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Dark Photons from Charged Pion Bremsstrahlung at Proton Beam Experiments

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Secondary charged particles in proton beam dump experiments offer a new production mechanism for new particles like dark photons. Proton beam dump experiments produce a multitude of secondary charged pions. As the charged pions travel down the beam path, they scatter off of the target's nuclei and can radiate a dark photon. We use chiral perturbation theory to calculate the production of dark photons through secondary charged pion bremsstrahlung. We find that the mass reach of SpinQuest is significantly extended compared to estimates based on dark photon production through proton bremsstrahlung or meson decay for the planned high-luminosity upgrade of the experiment.

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