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Particle Theory Seminar of LPT Orsay

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Domaines : hep-ph

Titre : *The FIMP wonder*

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Résumé : *For more than eighty years, we face evidence that about* 27% *of the energy budget of the universe today is in the form of a matter content which interacts gravitationally with the ordinary matter and do not emit or absorb light in a perceptible way – the dark matter (DM). If this matter is made out of particles, the standard model of particle physics (SM) must be extended. Well motivated SM extensions can accommodate DM candidates featuring sizable (detectable !) non-gravitational couplings to SM particles. However, the null results of the numerous experiments looking for dark matter motivates candidates which evade current detection due to their very feeble couplings to SM particles. Feebly interacting massive particles (FIMPs) are DM candidates whose interactions are so feeble that their production in the early universe must be non-thermal. A theoretical difficulty in this case is accommodating such tiny couplings in a satisfactory way. In this talk, we show that if heavy fields* ($10^{10} - 10^{16}$ GeV) *mediate the DM-SM interactions, DM candidates are inevitably FIMPs. Moreover, since the reheating scale in many scenarios lies in the range* $10^7 - 10^{10}$ GeV, *the relic density of FIMPs in this case is likely to happen during the reheating period. Such heavy fields are actually needed in theoretically well motivated high- energy scenarios like for instance GUT, seesaw, leptogenesis and inflation – we call this interesting coincidence the "FIMP wonder". We explore different realizations of such possibility, with models involving moduli, fermions, gauge bosons and spin-2 fields as heavy mediators.*