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Reactor antineutrino measurement at Daya Bay

Friday, 8 July 2022 14:45 (15 minutes)

This talk presents the latest results of the reactor antineutrino flux and spectrum measurement at Daya Bay. The antineutrinos were generated by six nuclear reactors with 2.9 GW thermal power each and were detected by eight antineutrino detectors deployed in two near and one far underground experimental halls. Deviations in the measured flux and positron prompt energy spectrum were found compared to the theoretical predictions. The ^{235}U and the ^{239}Pu fluxes and spectra were obtained by fitting the flux and spectrum evolution as a function of fission fractions. After that, the reactor antineutrino spectra of IBD reactions were unfolded to provide a data-based prediction for other reactor antineutrino experiments.
In 2021, a joint determination of the reactor antineutrino spectra resulting from the fission of ^{235}U and ^{239}Pu was carried out by the Daya Bay and PROSPECT Collaborations. The precision of the derived ^{235}U spectrum was improved beyond that individually observed by either experiment, and the degeneracy between the derived ^{235}U and ^{239}Pu spectra was reduced below that from Daya Bay alone. This is the first measurement of the ^{235}U and ^{239}Pu spectra based on a combination of experiments at low- and highly enriched uranium reactors.
Recently, high-energy reactor antineutrinos above 10 MeV were firstly observed at Daya Bay. A multivariant analysis was applied to statistically distinguish 2500 signal events from background events in nearly 9000 inverse beta-decay candidates in the prompt energy region of 8-12 MeV, rejecting the hypothesis of no reactor antineutrinos of energy above 10 MeV with a significance of 6.2σ. This first direct measurement of high-energy reactor antineutrinos provides a unique data-based reference for other experiments and theoreti

In-person participation

No

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