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The CoolGal Target: Core of the Phase 0 NEPIR (NEutron and Proton Irradiation) Facility

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The NEPIR (NEutron and Proton Irradiation) facility at the SPES (Selective Production of Exotic Species) project at LNL-INFN (Italy), is designed to serve as a unique fast neutron irradiation facility in Italy and a reference point for applied and basic science as well as industrial applications. Driven by the SPES cyclotron, which delivers 35-70 MeV protons at maximum currents of 500 μA, NEPIR will be developed in phases. Phase 0 will produce continuous energy (white spectrum) neutron beams with the possibility to mimic quasi monoenergetic neutron beams (we call it pseudo monochromatic). Phase 1 will provide not only a white spectrum but also true Quasi Mono-energetic Neutron (QMN) beams with controllable energy peaks in the 20-70 MeV range. NEPIR represents a significant step toward addressing the growing demand for accessible, cost-effective neutron sources, filling the gap left by the declining availability of reactor-based neutron facilities. CoolGal, the target system for NEPIR Phase 0, focuses on studying, designing, and testing an innovative target system for proton-induced neutron production. CoolGal is based on a beryllium target, but it is conceived to become a Galinstan liquid metal cooled target with the aim to advance the frontiers of neutron science by enabling the production of high-intensity neutron beams. It will support a wide range of scientific and industrial applications, from radiation shielding studies to developing advanced detectors and medical technologies. CoolGal will allow studies like Single Event Effects (SEE) in electronics, relevant to numerous fields including nuclear energy, space, aviation, and automotive industries. This talk will outline the overall details of the phases of NEPIR and highlight the innovative features of the CoolGal target system, the target assembly as well as the concerns regarding operation and decommissioning. The modular approach of NEPIR and the strategic integration within the SPES infrastructure emphasizes cost-to-benefit efficiency establishing it as a crucial milestone in the advancement of Compact Accelerator-driven Neutron Sources (CANS) technology.

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Future of CANS

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