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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) experiment aims 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. It is made up of two separate detectors; SABRE South located at the Stawell Underground Physics Laboratory (SUPL), in regional Victoria, Australia, and SABRE North at the Laboratori Nazionali del Gran Sasso (LNGS).

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. Significant work has been undertaken to understand and mitigate the background processes, that take into account radiation from the detector materials, from both intrinsic and cosmogenic activated processes, and to understand the performance of both the crystal and veto systems.

SUPL is a newly built facility located 1024 m underground (˜2900 m water equivalent) within the Stawell Gold Mine and its construction will be completed by mid-2022. The laboratory will house rare event physics searches, including the upcoming SABRE dark matter experiment, as well as measurement facilities to support low background physics experiments and applications such as radiobiology and quantum computing. The SABRE South detector assembly is planned to start once SUPL is finalised, and its commissioning is expected to occur in 2023.

This talk will report on the design of SUPL design and its current status, as well as the general status of the SABRE South assembly.

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