Optics of weakly twisted chiral liquid crystals. Theory and experiment

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The features of light propagation in uniaxial chiral liquid crystals with the large pitch are investigated. In such media the direction of the optical axis rotates in a spiral manner. The propagation of beams crucially depends on the incident angle. There is the angular range where the return back and the effect of beam penetration are observed. The effect of beam penetration is similar to the tunnelling for parabolic potential barrier. The theoretical description of these phenomena is beyond the geometrical optics applicability and model equation method is used. For experimental investigation of the penetration and return back effects the original cell containing twisted liquid crystal with the large pitch was constructed (1). The cell permits to introduce the beams into the liquid crystals with large incident angles. The calculated angular dependences (2) of transmitted through the forbidden zone and refracted beam intensities are in a good agreement with the experimental results (Figure 1).

References

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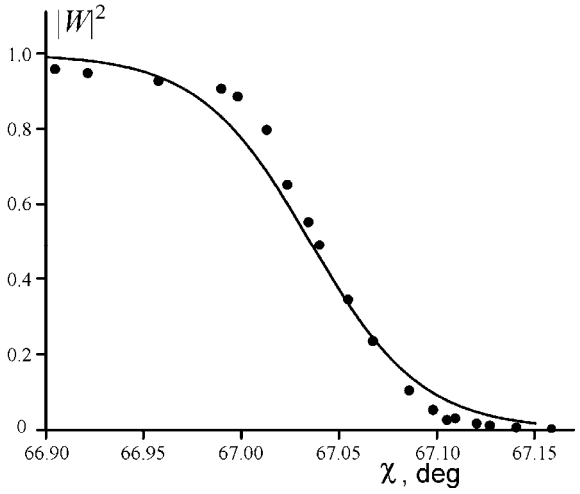

Figure 1. Transmission coefficient $|W|^2$ measured for the extraordinary (circles) beam. The solid curve is calculations.