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A Rotationally Symmetric Lateral Distribution Function for Radio Emission from Inclined Air Showers

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Radio detection of inclined air showers is currently receiving great attention: Inclined air showers illuminate large areas on the ground with detectable radio signals and can therefore be measured efficiently with sparse radio-antenna arrays. In addition, a combined measurement of radio signals and secondary particles of inclined air showers promises high sensitivity to the mass of the primary particle.
To exploit this potential, an event reconstruction for inclined air showers measured with radio-antenna arrays needs to be developed. The first step in this direction is the development of a model for the lateral distribution of the radio signals, which in the case of inclined air showers exhibits asymmetries due to "early-late" effects in addition to the usual asymmetries caused by the superposition of charge-excess and geomagnetic emission. We present a model for the radio emission from inclined air showers which corrects for all asymmetries and successfully describes the lateral distribution of the energy fluence with a rotationally symmetric function. This gives access to the radiation energy as a measure of the energy of the cosmic-ray primary, and is also sensitive to the depth of the shower maximum.

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