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Search for sterile neutrinos with the STEREO experiment

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All previous neutrino oscillation experiments at short distance from reactors have measured a small deficit of neutrinos with respect to predictions. This deficit could be explained either by a systematic error on the flux prediction, either by the existence of a new neutrino state, a light sterile neutrino. This new neutrino with no ordinary weak interaction would not be directly detected but could mix with the three ordinary neutrinos. If proven, the existence of this particle would be a major discovery, with deep impact in particle physics and cosmology. The goal of the Stereo experiment is to answer the existence of a sterile neutrino with a detector located at ten meters from the ILL reactor. The design of the detector with six independent cells will allow to measure the neutrino energy spectrum as a function of the distance from the reactor. Currently under construction, the detector will start the data-taking at the beginning of 2015.

Physical motivations for the existence of a sterile neutrino will be first introduced. Then, the STEREO experiment will be described in details, particularly the systematic errors and background problematics. Finally, expected sensitivities on the neutrino parameters, the mixing angle and the squared mass difference, will be presented.

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