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The SABRE South experiment at the Stawell Underground Physics Laboratory

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The SABRE (Sodium iodide with Active Background REjection) experiments aim to detect an annual rate modulation from dark matter interactions in ultra-high purity NaI(Tl) crystals in order to provide a model independent test of the signal observed by DAMA/LIBRA. The SABRE South experiment is located at the Stawell Underground Physics Laboratory (SUPL), Australia, and is partnered with SABRE North at the Laboratori Nazionali del Gran Sasso (LNGS). SUPL is the first deep underground laboratory in the Southern Hemisphere and is due to be ready for use by mid-2022.

SABRE South is designed to disentangle seasonal or site-related effects from the dark matter-like modulated signal by using an active veto and muon detection system. Ultra-high purity NaI(Tl) crystals are immersed in a linear alkyl benzene (LAB) based liquid scintillator veto, further surrounded by passive steel and polyethylene shielding and a plastic scintillator muon veto. Work has been undertaken to understand and mitigate the leading background processes, and to understand the performance of both the crystal and veto systems. In this talk we will present the final experiment design and results of our full GEANT4 based background simulation model. SABRE South has an expected background of < 0.7 cpd/kg/keV allowing us to probe a DAMA/LIBRA like signature with 3σ sensitivity within around 2 years of data taking. We will also discuss the overall experiment construction status and the characterisation of the key detector components, including our photomultiplier tubes, NaI(Tl) crystals, LAB liquid veto, and muon system.

Finally, We will report on the design of SUPL and its science program for the near future. SABRE South is the first major experiment in SUPL, with assembly to commence soon after the handover.

In-person participation

Yes

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