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## Exploring a Novel Dark Hyper Charge Model.

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We will explore the extensions of the Standard Model (SM) incorporating a new  $U(1)$  gauge symmetry. These extensions introduce modifications to the SM's gauge anomaly conditions, which in turn impose restrictions on the charges of fermions. While well-studied solutions, such as  $B - L$  and linear combinations of  $B - L$  and hypercharge, offer straightforward anomaly cancellations, the exploration of non-trivial chiral solutions has been lacking in the literature. Our research delves into these uncharted chiral solutions, presenting a comprehensive set of solutions for gauge anomaly cancellation through the inclusion of three new right-handed beyond the Standard Model (BSM) fermions (RHNs). These RHNs possess elevated  $U(1)x$  charges when compared to their SM counterparts, emphasizing the prominence of decays of new bosons into RHNs. Remarkably, these RHNs emerge as promising candidates for dark matter, with their interactions facilitated by the presence of a  $Z'$  boson satisfying the properties of dark matter. We confirm that our proposed dark matter candidate, denoted as  $N_1$ , within a mass range  $M_{N_1} \sim 150$  GeV, successfully adheres to all pertinent dark matter characteristics and existing constraints.

### Reference publication/preprint

### Designation

Student

### Institution

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