BRUSSELS

12th UIC ERTMS WORLD CONFERENCE 2016

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# GNSS for ETCS/ERTMS: integration and benefits. Case Study

## New Algoritm for odometric purpose

# Background

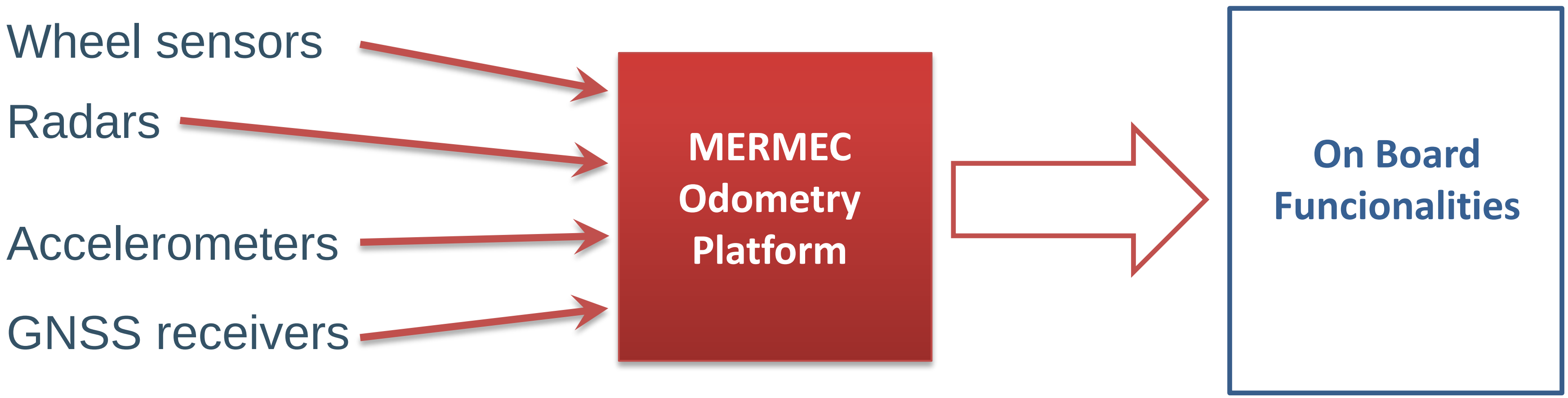
- The use of Global Navigation Satellite Systems (GNSS) in the Railway industry is increasing rapidly.
- UNISIG started investigating the application of GNSS for ETCS in June 2011
- The aim is to reduce cost of ETCS trackside (fewer balises on the track) by radically improve the reliability of train position and speed estimation on the line

# GNSS gaps

- Technical requirements for train position and speed estimation in ETCS are well defined
- Satellite Receiver alone does not fulfil these requirements

# New Odometry Platform

MERMEC has developed a flexible odometry algorithm/platform able to accept and fuse measures obtained from different sensors




Odometry platform produces a sensitive increasing in the estimation precision for speed and distance

# Test Campaign

MERMEC has conducted several field campaigns on two different railway lines

- **Line 1**: main line, 88 km length
- **Line 2**: high speed line, 204 km length

Two different configurations (two bundle of inputs to the odometry platform) have been tested

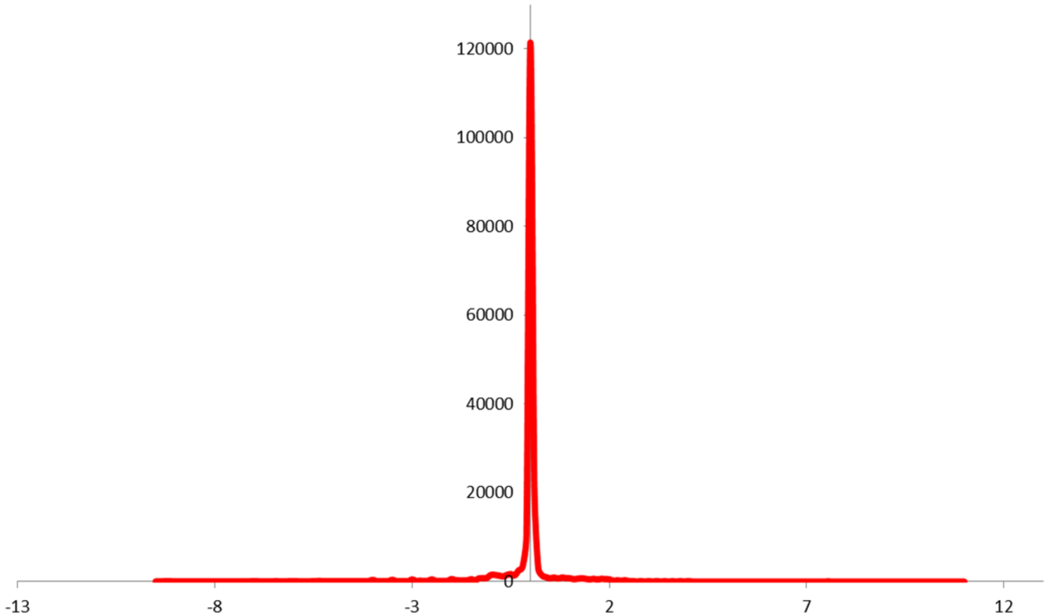
- **Configuration 1**: One wheel sensor, one GNSS receiver
- **Configuration 2**: One wheel sensor, one accelerometer, one GNSS receiver

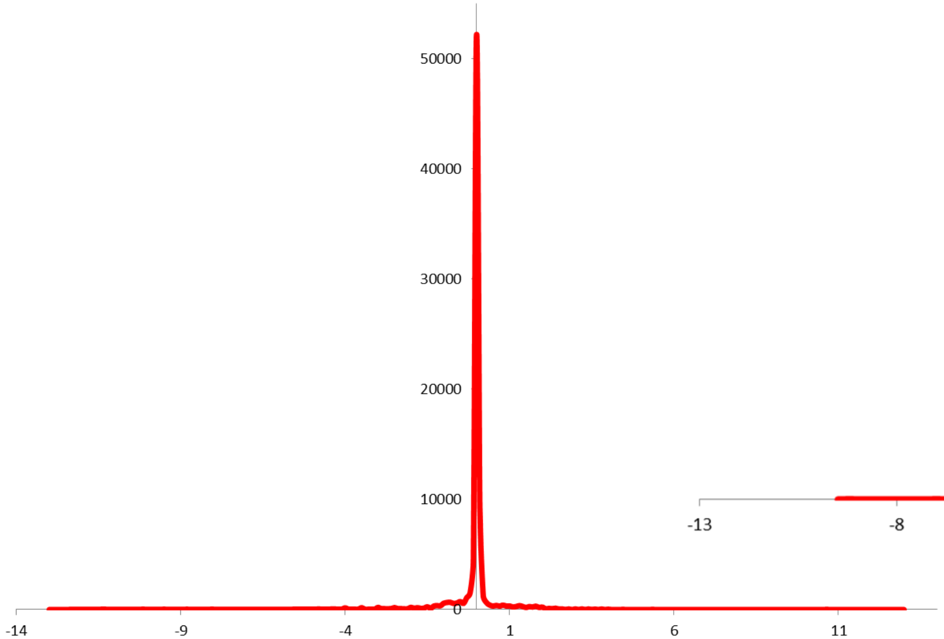
# Configuration 1

- 1 wheel sensor
- 1 GNSS receiver

Distribution of errors on 204 km High-Speed Line

Max instantaneous error -9,9 m




Distribution of errors on 88 km Main Line

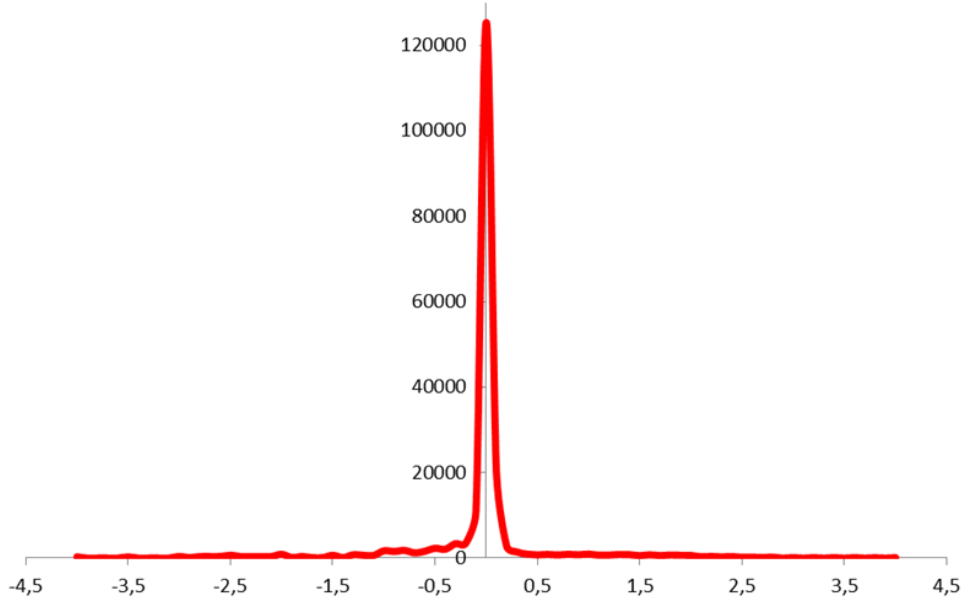
Max instantaneous error -13 m

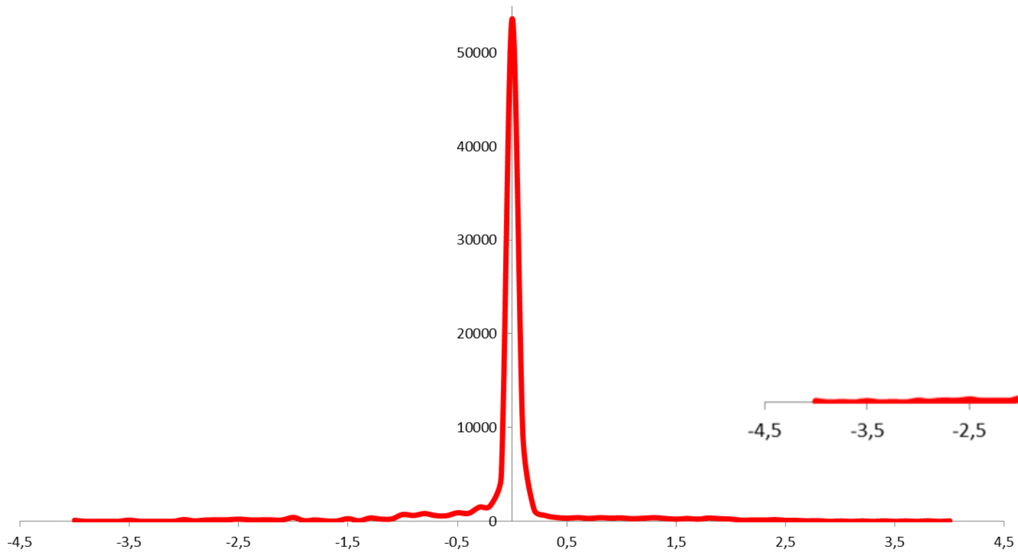
# Configuration 2

- 1 wheel sensor
- 1 GNSS receiver
- 1 Accelerometer

Distribution of errors on 204 km High-Speed Line

Max instantaneous error -4 m



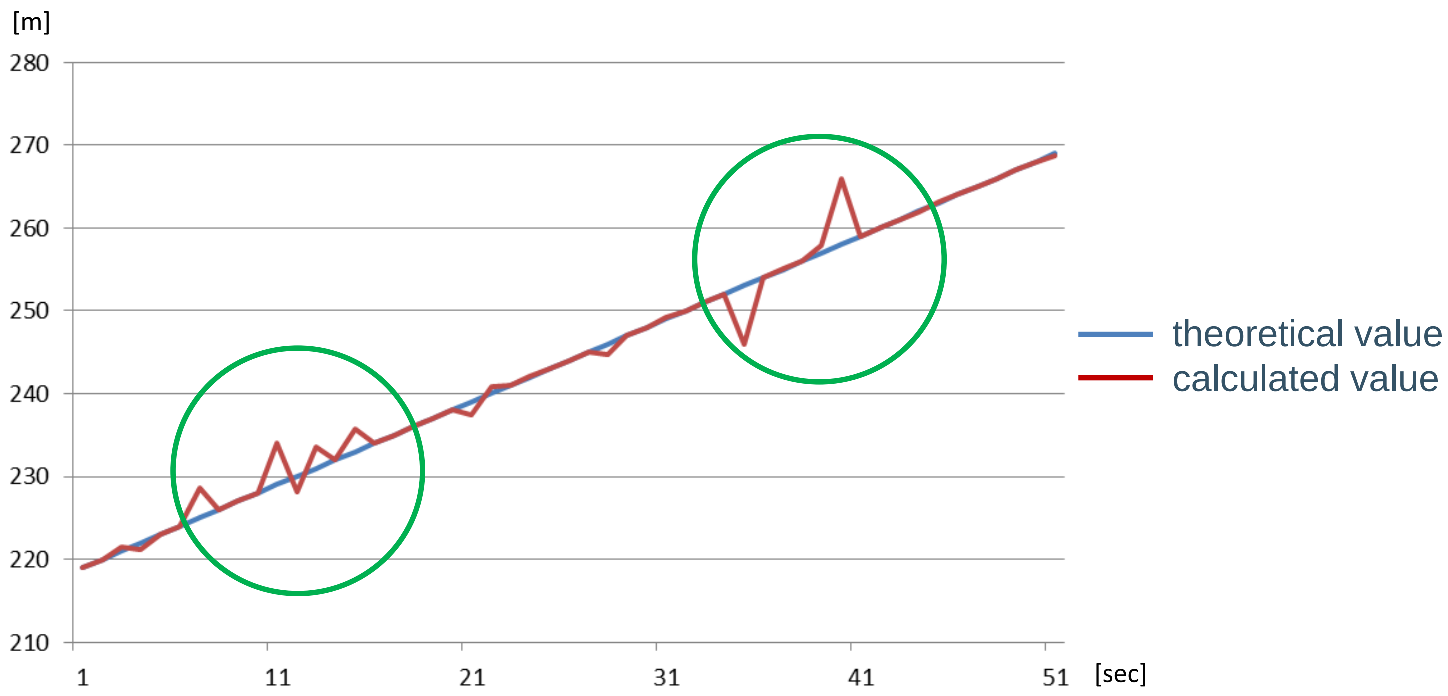

Distribution of errors on 88 km Main Line

Max instantaneous error -4 m

# Slipping Correction

## the intervention of the slipping correction done by the algorithm at 30 km/h

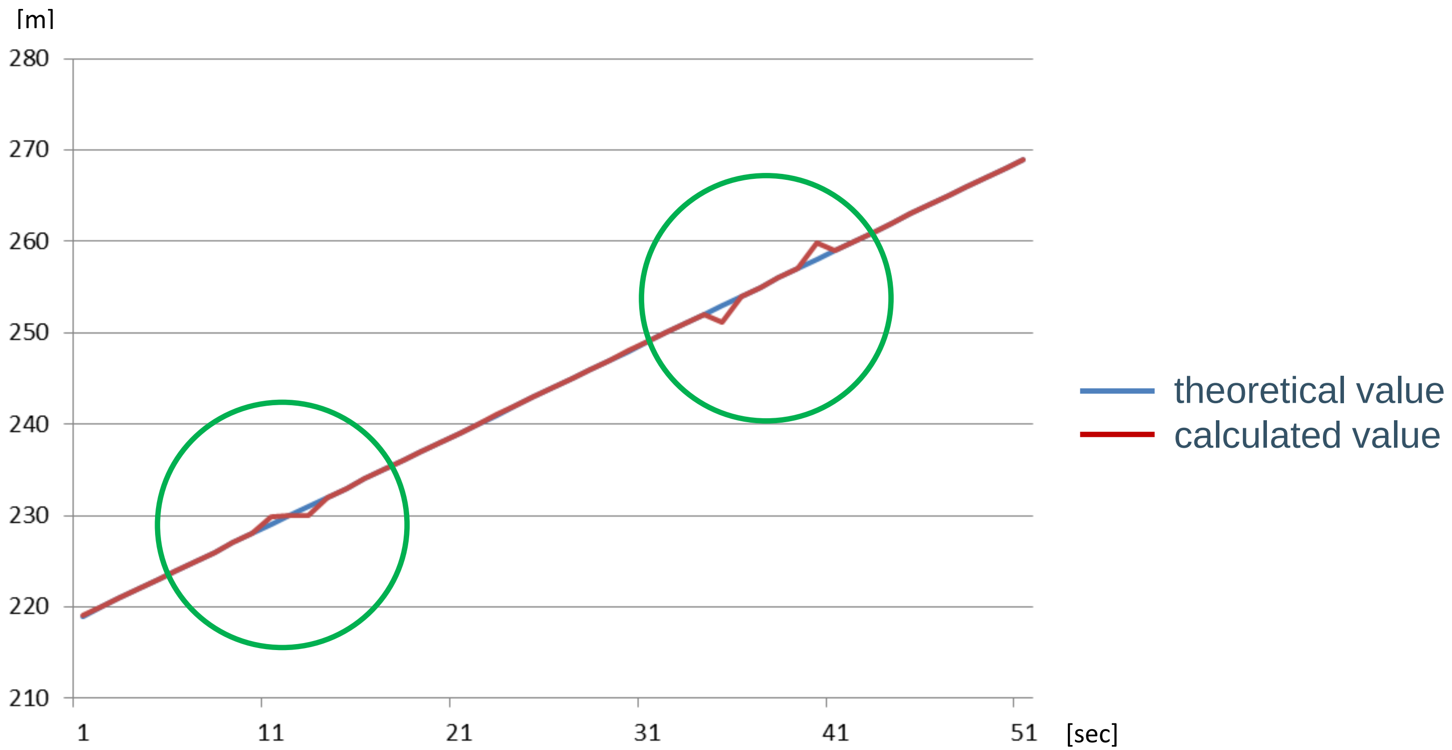
**Configuration 1: 1 wheel sensor + 1 GNSS Receiver**



# Slipping Correction

## the intervention of the slipping correction done by the algorithm at 30 km/h

**Configuration 2: 1 wheel sensor + 1 Accelerometer + 1 GNSS Receiver**



# Conclusion

- Configuration 1 and 2 don’t require external recalibration points for odometry purpose.
- **Configuration 2** is specifically suitable for heavy traffic scenarios due to the low average error value (around **2 meters**).
- The odometry algorithm/platform is undergoing SIL4 certification process.

# Thank you for your attention

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