FCC PART 15.247

EMI MEASUREMENT AND TEST REPORT

For

Dust Networks, Inc.

30695 Huntwood Ave. Hayward, CA 94544

FCC ID: SJCM1030

This Report Concerns:	**Product Type:**
☒ PCII Report	SmartMesh M1030 Mote module

Test Engineer:	Tom Chen
Report No.:	R0607313
Report Date:	2006-08-15
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

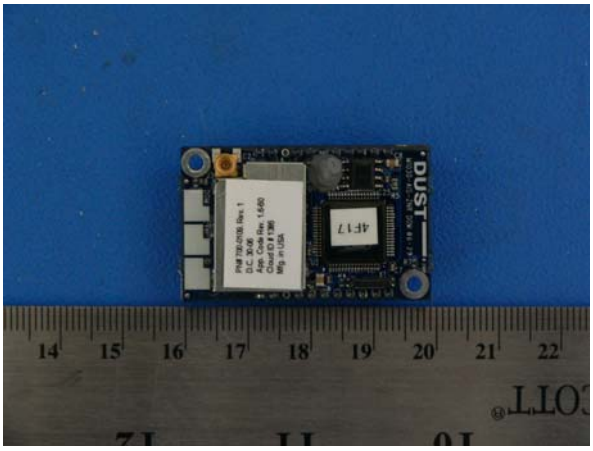
The SmartMesh® M1030 embedded wireless mote uses Time Synchronized Mesh Protocol (TSMP) to enable low-power wireless sensors and actuators with highly reliable wireless mesh networking. The M1030 is tailored for use in battery- and line-powered wireless devices for applications that demand proven performance, scalability, and reliability.
The M1030 uses a 900 MHz radio to achieve more than 200-meter communication distance outdoors, while consuming down to 40 µA in a typical network deployment. The combination of extremely high reliability and low power consumption enables applications that require very low installation cost and low-maintenance, long-term deployments.
The standard serial interface of the M1030 gives it flexibility to be used in a wide variety of different applications, from industrial process control to security, to lighting. When integrated into a product, the M1030 acts like a network interface card (NIC)—it takes a data packet and makes sure that it successfully traverses the network. By isolating the wireless mesh networking protocols from the user, the M1030 simplifies the development process and reduces development risk.
The EUT is a frequency-hopping device, which operates at the frequency range of 902– 928MHz, with the maximum conducted output power of 4dBm.

Mechanical Description:

The *Dust Networks, Inc*, FCC ID: *SJCM1030* or the "EUT" as referred to in this report is a SmartMesh M1030 Mote, which measures approximately 39mmL x 24.4mm W x 6mm H.

** The test data gathered are from a production sample, S/N: 700-0109, provided by the manufacturer.*

EUT Photo



EUT Photo

Antenna View

Additional photos in Exhibit B

Objective

This type approval report is prepared on behalf of *Dust Networks, Inc* in accordance with Part 2, Subpart J, Part 15, Subparts A, B, and C.

Dust Networks, Inc. is filling for a permissive change for FCC ID: SJCM1030 due to certain component changes. The original application was granted on 2006-02-16.

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003.

Test Facility

The semi-anechoic chambers used by BACL to collect radiated and conducted emissions measurement data is located in the building at it's facility in Sunnyvale, California, USA.

BACL's test sites have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at
http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the testing operating mode to represent *worst*-case results during the final qualification test.

The EUT was installed in the test tool box and set up with PC. After completion of the setup, the EUT worked without PC.

Special Accessories

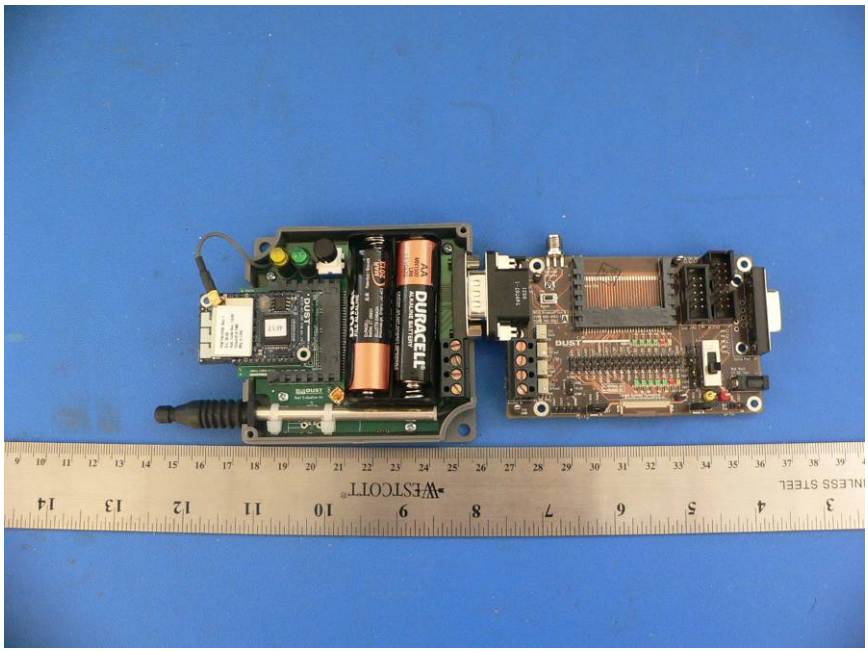
As shown in following test block diagram, all interface cables used for compliance testing are shielded.

Equipment Modifications

No modifications were made to the EUT.

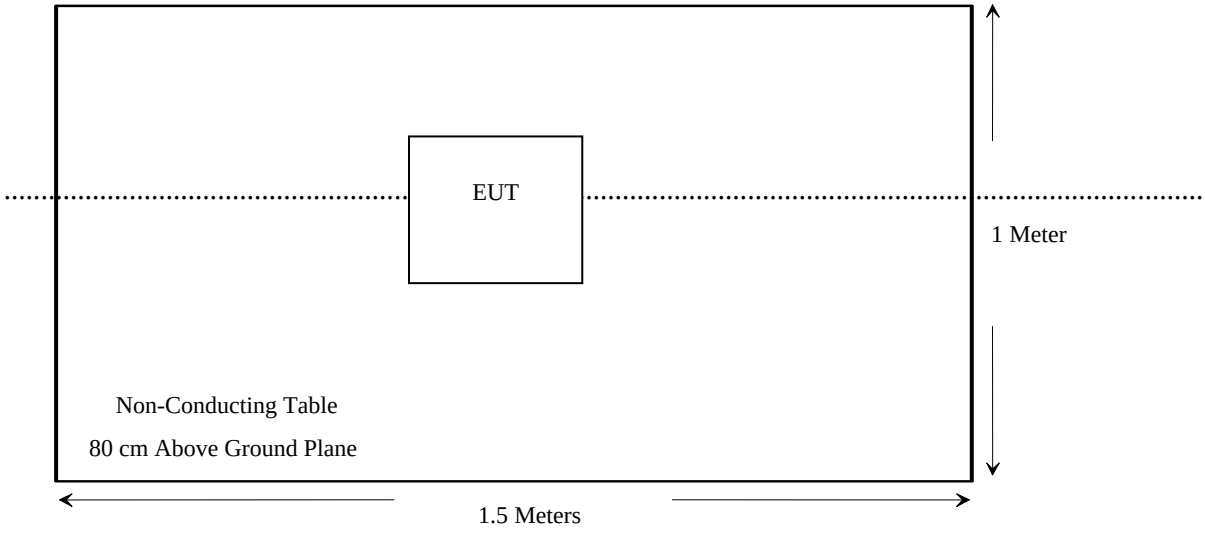
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Dust	Test Tool Box	N/A	N/A



Additional photos in Exhibit B

Test Setup Block Diagram



SUMMARY OF TEST RESULTS FOR FCC PART 15

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirements	Compliant
§ 15.205	Restricted Bands	Compliant
§15.207 (a)	Conducted Emissions	N/A
§15.209	Radiated Emissions	Compliant
§15.247 (a) (1)	Hopping Channel Separation	Compliant
§15.247 (a) (1)	Channel Bandwidth	Compliant
§15.247 (a) (1) (i)	Number of Hopping Frequencies Used	Compliant
§15.247 (a) (1) (i)	Dwell Time of Each Frequency	Compliant
§15.247 (b) (2)	Maximum Peak Output Power	Compliant
§2.1091& §2.1093	RF Safety Requirements	Compliant
§ 15.247 (d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§ 2.1051	Spurious Emissions at Antenna Port	Compliant

§ 15.247 (e)(i) and § 2.1091 - RF EXPOSURE

According to §15.247(e)(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal: 4.83(dBm)
Maximum peak output power at antenna input terminal: 3.04 (mw)
Prediction distance: 20 (cm)
Predication frequency: 927 (MHz)
Antenna Gain (typical): 6 (dBi)
Antenna gain: 1 (numeric)
Power density at predication frequency at 20 cm: 0.002(mW/cm^2)

MPE limit for uncontrolled exposure at prediction frequency: 0.61 (mW/cm^2)

Test Result

The EUT is a module device. The power density level at 20 cm is 0.002mW/cm^2, which is below the uncontrolled exposure limit of 0.61mw/cm^2 at 927 MHz.

§15.203 ANTENNA REQUIREMENTS

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to § 15.247 (b)(4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The antenna for the EUT is high performance omni directional antenna. The gain of the antenna used for transmitting is 6dBi .Please see EUT photo for details.

Antenna View

Additional photos in Exhibit B

§15.205, §15.209 & §15.247(c) - RADIATED SPURIOUS EMISSIONS

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ±4.0 dB.

Test Setup

The radiated emissions tests were performed in the 3-meter open area test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Sonoma Instruments	Pre amplifier	317	260406	2006-02-03
Agilent	Pre amplifier	8449B	3008A01978	2005-08-10
Sunol Science Corp	Combination Antenna	JB3 Antenna	A013105	2006-02-11
DRG	Horn Antenna	SAS-200/571	261	2006-04-20
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	100044	2005-12-14
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Rohde & Schwarz	Artificial-Mains Network	ESH2-Z5	871884/039	2005-11-14
Sonoma Instruments	Pre amplifier	317	260406	2006-02-03
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	25° C
Relative Humidity:	55%
ATM Pressure:	1025 mbar

**The testing was performed by Tom Chen on 2006-08-08.*

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

> Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emissions is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

> Margin = Corrected Amplitude - Class B Limit

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247, and had the worst margin of:

-11.2 dB at **858.6225 MHz** in the **Vertical** polarization, 30MHz-1GHz

-12.8 dB at **1804.9828 MHz** in the **Vertical** polarization, Low Channel, 1 GHz – 12GHz

-7.8 dB at **1829.9976 MHz** in the **Vertical** polarization, Middle Channel, 1 GHz – 12GHz

-6.3 dB at **1854.9646 MHz** in the **Vertical** polarization, High Channel, 1 GHz – 12GHz

Radiated Emissions Test Data @ 3 meter

30MHz-1GHz

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
858.6225	34.8	2	100	V	21.4	6.6	28.0	34.8	46	-11.2	Q-Peak
974.0525	34.4	5	100	V	23.0	6.8	27.4	36.8	54	-17.2	Q-Peak
974.17375	33.9	3	100	V	23.0	6.8	27.4	36.3	54	-17.7	Q-Peak
250.675	37.6	1	100	H	11.9	3.4	27.4	25.5	46	-20.5	Q-Peak
400.055	33.2	1	202	V	15.4	4.6	28.1	25.1	46	-20.9	Q-Peak
368.65125	32.8	5	100	V	14.8	4.1	27.8	23.9	46	-22.1	Q-Peak

1GHz – 12GHz

Low Channel

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
1804.9828	71.3	140	1.7	V	24.8	1.5	36.3	61.2	74	-12.8	Peak
1804.9828	50.5	140	1.7	V	24.8	1.5	36.3	40.4	54	-13.6	Ave
2707.4742	42.3	204	2.0	V	28.9	1.5	35.5	37.2	54	-16.8	Ave
2707.4742	41.5	227	2.1	H	28.9	1.5	35.5	36.4	54	-17.6	Ave
2707.4742	61.3	204	2.0	V	28.9	1.5	35.5	56.2	74	-17.8	Peak
3609.9656	39.8	266	1.7	V	30.0	0.8	34.8	35.7	54	-18.3	Ave
2707.4742	59.3	227	2.1	H	28.9	1.5	35.5	54.2	74	-19.8	Peak
1804.9828	43.0	193	2.3	H	24.8	1.5	36.3	32.9	54	-21.1	Ave
3609.9656	35.7	273	2.3	H	30.0	0.8	34.8	31.6	54	-22.4	Ave
3609.9656	55.3	266	1.7	V	30.0	0.8	34.8	51.2	74	-22.8	Peak
1804.9828	59.0	193	2.3	H	24.8	1.5	36.3	48.9	74	-25.1	Peak
3609.9656	48.5	273	2.3	H	30.0	0.8	34.8	44.4	74	-29.6	Peak

Mid Channel

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
1829.9976	76.3	158	1.5	V	24.8	1.5	36.3	66.2	74	-7.8	Peak
2744.9964	67.8	217	1.9	H	28.9	1.5	35.5	62.7	74	-11.3	Peak
2744.9964	46.2	217	1.9	H	28.9	1.5	35.5	41.1	54	-12.9	Ave
2744.9964	65.2	304	1.5	V	28.9	1.5	35.5	60.1	74	-13.9	Peak
2744.9964	45.0	304	1.5	V	28.9	1.5	35.5	39.9	54	-14.1	Ave
1829.9976	47.8	158	1.5	V	24.8	1.5	36.3	37.7	54	-16.3	Ave
1829.9976	47.8	183	1.4	H	24.8	1.5	36.3	37.7	54	-16.3	Ave
1829.9976	66.7	183	1.4	H	24.8	1.5	36.3	56.6	74	-17.4	Peak
3659.9952	40.2	223	1.4	H	30.0	0.8	34.8	36.1	54	-17.9	Ave
3659.9952	39.5	238	1.5	V	30.0	0.8	34.8	35.4	54	-18.6	Ave
3659.9952	54.2	223	1.4	H	30.0	0.8	34.8	50.1	74	-23.9	Peak
3659.9952	52.8	238	1.5	V	30.0	0.8	34.8	48.7	74	-25.3	Peak

High Channel

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
1854.9646	77.8	266	1.5	V	24.8	1.5	36.3	67.7	74	-6.3	Peak
1854.9646	56.0	266	1.5	V	24.8	1.5	36.3	45.9	54	-8.1	Ave
2782.4469	70.3	264	1.5	V	28.9	1.5	35.5	65.2	74	-8.8	Peak
2782.4469	47.5	264	1.5	V	28.9	1.5	35.5	42.4	54	-11.6	Ave
1854.9646	47.8	266	1.5	H	24.8	1.5	36.3	37.7	54	-16.3	Ave
2782.4469	41.7	314	1.8	H	28.9	1.5	35.5	36.6	54	-17.4	Ave
3709.9292	40.2	251	1.6	V	30.0	0.8	34.8	36.1	54	-17.9	Ave
1854.9646	64.7	266	1.5	H	24.8	1.5	36.3	54.6	74	-19.4	Peak
2782.4469	58.3	314	1.8	H	28.9	1.5	35.5	53.2	74	-20.8	Peak
3709.9292	36.7	307	1.2	H	30.0	0.8	34.8	32.6	54	-21.4	Ave
3709.9292	55.3	251	1.6	V	30.0	0.8	34.8	51.2	74	-22.8	Peak
3709.9292	49.2	307	1.2	H	30.0	0.8	34.8	45.1	74	-28.9	Peak

§15.247 (a) (1) - HOPPING CHANNEL SEPARATION

Applicable Standard

According to §15.247(a)(1), frequency hopping system shall have, hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies.

Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on a bench without connection to measurement instrument Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the Max-Hold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function, and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	25° C
Relative Humidity:	55%
ATM Pressure:	1025 mbar

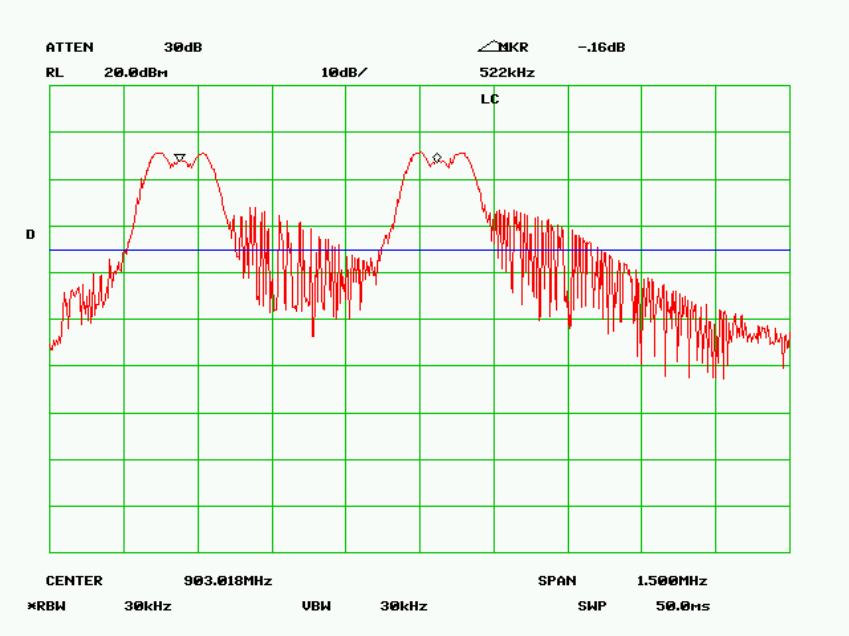
**The testing was performed by Tom Chen on 2006-08-08.*

Measurement Results

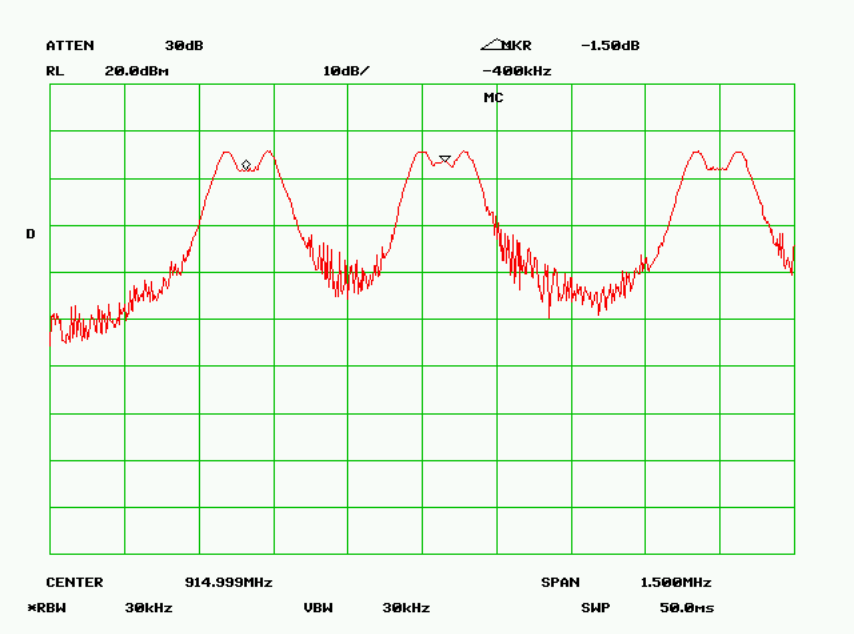
Channel	Channel Separation (KHz)
Low CH	522
Mid CH	400
High CH	505

Please refer to the following plots.

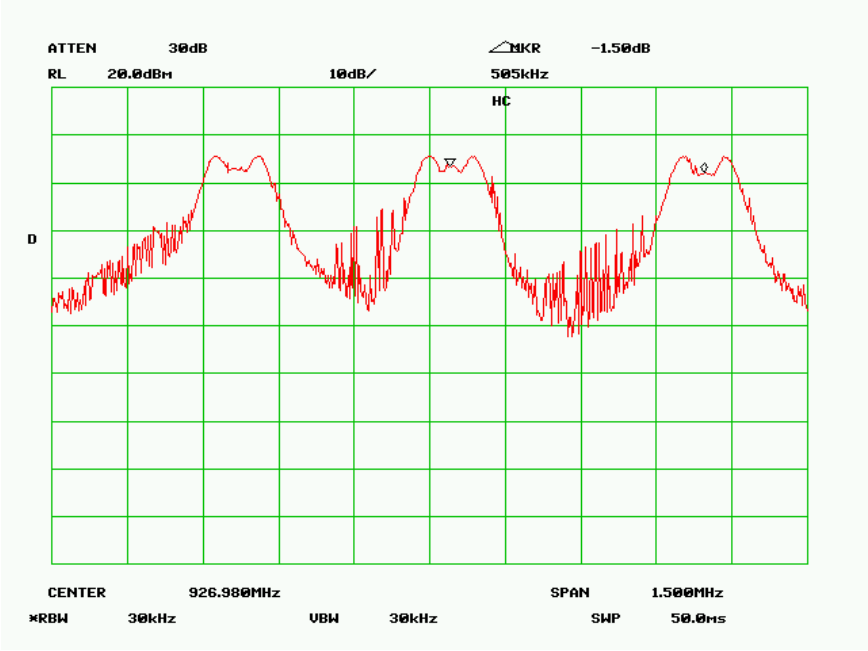
Low Channel



Middle Channel



High Channel



§15.247 (a) (1) - CHANNEL BANDWIDTH

Applicable Standard

According to §15.247(a)(l)(i), The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	25° C
Relative Humidity:	55%
ATM Pressure:	1025 mbar

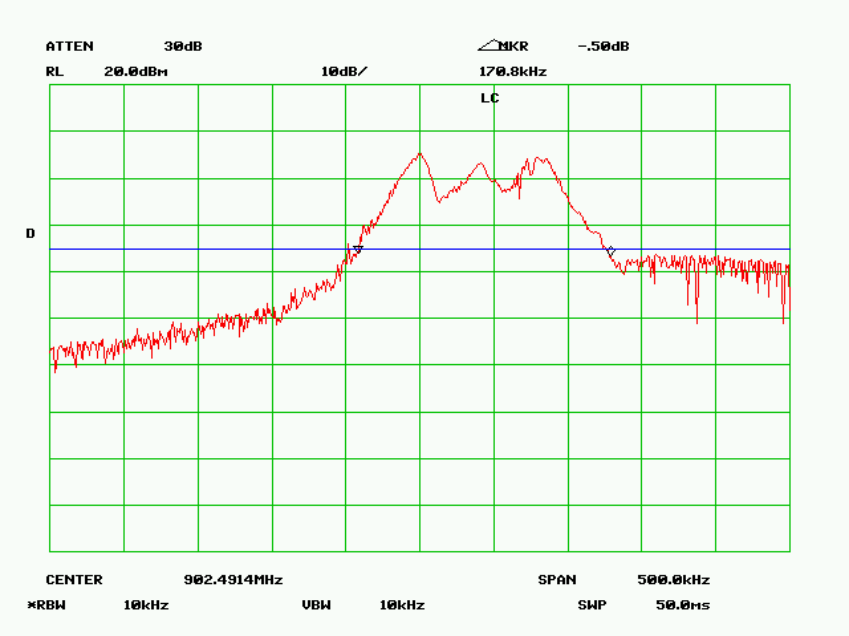
**The testing was performed by Tom Chen on 2006-08-08.*

Measurement Result

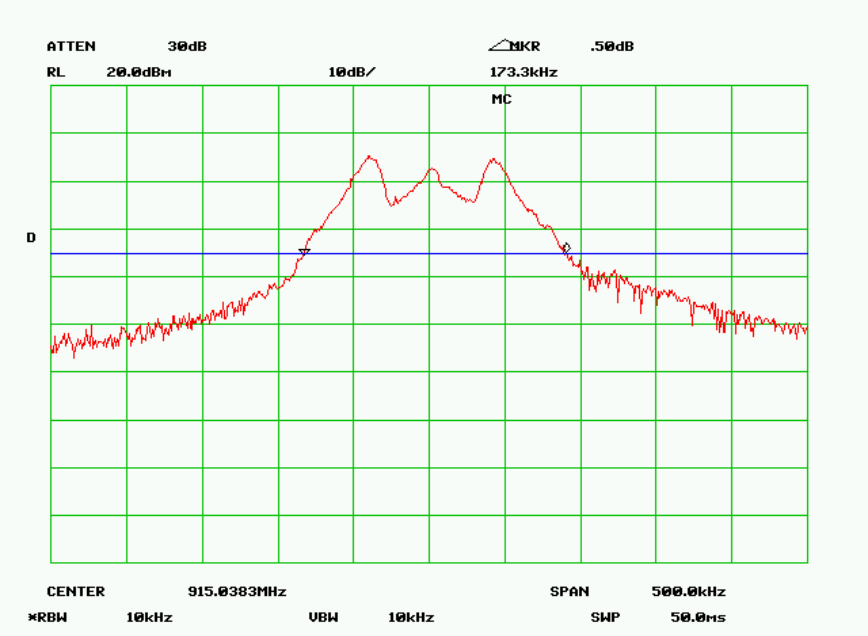
Channel	Channel Bandwidth (KHz)
Low CH	170.8
Mid CH	173.3
High CH	185.0

Please see the following plots:

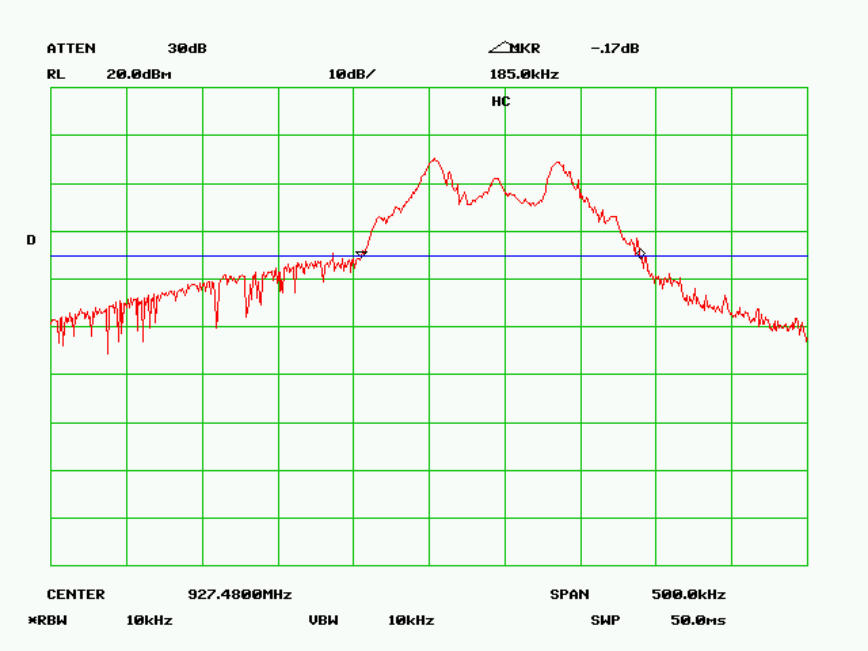
Low Channel



Middle Channel



High Channel



§15.247 (a) (1) (i) - NUMBER OF HOPPING FREQUENCIES USED

Applicable Standard

According to §15.247(a)(1)(iii), For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the bench without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

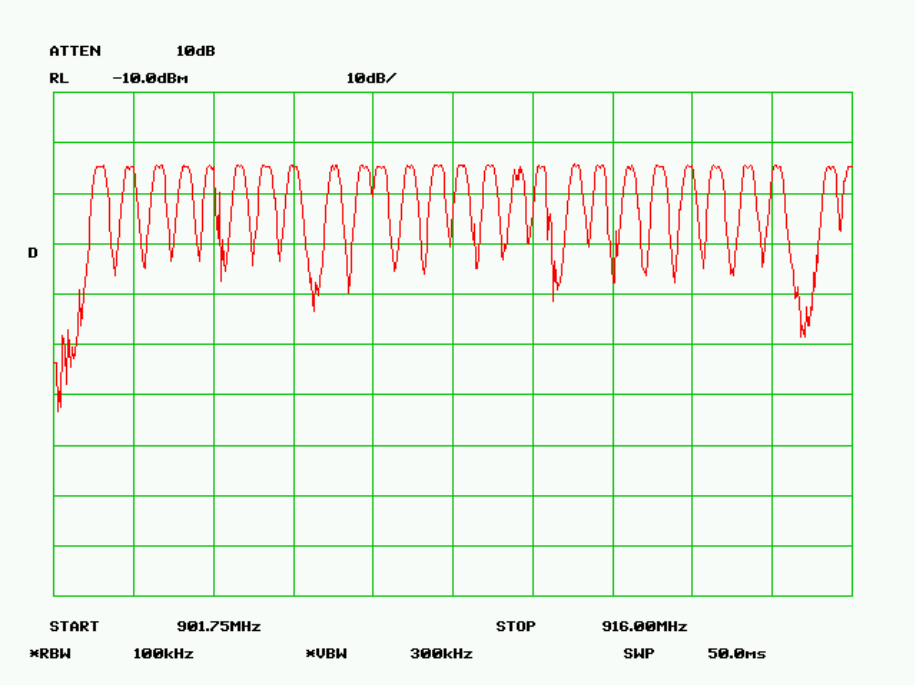
Environmental Conditions

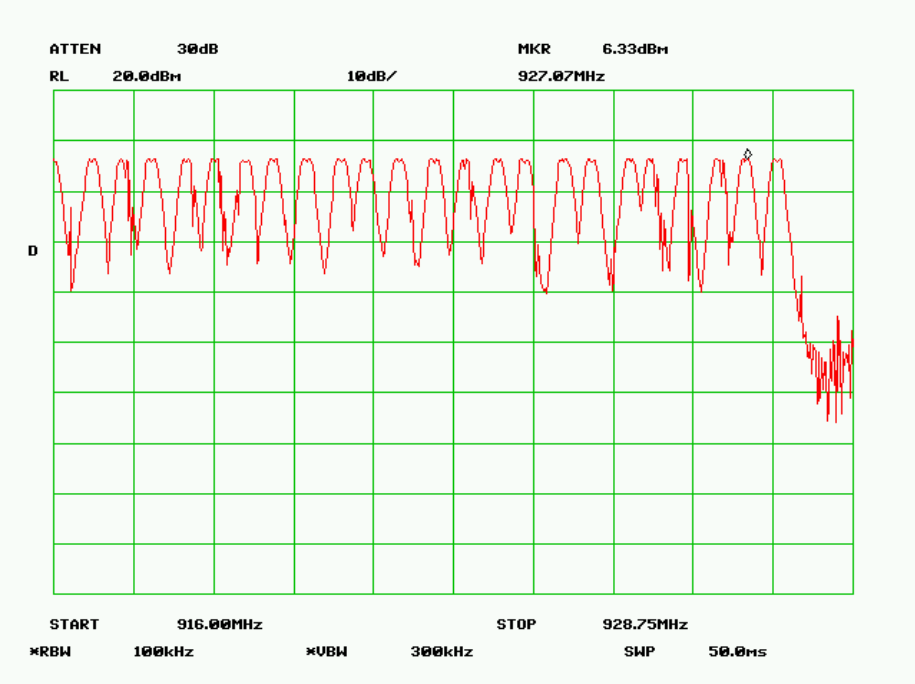
Temperature:	25° C
Relative Humidity:	55%
ATM Pressure:	1025 mbar

**The testing was performed by Tom Chen on 2006-08-08.*

Measurement Results: 51

Please refer to the attached plots.





§15.247(a)(1)(i) - DWELL TIME

Applicable Standard

According to §15.247 (a)(1)(i), For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	25° C
Relative Humidity:	55%
ATM Pressure:	1025 mbar

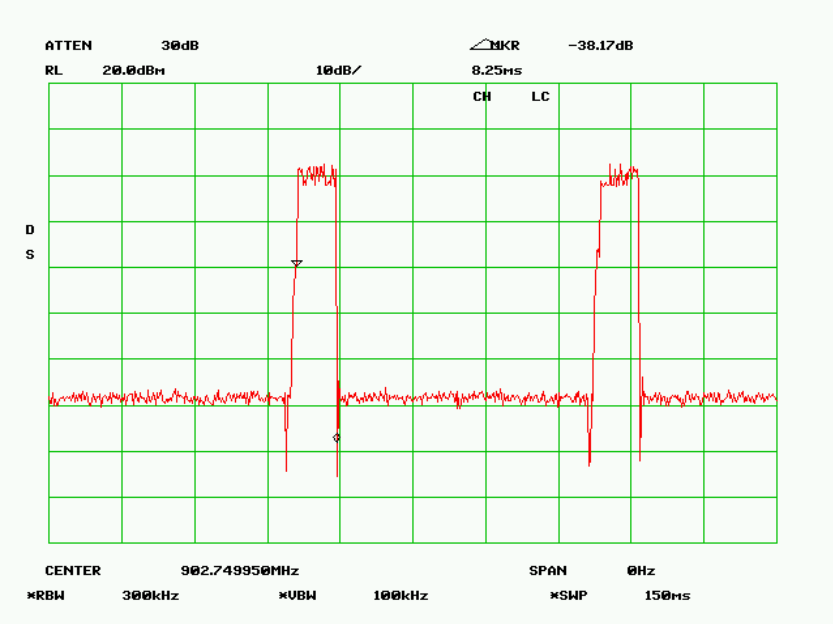
**The testing was performed by Tom Chen on 2006-08-08.*

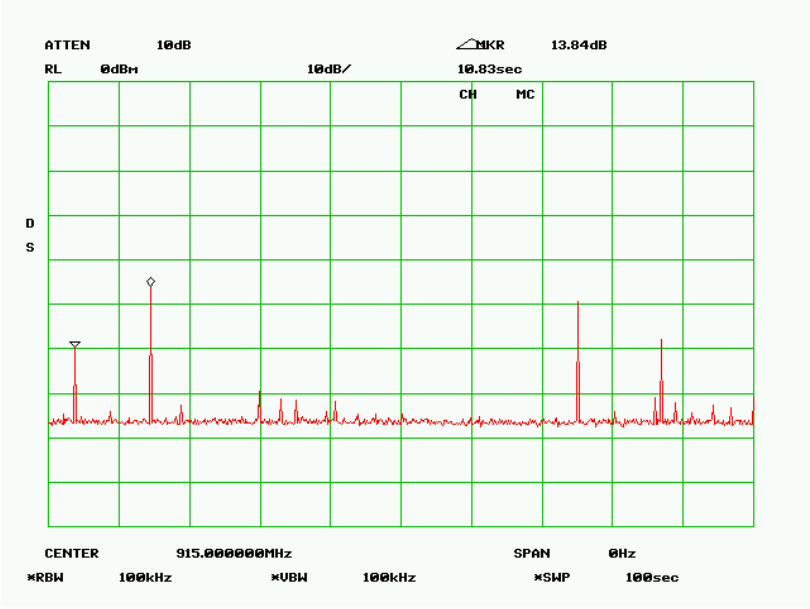
Measurement Results:

Channel	Frequency MHz	Pulse Width ms	Dwell Time Sec	Limit Sec	Result
Low	902.4914	8.25	0.017	0.4	Pass
Mid	914.9988	11	0.022	0.4	Pass
High	927.4823	9.25	0.019	0.4	Pass

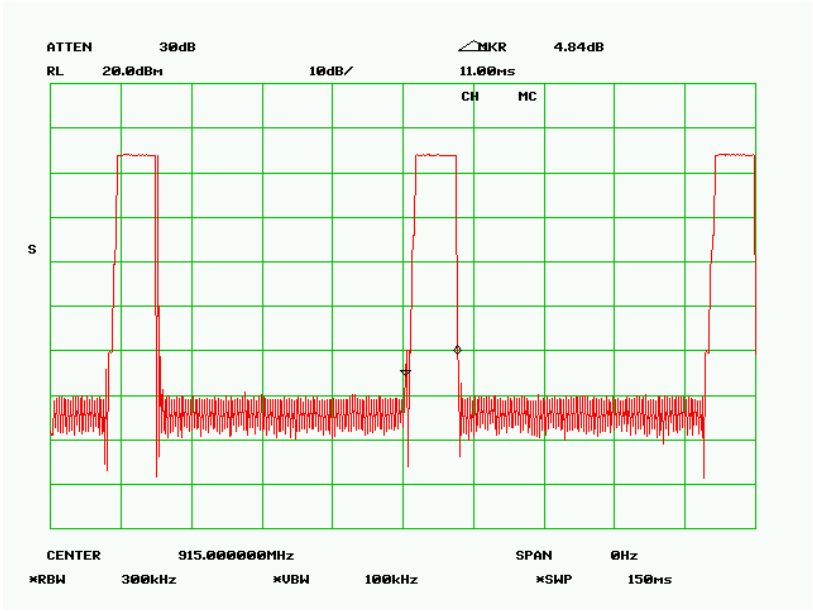
Please refer the following plots:

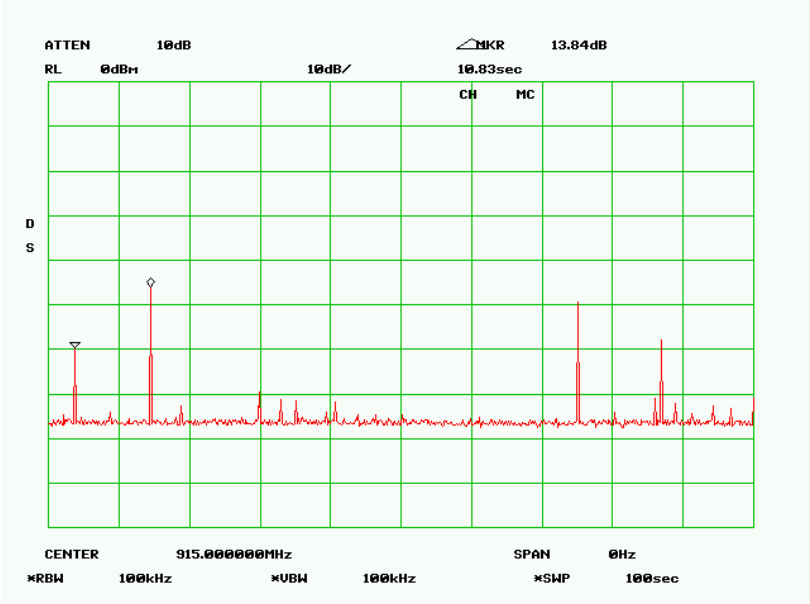
Low Channel



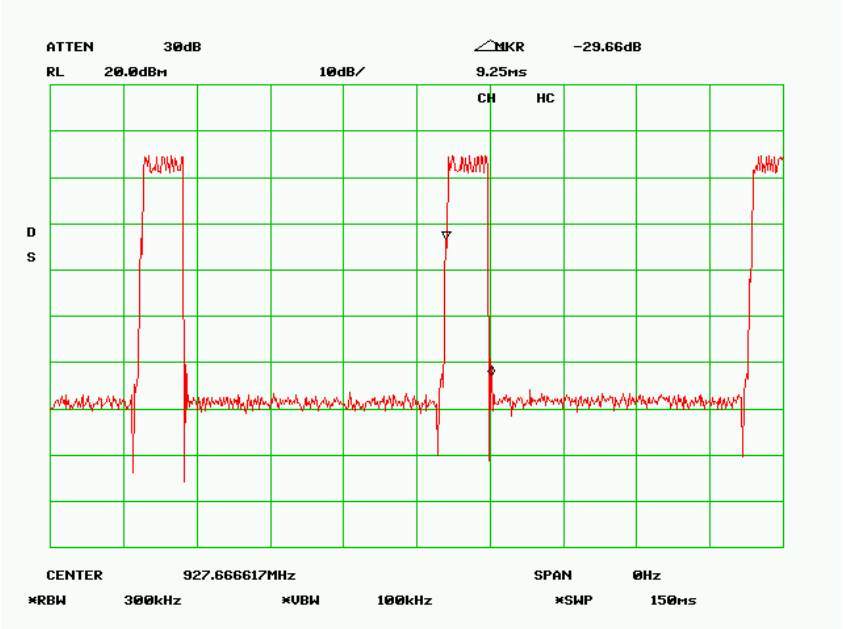


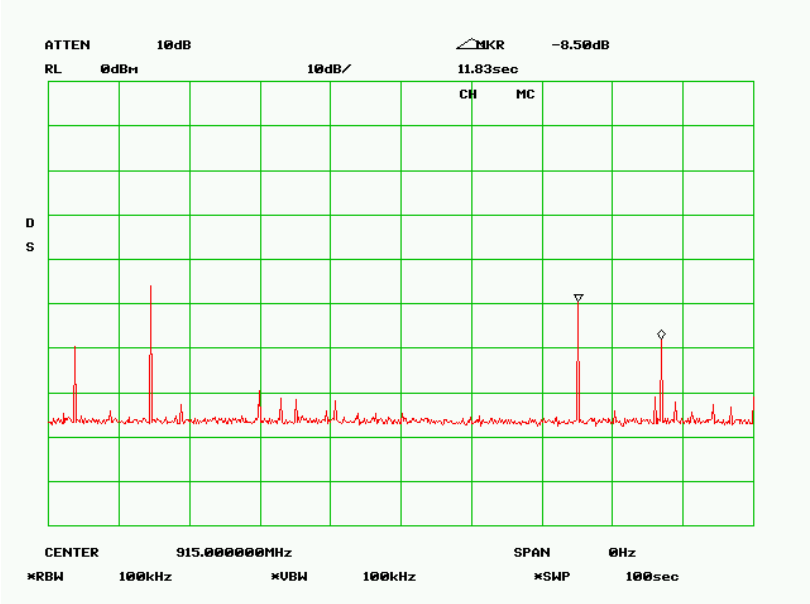
Middle Channel:





High Channel





§15.247(b)(2) - MAXIMUM PEAK OUTPUT POWER

Applicable Standard

According to §15.247(b) (2), For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

Measurement Procedure

1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	25° C
Relative Humidity:	55%
ATM Pressure:	1025 mbar

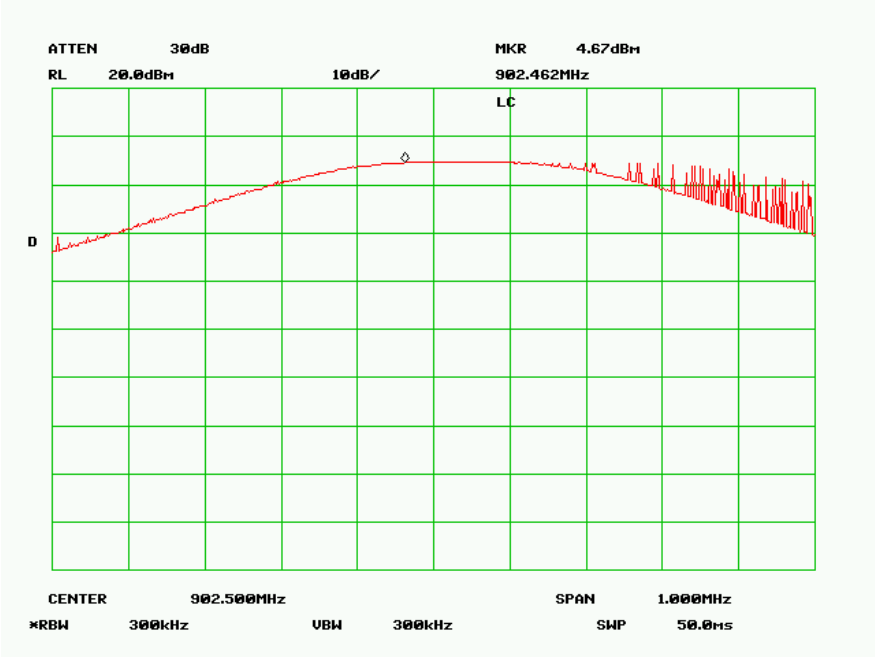
**The testing was performed by Tom Chen on 2006-08-08.*

Measurement Result

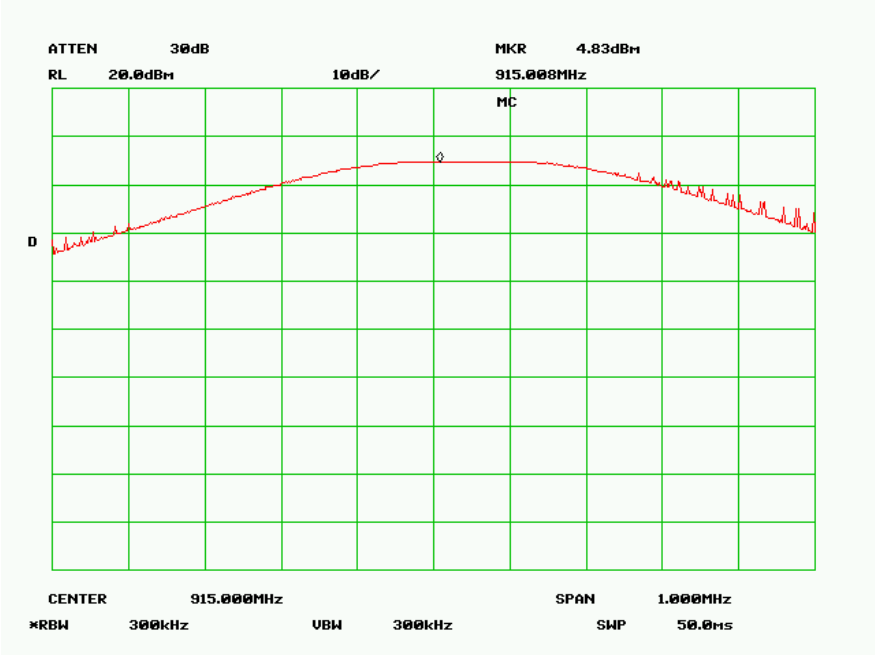
Channel	Frequency MHz	Max Peak Output Power		Limit (mw)	Result
		(dBm)	(mw)		
Low	902.4914	4.67	2.93	1000	Pass
Mid	914.9988	4.83	3.04	1000	Pass
High	927.4823	4.83	3.04	1000	Pass

Please see the following plots

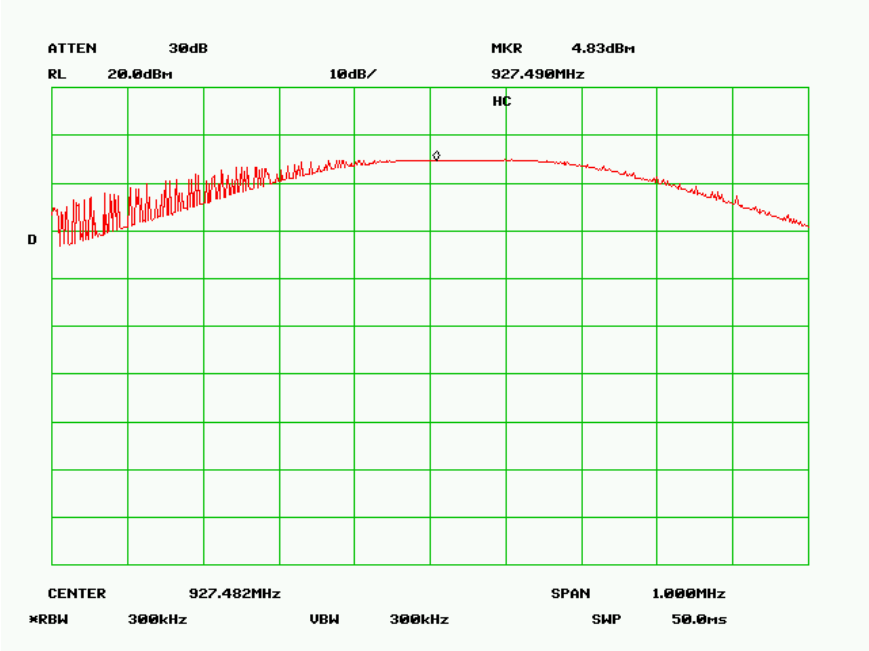
Low Channel



Middle Channel



High Channel



§15.247 (c) - 100 KHz BANDWIDTH OF BAND EDGES

Applicable Standard

According to §15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in §15.209(a) is not required.

Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

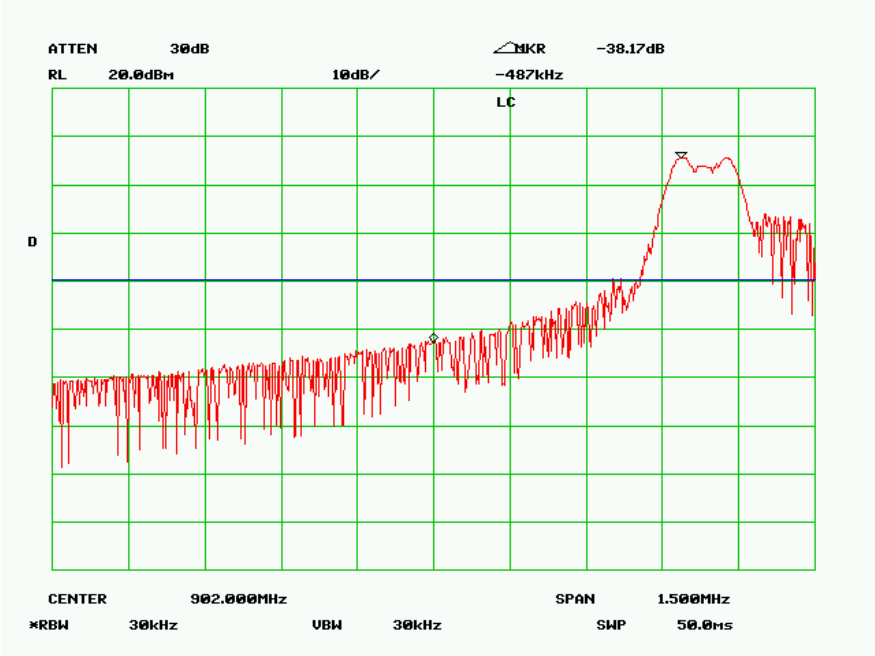
Temperature:	25° C
Relative Humidity:	55%
ATM Pressure:	1025 mbar

**The testing was performed by Tom Chen on 2006-08-08.*

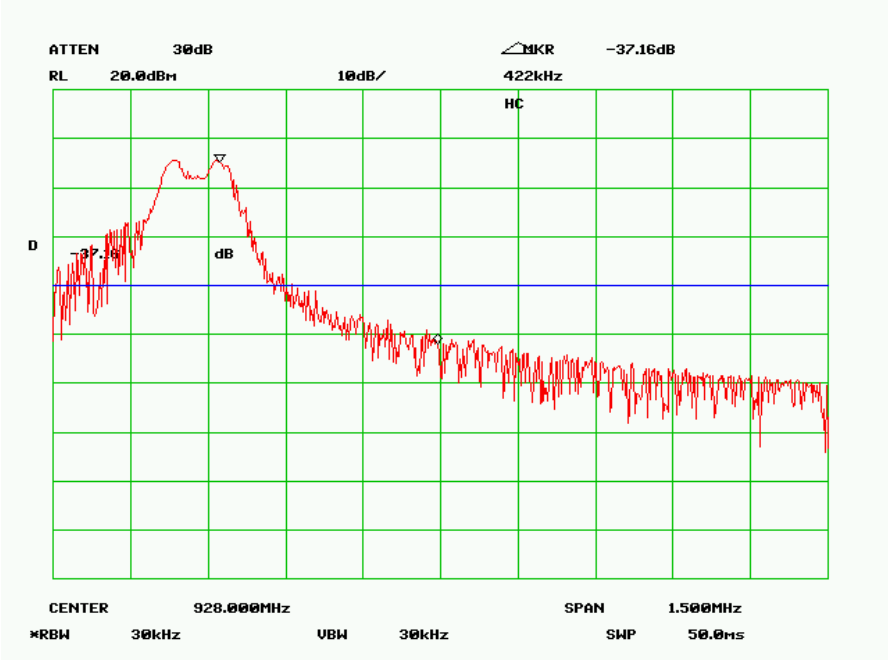
Plots of 100kHz Bandwidth of Band Edge

Please refer the following plots.

Low Channel



High Channel



§2.1051 & §15.247(d) SPURIOUS EMISSIONS AT ANTENNA PORT

Applicable Standard

According to §2.1051 the radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Position the EUT on a bench without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

3. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.

4. Set the SA on View mode and then plot the result on SA screen.

5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

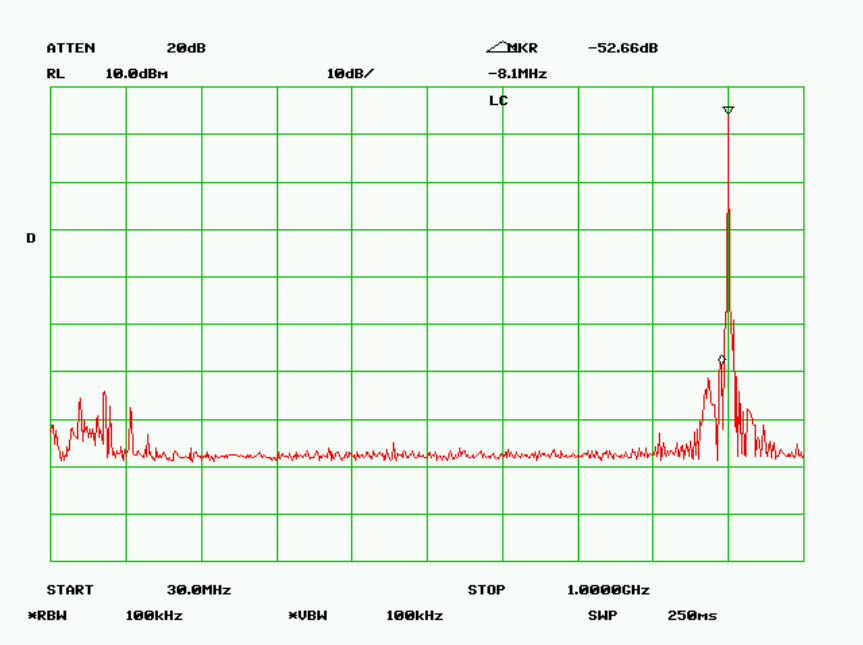
Temperature:	25° C
Relative Humidity:	55%
ATM Pressure:	1025 mbar

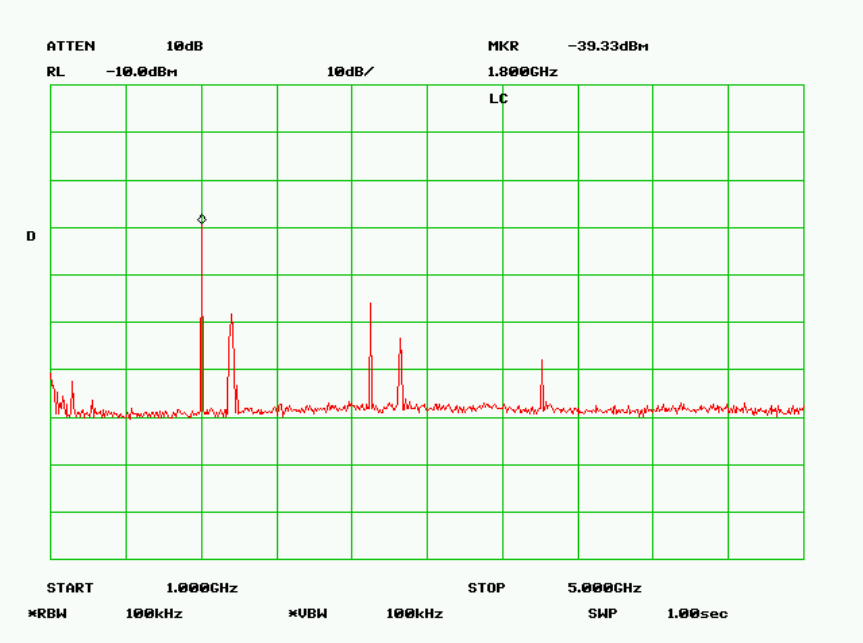
**The testing was performed by Tom Chen on 2006-08-08.*

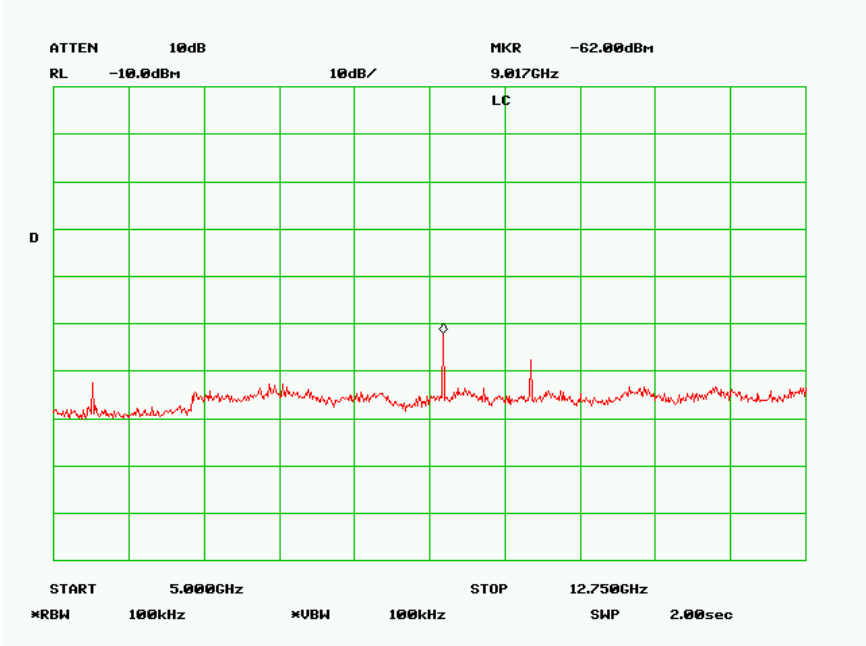
Measurement Results

Please refer to the following plots.

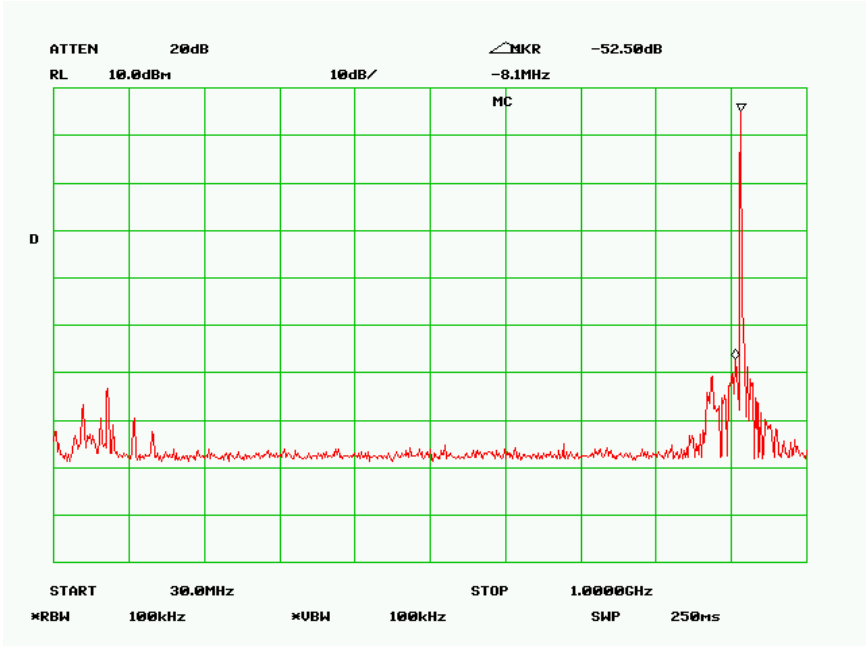
Low Channel

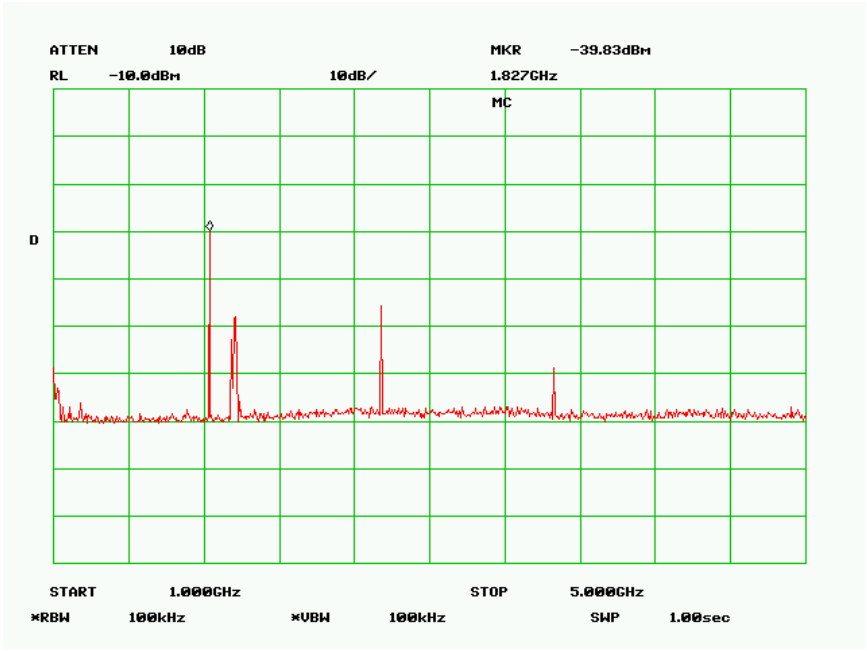

ATTEN 20dB
MKR -52.66dB
RL 10.0dBm
10dB/
-8.1MHz
LC
D
START 30.0MHz
STOP 1.0000GHz
*RBW 100kHz
*VBW 100kHz
SWP 250ms

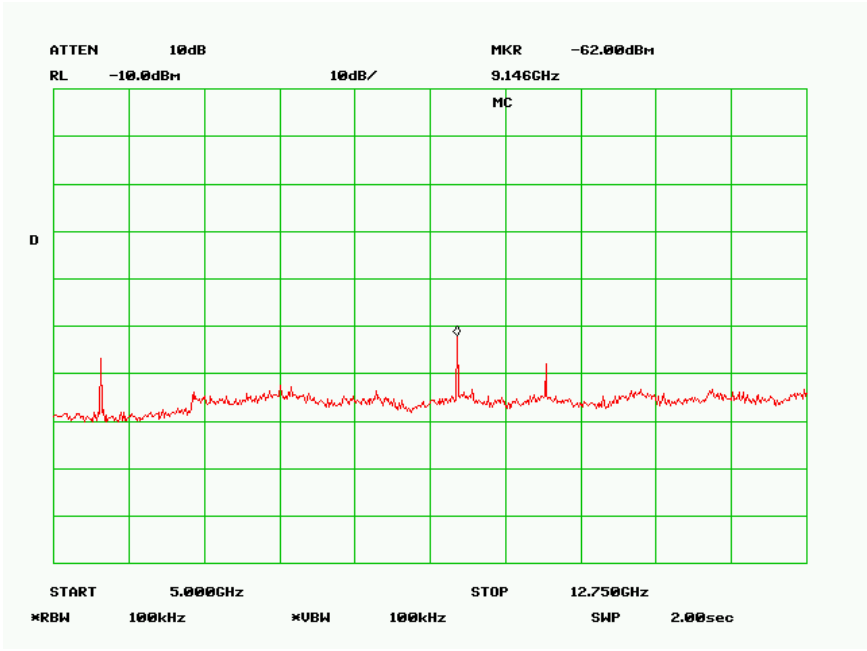

ATTEN 10dB
MKR -39.33dBm
RL -10.0dBm
10dB/
1.800GHz
LC
D
START 1.000GHz
STOP 5.000GHz
*RBW 100kHz
*VBW 100kHz
SWP 1.00sec



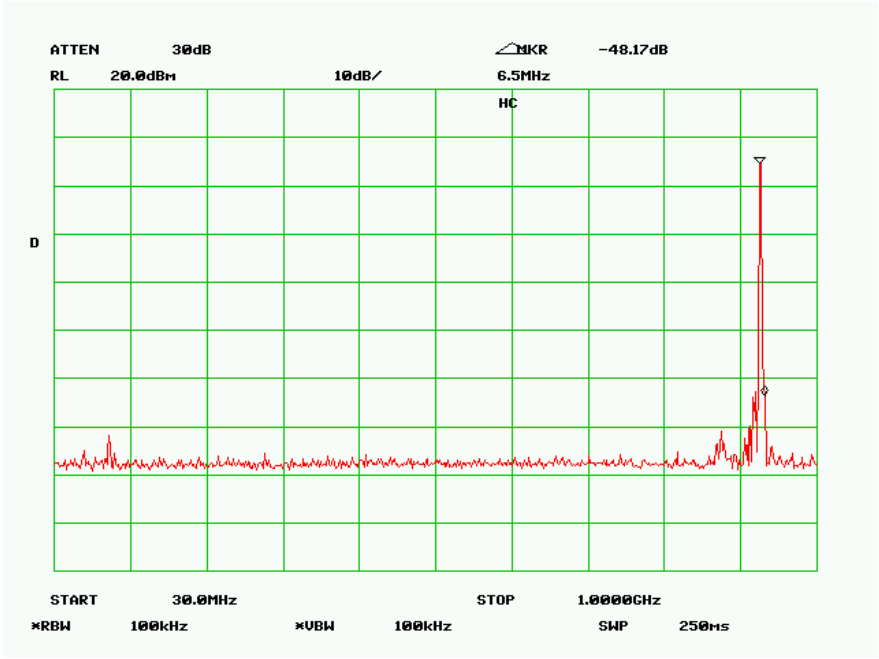
Middle Channel

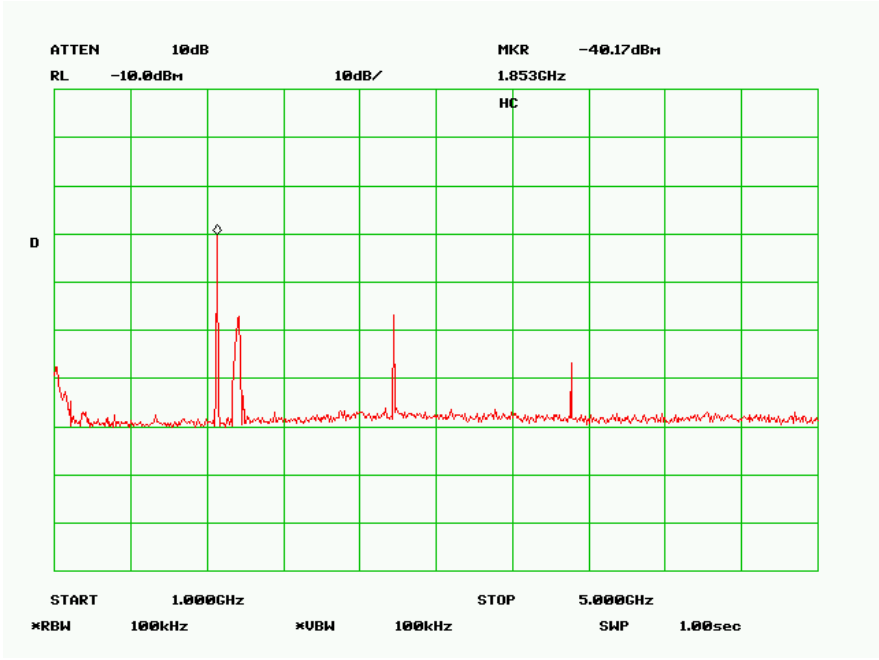


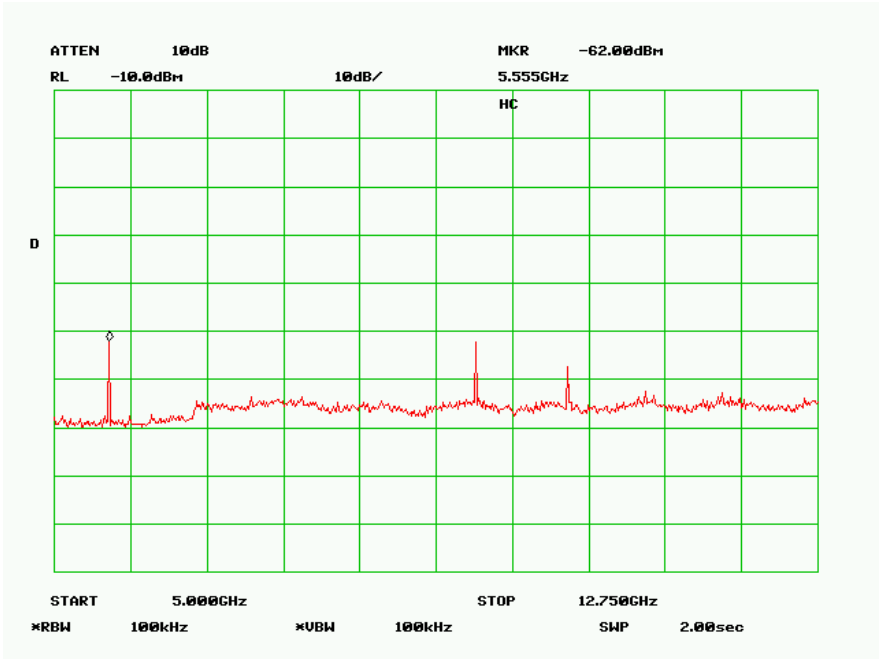

ATTEN 10dB
MKR -39.83dBm
RL -10.0dBm
10dB/
1.827GHz
MC
D
START 1.000GHz
STOP 5.000GHz
*RBW 100kHz
*VBW 100kHz
SWP 1.00sec


ATTEN 10dB
MKR -62.00dBm
RL -10.0dBm
10dB/
9.146GHz
MC
D
START 5.000GHz
STOP 12.750GHz
*RBW 100kHz
*VBW 100kHz
SWP 2.00sec

High Channel






ATTEN 10dB
MKR -62.00dBm
RL -10.0dBm
10dB/
5.555GHz
HC
D
START 5.000GHz
STOP 12.750GHz
*RBW 100kHz
*VBW 100kHz
SWP 2.00sec