Hidden Monopole Dark Matter via Axion Portal and its Implications for Direct Detection Searches, Beam-Dump Experiments, and the H_0 Tension

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Abstract: Hidden monopole is a plausible dark matter candidate due to its stability, but its direct experimental search is extremely difficult due to feeble interactions with the standard model particles in the minimal form. Then, we introduce an axion, a, connecting the hidden monopole and the standard model particles and examine the current limits and future prospects of direct dark matter searches and beam-dump experiments. We find two parameter regions around m_a = O(10) MeV, f_a = O(10^5) GeV and m_a = O(100) MeV, f_a = O(10^4) GeV where monopole dark matter and the axion are respectively within the reach of the future experiments such as PICO-500 and SHiP. We also note that the hidden photons mainly produced by the axion decay contribute to dark radiation with $\Delta N_{eff} \simeq 0.6$ which can relax the H_0 tension.

References

[1] R. Daido, S. Y. Ho and F. Takahashi, arXiv:1909.03627 [hep-ph].