

## **EXPERIMENTAL STUDY OF FREE REED INITIAL TRANSIENTS**

*James Cottingham<sup>1</sup>, Daniel Wolff<sup>2</sup>*

<sup>1</sup> Coe College, United States

<sup>2</sup> University of North Carolina Greensboro, United States

`jcotting@coe.edu`

`dmwolff@uncg.edu`

### **ABSTRACT**

Attack transients of harmonium-type free reeds from American reed organs have been studied in some detail. Oscillation waveforms were obtained using a laser vibrometer system, variable impedance transducer proximity sensors, and high speed video with tracking software. Although the fundamental transverse mode is dominant, the presence of higher transverse modes and torsional modes in the initial transient has been established. Typically the motion of the reed tongue begins with an initial displacement of the equilibrium position, often accompanied by a few cycles of irregular oscillation. This is followed by a short transitional period in which the amplitude of oscillation gradually increases and the frequency stabilizes at the steady state oscillation frequency. In the next stage, the amplitude of oscillation continues to increase to the steady state value. Spectra derived from the waveforms in each stage have been analyzed, showing that the second transverse mode and the first torsional mode are both observed in the early stages of the transient, with the torsional mode often appearing earlier. Measurements on reed tongues of different design have been made to further explore the significance of the torsional mode in the initial excitation. [Work partially supported by United States National Science Foundation REU Grant PHY-1004860.]