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Probing the blue axion with cosmic optical background anisotropies

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A radiative decaying big bang relic with a mass at the eV scale, which we dub "blue axion,"can be probed with direct and indirect observations of the cosmic optical background (COB). The strongest bounds on blue-axion cold dark matter come from the Hubble Space Telescope (HST) measurements of COB anisotropies at 606 nm. We suggest that new HST measurements at higher frequencies (336 nm and 438 nm) can improve current constraints on the lifetime up to one order of magnitude, and we show that also thermally produced and hot relic blue axions can be competitively probed by COB anisotropies. We exclude the simple interpretation of the excess in the diffuse COB detected by the Long Range Reconnaissance Imager (LORRI) as photons produced by a decaying hot relic. Finally, we comment on the reach of upcoming line intensity mapping experiments, that could detect blue axions in a large portion of the parameter space for either cold or hot dark matter.

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