An Analysis of Chevrons in Thin Liquid Crystal Cells

Lei Z. Cheng\textsuperscript{1}\textsuperscript{*} and Daniel Phillips\textsuperscript{2}

\textsuperscript{1}Department of Mathematics, Olivet Nazarene University, Bourbonnais, IL 60914 USA
\textsuperscript{2}Department of Mathematics, Purdue University, West Lafayette, IN 47907 USA

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This paper is an analysis of a model for the structure in a liquid crystal medium that arises when the material is cooled from the smectic-A to the chiral smectic-C phase in a surface-stabilized cell with prescribed boundary conditions under a given electric field. This phenomenon causes V-shaped (chevron-like) defects to form in liquid crystal display devices and has attracted interest from both theoretical and practical points of view. The work investigates the nature of the chevron shaped defects in solutions to a family of minimization problems. Their energy densities are highly nonlinear and we use the notion of Gamma-convergence as a way of identifying the solutions’ principal features. We single out the bulk smectic layer thickness as a small parameter, show that as this parameter tends to zero the energies Gamma-converge to a limiting energy, and characterize the minimizers for the limit problem.

\textbf{Keywords:} chevron-like defects, smectic liquid crystals, \textit{\Gamma}-convergence chevron-like defects, smectic liquid crystals, Gamma-convergence