

# Effect of LGAD (extra material) inside all-si tracker barrel

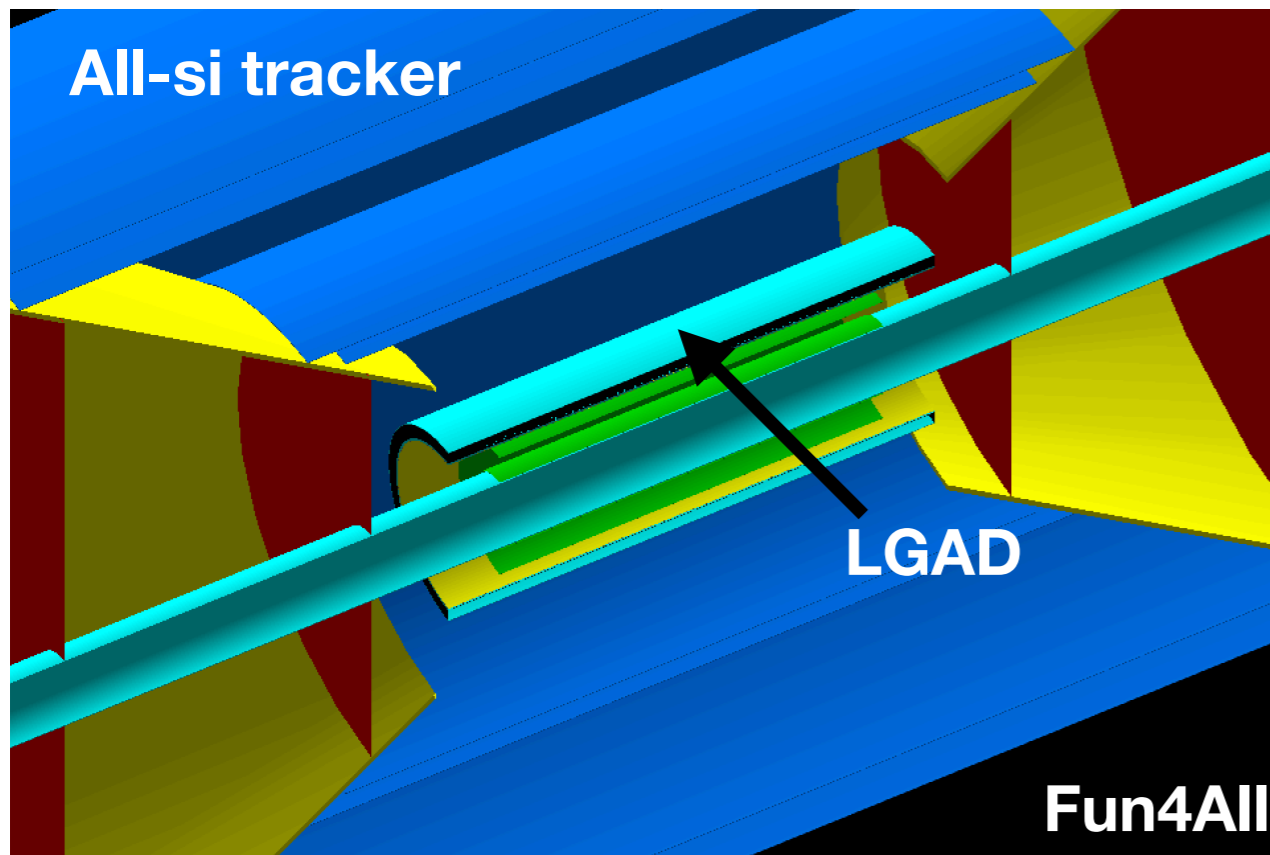


Rey Cruz-Torres, Wenqing Fan  
ATHENA PID Meeting  
06/14/2021

# LGAD Material Budget and characteristics

[https://github.com/reynier0611/g4lblvtx/blob/master/macros/auxiliary\\_studies/simplified\\_geometry/G4\\_TTL\\_EIC.C](https://github.com/reynier0611/g4lblvtx/blob/master/macros/auxiliary_studies/simplified_geometry/G4_TTL_EIC.C)

Resolution:  $500 \mu\text{m}/\sqrt{12}$

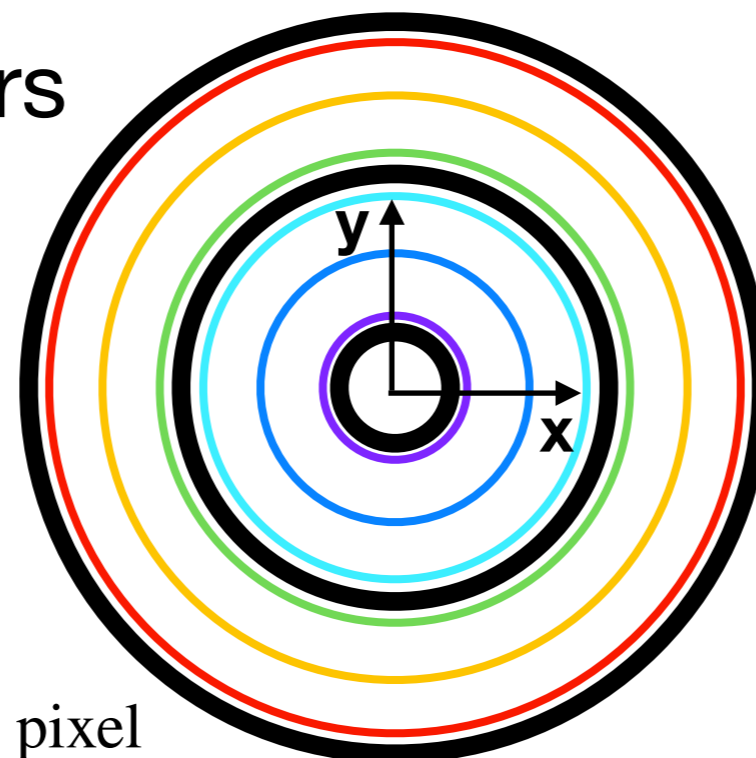


Component	Material	Thickness	X/X0 [%]
Silicon Sensor	Silicon	85 $\mu\text{m}$	0.091
Metal connection	Aluminum	0.15 mm	0.169
HDI	Kapton	0.2 mm	0.0700
Cooling	Water	1 mm	0.277
Support	Graphite	0.5 mm	0.259
Support Gap	Air	1 cm	0.003
Support	Graphite	0.5 mm	0.259
			<b>1.13</b>

## All-silicon tracker layers

Barrel layer	radius [cm]
1	3.30
2	5.70
3	21.00
4	22.68
5	39.30
6	43.23

10  $\mu\text{m}$  pixel



$R_{\text{LGAD}} = 6.2 \text{ cm}$

$R_{\text{LGAD}} = 12.6 \text{ cm}$

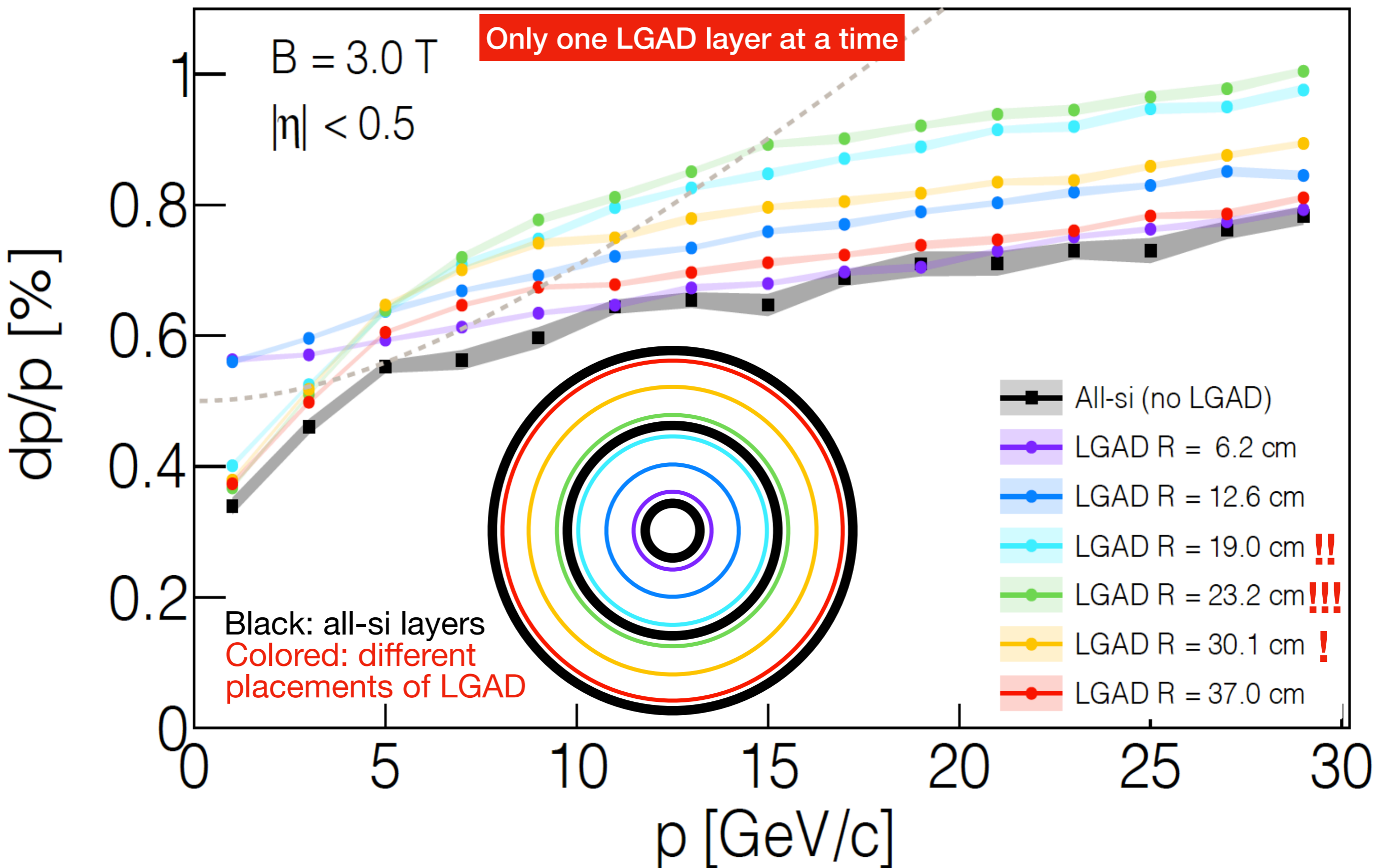
$R_{\text{LGAD}} = 19.0 \text{ cm}$

$R_{\text{LGAD}} = 23.2 \text{ cm}$

$R_{\text{LGAD}} = 30.1 \text{ cm}$

$R_{\text{LGAD}} = 37.0 \text{ cm}$

# Placement of LGAD layer inside the tracking volume



# Summary and Conclusions

- Momentum resolution most (negatively) impacted when LGAD layer is placed near the central barrel layers
- As the LGAD layer is moved away from the sagitta (in either direction), its impact on the momentum resolution decreases
- For LGAD layers placed symmetrically about the sagitta, the momentum resolution in the configuration where the LGAD has a larger radius provides a systematically larger momentum resolution
- At low momentum, the smaller radii LGAD layers have a more significant impact on momentum resolutions
- This study does not take into account the extra material that would need to live within the tracker to service the LGAD layer (from either side of the LGAD)
- Not shown, but also studied: whether the LGAD layers are included in the Kalman filter or not, the results don't change

