Impact of structure elements of the SPD setup on the performance of ECAL
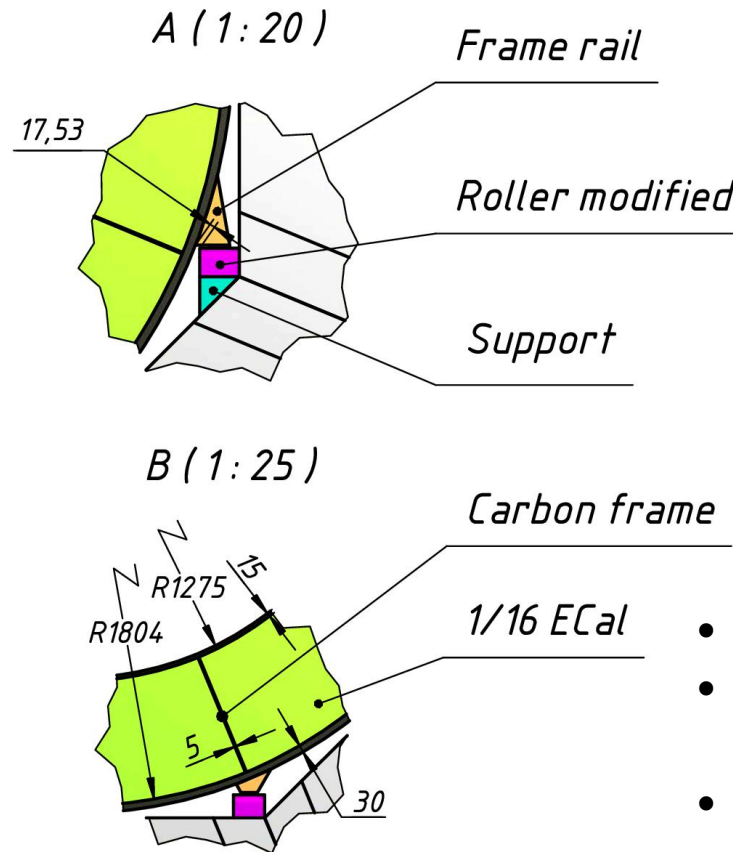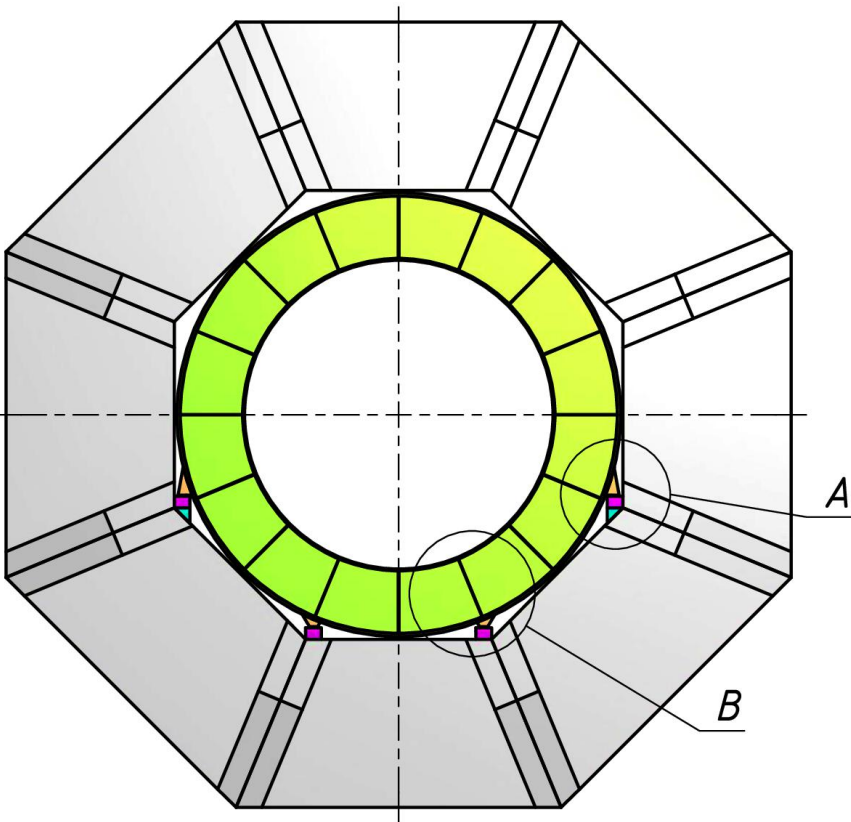
Andrei Maltsev, JINR (Dubna)

SPD Physics and MC meeting №14
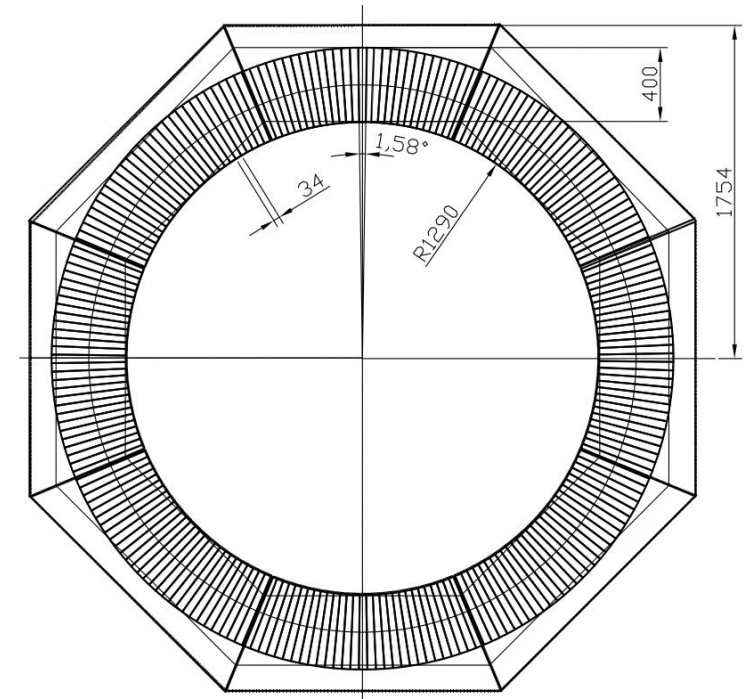
02.06.2020

Geometry options (carbon frame)
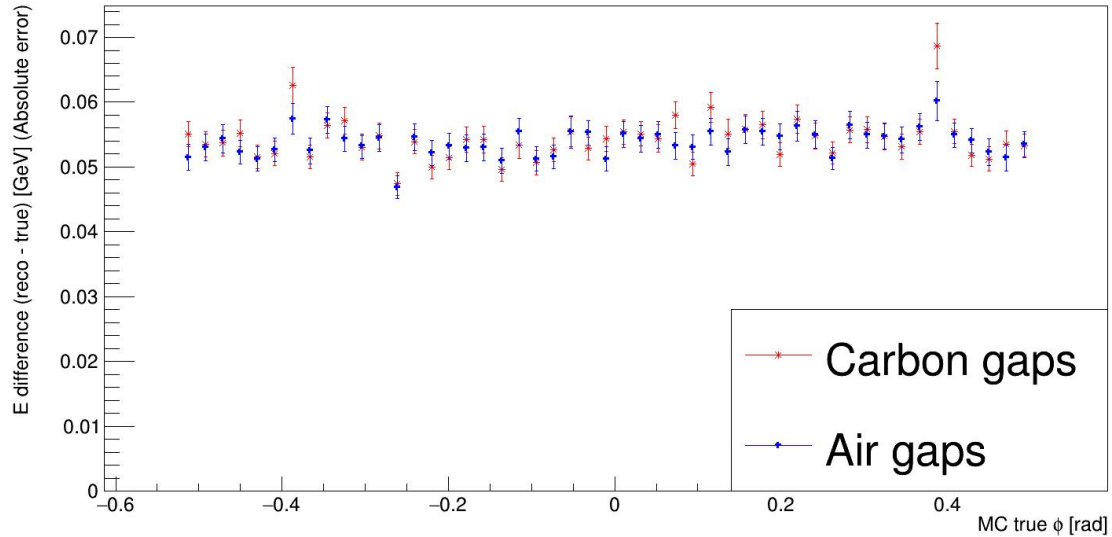
Proposed option (TDR)

Differences to CDR geomery:

A (1 : 20)

Frame rail

Roller modified

Support

17,53

B (1 : 25)

Carbon frame

1/16 ECal

R1275   15

R1804

5   30

400

1,58°

34

R1290

1754

- 16 "baskets" instead of 8
- no gaps between "baskets",
  but: 5 mm carbon frame in between
- 15 mm carbon frame in front

Will it impact the performance?
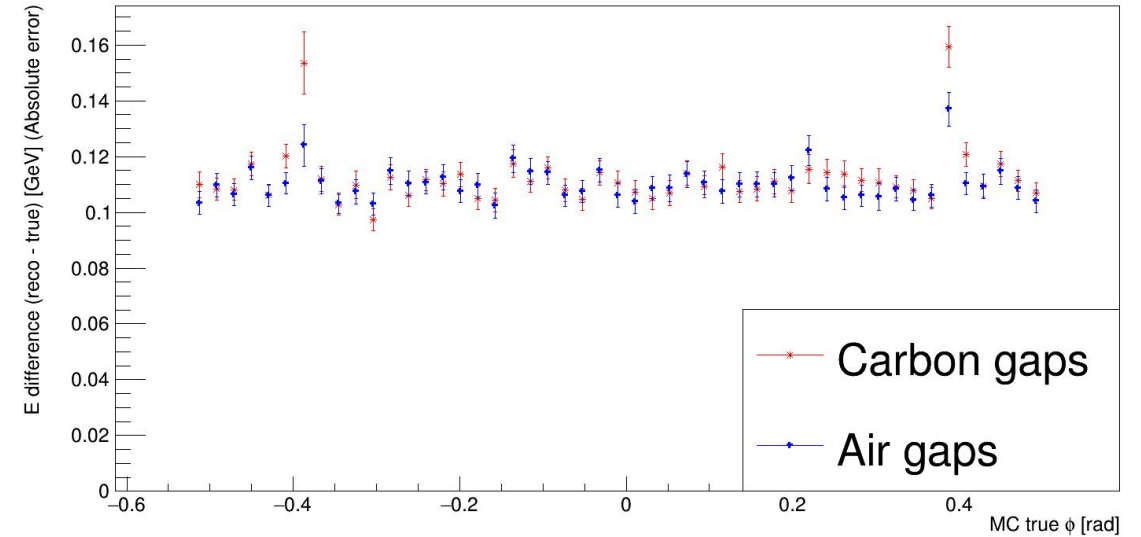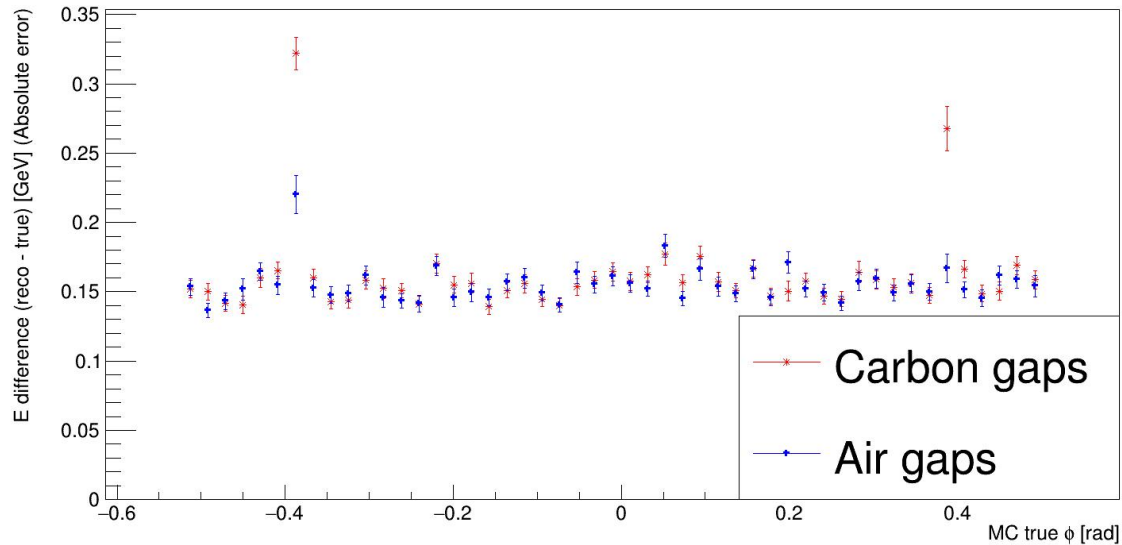
A

B

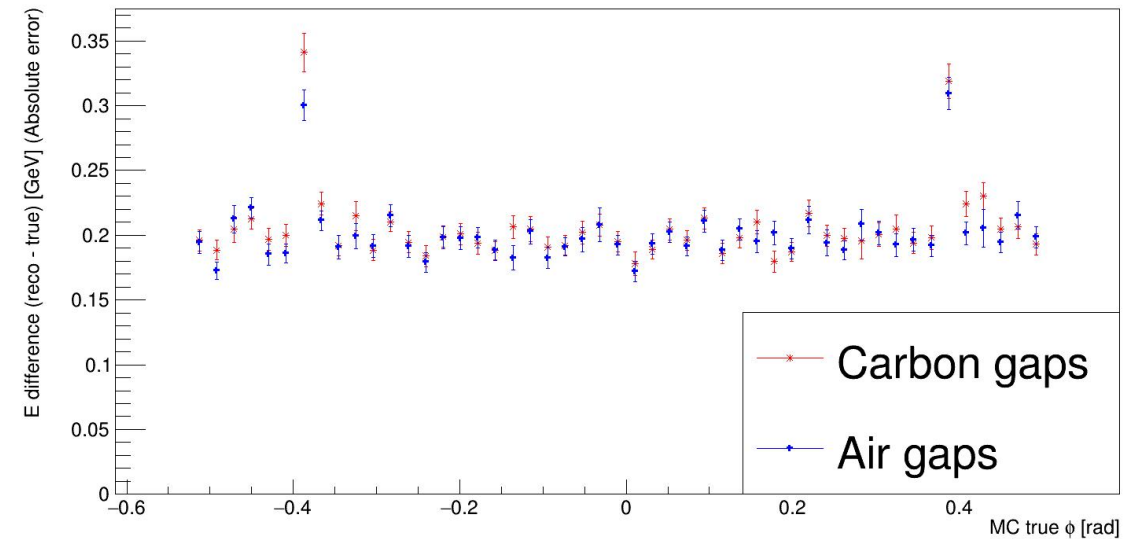# Impact of carbon gaps on energy resolution

Impact of carbon gaps on energy resolution ("zooming" on the gap)

Impact of carbon gaps on energy resolution ("zooming" on the gap)

E resolution for Energy 4.000000 GeV

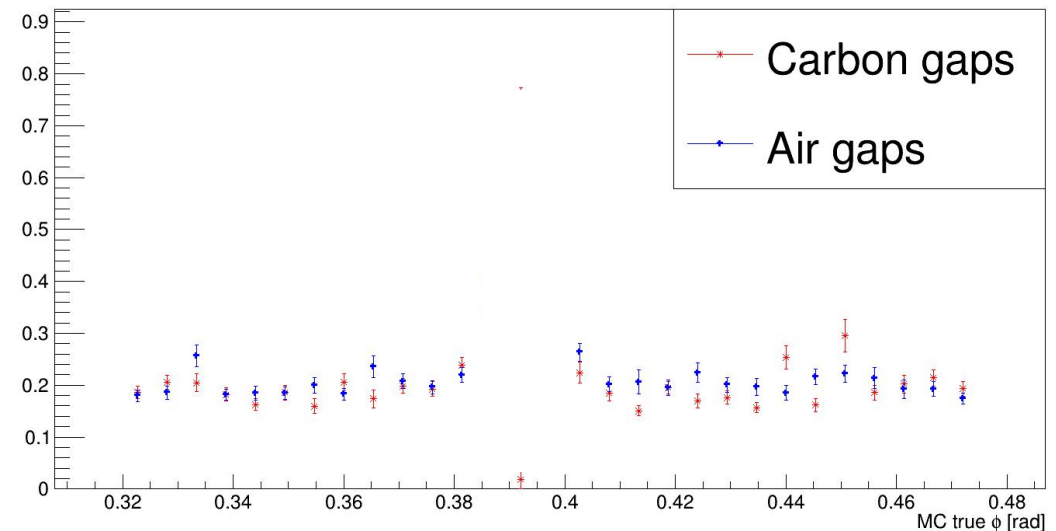| h_ediff_discEnergies_phiZoom_barrel_1	
Entries	4314
Mean x	0.4006
Mean y	−0.584
Std Dev x	0.04625
Std Dev y	0.7387

E absolute(!) error for 4 GeV photon

failed fit

Carbon gaps
Air gaps

E resolution for Energy 10.000000 GeV

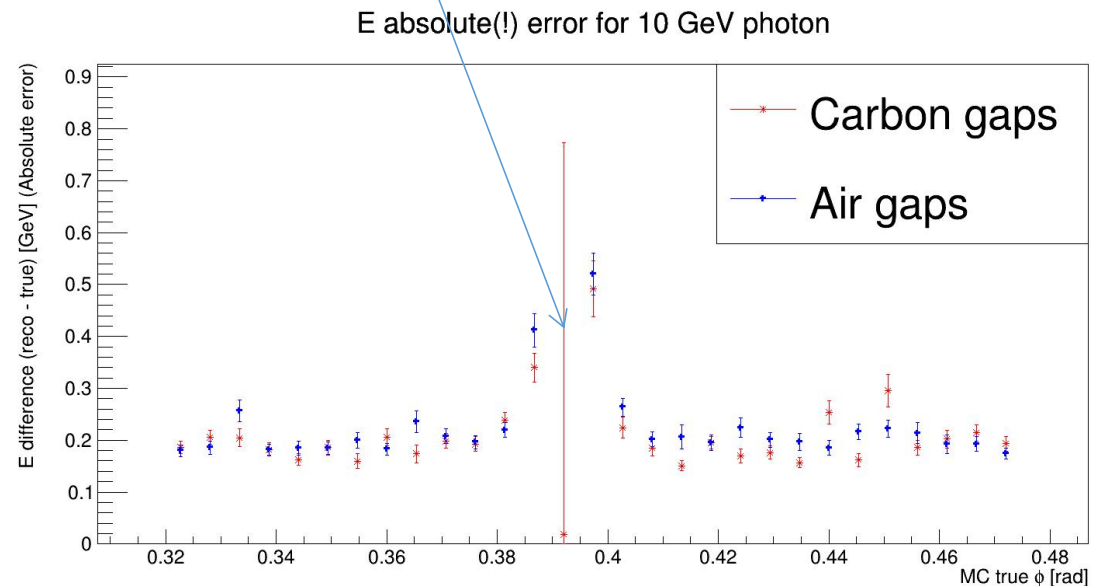| h_ediff_discEnergies_phiZoom_barrel_3	
Entries	4342
Mean x	0.3993
Mean y	−1.57
Std Dev x	0.04619
Std Dev y	1.973
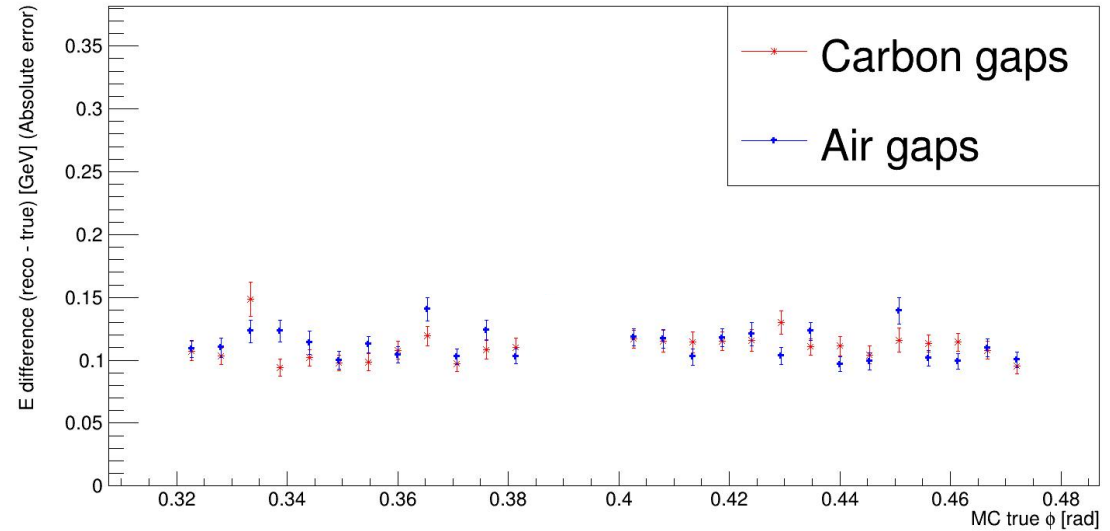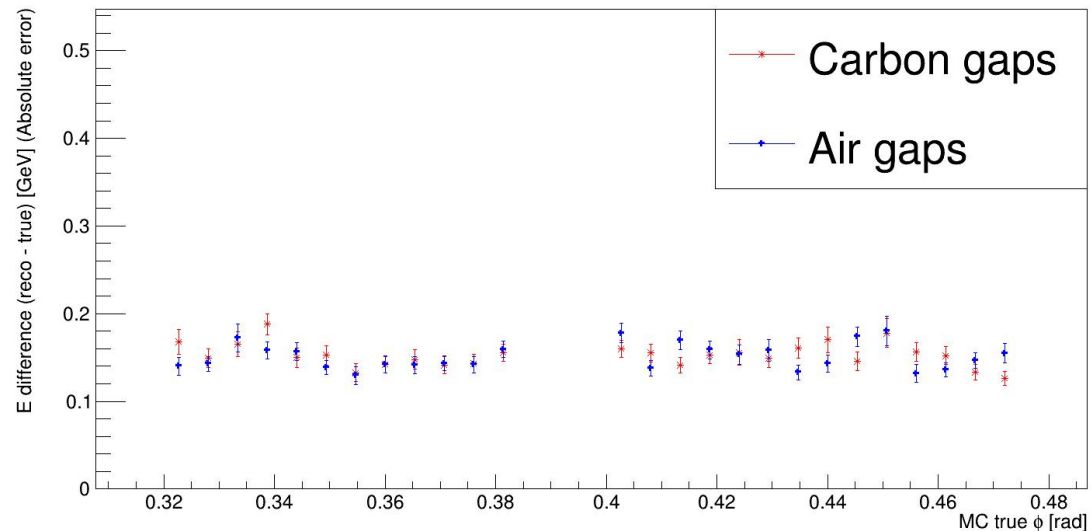
E absolute(!) error for 10 GeV photon

Carbon gaps
Air gaps

Geometry options (magnet cryostat)

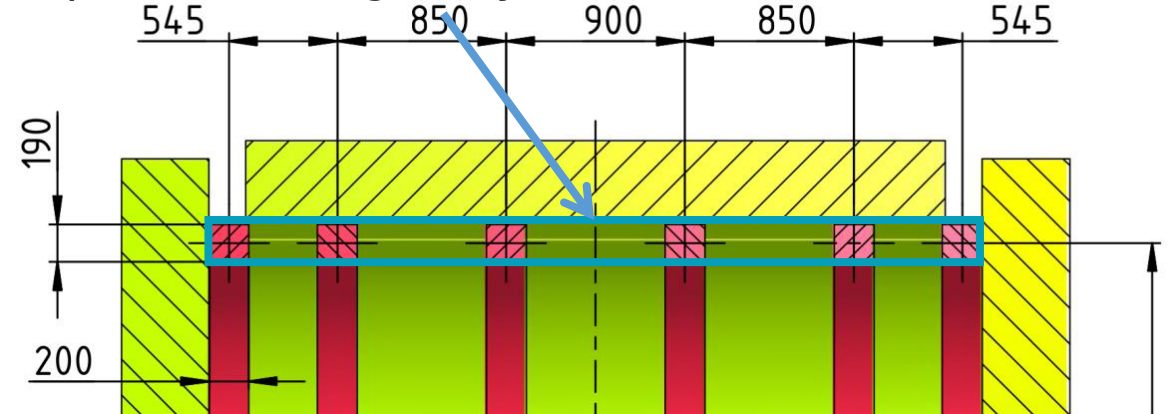Magnetic system (cryostat now shown)
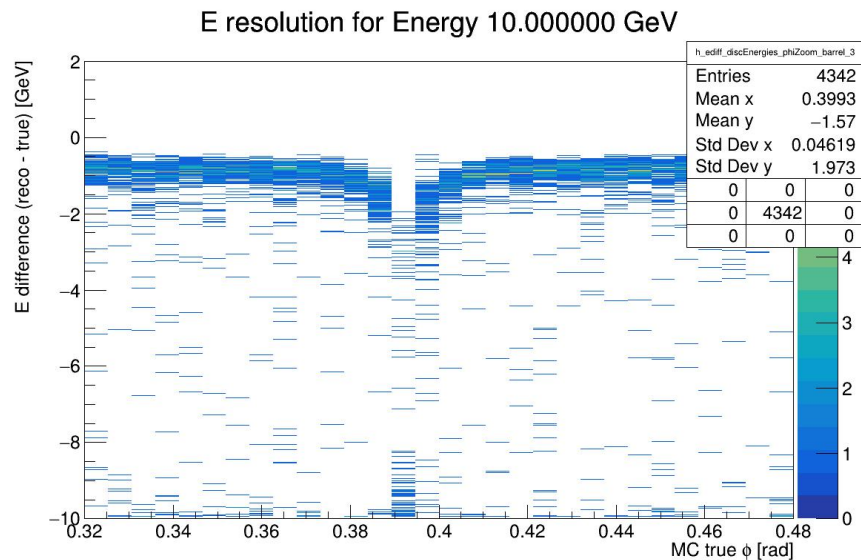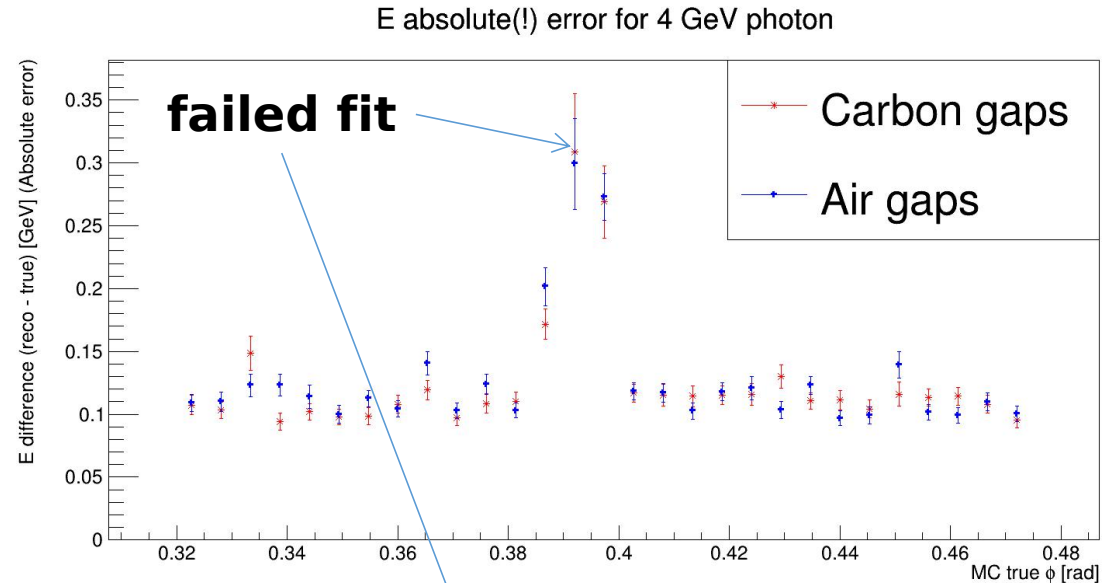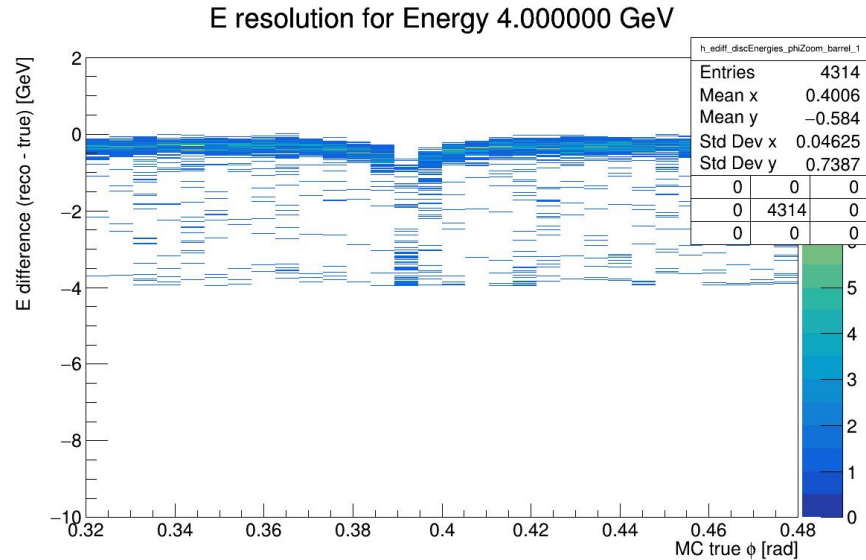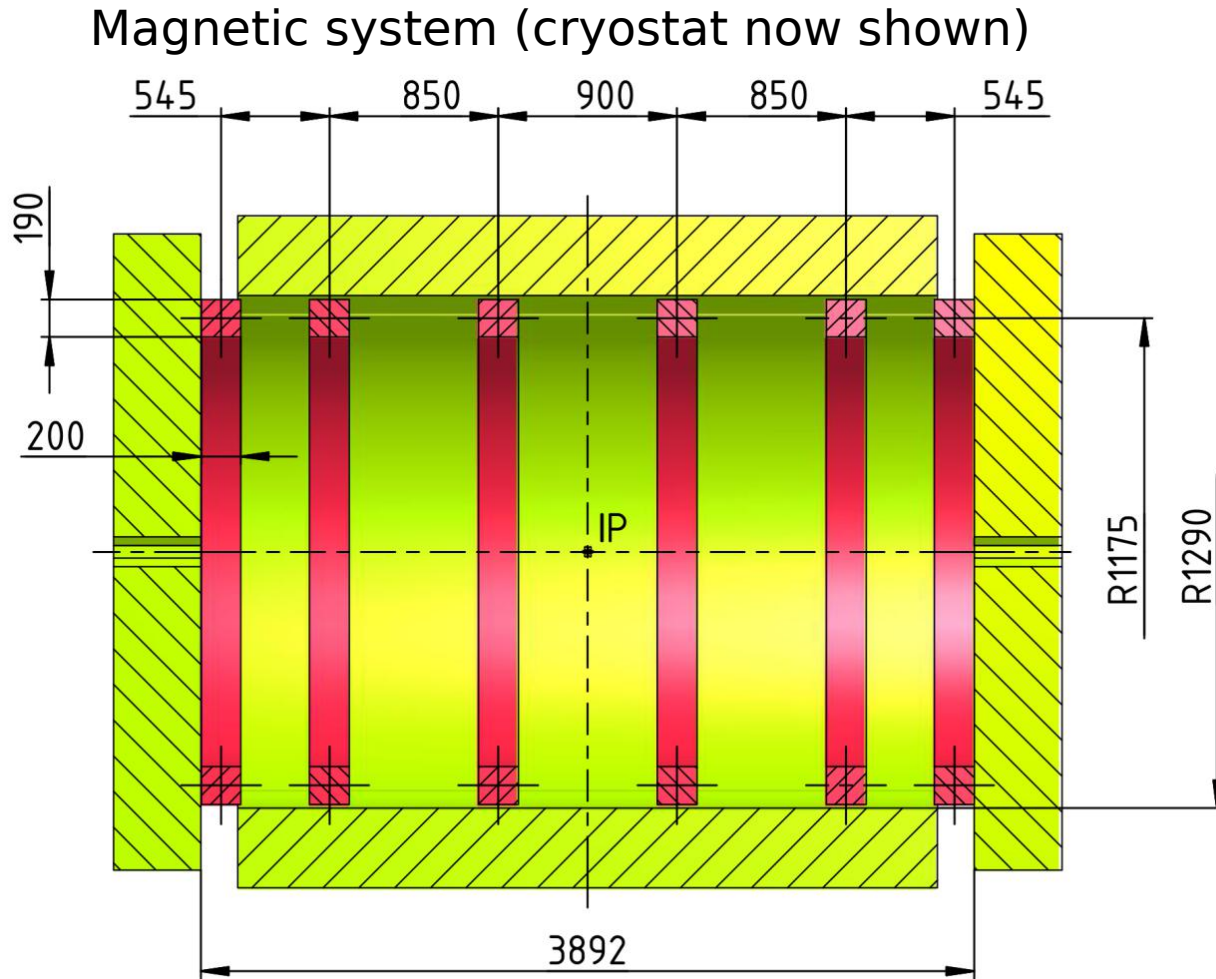
Option 1 ("multiple cryostats", 3 mm)
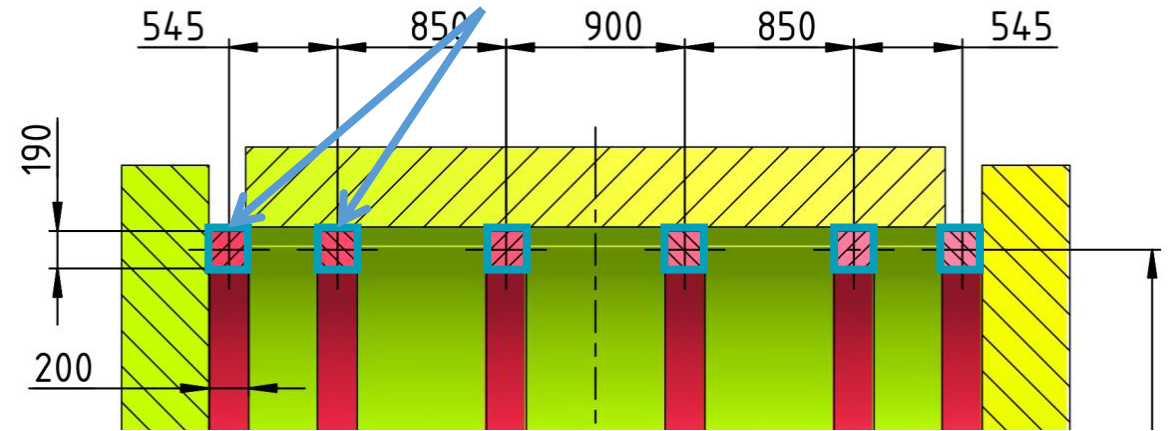
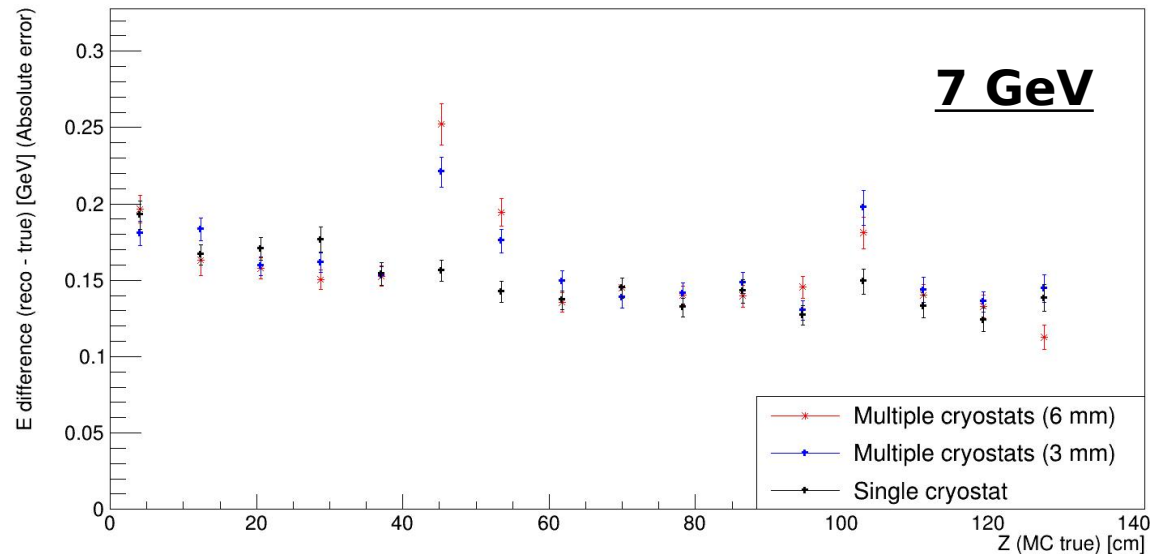Option 2 ("single cryostat", 6 mm)

Geometry options (magnet cryostat)
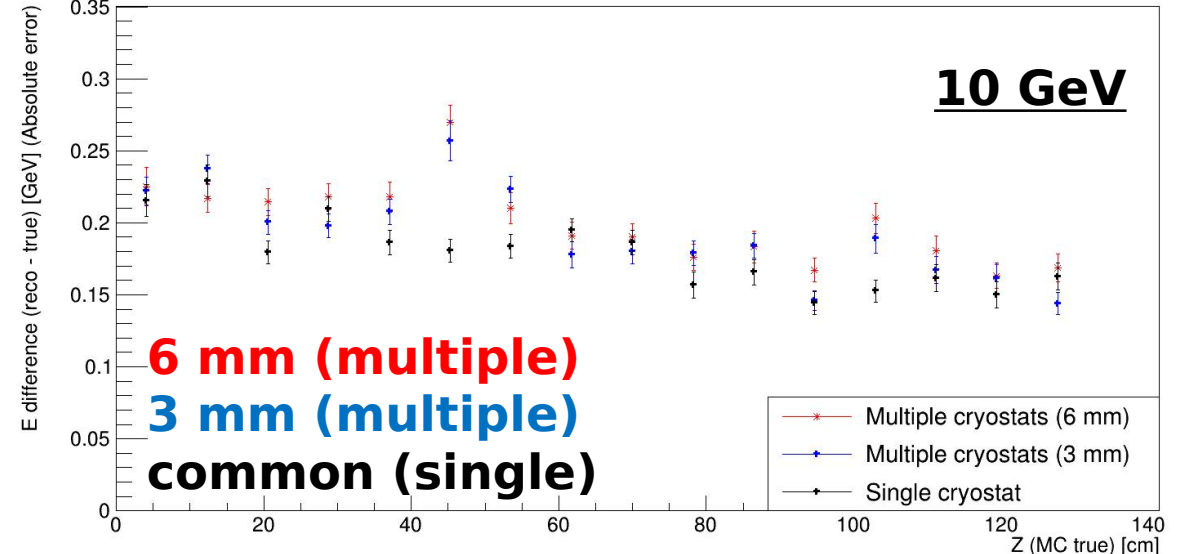
Conclusions

- Using carbon in the gaps doesn't significantly affect resolution, except for region of ± ~10 mrad within the gap
- For energies ~ 1 GeV, there is a tradeoff between multiple and common cryostat setups: setup with multiple cryostats has 50% worse resolution in 15 cm region near the coils, whereas common cryostat setup has 20% worse resolution overall
- At energies above 4 GeV, the two setups give similar resolutions, except for regions near the coils, where the separate cryostat setups yields worse resolution by 20-30%, depending on energy

Next steps:

- investigate the worsening of resolution at the positions of cryostats for "multiple cryostat" options