Measurement of Equivalent Stiffness and Damping of Shock Absorbers

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Abstract

This paper describes a new testing and analysis methodology for obtaining equivalent linear stiffness and damping of automotive shock absorbers for use in system-level chassis and vehicle computer aided engineering (CAE) models for noise and vibration prediction. Since most of the system-level CAE models in a vehicle are linear in nature, equivalent linear parameters of chassis components are much more useful than comprehensive non-linear models. Also, a hydraulic actuated elastomer test machine which is the current industry standard, is not suitable for testing shock absorbers in the mid-to-high frequency range where the typical road input displacements fall within the noise floor of the hydraulic machine. Hence, an electrodynamic shaker was used for exciting the shock absorbers under displacements less than 0.05 mm up to 500 Hz. Furthermore, instead of the swept sine technique, actual road data were used to excite the shocks. Equivalent linear spring-damper models were developed based on least-squares curve-fitting of the test data.