NeTIRail

Needs Tailored Interoperable Railway Infrastructure

Axle box acceleration measurements in Romania: Faurei test ring and line Bartolomeu-Zărneşti

NeTIRail-INFRA final conference

Ljubljana, 24 May 2018
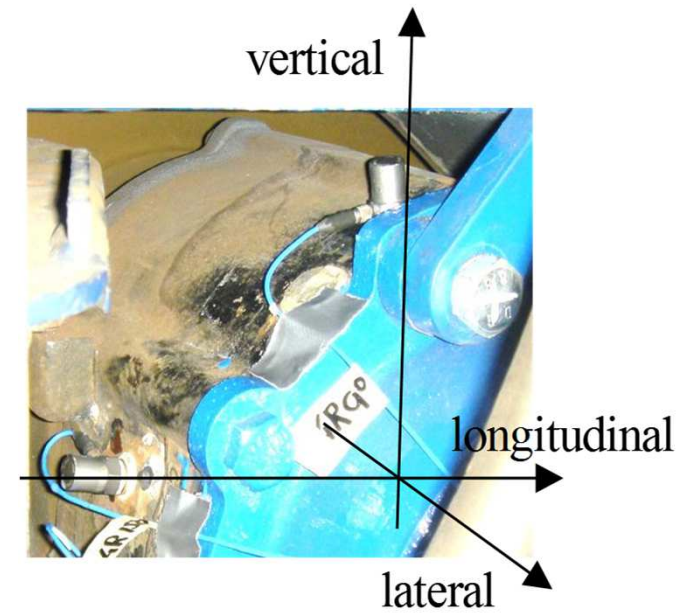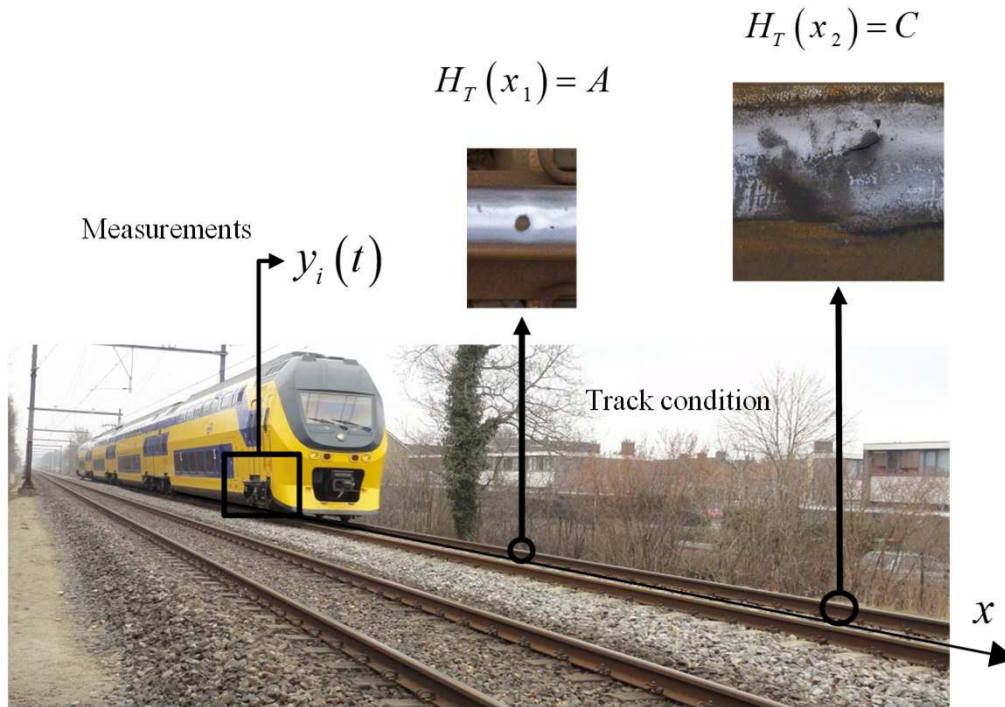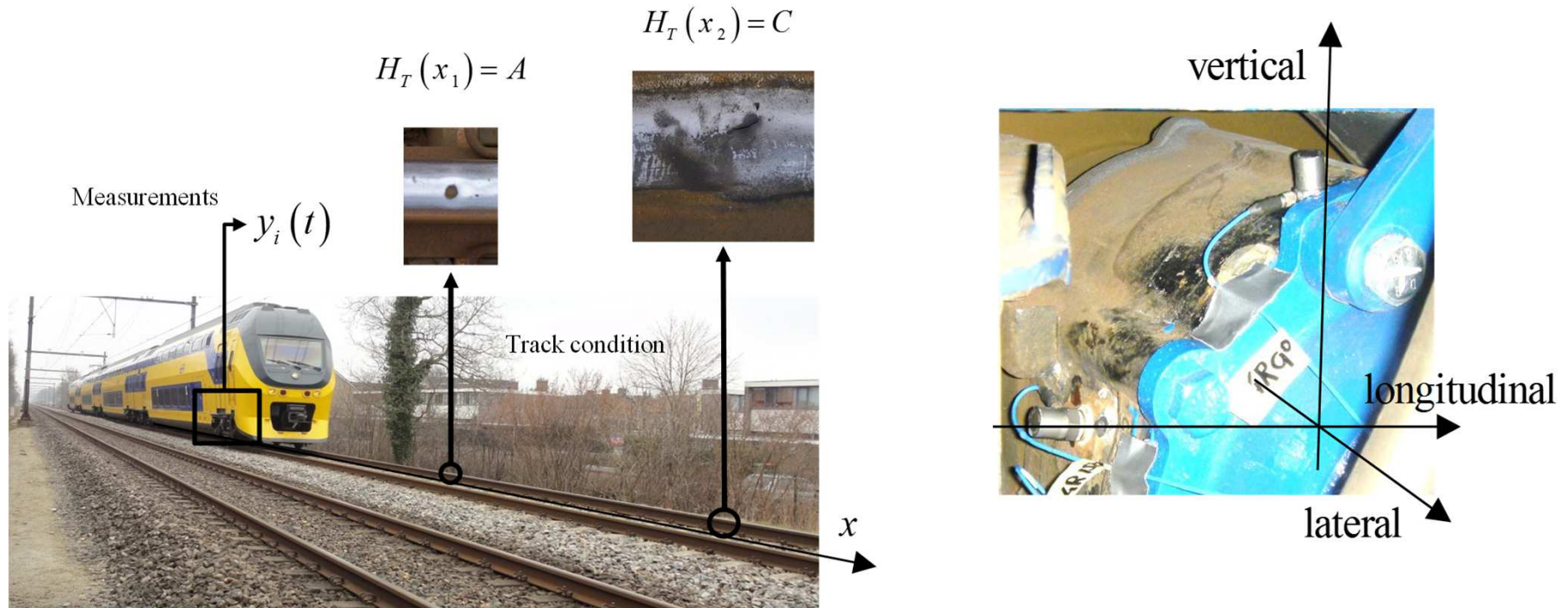
Alfredo Núñez

TUDelft

Content

- Rail condition monitoring based on axle box acceleration (ABA) measurements.

- Faurei testing ring in Romania: detection of rail defects over the whole testing ring. Examples of responses at a local defect (wheel-burn) is discussed with measurements at 80km/h (conventional speed measurement) and 200km/h (high speed measurement).

- ABA measurements were obtained during operation in a train with passengers in the railway line near Brasov, Bartolomeu-Zărneşti. Examples of the defects and validations are discussed.
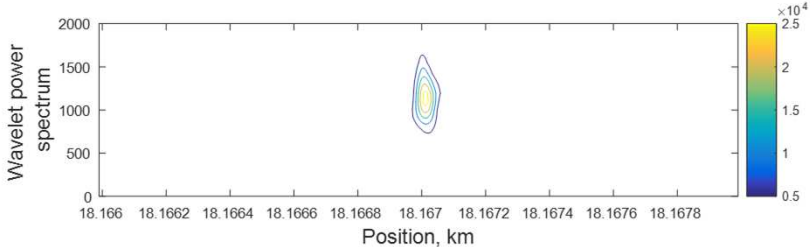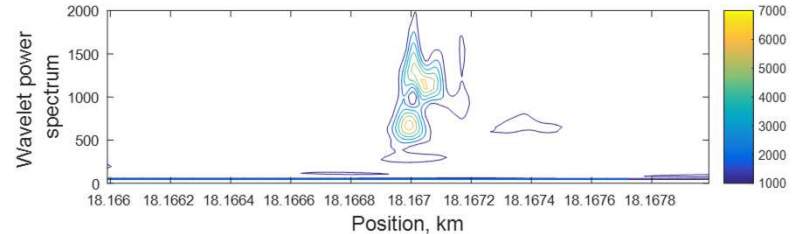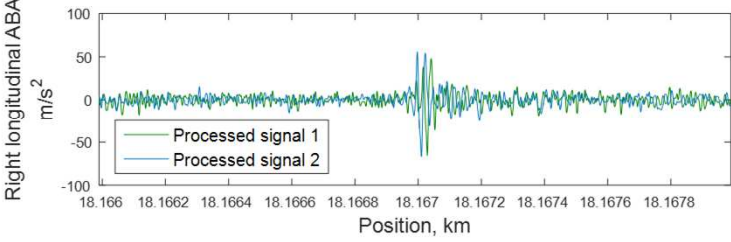
ABA Measuring System

$$H_T(x_1) = A$$

$$H_T(x_2) = C$$

Measurements

$y_i(t)$

Track condition

x

vertical

longitudinal

lateral

ABA Measuring System

$$H_T(x_1) = A$$

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The Netherlands

Faurei
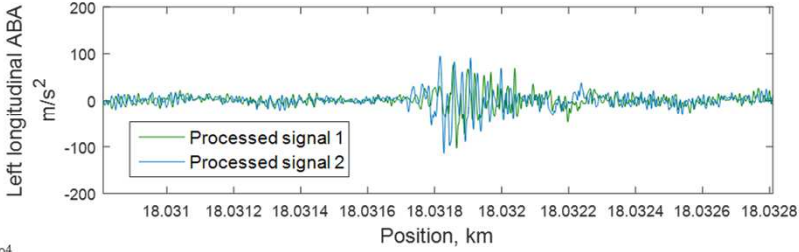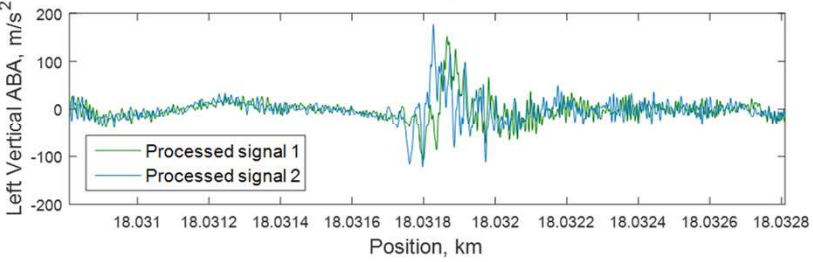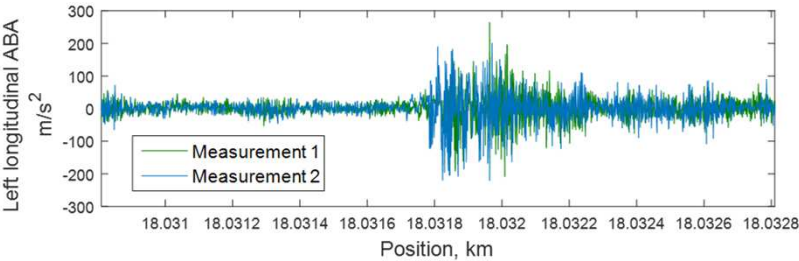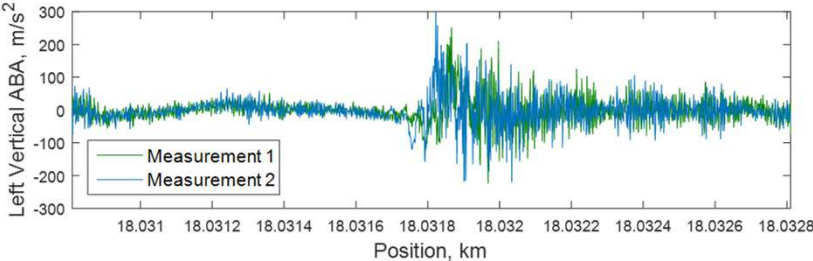
Bartolomeu-Zărneşti

ABA at early squat
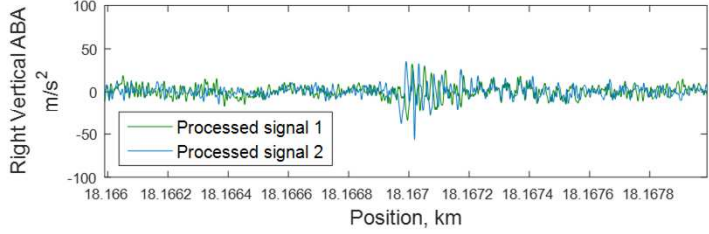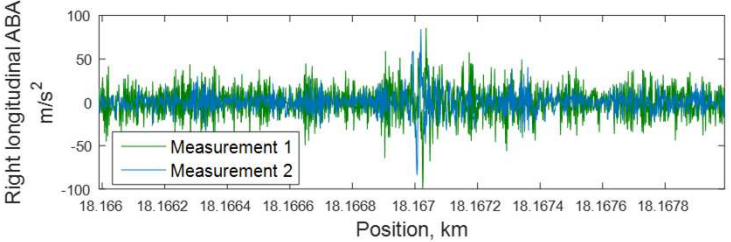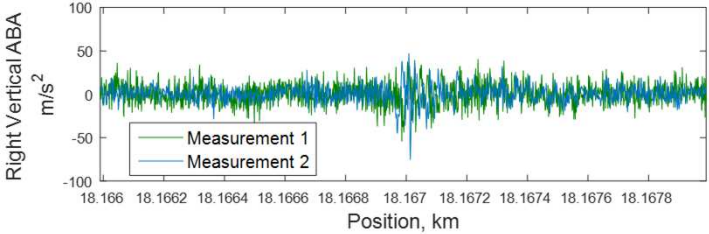
ABA at severe squat
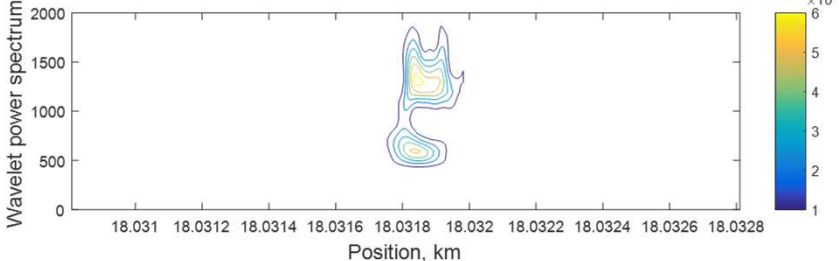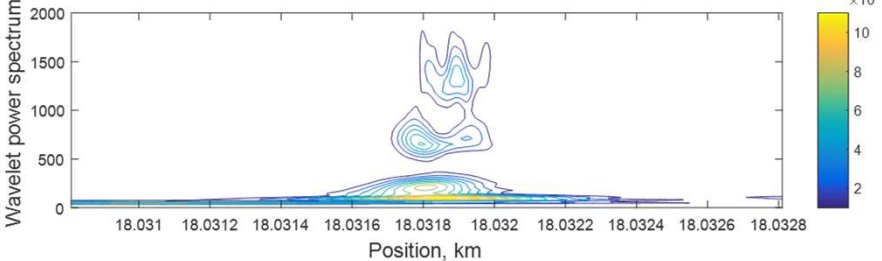
ABA measurement test ring AFER

- ABA measurements were performed in October 2017 in the test ring of AFER.
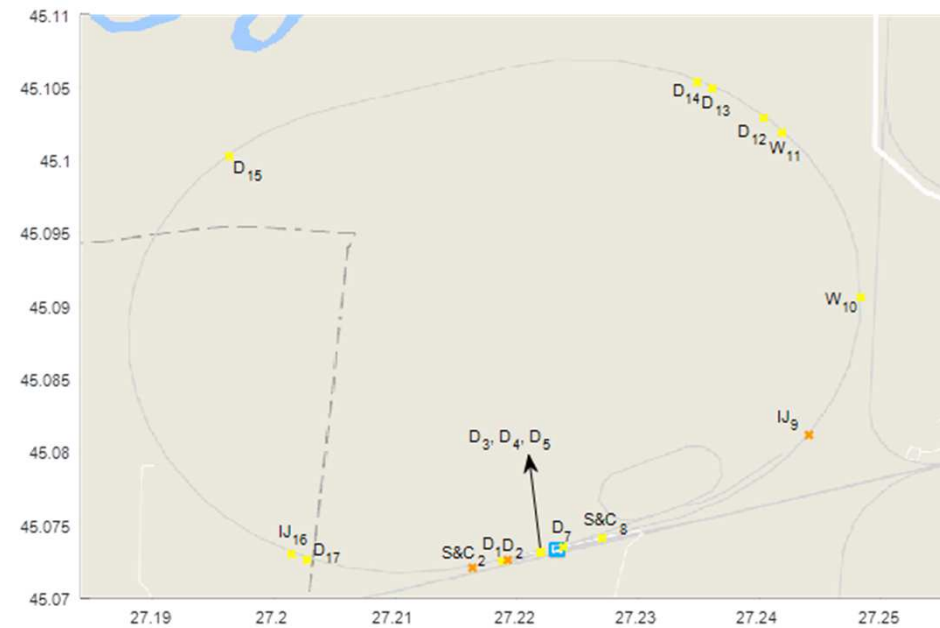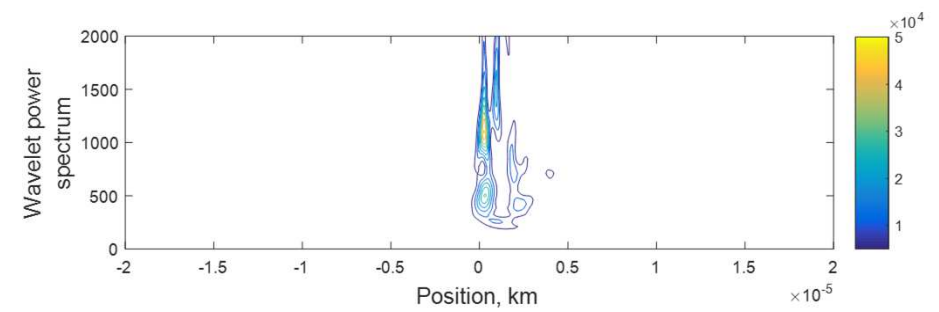
ABA measurement test ring AFER

Figure (a) Map of the test ring near the city Faurei, (b) detection results of the most interesting locations for inspection.

ABA measurement test ring AFER

Examples of some of the defects detected.

ABA measurement test ring AFER
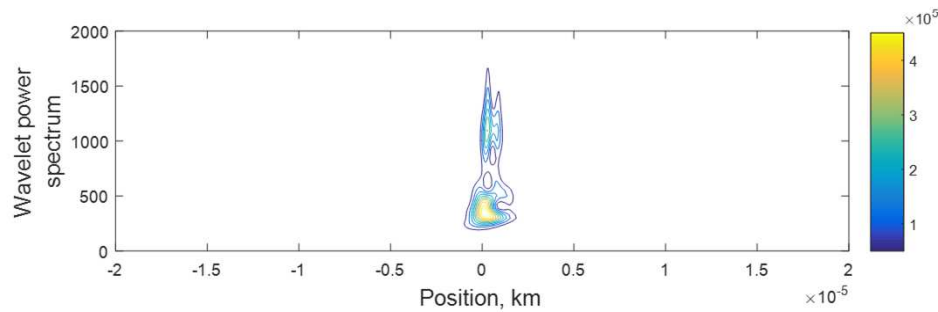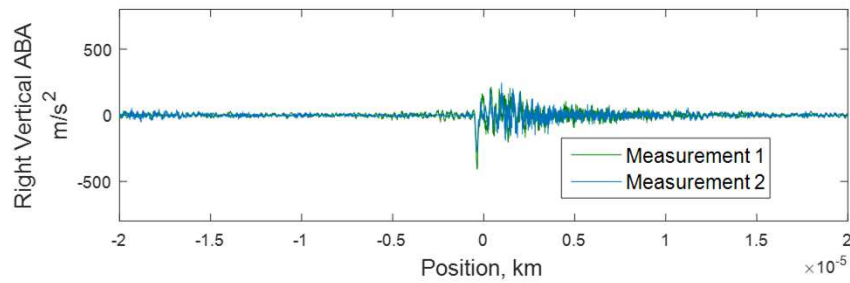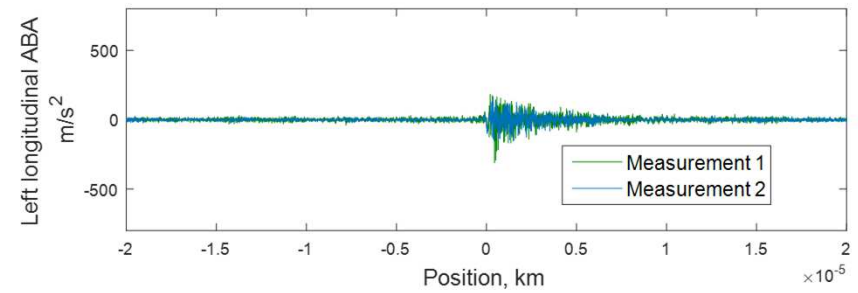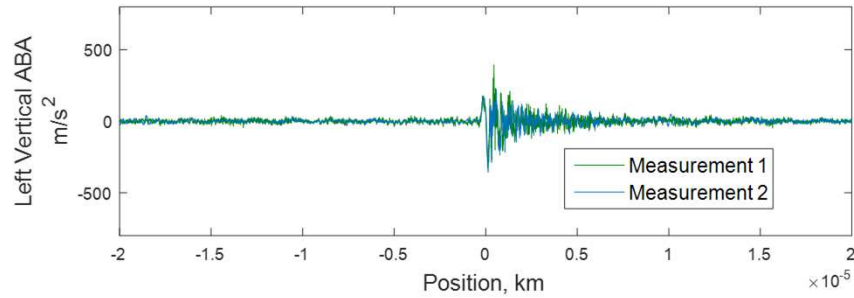
Vertical and longitudinal ABA and wavelet power spectrum at a defect, measured at 80 km/h.

ABA measurement test ring AFER

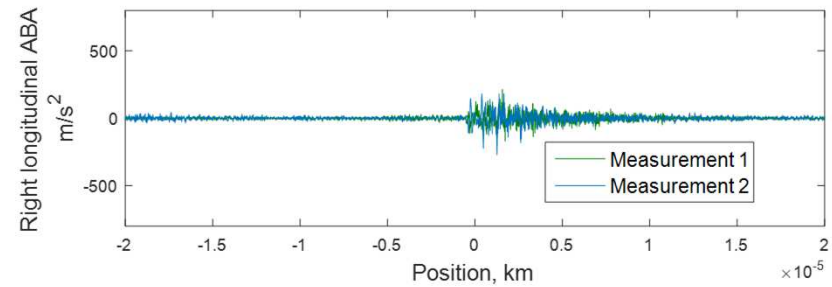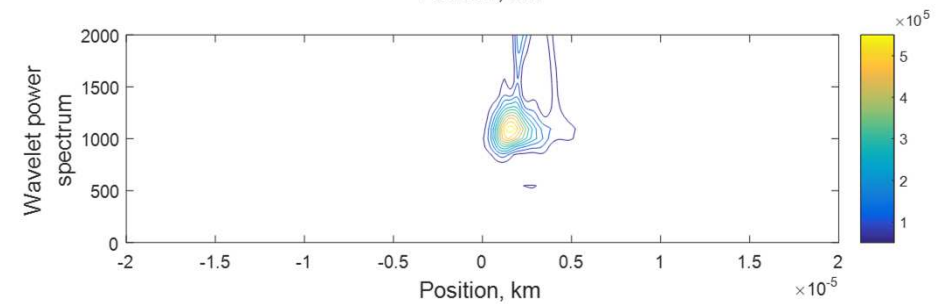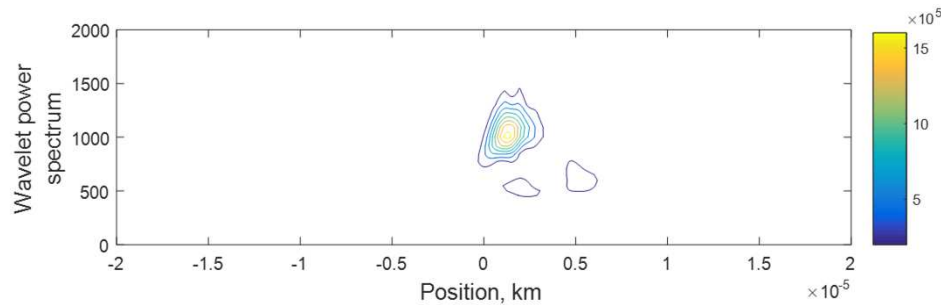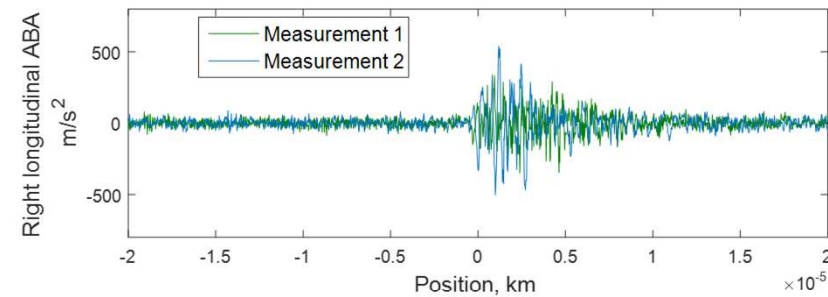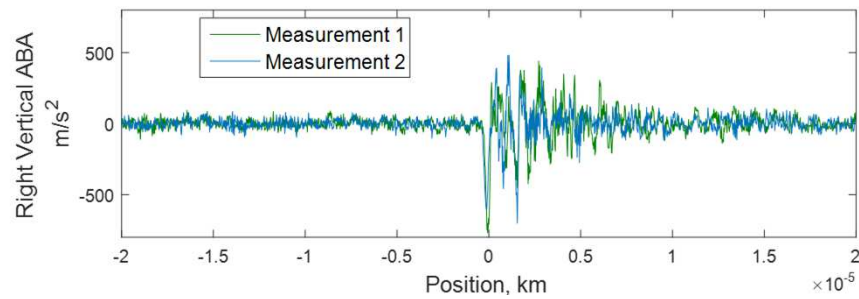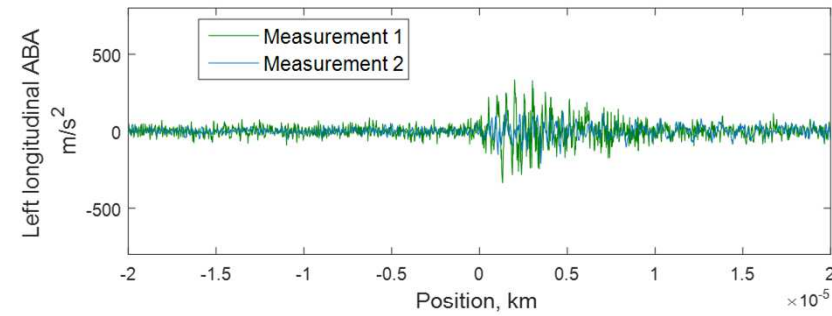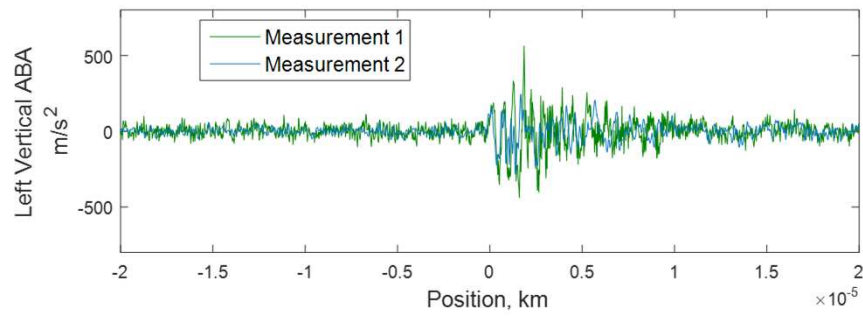Vertical and longitudinal ABA and wavelet power spectrum at a defect, measured at 200 km/h.

- ABA measurements where performed end of September 2016 in the line Bartolomeu-Zarnesti.

ABA measurement Bartolomeu-Zărneşti

For the first time, we obtained ABA measurement from train in operation with passengers on board!

ABA measurement Bartolomeu-Zărneşti

Many challenges to make full use of the data:

- Drastic variations of speeds (Faurei?)
- GPS accuracy
- And others ….
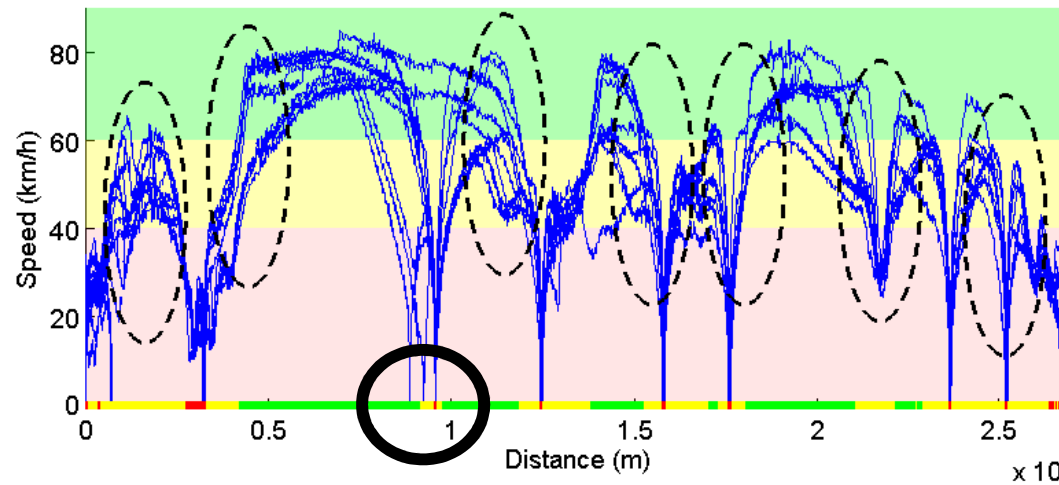
Informal stations

ABA measurement Bartolomeu-Zărneşti

Locations of the top 75 places where the ABA signal show largest energy variations

ABA measurement Bartolomeu-Zărneşti

ABA measurement Bartolomeu-Zărneşti
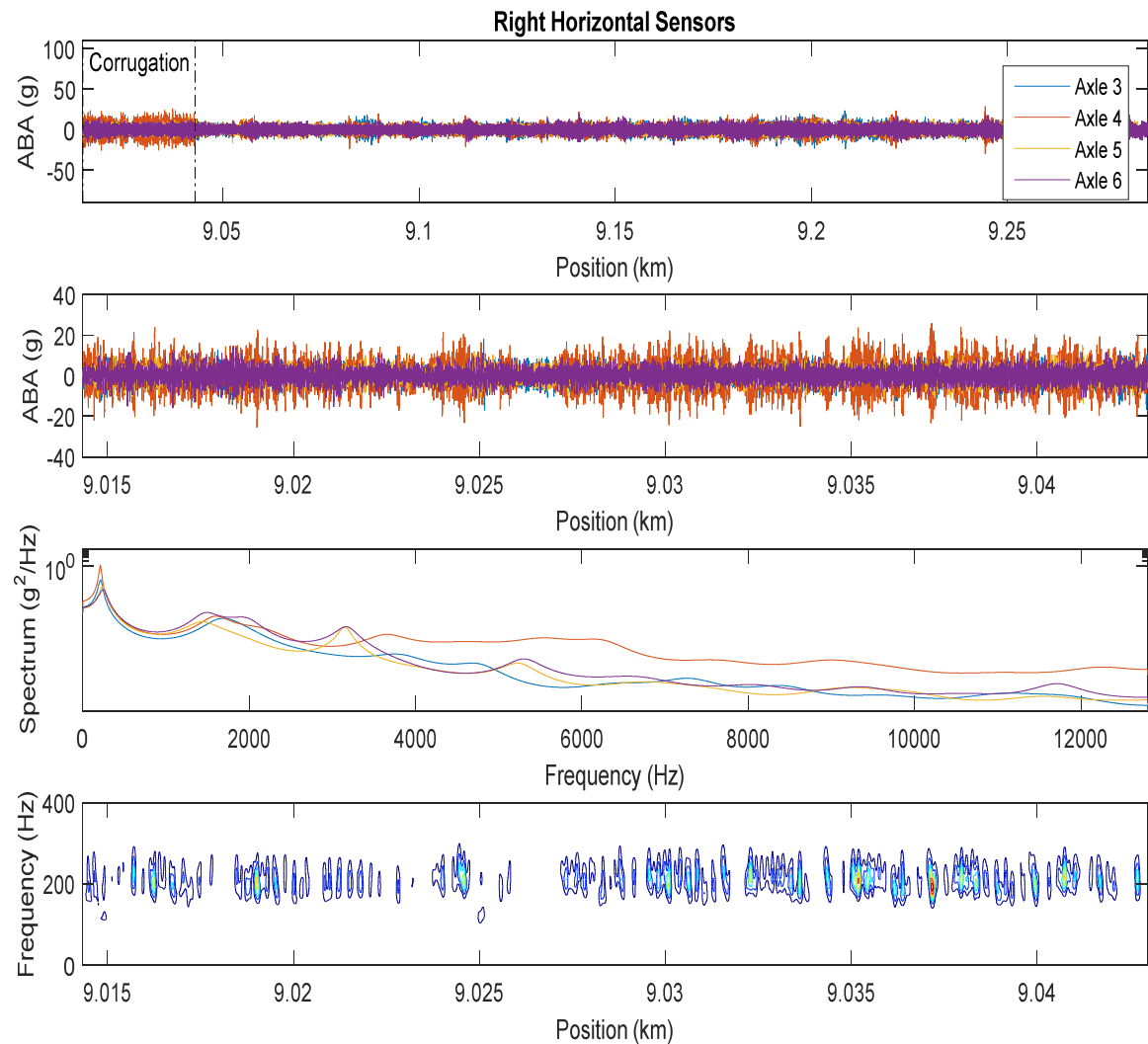
Conclusions

- In the Netherlands and Romania, the detection of local defects with different severity levels was possible. This supports to prove the generalization capabilities of the ABA system, with promising results for implementation in railway networks in other countries as well.

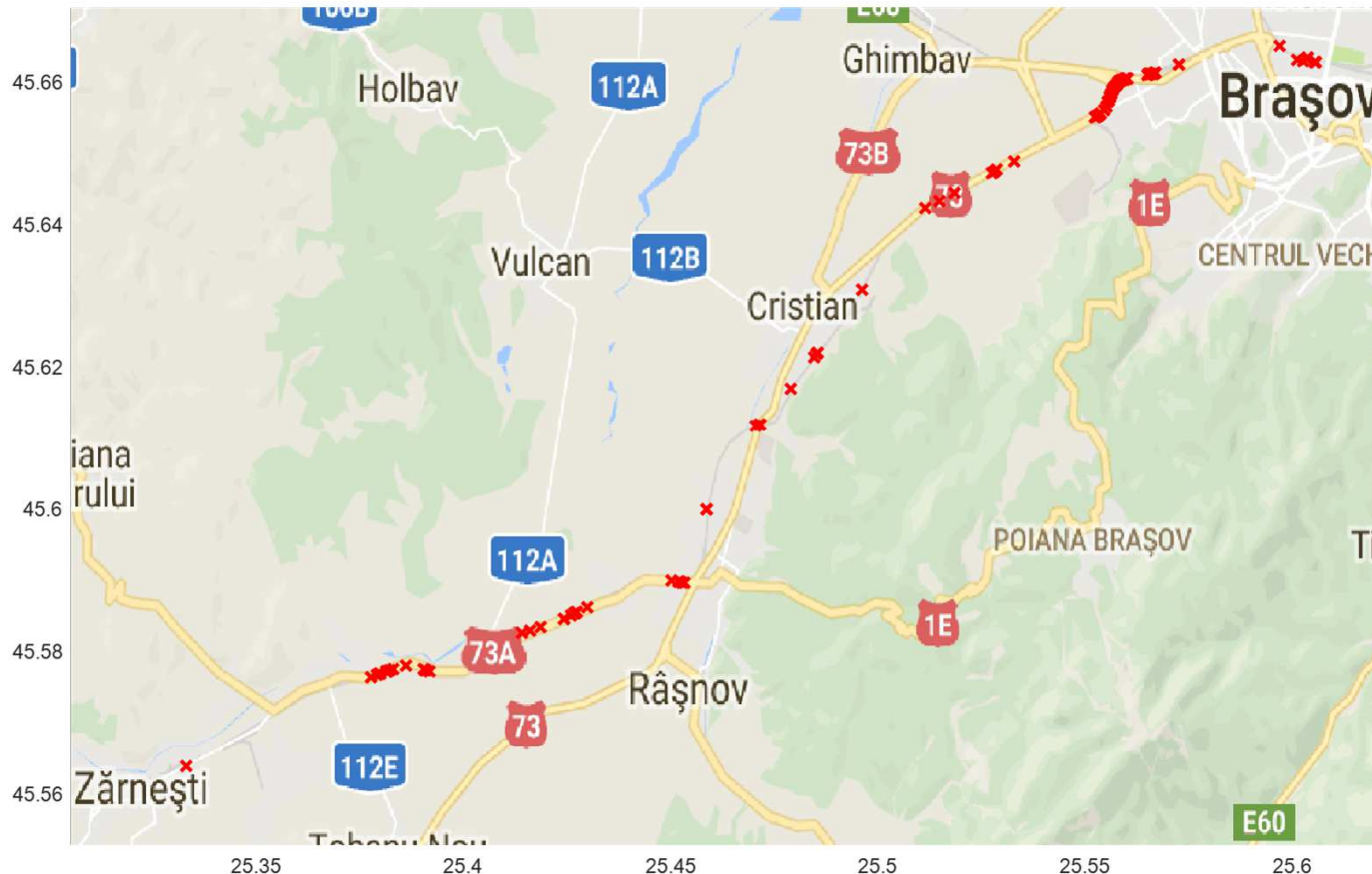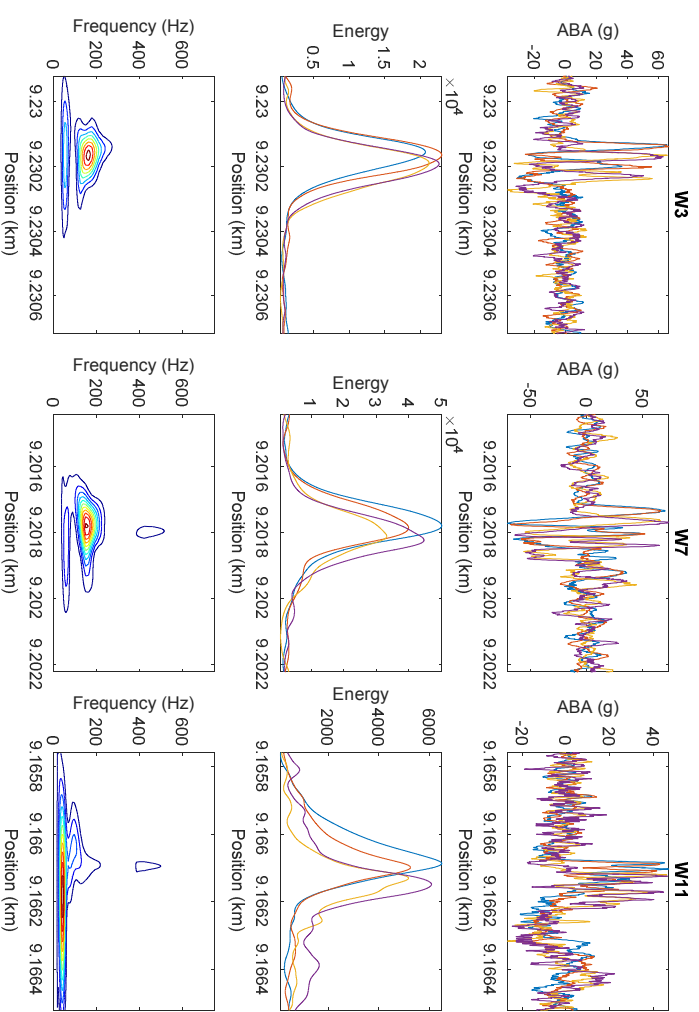- The detailed information of the defects can be used to optimize grinding plans, so to aim at areas with seed squats and light squats, where grinding is still effective.

- In the case of moderate and severe squats, a ranking of these can be conducted based on the highest energy of the ABA signals, so that replacement operations are conducted first in the most severe locations.

Conclusions

- From Faurei testing ring, the ABA system can detect defects and responses at weld, S&C and insulated joints at both conventional and high speeds. ABA proved efficient at a wide speed range from low to high speed, making the system suitable for metro, conventional and high speed railway.

- Finally, ABA measurements were obtained during operation in a train with passengers in the railway line near Brasov, Bartolomeu-Zărneşti. The information provided to the inframanager helped in defining the most relevant locations for field inspection.

- Further research is focus on the online detection of defects, self-learning algorithms to inspect infrastructures, and fusion of information with other sources such as image, ultrasonic and eddy current measurements.

Questions

Thank you for your attention !