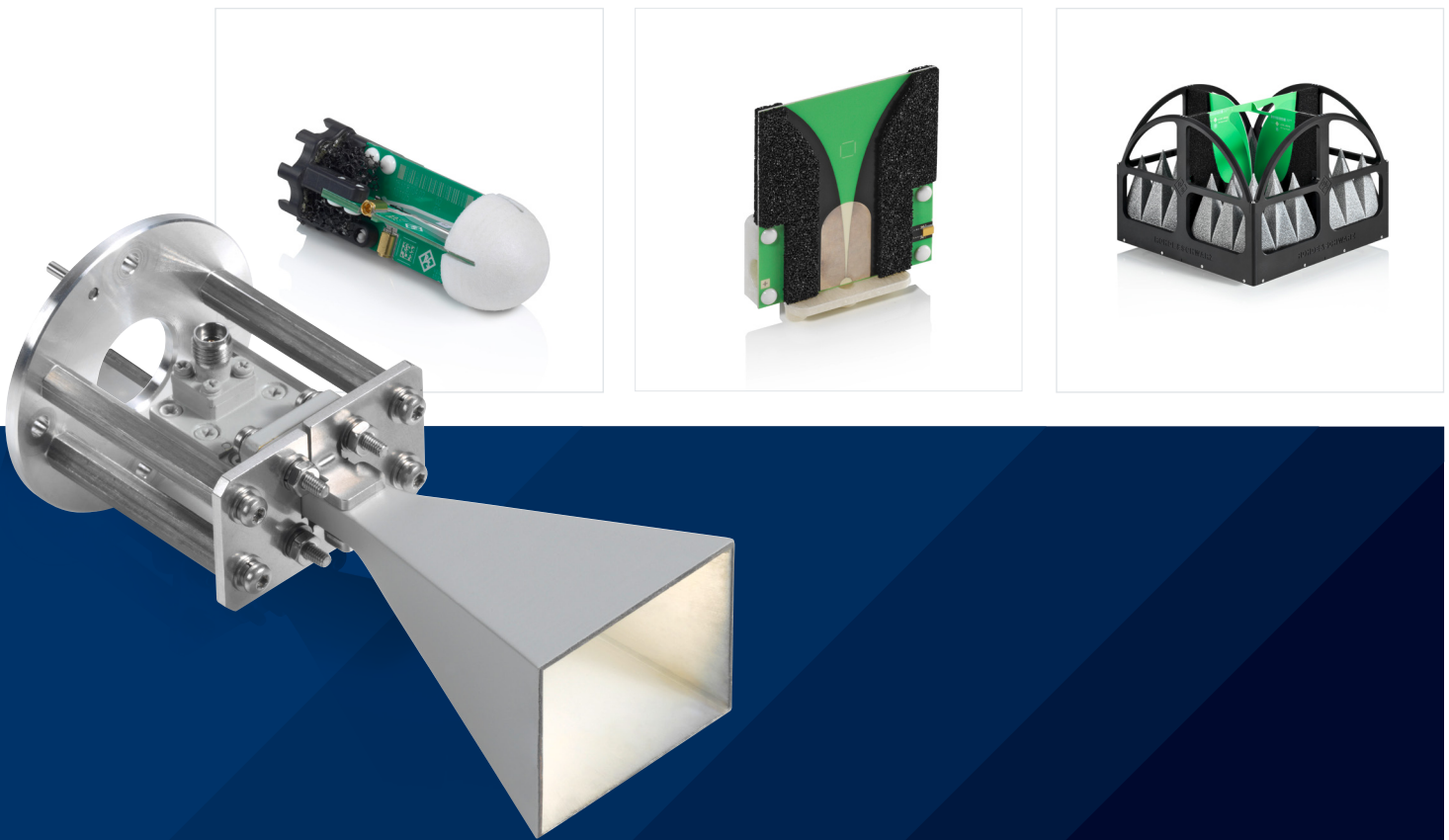


ANTENNA OVERVIEW FOR ROHDE & SCHWARZ OTA TEST SYSTEMS



ROHDE & SCHWARZ

Make ideas real



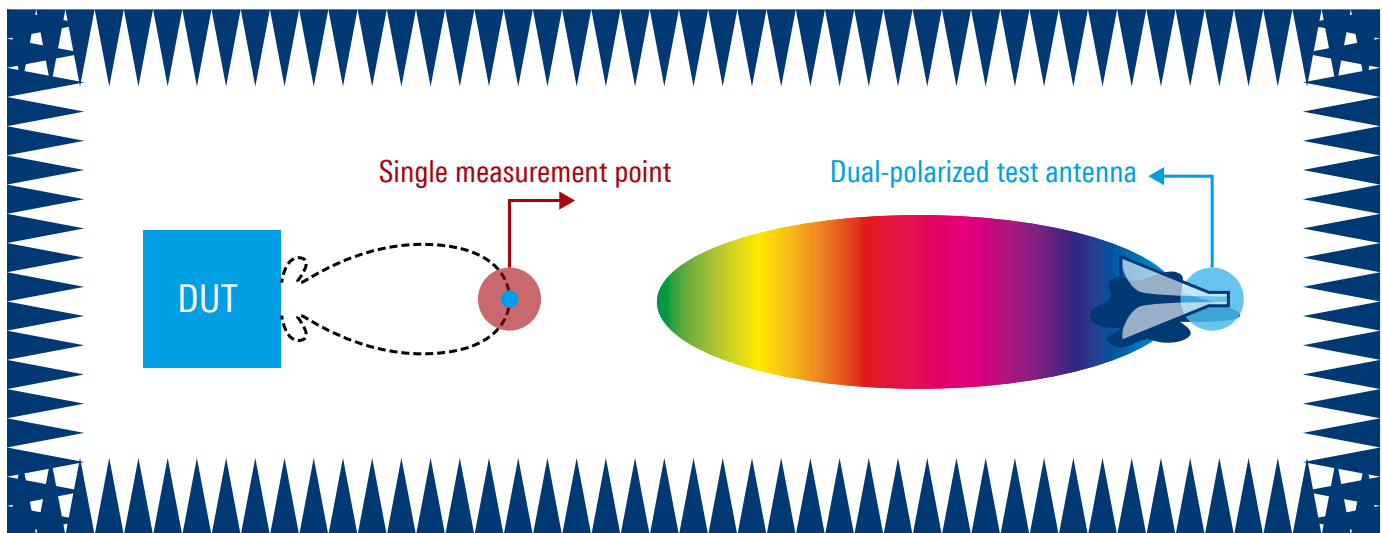
BASIC INFORMATION

In wireless communications, an antenna is an essential device made of conductive metal that transmits or receives electromagnetic radio waves. As the main enabler of wireless communications, antennas must satisfy a number of challenging parameters such as a wide frequency range, flat gain curves and high mechanical stability, so that they can 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.

Test antennas /probes, link/communications antennas and calibration antennas are used in OTA test systems.

Simplified overview of an antenna test system

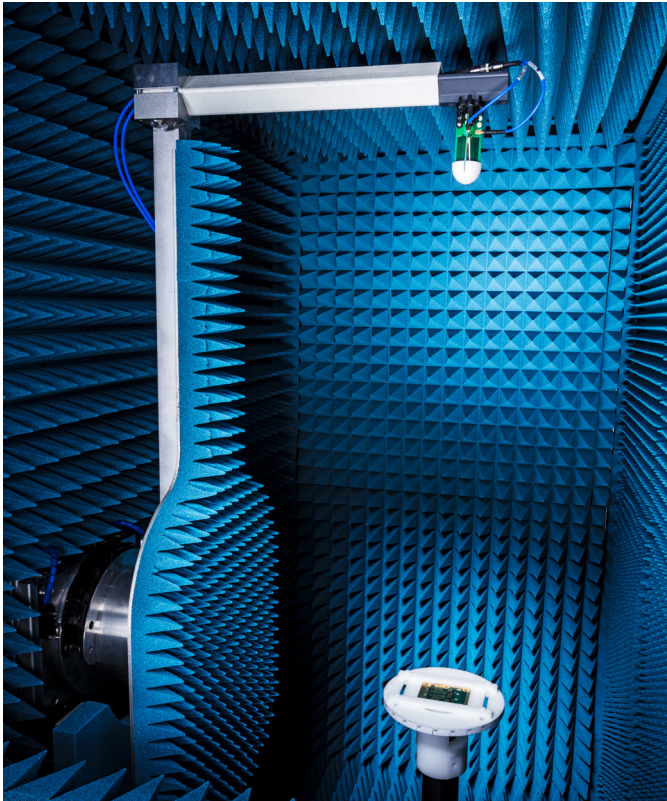


SINCE ANTENNA CHARACTERISTICS AND QUALITY HAVE A LARGE INFLUENCE ON THE OVERALL MEASUREMENT CERTAINTY IN OTA TEST SYSTEMS, SELECTING THE RIGHT ANTENNA IS CRITICAL. THE FOLLOWING IS AN OVERVIEW OF THE MOST COMMON OTA ANTENNAS AND THEIR KEY PARAMETERS. PLEASE CONTACT US FOR MORE DETAILS.

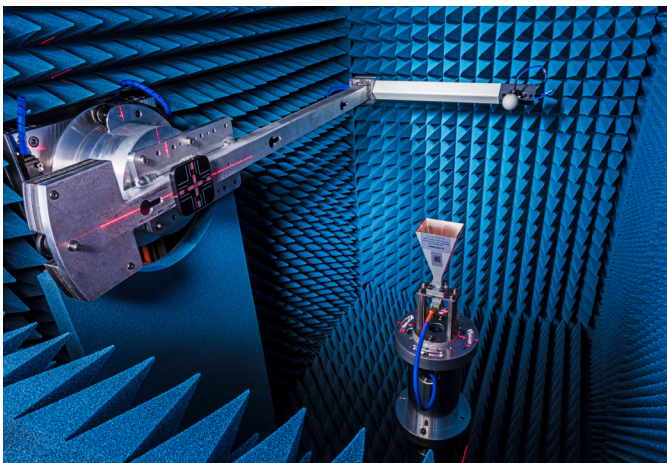
Test antennas/probes

Test antennas are connected to the test instruments used to perform TX and RX measurements in OTA systems. They cover a very wide frequency range so that a single antenna can be used even when measuring at different frequencies.

Dual-polarized test antennas are preferred when measuring 3D radiation patterns since they permit simultaneous measurements of both horizontal and vertical 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

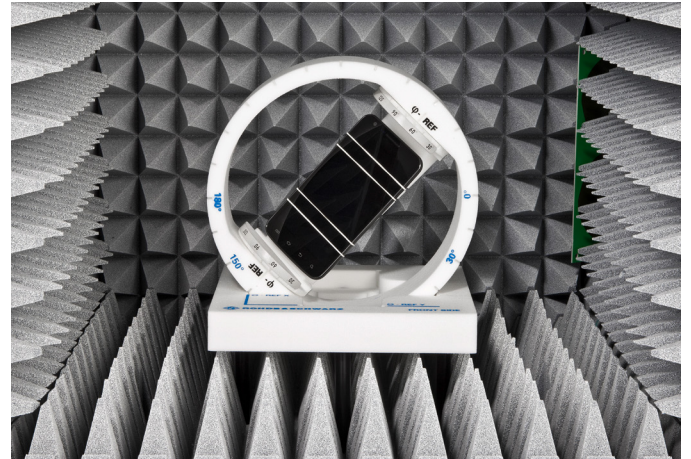


Example of a R&S®TC-SGH40 standard gain horn calibration antenna in an antenna test system

Link/communications antennas

Link/communications antennas establish stable communication links to the DUT. They are usually arranged close together in an OTA test system. Link/communication antennas are commonly used when base station simulations are needed on the signalling 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.



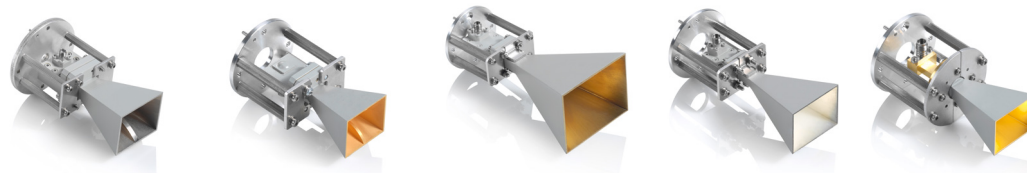
Example of the R&S®DST-B270 linear-polarized communications antenna in an antenna test system

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.

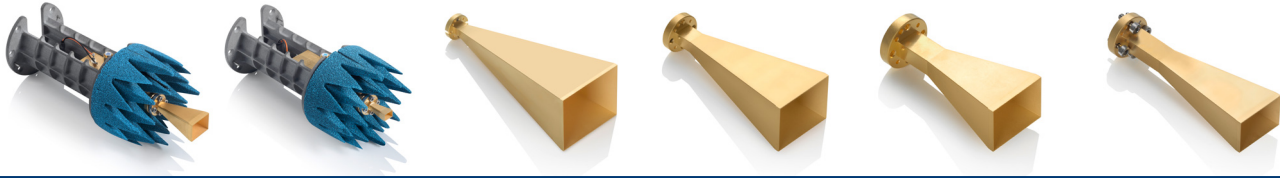
ANTENNAS OVERVIEW



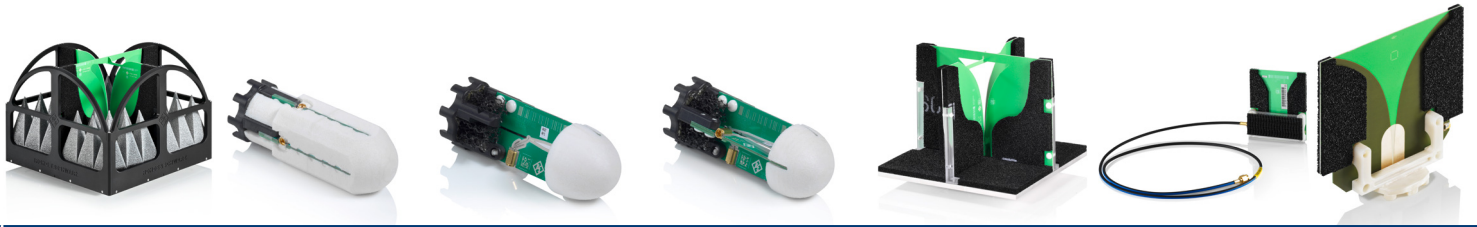
Antenna type	Horn antennas				
	R&S® TC-SGH18BB	TC-SGH40BB	TC-SGH26	TC-SGH40	TC-SGH60
Description	broadband horn antenna	broadband horn antenna	standard gain horn	standard gain horn	standard gain horn
Frequency range	8 GHz to 18 GHz	18 GHz to 40 GHz	18.0 GHz to 26.5 GHz	26.5 GHz to 40 GHz	40 GHz to 60 GHz
Gain (typ.)	10 dB (8 GHz)	15 dB (28 GHz)	20 dB (22.5 GHz)	20 dB (31 GHz)	20 dB (40 GHz)
Polarization (nom.)	single linear	single linear	single linear	single linear	single linear
VSWR	< 2.0	< 2.0	< 1.4	< 1.6	< 2.0
Power rating (meas.)	< 50 W CW	< 50 W CW	< 50 W CW	< 50 W CW	< 50 W CW
Outer dimensions (W × H × D)	48 × 39 × 96.7 mm	32 × 27 × 71 mm	63.5 × 50 × 135.5 mm	50 × 50 × 117 mm	50 × 50 × 100.5 mm
Aperture size	48 × 39 mm	32 × 27 mm	63.5 × 49.5 mm	40.5 × 32 mm	31.4 × 25 mm
RF connector	1 × SMA (f)	1 × 2.92 mm (f)	1 × 2.92 mm (f)	1 × 2.92 mm (f)	1 × 1.85 mm (f)
Weight (approx.)	–	0.08 kg	0.35 kg	0.24 kg	0.28 kg
Applications	FF system calibration	FF system calibration	NF/FF system calibration	NF/FF system calibration	NF/FF system calibration
Products applicable (WPTC, R&S®ATS1000, etc.)	all WPTC, R&S®ATS1000	all WPTC, R&S®ATS800, R&S®ATS1000, R&S®ATS1800	all WPTC, R&S®ATS800, R&S®ATS1000, R&S®ATS1800	all WPTC, R&S®ATS800, R&S®ATS1000, R&S®ATS1800	all WPTC, R&S®ATS800, R&S®ATS1000, R&S®ATS1800
Factory calibration	on request	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	1530.8623.02

NF Nearfield; FF Far-field; WPTC Wireless performance test chamber; RSE Radiated spurious emission

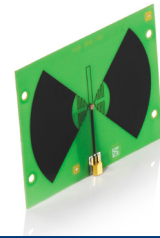
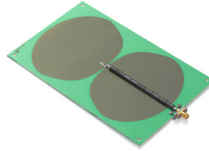
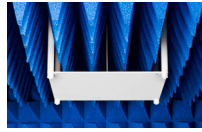
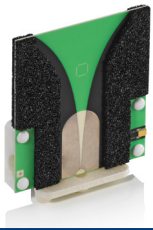
Note: The antenna photos are not to scale.



TC-SGH75M	TC-SGH90M	TC-HORN60	TC-HORN90	TC-HORN140	TC-HORN220
standard gain horn, with active multiplier	standard gain horn, with active multiplier	standard gain horn	standard gain horn	standard gain horn	standard gain horn
50 GHz to 75 GHz	60 GHz to 90 GHz	40 GHz to 60 GHz	60 GHz to 90 GHz	90 GHz to 140 GHz	140 GHz to 220 GHz
20 dB (62 GHz)	20 dB (66 GHz)	25 dB (sim.)	25 dB (sim.)	25 dB (sim.)	28 dB (sim.)
single linear	single linear	single linear	single linear	single linear	single linear
< 1.4	< 1.4	< 1.5	< 1.5	< 1.5	< 1.5
5 mW/7 dBm (operating input power)	5 mW/7 dBm (operating input power)	< 50 W CW	< 50 W CW	< 50 W CW	< 50 W CW
80 × 80 × 185 mm	80 × 80 × 173.5 mm	50 × 41 × 133.4 mm	31 × 25 × 82 mm	22.4 × 17.3 × 51.6 mm	20.7 × 15 × 76 mm
31.4 × 25 mm	31.4 × 25 mm	50 × 41 mm	31 × 25 mm	22.4 × 17.3 mm	20.7 × 15 mm
1 × 1.85 mm (f)	1 × 1.85 mm (f)	WR19	WR12	WR8	WR5
0.32 kg	0.32 kg	–	–	–	–
FF system calibration	FF system calibration	RSE test antenna	RSE test antenna	RSE test antenna	RSE test antenna
all WPTC, R&S®ATS800, R&S®ATS1000, R&S®ATS1800	all WPTC, R&S®ATS800, R&S®ATS1000, R&S®ATS1800	R&S®TC-RSExx, R&S®TC-MXxx	R&S®TC-RSExx, R&S®TC-MXxx	R&S®TC-RSExx, R&S®TC-MXxx	R&S®TC-RSExx, R&S®TC-MXxx
on request	on request	N./A.	N./A.	N./A.	N./A.
1536.8460.02	1536.8454.02	1538.5800.02	1538.5817.02	1538.5823.02	1538.5830.02



Vivaldi antennas						
TC-TA18	TC-TA50CPR	TC-TA85LP	TC-TA85CP	DST-B215	TC-CA6	TS-F24-V1
cross-polarized Vivaldi test antenna	ruggedized Vivaldi link antenna	linear-polarized Vivaldi test antenna	cross-polarized Vivaldi test antenna	cross-polarized Vivaldi test antenna	linear-polarized communications antenna	broadband Vivaldi antenna
0.4 GHz to 18 GHz	0.65 GHz to 50 GHz	4 GHz to 85 GHz	4 GHz to 85 GHz	0.4 GHz to 18 GHz	0.6 GHz to 6 GHz	0.7 GHz to 14 GHz
> 6 dBi (3 GHz to 18 GHz)	> 8 dBi (20 GHz to 50 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 14 GHz)
dual linear	dual linear	single linear	dual linear	dual linear	single linear	single linear
< 2 (700 MHz to 18 GHz)	< 2.2 (4 GHz to 85 GHz)	< 2.2	< 2.2 (7 GHz to 85 GHz)	< 2 (0.9 GHz to 18 GHz)	< 2 (2.4 GHz to 6 GHz)	< 2 (1 GHz to 14 GHz)
< 4 W CW	< 2 W CW	< 2 W CW	< 2 W CW	< 4 W CW	–	–
248 × 248 × 193 mm	28 × 28 × 77.3 mm	28 × 28 × 77.3 mm	28 × 28 × 77.3 mm	152 × 152 × 117 mm	80 × 70 × 8 mm	120 × 100 × 7 mm
–	–	–	–	–	70 × 8 mm	–
2 × SMA (f)	MMPX (f)	MMPX (f)	2 × MMPX (f)	2 × N (f)	SMP (m)	SMP (m)
1.6 kg	–	–	14 g	–	24 g	–
NF/FF OTA/antenna test system	OTA communications antenna	OTA communications antenna	NF/FF OTA/antenna test system	NF/FF OTA/antenna test system	OTA communications antenna	OTA test and communications antenna
WPTC-S, M, L, XL	R&S®ATS1800, R&S®ATS800	WPTC	WPTC-XS, S, M, L, XL, R&S®ATS1000	WPTC-XS, R&S®DST200	WPTC	R&S®TS7124
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	N./A.	N./A.
1530.8075.02	1531.8633.02	1531.8610.02	1531.8627.02	1527.3576.02	1530.8069.02	1525.8964.02



		Other antennas			
TS-F24-V2	TS-F24-V3	DST-B220	DST-B270	TS-F24WA1	TS-F24NB2
broadband Vivaldi antenna	cross-polarized Vivaldi antenna	circular-polarized test antenna	linear-polarized communications antenna	broadband circular-polarized antenna	bow-tie antenna
2.4 GHz to 16 GHz	1.7 GHz to 20 GHz	0.7 GHz to 6 GHz	0.7 GHz to 18 GHz	0.3 GHz to 6 GHz	0.7 GHz to 0.96 GHz
6 dBi to 8 dBi (4 GHz to 16 GHz)	6 dBi to 10 dBi (5 GHz to 20 GHz)	–	–	–7 dBi to 2 dBi (400 MHz to 3 GHz)	–7 dBi to –6 dBi
single linear	dual linear	right-hand circular	single linear	circular	single linear
typ. < 1.5	< 2 (2.4 GHz to 20 GHz)	–	< 2	< 2 (300 MHz to 4 GHz)	< 2 (730 MHz to 930 MHz)
–	–	< 4 W	< 10 W up to 6 GHz	–	–
70 × 80 × 7 mm	70 × 70 × 80 mm	–	130 × 210 × 8 mm	246 × 280 × 7 mm	80 × 60 × 4 mm
–	–	–	210 × 8 mm	–	80 × 60 mm
SMP (m)	2 × SMP (m)	SMA(f)	SMA (f)	SMA (f)	SMP (m)
–	–	–	–	–	–
OTA test and communications antenna	OTA test and communications antenna	OTA test antenna	OTA communications antenna	OTA test antenna	OTA communications antenna
R&S®TS7124	R&S®TS7124	R&S®DST200	R&S®DST200	R&S®TS7124	R&S®TS7124
N./A.	N./A.	N./A.	N./A.	N./A.	N./A.
1525.8970.02	1525.8987.02	1518.4509.02	1518.4515.02	1525.8670.02	1525.8793.02

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