

MICE cooling demonstration configuration MC results

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Outline

- Overview
 - Reference Lattice
 - Alternative Lattice
- Reference Lattice results
- Alternative Lattice results
- Comparison

Outline

● Overview

● Reference Lattice

● Alternative Lattice

● Reference Lattice results

● Alternative Lattice results

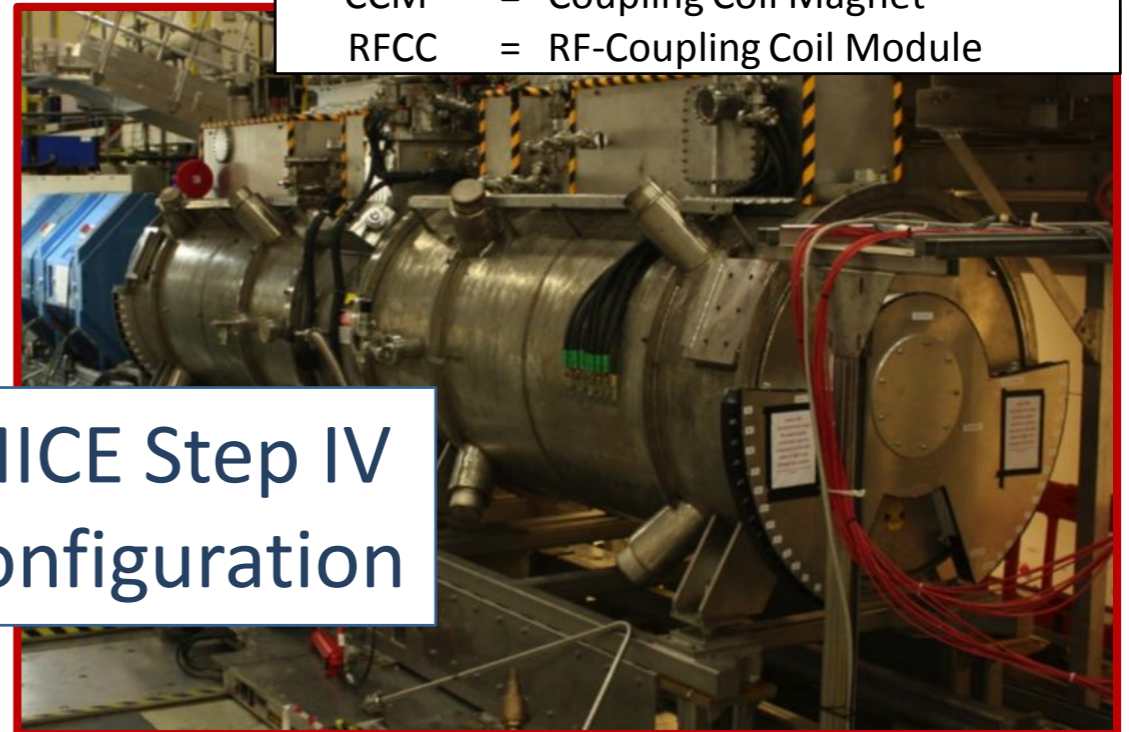
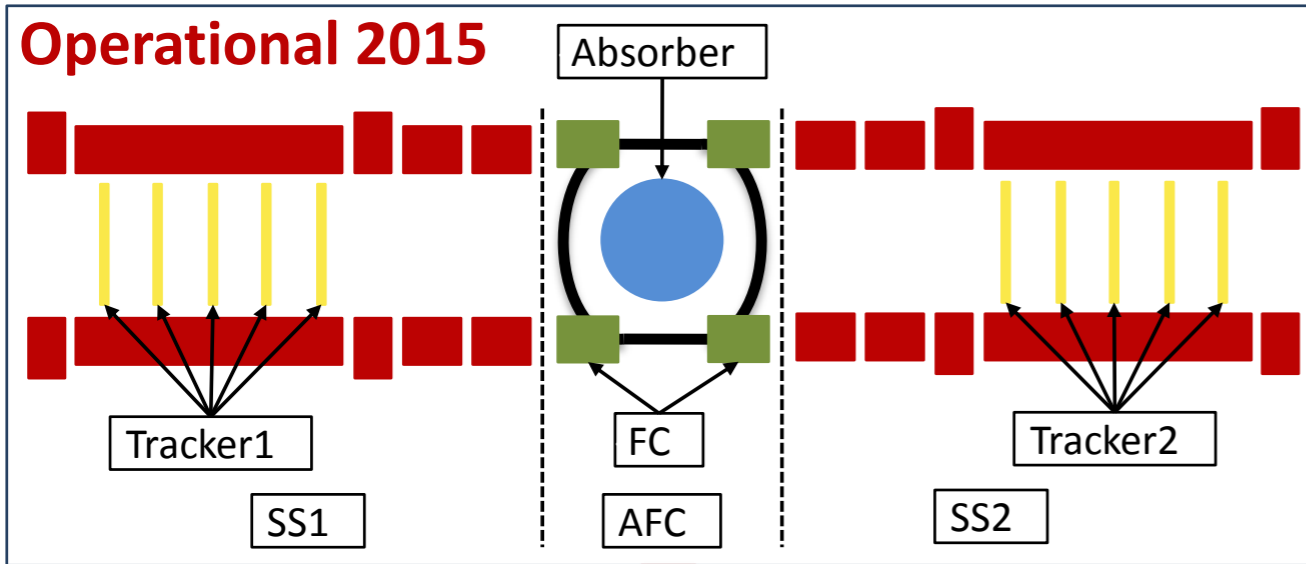
● Comparison

MICE Steps IV & V

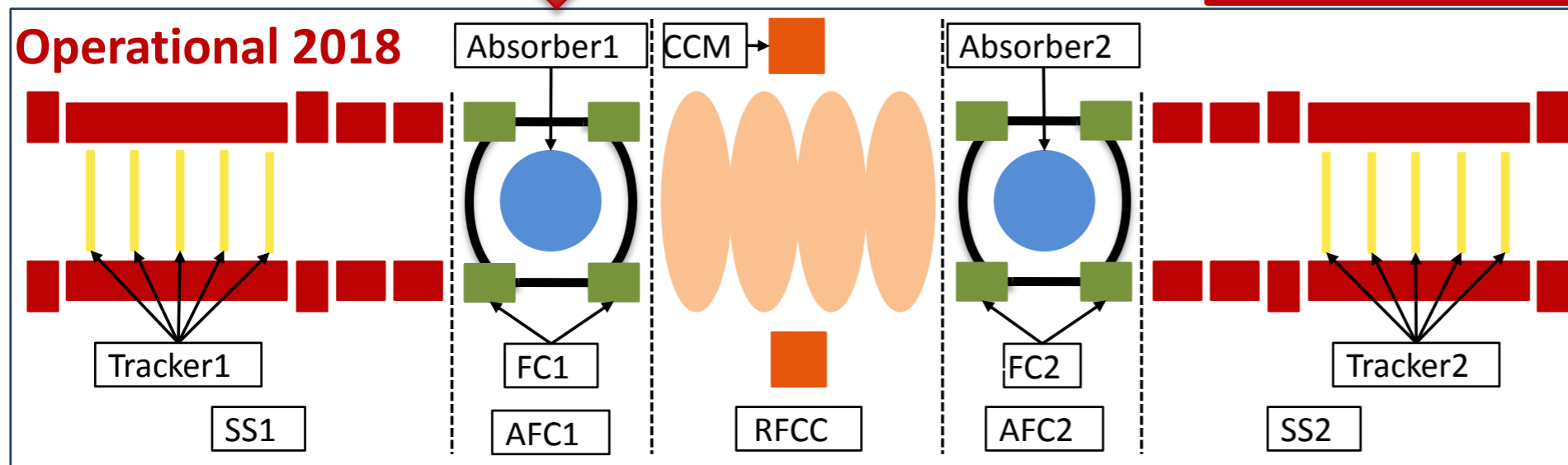
Plan endorsed by MICE
Project Board in April 2014

Legend:

- SS = Spectrometer Solenoid
- FC = Focus Coil
- AFC = Absorber-Focus Coil Module
- CCM = Coupling Coil Magnet
- RFCC = RF-Coupling Coil Module



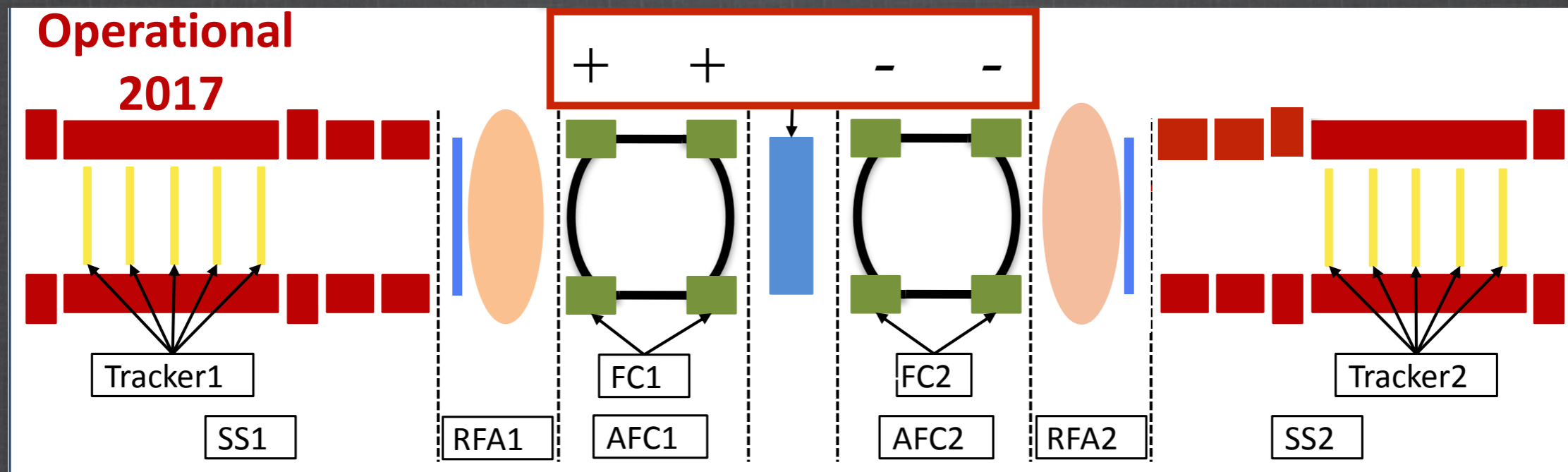
MICE Step IV
Configuration



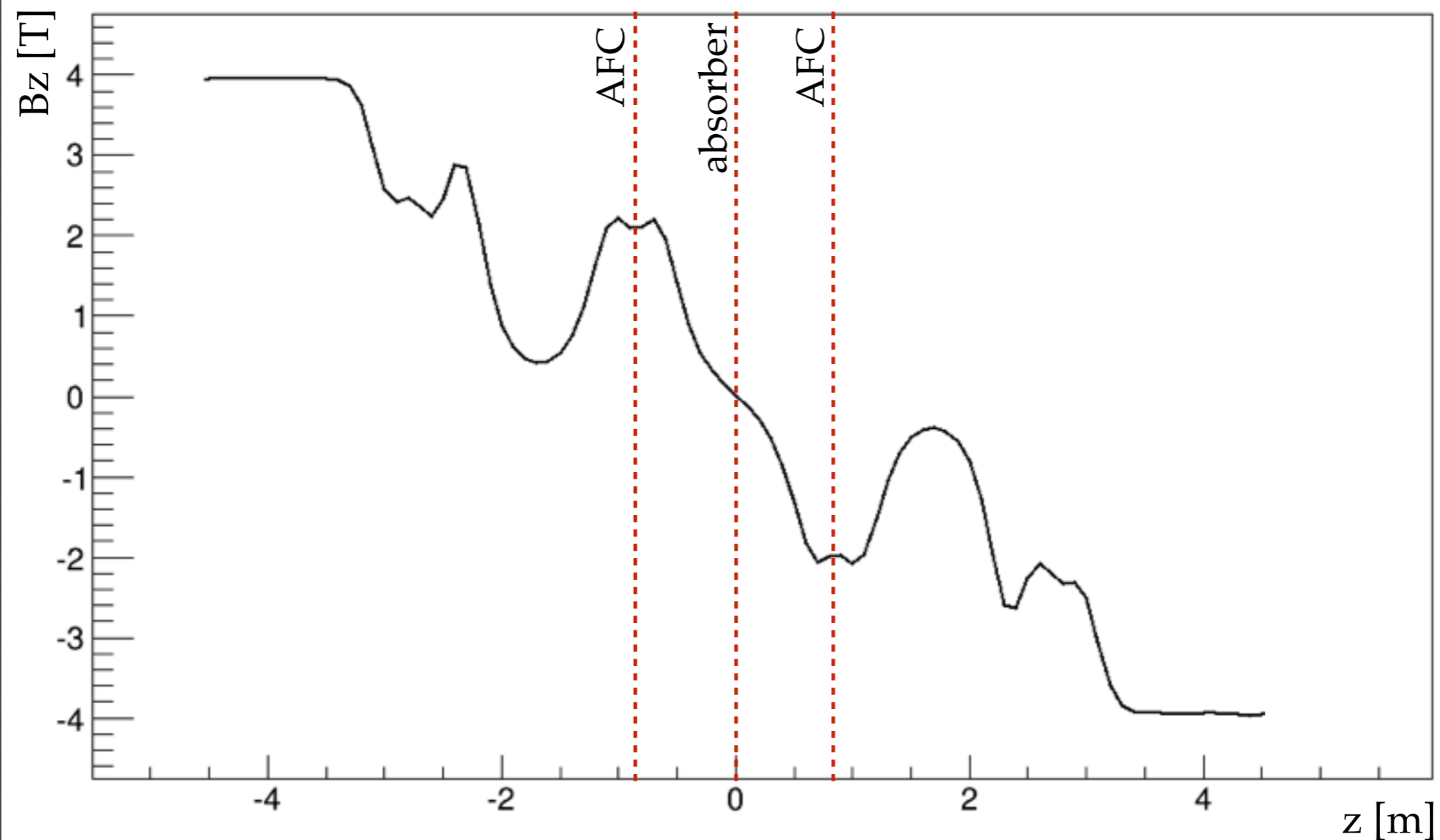
MICE Step V
Configuration

Reference Lattice

with secondary absorbers



Reference Lattice with secondary absorbers Magnetic field



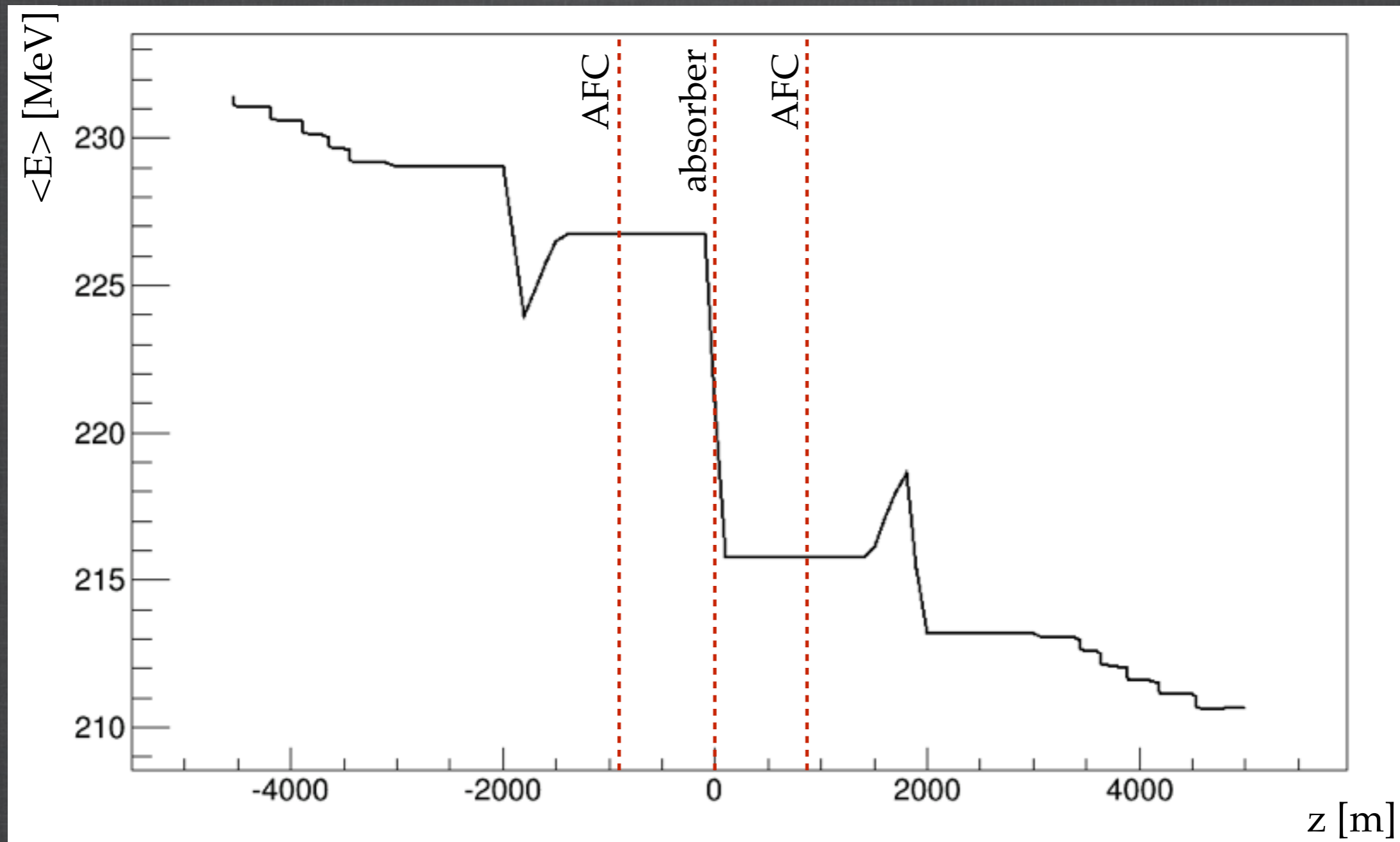
Reference Lattice

Coils currents (6 mm, 200 MeV)

Coil	Reference lattice	Nominal values (step V)
Upstream E2	+253.00	255.46
Upstream C	+274.00	288.27
Upstream E1	+234.00	239.37
Upstream M2	+203.13	290.69
Upstream M1	+240.61	274.34
Upstream AFC1	+77.86	245.65
Downstream AFC1	+77.86	245.65
Upstream AFC2	-72.94	245.65
Downstream AFC2	-72.94	245.65
Downstream M1	-218.39	274.34
Downstream M2	-187.68	290.69
Downstream E1	-234.00	239.37
Downstream C	-274.00	288.27
Downstream E2	-253.00	255.46

Reference Lattice with secondary absorbers

Energy

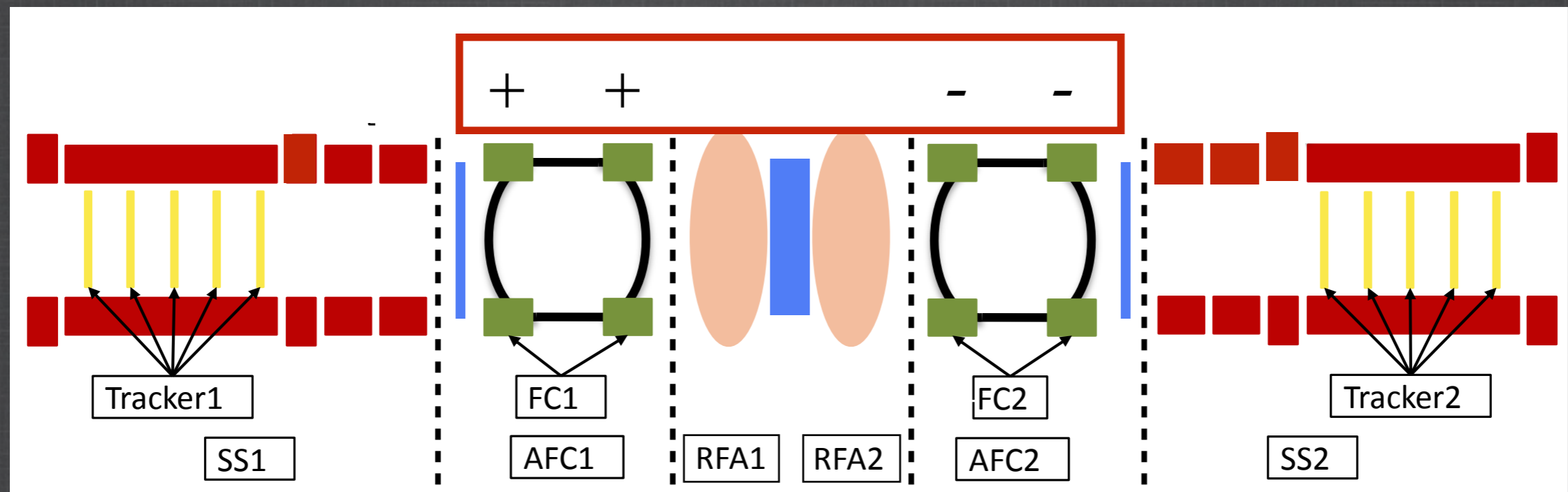


Outline

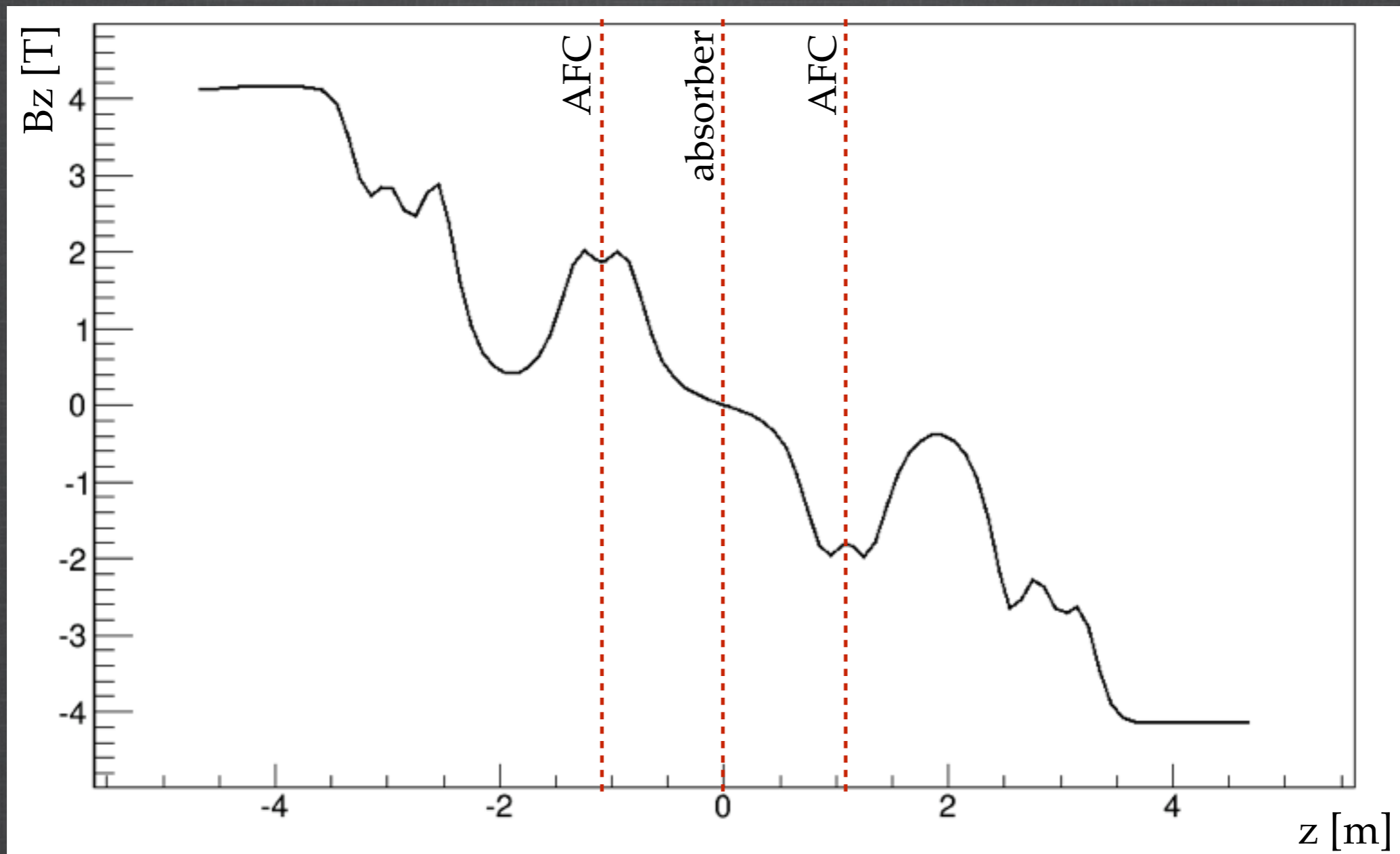
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Alternative Lattice

with secondary absorbers



Alternative Lattice with secondary absorbers Magnetic field



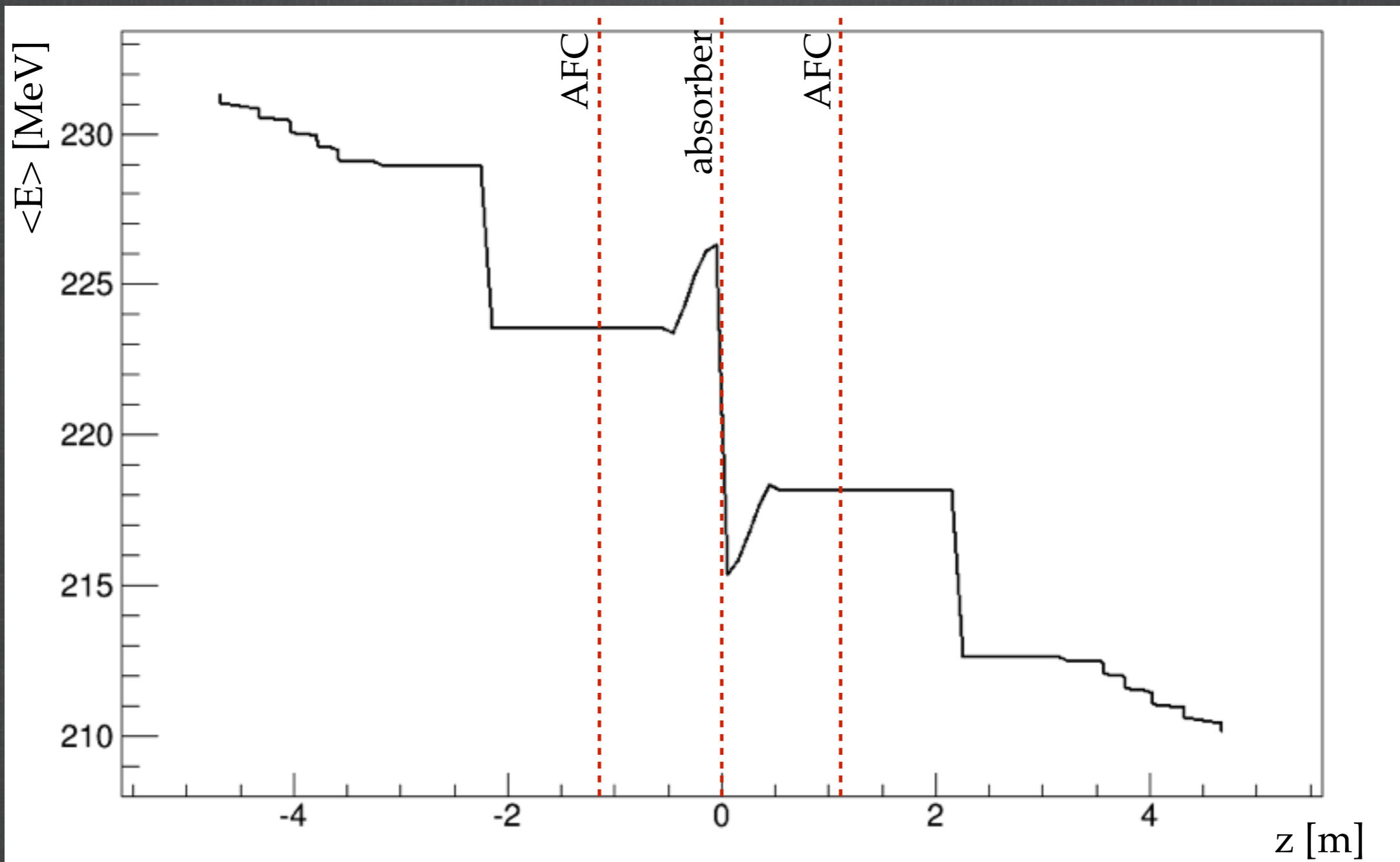
Alternative Lattice

Coils currents (6 mm, 200 MeV)

Coil	Reference lattice	Nominal values (step V)
Upstream E2	+255.46	255.46
Upstream C	+288.27	288.27
Upstream E1	+239.37	239.37
Upstream M2	+260.83	290.69
Upstream M1	+230.94	274.34
Upstream AFC1	+69.81	245.65
Downstream AFC1	+69.81	245.65
Upstream AFC2	-67.85	245.65
Downstream AFC2	-67.85	245.65
Downstream M1	-210.32	274.34
Downstream M2	-242.12	290.69
Downstream E1	-239.37	239.37
Downstream C	-288.27	288.27
Downstream E2	-255.46	255.46

Alternative Lattice with secondary absorbers

Energy



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Initial beam

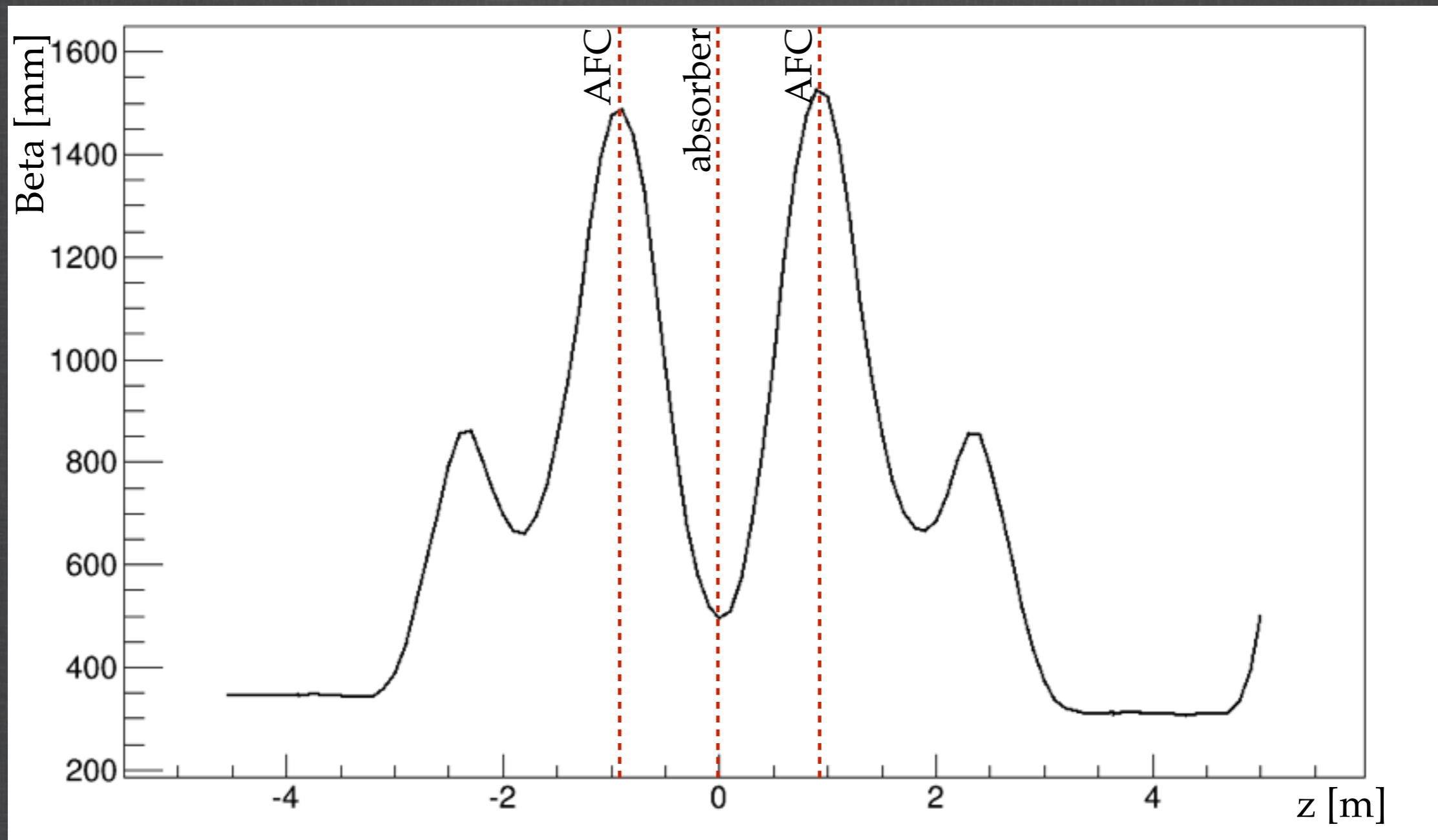
- Pure muon beam, $\sim 10\,000$ particles
- Position: before first plane upstream tracker (after diffuser)
- Gaussian distribution
- Normalised rms longitudinal emittance = 20 mm
- Normalised rms transverse emittance = 6 mm

Cuts

- PID cut
- Transmission cut
- Radial cut $r < 200$ mm, at first and last plane.

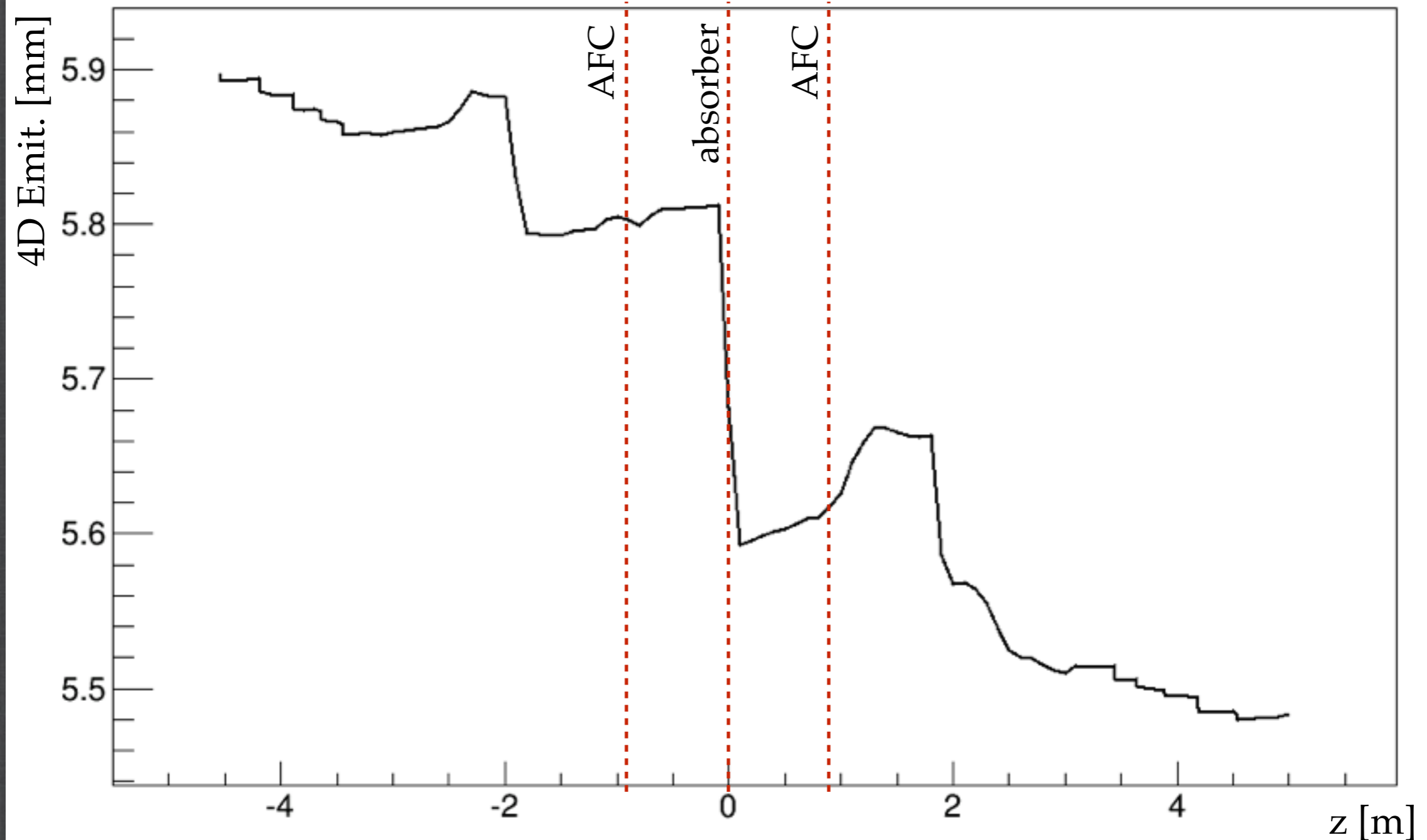
Reference Lattice (with secondary)

Transverse beta



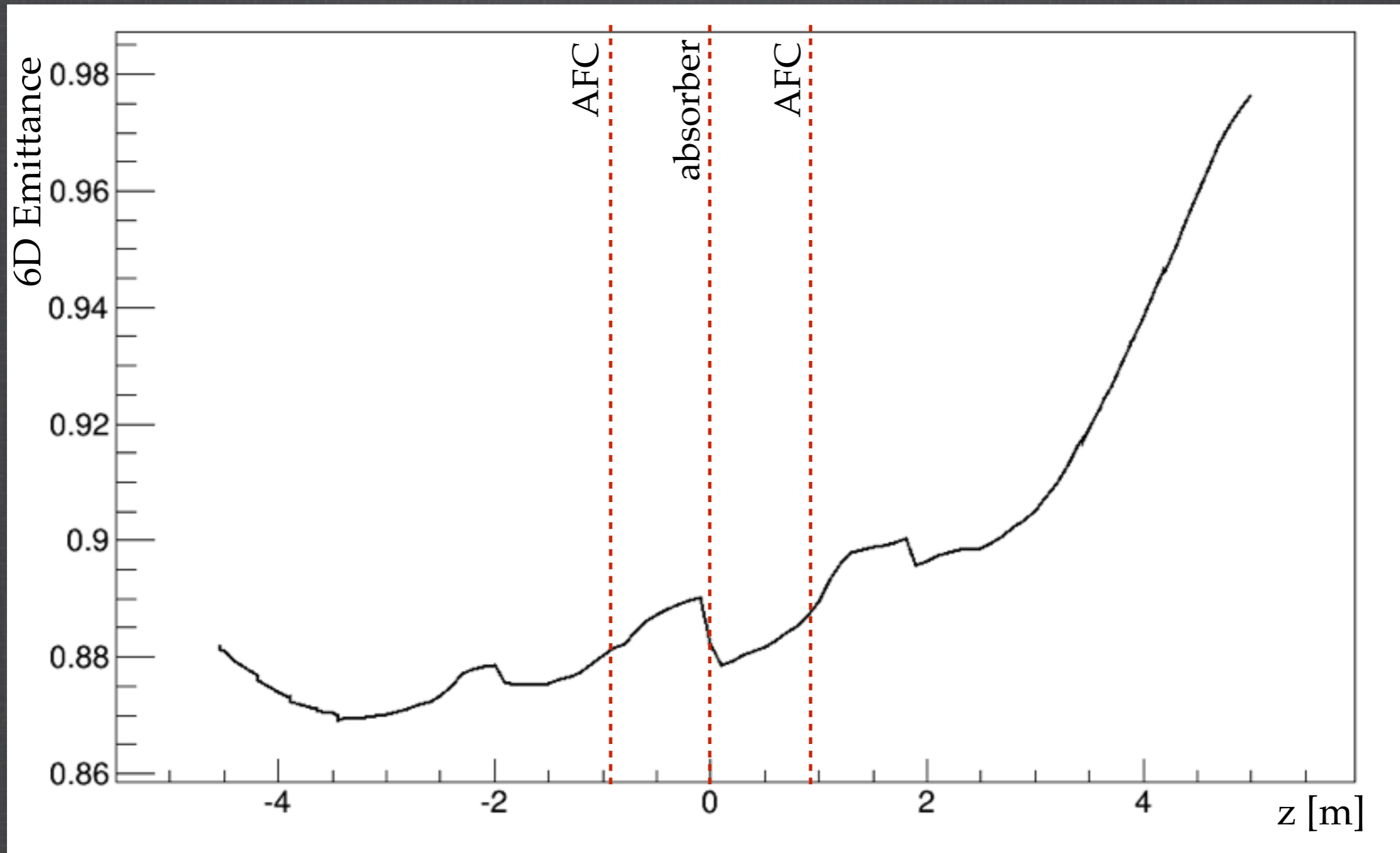
Reference Lattice (with secondary)

4D emittance



Reference Lattice (with secondary)

6D emittance



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Initial beam

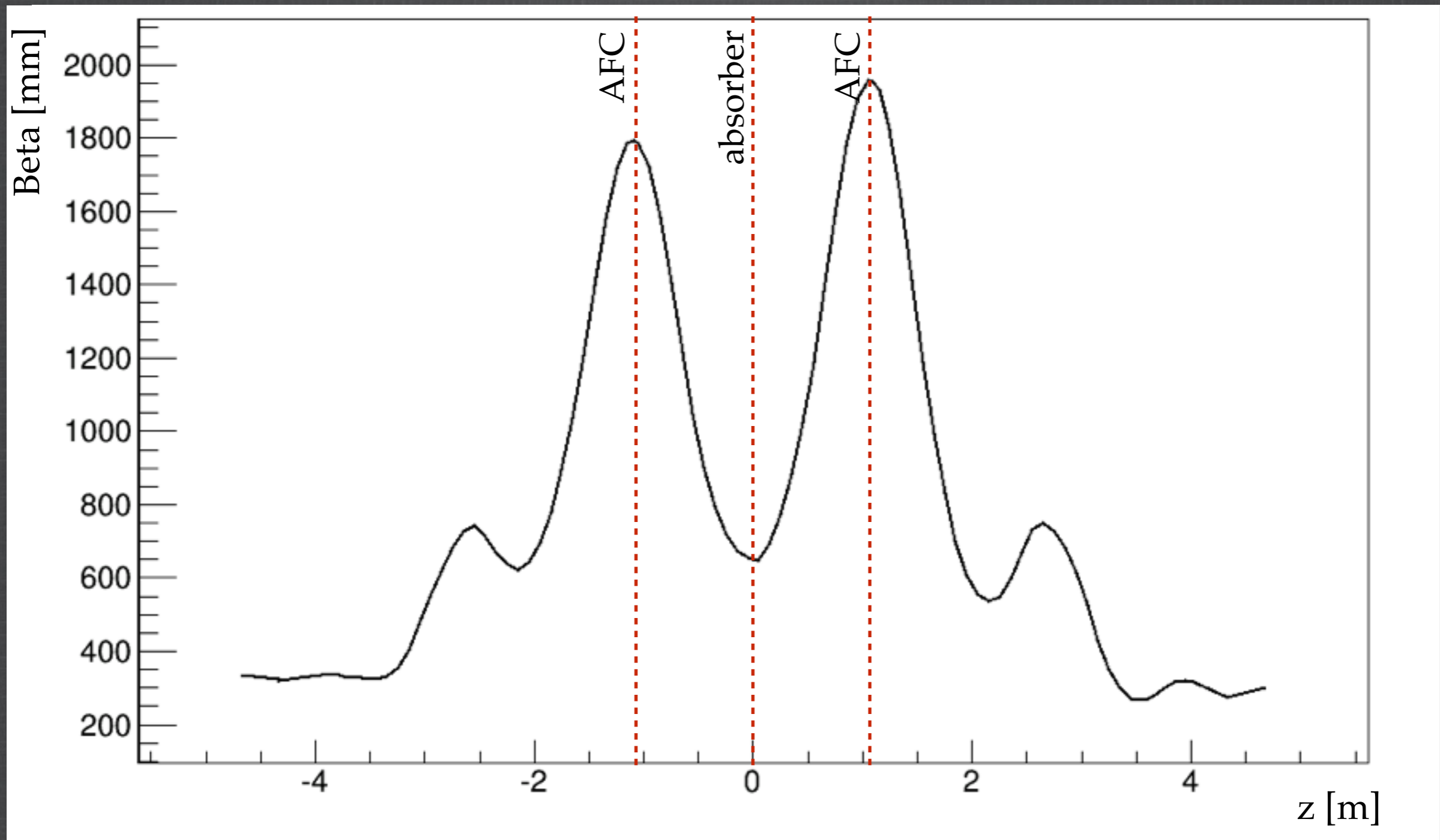
- Pure muon beam, $\sim 10\,000$ particles
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Cuts

- PID cut
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- Radial cut $r < 200$ mm, at first and last plane.

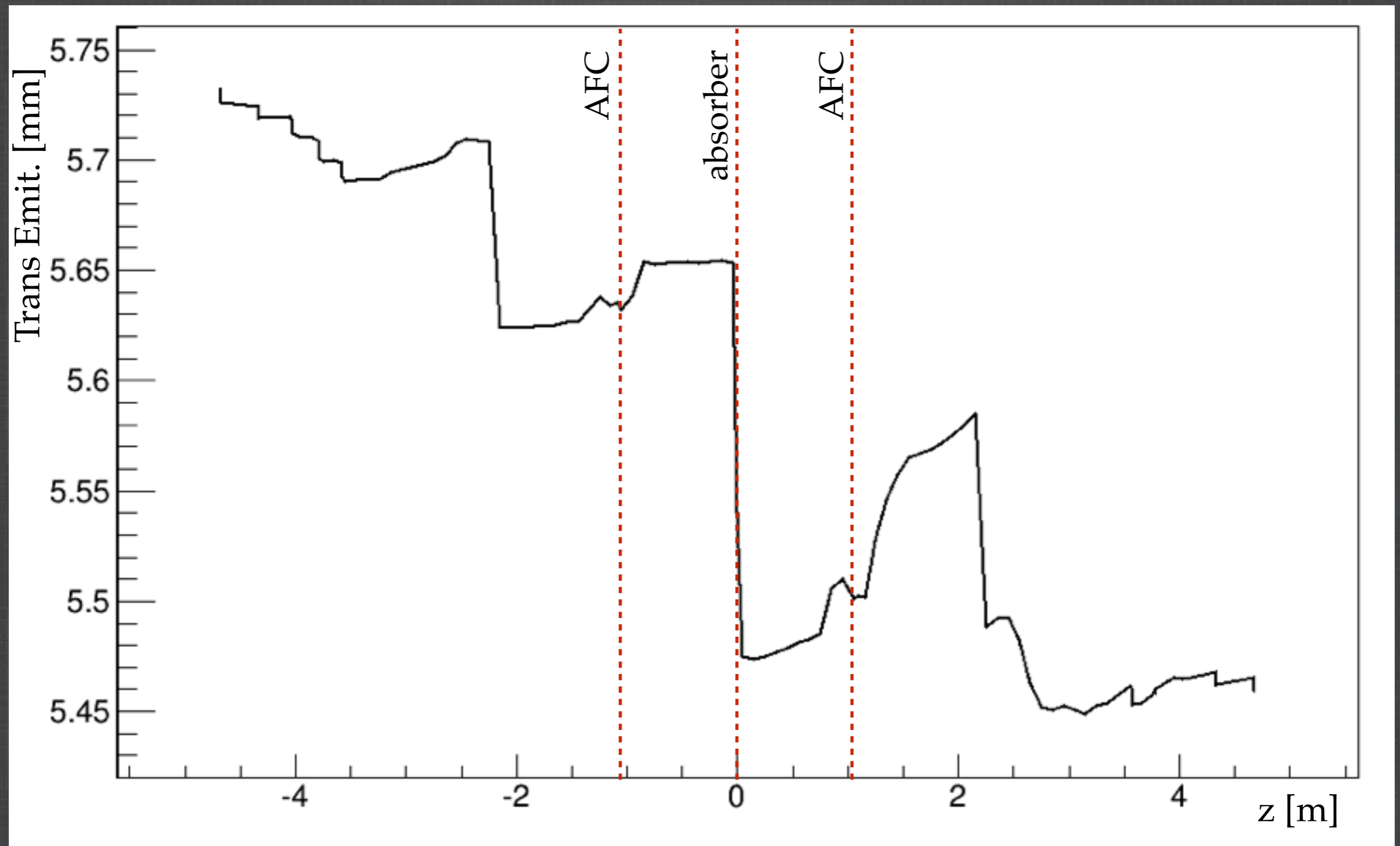
Alternative Lattice (with secondary)

Transverse beta



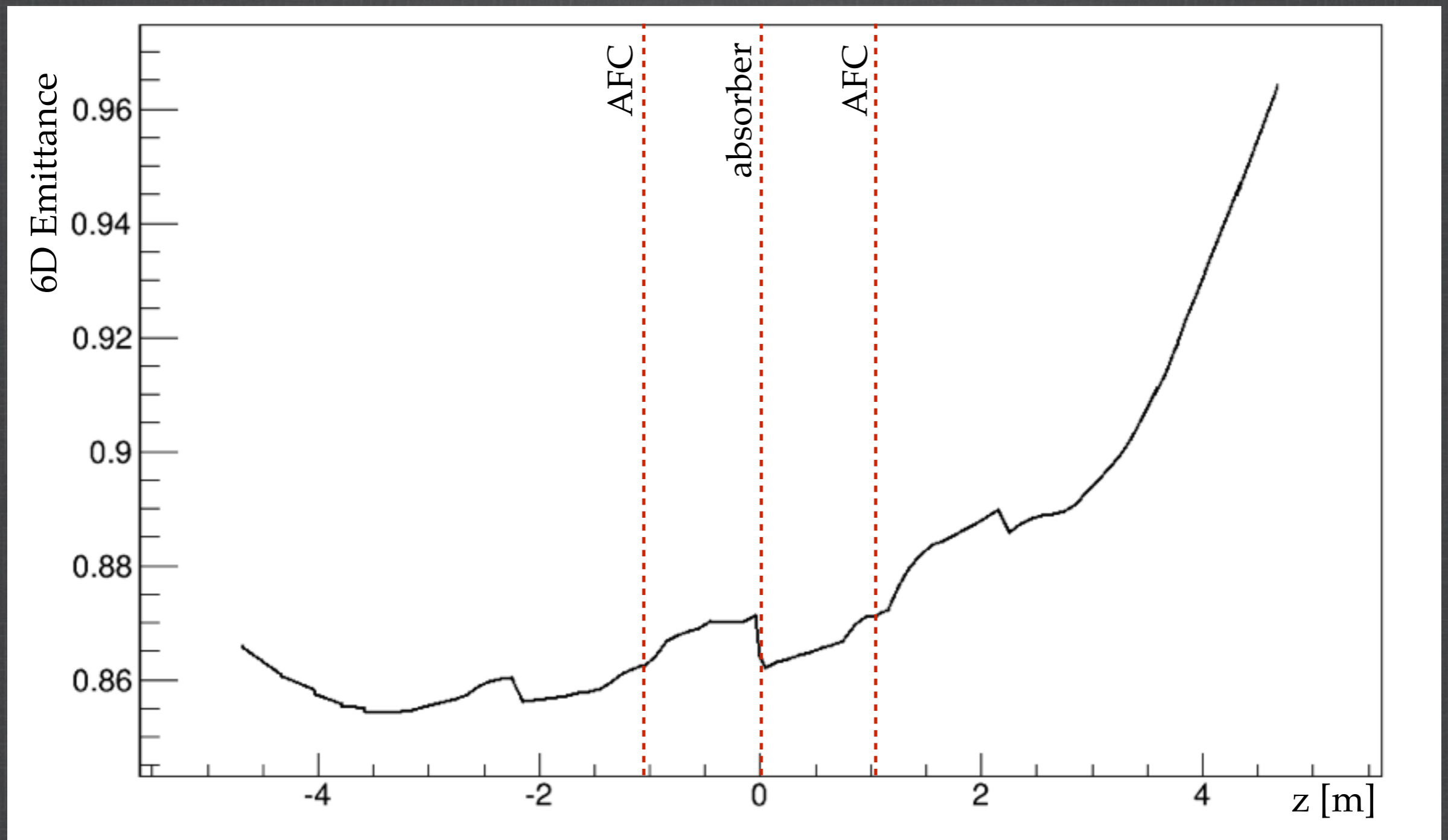
Alternative Lattice (with secondary)

4D emittance



Alternative Lattice (with secondary)

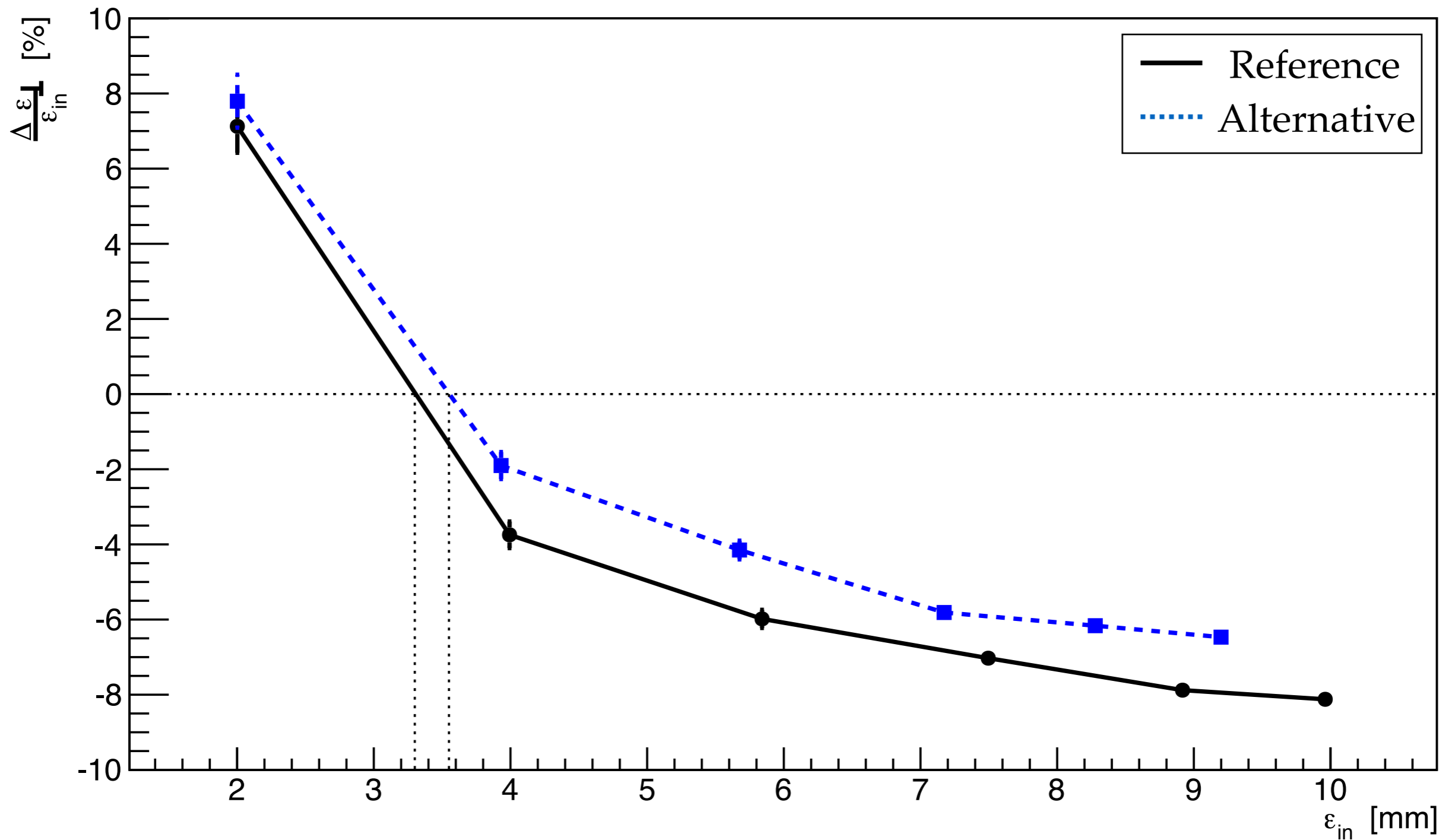
6D emittance



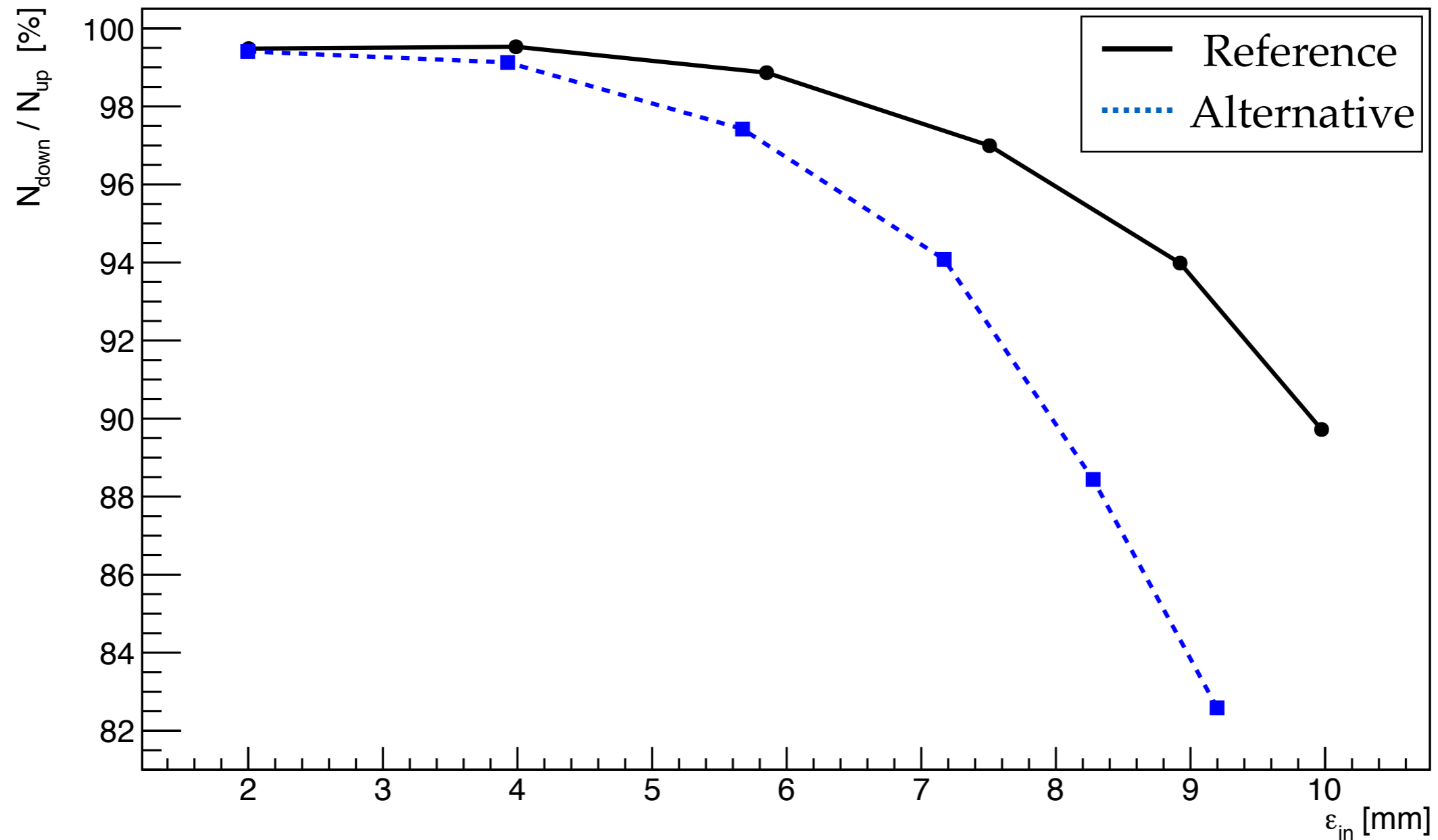
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4D emittance



Transmission (with secondary)



Summary

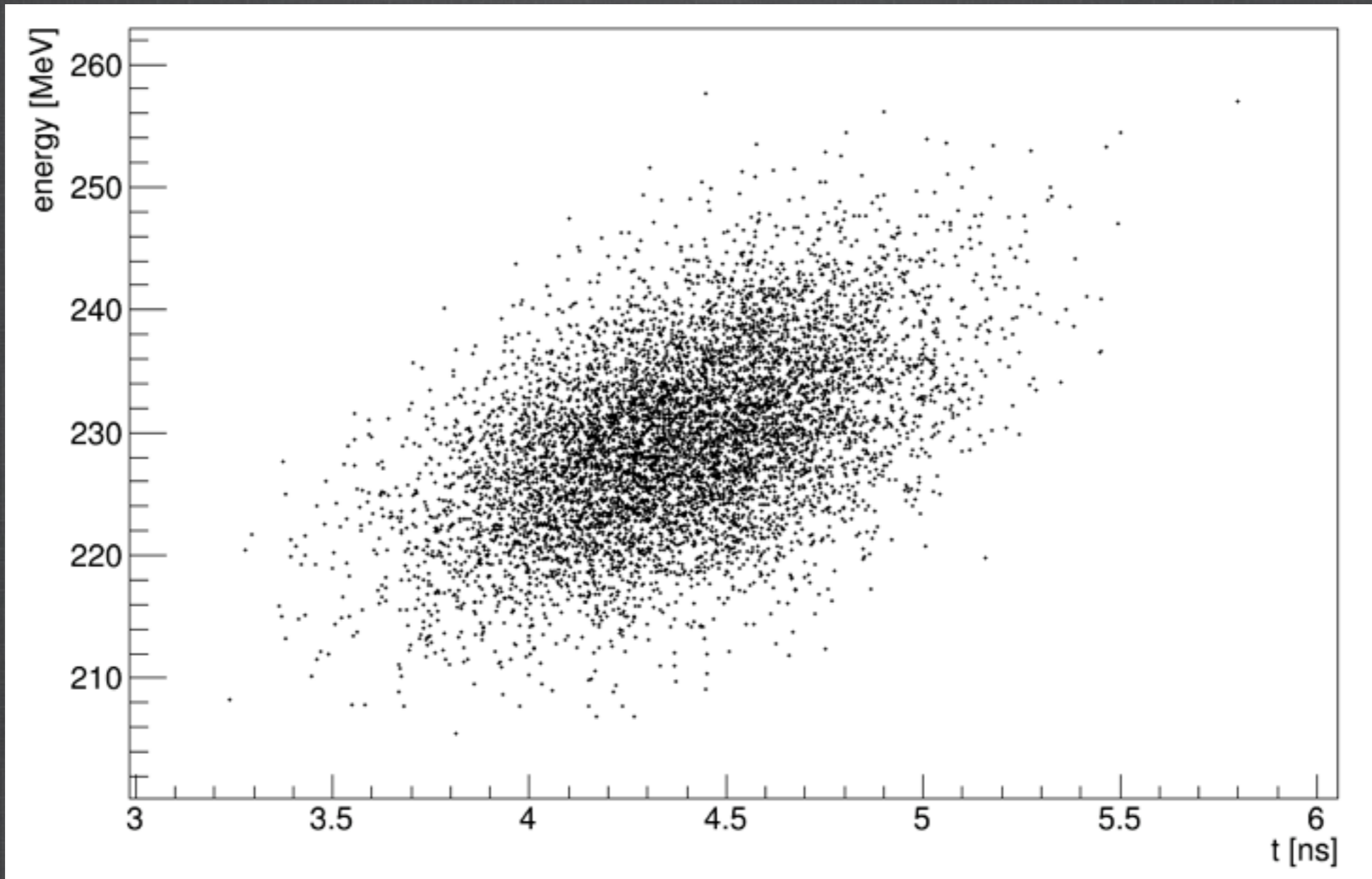
- 6D emittance behaves better in alternative lattice (because focusing is weaker?).
- The alternative lattice looks very much like the cooling cell in the old neutrino factory.
- The transmission is better in the reference lattice since the beta is smaller in the FC.
- 4D cooling is larger in the reference lattice.
- The reference lattice is more flexible regarding the value of the beta at the main absorber.
- The reference lattice seems to best represent the MICE interests.

Thank you for your attention

Back-up slides

Longitudinal phase space

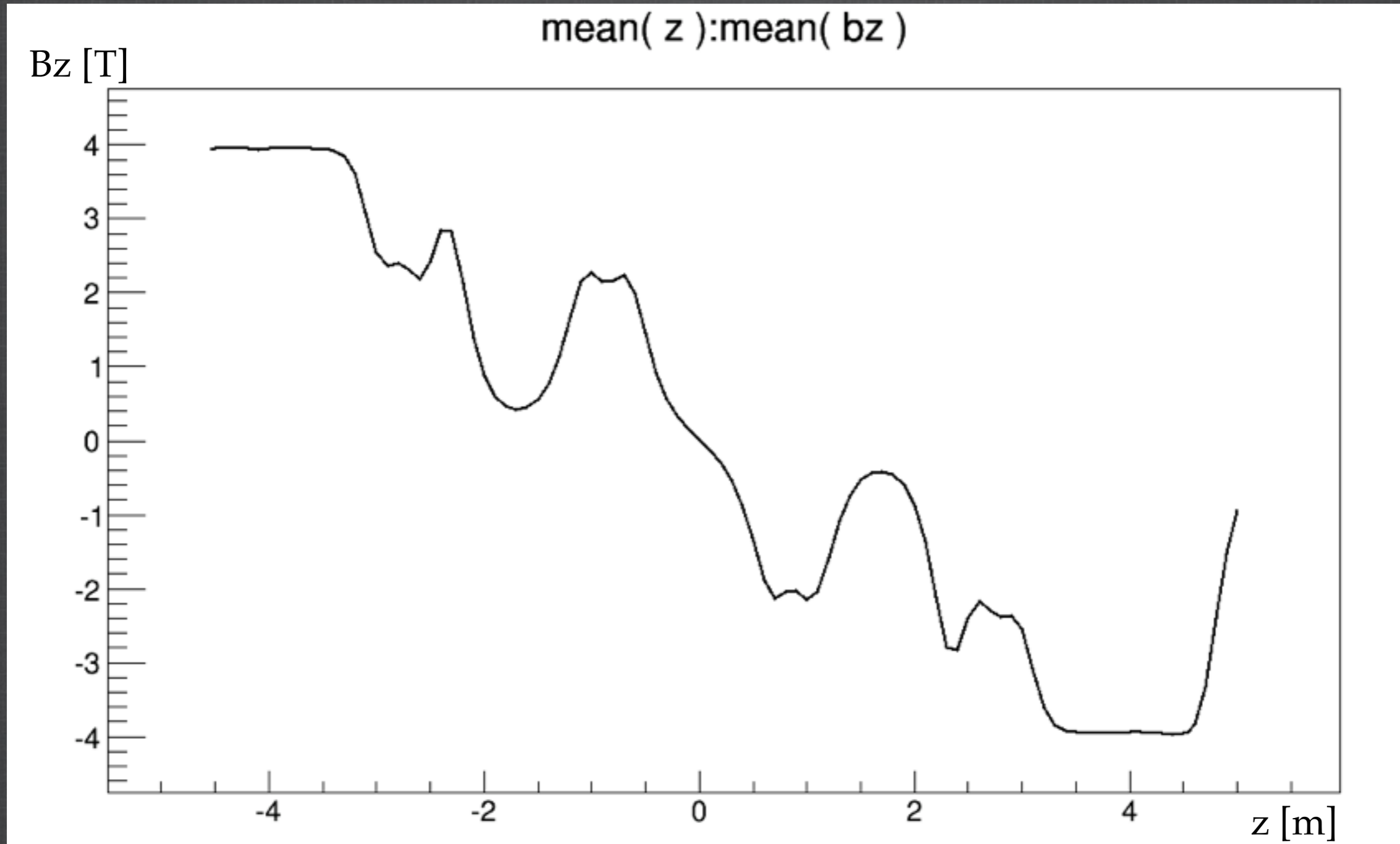
Upstream tracker



Reference Lattice

primary absorber only

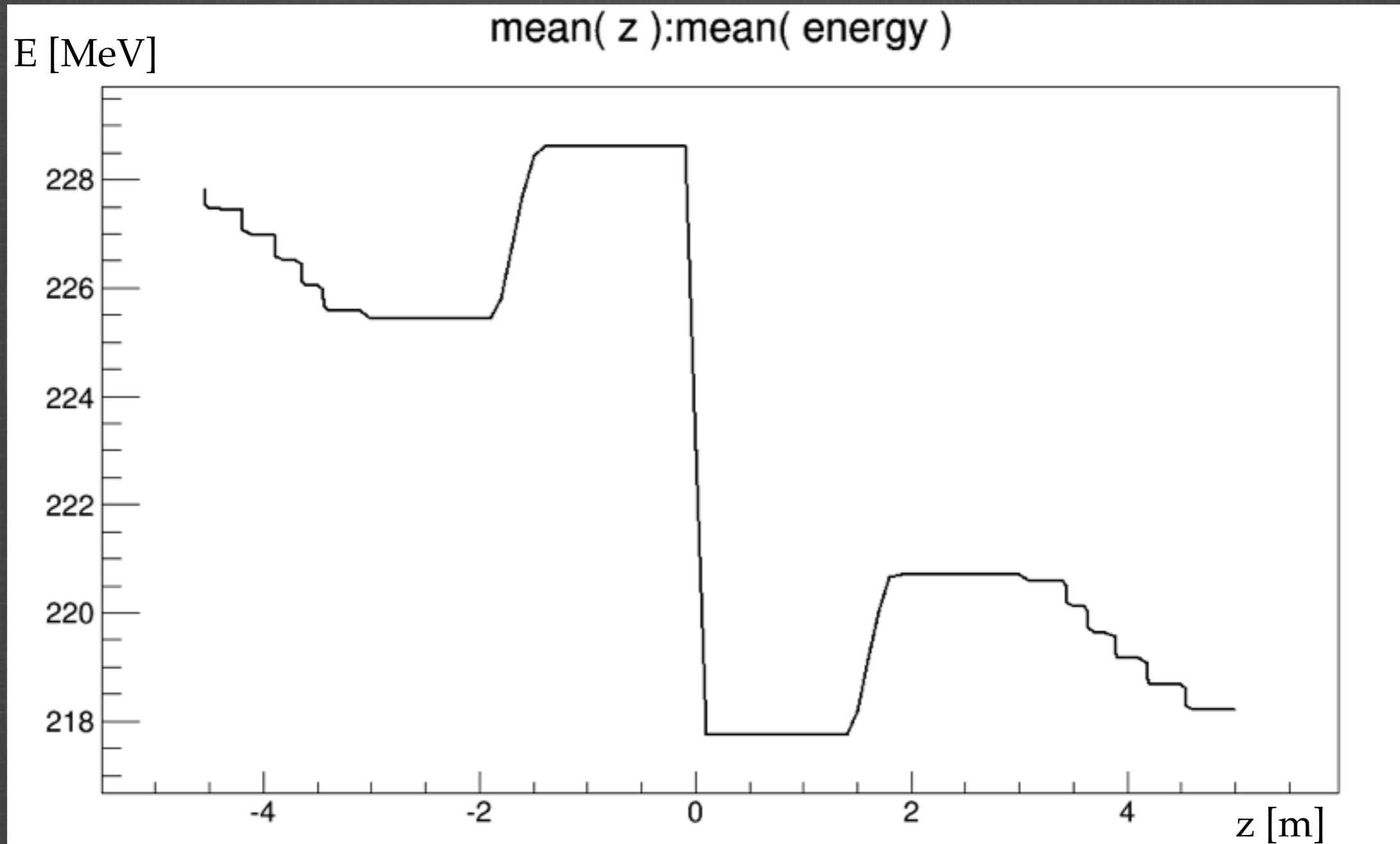
Magnetic field



Reference Lattice

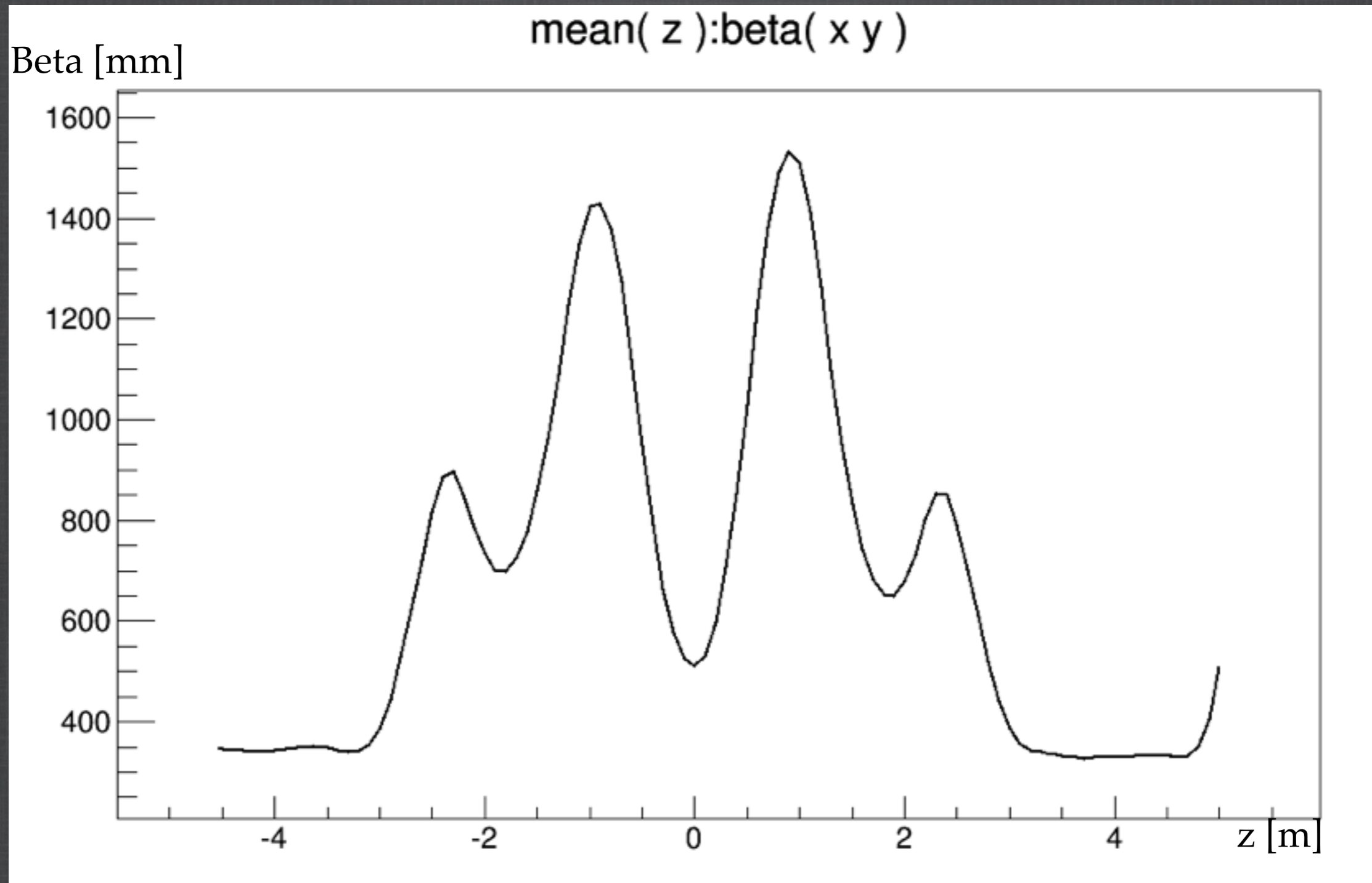
primary absorber only

Energy



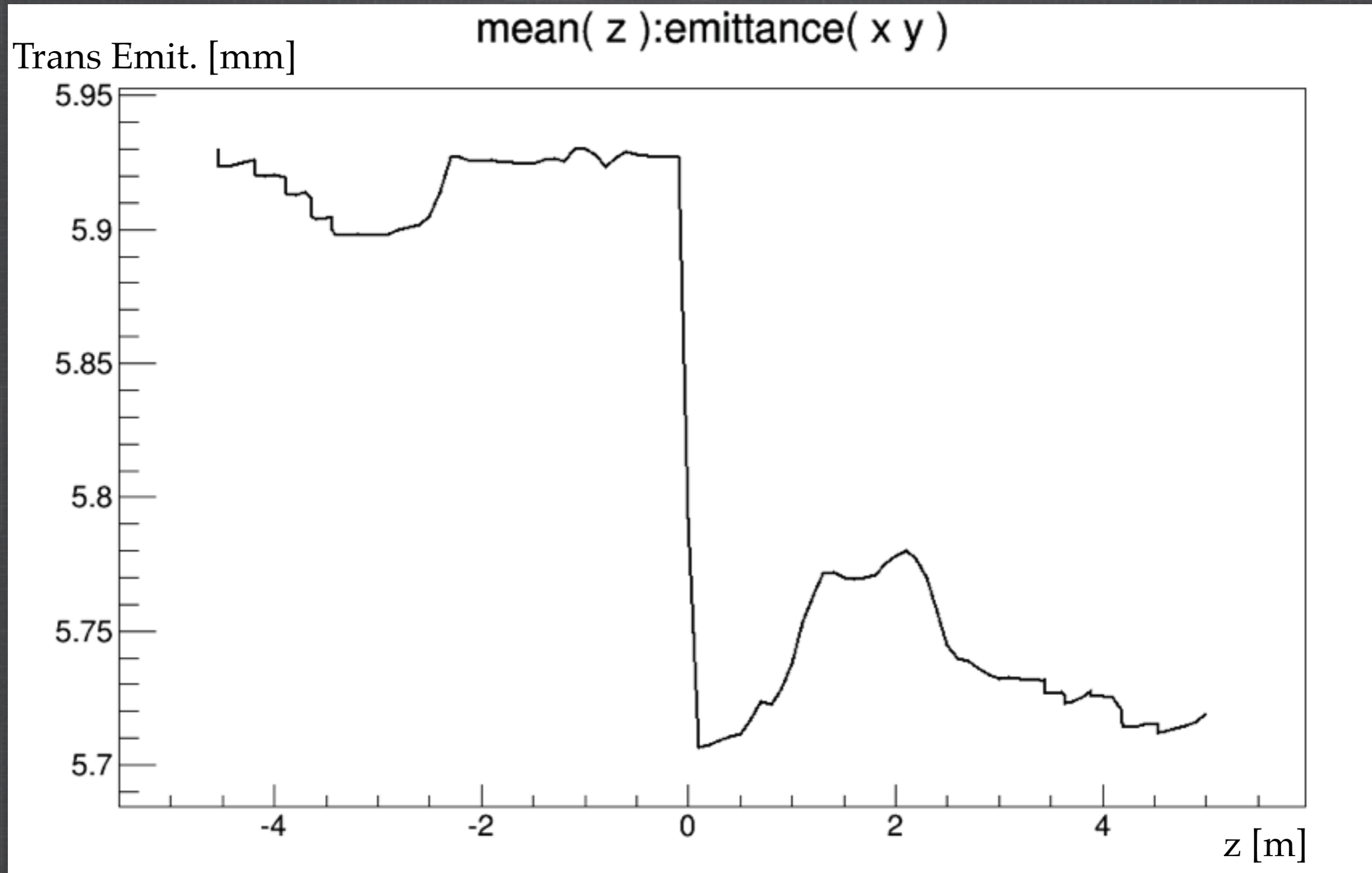
Reference Lattice (primary only)

Transverse beta



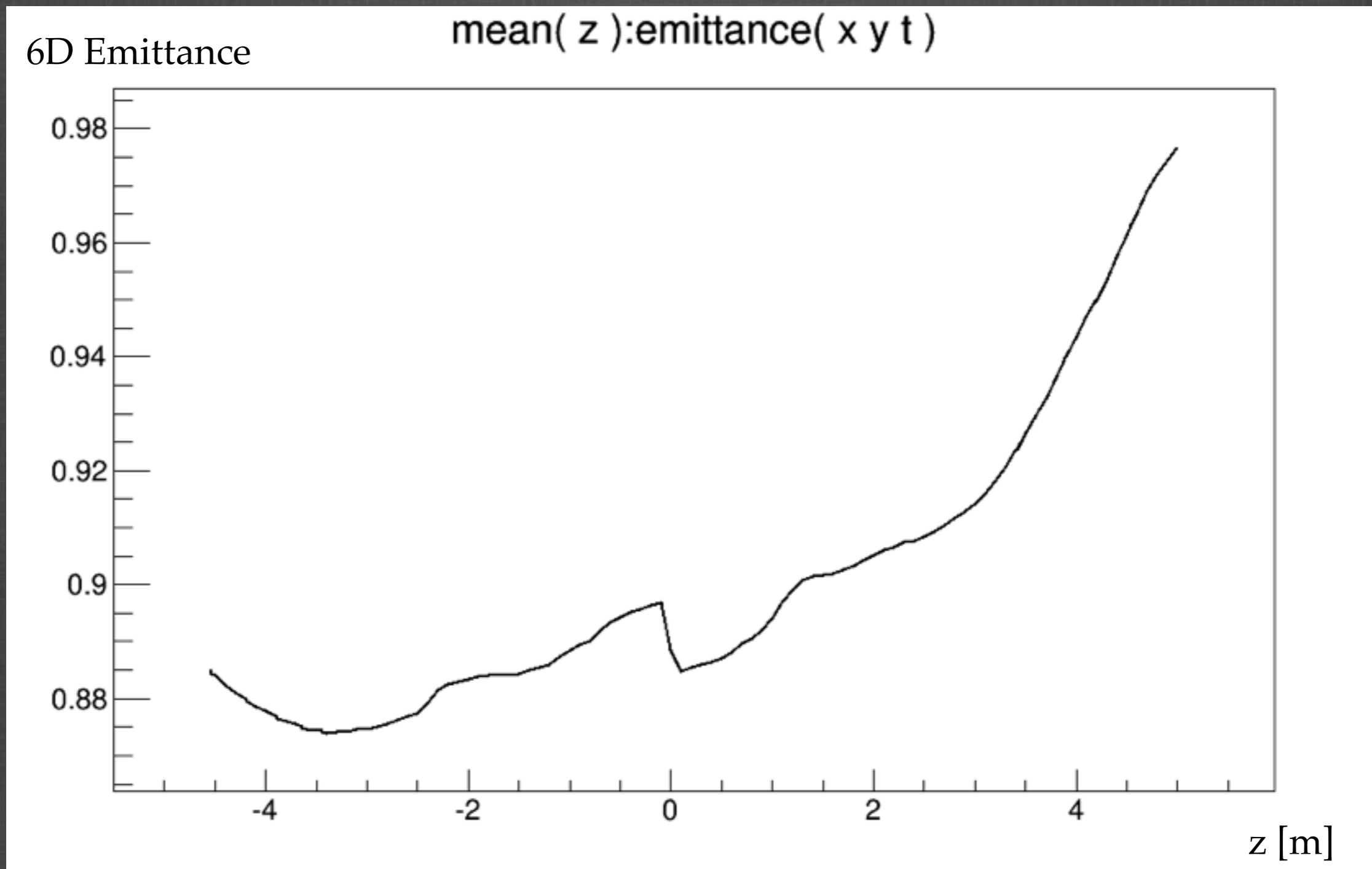
Reference Lattice (primary only)

4D emittance



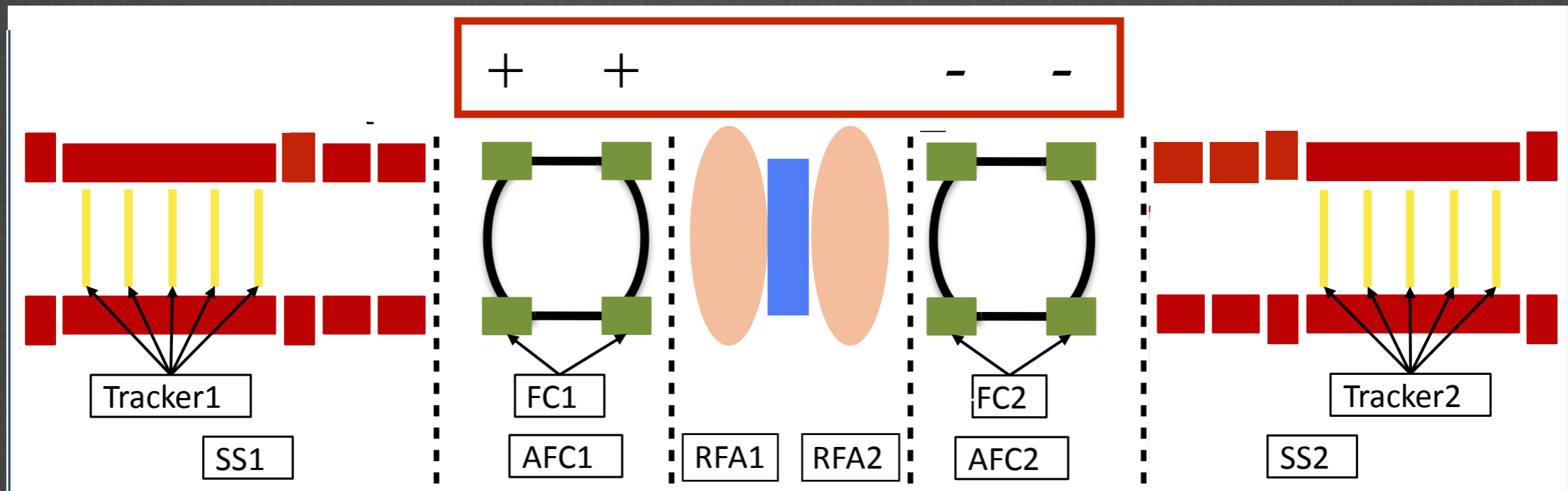
Reference Lattice (primary only)

6D emittance



Alternative Lattice

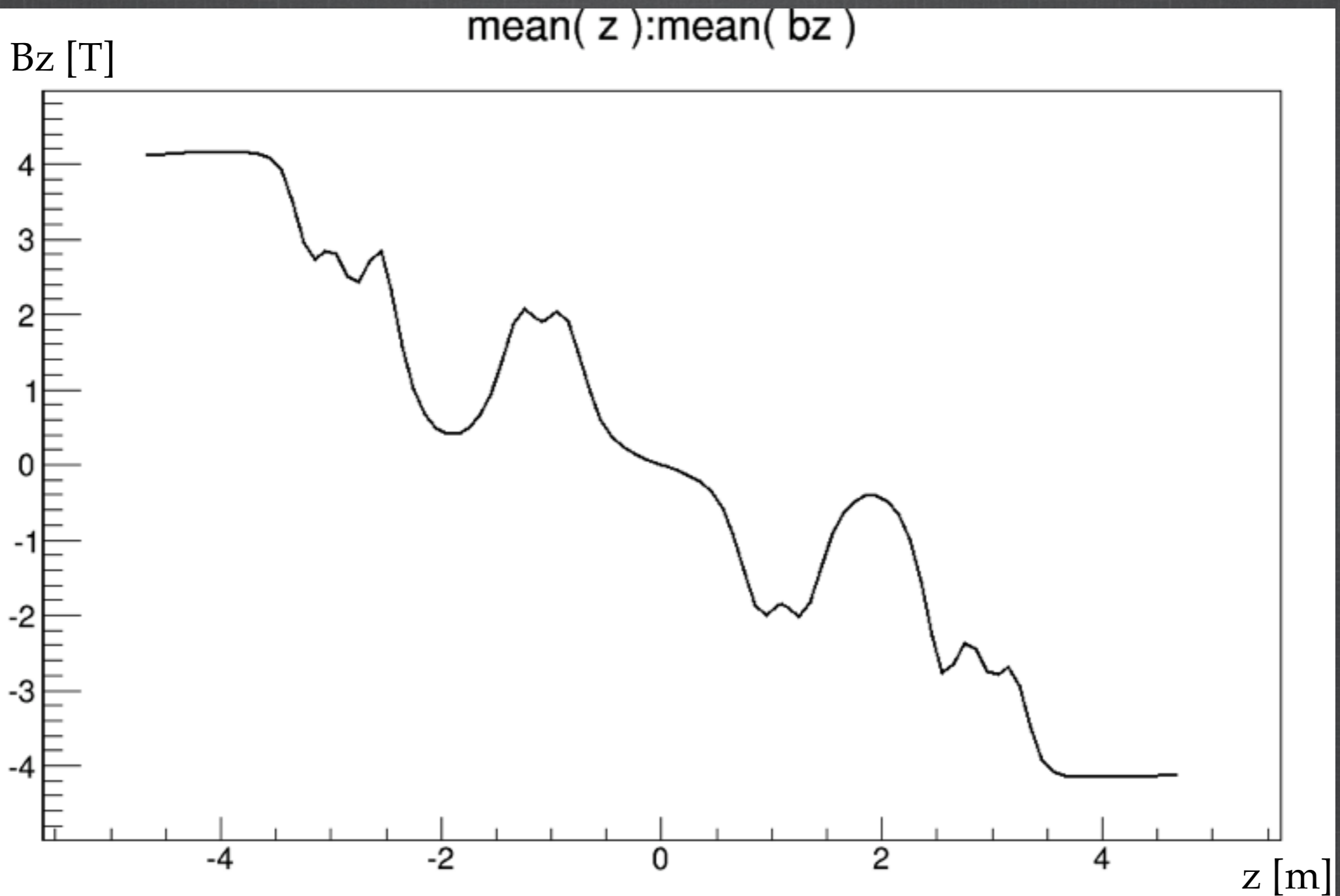
primary absorber only



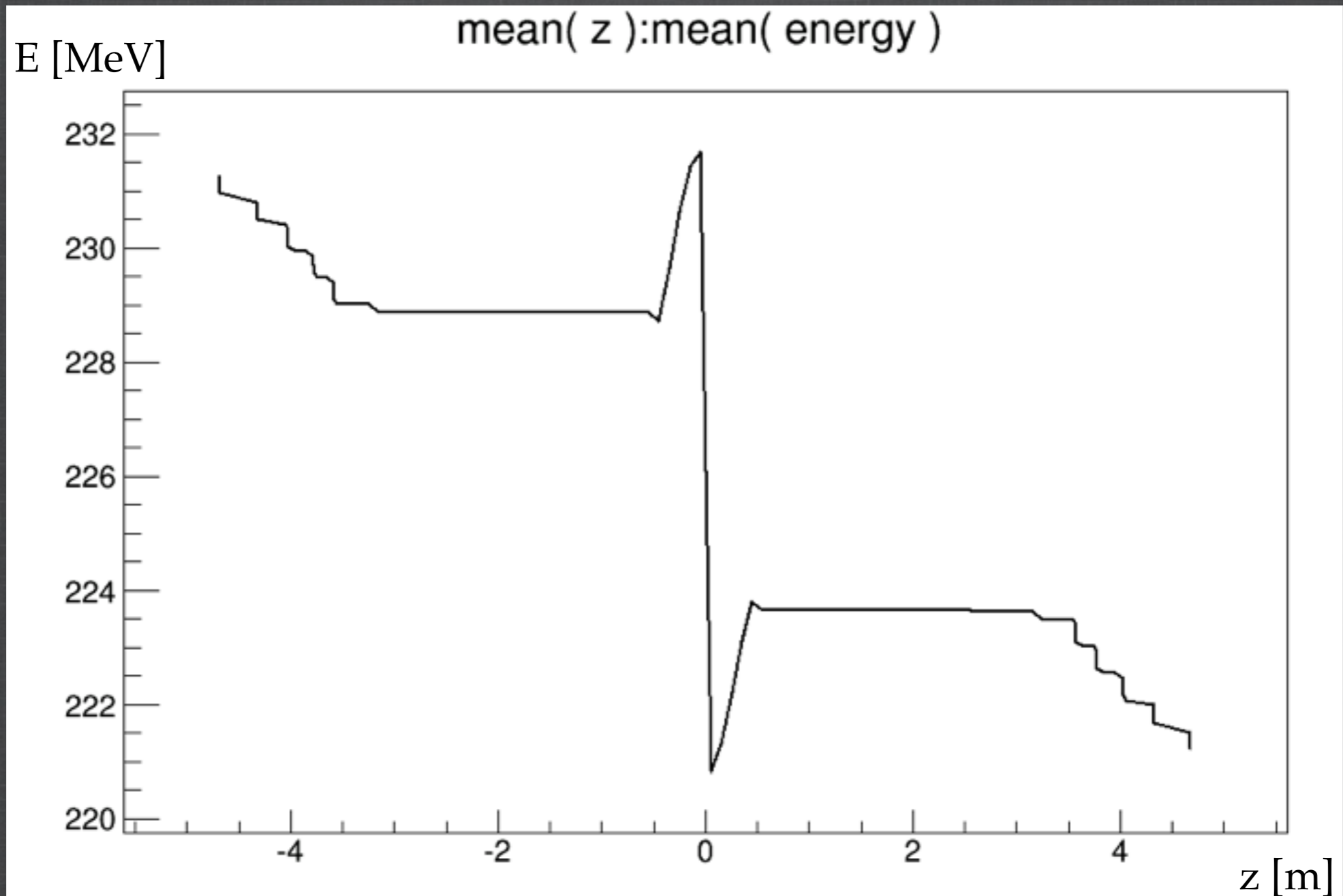
Alternative Lattice

primary absorber only

Magnetic field

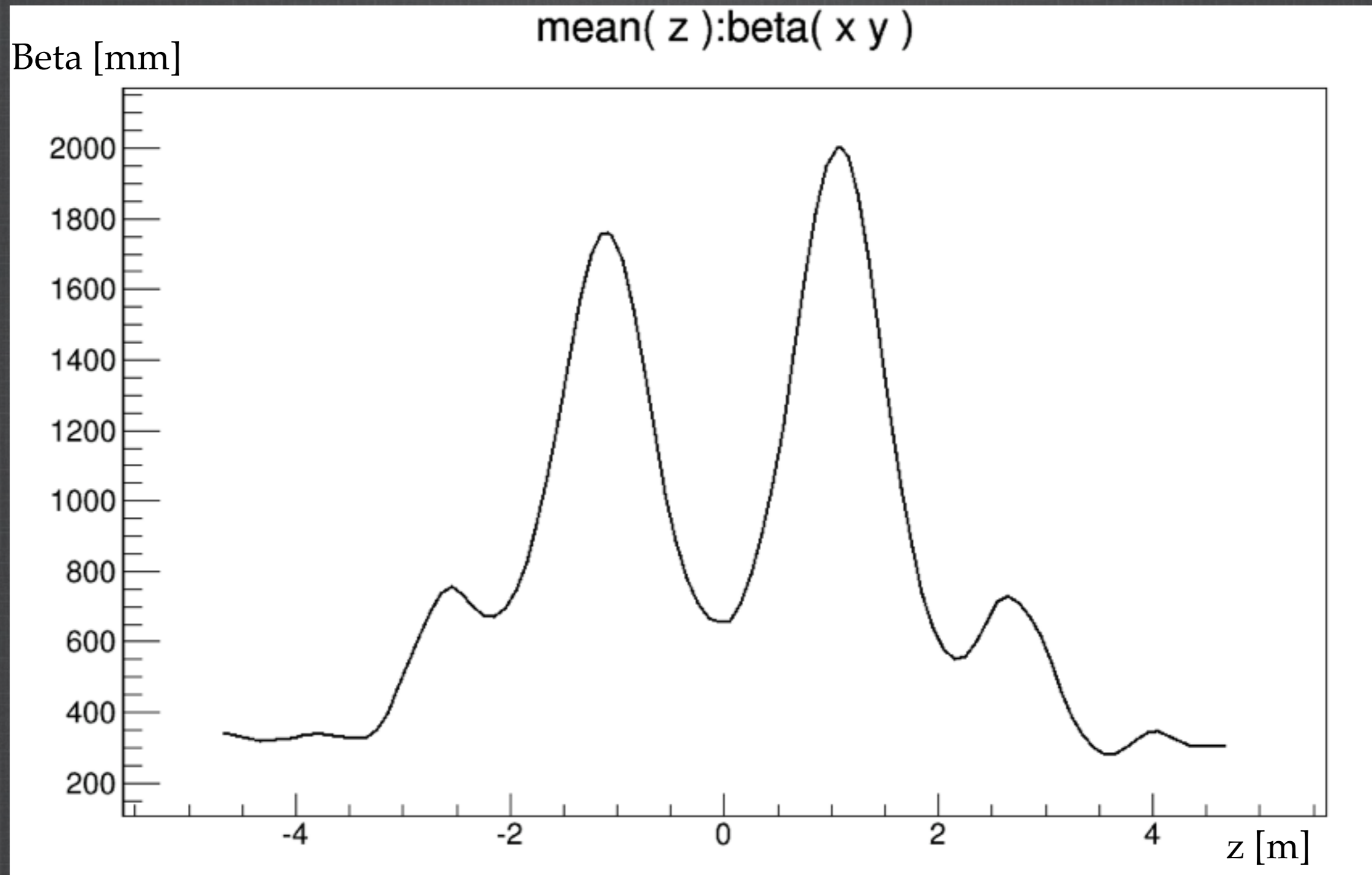


Alternative Lattice primary absorber only Energy



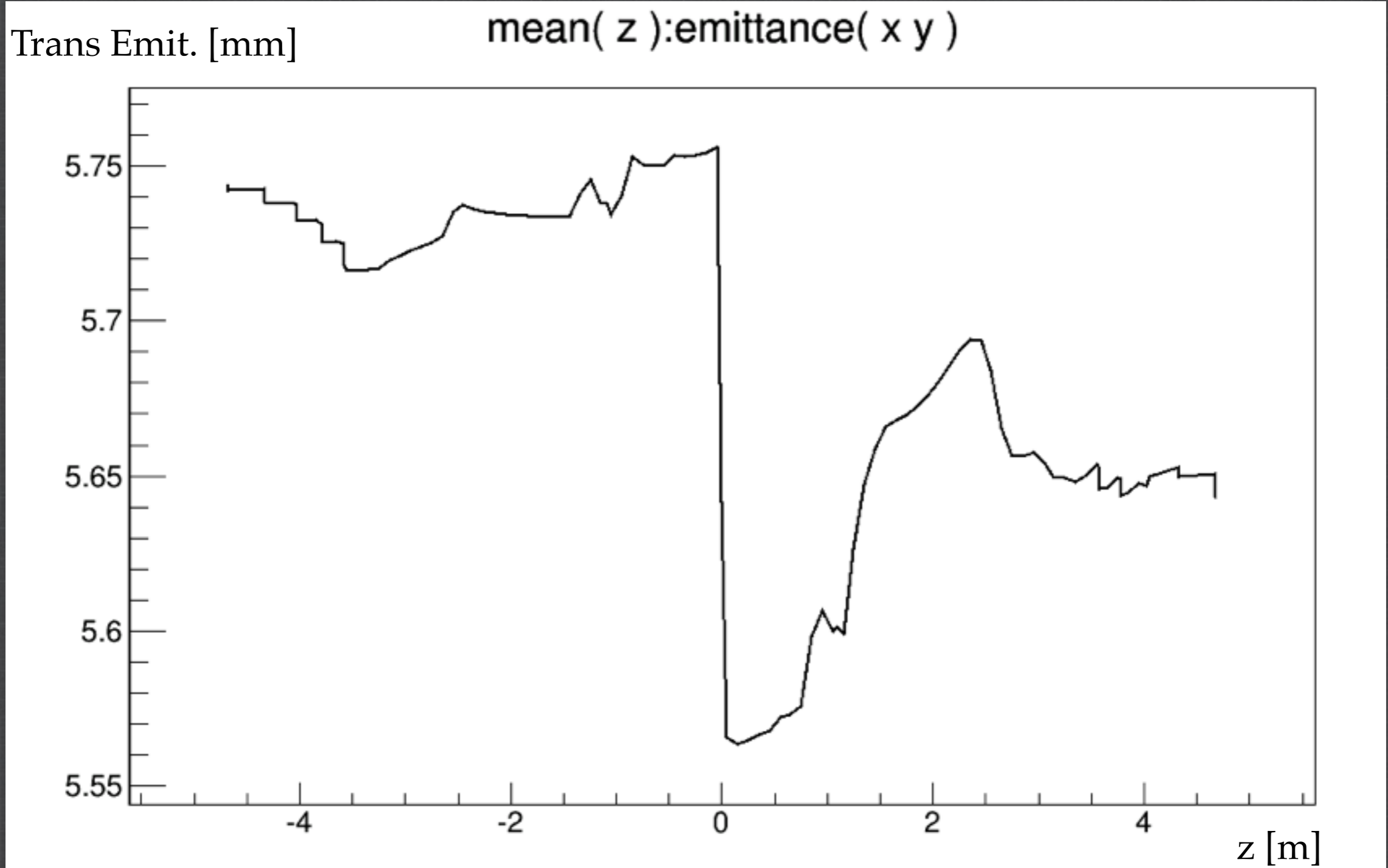
Alternative Lattice (primary only)

Transverse beta



Alternative Lattice (primary only)

4D emittance



Alternative Lattice (primary only)

6D emittance

