

Vertexing & Flavour tagging performance plots for IDR

Taikan Suehara
Tomohiko Tanabe
Masakazu Kurata
Ryo Yonamine

Condition to produce the plots in this talk

- ❖ **ilcsoft v02-00-01 + modified LCFIPlus (<https://github.com/lcfiplus/LCFIPlus/pull/43>)**
(Now it has been merged into the LCFIPlus master branch.)

- ▶ Reprocess primary + secondary vertexing with LCFIPlus.

- ❖ **Samples (6b, 6c, 6q 500GeV)**

- ▶ w/o beam bkg, I5 500GeV,

- ▶ /hsm/ilc/grid/storm/prod/ilc/mc-opt.dsk/ild/dst/500-TDR_ws/
flavortag/ILD_I5_oI_v02_nobg/v02-00-01/00010584

- ▶ w/o beam bkg, s5 500GeV,

- ▶ /hsm/ilc/grid/storm/prod/ilc/mc-opt.dsk/ild/dst/500-TDR_ws/
flavortag/ILD_s5_oI_v02_nobg/v02-00-01/00010583

- ▶ w/ beam bkg, I5 500GeV,

- ▶ /hsm/ilc/grid/storm/prod/ilc/mc-opt.dsk/ild/dst/500-TDR_ws/
flavortag/ILD_I5_oI_v02/v02-00-01/00010586

- ▶ w/ beam bkg, s5 500GeV,

- ▶ /hsm/ilc/grid/storm/prod/ilc/mc-opt.dsk/ild/dst/500-TDR_ws/
flavortag/ILD_s5_oI_v02/v02-00-01/00010585

Recent important updates (Since DBD)

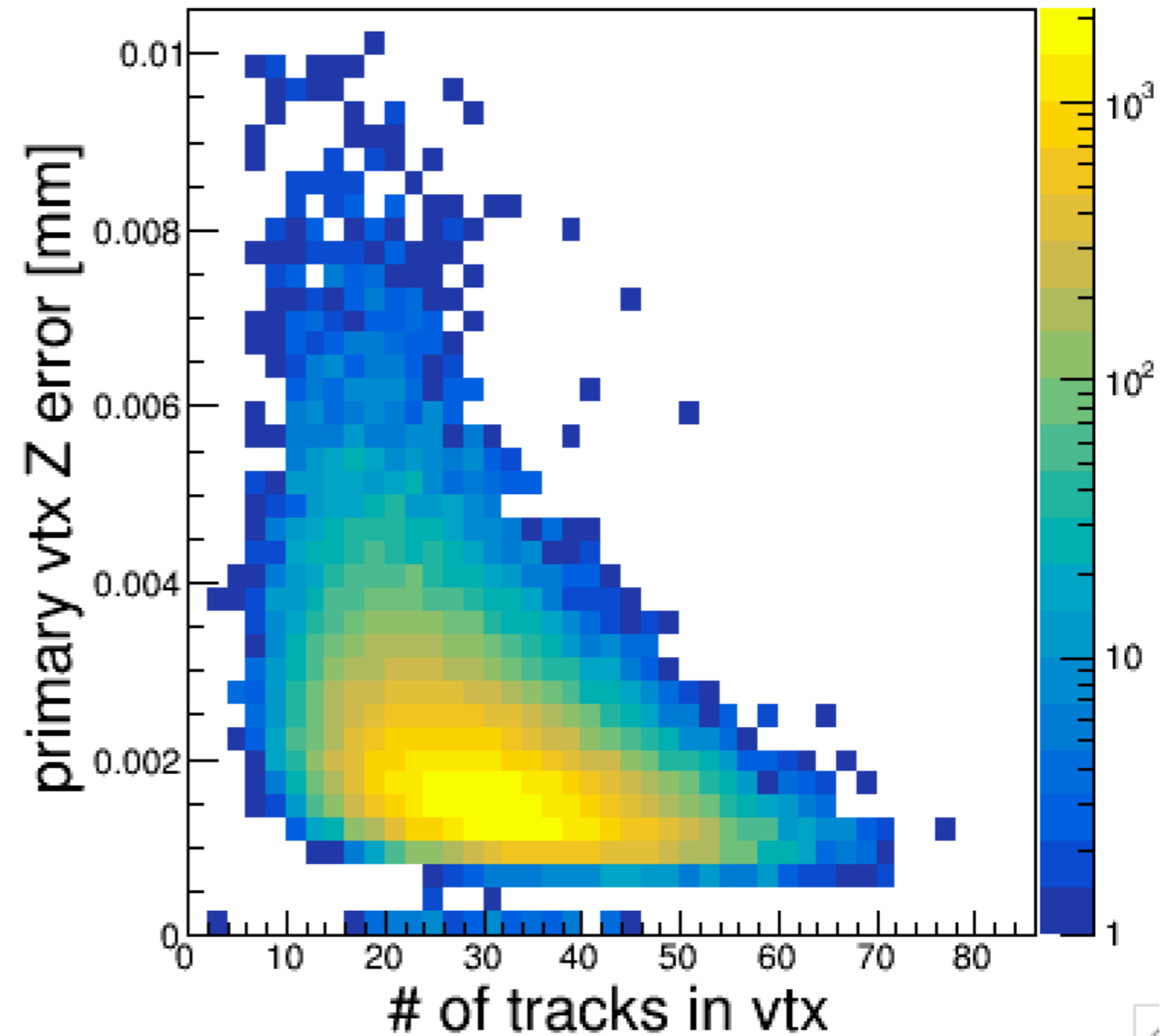
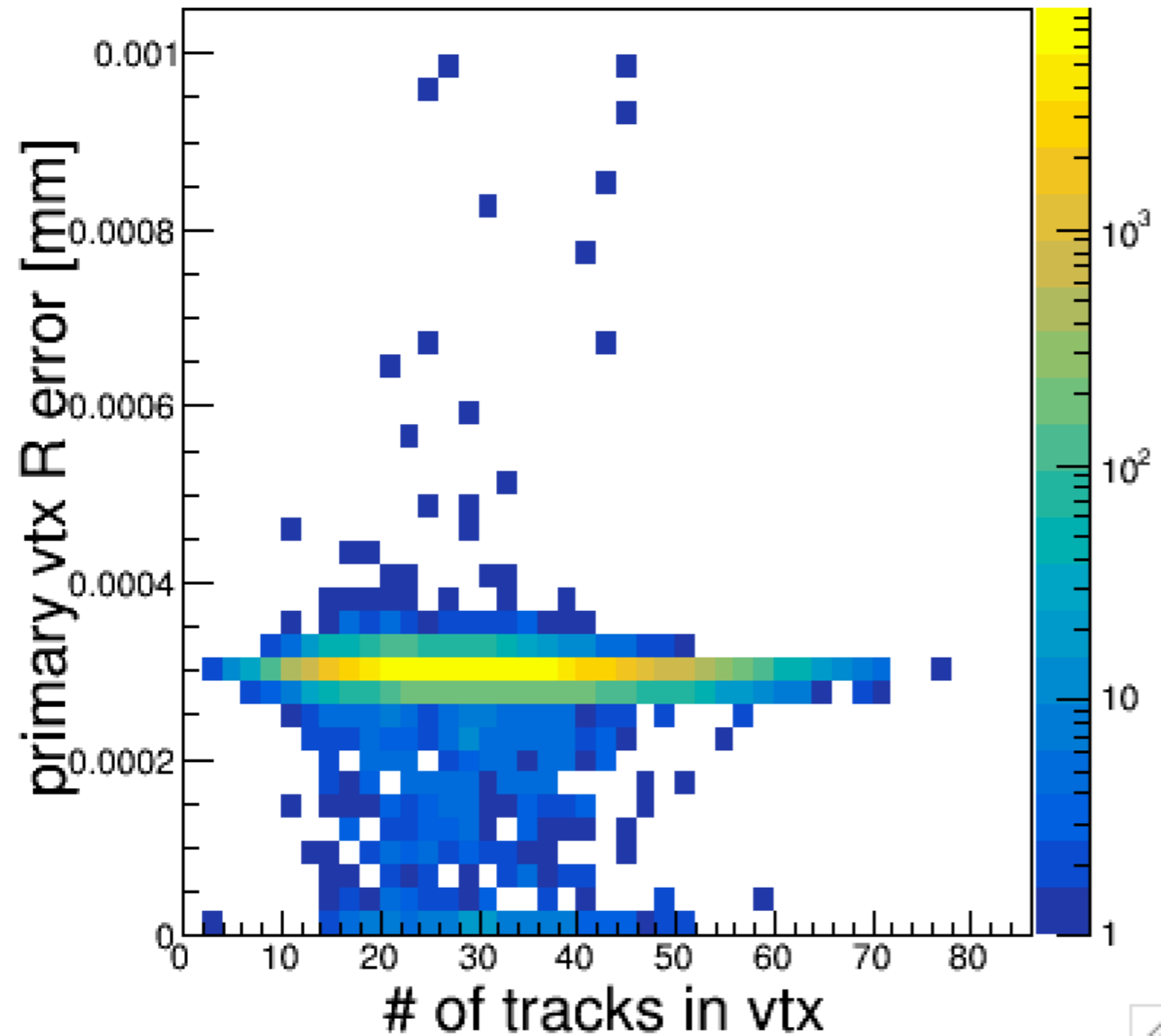
- ❖ **IP smearing in simulation has been taken into account.**
 - ▶ More realistic than DBD study where IP was fixed at (0,0,0).
 - ▶ Algorithms using Z0 were modified.
 - ▶ This solved major discrepancy seen between training samples with different statistics (e.g. 20k/100k).
- ❖ **Primary vertex fitting failures have been suppressed.**
 - ▶ Originally fitting parameters (range, step) were optimized only for secondary vertices.
 - ▶ Introduced a new feature to set those parameters for primary vertices and secondary vertices separately.
 - ▶ This solved too-small errors on the primary vertex positions, which existed since DBD.
- ❖ **Boolean type parameters were not correctly handled if you specify “true” or “false”. (We have been using “1” or “0”.)**
 - ▶ Current ILDConfig using “true” and “false”.
 - > **Merged into LCFIPlus master branch.**

To Do

- ❖ **Weight file preparation for the latest LCFIPlus**
 - ▶ I5/s5
 - ▶ MVA parameter (same as DBD/New)
 - ▶ BDT parameter (same as DBD/New)
- ❖ **New feature requested during the Benchmark Days.**
 - ▶ Functionality to remove specified tracks from the primary vertex and refit.

15 Vertexing performance

Primary vertex position resolution vs number of tracks (w/o beam bkg)

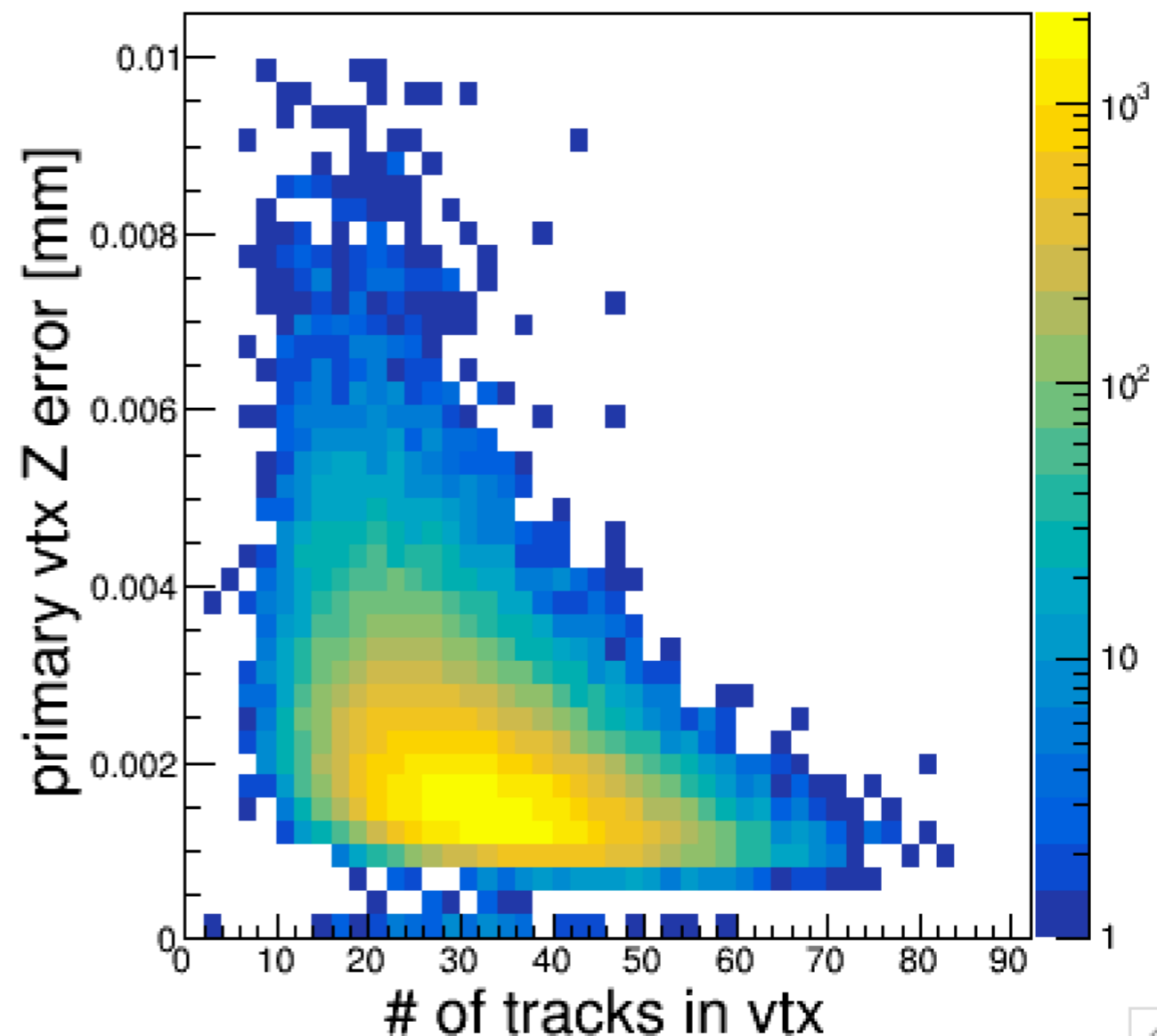
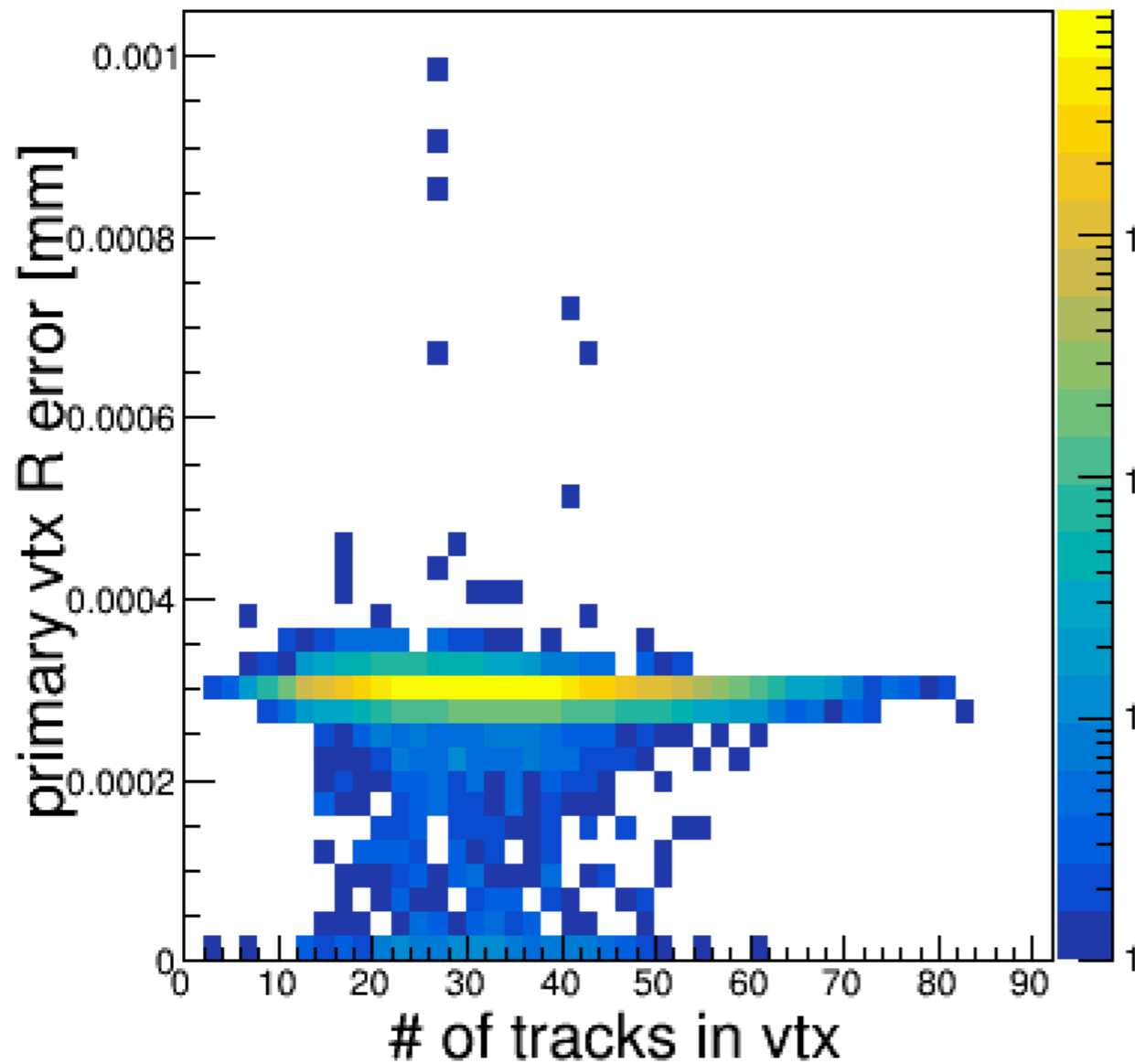


w/ beam constraint

beam size x ~ 300nm
beam size y ~ 2nm
beam size z ~ 200um

15 Vertexing performance

Primary vertex position resolution vs number of tracks (w/beam bkg)

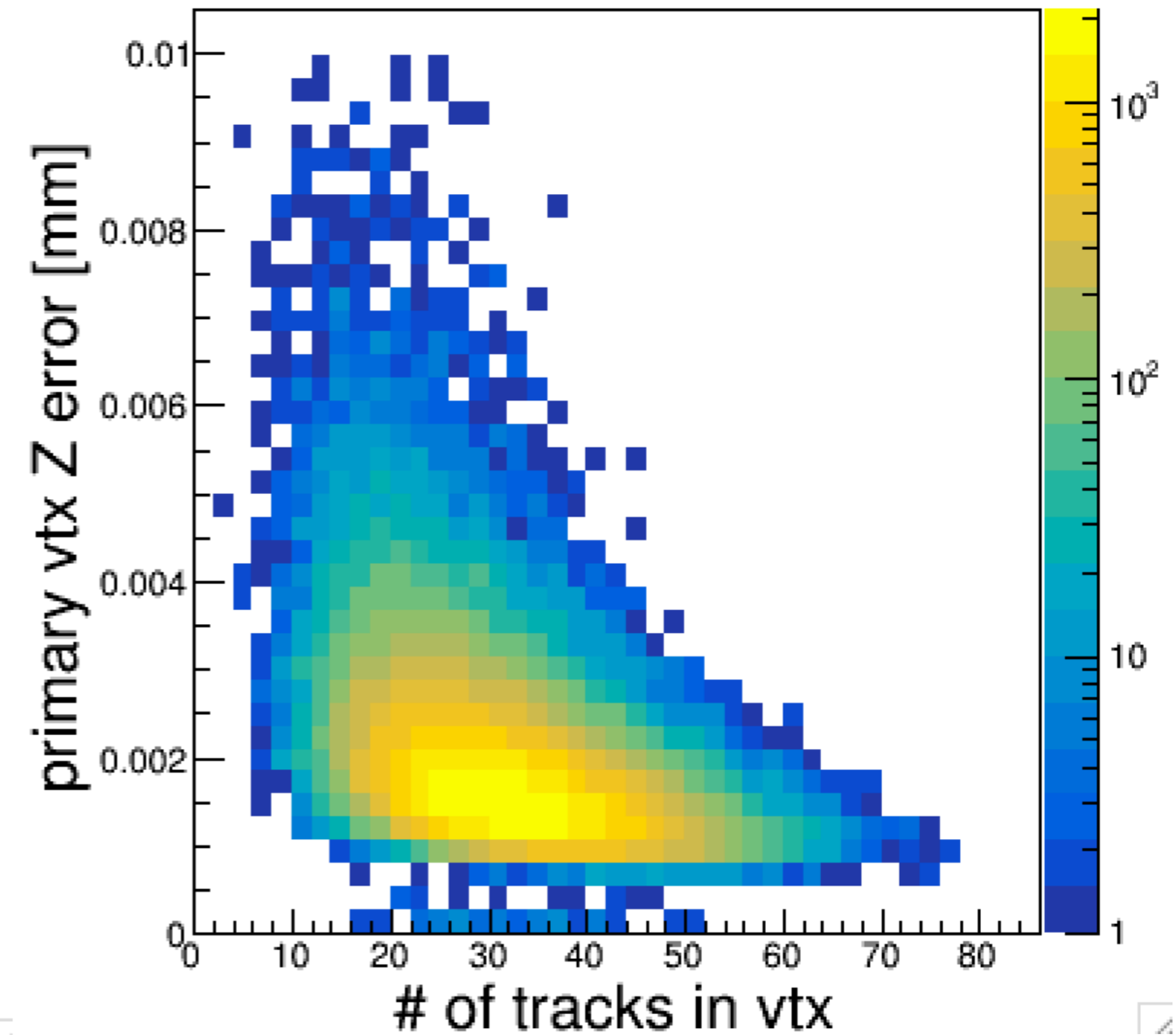
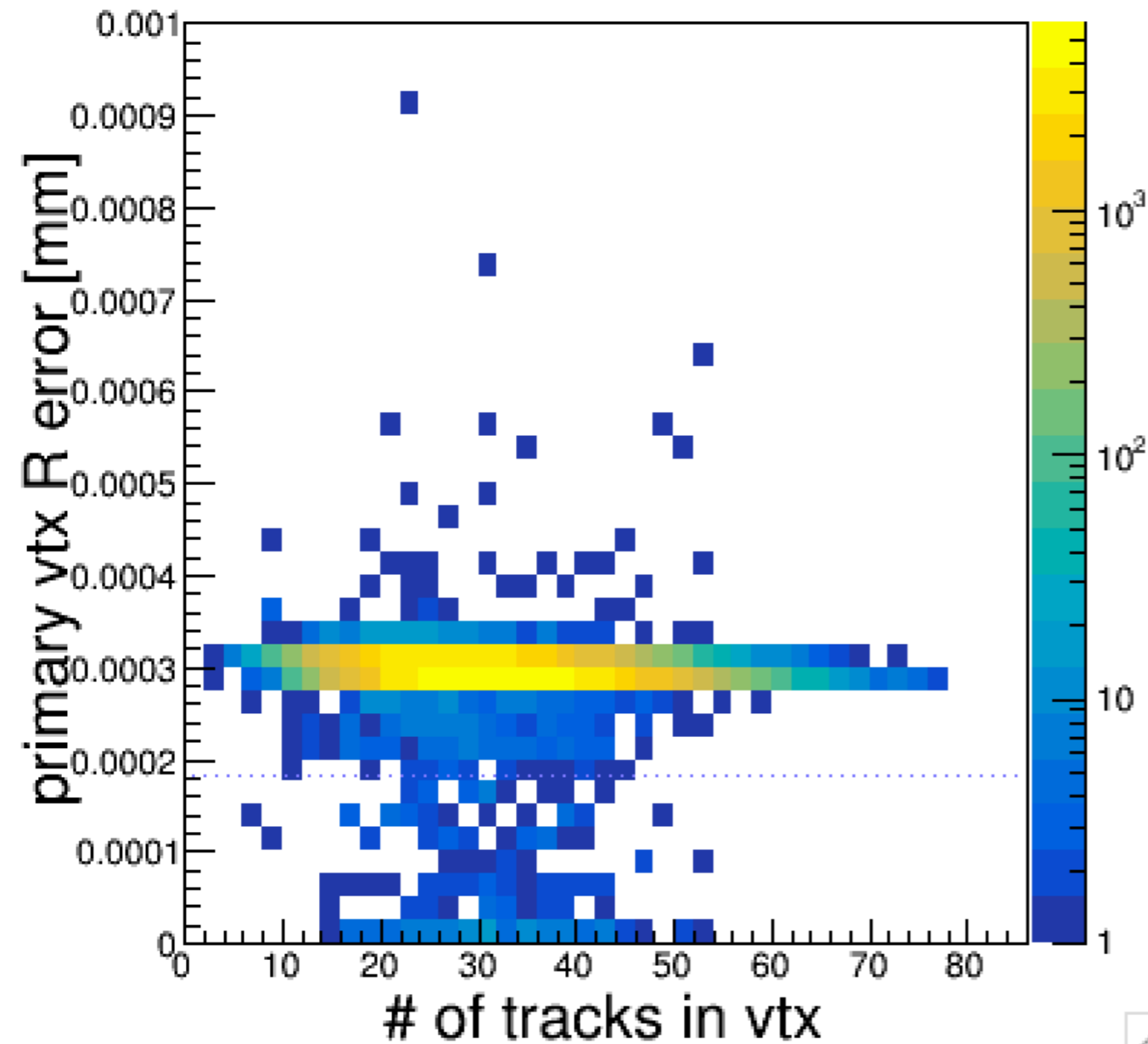


w/ beam constraint

beam size x ~ 300nm
beam size y ~ 2nm
beam size z ~ 200um

s5 Vertexing performance

Primary vertex position resolution vs number of tracks (w/beam bkg)

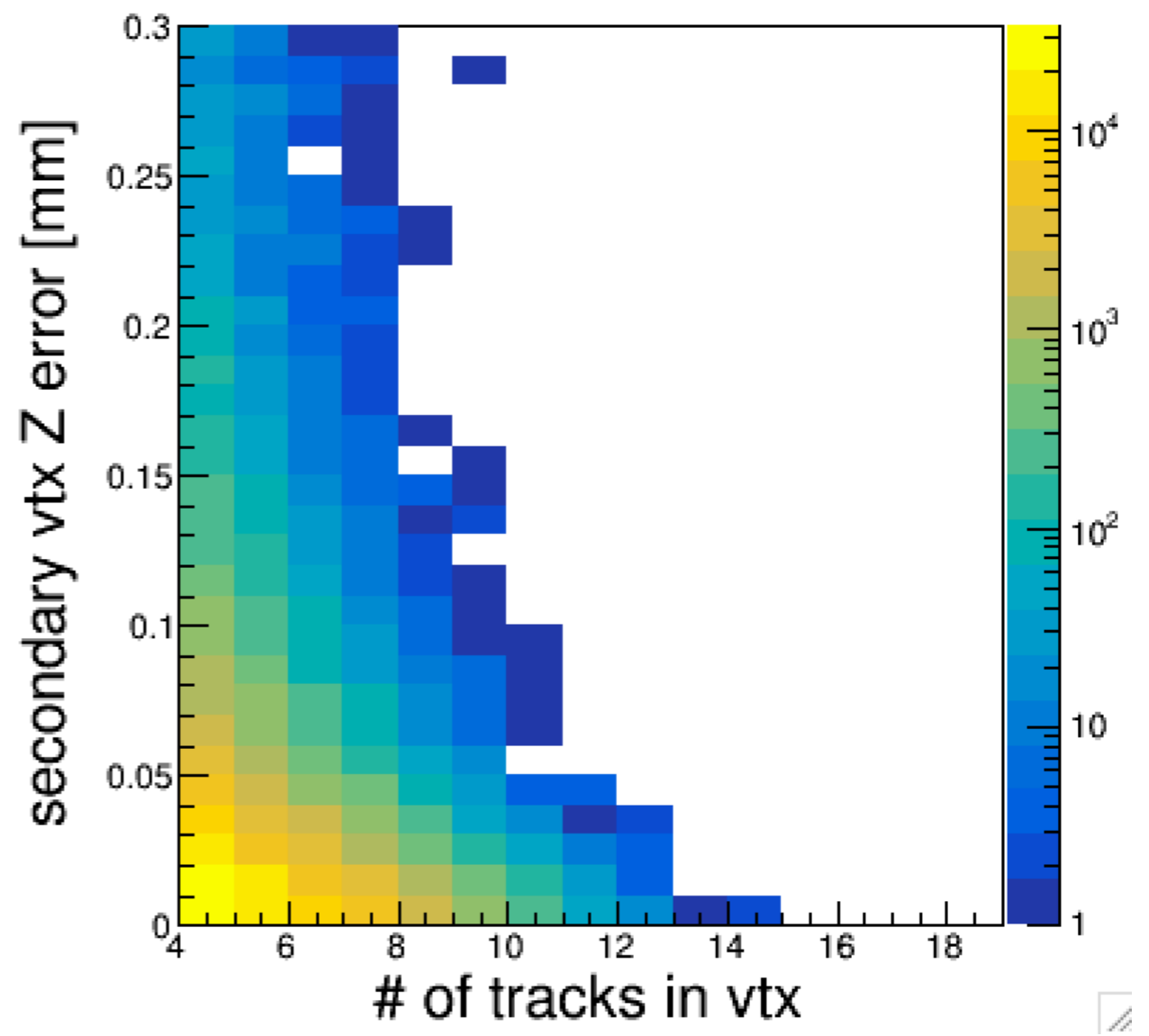
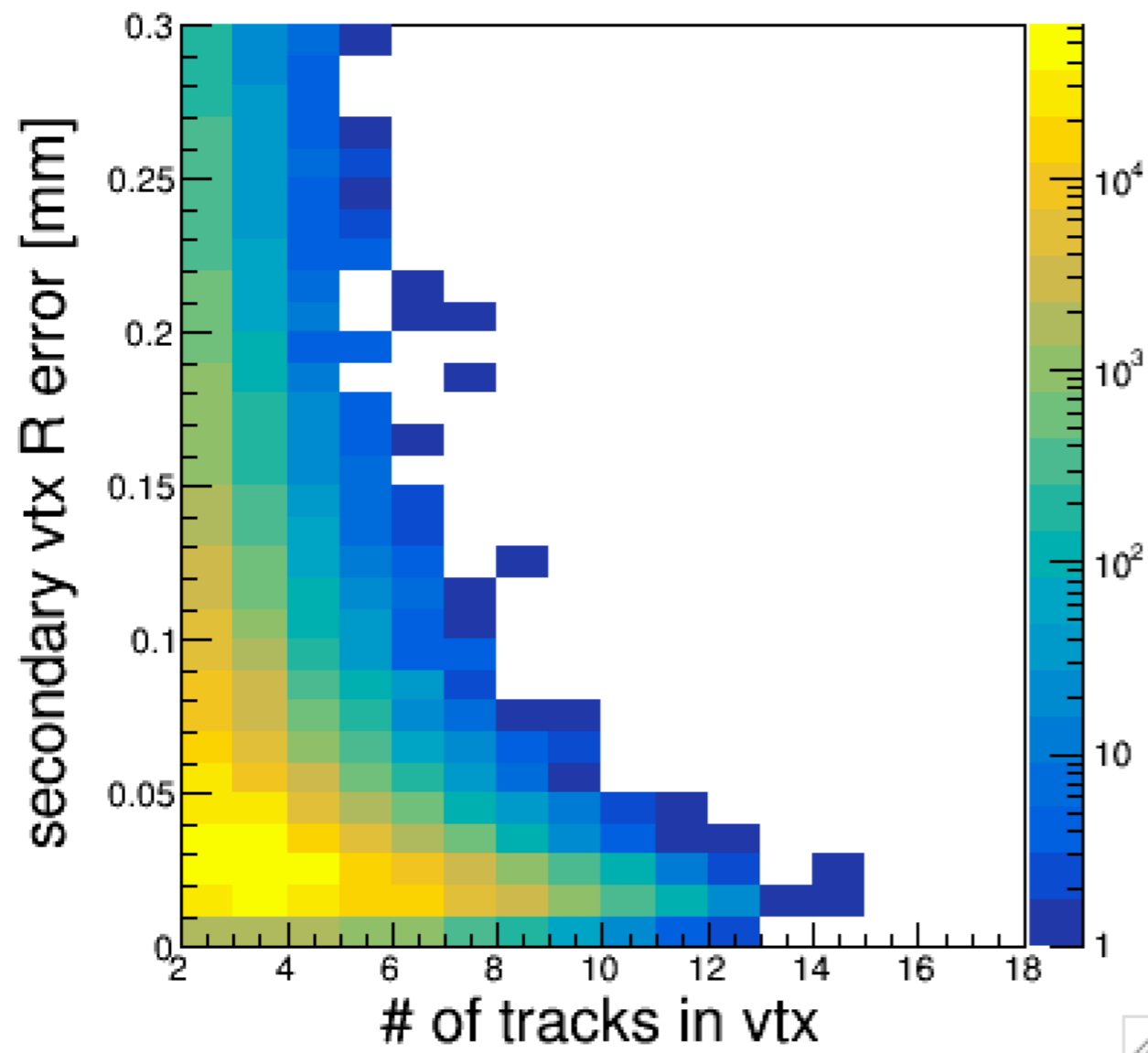


w/ beam constraint

beam size x ~ 300nm
beam size y ~ 2nm
beam size z ~ 200um

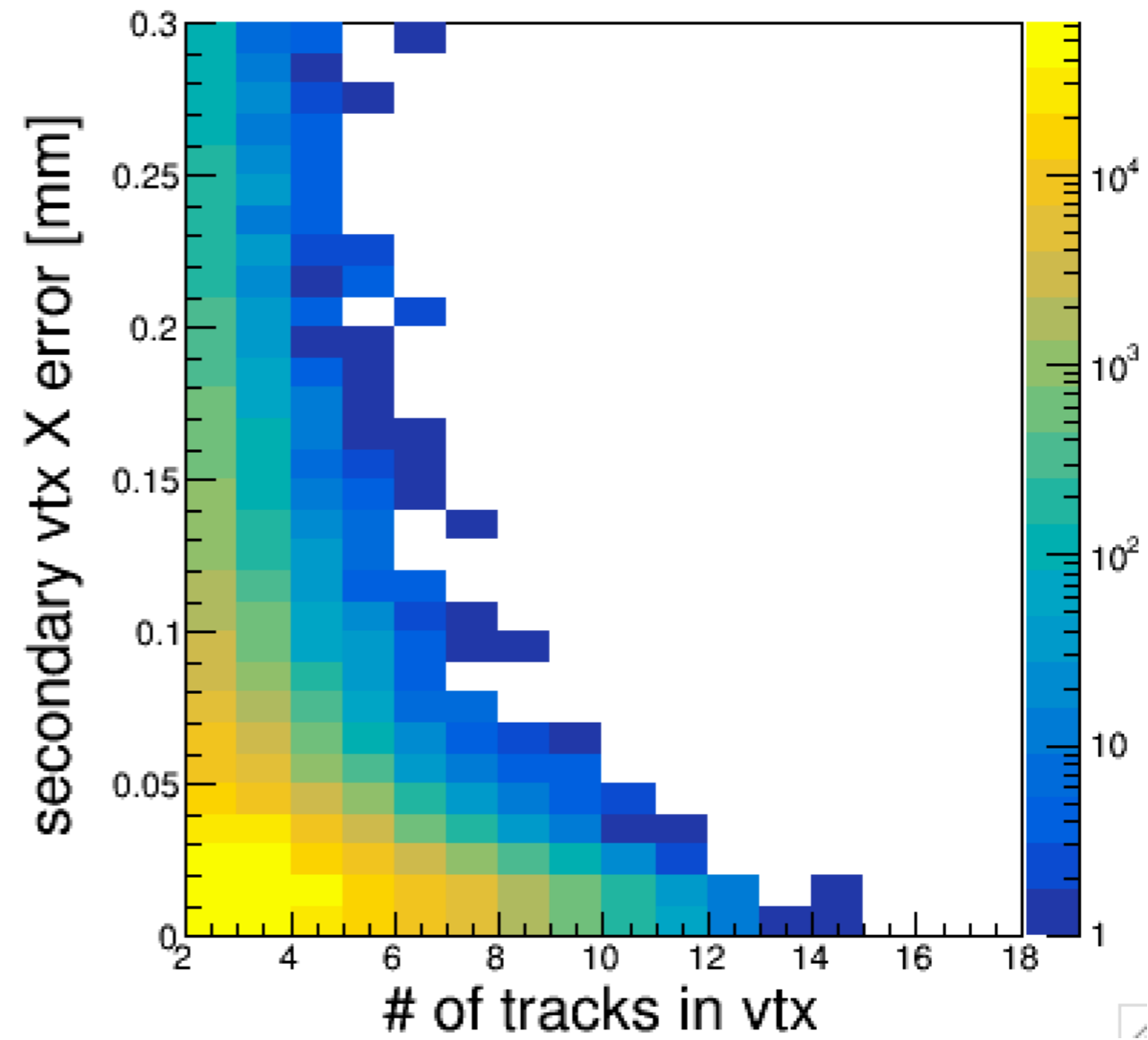
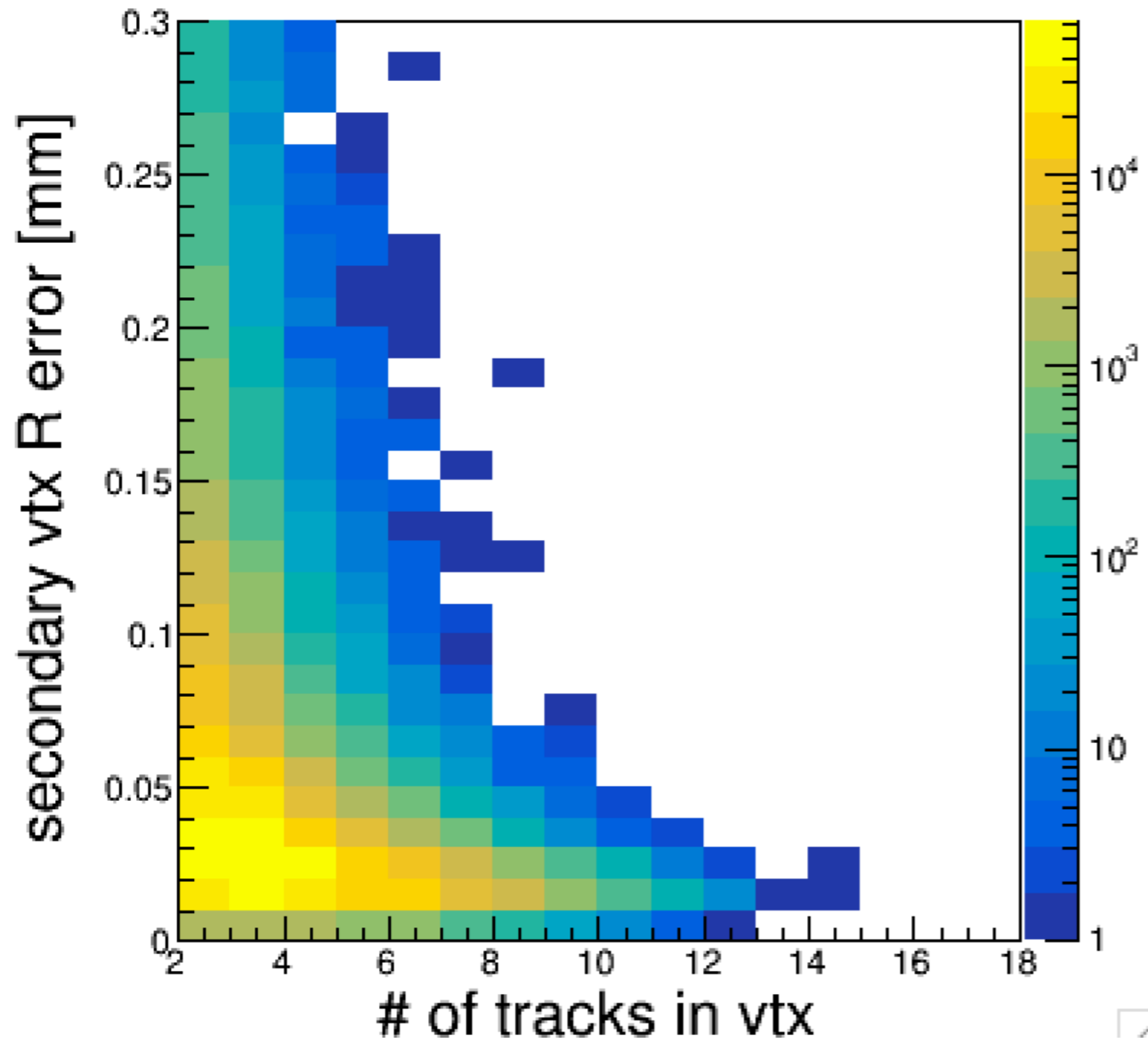
s5 Vertexing performance

Primary vertex position resolution vs number of tracks (w/o beam bkg)



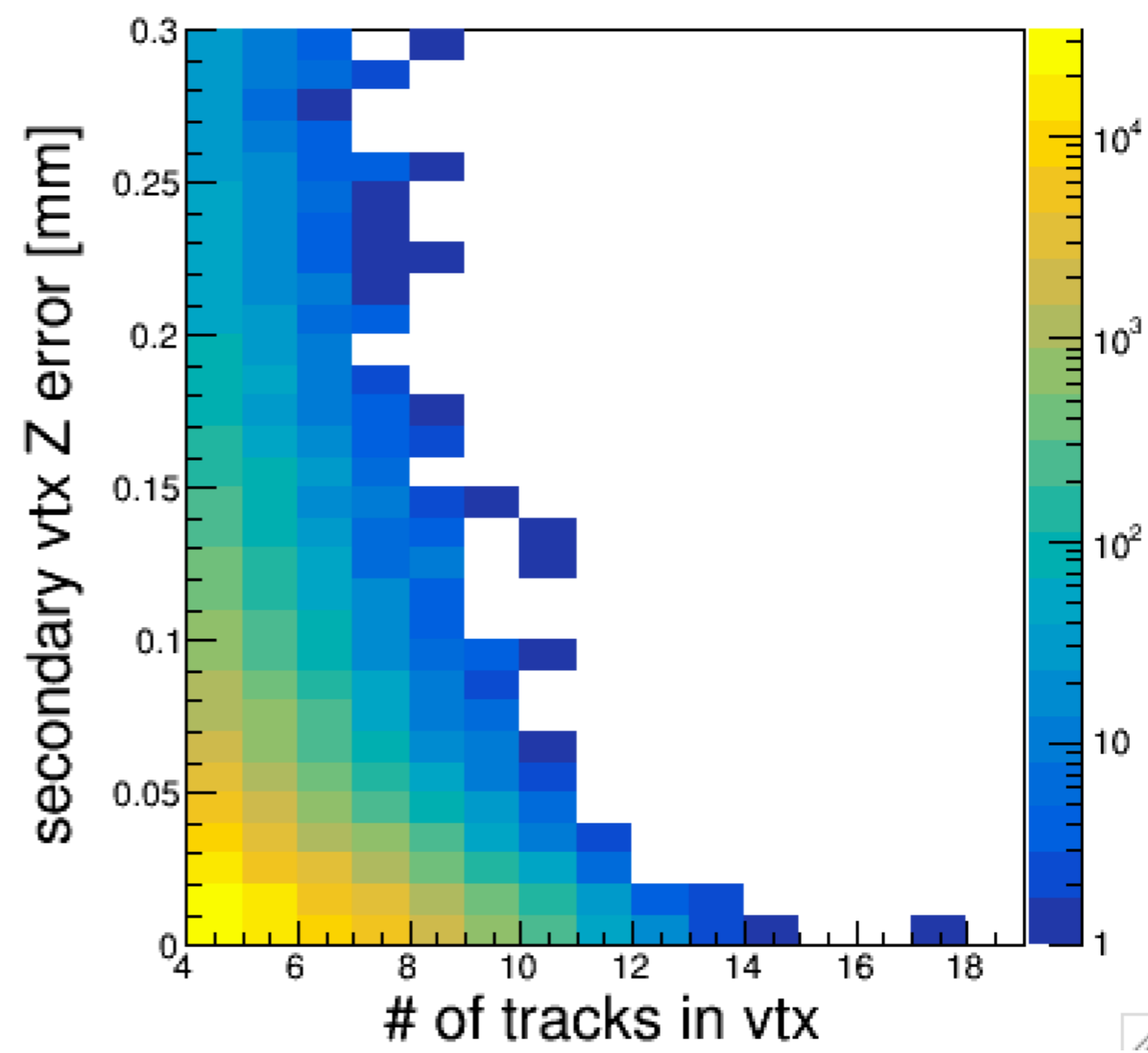
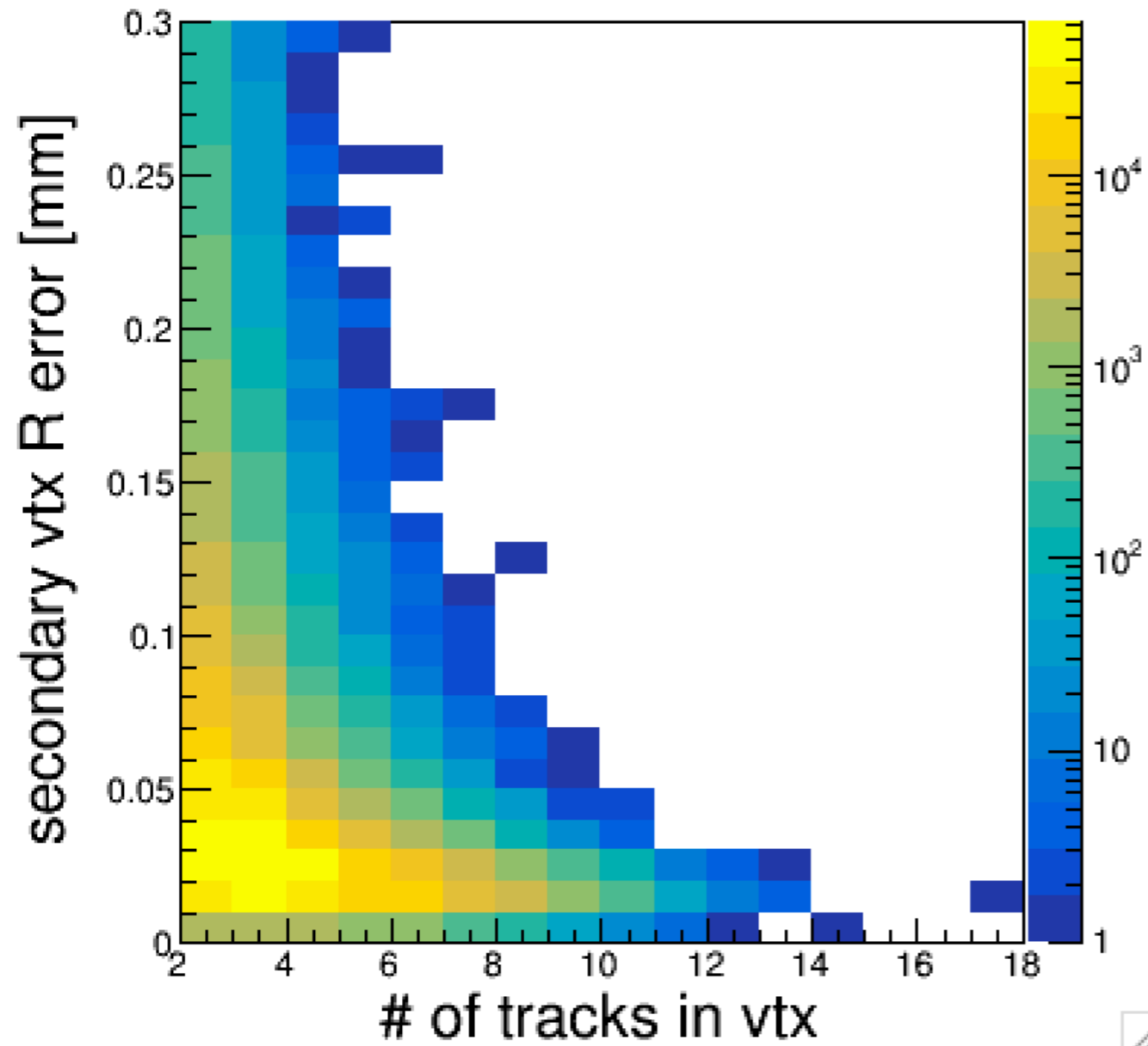
15 Vertexing performance

Secondary vertex position resolution vs number of tracks (w/beam bkg)



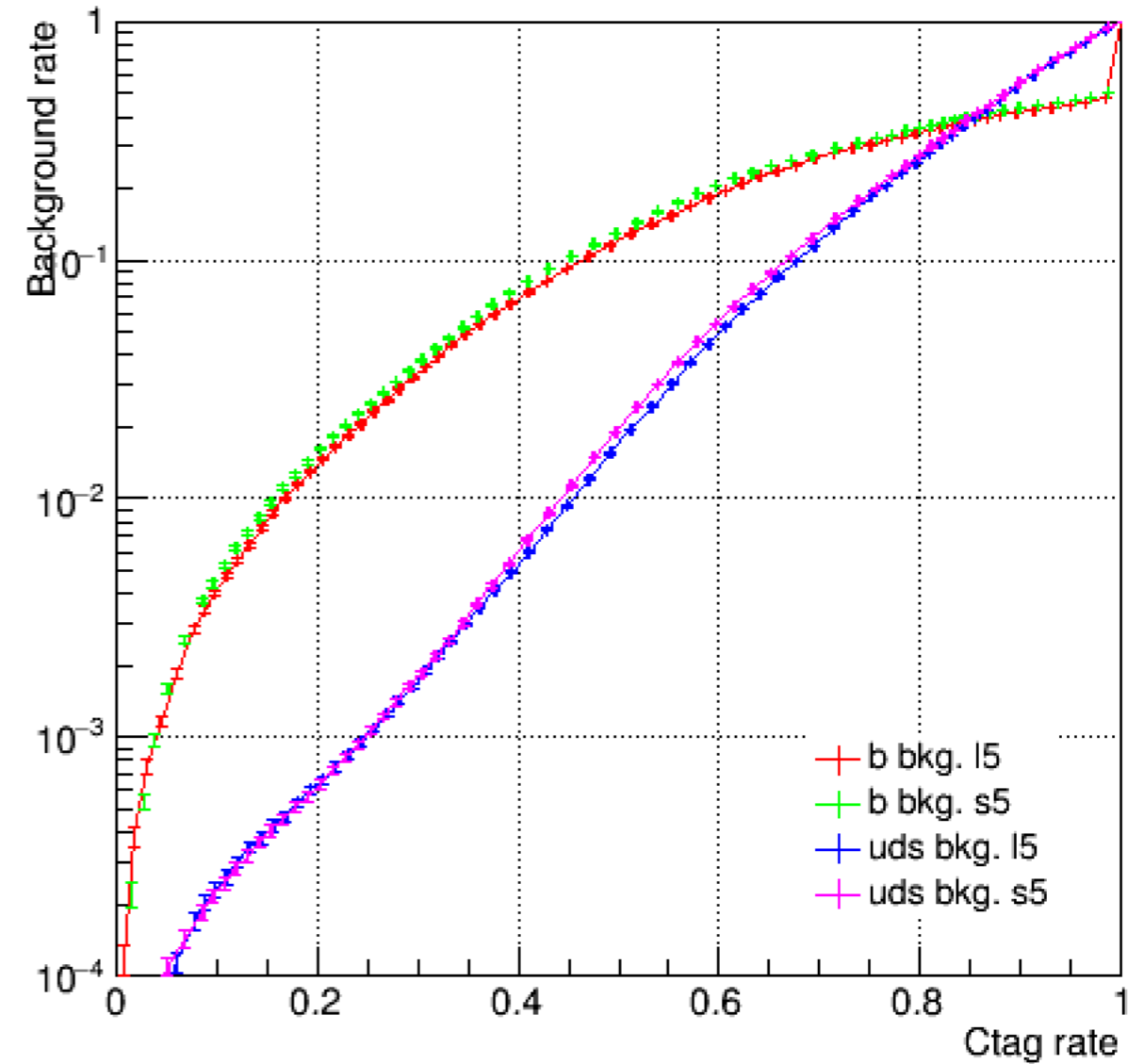
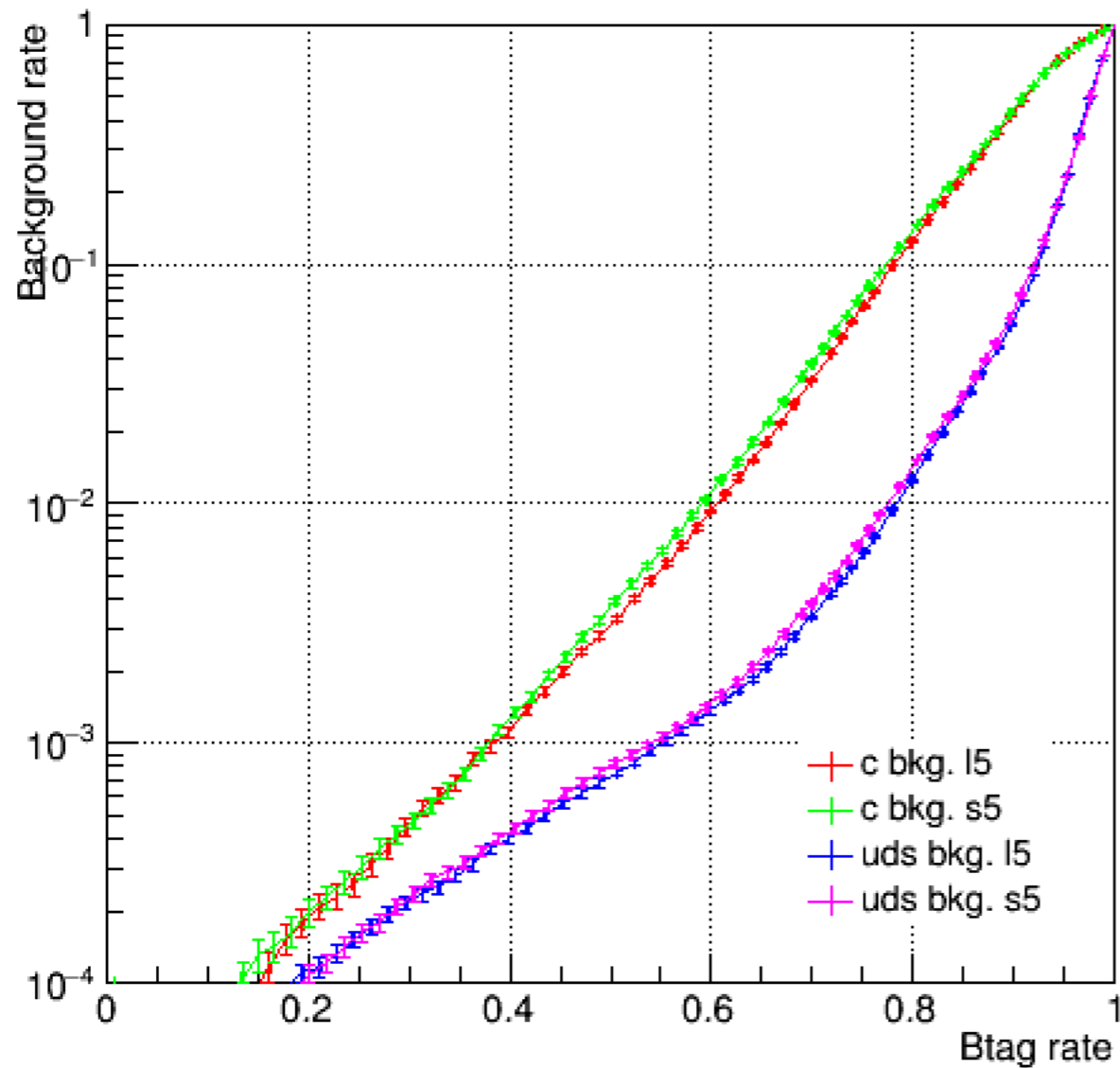
s5 Vertexing performance

Secondary vertex position resolution vs number of tracks (w/beam bkg)



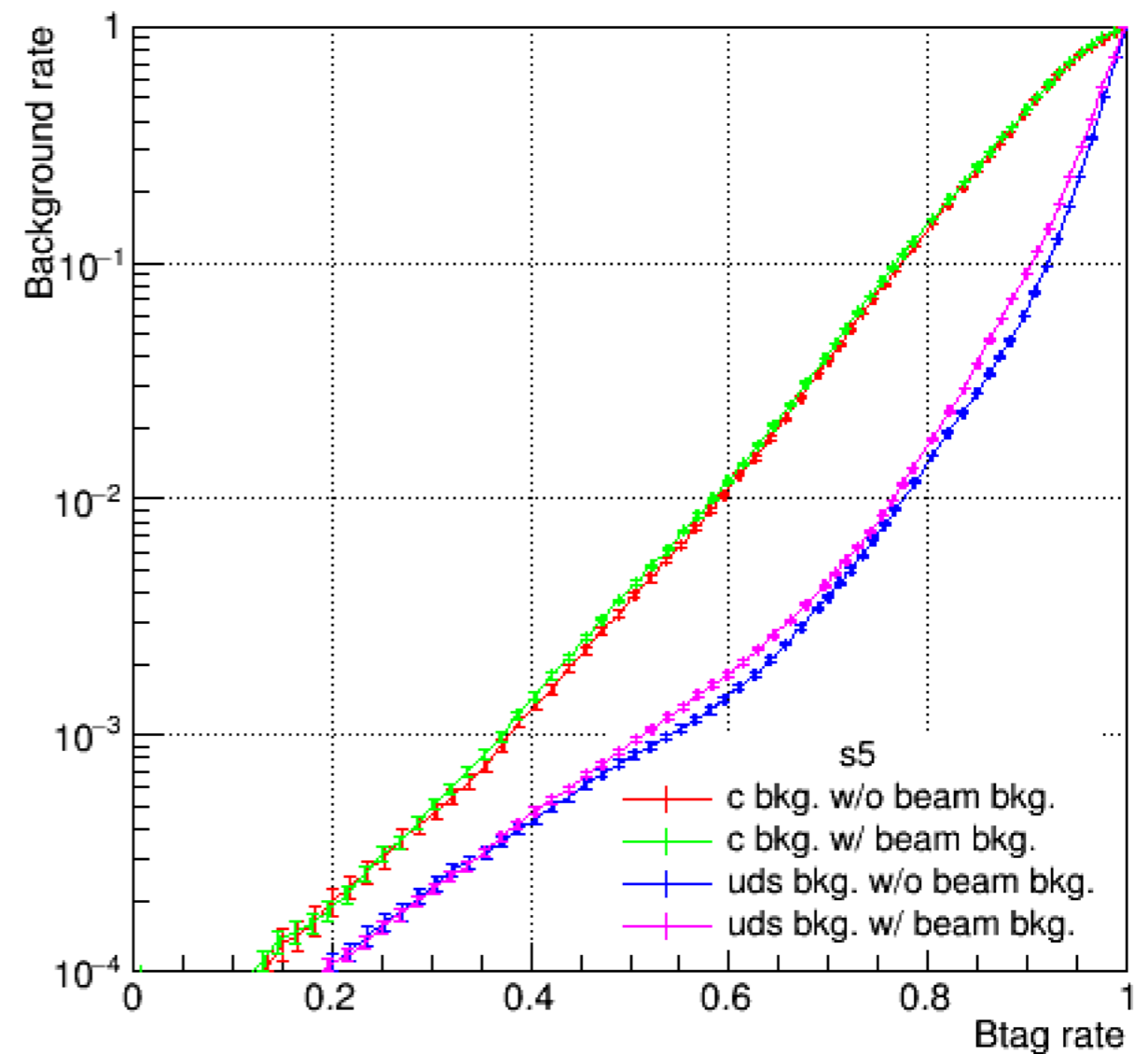
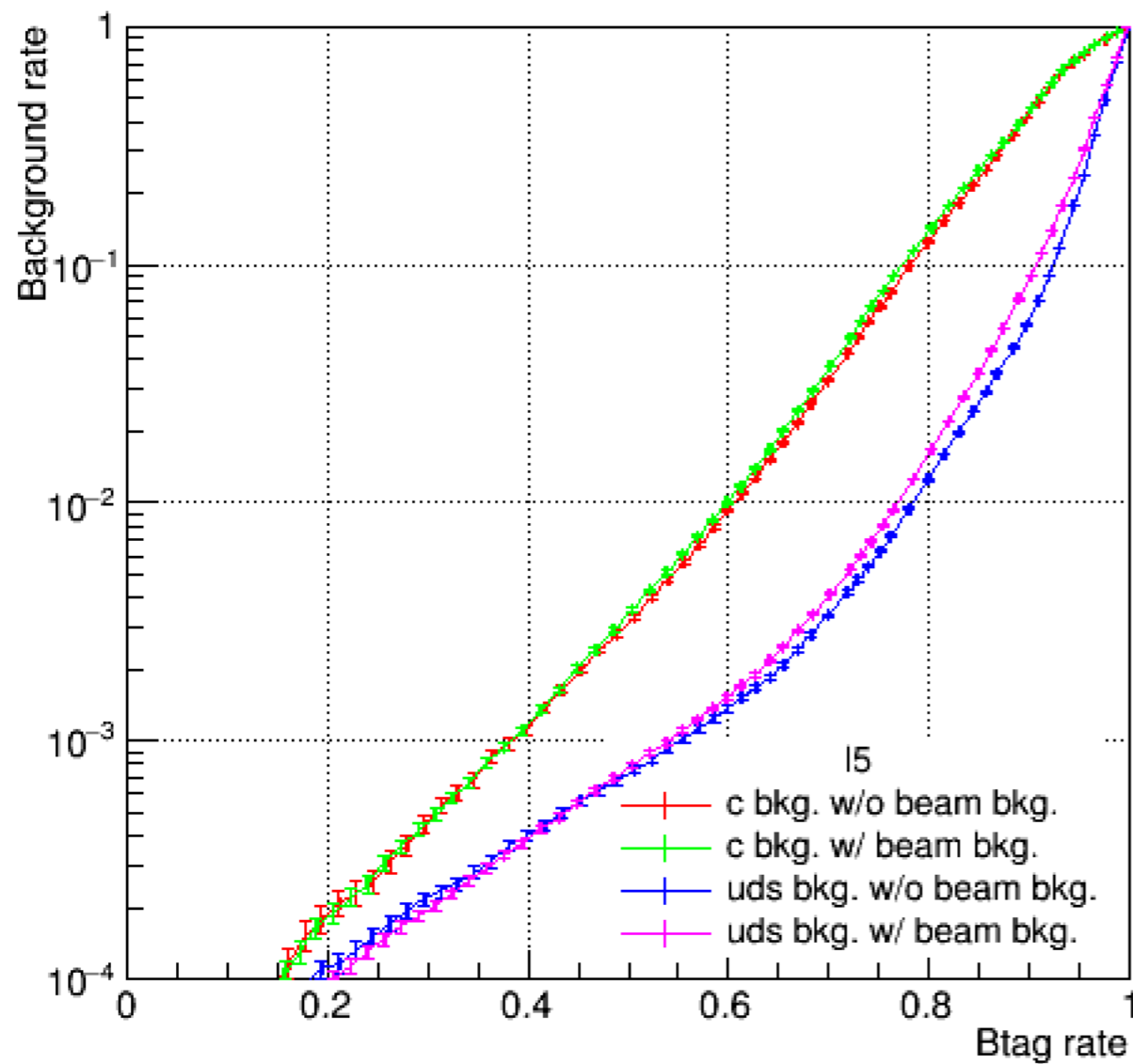
Flavour Tagging performance

w/o beam bkg sample (test and training)



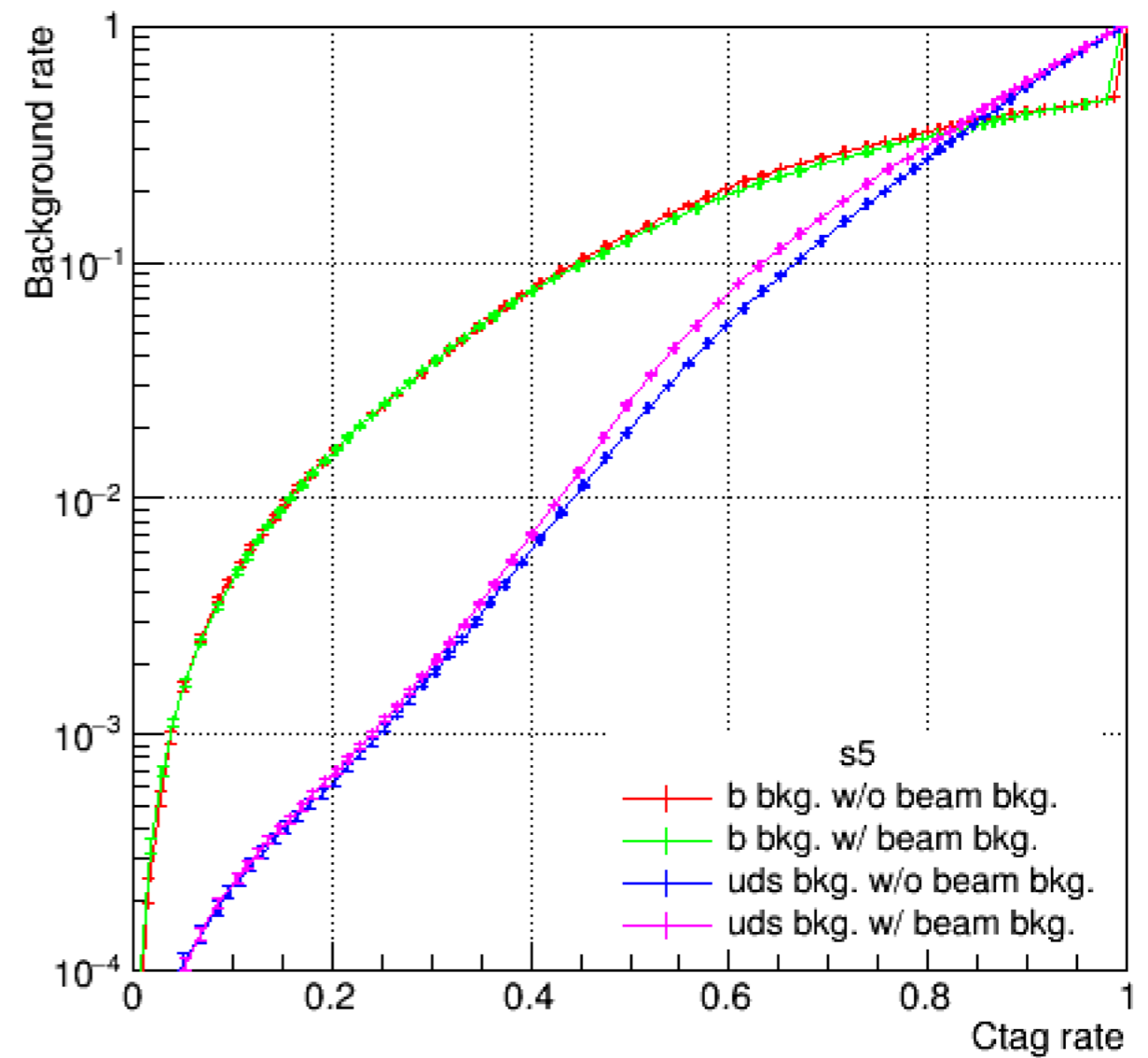
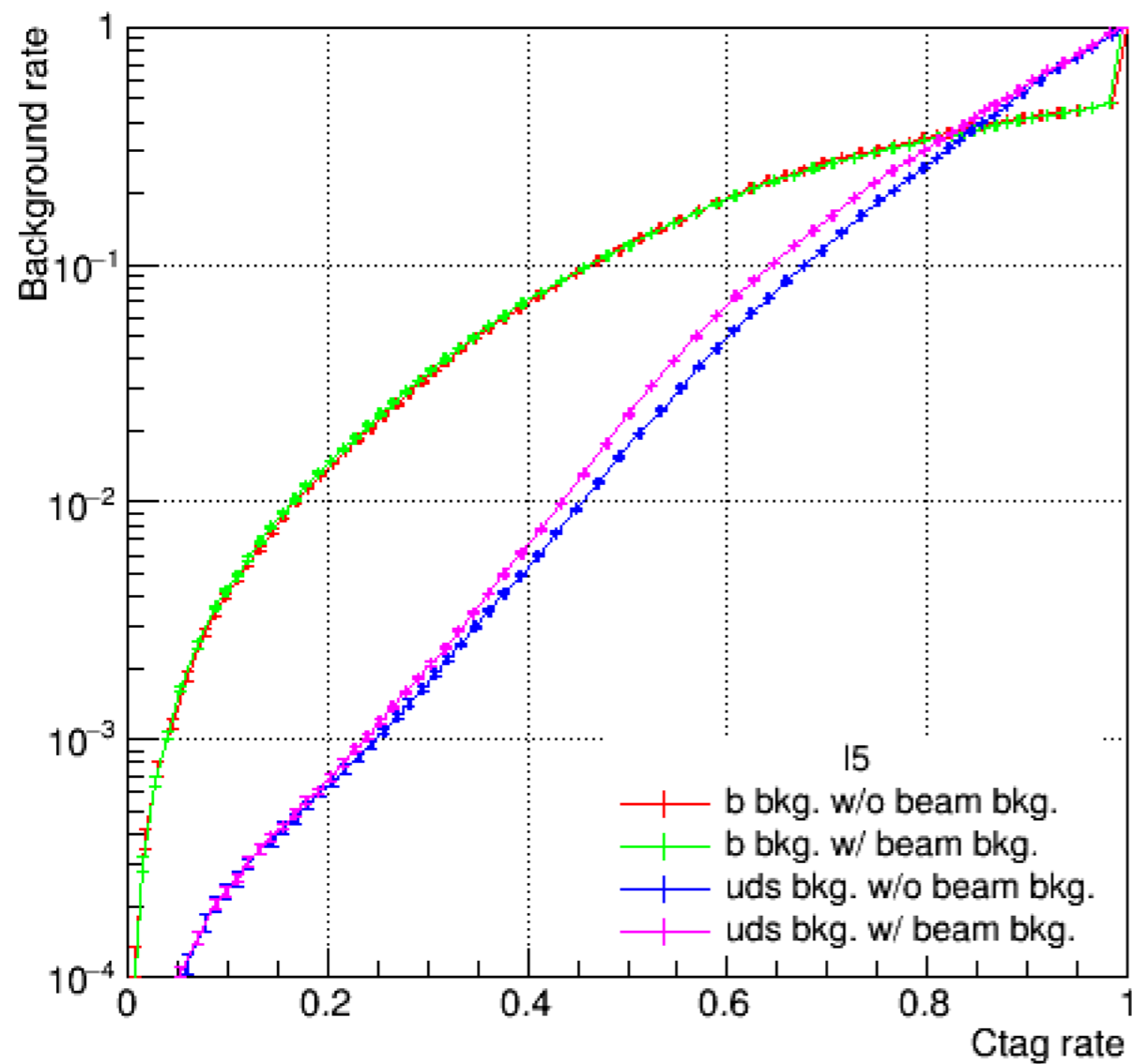
Flavour Tagging Performance (b tagging)

w/beam bkg sample as test sample
w/o beam bkg sample for training



Flavor Tagging Performance (c tagging)

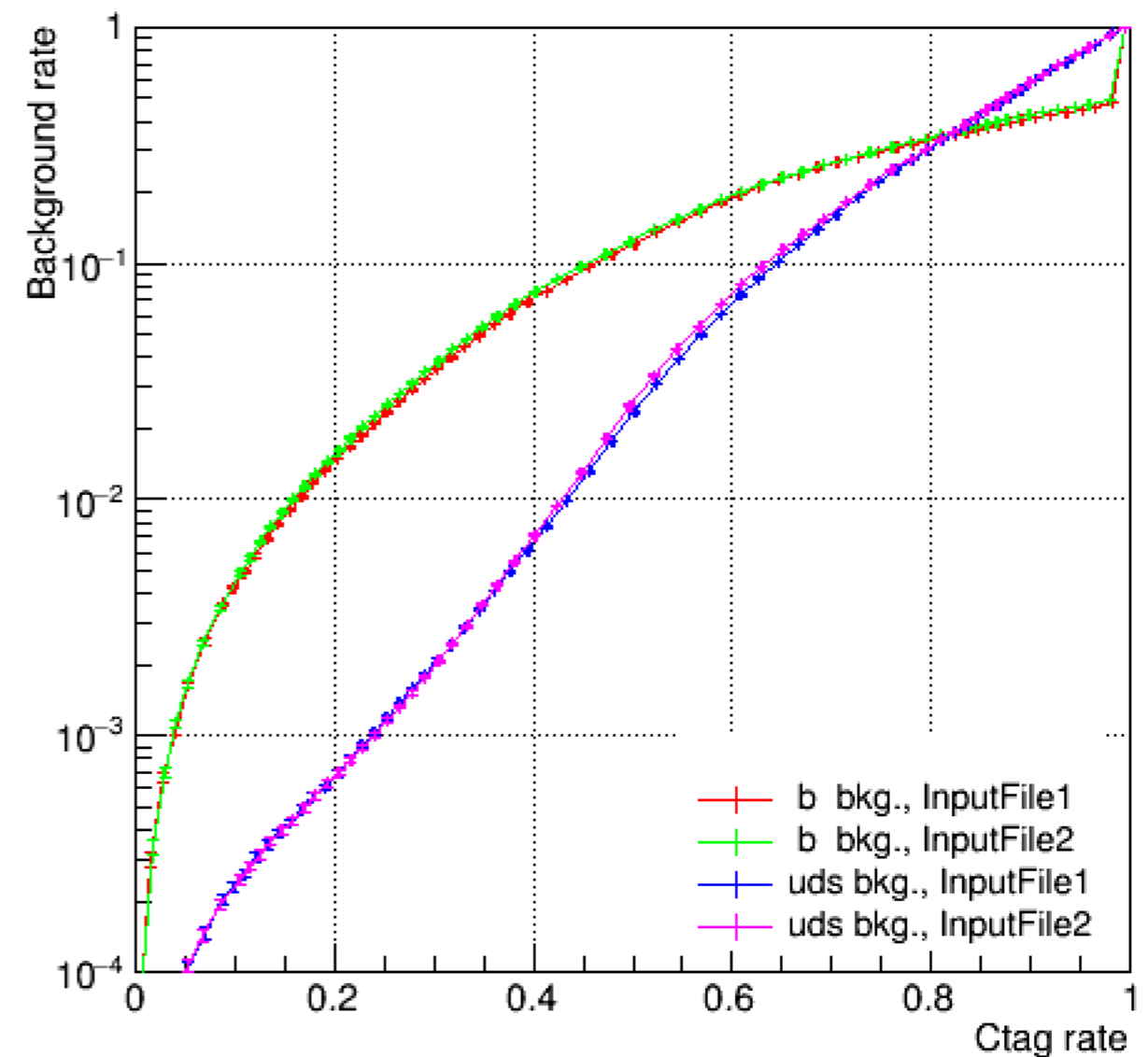
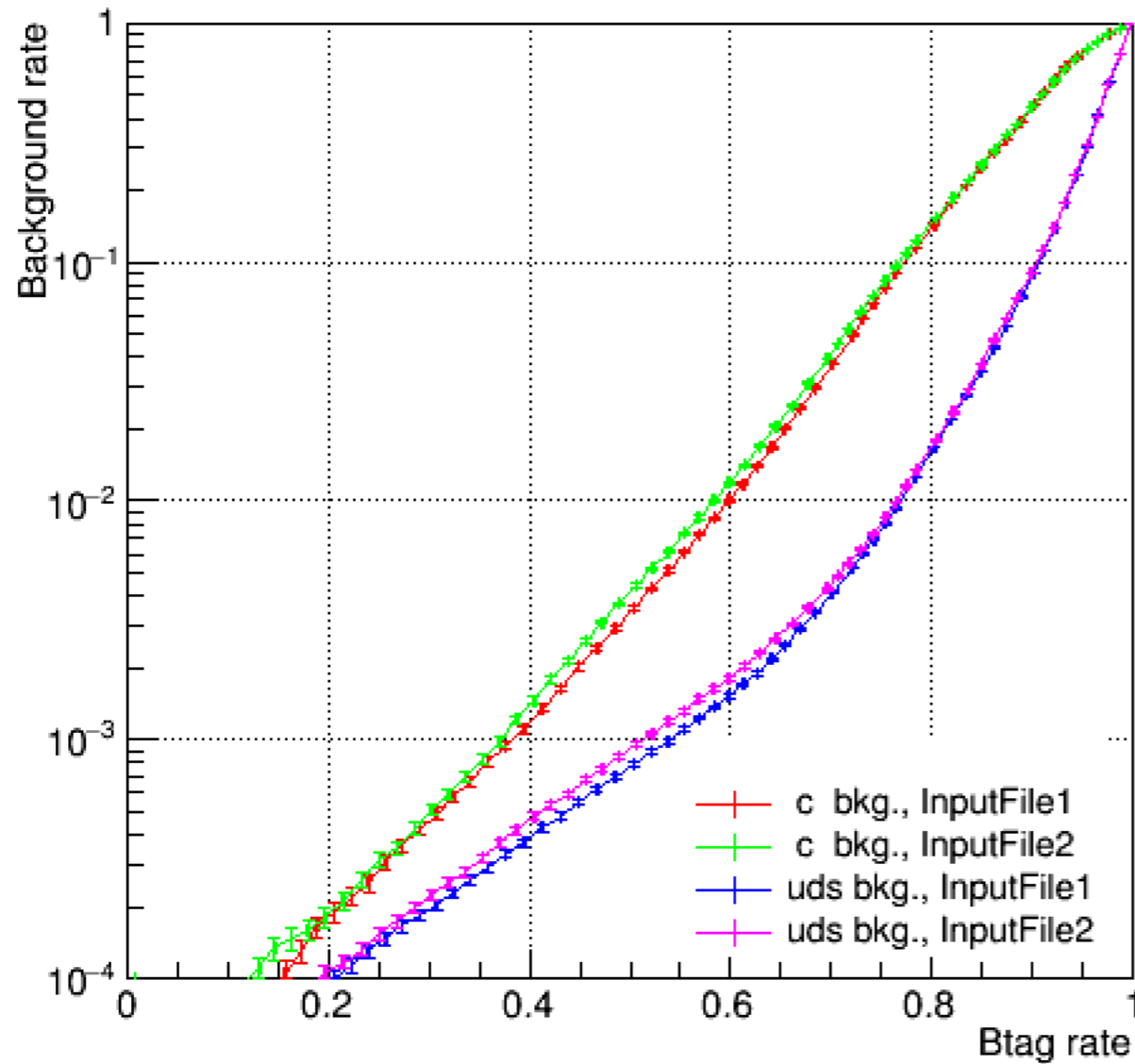
w/beam bkg sample as test sample
w/o beam bkg sample for training



Extra: Flavour Tagging Performance (I5/s5 comparison)

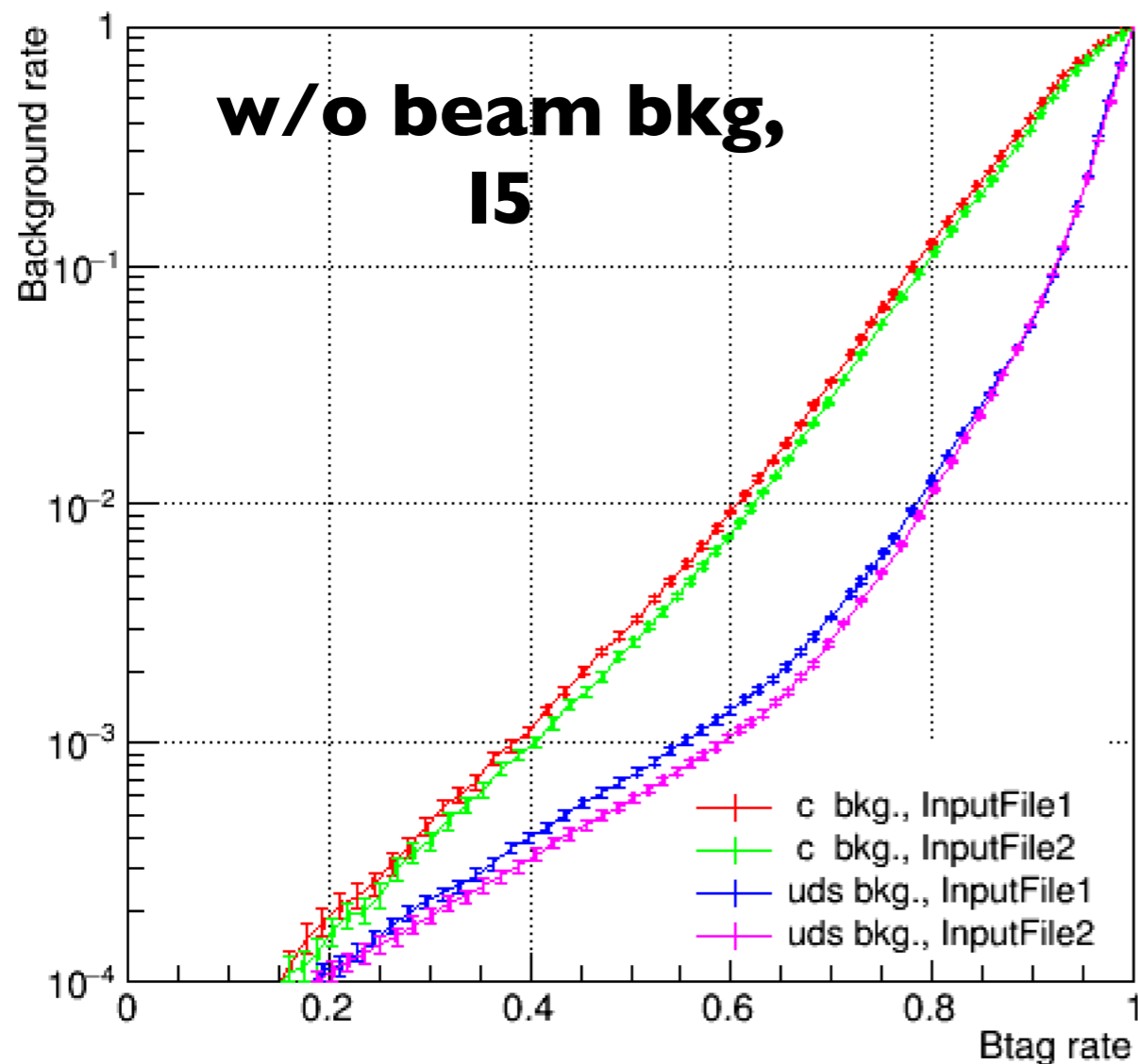
w/beam bkg sample as test sample
w/o beam bkg sample for training

InputFile1 : I5
InputFile2 : s5

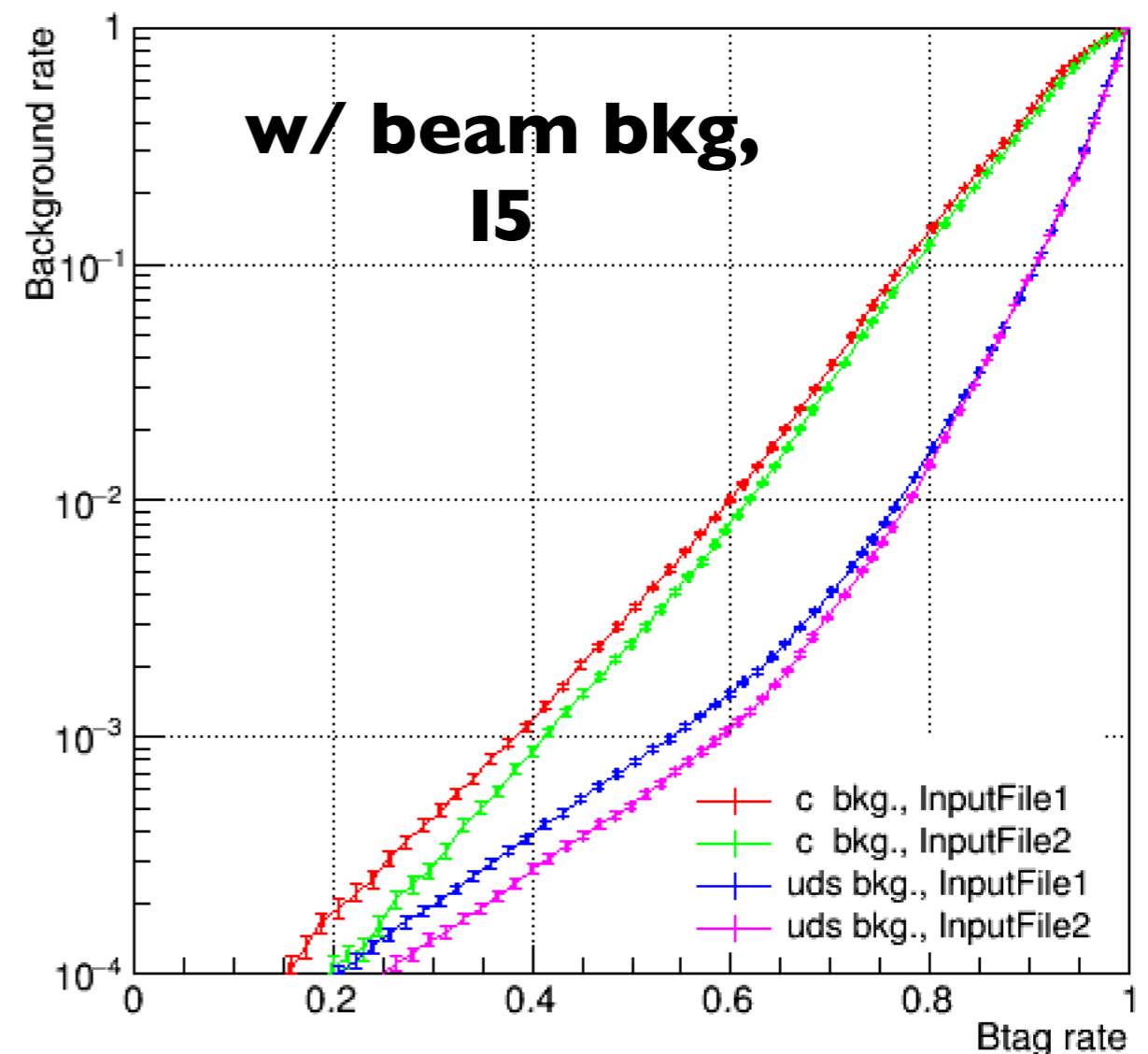


Flavour Tagging Performance (For discussion)

**BDT parameter optimization (for 6 jet 500GeV events?)
(potential improvement)**



**InputFile1 : w/o BDT param. opt.
InputFile2 : w/ BDT param. opt.**



**InputFile1 : w/o BDT param. opt.
InputFile2 : w/ BDT param. opt.**