IDR Report

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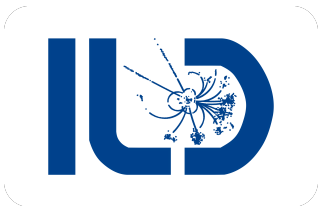

List

Progress for $t\bar{t}$ analysis so far:

- $b\bar{b}$ and $t\bar{t}$ polar angle distribution.
- Calculation of A_{fb} value.
- Calculation of final and partial efficiency.
- Vertex Restorer performance comparison.
- dEdx distribution and kaon identification.
- α and $d0$ value adaptation to the new definition.
- purity calculation (investigation on purity loss)
- tau isolated lepton efficiency loss.

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Environment

Setting

- ILCSoft v02-00-02
- Used yyxylv and yyxyev events (eliminated isolated tau)
- Polarization of eLpR is used.

Deviation from DBD

- Usage of Isolated Lepton Tagger instead of LAL Lepton Finder.
  - Isolated Lepton Tagger focuses on electron and muon ID, eliminating tau through the process.
  - Individual final efficiencies for electron, muon and tau are 28%, 31%, 4%, respectively.
- Definition of Z_0 and D_0 has been changed due to vertex smearing.

Cuts

Basic selection cuts:[1]

- Lepton cut: Iso.Lep. > 5 GeV
- Hadronic mass: $180 < M_{Had} < 420$
- $btag1 > 0.8$ or $btag2 > 0.3$
- Thrust: $thrust < 0.9$
- Top1 mass: $120 < m_{t1} < 270$
- W1 mass: $50 < m_{W1} < 250$

Lorentz Gamma cuts:

- $\gamma_t^{had} + \gamma_t^{lep} > 2.4$
- $\gamma_t^{lep} < 2.0$

b-quark Momentum cuts:

- $|p|_{had} > 15$ GeV

[1] Main distinct algorithm to distinguish top and anti-top.

Polar Angle Distribution (l5)

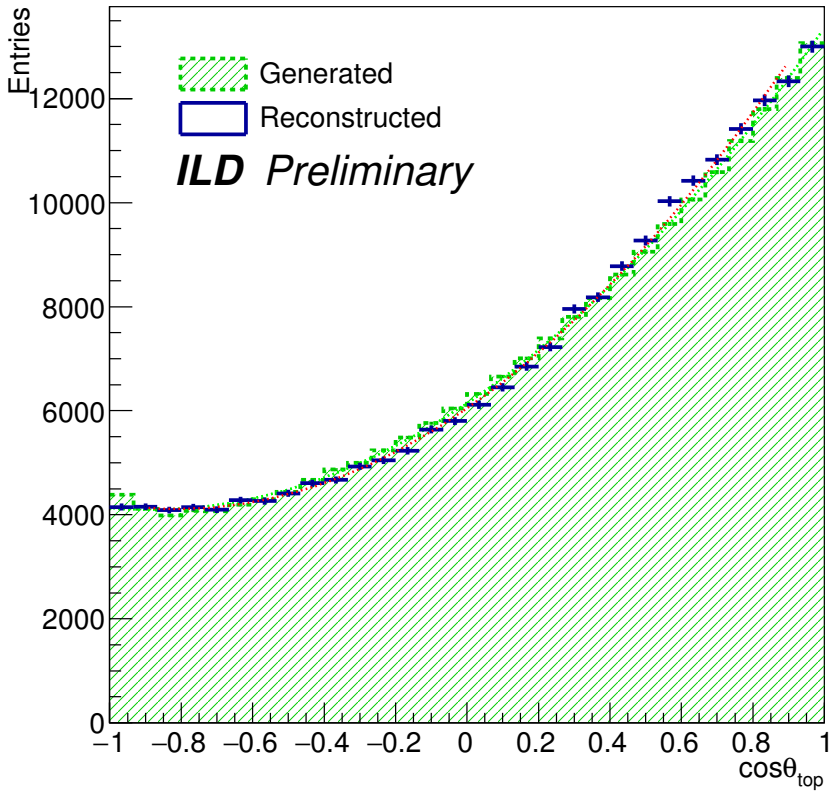


Figure: top polar angle

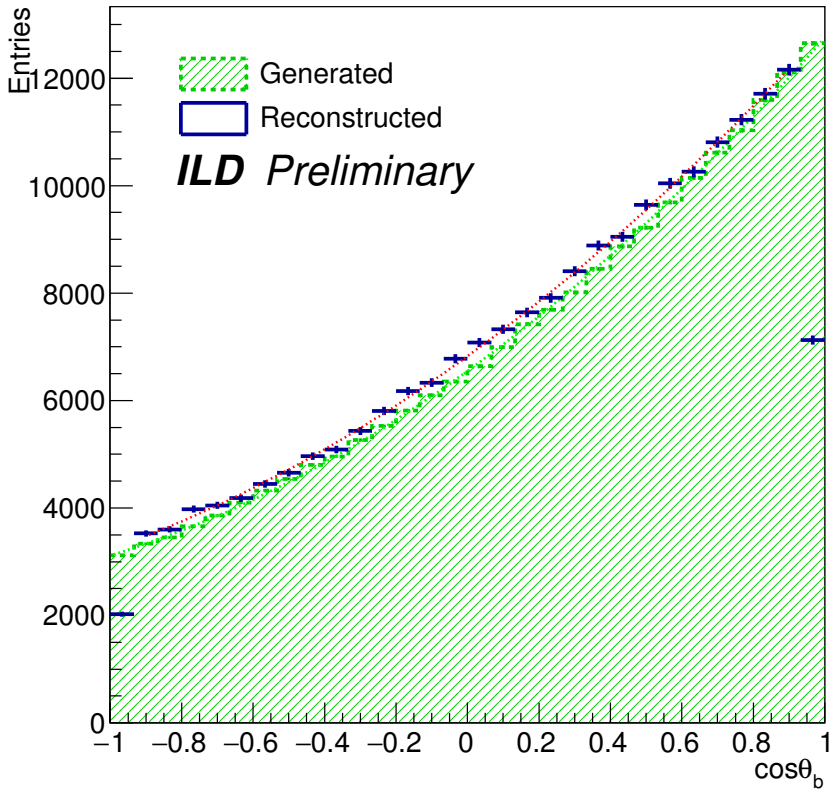


Figure: b polar angle

Afb gen	0.328288	N: 1351248
Afb reco	0.338966	N: 210334
Final efficiency	31.1318%	

Polar Angle Distribution (s5)

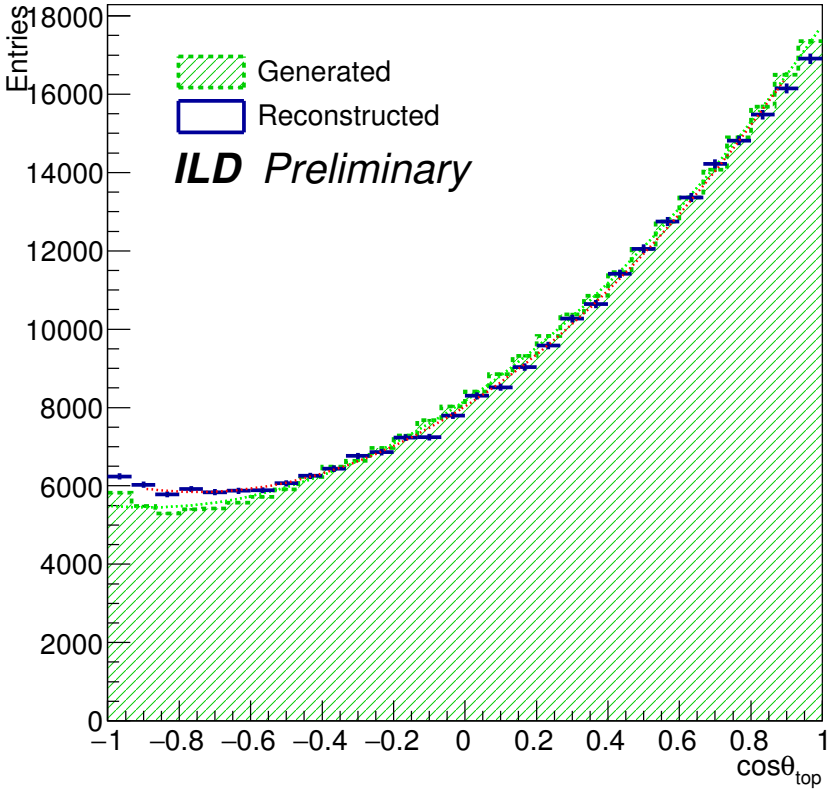


Figure: top polar angle

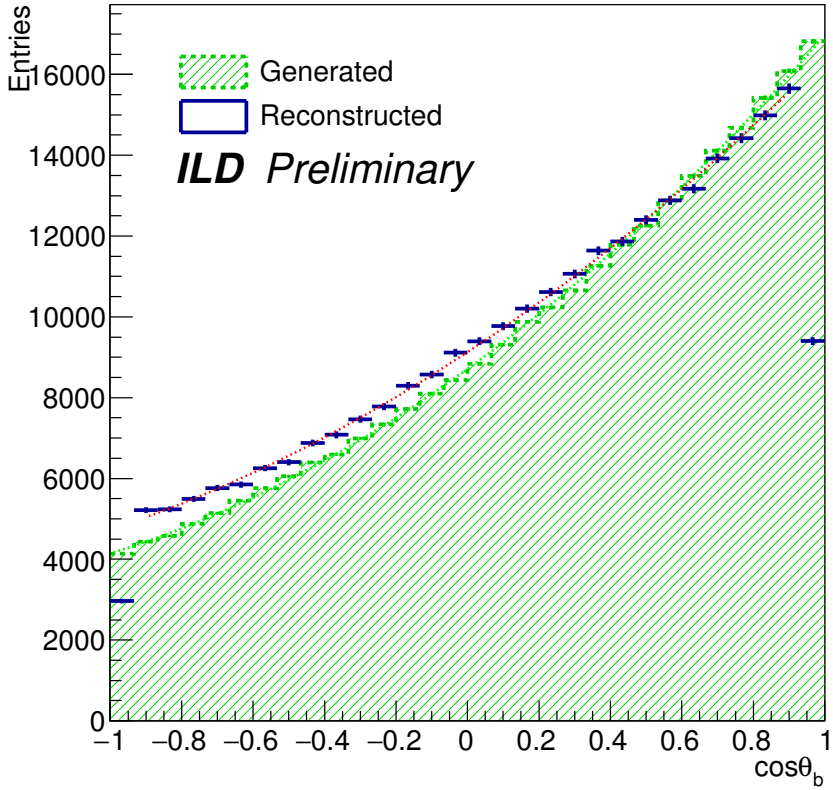


Figure: b polar angle

Afb gen	0.328233	N: 1418738
Afb reco	0.31198	N: 279733
Final efficiency	39.4341%	

Basic Selection Efficiencies

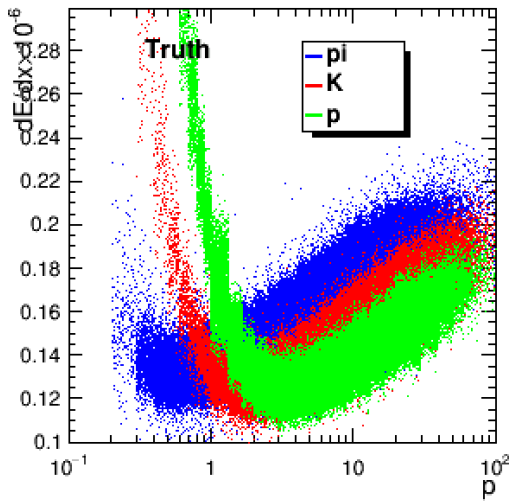
Large Detector

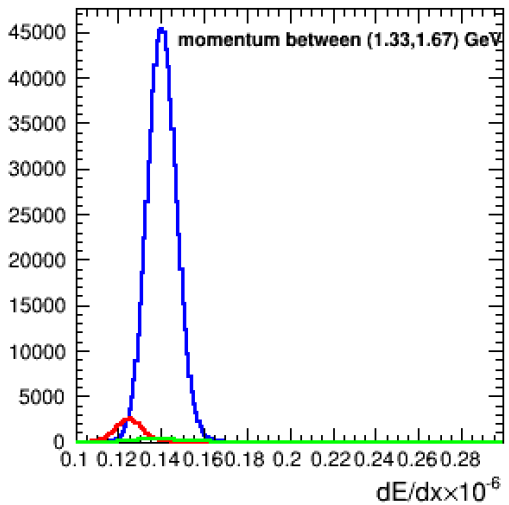
nEvents	697476	(100.%)
after lepton cuts	645418	(92.5%)
after btag cuts (0.8 & 0.3)	569699	(81.7%)
after thrust cut	569699	(81.7%)
after hadronic mass cut	549885	(78.8%)
after reco T & W mass cut	516152	(74.0%)

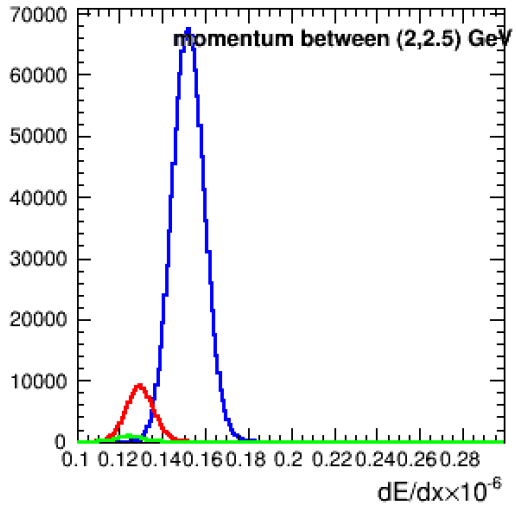
Small Detector

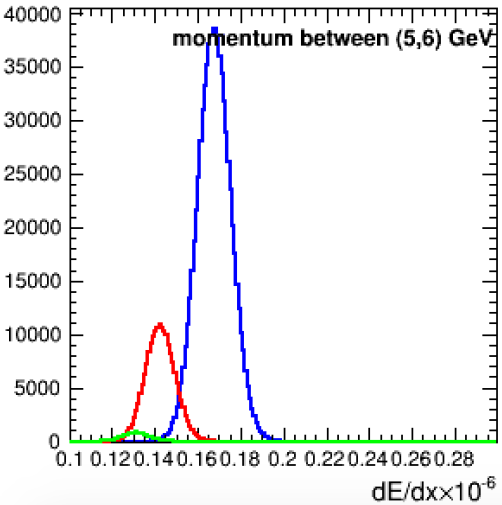
nEvents	732456	(100.%)
after lepton cuts	677523	(92.5%)
after btag cuts (0.8 & 0.3)	604902	(82.6%)
after thrust cut	604902	(82.6%)
after hadronic mass cut	584523	(79.8%)
after reco T & W mass cut	548214	(74.8%)

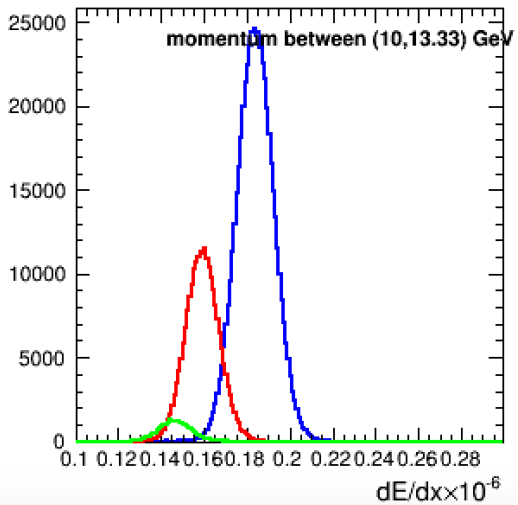
dEdx Distribution

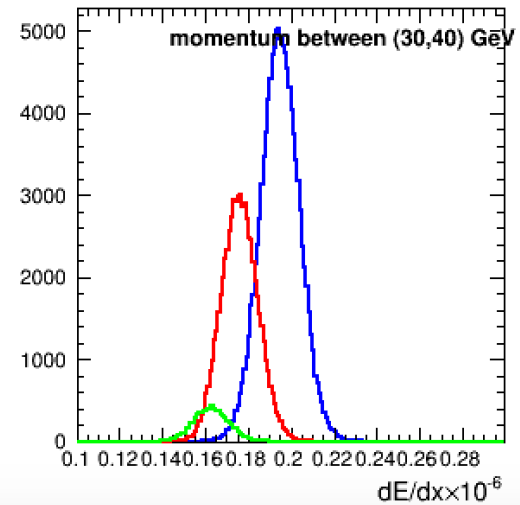












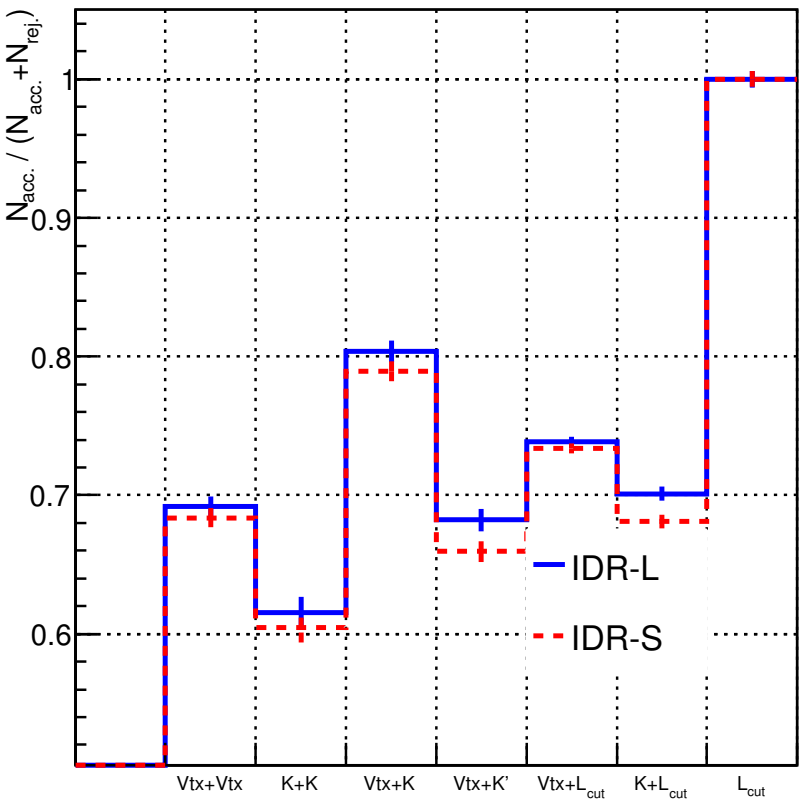
Efficiency and p-value

Calculation of p and q values

$$\left.\begin{aligned} N_{acc} &= Np^2 + Nq^2 \\ N_{rej} &= 2Npq \\ 1 &= p + q \end{aligned}\right\} \quad N_{corr} = N_{acc} \cdot \frac{p^2}{p^2 + q^2}$$

where N is total number of events, N_{acc} and N_{rej} are number of events that were accepted and rejected, respectively. p and q values represents probabilities of events being accepted and rejected.
Solving this equation will give us back both p and q, thus improving our results on A_{fb}.

Efficiency and p-value



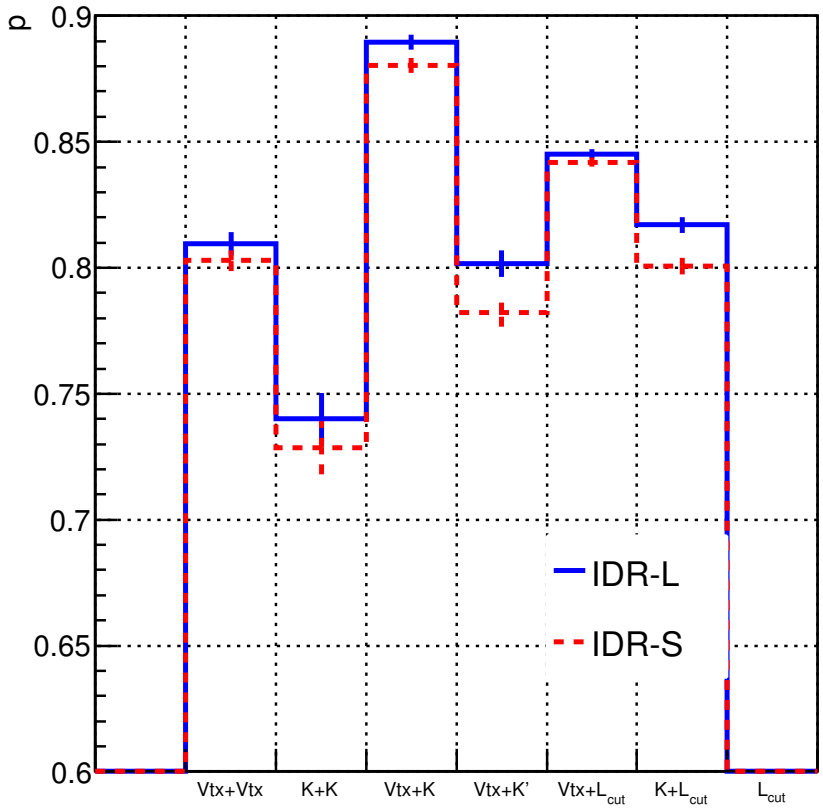


Figure: p for correct charge selection and its fractions on number of events.

Efficiency and p-value

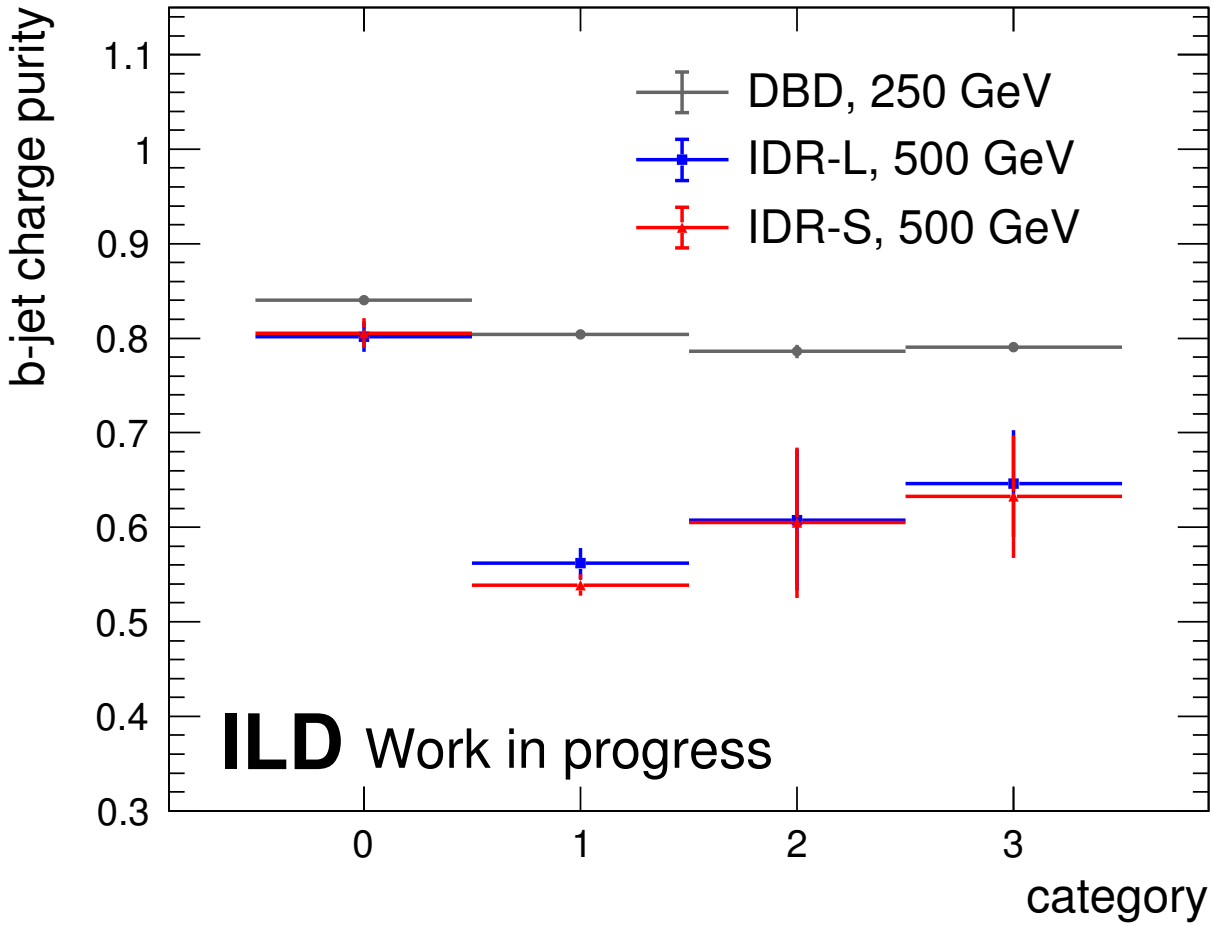


Figure: p for correct charge selection for DBD bbar (from Adrian's slide).

Charge Purity Distribution (Small and Large)

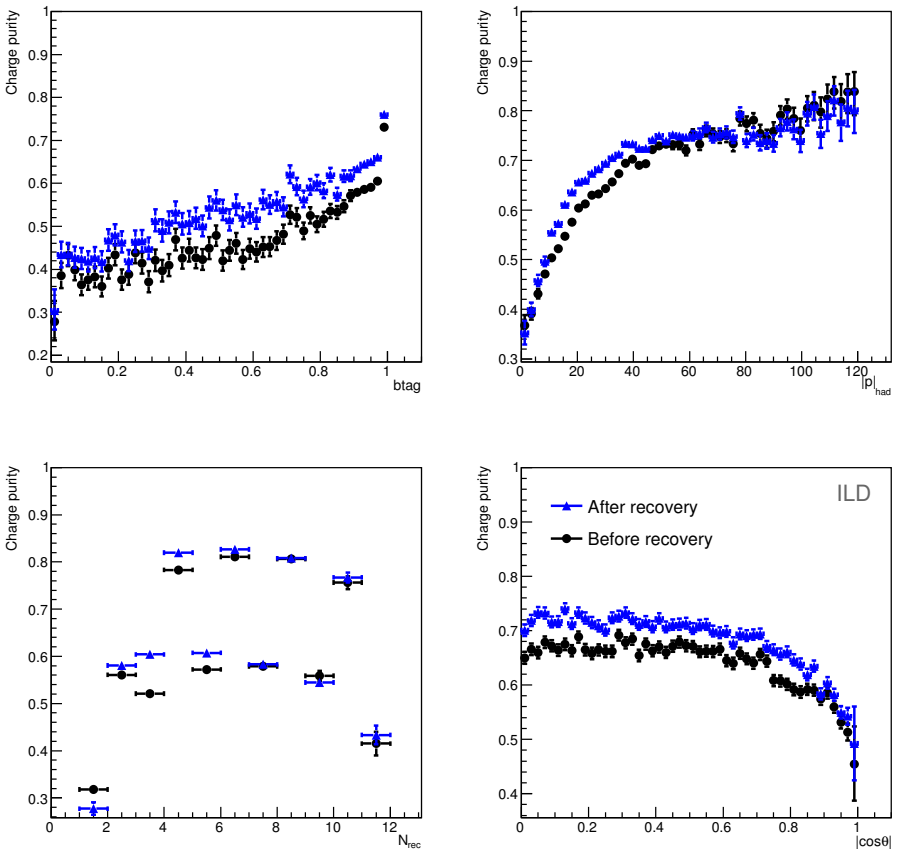


Figure: small

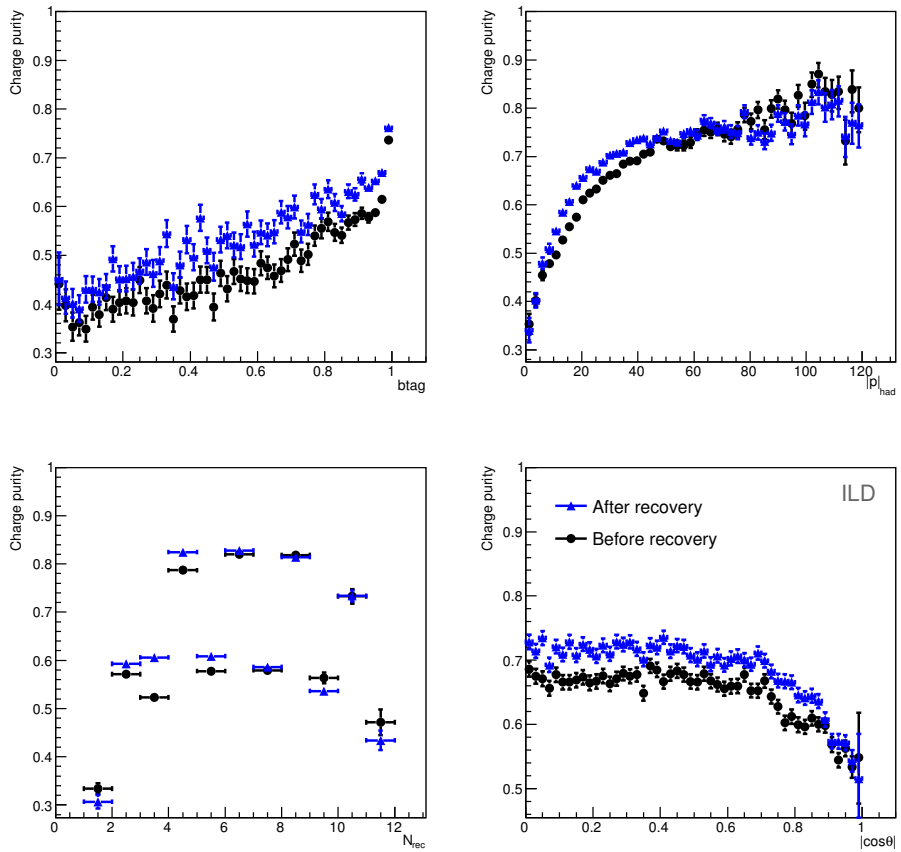


Figure: large

Charge Purity Distribution (Small and Large)

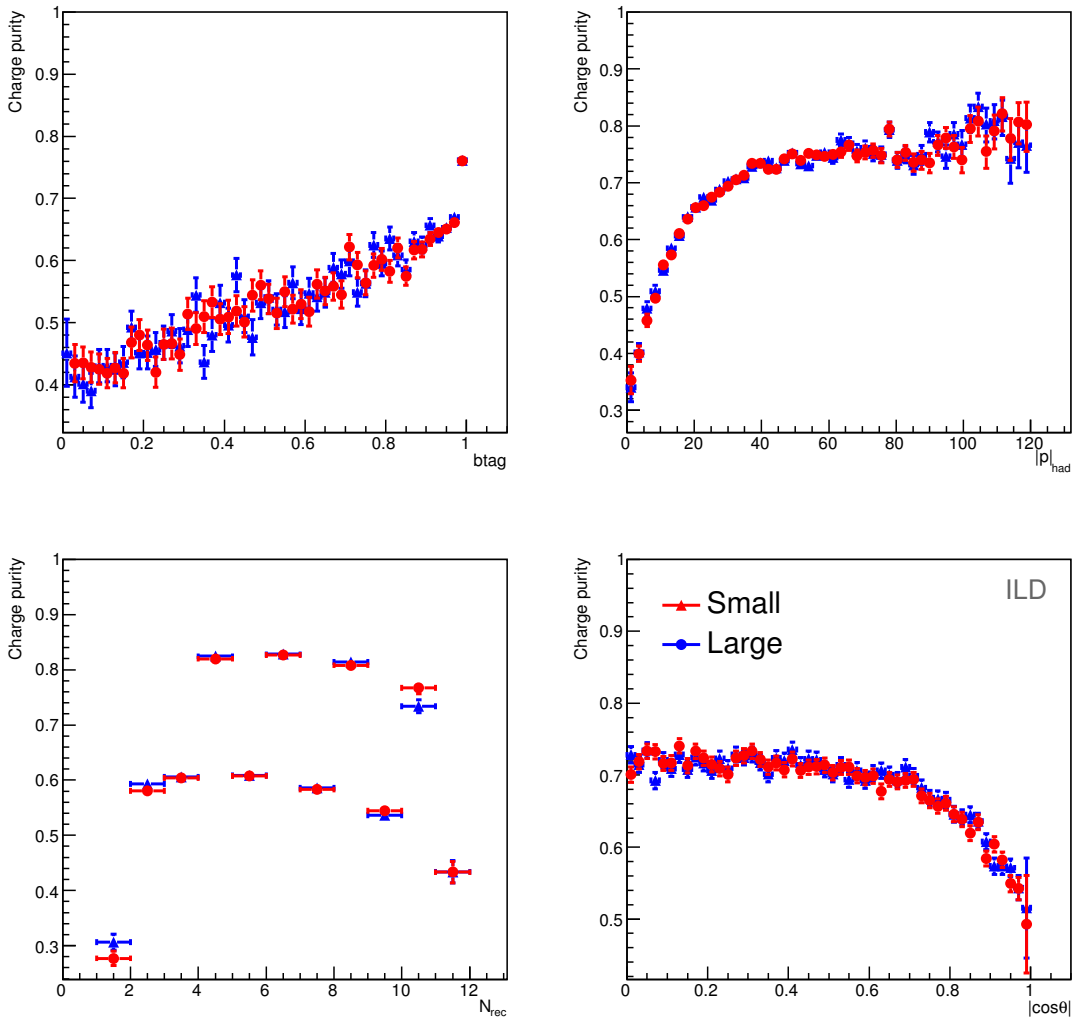


Figure: Large and small after recovery

Track Distribution (Large)

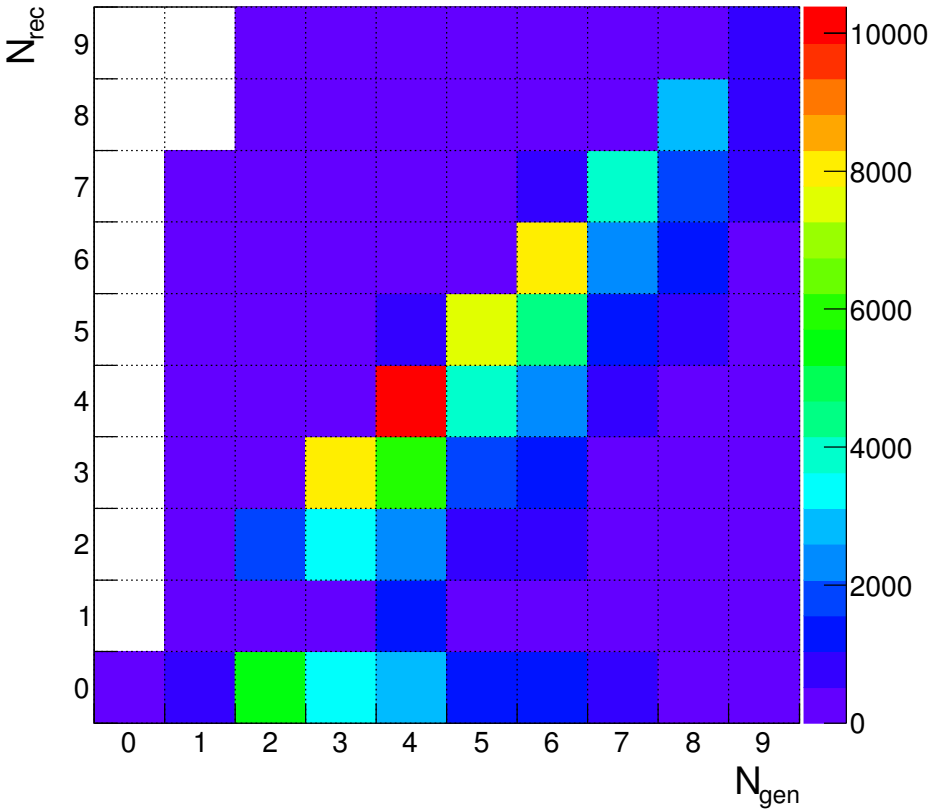
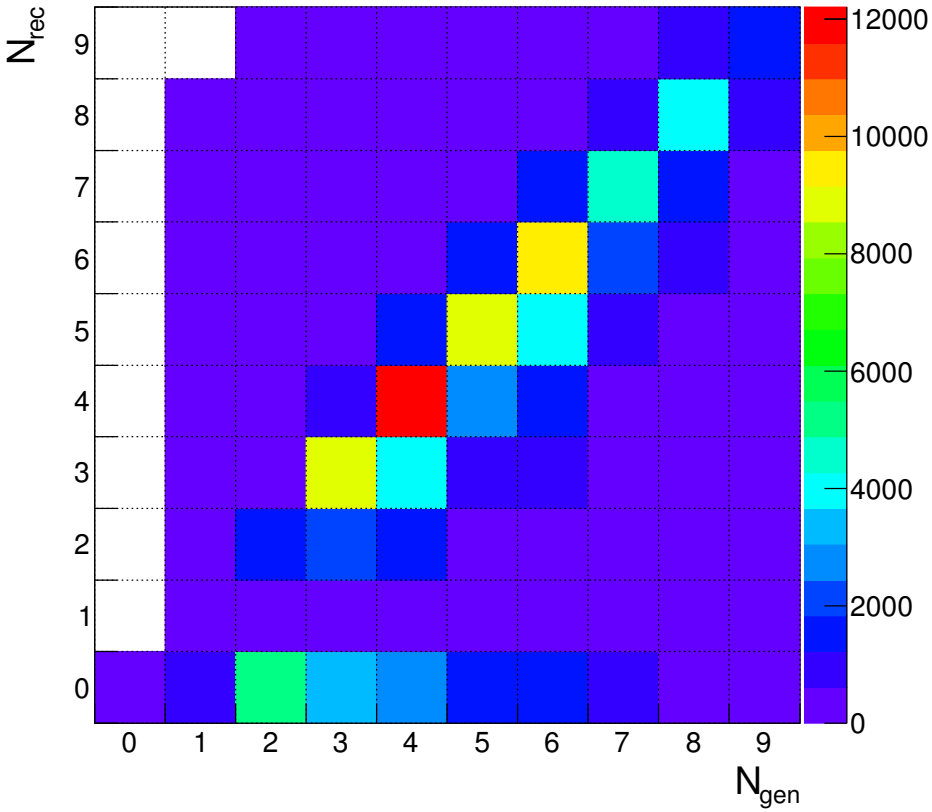


Figure: number of tracks before VR



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d0 and α

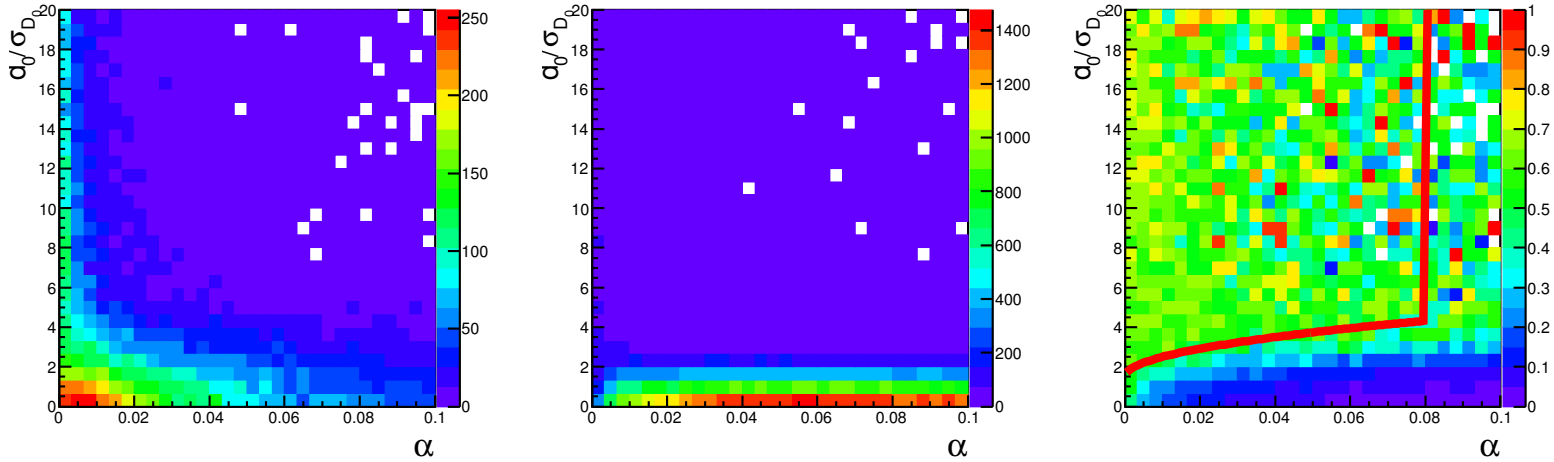


Figure: d0 and α LARGE

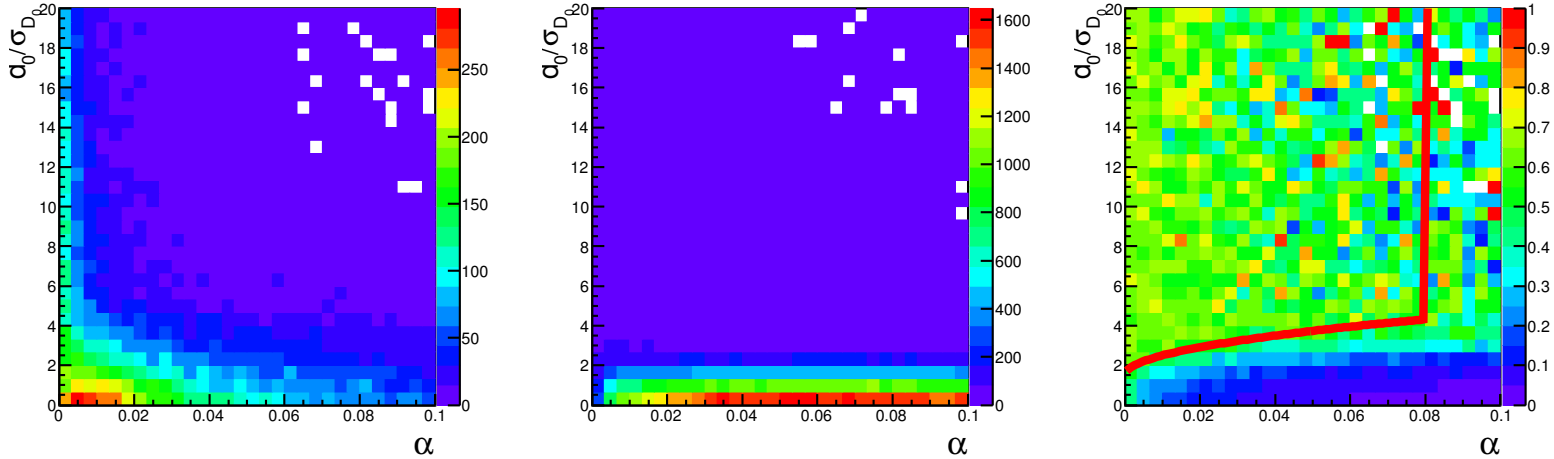
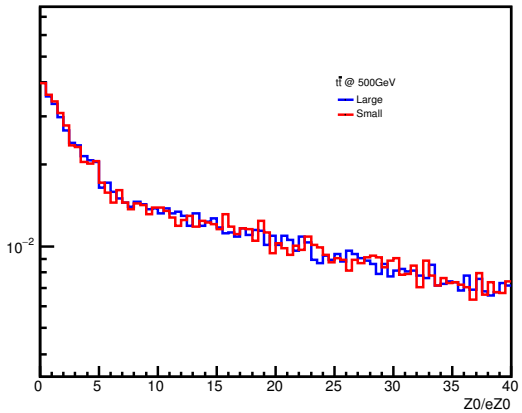


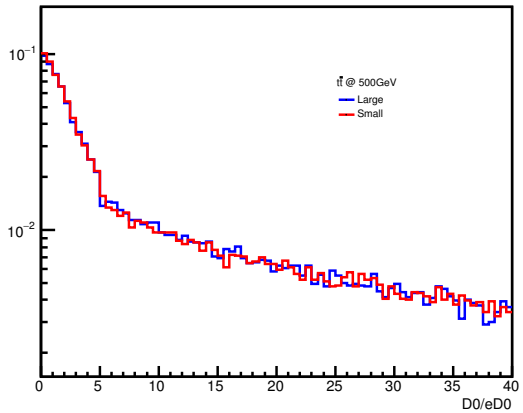
Figure: d0 and α SMALL

Missed and Background D0 and Z0

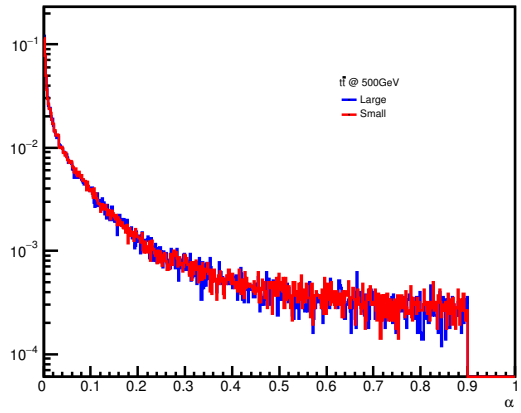
missed_sigZ0



missed_sigD0



missed_angle



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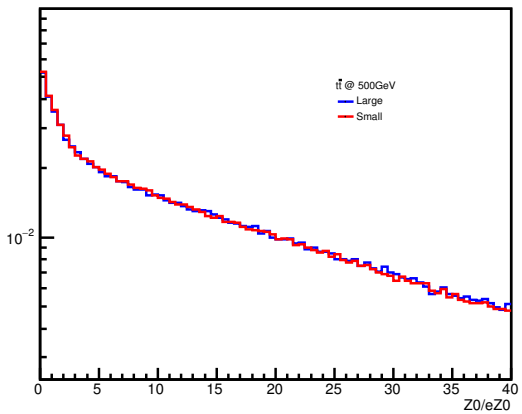

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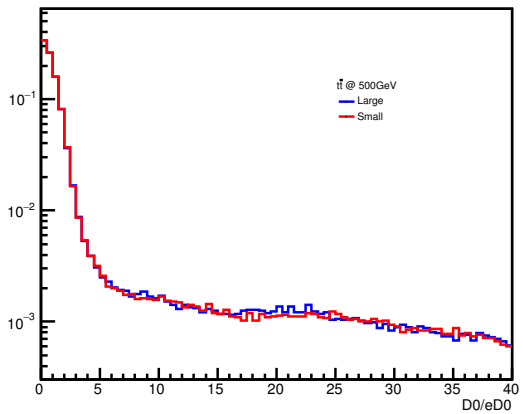

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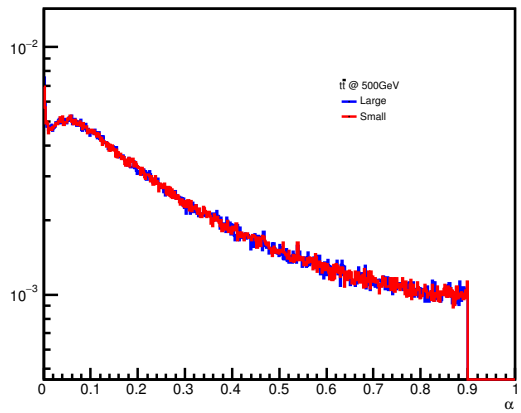

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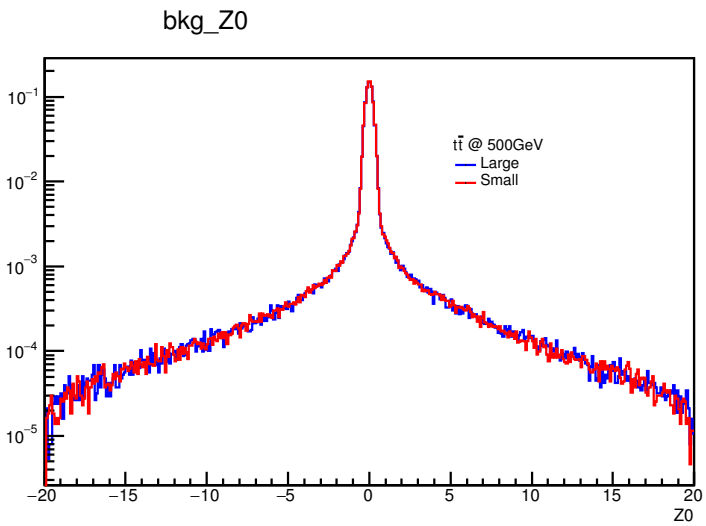

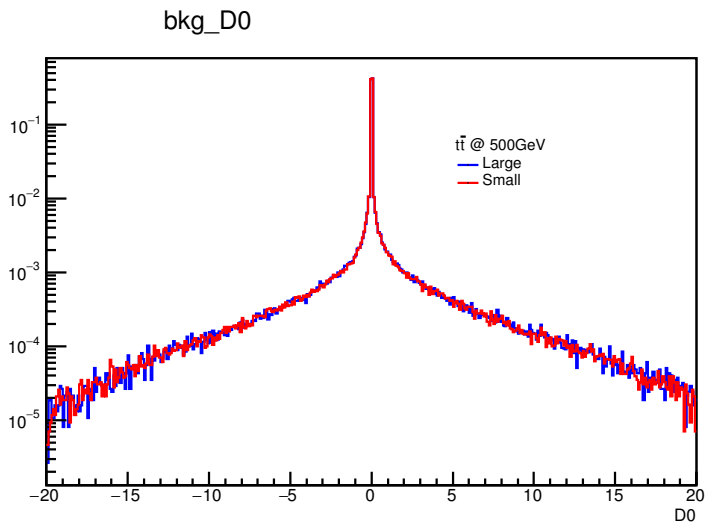

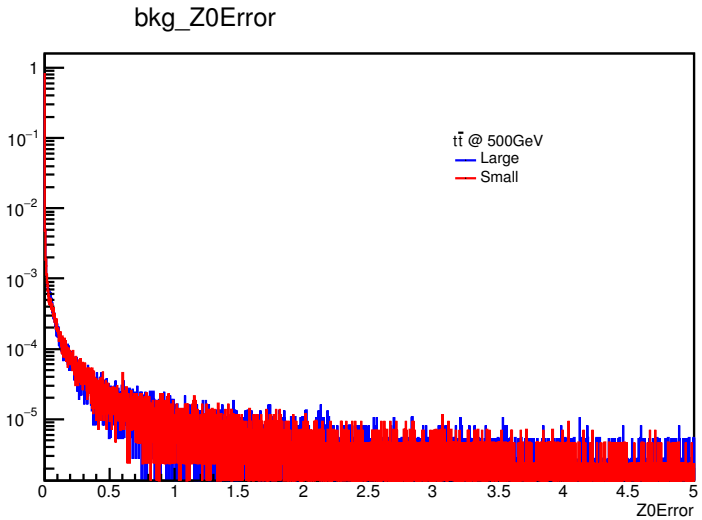

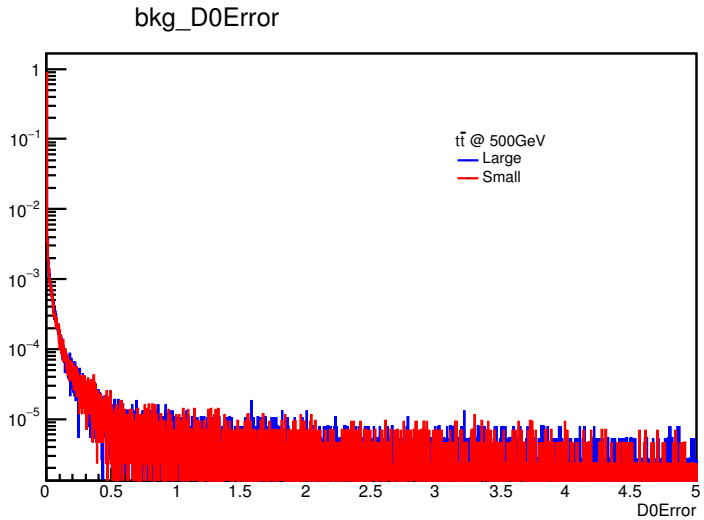

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- Writing up a draft of IDR by the end of next week might be ideal.
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