MICE Batch Simulation Analysis

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MICE CM41

Progress with of Batch Simulation

- Grid submission has not yet been conducted.
- Local submission has been redone.
  - Used MAUS v0.9.2, geoID 48.
  - 6π200 MeV G4beamline simulations used as input.
  - "Default" muon beam line and channel settings used.
  - Download at:
    `http://www.ppe.gla.ac.uk/~rbayes/MICE_6pi200_1/pass2_simulation_mausv0p9p2.tar.gz`

Default Settings

Element	Field (T/m)	Element	Scale	Element	Scale
Q4	0.908	SSU-E2	133.	SSD-E2	-133
Q5	1.218	SSU-C	148	SSD-C	-148
Q6	0.807	SSU-E1	126	SSD-E1	-126
Q7	0.797	SSU-M2	113	SSD-M2	-132
Q8	1.205	SSU-M1	132	SSD-M1	-113
Q9	1.029	FC-US	104	FC-DS	104
Diffuser	0110	Dipole 2	0.714		

Challenges in progress

- Grid scripts were required
  - have since been generated and tested.
  - Will appear in MAUS v0.9.3
- Selected interface point (Geneva 1) is inefficient
  - Twenty particles pass through D2 for each particle at DS Tracker.
  - All particles create records in MC; inefficiency in file size.
  - Interface point to be moved to 1 m after D2.
  - The is probably not sufficient.
- Version of MAUS (v0.9.3) must be installed on grid.

Immediate Plans and Studies

Alignment Studies

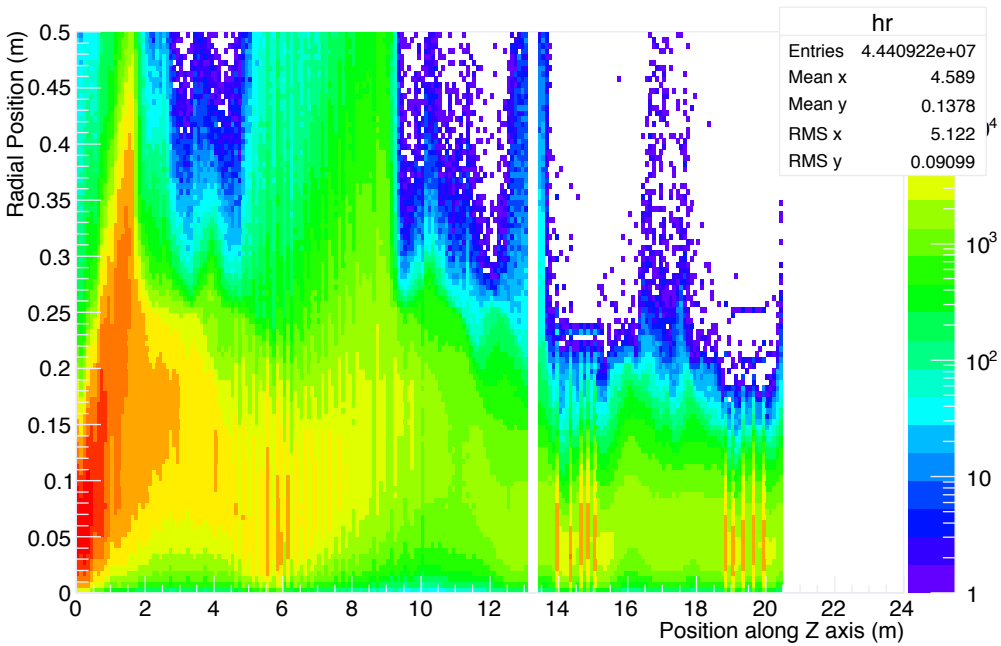
- Requires new geometries
  - Will be recorded in CDB
- Trackers (Solenoids) displaced and rotated
  - Proposed settings include

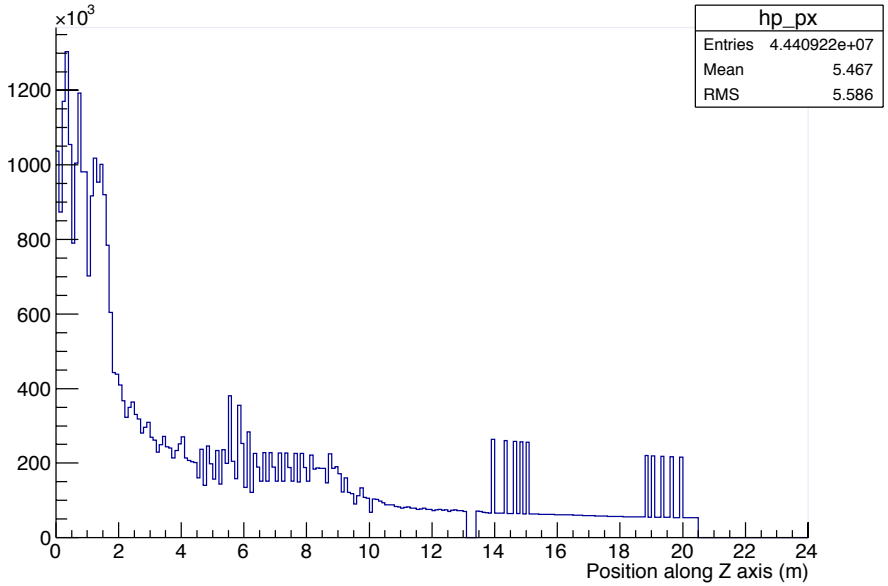
Changes in Initial Emittance

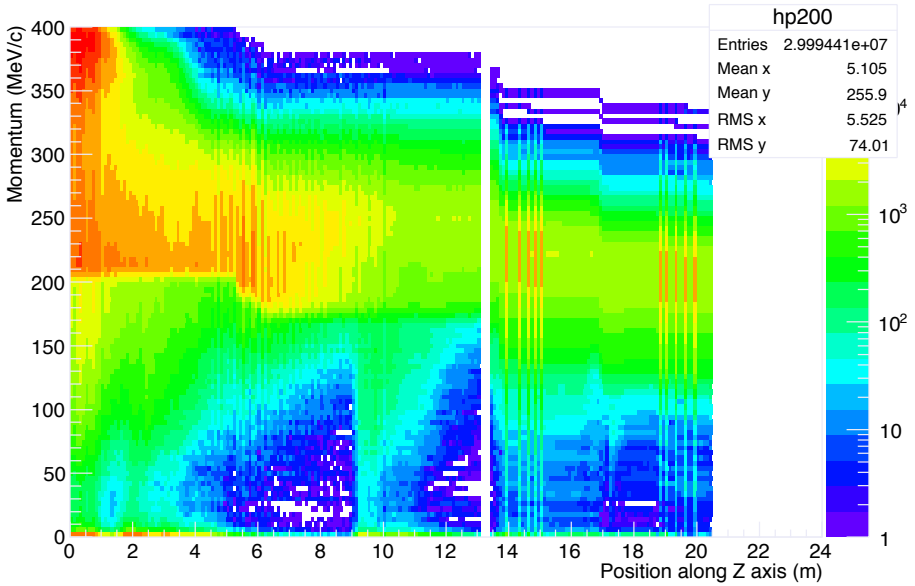
- Change diffuser settings
  - Consider 3π (0000) and 10π (1101)
  - Maintain a momentum of 200 MeV at absorber.

Virtual Plane Analysis

- Virtual planes placed every 10 cm.
- Sharp decrease in events prior to 4 m.
- New simulation shows p = 200 MeV/c at absorber.







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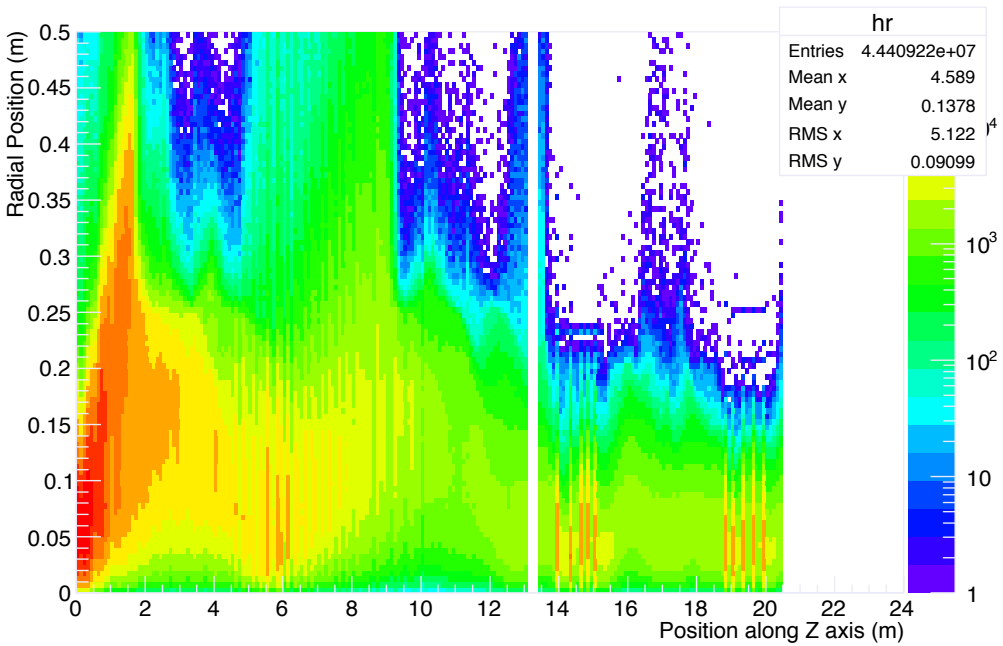
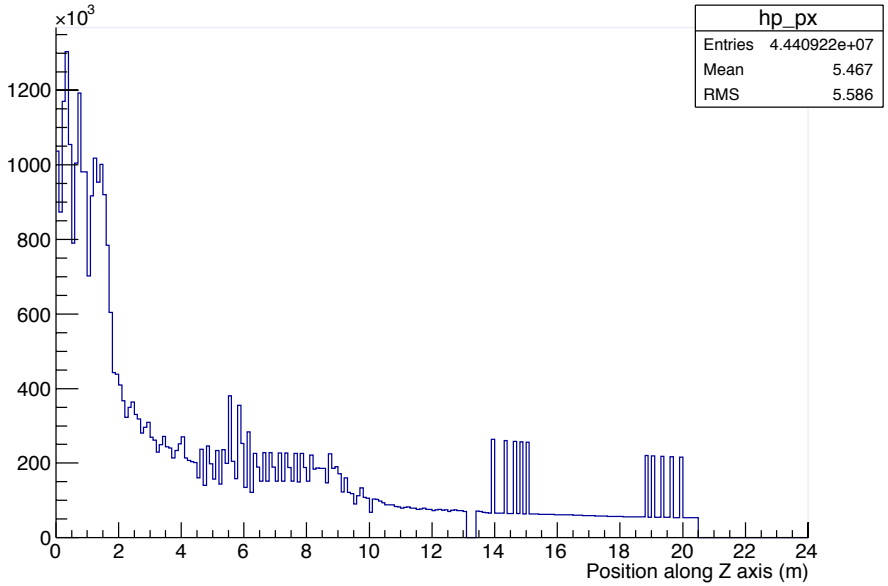
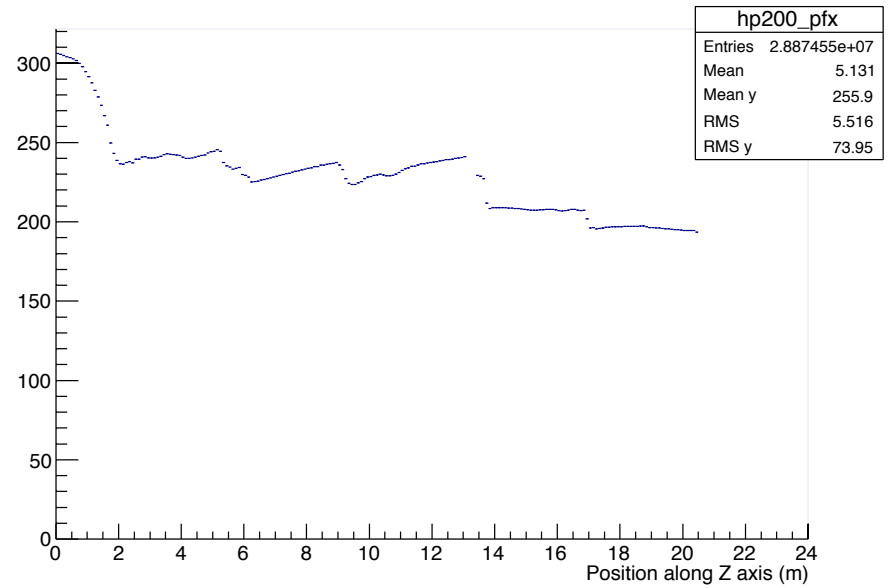
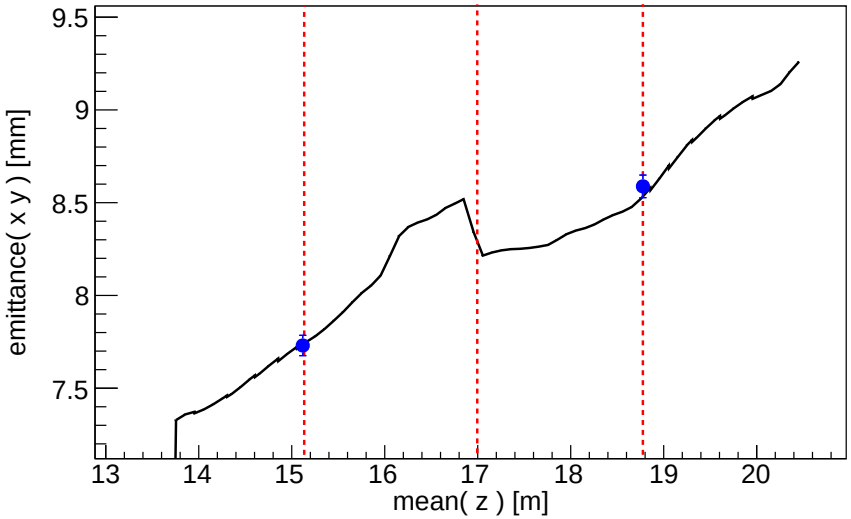


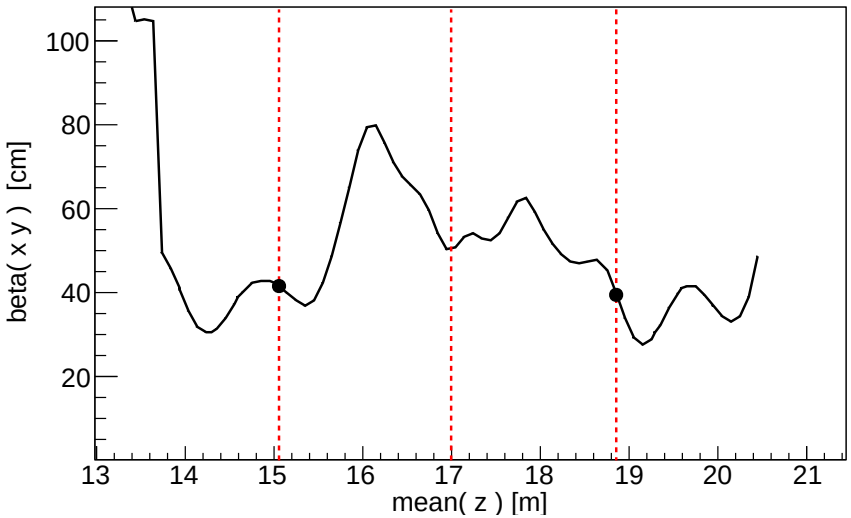




Emittance Analysis of Existing Simulation

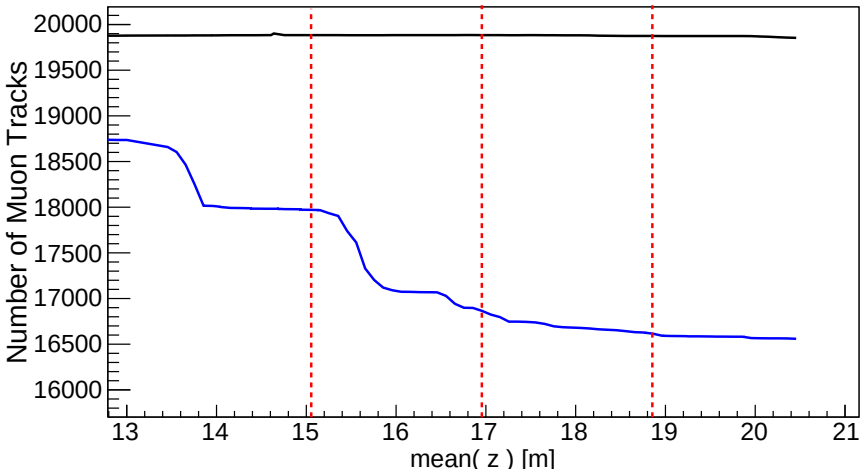
- Thanks to Chris Hunt for his analysis.
- Total of 20000 events pass cuts.
- Increase of emittance across absorber.
- Corrected reconstruction shown with blue dots



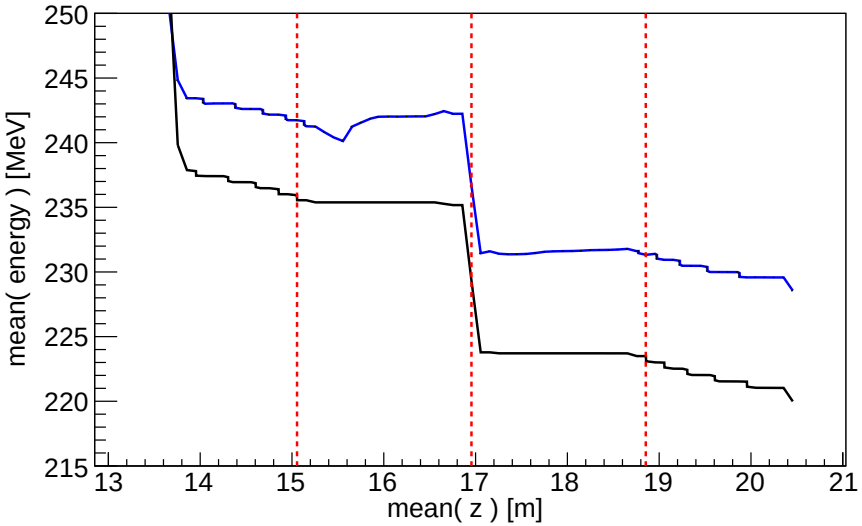


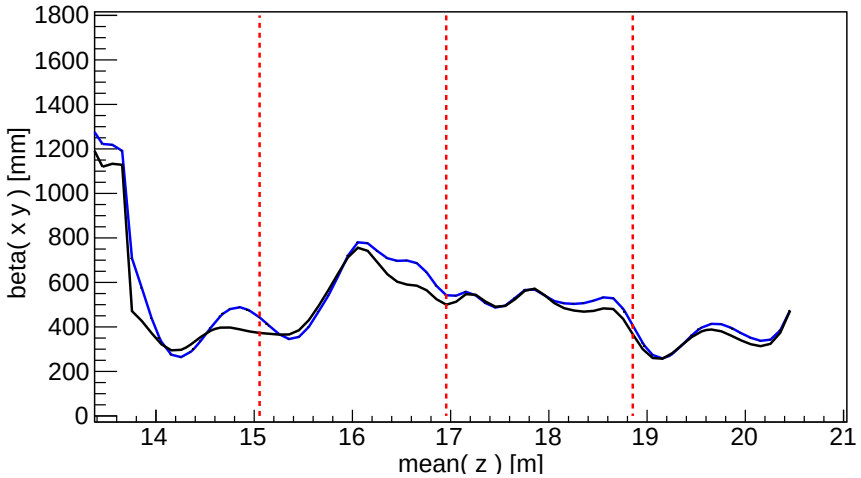
- Beta function shows poor matching.
  - Not symmetric across the absorber.
  - Large local minimum at absorber.

Where did the difference come from?



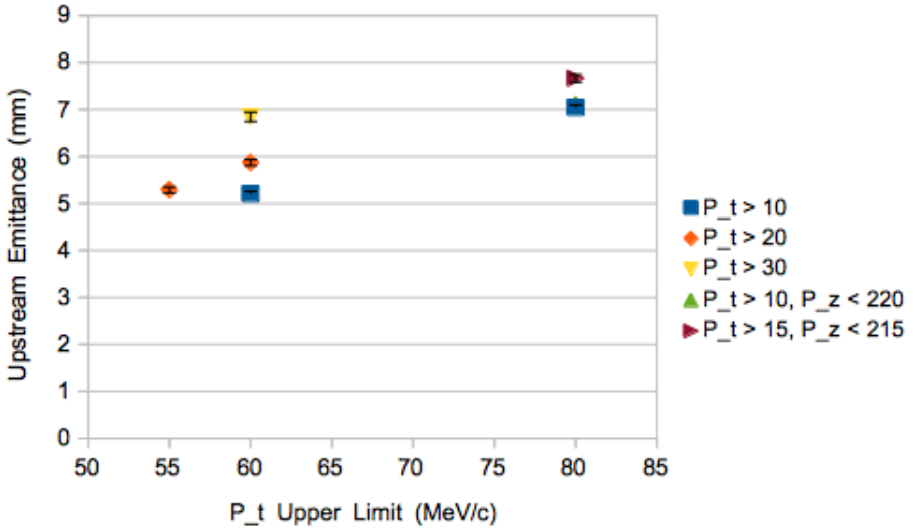
- New analysis in black, old in blue.
- Bunch weight is now fixed.
- No significant difference in beta
- Lower mean energy.

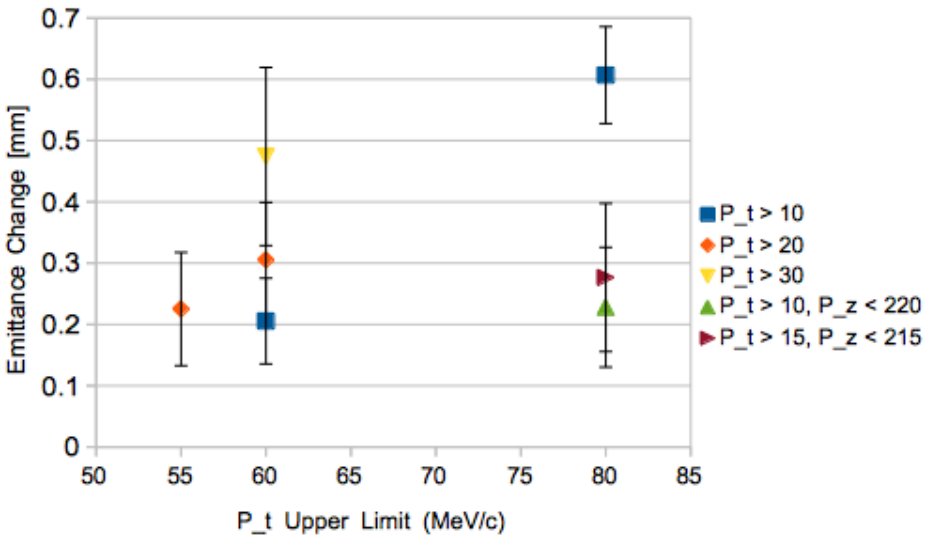


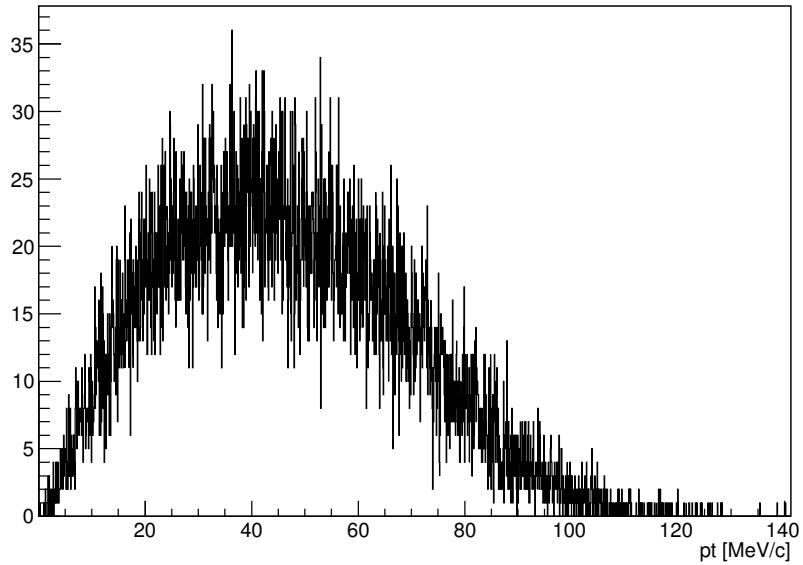


The effect of cuts on the emittance

- The selection of events can alter the emittance
- Evaluated emittance with cuts in p_t and p_z
  - cannot produce a negative change in ϵ
  - need an explicit selection of x, x', y, and y'







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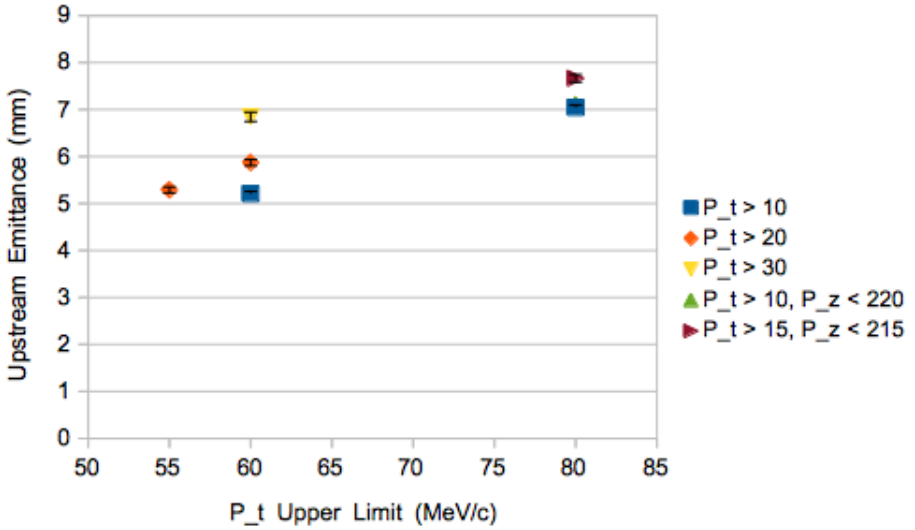

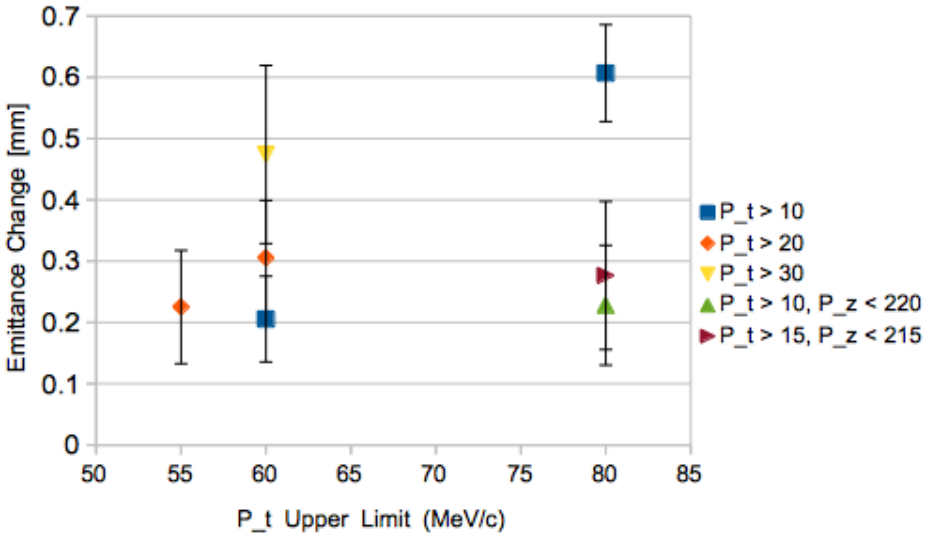

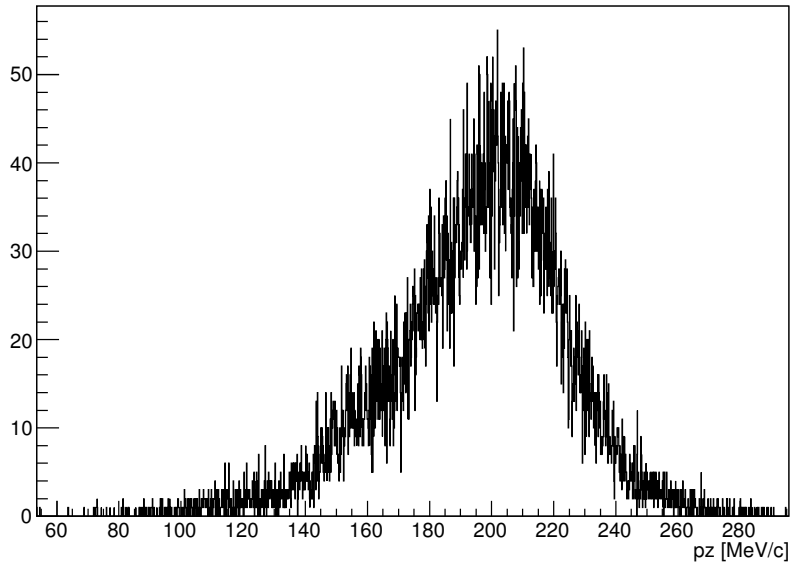

Outlook for Batch Simulations

- All existing simulations have been done on local systems
- A versioned simulation now exists.
- Need to exercise grid machinery.
- First priorities set by publication requirements.
  - Nominal 6π200 MeV setting
  - Alignment studies.

Requirements for Future Simulations

- Better matched beam settings.
- A simulated beam profile at the new interface point.