MICE Demonstration of Ionization Cooling

JB. Lagrange
on behalf of the MICE collaboration

Outline

- Lattice
- Simulations
  - 200 MeV / c
  - 140 MeV / c
  - 240 MeV / c
- Summary

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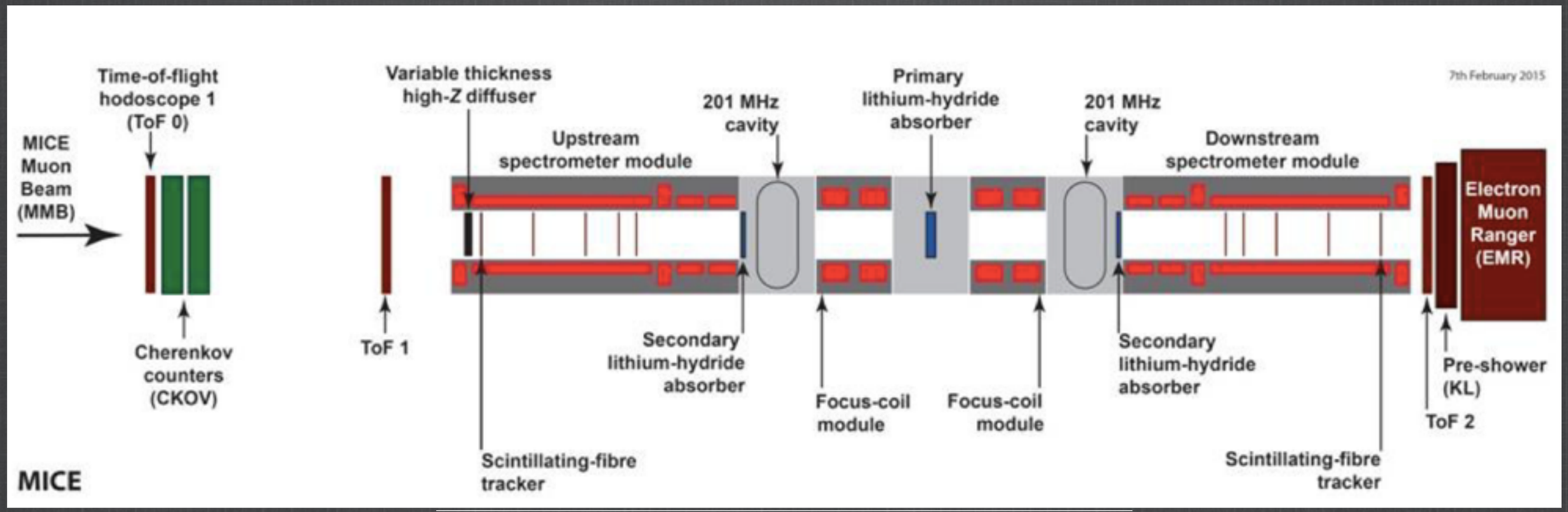
Demo Lattice



Parameter	Value
$L_{SS \to AFC}$ (mm)	2607.5
$L_{AFC \to AFC}$ (mm)	1678.8
$L_{RFmodule \to AFC}$ (mm)	784.0
RF Gradient (MV/m)	10.3
No. RF cavities	2
No. primary absorbers	1
No. secondary absorbers	2

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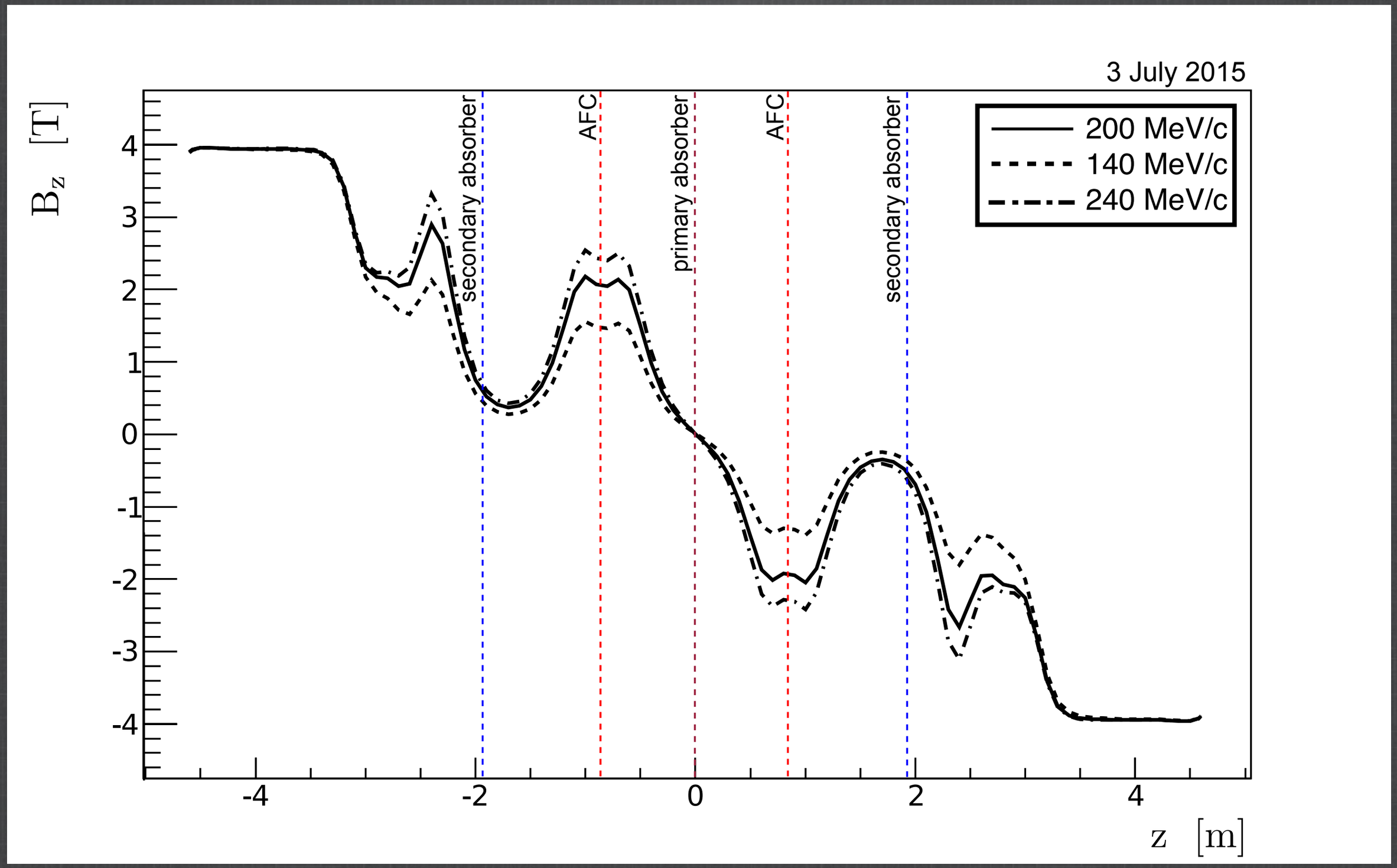
Initial beam

Parameter	Value
PDG particle ID	-13
Number of particles	10000
Longitudinal position [mm]	-4612.1
Central energy (140/200/240 MeV/c) [MeV]	175.4/228.0/262.2
Gaussian transverse distribution	
$\alpha_\perp$	0
$\beta_\perp$ (140/200/240 MeV/c) [mm]	233.5/339.0/400.3
Gaussian longitudinal distribution	
Longitudinal emittance [mm]	20
Longitudinal β [mm]	11
Longitudinal α	-0.7

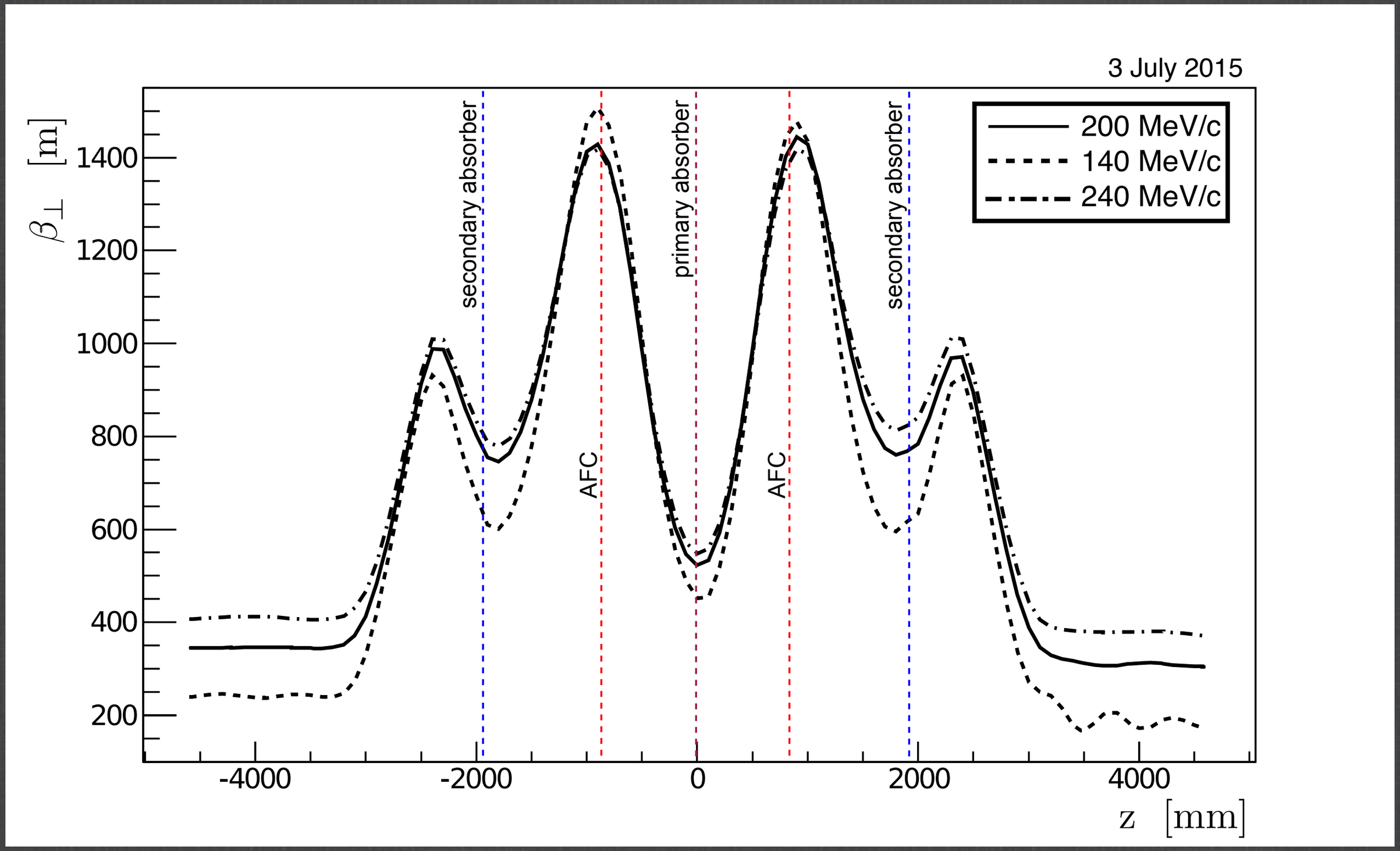
Cuts

Parameter	Muon accepted
Radius at upstream tracker (mm)	≤ 150.0
Radius at downstream tracker (mm)	≤ 150.0
Charge	$+$
PDG particle ID	$\|13\|$

Magnetic field on axis



Transverse Beta



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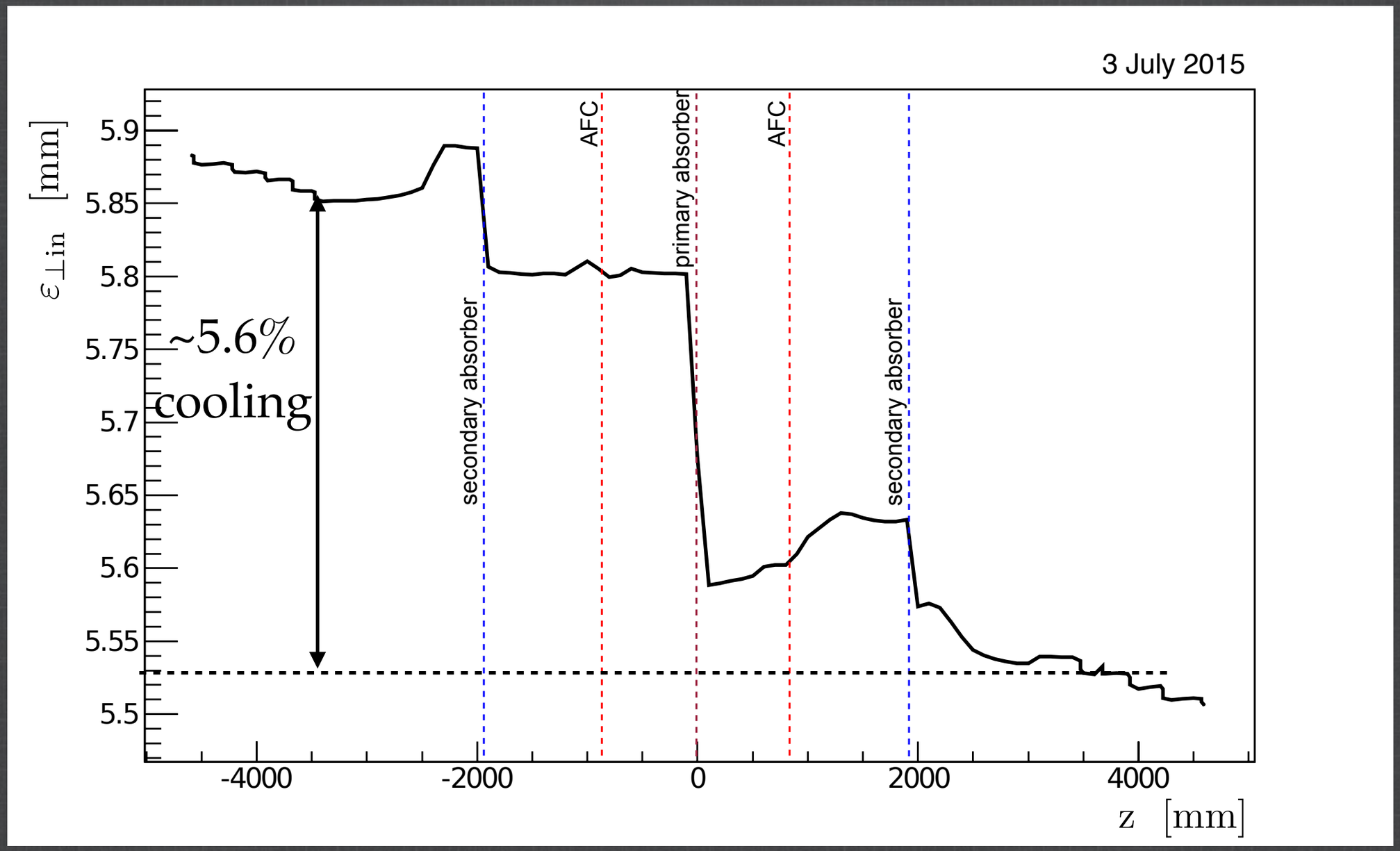
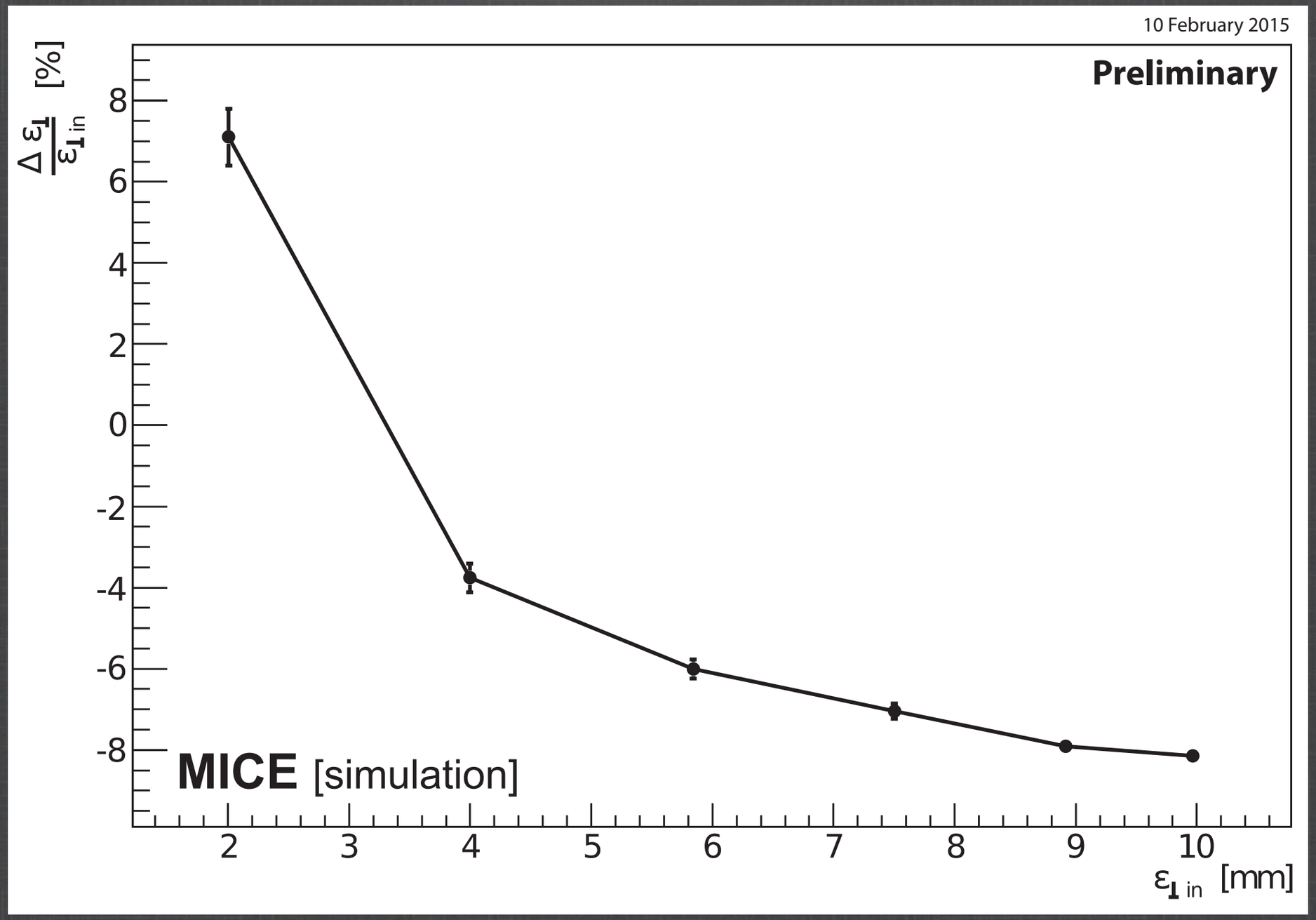
200 MeV/c settings

4D emittance (initial 6.0 mm)



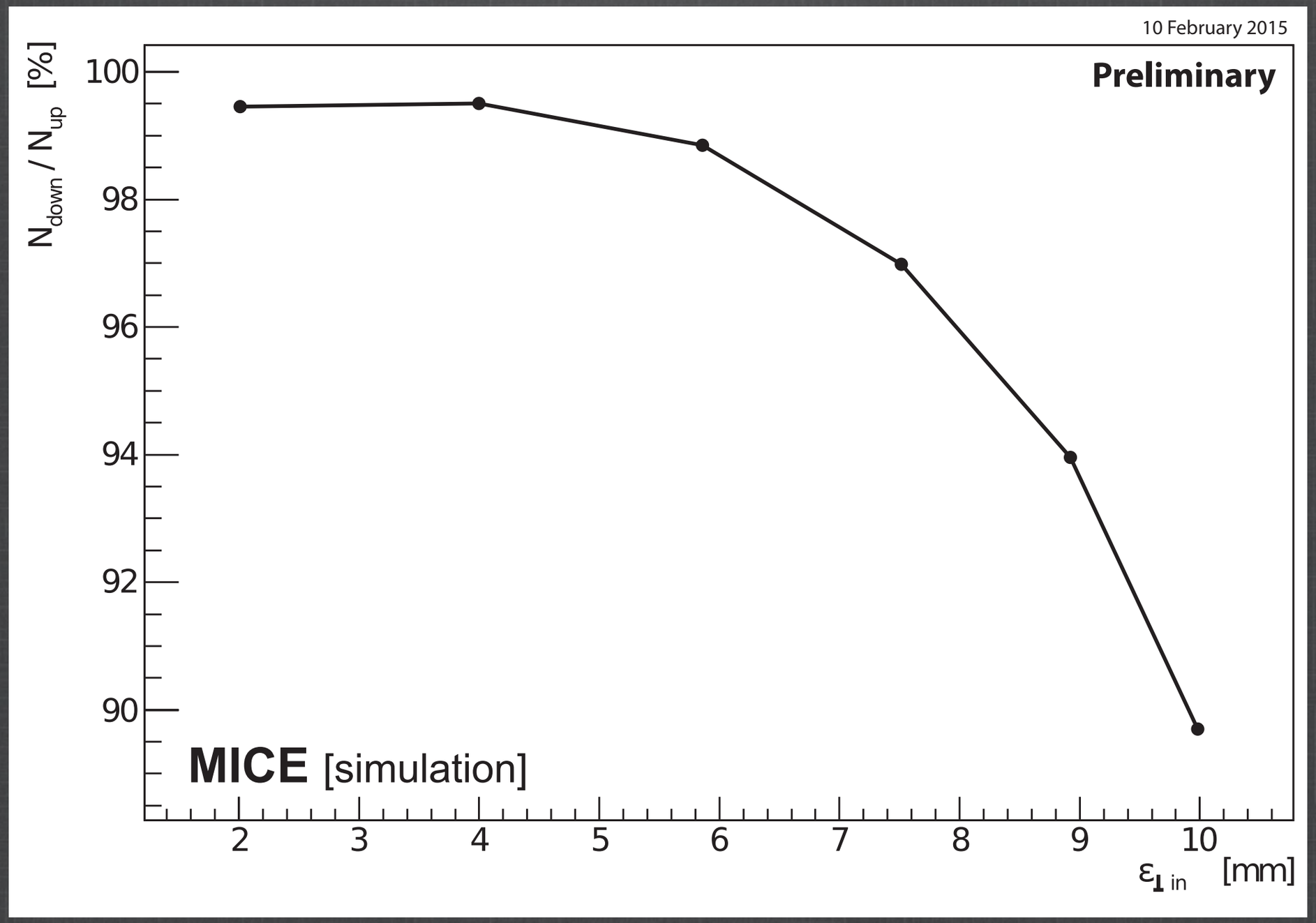
200 MeV/c settings

Performance vs initial emittance



200 MeV/c settings

Transmission



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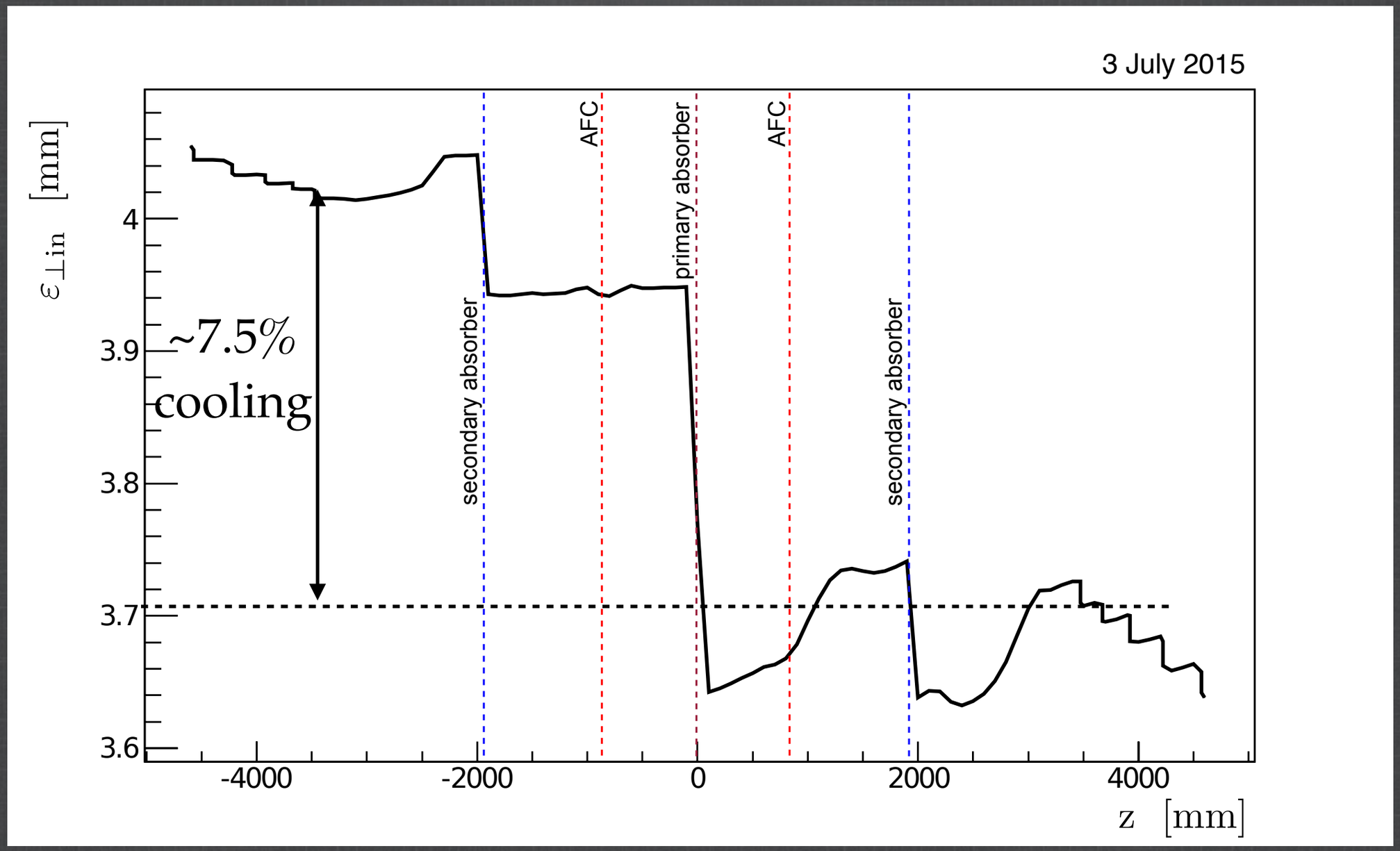
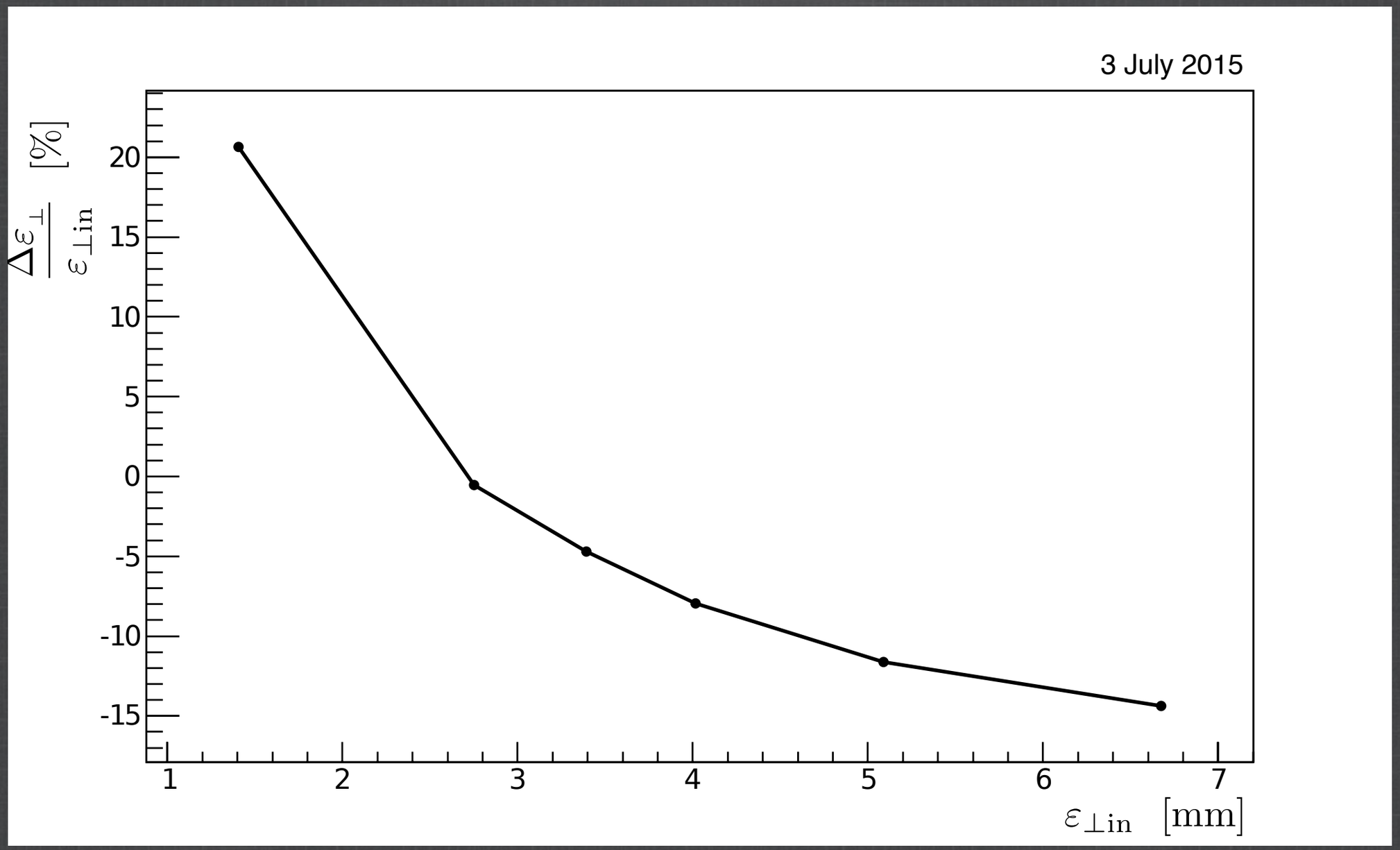
140 MeV/c settings

4D emittance (initial 4.2 mm)



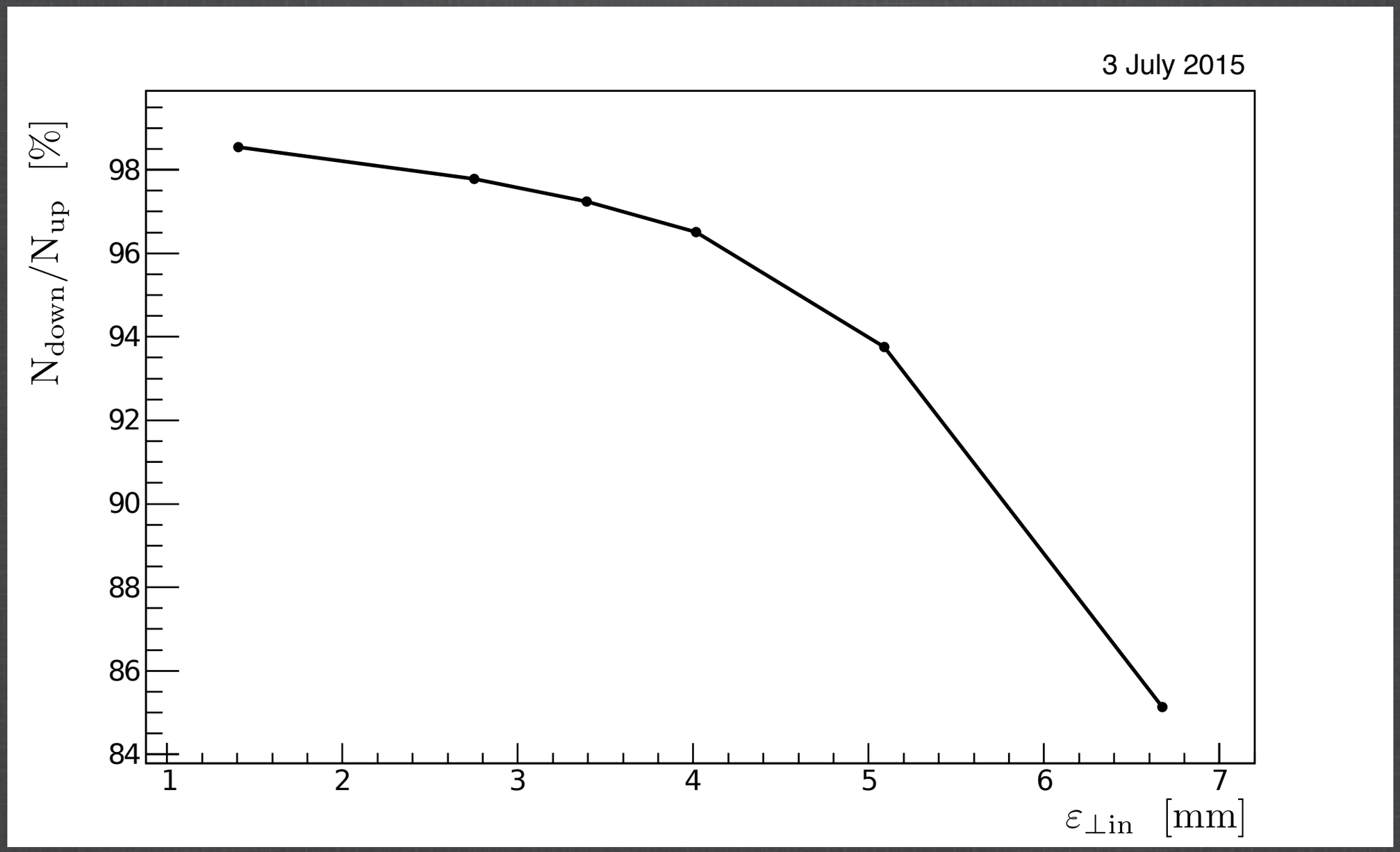
140 MeV/c settings

Performance vs initial emittance



140 MeV/c settings

Transmission



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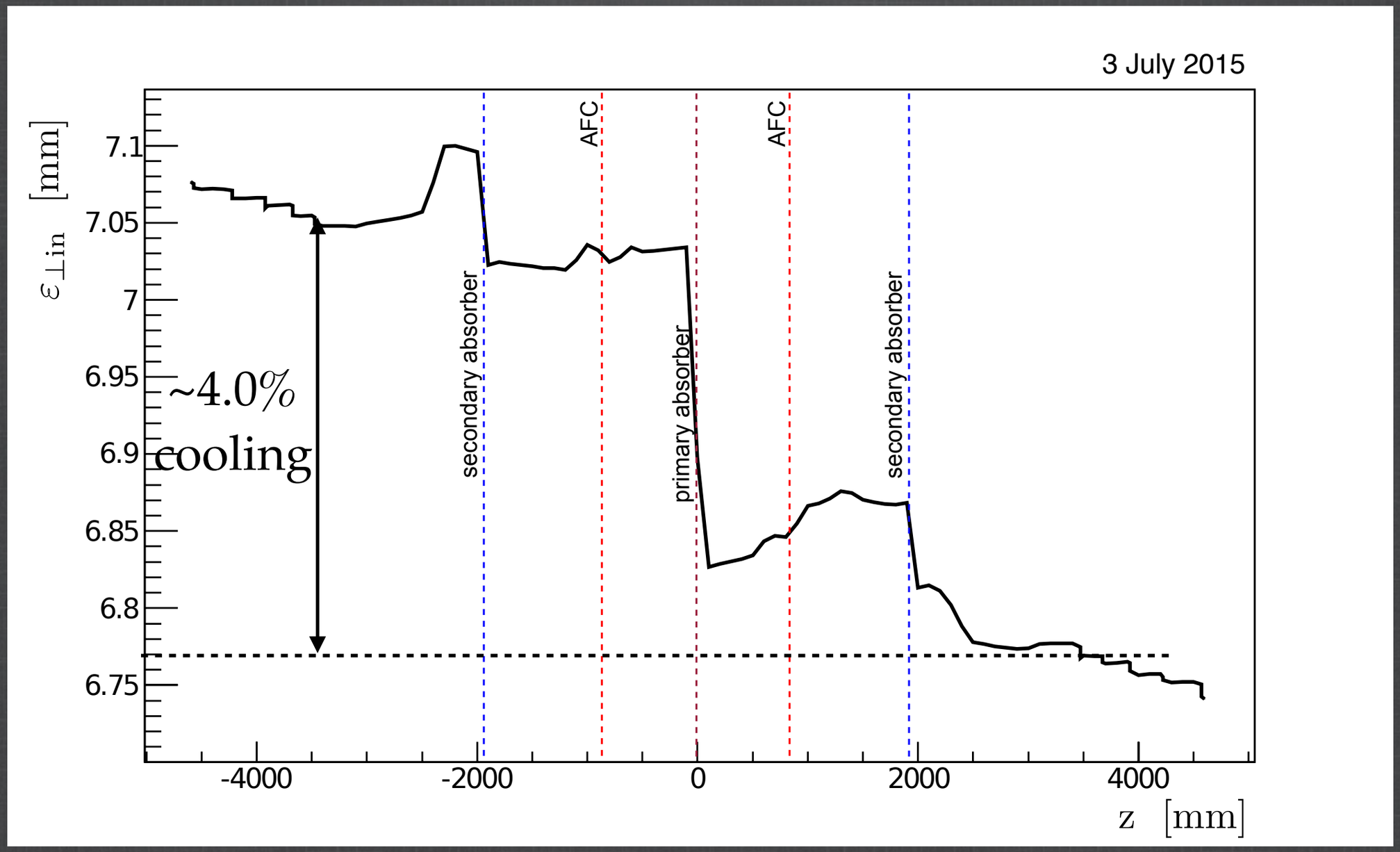
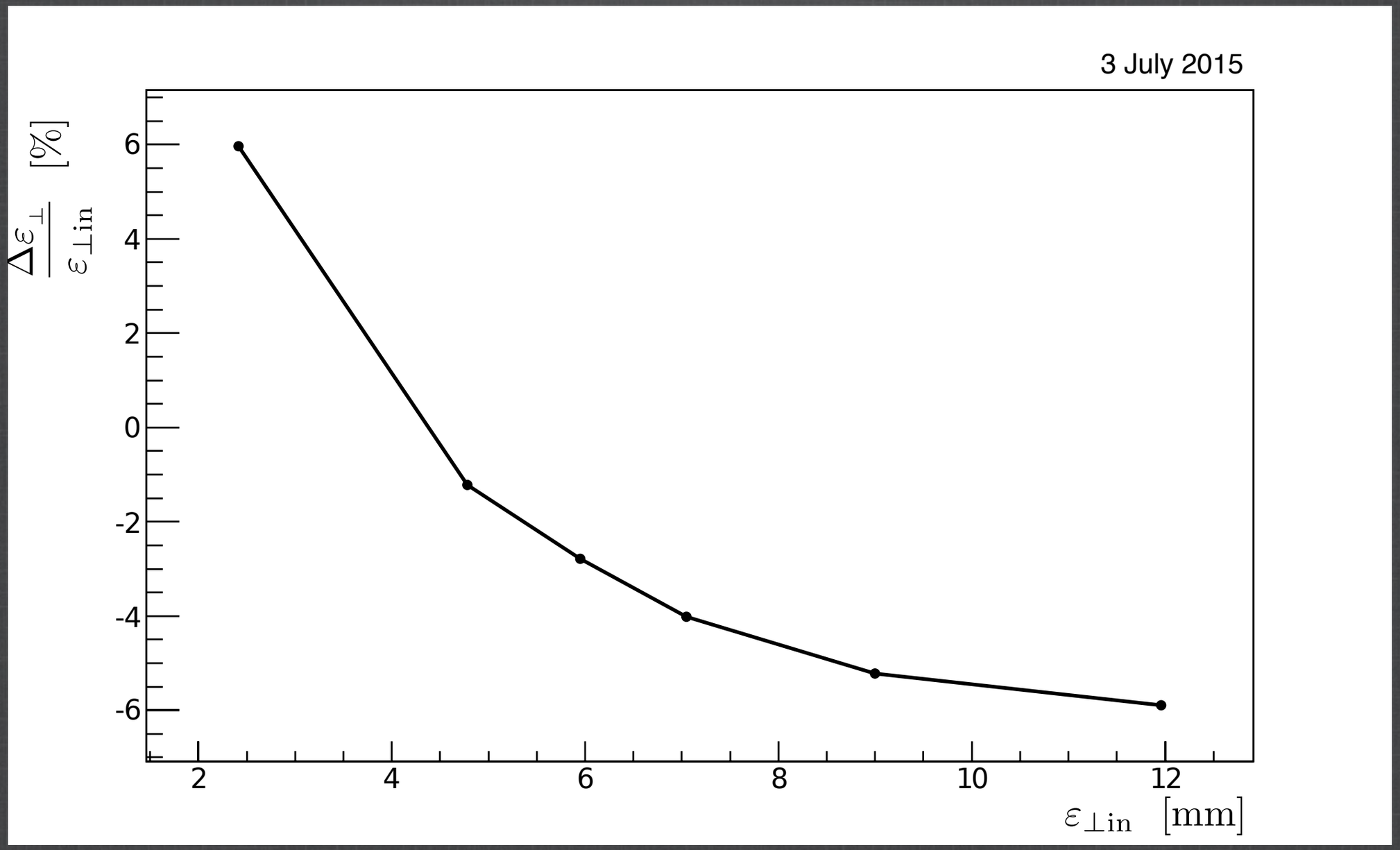
240 MeV/c settings

4D emittance (initial 7.2 mm)



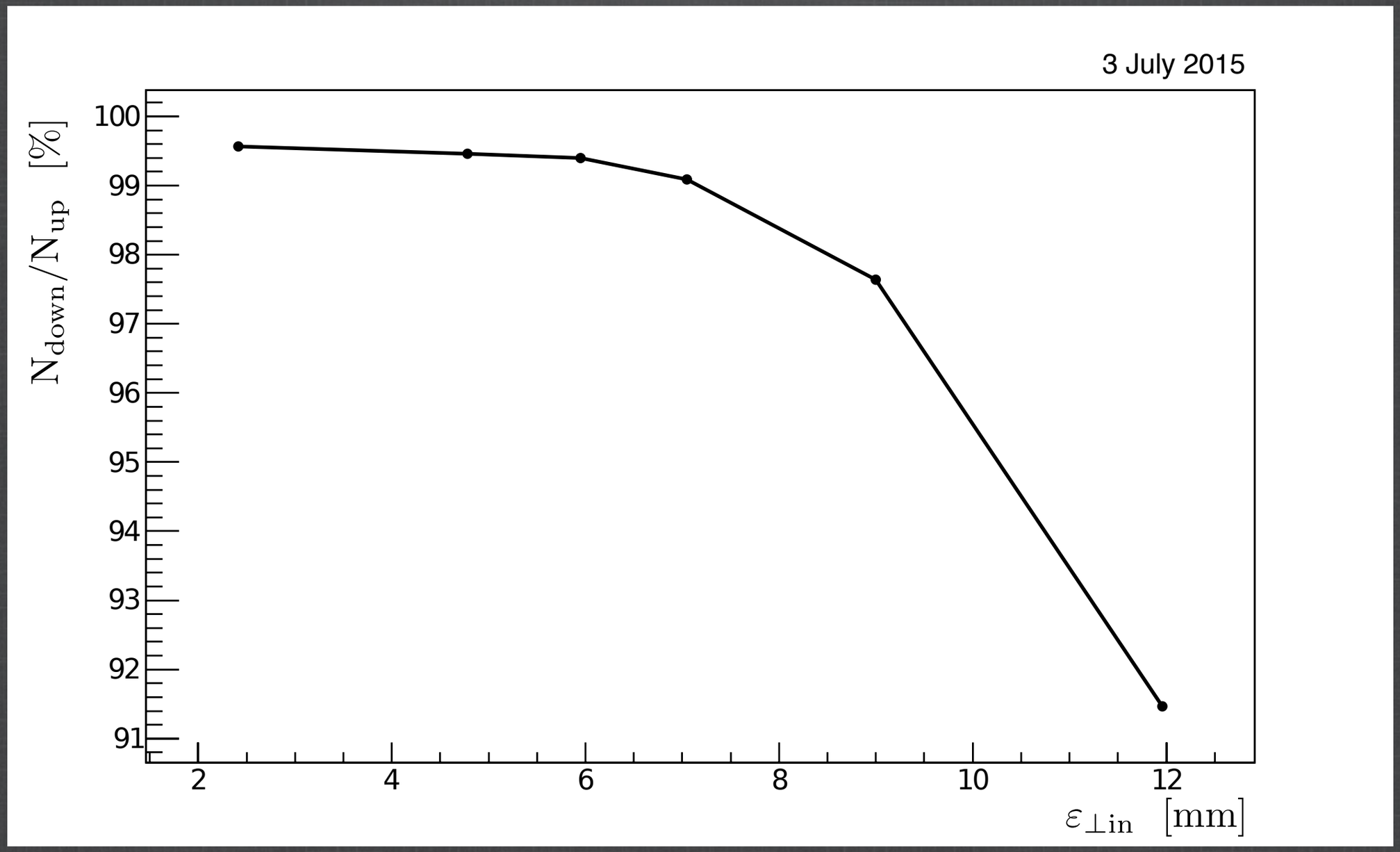
240 MeV/c settings

Performance vs initial emittance



240 MeV/c settings

Transmission



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Summary

- Lattice design is frozen.
- Good results for different settings:
  - 5.6% for 200 MeV/c settings (6 mm initial emittance),
  - 7.5% for 140 MeV/c settings (4.2 mm initial emittance),
  - 4.0% for 240 MeV/c settings (7.2 mm initial emittance).
- Optimization of 140 MeV/c settings under way to limit non-linear effects downstream.
- Paper draft almost ready.

Thank you for your attention