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Relaxation rates and phase transitions

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Using a bottom-up gauge gravity constructions, relaxation rates of strongly coupled field theories are computed. A variety of phase structures are considered, from a crossover up to a first order phase transition. It is established that near the transition the applicability of a hydrodynamic description breaks down at lower momenta than in the conformal case. In the case of the first order phase transition, a spinodal region appears at temperatures for which the speed of sound squared is negative. An estimate of the preferential scale attained by the unstable modes is also given. Additionally we observe a novel diffusive regime for sound modes over a range of wavelengths. Additionally, for a range of wavelengths we observe a novel diffusive regime for sound modes.

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