
Revealing the interstellar medium and the magnetic fields with LOFAR

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Résumé

Observations of synchrotron emission with LOFAR reveal a labyrinth of polarised Galactic structures. However, their explanation remains uncertain due to the complex interactions between the interstellar medium and the magnetic field. Depolarization effects associated with Faraday rotation are significant at low-radio frequencies and only a few per cent of the intrinsically polarized synchrotron emission is observed. The questions that arise are where along the line of sight does depolarization happen and from where does the observed emission originate? We observe mainly close-by emission, while far-away emission gets depolarized in the magneto-ionic medium on the way to us. However, determining this from the LOFAR observations only is very difficult. We need to take into consideration the full complexity of the magnetic fields, their possible reversals and the multiphase nature of the interstellar medium. In particular, we need to understand the ionization state across gas phases in the dynamical interstellar medium of the Milky Way. This is challenging, but it has been attempted recently in a number of the multi-tracer and -frequency studies of the LOFAR observations and by using the magneto-hydrodynamical simulations. During my talk, I will present the most recent results of these studies.

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