MC 10 TeV Uneven End Cap Distribution

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Distribution for BIB hits paired to an SiTrack



Ratio of BIB SiTrack hits in the -z endcaps to hits in the +z endcaps



Why these distributions are strange and possible explanations

- All three distributions are asymmetrical in the +z and -z end caps.
 - The ratio of asymmetry is consistent throughout the three distributions for each layer
 - The first layer of VX endcaps has a ratio of 0.0085 with 55k-126k total hits in the two endcaps which is far too high to be a statistical fluctuation
- Possibly due to simulation asymmetric BIB
 - Either because only one beam's BIB was simulated to save compute or some other reason
- Possibly from bias when going from AllTracks -> SiTracks
- Possibly due to hits from the truth particles acting as starting points for BIB reconstruction
- Possibly due to a bias in SiTracks reconstruction

Distribution of hits from truth particles paired to SiTracks



Ratio of truth particle hits paired to SiTracks in the -z endcaps to hits in the +z endcaps



Truth particle hits paired to SiTracks

- Might have the same bias, but it is hard to tell due to low counts in the inner and outer endcaps (ranged from 0 to 100 hits per layer)
- A correlation test could be performed if we knew the uncertainty of the hits per layer
- Distribution is somewhat similar in the vertex endcaps
- Photon gun without BIB is not shown because it had zero hits in most layers
 - This also shows that the asymmetry is probably not due to hits from the truth particles acting as starting points for BIB reconstruction

Ratio of all hits in the -z endcap to hits in the +z endcap



Ratio of BIB AllTrack hits paired to -z endcaps to hits paired to +z endcaps



All BIB hits and BIB hits paired to AllTracks

- Hits distribution is significantly more symmetrical between endcaps compared to hits paired to SiTracks
 - Deviation is still higher than what I might expect given that there are 30,000-100,000 hits per layer
 - Asymmetry in hits distribution does not seem to correlate to asymmetry due to hits paired to SiTracks
- Hits paired to AllTracks has the same asymmetry as SiTracks
- Our internal file called "TeV Detector Notes" says that the samples have "full BIB overlay" implying that the BIB was simulated from both beams