

**Feasibility Study on a Measuring Method of Rail Axial Stress
Based on the Resonant Frequency of Standing Wave Modes**

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This paper proposes a newly developed method which measures the absolute axial stress of continuous welded rails (CWR) based on the change of resonant frequency of standing wave mode. The motion equations regarding the vibration of a three-dimensional Timoshenko beam under an axial load were derived. By applying the Floquet's theorem to the equations of the unit cell, which is an irreducible sub-structure of the periodicity in the infinite track structure, the equations were led to an eigen-value problem with respect to the frequency domain. We made clear the relation among axial load, wave number and frequency through the dispersion analysis for wave modes propagating in a track, and investigated the applicability of the proposed method to the measurement of the rail axial stress. Furthermore, the paper confirmed the linearity between the axial stress and resonant frequency through the field experiments executed in the actual CWR track aiming the applicability.