MUSE Simulation (Beam)

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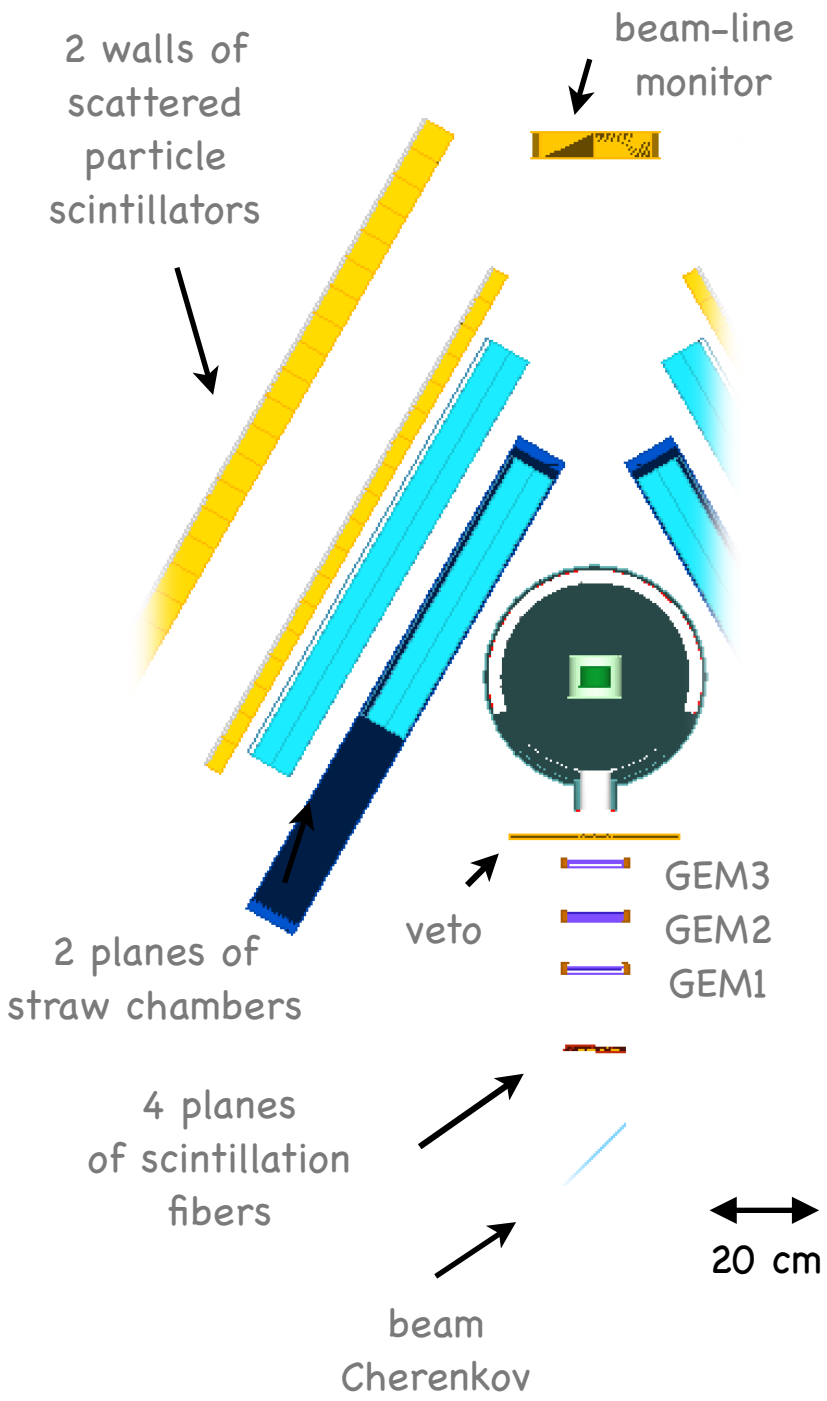
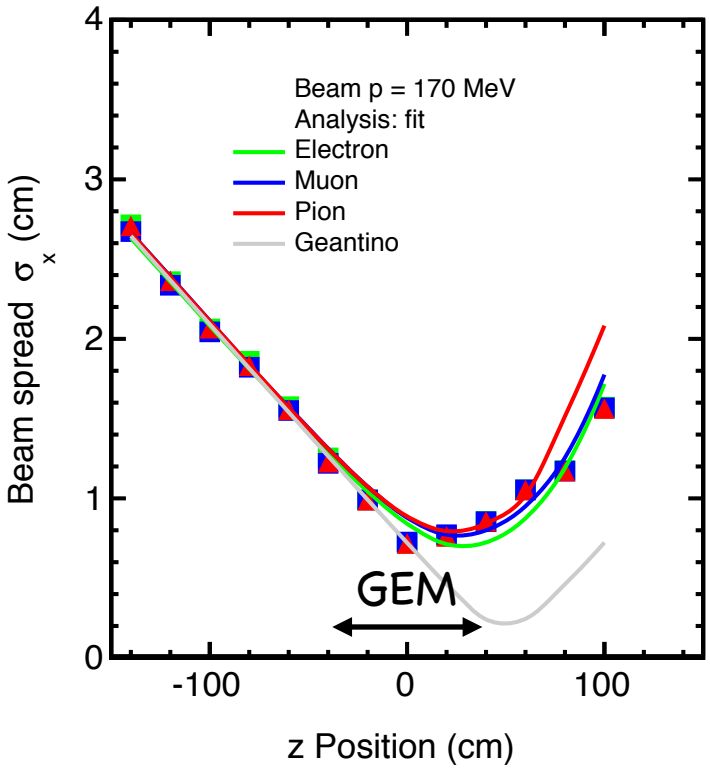
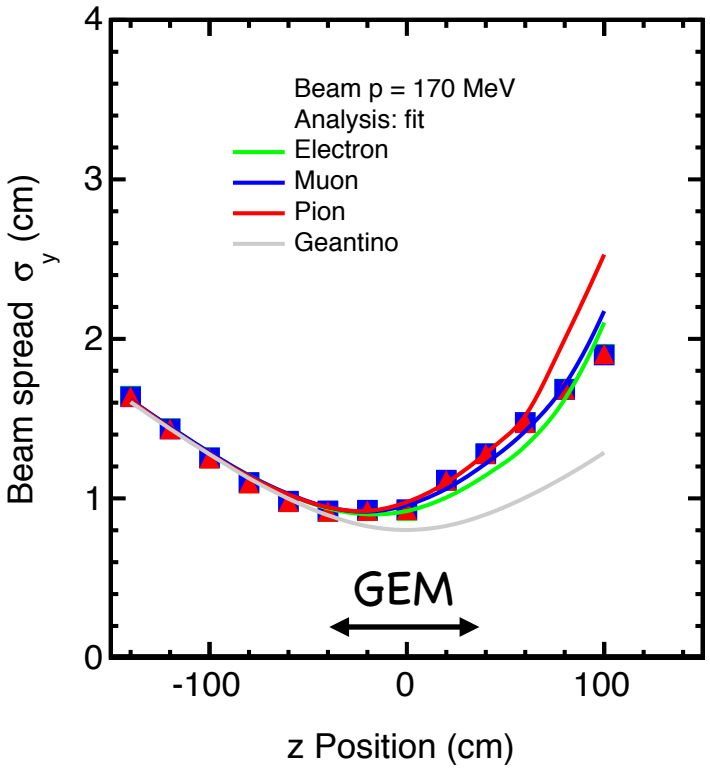


Geant4 Simulations

1. Properties of the **incident particle beam**, new data from June test run
2. New scattering chamber and LH2 target in the simulation
3. **Beam profile** with fully equipped beam line
4. Fraction of primary particles hitting the target

Simulated beam properties tuned to data

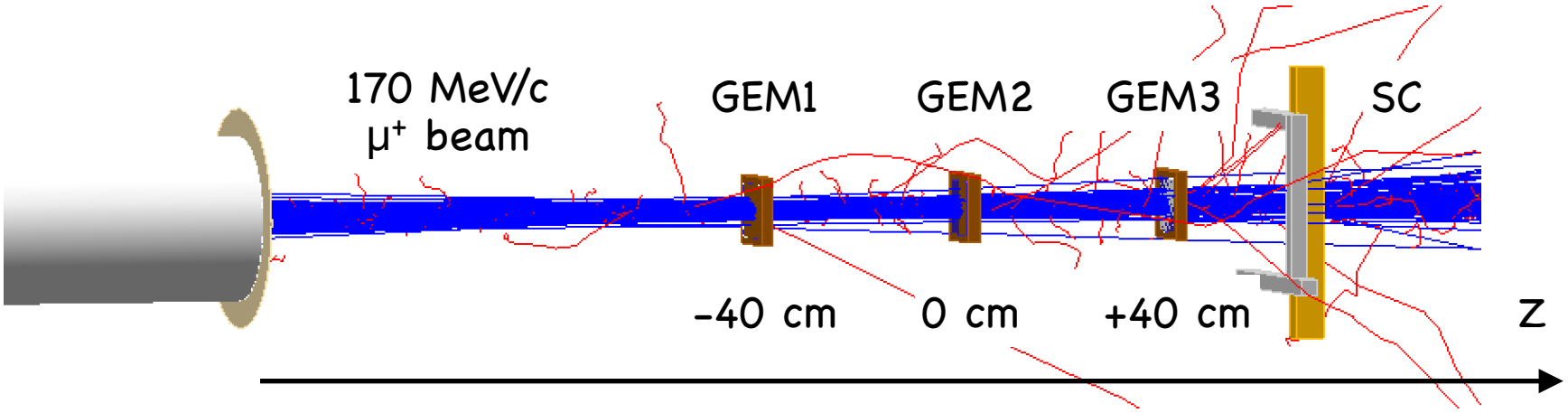




Beam parameter,

- focus,
- width at focus,
- divergence,

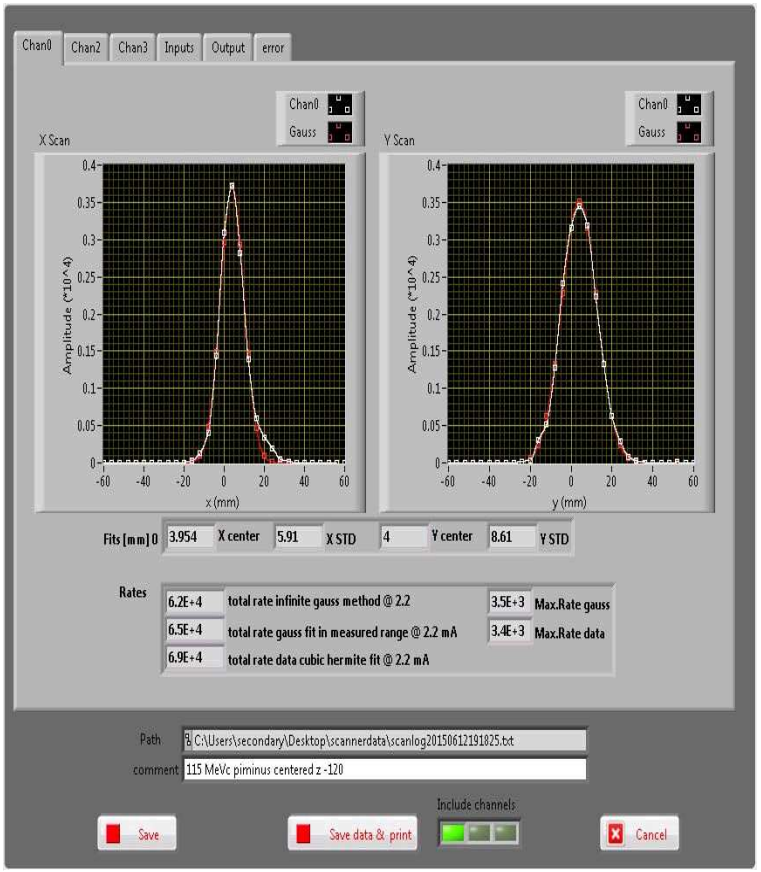
have been fit to results from beam study for each momentum setting.



Beam profile in June 2015

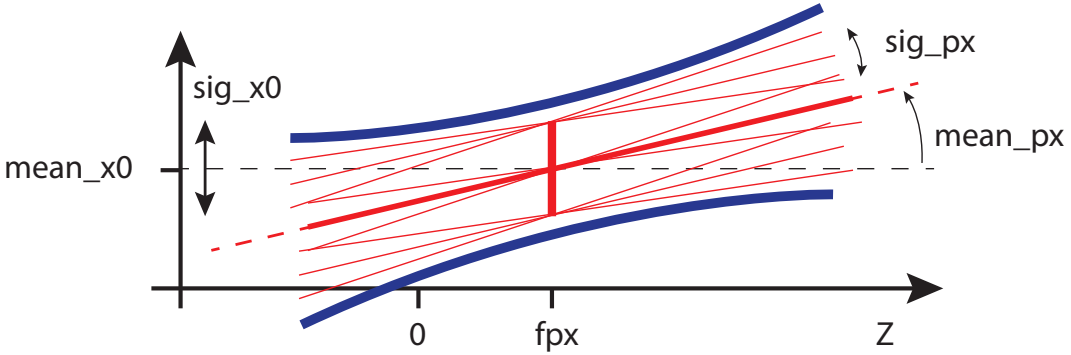
Measurement

- momenta: ±115, ±161, ±210 MeV/c
- z-positions: -240, -120, 0, +120, +240 mm



115 MeVc piminus centered z -120

Simulation

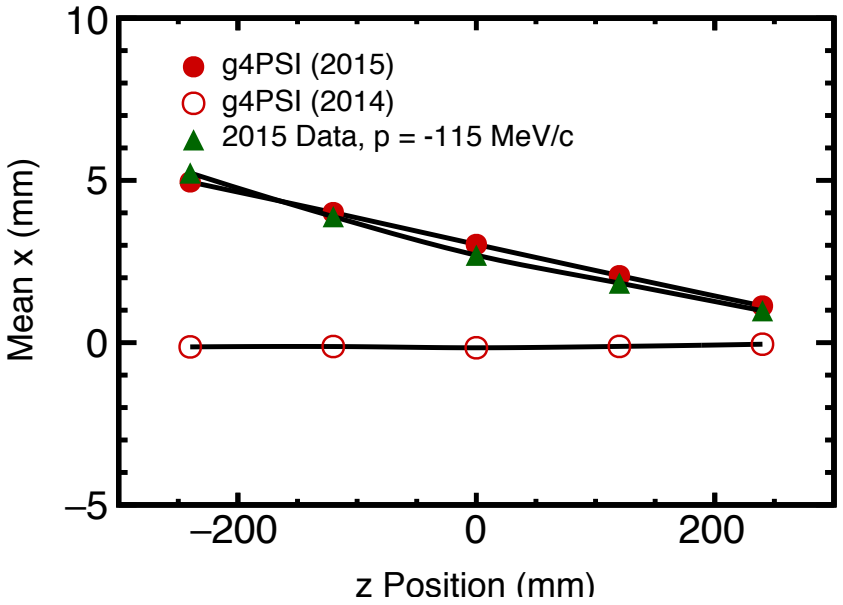


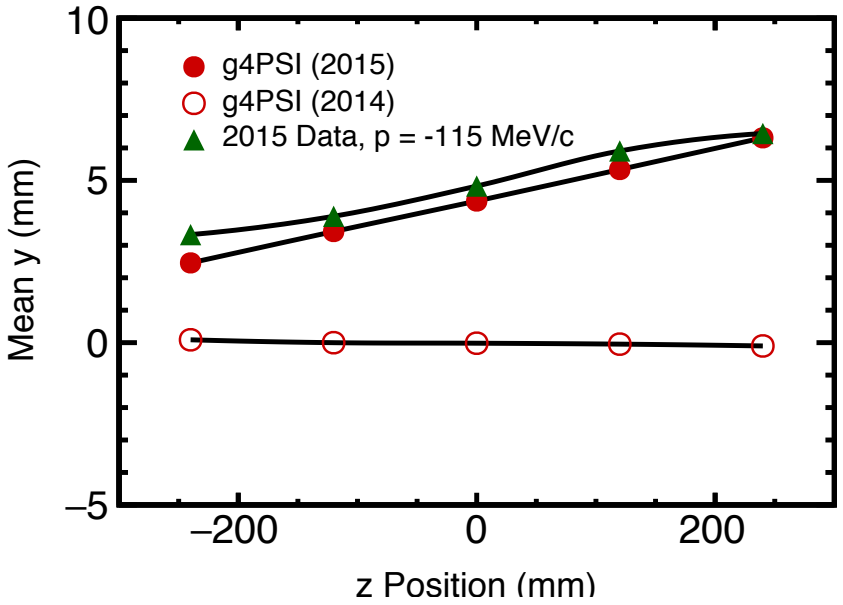
Beam parameter:

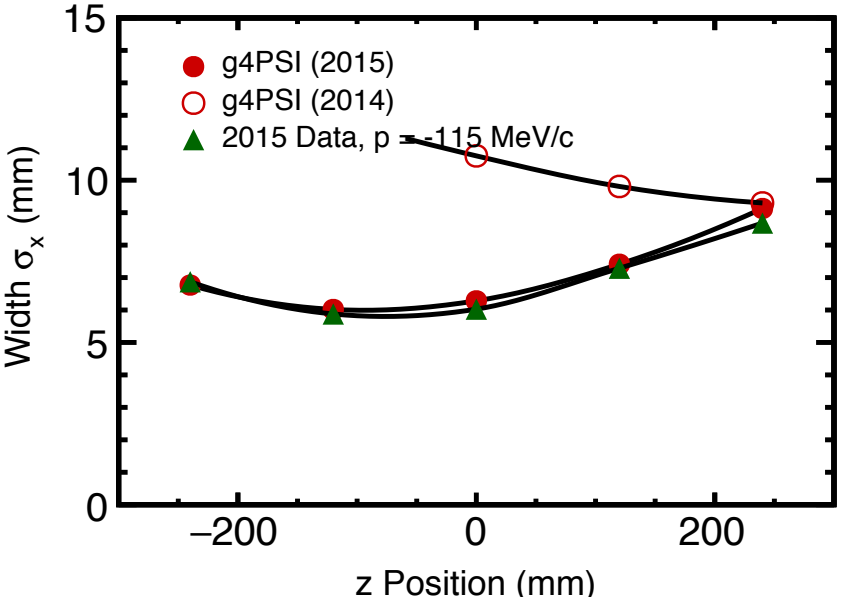
- focus (position and width)
- beam direction and
- divergence

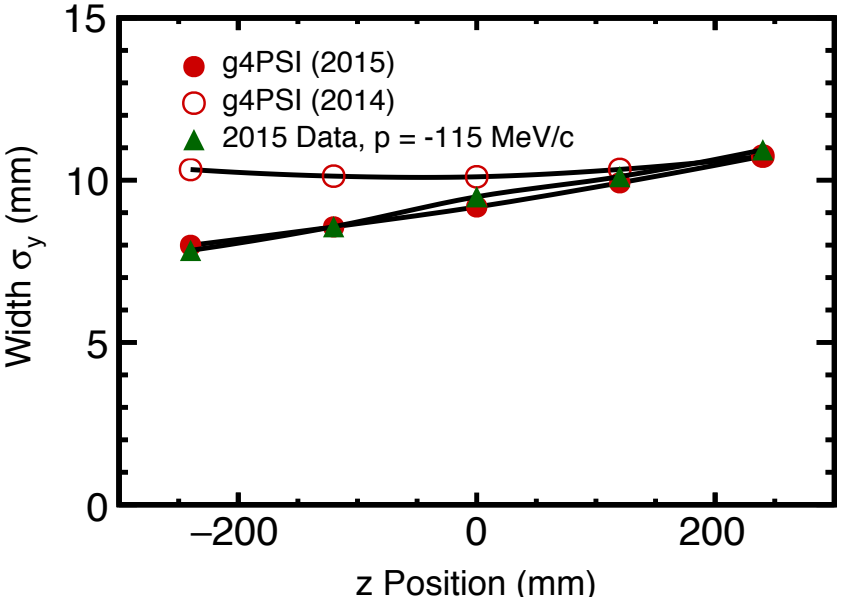
have been fit to results from beam study for each momentum setting.

Example results for -115 MeV/c

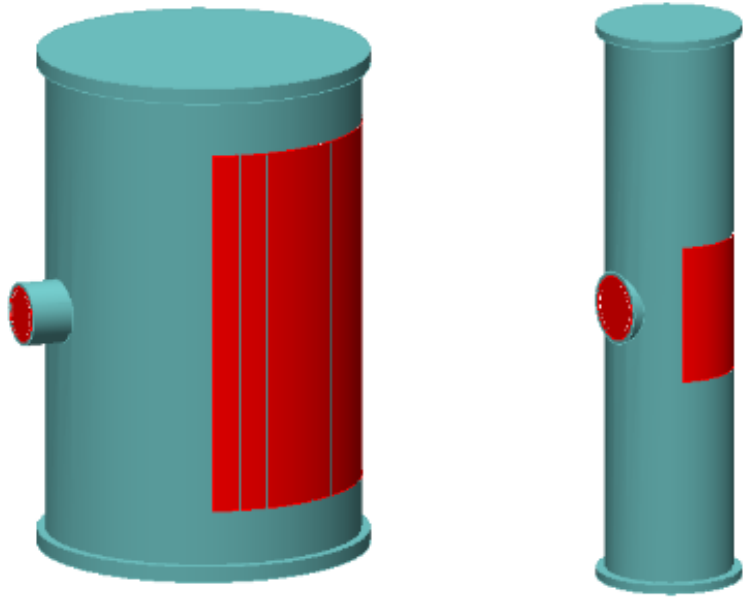








New in the Simulation

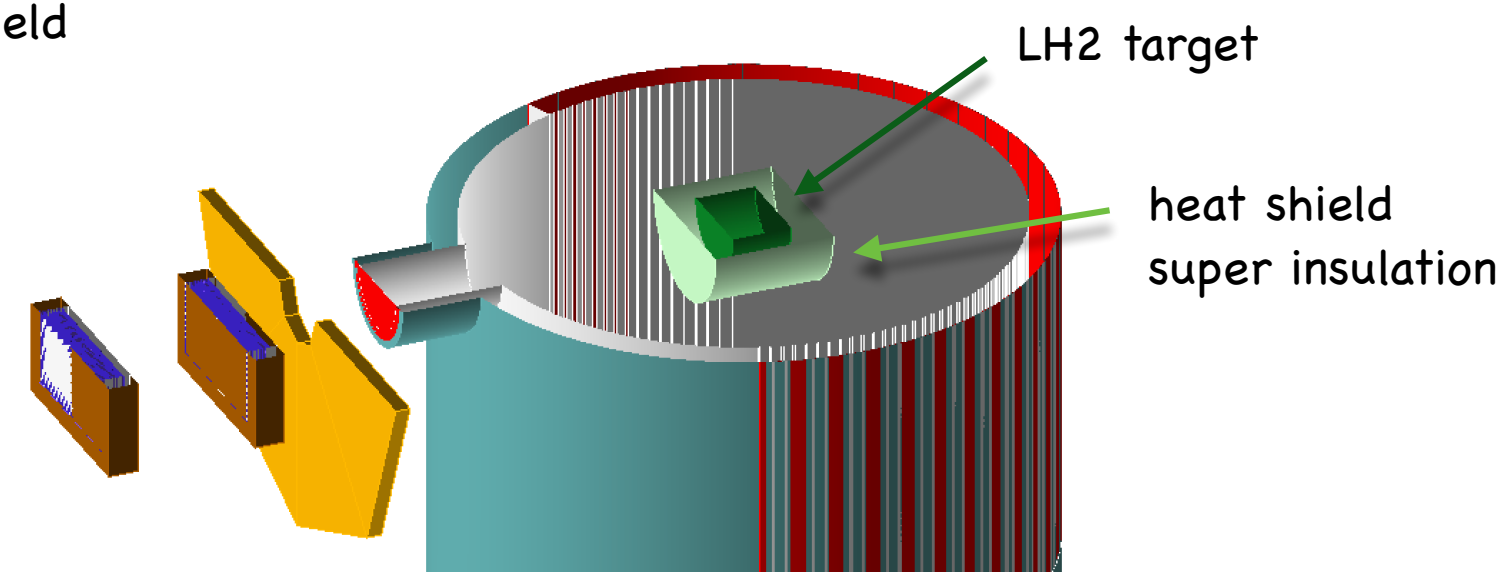


Two types of **scattering chambers**

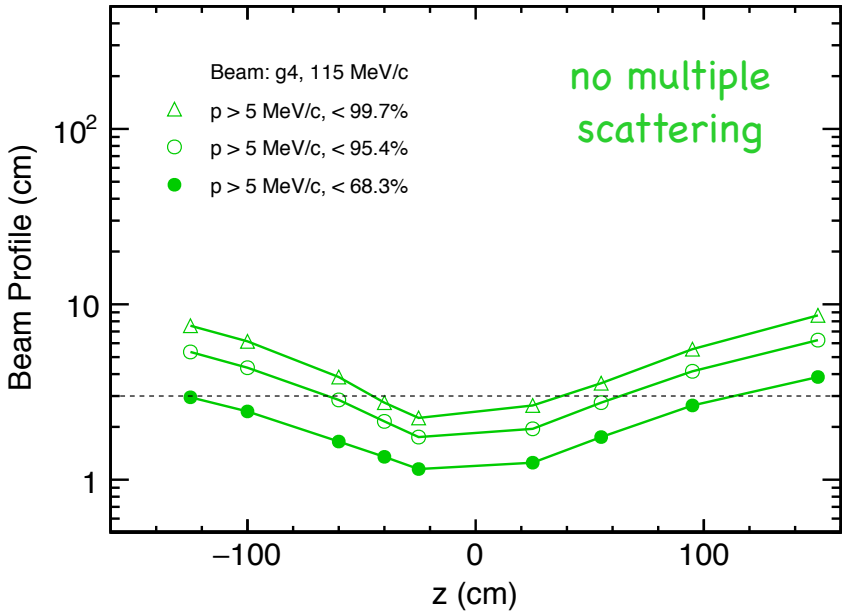
- r_{inner} = 18 cm, z_{enter} = -25 cm
- r_{inner} = 6 cm, z_{enter} = -7 cm

Two types of **LH2 targets**

- L = 4 cm, d = 4 cm
- L = 4 cm, d = 6 cm
- incl. heat shield



Beam profile - Standard Setup



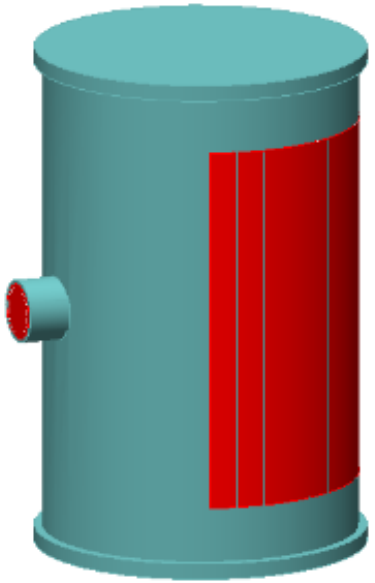
r_{inner} = 18 cm

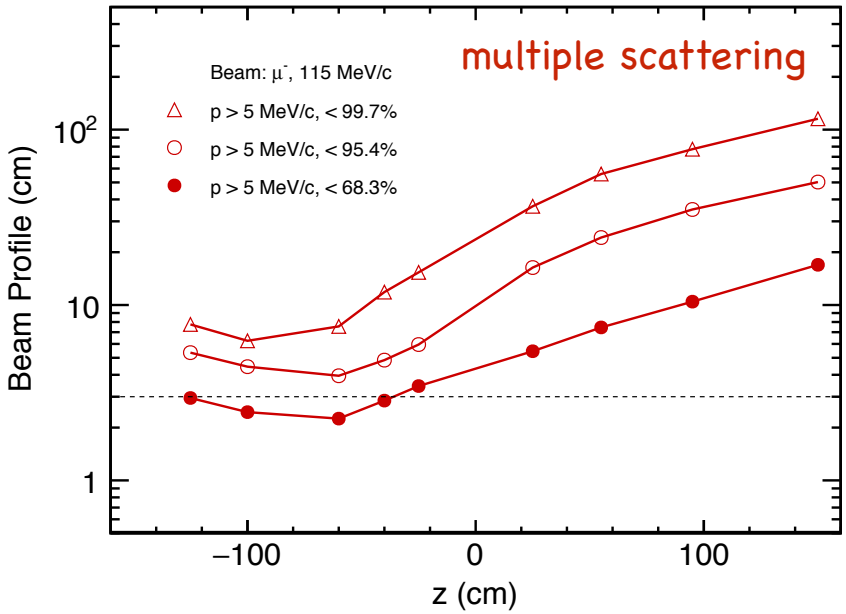
z_{enter} = -25 cm

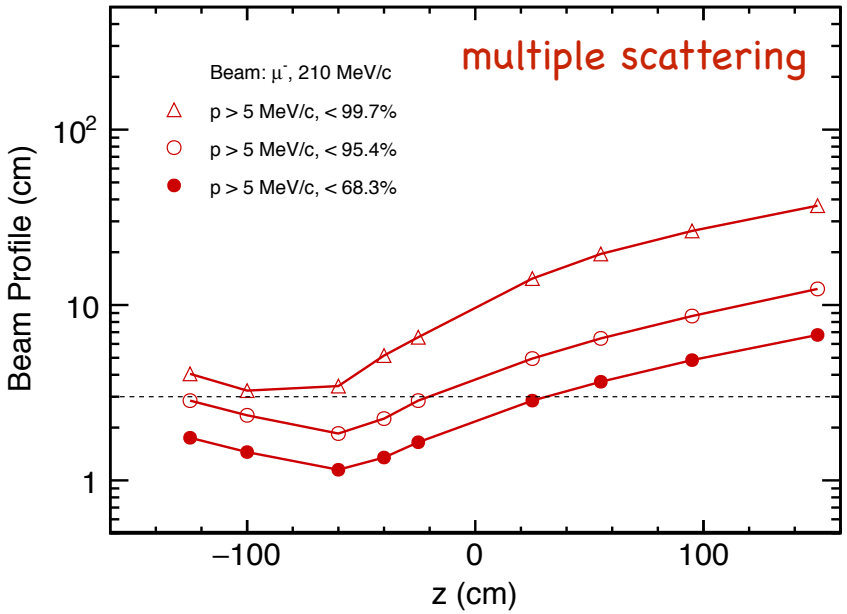
← r = 3 cm

BCC at -90 cm

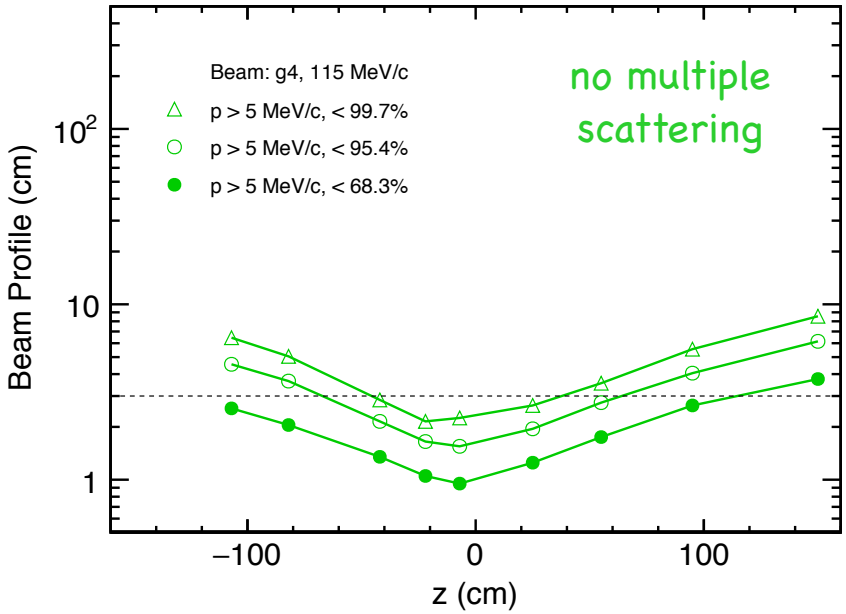
Scattering Chamber







Beam profile - Standard Setup



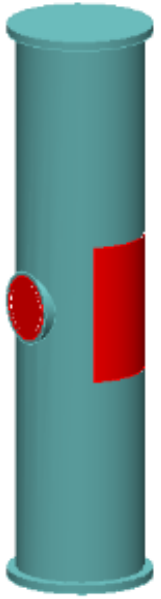
r_{inner} = 6 cm

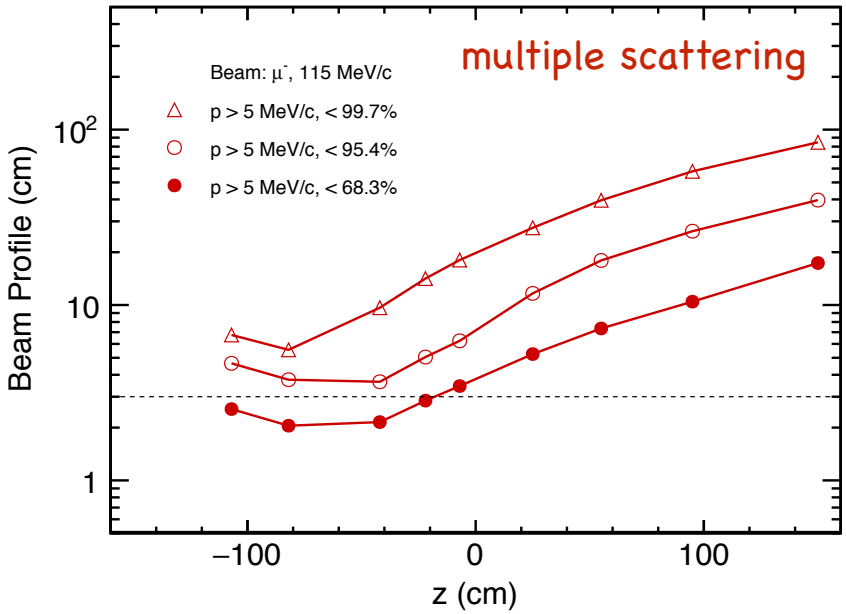
z_{enter} = -7 cm

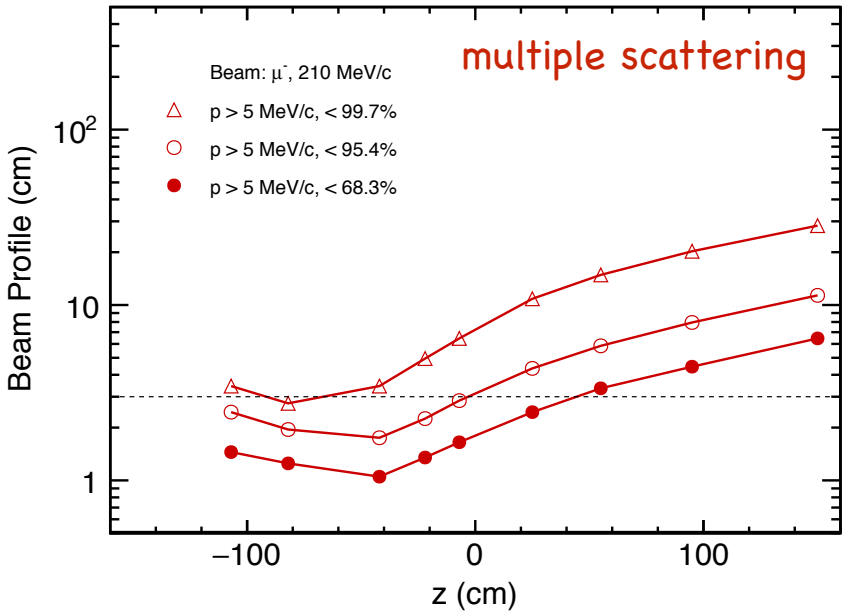
← r = 3 cm

BCC at -72 cm

Scattering Chamber







Fraction of beam particle hitting the target

Standard setup with BCC (quartz), SciFi (4)

Beam: μ	d = 4 cm Z = -25 cm	d = 4 cm Z = -7 cm	d = 6 cm Z = -25 cm	d = 6 cm Z = -7 cm
115 MeV/c	0.225	0.297	0.440	0.562
153 MeV/c	0.408	0.538	0.689	0.899
210 MeV/c	0.665	0.805	0.899	0.958

Standard setup with BCC (2 mm BC-404), SciFi (3)

Beam: μ	d = 4 cm Z = -25 cm	d = 4 cm Z = -7 cm	d = 6 cm Z = -25 cm	d = 6 cm Z = -7 cm
115 MeV/c	0.493	0.625	0.772	0.868
153 MeV/c	0.746	0.839	0.934	0.967
210 MeV/c	0.923	0.962	0.985	0.989