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Davide Belfiori - Studying magnetic fields structure of the starburst galaxy NGC253 through ALMA polarization observations

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The knowledge of magnetic field structure in the interstellar medium of galaxies is crucial to understand how magnetic fields influence gas dynamics and in particular their role in regulating star formation, driving galactic outflows and fuelling galactic nuclei. Given the multi-phase nature of the interstellar medium, the combination of different tracers is needed to get a complete picture. Synchrotron polarization traces mainly the hot and diffuse halo of galaxies, while polarized dust emission probes the magnetic fields in cold, dense regions of galaxies, where the star formation actually takes place. We present the analysis of ALMA polarization observations in band 4 (~140 GHz) and 7 (~300 GHz) of the central regions of the galaxy NGC253, a very well studied nearby starburst galaxy. Previous observations at cm wavelengths suggested the presence at large scale (> 0.5 kpc) of a magnetic field in the disk that is parallel to the midplane, and an X-shaped halo field centered on the nucleus. On the smallest scales (~ 150 pc) probed by radio polarisation, the magnetic field shows a vertical component aligned with the non-thermal radio filaments. ALMA band 4 observations, likely dominated by synchrotron emission, are sensitive to scales between 40 and 200pc, corresponding to the larger component of the magnetic field in the target region, overlapping with the previous radio polarisation measurements. The observations in band 7, sensitive to dust polarization, trace the magnetic field structure on spatial scales between 5 and 50 pc. This level of resolution has never been accessed before by radio polarization observations in NGC253. These high quality data allow to create a parsec scale map of the structures of the magnetic fields in the galaxy, and from the comparison of the two magnetic field tracers a more coherent picture of the role of magnetic fields in galaxies can be achieved.

Session Classification: Local Universe