

Millicharged particles from proton bremsstrahlung in the atmosphere

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Light millicharged particles can be copiously produced from meson decays in cosmic ray collisions with the atmosphere, leading to detectable signals in large underground neutrino detectors. In this paper we study a new channel to produce millicharged particles in the atmosphere, the proton bremsstrahlung process. We find that the proton bremsstrahlung channel can produce a much larger flux of millicharged particles than the previously studied meson decay channel, resulting in an improvement on the SuperK limit by nearly one order of magnitude. Consequently, SuperK can probe new parameter space beyond the current leading limits from ArgoNeuT. We further note that the study on the proton bremsstrahlung process can be extended to other atmospherically produced light particles, and to millicharged particle searches in proton accelerators.

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