

Microwave Antennas

Specialist Antenna Design and Manufacture Capabilities



SATELLITE

Satcoms
Passive/Active
GPS
BGAN
Fixed/Mobile



COMMERCIAL

WiMAX
WLAN
RFID
Cellular



DEFENCE

UAV/UGV
Ground Station
Link16
C-Band
ECM



SURVEILLANCE

Radar
Body-Worn
Covert
Telemetry

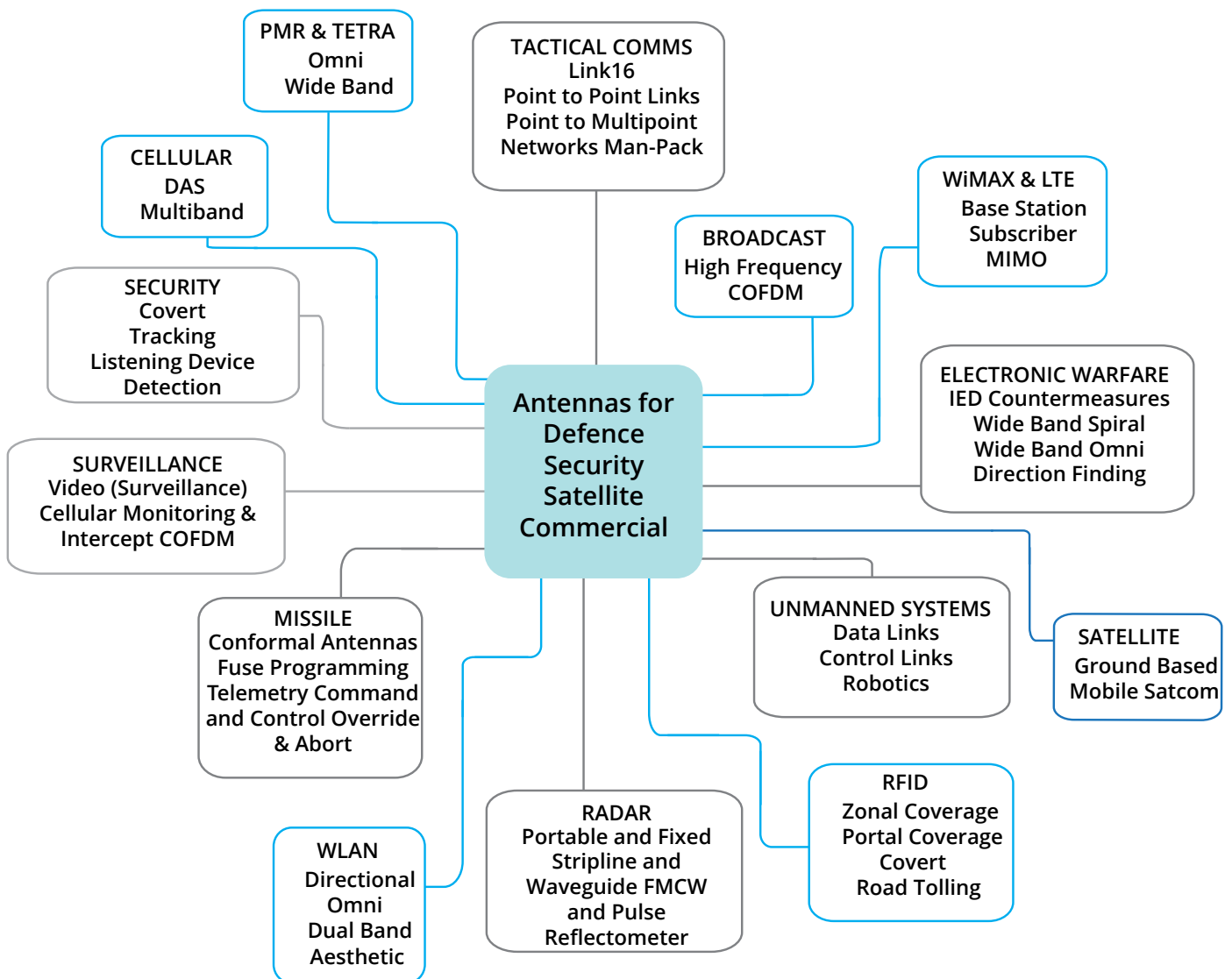


Microwave Antennas

British manufacturer -
part of the antenna
construction laboratory



Specialists in the design, engineering and manufacture of microwave antennas



ISO9001 certification forms the cornerstone of our customer service ethos to ensure that the company resources are focused on providing the optimum antenna to meet the needs of our customers.

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FMCW radar antenna array



Omni antenna for Swedish Space Corporation scientific experiment



A summary of the main applications for which our antennas can be used is contained in this leaflet.

We constantly develop antennas for new and emerging markets and applications. If you cannot see what you need, please contact us.

With more than 1000 antenna designs available, our flat panel, sector, omni, hemi omni and ultra wideband antennas are used in locations as diverse as UAVs, helicopters, aircraft, missiles, race cars, railway systems, TV cameras, weather buoys and satellites.

Applications include WLAN, Link16, Surveillance, Telemetry, Electronic News Gathering, WiMAX, Common Data Links and Radar.

The company's production, development and testing facilities are based in one UK location which ensures fast transition from design to production.

Our antennas are supplied to some of the largest organisations and companies worldwide, with over 60% exported.

All antennas are tested throughout development to ensure they meet quoted specifications and comply with relevant legislation.

Environmental testing can be carried out to recognised standards.

- **Our reputation is based on our customer focused design, supplying high performance antennas from 100MHz to 40GHz**
- **Proven expertise in all aspects of RF performance**
- **More than 1000 antenna designs**
- **Appropriate mechanical design to meet the specified environment**
- **Approved supplier to international defence organisations**
- **Mil standard qualification is available**
- **ISO9001 certification**

Engineering

Combining comprehensive knowledge and experience with the latest software design tools, the engineering team design antennas with optimised RF performance to meet customer's specific requirements.



Sales

Our experienced sales team has an understanding of applications in a wide range of markets which, when combined with their significant technical knowledge ensures that customers are offered the right products for their exact needs.



Catalogue

Our catalogue includes a wide range of antennas including high gain, multi-layer printed circuit arrays, directional, sector, ultra wideband spirals, collinear omnis and multi-octave bicones in various off-the-shelf designs.



Single UK location

Located in a single centre of excellence for the design, test and manufacture of antennas.



Defence

Blade antennas installed on Boeing prototype X-48B Blended Wing Body UAV



Remote controlled bomb disposal



Unmanned Airborne Systems

Unmanned Systems provide operational functions for airborne and remote ground surveillance, video transmission, border patrol and tactical systems. In all cases uninterrupted communication to the control centre is vital.

Competing performance and cost criteria are an important consideration when selecting the antenna. Standard, cost-effective, entry-level, high performance antennas are available that are already used on Unmanned Systems in extreme environments.

The correct antenna is critical to ensure system performance, battery-life and transmission range. Included in our range are:

- High gain collinear, vertically polarised, omni antennas installed in aerodynamic structures
- Common Data Link (CDL) Ku-band omni antennas have circular polarisation and up to 4dBiC gain
- Spiral antennas, phase and amplitude matched, for direction finding
- Directional antennas for communication between airborne towed target and the towing aircraft

Ground Control Centre Antennas

Antennas are available for both the control centre and remote platform. The ground based antenna normally provides the high gain part of the link and could be an omni, sector or directional antenna. A high gain directional antenna is likely to require a two-axis steering system. A less complex but compact multi-sector antenna array provides intermediate range coverage and can be used for quick deployment, tactical applications.

Airborne or Ground based platforms
Control Data
Link Robotics

Electronic Warfare

IED Countermeasures

Having detected RF signals which are associated with threats (missile radar or IED), one of the possible evasive actions is to deny use of the RF spectrum by countering (jamming) with appropriate levels (10 to 100 Watts) of microwave energy at the same frequencies.

If the direction of the threat is known a directional high power, high gain antenna would be most appropriate. If the direction is unknown then an omni antenna would provide 360° blanket coverage.

As RF sources and amplifiers used for jamming are developed to cover wider bands at higher power, it is important that appropriate antennas are developed in parallel. The antennas must be wide-open, covering all specified bands without tuning.

For omni antennas peak gain must be on the horizon at all frequencies, they must be small enough to be used by foot soldiers and rugged for vehicle applications, with high efficiency to extend battery life.

We have a portfolio of ultra wideband omni and directional planar spiral antennas in the range 100MHz to 18GHz covering all of the bands in which high power amplifiers currently operate.

High Power Planar Spiral Antennas

The reflector-backed spiral has no absorber to can handle up to 100Watts, fully efficiently, with up to 8dBi peak gain, giving an impressive level of EIRP for Countermeasures. The reflector-spiral antenna provides circular polarisation which can have benefits where the polarisation of the threat signal is unknown.

Ultra Wideband 100MHz to 18GHz
Directional Planar Spiral Omni-Directional
High Power
Direction Finding
Jamming



XPO2V-2.0-18.0/1397 (2 to 18GHz) (LEFT) and XPO2V-0.8-6.0GF/1441 (0.8to 6GHz)

SBA-38/919
Blade
3.80-4.00GHz

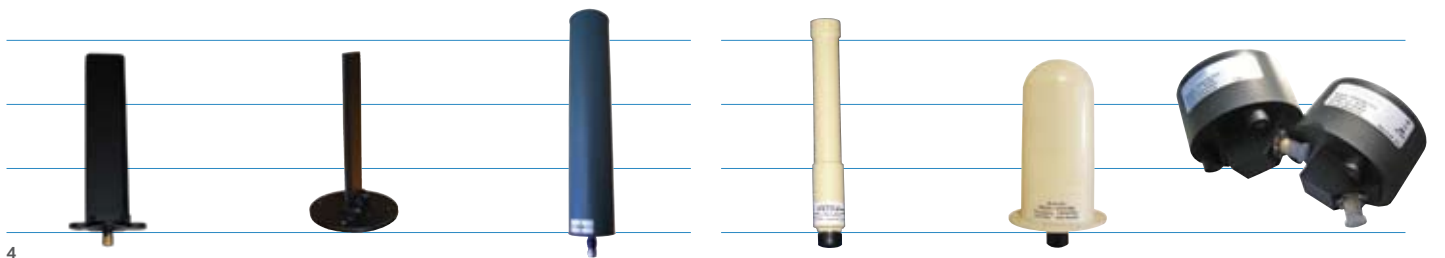
SBA-900/1249
Blade
0.90-0.93GHz

SA9-120-1.3V/1445
Sector, 9dBi, 120°
1.20-1.45GHz

XPO2V-1650-3000/135
4 Omni UWB
1.65-3.00GHz

XPO2V-1.0-6.0/1442
Omni UWB
1.00-6.00GHz

Two PSA0218L/1333 phase matched cavity-backed spirals 2.0 - 18.0GHz



Defence



Link16 antennas



Omni antennas on armoured vehicles

Tactical Communications

Antennas for tactical communications cover a wide variety of systems that are used by convoys, airborne vehicles, soldiers and control centres.

Link16

The Link16 protocol uses frequency bands that cover 960-1215MHz. Our range of extended performance broadband omni antennas has been designed for use in Link16 terrestrial and naval systems communicating with airborne platforms. All Link16 antennas are rugged, designed for extremes of weather and temperature, and have been tested under theatre conditions without affecting the performance or inhibiting mission requirements.

Extended range and operation can be achieved by using sector antennas in a diversity application.

Battlefield Communications

Reliable radio communications are crucial in theatre. Slim, light weight man-pack/body-worn antennas are designed to provide an improved signal pattern for a greater all round coverage. A further benefit is provided by circular polarisation that alleviates the problem of polarisation mismatch when soldiers are in different orientations with respect to each other. These antennas have the added advantage of being less intrusive and more comfortable for the wearer.

- Link16
- JTIDS
- JTRS
- MIDS
- Body-Worn
- Common Data
- Link Point to Point Links
- Point to Multipoint Networks



C-Band (4.4 to 6.0GHz)

Directional

A directional antenna radiates in one direction providing gain from 7dBi to 26dBi, depending on the size of the antenna. They are usually slim flat panels with a discreet profile and may be painted to blend in with the surroundings.

Low wind loading and robust construction allow our antennas to be used in demanding environments.

Omni-Directional

Our tough omni antennas are rugged enough for deployment on all types of vehicles as well as fixed installations with spring mount options.

- Fixed and Mobile
- Military and Security Data
- Links
- WLAN
- Telemetry
- Video and Voice
- Links



FPA20-47V/1323 Directional antenna

Sector and Multi-Sector Antennas for Base Stations

Sector antennas are normally used as base stations. They have narrow elevation beams and can be designed with null-fill, electrical downtilt and sidelobe suppression. Clearly defined, wide, azimuth coverage ranges from 30° to 210° in the horizontal plane with profiled vertical coverage.

Multi-sector arrays provide high gain, wide area coverage and are contained in a single radome.



MSA6-15-46L/879 Multi-Sector Antenna with 5 sectors and 1 overhead, with and without radome.

Model	Frequency	Gain	Mounting
DPA2-2.3V/1611	2.28-2.55GHz	Body-Worn	Body-worn
XPO3V-500-1300/03	0.50-1.30GHz	4 Omni	Vertical
XVO4-960-1215/142	0.96-1.21GHz	5 Omni	Vertical
SA17-60-4.7V/1419	4.40-5.00GHz	Sector	Panel
VOA8-47/1170	4.40-5.00GHz	Omni	Vertical
FPA21-10A-47R/591	4.40-4.85GHz	Directional	Radome

Defence

MARK Resources
HSTAT High Speed
Target
Acquisition and
Tracking radar
system



Conformal
antennas for
missiles



Radar

There are a wide variety of radar systems operating across the RF spectrum and they all work on the principle of a high power pulse or CW transmitted RF signal being reflected from the 'target' and usually being received by the same (or nearby) antenna.

Chelton Ltd have developed antennas for radar in Stripline and Waveguide for CW Doppler, FMCW, fixed beam pulse, and reflectometer arrays.

The antenna characteristics are critical to the system performance in order to resolve the target image.

Sophisticated modelling techniques combined with 20 years of experience in the design of microwave antennas will provide customers with an efficient, reliable antenna that meets their exact requirements. The company's near-field spherical anechoic test chamber supplies accurate patterns and 3-D images to demonstrate compliance with customers' specifications.



32 off panel antennas
on CW Doppler Radar
System for BAE Systems

Portable and Fixed
Stripline and
Waveguide
FMCW
Pulse

Missile



Antennas can be conformal
to avoid compromising
aerodynamics

Conformal Antennas
Fuse Programming
Ground and Airborne
Telemetry
Command and Control
Override and Abort

Conformal 'wrap-around' telemetry
antenna for missile



An S-band antenna (2.3GHz, 20MHz bandwidth) has been developed to transmit telemetry data from a missile.

Other types include patch and omni antenna that may be integrated into fins and wingtips.



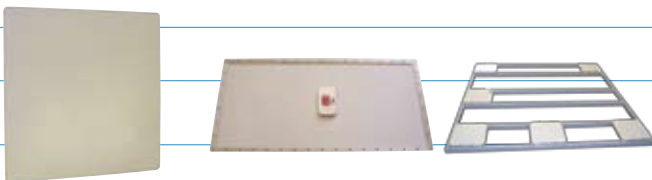
FPA29-105V/1246
Directional

X-Band,
Directional
antenna for radar

Reflectometer array

SBA-2.3V/1470
Blade
2.00-2.50GHz

HDA-1275/1148
Blade
1.20-1.35GHz



Satellite

Satellite image of the fires raging across California taken by UK-DMC satellite, which carries the nadir antenna for a GPS reflectometry experiment



Positioning TROLL - high gain directional antennas provide Inmarsat data links for differential GPS. Photograph courtesy of Shell Norske



Satellite

Fixed installations

High gain directional antennas can be pointed at the correct azimuth and elevation angles so that peak gain is directed towards the satellite for fixed installations. They can be located anywhere within the satellite footprint.

Suitable for SCADA applications.

Ground Based and Mobile Satcom

Inmarsat Surrey Satellite Technology Ltd

Directional antennas for Meteosat

Iridium

Passive and Active GPS antennas

Thuraya 1.52 to 1.66GHz

Satellite/GPS integrated antennas for use with Thuraya satphone and SM2500 module

A choice of antennas provides connectivity within Thuraya satellite coverage, used for land mobile and fixed installations.

Integral active GPS antenna for fast GPS acquisition and ease of installation.

Rugged, light weight, fully sealed.



HOA2-159L/GPS/1486

Mobile/Portable

Passive vehicle antenna for low elevation. Suitable for mobile applications. Hemi omni antenna, HOA2-159L-GPS/1548 mounted on vehicle in Australia. Photograph courtesy of Optus.



Satellite/GPS integrated antennas for use with Thuraya satphone docking units and SM2500 module

The FPA15-1.6L/1535 panel antenna can be used to operate the ThurayaIP unit at its maximum data rate.



High gain directional antenna

This antenna has 22dBic gain. Measuring 890x890x10mm, it replaces a 1.2m dish.

Remote antenna for Inmarsat BGAN system

This slim, directional antenna can be used with tripod mount. The antenna has 17dBic gain, left and right circular polarisation and operates within -50° to +50°C and 95% Relative Humidity.



FPA21-1.6R/1127

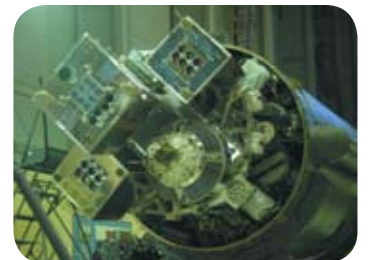
Data Collection Platforms and Weather Ships

Rugged, hemi-omni antenna withstands a hostile environment to provide meteorological data using a 402MHz satellite up-link. Photograph courtesy of the Met Office.



Nadir antenna

For Surrey Satellite Technology's UK-DMC satellite this L-band antenna has high gain, 10° offset from bore-site and was designed to help avoid RF interference. Photograph courtesy of SSTL.



HOA2-1.6L/1404
Hemi Omni

FPA8-1.6RL/1563
Directional

FPA7-1.6V/1510
Directional

LPA7-1.6L-GPS/1459
Directional

LPA7-1.6L/1405
Directional

HOA20159L-GPS/1548
Hemi Omni



Security and Surveillance

Suffolk Air Operations Unit EC135 helicopter. Photo courtesy of Eurocopter



Vehicle mount antennas



Security

Small, discreet and robust, our antennas are used for covert and overt systems within security and surveillance applications around the world.

For obvious reasons it is not possible to divulge these applications.

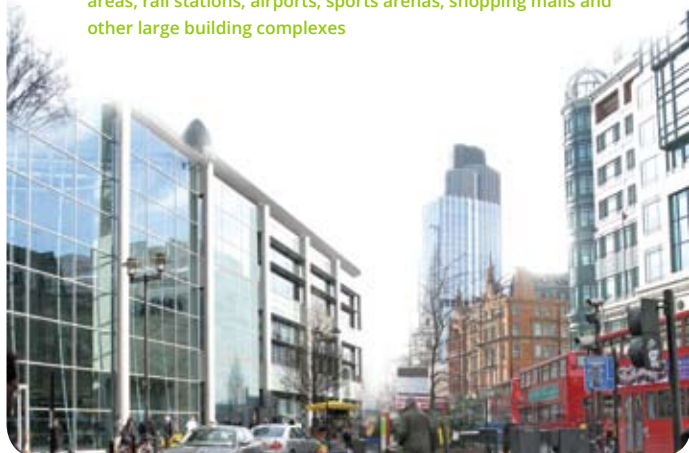
Practical, efficient and cohesive communications between staff, wherever they are, and central control is essential.

Our antennas are used within many types of applications including surveillance, unmanned vehicles, IED Countermeasures, video transmission, COFDM, PMR and Tetra systems.

IED Countermeasures
Counter Terror Surveillance
COFDM
UAVs
Video
Transmission
PMR and Tetra
Covert
Tagging
Telemetry

- High speed data and video links between helicopter and base station for real time monitoring, long distance links
- ISM band
- Switch sector base stations for tracking and covert surveillance.
- Remote monitoring via CCTV, motion and perimeter protection, PIR, RF intruder detection and covert systems.
- Inter-communication between operators and command for protection of security patrols, control of traffic, visitor access, building entry and facility monitoring in docks, warehouses or airports.

Applications include mobile and fixed systems in metropolitan areas, rail stations, airports, sports arenas, shopping malls and other large building complexes



Directional antennas with narrow beams reduce the possibility of intercept

High gain sector antennas for point-to-mobile systems

Data and video streaming

Optimised system performance by selection of transmit and receive, fixed and mobile antennas

Data transmission for real-time, informed, decision-making

Antennas can be mounted on cameras for ENG (Electronic News Gathering)

Long distance links

Discreet designs for covert operations

Directional antenna with right circular polarisation
FPA16-3.4R/1658
3.35 to 3.45 GHz



Example Frequencies

0.9GHz	Cellular intercept
1.2 - 1.4GHz	Data and video links
1.394GHz ±5MHz	Video for security & CCTV
1.5GHz	Military telemetry
2.3-2.5GHz	Video links
2.42 - 2.48GHz	ISM band
3.6 - 4.0GHz	Grand Prix telemetry
4.4 - 4.8GHz	Helicopter links
10.0GHz	Secure comms link

SA9-120-1.3V/1560
Sector
1.15-1.45GHz



OA-1.5V1630
UWB Omni
1.00-2.00GHz



HDA-1.3V/1488
compact Directional antenna for body worn systems 1.26-1.40GHz



Security and Surveillance

Multi Sector Antenna for COFDM

Sports stadia



A miniature Multi Sector antenna in the 2.0-2.7GHz band is available specifically for use with COFDM (Coded Orthogonal Frequency Division Multiplexed) radios.

COFDM provides significant benefits over conventional analogue microwave transmissions, especially in high multi-path environments such as dense urban areas.

It is possible to virtually eliminate Fade even in Non Line of Sight (NLOS) situations, through the use of spatial antenna diversity schemes.

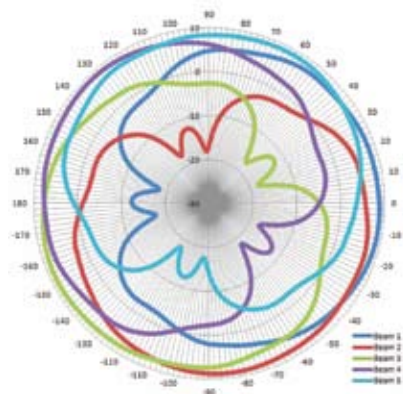
For this reason COFDM systems are being used for National Security, Police and Military applications where it is vital that integrity of video and data links is maintained under the most imposing situations.

- Airports
- Rail Stations
- Underground Train Networks
- Government Buildings Military Compounds
- Stadia
- Perimeter Monitoring
- Vehicles
- Helicopters
- Ground Stations

Model MSA6-2.4V/1795 has 6 antennas and is contained within a rugged housing which is only 6.5 inches diameter (155mm) x 12 inches tall (300mm).

Five of the antennas are sector antennas, each of which has up to 9dBi peak gain and azimuth beamwidths of 120°. They provide a very high level of overlap so that the COFDM radio can practically use 3-4 sectors worth of data at any time for recombination, ensuring that even very localized transient fading (especially associated with use in mobile applications) is eliminated.

The Multi Sector antenna contains a sixth antenna which is up-looking to provide complete hemispherical coverage. This increases the practical applications and maximizes operational flexibility for the antenna for rapid deployment as well as temporary and fixed installations.



Azimuth patterns showing 9dBi peak gain, 120° beamwidth and high level of overlap for the five sector antennas



Front line, video surveillance utilising helmet mounted antennas

Front line video surveillance

Body worn camera and helmet mounted antenna system - full scale public order training exercise by Kent Police using equipment developed by Reveal Media and Cobham Surveillance



High gain, circular polarised omni antenna in the 2.4GHz band, alleviates the need for expensive airborne tracking systems. They can be mounted in (or on) vehicles for mobile WLAN



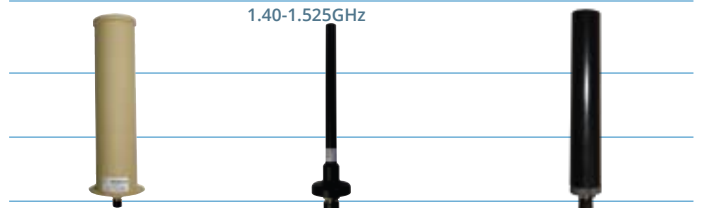
6-way, circular polarised, switch sector antenna used to track and receive video and telemetry from helicopters over London



XPO2V-500-1300/1351 extended performance omni antenna and IED CM 0.50-1.30GHz

EVD2-1.5V/1646 vertically polarised omni antenna for mounting on UAV 1.40-1.525GHz

Vertically polarised omnis, 184x32mm Ø, for L-band, S-band and C-band



Commercial

Sector antenna
WLAN coverage
in Sydney



RFID for tracking
valuable goods



Electronic News Gathering (ENG) COFDM

A range of transmit antennas can be mounted on to a video camera, as well as being used for digital and video uplinks from ground station or mobile vehicle to helicopter.



Photo from P4 Productions

These robust, small, discreet antennas makes them ideal for outside broadcast applications in the most demanding of locations such as on safari or mountaineering.

Video communications are now an essential part of many sporting activities so these light weight, small antennas are ideal.

Cellular

DAS
Multiband

Our antennas are used as microcell base stations in dense RF locations and for GSM based data communications systems.



Discreet appearance

There are single band antennas, plus dual and tri-band antennas for GSM900, GSM1800, PCS1900 and 3G. Ultra wideband antennas cover these frequencies as well as WiFi hotspots and WLAN for Distributed Antenna Systems (DAS).

This wide range of antennas includes sector base stations, omni-directional and directional panel antennas with a variety of gain, polarisation and beam patterns.

PMR and TETRA

Antennas have been designed to cover PMR and Tetra bands. Installations include discreet locations in the prestigious St Pancras International railway station and London Heathrow Airport Terminals.



Omni antennas for WLAN

In each case designs had to conform to strict RF specifications while meeting architect approval and fitting within demanding structures.

RFID

Zonal Coverage
Portal Coverage
Covert
Road Tolling

This range of omni and directional RFID antennas covers the 433MHz and 868MHz, and 915MHz and 2.5GHz bands for non-European installations.



RFID road tolling

WLAN

Directional
Omni
Dual Band

WLAN omni-directional, directional and sector antennas are available in 2.4GHz, 2.5GHz and 5.8GHz frequency bands. Dual band antennas allow simple upgrade paths between protocols. Dual slant 45° polarisation antennas provide diversity for all applications.



Cargo monitoring at Port of Felixstowe

Multiple antennas can be designed to be housed in a single radome to aid architectural approval. Used for metropolitan and rural WiFi networks, point-to-point and point-to-multipoint and COFDM systems.

WiMAX and LTE

Base Station,
Subscriber
MIMO

The VECTOR range of antennas meets demanding RF specifications required for the WiMAX, LTE, WLAN and WiFi, offering flexible antenna solutions across a range of frequency bands.

The VECTOR range consists of sector antennas (60°, 90° and 120° azimuth coverage), high gain directional antennas and omni antennas (2 to 11dBi gain).

All antennas are available with vertical polarisation, however base station sector antennas can be supplied with horizontal, dual polar or ±45° polarisation.

Engineering, Technology and Testing

Spherical Near-field Test Range

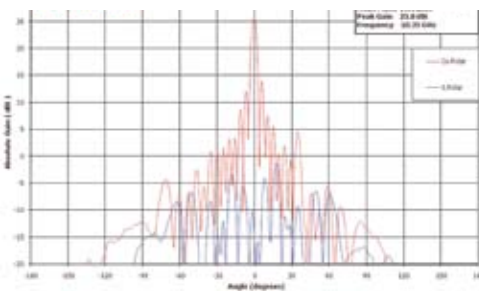
Measurement Capabilities

Frequency Range	0.4 to 40 GHz
Max Antenna Dimension	1.5m
Max Antenna Mass Max	5 kg
Antenna Directivity	40dBi
Measurement Method	Multi-frequency spherical near-field
Measurement Platform	PNA-X network analyser
Measurement Time	Depending on antenna specification and frequency

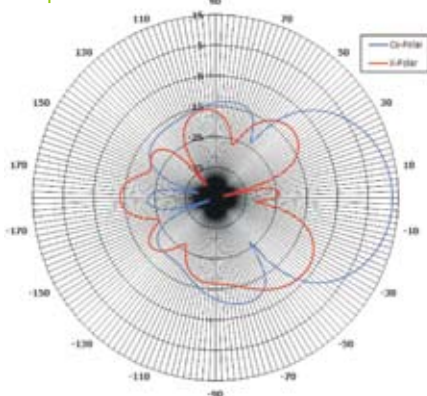
Data Extraction Capabilities

- Far-field gain over full 3D surface
- Far-field axial ratio over full 3D surface
- Far-field phase over full 3D surface
- Performance data in Cartesian or polar formats
- Text files of performance over full 3D surface
- Holographic back projection to antenna surface
- Near-field raw data

X-Y Spreadsheet



Polar Spreadsheet



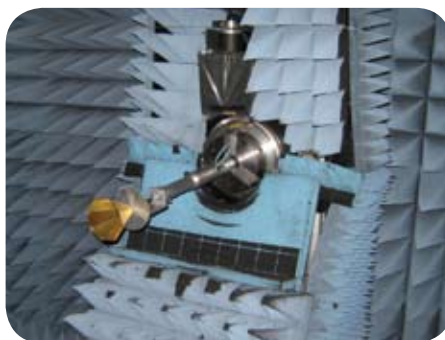
The on-site spherical near-field test range is an example of our commitment to enhancing development facilities and technical support to customers.

This facility provides radiation pattern data to verify specifications and to ensure compliance with stringent radiation pattern envelopes where necessary. The far field radiation pattern of the antenna can be calculated in any direction, in any polarisation, circular or linear, at any angle.

Operating within 0.4GHz to 40GHz, it has a dynamic range performance down to 800MHz.

Testing times depend on antenna size in wavelengths and the number of measurement frequencies. Gain measurements can be provided as well as directivity.

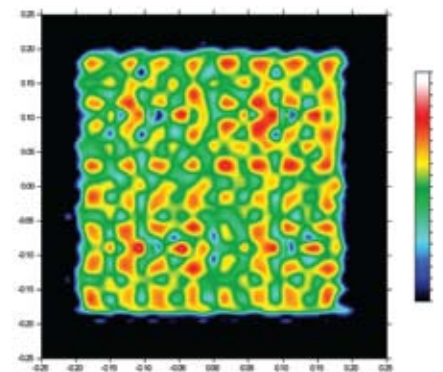
An additional benefit of the spherical near field test facility is the ability to perform back projections on to a given plane within the measurement sphere. A holographic back projection on to the aperture of the antenna highlights material defects that might affect antenna performance, and enables them to be resolved at the design stage. It is possible to determine the affects of coupling within a circuit that may cause amplitude, phase corruption within an array or if there is unwanted radiation off the feed circuit.



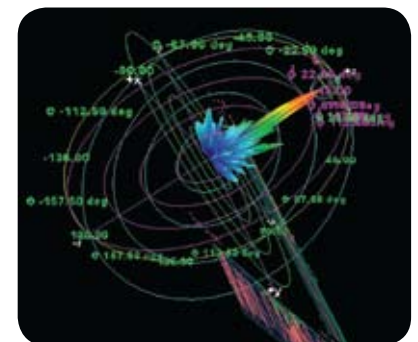
Environmental Testing Capabilities

- Vibration
- Shock – gravity
- Bounce
- Bench handling – impact
- Life testing
- Centrifugal
- Seismic
- Temperature
- Humidity
- Altitude
- Ingress
- Sand and dust
- Salt corrosion
- Susceptibility to fluids

Hologram Amplitude of 1688-03.NSI



3D image of antenna far field radiation pattern



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www.chelton.com/microwave