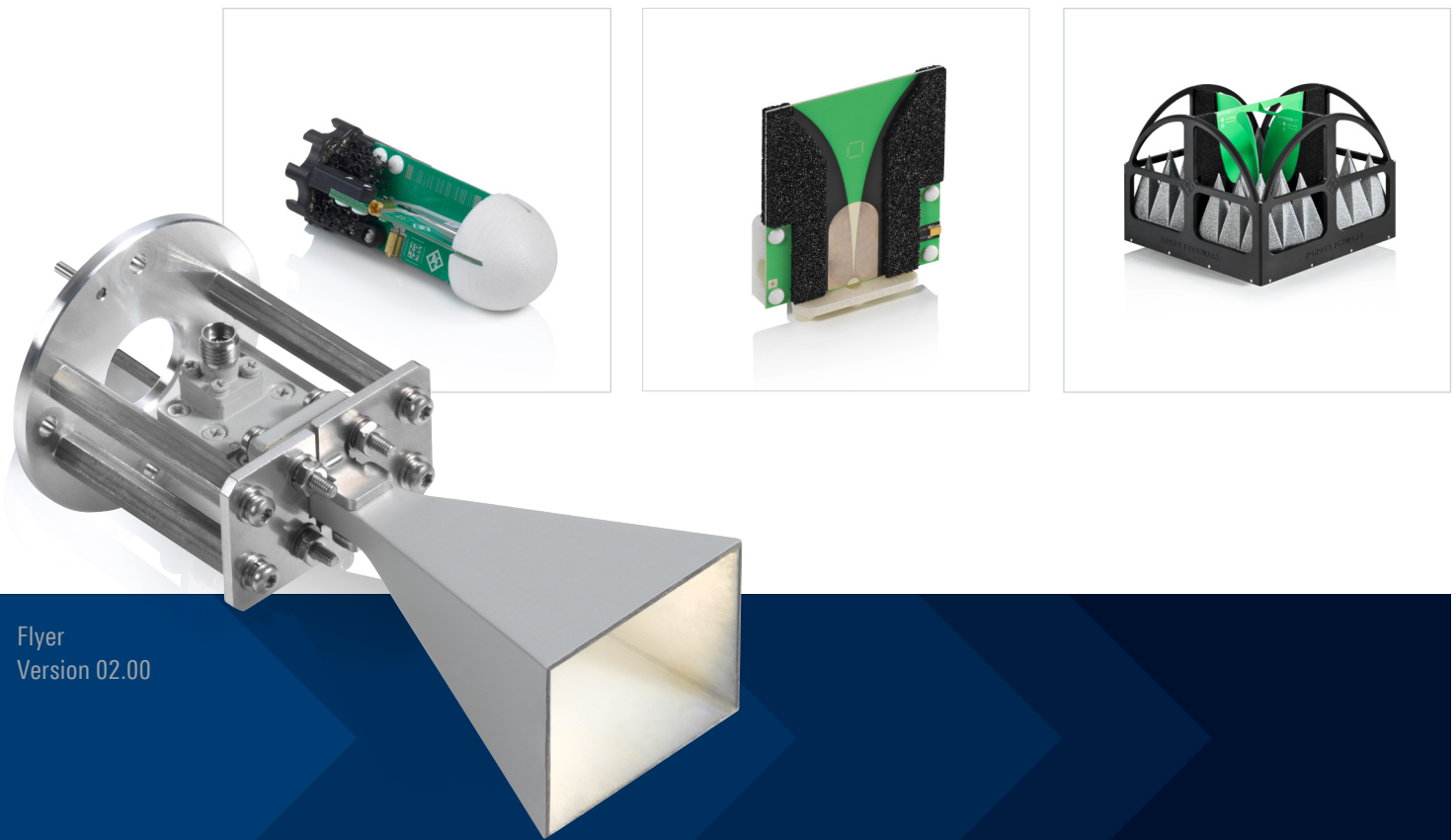


ANTENNA OVERVIEW FOR ROHDE & SCHWARZ OTA TEST SYSTEMS



Flyer
Version 02.00

ROHDE & SCHWARZ

Make ideas real



BASIC INFORMATION

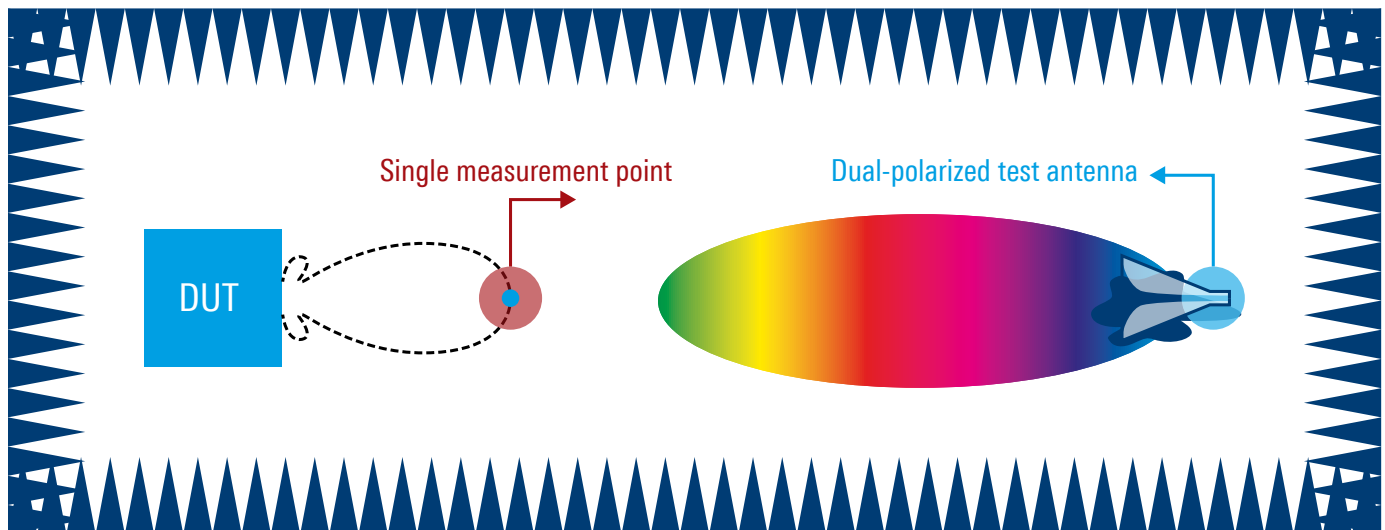
In wireless communications, an antenna is an essential device made of conductive material that transmits or receives electromagnetic radio waves. As the main enabler of wireless communications, antennas must meet several challenging parameters such as a wide frequency range, flat gain curves and high mechanical stability in order to support an ever-increasing range of applications.

Wireless communications testing requires over-the-air (OTA) test systems with various antenna types that serve different system functions. A variety of basic antenna designs have become established over time. These include standard gain horn, Vivaldi, patch and array antennas. Each has unique features that make them ideal for a specific application.

In OTA and antenna test systems, the following application purposes are relevant:

- ▶ Test antenna/measurement probe
- ▶ Link/communications antenna
- ▶ Reference or calibration antenna

Simplified overview of an antenna test system

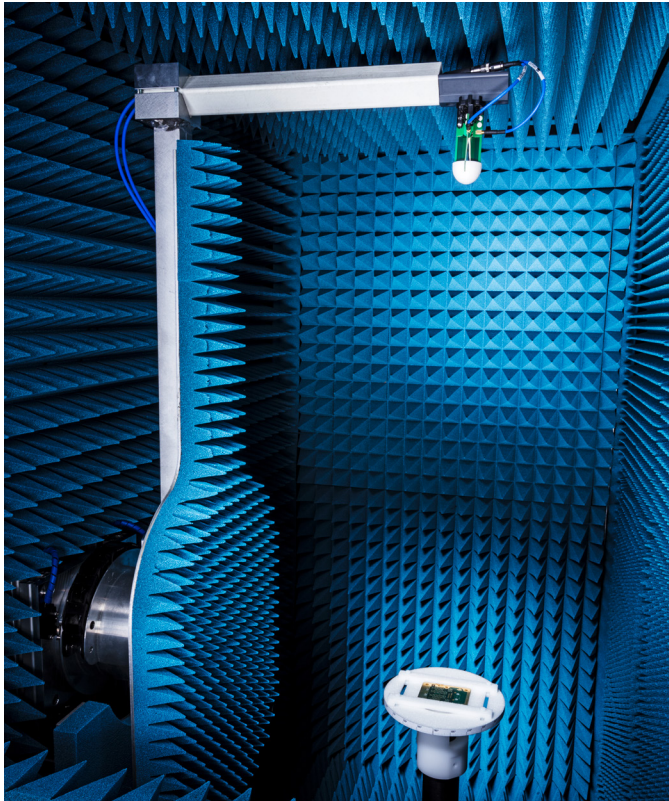


SINCE ANTENNA CHARACTERISTICS AND QUALITY HAVE A MAJOR INFLUENCE ON THE OVERALL MEASUREMENT CERTAINTY IN OTA TEST SYSTEMS, SELECTING THE RIGHT ANTENNA IS CRITICAL. THE FOLLOWING IS AN OVERVIEW OF THE MOST COMMON OTA ANTENNAS AND THEIR KEY PARAMETERS. CONTACT US FOR MORE DETAILS.

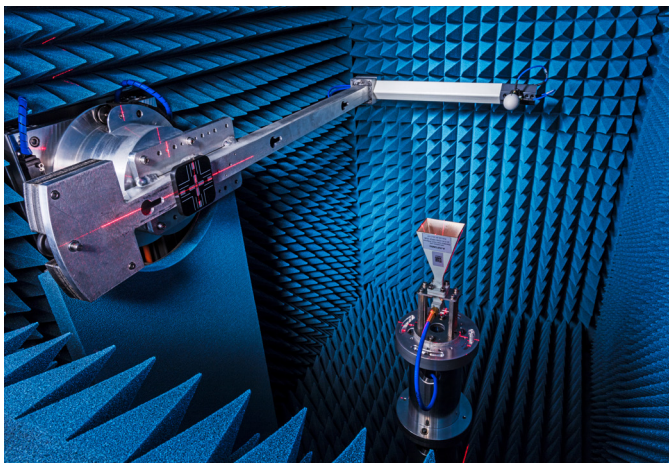
Test antennas/probes

Test antennas are connected to the test instruments used to perform TX and RX measurements in OTA systems. Since they cover a very wide frequency range, only one antenna is required – even when measuring at different frequencies.

Dual-polarized test antennas are preferred when measuring 3D radiation patterns, since they permit simultaneous measurements of both orthogonal field components with a four-port vector network analyzer.



Example of the R&S®TC-TA85CP cross-polarized Vivaldi test antenna measuring in an antenna test system

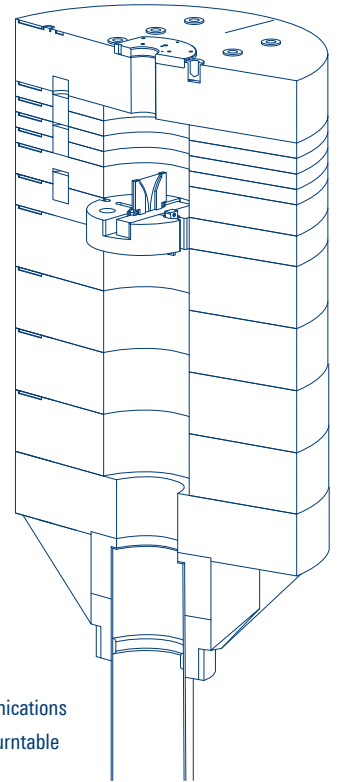


Example of an R&S®TC-SGH40 standard gain horn calibration antenna in an antenna test system

Link/communications antennas

Link/communications antennas establish stable communications links to the DUT. They are usually arranged in close proximity to the DUT. Link/communications antennas are commonly used when base station simulations are needed on the signaling level to guide uplink and downlink signals in a cellular system.

For the best performance, they are installed on a rotating positioner together with the DUT. The link antenna and DUT move in tandem with the positioner, helping to prevent level variations from irregular/scattered radiation patterns with deep nulls.



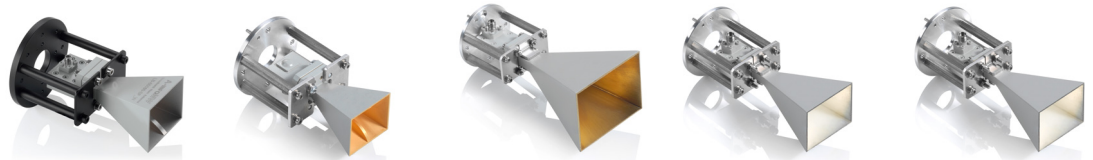
Drawing showing the R&S®TC-CA6 communications antenna located inside an RF transparent turntable made of Styrodur foam

Reference or calibration antennas

Calibration antennas are very important because they are used as the reference to determine the path loss in a test setup. They are installed in place of the DUT to determine the RF path loss along the entire RF chain in the OTA test system.

Accredited test labs normally calibrate these antennas. The exact antenna properties – including maximum measurement uncertainty – are disclosed when purchasing a calibration antenna. Total measurement uncertainty in an OTA test system is mainly influenced by the absolute calibration antenna accuracy.

ANTENNAS OVERVIEW



Antenna type	Horn antennas				
	R&S® TC-SGH18BB	TC-SGH40BB	TC-SGH26	TC-SGH40	TC-SGH40-2
Description	broadband horn antenna	broadband horn antenna	standard gain horn	standard gain horn	standard gain horn
Frequency range	6 GHz to 18 GHz	18 GHz to 40 GHz	18 GHz to 26.5 GHz	26.5 GHz to 40 GHz	26.5 GHz to 40 GHz
Gain (typ.)	12 dB (8 GHz)	15 dB (28 GHz)	20 dB (22.5 GHz)	20 dB (31 GHz)	20 dB (31 GHz)
Polarization (nom.)	single linear	single linear	single linear	single linear	single linear
VSWR	< 2.0	< 2.0	< 1.4	< 1.5	< 1.5
Power rating (meas.)	< 50 W CW	< 20 W CW	< 50 W CW	< 20 W CW	< 20 W CW
Outer dimensions incl. mechanical fixture (W × H × D)	55 × 50 × 133 mm	50 × 50 × 108 mm	64 × 50 × 135.5 mm	50 × 50 × 117 mm	50 × 50 × 117 mm
Aperture size	55 × 44 mm	32 × 27 mm	64 × 50 mm	40.5 × 32 mm	40.5 × 32 mm
RF connector	SMA (f)	PC 2.92 mm (f)	PC 2.92 mm (f)	PC 2.92 mm (f)	PC 2.4 mm (f)
Weight (approx.)	190 g	80 g	350 g	240 g	240 g
Applications	FF system calibration	FF system calibration	NF/FF system calibration	NF/FF system calibration	NF/FF system calibration
Applicable products (WPTC, R&S®ATS1000, etc.)	all WPTCs, R&S®ATS1000, R&S®ATS1800C	all WPTCs, R&S®ATS800B/R, R&S®ATS1000, R&S®ATS1800C	all WPTCs, R&S®ATS800B/R, R&S®ATS1000, R&S®ATS1800C	all WPTCs, R&S®ATS800B/R, R&S®ATS1000, R&S®ATS1800C	all WPTCs, R&S®ATS800B/R, R&S®ATS1000, R&S®ATS1800C
Factory calibration	incl. realized gain versus frequency	incl. realized gain versus frequency	incl. realized gain versus frequency	incl. realized gain versus frequency	incl. realized gain versus frequency
Order number	1530.8081.02	1530.8669.02	1530.8630.02	1530.8617.02	1538.7810.02

NF Near field; FF Far field; WPTC Wireless performance test chamber

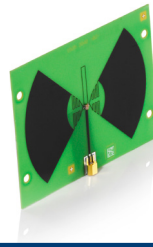
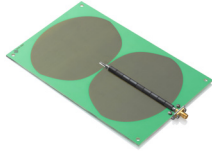
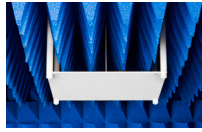
Note: The antenna photos are not to scale.



				Vivaldi antennas	
TC-SGH60	TC-SGH60M	TC-SGH75M	TC-SGH90M	TC-TA18	TC-TA50CPR
standard gain horn	standard gain horn with active multiplier	standard gain horn with active multiplier	standard gain horn with active multiplier	cross-polarized Vivaldi test antenna	cross-polarized Vivaldi test and link antenna (ruggedized)
40 GHz to 60 GHz	40 GHz to 60 GHz (input: 10 GHz to 15 GHz)	50 GHz to 75 GHz (input: 12.5 GHz to 18.75 GHz)	60 GHz to 90 GHz (input: 10 GHz to 15 GHz)	400 MHz to 18 GHz	<ul style="list-style-type: none"> ▶ link antenna: 650 MHz to 50 GHz ▶ test antenna: 4 GHz to 50 GHz
20 dB (40 GHz)	25 dB (50 GHz)	27 dB (62 GHz)	27 dB (66 GHz)	> 6 dBi (3 GHz to 18 GHz)	> 8 dBi (20 GHz to 50 GHz)
single linear	single linear	single linear	single linear	dual linear	dual linear
< 2.0	< 1.4	< 2.2	< 2.2	< 2 (700 MHz to 18 GHz)	< 2.2 (4 GHz to 50 GHz)
< 5 W CW	5 mW (operating input power)	5 mW (operating input power)	5 mW (operating input power)	< 4 W CW	< 2 W CW
50 × 50 × 100.5 mm	75 × 75 × 165 mm	75 × 75 × 157 mm	75 × 75 × 133 mm	248 × 248 × 193 mm	28 × 28 × 77.3 mm
31.4 × 25 mm	31.4 × 25 mm	20 × 16 mm	18 × 14 mm	–	–
PC 1.85 mm (f)	SMA (f)	SMA (f)	SMA (f)	2 × SMA (f)	2 × MMPX (f)
280 g	380 g	380 g	380 g	1.6 kg	300 g
NF/FF system calibration	FF system calibration	FF system calibration	FF system calibration	NF/FF OTA/antenna test system	OTA test and communications antenna
all WPTCs, R&S®ATS800B/R, R&S®ATS1000, R&S®ATS1800C	all WPTCs, R&S®ATS800R, R&S®ATS1000, R&S®ATS1800C	all WPTCs, R&S®ATS800R, R&S®ATS1000, R&S®ATS1800C	all WPTCs, R&S®ATS800R, R&S®ATS1500C, R&S®ATS1800C	WPTC-M/L/XL	R&S®ATS1800C, R&S®CMQ200/CMQ500
incl. realized gain versus frequency	incl. realized gain versus frequency	incl. realized gain versus frequency	incl. realized gain versus frequency	on request	on request
1530.8623.02	1536.8590.02	1536.8460.04	1536.8454.04	1530.8075.02	1531.8633.03



TC-TA85LP	TC-TA85CP	DST-B215	TC-CA6	TS-F24-V1	TS-F24-V2
linear-polarized Vivaldi test antenna	cross-polarized Vivaldi test antenna	cross-polarized Vivaldi test antenna	linear-polarized communications antenna	broadband Vivaldi antenna	broadband Vivaldi antenna
4 GHz to 85 GHz	4 GHz to 85 GHz	400 MHz to 18 GHz	400 MHz to 18 GHz	700 MHz to 18 GHz	2.4 GHz to 18 GHz
> 8 dBi (20 GHz to 85 GHz)	> 8 dBi (20 GHz to 85 GHz)	> 0 dBi (1 GHz to 18 GHz)	4 dBi (3.5 GHz to 6 GHz)	6 dBi to 8 dBi (2.7 GHz to 18 GHz)	6 dBi to 8 dBi (4 GHz to 18 GHz)
single linear	dual linear	dual linear	single linear	single linear	single linear
< 2.2	< 2.2 (7 GHz to 85 GHz)	< 2 (900 MHz to 18 GHz)	< 2.3 (1.7 GHz to 18 GHz)	< 2.5 (1.2 GHz to 18 GHz)	< 2.3
< 2 W CW	< 2 W CW	< 4 W CW	–	–	–
28 × 28 × 77.3 mm	28 × 28 × 77.3 mm	152 × 152 × 117 mm	80 × 70 × 8 mm	120 × 100 × 7 mm	70 × 80 × 7 mm
–	–	–	70 × 8 mm	–	–
MMPX (f)	2 × MMPX (f)	▶ at antenna: 2 × SMA (f) ▶ at R&S®DST200 chamber: 2 × N (f)	▶ at antenna: SMP (m) ▶ at included cable: SMA (m)	▶ at antenna: SMP (m) ▶ at included cable: SMA (m)	▶ at antenna: SMP (m) ▶ at included cable: SMA (m)
12 g	14 g	500 g	24 g	–	–
OTA test and communications antenna	NF/FF OTA/antenna test system	NF/FF OTA/antenna test system	OTA communications antenna	OTA test and communications antenna	OTA test and communications antenna
WPTC	WPTC-XS/S/M/L/XL, R&S®ATS1000	WPTC-XS/S, R&S®DST200	WPTC	R&S®TS7124, R&S®CMQ200/CMQ500	R&S®TS7124, R&S®CMQ200/CMQ500
incl. realized gain versus frequency	incl. realized gain versus frequency	on request	–	–	–
1531.8610.02	1531.8627.02	1527.3576.02	1530.8069.02	1525.8964.03	1525.8970.03



		Other antennas				
TS-F24-V3	DST-B220	DST-B270	TS-F24WA1	TS-F24NB2		
cross-polarized Vivaldi antenna	circular-polarized test antenna	linear-polarized communications antenna	broadband circular-polarized link antenna	bow-tie antenna		
1.7 GHz to 18 GHz	700 MHz to 6 GHz	700 MHz to 18 GHz	300 MHz to 6 GHz	700 MHz to 960 MHz		
6 dBi to 10 dBi (5 GHz to 18 GHz)	–	–	–7 dBi to 2 dBi (400 MHz to 3 GHz)	–7 dBi to –6 dBi		
dual linear	right-hand circular	single linear	circular	single linear		
< 2.3	< 2.2	< 2	< 2 (300 MHz to 4 GHz)	< 2 (730 MHz to 930 MHz)		
–	< 4 W	< 10 W up to 6 GHz	–	–		
70 × 70 × 80 mm	–	130 × 210 × 8 mm	246 × 280 × 7 mm	80 × 60 × 4 mm		
–	–	210 × 8 mm	–	80 × 60 mm		
▶ at antenna: 2 × SMP (m) ▶ at included cable: 2 × SMA (m)	SMA (f)	SMA (f)	SMA (f)	SMP (m)		
–	–	–	–	–		
OTA test and communications antenna	OTA test antenna	OTA communications antenna	OTA test antenna	OTA communications antenna		
R&S®TS7124, R&S®ATS800R, R&S®ATS1800C, R&S®CMQ200/CMQ500	R&S®DST200	R&S®DST200	R&S®TS7124	R&S®TS7124		
–	–	–	–	–		
1525.8987.03	1518.4509.02	1518.4515.02	1525.8670.02	1525.8793.02		

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