

PhD project in ASTROPHYSICS

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Title of the Project: *Study of magnetic field in Galaxies from dust polarized emission*

Supervisor: Rosita Paladino

Scientific Case:

Mapping the structure of magnetic fields in the cold 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 fueling galactic nuclei.

To date, magnetic field studies in external galaxies have mostly used radio synchrotron emission as a tracer of the magnetic field's strength and structure. This gives only a partial view since synchrotron emission traces mainly the hot and diffuse halo of galaxies.

The dust polarization traces instead the magnetic field in most dense and cold regions, where star formation actually happens. These measurements are crucial to understand the connection between magnetic fields and star formation processes as well as their effects on galaxy's structures (disc, spiral arms, jets, nuclei). Furthermore, dust polarization studies can help understand the physics of dust, and the different dust properties inside each galaxy and from galaxy to galaxy.

Outline of the Project:

Current new facilities, such as SOFIA and ALMA are opening a new perspective on magnetic field studies.

The proposed project will be focused on the analysis of the emission of polarized dust in nearby galaxies, already observed with SOFIA (HAWC+ data from the "Magnetic Fields in Galaxies" SOFIA Legacy programme) and ALMA (proprietary ALMA full polarization data). By comparing dust polarization and synchrotron emission in external galaxies it will be possible to build a coherent picture of magnetic fields in galactic interstellar medium.

The study will be extended to other targets, proposed for observations.

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