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Sensitivity of the DANSS detector to short range neutrino oscillations

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DANSS is a highly segmented 1m^3 plastic scintillator detector. It's 2500 scintillator strips have a Gd loaded reflective cover. Light is collected with 3 wave length shifting fibers per strip and read out with 50 PMTs and 2500 SiPMs. Light collection uniformity across and along the strip as well as the photoelectron yield are adequate to the physics goals of the experiment. Continuous calibration of all strips will minimize the systematic uncertainties in the detector response at different distances from the reactor. Together with the a very high antineutrino counting rate of ~10 thousand per day and a very low background level of less than ~1% this will lead to a high sensitivity of the detector to short range neutrino oscillations. The DANSS will be installed under the industrial 3GW reactor of the Kalinin Nuclear Power Plant at distances varying from 9.7m to 12.2m from the reactor core. Tests of the detector prototype demonstrated that in spite of a small size ($20 \times 20 \times 100 \text{ cm}^3$), it is quite sensitive to reactor antineutrinos, detecting about 70 Inverse Beta Decay events per day with the signal-to-background ratio of about unity. The prototype tests have demonstrated feasibility to reach the design performance of the DANSS detector. The DANSS experiment will have a high sensitivity to reactor antineutrino oscillations to sterile neutrinos, suggested recently to explain a so-called "reactor anomaly". It will start data taking early in 2015.

Summary

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