



Reoptimising Front End with proton absorber



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Proton absorber integration

- Adding a proton absorber skews the energy-time distribution of the outgoing muon beam
- Hope that adding a drift space would let it re-align
- That doesn't work
- Need to re-optimize the buncher and phase rotation to cope
- Prefer to work in g4beamline
 - Chicane is in g4beamline
- Need to develop optimisation routine
 - Make optimisation wrapper around g4bl
 - First check for straight lattice



Optimisation Routine

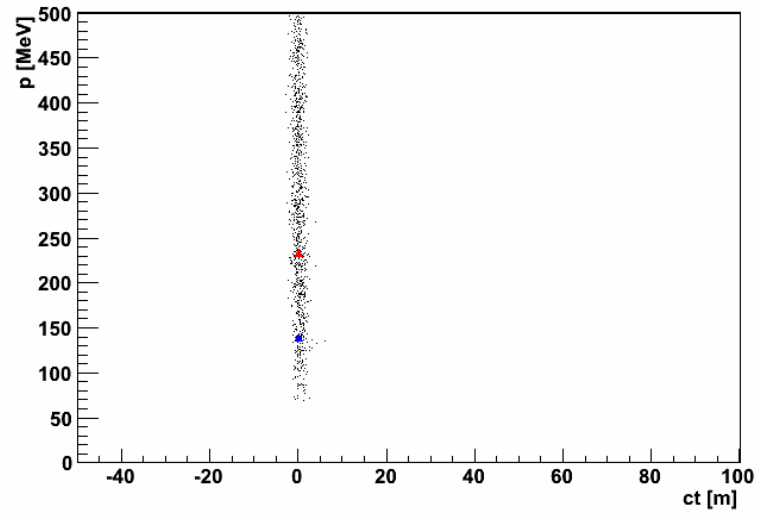


- 1D Model
 - RF Cavity model
 - Energy gain is sine wave
 - Standard transit time factor calculation
 - Implement energy loss routine to get nominal energy loss in Beryllium
 - Linear interpolation off PDG energy loss table
- Track high momentum and low momentum particle through
- Use time difference to set RF frequencies
 - As in icool routines
- Here, try linear ramp in voltage followed by linear ramp in phase on the second reference particle
 - i.e. the usual buncher followed by the usual phase rotation

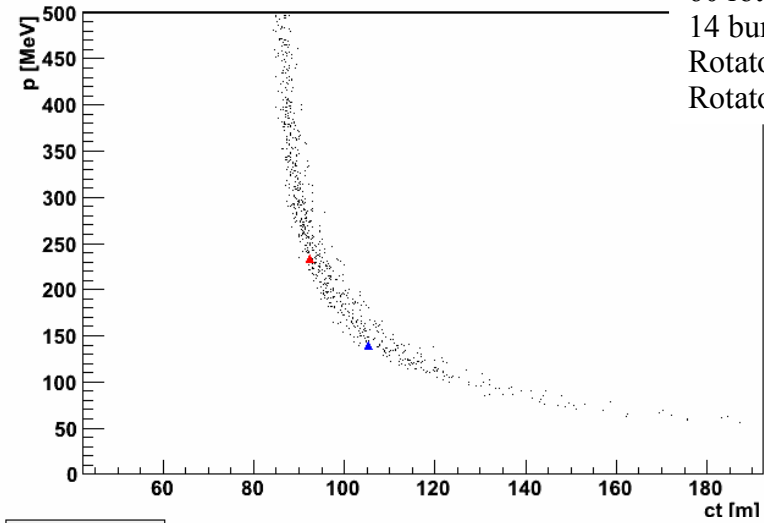
No absorber – ICOOL simulation

45 bunch cavities
 60 rotator cavities
 14 bunches (140-233 MeV/c)
 Rotator phase 16 degrees
 Rotator voltage 13 MV/m

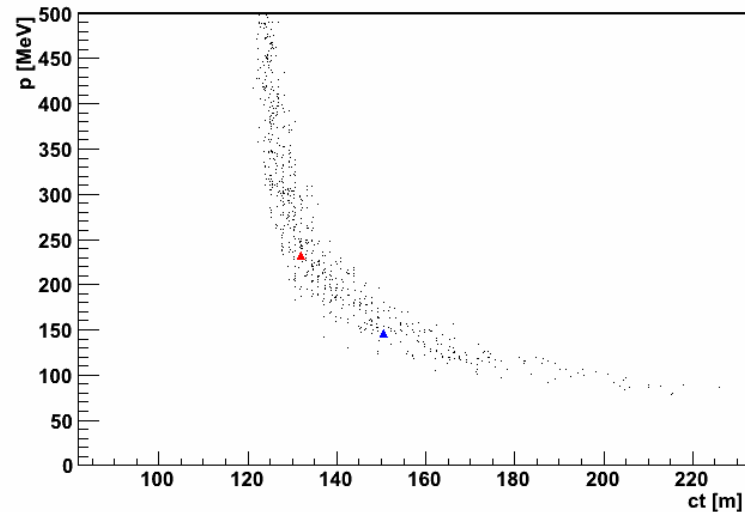
z = 0.1 m



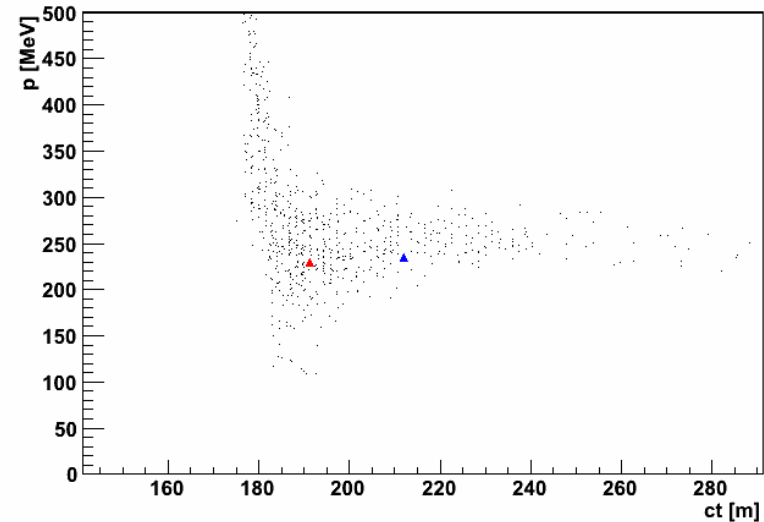
z = 84.1 m

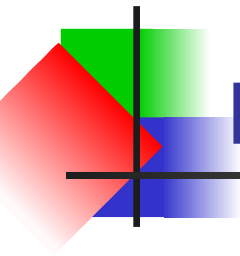


z = 120.1 m



z = 174.1 m



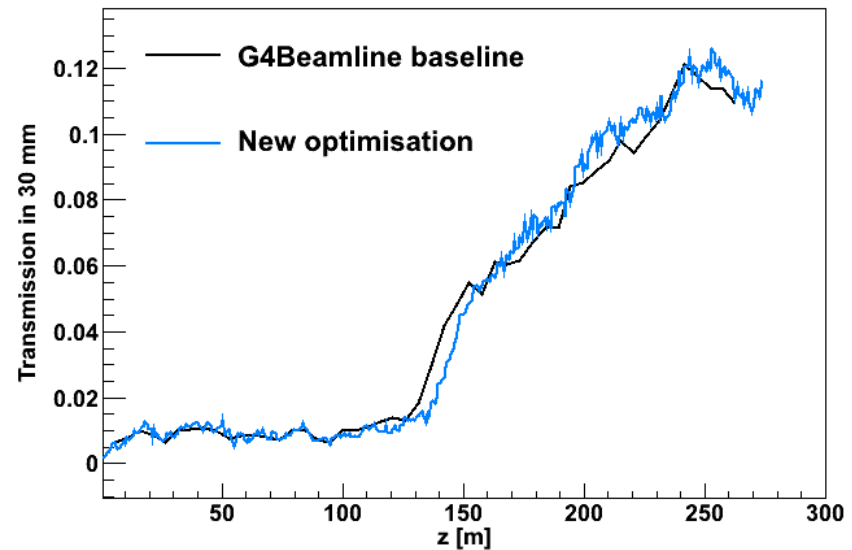
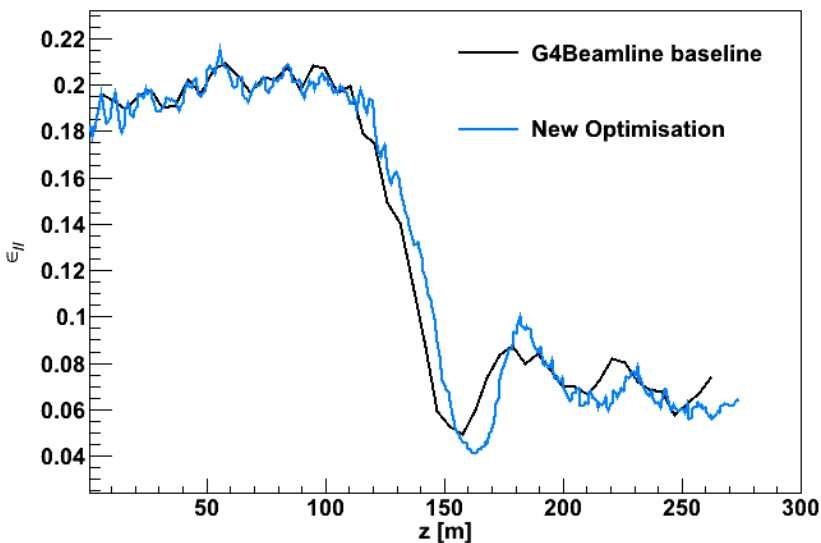


No absorber



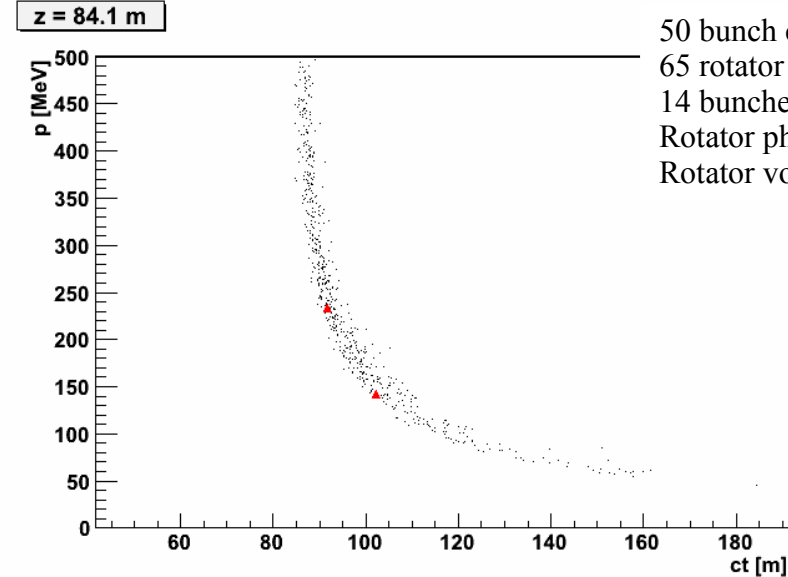
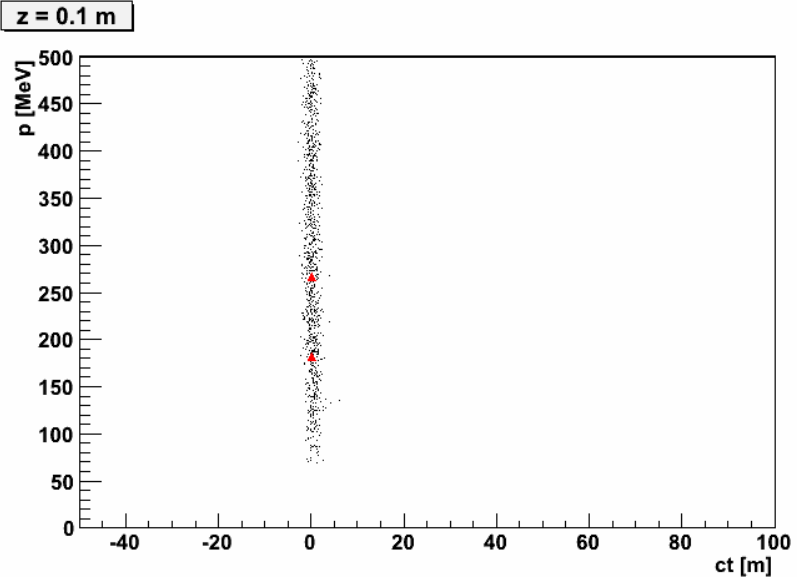
time_energy_movie-0mm.avi

Optimisation Routine

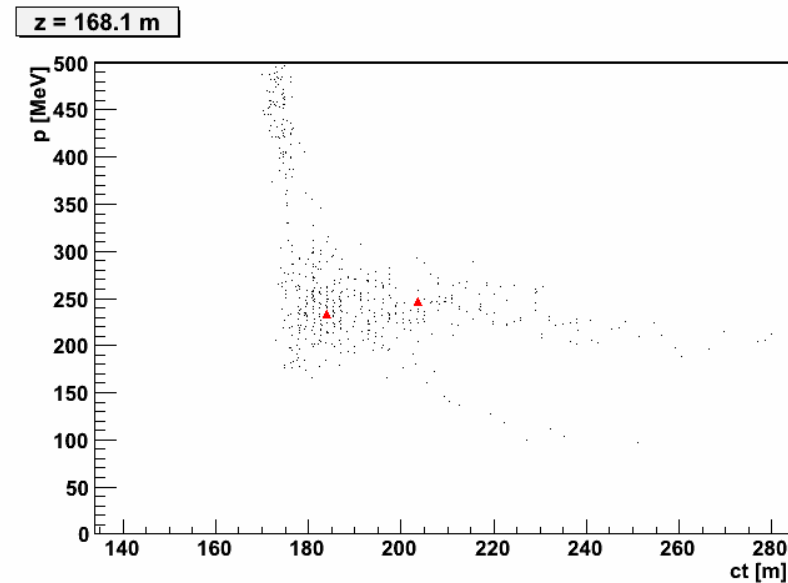
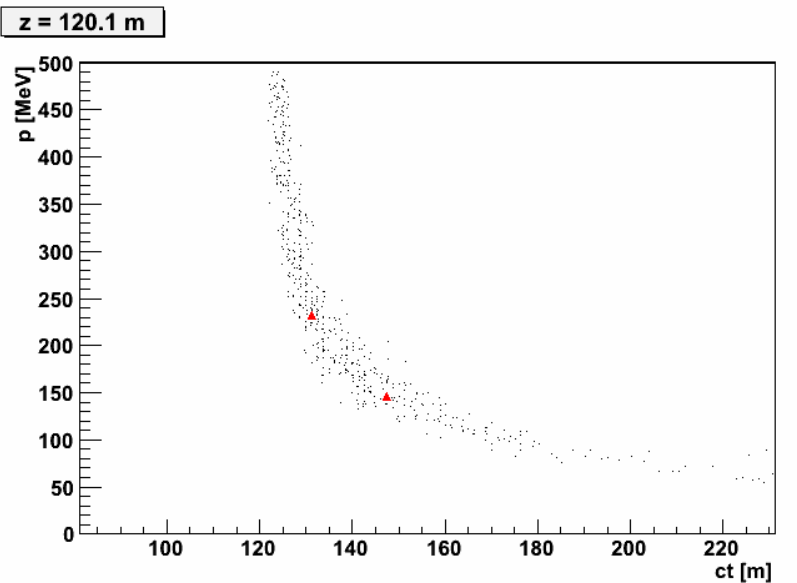


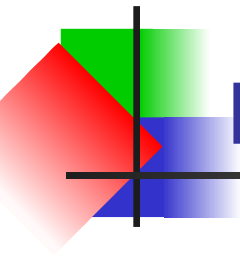
- Performance in ICOOL
 - Longitudinal emittance is well controlled
 - Still some longitudinal mismatch on entry to the cooling channel
 - Good muon rate is encouraging
- Note
 - No windows
 - Increased LiH absorber thickness in cooling channel (12 mm)

100 mm absorber – ICOOL simulation



50 bunch cavities
65 rotator cavities
14 bunches (140-233 MeV/c)
Rotator phase 15 degrees
Rotator voltage 13 MV/m



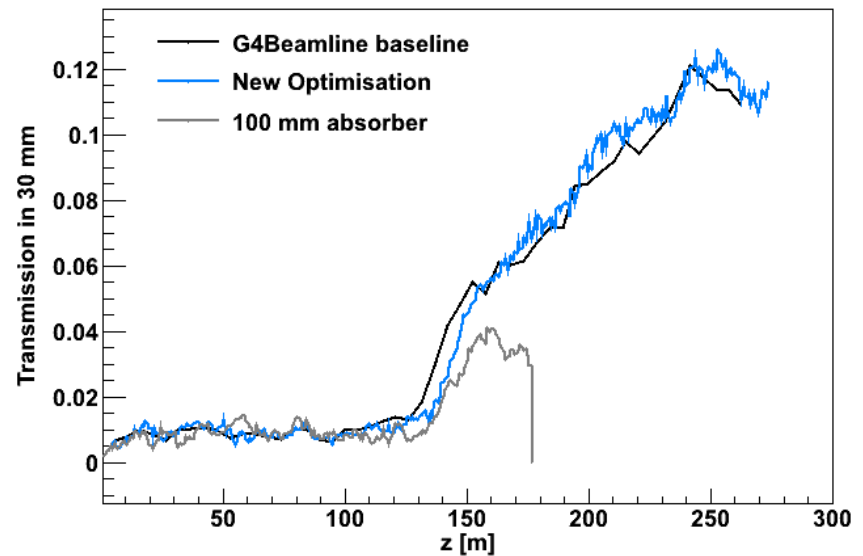
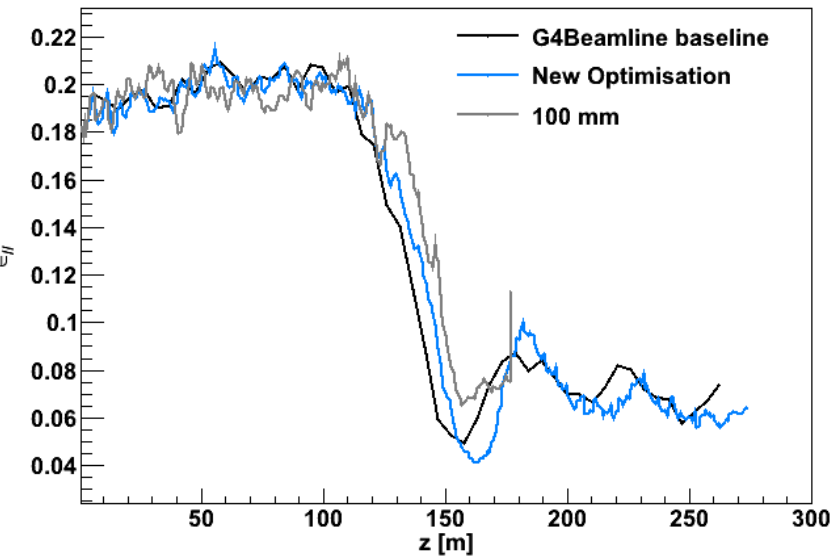


No absorber



time_energy_movie-100mm.avi

Optimisation Routine



- Performance in ICOOL
 - Longitudinal emittance is not so well controlled
 - Cavities dephase to ~ 1 ns == 100 deg phase
 - Cooling channel not simulated

A decorative graphic on the left side of the slide, consisting of a red triangle pointing right, a green square, and a blue square, all partially overlapping a vertical black line.

So...

- Optimisation using a simple 1D model works when no proton absorber
- Introducing a proton absorber screws up the 1D model
 - Energy loss from G4 is slightly different – enough to misphase cavities