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**Sonic booms, spectral analysis, and diffraction by buildings**

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An analysis has been performed upon conventional and low-amplitude N-wave sonic boom data taken by NASA outside two houses in June 2006 and July 2007. The buildings were one-floor residences which were carefully instrumented with strategically-placed, multiple microphones. The incident sonic booms had a substantial variation in rise times, most likely due to atmospheric effects. Previous work using the June 2006 data [Sparrow, Klos, and Buehrle, *J. Acoust. Soc. Am.* 122 (5, Pt. 2) 3084] revealed maximum pressure loads near the ground and wall facing the incident boom. A new spectral analysis of the individual booms now confirms that the diffraction of sound over the house tops is substantially affected by the spectral content of each boom. These results indicate that the pressure loading of homes due to conventional or low-amplitude sonic boom will be affected by both the spectral content of each boom's rise phase and each house's exterior geometry. [Work supported by NASA.]