SPECTRUM 2022

Customer Magazine - Special Edition Military

LS telcom
Smart Spectrum Solutions

LS telcom's portfolio for Electromagnetic Spectrum Operations (EMSO)

In future warfare, the electromagnetic spectrum will be considered a contested and congested resource that has become a key domain. Under the name of Electromagnetic Spectrum Operations (EMSO), a new discipline is emerging that aims to identify, organize and disseminate operational concepts, user requirements, doctrines, resources, material and technologies that enable electromagnetic spectrum dominance in peacetime, crisis and conflict. LS telcom presents its military portfolio, which fulfills various disciplines of EMSO.

// LS telcom's brand-new software product

Remote Transmitter Control (RTC) Software for ECM operations

LS telcom has released its brand-new product Remote Transmitter Control (RTC), a modern and user-friendly software for Electronic Counter Measure (ECM) operations. The web-based UI allows the user to remote control typical ECM hardware like signal generators, amplifiers, masts, and antennas. It offers various modes and features to interfere with hostile signals. Besides the typical fixed frequency, sweep and barrage mode, it offers advanced features and modes like a frequency hopper (called Synch Hopper mode), responsive mode, frequency list and Smart mode. In the Synch Hopper mode, the ECM can synchronize with a hostile hopping signal in order to interfere with it efficiently. In the responsive mode the ECM system monitors the spectrum either with its integrated receiver capability or in a combined solution with LS telcom's LS OBSERVER monitoring system.

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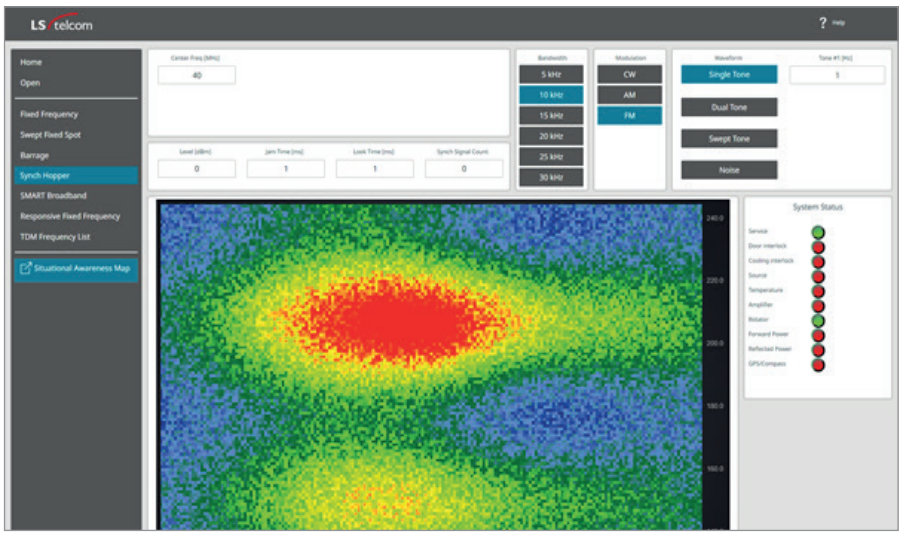
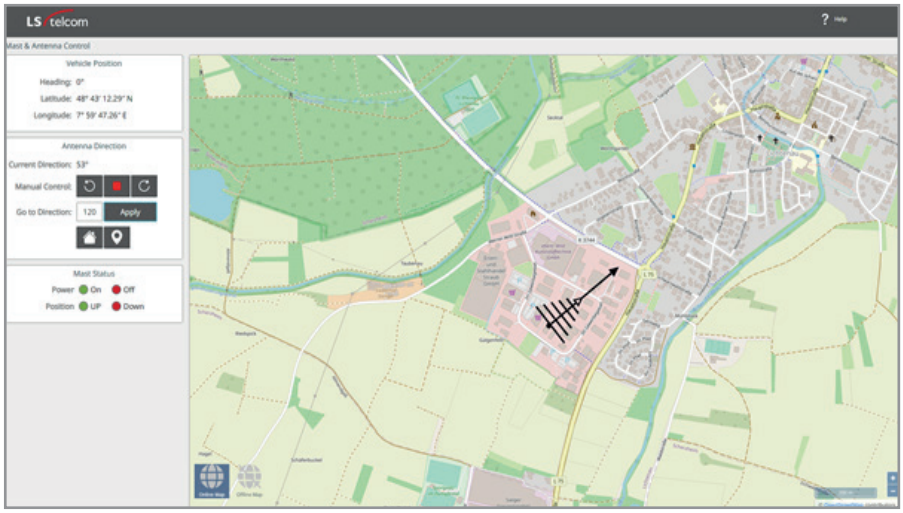


RTC Synch Hopper mode



RTC situational awareness map

Whenever a signal on a specific band is active, the ECM system will interact if it is active. In the frequency list mode, the operator can load a pre-defined frequency list with target frequencies and the ECM system automatically steps through the list. This list of target frequencies may be obtained from the LS telcom spectrum management system SPECTRAmil which is fully interoperable with the RTC software and thus ensures seamless data exchange. In the Smart mode, the user can by just one click apply a pre-defined parameter set which is available for various target systems e.g. for LTE or TETRA. This mode enables ultra-fast operations and a guidance for less experienced users. The RTC software further includes a situational awareness map including the position of the mobile ECM system and the antenna alignment. From the map view, the antenna mast can be moved up and down and the antenna can be rotated towards the target azimuth. ■

RTC Smart mode

// EW solution for Asian country

Integrated EMSO solution for Asian country

LS telcom was awarded to deliver an integrated Electromagnetic Spectrum Operations (EMSO) system for an Asian military customer. This Electronic Warfare (EW) solution consists of a combined Electronic Support Measurements (ESM), Signal Intelligence (SIGINT), Electronic Attack/ Electronic Counter Measurements (EA/ECM) and spectrum engineering solution. The ESM and SIGINT part consists of the LS OBSERVER automated spectrum surveillance system. The LS OBSERVER comprises multiple vehicle-based monitoring systems with direction finding capability, backpack surveillance systems, an airborne drone-based monitoring unit as well as a transportable operation center. The vehicle-based system includes a LS OBSERVER Transportable Monitoring Unit (TMU) with dual receiver option. This unique solution is able to do parallel tasking like direction finding and wideband scanning or demodulation with two fully independent

ECM system

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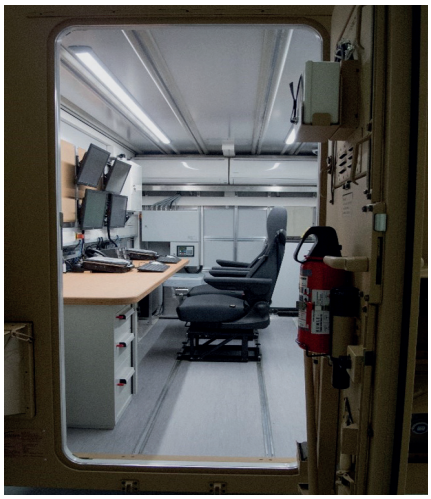
LS OBSERVER PPU

high-performance receivers. The included direction-finding system equipped with the unique AOA (Angle of Arrival) 112m antenna is able to perform Direction Finding (DF) and triangulation for signals up to 12 GHz including frequency hoppers. The backpack man portable system is for in-field spectrum surveillance and signal homing. It consists of the LS OBSERVER Protected Portable Unit (PPU) which can measure up to 18 GHz with an ultra-fast scanning receiver.

LS OBSERVER AMU

Via a ruggedized tablet, the operator controls the unit using the LS OBSERVER Central Monitoring Software (CMS). The software offers a dedicated mode for portable operations. In this mode, the user can easily track and locate a signal by using a directional handheld antenna. A unique solution to measure signals from the air offers the included LS OBSERVER Airborne Monitoring Unit (AMU). The AMU is a fully integrated spectrum surveillance and direction-finding solution based on a drone. It can carry different kind of antennas and can measure the spectrum in up to 500m heights. It can be operated either tethered where power and data connection are lead through a cable to the drone or in battery mode depending on the duration of the mission. With the AMU, obstacles can be overflown and thereby the coverage of the surveillance is increased massively. Negative influence of surrounding metal structures which can e.g. effect the direction finding accuracy can be overcome by measuring from the air. All LS OBSERVER monitoring units can be controlled by the transportable shelter-based operation system with the CMS software. This software offers a powerful set of features with multiple options for automation. The shelter is customized and integrated by LS telcom experts who benefit from years of experience in customized surveillance platform solutions. Further in the Transportable Operations Center (TOC), operators can calculate with SPECTRAemc the coverage of the used communication infrastructure to ensure that all friendly troops can communicate. Further the coverage and thereby effectiveness of the ECM and ESM solution can be calculated with SPECTRAemc. Where does the ECM needs to be placed to interfere with hostile communication systems? Where does the spectrum surveillance units need to be placed to be able to intercept hostile communication? All this can be done by using SPECTRAemc. The ECM is like the TOC a shelter-based platform integrated by LS telcom. It includes a heavy mast with rotator to carry big directional antenna elements. The ECM carries powerful amplifiers to capture a wide area. The ECM operator controls everything by one software, the RTC software solution from LS telcom. ■



TOC

TOC under production

// Direction Finding with LS OBSERVER

Multi-channel and frequency hopper Direction Finding with LS OBSERVER AOA 1xx system

AOA 1xx antenna

The LS OBSERVER Angle of Arrival (AOA) 1xx antenna system is the innovation in the sector of Direction Finding (DF). With the DF Time Travel® technology, it is able to perform DF not only live as usual, but also retrospectively based on recorded data. With its advanced DF method, the system is even able to resolve multiple co-channel signals by their angle of arrival. Where normally multiple antennas are needed, the AOA 1xx captures an ultra-wide frequency range, depending on the version 8 KHz up to 18 GHz, with only one module and this even for both vertically as well as horizontally polarized signals. The AOA 1xx antenna can be integrated on mobile or fixed platforms.

Recently the AOA 1xx technology was extended by a multichannel and hopper DF feature in the LS OBSERVER CMS software. The system is able to calculate the direction

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of multiple pre-defined channels in parallel. In the multi-channel DF mode, a direction vs. frequency diagram is displayed with the DF results for each predefined channel. The user can simply click on a channel to view the calculated line of bearing. With the direction vs. frequency chart the user can directly see which signals are originating from the same direction/station. This functionality further includes a burst mode to perform DF for frequency hopping signals. ■

Multi-channel DF mode with chart and bearing view

// Big success

LS telcom wins significant spectrum management project Down Under

The Australian Government has approved the commencement of a major project that will upgrade Defence's electromagnetic spectrum management capability. LS telcom Australia Pty Ltd has secured a contract, in value 19.8 million AUD (EUR 13.3 million) and will build up its local capability and presence in Canberra for both delivery and sustainment phases of the project.

Electromagnetic spectrum is a contested and congested resource that has become a key domain especially for military use. It is a critical communication resource which is used across several industries and enables crucial services to send and receive information via electronic devices including satellites and radios. The success of Defence operations and homeland protection is strongly dependent on the knowledge about the current electromagnetic spectrum landscape and the sanity of the used Spectrum Segments. This secures reliable radio communication during military operations and the differentiation between friendly and hostile communications. The investment the Australian Defence Force is taking will enable them staying on top of the raising wireless communication and device control challenges during operations both domestically and overseas.

Defence has initiated this Project for replacing ageing technology by implementing the newest and most advanced solution worldwide. It is based on LS telcom's flagship product mySPECTRA, consisting of an integrated Spectrum analysis package centralised but also autonomous operating databases and a powerful workflow, case optimized workflow engine.

With this, Defence will have an enhanced spectrum management capability that utilises modern, interoperable, and secure communications technology, combatting the rising threat from information and cyber-attacks.

The initial Project will be delivered over the next three years with the option to be extended with two additional three years periods to support and maintain the implemented system.

LS telcom looks forward to cooperating with Department of Defence and its Defence Industry Partners on this exciting and challenging Project. ■

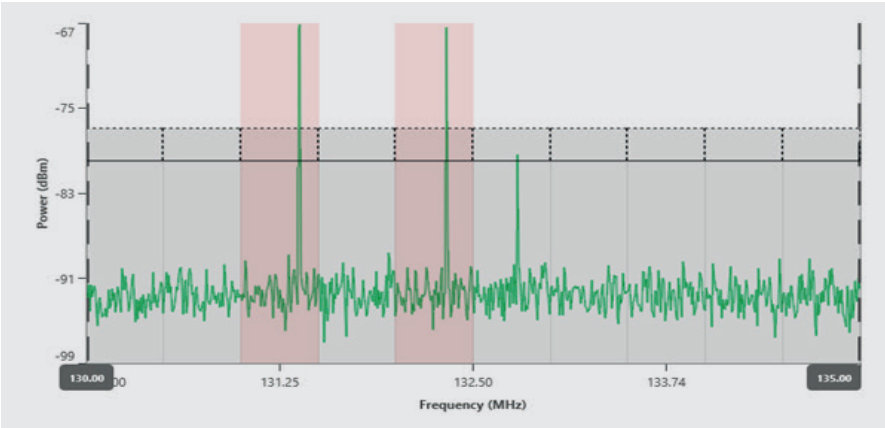
// LS telcom's AI based solutions

Artificial intelligence (AI) based alarming and classification

LS telcom develops AI based solutions for their tools with a dedicated AI Department. For spectrum monitoring two new features recently were introduced into the LS OBSERVER CMS software: AI based signal classification and AI based Smart Automatic Violation Detection (SAVD).

The signal classification feature includes the automatic classification of various service and modulation types. The usage of AI Deep Learning (DL) technology in comparison to traditional signal classification has significant advantages. The in-field accuracy can be massively improved by additional AI trainings on site to compensate for changes in the signal impairments by the local environment. Further the AI can be trained to classify new or unknown signal types.

The Smart AVD (Automatic Violation Detection) feature levitates the standard AVD of LS OBSERVER to the next level. This feature enables fully automatic violation/interference detection based on advanced AI methods. By this, anomalies which cannot be detected by traditional level-based masks will be identified and an alarm will be triggered. The AI can learn the normal spectrum on site and then later detect any anomaly from the reference situation. The smart AVD will run like traditional AVD 24/7 automated on the monitoring units and will be able to automatically trigger alarms via e-mail or other alarming systems.■



Automatic Violation Detection (AVD)

// Especially for EMSO systems

SPECTRAemc as universal mission planning tool

Since NATO has approved the increasingly complex Electromagnetic Environment (EME) as an operational environment, a level of coordination and synchronization of capabilities within the Electromagnetic Spectrum (EMS) is required. Accordingly, in the Electromagnetic Spectrum Operations (EMSO) domain, future battle management systems are expected to integrate spectrum management systems to provide comprehensive EMS situational awareness with the other EMSO assets Electronic Warfare (EW), Cyber Electromagnetic Activities (CEMA), and Signal Intelligence (SIGINT).

Due to its flexible architecture and the comprehensive library of wave propagation models not only relevant spectrum management tasks but also electronic attack calculations are possible with SPECTRAemc. The signal strength of the interfering transmitter is an important calculation factor, but even more important is the distance to the selected target.

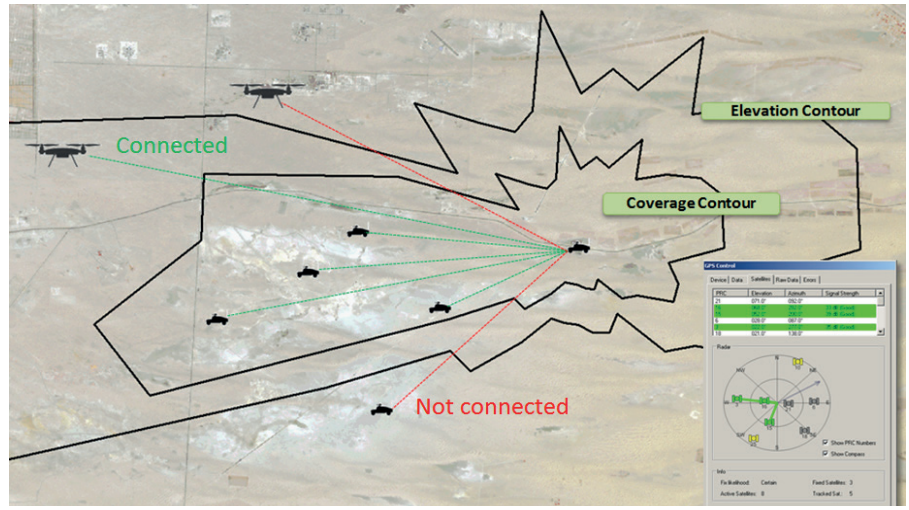
The calculation of the maximum range is quite easy, taking into account the technical parameters of the jammer and the topography. The requirement here is the line of sight between the jammer and the enemy receiver whereby the maximum range can be further increased by the height of the antennas. If receiver sensitivity is considered in the calculation, the maximum effective range can be calculated as the maximum distance at which a signal is expected to be accurate and therefore can achieve the desired effect.

The improvement of communication and interference protection can be achieved by improved antenna performance. Using a higher gain directional antenna helps both to increase the effective radiated power and to improve the signal-to-noise ratio at the receiver.

In addition, the interference effectiveness can be determined as a function of the distance between the transceivers. The greater the distance between transmitters and receivers, the more effective the interfering signal. Conversely, the closer the transmitter and receiver are to each other, the less effective the jamming signal is on the link. If the strength of the communication signal is greater than the strength of the interfering signal, the transmission signal may "burn through" the interfering signal, rendering the interfering signal ineffective.

Future requirements for spectrum-dependent systems, as well as a general need for spectrum access, will become increasingly important for successful future missions and will help enable efficient, flexible, and agile spectrum operations.

Further calculations in the area of Counter-Improvised Explosive Device (C-IED) are possible with SPECTRAemc as well as many other mission planning tasks in all radio areas. With the implementation of automated processes, these calculations can be made extremely user-friendly.



Coverage and elevation contour calculations

// Monitoring & Measurements

LS OBSERVER Airborne Monitoring Unit – A short overview

Unmanned aerial systems (UAS) or drones are now part of everyday life for many civilian and military users. The range of defense applications continues to grow and is by far not limited to surveillance based on drones provided with camera systems and other optical sensors.

At Colibrex, a 100% subsidiary of LS telcom, we have been focusing on drone applications for radio frequency measurements for years. Electromagnetic spectrum is an essential and critical factor for defense applications, which is why the LS OBSERVER Airborne Monitoring Unit (AMU) is attracting more and more military users.

The AMU should be considered a "spectrum eye in the sky" that can be used as a complementary tool to all other types of frequency monitoring equipment.

Direction Finding and Geolocation in the air is realized by triangulation of lines of bearing which are generated while the drone is turning 360° on its axis. The LS OBSERVER AMU is using the powerful and versatile Central Monitoring Software (CMS) of LS telcom. This is a major advantage compared to other solutions available on the market (also not comparable in terms of level of integration).

For military users, the main applications with the AMU can be summarized as follows:

- Observe the entire RF-Spectrum to detect suspicious or illegal activity, potential threats, unwanted emissions (such as jamming)
- DF / geolocate the potential emitters
- Observe radio activity from neighboring countries

The standard AMU is capable of measuring frequencies from 30 KHz up to 6 GHz (incl. demodulation of signals), but other versions are meanwhile available for much higher frequencies (32 GHz, 50 GHz, …). For long-time observation and in order to operate independently from the battery capacities, the AMU can be configured in a "tethered" version. ■

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// Save the date

Digital Spectrum Summit

This year's Spectrum Summit, which will again be held digitally, will consist of an interview and two panel discussions, followed by the successful "LS Studio" format with contributions from LS R&D, projects and the product world that fit the panel's theme.

Participation in the virtual event is free-of-charge. For more information about speakers and agenda and to register, visit the Spectrum Summit website.
(https://www.spectrum-summit.com).

Experience inspiring impulses, exciting discussions and the opportunity to exchange ideas with experts and decision makers about current technology trends and developments around the resource radio.

Digital Spectrum Summit
29th June 2022

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