

Backward Disk Array



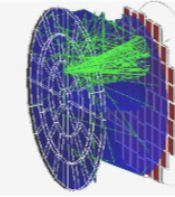
Region	Component	Sub-Component	WBS	Length (cm)	Inner Radius (cm)	Outer Radius (cm)	Offset from Center (cm)	Physical Start (cm)	Physical End (cm)	Volume (m ³)	Weight (kg)	Technology	Notes	
	Modular RICH		6.10.04	42.7	8.0	63	-130	-172.7	-130	0.52	97	Aerogel	Alternative Technology pfRICH (see alternatives table below) Offset: measured from face nearest to interaction point Weight: based on parametric estimate from CLAS LTCC	
	LD EMCal		6.10.05	60	9.0	63	-174	-234	-174	0.73	4,738	PbWO4	Offset: measured from face nearest to interaction point Weight: estimated as 85% lead glass and 15% steel	
	Service Gap			10			-320	-320	-330				Offset: measured from location nearest to interaction point	
LEPTON DIRECTION ENDCAP	Backward HCal		6.10.06	45	11.2	267	-329.6	-374.6	-329.6	5.37	34,393	Iron/SC	Offset: measured from face nearest to interaction point Weight: calculated as 100% iron.	
	Flux Return End Plate			20.32	12.4	271.3	-375	-395.32	-375	4.69	36,794	Iron	Offset: measured from face nearest to interaction point Weight: calculated as 100% iron.	
DESIGN ALTERNATIVES														
CENTRAL DETECTOR ALTERNATIVES	Proximity Focusing RICH		6.10.04	54.1	8.0	63	-118.6	-172.7	118.6	0.66	0	Aerogel + Gas	Alternative Technology to mRICH Offset: measured from face nearest to interaction point Weight: based on parametric estimate from CLAS LTCC	
	Barrel EMCal Alternative		6.10.05	479.5	78.3	117		-287	192.5	10.79	37,003			
		<i>Imaging Part</i>			<i>434.5</i>	<i>78.3</i>	<i>92.25</i>	<i>-39.75</i>	<i>-257</i>	<i>177.5</i>	<i>3.26</i>	<i>11,430</i>	<i>Pb+Sc+Si</i>	<i>Weight: based on parametric estimate from CMS EMCal</i>
		<i>Sampling Part</i>			<i>434.5</i>	<i>93.3</i>	<i>117</i>	<i>-39.75</i>	<i>-257</i>	<i>177.5</i>	<i>6.82</i>	<i>23,911</i>	<i>PB+Sc</i>	<i>Weight: based on parametric estimate from CMS EMCal</i>
		<i>LD Readout Electronics</i>			<i>15</i>	<i>78.3</i>	<i>117</i>	<i>-272</i>	<i>-287</i>	<i>-272</i>	<i>0.36</i>	<i>831</i>		<i>Offset: measured from face nearest to interaction point. Weight calculated as silicon.</i>
	<i>HD Readout Electronics</i>			<i>15</i>	<i>78.3</i>	<i>117</i>	<i>177.5</i>	<i>177.5</i>	<i>192.5</i>	<i>0.36</i>	<i>831</i>		<i>Offset: measured from face nearest to interaction point. Weight calculated as silicon.</i>	
Inner Tracker (Si, MPGD)		6.10.03	298.6	3.6	60	30.7	-118.6	180	3.36	509	MAPS	Alternative based on pfRich. This envelope includes the Si disks in the lepton and hadron direction as well as the barrel tracker. Weight: calculated as 3% aluminum and 3% silicon (balance is air)		

- mRICH is the reference,
- pfRICH is an alternative,
- Comparative review took place past March 20 and 21 — <https://indico.bnl.gov/event/18499/> (also has the report)

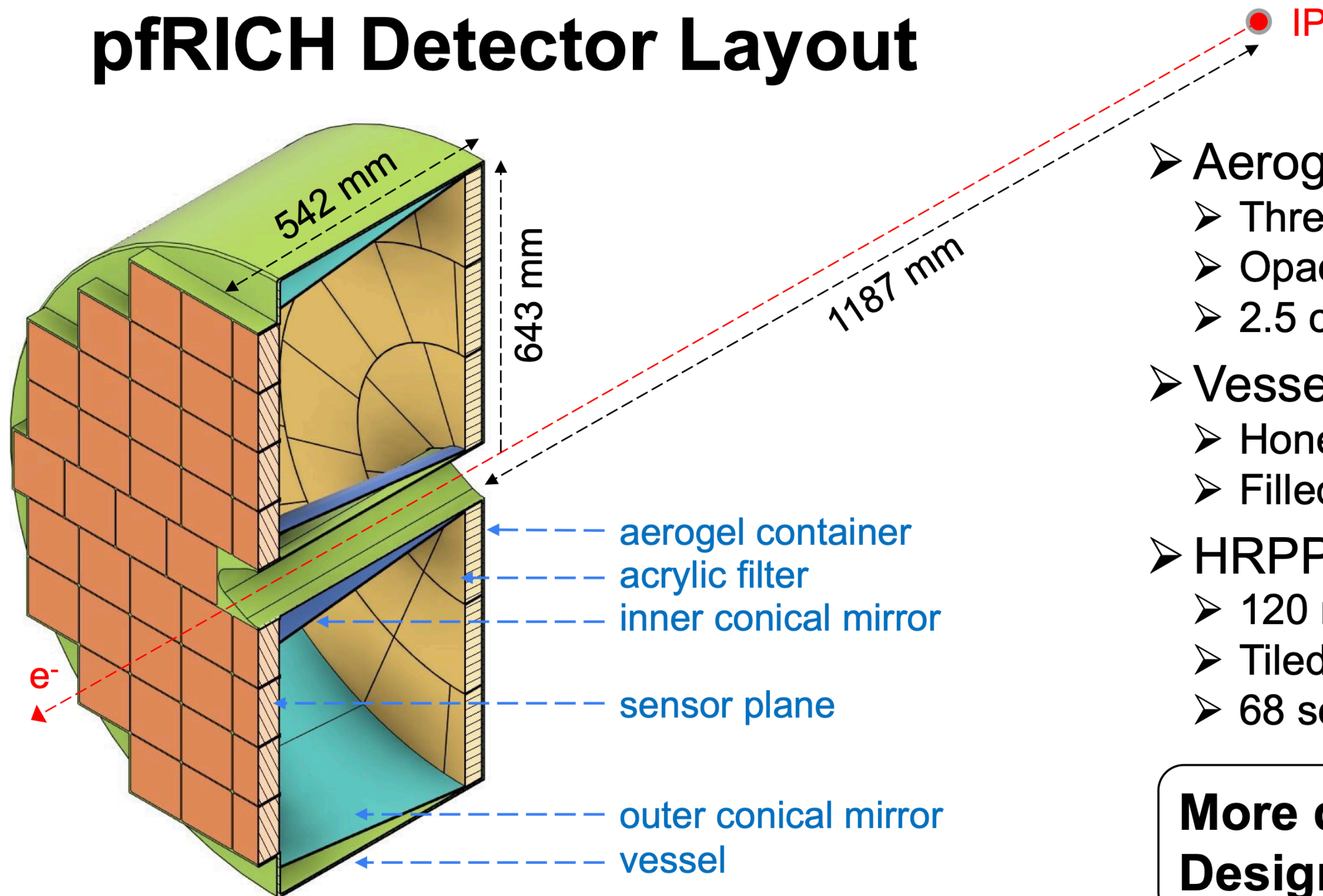


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- Comparative review took place past March 20 and 21 — <https://indico.bnl.gov/event/18499/> (also has the report)
- Space needs are different and appear not considered as part of the review; they affect (space for) tracking,
- <https://eic.jlab.org/Menagerie/> is (supposed to be) the source for envelopes.



pfRICH Detector Layout



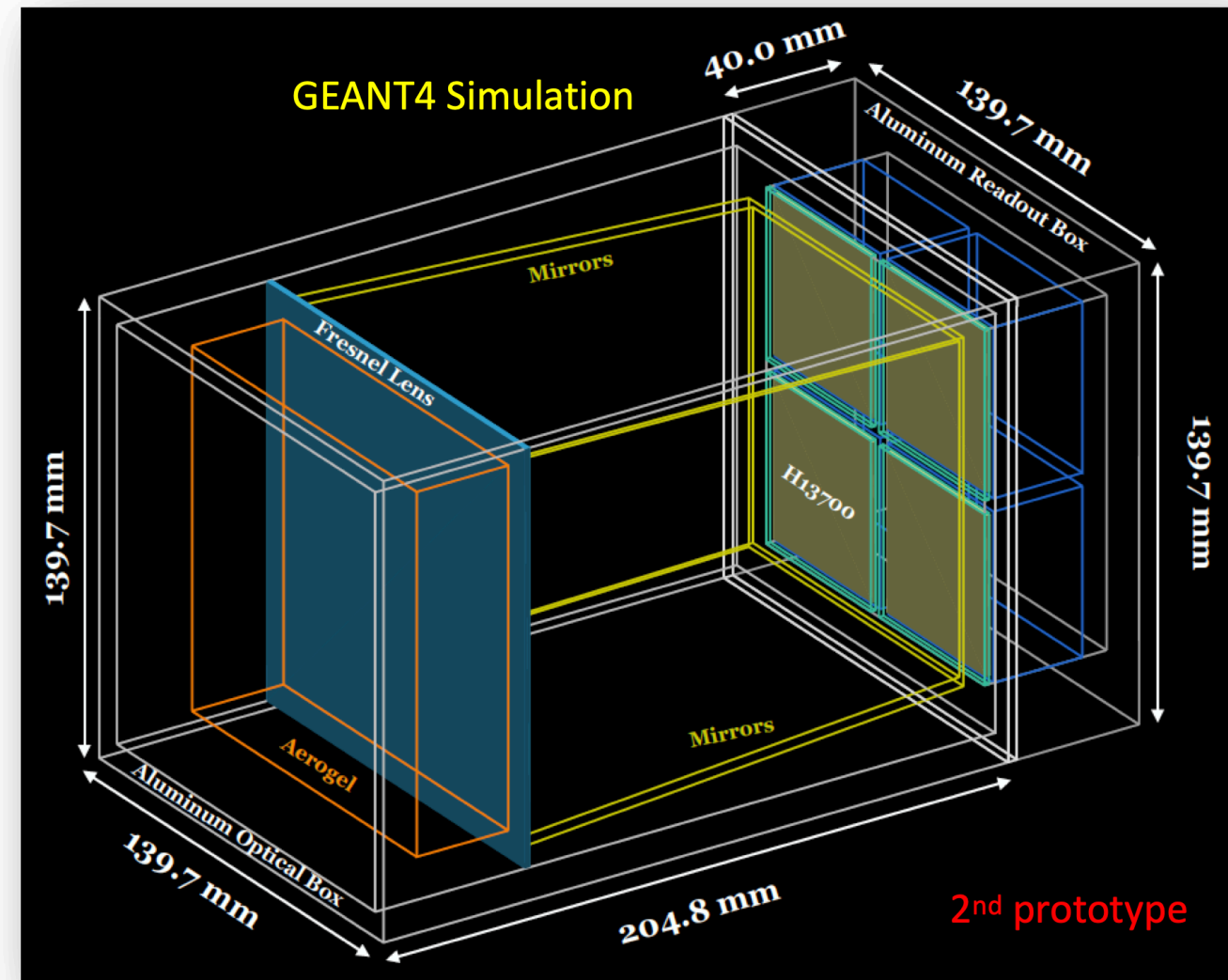
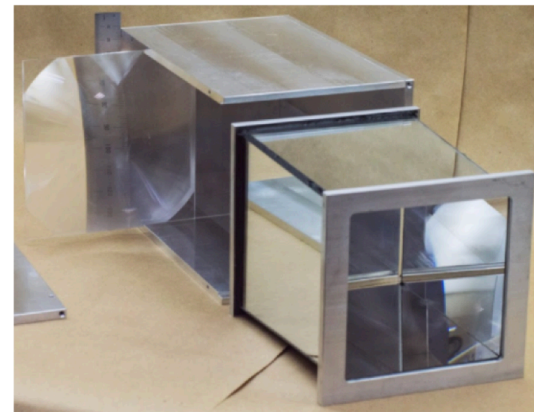
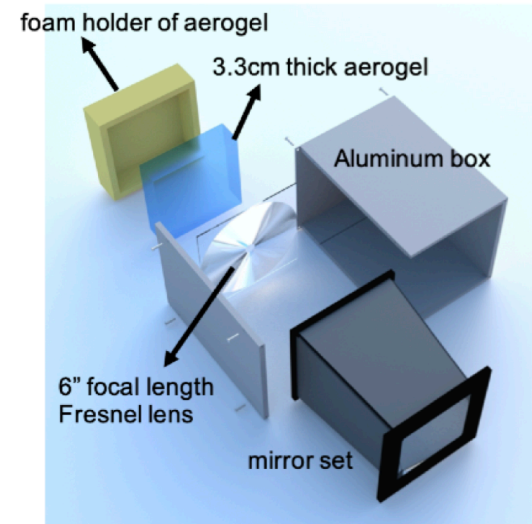
- **Aerogel**
 - Three radial bands
 - Opaque dividers
 - 2.5 cm thick, 42 tiles total
- **Vessel**
 - Honeycomb carbon fiber sandwich
 - Filled with nitrogen
- **HRPPD photosensors**
 - 120 mm size
 - Tiled with a 1.5mm gap
 - 68 sensors total

More details by talk on Design & Integration

- pfRICH layout presented at the review is consistent with the Menagerie, although private communications indicate that it can be shorter (by 150mm or more!),



mRICH Design

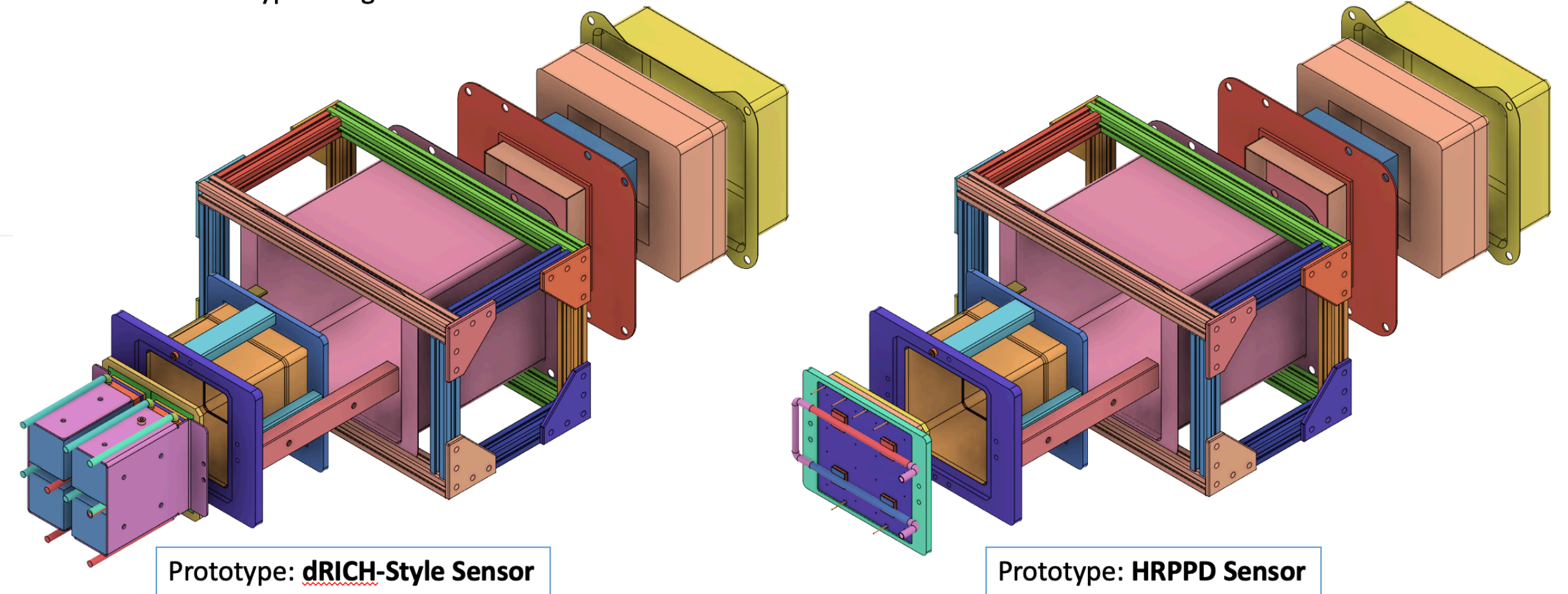


mRICH Review for ePIC

3/20/23

Prototype Design

eRD101: Prototype Design



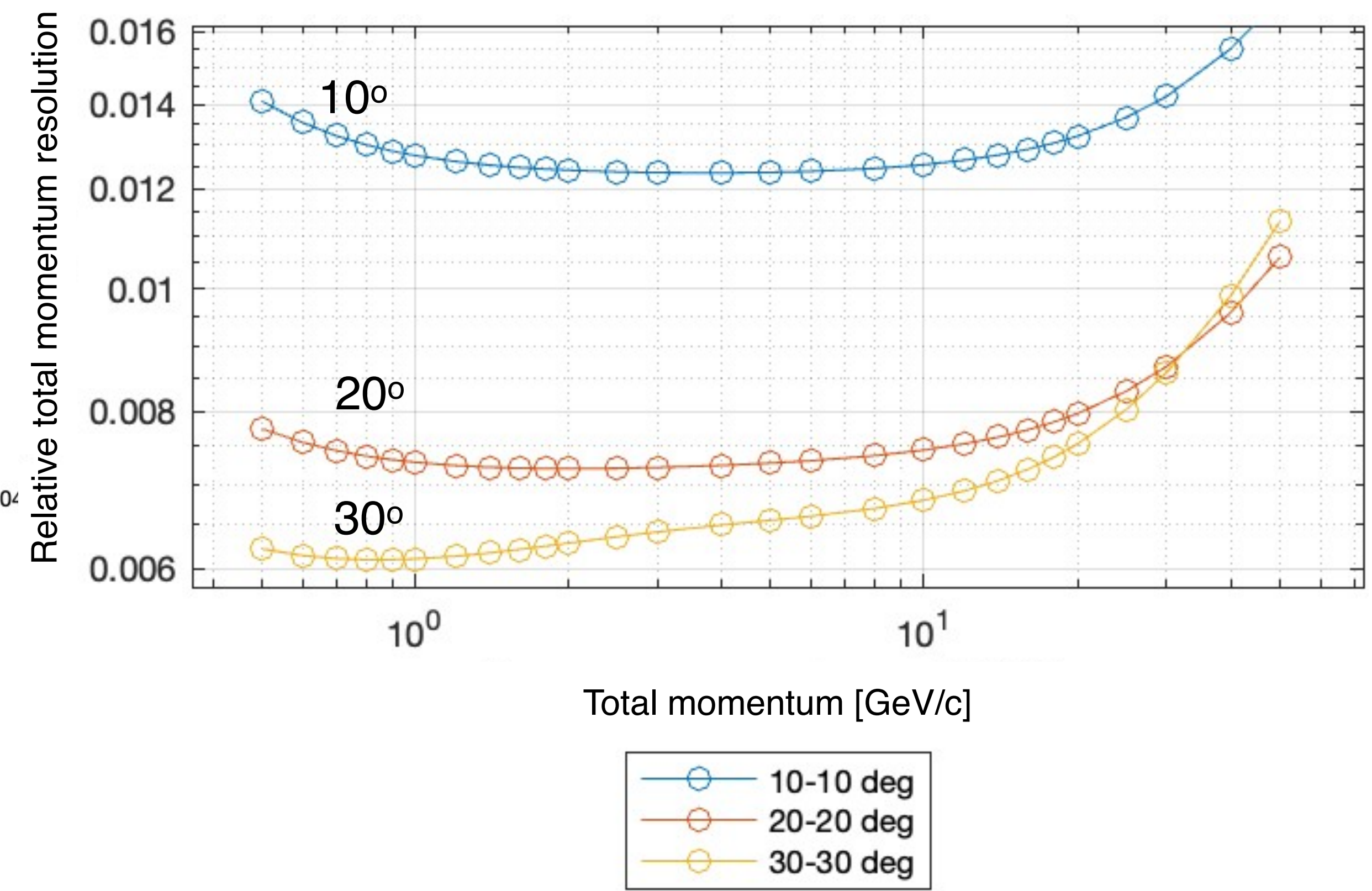
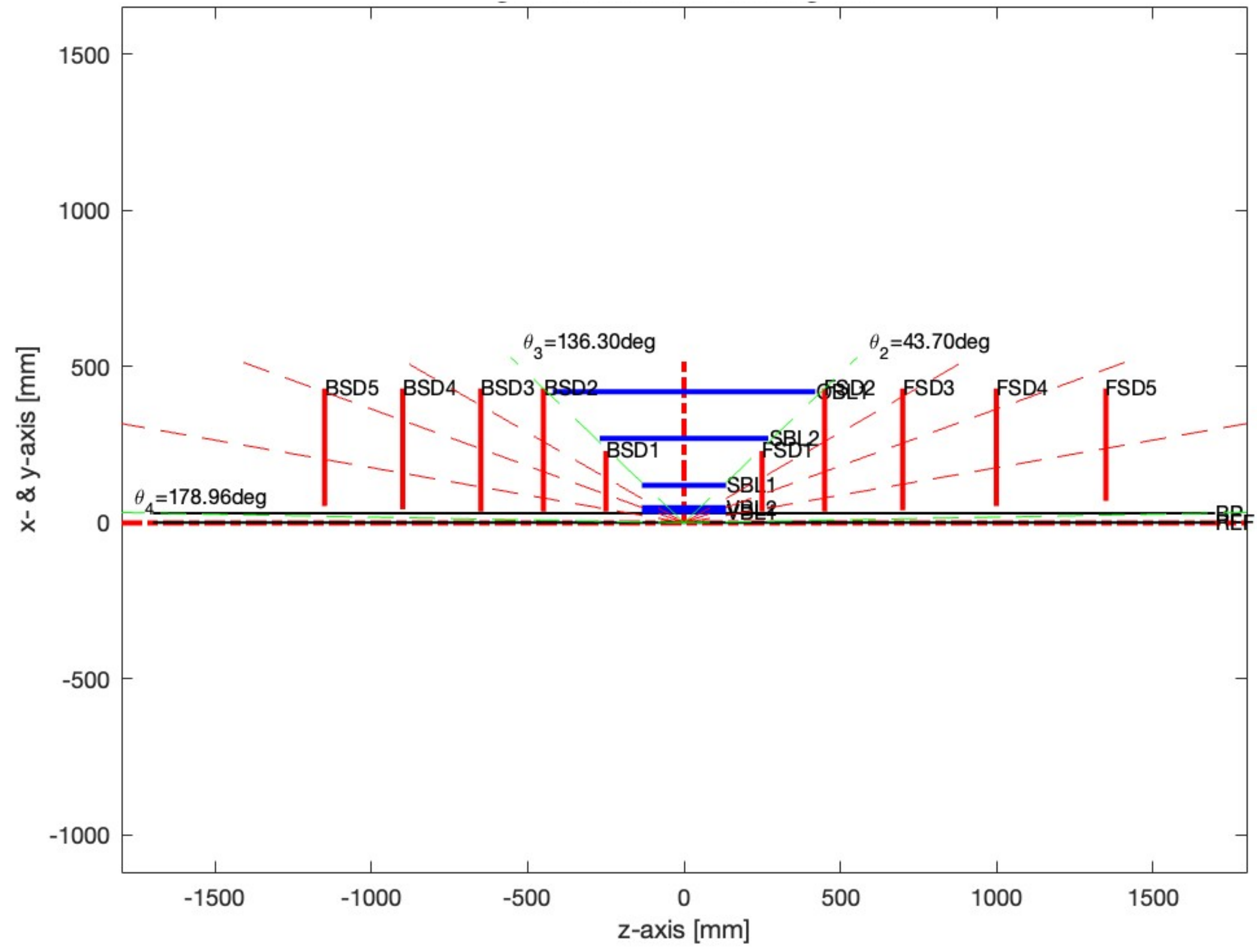
3/21/23

mRICH Review for ePIC

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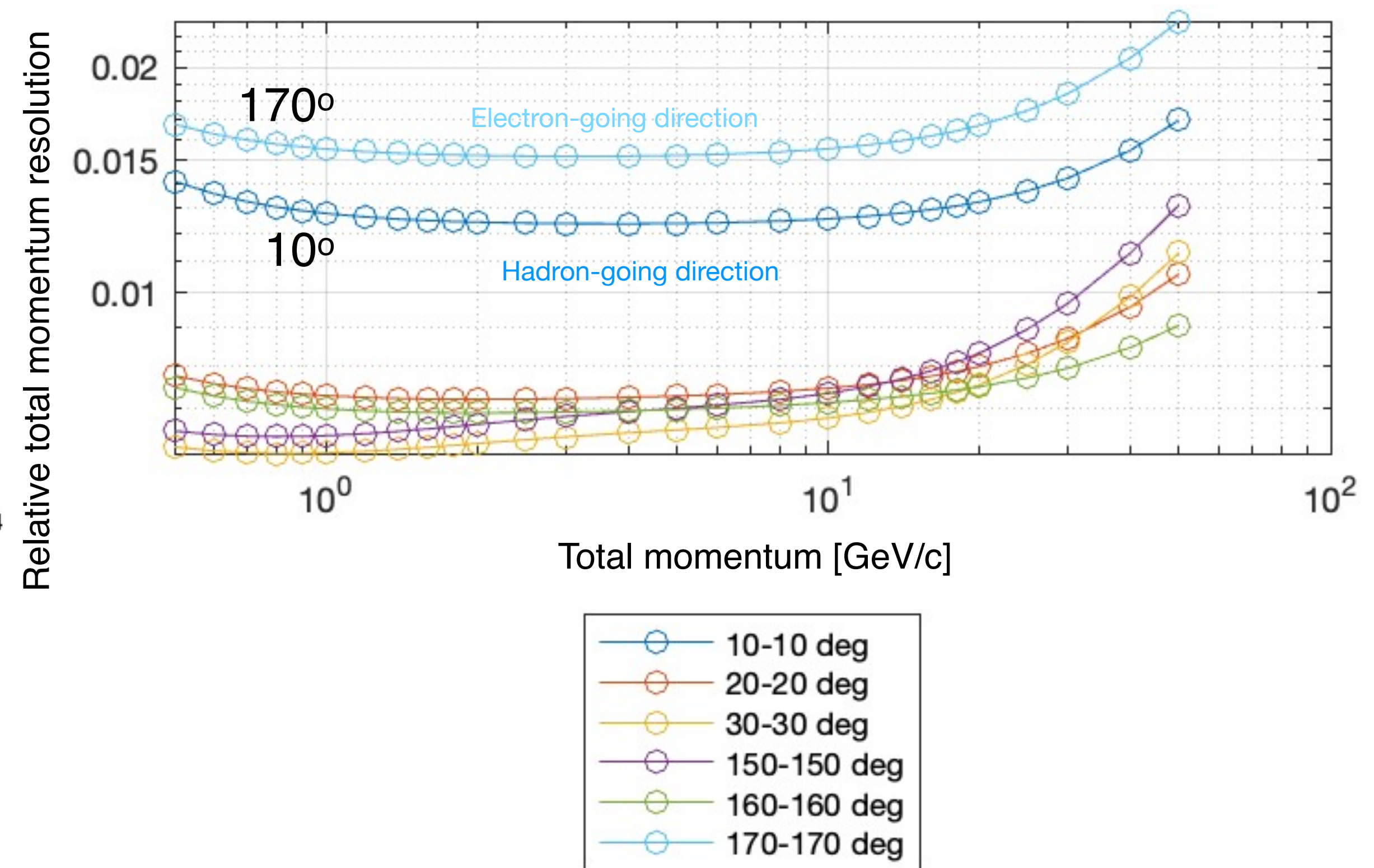
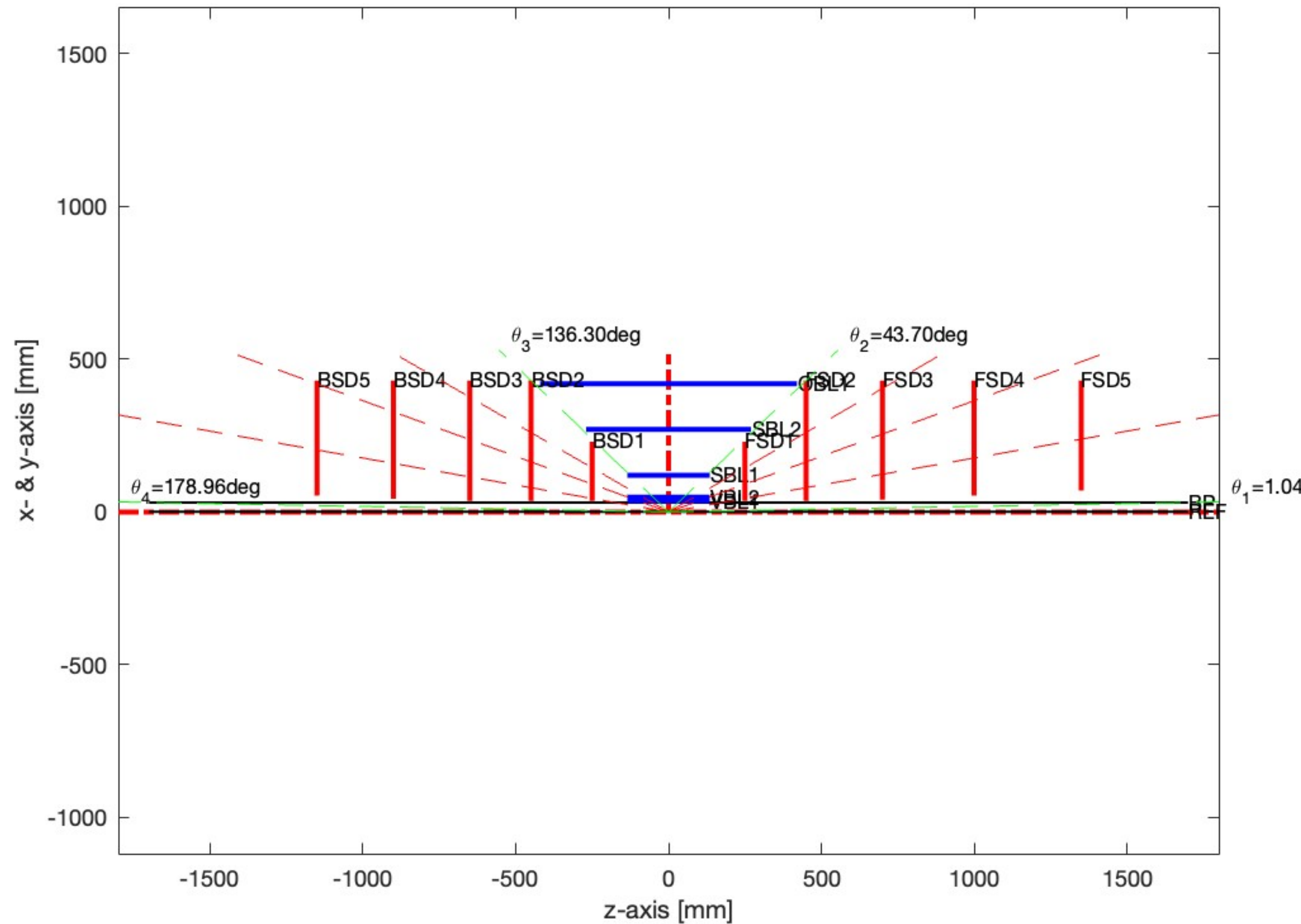
- mRICH is harder to puzzle out — the radiator and expansion volume has a length of 204.8mm,
- this length does not include the sensor,
- the total length in the menagerie is 427mm; private communication suggests that it might be as short as 250mm
- That is, ePIC envelopes are a gift that keeps on giving
- Timely to revisit MAPS array length and resolution — we have much of it by comparing the electron and hadron arm

Updated reference configuration and (selected) momentum performance



- Multiple factors in effect; B.dI decreases with decreasing angle, acceptance edges can affect dI and X0
- Arm in the electron-going direction ends at $z = -1150\text{mm}$; arm in the hadron-going direction ends at $z = +1350\text{mm}$

Updated reference configuration and (selected) momentum performance



- Multiple factors in effect; B.dl decreases with decreasing angle, acceptance edges can affect dl and X0
- Arm in the electron-going direction ends at $z = -1150\text{mm}$; arm in the hadron-going direction ends at $z = +1350\text{mm}$
- 10° corresponds to $\eta \sim 2.4$ (tracks at this angle traverse all five disks; $L = 900\text{mm}$ vs 1100mm , i.e. 50% in L^2).