Abstract Submitted
for the APR21 Meeting of
The American Physical Society

Sensitivities of ultra-high energy neutrino experiments to dark matter direct annihilation and decay to neutrinos[1] CLAIRE GUEPIN, NASA Goddard Space Flight Center, ROBERTO ALOISIO, Gran Sasso Science Institute, LUIS ANCHORDOQUI, City University of New York, Lehman College, AUSTIN CUMMINGS, Gran Sasso Science Institute, JOHN KRIZMANIC, NASA Goddard Space Flight Center, MARY HALL RENO, Department of Physics and Astronomy, University of Iowa, TONIA VENTERS, NASA Goddard Space Flight Center —
The evidence of dark matter is compelling from Galactic to cosmological scales, but its nature remains elusive. Recent Fermi-LAT observations weaken the promising weakly interacting massive particle scenario, and alternative scenarios involving superheavy dark matter (SHDM), possibly coupled to neutrinos, are being considered. Ultra-high energy neutrino detectors can uniquely probe the properties of SHDM annihilating or decaying into neutrinos. In the mass range $m_\chi = 10^7 - 10^{15}\,\mathrm{GeV}$, we evaluate the sensitivities of the future observatories POEMMA and GRAND, compared with the ones of IceCube, Auger and ANITA, to dark matter thermally averaged annihilation cross section and dark matter lifetime. We show that a ground-based radio detector such as GRAND can achieve high sensitivities due to its high duty cycle in radio quiet areas. Space-based Cherenkov detectors such as POEMMA have the advantage of full-sky coverage and rapid slewing, enabling an optimized SHDM observation strategy focusing on the Galactic Center. Moreover, POEMMAs fluorescence observation mode will achieve state-of-the-art sensitivity to SHDM properties.

[1]CG is supported by the Neil Gehrels Prize Postdoctoral Fellowship.

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Date submitted: 08 Jan 2021 Electronic form version 1.4