Lateral vibrations of curved railway tracks to transient excitations

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Wheel/rail interaction is a traveling source of excitation, sound radiation and vibration along the railway corridors. The train-track interaction on curved tracks constitutes high-pitch noise pollution inducing a considerable concern of rail asset owners, commuters and people living or working along the rail corridor. The sound and vibration can be in various forms and spectra. The undesirable sound and vibration on curves are often called squeal noises. This paper illustrates the dynamic influences of curve radii on the lateral vibrations, which are the possible mechanism for development of curve squeal under mode-coupling theory. The study is devoted to systems thinking the approach and dynamic assessment in resolving railway curve noise problems. Curve track models in three-dimensional space have been built using finite element package, STRAND7. The dynamic responses of curve track have been simulated by applying a moving train load. The simulations of railway tracks with different curve radii have been implemented to develop a comprehensive understanding of lateral track dynamics, containing dynamic behaviors of rail, cant, gauge and overall track responses.

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