

QT Updates

Jan 27, 2020

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Summary of Plan

- Goal: work on qualification task on optimizing the inputs of high-level discriminates (DL1 & MV2) for b-tagging in HI collisions.
- Problem: HI collisions have large number of Underlying Event (UE) tracks that modify some inputs.
- First step plans:
 - Look into current performance of SV reconstruction in HI collisions using MC overlay and compare with MC signal.
 - Experiment with selections on tracks in HI MC for all lower level taggers to see how it affects performance.

“The optimization of the inputs of high-level taggers(DL1 and MV2) for b-tagging in heavy ion collisions, following the work done in a previous QT described in [AFT-233](#). It is known that some inputs for the taggers training are affected (like ipxd probabilities and jet fitter and sv1 energy fraction) by the large number of tracks coming from the HI collision underlying event (UE). This degrades the performance for central collisions and induces a strong centrality dependence. This effect can be reduced by implementing tighter tracking selections or an UE subtraction at the tracking level prior the calculation of the tagger inputs. If time permits, following the optimization, the calibration of the taggers will be done using HI data control samples that have a specific flavor composition e.g. jets with a muon from a heavy flavor semi-leptonic decay. This study will be documented in an internal note and the analysis recommendations will be described on a twiki.”

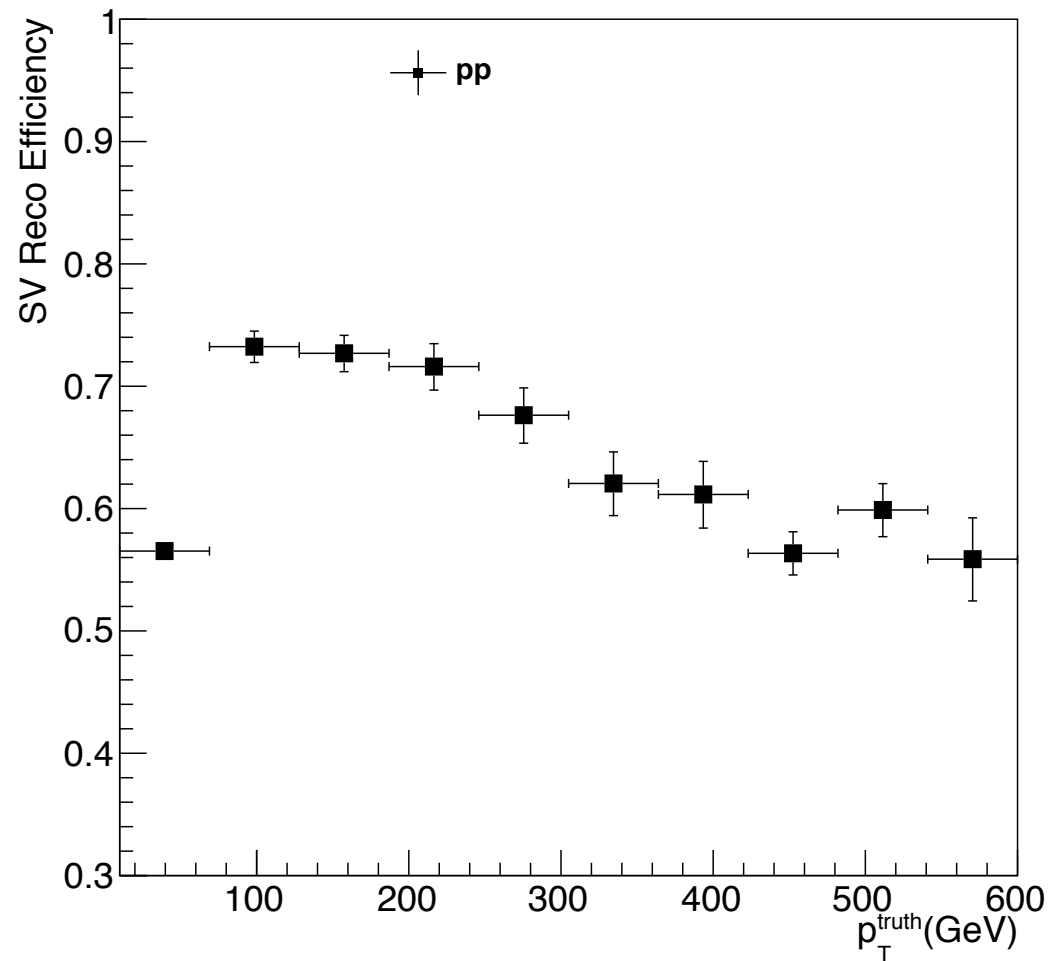
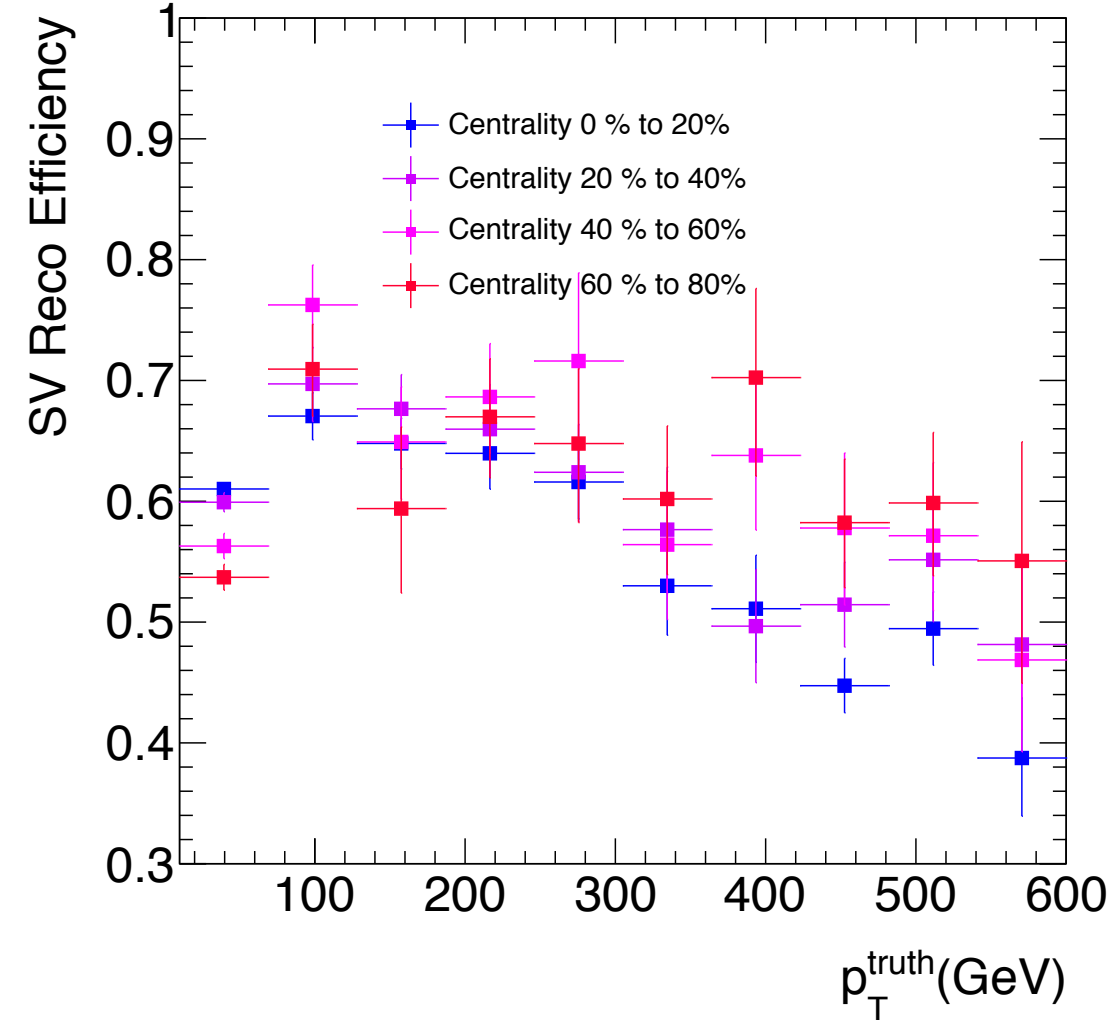
Planned Effort

- Ongoing works:
 - Xiaoning will be looking at the efficiency, purity and position resolution of the secondary vertex reconstruction as a function of centrality using the JetFitter and SV1 algorithms.
 - Will be working on the track selections for lower level taggers.
 - Have compiled the machinery to do track selections for lower level taggers
 - Dominik is going to start comparing the existing data and MC we're using.

MC Samples used

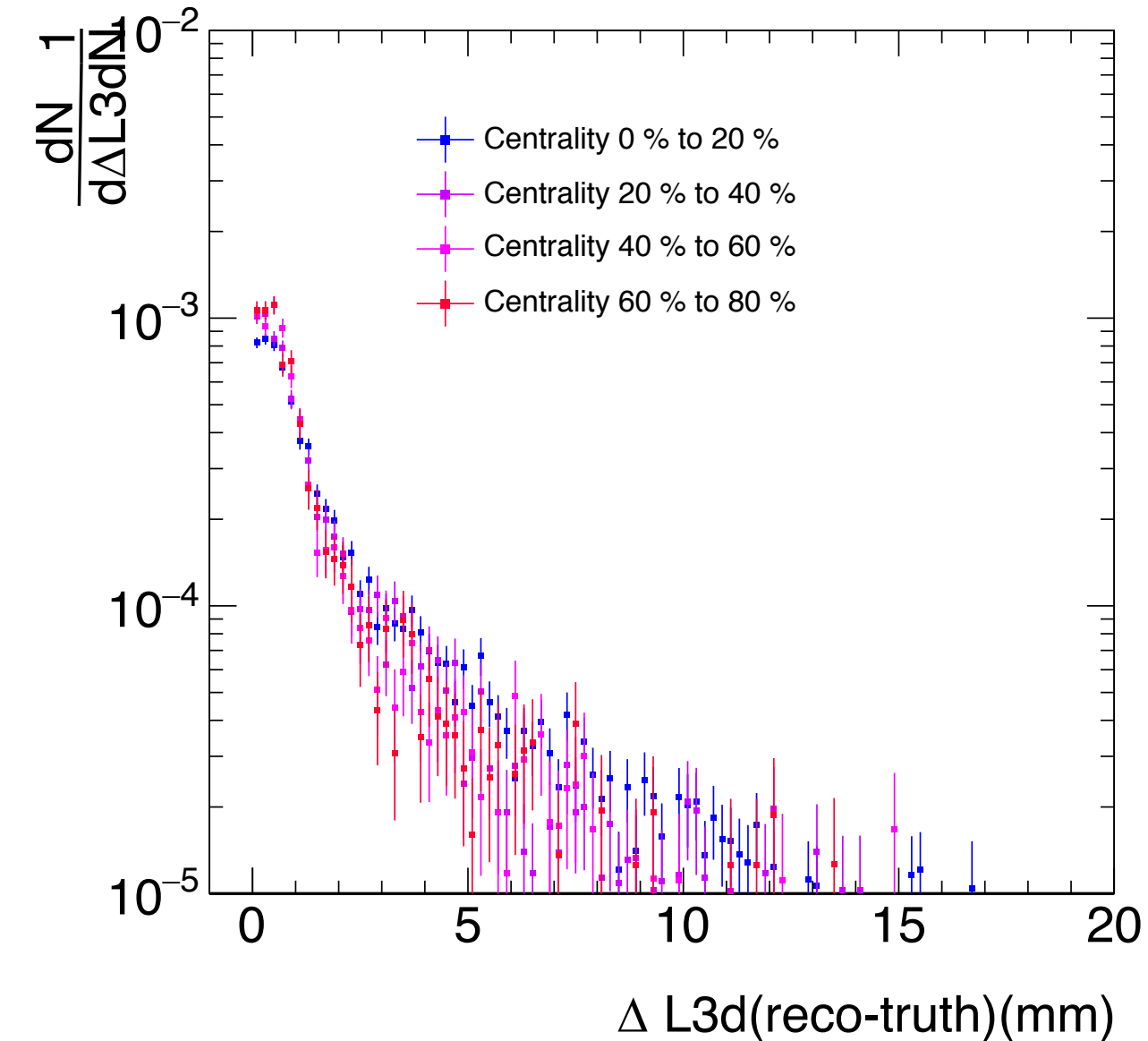
- MC Overlay:
 - mc16_5TeV.420271.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZ1_bbfilter.recon.AOD.e7383_d1521_r11472
 - mc16_5TeV.420272.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZ2_bbfilter.recon.AOD.e7383_d1521_r11472
 - mc16_5TeV.420273.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZ3_bbfilter.recon.AOD.e7383_d1521_r11472
 - mc16_5TeV.420274.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZ4_bbfilter.recon.AOD.e7383_d1521_r11472
- MC Signal:
 - mc16_5TeV.420274.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZ4_bbfilter.recon.AOD.e7383_s3428_r11320
 - mc16_5TeV.420273.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZ3_bbfilter.recon.AOD.e7383_s3428_r11320
 - mc16_5TeV.420272.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZ2_bbfilter.recon.AOD.e7383_s3428_r11320
 - mc16_5TeV.420271.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZ1_bbfilter.recon.AOD.e7383_s3428_r11320

SV Reco Efficiency in SV1



- SV Reconstruction for PbPb MC (left) is slightly ($\sim 5\%$) lower than pp (right).
- Dependence on centrality?

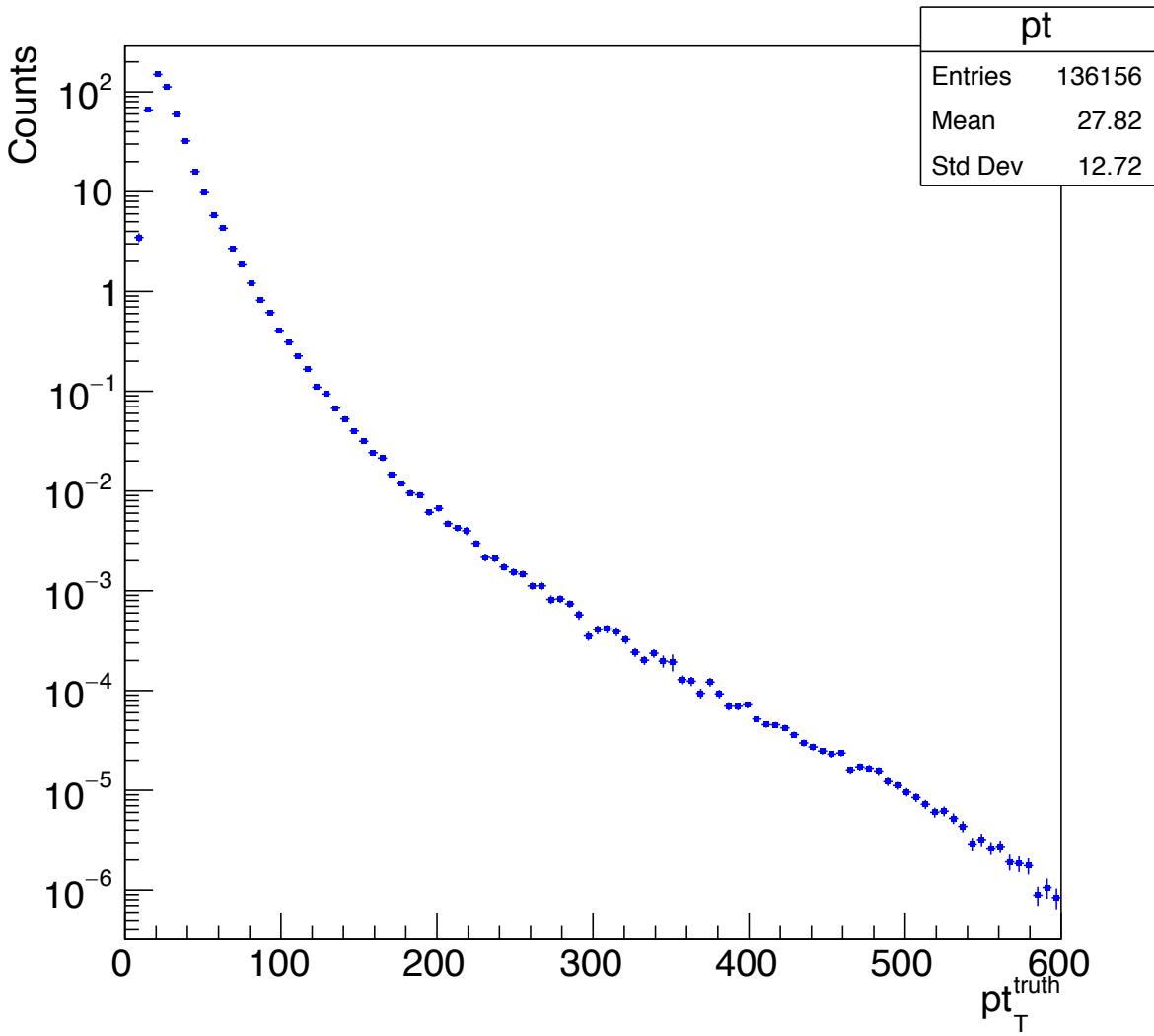
SV Reco Resolution in PbPb Overlay



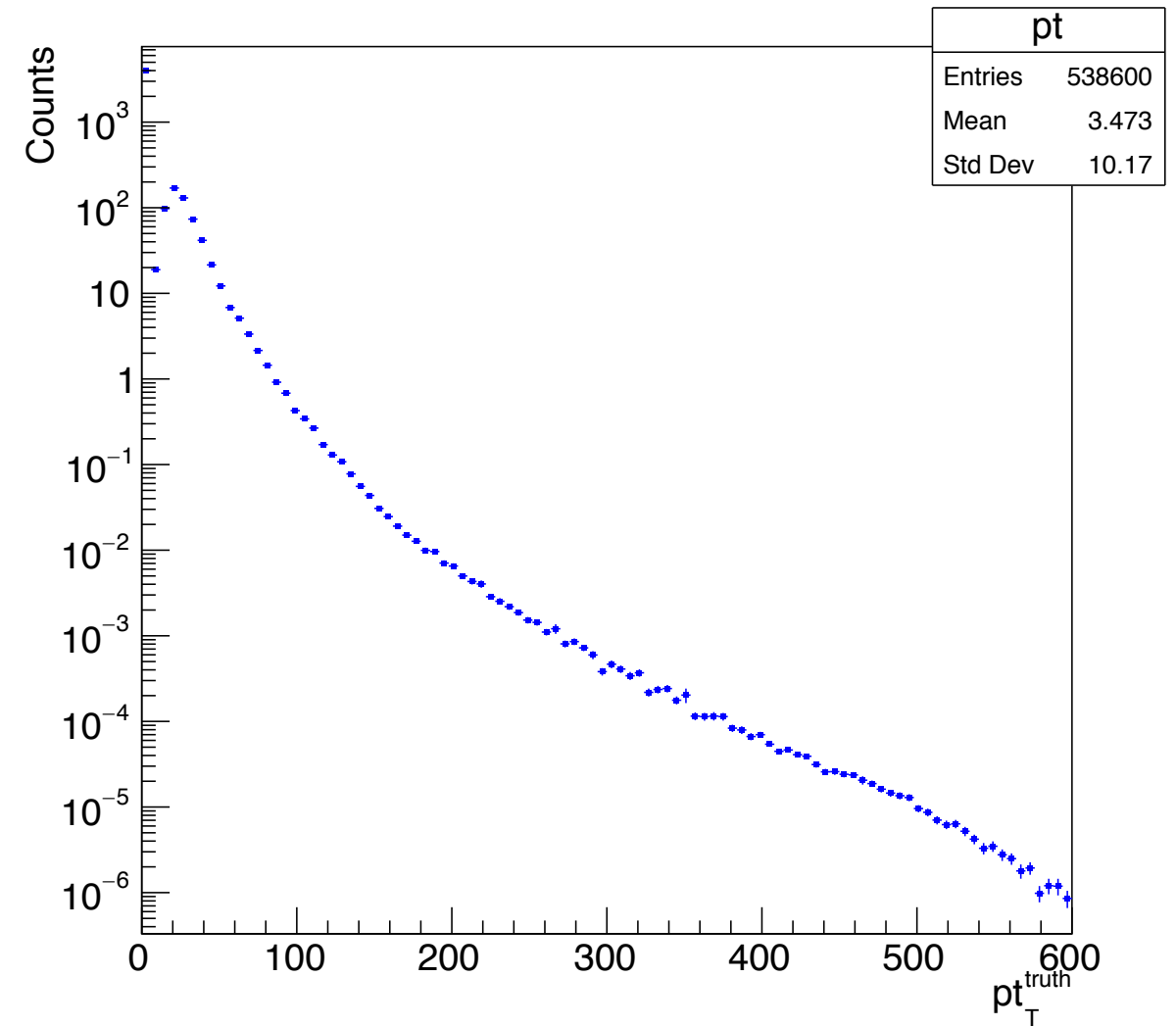
- SV reconstruction resolution here is defined as decay length difference.
 - Similar dependence on centrality can be seen in the distance between reco and truth SV, see back-up slide.
- More central events have more widely distributed $d(L3d)$ ($\text{abs}(\text{reco-truth})$ decay length), as expected.

MC pt Distribution for Validation Purpose

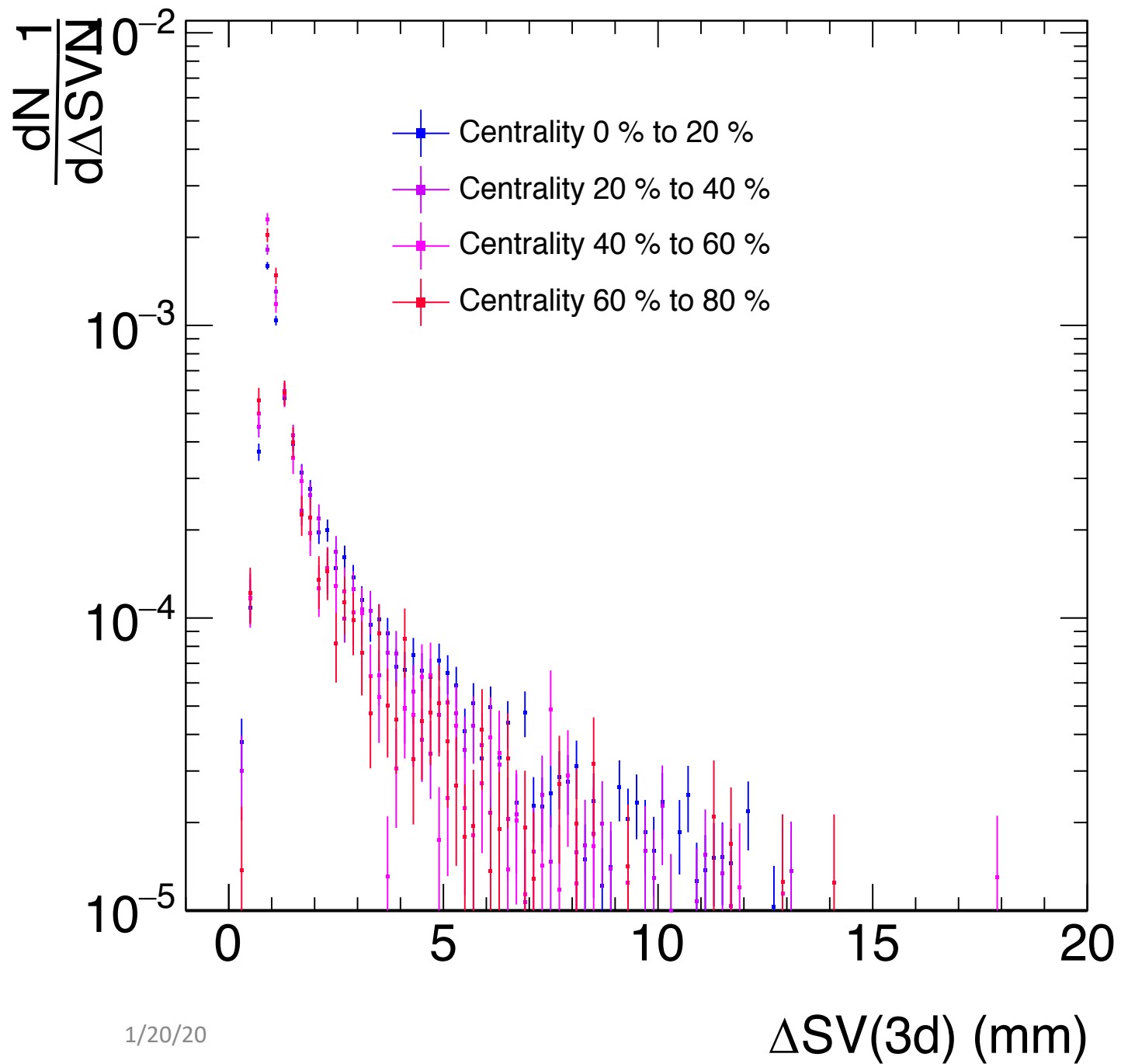
Distribution of truth jet pt in pp MC



Distribution of truth jet pt in PbPb MC



Back-Up



Goal of the Week

- For b-jet and c-jet using 50k MC overlay and 50k MC signal, for the default options of SV and JF algorithms respectively,
 - Plot decay length (L_{3d}) and x-y plane decay length (L_{xy}) resolution graphs and compare.
 - Plot fake rate (SV in light jet) and efficiency of SV reconstruction in b-jet and c-jet.
 - For MC overlay, add in centrality information
- Compile, test and try more options with track selection tools
 - With small local samples, compile and test the different p_T , cutLevel, etc.
 - If lower tagger inputs are improved, try with large samples.