

## ACOUSTICS2008/3378 Harmonicity of trumpet modes

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The mouthpiece on a brass instrument is generally removable but constitutes an important part of the whole instrument. In the frequency domain, it can be considered to provide a frequency dependent equivalent length that increases with frequency up to the Helmholtz resonance frequency  $f_{\text{pop}}$  of the mouthpiece itself. Geometrical changes that affect the total volume or the  $f_{\text{pop}}$  of the mouthpiece will affect the harmonicity of the nearly harmonic normal modes of the instrument. Using heterodyne filter analysis, the development of the frequency components and their amplitudes were measured for low trumpet notes, both for repeated attacks of short notes and for sustained note crescendos from pianissimo to fortissimo. The measurements were repeated after the mouthpiece was modified to improve the harmonicity of the normal modes. During both attack and crescendo tests, the modified mouthpiece was associated generally with more stable frequencies of the partials and more even development of the amplitudes of the partials.