



**Nemko**

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## CERTIFICATION TEST REPORT

**Report Number:** 2009 09133133 MONITOR FCC 15.247

**Project Number:** 24094-1

**Nex Number:** 133133

**Applicant:** CARDIONET  
1010 SECOND AVENUE. SUITE 700  
San Diego, CA 92101

**Equipment Under Test (EUT):** WIRELESS AMBULATORY ECG MONITORING SYSTEM

**Model:** 100-0025-01

**FCC ID:** QBI-1012

**IC:** 8686A-1012

**In Accordance With:** FCC Part 15 Subpart C, 15.247  
IC RSS-210 Issue 7 June 2007  
IC RSS-Gen Issue 2 June 2007

**Tested By:** Nemko USA Inc.  
11696 Sorrento Valley Road, Suite F  
San Diego, CA 92121

**Authorized By:**   
Alan Laudani, EMC/RF Test Engineer

**Date:** November 2, 2009

**Total Number of Pages:** 47



## Section1: Summary of Test Results

### General

#### All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15; Subpart C and IC RSS-210. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and IC.

The assessment summary is as follows:

**Apparatus Assessed:** Wireless Ambulatory ECG Monitoring System

**Model:** 100-0025-01

**Specification:** FCC Part 15 Subpart C, 15.247  
IC RSS-210 Issue 7 June 2007

**Date Received in Laboratory:** October 21, 2009

**Compliance Status:** Complies

**Exclusions:** None

**Non-compliances:** None



### 1.1 Report Release History

REVISION	DATE	COMMENTS	
-	November 2, 2009	Prepared By:	Ferdinand Custodio
-	November 2, 2009	Initial Release:	Alan Laudani

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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TESTED BY:

  
Ferdinand Custodio, EMC Test Engineer

Date: November 2, 2009



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## Section 2: Equipment Under Test

### 2.1 Product Identification

The Equipment Under Test was indentified as follows:

**Cardionet 100-0025-01 Wireless Ambulatory ECG Monitoring System**



### 2.2 Samples Submitted for Assessment

The following sample of the apparatus has been submitted for type assessment:

Sample No.	Description	Serial No.
133133-2	100-0025-01	N/A



## 2.3 Theory of Operation

The 100-0025-01 is part of an Wireless Ambulatory ECG Monitoring System called Cardionet C5. The system provides continuous ECG recording and automated analysis through three separate components (Sensor, Monitor and the Base).

- A body worn Sensor with 3 electrodes that captures 2 channels of ECG, stores 2 channels, and transmits the data to the Monitor for analysis.
- A mobile handheld computer and cell phone (the Monitor) that performs analysis of the ECG data from the Sensor, communicates cardiac events to the monitoring center, and functions as the primary user interface to the system (both Monitor and Sensor).
- A wireless POTS modem/Ethernet interface (the Base) that acts as an interface from the Monitor to the home phone line or broadband Internet connection for data transmissions. The wireless POTS modem/Ethernet interface is used for connection to the Data Center. This is the secondary data link when the wireless modem is unavailable; normally the cellular modem is used.

In the C5 architecture, the Sensor is primarily a data collection device that sends a continuous stream of ECG data to the Monitor. The Sensor communicates with the Monitor over an ISM Band (900 MHz) radio link utilizing a proprietary communications protocol. The Sensor is capable of storing up to 6 hours of ECG data in the event that it is out of communications range with the Monitor and operates on a single AAA battery for a 24 hour period. The Sensor weighs less than 4 ounces and can be worn on a lanyard around the neck or on a belt clip.

The actual Arrhythmia analysis is performed on the Monitor utilizing a proprietary CardioNet algorithm specifically designed for ambulatory monitoring. The Monitor continuously and automatically analyzes the patient's ECG and can detect

tachycardia (atrial or ventricular), bradycardia, asystole, atrial fibrillation, QT intervals and ventricular fibrillation. When events are detected by the Monitor, they are evaluated according to predetermined levels of urgency. If the event's classification requires it be transmitted to the center promptly, the Monitor will establish a link with the CardioNet Monitoring Center and transmit the data through either the POTS modem/Ethernet connection or cellular modem. Less urgent events and clinical information are uploaded to the Monitoring Center on a scheduled basis.

The Monitor detects cardiac events both automatically and with input from the patient. When a patient feels symptoms of concern, they can activate the record function and enter both their symptoms and activity levels into the Monitor. This symptom / event correlation is particularly useful to diagnosing physicians.

The 100-0025-01 was exercised using test software cycling the transmission at max power every time the power is cycled. The sequence is: Low Channel unmodulated, Low Channel modulated, Mid Channel unmodulated, Mid Channel modulated, High Channel unmodulated, High Channel modulated and finally Receive Mode.





## 2.4 Technical Specifications of the EUT

<b>Manufacturer:</b>	Cardionet
<b>Operating Frequency:</b>	902.93 MHz to 926.277 MHz in the 902-928 MHz Band
<b>Number of Operating Frequencies:</b>	32
<b>Rated Power:</b>	8.6 mW
<b>Modulation:</b>	FSK
<b>Reference Designator:</b>	653KF1D
<b>Antenna Data:</b>	Cardionet CN#010-0022-02
<b>Antenna Gain:</b>	0 dBi
<b>Antenna Connector:</b>	Internal contact type
<b>Power Source:</b>	3.7VDC (Lithium-Ion Battery - internal).



## Section 3: Test Conditions

### 3.1 Specifications

The apparatus was assessed against the following specifications:

#### ***FCC Part 15 Subpart C, 15.247***

Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

#### ***IC RSS-210 Issue 7 June 2007***

Low-power Licence-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment. Annex 8 - Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

#### ***IC RSS-Gen Issue 2 June 2007***

General Requirements and Information for the Certification of Radio-communication Equipment

### 3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

### 3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	19 – 24 °C
Humidity range	39-59 %
Pressure range	87 – 101.2 kPa
Power supply range	3.7VDC (freshly charged)

### 3.4 Test Equipment

Nemko ID	Device	Manu.	Model	Serial Number	Cal Date	Cal Due Date
911	Spectrum Analyzer	Agilent	E4440A	US41421266	11/6/2008	11/6/2009
946	Peak Power Sensor	HP	84815A 0.05-18GHz (-40 to 20dBm)	3318A01726	9/16/2009	9/16/2010
947	Peak Power Analyzer	HP	8991A	3621A00906	9/16/2009	9/16/2010
128	Antenna, Bicon	EMCO	3104	2882	2/9/2009	2/9/2011
111	Antenna, LPA	EMCO	3146	1382	10/20/2008	10/20/2010
902	pre amp	Sonoma	310 N	185803	8/4/2009	8/4/2010
317	Preamplifier	HP	8449A	2749A00167	4/16/2009	4/16/2010
746	Signal Generator	HP	8648B	3642U1905	1/22/2009	1/22/2010
674	Spectrum Analyzer	HP	8568B	2007A00910	4/15/2009	4/15/2010
675	Spectrum Analyzer Display	HP	85662A	2005A01282	4/15/2009	4/15/2010
676	Quasi-Peak Adapter	HP	85650A	2430A00576	4/15/2009	4/15/2010
681	Transient Limiter	HP	11947A	3107A02634	10/9/2009	10/9/2010
805	LISN	Solar	9348-50-R-24-BNC	992823	1/21/2009	1/21/2010
564	High Pass Filter	Solar	7801-5.0	853130	8/14/2009	8/14/2010

Registration of the OATS are on file with the Federal Communications Commission, under Registration Number 90579, the VCCI under registration number R-3027, and are also registered with Industry Canada under Site Numbers 2040B-1 and 2040B-2.



## **Section 4: Observations**

### **4.1 Modifications Performed During Assessment**

No modifications were performed during assessment.

### **4.2 Record Of Technical Judgements**

No technical judgements were made during the assessment.

### **4.3 EUT Parameters Affecting Compliance**

The user of the apparatus could not alter parameters that would affect compliance.

### **4.4 Test Deleted**

No Tests were deleted from this assessment.

### **4.5 Additional Observations**

There were no additional observations made during this assessment.



## Section 5: Results Summary

This section contains the following:

FCC Part 15 Subpart C:  
IC RSS-210 Issue 7 June 2007 Annex 8  
IC RSS-Gen Issue 2 June 2007

The column headed "Required" indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant  
Y Yes: Mandatory i.e. the apparatus shall conform to these tests.  
N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

### 5.1 Test Results

Part 15C	RSS	Test Description	Required	Result
15.207 (a)	RSS-Gen 7.2.2	Conducted Emission Limit	Y	Pass
15.215(c)	RSS-Gen 4.6.1	20 dB Bandwidth	Y	Pass
15.247(a)(2)		Minimum 6dB RF Bandwidth	Y	Pass
15.247(b)(3)	RSS-Gen 4.8 & 4.9	Peak Output Power	Y	Pass
15.247(d)		Band-edge Compliance of RF Conducted Emissions	Y	Pass
15.247 (d)		Spurious RF Conducted Emissions	Y	Pass
15.247 (d)		Spurious Radiated Emissions	Y	Pass
15.247(e)		Power Spectral Density for Digitally Modulated Devices	Y	Pass
	RSS-Gen 4.10	Receiver Spurious Emissions	Y	Pass



## Appendix A: Test Results

### Section 15.207(a) – Power Line Conducted Emissions

15.207(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

\*Decreases with the logarithm of the frequency.

### Test Conditions:

Sample Number:	100-0025-01	Temperature:	24°C
Date:	October 21, 2009	Humidity:	39 %
Modification State:	Low Channel	Tester:	FSCustodio
		Laboratory:	Shield Room #1

### Test Results:

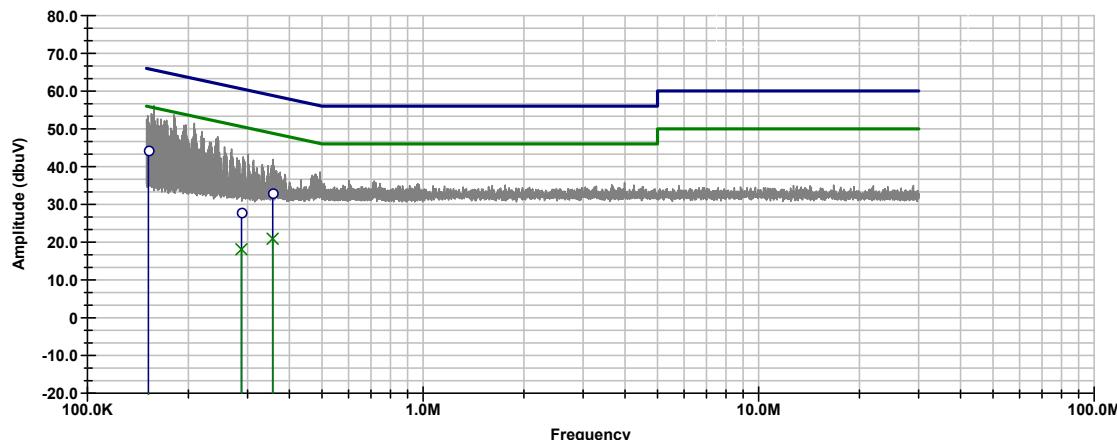
See attached plots for Line 1 (Hot) and Line 2 (Neutral).

### Additional Observations:

- Test parameters: Peak RBW/VBW is 100kHz/100kHz, Quasi-Peak and Average is 9kHz/30kHz.
- Blue line is Quasi Peak limit while green line is Average limit.
- represents quasi peak measurement while represent average measurement.
- Test was performed using worst case configuration (charging and transmitting at the same time) and channel (low channel – base from power measurements).

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FCC Class B Conducted Emissions  
120VAC @ 60Hz, L1 PK, QP = 0, AV = X

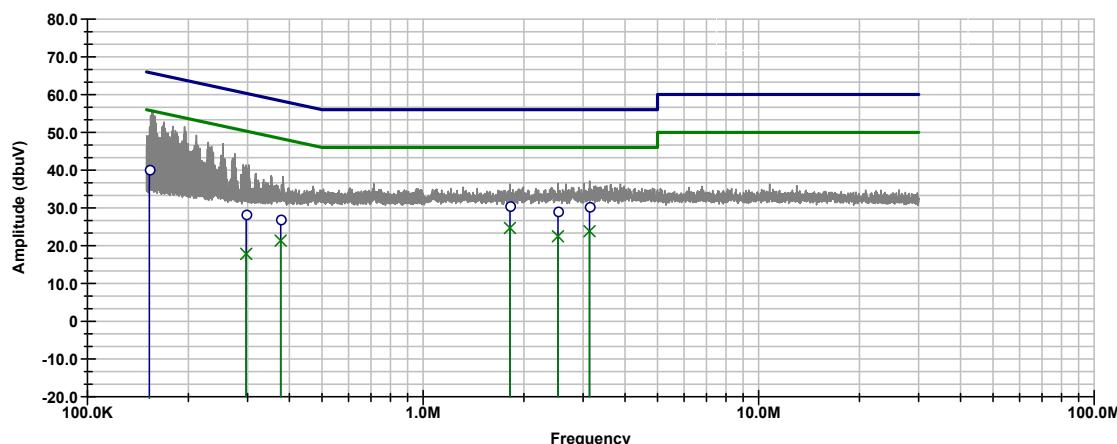
Cardionet  
Monitor (C5 System) - Charging and transmitting  
24094-1 NEX#133133



11:46:24 AM, Wednesday, October 21, 2009

Nemko USA, Inc.  
FCC Class B Conducted Emissions  
120VAC @ 60Hz, L2 PK, QP = 0, AV = X

Cardionet  
Monitor (C5 System) - Charging and transmitting  
24094-1 NEX#133133



11:52:37 AM, Wednesday, October 21, 2009



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**Section 15.215(c) – 20 dB Bandwidth**

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

**Test Conditions:**

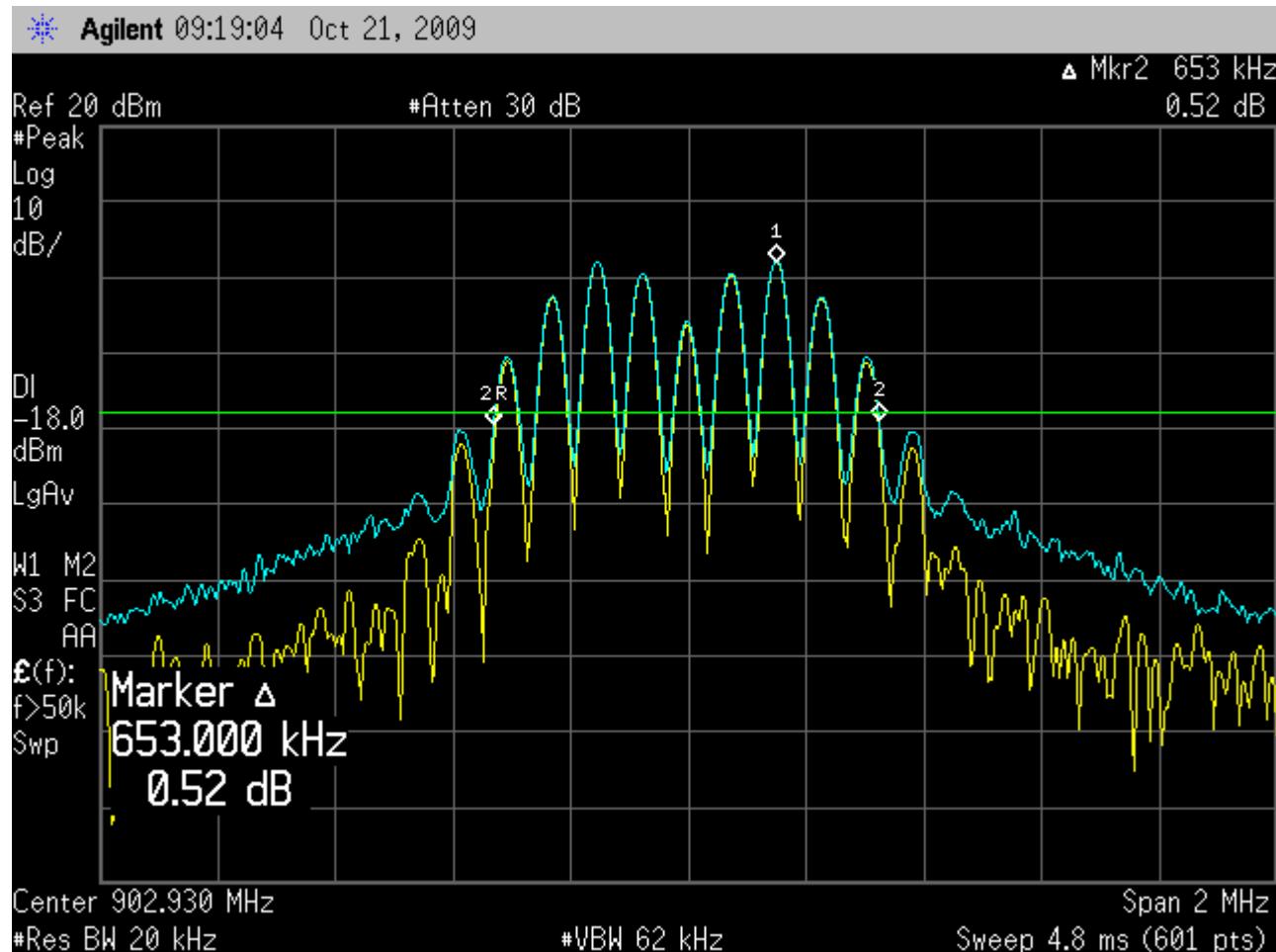
<b>Sample Number:</b>	100-0025-01	<b>Temperature:</b>	24°C
<b>Date:</b>	October 21, 2009	<b>Humidity:</b>	39 %
<b>Modification State:</b>	Low ,Mid and High Channel	<b>Tester:</b>	FSCustodio
		<b>Laboratory:</b>	Nemko

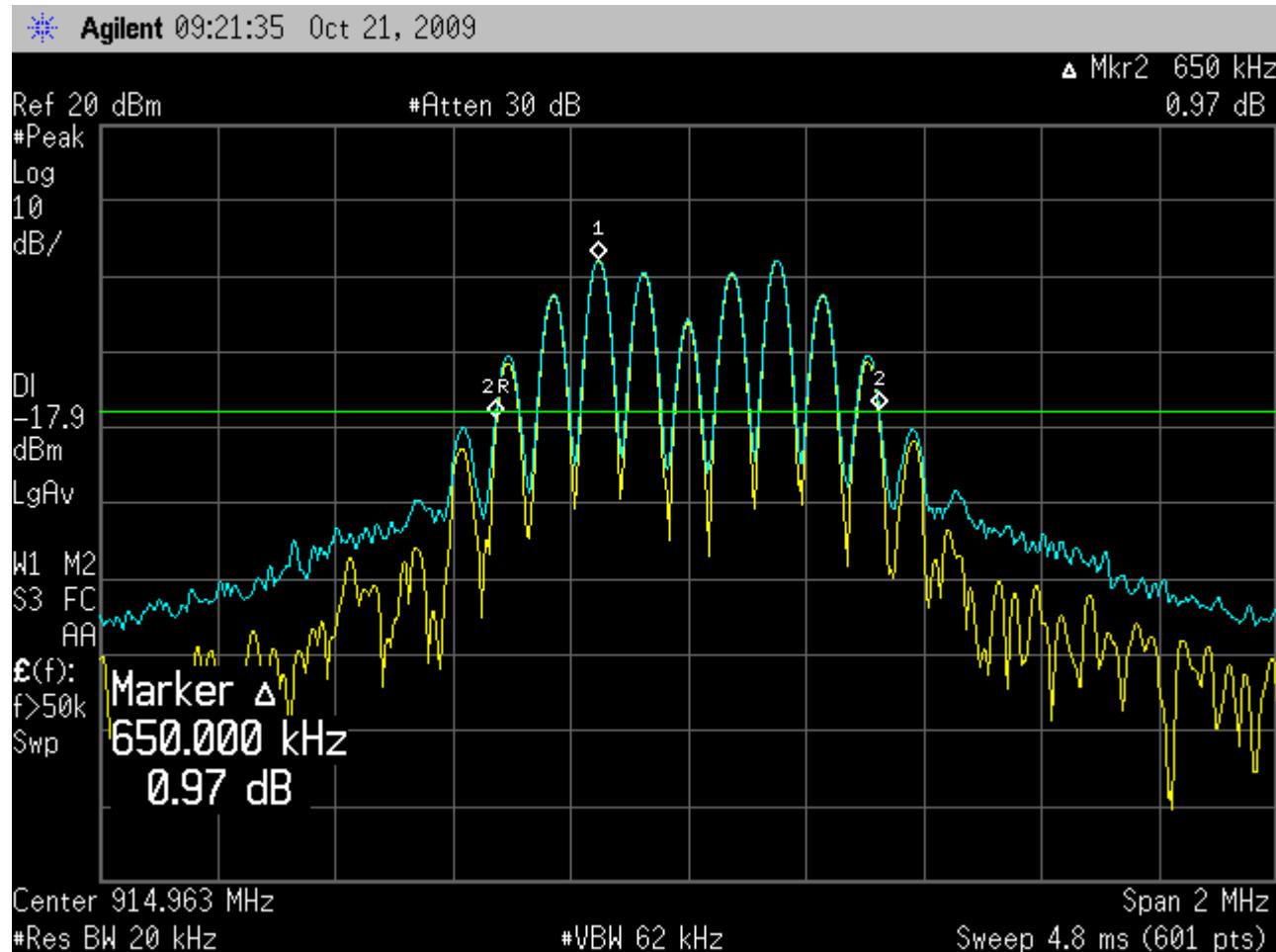
**Test Results:**

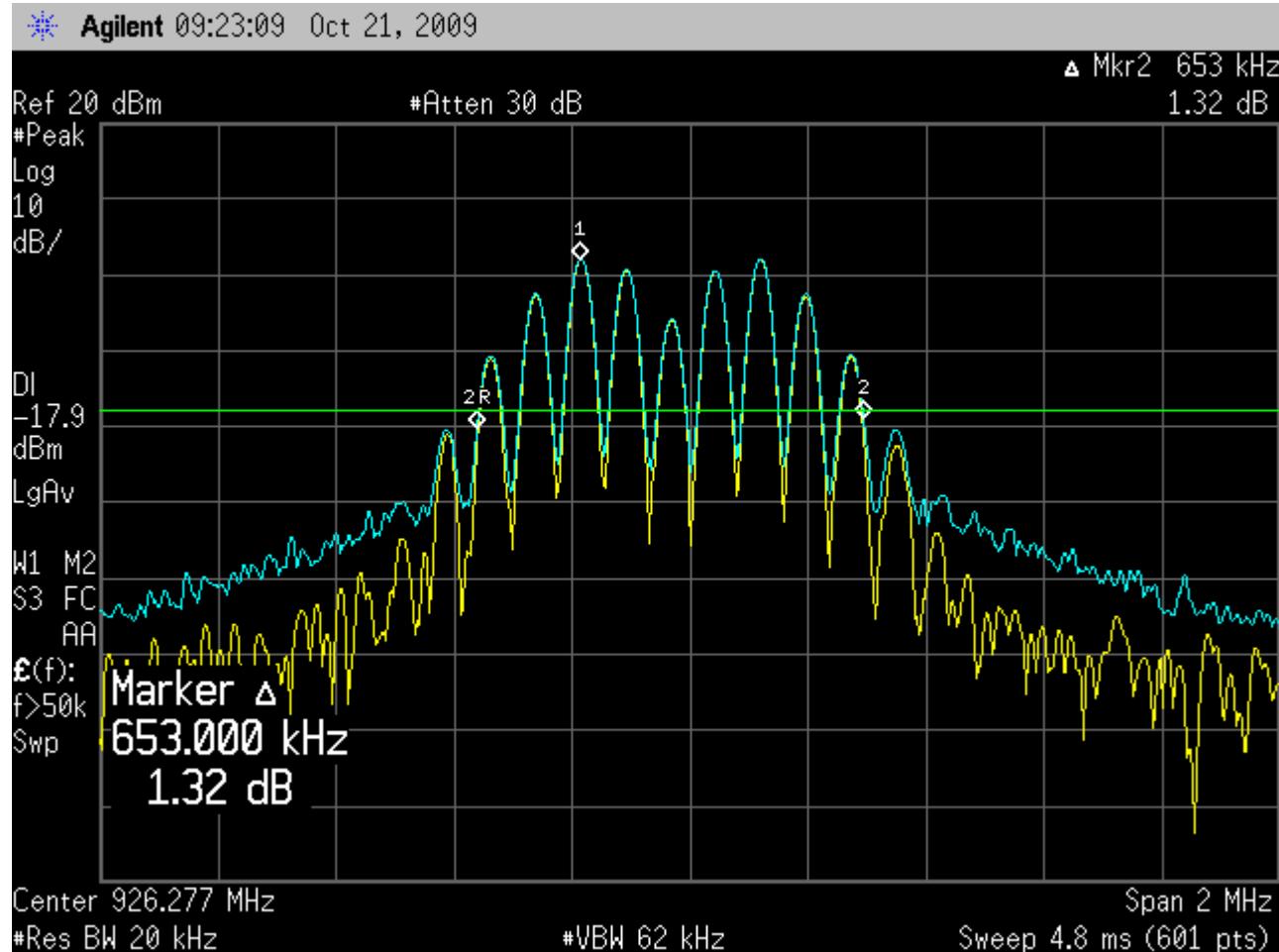
See attached plots.

**Additional Observations:**

- Span is wide enough to capture the channel transmission
- RBW is 1% of the span
- VBW is 3X RBW
- Sweep is auto
- Detector is Peak
- Trace is Max Hold
- A peak output max hold reading was taken, a display line was drawn 20 dB lower than peak level. The 20 dB bandwidth was determined from where the channel output spectrum intersected the display line.
- Observed 20 dB BW is 653 kHz.
- $902.930 \text{ MHz} - 0.653\text{MHz} = 902.277 \text{ MHz}$  (within the frequency band)
- $926.277 \text{ MHz} + 0.653\text{MHz} = 926.930 \text{ MHz}$  (within the frequency band)

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247(Low Channel) Observed 20 dB Bandwidth is **653 kHz**

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247(Mid Channel) Observed 20 dB Bandwidth is **650 kHz**

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247(High Channel) Observed 20 dB Bandwidth is **653 kHz**

**Section 15.247(a)(2) – Minimum 6dB RF Bandwidth**

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

**Test Conditions:**

<b>Sample Number:</b>	100-0025-01	<b>Temperature:</b>	24°C
<b>Date:</b>	October 21, 2009	<b>Humidity:</b>	39 %
<b>Modification State:</b>	Low ,Mid and High Channel	<b>Tester:</b>	FSCustodio

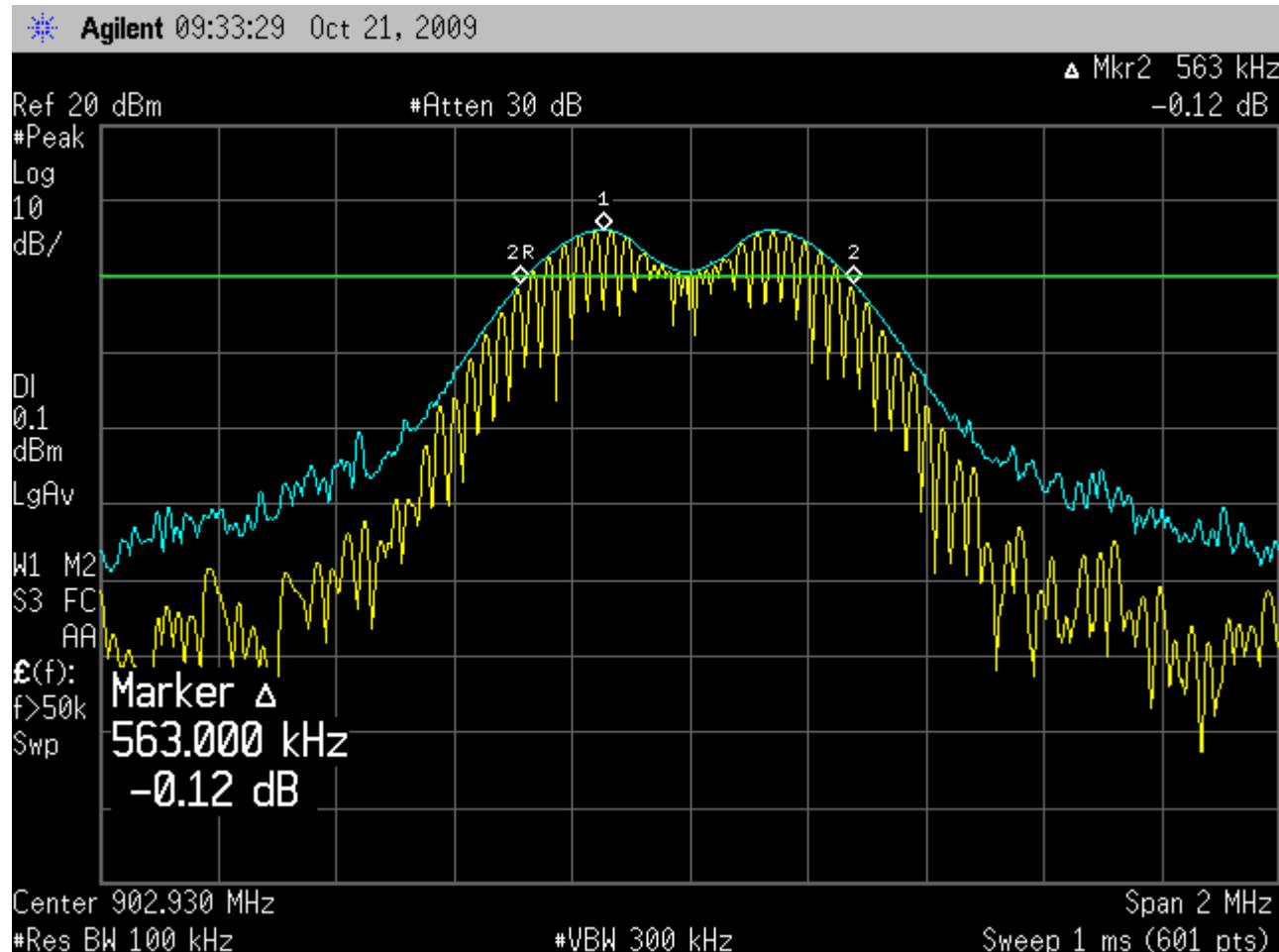
**Laboratory:** Nemko**Test Results:**

See attached plots.

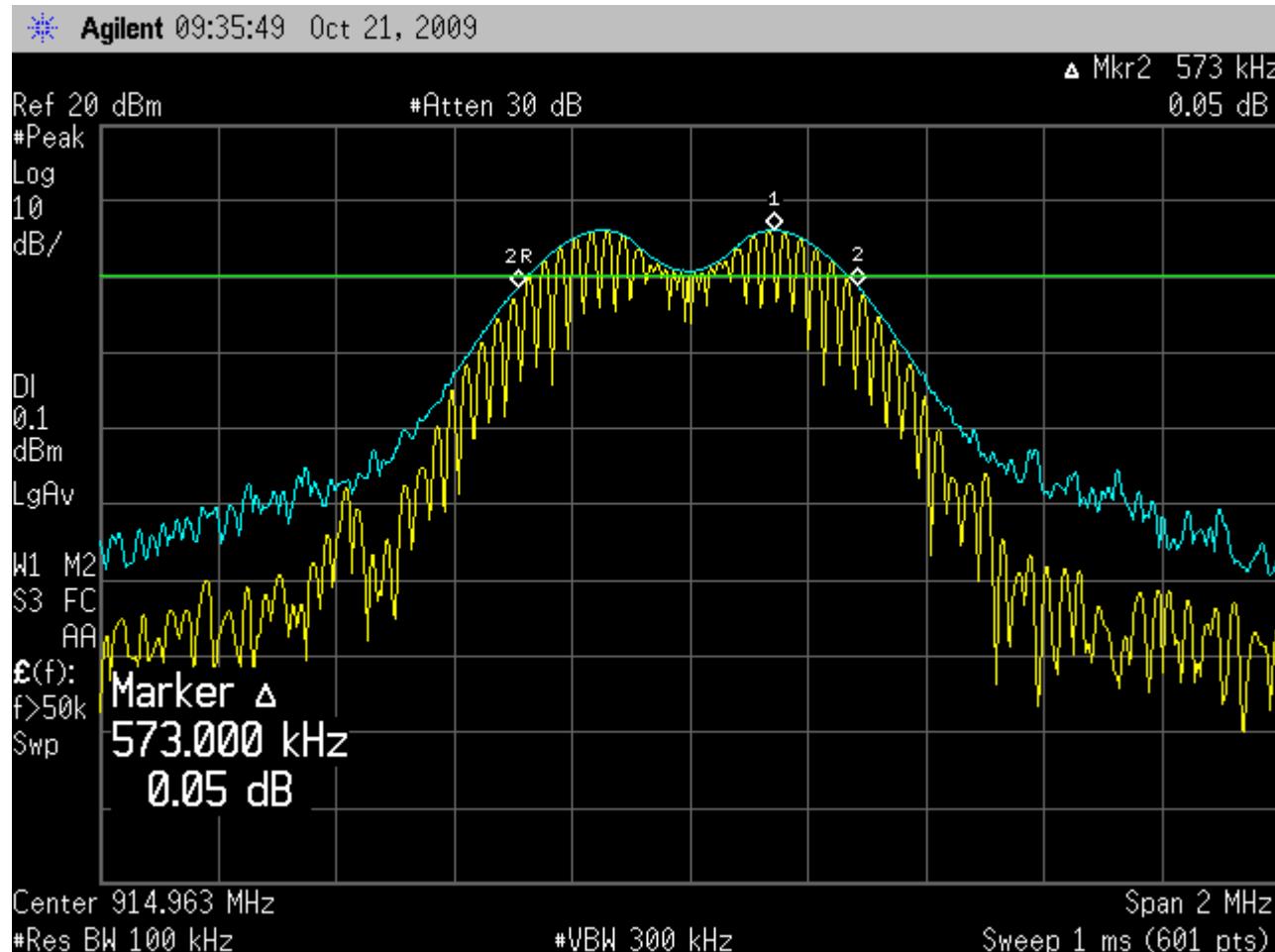
**Additional Observations:**

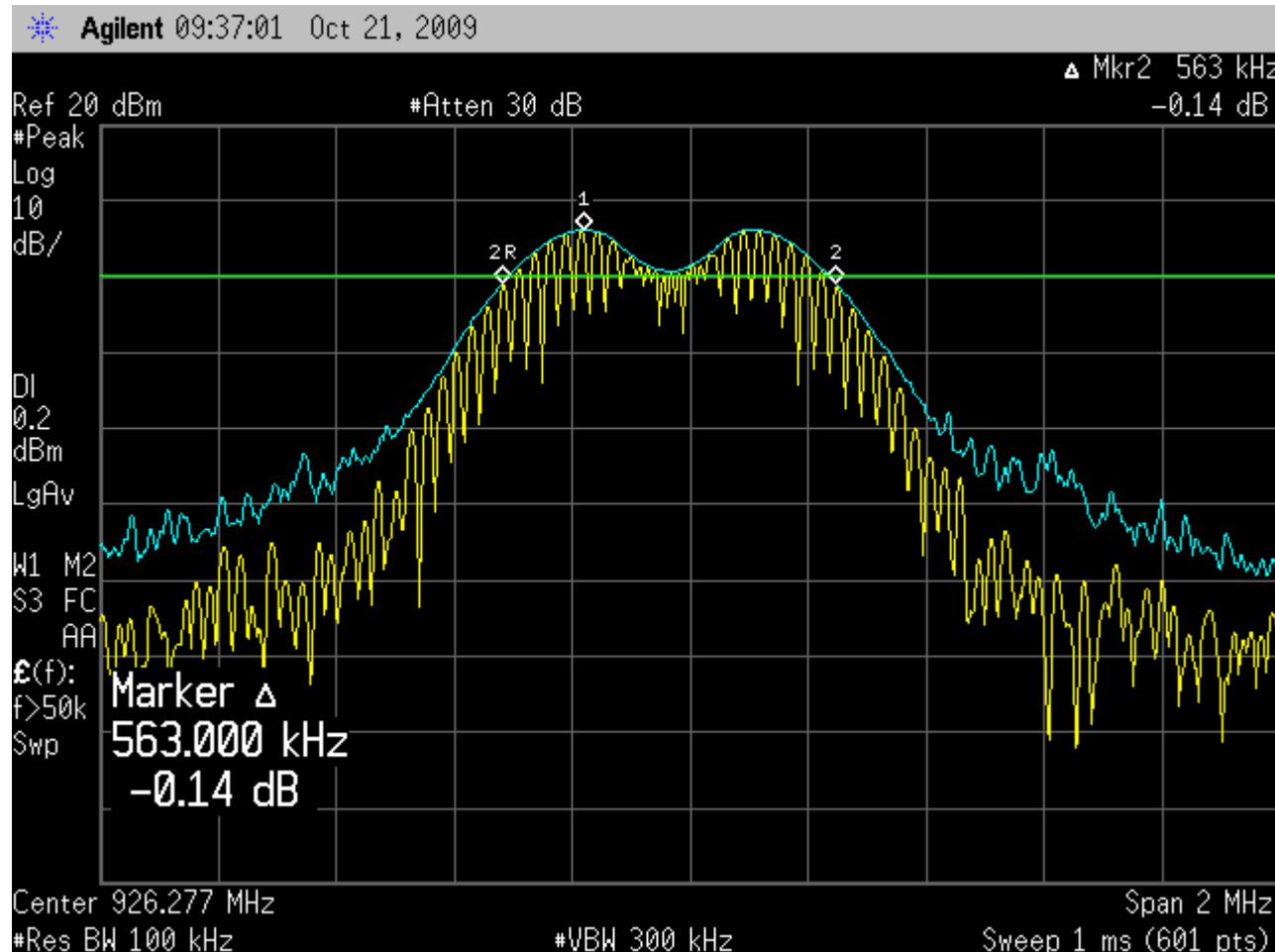
- This is a conducted test
- RBW is set to 100kHz
- VBW is 3X RBW
- Sweep is auto
- Detector is Peak
- Trace is Max Hold
- For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was plotted; a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Channel Range	6 dB Bandwidth
Low (902.930 MHz)	563 kHz
Mid (914.963 MHz)	573 kHz
High (926.377 MHz)	563 kHz



(Low Channel) Observed 6 dB Bandwidth is **563 kHz**

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247(Mid Channel) Observed 6 dB Bandwidth is **573 kHz**

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247



## Section 15.247(b)(1) – Peak Output Power

(3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

### Test Conditions:

Sample Number:	100-0025-01	Temperature:	24°C
Date:	October 21, 2009	Humidity:	39 %
Modification State:	Low ,Mid and High Channel	Tester:	FSCustodio
		Laboratory:	Nemko

### Test Results:

Peak Power Analyzer used on this test

### Additional Observations:

- This is a conducted test. A 20dB attenuator was placed between the sensor and the antenna port. Additional 0.5 dB was added for the cable assembly used.. Total offset used is 20.5 dB.
- The EUT was configured to transmit modulated during investigation.
- Measurements were made using a fresh battery.

Channel Range	Peak Power Output dBm @ 1.5VDC
Low (902.930 MHz)	9.34
Mid (914.993 MHz)	9.34
High (926.277 MHz)	9.26

Peak Output Power = 9.34 dBm or **8.6 mW**

**Section 15.247(d) – Band-edge Compliance of RF Conducted Emissions**

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**Test Conditions:**

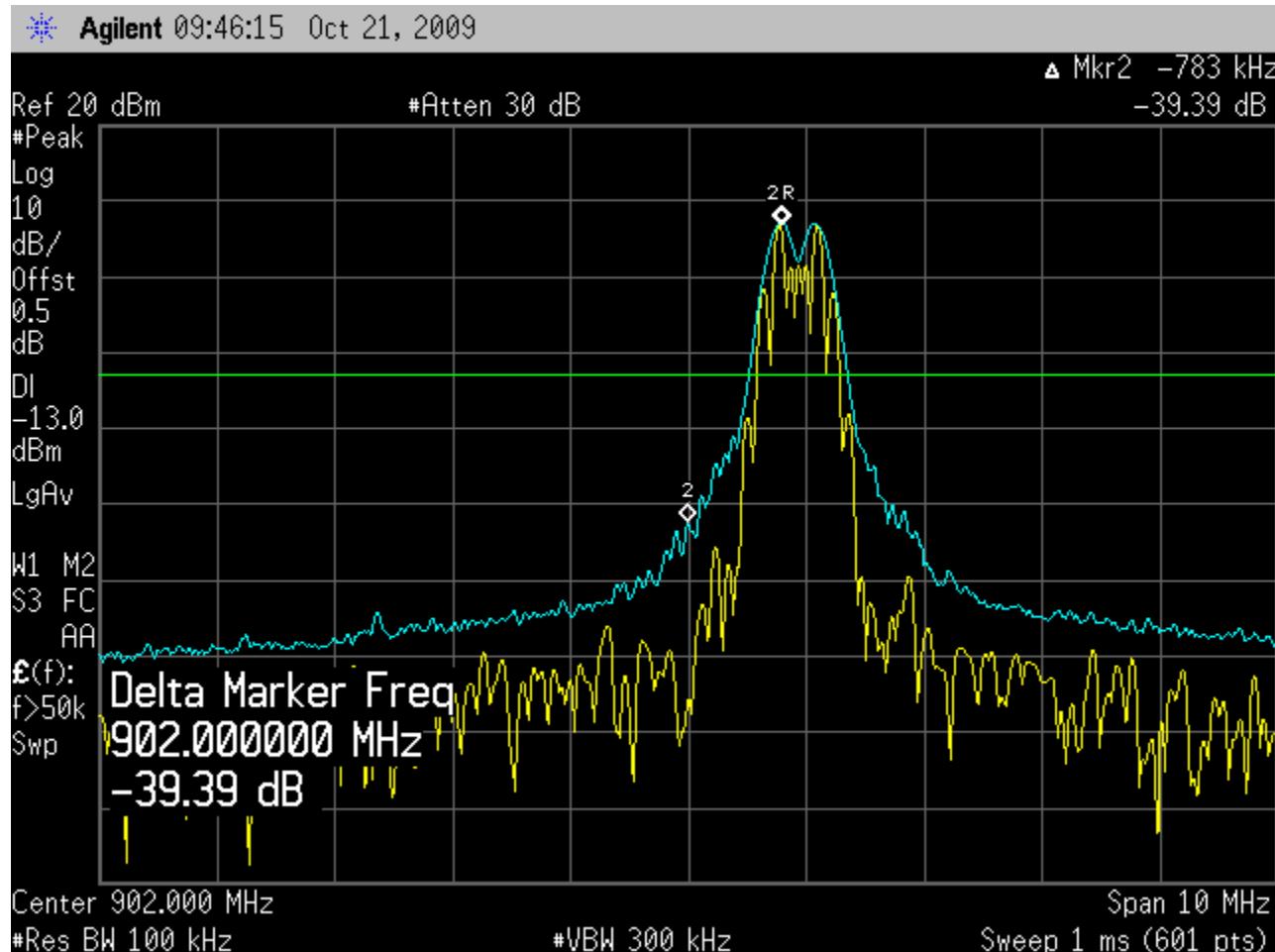
<b>Sample Number:</b>	100-0025-01	<b>Temperature:</b>	24°C
<b>Date:</b>	October 21, 2009	<b>Humidity:</b>	39 %
<b>Modification State:</b>	Low and High Channel	<b>Tester:</b>	FSCustodio

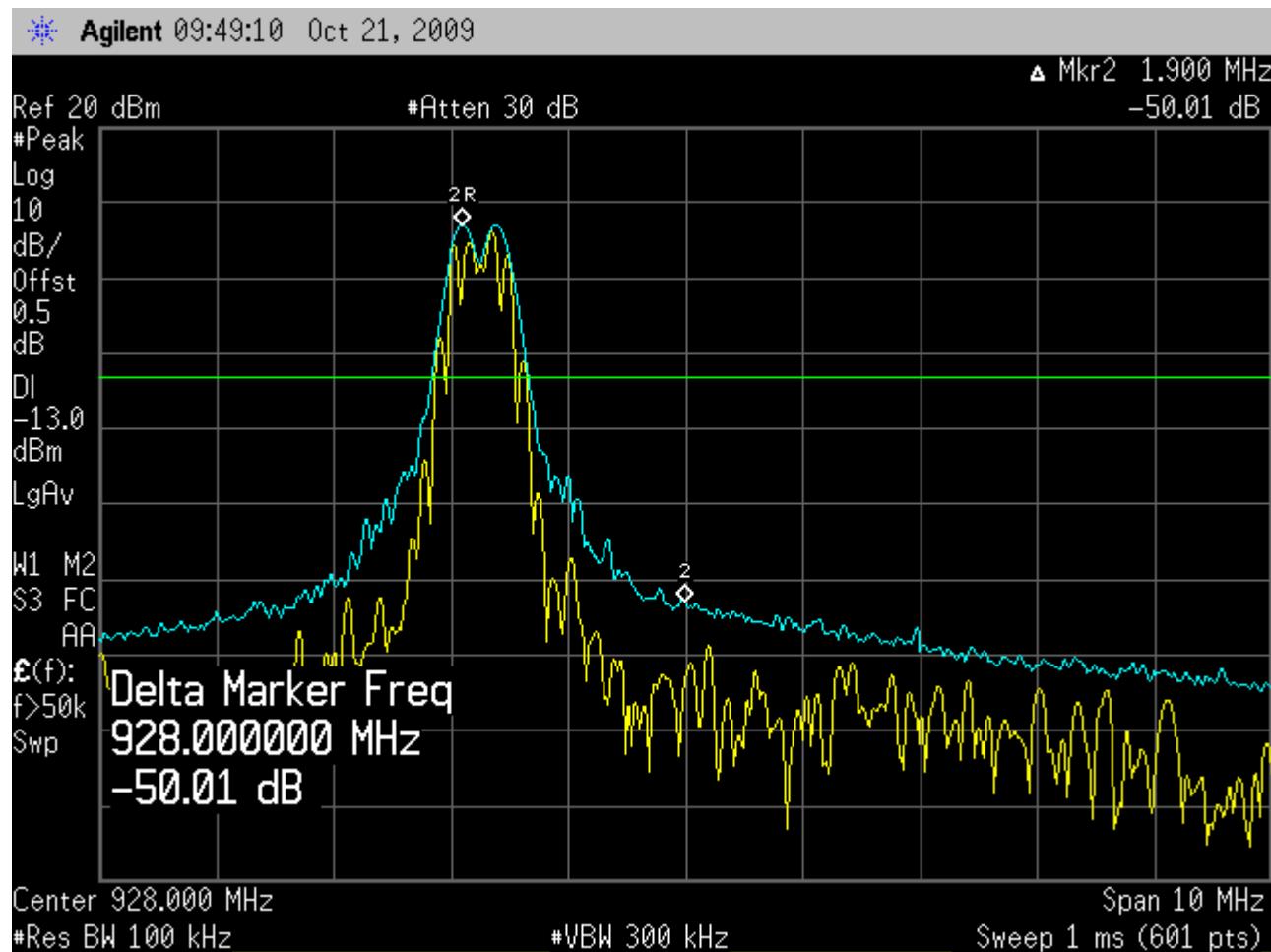
**Laboratory:** Nemko**Test Results:**

See attached plots.

**Additional Observations:**

- This is a conducted test. The 0.5dB offset is from the cable assembly used.
- Span is wide enough to capture the peak level of the emission operating on the channel closest to the band edges (Lower and Upper).
- RBW is 1% of the span
- VBW is 3X RBW
- Sweep is auto.
- Detector is Peak
- Trace is Max Hold
- For each investigation, the peak level reading was taken and a display line was drawn 20 dBc below this level which will be the limit for this test.

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247**Low Channel centered at 902 MHz**

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247**High Channel centered at 928 MHz**

**Section 15.247(d) – Spurious RF Conducted Emissions**

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**Test Conditions:**

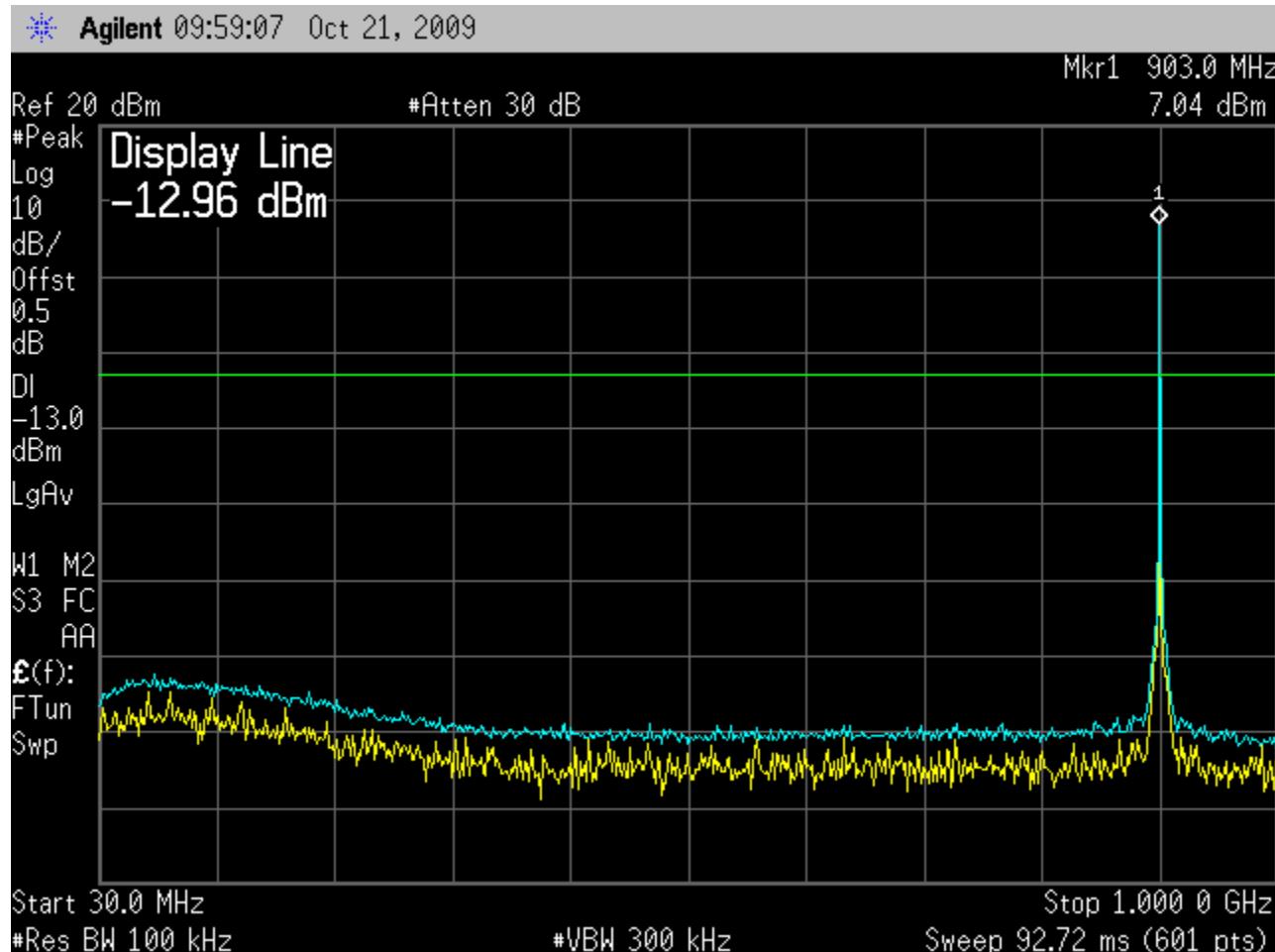
<b>Sample Number:</b>	100-0025-01	<b>Temperature:</b>	24°C
<b>Date:</b>	October 21, 2009	<b>Humidity:</b>	39 %
<b>Modification State:</b>	Low ,Mid and High Channel	<b>Tester:</b>	FSCustodio

**Laboratory:** Nemko**Test Results:**

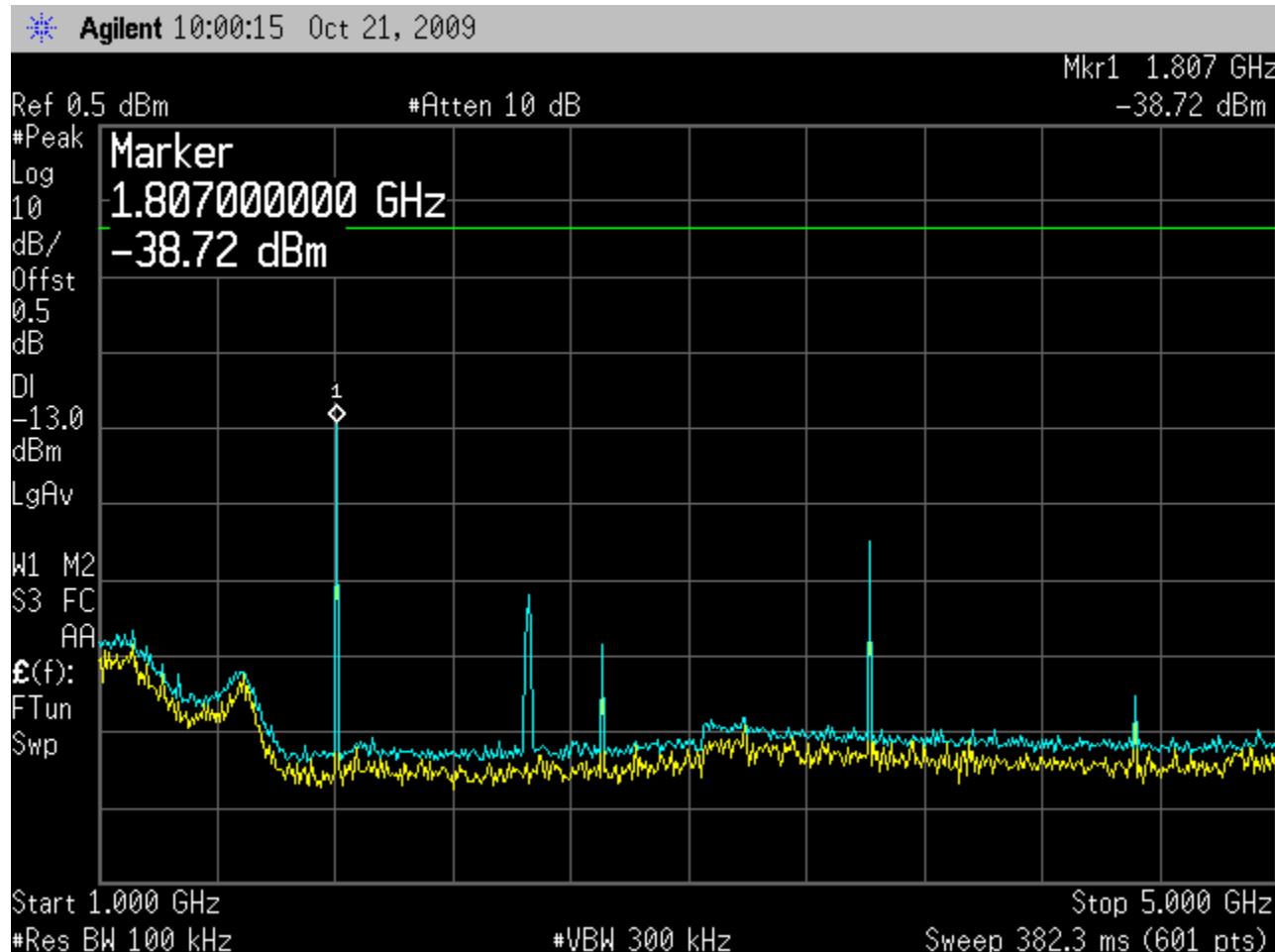
See attached plots.

**Additional Observations:**

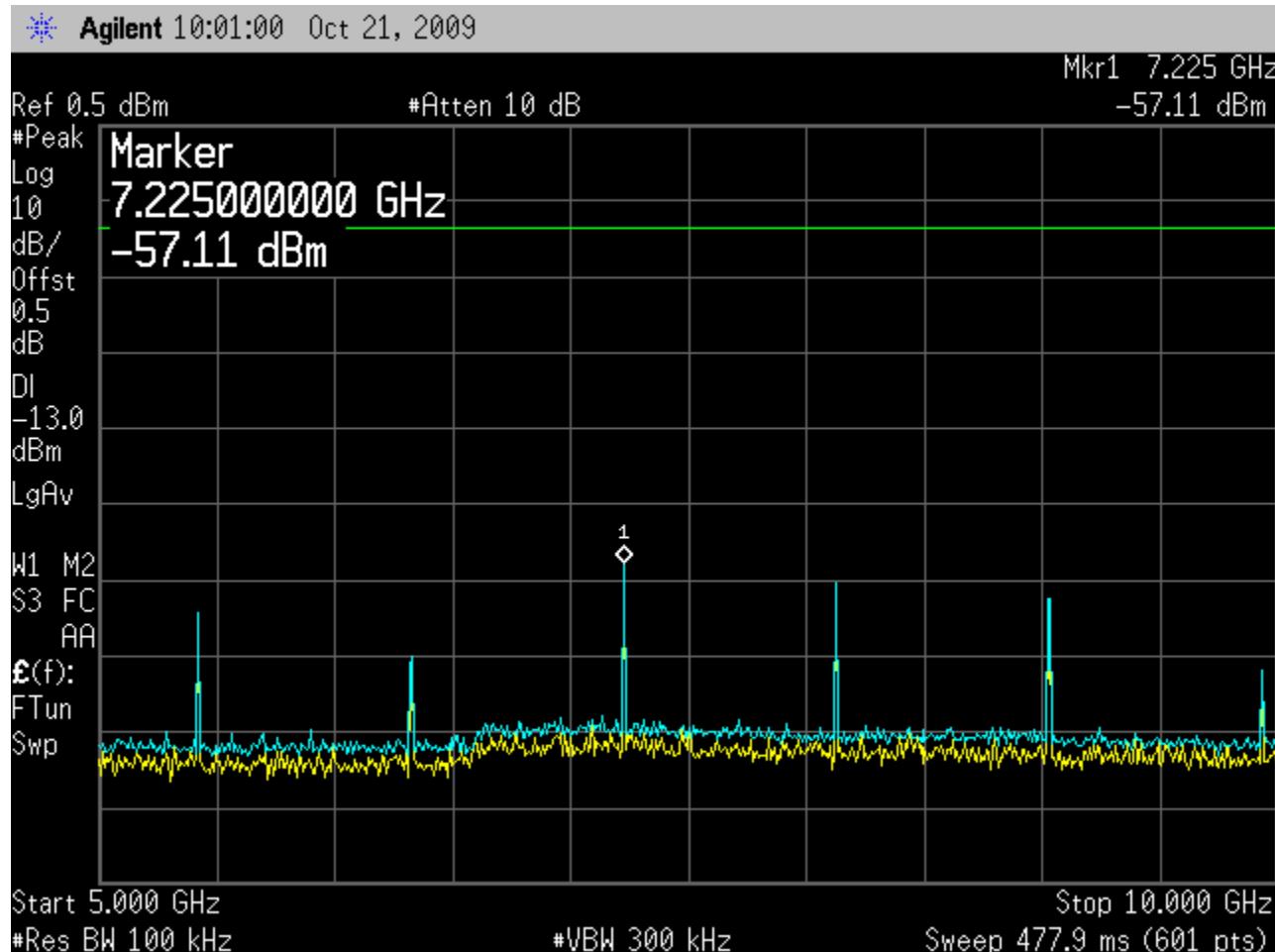
- This is a conducted test. The 0.5dB offset is from the cable assembly used.
- The peak level reading was taken at the carrier frequency then a display line was drawn 20 dBc below this level which will be the limit for this test.
- Internal attenuator is adjusted appropriately for each range.
- VBW is 3X RBW
- Sweep is auto.
- Detector is Peak
- Trace is Max Hold
- EUT complies.

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247

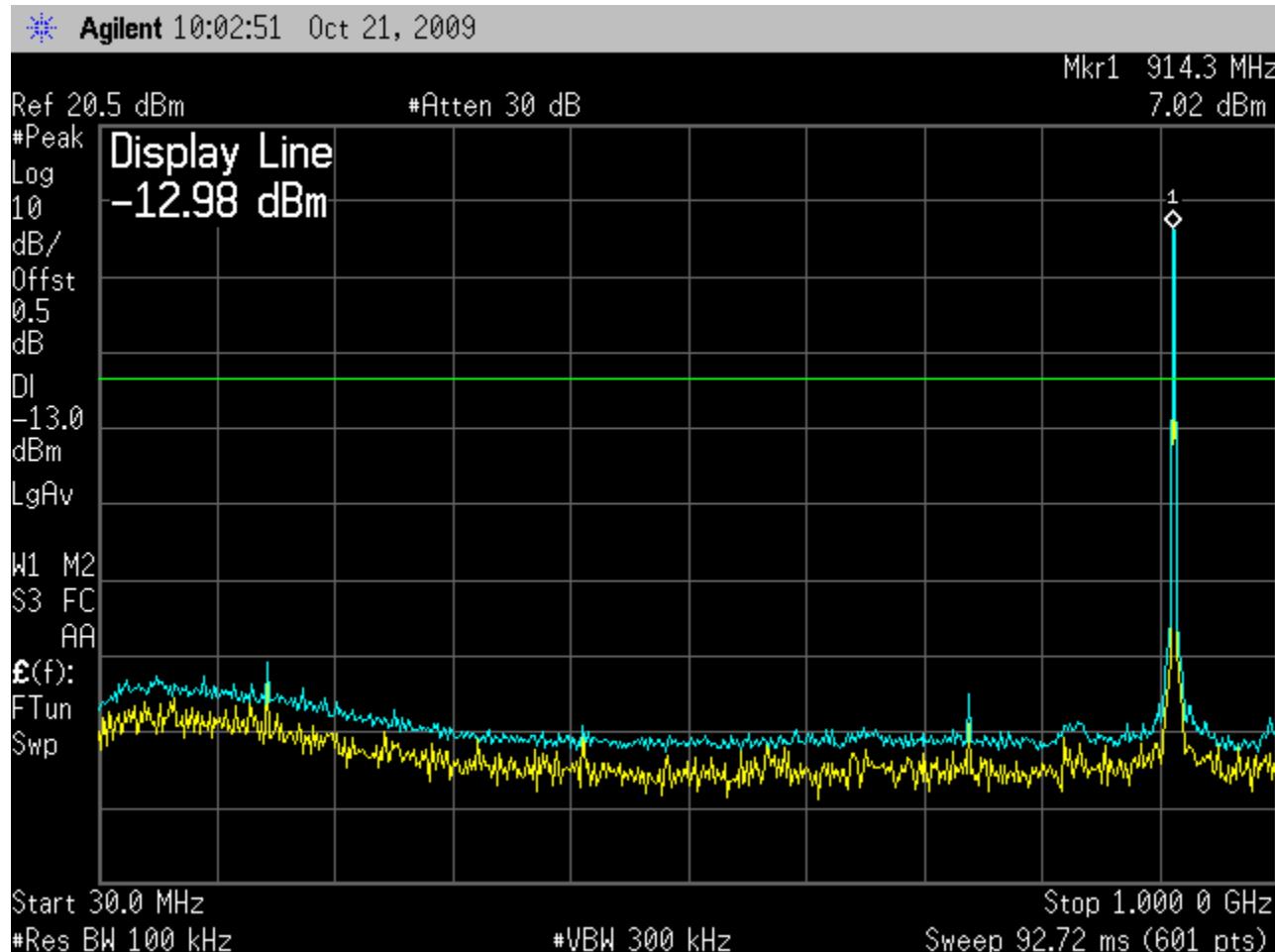
**Low Channel - Plots from 30 MHz to 1 GHz** , Display Line is –13.0 dBm which is 20dB below the highest in band emission.

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247

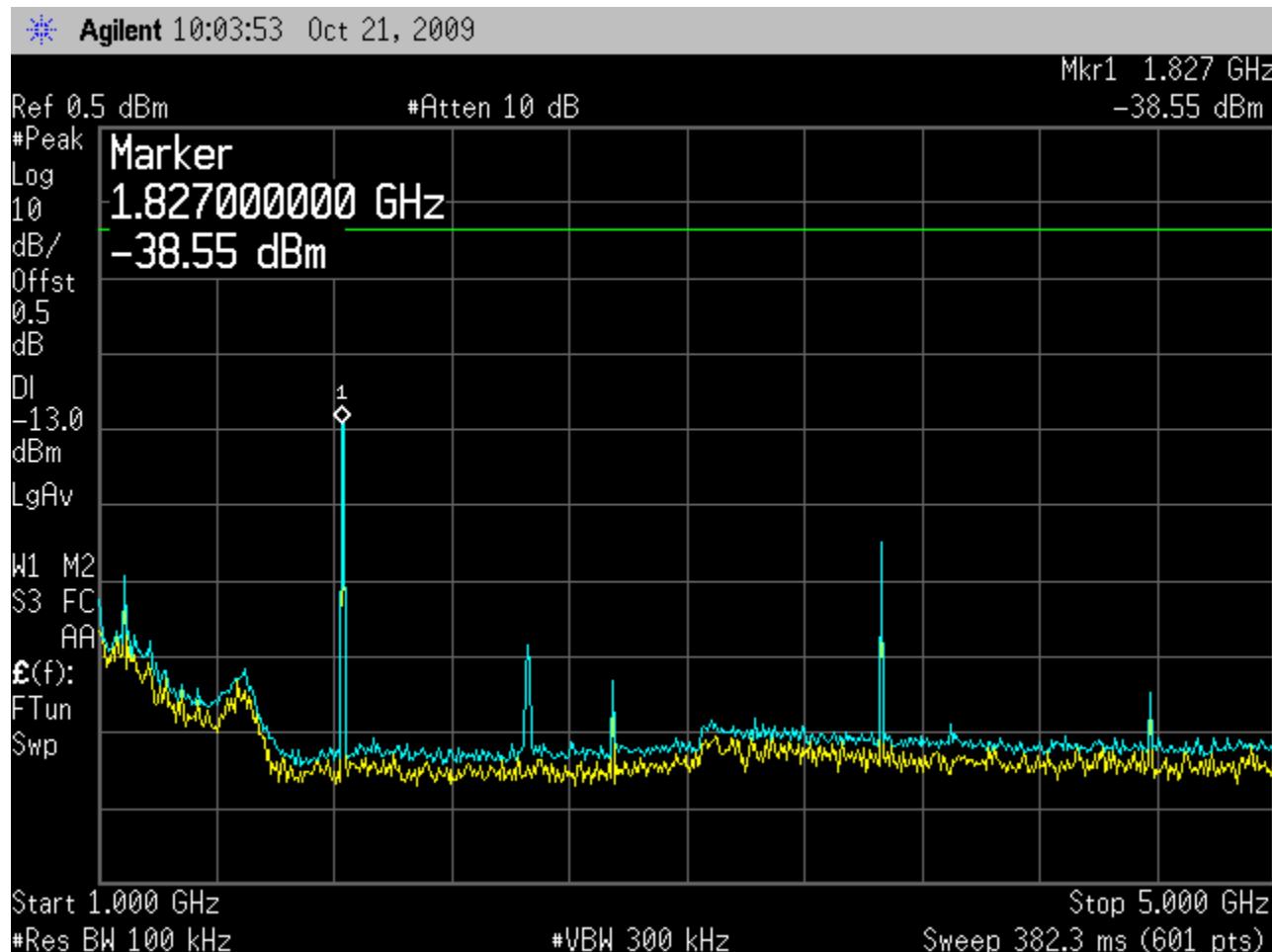
**Low Channel - Plots from 1 GHz to 5 GHz** , Display Line is -13.0 dBm which is 20dB below the highest in band emission.

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247

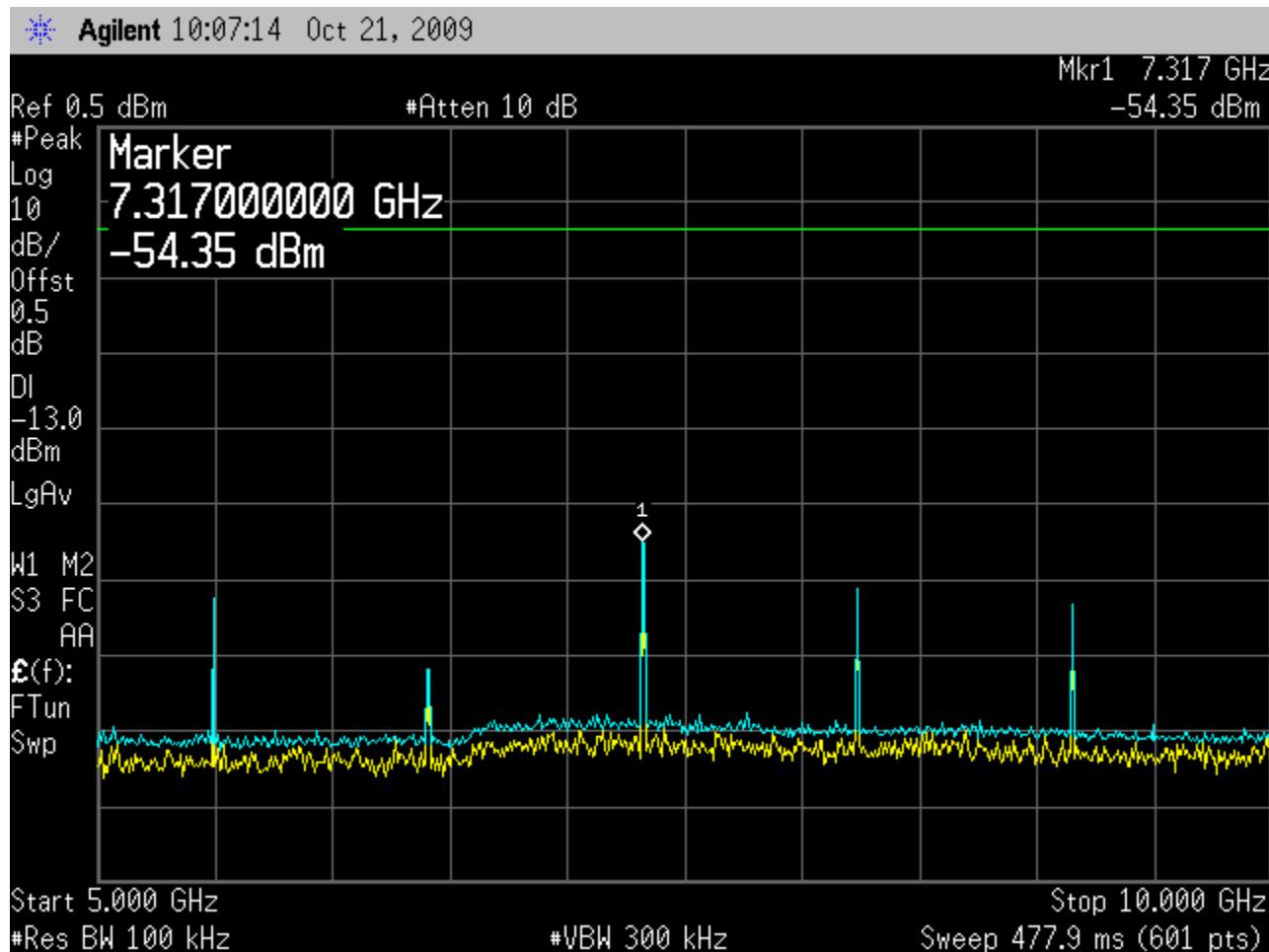
**Low Channel - Plots from 5 GHz to 10 GHz** , Display Line is –13.0 dBm which is 20dB below the highest in band emission.

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247

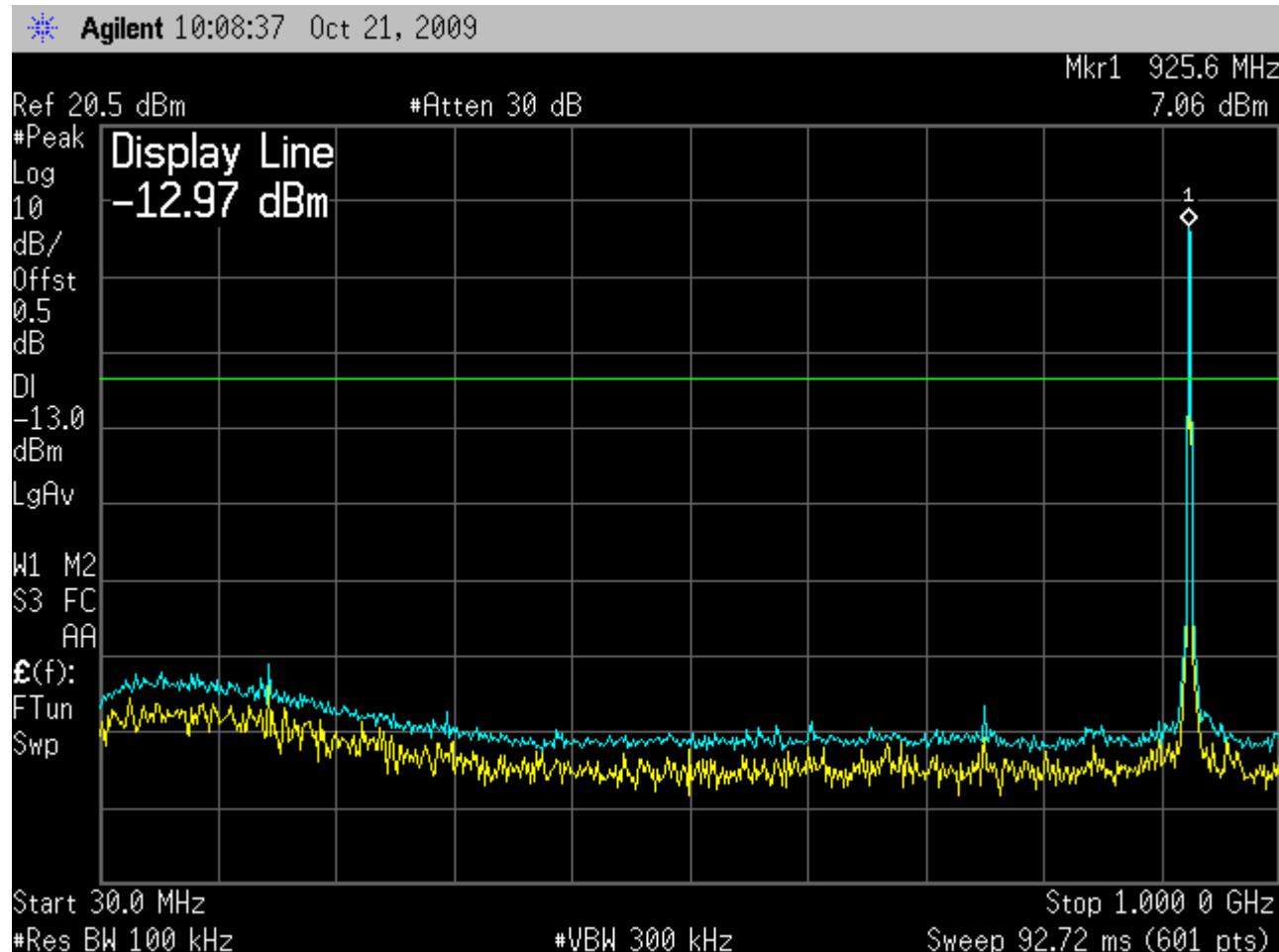
**Mid Channel - Plots from 30 MHz to 1 GHz** , Display Line is -13.0 dBm which is 20dB below the highest in band emission.



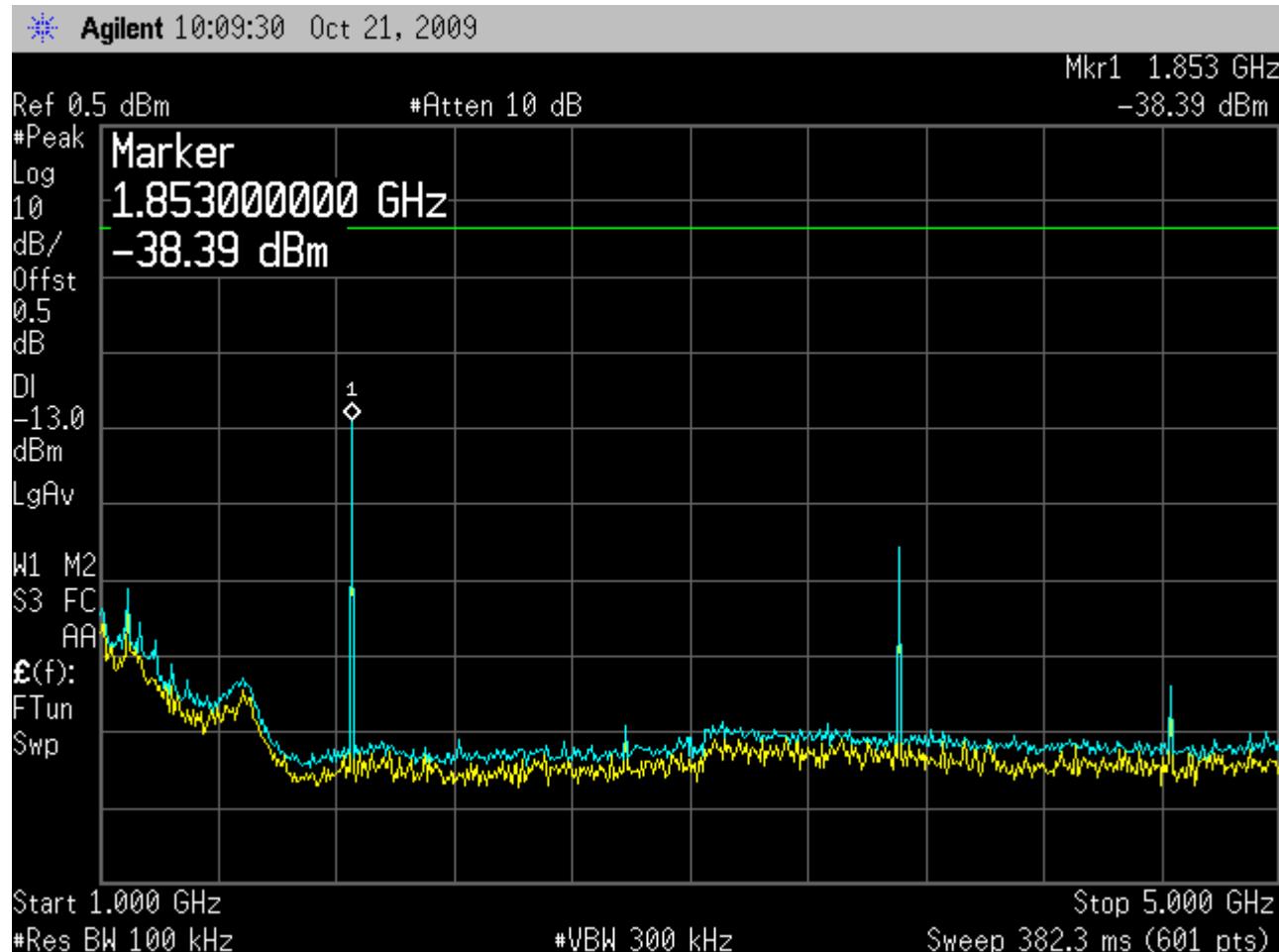
**Mid Channel - Plots from 1 GHz to 5 GHz** , Display Line is –13.0 dBm which is 20dB below the highest in band emission.



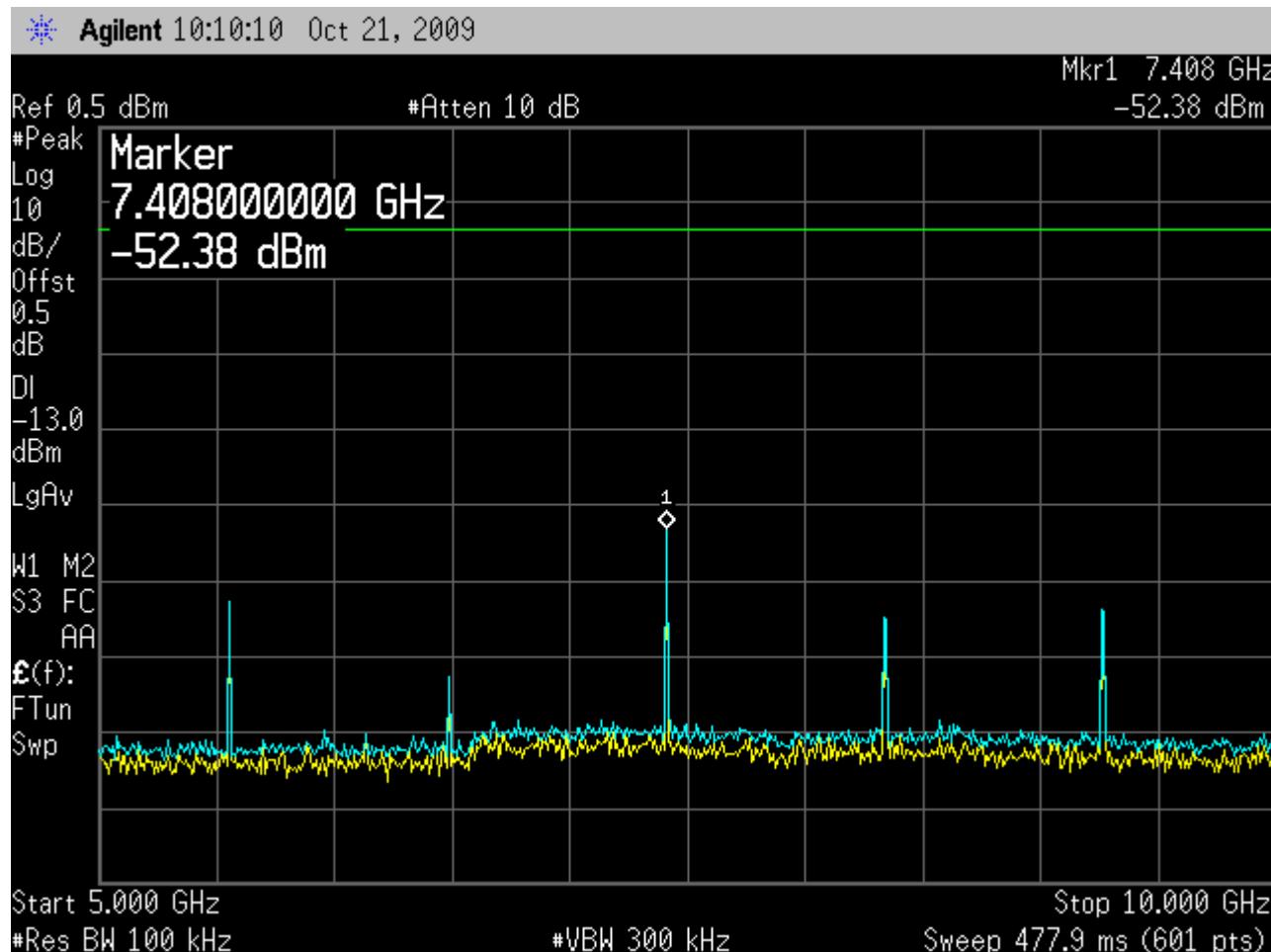
**Mid Channel - Plots from 5 GHz to 10 GHz** , Display Line is -13.0 dBm which is 20dB below the highest in band emission.

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247

**High Channel - Plots from 30 MHz to 1 GHz** , Display Line is –13.0 dBm which is 20dB below the highest in band emission.

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247

**High Channel - Plots from 1 GHz to 5 GHz** , Display Line is -13.0 dBm which is 20dB below the highest in band emission.

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247

**High Channel - Plots from 5 GHz to 10 GHz** , Display Line is –13.0 dBm which is 20dB below the highest in band emission.

**Section 15.247(d) – Spurious Radiated Emissions**

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**Test Conditions:**

<b>Sample Number:</b>	100-0025-01	<b>Temperature:</b>	19°C
<b>Date:</b>	October 23, 2009	<b>Humidity:</b>	49 %
<b>Modification State:</b>	Low, Mid and High Channels	<b>Tester:</b>	FSCustodio
		<b>Laboratory:</b>	SOATS

**Test Results:**

See attached plots.

**Additional Observations:**

- The Spectrum was searched from 30MHz to approx. 10<sup>th</sup> Harmonic, 10000 MHz. There are no emissions found that do not comply to the restricted bands defined in **FCC Part 15 Subpart C, 15.205 or Part 15.247(d)**.
- The EUT was measured on three orthogonal axes.
- Radiated emissions test results are the same for all three channels below 1GHz.
- Below 1GHz, worst case configuration is when connected to the charger.

**Sample Computation (base from page 38 data):**

$$\begin{aligned} \text{Correction factor @ 136.4} &= -18.82 \\ &= \text{Antenna factor} + \text{Cable loss} - \text{Preamp gain} \\ &= 11.74 + 1.64 - 32.2 \\ \text{Corrected reading} &= \text{Max. reading} + \text{Correction factor} \\ &= 58.99 + (-18.82) \\ &= 40.2 \text{ dB}\mu\text{V/m} \end{aligned}$$



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Fax: (858) 452-1810[www.nemko.com](http://www.nemko.com)**Radiated Emissions Data**

Job # :	24094-1	Date :	10/23/2009	Page	1	of	1
NEX#:	133133	Time :	8AM				
Staff :	FSC						
Client Name :	Cardionet						
EUT Name :							
EUT Model # :	100-0025-01						
EUT Serial # :	N/A						
EUT Config. :	Transmit at max.power (Mid Channel)						
Specification :	CFR47 Part 15, Subpart B, Class B						
Loop Ant. #:	NA						
Bicon Ant.#:	128_3m	Temp. (°C) :	19				
Log Ant.#:	111_3m	Humidity (%) :	49				
DRG Ant. #	877	Spec An.#:	911				
Cable LF#:	SOATS	Spec An. Display #:	N/A				
Cable HF#:	SOATS	QP #:	911				
Preamp LF#:	902	PreSelect#:	NA				
Preamp HF#:	NA						

EUT Voltage :	120VAC
EUT Frequency :	60Hz
Phase:	1
NOATS	
SOATS	X
Distance < 1000 MHz:	3 m
Distance > 1000 MHz:	3 m

Quasi-Peak	RBW: 120 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

Measurements below 1GHz are Quasi-Peak values, unless otherwise stated.

Measurements above 1GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading Vertical	Meter Reading Horizontal	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dB $\mu$ V)	Corrected Reading (dB $\mu$ V/m)	Spec. limit (dB $\mu$ V/m)	CR/SL Diff. (dB)	Pass Fail	Comment
136.4	59.0	52.6	Q	B	1.0	58.99	40.2	43.5	-3.3	Pass	
141.7	55.9	49.3	Q	B	1.0	55.91	37.2	43.5	-6.3	Pass	
158.6	56.6	48.8	Q	R	1.0	56.57	40.8	43.5	-2.7	Pass	
202.8	44.8	45.2	Q	B	1.0	45.23	27.9	43.5	-15.6	Pass	
204.3	37.3	37.3	Q		1.0	37.34	20.0	43.5	-23.5	Pass	Noise Floor
208.0	47.4	48.3	Q	FL	1.0	48.3	31.0	43.5	-12.5	Pass	
215.8	50.0	52.7	Q	BL	1.8	52.74	35.0	43.5	-8.5	Pass	
231.4	50.8	52.3	Q	BL	1.0	52.26	34.9	46.0	-11.1	Pass	
236.6	48.1	50.9	Q	L	1.0	50.9	33.8	46.0	-12.2	Pass	
241.8	41.3	47.3	Q	FR	1.0	47.3	30.7	46.0	-15.3	Pass	

**Below 1GHz Emissions Data**



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Job # :	24094-1	Date :	10/23/2009	Page	1	of	1
NEX#:	133133	Time :	10AM				
Staff :	FSC						
Client Name :	Cardionet						
EUT Name :							
EUT Model # :	100-0025-01						
EUT Serial # :	N/A						
EUT Config. :	Transmit at max.power (Low Channel)						
Specification :	CFR47 Part 15, Subpart B, Class B						
Loop Ant. #:	NA						
Bicon Ant.#:	128_3m	Temp. (°C) :	19				
Log Ant.#:	111_3m	Humidity (%) :	49				
DRG Ant. #	877	Spec An.#:	911				
Cable LF#:	SOATS	Spec An. Display #:	N/A				
Cable HF#:	SOATS	QP #:	911				
Preamp LF#:	902	PreSelect#:	NA				
Preamp HF#	317						

EUT Voltage :	120VAC
EUT Frequency :	60Hz
Phase:	1
NOATS	
SOATS	X
Distance < 1000 MHz:	3 m
Distance > 1000 MHz:	3 m

Quasi-Peak	RBW: 120 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

Measurements below 1GHz are Quasi-Peak values, unless otherwise stated.

Measurements above 1GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading Vertical	Meter Reading Horizontal	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dB $\mu$ V)	Corrected Reading (dB $\mu$ V/m)	Spec. limit (dB $\mu$ V/m)	CR/SL Diff. (dB)	Pass Fail	Comment
1805.9	55.8	54.1	P	B	1.0	55.83	56.9	74.0	-17.1	Pass	
1805.9	50.1	47.6	A	B	1.0	50.05	51.1	54.0	-2.9	Pass	
2708.8	49.3	47.5	P	B	1.0	49.25	56.0	74.0	-17.9	Pass	
2708.8	34.2	31.7	A	B	1.0	34.16	40.9	54.0	-13.0	Pass	
3611.7	51.5	50.2	P	B	1.0	51.48	61.5	74.0	-12.5	Pass	
3611.7	37.5	34.8	A	B	1.0	37.5	47.5	54.0	-6.5	Pass	
4514.7	46.2	46.2	P		1.0	46.22	59.8	74.0	-14.2	Pass	Noise Floor
4514.7	32.7	32.7	A		1.0	32.69	46.3	54.0	-7.7	Pass	Noise Floor
5417.6	44.7	44.7	P		1.0	44.65	62.7	74.0	-11.3	Pass	Noise Floor
5417.6	29.9	29.9	A		1.0	29.85	47.9	54.0	-6.1	Pass	Noise Floor



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Fax: (858) 452-1810[www.nemko.com](http://www.nemko.com)**Radiated Emissions Data**

Job # :	24094-1	Date :	10/23/2009	Page	1	of	1
NEX#:	133133	Time :	12:30PM				
Staff :	FSC						
Client Name :	Cardionet						
EUT Name :							
EUT Model # :	100-0025-01						
EUT Serial # :	N/A						
EUT Config. :	Transmit at max.power (Mid Channel)						
Specification :	CFR47 Part 15, Subpart B, Class B						
Loop Ant. #:	NA						
Bicon Ant.#:	128_3m	Temp. (°C) :	19				
Log Ant.#:	111_3m	Humidity (%) :	49				
DRG Ant. #	877	Spec An.#:	911				
Cable LF#:	SOATS	Spec An. Display #:	N/A				
Cable HF#:	SOATS	QP #:	911				
Preamp LF#:	902	PreSelect#:	NA				
Preamp HF#	317						

EUT Voltage :	120VAC
EUT Frequency :	60Hz
Phase:	1
NOATS	
SOATS	X
Distance < 1000 MHz:	3 m
Distance > 1000 MHz:	3 m

Quasi-Peak	RBW: 120 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 300 kHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

Measurements below 1GHz are Quasi-Peak values, unless otherwise stated.

Measurements above 1GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading Vertical	Meter Reading Horizontal	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dB $\mu$ V)	Corrected Reading (dB $\mu$ V/m)	Spec. limit (dB $\mu$ V/m)	CR/SL Diff. (dB)	Pass Fail	Comment
1829.9	54.4	53.9	P	B	1.0	54.36	55.4	74.0	-18.6	Pass	
1829.9	48.5	40.0	A	B	1.0	48.48	49.5	54.0	-4.4	Pass	
2744.9	48.7	46.8	P	B	1.0	48.68	55.5	74.0	-18.5	Pass	
2744.9	33.6	34.8	A	B	1.0	34.8	41.6	54.0	-12.4	Pass	
3659.9	51.1	49.2	P	B	1.0	51.13	61.1	74.0	-12.8	Pass	
3659.9	36.6	35.0	A	B	1.0	36.63	46.6	54.0	-7.3	Pass	
4574.8	46.7	46.7	P		1.0	46.7	60.3	74.0	-13.7	Pass	Noise Floor
4574.8	32.4	32.4	A		1.0	32.36	45.9	54.0	-8.0	Pass	Noise Floor
5489.8	44.6	44.6	P		1.0	44.63	62.7	74.0	-11.3	Pass	Noise Floor
5489.8	29.9	29.9	A		1.0	29.85	47.9	54.0	-6.1	Pass	Noise Floor



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Job # :	24094-1	Date :	10/23/2009	Page	1	of	1
NEX#:	133133	Time :	2:30PM				
Staff :	FSC						
Client Name :	Cardionet						
EUT Name :							
EUT Model # :	100-0025-01						
EUT Serial # :	N/A						
EUT Config. :	Transmit at max.power (High Channel)						
Specification :	CFR47 Part 15, Subpart B, Class B						
Loop Ant. #:	NA						
Bicon Ant.#:	128_3m	Temp. (°C) :	19				
Log Ant.#:	111_3m	Humidity (%) :	49				
DRG Ant. #	877	Spec An.#:	911				
Cable LF#:	SOATS	Spec An. Display #:	N/A				
Cable HF#:	SOATS	QP #:	911				
Preamp LF#:	902	PreSelect#:	NA				
Preamp HF#	317						

EUT Voltage :	120VAC
EUT Frequency :	60Hz
Phase:	1
NOATS	
SOATS	X
Distance < 1000 MHz:	3 m
Distance > 1000 MHz:	3 m

Quasi-Peak	RBW: 120 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

Measurements below 1GHz are Quasi-Peak values, unless otherwise stated.

Measurements above 1GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading Vertical	Meter Reading Horizontal	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dB $\mu$ V)	Corrected Reading (dB $\mu$ V/m)	Spec. limit (dB $\mu$ V/m)	CR/SL Diff. (dB)	Pass Fail	Comment
1852.6	54.0	48.9	P	B	1.0	53.99	55.1	74.0	-18.9	Pass	
1852.6	47.4	35.2	A	B	1.0	47.38	48.4	54.0	-5.5	Pass	
2778.8	47.4	46.3	P	B	1.0	47.41	54.2	74.0	-19.8	Pass	
2778.8	33.4	33.3	A	B	1.0	33.44	40.2	54.0	-13.8	Pass	
3705.1	48.3	48.2	P	B	1.0	48.32	58.8	74.0	-15.2	Pass	
3705.1	34.2	34.4	A	B	1.0	34.4	44.9	54.0	-9.1	Pass	
4631.4	46.8	46.8	P		1.0	46.78	60.3	74.0	-13.7	Pass	Noise Floor
4631.4	32.3	32.0	A		1.0	32.31	45.9	54.0	-8.1	Pass	Noise Floor
5557.7	44.1	44.2	P		1.0	44.2	62.2	74.0	-11.8	Pass	Noise Floor
5557.7	29.9	29.9	A		1.0	29.85	47.8	54.0	-6.2	Pass	Noise Floor

**Section 15.247(e) – Power Spectral Density for Digitally Modulated Devices**

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

**Test Conditions:**

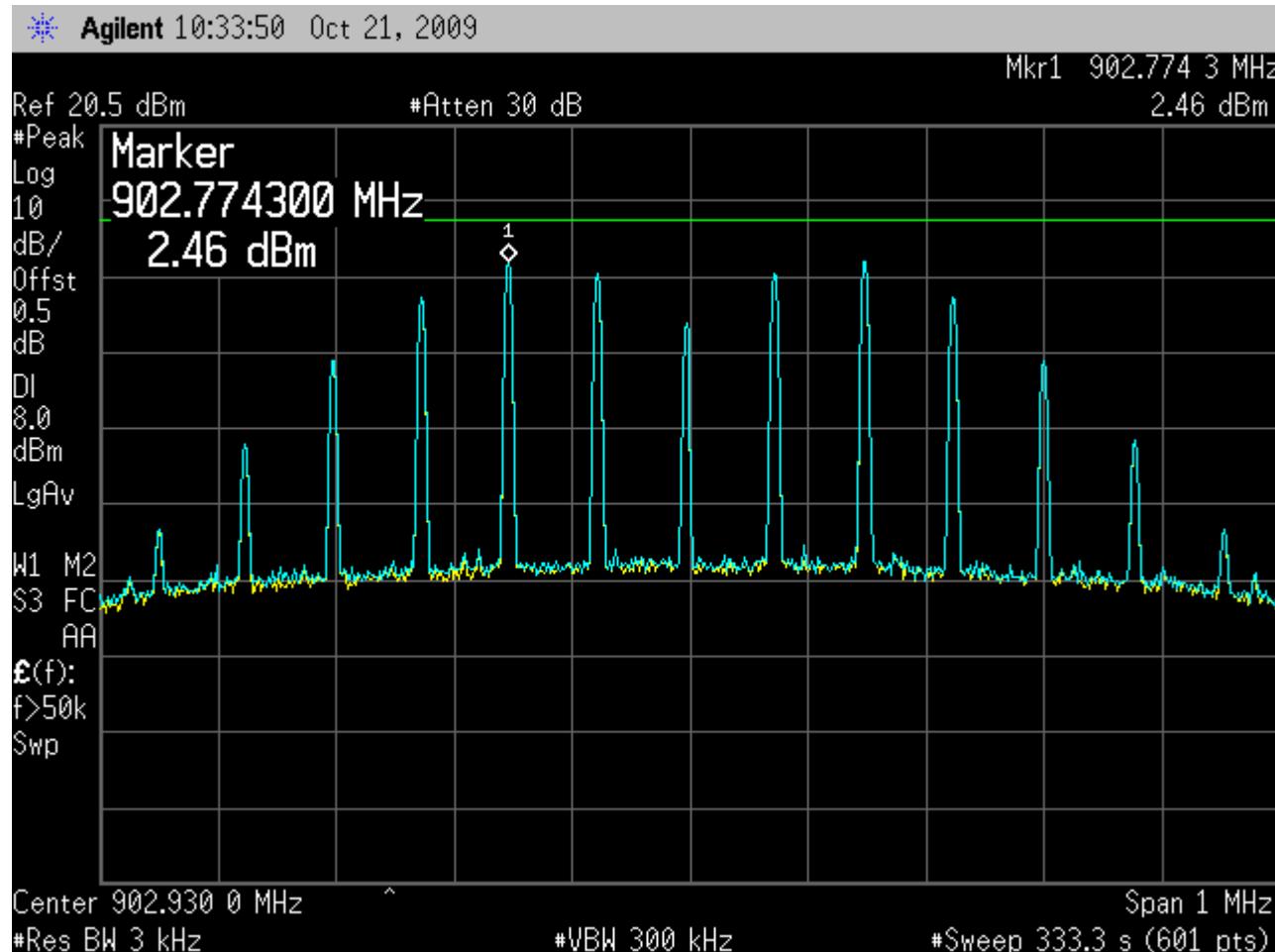
<b>Sample Number:</b>	100-0025-01	<b>Temperature:</b>	24°C
<b>Date:</b>	October 21, 2009	<b>Humidity:</b>	39 %
<b>Modification State:</b>	Low ,Mid and High Channel	<b>Tester:</b>	FSCustodio
		<b>Laboratory:</b>	Nemko

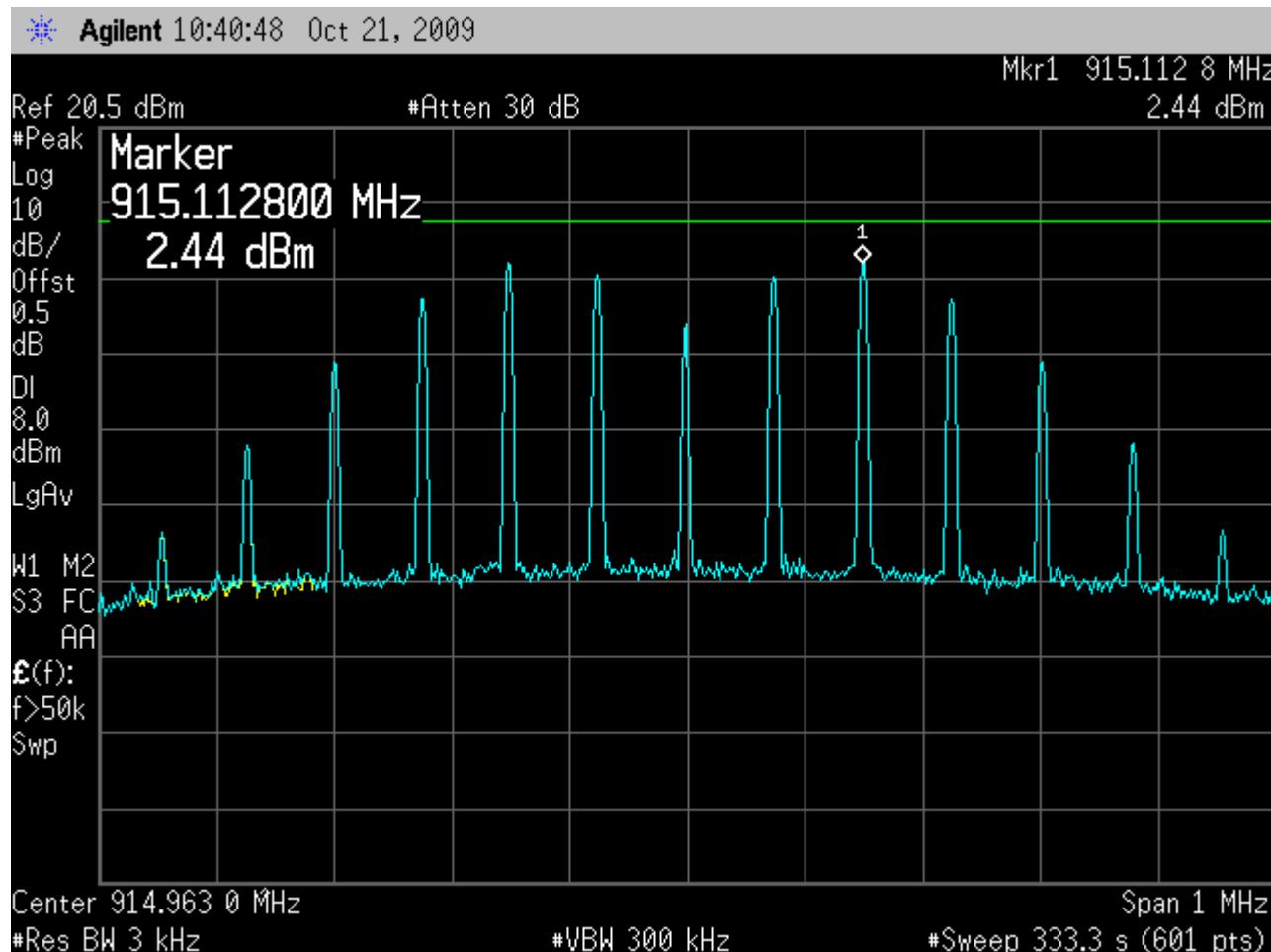
**Test Results:**

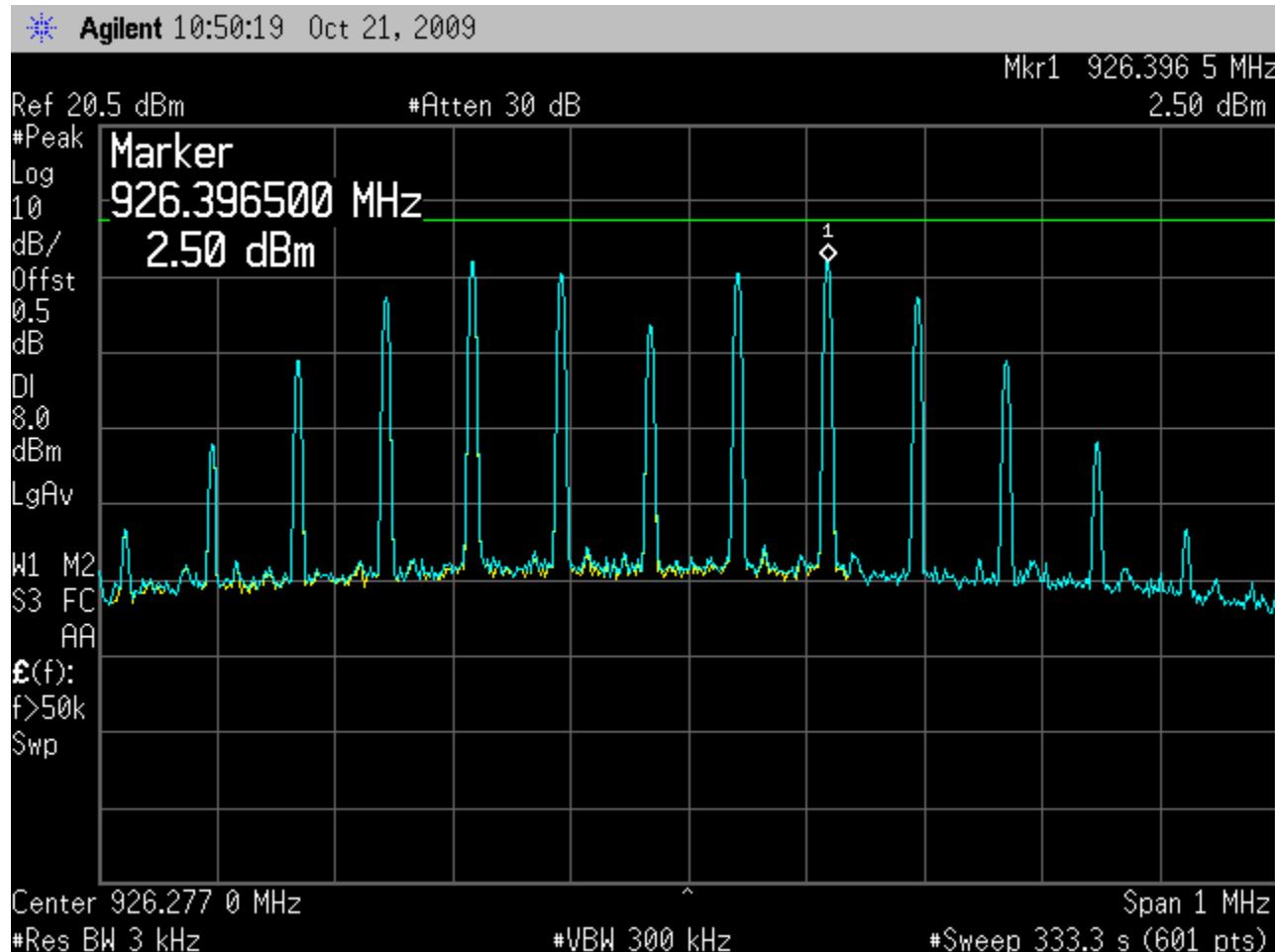
See attached plots.

**Additional Observations:**

- This is a conducted test. The 0.5dB offset is from the cable assembly used.
- Span is wide enough to capture the peak level of the emission.
- RBW is 3kHz
- VBW is > RBW
- Sweep is Span/RBW (1MHz/3kHz = 333.3 seconds).
- Detector is Peak
- Trace is Max Hold

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247**Low Channel – Peak level is 2.46dBm**

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247**Mid Channel – Peak level is 2.44dBm**

FCC ID: QBI-1012  
IC: 8686A-1012Report Number: 2009 09133133 Monitor FCC 15.247  
Specification: FCC Part 15 Subpart C, 15.247**High Channel – Peak level is 2.50dBm**

**RSS Gen. 4.10 and 6.0 – Receiver Spurious Emissions**

The following receiver spurious emission limits shall be complied with:

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1.

**Table 1 - Spurious Emission Limits for Receivers**

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

**Test Conditions:**

Sample Number:	100-0025-01	Temperature:	24°C
Date:	September 29, 2009	Humidity:	59 %
Modification State:	Receive mode	Tester:	FSCustodio
		Laboratory:	Nemko

**Test Results:**

No receiver spurious emissions detected.

**Additional Observations:**

- The Spectrum was searched from 30MHz to approx. 10<sup>th</sup> Harmonic, 10000 MHz.
- The EUT was investigated on three orthogonal axes.
- The EUT was investigated using a fresh battery.



## **Appendix B: Block Diagram of Test Setups**

### **Test Site For Radiated Emissions**

