NGV 2022
5th Nordic Ground Vibration Day
24 October 2022 • Aarhus • Denmark

INTERPRETATION OF TRACK ALIGNMENT MEASUREMENTS IN A GEODYNAMIC PERSPECTIVE

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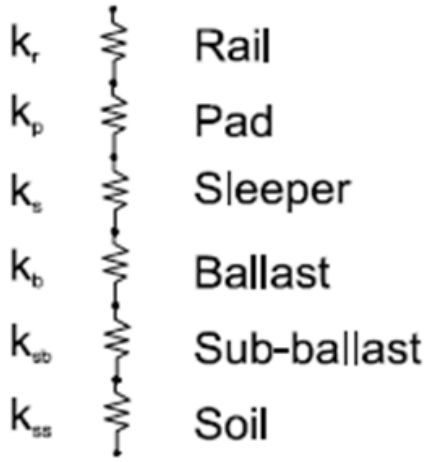
24 October 2022
5th Nordic Ground Vibration Day

TRACK ALIGNMENT

Longitudinal level of the railway track

(Barthelemy, S. , 2021)

TOTAL TRACK STIFFNESS



$$\frac{1}{k_{total}} = \frac{1}{k_r} + \frac{1}{k_p} + \frac{1}{k_s} + \frac{1}{k_b} + \frac{1}{k_{sb}} + \frac{1}{k_{ss}}$$

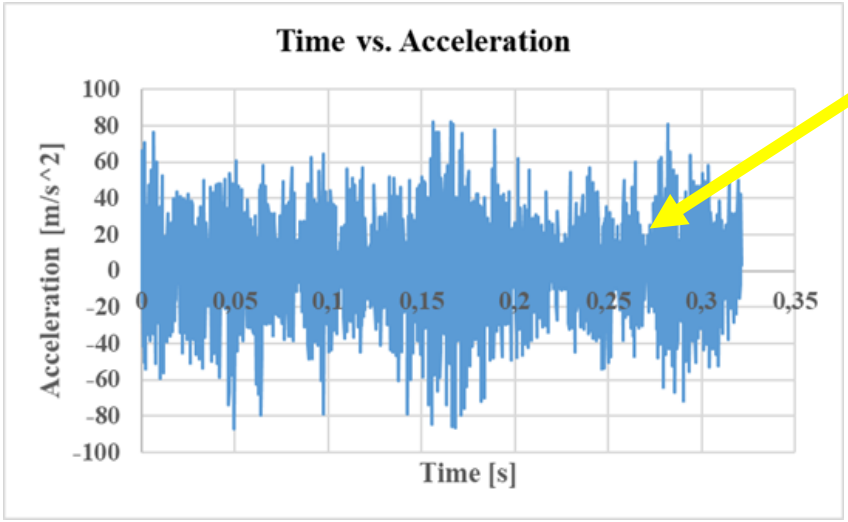
Berggren, E. (2009)

HOW ARE TRACK ALIGNMENT MEASUREMENTS PERFORMED?

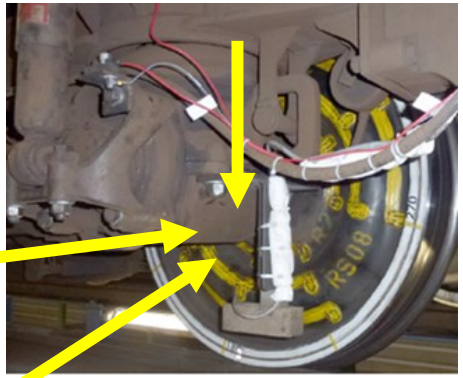
TRACK RECORDING COACH FOR TRACK ALIGNMENT MEASUREMENTS

(Barthelemy, S. , 2021)

(Trafikverket, 2018)



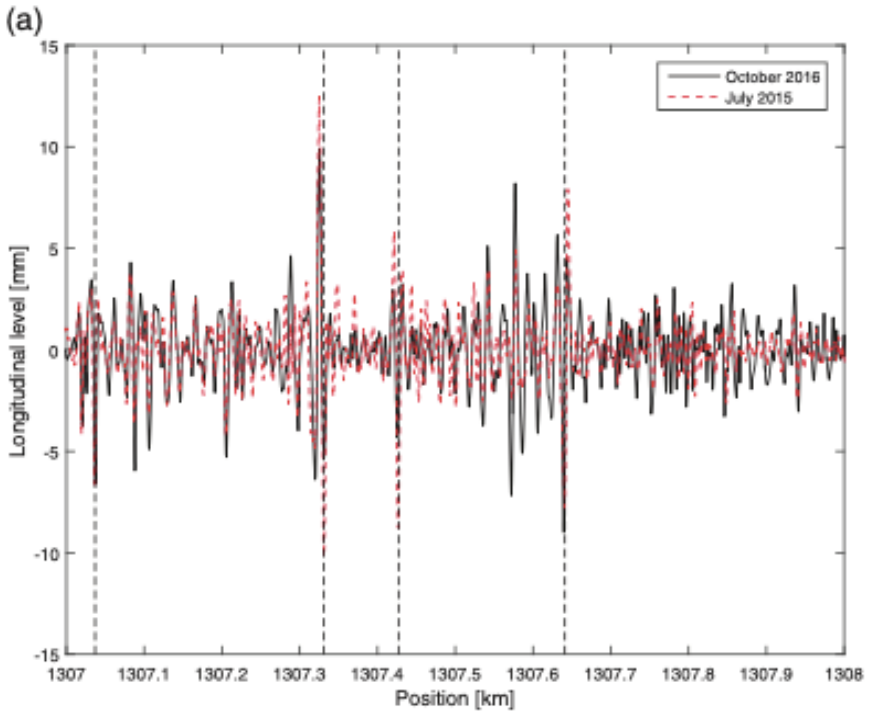
POSITION OF AXLE-BOX ACCELEROMETER



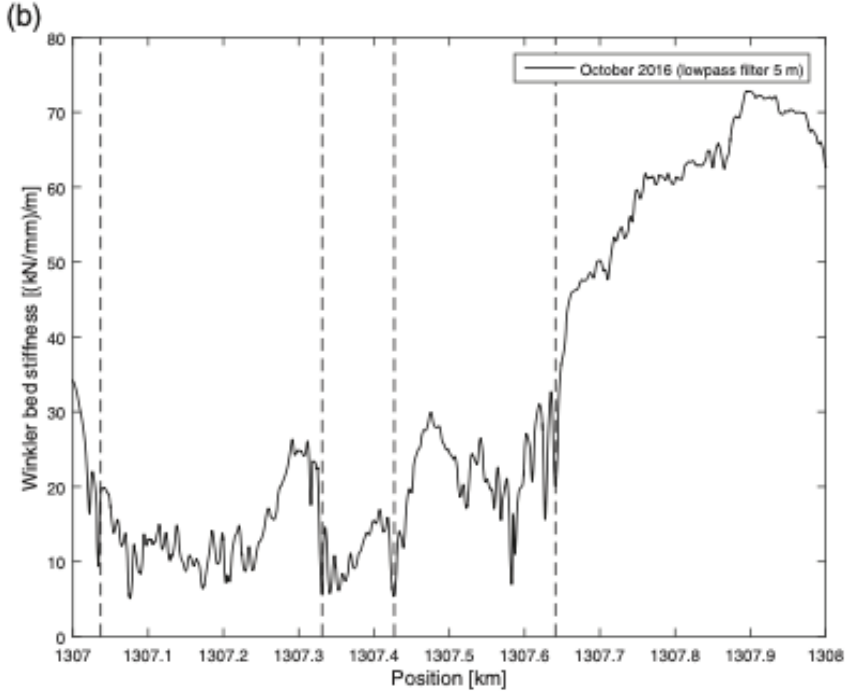
(Angehrn, 2015)

RESULTS FROM VERTICAL TRACK GEOMETRY DEGRADATION STUDIES ON THE SWEDISH HEAVY HAUL LINE "MALMBANAN" BASED ON VERTICAL TRACK ALIGNMENT –AND STIFFNESS MEASUREMENTS

A) Longitudinal level (mm) vs. Position (km)



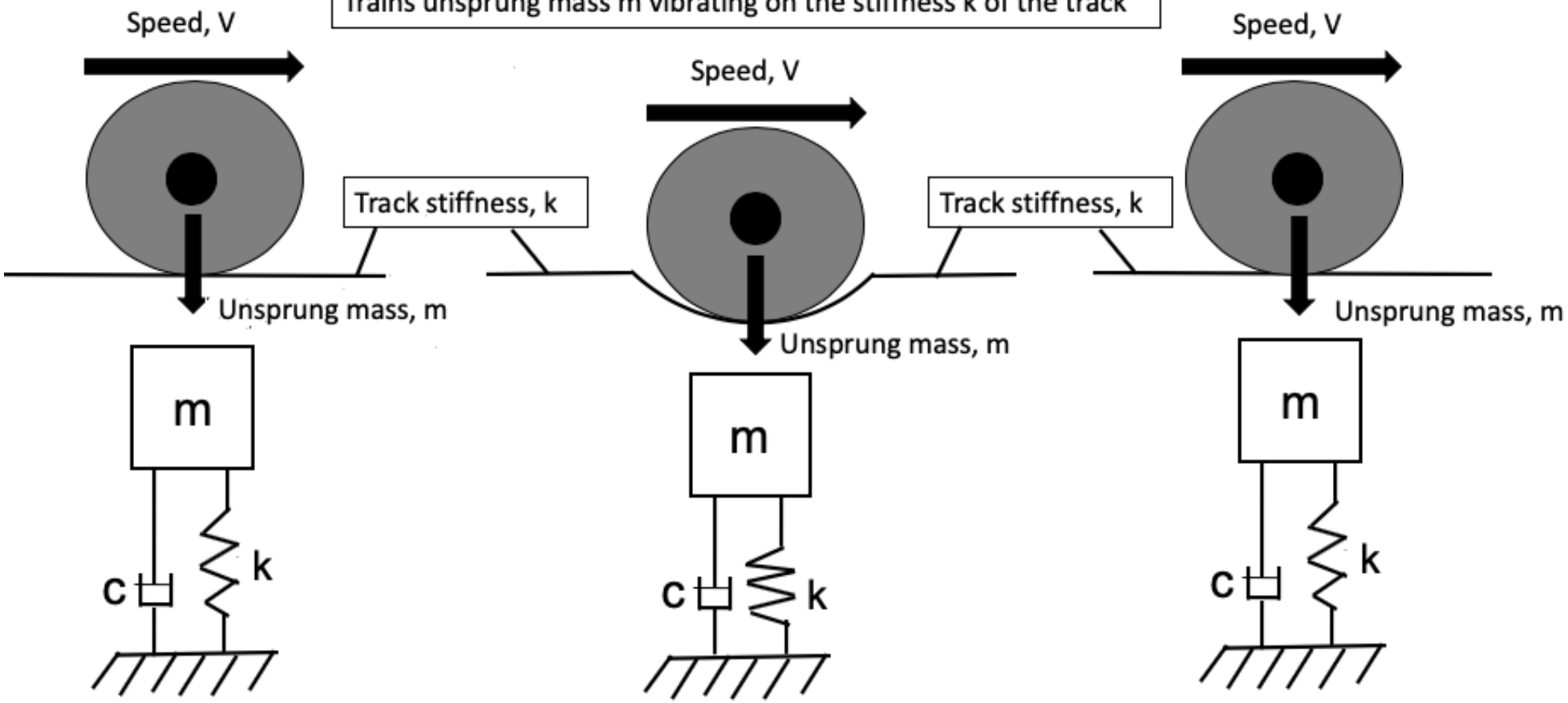
B) Track stiffness (kN/mm/m) vs. Position (km)

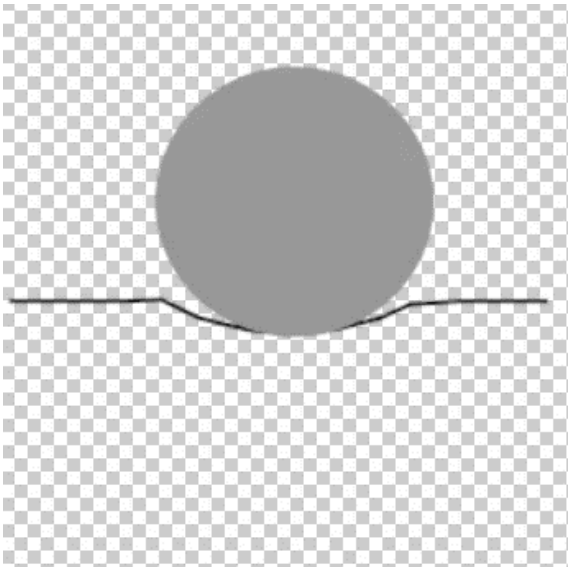


Nielsen, J., Berggren, E., Hammar, A., Jansson, F., Blomsvik, R. (2020)

Coupled Vehicle-Track System Response

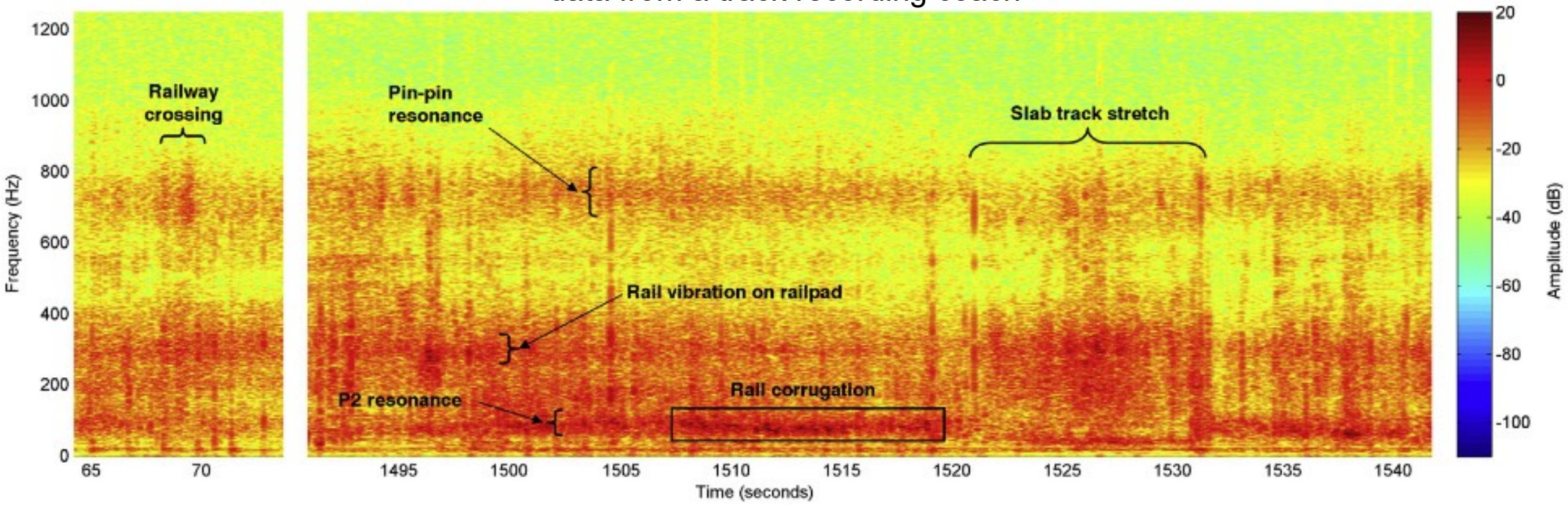
Trains unsprung mass m vibrating on the stiffness k of the track





FUNDAMENTAL COUPLED VEHICLE-TRACK SYSTEM RESPONSE 10-100 HZ "P2-RESONANCE" DISCOVERED IN FREQUENCY VS. TIME SPECTRUM

Frequency (Hz) vs. Time (s) spectrum obtained from axle-box accelerometer data from a track recording coach



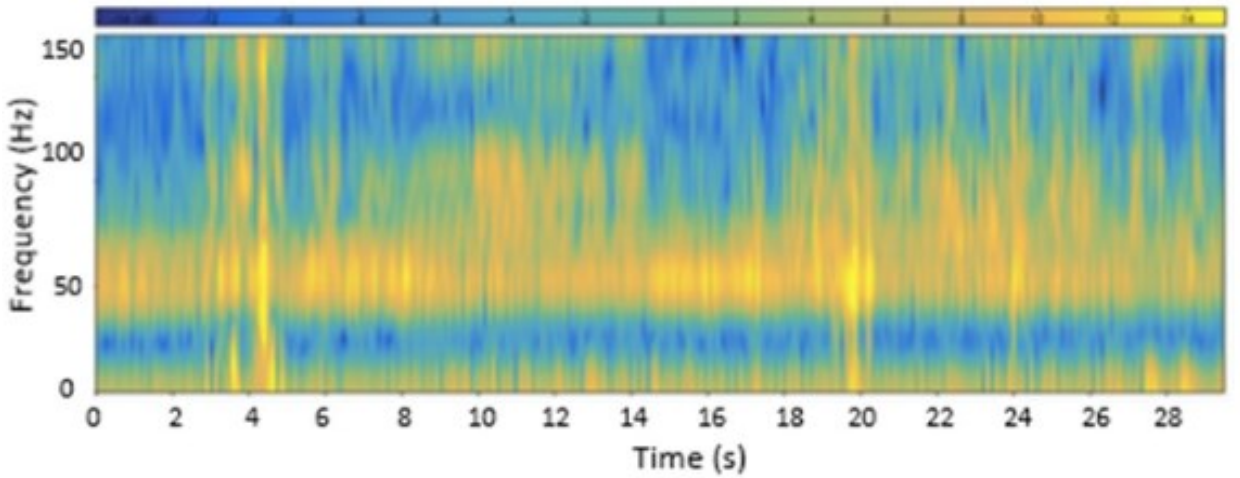
Salvador , P., Naranjo, V., Insa, R., & Teixeira, P. (2016)

RESEARCH QUESTION

DOES FREQUENCY CONTENT OF AXLE-BOX ACCELEROMETER DATA FROM TRACK ALIGNMENT MEASUREMENTS ENABLE MONITORING OF VARIATIONS/CHANGES IN TRACK STIFFNESS?

(Trafikverket, 2018)

(Angehrn, 2015)



CONCLUSIONS

- COUPLED VEHICLE-TRACK SYSTEM RESPONSE IS VISIBLE IN FREQUENCY VS. TIME SPECTRUMS
- CONTROL OF TRACK STIFFNESS (BALLAST/SUB-BALLAST -AND SUBGRADE-STIFFNESS) IS THEORETICALLY POSSIBLE WITH THIS METHOD

THANKS FOR YOUR ATTENTION

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