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Investigation on the Bogie Pseudo-Hunting Motion of a Reduced-Scale Model Railway Vehicle Running on Double-Curved Rails

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Abstract : In this paper, an experimental and theoretical study on the bogie pseudo-hunting motion of a reduced-scale model railway vehicle, running on double-curved rails, is presented. Since the actual bogie hunting motion, occurring for real railway vehicles running on straight rails at high travelling speeds, cannot be obtained in laboratory conditions, due to the speed and wavelength limitations, a pseudo- hunting motion was induced by employing double-curved rails. Firstly, the test rig and the experimental procedure are described. Then, a geometrical model of the double-curved rails is presented. Based on such model, the variation of the carriage rotation angle relative to the bogies and the working conditions of the yaw damper are clarified. Vibration spectra recorded during vehicle travelling, on straight and double-curved rails, are presented and interpreted based on a simple vibration model of the railway vehicle. Ride comfort of the vehicle is evaluated according to the ISO 2631 standard, and also by using some particular frequency weightings, which account for the discomfort perceived during the reading and writing activities. Results obtained in this work are useful for the adequate design of the yaw dampers, which are used to attenuate the lateral vibration of the train car bodies.

Keywords : double-curved rail, octave analysis, vibration model, ride comfort, railway vehicle
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