The 2017 Young Experimental Physicist Prize of the High Energy and Particle Physics Division of the EPS for outstanding work of a young physicist in the field of Particle Physics and/or Particle Astrophysics is awarded to Xin Qian “for his key contributions to the Daya Bay Reactor neutrino experiment that led to the measurement of the neutrino mixing angle $\theta_{13}$.”

Neutrinos, and antineutrinos - their antimatter counterparts, are known to exist in three flavours ($\nu_e, \nu_\mu, \nu_\tau$) and are mixtures of three mass states ($\nu_1, \nu_2, \nu_3$), as described by the Pontecorvo–Maki–Nakagawa–Sakata (PMNS) mixing matrix [1]. The PMNS matrix can be written in terms of 3 angles and 1 CP-violating phase. One of the angles, $\theta_{13}$, describes the probability that an electron neutrino will oscillate into other flavours of neutrino. The Daya Bay experiment, based at the reactor complex 52 km North-East of Hong Kong, consists of 8 antineutrino detectors clustered within 1.9 km of 6 nuclear reactors. The reactors produce electron antineutrinos and their rate of interactions is measured in detectors near the reactors to determine the flux prior to any significant oscillations. The rate is then measured in far detectors (sited kilometres from the reactors). Oscillations are observed as an apparent disappearance of electron antineutrinos in the far detectors.

The awardee, Xin Qian (Brookhaven), is renowned for his key contributions to the preparation and commissioning of the Daya Bay reactor neutrino experiment [2], and is the main analyser of the data that led to the measurement of the neutrino mixing angle $\theta_{13}$ [3]. Xin Qian’s ground-breaking measurement of a non-zero $\theta_{13}$ means that it now becomes feasible to search for differences between matter and antimatter (i.e. CP violation) in the neutrino sector. He was the main analyser of the Daya Bay data. He developed the overall analysis technique for neutrinos from reactors, determined the neutrino flux, optimised the event selection, estimated the background and fitted the data to the theory. He also developed a physics-inspired model to correct for detector energy non-linearities. This has proved extremely useful in the analysis of the spectrum shape, the measurement of $\theta_{13}$ and other key neutrino measurements, such as the mass splitting and limits on sterile neutrinos.

