



Integrated Detector Setup with LANL FST and LBNL Barrel

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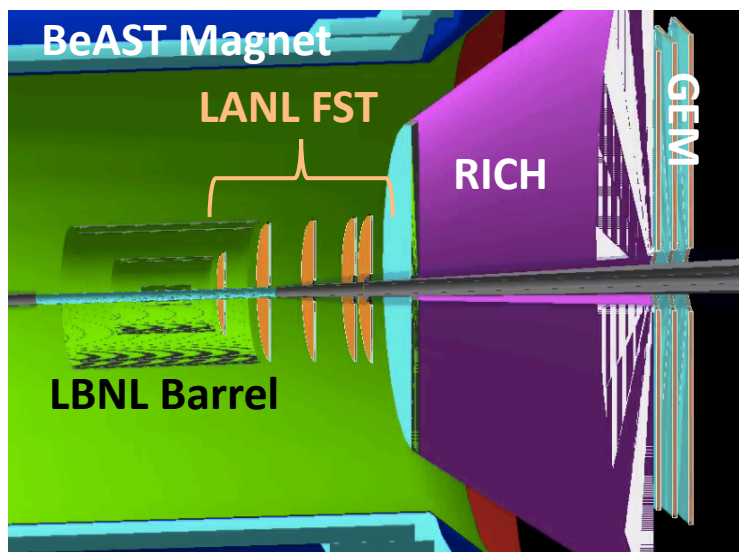
06-15-2021

Outline

- Update on the Integrated detector setup with the simplified FST design
- Tracking performance of the integrated setup
- Implementation of a **detailed** FST design in Fun4All
- Summary and plan



Detector Setup



- LANL FST -- arXiv:2009.02888
- LBNL barrel -- arXiv:2102.08337v1

LBNL barrel (Pixel pitch=10 μm)

Barrel layer	Radius (cm)	Full Length (cm)
1	3.30	30
2	5.70	30
3	21.00	54
4	22.68	60
5	39.30	105
6	43.23	114

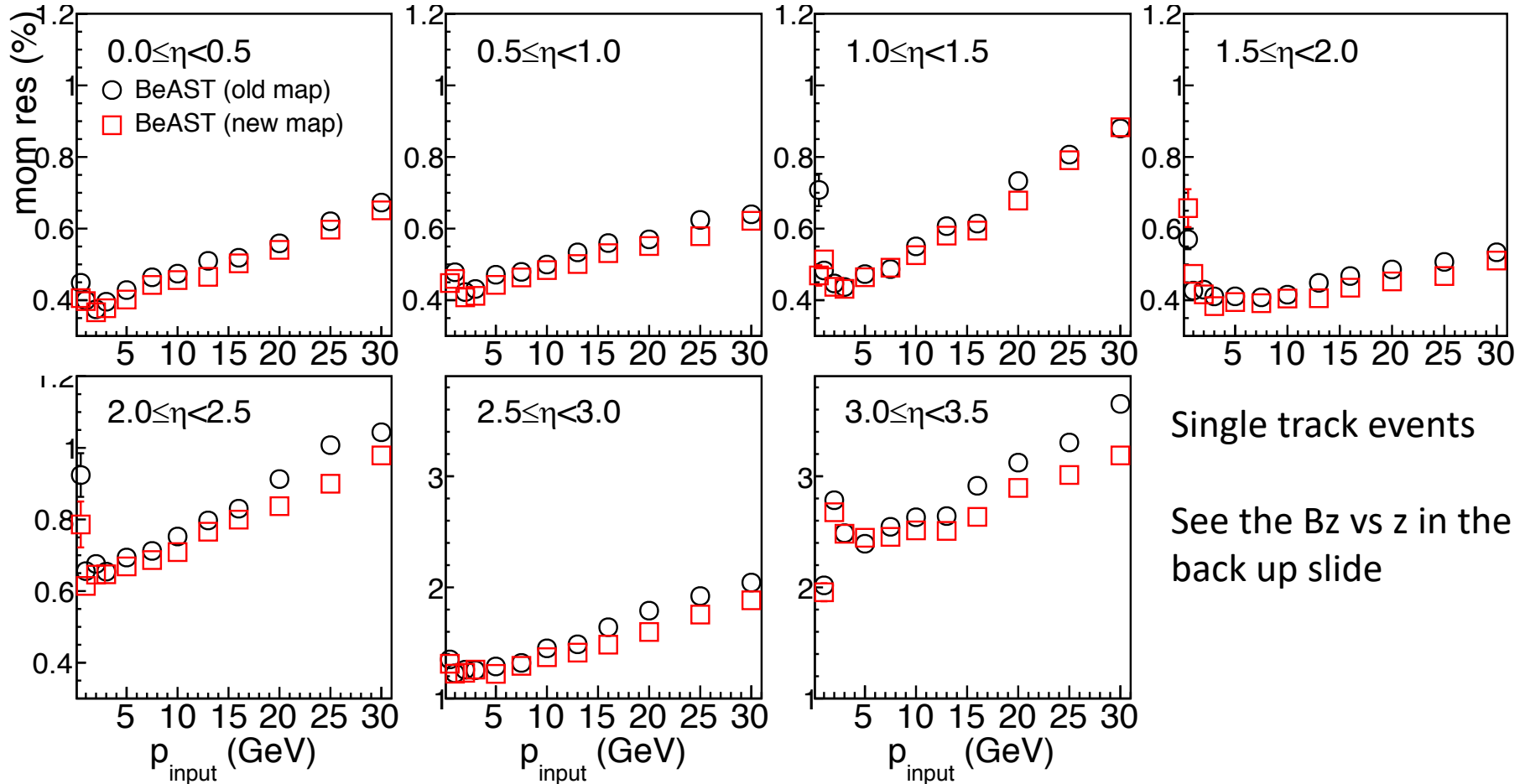
LANL barrel has a max radius of 27 cm
(see back up slide)

FST Plane	z (cm)	r_{in} (cm)	r_{out} (cm)	Pixel pitch (μm)	Silicon thickness (μm)
1	35	4	25	20	50
2	62.3	4.5	42	20	50
3	90	6.5	43	20	50
4	115	8.9	44	36.4	100
5	125	9.5	45	36.4	100



Momentum Resolution Comparison

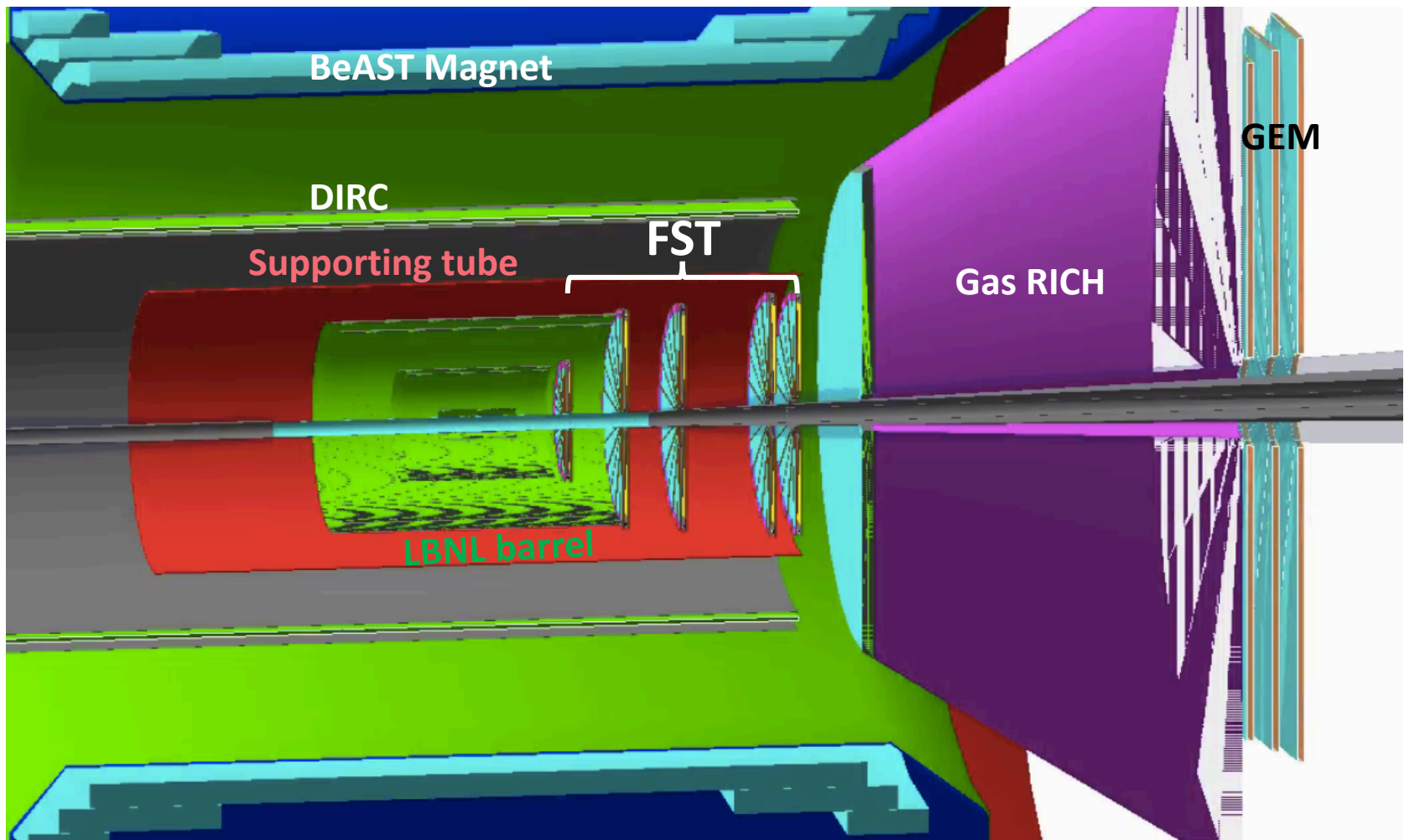
BeAST old map vs BeAST new map



Slight improvements in momentum resolution with the new magnetic field map of BeAST



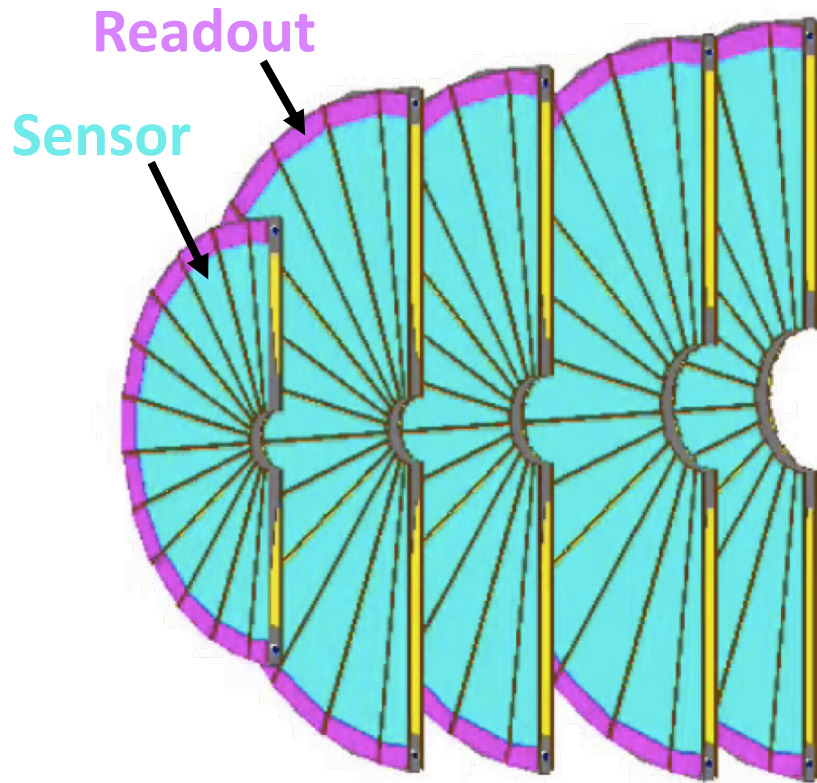
Plan for Detailed FST Implementation in Fun4All



Plan: tracking performance study with the detailed FST implemented in the integrated detector setup



Detailed FST Implementation (Work in Progress)



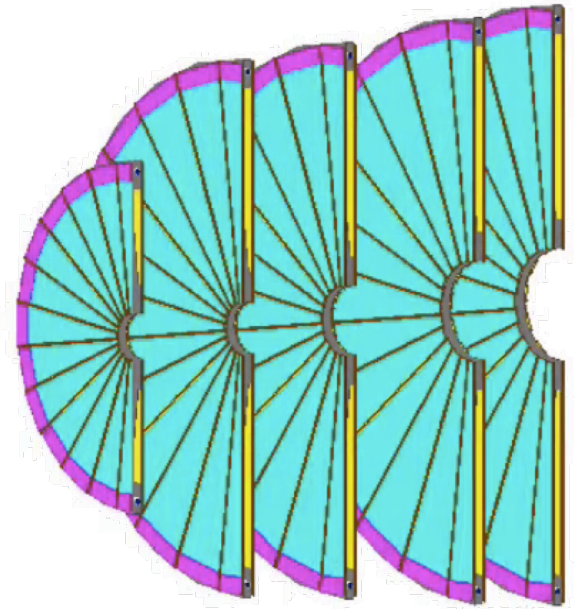
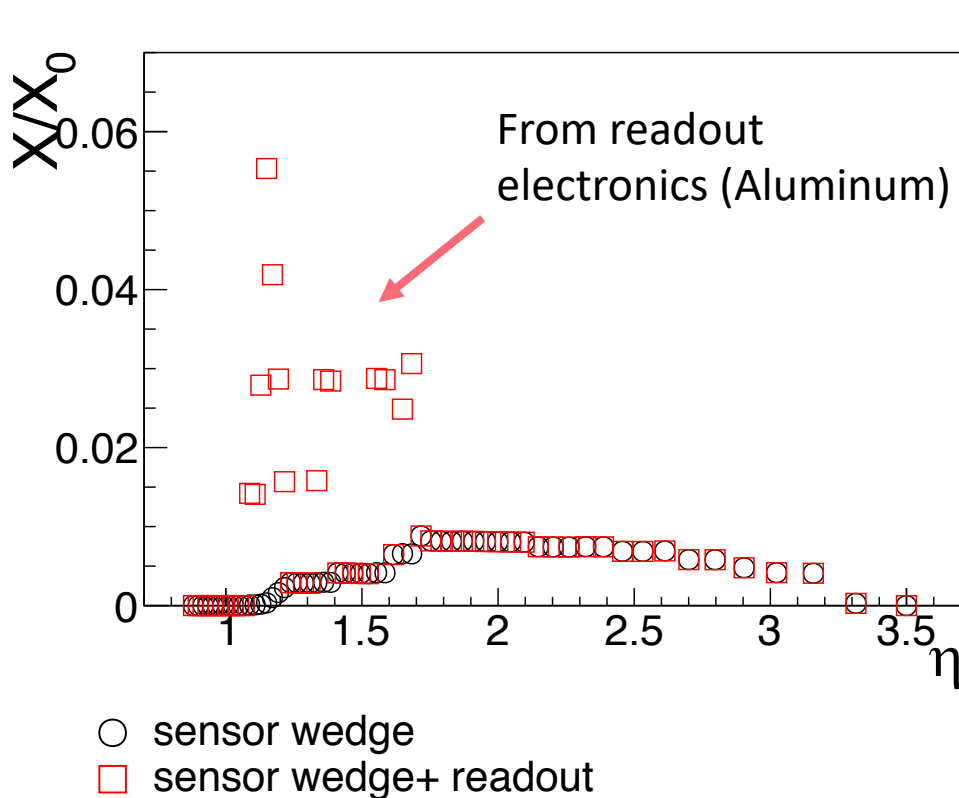
- Sensor wedges (cyan) and readout electronics (purple) on both sides of a plane
- Sensor wedges include silicon wafer, Al foil and HDI (yellow)



- Graphite supporting base for each plane
- Cooling tube and liquid on the outer edge



Material Scan of the Detailed FST Design

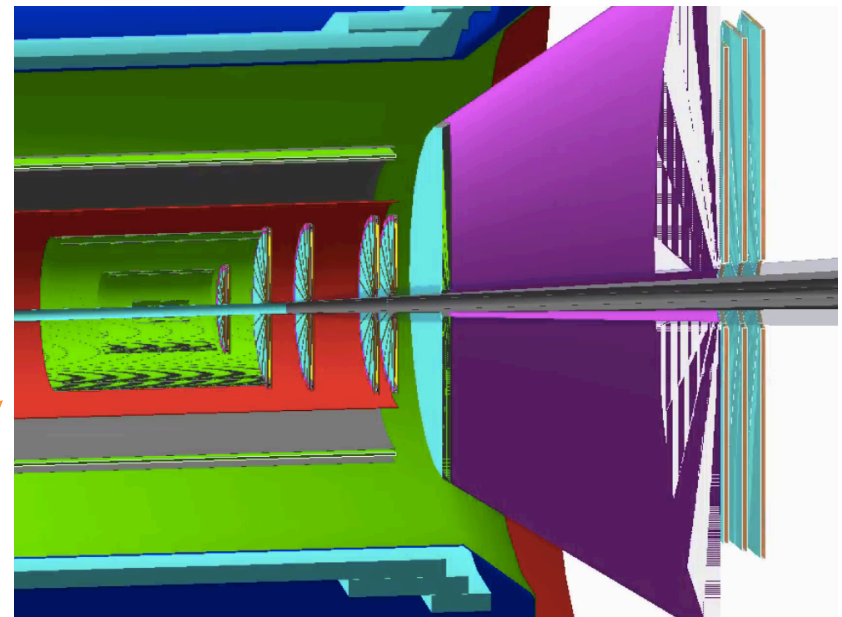


**Optimization of the service parts is under way
we welcome any inputs!**



Summary & Plan

- Integrated tracking system with LANL FST and LBNL barrel tracker
- Optimizing the FST design in this integrated setup currently
- The new BeAST field map improve the momentum resolution compared to the old map.
- Plan
 - Tracking performance study with the new BeAST map
 - Replace simplified FST with the detailed FST implementation and study tracking performance

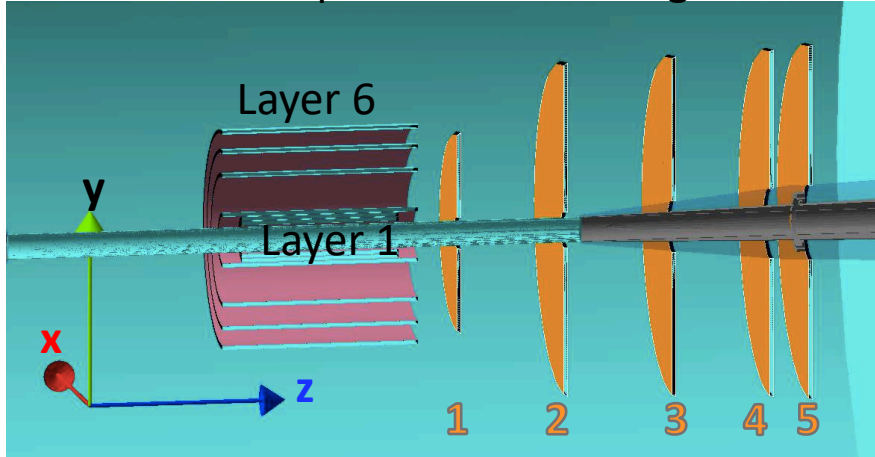


Back Up



LANL Barrel and FST Dimension

Using barrel setup in version 4 design,
And FST setup in version 5 design



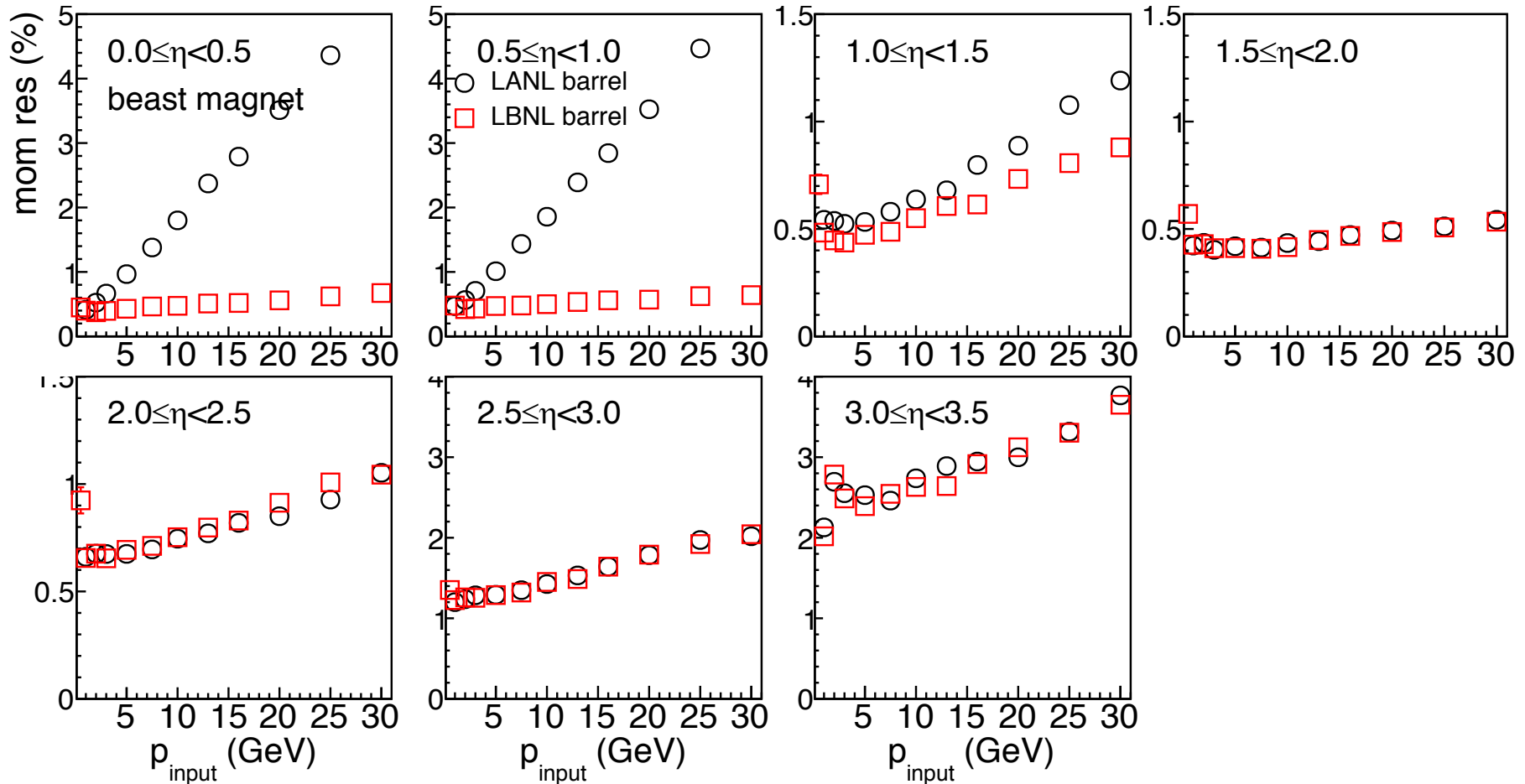
Barrel Layer	Half length (cm)	r (cm)	Pixel pitch (um)	Silicon thickness (um)
1	20	3.64	20	50
2	20	4.81	20	50
3	25	5.98	20	50
4	25	16	36.4	100
5	25	22	36.4	100
6	25	27	36.4	100

FST Plane	z (cm)	r_{in} (cm)	r_{out} (cm)	Pixel pitch (um)	Silicon thickness (um)
1	35	4	25	20	50
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Momentum Resolution Comparison (BeAST Old Map)

LANL barrel vs LBNL barrel



Significant improvement of momentum resolution in central region $\eta < 1.5$



Magnetic Fields vs z

- BeAST (old map)
- BeAST (new map)
- △ Babar

