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Indirect Searches for Ultraheavy Dark Matter in the Time Domain

Dark matter may exist today in the form of ultraheavy composite bound states. Collisions between such dark matter states can release intense bursts of radiation that includes gamma-rays among the final products. Thus, indirect-detection signals of dark matter may include unconventional gamma-ray bursts. Such bursts may have been missed not necessarily because of their low arriving gamma-ray fluxes, but rather their briefness and rareness. We point out that intense bursts whose non-detection thus far are due to the latter can be detected in the near future with existing and planned facilities. In particular, we propose that, with slight experimental adjustments and suitable data analyses, imaging atmospheric Cherenkov telescopes (IACTs) and Pulsed All-sky Near-infrared and Optical Search for Extra-Terrestrial Intelligence (PANOSETI) are promising tools for detecting such rare, brief, but intense bursts. We also show that if we assume these bursts originate from collisions of dark matter states, IACTs and PANOSETI can probe a large dark matter parameter space beyond existing limits. Additionally, we present a concrete model of dark matter that produces bursts potentially detectable in these instruments.

Author: TANIN, Erwin (Stanford University)

Presenter: TANIN, Erwin (Stanford University)