HF-tagged Jet Study with Pythia Simulation

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HF-tagged jet study with PYTHIA -- setup

Pythia8176 setting:

3 cases/processes: (1) hardQCD:all; (2) hardQCD:hardccbar; (3) hardQCD:hardbbbar

Each case was run in 7 partonic p_T ranges (CKIN3, CKIN4): 3-5, 5-10, 10-20, 20-40, 40-60, 60-80, 80-100.

Jet reconstruction:

anti_kT algorithm (fastJet 3.1.0)

jet cone size: 0.5

minimum p_T of jet: 5.0 GeV/c

$|\eta_{jet}| \leq 1.0$

Tagging:

$\sqrt{(\Delta\eta^2+\Delta\phi^2)} < 0.5$ (distance between tagged particle to jet axis)

HF-Jet was tagged with heavy quarks (b/bbar/c/cbar)

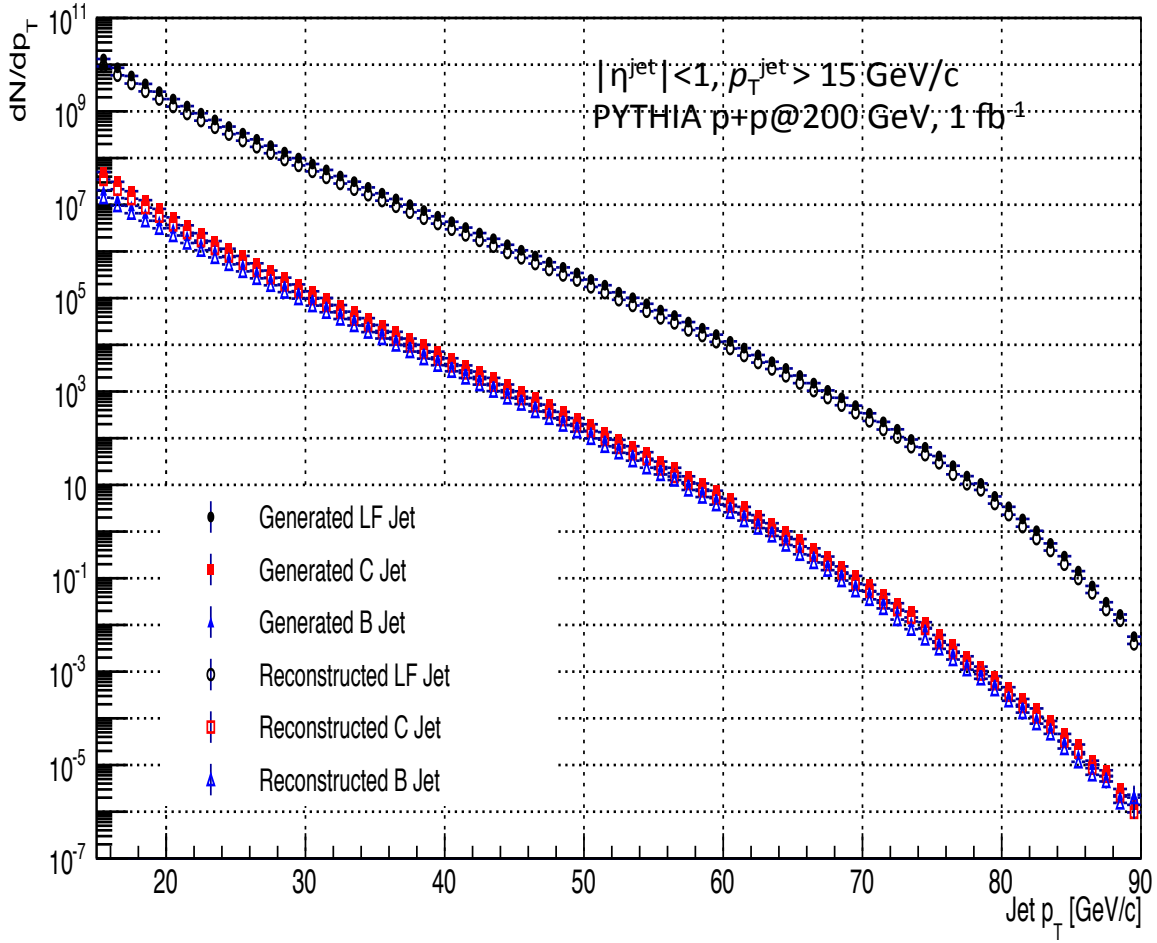
Statistics:

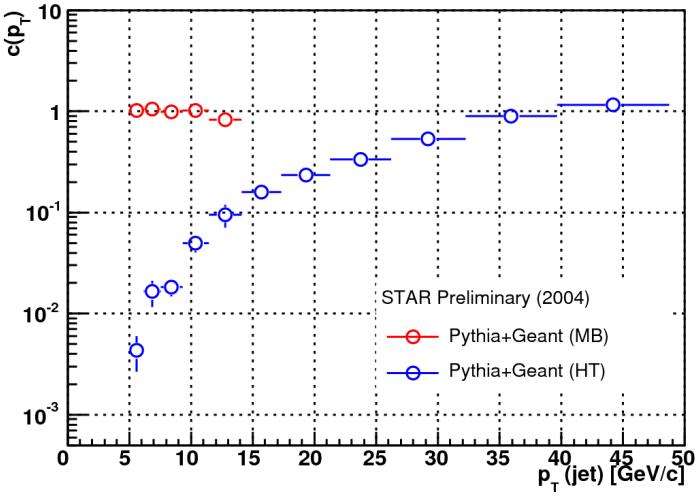
Simulated events: 7×10^6 events

Normalized to integrated luminosity: 1 fb^{-1}

Jet yield estimations

The reconstructed jet yield was corrected with the STAR jet corrector 0.69 for MB event.

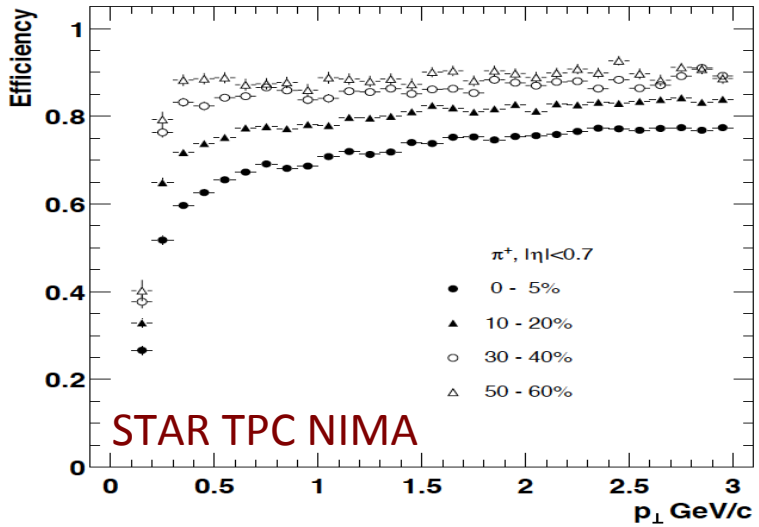




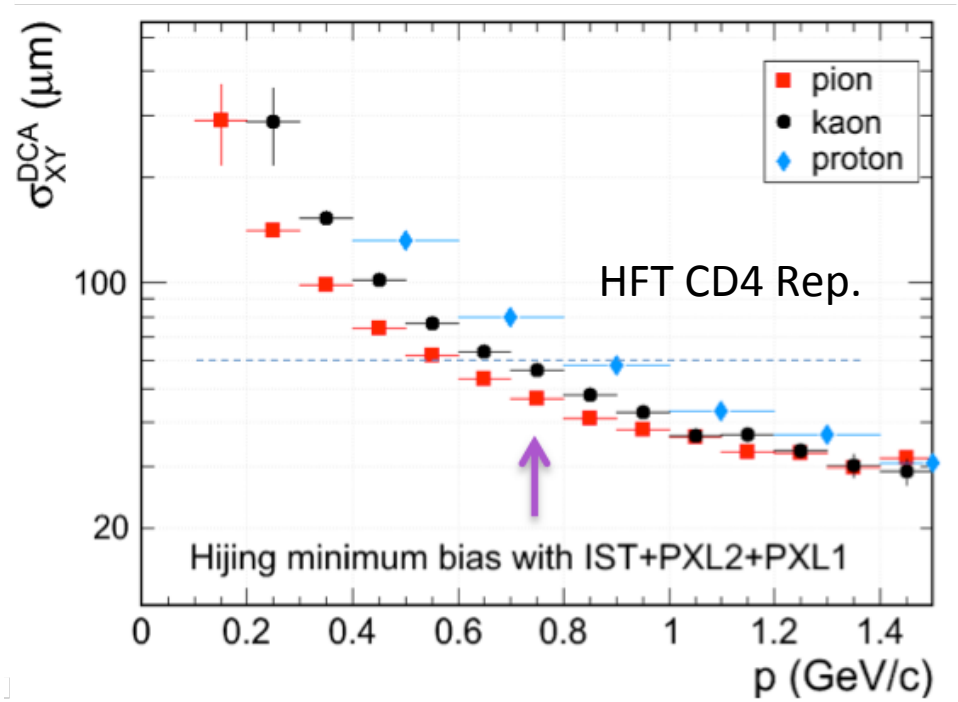
Correction factor from S. Vigdor's talk: *Spin Physics with Jets at STAR (http://www.phy.bnl.gov/~partsem/fy07/SVigdor_070315.pdf)*

Tracking efficiency corrections/track DCA smearing

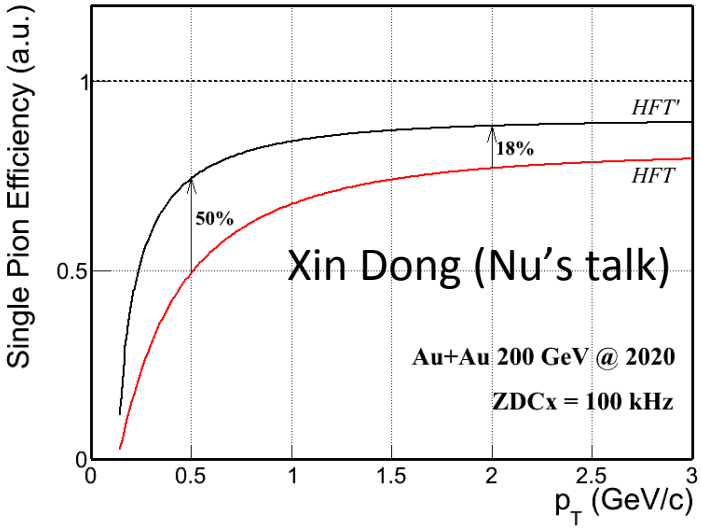
1. TPC tracking efficiency correction:



2. HFT(HFT$^+$) DCA resolution :



3. HFT/HFT$^+$ tracking efficiency correction:

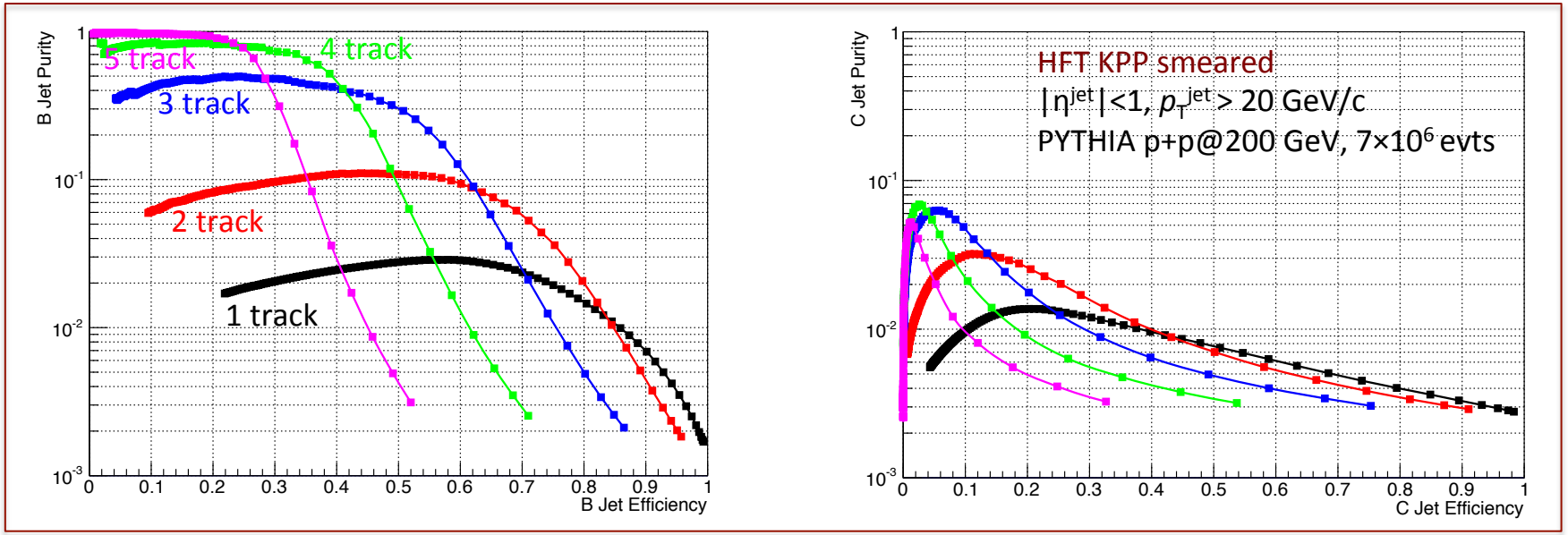


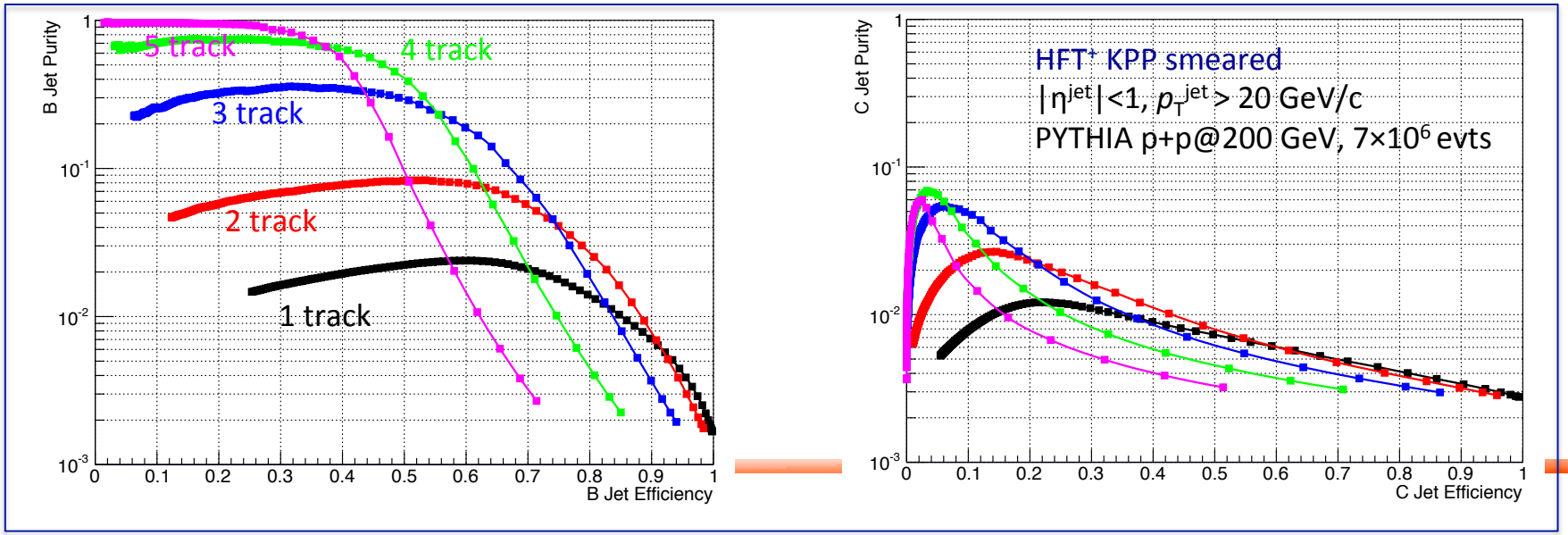
HFT KPP case: HFT(HFT$^+$) DCA res. + HFT tracking efficiency

HFT$^+$ KPP case: HFT(HFT$^+$) DCA res. + HFT$^+$ tracking efficiency

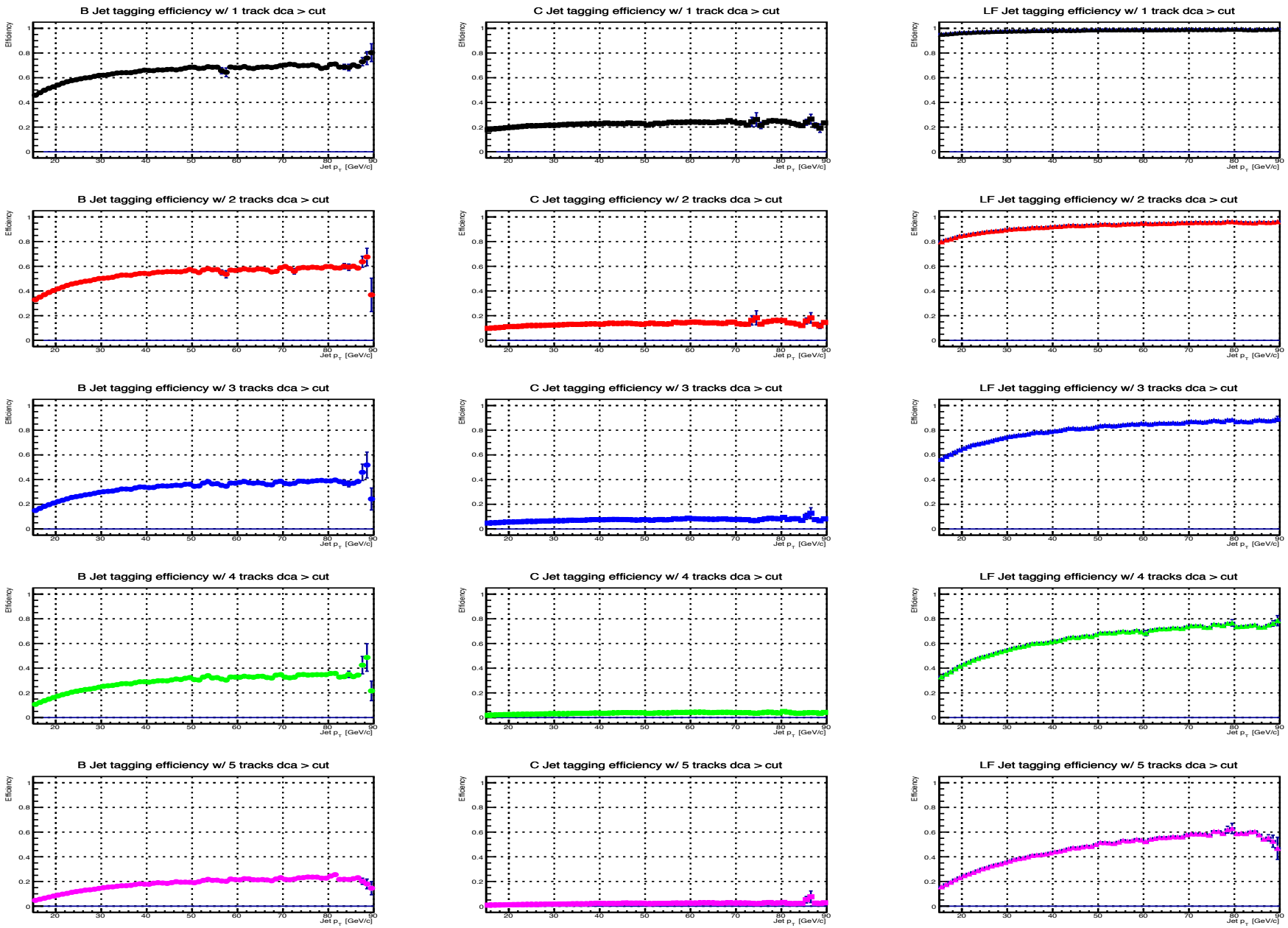
HF-Jet tagging efficiency vs. purity

HF-tagged jet purity vs. efficiency with number of tracks with dca > cut (cut interval 0.01 mm)

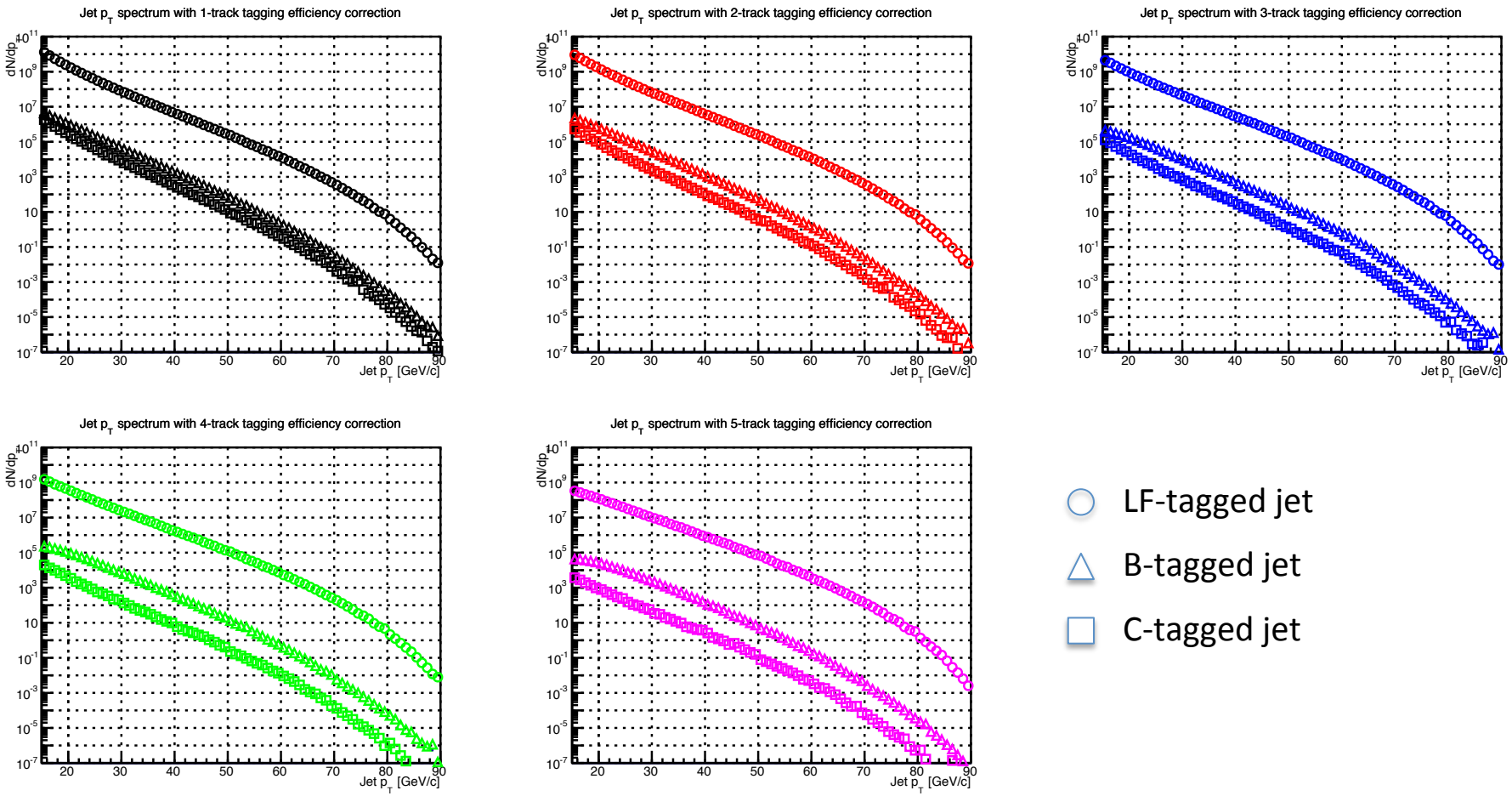




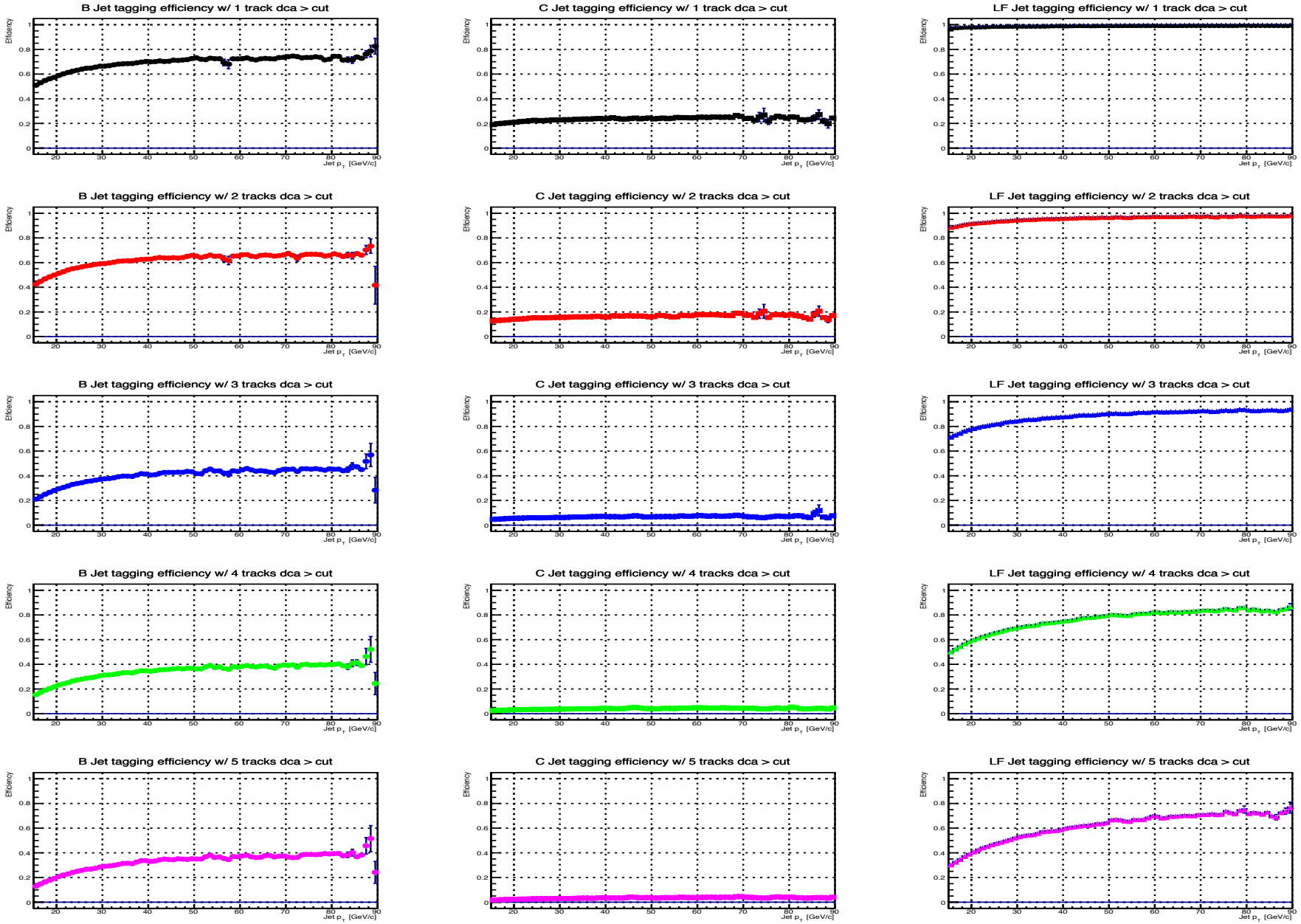
HF-Jet tagging efficiency for HFT KPP case



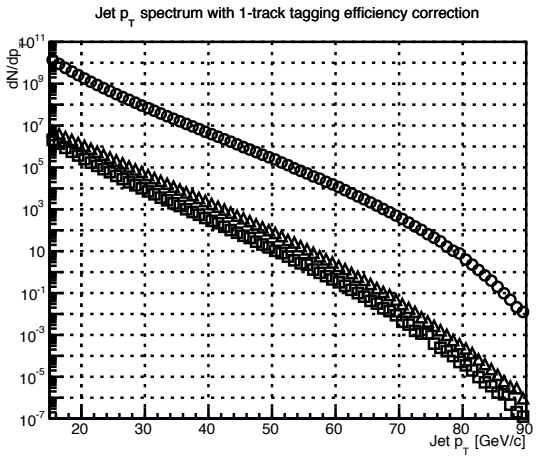
HF-Jet yield with tagging efficiency corrected for HFT KPP case

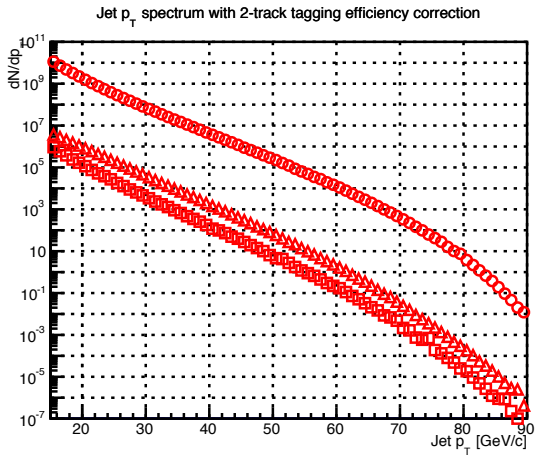


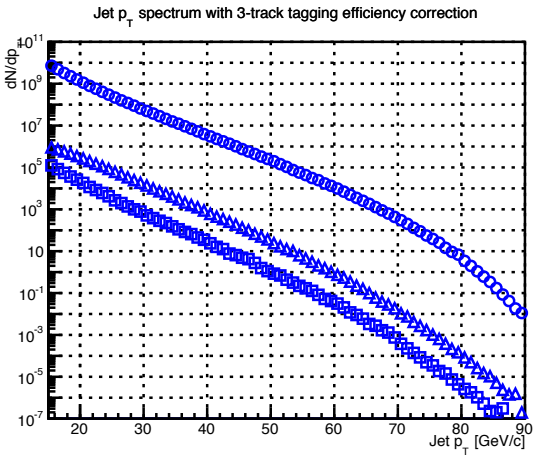
HF-Jet tagging efficiency for HFT+ KPP case

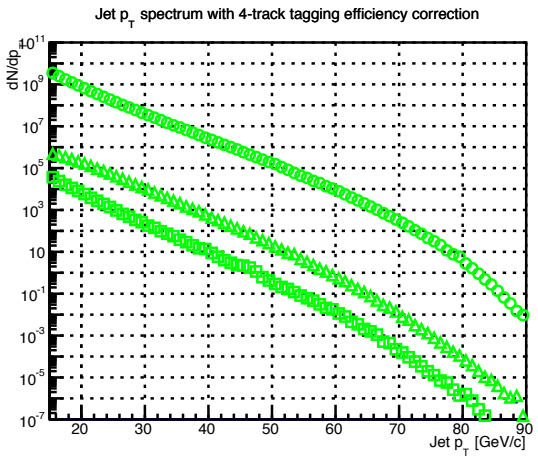


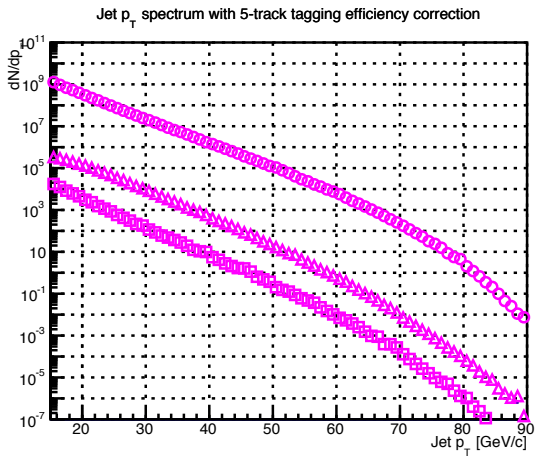
HF-Jet yield with tagging efficiency corrected for HFT+ KPP case











- ○ LF-tagged jet
- △ B-tagged jet
- □ C-tagged jet

Discussion

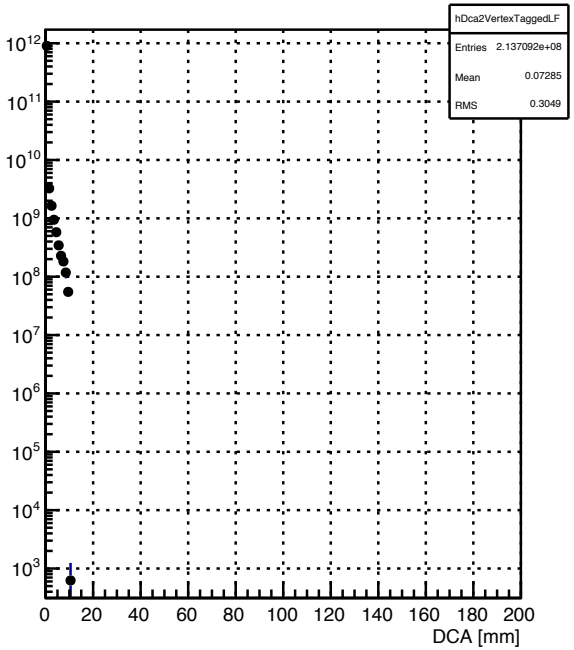
According to the PYTHIA simulation:

1) With HFT^{+} upgrade, the HF-tagged efficiency and HF jet statistics can be improved.

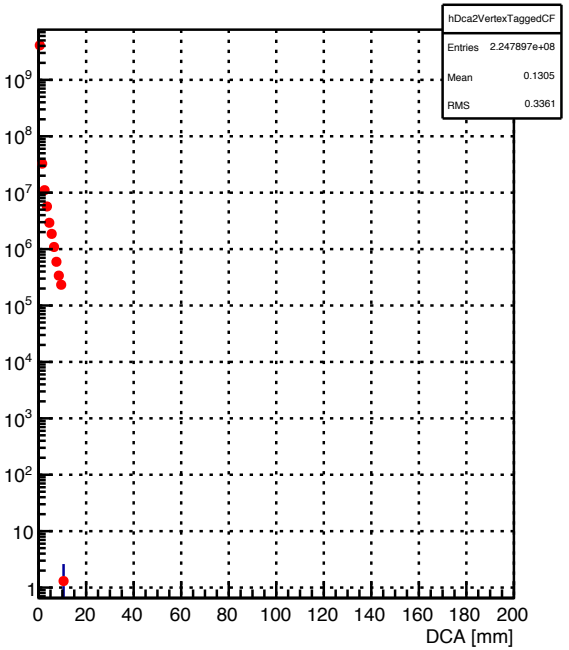
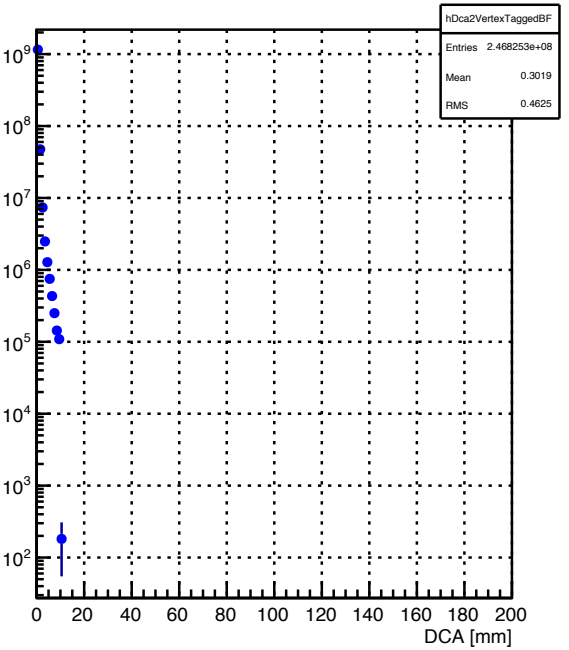
2) Next step: taking into detector effects …

Backup

LF jet track DCA to primary vertex



CF jet track DCA to primary vertex



BF jet track DCA to primary vertex