Time history-based excitation in the dynamic characterization of automotive elastomers

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Different input excitation approaches to measure the dynamic stiffness and damping properties of two automotive elastomer mounts were investigated in this research. The traditional methods of dynamic characterization of elastomers are based largely on sinusoidal input excitation where discrete frequency sine wave signals at specified amplitudes are used to excite an elastomer sample in a step-sine sweep fashion. This method is straight-forward in its signal processing and can easily be performed with a wide variety of available test equipment. However, many questions remain unanswered with respect to the behaviour of an elastomer during broadband frequency excitation. This paper examines how various other types of excitation affect the dynamic characterization results. These excitation inputs include continuous sine sweep (chirp), shaped random, and acquired road profile data. Use of the broadband data types is expected to provide a more accurate representation of conditions seen in the field, while helping to eliminate much of the interpolation that is inherent with the classic discrete step-sine technique. This paper elaborates on the use of time histories to facilitate broadband excitation, as well as to provide a description of accurate digital signal post-processing methods recommended for the various types of input.