
Cut-Based PID

Scott Wilbur, Tanaz Mohayai

Overview

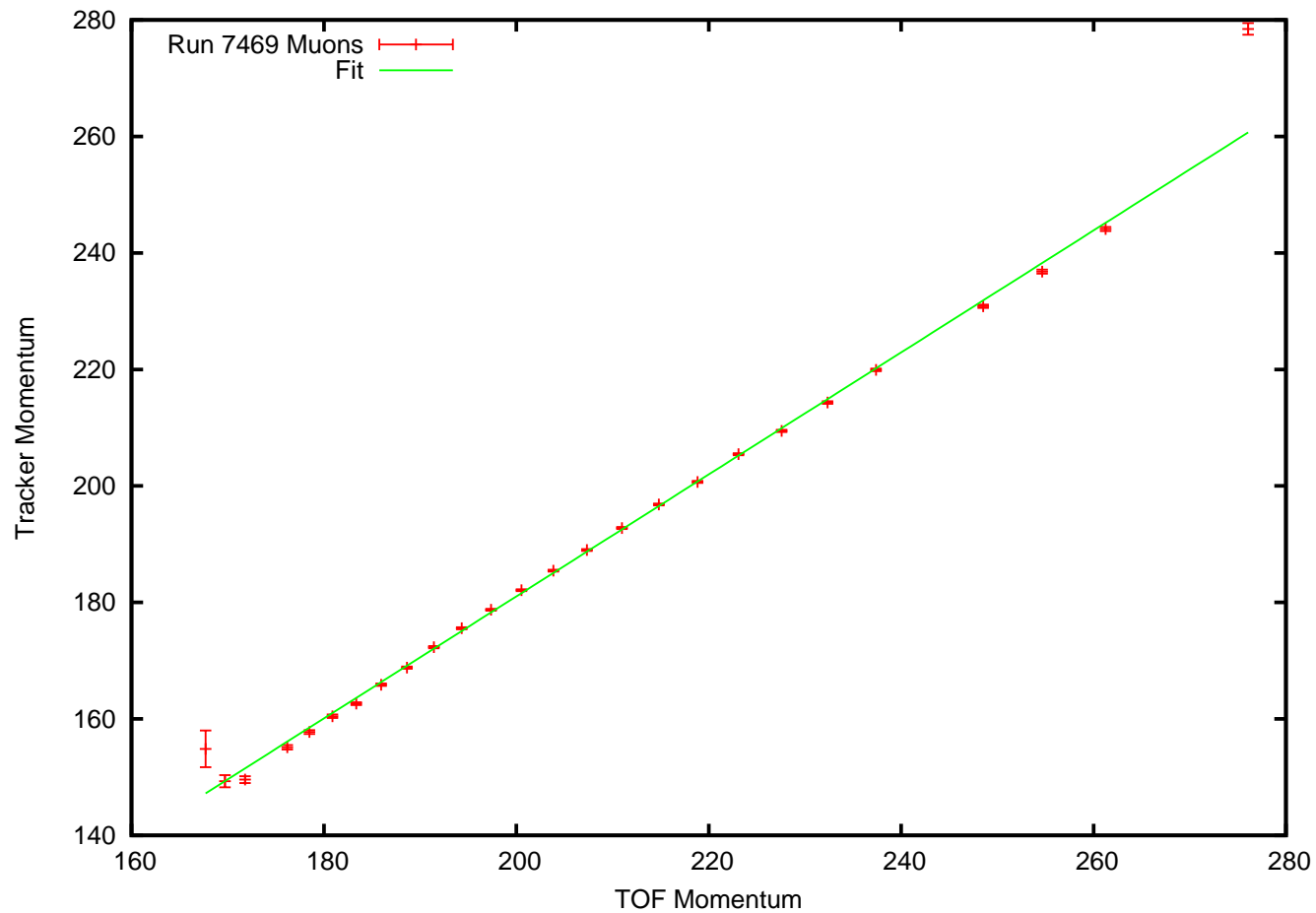
- Measure particle velocity using TOF
- Measure particle momentum using Tracker or EMR
- Add corrective factor to momentum to find momentum in TOF region
- Using velocity and momentum, find mass

Previously sent around an initial pass at this PID. Improvements here:

- EMR range is now automatically converted to momentum in MAUS.
- Momentum corrections make more sense

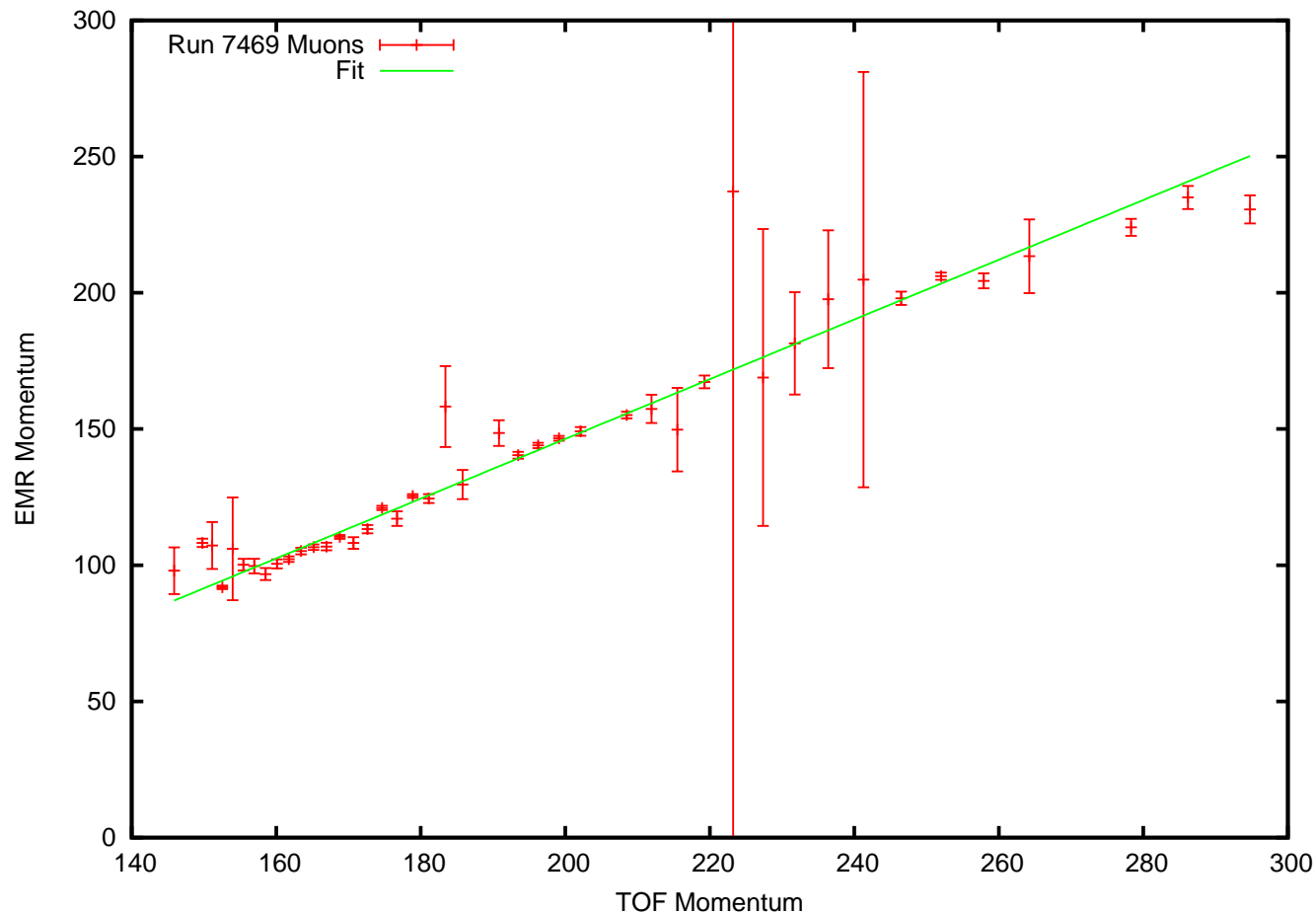
Upstream PID

- Use TOF01 and Upstream Tracker momentum
- Momentum correction: -18.8 ± 0.2 MeV (from fit to known muons)

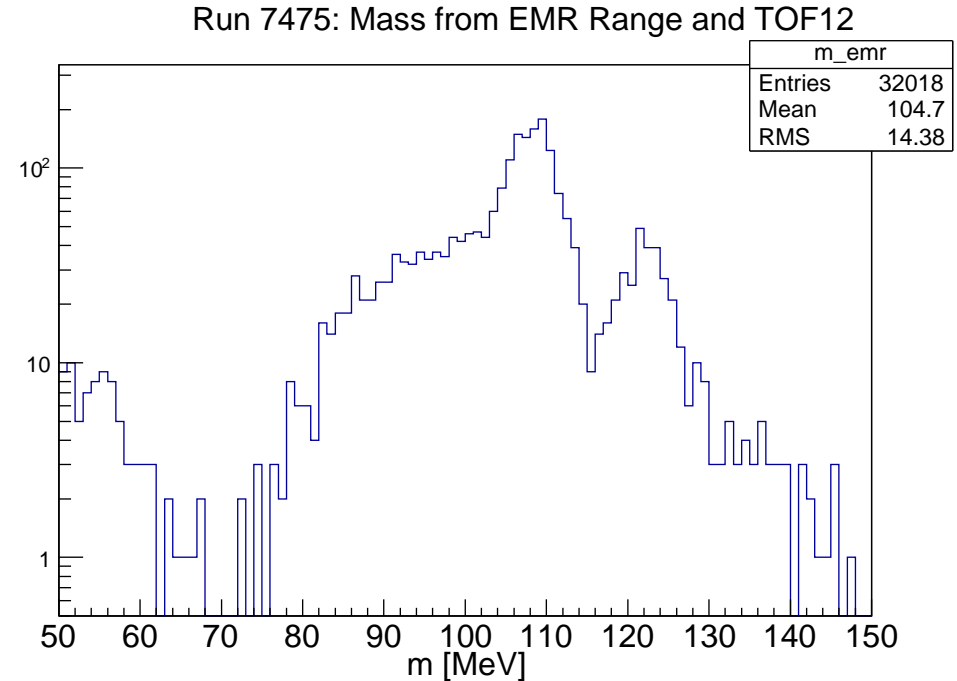
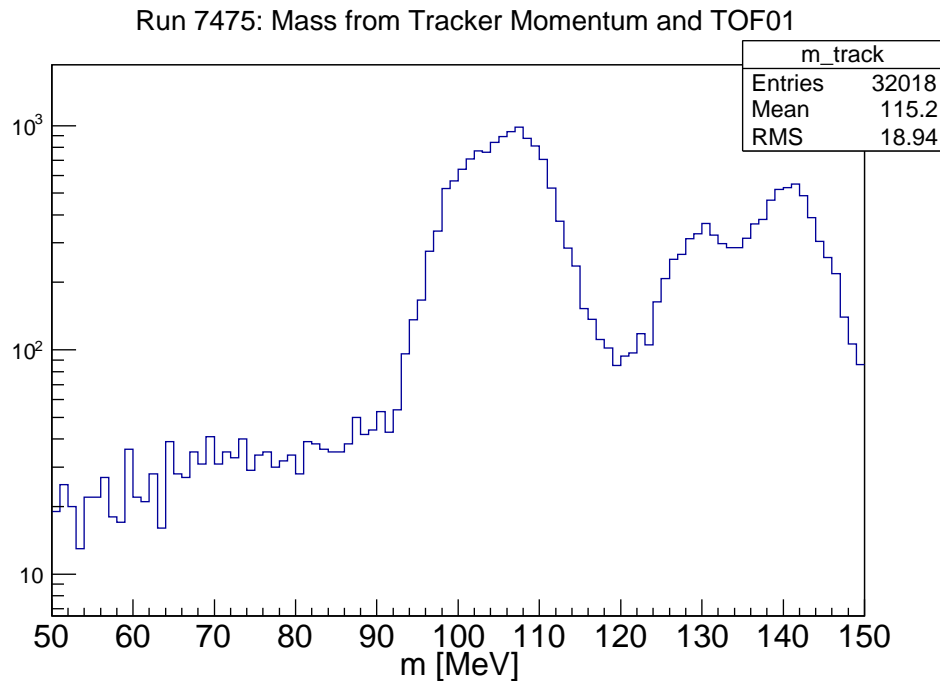


Downstream PID

- Use TOF12 and EMR momentum
- EMR momentum is not perfect for pions, but close enough to produce a distinct mass peak
- Momentum correction: -53.1 ± 0.5 MeV (from fit to known muons)

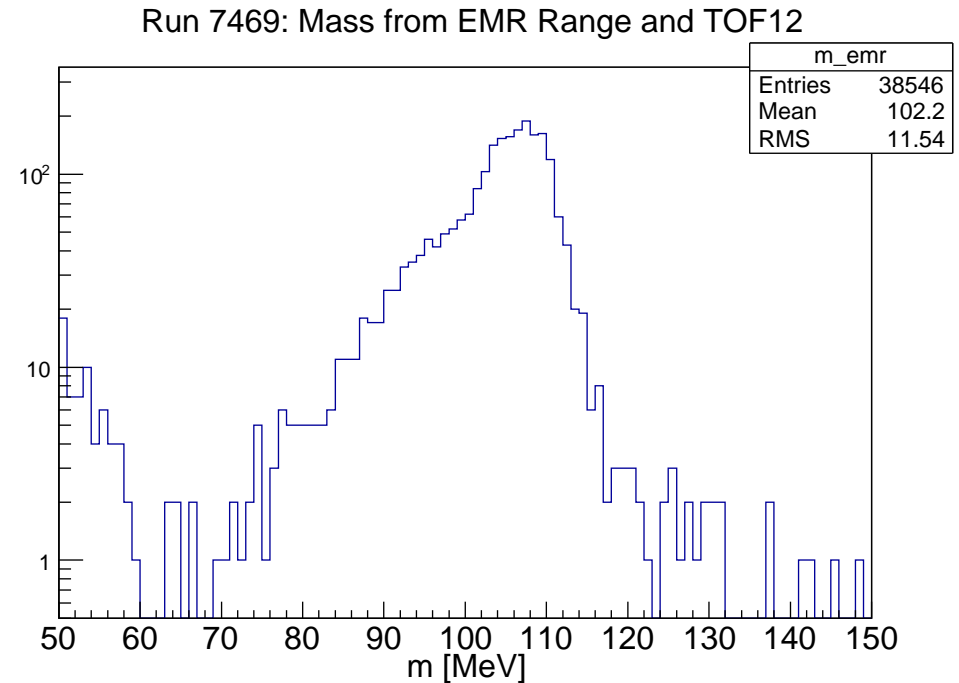
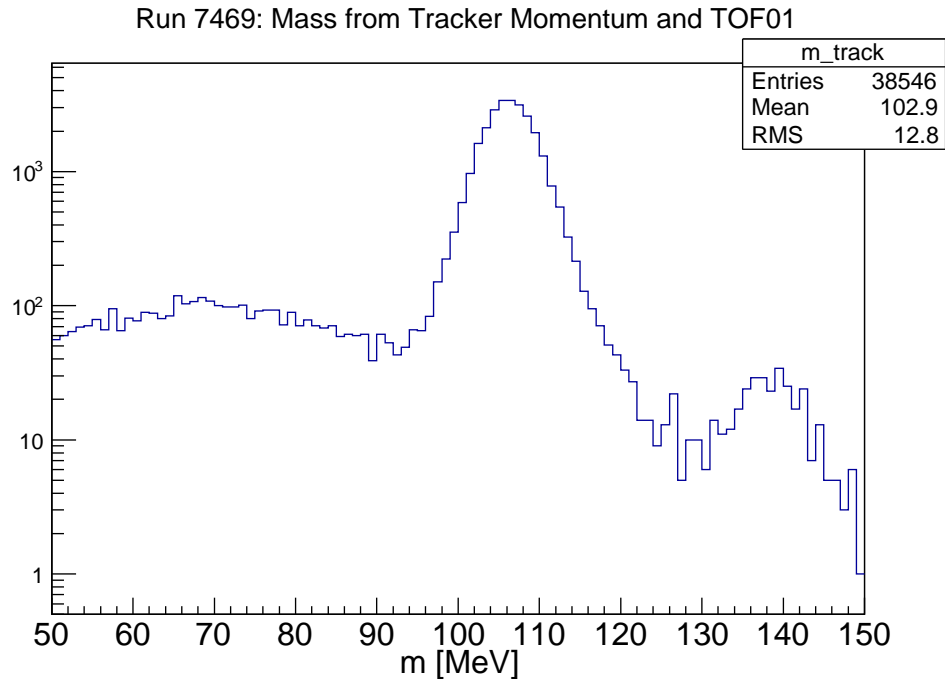


Mass Cuts



- Can see distinct muon and pion mass peaks in both Tracker and EMR mass (This is in a pion run with enough statistics to see the pion EMR mass peak)
- Currently placing tracker cuts at 90 MeV and 120 MeV
- Currently placing EMR cuts at 95 MeV and 115 MeV

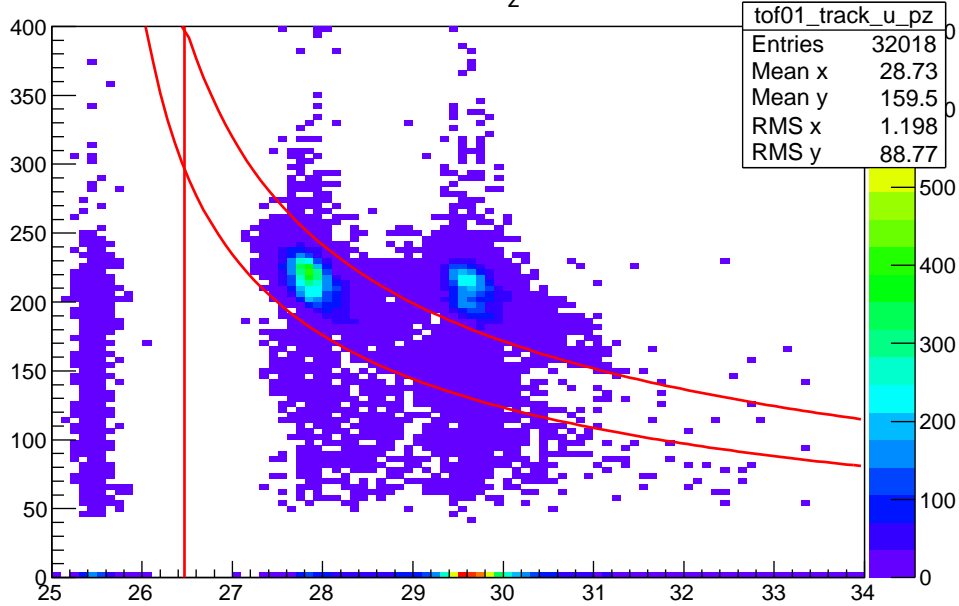
Performance in Run 7469



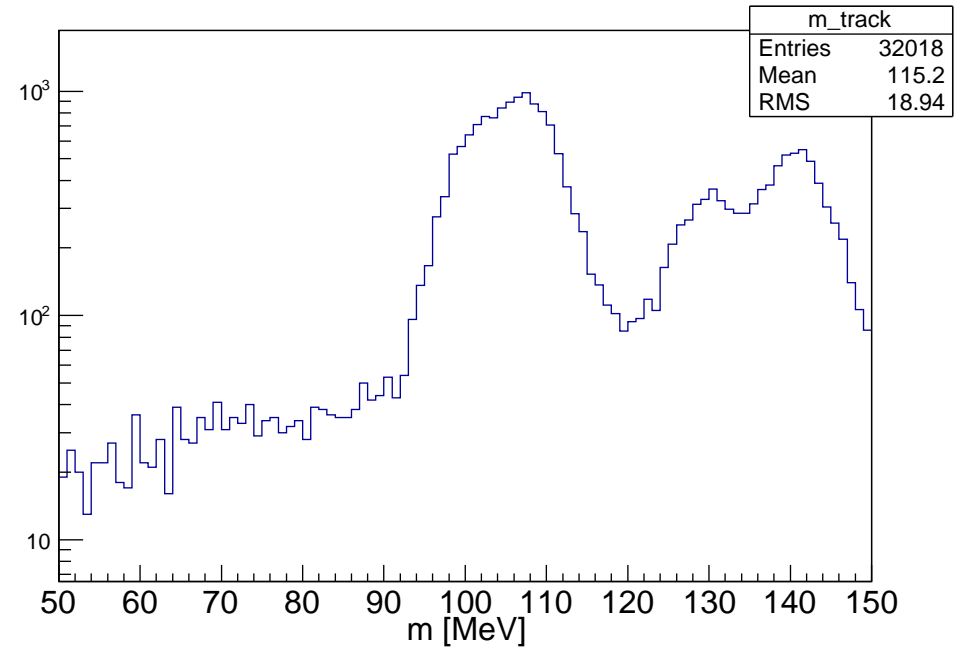
- 27316 Muon tracks identified with tracker mass
- 1778 muon tracks identified with EMR mass (2148 if we include down to 80 MeV)
- Note that pion peak in EMR is invisible due to low statistics

Run 7475 (Pion Run)

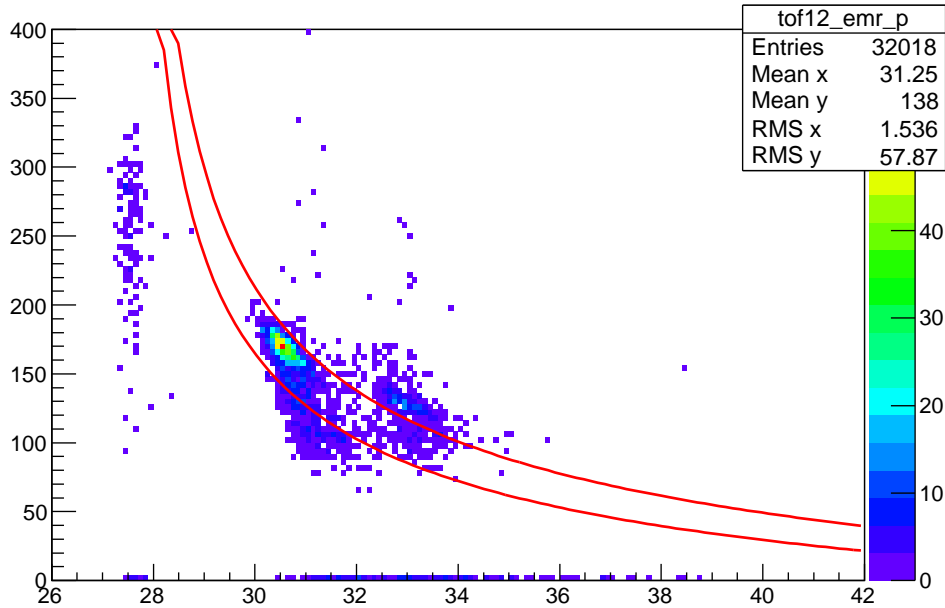
Upstream Track p_z vs. TOF01



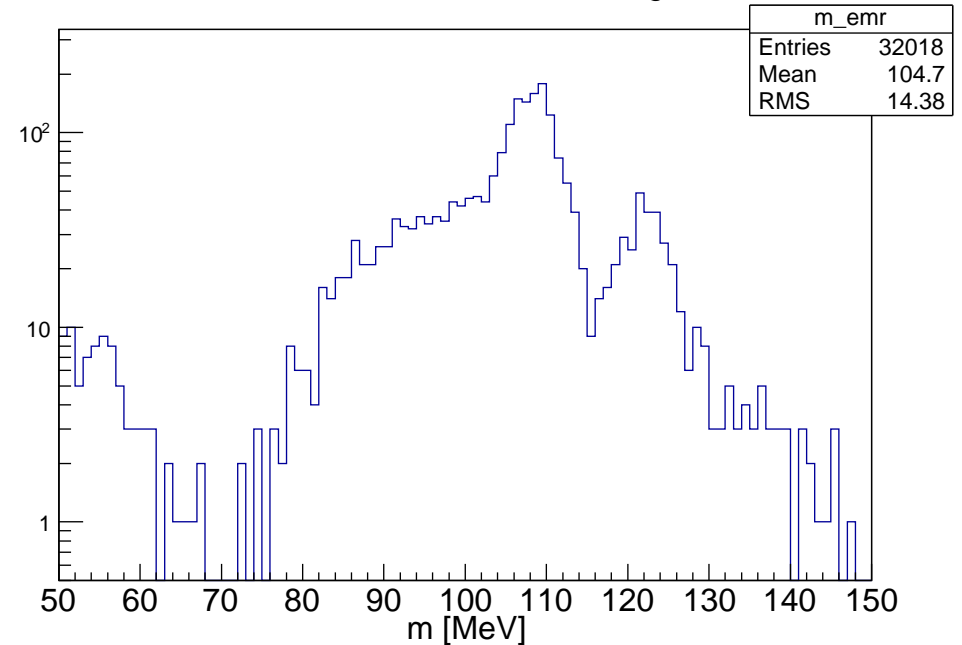
Run 7475: Mass from Tracker Momentum and TOF01



EMR Momentum vs. TOF12

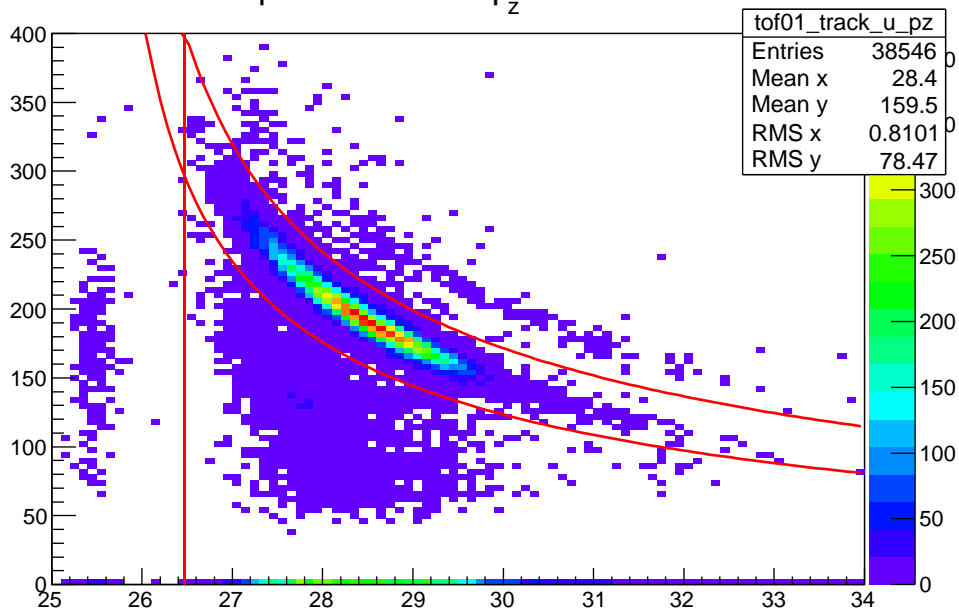


Run 7475: Mass from EMR Range and TOF12

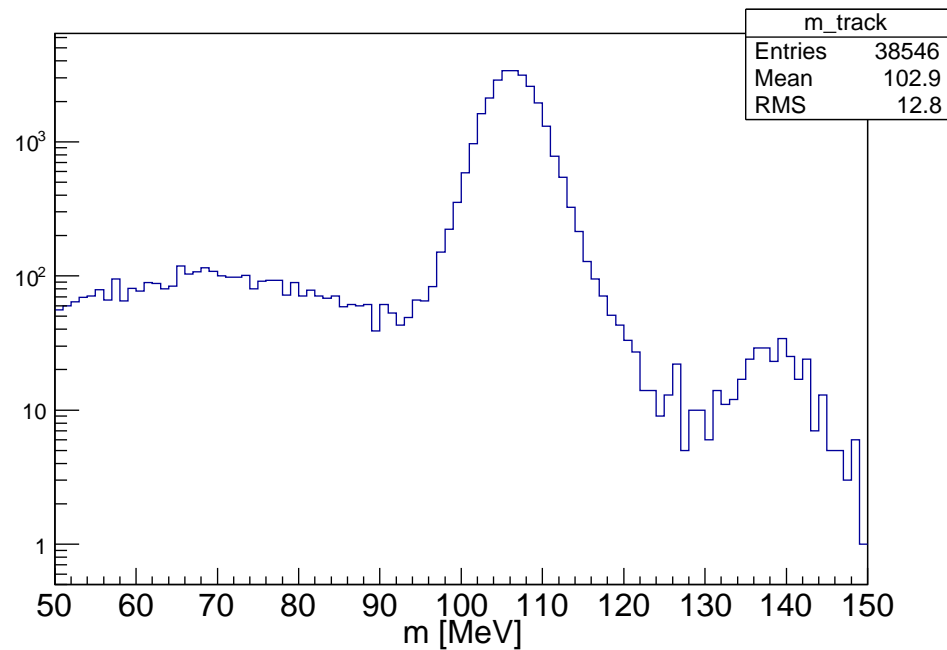


Run 7469 (Muon Run)

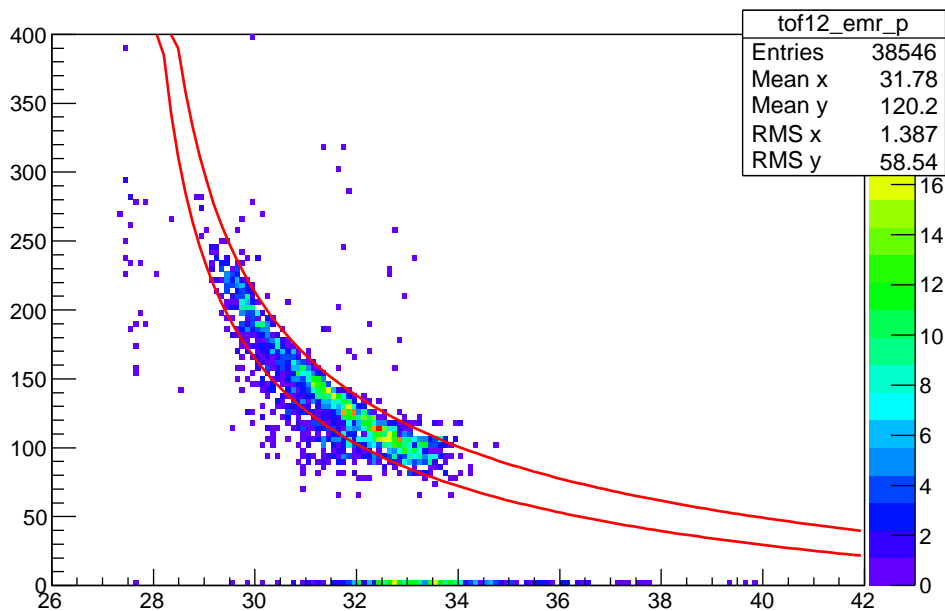
Upstream Track p_z vs. TOF01



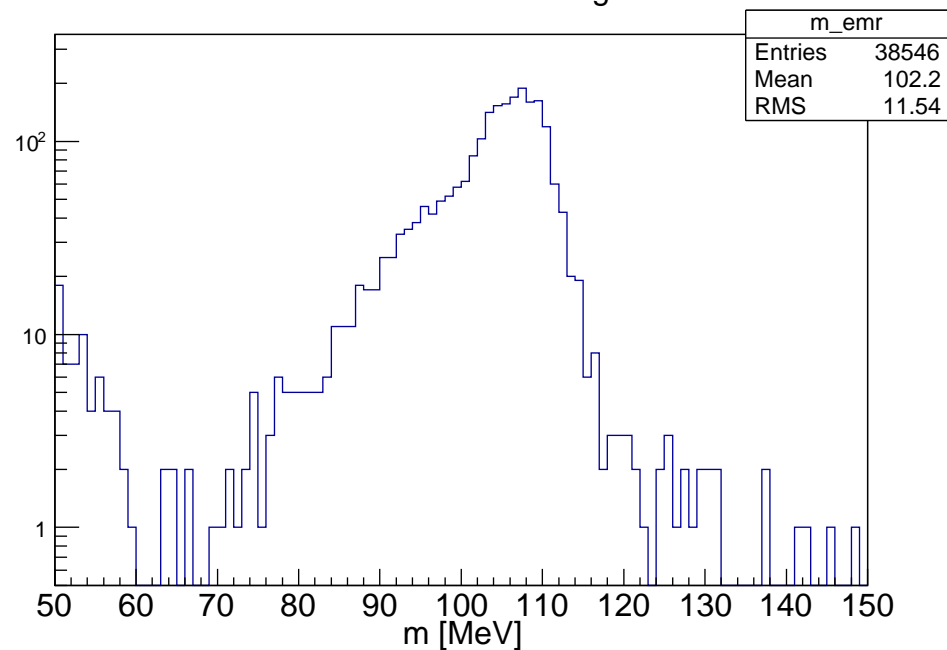
Run 7469: Mass from Tracker Momentum and TOF01



EMR Momentum vs. TOF12

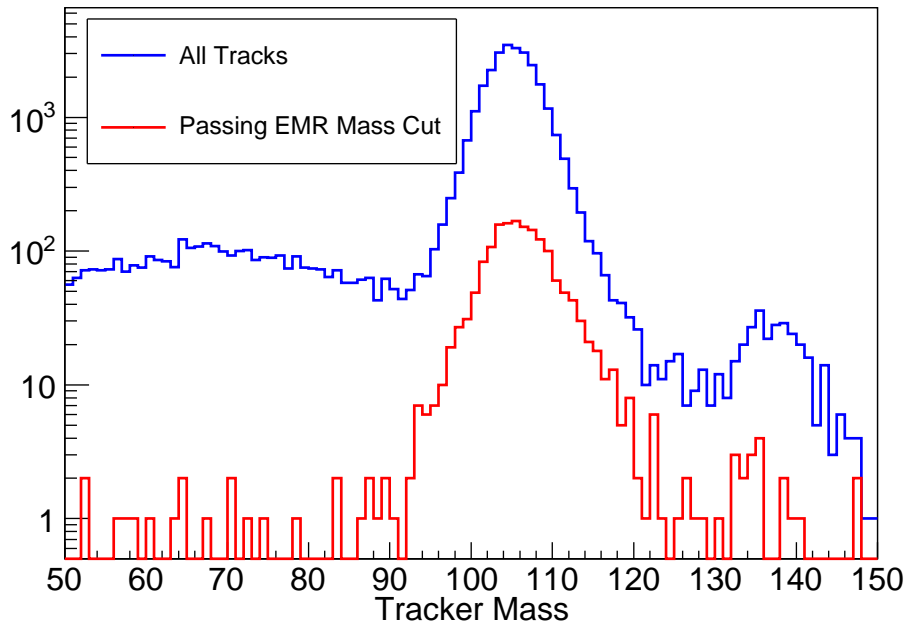


Run 7469: Mass from EMR Range and TOF12

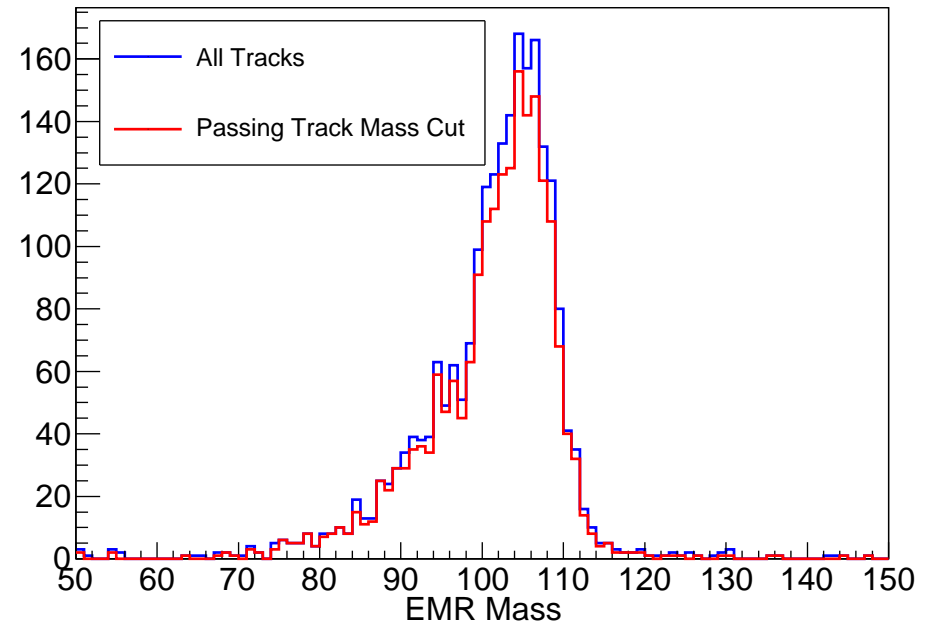


Cross-Checks in 7469 and 7475

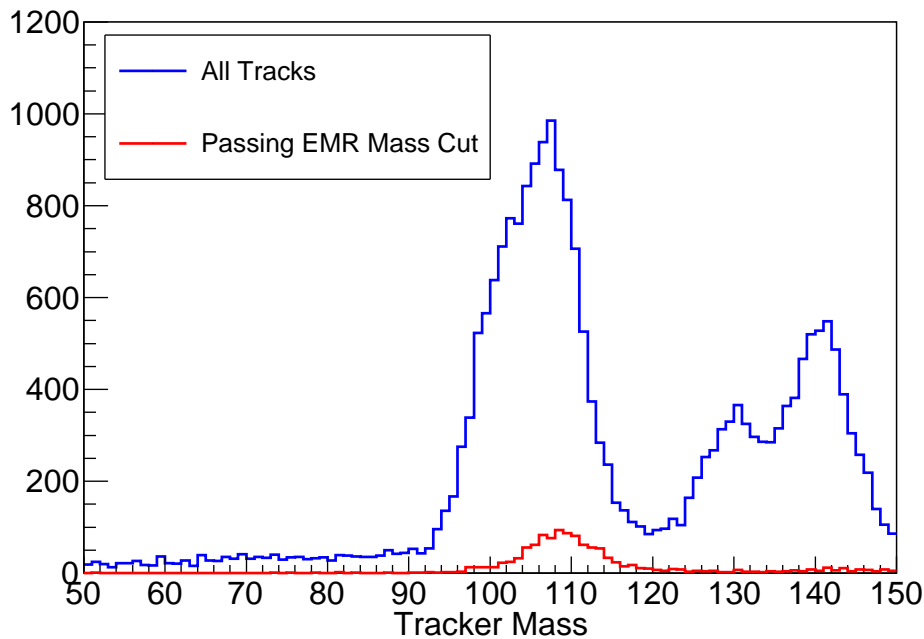
Tracker Mass Cross-Check



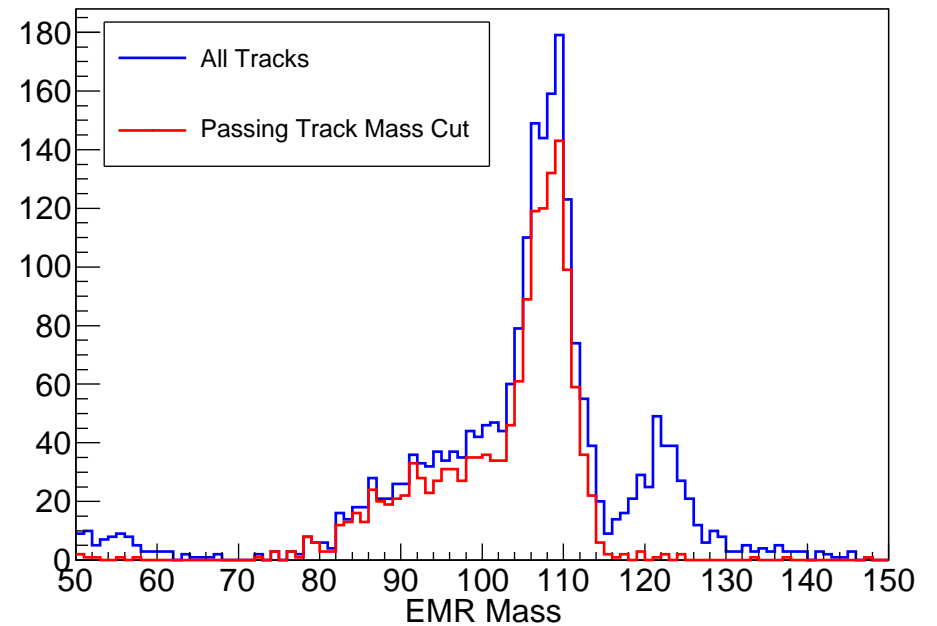
EMR Mass Cross-Check



Tracker Mass Cross-Check



EMR Mass Cross-Check



Next Steps

- Check PID on another muon run (7652?)
- Send around these cuts
- Write up PID section for paper