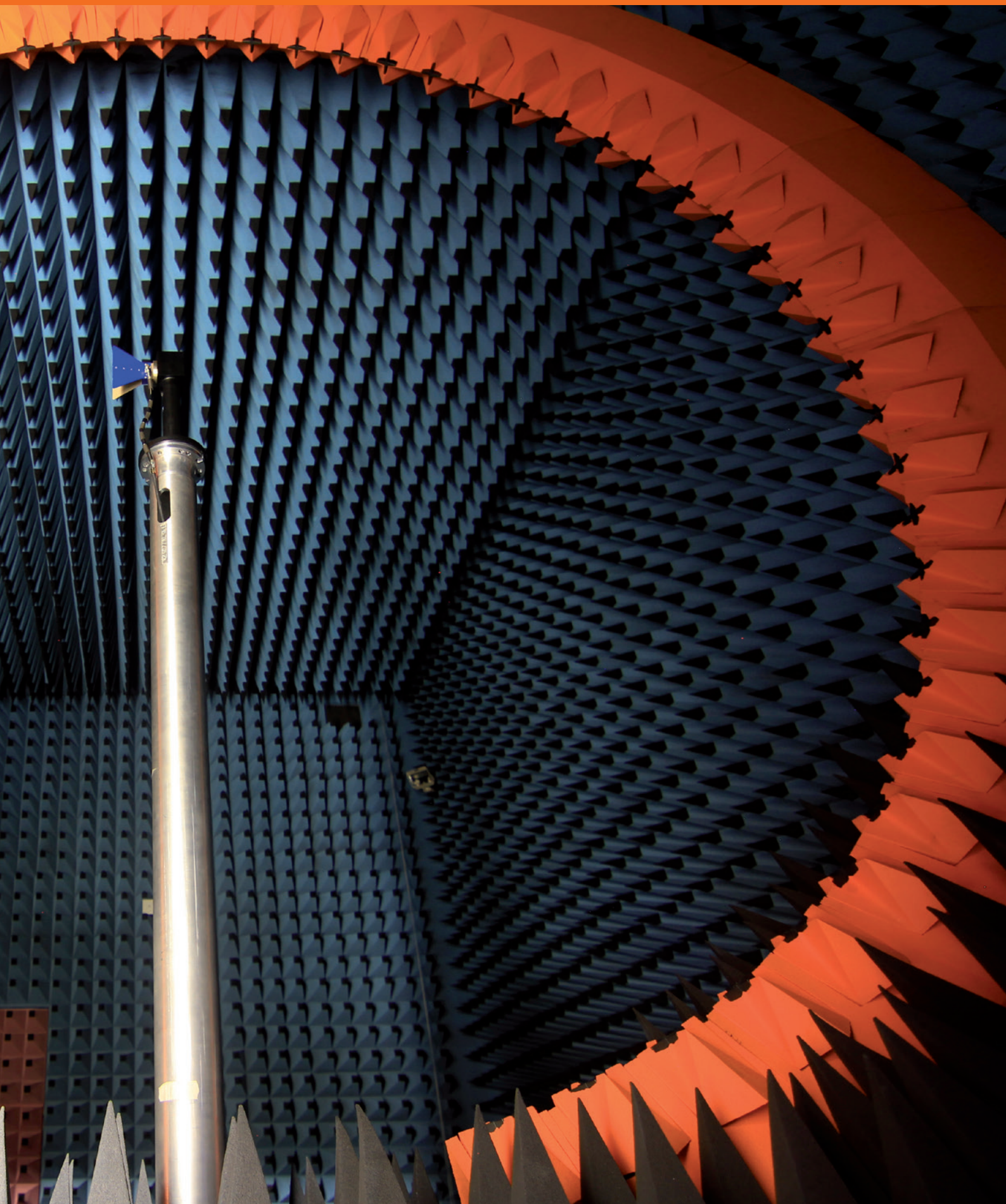
# SG 64

A Multi-Probe System Ideal for CTIA Certifiable Measurement Facilities



The most accurate solution for testing antennas and wireless devices: SG 64 has been developed to measure stand alone antennas or antennas integrated in subsystems. It is also ideal for CTIA certifiable measurement facilities.

- **CTIA certifiable**
- **Unmatched accuracy**

## SOLUTION FOR

- **Antenna Measurement**
- **OTA Testing**
- **CTIA Certifiable Measurement**
- **MIMO Measurement**
- **Linear Array Antenna Measurement**

## Main features

### Technology

- Near-field / Spherical
- Far-field

### Measurement capabilities

- Gain
- Directivity
- Beamwidth
- Cross polar discrimination
- Sidelobe levels
- Front to back ratio
- 1D, 2D and 3D radiation patterns
- Radiation pattern in any polarization (linear or circular)
- Antenna efficiency
- TRP, TIS, EIRP and EIS

### Frequency bands

- SG 64 - C, SG 64 - S and SG 64 - L: 400 MHz to 6 GHz
- SG 64 - 18 GHz: 400 MHz to 18 GHz
- SG 64 - LF: 70 MHz to 6 GHz

### Max. size of DUT

- 2.73 m for SG 64 - L

### Max. weight of DUT

- 5 kg on polystyrene mast
- 25 kg on fiberglass mast
- 50 kg on metal mast

### Typical dynamic range

- 70 dB

### Oversampling

- Elevation tilt by goniometer

## System configurations

### Software

**Measurement control, data acquisition and post processing**

■ MVG WaveStudio

**Near-field/far-field transform**

■ MV-Sphere

**OTA measurement suite**

□ MVG WaveStudio

**Advanced post processing**

□ Insight

### Equipment

■ Amplification unit
■ Mixer unit
■ N-PAC
■ Uninterruptible power supply
■ Instrumentation rack
■ DUT positioner
○ Primary synthetizer
○ Auxiliary synthetizer

### Add-ons

○ Shielded anechoic chamber*

OTA Equipment

□ Radio communication tester
□ Active switching unit
□ MIMO upgrade

### Accessories

■ Polystyrene mast
■ Acquisition PC & touch screen PC (tablet PC also possible)
□ PVC chair
□ Hand and head phantoms
□ Laptop interface
□ CTIA ripple antenna test
□ Positioning laser pointer
□ Polystyrene platform mast for wide devices (tv, laptop)
□ Fiberglass mast
□ Metal mast
□ Linear antenna pole mast
○ Reference antennas (horns, sleeve dipoles, loops)

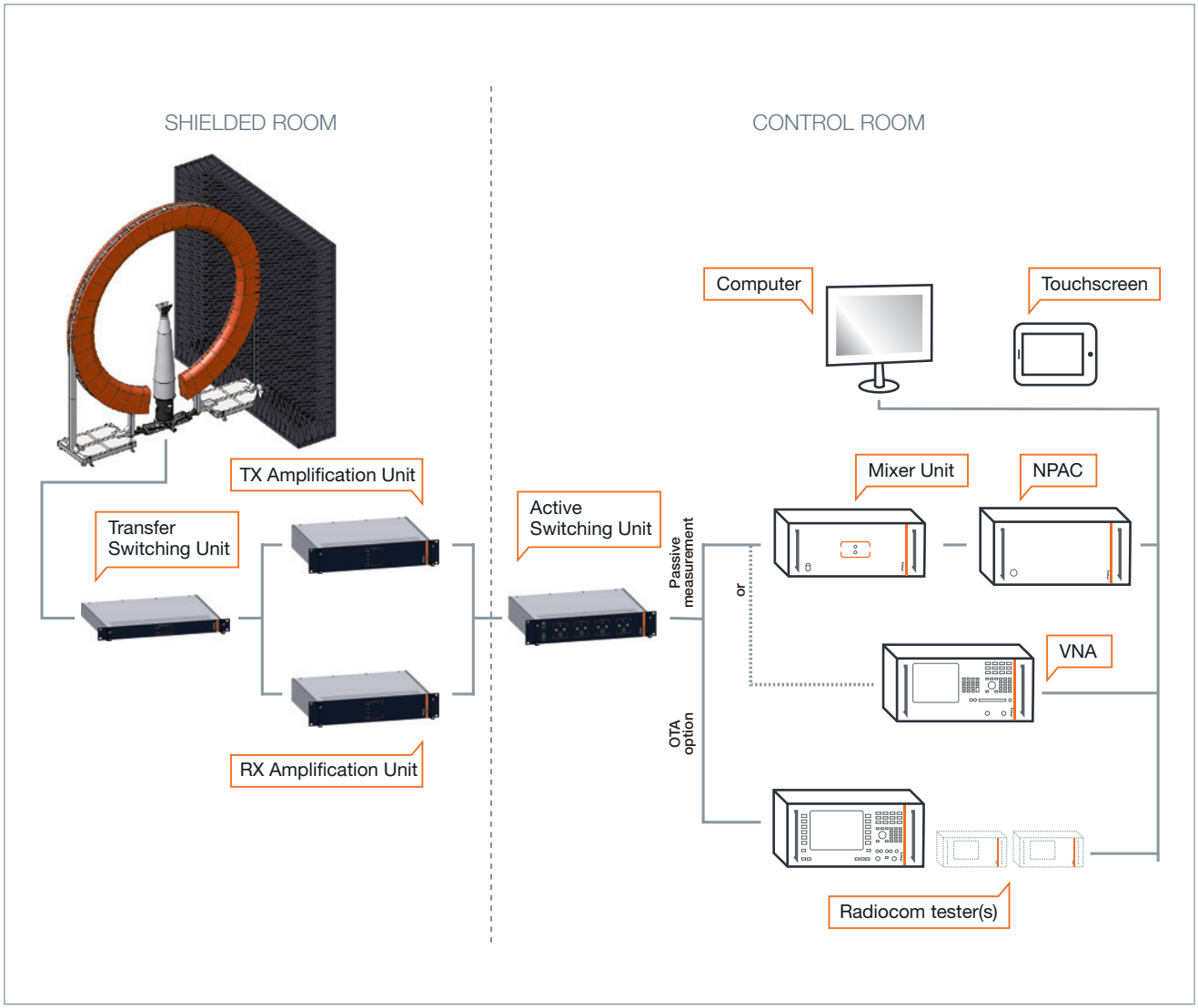
### Services

■ Installation & calibration
■ Warranty
■ Project management
■ Training
□ CTIA certification assistance
□ Post warranty service plans

* See www.mvg-world.com/EMC for more information

■ Included □ Optional ○ Required

# System overview




SG 64 uses analog RF signal generators to emit EM waves from the probe array to the antenna under test (AUT) or vice versa. It uses the NPAC as an RF receiver for antenna measurements. The NPAC also drives the electronic scanning of the probe array. The NPAC includes the fastest and most accurate sources and receivers on the market.

For OTA measurements, the tests are performed through the radio communication tester. The amplification units amplify the signal on transmission/reception channels to achieve optimum dynamic range. The Transfer Switching Unit is used to switch between the emission and reception modes of the AUT.

Adding the NPAC to your configuration is a great way to boost your SG 64 system capabilities. Alternatively, an existing VNA can be used if dedicated to the SG 64 system.

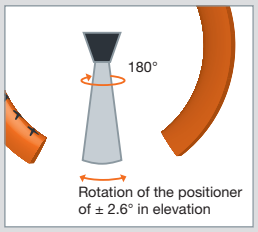
# Standard system components

## 1 Arch

- 3 sizes (compact, standard or large)
- A choice of 3 probe types (DP 70-450, DP 400-6000, DP 6000-18000)

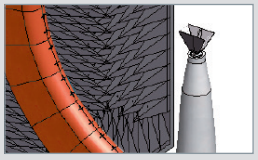
## 2 Mast

- 2 masts according to max. weight of DUT
- Linear antenna mast
- PVC chair
- Laptop interface
- TV mast




## 3 Patented Oversampling

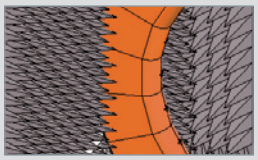
- Goniometer below positioner – size of arch, weight of DUT, and frequency range dependent.



## 4 Antennas

- A choice of reference antennas (horns, dipoles, linear array antennas, biconic and monocone antennas)

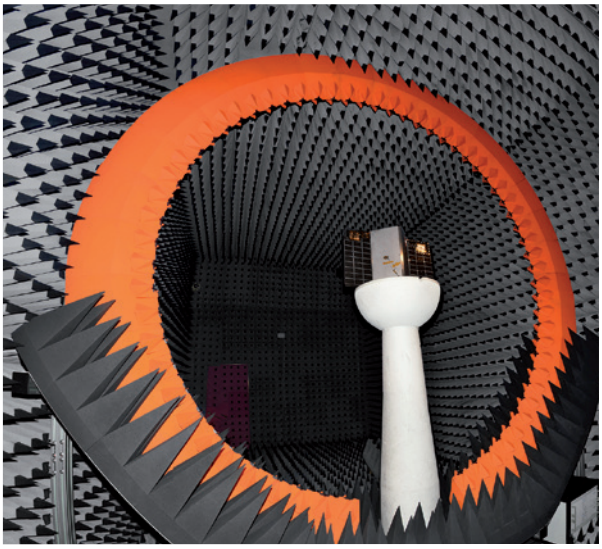
Antenna Product Overview
https://www.mvg-world.com/antennas



## 5 Absorbers and anechoic chambers

- A choice of standard, adapted and specialty absorbers
- Anechoic chambers with integrated design, production, installation and testing services

Absorber Product Overview
https://www.mvg-world.com/absorbers



**SG 64 - 18 GHz version**
For the 0.4 GHz to 18 GHz version, two probe arrays are interleaved, one with 0.4-6 GHz probes and one with 6-18 GHz probes. SG 64 - 18 has the same capabilities as the standard 6 GHz version.

**SG low frequency version (LF)**
For the SG LF version, the arch is divided in two probe arrays. On one side, an array with 0.07-0.4 GHz probes and on the other side, an array with 0.4-6 GHz probes. The SG LF has the same capabilities as the 6 GHz standard version. Specifications are provided upon request.

## System specifications*

| | COMPACT | STANDARD 6 GHz | STANDARD 18 GHz | LARGE 6 GHz |
|---|---|---|---|---|
| Typical max. size DUT | 134 cm | 179 cm | 179 cm | 273 cm |
| Measurement time for 11 frequencies** | < 3 min | < 3 min | < 3 min | < 3 min |
| Typical dynamic range | 70 dB | 70 dB | 70 dB | 70 dB |

## System specifications*

| | COMPACT | | | STANDARD 6 GHz | | | STANDARD 18 GHz | | | LARGE 6 GHz | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 dBi AUT | 20 dBi AUT | 30 dBi AUT | 10 dBi AUT | 20 dBi AUT | 30 dBi AUT | 10 dBi AUT | 20 dBi AUT | 30 dBi AUT | 10 dBi AUT | 20 dBi AUT | 30 dBi AUT |
| **PEAK GAIN ACCURACY** | | | | | | | | | | | | |
| 0.4 GHz - 0.8 GHz | ± 1.1 dB | ± 1.0 dB | - | ± 0.9 dB | ± 0.8 dB | - | ± 0.9 dB | ± 0.8 dB | - | ± 0.8 dB | ± 0.7 dB | ± 0.7 dB |
| 0.8 GHz - 1 GHz | ± 0.6 dB | ± 0.6 dB | - | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB |
| 1 GHz - 6 GHz | ± 0.6 dB | ± 0.6 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB | ± 0.5 dB |
| 6 GHz - 18 GHz | - | - | - | - | - | - | ± 0.7 dB | ± 0.6 dB | ± 0.5 dB | - | - | - |
| Peak gain repeatability | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB | ± 0.3 dB |
| **- 10 dB SIDELOBES ACCURACY** | | | | | | | | | | | | |
| 0.4 GHz - 0.8 GHz | ± 1.1 dB | ± 0.7 dB | - | ± 1.0 dB | ± 0.6 dB | - | ± 1.0 dB | ± 0.6 dB | - | ± 0.9 dB | ± 0.6 dB | ± 0.4 dB |
| 0.8 GHz - 1 GHz | ± 0.9 dB | ± 0.6 dB | - | ± 0.8 dB | ± 0.5 dB | ± 0.4 dB | ± 0.8 dB | ± 0.5 dB | ± 0.4 dB | ± 0.7 dB | ± 0.5 dB | ± 0.4 dB |
| 1 GHz - 6 GHz | ± 0.7 dB | ± 0.5 dB | ± 0.4 dB | ± 0.7 dB | ± 0.5 dB | ± 0.4 dB | ± 0.7 dB | ± 0.5 dB | ± 0.4 dB | ± 0.7 dB | ± 0.5 dB | ± 0.4 dB |
| 6 GHz - 16 GHz | - | - | - | - | - | - | ± 0.7 dB | ± 0.5 dB | ± 0.4 dB | - | - | - |
| 16 GHz - 18 GHz | - | - | - | - | - | - | ± 0.7 dB | ± 0.5 dB | ± 0.4 dB | - | - | - |
| **- 20 dB SIDELOBES ACCURACY** | | | | | | | | | | | | |
| 0.4 GHz - 0.8 GHz | ± 3.5 dB | ± 1.1 dB | - | ± 3.2 dB | ± 1.0 dB | - | ± 3.2 dB | ± 1.0 dB | - | ± 3.0 dB | ± 0.9 dB | ± 0.6 dB |
| 0.8 GHz - 1 GHz | ± 2.7 dB | ± 0.9 dB | - | ± 2.4 dB | ± 0.8 dB | ± 0.5 dB | ± 2.4 dB | ± 0.8 dB | ± 0.5 dB | ± 2.2 dB | ± 0.7 dB | ± 0.5 dB |
| 1 GHz - 6 GHz | ± 2.1 dB | ± 0.7 dB | ± 0.5 dB | ± 2.1 dB | ± 0.7 dB | ± 0.5 dB | ± 2.1 dB | ± 0.7 dB | ± 0.5 dB | ± 2.1 dB | ± 0.7 dB | ± 0.5 dB |
| 6 GHz - 16 GHz | - | - | - | - | - | - | ± 2.1 dB | ± 0.7 dB | ± 0.5 dB | - | - | - |
| 16 GHz - 18 GHz | - | - | - | - | - | - | ± 2.1 dB | ± 0.7 dB | ± 0.5 dB | - | - | - |
| **- 30 dB SIDELOBES ACCURACY** | | | | | | | | | | | | |
| 0.4 GHz - 0.8 GHz | - | ± 3.5 dB | - | - | ± 3.2 dB | - | - | ± 3.2 dB | - | - | ± 3.0 dB | ± 0.9 dB |
| 0.8 GHz - 1 GHz | - | ± 2.7 dB | - | - | ± 2.4 dB | ± 0.8 dB | - | ± 2.4 dB | ± 0.8 dB | - | ± 2.2 dB | ± 0.7 dB |
| 1 GHz - 6 GHz | - | ± 2.1 dB | ± 0.7 dB | - | ± 2.1 dB | ± 0.7 dB | - | ± 2.1 dB | ± 0.7 dB | - | ± 2.1 dB | ± 0.7 dB |
| 6 GHz - 16 GHz | - | - | - | - | - | - | - | ± 2.1 dB | ± 0.7 dB | - | - | - |
| 16 GHz - 18 GHz | - | - | - | - | - | - | - | ± 2.1 dB | ± 0.7 dB | - | - | - |

* Specifications given according to the following assumptions:
- Controlled temperature and humidity during measurement
- Measurements inside an anechoic chamber
- DUT phase center does not exceed 15 cm from arch center
- Specifications on radiation pattern are given for a normalized pattern
- Peak gain is given for a ± 0.3 dB of gain error on the reference antenna
- Measurement performed with a suitable mast depending on the load and directivity of the DUT

** No oversampling, no averaging

## Mechanical characteristics*

| | COMPACT 6 GHz | STANDARD 6 GHz | STANDARD 18 GHz | LARGE | SG LF |
|---|---|---|---|---|---|
| Probe array diameter (int/ext) | 2.4/ 3.52 m | 3.2/4.194 m | 3.2/4.194 m | 4.2/5.194 m | Custom |
| Shielded anechoic chamber size | 4.0 x 4.0 x 4.0 m | 5.0 x 5.0 x 5.0 m | 5.0 x 5.0 x 5.0 m | 6.0 x 6.0 x 6.0 m | Custom |
| Angle between probes in the same frequency band | 5,29° | 5,29° | 5,29° | 5,29° | Custom |
| Azimuth accuracy | 0.02° | 0.02° | 0.02° | 0.02° | 0.02° |
| Azimuth max. speed | 30°/s | 30°/s | 30°/s | 30°/s | 30°/s |
| Oversampling capability | Goniometer | Goniometer | Goniometer | Goniometer | No |
| **DUT MAX. WEIGHT** | | | | | |
| Styrofoam mast | 50 kg | 50 kg | 50 kg | 50 kg | 50 kg |
| Ultra rigid mast | 200 kg | 200 kg | 200 kg | 200 kg | 200 kg |
| PVC chair | 100 kg | 100 kg | 100 kg | 100 kg | 100 kg |
| Linear antenna pole mast | Not applicable | Option | Option | Option | Option |

* Centered load without oversampling

## RF equipment characteristics

| | COMPACT 6 GHz | STANDARD 6 GHz | STANDARD 18 GHz | LARGE | SG LF |
|---|---|---|---|---|---|
| Number of probes | 63 + 1 ref. channel | 63 + 1 ref. channel | 63 + 1 ref. channel and 62 + 1 (18 GHz) | 63 + 1 ref. channel | Custom |
| Frequency range | 0.4 GHz to 6 GHz | 0.4 GHz to 6 GHz | 0.4 GHz to 18 GHz | 0.4 GHz to 6 GHz | 0.07 GHz to 6 GHz |

## Maximum diameter of the DUT* (m)

| FREQUENCY (GHz) | NUMBER OF OVERSAMPLING x 1 | x 2 | x 3 | x 5 | x 10 |
|---|---|---|---|---|---|
| 0.4 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 |
| 1 | 1.79 | 1.79 | 1.79 | 1.79 | 1.79 |
| 2 | 1.62 | 1.79 | 1.79 | 1.79 | 1.79 |
| 3 | 1.08 | 1.79 | 1.79 | 1.79 | 1.79 |
| 4 | 0.81 | 1.62 | 1.79 | 1.79 | 1.79 |
| 5 | 0.65 | 1.30 | 1.79 | 1.79 | 1.79 |
| 6 | 0.54 | 1.08 | 1.62 | 1.79 | 1.79 |
| 7 | 0.46 | 0.93 | 1.39 | 1.79 | 1.79 |
| 8 | 0.41 | 0.81 | 1.22 | 1.79 | 1.79 |
| 9 | 0.36 | 0.72 | 1.08 | 1.79 | 1.79 |

| FREQUENCY (GHz) | NUMBER OF OVERSAMPLING x 1 | x 2 | x 3 | x 5 | x 10 |
|---|---|---|---|---|---|
| 9 | 0.36 | 0.72 | 1.08 | 1.79 | 1.79 |
| 10 | 0.32 | 0.65 | 0.97 | 1.62 | 1.79 |
| 11 | 0.30 | 0.59 | 0.89 | 1.48 | 1.79 |
| 12 | 0.27 | 0.54 | 0.81 | 1.35 | 1.79 |
| 13 | 0.25 | 0.50 | 0.75 | 1.25 | 1.79 |
| 14 | 0.23 | 0.46 | 0.70 | 1.16 | 1.79 |
| 15 | 0.22 | 0.43 | 0.65 | 1.08 | 1.79 |
| 16 | 0.20 | 0.41 | 0.61 | 1.01 | 1.79 |
| 17 | 0.19 | 0.38 | 0.57 | 0.95 | 1.79 |
| 18 | 0.18 | 0.36 | 0.54 | 0.90 | 1.79 |

* For standard model

# OTA performance testing

SG 64 can perform both TRP and TIS measurements according to CTIA specifications.

## OTA performance measurement specifications*

| ACCORDING TO CTIA SPECIFICATIONS | |
|---|---|
| TRP accuracy free space | <± 1.4 dB |
| TRP accuracy talk position | <± 1.5 dB |
| TRP repeatability | ± 0.3 dB |
| Typical TRP measurement time** | < 90 s |
| TIS accuracy free space | <± 1.5 dB |
| TIS accuracy talk position | <± 1.6 dB |
| TIS repeatability | ± 0.5 dB |
| Typical TIS measurement time*** | 15 min → 60 min |

* Specifications for standard model given according to the following assumptions:
- Controlled temperature and humidity during measurement
- Measurements inside an anechoic chamber
- DUT phase center does not exceed 15 cm from arch center
- Calibration done with dipole efficiency reference values
- Measurement performed with a suitable mast depending on the load and directivity of the DUT.

Specifications also depend on Radio Communication Tester and Protocol

| CTIA COMPARABLE | |
|---|---|
| GSM/WCDMA protocols: | |
| TIS based on Rx level accuracy | <± 2.2 dB |
| TIS based on Rx level repeatability | <± 1.5 dB |
| Typical TIS based on Rx level measurement time*** | < 5 min |
| CDMA2000 protocol: | |
| TIS optimized accuracy | <± 1.5 dB |
| TIS optimized repeatability | <± 0.5 dB |
| Typical TIS optimized measurement time*** | < 10 min |

** One channel, 15 deg sampling, one time each probe, measurement time depends on protocol

*** One channel, 30 deg sampling, one time each probe, measurement time depends on protocol

# Linear antenna measurement

## Linear antenna measurement characteristics

| | COMPACT | STANDARD 6 GHz | STANDARD 18 GHz | LARGE 6 GHz |
|---|---|---|---|---|
| Linear antenna measurement capability | Not applicable | Yes | Yes | Yes |
| Geometry | - | Spherical | Spherical | Spherical |
| Linear antenna Max Length/Weight | - | 179 cm / 200 kg | 179 cm / 200 kg | 273 cm / 200 kg |
| Measurement time for 11 frequencies* | - | < 3 min | < 3 min | < 3 min |

* 1 port (no oversampling, no averaging), Linear antenna of 160 cm at GSM900

# MVG - Testing Connectivity for a Wireless World

The Microwave Vision Group offers cutting-edge technologies for the visualisation of electromagnetic waves. Enhancing the speed and accuracy of wireless connectivity testing, as well as the performance and reliability of anechoic and EMC technologies, our systems are integral to meeting the testing challenges of a fully connected world.

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