



Contribution ID: 9

Type: **Parallel Contributed Talk**

Search for sterile neutrinos at RENO

Thursday, 25 February 2021 10:00 (20 minutes)

We present results of searches for light sterile neutrino oscillations at RENO. We have conducted a sub-eV scale sterile neutrino oscillation search using the RENO far and near detector data and an eV scale sterile neutrino oscillation search combining the RENO and NEOS data. The identical RENO near and far detectors are located at 294 m (near) and 1383 m (far), respectively, from the center of the reactor array of the Hanbit Nuclear Power Plant. The NEOS detector is located at 24m from the core of the fifth reactor in the same power plant. An observed prompt-spectral difference between RENO near and far detectors is found to be consistent with that of the three-flavor oscillation model, and thus yields 95% C.L. limits on $\sin^2 2\theta_{14}$ in the $10^{-4} |\Delta m_{41}^2| 0.5 \text{ eV}^2$. Based on the spectral comparison between RENO and NEOS spectra, we obtain a 90% C.L. excluded region of $10^{-3} |\Delta m_{41}^2| 7 \text{ eV}^2$. We also obtain a 68% C.L. allowed region with the best fit of $|\Delta m_{41}^2| = 2.37 \pm 0.03 \text{ eV}^2$ and $\sin^2 2\theta_{14} = 0.09 \pm 0.03$ with p-value 13% for the three-flavor oscillation model as a null hypothesis. Comparisons of obtained reactor antineutrino spectra at reactor sources are also made among RENO, NEOS and Daya Bay to find a possible spectral variation.

Collaboration name

RENO

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Session Classification: Sterile Neutrinos and New Physics

Track Classification: Neutrino Masses and Mixings