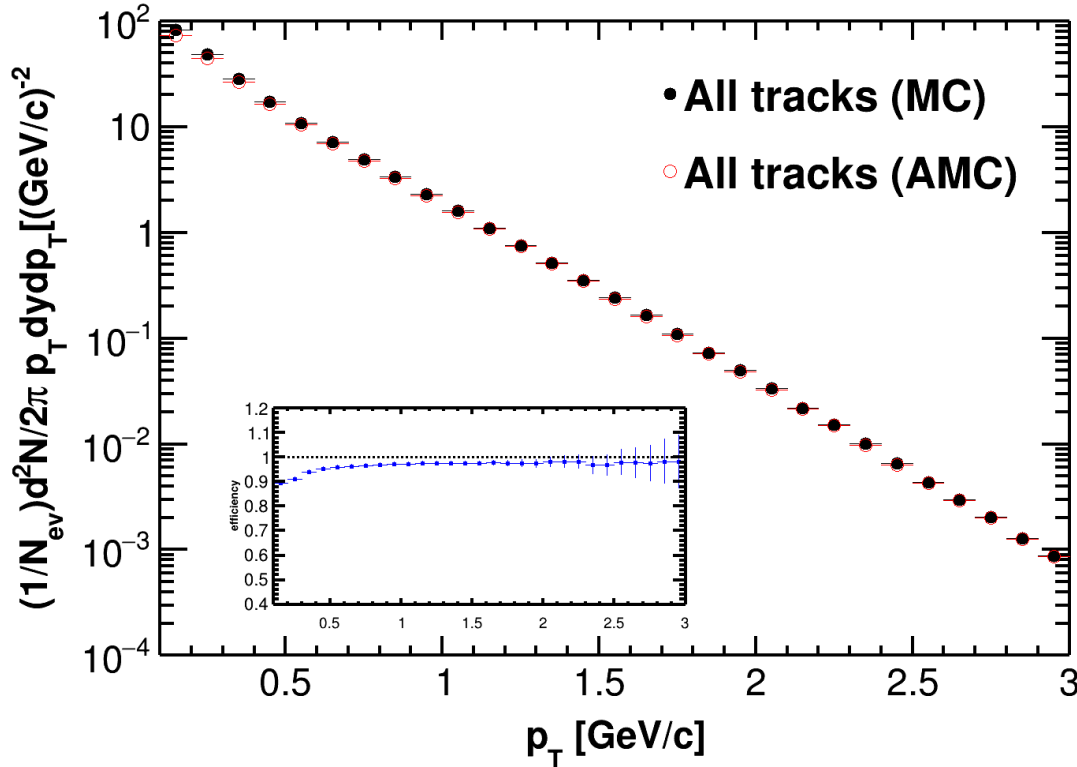
Bi+Bi at 9.2 GeV (Basic cuts)

Tot. Evts	Total No. of MC Tracks*	Total No. of rec Tracks*	Total No. of ghost tracks*	Evts. with ghost tracks*
2,000	82,117	76,811 (~94%)	7,483 (~10%)	1,036 (~51%)
100,000	4,276,436	4,009,684 (~94%)	398,101 (~10%)	52,224 (~52%)
996,673	42,530,479	39,880,216 (~94)	3,948,621 (~10%)	521,461 (~52%)

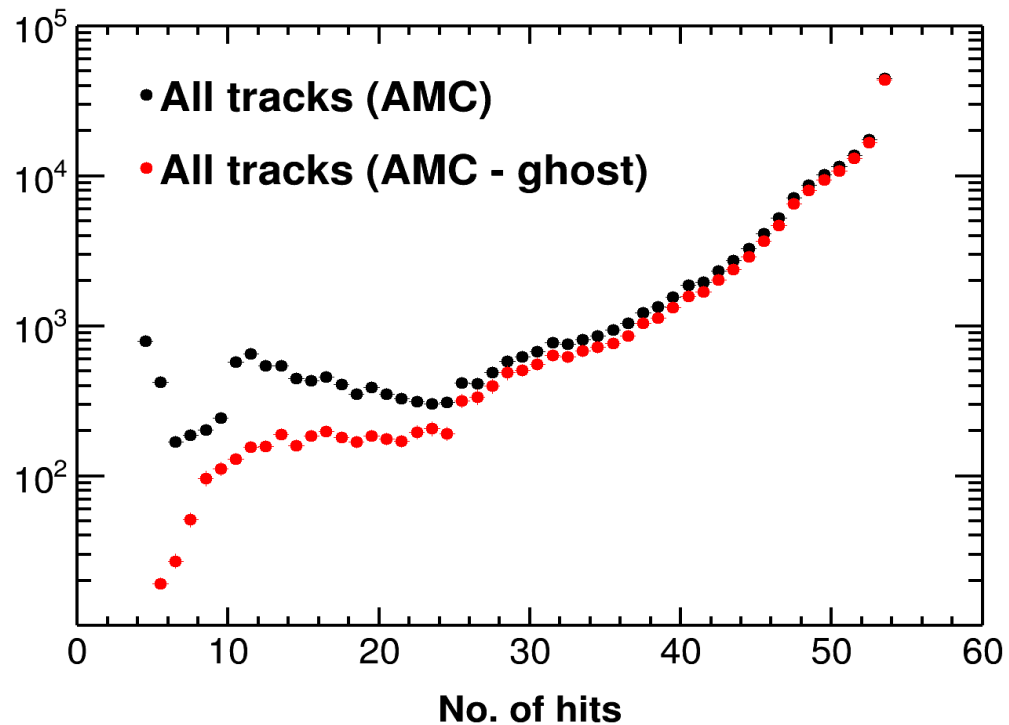
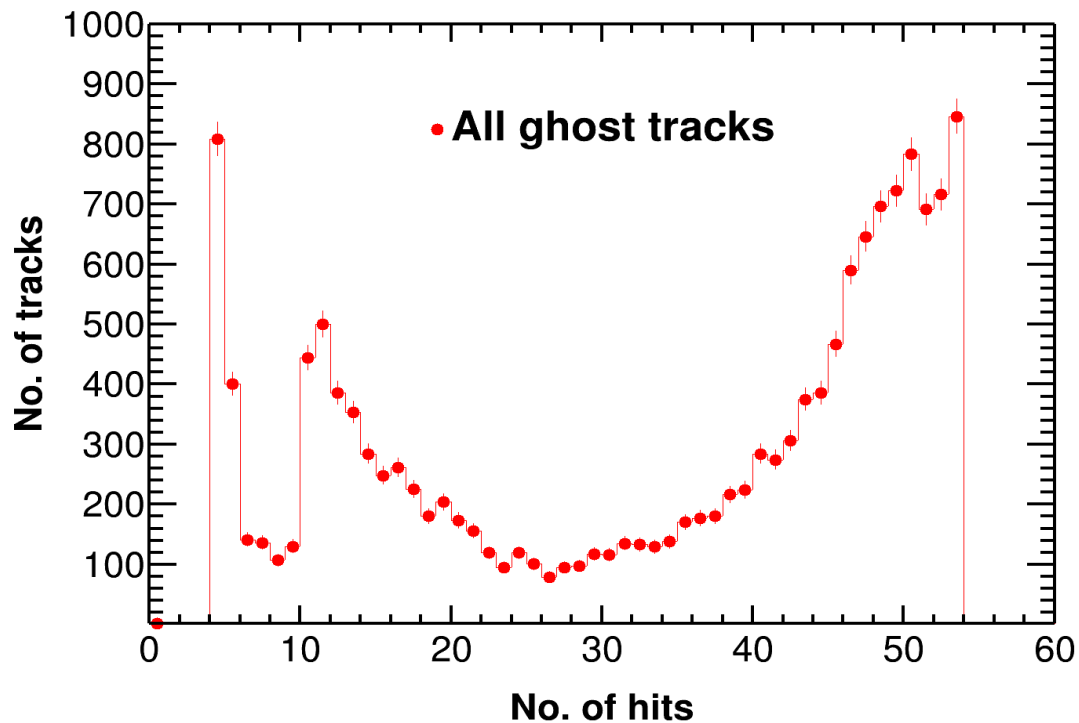
\*Only  $\pi$ ,  $k$ ,  $p$  satisfying the selection criteria

# Transverse momentum and efficiency

100,000 events



# NofH distributions



Most of the ghost tracks have  $>30$  hits

# Ghost tracks for different Number of Hits cut

Bi+Bi at 9.2 GeV (4,000 events)

Cuts	Total No. of MC Tracks*	Total No. of rec Tracks*	Total No. of ghost tracks*	Evts. with ghost tracks*
Basic	166,730	156,034 (~94%)	15,360 (~10%)	2,076 (~51%)
Basic + NofH > 20	166,730	149,229 (~89%)	11,328 (~8%)	1,902 (~48%)
Basic + NofH > 25	166,730	147,627 (~88%)	10,766 (~7%)	1,878 (~47%)

Basically, a NofH cut (>20-25) reduces the tracks (~5%), out of which ~60% are ghost tracks. But the net effect is ~2-3% less ghost tracks

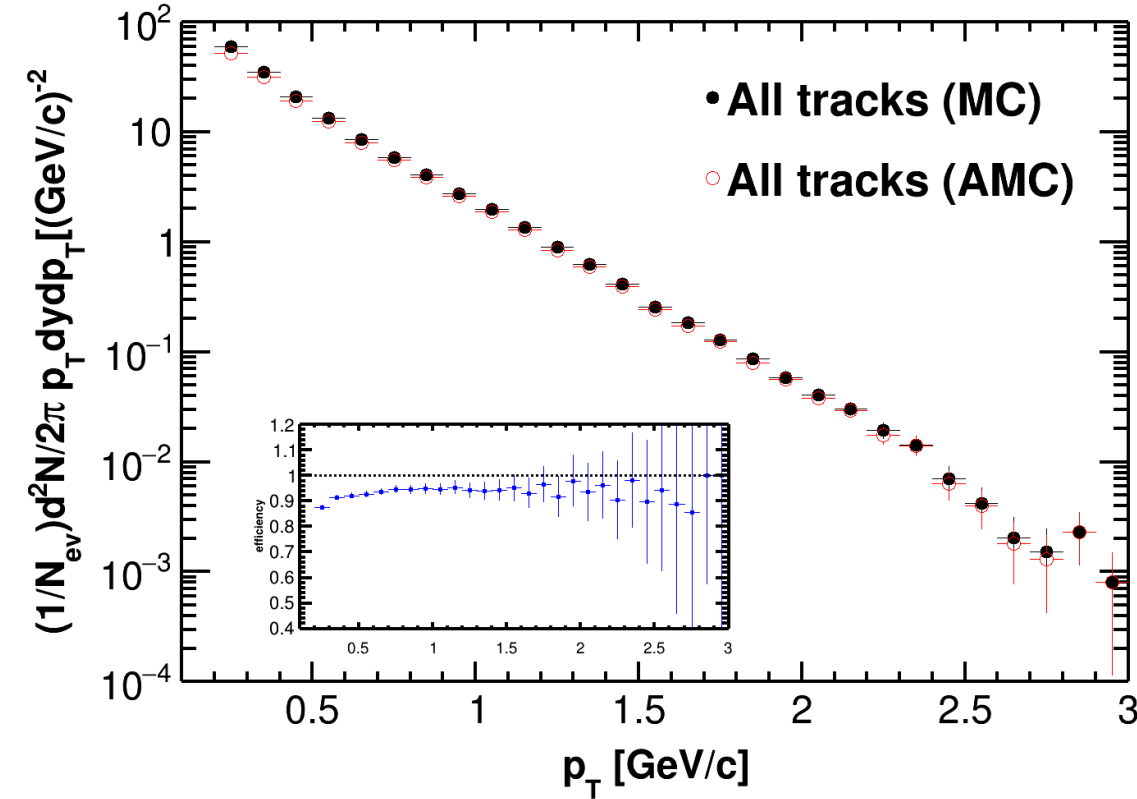


# Ghost tracks for Chi2/NofH, $|V_z|$ and $p_T$ cuts

Bi+Bi at 9.2 GeV (4,000 events)

Cuts	Total No. of MC Tracks	Total No. of rec Tracks	Total No. of ghost tracks	Evts. with ghost tracks
Basic	166,730	156,034 (~94%)	15,360 (~10%)	2,076 (~51%)
Basic + Chi2/NofH < 6	166,730	149,229 (~89%)	11,328 (~8%)	1,902 (~48%)
Basic + $ V_z  < 70$ cm	137,303	129,438 (~94%)	12,810 (~10%)	1,735 (~71%)
Basic + $0.2 \text{ GeV}/c < p_T$	136,631	129,228 (~95%)	11,236 (~9%)	1,882 (~47%)

# Transverse momentum distribution with all cuts



- **Bi+Bi at 9.2 GeV**
- **4,000 events**
- **$|Vz| < 70$  cm (2661 evt)**
- **Only primary (mID)**
- **$p_T > 0.2$  GeV**
- **NofH  $> 25$**
- **Chi2/NofH  $< 6$**

# Ghost tracks with all cuts applied

Bi+Bi at 9.2 GeV

Tot. Evts	Total No. of MC Tracks	Total No. of rec Tracks	Total No. of ghost tracks	Evts. with ghost tracks
4,000	166,730	156,034 (~94%)	15,360 (~10%)	2,076 (~51%)
2,661	112,647	103,487 (~91%)	7,207 (~7%)	1,441 (~54%)

By losing ~34% of the reconstructed tracks the ghost tracks are reduced to half the original, but they still represent ~7% of the tracks.

# Summary

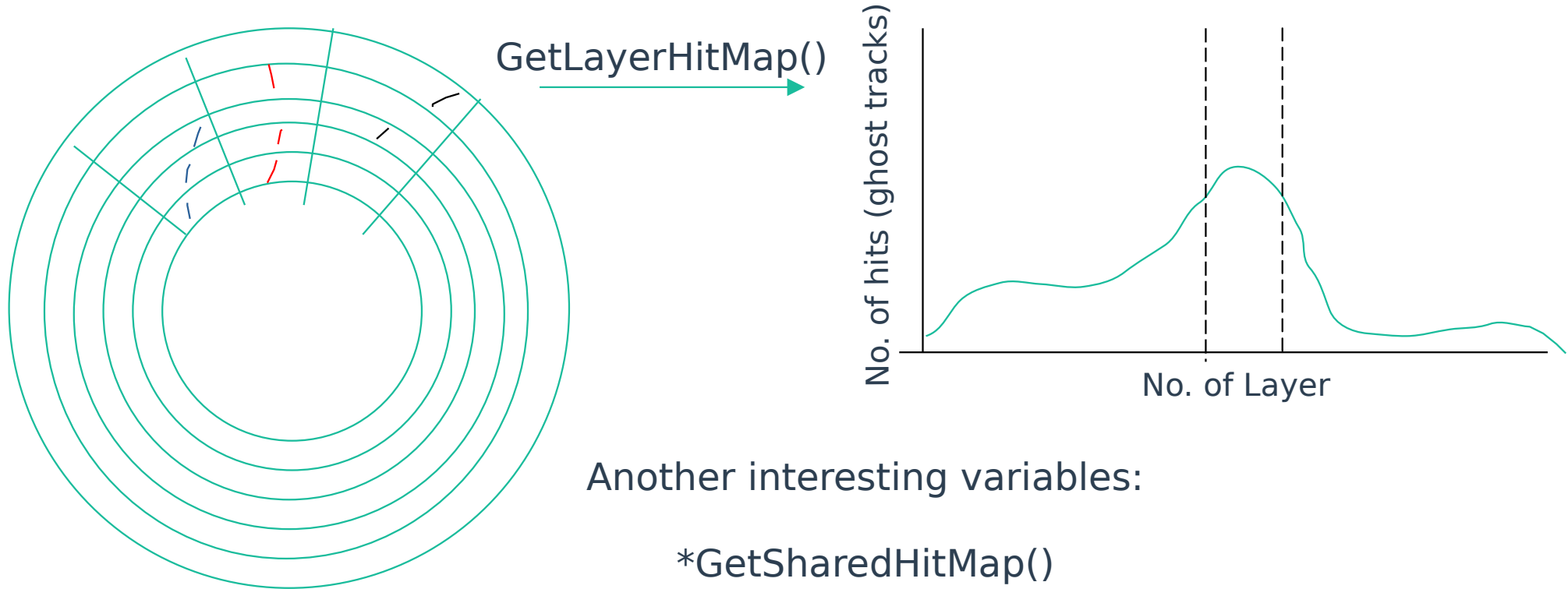
- **Ghost tracks have been analyzed for Bi+Bi collisions at 9.2 GeV (from request 25):**

**Ghost tracks represent ~10% of the reconstructed.**

**A small reduction of the ghost tracks is observed when applying cuts on kinematic variables (+ NofH & Chi2/NofH).**

- **A combination of different cuts allow us to reduce the ghost tracks up to ~7%, but losing up to ~34% of the tracks.**

# Future development



Another interesting variables:

\*GetSharedHitMap()

\*GetEdgeCut()



**Thank you!**