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Measurements of the neutrino flux and spectrum in the reactor from Daya Bay

Thursday 24 August 2023 08:30 (20 minutes)

This talk presents the latest results of the reactor antineutrino flux and spectrum measurement at Daya Bay. The antineutrinos were generated by six 2.9 GWth nuclear reactors and detected by eight antineutrino detectors deployed in two near (560 m and 600 m flux-weighted baselines) and one far (1640 m flux-weighted baseline) underground experimental halls. From December 2011 to December 2020, Daya Bay collected the largest sample of inverse beta decay (IBD) candidates to date.The ratio of measured to predicted antineutrino flux was found to be 0.953±0.014(exp.) for the Huber-Mueller (HM) model. The measured antineutrino IBD yield was (5.89±0.07)$\times 10^{-43}$cm^2/fission, and its normalized variation as the fuel evolution was (-0.300±0.024)$\times 10^{-43}$cm^2/fission. The HM model predictions in two measurements were rejected to 3.6 σ and 3.0 σ, but the SM2018 model prediction was consistent with these two results. Daya Bay measured the prompt energy spectrum of antineutrinos in the detector, which can not be described by the HM and SM2018 model, the discrepancies between data and models were 25 σ and 27 σ. We also found that altering the predicted antineutrino spectrum from ^{239}Pu fission does not improve the agreement with the measurement for either model. The individual antineutrino spectra of the two dominant isotopes, ^{235}U and ^{239}Pu, were extracted and unfolded to antineutrino energy spectra. To further improve this precision, Daya Bay and PROSPECT jointly determined the ^{235}U and ^{239}Pu antineutrino spectra.

Collaboration / Activity

Daya Bay collaboration

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