Karlsruhe Institute of Technology

Belle II

Validation - HowTo & Status

F2F Tracking Meeting Prague

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KARLSRUHE INSTITUTE OF TECHNOLOGY (KIT)

General Information

Purpose

- Detect degradation of the physics performance by comparing plots produced with different software versions
- Automatically executed after each nightly development build

Generated plots are shown on:
https://belle2.cc.kek.jp/internal/validation

How To

`PACKAGE/validation` directory

- `.py` scripts are executed with `basf2` (alphabetic order)
- `.C` scripts are executed with `ROOT` after the `.py`

`.py` files

- Steering of data generation
- Create validation plots

`.C` scripts

Only for plotting

Data Generation

- `ROOT`-files with generated data must be stored in the `parent directory`
- Use `set_random_seed()` in steering scripts to avoid statistical fluctuations
- Beam background can be added using files in `$BELLE2_BACKGROUND_DIR`

Example

```
# add beam background to simulation
bg = []
if os.environ.has_key('BELLE2_BACKGROUND_DIR'):
    bg += glob.glob(os.environ['BELLE2_BACKGROUND_DIR'] + '/*.root')
add_simulation(main, bkgfiles=bg)

# store data
root_output = register_module("RootOutput")
root_output.param("outputFileName", "../GeneratedData.root")
[...]
```

Validation Plots

- Possible objects: `TH1` and `TNtuple`
- Add a description and a check to each plot and tuple
- Save validation plots in a `ROOT`-file

Adding description and check

```
TH1F* h = ...
h->GetListOfFunctions()->Add(new TNamed("Description", "Add the description here."));
h->GetListOfFunctions()->Add(new TNamed("Check", "Add the instructions for the checks here."));

TNtuple* nt = ...
nt->SetAlias("Description", "Add the description here.");
nt->SetAlias("Check", "Add the instructions for the checks here.");
```

Reference Plots and Validation

Reference Plots

- Reference plots must be stored in a `ROOT`-file with the same name as the created validation plots
- Current plots are compared to the reference plots

Orange frame: Some difference between current and reference histogram
Red frame: Large difference (defined by chi-square p-value below 1%)

Validate it

- Start validation with the command `validate_basf2`
- Add package name as argument to validate only a single package
- See `validate_basf2 --help` for more information

Validation Page

Thu Dec 5 12:12:51 2013

Legend:

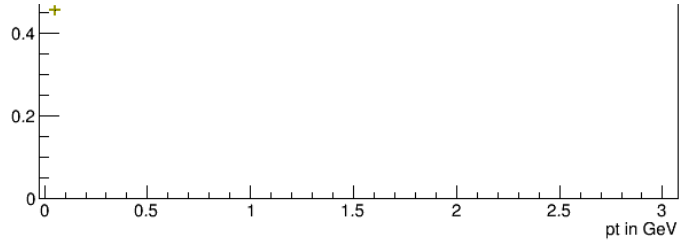
- reference
- 7710 (7735 (7753 (7769 (current))))
- 7696
- 7651
- 7631
- build-2013-12-02
- build-2013-11-10

analysis

- Bd_JpsiKS,mumu_Breco
- Bd_Kstgamma_Breco
- Bu_D0pi,Kpi_Breco
- EfficiencyValidationPho
- EfficiencyValidationTra
- FileEventSizes
- Hough3D
- MDSTSummary
- PIDValidationkID
- PIDValidationpiID
- RecoStats
- SimStats
- Timing
- pi0Validation

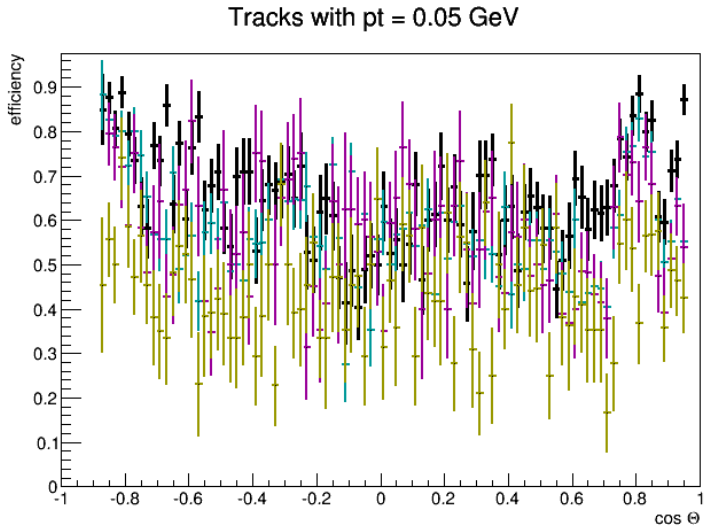
cdc

- CDCValidation
- CDCvalidation



This plot shows the single track reconstruction efficiency over the transverse momentum.

Check:
The efficiency should be stable for l pt values.



No current plot!

Description:
Events with 10 muon tracks with fi transverse momentum are generate using the ParticleGun (500 events f each pt value). The events are reconstructed with VXDTF+Trasan+MCTrackCandCo The plot shows the single track reconstruction efficiency in bins of polar angle for the fixed transverse momentum pt = 0.05 GeV.

Check:
Stable efficiency over the hole rang the polar angle.

For detailed information see the Twiki page.

Status Of Tracking Validation

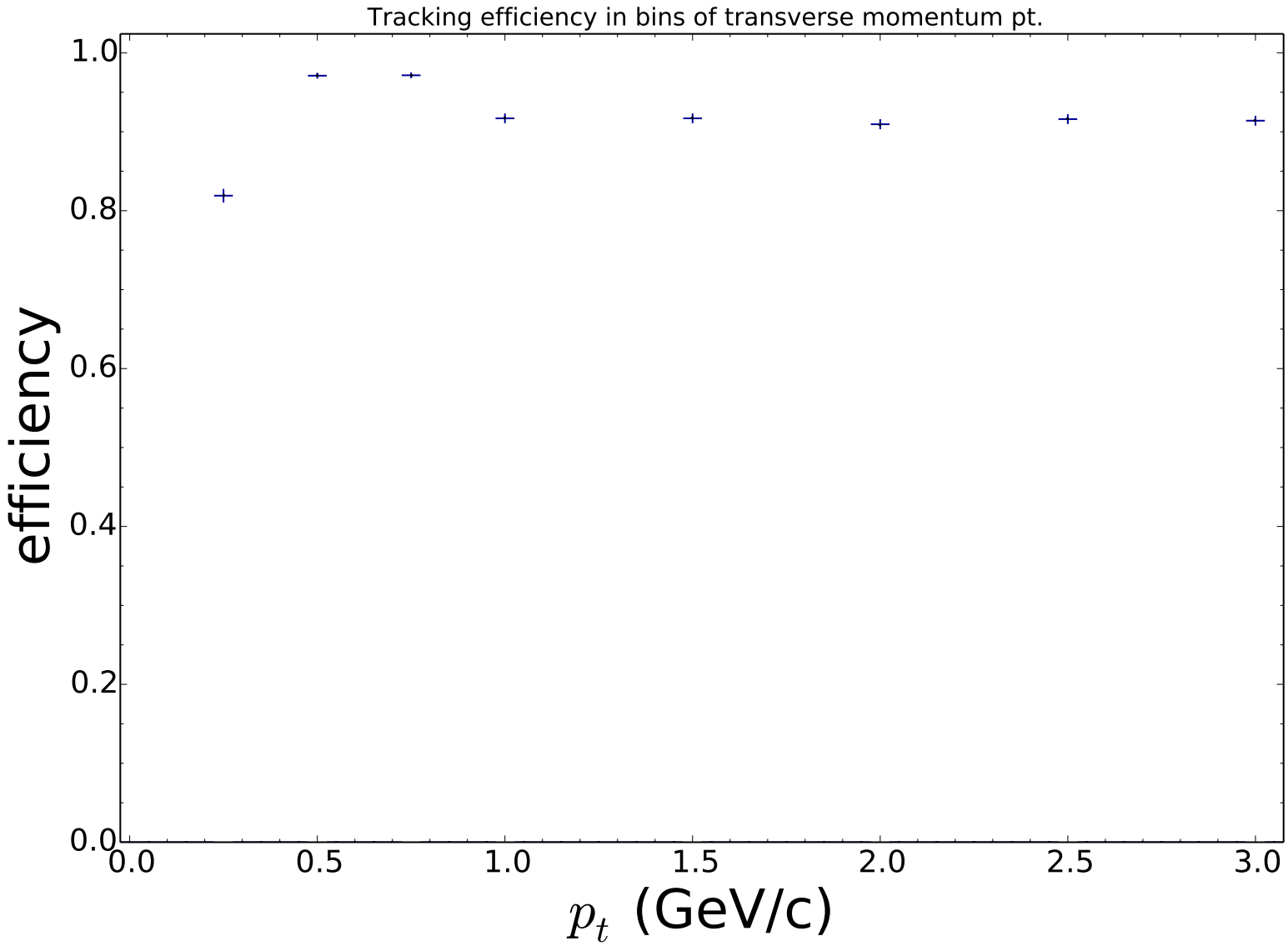
Generated Data

- Events with 10 μ tracks with fixed p_t
- 200 events per p_t value
- Standard simulation with beam background

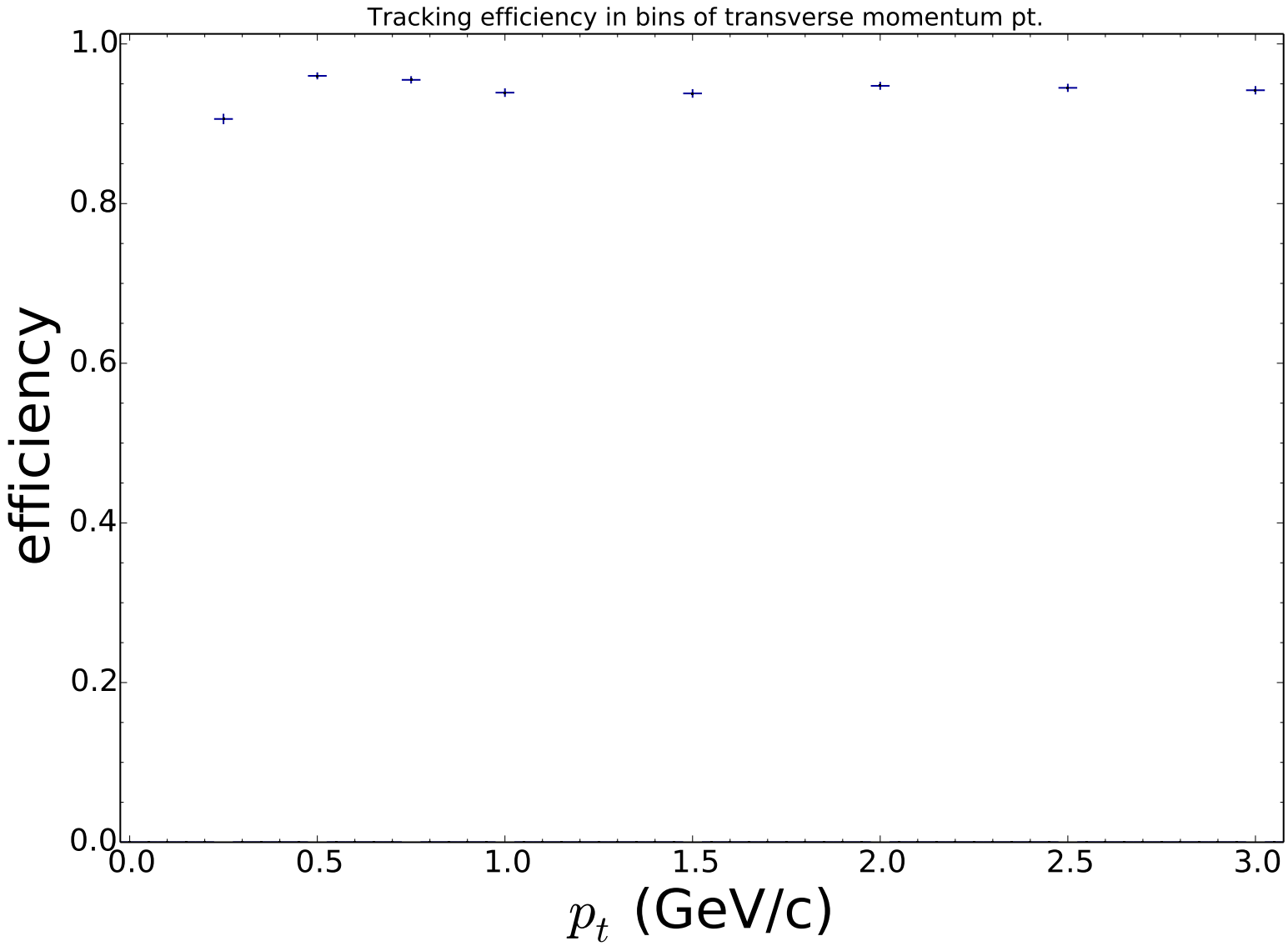
Reconstruction:
`VXDTF + Trasan + MCTrackCandCombiner + GenFitter`

Extract information with `StandardTrackingPerformance` module

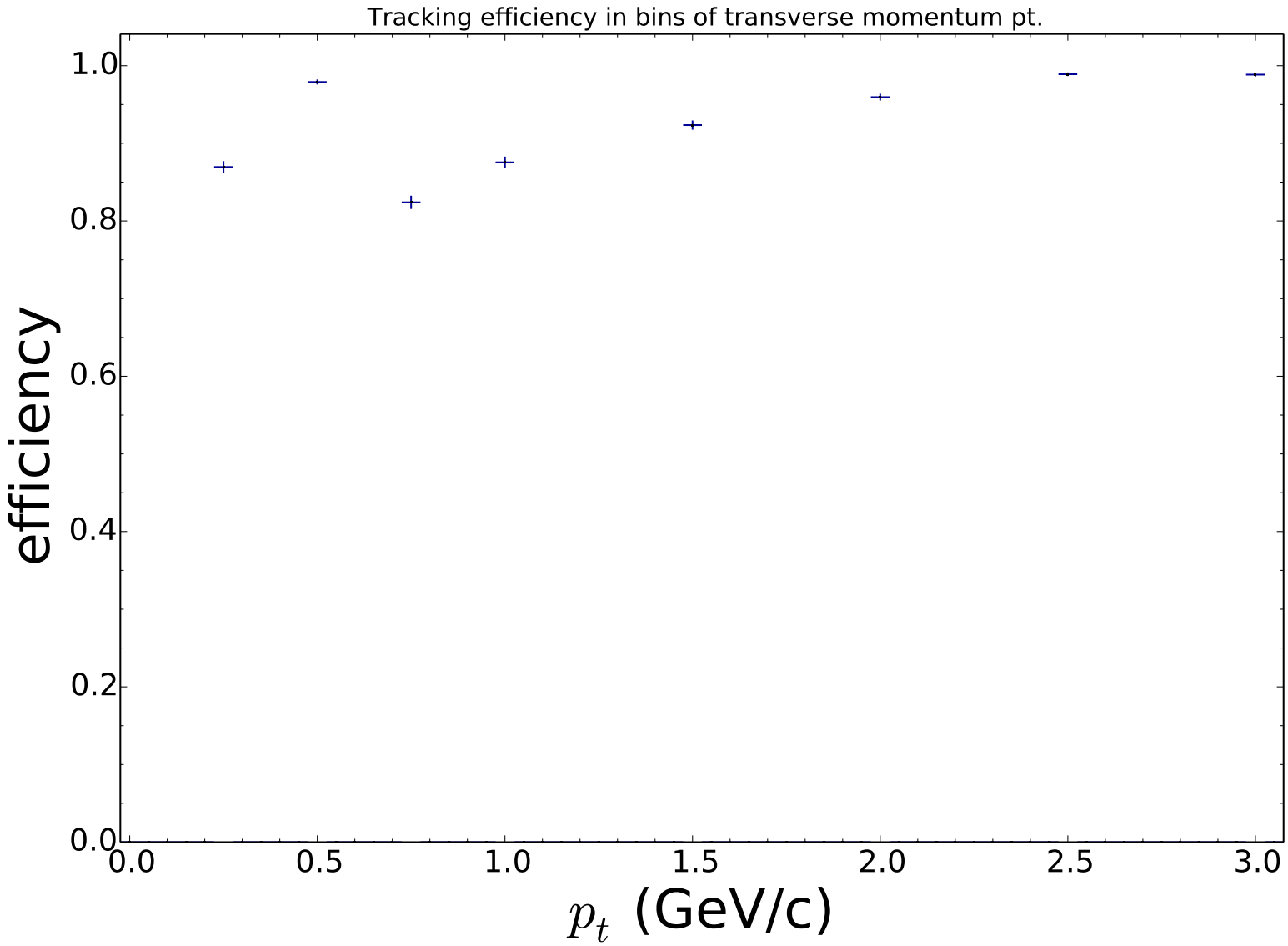
Tracking efficiency



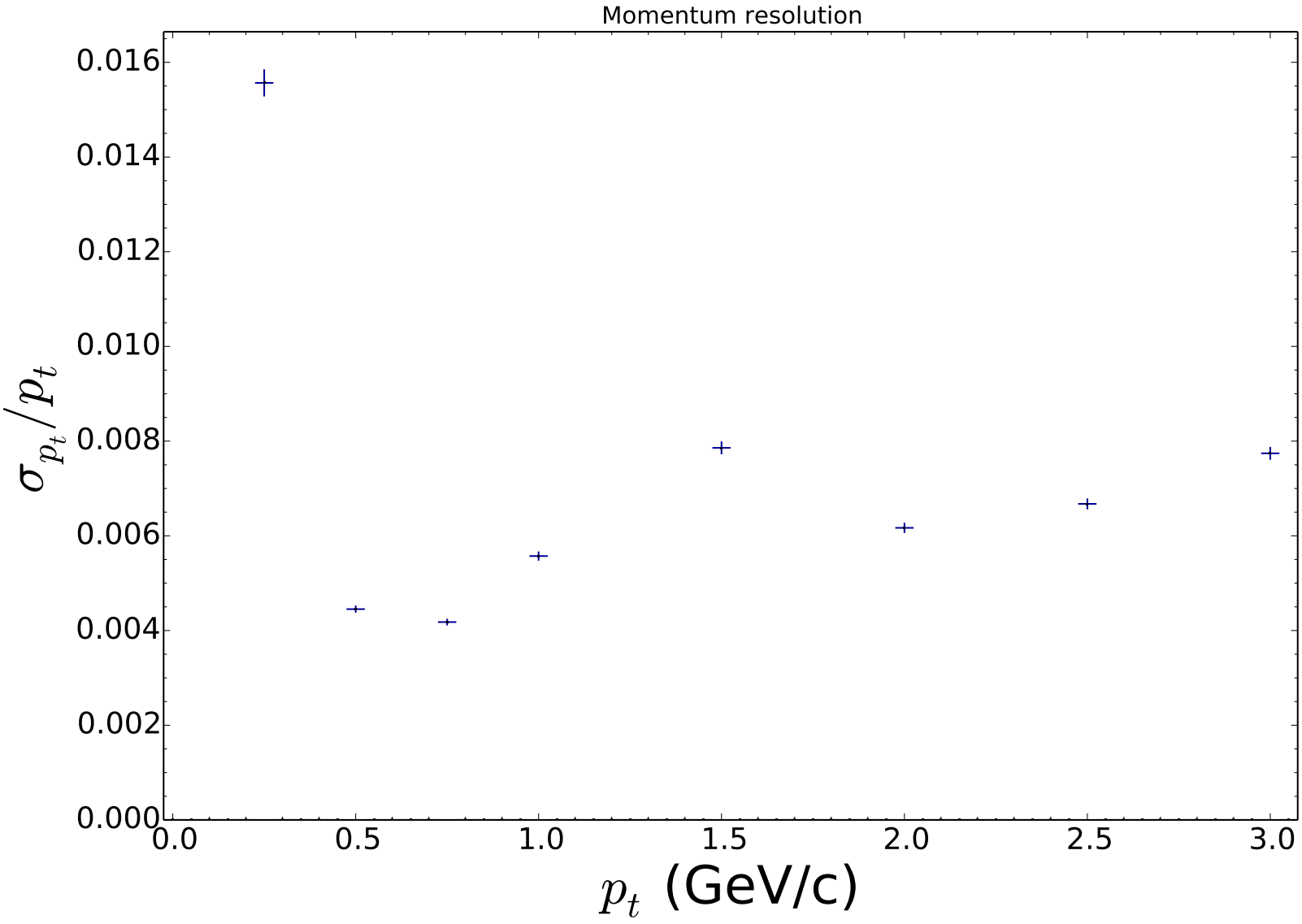
Tracking efficiency (Trasan only)



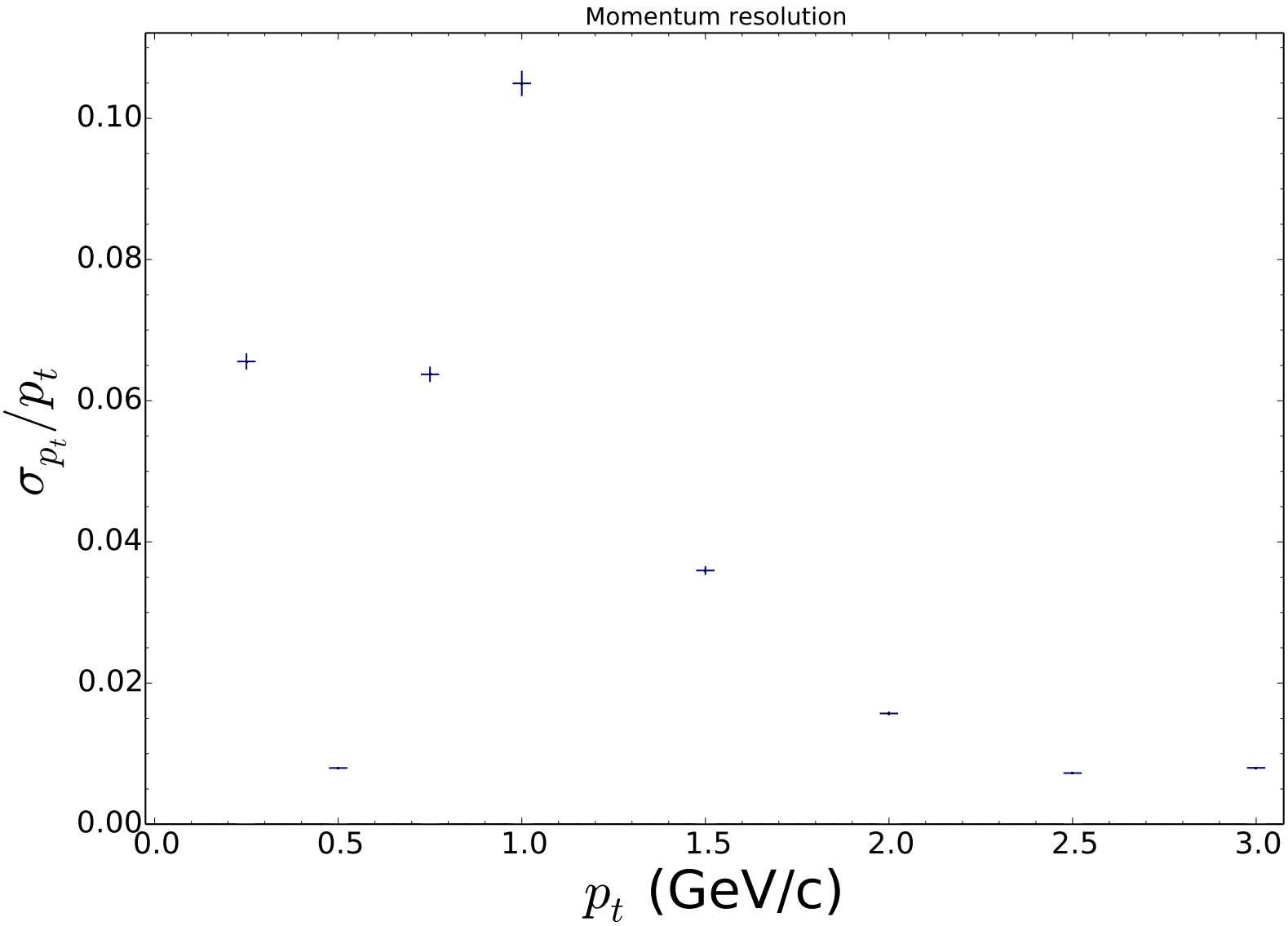
Tracking efficiency (MCTrackFinder)



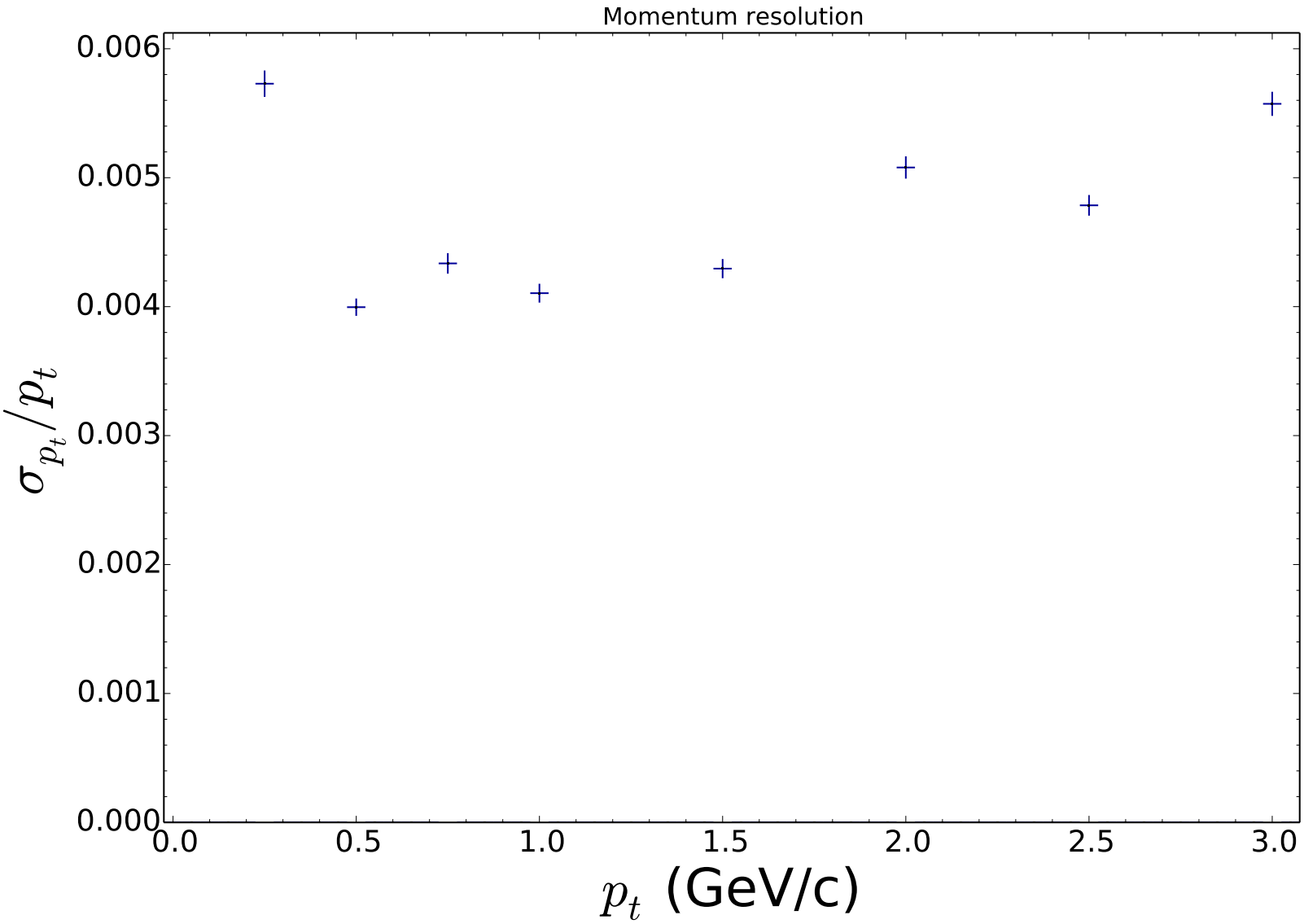
Momentum Resolution



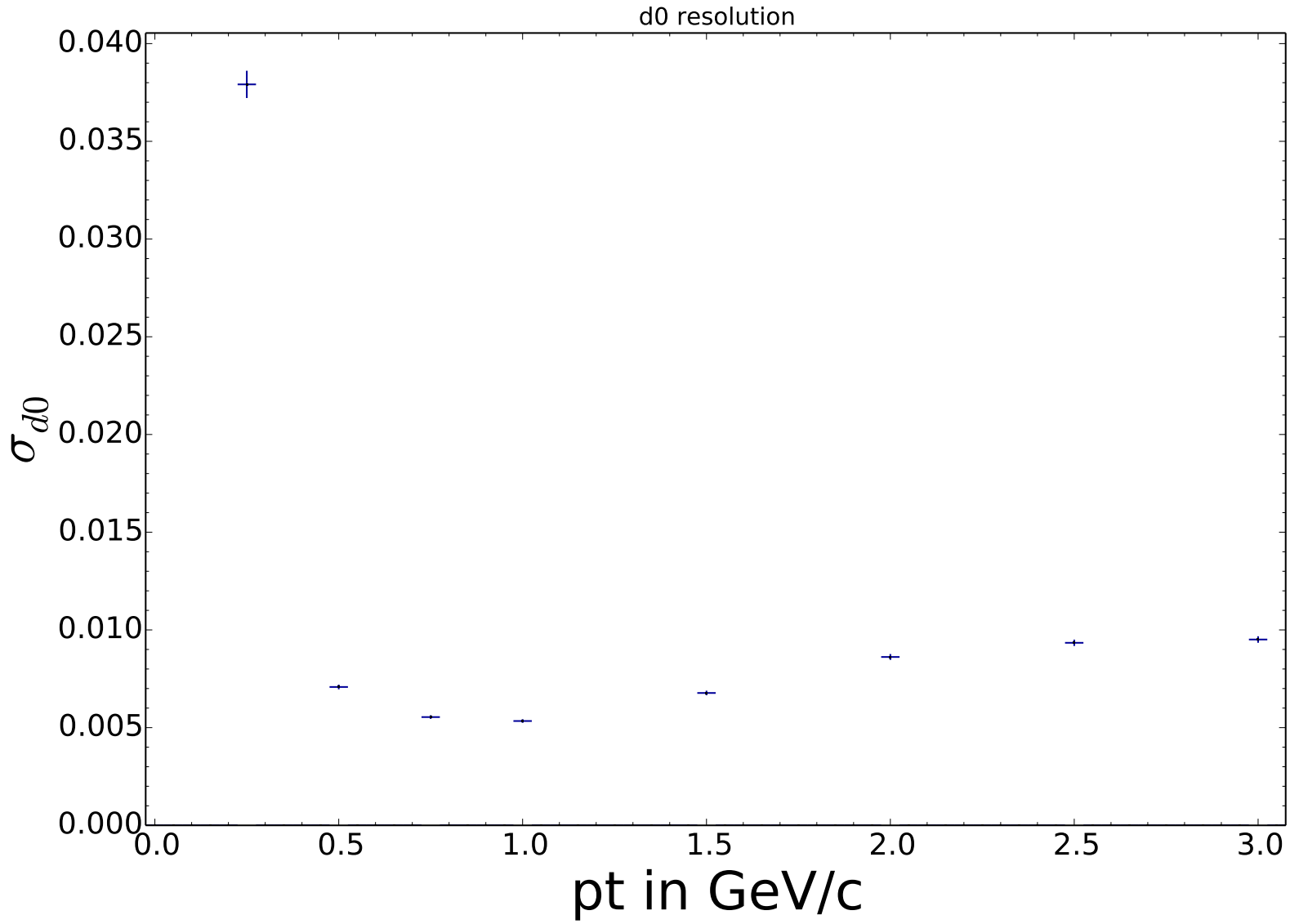
Momentum Resolution (Trasan only)



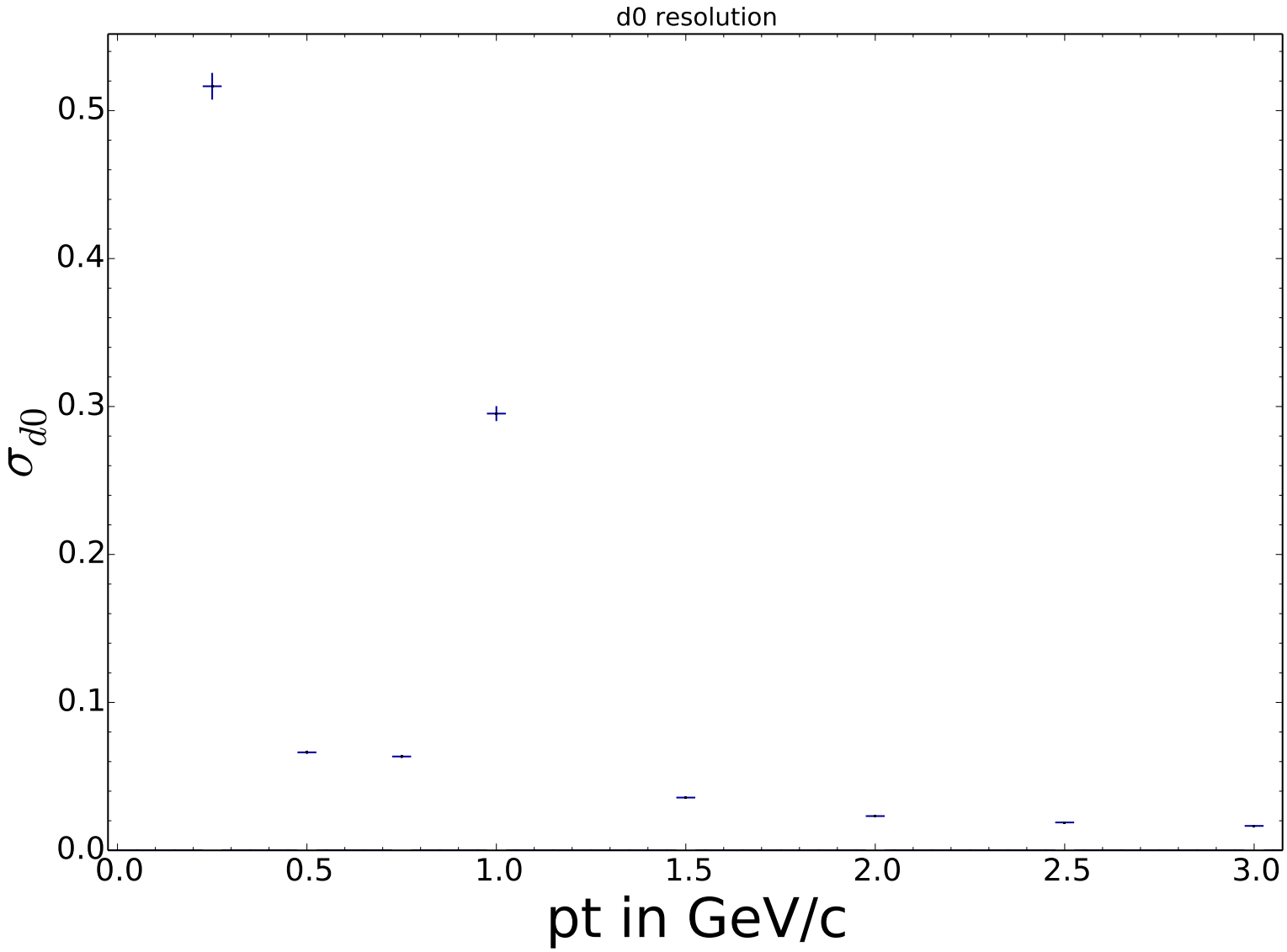
Momentum Resolution (MCTrackFinder)



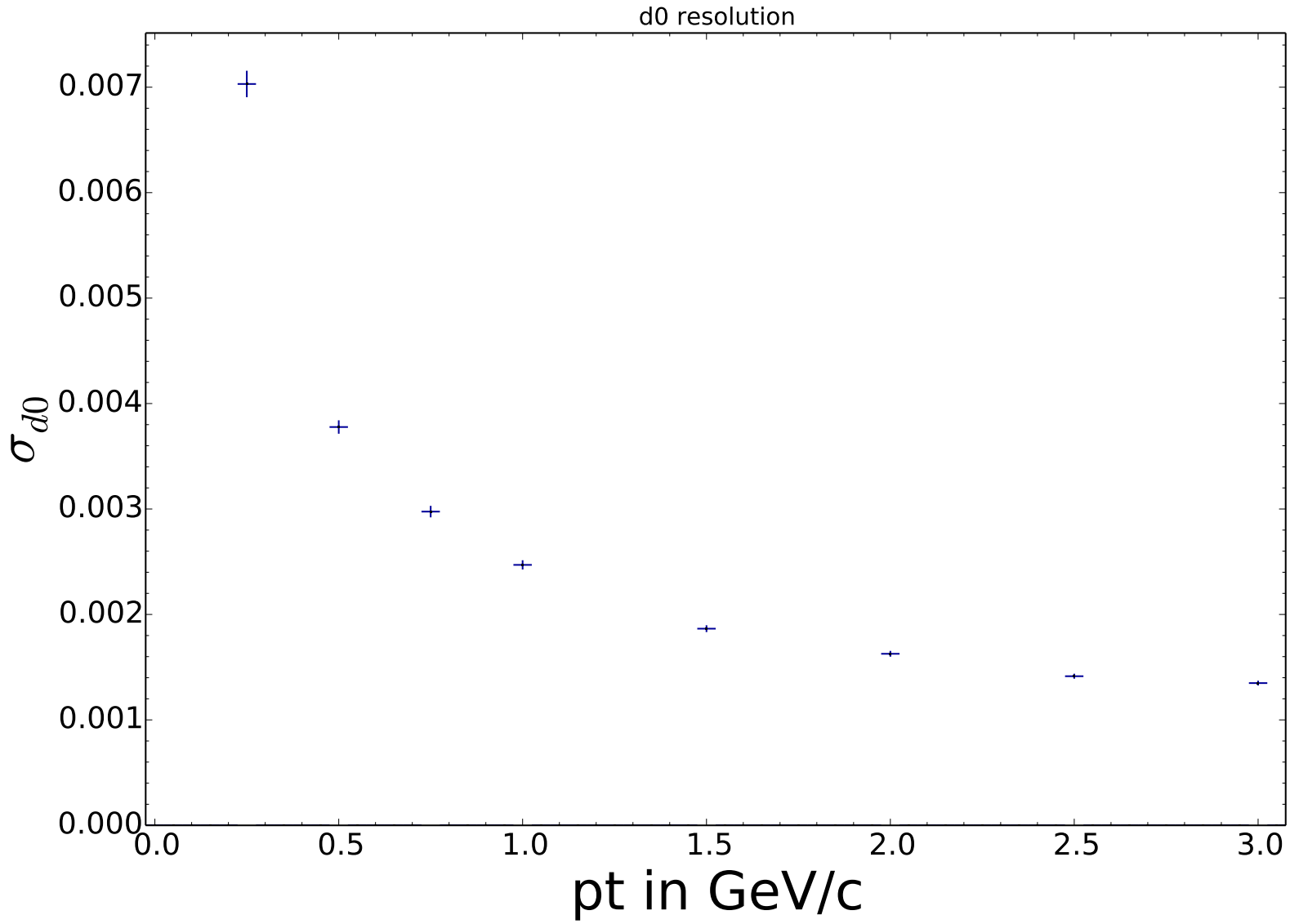
Impact Parameter Resolution



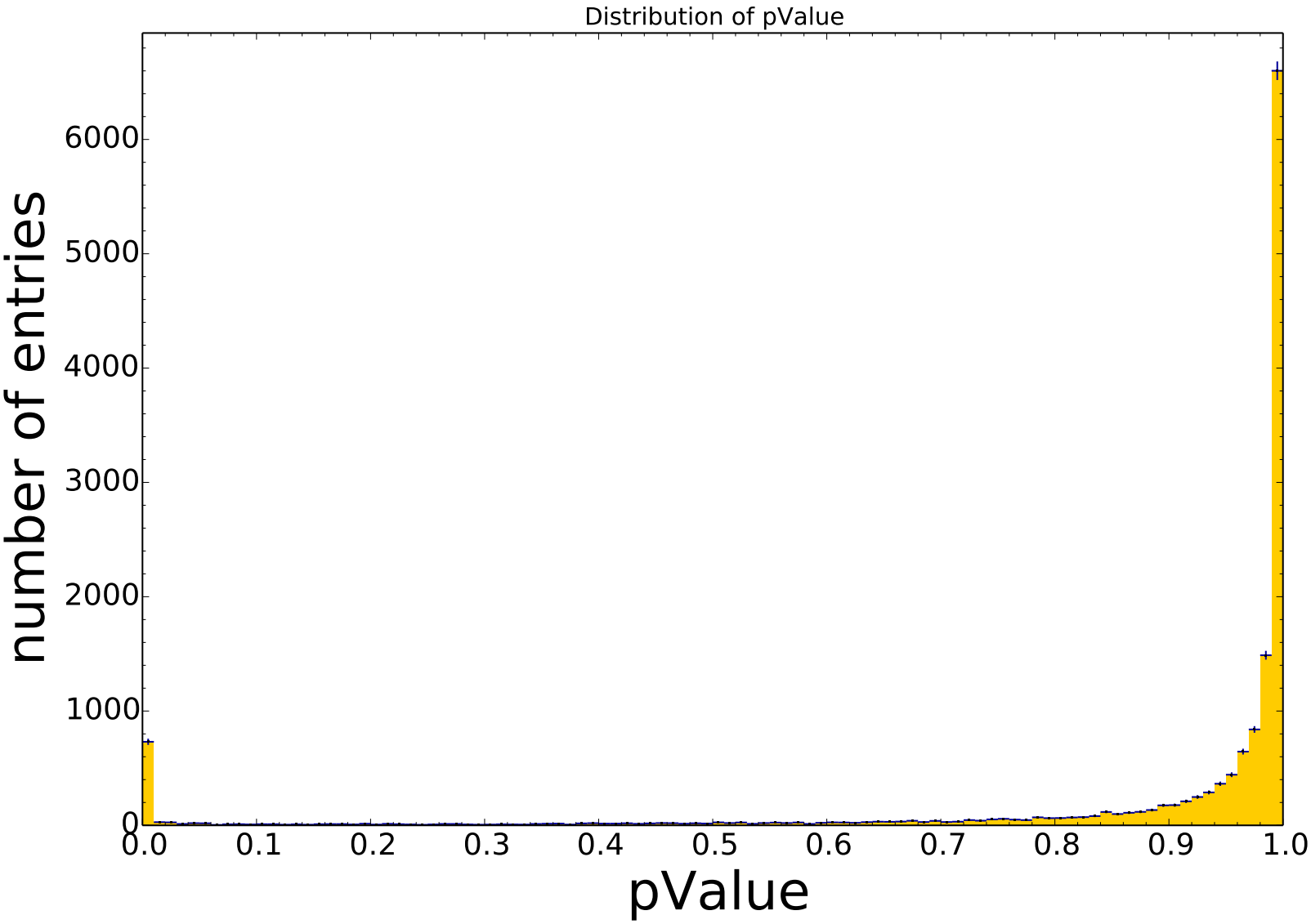
Impact Parameter Resolution (Trasan only)



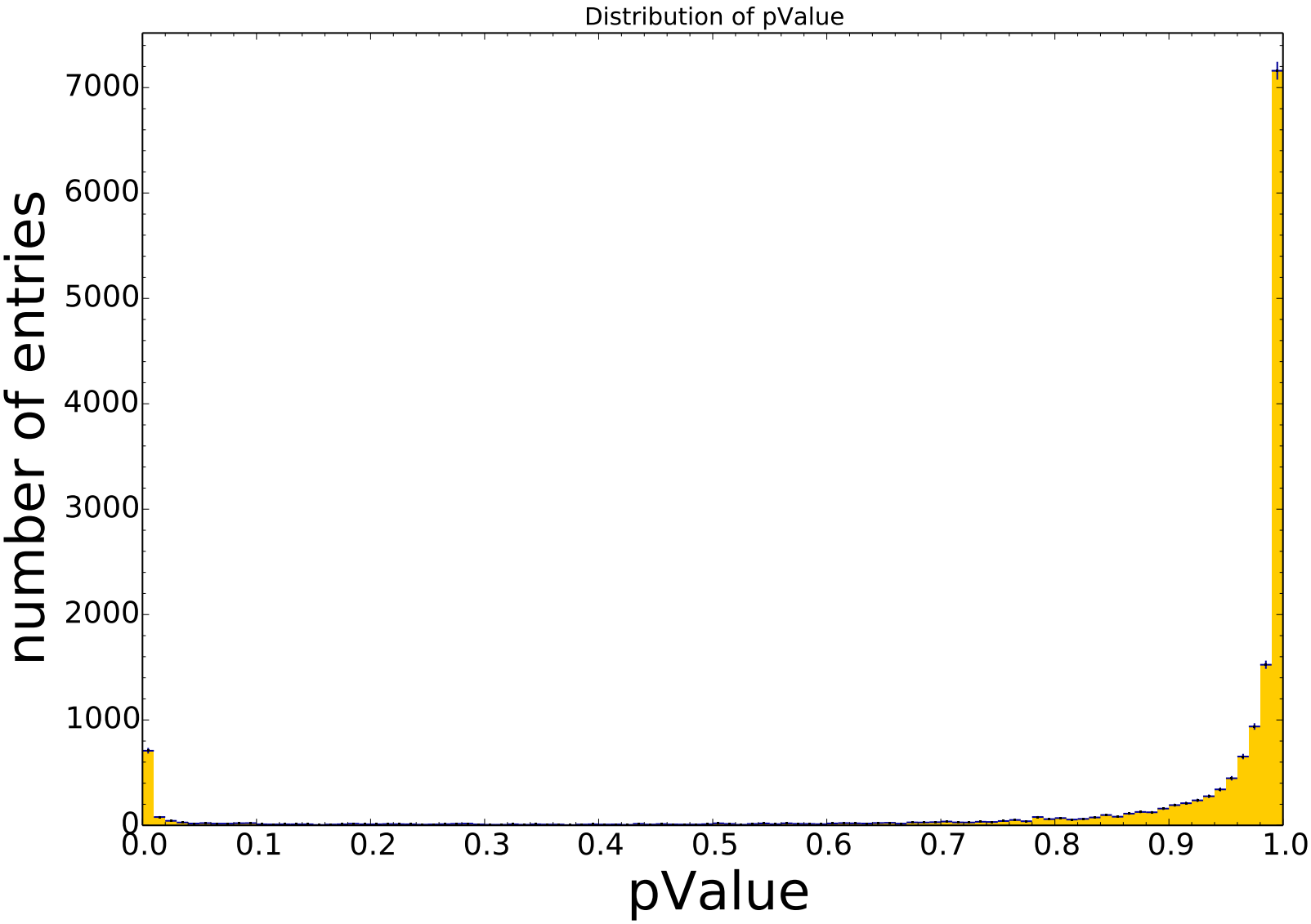
Impact Parameter Resolution (MCTrackFinder)



pValue


Distribution of pValue
number of entries
6000
5000
4000
3000
2000
1000
0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
pValue

pValue (Trasan only)



pValue (MCTrackFinder)