Contribution ID: **323** Type: **Poster**

Determination of the detection systematics in the Double Chooz experiment

The Double Chooz experiment aims for a precision measurement of the neutrino mixing angle θ_{13} at the Chooz nuclear power plant in France. The reactor antineutrino flux is detected via inverse beta decay reaction in a gadolinium-loaded liquid scintillator. In the near future two identical detectors located at different distances from the reactor cores will search for an oscillation pattern in the relative deficit of the measured neutrino rate and energy spectra. As a consequence the detection uncertainty will constitute one of the largest contributions to the systematic uncertainty of θ_{13}. Currently running with one detector, the experiment utilizes Monte Carlo simulations to derive the expected neutrino flux, requiring a high accuracy of the predicted spectrum.

This poster presents the measurement of the detection effects which account for the dominant contribution to the detection related normalization systematics on the θ_{13} measurement. Two analyses using both ^{252}Cf fission neutrons and the inverse beta decay signal, have shown independently how the revised Double Chooz signal selection criteria lead to a remarkable agreement between measured and predicted detection efficiencies, thus having negligible impact on the overall systematics budget. The dominant component of uncertainty emerging from the fraction of neutron captures on Gadolinium has been estimated by means of ^{252}Cf calibration source data. This measurement was cross-checked with two other data samples: inverse beta decay neutrons as well as spallation neutron background, giving consistent results. Different low energy neutron modelings in the Monte Carlo allowed to study boundary effects due to neutron migration. In this way, a reduction by a factor 2 of the total detection systematic uncertainty to a few per mil was achieved, leading to an improved measurement of θ_{13} and preparing the ground for a high precision result in the two detector phase.

Primary authors: Dr COLLIN, Antoine (Max-Planck-Institut für Kernphysik); YANG, Guang (Argonne National Lab/ Illinois Inst. of Tech.); CRESPO ANADON, Jose Ignacio (CIEMAT); HASER, Julia (Max-Planck-Institut fuer Kernphysik)

Presenter: HASER, Julia (Max-Planck-Institut fuer Kernphysik)

Track Classification: Reactor Neutrino Oscillations