Galactic Cosmic Rays as an Interstellar Laboratory

Specific Seminar – Curriculum 1

March 11, 2026, 2.30 p.m.

Speaker:

Prof. Philipp Mertsch - RWTH Aachen University

Abstract:

Abstract: Cosmic rays are a fundamental component of the Galactic ecosystem and offer insights that reach beyond the Milky Way, including how galaxies form and evolve. They also serve as probes for new physics, such as dark matter and primordial antimatter. However, all such investigations hinge on resolving the century-old question of cosmic-ray origin. Over the last decade and a half, space-based missions like AMS-02, CALET, and DAMPE have delivered a wealth of data; more recently, the ground-based LHAASO has provided high-precision measurements of protons and helium. Modeling these observations enables inferences about the classes of cosmic-ray sources and the conditions that govern their propagation--for example, transport through turbulent magnetic fields. The emerging picture is quite intricate, suggesting that prevailing models must be revised, if not completely reworked. I will highlight recent advances in modelling Galactic cosmic rays from stochastic source populations and explore the implications for diffuse emission. A specific class of such models are motivated by evidence for inhibited diffusion around Galactic cosmic-ray sources. If time permits, I will also review recent findings on the transport of magnetic field lines and particles in synthetic turbulence.

Online attendance:

Information on remote participation can be requested by sending an e-mail to dn_sst@unitn.it

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