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**Influence of a load on the nonlinear behavior of a piezoelectric rod
under high sinusoidal voltages**

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At high levels of excitation, appear, in piezoelectric devices, nonlinear phenomena which can adversely affect the quality of the applications to which they are devoted. It is, in particular, true in non-destructive evaluation, where the generation of harmonics in the ultrasonic transducer can make inaccurate measurements in materials. In a previous work, third-order constants in a piezoceramic rod of PZT-21 under high sinusoidal electric fields have been evaluated from the analysis of second harmonic generation in the mechanical displacement. All these measurements have been performed under condition of complete free stress. In order to allow a better understanding of the nonlinear behavior of the transducer, various loads, are, now, applied at one end of the piezoceramic rod. Velocity measurements performed by a laser probe at the free end of the active element provides then informations about the nonlinear behavior of the system. Influence of load on the linear and nonlinear behavior of the piezoelectric rod is then studied in the case of an aluminium bar, and in the case of more nonlinear materials. Results are compared both experimentally and theoretically in loaded and unloaded configurations.