P4.068 Background analysis for the SNO+ experiment

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on behalf of SNO+ collaboration

The SNO+ Experiment aims to make a world leading search for neutrino less double beta decay ($0\nu\beta\beta$) of ^{130}Te with a 5 year half-life sensitivity of 1.9×10^{26} years using 3.9 tonnes of natural Tellurium isotropically loaded in 780 tonnes of liquid scintillator. The total background budget within 0.5σ to 1.5σ of the $0\nu\beta\beta$ energy is 13.4 events per year, dominated by 8^{B} solar neutrinos.

This poster presents SNO+ analysis strategies to measure the residual Uranium and Thorium chain backgrounds through the timing coincidence of short half-life components. ^{214}Po alpha decays with a half-life of $^{164}\mu s$ providing a distinctive timing signature to tag and reject the preceding ^{214}Bi beta decay. Similarly, ^{212}Po alpha decays with a half-life of 0.3 μs providing a tag for the preceding ^{212}Bi decay.

We show that these so-called BiPo events can be rejected from the $0\nu\beta\beta$ region of interest (ROI) with 99.995% efficiency and minimal (<2%) signal sacrifice. Pure samples of BiPos can also be created to accurately measure the rates of Uranium and Thorium decays in-situ.

In a fraction of decays, the Polonium alpha decay will occur within the same 400ns event trigger window at the beta, resulting in a higher energy pile-up event. A separate classification has been developed based on the hit timing structure in order to reject these events. We show that large rejection factors can be achieved for this class of event, with minimal (<1%) signal loss.

A final class of background events results from the pile up of higher frequency low energy backgrounds with events such as $2\nu\beta\beta$, which would not otherwise contribute to the ROI. We present a final set of event classifiers developed specifically to reject these events and show that their contribution to the double beta analysis can be reduced to negligible levels.