

TEST REPORT

**ACCORDING TO: FCC 47CFR part 15 subpart C § 15.247 (FHSS) and subpart B,
RSS-210 issue 8 Annex 8**

FOR:

Visonic Ltd.

Remote keypad

**Models: KP-140 PG2 (915)
KP-141 PG2 (915)**

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1 Applicant information

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Contact name: Mr. Arick Elshtein

2 Equipment under test attributes

Product name: Remote keypad
Product type: Transceiver
Model(s): KP-141 PG2
Hardware version: 90-204024, revision PCB-2
Software release: JS-701195, version 1.0.09
Receipt date: 1/28/2011

3 Manufacturer information

Manufacturer name: Visonic Ltd.
Address: Habarzel street 24, Tel Aviv 69710, Israel
Telephone: +972 3645 6714
Fax: +972 3645 6788
E-Mail: aelshtein@visonic.com
Contact name: Mr. Arick Elshtein




4 Test details

Project ID: 21632
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 1/28/2011
Test completed: 2/16/2011
Test specification(s): FCC 47CFR part 15, subpart C, §15.247 (FHSS); subpart B; RSS-210 issue 8 Annex 8, RSS-Gen issue 3

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Section 15.247(a)1, RSS-210 section A8.1(a), The 20 dB bandwidth	Pass
FCC Section 15.247(a)1, RSS-210 section A8.1(b), Frequency separation	Pass
FCC Section 15.247(a)1, RSS-210 section A8.1(c), Number of hopping frequencies	Pass
FCC Section 15.247(a)1, RSS-210 section A8.1(c), Average time of occupancy	Pass
FCC Section 15.247(b), RSS-210 section A8.4(1), Peak output power	Pass
FCC Section 15.247(d), RSS-210 section A8.5, Emissions at band edges	Pass
FCC Section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	Pass
FCC Section 15.203, RSS-Gen section 7.1.2, Antenna requirements	Pass
FCC Section 15.207(a), RSS-Gen section 7.2.2, Conducted emission	Not required
FCC Section 15.247(i), RSS-Gen, section 5.5, RF exposure	Pass, the exhibit to the application of certification is provided
Unintentional emissions	
Section 15.107, Conducted emission at AC power port	Not required
Section 15.109, RSS-Gen section 6.2, Radiated emission	Pass

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

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, test engineer	February 16, 2011	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	March 22, 2011	
Approved by:	Mr. M. Nikishin, EMC and radio group manager	May 6, 2011	

6 EUT description

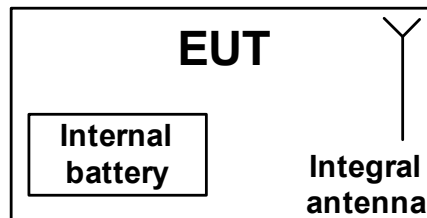
6.1 General information

The EUT, KP-140 PG2 and KP-141 PG2, is a 2-way PowerG wireless keypad for the PowerMaster family control panels. The KP-141 PG2 is the same as the KP-140 PG2 but also includes a built-in proximity RFID tag reader. Both keypads enable most common everyday user functions:

- Arm and Disarm the alarm system.
- Initiate Emergency, Fire and Panic alarms.
- Control X-10 devices and PGM output.
- Perform one of the AUX (auxiliary) predefined functions.
- Review system Status.

The KP-141 PG2 model as a full version of the device was tested.

6.2 Test configuration



6.3 Changes made in the EUT

No changes were implemented in the EUT.

6.4 EUT positions during testing

Photograph 6.4.1 EUT in X-axis orthogonal position



Photograph 6.4.2 EUT in Y-axis orthogonal position



Photograph 6.4.3 EUT in Z-axis orthogonal position



Photograph 6.4.4 EUT close view in Y-axis orthogonal position



6.5 Transmitter characteristics

Type of equipment					
X	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			
X	portable	May operate at a distance closer than 20 cm to human body			
Assigned frequency ranges		902 – 928 MHz			
Operating frequencies		912.750 – 919.106 MHz			
Maximum rated output power		At transmitter 50 Ω RF output connector		dBm	
		EIRP		16.5 dBm	
		Peak output power		24.5 dBm	
Is transmitter output power variable?		X	No		
			Yes	continuous variable	
				stepped variable with stepsize	
				minimum RF power	dBm
				maximum RF power	dBm
Antenna connection					
unique coupling		standard connector		X	integral
				X	with temporary RF connector
				X	without temporary RF connector
Antenna/s technical characteristics					
Type	Manufacturer		Model number		Gain
Integral	Visonic		Built-in wire antenna		-8 dBi
Transmitter aggregate data rate/s		50 kbps			
Type of modulation		GFSK			
Modulating test signal (baseband)		PRBS			
Maximum transmitter duty cycle in normal use		0.1%			
Transmitter power source					
X	Battery	Nominal rated voltage	3.0 VDC	Battery type	Lithium
	DC	Nominal rated voltage	VDC		
	AC mains	Nominal rated voltage	VAC	Frequency	
Common power source for transmitter and receiver					
				X	yes
					no
Spread spectrum technique used		X		Frequency hopping (FHSS)	
				Digital transmission system (DTS)	
				Hybrid	
Spread spectrum parameters for transmitters tested per FCC 15.247 only					
FHSS	Total number of hops		50		
	Bandwidth per hop		100 kHz		
	Max. separation of hops		130 kHz		

Test specification:	FCC section 15.247(a)1, RSS-210 section A8.1(a), 20 dB bandwidth		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict: PASS	
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 Annex 8 requirements

7.1 20 dB bandwidth

7.1.1 General

This test was performed to measure 20 dB bandwidth of the transmitter hopping channel. Specification test limits are given in Table 7.1.1.

Table 7.1.1 The 20 dB bandwidth limits

Assigned frequency, MHz	Maximum bandwidth, kHz	Modulation envelope reference points*, dBc
902.0 – 928.0	500	20
2400.0 – 2483.5	NA	
5725.0 – 5850.0	1000	

* - 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 at maximum data rate.

7.1.2.3 The transmitter 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 20 dB bandwidth test setup



Test specification:	FCC section 15.247(a)1, RSS-210 section A8.1(a), 20 dB bandwidth		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Table 7.1.2 The 20 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 902 – 928 MHz
 DETECTOR USED: Peak
 SWEEP TIME: Auto
 RESOLUTION BANDWIDTH: $\geq 1\%$ of the 20 dB bandwidth
 VIDEO BANDWIDTH: \geq RBW
 MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
 MODULATING SIGNAL: PRBS
 FREQUENCY HOPPING: Disabled

Carrier frequency, MHz	Type of modulation	Data rate, kbps	Symbol rate, Msymbols/s	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
Low frequency							
912.750	GFSK	50	NA	92.0	500.0	-408.0	Pass
Mid frequency							
915.863	GFSK	50	NA	96.5	500.0	-403.5	Pass
High frequency							
919.106	GFSK	50	NA	100.0	500.0	-400.0	Pass

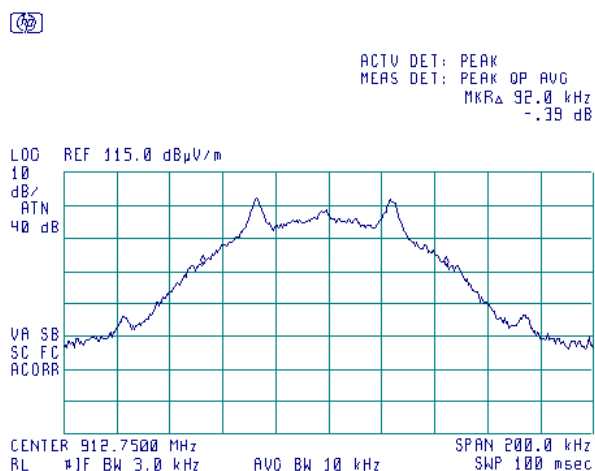
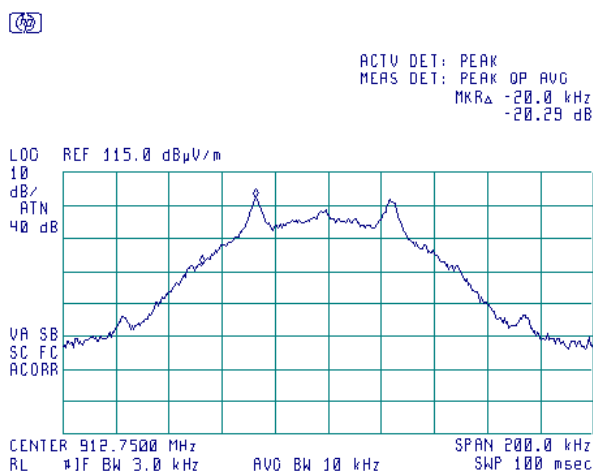
Reference numbers of test equipment used

HL 0034	HL 0415	HL 0593	HL 0594	HL 0812	HL 1425		
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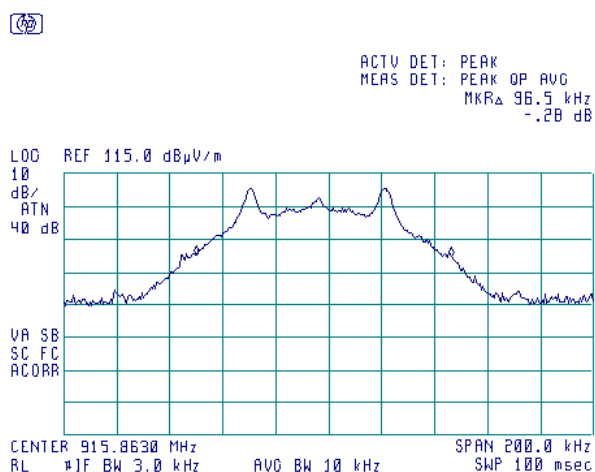
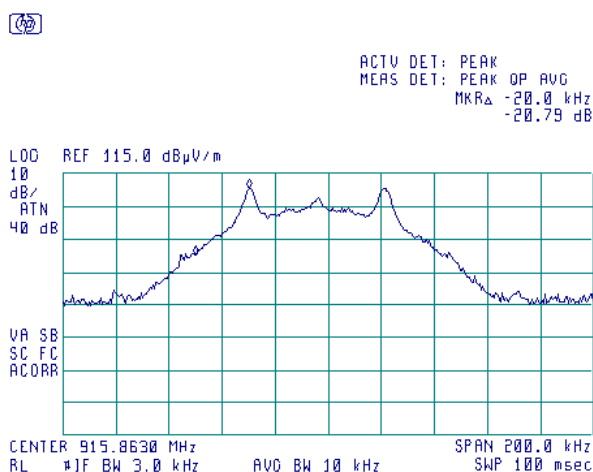
Full description is given in Appendix A.

Test specification: FCC section 15.247(a)1, RSS-210 section A8.1(a), 20 dB bandwidth			
Test procedure: Public notice DA 00-705			
Test mode: Compliance		Verdict: PASS	
Date: 2/6/2011			
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Plot 7.1.1 The 20 dB bandwidth test result at low frequency

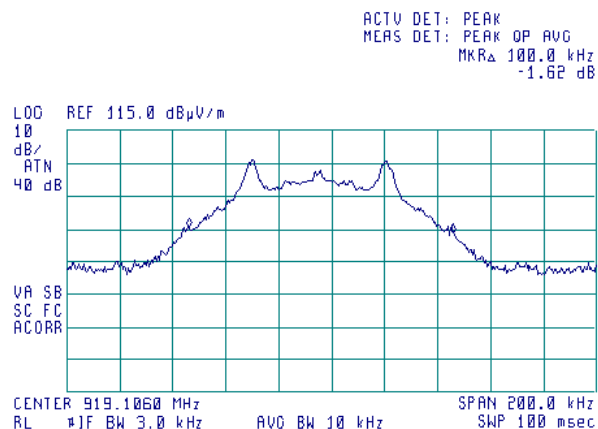
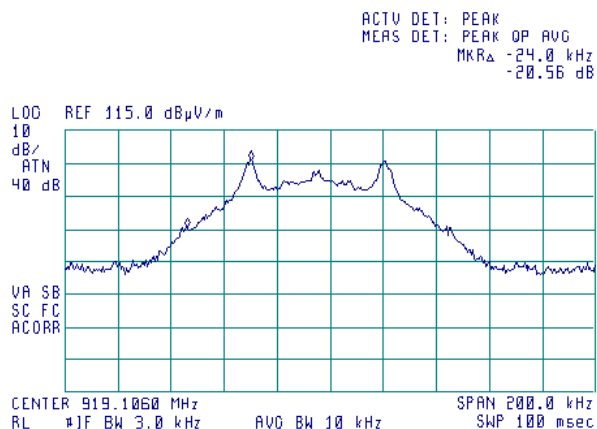


Plot 7.1.2 The 20 dB bandwidth test result at mid frequency



Test specification:		FCC section 15.247(a)1, RSS-210 section A8.1(a), 20 dB bandwidth	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/6/2011	
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Plot 7.1.3 The 20 dB bandwidth test result at high frequency



Test specification:	FCC section 15.247(a)1, RSS-210 section A8.1(b), Frequency separation		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date:	2/7/2011		
Temperature: 24 °C	Air Pressure: 1014 hPa	Relative Humidity: 47 %	Power Supply: 3 V battery
Remarks:			

7.2 Carrier frequency separation

7.2.1 General

This test was performed to measure frequency separation between the peaks of adjacent channels. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Carrier frequency separation limits

Assigned frequency range, MHz	Carrier frequency separation
902.0 – 928.0	25 kHz or 20 dB bandwidth of the hopping channel, whichever is greater
2400.0 – 2483.5	
5725.0 – 5850.0	

7.2.2 Test procedure

- 7.2.2.1** The EUT was set up as shown in Figure 7.2.1, energized with frequency hopping function enabled and its proper operation was checked.
- 7.2.2.2** The spectrum analyzer span was set to capture the carrier frequency and both of adjacent channels, the lower and the higher. The resolution bandwidth was set wider than 1 % of the frequency span.
- 7.2.2.3** The spectrum analyzer was set in max hold mode and allowed trace to stabilize.
- 7.2.2.4** The frequency separation between the peaks of adjacent channels was measured as provided in Table 7.2.2 and the associated plot.

Figure 7.2.1 Carrier frequency separation test setup



Test specification:		FCC section 15.247(a)1, RSS-210 section A8.1(b), Frequency separation	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/7/2011	
Temperature: 24 °C	Air Pressure: 1014 hPa	Relative Humidity: 47 %	Power Supply: 3 V battery
Remarks:			

Table 7.2.2 Carrier frequency separation test results

ASSIGNED FREQUENCY BAND: 902-928 MHz
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 50 kbps
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: $\geq 1\%$ of the span
 VIDEO BANDWIDTH: \geq RBW
 FREQUENCY HOPPING: Enabled
 20 dB BANDWIDTH: 100 kHz

Carrier frequency separation, kHz	Limit, kHz	Margin*	Verdict
130	100	30	Pass

* - Margin = Carrier frequency separation – specification limit.

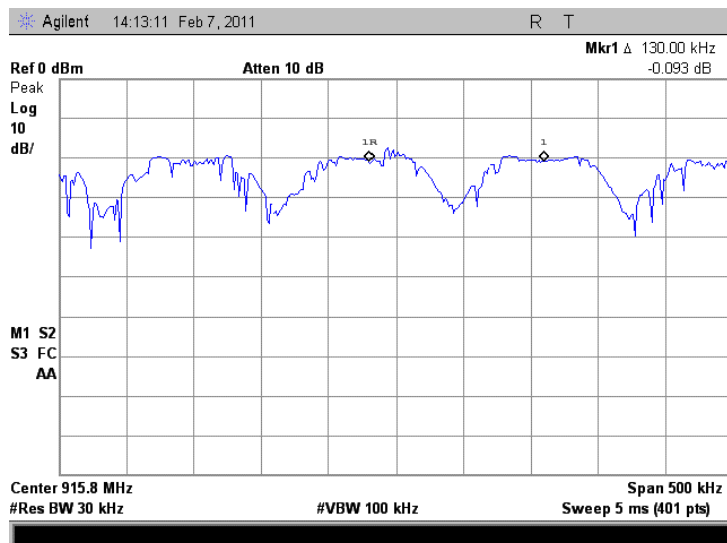
Reference numbers of test equipment used

HL 1984	HL 2909	HL 3632					
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Full description is given in Appendix A.

Test specification:		FCC section 15.247(a)1, RSS-210 section A8.1(b), Frequency separation	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/7/2011	
Temperature: 24 °C	Air Pressure: 1014 hPa	Relative Humidity: 47 %	Power Supply: 3 V battery
Remarks:			

Plot 7.2.1 Carrier frequency separation



Test specification:		FCC section 15.247(a)1, RSS-210 section A8.1(c), Number of hopping frequencies	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/7/2011	
Temperature: 24 °C	Air Pressure: 1014 hPa	Relative Humidity: 47 %	Power Supply: 3 V battery
Remarks:			

7.3 Number of hopping frequencies

7.3.1 General

This test was performed to calculate the number of hopping frequencies used by the EUT. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Minimum number of hopping frequencies

Assigned frequency range, MHz	Number of hopping frequencies
902.0 – 928.0	50 (if the 20 dB bandwidth is less than 250 kHz) 25 (if the 20 dB bandwidth is 250 kHz or greater)
2400.0 – 2483.5	15
5725.0 – 5850.0	75

7.3.2 Test procedure

- 7.3.2.1** The EUT was set up as shown in Figure 7.3.1, energized with frequency hopping function enabled and its proper operation was checked.
- 7.3.2.2** Initially the spectrum analyzer span was set equal to frequency band of operation and the resolution bandwidth was set wider than 1 % of the frequency span. If the separate hopping channels were not clearly resolved the frequency band of operation was broken to sections and the resolution bandwidth was set wider than 1 % of the frequency span of each section.
- 7.3.2.3** The spectrum analyzer was set in max hold mode and allowed trace to stabilize.
- 7.3.2.4** The number of frequency hopping channels was calculated as provided in Table 7.3.2 and the associated plots.

Figure 7.3.1 Hopping frequencies test setup



Test specification:		FCC section 15.247(a)1, RSS-210 section A8.1(c), Number of hopping frequencies	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/7/2011	
Temperature: 24 °C	Air Pressure: 1014 hPa	Relative Humidity: 47 %	Power Supply: 3 V battery
Remarks:			

Table 7.3.2 Hopping frequencies test results

ASSIGNED FREQUENCY BAND: 902-928 MHz
 MODULATION: GFSK
 BIT RATE: 50 kbps
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: $\geq 1\%$ of the span
 VIDEO BANDWIDTH: \geq RBW
 FREQUENCY HOPPING: Enabled

Number of hopping frequencies	Minimum number of hopping frequencies	Margin*	Verdict
50	50	0	Pass

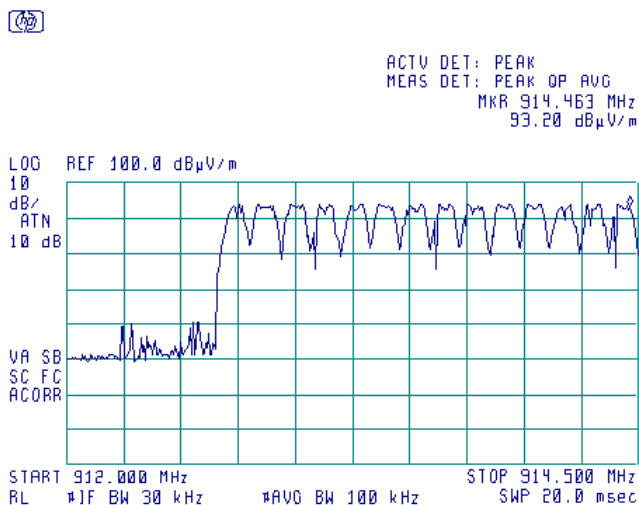
* - Margin = Number of hopping frequencies – Minimum number of hopping frequencies.

Reference numbers of test equipment used

HL 2909	HL 2883	HL 3386	HL 1984				
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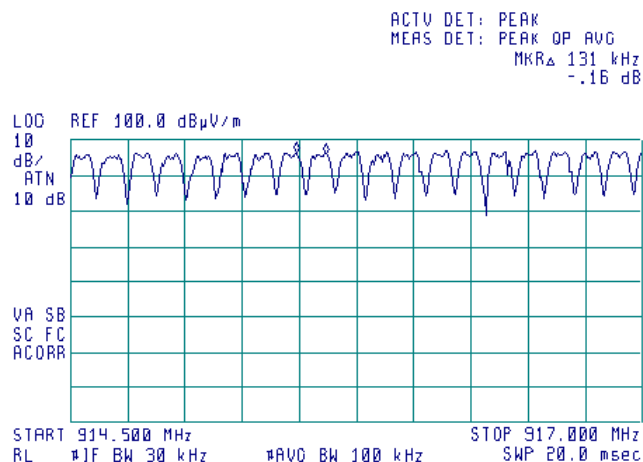
Full description is given in Appendix A.

Plot 7.3.1 Number of hopping frequencies in the frequency range 912 –914.5 MHz (fourteen)

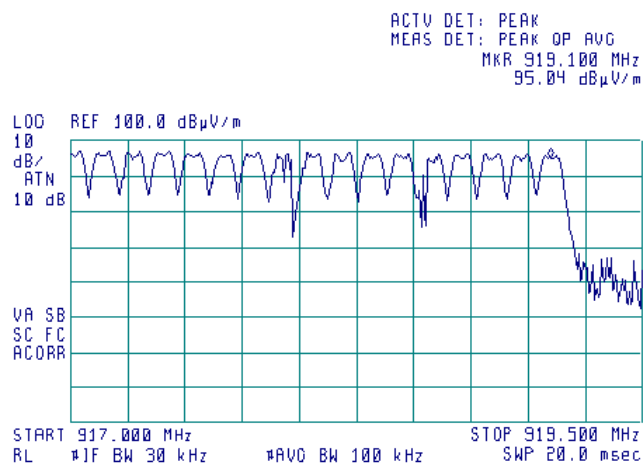


Test specification:		FCC section 15.247(a)1, RSS-210 section A8.1(c), Number of hopping frequencies	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/7/2011	
Temperature: 24 °C		Air Pressure: 1014 hPa	Relative Humidity: 47 %
Remarks:		Power Supply: 3 V battery	

Plot 7.3.2 Number of hopping frequencies in the frequency range 914.5 –917.0 MHz (nineteen)



Plot 7.3.3 Number of hopping frequencies in the frequency range 917 –919.5 MHz (seventeen)



Test specification:	FCC section 15.247(a)1, RSS-210 section A8.1(c), Average time of occupancy		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict: PASS	
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

7.4 Average time of occupancy

7.4.1 General

This test was performed to calculate the average time of occupancy (dwell time) on any frequency channel of the EUT. Specification test limits are given in Table 7.4.1.

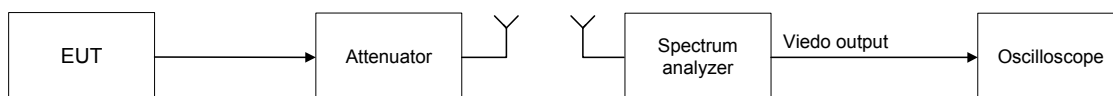
Table 7.4.1 Average time of occupancy limits

Assigned frequency range, MHz	Maximum average time of occupancy, s	Investigated period, s	Number of hopping frequencies
902.0 – 928.0	0.4	20.0	≥ 50
902.0 – 928.0	0.4	10.0	< 50
2400.0 – 2483.5	0.4	0.4 × N	N (≥ 15)
5725.0 – 5850.0	0.4	30.0	≥ 75

7.4.2 Test procedure

- 7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized with frequency hopping function enabled and its proper operation was checked.
- 7.4.2.2 The spectrum analyzer span was set to zero centered on a hopping channel.
- 7.4.2.3 The single transmission duration and period were measured with oscilloscope.
- 7.4.2.4 The average time of occupancy was calculated as the single transmission time multiplied by the investigated period and divided by the single transmission period.
- 7.4.2.5 The test results provided in Table 7.4.2 and the associated plots.

Figure 7.4.1 Average time of occupancy test setup



Test specification:	FCC section 15.247(a)1, RSS-210 section A8.1(c), Average time of occupancy		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict: PASS	
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Table 7.4.2 Average time of occupancy test results

ASSIGNED FREQUENCY BAND: 902-928 MHz
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 3 MHz
 VIDEO BANDWIDTH: 3 MHz
 NUMBER OF HOPPING FREQUENCIES: 50
 INVESTIGATED PERIOD: 20 s
 FREQUENCY HOPPING: Enabled

Carrier frequency, MHz	Single transmission duration, s	Single transmission period, s	Average time of occupancy*, s	Bit rate, kbps	Limit, s	Margin, s**	Verdict
915.863	4.975	2	0.04975	50	0.4	-0.35	Pass

* - Average time of occupancy = (Single transmission duration × Investigated period) / Single transmission period.

** - Margin = Average time of occupancy – specification limit.

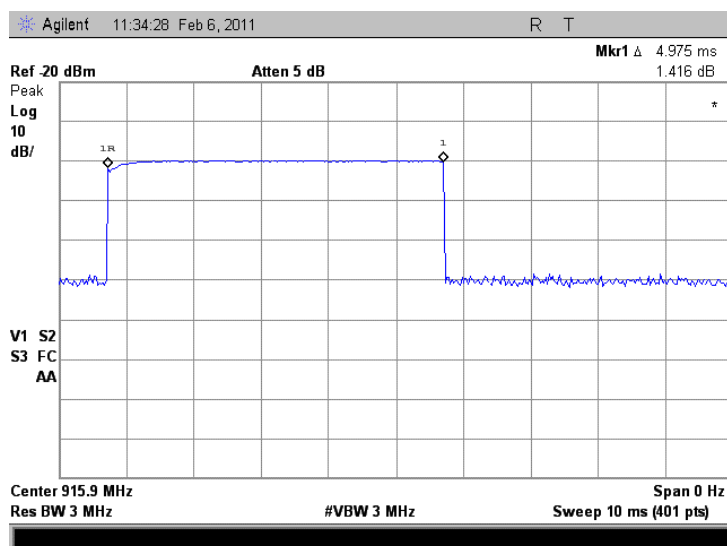
Reference numbers of test equipment used

HL 1984	HL 3001	HL 3632					
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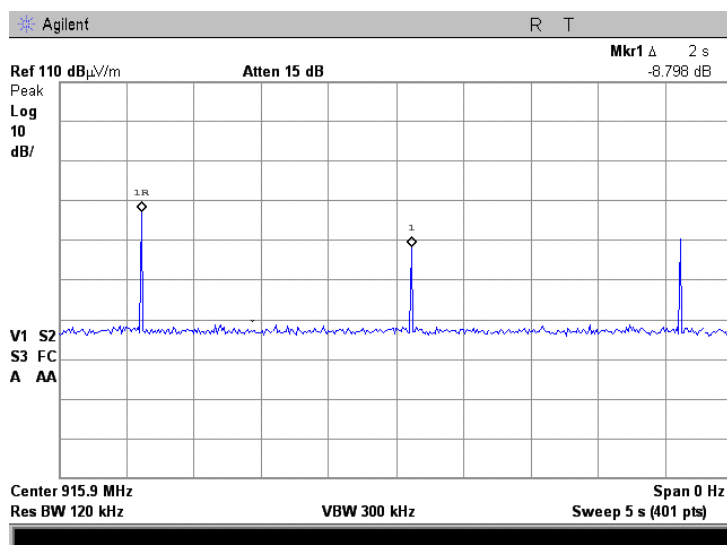
Full description is given in Appendix A.

Test specification:		FCC section 15.247(a)1, RSS-210 section A8.1(c), Average time of occupancy	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/6/2011	
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Plot 7.4.1 Single transmission duration



Plot 7.4.2 Single transmission period



Test specification:	FCC section 15.247(b), RSS-210 section A8.4(1), Peak output power		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

7.5 Peak output power

7.5.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Peak output power limits

Assigned frequency range, MHz	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)*	Maximum antenna gain, dBi
	W	dBm		
902.0 – 928.0	1.0	30.0	131.2	6.0*
2400.0 – 2483.5	0.125 (<75 hopping channels)	21.0(<75 hopping channels)	122.2 (<75 hopping channels)	
	1.0 (≥75 hopping channels)	30.0 (≥75 hopping channels)	131.2 (≥75 hopping channels)	
5725.0 – 5850.0	1.0	30.0	131.2	

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

** - 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.

7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked. The EUT was tested in 3 orthogonal positions.

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

7.5.2.3 The frequency span of spectrum analyzer was set approximately 5 times wider than 20 dB bandwidth of the EUT and the resolution bandwidth was set wider than 20 dB bandwidth of the EUT. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.5.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.5.2 and associated plots.

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

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

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

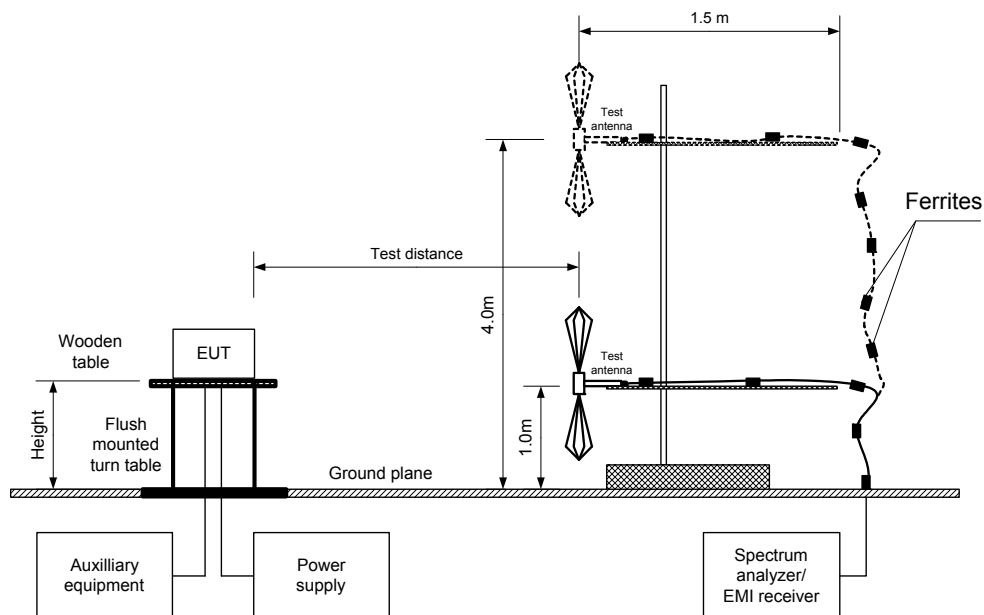
The above equation was converted in logarithmic units for 3 m test distance:

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

7.5.2.6 The worst test results (the lowest margins) were recorded in Table 7.5.1.

Test specification:		FCC section 15.247(b), RSS-210 section A8.4(1), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:	Compliance	Verdict:	PASS
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Figure 7.5.1 Setup for carrier field strength measurements



Test specification:	FCC section 15.247(b), RSS-210 section A8.4(1), Peak output power		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict: PASS	
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Table 7.5.2 Peak output power test results

ASSIGNED FREQUENCY BAND: 902 – 928 MHz
 TEST DISTANCE: 3 m
 TEST SITE: OATS
 EUT HEIGHT: 0.8 m
 DETECTOR USED: Peak
 TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (above 1000 MHz)
 MODULATION: GFSK
 BIT RATE: 50 kbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 EUT 20 dB BANDWIDTH: 100.0 kHz
 RESOLUTION BANDWIDTH: 120 kHz
 VIDEO BANDWIDTH: 300 kHz
 FREQUENCY HOPPING: Disabled
 NUMBER OF FREQUENCY HOPPING CHANNELS: 50

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
912.750	108.1	H	1.00	5	-8.0	20.8	30.0	-9.2	Pass
915.863	111.7	H	1.00	5	-8.0	24.5	30.0	-5.5	Pass
919.106	107.0	H	1.00	5	-8.0	19.8	30.0	-10.3	Pass

Maximum peak output power was obtained in the EUT Y-axis orthogonal position.

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

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

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

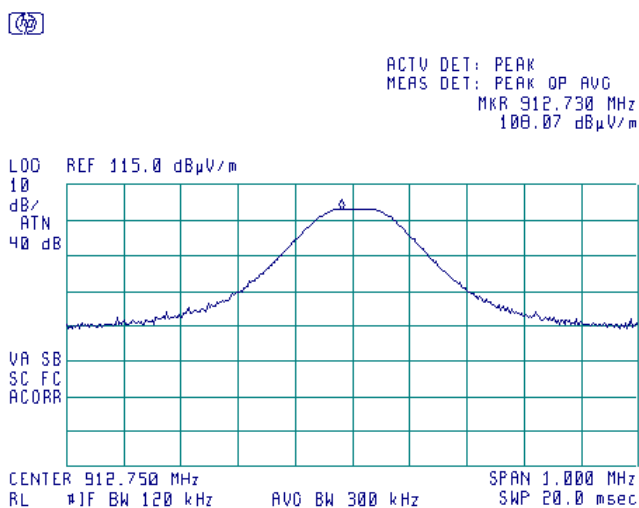
Reference numbers of test equipment used

HL 0034	HL 0415	HL 0593	HL 0594	HL 0812	HL 1425		
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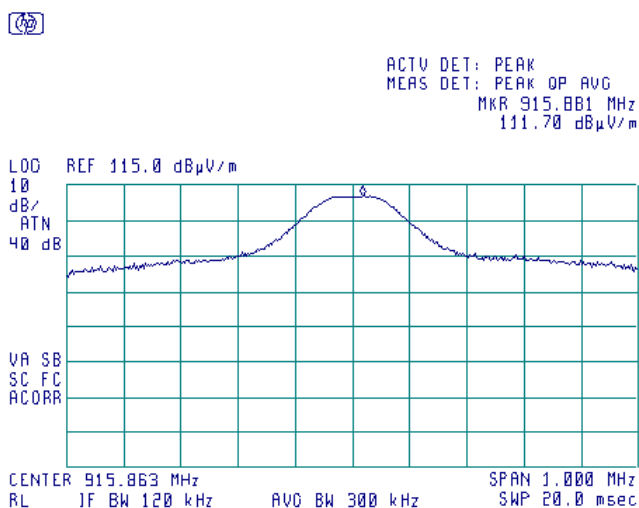
Full description is given in Appendix A.

Test specification:		FCC section 15.247(b), RSS-210 section A8.4(1), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/6/2011	
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Plot 7.5.1 Field strength of carrier at low frequency

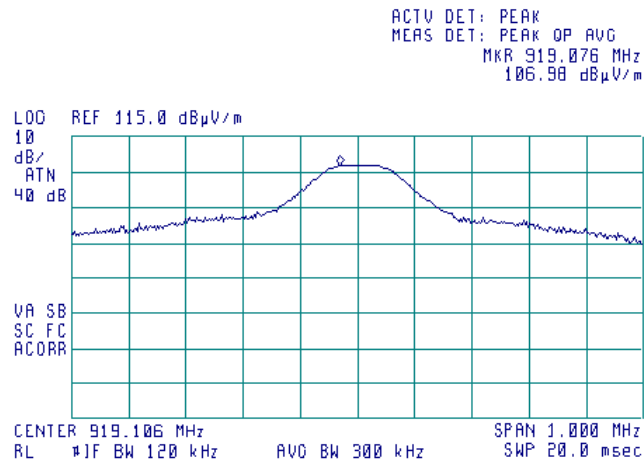


Plot 7.5.2 Field strength of carrier at mid frequency



Test specification:		FCC section 15.247(b), RSS-210 section A8.4(1), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/6/2011	
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Plot 7.5.3 Field strength of carrier at high frequency



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Emissions at band edges		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

7.6 Band edge radiated emissions

7.6.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Band edge emission limits

Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(μV/m)	
		Peak	Average
902.0 – 928.0	20.0	74.0	54.0
2400.0 – 2483.5			
5725.0 – 5850.0			

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

7.6.2 Test procedure

- 7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized normally modulated at the maximum data rate with its hopping function disabled and its proper operation was checked.
- 7.6.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.
- 7.6.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.
- 7.6.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.
- 7.6.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.6.2 and associated plots and referenced to the highest emission level measured within the authorized band.
- 7.6.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.
- 7.6.2.7 The above procedure was repeated with the frequency hopping function enabled.

Figure 7.6.1 Band edge emission test setup



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Emissions at band edges		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Table 7.6.2 Band edge emission test results

ASSIGNED FREQUENCY BAND: 902 – 928 MHz
 DETECTOR USED: Peak
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 50 kbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 TRANSMITTER OUTPUT POWER: 108.1 dBm at low carrier frequency
 107.0 dBm at high carrier frequency
 RESOLUTION BANDWIDTH: $\geq 1\%$ of the span
 VIDEO BANDWIDTH: \geq RBW

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBuV/m	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Frequency hopping disabled						
902.000	78.7	108.1	29.4	20.0	9.4	Pass
928.000	80.3	107.0	26.7		6.7	
Frequency hopping enabled						
902.000	54.59	108.1	53.51	20.0	33.51	Pass
928.000	49.41	107.0	57.59		37.59	

*- Margin = Attenuation below carrier – specification limit.

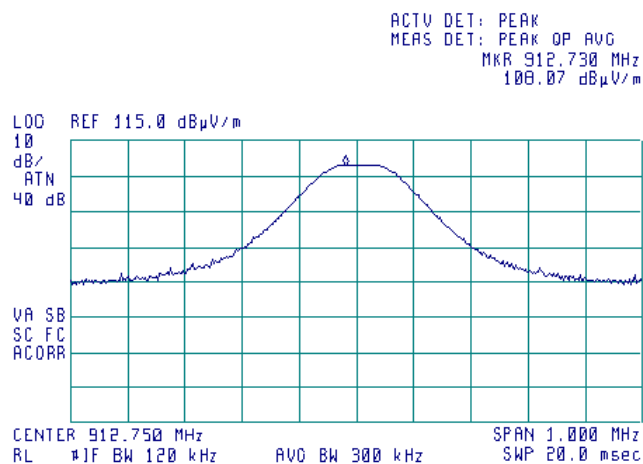
Reference numbers of test equipment used

HL 0034	HL 0415	HL 0593	HL 0594	HL 0812	HL 1425		
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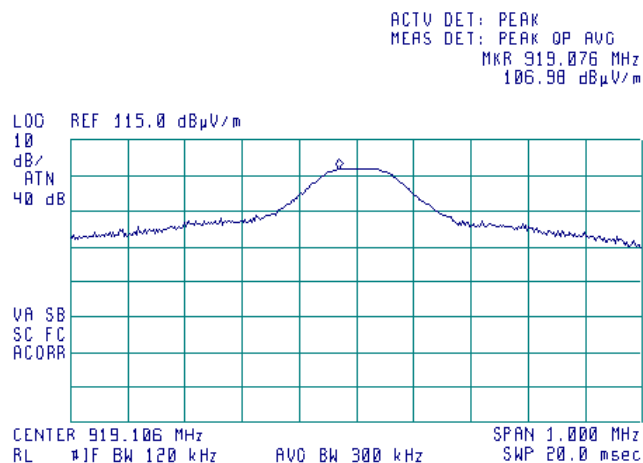
Full description is given in Appendix A.

Test specification: FCC section 15.247(d), RSS-210 section A8.5, Emissions at band edges			
Test procedure: Public notice DA 00-705			
Test mode: Compliance		Verdict: PASS	
Date: 2/6/2011			
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Plot 7.6.1 The highest emission level within the assigned band at low carrier frequency

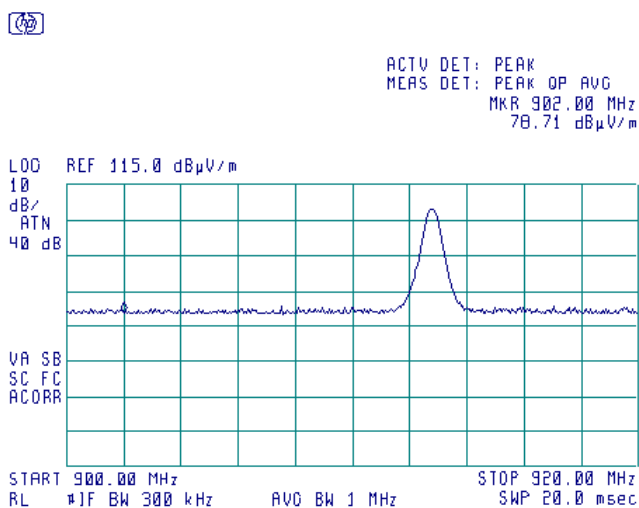


Plot 7.6.2 The highest emission level within the assigned band at high carrier frequency

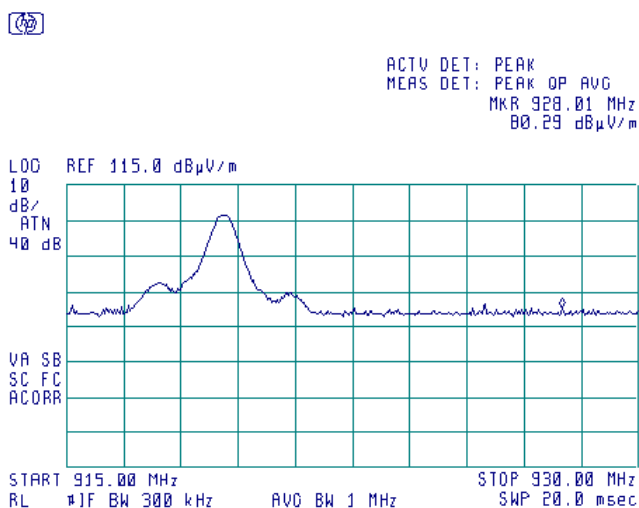


Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		2/6/2011	
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Plot 7.6.3 The highest band edge emission at low carrier frequency with hopping function disabled

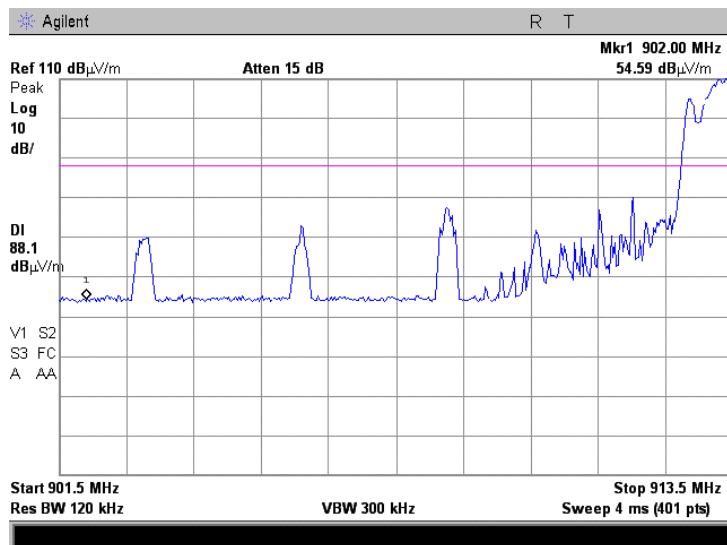


Plot 7.6.4 The highest band edge emission at high carrier frequency with hopping function disabled

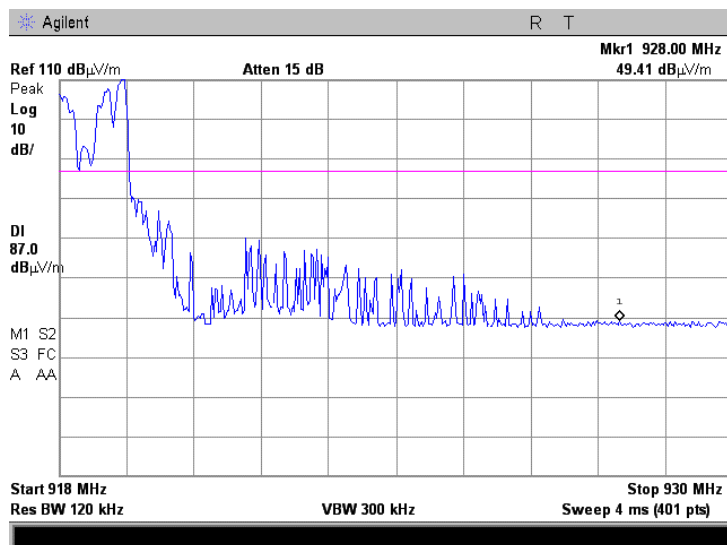


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Emissions at band edges		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict: PASS	
Date:	2/6/2011		
Temperature: 22 °C	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 3 V battery
Remarks:			

Plot 7.6.5 The highest band edge emission at low carrier frequency with hopping function enabled



Plot 7.6.6 The highest band edge emission at high carrier frequency with hopping function enabled



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

7.7 Field strength of spurious emissions

7.7.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.7.1.

Table 7.7.1 Radiated spurious emissions limits

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

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

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

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.

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

7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and the performance check was conducted.

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

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

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

7.7.3.1 The EUT was set up as shown in Figure 7.7.2, energized and the performance check was conducted.

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

7.7.3.3 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:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

Figure 7.7.1 Setup for spurious emission field strength measurements below 30 MHz

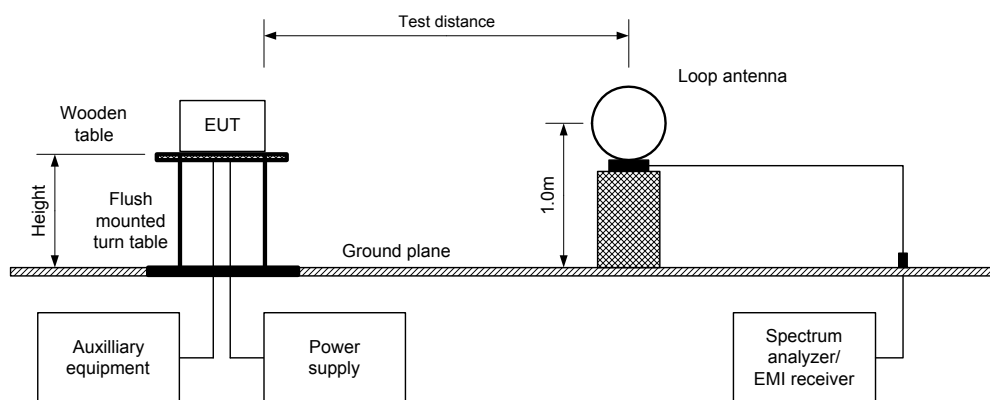
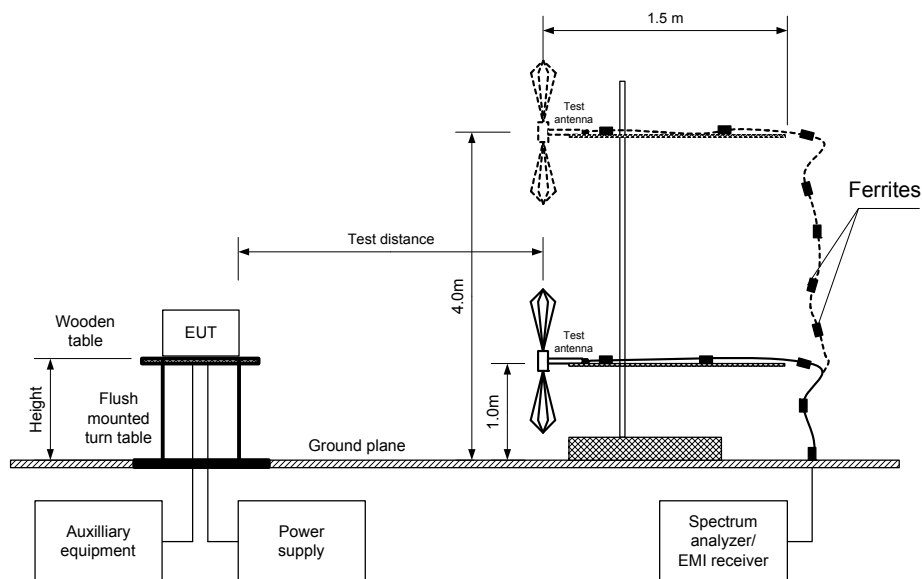


Figure 7.7.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions			
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode:	Compliance	Verdict: PASS		
Date:	2/2/2011 - 2/7/2011			
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery	
Remarks:				

Table 7.7.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY BAND: 902-928 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 - 9300 MHz
 TEST DISTANCE: 3 m
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 50 kbps
 DUTY CYCLE: 100 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (above 1000 MHz)
 FREQUENCY HOPPING: Disabled

Disabled									
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									
1825.540	55.28	H	1.8	170	108.07	52.79	20.0	32.79	Pass
5476.635	62.68	H	1.2	330		45.39		25.39	
6389.405	57.37	H	1.1	315		50.70		30.70	
Mid carrier frequency									
1831.765	62.35	H	2.0	180	111.7	49.35	20.0	29.35	Pass
5495.305	62.91	V	1.5	95		48.79		28.79	
6411.200	60.71	V	1.0	90		50.99		30.99	
High carrier frequency									
1838.250	53.92	H	2.3	180	107.00	53.08	20.0	33.08	Pass
5514.470	62.15	H	1.6	350		44.85		24.85	
6433.865	53.89	H	1.0	342		53.11		33.11	

*- 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:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode:	Compliance	Verdict:		PASS
Date:	2/2/2011 - 2/7/2011			
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery	
Remarks:				

Table 7.7.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY BAND: 902-928 MHz
 INVESTIGATED FREQUENCY RANGE: 1000 - 9300 MHz
 TEST DISTANCE: 3 m
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 50 kbps
 DUTY CYCLE DURING TEST: 100 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 TEST ANTENNA TYPE: Double ridged guide
 FREQUENCY HOPPING: Disabled

Antenna			Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
Frequency, MHz	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											
2738.277	V	1.3	10	53.90	74.00	-20.10	53.12	36.60	54.00	-17.40	Pass
3651.083	V	1.0	180	54.01	74.00	-19.99	51.24	34.72	54.00	-19.28	
4579.288	H	1.2	163	63.30	74.00	-10.70	62.20	45.68	54.00	-8.32	
7302.003	V	1.1	180	52.84	74.00	-21.16	49.86	33.34	54.00	-20.66	
8214.783	V	1.2	100	56.39	74.00	-17.61	52.93	36.41	54.00	-17.59	
9127.500	V	1.1	95	55.24	74.00	-18.76	51.79	35.27	54.00	-18.73	
Mid carrier frequency											
2747.715	V	1.1	0	54.30	74.00	-19.70	53.13	36.61	54.00	-17.39	Pass
3663.433	V	1.0	100	59.61	74.00	-14.39	58.29	41.77	54.00	-12.23	
4579.288	H	1.7	180	65.90	74.00	-8.10	64.87	48.35	54.00	-5.65	
7326.952	V	1.0	90	53.34	74.00	-20.66	47.62	31.10	54.00	-22.90	
8242.695	V	1.2	165	59.93	74.00	-14.07	54.77	38.25	54.00	-15.75	
9158.525	V	1.3	90	58.87	74.00	-15.13	51.57	35.05	54.00	-18.95	
High carrier frequency											
2757.190	V	1.5	180	50.39	74.00	-23.61	48.58	32.06	54.00	-21.94	Pass
3676.407	V	1.6	180	53.56	74.00	-20.44	48.66	32.14	54.00	-21.86	
4595.713	H	1.3	185	62.19	74.00	-11.81	60.57	44.05	54.00	-9.95	
7352.777	V	1.0	190	52.11	74.00	-21.89	45.28	28.76	54.00	-25.24	
8271.770	V	1.0	180	50.99	74.00	-23.01	42.68	26.16	54.00	-27.84	
9190.825	V	2.1	15	50.87	74.00	-23.13	39.48	22.96	54.00	-31.04	

*- 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 7.7.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
4.975	2000	NA	NA	NA	-16.52

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

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

for pulse train longer than 100 ms:

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

Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions			
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode:	Compliance	Verdict: PASS		
Date:	2/2/2011 - 2/7/2011			
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery	
Remarks:				

Table 7.7.5 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY BAND: 902-928 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 TEST DISTANCE: 3 m
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 50 kbps
 DUTY CYCLE DURING TEST: 100 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
 9.0 kHz (150 kHz – 30 MHz)
 120 kHz (30 MHz – 1000 MHz)
 VIDEO BANDWIDTH: > Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)
 FREQUENCY HOPPING: Disabled

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

*- Margin = Measured emission - specification limit.

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

Table 7.7.6 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

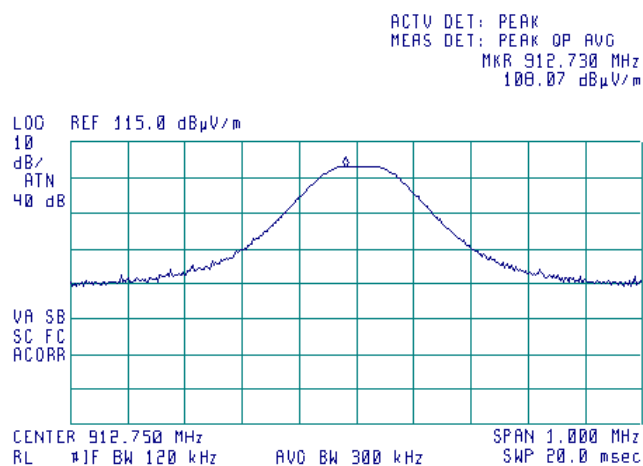
HL 0446	HL 1984	HL 2432	HL 2697	HL 2780	HL 2882	HL 2883	HL 3334
HL 3343	HL 3390	HL 3884					

Full description is given in Appendix A.

Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

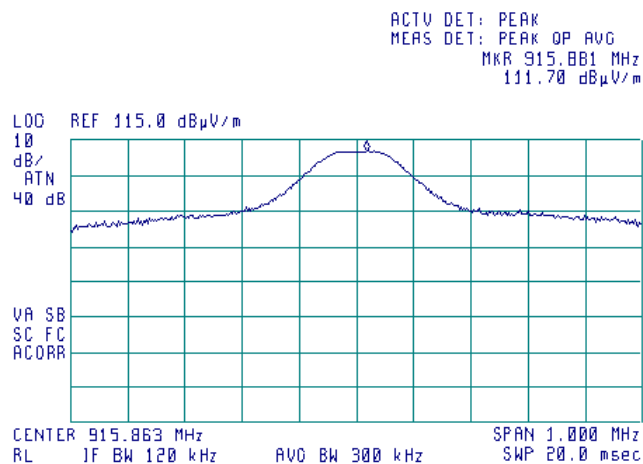
Plot 7.7.1 Radiated emission measurements at the low carrier frequency

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



Plot 7.7.2 Radiated emission measurements at the mid carrier frequency

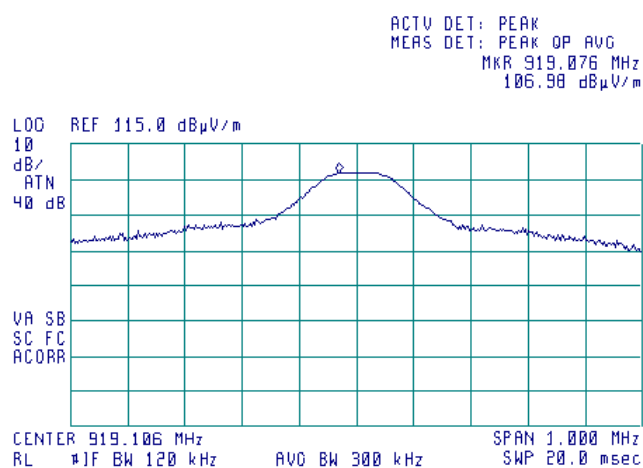
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

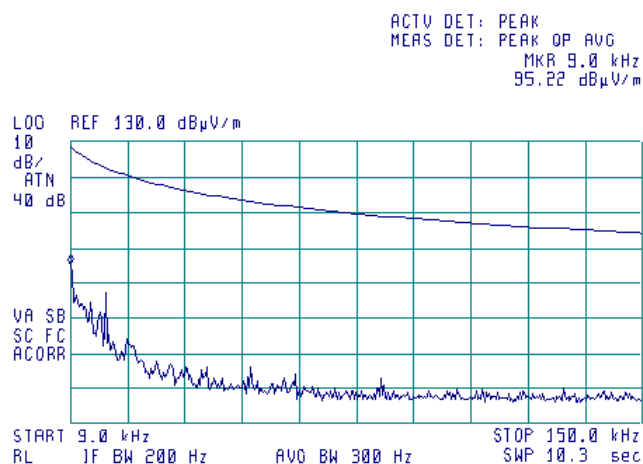
Plot 7.7.3 Radiated emission measurements at the high carrier frequency

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



Plot 7.7.4 Radiated emission measurements from 9 to 150 kHz at the low carrier frequency

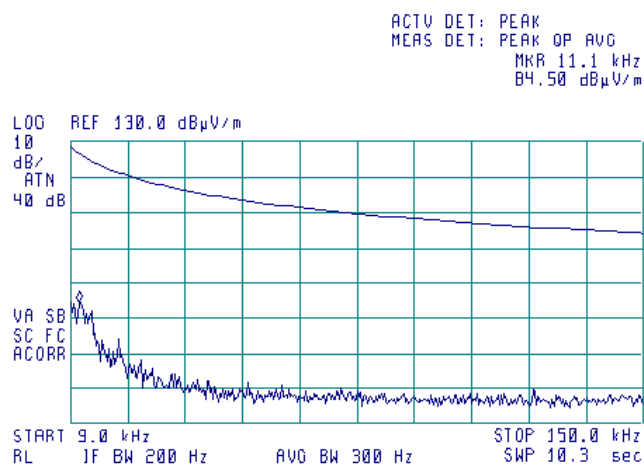
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

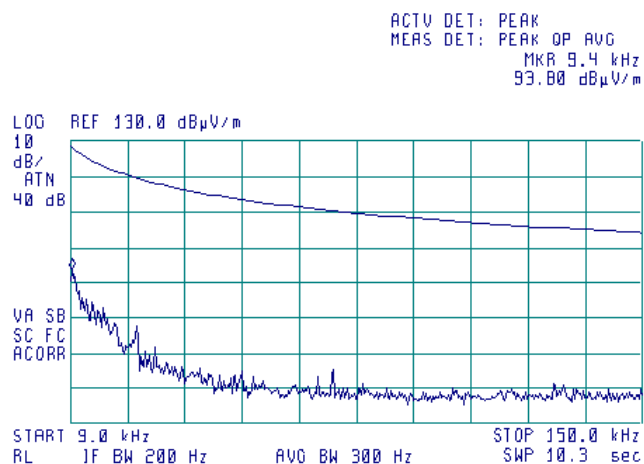
Plot 7.7.5 Radiated emission measurements from 9 to 150 kHz at the mid carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.7.6 Radiated emission measurements from 9 to 150 kHz at the high carrier frequency

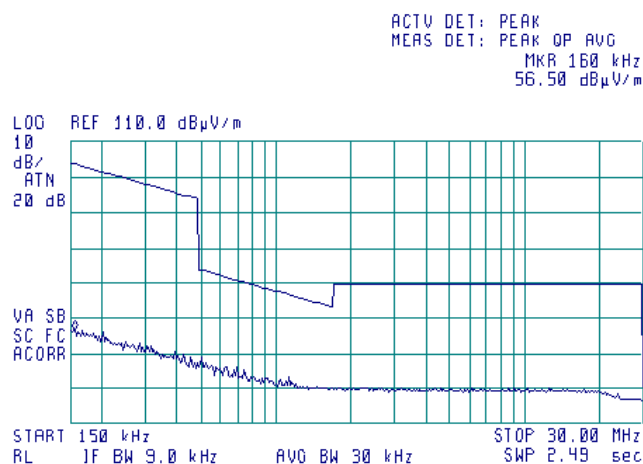
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

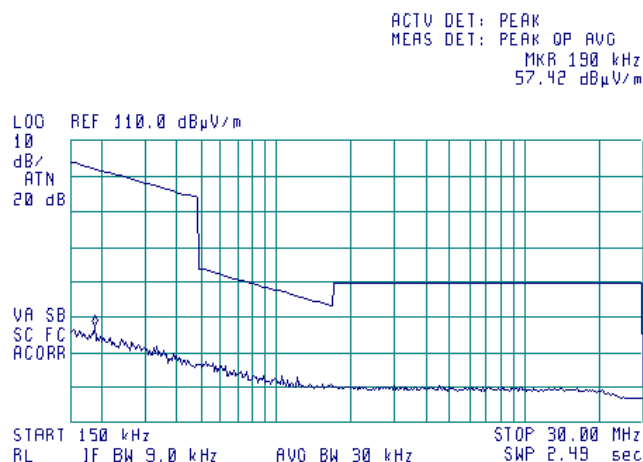
Plot 7.7.7 Radiated emission measurements from 0.15 to 30 MHz at the low carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.7.8 Radiated emission measurements from 0.15 to 30 MHz at the mid carrier frequency

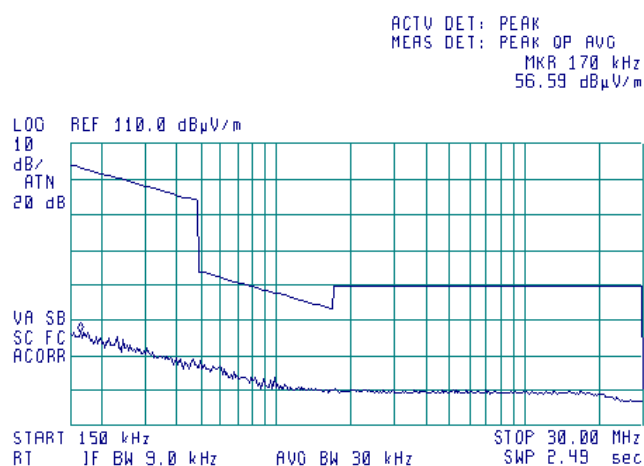
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

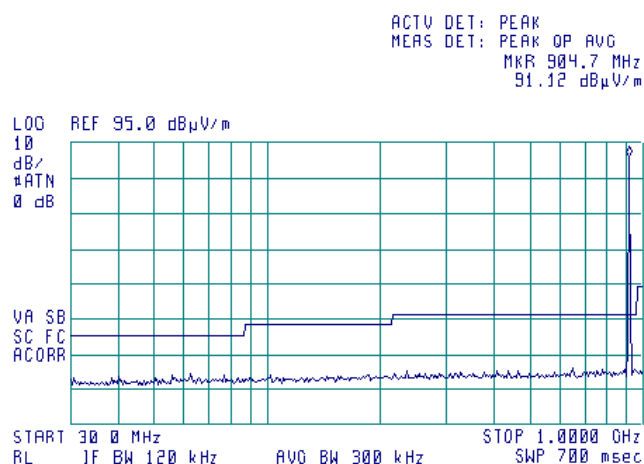
Plot 7.7.9 Radiated emission measurements from 0.15 to 30 MHz at the high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.7.10 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

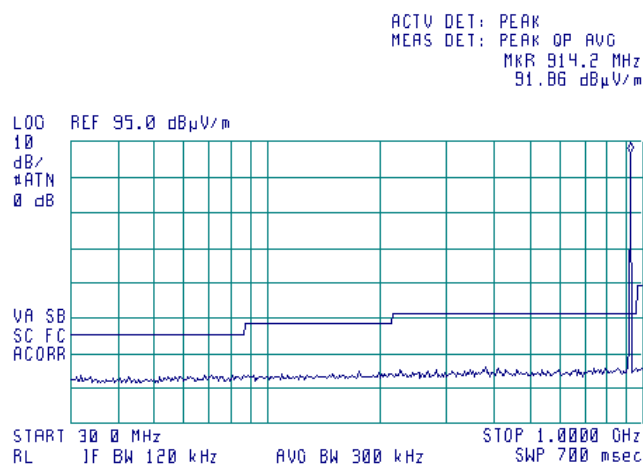
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

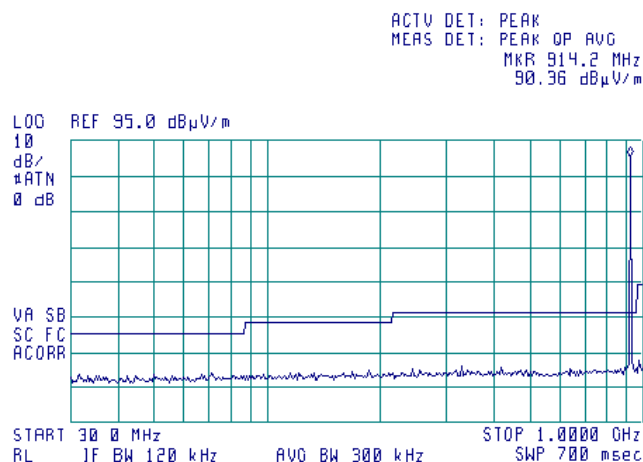
Plot 7.7.11 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

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



Plot 7.7.12 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

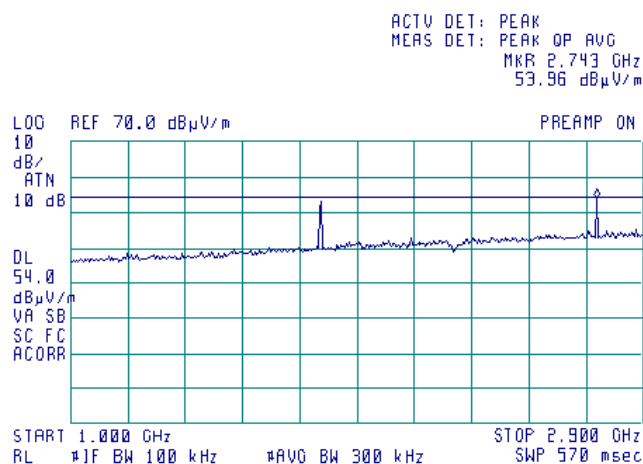
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

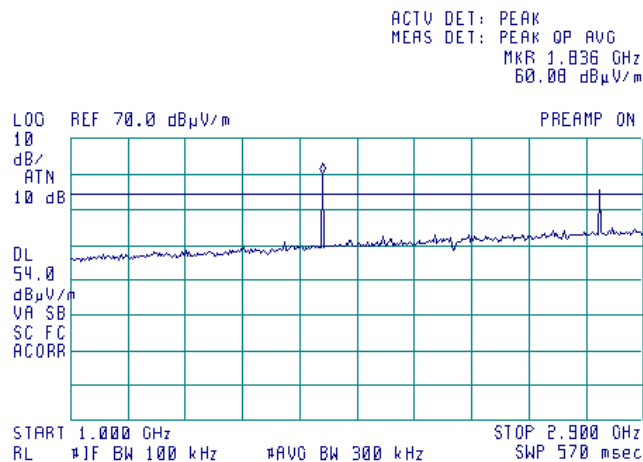
Plot 7.7.13 Radiated emission measurements from 1000 to 2900 MHz at the low carrier frequency

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



Plot 7.7.14 Radiated emission measurements from 1000 to 2900 MHz at the mid carrier frequency

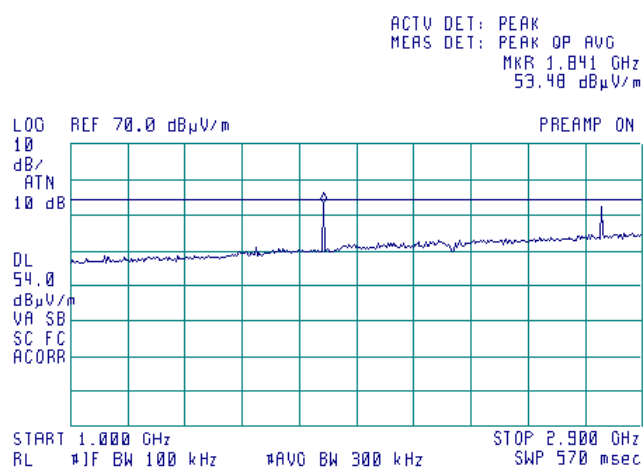
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

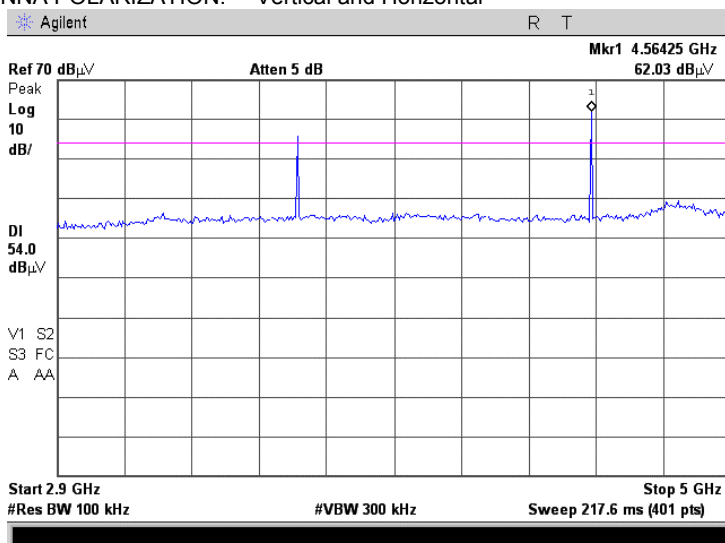
Plot 7.7.15 Radiated emission measurements from 1000 to 2900 MHz at the high carrier frequency

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



Plot 7.7.16 Radiated emission measurements from 2900 to 5000 MHz at the low carrier frequency

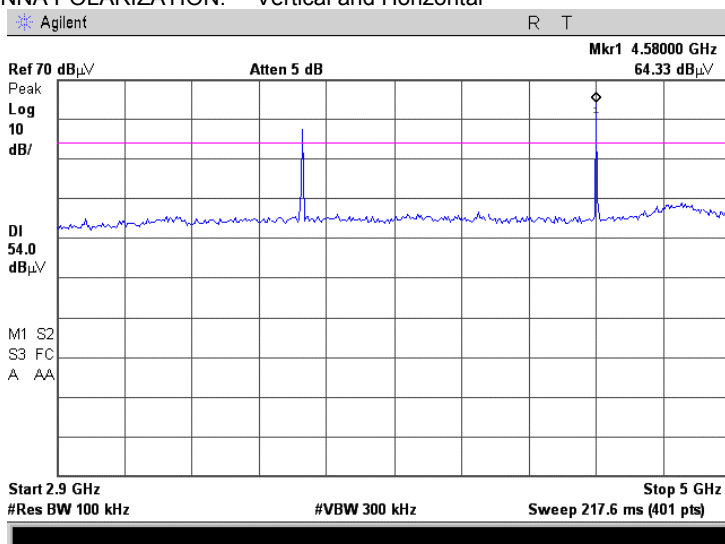
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

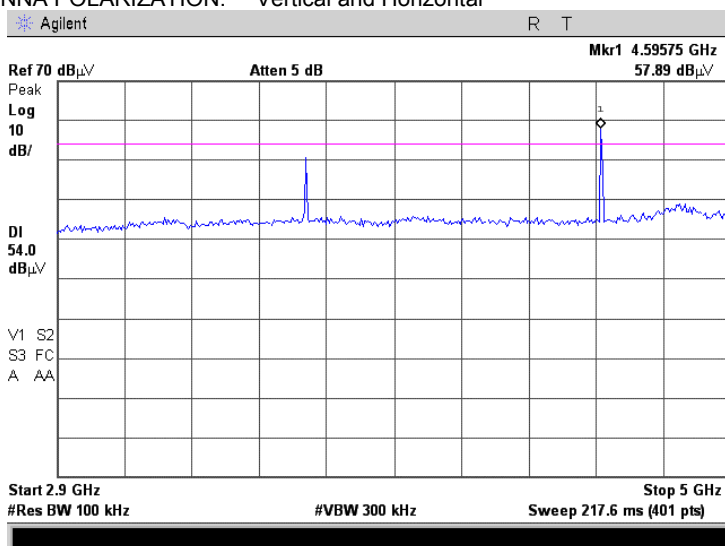
Plot 7.7.17 Radiated emission measurements from 2900 to 5000 MHz at the mid carrier frequency

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



Plot 7.7.18 Radiated emission measurements from 2900 to 5000 MHz at the high carrier frequency

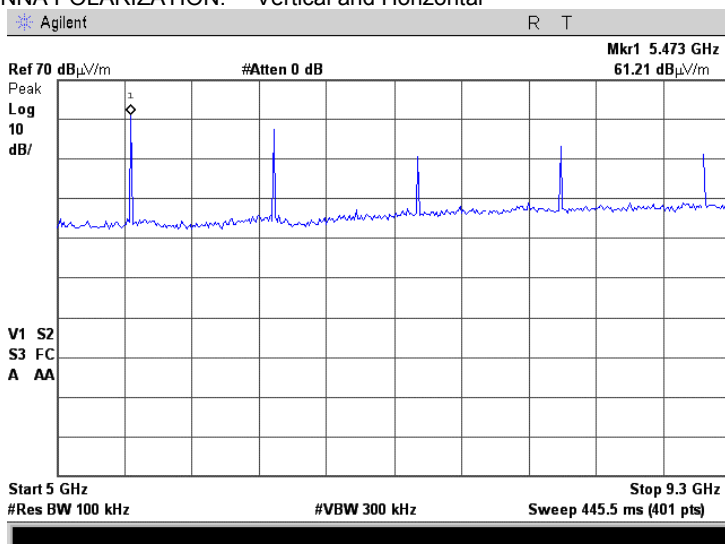
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

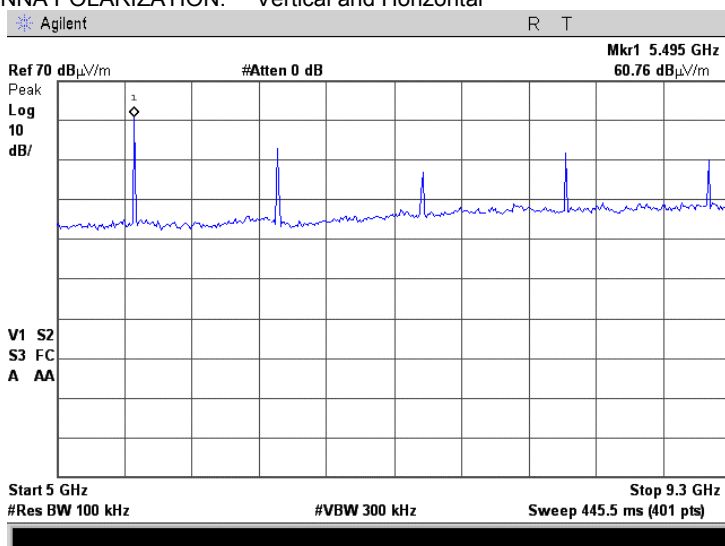
Plot 7.7.19 Radiated emission measurements from 5000 to 9300 MHz at the low carrier frequency

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



Plot 7.7.20 Radiated emission measurements from 5000 to 9300 MHz at the mid carrier frequency

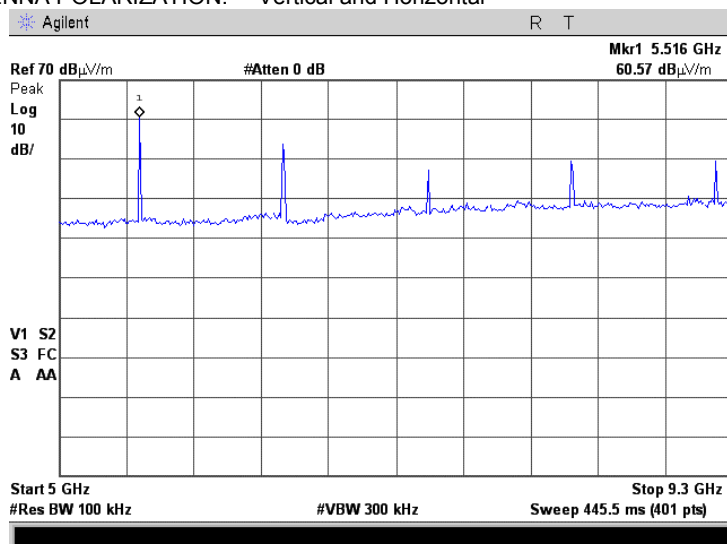
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

Plot 7.7.21 Radiated emission measurements from 5000 to 9300 MHz at the high carrier frequency

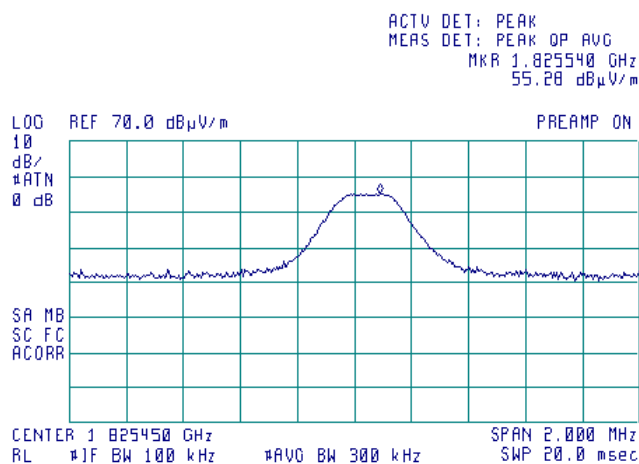
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

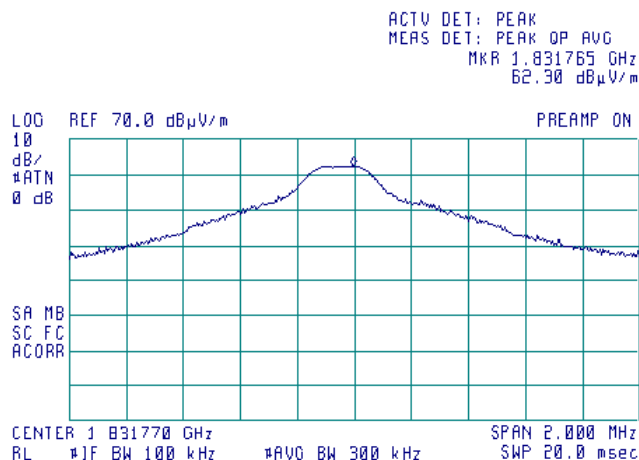
Plot 7.7.22 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.7.23 Radiated emission measurements at the second harmonic of mid carrier frequency

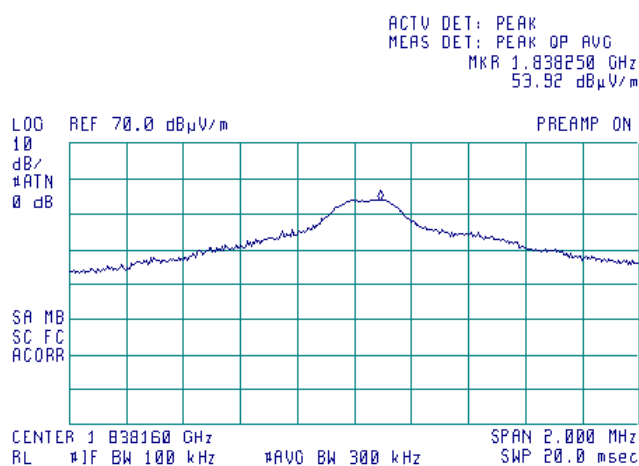
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

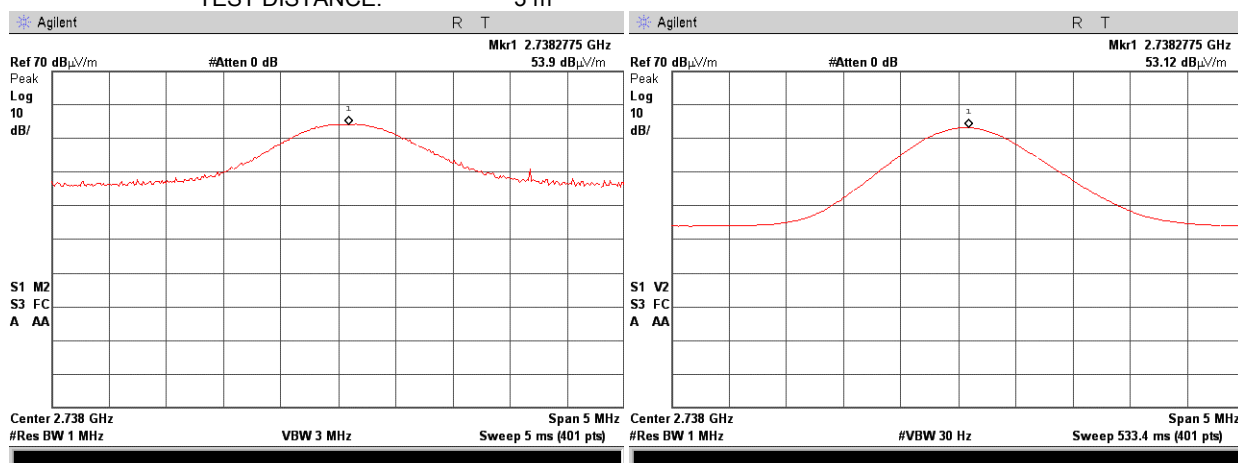
Plot 7.7.24 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.7.25 Radiated emission measurements at the third harmonic of low carrier frequency

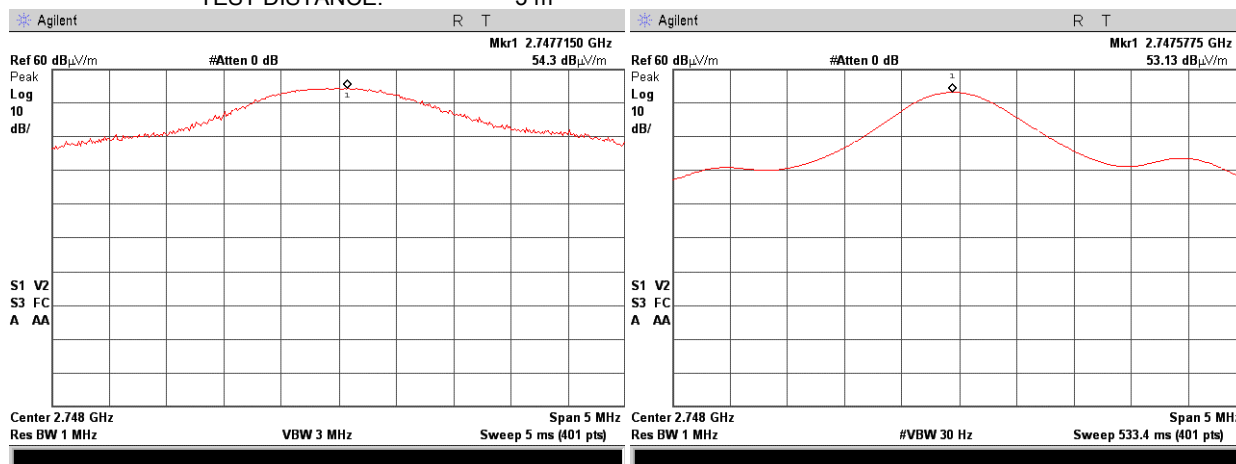
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

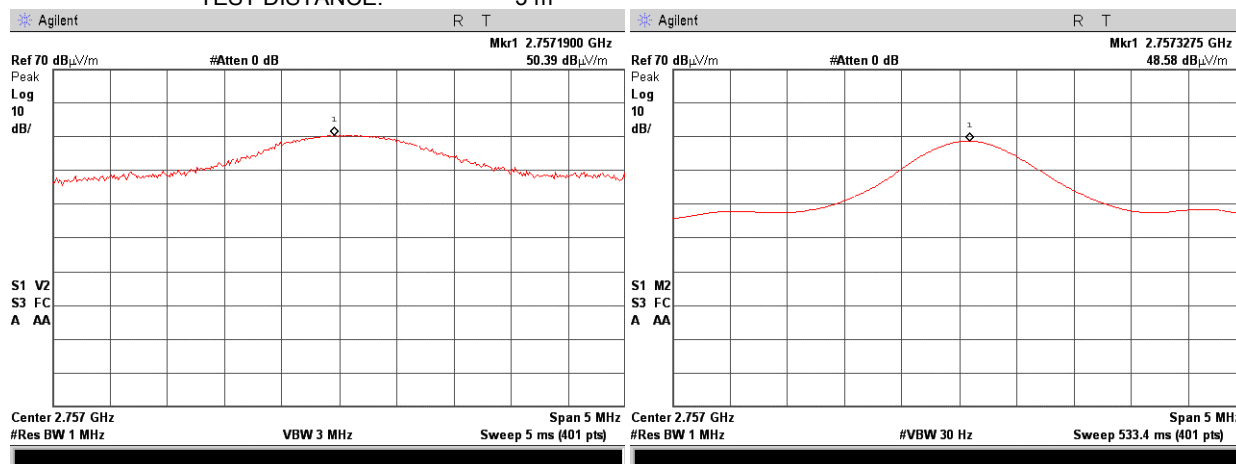
Plot 7.7.26 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.27 Radiated emission measurements at the third harmonic of high carrier frequency

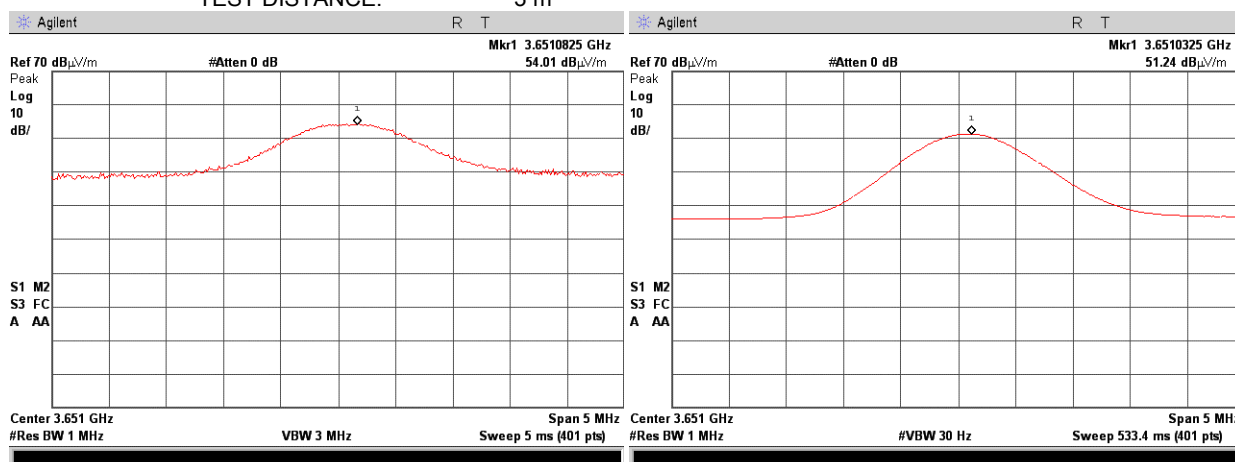
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

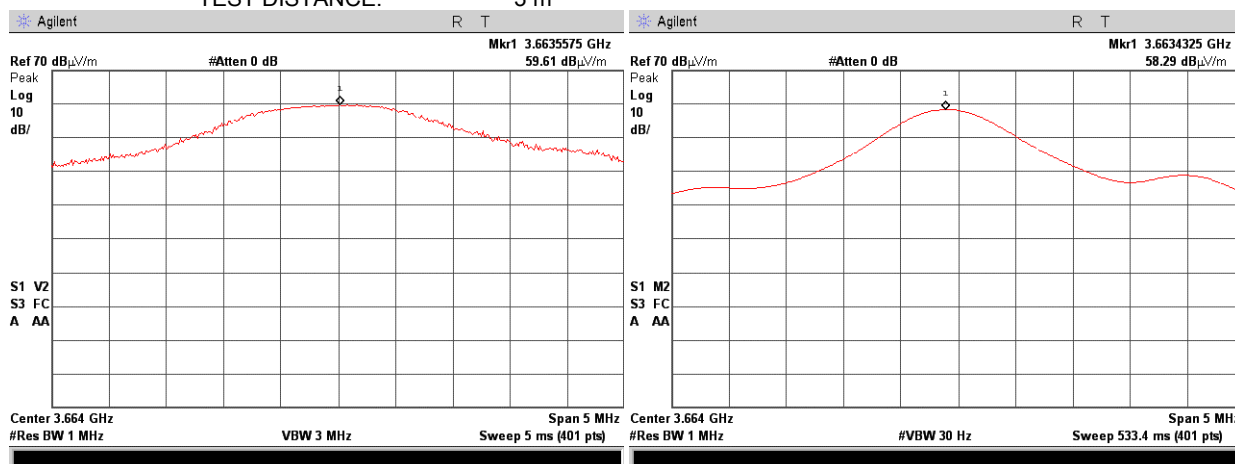
Plot 7.7.28 Radiated emission measurements at the fourth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.29 Radiated emission measurements at the fourth harmonic of mid carrier frequency

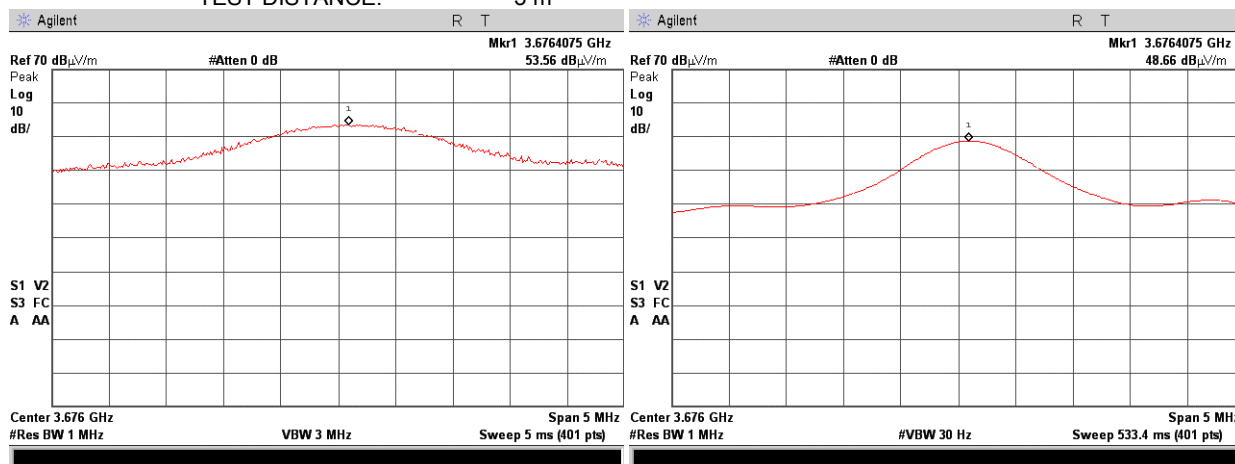
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

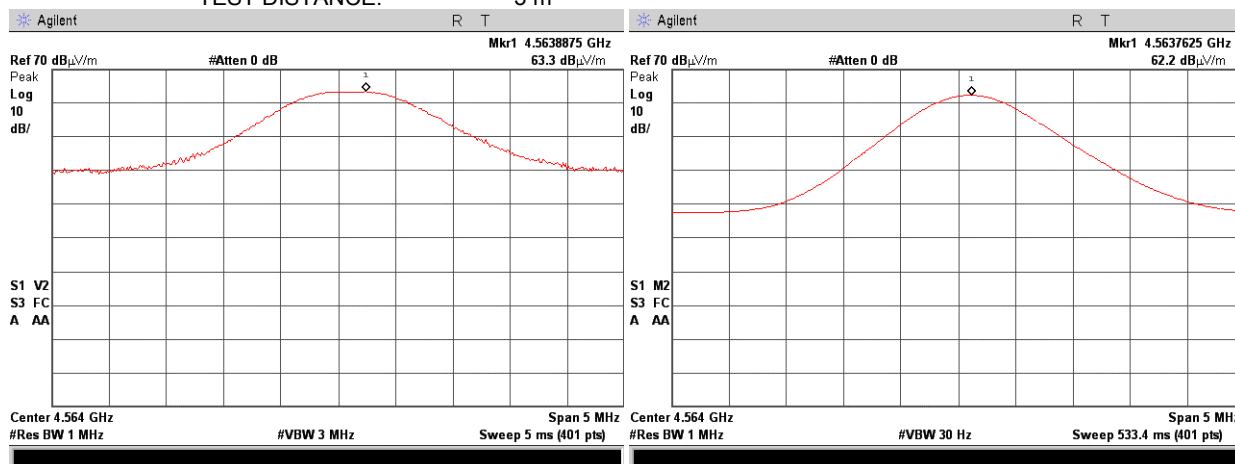
Plot 7.7.30 Radiated emission measurements at the fourth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.31 Radiated emission measurements at the fifth harmonic of low carrier frequency

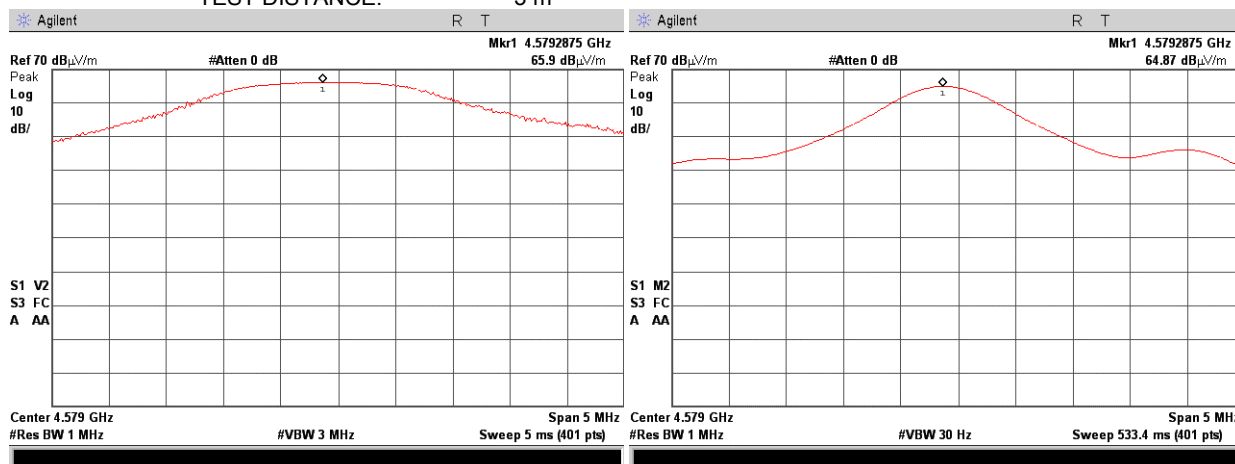
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

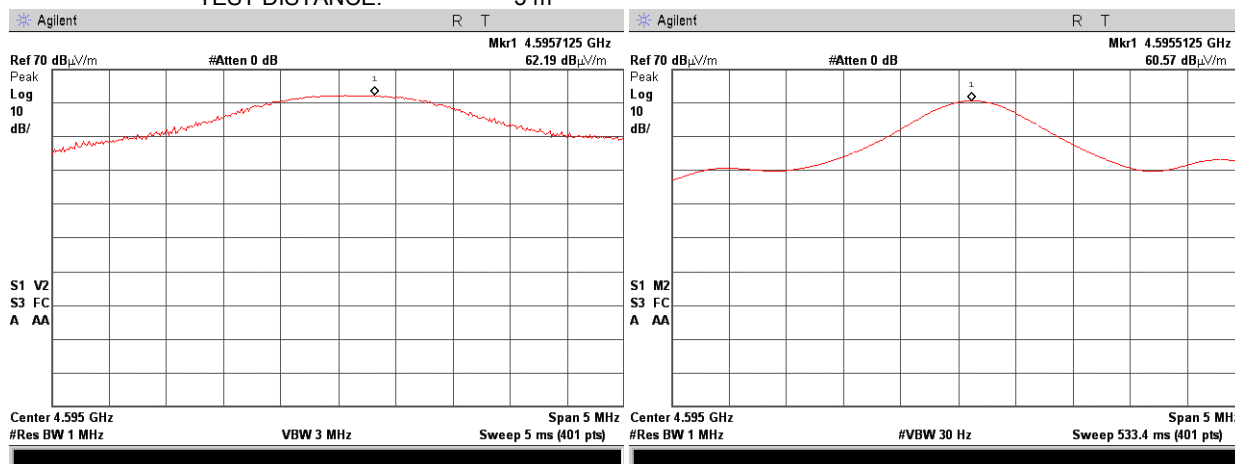
Plot 7.7.32 Radiated emission measurements at the fifth harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.33 Radiated emission measurements at the fifth harmonic of high carrier frequency

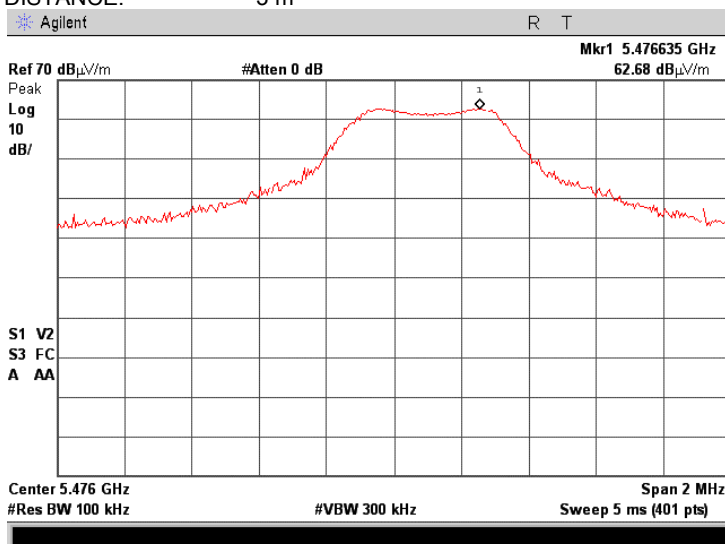
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

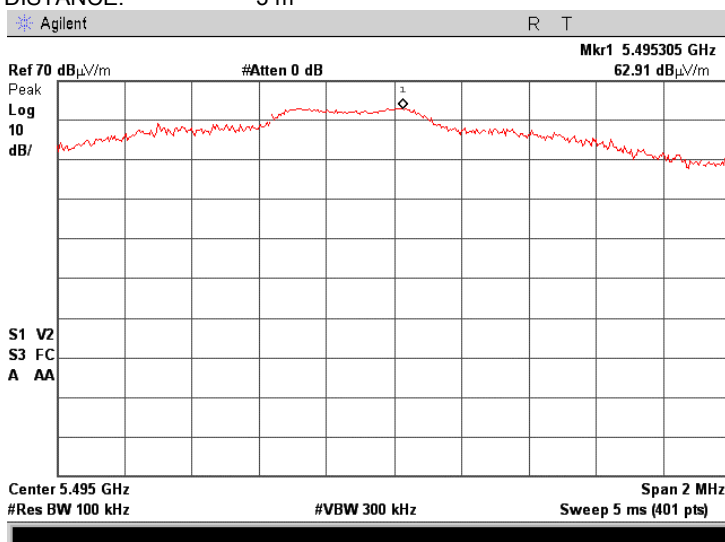
Plot 7.7.34 Radiated emission measurements at the sixth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.35 Radiated emission measurements at the sixth harmonic of mid carrier frequency

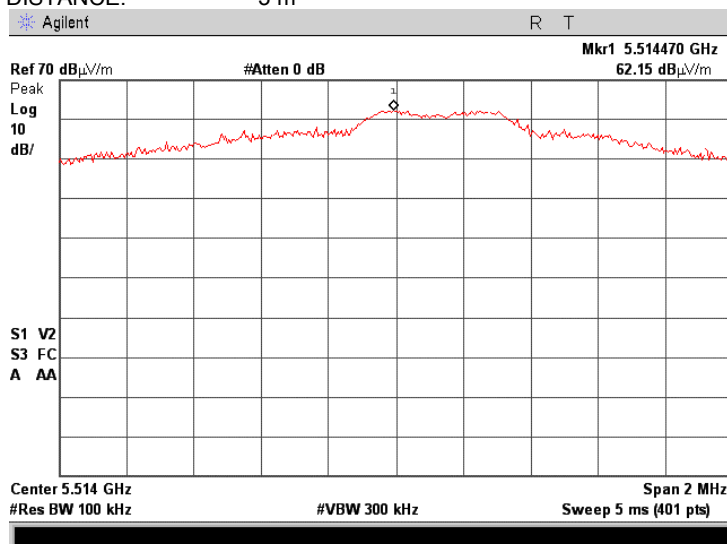
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

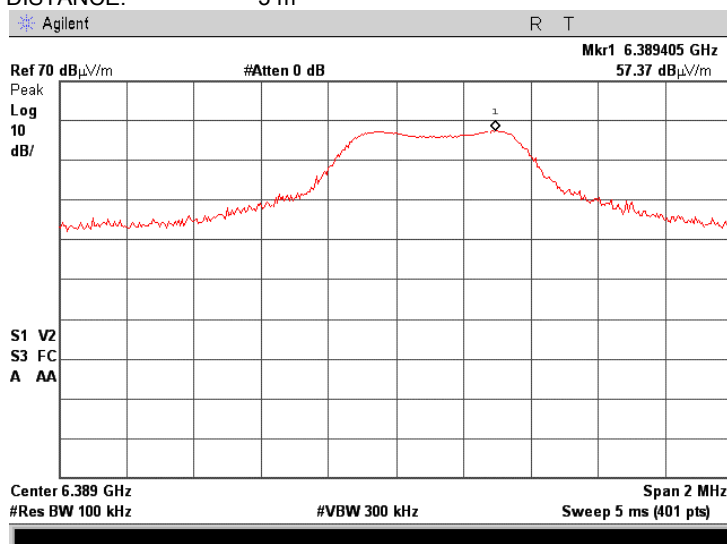
Plot 7.7.36 Radiated emission measurements at the sixth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.37 Radiated emission measurements at the seventh harmonic of low carrier frequency

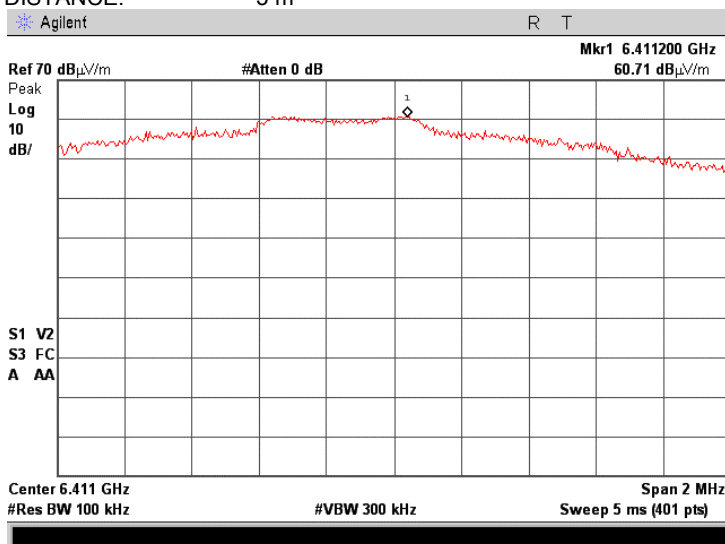
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

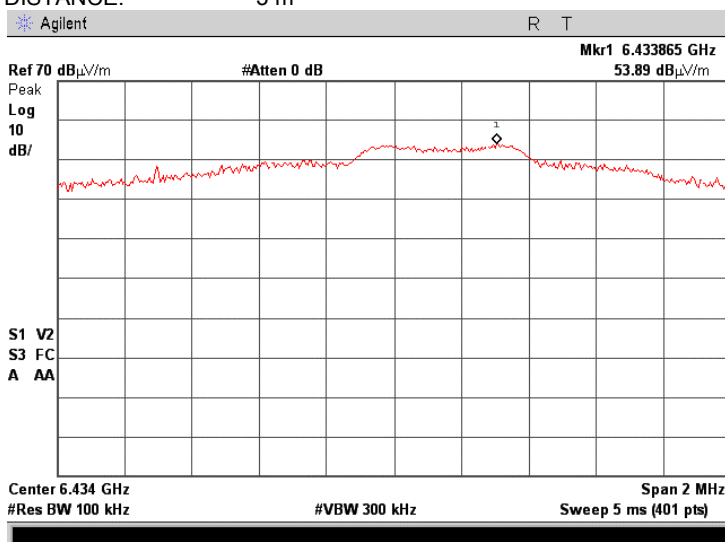
Plot 7.7.38 Radiated emission measurements at the seventh harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.39 Radiated emission measurements at the seventh harmonic of high carrier frequency

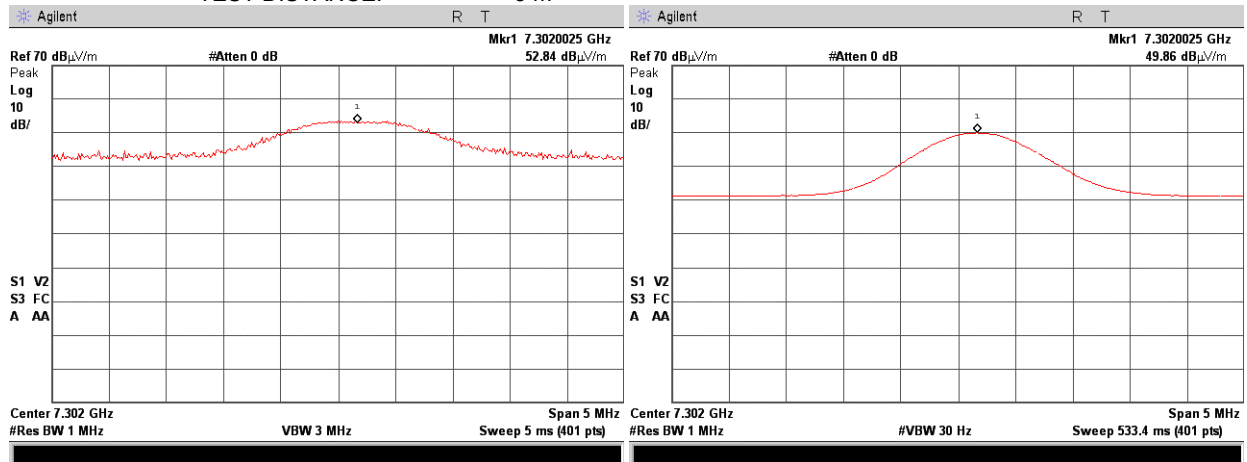
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

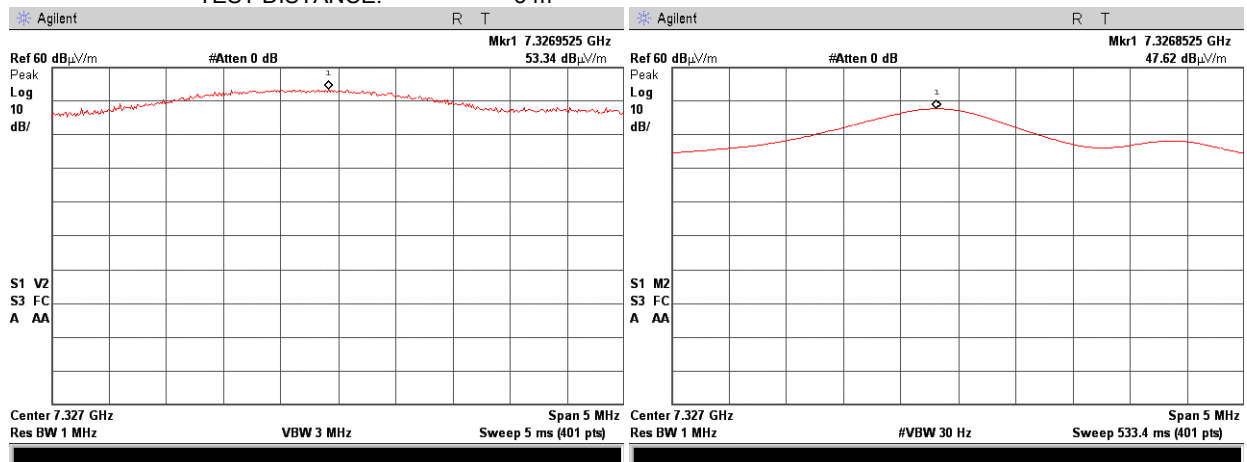
Plot 7.7.40 Radiated emission measurements at the eighth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.41 Radiated emission measurements at the eighth harmonic of mid carrier frequency

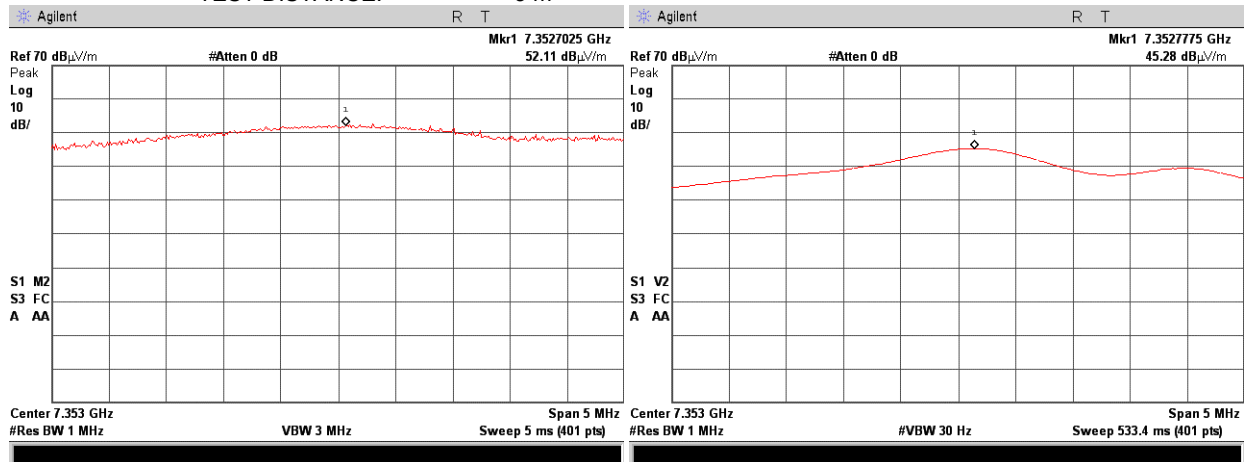
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:		FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

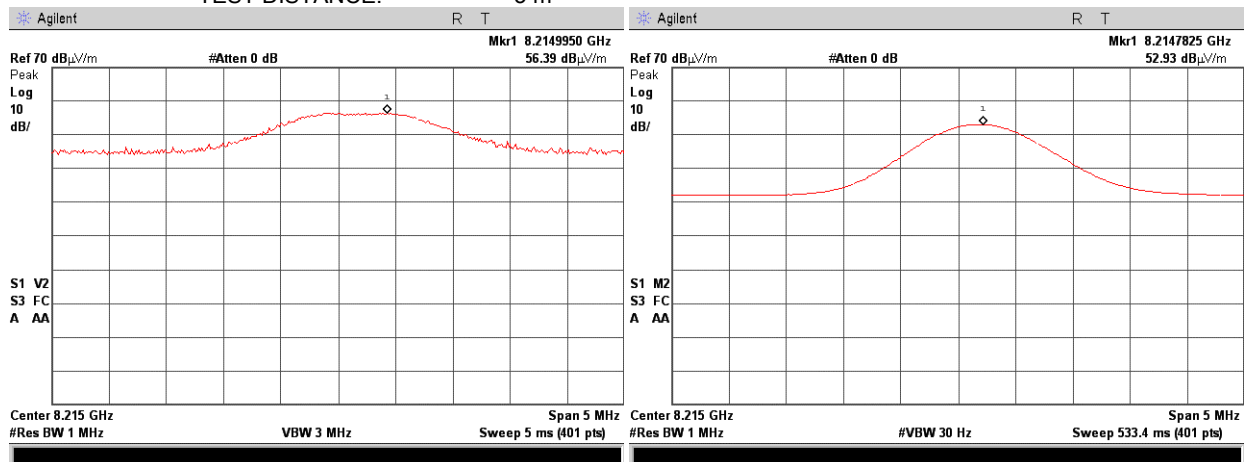
Plot 7.7.42 Radiated emission measurements at the eighth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.43 Radiated emission measurements at the ninth harmonic of low carrier frequency

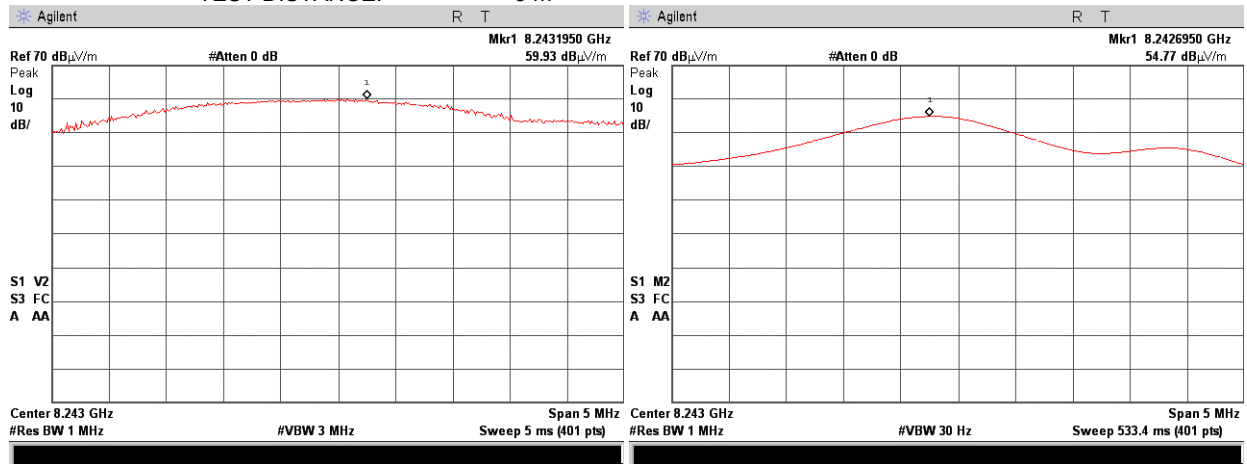
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification: FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions	
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date: 2/2/2011 - 2/7/2011	
Temperature: 22 °C	Air Pressure: 1015 hPa
Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:	

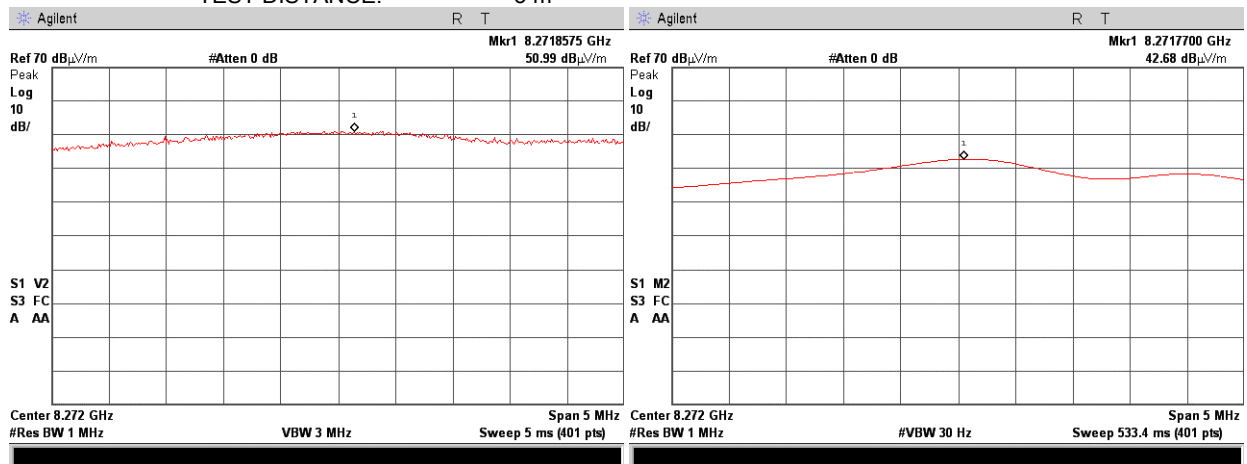
Plot 7.7.44 Radiated emission measurements at the ninth harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.45 Radiated emission measurements at the ninth harmonic of high carrier frequency

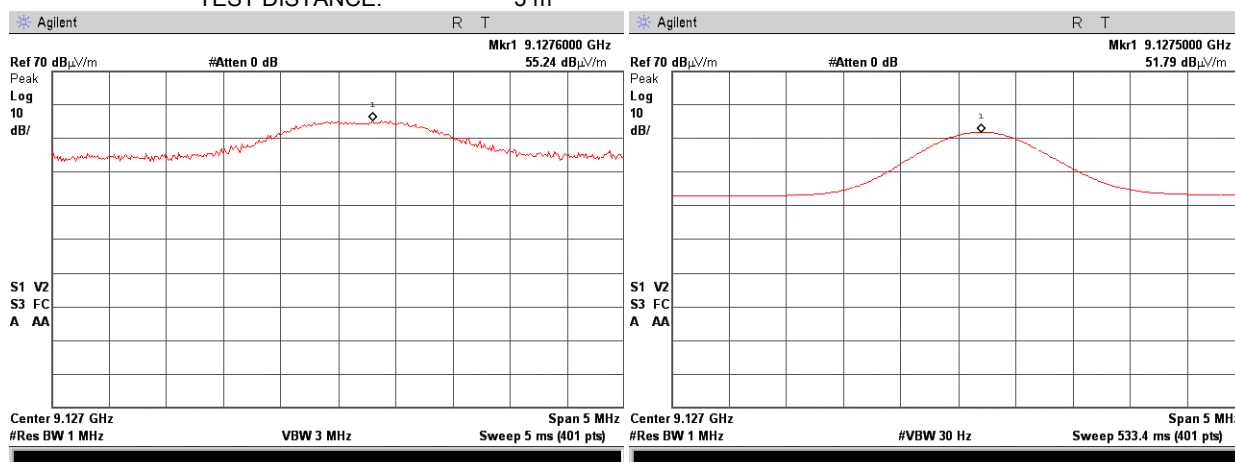
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

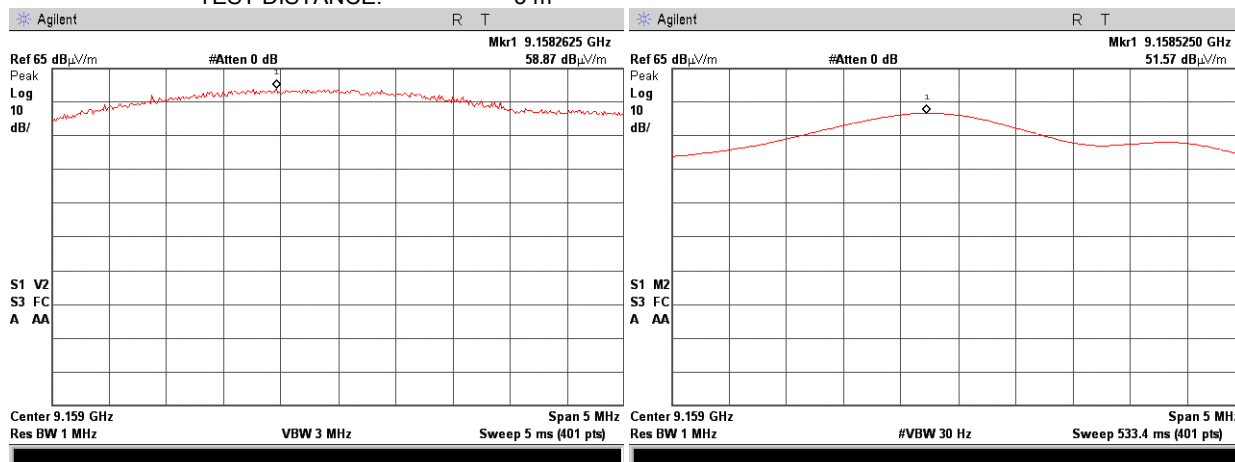
Plot 7.7.46 Radiated emission measurements at the tenth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.7.47 Radiated emission measurements at the tenth harmonic of mid carrier frequency

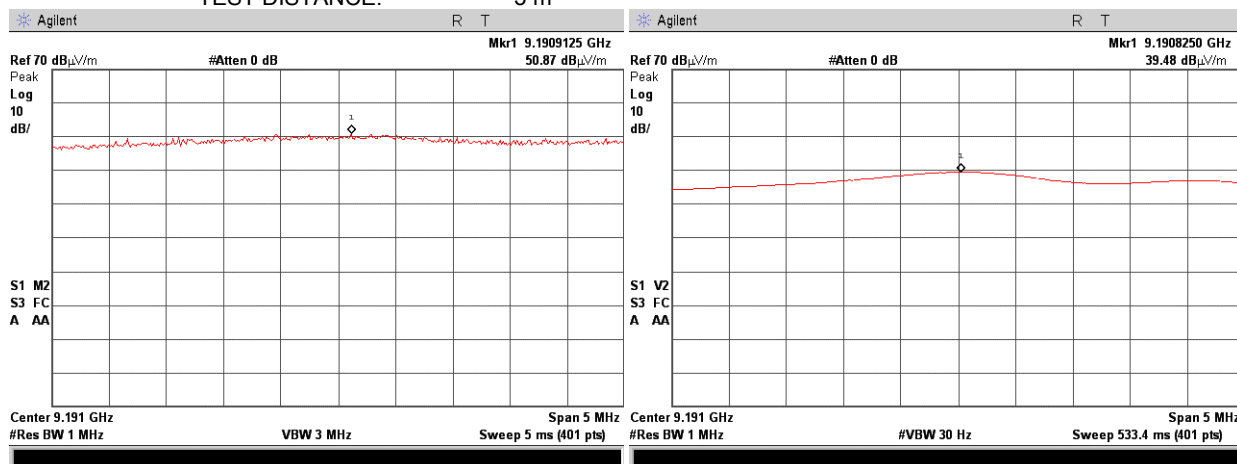
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

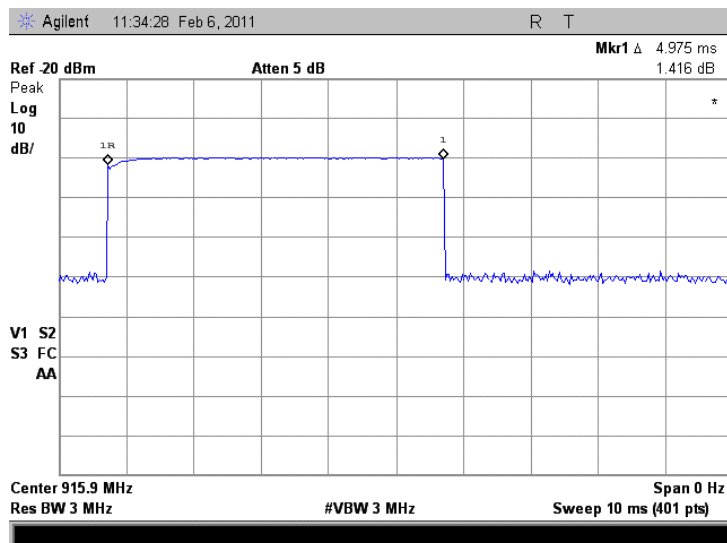
Plot 7.7.48 Radiated emission measurements at the tenth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

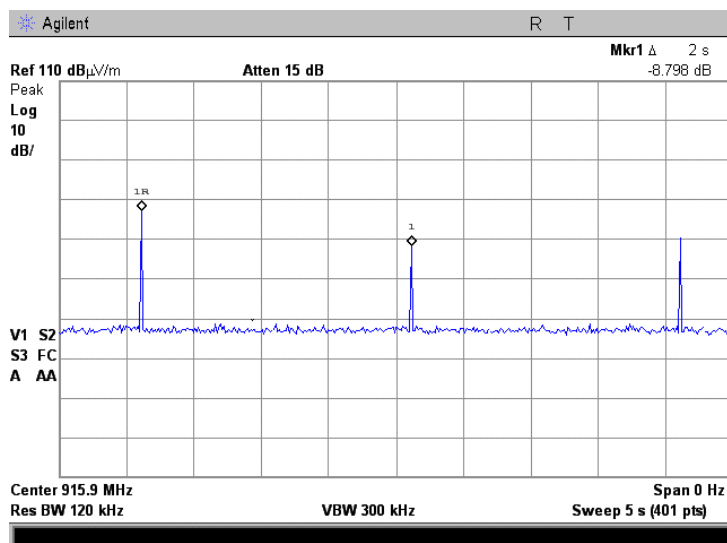


Test specification:	FCC section 15.247(d), RSS-210 section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/2/2011 - 2/7/2011		
Temperature: 22 °C	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3 V battery
Remarks:			

Plot 7.7.49 Transmission pulse duration



Plot 7.7.50 Transmission pulse period



Test specification:	FCC section 15.203, RSS-Gen section 7.1.2, Antenna requirements		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date:	12/13/2010		
Temperature: 25 °C	Air Pressure: 1018 hPa	Relative Humidity: 38 %	Power Supply: 3 V battery
Remarks:			

7.8 Antenna requirements

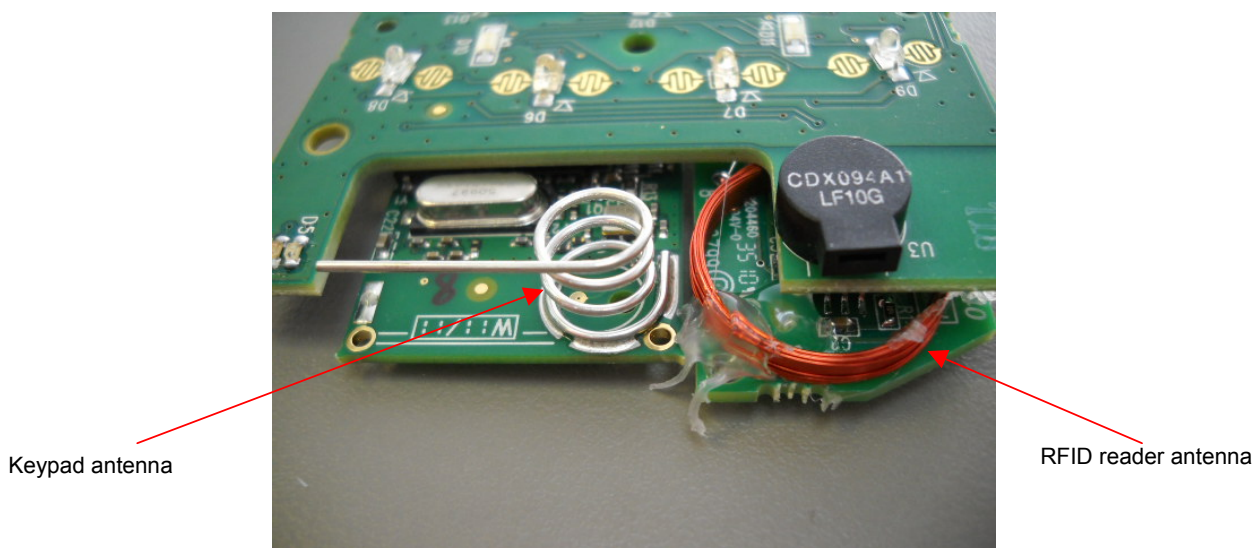
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.8.1.

Table 7.8.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Photograph 7.8.1 Antenna assembly



Test specification:		FCC section 15.109, RSS-Gen section 6.2, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:	Compliance	Verdict:	PASS
Date:	2/15/2011		
Temperature: 22 °C	Air Pressure: 1009 hPa	Relative Humidity: 52 %	Power Supply: 3 V battery
Remarks:			

8 Unintentional emissions

8.1 Radiated emission measurements

8.1.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.1.1 and Table 8.1.2.

Table 8.1.1 Radiated emission test limits according to FCC Part 15 Section 15.109

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
Above 960	43.5*	54.0	49.5	60.0*

* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $\text{Lim}_{S_2} = \text{Lim}_{S_1} + 20 \log(S_1/S_2)$, where S_1 and S_2 – standard defined and test distance respectively in meters.

Table 8.1.2 Radiated emission limits according to RSS-Gen, Section 6.2

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

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

8.1.2 Test procedure for measurements in semi-anechoic chamber

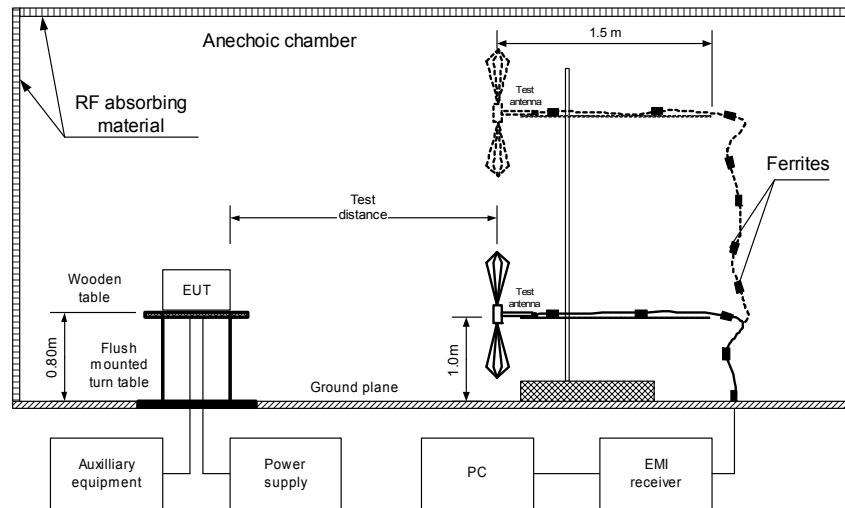
8.1.2.1 The EUT was set up as shown in Figure 8.1.1, energized and the performance check was conducted.

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

8.1.2.3 The worst test results (the lowest margins) were recorded in Table 8.1.3 and shown in the associated plots.

Test specification: FCC section 15.109, RSS-Gen section 6.2, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance		Verdict: PASS	
Date: 2/15/2011			
Temperature: 22 °C	Air Pressure: 1009 hPa	Relative Humidity: 52 %	Power Supply: 3 V battery
Remarks:			

Figure 8.1.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment



Test specification:	FCC section 15.109, RSS-Gen section 6.2, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/15/2011		
Temperature: 22 °C	Air Pressure: 1009 hPa	Relative Humidity: 52 %	Power Supply: 3 V battery
Remarks:			

Table 8.1.3 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Receive / Stand-by
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

RECESSION BANDWIDTH:					120 KHz			
Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No emissions were found								Pass

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 5000 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*				
No emissions were found										Pass

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

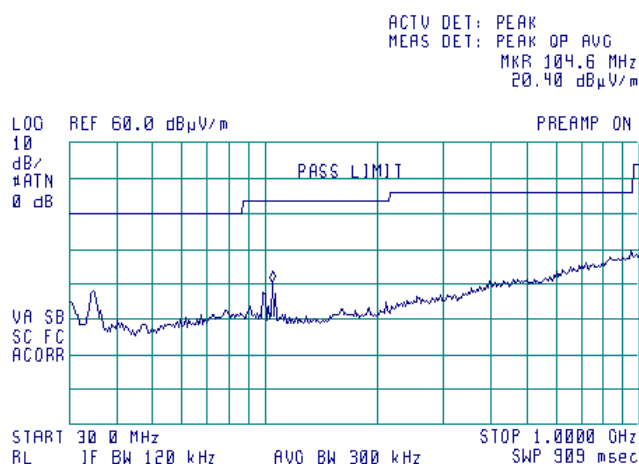
HL 0465	HL 0521	HL 0593	HL 0594	HL 0604	HL 1984	HL 2871	HL 3622
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Full description is given in Appendix A.

Test specification:	FCC section 15.109, RSS-Gen section 6.2, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	2/15/2011		
Temperature: 22 °C	Air Pressure: 1009 hPa	Relative Humidity: 52 %	Power Supply: 3 V battery
Remarks:			

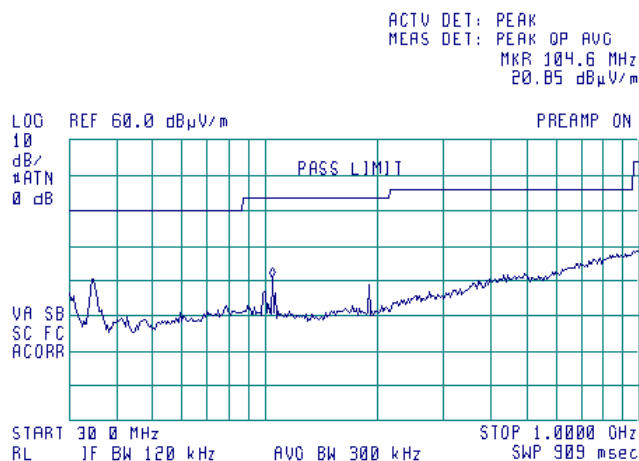
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

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



Plot 8.1.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

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

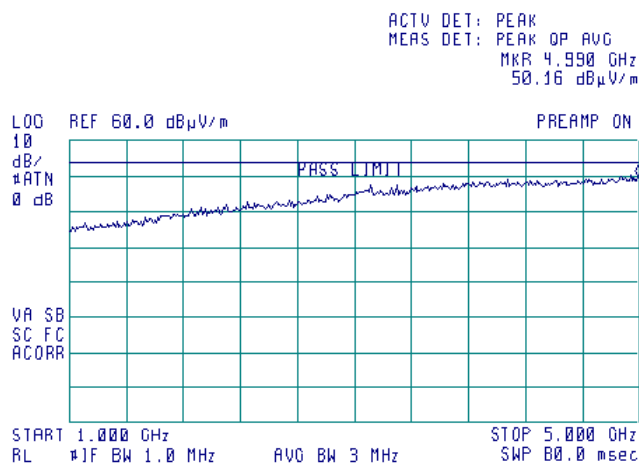


Test specification:		FCC section 15.109, RSS-Gen section 6.2, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:	Compliance	Verdict:	PASS
Date:	2/15/2011		
Temperature: 22 °C	Air Pressure: 1009 hPa	Relative Humidity: 52 %	Power Supply: 3 V battery
Remarks:			

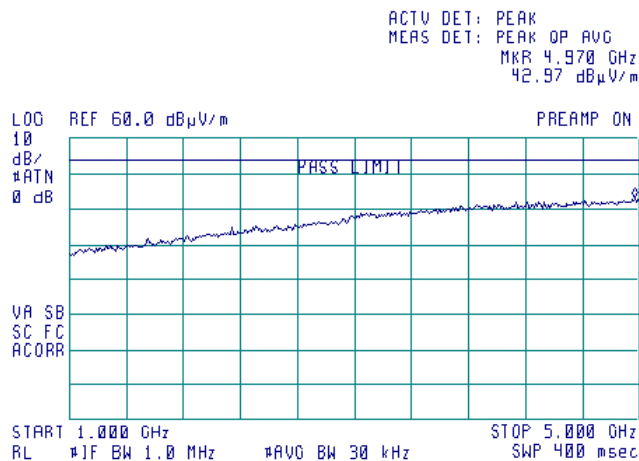
Plot 8.1.3 Radiated emission measurements above 1000 MHz, vertical antenna polarization

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

(42)



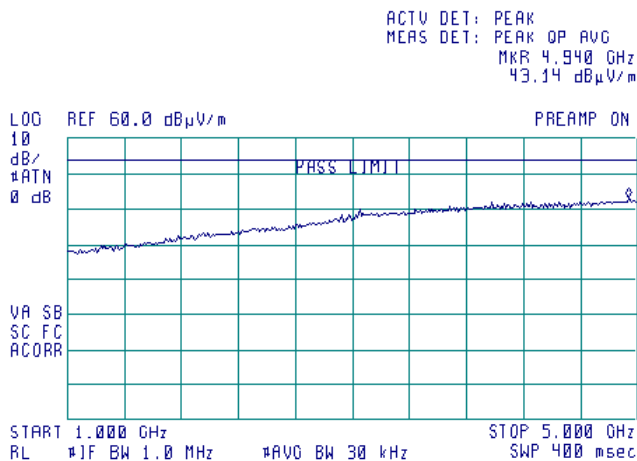
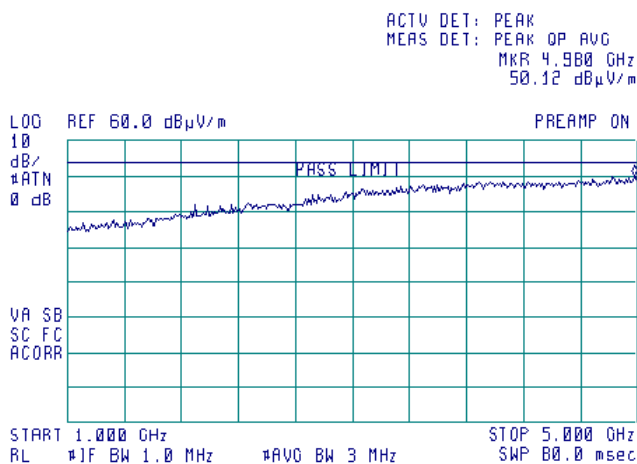
(42)



Test specification:		FCC section 15.109, RSS-Gen section 6.2, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:	Compliance	Verdict:	PASS
Date:	2/15/2011		
Temperature: 22 °C	Air Pressure: 1009 hPa	Relative Humidity: 52 %	Power Supply: 3 V battery
Remarks:			

Plot 8.1.4 Radiated emission measurements above 1000 MHz, horizontal antenna polarization

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



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0034	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1988	09-Mar-11	09-Mar-12
0415	Cable, Coax, RF, RG-214	Hermon Laboratories	CC-3	056	01-Dec-10	01-Dec-11
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-10	29-Jun-11
0465	Anechoic Chamber 9(L) x 6.5(W) x 5.5(H) m	Hermon Laboratories	AC - 1	023	16-Sep-10	16-Sep-11
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	25-Aug-10	25-Aug-11
0593	Antenna Mast, 1-4 m Pneumatic	Madgesh	AM-F1	101	04-Feb-11	04-Feb-12
0594	Turn Table FOR ANECHOIC CHAMBER flush mount d=1.2 m Pneumatic	Hermon Laboratories	TT- WDC1	102	12-Oct-10	12-Oct-11
0604	Antenna BiconiLog Log-Periodic/T Bow- TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-11	11-Jan-12
0812	Cable Coax, RG-214, 11.5 m, N-type connectors	Hermon Laboratories	C214-11	148	01-Dec-10	01-Dec-11
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	24-Aug-10	24-Aug-11
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	11-Jun-10	11-Jun-11
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	11-Jun-10	11-Jun-11
2697	Antenna, 30 MHz - 3.0 GHz	Sunol Sciences. Corp. Pleasanton, California USA	JB3	A022805	11-Jan-11	11-Jan-12
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	07-Jul-10	07-Jul-11
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155- 00	2871	14-Sep-10	14-Sep-11
2882	Cable, 18 GHz N-type, M-F, 3 m	Bird Electronic Corp.	TC- MNFN-3.0	211539 001	03-Oct-10	03-Oct-11
2883	Cable, 18 GHz N-type, M-F, 3 m	Bird Electronic Corp.	TC- MNFN-3.0	211539 003	01-Dec-10	01-Dec-11
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-10	07-May-11
3001	EMC Analyzer, 9 kHz to 3 GHz	Agilent Technologies	E7402A	US394401 80	26-Dec-10	26-Dec-11
3334	Filter, High Pass, 2.5 GHz	LORCH MICROWAVE	5HP7- 2500-SR	Z22	04-Oct-10	04-Oct-11
3343	High Pass Filter, 50 Ohm, 2650 to 6500 MHz	Mini-Circuits	VHF- 2700+	NA	04-Oct-10	04-Oct-11

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
3386	Microwave Cable Assembly, 26.5 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3386	07-Feb-11	07-Feb-12
3390	Microwave Cable Assembly, 26.5 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3390	07-Feb-11	07-Feb-12
3622	Cable RF, 6.0 m, N type-N type, DC-6.5 GHz	Alpha Wire	RG 214/U	NA	27-May-10	27-May-11
3632	Cable RF, 5.4 m, N type-N type, DC-6.5 GHz	Alpha Wire	RG 214/U	NA	27-May-10	27-May-11
3884	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out.	Agilent Technologies	87405C	MY470104 18	13-Jan-11	13-Jan-12

10 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 %
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.

11 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). The FCC Designation Number is US1003.

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e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

FCC 47CFR part 15: 2010	Radio Frequency Devices
Public notice DA 00- 705: 2000	Filing and measurement guidelines for frequency hopping spread spectrum systems.
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 8: 2010	Low Power Licence- Exempt Radiocommunication Devices
RSS-Gen Issue 3: 2010	General Requirements and Information for the Certification of Radiocommunication Equipment

13 APPENDIX E Test equipment correction factors

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

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

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

Antenna factor
Log periodic antenna
Electro-Metrics, model LPA-25/30
Ser.No.1988, HL 0034

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
200	12.6	625	20.4
225	12.2	650	20.9
250	13.4	675	22.0
275	14.3	700	22.2
300	15.2	725	22.7
325	15.7	750	22.5
350	15.9	775	22.7
375	16.4	800	22.8
400	17.0	825	23.2
425	17.4	850	23.5
450	17.9	875	23.9
475	18.6	900	24.0
500	19.1	925	24.0
525	19.3	950	24.2
550	19.6	975	24.7
575	19.8	1000	25.1
600	20.0		

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

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

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

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

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

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

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

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

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

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

Antenna calibration
Sunol Sciences Inc., model JB3, serial number A022805, HL 2697

Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain
30	22.2	-22.5	0.01	620	19.7	6.3	4.27	1215	24.9	7.0	5.05	1810	28.3	7.1	5.08	2405	30.9	6.9	4.93
35	18.5	-17.4	0.02	625	19.7	6.5	4.42	1220	24.9	7.0	4.99	1815	28.5	6.9	4.91	2410	30.9	6.9	4.89
40	14.7	-12.5	0.06	630	19.6	6.6	4.57	1225	25.1	6.9	4.91	1820	28.6	6.8	4.74	2415	31.0	6.9	4.85
45	11.3	-8.1	0.16	635	19.7	6.5	4.48	1230	25.2	6.8	4.82	1825	28.7	6.8	4.75	2420	31.0	6.8	4.82
45	11.3	-8.1	0.16	640	19.9	6.4	4.40	1235	25.1	7.0	4.96	1830	28.7	6.8	4.76	2425	31.1	6.8	4.81
50	8.9	-4.7	0.34	645	19.9	6.5	4.45	1240	25.0	7.1	5.09	1835	28.7	6.7	4.72	2430	31.0	6.9	4.87
55	7.9	-2.8	0.52	650	19.9	6.5	4.51	1245	25.0	7.1	5.12	1840	28.8	6.7	4.69	2435	31.0	6.9	4.88
60	7.8	-2.1	0.62	655	19.9	6.5	4.60	1250	25.0	7.1	5.15	1845	28.6	6.9	4.90	2440	31.2	6.8	4.74
65	8.5	-2.0	0.63	660	19.9	6.7	4.69	1255	25.0	7.2	5.25	1850	28.4	7.1	5.12	2445	31.1	6.9	4.91
70	9.0	-1.9	0.64	665	19.9	6.7	4.70	1260	24.9	7.3	5.36	1855	28.5	7.0	5.07	2450	31.0	7.0	4.96
75	6.8	-1.1	0.78	670	20.0	6.7	4.71	1265	25.0	7.3	5.31	1860	28.6	7.0	5.01	2455	31.0	7.0	5.01
80	8.4	-0.2	0.97	675	20.1	6.7	4.71	1270	25.1	7.2	5.26	1865	28.5	7.1	5.17	2460	30.9	7.2	5.19
85	8.0	0.8	1.20	680	20.1	6.7	4.71	1275	25.3	7.0	5.05	1870	28.4	7.3	5.33	2465	31.1	6.9	4.95
90	8.2	1.1	1.29	685	20.1	6.8	4.79	1280	25.5	6.8	4.84	1875	28.4	7.2	5.28	2470	31.3	6.8	4.76
95	9.2	0.5	1.13	690	20.1	6.9	4.88	1285	25.4	7.0	4.97	1880	28.5	7.2	5.22	2475	31.4	6.7	4.69
100	10.6	-0.4	0.92	695	20.2	6.8	4.82	1290	25.3	7.1	5.10	1885	28.5	7.2	5.22	2480	31.3	6.8	4.79
110	12.6	-1.6	0.70	705	20.4	6.8	4.75	1300	25.2	7.3	5.33	1895	28.6	7.2	5.24	2490	31.1	7.0	4.99
120	13.9	-2.1	0.82	715	20.5	6.8	4.80	1310	25.5	7.1	5.09	1905	28.5	7.3	5.36	2500	30.9	7.2	5.27
125	14.2	-2.0	0.83	720	20.5	6.9	4.85	1315	25.4	7.2	5.23	1910	28.5	7.4	5.45	2505	31.1	7.1	5.15
130	14.2	-1.7	0.68	725	20.6	6.8	4.81	1320	25.3	7.3	5.36	1915	28.5	7.3	5.38	2510	31.0	7.2	5.22
140	13.4	-0.3	0.94	735	20.9	6.7	4.65	1330	25.6	7.0	5.06	1925	28.6	7.3	5.35	2520	31.2	7.0	5.05
150	12.9	0.8	1.21	745	21.0	6.6	4.59	1340	25.7	7.1	5.09	1935	28.5	7.4	5.54	2530	31.0	7.3	5.37
160	11.6	1.6	1.44	755	21.3	6.7	4.74	1350	25.8	7.2	5.17	1945	28.5	7.5	5.68	2540	31.2	7.1	5.09
165	12.5	2.0	1.59	760	21.0	6.8	4.83	1355	25.8	7.0	5.06	1950	28.6	7.4	5.58	2545	31.0	7.3	5.43
170	12.2	2.6	1.83	765	21.1	6.8	4.73	1360	25.9	6.9	4.95	1955	28.6	7.5	5.57	2550	31.0	7.3	5.39
175	11.8	3.3	2.13	770	21.3	6.7	4.64	1365	26.0	6.9	4.95	1960	28.6	7.5	5.65	2555	31.1	7.2	5.30
180	11.6	3.7	2.36	775	21.3	6.7	4.68	1370	26.0	7.0	4.96	1965	28.7	7.4	5.47	2560	31.0	7.4	5.47
185	11.5	4.0	2.54	780	21.3	6.7	4.72	1375	26.0	7.0	5.01	1970	28.7	7.3	5.29	2565	30.8	7.6	5.70
190	11.6	4.2	2.61	785	21.3	6.8	4.77	1380	26.0	7.0	5.06	1975	28.9	7.2	5.22	2570	31.1	7.3	5.37
200	13.1	3.2	2.07	795	21.4	6.8	4.79	1390	26.1	6.9	4.92	1985	29.1	7.1	5.11	2580	31.6	6.9	4.87
205	12.0	4.4	2.76	800	21.5	6.8	4.77	1395	26.2	6.9	4.94	1990	29.1	7.0	5.06	2585	31.6	6.8	4.79
210	11.0	5.6	3.66	805	21.6	6.7	4.71	1400	26.2	7.0	4.96	1995	29.1	7.1	5.09	2590	31.6	6.9	4.88
215	11.3	5.6	3.59	810	21.7	6.7	4.65	1405	26.1	7.0	5.02	2000	29.1	7.1	5.11	2595	31.5	7.0	4.87
220	11.6	5.5	3.52	815	21.7	6.7	4.72	1410	26.1	7.1	5.08	2005	29.1	7.1	5.16	2600	31.6	6.9	4.86
225	11.7	5.5	3.55	820	21.7	6.8	4.80	1415	26.2	7.0	5.02	2010	29.1	7.1	5.15	2605	31.3	7.2	5.30
230	11.9	5.5	3.57	825	21.7	6.8	4.82	1420	26.3	7.0	4.96	2015	29.2	7.1	5.13	2610	31.4	7.1	5.15
235	12.1	5.5	3.56	830	21.7	6.9	4.85	1425	26.2	7.1	5.10	2020	29.2	7.1	5.18	2615	31.7	6.9	4.88
240	12.3	5.5	3.54	835	21.8	6.8	4.82	1430	26.1	7.2	5.25	2025	29.3	7.1	5.08	2620	31.6	7.0	4.97
245	12.3	5.7	3.71	840	21.9	6.8	4.80	1435	26.1	7.2	5.24	2030	29.3	7.0	5.05	2625	31.4	7.1	5.17
250	12.3	5.9	3.88	845	21.9	6.8	4.83	1440	26.2	7.2	5.24	2035	29.3	7.1	5.07	2630	31.6	7.0	5.00
255	12.3	5.9	3.85	850	21.9	6.9	4.86	1445	26.3	7.1	5.11	2040	29.3	7.1	5.13	2635	31.8	6.8	4.82
260	12.7	5.8	3.83	855	22.0	6.8	4.80	1450	26.5	7.0	4.98	2045	29.2	7.2	5.23	2640	31.7	7.0	4.98
265	13.2	5.5	3.54	860	22.1	6.8	4.74	1455	26.4	7.1	5.07	2050	29.2	7.2	5.27	2645	31.7	6.9	4.93
270	13.7	5.2	3.27	865	22.0	6.9	4.92	1460	26.4	7.1	5.17	2055	29.3	7.2	5.21	2650	31.8	6.9	4.85
275	13.7	5.3	3.39	870	21.9	7.1	5.11	1465	26.4	7.2	5.19	2060	29.5	7.0	5.02	2655	31.8	6.9	4.85
280	13.7	5.4	3.50	875	22.0	7.1	5.08	1470	26.4	7.2	5.22	2065	29.4	7.1	5.03	2660	31.7	7.0	5.02
285	13.7	5.6	3.61	880	22.1	7.0	5.05	1475	26.5	7.1	5.17	2070	29.4	7.1	5.10	2665	32.0	6.7	4.71
290	13.7	5.7	3.72	885	22.1	7.0	5.06	1480	26.5	7.1	5.12	2075	29.5	7.0	5.01	2670	32.0	6.7	4.67
295	13.8	5.8	3.77	890	22.1	7.0	5.06	1485	26.5	7.1	5.14	2080	29.8	6.8	4.76	2675	31.9	6.8	4.81
300	13.9	5.8	3.81	895	22.2	7.1	5.09	1490	26.5	7.1	5.17	2085	29.7	6.9	4.89	2680	31.7	7.0	5.04
305	14.0	5.9	3.85	900	22.2	7.1	5.12	1495	26.5	7.2	5.24	2090	29.7	6.9	4.86	2685	31.9	6.8	4.83
310	14.1	5.9	3.88	905	22.3	7.1	5.09	1500	26.5	7.2	5.31	2095	29.8	6.8	4.78	2690	32.1	6.7	4.72
315	14.3	5.9	3.89	910	22.3	7.0	5.05	1505	26.5	7.2	5.27	2100	29.9	6.8	4.75	2695	32.1	6.7	4.71
320	14.4	5.9	3.90	915	22.4	7.0	4.99	1510	26.6	7.2	5.23	2105	29.8	6.8	4.81	2700	32.0	6.8	4.81
325	14.5	5.9	3.92	920	22.6	6.9	4.92	1515	26.6	7.2	5.20	2110	29.9	6.8	4.78	2705	32.0	6.8	4.80
330	14.6	5.9	3.93	925	22.7	6.9	4.85	1520	26.5	7.3	5.38	2115	29.9	6.8	4.76	2710	32.1	6.8	4.79
335	14.7	6.0	4.02	930	22.8	6.8	4.77	1525	26.6	7.3	5.37	2120	29.9	6.8	4.84	2715	32.1	6.7	4.71
340	14.7	6.2	4.12	935	22.8	6.8	4.83	1530	26.6	7.3	5.36	2125	29.9	6.9	4.89	2720	32.4	6.5	4.47
345	14.9	6.1	4.06	940	22.8	6.9	4.89	1535	26.6	7.4	5.44	2130	29.9	6.9	4.90	2725	32.2	6.7	4.63
350	15.1	6.0	3.99	945	22.8	6.9	4.87	1540	26.5	7.4	5.53	2135	29.8	6.9	4.94	2730	31.9	7.0	5.05
355	15.3	5.9	3.88	950	22.9	6.9	4.85	1545	26.5	7.5	5.58	2140	29.8	7.1	5.08	2735	31.6	7.4	5.44
360	15.6	5.8	3.78	955	23.0	6.8	4.81	1550	26.5	7.5	5.63	2145	29.9	6.9	4.92	2740	31.6	7.1	5.46
365	15.5	5.9	3.89	960	23.1	6.8	4.77	1555	26.7	7.3	5.39	2150	29.9	7.0	4.98	2745	31.9	7.0	5.06
370	15.5	6.0	4.01	965	23.1	6.7	4.73	1560	26.9	7.1	5.16	2155	29.8	7.1	5.10	2750	32.0	6.9	4.94
375	15.6	6.1	4.03	970	23.2	6.7	4.69	1565	26.9	7.2	5.23	2160	29.8	7.1	5.09	2755	32.0	7.0	4.98
380	15.7	6.1	4.05	975	23.3	6.6	4.62	1570	26.9	7.2	5.30	2165	29.9	7.0	5.00	2760	32.0	7.0	5.06
385	15.7	6.2	4.15	980	23.5	6.6	4.54	1575	27.0	7.2	5.23	2170	29.9	7.1	5.07	2765	32.2	6.8	4.80
390	15.7	6.3	4.25	985	23.5	6.6	4.52	1580											

Cable loss
Cable Coaxial, RG-58/RG-214, s/n 056, HL 0415
+ Cable Coaxial, RG-214, 11.5m, s/n 148, HL 0812

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	20	0.73	±0.12
2	30	0.91	
3	50	1.2	
4	80	1.56	
5	100	1.76	
6	200	2.59	
7	300	3.26	
8	400	3.93	
9	500	4.42	
10	600	4.92	
11	700	5.36	
12	800	5.88	
13	900	6.41	
14	1000	6.71	
15	1500	8.63	
16	2000	10.39	

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, Bird, 18 GHz, N-type, M-F, model TC-MNFN-3.0, S/N 211539 001
HL 2882

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.08	5750	1.78	12000	2.57
30	0.12	6000	1.84	12250	2.62
100	0.22	6250	1.87	12500	2.66
250	0.35	6500	1.92	12750	2.68
500	0.49	6750	1.96	13000	2.67
750	0.60	7000	2.01	13250	2.75
1000	0.68	7250	2.08	13500	2.77
1250	0.78	7500	2.12	13750	2.90
1500	0.85	7750	2.19	14000	3.00
1750	0.92	8000	2.22	14250	3.12
2000	0.98	8250	2.28	14500	2.98
2250	1.06	8500	2.29	14750	3.03
2500	1.11	8750	2.27	15000	2.99
2750	1.19	9000	2.28	15250	2.99
3000	1.25	9250	2.26	15500	2.98
3250	1.30	9500	2.29	15750	2.98
3500	1.34	9750	2.33	16000	2.99
3750	1.40	10000	2.34	16250	3.05
4000	1.45	10250	2.41	16500	3.11
4250	1.51	10500	2.46	16750	3.18
4500	1.54	10750	2.48	17000	3.23
4750	1.59	11000	2.48	17250	3.21
5000	1.63	11250	2.52	17500	3.22
5250	1.68	11500	2.53	17750	3.22
5500	1.72	11750	2.56	18000	3.25

Cable loss
Cable coaxial, Bird, 18 GHz, N-type, M-F, model TC-MNFN-3.0, S/N 211539 003
HL 2883

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	5750	1.70	12000	2.46
30	0.12	6000	1.75	12250	2.48
100	0.21	6250	1.80	12500	2.52
250	0.34	6500	1.81	12750	2.50
500	0.47	6750	1.86	13000	2.54
750	0.59	7000	1.86	13250	2.48
1000	0.67	7250	1.92	13500	2.63
1250	0.76	7500	1.96	13750	2.65
1500	0.84	7750	1.98	14000	2.72
1750	0.92	8000	2.02	14250	2.67
2000	0.98	8250	2.03	14500	2.70
2250	1.05	8500	2.05	14750	2.72
2500	1.12	8750	2.11	15000	2.79
2750	1.17	9000	2.17	15250	2.80
3000	1.22	9250	2.17	15500	2.83
3250	1.27	9500	2.20	15750	2.75
3500	1.33	9750	2.19	16000	2.82
3750	1.38	10000	2.22	16250	2.85
4000	1.42	10250	2.25	16500	2.90
4250	1.46	10500	2.30	16750	2.89
4500	1.51	10750	2.28	17000	2.88
4750	1.54	11000	2.32	17250	2.85
5000	1.59	11250	2.34	17500	2.96
5250	1.62	11500	2.39	17750	3.04
5500	1.65	11750	2.42	18000	3.04

Cable loss
Cable coaxial, Microwave Cable Assembly, 104EA, 18 GHz, 1.0 m
Suhner Sucoflex, HL 3386

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.05	5750	1.01	12000	1.29
30	0.07	6000	1.02	12250	1.33
100	0.12	6250	1.02	12500	1.36
250	0.18	6500	0.95	12750	1.35
500	0.26	6750	0.96	13000	1.36
750	0.32	7000	1.01	13250	1.39
1000	0.35	7250	1.04	13500	1.37
1250	0.41	7500	1.09	13750	1.43
1500	0.45	7750	1.12	14000	1.46
1750	0.50	8000	1.13	14250	1.39
2000	0.54	8250	1.15	14500	1.36
2250	0.57	8500	1.15	14750	1.47
2500	0.61	8750	1.15	15000	1.47
2750	0.64	9000	1.16	15250	1.41
3000	0.67	9250	1.14	15500	1.52
3250	0.70	9500	1.14	15750	1.54
3500	0.71	9750	1.19	16000	1.49
3750	0.74	10000	1.20	16250	1.48
4000	0.77	10250	1.22	16500	1.52
4250	0.80	10500	1.23	16750	1.56
4500	0.84	10750	1.22	17000	1.57
4750	0.85	11000	1.21	17250	1.53
5000	0.84	11250	1.24	17500	1.55
5250	0.85	11500	1.26	17750	1.55
5500	0.92	11750	1.28	18000	1.54

Cable loss
Cable coaxial, Microwave Cable Assembly, 104EA, 18 GHz, 1.0 m
Suhner Sucoflex, HL 3390

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.03	4800	0.55	9800	0.89	14900	1.07
30	0.04	4900	0.56	9900	0.89	15000	1.07
50	0.05	5000	0.57	10000	0.86	15100	1.08
100	0.07	5100	0.58	10100	0.86	15200	1.07
200	0.10	5200	0.58	10200	0.88	15300	1.09
300	0.12	5300	0.59	10300	0.92	15400	1.10
400	0.14	5400	0.59	10400	0.94	15500	1.10
500	0.16	5500	0.60	10500	0.96	15600	1.12
600	0.17	5600	0.61	10600	0.93	15700	1.15
700	0.18	5700	0.61	10700	0.89	15800	1.15
800	0.20	5800	0.63	10800	0.89	15900	1.17
900	0.21	5900	0.63	10900	0.88	16000	1.14
1000	0.23	6000	0.64	11000	0.92	16100	1.14
1100	0.24	6100	0.64	11100	0.91	16200	1.15
1200	0.25	6200	0.64	11200	0.89	16300	1.14
1300	0.27	6300	0.65	11300	0.88	16400	1.13
1400	0.28	6400	0.65	11400	0.88	16500	1.13
1500	0.28	6500	0.66	11500	0.90	16600	1.13
1600	0.30	6600	0.67	11600	0.94	16700	1.14
1700	0.31	6700	0.67	11700	0.96	16800	1.14
1800	0.32	6800	0.67	11800	0.92	16900	1.14
1900	0.33	6900	0.68	11900	0.92	17000	1.14
2000	0.34	7000	0.67	12000	0.91	17100	1.15
2100	0.35	7100	0.68	12100	0.92	17200	1.14
2200	0.35	7200	0.69	12200	0.95	17300	1.15
2300	0.36	7300	0.69	12300	0.98	17400	1.15
2400	0.37	7400	0.68	12400	0.96	17500	1.16
2500	0.39	7500	0.69	12500	0.99	17600	1.16
2600	0.40	7600	0.70	12600	0.96	17700	1.16
2700	0.41	7700	0.71	12700	0.93	17800	1.19
2800	0.42	7800	0.72	12800	0.94	17900	1.21
2900	0.42	7900	0.72	12900	0.98	18000	1.25
3000	0.43	8000	0.72	13000	0.99		
3100	0.44	8100	0.73	13100	0.99		
3200	0.45	8200	0.74	13200	0.99		
3300	0.46	8300	0.75	13300	0.99		
3400	0.46	8400	0.74	13400	1.00		
3500	0.47	8500	0.73	13500	1.02		
3600	0.47	8600	0.73	13600	1.05		
3700	0.47	8700	0.75	13700	1.03		
3800	0.49	8800	0.77	13800	1.02		
3900	0.49	8900	0.77	13900	1.03		
4000	0.50	9000	0.77	14000	1.03		
4100	0.51	9100	0.77	14100	1.05		
4200	0.52	9200	0.78	14200	1.05		
4300	0.52	9300	0.80	14300	1.04		
4400	0.53	9400	0.82	14400	1.03		
4500	0.53	9500	0.82	14600	1.06		
4600	0.54	9600	0.83	14700	1.07		
4700	0.56	9700	0.89	14800	1.08		

Cable loss
Cable coaxial, RG-214/U, N type-N type, 6 m
Alpha Wire, HL 3622

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	2100	2.95	4400	4.99
30	0.24	2200	2.99	4500	5.00
50	0.32	2300	3.11	4600	5.17
100	0.47	2400	3.16	4700	5.18
200	0.70	2500	3.31	4800	5.33
300	0.88	2600	3.36	4900	5.34
400	1.05	2700	3.46	5000	5.50
500	1.21	2800	3.52	5100	5.56
600	1.36	2900	3.65	5200	5.76
700	1.49	3000	3.70	5300	5.76
800	1.63	3100	3.82	5400	5.85
900	1.72	3200	3.88	5500	5.88
1000	1.84	3300	3.99	5600	5.96
1100	1.96	3400	4.08	5700	6.02
1200	2.06	3500	4.19	5800	6.06
1300	2.15	3600	4.28	5900	6.14
1400	2.28	3700	4.42	6000	6.17
1500	2.35	3800	4.40	6100	6.28
1600	2.43	3900	4.51	6200	6.36
1700	2.57	4000	4.62	6300	6.47
1800	2.62	4100	4.70	6400	6.51
1900	2.75	4200	4.78	6500	6.65
2000	2.80	4300	4.83		

Cable loss
Cable coaxial, RG-214/U, N type-N type, 5.4 m
Alpha Wire, HL 3632

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	1750	2.12	3550	3.45	5350	4.75
30	0.17	1800	2.15	3600	3.48	5400	4.76
50	0.24	1850	2.16	3650	3.53	5450	4.80
100	0.35	1900	2.23	3700	3.57	5500	4.82
150	0.45	1950	2.25	3750	3.60	5550	4.88
200	0.54	2000	2.34	3800	3.64	5600	4.90
250	0.64	2050	2.36	3850	3.67	5650	4.94
300	0.69	2100	2.41	3900	3.73	5700	4.98
350	0.76	2150	2.46	3950	3.81	5750	5.01
400	0.83	2200	2.51	4000	3.81	5800	5.07
450	0.90	2250	2.52	4050	3.81	5850	5.13
500	0.95	2300	2.56	4100	3.90	5900	5.15
550	1.02	2350	2.57	4150	3.88	5950	5.20
600	1.07	2400	2.61	4200	3.92	6000	5.26
650	1.14	2450	2.68	4250	3.99	6050	5.28
700	1.18	2500	2.68	4300	4.01	6100	5.30
750	1.24	2550	2.72	4350	4.04	6150	5.37
800	1.31	2600	2.75	4400	4.05	6200	5.39
850	1.33	2650	2.79	4450	4.09	6250	5.45
900	1.38	2700	2.83	4500	4.18	6300	5.48
950	1.41	2750	2.89	4550	4.18	6350	5.52
1000	1.51	2800	2.91	4600	4.19	6400	5.56
1050	1.52	2850	2.96	4650	4.22	6450	5.61
1100	1.55	2900	2.97	4700	4.29	6500	5.62
1150	1.62	2950	3.00	4750	4.30		
1200	1.66	3000	3.04	4800	4.32		
1250	1.68	3050	3.08	4850	4.37		
1300	1.76	3100	3.12	4900	4.39		
1350	1.78	3150	3.18	4950	4.47		
1400	1.80	3200	3.20	5000	4.51		
1450	1.86	3250	3.24	5050	4.50		
1500	1.92	3300	3.27	5100	4.53		
1550	1.95	3350	3.32	5150	4.59		
1600	1.97	3400	3.35	5200	4.63		
1650	2.04	3450	3.41	5250	4.64		
1700	2.07	3500	3.42	5300	4.66		

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
DC	direct current
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
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

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