

This work is devoted to baryon and lepton number violation and flavour physics in theories beyond the Standard Model of particle interactions.

First, the relations between the accidental and imposed symmetries are discussed. For example, we argue that the Levi-Civita tensors in the color space may be understood as a unique spurion carrying the baryon number, and as such its absence in the Lagrangian of a specific model indicates baryon number conservation.

Afterwards, the two minimal scenarios of quark-lepton unification are analyzed in detail: the Minimal quark-lepton symmetry model and its extension by the inverse seesaw mechanism. We investigate if the observed anomalies in the B -meson decays could be to some extent accommodated within these models.

Finally, possible low-energy effects of gauge leptoquarks are studied in the theory of quark-lepton unification and its simple extensions by vector-like leptons. Taking fully into account the freedom in the quark-lepton mixing, a catalogue of measurements currently forming the border of the excluded parameter space is found. We argue that, within the considered class of models, the gauge leptoquark can account for the discrepancies in the neutral-current B decays if and only if at least two extra generations of weak-isosinglet leptons exist.