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FCC TEST REPORT

FCC 47 CFR Part 15C
Industry Canada RSS-210

Digital transmission systems operating within the 902 – 928 MHz band

Report Reference No. ..... :	G0M-1207-2105-TFC247D-V01
Testing Laboratory ..... :	Eurofins Product Service GmbH
Address ..... :	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation ..... :	A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 IC OATS Filing assigned code: 3470A
Applicant's name ..... :	Steute Schaltgeräte GmbH & Co KG
Address ..... :	Brückenstr. 91 32584 Löhne GERMANY
Test specification:	
Standard..... :	47 CFR Part 15C KDB Publication No. 558074 RSS-210, Issue 8, 2010-12 RSS-Gen, Issue 3, 2010-12 ANSI C63.4:2009
Test scope…….. ..... :	Class II permissive change
Equipment under test (EUT):	
Product description	SRD-Transceiver Modul
Model No.	RFRXSW915
Hardware version	None
Firmware / Software version	None
	FCC-ID: XK5-RFRXSW915 IC: N/A
Test result	**Passed**

Possible test case verdicts:	
- neither assessed nor tested ..... :	N/N
- not applicable or required ..... :	N/A
- required by standard but not tested ..... :	N/T
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)

Testing:

Date of receipt of test item ..... :	2012-07-31	
Date (s) of performance of tests ..... :	2012-07-31	
Compiled by ..... :	Christian Weber	
Tested by (+ signature) ..... : (Testing Manager)	Wilfried Treffke	.....
Approved by (+ signature) ..... : (Test Lab Manager)	Jens Zimmermann	.....
Date of issue ..... :	2012-08-31	
Total number of pages ..... :	26	

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional comments:

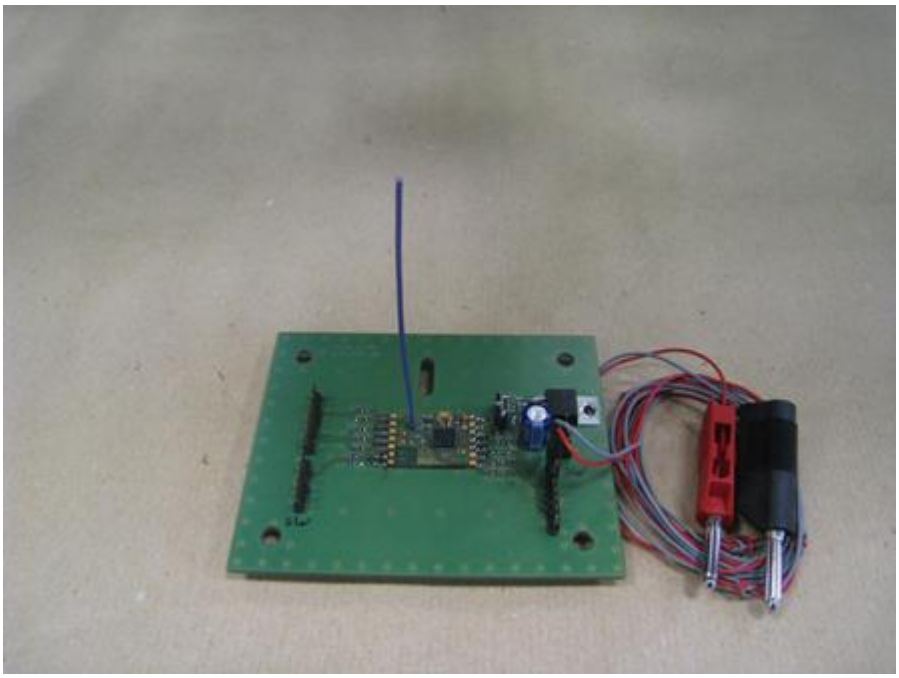
Class II permissive change tests are performed to show compliance of the modular transmitter with the FCC rules taking into account the changes stated in the class II permissive change letter.

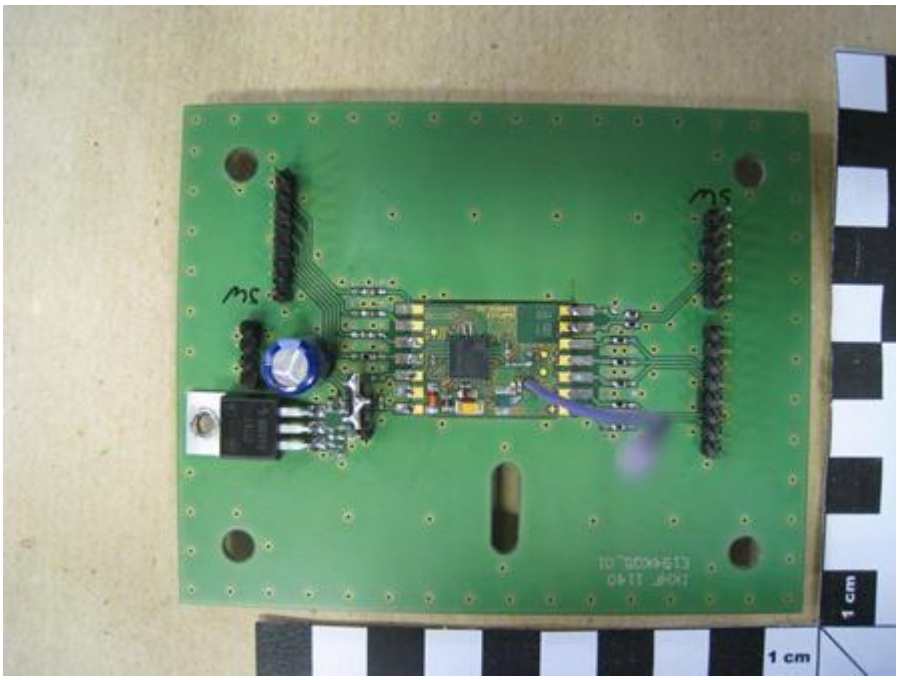
REPORT INDEX

1 Equipment (Test item) Description:

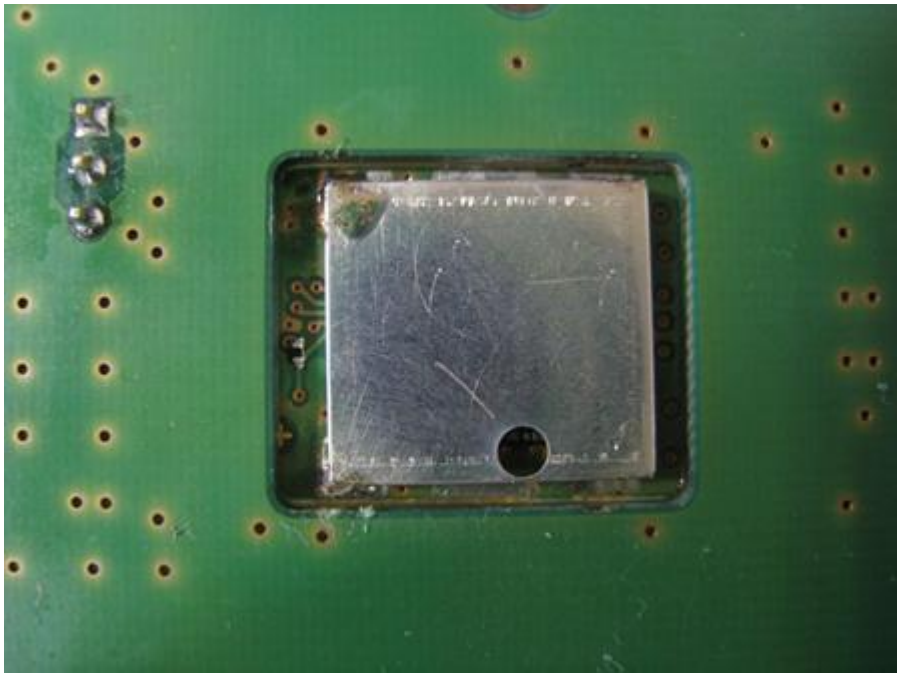
Description	SRD-Transceiver Modul	
Model	RFRXSW915	
Serial number	None	
Hardware version	None	
Software / Firmware version	None	
FCC-ID	XK5-RFRXSW915	
IC	N/A	
Equipment type	Radio module	
Radio type	Transceiver	
Radio technology	custom	
Operating frequency range	915 MHz	
Assigned frequency band	902 - 928 MHz	
Frequency range	F_{MID}	915 MHz
Spreading	None	
Modulations	FSK	
Number of channels	1 Channel	
Channel spacing	None	
Number of antennas	1	
Antenna	Type	integrated
	Model	λ/4 SMA straight monopole antenna, PSTG0-925SE
	Manufacturer	Mobile Mark
	Gain	+0.0 dBi
Manufacturer	Steute Schaltgeräte GmbH & Co KG Brückenstr. 91 32584 Löhne GERMANY	
Power supply	V_{NOM}	3.3 VDC
	V_{MIN}	2.80 VDC
	V_{MIN}	3.80 VDC
AC/DC-Adaptor	Model	N/A
	Vendor	N/A
	Input	N/A
	Output	N/A

1.1 Photos – Equipment External

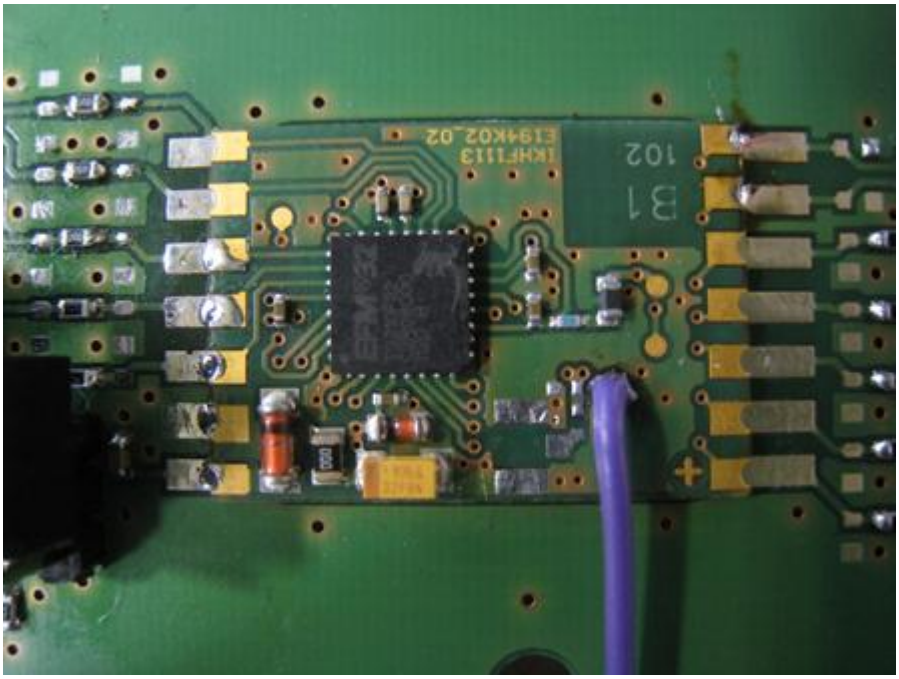
EUT ON EVALUATION BOARD


EUT ON EVALUATION BOARD TOP


EUT ON EVALUATION BOARD BOTTOM



1.2 Photos – Equipment internal

EUT TOP


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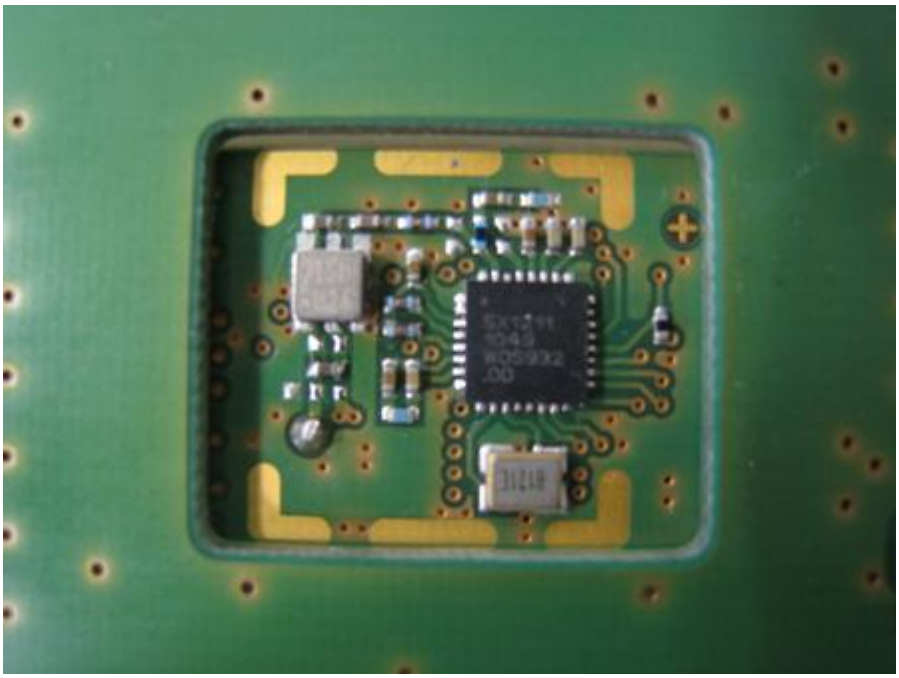
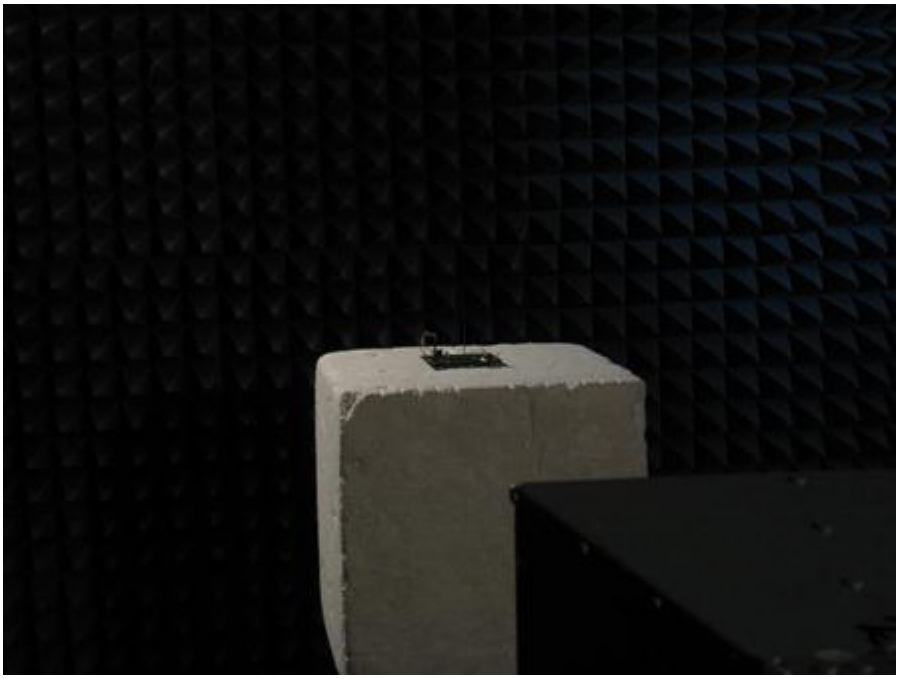


1.3 Photos – Test setup

TEST SETUP RADIATED EMISSIONS


1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
None				

***Note:** Use the following abbreviations:

AE : Auxiliary/Associated Equipment, or

SIM : Simulator (Not Subjected to Test)

CABL : Connecting cables

1.5 Test Modes

Mode #	Description	
Single	General conditions:	EUT powered by laboratory power supply
	Radio conditions:	Mode = standalone transmit Spreading = None Modulation = FSK Duty cycle = 10 % Power level = Maximum

1.6 Test Equipment Used During Testing

Maximum peak conducted power					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2011-12	2012-12

Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 5	EF00395	-	-
Spectrum Analyzer	R&S	FSIQ26	EF00242	2012-05	2013-05
Biconical Antenna	R&S	HK 116	EF00012	2010-01	2013-01
LPD Antenna	R&S	HL 223	EF00187	2011-02	2014-02
LPD Antenna	R&S	HL 025	EF00327	2010-02	2013-02

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer (dBµV) + A.F. (dB) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading	+	AF	=	Net Reading	:	Net reading - FCC limit	= Margin
21.5 dBµV	+	26 dB	=	47.5 dBµV/m	:	47.5 dBµV/m - 57.0 dBµV/m	= -9.5 dB

2 Result Summary

FCC 47 CFR Part 15C, IC RSS-210				
Product Specific Standard Section	**Requirement – Test**	**Reference Method**	**Result**	**Remarks**
RSS-Gen 4.6.1	Occupied Bandwidth	RSS-Gen 4.6.1	N/R	Informational only
FCC § 15.247(a)(2) IC RSS-210 § A8.2	6 dB Bandwidth	KDB Publication No. 558074	N/R	Not included in Class II permission change
FCC § 15.247(b)(3) IC RSS-210 § A8.4	Maximum peak conducted power	KDB Publication No. 558074	PASS	NTC only
FCC § 15.247(e) IC RSS-210 § A8.2	Power spectral density	KDB Publication No. 558074	N/R	Not included in Class II permission change
47 CFR 15.207 RSS-Gen 7.2.4	AC power line conducted emissions	KDB Publication No. 558074 / ANSI C63.4	N/R	Not included in Class II permission change
FCC § 15.247(d) IC RSS-210 § A8.5	Band edge compliance	KDB Publication No. 558074	N/R	Not included in Class II permission change
FCC § 15.247(d) IC RSS-210 § A8.5	Conducted spurious emissions	KDB Publication No. 558074	N/R	Not included in Class II permission change
FCC § 15.247(d) FCC § 15.209 IC RSS-210 A8.5 IC RSS-Gen 4.9 IC RSS-Gen 7.2.5	Transmitter radiated spurious emissions	KDB Publication No. 558074 / ANSI C 63.4	PASS	
IC RSS-Gen 4.10 IC RSS-Gen 6.1	Receiver radiated spurious emissions	ANSI C 63.4	N/R	
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Maximum peak conducted power

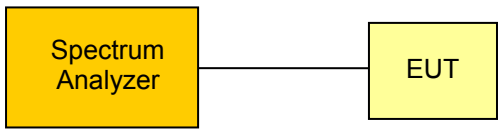
Maximum peak conducted power acc. FCC 15.247 / IC RSS-210	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.247(b)(3) / IC RSS-210 A8.4
Test according to measurement reference	Reference Method
	FCC KDB Publication No. 558074
Test frequency range	Tested frequencies
	F_{MID}
EUT test mode	Single
Measurement mode	Peak
Maximum antenna gain	0 dBi ⇒ Limit correction = 0 dB

Limits

1W (30dBm)

The conducted output power limit specified above is based on the use of antennas with directional gains that do not exceed 6dBi. If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in the table, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Test setup



Test procedure

1. EUT set to test mode (Communication tester is used if needed)
2. Center frequency set to test channel center frequency
3. Span is set to be larger than the 6 dB bandwidth and RBW is set to be at least the 6 dB bandwidth
4. Peak output power is determined from the maximum of the emission envelope

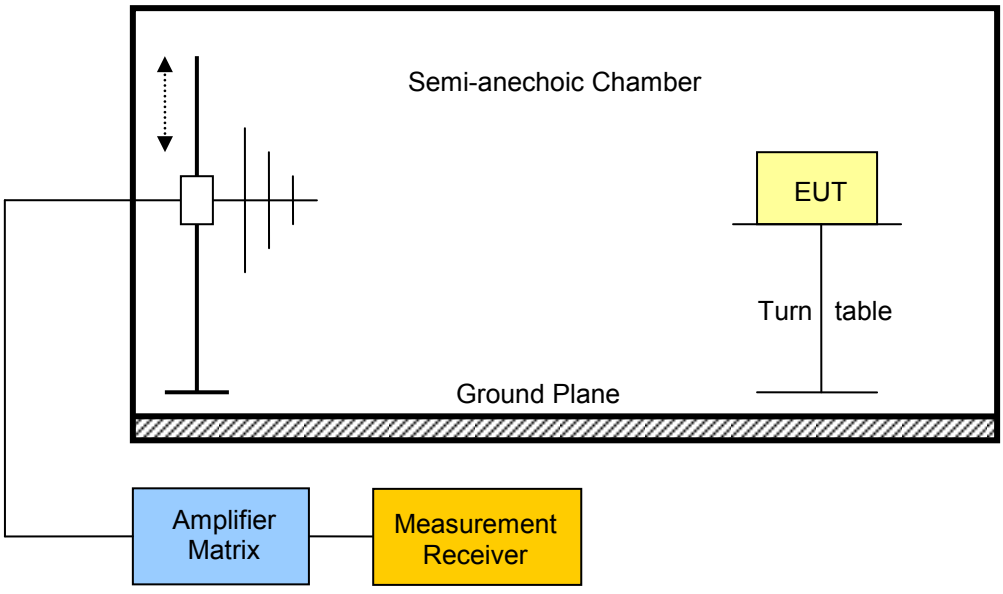
Test results

Channel	Frequency [MHz]	Voltage	Peak power [dbm]	Peak power [W]	Limit [dBm]	Margin [dB]	Result
F_{MID}	915	3.3 VDC	8.5	0.00708	30	-21.5	PASS

Comments:

3.2 Test Conditions and Results – Transmitter radiated emissions

Transmitter radiated emissions acc. FCC 47 CFR 15.247 / IC RSS-210				**Verdict: PASS**
Test according referenced standards		Reference Method		
		FCC 15.247(d) / IC RSS-210 A8.5		
Test according to measurement reference		Reference Method		
		FCC KDB Publication No. 558074 / ANSI C63.4		
Test frequency range		Tested frequencies		
		30 MHz – 10th Harmonic		
EUT test mode		Single		
Limits				
Frequency range [MHz]	Detector	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]
30 – 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 – 1000	Quasi-Peak	500	54	3
> 1000	Average	500	54	3
Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). When average radiated emission measurements are specified, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.				
Test setup				



Test procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span it set according to measurement range 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz 4. Markers are set to peak emission levels within restricted bands

Test results – Internal Antenna

Channel	Frequency [MHz]	Emission [MHz]	Level [dbµV/m]	Detector	Pol.	Limit [dbµV/m]	Limit distance [m]*	Margin [dB]
F_{MID}	915	2745	53.79	pk	hor	74	3	-20.21
F_{MID}	915	2745	47.92	avg	hor	54	3	-06.08
F_{MID}	915	3661	49.00	pk	ver	74	3	-25.00
F_{MID}	915	3661	39.62	avg	ver	54	3	-14.38
F_{MID}	915	4575	50.60	pk	ver	74	3	-23.40
F_{MID}	915	4575	38.41	avg	ver	54	3	-15.59

Comments: * Physical distance between EUT and measurement antenna.

ANNEX A Transmitter radiated spurious emissions

Spurious emissions according to FCC 15.247

Project number: G0M-1207-2105

Manufacturer:	Steute Schaltgeräte GmbH Co. KG
EUT Name:	SRD-Transceiver Modul
Model:	RFRXSW915
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 3.3V DC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; 915.0 MHz
Test Date:	2012-07-31
Note:	

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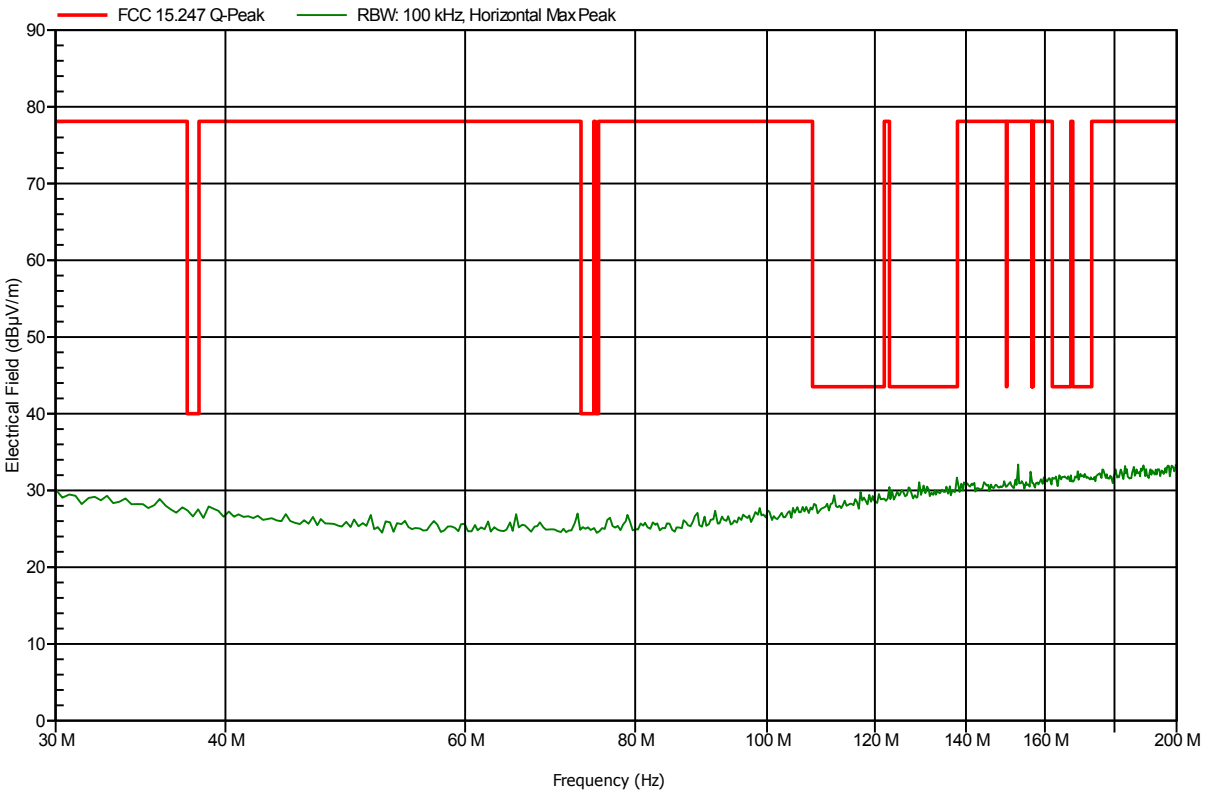

Spurious emissions according to FCC 15.247

Project number: G0M-1207-2105

Manufacturer:	Steute Schaltgeräte GmbH Co. KG
EUT Name:	SRD-Transceiver Modul
Model:	RFRXSW915
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 3.3V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; 915.0 MHz
Test Date:	2012-07-31
Note:	

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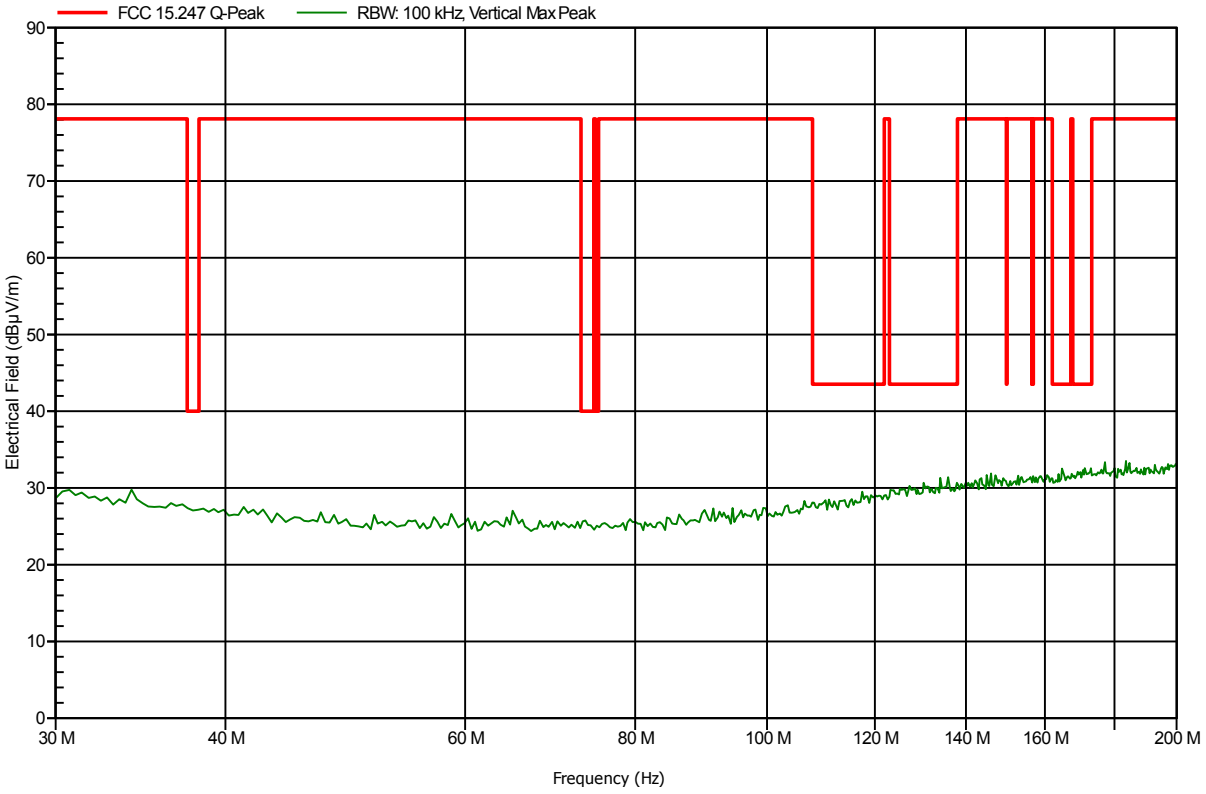

Spurious emissions according to FCC 15.247

Project number: G0M-1207-2105

Manufacturer:	Steute Schaltgeräte GmbH Co. KG
EUT Name:	SRD-Transceiver Modul
Model:	RFRXSW915
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 3.3V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; 915.0 MHz
Test Date:	2012-07-31
Note:	

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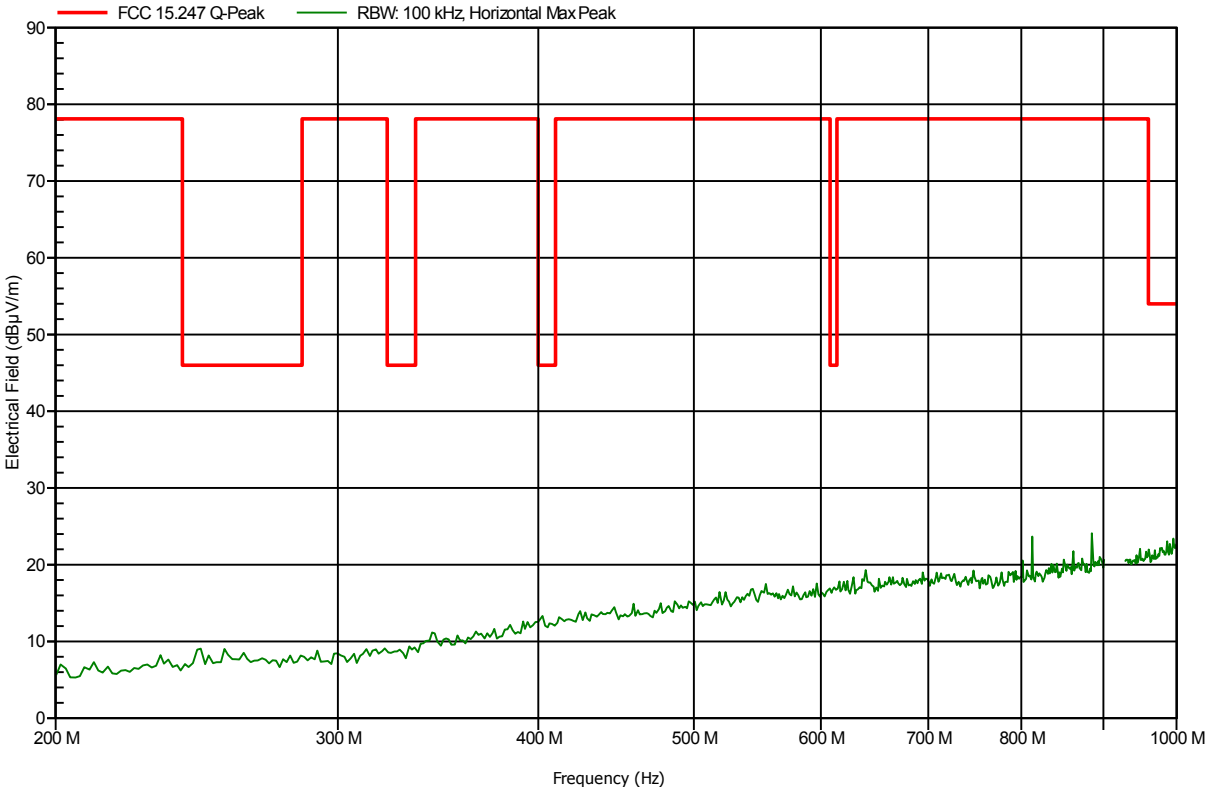

Spurious emissions according to FCC 15.247

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Manufacturer:	Steute Schaltgeräte GmbH Co. KG
EUT Name:	SRD-Transceiver Modul
Model:	RFRXSW915
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 3.3V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; 915.0 MHz
Test Date:	2012-07-31
Note:	

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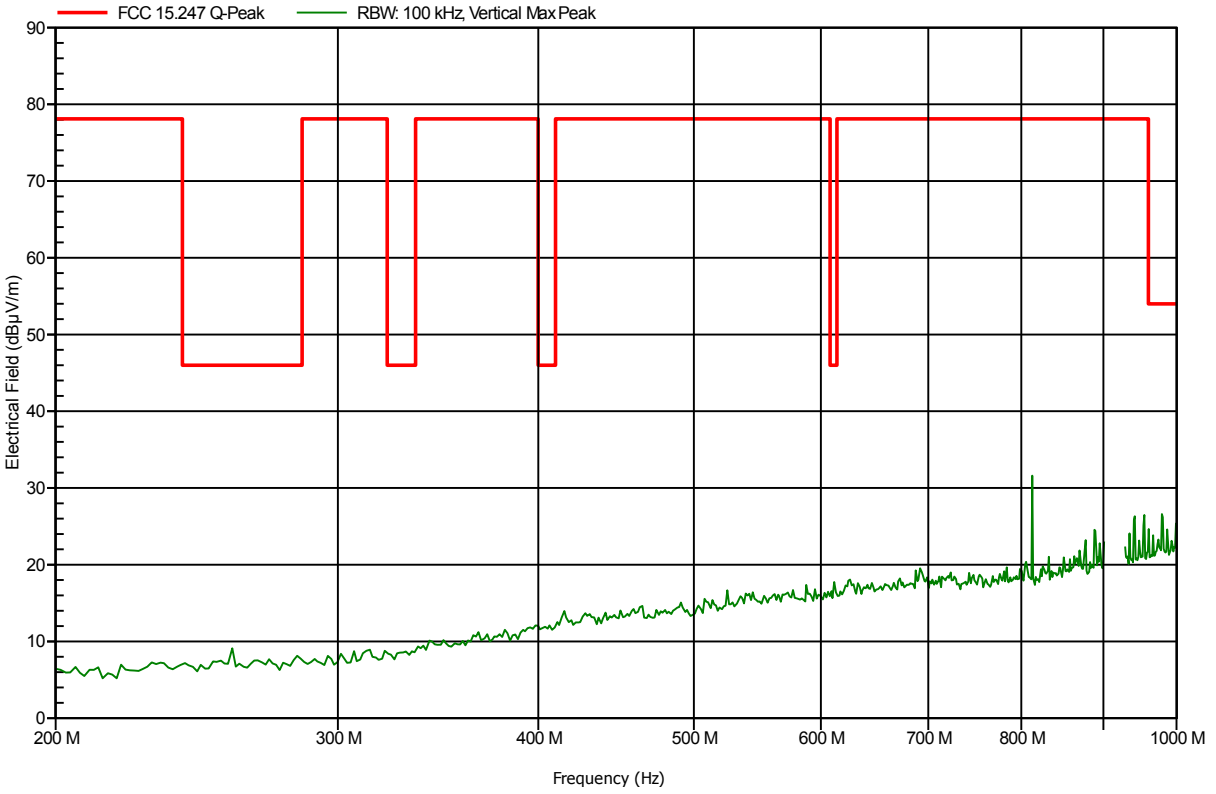

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Manufacturer:	Steute Schaltgeräte GmbH Co. KG
EUT Name:	SRD-Transceiver Modul
Model:	RFRXSW915
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 3.3V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; 915.0 MHz
Test Date:	2012-07-31
Note:	

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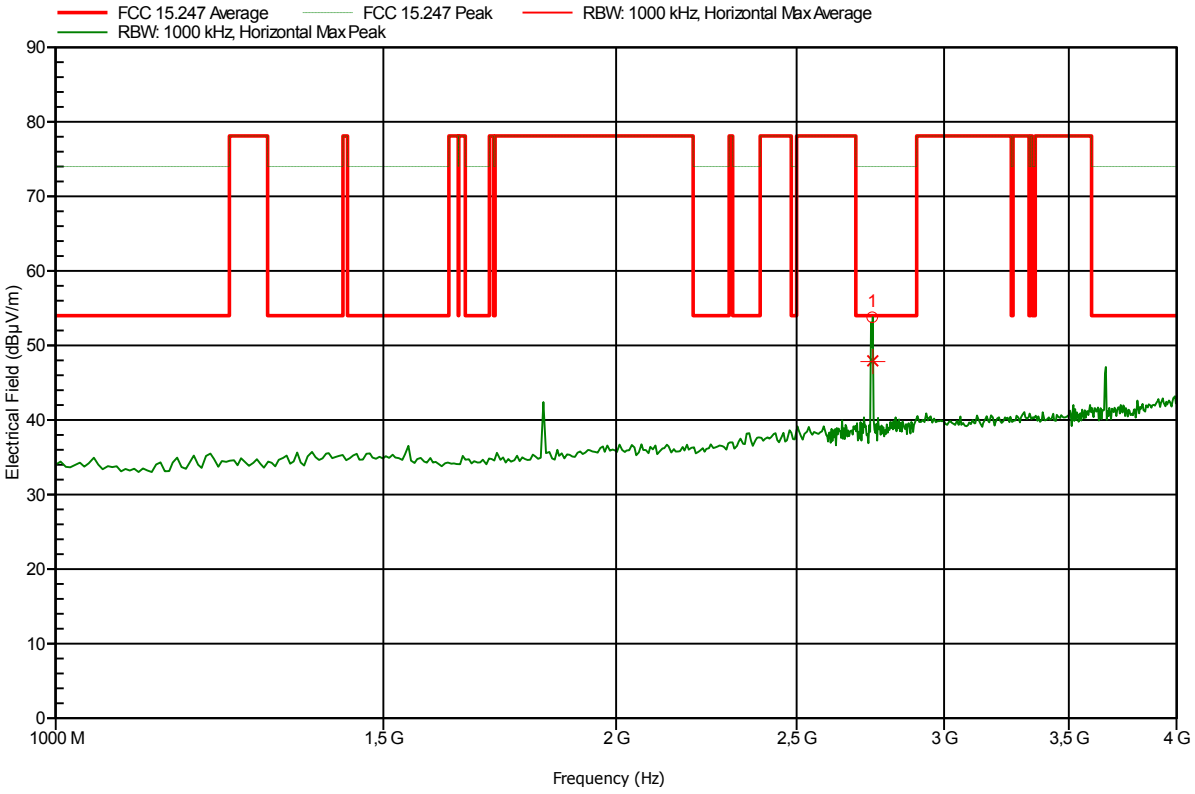

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.745 GHz	53.79 dBµV/m	74 dBµV/m	-20.21 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
2.745 GHz	47.92 dBµV/m	54 dBµV/m	-6.08 dB	Pass

Spurious emissions according to FCC 15.247

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EUT Name:	SRD-Transceiver Modul
Model:	RFRXSW915
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 3.3V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; 915.0 MHz
Test Date:	2012-07-31
Note:	

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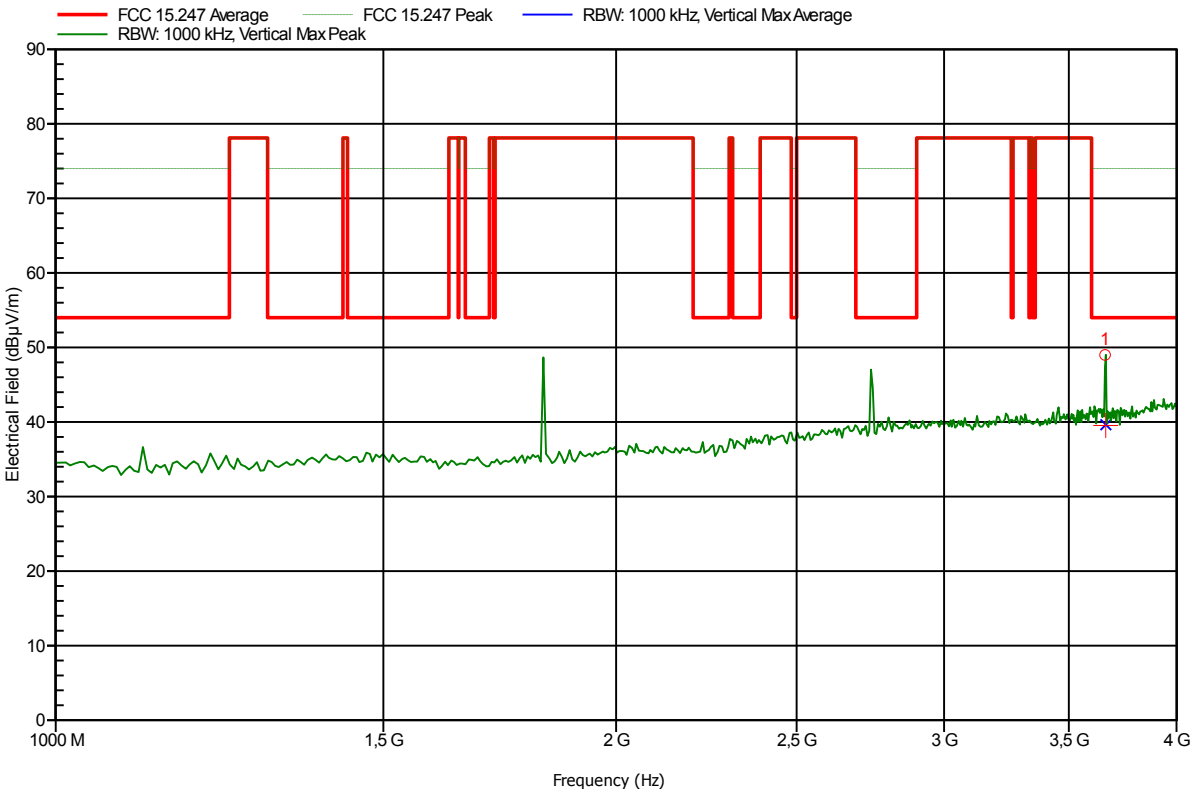

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
3.661 GHz	49 dBµV/m	74 dBµV/m	-25 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
3.661 GHz	39.62 dBµV/m	54 dBµV/m	-14.38 dB	Pass

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Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 3.3V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; 915.0 MHz
Test Date:	2012-07-31
Note:	

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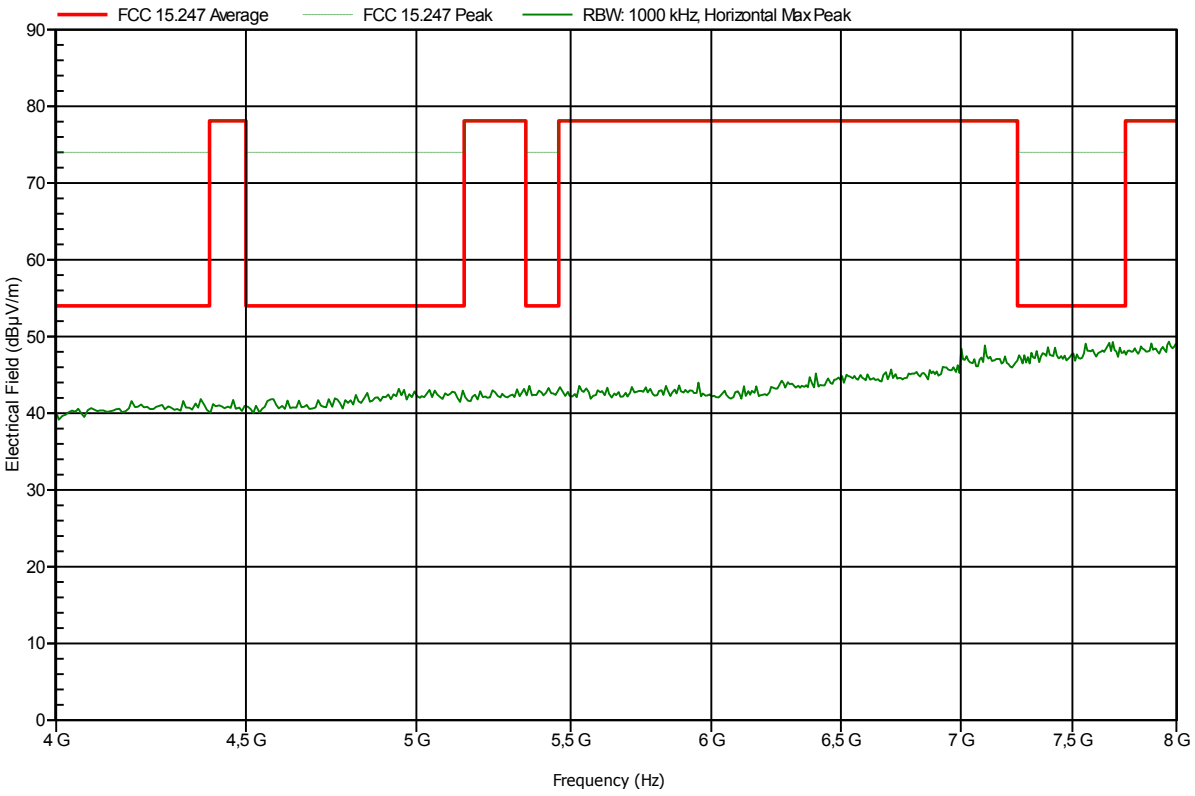

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Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; 915.0 MHz
Test Date:	2012-07-31
Note:	

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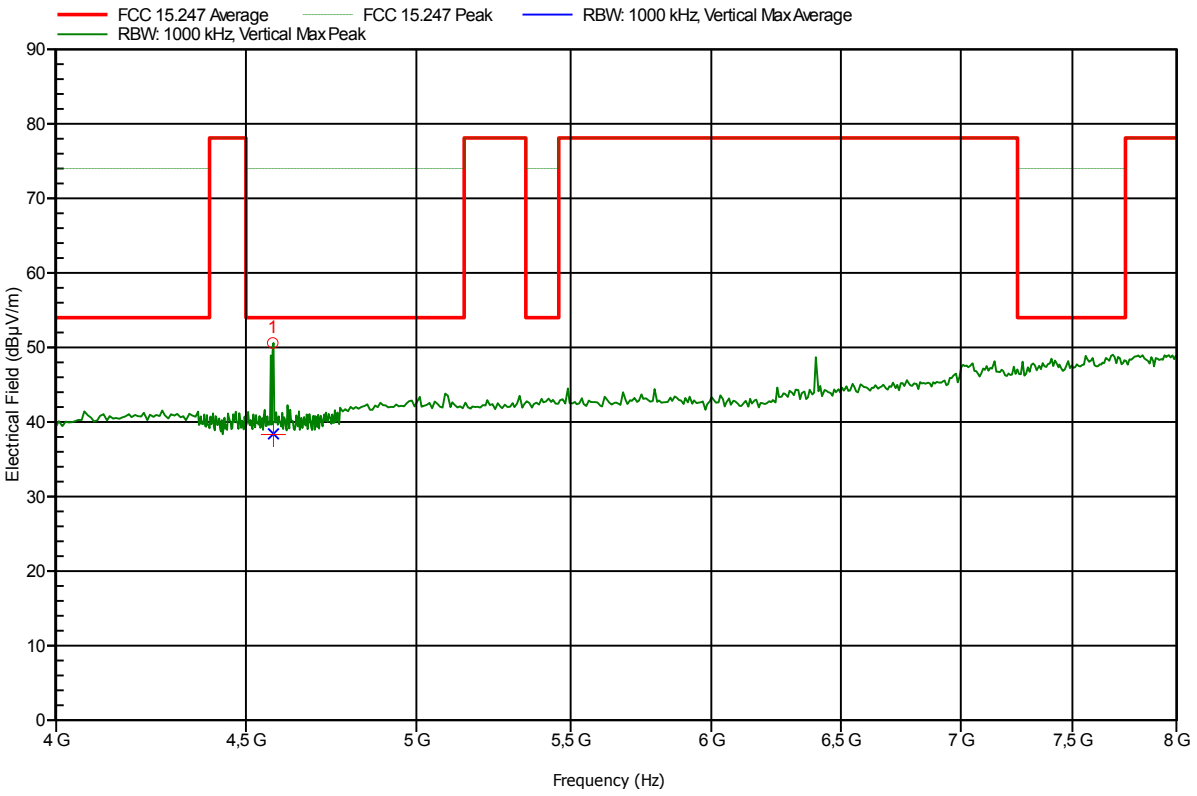

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.575 GHz	50.6 dBµV/m	74 dBµV/m	-23.4 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
4.575 GHz	38.41 dBµV/m	54 dBµV/m	-15.59 dB	Pass

Spurious emissions according to FCC 15.247

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Model:	RFRXSW915
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 3.3V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	100 cm
Mode:	TX; 915.0 MHz
Test Date:	2012-07-31
Note:	

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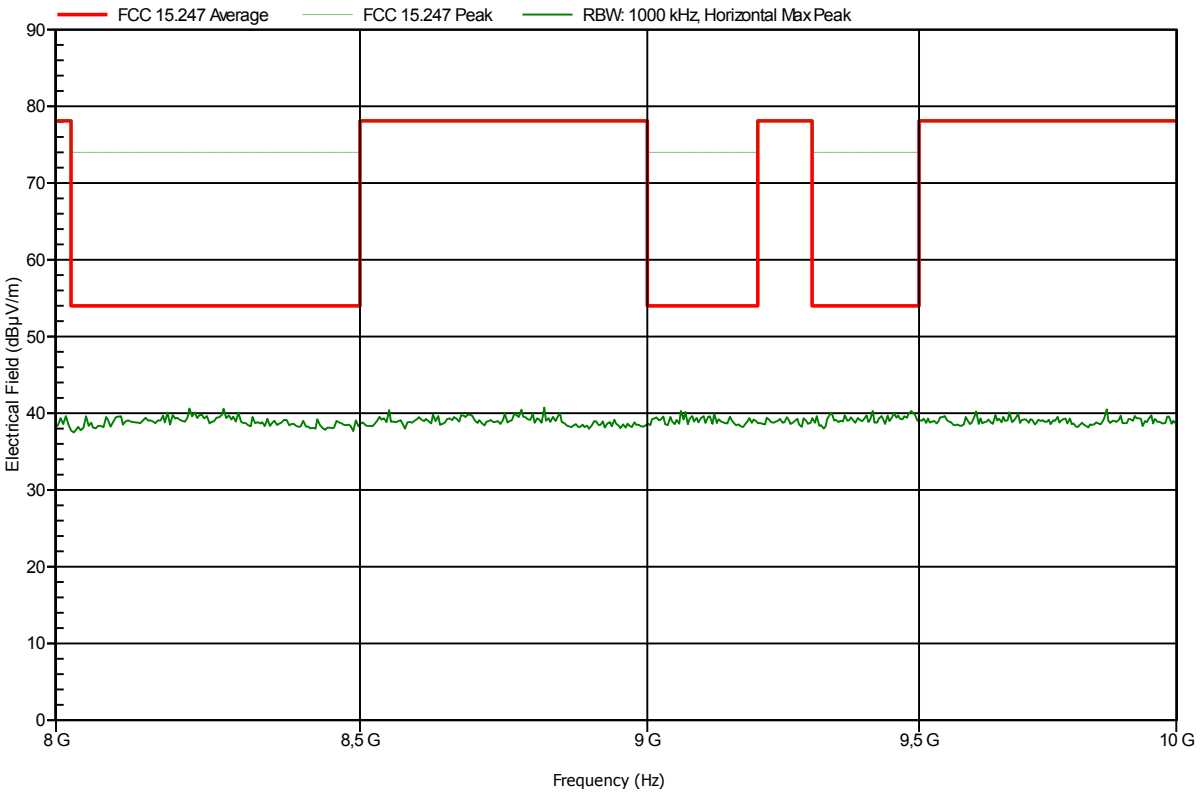

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