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Jinping Neutrino Experiment

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- We will present a preliminary R&D study of a low energy neutrino experiment (arxiv:1602.01733), which is proposed to be at China JinPing Laboratory, a laboratory with the thickest overburden and lowest reactor neutrino background. Based on about 4 kiloton of liquid scintillator or water-based liquid scintillator and the assessments of the site and potential detector designs, we will give the expected discoveries and precision improvements for neutrino physics, astrophysics, and geo-science.
- Jinping has a very strong potential to significantly improve the measurements of neutrinos with a few MeV energy from the interior solar fusion processes, including the components, fluxes and spectra. Jinping can precisely measure the transition phase for the solar neutrinos oscillation from the vacuum to the matter effect, providing a critical test for the Mikheyev-Smirnov-Wolfenstein (MSW) theory in the high density environment. Jinping can also discover solar neutrinos from the carbon-nitrogen-oxygen (CNO) cycle with more than 5 sigma of statistical significance, discovering the energy source for massive stars and shedding light on the metal abundance of the solar core and the homogeneous chemical assumption of the C, N, and O elements. It can also resolve the high and low metallicity hypotheses.
- Jinping can carry a precise measurement on geo-neutrinos with an unambiguous separation on U and Th cascade decays from the dominant crustal anti-electron neutrinos. The estimated event rates of 37 U and 9 Th geo-neutrino events/year/kton will be significantly above the expected <6 reactor neutrino events/year/kton. The ratio of U/Th can be determined to 10%. We expect that the measurement from Jinping together with the Borexino and KamLAND results can give an extrapolation of the flux for the desired mantle neutrinos and reveal the mystery of the engine driving Earth's continental growth, mountain movement and distribution of heat producing elements.

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