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ARIES: A High-Efficiency, High-Granularity Beta-Tagging Scintillator Array with Ultra-Fast Timing for Decay Spectroscopy Studies

The combination of large arrays of high-purity germanium (HPGe) detectors with auxiliary particle detection systems is among the most powerful methods for studying atomic nuclei. It is done through nuclear spectroscopy at radioactive ion beam facilities such as TRIUMF-ISAC [1] together with the use of high-efficiency gamma-ray spectrometers like GRIFFIN (The Gamma-Ray Infrastructure For Fundamental Investigations of Nuclei) [2].
The use of ancillary detectors is key for disentangling complex level schemes, providing high isotopic selectivity and giving access to physics observables which give direct insight to the nuclear structure.
The ARIES detector (Ancillary Detector for Rare-Isotope Event Selection) is a high-efficiency ultra-fast β-particles detector designed to operate as the main ancillary detector at the GRIFFIN spectrometer. Its design matches 1:1 the GRIFFIN geometry, allowing ☒-☒ angular correlations with more than 114 unique angles. ARIES entails low g-ray attenuation, superior counting rate greater than 20MBq and Fast Timing capabilities allowing lifetime measurement down to the few ps range.
In addition to its novel design, ARIES includes leverage technologies such as flex-circuit electronics, magnetron sputtering for coating plastic scintillators, and many more. The design, performance, and status of ARIES, along with an overview of the scientific opportunities, will be presented.

References

[1] https://www.triumf.ca/research-program/research-facilities/isac-facilities
[2] Garnsworthy, A. B., et al. "The GRIFFIN facility for Decay-Spectroscopy studies at TRIUMF-ISAC." Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 918 (2019): 9-29.

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