Magnetic field evolution in galaxy clusters

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Galaxy clusters are massive and gravitationally bound objects that form by accretion of less massive clusters and groups. Mergers between clusters are the most energetic events in the Universe, with up to 10^{64} erg released in the intra-duster medium. Part of this energy could be channeled into the amplification of the magnetic fields, which are are present on Mpc scale in the intracluster medium. To constrain the amplification mechanism, one needs to constrain the the magnetic field properties as a function of the mass of the cluster.

With this project, we aim at performing the first systematic study of magnetic field in galaxy clusters as a function of the cluster mass.

The selected candidate will analyse new radio observations in polarisation, obtained with the telescope MeerKAT, of a sample of galaxy clusters, in the mass range 1e14 - 1e15 solar masses. The sample is constructed to provide an accurate representation of the statistical properties of the underlying cluster population in the nearby Universe.

Data and methods:

This project will use new data, from the Extra-Large-Project of MeerKAT "Tracing magnetic field amplification in galaxy clusters during the process of structure formation" (PI A. Bonafede)

The PhD candidate will learn how to prepare, reduce, and analyse radio observations, using the most updated tools. To constrain the magnetic field properties, the PhD candidate will use and develop numerical techniques, starting from an existing numerical tool developed in the last years.

Scientific context:

The PhD thesis is part of a larger project BELOVED (*B-fields evolution and origin in vast extragalactic domains*). financed by the European Research Council (ERC-2024-CoG 101169773). The PhD candidate will work in close contacts with the other group members, and will be involved in international working groups (SKA-pathfinders working groups).