Analysis using SUSY D3PDs & Effect of pileup on MET performance

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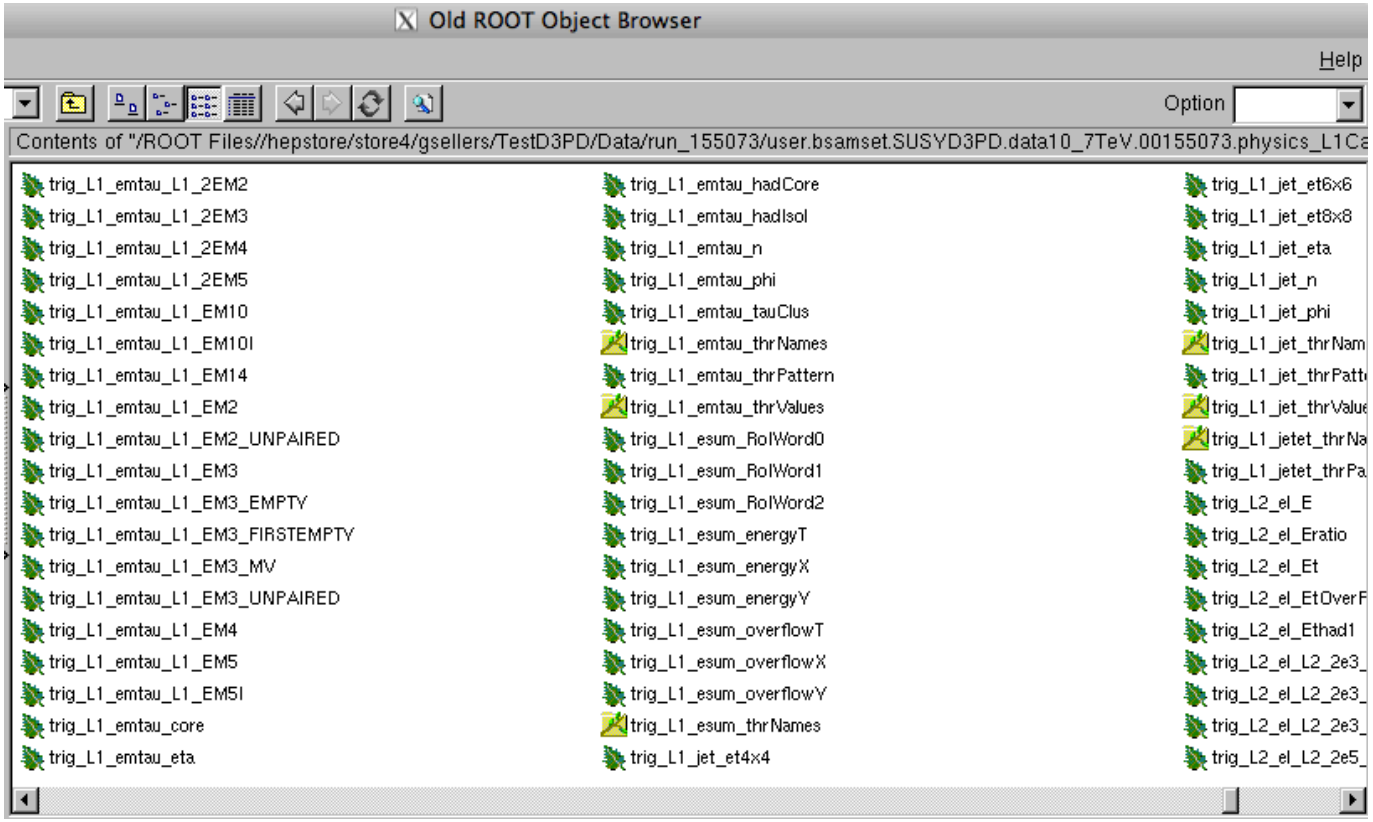
Introduction to D3PDs

- D3PDs are a type of dataset that predominantly contain a collection of flat ntuples
- Produced using ‘D3PDMaker’ software
- Currently produced directly from AODs
  - Soon to be AOD -> D2PD -> D3PD

Introduction to D3PDs

- Have ~1500 branches! - (some documentation)



D3PDs continued…

- Uploaded onto the grid after production
- Can be read directly by ROOT for analysis
- Fast and efficient
- Typical sizes:

	D3PD	AOD
Data	~16kb/event	~100kb/event
MC	~70kb/event	

D3PD Reader

- Also the option for using a “D3PD Reader”
  - Purpose made to improve usability of D3PDs
- Possible advantages include
  - Dynamic loading of leaves (accounts for change in content)
  - Read files in parallel
  - Useful functions for specific analysis tasks
- Disadvantage
  - Relying on central production
  - Maybe doesn’t suit each need

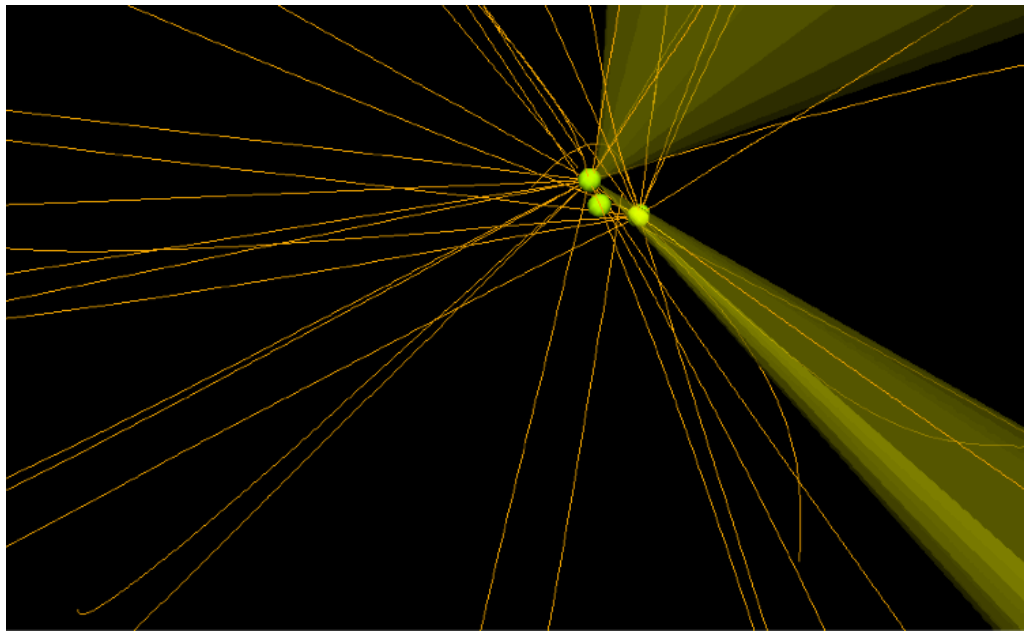
The Effects of Pile-up

- The LHC will see high levels of pile-up as luminosity increases
- Pile-up is the occurrence of multiple p-p interactions in the same bunch crossing
- Hinders successful reconstruction of events
- Already seeing presence of pile-up in first data

The Effects of Pile-up

- Identifying pile-up involves looking for extra reconstructed primary vertices in an event

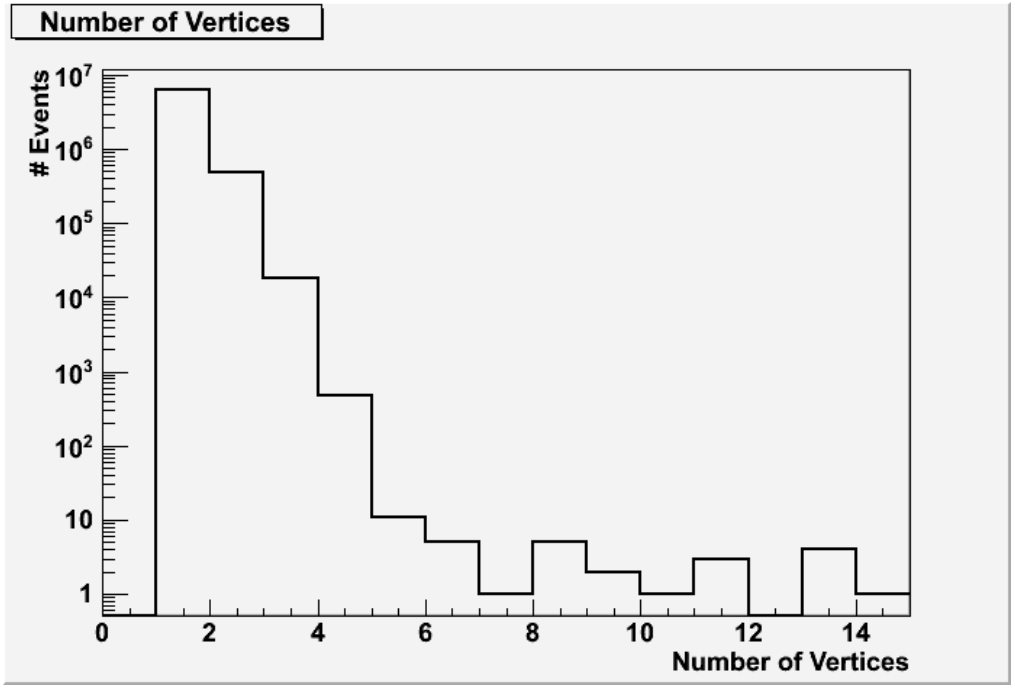
- Also important to distinguish position of vertex to help identify real pile-up



Datasets

- From the May reprocessing:
  - user.bsamset.SUSYD3PD.data10_7TeV.00155073.physics_L1Calo.merge.AOD.r1299_p161.000503.V1
  - user.bsamset.SUSYD3PD.data10_7TeV.00155112.physics_L1Calo.merge.AOD.r1299_p161.000503.V1
  - user.bsamset.SUSYD3PD.data10_7TeV.00155116.physics_L1Calo.merge.AOD.r1299_p161.000503.V1
  - user.bsamset.SUSYD3PD.data10_7TeV.00155160.physics_L1Calo.merge.AOD.r1299_p161.000503.V1

Number of Vertices

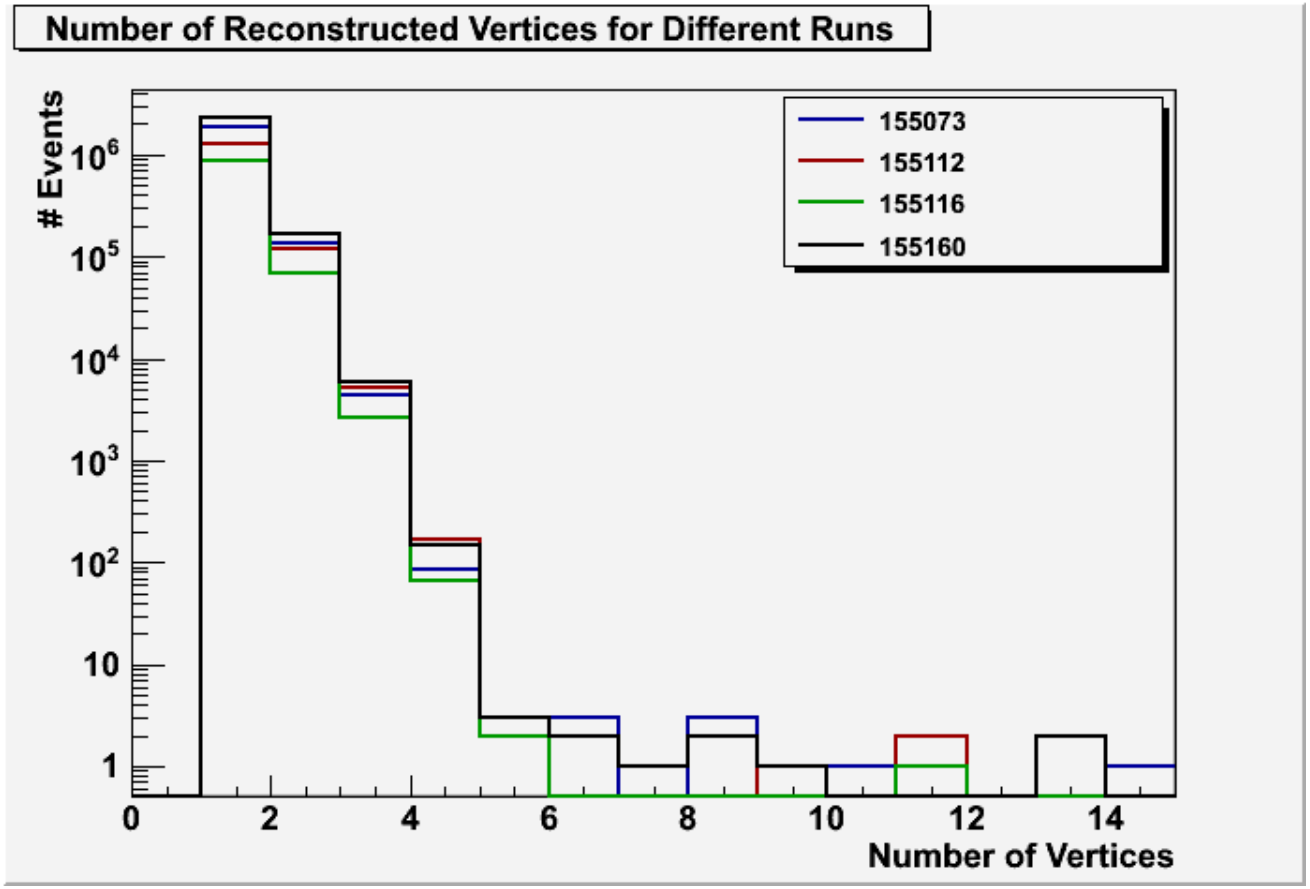


Require both $N_v > 1$ and $N_v^{trk} > 4$ for multiple well reconstructed vertices

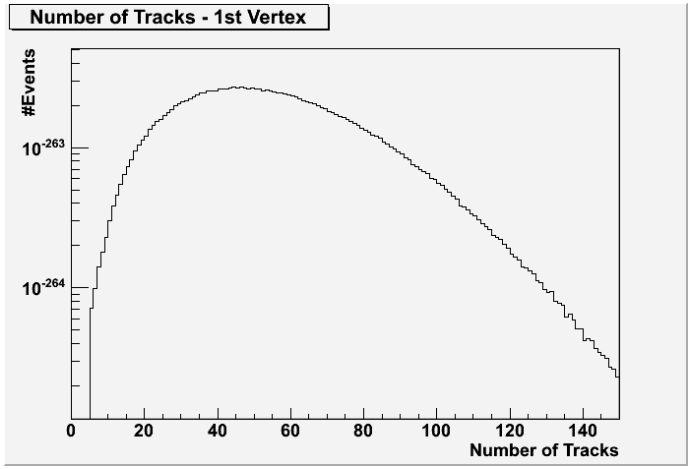
~ 10% of events involve pile-up like events in these runs (from Apr-May)

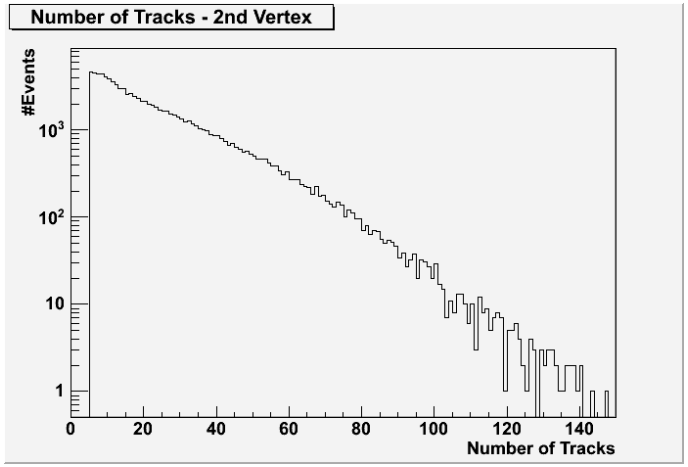
Total	**7 094 072**	
1 Vertex	6 396 851	90.17%
2 Vertex	490 285	6.91%
3 Vertices	182 320	2.57%
>3 Vertices	24 616	0.35%

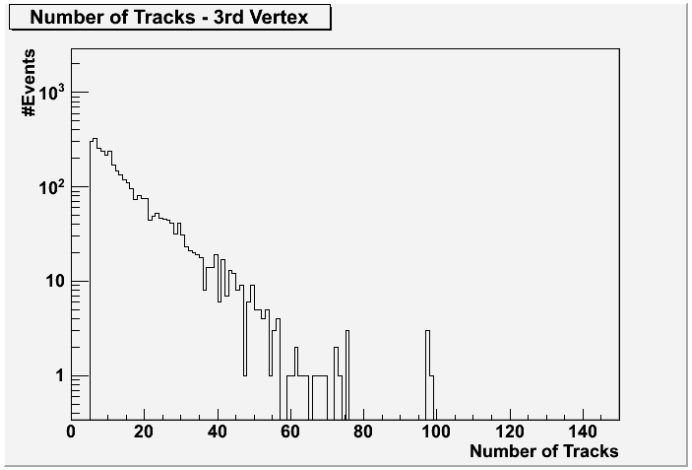
Number of Vertices - various runs

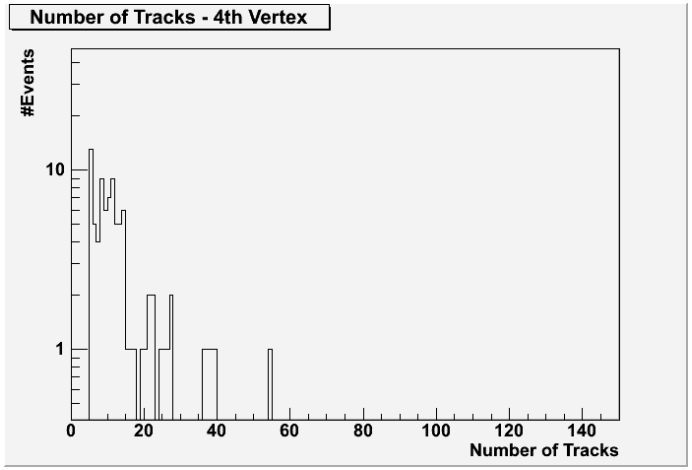


Number of Tracks – a comparison

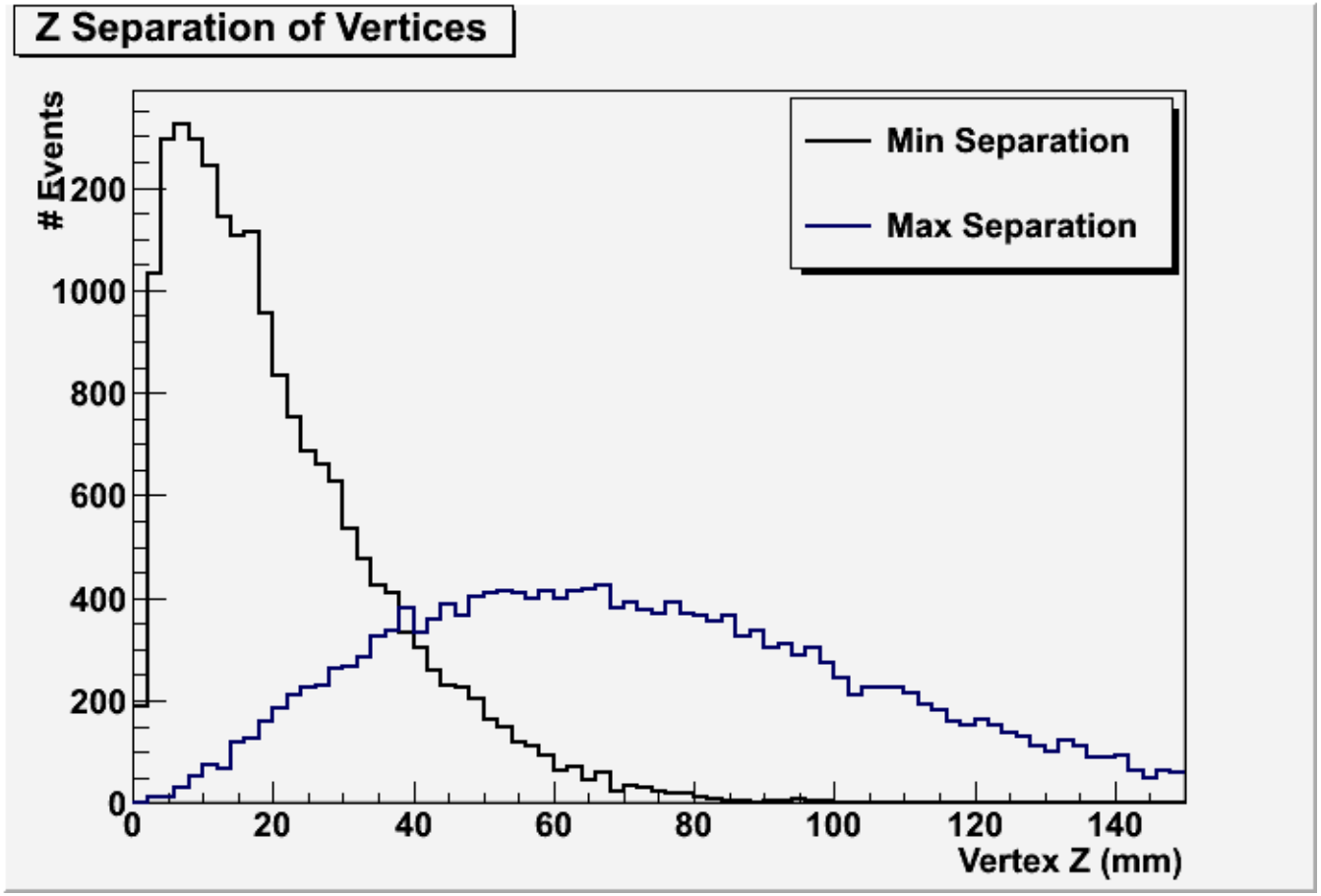






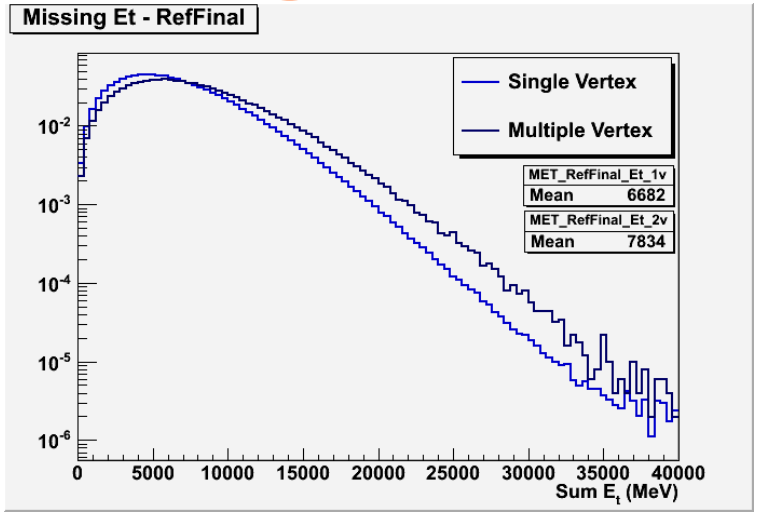


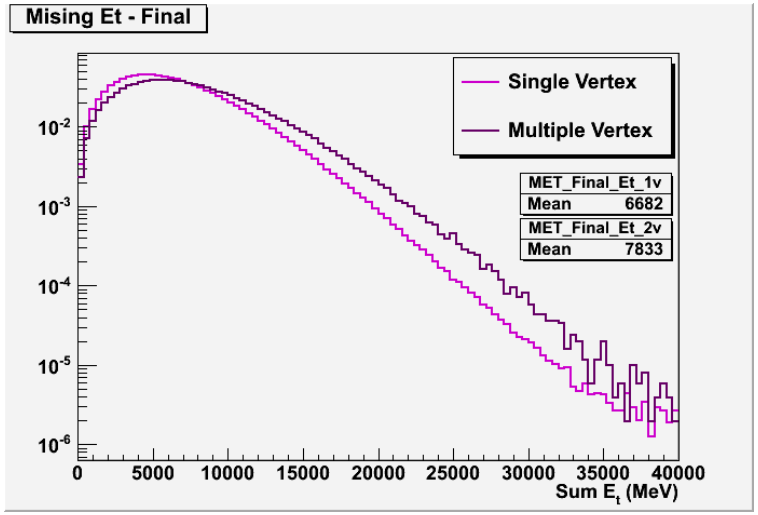
Separation of Vertices



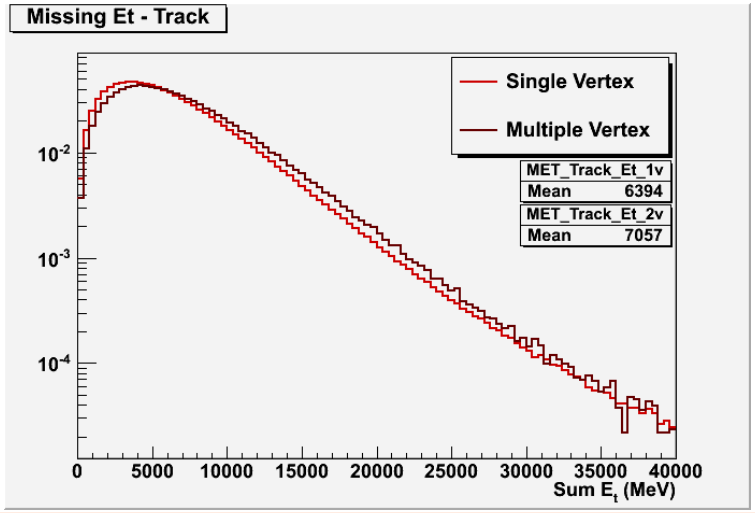
Minimum and maximum separation of vertices in $N_v \geq 3$ events

Missing Et



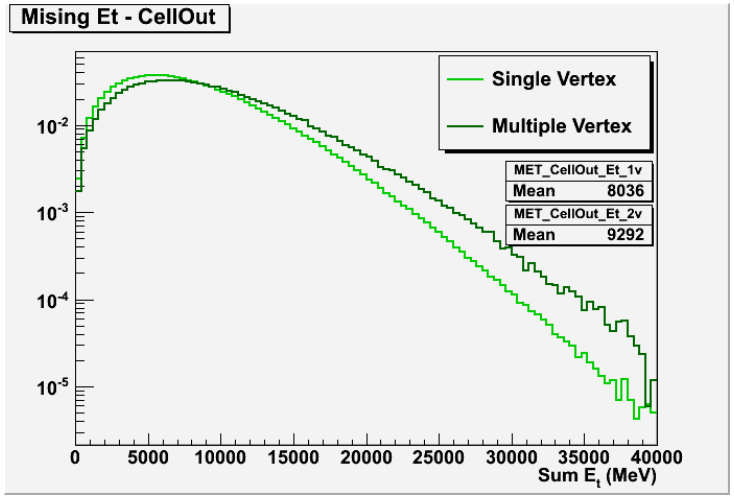


Different Missing Et Definitions (RefFinal, Final, Track) compared for $N_v = 1$ & $N_v > 1$ cases

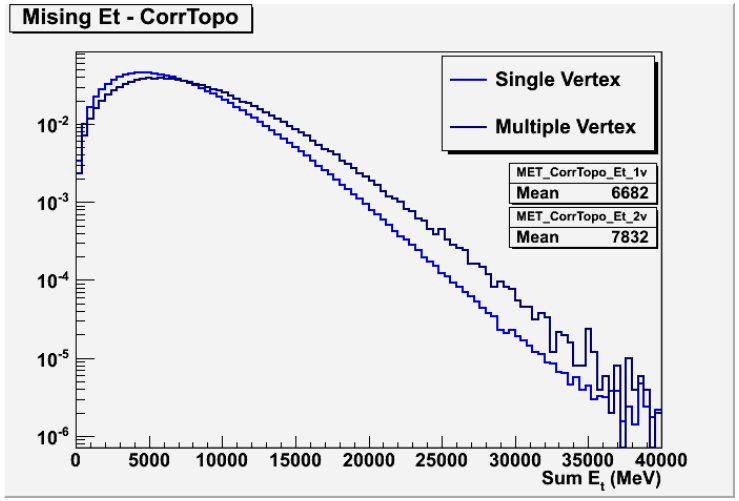


RefFinal, Final see discrepancy – Track based does not

Missing Et



Component of RefFinal CellOut



Component of Final CorrTopo

Summary

- D3PDs used to study pile-up events
- Agreement with previous results
- Relatively even spread of vertex separations
- Missing Et differs between pile-up and non pile-up events