Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

An upper-bound on the discontinuity at the smectic A-nematic phase transition in octylcyanobiphenyl (8CB): A high-resolution birefringence study MEHMET CAN ÇETINKAYA, Piri Reis University, 34970 Tuzla, Istanbul, Turkey, SEVTAP YILDIZ, HALUK OZBEK, Department of Physics, Istanbul Technical University, 34469 Maslak, Istanbul, Turkey, PATRICIA LOSADA-PÉREZ, JAN LEYS, JAN THOEN, Laboratorium voor Akoestiek en Thermische Fysica, Departement Natuurkunde en Sterrenkunde, KU Leuven, 3001 Leuven, Belgium — Although the nematic-smectic A (N-SmA) transition in liquid crystals (LCs) has been extensively studied, it is still quite controversial. Most theoretical studies predict that the transition should be of 3-dimensional (3D) XY type. However, the experimental results to date have not established a clear case of 3D XY universality. Halperin, Lubensky and Ma (HLM) predicted that the crossover should always make the N-SmA transition first order with very small latent heats. HLM-type first order N-SmA transitions has been evidenced by ASC data, but inconsistencies remain in reported discontinuity values. Of particular relevance is pure 8CB LC with an estimated HLM contribution substantially smaller than the upper limit for the latent heat from ASC. We carried out high-resolution birefringence measurements near the N-SmAtransition of 8CB LC. We find that the SmA-Nphase transition is continuous. For a possible discontinuity in the N order parameter $S(T)$ at T_{AN} we obtain an upper limit of 0.0002, which is consistent with the ASC latent upper limit and HLM theory. The temperature derivative of $S(T)$ exhibits a power law divergence with a critical exponent that is consistent with $\alpha = 0.31 \pm 0.03$ obtained from ASC.

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Date submitted: 15 Nov 2013 Electronic form version 1.4