# NAT Case study – Measurement campaign

Acoutrain Final Conference
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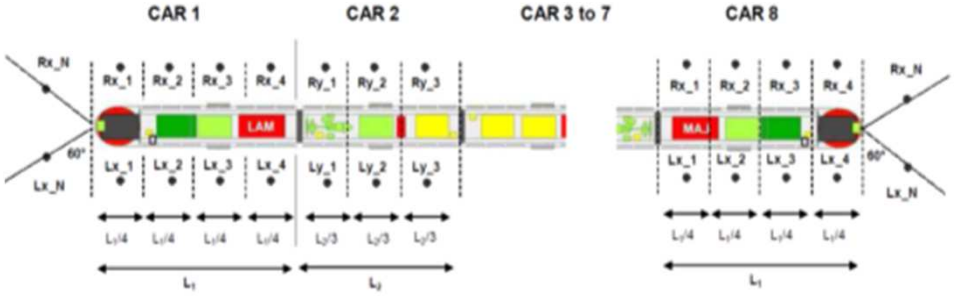
Date and Venue/location

# Acoutrain measurement campaign

Measurement EMU “NAT” Jan 2014, Valenciennes, by SNCF

- Stationary noise (ISO3095)
  - 3 operational configurations
  - Directivity measurements of single noise sources




- Noise at constant speed (ISO3095)
  - 2 vehicle speeds:  80 km/h, 130 km/h
  - TDR
  - Rail roughness
  - Wheel roughness
  - Sound propagation beside the track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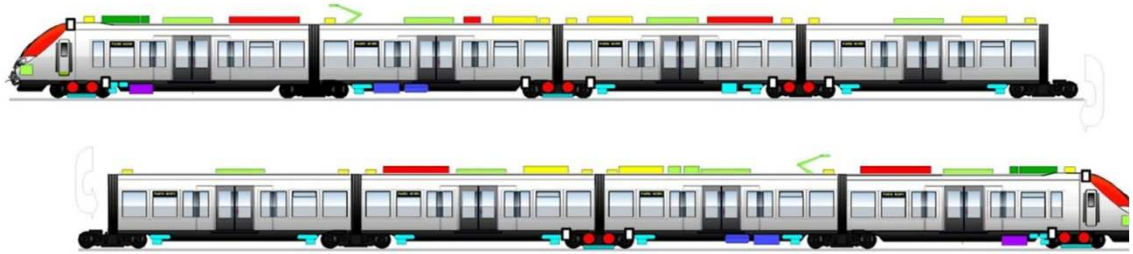
# NAT

**The NAT was chosen as the Acoutrain test train**

- it is a newly developed vehicle that well represents modern designs that are relevant for a future certification procedure.
- it is operated by SNCF, that were responsible for the measurement campaign and developed by BT. It was in the delivery phase, which simplified the cooperation.

The most important sources at stand-still are:

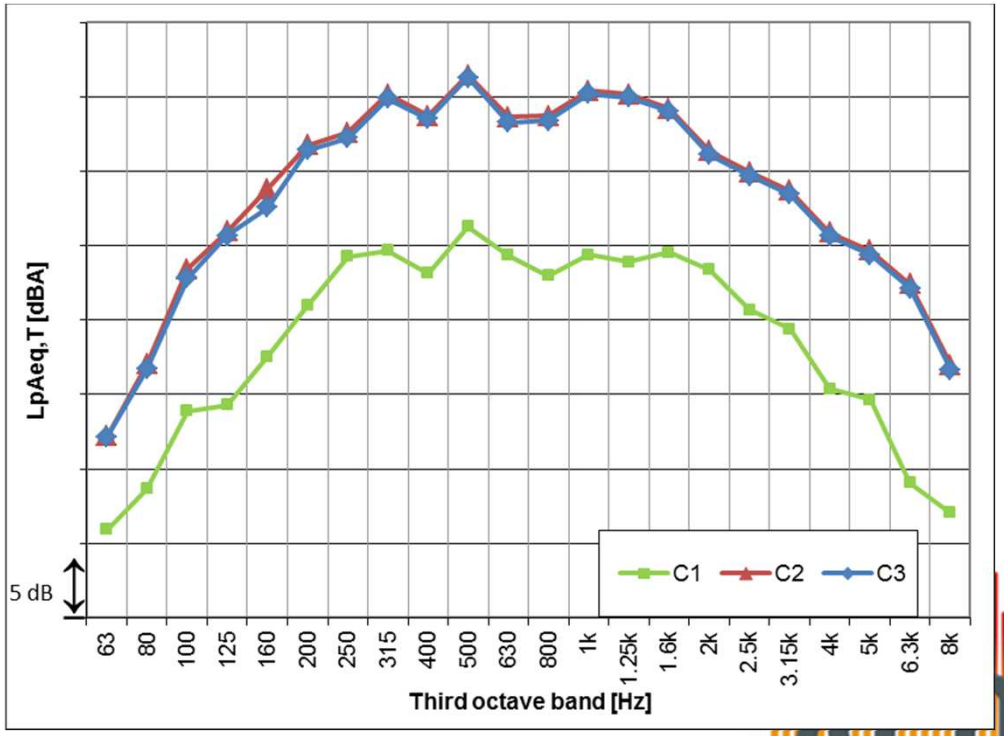
- HVAC
- Traction motor cooling
- Transformer and cooling
- Converter cooling



# Stationary measurements

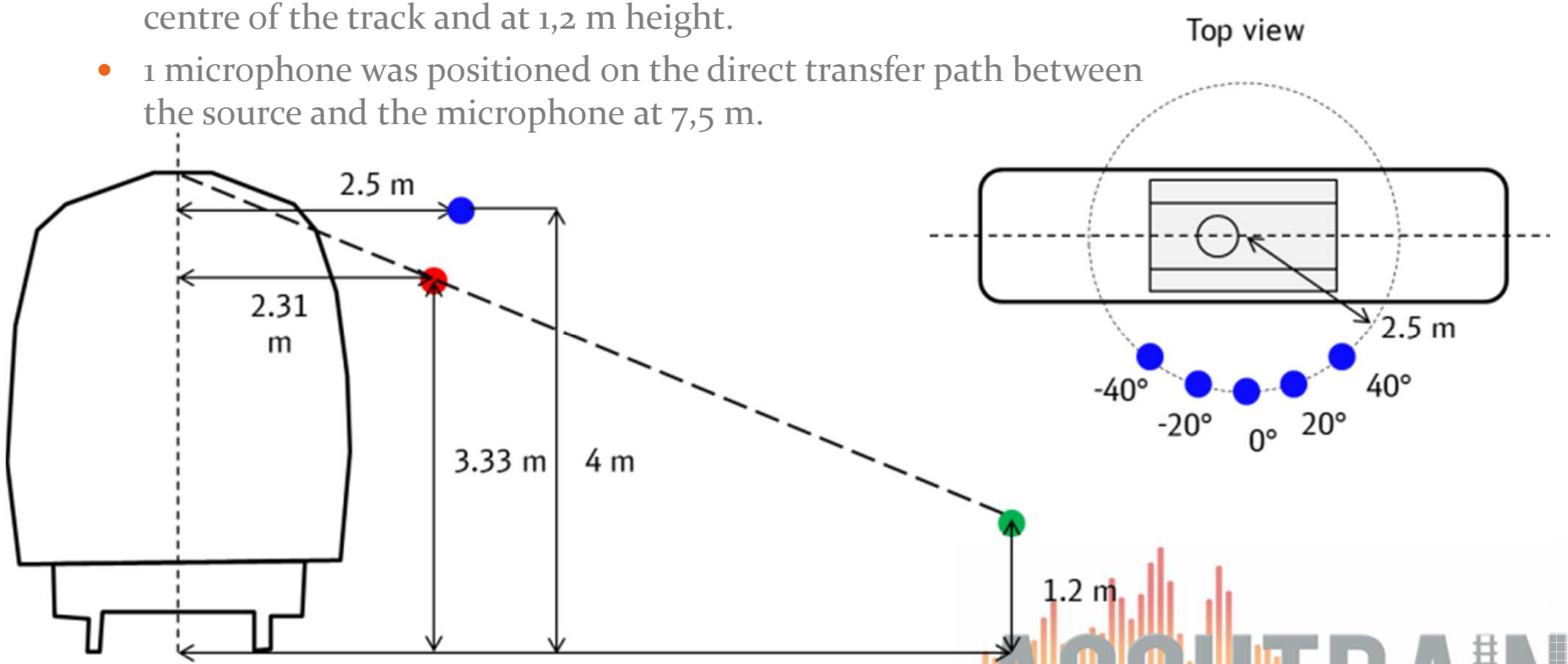
Three operational configurations were measured at stand-still

- Configuration 1: All systems at low speed
- Configuration 2: All systems at high speed
- Configuration 3. HVAC at low speed, other systems at high speed



# Directivity measurement in-situ

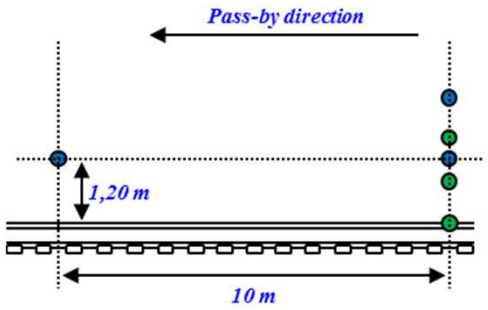
- 7 microphones were used to measure the directivity of the noise sources installed on the vehicle.
  - 5 of these were positioned in the shape of an arch close to the source.
  - 1 microphone was positioned in front of the source at 7,5 m distance from the centre of the track and at 1,2 m height.
  - 1 microphone was positioned on the direct transfer path between the source and the microphone at 7,5 m.

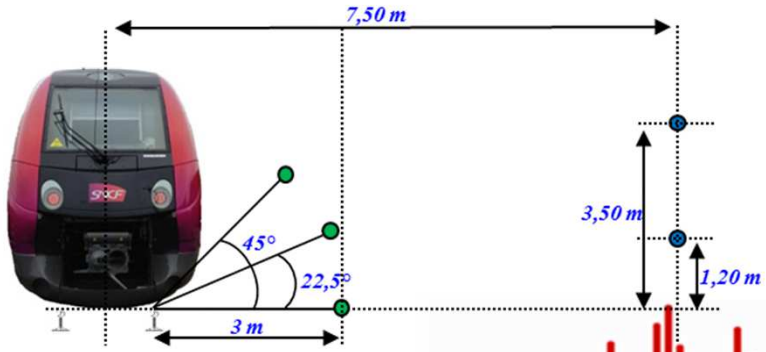


# Pass-by measurements

Two measurement series were performed at two parallel tracks at the speeds 80km/h and 130km/h.

| Measurement No. | Measurement track | Operational configuration | Speed | Traction |
|---|---|---|---|---|
| 1 | Track 1 | Conf. 2 | 130 km/h | ½ Traction |
| 2 | | Conf.1 | 80 km/h | ¼ Traction |
| 3 | Track 2 | Conf.1 with source | 80 km/h | 1/8 Traction |
| 4 | | Conf.1 | 80 km/h | 1/8 Traction |

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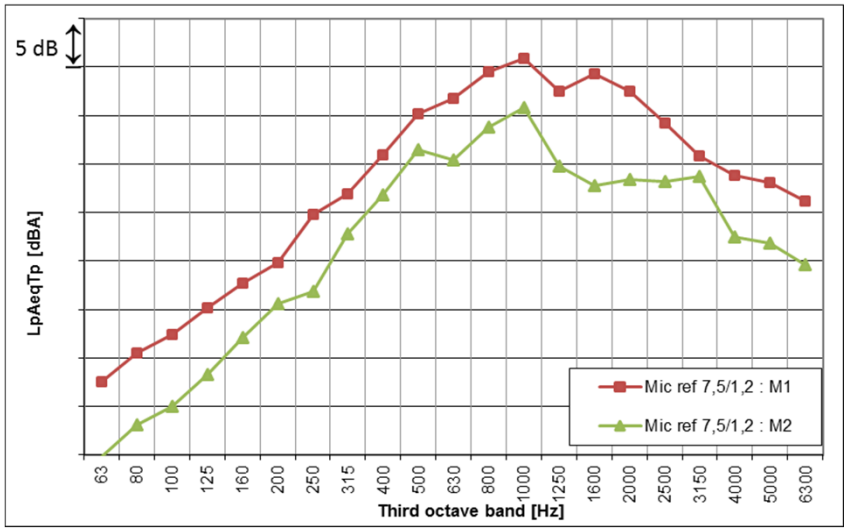
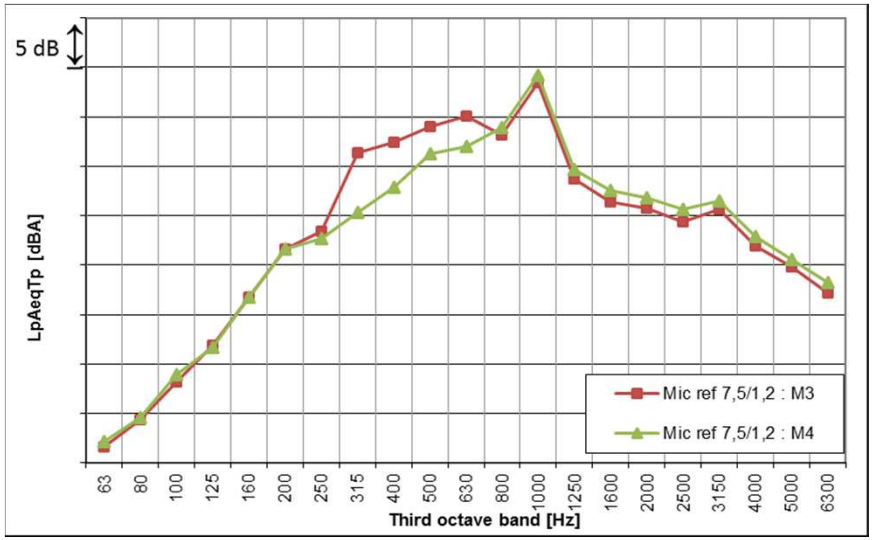
# Pass-by measurements results

Comparisons between the different measurement series.

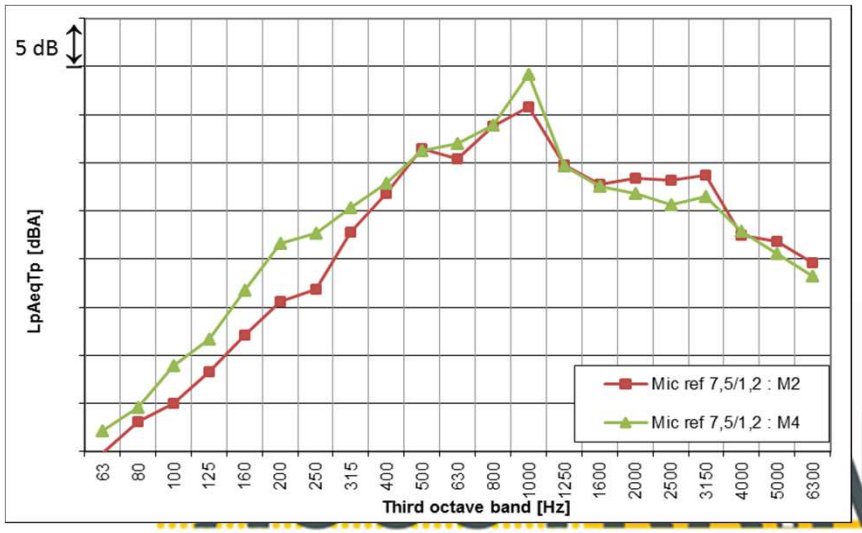
Track 1 80km/h vs 130 km/h




Track 2 with and without loudspeaker

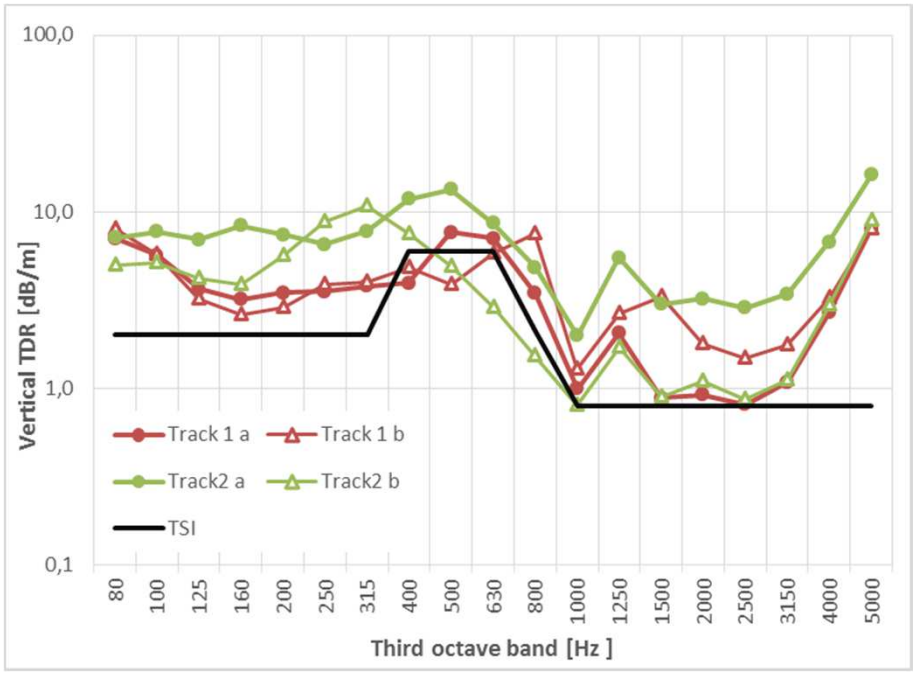


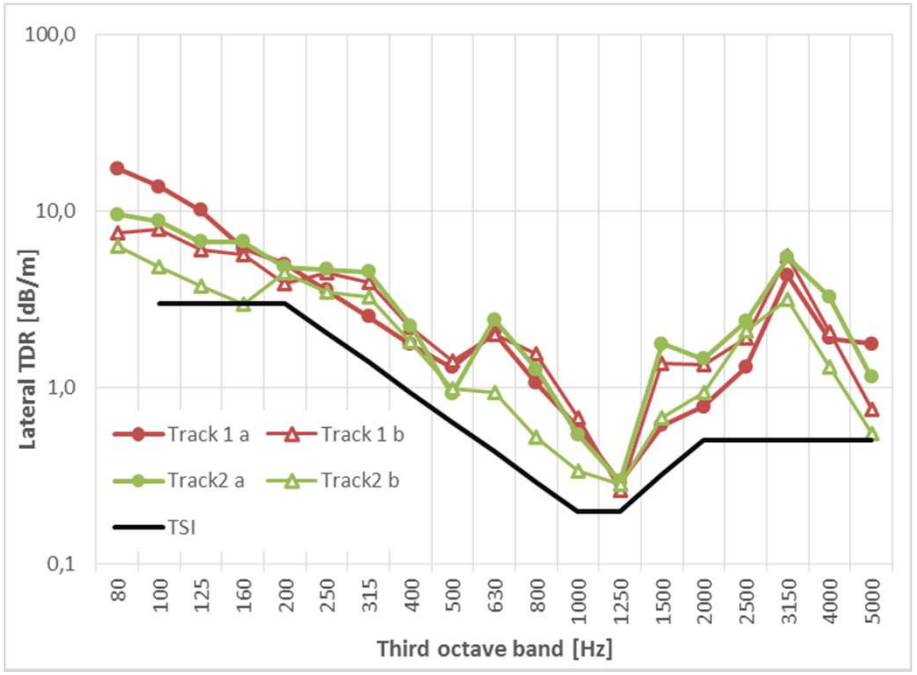

Track 1 vs Track 2



# The characterisation of the test site

## TDR measurement results

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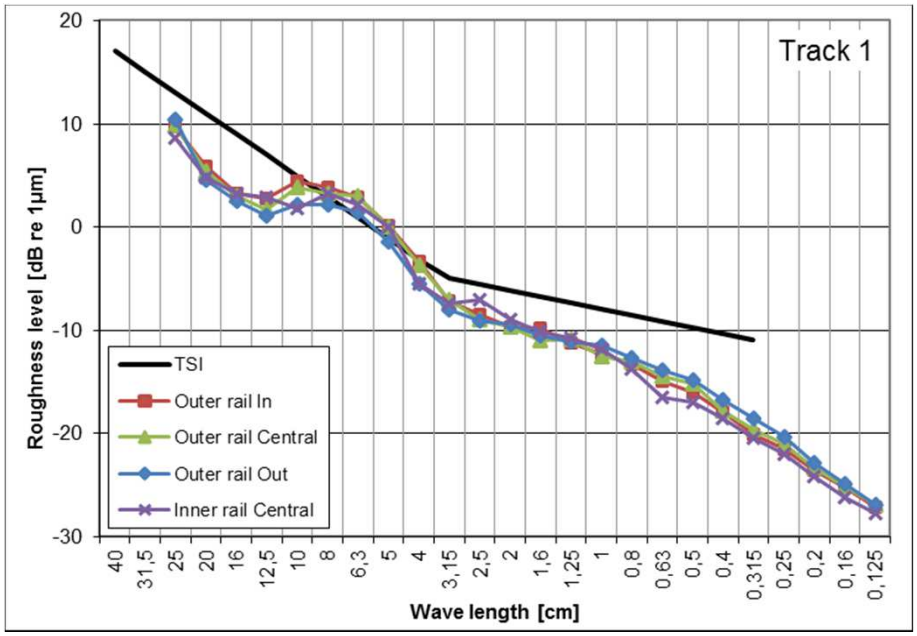
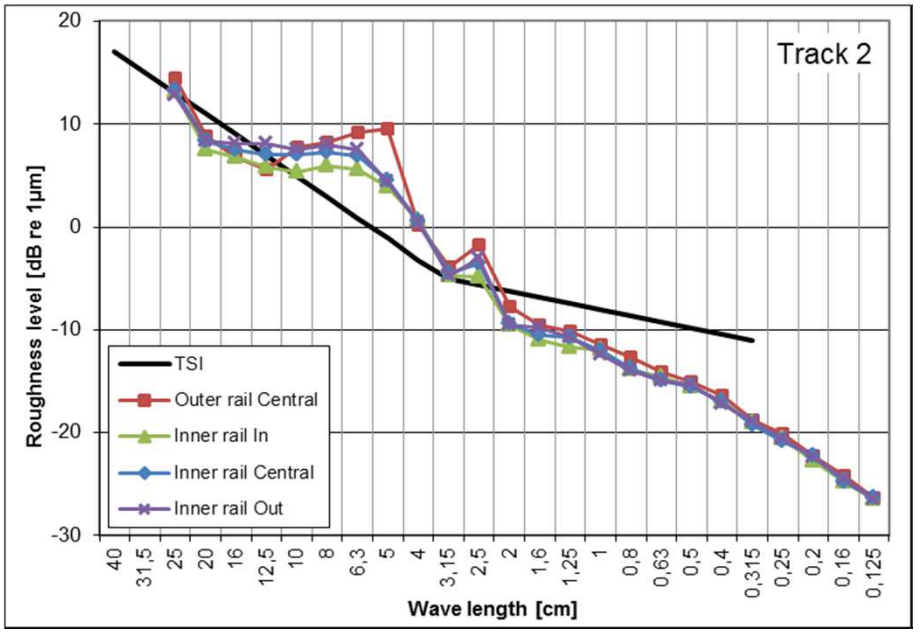
# The characterisation of the test site

## Rail roughness measurement results

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