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Lost in a Dark Photon Wood: Searches for Hidden Light Gauge Bosons at Colliders

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The past several years have seen an explosion in experimental searches for new low-mass gauge bosons (dark photons, hidden gauge bosons, A-primes, U-bosons, etc.) at colliders. Much of this activity stems from the intriguing prospect that such a particle with a mass of ~1 GeV could serve as an explanation for anomalies seen in non-collider based dark matter experiments. But as the collider experiments have been designed and performed, the theoretical motivation has developed robustly in parallel, resulting in a rich set of well-motivated production and decay modes —both to Standard Model particles and to invisible states —of low-mass hidden gauge bosons to be sought after in collider experiments. I will review the foundational collider beam dump experiments and other constraints from astrophysical data, describe the recent and current searches being performed at low-energy fixed target experiments and high-energy hadron colliders, and briefly touch upon the prospects and challenges at future circular colliders and even more speculative possibilities.

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