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Simulations of the antenna response for the Auger Radio Detector

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After more than 15 years of successful operation, the Pierre Auger Observatory is currently undergoing a major upgrade called AugerPrime. The aim is to study the mass composition of ultra-high energy cosmic rays. Part of this upgrade consists in installing a Short Aperiodic Loaded Loop Antenna (SALLA) atop each of the 1660 water-Cherenkov detectors.

To obtain an absolute calibration for the SALLA, the frequency and directionally dependent antenna response (or vector effective length) must be known. The characteristics of the SALLA depend on various parameters. Most prominent is the considered frequency of reception and the antenna geometry. Moreover, the interaction with the structure elements and the presence of the ground has an impact. The measurement of the characteristics of the SALLA is an immense experimental effort. In this view, investigation by numerical antenna simulations provides an important and useful tool. In this contribution, we describe the method used to calculate the vector equivalent length of the SALLA using an advanced and widely used software for antenna simulations like the Numerical Electromagnetics Code (NEC).

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