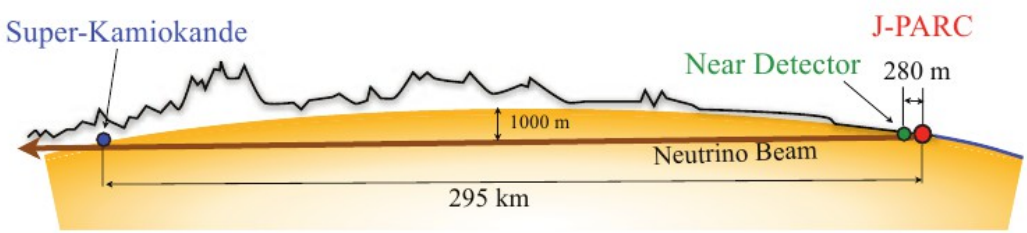
The T2K Neutrino Oscillation Experiment

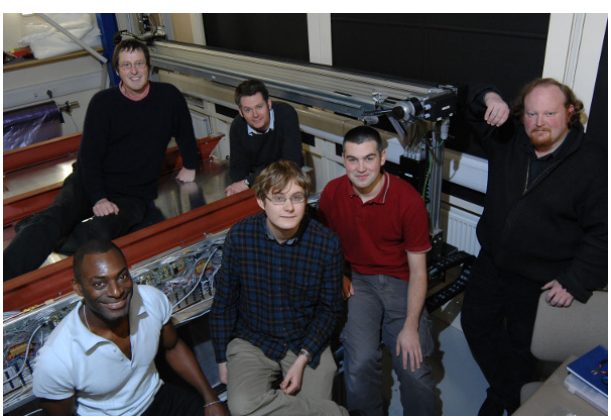
Opportunities exist for research students to join the research programme of the Warwick Experimental Neutrino Group working on the T2K neutrino oscillation experiment.

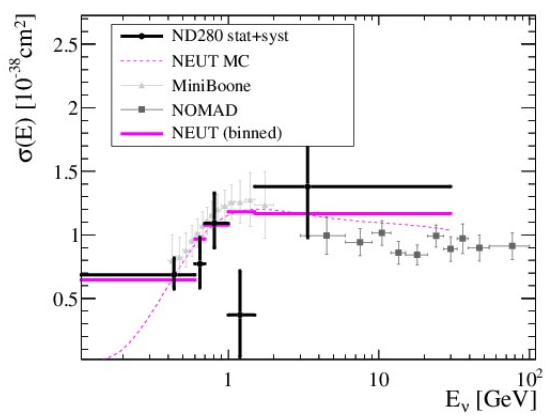
T2K has been constructed to measure precisely the characteristics of how neutrinos of a particular type can, over time, transform (or 'oscillate') into neutrinos of another type. The project involves generating a beam of muon-neutrinos at the Japan Proton Accelerator Research Complex, North of Tokyo on the East coast of Japan, and firing it 295km towards the Super-Kamiokande experiment in Kamioka as shown schematically below.



T2K was the first experiment to observe directly the oscillation mode of $\nu_\mu \to \nu_e$ in 2011 and since then it has made world-leading measurements of the neutrino oscillation parameters which theoretically describe the physics behind ν_μ oscillations. The experiment is now entering a phase where focus is shifting to higher precision measurements which may show sensitivity to a difference between neutrinos and anti-neutrinos ('CP-violation') and/or evidence for physics beyond the Standard Model. Another major area of activity is use of the T2K Near Detector, located 280m from the neutrino generation point, in order to accurately measure neutrino interaction probabilities which are currently poorly known and limit the precision of the oscillation measurements.

The Warwick group is pursuing a research programme studying both neutrino oscillation and neutrino interaction physics. The group is a founder member of the T2K collaboration and was heavily involved in the UK initiative to supply an Electromagnetic Calorimeter (ECAL) for the Near Detector. The picture below(left) shows members of the team with one of the completed ECAL modules built in our lab and the plot below (right) shows the result of a recent Warwick analysis to measure the neutrino interaction probability for the process $\nu_\mu \to \mu + p$.





For further details and information please contact: Dr Gary Barker (G.J.Barker@Warwick.ac.uk); Dr Steve Boyd (S.B.Boyd@Warwick.ac.uk).