



Electronic Warfare

EWAS **ELECTRONIC WARFARE ANTENNA SYSTEMS**

Selex ES has over 40 years experience in the supply and support of advanced antenna systems used on a variety of military platforms. The Company's areas of expertise include satellite ground terminals, airborne satellite communications, guided weapons and electronic warfare. Furthermore, Selex ES was the first UK supplier to provide a highly competitive antenna system for commercial satellite television and has gone on to supply transmit antennas for the Microwave Video Distribution Systems installed in Hong Kong and Qatar.

Selex ES's antenna portfolio includes:

- Narrowband high performance horns
- Octave & multi-octave horns
- Wideband spirals and sinuous antennas
- Printed antennas
- Waveguide slot arrays
- Broadband phased arrays
- Reflector antennas
- Lens antennas
- Quasi-optic systems.

Current design capability spans frequencies from 500MHz to 40GHz and is supported by an extensive range of CAD, CAE and test facilities. The modelling capability has been strengthened by the acquisition of a parallel processing PC cluster with 1TByte of memory. Previous experience has included design to 183GHz.

A major focus in the recent past has been the development of broadband conformal phased arrays with complete polarisation diversity based on the sinuous antenna. Integrating these elements with low noise amplifiers and switches or solid state custom designed power modules has resulted in highly versatile building blocks that can be configured to satisfy a wide range of requirements.

EW ANTENNAS AND SYSTEMS

CJ-band Antenna (Circular Polarisation)

Spiral Antenna

- Covers 0.5 to 18 GHz
- Typical gain 0 dBic
- Typical beamwidth 70°
- Size 110 x 110 x 100mm
- Mass 450g
- SMA Connector

Status: In Production

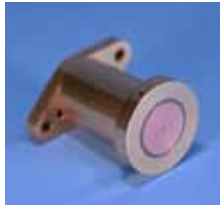


K-band Antenna (Circular Polarisation)

Spiral Antenna

- Covers 30 to 40 GHz
- Typical gain +5 dBic
- Typical beamwidth 70°
- Size 20 x 20 x 25mm
- Mass 10g
- SMP Connector

Status: In Production



Active EJ-band Antenna (Dual-CP)

Sinusoidal Antenna

- Covers 2 to 18 GHz
- Typical gain +8 dBic
- Typical beamwidth 70°
- Size 90 x 51 x 40mm
- Mass 150g
- SMA Connector
- RF Limiter, LNA & Switch
- RF Attenuation (10dB Steps)
- 3.0 GHz BIT
- 5V supply

Status: Available



CD-band Blade Array

(with Butler-Matrix beamformer)

4x Monopole Array

- Covers 0.5 to 2 GHz
- 2 Quadrantal Beams
- Typical gain +2 dBil (Vertical)
- Typical beamwidth 70°
- Size 200 x 140 x 110mm
- Mass 650g
- 2x SMA Connector

Status: Available



EJ-band HADF Array (Circular Polarisation)

Spiral Antenna Array

- Covers 2 to 18 GHz
- Typical gain +15 dBic
- Typical beamwidth 70°
- Size 451 x 110 x 115mm
- 4 Element interferometer and
- 2 Quadrantal antennas
- 2x TNC Connectors
- Ethernet control
- 28V supply
- Mass 1.7kg

Status: Available



EJ+K-band Antenna and Down-converter (Dual-CP)

Sinusoidal & Dual Spiral Antenna

- Covers 2-18 & 30-40 GHz
- Typical gain +3 dBic
- Typical beamwidth 70°
- Size 115 x 80 x 80mm
- Mass 500g
- SMA Connector
- 28V supply
- Discrete control

Status: In Development



EJ-band Antenna (Circular Polarisation)

Spiral Antenna

- Covers 2 to 18 GHz
- Typical gain +3 dBic
- Typical beamwidth 70°
- Size 51 x 51 x 35mm
- Mass 40g
- SMA Connector

Status: In Production



EJ-band Antenna (Dual-CP)

Sinusoidal Antenna

- Covers 2 to 18 GHz
- Typical gain +3 dBic
- Typical beamwidth 70°
- Size 75 x 51 x 40mm
- Mass 125g
- SMA Connector
- RF Limiter & Switch
- 5V supply

Status: In Production



K-band Antenna (Dual-CP)

Dual Spiral Antenna

- Covers 30 to 40 GHz
- Typical gain +5 dBic
- Typical beamwidth 70°
- Size 65 x 50 x 25mm
- Mass 75g
- 2.4mm Connector
- RF Switch
- 5V supply

Status: In Production

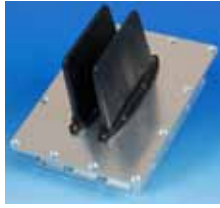


CD-band Blade Array and Up-converter

4x Monopole Array

- Covers 0.5 to 2.5 GHz
- 4 Quadrantal Beams
- Typical beamwidth 70°
- Typical gain +2 dBil (Vertical)
- Size 240 x 185 x 150mm
- Mass 1.6kg
- 28V supply
- 2x TNC Connectors
- Ethernet control

Status: In Development



Cylindrical Jamming Array

Polarisation Diverse Tx Array

- Covers 5 to 18 GHz
- EIRP ~750W
- Optically Fed
- Azimuth Beam steering

Status: In Development



Small Jamming Array with Monopulse Rx Channel

Polarisation Diverse Tx Array

- Covers 5 to 18 GHz
- EIRP ~600W
- 1D Scanning Array
- SMA Connector

Status: In Development

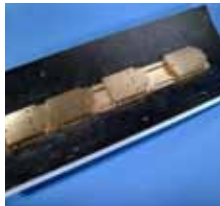


EJ-band HADF Array (Dual-CP)

Sinusoidal Antenna Conformal Array

- Covers 2 to 18 GHz
- 4 Element interferometer
- Typical gain +5 dBic
- Typical beamwidth 70°
- Size 300 x 50 x 30mm
- Mass 1kg
- RF Limiter & Switch (x4)
- 4x SMP Connectors
- 5V supply

Status: In Development



RADOMES

Existing radome products are all designed in-house and qualified for specific airborne platform requirements. Some typical examples are pictured and these come from both fast jet and helicopter based products.

Typical examples include:

- A-Sandwich
- Thin Wall
- Tuned Wall

GJ-band Antenna

Discone Antenna

- Covers 5 to 18 GHz
- Slant Linear Polarisation
- Omni directional
- Mass 150g
- PTNC Connector
- Typical gain +3 dBil
- Power Handling 150W
- Size 40 x 55 x 55mm

Status: In Production



EW PHASED ARRAY TECHNOLOGIES

GJ-band Solid State Power Module

Sinusoidal Antenna

- Covers 5 to 18 GHz
- EIRP 65W
- Full Polarisation Diversity
- Size 100 x 30 x 15mm
- Mass 50g
- SMP Connector

Status: In Development



Podded Jamming Array

Polarisation Diverse Tx Array

- Covers 6 to 16 GHz
- EIRP ~500W
- 2D Beam steering

Status: In Development

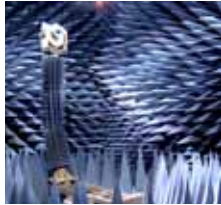


ANTENNA MEASUREMENT FACILITIES

Selex ES has a suite of Anechoic Chambers covering production and development testing, a high power test chamber and an EMC test facility. All of the facilities are RF screened from the outside environment to a level of 140dB at 40GHz. In addition, Selex ES has a Compact Antenna Test Range (CATR).

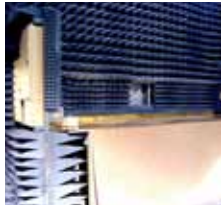
2x Antenna Test Ranges

- 8m x 8m x 6m
- 38kg Maximum Load
- 500MHz – 40 GHz
- 1m spherical quiet zone
- Agilent PNA-X Receiver
- MI3000 4-axis Positioning



EMC Test Range

- 8m x 8m x 6m
- Fibre grate flooring
- High Power Amplifier Room
- Support Room plus LISN



High Power Range

- 8m x 8m x 8m
- 1 Tonne Maximum Load
- 1 Tonne pendant crane
- 2GHz – 18GHz
- 1m spherical quiet zone
- Spherical NFR Capability
- MI3000 4-axis Positioning



CATR

- 1 Tonne Maximum Load
- 500MHz – 18GHz
- 3m quiet zone
- 7-Axis Positioning
- R&S Receiver
- Designed for High Power E Scan Testing



SOFTWARE PROGRAMS

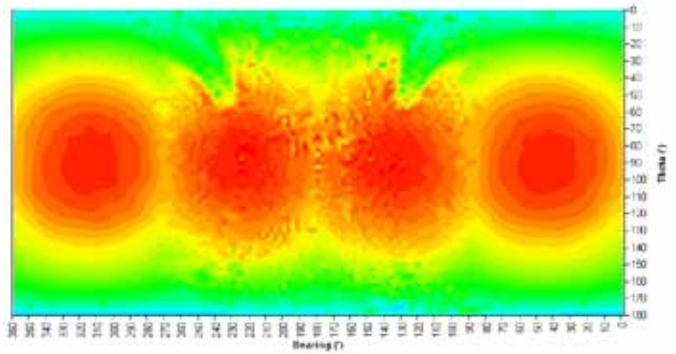
The Company has access to the following software design programmes as well as a number of Selex ES sponsored University research programmes.

3D EM Solvers

Commercial	CST Microwave Studio (Frequency and Time Domain solvers)
	FEKO
	HFSS
In-House	
Main uses - RCS, Installed Performance &	Radome modelling
	AGATE (FDTD code)
	MLFMM
3D Meshing Tools	Altair Hypermesh
	FEMAP
General Microwave Design Tools:	Agilent ADS
	AWR Microwave Office

INSTALLED PERFORMANCE MODELLING AND DESIGN CAPABILITY

Beowulf Cluster (Parallel Computing)



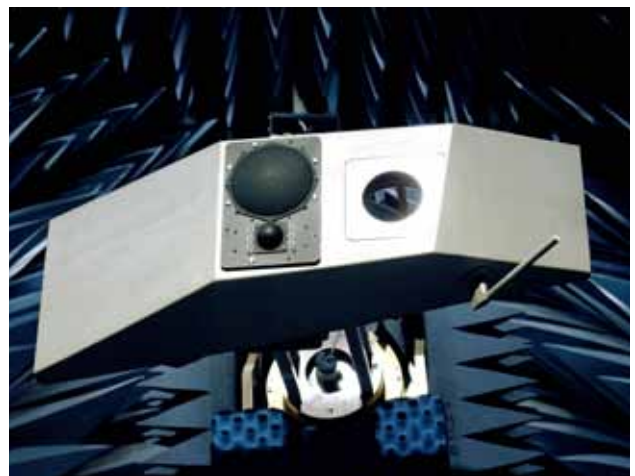
Demonstrating a typical installed performance plot for an installed RWR. Here, the four normally circular beam patterns are slightly perturbed by the presence of rotor blades.

Our in-house codes are all written for parallel execution. Our latest parallel computer consists of 256 CPU Cores and 1TB of physical RAM. The cluster interconnect fabric is InfiniBand™ operating at around 20GB/s. The cluster is cleared for operation up to and including UK Secret. Typical work includes computation of installed antenna performance and RCS prediction.

SCALE MEASUREMENTS

A technique that is well established in engineering disciplines is the use of scale models. By installing scaled antennas on metallised scale models (and measuring at scaled frequencies) we are able to get early confirmation of simulated installed performance.

This is particularly useful when initial models show that there are potential issues with a given installation. We also make use of localised section mock-ups, both to check that surface currents and the associated creeping waves have been effectively catered for in the models, but also to generate a better source description for the installed performance model itself.



HIDAS quadrant RX on AW159 mock up

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ASD MM08094 4-14