

EIC FST Fun4All Simulation

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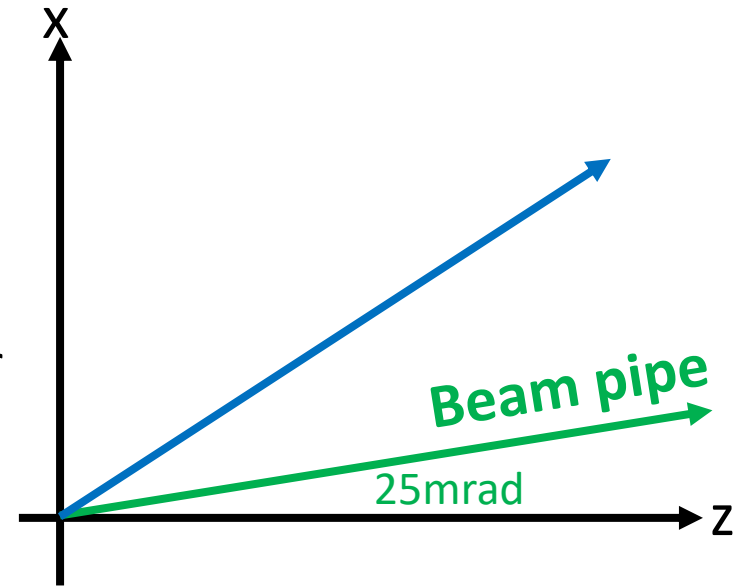
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Outline

- Version 5 design of the FST detector
- Momentum and DCA resolutions of version 5 design with the beam angle correction

Simulation Setup

- Event configuration:
 - single π^- per event.
 - Vertex (0,0,0)
 - no smearing for vertex reconstruction
 - 20 μ m smear in x and y direction for track reconstruction
 - 7.5M events in each p_T bin
- Track configuration:
 - p_T : 1-30 GeV with varying increments
 - Pseudorapidity: 1-4 in lab frame
 - Hit efficiency at 95%
- Magnetic Field: Beast Magnet peaks at 3T



Pseudorapidity correction
for ion beam angle

Detector Setup

Version 4.1

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	36.4	100
4	125	6.5	45	36.4	100
5	270	15	45	36.4	100

Version 5

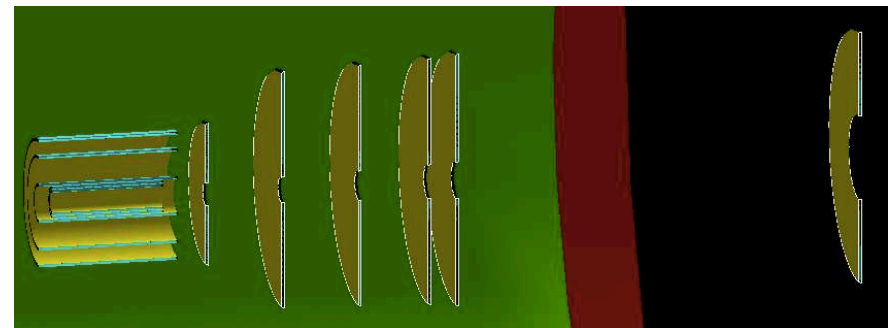
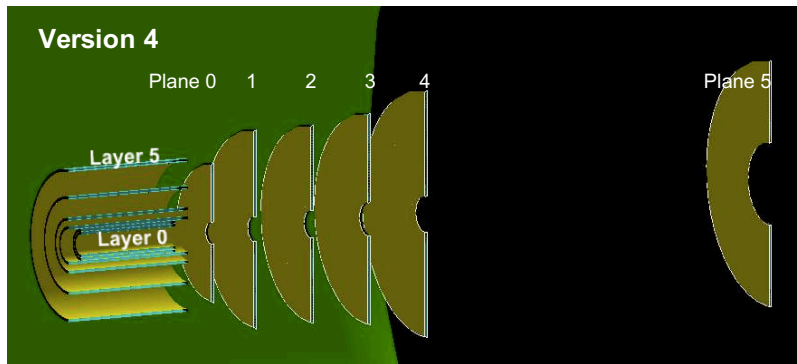
Barrel layer

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	16	36.4	100
4	25	22	36.4	100

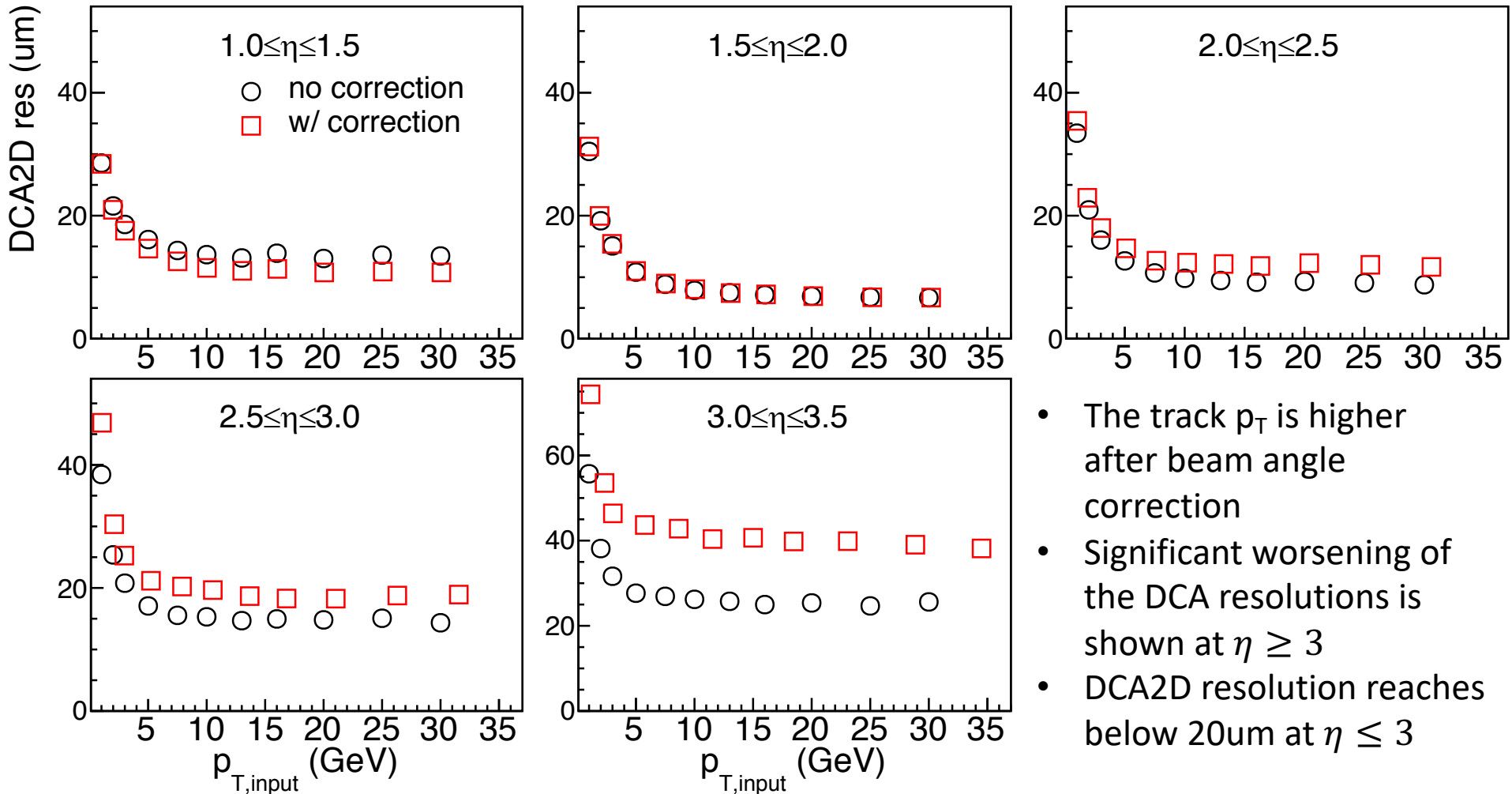
One less layer of barrel

Plane detector

Plane	z (cm)	r _{in} (cm)	r _{out} (cm)	Pixel pitch (um)	Silicon thickness (um)
0	35	4	25	20	50
1	62.3	4.5	42	20	50
2	90	5.2	43	20	50
3	115	6	44	36.4	100
4	125	6.5	45	36.4	100
5	270	15	45	36.4	100

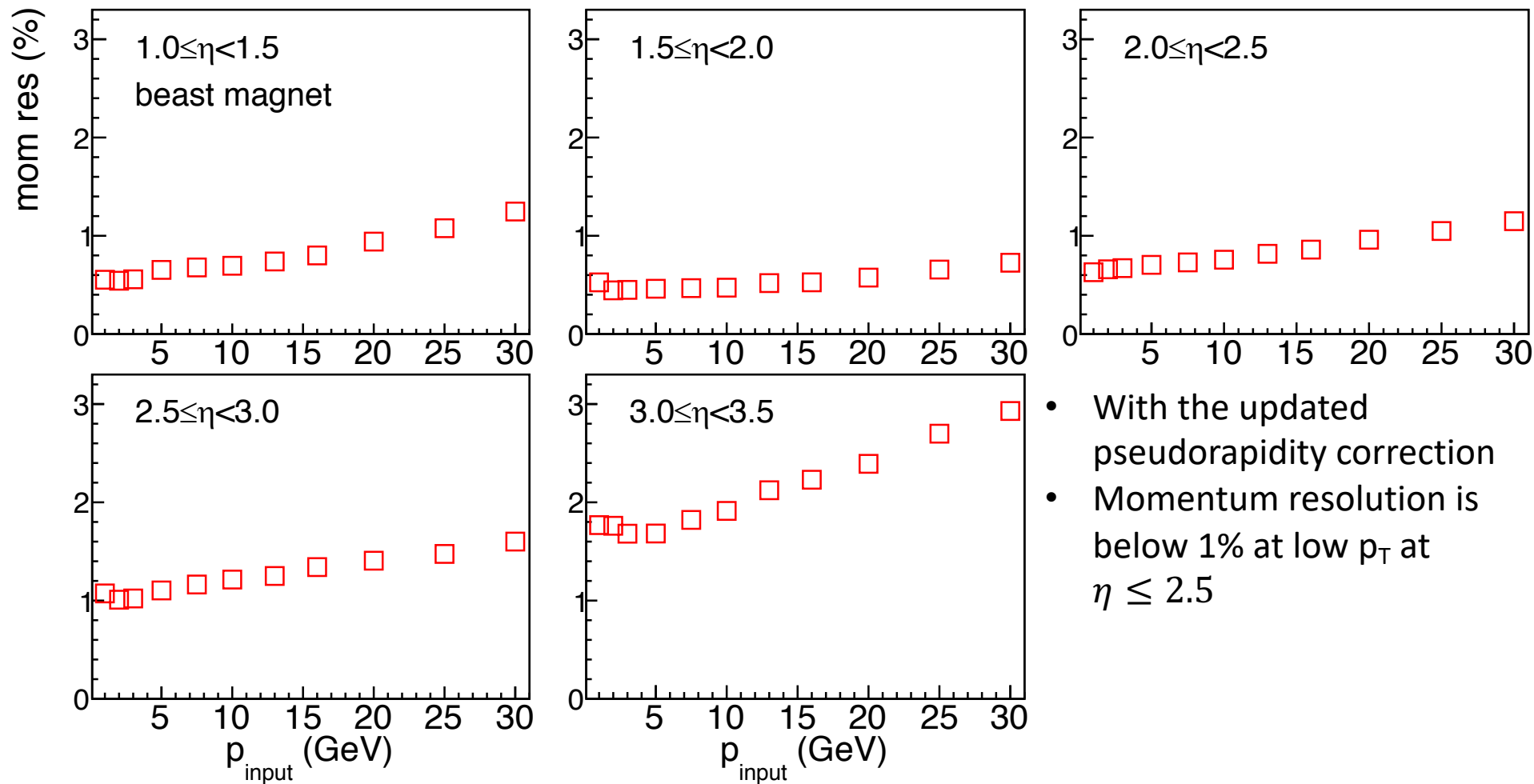


DCA2D Resolution



- The track p_T is higher after beam angle correction
- Significant worsening of the DCA resolutions is shown at $\eta \geq 3$
- DCA2D resolution reaches below 20 μm at $\eta \leq 3$

Full Momentum Resolution



- With the updated pseudorapidity correction
- Momentum resolution is below 1% at low p_T at $\eta \leq 2.5$

Summary:

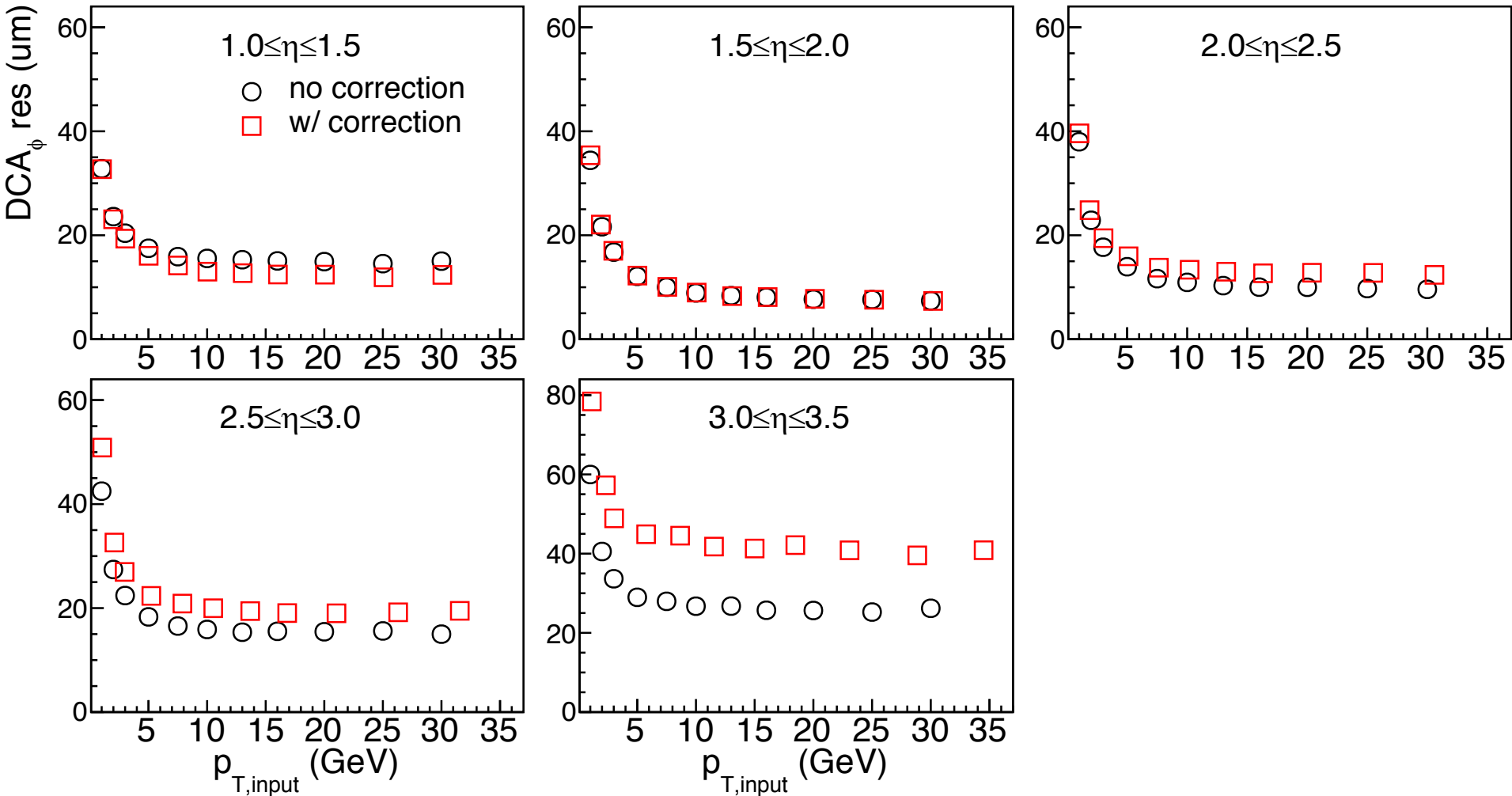
- DCA2D resolution reaches below 20um at $\eta \leq 3$
- Momentum resolution is below 1% at low p_T at $\eta \leq 2.5$

Next:

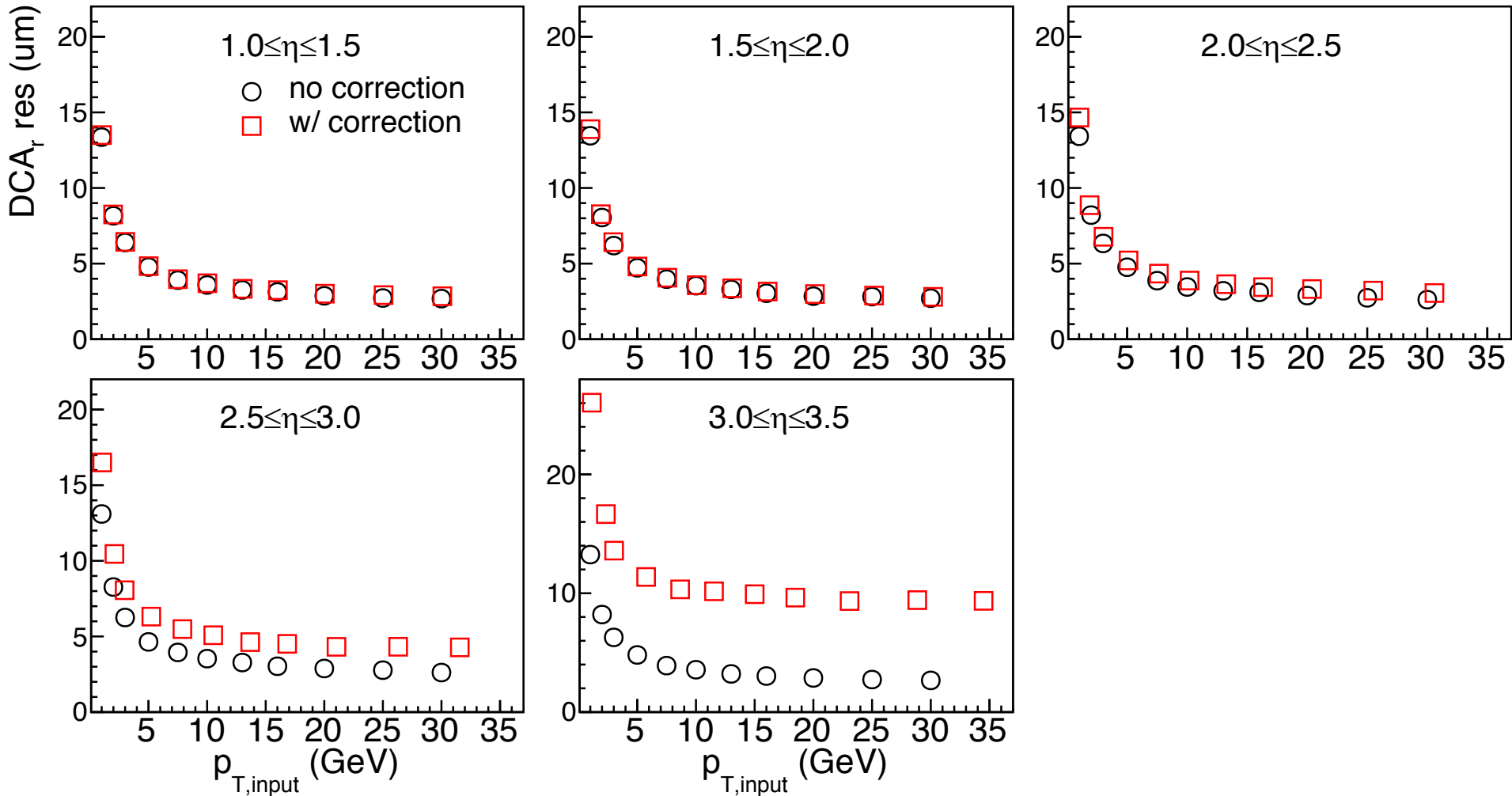
- Integrate other detector systems GEM, RICH, and beam pipe
- Input Pythia events in Fun4All

Back Up

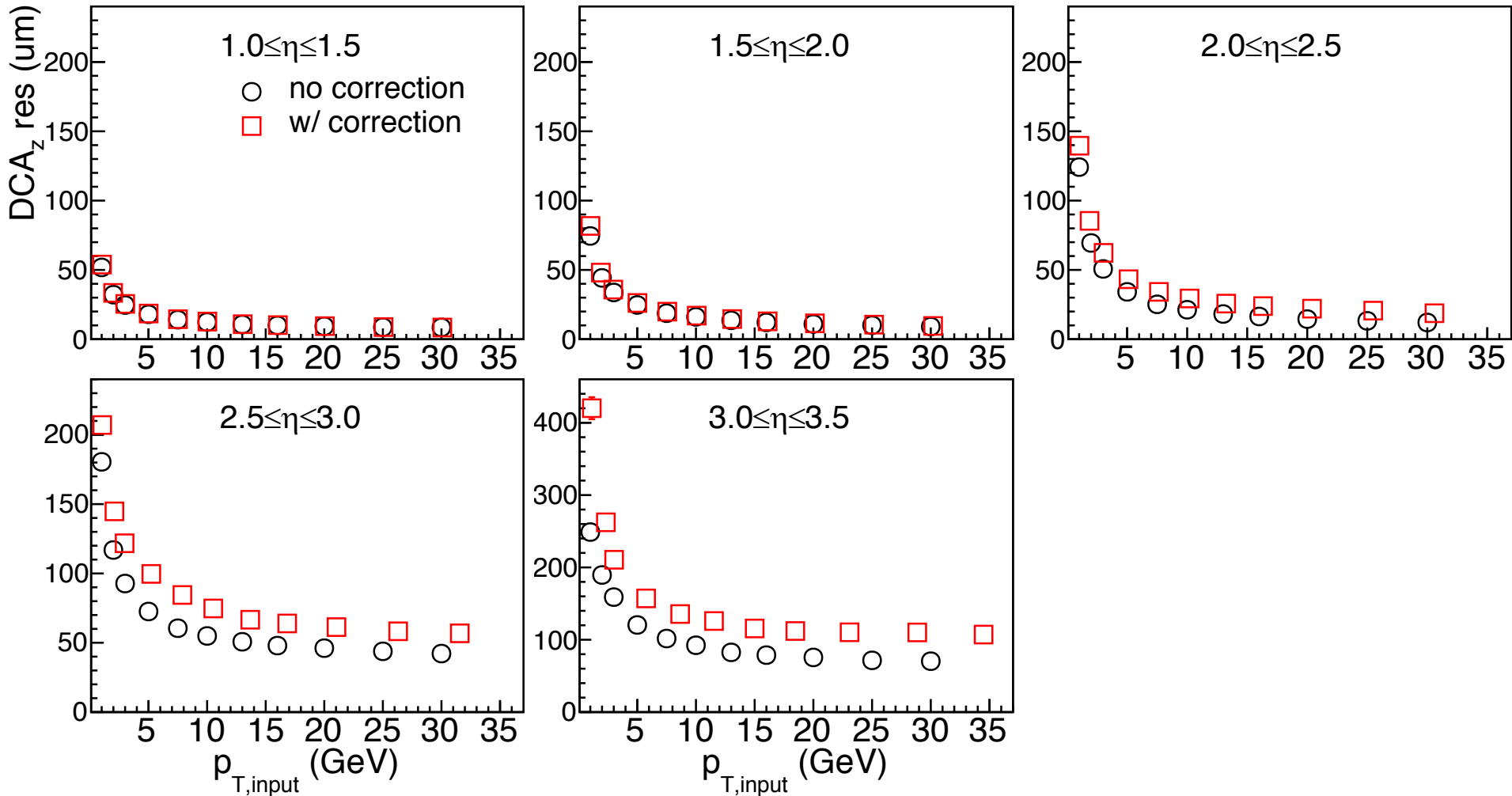
DCA_φ Resolution



DCA_r Resolution



DCA_z Resolution



Detector Initial Design in Fun4all

Material sublayers of the plane detectors
(arbitrary scale)

