Contribution ID: **138** Type: **not specified**

Improving the muon track reconstruction of IceCube and IceCube-Gen2

IceCube is a cubic-kilometer Cherenkov telescope operating at the South Pole. It aims at detecting astrophysical neutrinos and identifying their sources. High-energy muon neutrinos are identified through the muons produced in the interactions with the ice. The muon tracks are reconstructed using a maximum likelihood method, which models the arrival times of Cherenkov photons registered by the photomultipliers. This work aims at improving the muon angular resolution of IceCube and of its planned extension, IceCube-Gen2, in the sub-degree range. The current muon reconstruction assumes continuous energy loss along the muon track, and does not take into account photomultiplier related effects like prepulses and afterpulses. In the reconstruction scheme presented here, the expected arrival time distribution has been modified in order to parametrize the effect of prepulses and the stochastic muon energy losses.

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