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Modal properties investigation of car body-in-white with attached windscreen and rear screen

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Abstract. Vibration analysis of car body in white (BIW) is crucial during design stage. Car BIW holds all the essential components; therefore, analysing its dynamic behaviour is necessary to understand how vibrations are transferred to the end rows from any vibration sources. This paper presents the modal properties of car BIW with attached windscreen and rear screen calculated by means of finite element analysis (FEA) and experimental modal analysis (EMA). The aim for the analysis is to observe the effect of windscreen and rear screen to the dynamic properties of car BIW. Detailed CAD models of BIW for both schemes were used for normal modes calculation in FEA, therefore providing the finest prediction of its modal properties. Actual car BIW was hanged on a metal frame to imitate free-free boundary condition as in FEA; prior to EMA. The EMA was done for both schemes, whereby the results for FEA were confirmed with EMA, at least for the first five modes with errors below 15%. It can be concluded from the analysis that the attached windscreen and rear screen is significantly affects the first five modes of the BIW. However, other higher frequencies remain unchanged.

1. Introduction

Vibration analysis of a car body in white (BIW) is important to understand the Noise, Vibration and Harshness (NVH) of a car during earlier design stage [1-3]. A car BIW must be able to meet the NVH design criteria as well as the stiffness, strength and fatigue life [4]. In most car manufacturing development cycle, this procedure take place during engineering design where computational aided engineering (CAE) is involved [5].

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