

Special Edition

Special Edition Critical Communications

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Optimisation of the Frankfurt Airport TETRA network

As part of the TETRA radio network optimisation at Frankfurt Airport, Fraport AG, a leading international airport group and operator of the Frankfurt Airport, commissioned LS telcom to carry out coverage measurements and to assist with the frequency licence application.

The optimisation is based on the current radio coverage, measured by LS telcom and analysed together with the responsible department of Fraport AG. In order to obtain the desired coverage results, existing omni-antennas had to be replaced by sector antennas at different BTS locations. After the antenna change, the new radio coverage was documented and evaluated. This evaluation served as a basis for the final optimisation of the sectorised antenna configurations to guarantee the required coverage. LS telcom also supports Fraport AG in drawing up the frequency application. LS telcom developed the procedure and technical documents which are presented in the frequency application. ←

ER/R-GSM study for European Railway Agency (ERA)

LS telcom is working for the European Railway Agency (ERA) on a study to analyse the possibility of using the ER/R-GSM spectrum by other radio communication systems for railway use in coexistence with the existing GSM-R system operated in that frequency band.

Sharing the ER/R-GSM bands with a new radio communication technology will possibly impact both the operation of the GSM-R system and the additional radio system, therefore a careful analysis of the effects, their impact on the existing GSM-R system and possible mitigation methods are required. The overarching scope of the study can thus be summarised by the following question: Can the new system share the ER/R-GSM band or is new spectrum needed? Depending on the answer to this question ERA may need to take further steps and the results of the study may be used by ERA to inform the European Commission and the European Communication Committee about future spectrum needs for a successor to GSM-R. ←

LS telcom conducts study for the European Commission on repurposing the 700 MHz spectrum

LS telcom together with its partner VVA has completed a study for the European Commission (EC) on repurposing the 700 MHz spectrum.

The report of the study 'Economic and Social Impact of Repurposing the 700 MHz band for Wireless Broadband Services in the European Union' was published by the European Commission on 23rd February 2016. The analysis provided in the study is informing work by the EC on developing a proposal for a decision of the European Parliament and of the Council on the use of the 470-790 MHz frequency band across the European Union. ←
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LS telcom is a member of

- TETRA & Critical Communications Association
- PMeV (Verband Professioneller Mobilfunk e. V.)



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TETRA measurements at BOS sites via remotely piloted aircraft

Colibrex, a 100% subsidiary of LS telcom, carried out measurements of individual TETRA BOS radio antenna systems using a specially equipped Remotely Piloted Aircraft (RPA).*

The objective of the measurements was to verify propagation characteristics and validate the new antenna settings after structural alteration works. Conventional measurement methods merely provide results which are developed under laboratory conditions. Measurements via remotely piloted aircraft, on the other hand, obtain results under real operating conditions. The RPA records the real radiated field strength and then calculates the

horizontal and vertical antenna pattern. This way, errors in the antenna structure can be analysed. The antenna radiation patterns gained from the measurements can also be directly imported into planning tools, such as CHIRplus_BC of LS telcom, and hence provide improved simulation results, and optimise radio network planning. ←

* digital network of German security authorities and organisations



Picture: Multicopter with control and measurement units

Frankfurt Metro: Emergency services will soon communicate via modern TETRA network

LS telcom planned the indoor digital TETRA network for the underground railway of Municipal Transport Services of Frankfurt (Verkehrsgesellschaft Frankfurt, VGF).

The Frankfurt underground counts 27 underground stations and tunnel stretches of a total length of 48 km. The project includes all planning stages, from the pre-planning and the preparation of approval reports for the regulator, to the creation of the tender documents and tender support and finally the preparation of as well as assistance during the tender awards. The LS telcom experts

developed the technical concept for the integration of TETRA technology, which comprises a redundancy, hand-over and security concept. Part of the first delivery was the planning of the base station locations, the signal and cable routing plans, coverage and capacity planning, electromagnetic compatibility (EMC) certificates and positioning of network equipment. The planning for permission to build

was delivered and accepted by the responsible authorities. The next steps will cover the preparation of the tender documents, as well as a project schedule for the construction phase until commissioning. Finally, LS telcom will provide consultancy services for the tender process and the bid evaluation. ←

LS telcom plans digital radio coverage for road tunnels in Hessen

TETRA network planning services for Hessen Mobil.

Hessen Mobil, the administrative authority for road and transport management in Hessen, commissioned LS telcom to design a planning concept for the digital radio coverage of five road tunnels in the Federal Land of Hessen.

The objective of the introduction of a nationwide standardised digital voice and data radio system for the German public safety authorities and organisations (short: BOS) is a high-quality radio coverage in all major areas, even inside buildings and other vital

entities such as road tunnels. Generally, indoor radio coverage of road tunnels, regardless of the selected coverage category, cannot be guaranteed by a TETRA outdoor base station. This is why LS telcom took all the necessary measures to provide indoor coverage for security and relief units in all the tunnels under the responsibility of Hessen Mobil.

LS telcom carried out the following tasks:

- Planning of the active components of the BOS indoor digital

radio coverage for the connection of the road tunnels.

- Verification and provision of evidence that the connection of the road tunnels to the TETRA base station can be achieved respecting the required redundancy conditions.
- Preparation of tender documents for the delivery and installation of the passive and active components.
- Implementation of and support with procurement procedures. ←

LS telcom protects your radio links from interference by wind turbine generators

In the light of the energy revolution, a large number of wind turbine generators (WTG) is being built increasingly causing interference to existing microwave links.

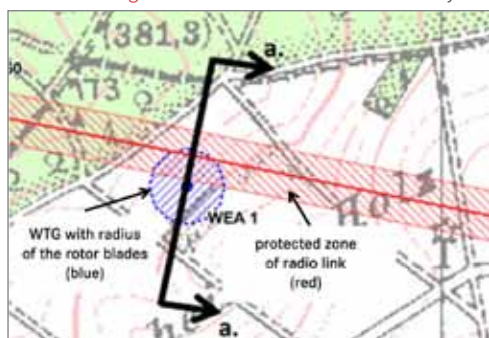
When towers and rotors of wind turbine generators (WTG) intercept with the protection zone of microwave links, the transmission quality and link availability may no longer be guaranteed. Commissioned by interior ministries, network operators and wind turbine operators, LS telcom has already examined the impact of many plan-

ned wind turbines on radio links. First, the planned locations for wind turbines and the radio relay links are displayed in the GIS system.

LS telcom radio experts then identify the frequencies of the microwave links under examination. The required safety distance is calculated at the point where the WTG is closest to the radio link. The safety distance depends on the location of the wind turbines to the radio field, the geometry and the frequency of the microwave link. The higher the frequency, the shorter is the safety distance. The figure shows the wind turbine with the

radius of the rotor blades (blue circle) which overlaps with the protected zone of the radio link (in red).

In this case the experts use a three-dimensional view to check whether the planned wind turbines comply with the safety distance to the radio link, both vertically and horizontally, or if the rotor blades intercept with the link. Should the distance be insufficient, LS telcom looks at technical solutions together with the planer of the wind turbine. ←



Radio coverage optimisation for shell petroleum platform

LS telcom successfully completed the radio coverage optimisation for the Shell Malikai offshore petroleum platform.

Staff on the platform will communicate via handheld and fixed terminals by means of a TETRA network infrastructure. As the majority of inner parts of the platform, such as the living areas, consists of thick steel walls and noise-reducing wall elements, which result in a high attenuation of radio signals, a Distributed

Antenna System (DAS) is required for indoor radio coverage.

LS telcom engineers carried out a complete radio frequency (RF) study. They prepared a 3D vector model of the platform and performed a coverage simulation of the initially planned distributed antenna system. Then they elaborated modifications

to the initial design and simulated the coverage for different TETRA DAS scenarios. They finally recommended an optimised TETRA network design, which will be implemented on the new Shell platform to be installed 110 km offshore Sabay, Malaysia. ←

Greater reliability for BOS network Hamburg

LS telcom supports the central office for digital radio Hamburg of the Ministry of Internal Affairs and Sport in the planning and implementation of necessary changes in the grid connection of TETRA radio sites of the BOS network Hamburg.

LS telcom performs the radio planning of the BTS connections (such as microwave links) and plans the emergency power supply of BOS sites. Besides the planning, the scope of service includes the procurement specifications. ←

PPDR since WRC-15

WRC-15 identified spectrum in the 694-894 MHz frequency band to facilitate mobile broadband communications for robust and reliable mission critical emergency services in public protection and disaster relief (PPDR), such as police, fire, ambulances and disaster response teams.* The development of user scenarios, the deter-

mination of capacity and spectrum requirements, the selection of the most appropriate technology and the design and procurement of networks is where LS telcom's expertise can support organisations with the move to new PPDR networks and technologies. ←

*Source: ITU

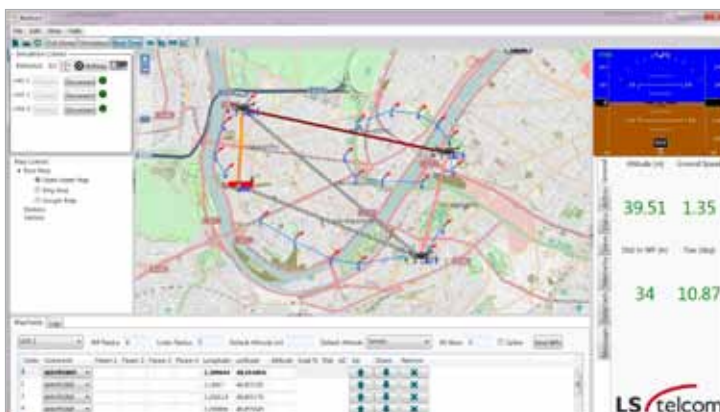
Ad-hoc broadband data network for PPDR (Public Protection and Disaster Relief)

LS telcom develops swarm mission planning tool for vehicular ad-hoc communication & remote sensor network.

In a joint Franco-German research project, LS telcom developed a swarm mission-planning tool, which builds and controls an ad-hoc communication and remote sensor network based on unmanned airborne vehicles (UAVs) and unmanned ground vehicles (UGVs).

The aim of the project, which comprises a consortium of French and German companies and research institutions, was to provide a broadband communication network for rescue forces and the ability to inspect the disaster area.

The network is made up of a swarm of drones and ground vehicles, which carry a transmitter and receiver for data transmission as well as a GPS

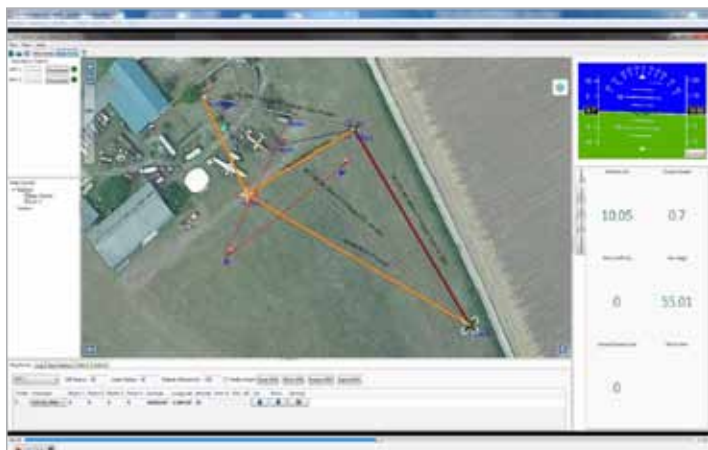


system for positioning. In addition, they carry cameras on board for real-time media footage of the disaster area - especially useful for otherwise inaccessible areas. Other possible payloads are radioactivity sensors, for example, in case of nuclear power station incidents. The vehicular ad-hoc network serves as emergency data communication link for rescue forces. The drones and ground vehicles streamline the information from their payload in real-time to the control station of the relief units.

With the help of the integrated GPS on the drones, the software displays the network of drones and ground vehicles in real-time on the map. At the same time battery status, height, and received power are displayed to control and ensure the connection between the vehicles while they are moving.

In a second step, the software will be able to simulate the ad-hoc network

in advance. It will simulate the radio coverage for each vehicle on the move and will send pre-programmed waypoints to the drones before take-off. The mission-planning software will help crisis managers to reduce the time for network deployment considerably, indispensable during a crisis. The ad-hoc broadband network was tested in demonstrations taking place in Dortmund/Germany, in April 2015, and Toulouse/France, September 2015, with potential users of the system, the German professional fire brigade and the Landeskriminalamt (the German state office of criminal investigation). Apart from LS telcom, CEA, Airbus DS, Groupe Intra and Onera took part in the project as well as the Technical Universities of Dortmund and Aachen, the Fraunhofer Institute, Mirion Health Physics and the Kerntechnischer Hilfsdienst (KHG, German nuclear emergency service). ←



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Coastal radio system for Denmark

LS telcom was chosen to prepare the tender for the design, delivery and implementation of a coastal radio system in Denmark that ensures safety at sea by enabling ship-to-shore and ship-to-ship communications using VHF and MF radio bands. The most prominent users of the system are the Danish Maritime Author-

ity and the Danish Defence. The radio system will support Denmark's fulfilment of its obligations as defined in the International Maritime Organisation's (IMO) treaty on supporting safety at sea and specifically in implementing the Global Maritime Distress and Safety System (GMDSS). ←



RF study for Petronas including on-site survey, indoor and outdoor measurements

Petronas, a fully integrated energy company in Malaysia, asked LS telcom to carry out a radio frequency study including surveys and radio coverage measurements for one of their chemical plants. A TETRA base station provides outdoor and indoor radio coverage for this plant and staff complained about weak coverage in selected areas. LS telcom experts

inspected the base station installation and configuration, cable routing and antenna configuration. This was followed by outdoor and indoor coverage measurements and several coverage simulations. For the coverage simulations a 3D vector model of the plant was used. The simulations showed that indoor coverage could be improved by changing the antenna configuration

of the existing base station, but this would still not be sufficient to achieve adequate coverage. LS telcom experts recommended a second base station to achieve full outdoor coverage of the plant and additionally bi-directional amplifiers for adequate indoor coverage. The measurements were carried out with the LS OBSERVER portable monitoring unit (PMU). ←

Concept study and design of SCADA via TETRA system

A study on migrating the UHF SCADA remote terminal units (RTUs), installed at locations such as oil and water injection wellheads and cathodic protection stations along pipelines, into Aramco's existing TETRA mobile radio network was carried out by LS telcom. LS telcom experts were asked to examine various para-

meters such as system reliability, system load and protocol performance of a SCADA system based on TETRA technology.

The experts also carried out a market study of different solutions and technologies available for SCADA systems using TETRA. ←



Solar flow meter installation for SCADA network of Saudi Aramco

LS telcom was tasked to perform a radio frequency study to include additional solar flow meters into the existing meter network of Saudi Aramco along a pipeline. During a site survey LS telcom engineers verified the

locations for radio towers, performed coverage measurements and determined the best antenna configuration for each additional remote terminal unit (RTU), as well as the optimum master base station, taking into

consideration signal strength, co-channel and adjacent channel interference. The RF path profiles, link budgets and RF fade margin were, of course, also calculated. ←

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