

Workshop on Grand Unified Theories: Phenomenology and Cosmology (GUTPC)

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Dark matter from sterile-sterile neutrino mixing

Tuesday, 9 April 2024 16:00 (30 minutes)

I will discuss the possibility that a heavy, metastable, dark right-handed neutrino with mass in the TeV-PeV range can play the role of (cold) dark matter particle. The right abundance would be produced by the Higgs induced mixing with a seesaw right-handed neutrino (RHINO model), i.e., by sterile-sterile neutrino mixing. Such a mixing would necessarily require a further extension of the minimal seesaw mechanism and can be described, effectively, by a dimension-five operator. The same mixing would also necessarily induce dark neutrino instability with lifetimes that can be much longer than the age of the universe and can escape current constraints from neutrino telescopes. Alternatively, a contribution to very high energy neutrino flux produced by dark neutrino decays could explain an anomalous excess at 100 TeV energies recently confirmed by the IceCube collaboration. Finally, I will discuss a simple UV complete model where the mediator is given by a massive fermion. Intriguingly, it comes out that the favoured scale of new physics for RHINO to satisfy the dark matter requirements coincides with the grand-unified scale: an intriguing grand-unified RHINO miracle.

Presenter: Prof. DI BARI, Pasquale (Southampton U)

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