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Feasibility study to measure the muon bremsstrahlung cross section with the energy loss profile using neutrino telescopes

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Muons are the dominant event signature for neutrino telescopes like IceCube and are the main background for neutrino searches. Furthermore, they are used to investigate extended air showers. In both cases, the stochasticity of the muon propagation is one key to perform the data extraction and an accurate understanding even of the edge cases is crucial. The main process driving stochastic losses for TeV muons is bremsstrahlung.

In this talk, a feasibility study is presented to measure the cross section of stochastic losses using neutrino-induced muons. The simulation study is based on the propagation of muons using the Monte-Carlo library PROPOSAL. For different reconstruction methods and resolutions, the energy loss distribution for different muon energies is used to estimate the sensitivity to measure the bremsstrahlung cross section. Two further systematic parameters, the detection efficiency, which scales the amount of detected light, and the spectral index are also estimated to analyze their correlation to the estimated bremsstrahlung normalization. The simulation statistic corresponds to 10 years of up-going muon neutrino data in IceCube.

Primary author(s) : SOEDINGREKSO, Jan (TU Dortmund); SANDROCK, Alexander (NRNU MEPhI); HUENNEFELD, Mirco (TU Dortmund); MEIER, Maximilian (Chiba University)

Presenter(s) : SOEDINGREKSO, Jan (TU Dortmund)

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