

TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C § 15.247 (FHSS)

FOR:

Telematics Wireless Ltd.
Water meter booster
Model:Booster 2

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1 Applicant information

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Contact name: Mr. Slava Snitkovsky

2 Equipment under test attributes

Product name: Water reader (Booster)
Product type: Transceiver
Model(s): Booster 2
Part number: 06535109
Receipt date: 3/06/2011

3 Manufacturer information

Manufacturer name: Telematics Wireless Ltd.
Address: 26 Hamelaha street, POB 1911, Holon, 58117, Israel
Telephone: +972 3557 5767
Fax: +972 3557 5753
E-Mail: slavas@tlmw.com
Contact name: Mr. Slava Snitkovsky

4 Test details

Project ID: 21789
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 3/06/2011
Test completed: 3/16/2011
Test specification(s): FCC 47CFR part 15, subpart C, §15.247

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.247(b), Peak output power	Pass
Section 15.247(i), RF exposure	Pass, the exhibit to the application of certification is provided
Section 15.247(d), Emissions at band edges	Pass
Section 15.247(d), Radiated spurious emissions	Pass

The antenna was changed in the certified product FCC ID:NTAWB2. Only relevant tests were performed for updated product. Full test results are provided in the test reports TELRAD_FCC.20425_DTS_rev1 and TELRAD_FCC.20425_FHSS_rev1.

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	March 16, 2011	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	March 31, 2011	
Approved by:	Mr. M. Nikishin, EMC and radio group manager	April 3, 2011	

6 EUT description

6.1 General information

The EUT, water meter booster (WMB), is a transceiver operating in three transmit modes: 905.55-924.75 MHz range (FHSS and DTS, PSK modulation) and @916.3 MHz (DTS, FSK modulation) without simultaneous operation.

The WMB communicates by a RF channel (path No.2 is Tx with PSK modulation and path No.4 is Rx at 916.3 MHz) with up to 2 meters and collects their data. The collected data is transmitted by the WMB towards the concentrator by the RF channel path No.1 using a Frequency Hopping or Direct Sequence Spread Spectrum techniques. The EUT receives the programming parameters and commands from a programmer and transmits the response (path No.5 is Tx with FSK modulation and path No.3 is Rx at 916.3 MHz).

Figure 6.1.1 EUT operational modes block diagram

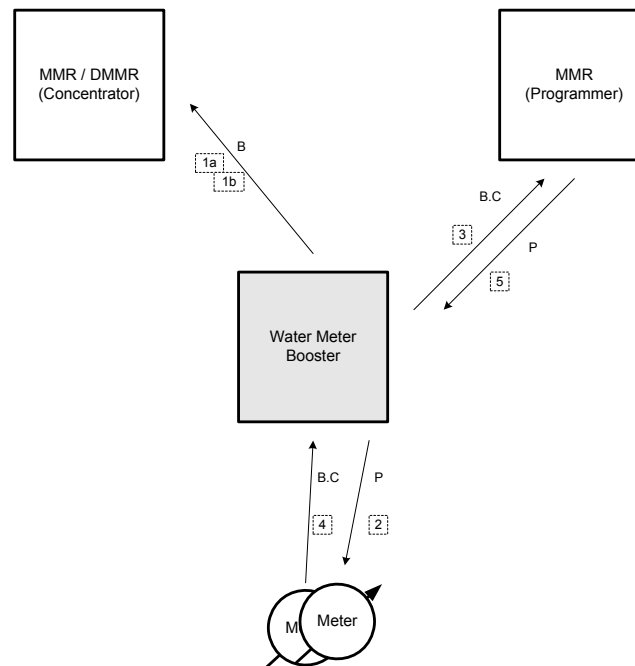


Table 6.1.1 EUT operational modes overview

Modulation technique	Low frequency	Mid frequency	High frequency	Power setting
Frequency-hopping spread spectrum (FHSS), External antenna	905. 55	915.00	924.75	85
Direct-Sequence Spread Spectrum (DSSS) FSK, External antenna	–	916.30	–	1E
Direct-Sequence Spread Spectrum (DSSS) FSK, Internal antenna	–	916.30	–	NA
Direct-Sequence Spread Spectrum (DSSS) PSK, External antenna	905.55	915.00	924.75	6A

6.2 Transmitter characteristics

Type of equipment							
Stand-alone (Equipment with or without its own control provisions)							
X	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			
X	mobile			Always at a distance more than 20 cm from all people			
portable				May operate at a distance closer than 20 cm to human body			
Assigned frequency range				902-928 MHz			
Operating frequency range				905.55-924.75 MHz			
RF channel spacing				NA			
Maximum rated output power				At transmitter 50 Ω RF output connector		NA	
				Peak output power		28.80 dBm	
Is transmitter output power variable?				X	No		
				Yes	continuous variable		
					stepped variable with stepsize		
					dB		
				minimum RF power		dBm	
				maximum RF power		dBm	
Antenna connection							
unique coupling		standard connector		X	integral		with temporary RF connector
							X without temporary RF connector
Antenna/s technical characteristics							
Type		Manufacturer		Model number		Gain	
Integrated		Telematics Wireless		Printed OMNI antenna		3 dBi	
Transmitter aggregate data rate/s				60 kbps			
Transmitter aggregate symbol (baud) rate/s				NA			
Modulating test signal (baseband)				PRBS			
Maximum transmitter duty cycle in normal use				0.1%			
Transmitter duty cycle supplied for test (FHSS)				1.22%	Tx ON time	5.12 msec	Period 420 msec
Transmitter power source							
X	Battery	Nominal rated voltage	3.6 VDC	Battery type	Lithium		
	DC	Nominal rated voltage	VDC				
	AC mains	Nominal rated voltage	VAC	Frequency			
Spread spectrum parameters for transmitters tested per FCC 15.247 only							
FHSS	Total number of hops		54				
	Bandwidth per hop		237 kHz				
	Max. separation of hops		322 kHz				

Test specification:	Section 15.247(b), Peak output power		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date:	3/13/2011		
Temperature: 21 °C	Air Pressure: 1024 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C §15.247 (FHSS) requirements

7.1 Peak output power

7.1.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.1.1.

Table 7.1.1 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	30	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.

7.1.2 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 adjusted to produce maximum available to end user RF output power.

7.1.2.3 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.

7.1.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.1.2 and associated plots.

7.1.2.5 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.

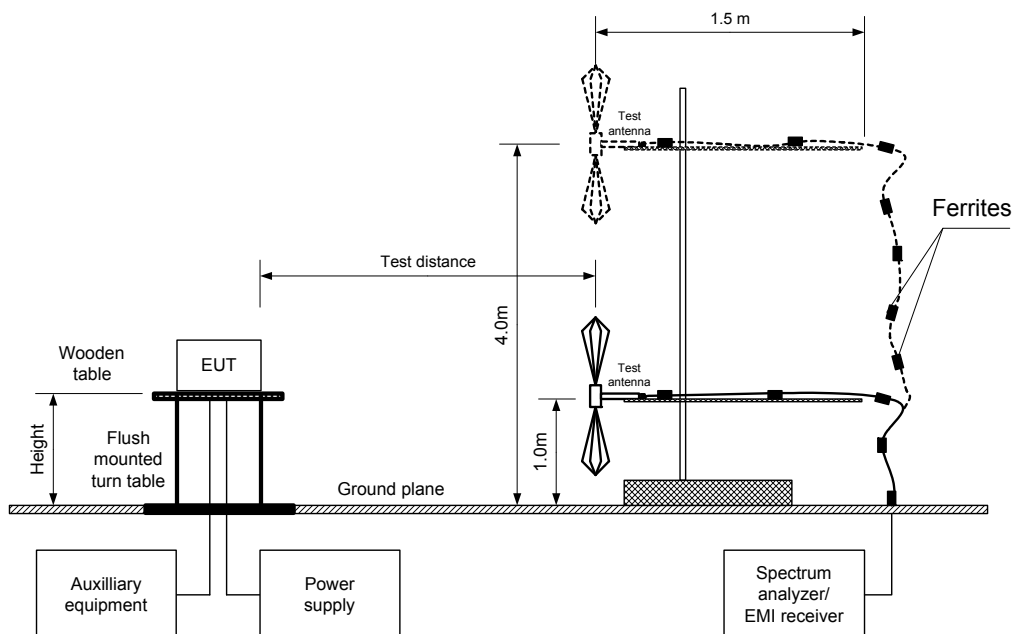
The above equation was converted in logarithmic units for 3 m test distance:

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

7.1.2.6 The worst test results (the lowest margins) were recorded in Table 7.1.2.

Test specification:		Section 15.247(b), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:	Compliance	Verdict:	PASS
Date:	3/13/2011		
Temperature: 21 °C	Air Pressure: 1024 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Figure 7.1.1 Setup for carrier field strength measurements



Test specification:		Section 15.247(b), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:	Compliance	Verdict:	PASS
Date:	3/13/2011		
Temperature: 21 °C	Air Pressure: 1024 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Table 7.1.2 Peak output power test results

ASSIGNED FREQUENCY: 902-928MHz
 TEST DISTANCE: 3 m
 TEST SITE: Semi anechoic chamber
 EUT HEIGHT: 0.8 m
 DETECTOR USED: Peak
 TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (above 1000 MHz)
 MODULATION: FSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 60 kbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 120 kHz
 VIDEO BANDWIDTH: 300 kHz
 FREQUENCY HOPPING: Disabled
 NUMBER OF FREQUENCY HOPPING CHANNELS: 54

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
905.55	127.00	V	1.1	0	3	28.80	30	-1.20	Pass
915.00	126.93	V	1.1	0	3	28.73	30	-1.27	Pass
924.75	125.86	V	1.1	0	3	27.66	30	-2.34	Pass

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

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

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

Note: Maximum peak output power was obtained at Unom input power voltage.

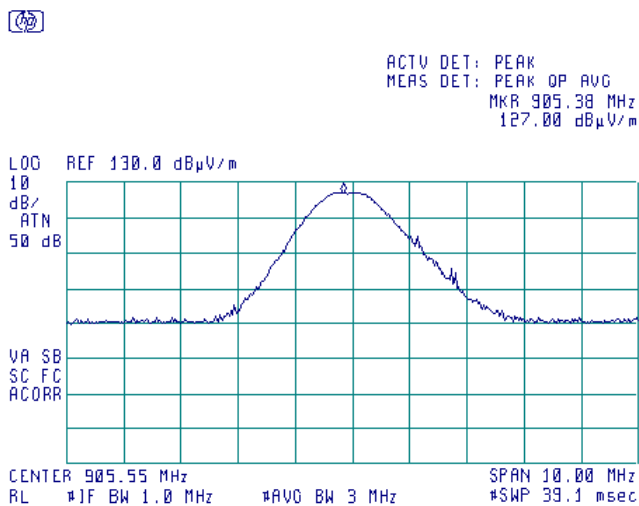
Reference numbers of test equipment used

HL 0521	HL 0604	HL 2871	HL 3623				
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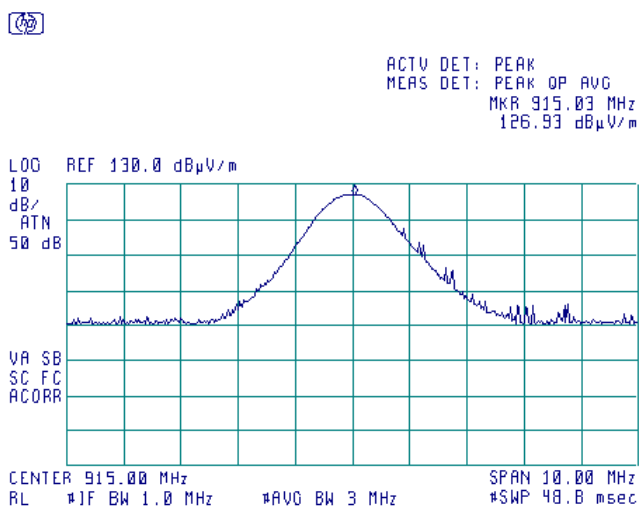
Full description is given in Appendix A.

Test specification:	Section 15.247(b), Peak output power		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date:	3/13/2011		
Temperature: 21 °C	Air Pressure: 1024 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Plot 7.1.1 Field strength of carrier at low frequency

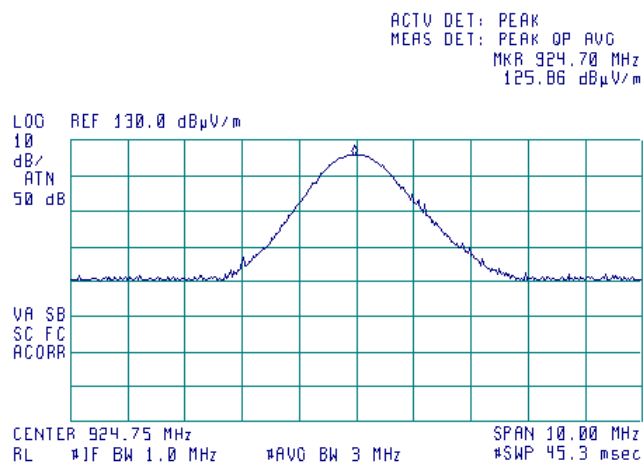


Plot 7.1.2 Field strength of carrier at mid frequency



Test specification:		Section 15.247(b), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		3/13/2011	
Temperature: 21 °C	Air Pressure: 1024 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Plot 7.1.3 Field strength of carrier at high frequency



Test specification:		Section 15.247(c), Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		3/13/2011	
Temperature: 21 °C	Air Pressure: 1024 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

7.2 Band edge radiated emissions

7.2.1 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 7.2.1.

Table 7.2.1 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.

7.2.2 Test procedure

- 7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized normally modulated at the maximum data rate with its hopping function disabled and its proper operation was checked.
- 7.2.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.
- 7.2.2.3 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.
- 7.2.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.
- 7.2.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.2.2 and associated plots and referenced to the highest emission level measured within the authorized band.
- 7.2.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.
- 7.2.2.7 The above procedure was repeated with the frequency hopping function enabled.

Figure 7.2.1 Band edge emission test setup



Test specification:		Section 15.247(c), Emissions at band edges			
Test procedure:		Public notice DA 00-705			
Test mode:		Compliance		Verdict: PASS	
Date:		3/13/2011			
Temperature: 21 °C		Air Pressure: 1024 hPa		Relative Humidity: 48 %	Power Supply: Battery
Remarks:					

Table 7.2.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 902-928 MHz
DETECTOR USED: Peak
MODULATION: FSK
MODULATING SIGNAL: PRBS
BIT RATE: 60 kbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
VIDEO BANDWIDTH: $\geq$ RBW

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Frequency hopping disabled						
905.55	83.25	127.08	-43.83	20.0	-23.83	Pass
924.75	82.71	125.96	-43.25		-23.25	
Frequency hopping enabled						
905.55	91.47	127.08	-35.61	20.0	-15.61	Pass
924.75	91.37	125.96	-34.59		-14.59	

*- Margin = Attenuation below carrier – specification limit.

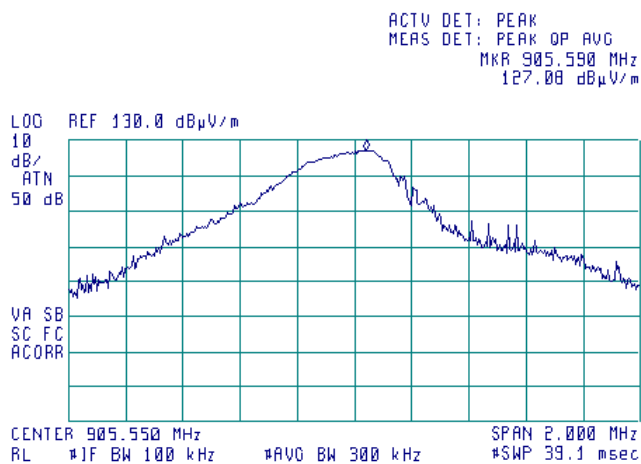
Reference numbers of test equipment used

HL 0521	HL 0604	HL 2871	HL 3121				
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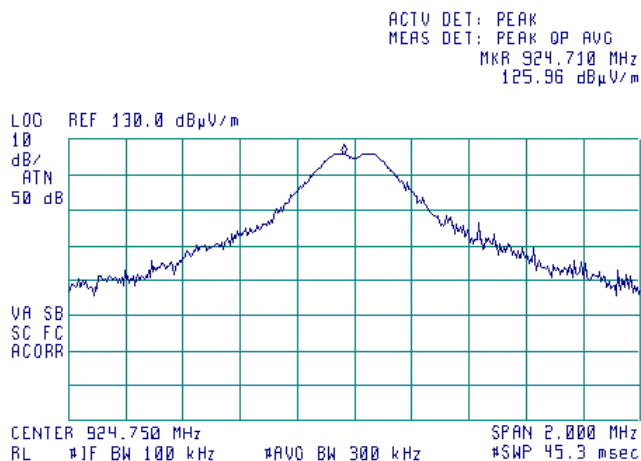
Full description is given in Appendix A.

Test specification:		Section 15.247(c), Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		3/13/2011	
Temperature: 21 °C	Air Pressure: 1024 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.2.1 The highest emission level within the assigned band at low carrier frequency

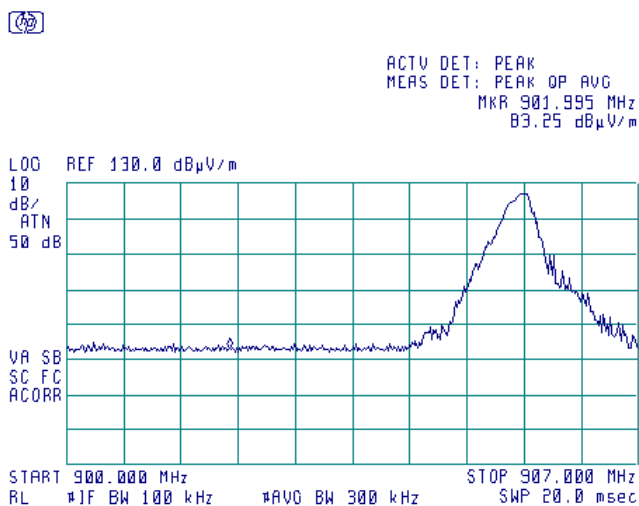


Plot 7.2.2 The highest emission level within the assigned band at high carrier frequency

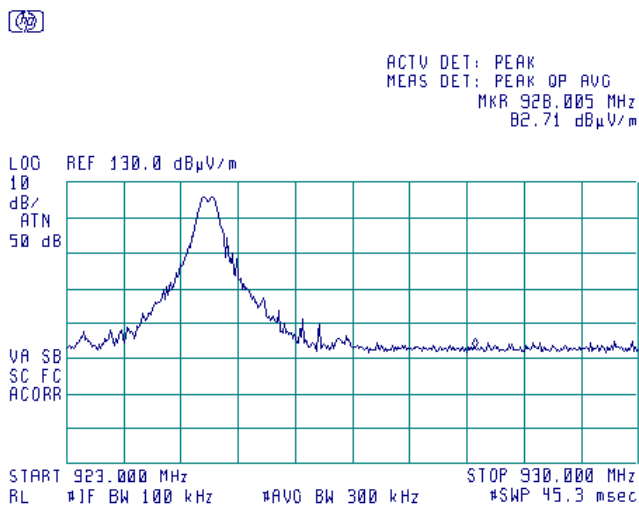


Test specification:		Section 15.247(c), Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		3/13/2011	
Temperature: 21 °C	Air Pressure: 1024 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.2.3 The highest band edge emission at low carrier frequency with hopping function disabled

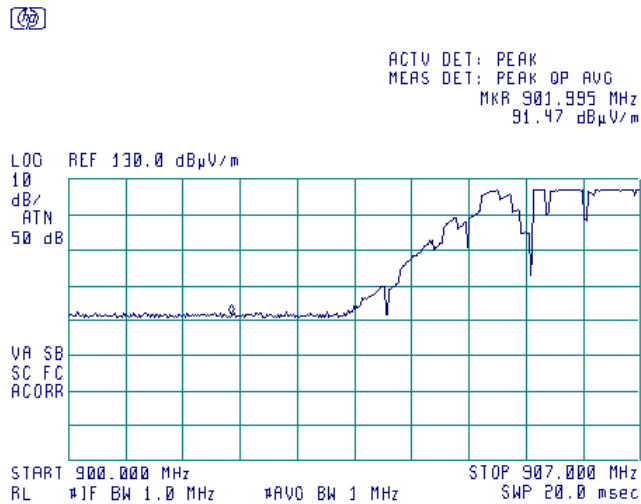


Plot 7.2.4 The highest band edge emission at high carrier frequency with hopping function disabled

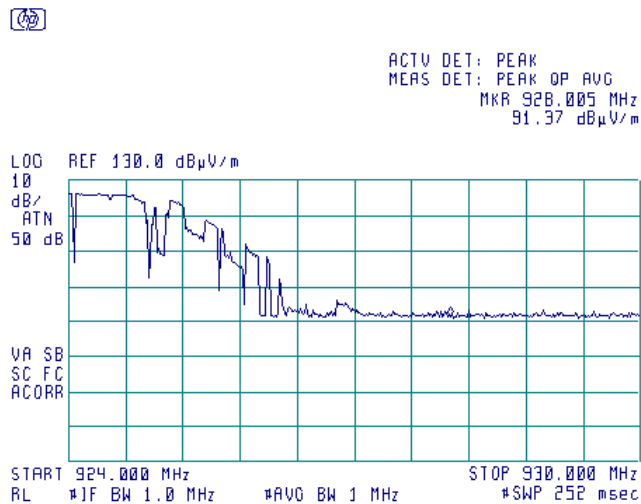


Test specification:		Section 15.247(c), Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date:		3/13/2011	
Temperature: 21 °C	Air Pressure: 1024 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.2.5 The highest band edge emission at low carrier frequency with hopping function enabled



Plot 7.2.6 The highest band edge emission at high carrier frequency with hopping function enabled



Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

7.3 Field strength of spurious emissions

7.3.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3m 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.

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

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

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

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

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

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

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

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

Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

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

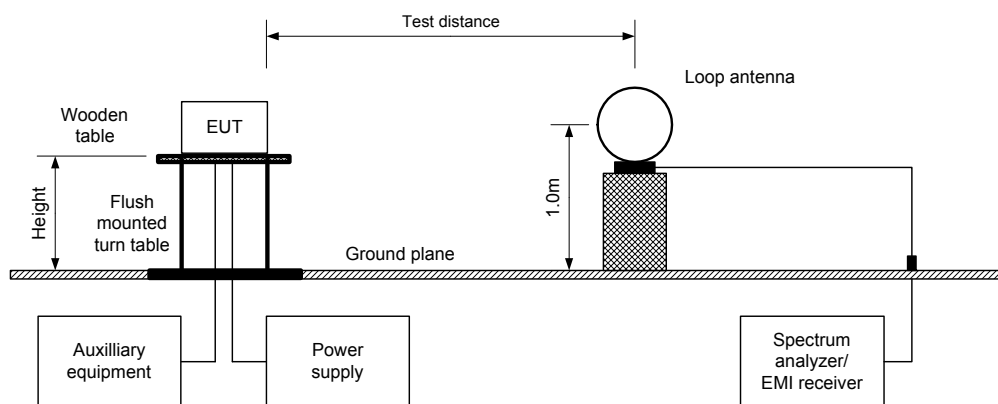
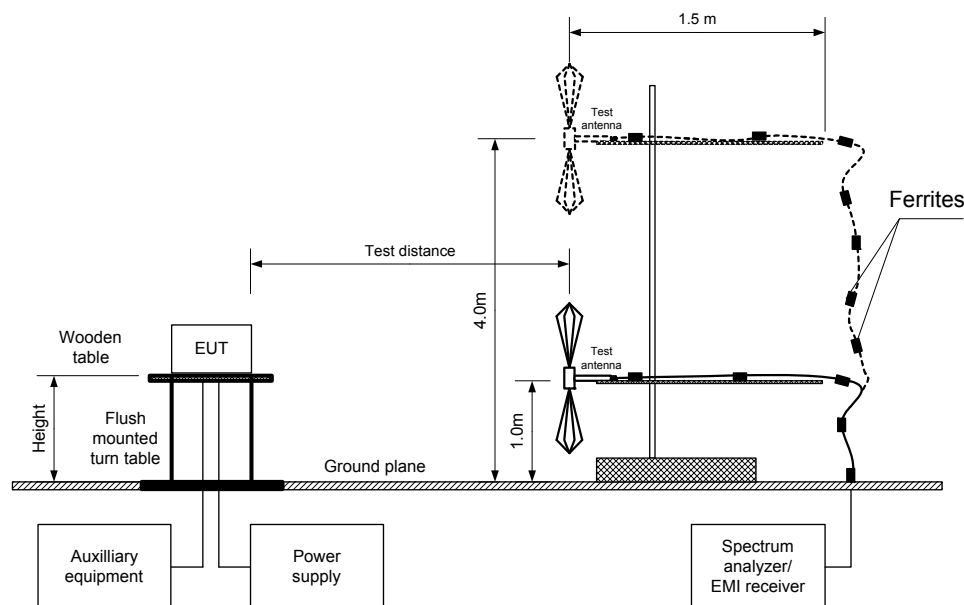


Figure 7.3.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011			
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery	
Remarks:				

Table 7.3.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY RANGE: 902 - 928 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 - 10000 MHz
 TEST DISTANCE: 3 m
 MODULATION: FHSS
 BIT RATE: 60 kbps
 MODULATING SIGNAL: PRBS
 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

REQUESTING FIRM:										Device
-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										
1811.170	62.86	Vert	1.2	0	127.08	-64.22	20.0	-44.22	Pass	
6338.9	54.11	Vert	1.0	45		-72.97		-52.97		
7243.942	58.18	Vert	1.1	42		-68.90		-48.90		
Mid carrier frequency										
1830	65.35	Vert	1.23	15	126.95	-61.60	20.0	-41.60	Pass	
5489.630	57.58	Vert	1.18	35		-69.37		-49.37		
6405	52.89	Vert	0.91	49		-74.06		-54.06		
High carrier frequency										
1849.580	73.36	Vert	1.26	328.2	125.96	-52.60	20.0	-32.60	Pass	
5548.130	58.05	Vert	1.12	58		-67.91		-47.91		
6473.3	51.43	Vert	1.0	45		-74.53		-54.53		
9247.5	50.13	Vert	1.05	85		-75.83		-55.83		

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

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

Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011			
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery	
Remarks:				

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

ASSIGNED FREQUENCY RANGE: 902 – 928 MHz
 INVESTIGATED FREQUENCY RANGE: 1000 - 10000 MHz
 TEST DISTANCE: 3 m
 MODULATION: FHSS
 MODULATING SIGNAL: PRBS
 BIT RATE: 60 kbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 TEST ANTENNA TYPE: Double ridged guide
 FREQUENCY HOPPING: Disabled

REQUENCY HOPPING				Disabled								
frequency MHz	Antenna		'azimuth degrees'	'Peak field strength'(VBW=3 MHz			Average field strength'(VBW=200Hz****)				Verdict	
	'olarization	height m		'easured dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	'easured dB(μV/m)	'alculated dB(μV/m)	Limit, dB(μV/m)	Margin dB***		
Low carrier frequency												
1219.520	Vert	1.0	0	52.18	74.0	21.82	33.32	7.32	54.0	46.68	Pass	
2716.7	Vert	1.1	360	69	74.0	5	66.99	40.99	54.0	13.01		
3622.20	Vert	1.0	150	60.44	74.0	13.56	58.01	32.01	54.0	21.99		
4527.800	Vert	1.0	101	62.6	74.0	11.4	60	34	54.0	20		
5433.3	Vert	1.2	120	61.73	74.0	12.27	58.75	32.75	54.0	21.25		
7244.4	Vert	1.0	122	64.3	74.0	9.7	58.16	32.16	54.0	21.84		
8114.95	Vert	1.01	38	57.46	74.0	16.54	51.6	25.6	54.0	28.4		
9055.5	Vert	1.0	85	50.29	74.0	23.71	40.1	14.1	54.0	39.9		
Mid carrier frequency												
1459.596	Vert	1.0	0	57.07	74.0	16.93	57	31	54.0	23	Pass	
2745	Vert	1.3	26.6	71.3	74.0	2.7	62.57	36.57	54.0	17.43		
3660	Vert	1.0	187	61.23	74.0	12.77	57.87	31.87	54.0	22.13		
4575	Vert	1.0	92.3	63.59	74.0	10.41	62.2	36.2	54.0	17.8		
5490	Vert	1.1	115	61.66	74.0	12.34	59.35	33.35	54.0	20.65		
7320	Vert	1.0	141	62.07	74.0	11.93	57.53	31.53	54.0	22.47		
8235	Vert	1.05	24	60.52	74.0	13.48	56.53	30.53	54.0	23.47		
9150	Vert	1.0	84	45.38	74.0	28.62	35.42	9.42	54.0	44.58		
High carrier frequency												
1462.684	Vert	1.0	0	57.46	74.0	16.54	34.58	8.58	54.0	45.42	Pass	
2774.3	Vert	1.29	36	67.63	74.0	6.37	64.23	38.23	54.0	15.77		
3699	Vert	1.0	151	61.33	74.0	12.67	60.11	34.11	54.0	19.89		
4623.8	Vert	1.0	132.2	63.18	74.0	10.82	61.7	35.7	54.0	18.3		
5548.5	Vert	1.15	112	59.11	74.0	14.89	52.7	26.7	54.0	27.3		
7398	Vert	1.0	142	62.51	74.0	11.49	58.47	32.47	54.0	21.53		
8322.75	Vert	1.05	32	57.39	74.0	16.61	52.97	26.97	54.0	27.03		

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

**** - VBW >= 1/T, where T is transmitter ON duration

Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Table 7.3.4 Average factor calculation for FHSS modulation

Transmission pulse		Average factor, dB
Duration, ms	Period, ms	
5.12	420	-25.81

*- 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:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011			
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery	
Remarks:				

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

ASSIGNED FREQUENCY: 902 – 928 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 TEST DISTANCE: 3 m
 MODULATION: FHSS
 MODULATING SIGNAL: PRBS
 BIT RATE: 60 kbps
 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 MHz		Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*					
Low carrier frequency									
402.449		40.45	21.20	46.0	-24.80	Vert	1.0	0	Pass
609.575		46.12	27.80	46.0	-18.20	Vert	1.0	10	
986.369		50.90	40.92	54.0	-13.08	Vert	1.2	10	
Mid carrier frequency									
407.712		41.83	19.40	46.0	-26.60	Vert	1.0	0	Pass
612.305		49.11	22.39	46.0	-23.61	Vert	1.0	10	
970.427		56.40	42.94	54.0	-11.06	Vert	1.2	10	
High carrier frequency									
407.736		43.76	18.83	46.0	-27.17	Vert	1.0	0	Pass
611.330		52.33	28.44	46.0	-17.56	Vert	1.0	15	
980.220		52.07	39.50	54.0	-14.50	Vert	1.2	15	

*- Margin = Measured emission - specification limit.

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

Table 7.3.6 Restricted bands

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

Reference numbers of test equipment used

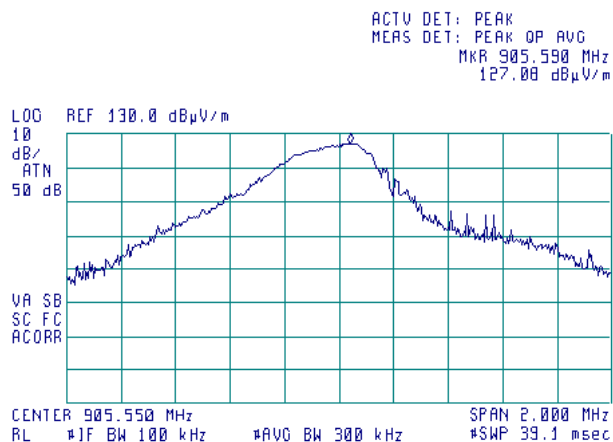
HL 0446	HL 0521	HL 0604	HL 1424	HL 1984	HL 3121	HL 2870	HL 2871
HL 2909	HL 3344	HL 3623	HL 3883				

Full description is given in Appendix A.

Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

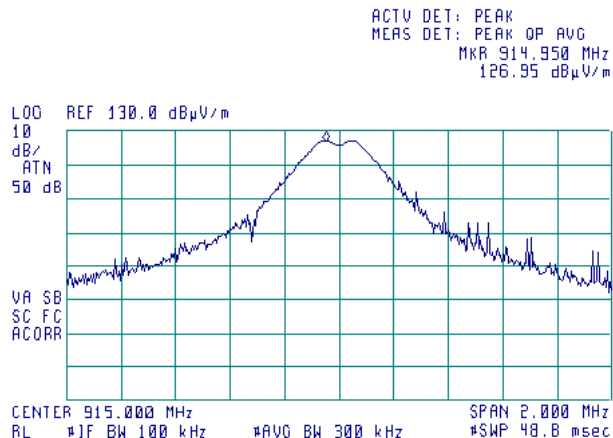
Plot 7.3.1 Radiated emission measurements at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATIONAL MODE: FHSS
ANTENNA: External



Plot 7.3.2 Radiated emission measurements at the mid carrier frequency

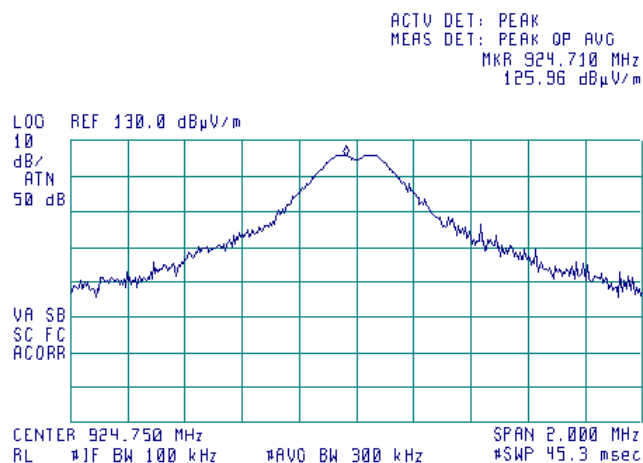
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATIONAL MODE: FHSS
ANTENNA: External



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Plot 7.3.3 Radiated emission measurements at the high carrier frequency

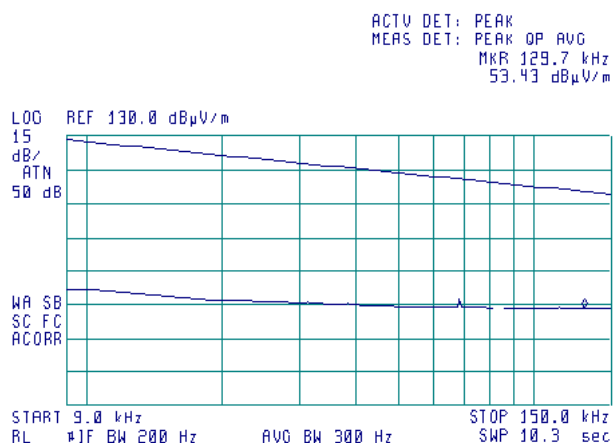
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATIONAL MODE: FHSS
ANTENNA: External



Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

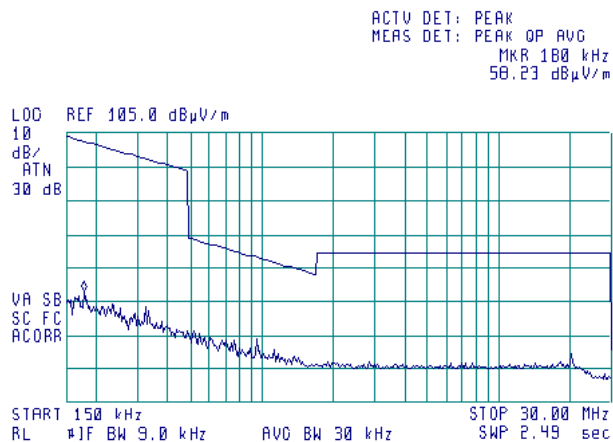
Plot 7.3.4 Radiated emission measurements from 9 to 150 kHz at the low; mid; high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
OPERATIONAL MODE: FHSS



Plot 7.3.5 Radiated emission measurements from 0.15 to 30 MHz at the low; mid; high carrier frequency

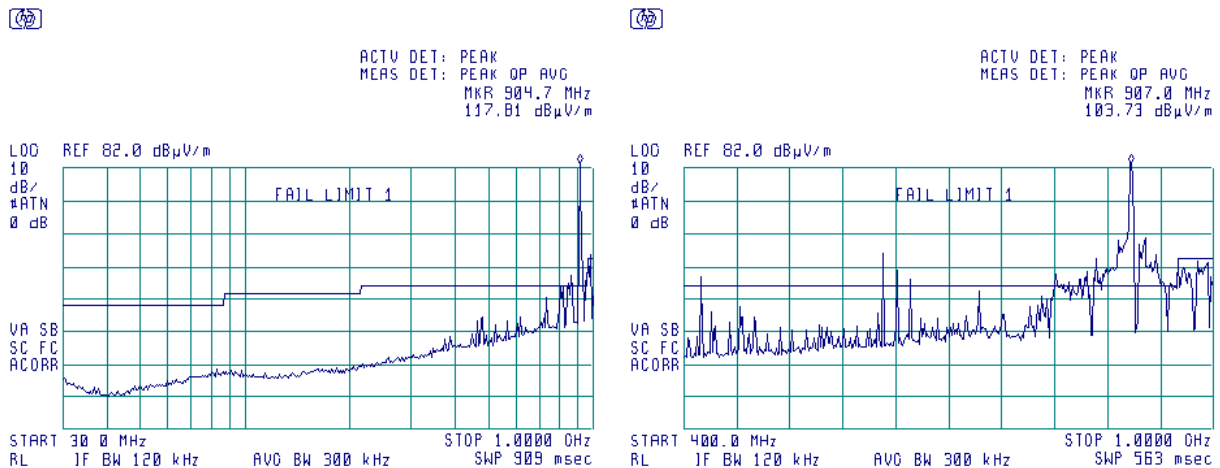
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
OPERATIONAL MODE: FHSS



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Plot 7.3.6 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

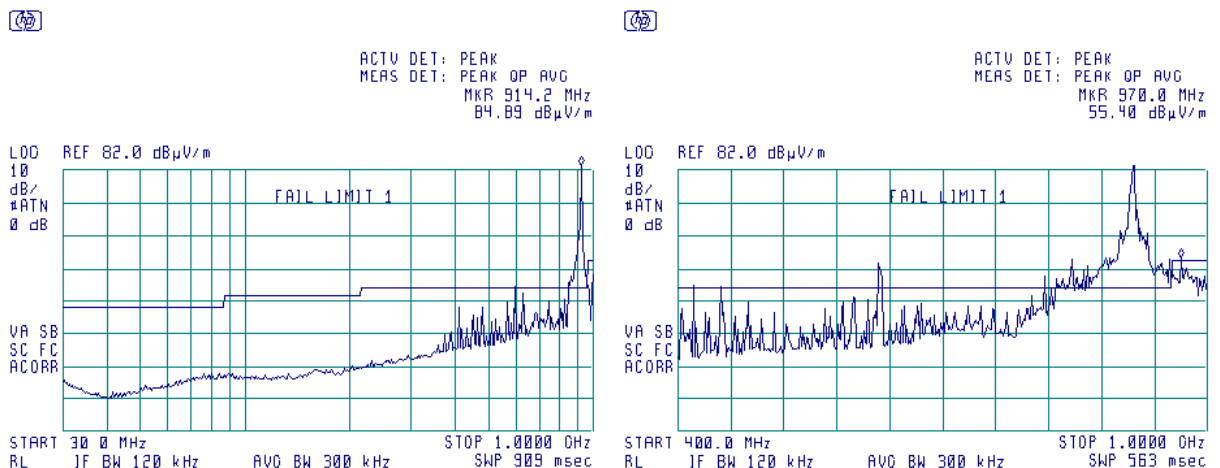
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS



Note: Due to large span used, frequency appears off. Actual frequency of fundamental is 905.55 MHz

Plot 7.3.7 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

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

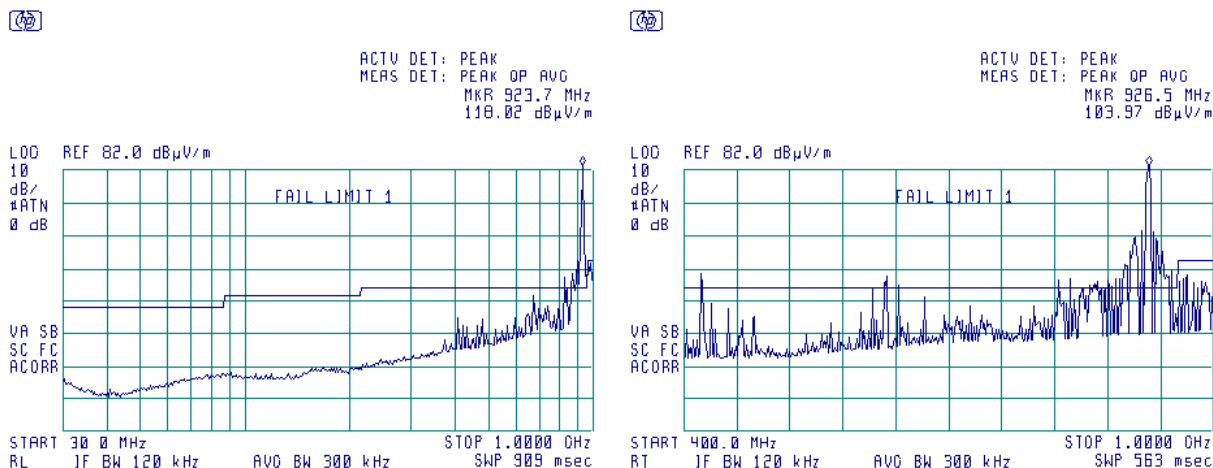


Note: Due to large span used, frequency appears off. Actual frequency of fundamental is 915 MHz

Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Plot 7.3.8 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

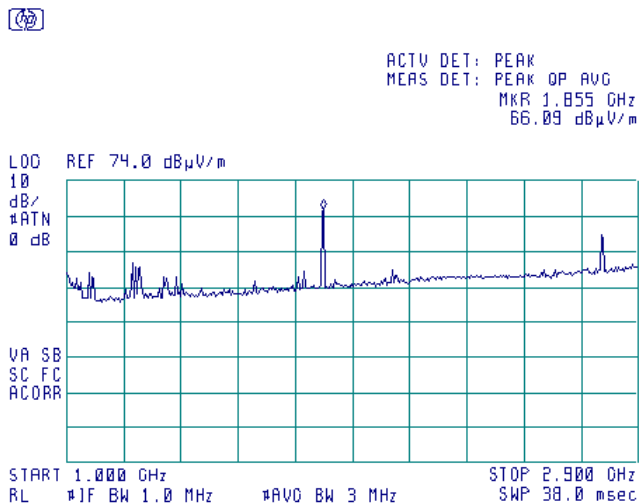
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS



Note: Due to large span used, frequency appears off. Actual frequency of fundamental is 924.75 MHz

Plot 7.3.9 Radiated emission measurements from 1000 to 2900 MHz at the low carrier frequency

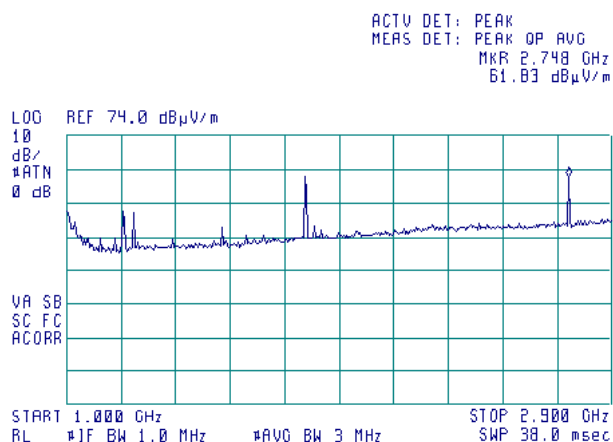
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS
DETECTOR: Peak



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

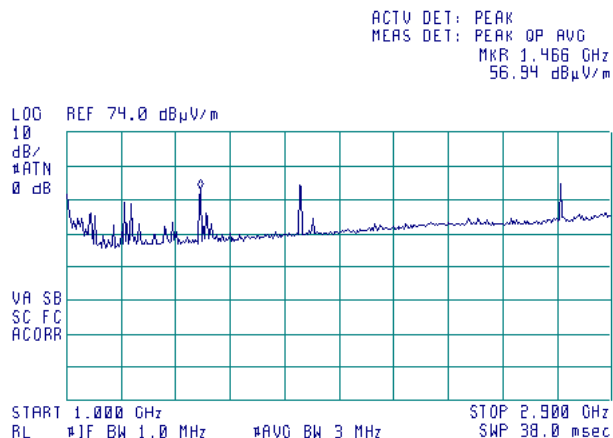
Plot 7.3.10 Radiated emission measurements from 1000 to 2900 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS
DETECTOR: Peak



Plot 7.3.11 Radiated emission measurements from 1000 to 2900 MHz at the high carrier frequency

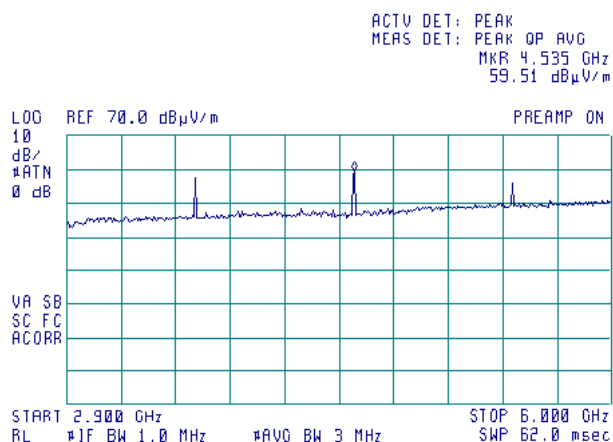
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS
DETECTOR: Peak



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

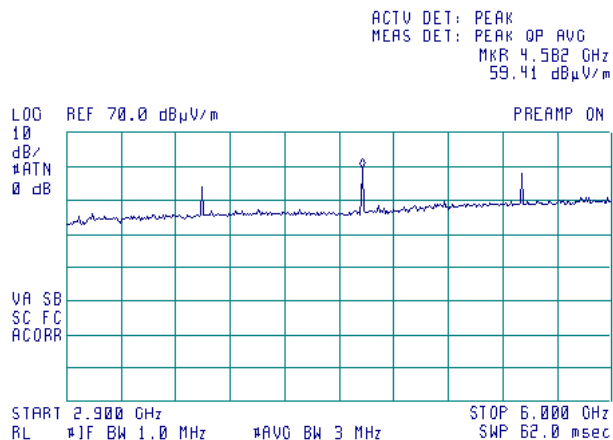
Plot 7.3.12 Radiated emission measurements from 2900 to 6000 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS
DETECTOR: Peak



Plot 7.3.13 Radiated emission measurements from 2900 to 6000 MHz at the mid carrier frequency

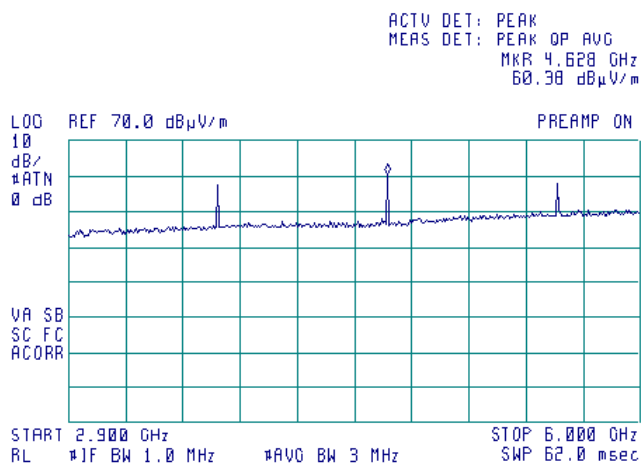
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS
DETECTOR: Peak



Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

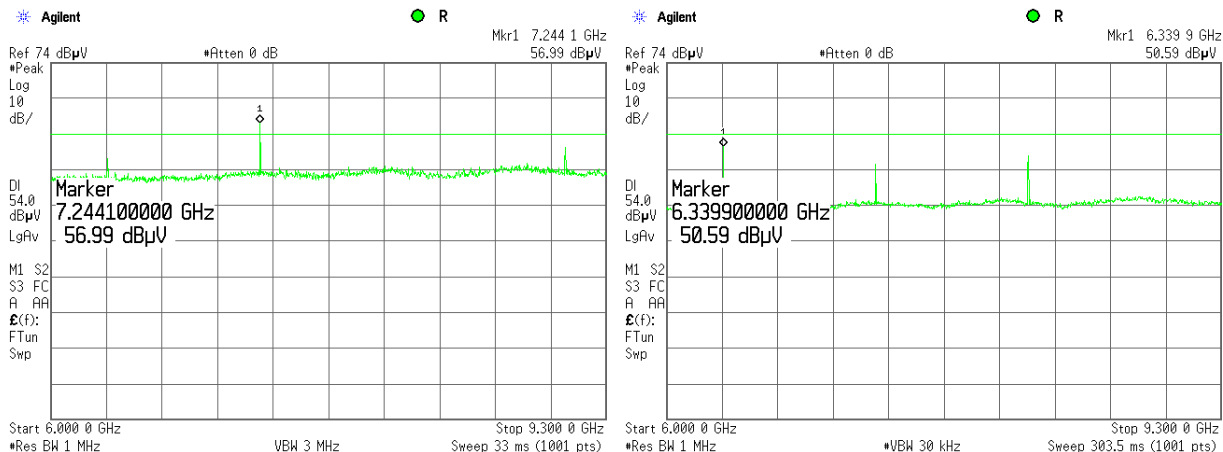
Plot 7.3.14 Radiated emission measurements from 2900 to 6000 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS
DETECTOR: Peak



Plot 7.3.15 Radiated emission measurements from 6000 to 9300 MHz at the low carrier frequency

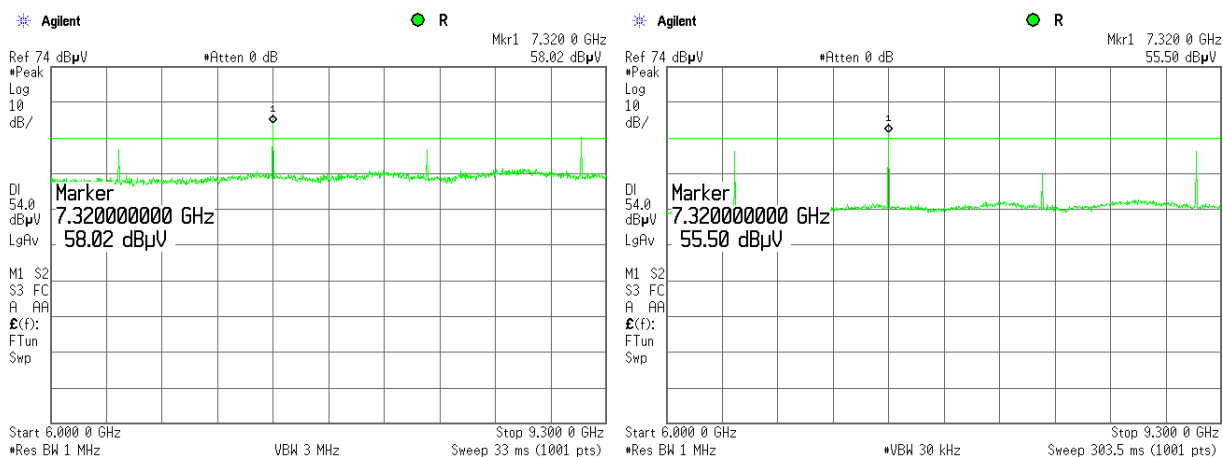
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS
DETECTOR: Peak



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

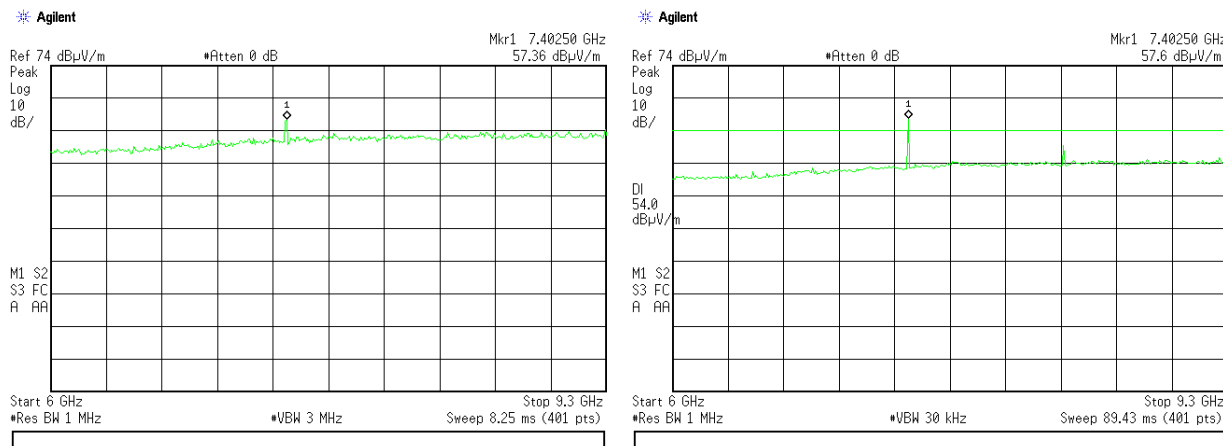
Plot 7.3.16 Radiated emission measurements from 6000 to 9300 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS
DETECTOR: Peak



Plot 7.3.17 Radiated emission measurements from 6000 to 9300 MHz at the high carrier frequency

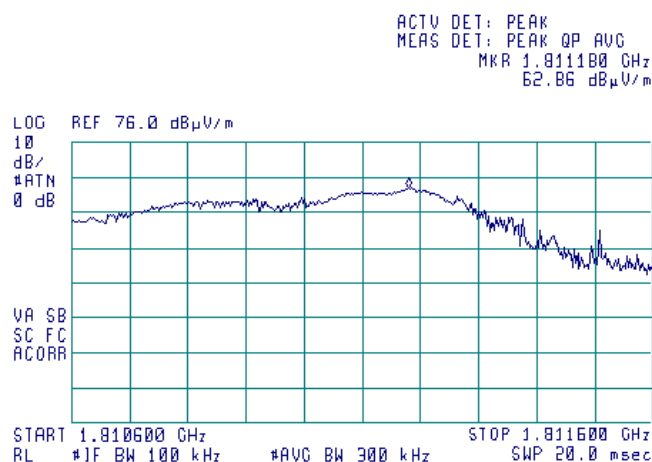
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
OPERATIONAL MODE: FHSS
DETECTOR: Peak



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

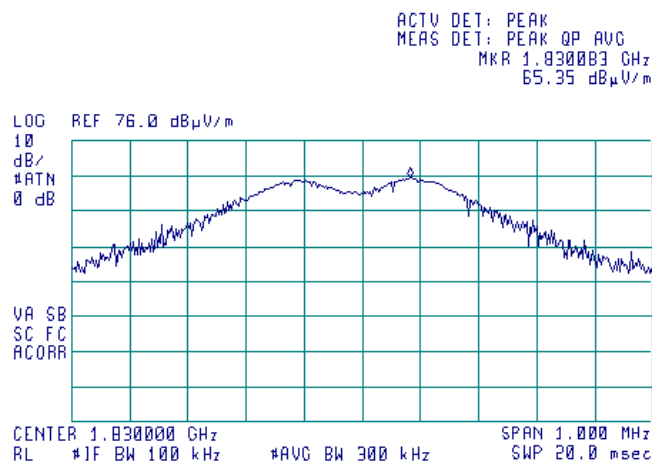
Plot 7.3.18 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.19 Radiated emission measurements at the second harmonic of mid carrier frequency

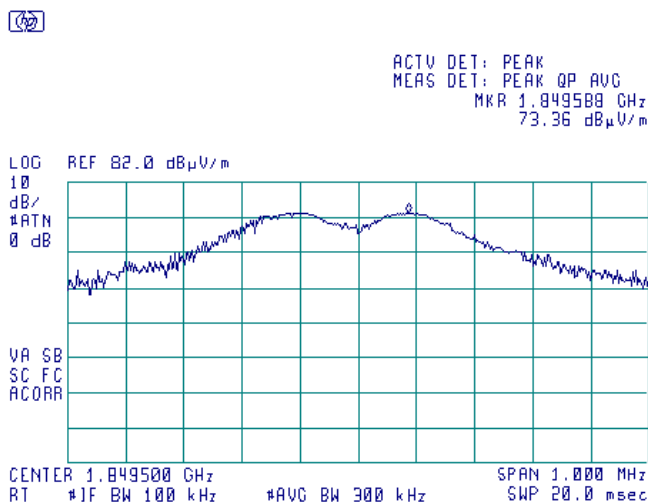
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

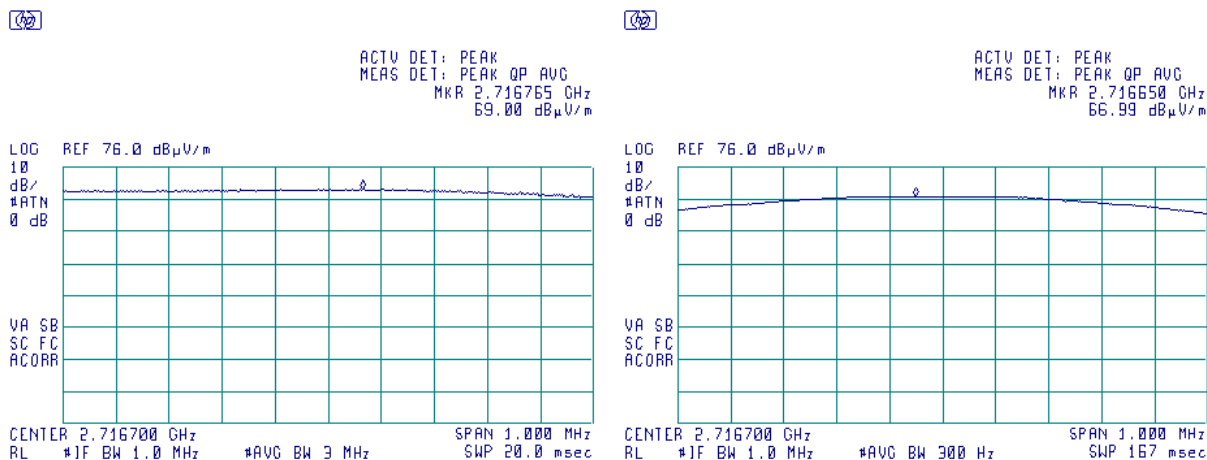
Plot 7.3.20 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.21 Radiated emission measurements at the third harmonic of low carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m

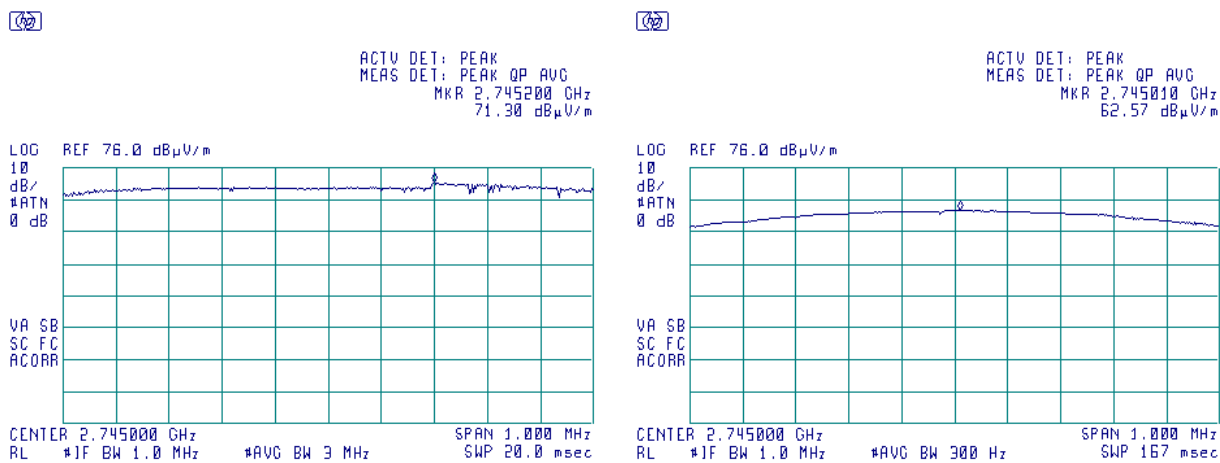


Pulse ON time over 100 msec is 5 msec, because of that the AVG BW = 200 Hz.

Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Plot 7.3.22 Radiated emission measurements at the third harmonic of mid carrier frequency

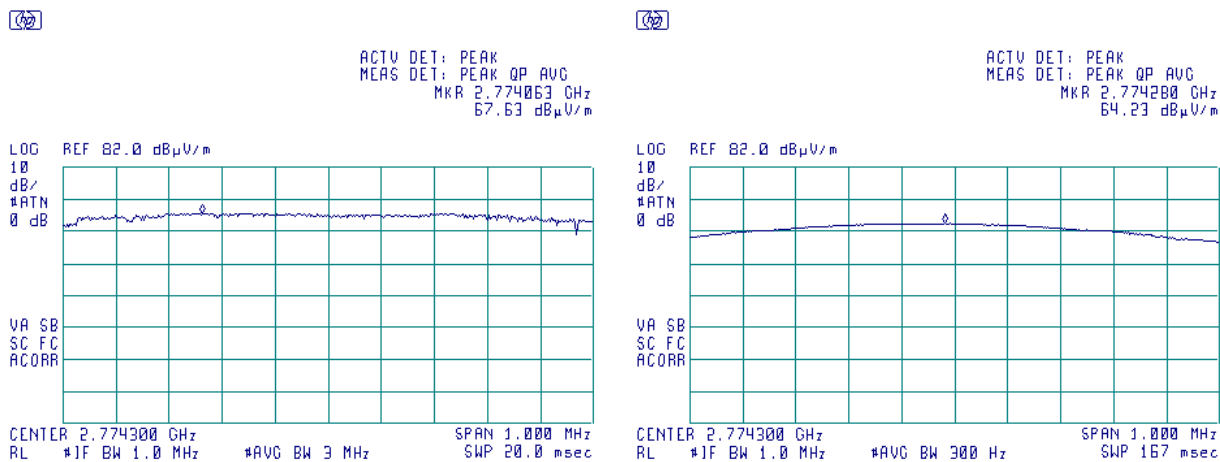
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Pulse ON time over 100 msec is 5 msec, because of that the AVG BW = 200 Hz.

Plot 7.3.23 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m

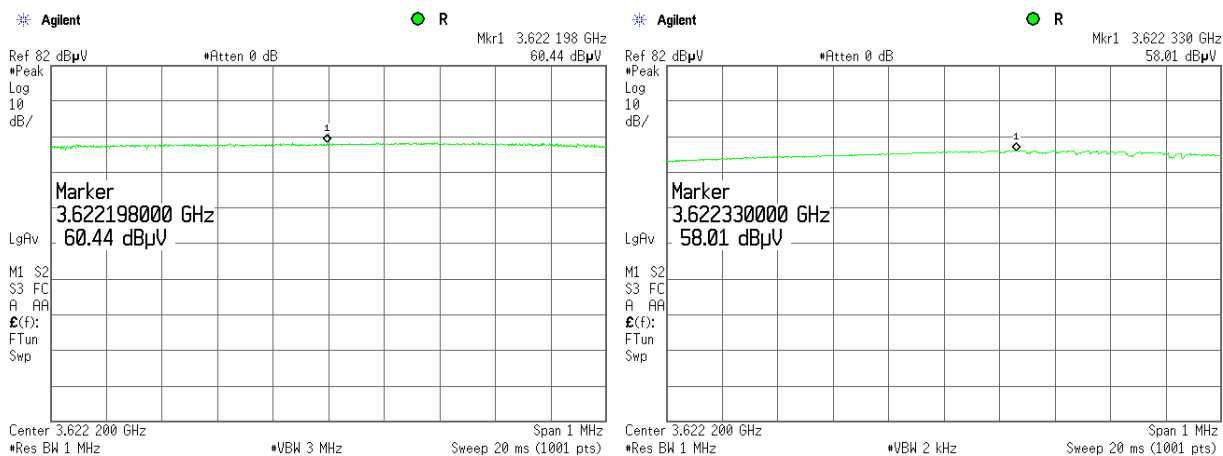


Pulse ON time over 100 msec is 5 msec, because of that the AVG BW = 200 Hz.

Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

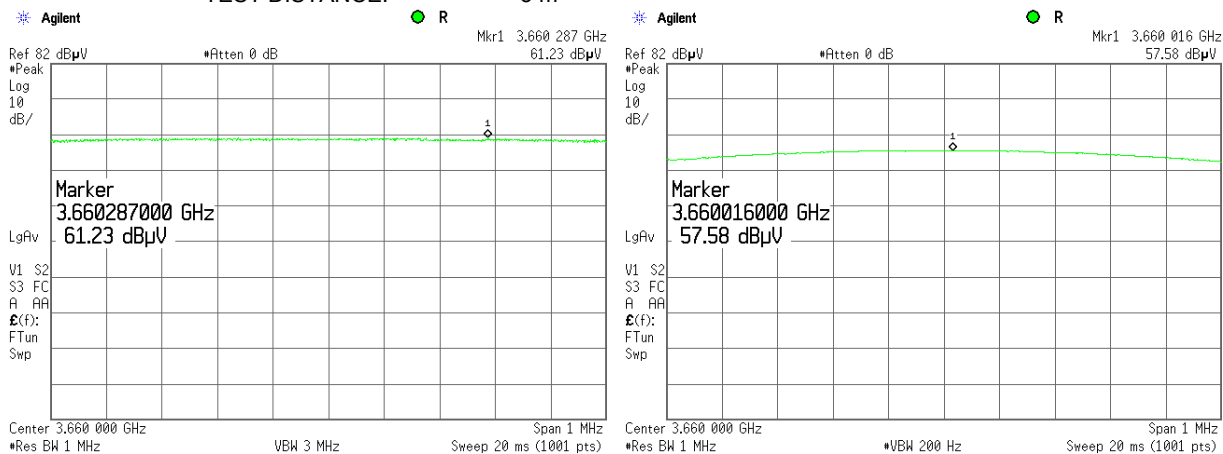
Plot 7.3.24 Radiated emission measurements at the fourth harmonic of low carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



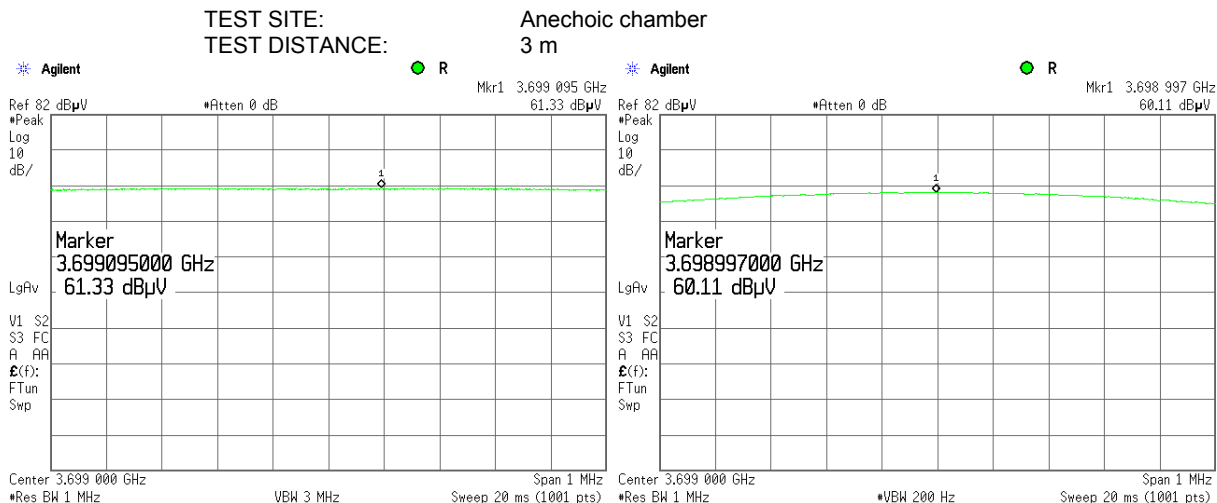
Plot 7.3.25 Radiated emission measurements at the fourth harmonic of mid carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m

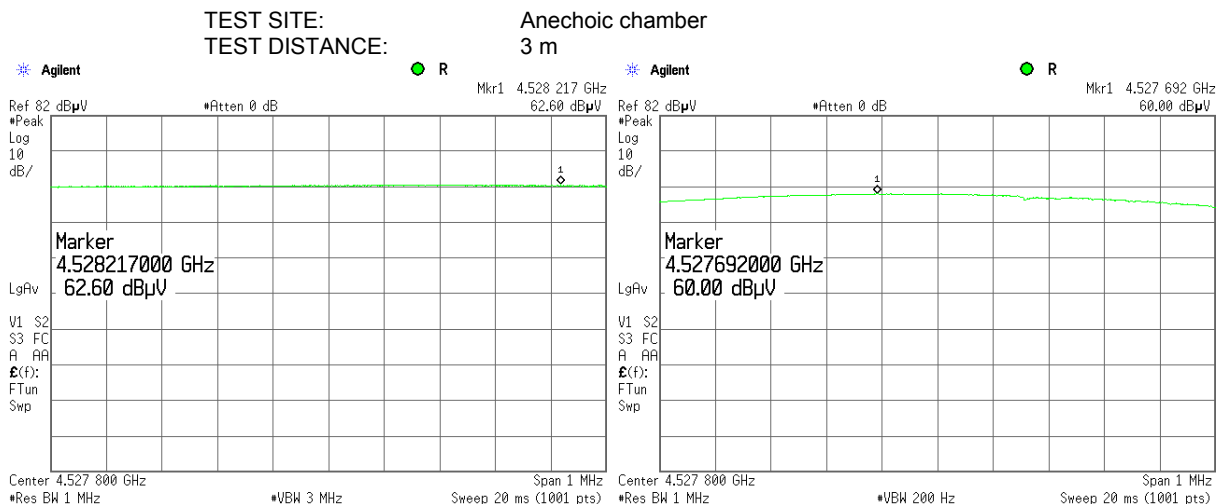


Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Plot 7.3.26 Radiated emission measurements at the fourth harmonic of high carrier frequency

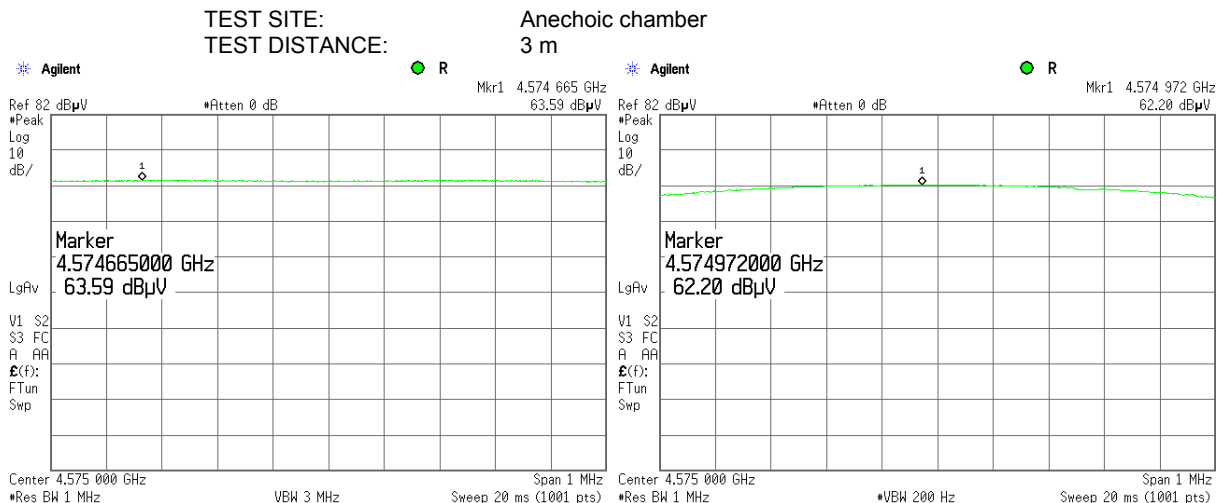


Plot 7.3.27 Radiated emission measurements at the fifth harmonic of low carrier frequency

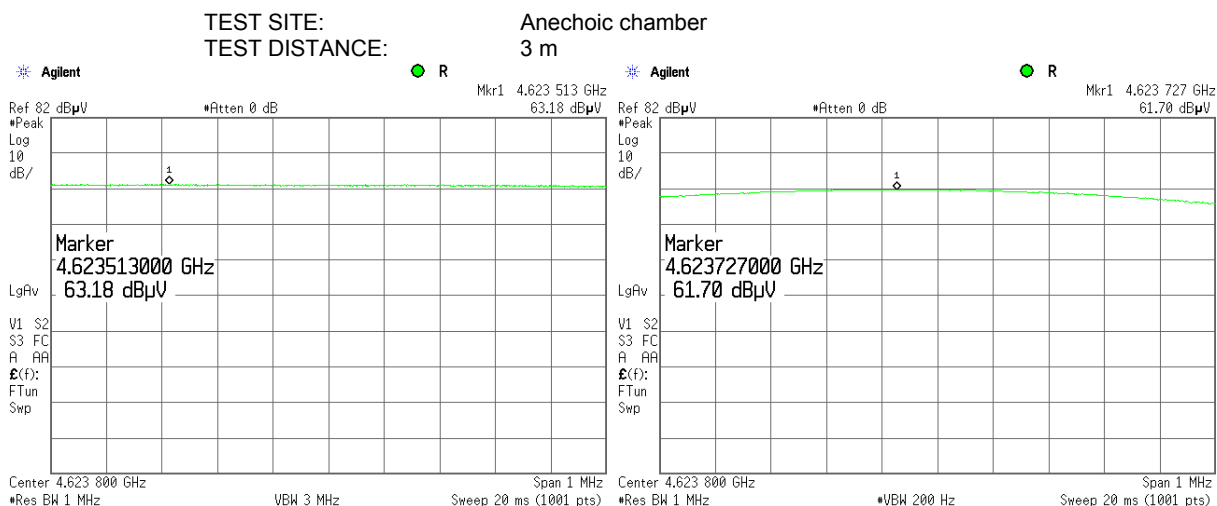


Test specification:		Section 15.247(c), Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Plot 7.3.28 Radiated emission measurements at the fifth harmonic of mid carrier frequency

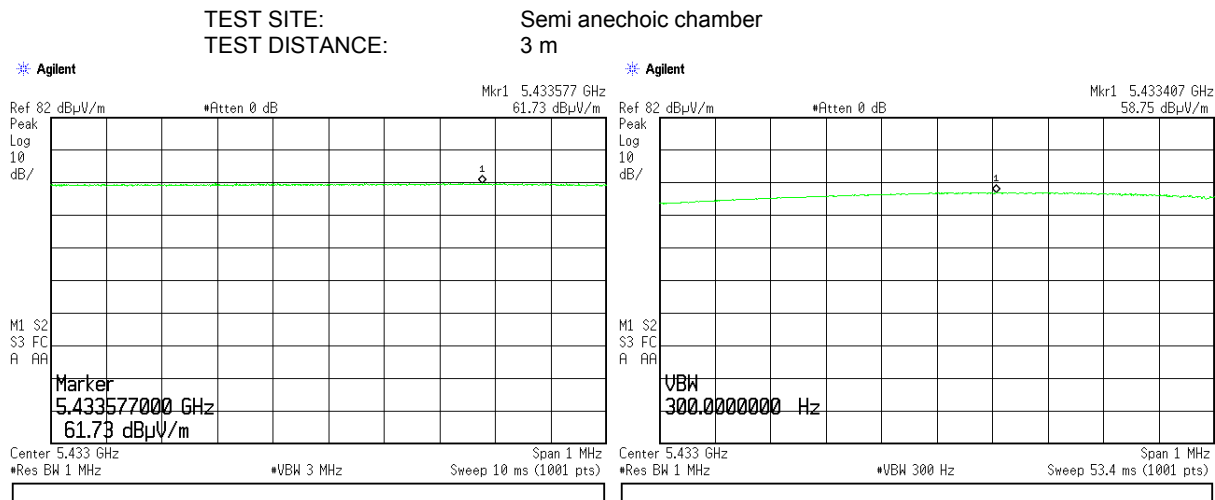


Plot 7.3.29 Radiated emission measurements at the fifth harmonic of high carrier frequency

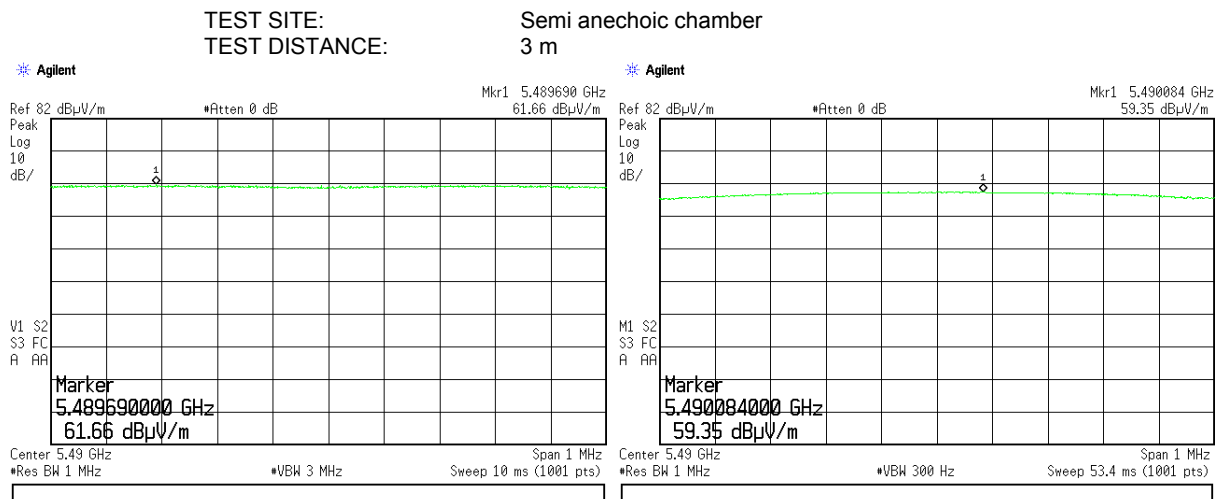


Test specification:		Section 15.247(c), Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Plot 7.3.30 Radiated emission measurements at the sixth harmonic of low carrier frequency



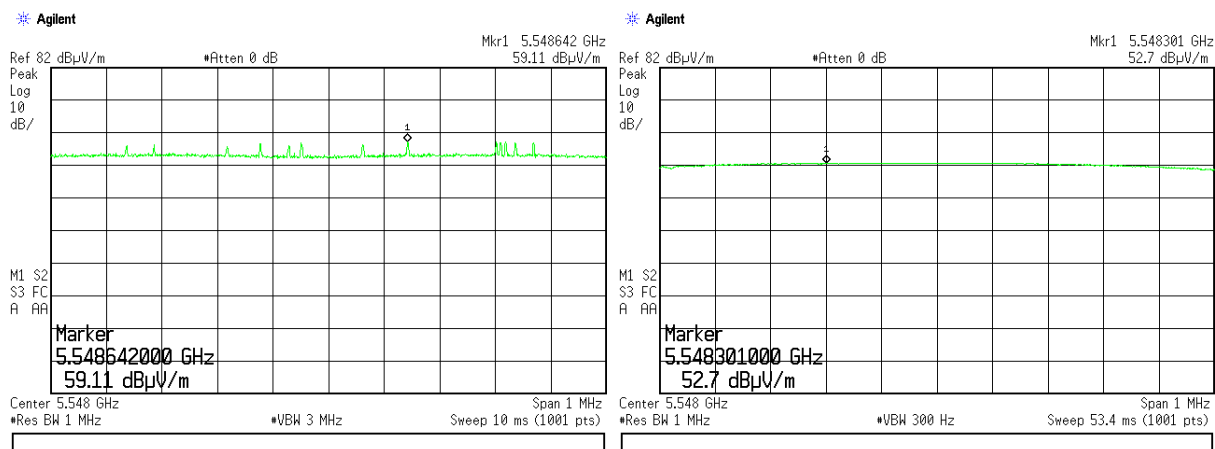
Plot 7.3.31 Radiated emission measurements at the sixth harmonic of mid carrier frequency



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

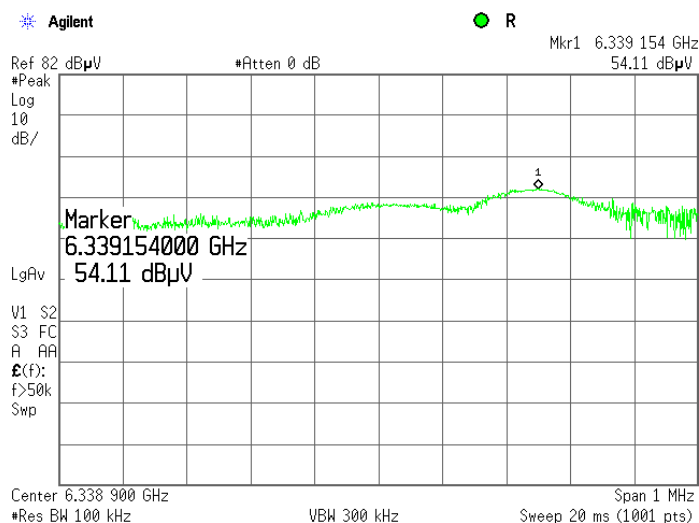
Plot 7.3.32 Radiated emission measurements at the sixth harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.33 Radiated emission measurements at the seventh harmonic of low carrier frequency

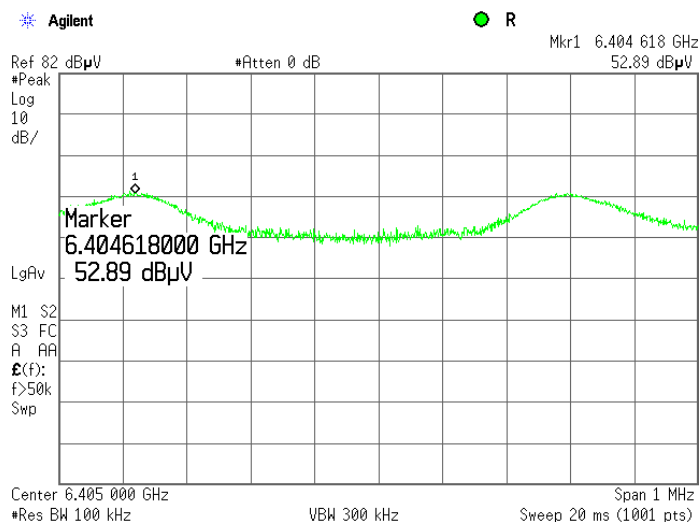
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

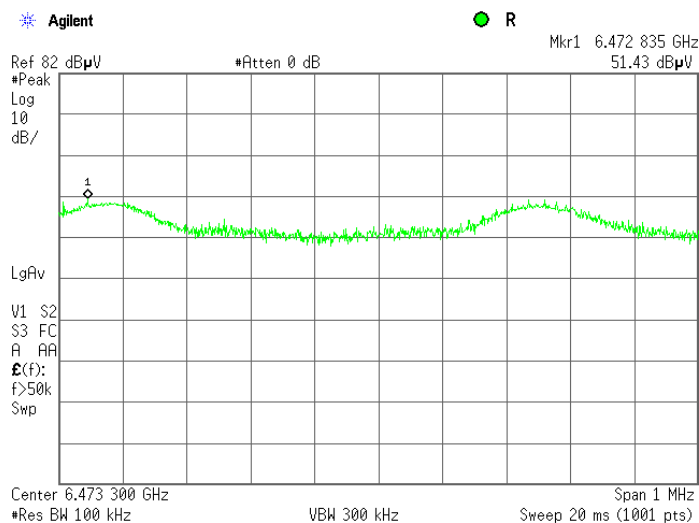
Plot 7.3.34 Radiated emission measurements at the seventh harmonic of mid carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.35 Radiated emission measurements at the seventh harmonic of high carrier frequency

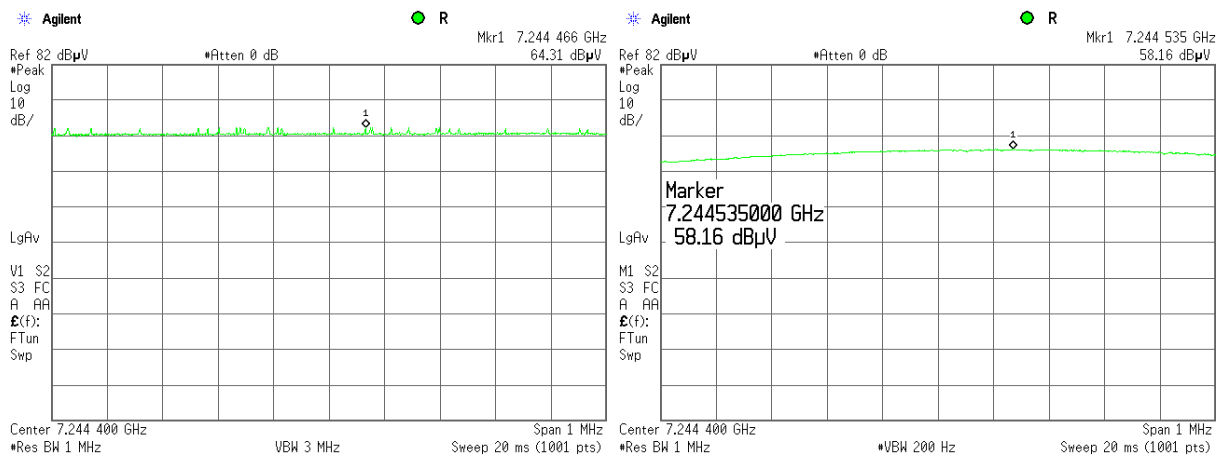
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

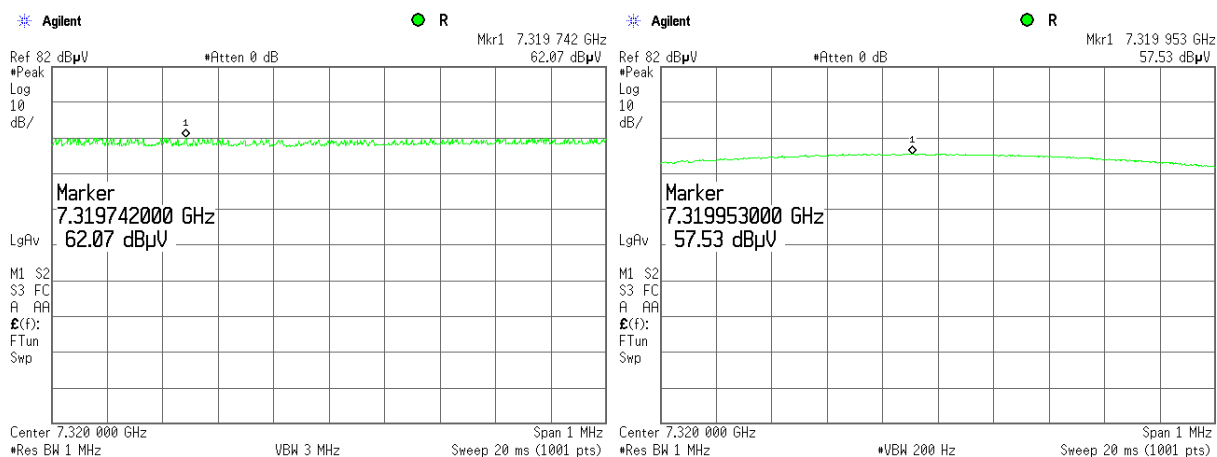
Plot 7.3.36 Radiated emission measurements at the eighth harmonic of low carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.37 Radiated emission measurements at the eighth harmonic of mid carrier frequency

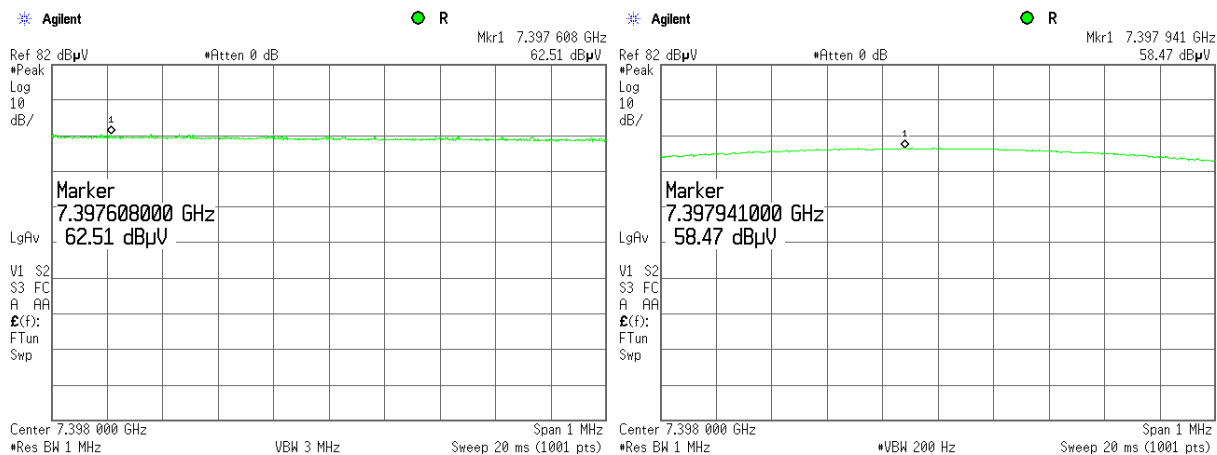
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), 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:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

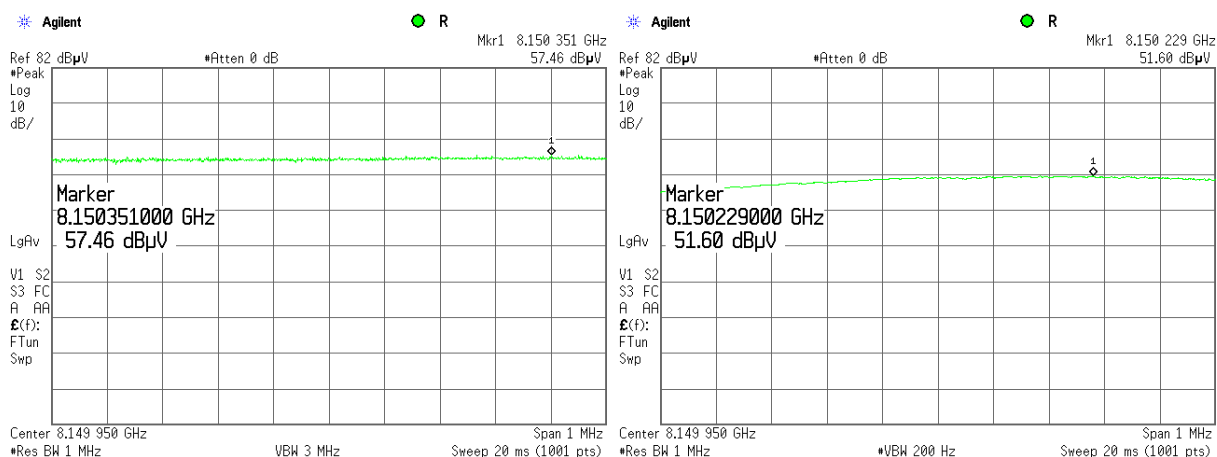
Plot 7.3.38 Radiated emission measurements at the eighth harmonic of high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.39 Radiated emission measurements at the ninth harmonic of low carrier frequency

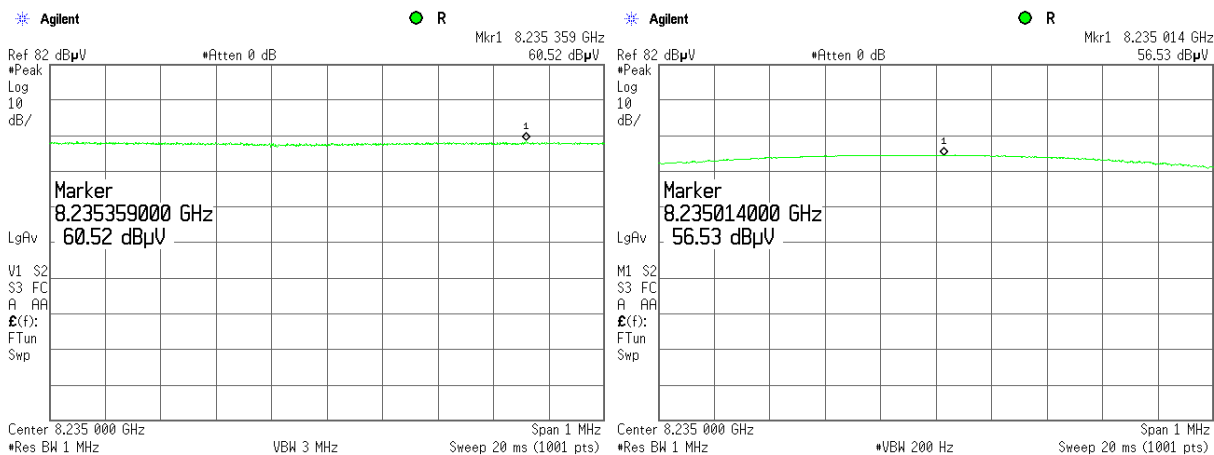
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

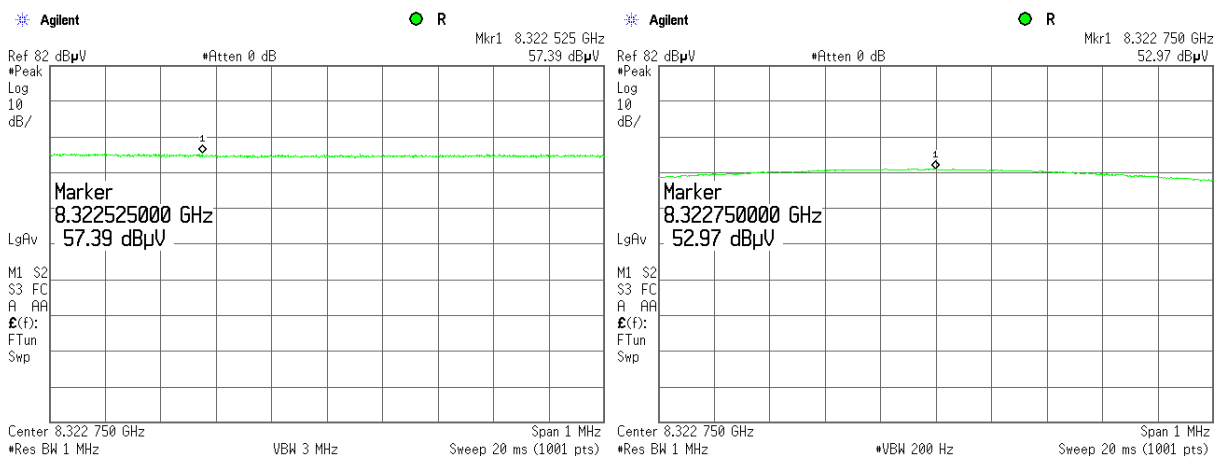
Plot 7.3.40 Radiated emission measurements at the ninth harmonic of mid carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



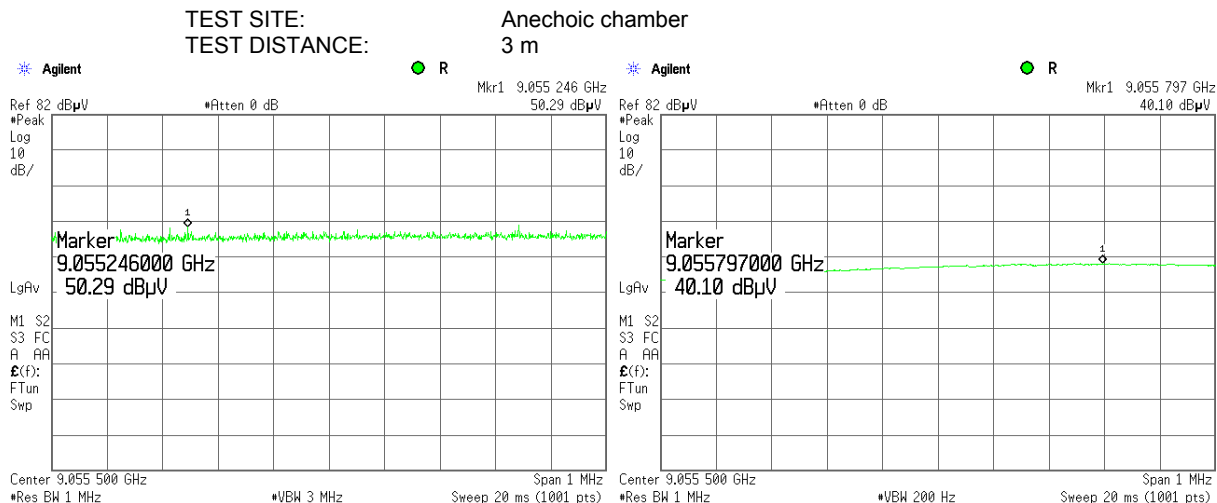
Plot 7.3.41 Radiated emission measurements at the ninth harmonic of high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m

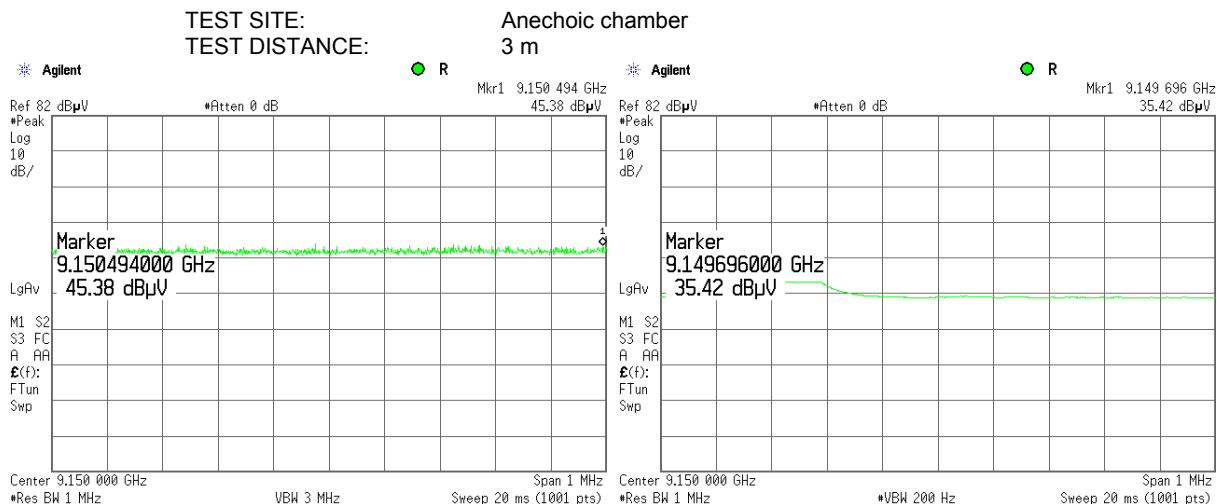


Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Plot 7.3.42 Radiated emission measurements at the tenth harmonic of low carrier frequency



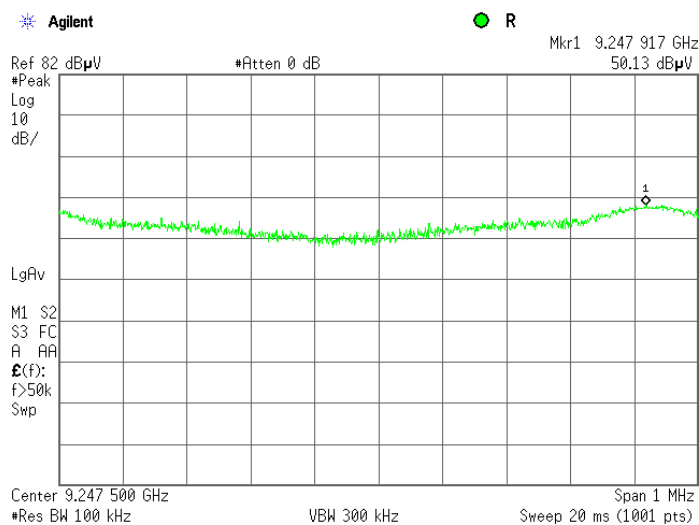
Plot 7.3.43 Radiated emission measurements at the tenth harmonic of mid carrier frequency



Test specification:		Section 15.247(c), 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:		3/6/2011 - 3/13/2011	
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

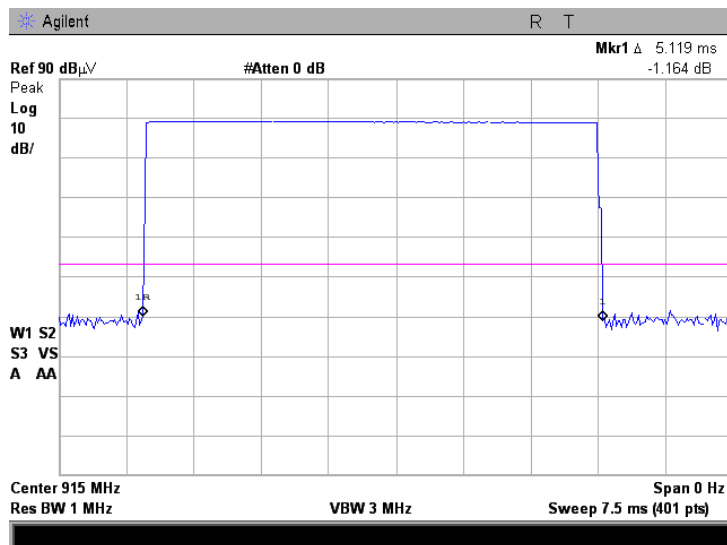
Plot 7.3.44 Radiated emission measurements at the tenth harmonic of high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m

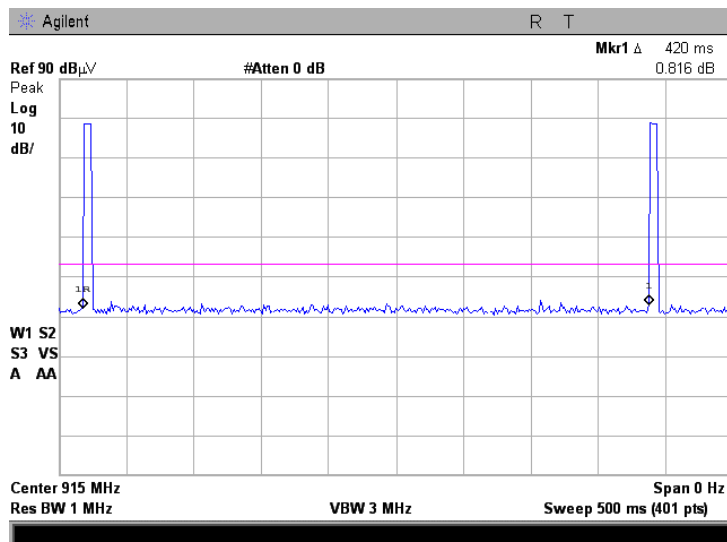


Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	3/6/2011 - 3/13/2011		
Temperature: 21 °C	Air Pressure: 1014 hPa	Relative Humidity: 59 %	Power Supply: Battery
Remarks:			

Plot 7.3.45 Transmission pulse duration, FHSS



Plot 7.3.46 Transmission pulse period, FHSS



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-10	29-Jun-11
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	25-Aug-10	25-Aug-11
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-11	11-Jan-12
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	31-Aug-10	31-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
2870	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	2870	14-Sep-10	14-Sep-11
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	14-Sep-10	14-Sep-11
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-10	07-May-11
3121	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3121	03-Oct-10	03-Oct-11
3344	High Pass Filter, 50 Ohm, 3400 to 9900 MHz	Mini-Circuits	VHF-3100+	NA	04-Oct-10	04-Oct-11
3623	Cable RF, 6.0 m, N type-N type, DC-6.5 GHz	Belden	MIL C-17	NA	27-May-10	27-May-11
3883	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type (f) in, N-type (m) out.	Agilent Technologies	87405C	MY470104 06	13-Jan-11	13-Jan-12

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

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

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

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

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

10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.

Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

11 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

12 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
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).

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

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

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

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

Cable loss
Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00
HL 3121

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.08	3600	2.10	7400	3.08	11200	3.85	15100	4.58
30	0.18	3700	2.14	7500	3.11	11300	3.85	15200	4.60
50	0.26	3800	2.18	7600	3.14	11400	3.86	15300	4.63
100	0.34	3900	2.19	7700	3.16	11500	3.86	15400	4.65
200	0.47	4000	2.25	7800	3.18	11600	3.87	15500	4.71
300	0.59	4100	2.25	7900	3.20	11700	3.85	15600	4.70
400	0.66	4200	2.28	8000	3.22	11800	3.96	15700	4.69
500	0.75	4300	2.35	8100	3.26	11900	3.92	15800	4.71
600	0.83	4400	2.35	8200	3.27	12000	3.92	15900	4.74
700	0.90	4500	2.38	8300	3.29	12100	3.94	16000	4.69
800	0.96	4600	2.43	8400	3.30	12200	3.94	16100	4.72
900	1.02	4700	2.43	8500	3.31	12300	3.99	16200	4.71
1000	1.07	4800	2.45	8600	3.33	12400	4.02	16300	4.74
1100	1.12	4900	2.48	8700	3.35	12500	4.10	16400	4.74
1200	1.15	5000	2.55	8800	3.36	12600	4.09	16500	4.75
1300	1.22	5100	2.54	8900	3.38	12700	4.15	16600	4.78
1400	1.28	5200	2.56	9000	3.40	12800	4.15	16700	4.86
1500	1.29	5300	2.58	9100	3.41	12900	4.08	16800	4.84
1600	1.36	5400	2.61	9200	3.45	13000	4.21	16900	4.83
1700	1.40	5500	2.64	9300	3.48	13100	4.19	17000	4.86
1800	1.45	5600	2.69	9400	3.52	13200	4.29	17100	4.83
1900	1.51	5700	2.67	9500	3.54	13300	4.24	17200	4.90
2000	1.50	5800	2.71	9600	3.59	13400	4.26	17300	4.91
2100	1.56	5900	2.73	9700	3.59	13500	4.26	17400	4.94
2200	1.59	6000	2.75	9800	3.62	13600	4.29	17500	4.93
2300	1.63	6100	2.81	9900	3.70	13700	4.35	17600	4.93
2400	1.73	6200	2.80	10000	3.70	13800	4.31	17700	5.00
2500	1.73	6300	2.82	10100	3.72	13900	4.29	17800	5.01
2600	1.78	6400	2.85	10200	3.73	14000	4.32	17900	5.00
2700	1.84	6500	2.87	10300	3.75	14100	4.33	18000	5.00
2800	1.84	6600	2.90	10400	3.76	14200	4.34		
2900	1.91	6700	2.91	10500	3.77	14300	4.36		
3000	1.91	6800	2.94	10600	3.79	14400	4.38		
3100	1.97	6900	2.96	10700	3.80	14600	4.42		
3200	1.98	7000	2.98	10800	3.81	14700	4.42		
3300	2.04	7100	3.01	10900	3.81	14800	4.55		
3400	2.04	7200	3.02	11000	3.83	14900	4.55		
3500	2.10	7300	3.04	11100	3.84	15000	4.55		

Cable loss
Cable coaxial, MIL C-17, N type-N type, 6 m
Belden, HL 3623

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	2600	4.38	5400	7.76
30	0.25	2700	4.53	5500	7.79
50	0.33	2800	4.64	5600	7.88
100	0.49	2900	4.79	5700	7.93
200	0.76	3000	4.93	5800	8.05
300	0.97	3100	5.02	5900	8.03
400	1.18	3200	5.18	6000	8.07
500	1.38	3300	5.27	6100	8.14
600	1.54	3400	5.41	6200	8.21
700	1.71	3500	5.57	6300	8.28
800	1.88	3600	5.65	6400	8.35
900	2.04	3700	5.82	6500	8.43
1000	2.19	3800	5.89		
1100	2.38	3900	6.02		
1200	2.61	4000	6.15		
1300	2.63	4100	6.26		
1400	2.79	4200	6.37		
1500	2.90	4300	6.52		
1600	3.08	4400	6.63		
1700	3.21	4500	6.74		
1800	3.31	4600	6.86		
1900	3.47	4700	6.98		
2000	3.59	4800	7.09		
2100	3.74	4900	7.17		
2200	3.86	5000	7.30		
2300	3.98	5100	7.41		
2400	4.12	5200	7.59		
2500	4.24	5300	7.71		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
DC	direct current
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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