We present results of theoretical investigations into the behaviour of a shear wave at the boundary between an isotropic solid and a smectic A liquid crystal, tracking the subsequent response of the smectic to the refracted wave. Using the techniques of Landau & Lifshitz for sound in isotropic fluids [1], we extend the results for smectic C by Gill & Leslie [2] and perform the analogous calculations for a sample of smectic A using the dynamic theory of Stewart [3] (with the relevant energy given by [4]). Within this framework, the director \( \mathbf{n} \) and the unit layer normal \( \mathbf{a} \) are allowed to separate, as first considered by Ribotta & Durand [5]. Carrying out these calculations enables comparison of the predicted results for smectic A with the extension by the present authors to the results of [2].

Motivated by the work of Auernhammer et al. [6,7], mechanisms for determining the impact of perturbations upon the modes of response behaviour will be analysed, with plots demonstrating the amplitudes of these waves relative to that of the incident wave displayed for a range of typical physical parameters characteristic to smectics C [8] and A [9].

References