UTC Project Information

Project Title	MPC-672 – The Feasibility of Promoting Local Rail Vibrations Using Electromechanical Impedance Method
University	University of Utah
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Funding Source(s) and Amounts Provided (by each agency or organization)	USDOT, Office of the Assistant Secretary for Research and Technology $40,000 Utah Department of Transportation $50,000
Total Project Cost	$90,000
Agency ID or Contract Number	69A3551747108
Start and End Dates	September 24, 2021 to July 31, 2024
Brief Description of Research Project	The mission of this project is to serve the rail industry by improving infrastructure safety and reliability with minimized risks of internal rail defects and rail thermal buckling. The team will develop an electromechanical impedance (EMI) measurement system to promote local rail vibrations, which were recently found to be promising tools for both rail structural integrity inspection and RNT estimation. The local rail vibrations are the vibrational modes that are easy to promote, highly localized, and immune from boundary conditions. The fundamental mechanism of this phenomenon is deeply rooted from guided wave propagation in rails. Previously, local rail vibrations were promoted by impulse excitation, such as impactor and pulse laser, which lack a control flexibility on input energy and frequency. The team proposes to investigate the usage of EMI method for a consistent local rail vibration promotion, and successfully conducted preliminary numerical simulation to prove its feasibility. The proposed mission will be accomplished by developing an innovative capability of consistent excitation and detection of local rail vibrations, and advancing the state-of-the-art of rail defect detection rail neutral temperature (RNT) measurement.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The research enabled the implementation of local resonances for rail defect detection and rail thermal stress measurement. Our research is currently funded by FRA and AAR on using local resonances for these two purposes.

Impacts/Benefits of Implementation (actual, not anticipated)	The research enabled the implementation of local resonances for rail defect detection and rail thermal stress measurement. FRA and AAR have funded our research on using local resonances for these two purposes.
Web Links • Reports • Project Website	• MPC Final Report – Local Resonances in Rail Structures