3D reconstruction of light emission points for geo-neutrino directional measurement

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Observation of geo-neutrinos is a new and unique way to observe Earth’ s interior directly. Geo-neutrinos are anti-electron neutrinos emitted by beta-decays of radioactive elements such as Uranium, Thorium and Potassium. They tell us some information of chemical composition of the Earth’ s interior and heat source distribution. The KamLAND experiment led by Tohoku University succeeded in observation of Geo neutrino for the first time in the world and constrained on Earth models.
Liquid scintillator detectors have sensitivity to low energy neutrinos such as geo-neutrinos, but on the other hand they can’ t measure neutrino directions. Therefore we started to develop directional sensitive liquid scintillator detector. We are planning to measure directions of neutrinos by using Li loaded liquid scintillator and imaging cameras which can detect light emission points precisely. Neutrino directional measurement will bring us new tool to distinguish crust and mantle contributions and to remove reactor neutrino background.
To obtain information of neutrino’ s directions, it is necessary to precisely measure positions of prompt positron signal and delayed neutron capture signals. In previous studies, we demonstrated to be able to measure reaction points caused by gamma-ray from radiation source with an imaging camera. The goal of this study is 3D reconstruction of neutron’ s light emission positions by two imaging cameras. I will explain a present state of our study which aims to establish new techniques for neutrino directional measurement.

Keywords: geo-neutrino, neutrino directional measurement

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