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Search for a 4th light neutrino state with a 5 PBq ^{144}Ce - ^{144}Pr electron antineutrino generator next to a large liquid scintillator detector

The reactor neutrino and gallium anomalies can be tested with a 5 PBq (100 kCi scale) ^{144}Ce - ^{144}Pr antineutrino beta-source deployed at the center or next to a large low-background liquid scintillator detector. The antineutrino generator will be produced by the Russian reprocessing plant PA Mayak in 2014, transported to the detector site, and deployed as early as 2015. We will describe the challenge of producing an intense ^{144}Ce -based antineutrino generator, the expected L/E signal, and the expected backgrounds. Borexino's target volume provides a suitable environment to measure the energy and position dependence of the detected neutrino flux. A characteristic oscillation pattern would be visible for a baseline of about 10 m or less, providing a very clean signal of neutrino disappearance into a yet-unknown, sterile neutrino state. This will provide a comprehensive test of the electron disappearance neutrino anomalies and could lead to the discovery of a 4th neutrino state for $\Delta m^2 > 0.1 \text{ eV}^2$ and $\sin^2(2\theta) > 0.05$.

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