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Electrical

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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

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Table of contents

HERMON LABORATORIES

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
Serial number:	L300 Plus CU 100
Hardware version:	1.0
Software release:	1.0.3
Receipt date	5/4/2010

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:	20764
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	5/4/2010
Test completed:	5/21/2010
Test specification(s):	FCC 47CFR Part 15, subpart C, §15.247; RSS-210 Issue 7:2007, Annex 8; RSS-Gen Issue 2:2007

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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.

This test report replaces the previously issued test report identified by Doc ID:BIORAD_FCC.20764.

	Name and Title	Date	Signature
Tested by:	Mr. L. Markel, test engineer	May 20, 2010	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	May 24, 2010	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	May 25, 2010	

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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 adapter 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 maintance only.

6.3 Support and test equipment

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

6.4 Operating frequencies

Source	Frequency, MHz
Tx	2401 - 2482
Rx	2401 - 2482
IF	0.406

6.5 Changes made in the EUT

No changes were implemented.

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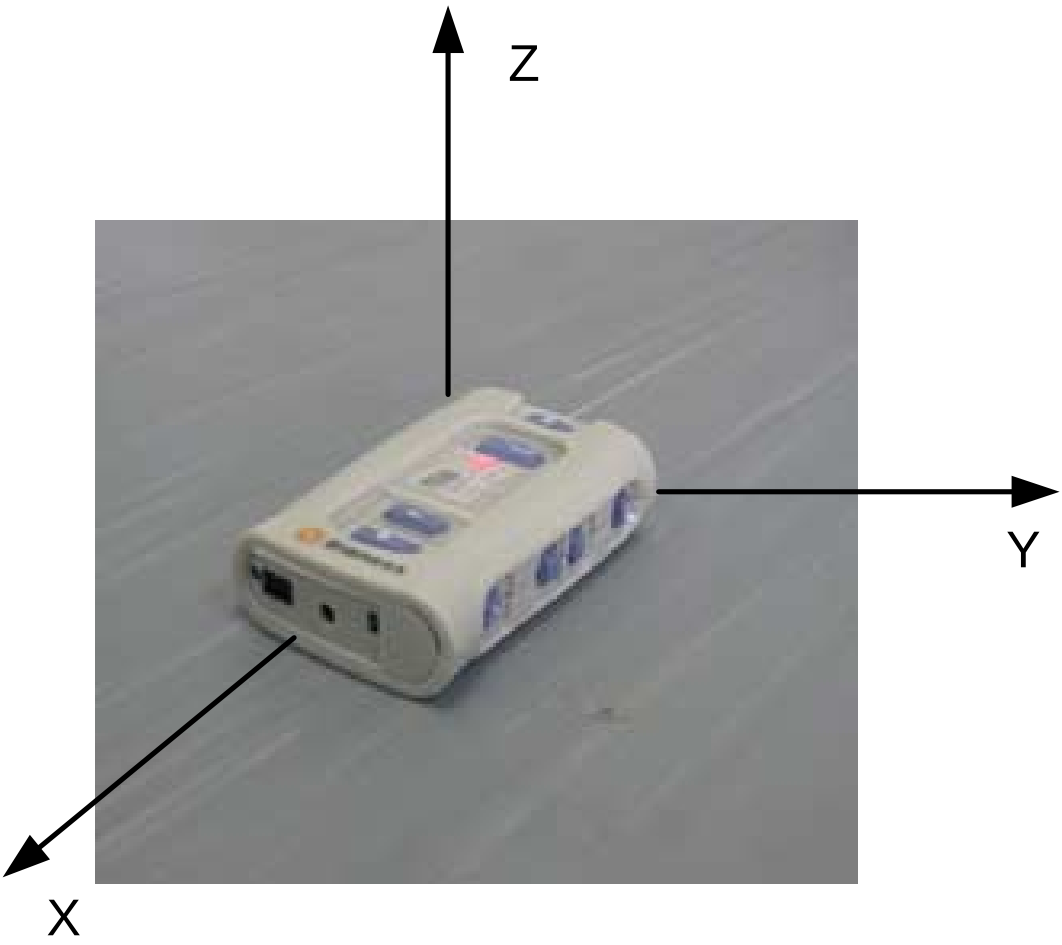
6.6 Test configuration



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6.7 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				**-11.10 dBm at 2401.0 MHz** -12.73 dBm at 2441.0 MHz -14.33 dBm at 2482.0 MHz		
Is transmitter output power variable?		**V**	No					
			Yes		continuous variable			
					stepped variable with stepsize	NA		
				minimum RF power		NA		
				maximum RF power		NA		
Antenna connection								
unique coupling		standard connector		**V**	integral		with temporary RF connector	
						V	without temporary RF connector	
Antenna/s technical characteristics								
Type		Manufacturer		Model number		Gain		
Chip		Fractus		FR05-S1-N-0-102		1.5 dBi		
Transmitter 99% power bandwidth		853.5 kHz						
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 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	Battery type	Rechargeable, NiMh, 900-1100 mAh (AAA)			
	DC	**Nominal rated voltage**	VDC					
	AC mains	**Nominal rated voltage**	VAC	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 & Time:	5/16/2010 4:26:35 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
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
2400.0 – 2483.5	6.0	500.0

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

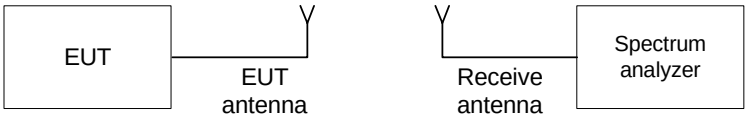
7.1.2 Test procedure

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 & Time:	5/16/2010 4:26:35 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
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
2401.0	660.0	500.0	-160.0	Pass
2441.0	660.0	500.0	-160.0	Pass
2482.0	655.0	500.0	-155.0	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% power
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	853.47	NA	NA	Pass
2441.0	864.92	NA	NA	Pass
2483.0	863.35	NA	NA	Pass

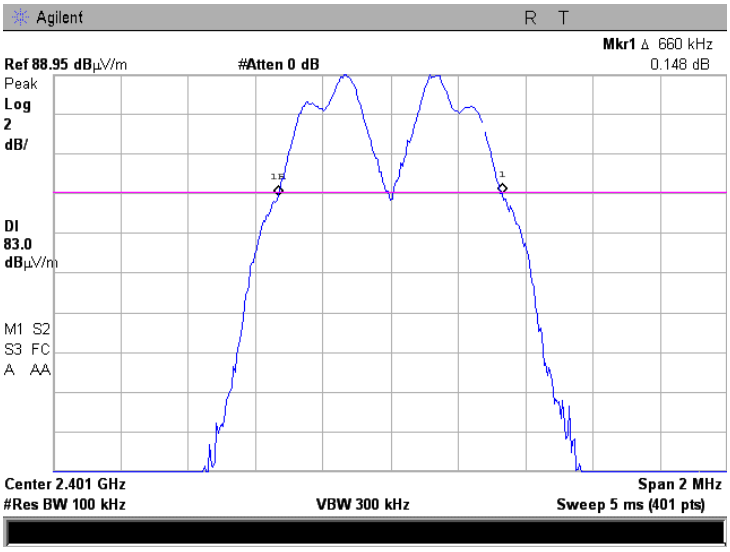
Reference numbers of test equipment used

HL 1984	HL 2871	HL 2909						

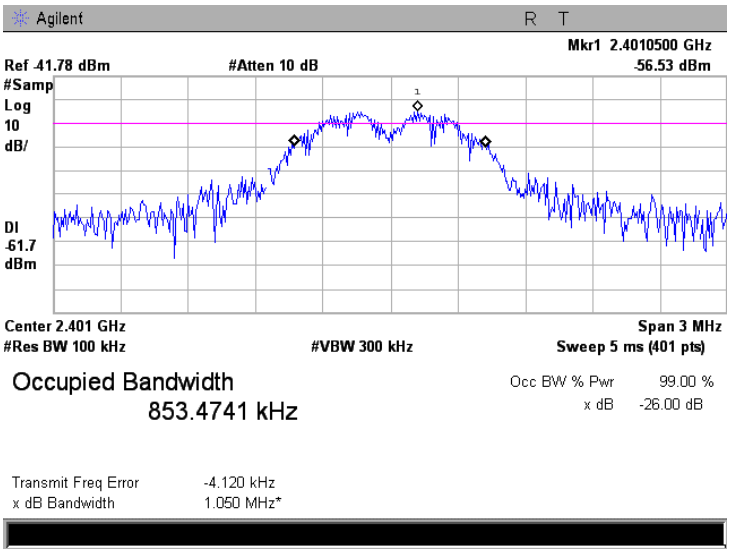
Full description is given in Appendix A.

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 & Time:	5/16/2010 4:26:35 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
Remarks:			

Plot 7.1.1 The 6 dB bandwidth test result at low frequency

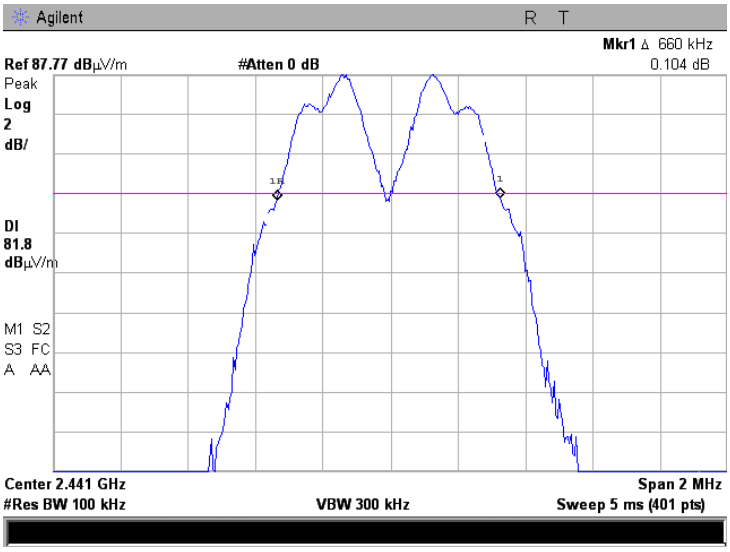


Plot 7.1.2 The 99% power bandwidth test result at low frequency

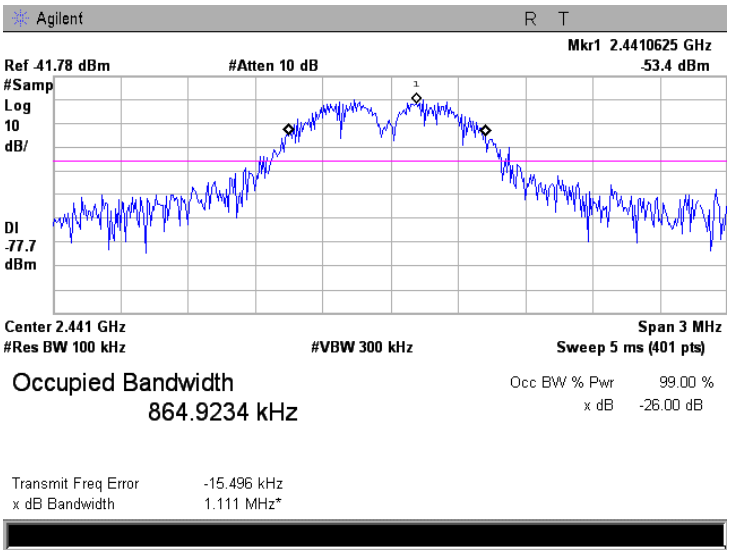


Test specification:	FCC section 15.247(a)(2), RSS-210 section A8.2(a), 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/16/2010 4:26:35 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
Remarks:			

Plot 7.1.3 The 6 dB bandwidth test result at mid frequency

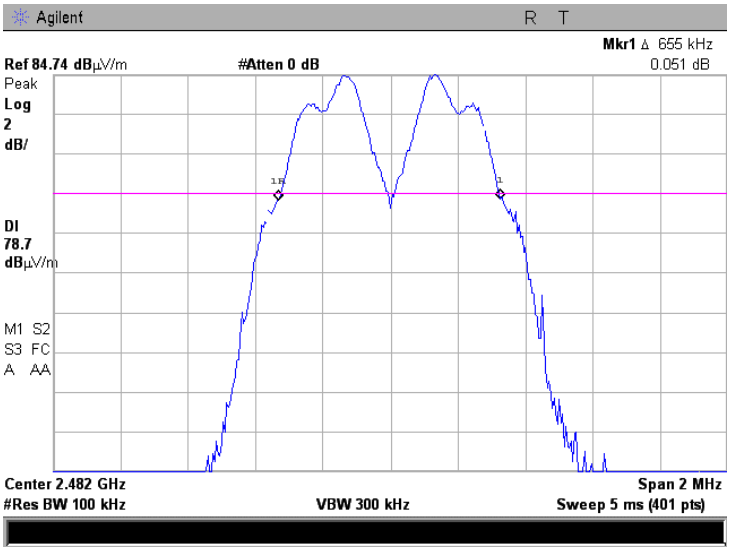


Plot 7.1.4 The 99% power bandwidth test result at mid frequency

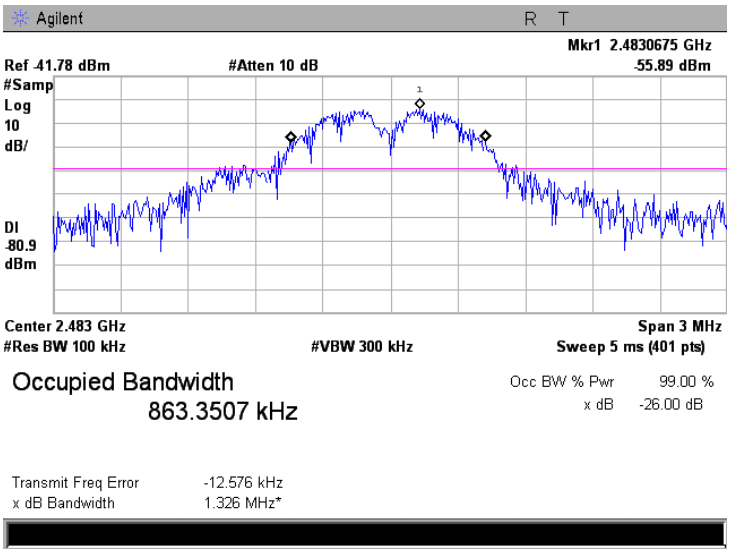


Test specification:	FCC section 15.247(a)(2), RSS-210 section A8.2(a), 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/16/2010 4:26:35 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
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 & Time:	5/16/2010 4:31:26 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
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(V/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×P×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 360^0 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:

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

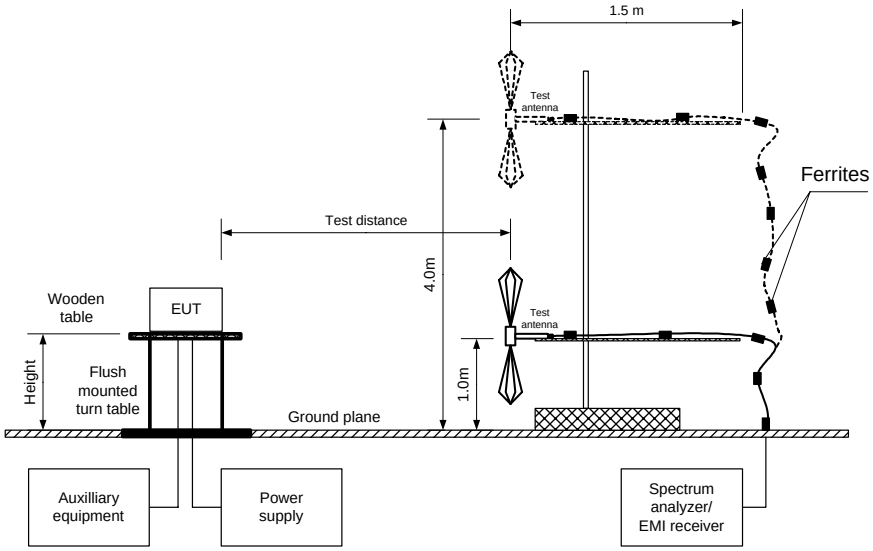
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi – 95.2 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 & Time:	5/16/2010 4:31:26 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
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 & Time:	5/16/2010 4:31:26 PM		
Temperature: 24.2 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 41 %	**Power Supply:** 1.2 VDC
Remarks:			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY:	2400.0 – 2483.5 MHz
TEST DISTANCE:	3 m
TEST SITE:	OATS
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:	0.25 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
DETECTOR USED:	Peak
EUT 6 dB BANDWIDTH:	MHz
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
2401.0	85.60	H	1.2	170	1.5	-11.10	30.0	-41.10	Pass
2441.0	83.97	H	1.2	180	1.5	-12.73	30.0	-42.73	Pass
2482.0	82.37	H	1.2	175	1.5	-14.33	30.0	-44.33	Pass

The recorded test results were obtained in the EUT Z-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.
Note: Maximum peak output power was obtained at Unom input power voltage.

Reference numbers of test equipment used

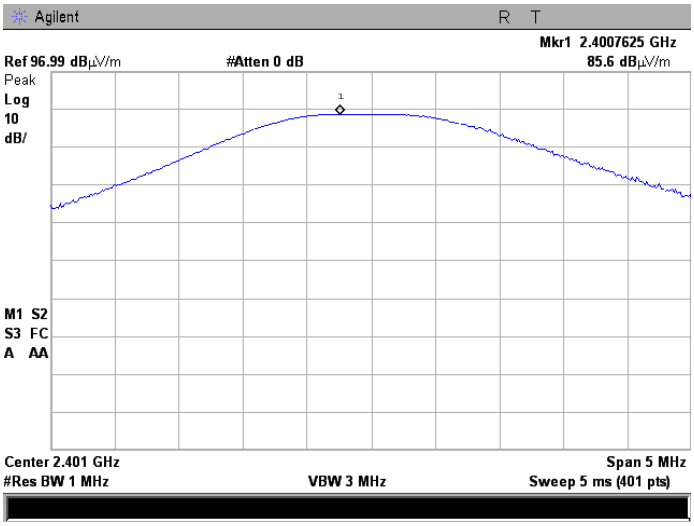
HL 1984	HL 2870	HL 2909					

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 & Time:	5/16/2010 4:31:26 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
Remarks:			

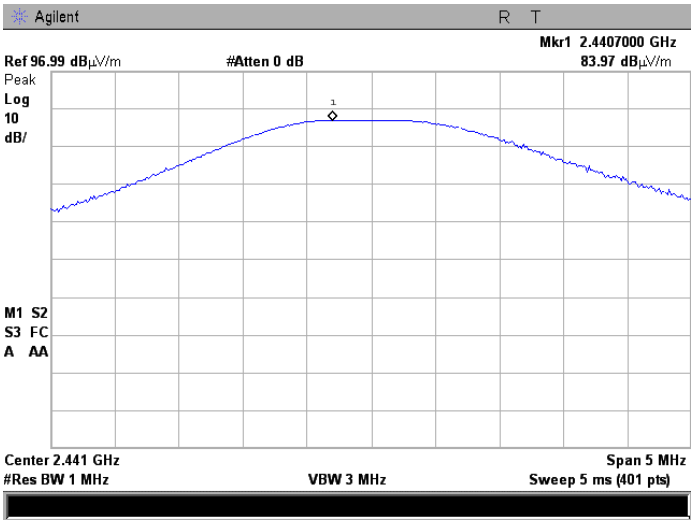
Plot 7.2.1 Field strength of carrier at low frequency and Unom

EUT POSITION:	Z-axis
ANTENNA POLARIZATION:	Horizontal



Plot 7.2.2 Field strength of carrier at mid frequency and Unom

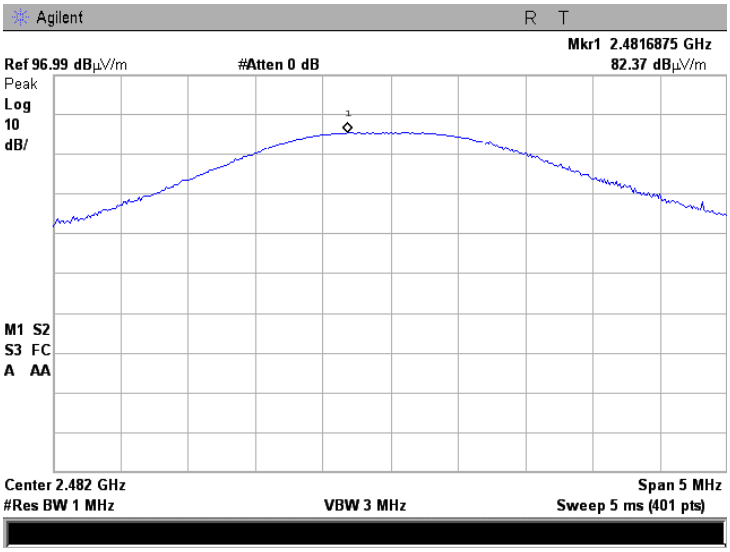
EUT POSITION:	Z-axis
ANTENNA POLARIZATION:	Horizontal



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 & Time:	5/16/2010 4:31:26 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
Remarks:			

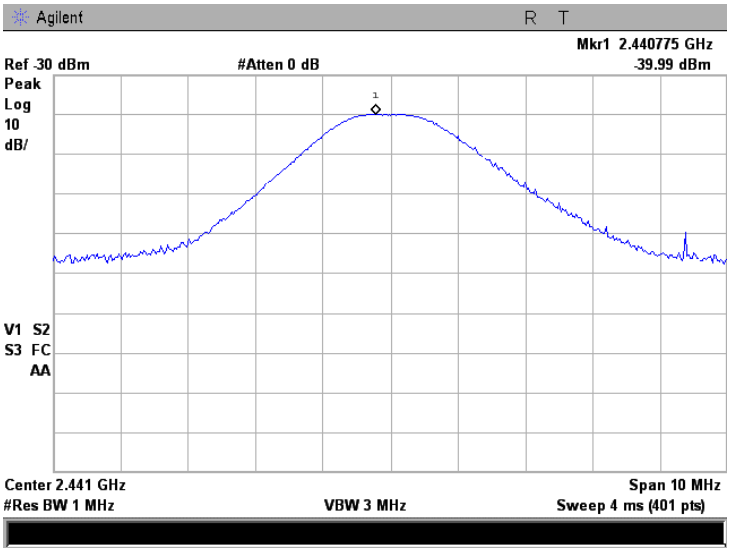
Plot 7.2.3 Field strength of carrier at high frequency and Unom

EUT POSITION:	Z-axis
ANTENNA POLARIZATION:	Horizontal

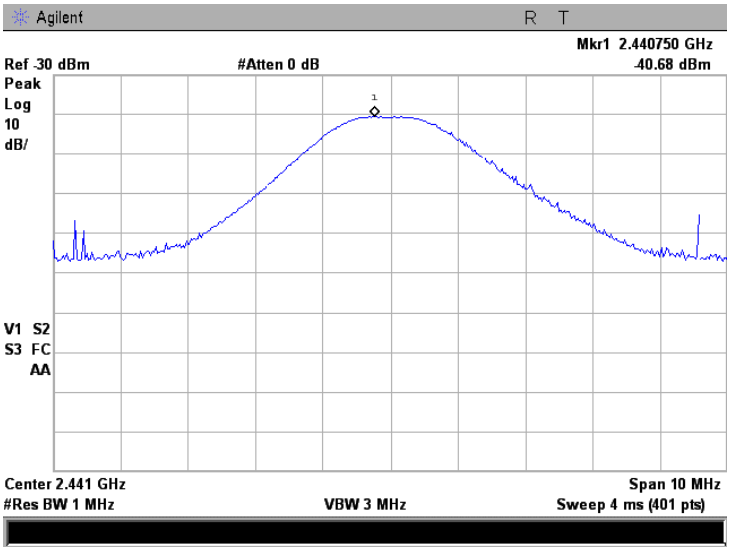


Test specification:	FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/16/2010 4:31:26 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
Remarks:			

Plot 7.2.4 Peak output power at mid frequency and Unom

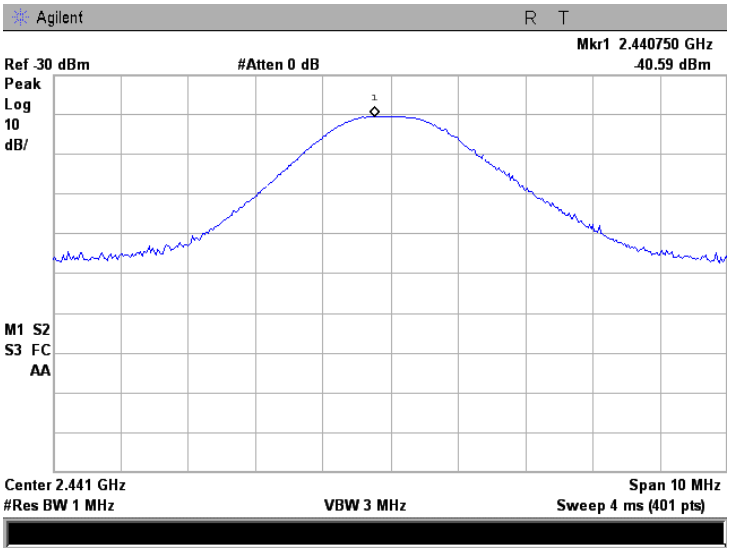


Plot 7.2.5 Peak output power at mid frequency and 115%Unom



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 & Time:	5/16/2010 4:31:26 PM		
Temperature: 24.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
Remarks:			

Plot 7.2.6 Peak output power at mid frequency and 85%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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

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 – 10th harmonic	74.0	NA	54.0	

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

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

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 360^0 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 360^0, 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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

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

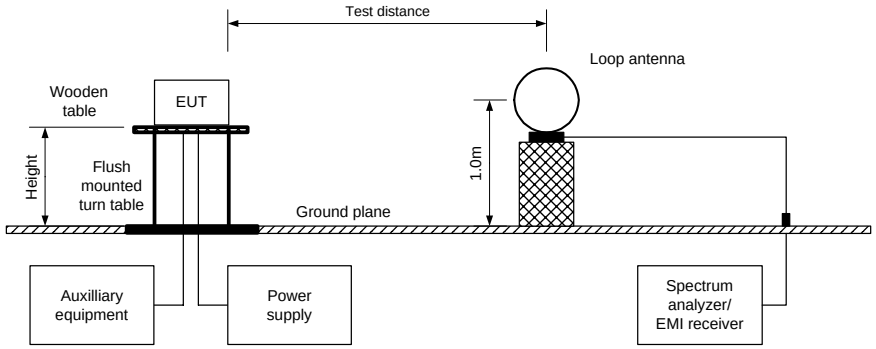
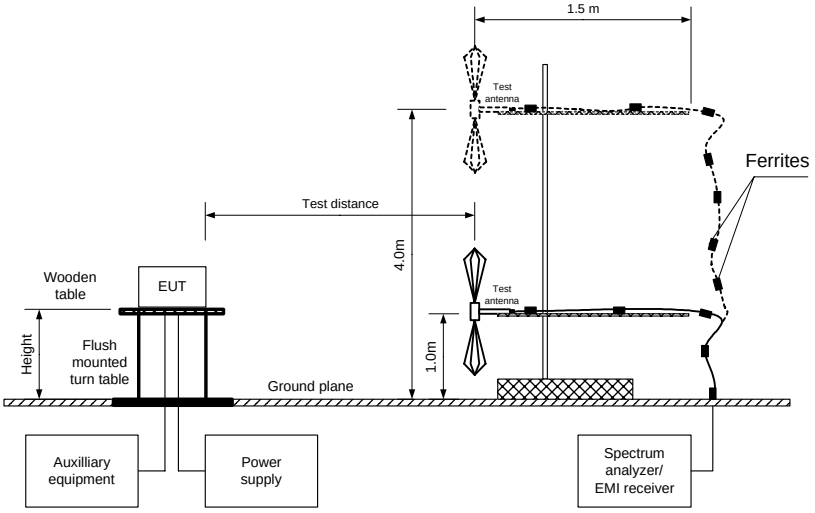


Figure 7.3.2 Setup for spurious emission field strength measurements above 30 MHz



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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 42 %	**Power Supply:** 1.2 VDC
Remarks: FCC+Canada			

Table 7.3.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY BAND:	2400.0 – 2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 26500 MHz
TEST DISTANCE:	3 m
MODULATION:	FSK
MODULATING SIGNAL:	Binary data message
BIT RATE:	0.25 Mbps
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
TRANSMITTER OUTPUT POWER:	-11.10 dBm at low carrier frequency -12.73 dBm at mid carrier frequency -14.33 dBm at high carrier frequency
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									
2400.00	54.25	H	1.2	170	82.43	28.18	20.0	-8.18	Pass
7203.35	36.41	H	1.3	110	82.43	46.02		-26.02	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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 42 %	**Power Supply:** 1.2 VDC
Remarks: FCC+Canada			

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

ASSIGNED FREQUENCY BAND:	2400.0 – 2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	1000 – 26500 MHz
TEST DISTANCE:	3 m
MODULATION:	FSK
MODULATING SIGNAL:	Binary data message
BIT RATE:	0.25 Mbps
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
TRANSMITTER OUTPUT POWER:	-11.10 dBm at low carrier frequency -12.73 dBm at mid carrier frequency -14.33 dBm at high carrier frequency
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=30 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											
4802.00	V	1.0	090	63.54	74.00	-10.46	60.27	42.27	54.00	-11.73	Pass
Mid carrier frequency											
4882.00	H	1.3	150	61.98	74.00	-12.02	58.61	40.61	54.00	-13.39	Pass
7322.08	H	1.0	110	45.35	74.00	-28.65	35.17	17.17	54.00	-36.83	
High carrier frequency											
2483.79	H	1.2	170	58.95	74.00	-15.05	49.72	31.72	54.00	-22.28	Pass
4964.00	V	1.1	100	62.49	74.00	-11.51	59.05	41.05	54.00	-12.95	
7446.00	H	1.0	110	42.64	74.00	-31.36	31.65	13.65	54.00	-40.35	

*****- 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					-18 dB

*- Average factor was calculated as follows

for pulse train shorter than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{Train\ duration} \times Number\ of\ bursts\ within\ pulse\ train\right)$$

for pulse train longer than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\,ms} \times Number\ of\ bursts\ within\ 100\,ms\right)$$

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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 42 %	**Power Supply:** 1.2 VDC
Remarks: FCC+Canada			

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

ASSIGNED FREQUENCY BAND:	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:	0.25 Mbps
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
TRANSMITTER OUTPUT POWER:	-11.10 dBm at low carrier frequency -12.73 dBm at mid carrier frequency -14.33 dBm at high carrier frequency
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) 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*				
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 0768	HL 1984	HL 2432	HL 2870	HL 2909
HL 3535	HL 3616	HL 3901					

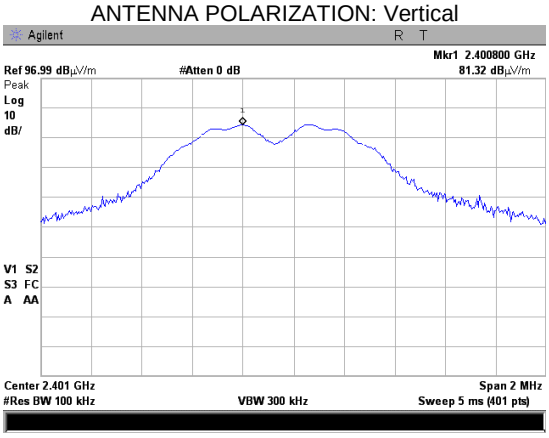
Full description is given in Appendix A.

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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

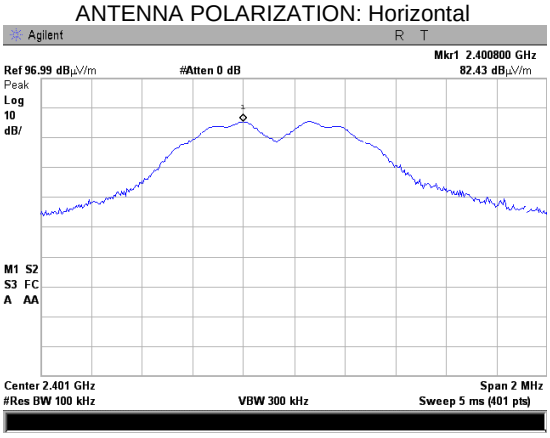
Plot 7.3.1 Radiated emission measurements at the low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

ANTENNA POLARIZATION: Vertical



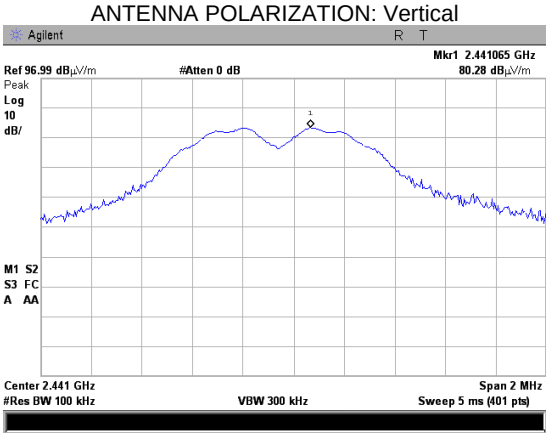
ANTENNA POLARIZATION: Horizontal



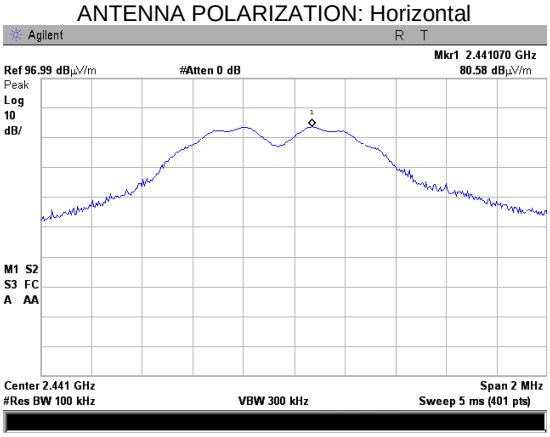
Plot 7.3.2 Radiated emission measurements at the mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

ANTENNA POLARIZATION: Vertical



ANTENNA POLARIZATION: Horizontal

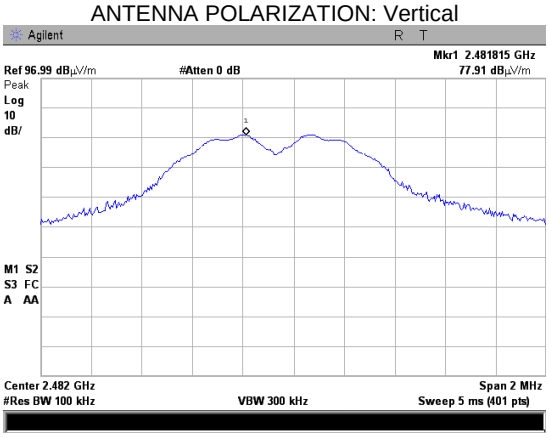


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

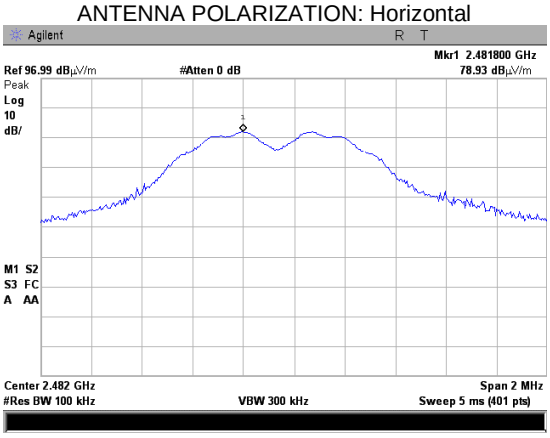
Plot 7.3.3 Radiated emission measurements at the high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

ANTENNA POLARIZATION: Vertical



ANTENNA POLARIZATION: Horizontal



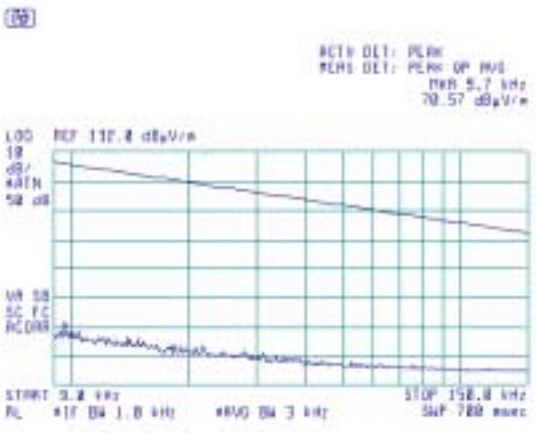
HERMON LABORATORIES

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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

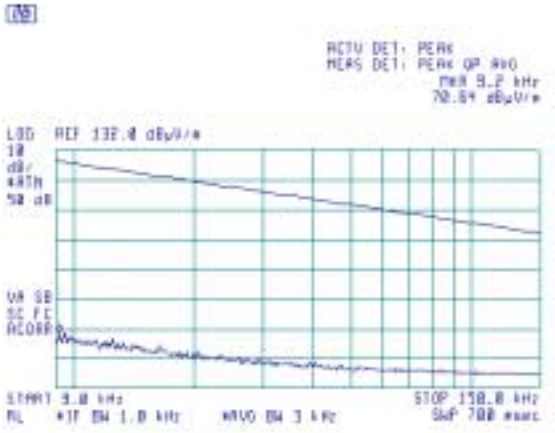
Plot 7.3.4 Radiated emission measurements from 9 to 150 kHz

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

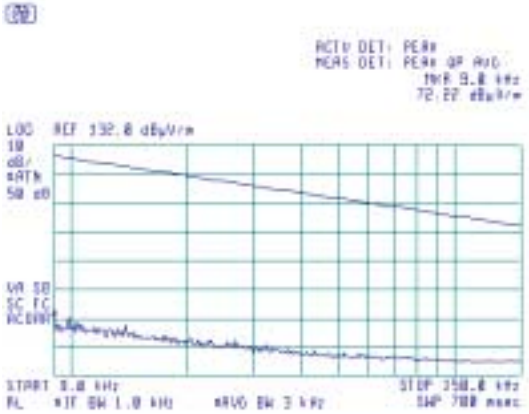
Low channel



Mid channel



High channel

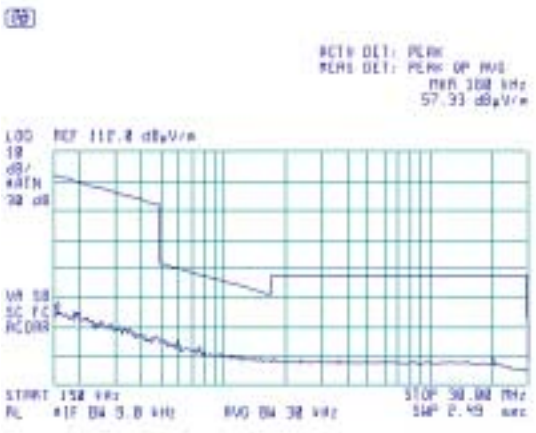


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

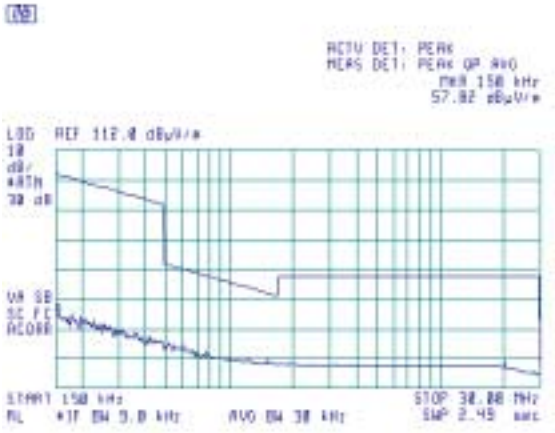
Plot 7.3.5 Radiated emission measurements from 0.15 to 30 MHz

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

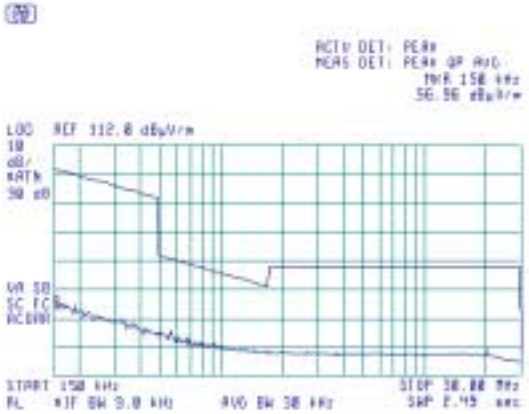
Low channel



Mid channel



High channel

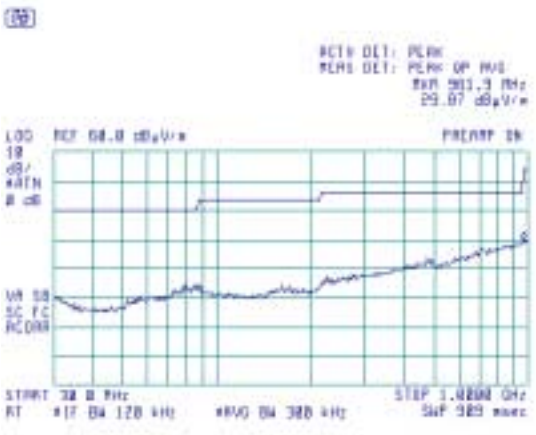


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

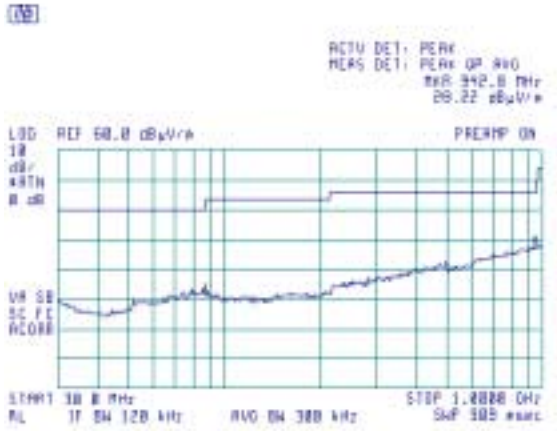
Plot 7.3.6 Radiated emission measurements from 30 to 1000 MHz

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

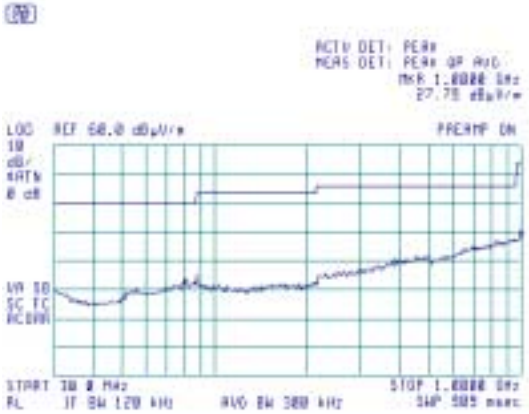
Low channel



Mid channel



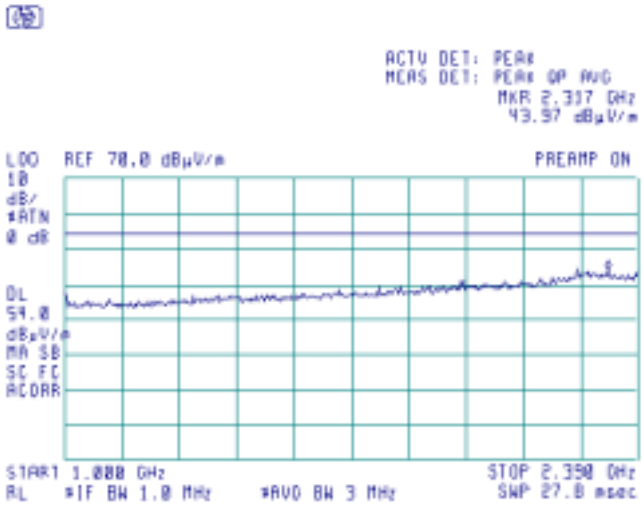
High channel



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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

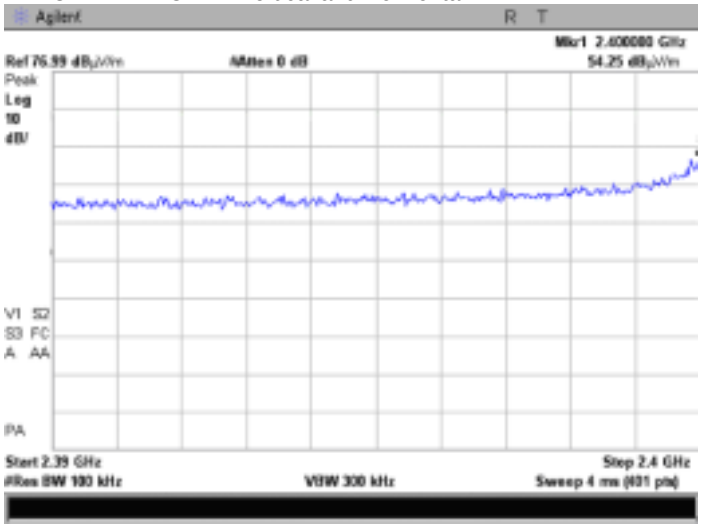
Plot 7.3.7 Radiated emission measurements from 1000 to 2390 MHz at the low carrier frequency

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



Plot 7.3.8 Radiated emission measurements from 2390 to 2400 MHz at the low carrier frequency

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

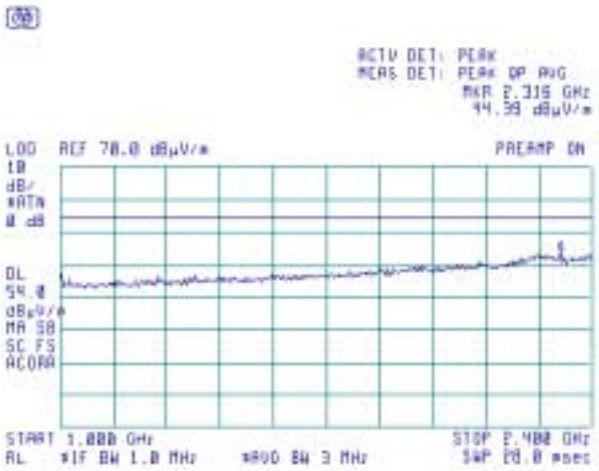


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

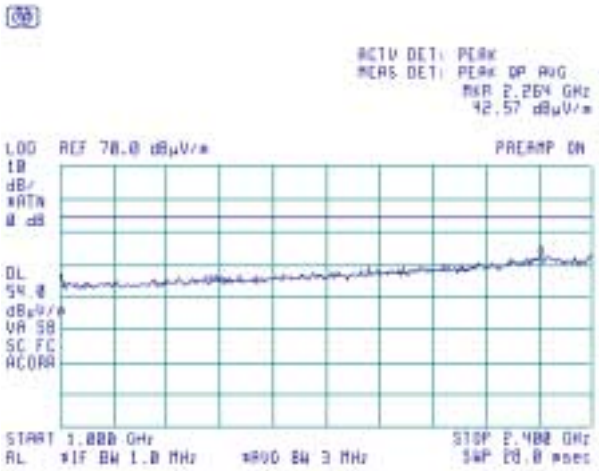
Plot 7.3.9 Radiated emission measurements from 1000 to 2400 MHz

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

Mid channel



High channel



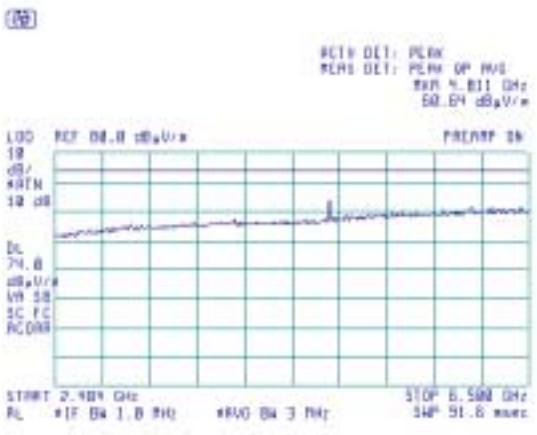
HERMON LABORATORIES

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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

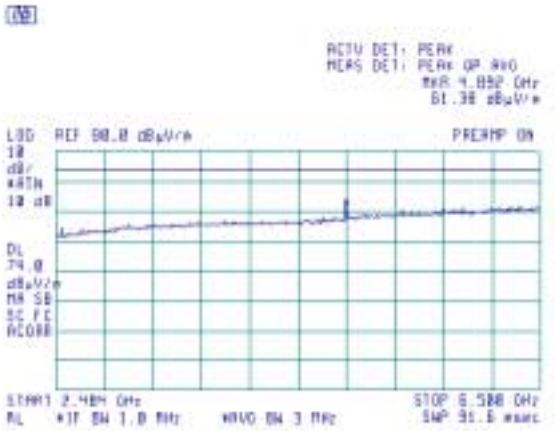
Plot 7.3.10 Radiated emission measurements from 2483.5 to 6500 MHz

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR / LIMIT	Peak / Peak

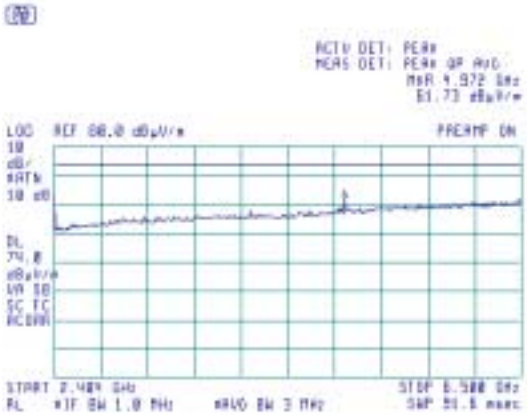
Low channel



Mid channel



High channel



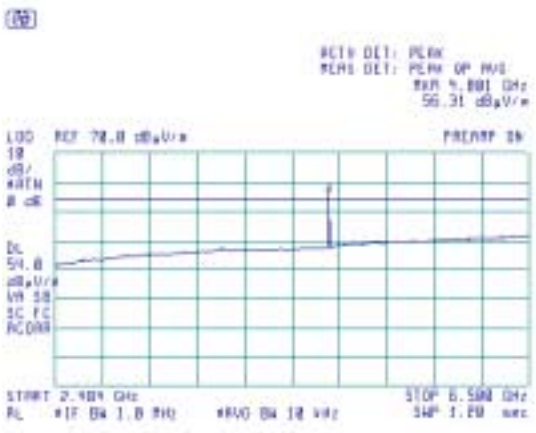
HERMON LABORATORIES

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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

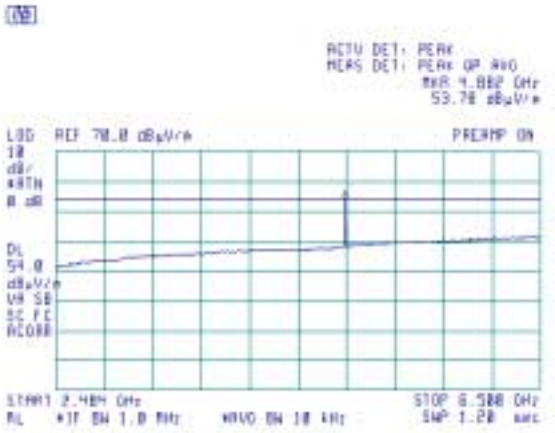
Plot 7.3.11 Radiated emission measurements from 2483.5 to 6500 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR / LIMIT VBW = 10 kHz / Average

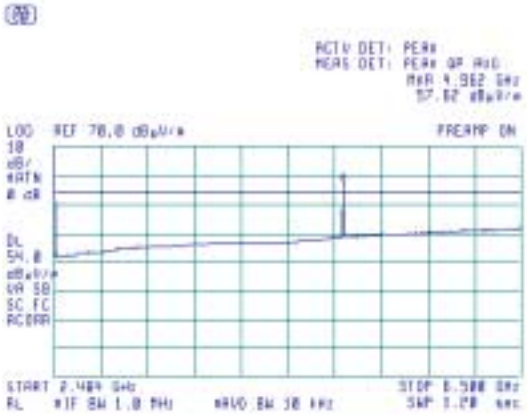
Low channel



Mid channel



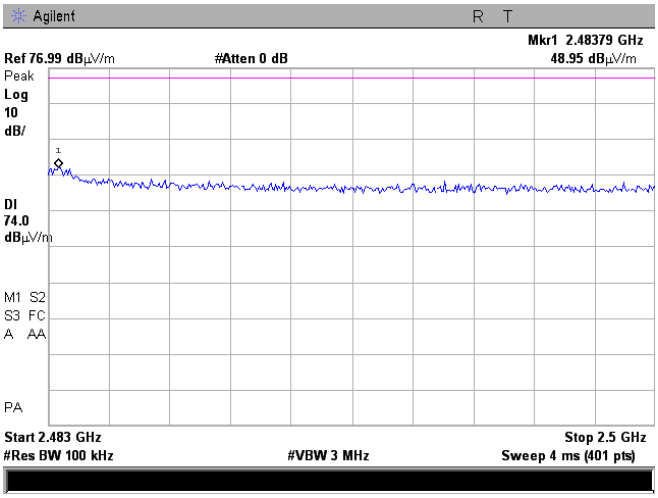
High channel



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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

Plot 7.3.12 Radiated emission measurements from 2483.5 to 2500 MHz at the high carrier frequency

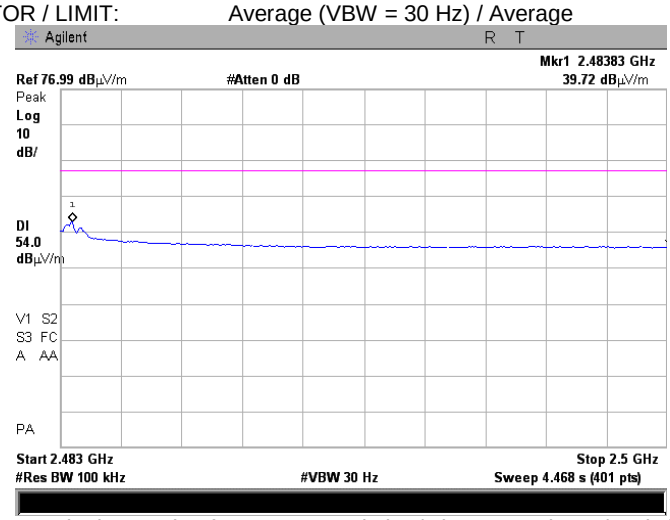
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR / LIMIT: Peak / Peak



Field strength = Measured + integration factor= 48.95 dB(µV/m)+10*LOG(1000/100) dB = 58.95 dB(µV/m)

Plot 7.3.13 Radiated emission measurements from 2483.5 to 2500 MHz at the high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR / LIMIT: Average (VBW = 30 Hz) / Average



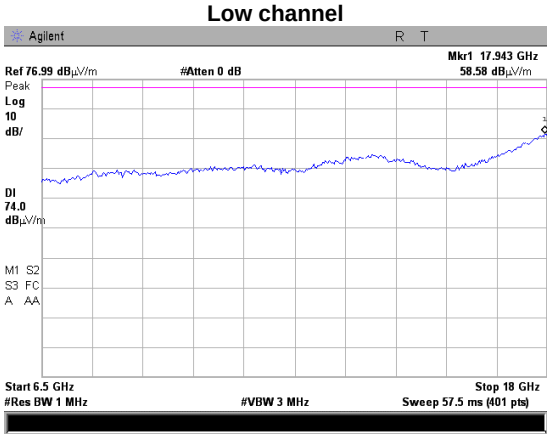
Field strength = Measured + integration factor = 39.72 dB(µV/m)+10*LOG(1000/100) dB = 49.72 dB(µV/m)

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 & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

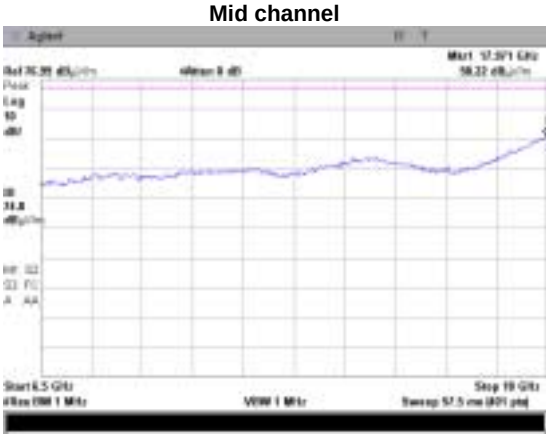
Plot 7.3.14 Radiated emission measurements from 6500 to 18000 MHz

TEST SITE:	Fully Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR / LIMIT	Peak / Peak

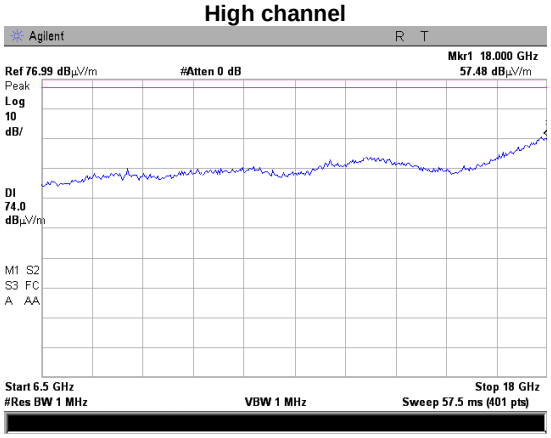
Low channel



Mid channel



High channel

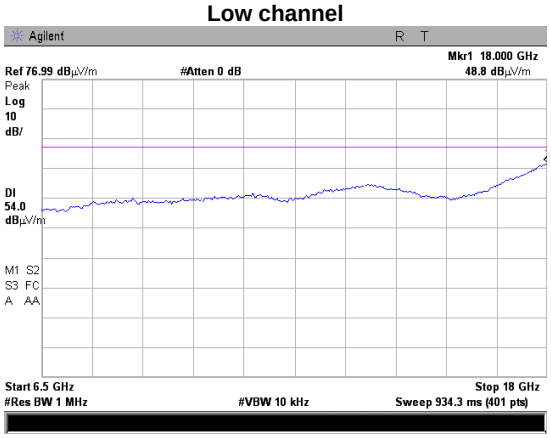


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

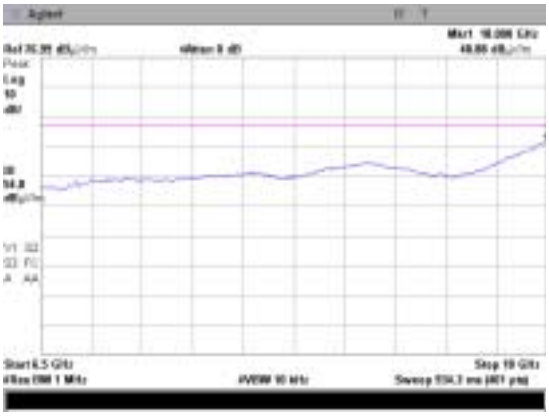
Plot 7.3.15 Radiated emission measurements from 6500 to 18000 MHz

TEST SITE: Fully Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR / LIMIT VBW = 10 kHz / Average

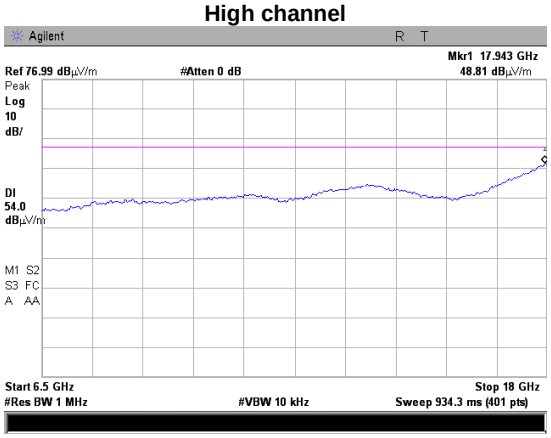
Low channel



Mid channel



High channel

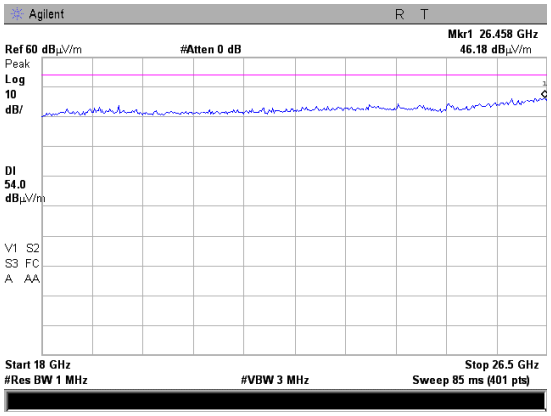


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

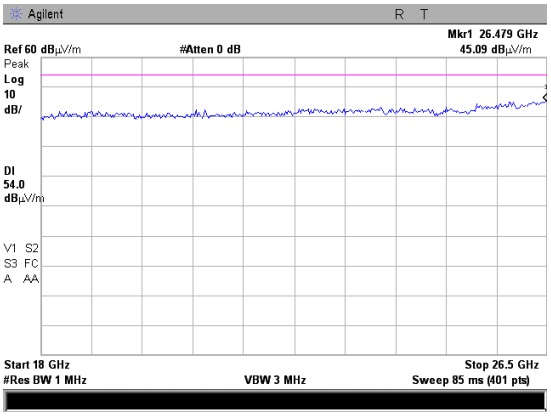
Plot 7.3.16 Radiated emission measurements from 18000 to 26500 MHz

TEST SITE:	OATS
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR / LIMIT	Peak / Peak

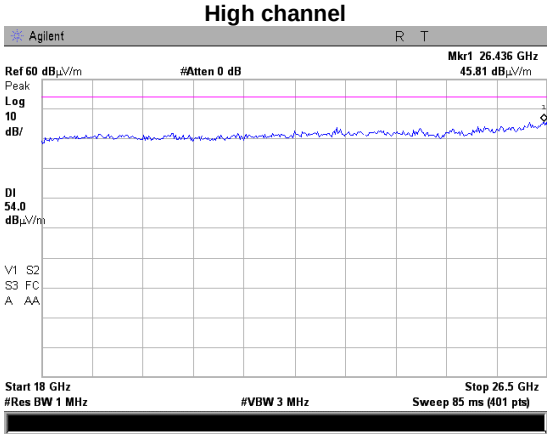
Low channel



Mid channel



High channel

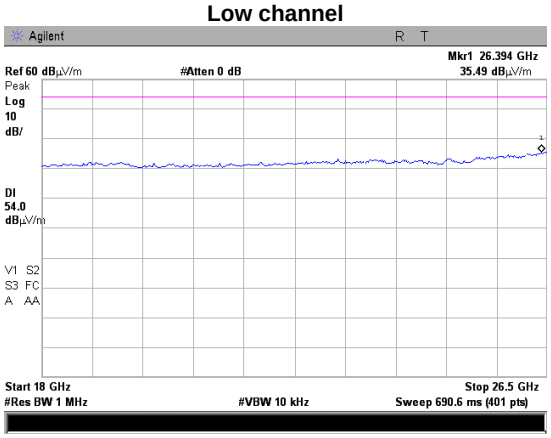


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

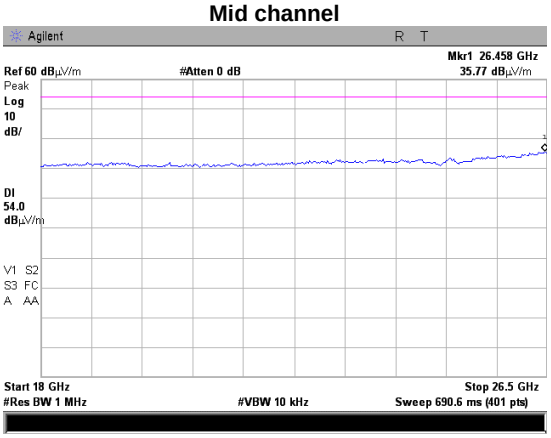
Plot 7.3.17 Radiated emission measurements from 18000 to 26500 MHz

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR / LIMIT VBW = 10 kHz / Peak

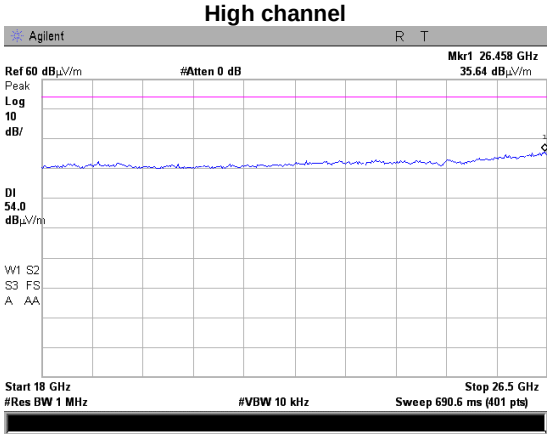
Low channel



Mid channel



High channel

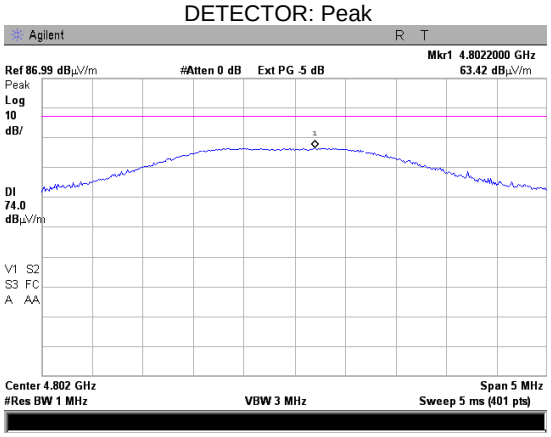


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

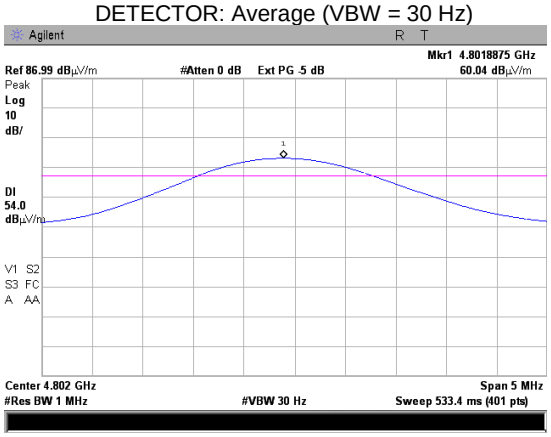
Plot 7.3.18 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

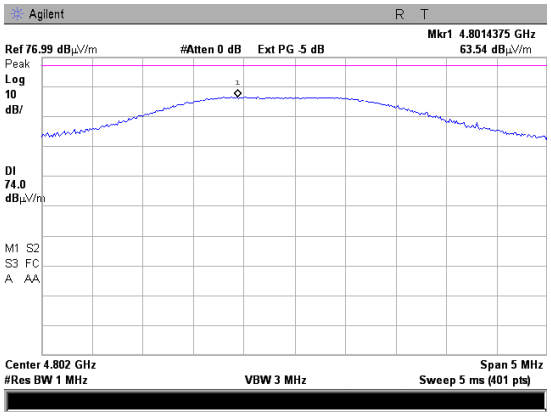
ANTENNA POLARIZATION: Horizontal
DETECTOR: Peak



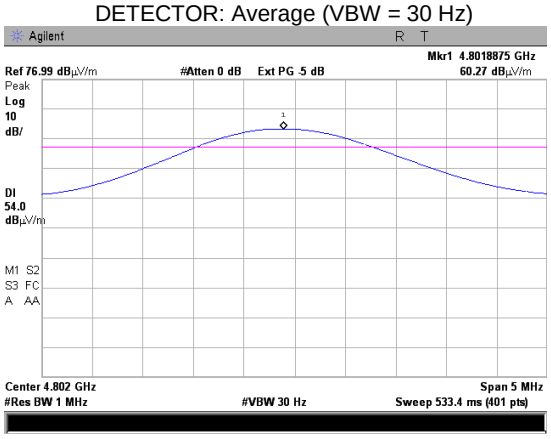
EUT position: Z-axis
DETECTOR: Average (VBW = 30 Hz)



ANTENNA POLARIZATION: Vertical
DETECTOR: Peak



EUT position: X-axis
DETECTOR: Average (VBW = 30 Hz)

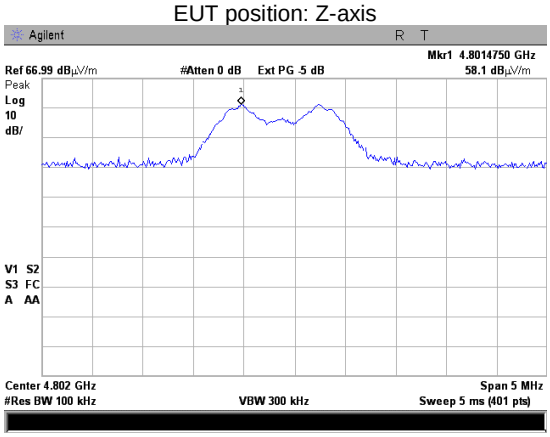


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

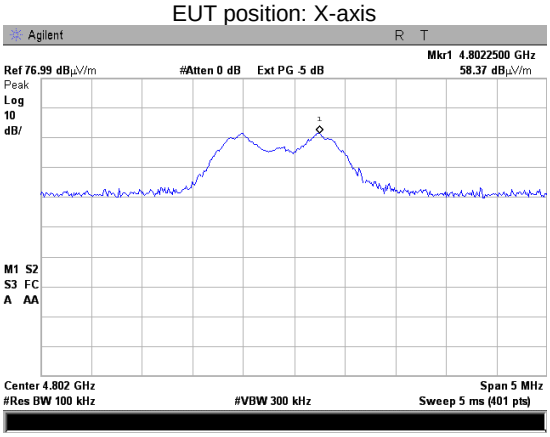
Plot 7.3.19 Radiated emission measurements at the second harmonic of low carrier frequency (RBW = 100 kHz)

TEST SITE: OATS
TEST DISTANCE: 3 m

ANTENNA POLARIZATION: Horizontal
EUT position: Z-axis



ANTENNA POLARIZATION: Vertical
EUT position: X-axis

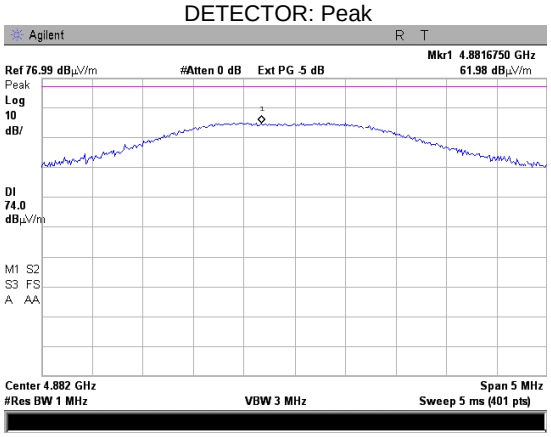


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

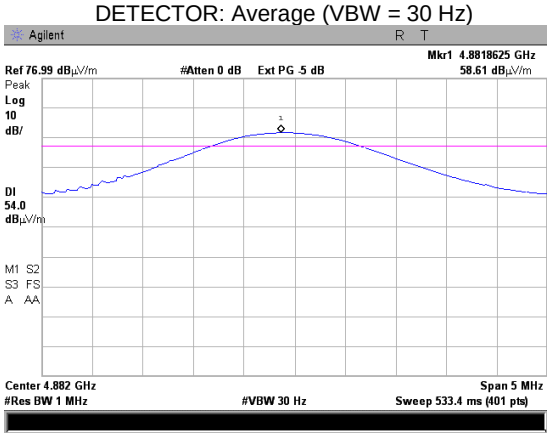
Plot 7.3.20 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

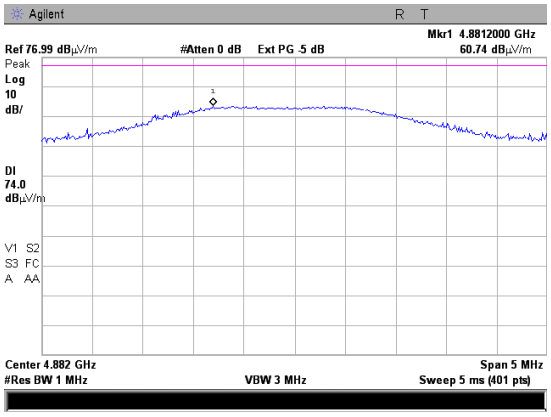
ANTENNA POLARIZATION: Horizontal
DETECTOR: Peak



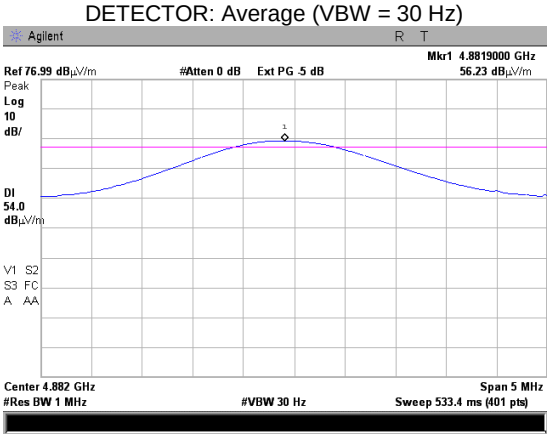
EUT position: Z-axis
DETECTOR: Average (VBW = 30 Hz)



ANTENNA POLARIZATION: Vertical
DETECTOR: Peak



EUT position: X-axis
DETECTOR: Average (VBW = 30 Hz)

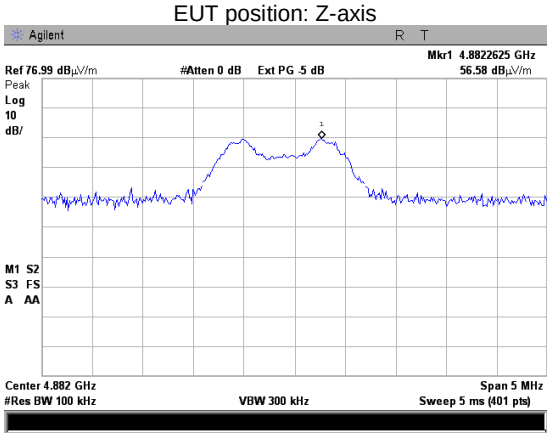


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

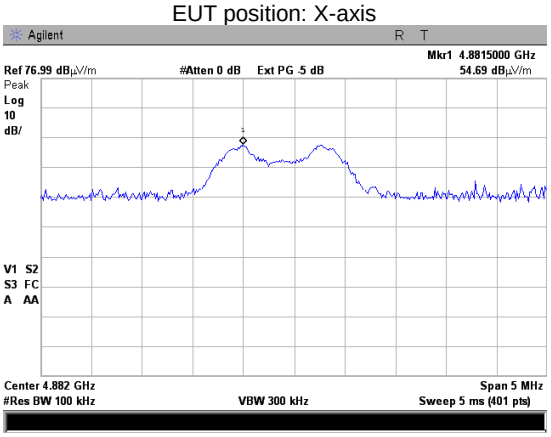
Plot 7.3.21 Radiated emission measurements at the second harmonic of mid carrier frequency (RBW = 100 kHz)

TEST SITE: OATS
TEST DISTANCE: 3 m

ANTENNA POLARIZATION: Horizontal
EUT position: Z-axis



ANTENNA POLARIZATION: Vertical
EUT position: X-axis

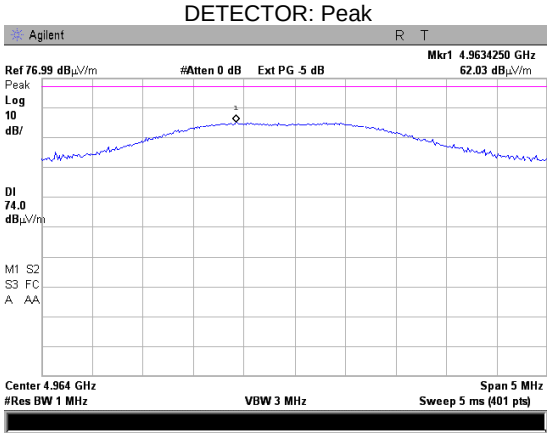


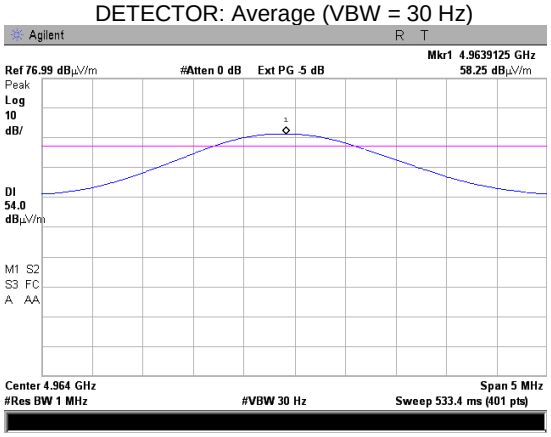
Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

Plot 7.3.22 Radiated emission measurements at the second harmonic of high carrier frequency

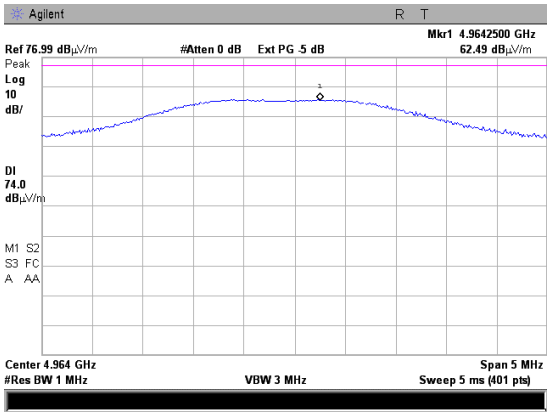
TEST SITE: OATS
TEST DISTANCE: 3 m

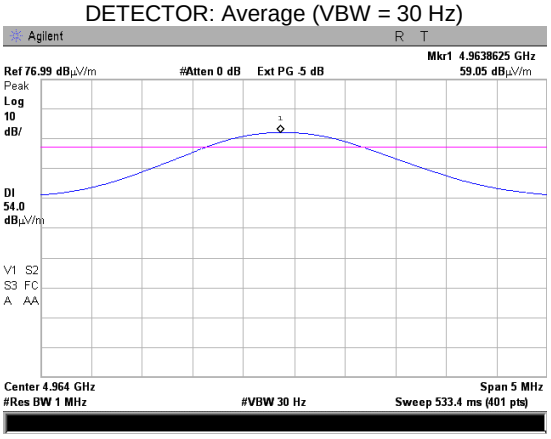
ANTENNA POLARIZATION: Horizontal
EUT position: Z-axis
DETECTOR: Peak
DETECTOR: Average (VBW = 30 Hz)





ANTENNA POLARIZATION: Vertical
EUT position: X-axis
DETECTOR: Peak
DETECTOR: Average (VBW = 30 Hz)



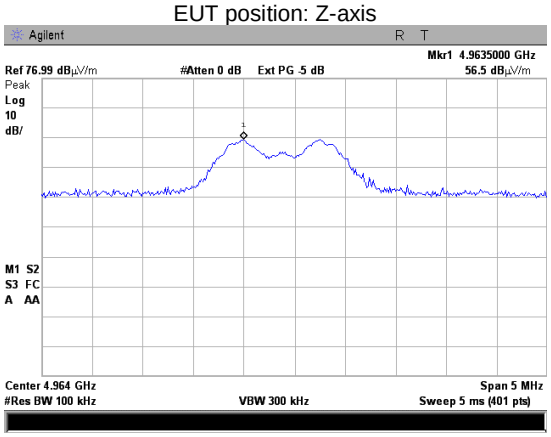


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

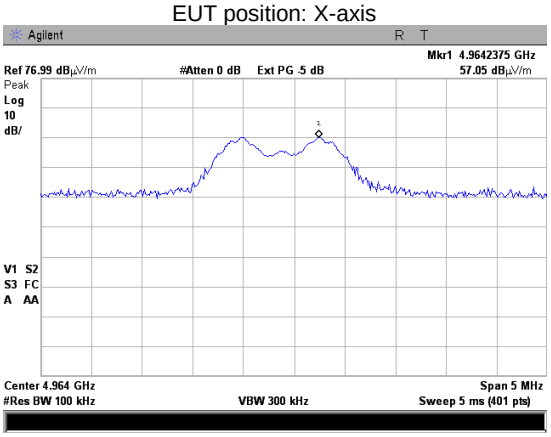
Plot 7.3.23 Radiated emission measurements at the second harmonic of high carrier frequency (RBW = 100 kHz)

TEST SITE: OATS
TEST DISTANCE: 3 m

ANTENNA POLARIZATION: Horizontal
EUT position: Z-axis



ANTENNA POLARIZATION: Vertical
EUT position: X-axis

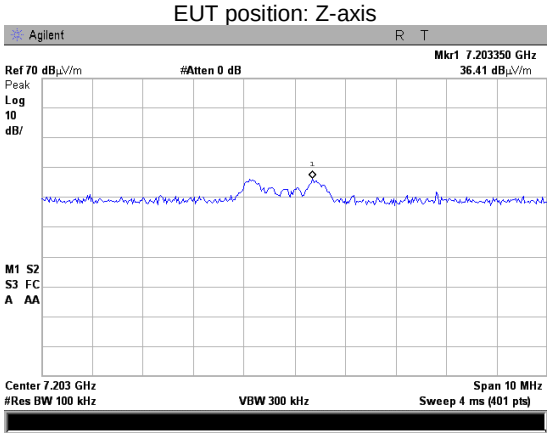


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

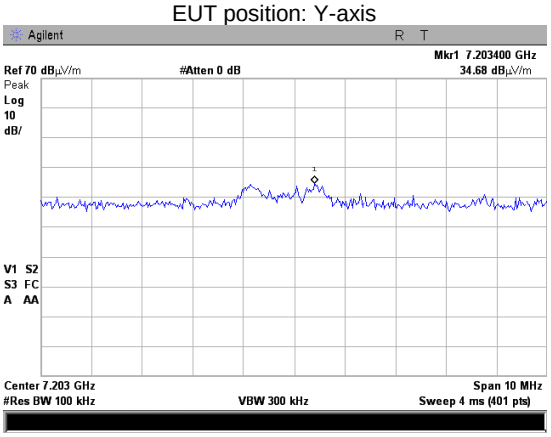
Plot 7.3.24 Radiated emission measurements at the third harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

ANTENNA POLARIZATION: Horizontal
EUT position: Z-axis



ANTENNA POLARIZATION: Vertical
EUT position: Y-axis

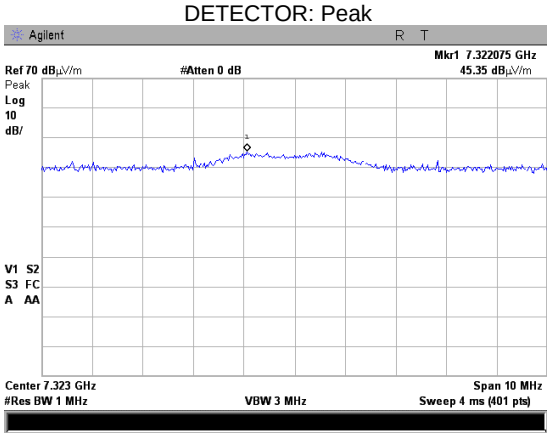


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

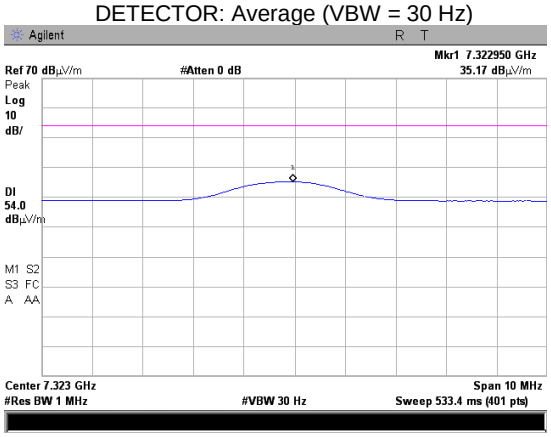
Plot 7.3.25 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

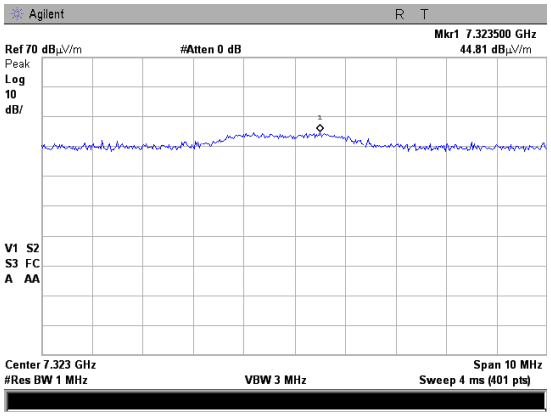
ANTENNA POLARIZATION: Horizontal
DETECTOR: Peak



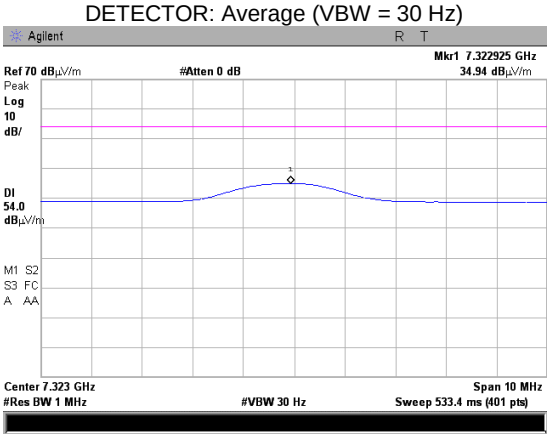
EUT position: Z-axis
DETECTOR: Average (VBW = 30 Hz)



ANTENNA POLARIZATION: Vertical
DETECTOR: Peak



EUT position: Y-axis
DETECTOR: Average (VBW = 30 Hz)

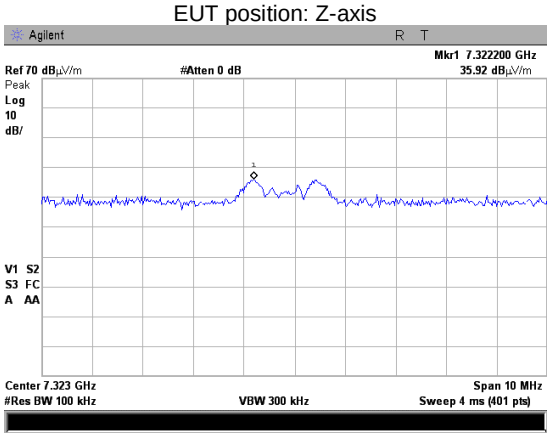


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

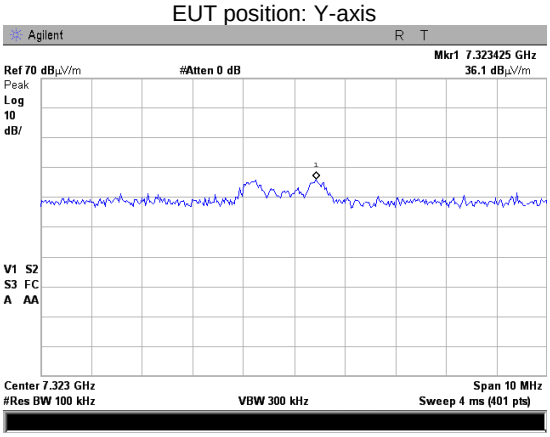
Plot 7.3.26 Radiated emission measurements at the third harmonic of mid carrier frequency (RBW = 100 kHz)

TEST SITE: OATS
TEST DISTANCE: 3 m

ANTENNA POLARIZATION: Horizontal
EUT position: Z-axis



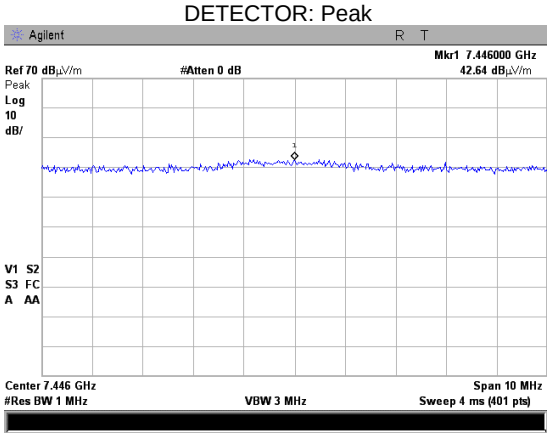
ANTENNA POLARIZATION: Vertical
EUT position: Y-axis



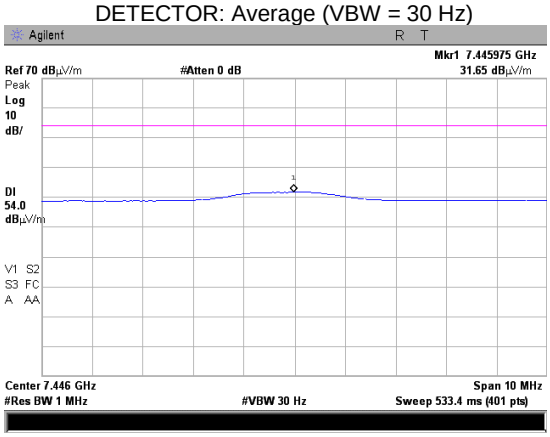
Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

Plot 7.3.27 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
DETECTOR: Peak

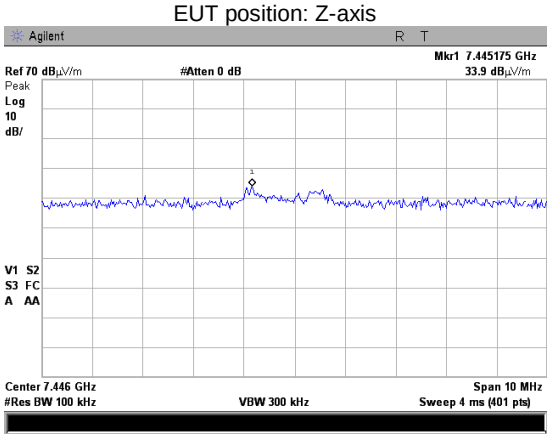


EUT position: Z-axis
DETECTOR: Average (VBW = 30 Hz)



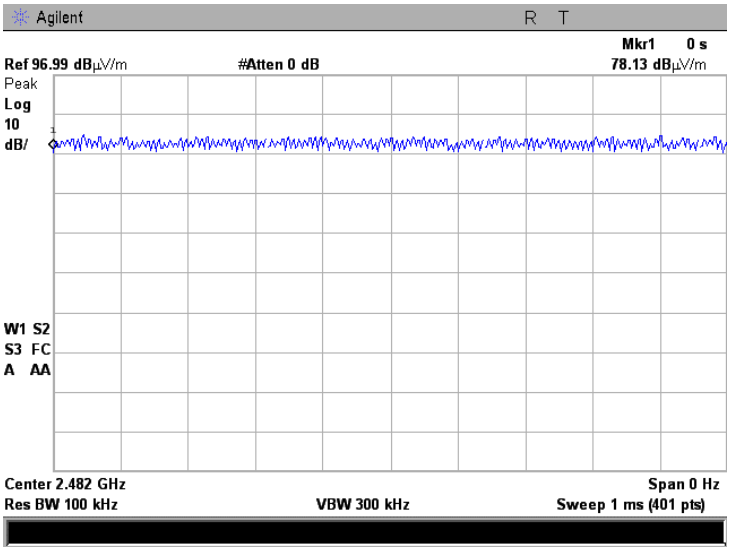
Plot 7.3.28 Radiated emission measurements at the third harmonic of high carrier frequency (RBW = 100 kHz)

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT position: Z-axis

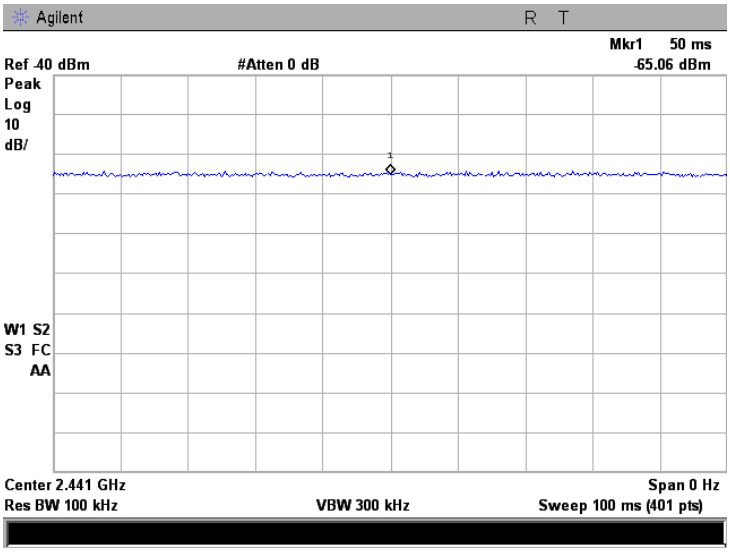


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/18/2010 11:56:56 AM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks: FCC+Canada			

Plot 7.3.29 Transmission duration for the test, high carrier frequency



Plot 7.3.30 Transmission duration for the test, mid carrier frequency



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 & Time:	5/16/2010 4:36:51 PM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
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×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.

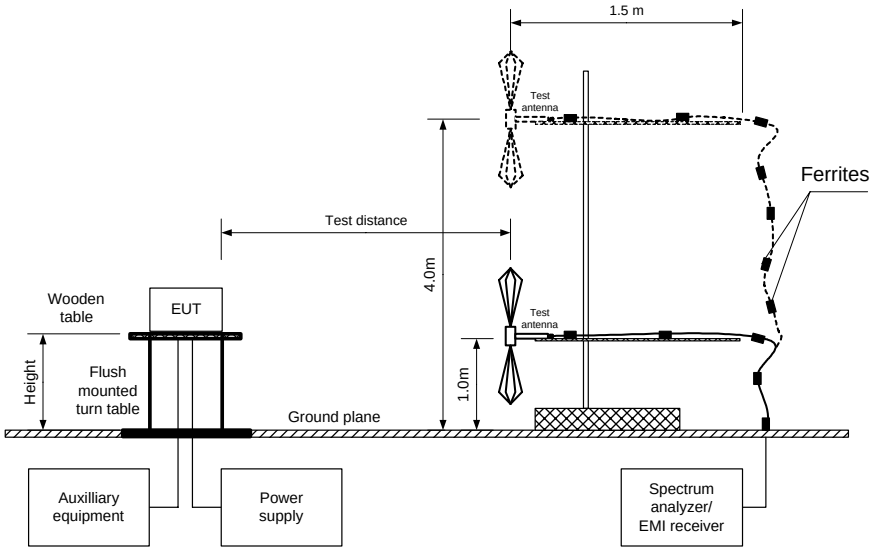
7.4.2.3 The field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

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 and 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 & Time:	5/16/2010 4:36:51 PM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
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 & Time:	5/16/2010 4:36:51 PM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks:			

Table 7.4.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY BAND:	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:	0.25 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
TRANSMITTER OUTPUT POWER:	-11.10 dBm at low carrier frequency -12.73 dBm at mid carrier frequency -14.33 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	Verdict
2401.0	82.50	1.5	103.2	-20.70	H	1.2	170	Pass
2441.0	80.76	1.5	103.2	-22.44	H	1.2	180	Pass
2482.0	80.10	1.5	103.2	-23.10	H	1.2	175	Pass

*****- Margin = Field strength - EUT antenna gain - calculated field strength limit.
******- EUT front panel refer to 0 degrees position of turntable.

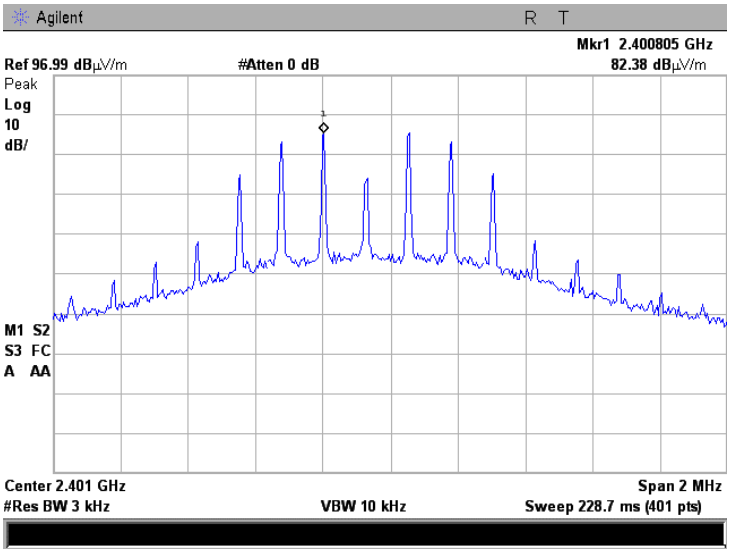
Reference numbers of test equipment used

HL 1984	HL 2870	HL 2909					

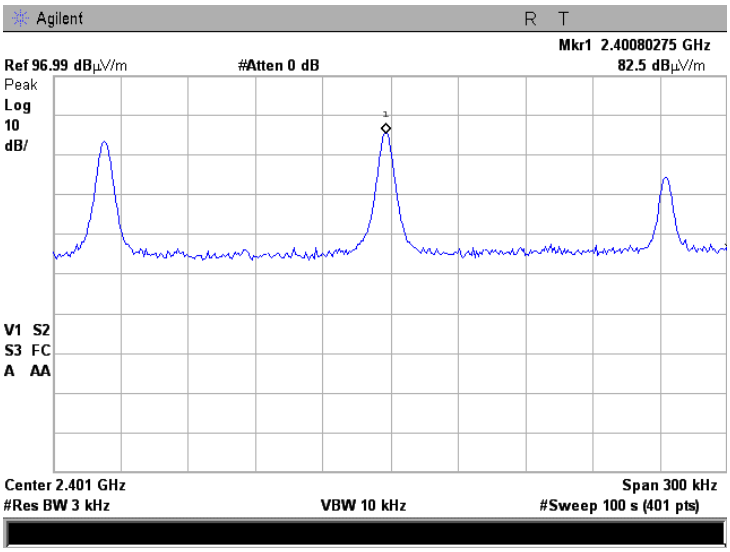
Full description is given in Appendix A.

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 & Time:	5/16/2010 4:36:51 PM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks:			

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

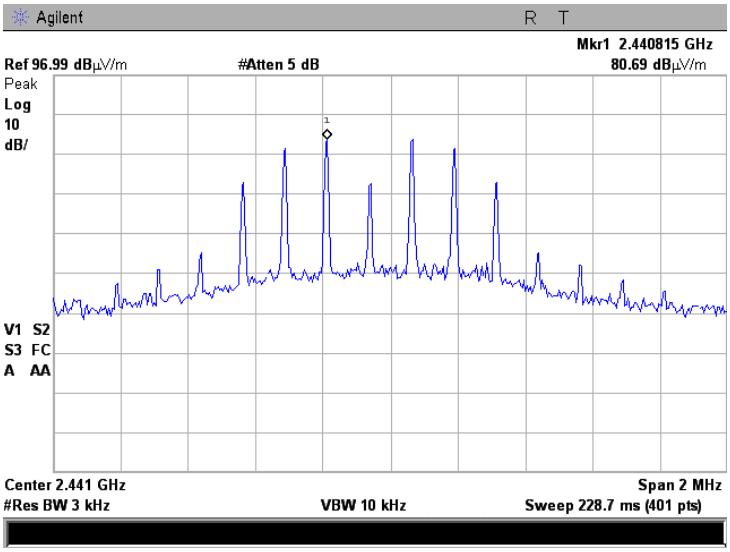


Plot 7.4.2 Peak spectral power density at low frequency zoomed at the peak

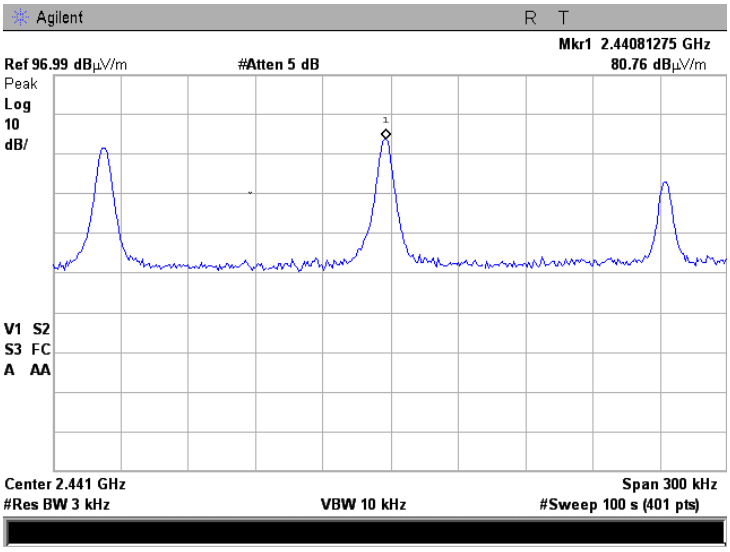


Test specification:	FCC section 15.247(e), RSS-210 A8.2(b), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/16/2010 4:36:51 PM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks:			

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

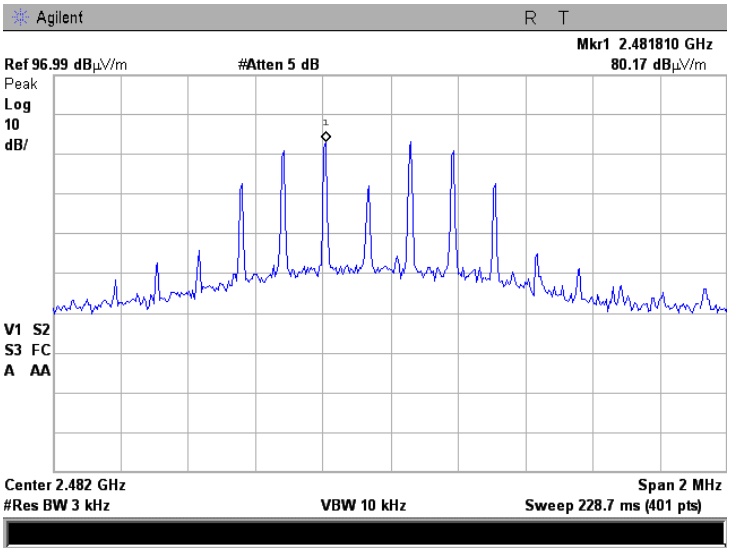


Plot 7.4.4 Peak spectral power density at mid frequency zoomed at the peak

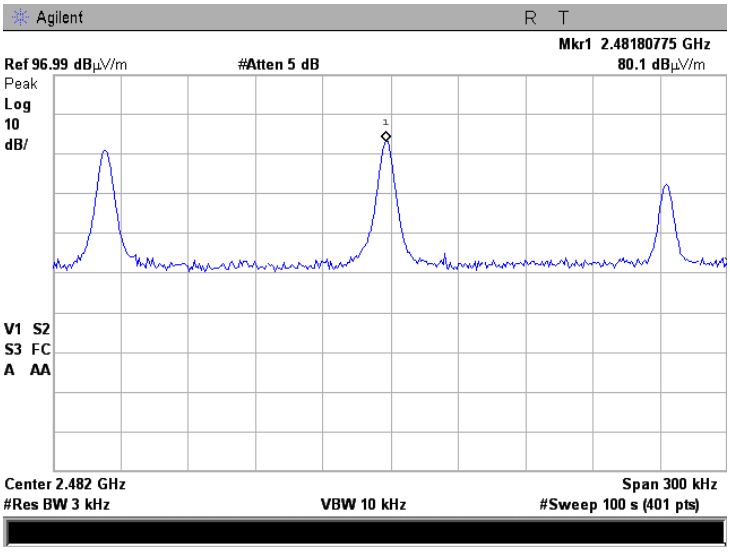


Test specification:	FCC section 15.247(e), RSS-210 A8.2(b), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/16/2010 4:36:51 PM		
Temperature: 24.3 ºC	Air Pressure: 1011 hPa	Relative Humidity: 42 %	Power Supply: 1.2 VDC
Remarks:			

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



Plot 7.4.6 Peak spectral power density at high frequency 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:	PASS
Date & Time:	5/16/2010 5:41:35 PM		
Temperature: 24.8 ºC	Air Pressure: 1009 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: at charger input			

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(µV)	
	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

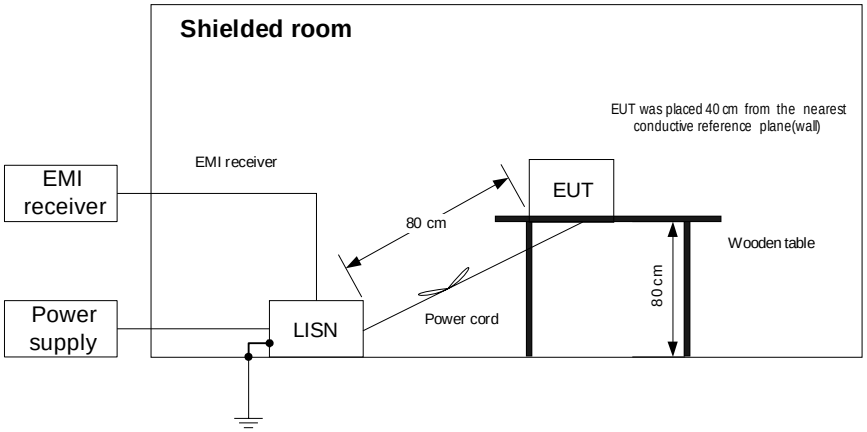
7.5.2.1 The EUT was set up as shown in Figure 7.5.1 and associated photographs, energized and the performance check was conducted.

7.5.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.5.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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:**	PASS
Date & Time:	5/16/2010 5:41:35 PM		
Temperature: 24.8 ºC	**Air Pressure:** 1009 hPa	**Relative Humidity:** 38 %	**Power Supply:** 120 VAC
Remarks: at charger input			

Table 7.5.2 Conducted emission test results

LINE: AC mains
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*		
0.152375	47.16	37.47	65.88	-28.41	8.84	55.88	-47.04	L1	Pass
0.169321	47.45	36.17	65.06	-28.89	7.91	55.06	-47.15		
0.177141	44.26	35.50	64.68	-29.18	7.14	54.68	-47.54		
0.196766	42.22	33.09	63.78	-30.69	4.96	53.78	-48.82		
0.151818	51.30	42.45	65.91	-23.46	18.26	55.91	-37.65	L2	Pass
0.173288	48.96	39.62	64.86	-25.24	16.28	54.86	-38.58		
0.186550	45.42	35.24	64.22	-28.98	14.63	54.22	-39.59		
0.217148	44.46	34.47	62.99	-28.52	9.56	52.99	-43.43		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

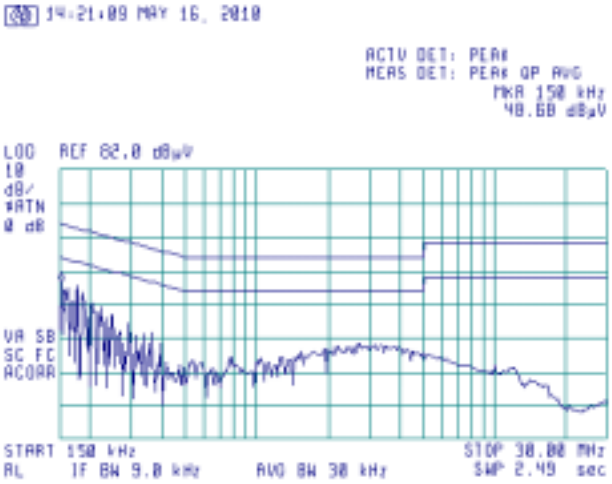
HL 0447	HL 1425	HL 1513	HL 3612				

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:	PASS
Date & Time:	5/16/2010 5:41:35 PM		
Temperature: 24.8 ºC	Air Pressure: 1009 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: at charger input			

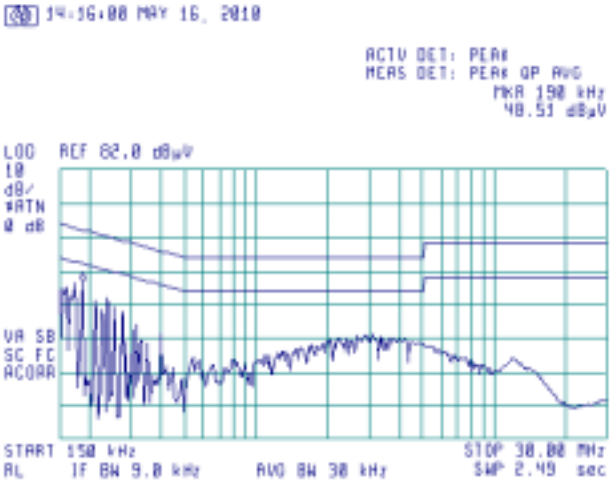
Plot 7.5.1 Conducted emission measurements

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



Plot 7.5.2 Conducted emission measurements

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



Test specification:	FCC section 15.109, ICES-003, 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 & Time:	5/18/2010 11:56:37 AM		
Temperature: 24.3 ºC	Air Pressure: 1009 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
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 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 - 3rd 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

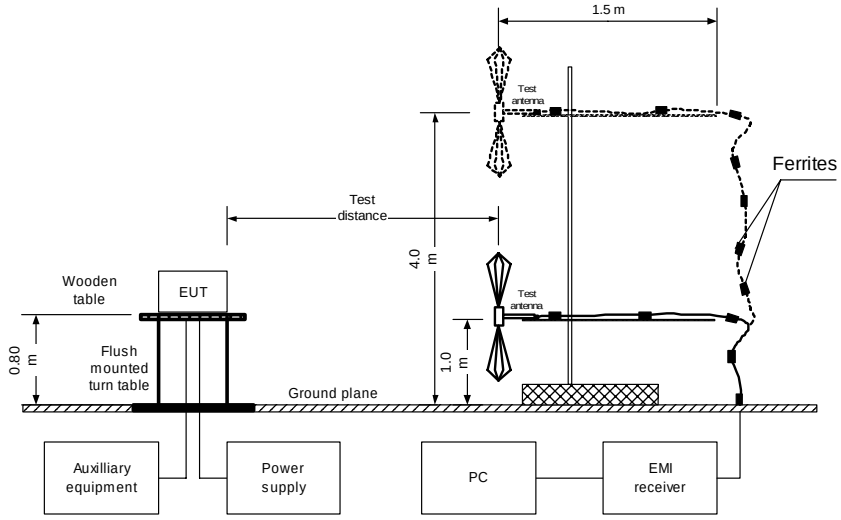
7.6.2.1 The EUT was set up as shown in Figure 7.6.1, and associated photograph/s, energized and the performance check was conducted.

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 360^0, 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:	FCC section 15.109, ICES-003, 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 & Time:	5/18/2010 11:56:37 AM		
Temperature: 24.3 ºC	Air Pressure: 1009 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
Remarks:			

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



Test specification:	**FCC section 15.109, ICES-003, 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 & Time:	5/18/2010 11:56:37 AM		
Temperature: 24.3 ºC	**Air Pressure:** 1009 hPa	**Relative Humidity:** 41 %	**Power Supply:** 1.2 VDC
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: OATS / SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
FREQUENCY RANGE: 1000 MHz – 12500 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak			Average			Antenna polarization	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*				
4965.085	60.40	74.00	-13.60	47.50	54.0	-6.50	Horizontal	1.18	202	Pass

Note: EUT was in Z-axis orthogonal position.

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

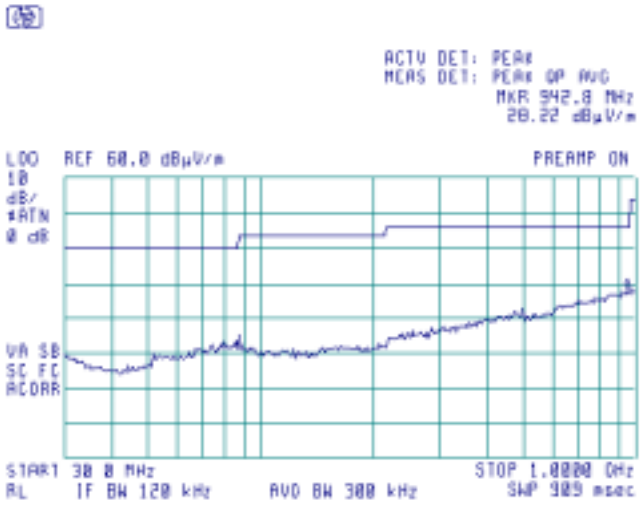
HL 0521	HL 0604	HL 1984	HL 2871	HL 3534	HL 3616	HL 3818	

Full description is given in Appendix A.

Test specification:	FCC section 15.109, ICES-003, 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 & Time:	5/18/2010 11:56:37 AM		
Temperature: 24.3 ºC	Air Pressure: 1009 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
Remarks:			

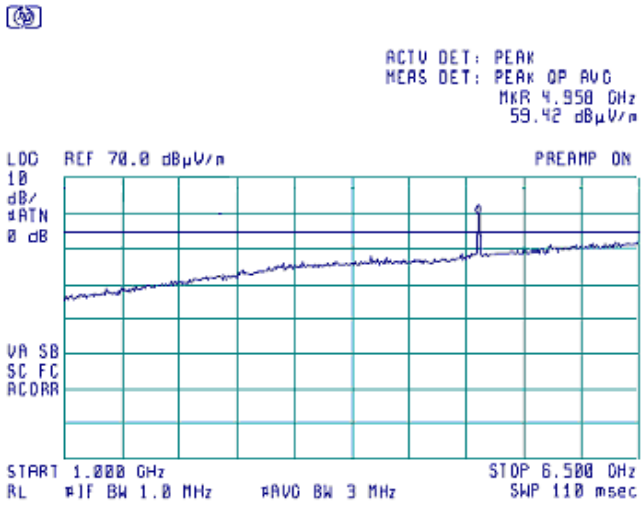
Plot 7.6.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization

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 - 6500 MHz range, vertical and horizontal antenna polarization

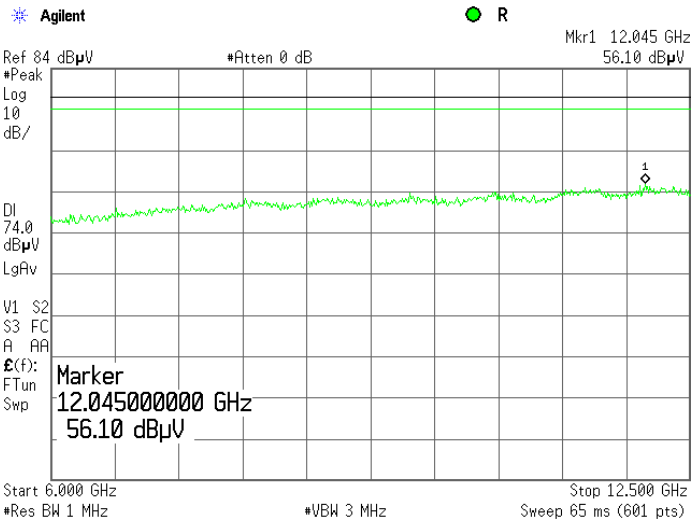
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by



Test specification:	FCC section 15.109, ICES-003, 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 & Time:	5/18/2010 11:56:37 AM		
Temperature: 24.3 ºC	Air Pressure: 1009 hPa	Relative Humidity: 41 %	Power Supply: 1.2 VDC
Remarks:			

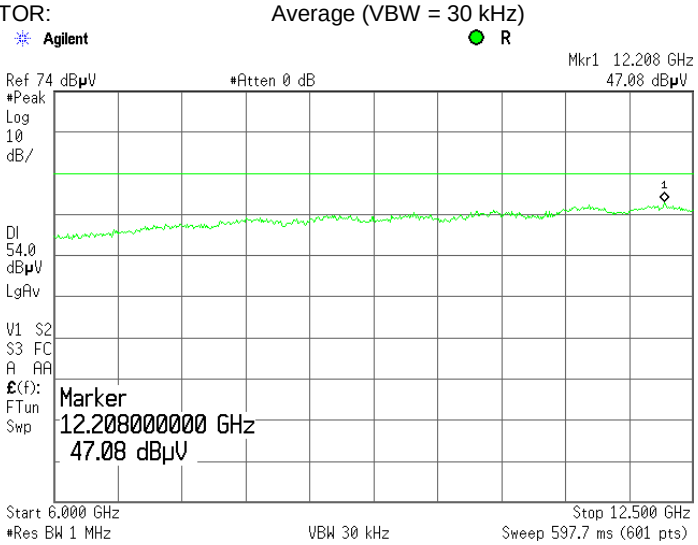
Plot 7.6.3 Radiated emission measurements in 6000 - 12500 MHz range, vertical and horizontal antenna polarization

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



Plot 7.6.4 Radiated emission measurements in 6000 - 12500 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
DETECTOR: Average (VBW = 30 kHz)



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-09	29-Jun-10
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	05-Nov-09	05-Nov-10
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A00253	27-Aug-09	27-Aug-10
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-10	11-Jan-11
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	23-Dec-08	23-Dec-11
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A00222, 3705A00204	28-Aug-09	28-Aug-10
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	01-Sep-09	01-Sep-10
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	29-Jan-10	29-Jan-11
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	29-Jan-10	29-Jan-11
2870	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	2870	17-Sep-09	17-Sep-10
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	15-Sep-09	15-Sep-10
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	07-May-10	07-May-11
3534	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	11159001002	06-Dec-09	06-Dec-10
3535	Amplifier, low noise, 18 to 40 GHz	Quinstar Technology	QLJ-18404537-J0	11159003001	06-Dec-09	06-Dec-10
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	02-Dec-09	02-Dec-10
3616	Cable RF, 6.5 m, N type-N type, DC-6.5 GHz	Suhner Switzerland	Rg 214/U	NA	02-Dec-09	02-Dec-10
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	25-Sep-09	25-Sep-10
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 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), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. 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).

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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 LISN 16 - 1
Hermon Laboratories, HL 0447

Frequency, kHz	Correction factor, dB
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

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(μV) to convert it into field intensity in dB(μV/m).

Antenna factor
Standard gain horn antenna
Quinstar Technology
Model QWH
Ser.No.110, HL 0768

Frequency min, GHz	Frequency max, GHz	Antenna factor, dB(1/m)
18.000	26.500	32.01
26.500	40.000	35.48
40.000	60.000	39.03
60.000	90.000	42.55
90.000	140.000	46.23
140.000	220.000	50.11

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

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AE	auxiliary equipment
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
CU	L300 Plus Control Unit
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
RFS	Radio Frequency Stimulation Unit
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere
WB	wideband

END OF DOCUMENT