

TEST REPORT

ACCORDING TO: FCC CFR 47 PART 15 Subpart C, §15.247 and
RSS-210, Issue 7, Annex 8

FOR:

**Bioness Neuromodulation Ltd. -
A Bioness Inc Company**

Trade mark: NESS L300 Plus

Model: L300 Plus Control Unit

This report is in conformity with ISO/ IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested. This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.

Table of contents

1	Applicant information	3
2	Equipment under test attributes	3
3	Manufacturer information	3
4	Test details	3
5	Tests summary	4
6	EUT description	5
6.1	General information	5
6.2	Ports and lines	5
6.3	Support and test equipment	5
6.4	Changes made in the EUT	5
6.5	Test configuration	6
6.6	Transmitter characteristics	7
7	Transmitter tests according to 47CFR part 15 subpart C and RSS-210 requirements.....	8
7.1	Minimum 6 dB bandwidth	8
7.2	Peak output power.....	13
7.3	Field strength of spurious emissions.....	18
7.4	Peak spectral power density	46
7.5	Conducted emissions	52
7.6	Radiated emission measurements	55
8	APPENDIX A Test equipment and ancillaries used for tests.....	61
9	APPENDIX B Measurement uncertainties	62
10	APPENDIX C Test laboratory description.....	63
11	APPENDIX D Specification references	63
12	APPENDIX E Test equipment correction factors.....	64
13	APPENDIX F Abbreviations and acronyms	74

1 Applicant information

Client name: Bioness Neuromodulation Ltd. - A Bioness Inc Company
Address: P.O.Box 2500, 19 Ha'haroshet street, Ra'anana 43654, Israel
Telephone: +972 9790 7100
Fax: +972 9748 5740
E-mail: eyal.lasko@bioness.co.il
Contact name: Mr. Eyal Lasko

2 Equipment under test attributes

Product: Control unit
Trade mark: NESS L300 Plus
Model(s): L300 Plus Control Unit
Part number: 502-00045-01
Serial number: 00032
Hardware version: 2.0
Receipt date 10/18/2010

3 Manufacturer information

Manufacturer name: Bioness Neuromodulation Ltd. - A Bioness Inc Company
Address: P.O.Box 2500, 19 Ha'haroshet street, Ra'anana 43654, Israel
Telephone: +972 9790 7100
Fax: +972 9748 5740
E-Mail: eyal.lasko@bioness.co.il
Contact name: Mr. Eyal Lasko

4 Test details

Project ID: 21179
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 10/18/2010
Test completed: 12/02/2010
Test specification(s): FCC 47CFR Part 15, subpart C, §15.247;
RSS-210 Issue 7:2007, Annex 8; RSS-Gen Issue 2:2007

5 Tests summary

Test	Status
Transmitter characteristics	
FCC section 15.247(a)(2), RSS-210 section A8.2(a), 6 dB bandwidth	Pass
FCC section 15.247(b)(3), RSS-210 section A8.4(4), Peak output power	Pass
FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	Pass
FCC section 15.247(e), RSS-210 A8.2(b), Peak power density	Pass
FCC section 15.247(i)/ RSS-Gen, section 5.5, RF exposure	Pass, Exhibit provided in documentation for Application
FCC section 15.207(a), RSS-Gen section 7.2.2, Conducted emission	Pass
Unintentional emissions	
RSS-Gen section 7.2.3.2, Radiated emission	Pass

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	December 2, 2010	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	December 8, 2010	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	March 11, 2011	

6 EUT description

6.1 General information

The EUT, "L300 Plus Control Unit", is a transceiver, part of the NESS L300 Plus system that is used to correct foot drop and/or knee weakness syndromes.

The EUT enables the user to activate/deactivate the system, select a mode of operation, fine-tune the stimulation intensity, and receive information regarding the system by visual and audio indicators. The "L300 Plus Control Unit" utilizes an RF link to communicate with the "Thigh RF Stimulation Unit" and GS (Gait Sensor). The "L300 Plus Control Unit" serves as a wireless bridge between the clinician programming system (CPS) and "Thigh RFS".

The EUT consists of a small PCB with an integrated RF transceiver, inside a plastic enclosure and is powered by a single rechargeable 1.2V AAA battery. The "L300 Plus Control Unit" is considered as internally powered unit (connected to AC/DC adaptor only in charging mode).

6.2 Ports and lines

Port type	Port description	Conn. from	Conn. to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	DC Power	AC/DC adaptor*	EUT	1	Unshielded	2.5 m	Indoor
Signal	USB**	PC	EUT	1	Unshielded	various	Indoor

* - for charging only

** - for maintenance only.

6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
AC/DC adaptor (charger)	Friwo	FW7555M/05	809T

6.4 Changes made in the EUT

No changes were implemented.

6.5 Test configuration



6.6 Transmitter characteristics

Type of equipment									
V		Stand-alone (Equipment with or without its own control provisions)							
		Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)							
		Plug-in card (Equipment intended for a variety of host systems)							
Intended use				Condition of use					
		fixed		Always at a distance more than 2 m from all people					
		mobile		Always at a distance more than 20 cm from all people					
V		portable		May operate at a distance closer than 20 cm to human body					
Assigned frequency range				2400.0 – 2483.5 MHz					
Operating frequency range				2401.0 – 2482.0 MHz					
RF channel spacing				1000 kHz					
Maximum rated output power				At transmitter 50 Ω RF output connector		NA			
				Peak power		-8.1 dBm			
Is transmitter output power variable?				V		No			
				Yes				continuous variable	
								stepped variable with stepsize	
								dB	
								minimum RF power	
				maximum RF power		dBm			
Antenna connection									
unique coupling		standard connector		V		integral			
				V		with temporary RF connector			
						without temporary RF connector			
Antenna/s technical characteristics									
Type		Manufacturer		Model number		Gain			
Chip		Fractus		FR05-S1-N-0-102		1.5 dBi			
Transmitter aggregate data rate/s				0.25 Mbps					
Type of modulation				FSK					
Type of multiplexing				NA					
Modulating test signal (baseband)				Binary data message					
Maximum transmitter duty cycle in normal use				Refer to the manufacturer declaration					
Transmitter duty cycle supplied for test				100 %		Tx ON time			
						NA			
				Period		NA			
Transmitter power source									
V		Battery		Nominal rated voltage		1.2 VDC			
		DC		Nominal rated voltage					
		AC mains		Nominal rated voltage		Frequency			
						Hz			
Common power source for transmitter and receiver				V		yes			
						no			

Test specification:	FCC section 15.247(a)(2), RSS-210 section A8.2(a), 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict: PASS	
Date:	10/18/2010		
Temperature: 23.4 °C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 requirements

7.1 Minimum 6 dB bandwidth

7.1.1 General

This test was performed to measure 6 dB bandwidth of the EUT carrier frequency. Specification test limits according to FCC part 15 section 15.247(a)(2) and RSS-210 section A8.2(a) are given in Table 7.1.1.

Table 7.1.1 The 6 dB bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum bandwidth, kHz
902.0 – 928.0	6.0	500.0
2400.0 – 2483.5		
5725.0 – 5850.0		

* - Modulation envelope reference points provided in terms of attenuation below the peak of modulated carrier.

7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

7.1.2.2 The EUT was set to transmit modulated carrier.

7.1.2.3 The transmitter minimum 6 dB bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and the associated plots.

Figure 7.1.1 The 6 dB bandwidth test setup



Test specification:	FCC section 15.247(a)(2), RSS-210 section A8.2(a), 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date:	10/18/2010		
Temperature: 23.4 °C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Table 7.1.2 The 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak
SWEEP MODE: Single
SWEEP TIME: Auto
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATION ENVELOPE REFERENCE POINTS: 6.0 dBc
MODULATION: FSK
MODULATING SIGNAL: Binary data message
BIT RATE: 0.25 Mbps

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
Low frequency				
2401.0	665	500	165	Pass
Mid frequency				
2441.0	640	500	140	Pass
High frequency				
2483.0	630	500	130	Pass

Table 7.1.3 The 99% power bandwidth test results

ASSIGNED FREQUENCY BAND: 2400.0 – 2483.5 MHz
DETECTOR USED: Sample
SWEEP MODE: Single
SWEEP TIME: Auto
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATION ENVELOPE REFERENCE POINTS: 99%
MODULATION: FSK
MODULATING SIGNAL: Binary data message
BIT RATE: 0.25 Mbps

Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2401.0	875.59	NA	NA	Pass
2441.0	852.17	NA	NA	Pass
2483.0	918.56	NA	NA	Pass

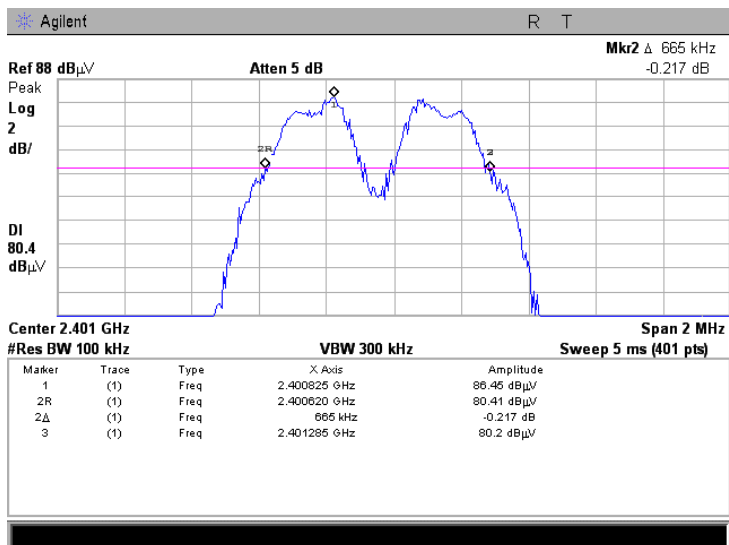
Reference numbers of test equipment used

HL 0337	HL 2909							
---------	---------	--	--	--	--	--	--	--

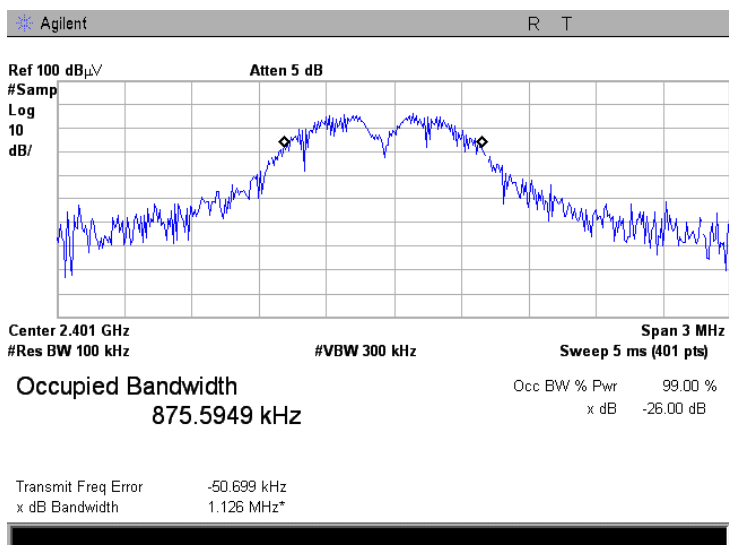
Full description is given in Appendix A.

Test specification:		FCC section 15.247(a)(2), RSS-210 section A8.2(a), 6 dB bandwidth	
Test procedure:		FR Vol.62, page 26243, Section 15.247(a)2	
Test mode:		Compliance	Verdict: PASS
Date:		10/18/2010	
Temperature: 23.4 °C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.1.1 The 6 dB bandwidth test result at low frequency

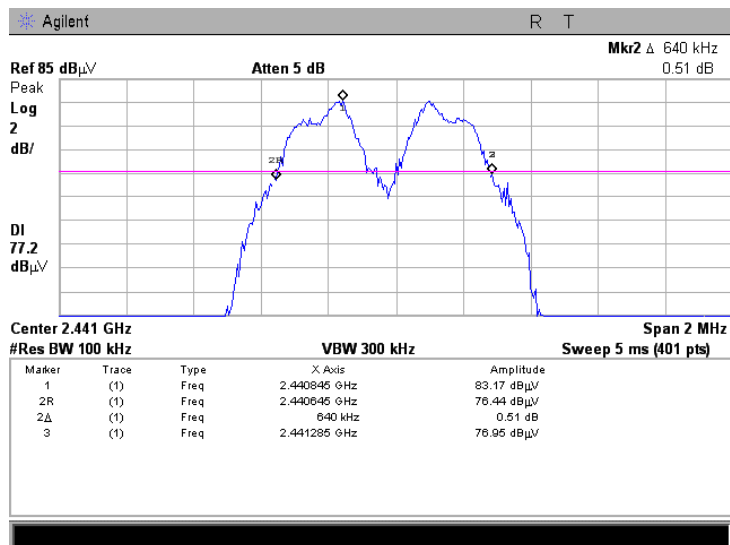


Plot 7.1.2 The 99% power bandwidth test result at low frequency

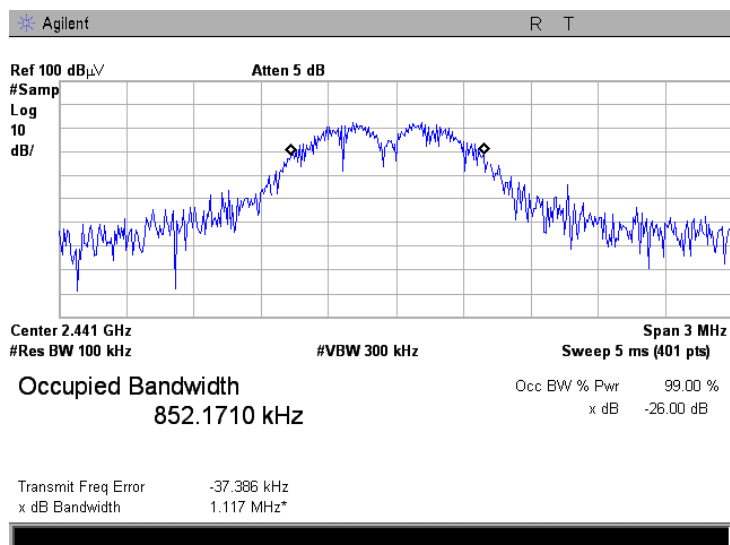


Test specification: FCC section 15.247(a)(2), RSS-210 section A8.2(a), 6 dB bandwidth	
Test procedure: FR Vol.62, page 26243, Section 15.247(a)2	
Test mode: Compliance	Verdict: PASS
Date: 10/18/2010	
Temperature: 23.4 °C	Air Pressure: 1012 hPa
Relative Humidity: 44 %	Power Supply: Battery
Remarks:	

Plot 7.1.3 The 6 dB bandwidth test result at mid frequency

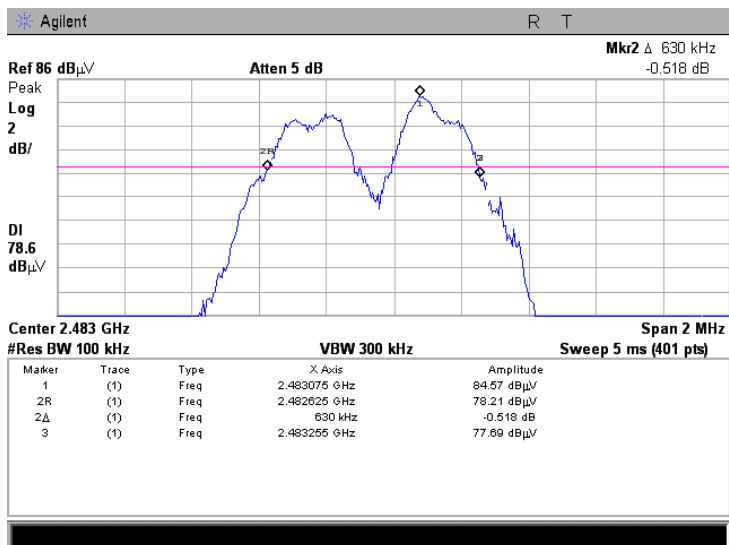


Plot 7.1.4 The 99% power bandwidth test result at mid frequency

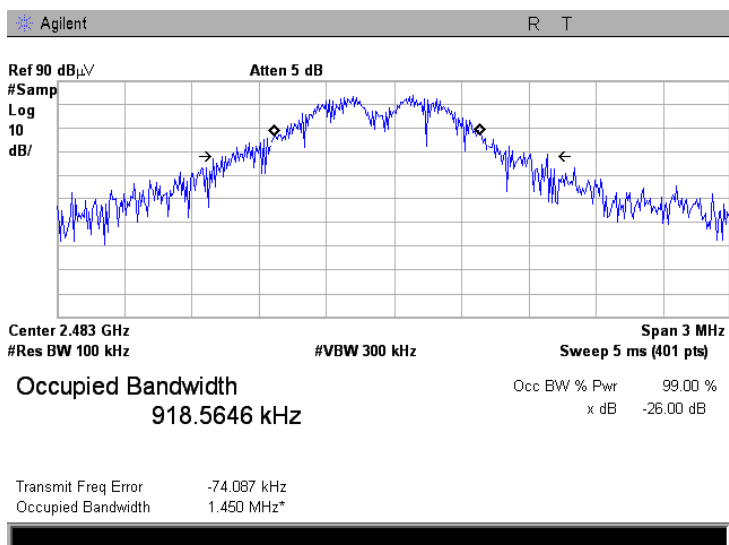


Test specification: FCC section 15.247(a)(2), RSS-210 section A8.2(a), 6 dB bandwidth	
Test procedure: FR Vol.62, page 26243, Section 15.247(a)2	
Test mode: Compliance	Verdict: PASS
Date: 10/18/2010	
Temperature: 23.4 °C	Air Pressure: 1012 hPa
	Relative Humidity: 44 %
Power Supply: Battery	
Remarks:	

Plot 7.1.5 The 6 dB bandwidth test result at high frequency



Plot 7.1.6 The 99% power bandwidth test result at high frequency



Test specification:		FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power	
Test procedure:		FR Vol.62, page 26243, Section 15.247(b)	
Test mode:	Compliance	Verdict:	PASS
Date:	10/24/2010		
Temperature: 24.1 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: Battery
Remarks:			

7.2 Peak output power

7.2.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits according to FCC part 15 section 15.247(b)(3) and RSS-210 section A8.4(4) are given in Table 7.2.1.

Table 7.2.1 Peak output power limits

Assigned frequency range, MHz	Maximum antenna gain, dBi	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)**
		W	dBm	
2400.0 – 2483.5	6.0	1.0	30.0	131.2

*- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

** - Equivalent field strength limit was calculated from the peak output power as follows: $E = \sqrt{30 \times P \times G} / r$, where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.

7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.2.2.3 The field strength of the EUT fundamental emission was measured in 3 orthogonal positions of the device.

7.2.2.4 The resolution bandwidth of spectrum analyzer was set wider than 6 dB bandwidth of the EUT and the field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.2.2.5 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.2.2 and associated plots.

7.2.2.6 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.

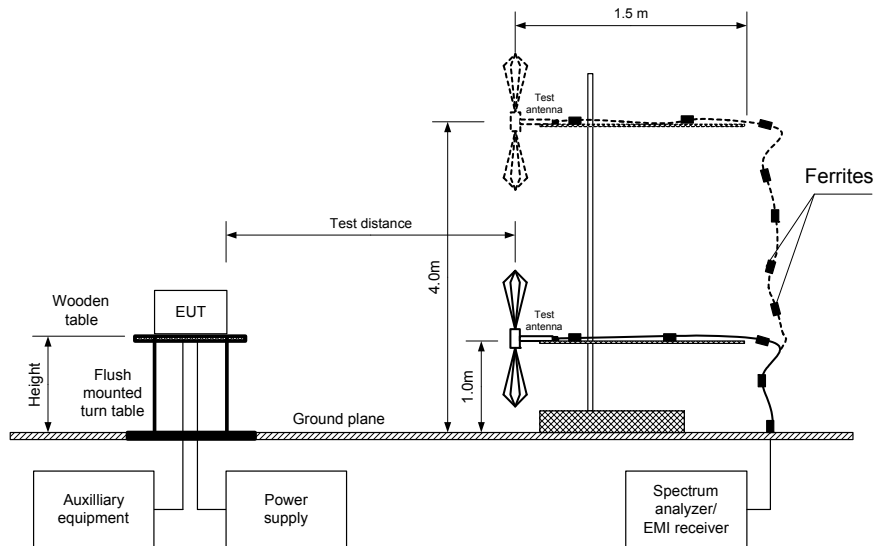
The above equation was converted in logarithmic units for 3 m test distance:

$$\text{Peak output power in dBm} = \text{Field strength in dB}(\mu\text{V/m}) - \text{Transmitter antenna gain in dBi} - 95.2 \text{ dB}$$

7.2.2.7 The worst test results (the lowest margins) were recorded in Table 7.2.2.

Test specification:		FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power	
Test procedure:		FR Vol.62, page 26243, Section 15.247(b)	
Test mode:		Compliance	Verdict: PASS
Date:		10/24/2010	
Temperature: 24.1 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: Battery
Remarks:			

Figure 7.2.1 Setup for carrier field strength measurements



Test specification:		FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power	
Test procedure:		FR Vol.62, page 26243, Section 15.247(b)	
Test mode:	Compliance	Verdict:	PASS
Date:	10/24/2010		
Temperature: 24.1 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: Battery
Remarks:			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY RANGE: 2400.0 – 2483.5 MHz
 TEST DISTANCE: 3 m
 TEST SITE: Semi anechoic chamber
 EUT HEIGHT: 0.8 m
 DETECTOR USED: Peak
 TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
 MODULATION: FSK
 MODULATING SIGNAL: Binary data message
 BIT RATE: 250 kbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 EUT 6 dB BANDWIDTH: 630.0 kHz
 RESOLUTION BANDWIDTH: 1 MHz
 VIDEO BANDWIDTH: 3 MHz

Frequency, MHz	Field strength, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2401.193	85.67	V	1.05	183	1.5	-11.06	30.0	-41.06	Pass
2400.655	88.38	H	2.2	210	1.5	-8.35	30.0	-38.35	Pass
2441.088	86.17	V	1.15	10	1.5	-10.56	30.0	-40.56	Pass
2411.163	88.63	H	1.85	210	1.5	-8.10	30.0	-38.10	Pass
2482.763	86.07	V	1.15	170	1.5	-10.66	30.0	-40.66	Pass
2482.700	85.59	H	1.85	210	1.5	-11.14	30.0	-41.14	Pass

The recorded test results were obtained in the EUT X-axis position.

*- EUT front panel refer to 0 degrees position of turntable.

** - Peak output power was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$, where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi – 95.2 dB*

*** - Margin = Peak output power – specification limit.

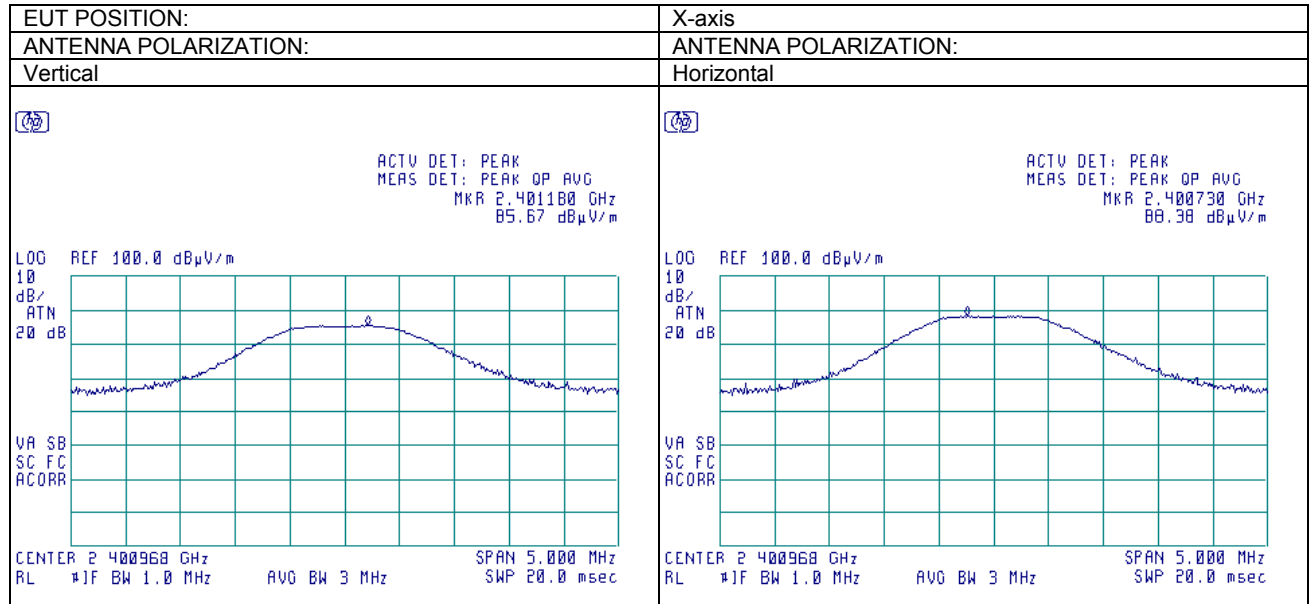
Reference numbers of test equipment used

HL 1984	HL 2870	HL 2871	HL 2909				
---------	---------	---------	---------	--	--	--	--

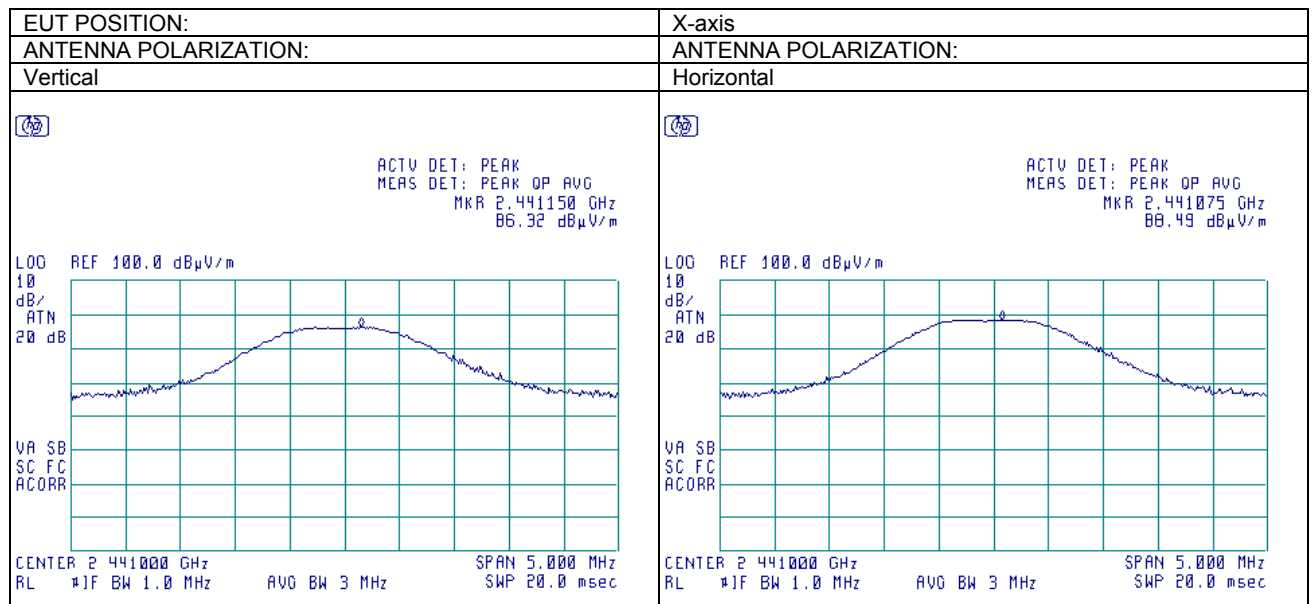
Full description is given in Appendix A.

Test specification:		FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power	
Test procedure:		FR Vol.62, page 26243, Section 15.247(b)	
Test mode:	Compliance	Verdict: PASS	
Date:	10/24/2010		
Temperature: 24.1 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: Battery
Remarks:			

Plot 7.2.1 Field strength of carrier at low frequency and Unom

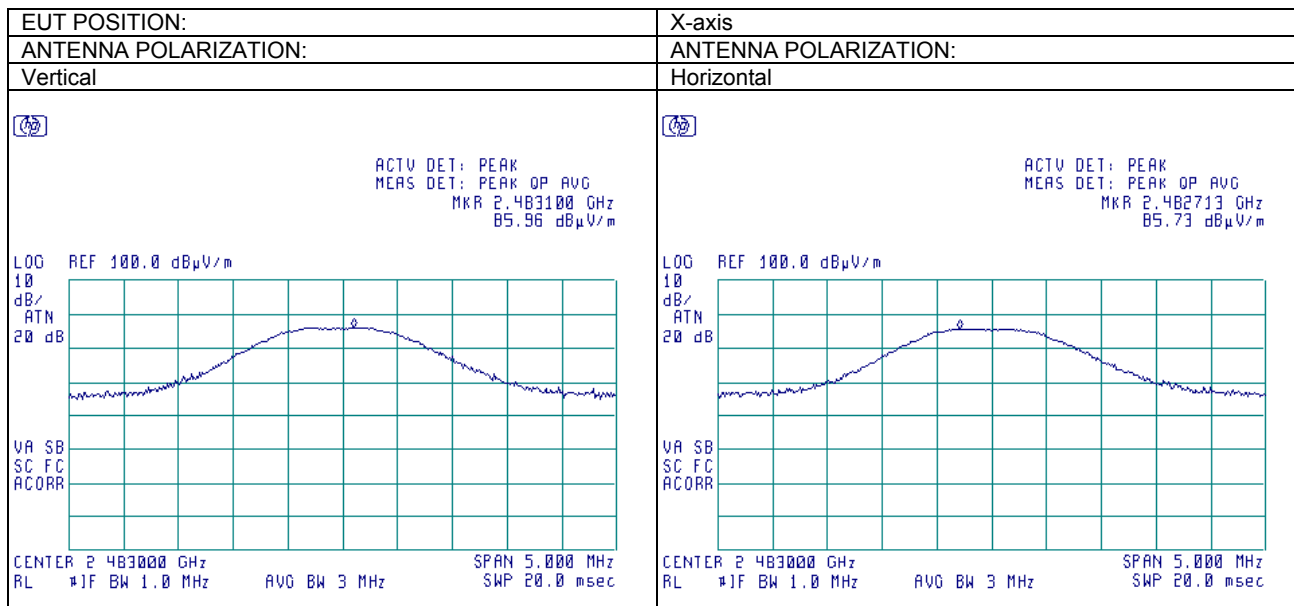


Plot 7.2.2 Field strength of carrier at mid frequency and Unom



Test specification:	FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	Verdict: PASS	
Date:	10/24/2010		
Temperature: 24.1 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: Battery
Remarks:			

Plot 7.2.3 Field strength of carrier at high frequency and Unom



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

7.3 Field strength of spurious emissions

7.3.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits according to FCC part 15 section 15.247(c) and RSS-210 section 6.2.2(o)(e1) are given in Table 7.3.1.

Table 7.3.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)*			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc***
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	20.0
0.090 – 0.110	NA	108.5 – 106.8**	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	
0.490 – 1.705	NA	73.8 – 63.0**	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
1000 – 10 th harmonic		74.0		

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$\text{Lim}_{S2} = \text{Lim}_{S1} + 40 \log (S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

** - The limit decreases linearly with the logarithm of frequency.

*** - The field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

7.3.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and the performance check was conducted.

7.3.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

7.3.2.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.

7.3.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.3.3.1 The EUT was set up as shown in Figure 7.3.2, energized and the performance check was conducted.

7.3.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.3.3.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.

Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Figure 7.3.1 Setup for spurious emission field strength measurements below 30 MHz

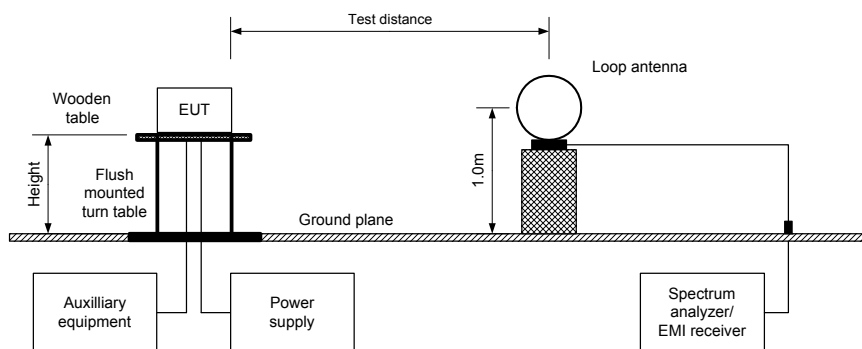
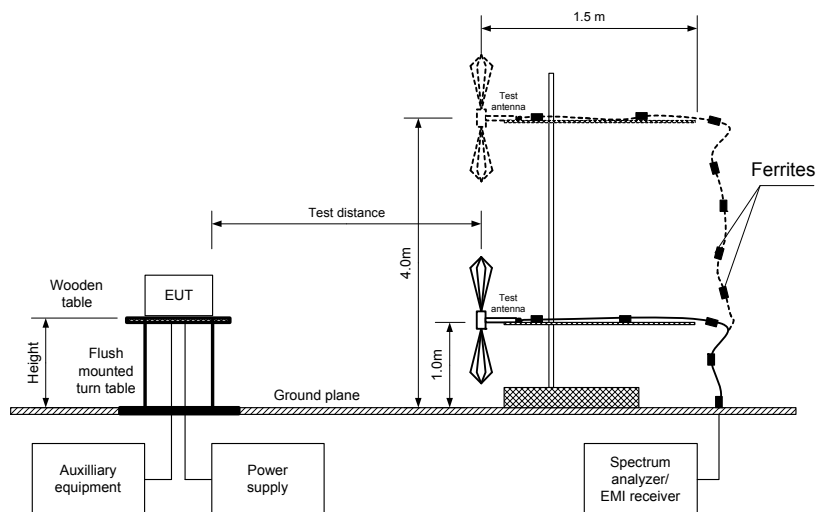


Figure 7.3.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:	Compliance	Verdict:	PASS
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Table 7.3.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY RANGE: 2400.0 – 2483.5 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 - 25000 MHz
 TEST DISTANCE: 3 m
 MODULATION: FSK
 MODULATING SIGNAL: Binary data message
 BIT RATE: 250 kbps
 DUTY CYCLE: 100 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (above 1000 MHz)

Frequency MHz	Field strength of spurious, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low carrier frequency									
No emissions were found									Pass
Mid carrier frequency									
No emissions were found									Pass
High carrier frequency									
No emissions were found									Pass

*- EUT front panel refers to 0 degrees position of turntable.

** - Margin = Attenuation below carrier – specification limit.

Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Table 7.3.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY RANGE: 2400.0 – 2483.5 MHz
 INVESTIGATED FREQUENCY RANGE: 1000 - 25000 MHz
 TEST DISTANCE: 3 m
 MODULATION: FSK
 MODULATING SIGNAL: Binary data message
 BIT RATE: 250 kbps
 DUTY CYCLE: 100 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 TEST ANTENNA TYPE: Double ridged guide

frequency MHz	Antenna		'Azimuth degrees'	'Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
	'Polarization'	'height m'		'Measured dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	'Measured dB(μV/m)	'Calculated dB(μV/m)	Limit, dB(μV/m)	Margin dB***	
Low carrier frequency											
2400.000	Hor	1.6	345	56.61	74.0	-17.39	48.52	37.52	54.0	-16.48	Pass
4801.950	Vert	1.05	54.23	57.81	74.0	-16.19	46.99	35.99	54.0	-18.01	Pass
Mid carrier frequency											
4881.925	Vert	1.05	350	57.81	74.0	-16.19	52.79	41.79	54.0	-12.21	Pass
High carrier frequency											
2483.500	Vert	1.5	330	65.77	74.0	-8.23	61.10	50.10	54.0	-3.90	Pass
4965.100	Vert	1.05	0	56.58	74.0	-17.42	51.68	40.68	54.0	-13.32	Pass

*- EUT front panel refers to 0 degrees position of turntable.

**- Margin = Measured field strength - specification limit.

***- Margin = Calculated field strength - specification limit,

where Calculated field strength = Measured field strength + average factor.

Table 7.3.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
Refer to manufacturer declaration					-11.0 dB

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left(\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{\text{Train duration}} \times \text{Number of bursts within pulse train} \right)$$

for pulse train longer than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left(\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{100 \text{ ms}} \times \text{Number of bursts within 100 ms} \right)$$

Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Table 7.3.5 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY RANGE: 2400.0 – 2483.5 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 TEST DISTANCE: 3 m
 MODULATION: FSK
 MODULATING SIGNAL: Binary data message
 BIT RATE: 250 kbps
 DUTY CYCLE: 100 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
 9.0 kHz (150 kHz – 30 MHz)
 120 kHz (30 MHz – 1000 MHz)
 VIDEO BANDWIDTH: > Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconical (30 MHz – 200 MHz)
 Log periodic (200 MHz – 1000 MHz)
 Biconilog (30 MHz – 1000 MHz)

Frequency MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB				
Low carrier frequency								
No emissions were found								Pass
Mid carrier frequency								
No emissions were found								Pass
High carrier frequency								
No emissions were found								Pass

*- Margin = Measured emission - specification limit.

**-. EUT front panel refer to 0 degrees position of turntable.

Table 7.3.6 Restricted bands

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

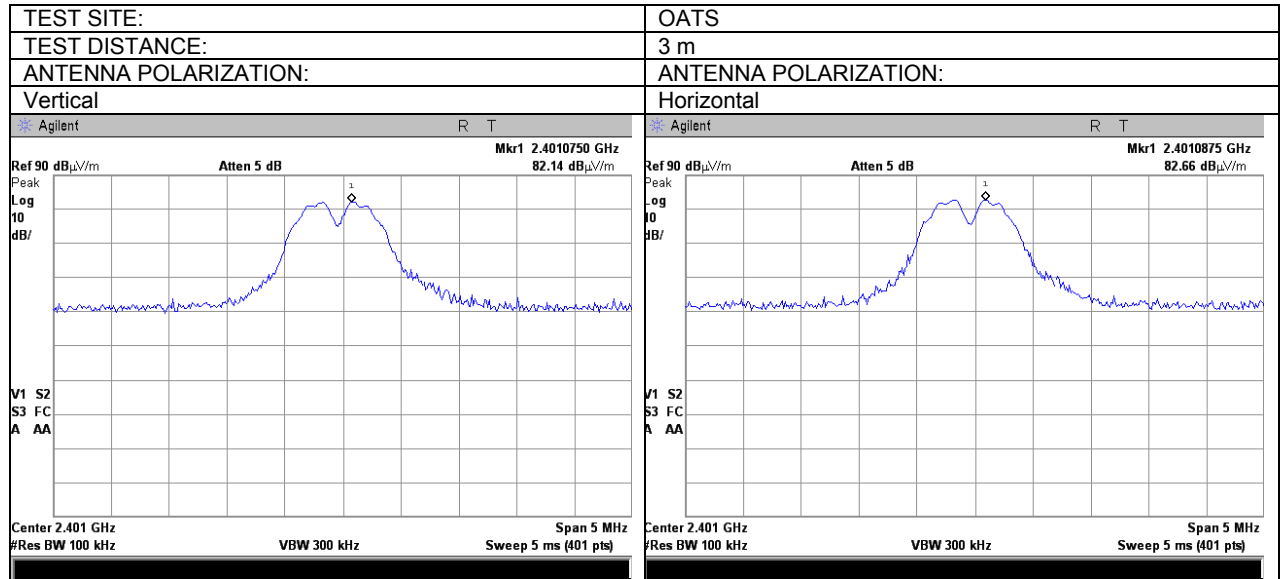
Reference numbers of test equipment used

HL 0446	HL 0521	HL 0604	HL 1984	HL 2870	HL 2871	HL 2909	HL 3533
HL 3818	HL 3883						

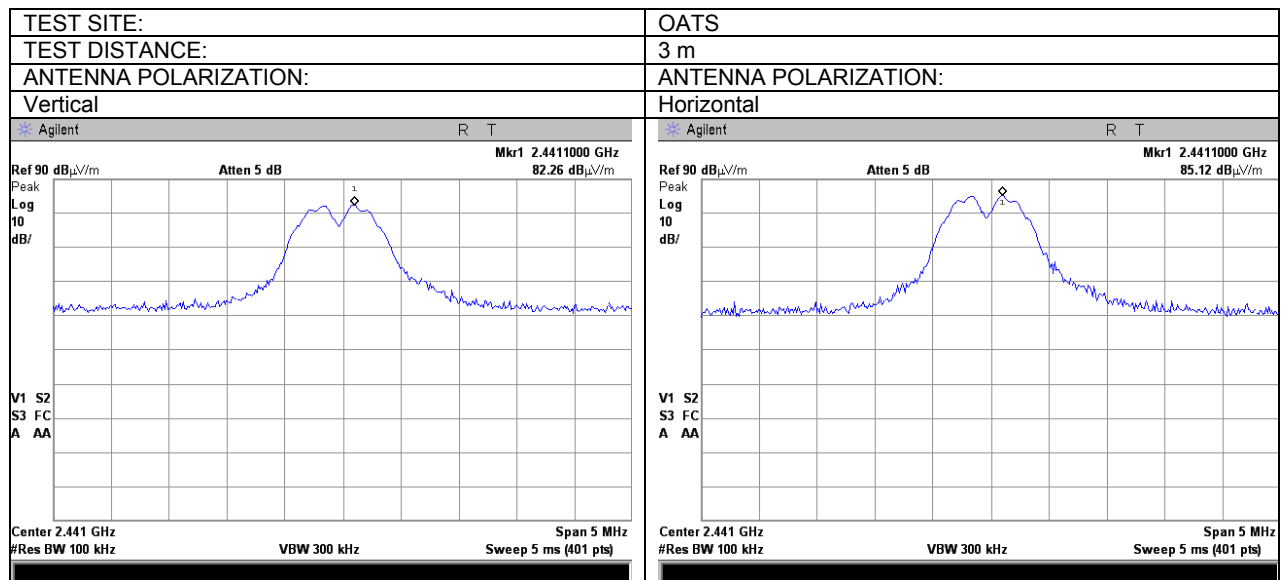
Full description is given in Appendix A.

Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.1 Radiated emission measurements at the low carrier frequency

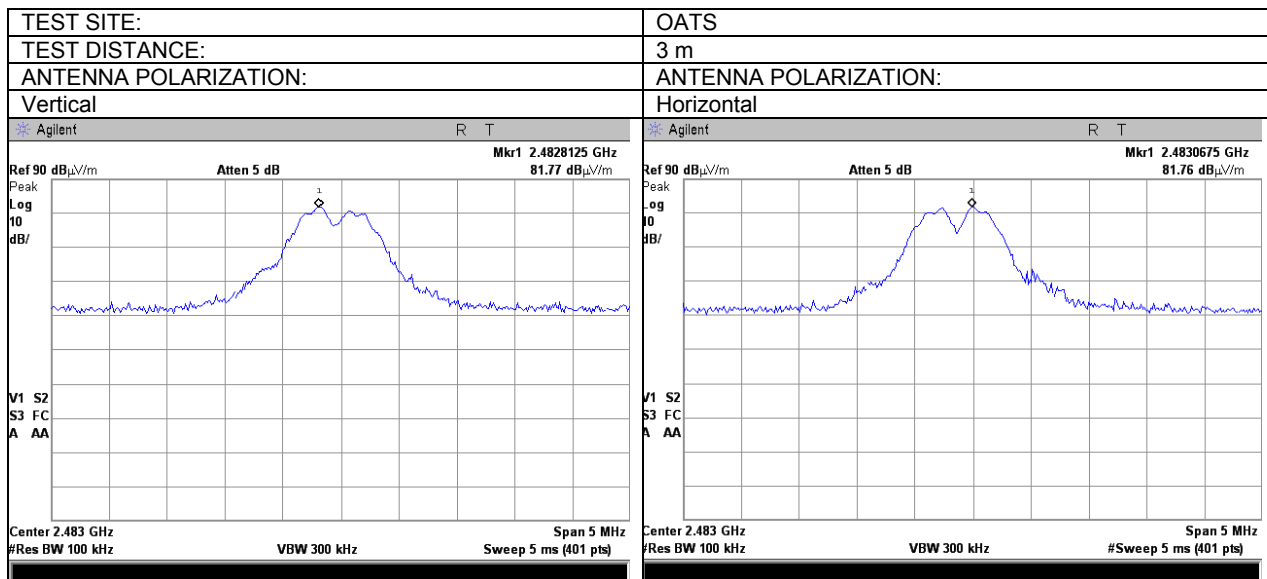


Plot 7.3.2 Radiated emission measurements at the mid carrier frequency



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

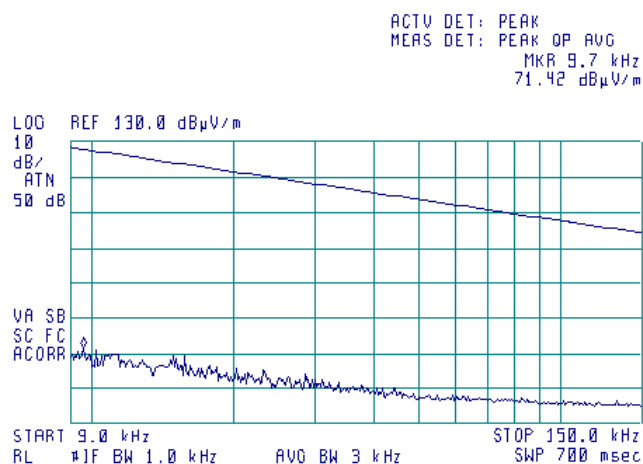
Plot 7.3.3 Radiated emission measurements at the high carrier frequency



Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		10/27/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

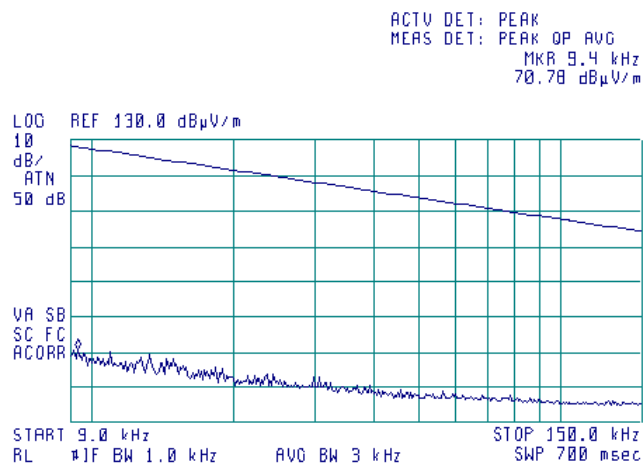
Plot 7.3.4 Radiated emission measurements from 9 to 150 kHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.3.5 Radiated emission measurements from 9 to 150 kHz at the mid carrier frequency

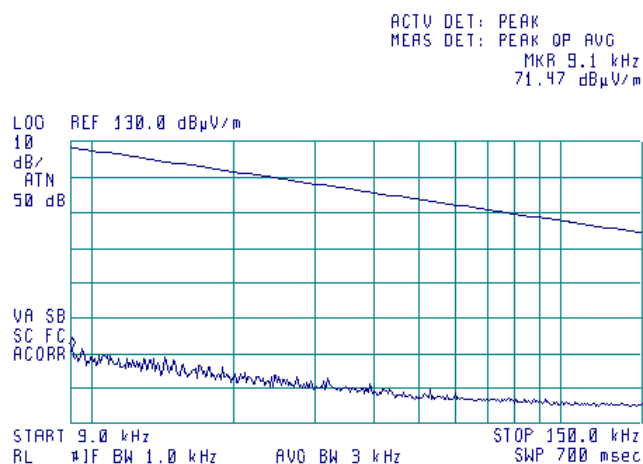
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		10/27/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

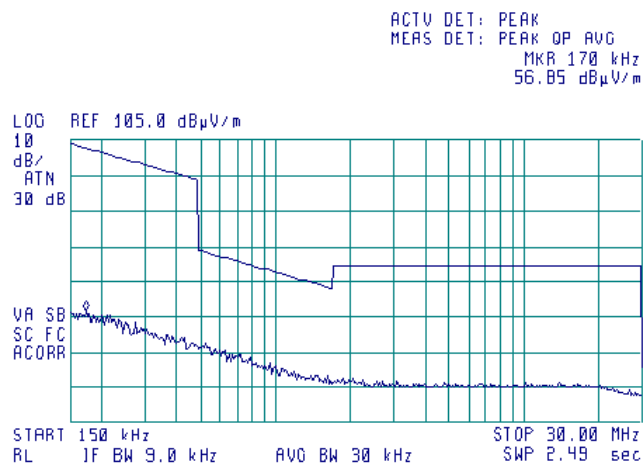
Plot 7.3.6 Radiated emission measurements from 9 to 150 kHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.3.7 Radiated emission measurements from 0.15 to 30 MHz at the low carrier frequency

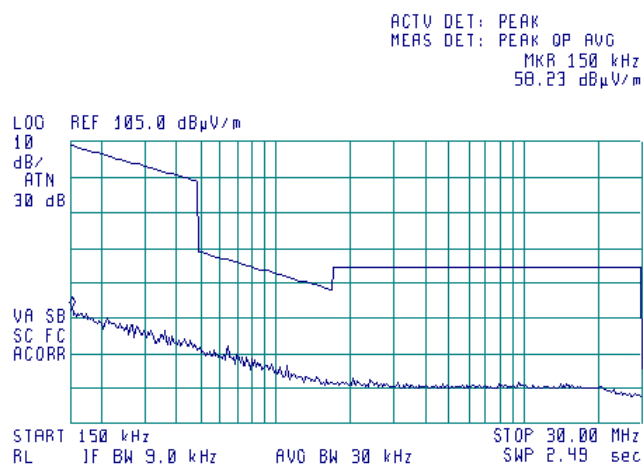
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

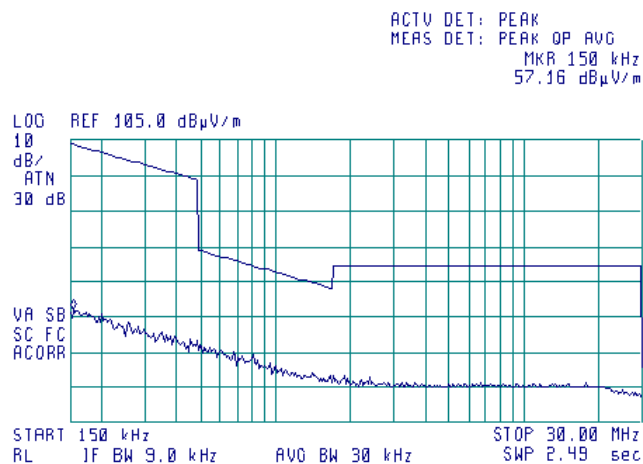
Plot 7.3.8 Radiated emission measurements from 0.15 to 30 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.3.9 Radiated emission measurements from 0.15 to 30 MHz at the high carrier frequency

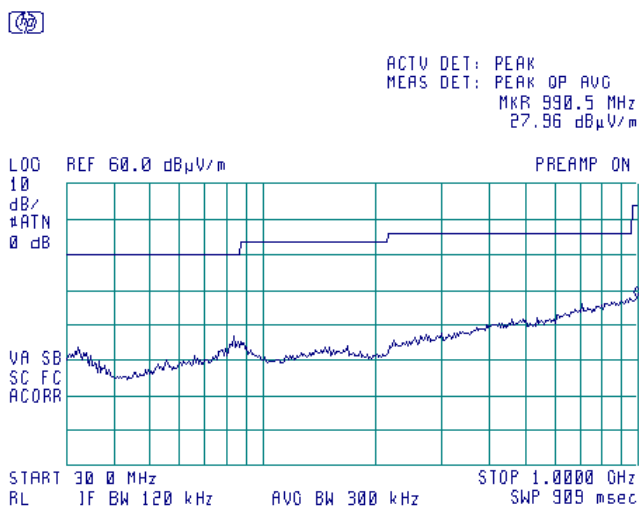
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

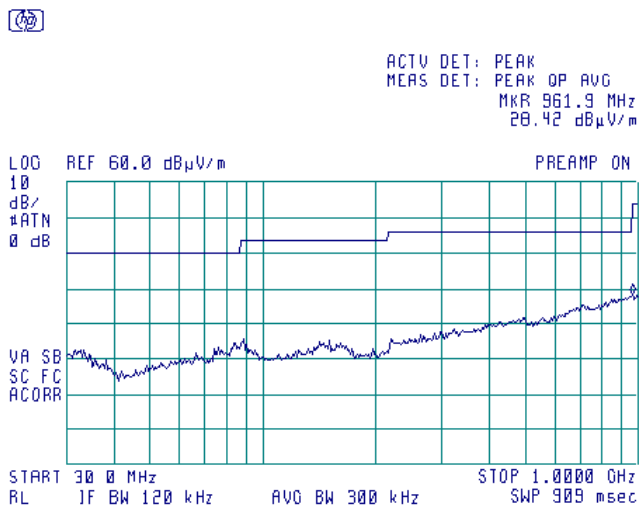
Plot 7.3.10 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.3.11 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

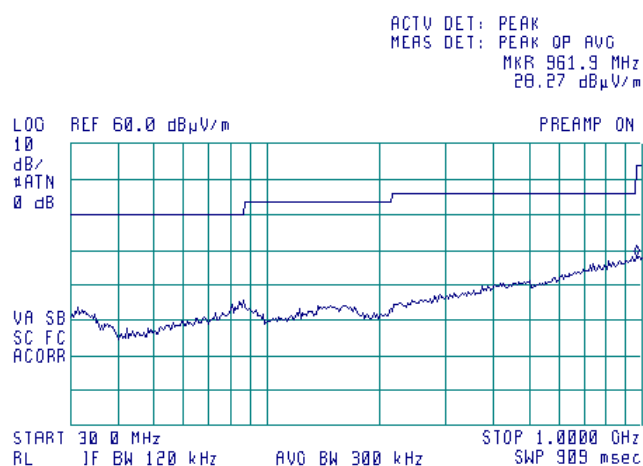
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

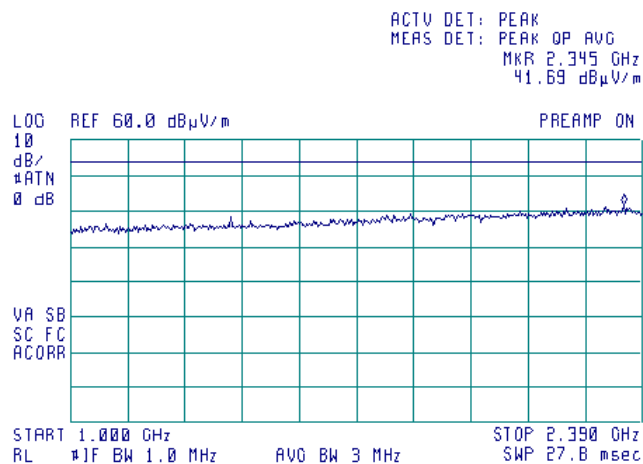
Plot 7.3.12 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.3.13 Radiated emission measurements from 1000 to 2390 MHz at the low carrier frequency

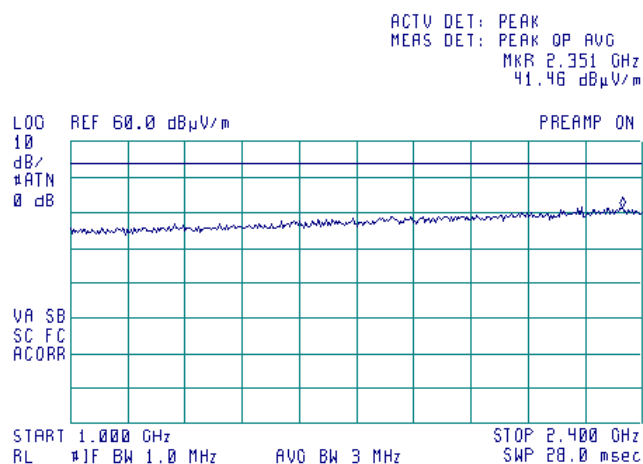
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		10/27/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

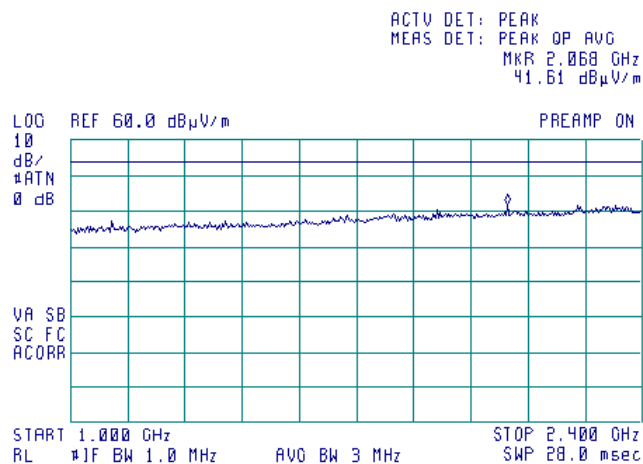
Plot 7.3.14 Radiated emission measurements from 1000 to 2400 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



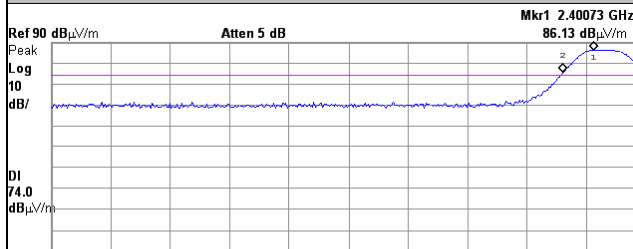
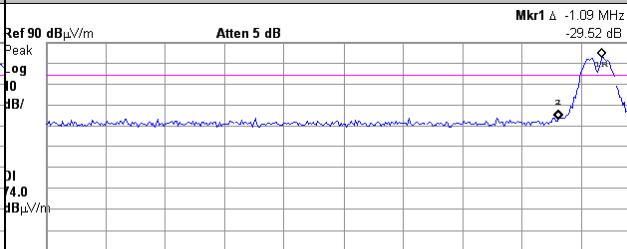
Plot 7.3.15 Radiated emission measurements from 1000 to 2400 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

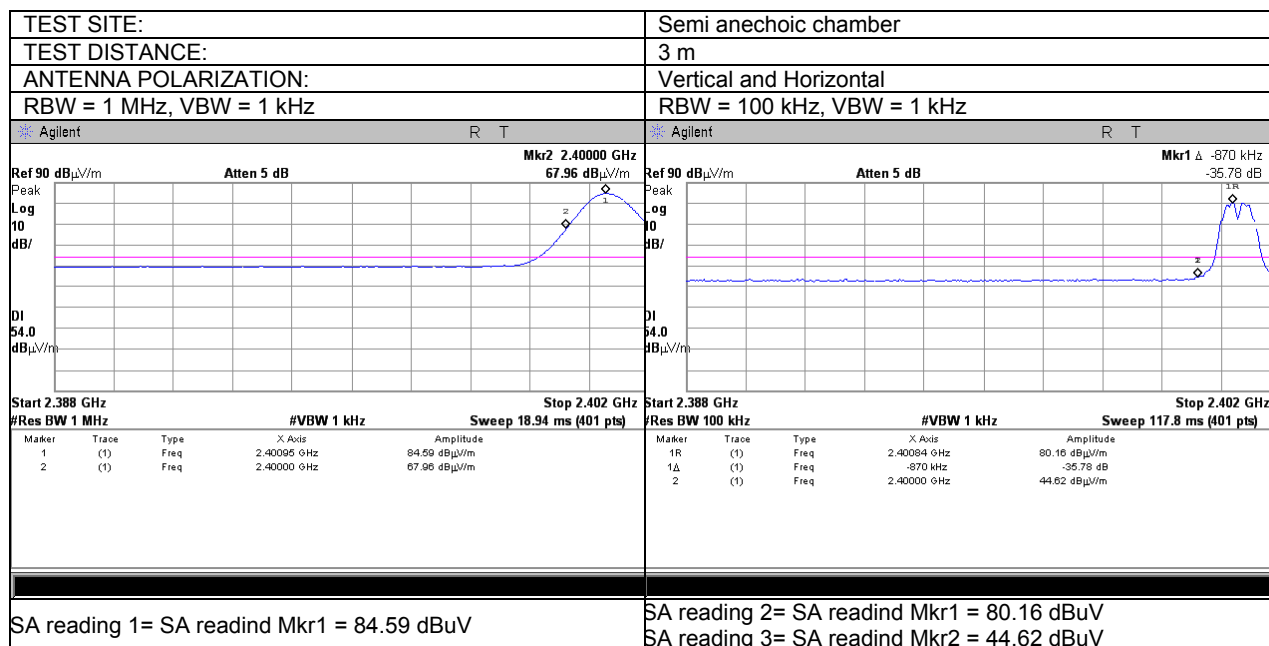
Plot 7.3.16 Radiated emission measurements from 2388 to 2402 MHz at the low carrier frequency

TEST SITE:		Semi anechoic chamber																																				
TEST DISTANCE:		3 m																																				
ANTENNA POLARIZATION:		Vertical and Horizontal																																				
RBW = 1 MHz, VBW = 3 MHz		RBW = 100 kHz, VBW = 300 kHz																																				
Agilent R T		Agilent R T																																				
																																						
Start 2.388 GHz #Res BW 1 MHz VBW 3 MHz Sweep 4 ms (401 pts)		Start 2.388 GHz #Res BW 100 kHz VBW 300 kHz Sweep 4 ms (401 pts)																																				
<table><tr><th>Marker</th><th>Trace</th><th>Type</th><th>X Axis</th><th>Amplitude</th></tr><tr><td>1</td><td>(1)</td><td>Freq</td><td>2.40073 GHz</td><td>86.13 dBμV/m</td></tr><tr><td>2</td><td>(1)</td><td>Freq</td><td>2.40000 GHz</td><td>75.83 dBμV/m</td></tr></table>		Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.40073 GHz	86.13 dBμV/m	2	(1)	Freq	2.40000 GHz	75.83 dBμV/m	<table><tr><th>Marker</th><th>Trace</th><th>Type</th><th>X Axis</th><th>Amplitude</th></tr><tr><td>1R</td><td>(1)</td><td>Freq</td><td>2.40109 GHz</td><td>82.61 dBμV/m</td></tr><tr><td>1Δ</td><td>(1)</td><td>Freq</td><td>-1.09 MHz</td><td>-29.52 dB</td></tr><tr><td>2</td><td>(1)</td><td>Freq</td><td>2.40000 GHz</td><td>53.09 dBμV/m</td></tr></table>		Marker	Trace	Type	X Axis	Amplitude	1R	(1)	Freq	2.40109 GHz	82.61 dBμV/m	1Δ	(1)	Freq	-1.09 MHz	-29.52 dB	2	(1)	Freq	2.40000 GHz	53.09 dBμV/m
Marker	Trace	Type	X Axis	Amplitude																																		
1	(1)	Freq	2.40073 GHz	86.13 dBμV/m																																		
2	(1)	Freq	2.40000 GHz	75.83 dBμV/m																																		
Marker	Trace	Type	X Axis	Amplitude																																		
1R	(1)	Freq	2.40109 GHz	82.61 dBμV/m																																		
1Δ	(1)	Freq	-1.09 MHz	-29.52 dB																																		
2	(1)	Freq	2.40000 GHz	53.09 dBμV/m																																		
SA reading 1= SA readind Mkr1 = 86.13 dBuV		SA reading 2= SA readind Mkr1 = 82.61 dBuV SA reading 3= SA readind Mkr2 = 53.09 dBuV																																				

$$\begin{aligned} \text{Test result} &= \text{SA reading 1} - [(\text{SA reading 2}) - (\text{SA reading 3})] = \\ &= 86.13 - (82.61 - 53.09) = 56.61 \text{ dBuV} \end{aligned}$$

Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

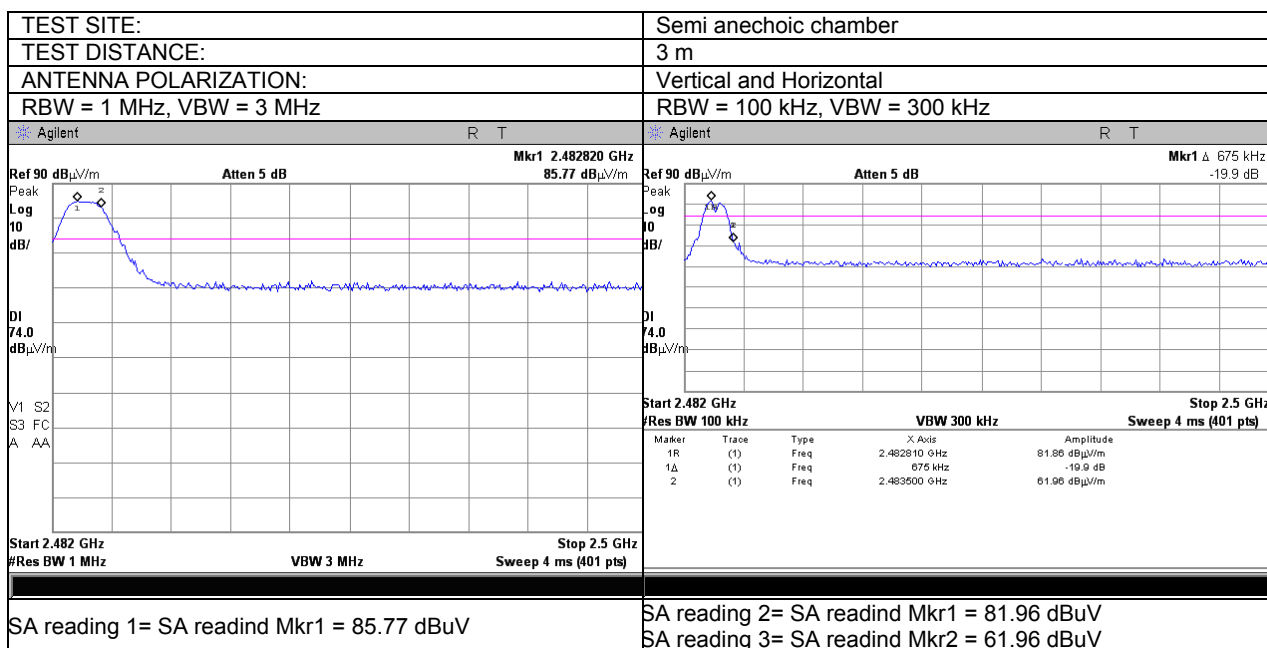
Plot 7.3.17 Radiated emission measurements from 2388 to 2402 MHz at the low carrier frequency



$$\begin{aligned} \text{Test result} &= \text{SA reading 1} - [(\text{SA reading 2}) - (\text{SA reading 3})] = \\ &= 84.59 - (80.16 - 44.52) = 48.52 \text{ dBuV} \end{aligned}$$

Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

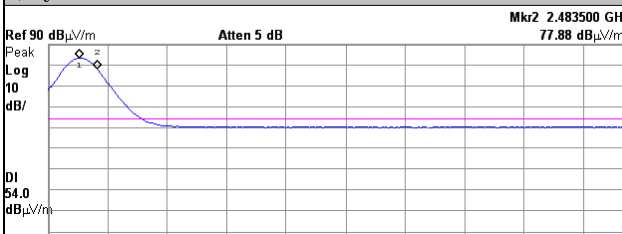
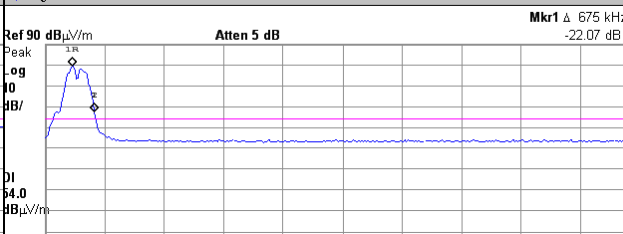
Plot 7.3.18 Radiated emission measurements from 2482 to 2500 MHz at the high carrier frequency



$$\begin{aligned} \text{Test result} &= \text{SA reading 1} - [(\text{SA reading 2}) - (\text{SA reading 3})] = \\ &= 85.77 - (81.96 - 61.96) = 65.77 \text{ dBuV} \end{aligned}$$

Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

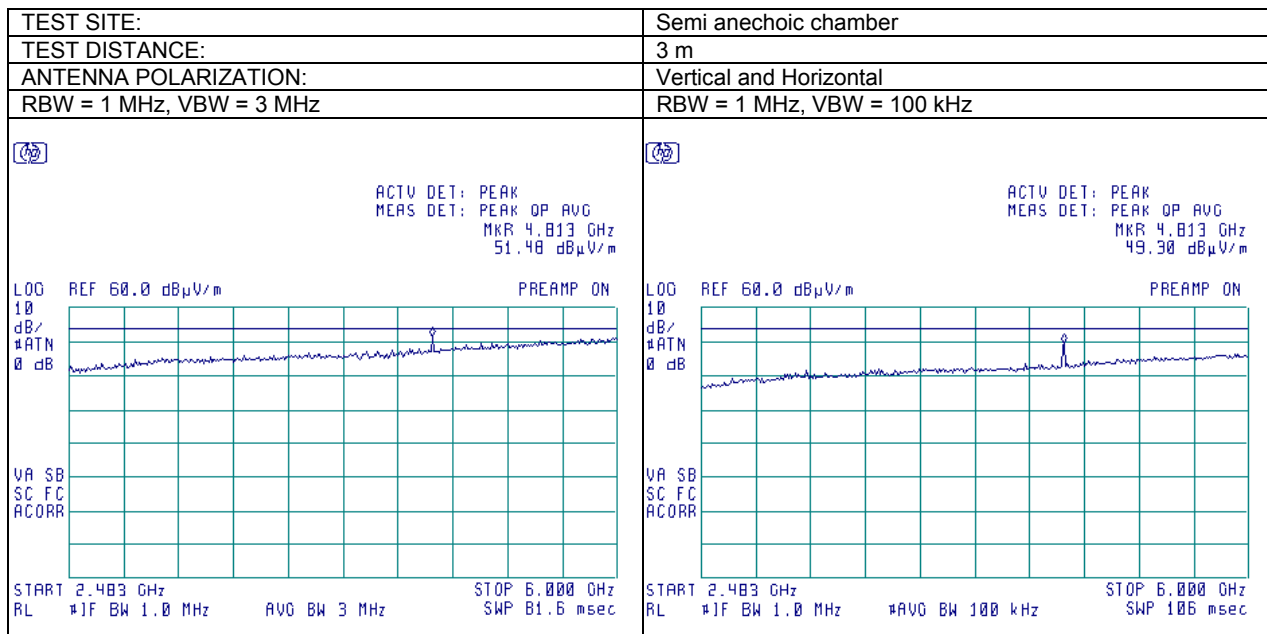
Plot 7.3.19 Radiated emission measurements from 2482 to 2500 MHz at the high carrier frequency

TEST SITE:		Semi anechoic chamber																																				
TEST DISTANCE:		3 m																																				
ANTENNA POLARIZATION:		Vertical and Horizontal																																				
RBW = 1 MHz, VBW = 1 kHz		RBW = 100 kHz, VBW = 1 kHz																																				
Agilent R T		Agilent R T																																				
																																						
Start 2.482 GHz #Res BW 1 MHz #VBW 1 kHz Sweep 23.51 ms (401 pts)		Start 2.482 GHz #Res BW 100 kHz #VBW 1 kHz Sweep 146.2 ms (401 pts)																																				
<table><tr><th>Marker</th><th>Trace</th><th>Type</th><th>X Axis</th><th>Amplitude</th></tr><tr><td>1</td><td>(1)</td><td>Freq</td><td>2.482945 GHz</td><td>83.17 dBμV/m</td></tr><tr><td>2</td><td>(1)</td><td>Freq</td><td>2.483500 GHz</td><td>77.88 dBμV/m</td></tr></table>		Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.482945 GHz	83.17 dBμV/m	2	(1)	Freq	2.483500 GHz	77.88 dBμV/m	<table><tr><th>Marker</th><th>Trace</th><th>Type</th><th>X Axis</th><th>Amplitude</th></tr><tr><td>1R</td><td>(1)</td><td>Freq</td><td>2.482810 GHz</td><td>79.61 dBμV/m</td></tr><tr><td>1Δ</td><td>(1)</td><td>Freq</td><td>675 kHz</td><td>-22.07 dB</td></tr><tr><td>2</td><td>(1)</td><td>Freq</td><td>2.483500 GHz</td><td>57.54 dBμV/m</td></tr></table>		Marker	Trace	Type	X Axis	Amplitude	1R	(1)	Freq	2.482810 GHz	79.61 dBμV/m	1Δ	(1)	Freq	675 kHz	-22.07 dB	2	(1)	Freq	2.483500 GHz	57.54 dBμV/m
Marker	Trace	Type	X Axis	Amplitude																																		
1	(1)	Freq	2.482945 GHz	83.17 dBμV/m																																		
2	(1)	Freq	2.483500 GHz	77.88 dBμV/m																																		
Marker	Trace	Type	X Axis	Amplitude																																		
1R	(1)	Freq	2.482810 GHz	79.61 dBμV/m																																		
1Δ	(1)	Freq	675 kHz	-22.07 dB																																		
2	(1)	Freq	2.483500 GHz	57.54 dBμV/m																																		
SA reading 1= SA reading Mkr1 = 83.17 dBuV		SA reading 2= SA reading Mkr1 = 79.61 dBuV SA reading 3= SA reading Mkr2 = 57.54 dBuV																																				

$$\begin{aligned} \text{Test result} &= \text{SA reading 1} - [(\text{SA reading 2}) - (\text{SA reading 3})] = \\ &= 83.17 - (79.61 - 57.54) = 61.10 \text{ dBuV} \end{aligned}$$

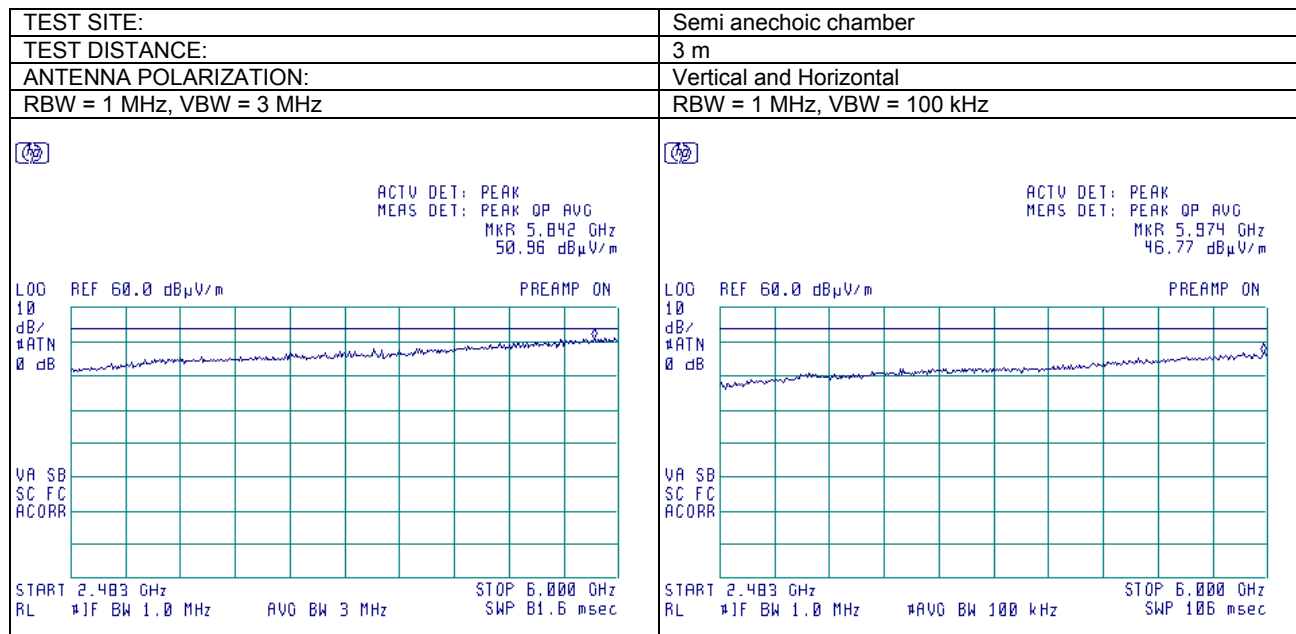
Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.20 Radiated emission measurements from 2483.5 to 6000 MHz at the low carrier frequency



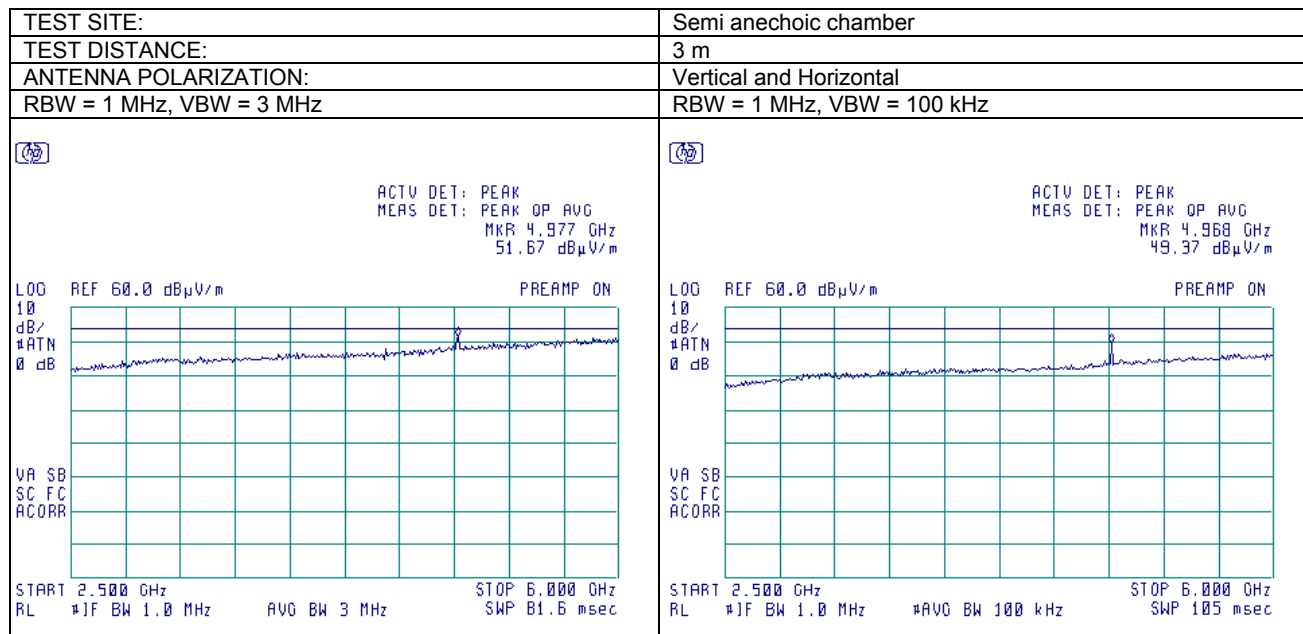
Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.21 Radiated emission measurements from 2483.5 to 6000 MHz at the mid carrier frequency



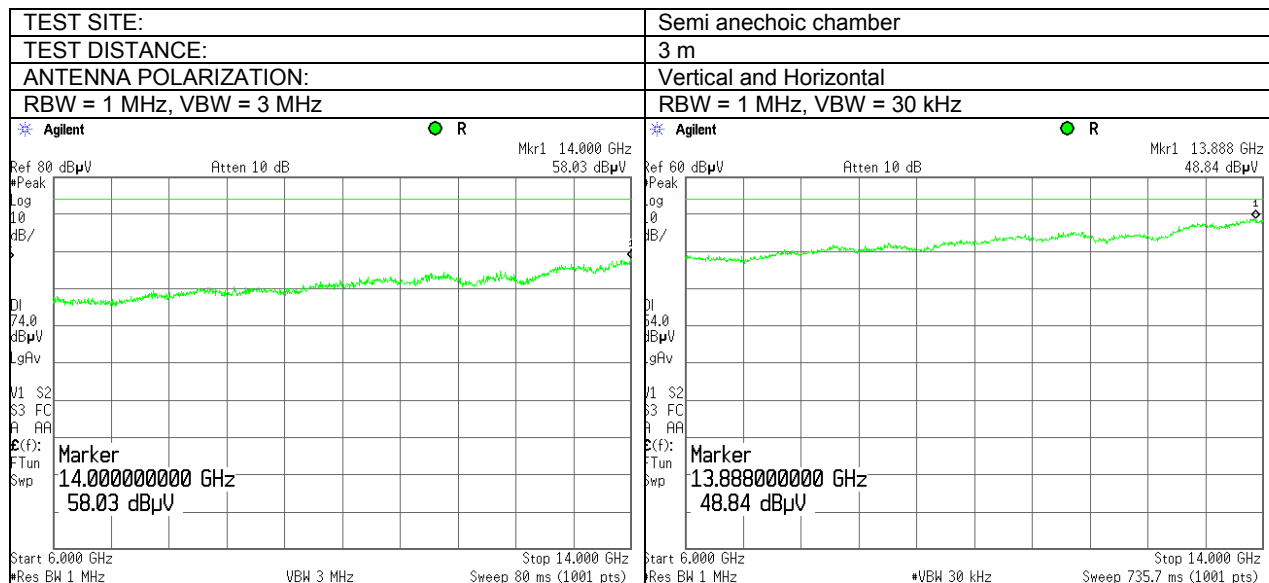
Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.22 Radiated emission measurements from 2500 to 6000 MHz at the high carrier frequency



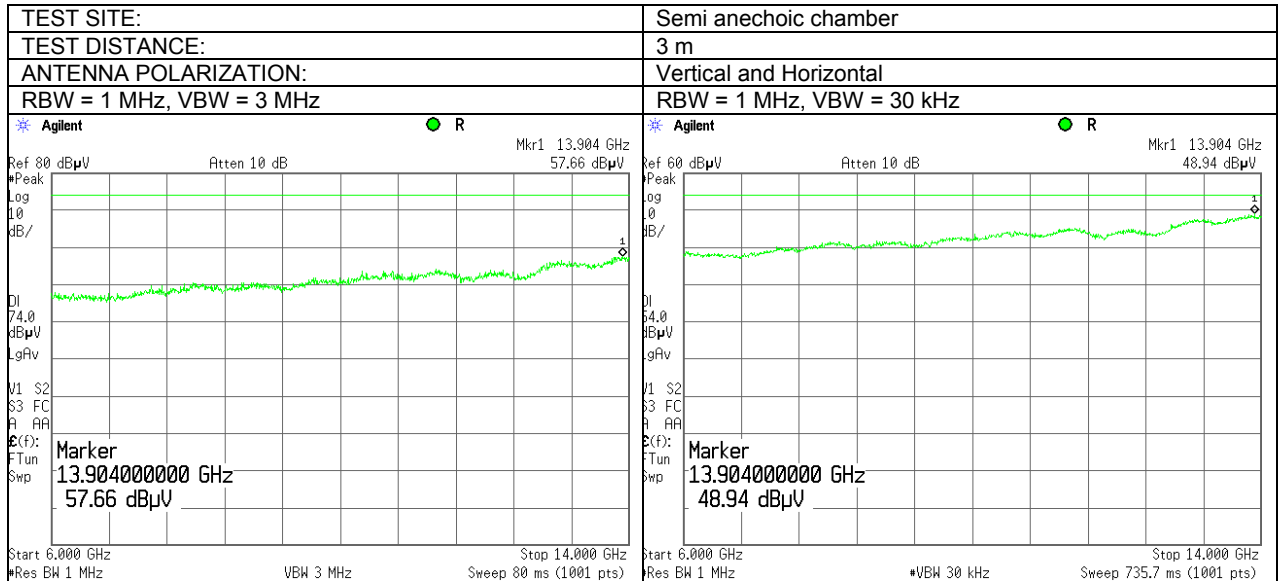
Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.23 Radiated emission measurements from 6000 to 14000 MHz at the low carrier frequency

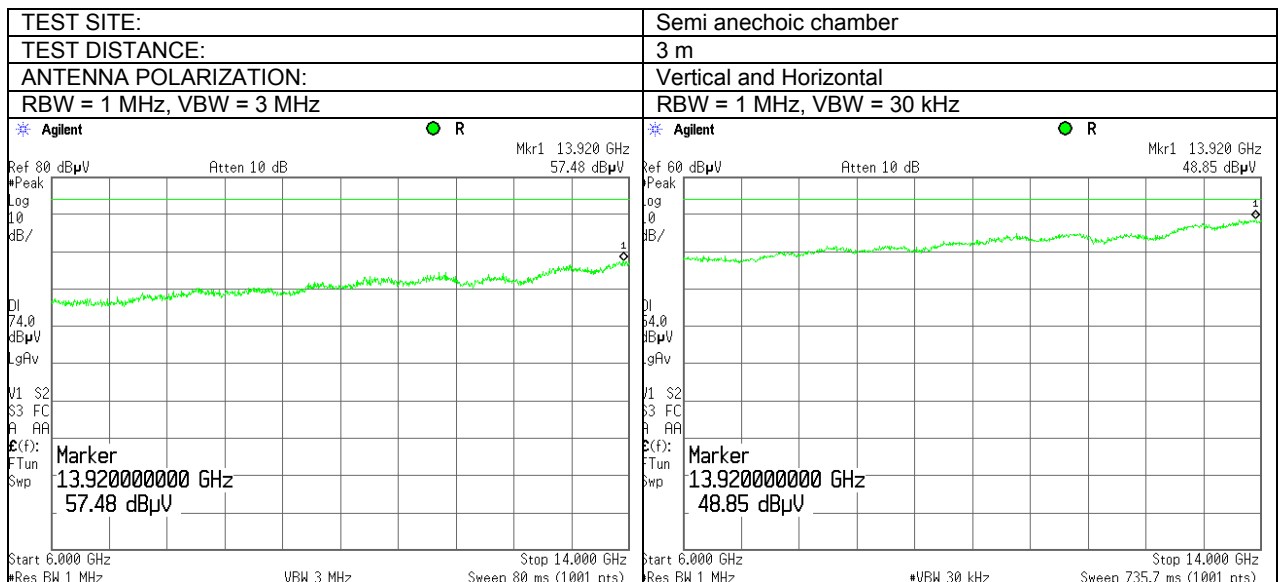


Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.24 Radiated emission measurements from 6000 to 14000 MHz at the mid carrier frequency

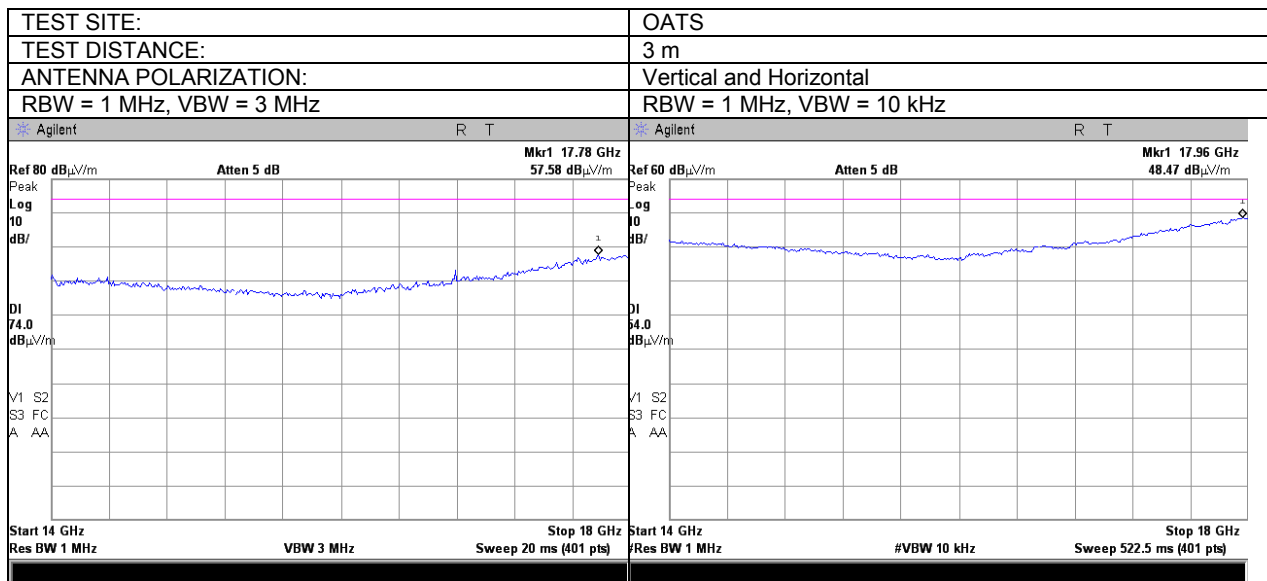


Plot 7.3.25 Radiated emission measurements from 6000 to 14000 MHz at the high carrier frequency

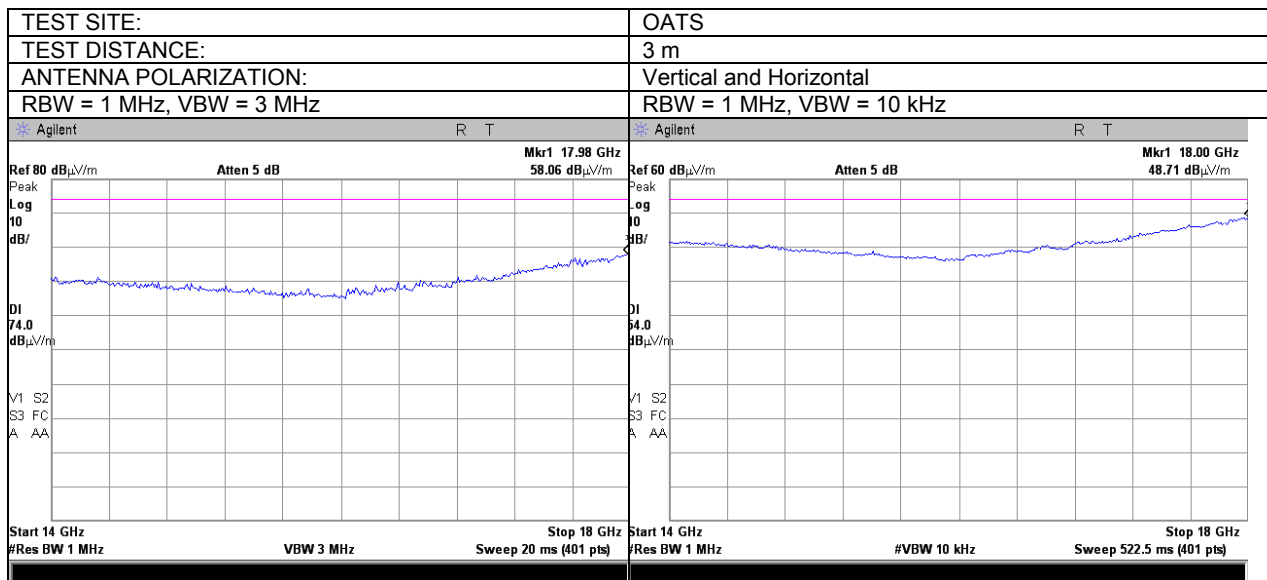


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.26 Radiated emission measurements from 14000 to 18000 MHz at the low carrier frequency

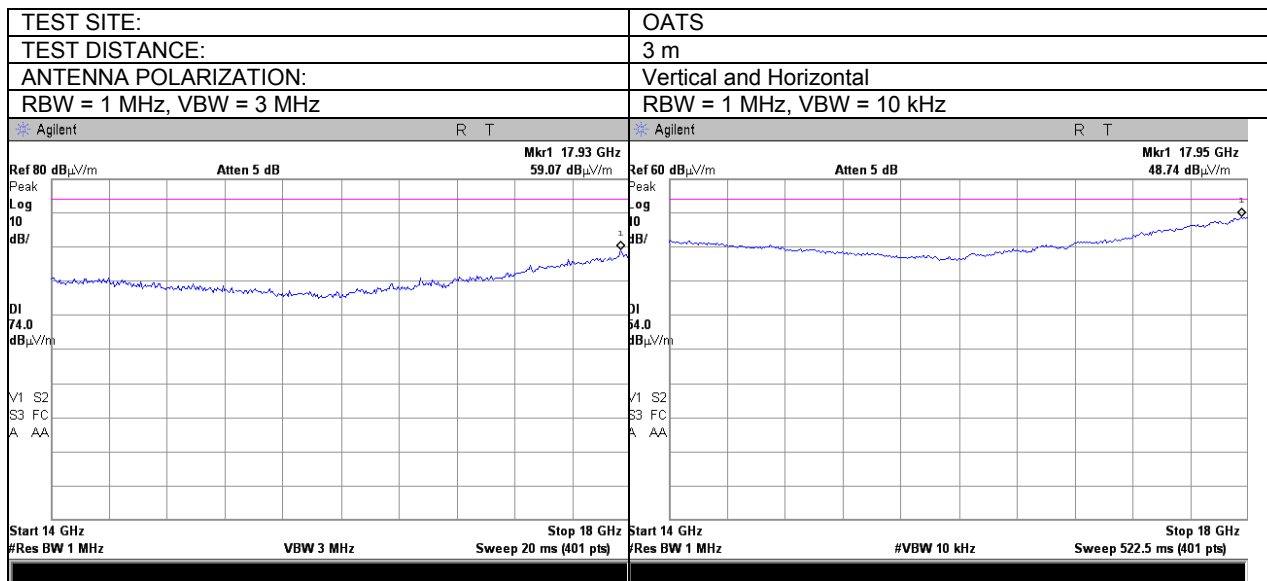


Plot 7.3.27 Radiated emission measurements from 14000 to 18000 MHz at the mid carrier frequency



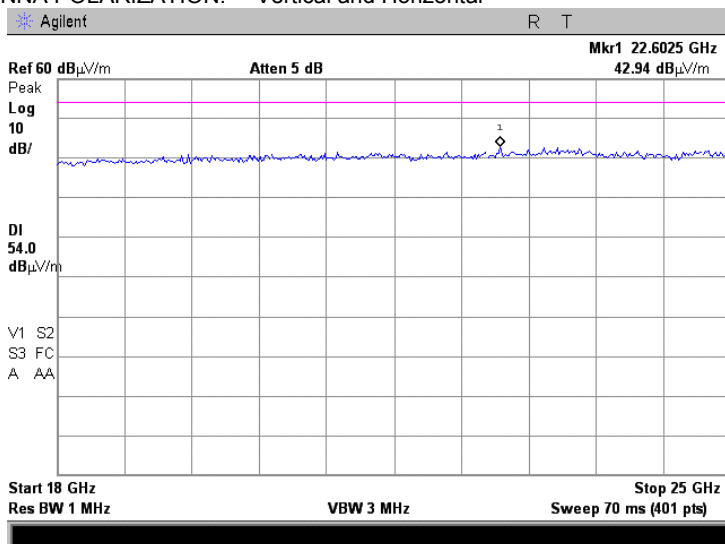
Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.28 Radiated emission measurements from 14000 to 18000 MHz at the high carrier frequency



Plot 7.3.29 Radiated emission measurements from 18000 to 25000 MHz at the low carrier frequency

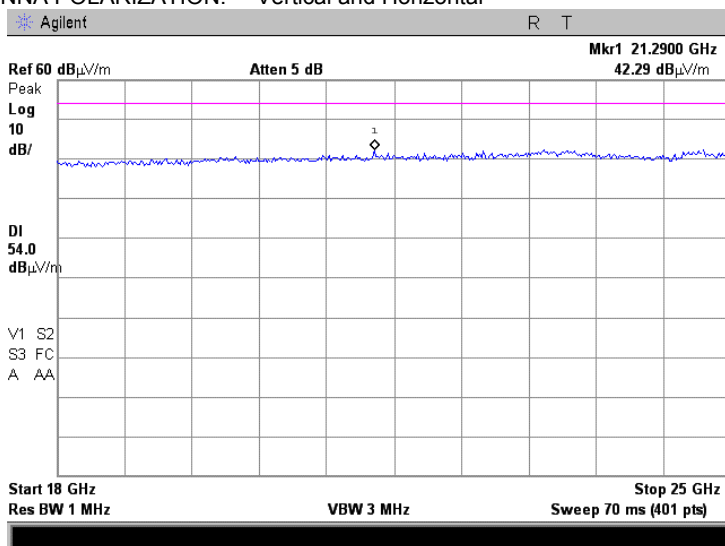
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		10/27/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

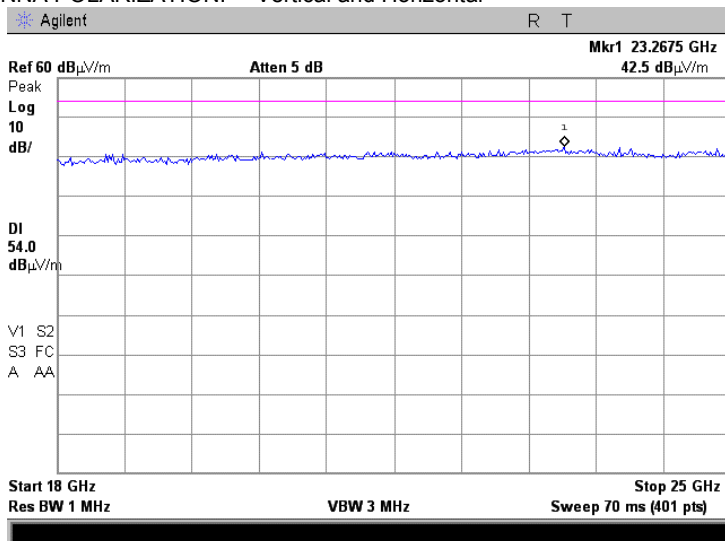
Plot 7.3.30 Radiated emission measurements from 18000 to 25000 MHz at the mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



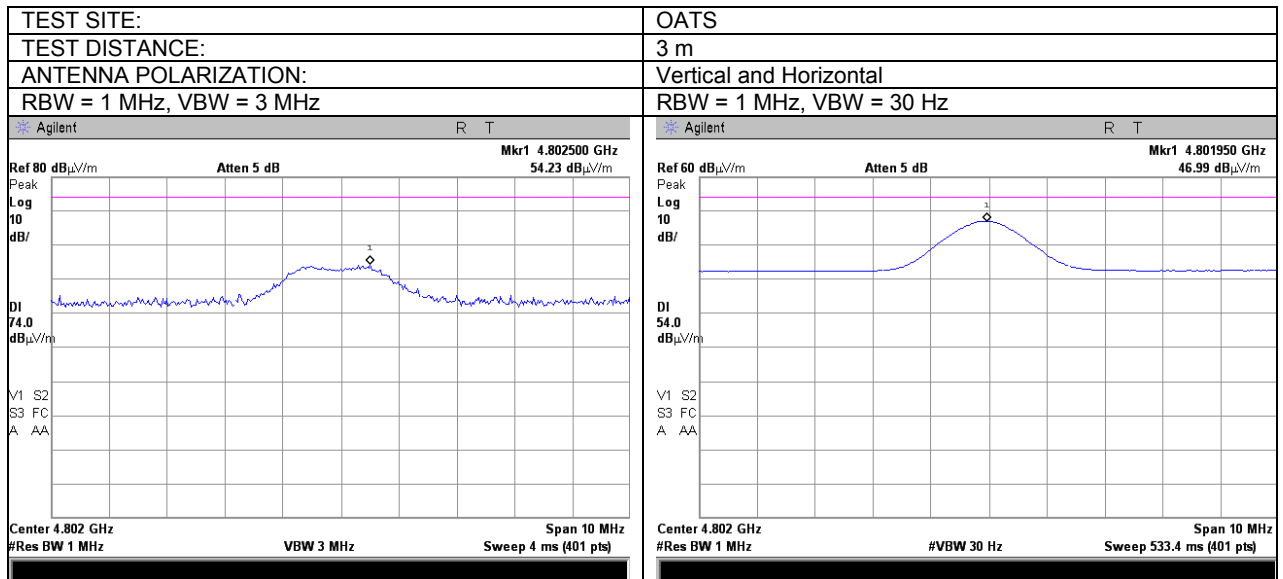
Plot 7.3.31 Radiated emission measurements from 18000 to 25000 MHz at the high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

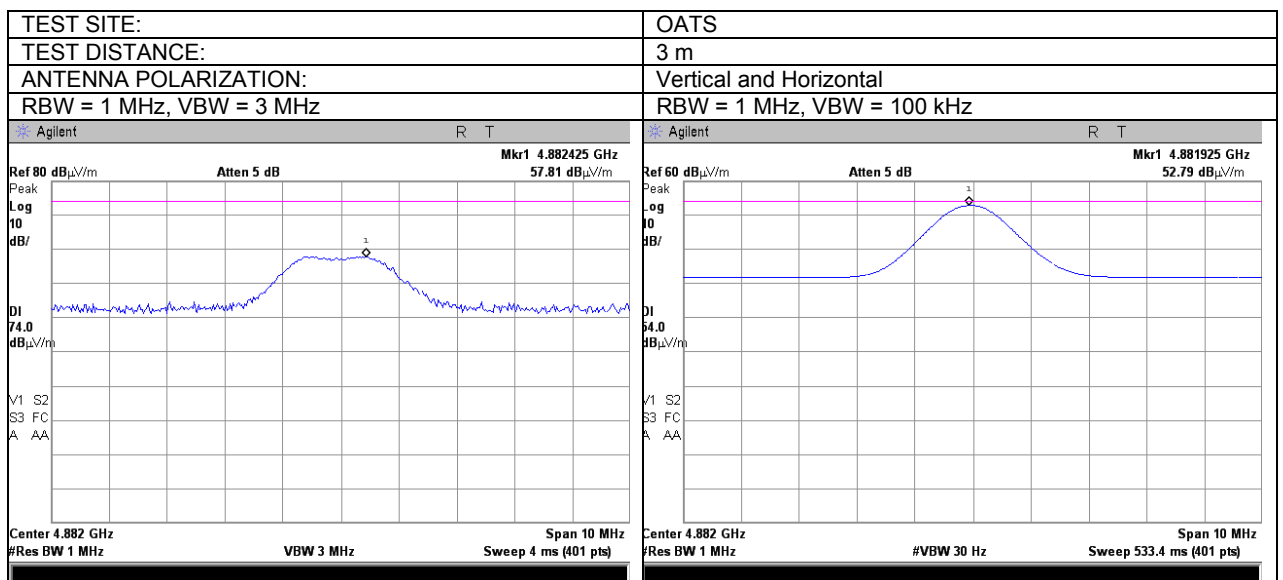


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.32 Radiated emission measurements at the second harmonic of low carrier frequency

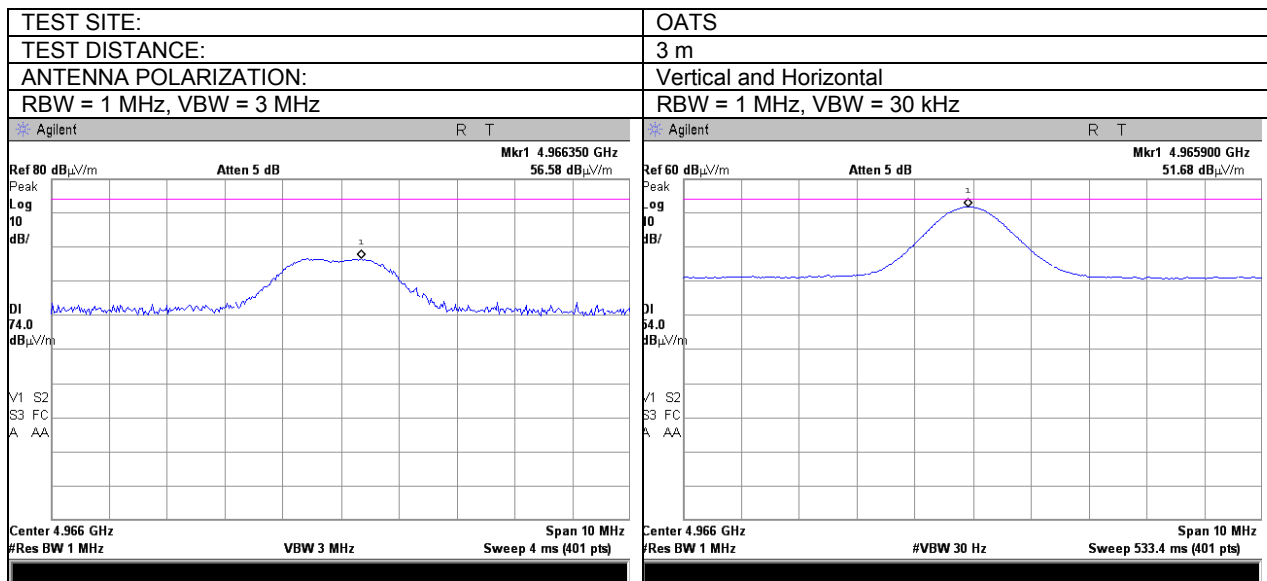


Plot 7.3.33 Radiated emission measurements at the second harmonic of mid carrier frequency

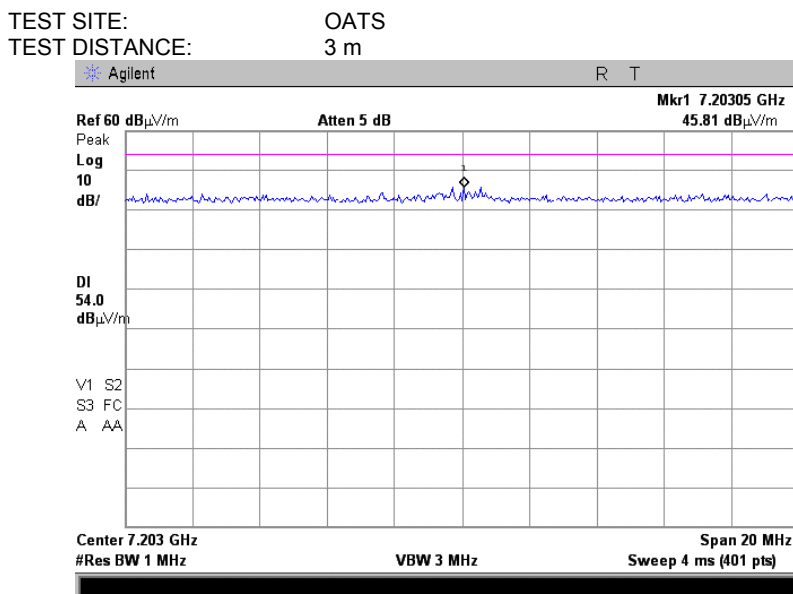


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.3.34 Radiated emission measurements at the second harmonic of high carrier frequency



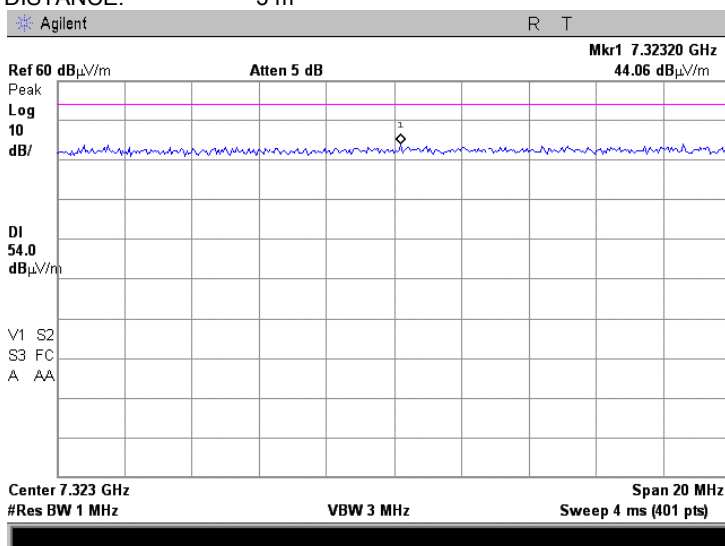
Plot 7.3.35 Radiated emission measurements at the third harmonic of low carrier frequency



Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		10/27/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

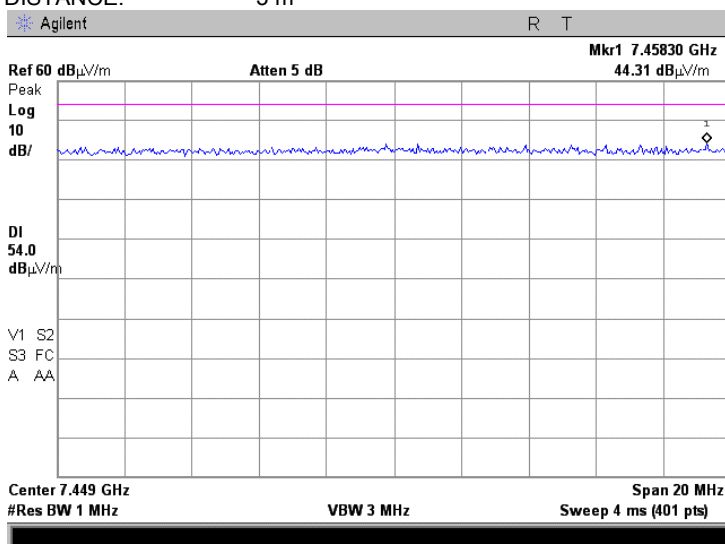
Plot 7.3.36 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.37 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:		FCC section 15.247(e), RSS-210 A8.2(b), Peak power density	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(d)	
Test mode:		Compliance	Verdict: PASS
Date:		11/2/2010	
Temperature: 23.2 °C	Air Pressure: 1015 hPa	Relative Humidity: 45.0 %	Power Supply: Battery
Remarks:			

7.4 Peak spectral power density

7.4.1 General

This test was performed to measure the peak spectral power density radiated by the transmitter RF antenna. Specification test limits according to FCC part 15 section 15.247(d) and RSS-210 section A8.2(b) are given in Table 7.4.1.

Table 7.4.1 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm	Equivalent field strength limit @ 3m, dB(μV/m)*
2400.0 – 2483.5	3.0	8.0	103.2

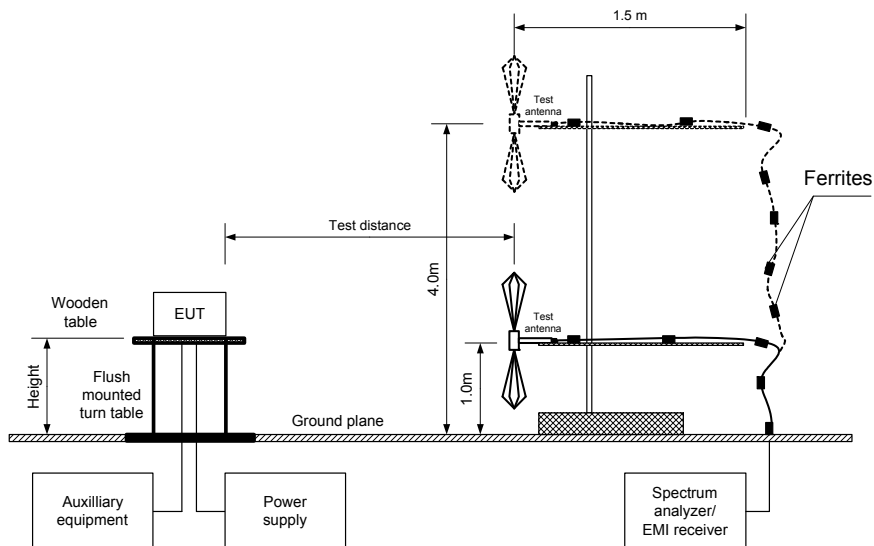
* - Equivalent field strength limit was calculated from the peak spectral power density as follows: $E = \sqrt{30 \times P} / r$, where P is peak spectral power density and r is antenna to EUT distance in meters.

7.4.2 Test procedure for field strength measurements

- 7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked.
- 7.4.2.2 The EUT was adjusted to produce maximum available to end user RF output power.
- 7.4.2.3 The field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.
- 7.4.2.4 The frequency span of spectrum analyzer was set to capture the entire 6 dB band of the transmitter, in peak hold mode with resolution bandwidth set to 3.0 kHz, video bandwidth wider than resolution bandwidth, auto sweep time and sufficient number of sweeps was allowed for trace stabilization. The spectrum lines spacing was verified to be wider than 3 kHz. Otherwise the resolution bandwidth was reduced until individual spectrum lines were resolved and the power of individual spectrum lines was integrated over 3 kHz band.
- 7.4.2.5 The peak of emission was zoomed with span set just wide enough to capture the emission peak area and sweep time was set equal to span width divided by resolution bandwidth. Spectrum analyzer was set in peak hold mode, sufficient number of sweeps was allowed for trace stabilization and peak spectral power density was measured as provided in Table 7.4.2, Table 7.4.3 and the associated plots.

Test specification:		FCC section 15.247(e), RSS-210 A8.2(b), Peak power density	
Test procedure:		FR Vol. 62, page 26243, Section 15.247(d)	
Test mode:	Compliance	Verdict:	PASS
Date:	11/2/2010		
Temperature: 23.2 °C	Air Pressure: 1015 hPa	Relative Humidity: 45.0 %	Power Supply: Battery
Remarks:			

Figure 7.4.1 Setup for carrier field strength measurements



Test specification:	FCC section 15.247(e), RSS-210 A8.2(b), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict: PASS	
Date:	11/2/2010		
Temperature: 23.2 °C	Air Pressure: 1015 hPa	Relative Humidity: 45.0 %	Power Supply: Battery
Remarks:			

Table 7.4.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY RANGE: 2400.0 – 2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: OATS
EUT HEIGHT: 0.8 m
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 3 kHz
VIDEO BANDWIDTH: 10 kHz
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
MODULATION: FSK
MODULATING SIGNAL: Binary data message
BIT RATE: 250 kbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
TRANSMITTER OUTPUT POWER: -8.35 dBm at low carrier frequency
-8.10 dBm at mid carrier frequency
-10.66 dBm at high carrier frequency

Frequency, MHz	Field strength, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees
2401.074	87.80	1.5	103.2	-16.90	H	2.2	210
2440.832	89.18	1.5	103.2	-15.52	H	1.85	210
2483.064	85.01	1.5	103.2	-19.69	H	1.85	210

*- Margin = Field strength - EUT antenna gain - calculated field strength limit.

**-. EUT front panel refer to 0 degrees position of turntable.

Table 7.4.3 Substitution measurement of peak spectral power density

ASSIGNED FREQUENCY RANGE: 2400 – 2483.5 MHz
TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 3 kHz
VIDEO BANDWIDTH: 10 kHz
SUBSTITUTION ANTENNA TYPE: Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength, dB(μV/m)	Antenna polarization	RF generator output, dBm	Antenna gain, dBi	Cable loss, dB	EUT ant. gain, dBi	Peak power density*, dB(mW/3 kHz)	Limit, dBm	Margin, dB**	Verdict
2401.074	87.80	Hor	-15.54	9.17	1.46	1.5	-9.33	8.00	-17.33	Pass
2440.832	89.18	Hor	-14.07	9.21	1.47	1.5	-7.83	8.00	-15.83	Pass
2483.064	85.01	Hor	-18.62	9.24	1.48	1.5	-12.36	8.00	-20.36	Pass

*- Peak power density provided in terms of conducted power density at antenna connector and was calculated as follows:

Peak power density = RF generator output in dBm – Cable loss in dB + Substitution antenna gain in dBi - Transmitter antenna gain in dBi

**-. Margin = Peak power density - EUT antenna gain - specification limit.

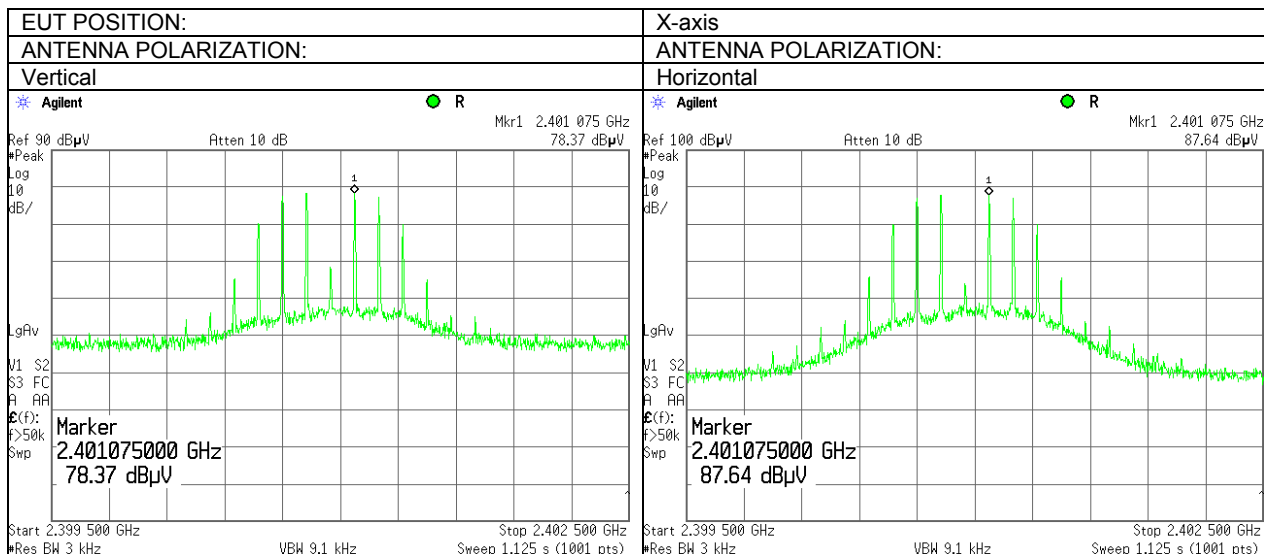
Reference numbers of test equipment used

HL 0661	HL 1984	HL 2432	HL 2870	HL 3818	HL 3901		
---------	---------	---------	---------	---------	---------	--	--

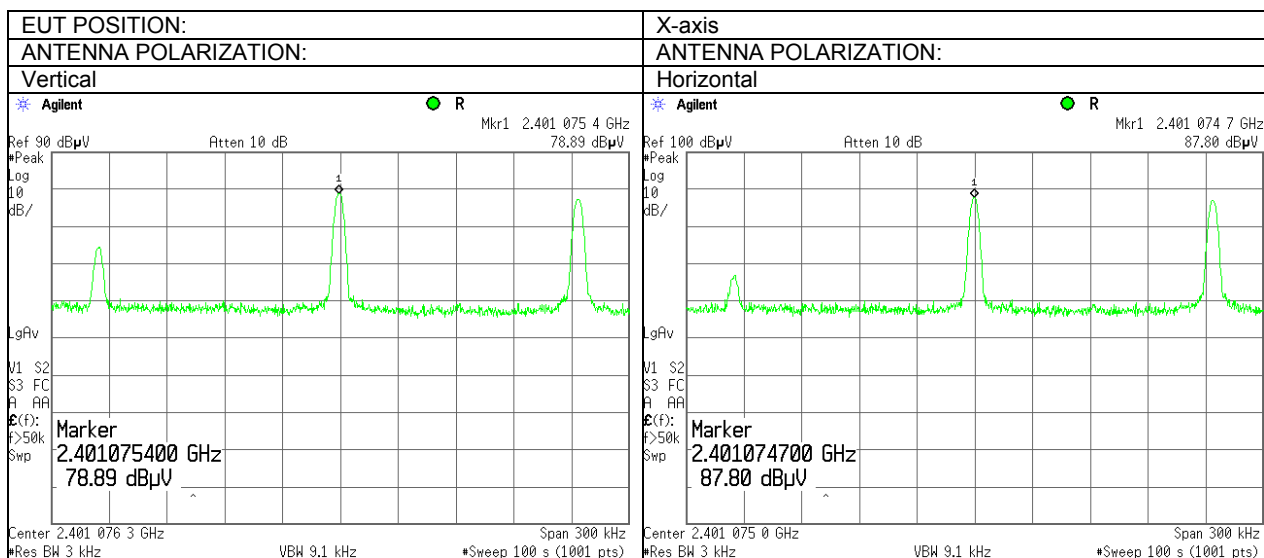
Full description is given in Appendix A.

Test specification:	FCC section 15.247(e), RSS-210 A8.2(b), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict: PASS	
Date:	11/2/2010		
Temperature: 23.2 °C	Air Pressure: 1015 hPa	Relative Humidity: 45.0 %	Power Supply: Battery
Remarks:			

Plot 7.4.1 Peak spectral power density at low frequency 2401 MHz within 6 dB band

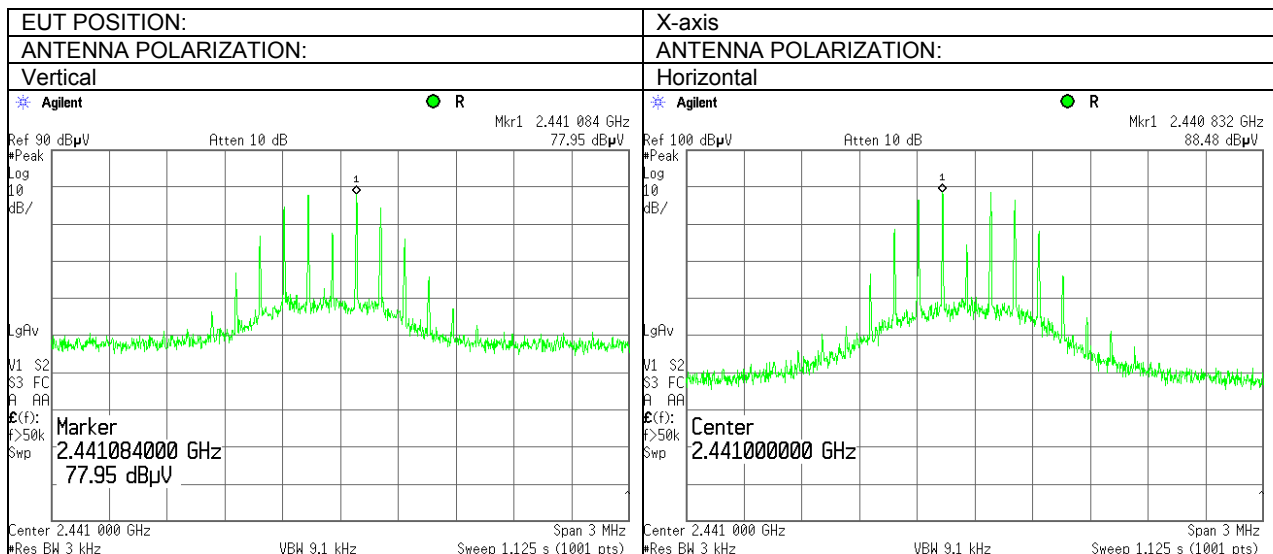


Plot 7.4.2 Peak spectral power density at low frequency 2401 MHz zoomed at the peak

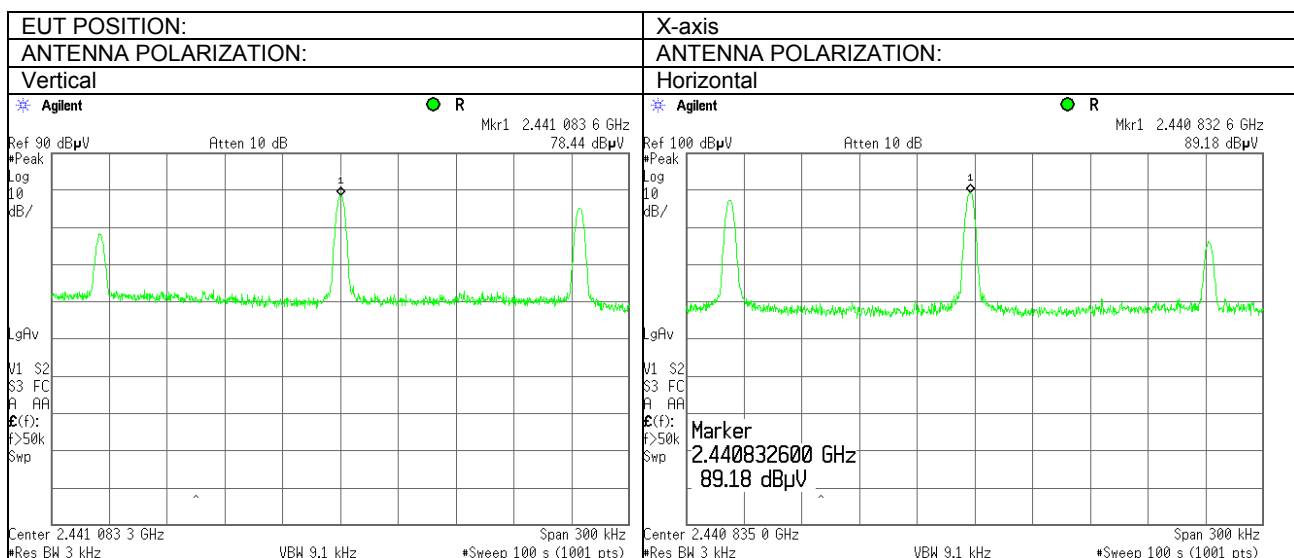


Test specification:	FCC section 15.247(e), RSS-210 A8.2(b), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict: PASS	
Date:	11/2/2010		
Temperature: 23.2 °C	Air Pressure: 1015 hPa	Relative Humidity: 45.0 %	Power Supply: Battery
Remarks:			

Plot 7.4.3 Peak spectral power density at mid frequency 2441 MHz within 6 dB band

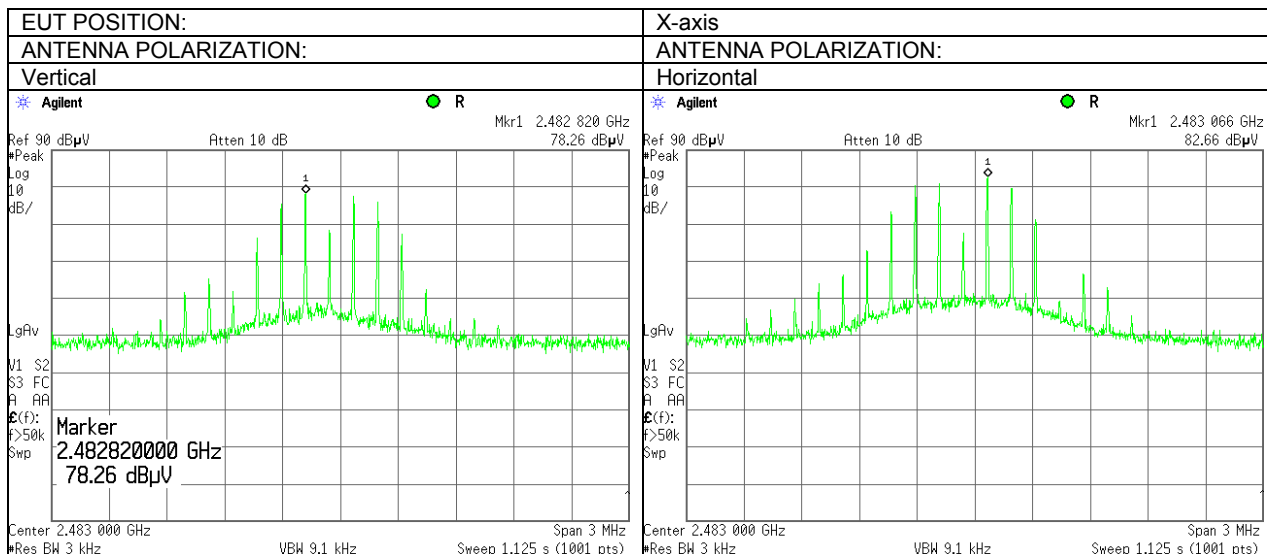


Plot 7.4.4 Peak spectral power density at mid frequency 2441 MHz zoomed at the peak

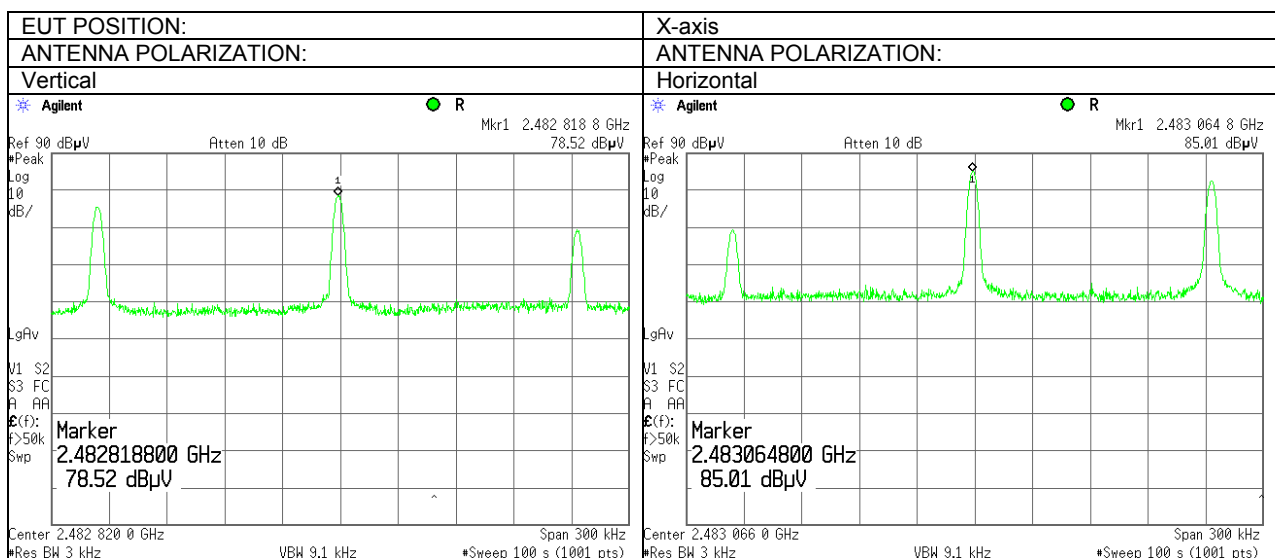


Test specification:	FCC section 15.247(e), RSS-210 A8.2(b), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict: PASS	
Date:	11/2/2010		
Temperature: 23.2 °C	Air Pressure: 1015 hPa	Relative Humidity: 45.0 %	Power Supply: Battery
Remarks:			

Plot 7.4.5 Peak spectral power density at high frequency 2482 MHz within 6 dB band



Plot 7.4.6 Peak spectral power density at high frequency 2482 MHz zoomed at the peak



Test specification:	FCC section 15.207(a), RSS-Gen section 7.2.2, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	
Date:	10/31/2010		
Temperature: 24.4°C	Air Pressure: 1016 hPa	Relative Humidity: 47%	Power Supply: 120 VAC
Remarks:			

7.5 Conducted emissions

7.5.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μ V)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

* - The limit decreases linearly with the logarithm of frequency.

7.5.2 Test procedure

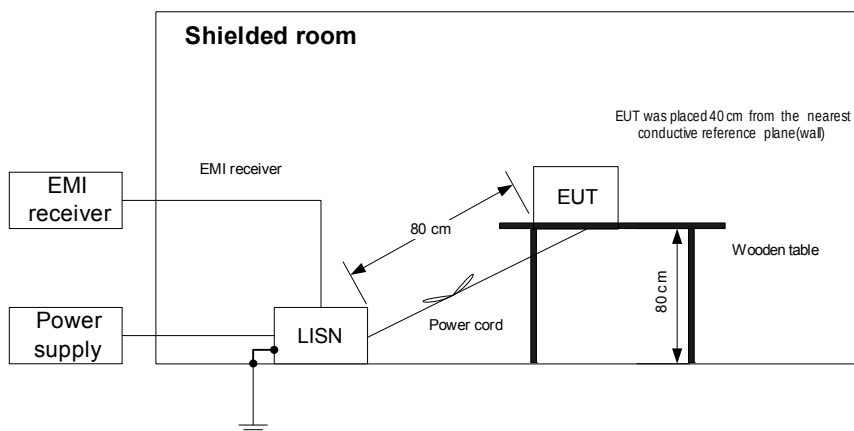
7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and the performance check was conducted.

7.5.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.

7.5.2.3 The position of the device cables was varied to determine maximum emission level.

7.5.2.4 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

Figure 7.5.1 Setup for conducted emission measurements, table-top equipment



Test specification:		FCC section 15.207(a), RSS-Gen section 7.2.2, Conducted emission	
Test procedure:		ANSI C63.4, Section 13.1.3	
Test mode:		Compliance	Verdict:
Date:		10/31/2010	
Temperature: 24.4°C	Air Pressure: 1016 hPa	Relative Humidity: 47%	Power Supply: 120 VAC
Remarks:			

Table 7.5.2 Conducted RF emission test results

LINE: AC power
 EUT OPERATING MODE: Transmit
 EUT SET UP: TABLE-TOP
 TEST SITE: SHIELDED ROOM
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
 FREQUENCY RANGE: 150 kHz - 30 MHz
 RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.176613	43.50	39.32	64.70	-25.38	22.60	54.70	-32.10	L1	Pass
0.247950	37.97	32.43	61.85	-29.42	15.64	51.85	-36.21		
0.425713	32.79	27.38	57.39	-30.01	10.85	47.39	-36.54		
2.768700	29.98	23.51	56.00	-32.49	14.22	46.00	-31.78		
0.177138	40.82	37.23	64.68	-27.45	22.33	54.68	-32.35	L2	Pass
0.247750	35.41	29.97	61.86	-31.89	14.73	51.86	-37.13		
0.775025	29.14	23.68	56.00	-32.32	13.49	46.00	-32.51		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

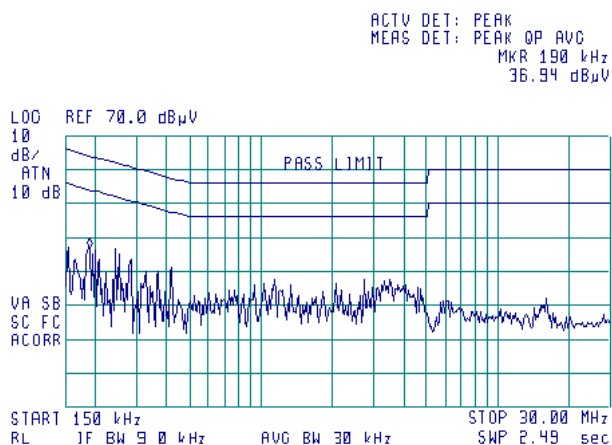
HL 0887	HL1425	HL 1513	HL 2888	HL 3612			
---------	--------	---------	---------	---------	--	--	--

Full description is given in Appendix A.

Test specification:		FCC section 15.207(a), RSS-Gen section 7.2.2, Conducted emission	
Test procedure:		ANSI C63.4, Section 13.1.3	
Test mode:		Compliance	Verdict:
Date:		10/31/2010	
Temperature: 24.4°C	Air Pressure: 1016 hPa	Relative Humidity: 47%	Power Supply: 120 VAC
Remarks:			

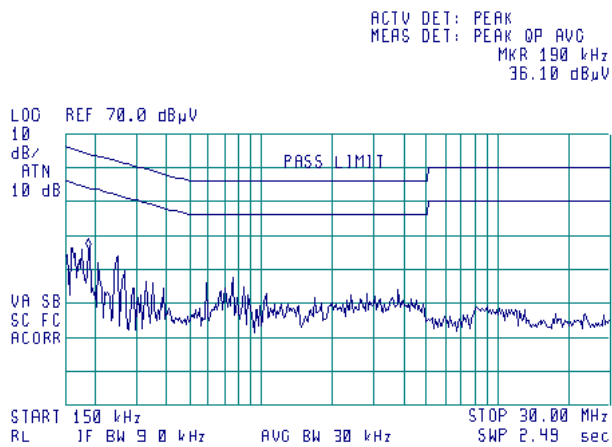
Plot 7.5.1 Conducted RF emission measurements

LINE: L1
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.5.2 Conducted RF emission measurements

LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:		RSS-Gen section 7.2.3.2, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

7.6 Radiated emission measurements

7.6.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits according to RSS-Gen, Section 6 are given in Table 7.6.1.

Table 7.6.1 Radiated emission limits according to RSS-Gen, Section 6

Frequency, MHz	Field strength limit at 3 m test distance, dB(μV/m)
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
960 - 3 rd harmonic**	54.0

** - harmonic of the highest frequency the EUT generates, uses, operates or tunes to.

7.6.2 Test procedure for measurements in semi-anechoic chamber

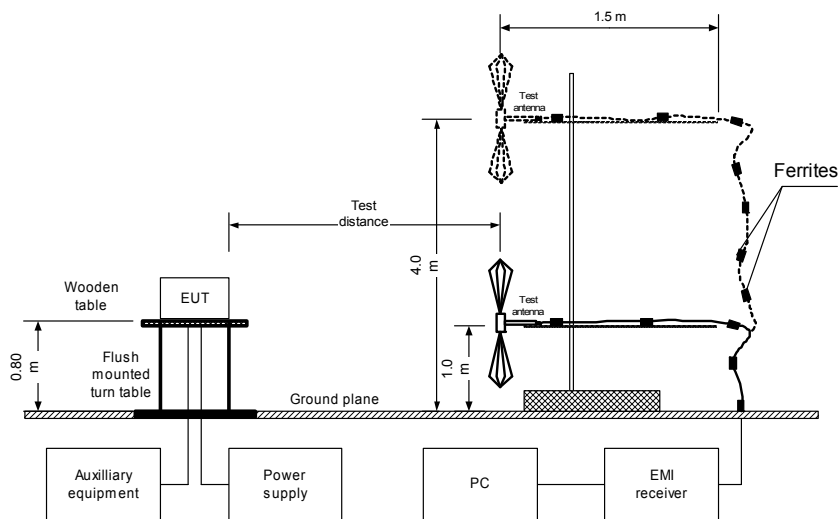
7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and the performance check was conducted.

7.6.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

7.6.2.3 The worst test results (the lowest margins) were provided in the associated tables and plots.

Test specification:		RSS-Gen section 7.2.3.2, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Figure 7.6.1 Setup for radiated emission measurements at anechoic chamber, table-top equipment





HERMON LABORATORIES

Test specification:		RSS-Gen section 7.2.3.2, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		10/27/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Table 7.6.2 Radiated emission test results according to RSS-Gen, Section 6

EUT SET UP: TABLE-TOP
 EUT OPERATING MODE: Receive
 TEST SITE: SEMI ANECHOIC CHAMBER
 TEST DISTANCE: 3 m
 FREQUENCY RANGE: 30 MHz – 1000 MHz
 RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No emissions were found								Pass

TEST SITE: SEMI ANECHOIC CHAMBER
 TEST DISTANCE: 3 m
 FREQUENCY RANGE: 1000 MHz – 12500 MHz
 RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak			Average			Antenna polariz.	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No emissions were found										Pass

Note: EUT was in X-axis orthogonal position.

*- Margin = Measured emission - specification limit.

**- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

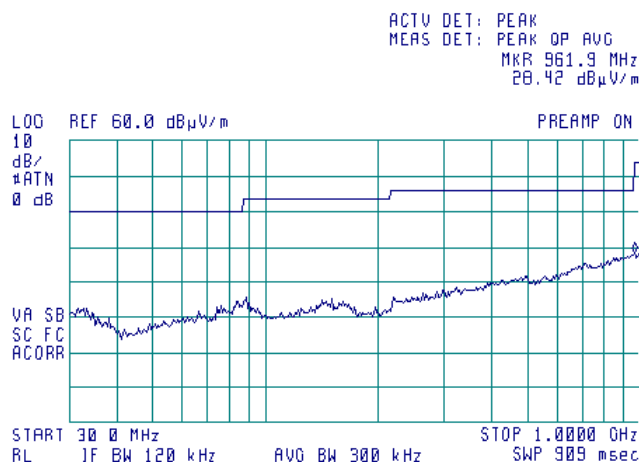
HL 0521	HL 0604	HL 1984	HL 2871	HL 3532	HL 3616	HL 3818	
---------	---------	---------	---------	---------	---------	---------	--

Full description is given in Appendix A.

Test specification: RSS-Gen section 7.2.3.2, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/27/2010			
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.6.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization

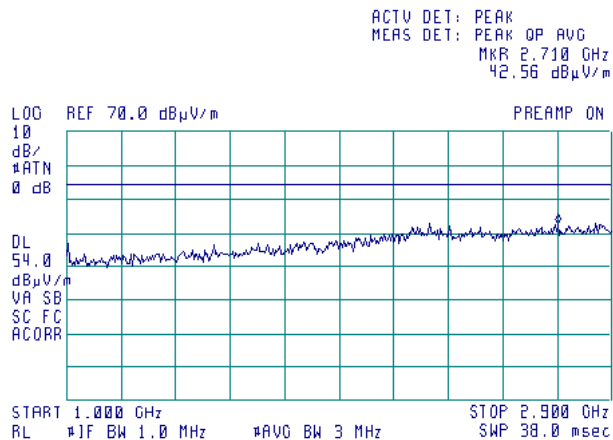
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by



Plot 7.6.2 Radiated emission measurements in 1000 – 2900 MHz range, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by

15:05:00 NOV 19, 2009

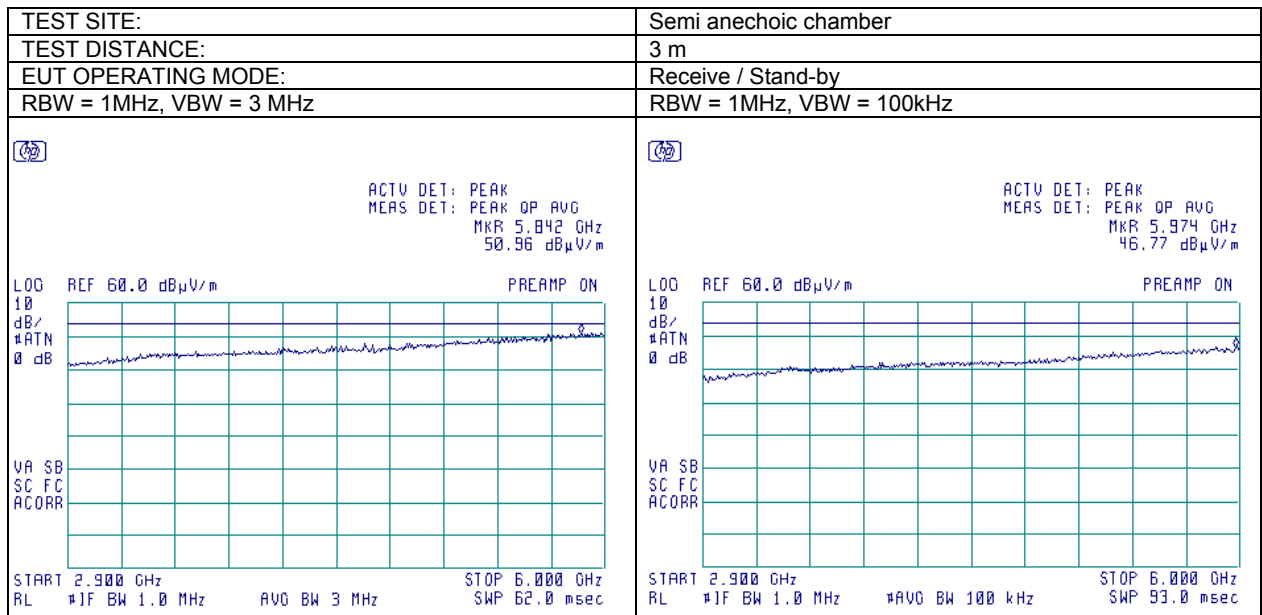




HERMON LABORATORIES

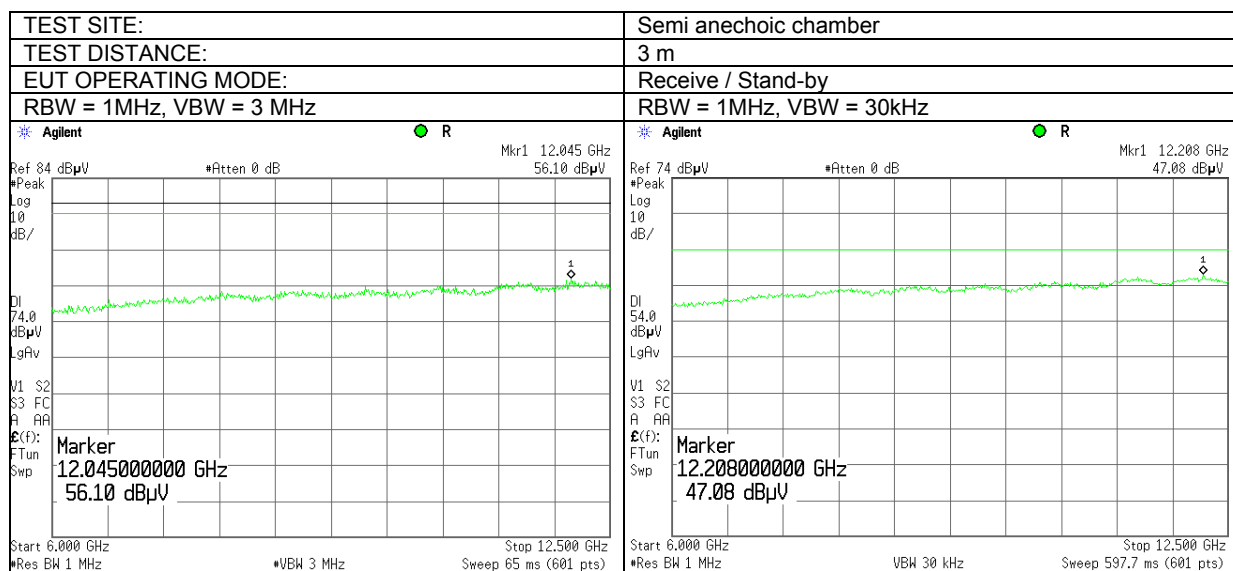
Test specification:		RSS-Gen section 7.2.3.2, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.6.3 Radiated emission measurements in 2900 – 6000 MHz range, vertical and horizontal antenna polarization



Test specification:		RSS-Gen section 7.2.3.2, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:	Compliance	Verdict: PASS	
Date:	10/27/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 44 %	Power Supply: Battery
Remarks:			

Plot 7.6.4 Radiated emission measurements in 6000 – 12500 MHz range, vertical and horizontal antenna polarization



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./Check	Due Cal./Check
0337	Probe Set, Hand held, 5 probes	Electro-Metrics	EHFP-30	238	08-Jun-10	08-Jun-11
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-10	29-Jun-11
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	25-Aug-10	25-Aug-11
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-10	11-Jan-11
0661	Generator Swept Signal, 10 MHz to 40 GHz, + 10 dBm	HP	83640B	3614A002 66	17-Dec-09	17-Dec-10
0887	Attenuator Coaxial, 30 dB, 100 W, 50 Ohm	Bird Electronic Corp.	8323	1639	03-Feb-10	03-Feb-11
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	24-Aug-10	24-Aug-11
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	01-Sep-10	01-Sep-11
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	11-Jun-10	11-Jun-11
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	11-Jun-10	11-Jun-11
2870	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	2870	04-Aug-10	04-Aug-11
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	14-Sep-10	14-Sep-11
2888	LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1	Rolf Heine	NNB-2/16Z	02/10018	07-Jul-10	07-Jul-11
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-10	07-May-11
3532	Amplifier, low noise, 2 to 8 GHz	Quinstar Technology	QLJ-02084040-J0	111590020 01	01-Jan-10	01-Jan-11
3533	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	111590010 01	01-Jan-10	01-Jan-11
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	01-Dec-10	01-Dec-11
3616	Cable RF, 6.5 m, N type-N type, DC-6.5 GHz	Suhner Switzerland	Rg 214/U	NA	27-May-10	27-May-11
3818	PSA Series Spectrum Analyzer, 3 Hz-44 GHz	Agilent Technologies	E4446A	MY482502 88	26-Sep-10	26-Sep-11
3883	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type (f) in, N-type (m) out.	Agilent Technologies	87405C	MY470104 06	13-Jan-10	13-Jan-11
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	07-Feb-10	07-Feb-11

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: ± 1.7 dB 12.4 GHz to 40 GHz: ± 2.3 dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Occupied bandwidth	± 8.0 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47) and by Industry Canada for electromagnetic emissions (file numbers IC 2186-1 for OATS and IC 2186-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01) and approved by Israel Ministry of environmental protection, radiation hazards department (Permit number 1158). The FCC Designation Number is US1003.

Address: P.O. Box 23, Binyamina 30500, Israel.
Telephone: +972 4628 8001
Fax: +972 4628 8277
e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

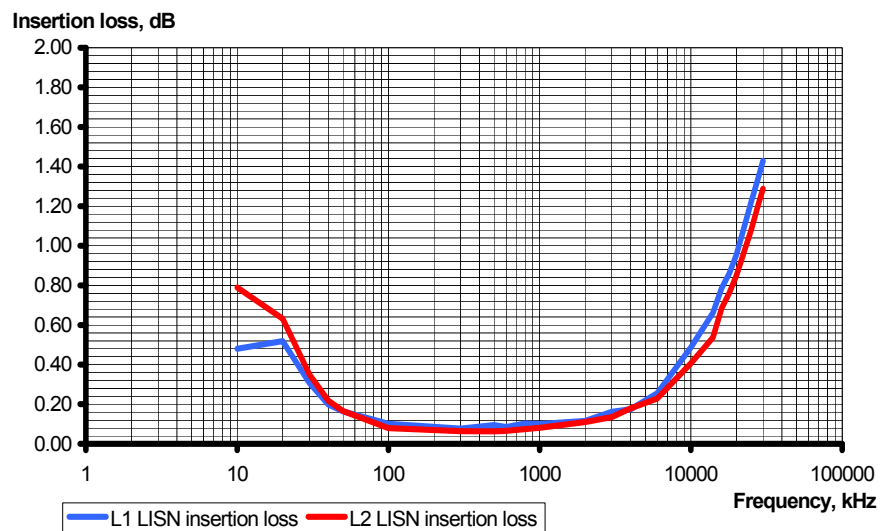
11 APPENDIX D Specification references

FCC 47CFR part 15: 2009	Radio Frequency Devices.
FR Vol.62	Federal Register, Volume 62, May 13, 1997
FCC New Guidance:2004	FCC New Guidance on Measurements for DTS
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	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.
RSS-210 Issue 7: 2007	Low Power Licence- Exempt Radiocommunication Devices
RSS-Gen Issue 2: 2007	General Requirements and Information for the Certification of Radiocommunication Equipment

12 APPENDIX E Test equipment correction factors

Correction factor
Line impedance stabilization network
Model NNB-2/16Z, Rolf Heine, HL 2888

Frequency, kHz	Insertion loss, dB		Measurement Uncertainty, dB
	L1	N	
10	0.48	0.79	±0.6
20	0.52	0.63	
30	0.31	0.35	
40	0.20	0.22	
50	0.16	0.17	
100	0.10	0.08	
300	0.08	0.06	
500	0.10	0.06	
600	0.09	0.07	
800	0.10	0.07	
1000	0.10	0.08	
2000	0.12	0.11	
3000	0.16	0.14	
4000	0.17	0.18	
6000	0.26	0.23	
10000	0.49	0.41	
14000	0.66	0.54	
16000	0.79	0.69	
18000	0.86	0.76	
20000	0.96	0.85	
25000	1.22	1.08	
28000	1.35	1.21	
30000	1.43	1.29	



Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604

Frequency, MHz	Antenna Factor, dB(1/m)	Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8	940	24.0
28	7.8	960	24.1
30	7.8	980	24.5
40	7.2	1000	24.9
60	7.1	1020	25.0
70	8.5	1040	25.2
80	9.4	1060	25.4
90	9.8	1080	25.6
100	9.7	1100	25.7
110	9.3	1120	26.0
120	8.8	1140	26.4
130	8.7	1160	27.0
140	9.2	1180	27.0
150	9.8	1200	26.7
160	10.2	1220	26.5
170	10.4	1240	26.5
180	10.4	1260	26.5
190	10.3	1280	26.6
200	10.6	1300	27.0
220	11.6	1320	27.8
240	12.4	1340	28.3
260	12.8	1360	28.2
280	13.7	1380	27.9
300	14.7	1400	27.9
320	15.2	1420	27.9
340	15.4	1440	27.8
360	16.1	1460	27.8
380	16.4	1480	28.0
400	16.6	1500	28.5
420	16.7	1520	28.9
440	17.0	1540	29.6
460	17.7	1560	29.8
480	18.1	1580	29.6
500	18.5	1600	29.5
520	19.1	1620	29.3
540	19.5	1640	29.2
560	19.8	1660	29.4
580	20.6	1680	29.6
600	21.3	1700	29.8
620	21.5	1720	30.3
640	21.2	1740	30.8
660	21.4	1760	31.1
680	21.9	1780	31.0
700	22.2	1800	30.9
720	22.2	1820	30.7
740	22.1	1840	30.6
760	22.3	1860	30.6
780	22.6	1880	30.6
800	22.7	1900	30.6
820	22.9	1920	30.7
840	23.1	1940	30.9
860	23.4	1960	31.2
880	23.8	1980	31.6
900	24.1	2000	32.0
920	24.1		

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Antenna factor
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL1984

Frequency, MHz	Antenna factor, dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.6
2500.0	28.9
3000.0	31.2
3500.0	32.0
4000.0	32.5
4500.0	32.7
5000.0	33.6
5500.0	35.1
6000.0	35.4
6500.0	34.9
7000.0	36.1
7500.0	37.8
8000.0	38.0
8500.0	38.1
9000.0	39.1
9500.0	38.3
10000.0	38.6
10500.0	38.2
11000.0	38.7
11500.0	39.5
12000.0	40.0
12500.0	40.4
13000.0	40.5
13500.0	41.1
14000.0	41.6
14500.0	41.7
15000.0	38.7
15500.0	38.2
16000.0	38.8
16500.0	40.5
17000.0	42.5
17500.0	45.9
18000.0	49.4

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Antenna factor
Double-ridged guide horn antenna
Model 3115, serial number: 00027177, HL 2432

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.8
2500.0	28.9
3000.0	30.7
3500.0	31.8
4000.0	33.0
4500.0	32.8
5000.0	34.2
5500.0	34.9
6000.0	35.2
6500.0	35.4
7000.0	36.3
7500.0	37.3
8000.0	37.5
8500.0	38.0
9000.0	38.3
9500.0	38.3
10000.0	38.7
10500.0	38.7
11000.0	38.9
11500.0	39.5
12000.0	39.5
12500.0	39.4
13000.0	40.5
13500.0	40.8
14000.0	41.5
14500.0	41.3
15000.0	40.2
15500.0	38.7
16000.0	38.5
16500.0	39.8
17000.0	41.9
17500.0	45.8
18000.0	49.1

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Cable loss
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-9155-00,
HL 2870

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	5750	2.49	12000	3.71
30	0.17	6000	2.53	12250	3.81
100	0.32	6250	2.58	12500	3.84
250	0.49	6500	2.64	12750	3.88
500	0.70	6750	2.69	13000	3.92
750	0.86	7000	2.75	13250	3.96
1000	1.00	7250	2.80	13500	3.98
1250	1.11	7500	2.87	13750	4.01
1500	1.23	7750	2.93	14000	4.03
1750	1.34	8000	2.94	14250	4.09
2000	1.41	8250	3.00	14500	4.08
2250	1.51	8500	3.04	14750	4.10
2500	1.59	8750	3.08	15000	4.15
2750	1.68	9000	3.14	15250	4.22
3000	1.76	9250	3.16	15500	4.31
3250	1.83	9500	3.22	15750	4.42
3500	1.91	9750	3.26	16000	4.48
3750	1.97	10000	3.36	16250	4.54
4000	2.05	10250	3.41	16500	4.56
4250	2.11	10500	3.46	16750	4.57
4500	2.18	10750	3.50	17000	4.59
4750	2.24	11000	3.54	17250	4.66
5000	2.30	11250	3.58	17500	4.70
5250	2.36	11500	3.63	17750	4.76
5500	2.43	11750	3.66	18000	4.72

Cable loss
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-8155-00,
HL 2871

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.12	5750	2.34	12000	3.55
30	0.14	6000	2.39	12250	3.61
100	0.27	6250	2.46	12500	3.67
250	0.45	6500	2.52	12750	3.74
500	0.63	6750	2.58	13000	3.79
750	0.76	7000	2.64	13250	3.82
1000	0.89	7250	2.68	13500	3.83
1250	1.01	7500	2.73	13750	3.83
1500	1.12	7750	2.78	14000	3.88
1750	1.23	8000	2.83	14250	3.93
2000	1.32	8250	2.88	14500	3.96
2250	1.41	8500	2.94	14750	4.01
2500	1.49	8750	2.97	15000	4.00
2750	1.58	9000	3.02	15250	4.01
3000	1.66	9250	3.07	15500	4.00
3250	1.73	9500	3.13	15750	4.13
3500	1.80	9750	3.18	16000	4.22
3750	1.87	10000	3.21	16250	4.29
4000	1.93	10250	3.26	16500	4.29
4250	2.01	10500	3.30	16750	4.32
4500	2.06	10750	3.36	17000	4.37
4750	2.12	11000	3.39	17250	4.45
5000	2.17	11250	3.44	17500	4.49
5250	2.24	11500	3.48	17750	4.53
5500	2.29	11750	3.52	18000	4.55

Cable loss
Cable coaxial, RG-214/U, N type-N type, 17 m
Teldor, HL 3612

Frequency, GHz	Cable loss, dB
0.1	0.05
0.5	0.07
1	0.10
3	0.22
5	0.29
10	0.39
30	0.68
50	0.90
100	1.27
150	1.58
200	1.80
250	2.12
300	2.36
350	2.60
400	2.82
450	2.99
500	3.23
550	3.40
600	3.56
650	3.71
700	3.90
750	4.04
800	4.23
850	4.39
900	4.55
950	4.65
1000	4.79

Cable loss
Cable coaxial, RG-214/U, N type-N type, 6.5 m
Suhner Switzerland, HL 3616

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	1750	2.66	3550	4.44	5350	6.08
30	0.25	1800	2.72	3600	4.46	5400	6.12
50	0.32	1850	2.78	3650	4.59	5450	6.17
100	0.48	1900	2.81	3700	4.60	5500	6.25
150	0.60	1950	2.86	3750	4.72	5550	6.31
200	0.71	2000	2.94	3800	4.72	5600	6.35
250	0.81	2050	2.97	3850	4.86	5650	6.41
300	0.91	2100	3.01	3900	4.85	5700	6.50
350	1.00	2150	3.06	3950	4.99	5750	6.52
400	1.07	2200	3.11	4000	4.90	5800	6.57
450	1.14	2250	3.16	4050	5.04	5850	6.61
500	1.23	2300	3.21	4100	5.01	5900	6.71
550	1.30	2350	3.26	4150	5.10	5950	6.70
600	1.37	2400	3.31	4200	5.08	6000	6.75
650	1.44	2450	3.35	4250	5.18	6050	6.74
700	1.50	2500	3.39	4300	5.14	6100	6.84
750	1.58	2550	3.46	4350	5.22	6150	6.87
800	1.64	2600	3.48	4400	5.21	6200	6.93
850	1.69	2650	3.55	4450	5.29	6250	6.96
900	1.77	2700	3.59	4500	5.31	6300	7.02
950	1.79	2750	3.66	4550	5.39	6350	7.04
1000	1.87	2800	3.68	4600	5.41	6400	7.10
1050	1.92	2850	3.75	4650	5.49	6450	7.11
1100	1.98	2900	3.79	4700	5.52	6500	7.19
1150	2.05	2950	3.86	4750	5.60		
1200	2.09	3000	3.89	4800	5.64		
1250	2.15	3050	3.94	4850	5.73		
1300	2.21	3100	3.98	4900	5.70		
1350	2.27	3150	4.03	4950	5.73		
1400	2.33	3200	4.06	5000	5.75		
1450	2.38	3250	4.12	5050	5.83		
1500	2.44	3300	4.14	5100	5.82		
1550	2.48	3350	4.22	5150	5.91		
1600	2.52	3400	4.24	5200	5.92		
1650	2.56	3450	4.31	5250	5.98		
1700	2.62	3500	4.35	5300	6.01		

Cable loss
Microwave Cable Assembly, Huber-Suhner, 40 GHz, 3.5 m, SMA-SMA, S/N 1225/2A
HL 3901

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	9500	4.29	21000	6.67
100	0.41	10000	4.40	22000	6.92
500	0.93	10500	4.52	23000	7.00
1000	1.33	11000	4.64	24000	7.18
1500	1.63	11500	4.76	25000	7.29
2000	1.90	12000	4.87	26000	7.55
2500	2.12	12500	4.99	27000	7.70
3000	2.33	13000	5.11	28000	7.88
3500	2.50	13500	5.20	29000	8.02
4000	2.67	14000	5.31	30000	8.15
4500	2.82	14500	5.42	31000	8.35
5000	2.99	15000	5.51	32000	8.40
5500	3.16	15500	5.58	33000	8.62
6000	3.32	16000	5.68	34000	8.73
6500	3.51	16500	5.78	35000	8.78
7000	3.65	17000	5.91	36000	8.94
7500	3.79	17500	5.99	37000	9.21
8000	3.92	18000	6.07	38000	9.37
8500	4.04	19000	6.36	39000	9.45
9000	4.18	20000	6.49	40000	9.52

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
DC	direct current
EMC	electromagnetic compatibility
EUT	equipment under test
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
kV	kilovolt
L	length
LISN	line impedance stabilization network
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
s	second
V	volt
VA	volt-ampere
W	width

END OF DOCUMENT