Summary

- Looked at Jetfitter performance in HI MC (same samples as ours) in terms of
  - Fraction (# of jets with JF vertices/total selected b-jets)
  - Purity (Fraction of tracks associated at JF vertices that are from B/D decay)

With different min pT selections on tracks.

- Looked at vertex resolution as a function of number of tracks at vertex, with different min pT selections on tracks.
- Looked at vertex resolution as a function of b hadron pT and decay length.
- Looked at inputs to higher level taggers for different centrality with different min pT.
- Planned to train using larger samples (inclusive dijet sample?)

Integrated Fraction/Purity vs different pT cut

JetFitter - reconstructed vertices

Table 2: Fractions of selected *b*-jets with JetFitter vertices reconstructed in different topologies, their purity and the average generated, $< N_{\mathrm{Bdec}} >$, and reconstructed, $< N^{\mathrm{JF}}_{\mathrm{Bdec}} >$, *B*-hadron charged decay multiplicity for JetFitter decay chains in simulated $t\bar{t}$ events.

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	JF Vert. All	≥1 Single Trk 0 Multi Trk	0 Single Trk 1 Multi Trk	≥1 Single Trk 1 Multi Trk	2 Multi Trk	≥3 Multi Trk
Fraction	0.893	0.147	0.414	0.227	0.102	0.004
Purity	0.846	0.684	0.894	0.825	0.839	0.769
$< N_{\mathrm{Bdec}} >$	4.9	3.8	4.8	5.1	6.3	7.3
$< N^{\mathrm{JF}}_{\mathrm{Bdec}} >$	3.0	1.1	2.9	3.7	4.9	6.0

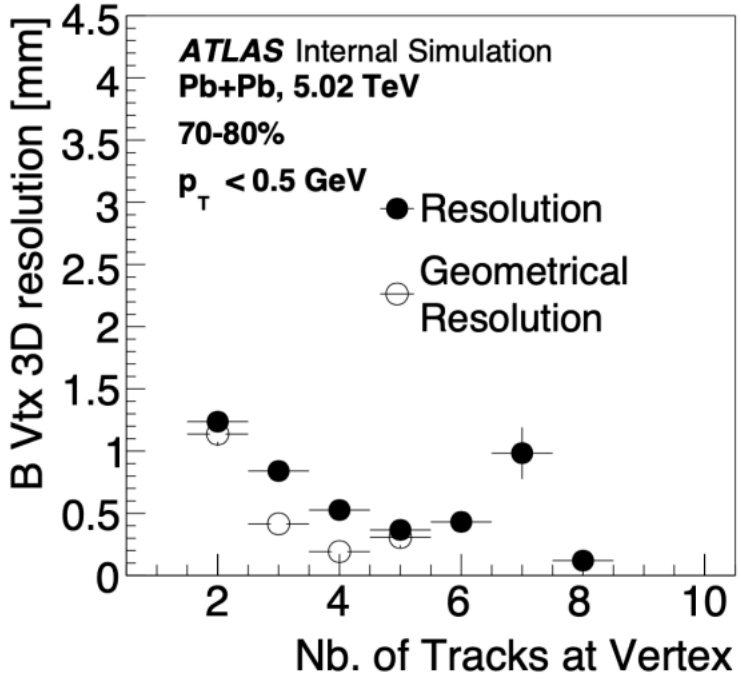
	pT > 0.5 GeV	pT > 1 GeV	pT > 2 GeV
Fraction/Purity **70-80%**	0.80 / 0.91	0.78 / 0.93	0.73 / 0.94
Fraction/Purity **30-40%**	0.83 / 0.76	0.80 / 0.86	0.72 / 0.92
Fraction/Purity **0-10%**	0.92 / 0.34	0.82 / 0.62	0.69 / 0.86

Fractions of selected b-jets with JetFitter vertices reconstructed with different min pT of tracks

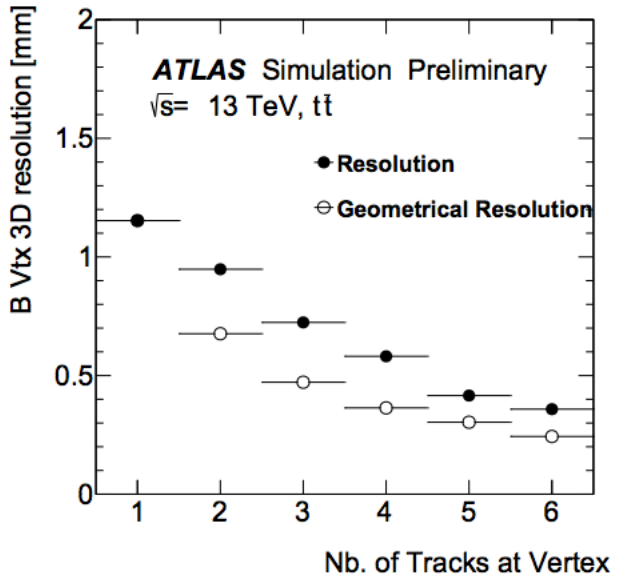
- pT > 0.5 GeV is the default in JetFitter
- Lower integrated efficiency is observed in peripheral.
- Very low purity is observed in central.

Vertex Resolution

(JetFitter) Vertex resolution



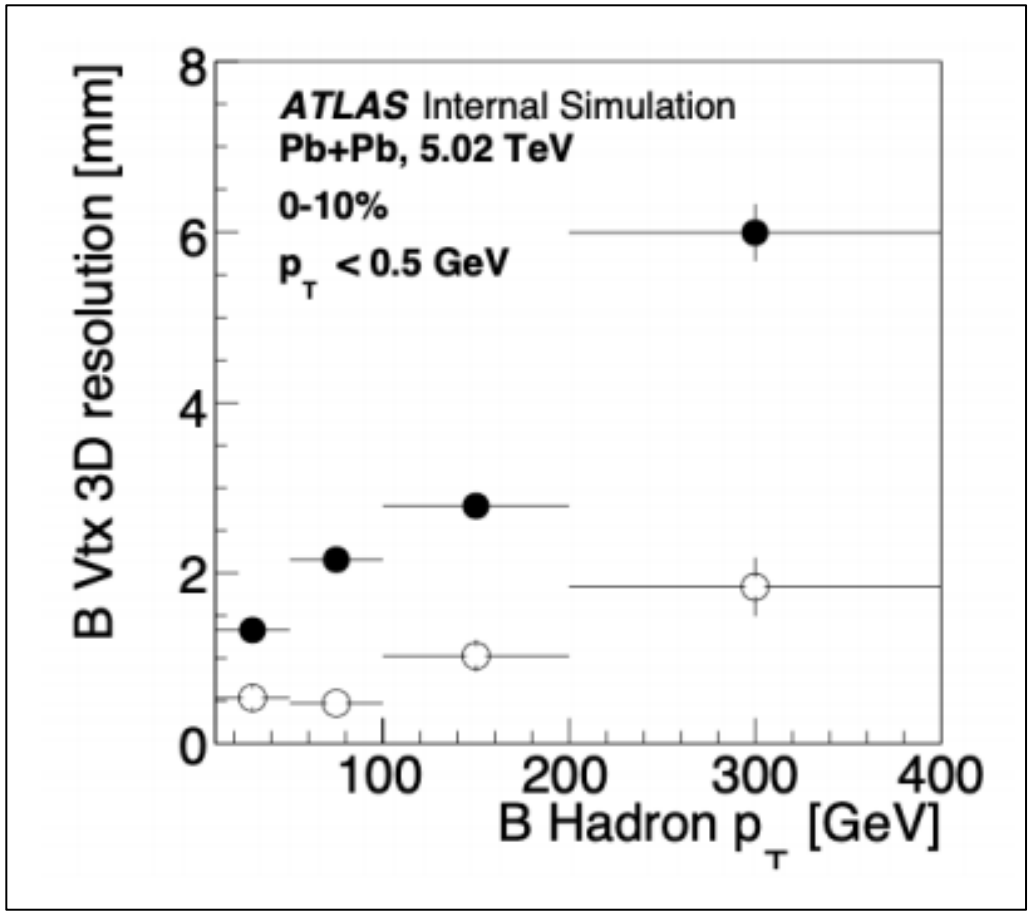
- **Resolution** - RMS of the difference between true and reco. vertex position
- **Geometrical Resolution** - as above, but with the restriction that the vertex was reconstructed only with the tracks that have truth links (best case scenario)

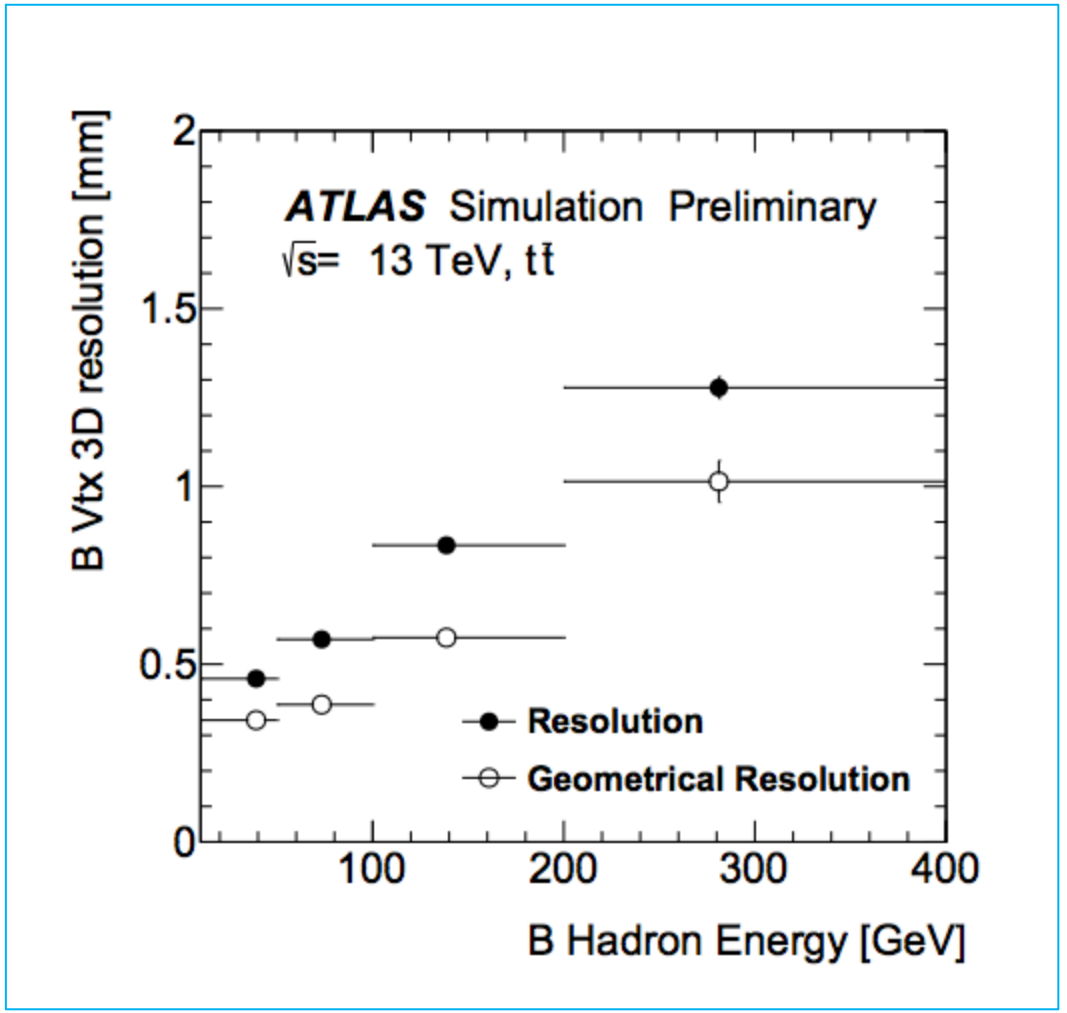


Performance Paper: https://cds.cern.ch/record/2645405/files/ATL-PHYS-PUB-2018-025.pdf

- Similar resolution vs tracks at vertex relation for peripheral as the one in JF performance paper.

Vertex Resolution





- Both observed worse resolution with higher b hadron energy.
- Central events they looked at overall had a worse resolution.
- This is consistent with the worse resolution in higher pT jet we observe: larger energy, longer decay length->worse resolution.