

GNSS Research and Applications in the Czech Republic



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Where do we come from?



Source: Wikimedia Maps



Authors:
Moyan Brenn [https://commons.wikimedia.org/wiki/File:Prague_\(6365119737\).jpg](https://commons.wikimedia.org/wiki/File:Prague_(6365119737).jpg)
A.Savin [https://commons.wikimedia.org/wiki/File:Prague_\(6365119737\).jpg](https://commons.wikimedia.org/wiki/File:Prague_(6365119737).jpg)



Where do we come from?



Source: Wikimedia Maps



Author: Czech Wikipedia user Packa, CC BY-SA 2.5,
<https://commons.wikimedia.org/w/index.php?curid=2524417>



History of GNSS in CZ

- 1980 First experiments in the GNSS field in our department
- 1988 Development of the first GPS receiver
- 1995 Continuously operating DGPS reference station at CTU
VLF or VHF (RDS)
- 1999 CGSIC-IISC meeting held in Prague
- 2005 CGSIC-IISC meeting held in Prague
- 2006 Collaboration on GARDA receiver project
- 2015 IAIN World Congress in Prague
- 2012-2020 Integrated Satellite and Terrestrial Navigation Technologies Centre



Source: <http://www.iain2015.org>



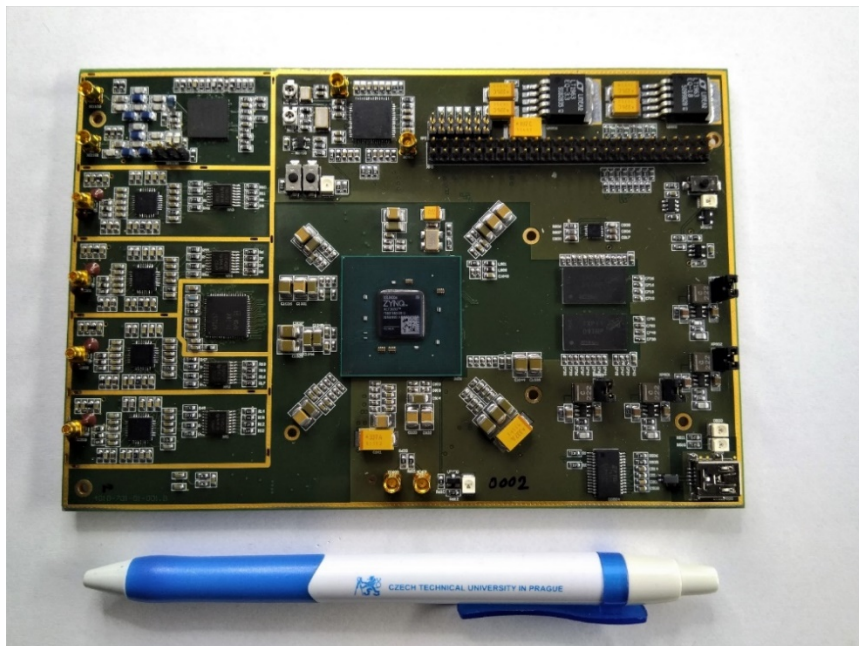
CzIN – Czech Institute of Navigation

- Founded in 1994 by prof. Frantisek Vejrazka
- Association of individuals and subjects interested in radio-navigation from the Czech and Slovak republic
- Member of International Association of Institutes of Navigation (IAIN)
- Organizer of IAIN World Congress 2015 in Prague



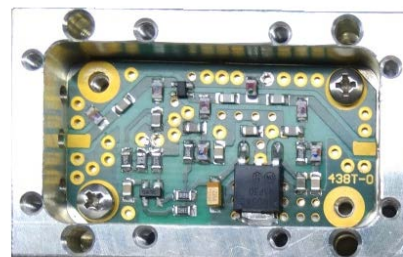
Recent GNSS-related works at FEE-CTU

GNSS receiver (SDR)

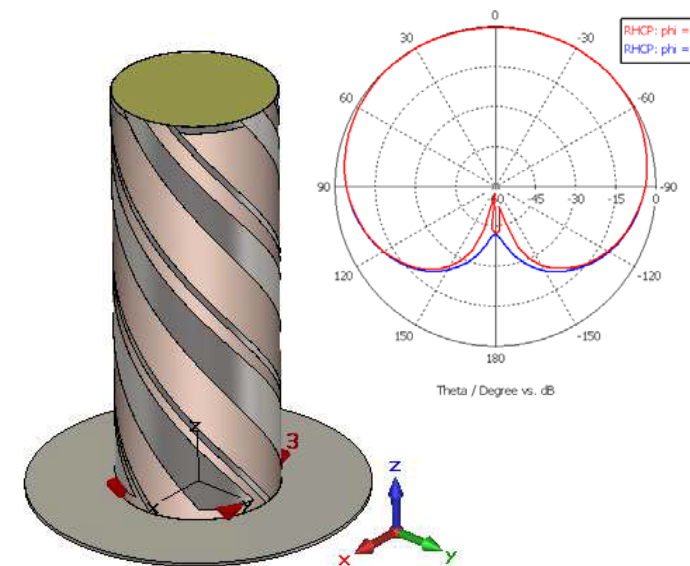


- GNSS & Radionavigation consulting:**
- e.g. GPS week rollover receiver testing

Low-noise amplifier



GNSS signal splitter



GNSS Antennas



CZEPOS – CORS network

- Administered by State Administration of Land Surveying and Cadastre
- 28 CORS stations
 - GPS+GLO+GAL+BDS
 - 7 in EUREF network



Source: <http://czeapos.cuzk.cz>



Switchover to GNSS-based toll

- Since December 2019 GNSS+GSM toll system is active
 - Meets all the requirements of the European Electronic Toll Service (EETS)
 - GNSS-based positioning + GSM-based communication
 - Previous fully-microwave system was discontinued
- Tolls mandatory for vehicles above 3.5 tons
 - By end of June 2020:
 - 489k vehicles registered (150k from CZ)
 - 424k on-board units (OBU) picked up



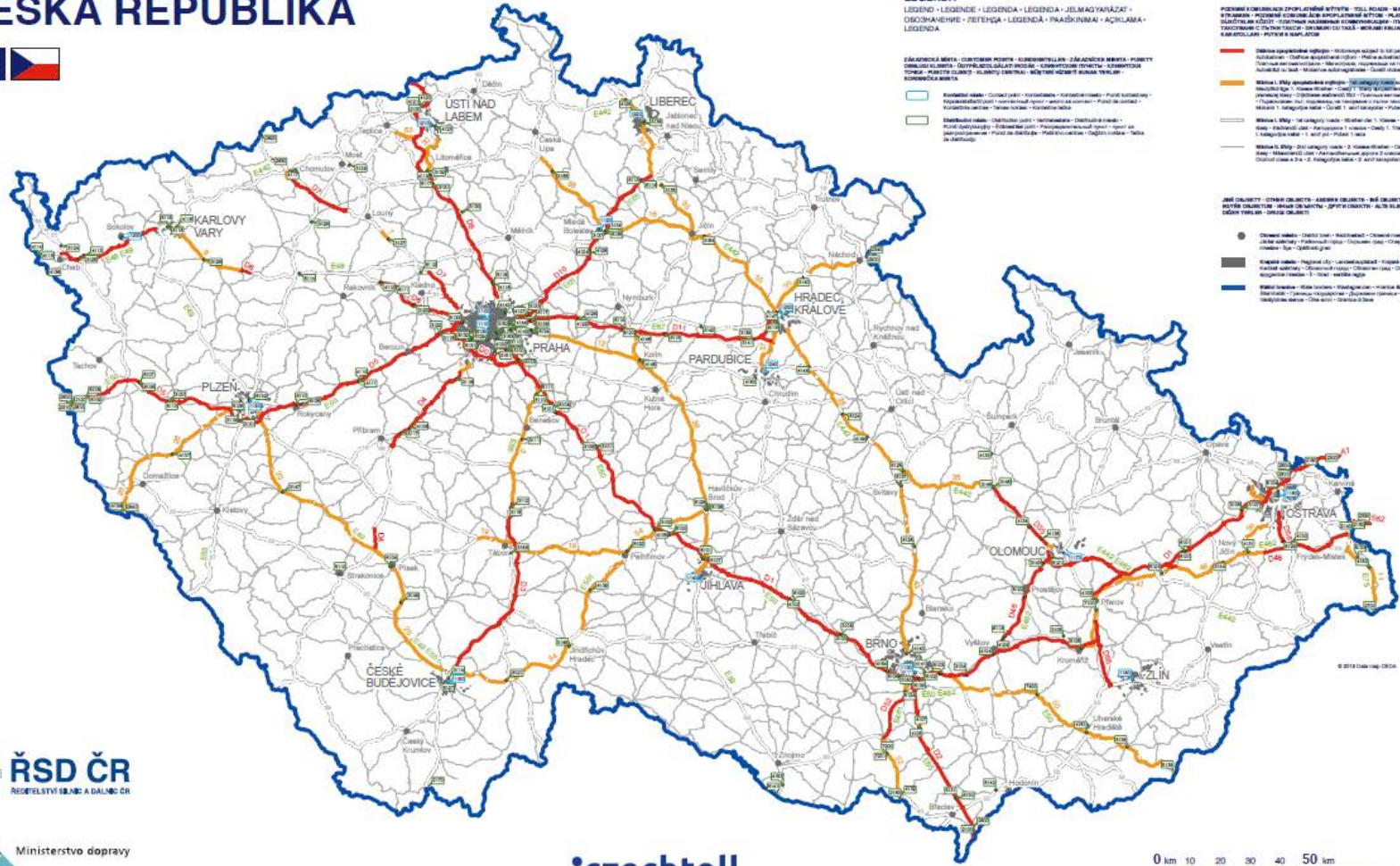
Source: <https://mytocz.eu>, <https://www.czechtoll.cz>



Switchover to GNSS-based toll

- Motorways: 1307 km
- 1st category roads: 1102 km

ČESKÁ REPUBLIKA



Source: <https://myto.cz.eu>



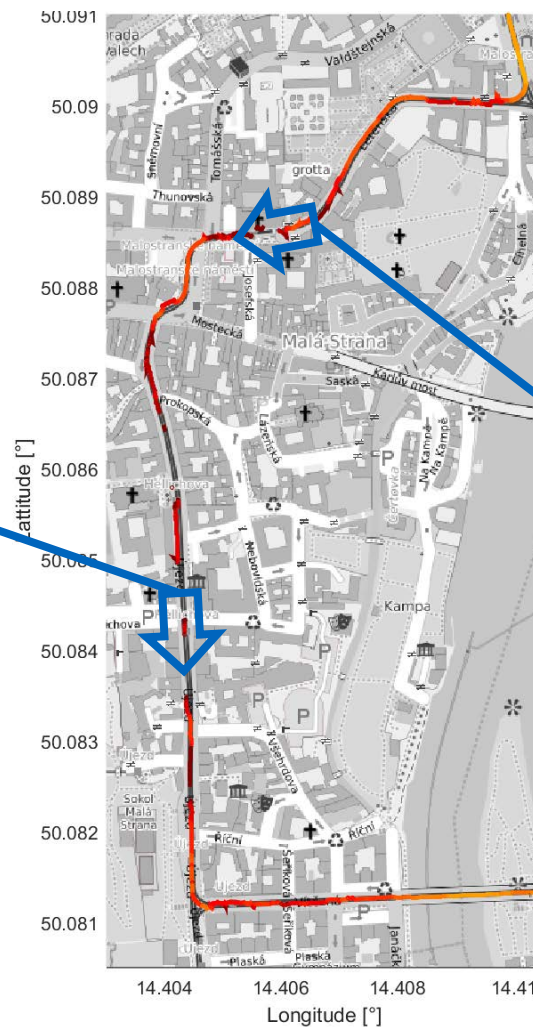
GNSS receivers for Prague trams

- Cooperation with Prague Public Transit Company
- GNSS for more than 800 vehicles
 - 7 tram types in operation
- Search for suitable solution
 - 20+ short-term tests with various receivers/configuration
 - More than 4 months of data for long-term analysis



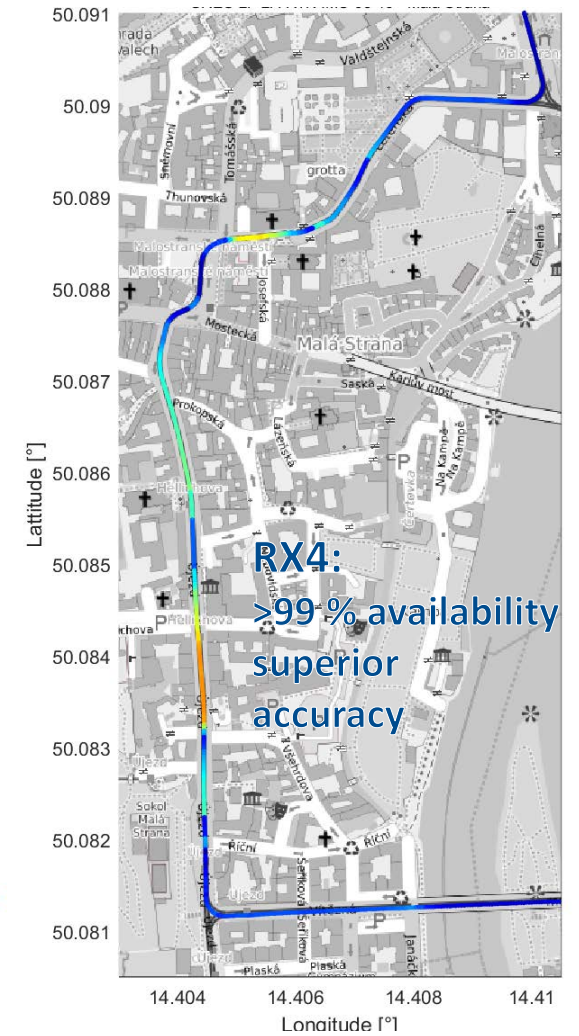
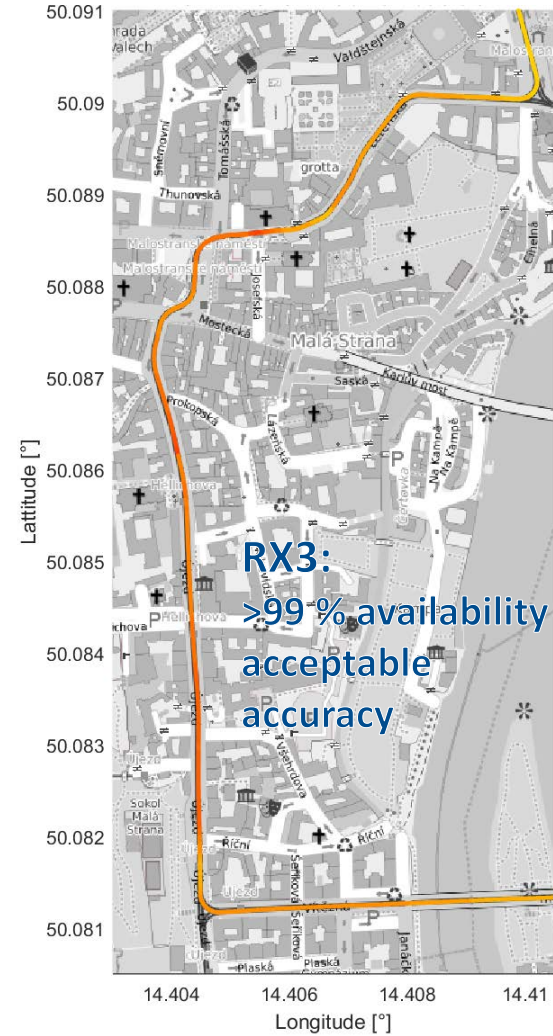
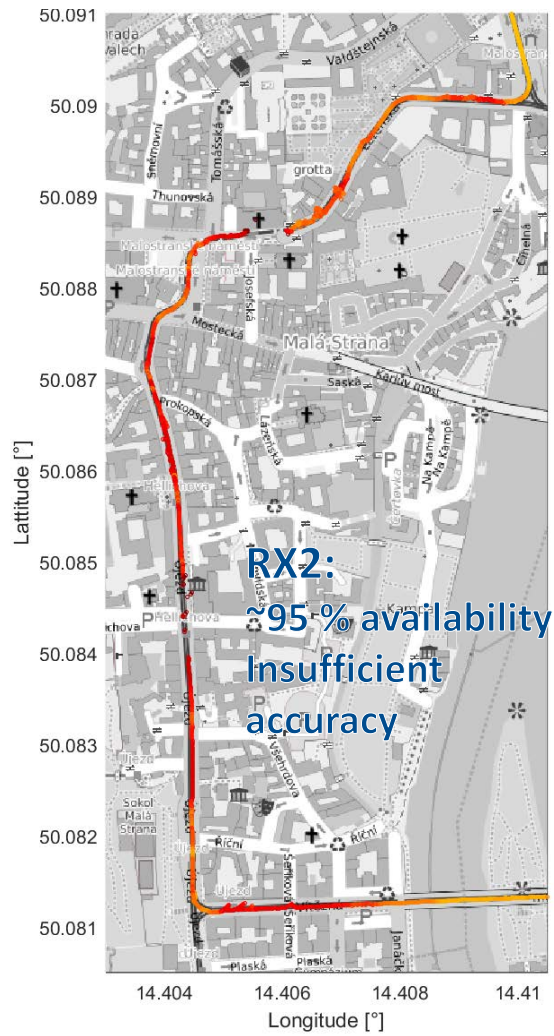
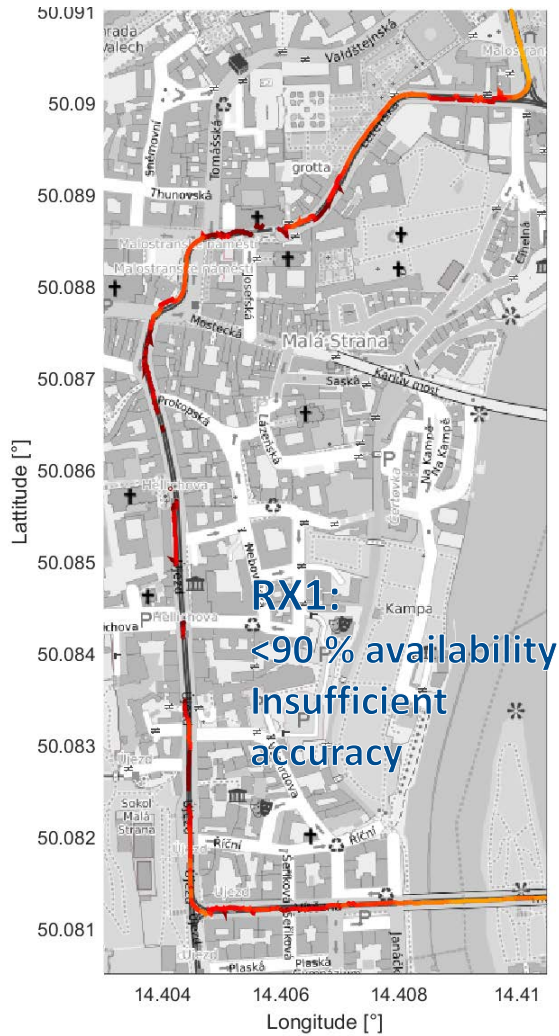


GNSS receivers for Prague trams



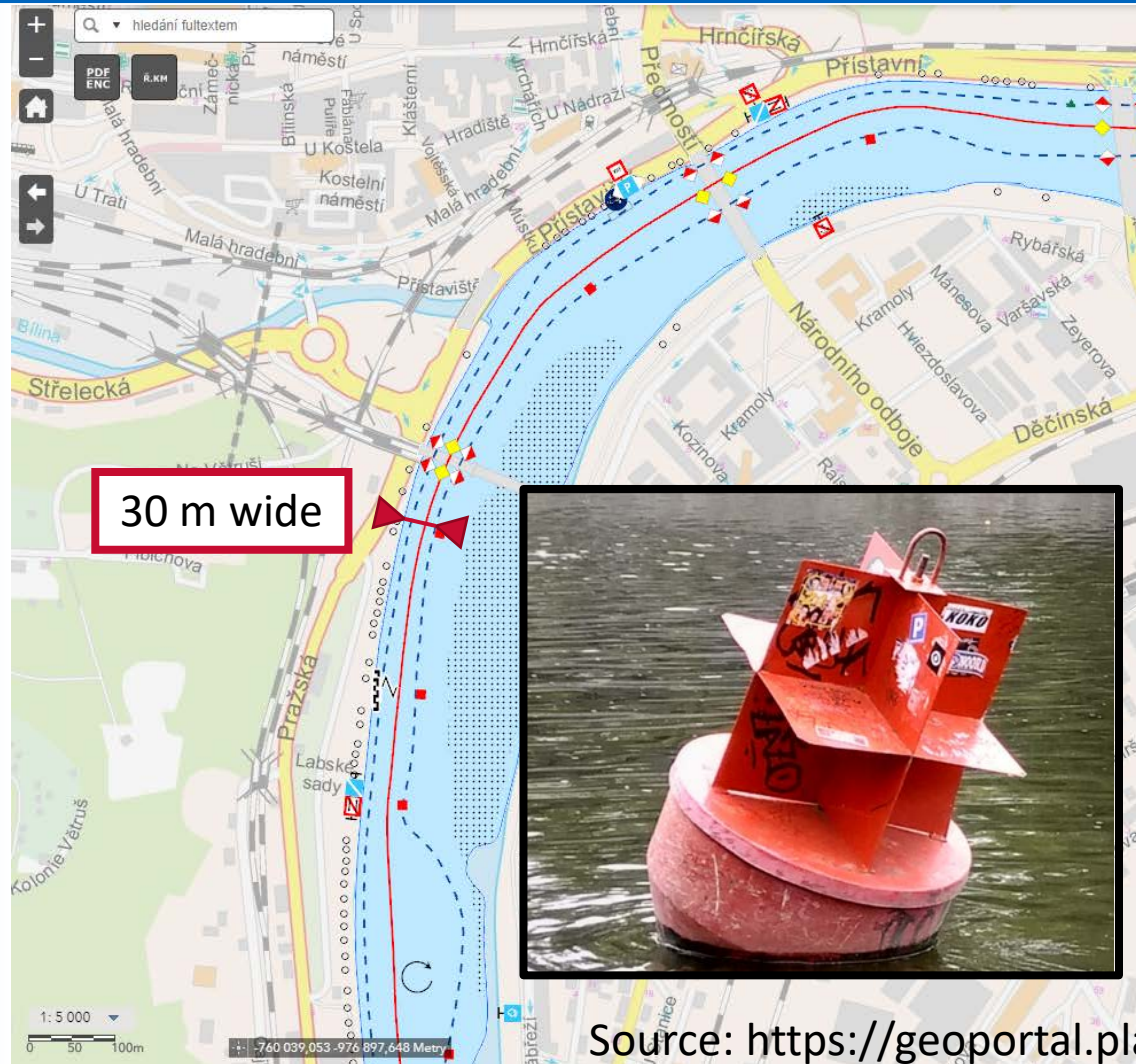


GNSS receivers for Prague trams





Inland waterway buoys



Analyses of GNSS positioning and energetic balance for Waterways Directorate of the Czech Republic performed by Czech Technical University in Prague

Recommendations taken into account:

- Extremely limited power budget
- Operation in shadowed areas
- Required accuracy
- Harsh conditions within the river
- Limited dimensions and weight
- Required visual appearance

Source: <https://geoportal.plavebniurad.cz/apps/vodni-cesty-verejnost>



Summary

- History of GNSS in the Czech republic reaches to 80's
- CZEPOS CORS in operation with 28 stations
- Motorway toll is GNSS-based since 2019
- GNSS receivers are used in public transport



Thank you for your attention!

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