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Direct measurement of the muon density in air showers with the Pierre Auger Observatory

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As part of the upgrade of the Pierre Auger Observatory, the AMIGA (Auger Muons and Infill for the Ground Array) underground muon detector extension will allow for direct muon measurements for showers falling into the 750m SD vertical array. We optimized the AMIGA muon reconstruction procedure by introducing a geometrical correction for muons leaving a signal in multiple detector strips due to their inclined momentum, and deriving a new unbiased parametrization of the muon lateral distribution function. Furthermore, we defined a zenith-independent estimator ρ_{35} of the muon density by parametrizing the attenuation of the muonic signal due to the atmosphere and soil layer above the buried detectors and quantified the relevant systematic uncertainties for AMIGA. The analysis of one year of calibrated data recorded with the prototype array of AMIGA confirms the results of previous studies indicating a significant disagreement between the muon content in simulations and data.

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