HungaroControl

MORE THAN AN ANSP

PBN IMPLEMENTATION IN HUNGARY Contributing to Safe, Secure and Environmentally-Friendly Operations Countrywide

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Short written summary of the presentation for the FABEC Ops Theatre

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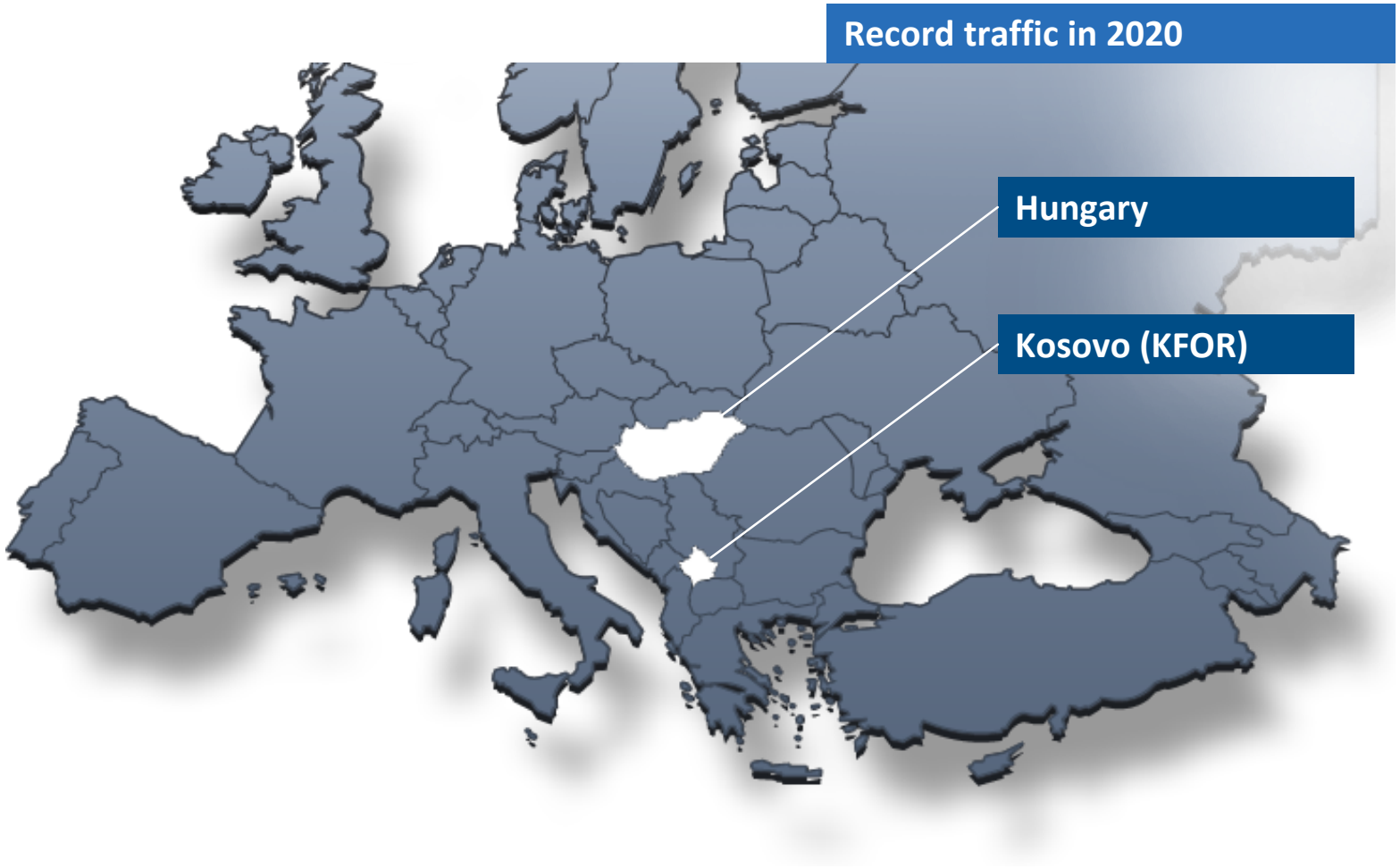
HungaroControl in a nutshell

1 087 355	• Movements in 2019
142 575	• KFOR sector
944 780	• In Hungarian airspace
757 812	• En-route services in Hungarian Airspace
121 849	• Arrival / departure at Budapest Airport
119	• Annual turnover from ANS (M EUR)
822	• Number of employees



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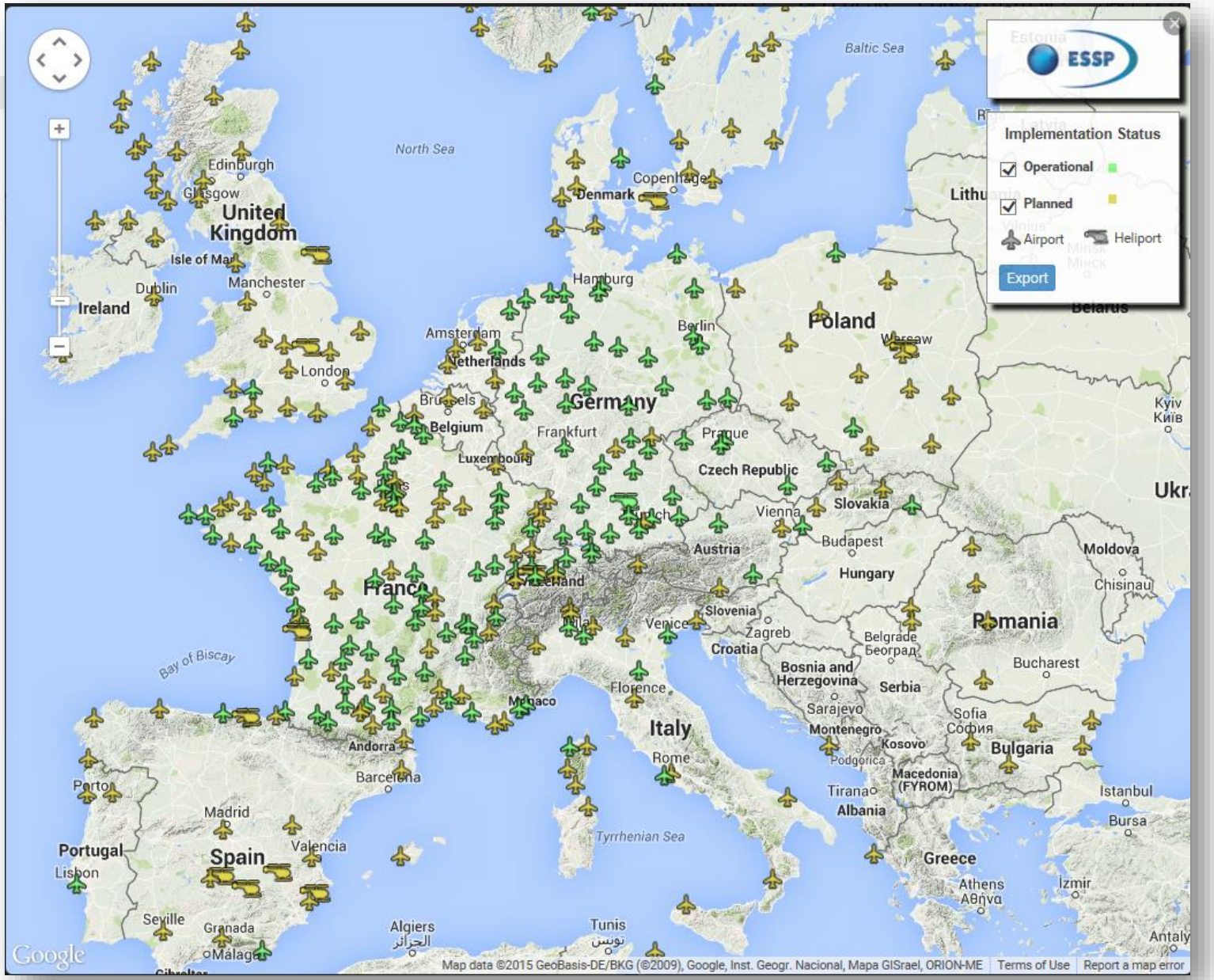
30/06/2015

Where did we start from?

As also stated by EUROCONTROL, performance based navigation (PBN) implementation in Europe is a key enabler for increasing efficiency, reducing environmental impact, increasing capacity, and improving airport access. Until recently, Hungary had not featured a very significant number of GNSS based navigational procedures on the different maps depicting the status of PBN implementation on the continent.



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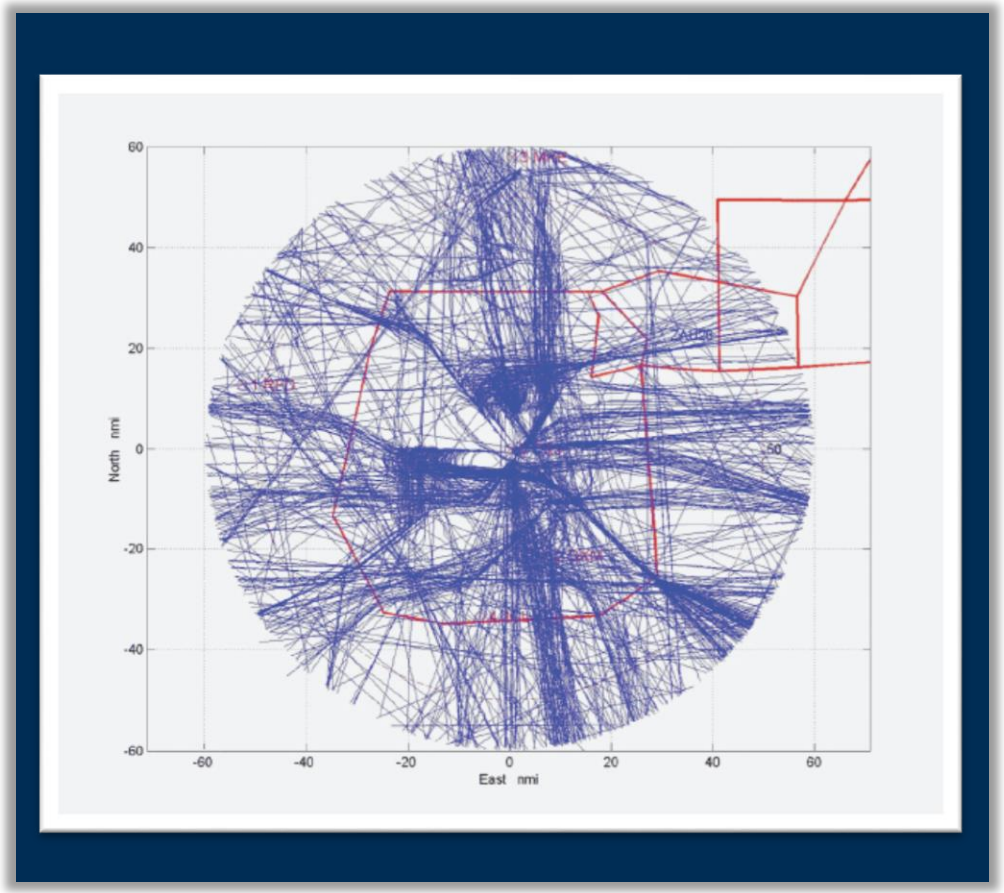
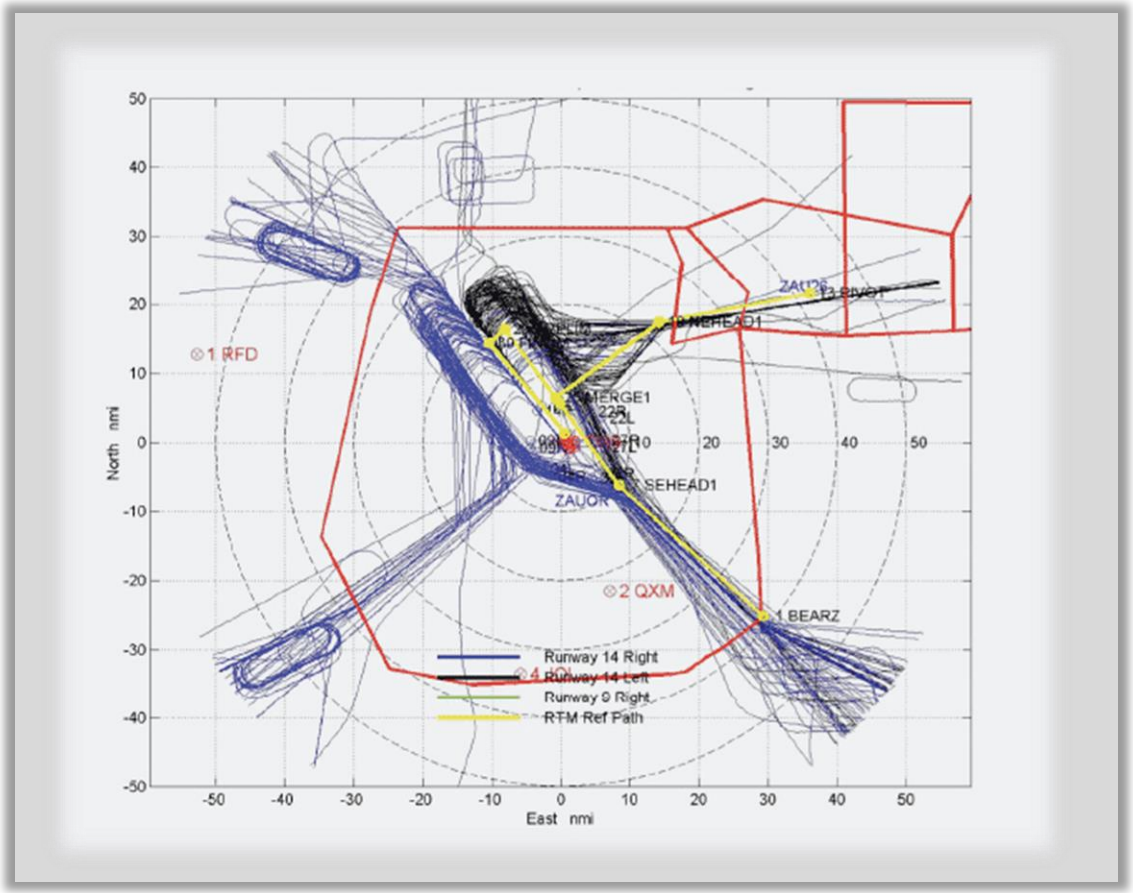
Why is PBN better?

Sensor based navigation

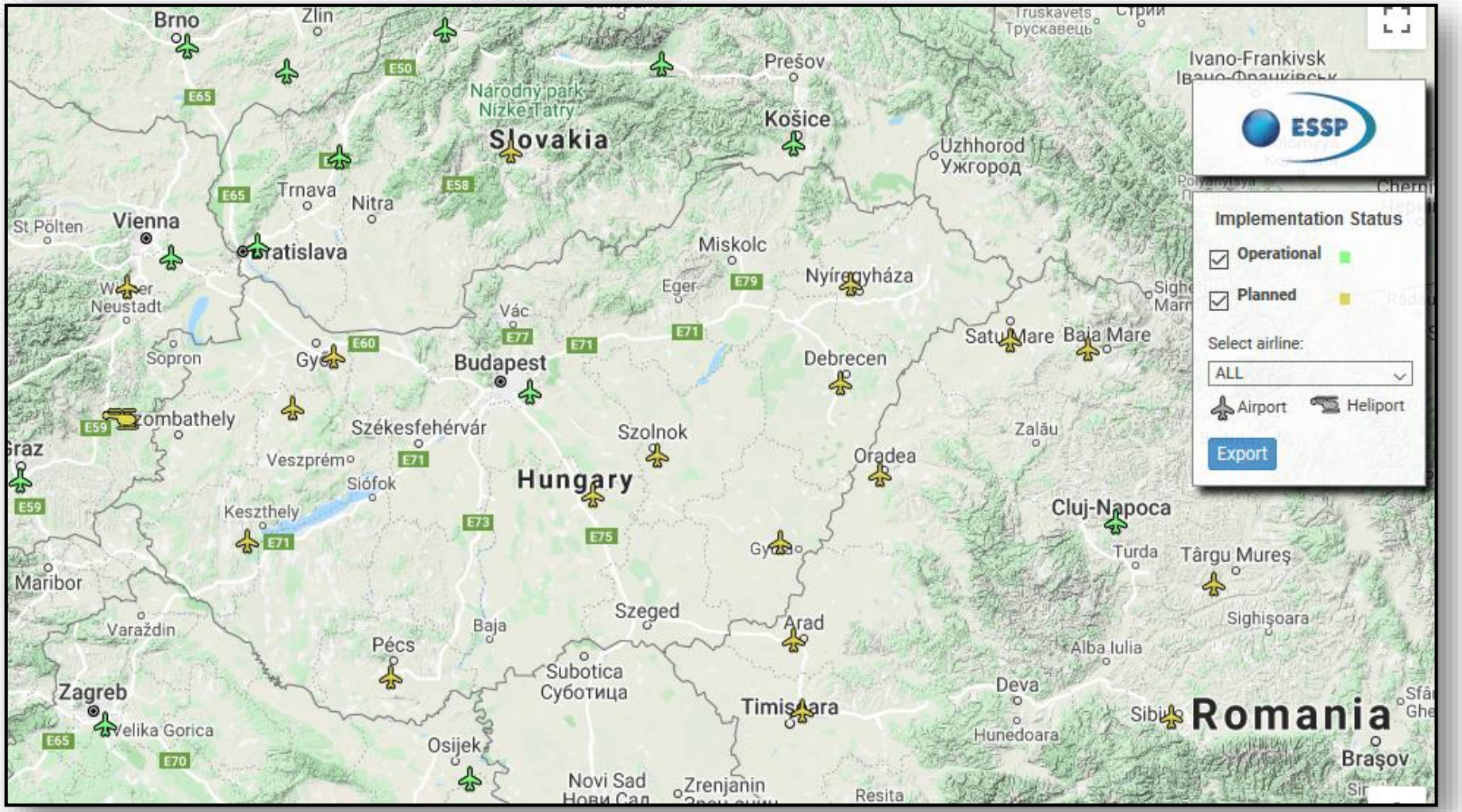


Performance based navigation (PBN)



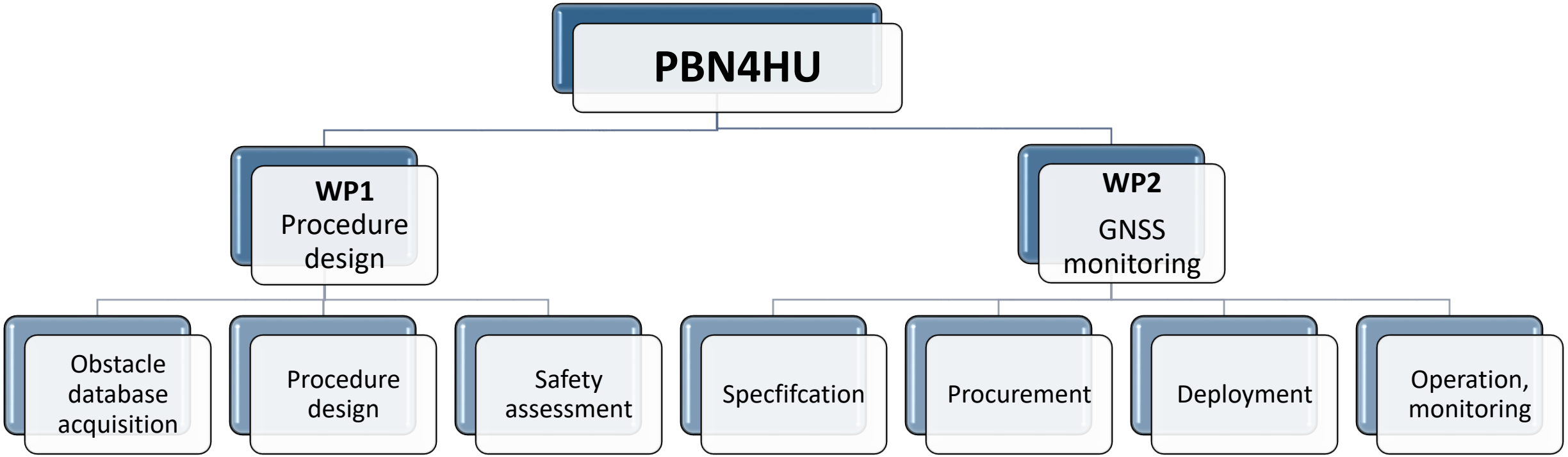
Source of illustrations: http://www.boeing.com/commercial/aeromagazine/articles/qtr_02_09/article_05_1.html

The INEA co-funded project



PBN approaches have been available at the major airport, Budapest Liszt Ferenc International Airport since autumn 2016. The different regional airports, however, have not yet been facilitated with such connections. The INEA funded "PBN Implementation in Hungary" project now includes the safety analysis and procedure design for 7 civil and 3 military airports.

The project's work breakdown structure



Augmentation systems

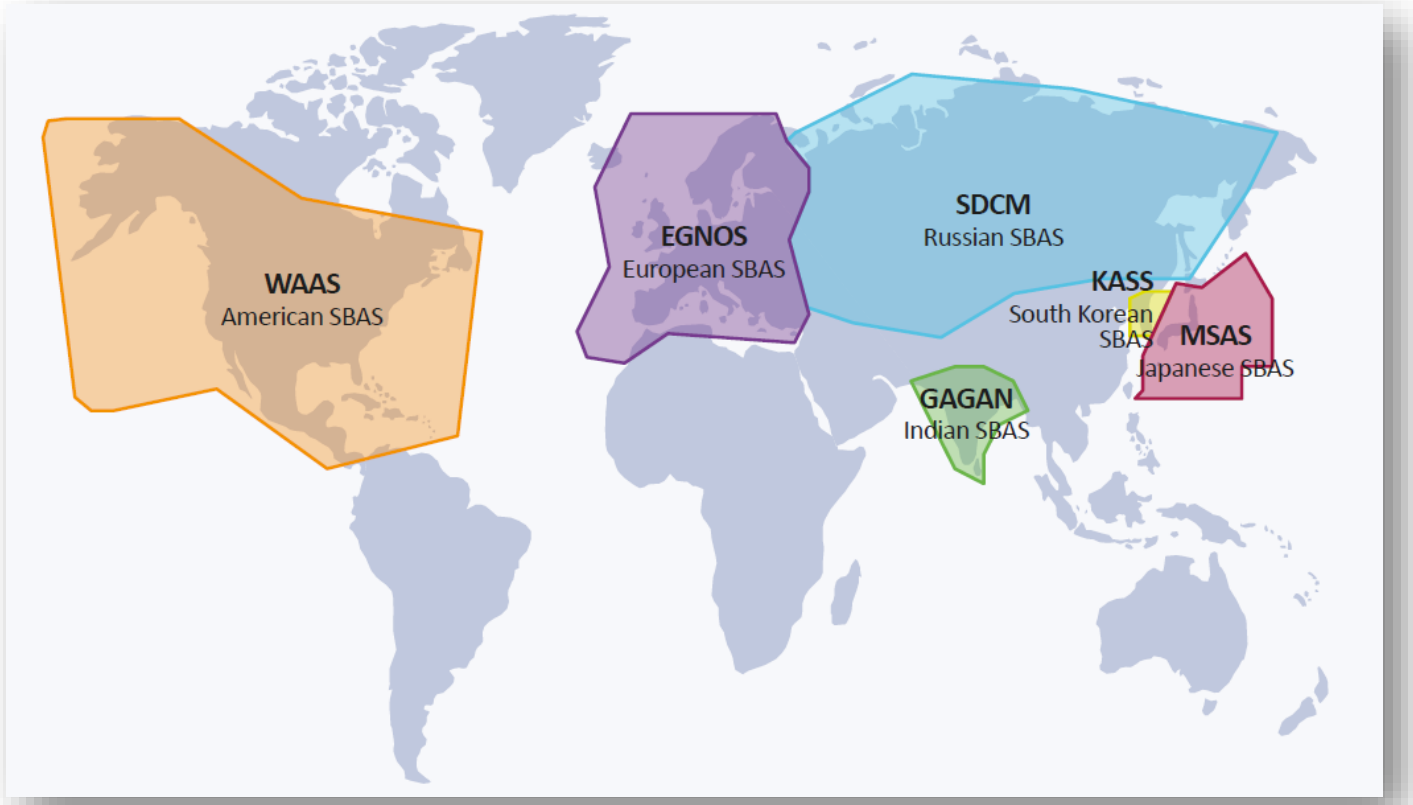
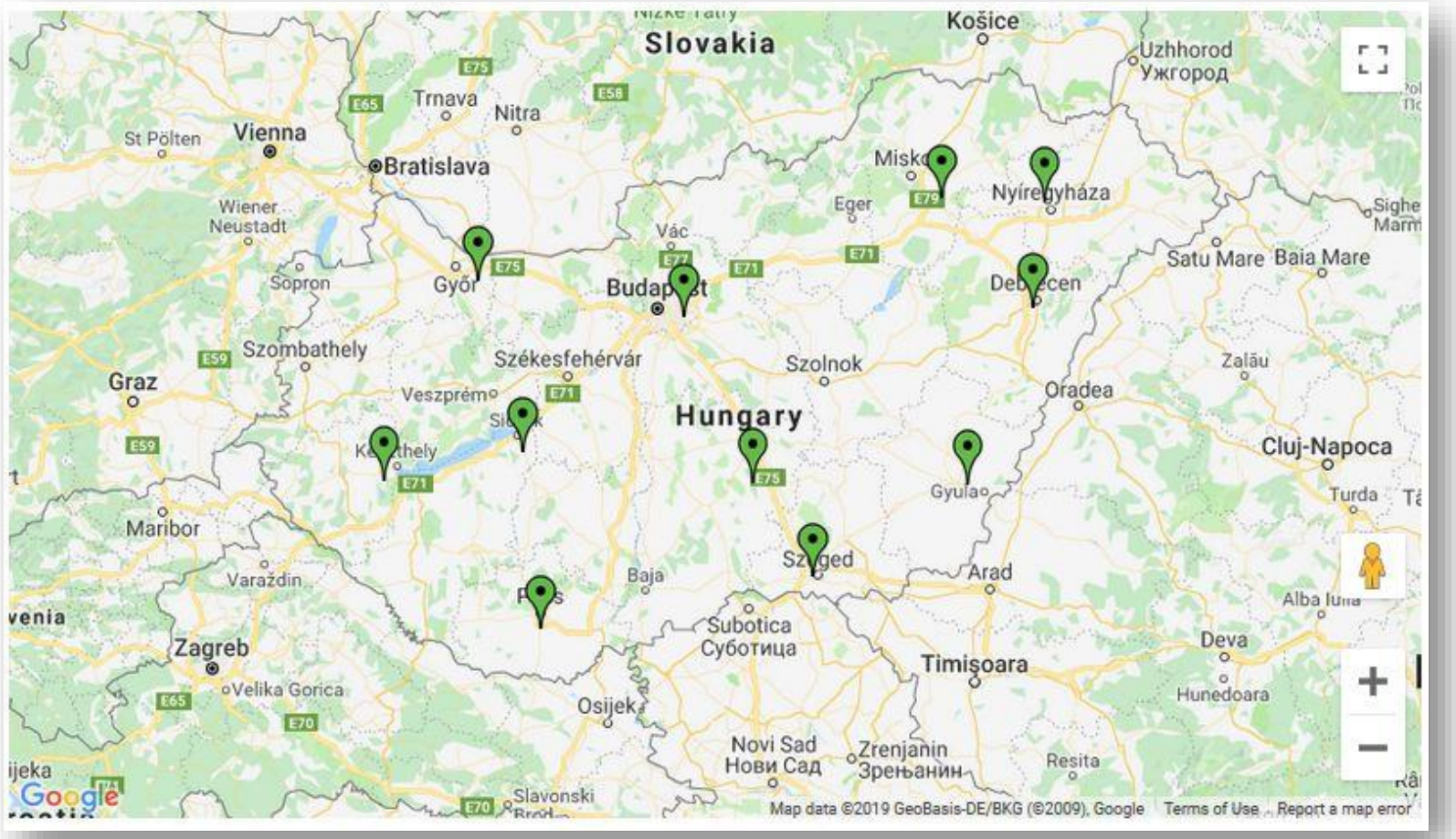


Illustration: https://egnos-user-support.essp-sas.eu/new_egnos_ops/documents/egnos-sdd/egnos-safety-life-service-sdd

As it is well known, for safety critical applications of global positioning, it is of utmost importance to provide sufficient integrity, which can be applied by using either Ground Based Augmentations Systems (GBAS) or Satellite Based Augmentation Systems (SBAS). When measuring several constellation of base and augmentation systems together we speak about Global Navigation Satellite System (GNSS). E-GNSS stands for European GNSS, which is in the focus of scientific research these days when Galileo becomes very close to its full operational state, while the EGNOS (European Geostationary Navigation Overlay Service) Safety of Live service has been officially declared available for aviation in 2011. As the outcome of the concerted action within the project, the Technical University, Pildo Labs and HungaroControl set up a GNSS monitoring network in the country as part of this project.

GNSS monitoring network



The network that has been implemented in Hungary consists of 11 stations equipped with the most modern triple frequency, Galileo capable receivers. Raw measurements are recorded with one second sampling interval and post processed in a full automatic way on a daily basis in accordance with ICAO (International Civil Aviation Organization) standards and requirements. Spectrum analysers are also installed at the stations to monitor all the three carrier frequencies in order to detect and report interference events.

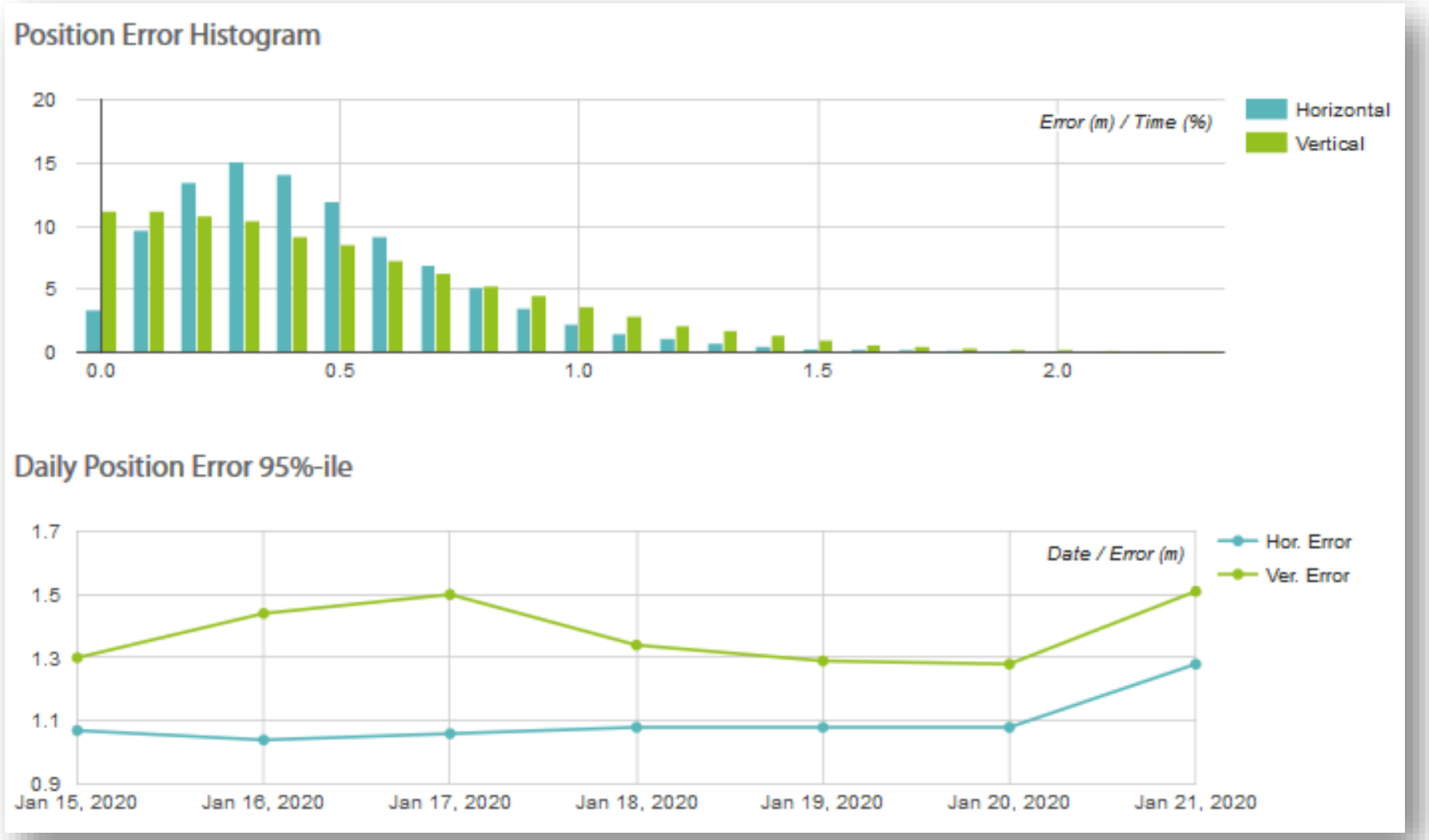
For a detailed explanation and further scientific results
the reader is referred to the proceedings of the H-Space 2020 conference
http://space.bme.hu/

Results from the monitoring network

EGNOS performances requirements in aviation

	APV-1	LPV-200
Horizontal accuracy [m] 95%	16	16
Vertical accuracy [m] 95%	20	6
Horizontal alarm limit [m]	40	40
Vertical alarm limit [m]	50	35
Availability	0.99	0.99
Continuity	$1 - 8 \times 10^{-6}$ per 15 seconds	$1 - 8 \times 10^{-6}$ per 15 seconds

Accuracy at Budapest station



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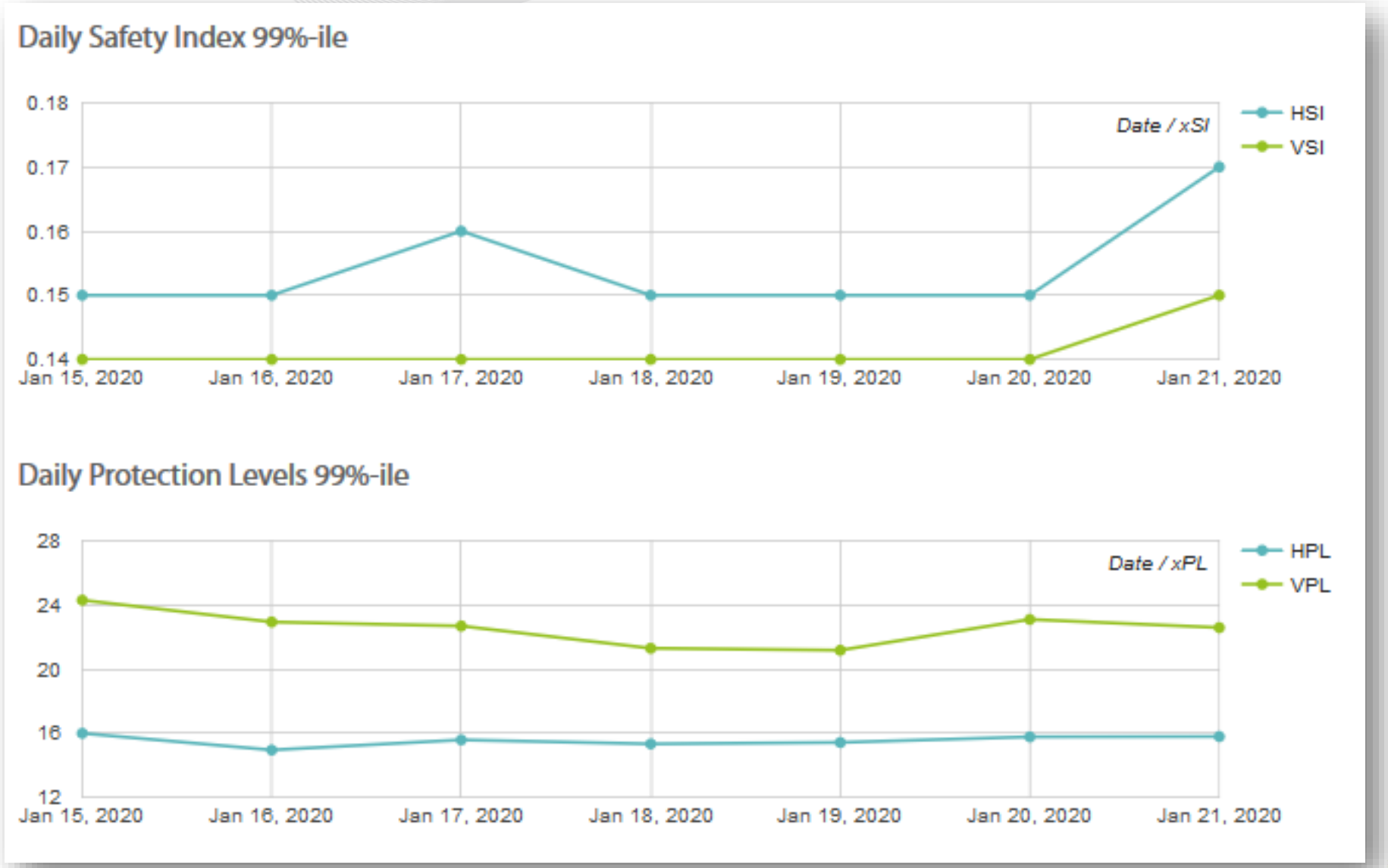
Integrity at Budapest station



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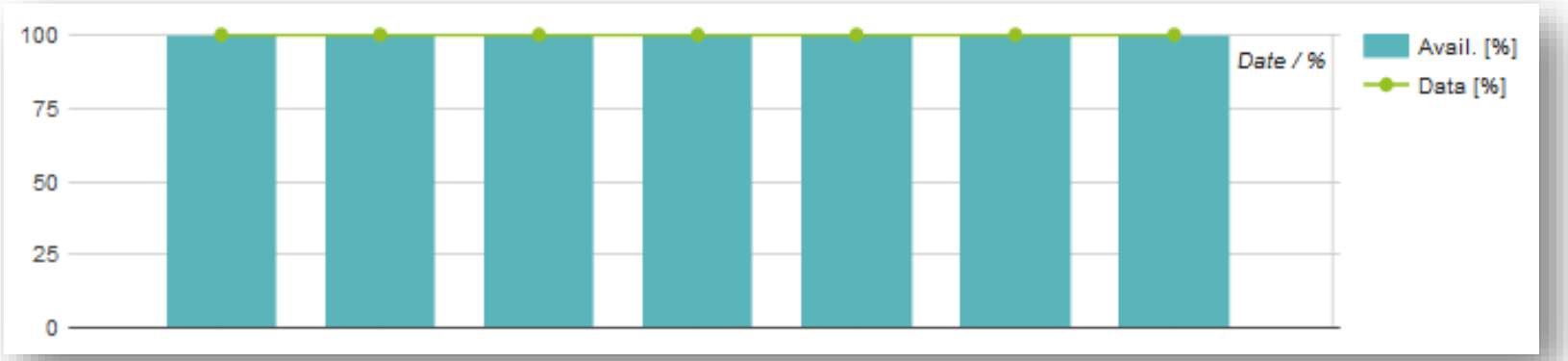
Availability and continuity at Budapest station



Criteria	Maximum allowed value	Actual value	Requirement achieved
ICAO	8.0E-6 per 15s	0.0 per 15s	
EGNOS SoL SDD	1.0E-4 per 15s	0.0 per 15s	

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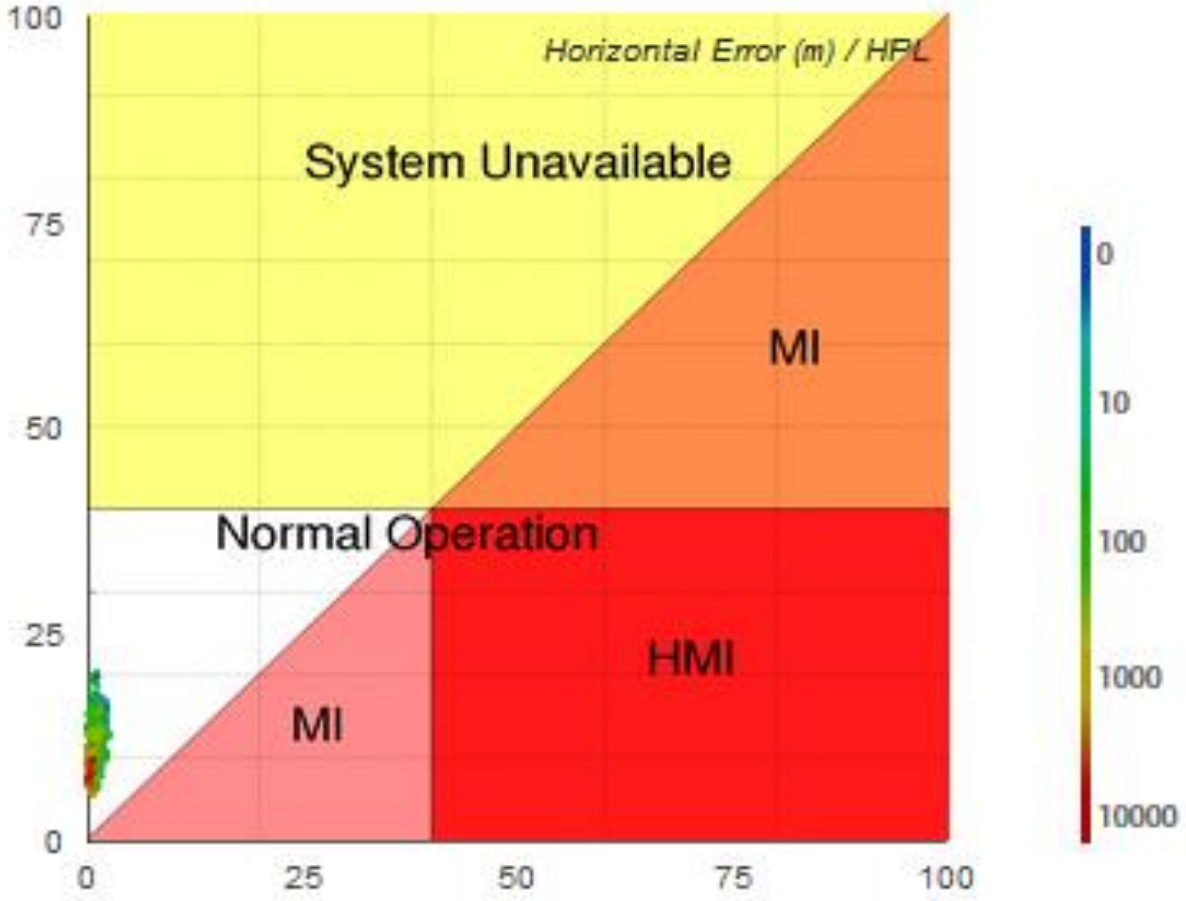
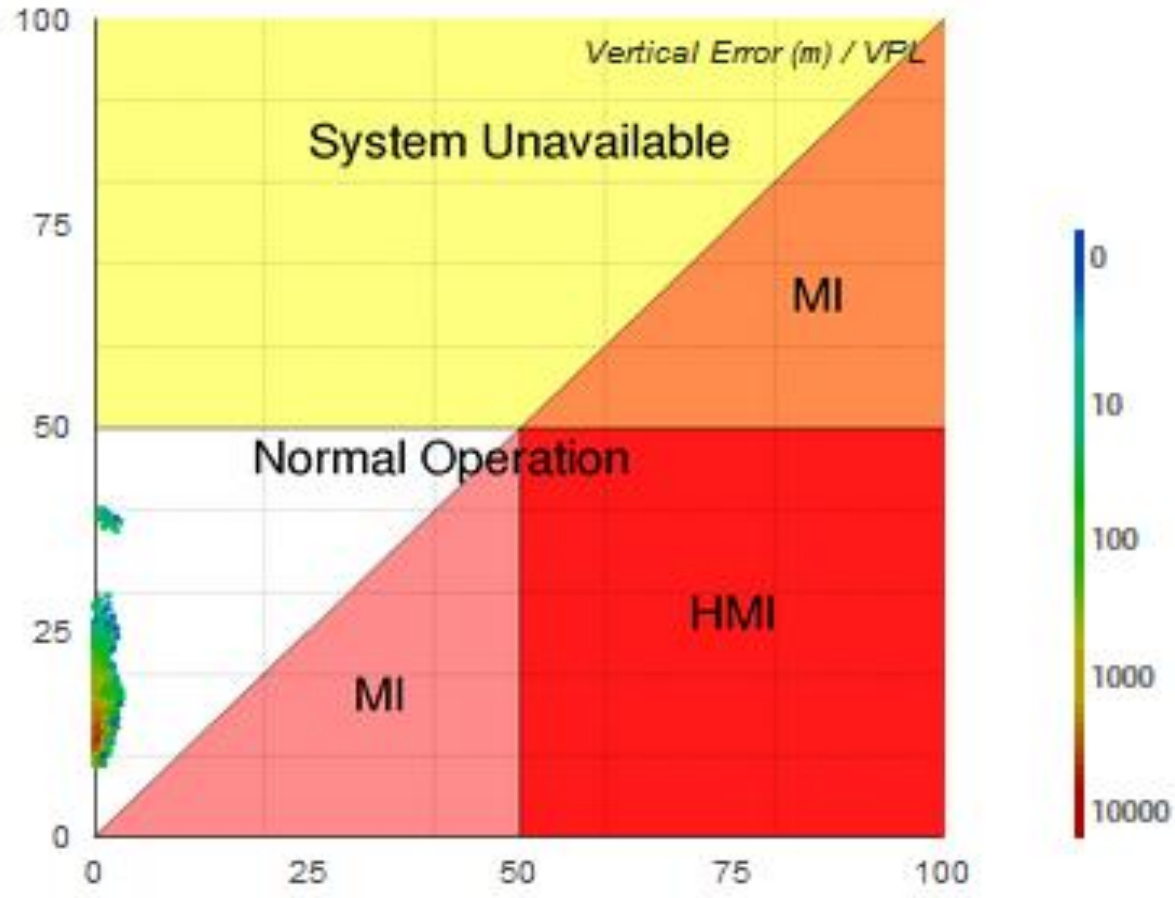
Stanford plots for Budapest station





between 15 and 21 January 2020

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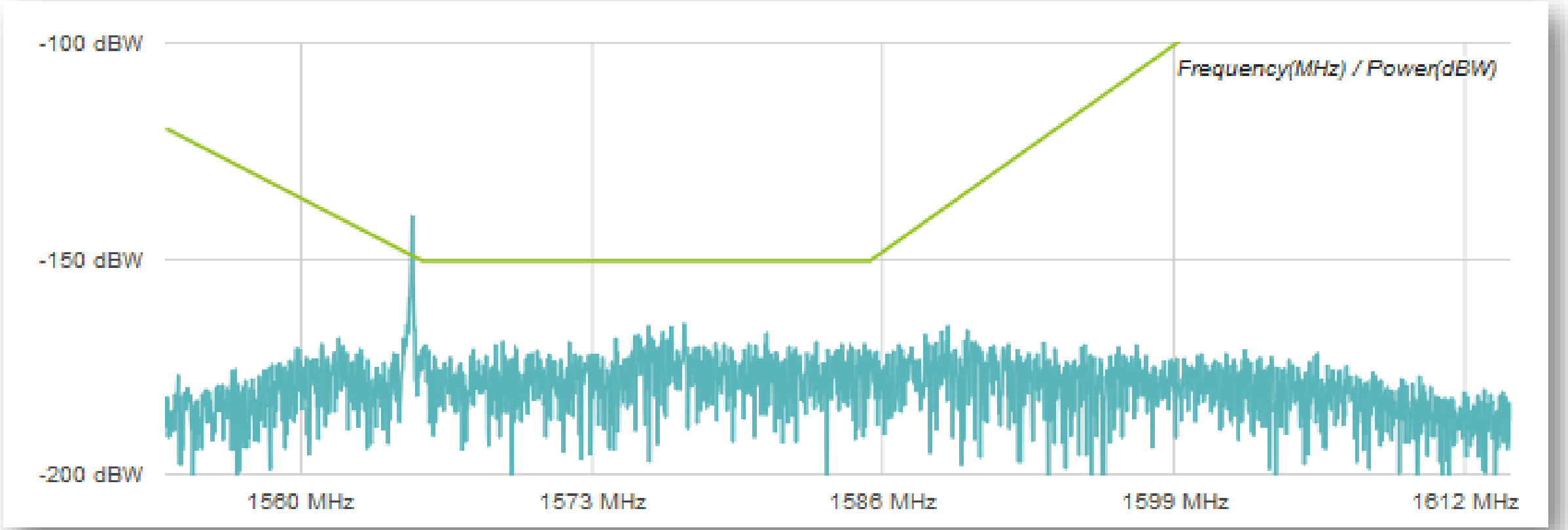
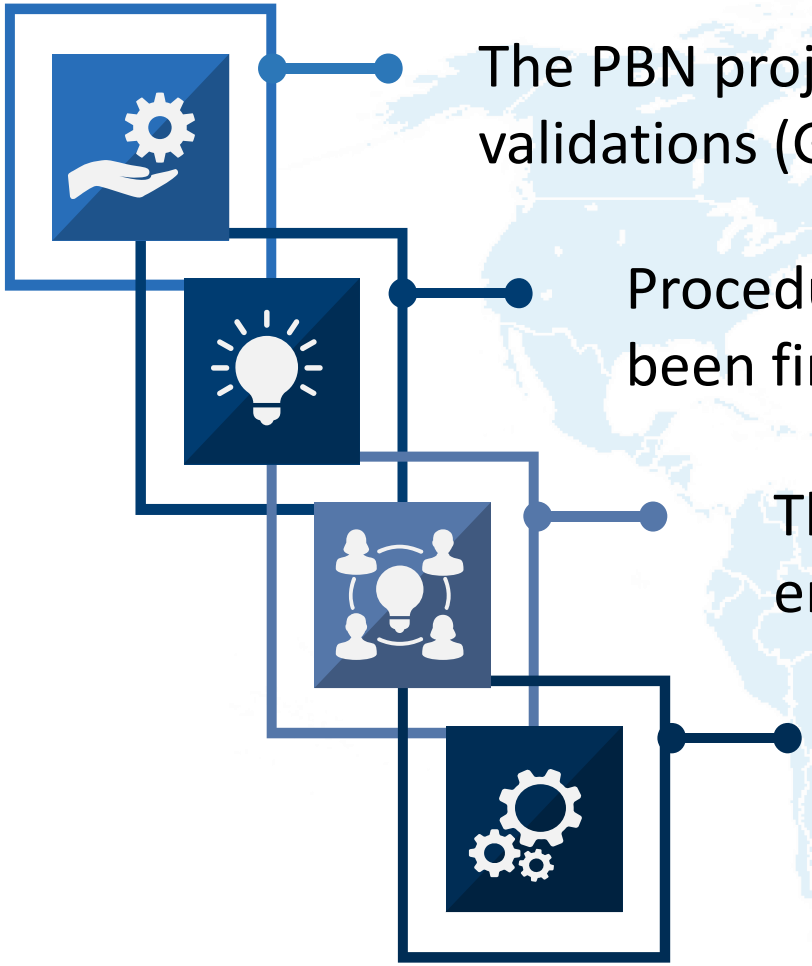
Spectrum anomaly event at Pécs airport, 2nd August 2019



Conclusions



The PBN project is on-going, with only 3 flight validations (Győr, Pápa, Szolnok) remaining for 2020 Q1

Procedure design for 6 civil and 1 military airports have been finalized, they are under publication

The GNSS monitoring network was installed by the end of 2018

After one year of its operation, data show that GNSS can be reliably used for aviation purposes, with some phenomena to be investigated scientifically

THANK YOU FOR YOUR ATTENTION