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Nonlinear perfect absorption by a subwavelength resonant scatterer (a side loaded Helmholtz resonator)

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n this work, we study the scattering properties for high amplitude waves of a system composed by a waveguide side loaded by an Helmholtz Resonator (HR). The amplitude dependence is first introduced theoretically in the imaginary part of the impedance of the resonator as nonlinear losses. Then, the scattering properties of the system are studied experimentally for high input pressure and the results are compared to the theoretical model. We found that for sufficiently high amplitude waves, critical coupling of the HR occurs leading to an absorption of 0.5 for a one-sided input. Furthermore, using a simplified nonlinear model describing the dynamics of the pressure in the resonator, we find conditions of coherent perfect absorption for two-sided inputs, induced by the nonlinear losses of the HR. The control of perfect absorption by the amplitude of waves will open new possibilities in important applications in various wave-control devices.