Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Sexaquark Dark Matter: Direct detection, astro and CMB constraints; exotic isotope predictions; self-interactions XINGCHEN XU, GLENNYS FARRAR, New York Univ NYU — In the Sexaquark Dark Matter scenario, DM is composed of six quarks (uuddss) and interacts with baryons by meson exchange. The observed DM-to-baryon density ratio is a consequence of QCD and is naturally preserved to late time (contrary to the conclusions of [arXiv:1809.06003]);SN1987a cooling is also not a problem. Unlike in the more commonplace weakly-coupled DM models, the SDM-baryon interaction is non-perturbative in much of the natural parameter space and therefore cannot be treated using Born approximation. The nuclear form factor and cross section scaling with atomic mass used in the literature are invalid and the SDM-baryon cross section exhibits resonant behavior. We re-evaluate the possible SDM parameter space, imposing constraints from XQC, CMB and dewar experiments; the most natural and interesting parameter region is allowed. If the interaction is attractive, S-nucleus bound states which appear as exotic isotopes can form. We examine the production of such isotopes in BBN as well as in Earth, and conclude that a ppb level abundance of exotic isotopes with mass-offset about 2 amu is natural but not inevitable in the Earth. We also explore the possibility of sexaquark as a realization of self-interacting dark matter and study its astrophysical consequences.

Xingchen Xu
New York Univ NYU

Date submitted: 10 Jan 2020 Electronic form version 1.4