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A new capability of radio astronomy at low frequency: detecting Extensive Air Showers and studying Ultra High Energy Cosmic Rays.

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The existence of cosmic rays (UHECR) observed at energies of 1 joule and beyond ($> 10^{19}$ eV) lies among the more challenging questions of contemporary particle physics and astrophysics.

But their observation is difficult and only indirect. High-energy cosmic rays passing through the Earth's atmosphere produce extensive showers (EAS) currently being studied by using giant ground-based particle detectors, whereas additional information can also be provided by observing fluorescence and Cerenkov radiation in the optical range.

Another observable feature of EAS, not accessed by previous methods, is the electric field created by charged secondary particles of the shower. This field is detectable in the decametre radio wave range with dedicated antennas as very fast pulses (up to tens of nanoseconds) while secondaries propagate down to the ground.

Based on the renewal of this 1960's idea (then abandoned for technical reasons), new researches (since 2002) have permitted to develop a new operational method of detecting and studying UHECR air showers. As an illustration, we describe the CODALEMA experiment, operated at Nançay (France) around the Nançay Decameter Array, and discuss the most significant results obtained so far. The radio technique appears to be an useful complement of the particle counting at the ground and, by giving a way to follow the shower developments both in spatial and temporal domains, to potentially provide unique information on the primary particle.

Among specific methods developed for UHECR study, several are of general interest for Radio Astronomy, namely: development of wideband active antennas, mitigation of ultra fast RFI, methodology for studying transient phenomena (both of astrophysical or geophysical origins).