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Measurement of Reactor Antineutrino Spectra from U(235) and Pu(239) Fission at RENO

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We report the measured reactor antineutrino spectra from the fission of ^{235}U and ^{239}Pu using 2,500 days of RENO near detector data. The change of fission fraction and thus reactor neutrino yield during a fuel cycle can be used to separate ^{235}U and ^{239}Pu contributions to the observed yields. The antineutrino spectra from the ^{235}U and ^{239}Pu fission are obtained from unfolding the detector effect of separated prompt spectra. The IBD (Inverse beta decay) yields from the ^{235}U and ^{239}Pu fission are measured as 6.11 ±0.14 cm^2 per fission and 4.35 ±0.21 cm^2 per fission, corresponding to deficits of (9.4 ±2.1)% and (1.0 ±4.7)% with respect to the prediction by Huber, respectively.
The deficit of the ^{235}U fission is alleviated in comparison with the Kurchatov Institute(KI) conversion model and the Estienne-Fallot (EF) summation model. The prompt (antineutrino) spectrum from ^{235}U fission shows a 5 MeV (6 MeV) excess of prompt (neutrino) energy with 3.9σ significance while such a clear excess is not seen in the ^{239}Pu spectrum.

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