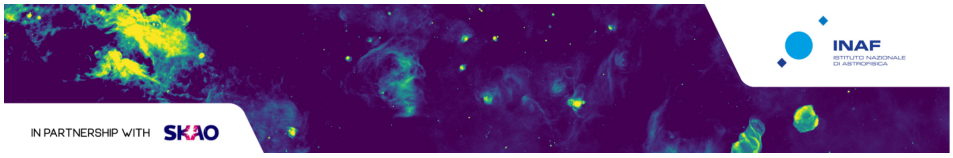

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MACS J1752+4440 across the spectrum: from SZ signatures to radio polarization

Thursday 27 November 2025 16:33 (3 minutes)

Within the filamentary web that constitutes the large-scale structure of the Universe, merging galaxy clusters represent some of the most energetic events since the Big Bang. A multi-wavelength approach-combining X-ray, optical, radio, and Sunyaev-Zel'dovich (SZ) observations-is essential to unravel their physics, trace their evolution, and assess the role of magnetic fields in shaping the intracluster medium (ICM).
The upcoming SKA1-Mid, with its Band 2 (0.95-1.76 GHz) and Band 5b (8.3-15.3 GHz) receivers will provide a significant improvement in this field, enabling high-sensitivity polarimetric studies at low frequencies and SZ–polarimetry synergy at higher frequencies.
In this context, I will present an important precursor study: a multi-frequency investigation of the galaxy cluster MACS J1752+4440, known to host a double radio relic system, using new observations with the Sardinia Radio Telescope (SRT) at 18.6 GHz and archival JVLA data at 1.6 GHz.
These data enabled a joint investigation of the system's total intensity, polarization, and SZ signatures. Importantly, the SRT observations provided the first detection of the SZ effect at $\sim$20 GHz in this cluster, directly probing the scattering of CMB photons by hot electrons in the ICM. Meanwhile, the JVLA data at 1.6 GHz allowed for a Rotation Measure (RM) synthesis analysis, yielding an RM profile and insights into the depolarization properties of the relics.
By combining the SZ-derived density profile with the RM measurements, we estimated an average line-of-sight magnetic field strength of $\sim$2 μG. This result highlights the power of combining radio polarimetry with SZ observations to jointly probe the non-thermal and thermal components of the ICM in merging galaxy clusters.

Topics

Galaxy Clusters & LSS (relativistic particles and magnetic fields)

Author: COCCHI, Silvia (Istituto Nazionale di Astrofisica (INAF))

Co-author: LOI, Francesca (INAF-OAC)

Presenter: COCCHI, Silvia (Istituto Nazionale di Astrofisica (INAF))

Session Classification: Flash talks