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First physics results from the SNO+ experiment

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Various theories beyond the Standard Model propose baryon number violating processes in order to explain the matter-antimatter asymmetry in the universe, many of which result in some form of nucleon decay. Some modes of nucleon decay are invisible, in the sense that the final state particles remain undetected. Following the disappearance of one or two nucleons in such a nucleus, the subsequent de-excitation of the remaining daughter nucleus may yet be observed via gamma-ray emission. Understanding the corresponding branching ratios for the population of various energy states in the daughter nuclei is crucial for setting lifetime limits on these decays.
The SNO+ experiment has been taking data for the past two years, during which the detector was filled with ultrapure water for commissioning and calibration purposes. Due to the 2 km rock overburden (6000 m.w.e.) and the high target purity, it was possible to conduct low background measurements as well as new physics searches in the 5-10 MeV energy range. In particular, a search for invisible nucleon and dinucleon decay modes in 16O was conducted. Additionally, the 8B solar neutrino flux was measured with an exceptionally low background rate. Results from these analyses are discussed here.

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