



Contribution ID: 124

Type: Oral presentation (young scientists)

Earth as a transducer for dark-photon and ALP dark-matter detection

Thursday 21 July 2022 15:30 (10 minutes)

In this talk, I will discuss a novel electromagnetic signal for two well-motivated ultralight dark-matter (DM) candidates: dark photons and axion-like particles (ALPs). The signal is a small (but larger than expected) oscillating magnetic-field pattern that appears across the entire surface of the Earth, driven by the DM field. It is highly phase-coherent and has a frequency set by the DM mass, with the specific signal pattern depending on the DM candidate. I will discuss searches for this signal that leverage the exceptional utility that distributed magnetometer networks hold as fundamental-physics discovery tools. In particular, I will discuss how my collaborators and I searched for this signal using an existing dataset maintained by the SuperMAG Collaboration, consisting of unshielded magnetometer readings taken at O(500) geographically distributed geomagnetic ground stations. These data have one-minute time resolution, with the earliest data taken in 1970. Our search finds no robust evidence for either DM candidate. However, we place the first direct exclusion bounds on dark-photon DM in the mass-range from 2×10^{-18} eV to 7×10^{-17} eV; these limits are complementary to existing astrophysical bounds. For ALP DM, we place limits in the same mass range that at some masses rival existing laboratory constraints on axions. I will mention ongoing work and future plans to extend these searches.

Author: Dr FEDDERKE, Michael A. (Johns Hopkins University)

Co-authors: Dr ARZA, Ariel; Prof. JACKSON KIMBALL, Derek F. (California State University East Bay); Prof. GRAHAM, Peter W. (Stanford University); Dr KALIA, Saarik (Stanford University)

Presenter: Dr FEDDERKE, Michael A. (Johns Hopkins University)

Session Classification: Parallel 3B - Axions