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Radiative Decay of sub-GeV Supersymmetric Neutralinos from Light Mesons

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In certain supersymmetric scenarios, no existing mass bounds apply to the lightest neutralino. In the case of broken R-parity, such very-light neutralinos —produced via rare decays of mesons —may decay radiatively over macroscopic timescales leading to a single boosted-photon signature in the far-forward region at the LHC. We consider various R-parity Violating Supersymmetry (RPV-SUSY) scenarios involving a sub-GeV neutralino, and show that a search for such a signal at FASER and FASER2 allows us to probe RPV couplings to values beyond current constraints by orders of magnitude.

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