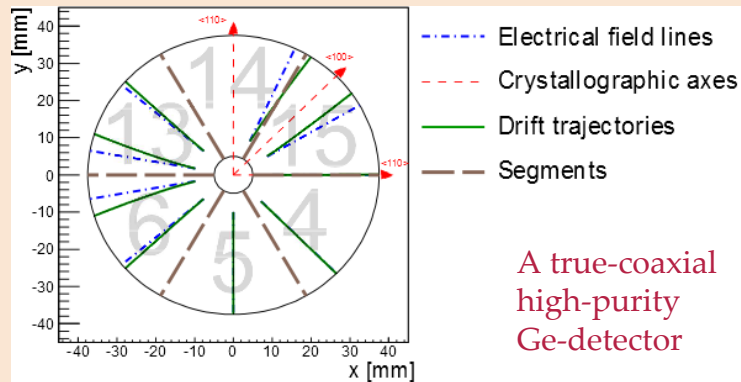# Bulk and Surface Effects in
Segmented High-Purity Germanium Detectors

I. Abt, A. Caldwell, B. Dönmez, S. Irlbeck, B. Majorovits, O. Volynets*

## Anisotropy

A true-coaxial high-purity Ge-detector

Mobility, μ, relates velocity of charge carriers, $v(r)$, and electric field, $E(r)$:
$$v(r) = \mu \cdot E(r).$$
Mobility is a **tensor** $\Rightarrow$ charges do not drift **radially** $\Rightarrow$ non-flat occupancy patterns seen in segments.

Application: fast determination of crystallographic axes using simulated occupancy patterns and comparison to the measured patterns.

Surface effects
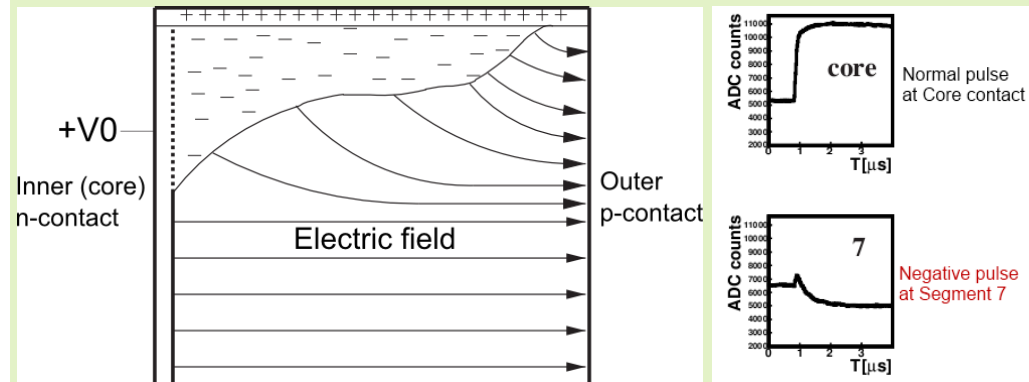
Drifting charges may be trapped close to the surface (inactive layers) $\Rightarrow$ *strange pulses* seen on detector electrodes.
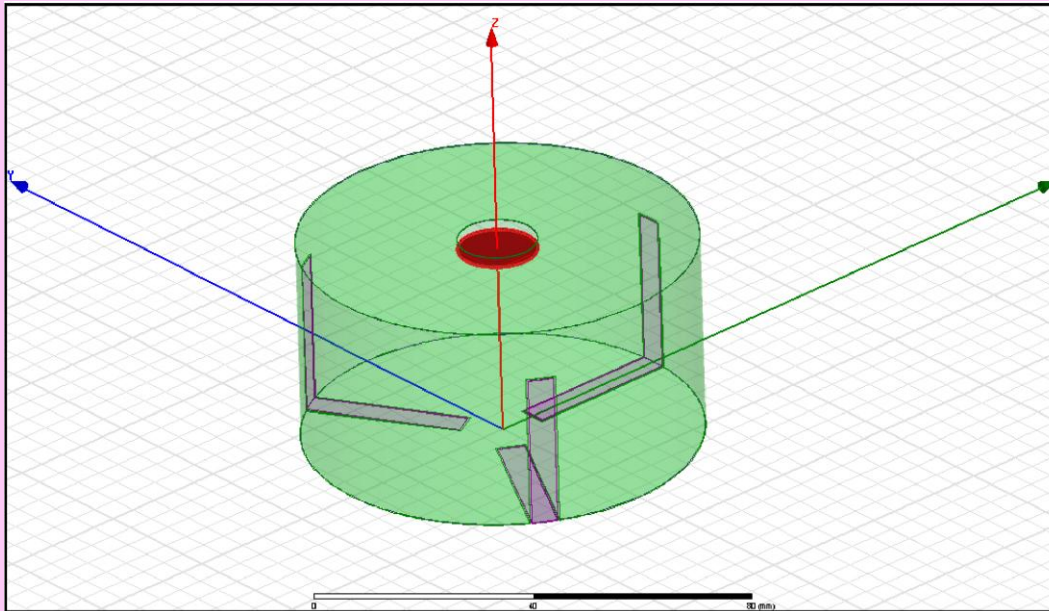
A new test stand, **GALATEA**, was designed and commissioned to study such effects.

Key feature: direct proximity of a radioactive source to the detector

Milestones:
- Cooling system
- Vacuum conditions
- Movable source
- Readout electronics

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Novel design of Segmented BEGe detectors

- Low capacitance:
  o low energy threshold
  o better energy resolution

- Use of segmentation for event topology reconstruction:
  o **Core** point-like **contact**: energy and timing information
  o **Segments**: position reconstruction using the so-called *mirror pulses*

Milestones in progress:

- Electric field calculation for various geometries using ANSYS Maxwell

- Pulse shape simulation

- Position reconstruction algorithms

- Possibility to distinguish between single- and multi-site events known for BEGes