STRUCTURE, POLARIZATION AND SPECTRUM OF COMPLEX RADIO EMISSION FROM THE X-RAY CLUSTER ABELL 2256

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The complex radio emission from the X-ray cluster Abell 2256 has been mapped using the Westerbork Synthesis Radio Telescope at 610·5 and 1415 MHz. A 1415-MHz map with 23 arcsec (HPBW) resolution shows that Abell 2256 contains at least four and possibly five "head-tail" radio galaxies, the greatest number of such structures known in any rich cluster. The cluster also contains bright diffuse emission on a scale of ~1 Mpc exhibiting a remarkably uniform linear polarization with an average value of ~20%. There are also several small-diameter radio sources associated with cluster galaxies. Comparison of 610 and 1415-MHz maps at 55 arcsec resolution made using closely similar (u,v) plane coverage shows strong spectral differences among the various radio features in Abell 2256. A localized source with an unusual S-shaped morphology has an extremely steep spectrum $S_\nu \propto \nu^{-1.7}$, while the bright diffuse emission has a surprisingly uniform spectrum $S_\nu \propto \nu^{-0.8}$. Two well-resolved "head-tail" structures show the spectral steepening away from the galaxy that is characteristic of such systems in other clusters.

Abell 2256 evidently contains an unusually large number of radio galaxies interacting strongly with circumgalactic magnetic fields and gas. The implications of these results for models of the intracluster medium and X-ray emission from Abell 2256 are briefly considered.