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Probing large extra dimensions with IceCube

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We study the highest energy sample of atmospheric neutrinos in the IceCube neutrino observatory to study for the first time the phenomenology of the matter effects of Large Extra Dimension Models. The oscillation probability in matter were computed for the LED model an distinct series of dips appear in anti- muon survival probability. We show that an effective $3+3*N$ model, which N is the number of sterile states that can effectively reproduce and explain these dips. From the absence of the observed oscillation in the high energy data of IceCube we can constrain the radius of the large extra dimension $R_{ED} < 6 \times 10^{-5}$ cm and $m^{D_1} < 2.7$ eV for IceCube-40 data and $R_{ED} < 3.5 \times 10^{-5}$ cm and $m^{D_1} < 4.0$ eV for IceCube-79 data.

Based on work done with Arman Esmaili, O. L. G. Peres, and Zahra Tabrizi

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