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Discovery of the Axion quasiparticle

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We report the observation of the Axion quasiparticle in the condensed matter system, 2D MnBi_2Te_4 . Its electronic properties feature a nonzero theta angle that relates electric and magnetic fields within the material. We observed coherent oscillation of this theta angle in real time at a frequency of 44 GHz by exciting a specific magnetic coherent mode (the out-of-phase antiferromagnetic magnon), thereby demonstrating the existence of the Axion quasiparticle based on its definition. This Axion quasiparticle can not only serve as a condensed matter simulation of the real Axion particle but also function as an Axion detector, as previously proposed. Interestingly, this detector operates in the sub-THz regime, which is both the most challenging and the most promising regime for detecting Dark Matter Axions. New and improved theoretical estimates of the coupling and damping in this material make this prospect appear promising.

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