agaTRACE: A highly-segmented silicon detector array for charged particle spectroscopy and discrimination

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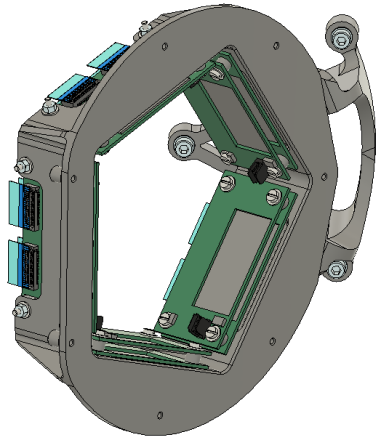
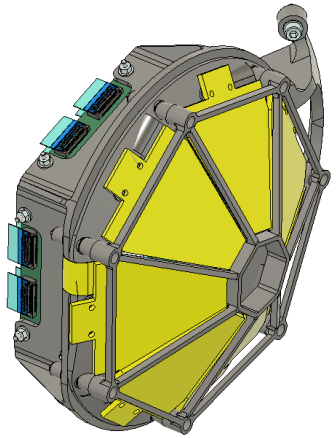
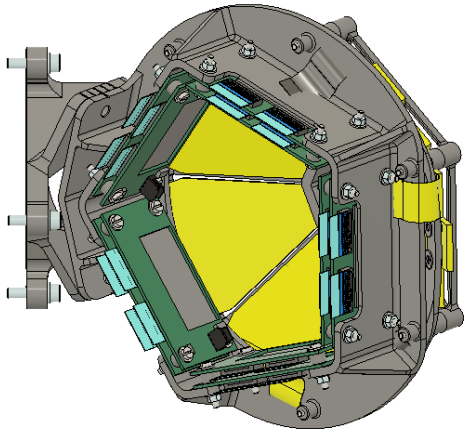
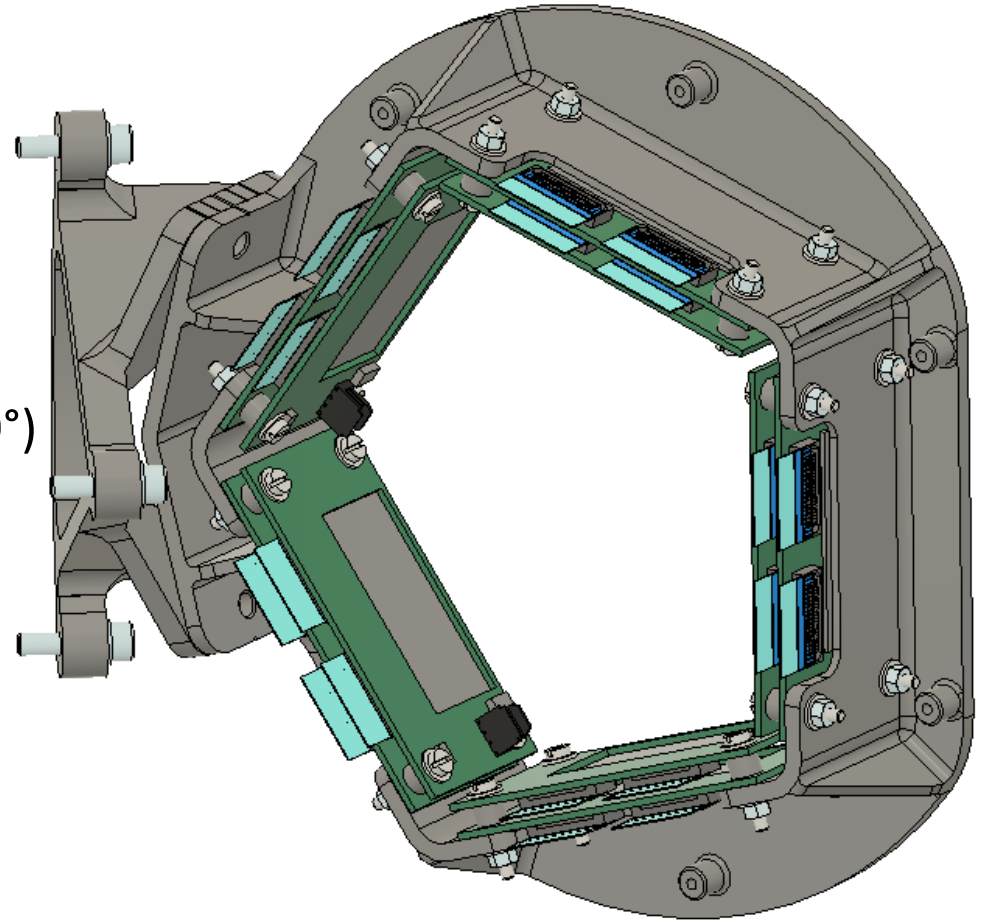
The array structure and purposes

- Five Silicon telescopes 20 mm x 50 mm
- Square segmentation (4 mm x 4 mm) -> 60 pads
- Pads on the E layer read-out independently or grouped in rows/columns
- Detector thickness: 200 µm (ΔE layer); 1 mm or 1.5 mm (E layer)
- Each detector pair (ΔE-E) mounted on a 3D-printed plastic support
- Detectors placed on backward angles (>90°) or forward angles (<90°)

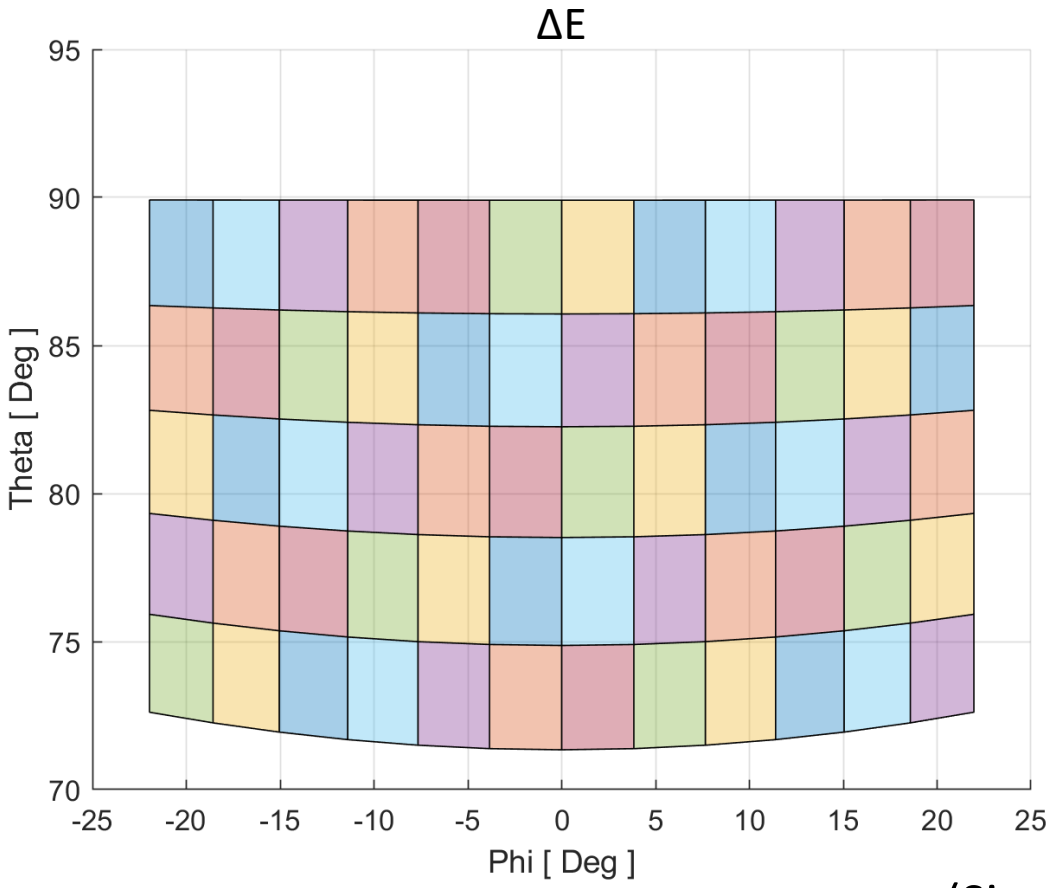


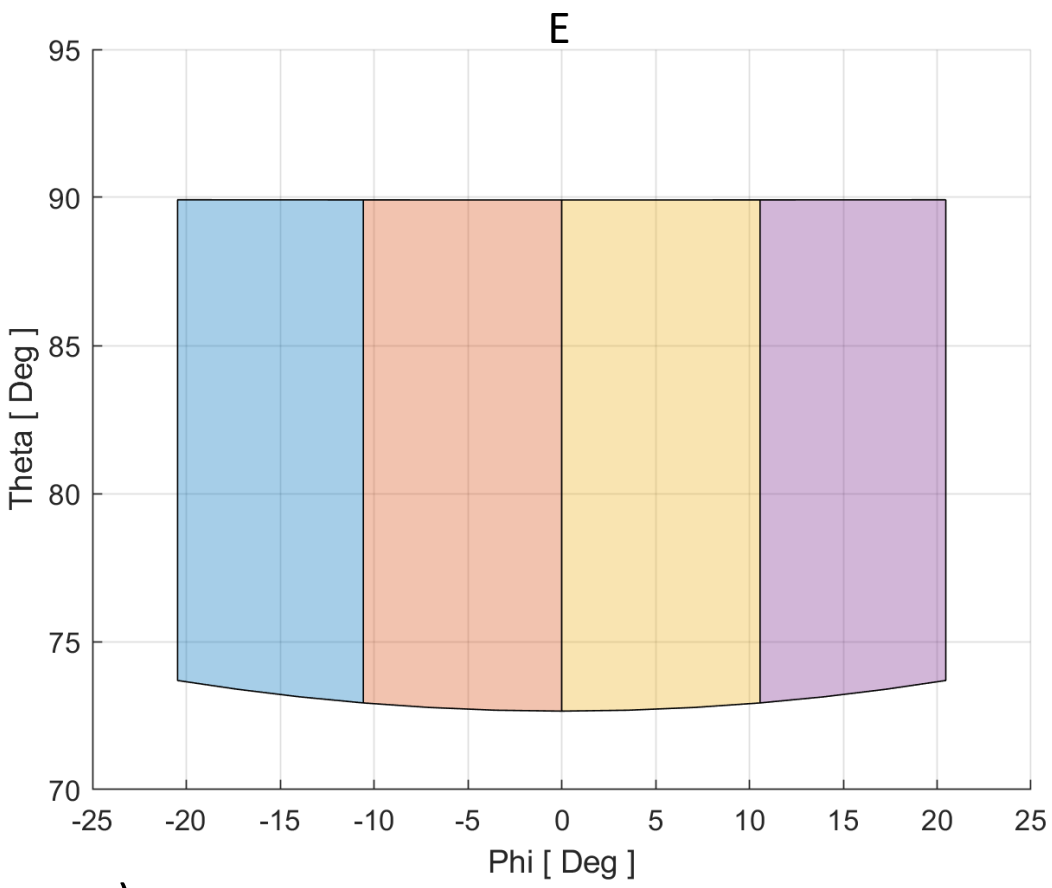






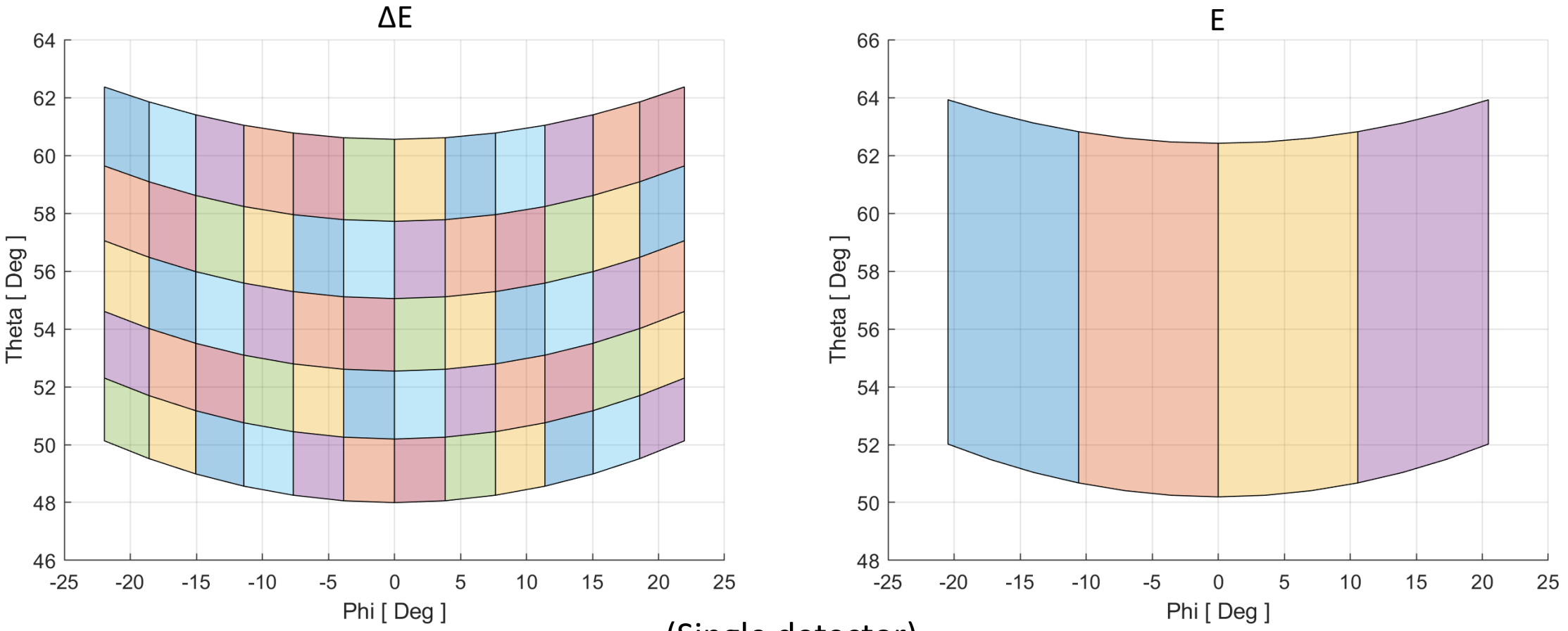
Angular coverage (zero displacement)





(Single detector)

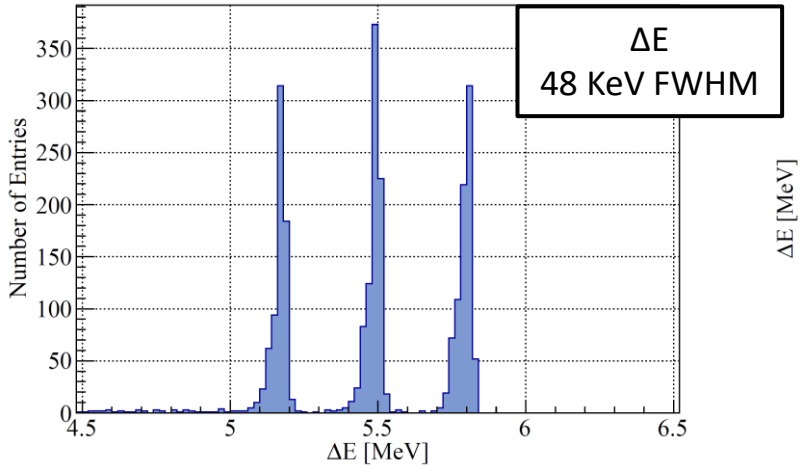
Angular coverage (35mm displacement)

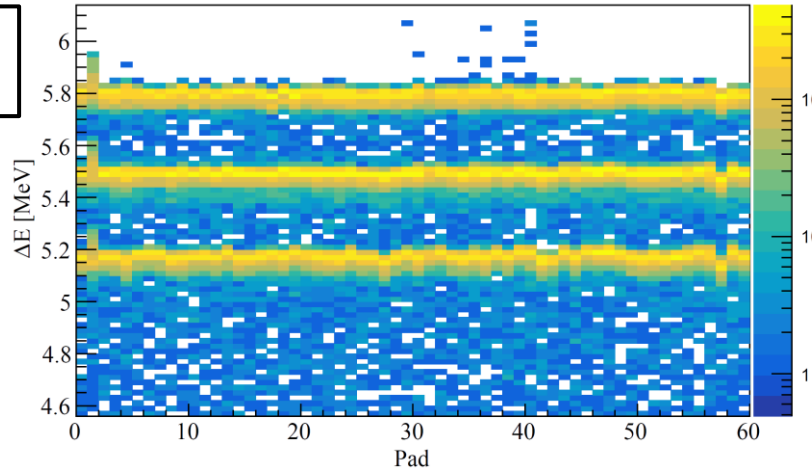


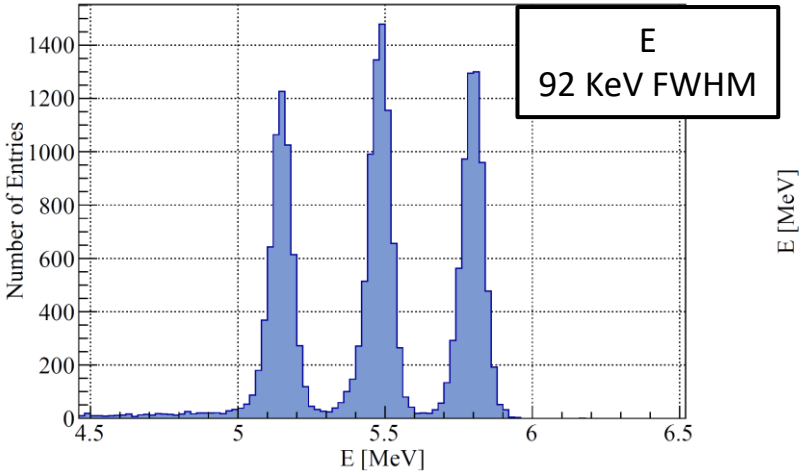
(Single detector)

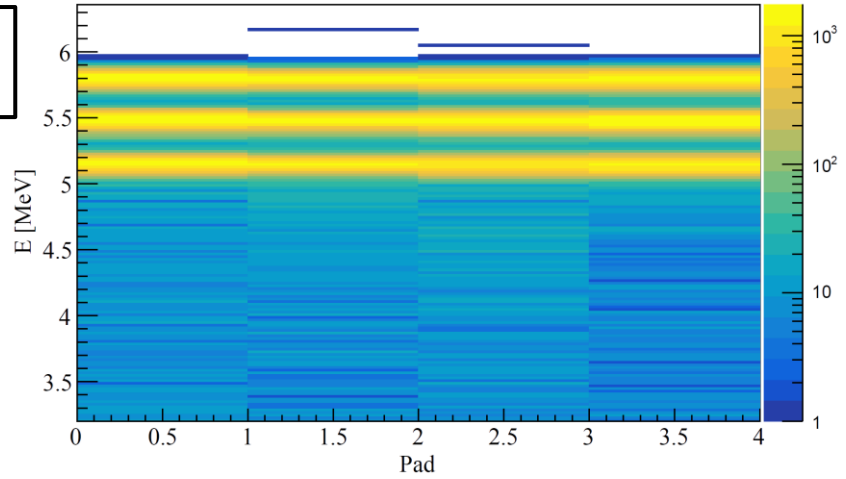
Energy Resolution and rate

- Data taken with a mixed Am-Cm-Pu alpha source
- ΔE resolution: 48 keV FWHM
- E resolution: 92 keV FWHM or better without PAD grouping
- Energy dynamic range: 100MeV
- Event rate: 10KHz on each detector
- 10% of geometric efficiency with five telescopes



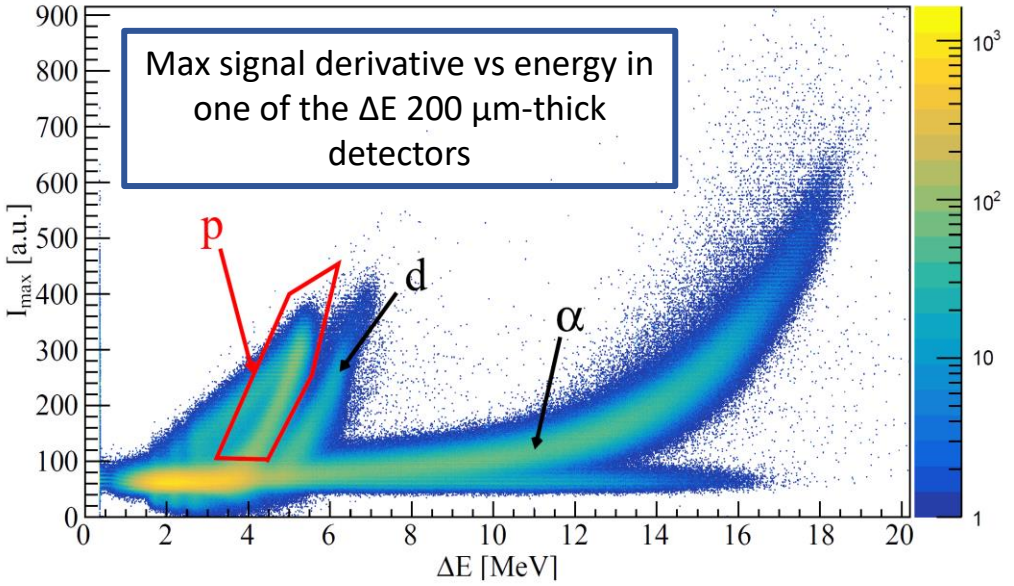


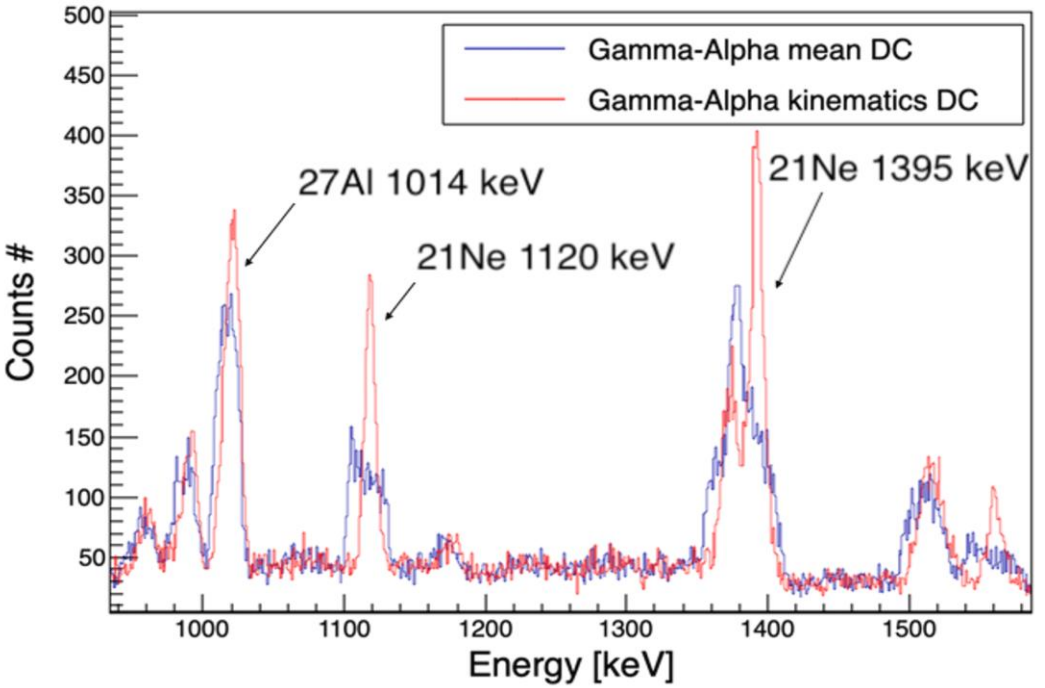




Particle discrimination and Doppler correction

- Preamplifier risetime of 10 ns with 4 pF detector capacitance
- Possibility to discriminate particles with different algorithms (rise-time, max derivative…)
- Possibility to use the proton punch-through energy to correct/extend the normal calibration with alpha source
- Signals sampled with the same AGATA 100 MHz DIGIOPT-12 digitizers
- Thanks to its high granularity, agaTRACE can improve the Doppler correction capabilities of AGATA
- On the right the results obtained in a previous campaign with the GALILEO array





Thank you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