HF jets analysis

20.04.2020 ALICE@IFJ meeting

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Outline

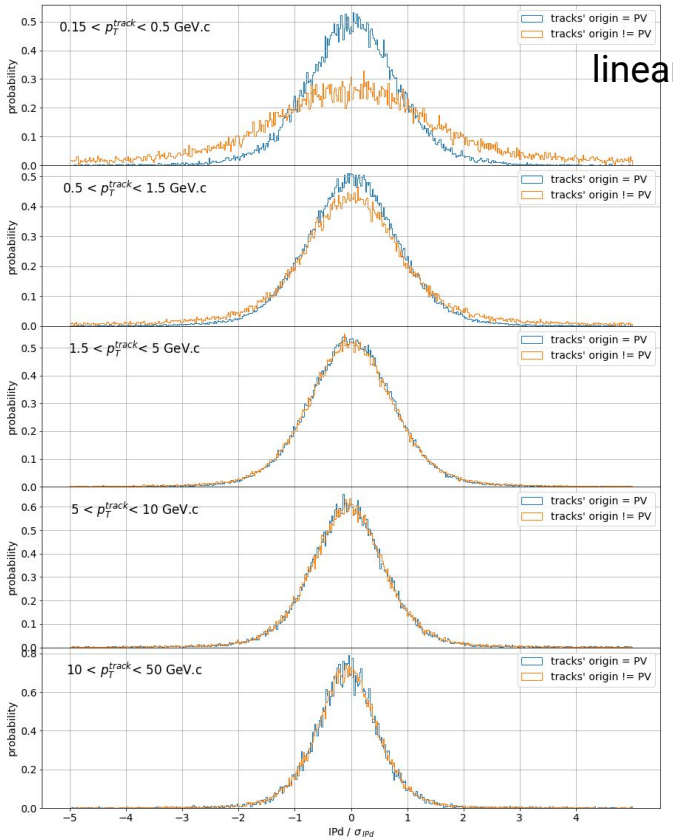
1. Progress in HF-jets analysis
    - tracks IP properties
2. Questions & issues
3. Plans for next week

pass3 re-merging status

- LHC18r: completed, available on EOS
- LHC18q: 40/144 runs

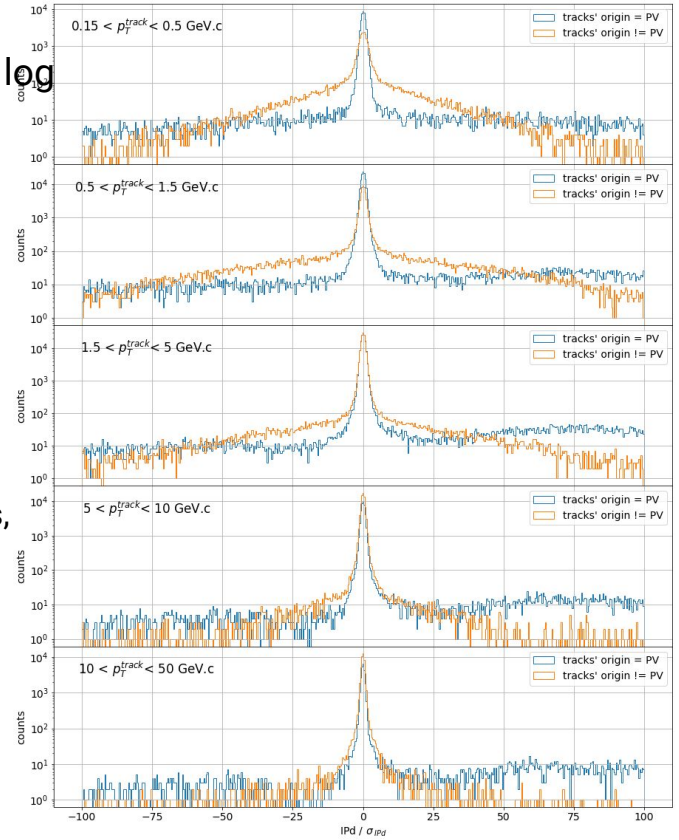
IPd Nsigma distribution - ***REMINDER***

linear



growing track pT

log



sigma of IPd is quite well calibrated (Nsigma ~ 1), but there are two issues, clearly visible on RHS:

- the tails are very long
- they are asymmetric

IPdNsigma distribution

I splitted the IPdNsigma distribution by its absolute value being < 20 or > 40, see plots on 3 following slides: distributions of IPdNsigma, IPd and IPdSigma.

It appears that tracks populating the tails of this distribution have higher IPd (values around 0 are completely gone, marked with *) and tends to have lower IPdSigma (the peak is at ~2x smaller value, **).

Data reproduction in MC is reasonable but not perfect. Faraway tails of IPdNsigma distribution in MC are flatter than in data, which is related to badly reconstructed beginning of IPdSigma distribution (***).

IPdNsigma distribution

On IPd plot, one can see that tracks with abs(IPdNsigma) < 20 are fully symmetric and the asymmetry appears on the bottom panel at IPd~0.25, which was previously recognised as artifact of hybrid tracking.

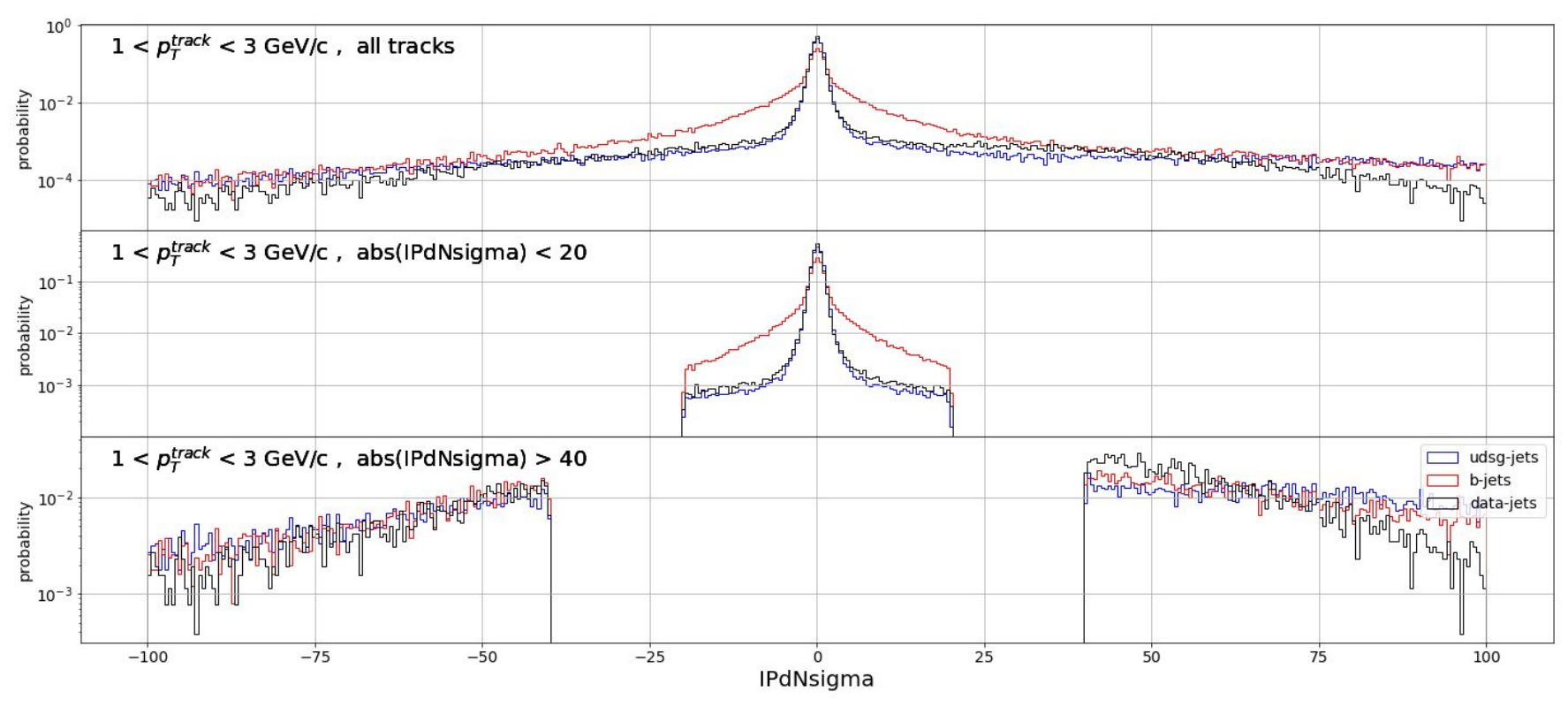
It is confirmed on tracks' phi plot.. This aspect of data is well reproduced in MC.

Conclusions:

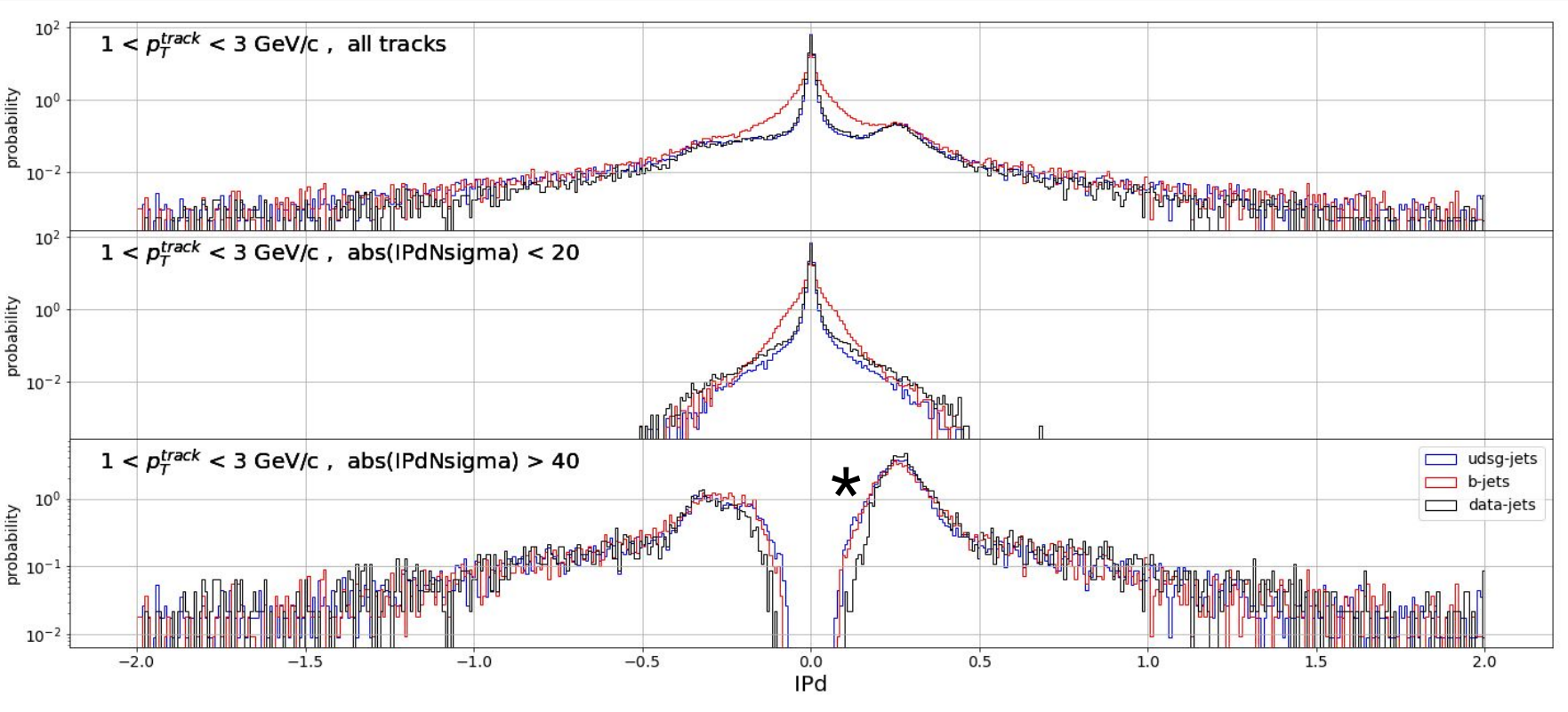
Presence of very high (low) values of IPdNsigma (IPdSigma) is related to hybrid tracking.

It can also explain observed asymmetry in IPdNsigma.

IPd**N**sigma


1 < p_T^{track} < 3 GeV/c , all tracks
1 < p_T^{track} < 3 GeV/c , abs(IPdNsigma) < 20
1 < p_T^{track} < 3 GeV/c , abs(IPdNsigma) > 40
probability
udsg-jets
b-jets
data-jets
IPdNsigma

IPd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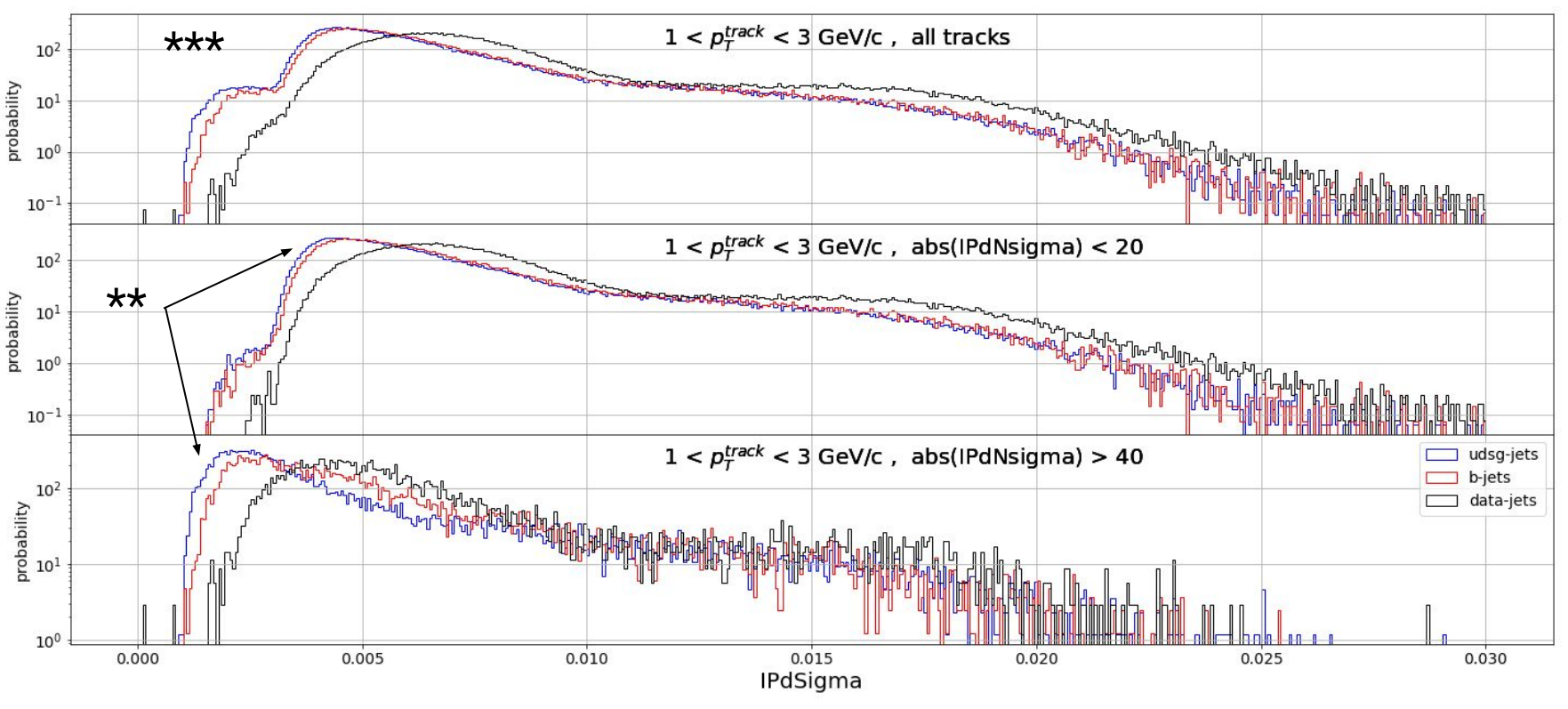
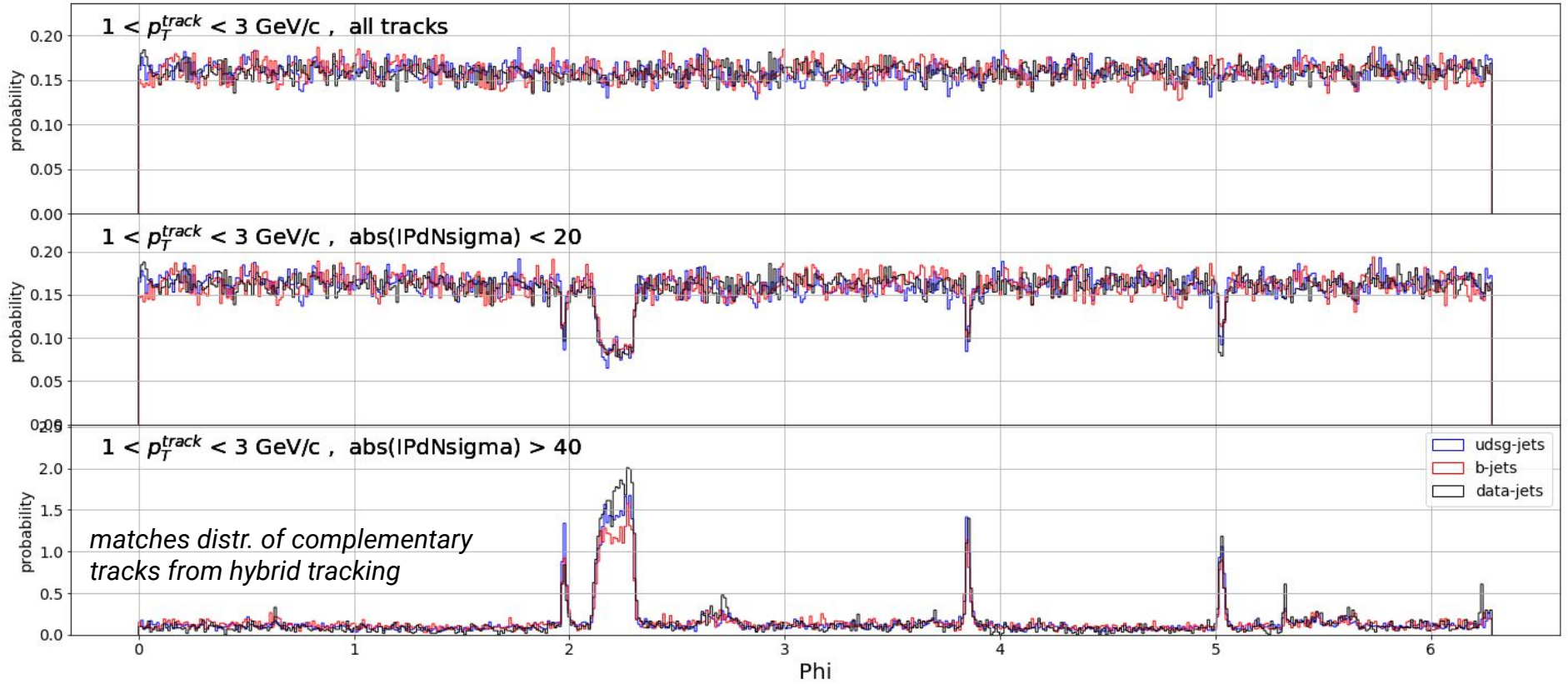
1 < p_T^{track} < 3 GeV/c , abs(IPdNsigma) < 20
1 < p_T^{track} < 3 GeV/c , abs(IPdNsigma) > 40
probability
udsg-jets
b-jets
data-jets
IPd

IPd**Sigma**


***
1 < p_T^{track} < 3 GeV/c , all tracks
**
1 < p_T^{track} < 3 GeV/c , abs(IPdNsigma) < 20
1 < p_T^{track} < 3 GeV/c , abs(IPdNsigma) > 40
probability
udsg-jets
b-jets
data-jets
0.000
0.005
0.010
0.015
0.020
0.025
0.030
IPdSigma

Phi

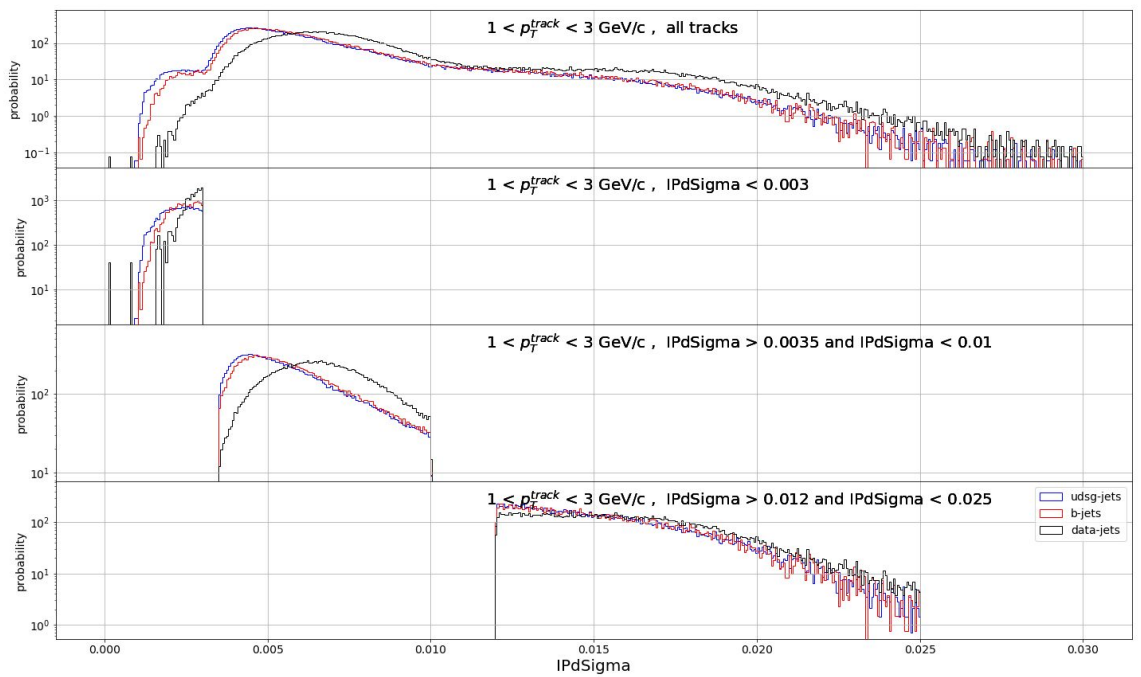

1 < p_T^{track} < 3 GeV/c , all tracks
1 < p_T^{track} < 3 GeV/c , abs(IPdNsigma) < 20
1 < p_T^{track} < 3 GeV/c , abs(IPdNsigma) > 40
probability
udsg-jets
b-jets
data-jets
matches distr. of complementary tracks from hybrid tracking
Phi

Grouping by IPdSigma

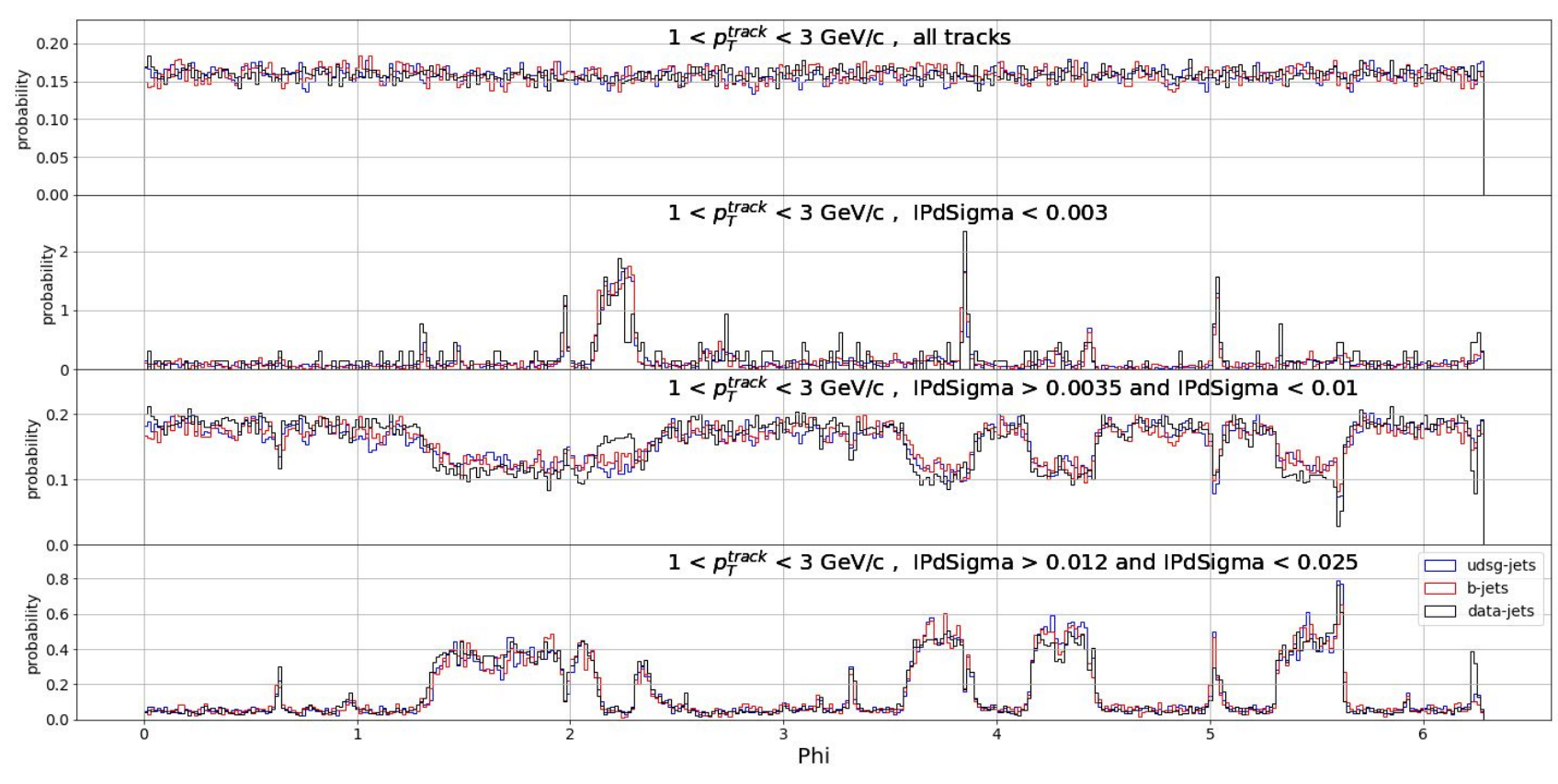
We can then group the tracks by their IPdSigma into 3 ranges corresponding to 3 modes visible on top panel.

On next slide we see the phi distribution for these groups.

Besides IPdSigma < 0.003, which gathers complementary tracks from hybrid tracking, the next two ranges are also highly non-uniform in phi, **WHY?**

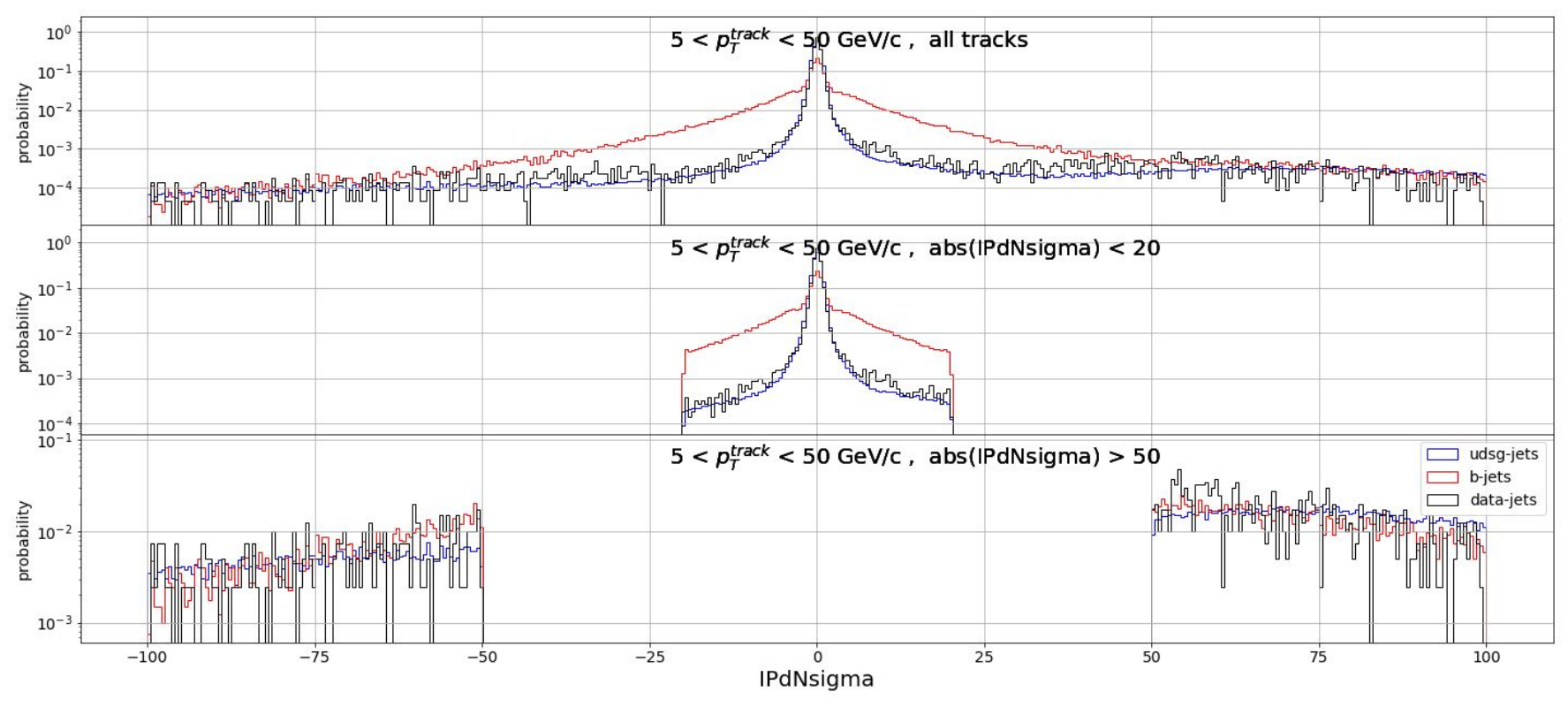


Phi, grouped by IPdSigma

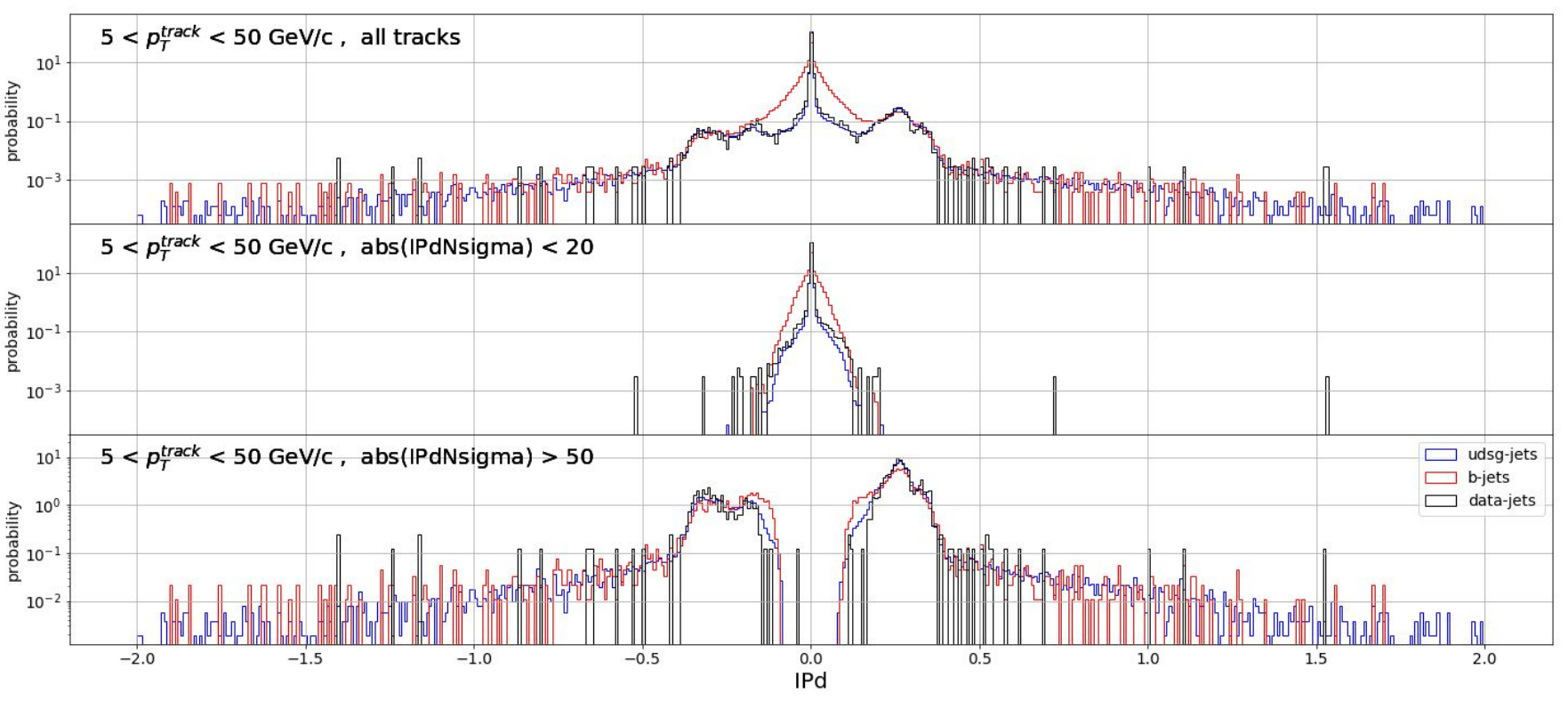


Same plots for track pT > 5 GeV/c

IPd**N**sigma


5 < p_T^{track} < 50 GeV/c , all tracks
5 < p_T^{track} < 50 GeV/c , abs(IPdNsigma) < 20
5 < p_T^{track} < 50 GeV/c , abs(IPdNsigma) > 50
probability
udsg-jets
b-jets
data-jets
IPdNsigma

IPd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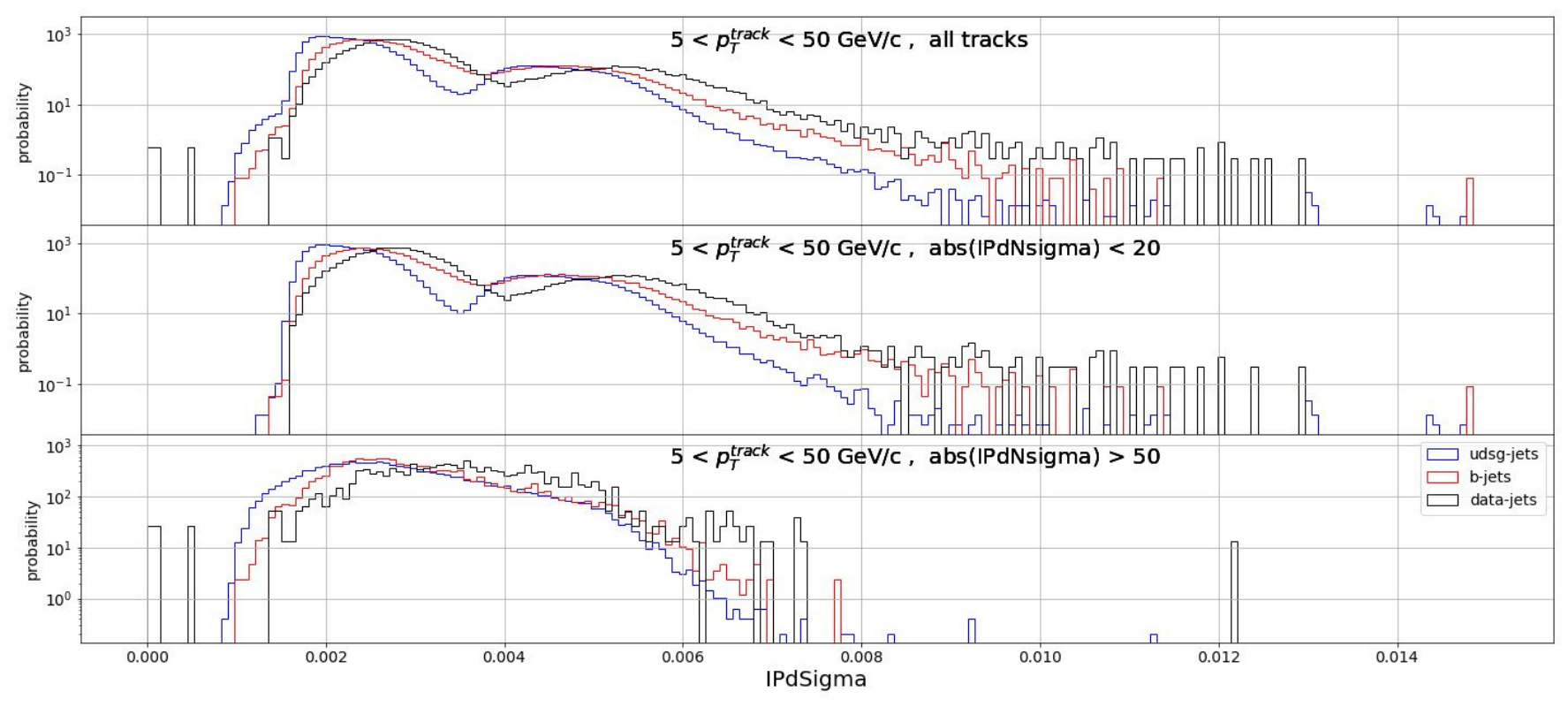
5 < p_T^{track} < 50 GeV/c , abs(IPdNsigma) < 20
5 < p_T^{track} < 50 GeV/c , abs(IPdNsigma) > 50
probability
udsg-jets
b-jets
data-jets
IPd

IPd**Sigma**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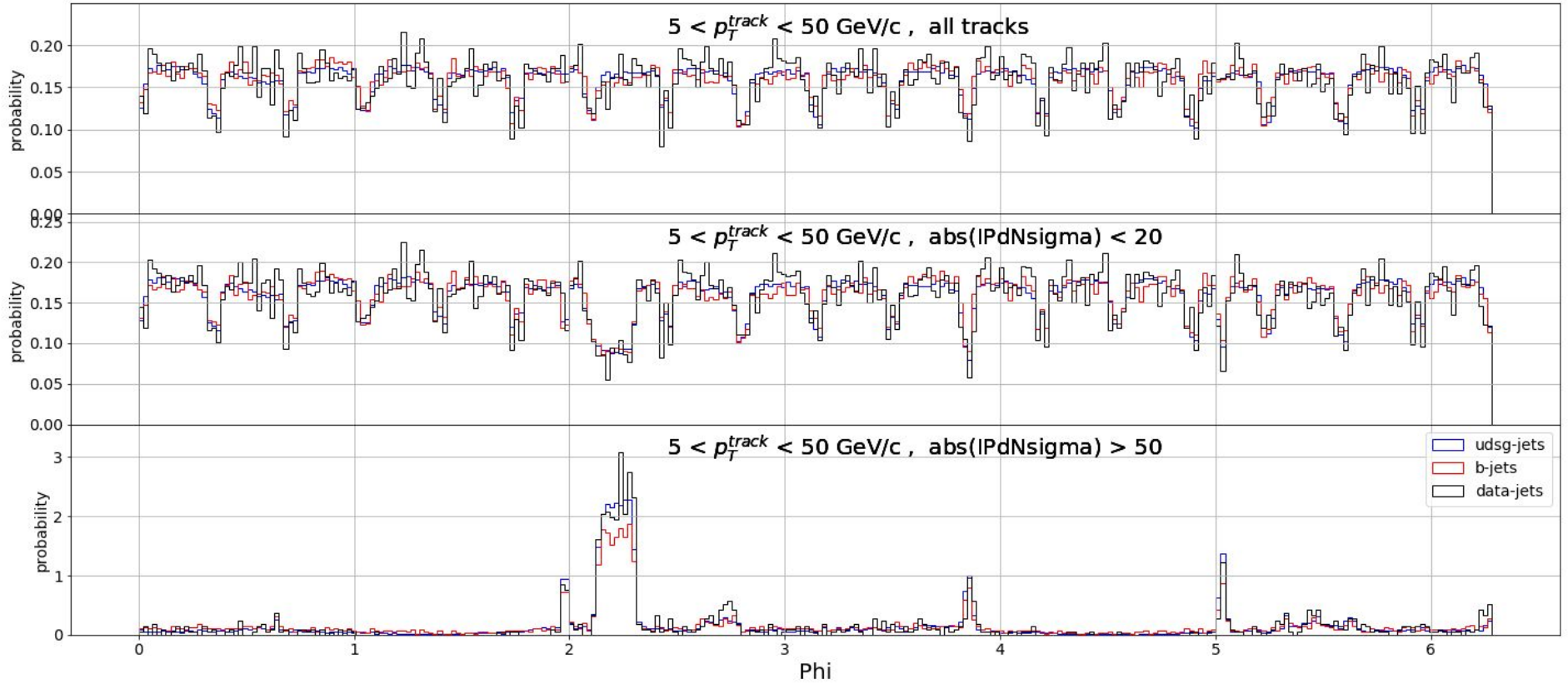
5 < p_T^{track} < 50 GeV/c , abs(IPdNsigma) > 50
probability
udsg-jets
b-jets
data-jets
IPdSigma

Phi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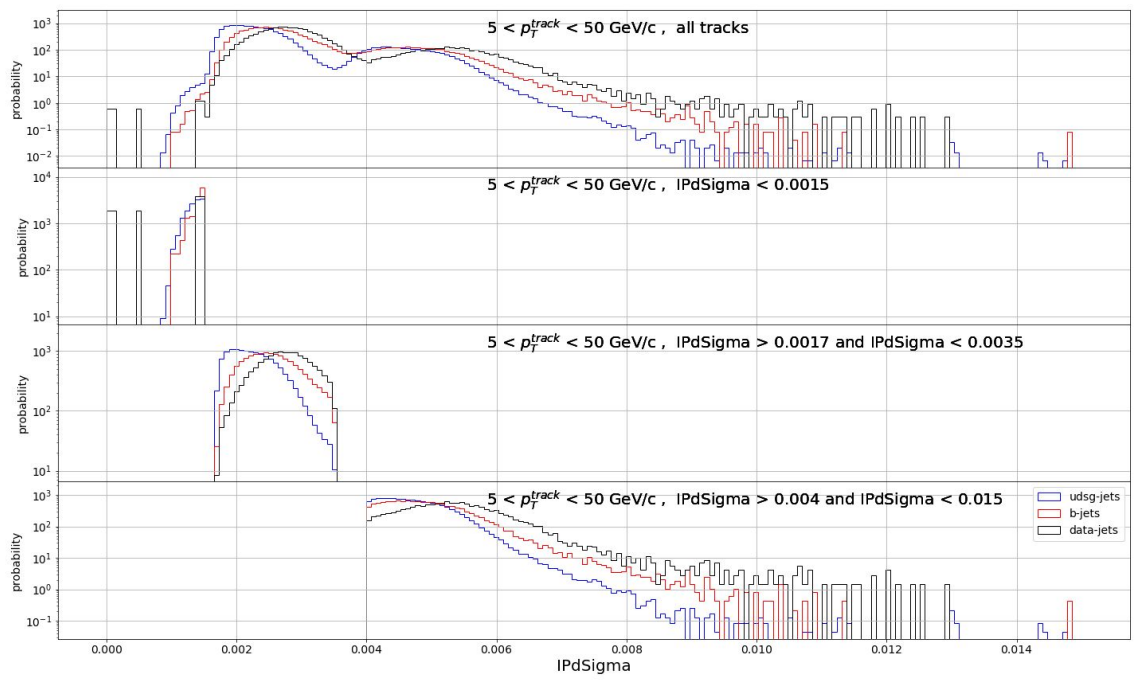
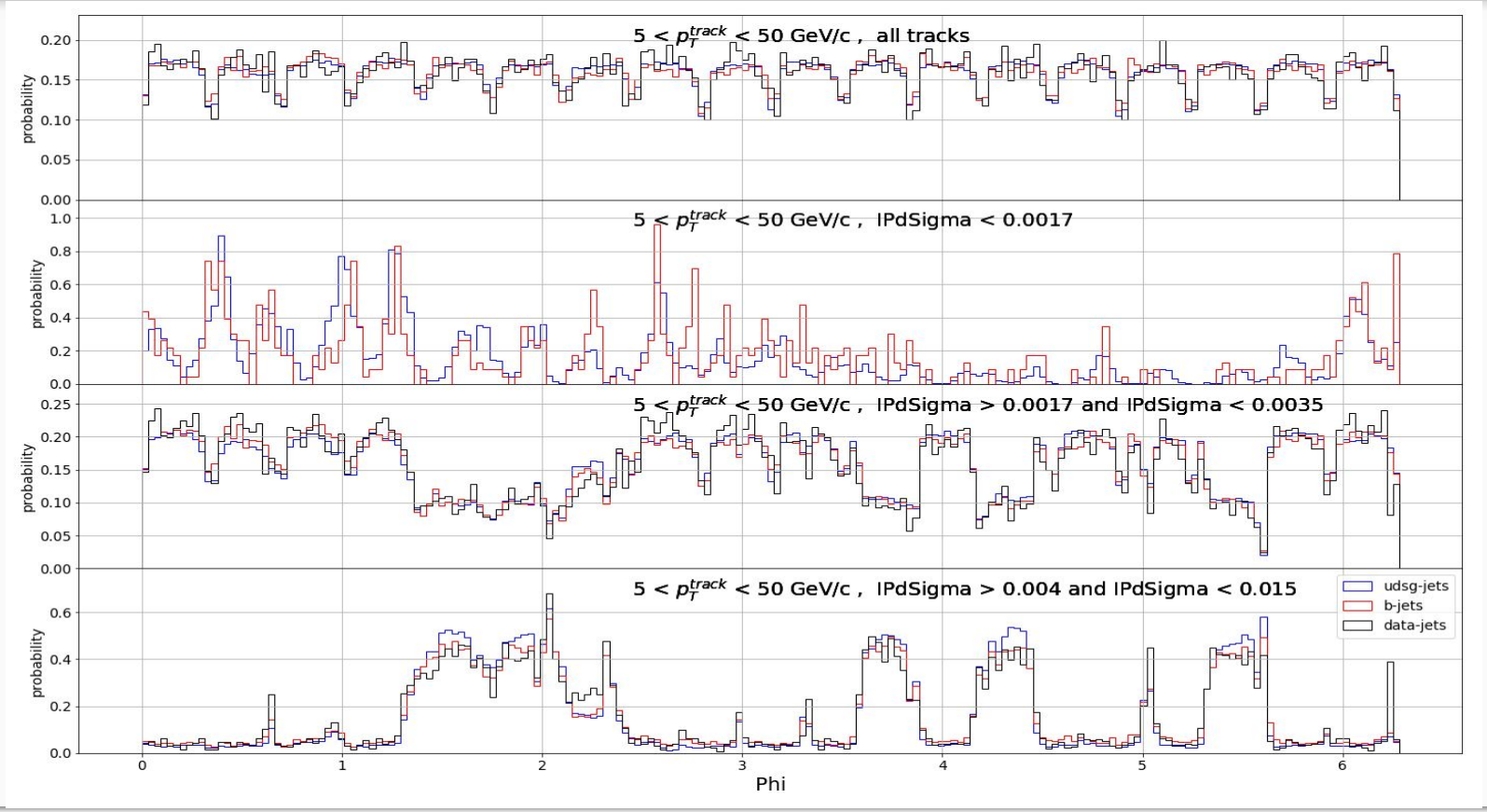
probability
udsg-jets
b-jets
data-jets
Phi

Grouping by IPdSigma

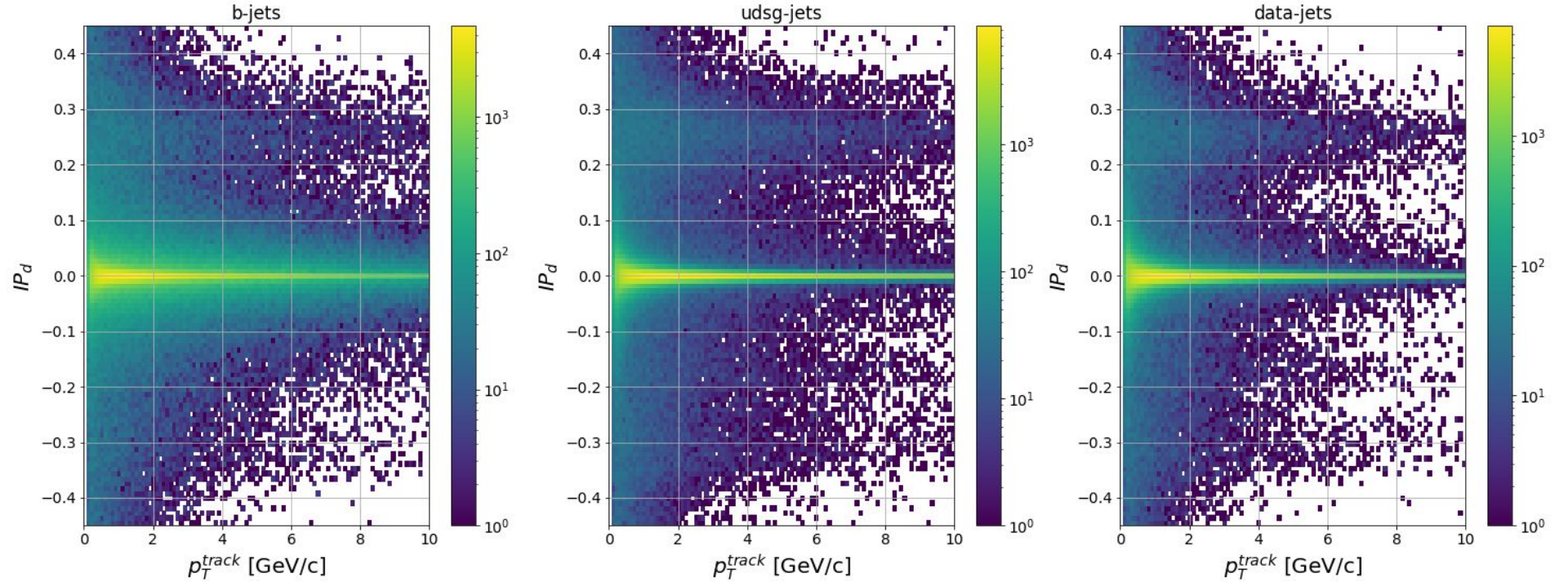


Phi, grouped by IPdSigma

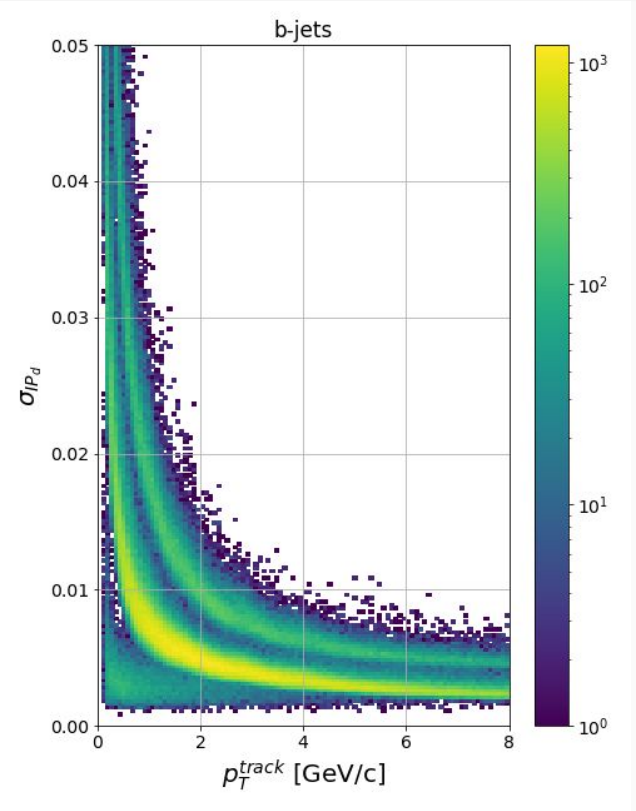


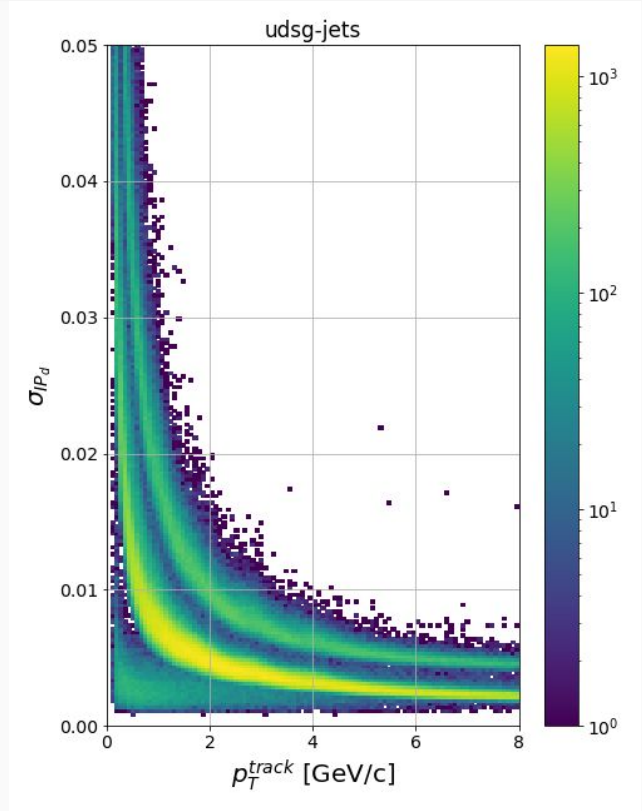
IPd and IPdSigma as a function of pT

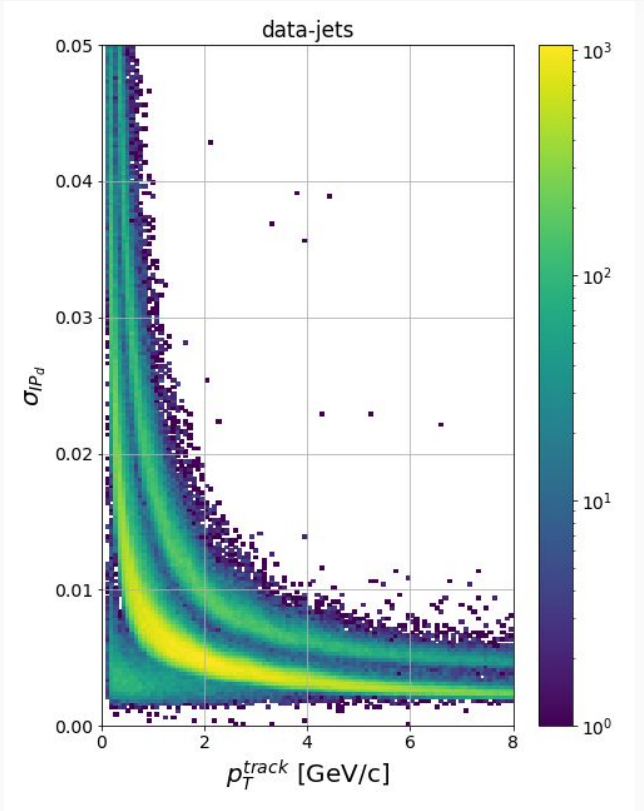
IPd vs pT



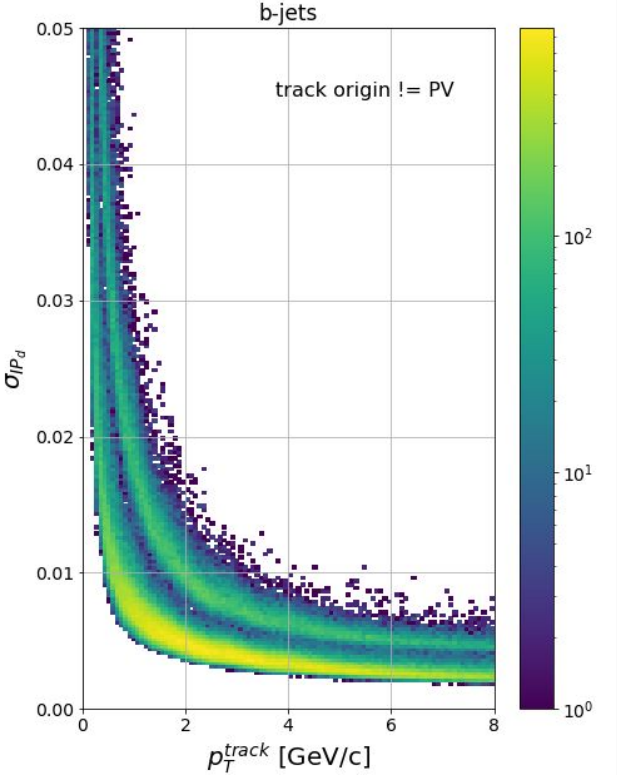
IPdSigma vs pT

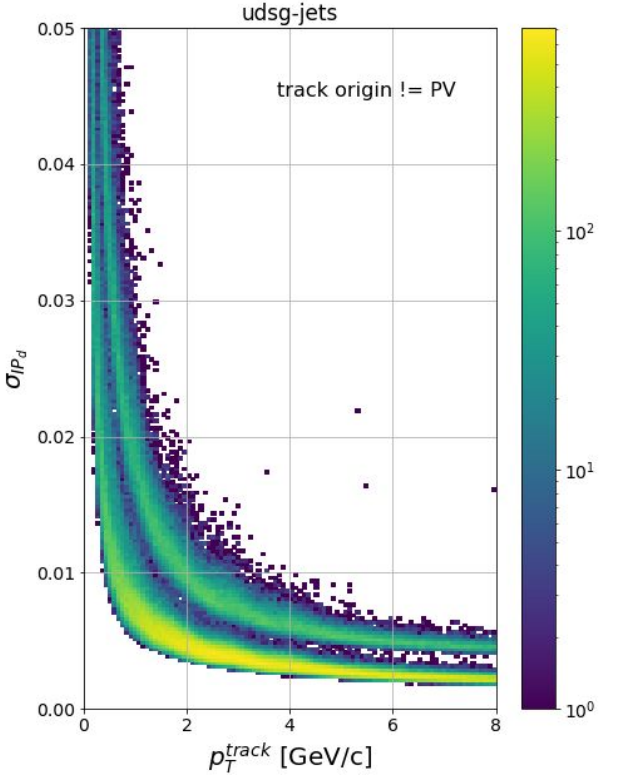




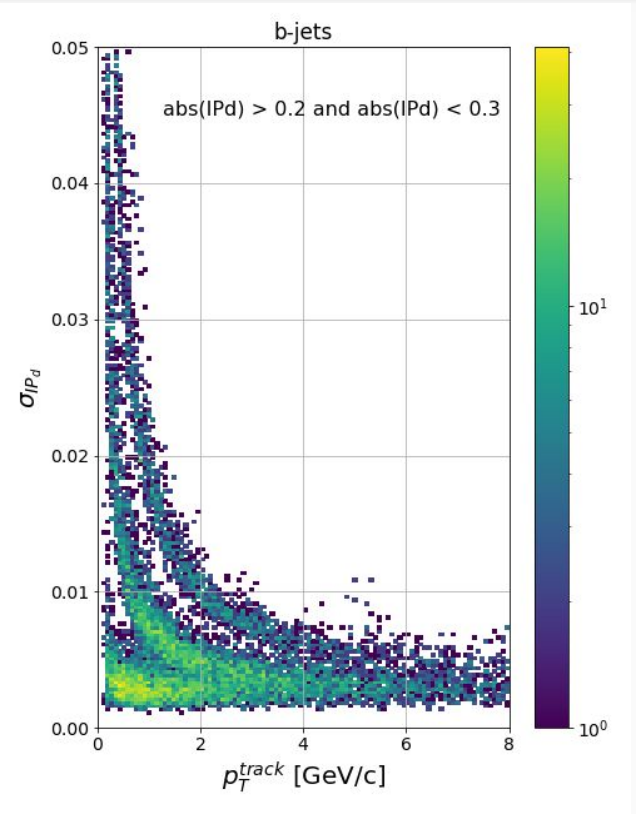


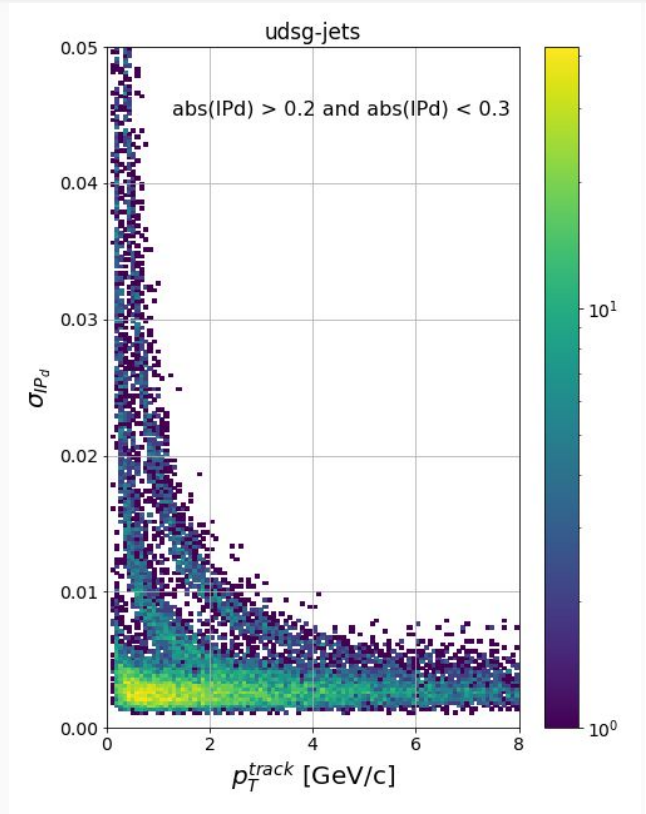
IPdSigma vs pT (origin != PV)

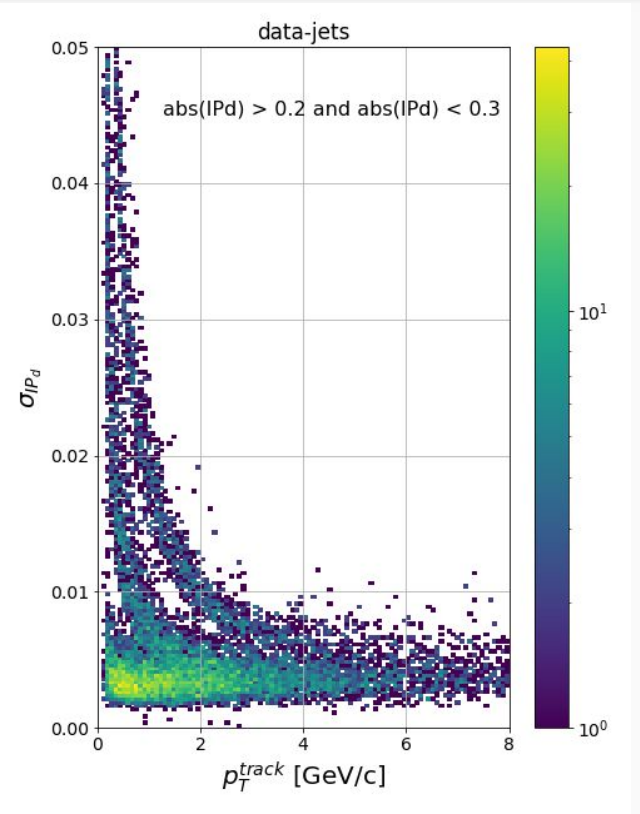




IPdSigma vs pT (0.2 < | IPd |< 0.3 ~ noSPD)







Work in progress

- checking models w/ and w/o IPd sigma info and SV cuts
- column-by-column comparison
- model performance vs phi

Question:

- why phi and eta have equal weights in jet reconstruction?

Plans for next week (discussion)

- invent new cuts: hint = where the data diverges from MC
- investigate experiments in detail:
  - control plots created for all these experiments, stability, artifacts
  - features used by models
- compare data-MC discrepancy on column level w/ & w/o cuts
- create best possible model with:
  - covIPd and unshuffled-pt fixed
  - added jet shapes/substructure observables e.g. mean/median pT, momentum dispersion, angularity etc
  - check possibility to include SV representative to their distribution, like highest, average and lowest LxyNsigma instead of list of 3 or 10
- apply on data and show critical distributions: Lxy & IP (after loose cuts on SV quality)