



Contribution ID: 20

Type: **not specified**

Probing diffuse radio emission in bridges between galaxy clusters

Wednesday 29 November 2023 10:20 (20 minutes)

Evidence of radio synchrotron emission from bridges of low-density gas connecting pairs of galaxy clusters allows us to trace the filaments of the so-called cosmic web, along which the accretion of matter on galaxy clusters happens. The origin of the seed particles for the radio emission on Mpc- and over scales, is still not well understood. We aim to a more comprehensive understanding of the processes behind such emission, by working on promising pairs of galaxy clusters where their dynamical interaction is supported by the detection of a bridge of ionised plasma between them observed through the SZ effect. Abell 0399-Abell 0401 is a unique cluster pair found in an interacting state. Their connection along a filament is supported by SZ effect detected by the Planck satellite and the presence of a radio bridge has been already confirmed by LOFAR observations at 140 MHz. In this talk, I will present the the first the determination of a spectral index value for the bridge emission in A399-A401 using LOFAR HBA at 140MHz and LBA data at 60 MHz. When investigating higher frequencies with uGMRT where the emission is not detected, I will present a new procedure to place limits on the emission of radio bridges. Looking ahead, as we dive deeper into understanding the cosmic web and the mechanisms driving radio bridge emissions, we recognise the potential of new and advanced observatories, especially in the low frequency regime. The upcoming Square Kilometre Array (SKA) Observatory, with its unprecedented sensitivity and capability, promises to revolutionise our exploration of the universe. In particular with SKA-Low at very low frequencies we we anticipate the ability to not only detect but also strengthen the models made now on radio bridges with unmatched precision.

Research area

Extragalactic Continuum (galaxies/AGN, galaxy clusters)

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Session Classification: Parallel - Galaxy Clusters & Magnetism