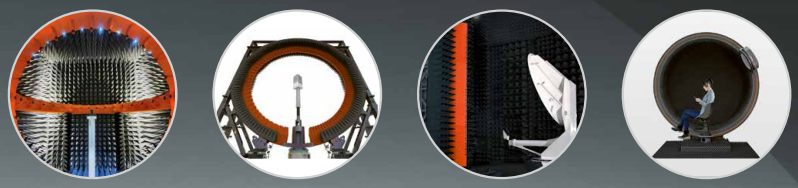
ANTENNA MEASUREMENT AND RADOME TEST SYSTEMS

OVERVIEW



mvg
Microwave Vision Group

Testing Connectivity for a Wireless World

The Microwave Vision Group (MVG) incorporates the technical expertise, product portfolios and infrastructures of four historic antenna measurement industry leaders: SATIMO, ORBIT/FR, AEMI and Rainford EMC.

Combining our strengths, we are dedicated to developing turn-key antenna measurement systems, services, and solutions capable of meeting customer specific needs.

We are committed to serving you through offices worldwide, where you'll find our sales, project management and customer support teams locally at your convenience.

COMPREHENSIVE PRODUCT RANGE

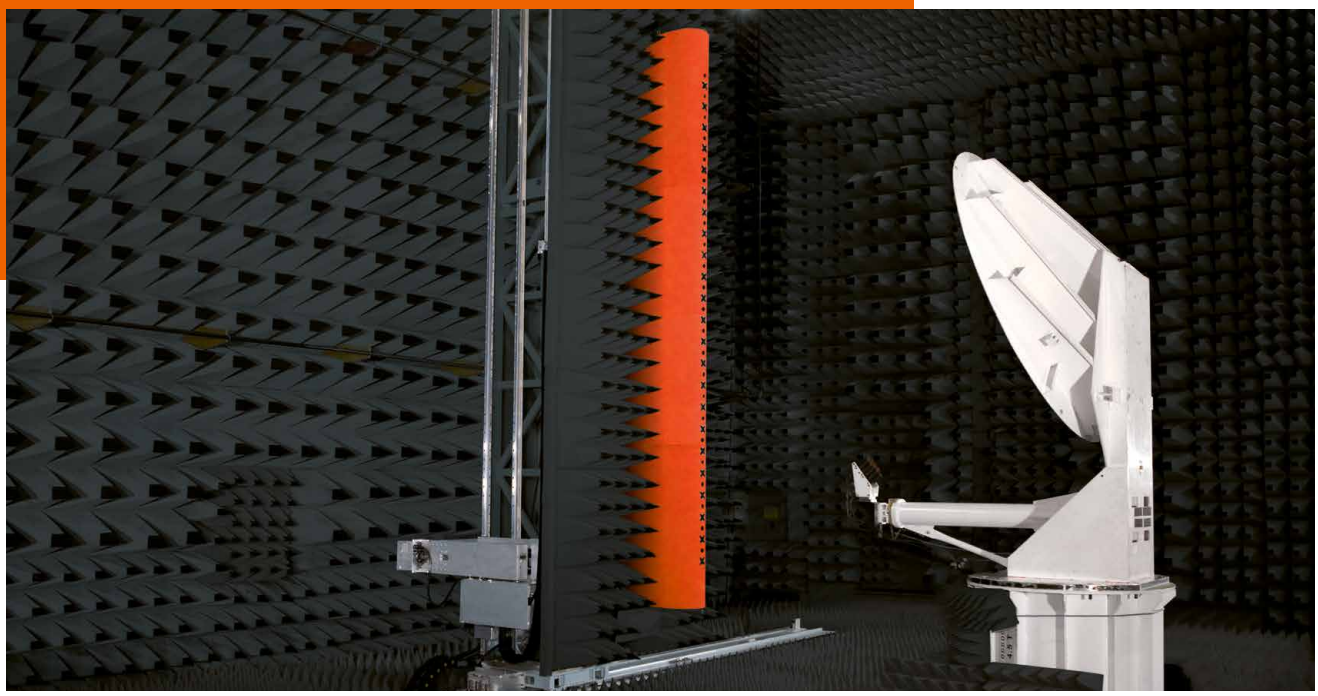
From components and parts to full turn-key solutions, the right combination enables you to meet your specific measurement needs in a variety of testing configurations. Our offer allows you not only the facility of finding suitable off-the-shelf products, it also guarantees an upgrade path to enhance system capabilities.

MVG products are grouped into several families:

- **Absorbing materials:** pyramidal, wedged, convoluted; standard, clean room absorbers, rubberized absorbers, HP absorbers, EMC absorbers, walkways
- **Shielded chambers for Antenna Measurement and EMC:** 10, 5, 3 m chambers, MIL-STD, compact chambers, shielded doors and rooms for testing and EMI, EMC, EMPP and more
- **Positioners:** Rotary and linear positioners, model towers
- **RCS Pylons:** Standard and tailored models; choice of 3 tip types: AZ/EL hat-type, AZ/EL low profile, AZ only
- **Controllers:** Positioner controllers, Power Control Units, Local Control Units
- **RF system units**
- **Compact ranges**
- **Reflectors:** serrated edge, rolled edge
- **Multi-probe systems:** Starlab, StarMIMO, SG 24, SG 64, SG 128, SG Evo, StarBot 4300, SG 3000 F, SG 4100 F, T-DualScan, G-DualScan, StarLab 50 GHz, MiniLab, AeroLab, Starwave
- **Single-probe systems:** µlab, TScan, HScan
- **Measurement control, data acquisition and post processing software:** MiDAS, Insight, 959 Spectrum, MV-Echo, WaveStudio Automated Antenna and OTA Measurement Software Suite
- **Antennas and probes:** Biconic, diagonal horns, dual polarized feeds, dual polarized OEWs, dual polarized probes, electric sleeve dipoles, feed horns, magnetic dipoles, monocones, monopoles, open quad ridge horns, closed quad ridge horns, open-ended waveguides, linear arrays, standard gain horns, wide-band horns

www.mvg-world.com/ams

CUTTING-EDGE TECHNOLOGIES



The advanced technology in MVG systems supports our customers in their drive to innovate. Our aim: to give you a sharper technological edge and faster ROI (Return on Investment). The speed and accuracy of our systems stems from two cutting-edge technologies:
❶ MV-Scan™ Technology
❷ Advanced Precision Electro-mechanical Technology

1/ MV-SCAN™ TECHNOLOGY: FAST - ACCURATE - SMART

MV-Scan™ Technology is integrated into all our multi-probe systems. With MV-Scan™, an array of probes is electronically scanned, increasing measurement speed while also gaining in measurement accuracy. It's also smart technology that allows for choices in configurations in order to limit mechanical movements.

Fast

The need for faster measurement of antennas and radomes is a growing concern in the industry. Not only do our customers want to test significant numbers of beams at once, they want to test more frequently and in a short amount of time. Optimizing ROI is essential.

The electronic scanning of an array of ten to hundreds of probes using MV-Scan™ allows the measurement of a full cut in quasi-real time.

Faster measurement time quickens the overall antenna development process

As you gain time in antenna testing and measurement, you gain time in the development of your new product.

Faster measurement time optimizes measurement facilities

A major R&D investment, facilities are used more efficiently as faster measurements allow more antennas to be measured in a shorter amount of time. ROI is maximized.

Accurate

High levels of accuracy and repeatability remain an absolute necessity for the needs of increasingly complex testing. We are able to ensure measurement accuracy of our systems as a result of several complementary factors.

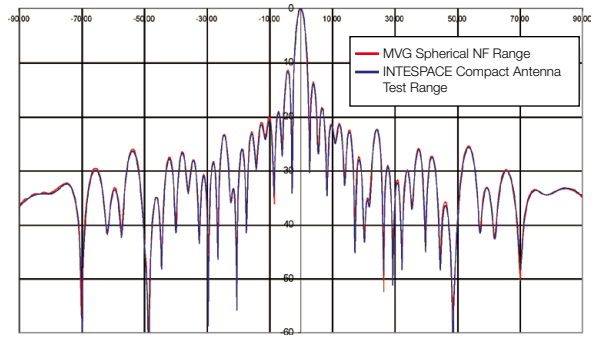
- Precise knowledge of our systems' error budget
- Comparison studies
- Reduction of mechanical movements
- Continuous probe calibration

Precise knowledge of our systems' error budget

Knowing the error budget is essential for predicting the accuracy and repeatability of a system. Each of our systems undergoes a validation process where the error budget is determined for reference during installation and maintenance.

Comparison studies

As a second measure in system validation, we perform comparison tests in different types of ranges (near-field, far-field, compact ranges, etc.). The results of these studies allow us to obtain the data necessary in fine tuning the accuracy and repeatability of our systems.



H-cut of the Aircraft Front Radar

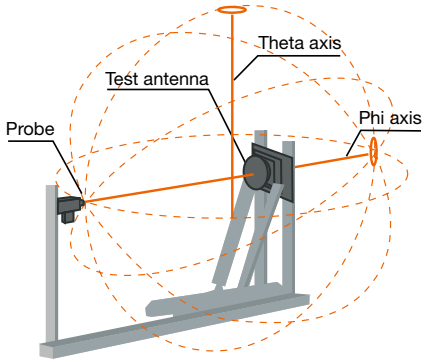
Continuous probe calibration

All our systems are equipped with a reference channel that is connected to the same amplification unit as the measurement probes. This allows continuous drift compensation, thus ensuring measurement data accuracy over time.

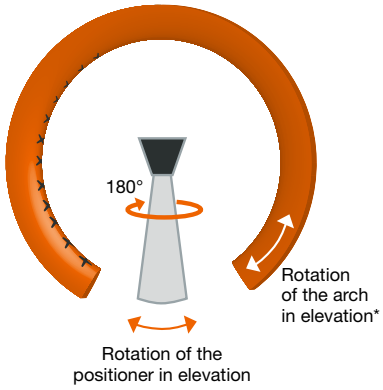
Reduction of mechanical movements

In most classical spherical single-probe measurement systems, the DUT (device under test) is rotated in azimuth from 0 to 360° and in elevation from 0 to 180° in front of a single, stationary probe to measure the field surrounding the device. MVG's spherical multi-probe systems limit mechanical movements by rotating only the DUT 180° in azimuth while the fields surrounding the device is simultaneously scanned by the multi-probe array.

Traditional single probe spherical configuration



MVG's multi-probe spherical configuration



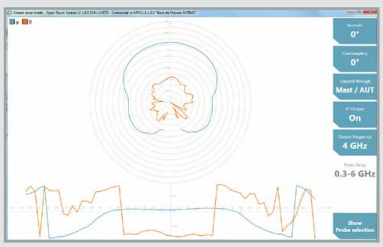
*Currently only available on SG Evo and StarLab system

The reduction of mechanical movements enables:

- **Improved measurement accuracy,** for roll over azimuth measurements where multiple mechanical movements can be a source of disturbance especially for low gain antenna
- **Increased measurement repeatability,** reducing the risk of error which is an important factor in antenna optimization
- **Extended system life,** as repeated movements can affect the reliability of mechanical parts

N-Probe Array Controller (N-PAC)

The N-Probe Array Controller is the heart of MVG's multi-probe advanced measurement systems. It comprises the necessary components driving the system's equipment (motors, probe array, instrumentation…). This powerful and highly accurate instrumentation provides real-time acquisition and system management thanks to an embedded FPGA. This includes an IF receiver offering a high dynamic acquisition range (up to 110 dB) and asynchronous communication with several remote PCs. Its massively parallel architecture brings new possibilities into the monitoring of complex measurement. The N-PAC comes with monitoring software to manually control the motors, select probes and visualize the pattern of the device under test in real time. All this via a touch screen PC or tablet.



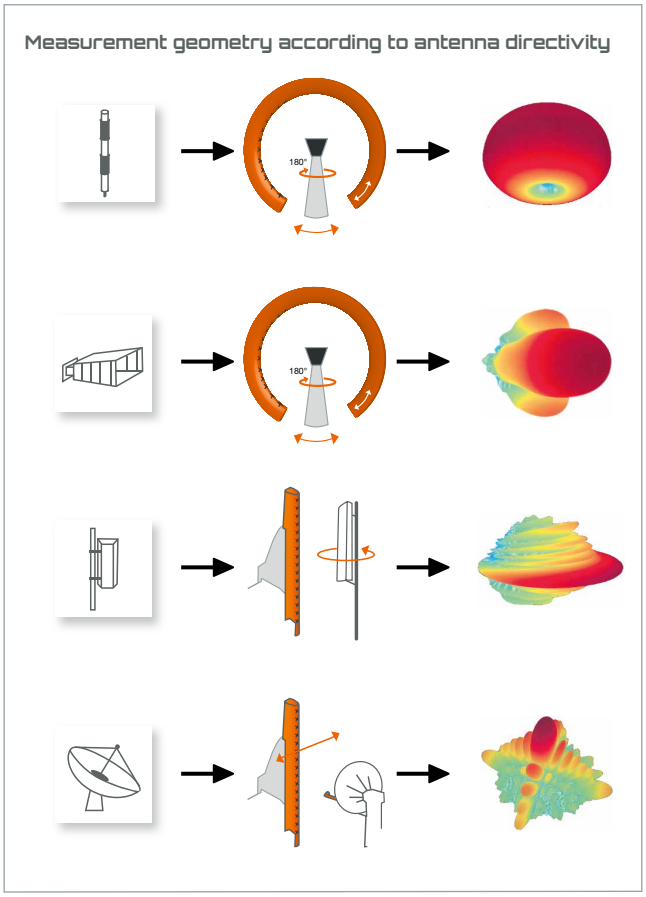
Smart

The use of probe arrays reduces the number of probe/DUT positions necessary to complete a test. This results in fewer mechanical movements. In addition, we offer a choice of geometries as well as different types of arrays to allow you to attain the most efficient configuration. Mechanical movements are thus minimized and speed and accuracy are maximized.

The right geometry for your application

An array of probes can be integrated into different system architectures.

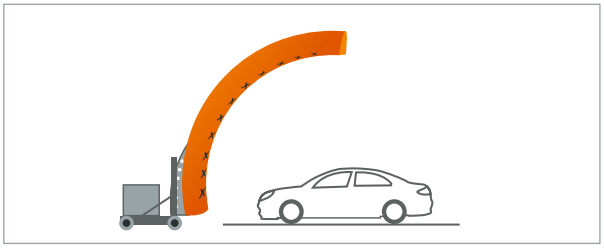
- **Spherical geometry (SG systems – SG 24, SG 32, SG 64, etc.):** Tests any type of antenna. Necessary for OTA testing or for testing wide-beam and omni-directional antennas such as wireless devices.
- **Cylindrical geometry (StarLab, T-DualScan):** For semi-directive antennas such as BTS antennas.
- **Planar geometry (T-DualScan):** For highly directive antennas such as phased arrays, satellites, communication antennas.



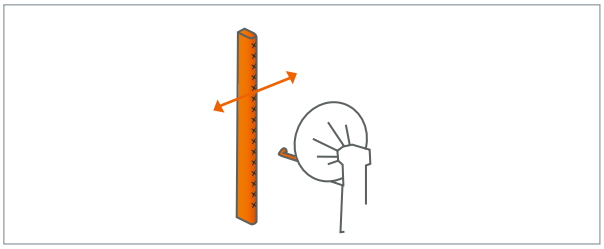
Optimized positioning configurations

Various probe array and positioner configurations are possible depending on customer constraints and on the size of the object under test.

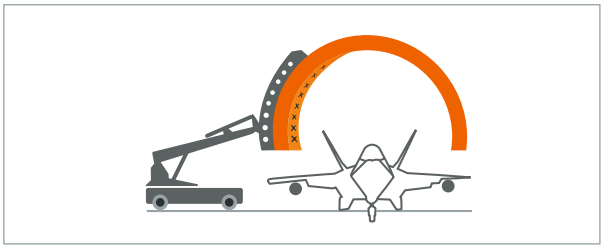
- **Stationary arch** - the positioner rotates the object under test 180°.
- **Stationary or movable arch** - the array can move in and out of the shielded anechoic chamber. The object under test rotates on a positioner or a turntable.



- **Linear probe array** - the array is fixed to a frame scanner; it moves on one axis.



- **Movable arch** - the array moves around the object under test. This innovative technique simplifies the measurement set-up for very large devices under test: the DUT remains stationary as the measurement array is displaced as required.



Unlimited scan resolution in both azimuth and elevation

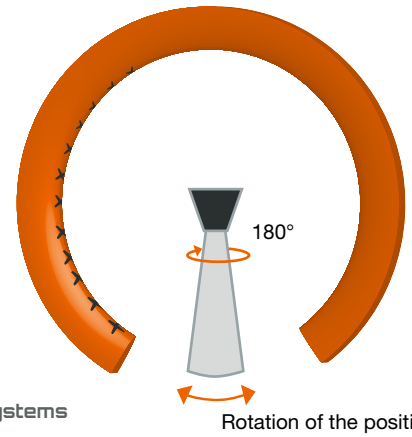
PATENTED

Our multi-probe systems offer patented oversampling capabilities in order to achieve unlimited scan resolution. Oversampling is done by combining automated mechanical movements and the electronically scanned probe array.

The spacing between two probes of an array, for example 5.29° for the SG 64 is suitable for small antenna testing. For larger antennas, an additional mechanical rotation in elevation can complement the probe array azimuth scan. The arch rotates in elevation, for instance ± 2.6° for the SG 64, to "fill in the gaps" and provides the possibility of unlimited sampling.

OVERSAMPLING CAPABILITIES

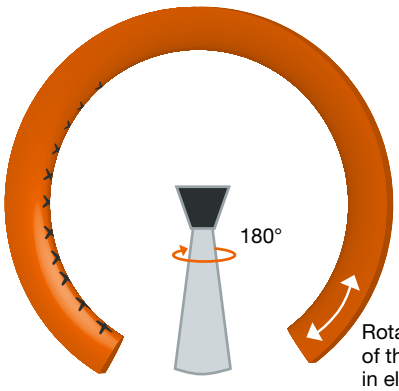
❶ GONIOMETER



SG systems

Rotation of the positioner in elevation

❷ ARCH ROTATION



Rotation of the arch in elevation

SG Evo and StarLab system

2/ ADVANCED PRECISION ELECTRO-MECHANICAL TECHNOLOGY

Integrated in all our systems, this technology allows:

- Real-time control of positioning sub-systems
- Fast measurement with high speed linear motors
- Increased accuracy of positioning systems and subsystems with the MV-Cor™ correction table service

Real-Time Full Control of Positioning Sub-systems

MVG positioner controllers offer real-time control of positioning subsystems up to 4 axes in parallel for use in near-field and far-field antenna measurement systems.

They may also be configured to drive planar scanners and general purpose far-field positioners that are encoder-based or involve simultaneous motion.

Our controllers have an on-the-fly real time discrete table triggering capability, real time on-the-fly position correction, and are made to work with various types of feedback such as EnDat absolute encoders, incremental encoders and tachometer velocity feedback.

High Speed Linear Motors

Our linear motors provide high acceleration for stepped-mode operation, scan speeds up to 1 m/s in continuous measurement mode and high acceleration in stepped-mode.

High speed linear motors

The main components of this drive system are an array of permanent magnets along the linear axis and an assembly of motor windings on the slide carriage.

The linear motor drive system offers several important advantages over conventional drive systems:

- No backlash
- High acceleration
- High motor force
- Excellent mechanical dynamics; for very fast stepped-mode measurements
- Continuous y-axis speed, up to 2 m/s for on-the-fly measurements

Combined with MV-Cor™ on-the-fly positioning error correction, linear motorization allows superb mechanical accuracy of the planar scanner while maintaining high measurement speed.

MV-Cor™ - Increased Accuracy

Using MV-Cor™, the corrected accuracy of mechanical systems is given by the repeatability of the system, the accuracy of the independent calibration equipment (like a laser tracker), and the stability of the environment (foundation, temperature, etc.).

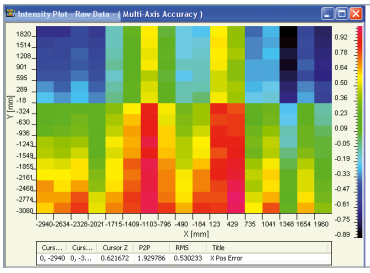
This unique service increases the accuracy of positioning systems and subsystems (typical accuracy improvement is a factor of 2 or 3) by integrating geometrical error correction techniques into new or existing systems.

MV-Cor™ uses continuous feedback correction, the only method that compensates for both position commands/feedback and the variable gain measured by the control filter. Correction tables are loaded into the positioning controller.

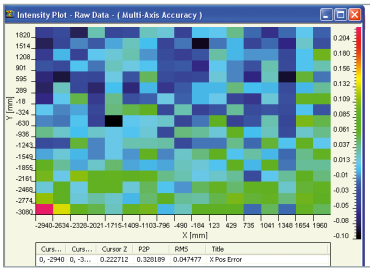
The implementation of these correction tables is a two-stage process:

1. The raw positioning accuracy of the axes is measured using a laser tracker. The data is then analyzed, processed, and a set of geometrical error correction maps are built and loaded into the controller using a proprietary MVG calibration tool (Mect™ software).
2. The correction algorithms are activated and the positioning measurement is repeated to verify that the required accuracy is achieved.

The MV-Cor™ correction table service is a cost-effective solution to enhance range performance without replacing the entire positioning system. MV-Cor™ ensures minimum range down-time.



Before
2D evaluation
of system's
accuracy



After
2D evaluation
of system's
accuracy

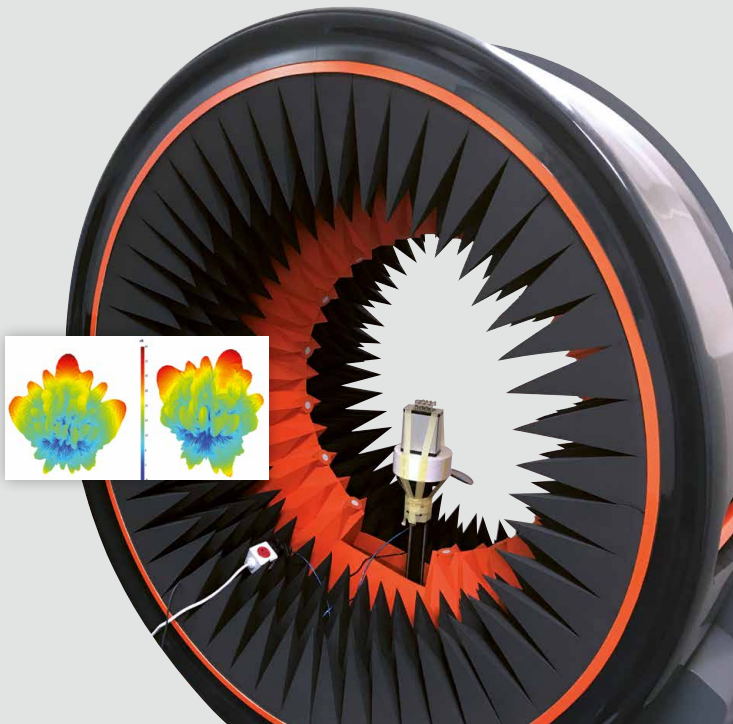
CASE STUDY Millimeter Wave OTA Testing Gives Proof of Concept for 5G Beamforming Solutions for TMYTEK

For system level architects and industry test engineers, the availability of 5G has been long awaited, allowing more data to be transferred at faster speeds. Unlike previous generations of telecommunications standards, 5G NR mmWave uses dynamically-steerable beams which maximize connectivity by directing as much of the signal toward the device as possible.

These steerable beams are created by phased array antennas and their associated electronics which need to be calibrated and measured in a large number of configurations through advanced OTA tests to ensure connectivity is optimized.

"BBox is set to be a highly valued asset for designers, 5G system-level architects and industry test engineers, saving time and speeding up product development. Because of the crucial nature of its role in the development process we needed to ensure that it was as robust and effective as possible. Having worked with MVG on similar projects in the past I knew that through StarLab, TMYTEK could not only ensure highly credible results, but that they could be delivered in a timely and effective manner."

Dr Sidina Wane, *CEO & Founder of eV-Technologies*



MVG Antennas and Probes

At MVG, we design antennas with outstanding performance in mind. It begins with a careful design process, alternating simulation and measurements. It extends to the use of the most advanced machining techniques and quality materials to achieve tight mechanical tolerances. That's why all our antenna characteristics are outstanding. And that's why we can guarantee the best electrical performance/operational bandwidth trade-off.

Antennas Designed for Outstanding Performance

The MVG antenna design team is an experienced multi-disciplinary group that considers all aspects of the antenna during the full development sequence based on a concurrent engineering approach. Our design processes, involving state-of-the-art numerical simulation and CAD tools, are continuously validated with prototyping and measurements, enabling tight performance optimization and absolute confidence in the final result.

MVG antennas are manufactured from quality materials and benefit from advanced numerical machining technology. All processes, from conception and design to manufacturing and final testing, are regulated by high quality standards. Our commitment to excellence is demonstrated by our certification as an ISO 9001:2008 compliant manufacturer and ISO 17025 for antenna test and calibration.

Dual Polarized Probes

Standard Gain Horns

Dual Ridge Horn

Open Boundary Quad-Ridge Horns

International Standards and Projects Meeting Future Technological Challenges

MVG is actively involved in the continued development of international standards in antenna measurements. Our experts participate in numerous European and national research programs as part of a team of key players in research and innovation. Several of these projects have been in cooperation with the French Centre National des Etudes Spatiales (CNES) and the European Space Agency (ESA).

A Complete Antenna Product Range

Our product portfolio includes antennas for measurement applications, high-power antennas, and antennas for telecommunications and navigation.

Antennas for Measurement Applications comprise both Reference Antennas and Measurement Probes and Feeds. The first are ideally suited for calibration reference within antenna measurement systems thanks to their high reliability and repeatability. The latter are precision microwave sensors to collect the characteristics of the device under test for all antenna measurement ranges (Planar, Cylindrical and Spherical Near-field, Far-Field, Compact Antenna Test Range, quasi monostatic RCS measurements, etc.).

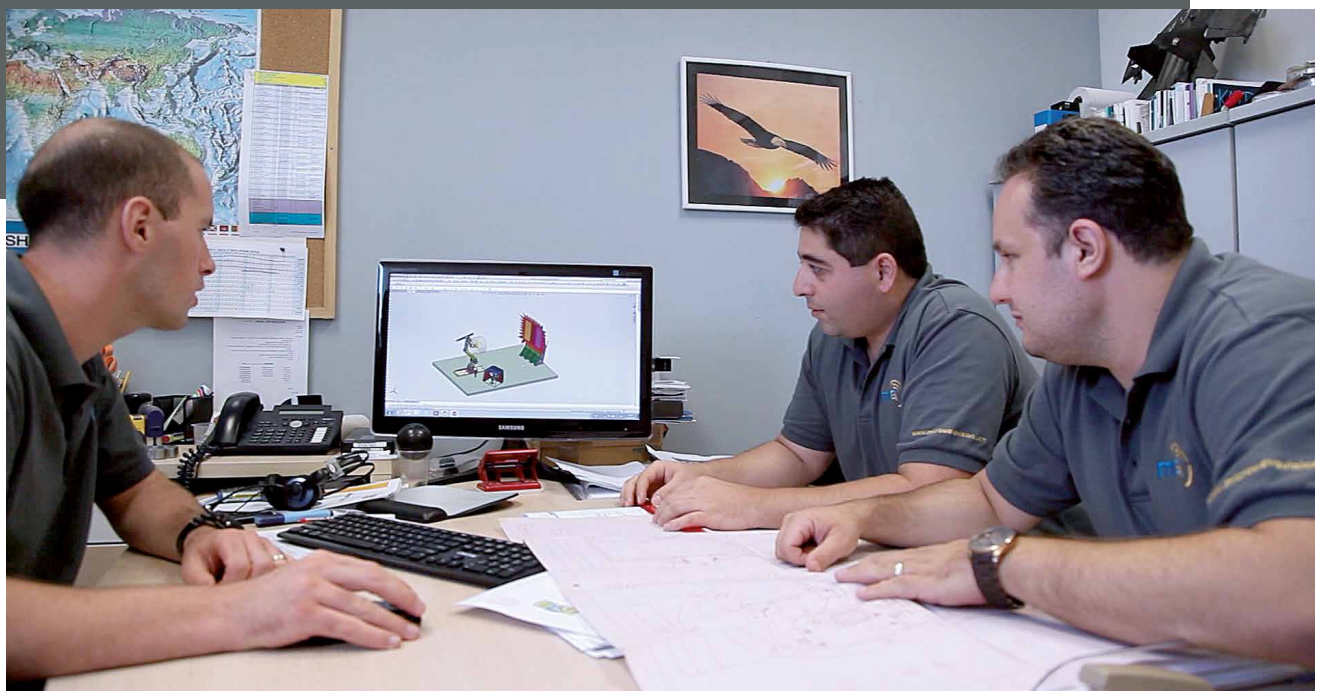
Antennas for High Power Applications are specifically conceived to handle high input RF power with no degradation to the radiation parameters.

Telecommunication Antennas are designed to meet Telecom standards and protocols ranging from 50 MHz to 18 GHz.

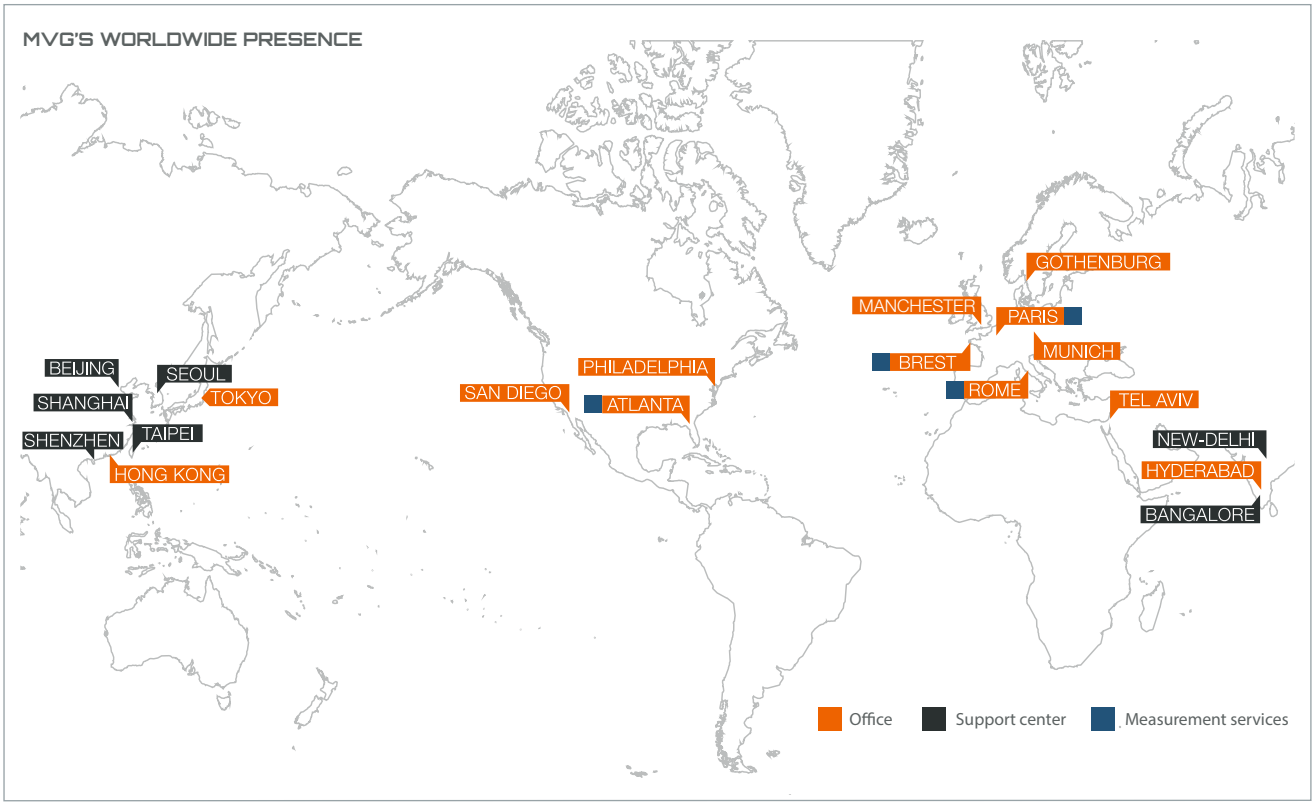
Positioning Antennas encompass terminal antennas for GNSS receivers and for localization/safety applications.

https://mvg.link/antennas

WORLD-WIDE, LOCAL PROJECT MANAGEMENT AND SUPPORT NETWORK

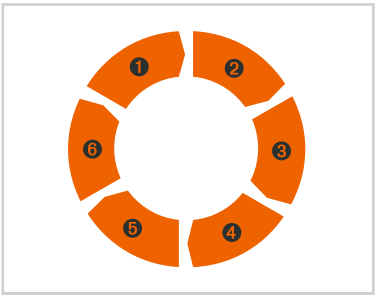


MVG teams, in offices around the world, guide and support our customers from purchase, through design, to delivery and installation. Because we are local, we can assure speed and attention in project follow through. This includes customer support and maintenance once the system is in place.

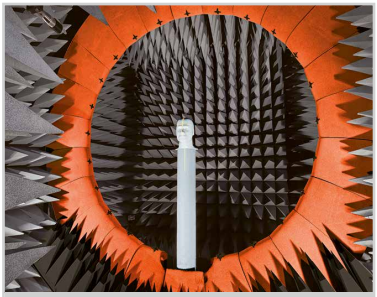


MVG Services

Antenna Measurement Services



Project Management and Consulting

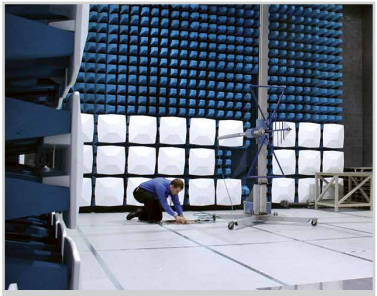


AMS Certification Assistance

Facility Upgrade Services

Training

Post Warranty Services



EMC Certification Services

Relocation Services

❶ CONSULTATION
- Discussions
- Site survey & facility assessment
- Solution assessment

❷ DESIGN
- Project planning
- Chamber configuration
- System requirement analysis
- Block diagrams
- Power & error budget
- Mechanical & RF simulations

❸ PRODUCTION
- Production planning
- Quality control through dedicated procedures

❹ INTEGRATION
- Interface development
- Integration testing

❺ INSTALLATION
- Equipment installations
- Testing
- Calibration
- Certification

❻ SUPPORT
- Remote & on-site technical support
- Periodic calibration
- Refurbishment
- Upgrades
- Training
- Relocations
- Post-warranty plans

https://mvg.link/service

OUR SOLUTIONS

MVG offers a wide selection of solutions based on near-field, far-field and compact range measurement techniques for Antenna, EMC, RCS and Radome testing. Our solutions support the measurement needs of the Aerospace & Defense, Telecommunications and Automotive industries, as well as Academic and Research institutes.

Multi-probe systems

Our multi-probe systems utilize MV-Scan™ technology to conduct fast, accurate and smart antenna measurements and radome tests. MV-Scan™ Technology is integrated in all multi-probe systems, allowing major improvements in terms of measurement speed.

Single-probe systems

Our single-probe systems are able to control in real-time up to 4 axes in parallel in near-field and far-field measurements. The systems utilize the MV-Cor™ correction table service and a high speed linear motor to improve accuracy and measurement speed.

Our single-probe systems are the solution for measurement of high frequency bands - above 18 GHz.

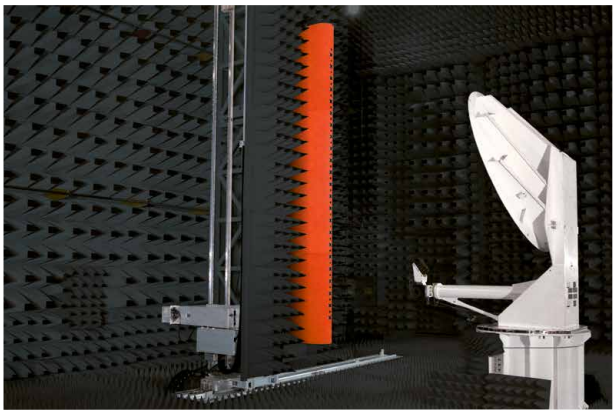
When you purchase a single-probe system, know that you can upgrade your system to a multi-probe or hybrid system.

Hybrid systems

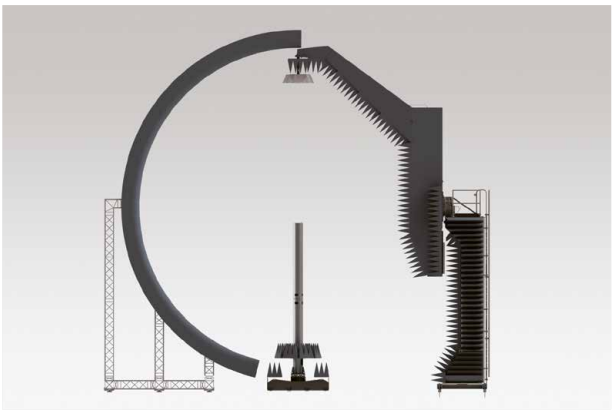
MVG is at the forefront of the industry with the launch of hybrid systems. Combining multi-probe and single-probe technologies, hybrid systems are the best compromise of accuracy, flexibility and measurement speed.

The hybrid systems consist of the best of two technologies:

- High speed electronically scanned multi-probe array
- Fast and accurate electro-mechanical systems for higher frequency bands of up to 400 GHz offered by single-probe



T-DualScan



G-DualScan

We offer two hybrid solutions, T-DualScan and G-DualScan. T-DualScan is a hybrid system for planar measurement. It measures highly directive antennas such as satellite or phased array antennas.

G-DualScan represents a step forward in spherical near-field measurements. It measures antennas with large dimensions and analyzes a very broad range of frequency bands.

INNOVATION

At MVG, the diversity of our team is a key element of innovation.

Our workforce of more than 24 nationalities brings us international insight and perspective allowing us to continue to compete on a global scale. MVG boasts 4 Research and Development (R&D) facilities in Paris, Rome, Brest and San Diego. Our R&D teams work across borders in the collaboration and creation of innovative solutions. As of today, we hold 22 international patents and regularly publish technical papers in major international industry conferences and publications. We believe that collaborative work generates insight and invention. That is why, beyond the strong partnerships we currently maintain with CNES, ESA, and several universities, we look forward to creating more partnerships with our customers, industry leaders, and government.

AT THE FOREFRONT OF 5G WIRELESS CONNECTIVITY

5G by MVG

5G is an evolving standard, and the amount of applications and use cases is expected to increase over time as 5G is deployed in new industries and markets. This will drive a continuous need for new test solutions as well as adaptations of existing solutions.

One of the bigger challenges in the 5G markets is the test capacity increase needed for 5G product development, as some tests will be done OTA instead of through cables. We can see already now that companies are starting to transform their labs from purely conducted test labs to OTA-based test labs. Those tests will include the agility of the devices to network communication, including handovers in dynamic RF environment scenarios representing real environments.

MVG aims to be at the leading edge of what the market needs in terms of 5G testing. We are working closely with customers across the world to align our product road-map with their product visions and needs, proactively driving the development of immediately applicable test solutions.

Quick Guide: MVG Software for Antenna Measurement

	WaveStudio	959 Spectrum	Midas
Name	WaveStudio Automated Antenna and OTA Measurement Software Suite	959 Spectrum	Midas
Applications	Data acquisition & post processing – Automated antenna and OTA measurements	Data acquisition & analysis - Antenna measurement	Data acquisition & analysis - Antenna measurement
Objective	• Antenna and OTA measurements & advanced post-processing techniques • Setup and batching in pre-measurement configuration console • Provide fast & flexible antenna and OTA measurements results	• Automation of the measurement • Provide common interface for both DA and Ana • Analysis & presentation of results	• Automation of the measurement • Display measurement during acquisition process • Analysis & presentation of results
Key features	• 3 modules in one software: - Pre-measurement configuration console (free) - Core measurement module (licensed) - Results viewer (free) • Large choice of measurements types: - Passive antenna radiation pattern measurements: efficiency and gain - Active measurement, OTA or conducted, up or downlink: TRP, TIS, (including A-GPS) • Supports wireless communication protocols defined in the CTIA and 3GPP test standards + many others* • Advanced mathematical field computations (for passive measurements) • Post-processing (NF to FF Transformation) • Batching and batch cloning capabilities • Advanced predictive algorithms • Results in 1D, 2D & 3D plots • Parallel viewing of result plots • Fine search data filters • Exporting capabilities • Automatic data storage • Advanced backup and recovery process	• Quicklook plots • Multi-threaded kernal • Enhanced calibration capabilities - Rotatable 3D plots - Customizable interface	• Multi-axis control with linked axis capabilities • Continuous step or spin measurement mode • Unlimited shape area - 2D or 3D plots - Zooming, markers, - Comparison of pattern in different files
Website category page	www.mvg.link/software		

MV-Echo	Insight
Echo reduction of antenna measurements	Post-processing and model sourcing for numerical computations in large EM problems
• Filtering out echos in near-field and far-field measurements • Optimization of the AUT minimum sphere • Improvement of accuracy in antenna measurerment performance	• Compute equivalent source models • Provide diagnosis of antenna radiation pattern • Detect spurious radiation
• Echo filters for NF and FF • Modal filtering algorithms • Modules in the Spherical Wave Harmonics domain	• Computation of authentic EM current distributions and extreme near-field of antenna • 3D equivalent current distribution reconstruction • Definition of 3D surface • Currents to near-field transformation

www.mvg.link/software

Quality Products and Services,
the Key to Customer Satisfaction

Satisfied Customers on Three Continents

A portfolio of key accounts:

AIRBUS, BAE, BMW, BOEING, CNES, EADS, ERICSSON, ESA, HUAWEI, IAI, INTEL, LOCKHEED MARTIN, NASA, NOKIA, NORTHROP GRUMMAN, PANASONIC, QUALCOMM, RAYTHEON, RENAULT, SAMSUNG and ZTE

QUALITY MANAGEMENT AT MVG

MVG is ISO 9001: 2015 certified. This certificate ensures that:

- Our products meet customer and applicable regulatory requirements
- Our processes aim at continuous improvement of customer satisfaction and conformity of our products to requirements

CERTIFICATION COMPLIANCE

Our systems are particularly well suited for testing wireless devices in active mode. It is our company strategy to follow the evolution of the different telecommunication protocols and to be present in the standardization committees to actively contribute to the drafting of the test plan.

- **CTIA (International Association for the Wireless Telecommunication Industry)**

We are a member of all CTIA OTA working groups focusing on defining test plans for Over-The-Air (OTA) radiated measurements of wireless devices supporting 2G, 3G, 4G-LTE, and 5G NR FR1 and FR2 technologies. Both our SG 24 and SG 64 can perform measurements in compliance with CTIA SISO and MIMO OTA test plans.

Several of our customers, including test laboratories, mobile manufacturers and antenna design houses have CTIA accredited systems, using MVG equipment.

Our MVG measurement labs near Atlanta, GA, Paris and Brest, France, and Rome, Italy perform calibrations and pre-compliance testing and services.

MVG is also part of CTIA's Converged Wireless Sub-working Group, which is responsible for standardizing WiFi OTA measurements.

ISO 17025 accreditation and A2L accreditation* concerns calibration quality of our measurement facilities.

** The scope of accreditation is location dependent and does not include the entire scope of MVG activities.*

2246.02 Calibration

Scope available on www.cofrac.fr

- **COST (European Cooperation in Science and Technology) and COST IC1004 IC1004 (Cooperative Radio Communications for Green Smart Environments)**

We have taken part in COST273, COST2100, and COSTIC1004 actions with focus on supporting the wireless industry in defining test procedures for OTA radiated conformance testing of wireless devices, including both SISO and MIMO OTA.

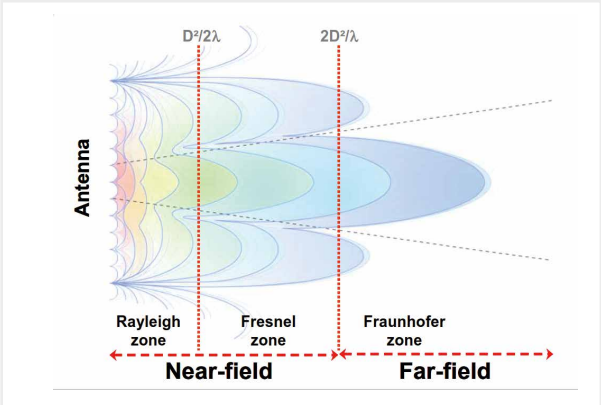
- **3GPP (3rd Generation Partnership Project)**

Since 2009 we are a member of ETSI and are following the 3GPP RAN4, and RAN5 working groups. The main objective of 3GPP standards development organizations is to produce technical reports and specifications for next generation wireless systems.

Quick Guide: Evaluating the scan area requirement for planar, cylindrical and spherical measurements

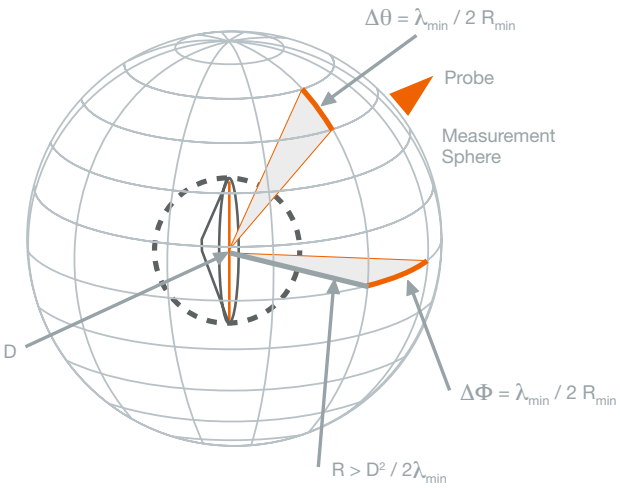
Sampling steps are based on the minimum measured wavelength (λ_{min}).

FIELD REGIONS



For spherical measurements, the required scan area is calculated according to the following formula:

D = The minimum diameter of the sphere enclosing the antenna
R_{min} = D / 2 (radius of the minimum sphere)
R = Measurement distance
$R > D^2 / 2\lambda_{min}$

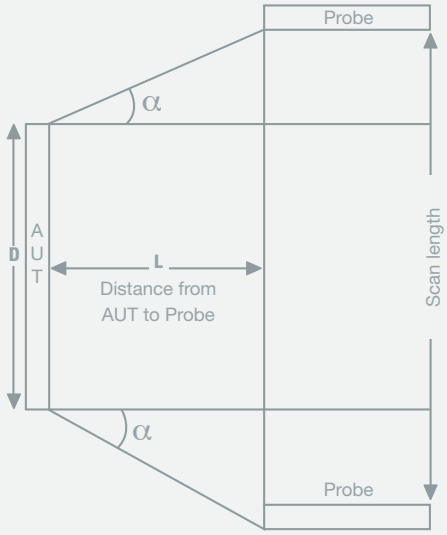


Sampling principle:

$D_{sampling} = \Delta\theta = \Delta\Phi = \lambda_{min} / 2 R_{min}$

For planar and cylindrical measurements, the required scan area is calculated according to the following formula:
Scan length = D + 2 L tg (α)

Where: - α is the relevant data angle in far-field
- L, the distance between the probe and the AUT
- and D, the antenna size.



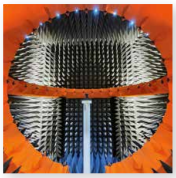
Sampling principle:

$D_{sampling} = (\lambda_{min} / 2)$

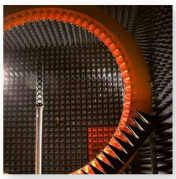
Quick Guide: MVG Antenna Measurement Solutions

MULTI-PROBE





System name	StarLab	StarLab 50 GHz (NEW)	StarMIMO	StarWave (NEW)	SG 24
5G by MVG	Yes	Yes	Yes	Yes	Yes
Applications	• Antenna measurement • Linear array antenna measurement • OTA testing	• mm-wave antenna measurement • mm-wave OTA testing • BTS antenna testing	• MIMO OTA testing • MIMO measurement	• Antenna Measurement • OTA testing • BTS antenna testing	• Antenna measurement • OTA testing • MIMO measurement • Linear array antenna measurement • CTIA certifiable measurement
Technology	• Near-field / Spherical • Near-field / Cylindrical	• Near-field / Spherical	• MIMO	• Full spherical measurement system in indirect far-field condition according to 3GPP IFF specification	• Near-field / Spherical • Far-field
Frequency bands	• StarLab 6 GHz: 650 MHZ - 10 GHz • StarLab 10 GHz: 650 MHZ - 10 GHz • StarLab 18 GHz 650 MHz - 18 GHz	• 650 MHz - 50 GHz	• 400 MHz to 6 GHz (depending on the specification of the spatial channel emulator) • 28 GHz	• 5G FR1 and FR2 are covered • PWG6: 60 MHz - 6 GHz *(coming soon)* • PWG28 24.25 GHz - 29 GHz *(available)* • PWG39 up to 39 GHz *(under development)*	• SG 24 - Compact: 650 MHz - 6 GHz • SG 24 - Standard: 400 MHz - 6 GHz • SG 24 - Large: 400 MHz - 6 GHz 400 MHz - 18 GHz
Max size of DUT	• 45 cm for spherical set-up • 2.7m x 45 cm for cylindrical set up • Specific lengths available upon request for cylindrical set-up	• 45 cm for spherical set-up	• Depending on the number of probes	• 35 cm (size of the QZ)	• 1.79 m for SG 24 - L
Antenna directivity	• Low to High	• Low to High	• Low to High	• Low to High	• Low to High
Measurement speed	• 10 times faster than standard	• 10 times faster than standard	• 10 times faster than standard	• Quick and highly accurate measurement	• 10 times faster than standard
Industries	• Aerospace & Defense • Telecom • Automotive • Academic & Research institutes	• Aerospace & Defense • Telecom • Automotive • Academic & research institutes	• Telecom • Aerospace & Defense • Automotive	• Aerospace & Defense • IoT • Telecom • Academic & research institutes	• Aerospace & Defense • Telecom • Automotive • Academic & research institutes
Website category page	www.mvg.link/multi-probe-systems				



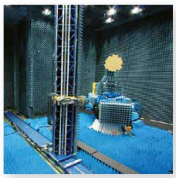



SG 64	SG 128	New SG Evo	New SG 3000	New AeroLab	Mini-Lab
Yes	Yes	Yes	Yes		Yes
• Antenna measurement • OTA testing • MIMO measurement • Linear array antenna measurement • CTIA certifiable measurement	• Antenna measurement • Linear array antenna measurement • Sub-system antenna measurement	• Antenna measurement • OTA testing • MIMO measurement • Linear array antenna measurement • Payload testing	• Vehicle testing	• Commercial aircraft radome testing	• IoT measurements • M2M • Full radiation visualization
• Near-field / Spherical • Far-field	• Near-field / Spherical • Far-field	• Near-field / Spherical	• Near-field / Spherical	• Near-field / Spherical	• Near-field / Spherical
• SG 64 - Compact, SG 64 - Standard: 400 MHz - 6 GHz • SG 64 - LF: 70 MHz - 6 GHz • SG 64 - 18 GHz: 70 MHz - 18 GHz	• SG128 - 6 GHz: 400 MHz to 6 GHz • SG 128 - 18 GHz: 400 MHz to 18 GHz	• 400 MHz - 50 GHz (Customizable with a selection of seven types of precision probes)	• SG 3000 10 GHz: 70 MHz - 10 GHz • SG 3000 18 GHz: 70 MHz - 18 GHz	• System optimized for X band but customizable from 70 MHz to 18 GHz (up to 40 GHz with single-probe)	• 650 MHz to 6 GHz
• 2.73 m for SG 64 - L	• 4.16 m	• Arch adapted to the DUT size	• 2.4 m x 6 m (W x L)	• 2.3 m diameter	• Up to 40 cm
• Low to High	• Low to High	• Low to High	• Low to High	• Low to High	• Low
• 10 times faster than standard	• 10 times faster than standard	• 10 Times faster than standard	• 10 times faster than standard	• 10 times faster than standard	• 10 times faster than standard
• Aerospace & Defense • Telecom • Automotive	• Aerospace & Defense • Telecom • Automotive	• Aerospace & Defense • Telecom	• Aerospace & Defense • Automotive	• Aerospace	• IoT

www.mvg.link/multi-probe-systems

SINGLE-PROBE




System name	µ-Lab	Mini Compact Range	Compact Range	TScan	HScan
5G by MVG	Yes	Yes	Yes	Yes	Yes
Applications	• Chip measurements • Miniature connectorized antenna measurements • Measurements of laptops and other devices	• Characterization of small and high gain antennas • Millimeter wave applications • Production testing	• Antenna measurement • Radome measurement • RCS measurement	• Phased array antenna testing • High gain antenna testing • Near-field focused antenna testing • Array illumination assessment • Array element failure analysis	• Space-borne antenna measurements • Payload testing • Phased array antenna testing • High gain antenna testing • Array illumination assessment • Array element failure
Technology	• Near-field / Spherical • Far-field / Spherical	• Compact Range	• Compact Range	• Near-field / Planar • Optional: Near-field / Spherical Near-field / Cylindrical	• Near-field / Planar • Near-field / cylindrical or Spherical - optional
Frequency bands	• 50 - 110 GHz • 18 - 50 GHz optional • Other bands possible upon request	• CR-M8: 18-110 GHz • CR-M12: 8 - 110 GHz • CR-M20: 4 - 110 GHz	• Small: 2 - 110 GHz* • Medium: 700 MHz - 110 GHz* • Large: 700 MHz - 110 GHz*	• 100 MHz - 110 GHz	• 100 MHz - 110 GHz
Max size of DUT	• On centered support column: as large as a standard laptop • On offset column for chip measure-ments: 5 cm x 5 cm (chipset)	• Up to 50 cm diameter	• During full rotation of the DUT, the radiating parts of the DUT must stay within the quiet zone	• Depending on the scan length and antenna length	• Depending on the scan length and antenna length
Antenna directivity	• Low to High	• High	• Medium to High	• High	• High
Measurement speed	• Standard	• Standard	• Standard	• Standard	• Standard
Industries	• Telecom • Academic & Research institutes	• Aerospace & Defense • Telecom • Automotive	• Aerospace & Defense • Telecom • Automotive	• Aerospace & Defense • Telecom • Automotive	• Aerospace & Defense • Telecom • Research institutes
Website category page	www.mvg.link/single-probe-systems				

HYBRID

System name	T-DualScan	G-DualScan	Starbot 4300
5G	Yes	Yes	
Applications	• Antenna measurement • Pulsed measurement • Phased array antenna measurement	• Antenna measurement • Pulsed measurement • Phased array antenna measurement	• Aircraft/ vehicle in situ antenna characterization • Radar antenna testing
Technology	• Near-field / Planar • Near-field / Cylindrical	• Near-field / Spherical • Far-field / Spherical	• Near-field / Spherical
Frequency bands	• Single-probe: 800 MHz - 110 GHz • Multi-probe: 800 MHz - 18 GHz • Multi-probe: 70 - 800 MHz upon request	• Single-probe: 200 MHz - 18 GHz, divided in sub-bands (up to 40 GHz upon request) • Multi-probe: 400 MHz - 6 GHz (400 MHz - 18 GHz or 70 - 400 MHz upon request)	• 500 MHz - 18 GHz
Max size of DUT	• Depending on the scan length and antenna length	• 7 m diameter	• N.A
Antenna directivity	• High	• Low to High	• Low to High
Measurement speed	• Multi-probe: 10 times faster than standard • Single-probe: Standard	• Multi-probe: 10 times faster than standard • Single-probe: Standard	• 10 times faster than standard
Industries	• Aerospace & Defense • Telecom	• Aerospace & Defense • Telecom	• Aerospace & Defense
Website category page	www.mvg.link/hybrid-systems		

Ordering information

Single-probe systems

Each Single-probe system has its own unique model number to facilitate the ordering process. For example, in the CR-M series, there is the CR-M8, CR-M12, and CR-M20. If customization is required, your local sales representative will provide you with the list of referenced components.

Multi-probe systems

Our multi-probe system part numbers include the system model name and the probe array part numbers, according to the following scheme: Model-{Array1}-{Array2}-…

THE MODEL FIELD CAN HAVE THE FOLLOWING VALUES

- StarLab
- StarMIMO
- StarWave
- SG 24
- SG 64
- SG 128
- SG Evo
- SG 3000
- Compact Range
- Mini Compact Range
- AeroLab
- StarLab 50 GHz
- MiniLab
- TScan
- HScan
- T-DualScan
- G-DualScan
- StarBot 4300

ARRAY PART NUMBERS ARE COMPOSED OF THE FOLLOWING FIELDS

[Distance] - [Probes] - [Number of Probes] - [Distance between probes] according to these rules:

Field	Linear array	Circular array
[Distance]	Distance between first and last probes, in mm	Internal diameter in mm
[Probes]	The probe model or list of probe models (if probes are interleaved) comprising the array, selected from: • DP70-450 • DP400-6000 • DP6000-18000 And separated by “/” if necessary	
[Number of Probes]	The number of each probe model separated by "/" if necessary	
[Distance between probes]	The distance between probes in mm	The angle between probes in degrees

WIDEBAND DUAL POLARIZED PROBES

Seven types of probes and several sizes of supporting structures are available for measurements covering the 70 MHz - 50 GHz range. Extended bandwidth can be achieved by combining the technology of a multi-probe and single probe system. The wide bandwidth of our systems offers an additional advantage of increased speed in measuring wide band and multi-band antennas without changing probes.

Seven probes that can be interleaved*

Product reference	DP 70-450	DP 200-6000	DP 400-6000	DP 6000-10000	DP 6000-18000	DP 200-10000	DP 18000-50000
Frequency band	0.07 GHz - 0.45 GHz		0.4 GHz - 6.0 GHz		6.0 GHz - 18 GHz		18 GHz - 50 GHz
Extended frequency band		0.2 GHz - 6.0 GHz		6.0 GHz - 10.0 GHz		0.2 GHz - 10.0 GHz	
Aperture size	247 mm x 247 mm		63 mm x 63 mm		22 mm x 22 mm		Ø 48 mm

Sample ordering code:

- StarLab 6 GHz: StarLab-{[900]-[DP400-6000]-[15]-[22.5]}
- StarLab 18 GHz: StarLab-{[900]-[DP400-6000/DP6000-18000]-[15/14]-[11.25]}
- SG 64-L: SG64-{[4200]-[DP400-6000]-[63]-[5.29]}
- …

* Interleaved arrays are considered one array.

+ Hybrid systems

The hybrid systems, T-dual and G-dual, are composed of both a multi-probe and a single-probe configuration. Please use the same ordering process given above for multi-probe and single-probe systems. Indicate the single probe information first, then the multi-probe information.

MVG - Testing Connectivity for a Wireless World

The Microwave Vision Group - MVG offers cutting-edge technologies for the visualization of electromagnetic waves. With advanced test solutions for antenna characterization, radar signature evaluation and electromagnetic measurements, we support company R&D teams in their drive to innovate and boost product development.

WORLDWIDE GROUP, LOCAL SUPPORT

Our teams, in offices around the world, guide and support you from purchase, through design, to delivery and installation. Because we are local, we can assure speed and attention in project follow through. This includes customer support and maintenance once the system is in place. For the exact addresses and up-to-date contact information:
www.mvg-world.com/mvg-offices

mvg Microwave Vision Group

For more information:
https://www.mvg-world.com/ams

Contact us:
www.mvg-world.com/en/contact