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Technological developments for the Auger Engineering Radio Array (AERA)

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The Auger Engineering Radio Array consists of 124 radio stations covering 6 km² installed within the low energy extension of the Pierre Auger Observatory in Argentina; this location allows a multi-hybrid measurement of air-showers with the fluorescence telescopes, the water-Cherenkov and the muon detectors close to the radio array. AERA detects the radio emission from cosmic-ray induced air showers above 10¹⁷ eV. The measured electric field is used to constrain the characteristics of the primary particle: arrival direction, energy and particle type (mass). These studies are possible due to an instrumentation development allowing externally-triggered in parallel with self-triggered measurements in the MHz domain and an improved understanding of the radio emission processes.

We will present the main technological developments of AERA that have been realized since 2010, within the Pierre Auger collaboration, to reach the requested quality allowing the accurate measurement of the electric field emitted by air showers. We will review the antennas and their Low Noise Amplifiers, the trigger board and the full acquisition chain up to the communication system. The current R&D on new technical developments will be also discussed.

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