

Sterile Neutrino Oscillation Searches using the VALOR Fitting Framework at SBN

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The Short Baseline Neutrino (SBN) programme has an extensive physics program where one of the key aims is to investigate the existence of light sterile neutrinos. It comprises 3 LArTPC detectors along the Booster Neutrino Beam (BNB), a muon neutrino (μ) beam. The near detector of the programme (SBND) sits at a distance of only 110m from the BNB target; this, along with the size of SBND, will result in a large neutrino flux being measured at SBND. SBND will carry the main burden of reducing systematic error for the programme. With the high statistics and excellent imaging capabilities, the detector will fully characterise the neutrino flux and neutrino-Argon cross-section and enable sensitive oscillation searches with the full SBN. Additionally, due to its short baseline, SBND is sensitive to very fast oscillations, characterised by large squared mass splittings.

The VALOR Neutrino Fitting Framework is a well established and validated framework that has been developed within T2K and used for many published results. It is fully integrated within the SBN analysis chain where it will support standalone analysis of each of the three oscillation channels available to SBND; ν_μ disappearance, ν_μ appearance, and ν_e disappearance along with joint multi-channel analyses. VALOR will incorporate a combination of inclusive and exclusive samples and exploit the SBND-PRISM capabilities to provide robust systematic constraints and definitive tests of the light sterile neutrino hypothesis. This talk will cover the VALOR analysis procedure and preliminary sensitivity results along with a discussion of a novel analysis technique known as PRISM.

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