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Search for eV Sterile Neutrinos - The STEREO Experiment

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Search for eV Sterile Neutrinos – The STEREO Experiment

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In the recent years, the study of reactor antineutrinos has revealed two unsolved anomalies. The first one is related to the neutrino spectral shape where an excess of detected neutrinos compared to the model is observed around 5 MeV. The second anomaly, called Reactor Antineutrino Anomaly (RAA), is a deficit of the detected neutrino flux compared to the expected one. This phenomenon could be explained by an oscillation to a new light sterile neutrino. It can be tested by searching for oscillations at a reactor with very short baselines.

The STEREO experiment was installed at $\sim$ 10 m from the compact core, highly enriched in ^{235}U, of the research reactor of the Institut Laue-Langevin (Grenoble, France). The detector has been designed to search for a new light sterile neutrino in the parameter region of the RAA best fit parameters (Δm^2_{41} = 2.3 eV^2 and $\sin^2(2\theta_{ee}) = 0.17$), but also to characterize the flux and the shape of the pure ^{235}U spectrum. Data were taken between November 2016 and November 2020. STEREO has been able to exclude a significant part of the parameter space with a dataset of 179 (211) days reactor on (off) data. A measurement of the absolute flux, with the best precision for a single experiment at a reactor with highly enriched ^{235}U, has also been achieved. Finally the STEREO analysis provided a neutrino energy spectrum which shows an excess, compared to the rate-normalized Huber model, around 5 MeV similar to the one reported by other reactor experiments.

In this contribution we will give an overview of the STEREO experiment. Then, updated results obtained with the whole STEREO dataset,
collecting 334 (543) days on (off), will be presented.

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