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e-mu discrimination at high energy in the JUNO detector

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The neutrino oscillation physics can be studied by using atmospheric neutrinos as source. JUNO is a large liquid scintillator detector with low energy threshold and excellent energy resolution. The detector performances allow the atmospheric neutrino oscillation measurements. In this work, a discrimination algorithm for different reaction channels of neutrino-nucleon interactions in the JUNO liquid scintillator , in the GeV/sub-GeV energy region, is presented. The atmospheric neutrino flux is taken as reference, considering \nu_e and \nu_\mu. Depending on the nature of the interaction, neutrinos can produce their corresponding charged lepton plus hadronic particles in the final state, if they undergo a charged-current (CC) interaction, or can generate only secondary hadrons, if they undergo a neutral-current (NC) interaction. When the energy of the event is high enough, namely \gtrsim 1 GeV, muons travel for a longer distance inside the matter with respect to electrons. Additionally, muons have the property of being unstable particles and decaying in an electron plus two neutrinos, which translates in a late energy emission inside a particle detector. These differences make \nu_\mu CC events more elongated in time with respect of \nu_e CC events, which indeed appear point-like. Hadronic particles are all unstable, thus adding late energy releases to all the events.

The different temporal behaviour of the classes of events have been exploited to build a time profile-based discrimination algorithm. The results show a good selection power for \nu_e CC events, while the \nu_mu CC component suffers of an important contamination from NC events at low energy, which is now under study.

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