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Search for sterile neutrinos at the ILL reactor

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The goal of the Stereo experiment is to answer the question of the existence of a sterile neutrino with a mass around 1 eV. The proposed measurement will take place at short distance from the research reactor of ILL in Grenoble. If a sterile neutrino exists then one should observe a distortion of the energy spectrum of the reactor electron antineutrinos induced by the mixing with the new sterile state. The detection concept is based on the interaction of the antineutrinos in a liquid scintillator (LS) via the inverse beta decay process. The target volume consists in 6 cells stacked along the direction of the core. They are filled with Gadolinium (Gd) -doped LS to tag the radiative neutron capture on Gd in coincidence with the annihilation of the positron. An outer crown, filled with LS without Gd, recovers part of the escaping gammas to improve the detection efficiency and the energy resolution. The light emits by the reaction is collected by 54 photomultipliers (PMT), placed at the top of the vessel. The optically coupling between the LS and the PMT is realized thanks to acrylics blocks . To collect the maximum of the light emitted, an acrylic aquarium which is comprising within a reflector foil is placed inside the internal vessel.

The CEA Irfu team is in charge of the design, the realization and the integration of the inner detector of the experiment.

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