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Phenomenology of SM extensions with vector-like fermions

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The Standard Model (SM) of particle physics successfully describes the electroweak (EW) and strong interactions among the elementary particles known to mankind. However, physical phenomena such as the baryon assymetry of the Universe (BAU), the existence of dark matter and neutrino oscillations require Beyond the SM (BSM) theories in order to be explained. Vector-like fermions are hypothetical 1/2 spin particles whose chiral components are in the same representation of the gauge group of the SM. These particles are interesting for several reasons: they provide a new source of CP-violation, necessary to explain the BAU, and constitute a dark matter candidate. The aim of my thesis is to study SM extensions with VLF and verify their compatibility with experimental observations.

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