Product Service

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October 16, 2015

Prüfbericht / *Test Report* Nr. / *No.* 5010209774-29641-6 (Edition 1)

„Spurious emission“

Applicant:	Agrident GmbH
Type of equipment:	Bluetooth Module integrated in RFID Reader
Type designation:	RN-41
Order No.:	--
Test standards:	FCC Code of Federal Regulations, CFR 47, Part 15, Sections 15.205, 15.207, 15.209 and 15.247 Industry Canada Radio Standards Specifications RSS-GEN Issue 4, Section 8.8, 8.9 and 8.10 RSS-247 Issue 1, Section 5

Note:

The test data of this report is related only to the individual item which has been tested. This report shall not be reproduced except in full extent without the written approval of the testing laboratory.

TÜV SÜD Product Service GmbH
Äußere Frühlingstraße 45
94315 Straubing
Germany

Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
Web: www.tuev-sued.de

Product Service

Table of Contents

1 Description of the Equipment Under Test (EUT)

General data of EUT	
Type designation[1]:	RN-41
Parts[2]:	--
Manufacturer:	Agrident GmbH
Type of equipment:	Bluetooth Module integrated in RFID Reader
Version:	As delivered
FCC ID:	T9JRN41-3
Additional parts/accessories:	--

[1] Type designation of the system if EUT consists of more than one part.
[2] Type designations of the parts of the system, if applicable.

Technical data of EUT		
Application frequency range:	2402 - 2480 MHz	
Frequency range:	2402 - 2480 MHz	
Operating frequencies:	2402 MHz / 2441 MHz / 2480 MHz	
Type of antenna:	Chip antenna	
Size/length of antenna:	N/A	
Connection of antenna:	☐ detachable	☒ not detachable
Type of power supply:	Battery supply	
Specifications for power supply:	nominal voltage: minimum voltage: maximum voltage: nominal frequency:	5.0 V V -- V -- V DC
Type of power supply of cradle:	AC supply	
Specifications for power supply:	nominal voltage: minimum voltage: maximum voltage: nominal frequency:	115 V V -- V -- V AC 50/60Hz

2 Administrative Data

Application details	
Applicant (full address):	Agrident GmbH Steinklippenstrasse 10 30890 Barsinghausen / Germany
Contact person:	Torsten Bade
Order number:	--
Date(s) of test:	8 / 9 October 2015
Note(s):	--

Report details	
Report number:	5010209774-29641-6
Edition:	1
Issue date:	October 16, 2015

3 Identification of the Test Laboratory

Details of the Test Laboratory	
Company name:	TÜV SÜD Product Service GmbH
Address:	Aeussere Fruehlingstrasse 45 D-94315 Straubing Germany
FCC test site registration number	90926
Industry Canada test site registration:	3050A-2
Contact person:	Mr. Johann Roidt Phone: +49 9421 5522-0 Fax: +49 9421 5522-99

4 Summary

Summary of test results
The tested sample complies with the requirements set forth in the **Code of Federal Regulations CFR 47, Part 15, Subpart C** of the Federal Communication Commission (FCC) and the **Radio Standards Specifications** **RSS-GEN Issue 4** **RSS-247 Issue 1** of Industry Canada (IC).

Personnel involved in this report	
Laboratory Manager:	 Mr. Johann Roidt
Responsible for testing:	 Mr. Markus Biberger
Responsible for test report:	Mr. Markus Biberger

5 Operation Mode and Configuration of EUT

Operation Mode(s)
For this report the EUT was tested Bluetooth transmitting mode. The RFID reader was switched off.

Configuration(s) of EUT	
Product	Bluetooth Module integrated in RFID Reader
Model No.	RN-41
FCC ID	T9JRN41-3
Power Supply	DC 5.0 V from battery, DC 5V to cradle
Modulation Type	For Bluetooth: GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	For Bluetooth: FHSS
Transfer Rate	For Bluetooth: DH1, DH3, DH5 + EDR
Freqquency Range	Bluetooth: 2402 – 2480 MHz
Number of Channels	Bluetooth: 79
Channel Spacing	Bluetooth: 1 MHz
Maximum Output Power	Bluetooth 68.7 mW

List of ports and cables				
Port	*Description*	*Classification*[3]	*Cable type*	*Cable length*
1	DC Power input (via battery)	dc power	Unshielded	--

[3] Ports shall be classified as ac power, dc power or signal/control port

List of devices connected to EUT				
Item	*Description*	*Type Designation*	*Serial no. or ID*	*Manufacturer*
	--			

List of support devices				
Item	*Description*	*Type Designation*	*Serial no. or ID*	*Manufacturer*
1	Cradle Dock			
2	AC Adapter			

6 Measurement Procedures

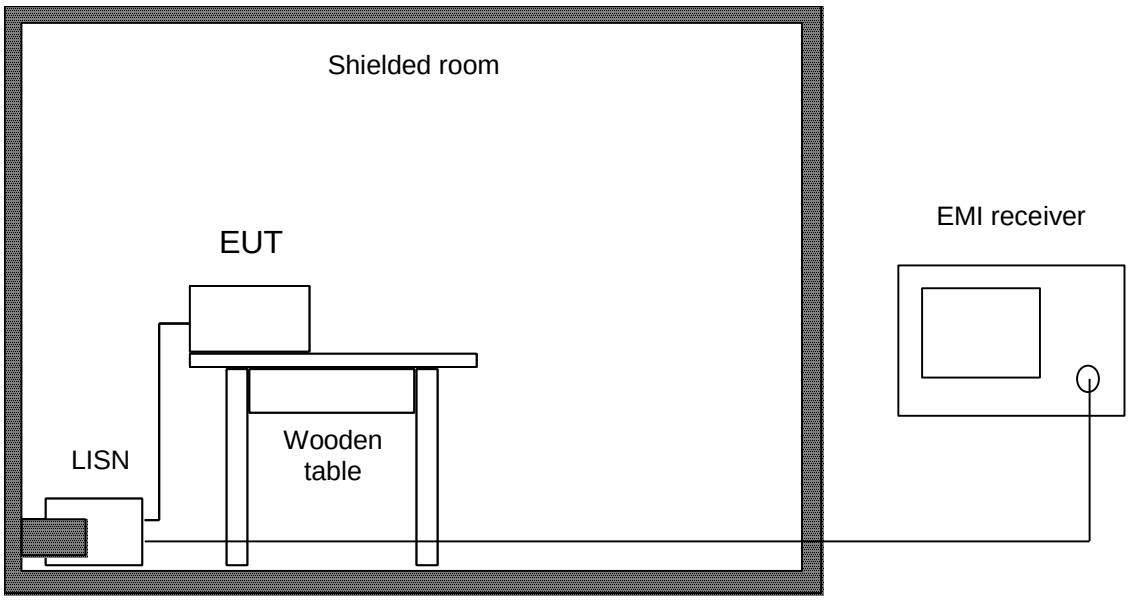
6.1 Conducted AC Powerline Emission

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, section 15.207 IC RSS-Gen Issue 4, section 8.8
Guide:	ANSI C63.10 / CISPR 22

Conducted emission tests in the frequency range 150 kHz to 30 MHz are performed using Line Impedance Stabilization Networks (LISNs). To simplify testing with quasi-peak and average detector the following procedure is used:

First the whole spectrum of emission caused by the equipment under test (EUT) is recorded with detector set to peak using CISPR bandwidth of 10 kHz. After that all emission levels having less margin than 10 dB to or exceeding the average limit are retested with detector set to quasi-peak.
If average limit is kept with quasi-peak levels no additional scan with average detector is necessary. In cases of emission levels between quasi-peak and average limit an additional scan with detector set to average is performed.

According to ANSI C63.10, testing of intentional radiators with detachable antenna shall be performed using a suitable dummy load connected to the antenna output terminals. Otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended.
Testing with dummy load may be necessary to distinguish (unintentional) conducted emissions on the supply lines from (intentional) emissions radiated by the antenna and coupling directly to supply lines and/or LISN. Usage of dummy load has to be stated in the appropriate test record(s) and notes should be added to clarify the test setup.



Test instruments used:

	Type	*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☒	Test receiver	ESHS 10	1028	860043/016	Rohde & Schwarz
☒	V-network	ESH 3-Z5	1059	894785/005	Rohde & Schwarz
☐	V-network	ESH 3-Z5	1218	830952/025	Rohde & Schwarz
☐	Artificial mains network	ESH 2-Z5	1536	842966/004	Rohde & Schwarz
☐	Shielded room	No. 1	1451	---	Albatross
☒	Shielded room	No. 4	1454	3FD 100 544	Euroshield

6.2 Radiated Emission Measurement 9 kHz to 30 MHz

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.205, 15.215(b) IC RSS-GEN Issue 4, sections 8.10 and 8.9
Guide:	ANSI C63.10

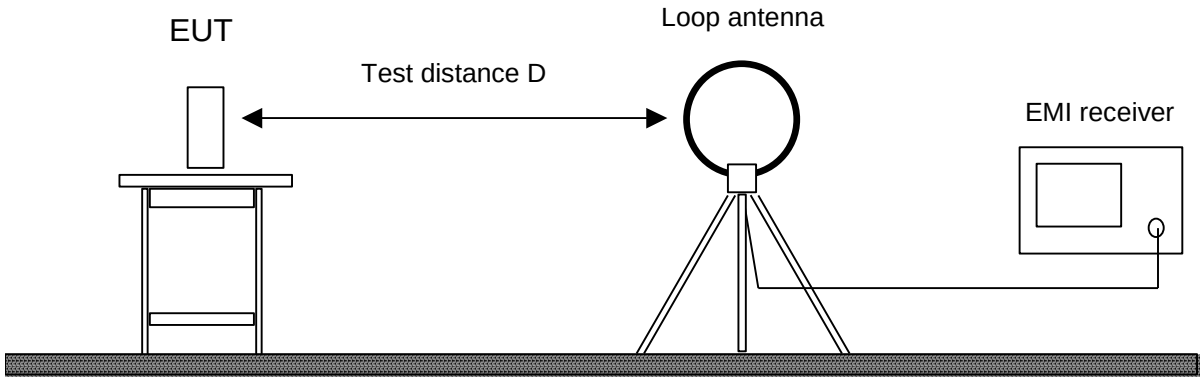
Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak. This configuration is also used for recording the spectrum of intentional radiators.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.
If worst case emission of the EUT cannot be recorded with EUT in standard position and loop antenna in vertical polarization the EUT (or the radiating part of the EUT) is rotated by 90 degrees instead of changing the loop antenna to horizontal polarization. This procedure is selected to minimize the influence of the environment (e.g. effects caused by the floor especially with longer distances).

Final measurement is performed at a test distance D of 30 meters using an open field test site. In case the regulation requires testing at other distances, the result is extrapolated by either making measurements at an additional distance D of 10 meters to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). In cases of very low emissions measurements are performed at shorter distances and results are extrapolated to the required distance. The provisions of CFR 47 Part 15 sections 15.31(d) and (f)(2) apply. According to CFR 47 Part 15 section 15.209(d) final measurement is performed with detector function set to quasi-peak except for the frequency bands 9 to 90 kHz and 110 to 490 kHz where, for non-pulsed operation, average detector is employed.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.



Test instruments used:

	Type		*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☒	Spectrum analyzer		FSP30	1666	100036	Rohde & Schwarz
☐	EMI test receiver		ESMI	1569	839379/013 839587/006	Rohde & Schwarz
☐	Test receiver		ESHS 10	1028	860043/016	Rohde & Schwarz
☐	Preamplifier	Cabin no. 2	CPA9231A	1716	3557	Schaffner
☒	Loop antenna		HFH2-Z2	1016	882964/1	Rohde & Schwarz
☐	Fully anechoic room		No. 2	1452	---	Albatross
☐	Semi anechoic room		No. 3	1453	---	Siemens
☐	Semi anechoic room		No. 8	2057	---	Albatross

6.3 Radiated Emission in Fully or Semi Anechoic Room

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.205(b) IC RSS-GEN Issue 4, sections 8.10(b)(c) and 8.9
Guide:	ANSI C63.10

Radiated emission in fully or semi anechoic room is measured in the frequency range from 30 MHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33.

Measurements are made in both the horizontal and vertical planes of polarization using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwidth set to 100 kHz (below 1 GHz) or 1 MHz (above 1 GHz).

Testing up to 1 GHz is performed with a linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna"). For testing above 1 GHz horn antennas are used.

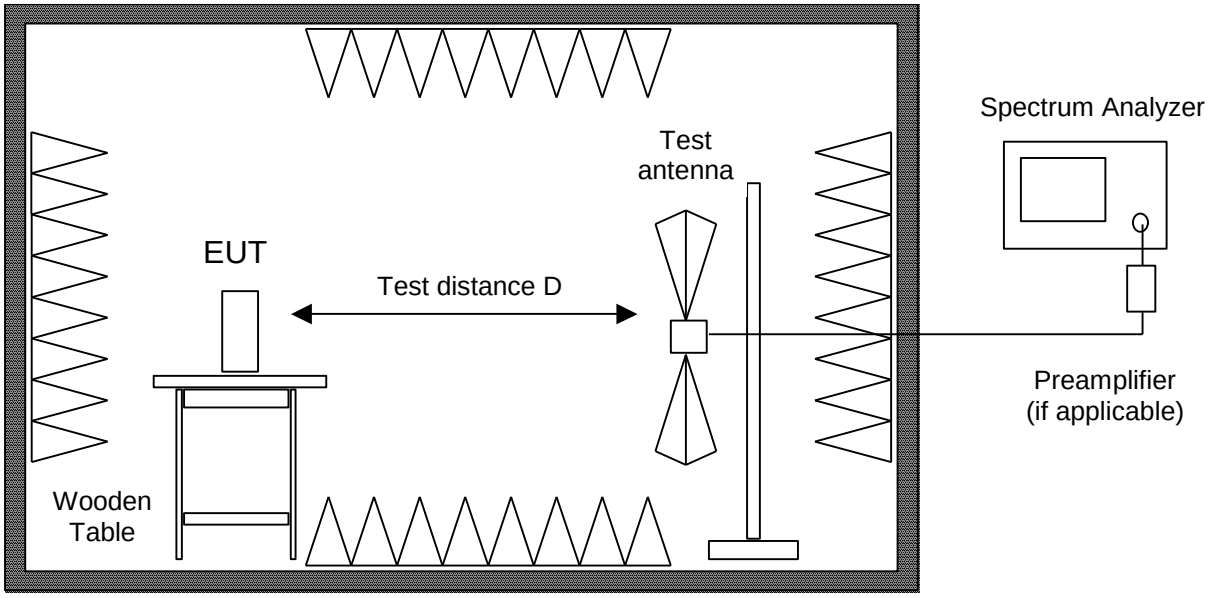
All tests below 8.2 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For final testing below 1 GHz a semi anechoic room complying with the NSA requirements of ANSI C63.10 for alternative test sites is used (see 6.4). If prescans are recorded in fully anechoic room they are indicated appropriately.



Fully or semi anechoic room

Test instruments used:

	Type		*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☒	Spectrum analyzer		FSP30	1666	100036	Rohde & Schwarz
☐	EMI test receiver	Cabin no. 3	ESPI7	2010	101018	Rohde & Schwarz
☐	EMI test receiver		ESU8	2044	100232	Rohde & Schwarz
☐	EMI test receiver		ESMI	1569	839379/013 839587/006	Rohde & Schwarz
☒	Preamplifier	Cabin no. 2	CPA9231A	1716	3557	Schaffner
☐	Preamplifier		R14601	1142	13120026	Advantest
☒	Preamplifier (1 - 8 GHz)		AFS3-00100800-32-LN	1684	847743	Miteq
☐	Preamplifier (0.5 - 8 GHz)		AMF-4D-005080-25-13P	1685	860149	Miteq
☒	Preamplifier (8 - 18 GHz)		ACO/180-3530	1484	32641	CTT
☐	External Mixer		WM782A	1576	845881/005	Tektronix
☐	Harmonic Mixer Accessories		FS-Z30	1577	624413/003	Rohde & Schwarz
☐	Trilog antenna	Cabin no. 2	VULB 9163	1802	9163-214	Schwarzbeck
☐	Trilog antenna	Cabin no. 3	VULB 9163	1722	9163-188	Schwarzbeck
☒	Trilog antenna	Cabin no. 8	VULB 9163	2058	9163-408	Schwarzbeck
☒	Horn antenna		3115	1516	9508-4553	EMCO
☐	Horn antenna		3160-03	1010	9112-1003	EMCO
☐	Horn antenna		3160-04	1011	9112-1001	EMCO
☐	Horn antenna		3160-05	1012	9112-1001	EMCO
☐	Horn antenna		3160-06	1013	9112-1001	EMCO
☐	Horn antenna		3160-07	1014	9112-1008	EMCO
☐	Horn antenna		3160-08	1015	9112-1002	EMCO
☐	Horn antenna		3160-09	1265	9403-1025	EMCO
☐	Horn antenna		3160-10	1575	399185	EMCO
☒	Fully anechoic room		No. 2	1452	---	Albatross
☐	Semi anechoic room		No. 3	1453	---	Siemens
☐	Semi anechoic room		No. 8	2057	---	Albatross

6.4 Radiated Emission at Alternative Test Site

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, section 15.209 IC RSS-GEN Issue 4, section 8.9
Guide:	ANSI C63.10

Radiated emission in the frequency range 30 MHz to 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.10 for alternative test sites. A linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

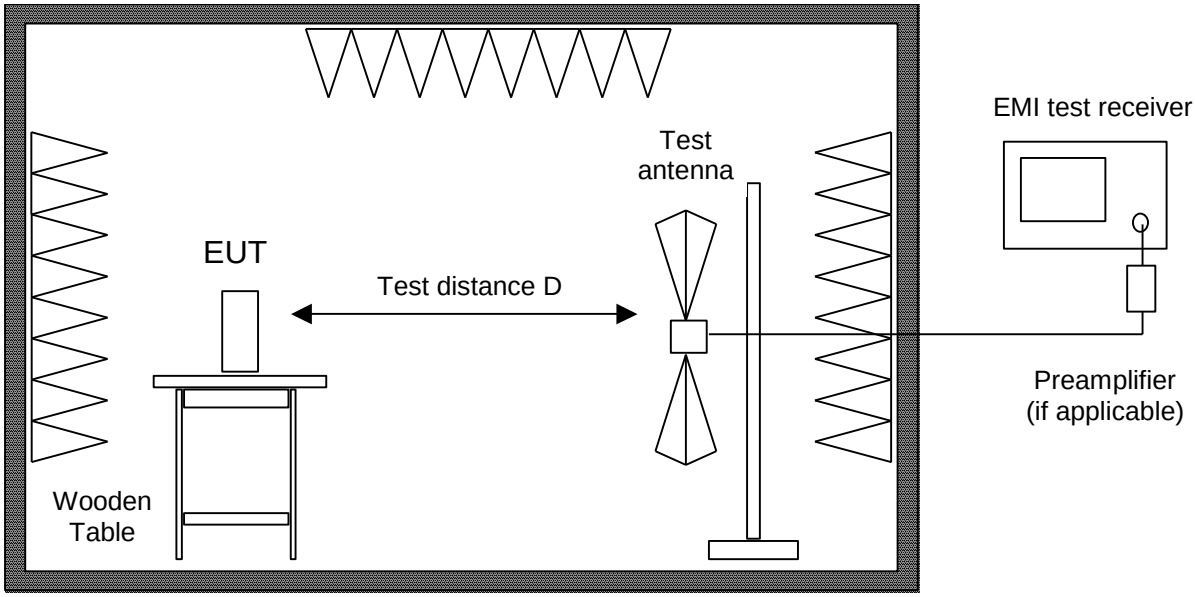
Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in fully anechoic room.

If no prescan in a fully anechoic room is used first a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarization for the maximum emission levels.
Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.
With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

In cases where prescans in a fully anechoic room are taken (e. g. if EUT is operating for a short time only or battery is dircharged quickly) final measurements with quasi-peak detector are performed manually at frequencies indicated by prescan with EUT rotating all around and receiving antenna raising and lowering within 1 meter to 4 meters to find the maximum levels of emission.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.

Radiated emission test above 1 GHz will be tested at the table height of 1.5 m (see 6.6.3.1).



Alternate test site (semi anechoic room)

Test instruments used:

	Type		*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☒	EMI test receiver		ESU8	2044	100232	Rohde & Schwarz
☒	EMI test receiver		FSV40	XXX	100232	Rohde & Schwarz
☒	Trilog antenna	Cabin no. 8	VULB 9163	2058	9163-408	Schwarzbeck
☒	Semi anechoic room		No. 8	2057	---	Albatross

7 Test Results

FCC CFR 47 Parts 2 and 15			
Section(s)	*Test*	*Page*	*Result*
15.207	Conducted AC powerline emission 150 kHz to 30 MHz	19	Test passed
15.205(b) 15.209	Radiated emission 9 kHz to 30 MHz	22	Test passed
15.205(b) 15.209	Radiated emission 30 MHz to 40 GHz	24	Test passed

IC RSS-GEN Issue 4			
Section(s)	*Test*	*Page*	*Result*
8.8	Transmitter AC power lines conducted emissions 150 kHz to 30 MHz	19	Not applicable
8.10(b)(c) 8.9	Unwanted emissions 9 kHz to 30 MHz	22	Test passed
8.10(b)(c) 8.9	Unwanted emissions 30 MHz to 40 GHz	24	Test passed

7.1 Conducted Powerline Emission Measurement 150 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, section 15.207 IC RSS-Gen Issue 4, section 8.8		
Guide:	ANSI C63.4 / CISPR 22		
Limit:	Frequency of Emission (MHz)	Conducted Limit (dBµV)	
		Quasi-peak	Average
	0.15 - 0.5	66 to 56	56 to 46
	0.5 - 5	56	46
	5 - 30	60	50
Measurement procedure:	Conducted AC Powerline Emission (6.1)		

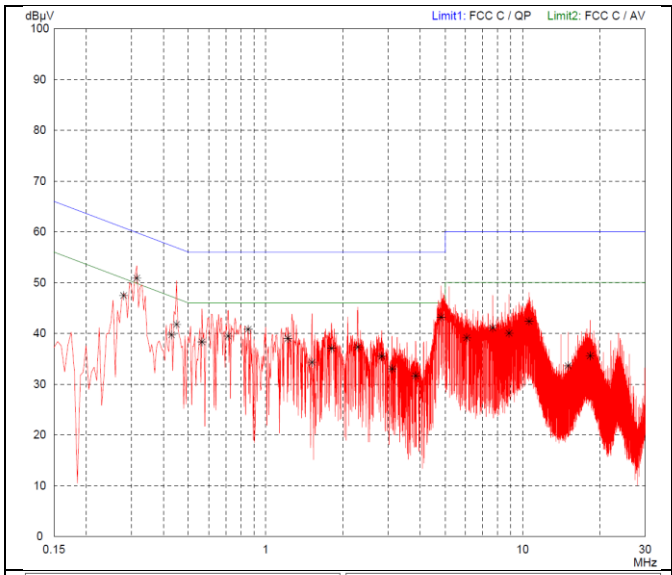
Comment:	Bluetooth TX 2402 MHz
Date of test:	8 October 2014
Test site:	Shielded room, cabin no. 1

Test Result:	Test passed

TÜV SÜD Product Service GmbH
Äußere Frühlingstraße 45
94315 Straubing
Germany

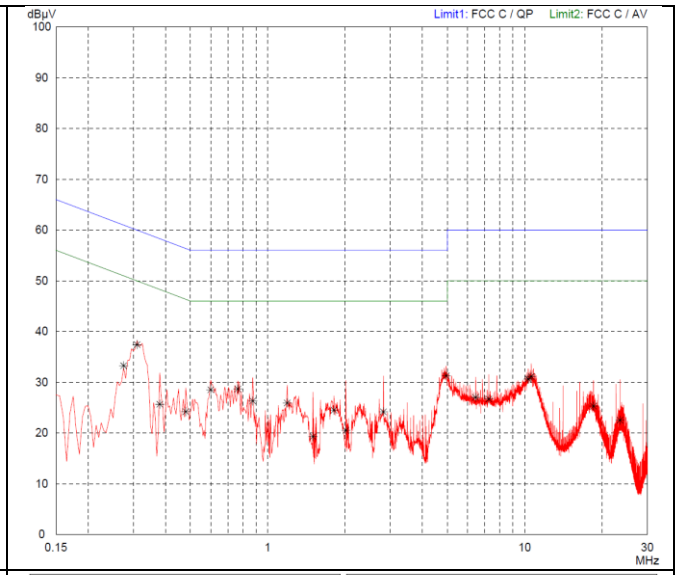
Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
Web: www.tuev-sued.de

Tested on:	AC Port / Live Terminal



Detector: Peak / Final Results: QP
Final results: 20 dB Margin 25 Subranges

Frequency MHz	Reading dBµV	Correction factor dB	Value dBµV	Limit dBµV	Margin dB
0.280	47.4		47.4	60.8	13.4
0.315	50.9		50.9	59.8	8.9
0.430	39.7		39.7	57.3	17.6
0.450	41.8		41.8	56.9	15.1
0.565	38.3		38.3	56.0	17.7
0.715	39.5		39.5	56.0	16.5
0.855	40.8		40.8	56.0	15.2
1.220	39.0		39.0	56.0	17.0
1.515	34.3		34.3	56.0	21.7
1.805	37.0		37.0	56.0	19.0
2.285	37.3		37.3	56.0	18.7
2.830	35.5		35.5	56.0	20.5
3.105	33.0		33.0	56.0	23.0
3.835	31.6		31.6	56.0	24.4
4.815	43.2		43.2	56.0	12.8
6.060	39.1		39.1	60.0	20.9
7.650	41.1		41.1	60.0	18.9
8.860	40.0		40.0	60.0	20.0
10.600	42.4		42.4	60.0	17.6
15.030	33.6		33.6	60.0	26.4
18.330	35.6		35.6	60.0	24.4



Detector: Average / Final Results: AV
Final results: 20 dB Margin 25 Subranges

Frequency MHz	Reading dBµV	Correction factor dB	Value dBµV	Limit dBµV	Margin dB
0.275	33.3		33.3	51.0	17.7
0.310	37.4		37.4	50.0	12.6
0.380	25.7		25.7	48.3	22.6
0.480	24.2		24.2	46.3	22.1
0.600	28.5		28.5	46.0	17.5
0.765	28.7		28.7	46.0	17.3
0.875	26.3		26.3	46.0	19.7
1.190	25.9		25.9	46.0	20.1
1.500	19.3		19.3	46.0	26.7
1.810	24.5		24.5	46.0	21.5
2.015	20.5		20.5	46.0	25.5
2.820	24.2		24.2	46.0	21.8
4.950	31.3		31.3	46.0	14.7
6.440	27.0		27.0	50.0	23.0
7.250	26.7		26.7	50.0	23.3
10.325	30.6		30.6	50.0	19.4
10.605	31.1		31.1	50.0	18.9
18.520	25.3		25.3	50.0	24.7
23.485	22.5		22.5	50.0	27.5

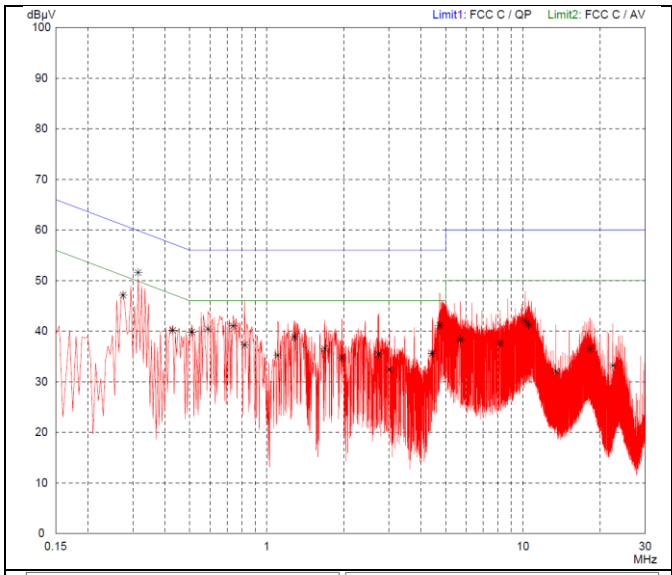
Sample calculation of final values:

Final Value (dBµV) = Reading Value (dBµV) + Correction Factor (dB)

TÜV SÜD Product Service GmbH
Äußere Frühlingstraße 45
94315 Straubing
Germany

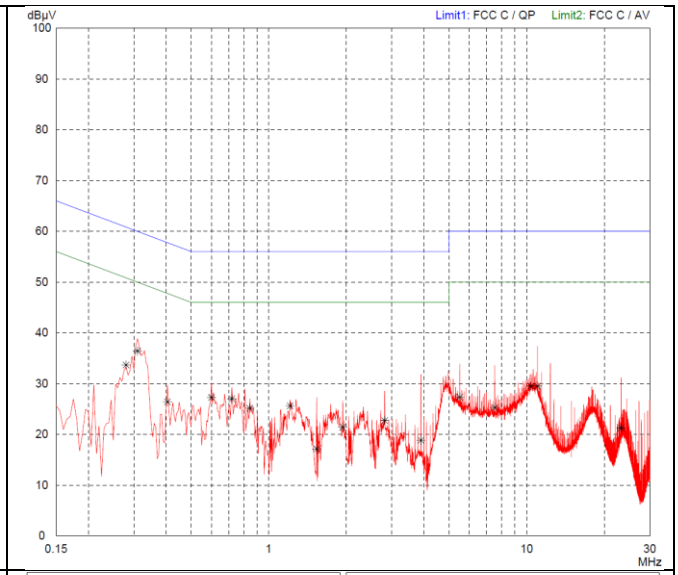
Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
Web: www.tuev-sued.de

Tested on:	AC Port / Neutral Terminal



Detector: Peak / Final Results: QP
Final results: 20 dB Margin 25 Subranges

Frequency MHz	Reading dBµV	Correction factor dB	Value dBµV	Limit dBµV	Margin dB
0.275	47.1		47.1	61.0	13.9
0.315	51.6		51.6	59.8	8.2
0.430	40.1		40.1	57.3	17.2
0.510	39.8		39.8	56.0	16.2
0.590	40.4		40.4	56.0	15.6
0.740	41.0		41.0	56.0	15.0
0.820	37.2		37.2	56.0	18.8
1.105	35.2		35.2	56.0	20.8
1.285	38.9		38.9	56.0	17.1
1.685	36.5		36.5	56.0	19.5
1.965	34.7		34.7	56.0	21.3
2.730	35.4		35.4	56.0	20.6
3.020	32.4		32.4	56.0	23.6
4.425	35.6		35.6	56.0	20.4
4.730	41.1		41.1	56.0	14.9
5.690	38.3		38.3	60.0	21.7
8.140	37.6		37.6	60.0	22.4
10.200	42.1		42.1	60.0	17.9
10.535	41.2		41.2	60.0	18.8
13.425	32.0		32.0	60.0	28.0
18.255	36.6		36.6	60.0	23.4
22.415	33.2		33.2	60.0	26.8



Detector: Average / Final Results: AV
Final results: 20 dB Margin 25 Subranges

Frequency MHz	Reading dBµV	Correction factor dB	Value dBµV	Limit dBµV	Margin dB
0.280	33.7		33.7	50.8	17.1
0.310	36.4		36.4	50.0	13.6
0.405	26.4		26.4	47.8	21.4
0.600	27.3		27.3	46.0	18.7
0.720	27.0		27.0	46.0	19.0
0.845	25.1		25.1	46.0	20.9
1.210	25.6		25.6	46.0	20.4
1.535	17.1		17.1	46.0	28.9
1.935	21.4		21.4	46.0	24.6
2.815	22.7		22.7	46.0	23.3
3.890	18.8		18.8	46.0	27.2
5.500	27.3		27.3	50.0	22.7
7.515	25.3		25.3	50.0	24.7
10.385	29.5		29.5	50.0	20.5
11.005	29.5		29.5	50.0	20.5
23.220	21.2		21.2	50.0	28.8

Sample calculation of final values:

Final Value (dBµV) = Reading Value (dBµV) + Correction Factor (dB)

7.2 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.205, 15.215(b) IC RSS-GEN Issue 4, sections 8.10 and 8.9			
Guide:	ANSI C63.4			
Limit:	Frequency of Emission (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance d (meters)
	0.009 - 0.490	2400/F(kHz)	67.6 - 20 · log(F(kHz))	300
	0.490 - 1.705	24000/F(kHz)	87.6 - 20 · log(F(kHz))	30
	1.705 - 30.000	30	29.5	30
	Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.			
Measurement procedure:	Radiated Emission Measurement 9 kHz to 30 MHz (6.2)			

Comment:	Bluetooth TX 2402 MHz
Date of test:	8 October 2015
Test site:	Open field test site, prescan in fully anechoic chamber

Frequency MHz	Reading dBµV	Polarisation	Detector	Antenna correction dB/m	Distance Correction (dB)	Field Strength value dBµV/m	Limit dBµV/m	Margin (dB)
No result*	--	--	--	--	--	--	--	--

Comment:	Bluetooth TX 2441 MHz
Date of test:	8 October 2015
Test site:	Open field test site, prescan in fully anechoic chamber

Frequency MHz	Reading dBµV	Polarisation	Detector	Antenna correction dB/m	Distance Correction (dB)	Field Strength value dBµV/m	Limit dBµV/m	Margin (dB)
No result*	--	--	--	--	--	--	--	--

Comment:	Bluetooth TX 2480 MHz
Date of test:	8 October 2015
Test site:	Open field test site, prescan in fully anechoic chamber

Frequency MHz	Reading dBµV	Polarisation	Detector	Antenna correction dB/m	Distance Correction (dB)	Field Strength value dBµV/m	Limit dBµV/m	Margin (dB)
No result*	--	--	--	--	--	--	--	--

* no emission above the noise floor!

Sample calculation of final values:

Distance Correction Factor (dB) = 40 dB/Decade

Final Value (dBµV/m) = Reading Value (dBµV) + Antenna Correction Factor (dB/m) + Distance Correction Factor (dB)

Note: Extrapolation factor (dB) and final value (dBµV/m) are relating to distance d.

Test Result:	Test passed

7.3 Radiated Emission Measurement 30 MHz to 40 GHz

Rules and specifications:	CFR 47 Part 15, section 15.209 IC RSS-GEN Issue 4, section 8.9		
Guide:	ANSI C63.4		
Limit:	Frequency of Emission (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	Above 960	500	54.0
	Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.		
Measurement procedures:	Radiated Emission in Fully or Semi Anechoic Room (6.3) Radiated Emission at Alternative Test Site (6.4)		

Comment:	No duty cycle correction was added to the reading
Date of test:	9 October 2015
Test site:	Frequencies ≤ 1 GHz: Semi-anechoic room, cabin no. 8 Frequencies > 1 GHz: Semi anechoic room, cabin no. 8
Test distance:	3 meters

Test Result:	Test passed

BT TX 2402 MHz (3m):

Frequency [MHz]	Detector	Result [dBuV/m]	Limit (3m) [dBuV/m]		Margin [dB]	Table Degree [Deg.]	Antenna Pol.	Ant. High [cm]
			Pk	AV				
30.5	Pk	33.9	40.0		6.1	46	Ver.	100
165.4	Pk	30.1	43.5		13.4	121	Hor.	100

BT TX 2402 MHz (3m):

Frequency [MHz]	Detector		Result [dBuV/m]	Limit (3m) [dBuV/m]		Margin [dB]	Table Degree [Deg.]	Antenna Pol.	Ant. High [cm]
	Pk	AV		Pk	AV				
1604.0	Pk	--	46.8	74.0	54.0	27.2	230	Ver.	100

BT TX 2402 MHz (1m):

Frequency [MHz]	Result [dBuV/m]		Limit (1m) [dBuV/m]		Margin [dB]	Table Degree [Deg.]	Antenna Pol.	Ant. High [cm]
	Pk	AV	Pk	AV				
4804.2	65.9	54.7	84.0	64.0	10.3	287	Ver.	100
7206.4	65.2	54.9	84.0	64.0	9.1	120	Ver.	100
9608.0	60.5	50.3	84.0	64.0	13.7	111	Ver.	100
12010.2	54.1	44.0	84.0	64.0	20.0	98	Ver.	100

BT TX 2441 MHz (3m):

Frequency [MHz]	Detector	Result [dBuV/m]	Limit (3m) [dBuV/m]		Margin [dB]	Table Degree [Deg.]	Antenna Pol.	Ant. High [cm]
			Pk	AV				
30.1	Pk	33.8	40.0		6.2	24	Ver.	100
160.9	Pk	29.9	43.5		13.6	155	Hor.	100

BT TX 2441 MHz (3m):

Frequency [MHz]	Detector		Result [dBuV/m]	Limit (3m) [dBuV/m]		Margin [dB]	Table Degree [Deg.]	Antenna Pol.	Ant. High [cm]
	Pk	AV		Pk	AV				
1628.2	Pk	--	44.5	74.0	54.0	29.5	181	Ver.	100

BT TX 2441 MHz (1m):

Frequency [MHz]	Result [dBuV/m]		Limit (1m) [dBuV/m]		Margin [dB]	Table Degree [Deg.]	Antenna Pol.	Ant. High [cm]
	Pk	AV	Pk	AV				
4882.4	64.5	53.9	84.0	64.0	10.1	322	Ver.	100
7323.3	64.1	53.1	84.0	64.0	10.9	88	Ver.	100
9764.0	58.9	49.3	84.0	64.0	14.7	101	Ver.	100
12205.0	52.9	41.8	84.0	64.0	22.2	10	Ver.	100

BT TX 2480 MHz (3m):

Frequency [MHz]	Detector	Result [dBuV/m]	Limit (3m) [dBuV/m]		Margin [dB]	Table Degree [Deg.]	Antenna Pol.	Ant. High [cm]
			Pk	AV				
30.0	Pk	30.1	40.0		9.9	5	Ver.	100
161.0	Pk	32.1	43.5		11.4	98	Hor.	100

BT TX 2480 MHz (3m):

Frequency [MHz]	Detector		Result [dBuV/m]	Limit (3m) [dBuV/m]		Margin [dB]	Table Degree [Deg.]	Antenna Pol.	Ant. High [cm]
	Pk	AV		Pk	AV				
1656.0	Pk	--	42.8	74.0	54.0	31.2	176	Ver.	100

BT TX 2480 MHz (1m):

Frequency [MHz]	Result [dBuV/m]		Limit (1m) [dBuV/m]		Margin [dB]	Table Degree [Deg.]	Antenna Pol.	Ant. High [cm]
	Pk	AV	Pk	AV				
4960.4	62.1	51.7	84.0	64.0	12.3	55	Ver.	100
7440.0	63.2	52.9	84.0	64.0	11.1	320	Ver.	100
9922.2	59.1	49.0	84.0	64.0	15.0	256	Ver.	100
12400.0	52.1	41.4	84.0	64.0	22.6	87	Ver.	100

Sample calculation of final values:

Final Value (dBµV/m) = Reading Value (dBµV) + Correction Factor (dB/m) + Pulse Train Correction (dB)

8 Referenced Regulations

All tests were performed with reference to the following regulations and standards:

☒	CFR 47 Part 2	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)	October 1, 2014
☒	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	October 1, 2014
☒	ANSI C63.10	American national Standard of Procedures for Compilance Testing of Unlicensed Wireless Devices	June 27, 2013 (published on September 13, 2013)
☐	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	December 11, 2003 (published on January 30, 2004)
☐	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	June 7, 2009 (published on September 15, 2009)
☒	RSS-Gen	Radio Standards Specification RSS-Gen Issue 4 containing General Requirements and Information for the Certification of Radiocommunication Equimpment, published by Industry Canada	November 2014
☒	RSS-210	Radio Standards Specification RSS-210 Issue 8 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada	December 2010
☐	RSS-310	Radio Standards Specification RSS-310 Issue 3 for Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment, published by Industry Canada	December 2010
☐	RSS-102	Radio Standards Specification RSS-102 Issue 4: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), published by Industry Canada	March 2010, footnote 13 updated December 2010
☐	ICES-003	Interference-Causing Equipment Standard ICES-003 Issue 4 for Digital Apparatus, published by Industry Canada	February 7, 2004

☒	CISPR 22	Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, “Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement”	1997
☐	CAN/CSA-CEI/IEC CISPR 22	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment CAN/CSA CISPR 22-10 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (Adopted IEC CISPR 22:2008, sixth edition, 2008-09)	2002
☐	CAN/CSA CISPR 22-10	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (Adopted IEC CISPR 22:2008, sixth edition, 2008-09)	2010
☐	TRC-43	Notes Regarding Designation of Emissions (Including Necessary Bandwidth and Classification), Class of Station and Nature of Service, published by Industry Canada	October, 2008

9 Test Equipment List with Calibration Data

Type	*Inv.-No.*	*Type Designation*	*Serial Number*	*Manufacturer*	*Calibration Organization*	*Last Calibration*	*Next Calibration*
EMI test receiver	1028	ESHS10	860043/016	Rohde & Schwarz	Rohde & Schwarz	09/2015	09/2016
EMI test receiver	2044	ESU8	100232	Rohde & Schwarz	Rohde & Schwarz	02/2015	02/2016
Spectrum analyser	1666	FSP30	100063	Rohde & Schwarz	Rohde & Schwarz	05/2014	11/2015
Spectrum analyser	2364	FSV 40	101448	Rohde & Schwarz	Rohde & Schwarz	09/2015	09/2017
V-network	1060	ESH3-Z5	862770/021	Rohde & Schwarz	Rohde & Schwarz	06/2015	06/2016
Loop antenna	1016	HFH2-Z2	882964/0001	Rohde & Schwarz	Rohde & Schwarz	05/2015	05/2016
TRILOG Broadband Antenna	2058	VULB 9163	9163-408	Schwarzbeck	Rohde & Schwarz	06/2014	06/2016
TRILOG Broadband Antenna (FAC)	2256	VULB 9162	9162-048	Schwarzbeck	Rohde & Schwarz	09/2015	09/2017
Preamplifier	1484	ACO/180-3530	32641	CTT	TÜV SÜD PS-EMC-STR	06/2015	06/2017
Preamplifier	1651	CPA9231A	3393	Schaffner Electrotest	TÜV SÜD PS-EMC-STR	09/2015	09/2016
Preamplifier	1684	AFS3-00100800-32-LN	847743	MITEQ	TÜV SÜD PS-EMC-STR	04/2015	04/2017
Preamplifier	1685	AMF-4D-005080-25-13P	860149	MITEQ	TÜV SÜD PS-EMC-STR	08/2013	11/2015
Preamplifier	1716	CPA9231A	3557	Schaffner EMC Systems	TÜV SÜD PS-EMC-STR	01/2014	01/2016
Double ridged horn antenna	2073	HF907	100154	Rohde & Schwarz	Rohde & Schwarz	05/2015	05/2017
Double ridged waveguide horn antenna	1516	3115	9508-4553	EMCO Elektronik	Seibersdorf Laboratories	11/2014	11/2016
Horn antenna	1576	WM782A, FS-Z40	845881/005	Tektronix	Rohde & Schwarz	01/2013	01/2016
Horn antenna	1010	3160-03	9112 -1003	EMCO Elektronik		see note 1	
Horn antenna	1011	3160-04	9112-1001	EMCO Elektronik		see note 1	
Horn antenna	1012	3160-05	9112-1001	EMCO Elektronik		see note 1	

Type	*Inv.-No.*	*Type Designation*	*Serial Number*	*Manufacturer*	*Calibration Organization*	*Last Calibration*	*Next Calibration*
Horn antenna	1013	3160-06	9112-1001	EMCO Elektronik		see note 1	
Horn antenna	1014	3160-07	9112-1008	EMCO Elektronik		see note 1	
Horn antenna	1015	3160-08	9112-1002	EMCO Elektronik		see note 1	
Horn antenna	1265	3160-09	9403-1025 (931941-010)	EMCO Elektronik		see note 1	
Horn antenna	1575	3160-10	399185	EMCO Elektronik		see note 1	
Horn antenna	2086	24240-20	157845	Flann		see note 1	
Horn antenna	2180	25240-25	205900	Flann		see note 1	
Horn antenna	2182	27240-25	204260	Flann		see note 1	

Note 1: No calibration required.
Note 2: Not calibrated separately but with the whole test system when recording calibration data.
Note 3: No calibration required. Devices are checked before use.
Note 4: No calibration required. Devices are checked by calibrated equipment during test.

10 Revision History

Revision History			
Edition	*Date*	*Issued by*	*Modifications*
1	16 Oct. 2015	M. Biberger	First Edition