**Constraints on axion-like ultralight dark matter from observations of the HL Tauri protoplanetary disk**

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There are many experimental confirmations of the existence of dark matter, but nevertheless, an unambiguous understanding of its nature is still missing [1]. One possible explanation is ultra-light dark matter [4, 3]. In the present Letter, we assume that ultra-light dark matter (ULDM) consists of axion-like particles (ALPs). This is motivated by the lack of perturbative renormalization of the ALP mass, so that the small mass remains protected from radiative corrections. Dark matter of this type may be detected thanks to the fact that ALPs interact with photons.

When polarized electromagnetic radiation passes through the dark-matter media, interaction with background ALPs affects the polarization of photons. The condensate of axionic dark matter experiences periodic oscillations, and the period of the oscillations is of order of years for ultra-light dark matter. This would result in observable periodic changes in the polarization plane, determined by the phases of the ALP field at the Earth and at the source. In this paper, we use recent polarimetric observations of the HL Tauri protoplanetary disk performed in different years to demonstrate the lack of changes of polarization angles, and hence to constrain masses and photon couplings of the hypothetical axion-like ultralight dark matter.

Here, we take advantage of recently published [5] ALMA precise polarization map of another protoplanetary disk, HL Tau, which can be compared to previous observations of the same system with the same instrument, but several years ago [6].

As a result, we obtain some restrictions on axion mass and photon-axion coupling and discuss some reasons why our method is more desirable than the other one used in Ref [2].

Special thanks to Sergey Troitskiy for helping and supporting this work.

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