Stan Alama (alamamcmaster.ca), Department of Mathematics & Statistics, McMaster University, Hamilton, ON L8S 4K1, Canada, Lia Bronsard* (bronsard@mcmaster.ca), Department of Mathematics & Statistics, McMaster University, Hamilton, ON L8S 4K1, Canada, and Bernardo Galvão Sousa (beni@math.toronto.edu), Department of Mathematics, University of Toronto, Toronto, ON M5S 2E4, Canada. Weak Anchoring for 2D Liquid Crystals.

We study the weak anchoring condition for nematic liquid crystals in the context of the Landau-De Gennes model. We restrict our attention to two dimensional samples and to nematic director fields lying in the plane, for which the Landau-De Gennes energy reduces to the Ginzburg–Landau functional, and the weak anchoring condition is realized via a penalized boundary term in the energy. We study the singular limit as the length scale parameter \(\epsilon\to 0\), assuming the weak anchoring parameter \(\lambda = \lambda(\epsilon) \to \infty\) at a prescribed rate. We also consider a specific example of a bulk nematic liquid crystal with an included oil droplet and derive a precise description of the defect locations for this situation, for \(\lambda(\epsilon) = K\epsilon^{-\alpha}\) with \(\alpha \in (0,1]\). We show that defects lie on the weak anchoring boundary for \(\alpha \in (0,\frac{1}{2})\), or for \(\alpha = \frac{1}{2}\) and \(K\) small, but they occur inside the bulk domain \(\Omega\) for \(\alpha > \frac{1}{2}\) or \(\alpha = \frac{1}{2}\) with \(K\) large. (Received August 11, 2015)