SPECTRUM 2019

Customer Magazine - Special Edition Military

LS telcom
Smart Spectrum Solutions

Global Spectrum Experience

// Colibrex

Unmanned aircraft spectrum surveillance for military, defense and security missions as well as homeland security

Monitoring sensors are available in different kinds of formats, from fixed, over mobile to portable. But what if drive tests cannot be conducted and suitable monitoring locations are not accessible? LS telcom's Colibrex has introduced a new unmanned aircraft system for monitoring. Drones equipped with sensor units can be deployed ad hoc in the sky, exactly where you need them. In-the-air drone monitoring brings many new monitoring capabilities and benefits. A monitoring antenna at an altitude of 100 m i.e. allows the identification of radio frequency signals that may not be detectable at ground level or even at the top of a building. During tests, the drone-monitoring unit detected more emissions than the ground measurement. Frequency monitoring by drone from high altitudes, compared to monitoring by an antenna placed on a mast (on a vehicle for example) of 7-12 m height, naturally enlarges the capture area. In addition, ground reflections can be avoided or reduced and results are thus much more accurate.

The monitoring drone observes the entire RF spectrum to detect suspicious or enemy radio frequency activity, potential threats and unwanted emissions. It can be equipped with an AoA (Angle of Arrival) antenna for direction finding. The tethered drone is also fitted with a stable downlink communication via Ethernet cable. Applications of the tethered drone monitoring solution are various: to protect large industrial areas, major events, national borders, areas of operations and other sensitive sites. It also serves SIGINT operations.

// Protected Portable Unit

Monitoring in inaccessible terrain with the Protected Portable Unit

The Protected Portable Unit (PPU) is used for field operations under rough conditions (Protection grade of IP 67). It consists of an integrated monitoring receiver, an embedded computer, data storage capacity, GPS, interfaces for network connection as well as batteries. The unit can be used as a portable device, or can alternatively be carried and left in difficult and pathless terrain inaccessible by vehicle for standalone measurements run on battery power (for up to 4 hours). The unit can also be used for long-term measurements, in which case it requires line power.

The PPU offers a wide range of features such as monitoring, DF, TDoA geolocation (in combination with two other TDoA capable devices), PDoA geolocation (sequential or in combination with two other PDoA capable devices), demodulation, signal measurements and analysis.

Detect and locate hostile emitters when they are not emitting!

For tactical mission planning you need a safe and reliable picture of your electromagnetic environment.

Conventional direction finding requires signals to be in the air to locate them "live". With DF Time Travel™, mission planners can now perform direction finding based on emissions in the past. DF Time Travel™ integrates with the LS OBSERVER monitoring system and includes an AoA antenna system. The system monitors, collects and stores all monitoring (frequency/level/time) information as well as direction finding data within the monitoring units for many months.

Monitoring operators simply enter the center frequency and the bandwidth of the signal to be located. The system will automatically search for emissions and locate them, providing the operator with the bearings calculated for different periods in the past.

This knowledge base will help estimating possible enemy positions; it can be cross-checked with other intelligence data and contributes to the intelligence collection. It also helps to better target future direction finding exercises in the area of operation. ■

Spectrum surveillance and full control of the electromagnetic spectrum for wide-area monitoring, border control and critical sites' protection

Spectrum control and surveillance are indispensable for the success of military operations and the security of military and mission critical sites. The distributed spectrum monitoring system LS OBSERVER monitors spectrum along land, sea, and air borders as well as in areas of responsibility (AOR), areas of operations (AOO), areas of interest (AOI) requiring considerably less manpower than legacy systems.

Mr. Wayne Seal served within the British military for 22 years working within the Electronic Warfare and Intelligence branches. On completion of his military career, he undertook a lead role in the training of NATO Forces in detecting and countering of hostile communications and radar emissions whilst at NATO JEWCS. He now holds the position of Military Consultant Naval and Land systems at LS telcom UK. He explains how the next generation spectrum monitoring system LS OBSERVER works and how it is used.

Can you describe and explain the LS OBSERVER system?

LS OBSERVER is a distributed RF monitoring system. It consists of a central control unit, software for detailed surveillance data analysis, and various remote measurement units (RMUs) that spread over the area under interest.

Typically, for continuous spectrum monitoring, you install fixed stations along borders, around military base camps, or at critical sites that need special protection.

For tactical ad hoc surveillance and special events protection, there are mobile, transportable, portable, handheld, and airborne monitoring devices available. All devices function in stand-alone mode or in combination with other sensors make up an integrated monitoring system.

In a nutshell – what does the system do?

LS OBSERVER monitors the complete frequency spectrum continuously. The system automatically compresses and stores all data on a permanent basis in the remote monitoring units (RMUs). This way you draw a detailed picture of common frequency occupancy and usage in the area of operation. Let's take the example of a border. Should the system detect any new, unusual, or unknown signals, from illegal radios, cell phones, and other transmitting devices, it will trigger an alarm. The border guard can then identify and locate the signal.

How can the border guard find the exact location of the transmitting device?

The border guard uses LS OBSERVER with integrated geolocation and direction finding functionality, such as Time Difference of Arrival (TDoA), field strength or Angle of Arrival (AoA) to locate the source of illegal transmissions. The information can be correlated with other intelligence data, such as imagery and motion sensors. Mobile forces can then be sent to that location.

Can you cite more areas of applications?

The LS OBSERVER system is also used to obtain the complete picture of the electromagnetic environment and to create spectrum situational awareness in AOR or AOO, around military camps and other critical sites that need particular protection. The system detects and geolocates illegal and threat transmissions for immediate action.

With the monitored data stored in the LS OBSERVER remote sensors, armed forces can establish a database of real spectrum usage data, the optimal foundation for strategic spectrum planning and efficient and secure frequency allocation in the area of operations.

What is unique about LS OBSERVER?

The complete concept of LS OBSERVER is unique. The system does not only monitor the entire frequency spectrum, but also stores terabytes of data in the remote monitoring unit. Secondly, the unique integrated data mining, data analysis and data processing provides real spectrum intelligence and spectrum superiority to the forces. With indications and warnings (I&W), the system enables immediate reaction to threats and guarantees long-term security for the area of operations.

In combination with SpectrumMap (see page 4), the real spectrum data is displayed on a map in a fast, user-friendly way and is customized to users at any level of command.

How many monitoring stations are typically needed to cover a certain area?

The number of stations to be deployed depends on several factors, such as the length of the borderline or the area covered, the service or frequency as well as the bandwidth you want to measure. It also depends on the

Frequency range	Technology	Number of stations needed	Cell radius/ measurement area
VHF range 29 MHz	Push-talk-radios	3	90 km
UHF range 390 MHz	TETRA	7	45 km
UHF range 900 MHz	2G Mobile	22	13 km
UHF range 1950 MHz	3G Mobile	46	6,6 km

nature of the terrain, i.e. rural, hilly, or plain country. The table above demonstrates how many stations you will need for different use cases for a border length of 450 km.

Moreover, how do I know how many stations I need for my particular terrain?

Planning and optimizing a monitoring net-

work is a non-trivial task that needs to take into account several aspects from propagation, interference, receiver sensitivity, and desensitization, interconnection, power, terrain, site accessibility.

Our monitoring and system integration experts can help you with the planning of your monitoring network or the extension and optimization of your existing system. Our software considers existing sites and finds the optimal balance of reused sites, coverage and number of monitoring stations needed. ■

// LS OBSERVER PMU

Hunting for hostile transmitters with LS OBSERVER Portable Monitoring Unit PMU

The LS OBSERVER PMU is an integrated monitoring system for real-time monitoring of the spectrum environment.

It consists of a fully stand-alone RF surveillance system in a sealed enclosure (sensor unit) with data analysis software supplied on a tablet-PC for displaying results in real time. The PMU is highly practical for RF surveillance in a wide range of applications including at borders, airfields, HQ/FOB and areas of interest.

The tablet can be detached from the measurement unit and located on the carrying

straps of a standard day sack. This allows the operator to operate the system whilst dismounted. The sensor unit can be fitted into a suitably modified day sack while the operator follows the measurement results in real time on the tablet-PC.

The unit comes with a range of different receivers and antenna options including a handheld DF antenna and with bearing information being displayed on the tablet-PC. ■

Handheld DF   LS OBSERVER PMU

// Turnkey shelters

LS telcom builds tactical turnkey shelter monitoring solutions for EWOC and ESM

LS telcom builds turnkey shelters to host Electronic Warfare Operation Centers (EWOC), Electronic Support Measures (ESM) and other military monitoring applications.

This includes the integration of software and hardware as well as all other equipment necessary for full operational use of the units. Installed software is typically for monitoring and spectrum analysis, for network planning, map generation and conversion. A variety of omni and directional monitoring antennas can be mounted for various frequency ranges, in addition to direction finding antennas for HF, VHF & UHF.

Shelters are designed in-house with features offered in customizable packages, for example

UPS backup for mission critical systems to provide limited operational capability in the event of a main power failure.

We also integrate monitoring units into your existing monitoring system, into our own LS OBSERVER system and on whatever platform you need – on vehicles, naval units, aircraft and UAVs.

Each of the projects that LS telcom delivers has a team of ex-military personnel who have extensive knowledge in doctrine, planning

and operating military hardware. These are backed up by a highly skilled workforce of project managers, designers, engineers and support staff. ■

// WRC-19

LS telcom assists military organizations to be prepared for WRC-19 outcomes

Preparations for the WRC in November 2019 are well underway with some key agenda items focusing on a range of different bands for re-allocation to support the introduction of 5G.

A number of the frequency allocation changes are in the millimeter wave (mmWave bands) above 24 GHz in which both new mobile and International Mobile Telecommunications (IMT) allocations are proposed.

For the military, a detailed understanding of the new mobile system characteristics is

imperative to understand the potential impact it could cause in these mmWave bands and other bands to protect their own systems.

As a member of ITU, LS telcom follows closely many developments in the ITU working parties and task groups and can assist military organizations to prepare for WRC-19 outcomes.

LS telcom has long-standing experience in spectrum planning, capacity building as well as interference and coexistence studies, and has worked in numerous countries around the world. LS telcom also assists military organizations in identifying and evaluating incentives for spectrum sharing and exploiting technologies using underutilized spectrum. ■

UK Ministry of Defence uses LS telcom's spectrum management system SPECTRA through contract with CGI

The UK Ministry of Defence (MOD) uses LS telcom's SPECTRA spectrum management system as part of the MOD's contract with CGI. The extended, entirely integrated and interoperable spectrum management system enables spectrum managers to allocate and assign the electromagnetic spectrum more effectively. The process automation of the system secures and accelerates processes to improve decision-making, and is another contributor to more efficient spectrum use. This is essential with military spectrum becoming increasingly congested and contested. The SPECTRA spectrum management system is in use at the UK Spectrum Regulator Ofcom, and in over 100 countries around the world. The contract held with CGI will provide integration and support services for the MOD's Spectrum management capability. ∎

The soldier: Do I have radio connection to the command base or not?

Coverage-on-the-go: The ultimate and robust solution for the soldier in the battlefield. Communication between the command base and soldiers in vehicles in the operational area is one of the highest priorities. But what happens if the mission doesn't run as planned and there is no communication between the command base and the vehicle?
LS telcom and Roda Computer have developed a solution that indicates to the soldier in the vehicle how far the field strength of his radio extends and whether the command centre is within range or not. The software is GPS supported and shows the vehicle's location. ∎

// SpectrumMap

SpectrumMap: display spectrum usage data for your area of operations

Imagine easily validating your spectrum environment anywhere in your area of operations!
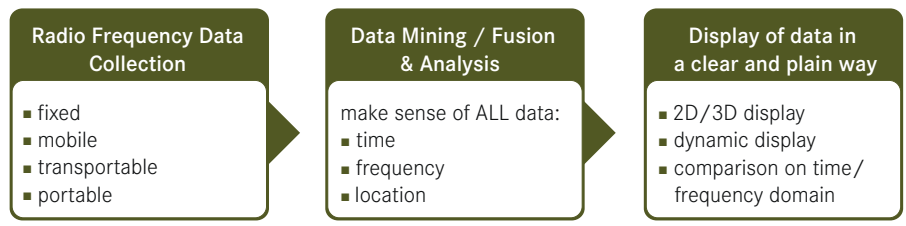
For the success of any military mission, spectrum situational awareness in the area of operations is essential. A variety of spectrum surveillance sensors are available to collect and store massive amounts of surveillance data from the Area of Interest.

Surveillance operators can then retrieve and review the data whenever they need, but they need to know exactly where the sensors are located and they can only access the sensors one-by-one. With SpectrumMap, military commanders can now display the complete spectrum picture of the operations area, without knowing the exact location of the sensors.

SpectrumMap gathers real spectrum usage data from a surveillance network and presents it on a map in a fast, user-friendly way. The system collects and stores spectrum data from many sources, such as fixed sites, temporary sites, drive tests, handheld and portable devices. It provides a range of analytical tools for different users to access through web apps. Military commanders can zoom in on a map and display the real frequency coverage for a selected geographic area. They can display the information in many ways, i.e. by frequency band, by channel, by band occupancy, service type or spectrum density and use.

With SpectrumMap, real world spectrum usage data is made available in a plain and explicit format for fast and effective spectrum decisions for mission preparation and planning. Achieve real spectrum superiority by including SpectrumMap in your solutions! ∎

Radio Frequency Data Collection	Data Mining / Fusion & Analysis	Display of data in a clear and plain way
▪ fixed ▪ mobile ▪ transportable ▪ portable	make sense of ALL data: ▪ time ▪ frequency ▪ location	▪ 2D/3D display ▪ dynamic display ▪ comparison on time/ frequency domain

We bring it all together

// Meet us at...

- **IDEX**
  Abu Dhabi/UAE
  17th - 21th February 2019

- **CANSEC** (Canada's Global Defence & Security Trade Show)
  Ottawa/Canada
  29th - 31th May 2019

- **Electronic Warfare Europe**
  Stockholm/Sweden
  13th - 15th May 2019

Don´t miss...
- **Spectrum Summit**
  Lichtenau/Baden
  3rd July 2019

24th Annual **Spectrum summit**