European
Global Navigation
Satellite Systems
Agency

GALILEO EGNOS
NAVIGATION SOLUTIONS
POWERED BY EUROPE

Use of E-GNSS in railways - current status and future opportunities

Daniel Lopour

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GSA in a nutshell

Mission:

Gateway to Services

- Galileo & EGNOS Operations and Service Provision
- Market Development of the applications and the receivers

Gatekeeper of security

- Security Accreditation
- Operation of Galileo Security Monitoring Centre, governmental service (PRS) activities

Services:

GALILEO

- Worldwide navigation system “made in EU”
- Fully compatible with GPS
- Open service free of charge, delivering dual frequencies
- Signal authentication will provide trustability

EGNOS

- Satellite Based Augmentation System (SBAS)
- Improves GNSS performance
- European coverage (under extension in other regions, e.g. North Africa)
- Available NOW, free of charge and widely adopted in off-the-shelf receivers

E-GNSS value proposition for rail applications

Safety relevant applications

Combination of E-GNSS with sensors for precise train positioning for use within ETCS Level 2 and Level 3 or with conventional communication technologies for other applications.

Non safety-relevant applications

Low traffic lines

Improve safety and reduce the cost of signalling (requires very few or no line side components)

Main lines

Reduce the number of physical balises and to improve the precision of the odometry

Asset management

Improve monitoring of the railway assets both for operators and infrastructure managers

Cargo monitoring

Improve availability of the supply chain visibility information to the LSP/LSC:

- Georeferenced cargo status monitoring
- Corridoring
- Geofencing

Passenger information systems

Improve precision and availability of positioning for on board passenger information systems

GSA objectives in rail signalling

Include E-GNSS within ERTMS:

- contribute to reduction of ERTMS infrastructure CAPEX/OPEX
- improve flexibility and attractiveness of ERTMS for users in Europe and abroad

GSA actions:

- drive GNSS adoption to deliver benefits for IM`s and RU´s
- coordinate the R&D and market related initiatives with key rail and GNSS stakeholders
- provide expertise with GNSS deployment from other market segments and contribute to the safety and certification aspects
- facilitate collaboration between GNSS and railway industry

GSA funded H2020 projects:

Projects related to E-GNSS in rail safety relevant applications

ERSAT EAV was focused on verification of the suitability of EGNSS (including EGNOS and Galileo early services) for safety railway application for Low density lines.
Main result: system for safe localization of the trains, based on E-GNSS defined, developed and tested on pilot line in Sardinia, leading the way for the **harmonization with the European ERTMS standard.**
COMPLETED

RHINOS was focusing on investigation of candidate concepts for the provision of the high integrity needed to protect the detected position of the train, as required by the train control system application.
Main result: proof-of-concept architecture combining SBAS/Local Differential GNSS and local monitoring via ARAIM along with (optional) additional monitoring to mitigate multipath.
COMPLETED

STARS project is focused on characterisation of the railway environment and development of a **universal approach to predict the achievable GNSS performance in a railway environment**, especially for safety critical applications within ERTMS and to determine the its necessary evolution.
IN PROGRESS – To be closed in Q4 2018

Projects related to E-GNSS in rail safety relevant applications

ERSAT GGC – a contribution to the GNSS in rail certification activities

The main goal of ERSAT GGC is to contribute to the certification process to enable the adoption of EGNSS for the generation of Virtual Balises:

Project will deliver:
- A Certified Enhanced Functional ERTMS Architecture that includes the SIL 4 Train Positioning Function also based on Galileo constellation and the EGNOS Augmentation

- Test Specifications to validate ERTMS based system

- A certified process, related methodology and toolset for classification of track area suitability for enabling localization using Virtual Balises

Projects related to E-GNSS in rail safety relevant applications

GSA/OP/12/16/SC1: Cost-benefit analysis methodology and KPIs for virtual balise

- identification of key factors and the proposal of main principles for the definition of a methodology for cost benefit analysis for the implementation of E-GNSS based positioning within ERTMS, to be validated by stakeholders
    - Analysis and validation of a list of the key factors as technical inputs to the cost-benefit analysis and impact assessments, influencing the introduction of virtual balise
    - Analysis and provision of the most suitable CBA methodological framework
    - Organisation of workshops with stakeholders for consultation
    - Analysis, consultation and performance indicators validation with stakeholders

Call: EGNSS market uptake 2019-2020 H2020-SPACE-EGNSS-2019

Type of Action	Topic	Indicative budget (EUR mln)	Funding rate	Indirect costs
IA	EGNSS applications fostering green, safe and smart mobility	**10.00**	70% (except for non-profit legal entities, where a rate of 100% applies)	25% of the total eligible costs excluding: • Subcontracting • Costs of resources made available by 3rd parties • Financial support to 3rd parties
IA	EGNSS applications fostering digitisation	**4.00**		
IA	EGNSS applications fostering societal resilience and protecting the environment	**4.00**		
CSA	EGNSS awareness raising and capacity building	**2.00**	100%	
	TOTAL budget:	**20.00**		

Opening: **16 October 2018**
Deadline: **05 March 2019**

IA: activities aimed at producing plans and arrangements or designs for new, altered or improved products, processes or services
CSA: consisting of accompanying measures such as standardisation, dissemination, awareness-raising and communication, networking, policy dialogues and studies

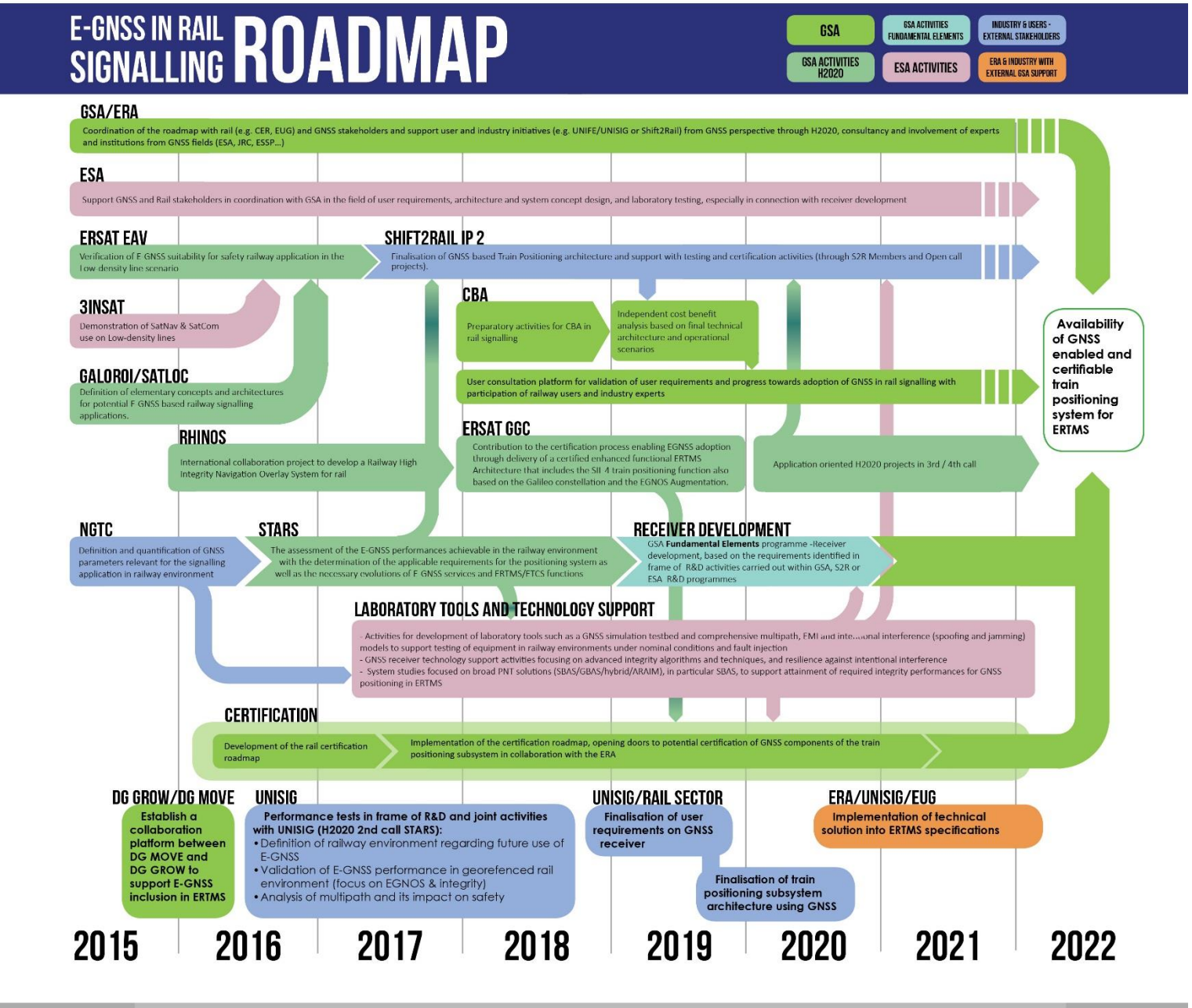
HORIZON 2020 SPACE INTERNATIONAL INFORMATION DAY AND BROKERAGE EVENT

11-12 October 2018, Prague

COSMOS
SPACE | NCP NETWORK

European Global Navigation Satellite Systems Agency

HORIZON 2020



THE EUROPEAN GNSS AGENCY IS WORKING TOGETHER WITH RAIL AND SPACE INDUSTRY STAKEHOLDERS TO ENABLE THE USE OF SATELLITE-BASED POSITIONING FOR RAILWAY SIGNALLING

At the heart of this multi-stakeholder initiative lies the European Train Control System (ETCS), which is now being adopted both in Europe and beyond, as one of the components of the European Rail Traffic Management System (ERTMS). At present, in ETCS the positioning of the train is based on "balise", a physical element mounted at specific intervals along the railway track. The goal is to ensure that wherever possible, the physical balises can be replaced by virtual ones, based on precise, GNSS-based positioning without any operational or safety implications on the ETCS. The roadmap below summarises the main projects currently running and planned, as well as the involvement of the various stakeholders interested to achieve the objective of E-GNSS enabled ETCS together with the GSA.

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Link for download:

https://www.gsa.europa.eu/segment/rail

E-GNSS IN RAIL SIGNALLING ROADMAP

GNSS performance analysis

- Rail environment characterised and possibilities of European GNSS contribution to ERTMS evolution identified
- First set of requirements agreed by industry

System Architecture Definition

- Common agreed architecture of the GNSS based train positioning subsystem for ERTMS evolution delivered
- Independent cost benefit analysis performed

System Deployment Definition

- Certification aspects of GNSS solution for low density lines analysed
- Demonstrator of the agreed architecture in preparation

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… next steps to be taken by the roadmap partners

In Progress….

- Rail environment characterisation
- Industry requirements on E-GNSS component of train positioning
- Architecture of the E-GNSS based train positioning subsystem

- Final cost/benefit analysis based on a mature architecture agreed by users and industry
- Safety case / certification support

- Development of specific receivers for rail (if necessary)
- Service provisioning aspects

Running projects:

H2020 STARS

H2020 STARS +UCP

X2RAIL2

GSA SC

ERSAT GGC, SIM4RAIL

Linking space to user needs

How to get in touch:

www.GSA.europa.eu

EGNOS-portal.eu

GSC-europa.eu

UseGalileo.eu