Resumos da DSM2022
2ª Conferência Nacional de Dinâmica de Sistemas Multicorpo
F. Marques e C. Quental eds.
Guimarães, Portugal, 5-6 dezembro 2022

SEAT VIBRATION TRANSMISSIBILITY OF THE PORTUGUESE ALFA PENDULAR TILTING TRAIN

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ABSTRACT

Railways are one of the most used public transportation modes, its low environmental impact presents a huge advantage when compared to airplanes. Therefore, its use has been promoted as a solution to connect cities up to 850km distance. Comfort is a crucial parameter to fulfil this objective once it is the key to keeping customers satisfied and attracting new ones. Vibration is a primary comfort concern. Since it is derived from the train motion, the passenger will be subject to it throughout the journey due to the contact with the floor and seat. Seat transmissibility provides useful information regarding the extent to which the seat is attenuating or amplifying vibration, thus it is one of the parameters used to evaluate dynamic comfort. The vertical transmissibility of Alfa Pendular train seats was measured with 4 subjects (2 males/2 females, aged 9 – 39, weight 33 – 115kg, 1.33 – 1.87m stature) and tested for one comfort class seat and two touristic class seats. A tri-axial accelerometer seat pad was placed at the seat surface, 1 uniaxial accelerometer was placed at the floor and 3 at the rigid frame structure, allowing the identification of movements from the support seat frame. The results were similar for all subjects within the same seat. Comparing both seat types, higher frequency transmissibility was found for the latter. Regarding the touristic seats, 2 transmissibility peaks were obtained, a lower frequency resonance (under 1Hz) dependent on the foam and, a higher peak (between 2 – 3 Hz) corresponding to the movement of the rigid frame structure. Using ARTeMIS software, the movement type and origin of the previous frequencies were confirmed. The findings of this study may assist the optimization of the seat structural frame design, promoting a reduction of vibration transmissibility and, consequently, increasing passenger comfort levels.

Keywords: transmissibility; railway seat; vibration transmission

ACKNOWLEDGMENTS

The first author thanks to Fundação para a Ciência e Tecnologia (FCT) for a PhD scholarship under the project iRail (PD/BD/143161/2019). The authors would like to acknowledge the support of the projects FCT LAETA–UIDB/50022/2020, UIDP/50022/2020 and UIDB/04077/2020.

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