



GNSS Signal Monitoring Solution for aviation: an opportunity for Ukrainian airports



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In the last decade, Global Navigation Satellite Systems (GNSS) have gained an important position within our daily life, often hidden from plain sight. The fact that GNSS is not only used for positioning but also for timing, synchronization of GSM networks, electricity management or bank transfers is not commonly known. Furthermore, a combination of GNSS and Satellite Based Augmentation Systems (SBAS) like EGNOS (European GNSS Overlay Service), is already used for different GNSS applications.

While the technology gets more and more important to our society, the interest of malicious subjects in harming this technology also increases. The threat is real.

Did you know that...

- Taiwanese researchers detected an average of 117 Jamming incidents per day at Kaohsiung Airport?
- The financial industry relies on GNSS timing and spoofed GNSS signals can be used for financial fraud?
- A personal privacy device (GNSS Jammer) is available on the Internet for below 50€?
- GNSS plays a major role in generation transmission systems in the energy sector?
- A GNSS Jammer has been detected during the first hour of a field tests near Graz, Austria?
- **Such incidents can be detected and localized?**

GNSS SIGNAL MONITORING SOLUTIONS

A GNSS jammer is transmitting a noise-like signal that aims to overpower the GNSS signals and thus prevents normal operation of the receiver.

As shown in the figure below, the basic system architecture of the **interference monitoring solution** consisting of three or more interference monitoring modules (IM) and a control centre. The system is using multiple algorithms for detection, classification and localization of interferers including pre- and post-correlation methods to ensure reliable detection.

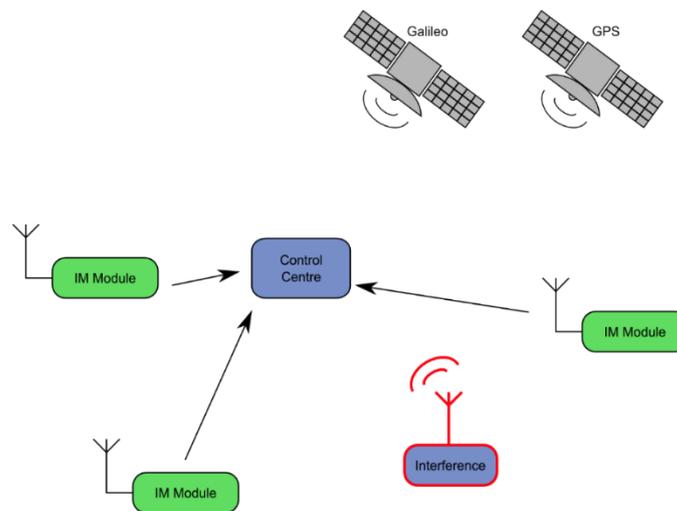


Figure 1- Signal Monitoring Solution

Using the self-developed software-defined radio (SDR) GNSS receiver as basic framework for the interference monitoring solution has the advantage of great flexibility concerning the tracked signals and applied monitoring algorithms. All system parameters can easily be adopted to the user needs.

BENEFITS DERIVING FROM GNSS INTERFERENCE MONITORING SOLUTIONS FOR AVIATION

The use of interference monitoring solutions such as the one developed by UKRAINE partner [TeleConsult Austria](#) can provide significant technical and operative advantages to the aviation industry, among which:

- Permanent monitoring of the GNSS signals
- Cost-effective and flexible solution: software-based signal processing can easily be adopted to the individual user needs
- Easy to integrate into existing solutions
- Precise (typically <10m) and reliable detection and localization of interferers
- Real-time localisation of interferences and processing
- Low hardware costs
- All major types of interference (AM, FM, CW, SCW, etc.) can be detected and classified
- Classification regarding signal period, bandwidth, power, pulse duration
- Further analyses can be conducted in post processing
- Jammer database for interference recognition

STATE OF THE ART IN UKRAINE

Following the analysis of the potential Ukrainian airports that could benefit from EGNOS procedures, within the UKRAINE research project, TeleConsult Austria performed an interference analysis at Zhuliany airport, one of the most suitable aerodrome for the implementation of EGNOS-based procedures. These are the key results:

- Several interference incidents, unintentional (out-of-band emission, satellite/airport equipment testing, obstruction or destructive interference) and intentional (e.g. jamming) have been detected
- Long-term test installation of GNSS interference monitoring system showed high quality of implemented algorithms
- Test results show that the monitored region suffers from significant interference in the GNSS L1/E1 frequency band
- Less interference incidents compared to other regions (e.g. highways) due to controlled environment
- Further activities necessary to pinpoint sources of interference (longer testing period, different locations, etc.)

The analysis performed so far confirms the utility of signal monitoring solutions, since several interferences have been successfully detected. In order to intervene and mitigate those signal issues, the close collaboration between TeleConsult Austria and Zhuliany airport is willing to continue, in order to pave the way for EGNOS-based approach procedure adoption in Ukraine.