Cut based PID

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Motivation

- MC has large discrepancy with data so the ML-based PID would not work.
- Can develop a set of cut-based PID tool to select mini pure samples.













Test Beam data distribution

Electron and pion showers have the largest similarity.

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Shower Density

Density : 12

Density : 11.97

Possibly electron showers

Density : 4.95

Possibly pion showers

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Shower density

Density is calculated by counting the number of hit cells within the 3x3x3 range of each hit.

$$Density = \frac{\sum_{i=1}^{i=N_{hit}} N_i}{N_{hit}}$$

As expected, muons have smallest density. EM shower density is the largest.

30GeV

Electron should be the second peak at 13

40GeV & 50 GeV

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60GeV & 70 GeV

80GeV & 100 GeV

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10GeV & 120 GeV

Conclusion

- Muons could be easily picked out
- Cut on shower density at 10 could be used to select pure electron samples.
- Could be used to select samples for more energy points