Baseline Update

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New Baseline - aim

- Aim is to define a new baseline for the front end
  - Take forward to RDR
- Elements to include:
  - RDR target design (Kirk)
  - Chicane (Rogers)
  - Proton absorber (Rogers)
  - Modified RF capture for chicane/proton absorber (Neuffer)
    - Modified coils for 1.5 T field region (Stratakis/Grant)
  - 5 cell option ionisation cooling channel (Stratakis)
  - Discretize RF, add Be windows (?Neuffer)
- Would like ICOOL and G4Beamline lattice files
- As a starting point I am taking Dave Neuffer's ICOOL version of chicane/proton absorber/RF capture
  - p99s
- Version controlled lattice files available at:
  - http://bazaar.launchpad.net/~chris-rogers/muon-front-end/trunk/files
  - bzr checkout lp:~chris-rogers/muon-front-end/trunk

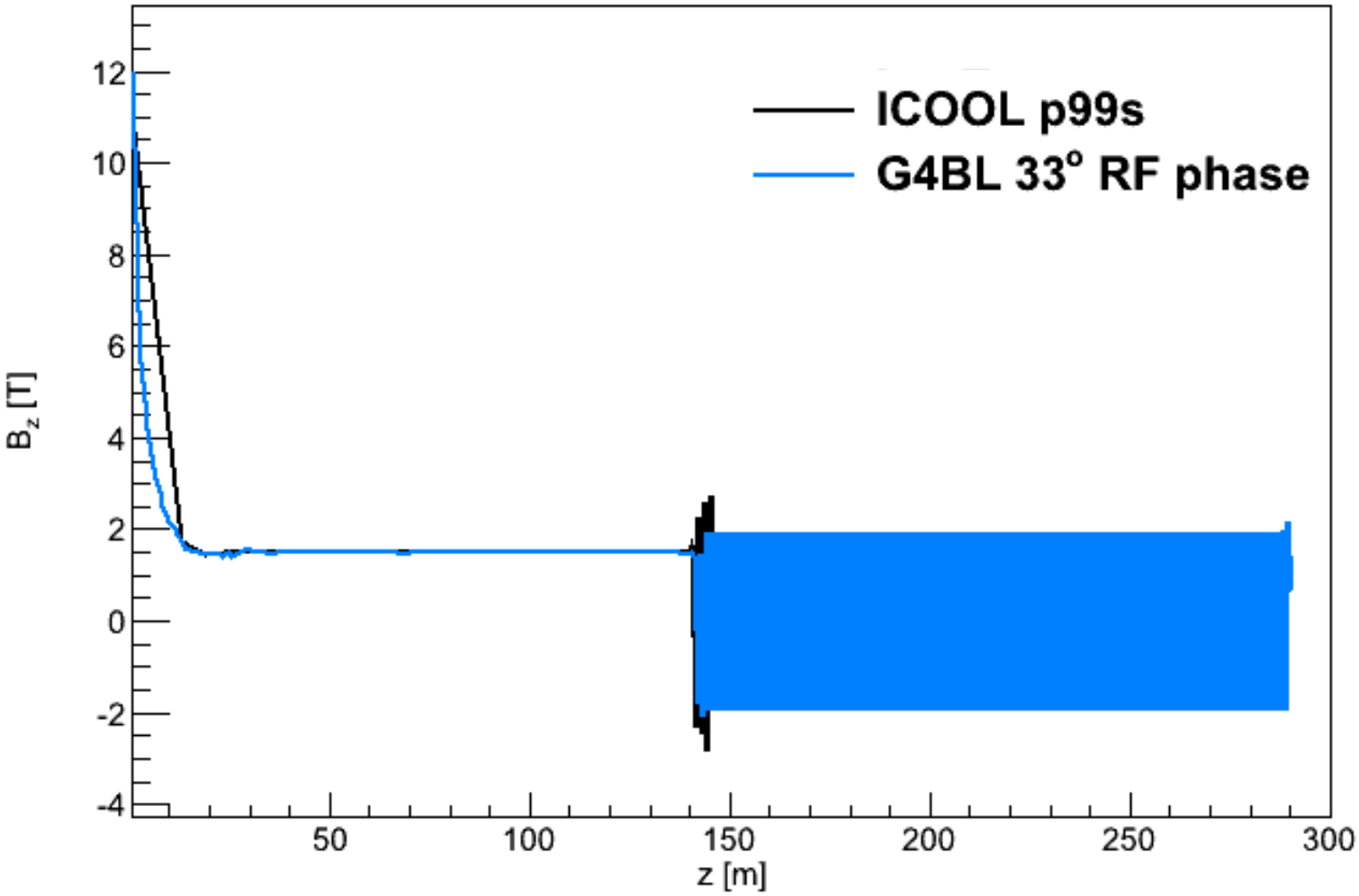
So far

- RDR target design (Kirk)
  - Old target design still in
    - Need new lattice from target group
  - g4bl finishes target magnets at 30 m (target magnets at 1.5 T for 10 m)
  - Icool finished target magnets at ~ 20 m
  - Seek advice from target group on RDR design
- Chicane (Rogers)
  - 12.5 degree chicane implemented in icool starting at ~ 20 m
  - Same in g4bl but starting at ~ 30 m due to different target magnets
- Proton absorber (Rogers)
  - 100 mm proton absorber implemented in icool 10 cm after chicane
  - 100 mm proton absorber implemented in g4bl immediately after chicane

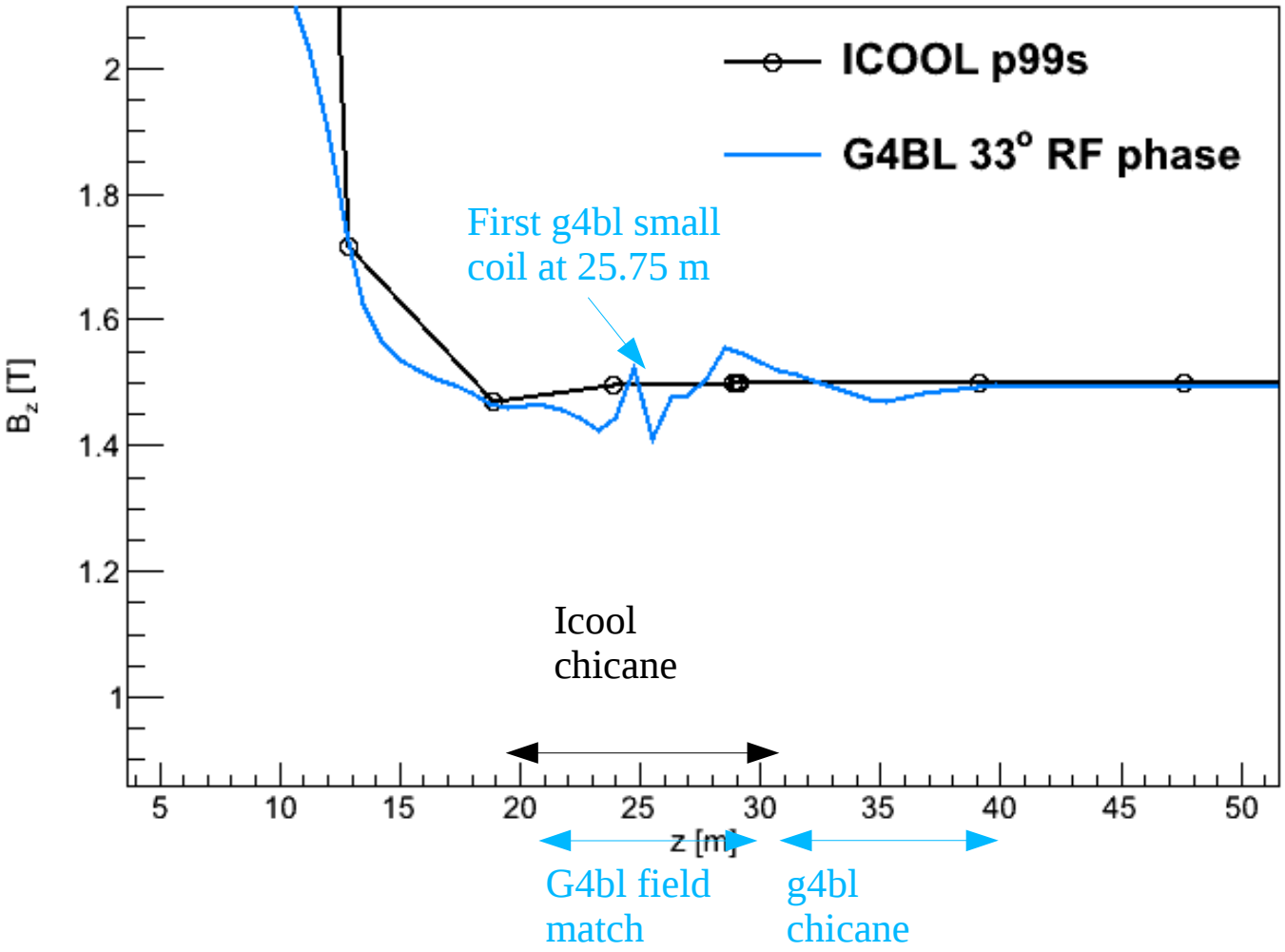
So far (cont)

- Modified RF capture for chicane/proton absorber
  - Continously changing RF frequencies defined in ICOOL
    - no discretisation
  - Use for001 deck to define accelerating phase and length in g4bl
    - See next slides for comments on phase
  - Use icool RFDIAG file to define voltage and z-position in g4bl
  - ICOOL assumes constant 1.5 T field
  - G4BL has FS2A-like coils
    - Need coils for chicane – no bent solenoid model in g4bl
- 5 cell option ionisation cooling channel
  - Not implemented – still use baseline
- Discretize RF, add Be windows (?Neuffer)
  - No implementation in ICOOL or G4BL
- Beam – use Dave Neuffer's beam
  - convert to g4bl BLTrackFile format
- Using revision 6 in the repository (current repository head)

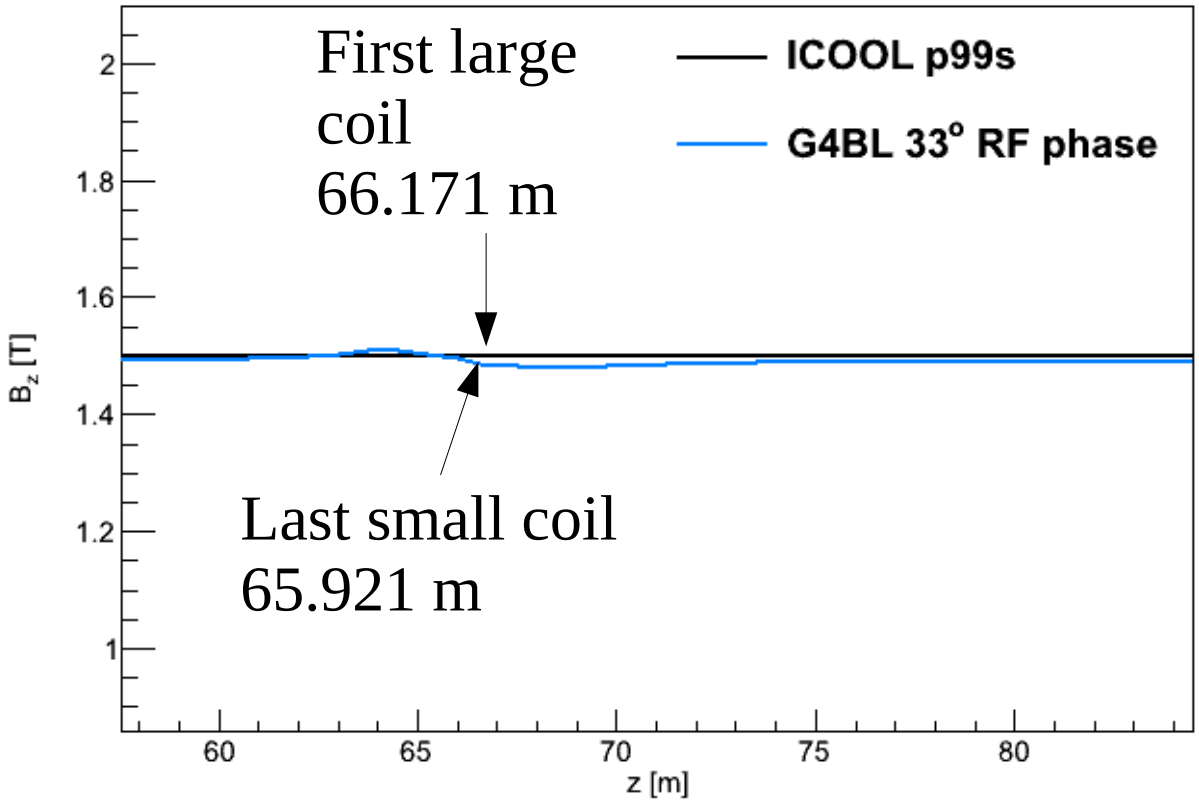
Magnetic Field



Magnetic Field – taper + chicane

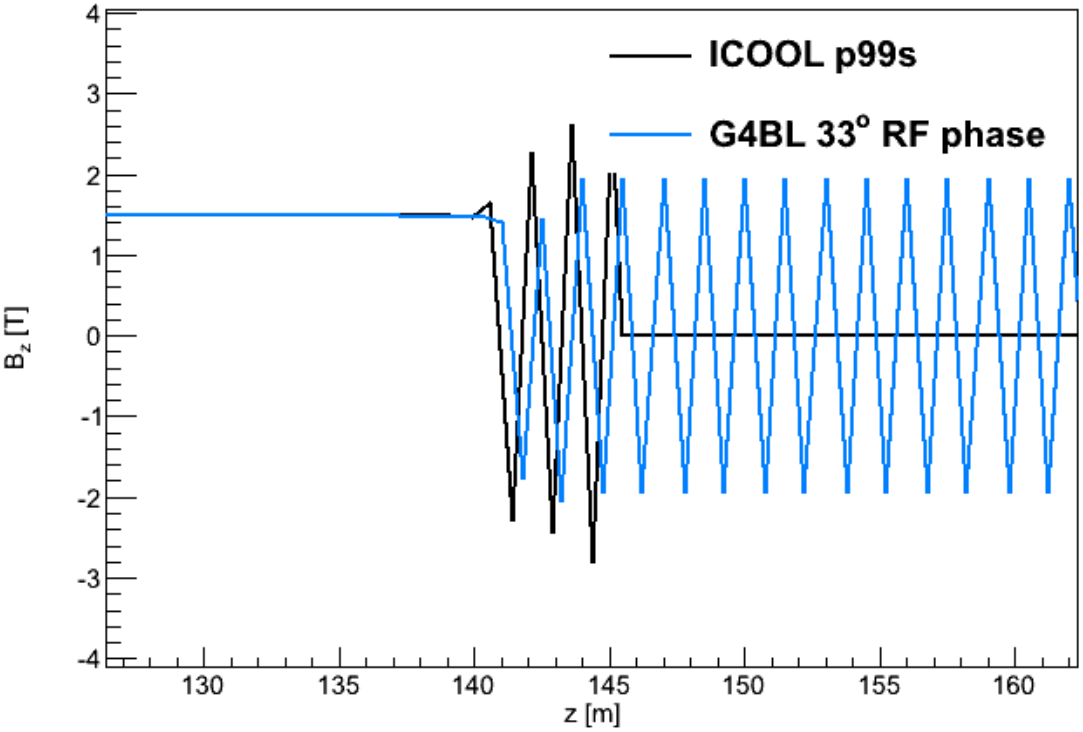


Magnetic Field – coil size change



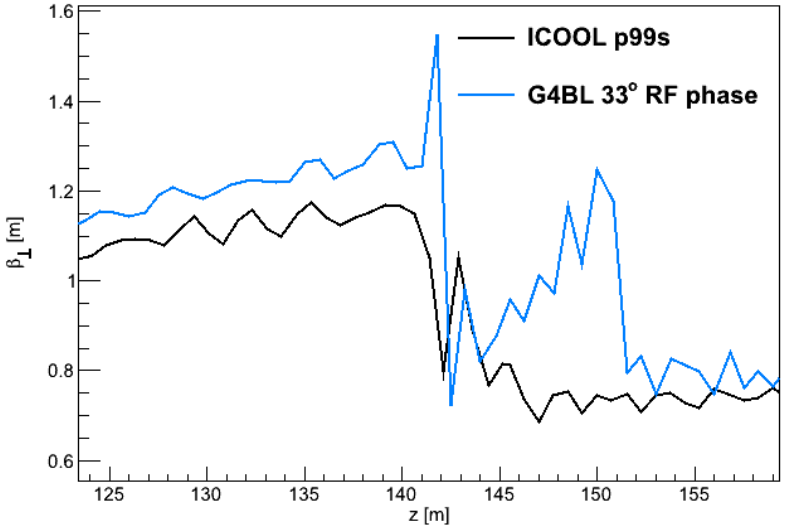
- Small coil
  - Inner rad 430 mm
  - Outer rad 530 mm
  - Length 180 mm
  - 16.570 A/mm^2
- Large coil
  - Inner rad 650 mm
  - Outer rad 750 mm
  - Length 650 mm
  - 13.724 A/mm^2
- Large coil needs to be adjusted for engineering

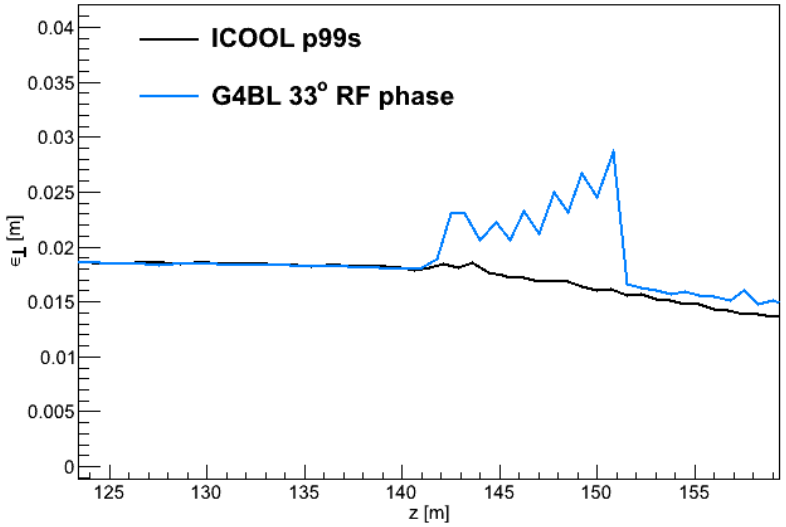
Magnetic Field – cooling + match



- ICOOL match uses some “virtual coils”
- Need to redo match for g4bl

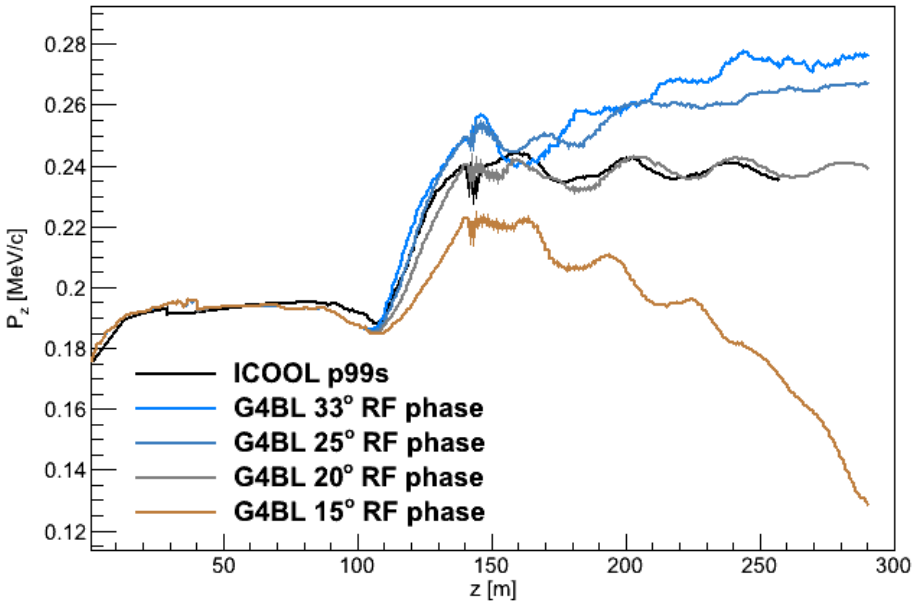
Optics – cooling + match





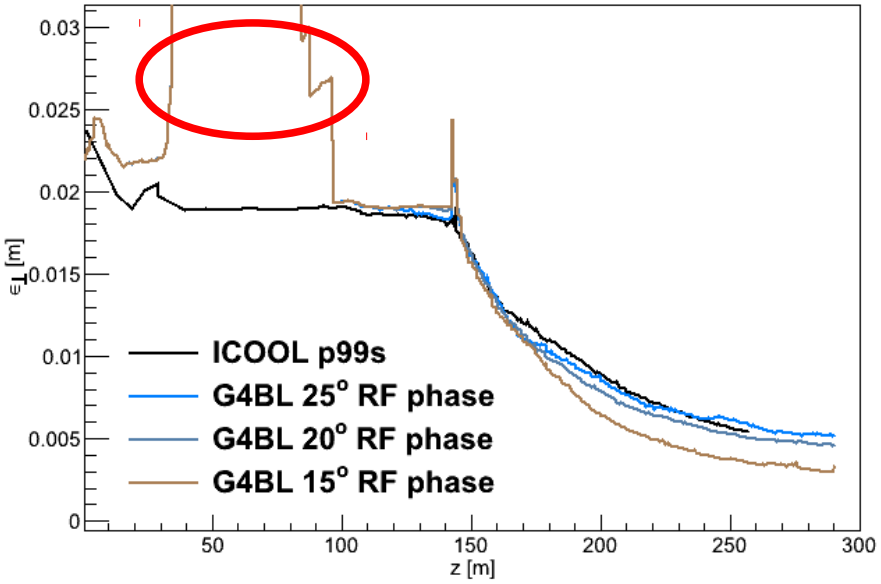
- Quite a bit of emittance growth
  - Could try to improve the match here

RF Capture – Pz



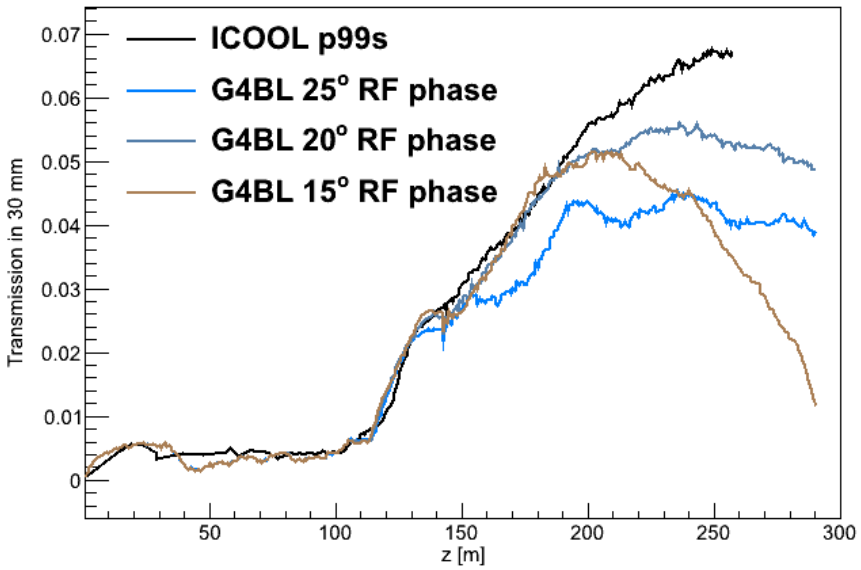
- ICOOL model for rotator
  - REF1 keeps velocity constant
  - Frequency chosen by nbunches parameter and delta time to REF2
  - “phase shift” at 50 degrees?
- G4BL model only one reference particle
  - Try phasing against REF2 with different RF phases
  - Nbunches = 10.045 => REF2 phase = 16.2°
  - Look at resultant beam pz

Cooling – Emittance



- Big emittance blow up in chicane and downstream
  - Presumably lost particles not properly collimated
- Some mismatch going into the cooling
- G4BL seems to cool faster
  - Scraping?

Cooling - Capture Performance



- Usual (ecalc9f 2.09) cuts:
  - 100 MeV/c < Pz < 300 MeV/c
  - A_{trans} < 30 mm
  - A_{long} < 150 mm
- 20 degree phase does best
- 15 degree phase undershoots on momentum and falls out of momentum acceptance
- 25 degree phase overshoots on momentum and fails to cool

Plan

1. Would like to implement G4BL version of chicane/proton absorber
   - Make a “release” of the lattice files
   - Use with ICOOL deck as basis for documentation of the chicane/proton absorber
2. Then redo the 1.5 T magnets following engineering (and Hisham studies if timely)
   - “Release”
3. Then work through the ionisation cooling channel
   - “Release”
4. Implement target when target group tell me what they want
   - “Release” + new beam

- The first three items are possible to implement before IDS meeting
  - But quite a bit of work – may run out of time
  - New target comes when it comes