

Analytical Study of Birefringence Effects in an Optical Cavity for Axion-Like Particle Search (#5)

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“If cold dark matter is light pseudo scalar particles, herein referred to as Axion-Like Particles (ALPs), it rotates the polarization of linearly polarized light. Several experimental schemes using an optical cavity have been proposed to detect this effect. Birefringence at the mirrors, however, would degrade the sensitivity. We have studied the effect of the birefringence on the sensitivity analytically. The birefringent mirrors are treated as mirrors covered by wave plates. We have found that degradation of the sensitivity exists in the region where the axion mass is smaller than the inverse of the averaged round-trip time of the cavity when the phase retardations of the wave plates are larger than the inverse of the finesse. On the contrary, the sensitivity with birefringence is higher than that without birefringence in a special mass region where both carrier light and signal light are resonant simultaneously.”

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