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Spinor Bose Einstein Condensates : From Cosmos to Laboratory

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I will describe spatially localized Bose Einstein condensates (BECs) composed of non-zero spin particles, that carry huge amounts of intrinsic spin angular momentum. Such objects are naturally present in the spectrum of a massive integer spin field theory admitting attractive self-interactions, and are relevant both in cosmology and laboratory setups. In the cosmological scenario, they are relevant in dark photon dark matter and can form at different epochs in the history of our Universe depending on the formation mechanism of the vector field. In dark matter halos, such BECs/solitons arise inevitably via kinetic condensation. In laboratory setups, spinor BECs comprise of ultracold atoms, with various hyperfine levels serving as effective spin quantum numbers. Time permitting, I will also present an interesting setup of atoms trapped under a uniform bias magnetic field + a sinusoidal quadrupole magnetic field, leading to the formation of Dirac strings.

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