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MuGrid: a novel plastic scintillator detector with light guide array and WLS fibers

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Muography, traditionally recognized as a potent instrument to visualize the internal structure of gigantic objects, has spawned some novel interdisciplinary applications such as an underground navigator. To better serve interdisciplinary purposes and cope with various challenging environments, we develop a scintillation detector called MuGrid for the sake of stability and low cost. By coupling the plastic scintillator with the light guide array, MuGrid could achieve a higher spatial resolution and a larger acceptance angle with fewer readout channels, compared to the other strategies. Simulation results indicate that a spatial resolution better than 3mm is attainable on a 30cm x 30cm planar scintillator, though the light guide transparency moderates the detection efficiency. It is promising to improve the light guide transparency in the current design so that both the detection efficiency and the spatial resolution can be further enhanced to meet requirements in interdisciplinary applications.

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