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Istituto Nazionale di Fisica Nucleare



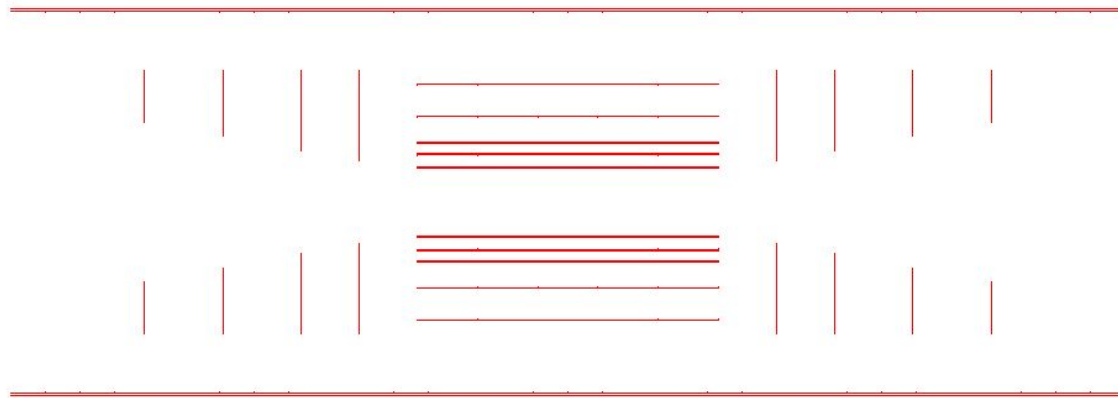
Update on tracker studies with MuSIC detector

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Good point by Federico

- At least **3 layers** are needed in first **~ 5 cm of VXD barrel** to properly reconstruct disappearing tracks (fundamental for Higgsino searches)
- In MUSIC, removing DL, only 2 layers in first ~ 5 cm of VXD barrel
- Proposal: add a layer between 1st and 2nd layers → **MuSIC_v2**



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Today: focusing on MuSIC_v1 geometry



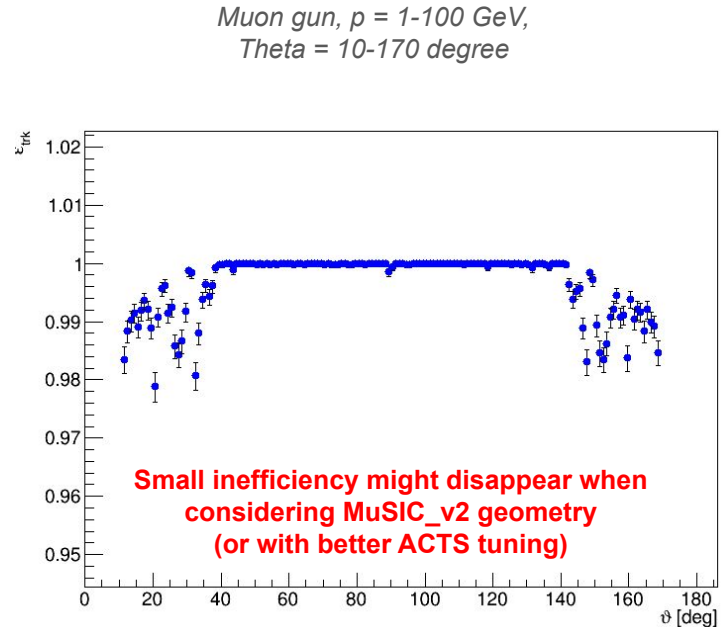
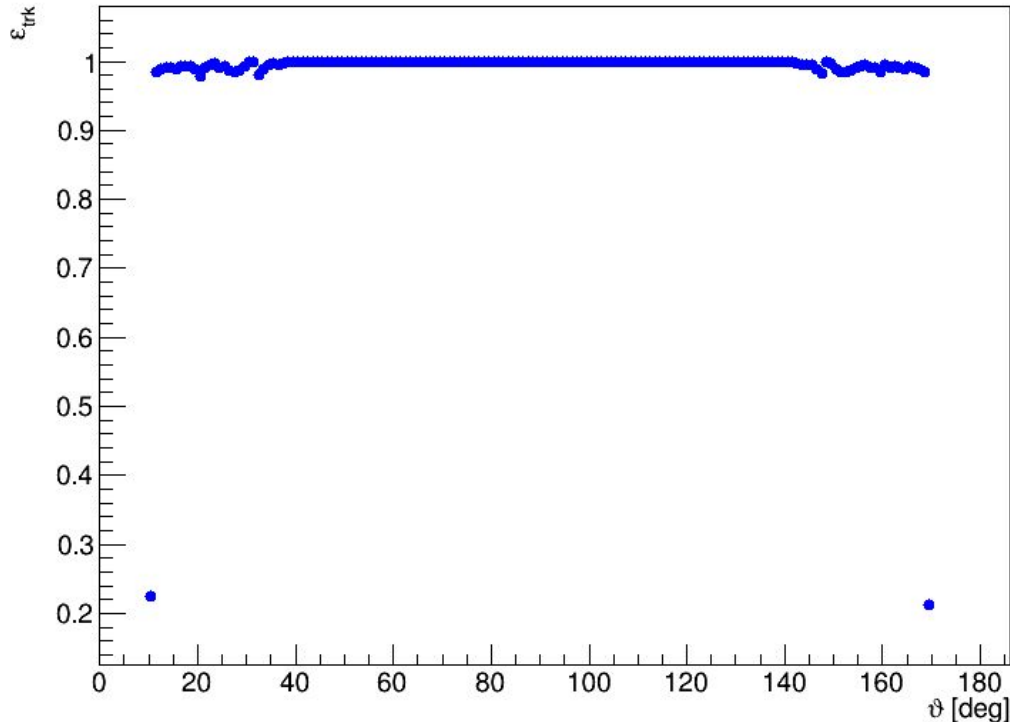
Performance with pgun for MuSIC_v1

- Big sample of 600k muons simulated and reconstructed
- $p = 1-100$ GeV,
theta = 10-170 degree
- Small change in ACTS configuration
 - Holes in reconstruction efficiency disappeared

```
CKFTracking = MarlinProcessorWrapper("CKFTracking")
CKFTracking.OutputLevel = INFO
CKFTracking.ProcessorType = "ACTSSeededCKFTrackingProc"
CKFTracking.Parameters = {
  "CKF_Chi2CutOff": ["10"],
  "CKF_NumMeasurementsCutOff": ["1"],
  "MatFile": [the_args.MatFile],
  "PropagateBackward": ["False"],
  "RunCKF": ["True"],
  "SeedFinding_CollisionRegion": ["3.5"],
  "SeedFinding_DeltaRMax": ["80"],
  "SeedFinding_DeltaRMin": ["2"],
  "SeedFinding_DeltaRMaxBottom": ["80"],
  "SeedFinding_DeltaRMaxTop": ["80"],
  "SeedFinding_DeltaRMinBottom": ["5"],
  "SeedFinding_DeltaRMinTop": ["2"],
  "SeedFinding_ImpactMax": ["3"],
  "SeedFinding_MinPt": ["500"],
  "SeedFinding_RMax": ["150"],
  "SeedFinding_ZMax": ["500"],
  "SeedFinding_RadLengthPerSeed": ["0.1"],
  "SeedFinding_zBottomBinLen": ["1"],
  "SeedFinding_zTopBinLen": ["1"],
  "SeedFinding_phiBottomBinLen": ["1"],
  "SeedFinding_phiTopBinLen": ["1"],
  "SeedFinding_SigmaScattering": ["3"],
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  #   "15", "2", "15", "6", "15", "10", "15", "14",
  #   ],
  "SeedingLayers": [
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    ],
  "TGeoFile": [the_args.TGeoFile],
  "TGeoDescFile": [the_args.TGeoDescFile],
  "TrackCollectionName": ["AllTracks"],
  "TrackerHitCollectionNames": ["VXDBarrelHits", "ITBarrelHits", "OTBarrelHits", "VXDEndcapHits", "ITEndcapHits", "OTEndcapHits"],
  "CaloFace_Radius": ["1500"],
  "CaloFace_Z": ["2307"]
}
```

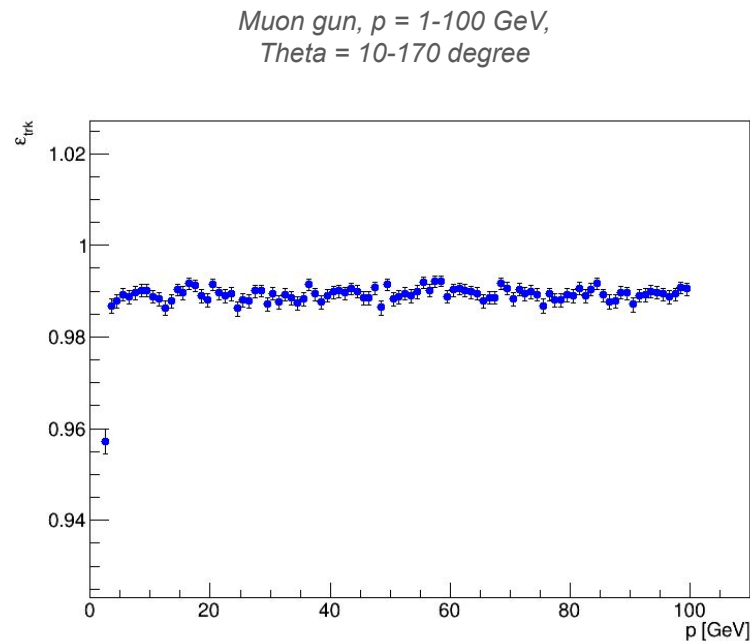
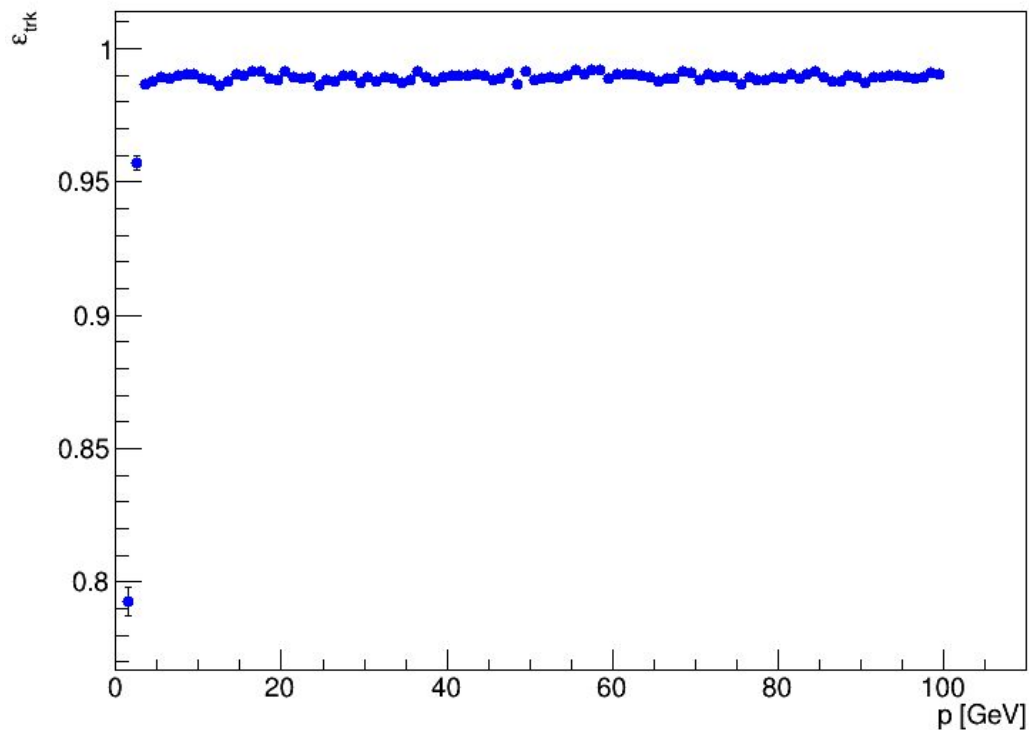
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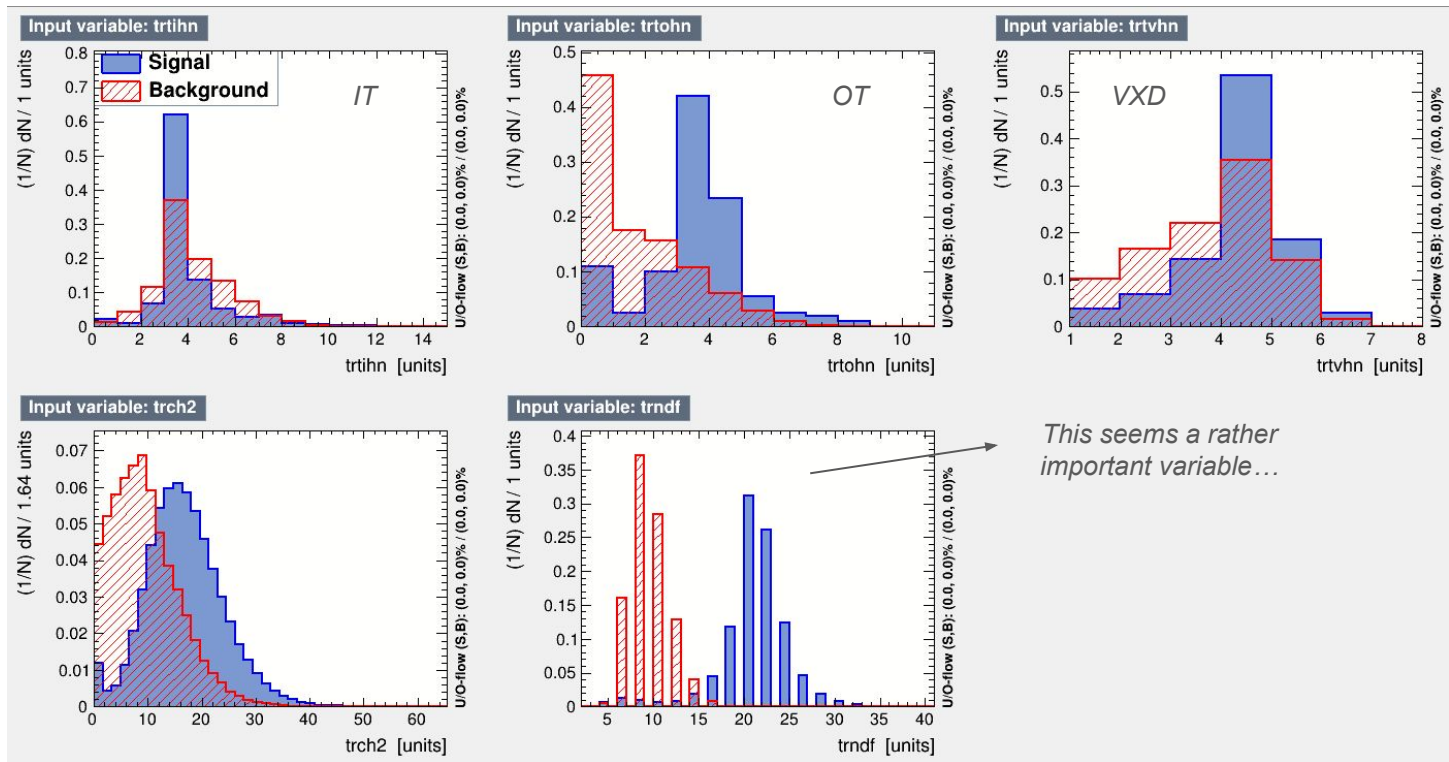


What about BIB?

- Performed simulation and reconstruction of 1 BIB event
 - Incoherent pairs is WIP
- Before *Refit*, ~650k tracks are found
 - All 4 layers have been used for seeding
- See if we can separate BIB tracks from signal ones

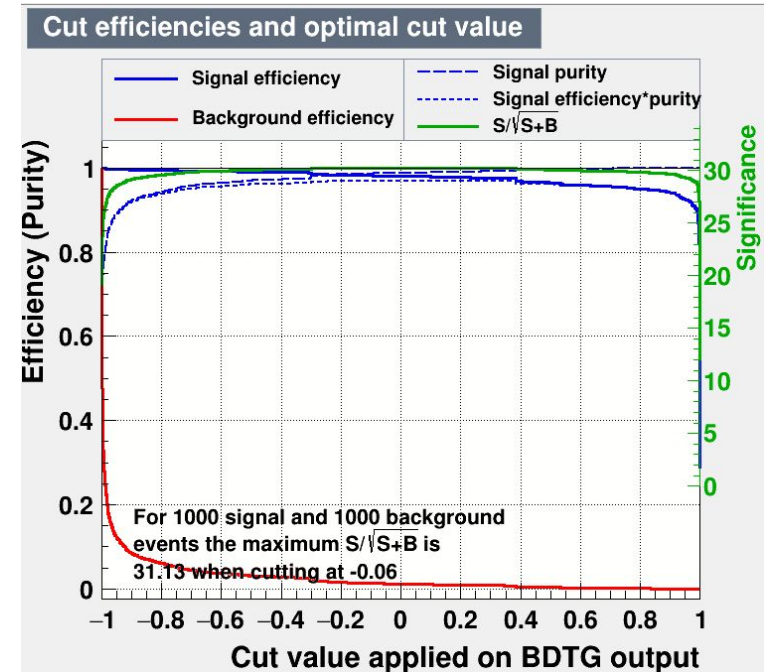
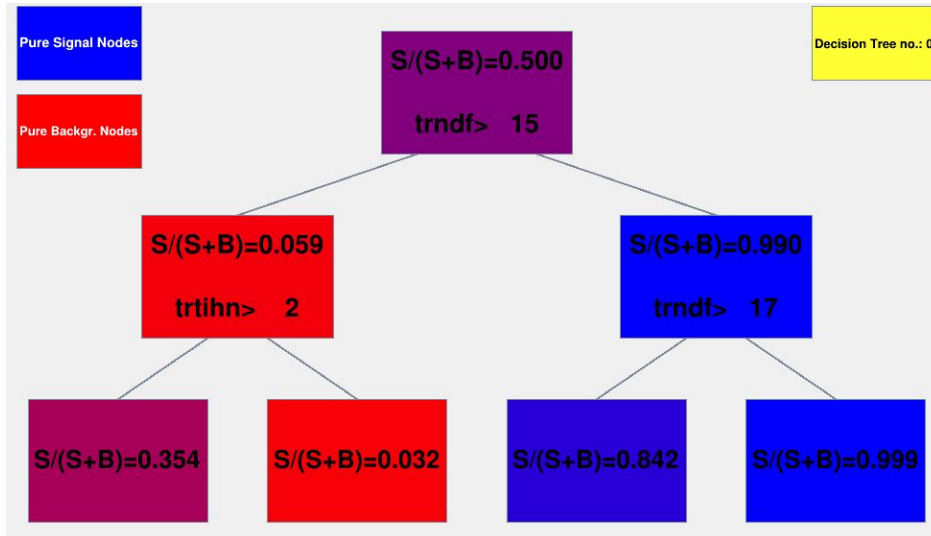
What about BIB?

- Checking number of hits in sub-detectors, χ^2 and ndf



What about BIB?

- Quick implementation of BDTG using TMVA to perform track classification



Next steps

- Since this approach seems valid, we are writing a processor to filter tracks based on this classifier
 - Doesn't help in reducing number of tracks “online”, but might help in separation afterwards
- Redo everything for MuSIC_v2 geometry
- Start reconstructing events **with** BIB