

TEST REPORT

ACCORDING TO: FCC CFR 47 PART 15 Subpart C, section 15.247 (FHSS) and
RSS-210, Issue 8, Annex 8

FOR:

Cardo Systems Inc.
Bluetooth headset
Model: scala rider Q3
FCC ID:Q95ER15
IC:4668A-ER15

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1 Applicant information

Client name: Cardo Systems Inc.
Address: 100 High Tower Blvd, Pittsburgh, PA 15205, USA
Telephone: 001 412-788-4533
Fax: 001 412-788-0270
E-mail: moato@cardosystems.com
Contact name: Mr. Avi Moato

2 Equipment under test attributes

Product name: Bluetooth Headset
Product type: Transceiver
Model(s): scala rider Q3
Serial number: HS1
Hardware version: 1.0
Software release: 1.0
Receipt date 9/9/2012

3 Manufacturer information

Manufacturer name: Cardo Systems Inc.
Address: 100 High Tower Blvd, Pittsburgh, PA 15205, USA
Telephone: 001 412-788-4533
Fax: 001 412-788-0270
E-Mail: moato@cardosystems.com
Contact name: Mr. Avi Moato

4 Test details

Project ID: 23657
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 9/09/2012
Test completed: 2/27/2013
Test specification(s): FCC Part 15, subpart C, §15.247 (FHSS);
RSS-210 Issue 8:2010, Annex 8

5 Tests summary

Test	Status
Transmitter characteristics	
FCC section 15.247(a)1, (g), (h) / RSS-210 section A8.1, Frequency hopping requirements	Pass
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(d), Number of hopping frequencies	Pass
FCC section 15.247(a)1 / RSS-210 section A8.1(d), Average time of occupancy	Pass
FCC section 15.247(b) / RSS-210 section A8.4(2), Peak output power	Pass
FCC section 15.247(i) / RSS-Gen, section 5.5, RF exposure	Exhibit provided in documentation for Application
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 7.2.4, Conducted emission	Not required
RSS-Gen, Section 4.6.1, 99% emission occupied bandwidth	Measured

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.

The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

This test report supersedes the previously issued test report identified by Doc ID:CARRAD_FCC.23657.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	October 11, 2012	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	March 4, 2013	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	March 4, 2013	

6 EUT description

6.1 General information

The EUT is a Bluetooth headset, technology compliant with Bluetooth™ Ver 3.0, Bluetooth intercom for motorbikes. The device equipped with power amplifier (PA). The transmitter hopping parameters were tested once, the OBW, occupancy time, peak output power and band edge emissions were tested for the both GFSK and DQPSK type of modulation.

6.2 Changes made in the EUT

To decrease emission from the EUT during radiated emission measurement in 1600-1654 MHz frequency range the following change was implemented in the EUT during the testing:

A capacitor of 15 pF $\pm 5\%$ 50V 0402 COG manufactured by Samsung, part number CL05C150JB5NNNC, Cardo part number CAP00056 was installed on PCB between analog GND to digital GND.

It is manufacturer responsibility to implement the changes in the production version of the EUT. In any case the test report applies to the tested item only.

6.3 Test configuration



6.4 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 range		2400 - 2483.5 MHz			
Operating frequency range		2401.775 – 2479.825 MHz			
RF channel spacing		1 MHz			
Maximum rated output power		Peak output power		19.03 dBm	
Is transmitter output power variable?		X	No		
			Yes	continuous variable	
				stepped variable with stepsize	dB
				minimum RF power	dBm
					maximum RF power
Antenna connection					
unique coupling		standard connector		X	integral
				X	without temporary RF connector
Antenna/s technical characteristics					
Type		Manufacturer		Model number	
Printed		Cardo Systems, Inc.		NA	
Transmitter aggregate data rate/s		1 Mbps		2 Mbps	
Modulation		GFSK		DQPSK with packet type 3-DH5	
Modulating test signal (baseband)		PRBS			
Transmitter power source					
X	Battery	Nominal rated voltage	4.2 VDC	Battery type	Li Polymer
	DC	Nominal rated voltage	VDC		
	AC mains	Nominal rated voltage	VAC	Frequency	

Test specification:		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(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: 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 the 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	250	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, Table 7.1.3, Table 7.1.4 and the associated plots.

7.1.2.4 The test was repeated for each data rate and each modulation format.

Figure 7.1.1 The 20 dB bandwidth test setup





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Test specification:		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(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Table 7.1.2 The 20 dB bandwidth test results, GFSK modulation

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz
 DETECTOR USED: Peak
 SWEEP TIME: Auto
 VIDEO BANDWIDTH: ≥ RBW
 MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
 MODULATING SIGNAL: PRBS
 FREQUENCY HOPPING: Disabled

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	Symbol rate, Msymbols/s	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402	GFSK	1	1	935	NA	NA	NA
2441				905			
2480				900			

Reference numbers of test equipment used

HL 1425								
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Full description is given in Appendix A.

Table 7.1.3 The 99% bandwidth test results, GFSK modulation

ASSIGNED FREQUENCY BAND: 2400- 2483.5 MHz
 DETECTOR USED: Peak
 SWEEP MODE: Peak hold
 SWEEP TIME: Auto
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 MODULATION ENVELOPE REFERENCE POINTS: 99%
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	Symbol rate, Msymbols/s	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402	GFSK	1	1	1245.0	NA	NA	NA
2441				1237.5			
2480				1245.0			

Reference numbers of test equipment used

HL 0337	HL 2909							
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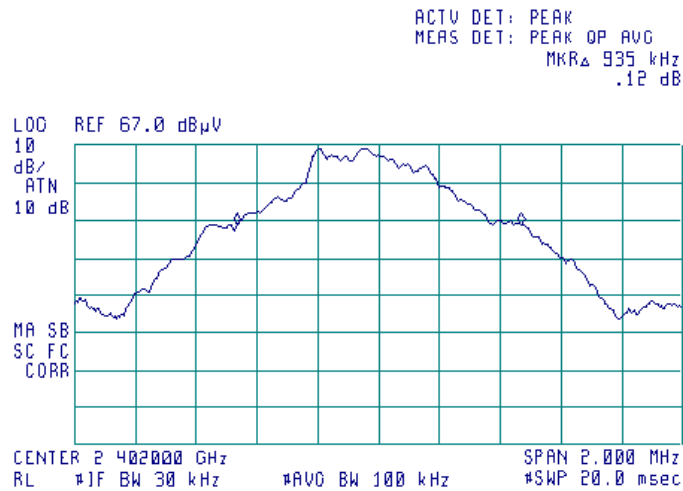
Full description is given in Appendix A.



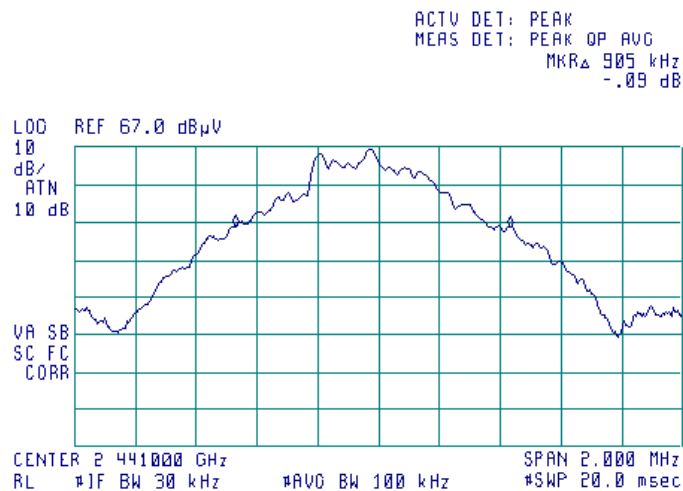
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Test specification:		Section 15.247(a)1/ RSS-210, Section A8.1(a), 20 dB bandwidth	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.1.1 The 20 dB bandwidth test result at low frequency, GFSK modulation



Plot 7.1.2 The 20 dB bandwidth test result at mid frequency, GFSK modulation

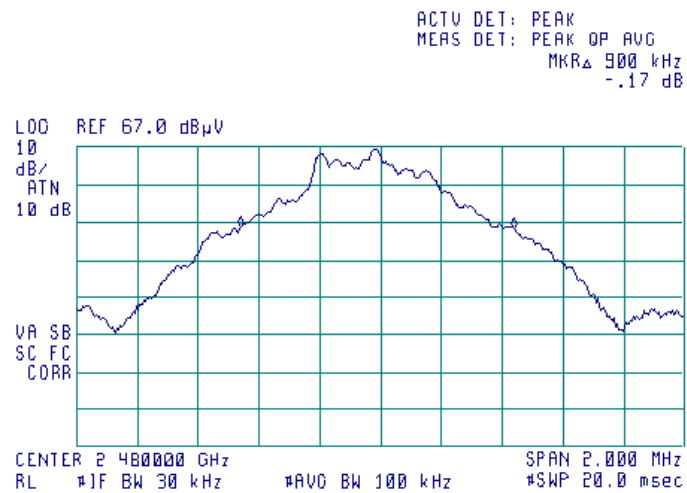




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Test specification:		Section 15.247(a)1/ RSS-210, Section A8.1(a), 20 dB bandwidth	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.1.3 The 20 dB bandwidth test result at high frequency, GFSK modulation

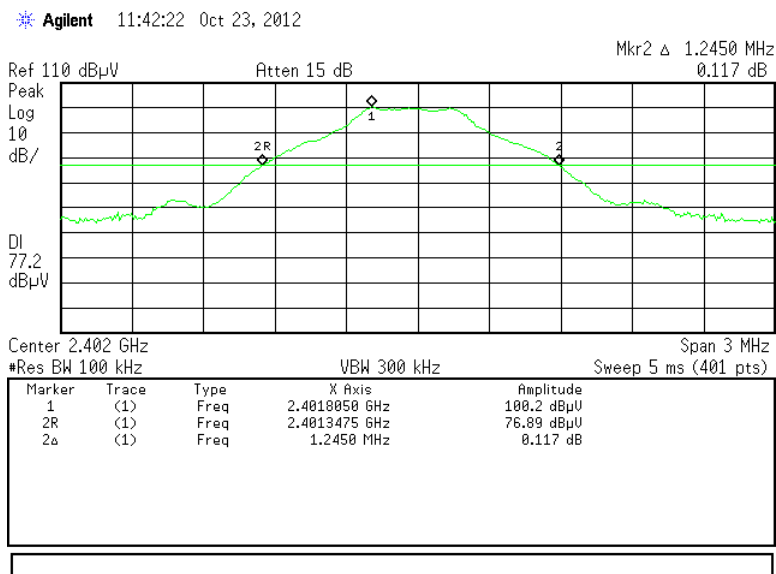




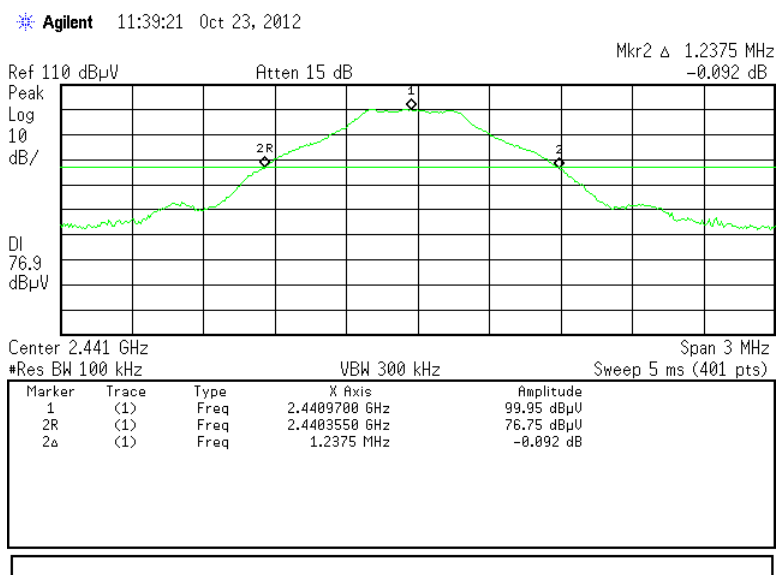
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Test specification:		Section 15.247(a)1/ RSS-210, Section A8.1(a), 20 dB bandwidth	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.1.4 The 99% bandwidth test result at low frequency, GFSK modulation



Plot 7.1.5 The 99% bandwidth test result at mid frequency, GFSK modulation

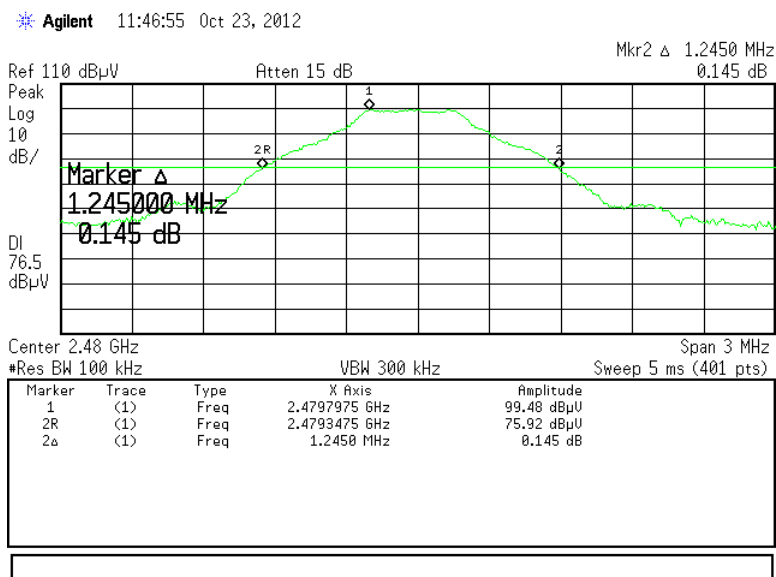




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Test specification:		Section 15.247(a)1/ RSS-210, Section A8.1(a), 20 dB bandwidth	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.1.6 The 99% bandwidth test result at high frequency, GFSK modulation





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Test specification:		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(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Table 7.1.4 The occupied bandwidth test results, DQPSK modulation

ASSIGNED FREQUENCY BAND: 2400- 2483.5 MHz
 DETECTOR USED: Peak
 SWEEP TIME: Auto
 RESOLUTION BANDWIDTH: 30 kHz
 VIDEO BANDWIDTH: ≥ RBW
 MODULATION: DQPSK
 PACKET TYPE: 3-DH5
 MODULATING SIGNAL: PRBS
 FREQUENCY HOPPING: Disabled

MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	Symbol rate, Msymbols/s	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402	DQPSK	2.0	1.0	1310.0	NA	NA	NA
2441		2.0	1.0	1305.0	NA	NA	NA
2480		2.0	1.0	1305.0	NA	NA	NA

MODULATION ENVELOPE REFERENCE POINTS: 99%

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	Symbol rate, Msymbols/s	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402	DQPSK	2.0	1.0	1350.0	NA	NA	NA
2441		2.0	1.0	1350.0	NA	NA	NA
2480		2.0	1.0	1375.0	NA	NA	NA

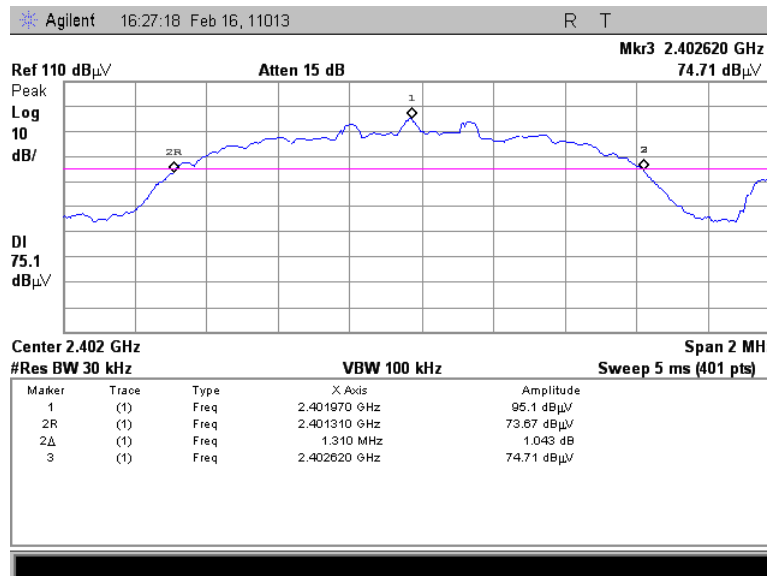
Reference numbers of test equipment used

HL 1454	HL 2909	HL 4138						
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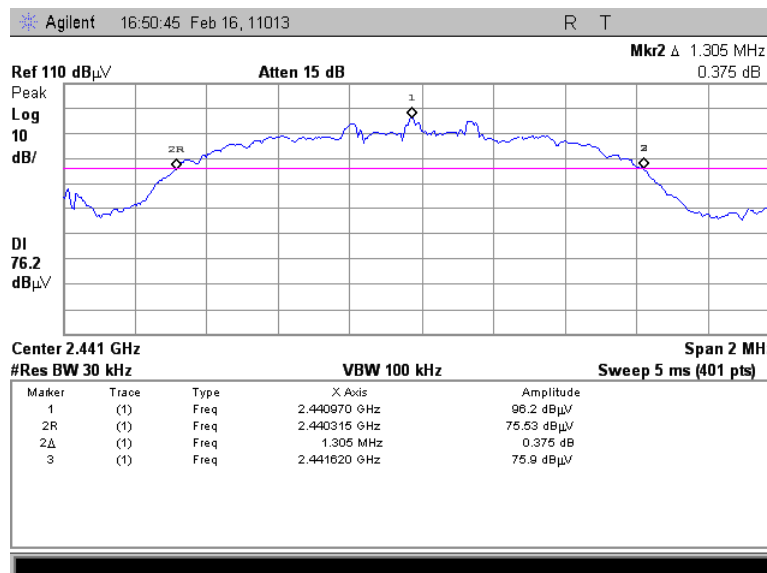
Full description is given in Appendix A.

Test specification:		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(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.1.7 The 20 dB bandwidth test result at low frequency, DQPSK modulation

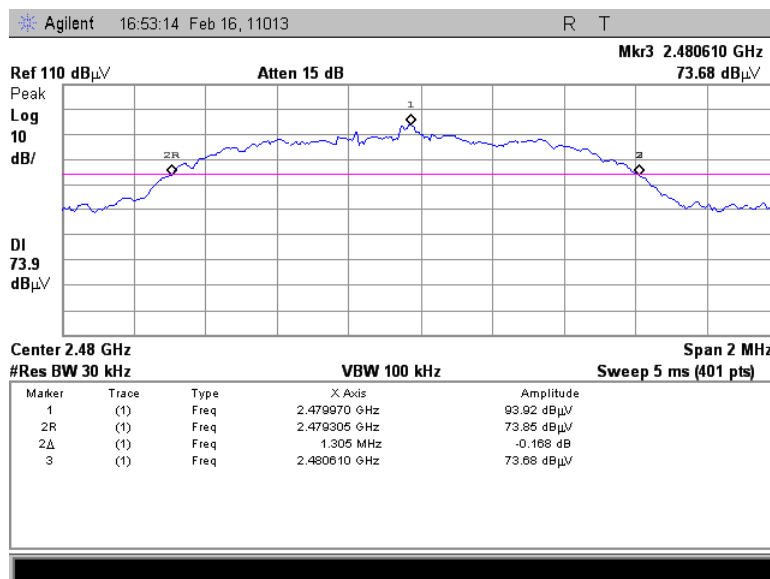


Plot 7.1.8 The 20 dB bandwidth test result at mid frequency, DQPSK modulation

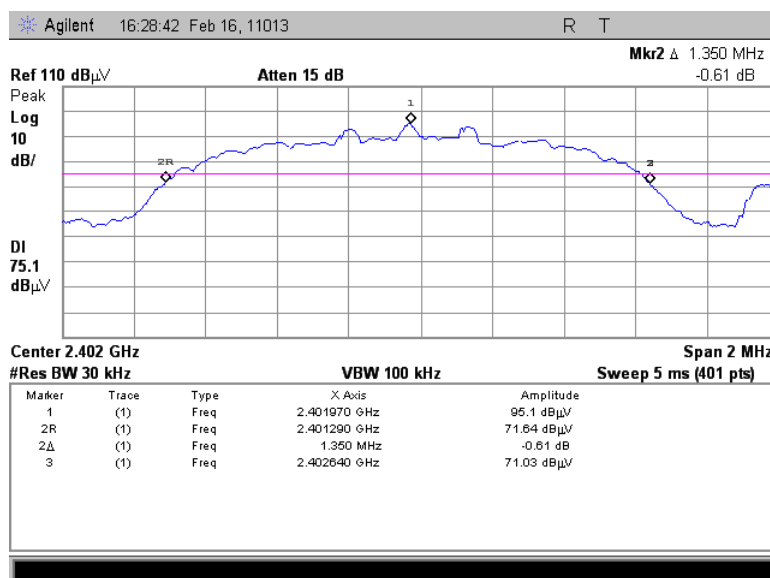


Test specification:		Section 15.247(a)1/ RSS-210, Section A8.1(a), 20 dB bandwidth	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.1.9 The 20 dB bandwidth test result at high frequency, DQPSK modulation

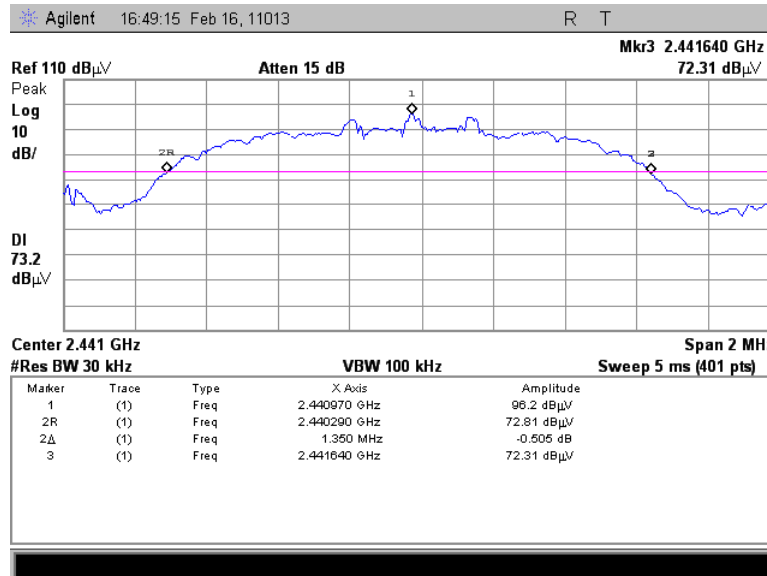


Plot 7.1.10 The 99% bandwidth test result at low frequency, DQPSK modulation

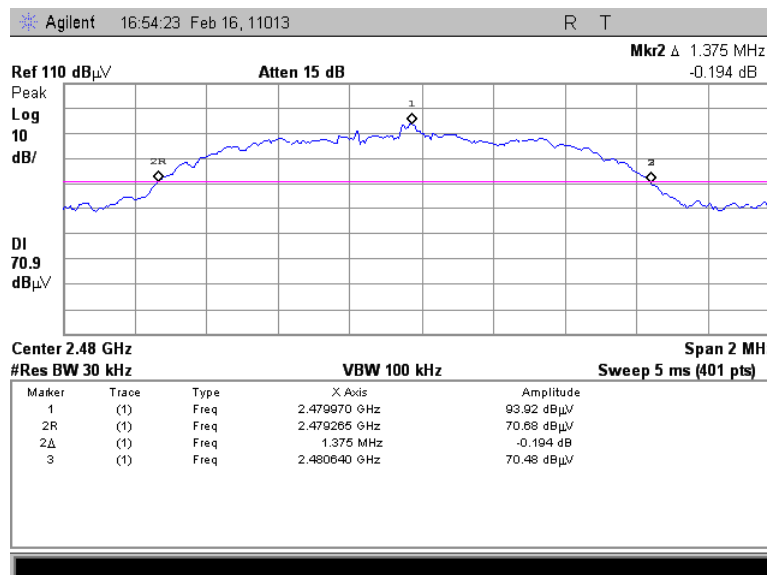


Test specification:		Section 15.247(a)1/ RSS-210, Section A8.1(a), 20 dB bandwidth	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		2/25/2013	
Temperature: 19 °C	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

Plot 7.1.11 99% bandwidth test result at mid frequency, DQPSK modulation



Plot 7.1.12 99% bandwidth test result at high frequency, DQPSK modulation



Test specification:		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(s):		9/23/2012	
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 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 associated plots.

Figure 7.2.1 Carrier frequency separation test setup





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Test specification:		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(s):		9/23/2012	
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: Battery
Remarks:			

Table 7.2.2 Carrier frequency separation test results

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 1 Mbps
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: $\geq 1\%$ of the span
 VIDEO BANDWIDTH: $\geq$ RBW
 FREQUENCY HOPPING: Enabled
 20 dB BANDWIDTH: 935 kHz

Carrier frequency separation, kHz	Limit, kHz	Margin*	Verdict
995	935	60	Pass

* - Margin = Carrier frequency separation – specification limit.

Reference numbers of test equipment used

HL 1425							
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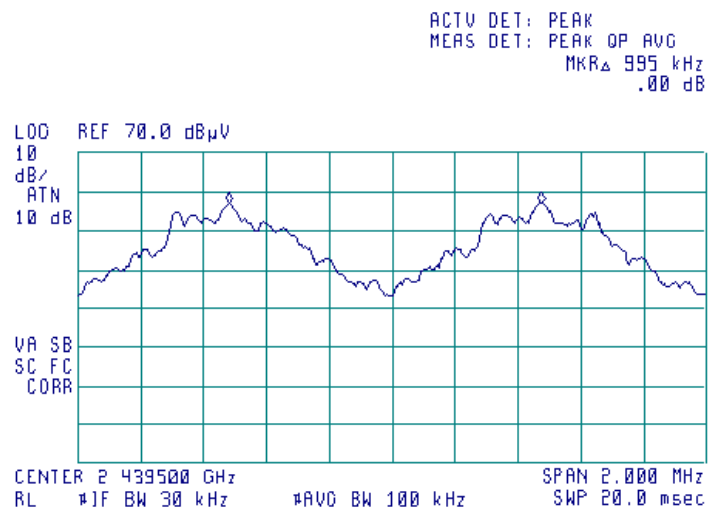
Full description is given in Appendix A.



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Test specification:		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(s):		9/23/2012	
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: Battery
Remarks:			

Plot 7.2.1 Carrier frequency separation



Test specification:		Section 15.247(a)1/ RSS-210, Section A8.1(d), Number of hopping frequencies	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/23/2012	
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 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 associated plots.

Figure 7.3.1 Hopping frequencies test setup





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Test specification:	Section 15.247(a)1/ RSS-210, Section A8.1(d), Number of hopping frequencies		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/23/2012		
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: Battery
Remarks:			

Table 7.3.2 Hopping frequencies test results

ASSIGNED FREQUENCY BAND: 2401-2483.5 MHz
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 1 Mbps
 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
79	15	64	Pass

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

Reference numbers of test equipment used

HL 1425							
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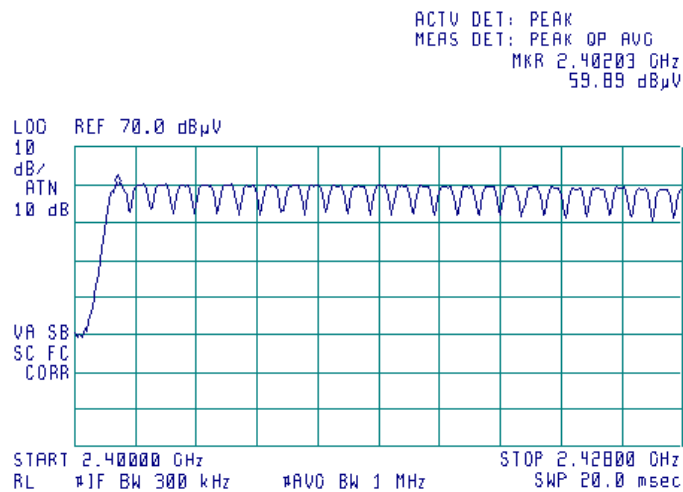
Full description is given in Appendix A.



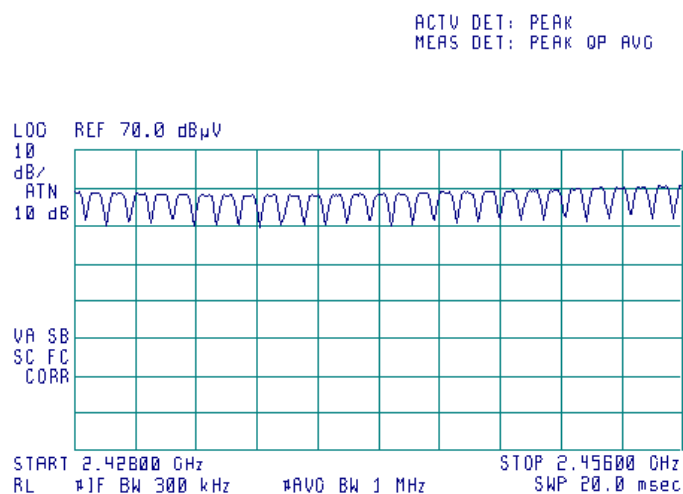
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Test specification:	Section 15.247(a)1/ RSS-210, Section A8.1(d), Number of hopping frequencies		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/23/2012		
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: Battery
Remarks:			

Plot 7.3.1 Number of hopping frequencies, channels from 1 to 26



Plot 7.3.2 Number of hopping frequencies, channels from 27 to 55

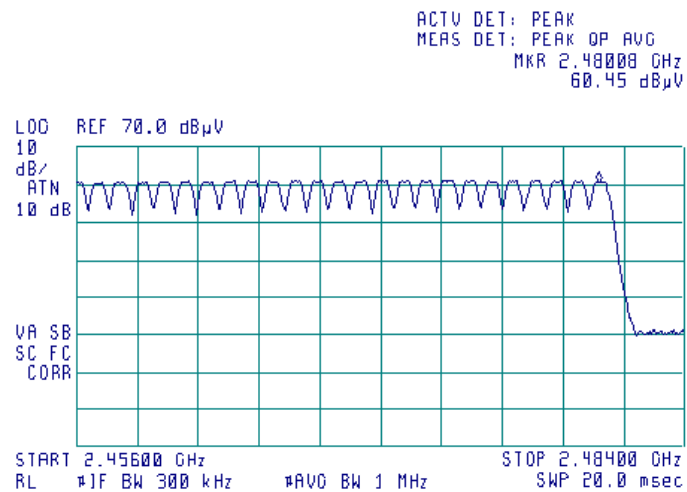




HERMON LABORATORIES

Test specification:	Section 15.247(a)1/ RSS-210, Section A8.1(d), Number of hopping frequencies		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/23/2012		
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: Battery
Remarks:			

Plot 7.3.3 Number of hopping frequencies, channels from 56 to 79



Test specification:		Section 15.247(a)1/RSS-210, Section A8.1(d), Average time of occupancy	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/23/2012	
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 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.

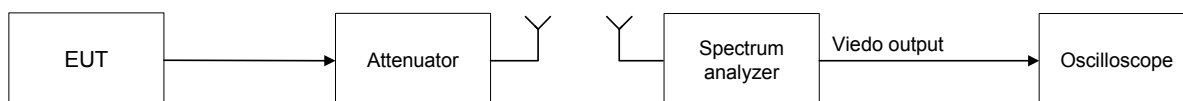
7.4.2.2 The spectrum analyzer span was set to zero centered on a hopping channel.

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 was repeated at each data rate and modulation type as provided in Table 7.4.2 and associated plots.

Figure 7.4.1 Average time of occupancy test setup





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Test specification:		Section 15.247(a)1/RSS-210, Section A8.1(d), Average time of occupancy	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/23/2012	
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: Battery
Remarks:			

Table 7.4.2 Average time of occupancy test results

ASSIGNED FREQUENCY BAND: 2402-2483.5 MHz
 MODULATING SIGNAL: PRBS
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1 MHz
 VIDEO BANDWIDTH: 3 MHz
 NUMBER OF HOPPING FREQUENCIES: 79
 INVESTIGATED PERIOD: 31.6 s
 FREQUENCY HOPPING: Enabled

MODULATION: GFSK

Carrier frequency, MHz	Single transmission duration, ms	Single transmission period, ms	Average time of occupancy*, s	Bit rate, Mbps	Symbol rate, Msymbol/s	Limit, s	Margin, s**	Verdict
2441	0.45	97.5	0.146	1	1	0.4	-0.254	Pass

MODULATION: DQPSK

Carrier frequency, MHz	Single transmission duration, ms	Single transmission period, ms	Average time of occupancy*, s	Bit rate, Mbps	Symbol rate, Msymbol/s	Limit, s	Margin, s**	Verdict
2402	2.925	297	0.31	2	1	0.4	-0.09	Pass

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

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

Reference numbers of test equipment used

HL 1425							
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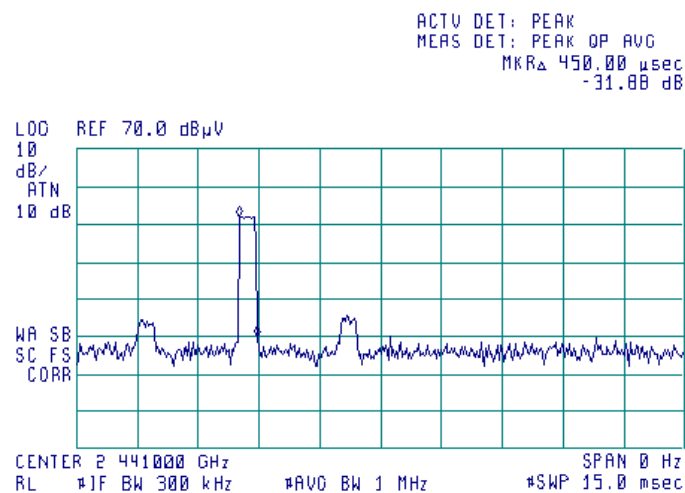
Full description is given in Appendix A.



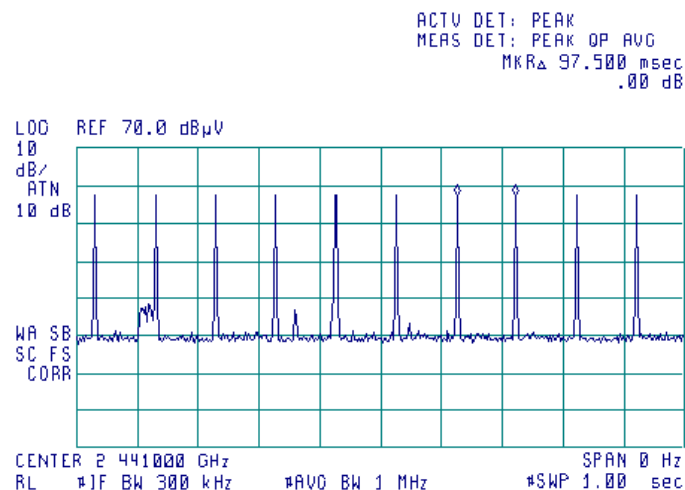
HERMON LABORATORIES

Test specification:		Section 15.247(a)1/RSS-210, Section A8.1(d), Average time of occupancy	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/23/2012	
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: Battery
Remarks:			

Plot 7.4.1 Single transmission duration, GFSK modulation

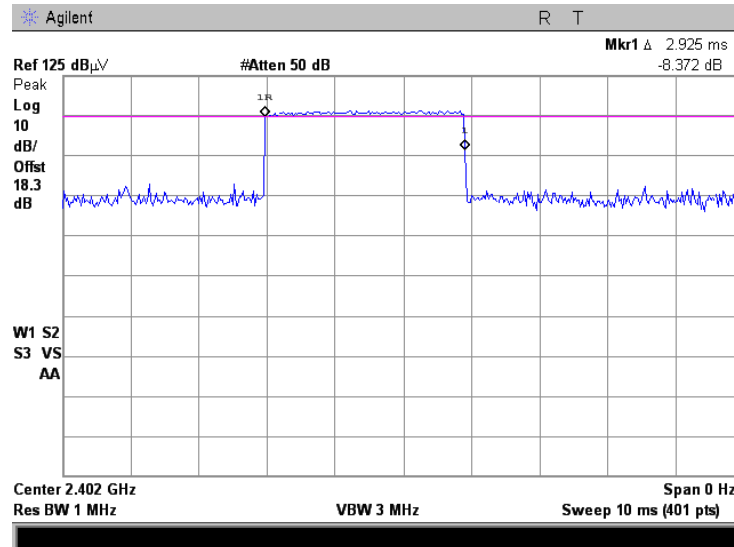


Plot 7.4.2 Single transmission period, GFSK modulation

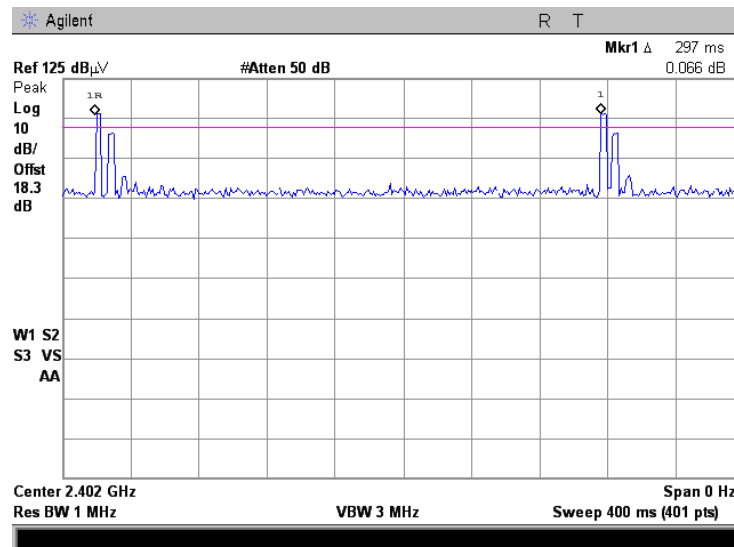


Test specification:		Section 15.247(a)1/RSS-210, Section A8.1(d), Average time of occupancy	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/23/2012	
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: Battery
Remarks:			

Plot 7.4.3 Single transmission duration, DQPSK modulation



Plot 7.4.4 Single transmission period, DQPSK modulation





Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/9/2012, 2/24/2013	
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 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	0.25 (<50 hopping channels)	24.0(<50 hopping channels)	125.2 (<50 hopping channels)	6.0*	
	1.0 (≥50 hopping channels)	30.0 (≥50 hopping channels)	131.2 (≥50 hopping channels)		
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 7.6.1, energized and its proper operation was checked.

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 7.6.2, Table 7.5.3 and the 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:

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

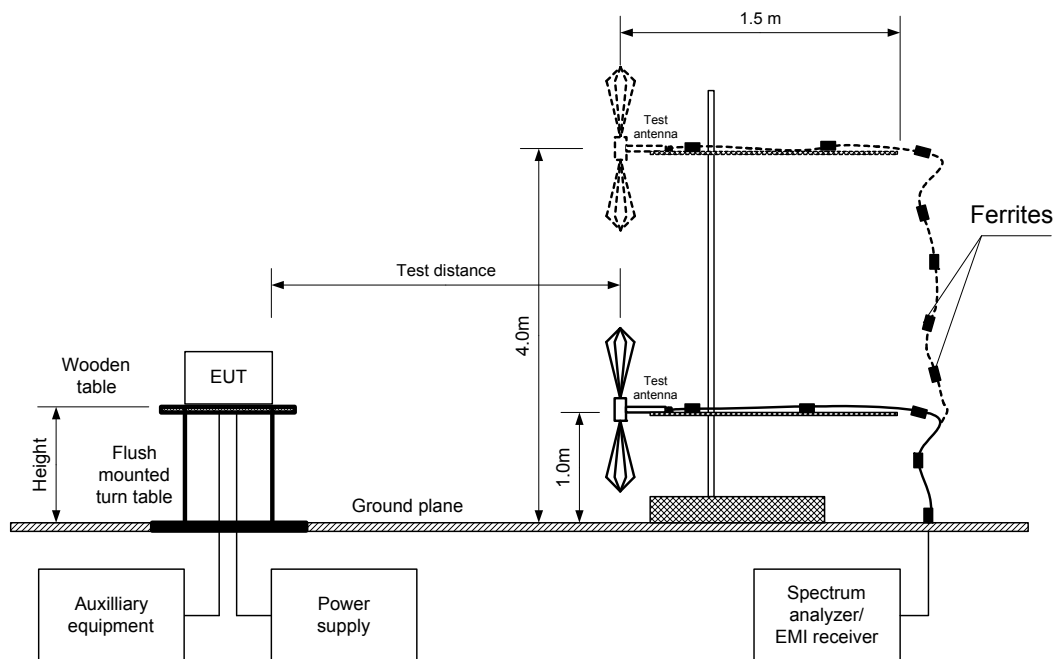
7.5.2.6 The worst test results (the lowest margins) were recorded in Table 7.6.2, Table 7.5.3.



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Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/9/2012, 2/24/2013		
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

Figure 7.5.1 Setup for carrier field strength measurements





HERMON LABORATORIES

Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/9/2012, 2/24/2013		
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

Table 7.5.2 Peak output power test results, GFSK modulation

ASSIGNED FREQUENCY BAND: 2400 – 2483.5 MHz
 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: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 1 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 EUT 20 dB BANDWIDTH: 0.93 MHz
 RESOLUTION BANDWIDTH: 1 MHz
 VIDEO BANDWIDTH: 3 MHz
 FREQUENCY HOPPING: Disabled
 NUMBER OF FREQUENCY HOPPING CHANNELS: 79

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
2402.200	116.21	Vert	1.5	15	2.0	18.98	30.0	-11.02	Pass
2441.838	116.26	Vert	1.4	15	2.0	19.03	30.0	-10.97	Pass
2479.825	113.62	Vert	1.1	17	2.0	16.39	30.0	-13.61	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, dB = Peak output power – specification limit.

Reference numbers of test equipment used

HL 0521	HL 0604	HL 4352	HL 4353				
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Full description is given in Appendix A.

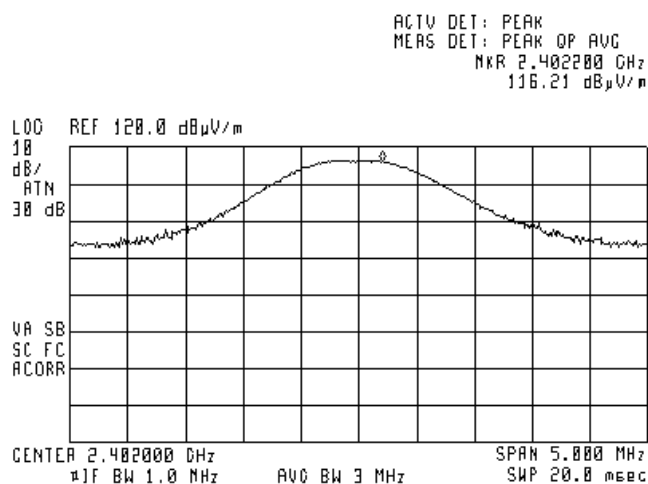


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Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/9/2012, 2/24/2013	
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

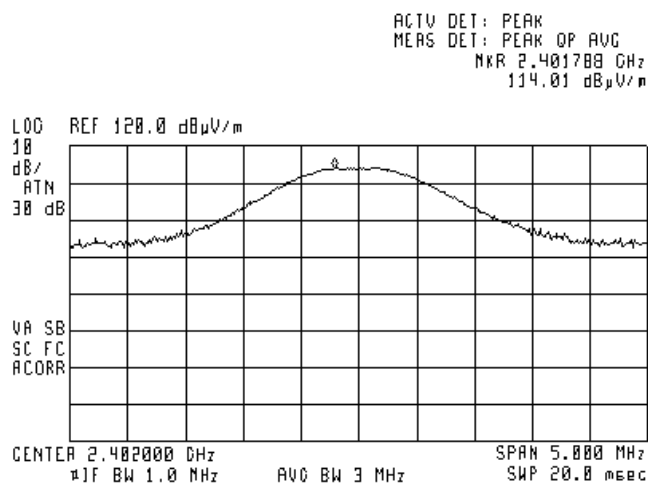
Plot 7.5.1 Peak output power at low frequency, GFSK modulation

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



Plot 7.5.2 Peak output power at low frequency, GFSK modulation

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





HERMON LABORATORIES

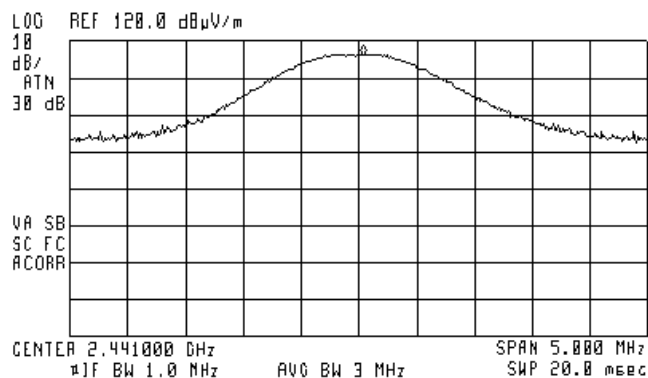
Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/9/2012, 2/24/2013	
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

Plot 7.5.3 Peak output power at mid frequency, GFSK modulation

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 2.441038 GHz
116.26 dBμV/m

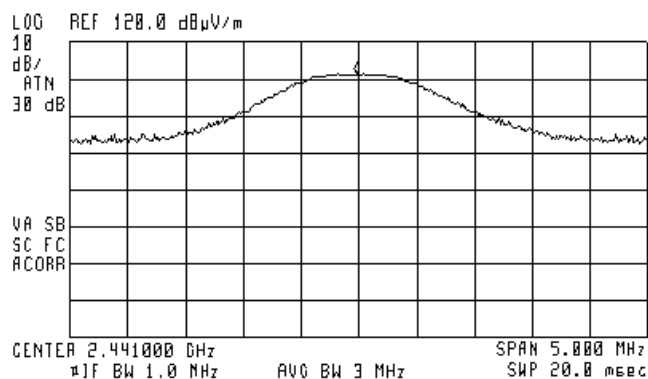


Plot 7.5.4 Peak output power at mid frequency, GFSK modulation

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 2.440975 GHz
111.62 dBμV/m





HERMON LABORATORIES

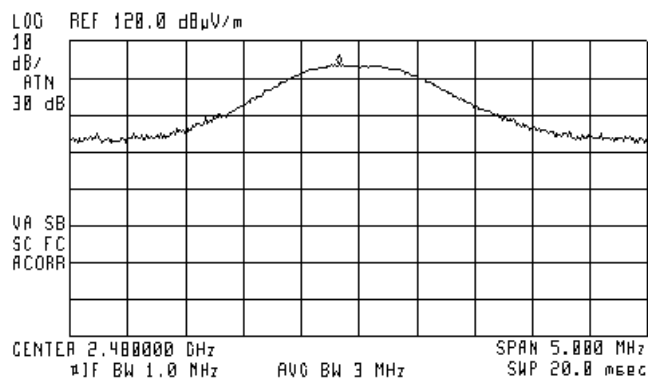
Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/9/2012, 2/24/2013	
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

Plot 7.5.5 Peak output power at high frequency, GFSK modulation

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 2.479825 GHz
113.62 dBμV/m

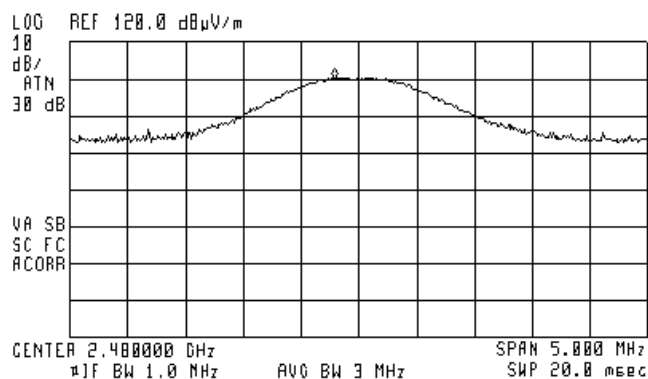


Plot 7.5.6 Peak output power at high frequency, GFSK modulation

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

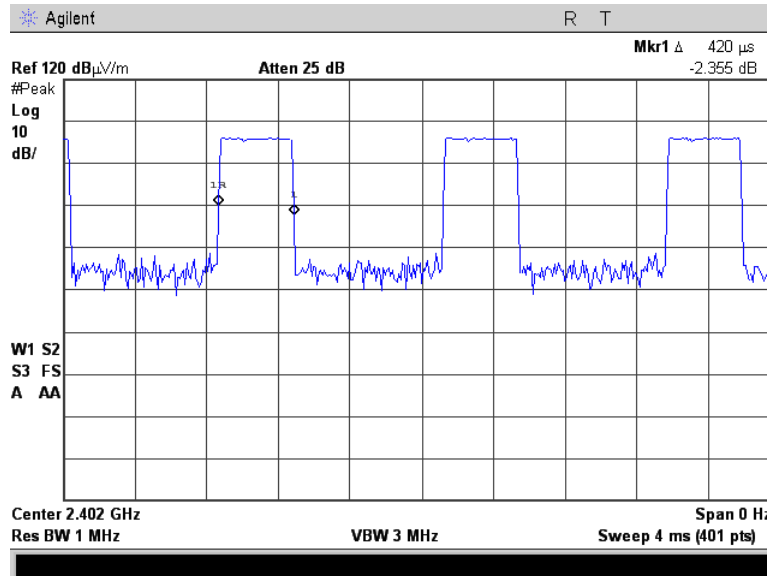


ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 2.479788 GHz
110.33 dBμV/m

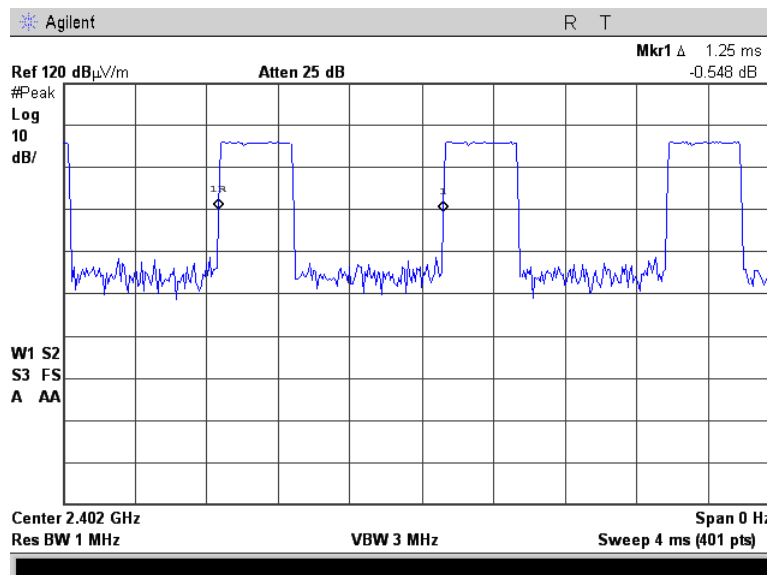


Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/9/2012, 2/24/2013	
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

Plot 7.5.7 Transmitter duty cycle, pulse duration, GFSK modulation



Plot 7.5.8 Transmitter duty cycle, pulse period, GFSK modulation





HERMON LABORATORIES

Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/9/2012, 2/24/2013		
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

Table 7.5.3 Peak output power test results, DQPSK modulation

ASSIGNED FREQUENCY: 2400 – 2483.5 MHz
 TEST DISTANCE: 3 m
 TEST SITE: OATS
 EUT HEIGHT: 0.8 m
 DETECTOR USED: Peak
 TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
 MODULATION: DQPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 2 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 EUT 20 dB BANDWIDTH: 1.3 MHz
 RESOLUTION BANDWIDTH: 1 MHz
 VIDEO BANDWIDTH: 3 MHz
 FREQUENCY HOPPING: Disabled
 NUMBER OF FREQUENCY HOPPING CHANNELS: 79

Frequency, MHz	Field strength, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2401.981	116.00	Vert	1.1	8	2.0	18.77	30.0	-11.23	Pass
2441.000	116.10	Vert	1.1	5	2.0	18.87	30.0	-11.13	Pass
2480.025	115.2	Vert	1.1	8	2.0	17.97	30.0	-12.03	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 (115%Unom, 85%Unom) input power voltage.

Reference numbers of test equipment used

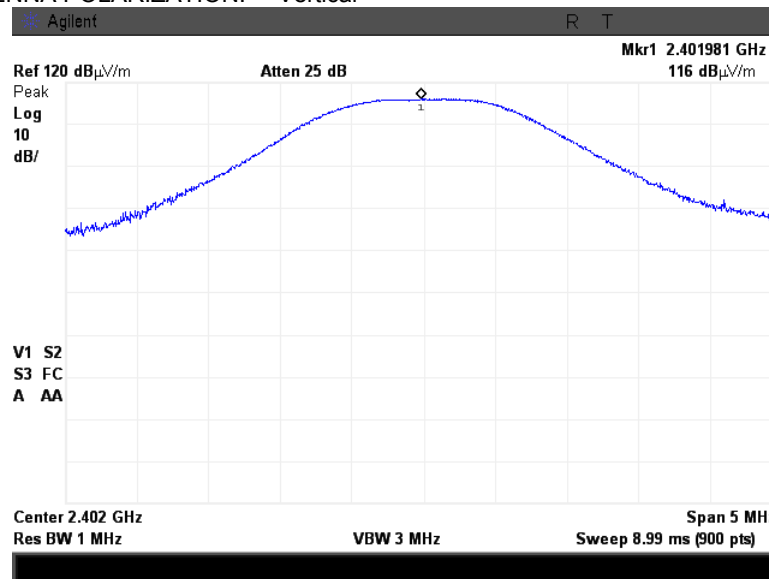
HL 2909	HL 4114	HL 4351					
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Full description is given in Appendix A.

Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/9/2012, 2/24/2013	
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

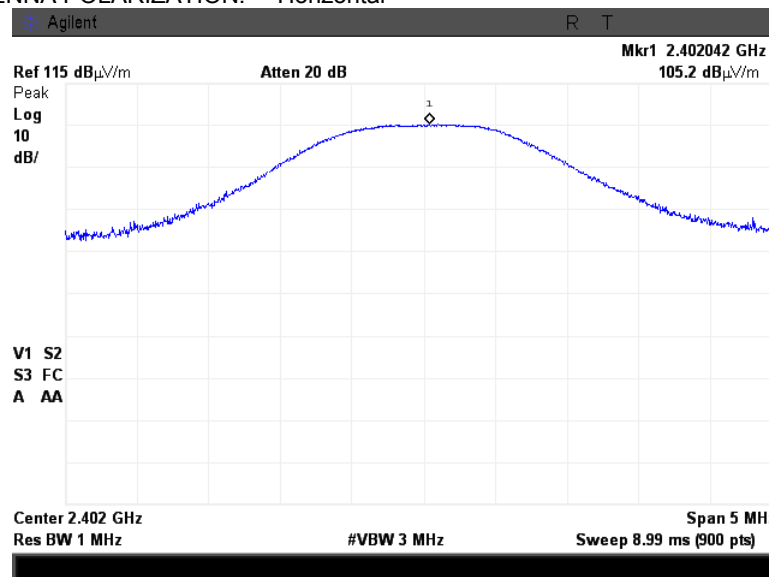
Plot 7.5.9 Peak output power at low frequency, DQPSK modulation

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



Plot 7.5.10 Peak output power at low frequency, DQPSK modulation

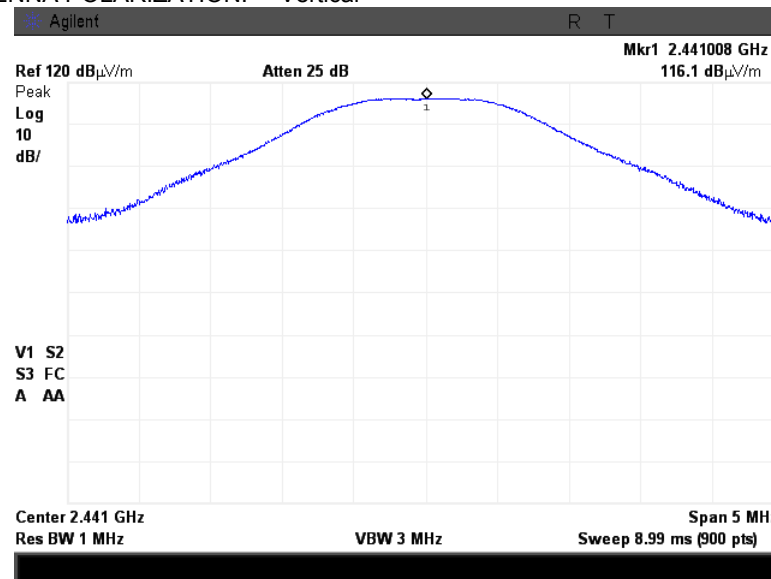
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/9/2012, 2/24/2013	
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

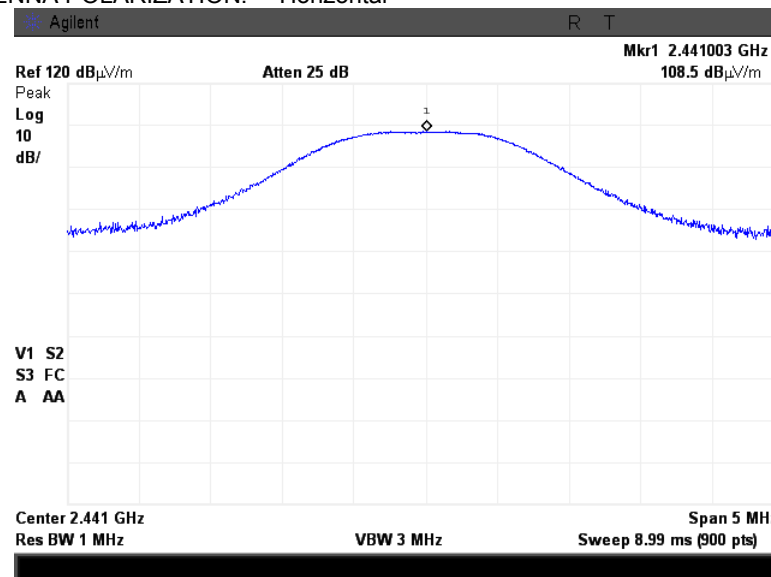
Plot 7.5.11 Peak output power at mid frequency, DQPSK modulation

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



Plot 7.5.12 Peak output power at mid frequency, DQPSK modulation

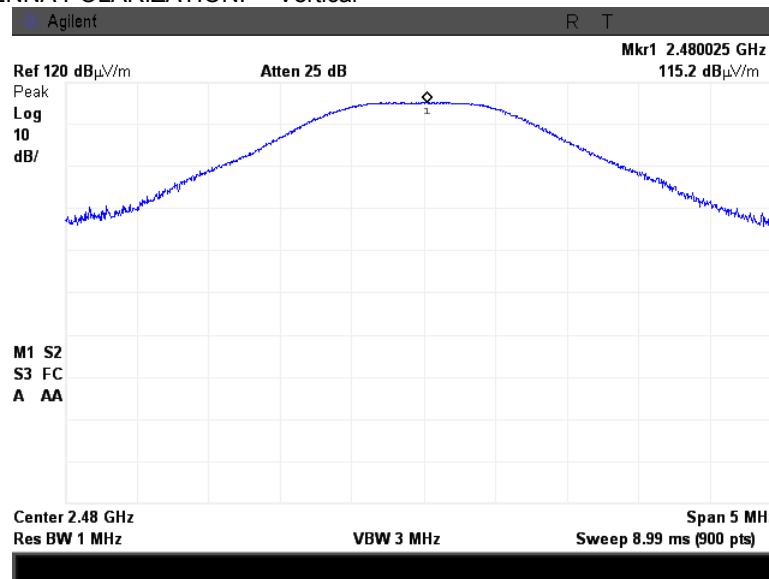
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/9/2012, 2/24/2013	
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

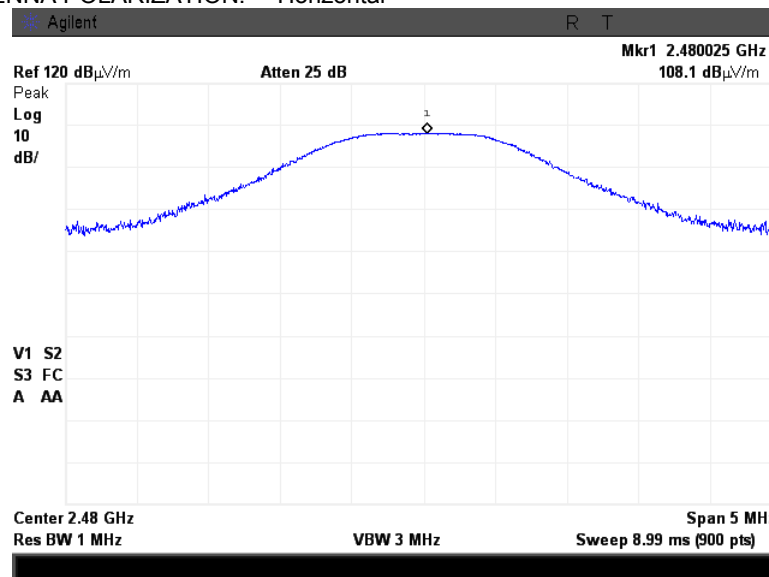
Plot 7.5.13 Peak output power at high frequency, DQPSK modulation

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



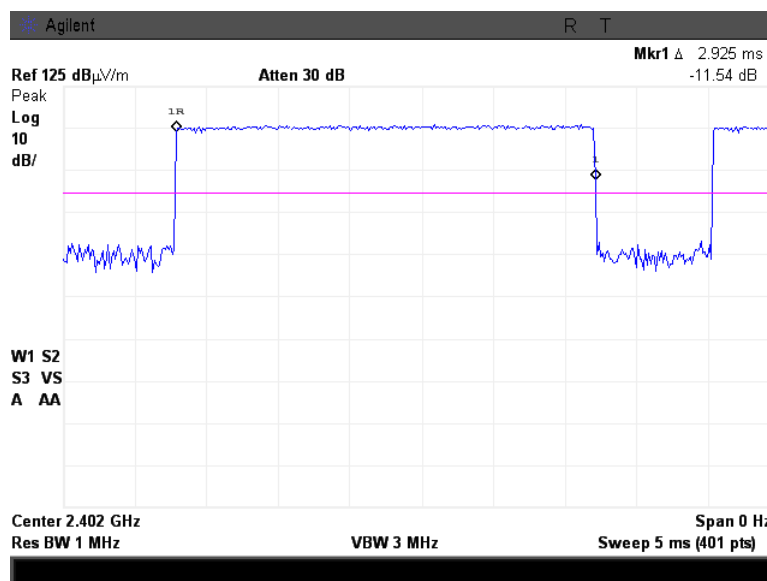
Plot 7.5.14 Peak output power at high frequency, DQPSK modulation

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

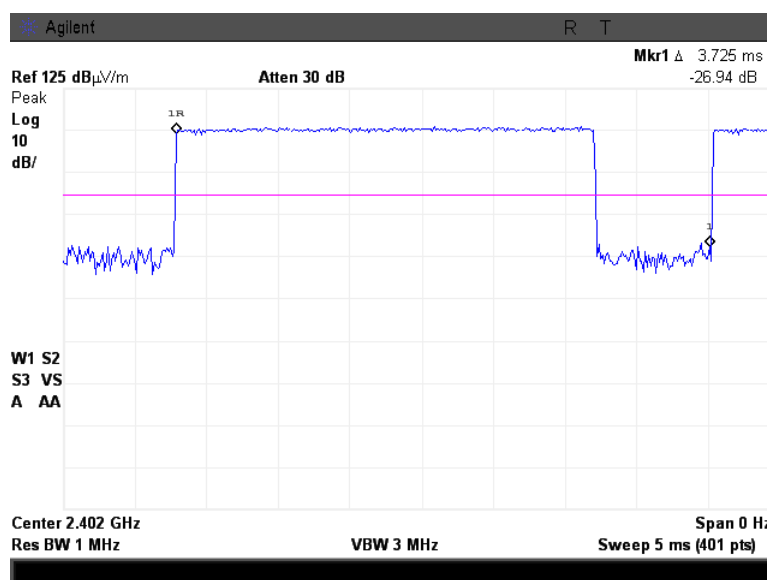


Test specification:		Section 15.247(b)/RSS-210, Section A8.4(2), Peak output power	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/9/2012, 2/24/2013	
Temperature: 19°C	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: Battery
Remarks:			

Plot 7.5.15 Transmitter duty cycle, pulse duration, DQPSK modulation



Plot 7.5.16 Transmitter duty cycle, pulse period, DQPSK modulation



Test specification:		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(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 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





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Test specification:		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(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Table 7.6.2 Band edge emission test results, GFSK modulation

ASSIGNED FREQUENCY BAND: 2400 – 2483.5 MHz
DETECTOR USED: Peak
MODULATION: GFSK
MODULATING SIGNAL: PRBS
BIT RATE: 1 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
RESOLUTION BANDWIDTH: $\geq 1\%$ of the span
VIDEO BANDWIDTH: $\geq$ RBW

Frequency, MHz	Band edge emission, dB(μ V/m)	Emission at carrier, dB(μ V/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Frequency hopping disabled						
2399.980	69.79	115.29	45.50	20.0	25.50	Pass
Frequency hopping enabled						
2398.580	68.12	115.29	47.17	20.0	27.17	Pass

*- Margin = Attenuation below carrier – specification limit.

RESTRICTED BANDS: 2310.0 – 2390 MHz
2483.5 – 2500 MHz

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=3 kHz)				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Frequency hopping disabled											
2376.200	Vert	1.5	15	60.33	74.0	-13.67	46.11	36.67	54.0	-17.3	Pass
2483.500	Vert	1.5	15	68.01	74.0	-5.99	49.64	40.20	54.0	-13.8	
Frequency hopping enabled											
2389.400	Vert	1.5	15	60.02	74.0	-13.98	44.83	35.39	54.0	-18.6	Pass
2483.500	Vert	1.5	15	66.48	74.0	-7.52	46.44	37.00	54.0	-17.0	

For average factor calculation (-9.44 dB) refer to Table 7.7.4.

VBW $\geq 1/T_{on}$ = 1/0.42 ms $\geq$ 2380 Hz, 3 kHz was used.

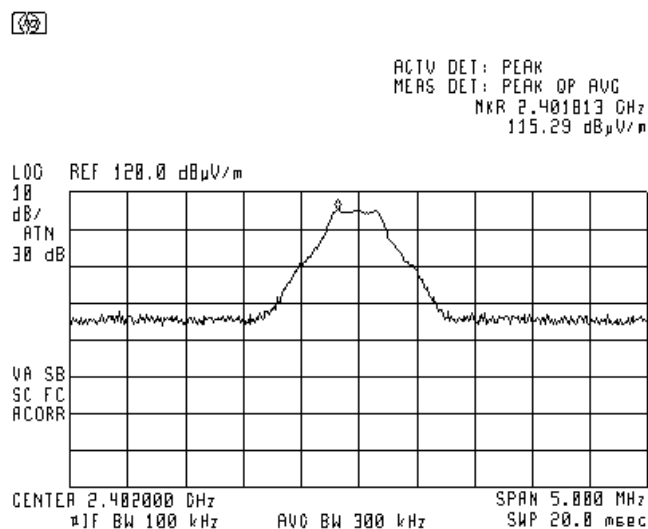
Reference numbers of test equipment used

HL 0521	HL 4114	HL 4352	HL 4353				
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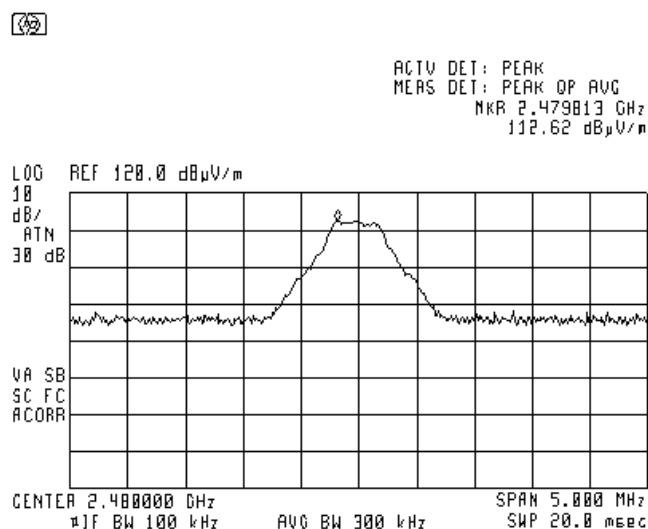
Full description is given in Appendix A.

Test specification:		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(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

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



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



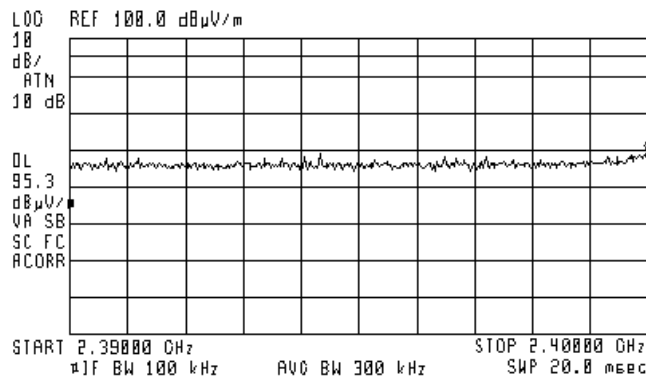
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

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

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
NOTE: Outside restricted band 2390 – 2400 MHz



ACTV DET: PEAK
MERS DET: PEAK QP AVG
MKR 2.39998 GHz
69.79 dBμV/m



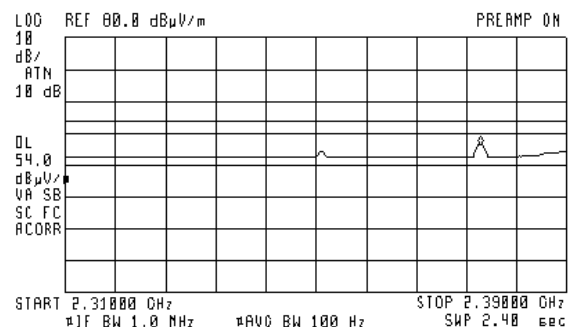
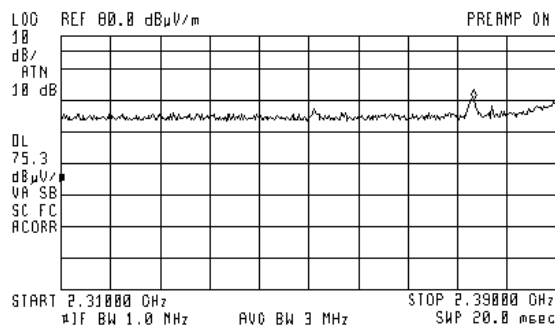
Plot 7.6.4 The highest band edge emission at low carrier frequency with hopping function disabled, GFSK modulation

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
RBW=1 MHz; VBW=3 MHz
Within restricted band 2310 – 2390 MHz



ACTV DET: PEAK
MERS DET: PEAK QP AVG
MKR 2.37660 GHz
60.33 dBμV/m

ACTV DET: PEAK
MERS DET: PEAK QP AVG
MKR 2.37620 GHz
46.11 dBμV/m



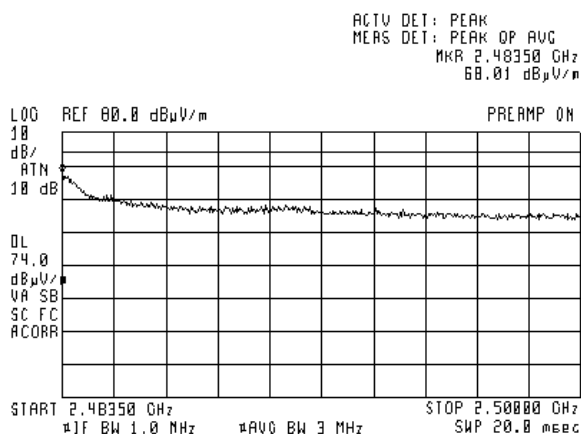
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Plot 7.6.5 The highest band edge emission at high carrier frequency with hopping function disabled, GFSK modulation

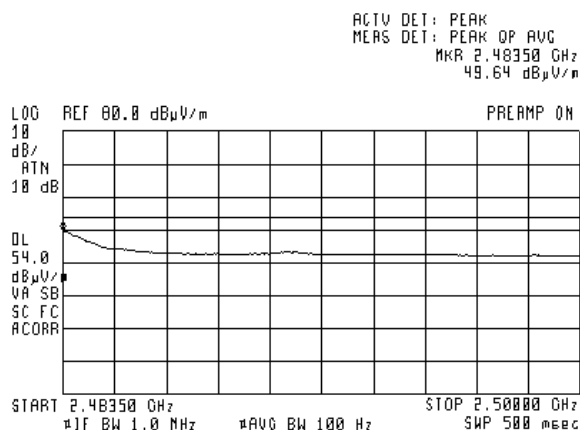
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1 MHz; VBW=3 MHz

Semi anechoic chamber
3 m
Vertical and Horizontal
RBW=1 MHz; VBW=100 Hz
Within restricted band 2483.5 – 2500 MHz

(32)



(32)





HERMON LABORATORIES

Test specification:		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(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

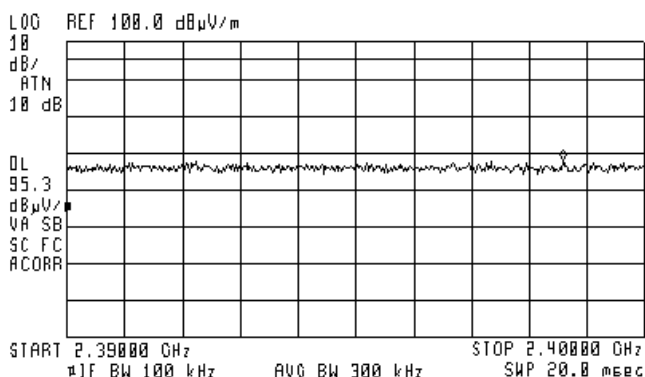
Plot 7.6.6 The highest band edge emission at low carrier frequency with hopping function enabled, GFSK modulation

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
NOTE:

Semi anechoic chamber
3 m
Vertical and Horizontal
Outside restricted band 2390 – 2400 MHz



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 2.39858 GHz
68.12 dBμV/m



Plot 7.6.7 The highest band edge emission at low carrier frequency with hopping function enabled, GFSK modulation

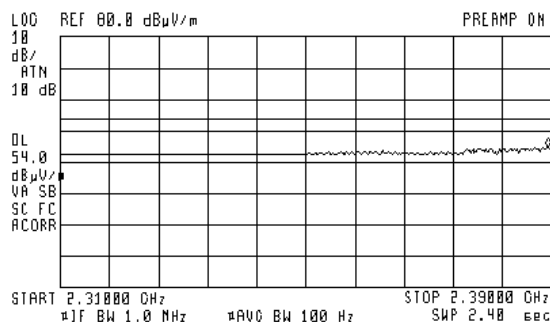
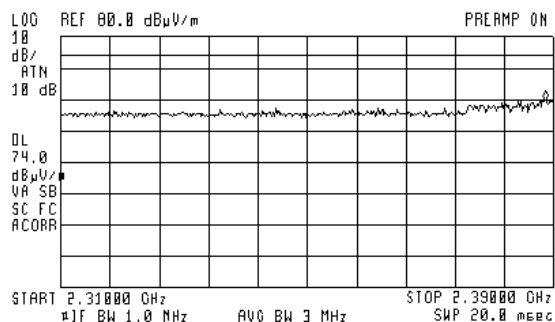
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1 MHz; VBW=3 MHz
NOTE:

Semi anechoic chamber
3 m
Vertical and Horizontal
RBW=1 MHz; VBW=100 Hz
Within restricted band 2310 – 2390 MHz



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 2.38860 GHz
68.02 dBμV/m

ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 2.38940 GHz
44.83 dBμV/m



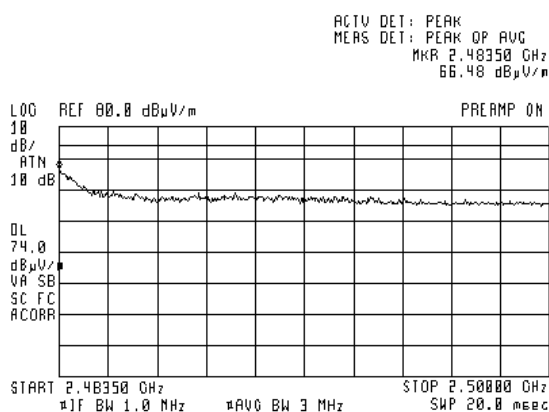
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Plot 7.6.8 The highest band edge emission at high carrier frequency with hopping function enabled, GFSK modulation

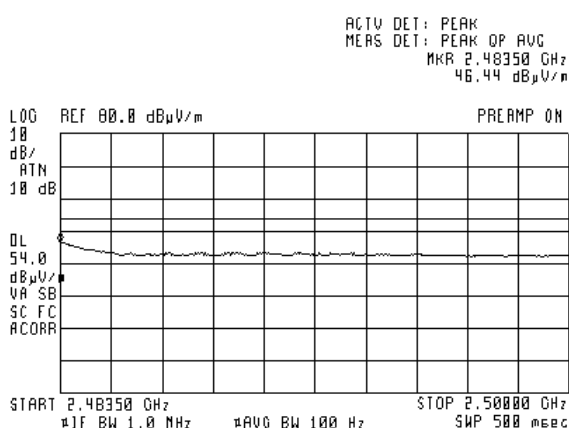
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz
NOTE:

Semi anechoic chamber
3 m
Vertical and Horizontal
RBW=1 MHz; VBW=100 Hz
Within restricted band 2483.5 – 2500 MHz

(32)



(32)





HERMON LABORATORIES

Test specification:		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(s):	9/27/2012, 2/26/2013		
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Table 7.6.3 Band edge emission test results, DQPSK modulation

ASSIGNED FREQUENCY RANGE: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak
MODULATION: DQPSK
MODULATING SIGNAL: PRBS
BIT RATE: 2 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
RESOLUTION BANDWIDTH: ≥ 1% of the span
VIDEO BANDWIDTH: ≥ RBW
OUTSIDE RESTRICTED BAND: 2390 – 2400 MHz

Frequency, MHz	Band edge emission, dBuV	Emission at carrier, dBuV	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Frequency hopping disabled						
2399.576	50.24	96.15	45.91	20.0	25.91	Pass
Frequency hopping enabled						
2399.385	50.99	95.99	45.00	20.0	25.00	Pass

*- Margin = Attenuation below carrier – specification limit.

RESTRICTED BANDS: 2310.0 – 2390 MHz
2483.5 – 2500 MHz

Frequency, MHz	Peak field strength(VBW=3 MHz)			Average field strength(VBW=3 kHz)				Verdict
	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
2376.260	58.80	74.0	-15.20	48.54	17.87	54.0	-36.13	Pass
2483.500	68.62	74.0	-5.38	71.81	41.14	54.0	-12.86	
2388.200	58.89	74.0	-15.11	49.15	18.48	54.0	-35.52	Pass
2483.500	69.49	74.0	-4.51	74.05	43.38	54.0	-10.62	

$VBW \geq 1/T_{on} = 1/2.925 \text{ ms} \geq 342 \text{ Hz}$, 1 kHz was used.

Average factor calculation: $20 \log (2.925 \text{ ms}/100 \text{ ms}) = -30.67 \text{ dB}$

where

Tx On = 2.925ms; pulse period=297 ms.

Reference numbers of test equipment used

HL 1454	HL 2909	HL 4114	HL 4138	HL 4352	HL 4353		
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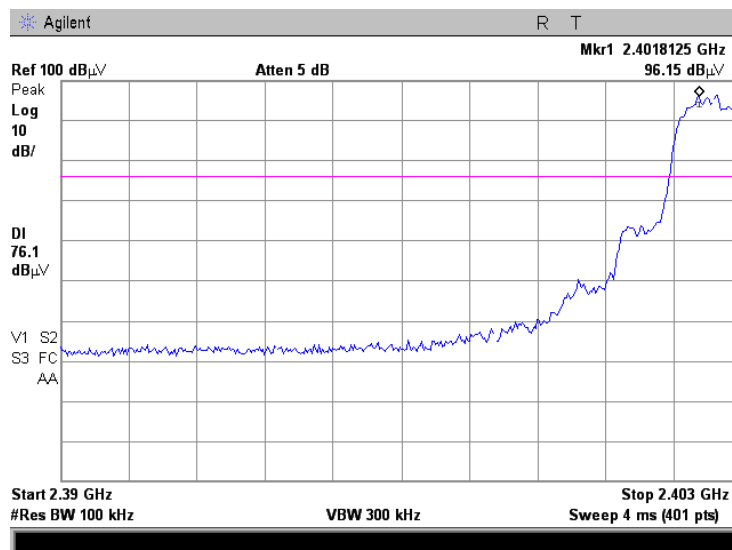
Full description is given in Appendix A.



HERMON LABORATORIES

Test specification:		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(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Plot 7.6.9 The highest emission level within the assigned band at low carrier frequency, DQPSK modulation

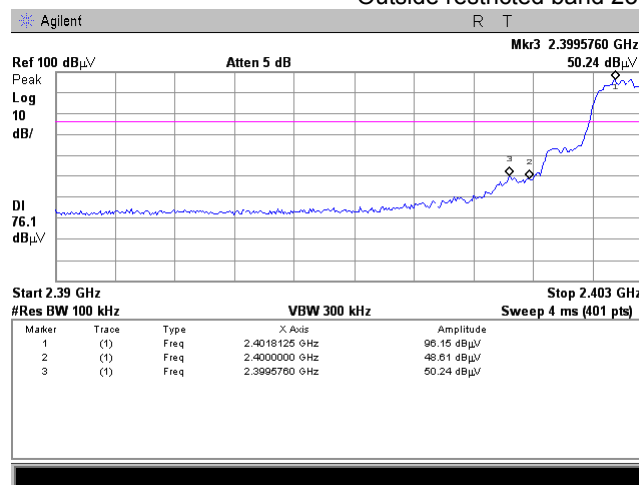


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Plot 7.6.10 The highest band edge emission at low carrier frequency with hopping function disabled, DQPSK modulation

TEST SITE:
NOTE:

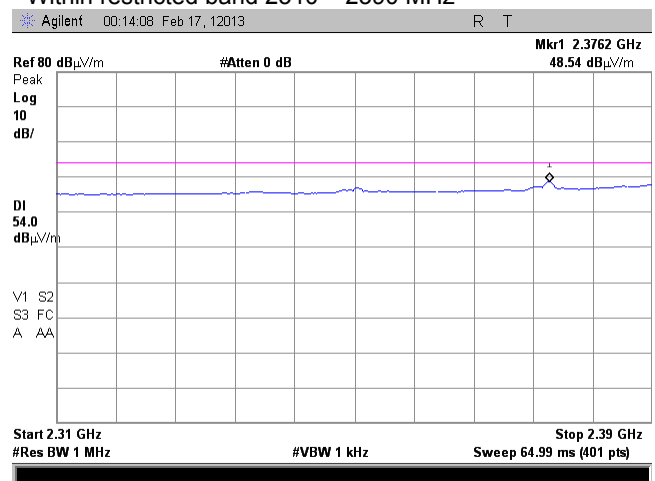
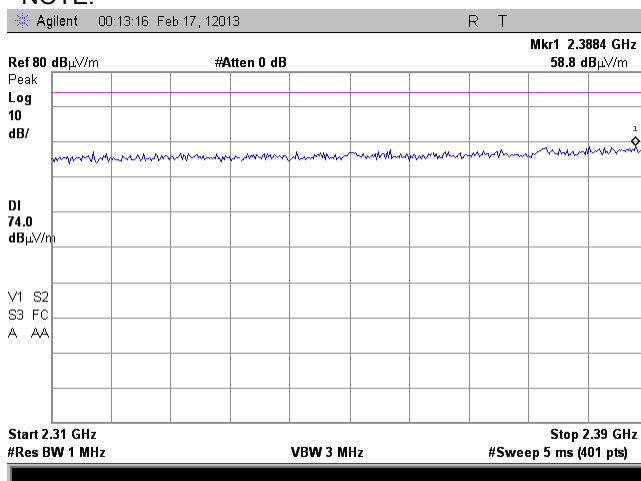
Radio
Outside restricted band 2390 – 2400 MHz



Plot 7.6.11 The highest band edge emission at low carrier frequency with hopping function disabled, DQPSK modulation

TEST SITE:
TEST DISTANCE:
RBW=1 MHz; VBW=3 MHz
NOTE:

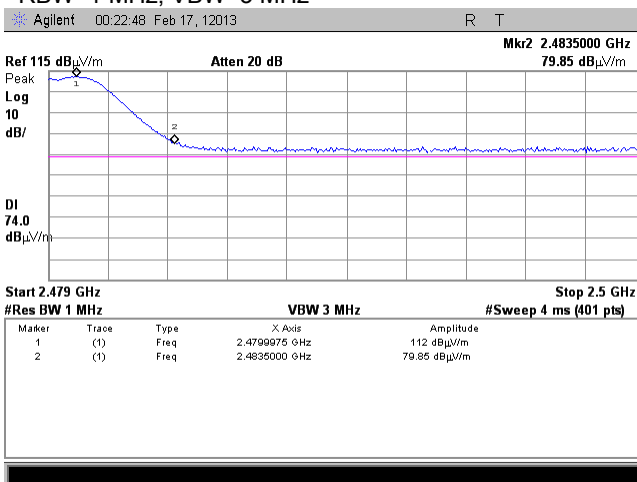
Semi anechoic chamber
3 m
RBW=1 MHz; VBW=1 kHz
Within restricted band 2310 – 2390 MHz



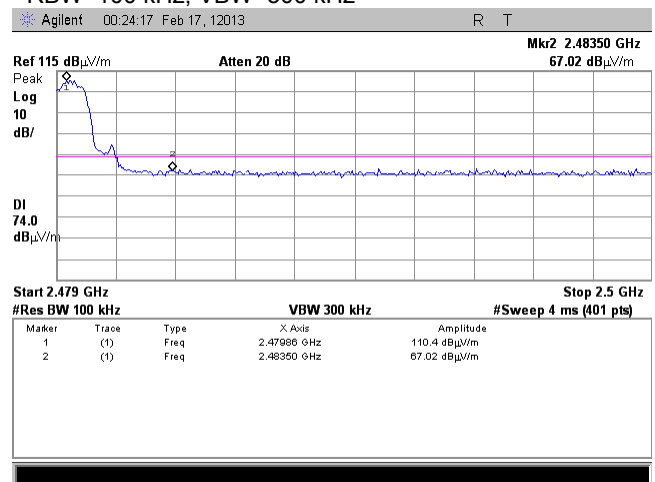
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Plot 7.6.12 The highest band edge emission at high carrier frequency with hopping function disabled, DQPSK modulation

TEST SITE:
TEST DISTANCE:
NOTE:
RBW=1 MHz; VBW=3 MHz



Semi anechoic chamber
3 m
Within restricted band 2483.5 – 2500 MHz
RBW=100 kHz; VBW=300 kHz



$$\text{SA peak} = \text{SA reading M1(RBW=1 MHz)} - (\text{SA reading M1(RBW=100 kHz)} - \text{SA reading M2(RBW=100 kHz)}) = 112.0 \text{ dB}\mu\text{V/m} - (110.4 \text{ dB}\mu\text{V/m} - 67.02 \text{ dB}\mu\text{V/m}) = 68.62 \text{ dB}\mu\text{V/m}$$

RBW=1 MHz; VBW=1 kHz

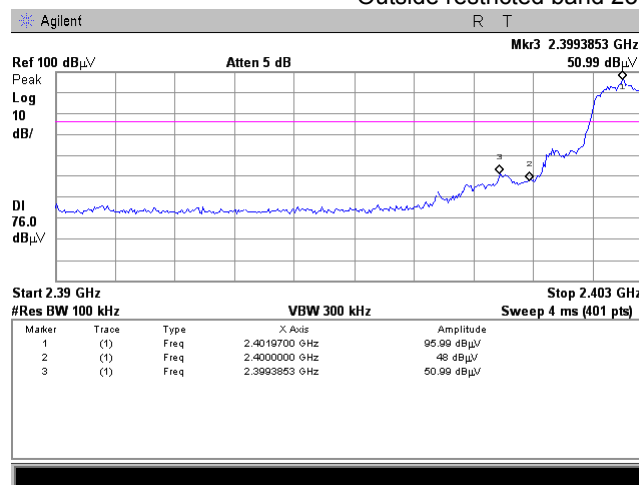


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Plot 7.6.13 The highest band edge emission at low carrier frequency with hopping function enabled, DQPSK modulation

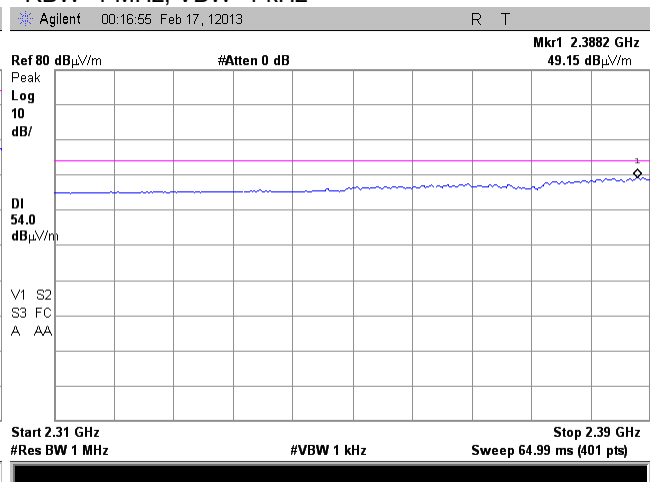
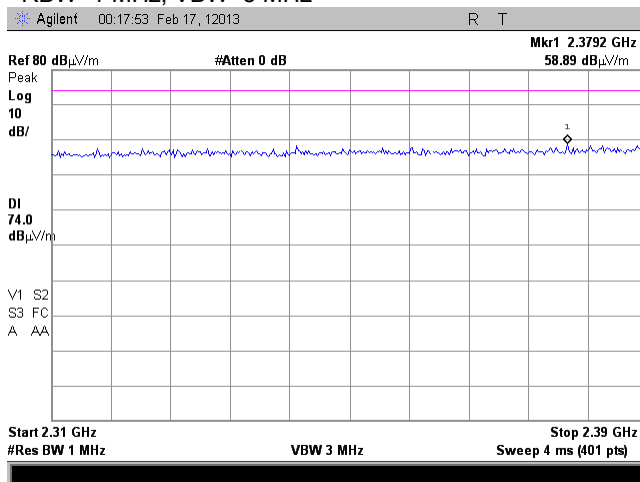
TEST SITE:
NOTE:

Radio
Outside restricted band 2390 – 2400 MHz



TEST SITE:
TEST DISTANCE:
NOTE:
RBW=1 MHz; VBW=3 MHz

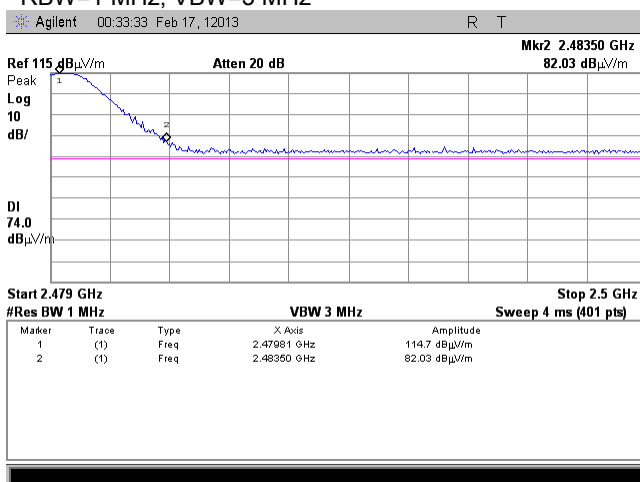
Semi anechoic chamber
3 m
Within restricted band 2310 – 2390 MHz
RBW=1 MHz; VBW=1 kHz



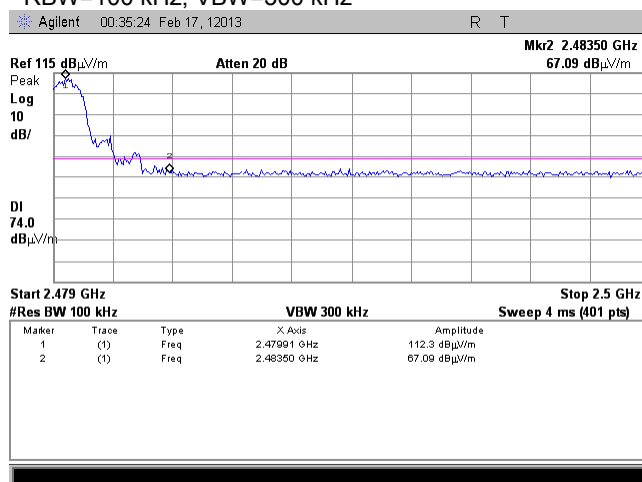
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Emissions at band edges	
Test procedure:		Public notice DA 00-705	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/27/2012, 2/26/2013	
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: Battery
Remarks:			

Plot 7.6.14 The highest band edge emission at high carrier frequency with hopping function enabled, DQPSK modulation

TEST SITE:
TEST DISTANCE:
NOTE:
RBW=1 MHz; VBW=3 MHz



Semi anechoic chamber
3 m
Within restricted band 2483.5 – 2500 MHz
RBW=100 kHz; VBW=300 kHz



$$\text{SA peak} = \text{SA reading M1(RBW=1MHz)} - (\text{SA reading M1(RBW=100kHz)} - \text{SA reading M2(RBW=100kHz)}) = 114.7 \text{ dB}\mu\text{V/m} - (112.3 \text{ dB}\mu\text{V/m} - 67.09 \text{ dB}\mu\text{V/m}) = 69.49 \text{ dB}\mu\text{V/m}$$

RBW=1MHz; VBW=1 kHz





Test specification:	Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/20/2012 - 10/2/2012		
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: 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:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

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

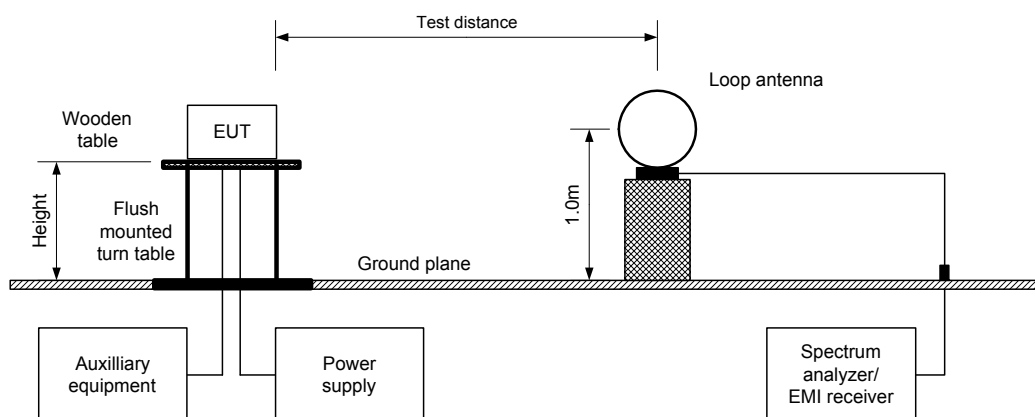
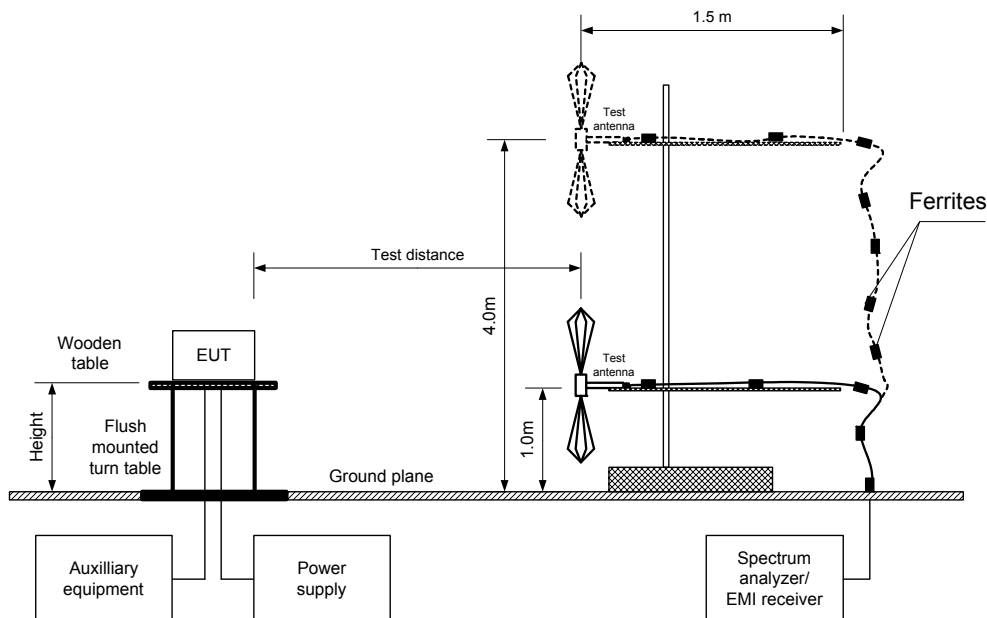


Figure 7.7.2 Setup for spurious emission field strength measurements above 30 MHz





HERMON LABORATORIES

Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Table 7.7.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 25000 MHz
 TEST DISTANCE: 3 m
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 1 Mbps
 DUTY CYCLE: 34 %
 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

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									
9608.50	60.08	V	1.2	280	115.29	55.21	20.0	35.21	Pass
14412.85	65.40	V	1.0	30		49.89		29.89	
16815.00	61.27	V	1.0	30		54.02		34.02	
Mid carrier frequency									
9764.75	59.89	V	1.2	283	115.19	55.30	20.0	35.30	Pass
14646.85	71.00	V	1.0	24		44.19		24.19	
1708.80	62.74	V	1.0	30		52.45		32.45	
High carrier frequency									
9919.18	54.55	V	1.1	93	112.62	58.07	20.0	38.07	Pass
14880.85	53.71	V	1.0	24		58.91		38.91	

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

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



Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions			
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4			
Test mode:		Compliance		Verdict: PASS	
Date(s):		9/20/2012 - 10/2/2012			
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %		Power Supply: Battery	
Remarks:					

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

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz
 INVESTIGATED FREQUENCY RANGE: 1000 - 25000 MHz
 TEST DISTANCE: 3 m
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 1 Mbps
 DUTY CYCLE: 34 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 TEST ANTENNA TYPE: Double ridged guide
 FREQUENCY HOPPING: Disabled

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Low carrier frequency											
1601.3	H	1.0	10	55.37	74.0	-18.63	48.70	39.26	54.0	-14.7	Pass
4804.1	H	1.0	92	53.99	74.0	-20.01	37.83	28.39	54.0	-25.6	
7206.0	H	1.2	15	60.54	74.0	-13.46	40.77	31.33	54.0	-22.7	
1200.92	V	1.1	0	64.46	74.0	-9.54	41.80	32.36	54.0	-21.6	
19214.65	V	1.1	25	60.83	74.0	-13.17	37.14	27.70	54.0	-26.3	
Mid carrier frequency											
1627.30	H	1.3	182	54.58	74.0	-19.42	48.36	38.92	54.0	-15.1	Pass
4882.00	V	1.1	43	51.91	74.0	-22.09	36.96	27.52	54.0	-26.5	
7322.45	H	1.5	28	60.06	74.0	-13.94	40.58	31.14	54.0	-22.9	
1220.39	V	1.1	10	65.11	74.0	-8.89	42.33	32.89	54.0	-21.1	
19526.55	V	1.1	25	62.39	74.0	-11.61	39.19	29.75	54.0	-24.3	
High carrier frequency											
1653.30	H	2.2	17	54.34	74.0	-19.66	44.62	35.18	54.0	-18.8	Pass
4960.30	H	1.2	50	50.40	74.0	-23.6	35.88	26.44	54.0	-27.6	
7439.47	H	1.5	83	56.30	74.0	-17.70	38.97	29.53	54.0	-24.5	
12400.72	V	1.1	30	61.49	74.0	-12.51	38.14	28.70	54.0	-25.3	

*- 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		
0.42	1.25	NA	NA	NA	-9.44

*- 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(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/20/2012 - 10/2/2012		
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

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

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 TEST DISTANCE: 3 m
 MODULATION: GFSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 1 Mbps
 DUTY CYCLE: 34 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 RESOLUTION BANDWIDTH: 1.0 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*				
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 0521	HL 0604	HL 0768	HL 2909	HL 3901	HL 4114	HL 4150
HL 4352	HL 4353						

Full description is given in Appendix A.

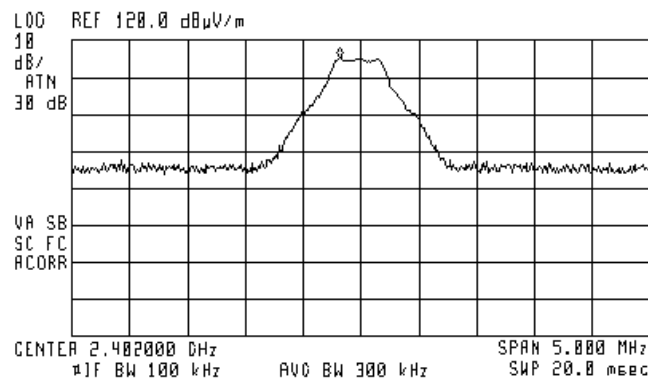
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.1 Radiated emission measurements at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



ACTV DET: PEAK
MERS DET: PEAK OP AVG
NKR 2.401013 GHz
115.29 dBμV/m

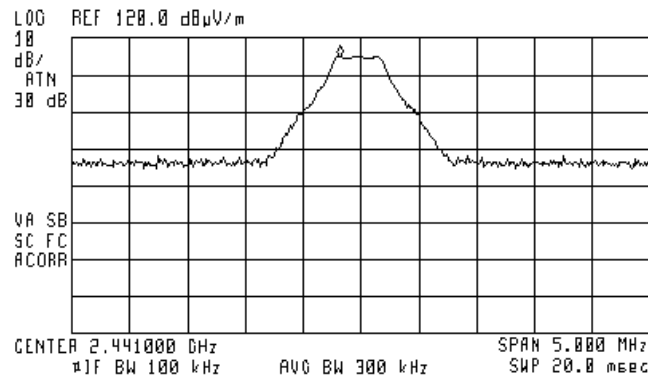


Plot 7.7.2 Radiated emission measurements at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



ACTV DET: PEAK
MERS DET: PEAK OP AVG
NKR 2.440013 GHz
115.19 dBμV/m





HERMON LABORATORIES

Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.3 Radiated emission measurements at the high carrier frequency

TEST SITE:

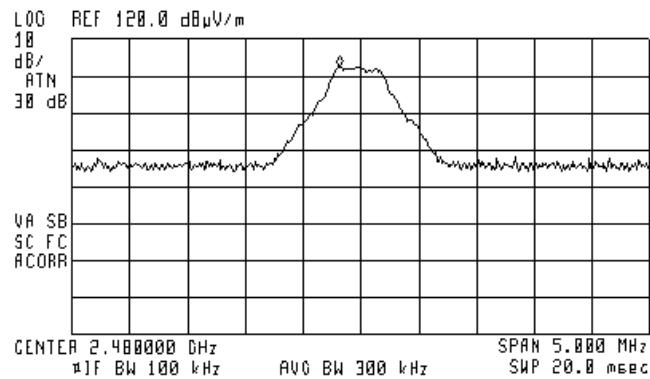
Semi anechoic chamber

TEST DISTANCE:

3 m



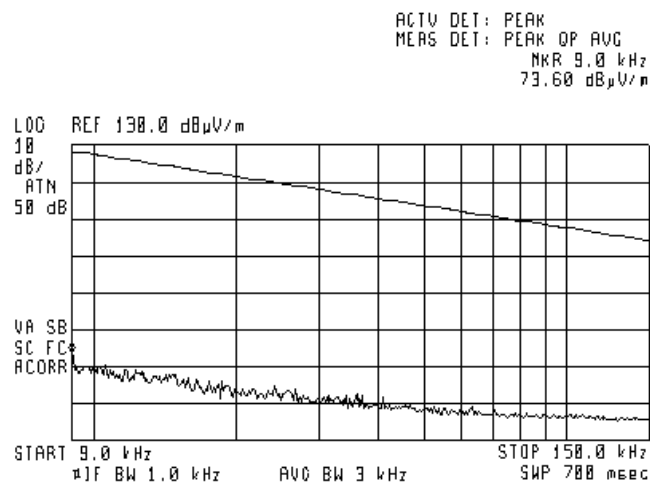
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 2.479813 GHz
112.62 dBμV/m



Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

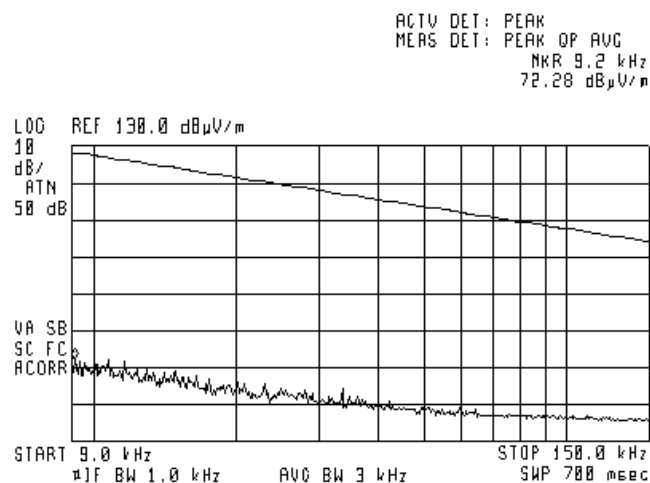
Plot 7.7.4 Radiated emission measurements from 9 to 150 kHz at the low carrier frequency

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



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

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





HERMON LABORATORIES

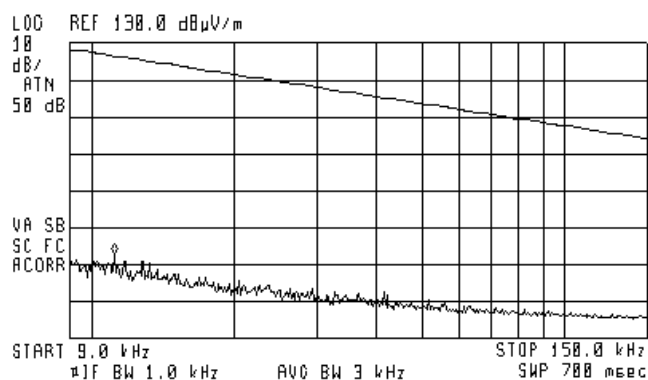
Test specification:	Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/20/2012 - 10/2/2012		
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

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

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 11.3 kHz
73.00 dB μ V/m

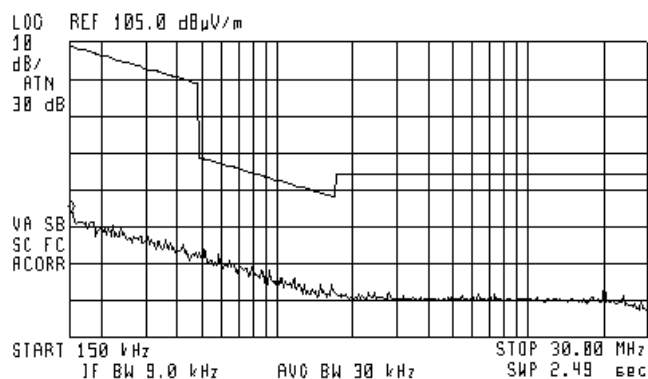


Plot 7.7.7 Radiated emission measurements from 0.15 to 30 MHz at the low carrier frequency

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 150 kHz
59.11 dB μ V/m





HERMON LABORATORIES

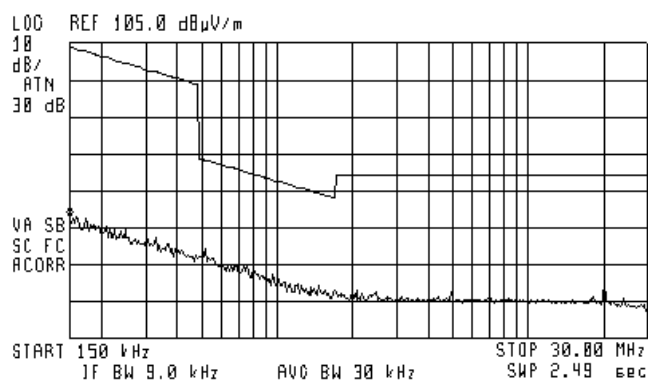
Test specification:	Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/20/2012 - 10/2/2012		
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

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

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
NR 150 kHz
57.91 dB μ V/m

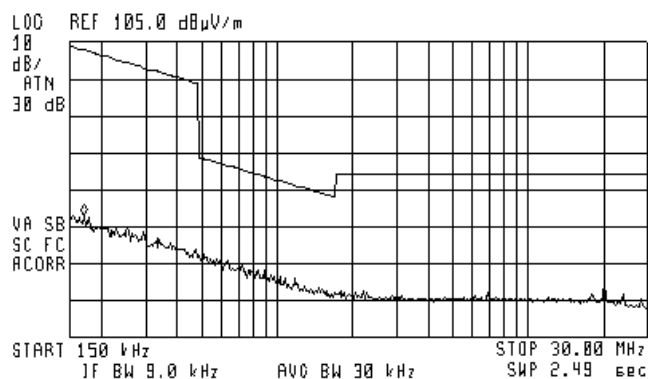


Plot 7.7.9 Radiated emission measurements from 0.15 to 30 MHz at the high carrier frequency

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
NR 170 kHz
57.98 dB μ V/m



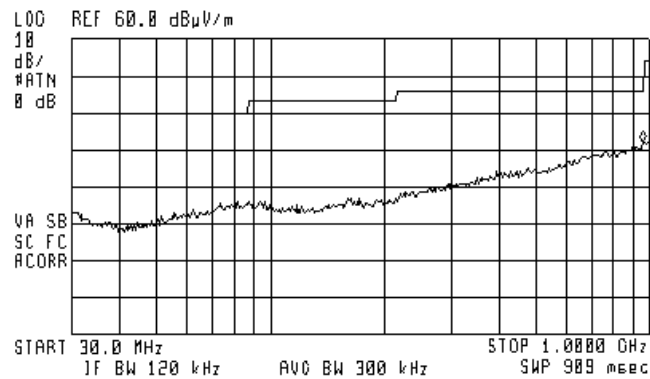
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

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

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
Mkr 952.3 MHz
32.18 dBμV/m

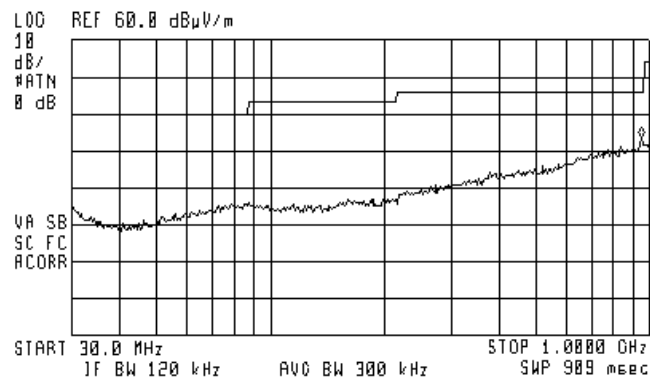


Plot 7.7.11 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
Mkr 942.8 MHz
33.50 dBμV/m





HERMON LABORATORIES

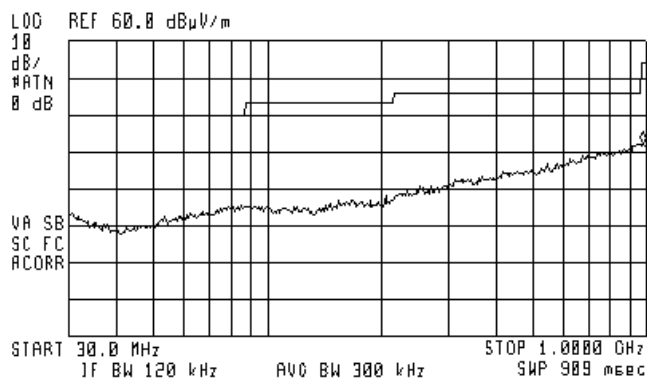
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

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

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



ACTV DET: PEAK
MERS DET: PEAK OP AVG
Mkr 971.4 MHz
32.66 dBμV/m





HERMON LABORATORIES

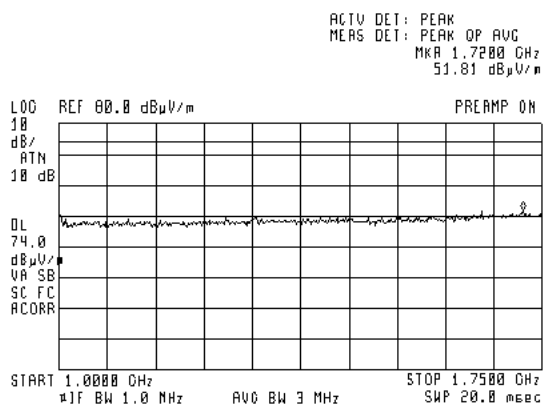
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.13 Radiated emission measurements from 1000 to 2400 MHz at the low carrier frequency within restricted band

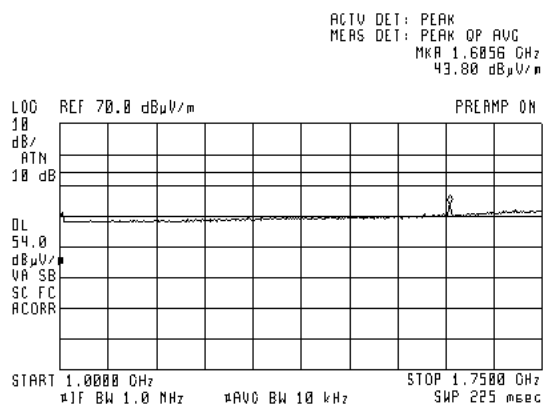
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

Semi anechoic chamber
3 m
Vertical and Horizontal

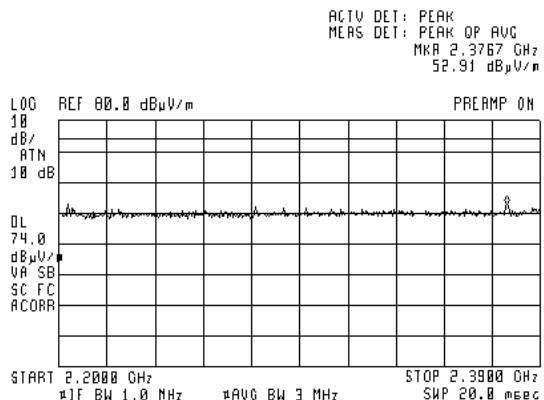
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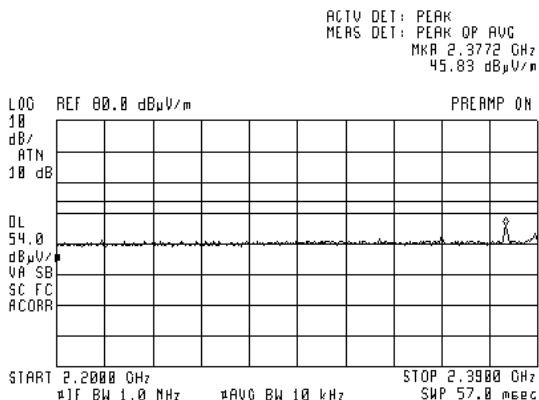
(42)



(42)



(42)





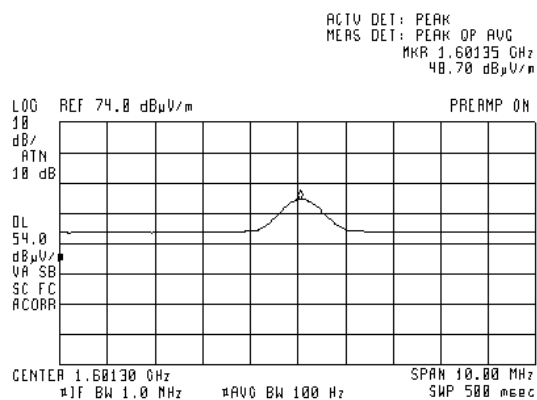
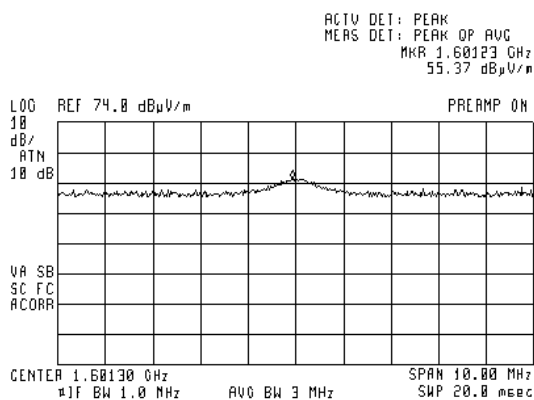
HERMON LABORATORIES

Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.14 Radiated emission measurements at 1601 MHz at the low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

Semi anechoic chamber
3 m
Vertical and Horizontal



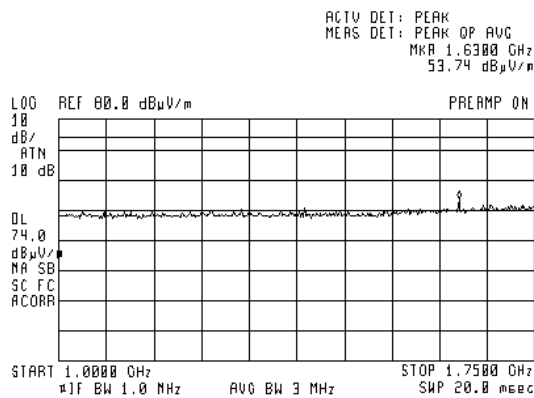
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.15 Radiated emission measurements from 1000 to 2400 MHz at the mid carrier frequency within restricted band

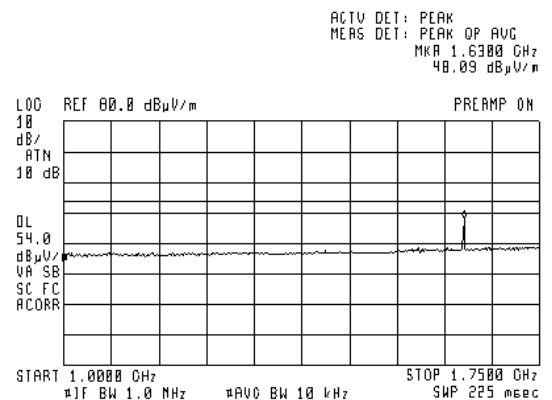
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

Semi anechoic chamber
3 m
Vertical and Horizontal

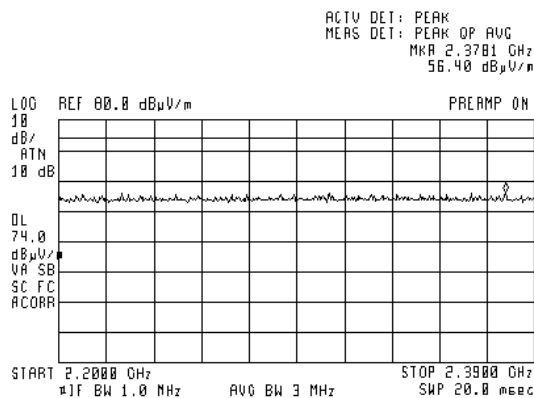
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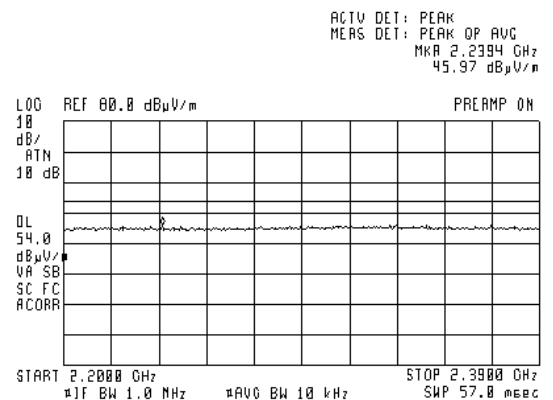
(32)



(32)



(32)

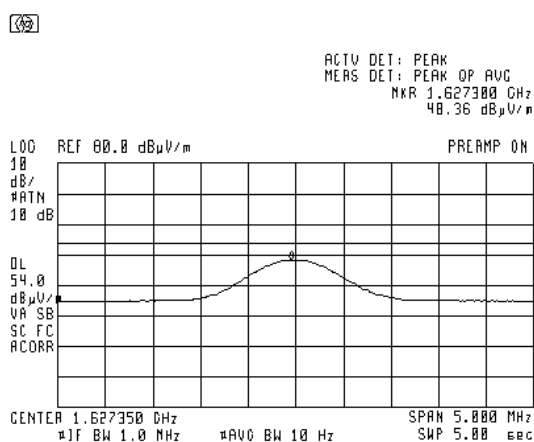
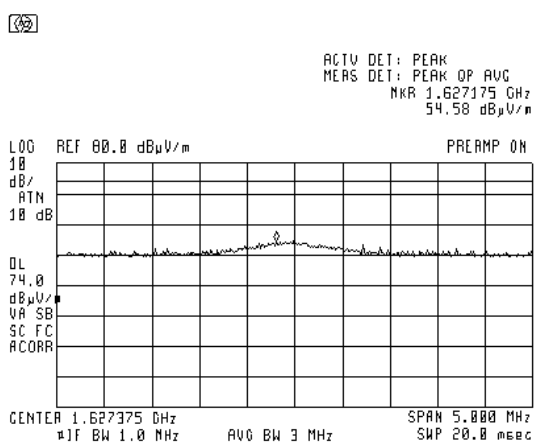


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

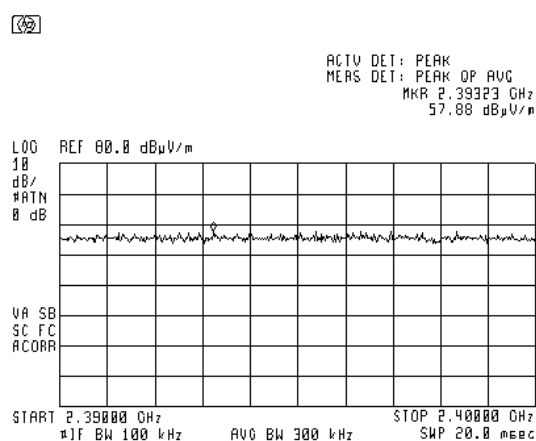
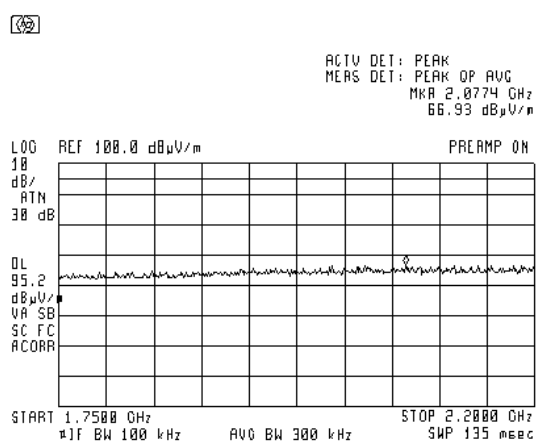
Plot 7.7.16 Radiated emission measurements at 1627 MHz at the mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

Semi anechoic chamber
3 m
Vertical and Horizontal



Plot 7.7.17 Radiated emission measurements from 1000 to 2400 MHz at the mid carrier frequency outside restricted band



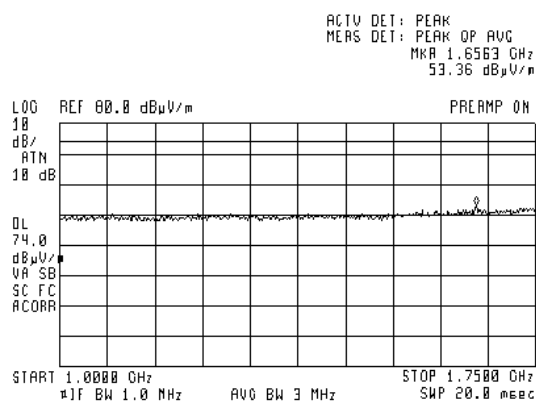
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.18 Radiated emission measurements from 1000 to 2400 MHz at the high carrier frequency within restricted band

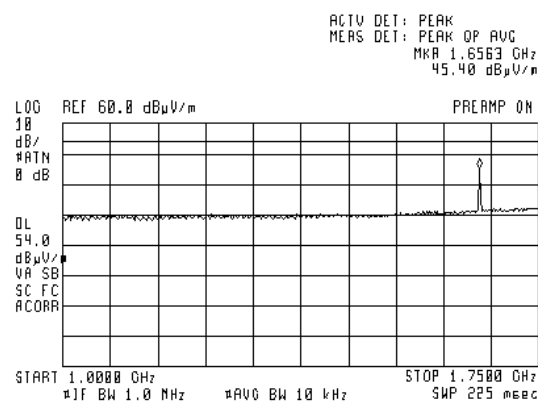
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

Semi anechoic chamber
3 m
Vertical and Horizontal

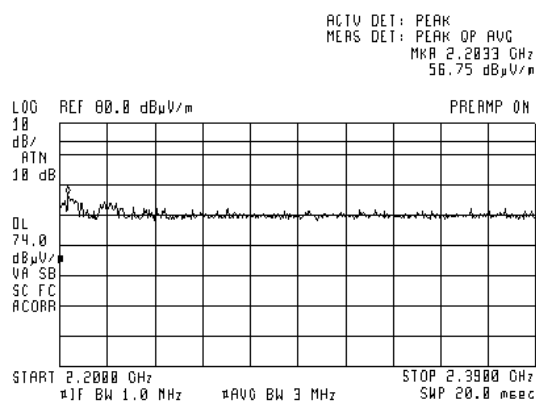
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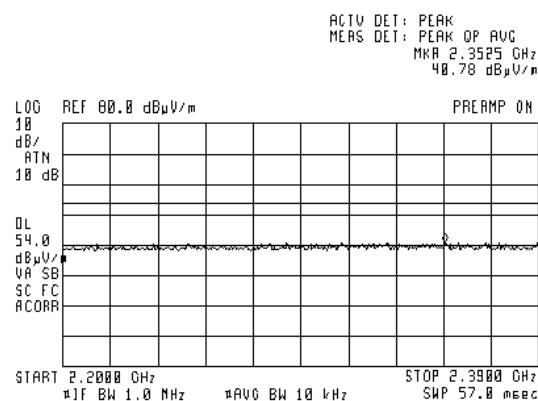
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(32)

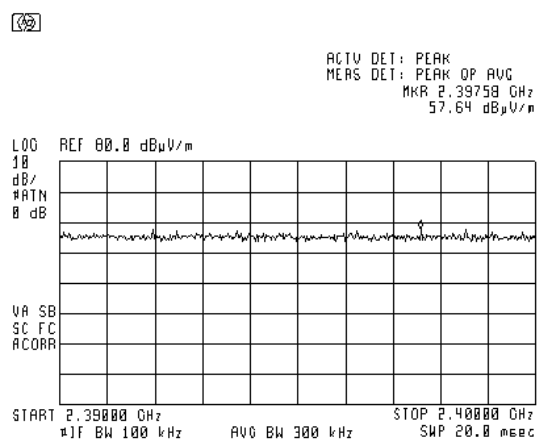
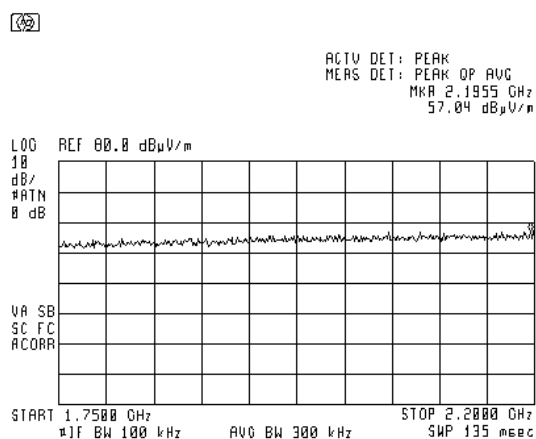


(32)



Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

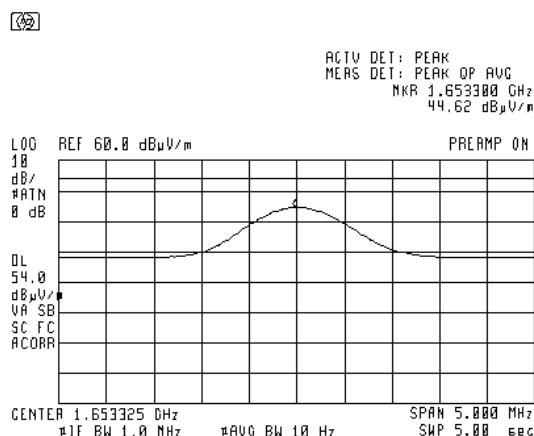
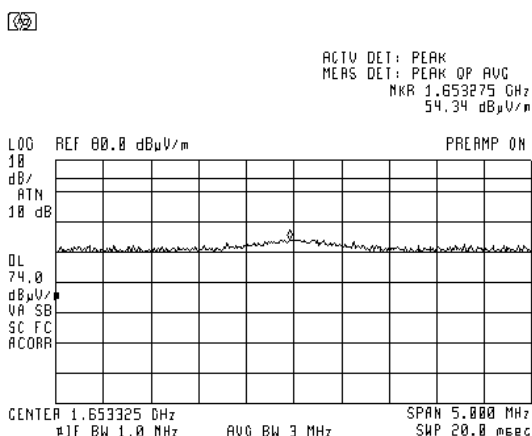
Plot 7.7.19 Radiated emission measurements from 1000 to 2400 MHz at the high carrier frequency outside restricted band



Plot 7.7.20 Radiated emission measurements at 1653 MHz at the high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

Semi anechoic chamber
3 m
Vertical and Horizontal



Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

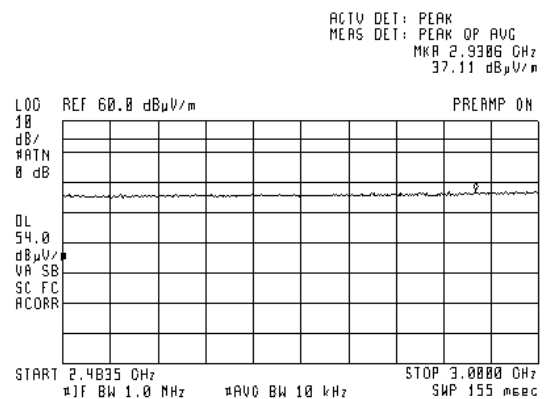
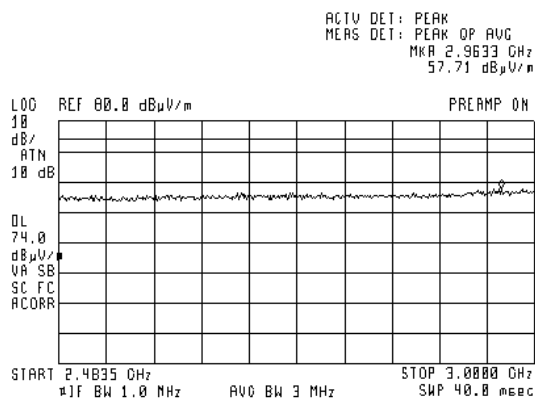
Plot 7.7.21 Radiated emission measurements from 2483.5 to 3000 MHz at the low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

Semi anechoic chamber
3 m
Vertical and Horizontal
RBW=1MHz; VBW=10 kHz

(32)

(32)



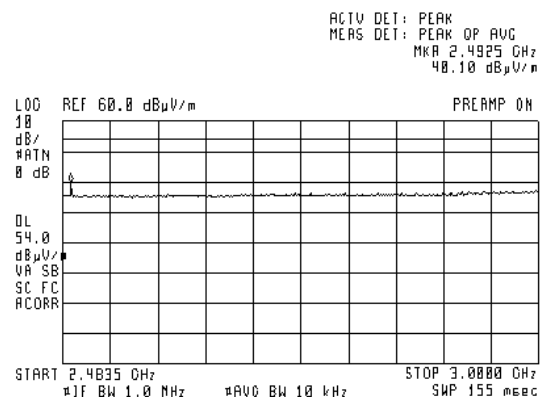
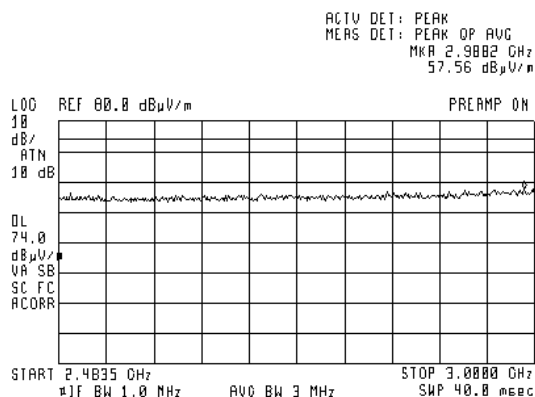
Plot 7.7.22 Radiated emission measurements from 2483.5 to 3000 MHz at the mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

Semi anechoic chamber
3 m
Vertical and Horizontal
RBW=1MHz; VBW=10 kHz

(32)

(32)



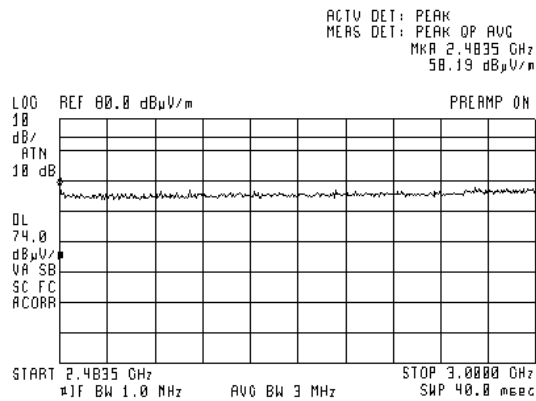
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.23 Radiated emission measurements from 2483.5 to 3000 MHz at the high carrier frequency

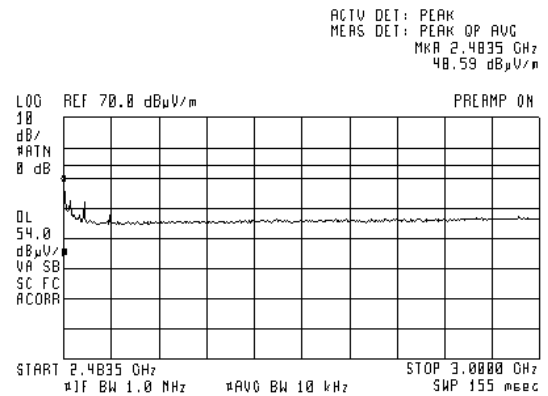
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

Semi anechoic chamber
3 m
Horizontal
RBW=1MHz; VBW=10 kHz

(32)



(32)



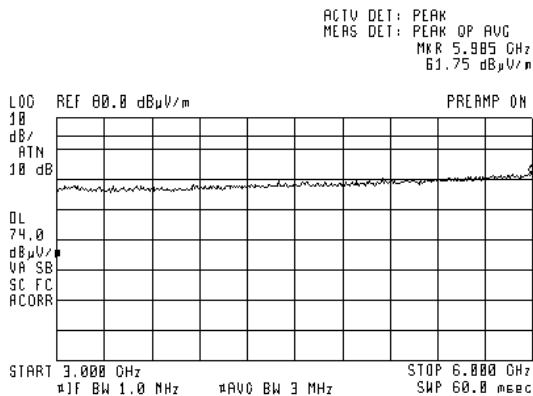
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.24 Radiated emission measurements from 3.0 to 6.0 GHz at the low carrier frequency

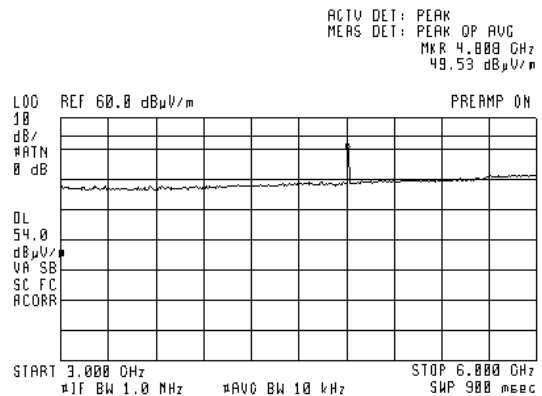
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

Semi anechoic chamber
3 m
Vertical and Horizontal
RBW=1MHz; VBW=10 kHz

(32)



(32)

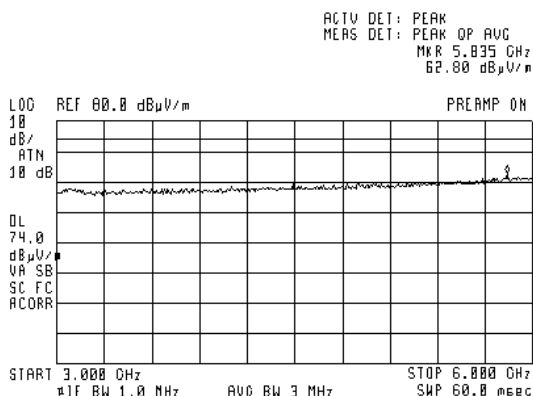


Plot 7.7.25 Radiated emission measurements from 3.0 to 6.0 GHz at the mid carrier frequency

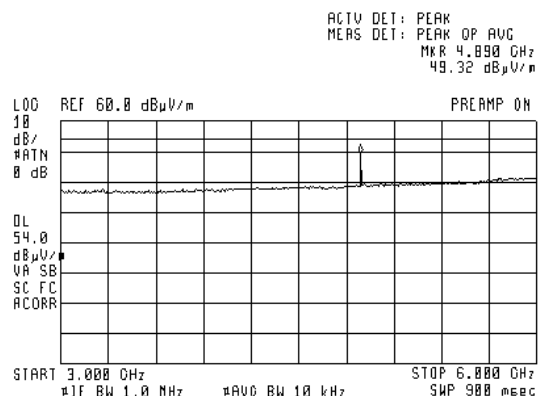
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

Semi anechoic chamber
3 m
Vertical and Horizontal
RBW=1MHz; VBW=10 kHz

(32)



(32)

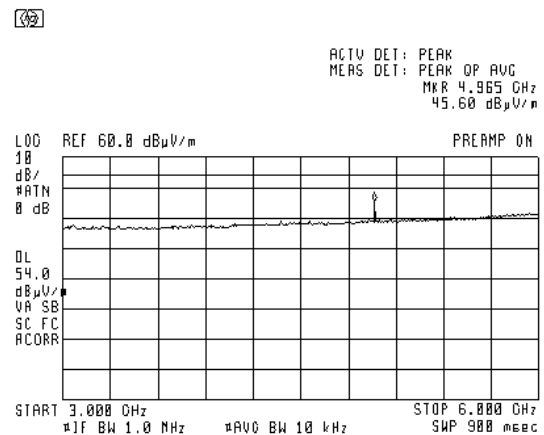
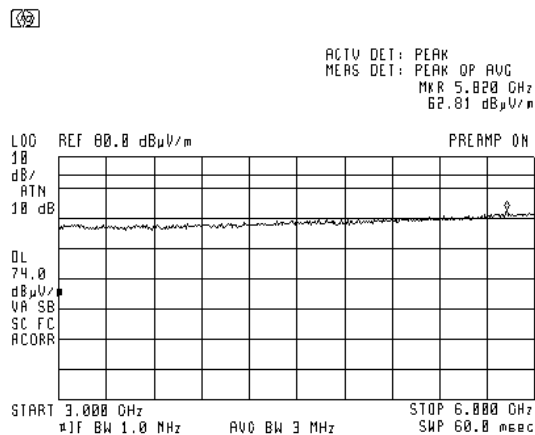


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.26 Radiated emission measurements from 3.0 to 6.0 GHz at the high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

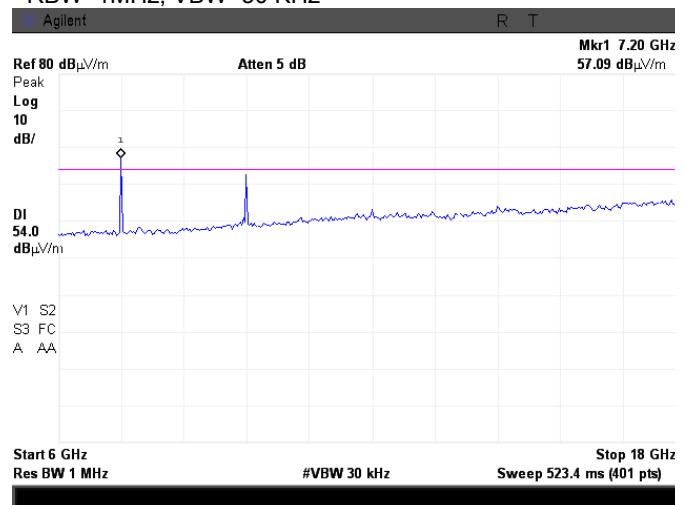
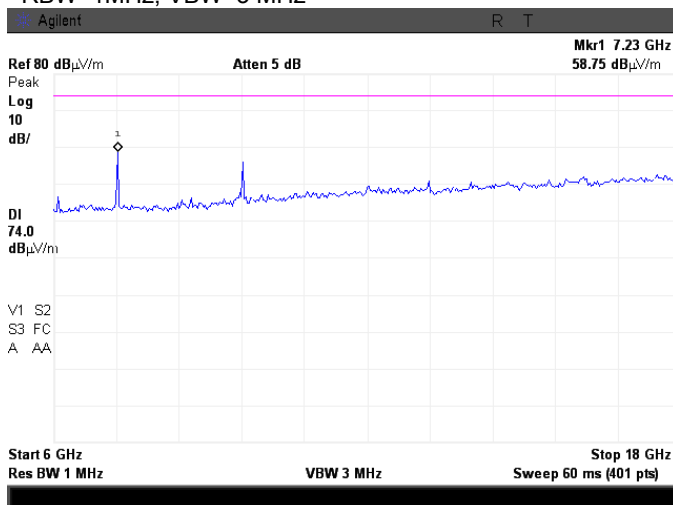
Semi anechoic chamber
3 m
Vertical and Horizontal
RBW=1MHz; VBW=10 kHz



Plot 7.7.27 Radiated emission measurements from 6.0 to 18.0GHz at the low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

OATS
3 m
Vertical and Horizontal
RBW=1MHz; VBW=30 KHz

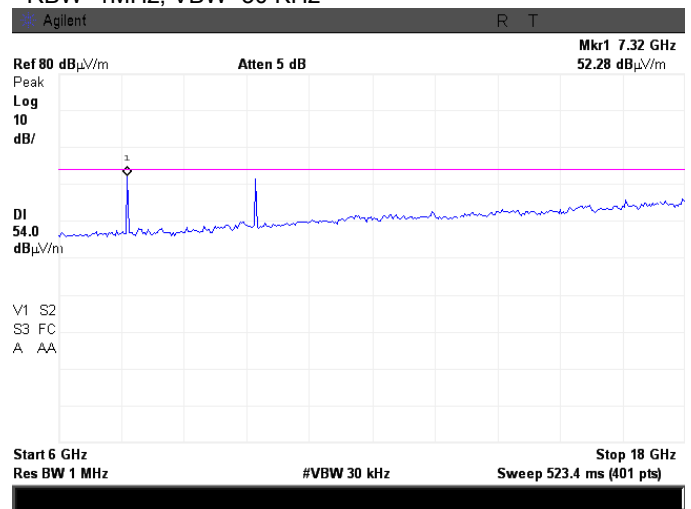
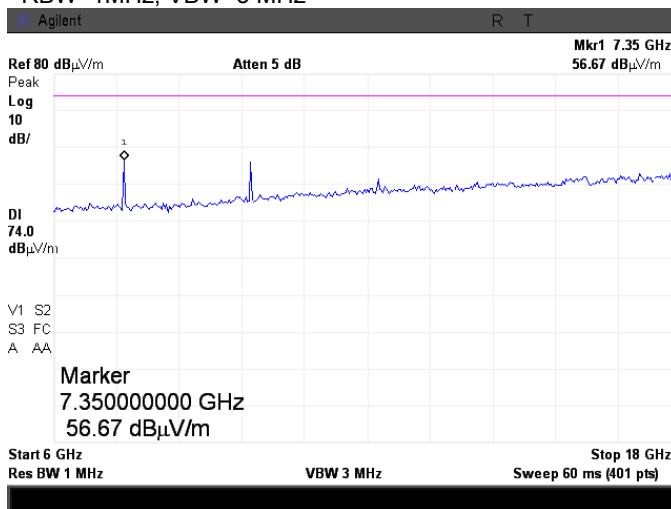


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.28 Radiated emission measurements from 6.0 to 18.0GHz at the mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

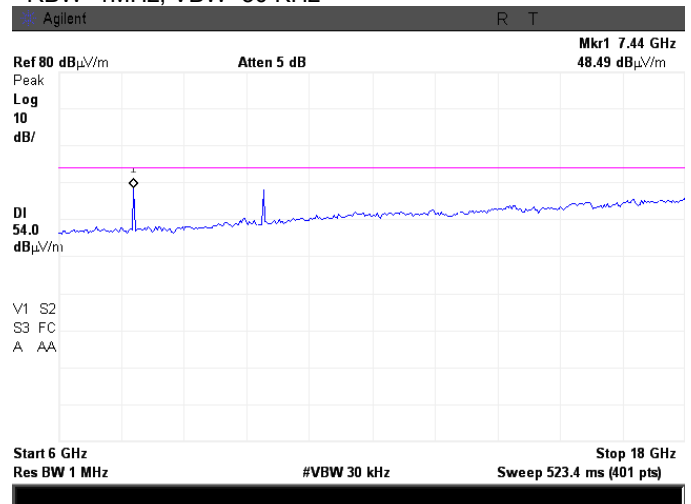
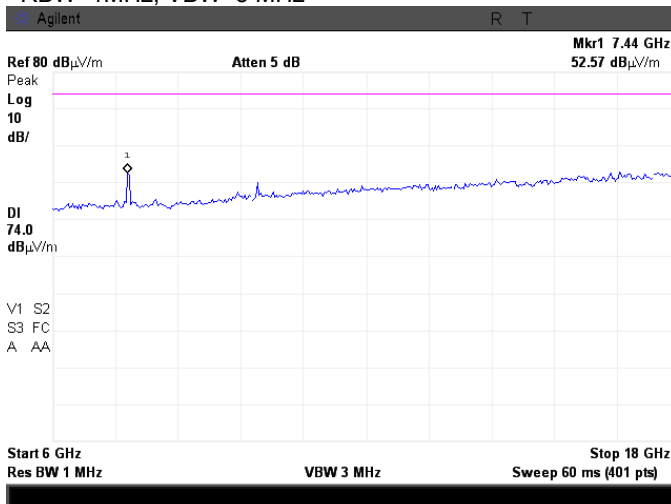
OATS
3 m
Vertical and Horizontal
RBW=1MHz; VBW=30 KHz



Plot 7.7.29 Radiated emission measurements from 6.0 to 18.0 GHz at the high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

OATS
3 m
Vertical and Horizontal
RBW=1MHz; VBW=30 KHz

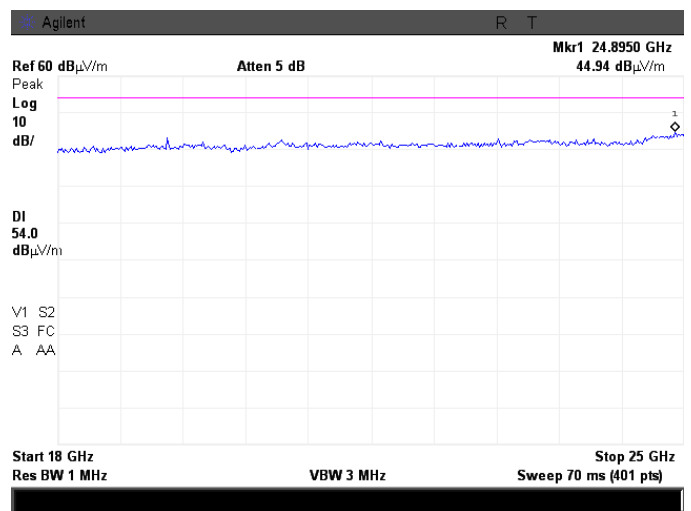
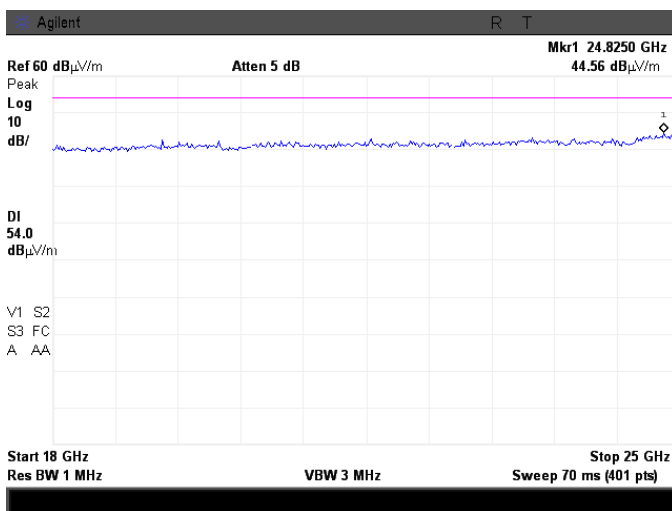


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.30 Radiated emission measurements from 18.0 to 25.0 GHz at the low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

OATS
3 m
Vertical 1.2 m 250dgr
RBW=1MHz; VBW=100 KHz

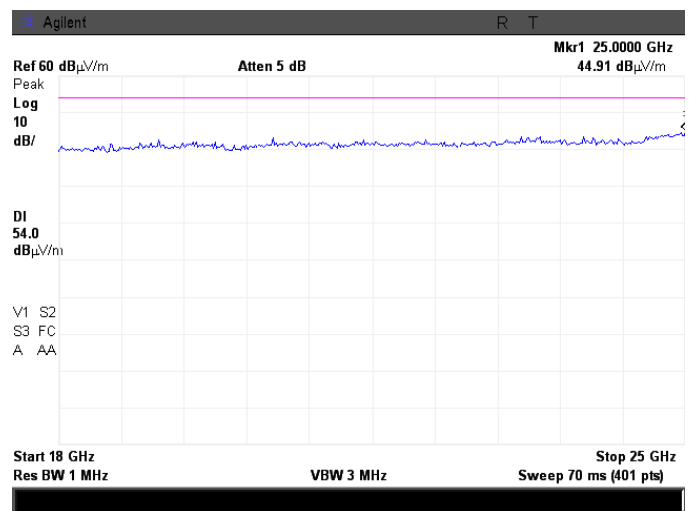
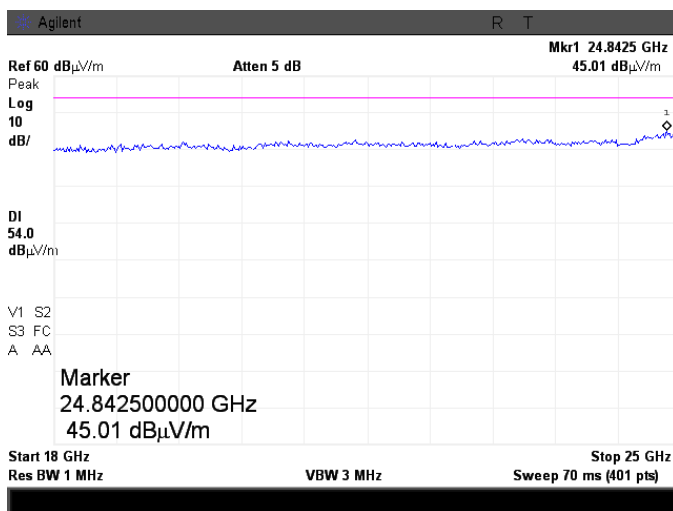


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.31 Radiated emission measurements from 18.0 to 25.0 GHz at the mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

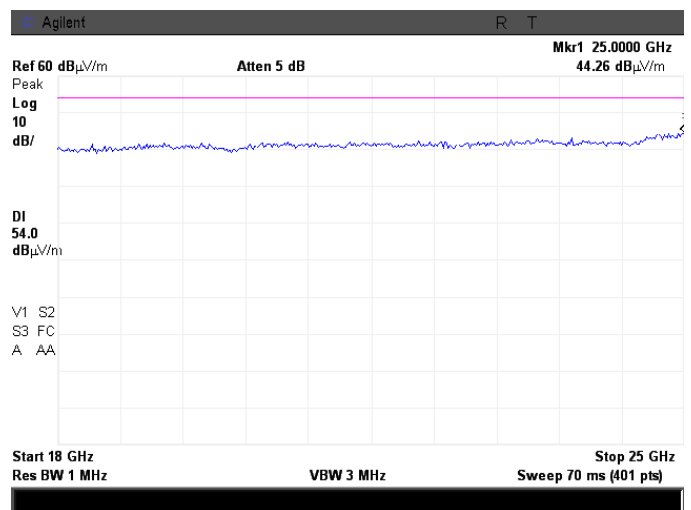
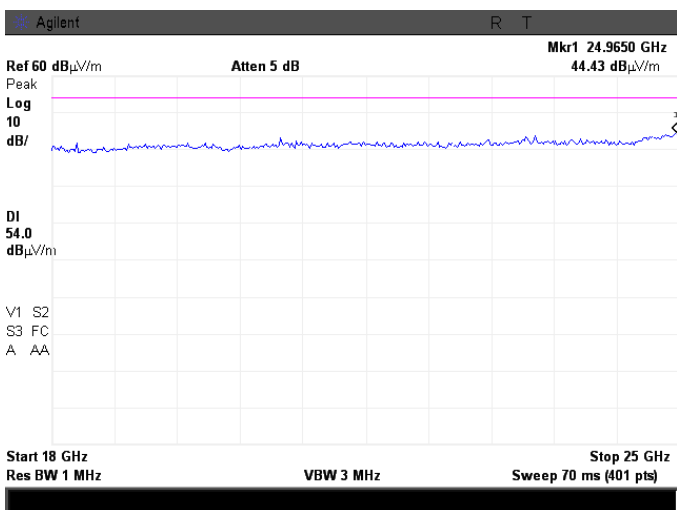
OATS
3 m
Vertical and Horizontal
RBW=1MHz; VBW=100 KHz



Plot 7.7.32 Radiated emission measurements from 18.0 to 25.0 GHz at the high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
RBW=1MHz; VBW=3 MHz

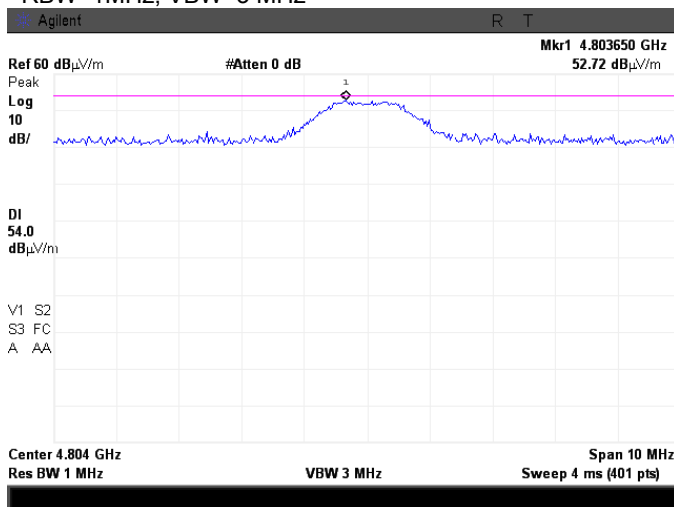
OATS
3 m
Vertical and Horizontal
RBW=1MHz; VBW=100 KHz



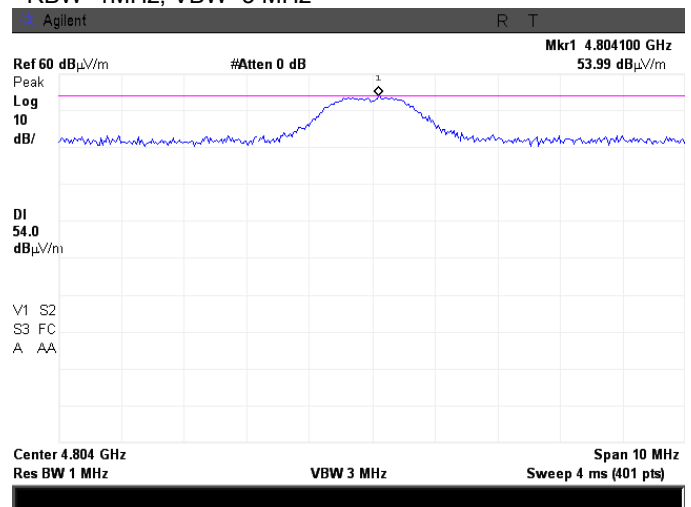
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.33 Radiated emission measurements at the second harmonic of low carrier frequency

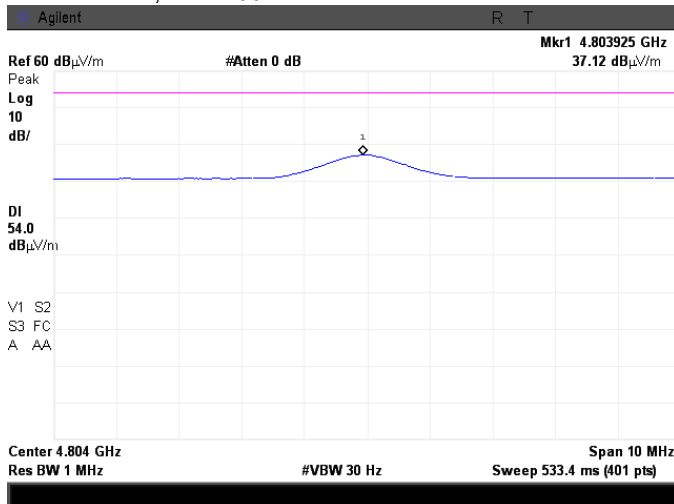
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz



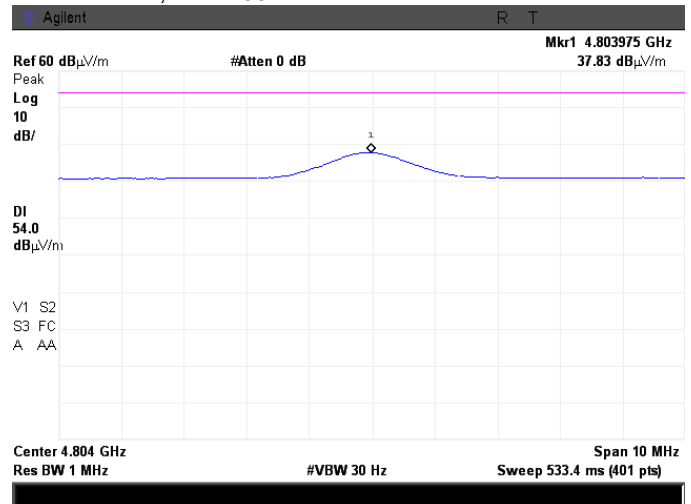
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



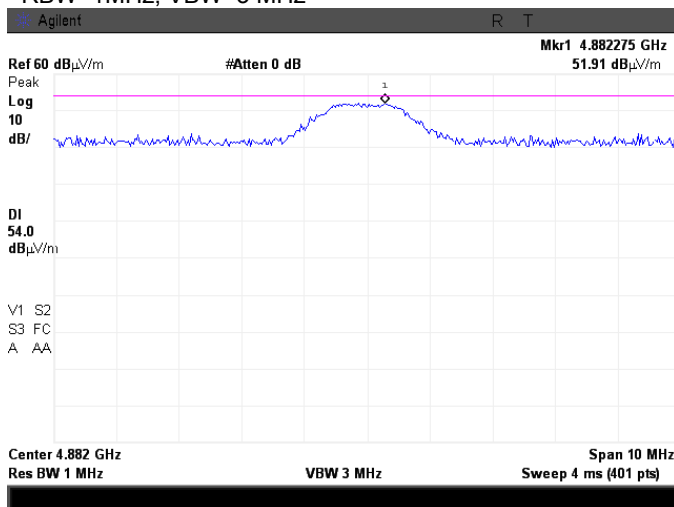
RBW=1MHz; VBW=30 Hz



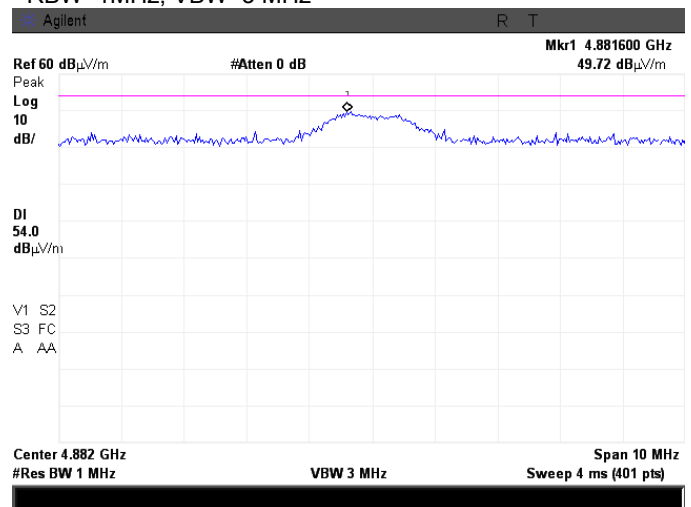
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.34 Radiated emission measurements at the second harmonic of mid carrier frequency

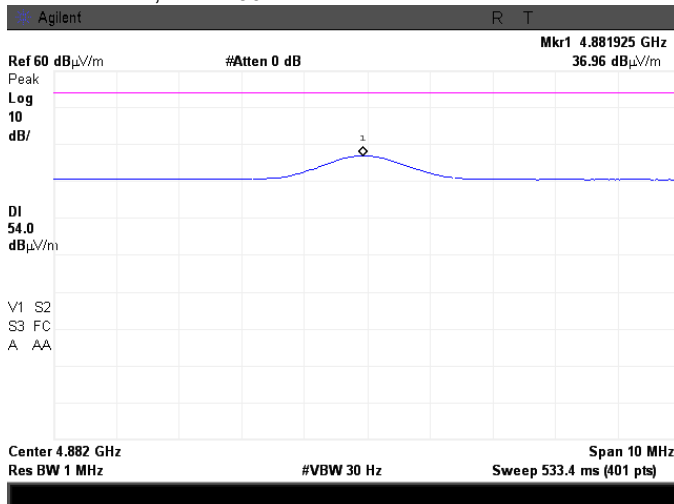
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz



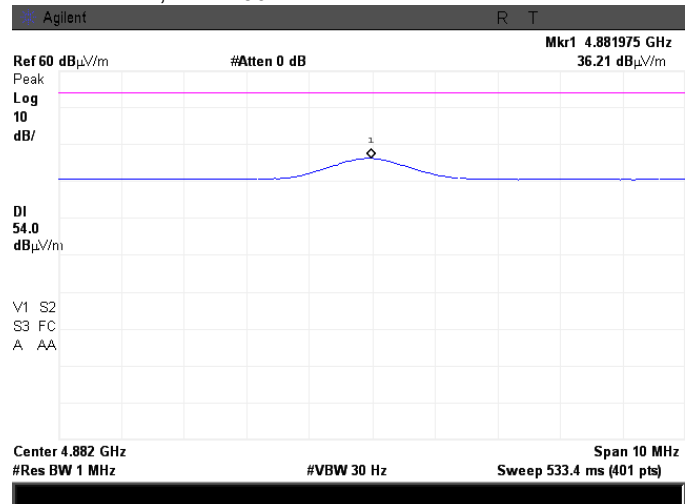
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



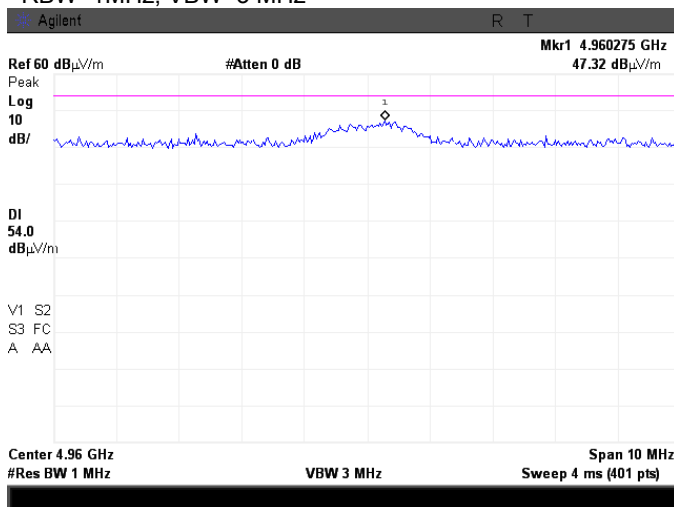
RBW=1MHz; VBW=30 Hz



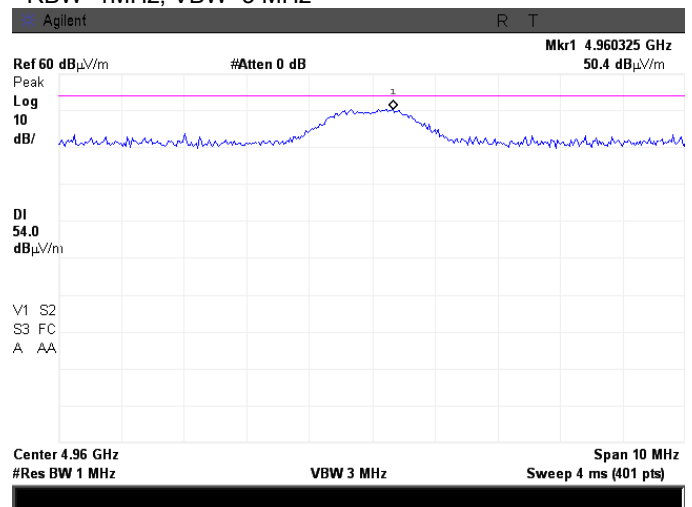
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.35 Radiated emission measurements at the second harmonic of high carrier frequency

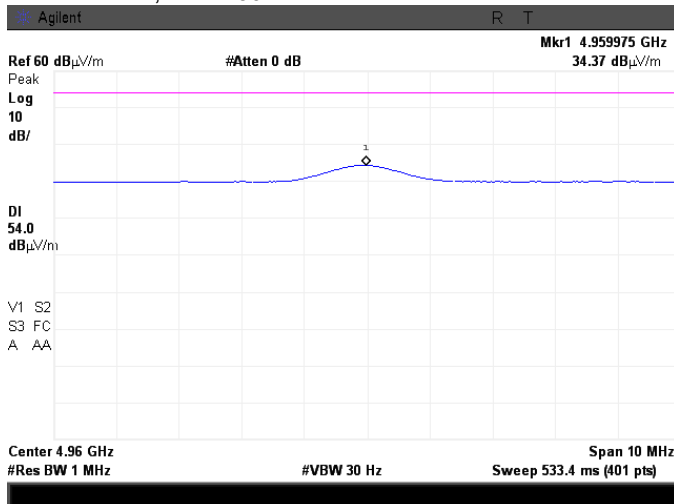
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz



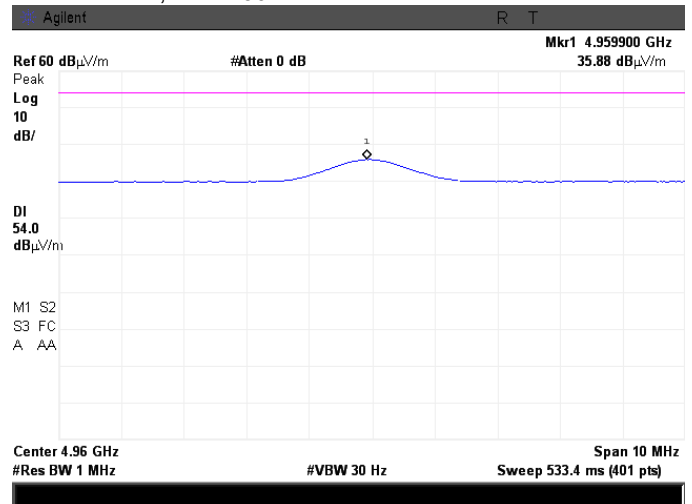
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



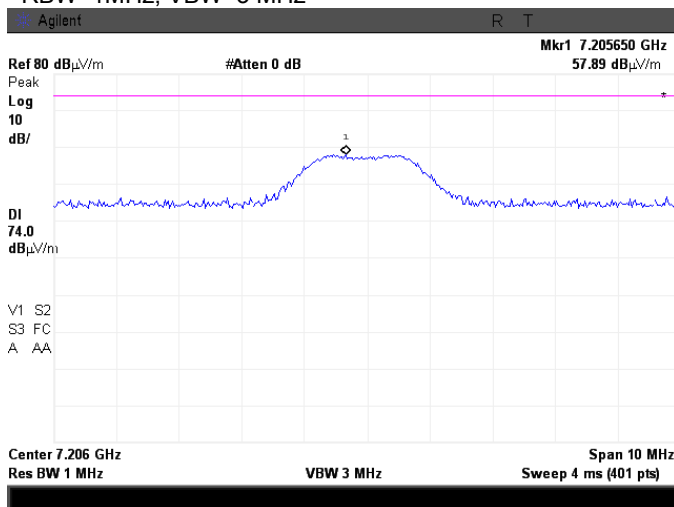
RBW=1MHz; VBW=30 Hz



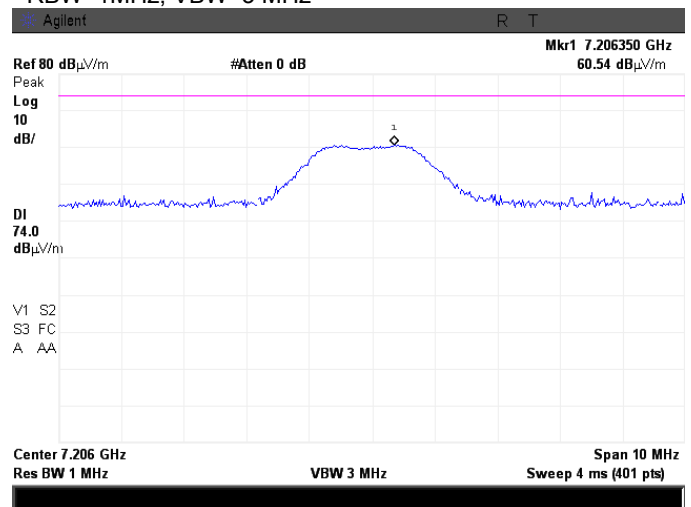
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.36 Radiated emission measurements at the third harmonic of low carrier frequency

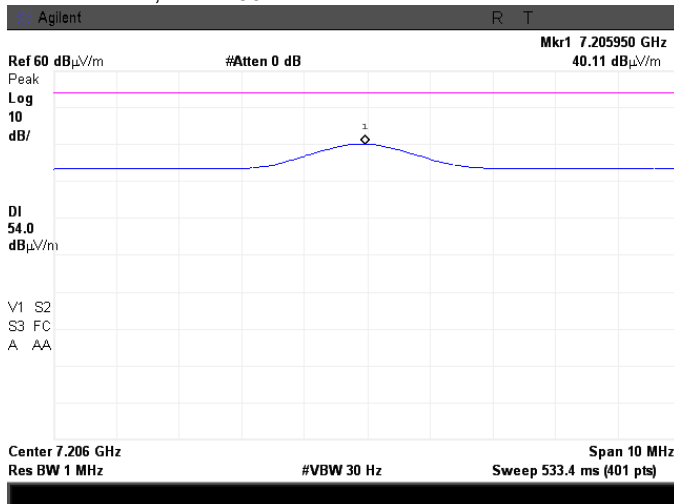
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz



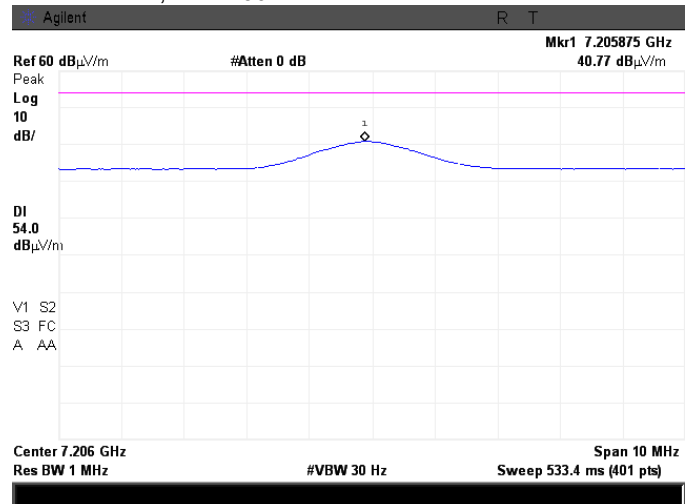
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



RBW=1MHz; VBW=30 Hz

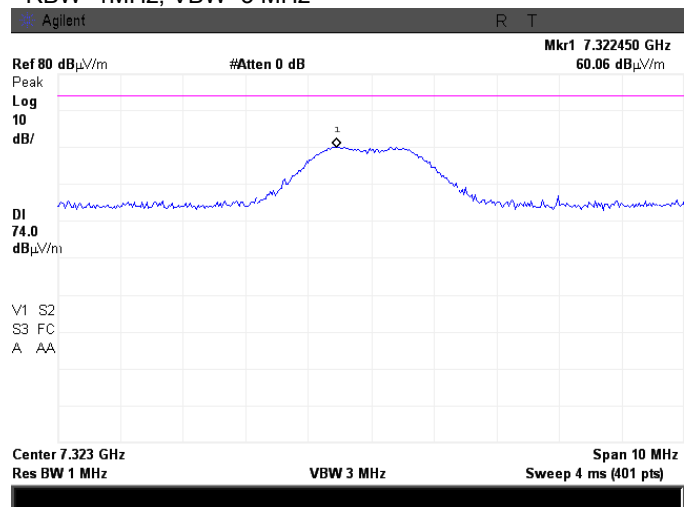
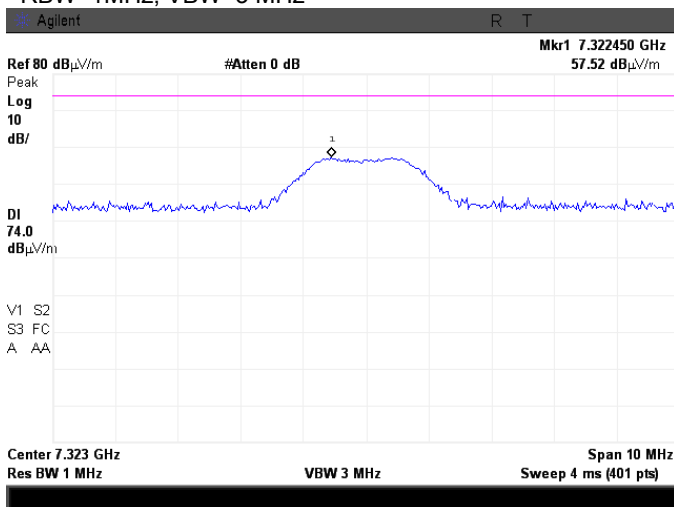


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.37 Radiated emission measurements at the third harmonic of mid carrier frequency

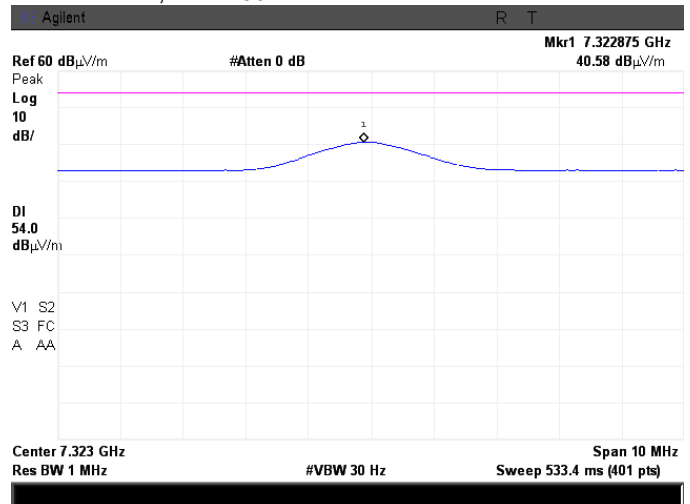
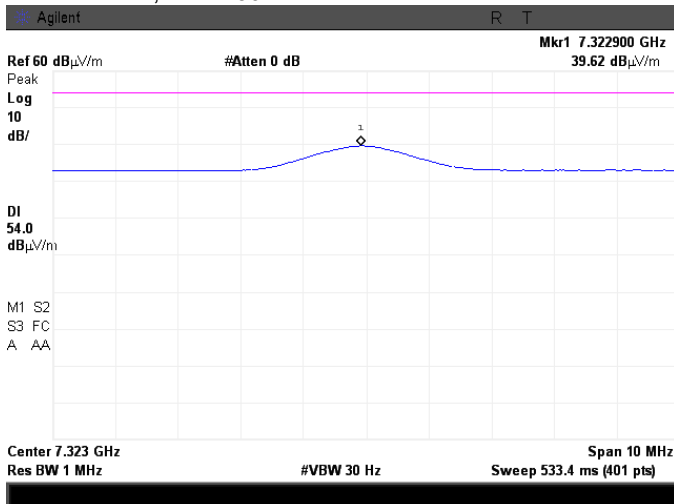
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz

OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz

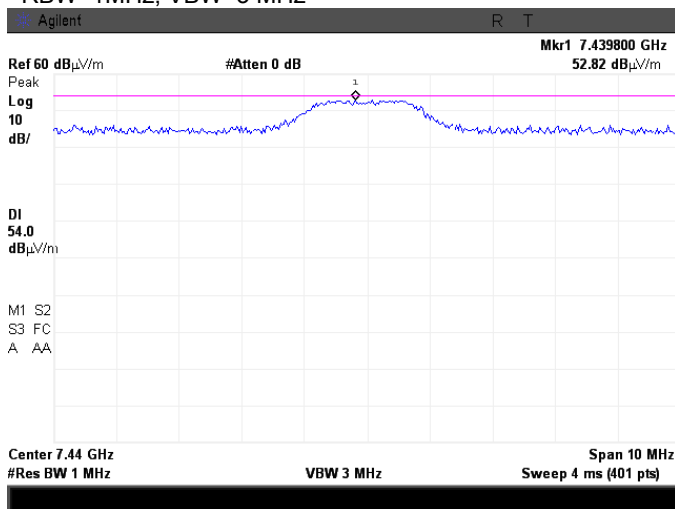
RBW=1MHz; VBW=30 Hz



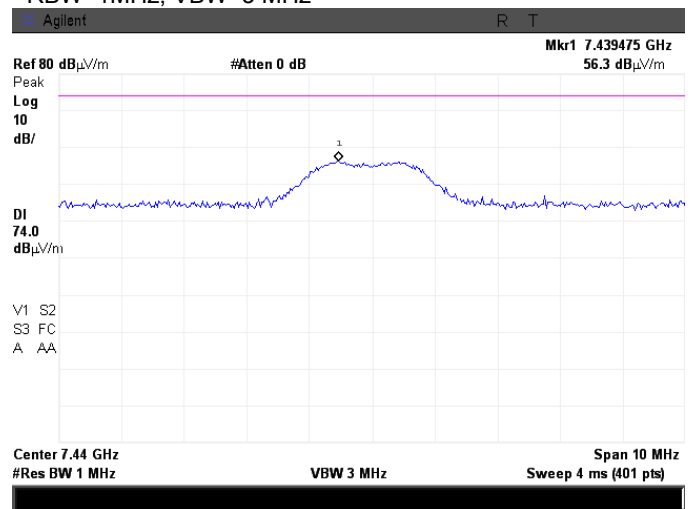
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.38 Radiated emission measurements at the third harmonic of high carrier frequency

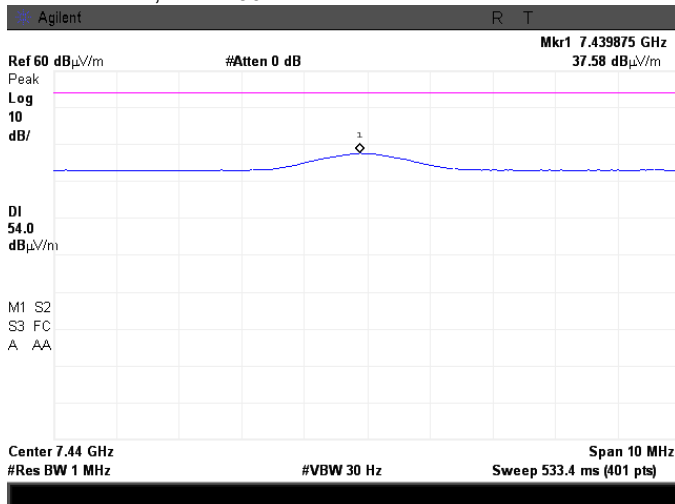
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz



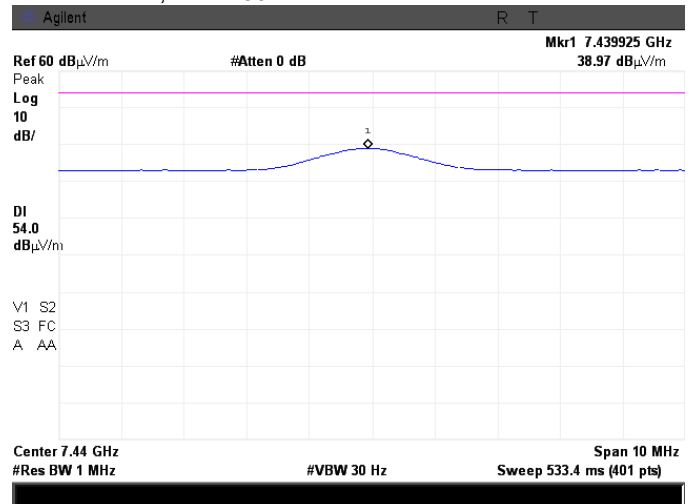
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



RBW=1MHz; VBW=30 Hz

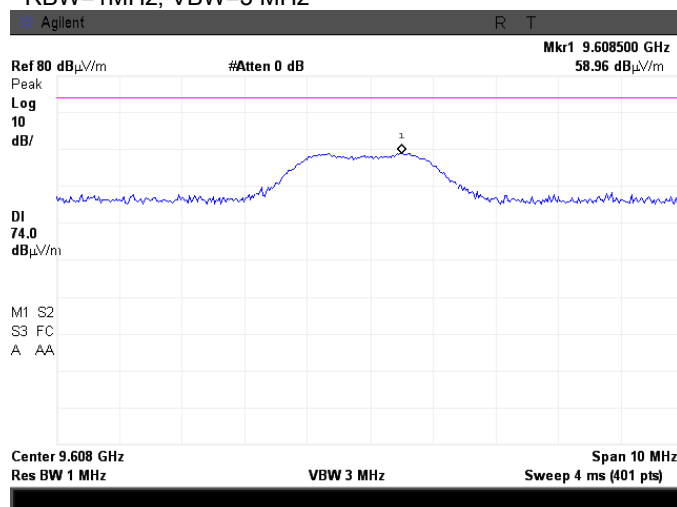
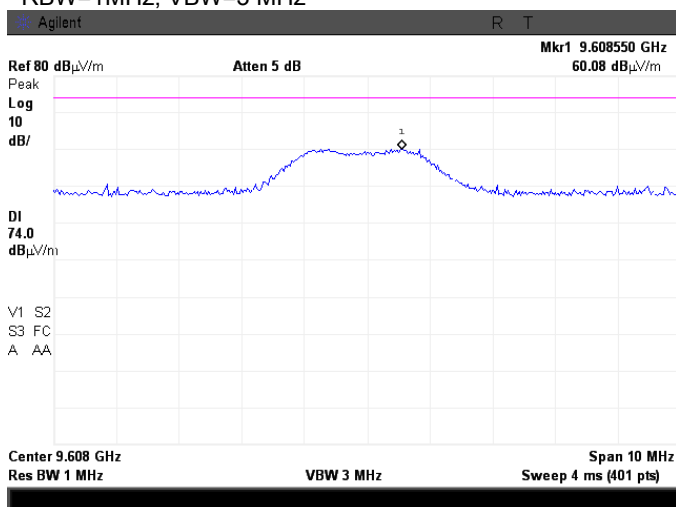


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

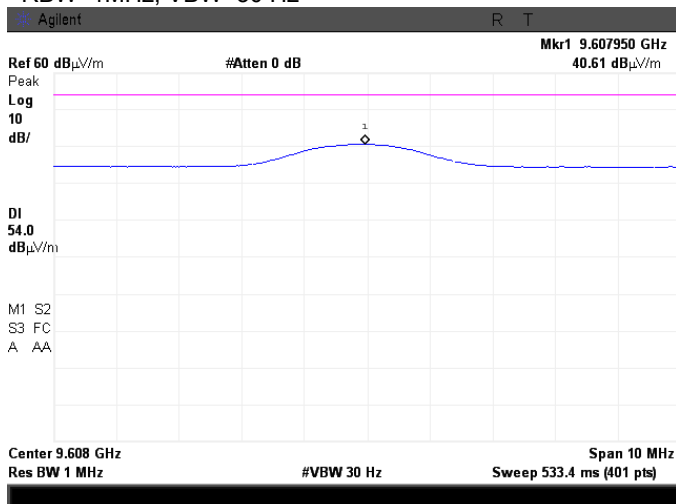
Plot 7.7.39 Radiated emission measurements at the fourth harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz

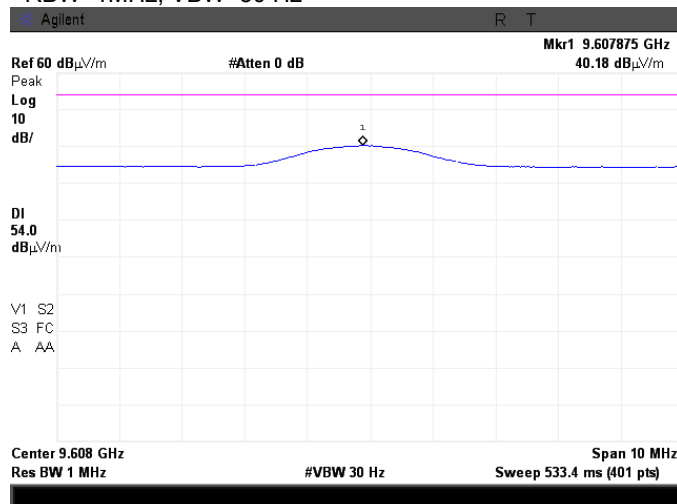
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



RBW=1MHz; VBW=30 Hz

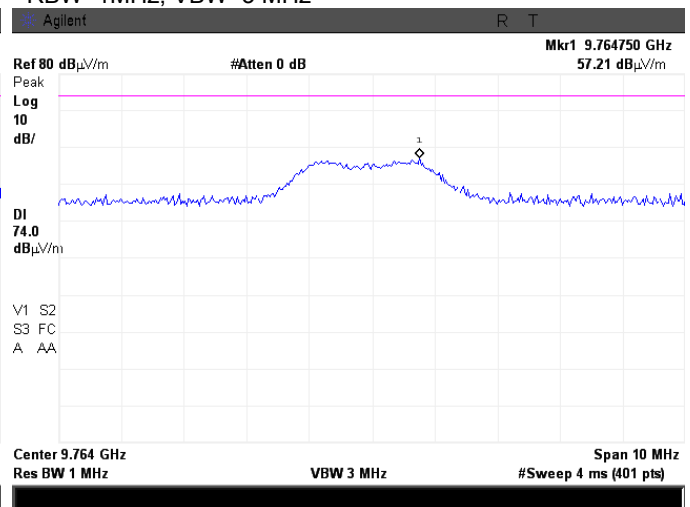
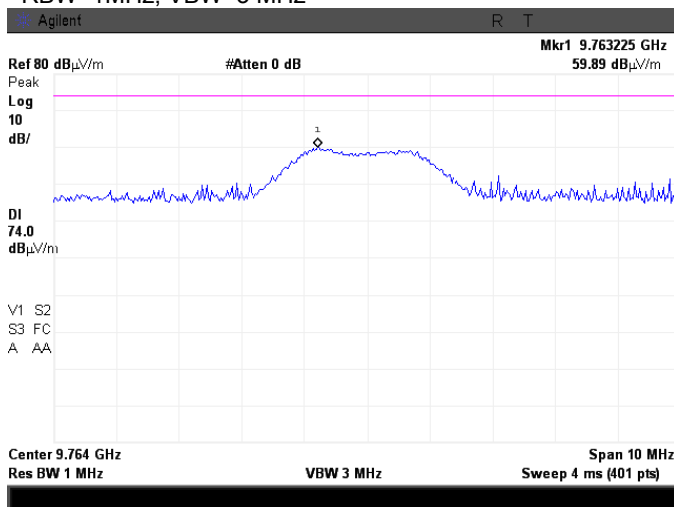


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

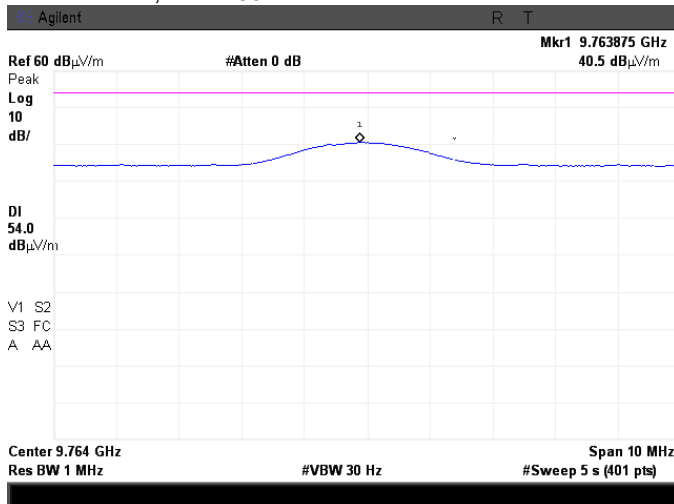
Plot 7.7.40 Radiated emission measurements at the fourth harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz

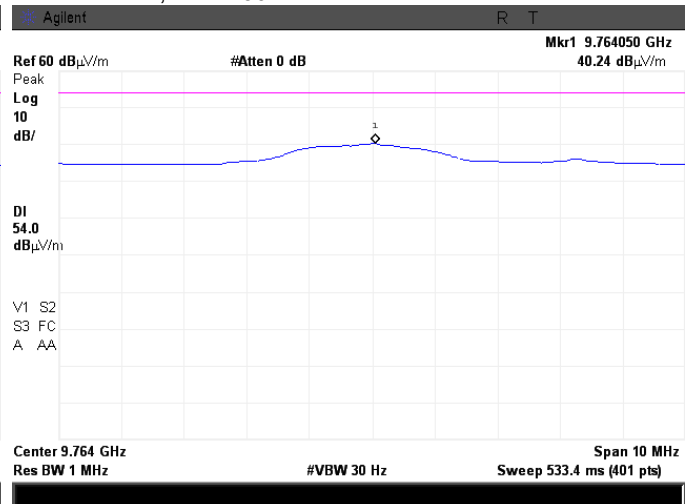
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



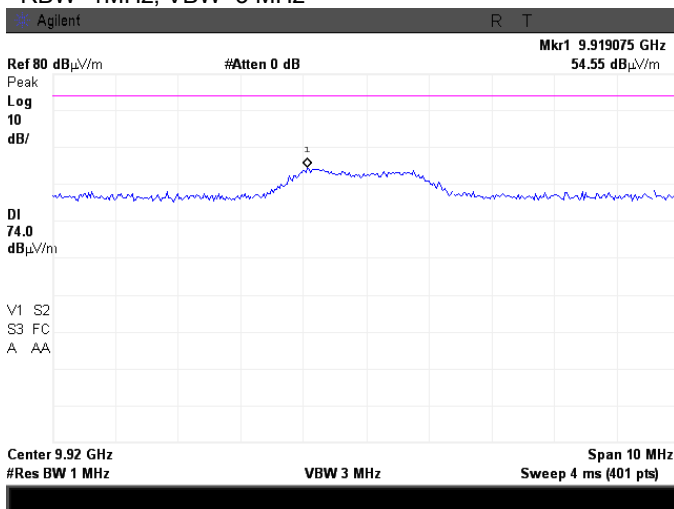
RBW=1MHz; VBW=30 Hz



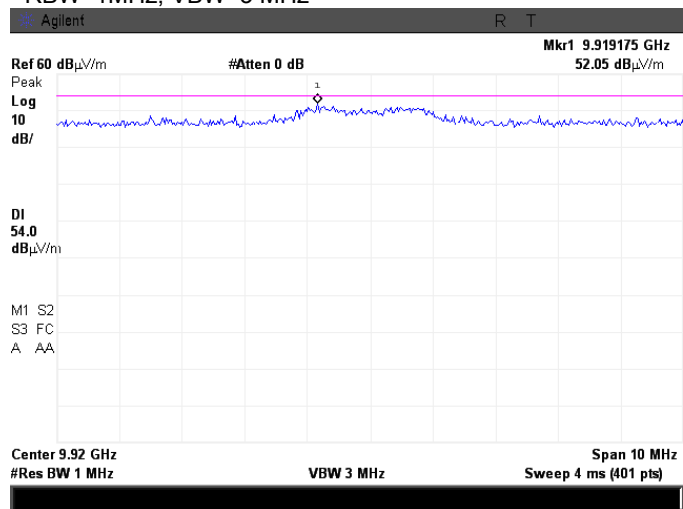
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.41 Radiated emission measurements at the fourth harmonic of high carrier frequency

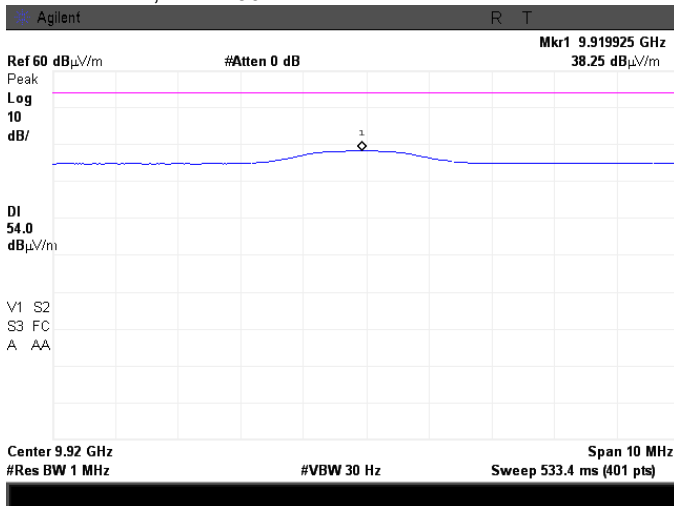
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz



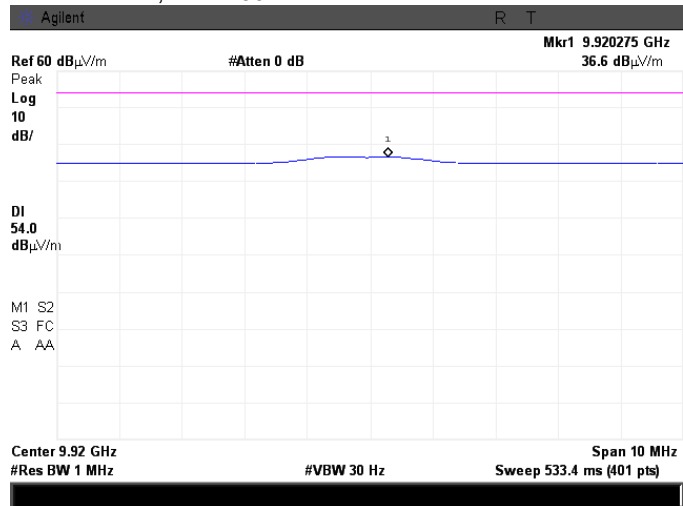
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



RBW=1MHz; VBW=30 Hz

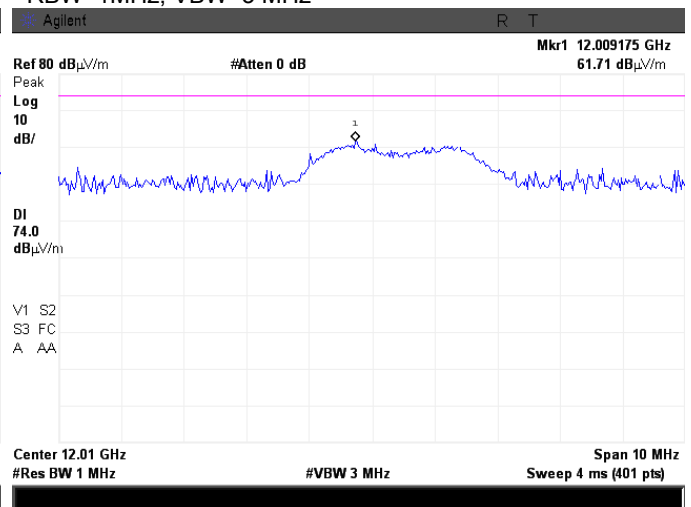
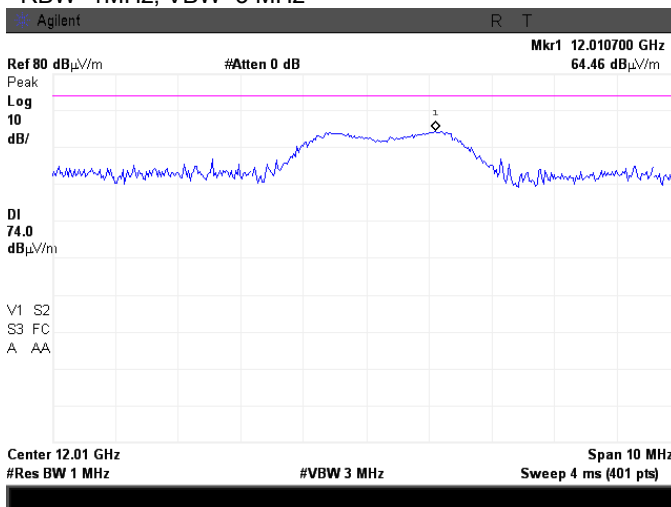


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

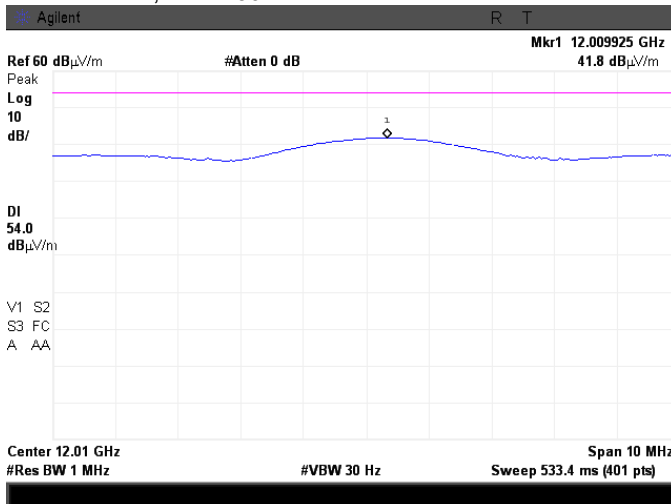
Plot 7.7.42 Radiated emission measurements at the fifth harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz

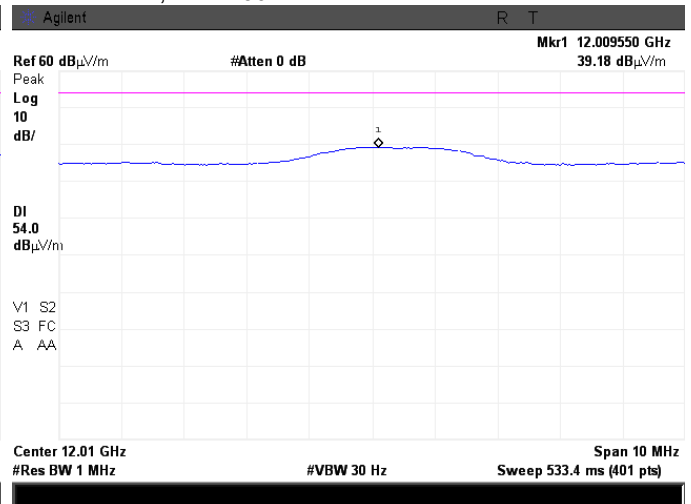
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



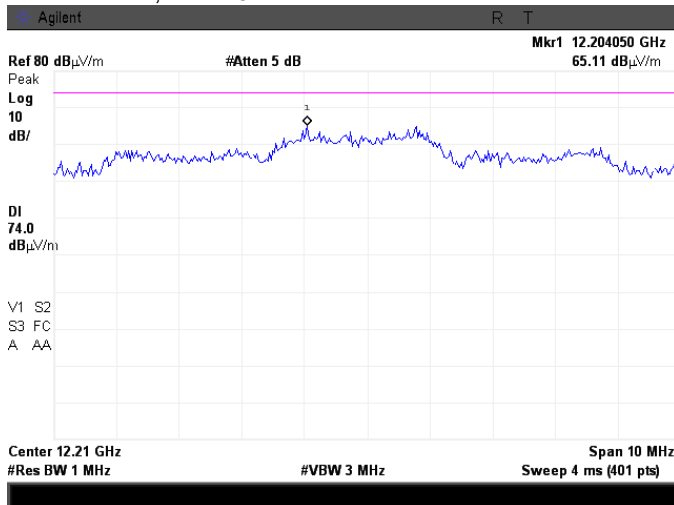
RBW=1MHz; VBW=30 Hz



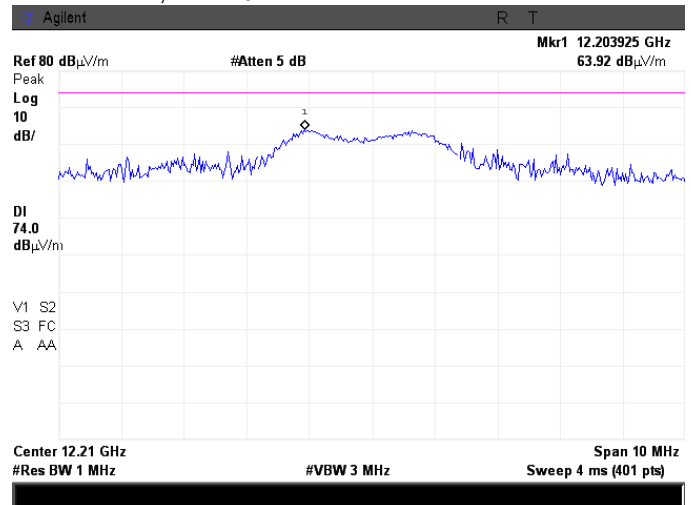
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.43 Radiated emission measurements at the fifth harmonic of mid carrier frequency

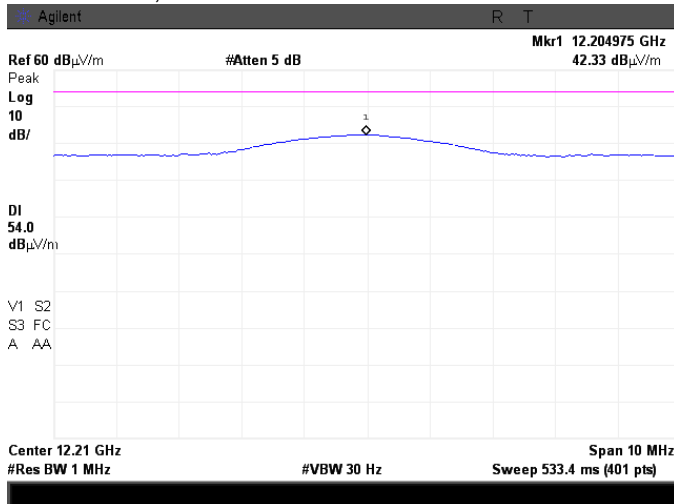
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz



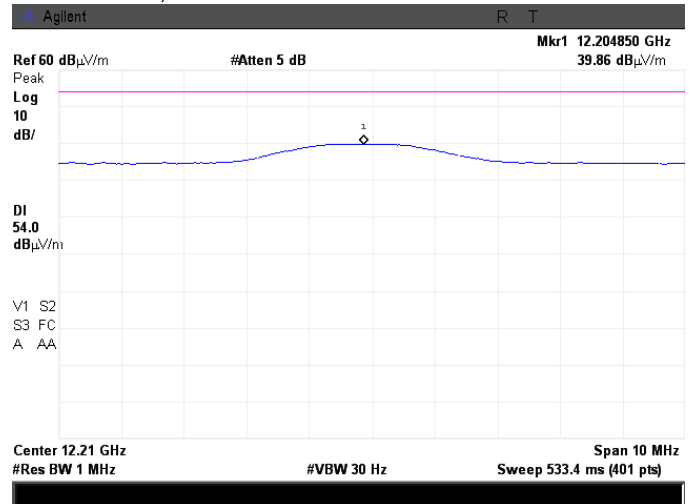
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



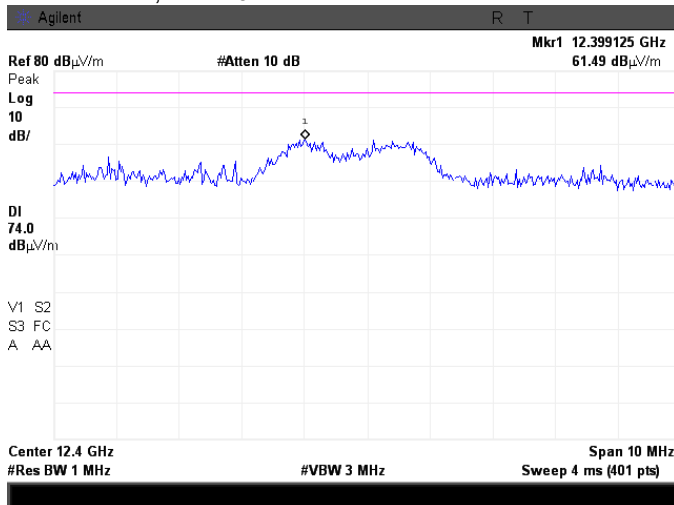
RBW=1MHz; VBW=30 Hz



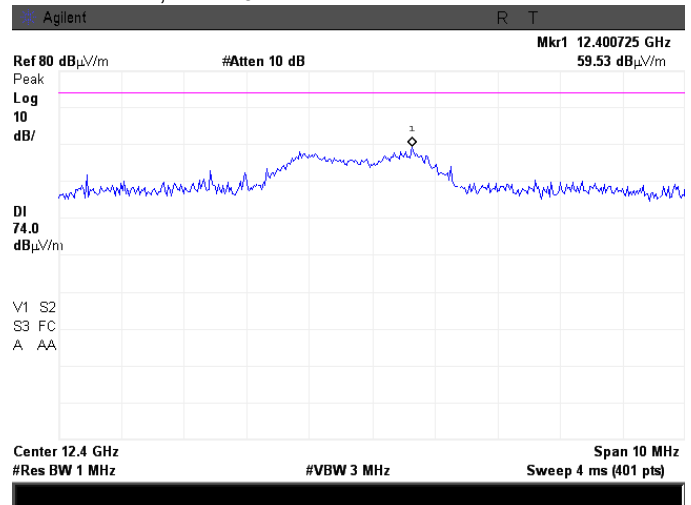
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.44 Radiated emission measurements at the fifth harmonic of high carrier frequency

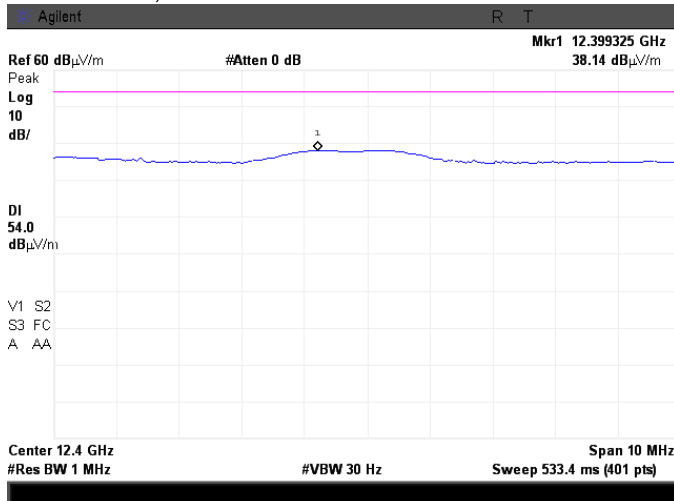
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
RBW=1MHz; VBW=3 MHz



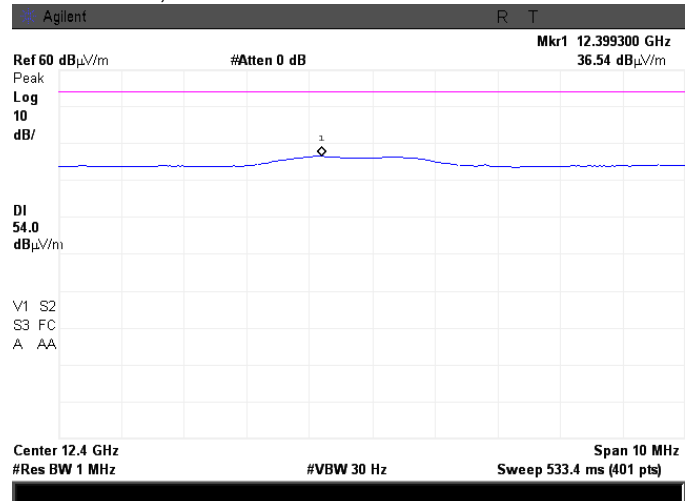
OATS
3 m
ANTENNA POLARIZATION: Horizontal
RBW=1MHz; VBW=3 MHz



RBW=1MHz; VBW=30 Hz



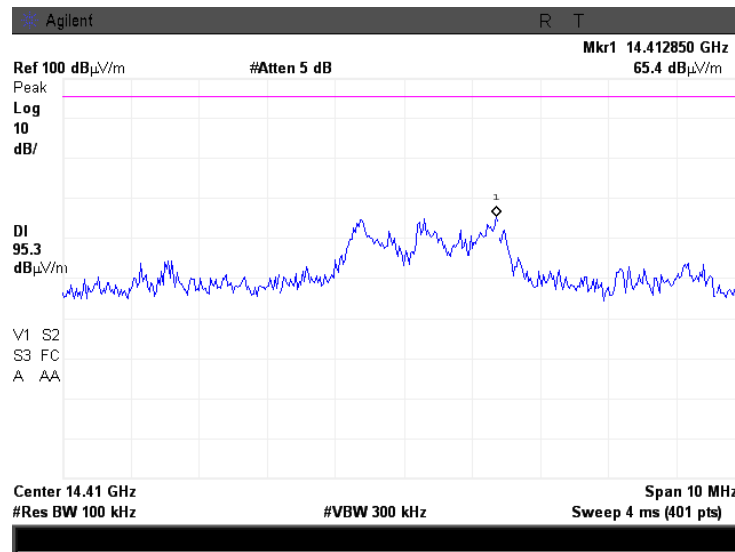
RBW=1MHz; VBW=30 Hz



Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

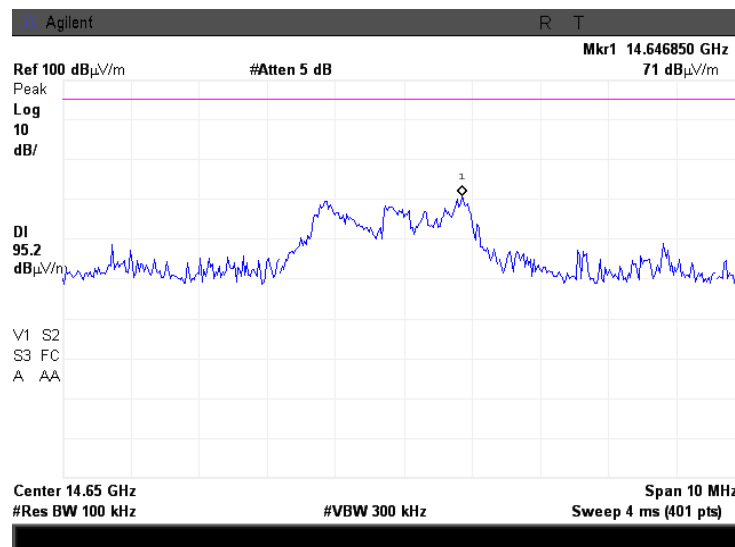
Plot 7.7.45 Radiated emission measurements at the sixth harmonic of low carrier frequency

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



Plot 7.7.46 Radiated emission measurements at the sixth harmonic of mid carrier frequency

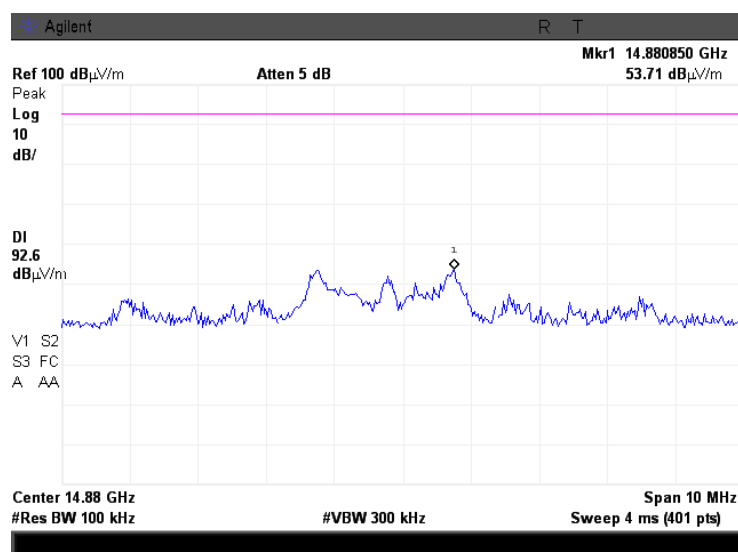
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.47 Radiated emission measurements at the sixth harmonic of high carrier frequency

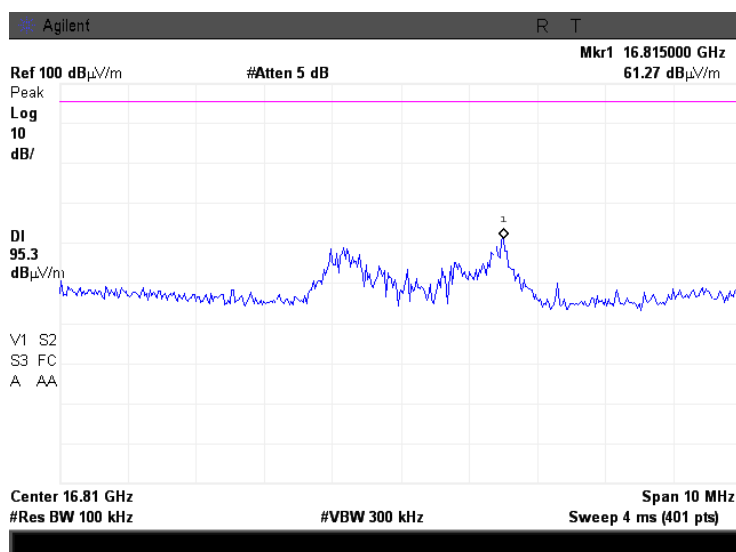
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

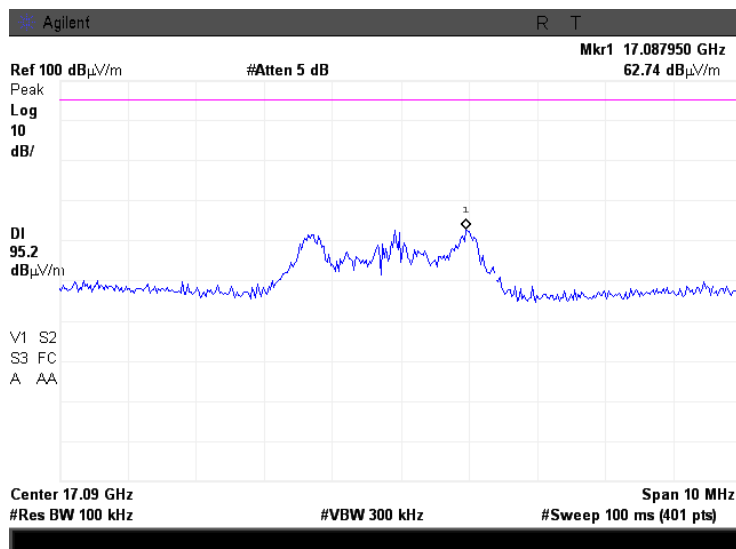
Plot 7.7.48 Radiated emission measurements at the seventh harmonic of low carrier frequency

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



Plot 7.7.49 Radiated emission measurements at the seventh harmonic of mid carrier frequency

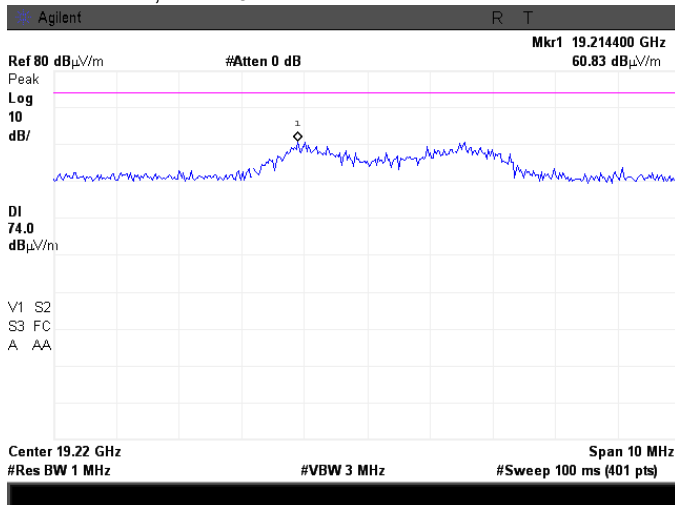
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



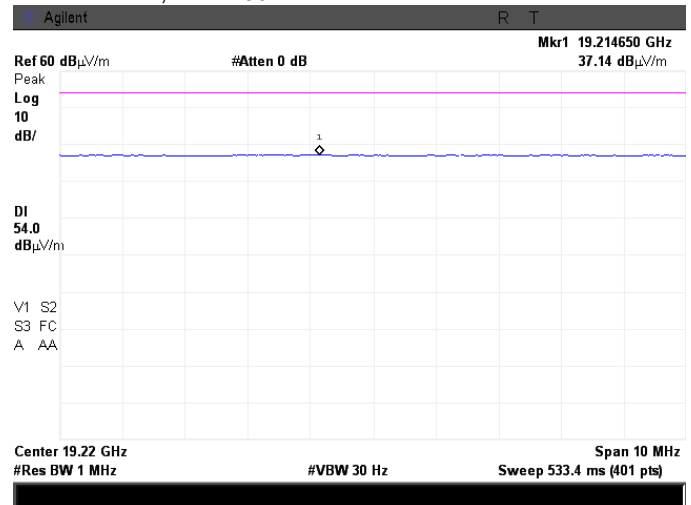
Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.50 Radiated emission measurements at the eighth harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION
RBW=1MHz; VBW=3 MHz

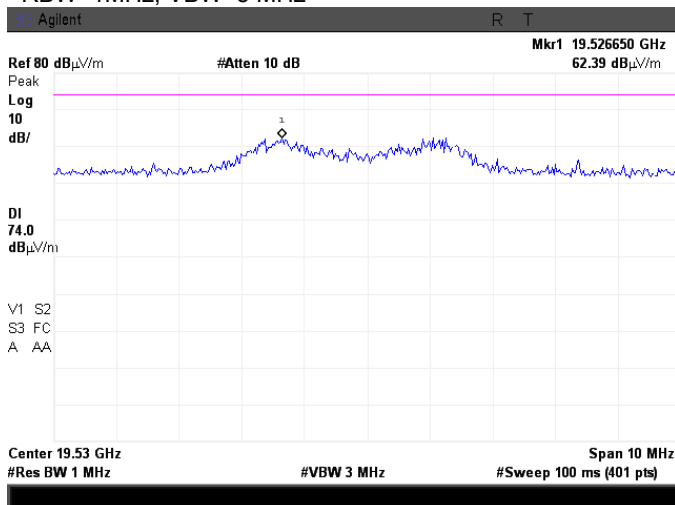


OATS
3 m
Vertical & Horizontal
RBW=1MHz; VBW=30 Hz

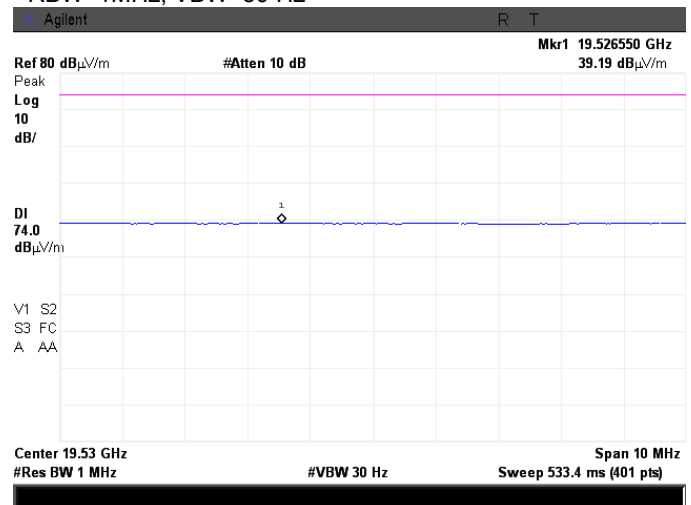


Plot 7.7.51 Radiated emission measurements at the eighth harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION
RBW=1MHz; VBW=3 MHz

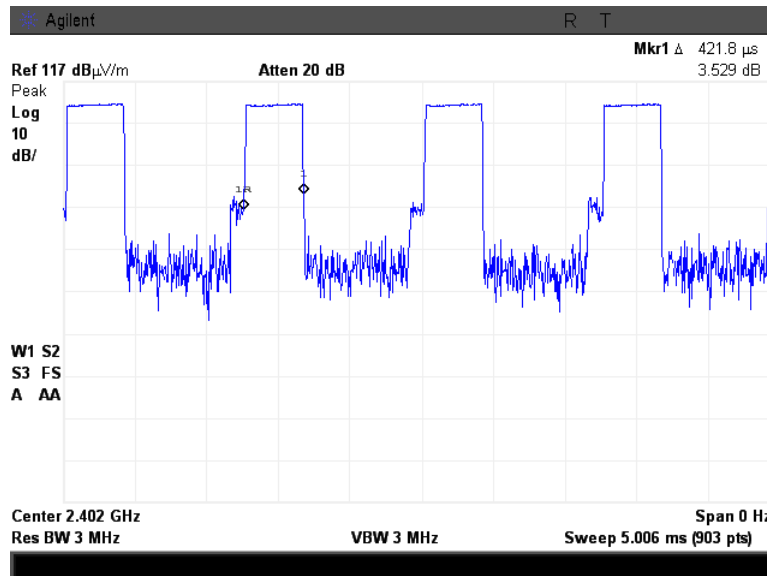


OATS
3 m
Vertical & Horizontal
RBW=1MHz; VBW=30 Hz

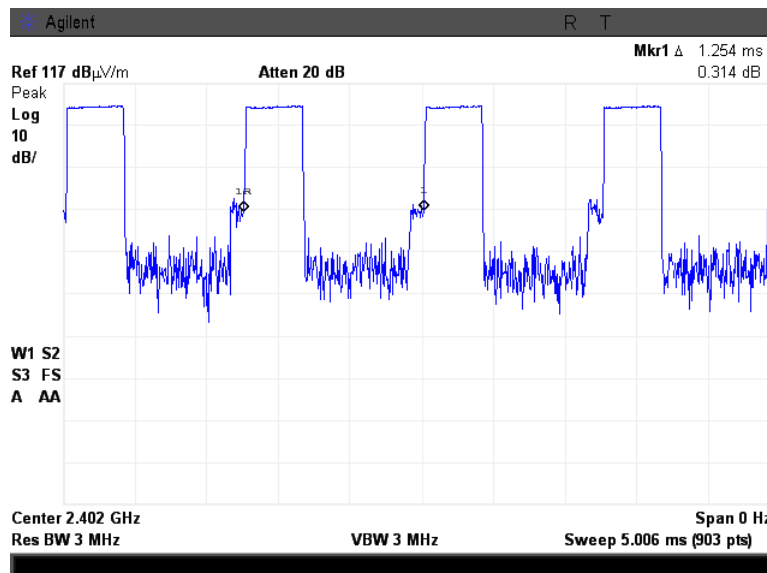


Test specification:		Section 15.247(d) / RSS-210, Section A8.5, Radiated spurious emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(d) / ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/20/2012 - 10/2/2012	
Temperature: 23.9 °C	Air Pressure: 1008 hPa	Relative Humidity: 41 %	Power Supply: Battery
Remarks:			

Plot 7.7.52 Transmission pulse duration



Plot 7.7.53 Transmission pulse period



Test specification:		Section 15.203/ RSS-Gen, section 7.1.2, Antenna requirements	
Test procedure:		Public notice DA 00-705	
Test mode:	Compliance	Verdict:	PASS
Date(s):	10/10/2012		
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: Battery
Remarks:			

7.8 Antenna requirements

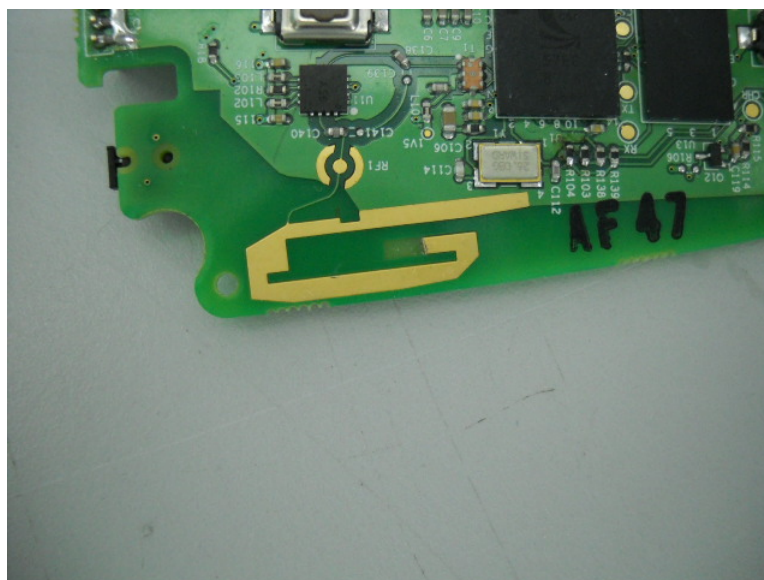
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed 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



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0337	Probe Set, Hand held, 5 probes	Electro-Metrics	EHFP-30	238	06-Jun-12	06-Jun-13
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	03-Jul-12	03-Jul-13
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	24-Sep-12	24-Sep-13
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	20-May-12	20-May-14
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	12-Dec-12	12-Dec-15
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	26-Aug-12	26-Aug-13
1454	Cable, 1 m	Harbour Industries	MIL 17/60-RG142	1454	02-Sep-12	02-Sep-13
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	20-Dec-12	20-Dec-13
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	06-Feb-13	06-Feb-14
4114	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz	ETS Lindgren	3117	00123515	07-Dec-12	07-Dec-13
4138	Dipole Antenna	TESCOM CO., LTD	NA	NA	10-Apr-12	10-Apr-13
4150	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out.	Agilent Technologies	87405C	MY470105 91	18-Jun-12	18-Jun-13
4351	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 001	06-Mar-13	06-Mar-14
4352	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 002	01-Jan-13	01-Jan-14
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 003	06-Mar-13	06-Mar-14

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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Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

FCC 47CFR part 15: 2012	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

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

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

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field strength 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 waveguide horn antenna
ETS Lindgren, Model 3117, serial number: 00123515, HL 4114

Frequency, MHz	Antenna factor, dB/m		
	Measured	Manufacturer	Deviation
1000	28.0	28.4	-0.4
1500	28.0	27.4	0.6
2000	31.2	30.9	0.3
2500	32.5	33.4	-0.9
3000	32.9	32.6	0.3
3500	32.7	32.8	-0.1
4000	33.1	33.4	-0.3
4500	33.8	33.9	-0.1
5000	33.8	34.1	-0.3
5500	34.4	34.5	-0.1
6000	35.0	35.2	-0.2
6500	35.4	35.5	-0.1
7000	35.7	35.7	0.0
7500	35.9	35.7	0.2
8000	35.8	35.8	0.0
8500	35.9	35.8	0.1
9000	36.3	36.2	0.1
9500	36.6	36.6	0.0
10000	37.1	37.1	0.0
10500	37.6	37.5	0.1
11000	37.9	37.7	0.2
11500	38.5	38.1	0.4
12000	39.2	38.7	0.5
12500	39.0	38.9	0.1
13000	39.1	39.1	0.0
13500	38.9	38.8	0.1
14000	39.0	38.8	0.2
14500	39.6	39.9	-0.3
15000	39.9	39.7	0.2
15500	39.9	40.1	-0.2
16000	40.7	40.8	-0.1
16500	41.3	41.8	-0.5
17000	42.5	42.1	0.4
17500	41.3	41.2	0.1
18000	41.4	40.9	0.5

Antenna factor is to be added to receiver meter reading in dB(μ V) to convert to field strength in dB(μ V/meter)

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

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

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 001,
HL 4351

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.21	9000	2.86
100	0.28	9500	2.96
300	0.49	10000	3.05
500	0.63	10500	3.12
1000	0.90	11000	3.18
1500	1.10	11500	3.24
2000	1.29	12000	3.30
2500	1.44	12500	3.37
3000	1.58	13000	3.45
3500	1.71	13500	3.53
4000	1.84	14000	3.58
4500	1.95	14500	3.66
5000	2.05	15000	3.73
5500	2.17	15500	3.79
6000	2.29	16000	3.87
6500	2.39	16500	3.94
7000	2.47	17000	3.98
7500	2.56	17500	4.07
8000	2.70	18000	4.14
8500	2.77		

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 002,
HL 4352

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.81
100	0.28	9500	2.89
300	0.49	10000	3.00
500	0.63	10500	3.07
1000	0.90	11000	3.15
1500	1.10	11500	3.23
2000	1.28	12000	3.30
2500	1.44	12500	3.38
3000	1.57	13000	3.47
3500	1.71	13500	3.55
4000	1.85	14000	3.61
4500	1.95	14500	3.68
5000	2.05	15000	3.76
5500	2.14	15500	3.86
6000	2.27	16000	3.92
6500	2.38	16500	3.97
7000	2.47	17000	4.03
7500	2.58	17500	4.10
8000	2.65	18000	4.18
8500	2.74		

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 003,
HL 4353

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.71
100	0.27	9500	2.81
300	0.47	10000	2.90
500	0.61	10500	2.97
1000	0.87	11000	3.06
1500	1.07	11500	3.13
2000	1.24	12000	3.20
2500	1.39	12500	3.26
3000	1.53	13000	3.34
3500	1.65	13500	3.39
4000	1.77	14000	3.47
4500	1.89	14500	3.54
5000	1.99	15000	3.62
5500	2.07	15500	3.69
6000	2.20	16000	3.76
6500	2.30	16500	3.83
7000	2.39	17000	3.86
7500	2.51	17500	3.94
8000	2.58	18000	4.02
8500	2.65		

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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