Tuning parametric models of the atmospheric muon flux in MUPAGE to data from the KM3NeT detector

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MUPAGE is a fast atmospheric muon generator for underwater or in-ice neutrino detectors such as KM3NeT and ANTARES. In this contribution we present a means of tuning the parametric equations within MUPAGE to the KM3NeT/ORCA data. This is important for high-precision measurements of observables.

We show that the significance test can be used to compare the level of agreement between different distributions, and that minimising this metric indicates the distributions which are best in agreement between data and simulation. We perform a preliminary scan of the MUPAGE phase space for 6 parameters, scanning their values independently.

We find with the significance test the parameter value which gives the best data-MC agreement for this preliminary scan, when we look at the reconstructed atmospheric muon direction, and separately, the reconstructed muon energy.

In a nutshell, these parametric simulations are tunable, and with the significance test we can identify candidate MUPAGE parameter sets which provide even better data-MC agreement. This paves the way for high-precision measurements in KM3NeT/ORCA and KM3NeT/ARCA.