# AN EXPERIMENTAL EVALUATION OF THE EXPERIMENTAL SPATIAL DYNAMICS MODELING (ESDM) TECHNIQUE

by

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(ABSTRACT)

Relatively new transducers permit the measurement of dynamic response at many structure locations. Included among such transducers is the scanning laser Doppler vibrometer (LDV). A scanning LDV can measure velocity at many structure locations. An important new technique, Experimental Spatial Dynamics Modeling (ESDM), utilizes such spatially dense velocity data. ESDM models continuous, three-dimensional velocity fields using LDV velocity data. Thus, ESDM is a powerful structural dynamics analysis tool that significantly enhances the usefulness of a scanning LDV. However, heretofore, ESDM has not been experimentally evaluated. The results contained herein partially satisfy this need. Specifically, this research evaluated the ability of ESDM to reconstruct velocity response fields with large in-plane components parallel to a surface in the presence of small out-of-plane components transverse to the surface. To fulfill this objective, a test structure was developed and fabricated; the structure had certain dynamic properties which aided ESDM evaluation. Subsequently, the test structure was harmonically excited at a single frequency such that large in-plane and small out-of-plane velocity components were present on a particular surface. LDV and accelerometer data were then collected. Ultimately, velocity results were obtained from the LDV data via

ESDM and the accelerometer data. Velocity results derived from the accelerometer data served as an experimental standard against which ESDM results were compared. Result comparisons clearly indicate that ESDM accurately reconstructs surface velocity fields with large in-plane and small out-of-plane components.