Abstract Submitted
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Dark Matter and Grand Unification in an Extension of the Standard Model[1] NICHOLAS CHARLES, Harvard University — The Standard Model predicts that the strong, weak, and electromagnetic gauge couplings nearly unify around 10^{15} GeV. Meanwhile, galaxy rotation curves and other estimates of the universe's dark matter relic density provide strong evidence of unidentified dark matter. This project investigates additions to the Standard Model which provide a particle source for dark matter, unify the gauge couplings, and fit into a representation of a Grand Unification group. We consider solutions with a real or complex scalar dark matter field of minimal multiplicity and multiple complex color-carrying fields. Experiment and Standard Model symmetries impose restrictions on which particles we can add. In addition, to minimize proton decay, we set a lower bound on the Grand Unification Theory (GUT) scale of 10^{16} GeV. In our search, we define an "interesting" solution as having either a minimal particle content or a high likelihood of fitting into a simple representation of a GUT group. Using Mathematica, we found "interesting" solutions which achieve Grand Unification to within 4%. We then investigated solutions for which the new colored particles fit into a single SU(5) representation of dimension at most 210.

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