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Addendum

Damping of Second Sound in the Critical Dynamics of Liquid Helium below T_λ

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We have investigated in detail the nonuniversal deviations from our asymptotic theory. We have found that such deviations must not be treated in the usual way [1, 7] by expanding around the dynamic fixed point. The reason for this is the small transient exponent $\omega_w \ll 1$ which makes a full nonlinear renormalization-group analysis imperative. This is indeed feasible due to the fact that the dynamic parameter w does not represent a nonlinear coupling. By integrating the nonlinear dynamic flow equations we have treated both large departures from dynamic scaling ($d > d^*$, $0 < w^* \ll 1$) and the possible breakdown of scaling ($d < d^*$, $w^* = 0$). The nonuniversal initial conditions have been determined independently via Ahlers' thermal conductivity data [4]. The resulting effective amplitude ratio R_2^{eff} is shown in Fig. 2 which complements our previous Fig. 1. Our non-asymptotic theory provides a satisfactory explanation of Ahlers' recent experiment on second-sound damping [Phys. Rev. Lett. **43**, 1417 (1979)] and demonstrates that the numerical agreement with previous asymptotic theories [11, 12] is fortuitous. For a more detailed presentation and for additonal results see V. Dohm and R. Folk, *Nonlinear Dynamic Renormalization-Group Analysis above and below the Superfluid Transition in* ^{4}He, March 1980, submitted to Phys. Rev. Lett.

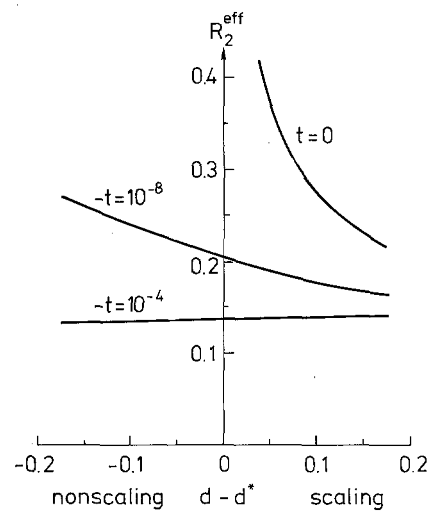

Fig. 2. The effective nonuniversal ratio entering the amplitude of second-sound damping versus the deviation $d - d^*$ from the borderline dimension d^* for different temperatures $-t \equiv (T_\lambda - T)/T_\lambda$. The $t = 0$ curve shows the asymptotic universal ratio R_2 of the previous Fig. 1

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