

SpinQuest Polarized Target System

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Abstract

The SpinQuest experiment at Fermilab uses a solid-state polarized ammonia target held at a magnetic field of 5 T, immersed in liquid helium-4, which is held at approximately 1K by the evaporation refrigerator. The refrigerator provides the required cooling power during the dynamic nuclear polarization (DNP) process and the high intensity interaction with the 120 GeV proton beam from the Fermilab main injector. The refrigerator was designed in compliance with the American Society of Mechanical Engineers (ASME) to operate safely at Fermilab. The high pumping capacity ($17'000m^3/h$) roots stack provides the required pumping speed during DNP production data taking and a custom-made radiation hard flow control valve regulates the refrigerator temperature during the thermal equilibrium calibration measurements. The frequency of the microwave generator, an Extended Interaction Oscillator (EIO), is automated to keep the maximum polarization while the (Nuclear Magnetic Resonance) NMR system continuously measures the polarization of the target material. In this talk, an overview of the SpinQuest polarized target system will be presented as well as a brief report of recent commissioning activities and target performance during the early production runs in 2024.