Poster session 4 – Friday 8 July

P4.067 **Physics capabilities of the SNO+ experiment**

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Later this year SNO+ will enter its first phase of physics data-taking. The Canadian based detector forms part of the SNOLAB underground facility, in a Sudbury Nickel mine; its location providing more than two kilometres of rock overburden. In this poster we present an overview of the SNO+ experiment and its physics capabilities. The detector comprises a 12 m diameter acrylic vessel filled with 780 tonnes of liquid scintillator, providing a low energy threshold. Surrounding the acrylic vessel are seven kilotonnes ultra-pure water shielding and ∼9300 photomultiplier tubes to detect photons produced by interactions in the scintillator.

SNO+ has a varied and extensive physics program, with a focus on neutrinoless doublebeta decay. For this phase of the experiment the scintillator will be loaded with 0.5% natural Tellurium. Our expected sensitivity would place an upper limit of 1.9×10^{26} y, at 90% CL, on the half-life of neutrinoless double-beta decay in ^{130}Te. This would begin to probe the inverted hierarchy region. We also intend to build on the success of multiaward-winning predecessor SNO, in studying the solar neutrino spectrum. In the unloaded scintillator phase SNO+ has the ability to make high precision measurements of the fluxes of low-energy pep neutrinos and neutrinos from the CNO cycle. Other physics goals include: measuring the flux of geo-neutrinos produced in the Earth's crust and mantle; determining the flux of reactor antineutrinos to further constrain Δm^2_{12} and detecting neutrinos produced by galactic supernovae.

The physics reach of SNO+ also includes some more exotic searches, such as certain modes of nucleon decay. This will be the focus of the phase of physics data-taking later this year, where the acrylic vessel will be filled with ultra-pure water. We aim to improve on existing limits by a factor of two within just three months.