



SENTON

Choose certainty.
Add value.

April 14, 2010

Prüfbericht / Test Report

Nr. / No. 69861-00626-2 (Edition 4)

Applicant: Identec Solutions AG
Type of equipment: RDID Reader
Type designation: i-PORT M350 RTLS
Order No.: 1930298
Test standards: FCC Code of Federal Regulations,
CFR 47, Part 15,
Sections 15.107, 15.109, 15.205, 15.207, 15.215 and 15.247

Industry Canada Radio Standards Specifications
RSS-Gen Issue 2, Sections 7.2.2, 7.2.3 and
RSS-210 Issue 7, Sections 2.2, A2.9 (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	4
3	Identification of the Test Laboratory.....	5
4	Summary.....	6
5	Operation Mode and Configuration of EUT	7
6	Measurement Procedures.....	8
6.1	Conducted Maximum Transmitter Power.....	8
6.2	Bandwidth Measurements	10
6.3	Conducted AC Powerline Emission	12
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 Open Field Test Site	18
7	Photographs Taken During Testing.....	20
8	Test Results for Transmitter	24
8.1	Restricted Band & Band Edge Compliance	25
8.2	Channel Bandwidth.....	27
8.3	Carrier Power Measurement.....	29
8.4	Spurious Emissions	31
8.5	Power Spectral Density.....	47
8.6	Antenna connector requirement.....	51
8.7	Conducted Powerline Emission Measurement 150 kHz to 30 MHz.....	52
8.8	Radiated Emission Measurement 9 kHz to 30 MHz.....	55
8.9	Exposure of Humans to RF Fields	57
9	Test Results for Receiver.....	59
9.1	Radiated Emission Measurement 30 MHz to 12.75 GHz.....	60
10	Referenced Regulations.....	64
11	Revision History	66

1 Description of the Equipment Under Test (EUT)

General data of EUT	
Type designation ¹ :	i-PORT M350 RTLS
Parts ² :	
Serial number(s):	<Serial Number>
Manufacturer:	Identec Solutions AG
Type of equipment:	RDID Reader
Version:	As delivered
FCC ID:	<FCC ID>
Additional parts/accessories:	

Technical data of EUT	
Application frequency range:	2400 -2483.5 MHz
Frequency range:	2400 – 2483.5 MHz
Operating frequency:	12 overlapping channel with 5 MHz spacing starting at 2412 MHz up to 2472 MHz
Type of modulation:	F1D
Pulse train:	N/A
Pulse width:	N/A
Number of RF-channels:	12
Channel spacing:	N/A
Designation of emissions ³ :	
Type of antenna:	External
Type of antenna:	Huber + Suhner 90A-2400/360/6/0/V: 6.0 dBi, 50 ohms 2400 – 2500 MHz
Connection of antenna:	<input checked="" type="checkbox"/> detachable <input type="checkbox"/> not detachable
Type of power supply:	DC supply
Specifications for power supply:	nominal voltage: 24 V minimum voltage: 18 V maximum voltage: 30 V nominal frequency: DC Hz

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.

³ Also known as "Class of Emission".



2 Administrative Data

Application details

Applicant (full address):	Identec Solutions AG Millenium Park 2 A-6890 Lustenau - Austria
Contact person:	Hans-Guenther Meuthen
Order number:	1930298
Receipt of EUT:	21 July 2009
Date(s) of test:	August 2009
Note(s):	Mr Meuthen attended testing on 21 and 22 July 2009

Report details

Report number:	69861-00626-2
Edition:	3
Issue date:	April 14, 2010



3 Identification of the Test Laboratory

Details of the Test Laboratory

Company name:	TÜV SÜD SENTON GmbH
Address:	Aeussere Fruehlingstrasse 45 D-94315 Straubing Germany
Laboratory accreditation:	DAR-Registration No. DAT-P-171/94-02
FCC test site registration number	90926
Industry Canada test site registration:	3050A-1
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 and 15.247

of the Federal Communication Commission (FCC) and the

**Radio Standards Specifications
RSS-Gen Issue 2, Sections 7.2.2, 7.2.3 and
RSS-210 Issue 7, Sections 2.2, A2.9 (Category I Equipment)**

of Industry Canada (IC).

Personnel involved in this report

Laboratory Manager:



Mr. Johann Roidt

Responsible for testing:

Mr. Johann Roidt

Responsible for test report:

Mr. Johann Roidt



5 Operation Mode and Configuration of EUT

Operation Mode(s)

Transmitter operating continuously,
 full tests were performed on lowest, middle and highest RF channel.

Lowest RF Channel (01) = 2412 MHz

Middle RF Channel (08) = 2442 MHz

Highest RF Channel (15) = 2472 MHz

CW for spurious emission measurements, modulated for bandwidth measurements.

Configuration(s) of EUT

The reader was connected to a Notebook PC outside the testing area

List of ports and cables

<i>Port</i>	<i>Description</i>	<i>Classification⁴</i>	<i>Cable type</i>	<i>Cable length</i>
1	RS 485 Master / Slave	dc power	Shielded	> 3 m
		signal/control port	Shielded	

List of devices connected to EUT

<i>Item</i>	<i>Description</i>	<i>Type Designation</i>	<i>Serial no. or ID</i>	<i>Manufacturer</i>
1	Notebook PC	Latitude D 620	N/A	Dell Computers
2	USB-Serial Converter	N/A	N/A	N/A
3	Serial – RS 485 Converter	N/A	N/A	Identec Solutions AG
4				

List of support devices

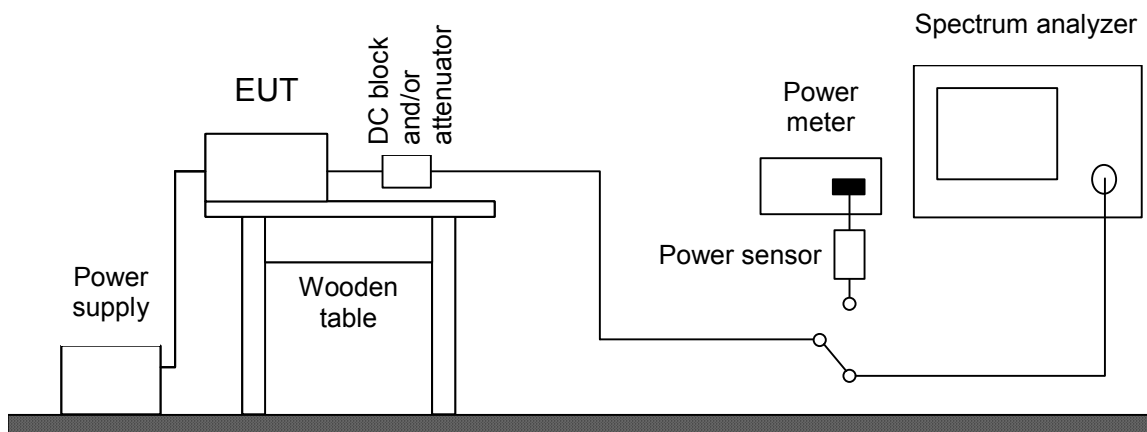
<i>Item</i>	<i>Description</i>	<i>Type Designation</i>	<i>Serial no. or ID</i>	<i>Manufacturer</i>
1	AC Adapter 24 V DC			
2				

⁴ Ports shall be classified as ac power, dc power or signal/control port

6 Measurement Procedures

6.1 Conducted Maximum Transmitter Power

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 2, section 2.1046(a), CFR 47, Part 15, section 15.247 IC RSS-Gen Issue 2, section 4.8
Guide:	CFR 47 Part 2, section 2.1046 / IC RSS-Gen Issue 2
<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>	



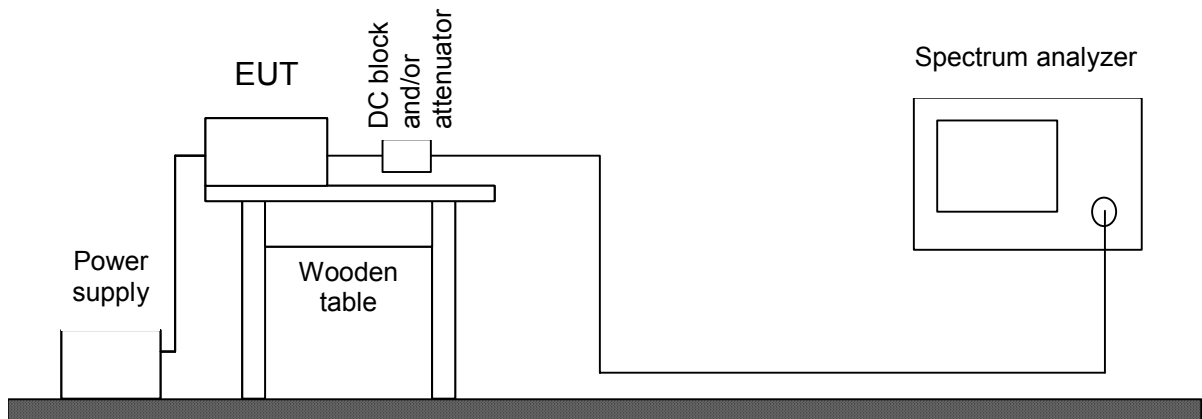


Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
<input 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 839587/006	Rohde & Schwarz
<input checked="" type="checkbox"/>	Power meter	NRVS	836856/015	Rohde & Schwarz
<input checked="" type="checkbox"/>	Peak power sensor	NRV-Z31	8579604.03	Rohde & Schwarz
<input type="checkbox"/>	Power sensor	NRV-Z52	837901/030	Rohde & Schwarz
<input checked="" 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 2, section 2.202(a) CFR 47 Part 15, section 15.215(c) IC RSS-Gen Issue 2, sections 4.6.1 and 4.6.2 IC RSS-210 Issue 7, section A1.1.3 ANSI C63.4, annex H.6
Guide:	ANSI C63.4 / IC RSS-Gen Issue 2, sections 4.6.1 and 4.6.2
Measurement setup:	<input checked="" type="checkbox"/> Conducted: See below <input 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>	



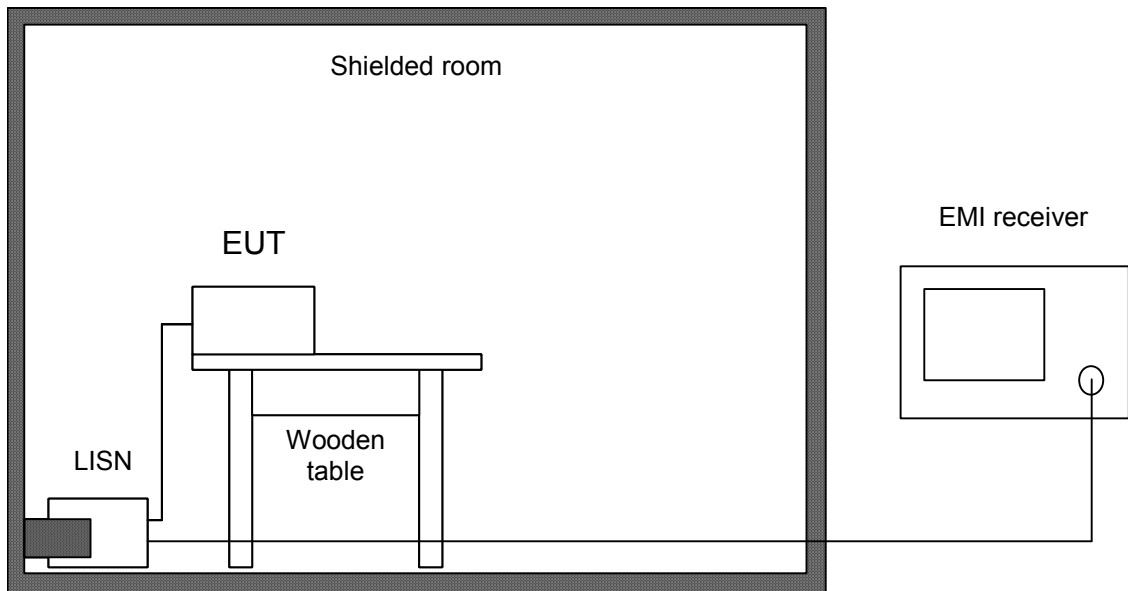


Test instruments used for conducted measurements:

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 839587/006	Rohde & Schwarz
<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

6.3 Conducted AC Powerline Emission

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.107 and 15.207 IC RSS-Gen Issue 2, section 7.2.2
Guide:	ANSI C63.4 (CISPR 22)
<p>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:</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	



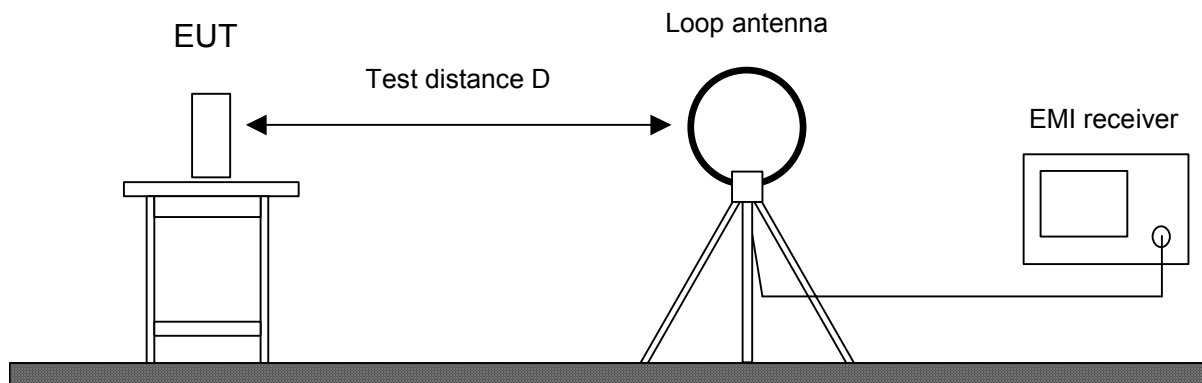


Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	EMI receiver	ESHS 10	860043/016	Rohde & Schwarz
<input type="checkbox"/>	LISN	ESH3-Z5	862770/021	Rohde & Schwarz
<input checked="" 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, sections 15.215(b) and 15.231(b)(3) IC RSS-210 Issue 7, section A1.1.2(b)
Guide:	ANSI C63.4
<p>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.</p> <p>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.</p> <p>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).</p> <p>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.</p> <p>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 15.35I. 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.</p>	

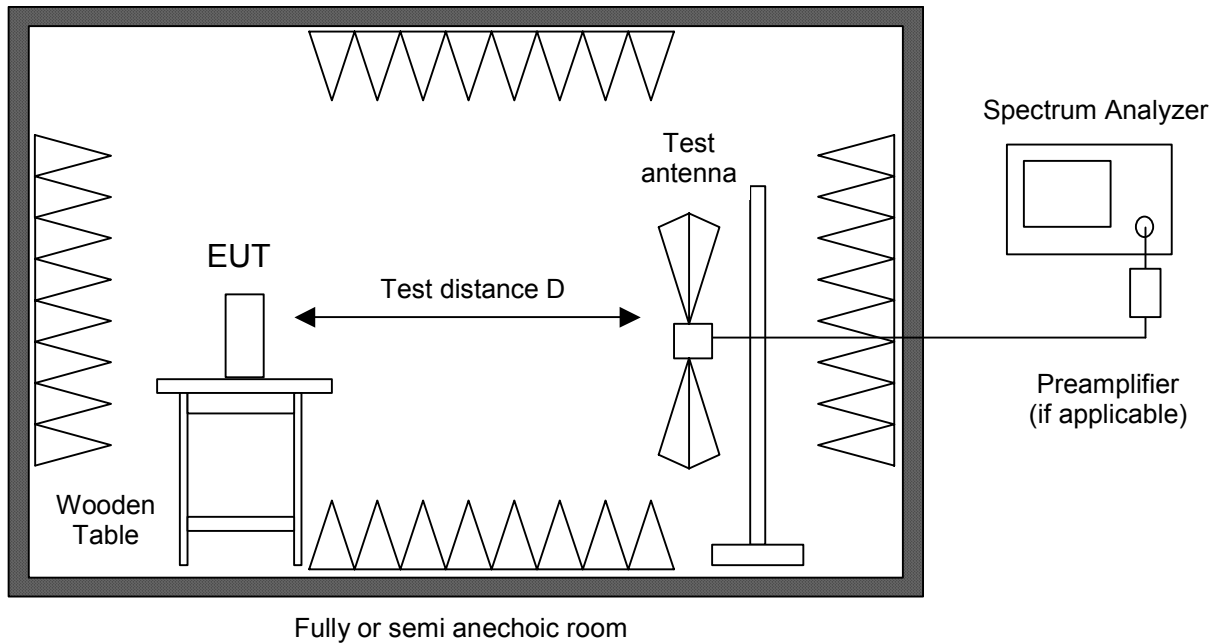


Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
<input type="checkbox"/>	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
<input checked="" type="checkbox"/>	EMI test receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
<input type="checkbox"/>	Test receiver	ESHS 10	860043/016	Rohde & Schwarz
<input type="checkbox"/>	Preamplifier	CPA9231A	3393	Schaffner
<input checked="" 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, sections 15.109, 15.215(b) and 15.247 IC RSS-Gen Issue 2, sections 6(a), 7.2.3.2 IC RSS-210 Issue 7, section A2.9
Guide:	ANSI C63.4
<p>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.</p> <p>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).</p> <p>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.</p> <p>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.</p> <p>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 15.351. 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.</p> <p>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.</p> <p>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.</p> <p>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.</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	101018	Rohde & Schwarz
<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 checked="" 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 checked="" type="checkbox"/>	Horn antenna	3160-08	9112-1002	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-09	9403-1025	EMCO
<input checked="" 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 Open Field Test Site

Measurement Procedure:

Rules and specifications: CFR 47 Part 15, sections 15.109, 15.215(b) and 15.247
 IC RSS-Gen Issue 2, sections 6(a), 7.2.3.2
 IC RSS-210 Issue 7, section A2.9

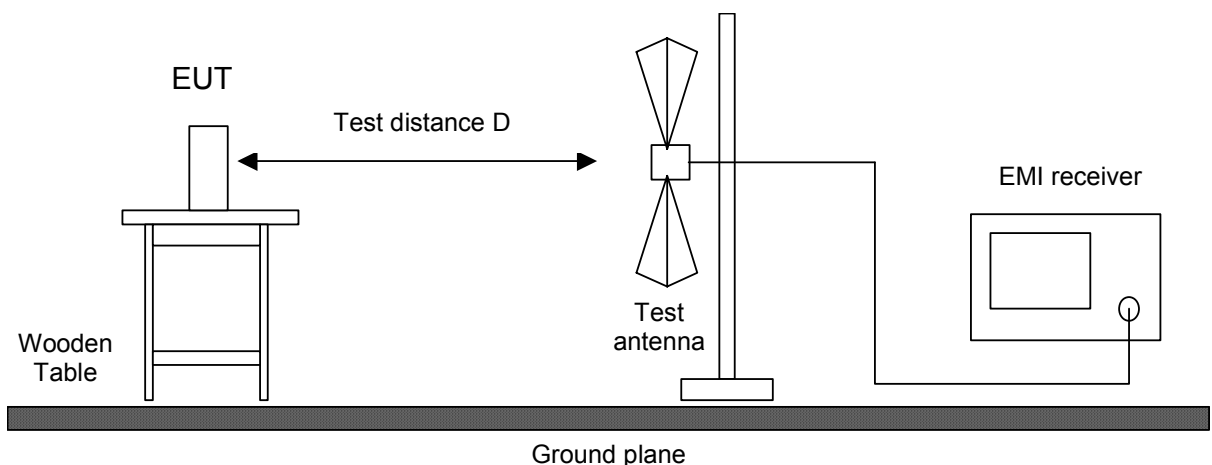
Guide: ANSI C63.4

Radiated emission at open field test site is measured in the frequency range 30 MHz to 1 GHz using a biconical antenna up to 300 MHz and a logarithmic periodic antenna above. 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 15.35I. 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 the fully anechoic room. EUT is rotated all around and receiving antenna is raised and lowered 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.





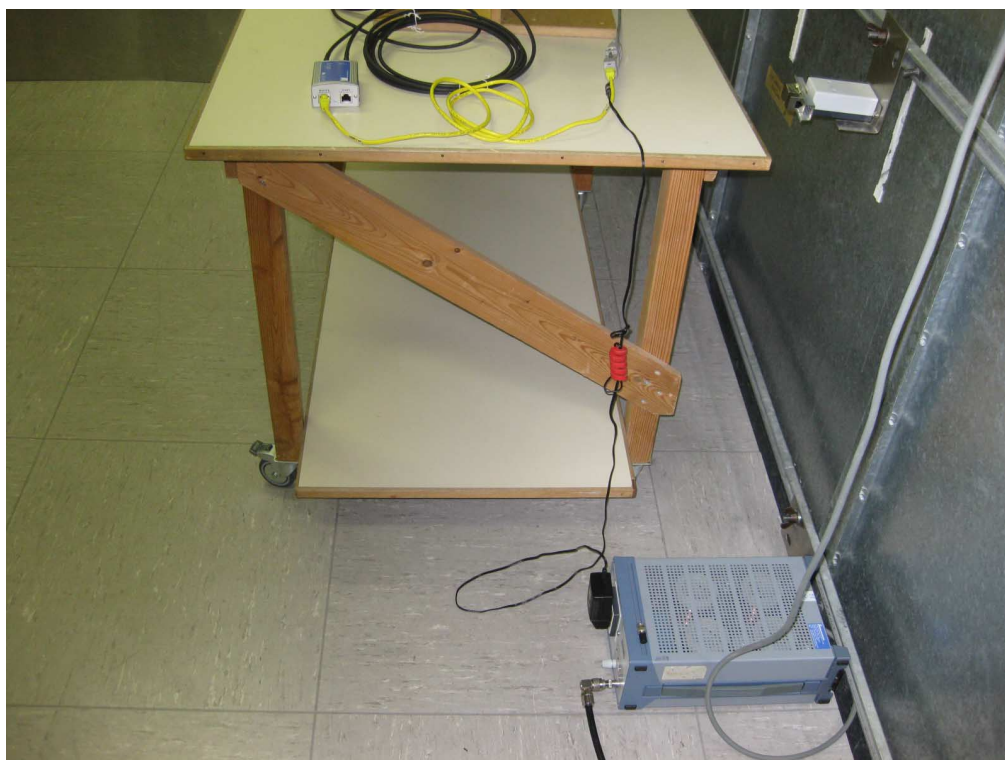
Test instruments used:

Used	Type		Model	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	EMI receiver	EG 1	ESVP	881120/024	Rohde & Schwarz
<input type="checkbox"/>	EMI receiver		ESVP	891846/003	Rohde & Schwarz
<input checked="" type="checkbox"/>	Biconical antenna	EG 1	HK 116	842204/001	Rohde & Schwarz
<input checked="" type="checkbox"/>	Log. per. antenna	EG 1	HL 223	841516/023	Rohde & Schwarz
<input checked="" type="checkbox"/>	Open field test site		EG 1	1450	Senton



7 Photographs Taken During Testing

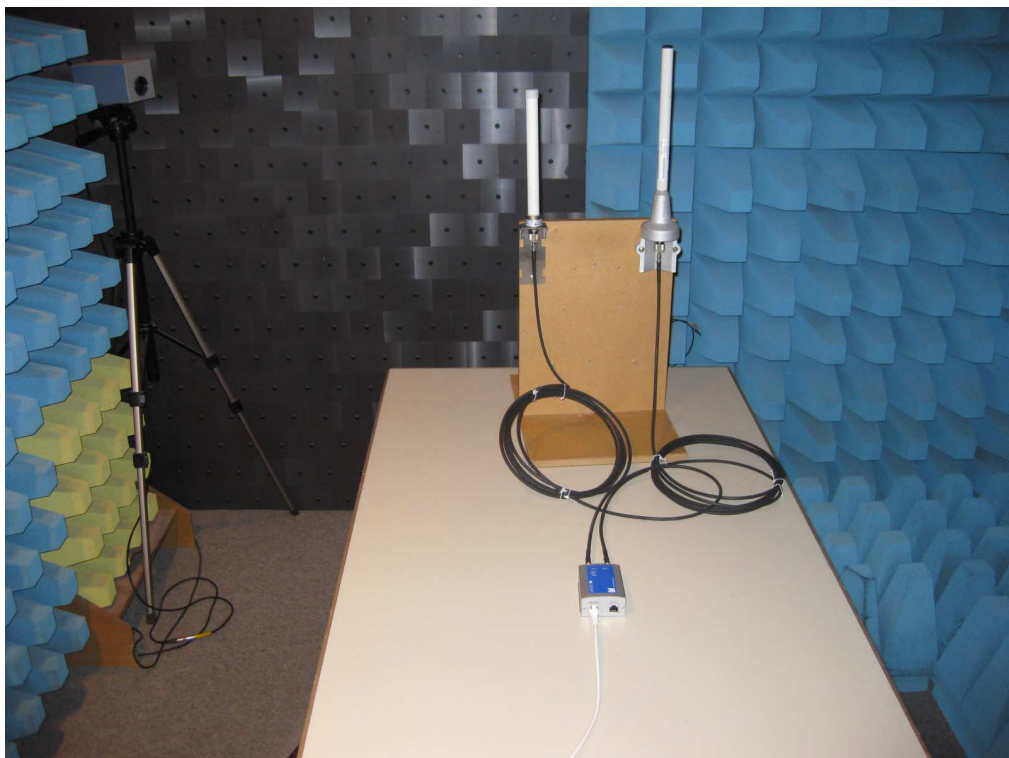
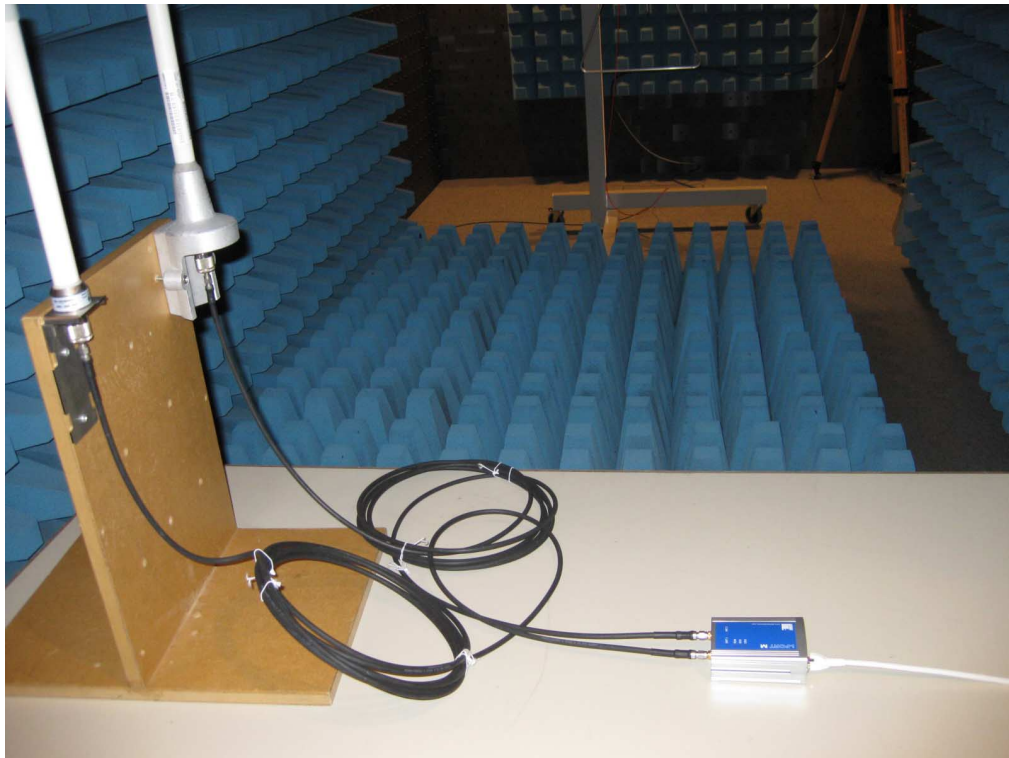
Test setup for conducted AC powerline emission measurement



Test setup for radiated emission measurement 9 kHz – 30 MHz



Test setup for radiated emission measurement (fully anechoic room)





8 Test Results for Transmitter

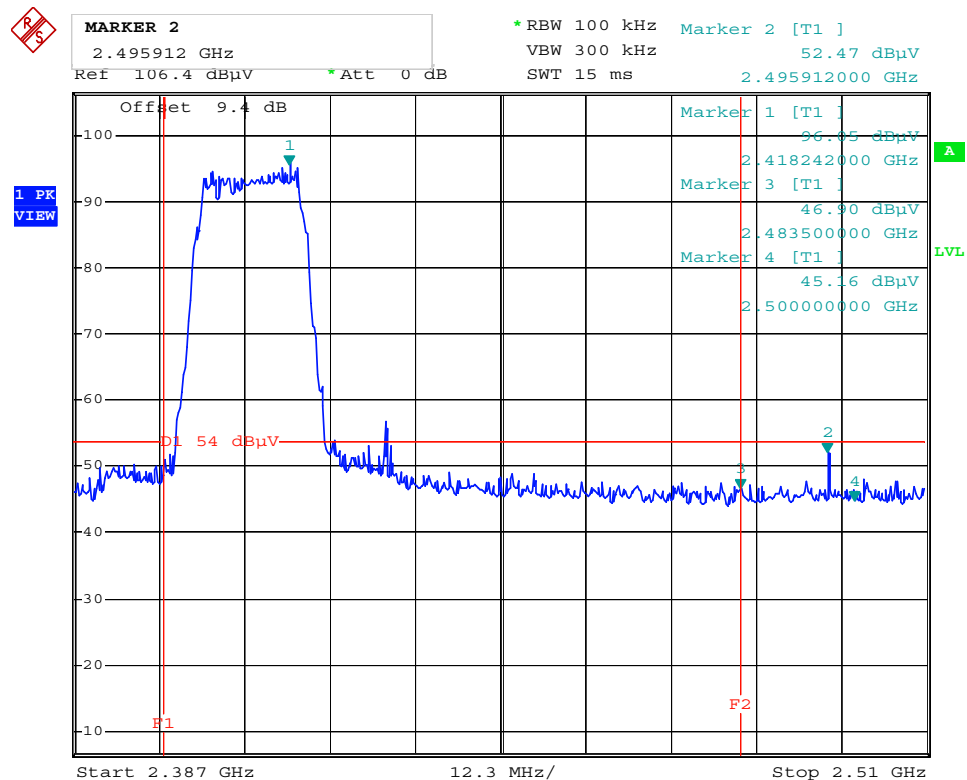
FCC CFR 47 Parts 2 and 15			
Section(s)	Test	Page	Result
	Transmitter:		
15.205	Restricted Bands		Pass
15.247 (a) (a2)	Channel Bandwidth		Pass
15.247 (b) (3)	Maximum Peak Output Power		Pass
15.247 (d)	Spurious Emissions - conducted		Pass
15.247 (d)	Spurious Emissions - radiated		Pass
15.205 15.209	Radiated emissions 9 kHz - 30 MHz		Pass
15.247 (e)	Power Spectral Density		Pass
15.203	Antenna Requirement		Pass
2.1093	RF Exposure Requirement		Pass
15.207	Conducted AC Powerline Emissions		Pass
	Receiver		
15.111	Spurious Emissions on Antenna Port		N/A
15.109	Radiated Emissions		Pass

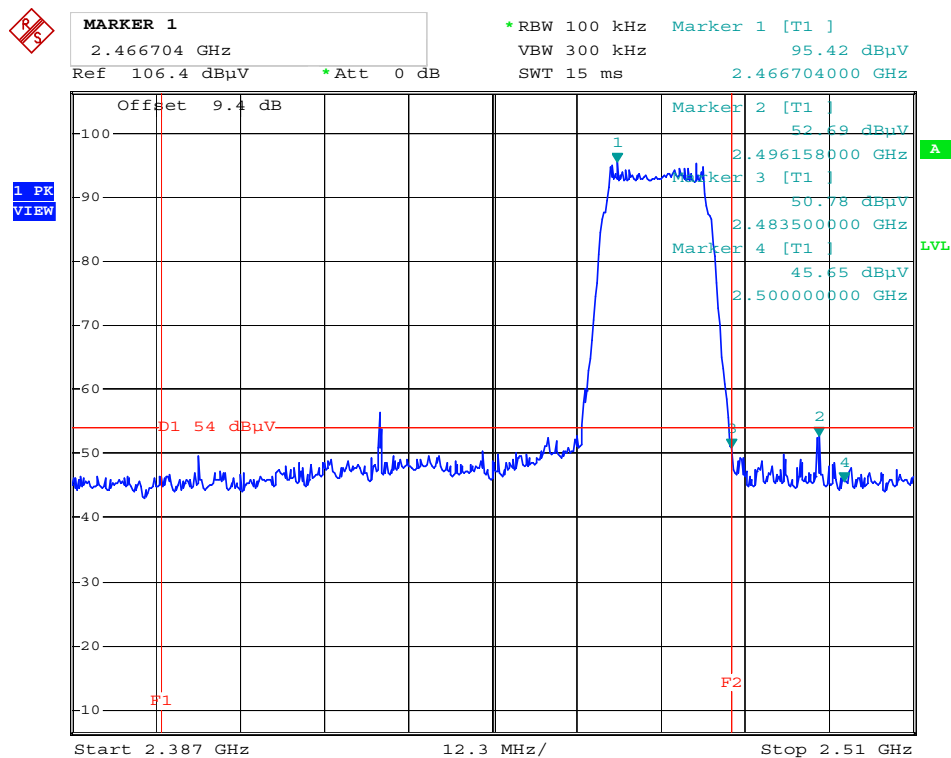
8.1 Restricted Band & Band Edge Compliance

Rules and Specifications:	15.205
Guide:	ANSI C63.4:2003
Requirement:	Except as shown in paragraph (d) of section 15.205, only spurious emissions are permitted in any of the frequency bands listed.

Test Site:	Open Area Test Site (< 1GHz), Fully anechoic room (>1 GHz)
Distance:	Radiated Measurement
Date of Test:	

Restricted Band (MHz)	RF Channel	Result
2310 - 2390	Channel 1 (2412 MHz)	Pass
2483..5 - 2500	Channel 15 (2472 MHz)	Pass



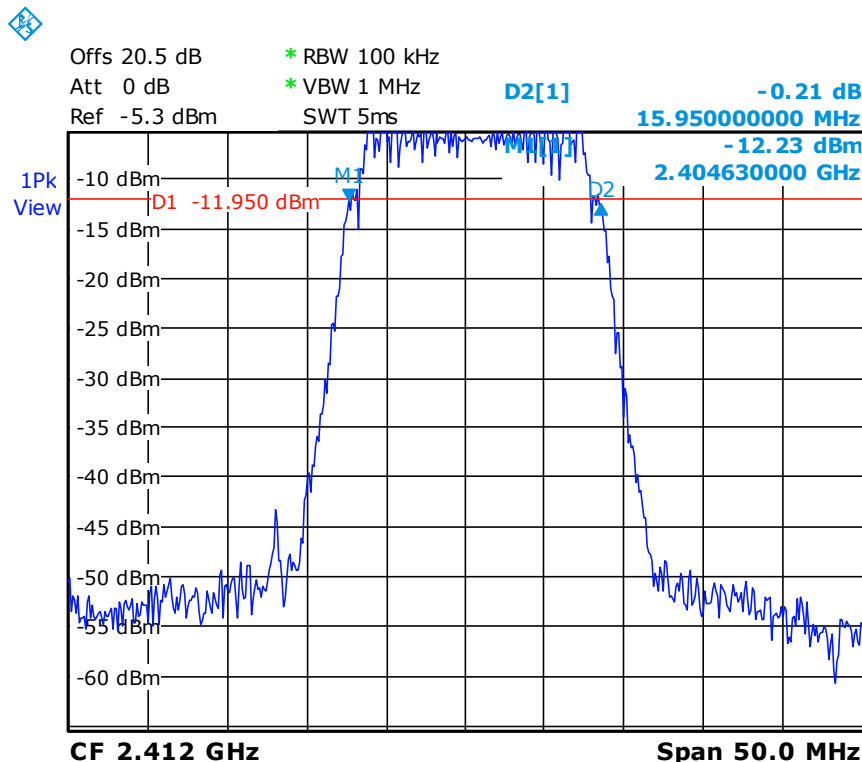


8.2 Channel Bandwidth

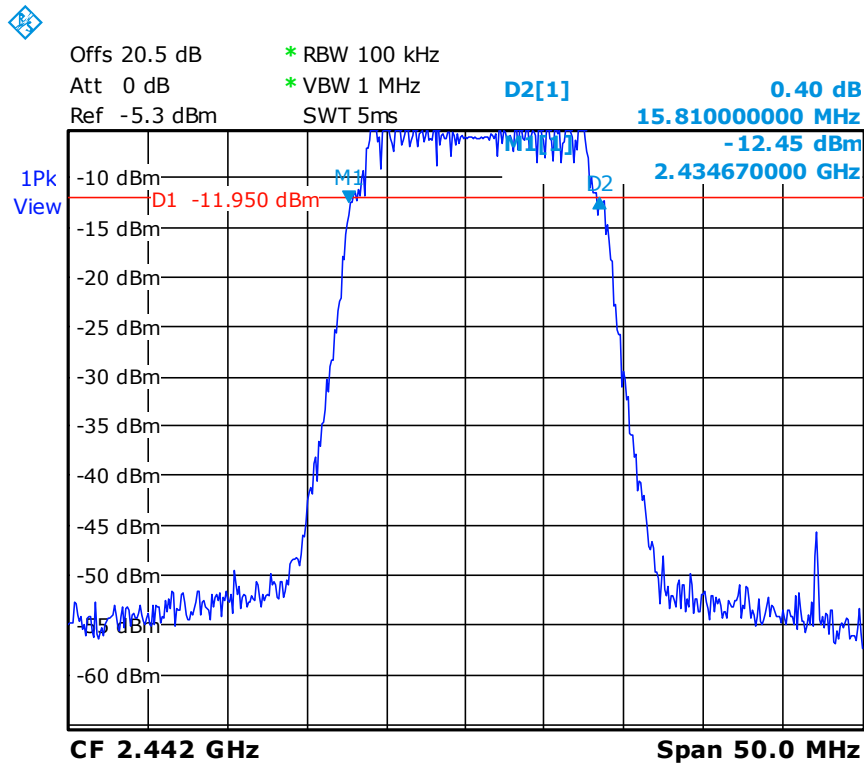
Rules and Specifications:	15.247 (a) (1) (i)
Guide:	ANSI C63.4:2003
Limit:	Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Site:	Radio Lab.
Distance:	Conducted Measurement
Date of Test:	27 August 2009

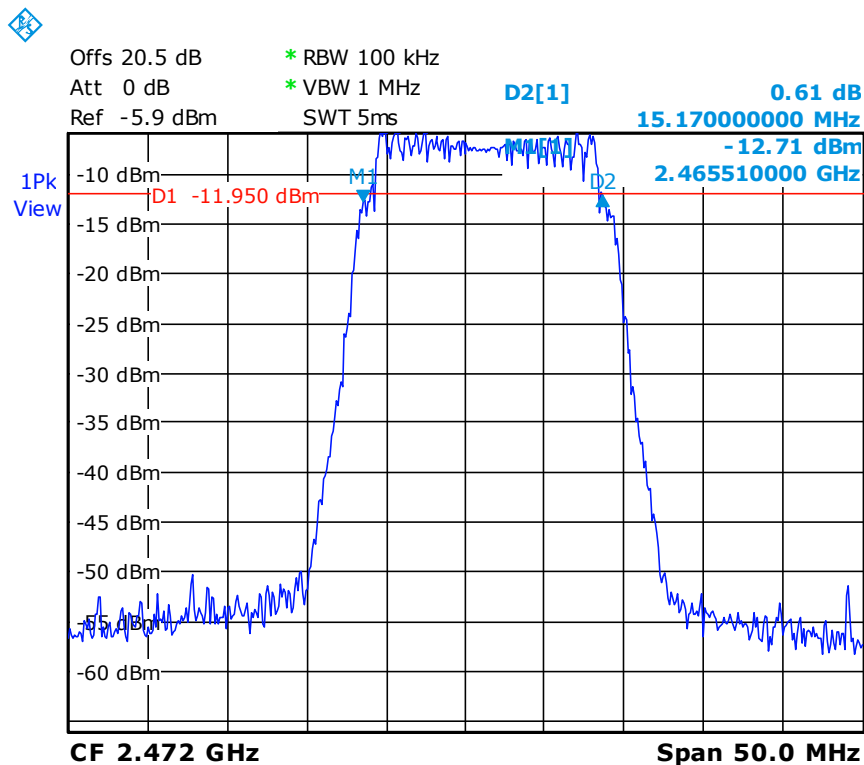
Frequency	Channel Bandwidth in MHz	Standard	Result
Low (2412 MHz)	15.95	>500 kHz	Pass
Middle (2442 MHz)	15.81	>500 kHz	Pass
High (2472 MHz)	15.17	>500 kHz	Pass



Date: 27.AUG.2009 17:03:30



Date: 27.AUG.2009 17:01:56



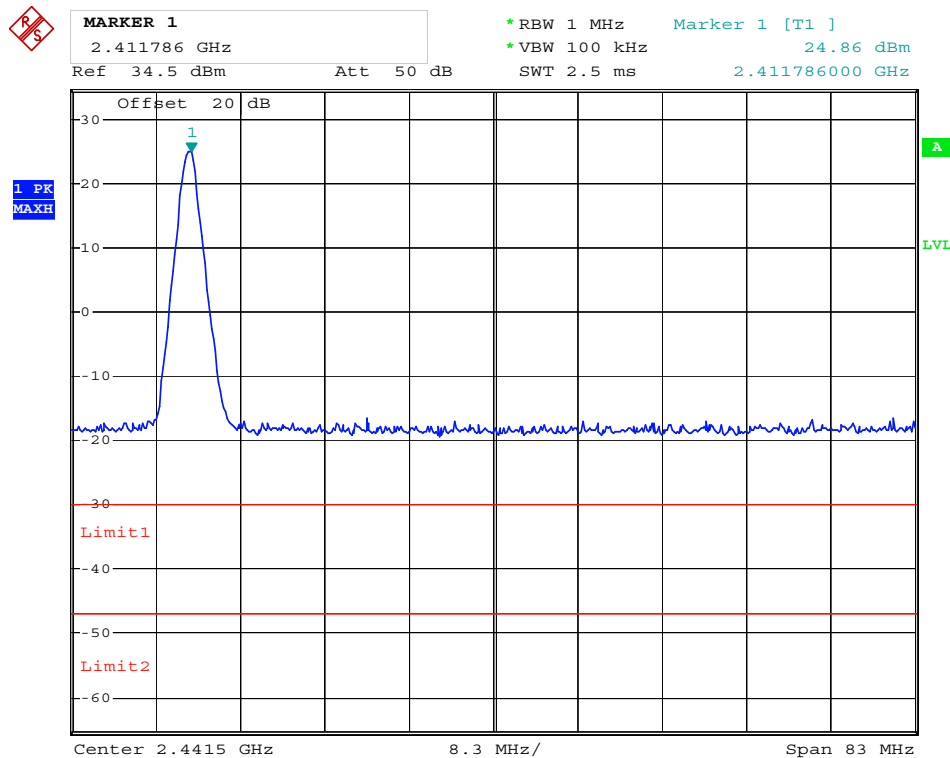
Date: 27.AUG.2009 16:59:25

8.3 Carrier Power Measurement

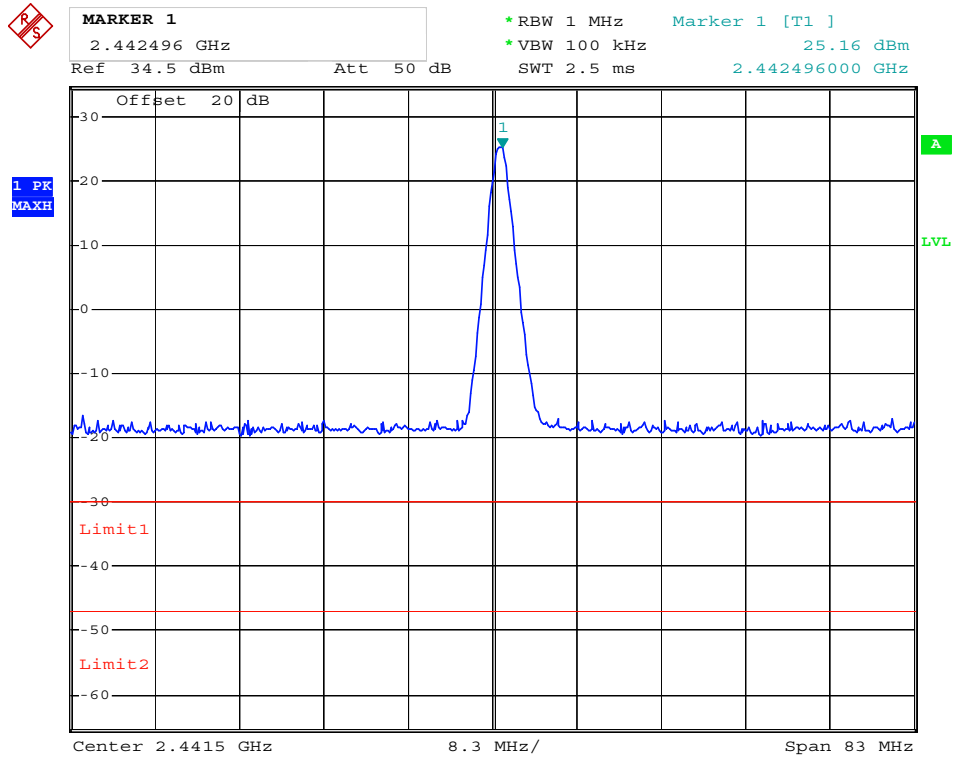
Rules and Specifications:	15.247 (b) (2)
Guide:	ANSI C63.4:2003
Limit:	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt

Test Site:	Radio Lab.
Distance:	Conducted Measurement, output power set to maximum
Date of Test:	06 November 2007

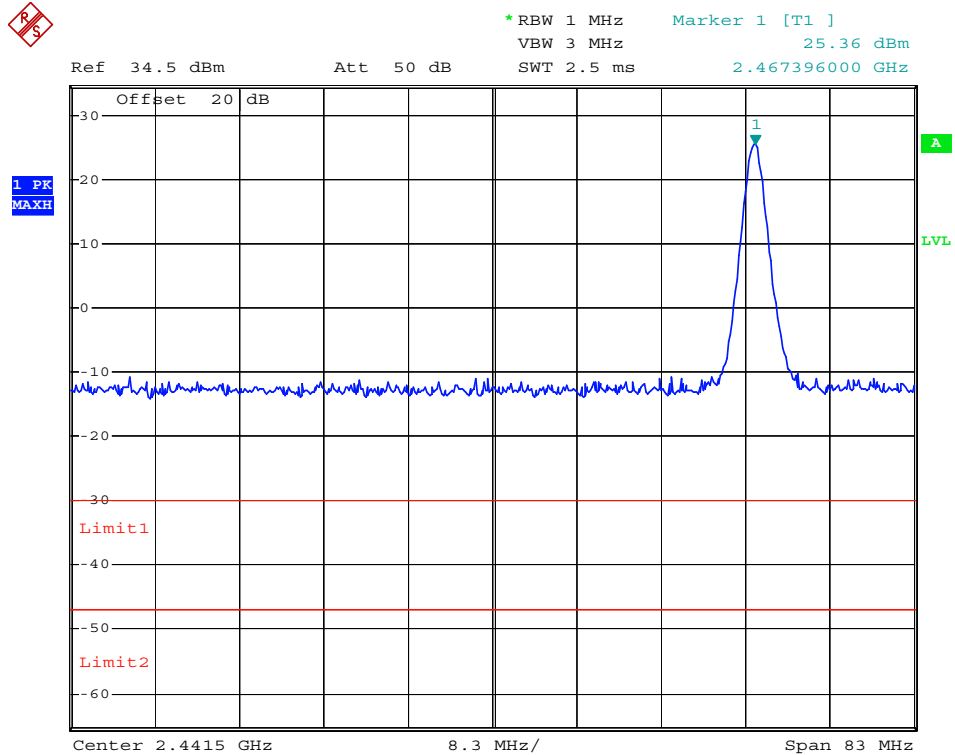
Frequency	Output Power in dBm	Output Power in W	Standard	Result
Low (2405 MHz)	24.86		≤1.00W	Pass
Middle (2440 MHz)	25.16		≤1.00W	Pass
High (2475 MHz)	25.36		≤1.00W	Pass



Date: 12.AUG.2009 21:04:36



Date: 12.AUG.2009 21:05:49



Date: 12.AUG.2009 21:09:12

8.4 Spurious Emissions

Rules and Specifications:	15.247 ©
Guide:	ANSI C63.4:2003
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

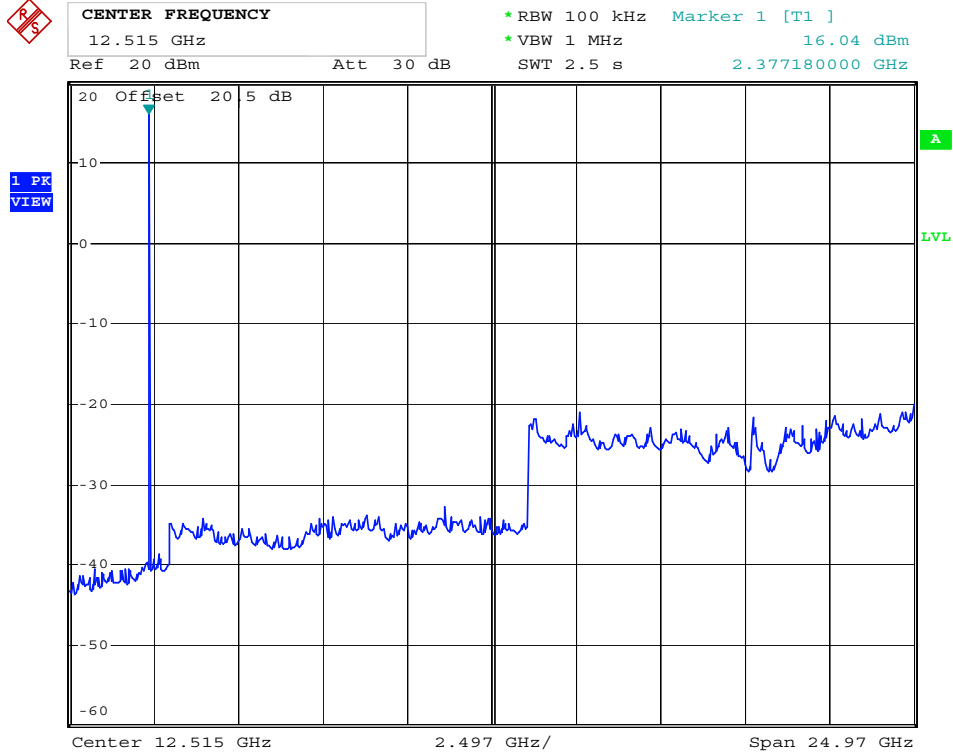
Test Site:	Radio Lab.
Distance:	Conducted Measurement, output power set to maximum
Date of Test:	27 Aug. 2009

Frequency (MHz)	Measured Value (dBm)	Limit (dBm)	Margin (dB)	Result
2412.0	16.04	30	---	Fundamental
2442.0	16.09	30	---	Fundamental
2472.0	16.04	30	---	Fundamental

30 MHz – 25 GHz	***			

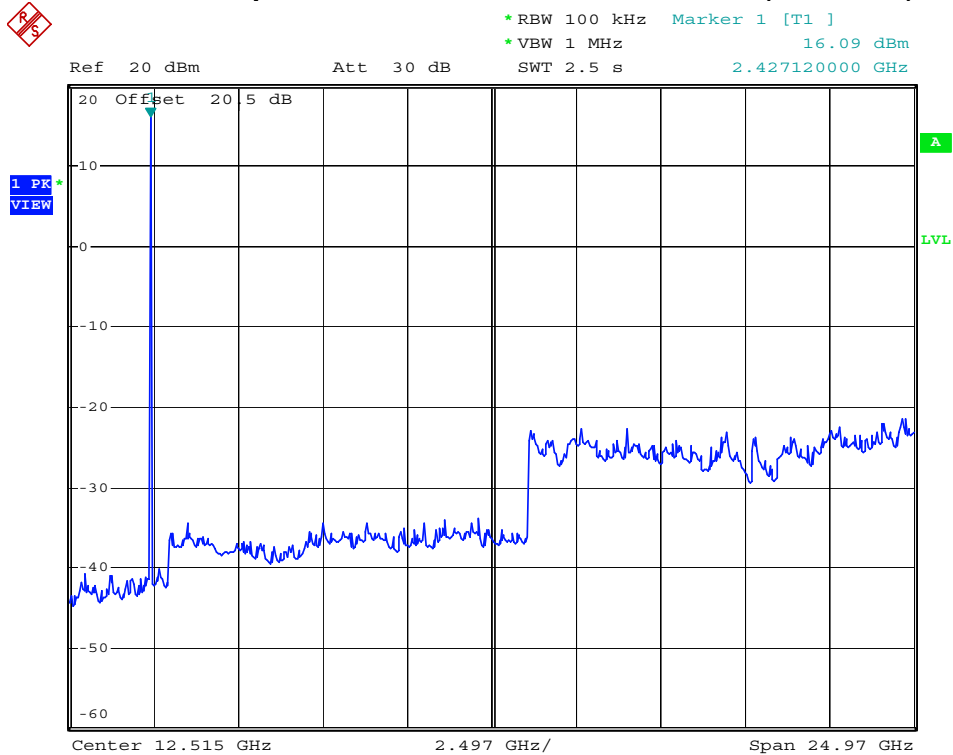
*** = No emissions above noise level of test system detected.

Conducted spurious emissions - low channel (2412 MHz)



Date: 27.AUG.2009 18:20:13

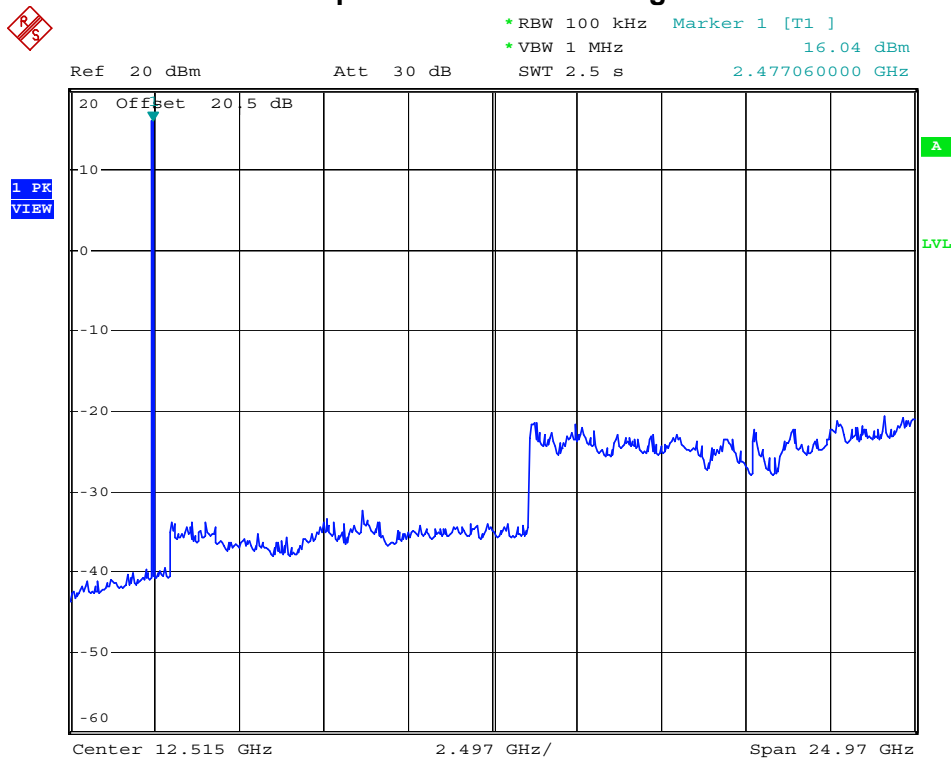
Conducted spurious emissions - middle channel (2442 MHz)



Date: 27.AUG.2009 18:23:30



Conducted spurious emissions - high channel



Date: 27.AUG.2009 18:26:24

Spurious Emissions

Rules and Specifications:	15.247 ©
Guide:	ANSI C63.4:2003
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, 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).

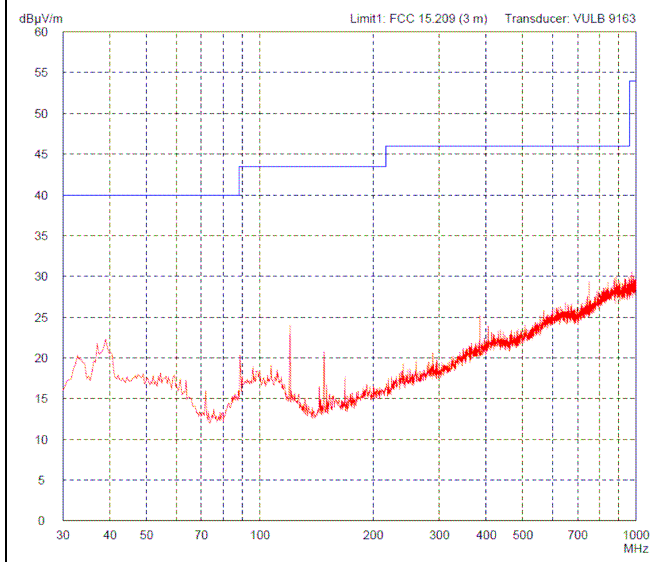
Test Site:	Open Area Test Site (< 1GHz), Fully anechoic room (>1 GHz)
Distance:	Radiated Measurement, output power set to maximum
Date of Test:	

Frequency (MHz)	Antenna Polarisation	Detector	Meter Reading (dBµV)	Antenna Correction (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412.0	Vertical	Peak	77.58	36.07	113.65	---	Fundamental
2442.0	Vertical	Peak	74.64	36.21	110.85	---	Fundamental
2472.0	Vertical	Peak	68.97	36.35	105.32	---	Fundamental
Low Channel							
4824.0	Vertical	Peak	16.68	34.28	50.96	54.0	3.04
Middle Channel							
4884.0	Vertical	Peak	13.13	34.34	47.74	54.0	6.26
High Channel							
4945.6	Vertical	Peak	9.32	34.40	43.72	54.0	10.28

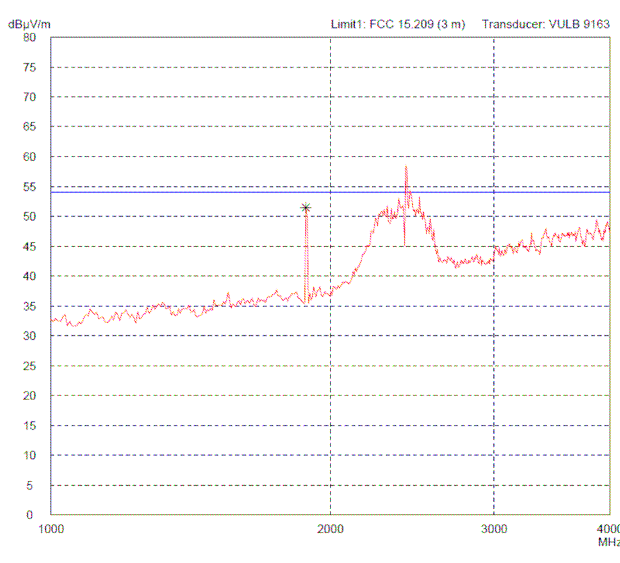
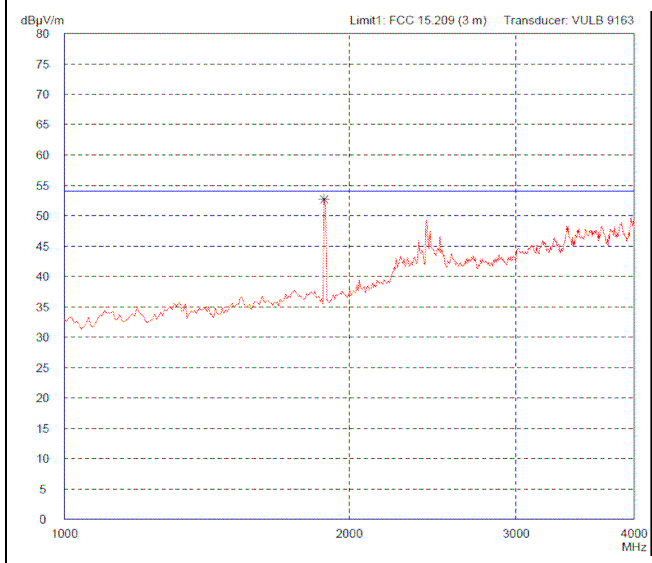
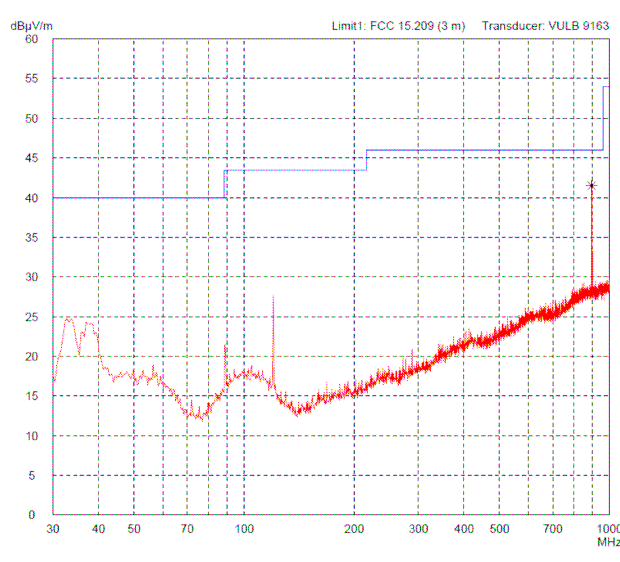
*** Margin to limit >> 10 dB

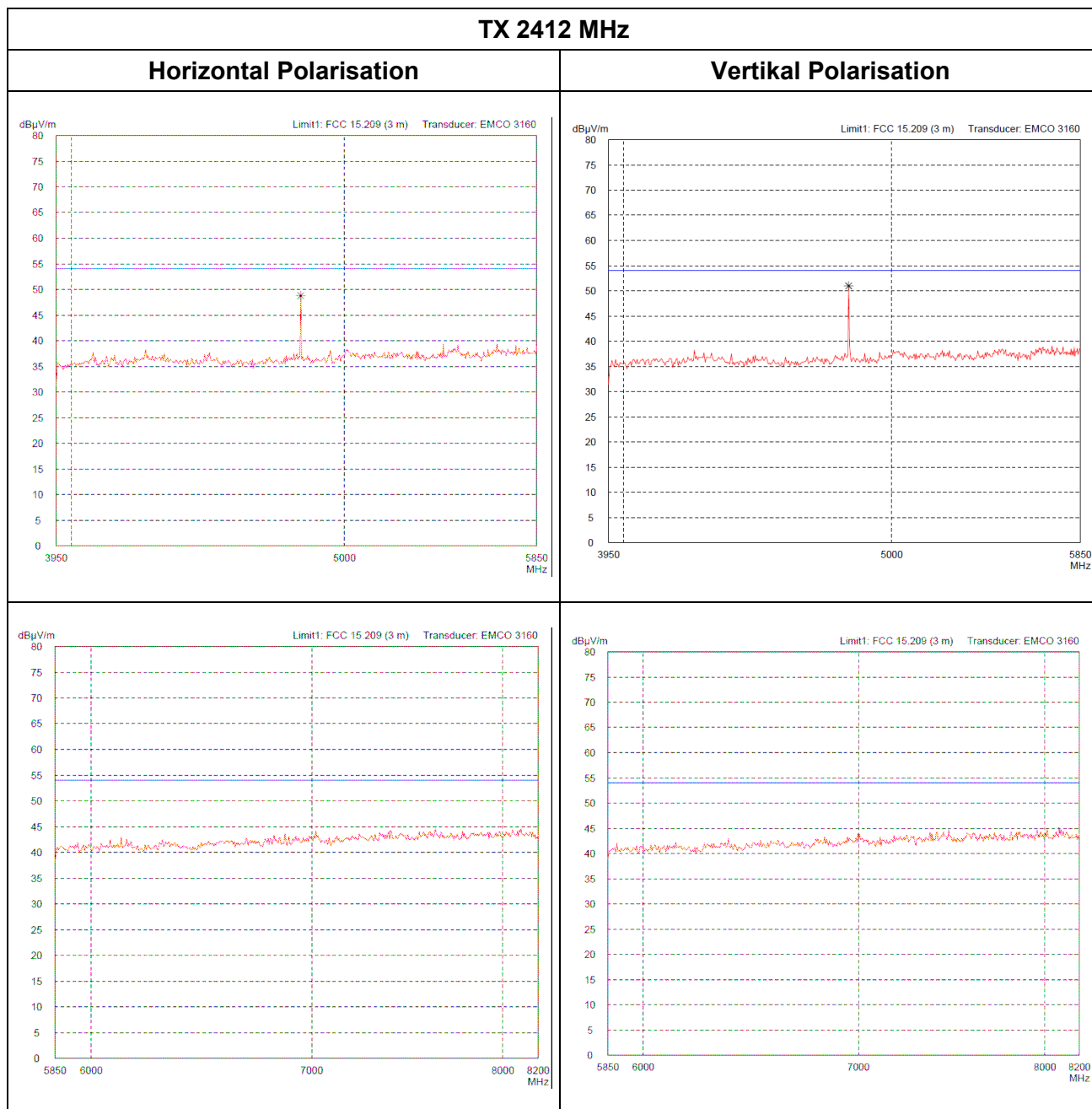
TX 2412 MHz

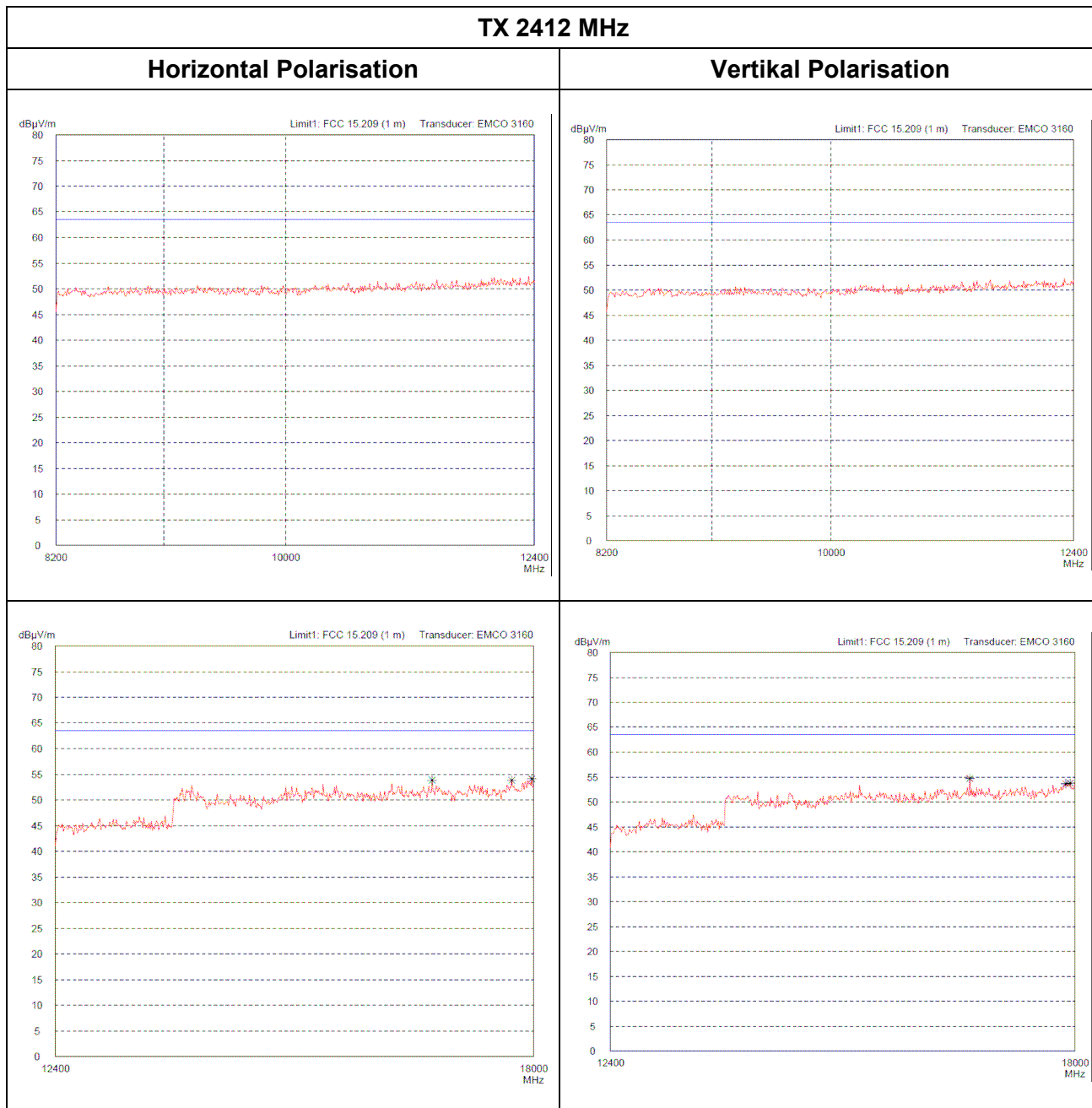
Horizontal Polarisation

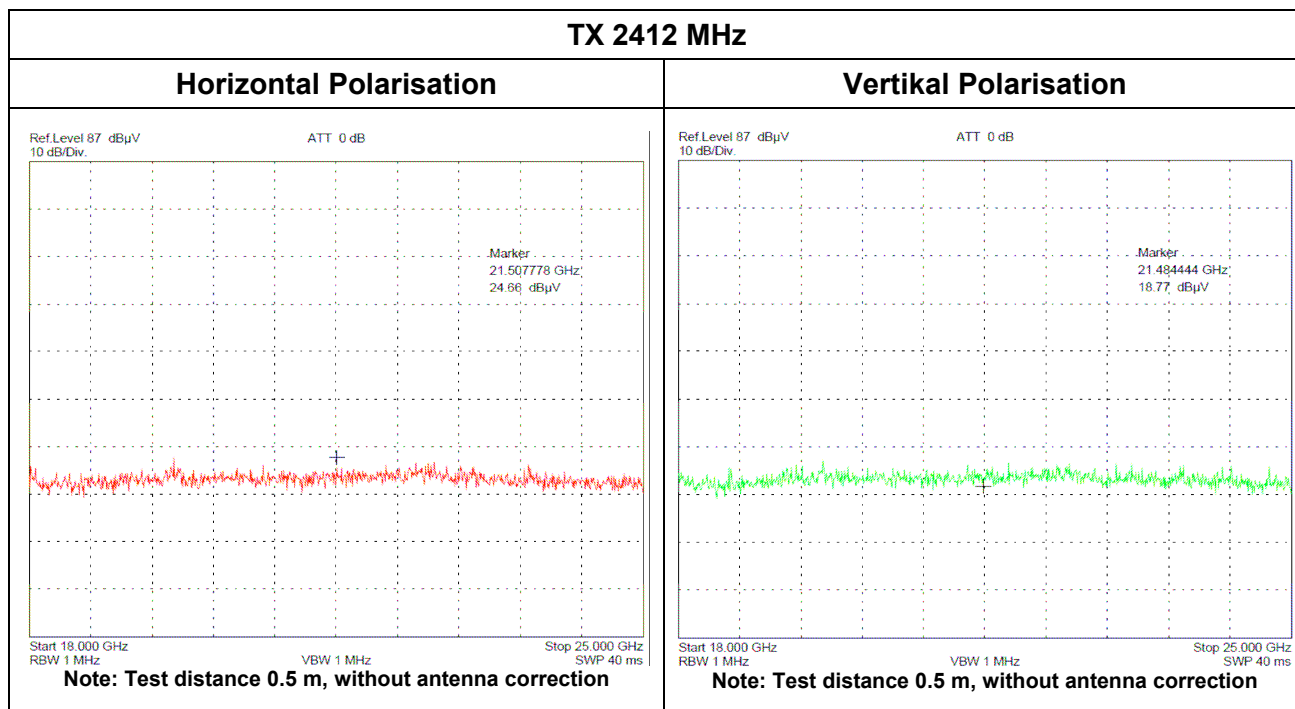


Vertikal Polarisation



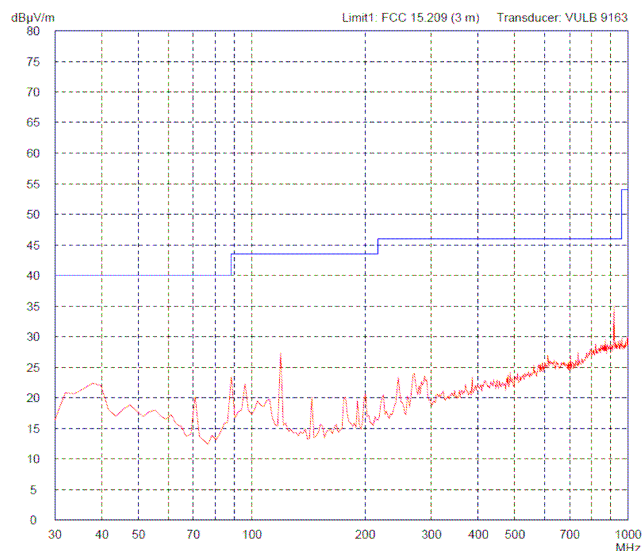




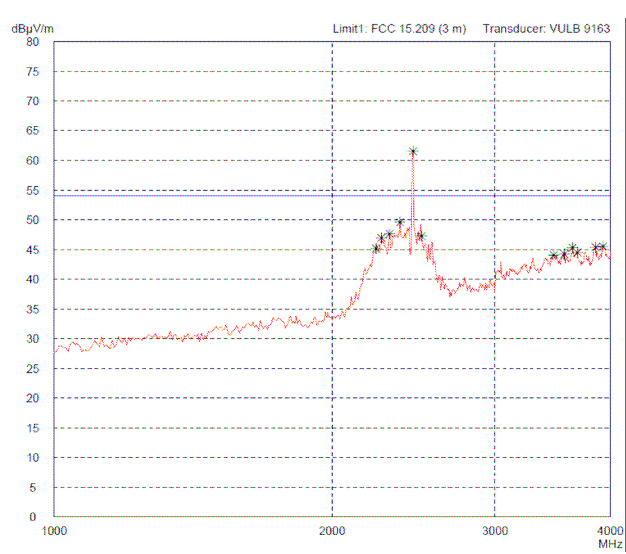
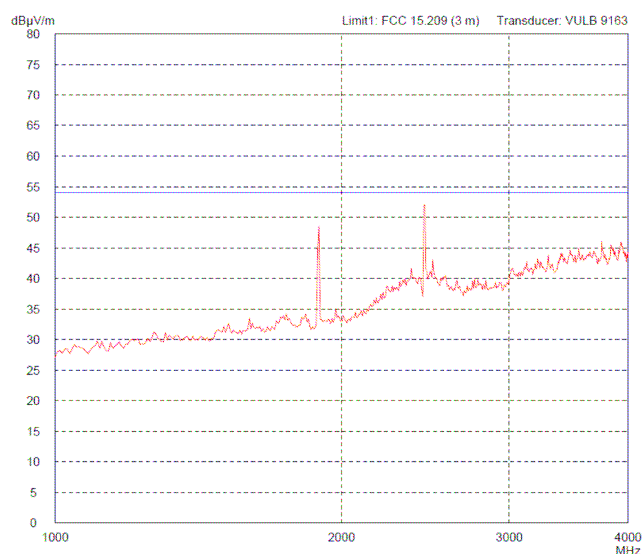
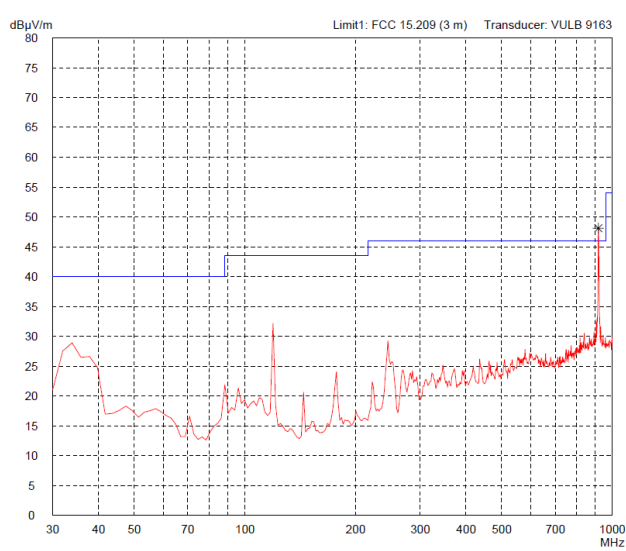


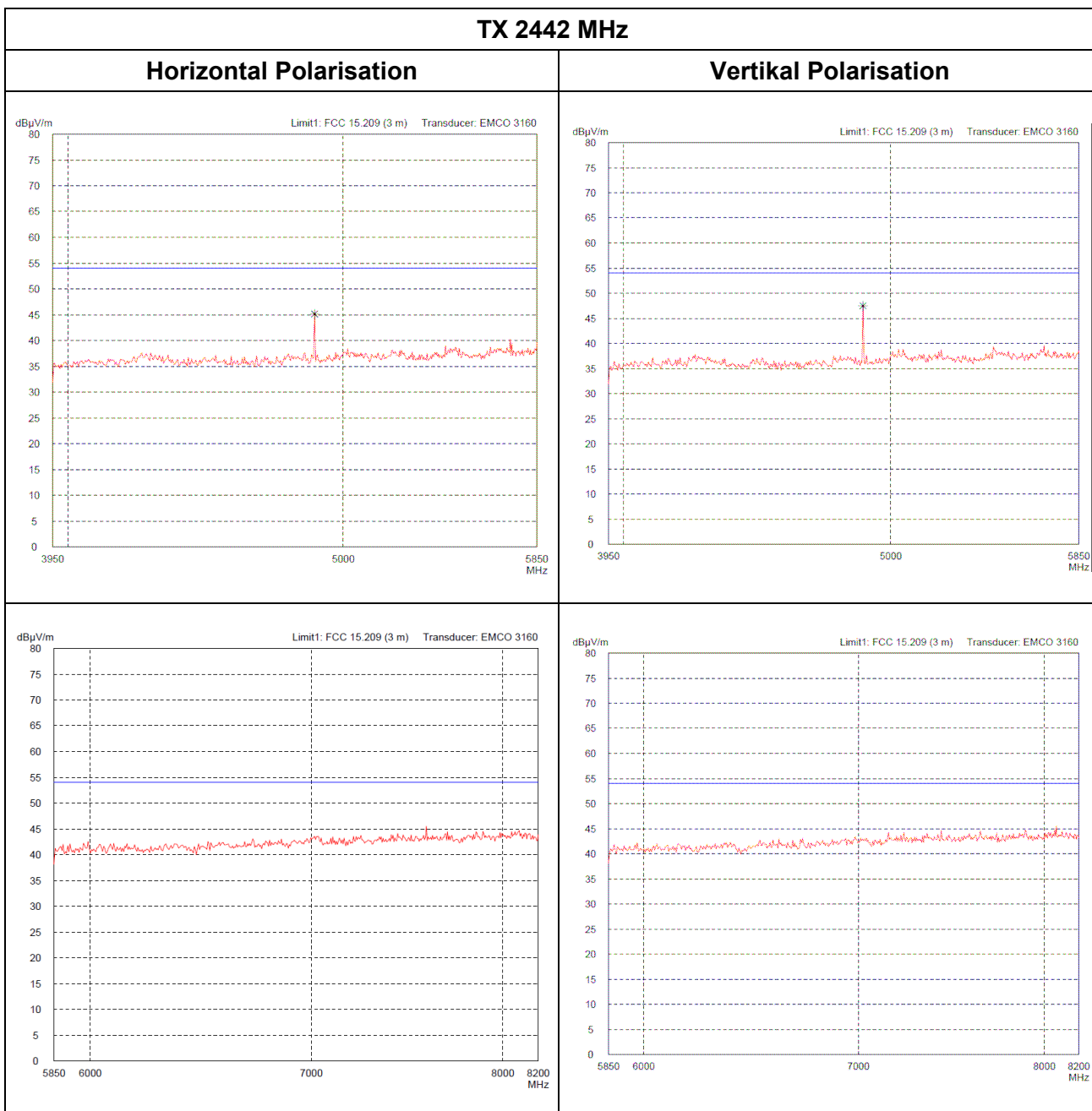
TX 2442 MHz

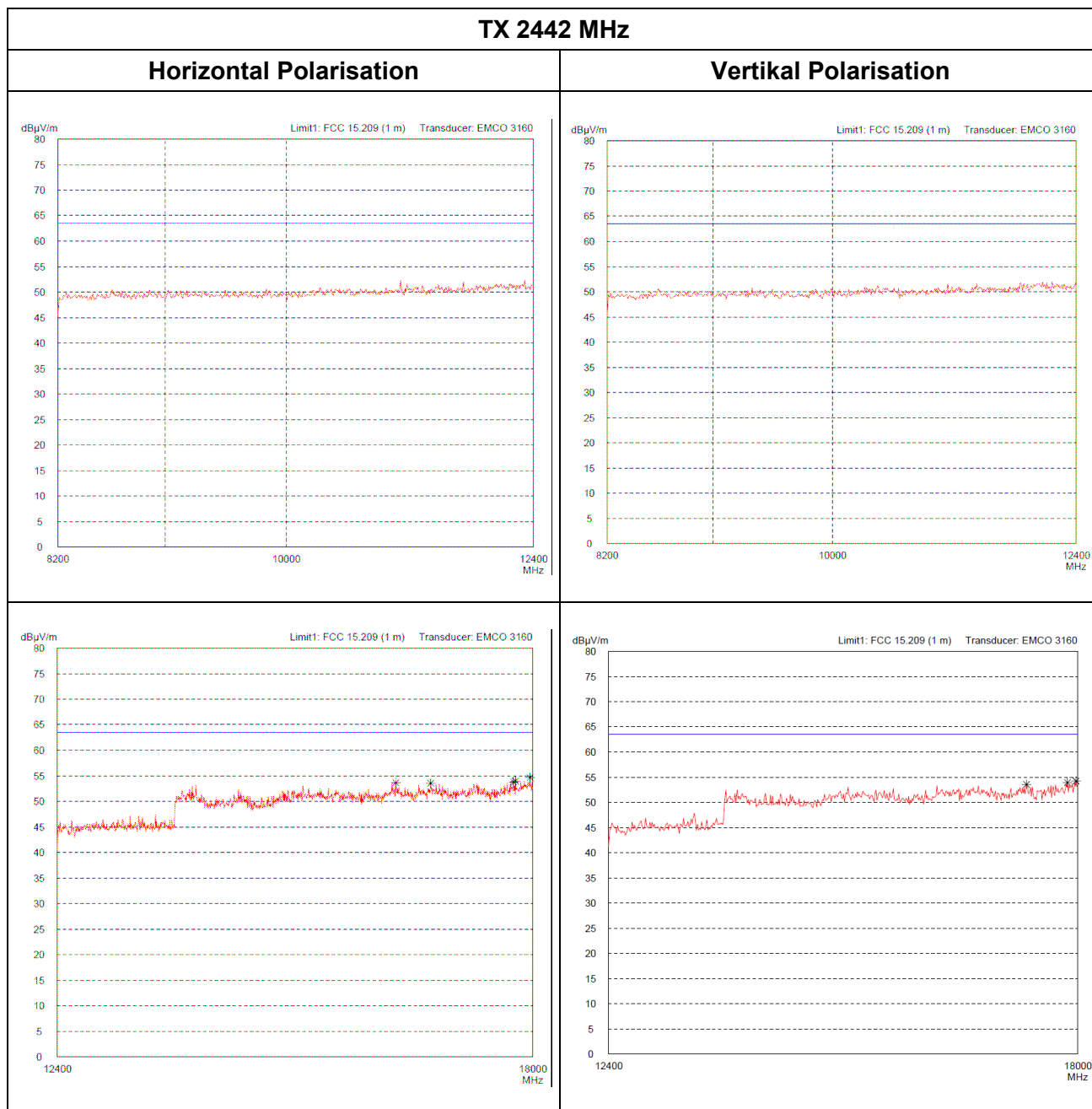
Horizontal Polarisation

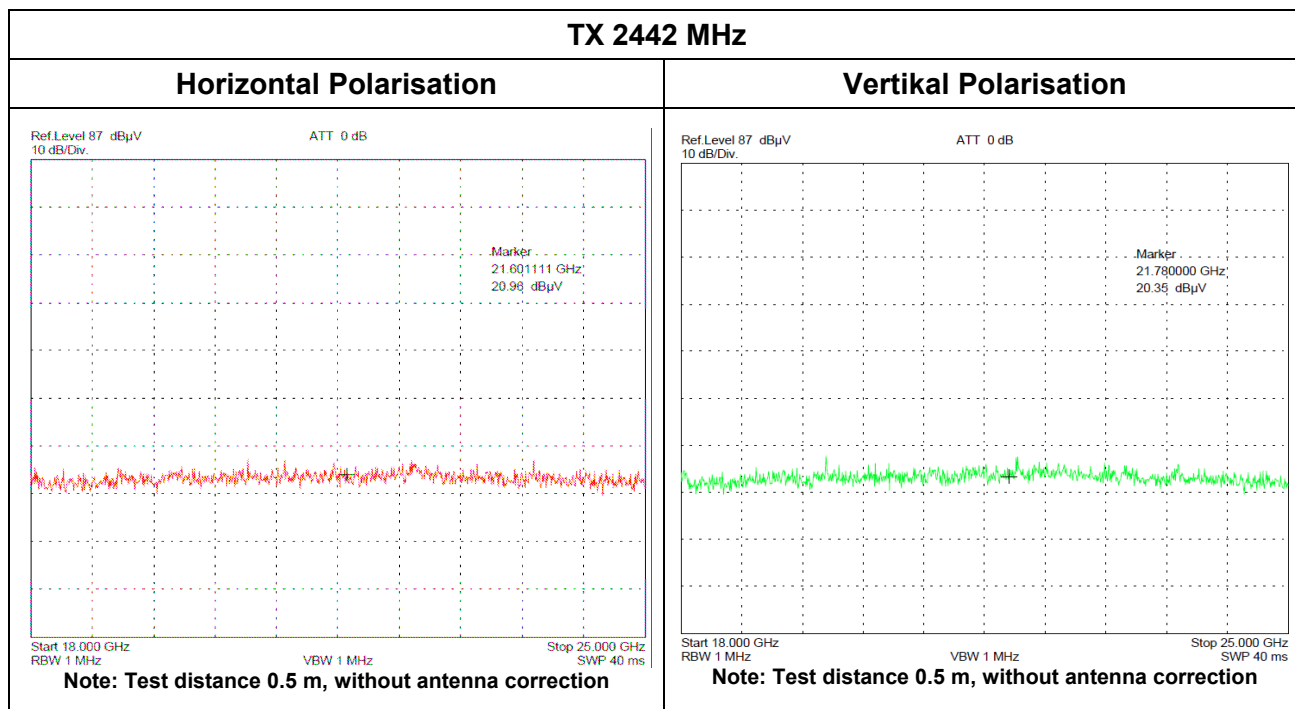


Vertikal Polarisation



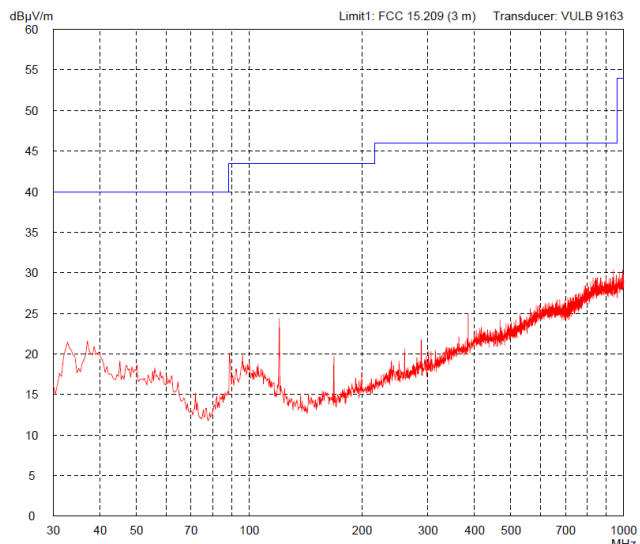




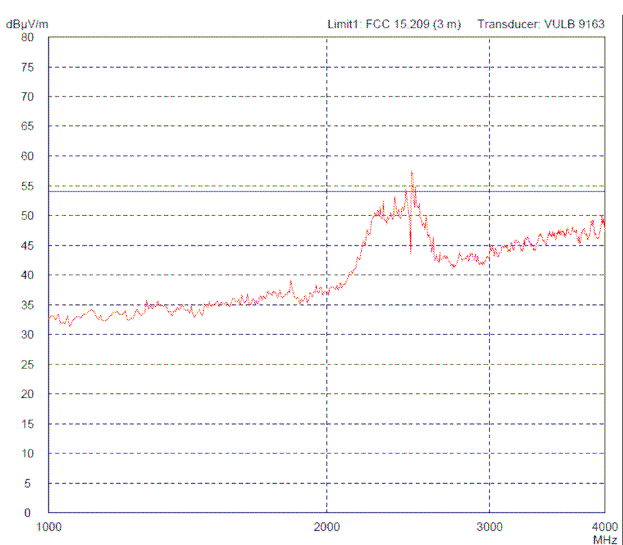
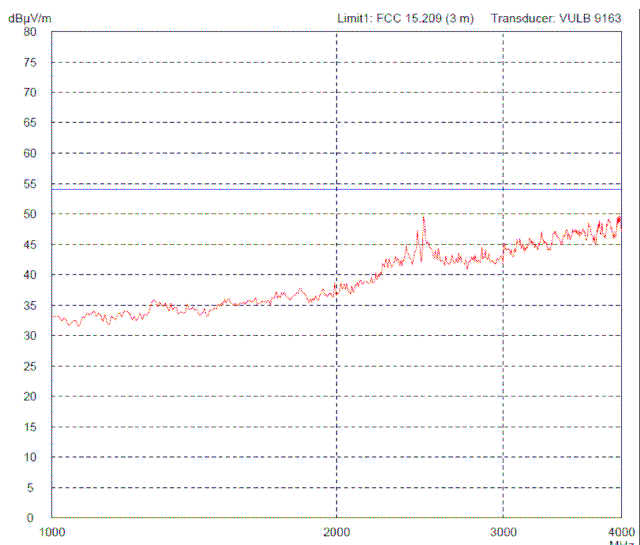
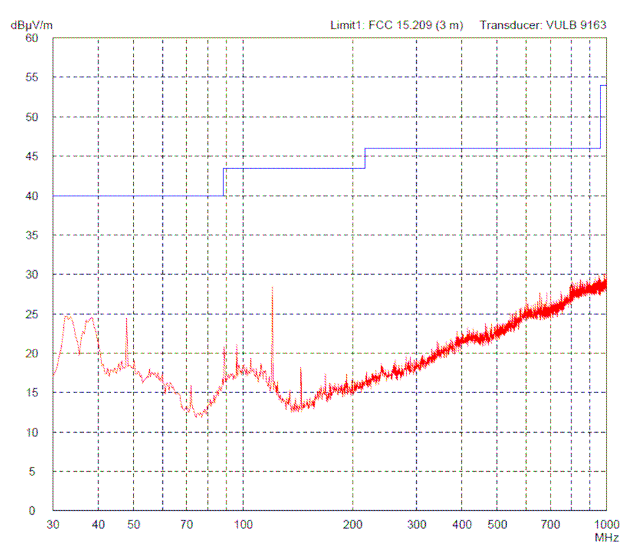


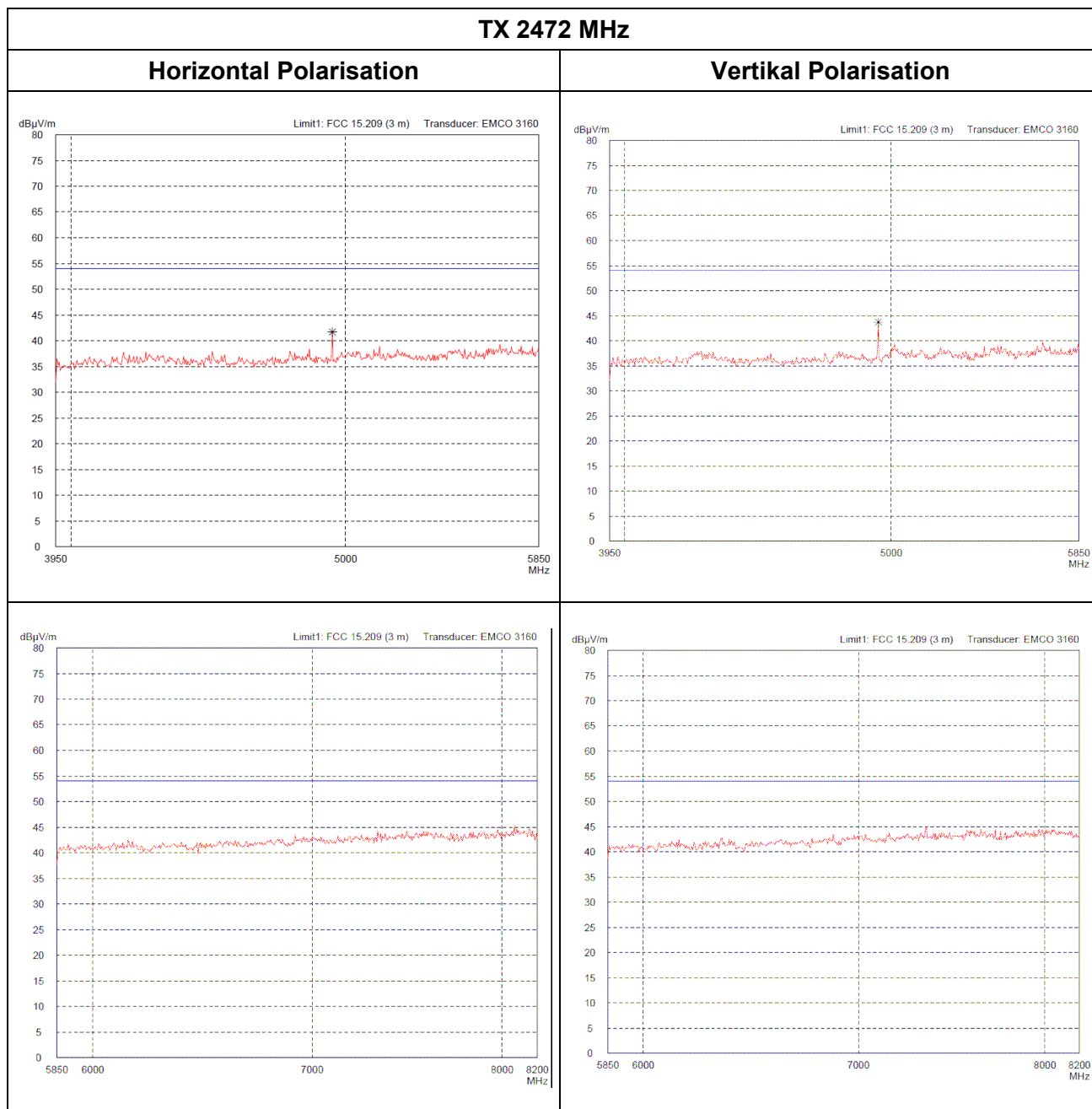
TX 2472 MHz

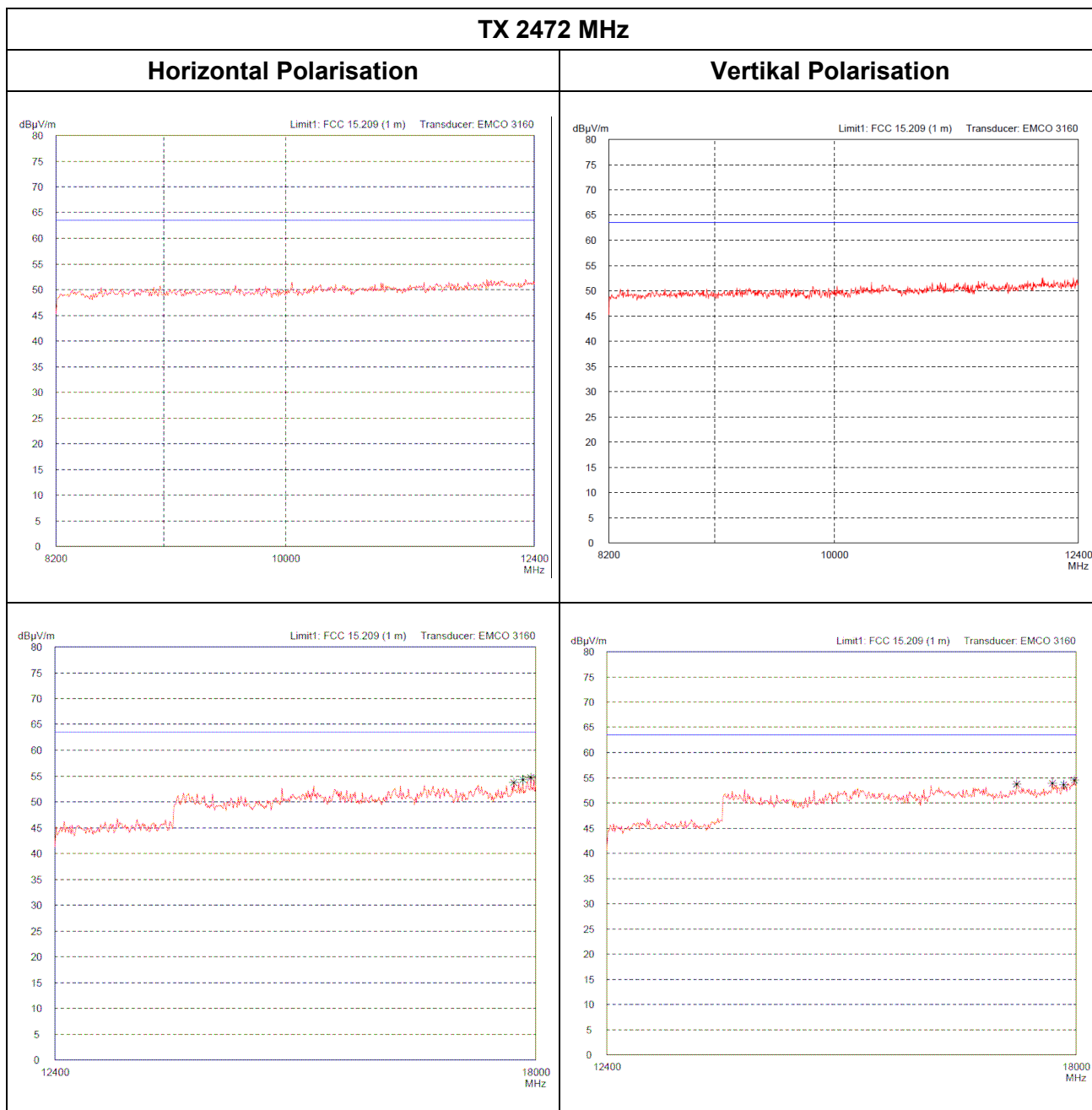
Horizontal Polarisation

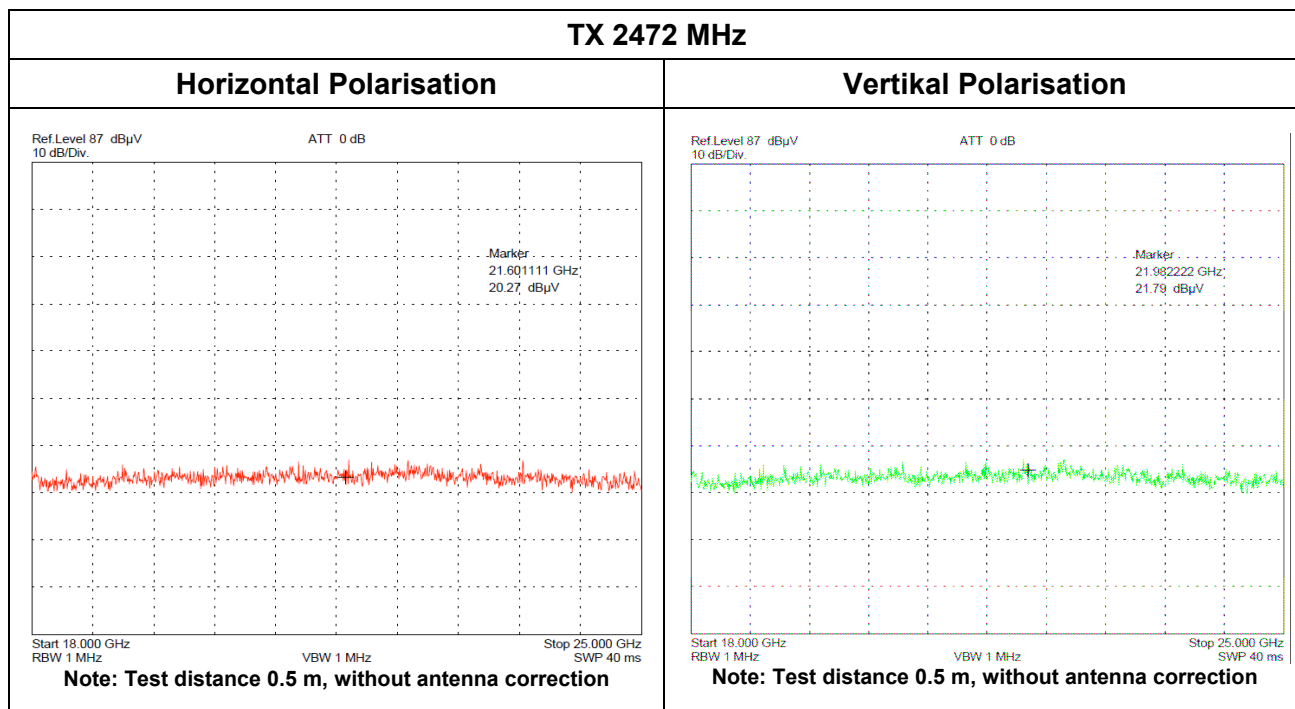


Vertikal Polarisation









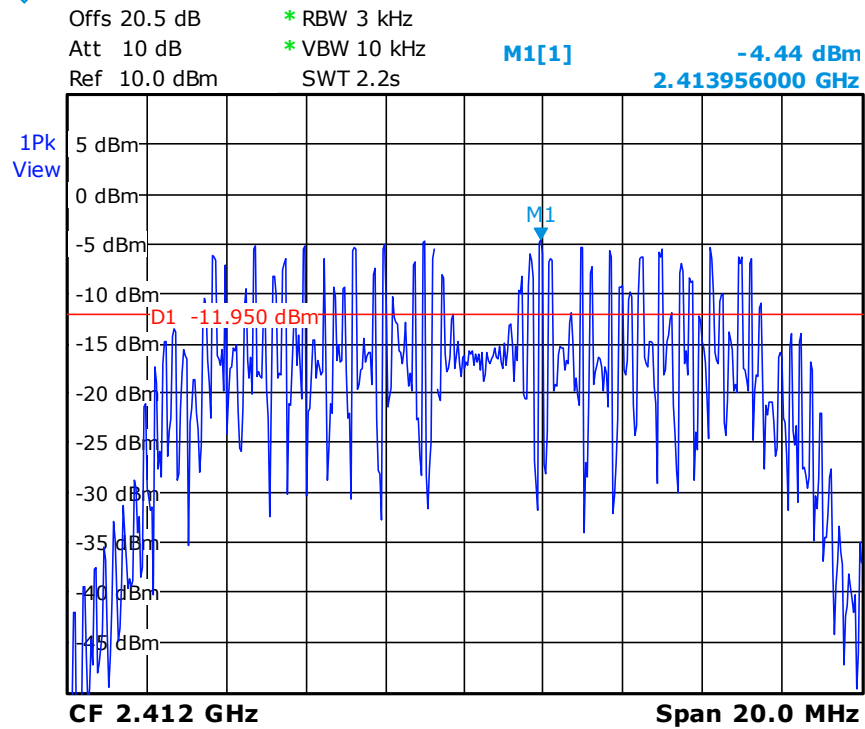
8.5 Power Spectral Density

Rules and Specifications:	15.247 (e)
Guide:	ANSI C63.4:2003
Limit:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

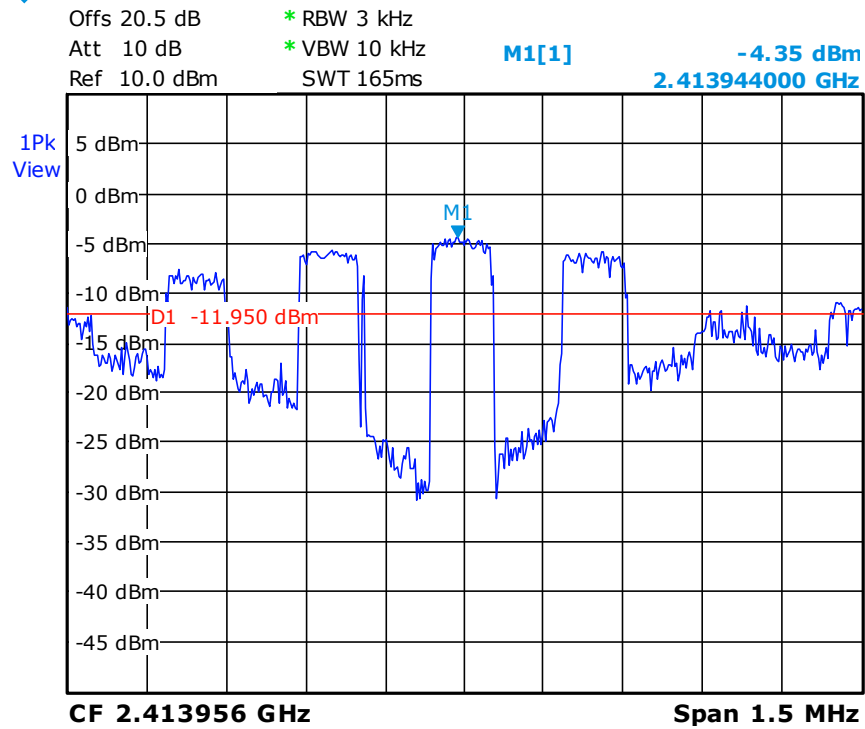
Test Site:	Radio Lab.
Distance:	Conducted Measurement, output power set to maximum
Date of Test:	27 Aug 2009

Frequency	Power Spectral Density in dBm/3 kHz	Standard dBm / 3 kHz	Result
Low (2412 MHz)	-4.35	< 8	Pass
Middle (2442 MHz)	-5.05	< 8	Pass
High (2472 MHz)	-6.06	< 8	Pass

Power Spectral Density – Test Charts

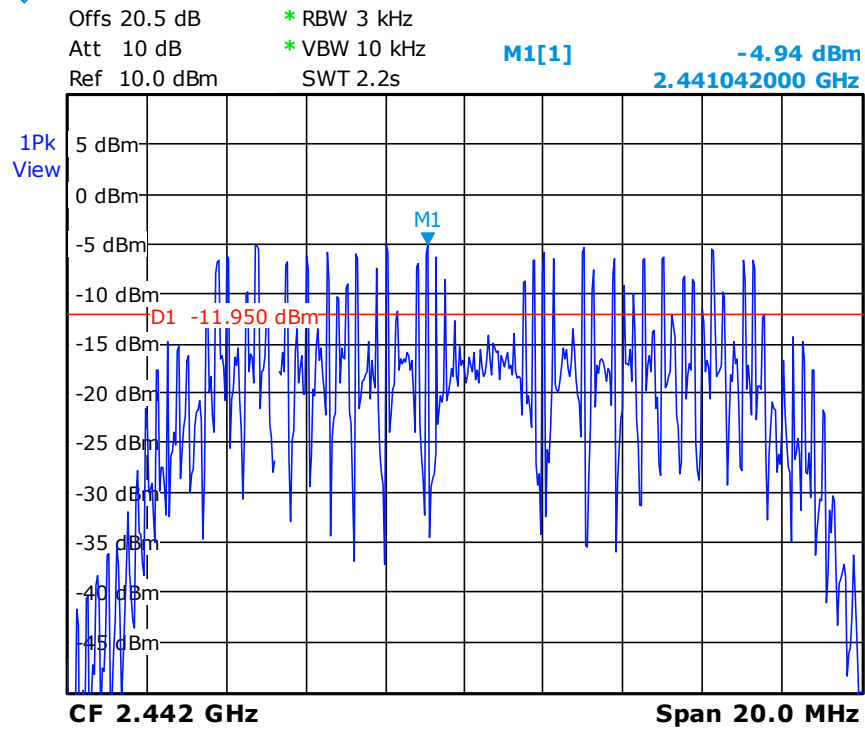


Date: 27.AUG.2009 17:12:09

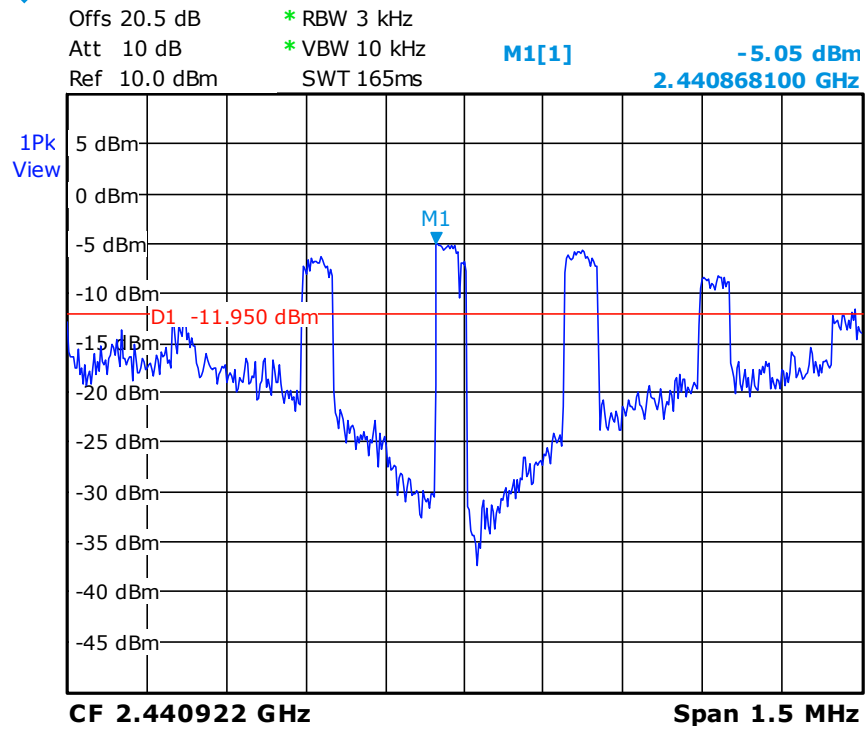


Date: 27.AUG.2009 17:15:08

Power Spectral Density – Test Charts

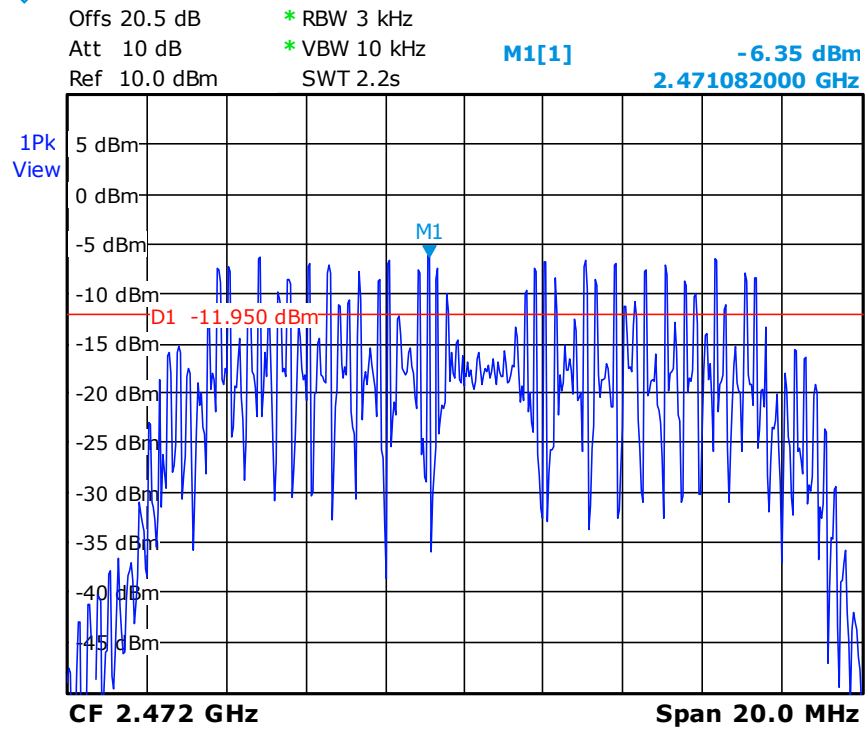


Date: 27.AUG.2009 17:17:55

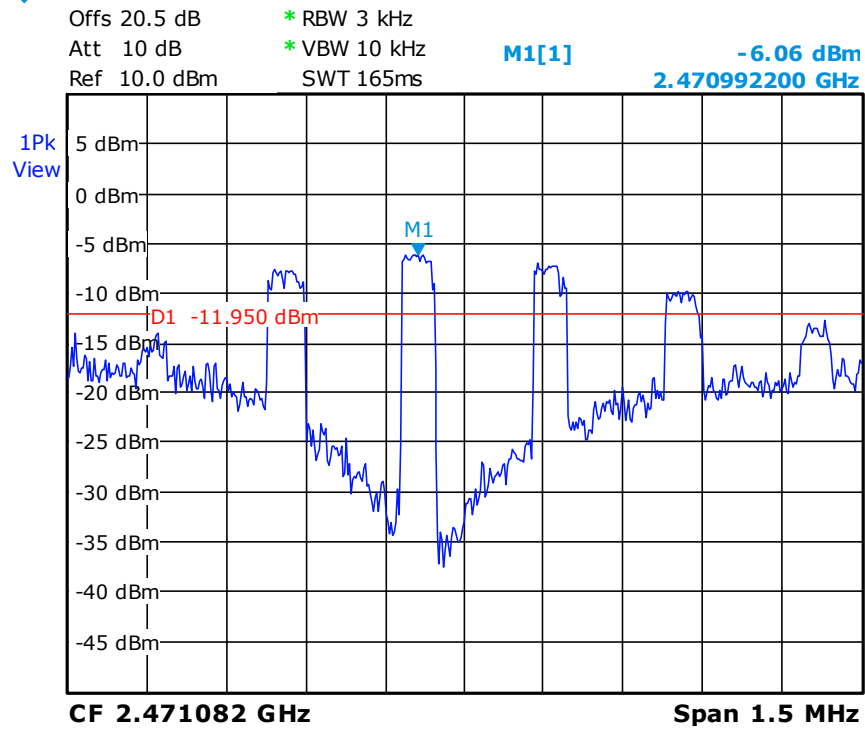


Date: 27.AUG.2009 17:19:33

Power Spectral Density – Test Charts



Date: 27.AUG.2009 17:21:41



Date: 27.AUG.2009 17:23:05

8.6 Antenna connector requirement

Rules and Specifications:	15.203
Guide:	---
Limit:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.
Test Result	Pass
	The UUT is qualified for professional installation, no connector requirement.



Connector for external antenna, EUT qualified for professional installation



8.7 Conducted Powerline Emission Measurement 150 kHz to 30 MHz

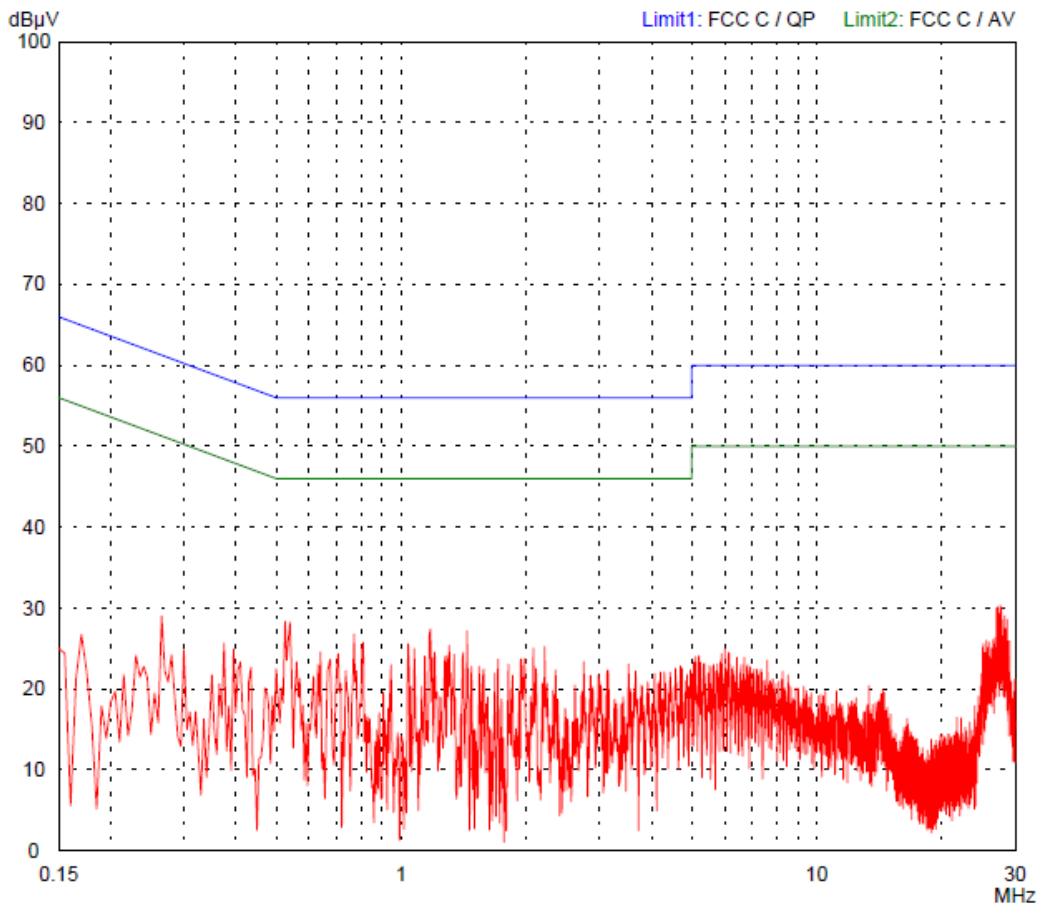
Rules and specifications:	CFR 47 Part 15, section 15.207 IC RSS-Gen Issue 2, section 7.2.2		
Guide:	ANSI C63.4 / CISPR 22		
Limit:	Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
		Quasi-peak	Average
	0.15 - 0.5	66 to 56	56 to 46
	0.5 - 5	56	46
	5 - 30	60	50
Measurement procedure:	Conducted AC Powerline Emission (6.3)		

Comment:	
Date of test:	28 August 2009
Test site:	Shielded room, cabin no. 1

Test Result:	Test passed, see test charts overleaf
--------------	---------------------------------------

Tested on: AC input of AC adapter, Live Wire

Conducted Emission Test 150 kHz - 30 MHz according to FCC Part 15 Subpart C	
Model: i-PORT M350 RTLS	Mode: Communication with Tag
Serial no.: 09255M0101	Supply Voltage = 115 V AC
Applicant: Identec Solutions AG	
Test site: Shielded room, cabin no. 4	
Tested on: Linecord Live Wire	
Date of test: 08/28/2009	Operator: J. Roidt
Test performed: automatically	File name:
Detector: Peak / Final Results: QP	Final results: 20 dB Margin 25 Subranges

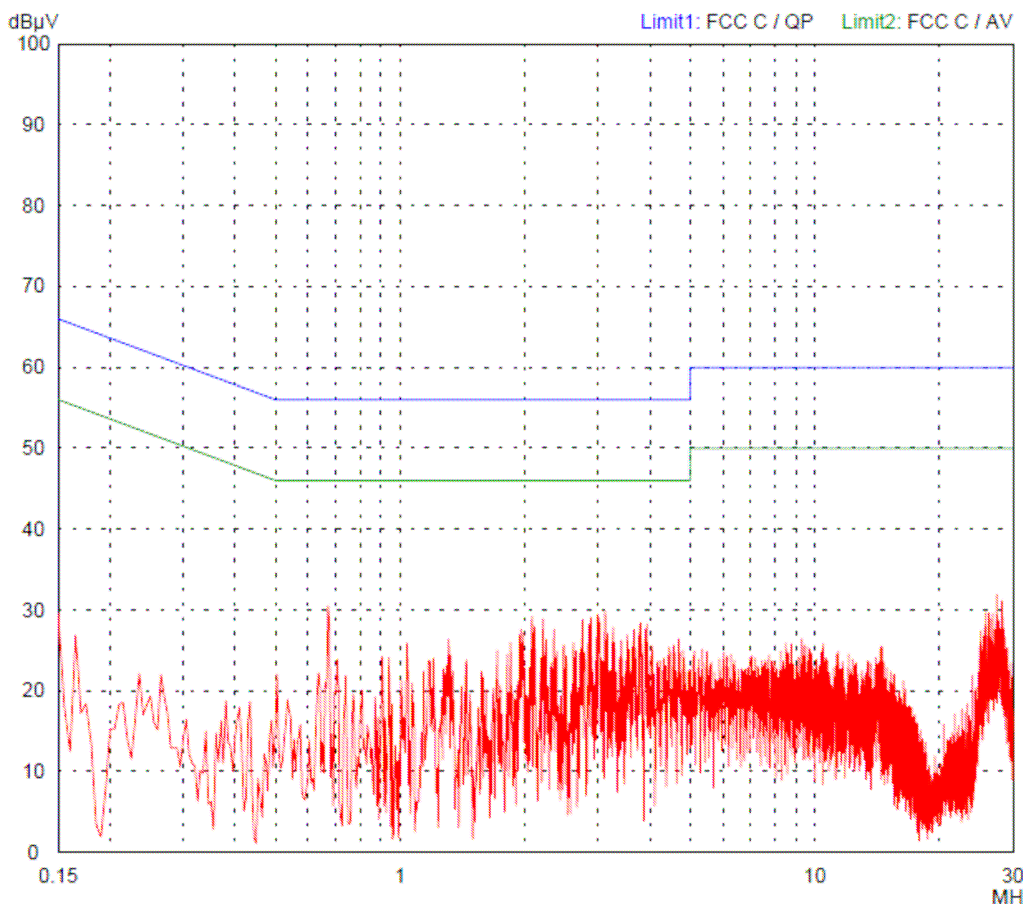


Tested on: AC input of AC adapter, Neutral Wire

**Conducted Emission Test 150 kHz - 30 MHz
 according to FCC Part 15 Subpart C**

<p>Model: i-PORT M350 RTLS</p> <p>Serial no.: 09255M0101</p> <p>Applicant: Identec Solutions AG</p> <p>Test site: Shielded room, cabin no. 4</p> <p>Tested on: Linecord Neutral Wire</p> <p>Date of test: 08/28/2009 Operator: J. Roidt</p> <p>Test performed: automatically File name:</p>	<p>Mode: Communication with Tag</p> <p>Supply Voltage = 115 V AC</p>
--	--

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



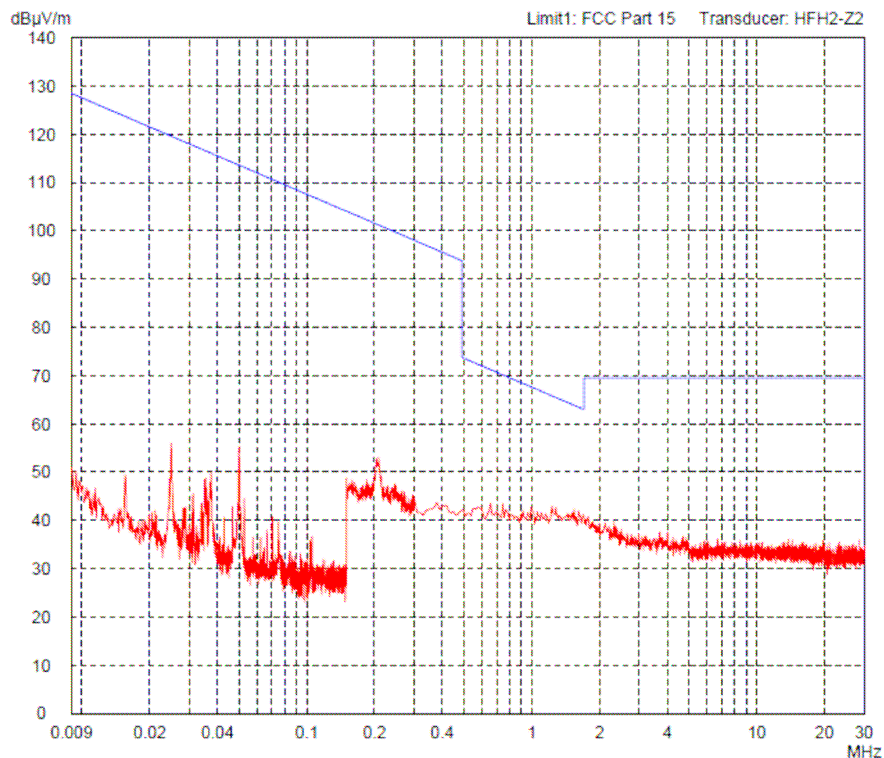
Sample calculation of final values:

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

8.8 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.231(b)(3) IC RSS-210 Issue 7, section A1.1.2(b)			
Guide:	ANSI C63.4			
Limit:	Frequency of Emission (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	Field Strength ($\text{dB}\mu\text{V}/\text{m}$)	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:	Prescan taken at 3 m distance in a shielded enclosure, no emissions above noise floor detected
Date of test:	22 August 2009
Test site:	Open field test site



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

Sample calculation of final values:

$$\text{Extrapolation Factor (dB)} = (\text{Log}(d) - \text{Log}(d_1)) \cdot \text{Extrapolation Factor (dB/decade)}$$

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value } d_1 \text{ (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} \\ + \text{Extrapolation Factor (dB)} + \text{Pulse Train Correction (dB)}$$

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



8.9 Exposure of Humans to RF Fields

Rules and specifications:	IC RSS-Gen Issue 2, section 5.5
Guide:	IC RSS-102 Issue 2, section 2.5

Exposure of Humans to RF Fields	Applicable	Declared by applicant	Measured	Exemption		
The antenna is						
<input checked="" type="checkbox"/> detachable						
<p>The conducted output power (CP in watts) is measured at the antenna connector:</p> <p style="text-align: center;">$CP = 25.36 \text{ dBm} = 0.344 \text{ W}$</p> <p>The effective isotropic radiated power (EIRP in watts) is calculated using</p> <p><input checked="" type="checkbox"/> the numerical antenna gain: $G = 4.00$</p> <p style="text-align: center;">$EIRP = G \cdot CP \Rightarrow EIRP = 1.376 \text{ W}$</p> <p><input type="checkbox"/> the field strength⁵ in V/m: $FS = \dots\dots\dots \text{ V/m}$</p> <p style="text-align: center;">$EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = \dots\dots\dots \text{ W}$</p> <p>with:</p> <p>Distance between the antennas in m: $D = 0.02 \text{ m}$</p>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> not detachable						
<p>A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by⁵:</p> <p style="text-align: center;">$EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = \dots\dots\dots \text{ W}$</p> <p>with:</p> <p>Field strength in V/m: $FS = \dots\dots\dots \text{ V/m}$</p> <p>Distance between the two antennas in m: $D = \dots\dots\dots \text{ m}$</p>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Selection of output power						
<p>The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.):</p> <p style="text-align: center;">$TP = \dots\dots\dots \text{ W}$</p>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

⁵ The conversion formula is valid only for properly matched antennas. In other cases the transmitter output power may have to be measured by a terminated measurement when applying the exemption clauses. If an open area test site is used for field strength measurement, the effect due to the metal ground reflecting plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.

9 Test Results for Receiver

FCC CFR 47 Part 15			
<i>Section(s)</i>	<i>Test</i>	<i>Page</i>	<i>Result</i>
15.107	Conducted AC powerline emission 150 kHz to 30 MHz		See TX section of this report
15.109	Radiated emission 30 MHz to 12.75 GHz	60	Test passed
15.111(a)	Antenna power conduction emission of receivers 9 kHz to 12.75 GHz	---	Not applicable

IC RSS-Gen Issue 2			
<i>Section(s)</i>	<i>Test</i>	<i>Page</i>	<i>Result</i>
7.2.2	Transmitter AC power lines conducted emissions 150 kHz to 30 MHz		See TX section of this report
6(a), 7.2.3.2	Receiver spurious emissions (radiated) 30 MHz to 12.75 GHz	60	Test passed
6(b), 7.2.3.1	Receiver spurious emissions (antenna conducted) 9 kHz to 12.75 GHz	---	Not applicable



9.1 Radiated Emission Measurement 30 MHz to 12.75 GHz

Rules and specifications:	CFR 47 Part 15, section 15.109 (Class B) IC RSS-Gen Issue 2, sections 6(a) and 7.2.3.2		
Guide:	ANSI C63.4		
Limit:	Frequency of Emission (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	Field Strength ($\text{dB}\mu\text{V}/\text{m}$)
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	Above 960	500	54.0
Measurement procedures:	Radiated Emission in Fully or Semi Anechoic Room (6.5) Radiated Emission at Open Field Test Site (6.6)		

Comment:	
Date of test:	25 August 2009
Test site:	Frequencies ≤ 1 GHz: Open field test site Frequencies > 1 GHz: Fully anechoic room, cabin no. 2
Test distance:	3 meters

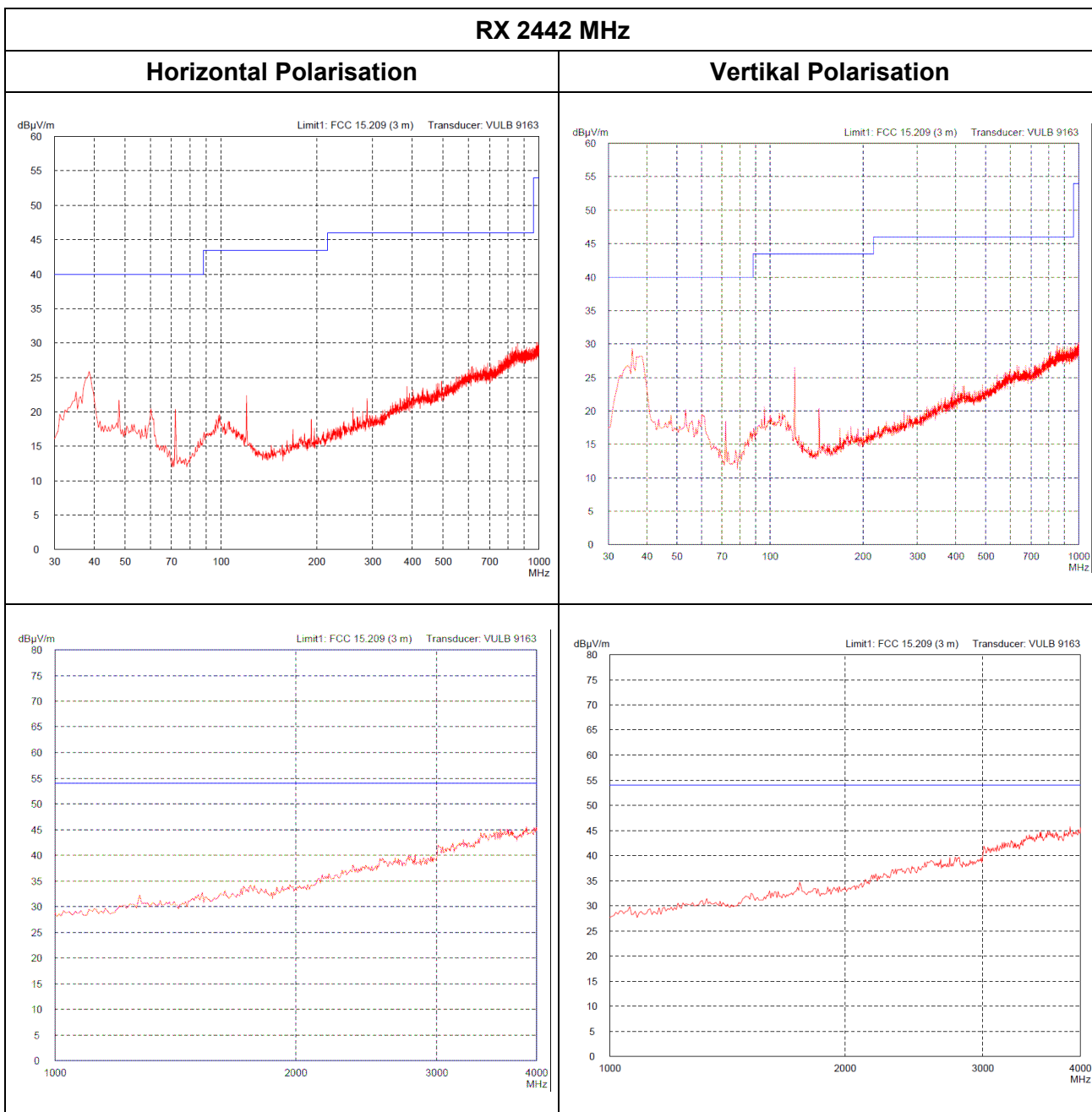
Test Result:	Test passed
--------------	-------------

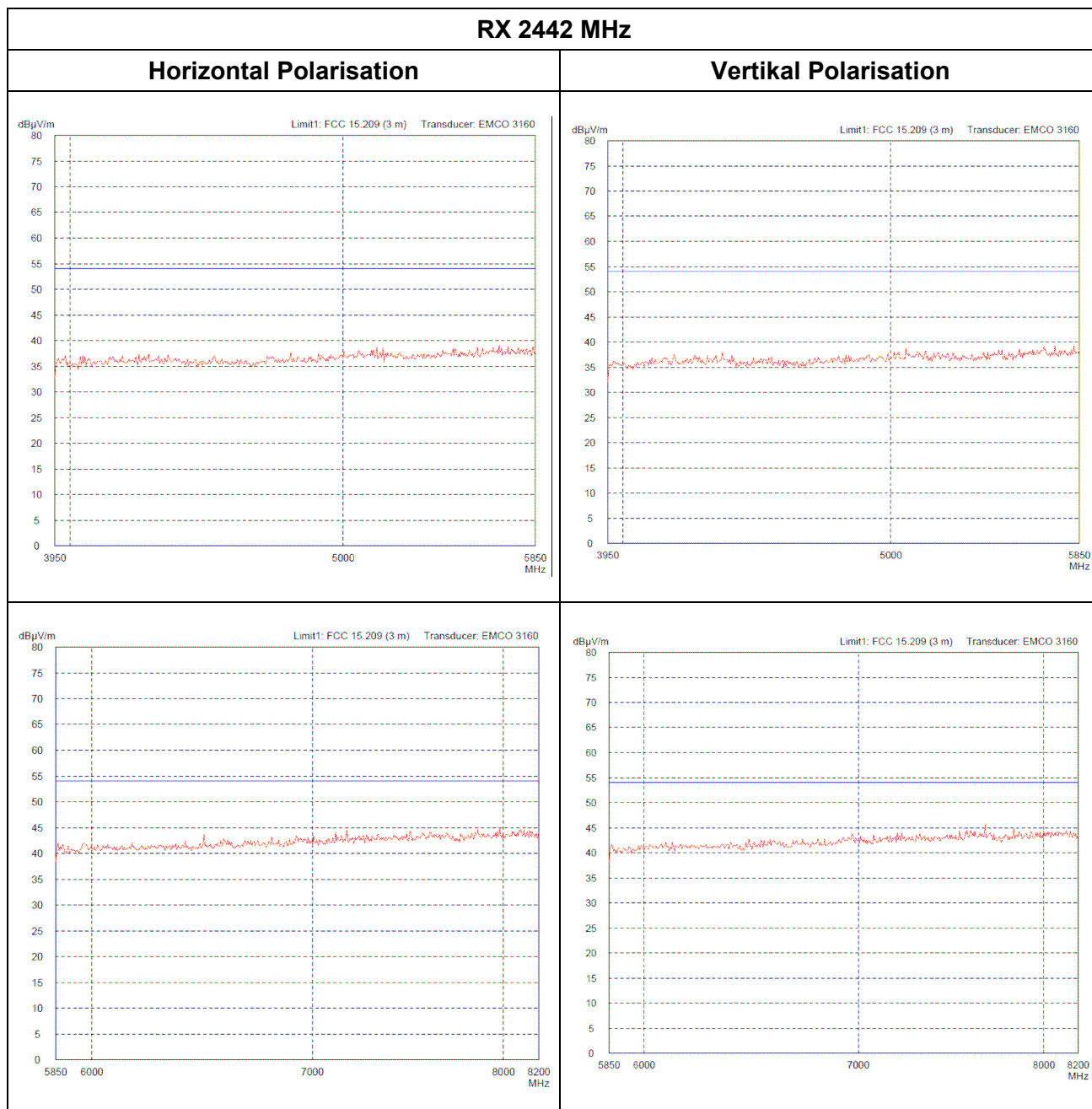
Frequency (MHz)	Antenna Polarisation	Detector	Receiver Reading ($\text{dB}\mu\text{V}$)	Correction Factor (dB/m)	Duty Cycle Correction	Final Value ($\text{dB}\mu\text{V}/\text{m}$)	Limit ($\text{dB}\mu\text{V}/\text{m}$)	Margin (dB)
30-12750	hor/ver	Q.P. /Peak	***					

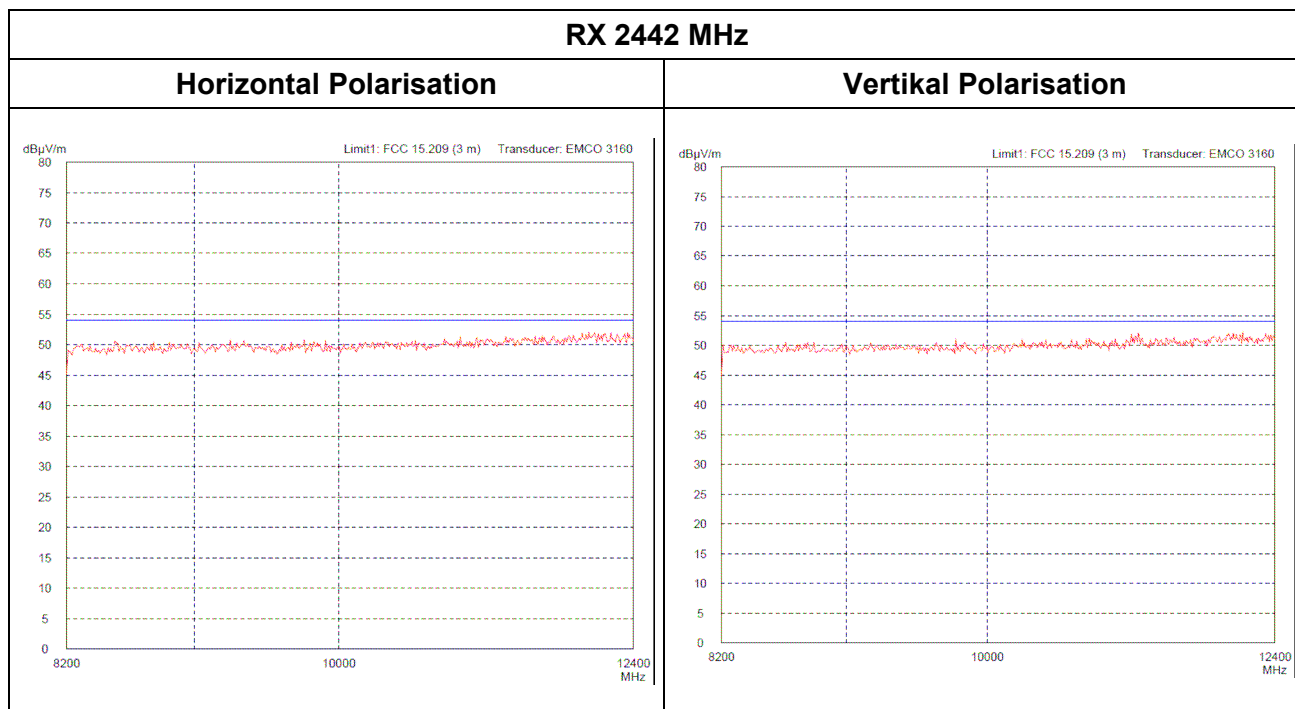
*** No emissions above noise floor detected

Sample calculation of field final values:

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







10 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, 2008
<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, 2008
<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 checked="" type="checkbox"/>	RSS-Gen	Radio Standards Specification RSS-Gen Issue 2 containing General Requirements and Information for the Certification of Radiocommunication Equipment, published by Industry Canada	June 2007
<input checked="" type="checkbox"/>	RSS-210	Radio Standards Specification RSS-210 Issue 7 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada	June 2007
<input type="checkbox"/>	RSS-310	Radio Standards Specification RSS-310 Issue 2 for Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment, published by Industry Canada	June 2007
<input checked="" type="checkbox"/>	RSS-102	Radio Standards Specification RSS-102 Issue 3: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) , published by Industry Canada	June 2009
<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



TRC-43

Notes Regarding Designation of Emission (Including Necessary Bandwidth and Classification), Class of Station and Nature of Service, published by Industry Canada

October 9, 1982



11 Revision History

Revision History			
<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	29 Sept. 2009	J. Roidt	First Edition
2	25 Feb. 2010	C. Jäger	Edition 2 Modification required for FCC- and IC Certification - Update of Referenced Standards - Markings selected by Exposure of Humans to RF Fields
3	01 April 2010	J. Roidt	Edition 3 Modification required for FCC- and IC Certification
4	14 April 2010	C. Jäger	Edition 4 Modification required for FCC- and IC Certification Band Edge Test Plots changed