

Reconstruction of Long-Lived Particles (LLPs) in IDEA Tracker at FCC-ee

Masters Thesis Status and Prospects

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CONTENTS

1. Updates



This Study

Current Status

1. Studying the algorithm step by step to understand its behavior and expected outputs at each stage.

```
parser.add_argument("--tbeta", default=0.6, help="tbeta clustering parameter")
parser.add_argument("--td", default=0.3, help="td clustering parameter")
args = parser.parse_args()
```

```
parser.add_argument("--Beta_init", default=100, help="OutputFile")
parser.add_argument("--Beta_final", default=0.1, help="OutputFile")
parser.add_argument("--Beta_steps", default=10, help="OutputFile")
args = parser.parse_args()
```



- What are these parameters really doing?
- Why are they assigned to these values by default?
- Are they optimized to handle displaced tracks?
- If not, how do we optimize them?

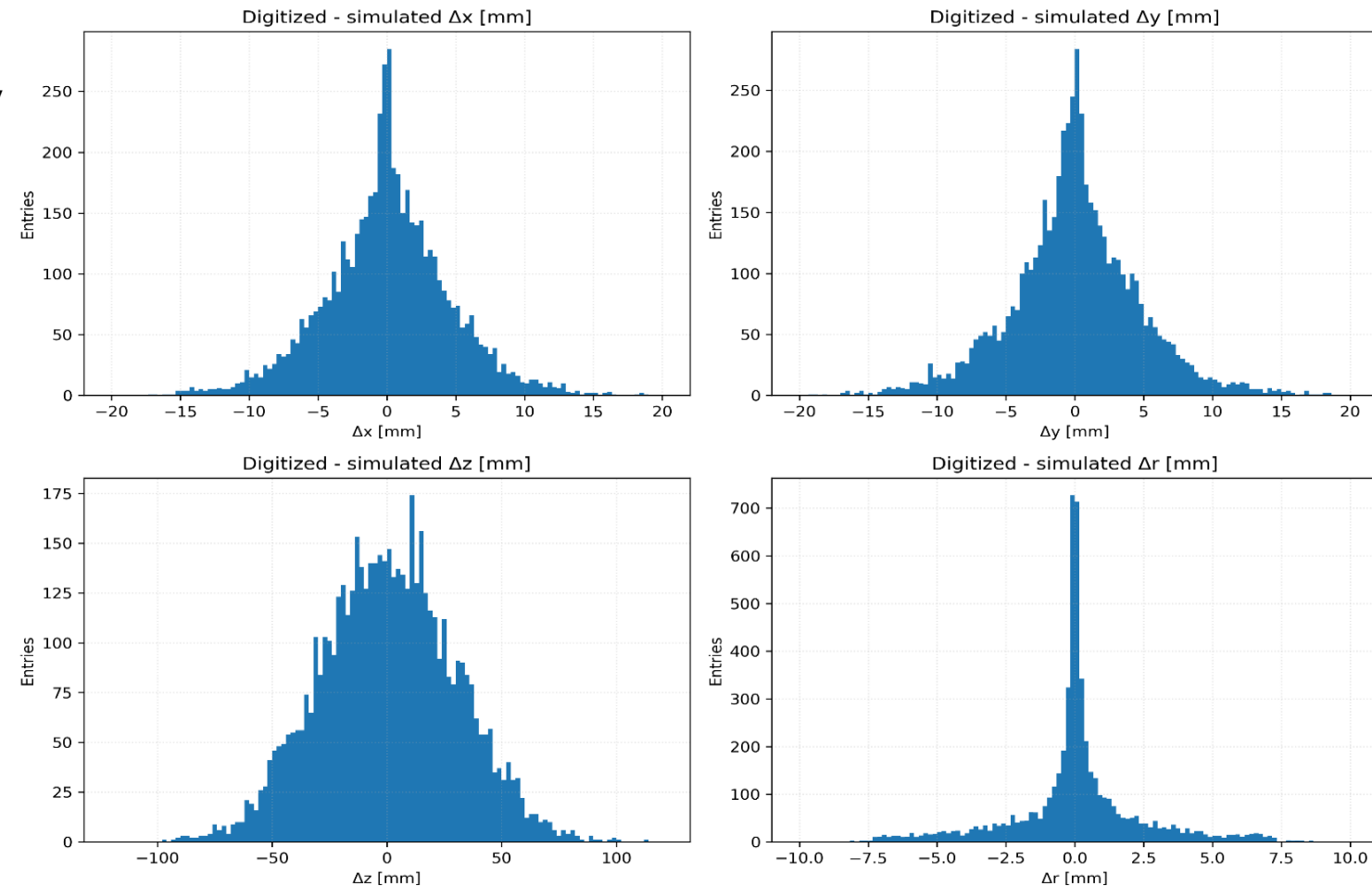
2. What are the most useful variables from the output root file (from particle gun) at each stage?
3. What are the necessary plots to validate track finding and track fitting algorithm.

Residual Plots

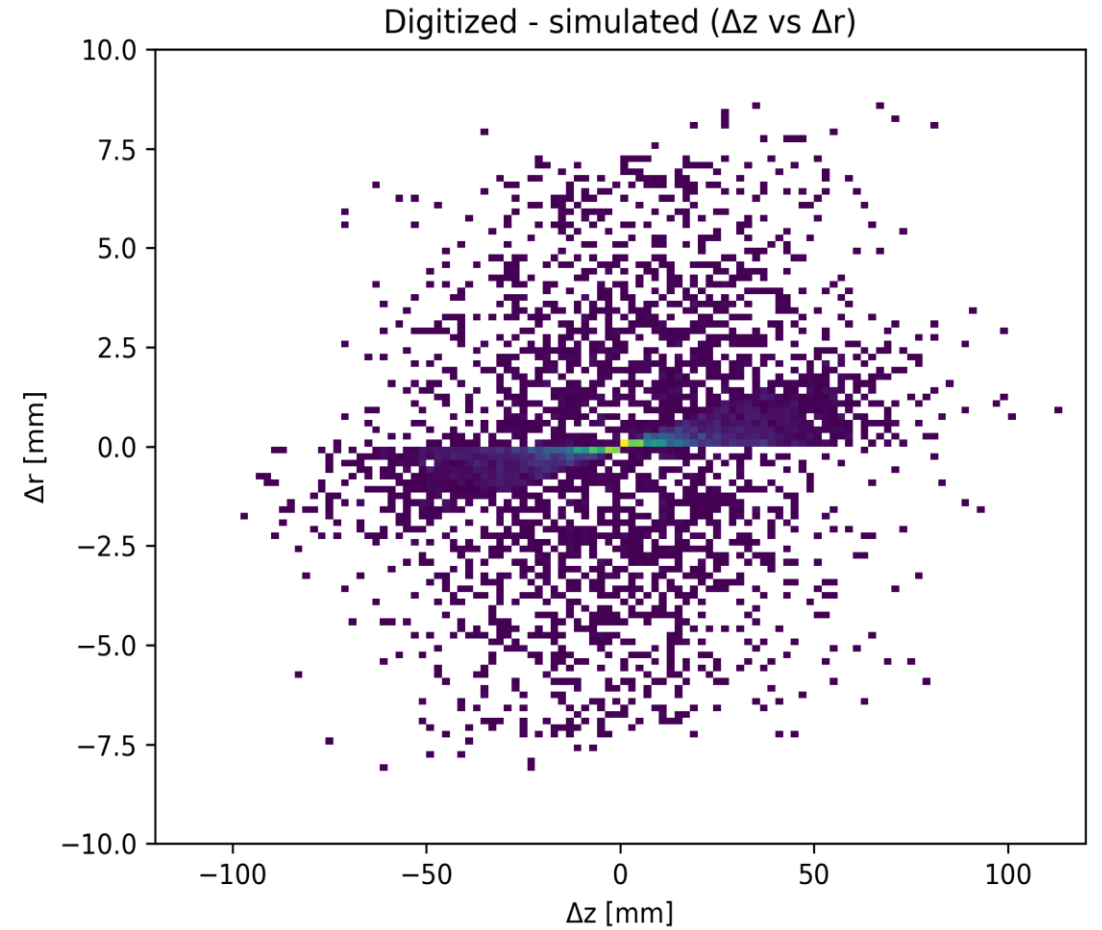
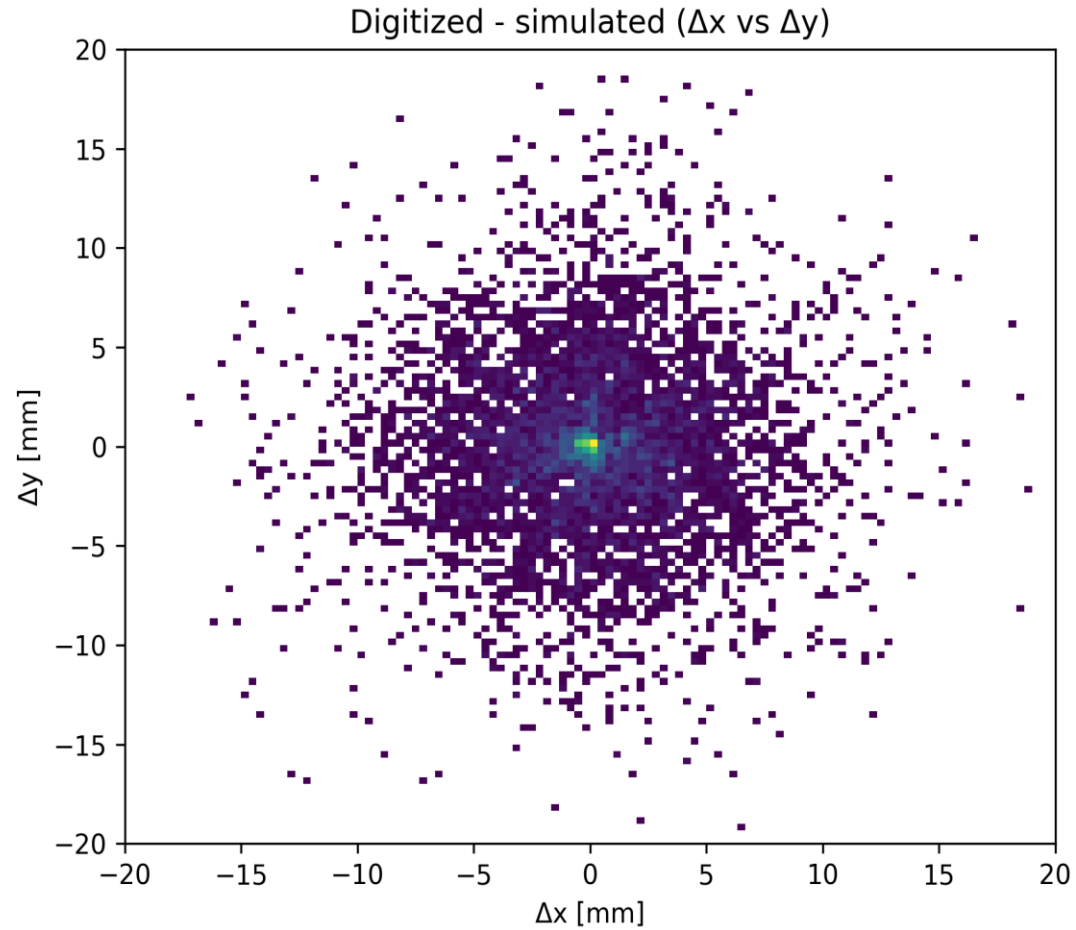
Distributions of digitized – simulated hit in the DCH after digitization

Residuals: digitized vs simulated DCH hits

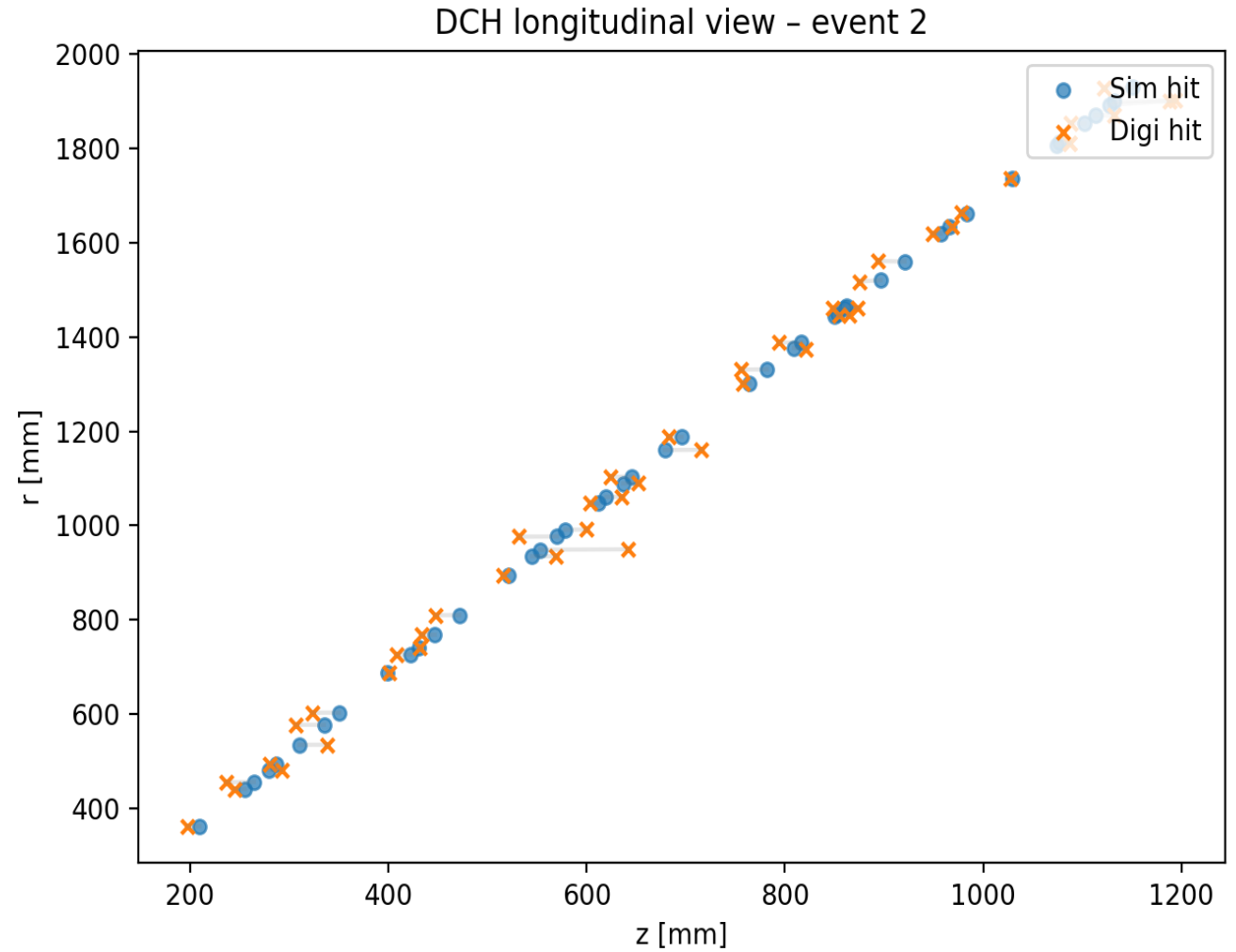
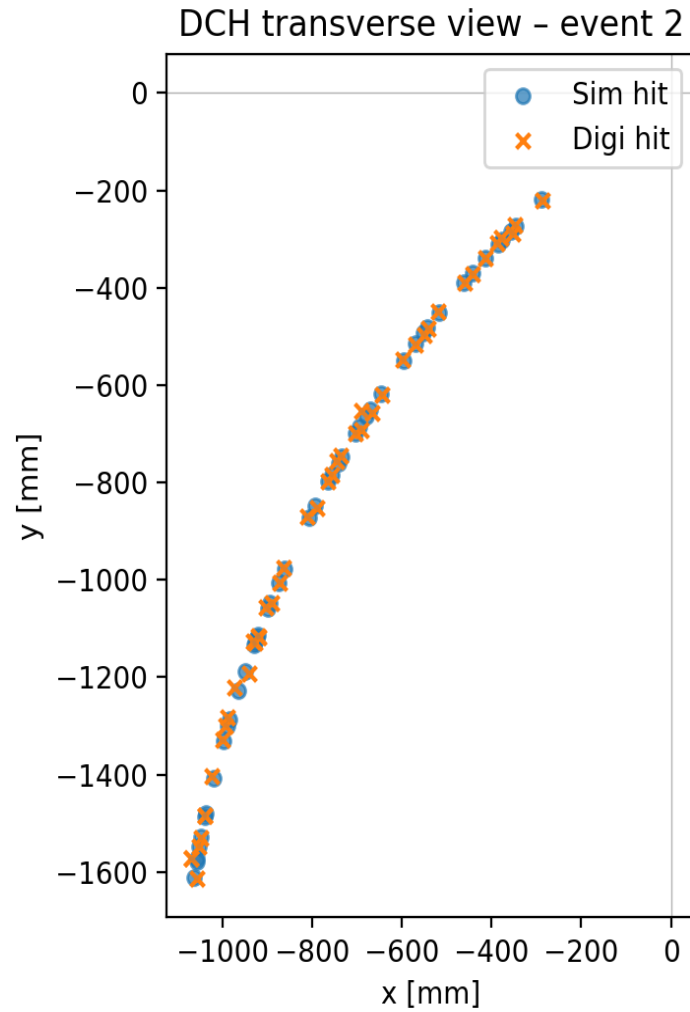
- Single muon gun 100 events
- Momentum range: 0.5-5 GeV



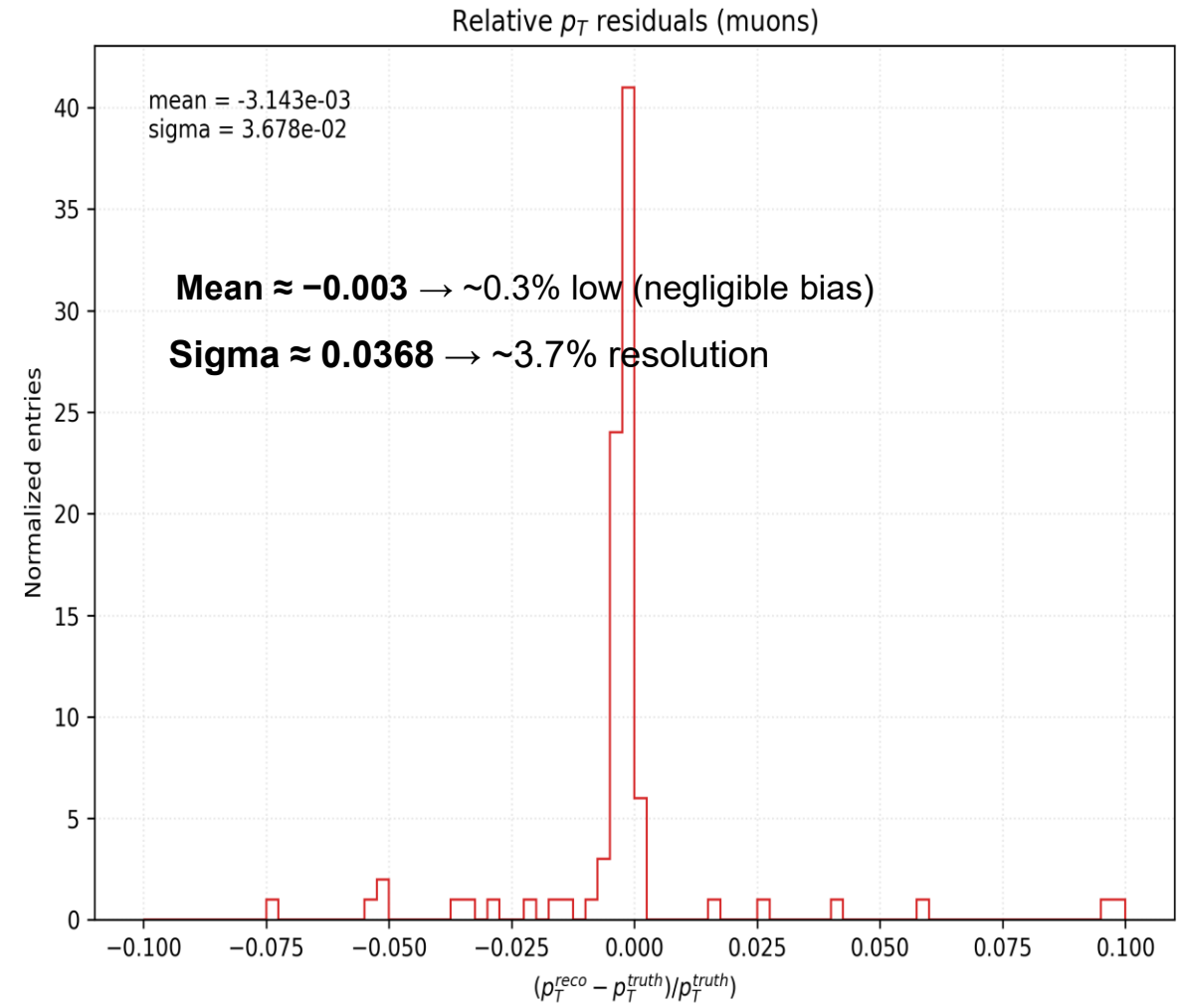
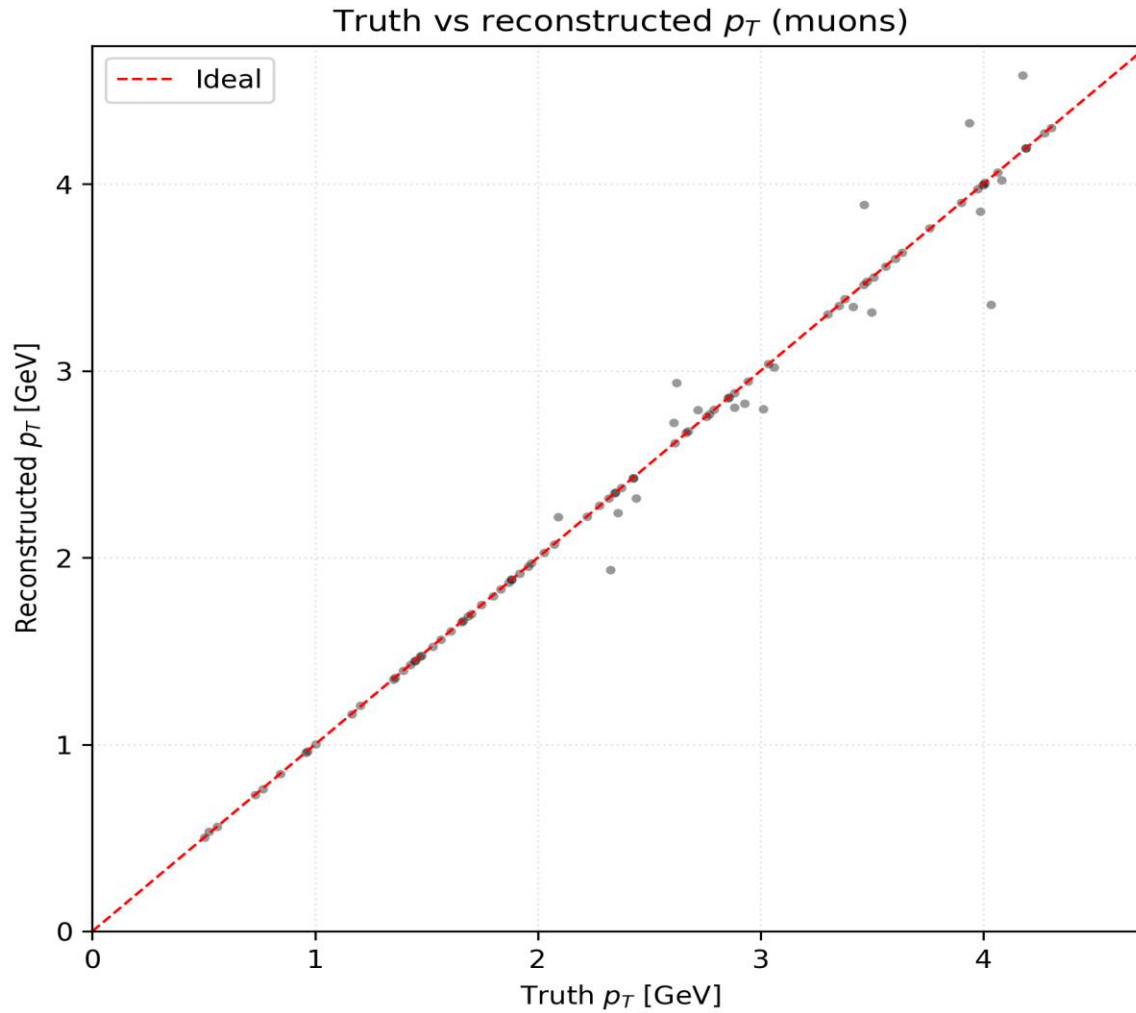
Residual Plots



Event Display



Validation plot for muon p_T reconstruction.



Tracking Efficiency

Def:- the percentage of reconstructable charged particles with both ratios, the track hit purity and the track hit efficiency, above 50%

Track hit purity:- ratio of the number of hits in the track that belong to the MC particle and the total number of hits of the reconstructed track.

$$P = \frac{N_{\text{hits, shared}}}{N_{\text{hits, reco}}}$$

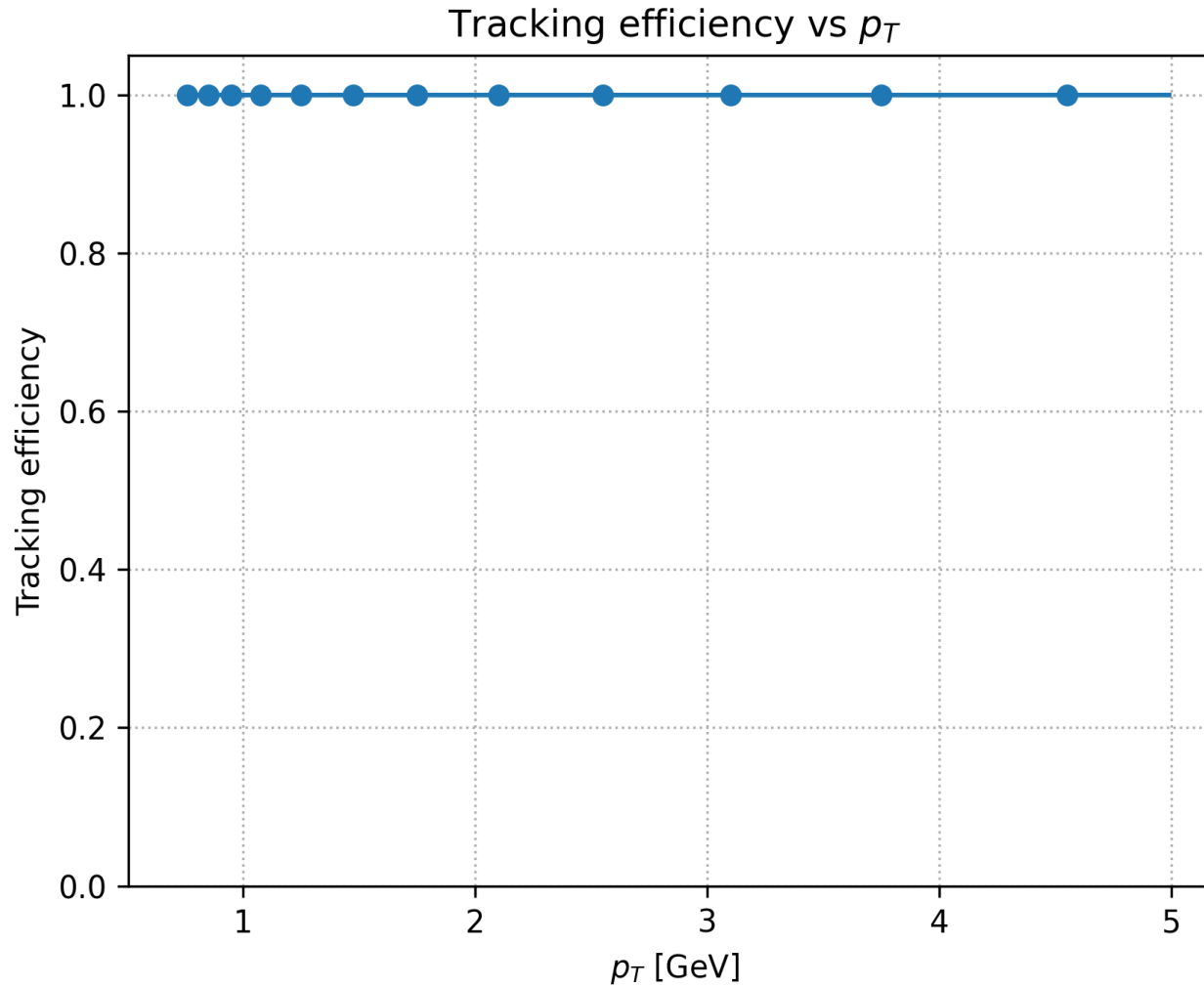
Track hit efficiency:- ratio of the number of hits in the track that belong to the MC particle and the total number of hits this particle left in the detector.

$$Eff_{hit} = \frac{N_{\text{hits, shared}}}{N_{\text{hits, MC}}}$$

Match:- Each reconstructed track is matched to a ground truth particle to which it shares the largest number of hits

[Dolores Garcia1, Brieuc Francois1 and Michele Selvaggi1](#)

Tracking Efficiency



- Single muon gun 100 events
- Momentum range: 0.5-5 GeV

Thank You!

Questions & Feedbacks are welcome.

BACKUP

PLOTS

