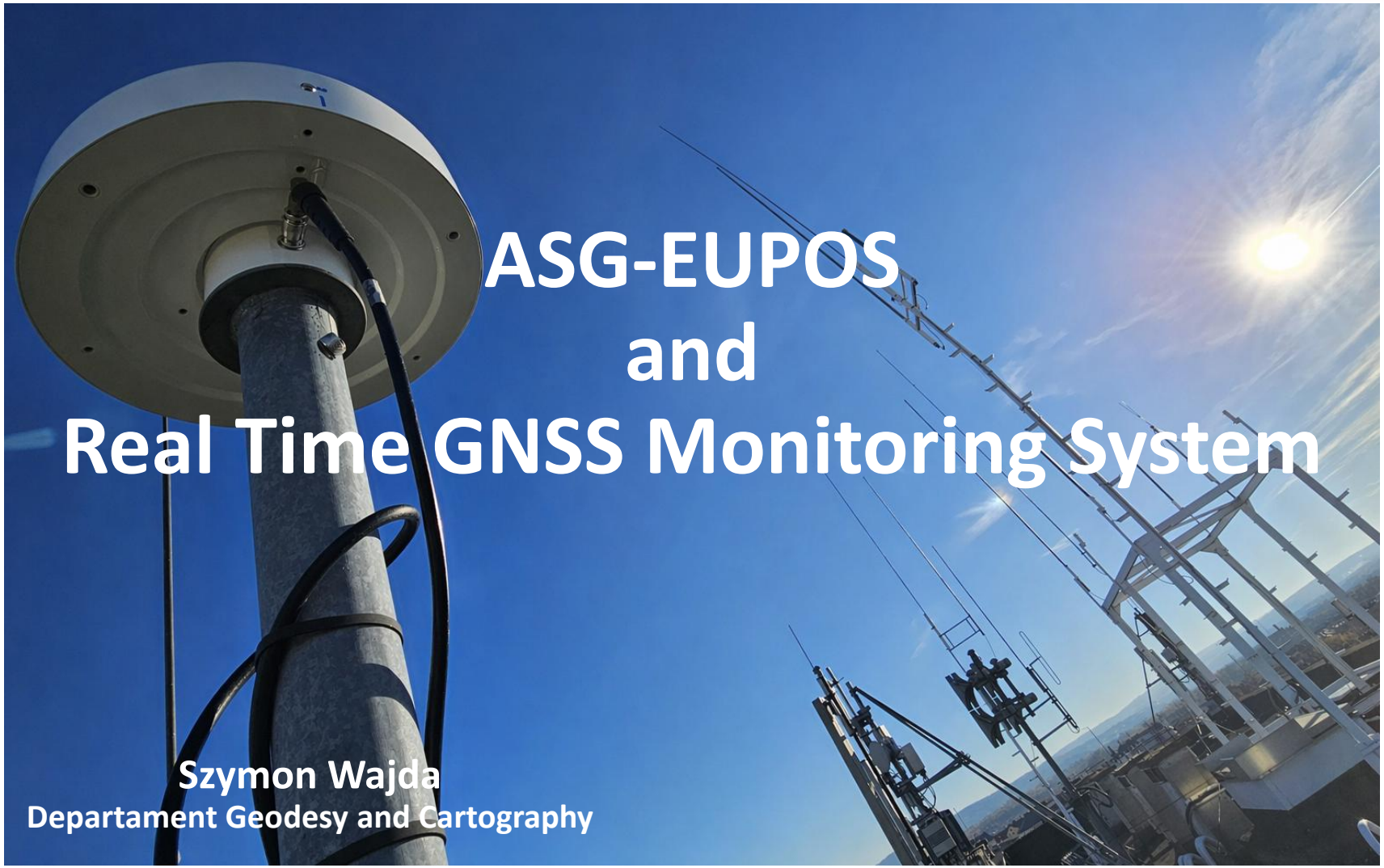


ASG-EUPOS and Real Time GNSS Monitoring System

Szymon Wajda
Departament Geodesy and Cartography

ASG-EUPOS info

Currently, **149** reference stations are included in the ASG-EUPOS system:
120 from Polish territory (**109** GUGiK stations+ 11 from external institutions
29 foreign stations from neighboring countries

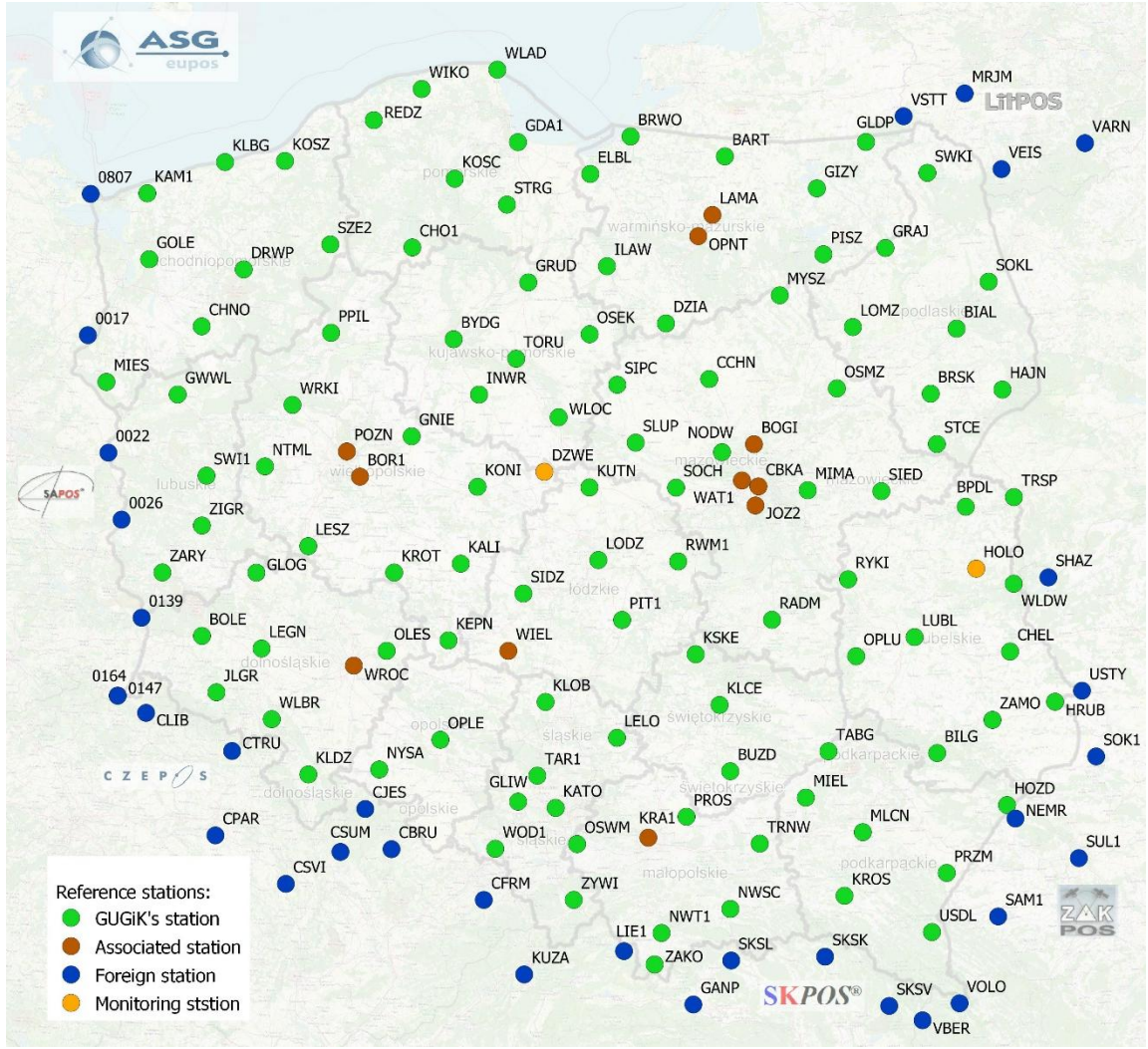
Management Centers:

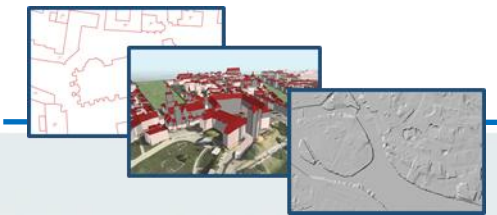
- Warsaw
- Katowice

Software:

- **Trimble Pivot Software 5.2.3**

  (version 5.3 is during installation)

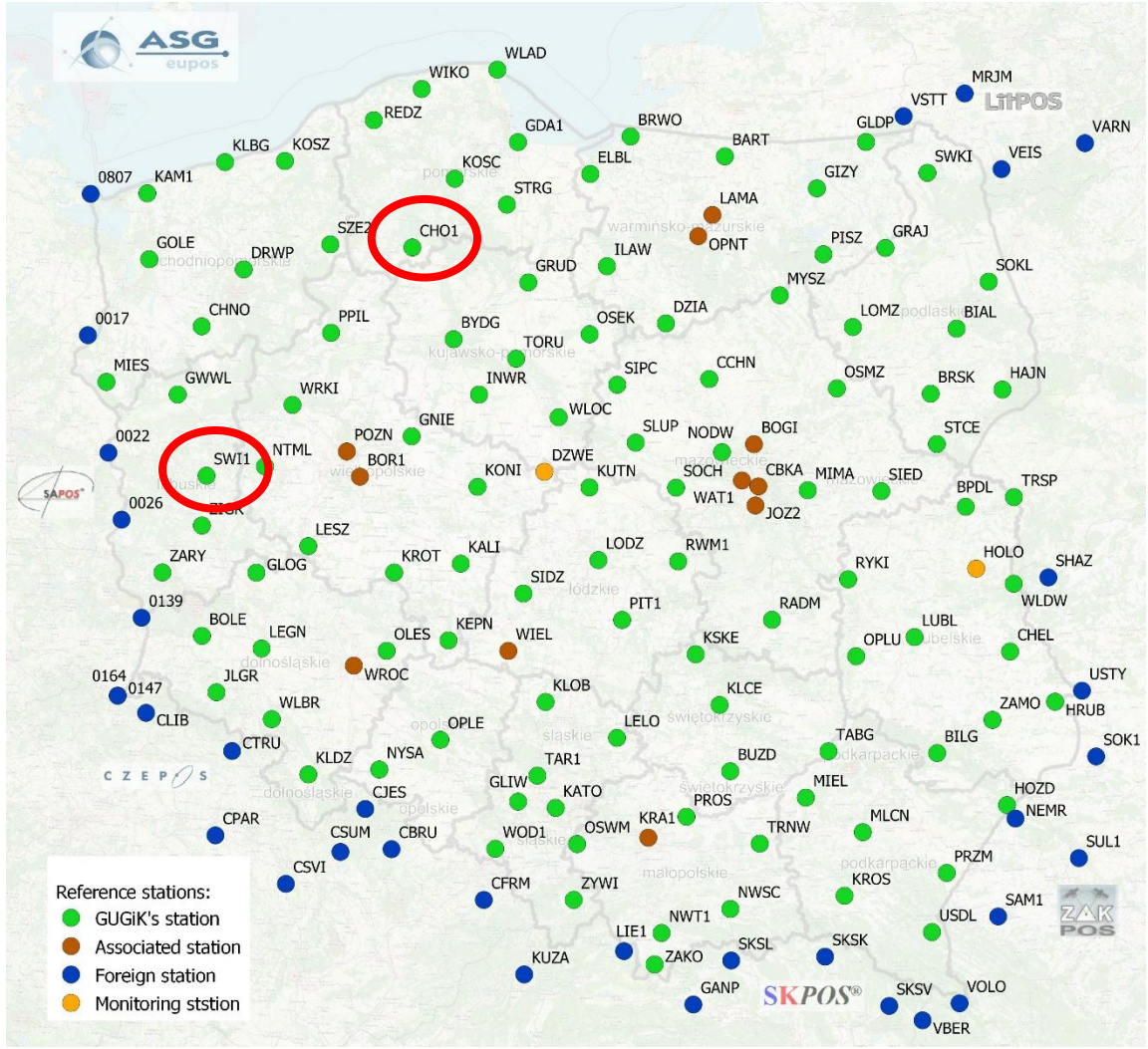


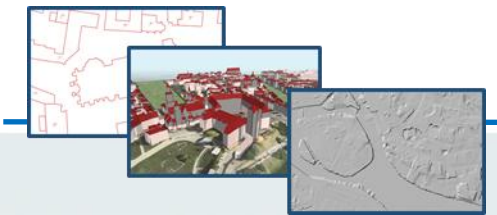


ASG-EUPOS info

Last year changes in ASG-EUPOS:

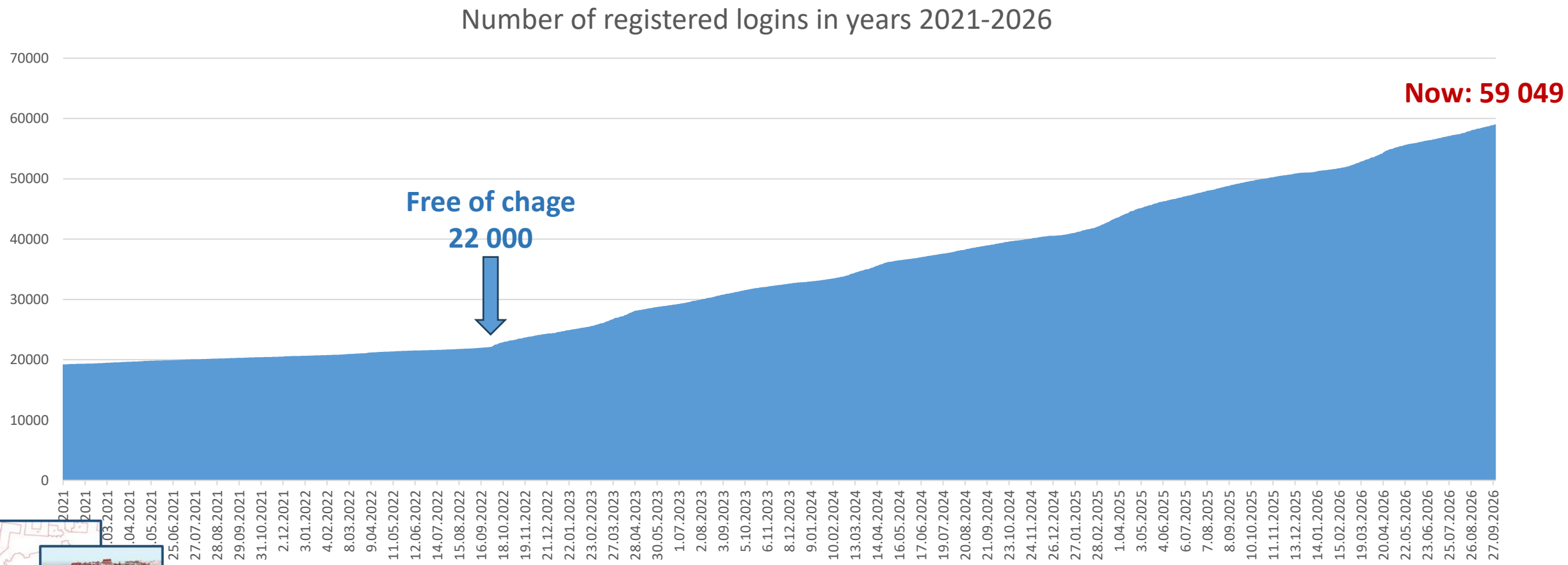
- New calculation servers – under implementation
- New Trimble Pivot Platform version 5.3 – under implementation
- Trimble Jamming & Spoofing Portal implemented
- New location for 2 reference stations
- Communication links to ref. stations and MC upgrade and expansion
- Expansion of bandwidth of Internet links from MC





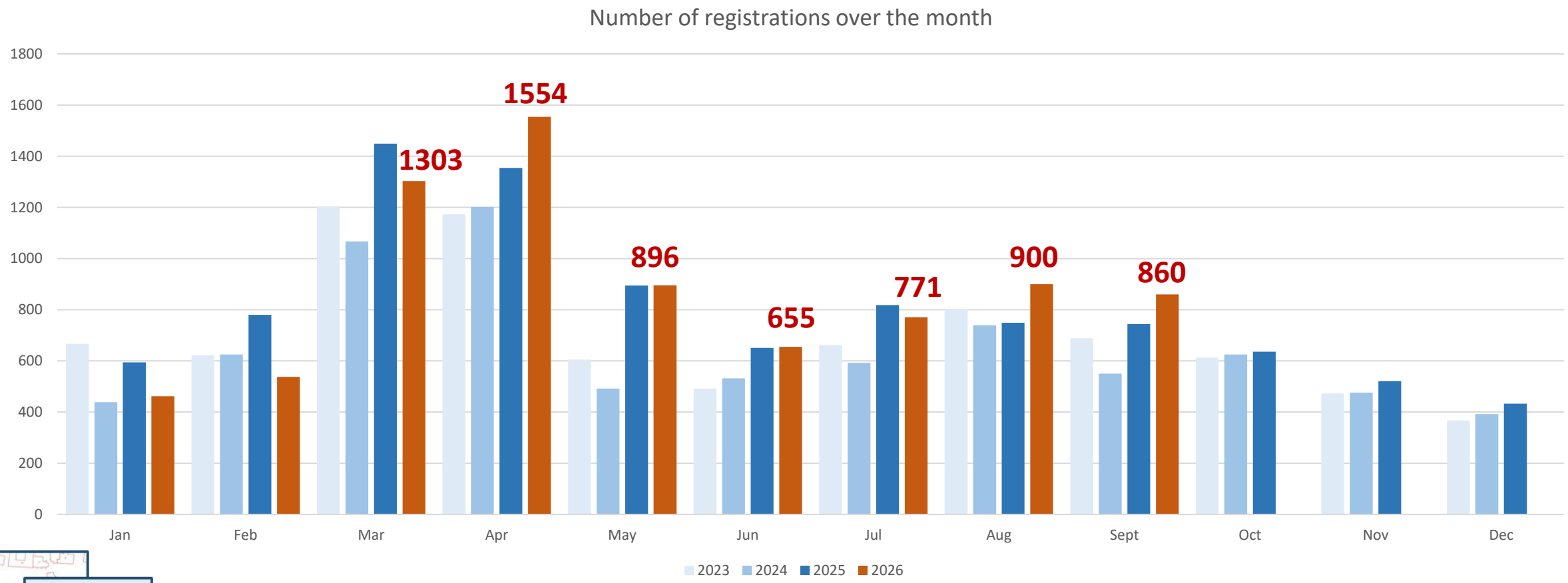
Statistics

Huge number of logins registered in the system.



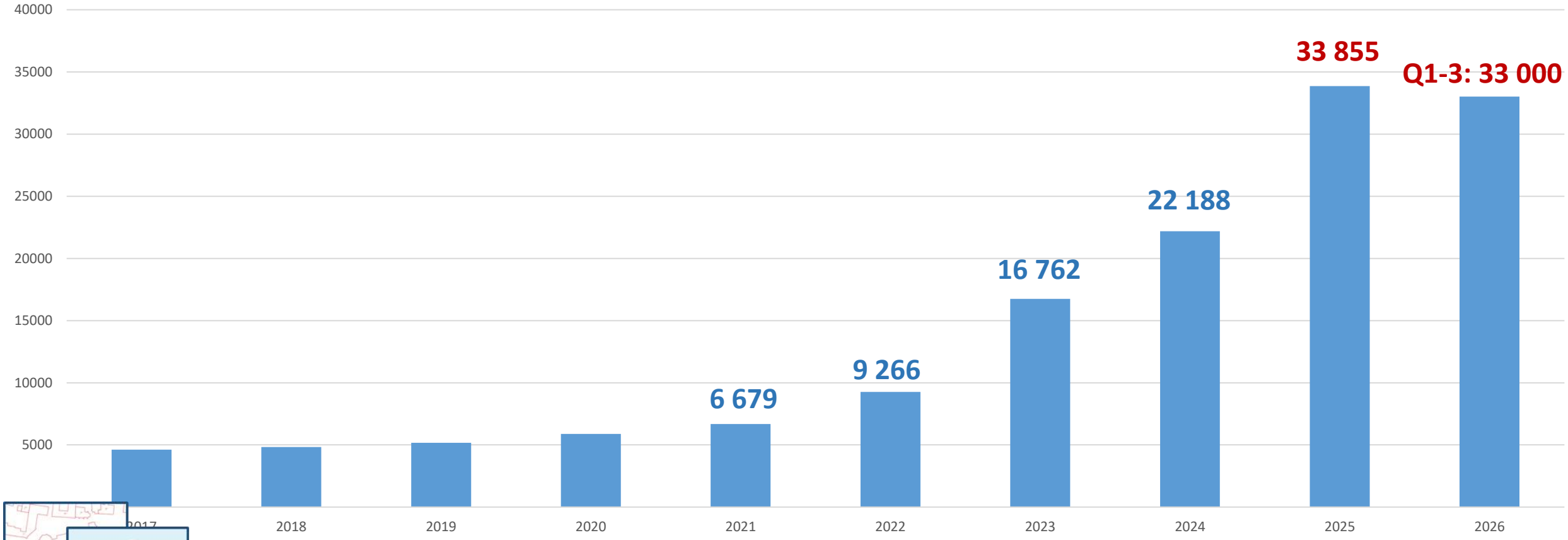
Statistics

Monthly number of registrations over 1300 in the spring sezon



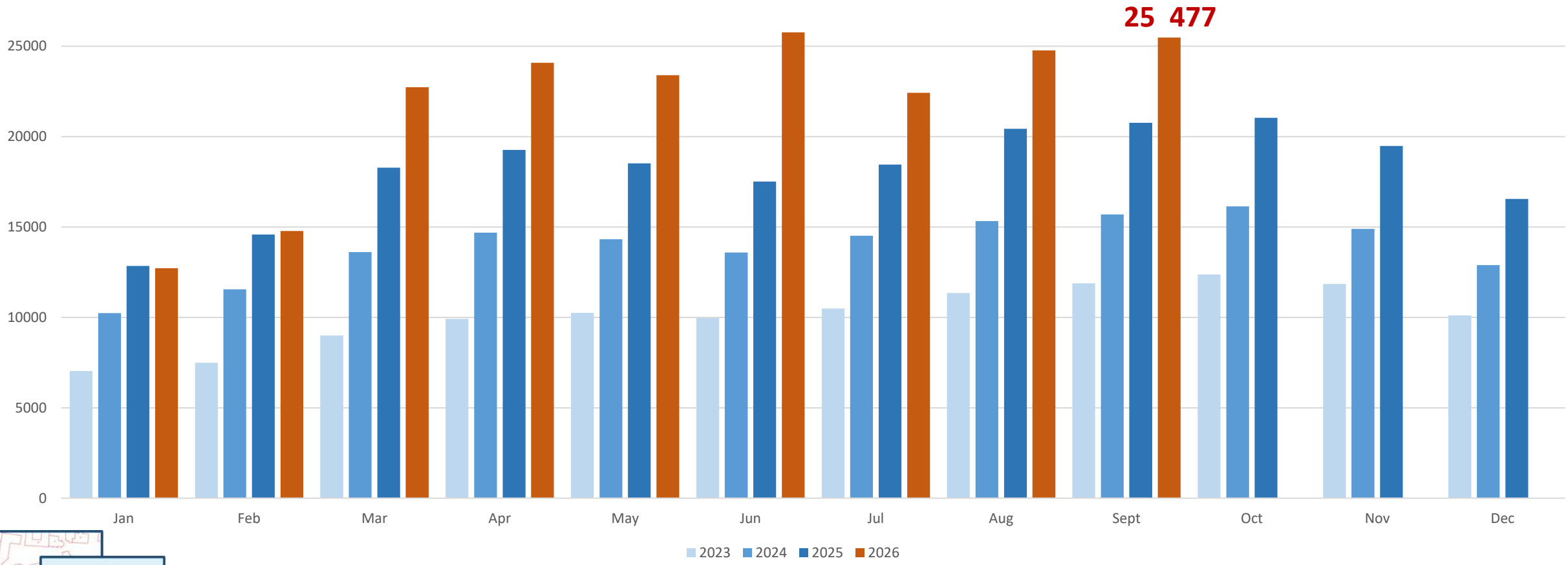
Statistics

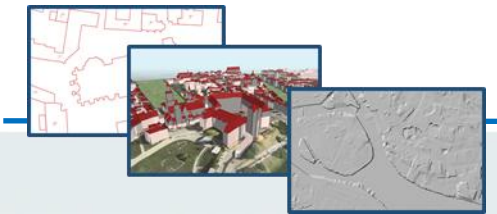
Number of logins connected to the system during the year.



Statistics

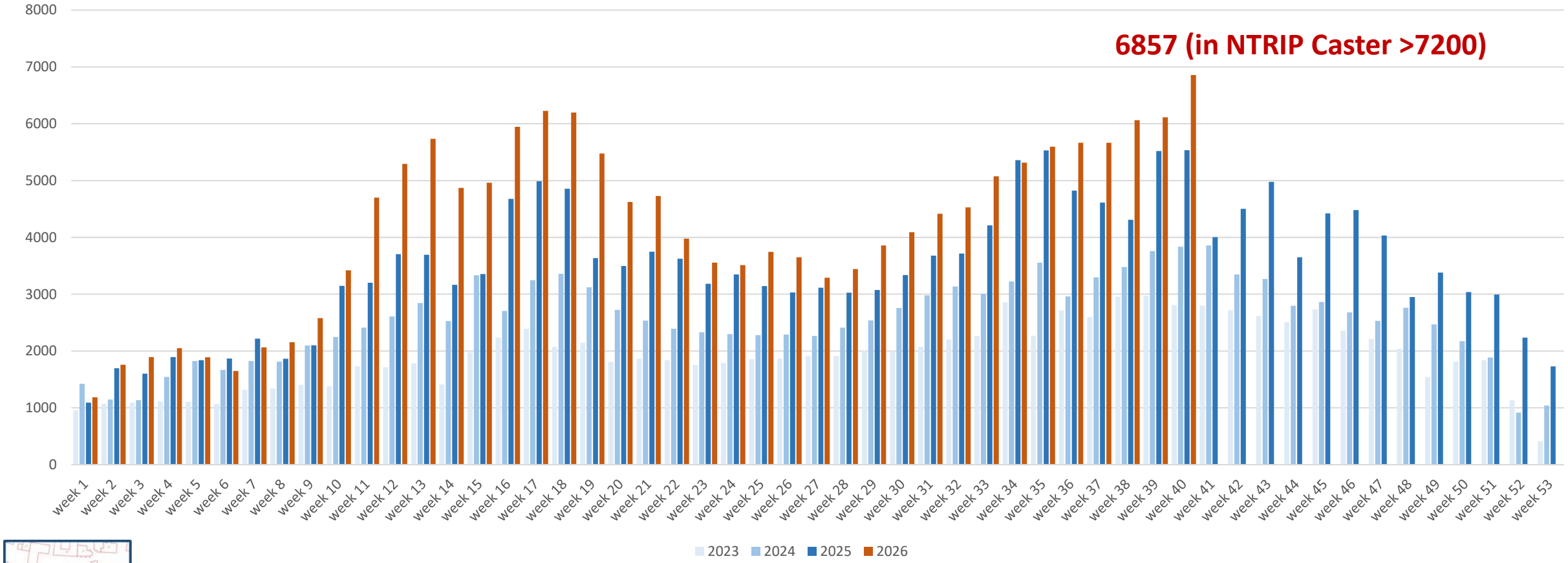
Number of logins connected to the system during the month.

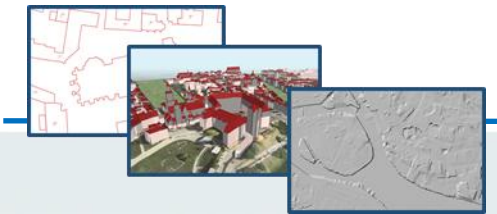




Statistics

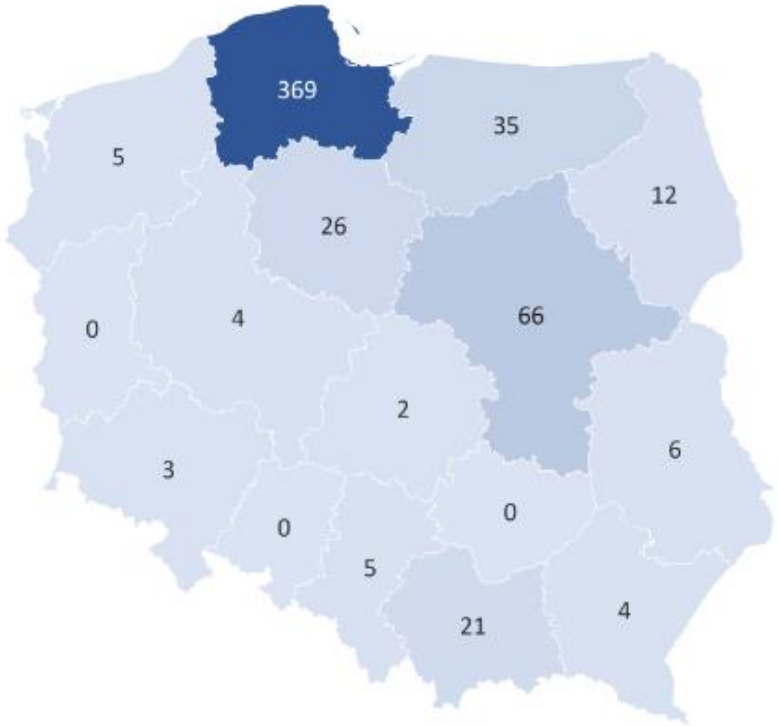
The highest numer of simultaneous connections to the system.

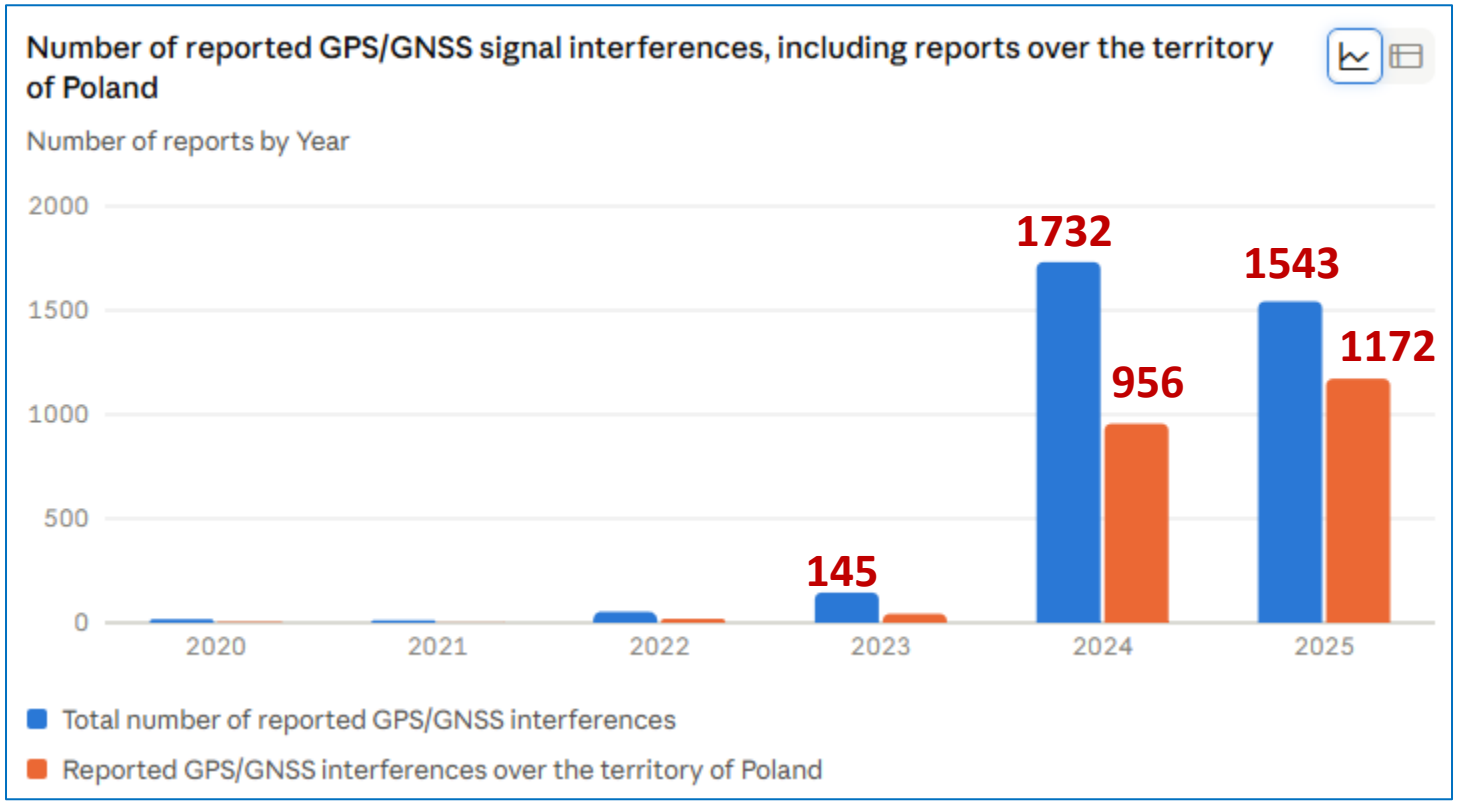




GNSS Interferences

Huge increase numer of GNSS interference incidents reported to Civil Aviation Authority.

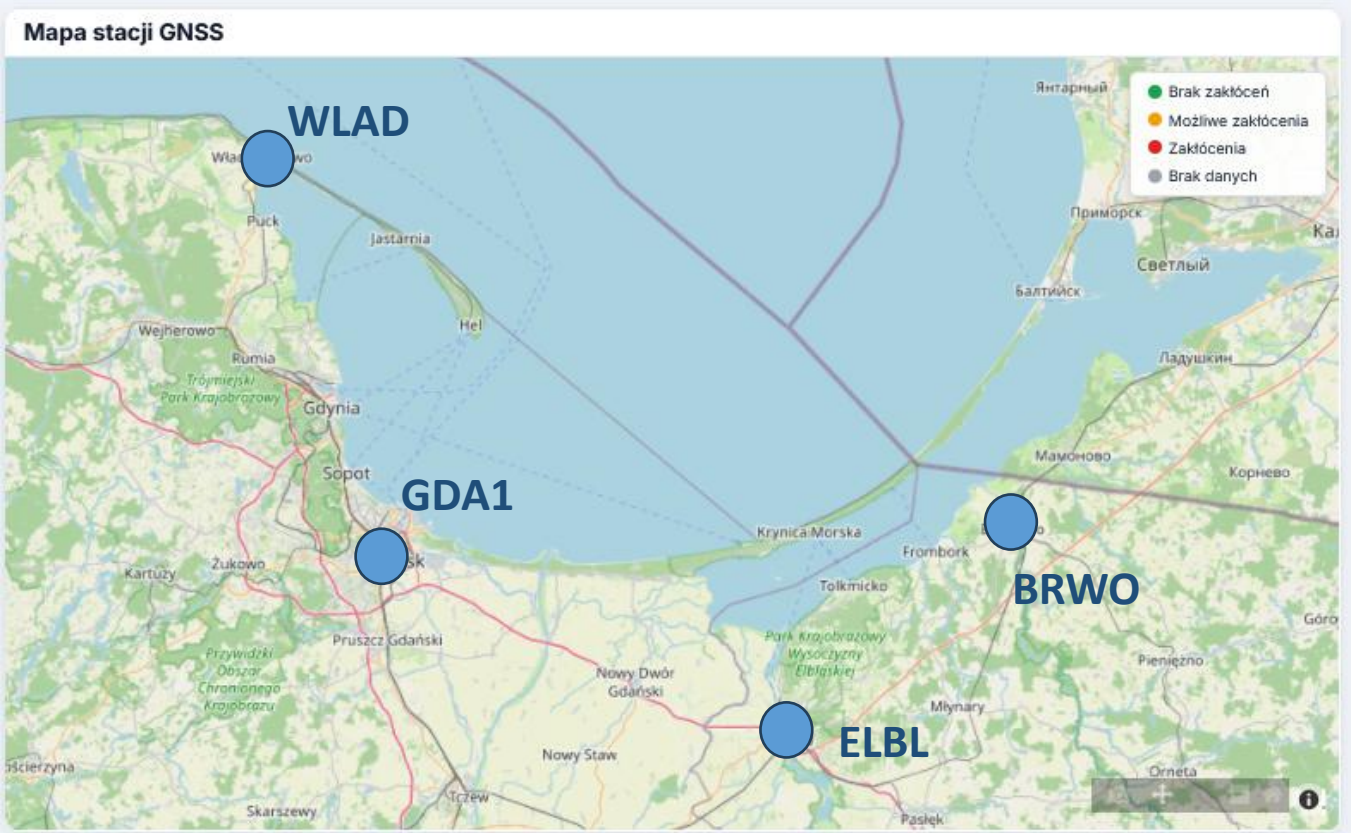




Source: Civil Aviation Authority – National Safety Plan 2026-2028

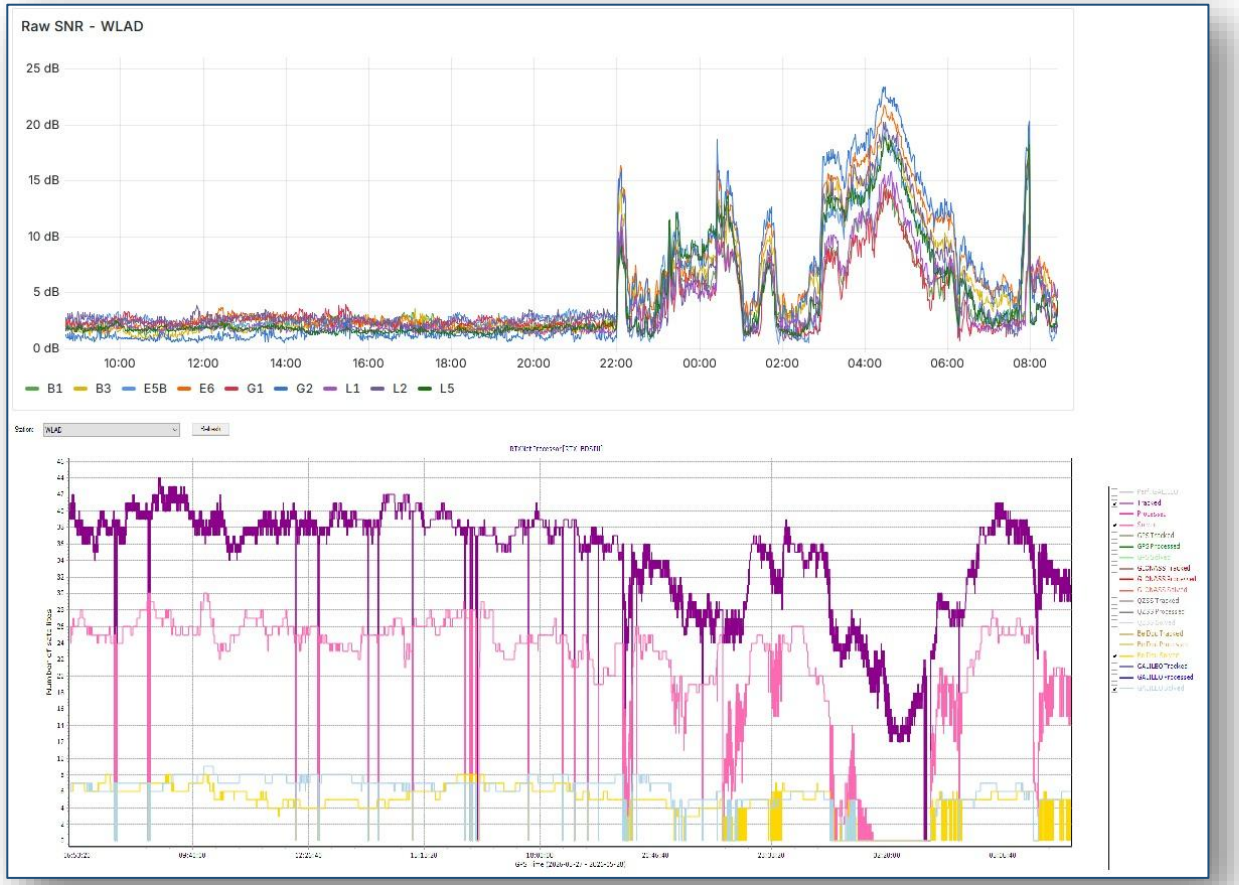
GNSS Interferences

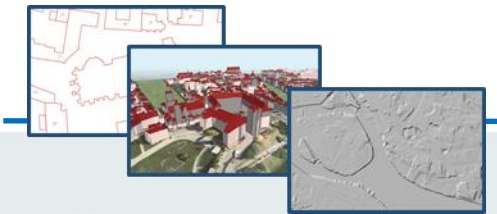
- **Ref. stations in Gulf of Gdansk:**
- Gdańsk (GDA1)
- Braniewo (BRWO)
- Elbląg (ELBL)
- Władysławowo (WLAD)



GNSS Interferences

- Significant increase in disruptions from the end of April 2026
- There are hard interferences even for surveying receivers
- Interference affects RTK/RTN correction data
- Interferences occurs mainly at night
- Some of the interference includes two WLAD stations and GDA1 – large area affected.

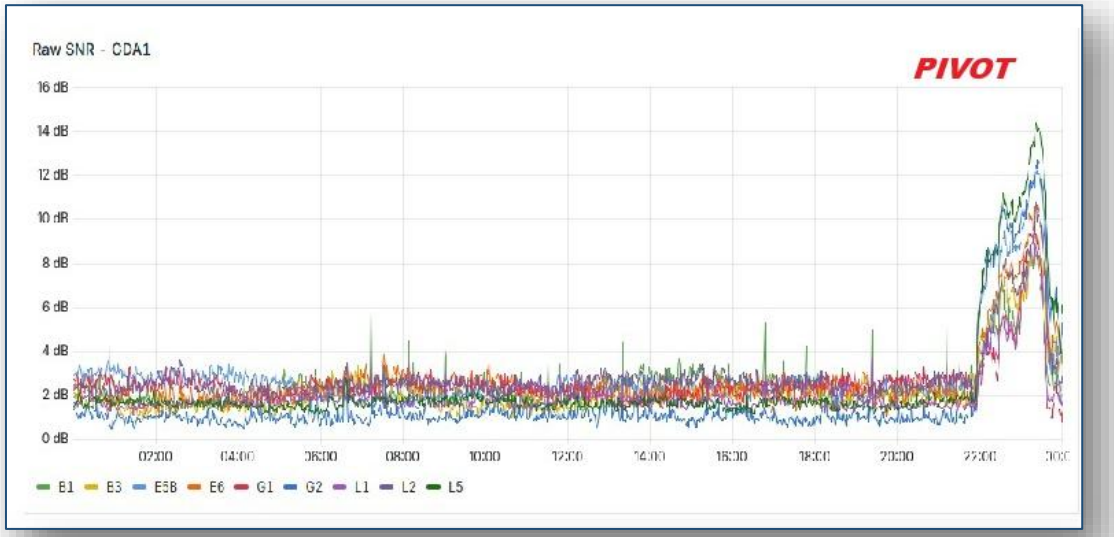


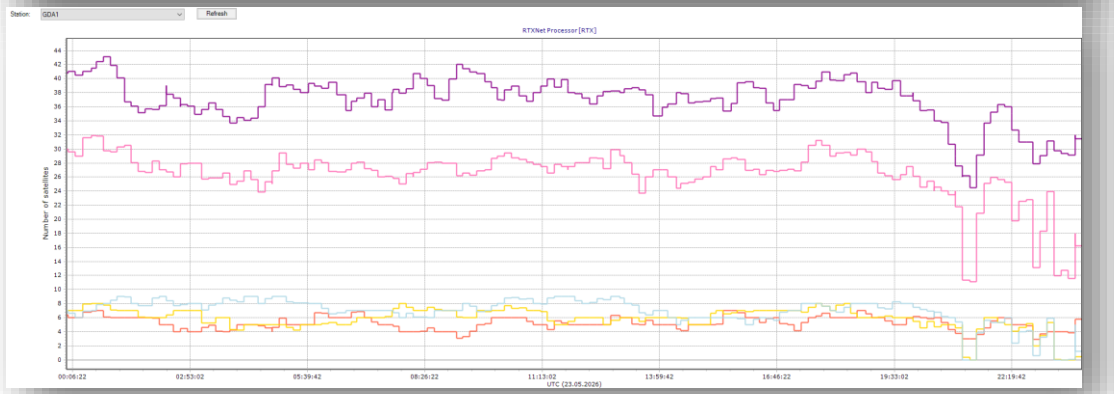


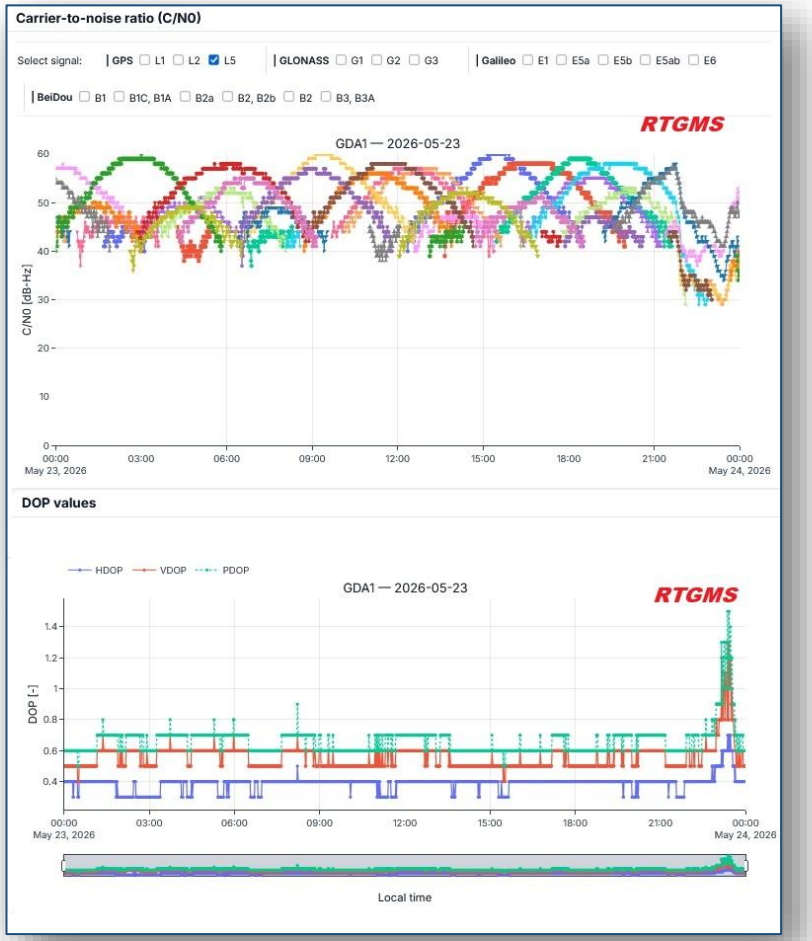
GNSS Interferences

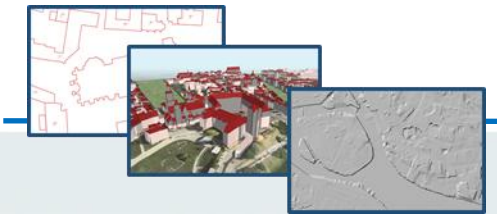
Signal quality degradation at all frequencies

Reduction of the number of satellites in the RTN network correction data



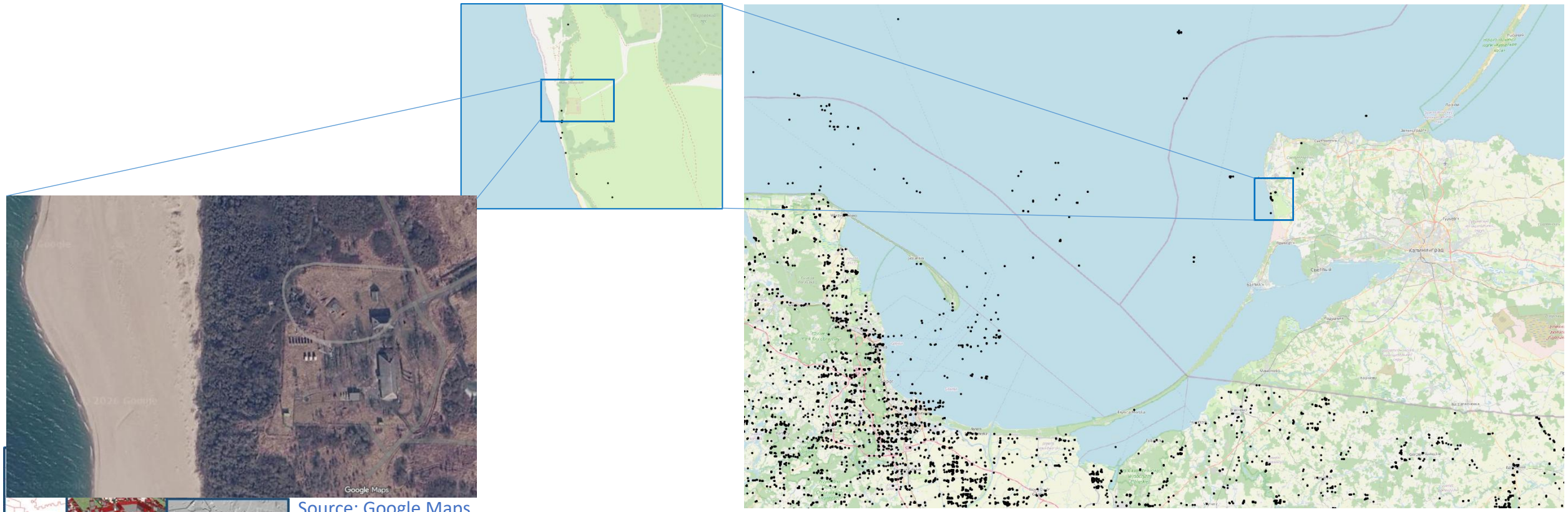






GNSS Interferences

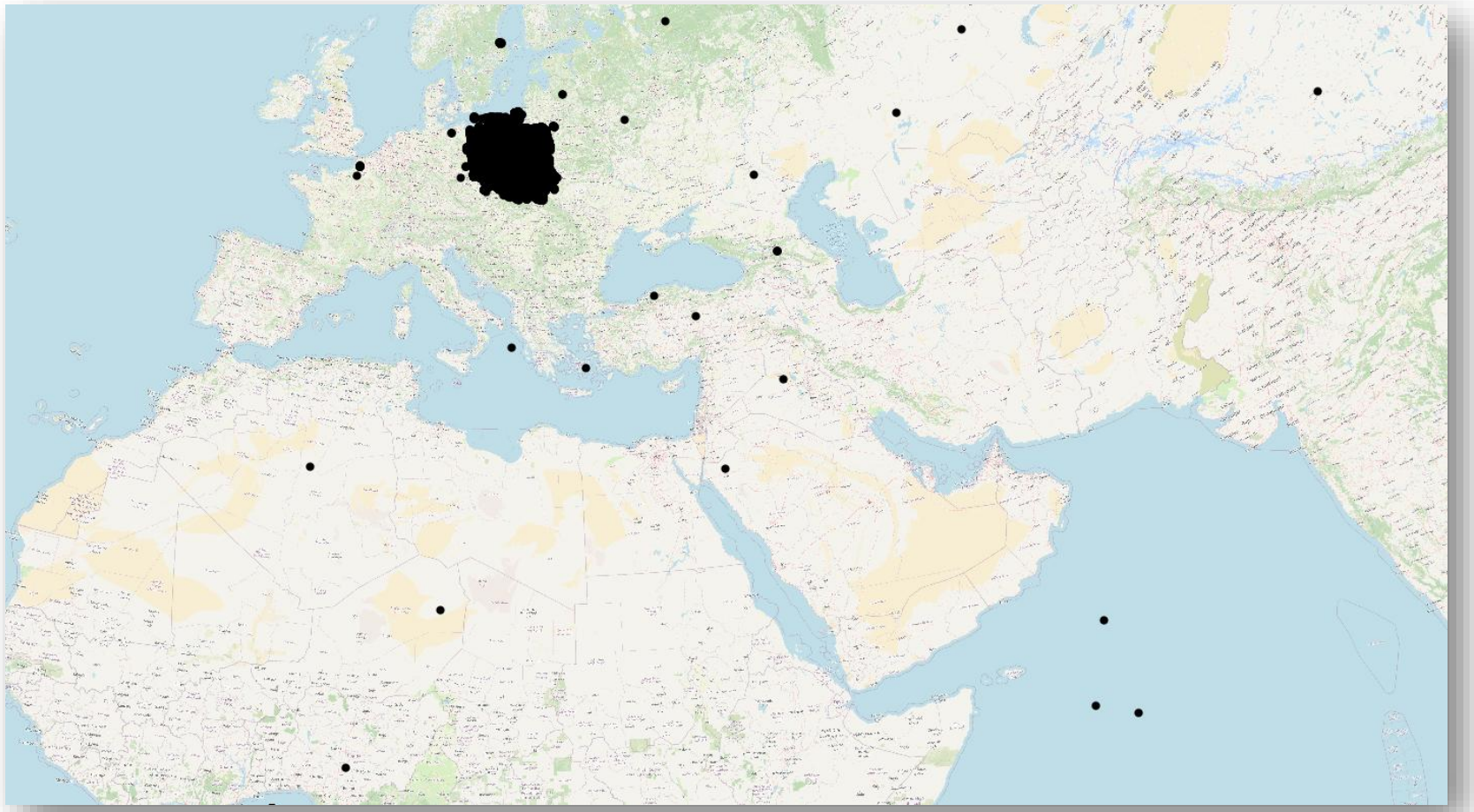
April 2026: Spoofing- injected position from military base in Okuniewo:

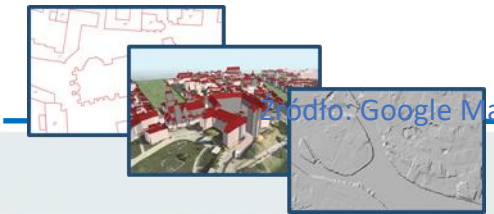


Source: Google Maps

GNSS Interferences

April 2026: Spoofing- you can see that spoofing allows to change the position of the receiver even by several thousand km.

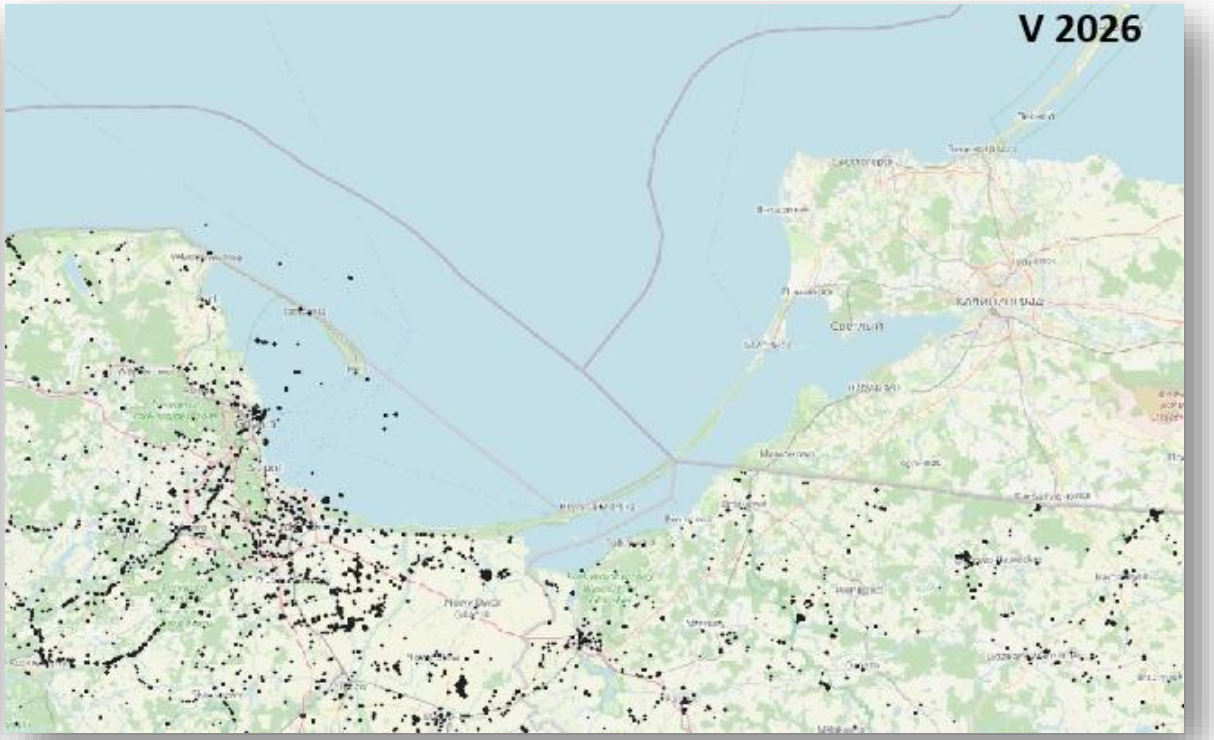




Źródło: Google Maps

GNSS Interferences

- April 2026: Spoofing- A comparison of users' positions from April and May indicates that there were no cases of spoofing on such a scale in May.

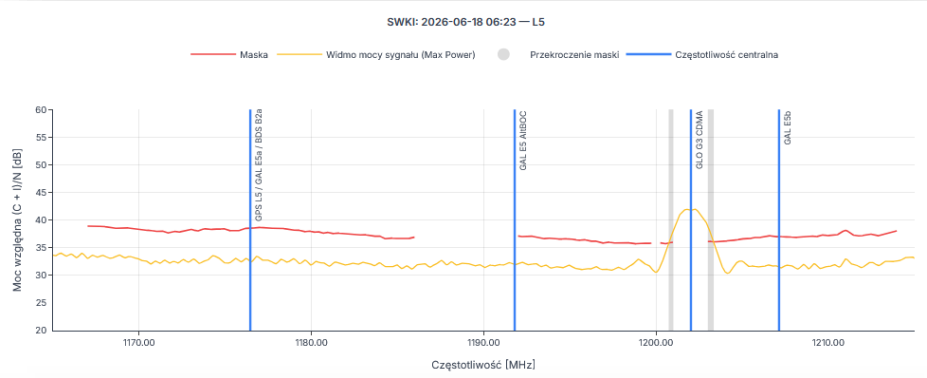


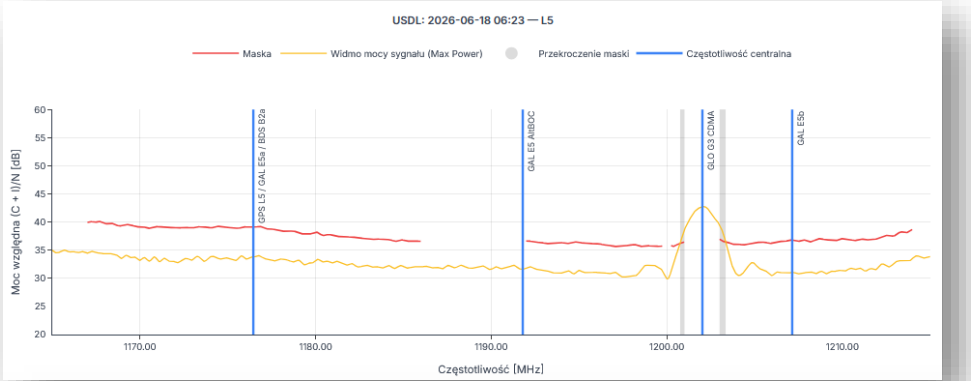
Źródło: Google Maps

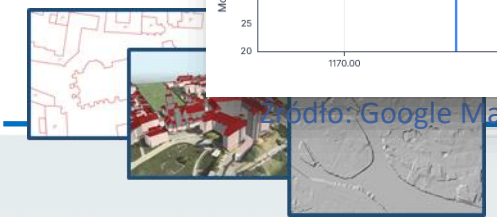
GNSS Interferences

Disruptions at all stations (18.06.2026)

All stations in the RTGMS system were subject to identical interference at the same time







Źródło: Google Maps

Real Time GNSS Monitoring System for Poland

In cooperation with National Institute of Telecommunication application to ESA – NAVISP programme for monitoring of GNSS signals interferences.

Pilot coverage for most affected region northern-east part of Poland.

In case of interference system is sending alerts to registered users.

Project has started in Nov 2024 and was finished in May 2026.

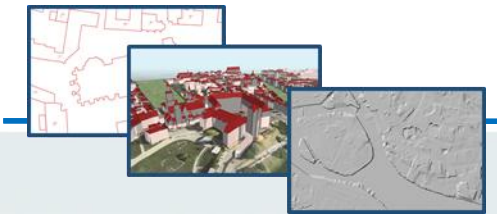
Budget is 305 000 EUR

RTGMS

038 - REAL-TIME GNSS MONITORING SYSTEM FOR POLAND (RTGMS)

Status: On Going
Activity Code: NAVISP-EL3-038
Start date: 21/10/2024
Duration: 18 Months

Reliable and uninterrupted access to satellite navigation data is nowadays a key element for various branches of economy, security and safety. At the same time, GNSS systems are not 100% reliable and the issue of interference (both unintentional and intentional) affecting their operation is becoming more and more significant – especially in current geo-political situation. That is why a constant monitoring of GNSS signals and detection of interference is so important.

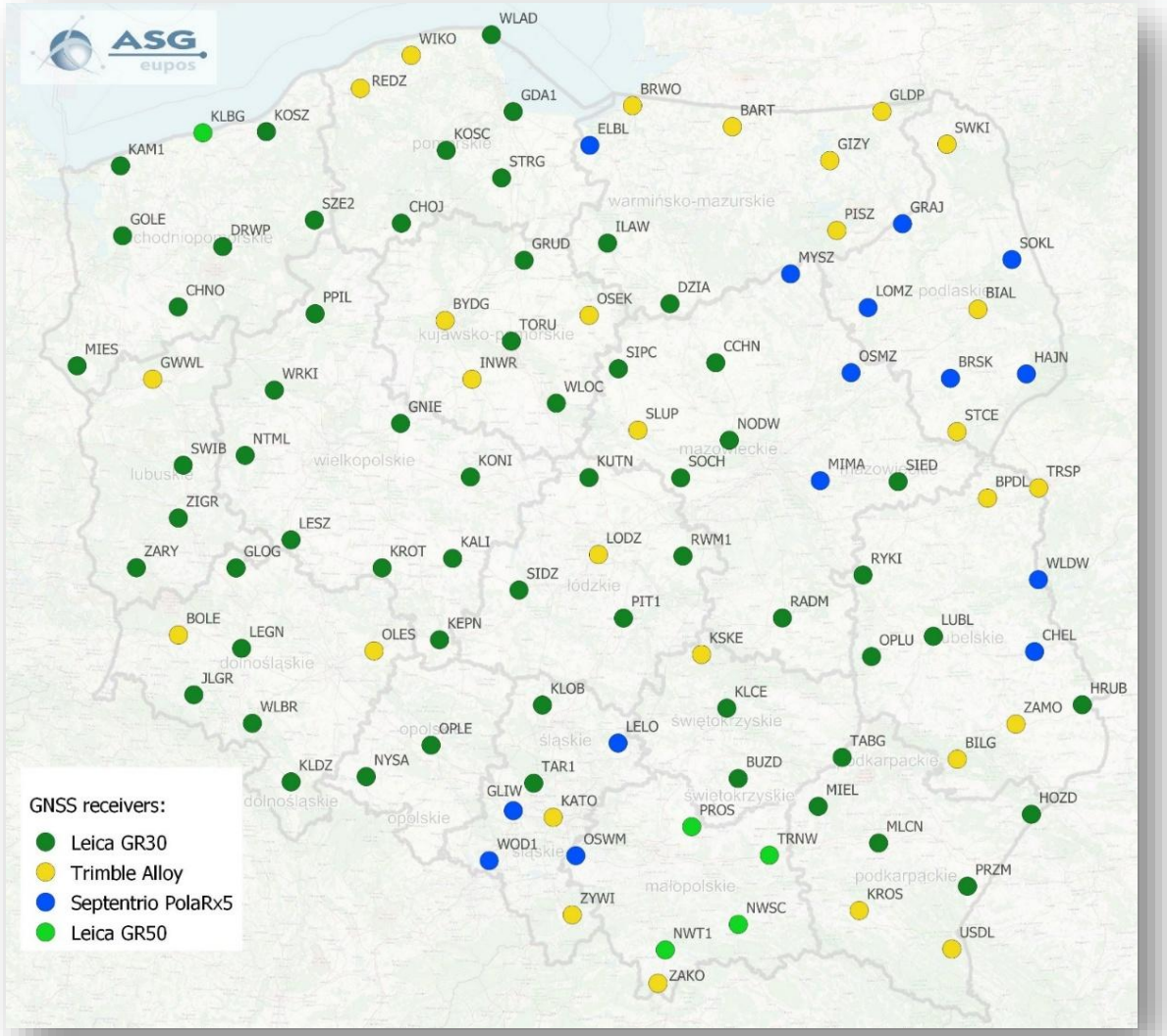


RTGMS system

Receivers on GUGiK's stations:

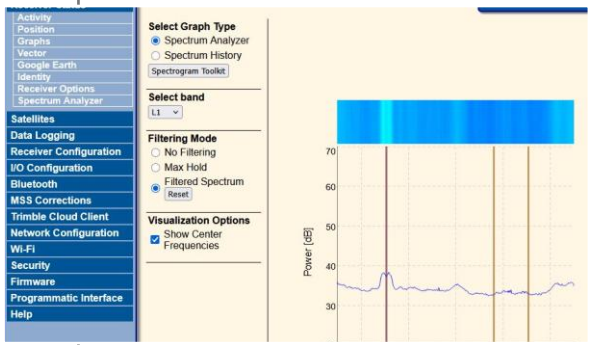
- Trimble Alloy (28)
- Leica GR30/GR50 (65)
- Septentrio PolaRx5 (18)

On the most important locations Trimble Alloy receivers are installed.



RTGMS system

Trimble Alloy

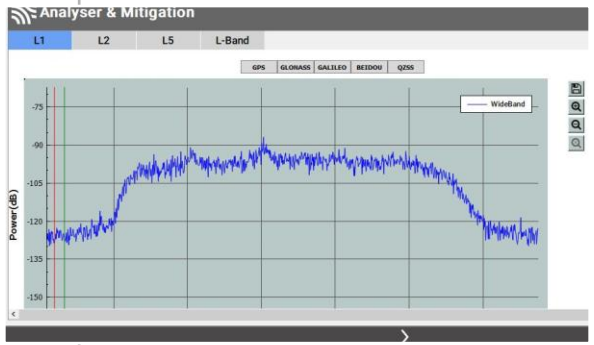


Spectral analysis on the receiver side

Access to archival data

Remote access to spectral data

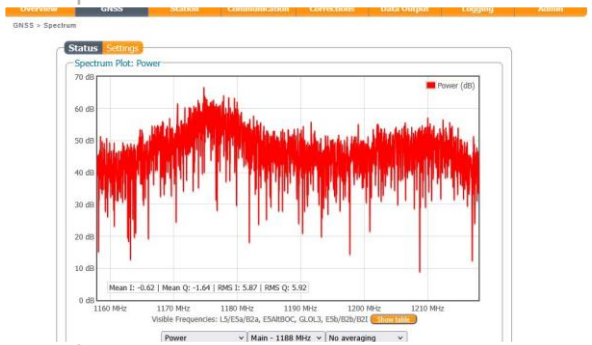
Leica GR30/GR50



Spectral analysis remotely in dedicated software

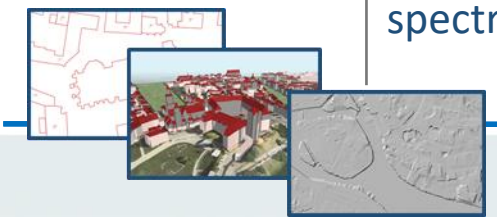
The data stream documentation is not publicly available

Septentrio PolaRx5



Real-time signal analysis on the receiver side or in remote software

Remote access to spectral data in a data stream



RTGMS system

System RTGMS is running at: https://rtgms.pl

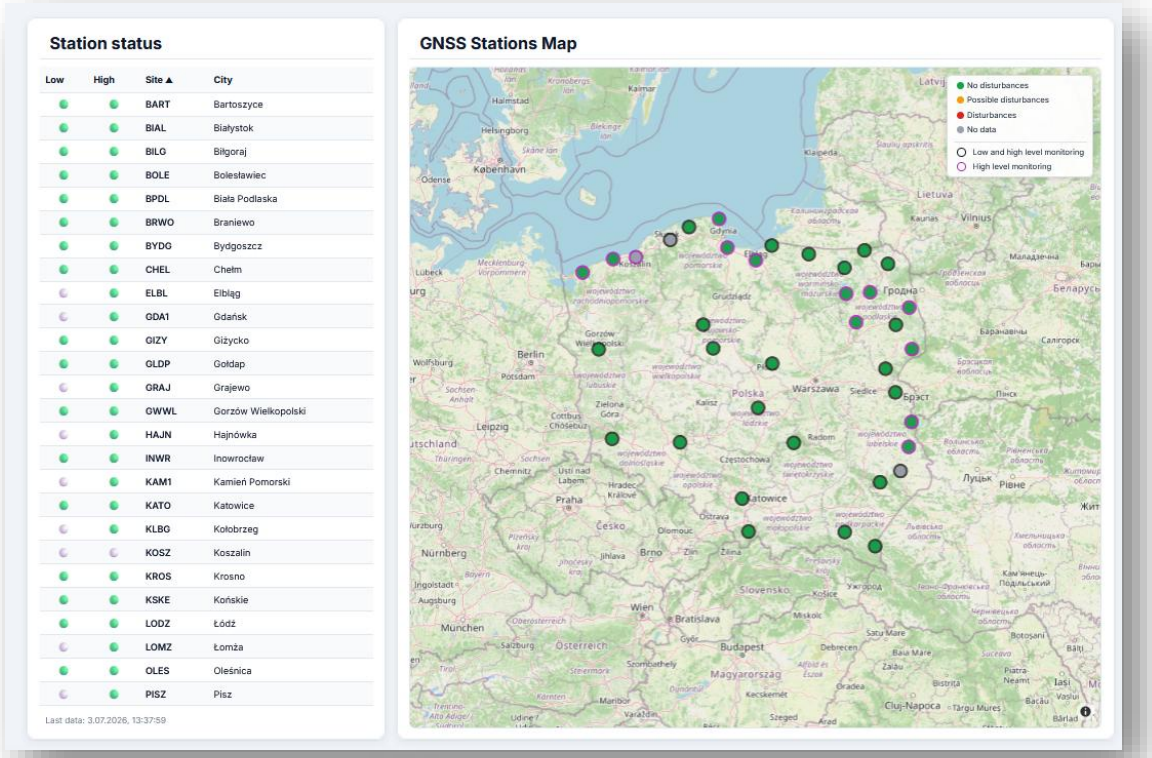
System was released on 25th of November 2025

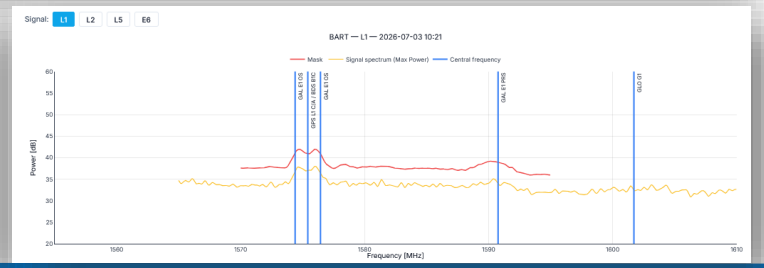
Three levels of monitoring are implemented.

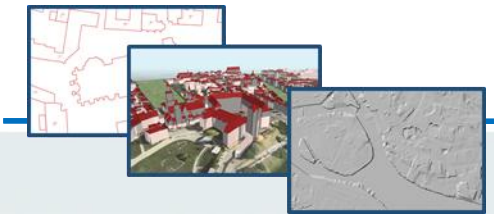
Web interface is simple and intuitive.

Colors are representing general status

For advanced users additional detailed information



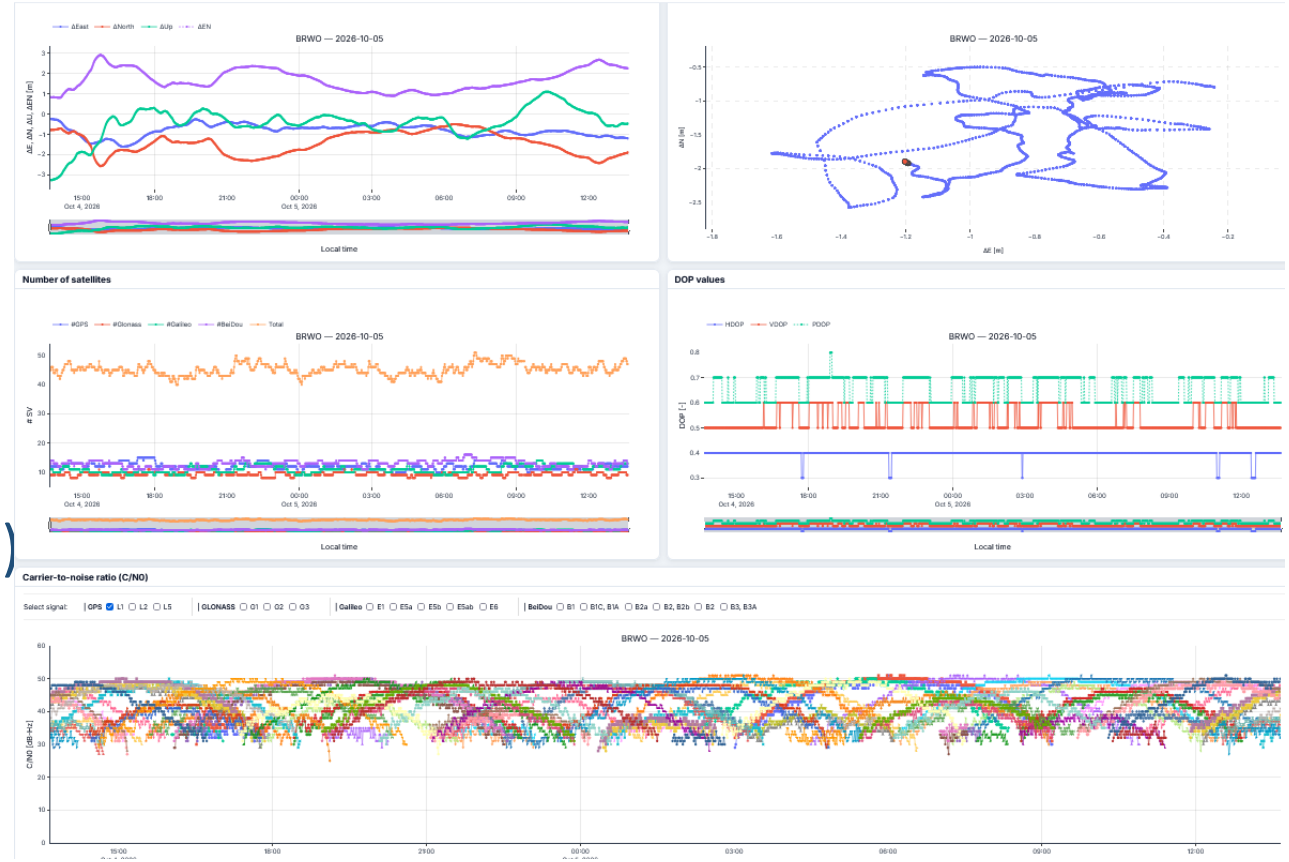


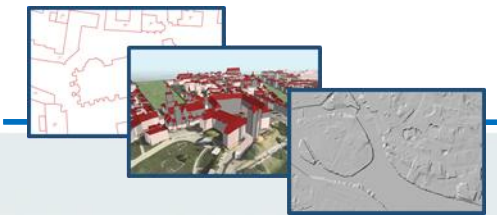


RTGMS – High level

Based on RTCM and NMEA streams, the quality of observation data and GNSS solutions is monitored in real time and presented in real-time

- Calculated GNSS position
- Number of satellites and DOP parameters
- Signal quality C/N0 (carrier-to-noise density)



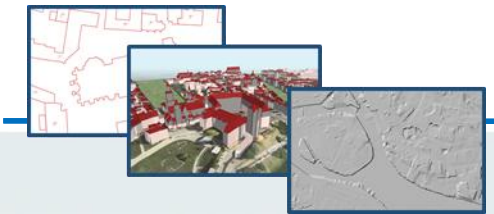


RTGMS – Medium level

Long term monitoring based on RINEX files analyzed in Anubis software.

Monitored parameters:

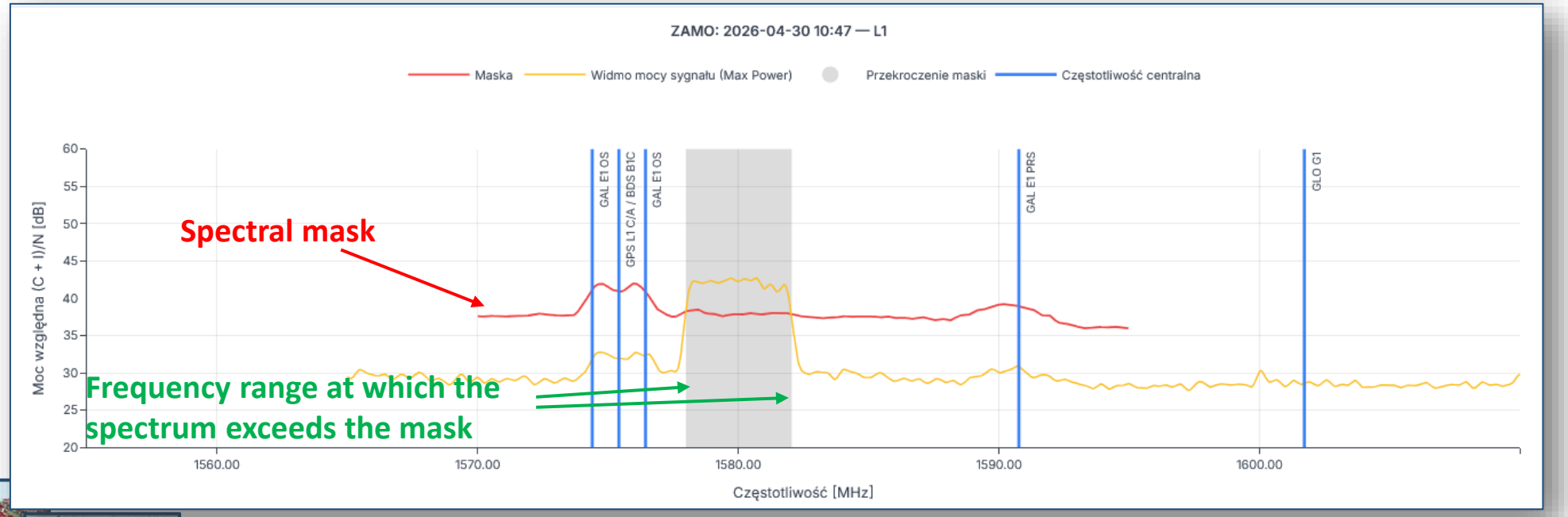
- Ratio observed to expected observations
- Number of cycle slips
- Number of missing epochs
- Signal multipath



RTGMS – Low level

For the purposes of the project, the Institute of Telecommunications developed a detection algorithm using spectral data obtained from GNSS receivers.

During the period of operation without interference, a spectral mask is determined to represent the normal operation of the receiver. Exceeding it may be marked as interference.



RTGMS – Low level

Based on the current data from the RTGMS detection algorithm, the status of individual monitoring stations is presented in color in the table and on the map view.

When you hover over a station, additional details about the interference are displayed.

Station status

DATA	STATUS	STATION	CITY
		BART	Bartoszyce
		BIAL	Białystok
		BILG	Biłgoraj
		BOLE	Bolesławiec
		BPDL	Biała Podlaska
		BRWO	Braniewo
		BYDG	Bydgoszcz
		GIZY	Giżycko
		GLDP	Gołdap
		GWWL	Gorzów Wielkopolski
		INWR	Inowrocław
		KATO	Katowice
		KROS	Krosno
		KSKE	Końskie
		LODZ	Łódź

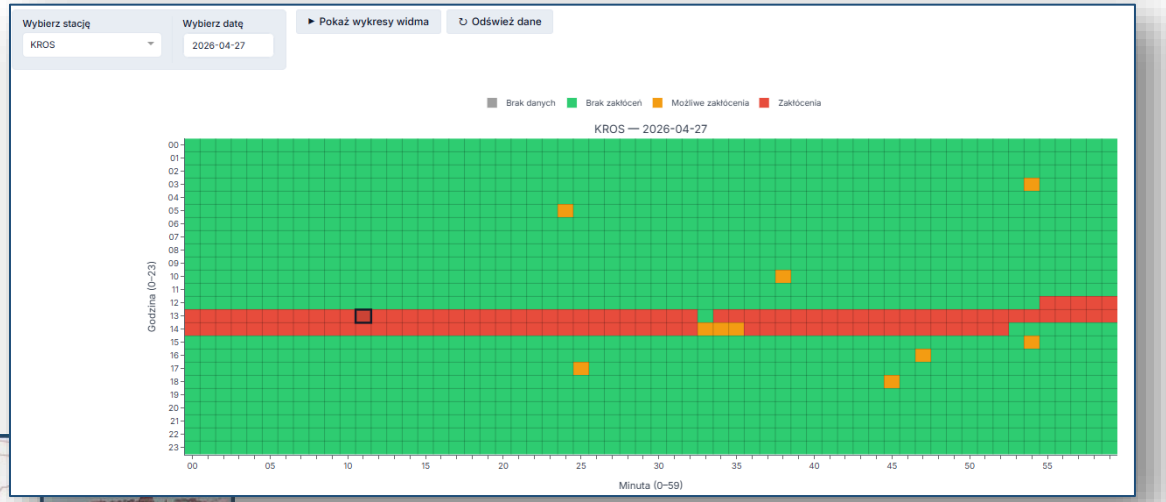
Last data: 2026-10-05 12:06:22

GNSS Stations Map

RTGMS – Low level

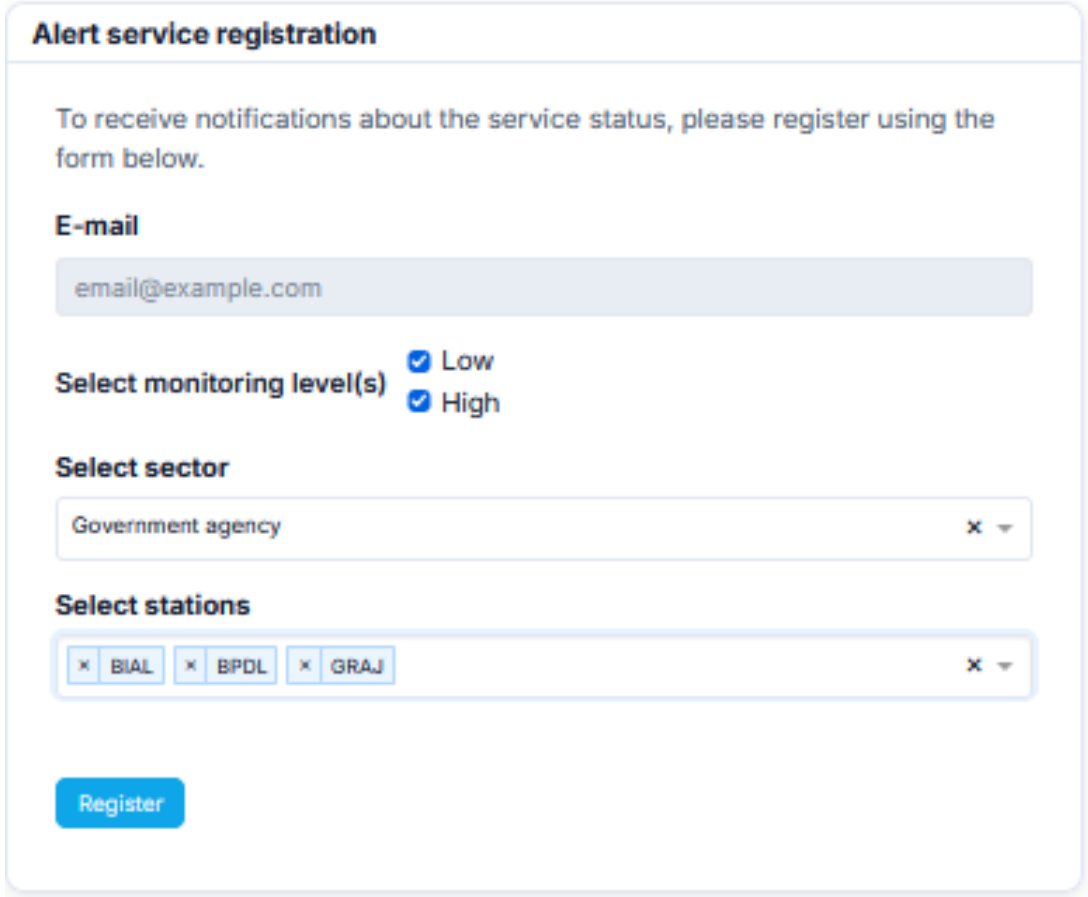
Further down the page, the user can select the station and the day and minute of the day, for which the power of signal graphs for the monitored bands L1, L2, L5, E6 are displayed.

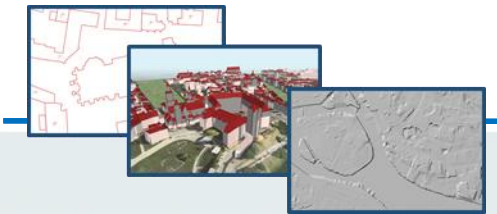
If an interference occurs, you can view detailed numerical information that describes the interference.



RTGMS system – Alerts

- A notification service has been launched, where the user receives email notifications about disruptions that have occurred in the last two hours.
- During registration, you should select the monitoring level and stations for which notifications will be sent.

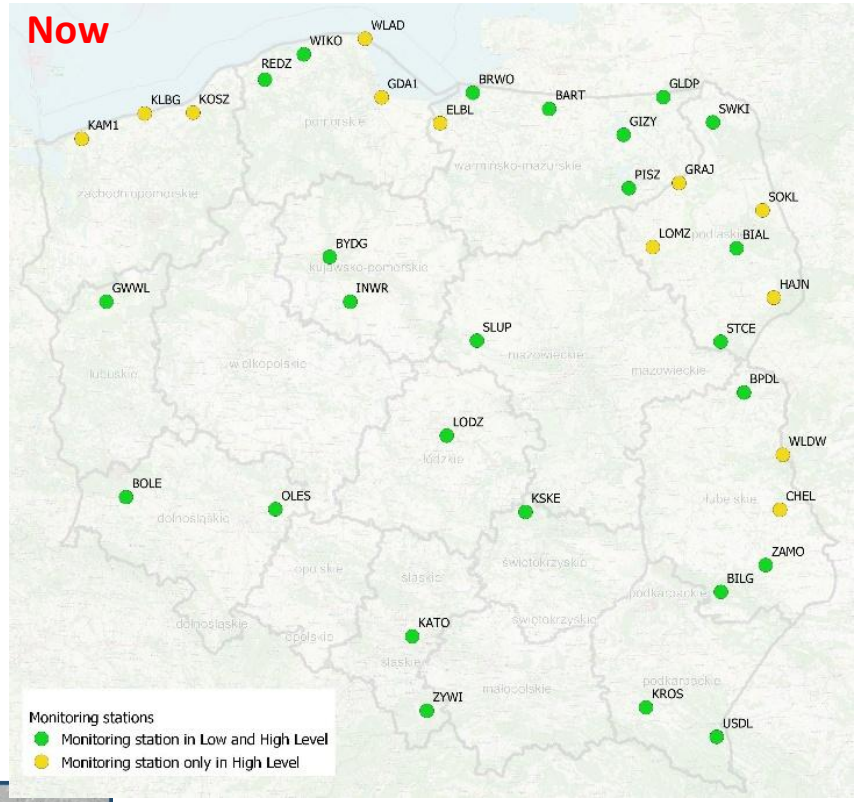


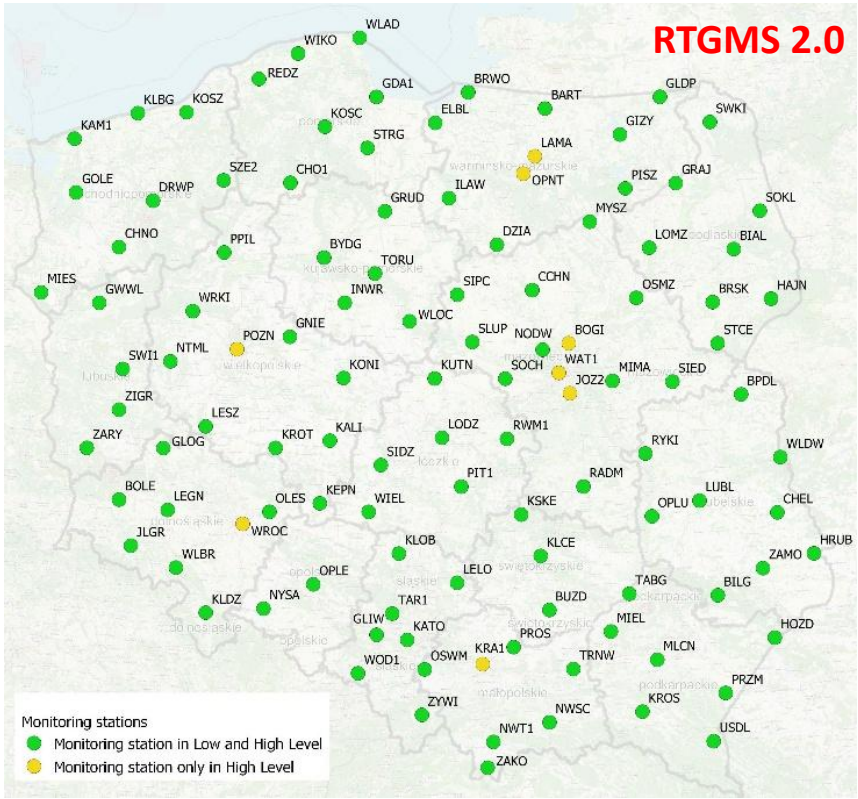


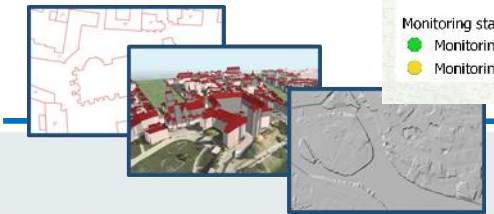
RTGMS system – to be continued…

We are appling to ESA for extension of RTGMS for next 2 years.

The coverage of the system will be expanded to whole Poland



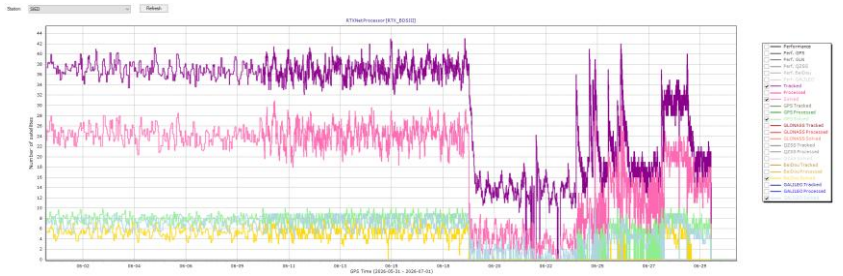


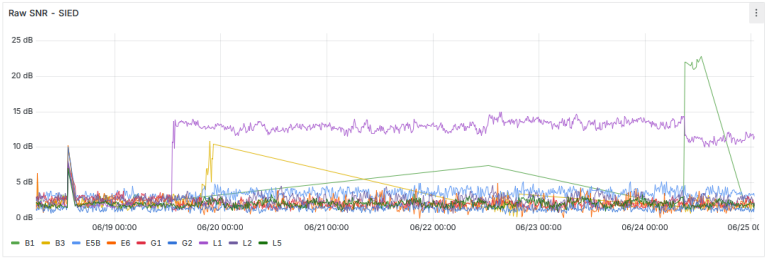


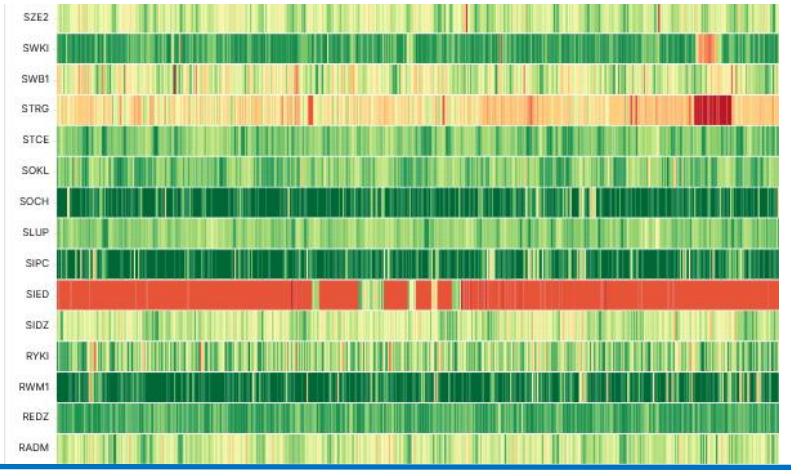
Additional activities

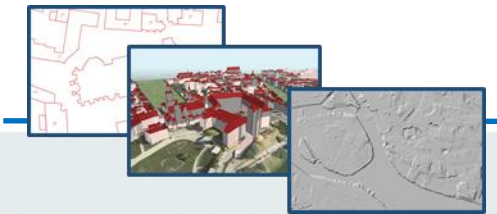
Testing and implementation of Trimble Jamming &Spoofing Portal.

- Best performance with Trimble Alloy receivers
- All receivers supported in 4xGNSS are also supported in J&S Portal in limited range
- Recommendation to check and test this module in TPP 5.3.





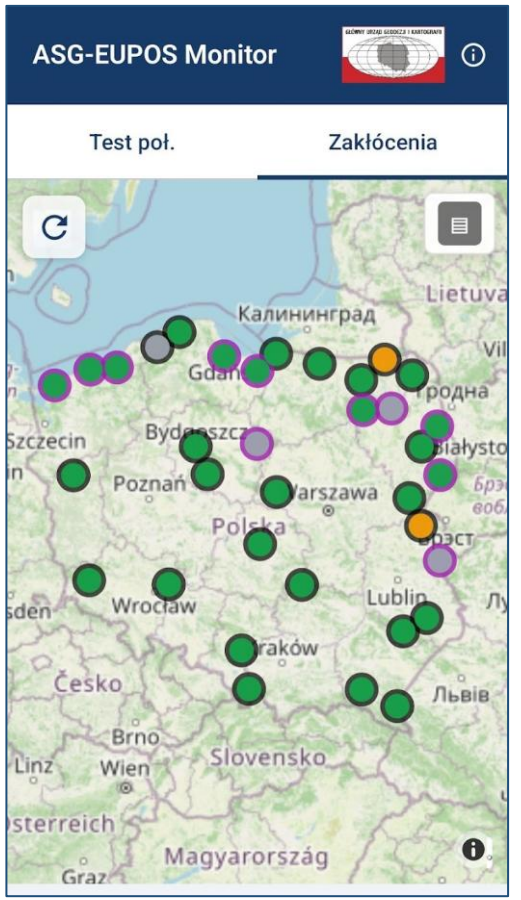


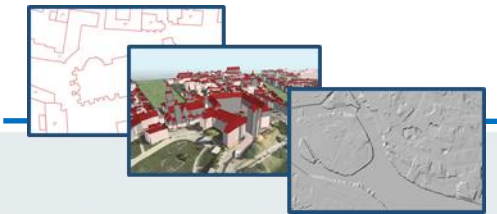


Additional activities

Application ASG-EUPOS Monitor for Android devices to independent check connection with RT services from ASG-EUPOS.

Basic status from RTGMS monitoring system

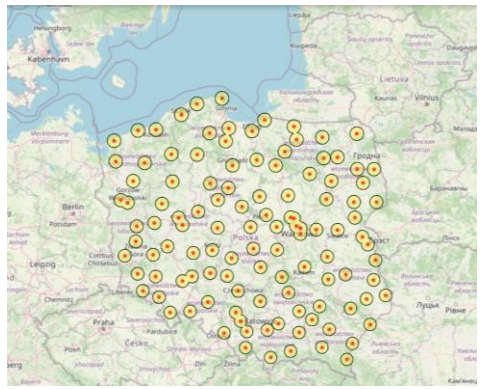




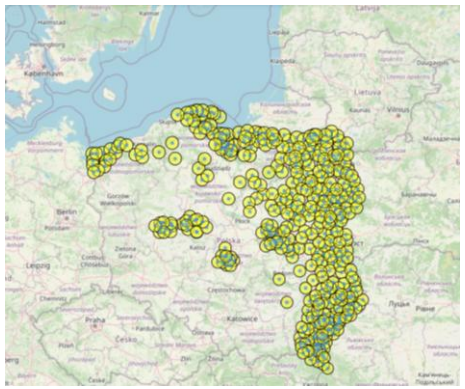
Project One PNT Module 1

Project together with Geospatial Intelligence and Satellite Services Agency is focused on integration existing monitoring systems and sensors into one system to give whole overview about GNSS systems:

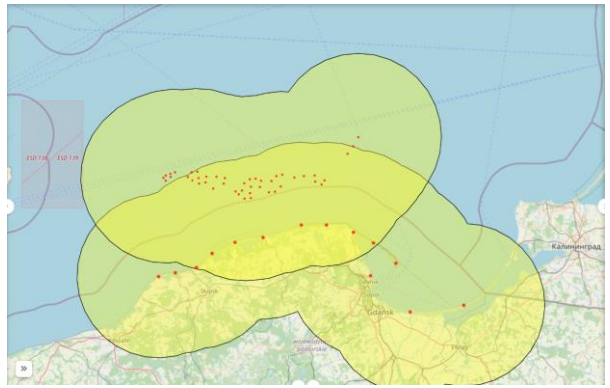
- Monitoring of constelations
- Monitoring of propagation conditions (ionosphere, troposphere, CME, etc.)
- Monitoring of received signals
- Monitoring of results from measurements (coordinates, accuracy, etc.)



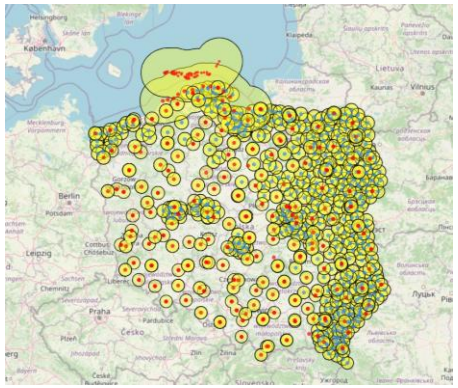
ASG-EUPOS/RTGMS



SMZSG - POLSA

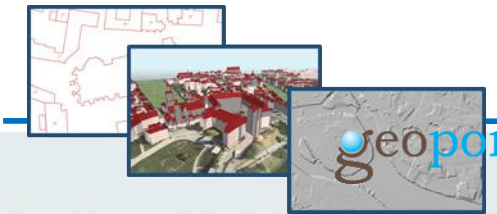


SOUKG - MON



Integration

geoportal.gov.pl

Thank you

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