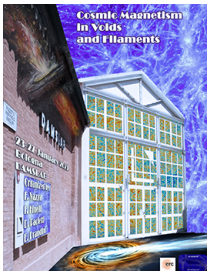

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Channeling astrophysical magnetic fields to the intergalactic medium via galactic outflows

Thursday, 26 January 2023 09:50 (20 minutes)

Galactic outflows driven by starbursts can modify the galactic magnetic fields and drive them away from the galactic planes. I will present a novel approach to quantify the magnetic field in the galactic wind of the canonical starburst galaxy M82. We used HAWC+/SOFIA polarimetric observations and a potential field extrapolation commonly applied in solar physics. I will present the modification to the classical Davis-Chandrasekhar-Fermi method to account for large-scale flows in the estimation of the magnetic field strength, and the basics of the potential field extrapolation to obtain the magnetic field strength and structure in the halo of M82. Results show that the observed magnetic fields in the starburst region arise from the combination of a large-scale turbulent field associated with the outflow and a small-scale turbulent field associated with bow-shock-like features. We estimate that the turbulent kinetic and turbulent magnetic energies are in close equipartition up to ~2 kpc (measured), while the turbulent kinetic energy dominates at ~7 kpc (extrapolated). We conclude that the fields are frozen into the ionized outflowing medium and driven away kinetically, which implies that the magnetic field lines in the galactic wind of M82 are 'open.'These results are of particular interest because they show a direct channel between the starburst core and the intergalactic medium, which can be refilled with astrophysical magnetic fields potentially affecting the measurements of primordial magnetic fields.

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