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Latest results of the STEREO search for a sterile neutrino at a research reactor

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During the last period, reactor neutrino experiments have played an increasing role in understanding neutrino oscillations, in particular with the precise measurement of the mixing angle θ_{13}. However, following a reevaluation in 2011 of reactor antineutrino fluxes, a discrepancy between measured and expected fluxes, known as the Reactor Antineutrino Anomaly (RAA), was observed and has yet to be fully understood. This anomaly could result from the existence of an additional (thus sterile) light neutrino state participating in the oscillation. The parameter values that best match this conjecture are: $\sin^2(2\theta_{ee})$ =0.14 and Δm^2_{41}=2.4 eV^2.

The STEREO experiment was designed to test this oscillation hypothesis independently of predicted antineutrino spectra and fluxes, using the antineutrinos emitted by the compact core of the research reactor at the Laue-Langevin Institute in Grenoble, France. The target located at about 10 m from the core is segmented in six cells, allowing for a measurement of the antineutrino energy spectrum at various baselines, so that the experiment is sensitive to the oscillation toward a sterile neutrino that would distort each cell's spectrum differently.

Data taking began in 2016 and is ongoing. In 2018 the STEREO collaboration published its first results excluding the RAA best fit with a confidence level of more than 99% and excluding a large part of the parameter space. This talk will present the latest results of STEREO with significantly improved sensitivity to the oscillation of a sterile neutrino, and will include measurements of antineutrino flux normalization and spectrum shape emitted by a ^{235}U-dominated nuclear fuel.

Secondary track (number)

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