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Light particles with baryon and lepton numbers

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We consider light new particles χ and ϕ that carry baryon and lepton numbers. If these particles are lighter than nucleons they lead to exotic decays such as $p \to \pi^+\chi$ and $p \to e^+\phi$, not yet fully constrained by dedicated searches. For χ and ϕ masses in the GeV range, proton decays are kinematically forbidden but other decays of the forms baryon\,→\,meson+χ, meson\,→\,baryon+$\bar{\chi}$, and baryon\,→\,anti-lepton+ϕ involving heavy initial hadrons are allowed. This opens up the possibility to search for apparent baryon number violation not just in underground experiments such as Super-Kamiokande and DUNE but also in decays of heavy hadrons in charm and B factories.

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