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Geometry Calibration in IceCube

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The IceCube Neutrino Observatory at the South Pole has instrumented one cubic kilometer of ice by deploying digital optical modules (DOMs) in 86 drill holes, each containing a string of DOMs So far IceCube has used the GPS-determined location of the drill tower for the positions of DOMs in the transverse directions (x and y) while the depth (z) is calibrated in situ. The large inter-string spacing makes higher precision (˜1m) localization of the x and y positions of the DOMs in the ice challenging. This talk presents a new method for calibrating the positions of the DOMs. For a large selection of muon tracks, a maximum likelihood-based approach is used to determine the positions of DOMs. As a proof of concept, four central strings are studied to keep systematic uncertainties as low as possible. The method can find x and y positions to 0.2m as found using simulation corresponding to four days of data. In four days of real data, we find that for the x and y positions the results are consistent with nominal positions except for string 36. I will discuss how this method in combination with additional developments in IceCube calibration will provide improved event reconstructions, applicable to both existing and future data.

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