Quadratic damping of mechanical oscillators and its effect on their resonant response

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In the studies of both classical and quantum turbulence, significant attention is devoted to the investigation of the behaviour of various submerged oscillators. Upon entering the turbulent regime, the oscillators start to experience a significant drag force, which is non-linear with the peak velocity. We present a simple model of such a system, derive the limiting cases, and calculate its resonant response at the fundamental frequency as a function of the applied driving force. We apply the model to the crossover from linear to non-linear drag forces and compare with previous models[1] and selected experimental data on the transition to turbulence ^{4}He.

1. E. Zemma & J. Luzuriaga, J. Low Temp. Phys. **172**(3/4), (2013), in print.