

Rail Clip Failure Investigation at Sound Transit

ADC40 SUMMER MEETING 2018

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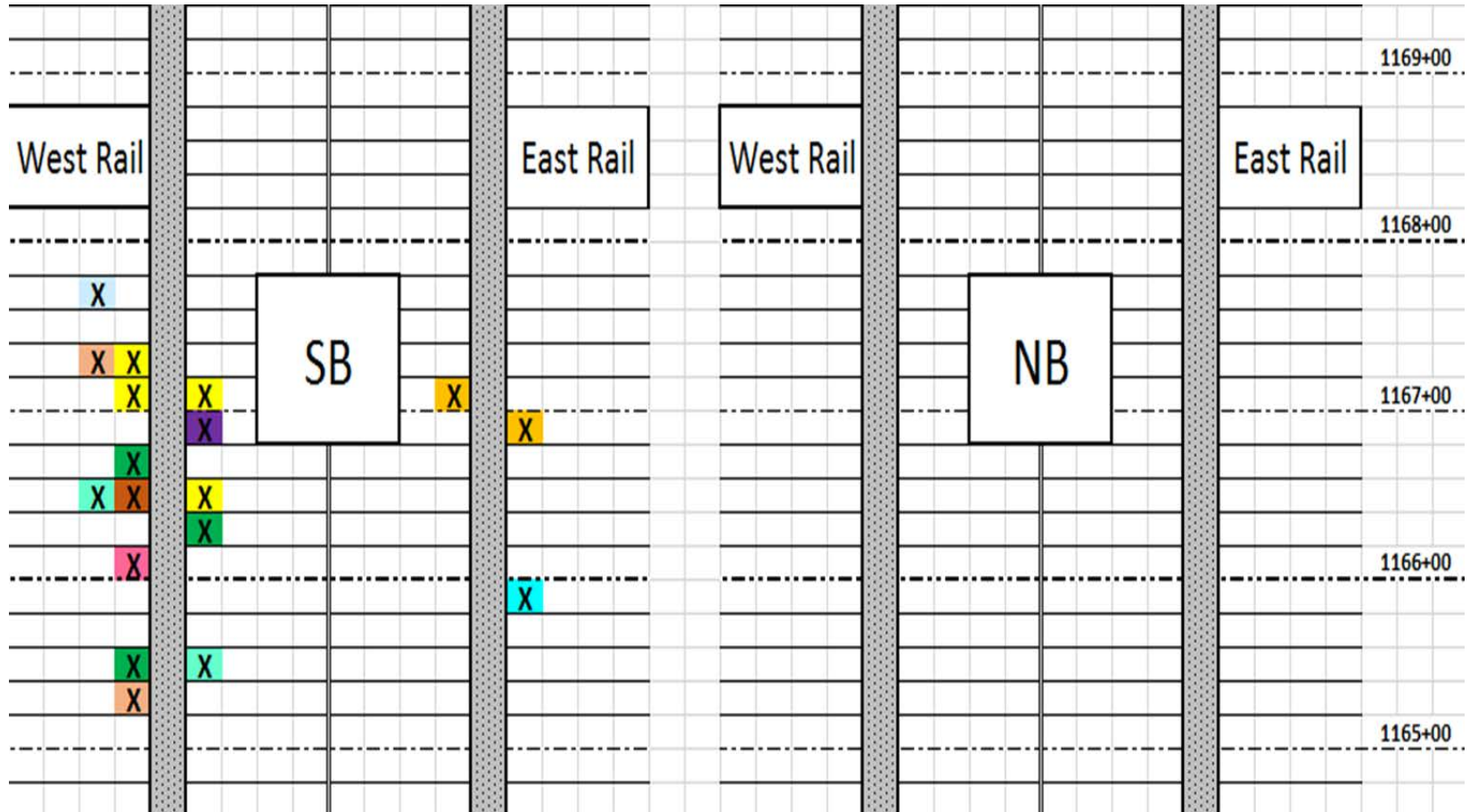


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Clip Failures – As of 4/11/2017 – 1 Year

	North Bound Track				South Bound Track			
	East Rail		West Rail		East Rail		West Rail	
	Field Side	Gage Side	Field Side	Gage Side	Field Side	Gage Side	Field Side	Gage Side
GAUGE/FIELD	4	5	5	6	18	22	36	21
EAST/WEST	9		11		40		57	
NORTH/SOUTH	20				97			
TOTAL	132							

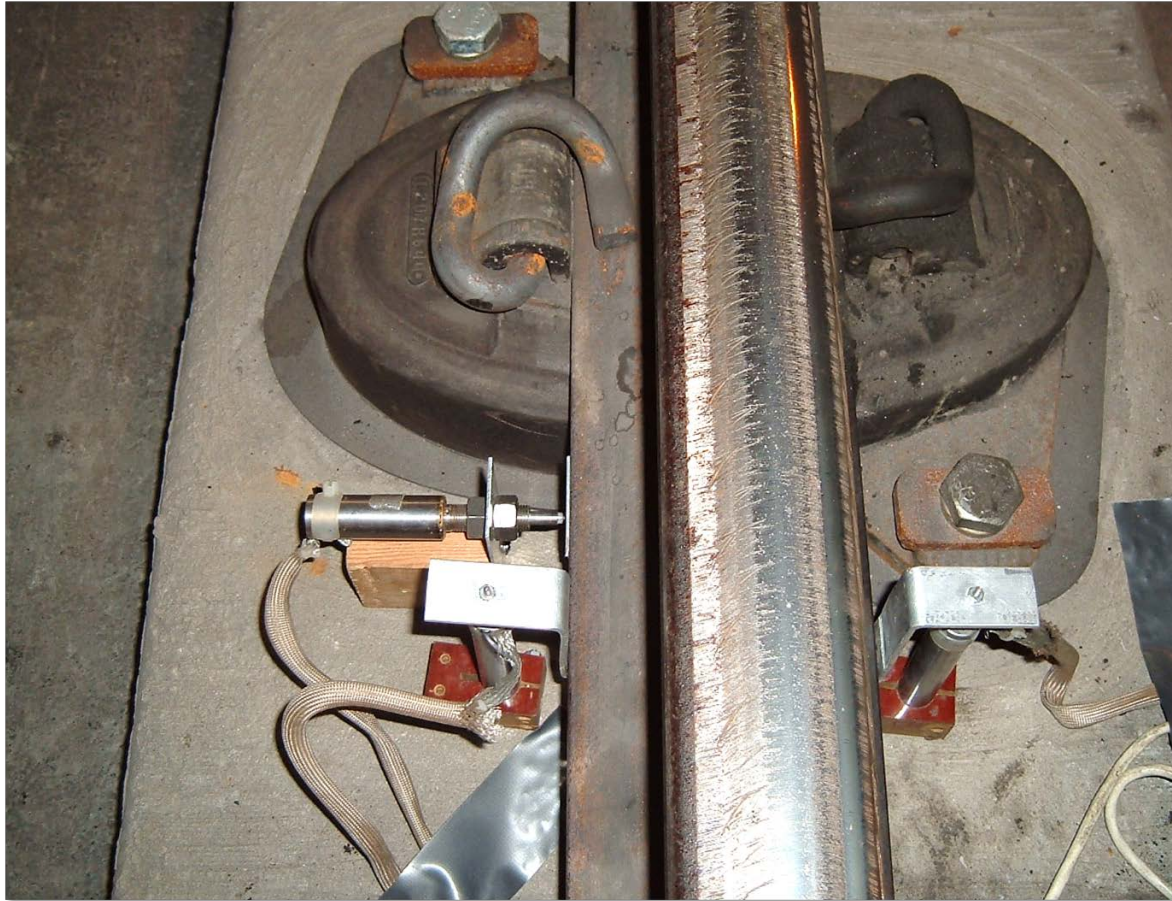
Map of Clip Failures



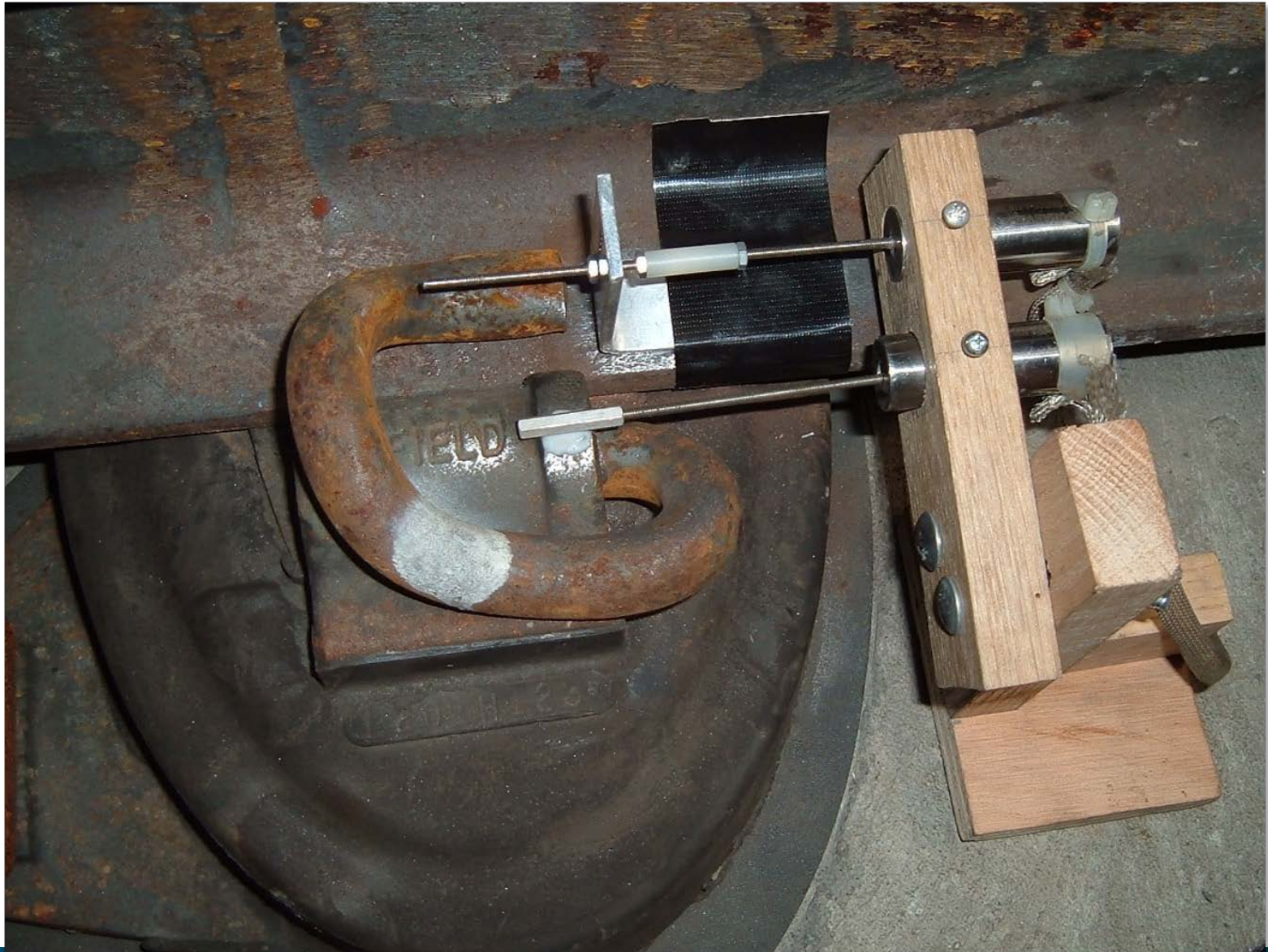
Clip Failure



Rail Deflection



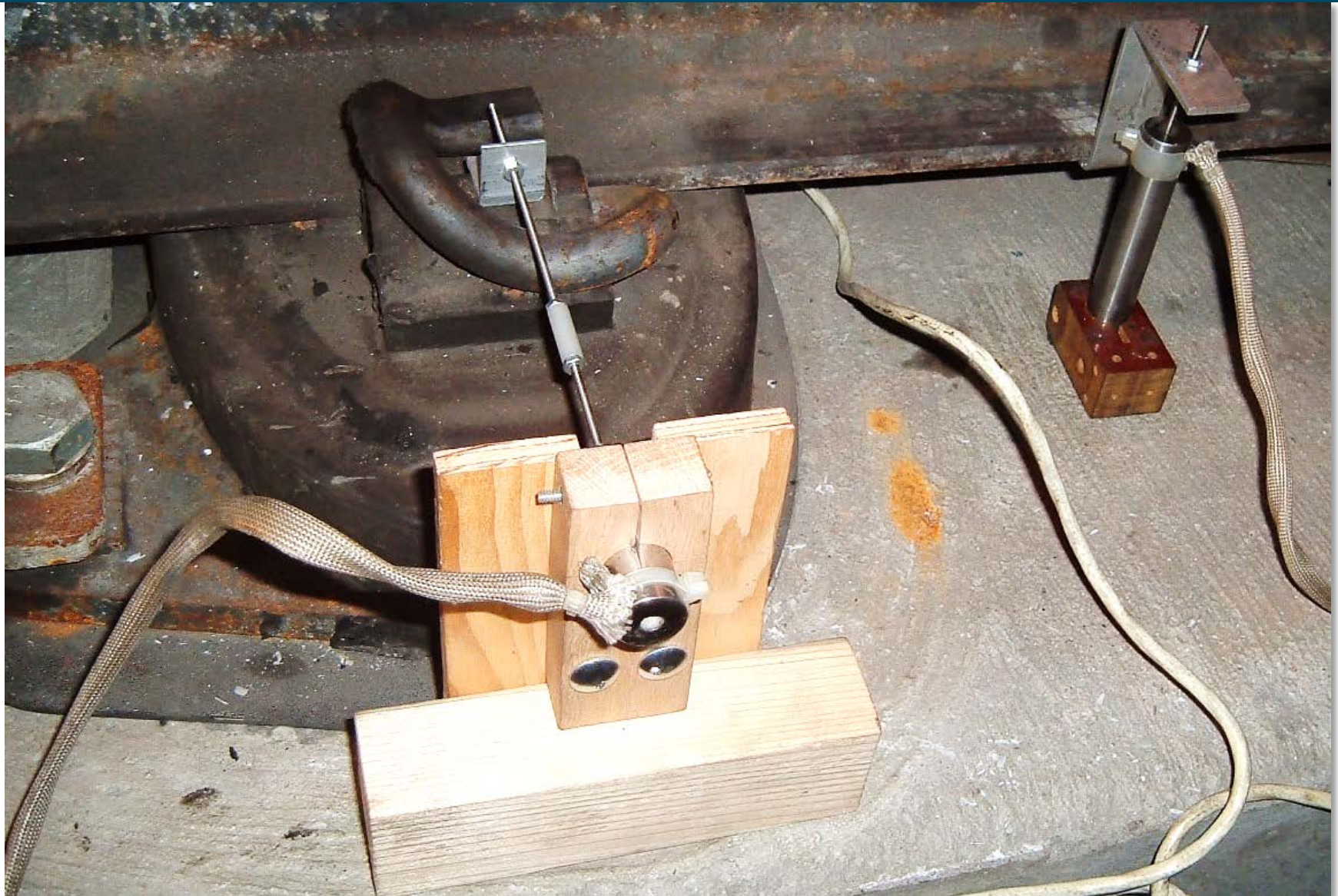
Longitudinal Deflection



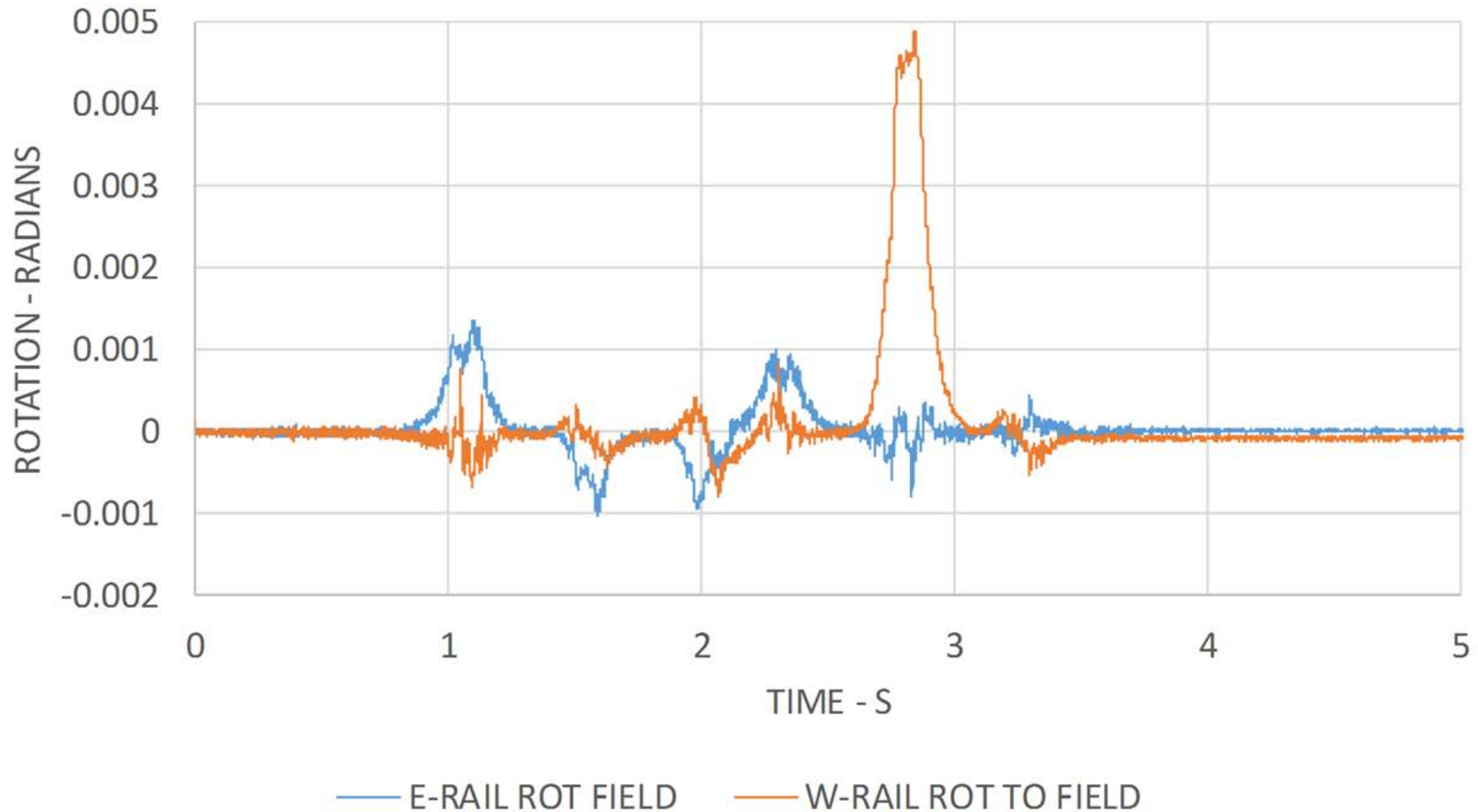
Top Plate Vertical Deflection and Rotation



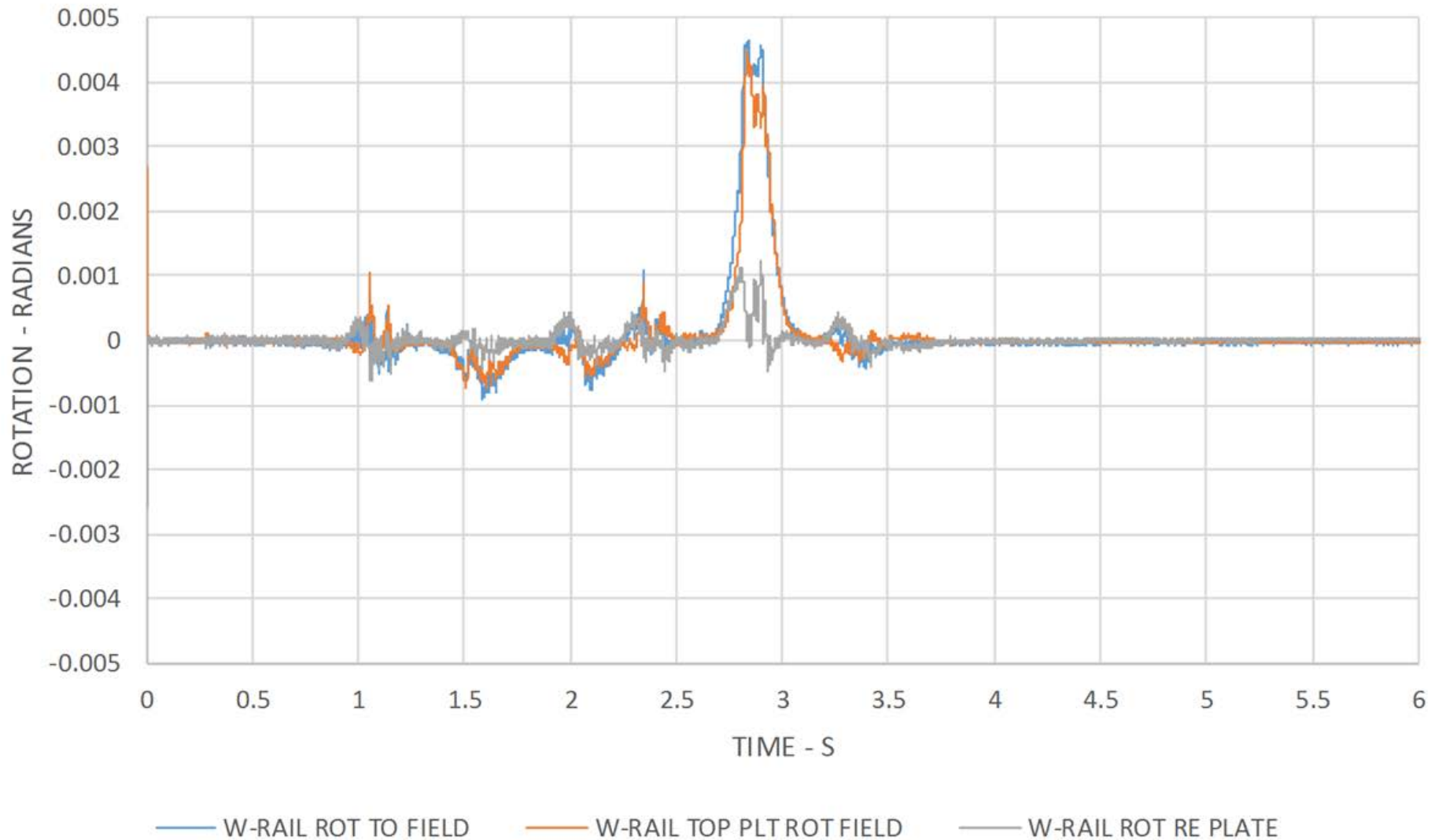
Top Plate Lateral



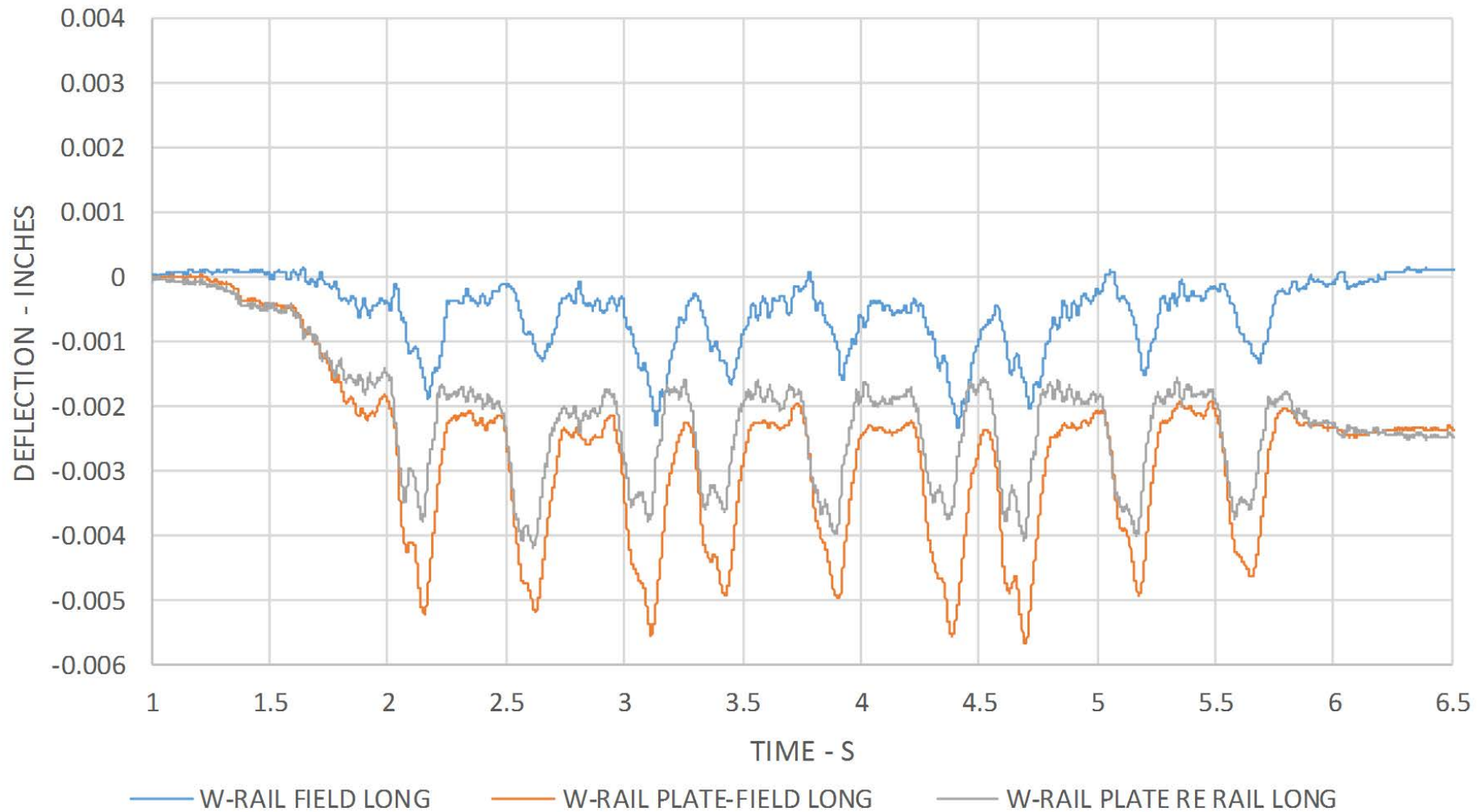
Southbound Track Rail Rotation



Southbound Western Rail and Fastener Rotation



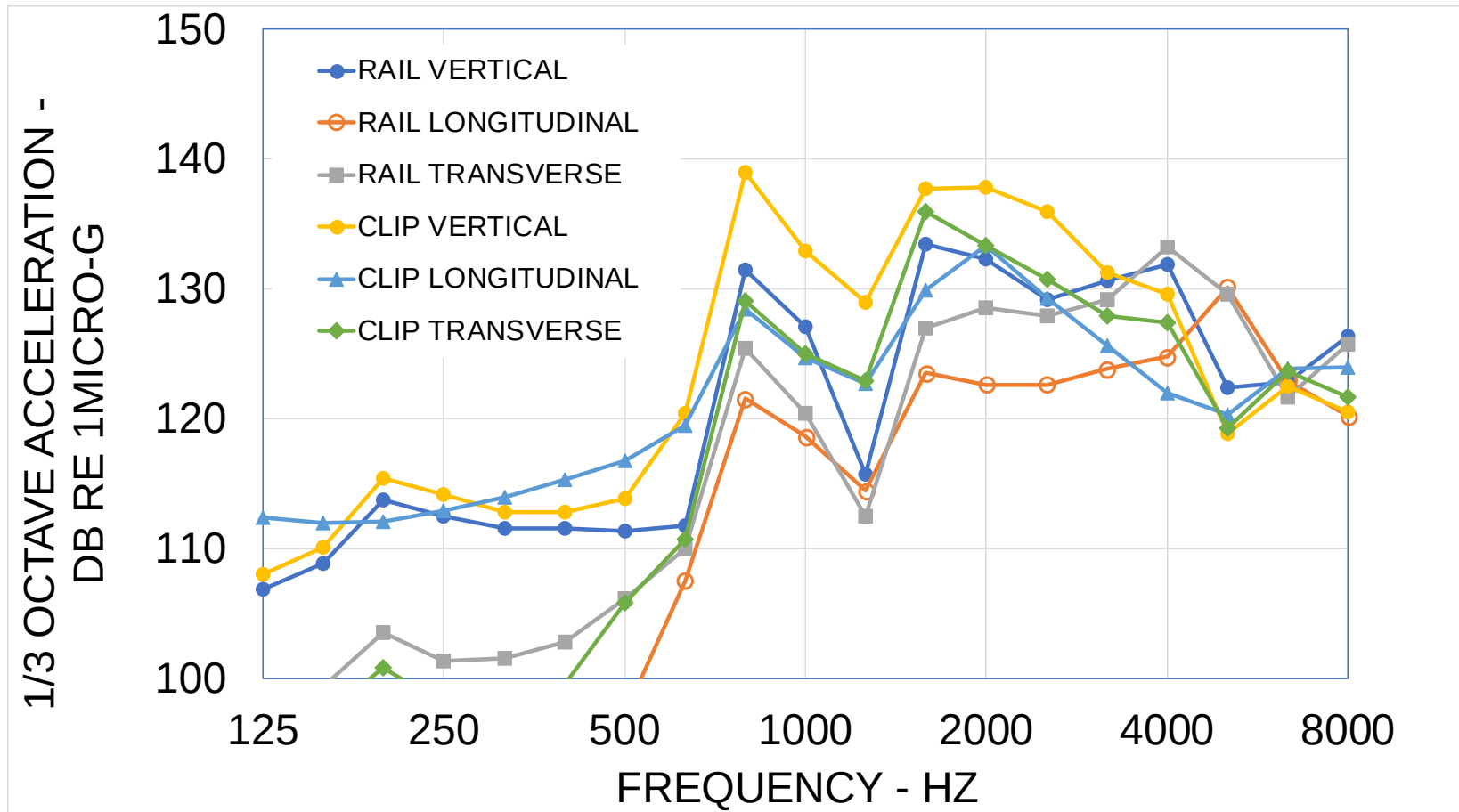
Longitudinal Deflection



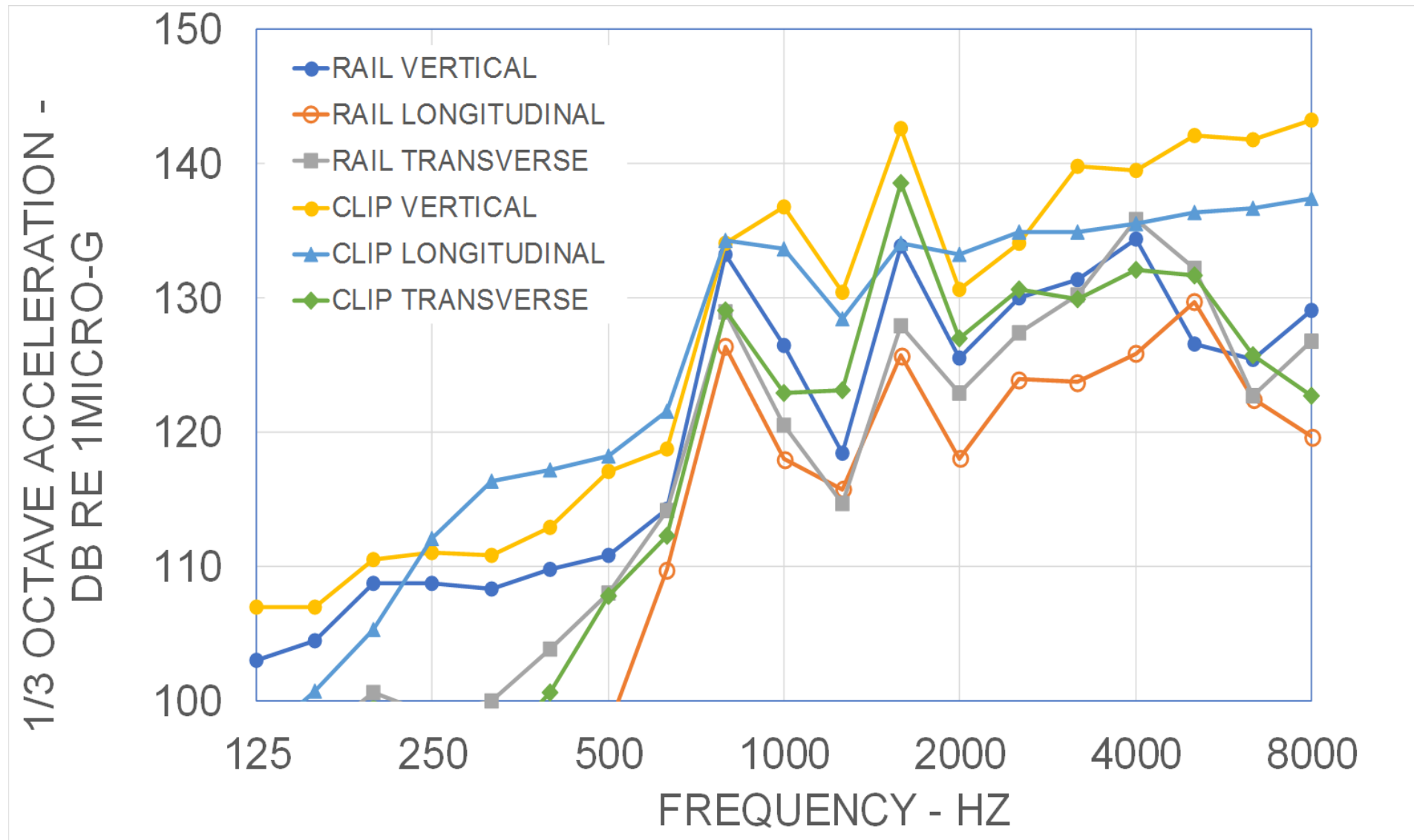
Accelerometers



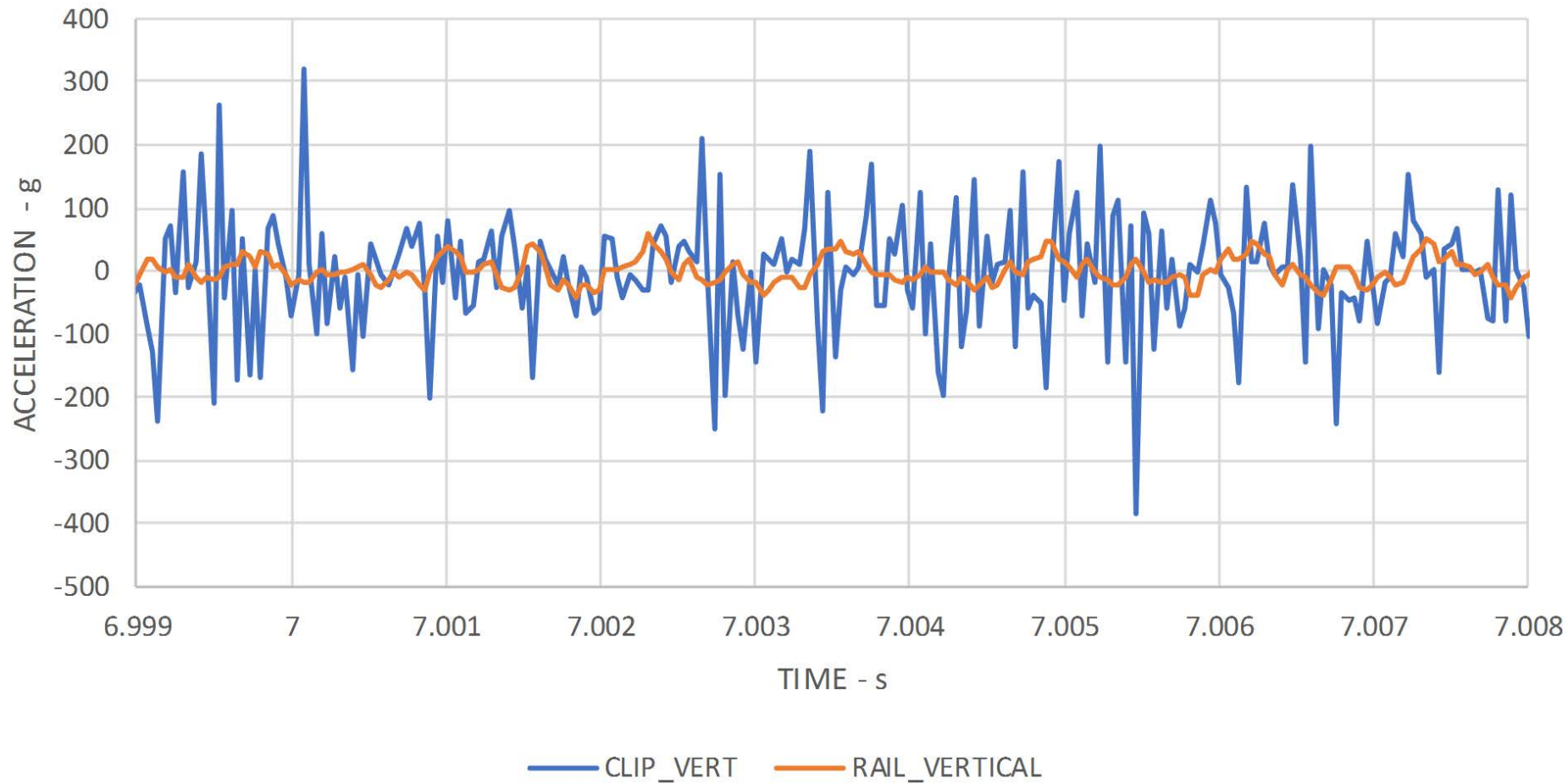
Acceleration Spectra – Northbound Track



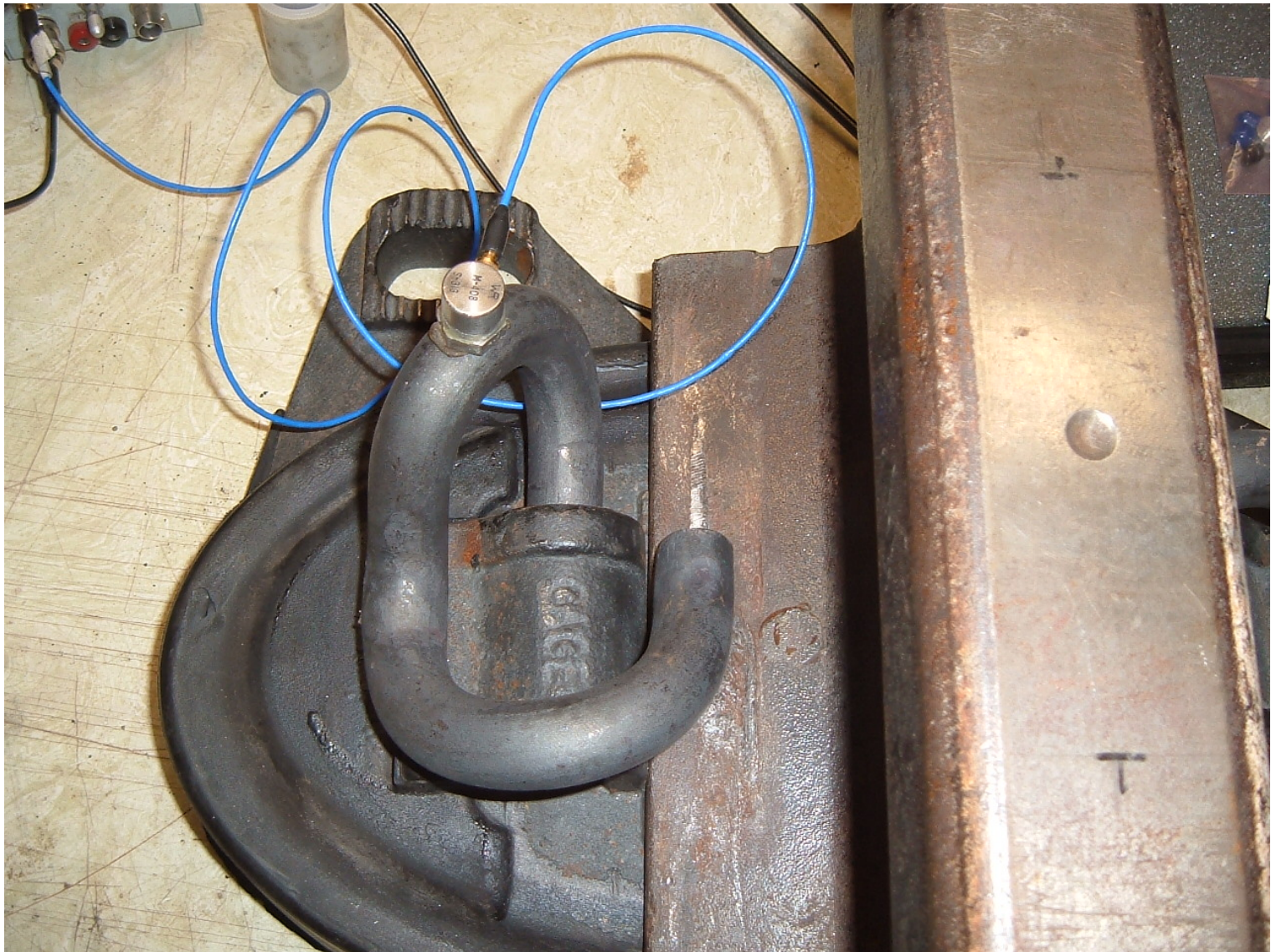
Acceleration Spectra – Southbound Track



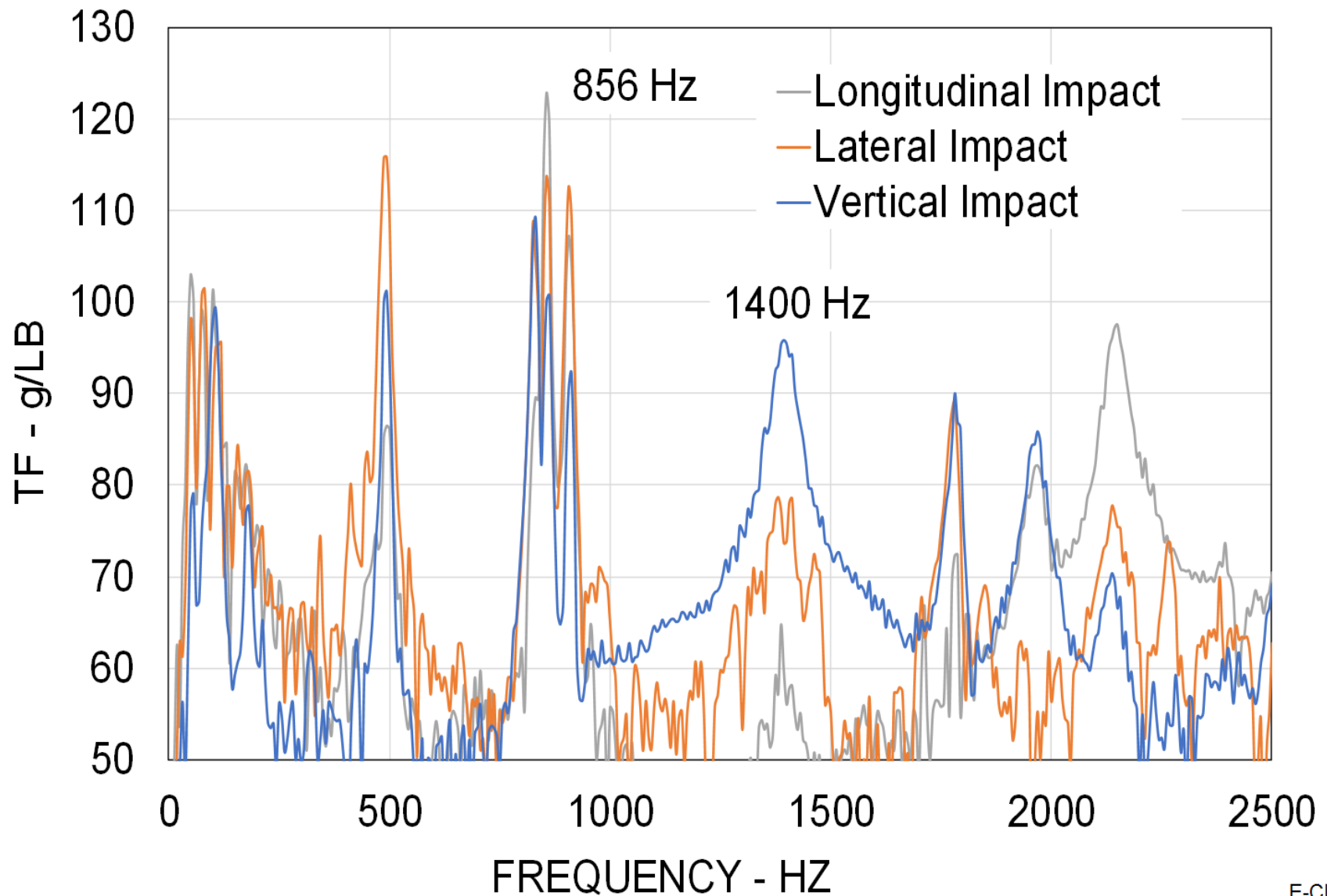
Broadband Vertical Acceleration



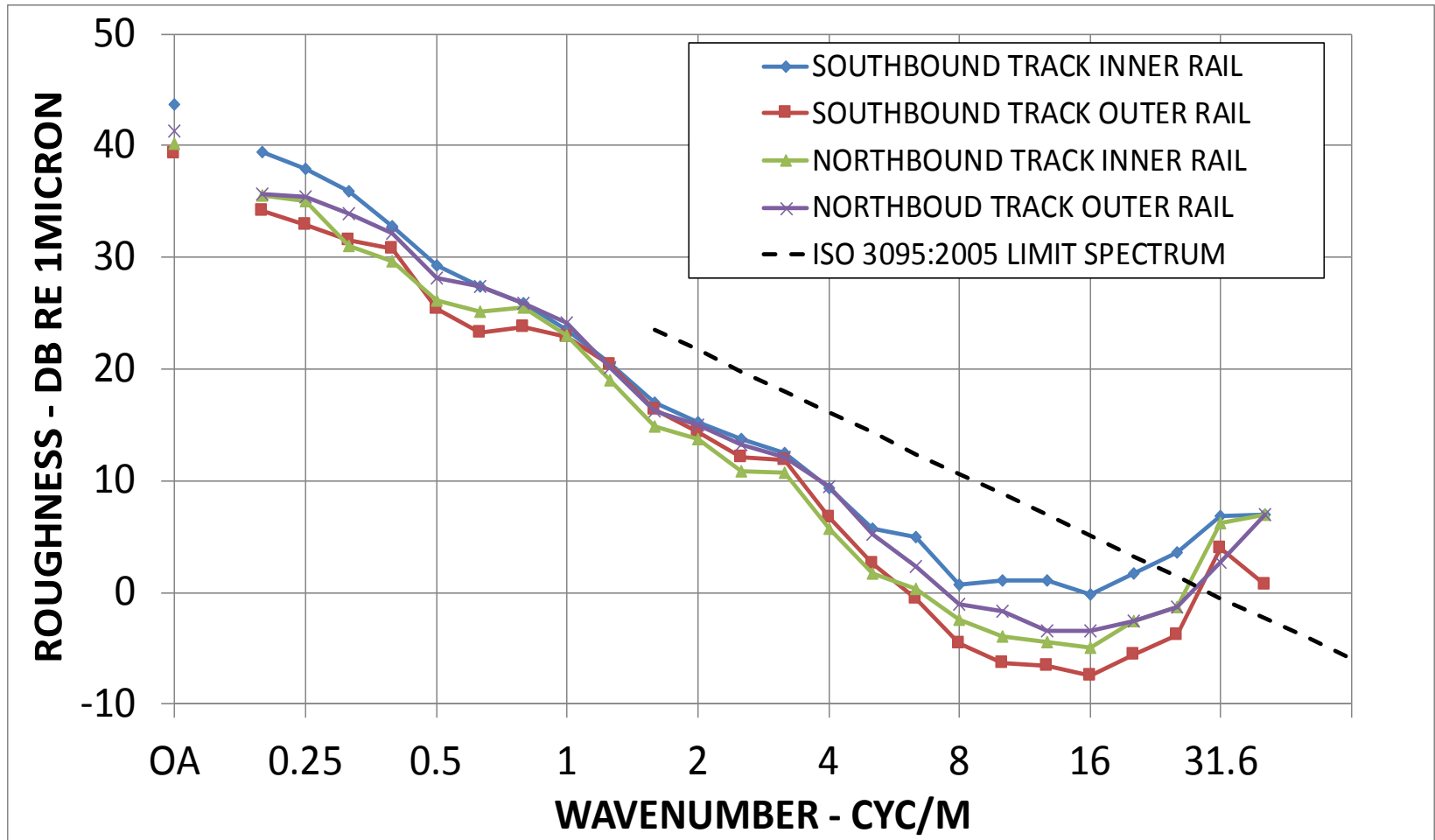
Vertical Accel



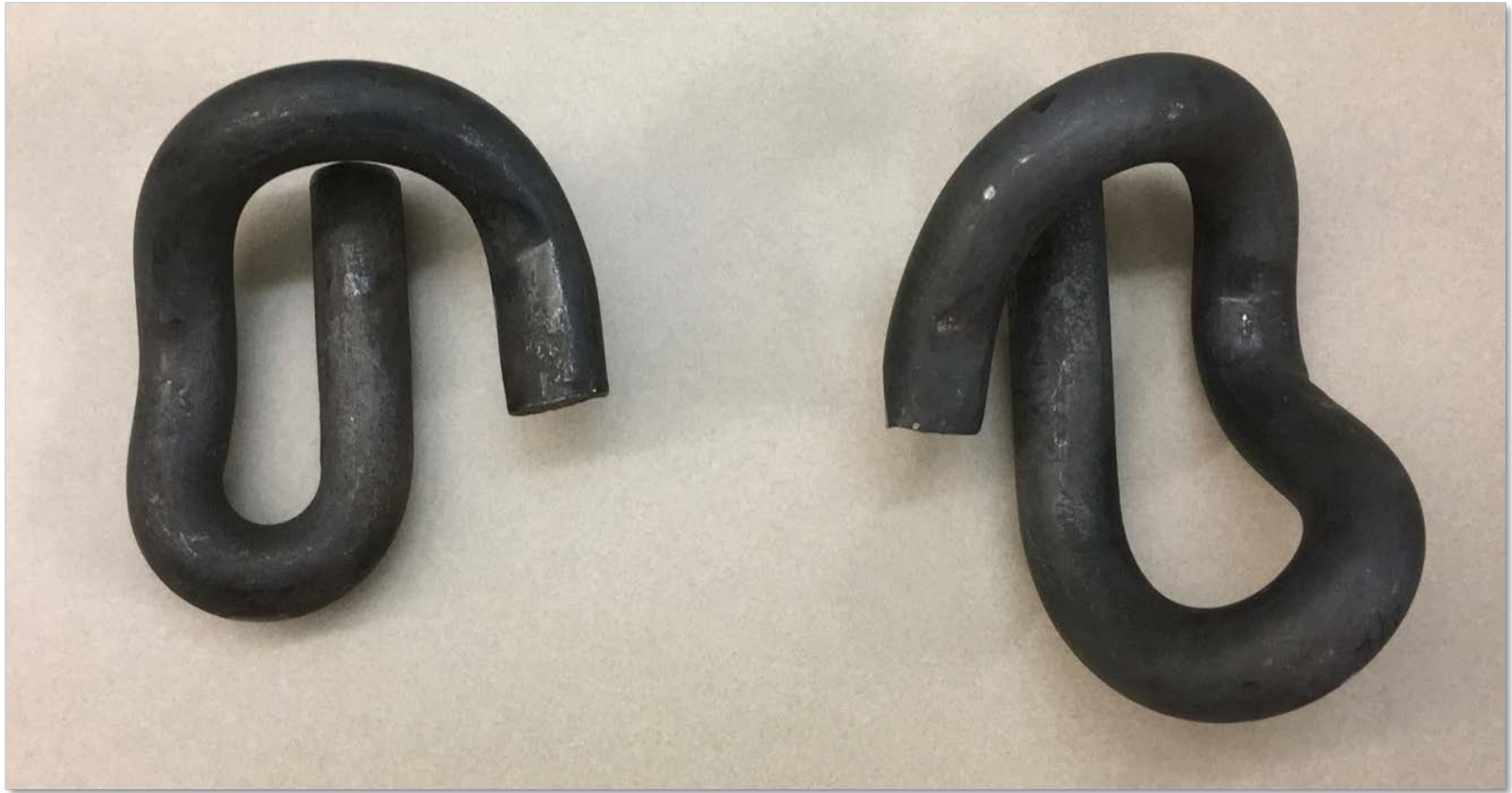
Laboratory Test – E-Clip



Rail Roughness Prior To Startup



Rail Clips



Conclusions

- Center truck produces largest rail rotation and lateral displacement
- No evidence of clip toe load being overcome
- No clear evidence of fatigue due to relative deflection of rail and fastener
- Acceleration spectrum contains strong peaks above 800Hz
- Laboratory tests indicate system resonance at about 800 to 900Hz
- Amplification of rail vibration acceleration at nominally 800 to 900Hz

ACKNOWLEDGMENTS

SHANKAR RAJARAM / SOUND TRANSIT
JASON BAILEY / SOUND TRANSIT
XIANGDONG HAN / SOUND TRANSIT
ANTHONY BOHARA / HDR INC



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