Latest Result of the STEREO Experiment at the ILL & Interpreting Reactor Antineutrino Anomalies

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Abstract: The experimental and theoretical research on the physics of massive neutrinos is based on the standard paradigm of three-neutrino (3ν) mixing, which describes the oscillations of neutrino flavors measured in solar, atmospheric and long-baseline experiments. However, several anomalies are short baseline oscillation data, corresponding to an L/E of about 1m/MeV could be interpreted by involving a hypothetical fourth neutrino such as reactor antineutrino anomaly (RAA) and Galium anomaly.

The STEREO experiment was designed to investigate this conjecture, which would potentially extend the Standard Model of particle physics. The STEREO detector (has segmented design) is a high-precision very-short-baseline experiment studying ^{235}U antineutrinos produced by highly enriched nuclear fuel. Located at about 10 meters from reactor core at the research of Institut Laue-Langevin (Grenoble, France), and are detected in six cells Gd-loaded liquid scintillator volumes via the IBD process.

STEREO provides a complete study of all anomalies for a pure ^{235}U antineutrino spectrum, using HEU ILL core (93% ^{235}U).

This presentation will describe an analysis of the full set of data generated by STEREO and an accurate prediction of the reactor. The measured antineutrino energy spectrum suggests that anomalies originate from biases in the nuclear experimental data used for the predictions, while rejecting the hypothesis of a light sterile neutrino. Our result supports the neutrino content of the Standard Model and establishes a new reference for the ^{235}U antineutrino energy spectrum.

Keywords— Neutrinos, STEREO, Light Sterile Neutrinos, Reactor Antineutrinos Anomalies, Spectrum Prediction, Nuclear Reactor, Oscillation, Liquid Scintillator