

EIC FST Fun4All Simulation

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Outline

- Simulation of FST with GEM and a gas RICH detector
- Update on pseudorapidity correction

Detector Setup

Version 4

Barrel layer

Layer	Half length (cm)	r (cm)	Pixel pitch (um)	Silicon thickness (um)
0	20	3.64	20	50
1	20	4.81	20	50
2	25	5.98	20	50
3	25	9.2	20	100
4	25	17	20	100
5	25	27	20	100

Plane detector

Plane	z (cm)	r _{in} (cm)	r _{out} (cm)	Pixel pitch (um)	Silicon thickness (um)
0	35	4	25	20	50
1	53	4.5	36	20	50
2	77	5	36	20	50
3	101	6	38.5	20	50
4	125	6.5	45	20	50
5	270	15	45	20	50

Version 4 + GEM

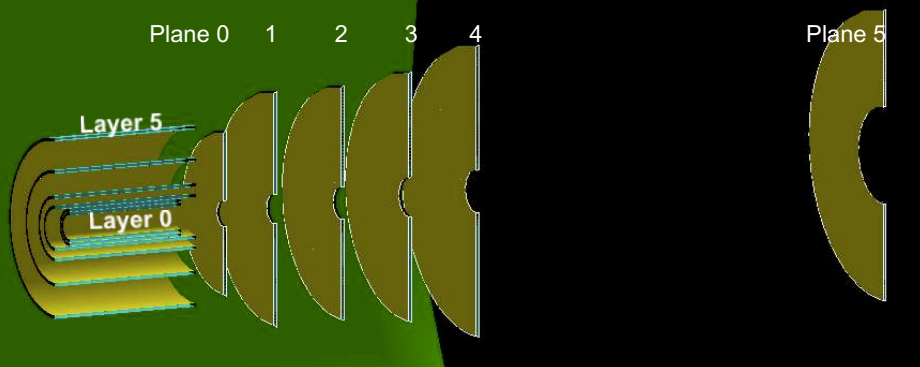
Plane detector

Plane	z (cm)	r _{in} (cm)	r _{out} (cm)	Pixel pitch (um)	Silicon thickness (um)
0	35	4	25	20	50
1	53	4.5	36	20	50
2	77	5	36	20	50
3	101	6	38.5	20	50
4	125	6.5	45	20	50

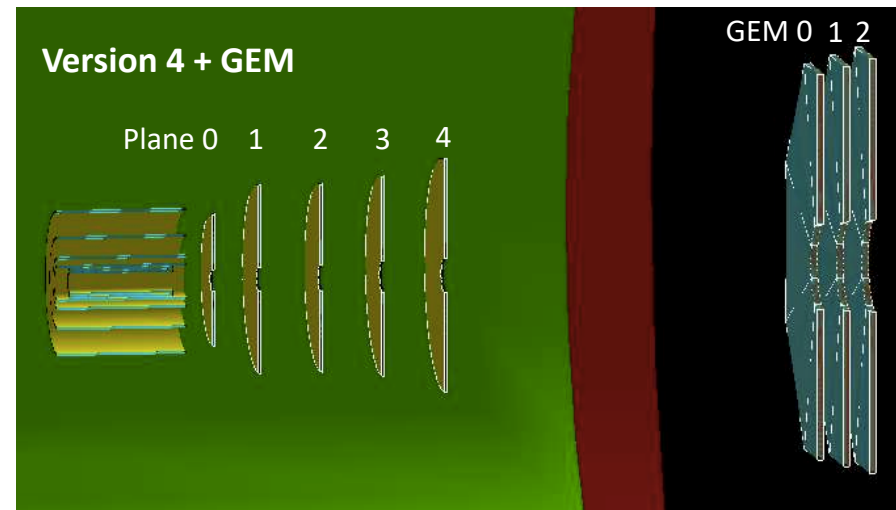
GEM

Plane	z (cm)	η_{min}	η_{max}	r res (um)	ϕ res (um)	Gas
0	275	2	3.5	100	70	methane
1	285	2	3.5	100	70	methane
2	295	2	3.5	100	70	methane

Version 4



Version 4 + GEM



Detector Setup

Version 4

Barrel layer

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0	20	3.64	20	50
1	20	4.81	20	50
2	25	5.98	20	50
3	25	9.2	20	100
4	25	17	20	100
5	25	27	20	100

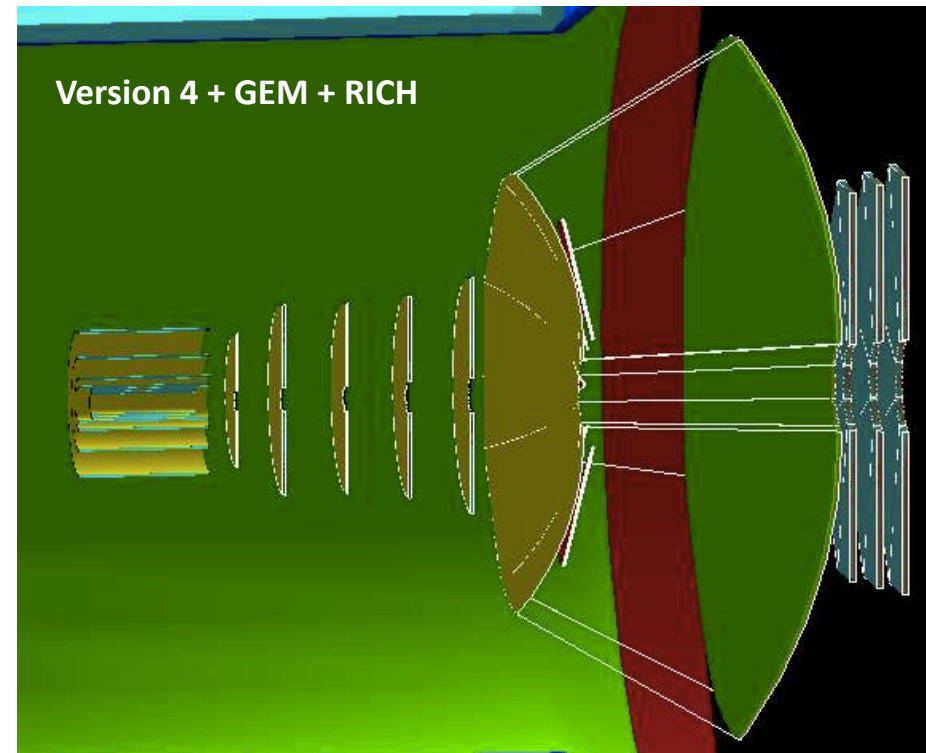
Plane detector

Plane	z (cm)	r _{in} (cm)	r _{out} (cm)	Pixel pitch (um)	Silicon thickness (um)
0	35	4	25	20	50
1	53	4.5	36	20	50
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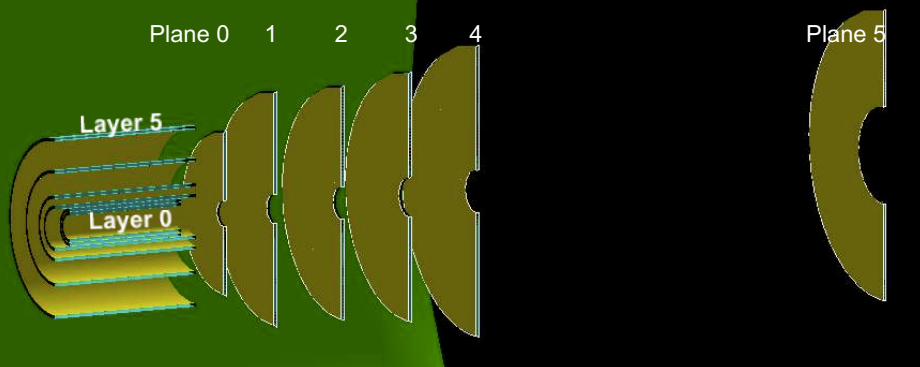
Version 4 + GEM+Gas RICH

Plane detector

Plane	z (cm)	r _{in} (cm)	r _{out} (cm)	Pixel pitch (um)	Silicon thickness (um)
0	35	4	25	20	50
1	53	4.5	36	20	50
2	77	5	36	20	50
3	101	6	38.5	20	50
4	125	6.5	45	20	50

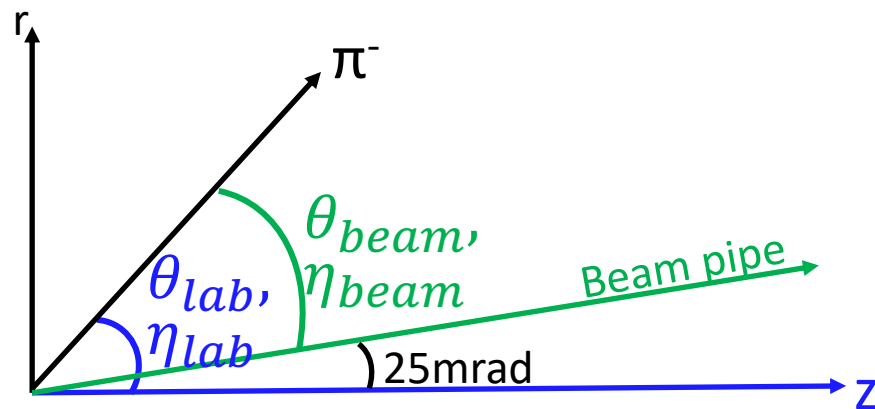


Version 4



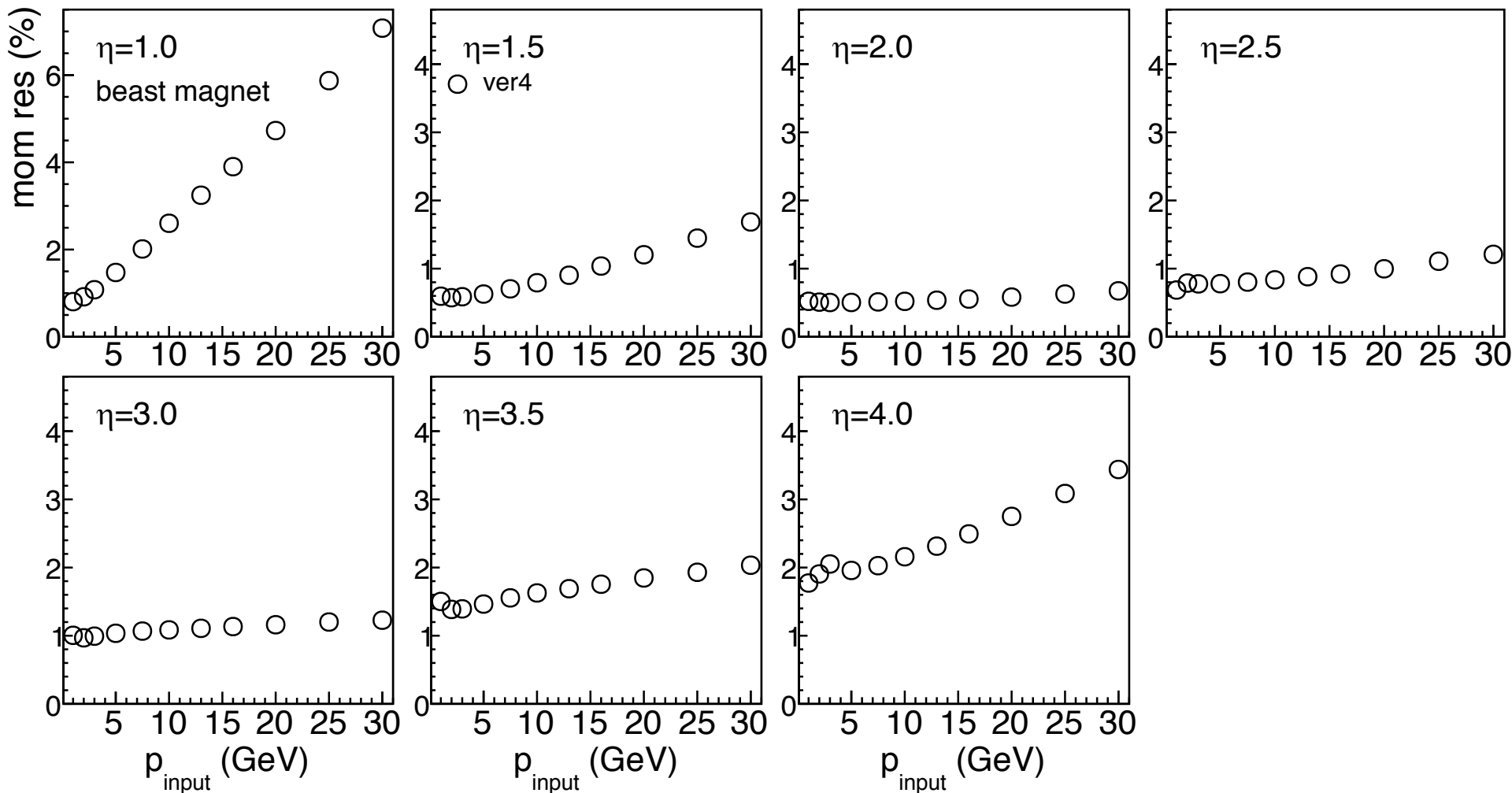
Simulation Setup

- Event configuration:
 - single π^- per event.
 - Vertex (0,0,0), 20 μ m smearing in both x and y direction
 - 50k events in each $p \otimes \eta$ bin
- Track configuration:
 - Momentum: 1-30 GeV with varying increments
 - Pseudorapidity: 1-4 with a 0.5 increment
 - Hit efficiency at 95%.
- Magnetic Field: Beast Magnet peaks at 3T

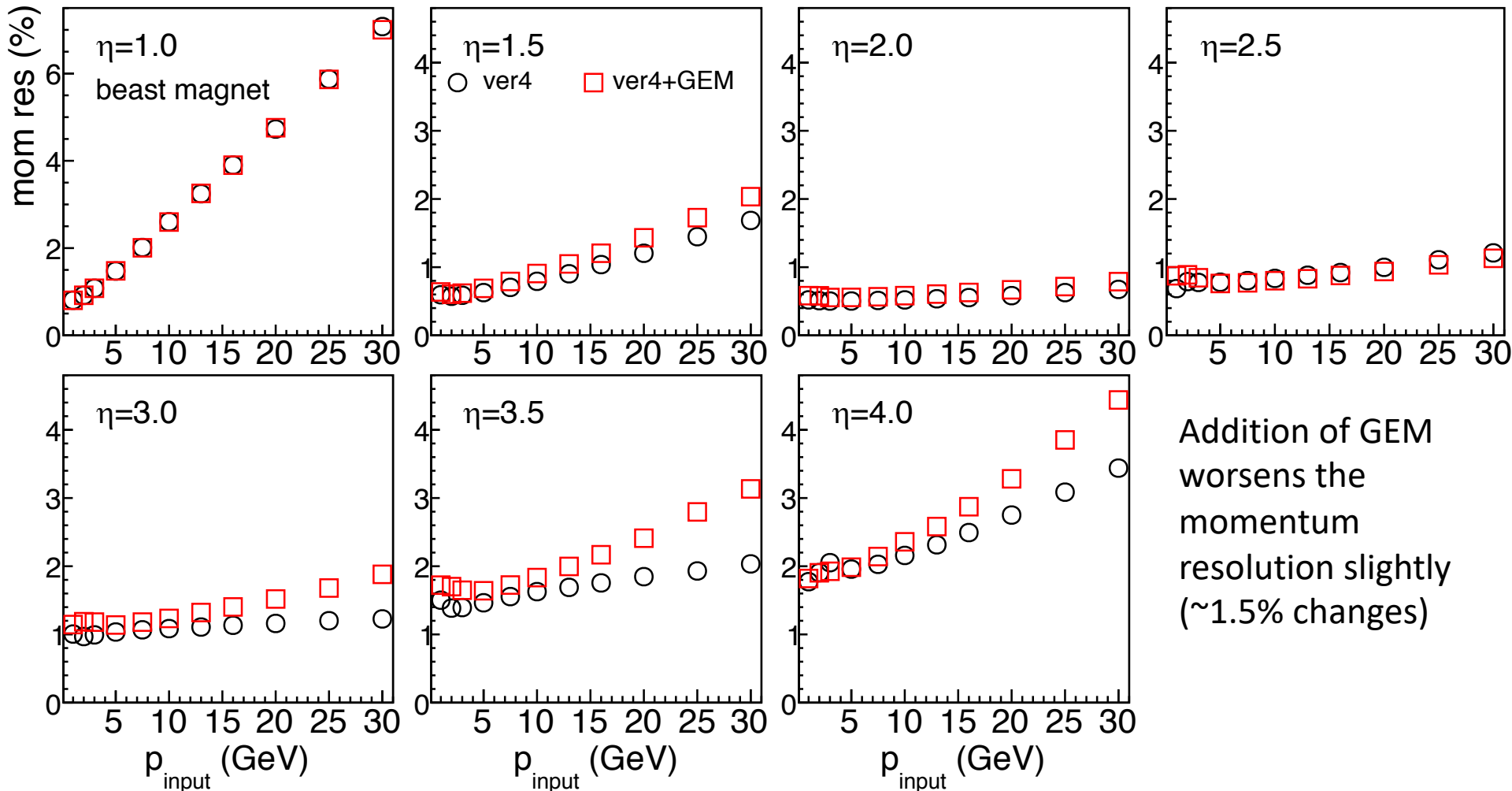


η_{beam} w.r.t. to the ion beam pipe	η_{lab} w.r.t to lab frame
1	0.962
1.5	1.43
2	1.91
2.5	2.36
3	2.77
3.5	3.15
4	3.48

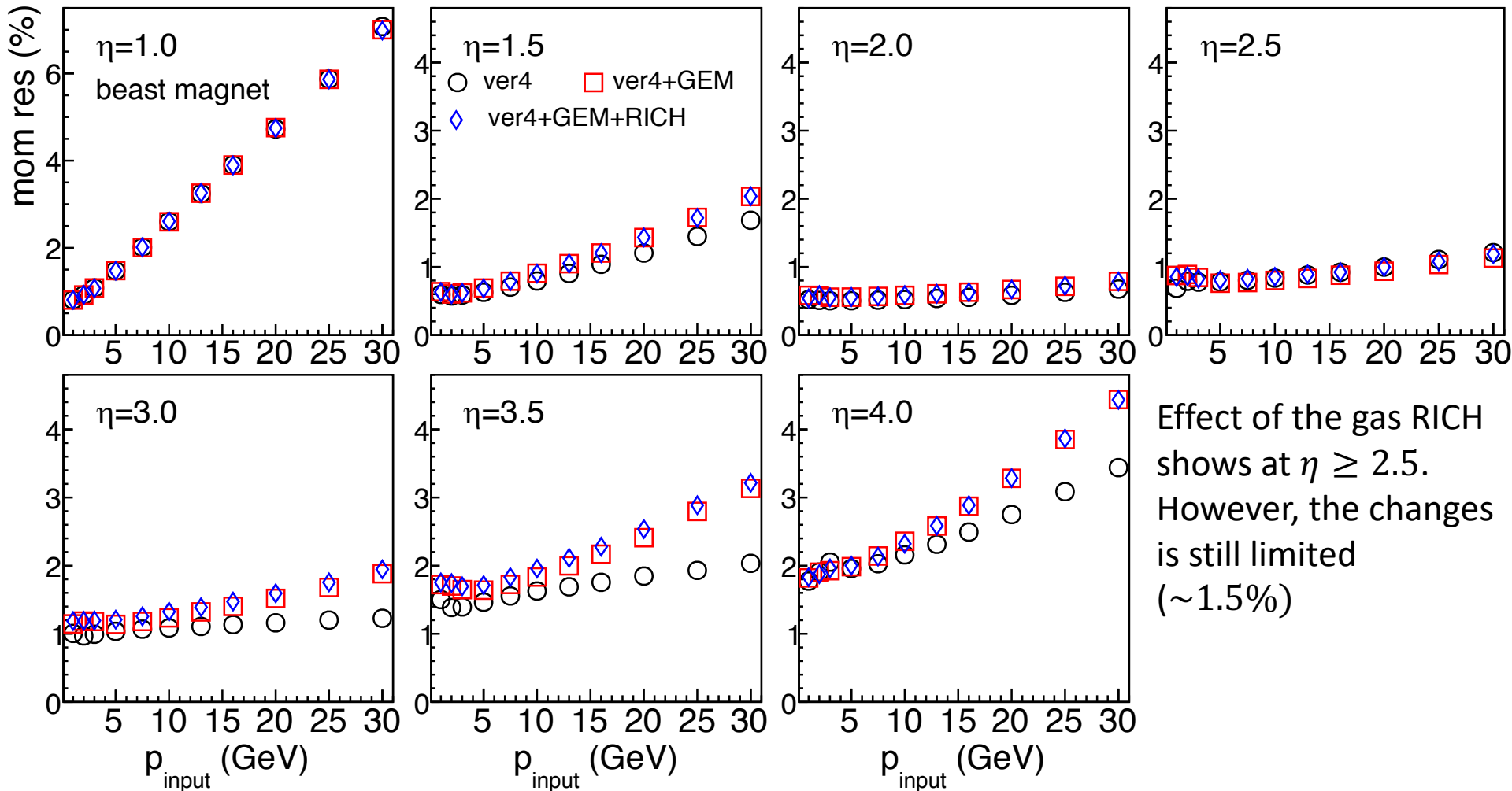
Momentum Resolution Using BeAST Magnet



Momentum Resolution Using BeAST Magnet



Momentum Resolution Using BeAST Magnet



Summary

- The added materials of the gas RICH and the GEM detectors worsen the momentum resolution ($<1.5\%$)

Ongoing Work

- Continue improving FST design
- Material budget of GEM, RICH and beam pipe
- Input ePythia (pythia 6) events in Fun4all simulation

Back Up

Detector Initial Design in Fun4all

Material sublayers of the plane detectors
(arbitrary scale)

