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Particle Astrophysics

The research of G.-L. Lin and his group focuses on dark matter (DM) phenomenology and reactor neutrino experiment. In the area of DM phenomenology, they have been interested in probing the properties of low-mass DM (few GeV to few tens of GeV) by studying the neutrino signature resulting from DM annihilation in the galactic halo and the Earth's core. They have argued that the recently completed IceCube DeepCore detector is the ideal facility for probing the thermally averaged DM annihilation cross section and the scattering cross section between DM and nucleons. Lin and his collaborators also studied the effect of DM self-interaction through the neutrino signature arising from DM annihilation in the Sun. They pointed out that the developing IceCube-PINGU detector could be used to probe such an effect.

In the area of reactor neutrino experiments, Lin and his group members joined the Daya Bay reactor neutrino experiment in 2006. The Data Bay collaboration published the discovery of electron anti-neutrino oscillation governed by the mixing angle θ_{13} in March 2012. For this remarkable result, the NCTU group made significant contributions in Data Acquisition Systems. The NCTU group also contributed to physics analysis for the Daya Bay collaboration, particularly in the measurement of the mixing angle θ_{13} from delayed neutron capture on hydrogen. Currently the NCTU group continues the ongoing effort to help provide Daya Bay's physics analysis. Furthermore this group also joins the newly established JUNO collaboration, which is situated in Southern China and aims at uncovering neutrino mass ordering. ◦