

## Probing particle acceleration in the famous cluster Abell 2256: from 16 MHz to gamma rays

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Merging galaxy clusters often host an impressive collection of diffuse radio sources. These diffuse synchrotron sources can be explained by a non-thermal pool of relativistic electrons accelerated by shocks and turbulence in the intracluster medium. The origin of the pool of relativistic electrons and details of the acceleration mechanisms in clusters are still open questions. Due to the often extremely steep spectral indices of diffuse radio emission, it is best studied at low frequencies. However, the lowest frequency window available to ground-based telescopes (10-30 MHz) has remained largely unexplored, as RFI and calibration problems related to the ionosphere become severe.

In this talk, I will present the deepest-ever image produced at decametre wavelengths, targeted on the famous cluster Abell 2256, made with the LOFAR telescope. By combining with literature data, we study the spectrum of cluster diffuse emission over three orders of magnitude in frequency. Finally, I will show how we can directly constrain the origin of the radio halo through the combination of the radio observations with upper limits from 13.5 years of observations of the Fermi Large Area Telescope in the gamma-rays.

**Primary author:** OSINGA, Erik (Leiden University)

**Presenter:** OSINGA, Erik (Leiden University)

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