Contribution ID: **376** Type: **Oral**

Search for eV Sterile Neutrinos –The STEREO Experiment

Tuesday 4 June 2019 16:50 (20 minutes)

In 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 anti-neutrino 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 (RAA) and could be caused by the existence of a light sterile neutrino eigenstate participating in the neutrino oscillation phenomenon. The RAA is best explained by an oscillation with parameters $\sin^2(2\theta_{ee}) = 0.14$ and $\Delta m^2_{41} = 2.4\,\mathrm{eV}^2$.

The STEREO experiment was built to probe this parameter region. 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 metres, it measures the anti-neutrino flux and spectrum emitted by a compact research reactor. The segmentation of the detector in six cells allows for independent measurements of the neutrino spectrum at multiple baselines. An active-sterile flavour oscillation could be unambiguously detected, as it distorts the spectral shape of each cell's measurement differently. In 2018, STEREO was able to exclude significant part of the parameter space with its first data set of 66 (138) days reactor-on (off) data.

In this contribution, an overview on the STEREO experiment will be given. Furthermore, updated results with the new increased dataset of 185 (233) days of reactor-on (off) will be presented.

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Subject

Neutrinos

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Abstract Title

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Session Classification: Parallel Session Neutrinos