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Search for eV Sterile Neutrinos – The Stereo Experiment

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In the recent years, major milestones in neutrino physics were accomplished at nuclear reactors: the smallest neutrino mixing angle θ_{13} was determined with high precision and the emitted antineutrino spectrum was measured at unprecedented resolution. However, two anomalies, the first one related to the absolute flux and the second one to the spectral shape, have yet to be solved. The flux anomaly is known as the Reactor Antineutrino Anomaly and could be caused by the existence of a light sterile neutrino eigenstate participating in the neutrino oscillation phenomenon. Introducing a sterile state implies the presence of a fourth mass eigenstate, while global fits favor oscillation parameters around $\sin^2 2\theta = 0.09$ and $\Delta m^2 = 1.8\,\mathrm{eV}^2$.

The Stereo experiment was built to finally solve this puzzle. It is one of the first running experiments built to search for eV sterile neutrinos and takes data since end of 2016 at ILL Grenoble (France). At a short baseline of 10 meters, it measures the antineutrino flux and spectrum emitted by a compact research reactor. The segmentation of the detector in six target cells allows for independent measurements of the neutrino spectrum at multiple baselines. An active-sterile flavor oscillation could be unambiguously detected, as it distorts the spectral shape of each cell's measurement differently.
This talk will give an overview on the Stereo experiment, along with details on the detector design, detection principle and the current status of data analysis.

Experimental Collaboration

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