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GPS constellation as a dark matter detector MAC MURPHY, GEOFFREY BLEWITT, ANDREI DEREVIANKO, Univ of Nevada - Reno — Despite solid observational evidence for the existence of dark matter, its nature remains a challenge to modern physics. In this work we use the existing GPS constellation as a 50,000 km-aperture dark matter sensor array. We focus on dark matter in a form of stable configurations of light fields (topological defects or TDs). Such defects may lead to transient changes of particle masses and coupling constants, thereby affecting atomic clock frequencies and clock phases across the GPS constellation. Based on cosmological models, the most probable speed of TDs in the barycentric reference frame is $\sim$ 300 km/sec. A TD sweep across the array would generate step-like functions in clock phase for a period of $\sim$ 200 s for the GPS constellation. Since GPS carrier phase data is acquired with few-mm precision at 1s intervals, detecting $\sim$ 1 ns signals in the atomic clock phase over a 200 s aperture is achievable. Observing such a signature would provide evidence of the existence of TDs with a high confidence level, as there is no known mechanism for background events that would mimic such a signature. We present preliminary results of our analysis.

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