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# Magnetic fields and non thermal emission in galaxy clusters and beyond

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## Abstract

Galaxy clusters are massive objects that form at the intersection of intergalactic filaments by accretion of lower mass groups and clusters. Most of the baryonic matter in clusters consists of a dilute hot thermal plasma, the intracluster medium (ICM) seen in X-rays, which permeates the cluster's volume. Radio observations have shown that the ICM is also filled with cosmic rays and Mpc-scale magnetic fields. In these years, new radio instruments have shown that magnetic fields and relativistic electrons permeate clusters even beyond their virial radius. In this talk, I will present the main advancements in the field and I will show how future observations can help us disentangling the role of magnetic fields in particle (re) acceleration processes

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