ACOUSTICS2008/1852
Intensity measurement of a periodic acoustic shock wave in a resonator

Tetsushi Biwa[a] and Taichi Yazaki[b]
[a]Dept. of Mechanical Systems and Design, Tohoku Univ., Aramaki 6-6-01, Aoba-ku, 980-8579 Sendai, Japan
[b]Aichi Univ. Education, Igaya, 448-8542 Kariya, Japan

A periodic shock wave of a gas column is formed in a duct, when the gas column is sinusoidally driven near the resonance frequency. This phenomenon has been one of the fundamental problems in nonlinear acoustics and has been studied extensively both theoretically and experimentally. In this work, we study the nonlinear effect leading to the shock formation through measurements of the acoustic intensity. A gas column of atmospheric air is filled in a resonator with a length of 1.15 m and internal radius of 10.5mm, and driven by an oscillating piston at 144.4 Hz near the fundamental resonance frequency. Pressure and axial acoustic particle velocity of the gas column are measured as a function of the resonator axis using small pressure transducers and a laser Doppler velocimeter. We show the spatial distribution of the acoustic intensity associated with the fundamental and the second modes, from which we show the nonlinear interaction between these oscillating modes.