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Spectrometry of cosmic-ray neutrons with the High Efficiency Neutron Spectrometry Array

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The High Efficiency Neutron Spectrometry Array (HENSA) project focuses on the development and scientific application of high-efficiency neutron spectrometers [1], with uses in underground laboratories, rare-events experiments, cosmic-ray neutron studies, space weather research, and environmental dosimetry. The detection principle of HENSA is based on the Bonner Spheres System (BSS) [2], but incorporates a topological modification in detector geometry, achieving up to a tenfold increase in overall detection efficiency compared to standard BSS [3]. The extended-energy-range version of HENSA is sensitive to neutrons from thermal energies up to 10 GeV, enabling full-spectrum measurements of cosmic-ray neutrons. Its high efficiency and wide energy sensitivity allow for the determination of the neutron spectrum and the ambient neutron dose equivalent within 30–60-minute intervals, complementing ground data from the Neutron Monitor Network [4]. This capability enables near real-time analysis of spectral fluctuations throughout the solar cycle and during high-intensity solar events, such as Ground Level Enhancements (GLEs) and Forbush Decreases (FDs).

In 2020, a HENSA detector was deployed in a measurement campaign to study the cosmic-ray neutron spectrum under quiet solar conditions at the beginning of Solar Cycle 25. This campaign enabled the mapping of cosmic-ray neutrons across magnetic rigidities from 5.5 to 8.5 GV and altitudes from sea level to 3000 m, complementing previous studies [5]. Building on these results, a new spectrometer, HENSA++, has been developed with optimized energy resolution for cosmic-ray neutron studies. Since 2024, HENSA++ has begun commissioning, first in Valencia city (sea level, $R_c = 7.5$ GV) and later at the Observatorio Astrofísico de Javalambre (OAJ) in Teruel, Spain (1957 m above sea level, $R_c = 7.07$ GV) [6].

In this talk, we present an overview of the HENSA project for cosmic-ray neutron studies, including results from the 2020 measurement campaign and preliminary findings from the commissioning phase. Finally, we discuss the status and future perspectives for continuous cosmic-ray neutron monitoring with HENSA++ during the second half of Solar Cycle 25.

References

- [1] <https://www.hensaproject.org/>
- [2] D.J. Thomas and A.V. Alevra (2002). NIMA, 476, p. 12–20.
- [3] B. Wiegel, A.V. Alevra (2002). NIMA 476 (2002) 36–41.
- [4] <https://www.nmdb.eu/>
- [5] M. S. Gordon, et al. (2004). IEEE Transactions on Nuclear Science, 51(6)
- [6] <https://www.cefca.es/observatorio/descripcion>

Abstract

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