

ACOUSTICS2008/266
**A qualitative and quantitative analysis of impulse responses from
balloon bursts**

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Anechoic recordings of balloon bursts were systematically acquired for various conditions of balloon diameters, puncture location, and inflation pressure. The recordings were analyzed to derive the average frequency spectrum over the effective duration of the acoustic impulse. Although the data show the well-known limitations for the impulse responses (in terms of repeatability and directional behavior) when viewed at high resolution, the results are quite consistent when averaged over one-third octave bands and reveal that the diameter factor (the ratio between the diameter of the inflated balloon to that of its stated maximum), rather than the overall diameter of the balloon, is a good indicator of the sound pressure level, especially above 200 Hz. The study proposes some simple empirical formulas to predict the quantitative sound pressure level and the qualitative spectral response (using the spectral centroid & skewness) from balloon bursts, based on the inflation factor as a variable. The study also offers suggestions to maximize the value of the balloon-burst methodology in building acoustics measurements by describing an effective way to measure reverberation time while simultaneously acquiring useful directional information associated with the reflected sound.