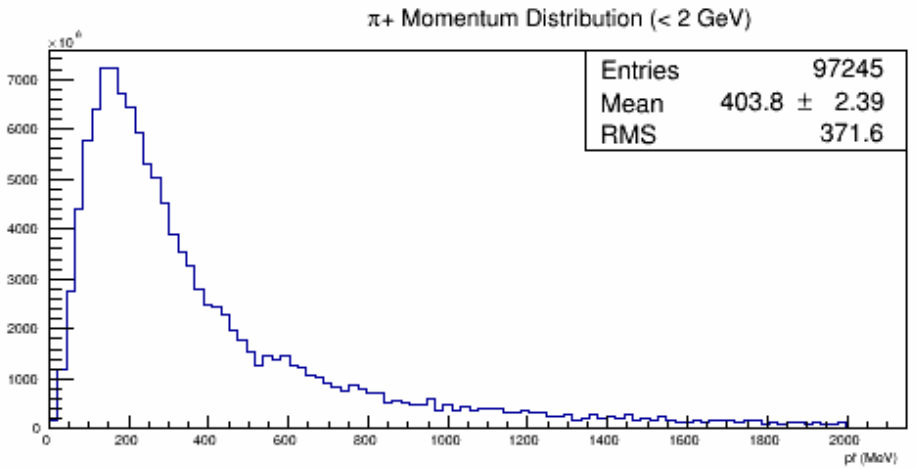
Pions(+) Background Study

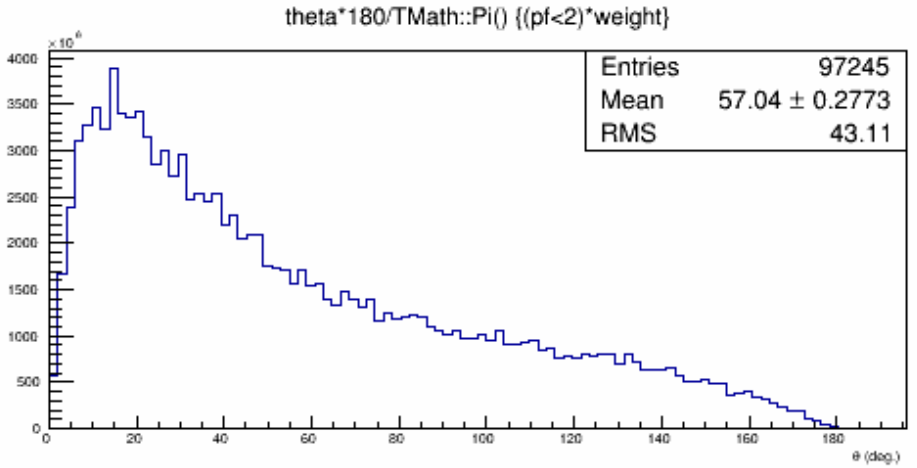
Update-3

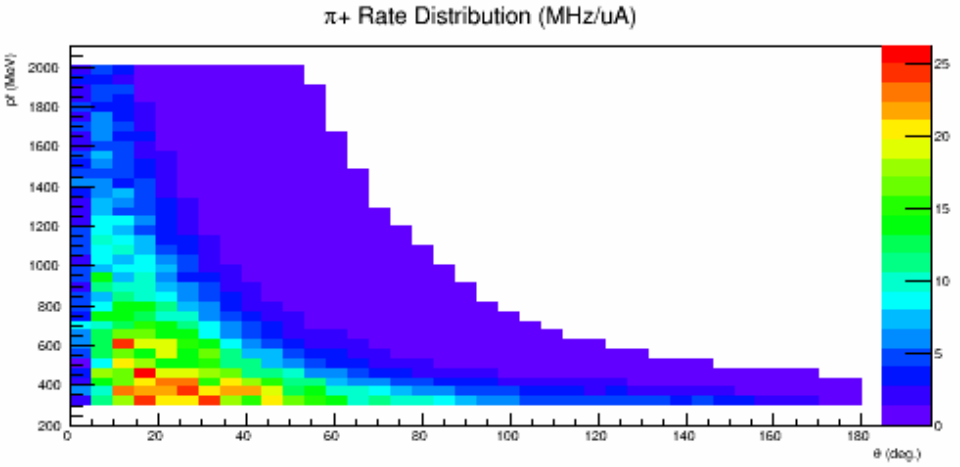
Wiesser Input

Low energy Pions from Wiesser fits have very high rates →Large rates at GEMs

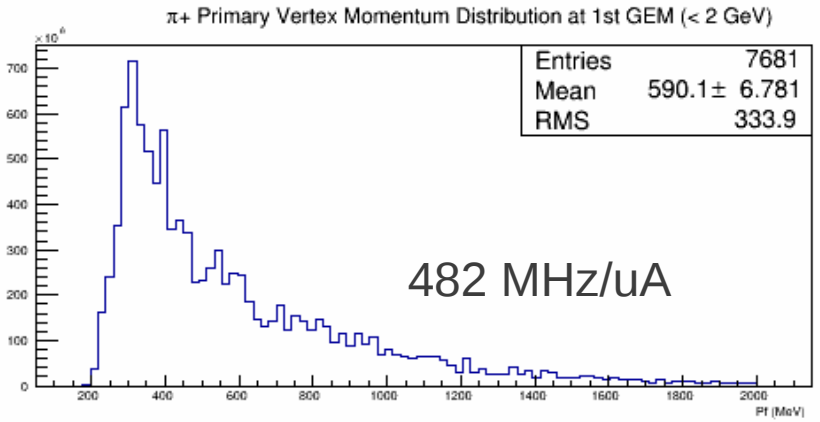
Total pi+ rate for momentum < 2 GeV = 5694 MHz/uA

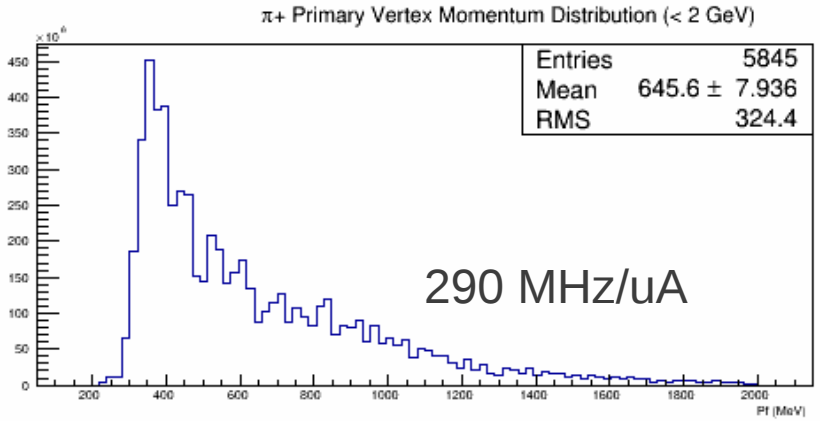


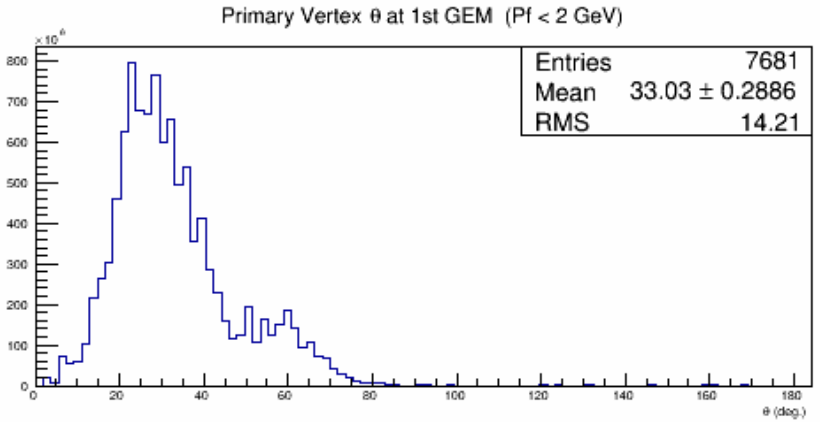


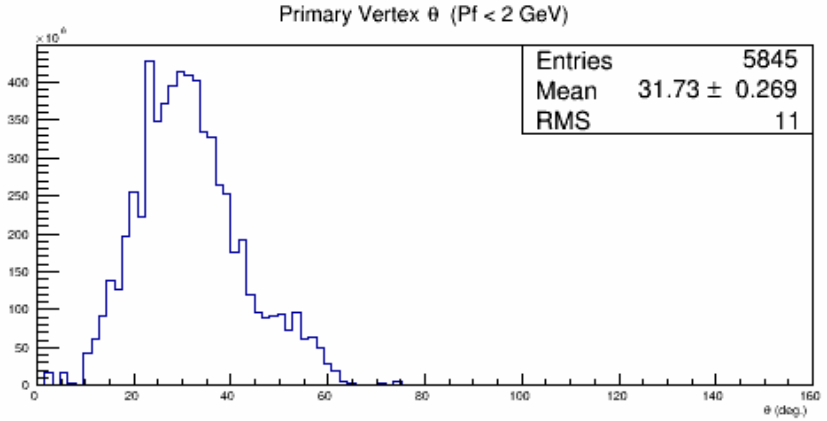


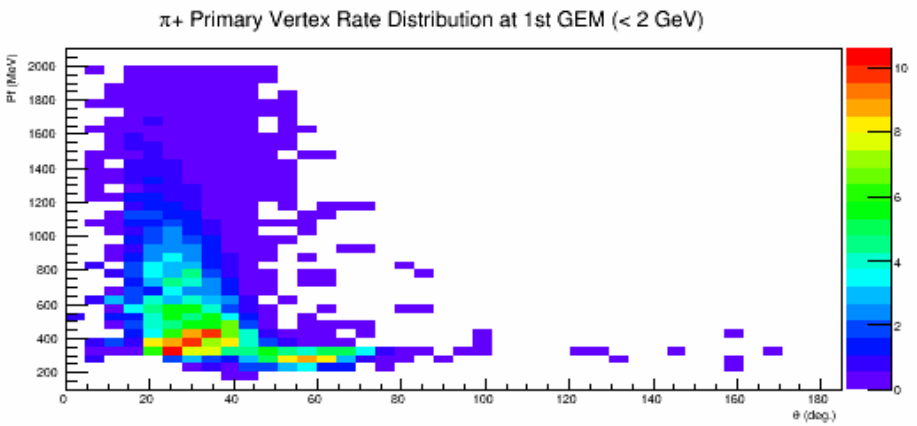
Pion rates across the GEM planes

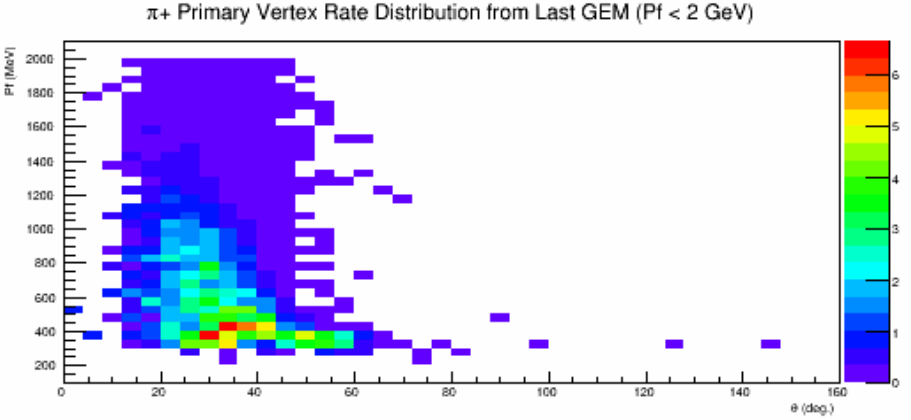








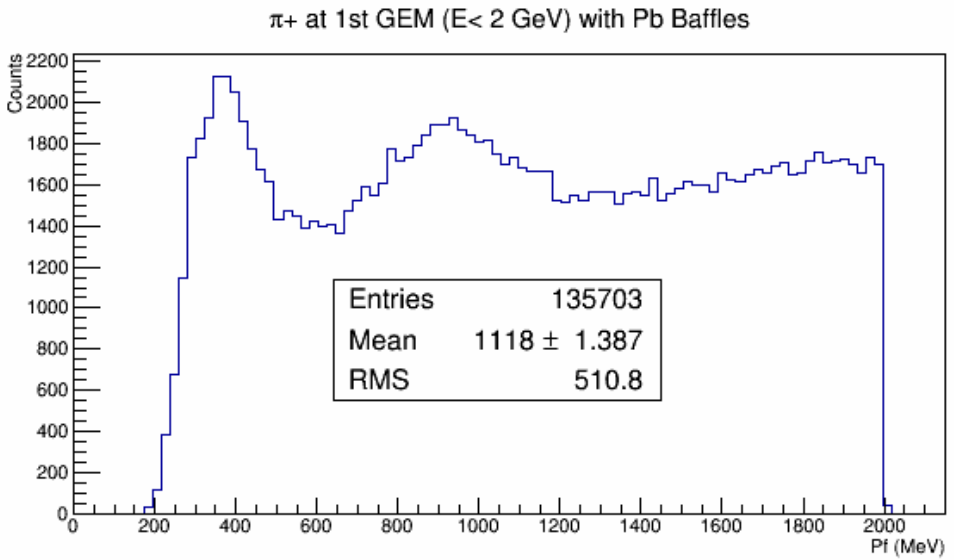


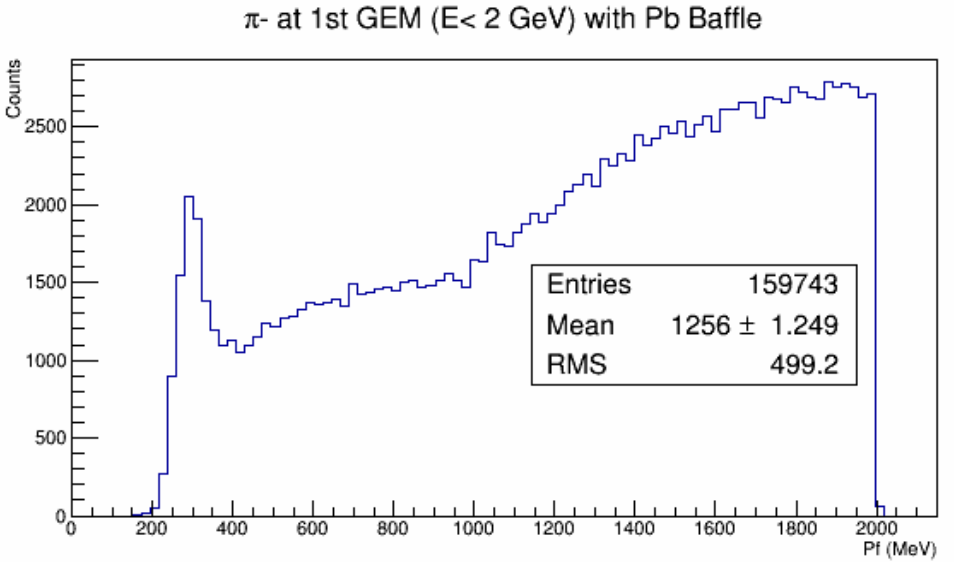


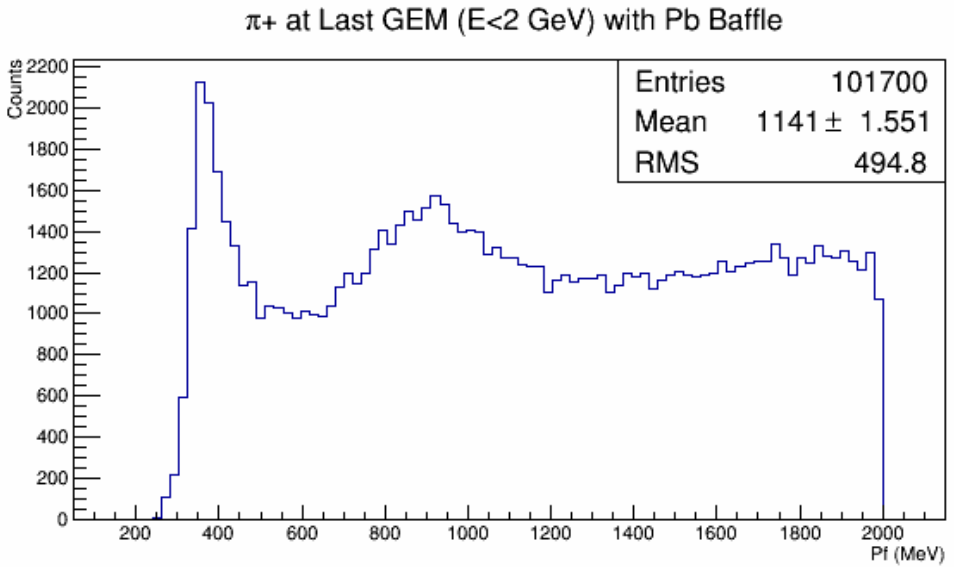
Simulation Test 1

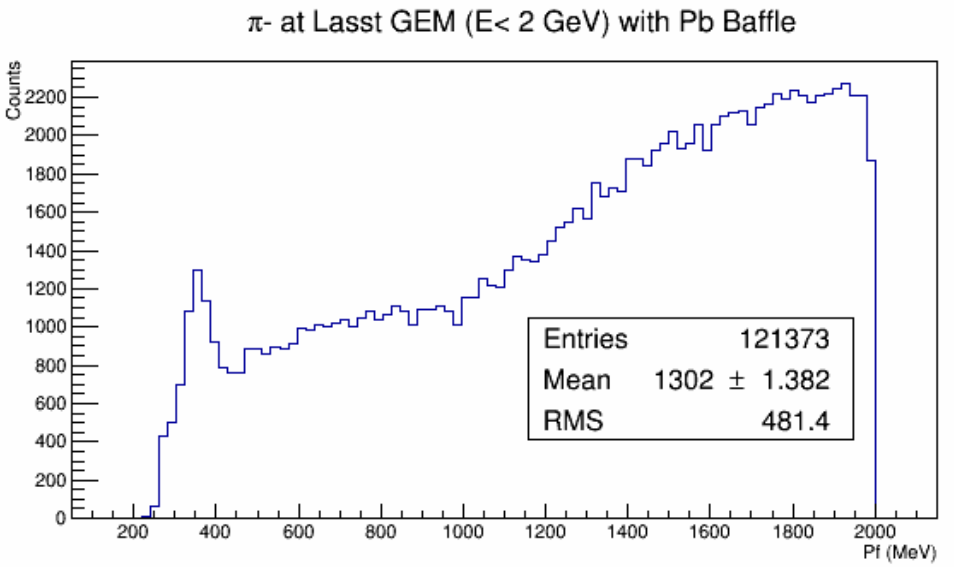
- Generated Pions (+/-) at the target (No Physics)
  - Mean : 1*GeV, 30*deg, 180*deg"
  - Spread : 1*GeV, 30*deg, 180*deg
  - Mean (Vertex) : (0, 0, 0) cm
  - Spread (Vertex) : (0.1, 20) cm
- Used Lead and Kryptonite baffles
- Only primary tracks are considered

Primary Momentum at GEM Planes with Lead Baffles

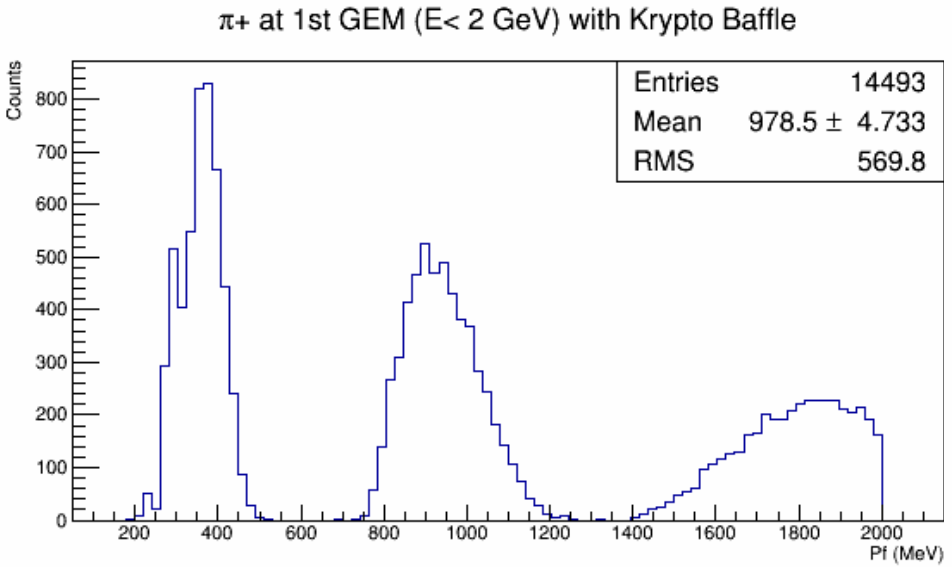


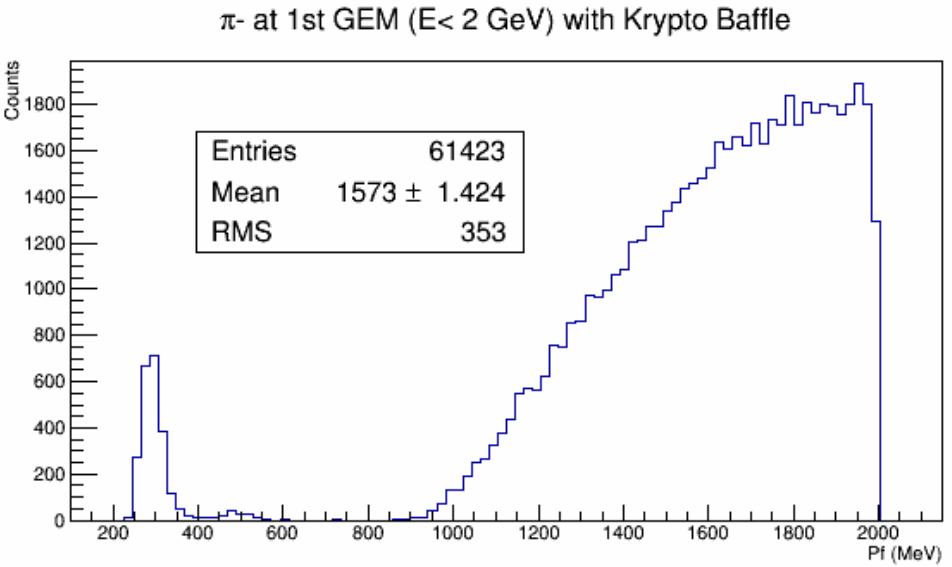


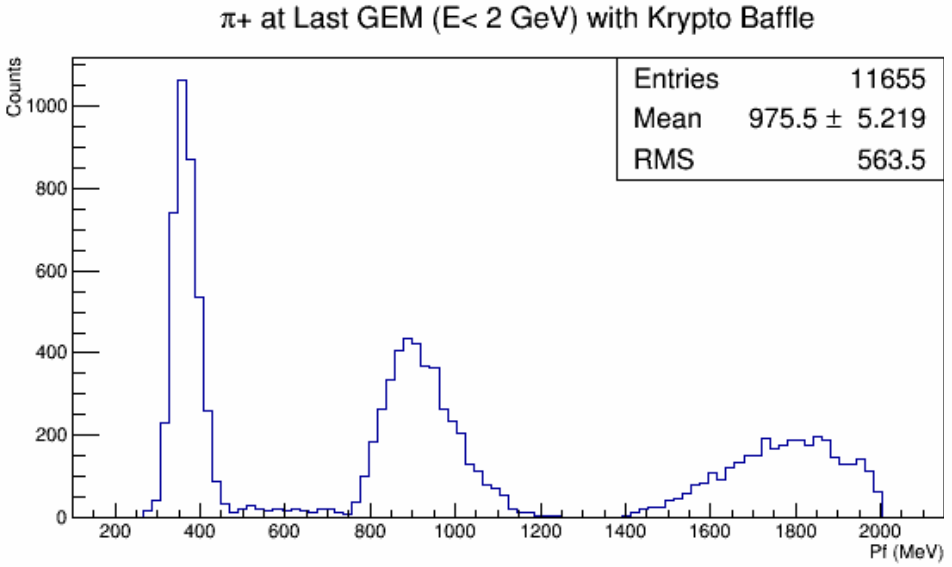


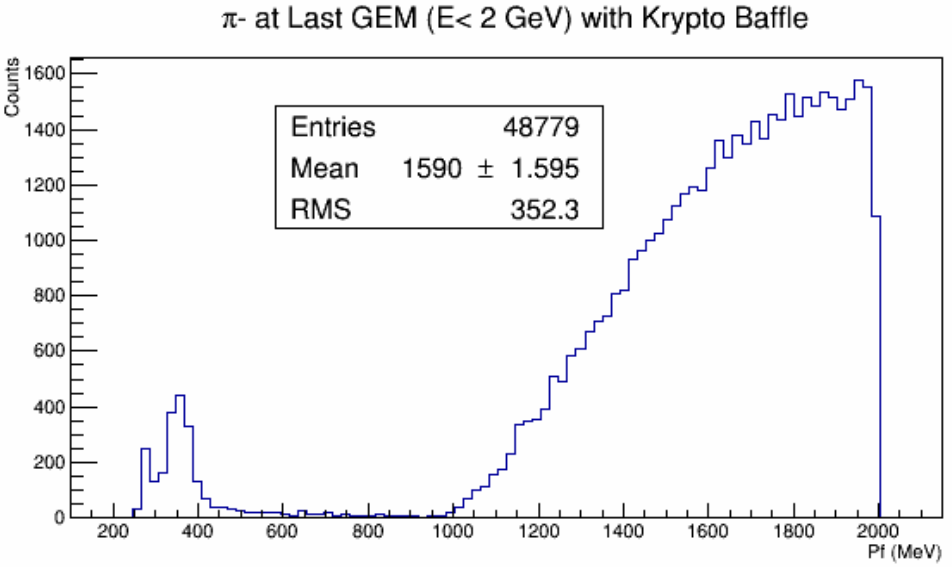


Primary Momentum at GEM Planes with Kryptonite Baffles

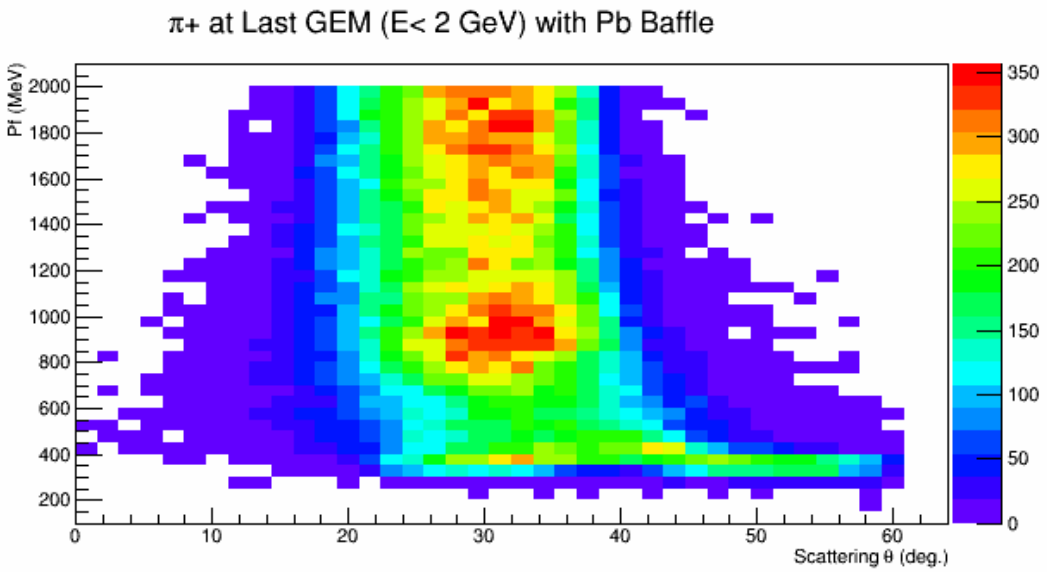


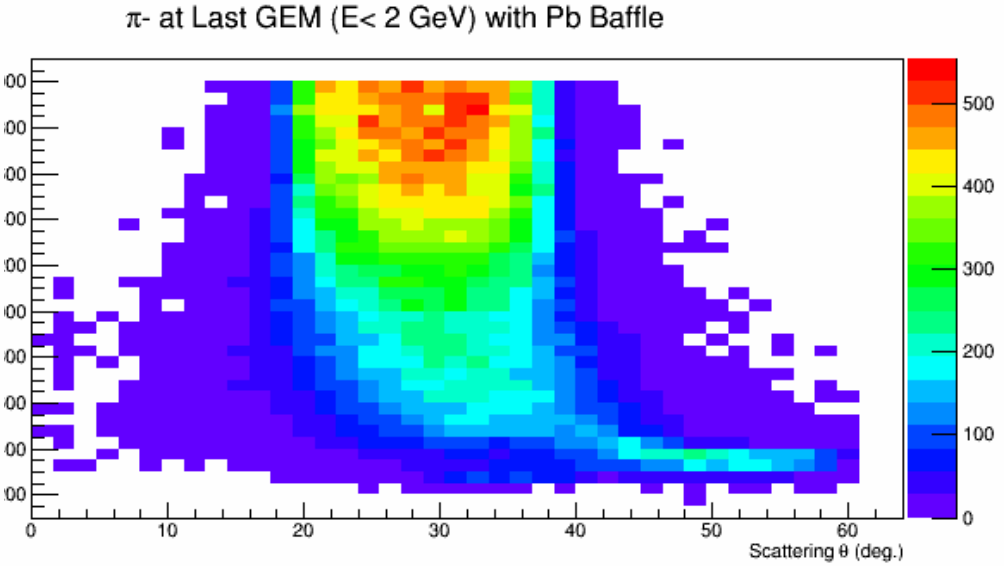


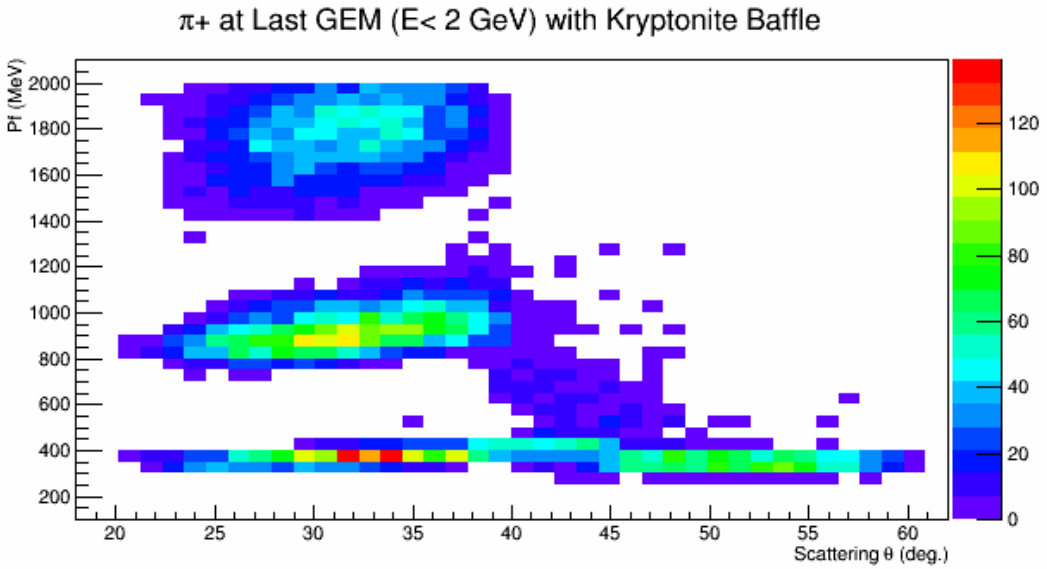


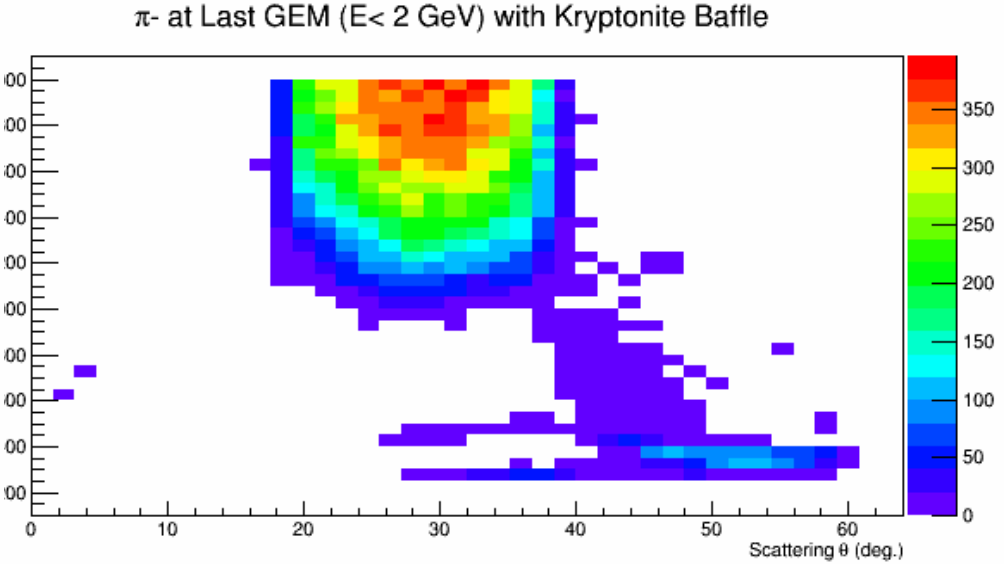


Simulation Test 1 : Kinematics Summary





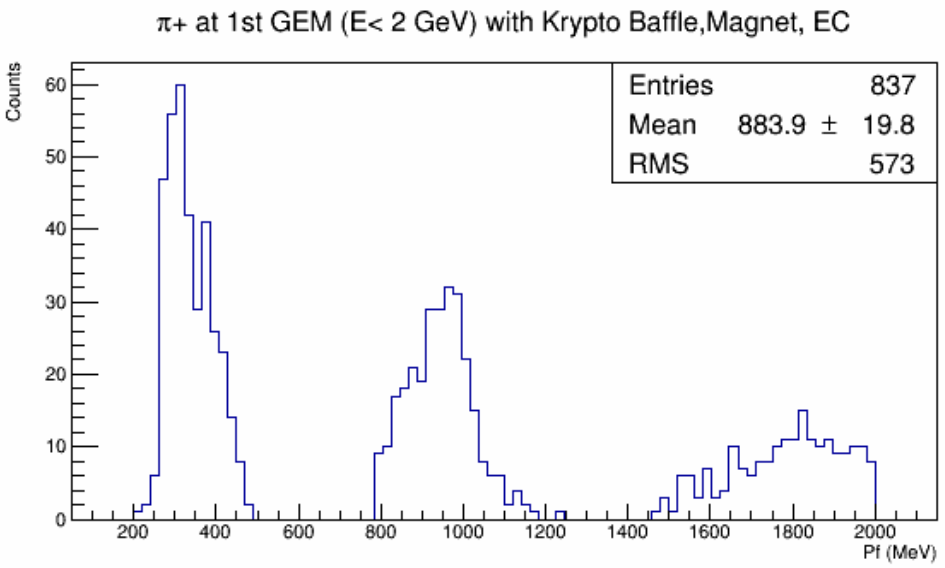


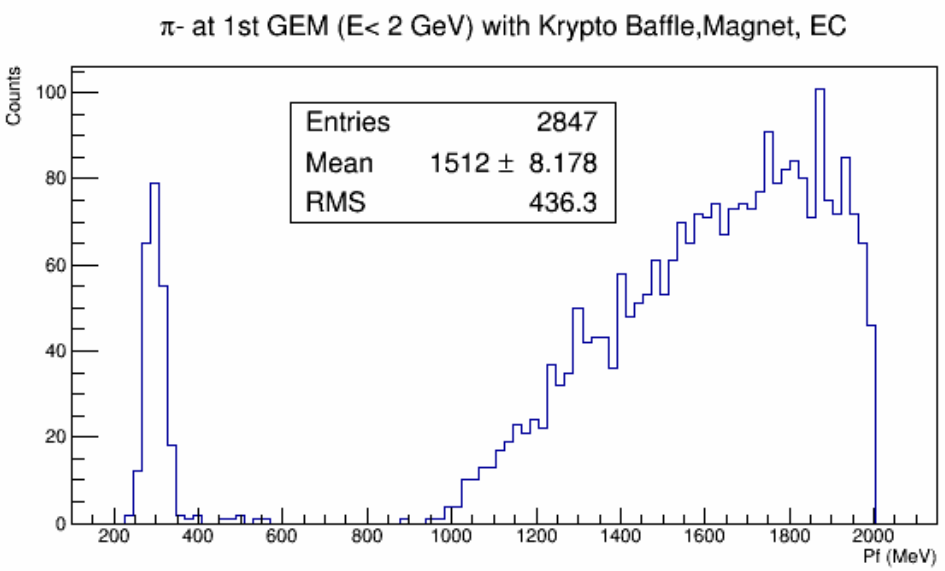


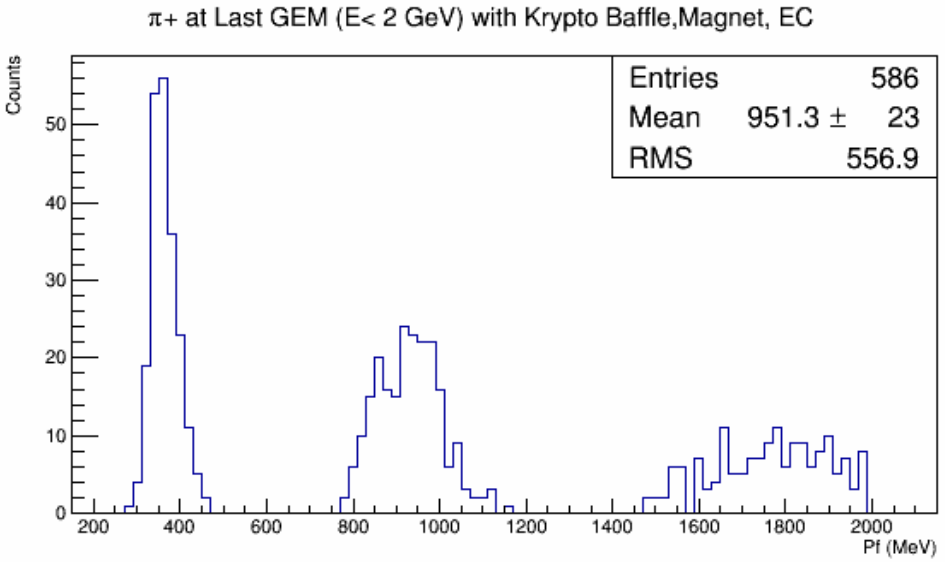
Simulation Test 2 : All Kryptonite Geometry

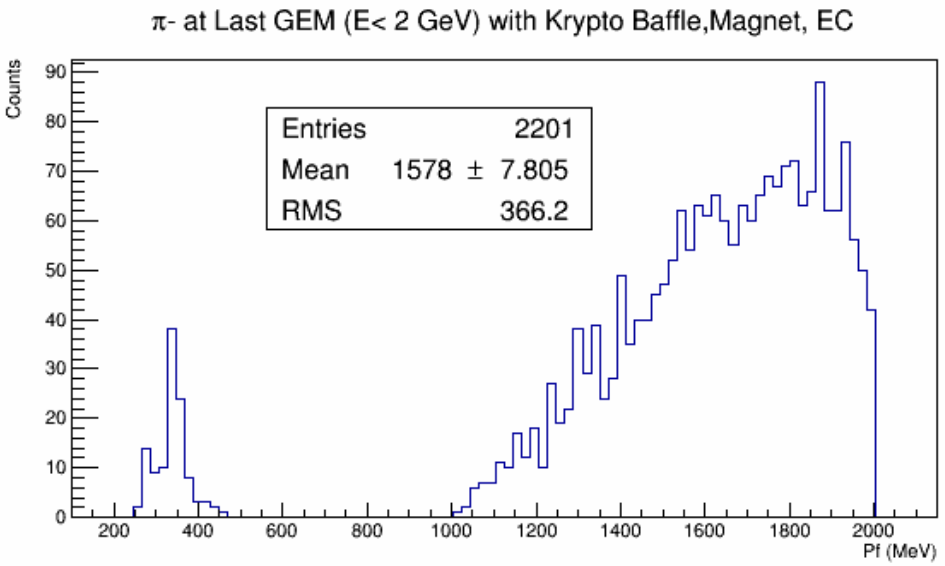
- Used kryptonite for,
  - Magnet, baffles, and EC-forward angle
- Input Wiesser-fit pions (+/-)
- Only primary tracks are considered

Pi + and - : All Kryptonite Geometry

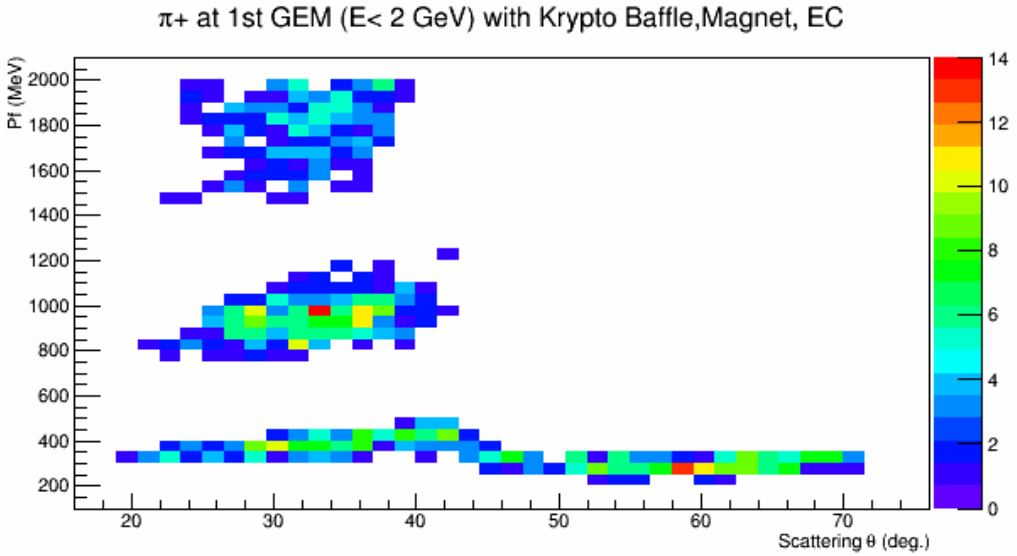


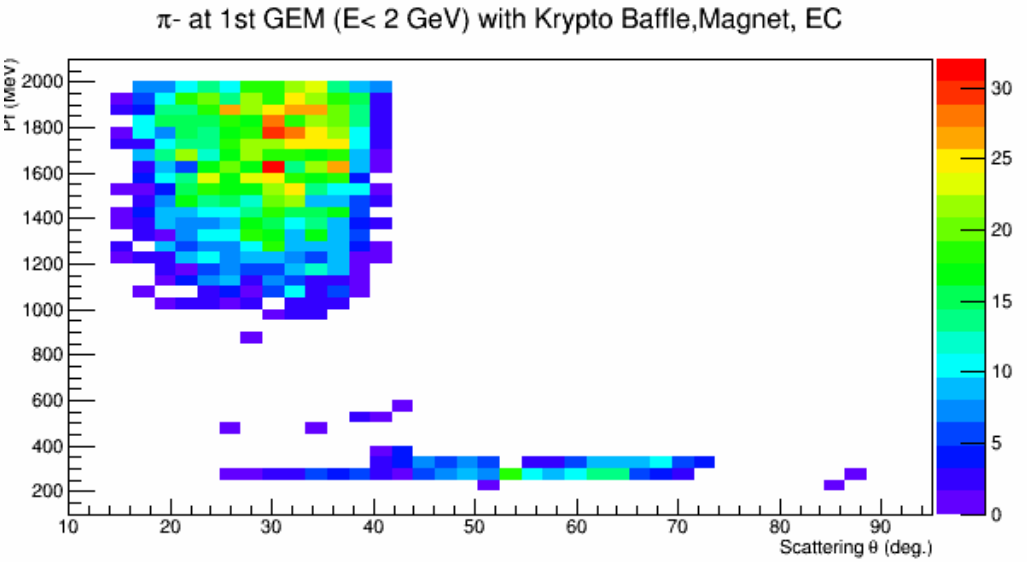


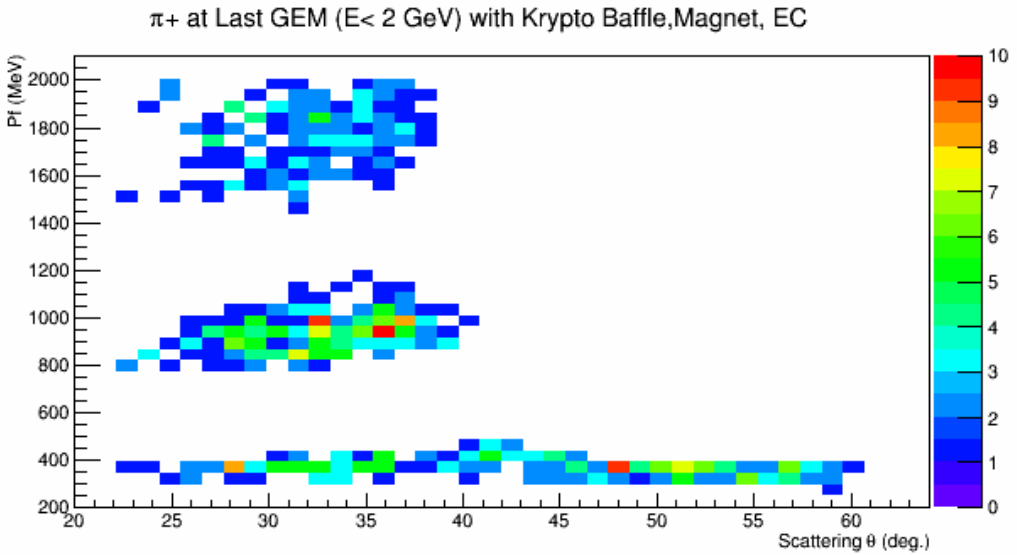


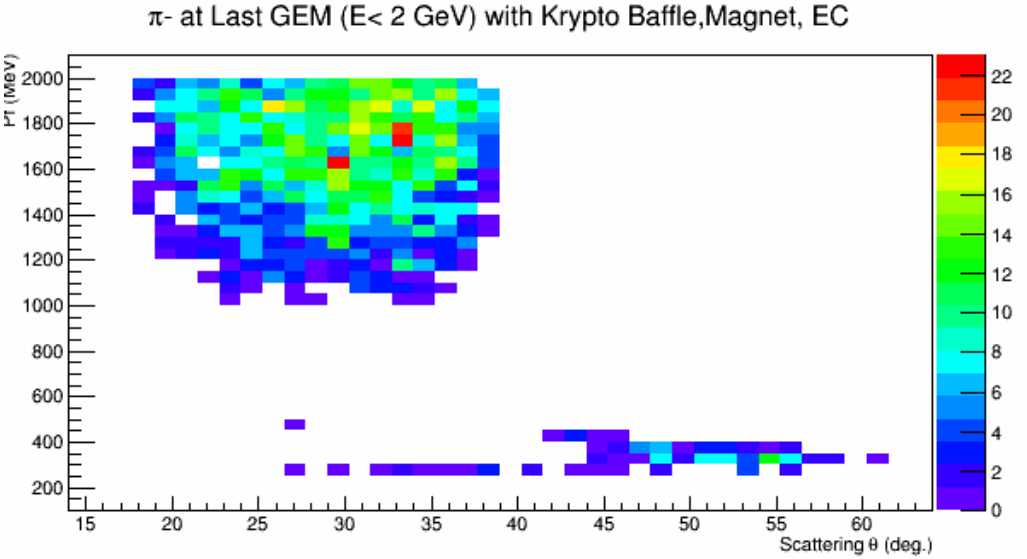


Pi + and - : All Kryptonite Geometry









Supplementary

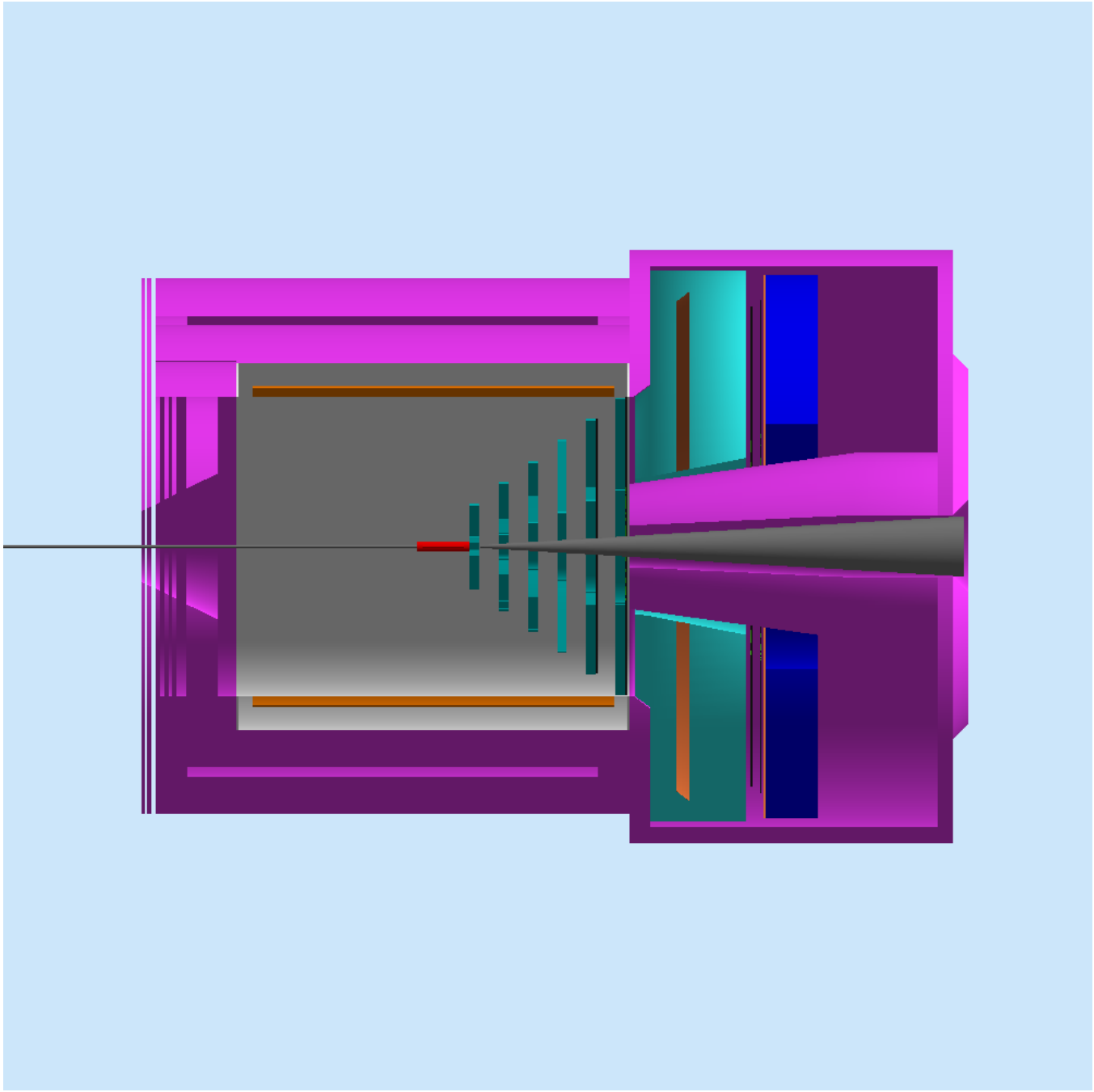
Input Summary

- Pions(+/-) generated with following input conditions using Wisser fits,
  - LD2 target
  - Luminosity 540e+36 Hz/cm2 or 22 uA
  - Incident electron beam energy: 11 GeV
  - Target length: 40 cm
  - Raster: 2x2 mm^2
  - 1 million events

Simulation Summary

- Used solgemc and results are weighted using the pion rate
- Things included in the simulation,
  - CLEO solenoid
  - Target
  - Al Beamline
  - Pb Baffles
  - Cerenkov
  - GEM (4 GEMs)
  - EC forward-angle
- Field is ON
- Ran about 1 million events

Simulation Summary



Pi+ Rate Summary

Process	Baffle Geometry	
	Lead (MHz/uA)	Kryptonite (MHz/uA)
π^+ (p> 0.3 GeV)	235	40
π^+ (p> 1 GeV)	17	1
π^+ (p> 2 GeV)	1	0.02
π^- (all)*	3	0.1

* Only π^- generated by π^+

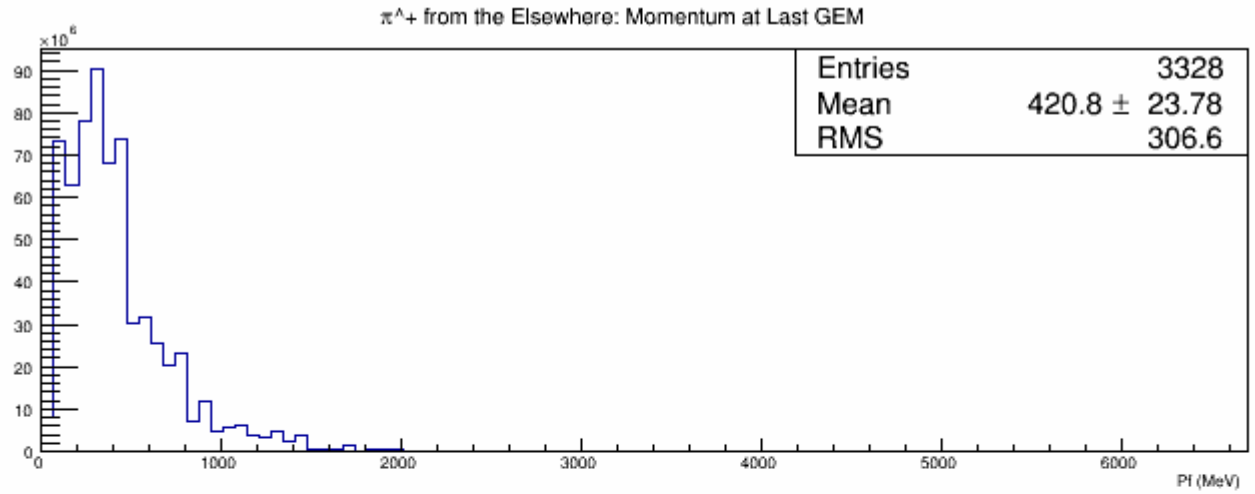
Pi- Rate Summary

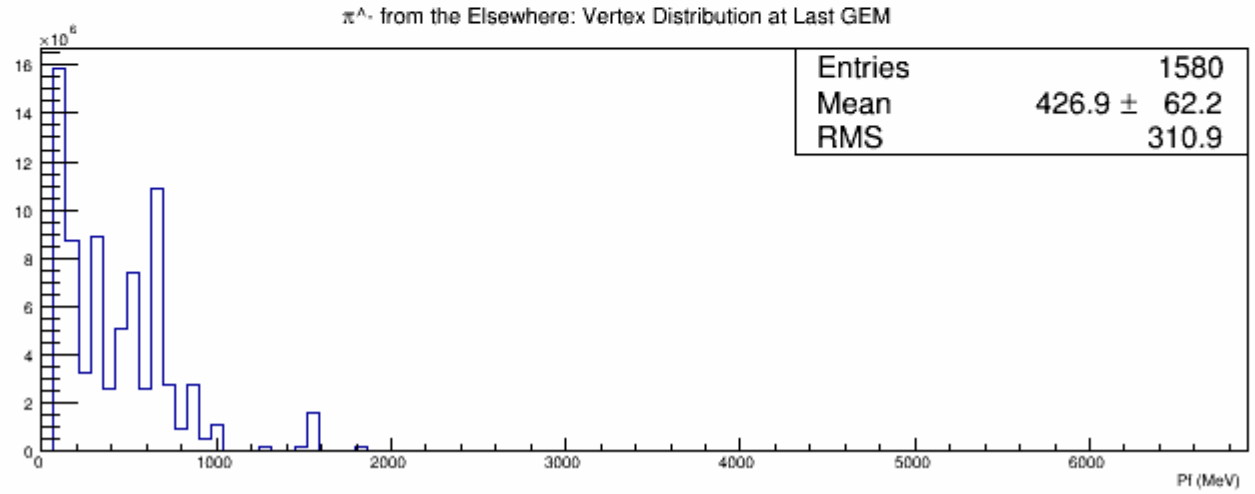
Process	Baffle Geometry	
	Lead (MHz/uA)	Kryptonite (MHz/uA)
π^- (p> 0.3 GeV)	178	25
π^- (p> 1 GeV)	31	15
π^- (p> 2 GeV)	3	2
π^+ (all)*	3	0.2

* Only π^+ generated by π^-

Comparison with Pion(-)

- Compare Pion(+) with Pion(-) energies With Lead Baffles
- Almost all the Pi(-) are generated outside of the target
- Pi- rate : 2.7 MHz



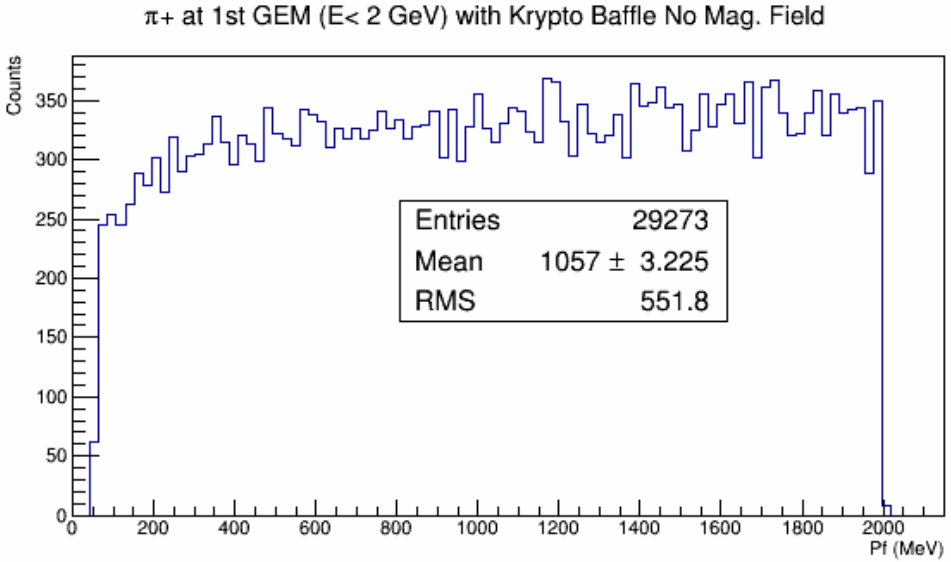


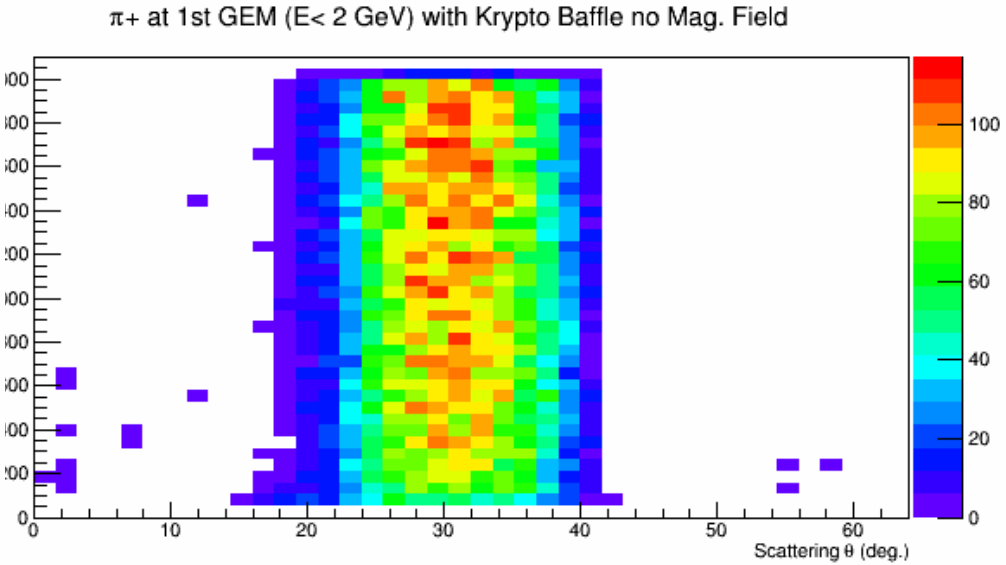
Input Generation

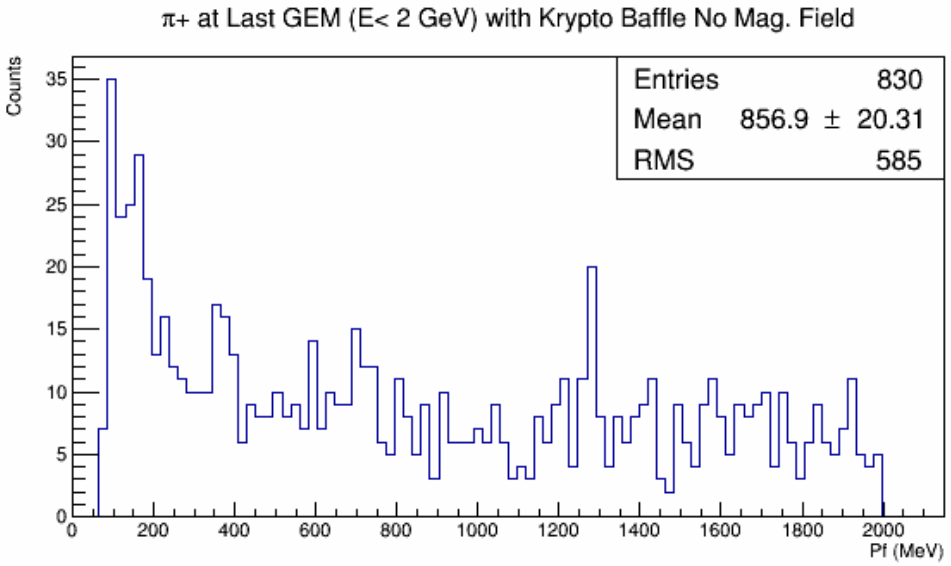
Simulation Test 3 : No Field Check

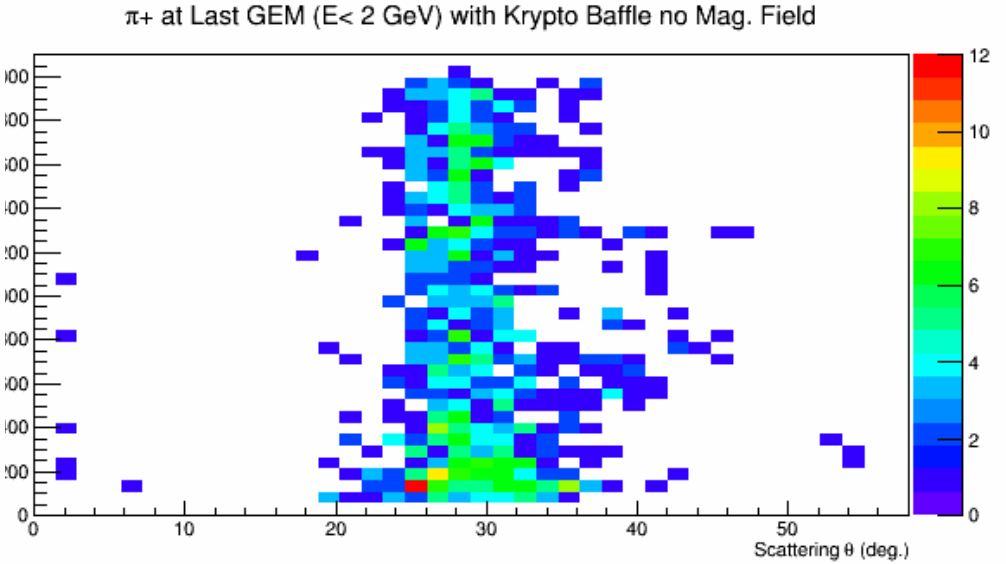
- Input Isotropic pion distribution described at the beginning
- Used Kryptonite baffles
- Simulate with no magnetic filed
- Only primary tracks are considered

Pi+ : No Field Check

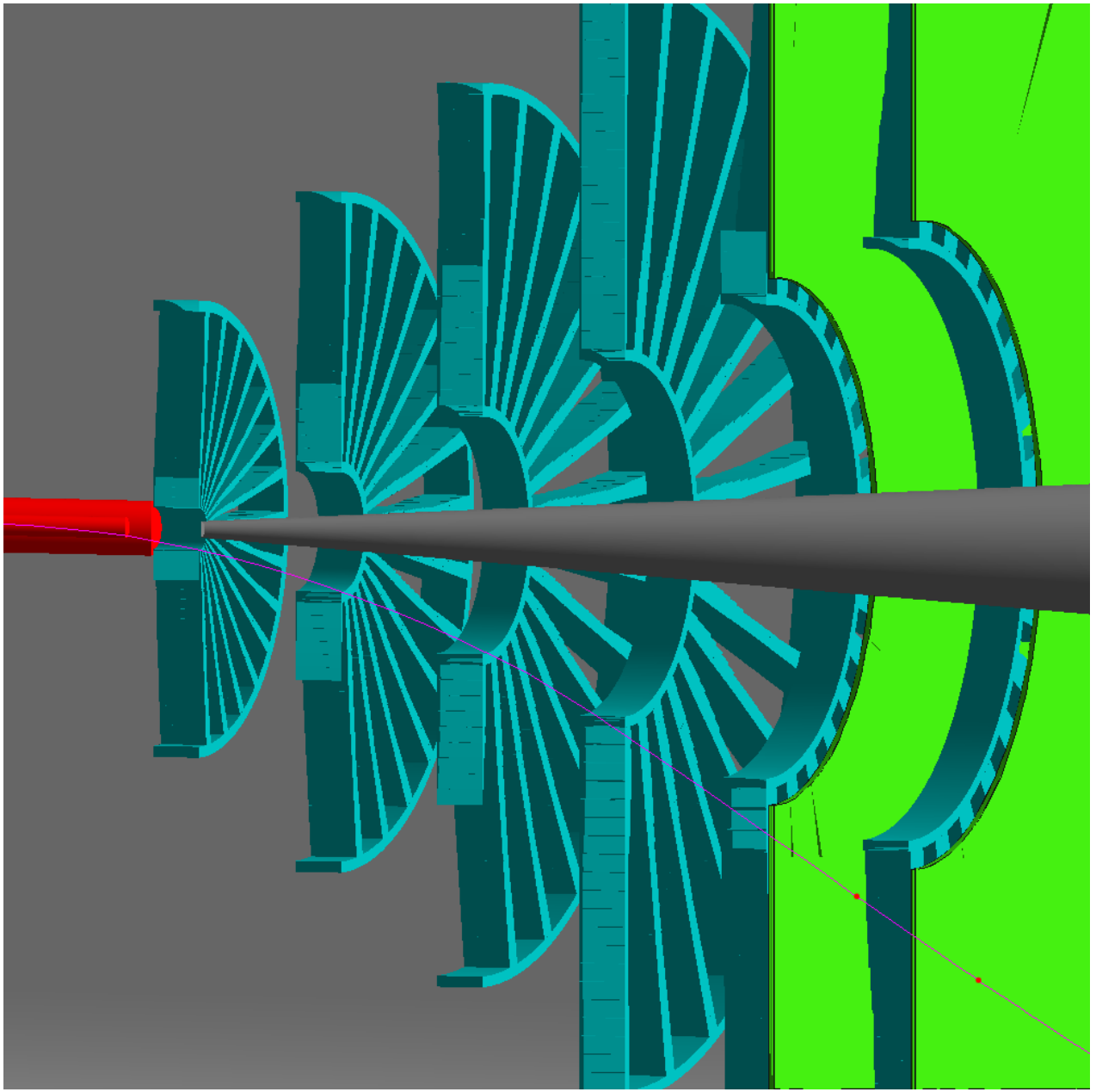




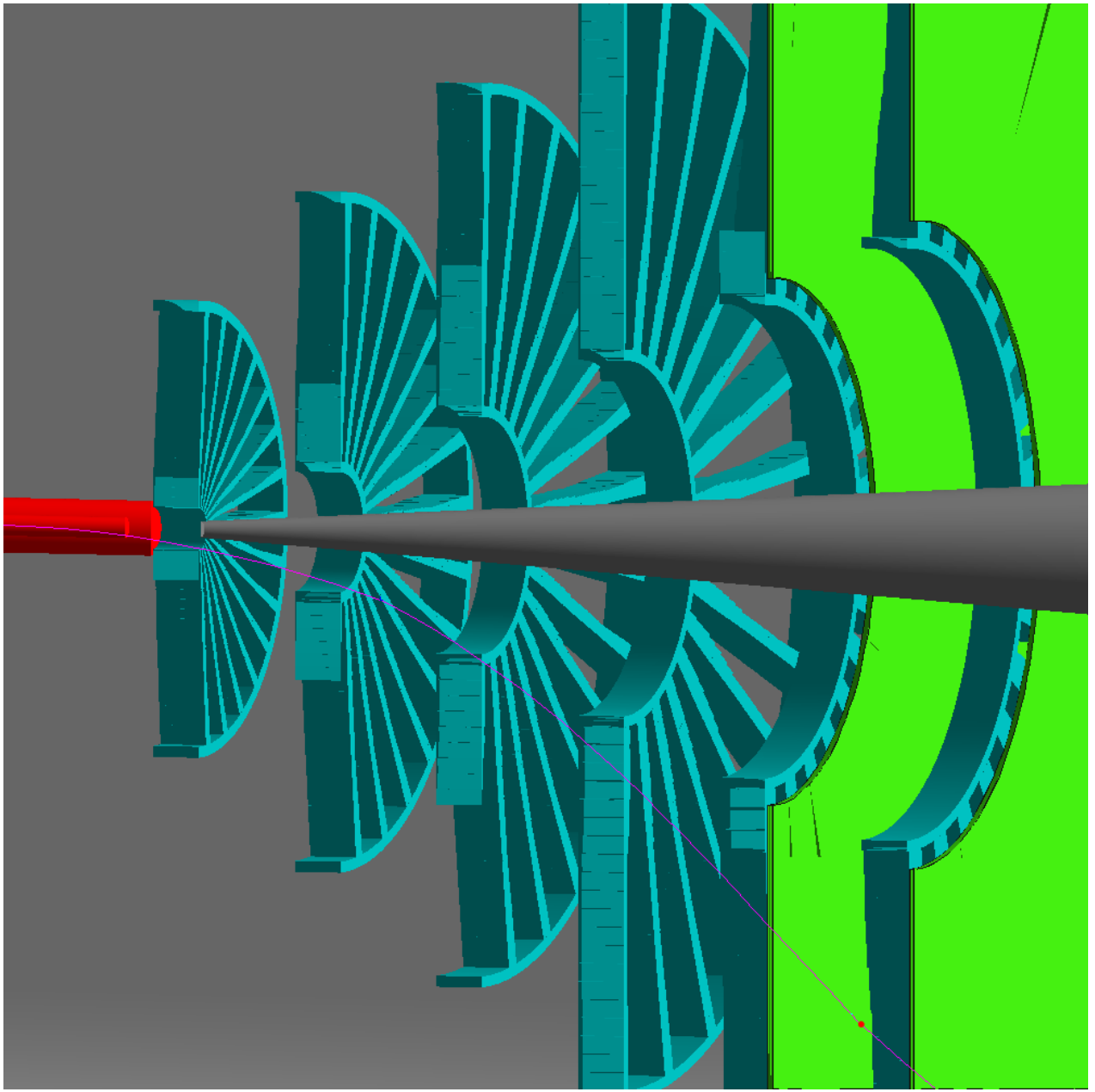




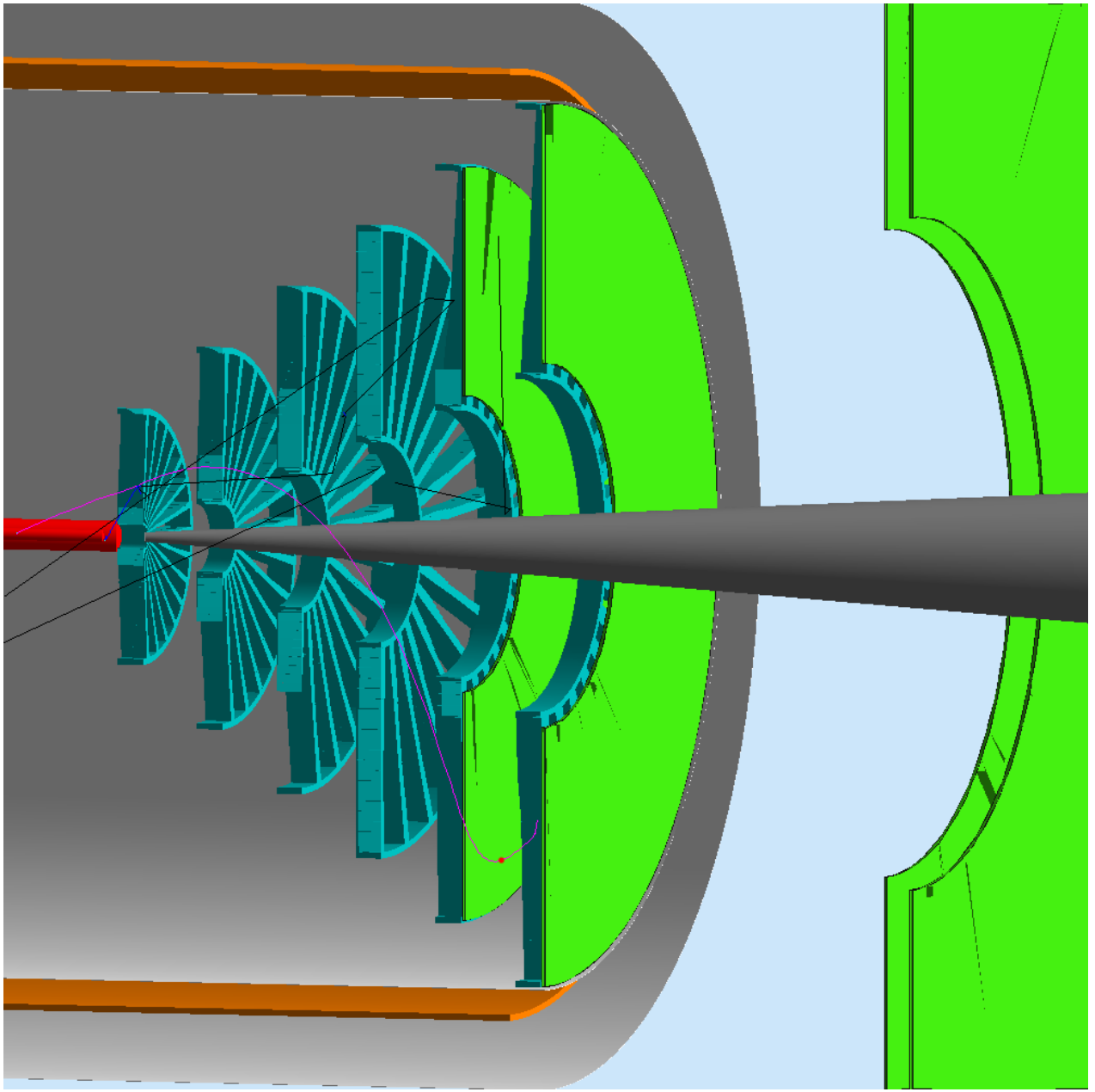
Pi+ Tracks



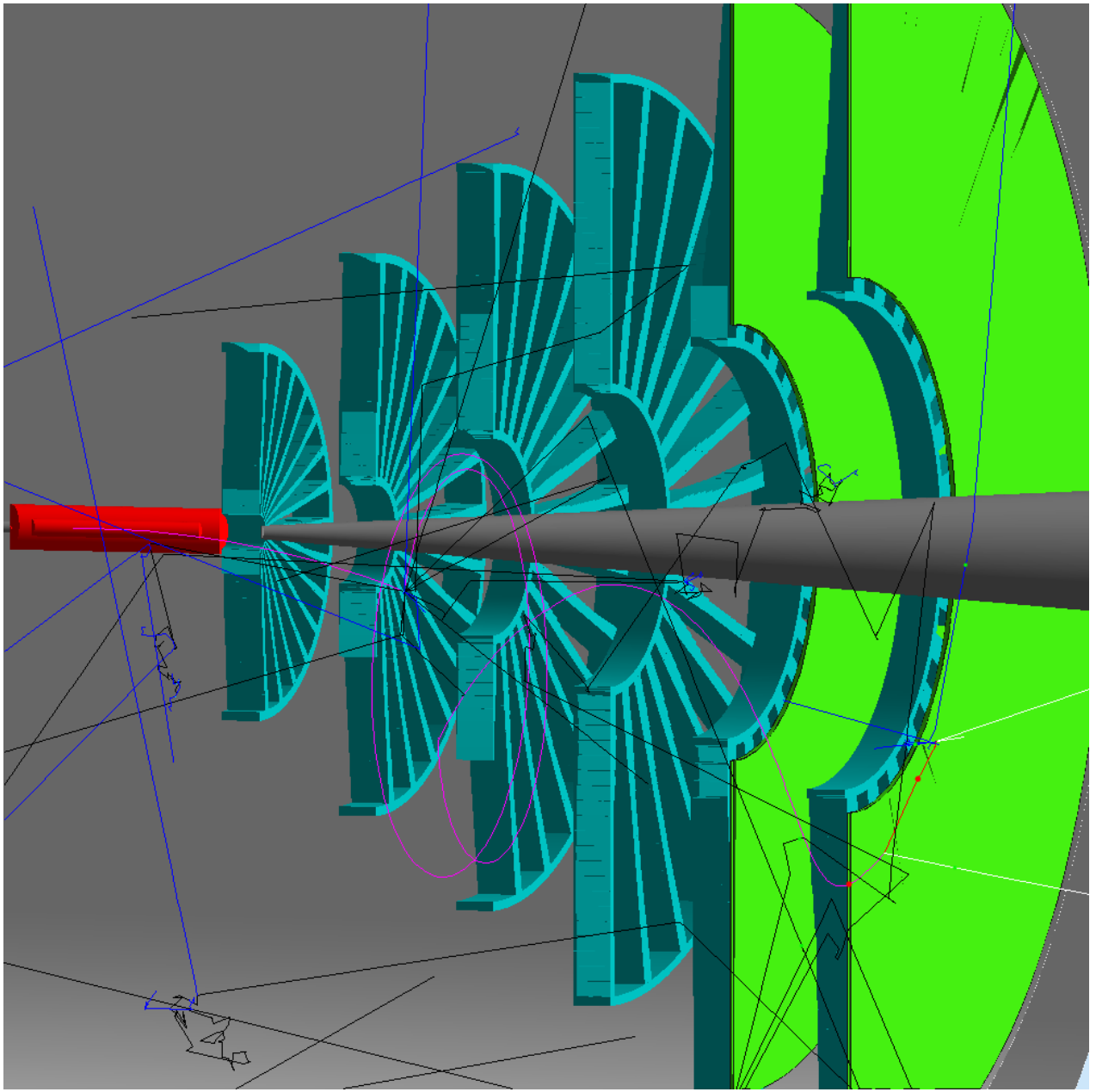
Pi+ Tracks



Pi+ Tracks



Pi+ Tracks



Pi+ Tracks