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Total Reflection in Cholesteric Liquid Crystal Cells Using Optical Transmission Grating Windows IGHODALO IDEHENRE, VINCENT TONDIGLIA, TIMOTHY BUNNING, DEAN EVANS, Air Force Research Laboratory — We present experimental and simulated results of utilizing optical transmission gratings to achieve total reflection in cholesteric liquid crystal systems. Total reflection occurs when the light incident upon a cholesteric liquid crystal cell at certain angle, is totally reflected regardless of the polarization state. Experimental as well as numerical studies using Bloch wave analysis have shown that a relatively steep angle of incidence with respect to the helical axis (>55 degrees) is required to achieve strong polarization independent (near 100%) total reflection. We propose the use of transmission grating windows as a means of introducing high angular incidence into the cholesteric liquid crystal region while using optical inputs at normal incidence to the windows. We analyze the total reflection behavior of these cells numerically using Fourier optical theory and 4 x 4 matrix method to simulate the angular and wavelength spectrum of the cell. The numerical simulations are then compared against experimental results.

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