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Distortion of cholesteric helical structures by in-plane fields and effect on the efficiency of second-order Bragg reflections MARIACRISTINA RUMI, TIMOTHY BUNNING, Air Force Rsch Lab - WPAFB — When an electric field is applied perpendicular to the helical axis of a chiral nematic liquid crystal, as at the center of gap regions in cells with interdigitated electrodes, materials with positive dielectric anisotropy and in a planar conformation not only experience an elongation of the pitch, but also undergo a deformation of their helical structure so that the refractive index deviates from exhibiting a sinusoidal variation in any direction perpendicular to the axis. Under these conditions, Bragg reflections of all orders are in principle active even for light at normal incidence. We will show that for various chiral nematic mixtures with the main (first-order) reflection in the near-infrared range, second and third-order reflections can easily be observed in the visible range when an electric field is applied and the material optical properties are probed selectively in the center of gap regions. The efficiency of the second-order reflections increases with the magnitude of the applied field and can become comparable to that of the first order reflection at high fields. This process can be exploited in the design of switchable reflective filters whose reflection band can be electrically tuned.

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