Measurements of beta-energy spectra with 4π calorimetric techniques*

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Over the past decade, it has been recognized that the Fierz interference term in nuclear beta decay plays a crucial role in constraining exotic scalar and tensor contributions to the weak interaction involving the lightest quarks [1]. However, competitive determinations of the Fierz term have so far only been obtained in an *indirect* way, either through its contribution to $\mathcal{F}t$ values in superallowed Fermi transitions [2] or through its contribution to correlation coefficients involving the spins and momenta in the decay process [3]. *Direct* competitive determinations of the Fierz term require precision measurements of beta-energy spectra and these have been precluded due in particular to the poorly known description of the beta-particle backscattering in matter.

This presentation will review efforts undertaken to measure beta-energy spectra using 4π calorimetric techniques at the National Superconducting Cyclotron Laboratory (East Lansing, Michigan) and at the Grand Accélétareur National d'Ions Lourds (Caen, France). These involve either high energy ^{6}He or ^{20}F ion beams implanted deep into inorganic scintillator crystals or a low energy ^{6}He beam implanted at the surface of inorganic crystals where the 4π geometry is achieved with moving parts. The pros and cons of both approaches will be discussed providing the background for future measurements.

[1] O. Naviliat-Cuncic and M. González-Alonso, Ann. Phys. (Berlin) **525** (2013) 600.
[2] J.C. Hardy and I.S. Towner, Phys. Rev. C **102** (2023) 045501.
[3] M. González-Alonso, O. Naviliat-Cuncic and N. Severijns, Prog. Part. Nucl. Phys. **104** (2019) 165.

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