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Precision measurement of the neutrino mixing angle θ_{13} with the Double Chooz experiment: background reduction through pulse shape discrimination and search for oscillation into sterile neutrinos

Reactor experiments provide a direct and simple means towards a measurement of the neutrino mixing angle θ_{13} . The Double Chooz experiment was the first experiment to observe the disappearance of electron anti-neutrinos from the reactor cores at a distance of 1 km, leading to a first measurement of the mixing angle θ_{13} in 2011.

The experiment will start its second phase in 2014, with a second detector at a distance of 400m from the reactor cores. This near detector will monitor precisely the reactor neutrino flux and spectrum, leading to a great improvement on the precision of the measurement of θ_{13} .

The proposed PhD project will be focused on the data analysis of the Double Chooz experiment, with special emphasis on the background reduction through pulse shape discrimination. Given a sufficiently low background level, the data of the Double Chooz near detector can be used to search for neutrino oscillations into sterile states, which would lead to an additional suppression of the measured absolute neutrino flux.