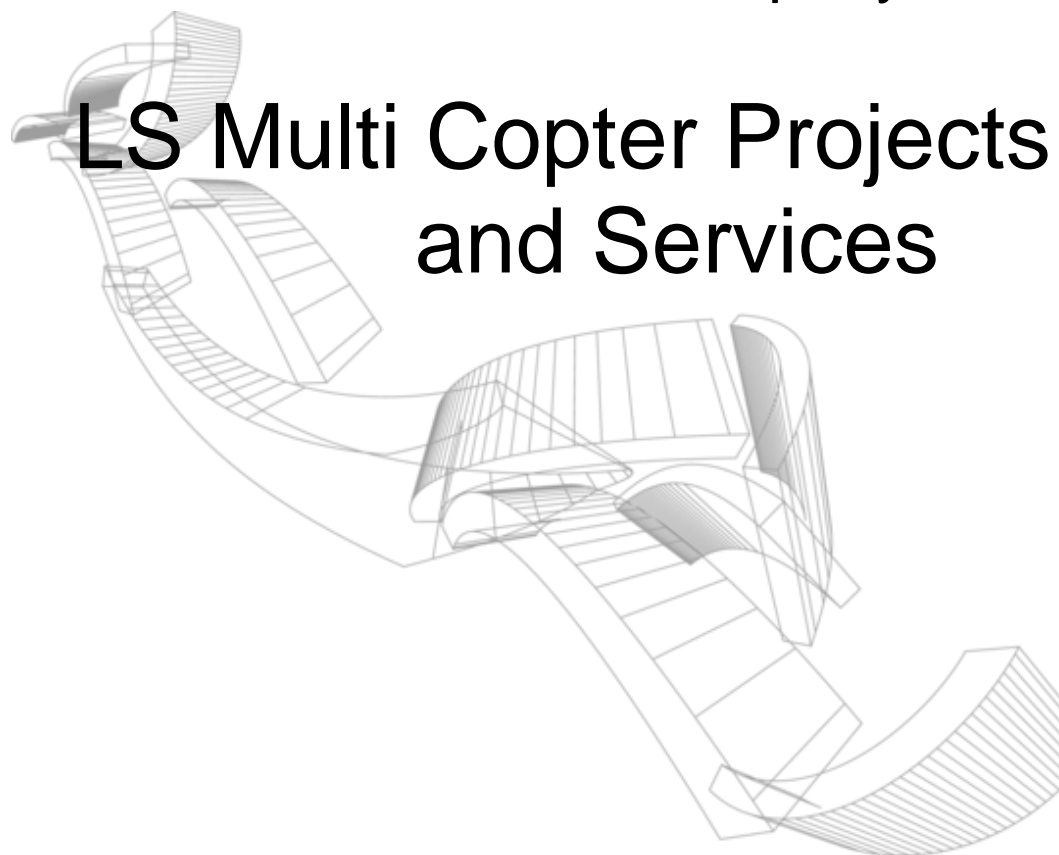




LS Multi Copter Projects and Services (Pty) Ltd

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## Company Profile



# 1 Company Background

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LS Multi Copter Projects and Services (PTY) Ltd (LSMC), one of South Africa's leading Remote Piloted Aircrafts Service (RPAS) providers, was established in 2015.

LS Multi Copter Projects and Services (Pty) Ltd, a South African based company, was formed to support LS of South Africa Radio Communication Services (Pty) Ltd, an associated company, with airborne RF spectrum and site infrastructure audits locally and internationally.

LS of South Africa Radio Communication Services (Pty) Ltd (LSSA), which is part of the LS telcom group of international companies, specializes in Radio Frequency (RF) measurements using Remote Piloted Aircraft Systems (RPAS).

The company prides itself for its customer requirement sensitivity and specialist offering of a wide range of drone services ranging from high level engineering applications to basic photography. We specialize in in-flight radio frequency measurement using our diverse RPAs fleet consisting of DJI Phantoms, DJI Matrice 210 series, multiple DJI Matrice 300 RTK series and a DJI Matrice 600 Pro.

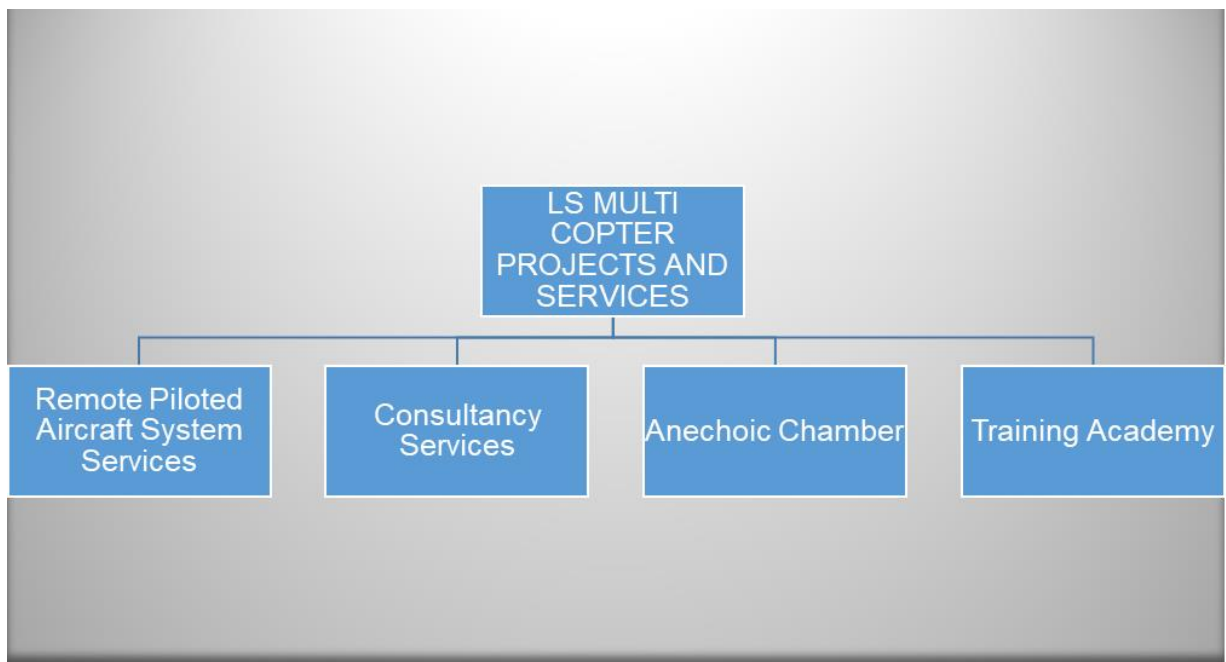
LSMC is licensed by the South African Civil Aviation Authority (SACAA) as a commercial RPAS service provider with well qualified and experienced pilots.

Our SACAA accreditation, RPAS Operating Certificate (G1269D) and Air Service License (G1228D) is largely recognised internationally where LS has conducted international work in numerous countries across the globe.

We have expanded our drone offerings over the years to a wide range of services. The company also expanded by the establishment of the LS of South Africa Training Academy and an Anechoic Chamber.

## 2 Company Structure

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### 2.1 Remote Piloted Aircraft System Services

The RPAS division of LS Multi Copter Projects and Services (Pty) Ltd provides the following range of services:

- Radio Frequency Antenna Pattern measurements
- Mobile and Broadcast RF site audits
- Drone based Solutions for RF Surveillance and RF Direction Finding
- Antenna Beam Calibration and measurement using Drone Technology and Anechoic Chamber Measurements (various frequency bands)
- Radiation Safety Measurements and Predictions
- RF Interference Hunting
- Airborne Mapping and Surveying
- Airborne Inspections
- Power-line surveys
- Thermal imaging
- Full scale 3D modelling
- Photography and Video footage

The following is an elaboration of some of the services on offer:

### **Radio Frequency Antenna Pattern Measurements**

We offer a unique and highly-accurate method of performing antenna measurements for various broadcast and telecommunications transmission technologies using remotely piloted aircraft systems (RPAS).

The measurements are performed over the air (OTA) and focus on quality of service measurements for quick assessment of base line transmissions from a transmit antenna system. The measurements provide the network and the multiplex operator with the confidence that the transmission problem is not linked to this specific transmitter site.

This system developed by LS of South Africa Radio Communication Services has revolutionised comprehensive performance characterisation of operational transmission antennas and sites around the globe.

The procedure is wholly unintrusive and the output provides an extensive one-stop performance assessment of complex radiating antennas in all azimuth and elevation directions. Alternative value added services such as mast inventories, site layout surveys, photographic rendering and infrared applications associated with transmission sites and industrial installations are also offered.



**Matrice 300 RTK**

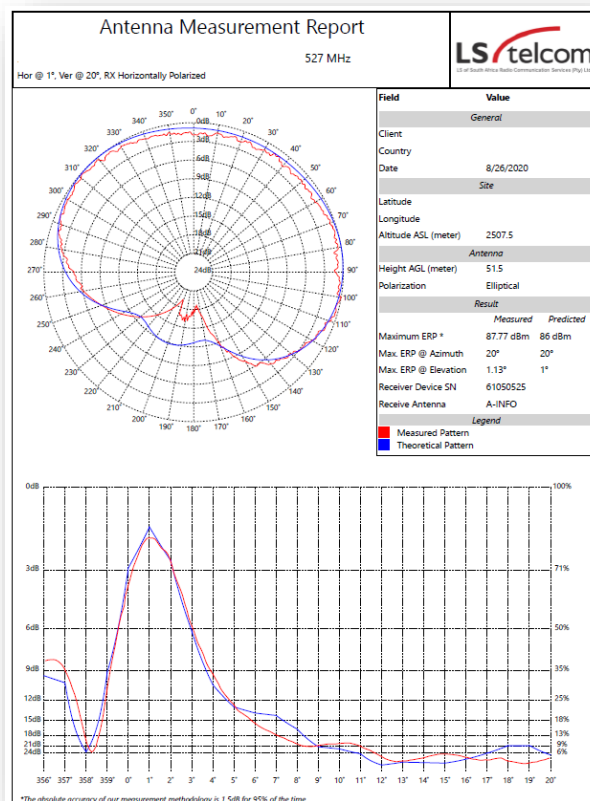


**Drone with RF screened Jacket**

The measurement vehicle is a crucial component in the measurement system. The fact that the measurement system is designed to measure radio frequencies, demand that the vehicle has low levels of RF radiations. At the same time, it is also crucial that the user of the vehicle is well aware of the RF radiation that is generated by the airborne vehicle. For this reason, it is important that the vehicle is analysed in an anechoic chamber to determine the levels of radiation originating from the measurement vehicle. It is also very important to ensure that the measurement vehicle's RF radiation does not impact on the measurements which is performed on the antenna systems.

The flight paths we use for our measurements range between vertical flights to horizontal to spiral flights. It is therefore important to make use of a multi rotor vehicle that supports the type of flights that is required to perform the required measurements.

The antenna measurements also require take-off in areas where there is very little space with uneven terrain conditions.



### Antenna elevation & azimuth pattern and ERP measurements

The measurement system provides the following advantages:

- The measurements are unintrusive and do not require the transmitter to be switched off to perform any of the measurements.
- Full measurement report available within two days after the measurement have been performed.
- The measurements are performed with RTK GPS to provide centimetre accuracy to the measurements.
- Our drones are well screened against high radio frequency fields to ensure safety during the measurement exercised.
- We are a licensed Civil Aviation operator and we ensure that all flights are registered with the relevant authorities.
- LS telcom has more than 15 years of experience in airborne radio frequency measurements.
- The measurement can be expanded to perform a full off-air commissioning report in line with the specific operator and his requirements.

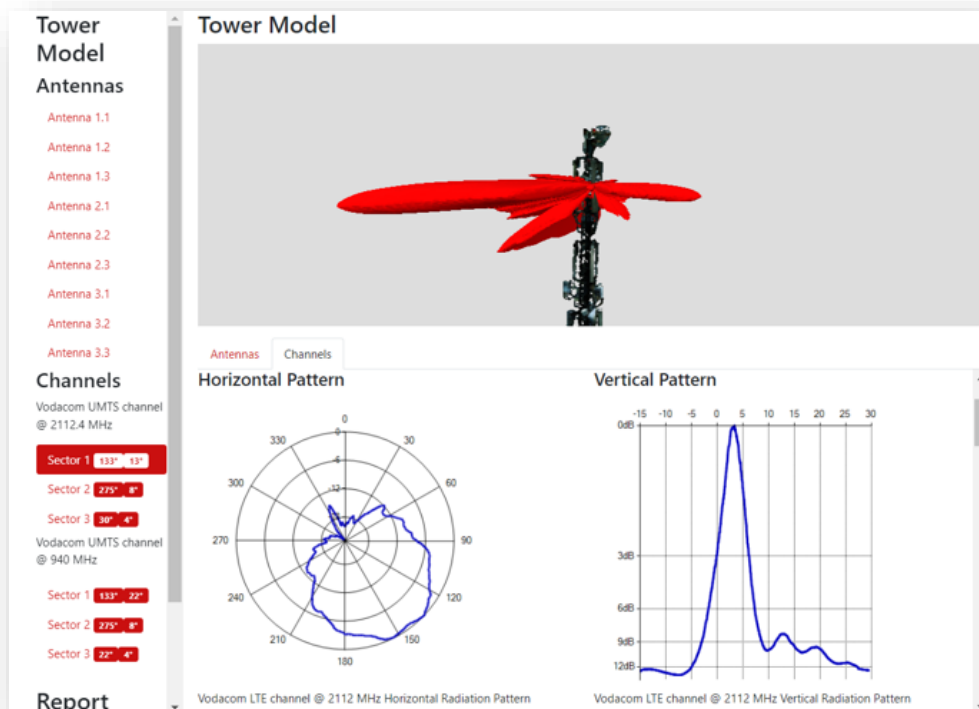
## Mobile Site Audits

We provide an advanced Remotely Piloted Aircraft Measurement System enabling a full mobile site audit that supports:

- A spectrum scan displaying active channels
- Detailed information of individual channels based on the National Radio Frequency Plan Band Plans (Service Provider frequency, bandwidth, and technology type)
- A display of the radiation pattern of each individual transmitting channel (Vertical pattern, Horizontal pattern, and 3D representation)
- Technical specifications of the channel transmission (Effective Radiated Power (ERP) and bandwidth)
- Highly accurate positioning of individual antennas mounted on the mobile tower/mast
- Antenna characteristics: Centre of Radiation (CoR), Height Above Ground Level, Antenna Width, Antenna Length, Electrical tilt and Mechanical tilt.
- A list of the channels being transmitted from each individual antenna
- A scaled model of the mast for mechanical and civil analysis
- 3D viewer of the mast with integrated RF patterns and information for client-side analysis

The system uses a Real Time Kinetic (RTK) based positioning system allowing flight position accuracy within just a few centimetres.

The site audit allows significant improvement opportunities of each mobile site as result of a visual inspection of the tower and surroundings, the validation of existing RF activity and an integrated visual representation of the active channels and correlating transmitting antennas.



## RF Site Audit results

## Full Scale 3D Modelling

LSMC offers a 3D modelling service whereby the site infrastructure is rendered and represented using photogrammetry and Lidar. High resolution photographs of all site and mast elements are available for any portion of the 3D model of the site and this allows the customer to “virtually” scrutinize the 3D rendered model in the comfort of their office. This service is particularly suited for the determination of installation quality, operational integrity and rental capacity on mast structures and sites. Site element dimensions and spatial positions can also be accurately determined.

The service is also offered in synergy with LSSA’s spectral measurement airborne services.

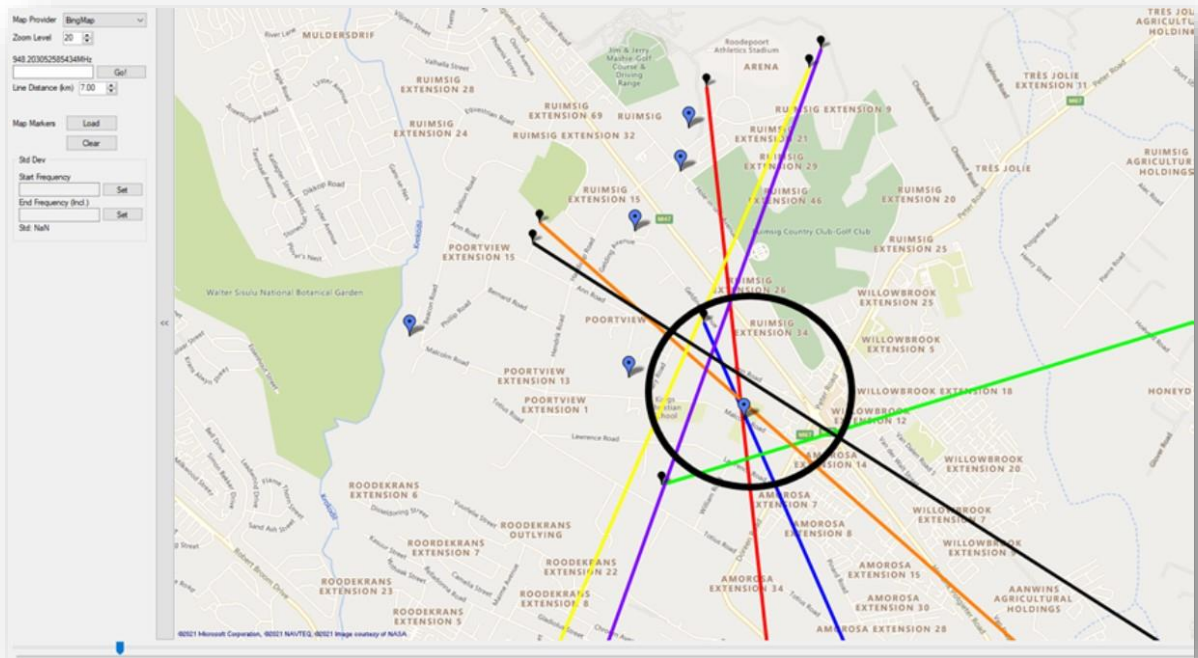
Recordings can be done of equipment mounted on the mast, the site layout and for the various site services such as power line routes and roads.

## Direction Finding

A general technique direction finding method called, angle of arrival, is implemented on an RPAS to be able to track and find a source location of a specified channel. This is done by doing point rotations at a certain altitude while sweeping through the spectrum.

As a starting point LSSA has created a tool allowing us to scan a spectrum and automatically detect the active channels in a certain scanned bandwidth. Standard ITU recommendations are used to define channel thresholds and the National Radio Frequency Plan Band Plans assists with identifying and naming the channels.

Specific power calculation techniques are then implemented to calculated individual channel power which are then used to define the vectors for direction finding.



**Direction Finding Results**

## 2.2 CONSULTANCY SERVICES

### CRITICAL COMMUNICATIONS

LS telcom group of companies is a leading supplier of system solutions, consulting, and engineering services for professional mobile radio networks.

When it comes to secure radio services for professional users accurate planning is very important. The planning processes must be adapted to the specific requirements and conditions of PMR services and use. Reliability and redundancy as well as economic feasibility are critical.

Professional and reliable critical communications network planning is our core competency. We address all steps in the network life cycle, from network design, planning, procurement, and implementation as well as measurement, analysis, evaluation, and optimisation of operational networks. We design, modernise and optimise networks of all kinds of technologies and for all types of applications.

We guarantee the right system component and technology mix, tailored to fit your particular needs. The combination of technology experts, engineers, and project managers using our highly modern planning tool (TETRA Planning and Optimization Software) and measurement hardware, makes up our success.

TETRA consulting services typically include the following tasks:

- Requirement & Feasibility Studies
- Development of Concept Studies
- Migration Concepts
- Cost Assignments & Business Case Analysis
- Support in technical decision making
- Support of Procurement Processes
- Return of Investment Studies

We provide TETRA Training to our clients which covers the following

- Introduction to TETRA Networks (Design, Implementation and Operation)
- Radio Network Planning of TETRA Networks
- TETRA Planning Exercises
- Planning of Microwave Links

Cost-effective antenna measurements using remotely piloted aircraft:

Determine in an easy, quick, and cost-efficient way the true radio frequency radiation characteristics of your TETRA base station using remotely piloted aircraft (RPA).

The remotely piloted aircraft (RPA) technology is adapted to carry a measurement sensor, high-resolution position and orientation sensors, an autopilot, a high-powered processor and storage unit and a telemetry system. The measurement and navigational data are stored on board and streamed to the ground control station in real time.

The RPA flies semi-remote controlled and in accordance with a pre-programmed flight path. Several safety features are built into the system amongst which is a 'return to take-off point' in the unlikely event of failure. Software for data analysis completes the system solution.

We have performed a TETRA network design and planning project for Sasol at their Secunda plant in South Africa.



We have also recently investigated and defined a digital trunking radio communication system for Grootegeluk Mine – EXXARO Coal.

Another project performed was at Anglo American - Kumba Iron Ore, which entailed an Investigation, Detailed Engineering and Design to enable the conversion from Analogue Radio (MPT1327) to Digital Trunked Radio (TETRA).



## 2.3 ANECHOIC CHAMBER WITH AUTOMATED MEASUREMENT CAPABILITY AND AUTO REPORT GENERATION

An anechoic chamber is a shielded room that is lined with absorber material such as conductive carbon to inhibit external interference but also eliminate multipath artifacts. This creates an ideal environment for testing electronic devices. Electronic devices must undergo testing at an official certification lab before market launch to ensure regulatory compliance.

We have designed and installed our own anechoic chamber at our head office with a frequency range of 100 MHz to 6 GHz. The chamber is a full chamber that include absorbers on the floor, walls and roof. We intend to extend the frequency range of the anechoic chamber to 30 GHz during the next year to cater for extended frequency usage in higher frequency bands as well as international mobile telecommunication (IMT) equipment operating in higher frequency bands.

Our anechoic chamber is automated to perform 3D analysis in an automated manner with one single measurement computer controlling the measurement device, the signal generator and the turntable. We can measure up to 1 degree accuracy with our turntable and the measurement report generation is automated. Our UAV measurement capability compliments the anechoic chamber as it can instantly be deployed on an open test range to simulate the measurements in the anechoic chamber.

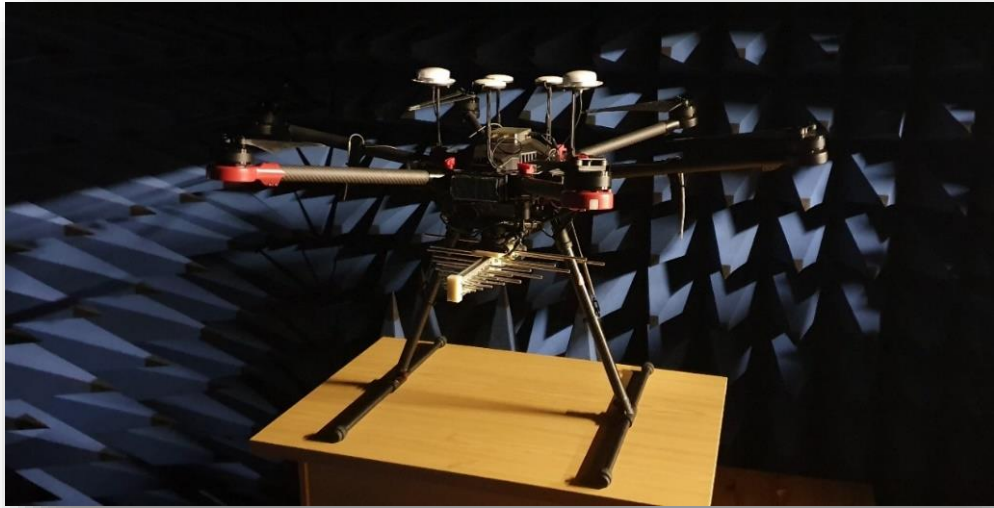
We provide the following services:

- LSMC offers in house Pre-compliance EMC and EMI testing in its Full Anechoic Room to assist device manufacturers in the prototyping stage prior to entering official certification labs for full compliance and approval.
- Antenna testing services to characterize antenna specifications.
- EMC radiated measurements
- EMI immunity measurements
- Antenna pattern and gain characterization
- Out of band measurements

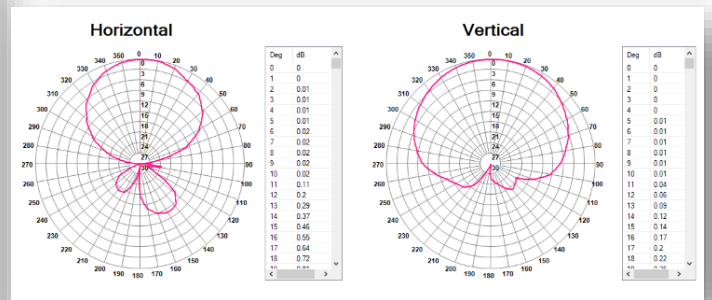
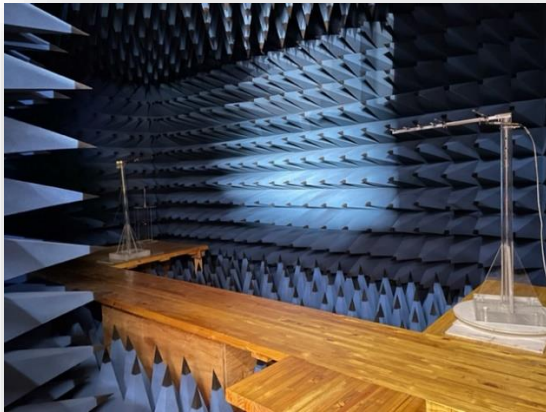
Benefits of using our Anechoic Chamber:

- High accuracy of EMC Pre-compliance measurements
- Fully lined walls and floor with carbon coated absorber cones eliminates multipath artifacts for accurate characterization of antenna field measurements
- Use of Real-Time Spectrum Analyzer and a set of industry approved EMC antennas to obtain representative RF performance
- Automated measurement reporting for fast turnaround testing times
- A cost-effective way to determine whether your product will pass official certification

Our chamber meets the requirement for Pre-compliance using the NSA method outlined in the CISPR-16 -1- 4 guidelines.



**Drone calibration inside Anechoic Chamber**



**Antenna Radiation Pattern in the H and V Field**

## 2.4 LS OF SOUTH AFRICA TRAINING ACADEMY

The LS of South Africa Training Academy, a division of LS Multi Copter Projects and Services (Pty) Ltd, was established in 2016 to contribute to the skills development of all clients in the radio engineering, telecommunication and spectrum management industry, public broadcasters, ministries and communication regulators.

We noted the increased need for specialist training programs around Broadcast Engineering, Radio Frequency and Spectrum engineering. These skill sets are in a state of decline in South Africa (and the SADC region) and it is therefore an invaluable opportunity for us to offer training programs in this field of study as very few courses are available at tertiary educational institutions.

Our mission is therefore to provide all clients with quality, outcome-based education by:

- Sharing long-term knowledge and profound experience with national and international clients.
- Valuing and developing skills to build sustainable capacity in the industry.
- Providing affordable but specialised academic and practical training.

The broader objective of the academy is therefore to bridge the skills gap and to contribute towards the development of upcoming radio technicians, engineers and policy makers through the sharing of “in-the-trench” theoretical and practical experience, for building sustainable capacity within the industry.

We offer training courses covering a variety of topics in broadcast, spectrum management, digital mobile and microwave link planning, radio network planning and telecommunication regulations.

The facility at the training academy is multi-functional as it is not only being used for local training events but also for on-line training across the world and hosting of events and presentations to promote products and services to national and international clients in the industry.

The academy is also a MICTSETA accredited training provider for the Certificate in Broadcast Engineering (ID no. 48792) and we offer several unit standards specifically developed for SETA.

Being MICTSETA accredited we were offered the opportunity to train 50 beneficiaries participating in the EPWP Infrastructure project in the Lejweleputswa District of Free State Province on the unit standard “Understand the operational principles and circuit theory of satellite and digital television decoder (Unit Standard #115027).

Training has been provided to delegates from several institutions since the launch of the training academy.

The list includes inter alia, Department of Public Works (EPWP programme), Sentech, ICASA, CSIR, LiquidTelecom, Multichoice, Altech Multimedia, Local Radio stations, SA-Civil Aviation Authority, United Nations of South Sudan, Uganda, Sonangol-MStelcom, Eswatini Electricity company, Eswatini Communication Commission, Malawi Communications Regulatory Authority and EXXARO Coal Mine.



**Training Centre**



**Practical Microwave Link Planning training**

### 3 Clients

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Our clients include:

- Anglo American - Kolomela Iron Ore Mine
- Ministry of Telecommunication of Antigua and Barbuda
- SBG – Sinclair Broadcast Group
- Anatel (Brazil)
- Medcom Panama
- Radio Pretoria
- City of uMhlatize
- Multichoice (South Africa)
- MTN South Africa
- Eskom (Wear check)
- CRAN (Namibia)
- CSIR (South Africa)
- Towercast (France)
- Radio Senale/Rohde & Schwarz (Colombia)
- TéléDiffusion de France (TDF) (France)
- Südwestrundfunk (SWR) (Germany)
- Emitel (Poland)
- Swiss Broadcasting Corporation (SRG SSR) (Switzerland)
- Swisscom (Switzerland)
- Sentech (South Africa)
- Norkring, Telenor Group
- Mesa Solutions (SKA South Africa)
- Romkatel(Croatia)
- MYTV (Malaysia)

## 4 Contact Detail

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