

The danger lurks in bluetooth beacons and in WiFi

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// Spectrum as valuable infrastructure

Are you sure you know all the wireless systems and services operating at your airport?

Airports have to efficiently manage the use of ground-based radio spectrum. From mobile networks and WiFi serving passengers, to wireless applications linked to ATC, public safety, logistics and other services at the airport - all wireless operational communication systems have to function smoothly without interference. More and more frequencies are needed to cover the increasing number of wireless applications that is why existing frequencies have to be managed with greatest efficiency. The arrival of 5G adds to this challenge, but also brings opportunities for new radio-based services at airports.

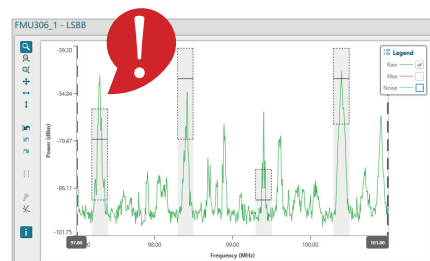
We have heard about power outages at airports and its consequences. The failure of radio coverage can have similar devastating consequences for airport operations. Those responsible for frequency management and radio coverage at airports are faced with the questions „how can I best protect and manage the radio spectrum around my airport? How do I guarantee reliable, highly available, safe, and cost-efficient radio coverage in a demanding environment? In addition, how can I develop more wireless services without causing interference to existing systems? ”

Reliable and safe radio coverage at airports - What are the prerequisites?

Continuous spectrum monitoring as an early warning system

Radio interferences often occur temporarily – for example, a taxi approaching the airport with a GPS jammer to avoid being tracked, or a landing aircraft with a malfunctioning radio device on board – and once the interference is gone, what can you do?

Immediate detection and action is possible, with a continuous radio monitoring and network control system. A “preventive radio network protection system” functions rather like a smoke detector. In the event of defined deviations from the normal network status, the system automatically generates real-time alerts in form of e-mails or text messages and sends them to the monitoring or network surveillance center, via radio or VPN connection. The system operator can analyze these messages by logging into the central control system. Any temporary sources of interference, i.e. deliberate interference and other deviations from the normal network status can be detected promptly and appropriate measures initiated.



Automatic Violation Detection

The LS OBSERVER system from LS telcom consists of various fixed, transportable, and portable measuring devices, which permanently record the radio frequency spectrum and send the measured data to a control center on demand.

Time	Task Name	Alarm #	Station	Start Frequency	Stop Frequency	Description
2018-05-15T14:03:53.900000-02:00	ATC	ATC214		120.81 MHz	120.83 MHz	Back to normal
2018-05-15T14:03:28.800000-02:00	ATC	ATC214		120.81 MHz	120.83 MHz	Level too high
2018-05-15T14:03:28.800000-02:00	ATC	ATC214		120.81 MHz	120.83 MHz	Back to normal
2018-05-15T14:05:17.740000-02:00	ATC					
2018-05-15T14:05:15.220000-02:00	ATC					
2018-05-15T14:06:15.840000-02:00	ATC					
2018-05-15T14:06:15.570000-02:00	ATC					
2018-05-15T14:06:15.300000-02:00	ATC					
2018-05-15T14:06:15.030000-02:00	ATC					
2018-05-15T14:06:14.760000-02:00	ATC					
2018-05-15T14:06:14.490000-02:00	ATC					
2018-05-15T14:06:14.220000-02:00	ATC					
2018-05-15T14:06:13.950000-02:00	ATC					
2018-05-15T14:06:13.680000-02:00	ATC					
2018-05-15T14:06:13.410000-02:00	ATC					
2018-05-15T14:06:13.140000-02:00	ATC					
2018-05-15T14:06:12.870000-02:00	ATC					
2018-05-15T14:06:12.600000-02:00	ATC					
2018-05-15T14:06:12.330000-02:00	ATC					
2018-05-15T14:06:12.060000-02:00	ATC					
2018-05-15T14:06:11.790000-02:00	ATC					
2018-05-15T14:06:11.520000-02:00	ATC					
2018-05-15T14:06:11.250000-02:00	ATC					
2018-05-15T14:06:10.980000-02:00	ATC					
2018-05-15T14:06:10.710000-02:00	ATC					
2018-05-15T14:06:10.440000-02:00	ATC					
2018-05-15T14:06:10.170000-02:00	ATC					

Automatic Violation Detection: Logs

Furthermore, LS telcom is quick on the trigger when sudden and serious interference or other radio anomalies occur. If the radio environment

...continued from page 1

is unknown to the operator of a certain area, LS telcom can immediately locate and identify the source of interference onsite with the LS OBSERVER handheld measurement device.

Spectrum inventory and spectrum management

With the growing need for radio frequencies, due to the introduction of 5G, the Internet of Things and progressing digitalization, efficient frequency planning is becoming a priority for airport operations, too. Spectrum is becoming increasingly valuable and is part of the urgently needed infrastructure. Airport operators have to ensure safe and reliable communication everywhere around the airport, not least to offer better and more wireless-based services and end-user experience to passengers. At the same time, while frequency use is densifying, networks also become more prone to interference.

It needs efficient spectrum management and spectrum inventory to determine the current

and future demand for frequencies. A spectrum management system and frequency database support frequency allocation and guaranty interference-free, efficient, and safe frequency usage. Measurements initially help to validate current frequency use and the quality of data entered into the database. Should further radio services be added, future frequency requirements can be determined based on current use. When new radio services are put into operation, they can be validated via measurements and the database updated accordingly.

Besides offering integrated spectrum management systems, LS telcom offers spectrum management as a service. We start by evaluating your current and future frequency requirements, review your existing data, and then set up a complete frequency database, which will be integrated into a spectrum management system. We also support our customers in data migration and system hosting. We carry out an initial inventory by measuring the complete radio frequency environment to guarantee the

quality of the data, which will be entered into the frequency database. After commissioning the database and the spectrum management system, we process the frequency requests and manage existing licenses on behalf of our clients.

In addition, spectrum management software, measurement equipment, and complete systems can be purchased, borrowed, or leased from LS telcom. ■



Network Security: Avoiding interference between different wireless services

// Hackers at work

The danger lurks in bluetooth beacons and in WiFi

LS telcom fixes security flaws in radio connections at airports, railway stations and event locations

More and more service providers discover the benefits of beacons - transmitters that are used, for example, for targeted customer marketing and the transmission of data for statistical purposes. Can you imagine your data being hacked and passed on to criminal third parties when you draw your boarding pass, train ticket or admission ticket from a ticket machine?

LS telcom was recently commissioned to search for „unknown“, non-registered beacons that allowed access by hackers through unencrypted data transmission. LS telcom was able to locate and identify the beacons within a few hours with targeted measurements using their LS OBSERVER handheld measurement device, so that the illegal data transfer could quickly be stopped. Michael Braun,

Managing Director of LS telcom's subsidiary Vision2comm, explains, „We were able to apply exclusion procedures to quickly identify the beacons, which were not registered and which presented security holes, since the location of other emitters in the area under investigation were known.“ Airport and train station operators as well as event location managers are responsible for security gaps in their WiFi, Bluetooth and other radio systems. „Often they are not even aware of all the radio installations that are operating on their premises,“ according to Michael Braun.

LS telcom has the necessary expertise and experience as well as the measuring equipment and analysis software to locate interference, illegal transmitters and transmitters impairing safety. „We cannot only quickly



locate unknown and illegal interferers when required. We also act preventively, i.e. we ensure that the radio environment of e.g. airports, train stations and other public places functions smoothly. We identify and register all radio systems and operators. Sudden radio interference and other anomalies that deviate from the 'normal' frequency environment can be detected immediately for the operator to receive an instant email or other alert. We clearly see that long-term measurement and registration is becoming a trend“, concludes Michael Braun. ■

// Airport Frankfurt

Optimization of Frankfurt Airport TETRA network

As part of the TETRA network optimization at Frankfurt Airport, Fraport AG, a leading international airport group and operator of Frankfurt Airport, commissioned LS telcom to carry out coverage measurements and assist with the frequency license application. The optimization study was based on

the previous radio coverage at the airport, as measured by LS telcom and analyzed together with the experts of Fraport AG. In order to obtain the desired coverage results, existing omni-antennas had to be replaced by sector antennas at different base station locations. After the antenna replacement, the new radio

coverage was documented and evaluated, and the new sectorized antenna configuration was adjusted to achieve final optimization and the required coverage. LS telcom also supported Fraport AG in drawing up the frequency application, including procedures and technical documents. ■

Ready for take-off with a modern spectrum management system at Amsterdam Airport Schiphol

Efficient radio spectrum management is one of the essential components for the successful operation of an airport. It ensures a safe, interference- and incident-free radio environment at the airport while providing enough radio frequencies for all the radio networks, services and applications required at the airport. It is Ether Control Schiphol (ECS) of Royal Schiphol Group, which is tasked with the management of frequencies at Amsterdam Airport Schiphol. ECS has recently invested in a modern spectrum management system from LS telcom to meet the growing demand from all customers for wireless air and ground communication at Amsterdam Airport Schiphol. Willem Blom, senior service coordinator of Royal Schiphol

Group, said: "Mobile communications play an increasingly important role and help optimize the efficiency of services and processes. To meet the growing frequency demand, we have sought professional advice from LS telcom and have asked them to implement an automated spectrum management system for us." LS telcom together with ECS developed a general licensing framework and a system design concept for spectrum management. All legacy data was migrated to a frequency database, which was integrated into a spectrum management system. The quality of the database was validated through on-site measurements. LS telcom now manages the entire licensing process for ECS, from receiving licence applications to technical

analysis and issuing of the licence. LS telcom's experts carry out measurements to validate the interference-free operation of wireless systems and networks, and deal with sudden interference and other incidents and system anomalies as and when they occur.



LS telcom determines radio network coverage at Karlsruhe/Baden-Baden Airport (FKB)

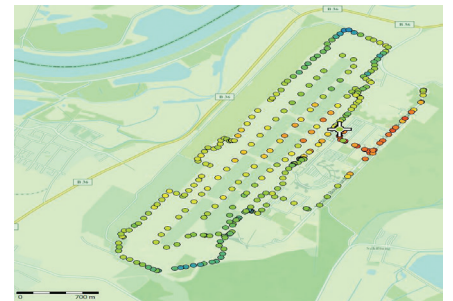
The operator of Karlsruhe/Baden-Baden Airport (FKB), BadenAirpark GmbH, commissioned LS telcom to carry out coverage measurements in the security and outdoor areas of the airport and in the office park. The aim was to achieve optimal network coverage providing maximum data rates on all the premises of Baden-Airpark, supplied by the GSM operator.

evaluation and results was presented using the LS OBSERVER Central Monitoring and Analysis Software. Based on the measurement results, the airport operator decides on the appropriate network provider. The measurements also help to evaluate other radio services, as and if needed, without having to repeat the drive test measurements.

a clear decision within two weeks and act quickly to optimize coverage of the mobile network at the Baden-Airpark site."

LS telcom performed the measurements with LS OBSERVER measurement units. The complete documentation, including measurement

Mario Seidenberg, Technical Manager at Baden-Airpark GmbH confirmed, "We are very satisfied with the measurements. Thanks to the precise results, we were able to make

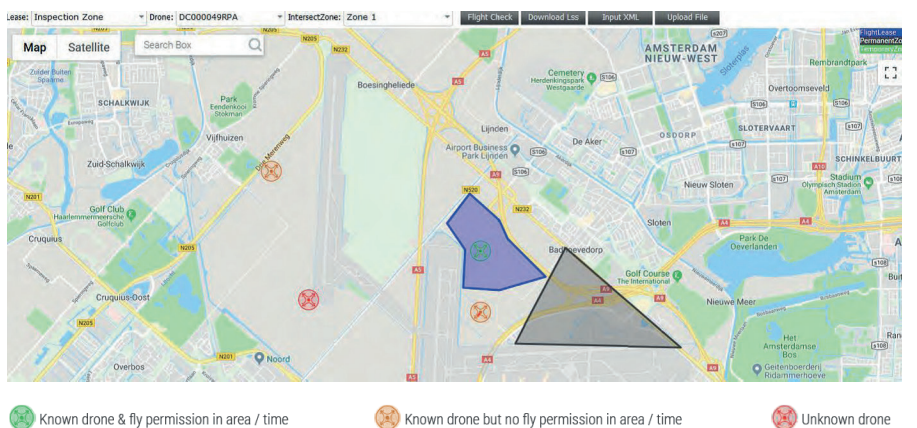


Drone-Flight-Check to manage and control commercial use of drones at airports

Airport operators can ensure safe use of drones for commercial purposes or ILS measurements with the Drone-Flight-Check System by LS telcom. The system consists of four parts: drone and user registration in a database, the no-fly zones database, flight permission management and drone traceability via radar. The key of the system is that drone pilots can register themselves and their drones and can then enter a flight lease request for a certain area and time. Based on the no-fly zones database, flight permission is granted or refused. The system operator can define no-fly zones, restricted no-fly zones and temporary no-fly zones. Flying drones can be traced based on radio frequency identification and the connection to an external drone radar

system. The operator can distinguish between identified drones with flight permission, identi-

fied drones without flight permission as well as unknown drones.



// Drones can collide with planes? Why drones at airports can be extremely useful...

Drones open a new era in inspection of NavAids and Radar systems

LS telcom's Colibrex together with FCS Flight Calibration Services have developed a drone-based system for navigational aid (NavAids) and radar systems' inspections. The NavAidDrone performs ILS localizer (LOC) and glide path (GP) measurements. The system is currently tested at different airports in Europe and is commercially available within this year. VOR and GBAS measurements will also be possible without hardware changes.

Luc Haeberlé, Managing Director of Colibrex, illustrates the new opportunities for NavAids measurements brought by the drone-based system, and explains why the airborne platform is advantageous compared to traditional measurement methods.

What does the drone-based NavAids measurement system consist of exactly?

Luc Haeberlé: The NavAidDrone is not just a drone equipped with a measurement receiver, as are some concepts announced or available on the market. The NavAidDrone is a fully integrated system with specifically designed components and software. The relatively small "X8" multi-copter with 4x2 motors and a robust frame integrates a shielded compartment to house the extremely light FCS receiver for very innovative measurement processes. The platform also houses a high-end RTK GPS receiver, other sensors and key components dedicated to flight stability and safety, and the measuring antennas, which have been designed, based on a numeric simulation of the complete system. The system unites the flight inspection, receiving and processing expertise of FCS Flight Calibration Services and Colibrex's expertise in the design and international commercial operation of unmanned aircraft systems for radio frequency measurements. The technology has been designed in cooperation with and approved by PTB, the National Metrology Institute of Germany, and Germany's highest authority for reliable measurements.

Who will benefit from the system?

Luc Haeberlé: NavAidDrone will support NavAids system manufacturers and installation companies as well as CNS (communication, navigation, surveillance) operation and maintenance service engineers from Air Navigation Service Providers around the world.

What are the advantages of the NavAidDrone for ILS measurements?

Luc Haeberlé: In a nutshell, the NavAidDrone improves measurement results and is extremely time- and cost efficient compared to conventional measurement techniques. Every CNS engineer inspecting the glide path knows about the deficiency of the traditional methodology using a telescopic mast: the limited height of the measuring antenna allows near field measurements only, and wider-angle measurements are not possible. With the NavAidDrone, the measurement can be made at the middle marker, where a fully established signal-in-space in the 3° approach path is available. The drone measurement captures the real signal in the far field, which is usually carried out by plane before the inspection flight for the final certificate. The NavAidDrone measurements can partially replace the measurements by plane after the antenna installation, to indicate potential adjustment to be made to the antenna before the final inspection and certificate flight. The flight inspection will only be needed for the official proof of performance on a system already well adjusted. Besides the cost reduction, imagine how this will accelerate the commissioning of a new GP installation, with extra measurement flights always difficult to schedule at a busy airport!



When it comes to regular inspection of the ILS, the drone-based measurement will significantly contribute to obtain correlation data with the ultimate objective to extend ILS flight inspection intervals, following the recommendations from ICAO. The same advantages as for the glide path hold for localizer measurements. The drone can fly programmed orbit paths, so there is no need for service roads as for vehicle measurements. The drone measurement system can also detect high frequency oscillations of ILS signals caused by buildings, cranes or other construction work obstacles.

Finally, we shall mention the possibility to conduct "slope flights" within a partial ILS approach path which enable us to measure the course alignment of both the localizer and glide path signals together, in a process comparable to flight inspection.

Can you use the drone for other applications around the airport apart from NavAids measurements?

Luc Haeberlé: Beyond, applications in the navigation domain, measurement drones can be used in air traffic control for monitoring the critical 1030/1090 MHz channel shared by today's surveillance systems, i.e. radar, multilateration and ADS-B. EU Regulation No 1207/2011 requires the member states by June 2020 to assure that SSR transponders are not subject to excessive interrogations. Validation tests to measure these interrogations can be performed at SSR hotspots using the RadarDrone.

We have already carried out test measurements using the RadarDrone in Germany and the industrialized "RadarDrone" solution should be available by the end of 2019. ■

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