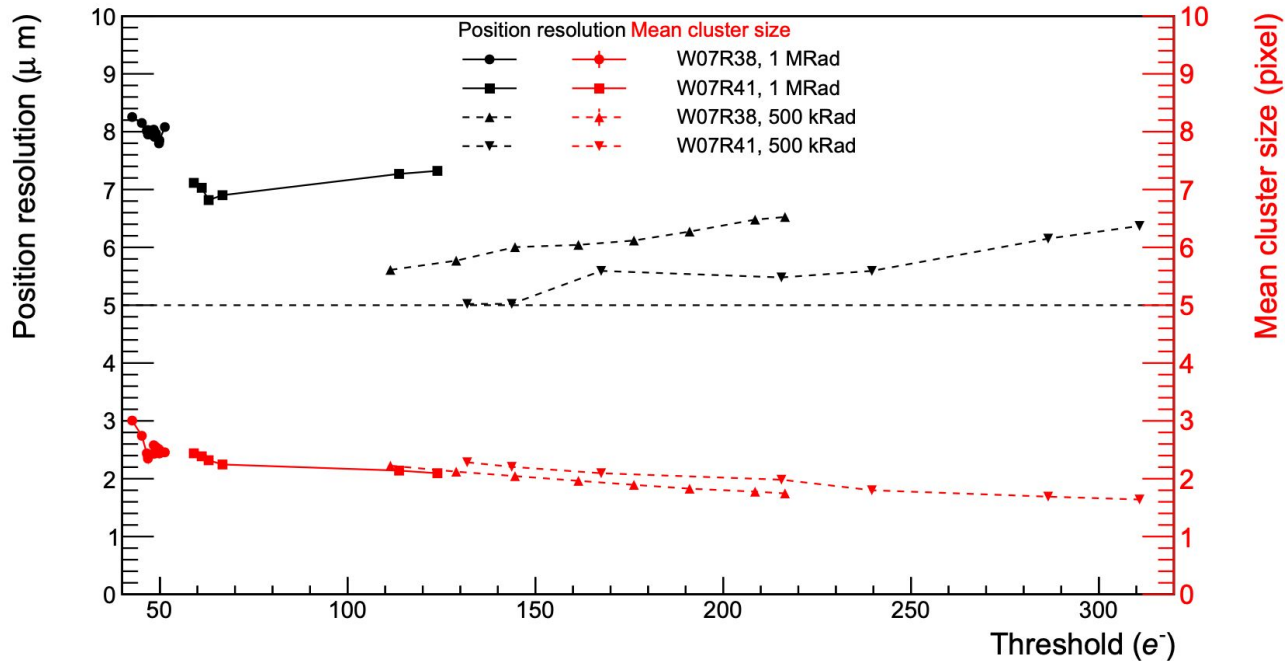


CMOS AI Jul 16

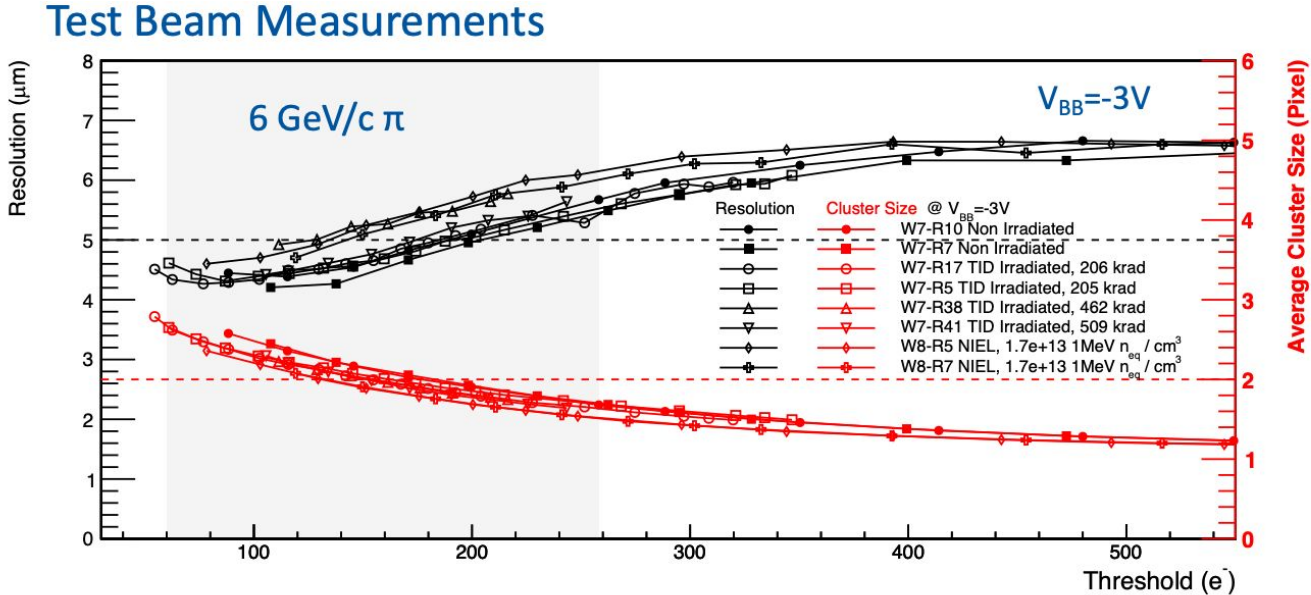
Analysis of test beam data of ALPIDE, the Monolithic Active Pixel Sensor (MAPS) for the ALICE ITS upgrade
Tatiana Lazareva

Properties to replicate



Efficiency?

Irradiated vs. Non-irradiated detectors

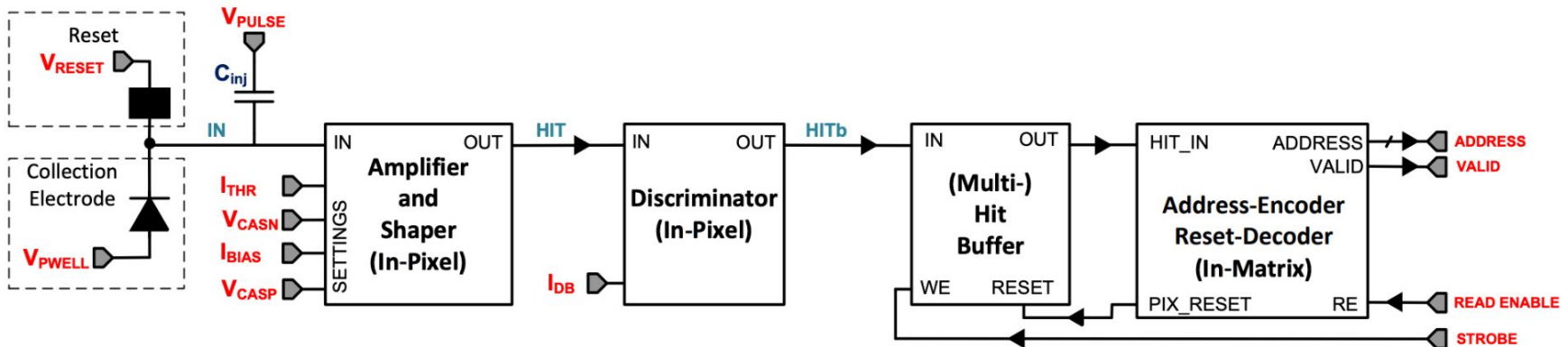


Overview of the ALPIDE Pixel Sensor Features Gianluca Aglieri Rinella, CERN

<https://indico.cern.ch/event/863068/contributions/3752479/attachments/1996261/3330551/20200302-Aglieri-ALPIDE-Overview.pdf>

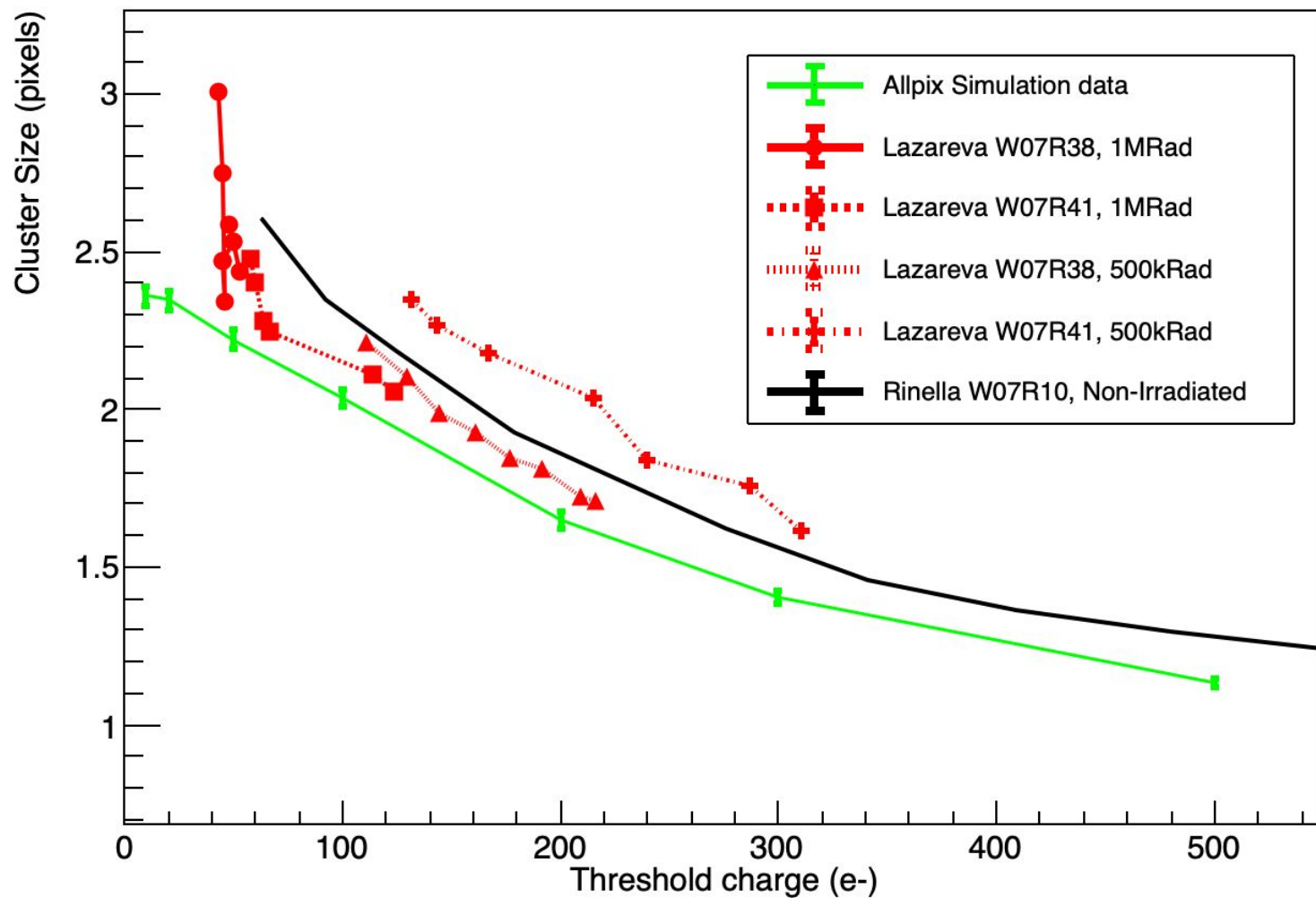
Groups of parameters we can tune

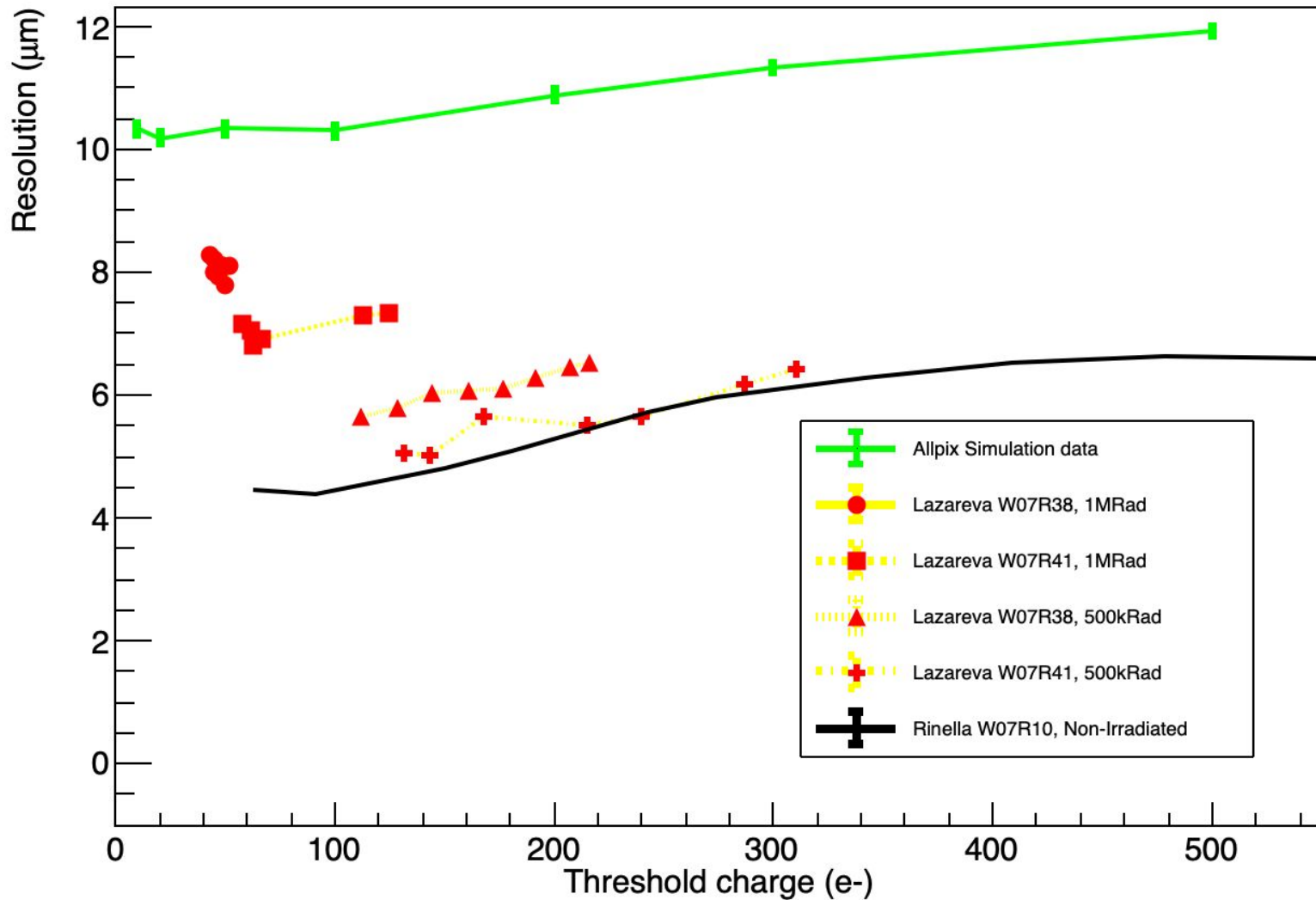
- Beam and related setup parameters
- QDC and TDC resolution and fit parameters
- Electric field characterization
 - How do we characterize depletion depth bias
 - Which models are suitable for the fields in the ALPIDE detector



Current simulations

- Pipeline established!
- 7 Alpide detector telescope to replicate PS
- 1000 Events*
- 6 Gev Pi-
- -3 Bias Voltage
- Depletion depth 20 um
- Beam radius 7um
- Default settings for the remainder





Tracking resolution subtraction?

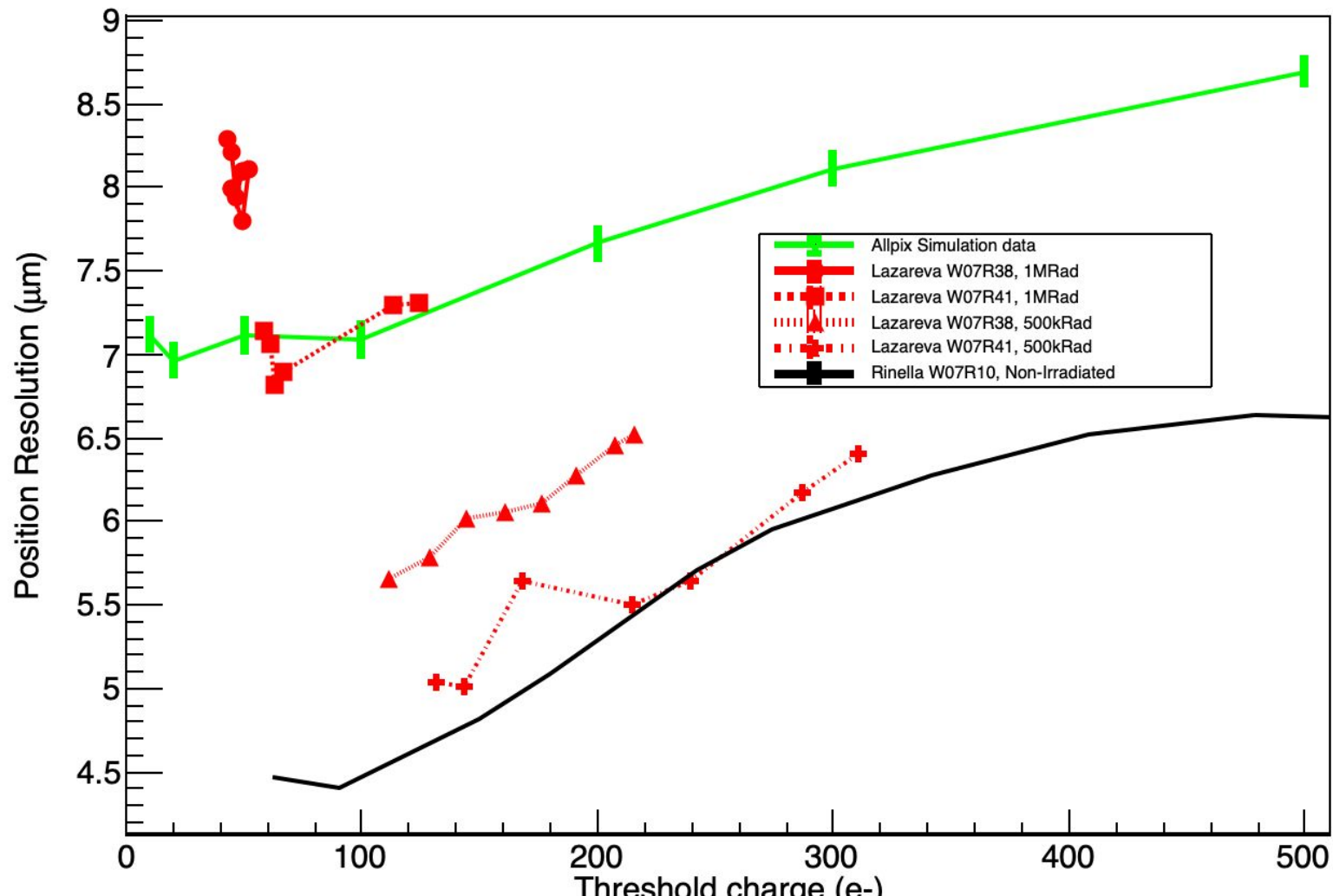
$$\sigma_{pos}^2 = \sigma_{res}^2 - \sigma_{track}^2,$$

<https://cds.cern.ch/record/2290779/files/project.pdf>

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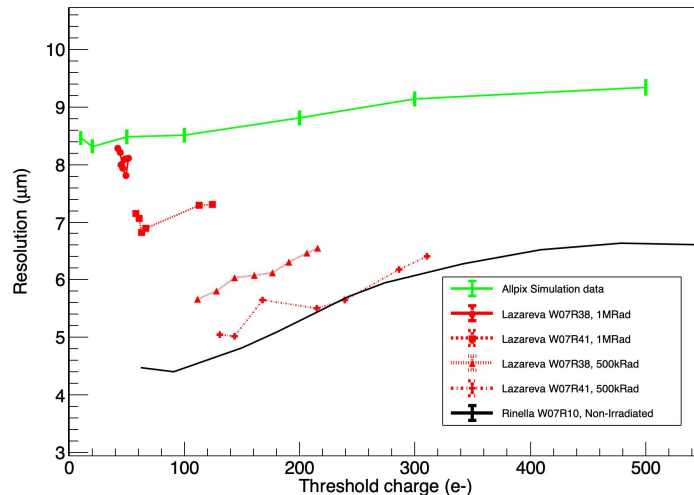
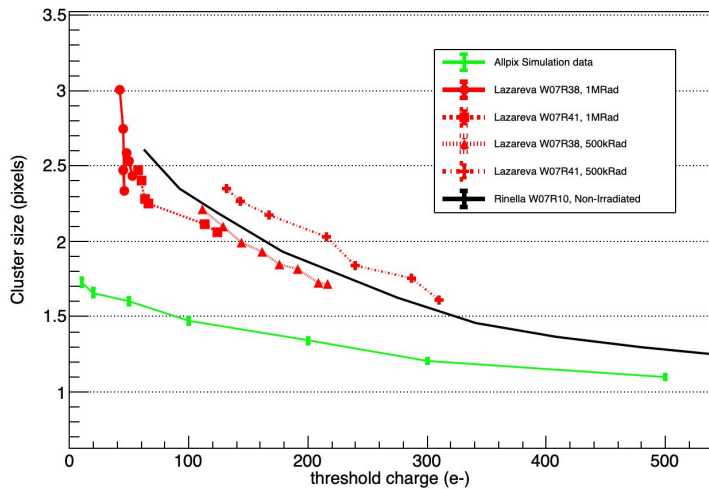
Table 4.1.: Tracking resolution from the simulation.

Angle	PS		SPS	
	50 μm	100 μm	50 μm	100 μm
0	3.22	3.63	2.24	2.24
10	3.28	3.71	2.28	2.28
20	3.47	3.93	2.39	2.39
30	3.83	4.36	2.59	2.60
40	4.45	5.10	2.94	2.94
50	5.52	6.38	3.50	3.51
60	7.56	8.84	4.51	4.51

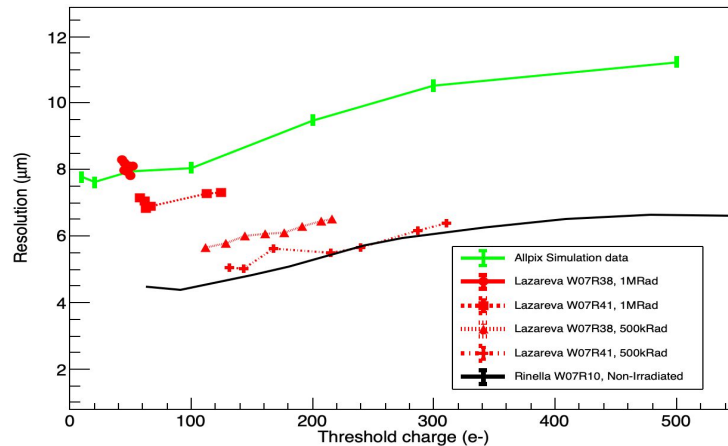
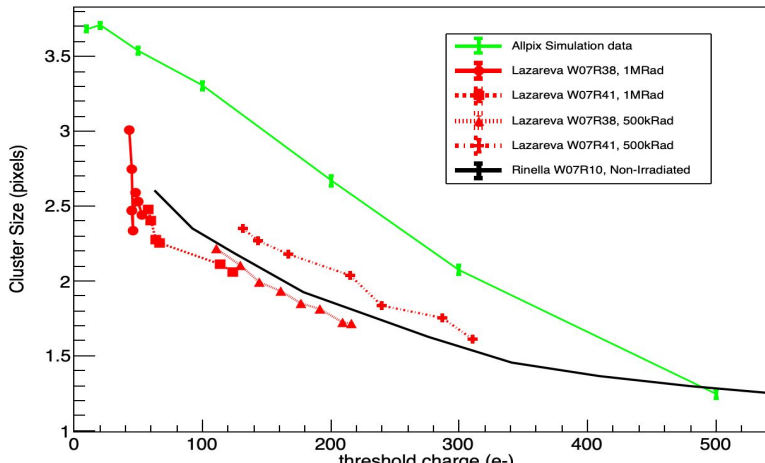


Dependence on Beam radius

1mm

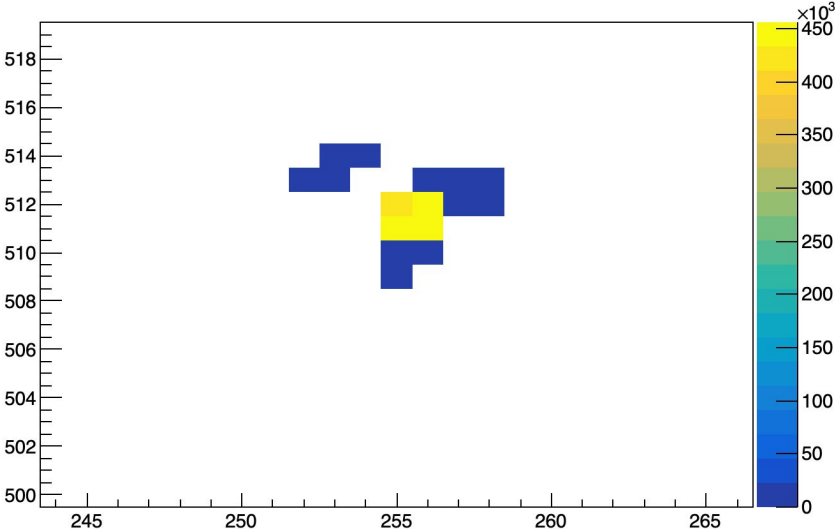


1 μm

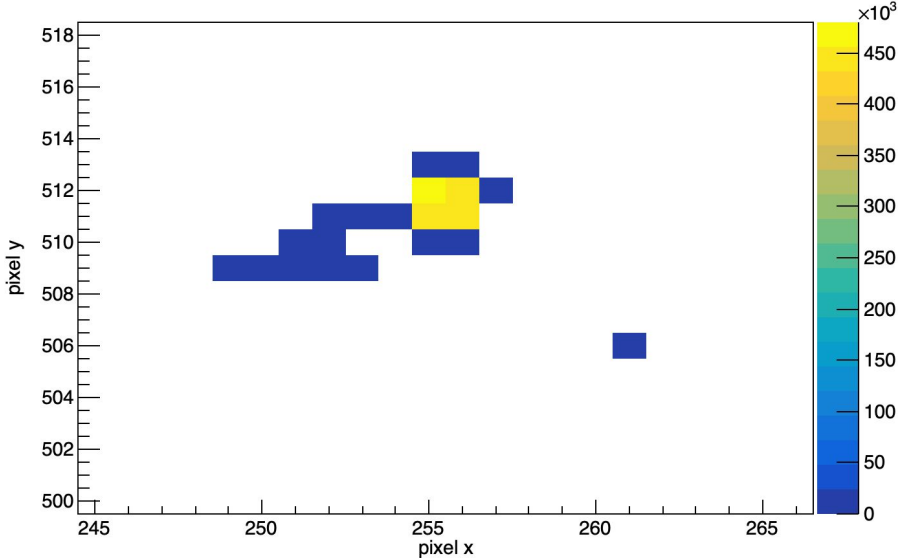


Aggregated pixel hits (weighted by signal in ADC)

Threshold at 10

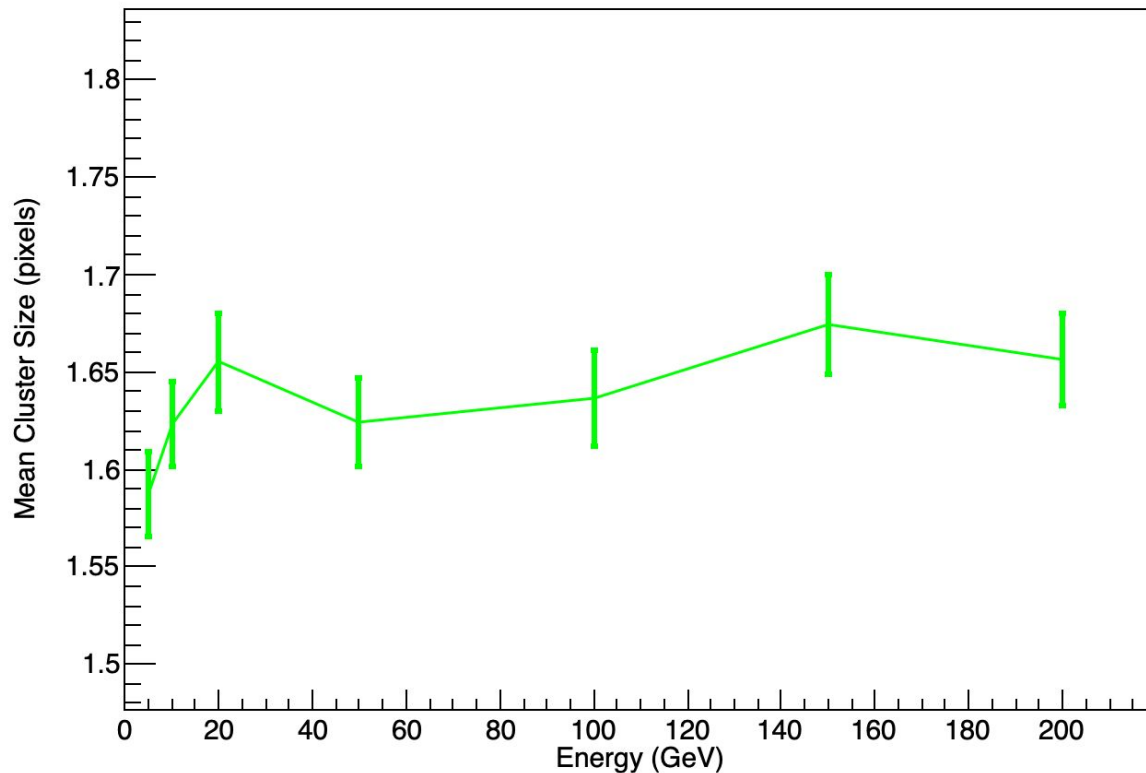


Threshold at 200

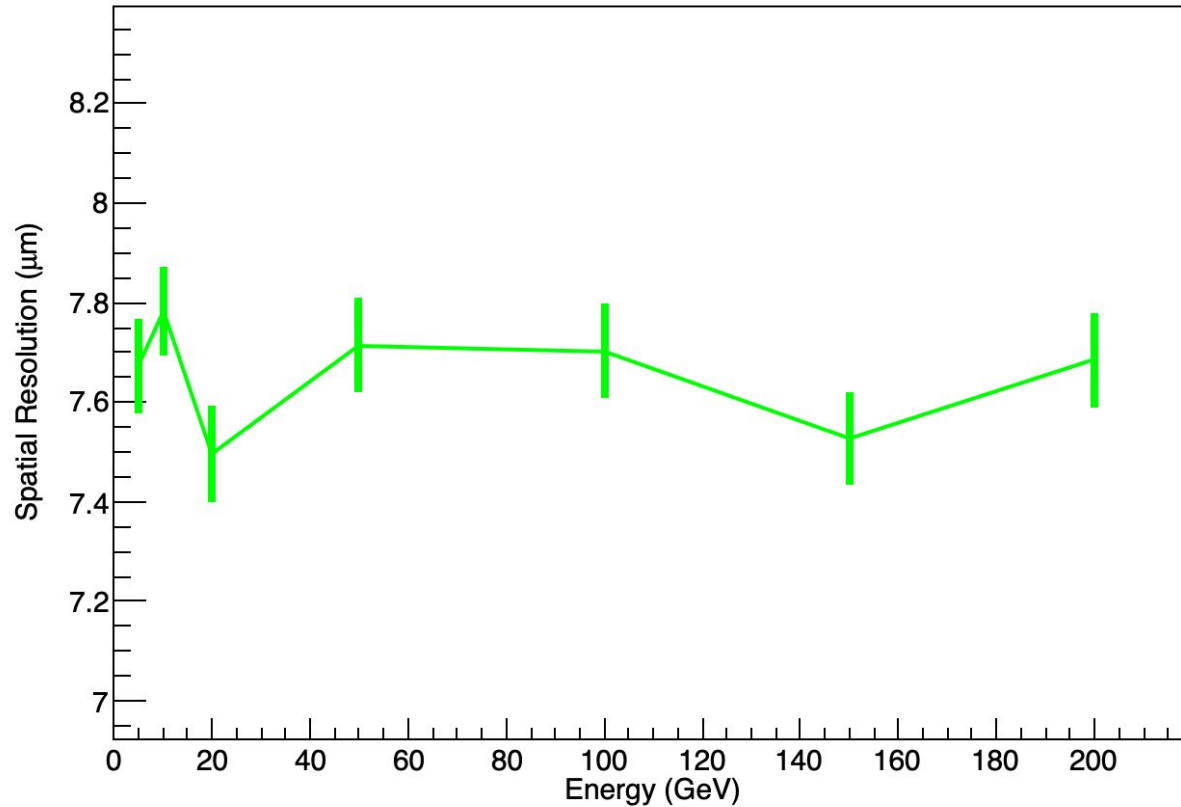


Cluster size energy dependence

- 7 detector telescope
- 1000 Events*
- **6 Gev Pi- <- change**
- -3 Bias Voltage
- Depletion depth 20 um
- Beam radius 7um
- Fix threshold at 200 e-



Position resolution energy dependence



Other things to try

- Adding QDC/TDC resolution
- Cluster shapes
- Custom field for the ALPIDE detector: <https://arxiv.org/pdf/2209.03457>

