Critical Behavior of A Non-polar Smectic Liquid Crystal via Optical Birefringence Measurements[1] MEHMET CAN CETINKAYA, SELEN ERKAN, SEVTAP YILDIZ, HALUK OZBEK, Department of Physics, Istanbul Technical University, 34469, Maslak, Istanbul, Turkey, ITU LIQUID CRYSTALS LABORATORY TEAM — We present high sensitivity and high temperature resolution experimental data on the temperature dependence of the optical birefringence in the nematic and smectic A phases of nonpolar monolayer smectogen 4-butyloxyphenyl-4'-decyloxybenzoate liquid crystal by using a rotating-analyzer technique. We have used the birefringence data to probe the temperature behavior of the nematic order parameter S(T) in the vicinity of both the nematic-isotropic (N-I) and the nematic-smectic A (N-SmA) transitions. The critical behavior of S(T) at the N-I transition has been discussed in detail by comparing our results with the latest reports in literature and we have then concluded that the isotropic internal field assumption by Vuks model is adequate to extract the critical behavior of S(T) from the birefringence data [1-3]. We have tested the validity of the scaling relation $\lambda = 1-\alpha$ between the critical exponent λ describing the limiting behavior of the nematic order parameter and the specific heat capacity exponent α. We have shown that the temperature derivative of the nematic order parameter S(T) near the N-SmA transition has the same power law behavior as the specific heat capacity [4,5].

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