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P1.016 Benefits of Gd for high energy neutrinos

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The SuperK-Gd project is the approved upgrade of the Super-Kamiokande (SK) detector in order to enable it to efficiently (>80 %) detect thermal neutrons by dissolving 0.2 % of gadolinium sulphate into its water. In addition to its well known benefits for the study of relatively low energy supernova (<40 MeV) and reactor neutrinos (<10 MeV), this ability to tag most of the neutrons produced in the final state has significant advantages in the analysis of high energy (>100 MeV) neutrino interactions in SK.

In this work we discuss the improvements in the separation of the interacting neutrino/antineutrino, the distinction between Neutral Current and Charged Current neutrino interactions, and the use of the tagged final state neutrons for better reconstruction of the interacting neutrino energy. We study the impact of those features on both atmospheric and long baseline neutrino oscillation analyses.