ICRC2015

ICRC
The Astroparticle Physics Conference
34th International Cosmic Ray Conference
July 30 - August 6, 2015
The Hague, The Netherlands

Contribution ID: **1120** Type: **Poster contribution**

Reconstruction of track-type neutrino events in KM3NeT/ORCA

Saturday, August 1, 2015 3:30 PM (1 hour)

KM3NeT is a next-generation research infrastructure being installed in the deep seas at the south coasts of Europe. Within this infrastructure, KM3NeT/ORCA is a future neutrino telescope targeting the measurement of the neutrino mass hierarchy (NMH) by investigating atmospheric neutrino oscillation in matter in the energy range between 5 and 20 GeV. Charged-current muon-neutrino events significantly contribute to the NHM sensitivity. In these events, the final-state muon induces a track-like topology. The precise reconstruction of such events is an indispensible prerequisite for the NMH measurement.

The algorithm used starts by selecting hits fulfilling space-time coincidence requirements, thus reducing the optical background from the decay of ^{40}K in the sea water. The muon direction is determined by applying a likelihood maximisation method based on time residuals with respect to a track hypothesis. The inelasticity parameter, Bjorken-y, is estimated using the time residuals of the hits with respect to track and cascade hypotheses. The interaction vertex and the muon track length are reconstructed from the time and position of the hits used for the direction reconstruction. The energy of the neutrino is calculated taking into account the reconstructed track length (i.e. the muon energy), the reconstructed Bjorken-y and the number of hits used in the fit. In the poster, the track reconstruction algorithm and the achieved resolutions in neutrino direction and energy are presented.

Collaboration

KM3NeT

Registration number following "ICRC2015-I/"

908

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Session Classification: Poster 2 DM and NU

Track Classification: NU-EX