Talk at Splinter Meeting

Splinter B

Investigating diffuse radio emission with LOFAR: The complex merging galaxy cluster Abell 2069

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Extended diffuse radio features, so-called radio halos and radio relics are found in many merging galaxy clusters. The emission originates from relativistic electrons suffering synchrotron losses in the magnetized intra-cluster medium. How electrons get accelerated to highly relativistic velocities is still poorly understood. With the Westerbork Synthesis Radio Telescope (WSRT) we have revealed radio features with remarkable morphology in the complex merging galaxy cluster Abell 2069: The main cluster component evidently possesses a giant radio halo and the infalling subcluster exhibits steep spectrum extended radio emission, with uncertain nature. A cold front in the infalling component suggests that internal gas sloshing could have introduced turbulence and therefore caused diffuse radio emission.

We have observed Abell 2069 with the Low Frequency Array (LOFAR) for 10 hours in the HBA frequency range from 120 to 180 Megahertz. Our analysis confirmes the presence of a giant radio halo in the main cluster component. Furthermore, we provide evidence for a mini-halo in the infalling subcluster. We have detected signatures of fossil plasma ejected by a former Active Galactic Nuclei (AGN) which might provide the necessary seed electrons for the mini-halo. Moreover, our images show extended low surface brightness emission which traces the hot compressed gas in the gap between both cluster components. The richness of radio features in Abell 2069 provides an exciting example how non-thermal cluster components like the intracluster magnetic fields and relativistic cosmic rays cause synchrotron emission.