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December 2, 2013

Page 1 of 73

Prüfbericht / Test Report

Nr. / No. 20820838-26357-7 (Edition 2)

Applicant: Bartec GmbH
Type of equipment: UHF Reader (external antenna)
Type designation: MC92N0ex RFID-UHF
Order No.: --
Test standards: FCC Code of Federal Regulations,
CFR 47, Part 15,
Sections 15.205, 15.207, 15.215 and 15.247

Industry Canada Radio Standards Specifications
RSS-Gen Issue 2, Section 7.2.2 and
RSS-210 Issue 7, Sections 2.2, A8 (Category I Equipment)

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.

Table of Contents

1	Description of the Equipment Under Test (EUT)	3
2	Administrative Data	6
3	Identification of the Test Laboratory	7
4	Summary	8
5	Operation Mode and Configuration of EUT	9
6	Measurement Procedures	10
6.1	Conducted Output Power	10
6.2	Bandwidth Measurements	12
6.3	Conducted AC Powerline Emission	13
6.4	Radiated Emission Measurement 9 kHz to 30 MHz	14
6.5	Radiated Emission in Fully or Semi Anechoic Room	16
6.6	Radiated Emission at Alternative Test Site	18
7	Photographs Taken During Testing	20
7.1	Occupied Bandwidth	27
7.2	Bandwidth of the Emission	31
7.3	Designation of Emissions	35
7.4	Restricted Bands of Operation	36
7.5	Hopping channel separation	39
7.6	Number of hopping frequencies used	42
7.7	Time occupancy on any channel	44
7.8	Maximum output power	46
7.9	Conducted Powerline Emission Measurement 150 kHz to 30 MHz	49
7.10	Radiated Emission Measurement 9 kHz to 30 MHz	51
7.11	Radiated Emission Measurement 30 MHz to 10 GHz	56
7.12	RF exposure requirement	67
7.13	Exposure of Humans to RF Fields	68
8	Referenced Regulations	70
9	Test Equipment List with Calibration Data	72
10	Revision History	73

1 Description of the Equipment Under Test (EUT)

General data of EUT	
Type designation ¹ :	UHF Reader (external antenna)
Version:	--
Serial number(s):	1314100505472
Manufacturer:	Bartec GmbH
Type of equipment:	MC92N0ex RFID-UHF
Version:	As received
FCC ID:	TBUUHFG1
Industry Canada ID:	5736C-UHFG1
Additional parts/accessories:	Accumulator: BARTEC – Type: 17-A1Z0-0002, Charging cradle: SYMBOL TECHNOLOGIES INC. – Part: CRD9000-1001SR, Model: CRD9000-1000, S/N: 12153000500777 Power supply: HIPRO – P/N: PWRS-14000-148R Rev. C, Model: HP-A0502R3D, S/N: F33351234012660

¹ Type designation of the system if EUT consists of more than one part.

Technical data of EUT

Application frequency range: N/A
Frequency range: 902 – 928 MHz
Operating frequency: 902.75 - 927.25 MHz
Type of modulation: ASK
Number of RF-channels: 50
Channel spacing:

Pseudo-random List

Channel No.	Center Frequency
1	914,75 MHz
2	920,25 MHz
3	925,75 MHz
4	909,25 MHz
5	920,75 MHz
6	907,25 MHz
7	922,25 MHz
8	927,25 MHz
9	919,75 MHz
10	906,25 MHz
11	911,75 MHz
12	903,75 MHz
13	909,75 MHz
14	917,25 MHz
15	925,25 MHz
16	912,25 MHz
17	906,75 MHz

Channel No.	Center Frequency
18	917,75 MHz
19	907,75 MHz
20	902,75 MHz
21	914,25 MHz
22	924,25 MHz
23	919,25 MHz
24	908,25 MHz
25	903,25 MHz
26	910,25 MHz
27	916,75 MHz
28	924,75 MHz
29	918,25 MHz
30	923,25 MHz
31	916,25 MHz
32	910,75 MHz
33	904,25 MHz
34	913,75 MHz

Channel No.	Center Frequency
35	921,75 MHz
36	926,75 MHz
37	915,75 MHz
38	911,25 MHz
39	904,75 MHz
40	915,25 MHz
41	905,75 MHz
42	921,25 MHz
43	926,25 MHz
44	918,75 MHz
45	912,75 MHz
46	923,75 MHz
47	905,25 MHz
48	913,25 MHz
49	922,75 MHz
50	908,75 MHz

Designation of emissions²: 40K0A1D

Type of antenna: Integrated
Size/length of antenna: N/A
Connection of antenna: ☐ detachable ☒ not detachable

Type of power supply: DC supply
Specifications for power supply:
nominal voltage: 7.4 V
minimum voltage: 7.4 V
maximum voltage: 8.4 V
nominal frequency: DC Hz

² Also known as "Class of Emission".

Type of power supply of cradle:	AC supply		
Specifications for power supply of the cradle:	nominal voltage:	115 V V	
	minimum voltage:	-- V	
	maximum voltage:	-- V	
	nominal frequency:	AC 50/60Hz	

2 Administrative Data

Application details

Applicant (full address):	Bartec GmbH Max-Eyth-Str. 16 97980 Bad Mergentheim - Germany
Contact person:	Ralph Lanig
Order number:	--
Receipt of EUT:	15 July 2013
Date(s) of test:	August, September 2013
Note(s):	

Report details

Report number:	20820838-26357-7
Edition:	2
Issue date:	December 2, 2013

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
Laboratory accreditation:	DAR-Registration No. D-PL-11321-11-01
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, Sections 15.107, 15.109, 15.205, 15.207, 15.215, 15.247 and 2.1093

of the Federal Communication Commission (FCC) and the

Radio Standards Specifications

ICES-003 Issue 4 (Class A), Sections, 5.2 and 5.4

RSS-Gen Issue 2, Sections 7.2.2 and

RSS-210 Issue 7, Sections 2.2, 2.6 and A8 (Category I Equipment)

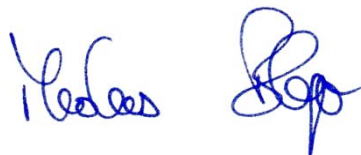
of Industry Canada (IC).

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)

- 1 Transmit on 902.75 MHz
- 2 Transmit on 915.25 MHz
- 3 Transmit on 927.25 MHz
- 4 Transmit on all channels (hopping enabled)
- 5 Charging mode (RFID reader switched off automatically by operating system)

Configuration(s) of EUT

EUT is voltage supplied via accumulator, operation will be done by test software supplied by applicant

List of ports and cables

Port	Description	Classification ³	Cable type	Cable length
--		--	--	--

List of devices connected to EUT

Item	Description	Type Designation	Serial no. or ID	Manufacturer
1	Transponder 902 MHz	Unique	N/A	--

List of support devices

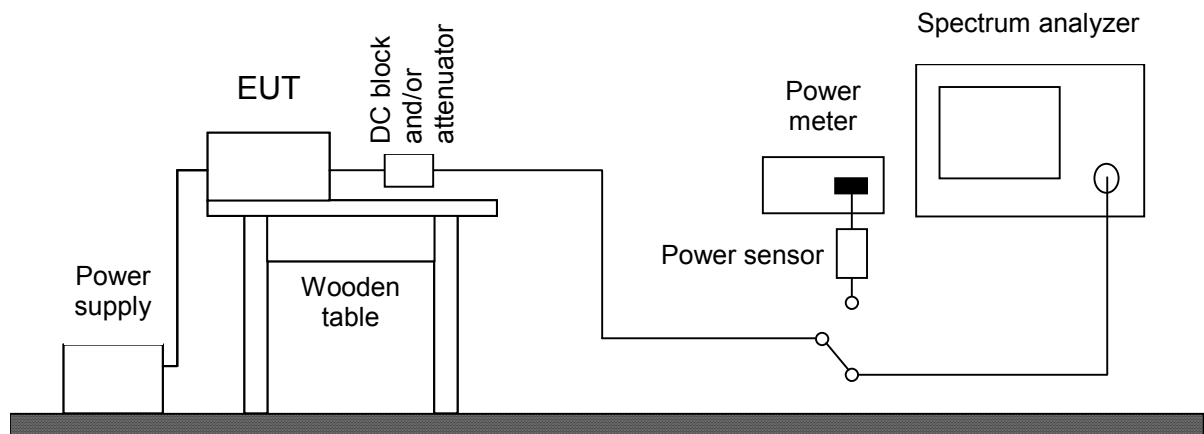
Item	Description	Type Designation	Serial no. or ID	Manufacturer
1	Cradle Dock	CRD9000-1001SR	12153000500777	Symbol Technologies
2	AC Adapter	PWRS-14000-148R	F33351234012660	HIPRO

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

6 Measurement Procedures

6.1 Conducted Output Power

Measurement Procedure: (radiated)	
Rules and specifications:	CFR 47 Part 15, section 15.247 (b) (2) IC RSS-Gen Issue 3 [5] or IC RSS-210 Issue 8 [4], section A8.4 (1) [4]
Measurement setup:	<input type="checkbox"/> Conducted: See below <input checked="" type="checkbox"/> Radiated: Radiated Emission in Fully or Semi Anechoic Room (6.5)
<p>If antenna conducted tests cannot be performed on this device, radiated tests to show compliance with the peak output power limit specified in Section 15.247(b) and the spurious RF conducted emission limit specified in Section 15.247(c) are acceptable. (According Public Notice DA 00-0705)</p> <p>Conducted output power is measured at the RF output terminals (e.g. antenna connector if antenna is detachable) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The RF output terminals are connected to a spectrum analyzer and/or a power meter with appropriate sensor. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.</p> <p>If a spectrum analyzer is used and no other settings are specified resolution bandwidth shall be selected according to the carrier frequency f_c and set to 10 kHz ($150 \text{ kHz} \leq f_c < 30 \text{ MHz}$), 100 kHz ($30 \text{ MHz} \leq f_c < 1 \text{ GHz}$) or 1 MHz ($f_c \geq 1 \text{ GHz}$). The video bandwidth shall be at least three times greater than the resolution bandwidth. The settings used have to be indicated within the appropriate test record(s).</p>	



Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
<input type="checkbox"/>	EMI test receiver	ESPI7	836914/0002	Rohde & Schwarz
<input type="checkbox"/>	EMI test receiver	ESMI	839379/013	Rohde & Schwarz
<input type="checkbox"/>			839587/006	
<input type="checkbox"/>	Power meter	NRVS	836856/015	Rohde & Schwarz
<input type="checkbox"/>	Peak power sensor	NRV-Z31	8579604.03	Rohde & Schwarz
<input type="checkbox"/>	Power sensor	NRV-Z52	837901/030	Rohde & Schwarz
<input type="checkbox"/>	Power sensor	NRV-Z4	863828/015	Rohde & Schwarz
<input type="checkbox"/>	DC-block	7006	A2798	Weinschel
<input checked="" type="checkbox"/>	Attenuator	4776-10	9412	Narda
<input type="checkbox"/>	Attenuator	4776-20	9503	Narda

6.2 Bandwidth Measurements

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, section 15.247 (a) (1) (i) IC RSS-Gen Issue 3 [5] or IC RSS-210 Issue 8 [4], section A8.1 (c) [4]
Measurement setup:	<input type="checkbox"/> Conducted: See below <input checked="" type="checkbox"/> Radiated: Radiated Emission in Fully or Semi Anechoic Room (6.5)
<p>If antenna is detachable bandwidth measurements shall be performed at the antenna connector (conducted measurement) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.</p> <p>If radiated measurements are performed the same test setups and instruments are used as with radiated emission measurements for the appropriate frequency range.</p> <p>The analyzer settings are specified by the test description of the appropriate test record(s).</p>	

6.3 Conducted AC Powerline Emission

Measurement Procedure:

Rules and specifications:

CFR 47 Part 15, section 15.207 (a)
IC RSS-Gen Issue 3 [5] or IC RSS-210 Issue 8 [4], section 7.2.4 [5]

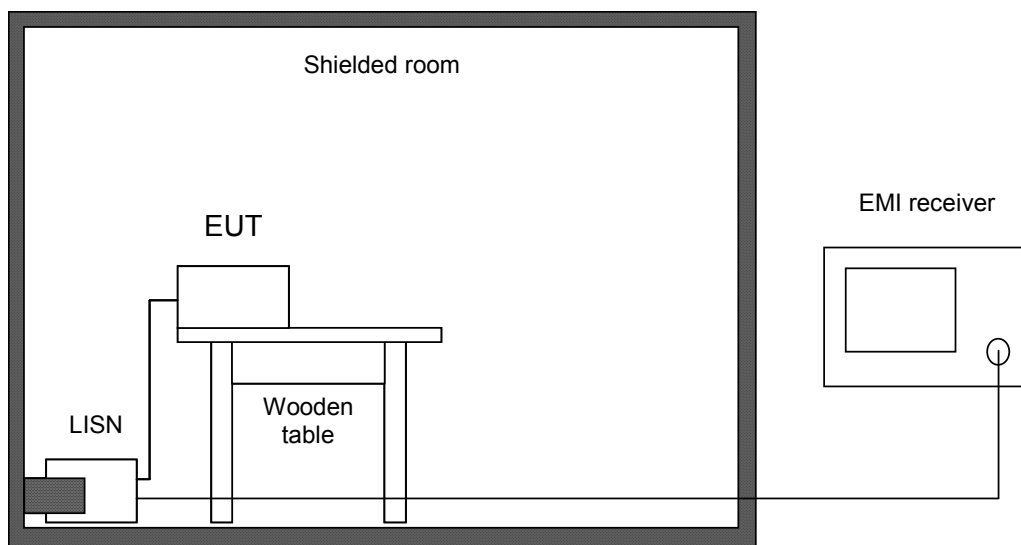
Conducted emission tests in the frequency range 150 kHz to 30 MHz are performed using Line Impedance Stabilization Networks (LISNs). To simplify testing with quasi-peak and average detector the following procedure is used:

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 C63.4, section 13.1.3.1, 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:

Used	Type	Model	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	EMI receiver	ESHS 10	860043/016	Rohde & Schwarz
<input checked="" type="checkbox"/>	LISN	ESH3-Z5	862770/021	Rohde & Schwarz
<input type="checkbox"/>	LISN	ESH3-Z5	830952/025	Rohde & Schwarz
<input type="checkbox"/>	Artificial mains network	ESH 2-Z5	842966/004	Rohde & Schwarz
<input type="checkbox"/>	Shielded room	No. 1	1451	Albatross Projects
<input checked="" type="checkbox"/>	Shielded room	No. 4	3FD-100 544	Euroshield

6.4 Radiated Emission Measurement 9 kHz to 30 MHz

Measurement Procedure:

Rules and specifications:	CFR 47 Part 15, section 15.247 (d), 15.205 (a), 15.209 (a), IC RSS-Gen Issue 3 [5] or IC RSS-210 Issue 8 [4], section A8.5 [4], 2.5 [4], 7.2.2 [5]
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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.

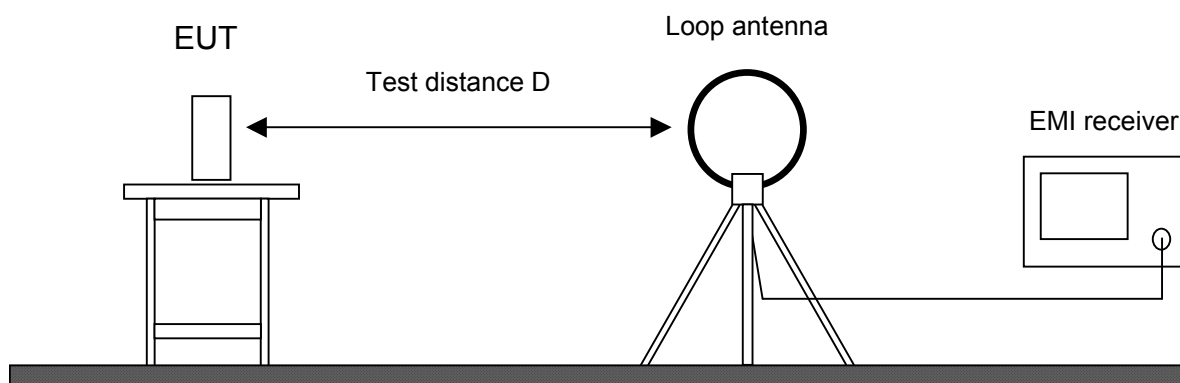
Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

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:

Used	Type	Model	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
<input type="checkbox"/>	EMI test receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
<input checked="" type="checkbox"/>	Test receiver	ESHS 10	860043/016	Rohde & Schwarz
<input type="checkbox"/>	Preamplifier	CPA9231A	3393	Schaffner
<input type="checkbox"/>	Loop antenna	HFH2-Z2	882964/1	Rohde & Schwarz
<input checked="" type="checkbox"/>	Fully anechoic room	No. 2	1452	Albatross Projects
<input type="checkbox"/>	Semi-anechoic room	No. 3	1453	Siemens
<input checked="" type="checkbox"/>	Open field test site	EG 1	1450	Senton

6.5 Radiated Emission in Fully or Semi Anechoic Room

Measurement Procedure:

Rules and specifications:	CFR 47 Part 15, section 15.247 (d), 15.205 (a), 15.209 (a), IC RSS-Gen Issue 3 [5] or IC RSS-210 Issue 8 [4], section A8.5 [4], 2.5 [4], 7.2.2 [5]
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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 in a fully anechoic room 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.

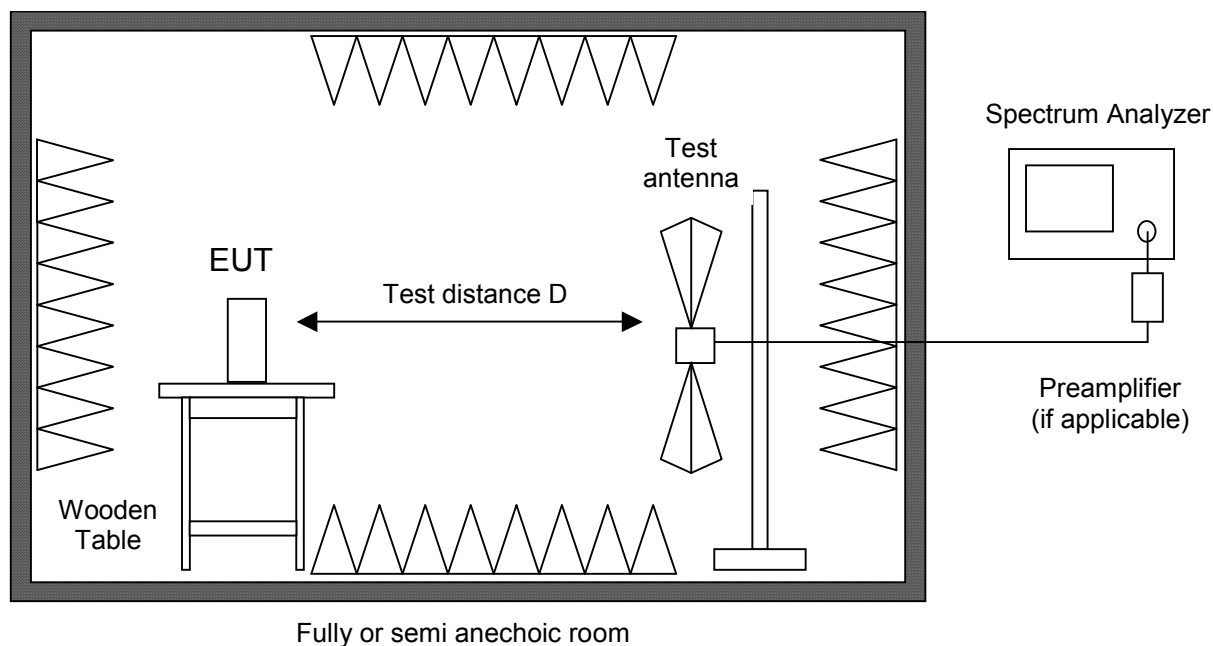
All tests below 18 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance is reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation 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 an open field test-site is used and the plots recorded in the fully or semi anechoic room are indicated as prescans.



Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
<input type="checkbox"/>	Spectrum analyzer	R 3271	05050023	Advantest
<input type="checkbox"/>	EMI test receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
<input checked="" type="checkbox"/>	Preamplifier	CPA9231A	3393	Schaffner
<input type="checkbox"/>	Preamplifier	R14601		Advantest
<input checked="" type="checkbox"/>	Preamplifier 1-8 GHz	AFS3-00100800-32-LN	847743	Miteq
<input type="checkbox"/>	Preamplifier 0.5-8 GHz	AMF-4D-005080-25-13P	860149	Miteq
<input checked="" type="checkbox"/>	Preamplifier 8-18 GHz	ACO/180-3530	32641	CTT
<input type="checkbox"/>	External Mixer	WM782A	845881/005	Tektronix
<input type="checkbox"/>	Harmonic Mixer	FS-Z30	843389/007	Rohde & Schwarz
	Accessories			
<input checked="" type="checkbox"/>	Trilog broadband antenna	VULB 9163	9163-188	Schwarzbeck
<input checked="" type="checkbox"/>	Horn antenna	3115	9508-4553	EMCO
<input type="checkbox"/>	Horn antenna	3160-03	9112-1003	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-04	9112-1001	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-05	9112-1001	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-06	9112-1001	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-07	9112-1008	EMCO
<input type="checkbox"/>	Horn antenna	3160-08	9112-1002	EMCO
<input type="checkbox"/>	Horn antenna	3160-09	9403-1025	EMCO
<input type="checkbox"/>	Horn antenna	3160-10	399185	EMCO
<input checked="" type="checkbox"/>	Fully anechoic room	No. 2	1452	Albatross Projects
<input type="checkbox"/>	Semi-anechoic room	No. 3	1453	Siemens

6.6 Radiated Emission at Alternative Test Site

Measurement Procedure:

Rules and specifications:	CFR 47 Part 15, section 15.247 (d), 15.205 (a), 15.209 (a), IC RSS-Gen Issue 3 [5] or IC RSS-210 Issue 8 [4], section A8.5 [4], 2.5 [4], 7.2.2 [5]
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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 C63.4 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.

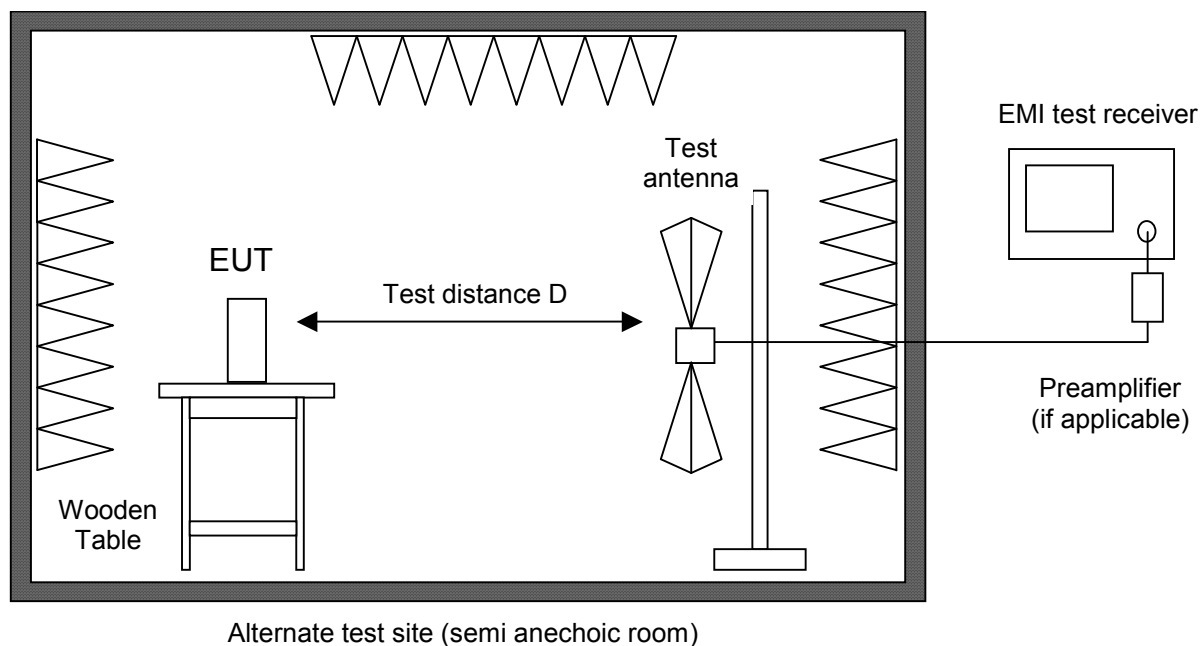
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

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 discharged 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.



Test instruments used:

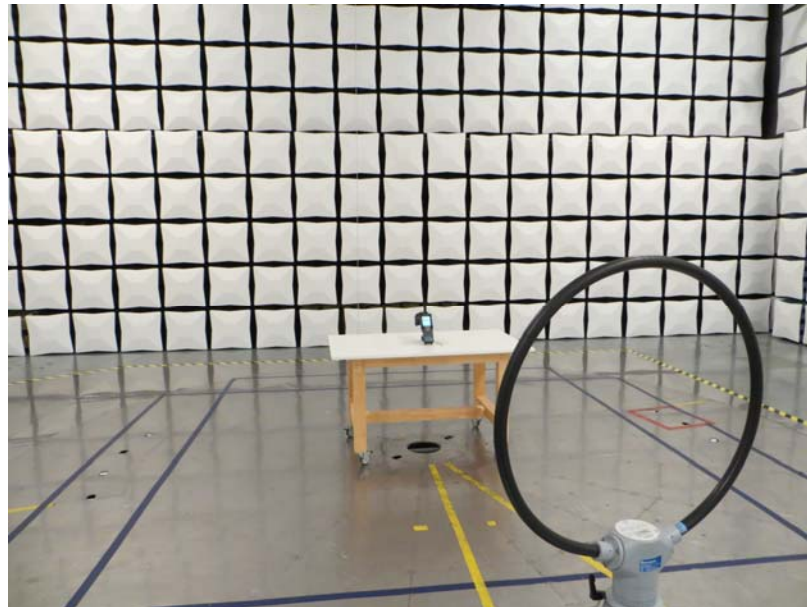
Type		Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input type="checkbox"/> EMI test receiver		ESU8	2044	100232	Rohde & Schwarz
<input type="checkbox"/> Trilog antenna	Cabin no. 8	VULB 9163	1802	9163-214	Schwarzbeck
<input type="checkbox"/> Semi anechoic room		No. 8	2057	---	Albatross

7 Photographs Taken During Testing

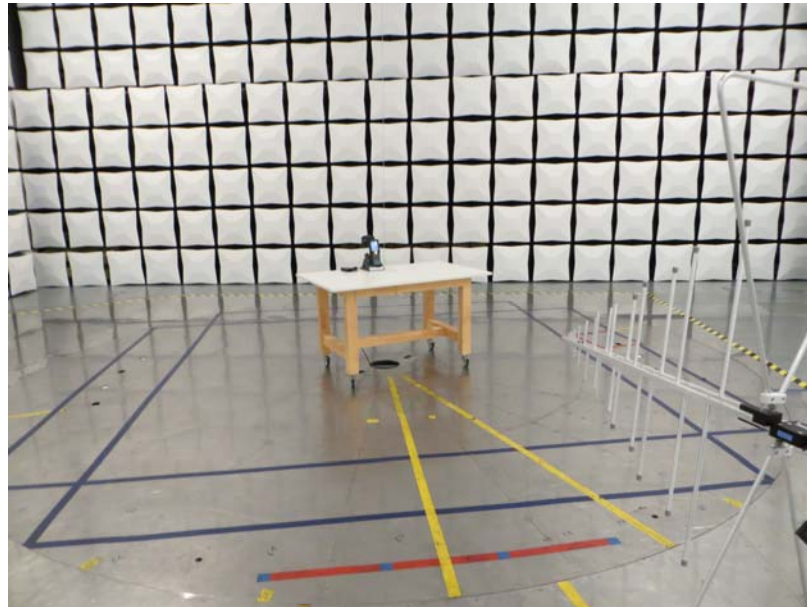
Test setup for conducted AC powerline emission measurement



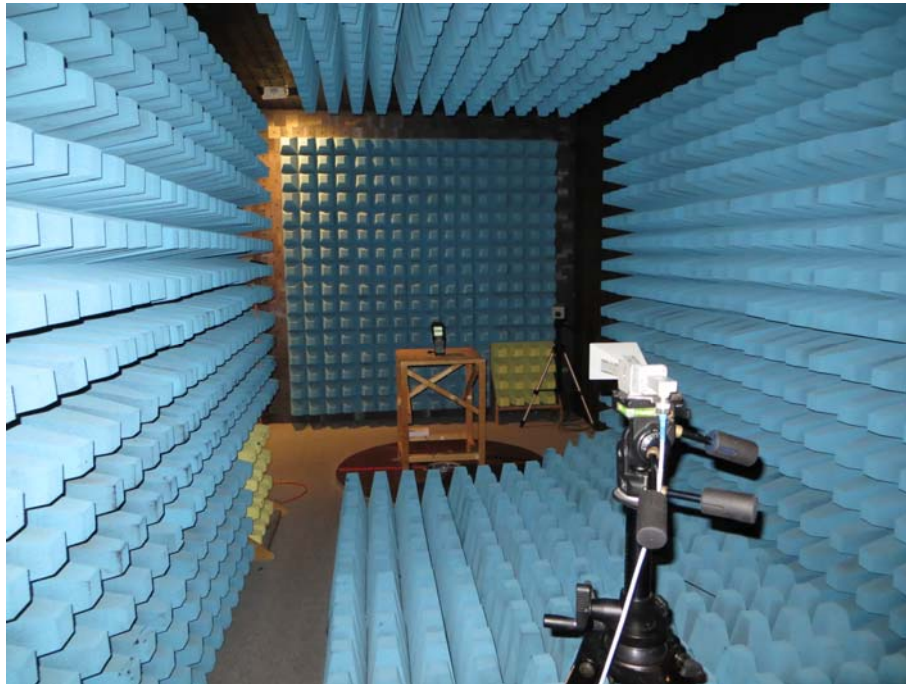
Test setup for radiated emission measurement 9 kHz – 30 MHz



Test setup for radiated emission measurement (Semi anechoic room)



Test setup for radiated emission measurement (fully anechoic room)



Test Results

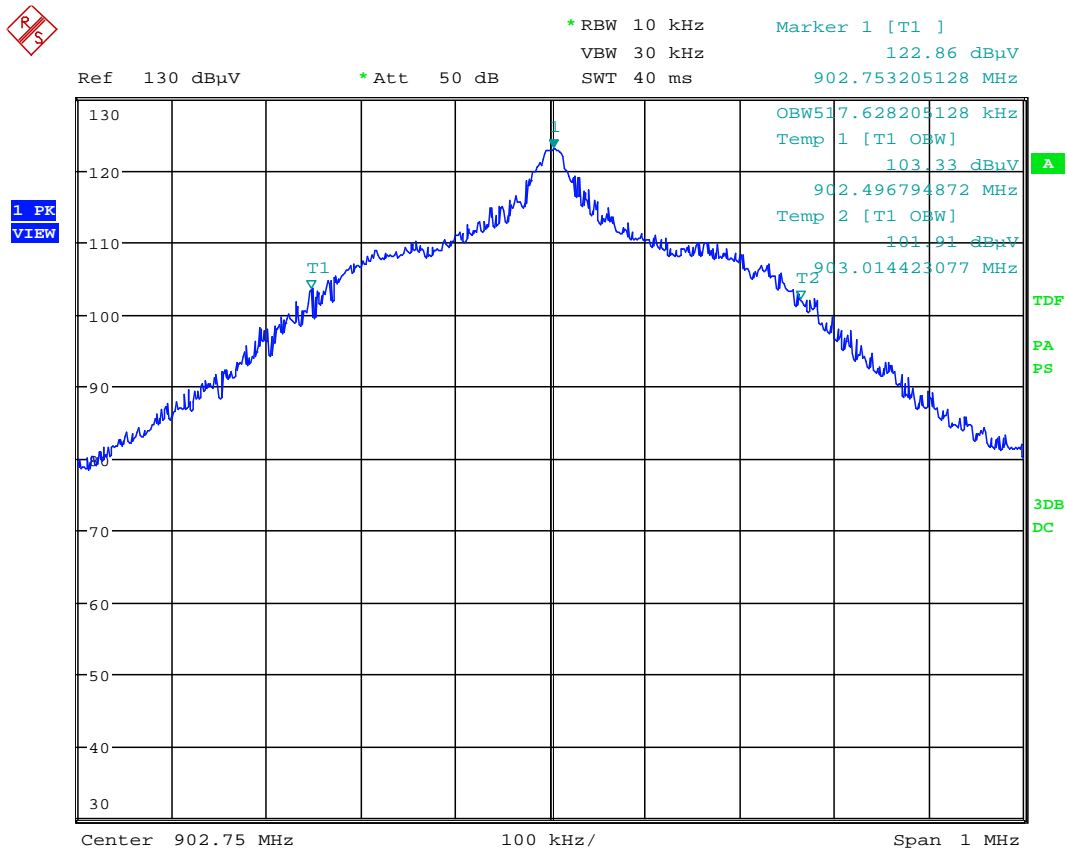
FCC CFR 47 Parts 15 [2]			
Section(s)	Test	Page	Result
2.202(a)	Occupied bandwidth	27	Recorded
15.204	Antenna requirement	---	Integrated Antenna
15.247 (a) (1) (i)	Channel Bandwidth	31	Test passed
2.201, 2.202	Class of emission	35	Calculated
15.247(a)(1)	Hopping channel separation	39	Test passed
15.247(a)(1)(i)	Number of hopping frequencies used	42	Test passed
15.247(a)(1)(i)	Time occupancy on any channel	44	Test passed
15.247(b)(2)	Maximum peak output power	46	Test passed
15.207	Conducted AC powerline emission 150 kHz to 30 MHz	49	Test passed
15.205(a) 15.209(a) 15.247(d)	Radiated emission 9 kHz to 10 GHz	51	Test passed
15.247(i) 2.1093	RF exposure requirement	68	Test passed

IC RSS-210 Issue 8 [4] / RSS Gen Issue 3 [5]			
Section(s)	Test	Page	Result
4.6.1	Occupied Bandwidth	27	Recorded
7.1.4	Antenna requirement	---	Integrated antenna
A8.1(c)	Channel bandwidth	31	Test passed
3.2(h), 8	Designation of emissions	35	Calculated
A8.1(b)	Hopping channel separation	39	Test passed
A8.1(c)	Number of hopping frequencies used	42	Test passed
A8.1(c)	Time occupancy on any channel	44	Test passed
A8.4(1)	Maximum peak output power	46	Test passed
7.2.4	Conducted AC powerline emission 150 kHz to 30 MHz	49	Test passed
7.2.2 2.5 A8.5	Radiated emission 9 kHz to 10 GHz	51	Test passed
5.5	Exposure of Humans to RF Fields	68	Exempted from SAR and RF evaluation

7.1 Occupied Bandwidth

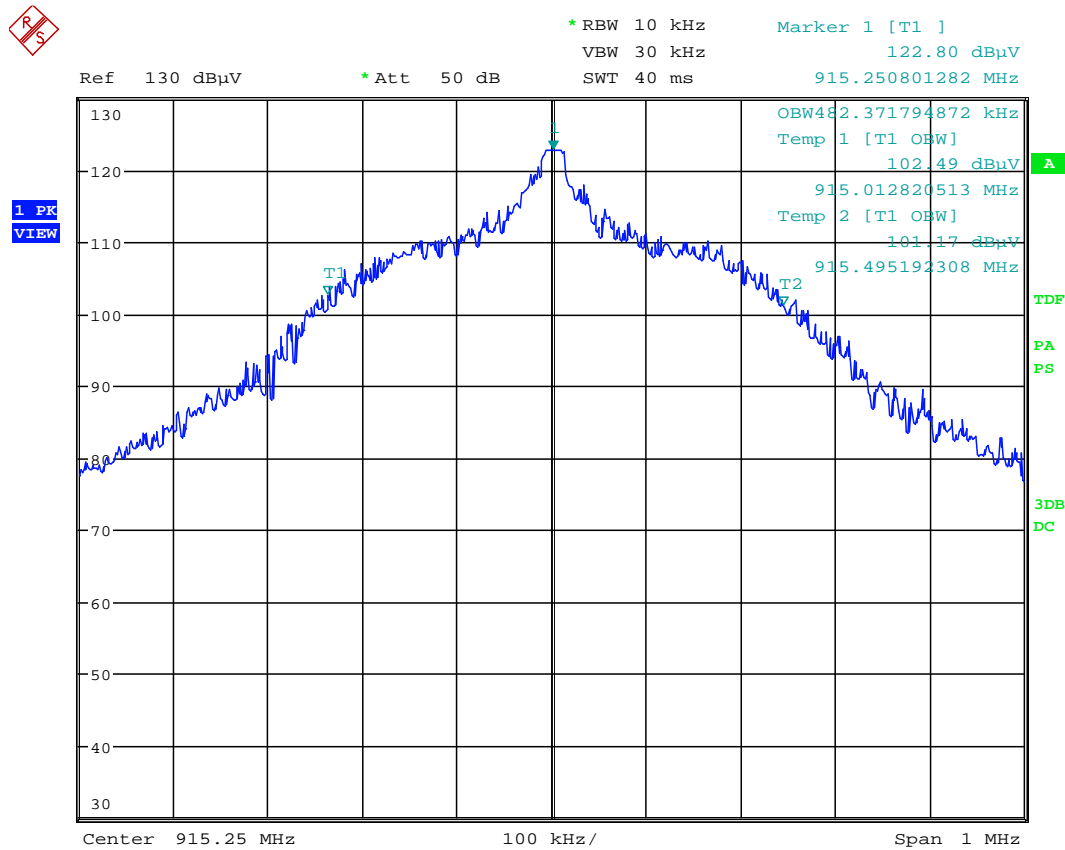
Rules and specifications:	IC RSS-Gen Issue 3, section 4.6.1	
Description:	<p>The occupied bandwidth according to CFR 47 Part 2, section 2.202(a), is measured as the 99% emission bandwidth, i.e. below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.</p> <p>The occupied bandwidth according to ANSI C63.4, annex H.6; is measured as the frequency range defined by the points that are 26 dB down relative to the maximum level of the modulated carrier.</p> <p>The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth. If no bandwidth specifications are given, the following guidelines are used:</p>	
	Fundamental frequency	Minimum resolution bandwidth
	9 kHz to 30 MHz	1 kHz
	30 MHz to 1000 MHz	10 kHz
	1000 MHz to 40 GHz	100 kHz
	The video bandwidth shall be at least three times greater than the resolution bandwidth.	
Measurement procedure:	Bandwidth Measurements (6.2)	
Comment:	Operating mode 1 & 2 & 3	
Date of test:	September 6, 2013	
Test site:	Fully anechoic room, cabin no. 2	

Operating mode 1:



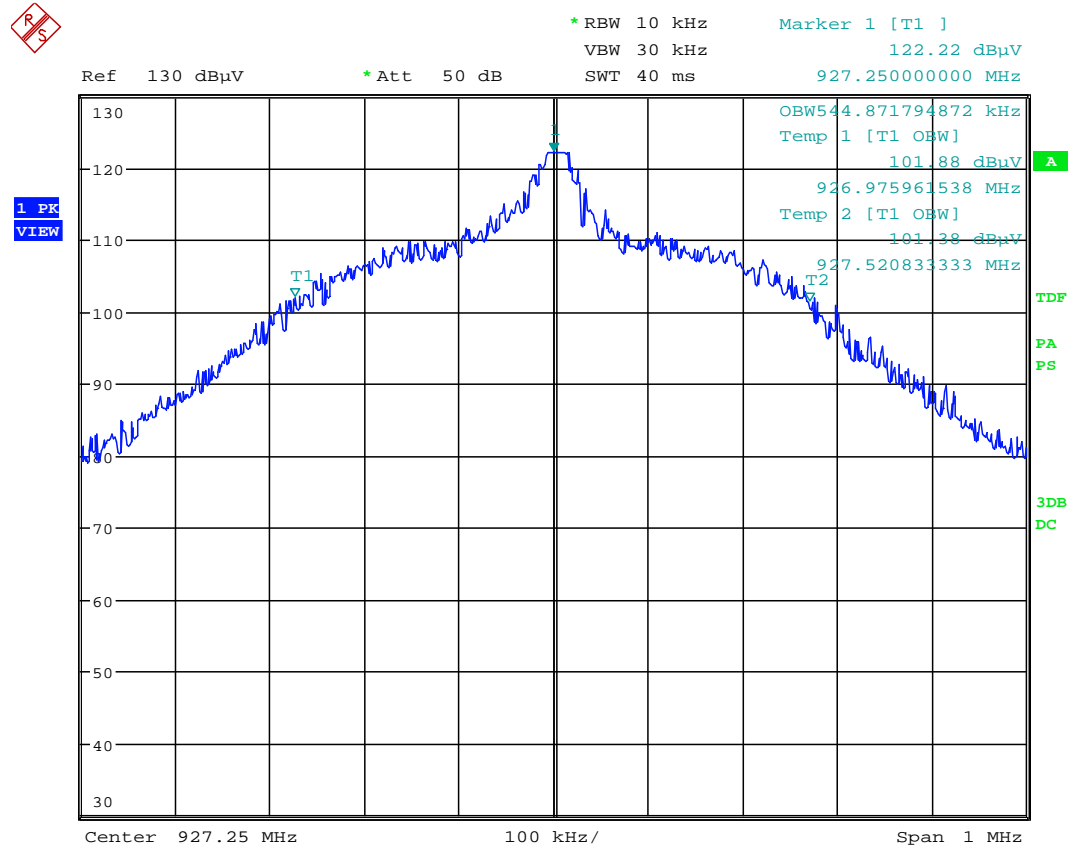
Occupied Bandwidth (99 %): **517.6 kHz**

Operating mode 2:



Occupied Bandwidth (99 %):	482.4 kHz
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Operating mode 3:



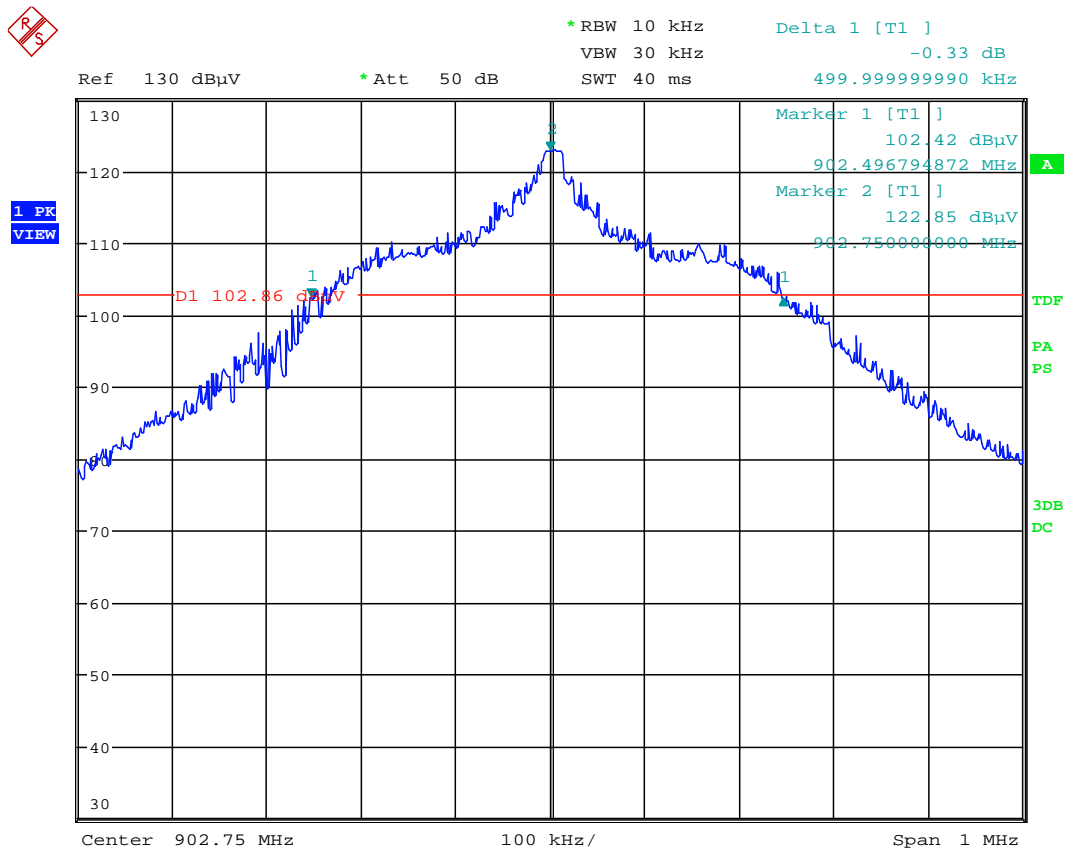
Occupied Bandwidth (99 %):	544.9 kHz
----------------------------	-----------

7.2 Bandwidth of the Emission

Rules and specifications:	CFR 47 Part 15, section 15.247 (a) (1) (i) IC RSS-Gen Issue 3 [5] or IC RSS-210 Issue 8 [4], section A8.1 (c) [4]	
Description:	<p>The 20 dB bandwidth of the emission is measured as the frequency range defined by the points that are 20 dB down relative to the maximum level of the modulated carrier.</p> <p>For intentional radiators operating under the alternative provisions to the general emission limits the requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.</p> <p>The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth. If no bandwidth specifications are given, the following guidelines are used:</p>	
	Fundamental frequency	Minimum resolution bandwidth
	9 kHz to 30 MHz	1 kHz
	30 MHz to 1000 MHz	10 kHz
	1000 MHz to 40 GHz	100 kHz
	The video bandwidth shall be at least three times greater than the resolution bandwidth.	
Measurement procedure:	Bandwidth Measurements (6.2)	
Comment:	Operating mode 1 & 2 & 3	
Date of test:	September 6, 2013	
Test site:	Fully anechoic room, cabin no. 2	

Operating mode 1:

Bandwidth (- 20 dB):	105.8 kHz
----------------------	-----------



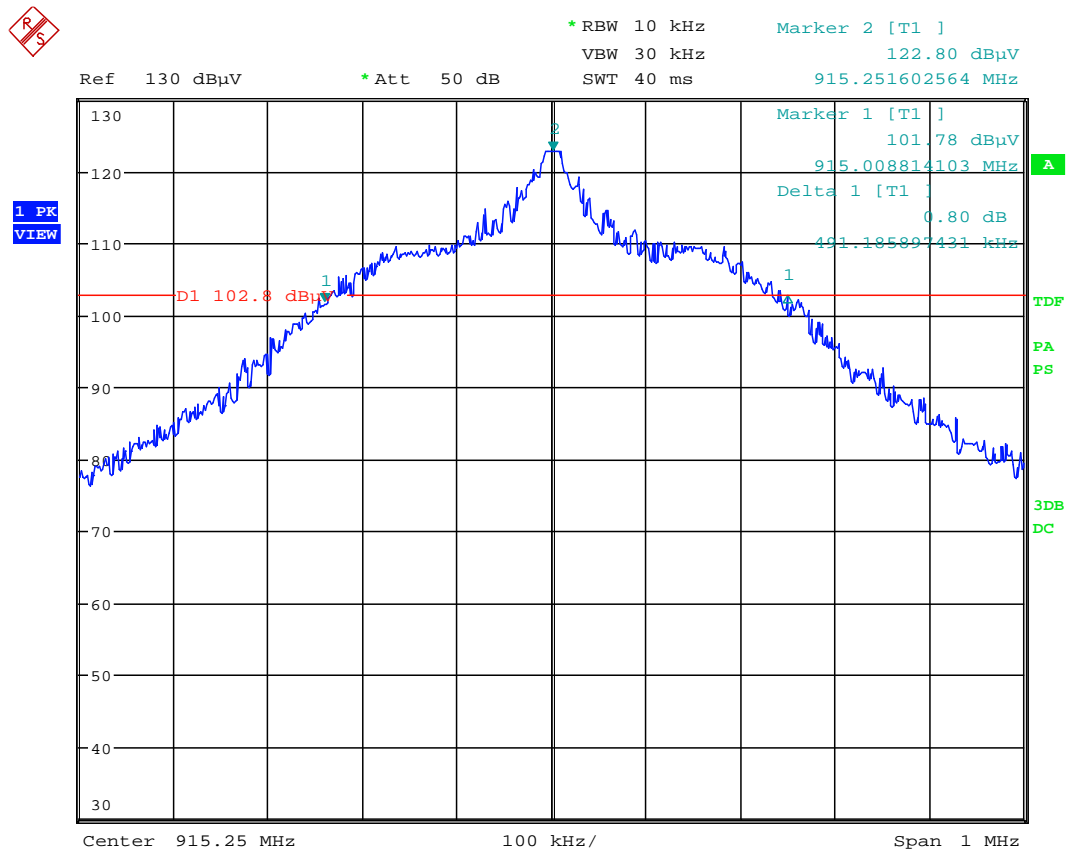
Permitted frequency band:	902 – 928 MHz	
20 dB bandwidth:	500 kHz	
Carrier frequency stability:	<input type="checkbox"/> specified	<input checked="" type="checkbox"/> not specified
Maximum frequency tolerances:	+0 kHz - 0 kHz	
Bandwidth of the emission:	500 kHz	within permitted frequency band ⁴ : <input checked="" type="checkbox"/> yes <input type="checkbox"/> no

Test Result:	Test passed
--------------	-------------

⁴ If a frequency stability is not specified, it is recommended that the fundamental emission is kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Operating mode 2:

Bandwidth (- 20 dB):	109 kHz
----------------------	---------



Permitted frequency band:	902 – 928 MHz	
20 dB bandwidth:	491 kHz	
Carrier frequency stability:	<input type="checkbox"/> specified	<input checked="" type="checkbox"/> not specified
Maximum frequency tolerances:	+0 kHz - 0 kHz	
Bandwidth of the emission:	491 kHz	within permitted frequency band⁵: <input checked="" type="checkbox"/> yes <input type="checkbox"/> no

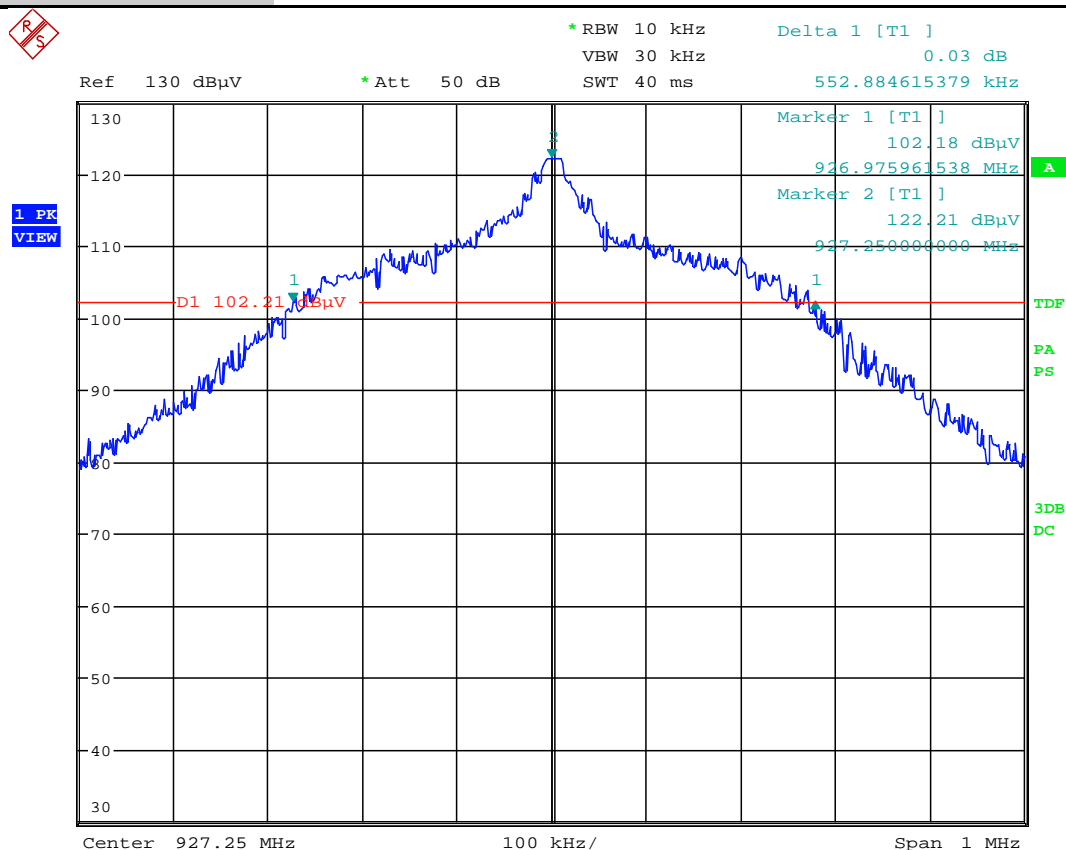
Test Result:	Test passed
--------------	-------------

⁵ If a frequency stability is not specified, it is recommended that the fundamental emission is kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Operating mode 3:

Bandwidth (- 20 dB):

94.6 kHz



Permitted frequency band:	902 – 928 MHz	
20 dB bandwidth:	553 kHz	
Carrier frequency stability:	<input type="checkbox"/> specified	<input checked="" type="checkbox"/> not specified
Maximum frequency tolerances:	+0 kHz - 0 kHz	
Bandwidth of the emission:	553 kHz	within permitted frequency band ⁶ : <input checked="" type="checkbox"/> yes <input type="checkbox"/> no

Test Result:

Test passed

⁶ If a frequency stability is not specified, it is recommended that the fundamental emission is kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

7.3 Designation of Emissions

Rules and specifications:	CFR 47 Part 2, sections 2.201 and 2.202 IC RSS-Gen Issue 3, sections 8
Guide:	ANSI C63.4 / TRC-43

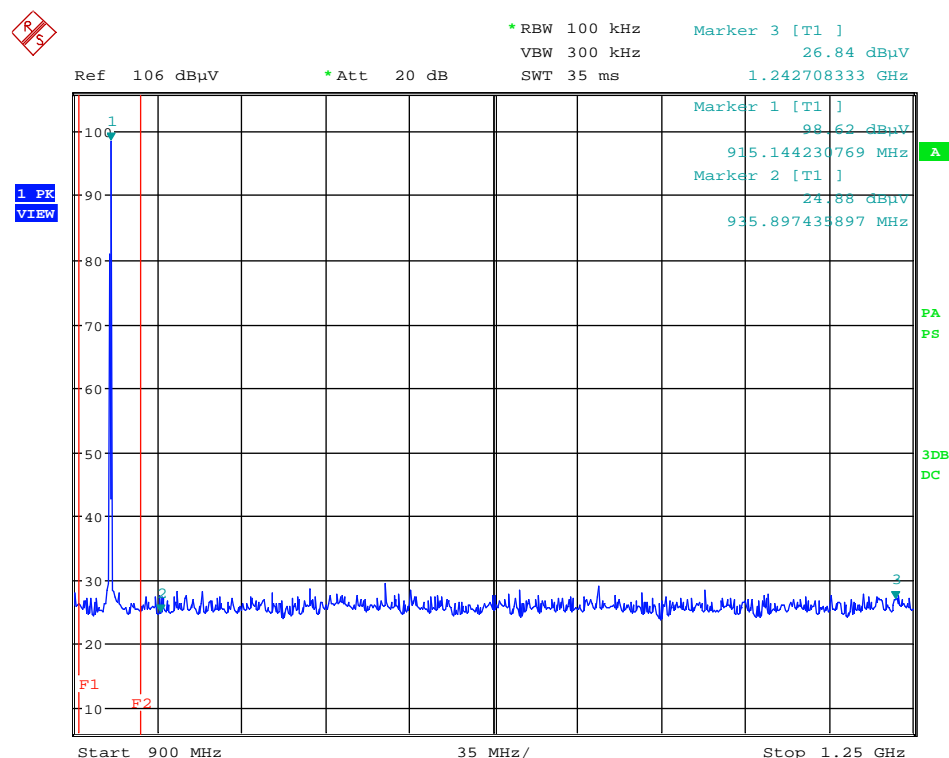
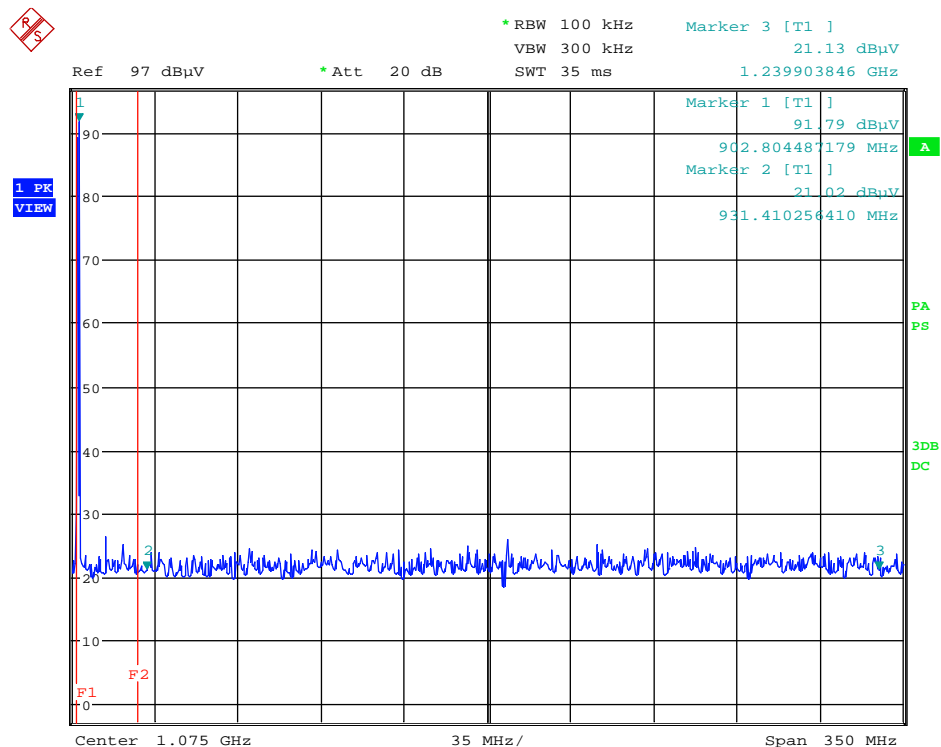
Type of modulation:	Amplitude Modulation
---------------------	----------------------

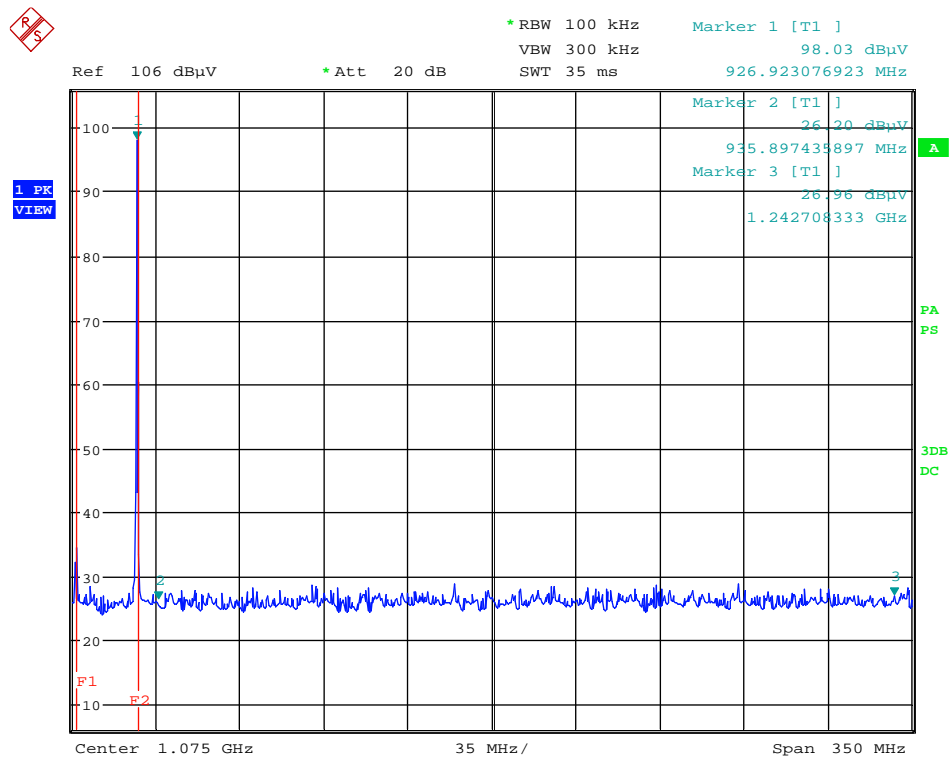
B_n = Necessary Bandwidth	$B_n = 2BK$
B = Modulation rate	$B = 40 \text{ kbs} = 20 \text{ kHz}$
K = Overall numerical factor	$K = 1$
Calculation:	$B_n = 2 \cdot (20 \text{ kHz}) \cdot 1 = 40 \text{ kHz}$

Designation of Emissions:	40K0A1D
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7.4 Restricted Bands of Operation

Rules and specifications:	CFR 47 Part 15, section 15.205(a) IC RSS-210 Issue 7, section 2.2(a)			
Guide:	ANSI C63.4			
Limit:	Only spurious emissions are permitted in any of the frequency bands listed in CFR 47 Part 15, section 15.205(a) or IC RSS 210 Issue 7, section 2.2(a).			
	MHz	MHz	MHz	GHz
	0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
	¹ 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
	2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
	4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
	4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
	4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
	6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
	6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
	6.31175–6.31225	123–138	2200–2300	14.47–14.5
	8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
	8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
	8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
	8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
	12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
	MHz	MHz	MHz	GHz
	12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
	12.57675–12.57725	322–335.4	3600–4400	(²)
	13.36–13.41			
	¹ Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz. ² Above 38.6			
Measurement procedure:	Radiated Emission in Fully or Semi Anechoic Room (6.5)			
Comment:	Operating mode 1 & 2 & 3			
Date of test:	September 6, 2013			
Test site:	Fully anechoic room, cabin no. 2			
Test distance:	3 meters			





Test Result:	Test passed
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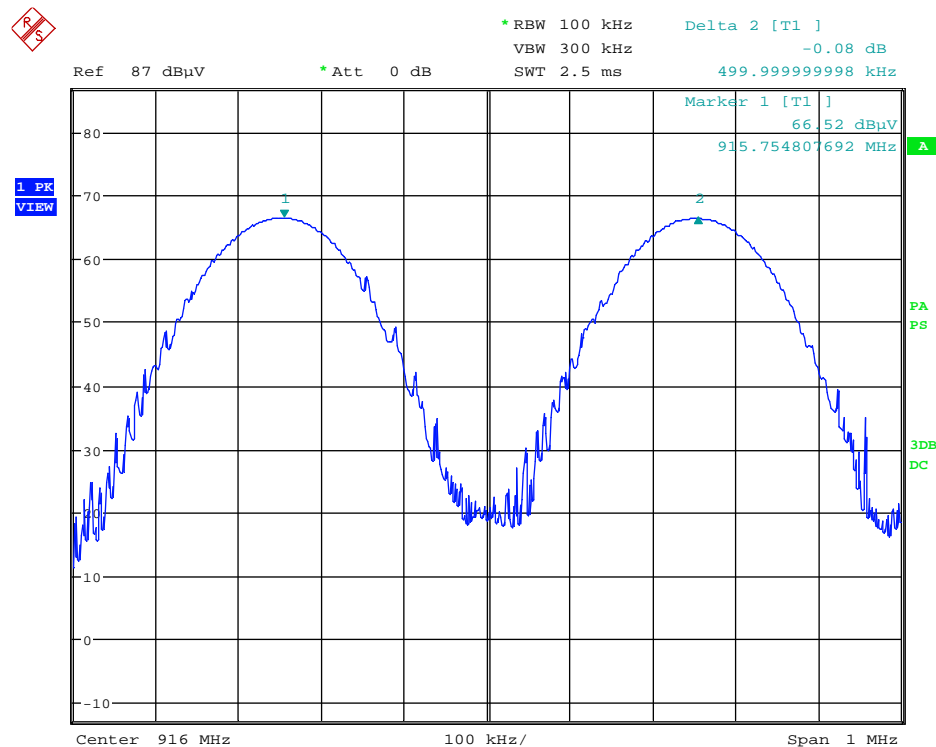
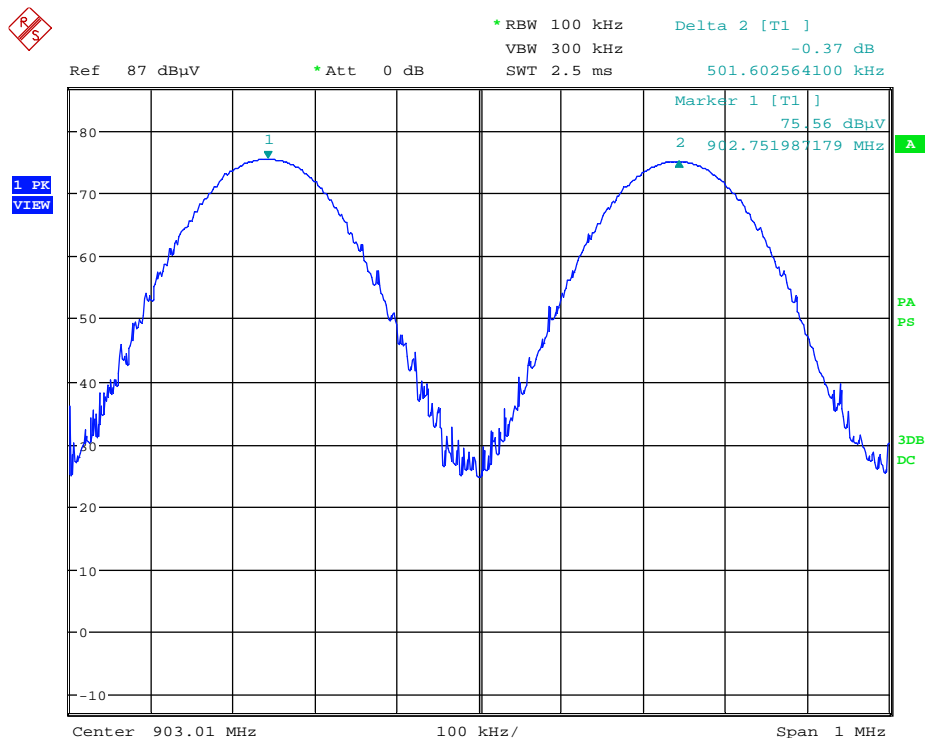
7.5 Hopping channel separation

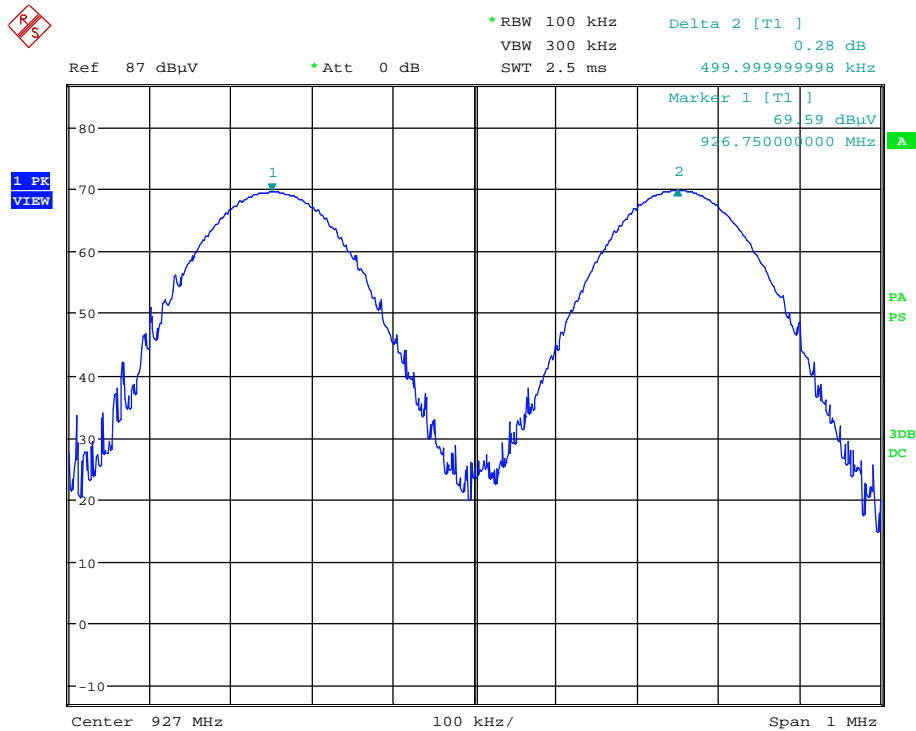
Rules and specifications:	CFR 47 Part 15, section 15.247 (a) (1) IC RSS-210 Issue 8 [4], section A8.1(c)
Limit:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
Measurement procedure:	Radiated Emission in Fully or Semi Anechoic Room (6.5)

Comment:	Operating mode 1 & 2 & 3
Date of test:	September 6, 2013
Test site:	Fully anechoic room, cabin no. 2
Test distance:	3 meters

Frequency (MHz)	Channel separation (kHz)	Limit (kHz)	Result
902.75	502	> 105.8	Pass
915.25	500	> 109	Pass
927.25	500	> 94.6	Pass

Test Result:	Test passed
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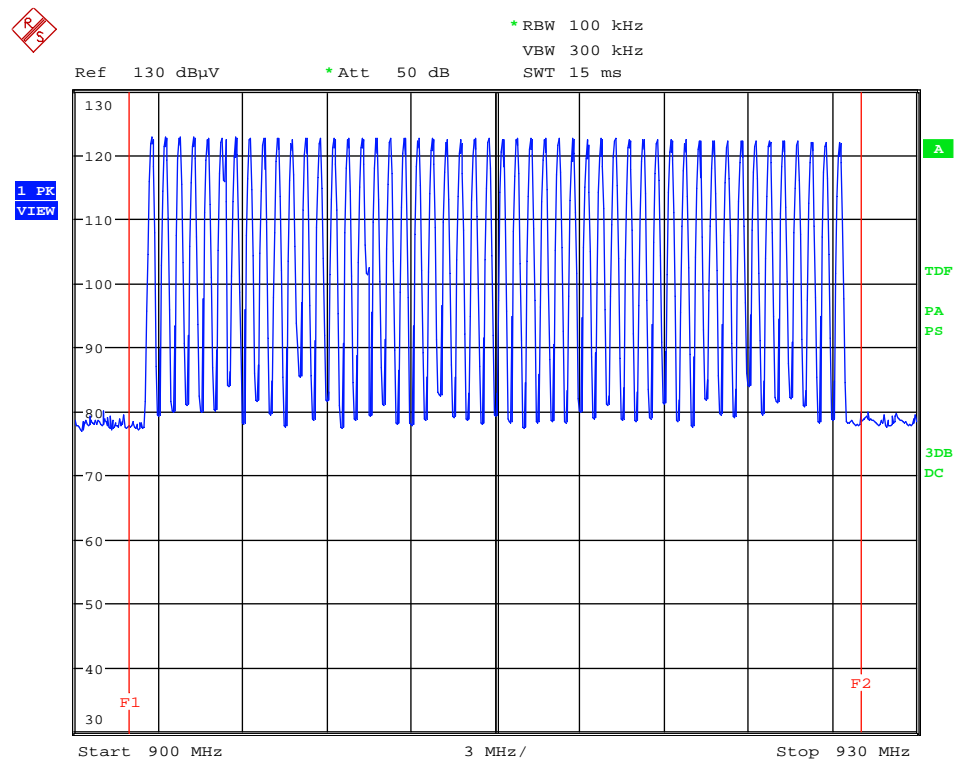
7.6 Number of hopping frequencies used

Rules and specifications:	CFR 47 Part 15, section 15.247(a)(1)(i) IC RSS-210 Issue 8, section A8.1(c)[4]
Guide:	ANSI C63.4
Limit:	If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.
Measurement procedure:	Radiated Emission in Fully or Semi Anechoic Room (6.5)

Comment:	Operating mode 4
Date of test:	September 6, 2013
Test site:	Fully anechoic room, cabin no. 2
Test distance:	3 meters

Frequencies	Limit	Result
50	≥ 50	Pass

Test Result:	Test passed
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7.7 Time occupancy on any channel

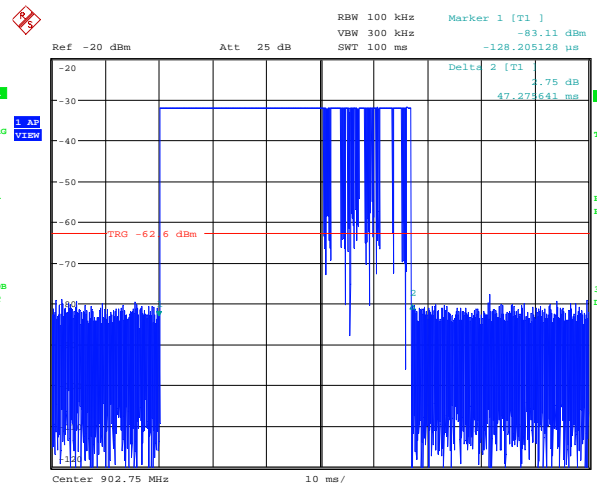
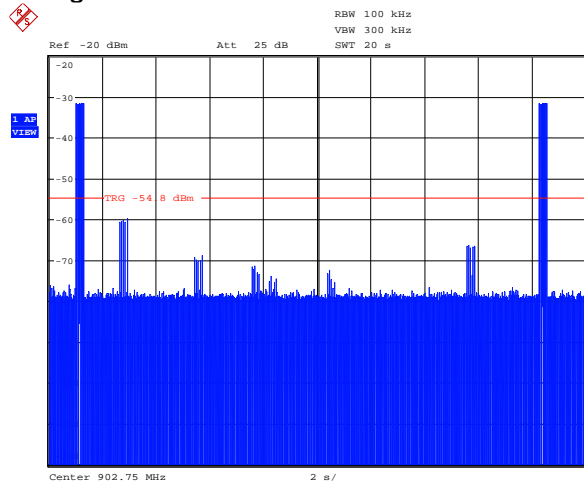
Rules and specifications:	CFR 47 Part 15, section 15.247(a)(1)(i) IC RSS-210 Issue 8, section A8.1(c)[4]
Guide:	ANSI C63.4
Limit:	If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 seconds period.
Measurement procedure:	Radiated Emission in Fully or Semi Anechoic Room (6.5)

Comment:	Since the EUT uses a cycle-time of approximately 15 s to use all hopping channels the evaluation was taken for 15 s instead of 20 s. Thus the limit for average time occupancy calculates to 0.3 seconds within a 15 second period.
Date of test:	September 6, 2013
Test site:	Fully anechoic room, cabin no. 2
Test distance:	3 meters

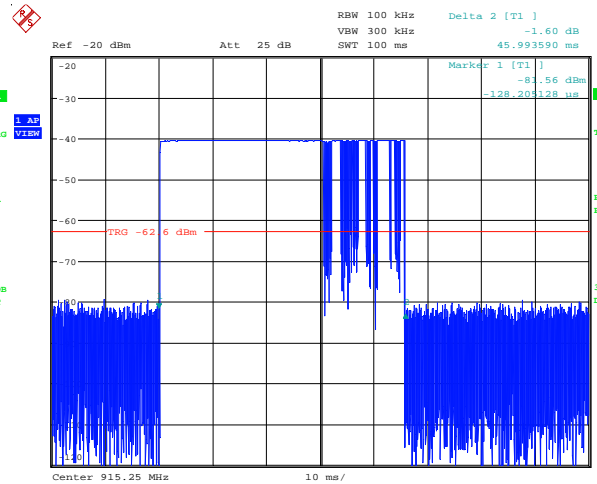
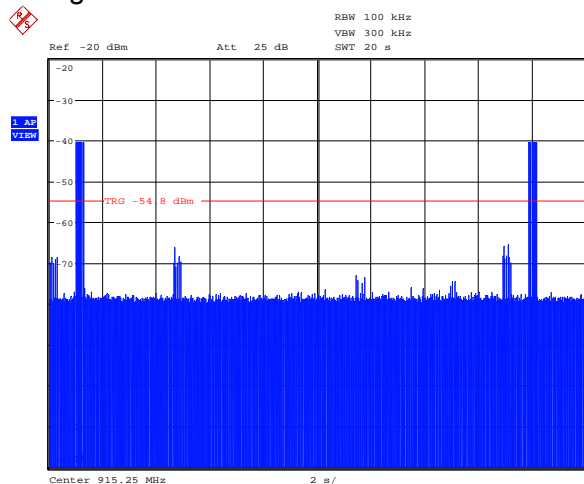
Frequency (MHz)	Number of transmission in 20 s	Length of transmission time (ms)	Result (ms)	Limit (ms in a 20 s period)
902.75	2	47.3	94.6	400
915.25	2	46.0	92.0	400
927.25	2	48.2	96.4	400

Test Result:	Test passed
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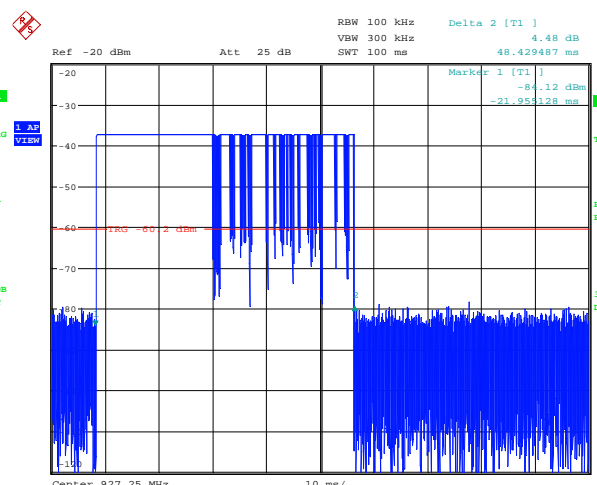
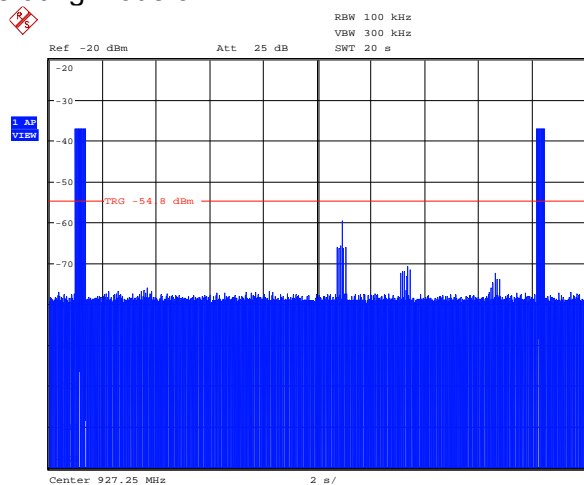
Operating mode 1:



Operating mode 2:



Operating mode 3:



7.8 Maximum output power

Rules and specifications:	CFR 47 Part 15, section 15.247(b)(2) IC RSS-210 Issue 8, section A8.4(1)[4]
Guide:	ANSI C63.4 / Public Notice DA 00-0705
Limit:	The maximum output power is 1 W (30 dBm) for systems employing at least 50 hopping channels; and 0.25 W (24 dBm) for systems employing less than 50 hopping channels but at least 25 hopping channels.
Measurement procedure:	Radiated Output Power

Comment:	Operating mode 1 & 2 & 3
Date of test:	September 6, 2013
Test site:	Fully anechoic room, cabin no. 2
Test distance:	3 meters

Following calculation will be used for transmitter peak power:

$$P = \frac{(E \cdot d)^2}{30G}$$

Where:

E is the measured maximum fundamental field strength in V/m, utilizing a RBW \geq the 20 dB bandwidth of the emission, VBW > RBW, peak detector function. Follow the procedures in C63.4-1992 with respect to maximizing the emission.

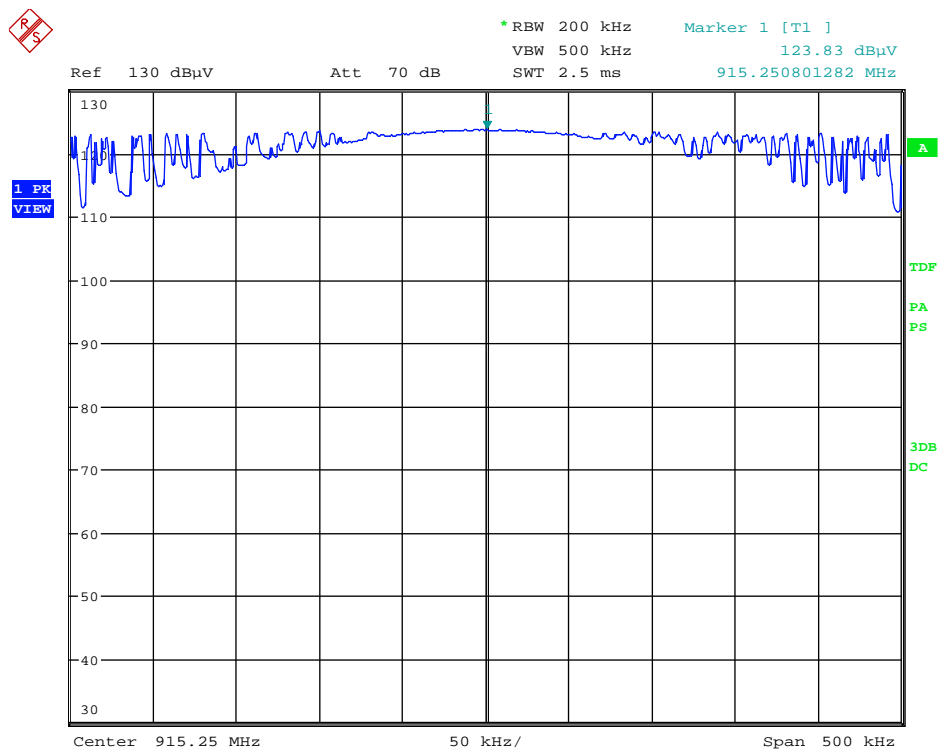
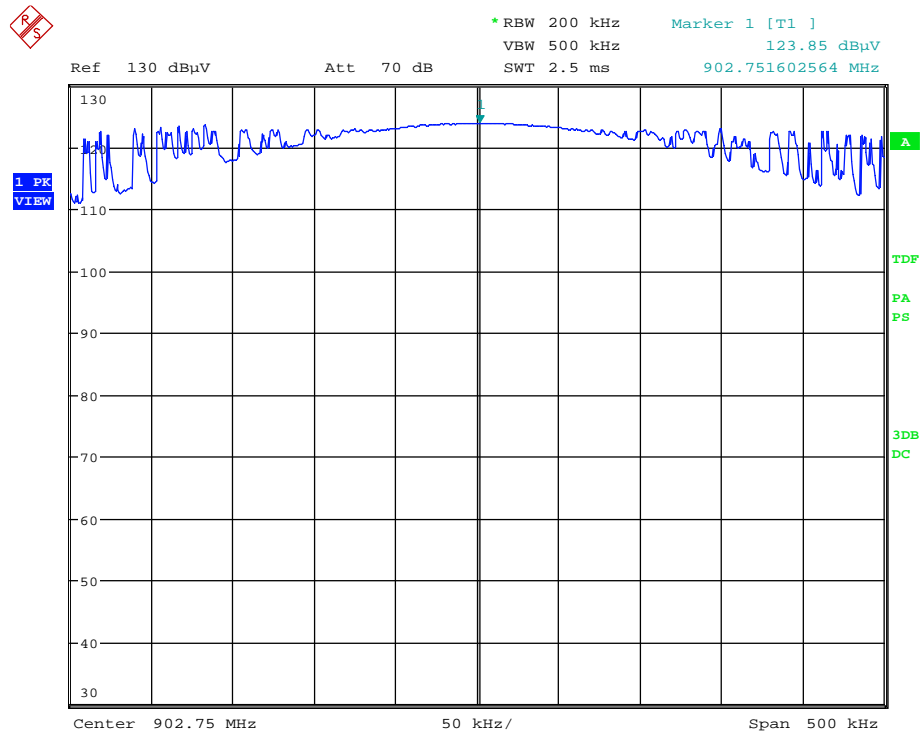
G is the numeric gain of the transmitting antenna with reference to an isotropic radiator.

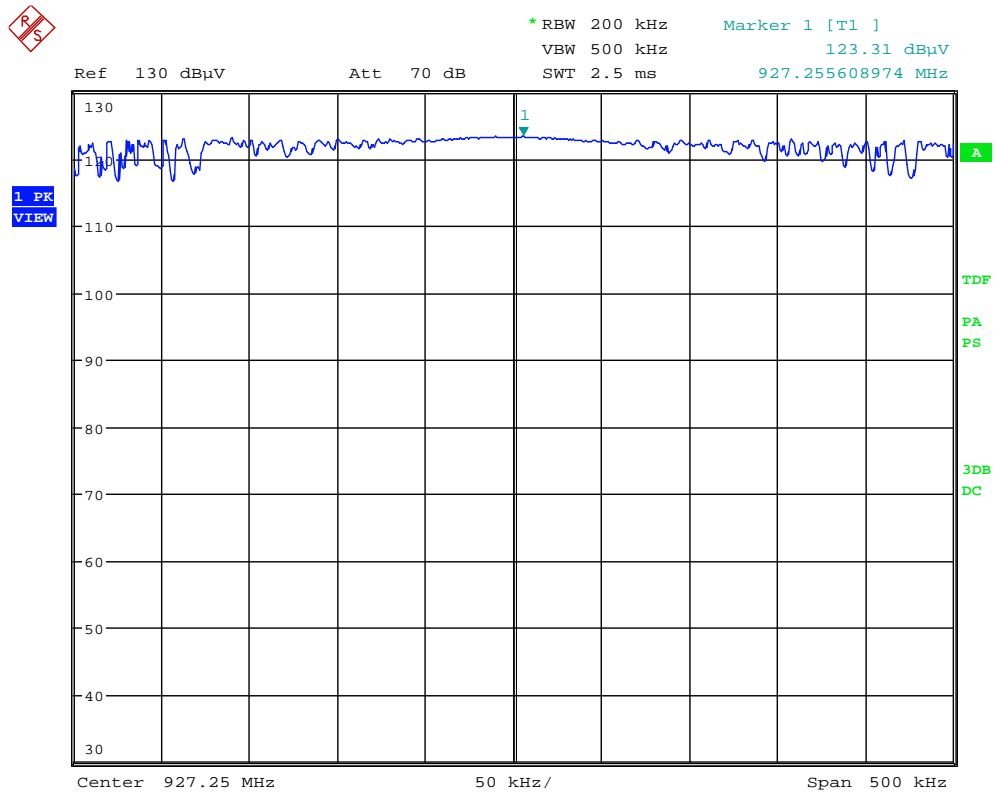
d is the distance in meters from which the field strength was measured.

P is the power in watts for which you are solving:

Frequency (MHz)	Measured field strength (V/m)	Measurement distance (m)	Gain of transmitting antenna (numeric)	Power (W)	Limit (W)
902.75	1.557758	3	2.82	0.26	≤ 1
915.25	1.554175	3	2.82	0.26	≤ 1
927.25	1.463862	3	2.82	0.23	≤ 1

Test Result:	Test passed
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7.9 Conducted Powerline Emission Measurement 150 kHz to 30 MHz

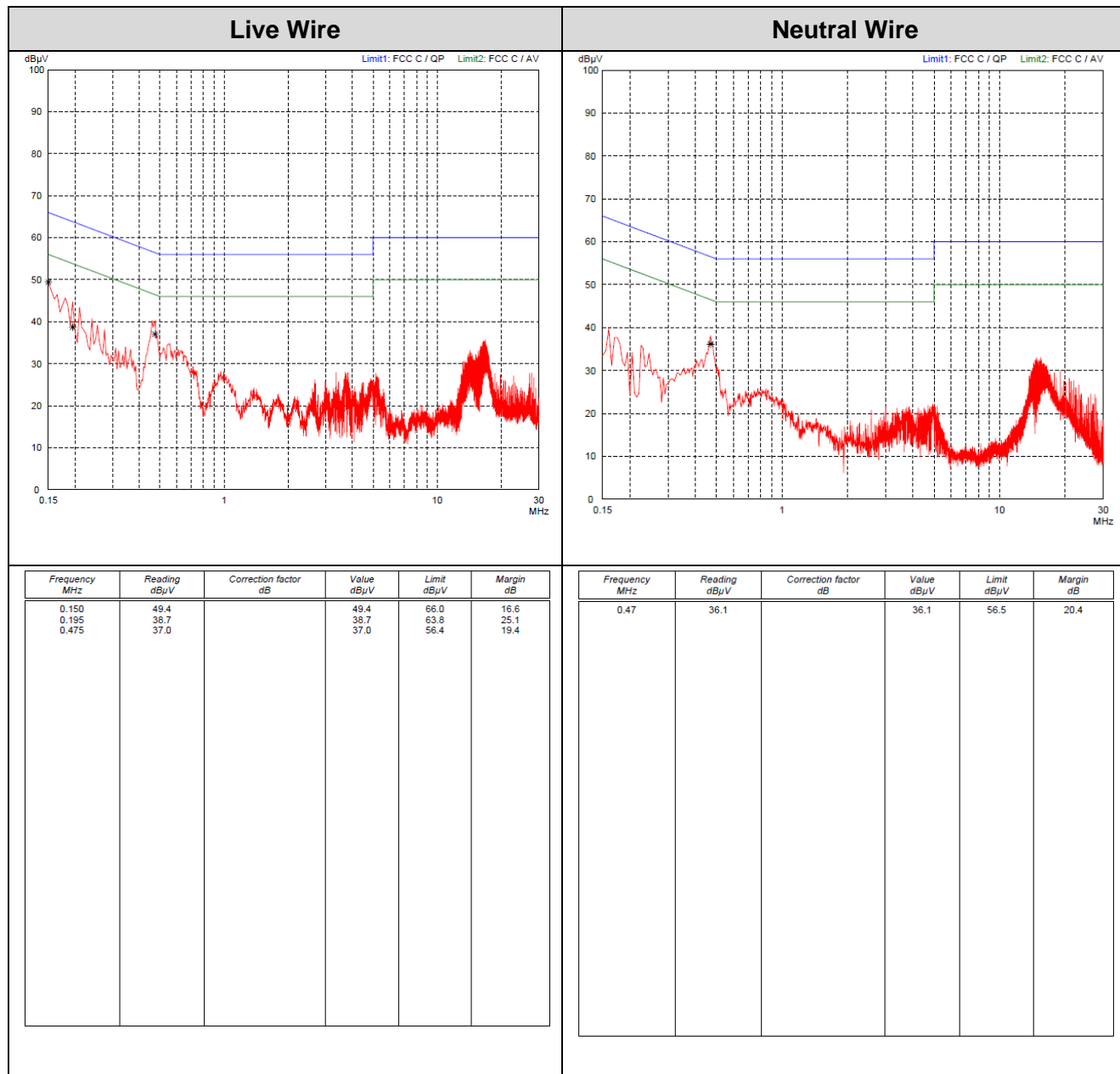
Rules and specifications:	CFR 47 Part 15, section 15.207 IC RSS-GEN Issue 3, section 7.2.4		
Guide:	ANSI C63.4 / CISPR 22		
Limit:	Frequency of Emission (MHz)	Conducted Limit (dBµV)	
		Quasi-peak	Average
	0.15 - 0.5	66 to 56	56 to 46
	0.5 - 5	56	46
	5 - 30	60	50
Measurement procedure:	Conducted AC Powerline Emission (6.3)		

Comment:	Operating mode 5 $U_{AC} = 115 \text{ V} / 60 \text{ Hz}$
Date of test:	30 July 2013
Test site:	Shielded room, cabin no. 1

Test Result:	Test passed
--------------	-------------

Tested on:

AC Input of the charging cradle, $U_{AC} = 115 \text{ V} / 60 \text{ Hz}$



Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB)}$$

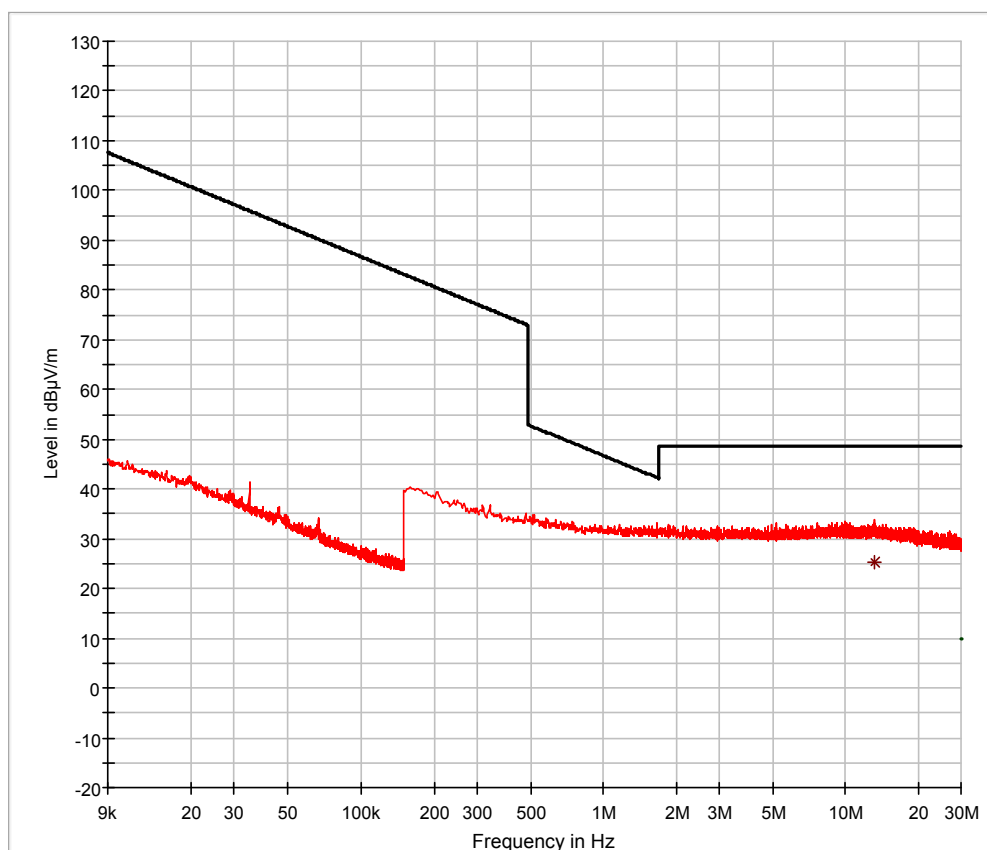
7.10 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.247(d), 15.205(a) and 15.209(a) IC RSS-210 Issue 8, section A8.5[4], 2.5[4] and 7.2.2[5]			
Guide:	ANSI C63.4			
Limit:	Frequency of Emission (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)	Measurement Distance d (meters)
	0.009 - 0.490	$2400/F(\text{kHz})$	$67.6 - 20 \cdot \log(F(\text{kHz}))$	300
	0.490 - 1.705	$24000/F(\text{kHz})$	$87.6 - 20 \cdot \log(F(\text{kHz}))$	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 (6.4)			

Comment:	Operating mode 1, 2, 3, 5
Date of test:	September 2, 2013
Test site:	Open field test site

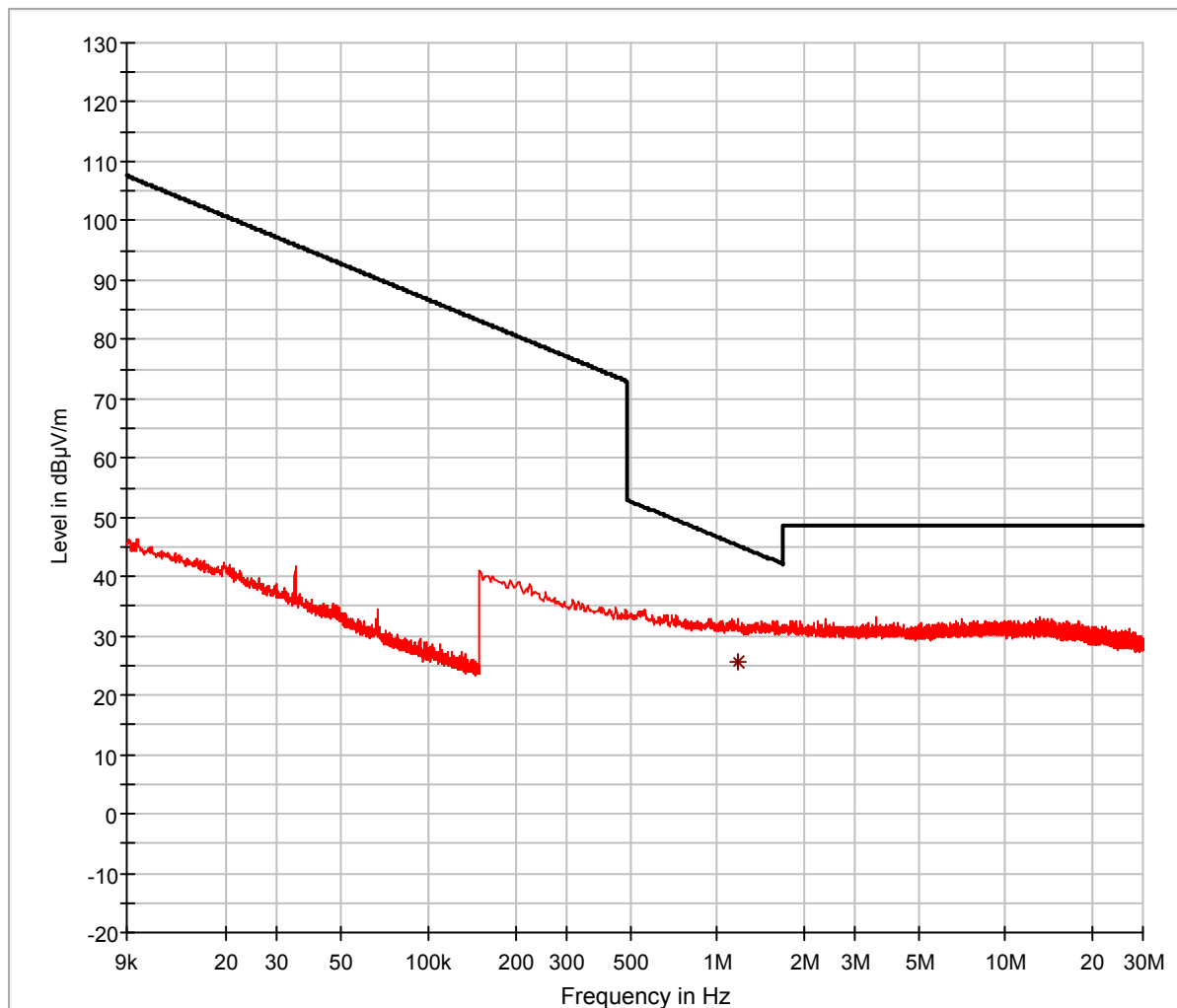
Test Result:	Test passed
--------------	-------------

Operating mode 1:



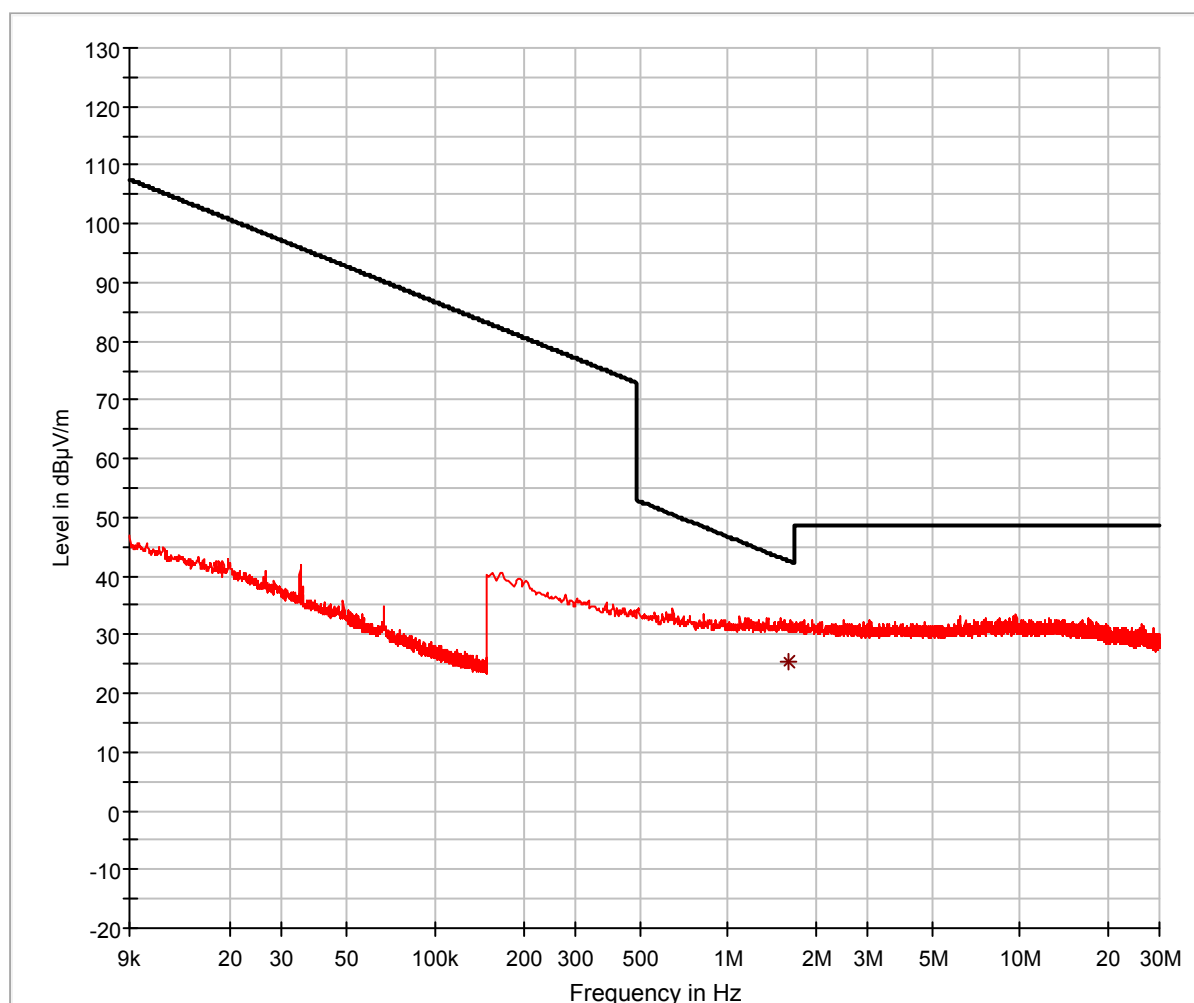
— FCC 15.209 mag (10 m) — DUMMY — Preview Result 1-PK+ * Final Result 1-QPK

Operating mode 2:



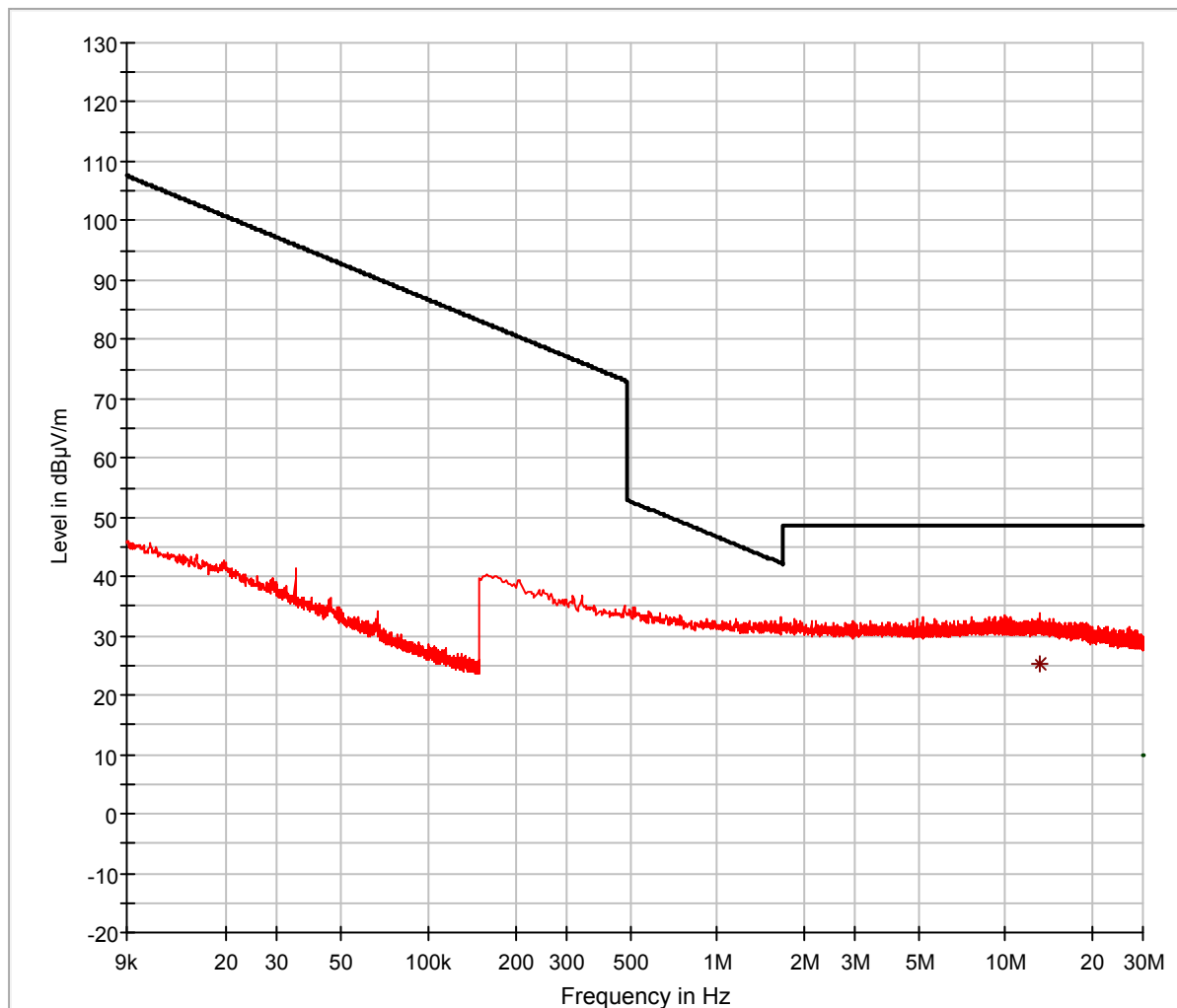
— FCC 15.209 mag (10 m) — Preview Result 1-PK+ * Final Result 1-QPK

Operating mode 3:



— FCC 15.209 mag (10 m) — EN 300 330 tx mag
 — Preview Result 1-PK+ * Final Result 1-QPK

Operating mode 5:



— FCC 15.209 mag (10 m) — DUMMY — Preview Result 1-PK+ * Final Result 1-QPK

Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)}$$

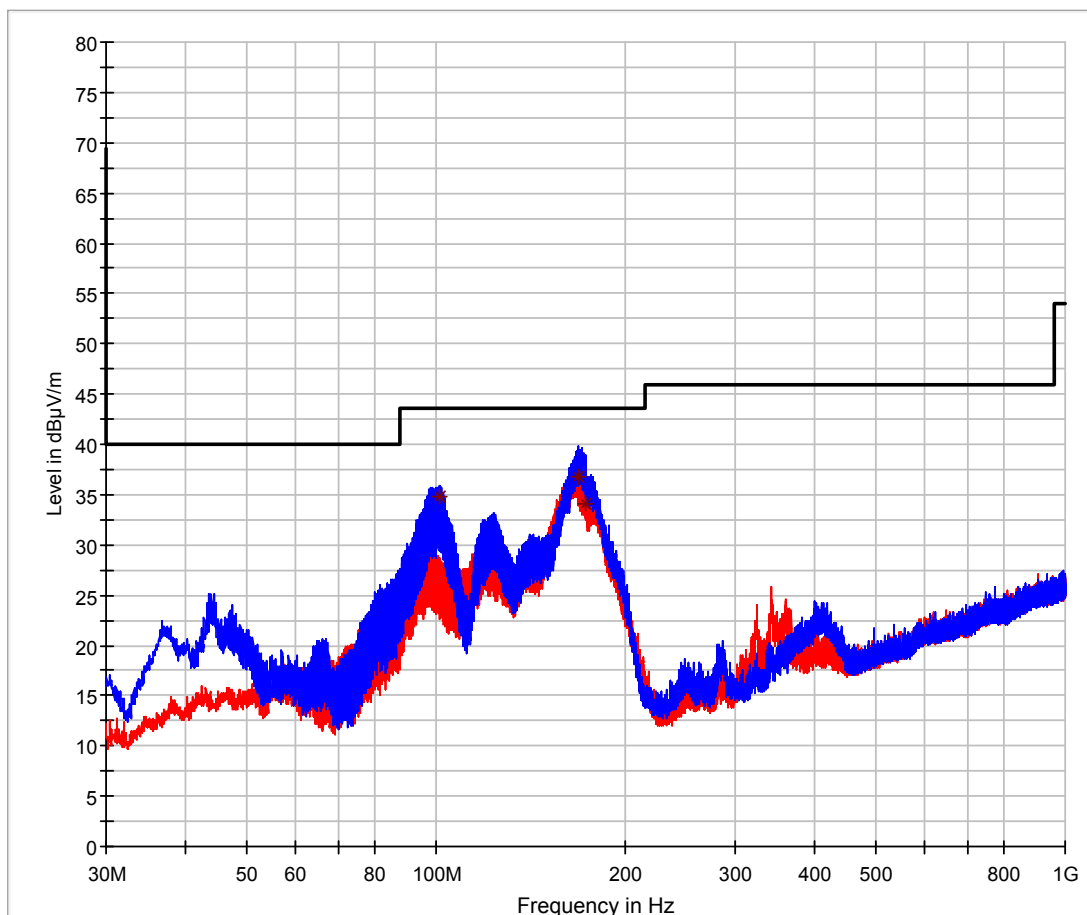
7.11 Radiated Emission Measurement 30 MHz to 10 GHz

Rules and specifications:	CFR 47 Part 15, sections 15.247(d), 15.205(a) and 15.209(a) IC RSS-210 Issue 8, section A8.5[4], 2.5[4] and 7.2.2[5]		
Guide:	ANSI C63.4		
Limit:	Frequency of Emission (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)
	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 (6.5)		

Comment:	Operating mode 1, 2, 3, 5
Date of test:	September 2, 3, 4, 2013
Test site:	Frequencies ≤ 1 GHz: Semi-anechoic room, cabin no. 8 Frequencies > 1 GHz: Fully anechoic room, cabin no. 2
Test distance:	3 meters

Test Result:	Test passed
--------------	-------------

Operating mode 5 Horizontal / Vertical Polarisation



— FCC 15.209
— Preview Result 1V-PK+
— Preview Result 1H-PK+
* Final Result 1-QPK

Final Results 1:

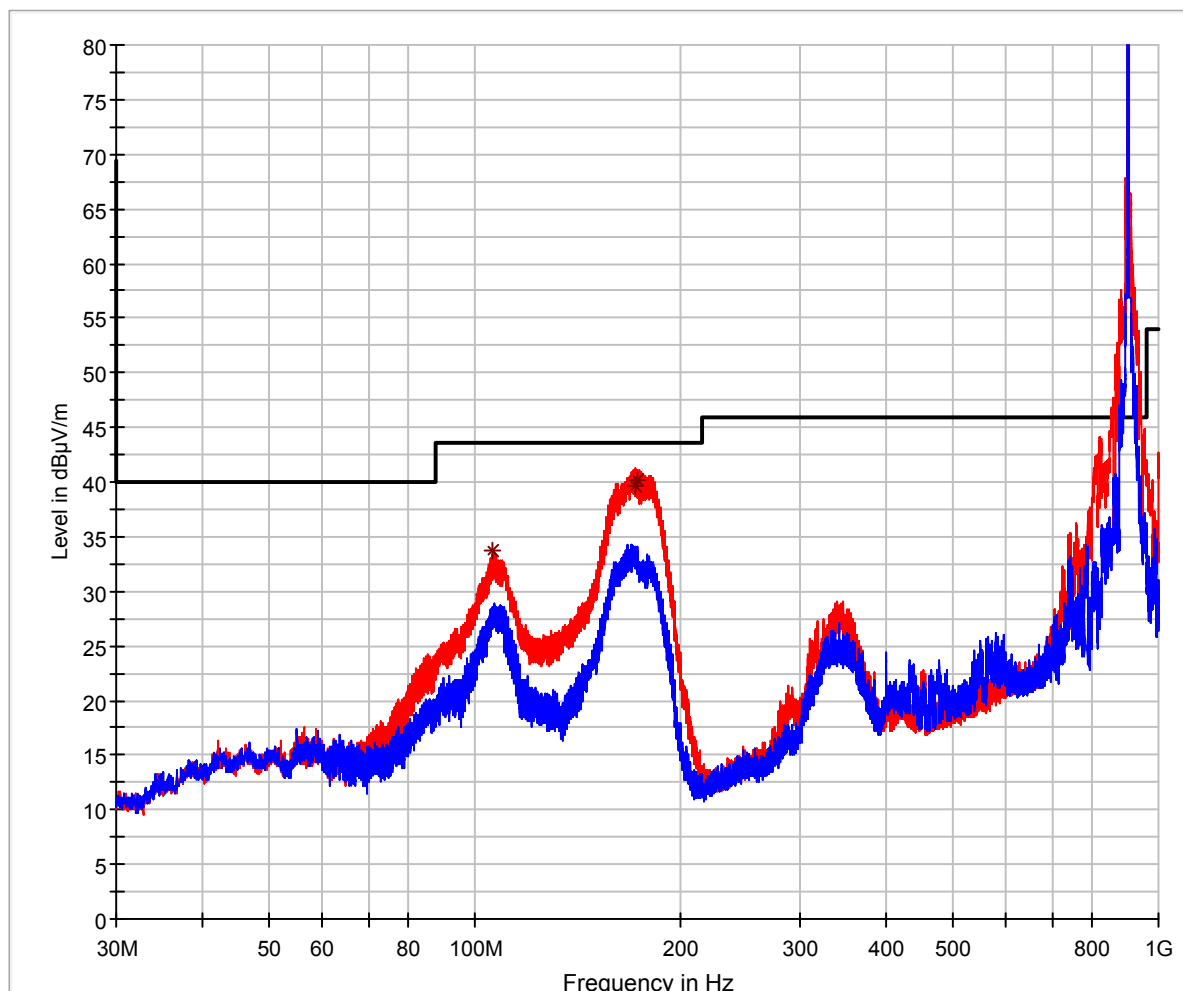
Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Margin dB	Limit dBµV/m
101,87	34,8	1000,0	120,000	116,0	V	-93,0	13,8	8,7	43,5
168,79	36,8	1000,0	120,000	100,0	V	5,0	10,4	6,7	43,5
173,41	34,1	1000,0	120,000	100,0	V	-11,0	10,4	9,4	43,5

Sample calculation of final values:

$$\text{Final Value (dBµV/m)} = \text{Reading Value (dBµV)} + \text{Correction Factor (dB/m)}$$

Operating mode 1:

Horizontal / Vertical Polarisation



— FCC 15.209
— Preview Result 1H-PK+
— Preview Result 1V-PK+
* Final Result 1-QPK

Final Results 1:

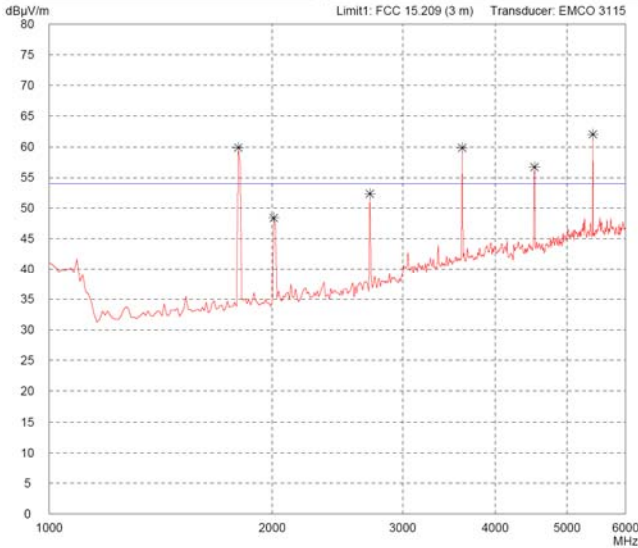
Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Margin dB	Limit dBµV/m
106,05	33,7	1000,0	120,000	304,0	H	95,0	13,8	9,8	43,5
172,61	39,7	1000,0	120,000	116,0	H	85,0	10,4	3,8	43,5
172,95	40,2	1000,0	120,000	151,0	H	95,0	10,4	3,3	43,5
*902,74	122,7	1000,0	120,000	216,0	H	-181,0	24,9	-76,7	

* Operating frequency!

Horizontal Polarisation

dBuV/m

Limit1: FCC 15.209 (3 m) Transducer: EMCO 3115



80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

1000 2000 3000 4000 5000 6000 MHz

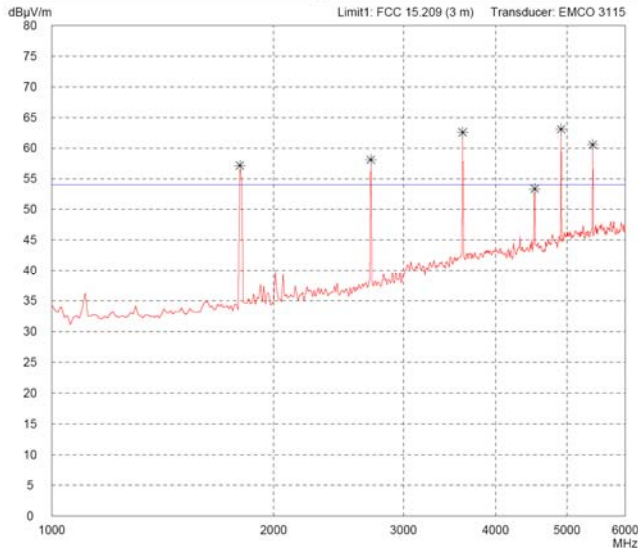
Frequency [MHz]	Reading [dBuV]	Correction factor [dB]	Value [dBuV/m]	Limit [dBuV/m]	Limit exceeded
1800.000000	28.61	31.27	59.88	102.7	
2010.000000	16.12	32.27	48.39	54.00	
2710.000000	17.70	34.64	52.34	54.00	
3610.000000	21.76	38.11	59.86	102.7	
4520.000000	16.94	39.77	56.70	102.7	
5420.000000	19.50	42.45	61.96	102.7	

* Unwanted emission of the operating frequency. Limit kept because the measurement values are 20 dB below the operating frequency level.
The measurements was carried out with Peak-detector.
The limit for the harmonics is 20dB below the measured fieldstrenght of the carrier frequency.

Vertical Polarisation

dBuV/m

Limit1: FCC 15.209 (3 m) Transducer: EMCO 3115

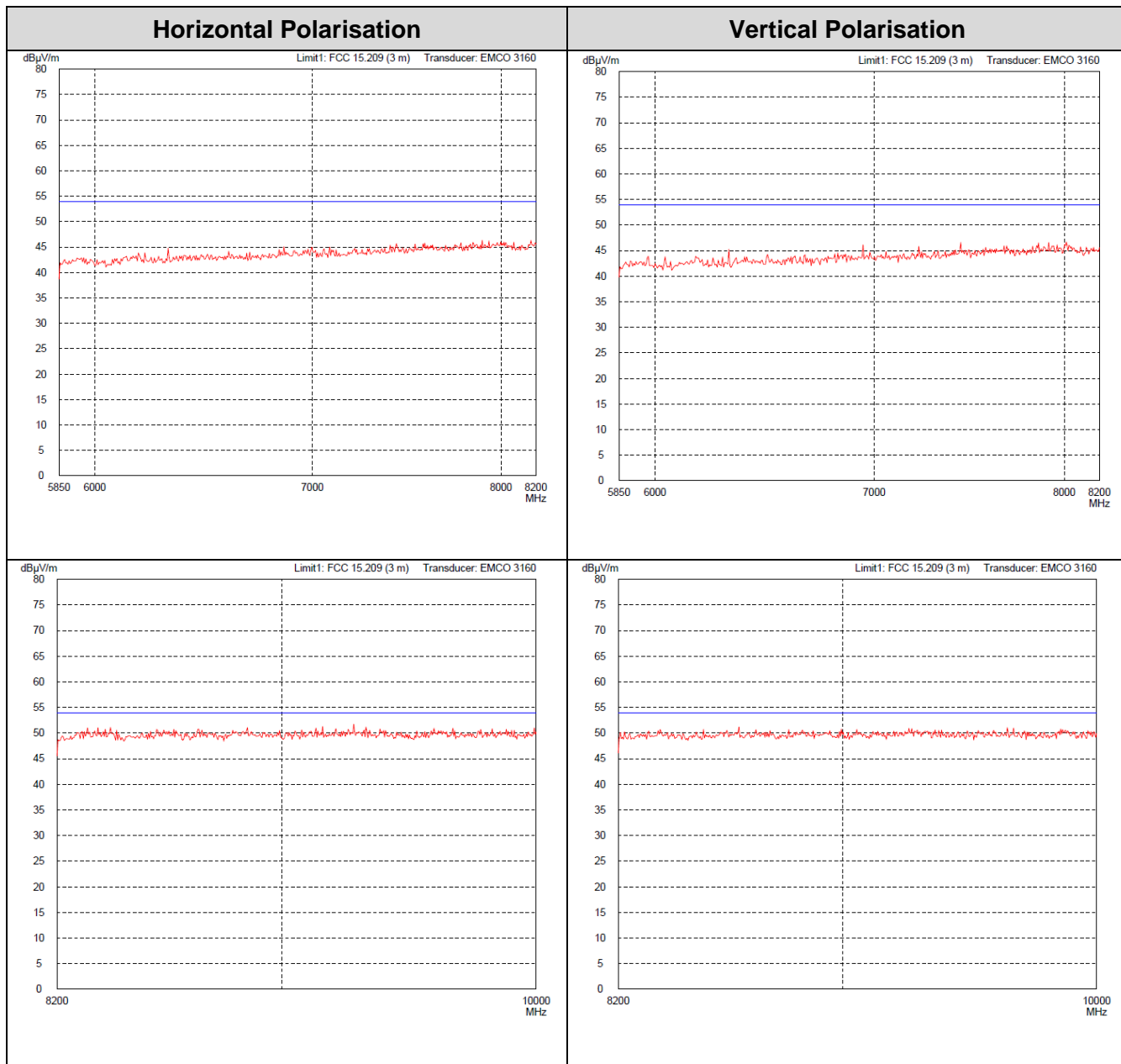


80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

1000 2000 3000 4000 5000 6000 MHz

Frequency [MHz]	Reading [dBuV]	Correction factor [dB]	Value [dBuV/m]	Limit [dBuV/m]	Limit exceeded
1800.000000	25.88	31.27	57.14	102.7	
2710.000000	23.43	34.64	58.07	102.7	
3610.000000	24.49	38.11	62.59	102.7	
4520.000000	13.56	39.77	53.33	54.00	
4910.000000	21.73	41.35	63.08	102.7	
5420.000000	18.07	42.45	60.53	102.7	

* Unwanted emission of the operating frequency. Limit kept because the measurement values are 20 dB below the operating frequency level.
The measurements was carried out with Peak-detector.
The limit for the harmonics is 20dB below the measured fieldstrenght of the carrier frequency.

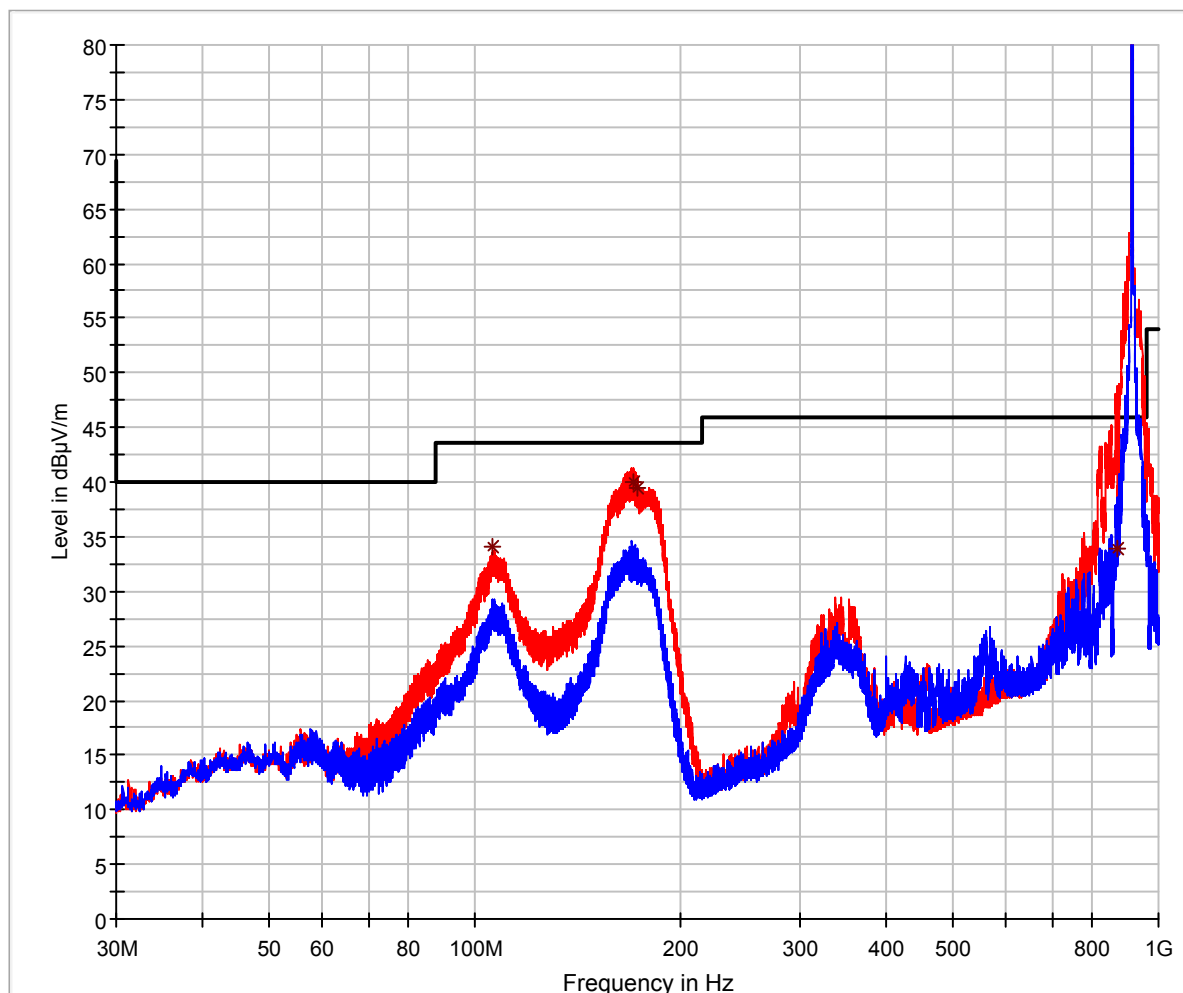


Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)}$$

Operating mode 2:

Horizontal / Vertical Polarisation

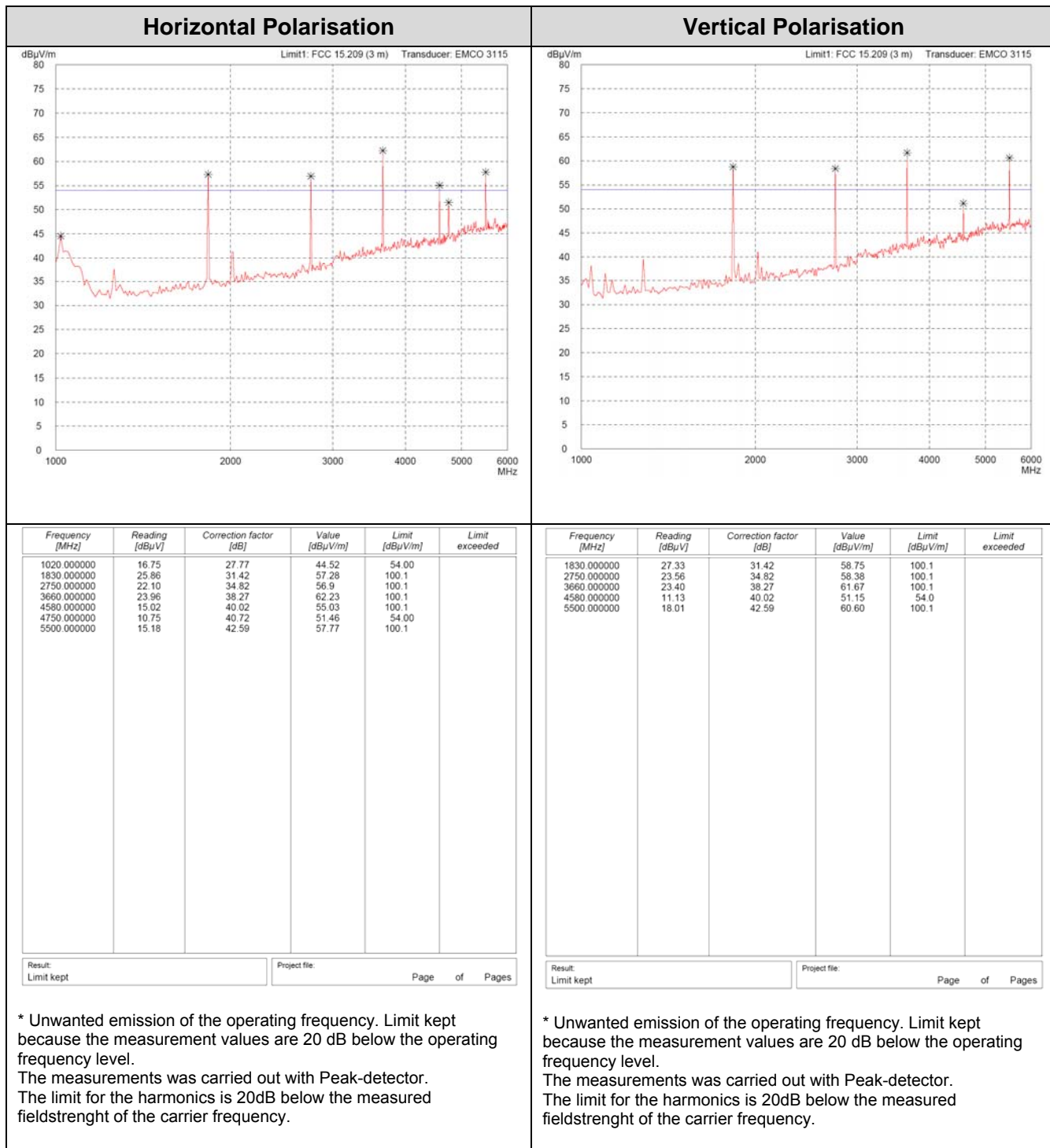


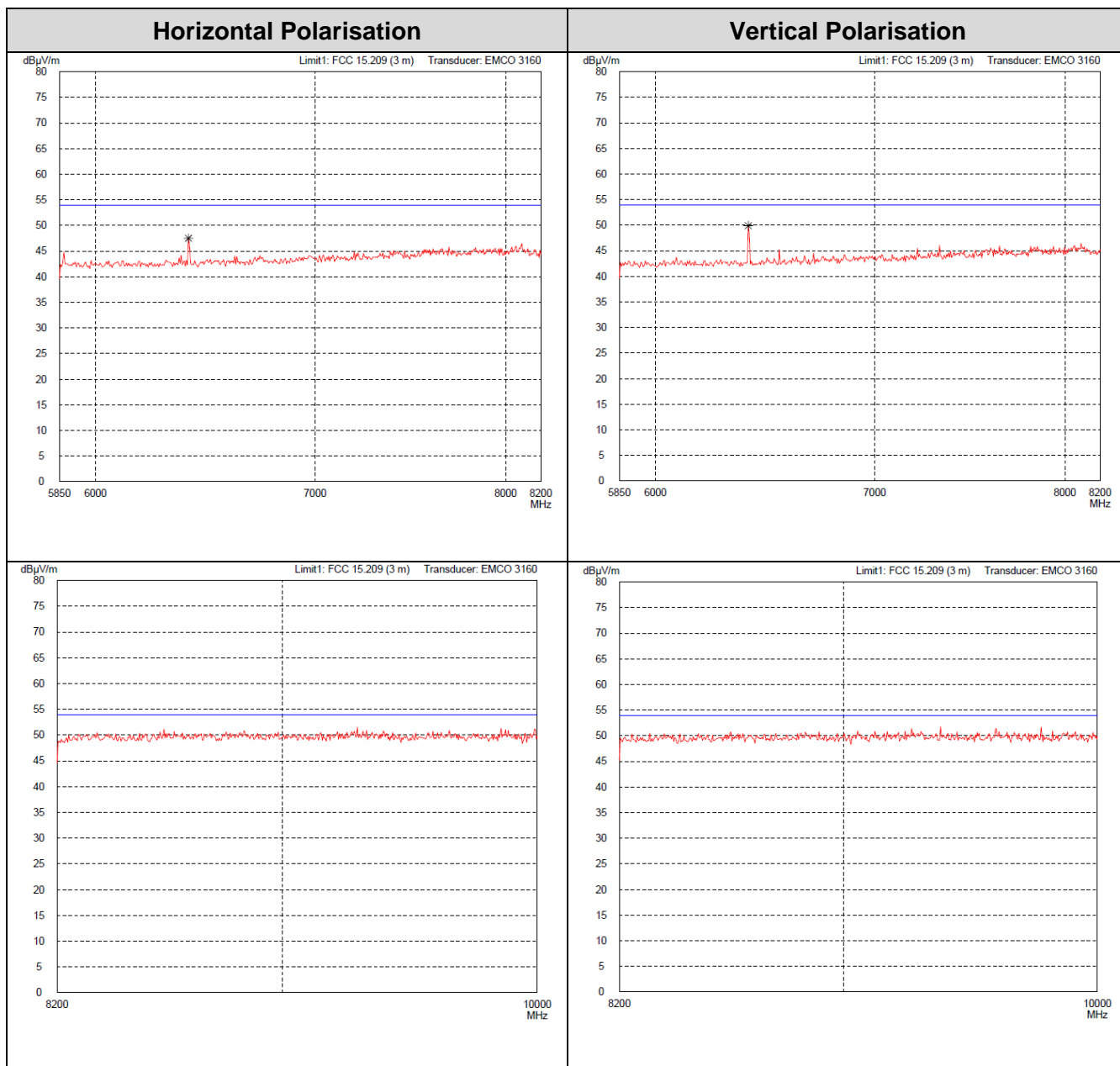
— FCC 15.209
— Preview Result 1H-PK+
— Preview Result 1V-PK+
* Final Result 1-QPK

Final Results 1:

Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Margin dB	Limit dBµV/m
106,44	34,1	1000,0	120,000	323,0	H	90,0	13,7	9,4	43,5
170,67	40,1	1000,0	120,000	158,0	H	95,0	10,4	3,4	43,5
173,30	39,5	1000,0	120,000	150,0	H	91,0	10,4	4,0	43,5
871,16	34,0	1000,0	120,000	152,0	H	-181,0	24,6	12,0	46,0
915,26*	120,1	1000,0	120,000	320,0	H	-181,0	25,1	-74,1	

* Operating frequency!



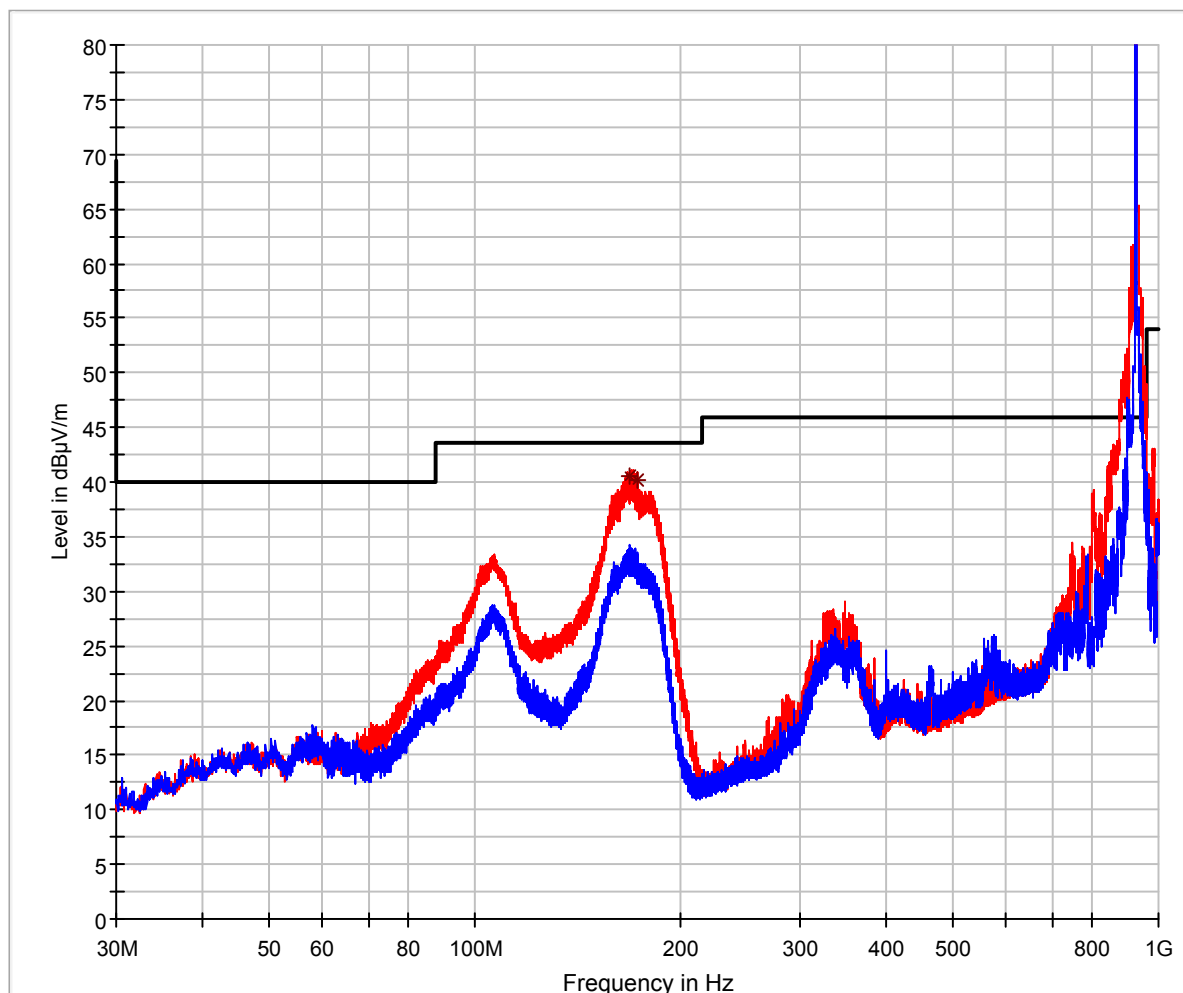


Sample calculation of final values:

$$\text{Final Value (dBµV/m)} = \text{Reading Value (dBµV)} + \text{Correction Factor (dB/m)}$$

Operating mode 3:

Horizontal / Vertical Polarisation

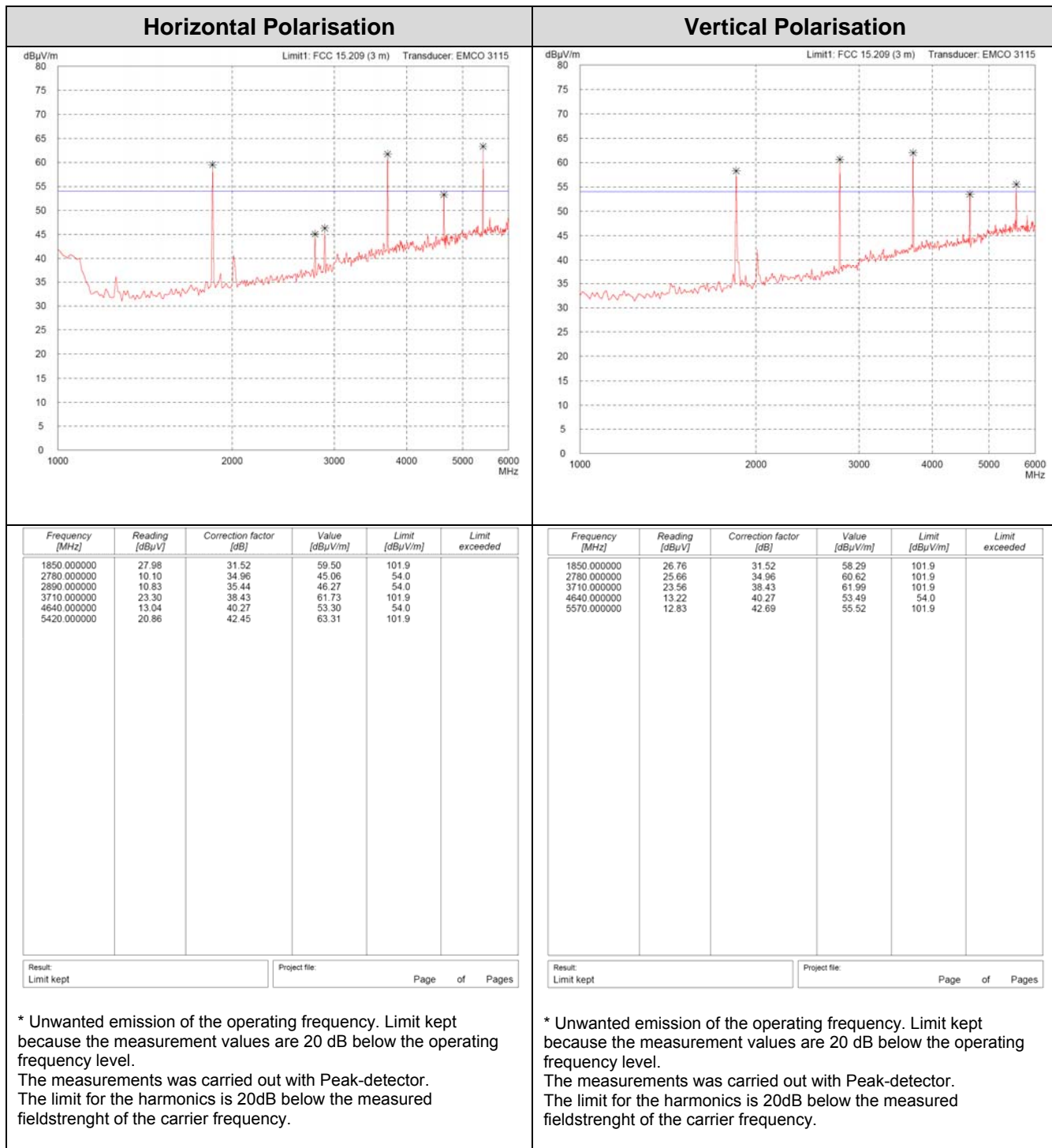


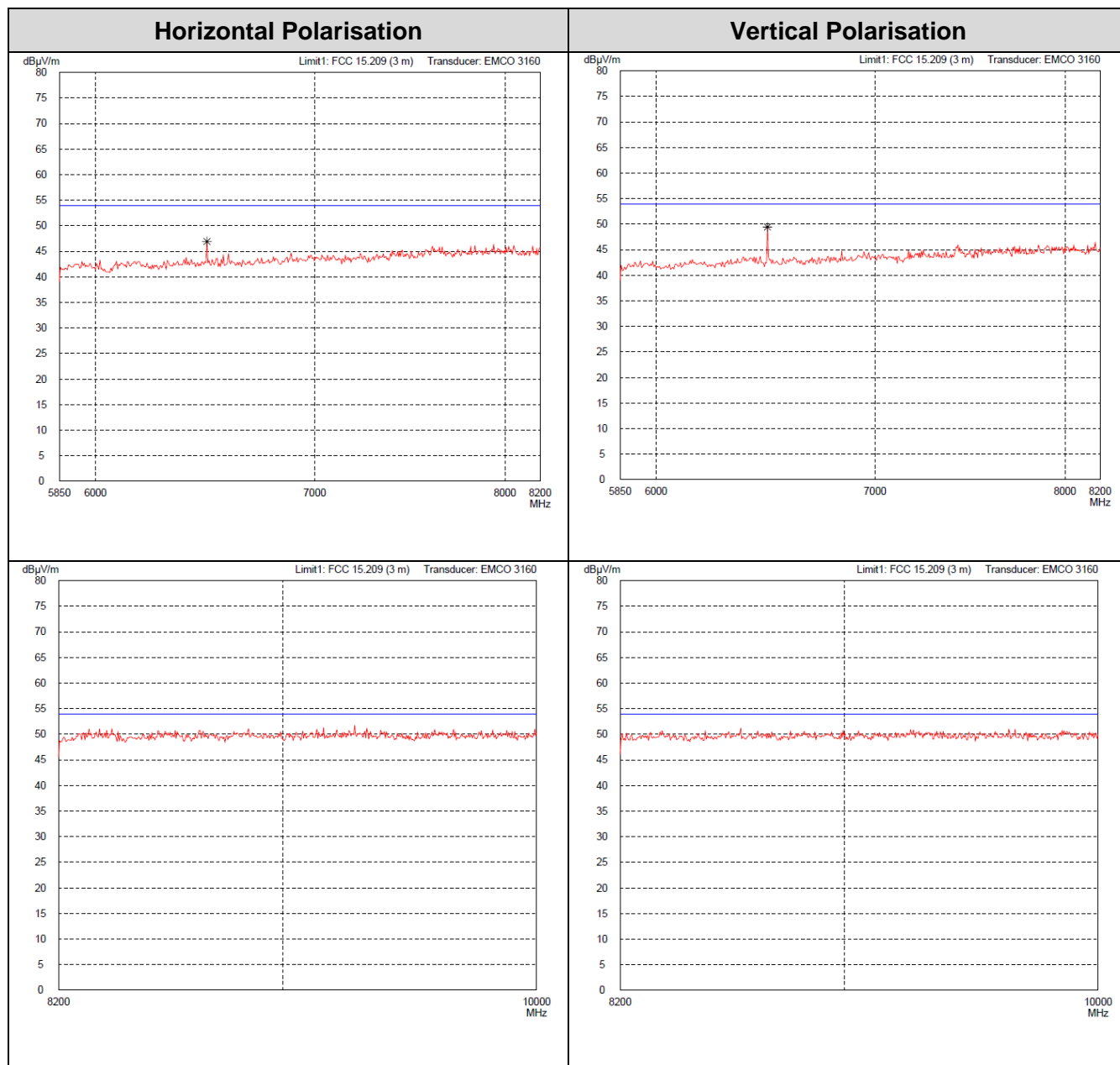
— FCC 15.209
— Preview Result 1H-PK+
— Preview Result 1V-PK+
* Final Result 1-QPK

Final Results 1:

Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Margin dB	Limit dBµV/m
169,18	40,6	1000,0	120,000	147,0	H	88,0	10,4	2,9	43,5
173,00	40,1	1000,0	120,000	116,0	H	90,0	10,4	3,4	43,5
927,26*	121,9	1000,0	120,000	210,0	H	-186,0	25,2	-75,9	

* Operating frequency!





Sample calculation of final values:

$$\text{Final Value (dBµV/m)} = \text{Reading Value (dBµV)} + \text{Correction Factor (dB/m)}$$

7.12 RF exposure requirement

Rules and specifications:	CFR 47 Part 15, section 15.247(i) CFR 47 Part 1, sections 1.1307(b)(1)				
Guide:	OET Bulletin 65, Edition 97-01				
Limits:	Limits for general population / uncontrolled exposure				
	Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time (minutes)
	0.3 - 1.34	614	1.63	(100)*	30
	1.34 - 30	824 / f	2.19 / f	(180 / f ²)*	30
	30 - 300	27.5	0.073	0.2	30
	300 - 1500	---	---	f/1500	30
	1500 - 100000	---	---	1.0	30
	f = frequency in MHz * Plane-wave equivalent power density				

Spectral power density		Declared by applicant	Measured
Prediction ⁷ :	$S = P G / 4 \pi R^2$		
Where:	<p>S = Power density</p> <p>P = Power input of antenna</p> <p>G = Power gain of the antenna relativ to an isotropic radiator</p> <p>R = Distance to the center of radiation of the antenna</p>		
Maximum output power:	P = 28.6 dBm = 724.44 mW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Antenna gain:	G = 2.5 dBi = 2.82	<input checked="" type="checkbox"/>	
Prediction distance:	R = 20 cm		
Power density at 20 cm:	S = 0.406 mW/cm²		
Limit	S_{lim} = 0.602 mW/cm²		

Test Result:	Test passed
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⁷ MPE Prediction of MPE according to equation from page 19 of OET Bulletin 65, Ed. 97-01

Exposure of Humans to RF Fields (continued)	Applicable	Declared by applicant	Measured	Exemption
Separation distance between the user and the transmitting device is				
<input checked="" type="checkbox"/> less than or equal to 20 cm <input type="checkbox"/> greater than 20 cm		<input checked="" type="checkbox"/>		
Transmitting device is				
<input type="checkbox"/> in the vicinity of the human head <input checked="" type="checkbox"/> body-worn		<input checked="" type="checkbox"/>		
SAR evaluation				
<p>SAR evaluation is required if the separation distance between the user and the device is less than or equal to 20 cm.</p> <p><input checked="" type="checkbox"/> The device operates from 3 kHz up to 1 GHz inclusively and with output power (i.e. the higher of the conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 200 mW for general public use and 1000 mW for controlled use.</p> <p><input type="checkbox"/> ;</p> <p><input type="checkbox"/> The device operates above 1 GHz and up to 2.2 GHz inclusively and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 100 W for general public use and 500 W for controlled use.</p> <p><input type="checkbox"/> The device operates above 2.2 GHz and up to 3 GHz inclusively and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 20 mW for general public use and 100 mW for controlled use.</p> <p><input type="checkbox"/> The device operates above 3 GHz and up to 6 GHz inclusively and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 10 mW for general public use and 50 mW for controlled use.</p> <p><input type="checkbox"/> SAR evaluation is documented in test report no.</p>				<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
RF exposure evaluation				
<p>RF exposure evaluation is required if the separation distance between the user and the device is greater than 20 cm.</p> <p><input checked="" type="checkbox"/> The device operates below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W.</p> <p><input type="checkbox"/> The device operates at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.</p> <p><input type="checkbox"/> RF exposure evaluation is documented in test report no.</p>				<input checked="" type="checkbox"/> <input type="checkbox"/>

8 Referenced Regulations

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

<input checked="" type="checkbox"/>	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, 2012
<input checked="" type="checkbox"/>	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	October 1, 2012
<input checked="" type="checkbox"/>	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)
<input type="checkbox"/>	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)
<input checked="" type="checkbox"/>	RSS-Gen	Radio Standards Specification RSS-Gen Issue 3 containing General Requirements and Information for the Certification of Radiocommunication Equipment, published by Industry Canada	December 2010
<input checked="" type="checkbox"/>	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
<input type="checkbox"/>	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
<input checked="" type="checkbox"/>	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
<input type="checkbox"/>	ICES-003	Interference-Causing Equipment Standard ICES-003 Issue 4 for Digital Apparatus, published by Industry Canada	February 7, 2004
<input checked="" type="checkbox"/>	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

<input type="checkbox"/>	CAN/CSA- CEI/IEC CISPR 22	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment	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)	
<input type="checkbox"/>	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
<input checked="" type="checkbox"/>	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
V-network	1059	ESH3-Z5	894785/005	Rohde & Schwarz	Rohde & Schwarz	08/2013	08/2015
V-network	1060	ESH3-Z5	862770/021	Rohde & Schwarz	Rohde & Schwarz	05/2012	05/2014
V-network	1218	ESH3-Z5	830952/025	Rohde & Schwarz	Rohde & Schwarz	08/2011	08/2013
EMI test receiver	1028	ESHS10	860043/016	Rohde & Schwarz	Rohde & Schwarz	03/2013	09/2014
EMI test receiver	2044	ESU8	100232	Rohde & Schwarz	Rohde & Schwarz	07/2012	01/2014
Spectrum analyser	1666	FSP30	100063	Rohde & Schwarz	Rohde & Schwarz	11/2012	05/2014
Preamplifier	1651	CPA9231A	3393	Schaffner Electrotest	TÜV SÜD PS-EMC-STR	09/2012	09/2014
Double ridged waveguide horn antenna	1516	3115	9508-4553	EMCO Elektronik	Seibersdorf Laboratories	11/2012	11/2014
Horn antenna	1014	3160-07	9112-1008	EMCO Elektronik		see note 1	
Loop antenna	1016	HFH2-Z2	882964/0001	Rohde & Schwarz	Rohde & Schwarz	11/2012	05/2014
TRILOG Broadband Antenna	1802	VULB 9163	9163-214	Schwarzbeck	Rohde & Schwarz	05/2013	11/2014
TRILOG Broadband Antenna	2058	VULB 9163	9163-408	Schwarzbeck	Rohde & Schwarz	11/2012	05/2014

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			
<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	09-18-2013	M. Biberger	First Edition
2	12-02-2013	M. Biberger	Second Edition, OBW, Note to radiated emission added, Test instruments used changed