TRIMS DETECTING LIGHT IONS AND ELECTRONS WITH TRIMS SILICON DETECTORS

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PIPS Canberra silicon detector



Thickness: 500 µm
Dead layer: 100 nm

Goal: measure the molecular tritium (T_2) beta decay branching ratio to the bound state ³HeT⁺.

- Understand the TRIMS energy reconstruction and branching ratios by modeling scattering interactions of ions and beta electrons inside the dead layer.



Energy deposition of ions and betas in the silicon detectors

- Simulations with SRIM and KESS of ion and beta interactions in the dead layer
- Ion species-dependent interactions include: •
 - Backscattering Ο
 - Stopping Ο

(keV)

Energy deposited in dead layer Ο

- Energy deposition of beta electrons
 - Electrons in energy range from 5 keV Ο to 80 keV
 - Mean value for energy loss at each Ο energy step

Ion detected energy Energy loss of electrons in the dead layer ∆E/E_{initial} 16 e⁻ in silicon 50 0.14 detector Detected energy 40 30 0.08E 0.06 н 20 0.04E 10 ӟНе 0.02 10 50 60 80 30 40 10 20 30 40 50 60 Einitial (keV) Initial energy (keV)