CONFORMANCE TEST REPORT
FOR
FCC 47 CFR, Part 15 Subpart C

Report No.: 10-04-MAS-280-02

Client:	Carmar Technology Co., LTD.
Product:	Two Ports Mini Reader
Model:	ISTC04
FCC ID:	YD400000UHFISTC04
Manufacturer/supplier:	Carmar Technology Co., LTD.

Date test item received:	2010/04/09
Date test campaign completed:	2010/08/31
Date of issue:	2010/09/02

Total number of pages of this test report: 46 pages
Total number of pages of photos: External photos 4 pages
Internal photos 2 pages
Setup photos 3 pages

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Manufacturer	: Carmar Technology Co., LTD.
Address	: No. 2, Li-Hsin 6th Road, Science-Based Industrial Park, Hsin-Chu City 300,Taiwan, R.O.C
EUT	: Two Ports Mini Reader
Trade name	: CARMAR
Model No.	: ISTC04
Power Source	: 3.3Vdc
Regulations applied	: FCC 47 CFR, Part 15 Subpart C (2008)

The testing described in this report has been carried out to the best of our knowledge and ability, and our responsibility is limited to the exercise of reasonable care. This certification is not intended to believe the sellers from their legal and/or contractual obligations.

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② ISO/IEC 17025: BSMI, CNLA, DGT, NVLAP, CCIBLAC, UL, Compliance

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⑤ FCC Registration Number: 90588, 91094, 91095

⑥ Industry Canada Site Regisitation number: IC 2949A-1

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1 GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : Two Ports Mini Reader
b) Trade Name : CARMAR
c) Model No. : ISTC04
d) FCC ID : YD400000UHFISTC04
e) Operation frequency : 902.75 MHz ~ 927.25 MHz
f) Channels : 50

1.2 Characteristics of Device

The main operation principle of RFID is utilizing the reading device (Reader) Send RF wave for the electronic label that is planted into or stuck on the things(Tag) in order to distinguish the wireless materials. The composition component of RFID system includes Reader, Tag, PAD or cell-phone and the contents. The rated output power is 29.35 dBm (860.994 mW).

1.3 Test Methodology

All testing were performed according to the procedures in ANSI C63.4 (2003) an FCC CFR 47 Part 2 and Part 15.

1.4 Modifiction List of EUT

N/A

1.5 Test Facility

The semi-anechoic chamber and conducted measurement facility used to collect the radiated and conducted data are located inside the Building at No.8, Lane 29, Wen-ming Road, Lo-shan Tsun, Kweishan Hsiang, Taoyuan, Taiwan, R.O.C.
This site has been accreditation as a FCC filing site.

1.6 Test Summary

Requirement	FCC Paragraph #	Test Pass
Radiated Emission	15.247 (d)	☒
Antenna Requirement	15.203	☒
20dB Emission Bandwidth	15.247 (a)(1)	☒
Output Power	15.247 (b)(2)	☒
OUT-OF-BAND RF Conducted Spurious Emission	15.247 (d)	☒
Number of Hopping Channels	15.247 (a)(1)(i)	☒
Hopping Channel Carrier Frequency Seperated	15.247 (a)(1)	☒
Dwell Time	15.247 (a)(1)(i)	☒

2 PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:
A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:
A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :
A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:
A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

For unintentional device, according to §15.107(a) Line Conducted Emission Limits is as following:

Frequency MHz	Quasi Peak dB μV	Average dB μV
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

*Decreases with the logarithm of the frequency.

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

(2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency MHz	Distance Meters	Radiated dB μV/m	Radiated μV/m
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
above 960	3	54.0	500

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

(3) Antenna Requirement

For intentional radiator, according to §15.203, shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

(4) 20dB Bandwidth Requirement

For frequency hopping systems, according to 15.247(a)(1), hopping channel carrier frequencies seperated by a minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is greater.

For frequency hopping systems, According to 15.247(a)(1)(i), 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 shll not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(5) Output Power Requirement

For frequency hopping systems, according to 15.247(b)(2), operating in the 902-928 MHz band: 1 watt for system 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.

If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(6) 100 kHz Bandwidth of Frequency Band Edges Requirement

According to 15.247(d), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

(7) Number of Hopping Channels

For frequency hopping systems, According to 15.247(a)(1)(i), 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 shll not be greater than 0.4 seconds within a 10 second period.

(8) Channel Carrier Frequencies Seperation

For frequency hopping systems, According to 15.247(a)(1), hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

(9) Dwell Time

For frequency hopping systems, According to 15.247(a)(1)(i), 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 shll not be greater than 0.4 seconds within a 10 second period.

2.3 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.25
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio / TV technician for help.

To comply with the FCC RF exposure compliance requirement, this device and its antenna must not be co-located or operating to conjunction with any other antenna or transmitter.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

For the purposes of this test report ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT during the test. Notebook PC was used to control the RF channel under the hightest, middle and lowest frequency and transmit the maximun RF power. Customer would not use it. But never the less ancillary equipment can influence the test results..

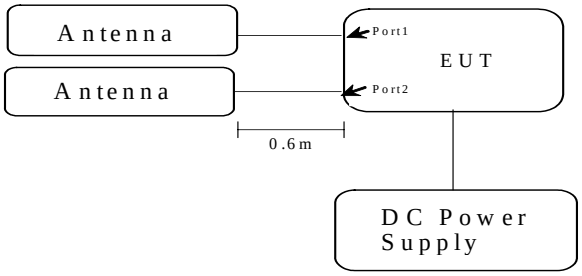
3.2 Devices for Tested System

Device	Manufacture	Model	Cable Description
* Two Ports Mini Reader	Carmar Technology Co., LTD.	ISTC04	0.6m*1, Unshielded Signal Line
DC Power Supply	GW	GPS-3030D	2.0m*1, Unshielded Power Line 1.0m*1, Unshielded Signal Line

Remark : 1."*" means equipment under test.

2.The EUT has two RF ports but will not operate at the same time. For this device is working with data transmitter and receiver at one path and one time only. The testing chooses "Port 1" for final testing.

3. Two antennas are the same model.



Port 1

4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For unintentional radiator, the radiated emission shall comply with §15.109(a).

For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and digitally modulated, and the out band emission shall be comply with § 15.247 (c)

4.2 Measurement Procedure

A.Preliminary Measurement For Portable Devices.

For the device that antenna not fixed, the following procedure was performed to determine the maximum emission axis of antenna (X,Y and Z axis):

1. With the receiving antenna is H polarization, rotate the antenna in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving ntenna is V polarization, rotate the antenna in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. The axis of maximum emission was determined and the configuration was used to perform the final measurement.
4. The position in which the maximum noise occurred was “Z axis”. (Please see the test setup photos)

B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, it is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions. For emission frequencies measured above 1 GHz, a pre-scan be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 120 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

   Note : A filter was used to avoid pre-amplifier saturated when measure TX operation mode.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the datarate, placement of ANT. cables associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

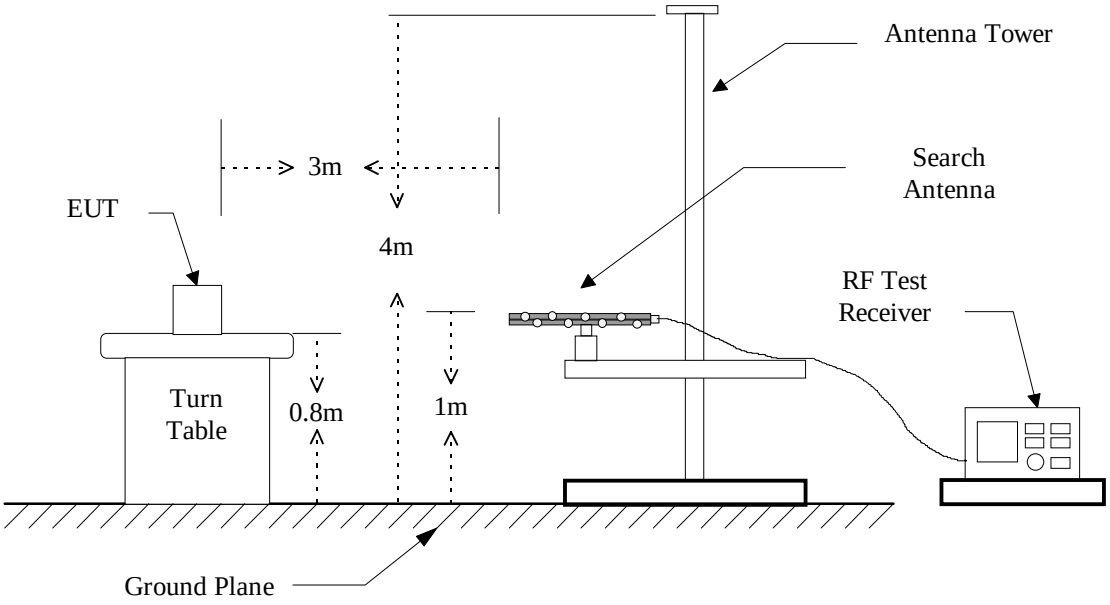
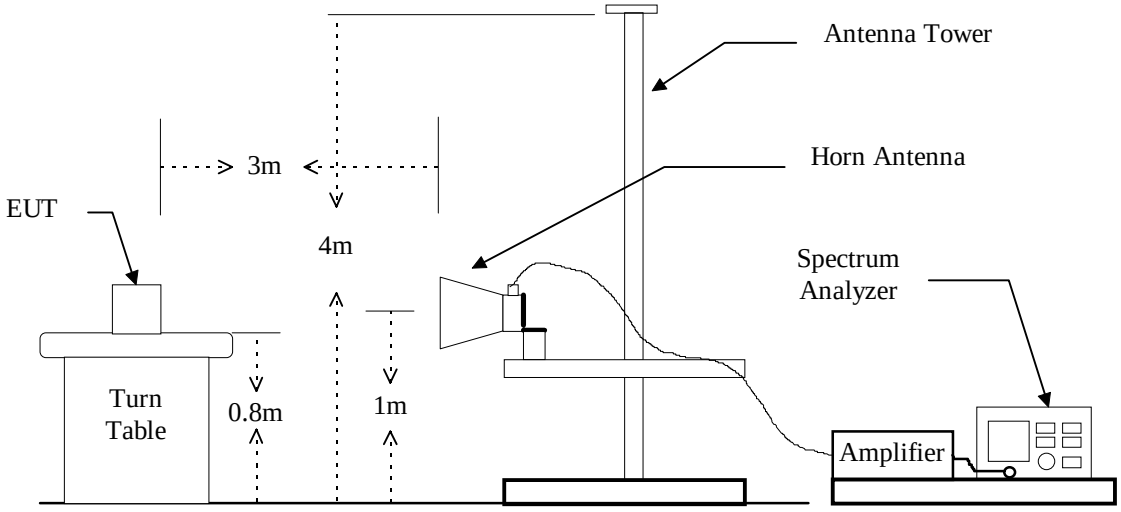


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement :

Equipment	Manufacturer	Model No.	Next Cal. Due
EMI Test Receiver	R&S	ESIB7	07/19/2011
Spectrum Analyzer	Rohde & Schwarz	FSU46	11/18/2010
Horn Antenna	EMCO	3115	12/13/2010
BiLog Antenna	Schaffner	CBL 6112B	08/17/2011
Horn Antenna	EMCO	3116	12/13/2010
Preamplifier	Hewlett-Packard	8449B	10/11/2010

Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	300 kHz
	RF Test Receiver	Peak	120 kHz	300 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz

4.4 Radiated Emission Data

4.4.1 Harmonics Emission

Test Date : Apr. 09, 2010 Temperature : 17℃ Humidity : 63%

4.4.1.1 Fundamental Frequency : 902.750 MHz

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak (H/V Max.)	Result @3m (dBuV/m) Ave (H/V Max.)	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.
1805.500	---	---	---	---	-10.58	---	---	74.0	54.0
2708.250	51.2	---	64.2	57.1	-7.39	56.8	49.7	74.0	54.0
3611.000	---	---	---	---	-4.58	---	---	74.0	54.0
4513.750	---	---	---	---	-3.17	---	---	74.0	54.0
5416.500	---	---	---	---	-1.35	---	---	74.0	54.0

4.4.1.2 Fundamental Frequency : 915.250 MHz

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak (H/V Max.)	Result @3m (dBuV/m) Ave (H/V Max.)	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.
1830.500	---	---	---	---	-10.45	---	---	74.0	54.0
2745.750	57.5	---	68.7	55.9	-7.26	61.4	48.6	74.0	54.0
3661.000	---	---	---	---	-4.39	---	---	74.0	54.0
4576.250	---	---	---	---	-3.03	---	---	74.0	54.0
5491.500	---	---	---	---	-1.21	---	---	74.0	54.0

4.4.1.3 Fundamental Frequency : 927.250 MHz

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak (H/V Max.)	Result @3m (dBuV/m) Ave (H/V Max.)	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.
1854.500	---	---	---	---	-10.33	---	---	74.0	54.0
2781.750	58.5	---	64.4	54.6	-7.14	57.3	47.5	74.0	54.0
3709.000	52.1	---	---	---	-4.20	47.9	---	74.0	54.0
4636.250	---	---	---	---	-2.89	---	---	74.0	54.0
5563.500	---	---	---	---	-1.18	---	---	74.0	54.0

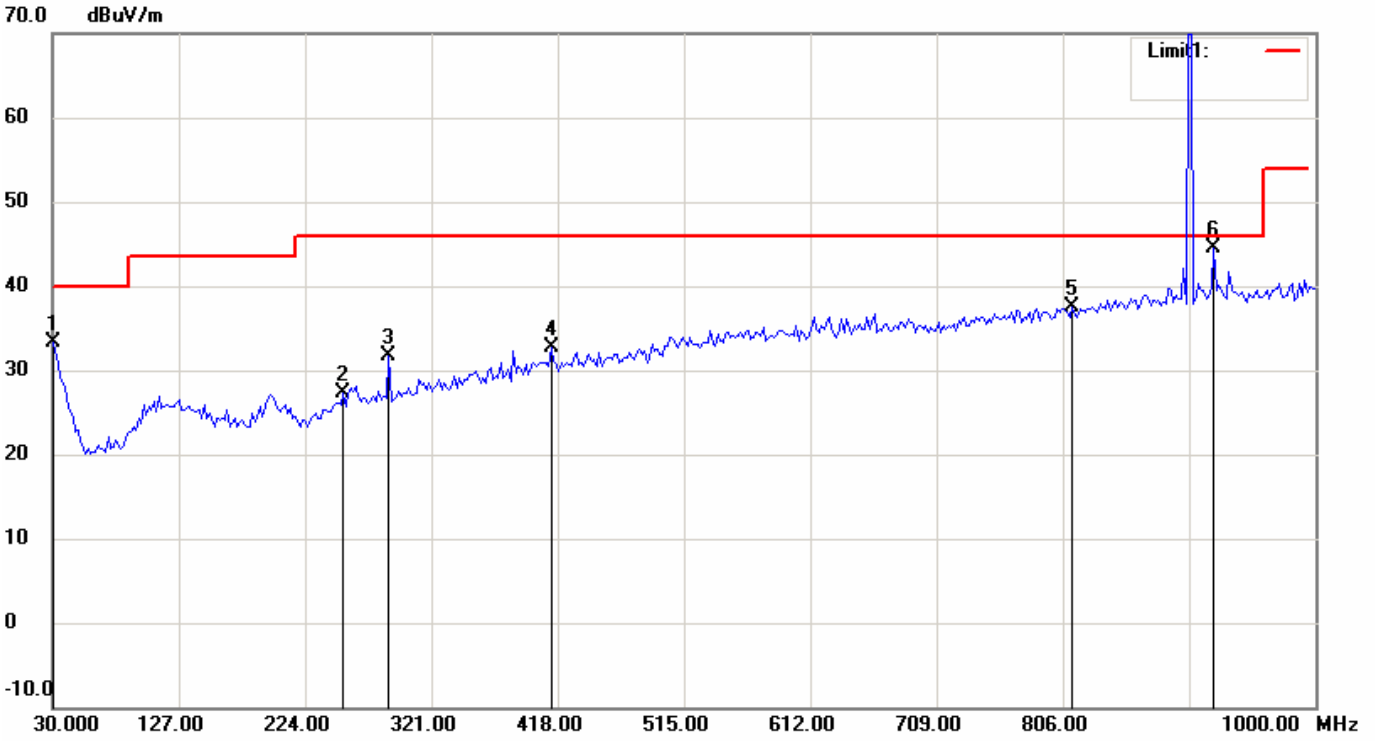
Note :

1. Item of margin shown in above table refer to average limit.
2. Remark "---" means that the emissions level is too low to be measured.
3. Item "Margin" referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

4.4.2 Other Emission

A. below 1GHz

File: **Data: #1** **Date: 2010/4/9** **Temperature: 17 ℃**
Time: AM 10:17:56 **Humidity: 63 %**

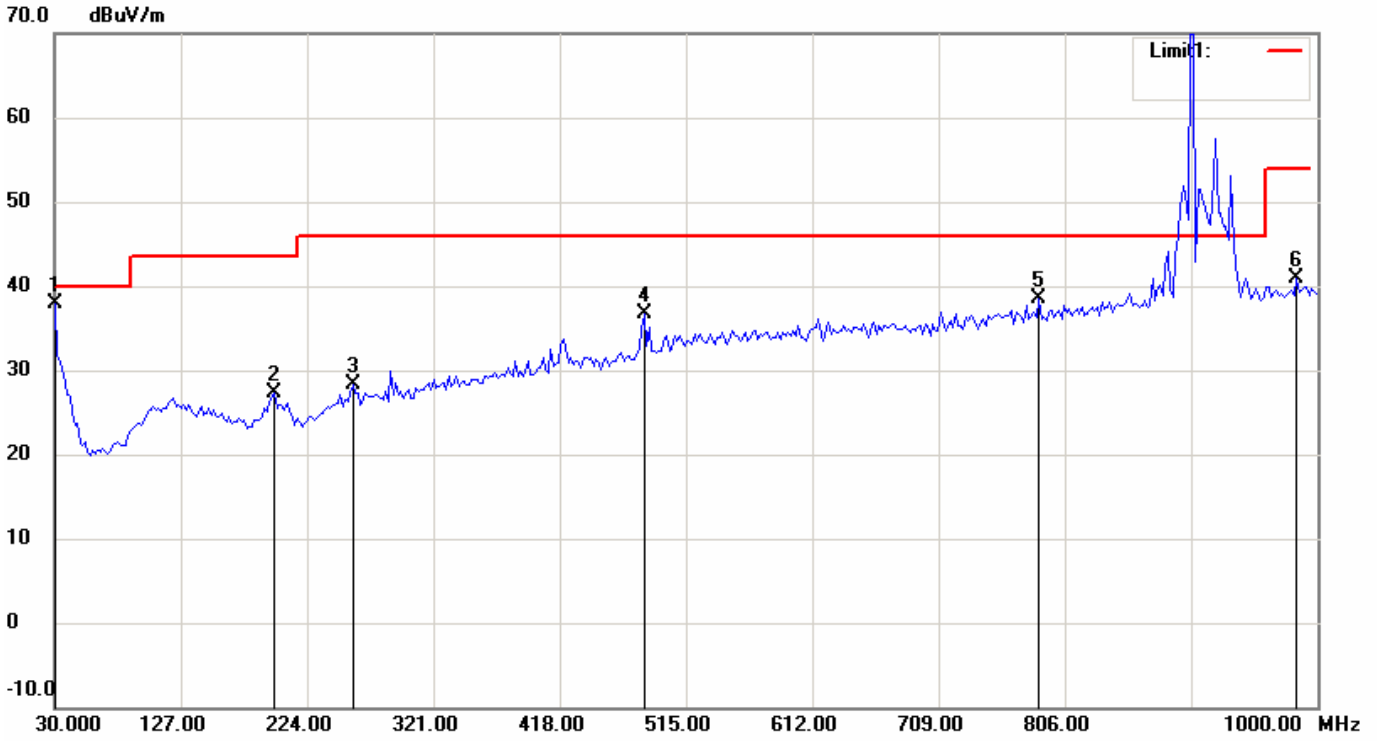


Condition: **FCC Part15 RE-Class B_30-1000MHz** **Polarization:** **Horizontal**
EUT: **Distance:** **3m**
Model:
Test Mode: **902.75**

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	30.0000	12.45	peak	20.84	33.29	40.00	-6.71
2	253.5471	12.14	peak	15.21	27.35	46.00	-18.65
3	288.5371	15.97	peak	15.72	31.69	46.00	-14.31
4	412.9459	13.34	peak	19.29	32.63	46.00	-13.37
5	813.3868	13.05	peak	24.54	37.59	46.00	-8.41
6	922.2445	18.66	peak	25.81	44.47	46.00	-1.53

File: **Data: #2** **Date: 2010/4/9** **Temperature: 17 ℃**

Time: AM 10:19:57 **Humidity: 63 %**



Condition: **FCC Part15 RE-Class B_30-1000MHz** **Polarization: Vertical**

EUT: **Distance: 3m**

Model:

Test Mode: **902.75**

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	30.0000	17.03	peak	20.84	37.87	40.00	-2.13
2	199.1182	12.66	peak	14.57	27.23	43.50	-16.27
3	259.3788	12.49	peak	15.76	28.25	46.00	-17.75
4	482.9259	16.34	peak	20.43	36.77	46.00	-9.23
5	786.1723	14.38	peak	24.20	38.58	46.00	-7.42
6	984.4489	14.49	peak	26.46	40.95	54.00	-13.05

B. above 1GHz

Frequency (MHz)	Ant Pol H / V	Reading (dBuV) Peak	Correct Factor (dB)	Duty Factor (dB)	Result @3m (dBuV/m) Peak AVG	Limit @3m (dBuV/m) Peak AVG	Margins (dB)
Radiated emission frequencies above 1 GHz to 10 GHz were too low to be measured.							

Note:
1. Place of Measurement: Measuring site of the ETC.
2. The worse mode was recorded in the report for "Other emission" testing.
3. The estimated measurement uncertainty of the result measurement is
   ±4.6dB (30MHz≦f<300MHz).
   ±4.4dB (300MHz≦f<1000MHz).
   ±4.1dB (1GHz≦f≦18GHz).
   ±4.4dB (18GHz<f≦40GHz).

4 Remark "---" means that the emissions level is too low to be measured.

4.4.3 Radiated Measurement at Bandedge with Fundamental Frequencies

Channel High

Operation Mode : Transmitting

Fundamental Frequency : 927.250 MHz

Frequency (MHz)	Reading (dBuV) H QP	Reading (dBuV) V QP	Factor (dB) Corr.	Result @3m (dBuV/m) QP	Limit @3m (dBuV/m) QP
961.122	13.21	13.74	26.22	39.96	54.0

Note:

The result is the highest value of radiated emission from restrict band of 960 ~1240 MHz.

4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

where

Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Amplifier Gain

5 CONDUCTED EMISSION MEASUREMENT

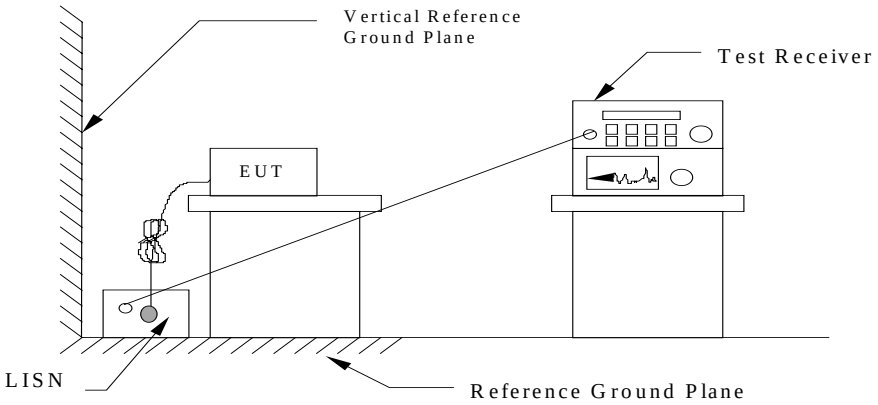
5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and §15.207(a) respectively. Both Limits are identical specification.

5.2 Measurement Procedure

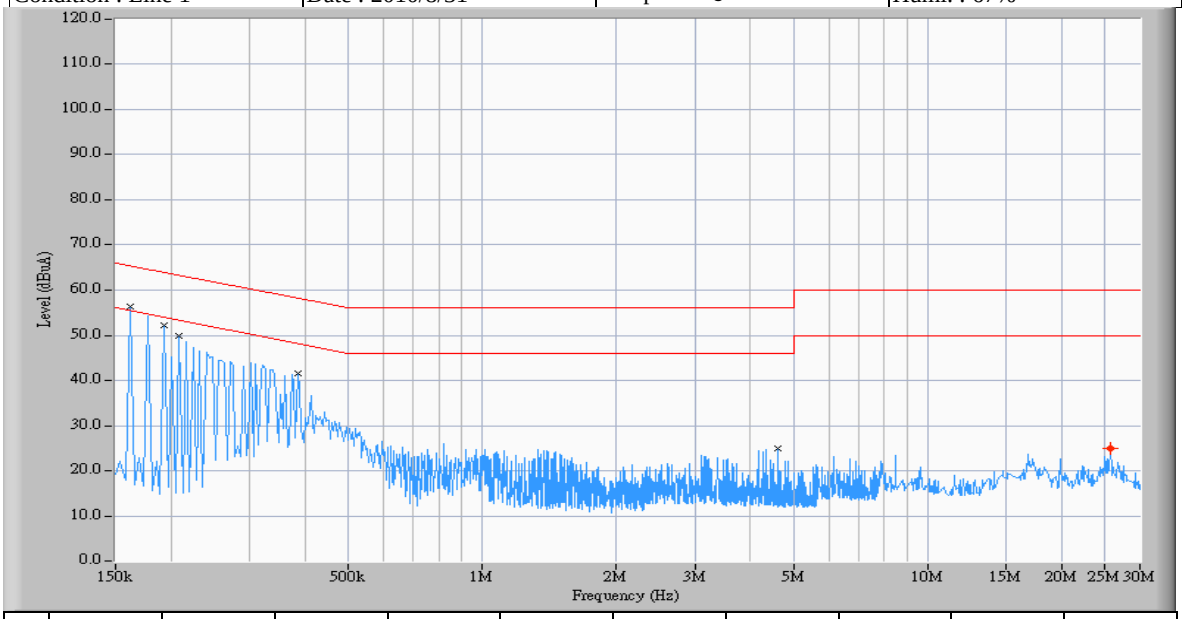
1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



5.3 Conducted Emission Data

EUT :	Model :	Status :	
Condition : Line 1	Date : 2010/8/31	Temp. : 21℃	Humi. : 67%

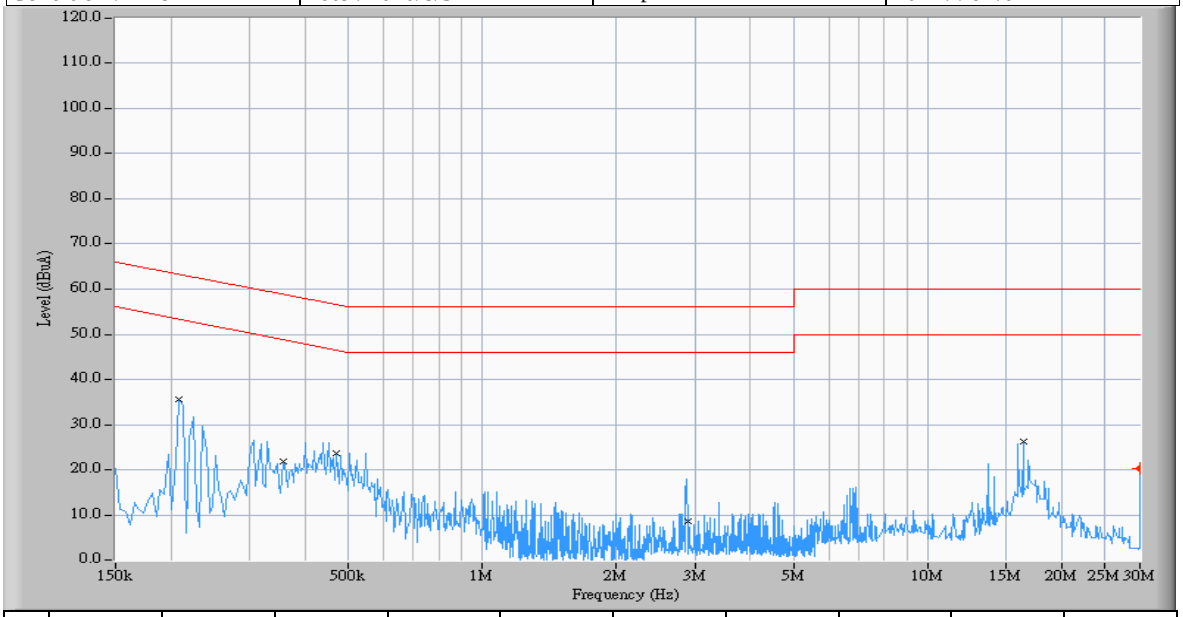


	Freq (MHz)	QP Level (dBuA)	AVG Level (dBuA)	Factor (dB)	QP Result (dBuA)	AVG Result (dBuA)	QP Limit (dBuA)	AVG Limit (dBuA)	QP Margin (dB)	AVG Margin (dB)
1	0.162	56.5	22.3	0.1	56.6	22.4	65.4	55.4	-8.8	-33.0
2	0.193	52.3	17.4	0.1	52.4	17.5	63.9	53.9	-11.5	-36.4
3	0.209	49.9	15.8	0.1	50.0	15.9	63.2	53.2	-13.2	-37.3
4	0.384	41.6	----	0.1	41.7	----	58.2	48.2	-16.5	----
5	4.627	25.0	----	0.2	25.2	----	56.0	46.0	-30.8	----
6	25.752	24.9	----	0.6	25.5	----	60.0	50.0	-34.5	----

Note:

1. Place of measurement: EMC LAB. of the ETC.
2. “***” means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is ±2.5dB.

EUT :	Model :	Status :	
Condition : Line 2	Date : 2010/8/31	Temp. : 21℃	Humi. : 67%



	Freq (MHz)	QP Level (dBuA)	AVG Level (dBuA)	Factor (dB)	QP Result (dBuA)	AVG Result (dBuA)	QP Limit (dBuA)	AVG Limit (dBuA)	QP Margin (dB)	AVG Margin (dB)
1	0.209	35.6	----	0.1	35.7	----	63.3	53.3	-27.6	----
2	0.357	21.8	----	0.1	21.9	----	58.8	48.8	-36.9	----
3	0.470	23.7	----	0.1	23.8	----	56.5	46.5	-32.7	----
4	2.892	8.6	----	0.1	8.7	----	56.0	46.0	-47.3	----
5	16.431	26.3	----	0.4	26.7	----	60.0	50.0	-33.3	----
6	29.959	20.4	----	0.7	21.1	----	60.0	50.0	-38.9	----

Note:

1. Place of measurement: EMC LAB. of the ETC.
2. “***” means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is ±2.5dB.

5.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR (Included Cable Loss)

5.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test.

Equipment	Manufacturer	Model No.	Next Cal. Due
RF Test Receiver	Rohde and Schwarz	ESCS30	08/22/2011
LISN	EMCO	37100/2M	03/04/2011

6 ANTENNA REQUIREMENT

6.1 Standard Applicable

For intentional radiator, according to §15.203, shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

6.2 Antenna Construction

Brand	ARA
Model No.	RFID-11-2
Frequency range	902.75 MHz ~ 927.25 MHz
Antenna Gain	6.0 dBi
Antenna Connector Type	SMA Reverse

The antenna connector is not a standard jack.

7 20dB EMISSION BANDWIDTH MEASUREMENT

7.1 Standard Applicable

For frequency hopping systems, according to 15.247(a)(1), hopping channel carrier frequencies seperated by a minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is greater.

For frequency hopping systems, According to 15.247(a)(1)(i), 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 shll not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect it to measurement instrument. Then set it to any 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 emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Figure 4: Emission bandwidth measurement configuration.

7.3 Measurement Equipment

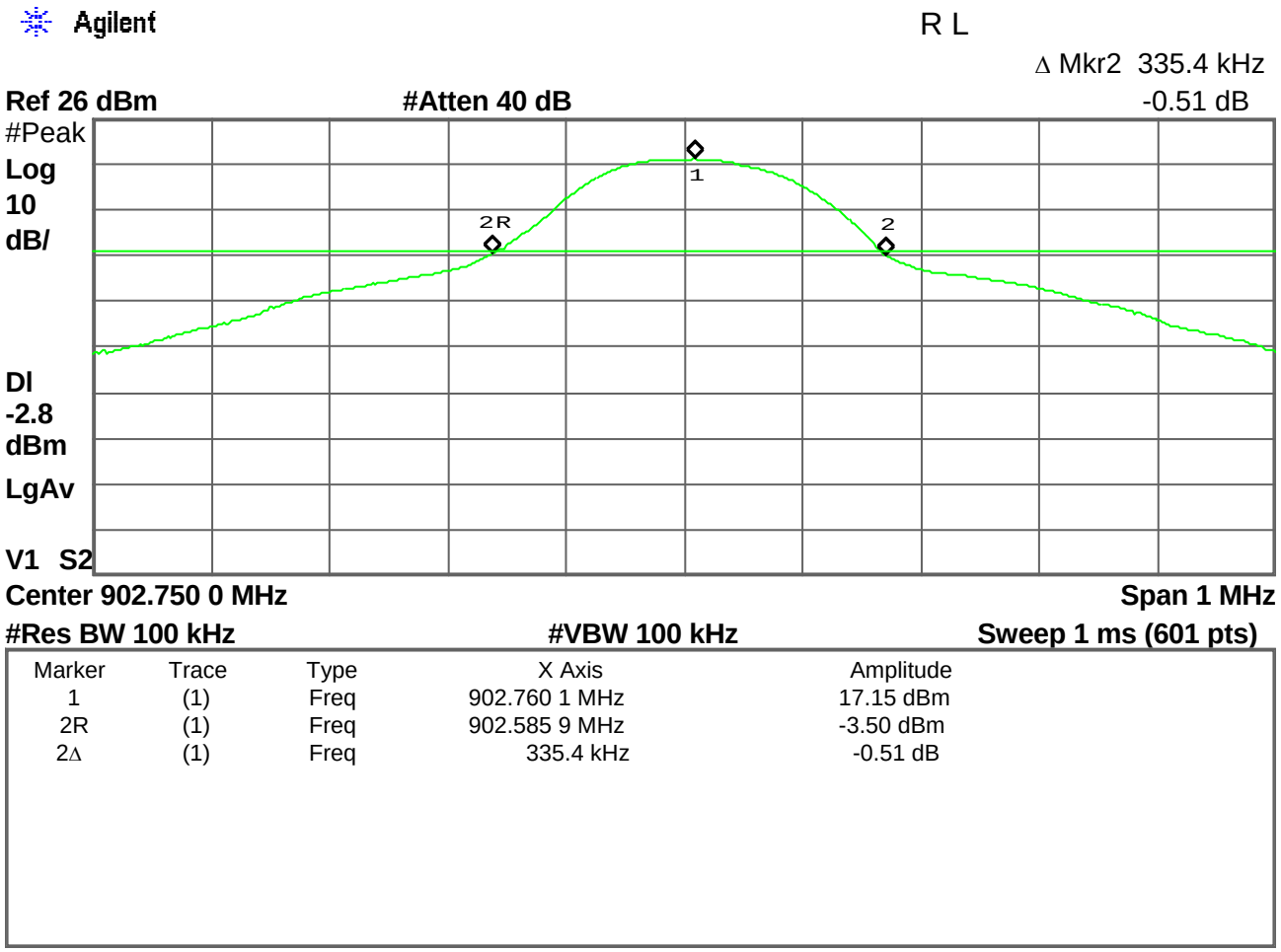
Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	E4446A	09/27/2010

7.4 Measurement Data

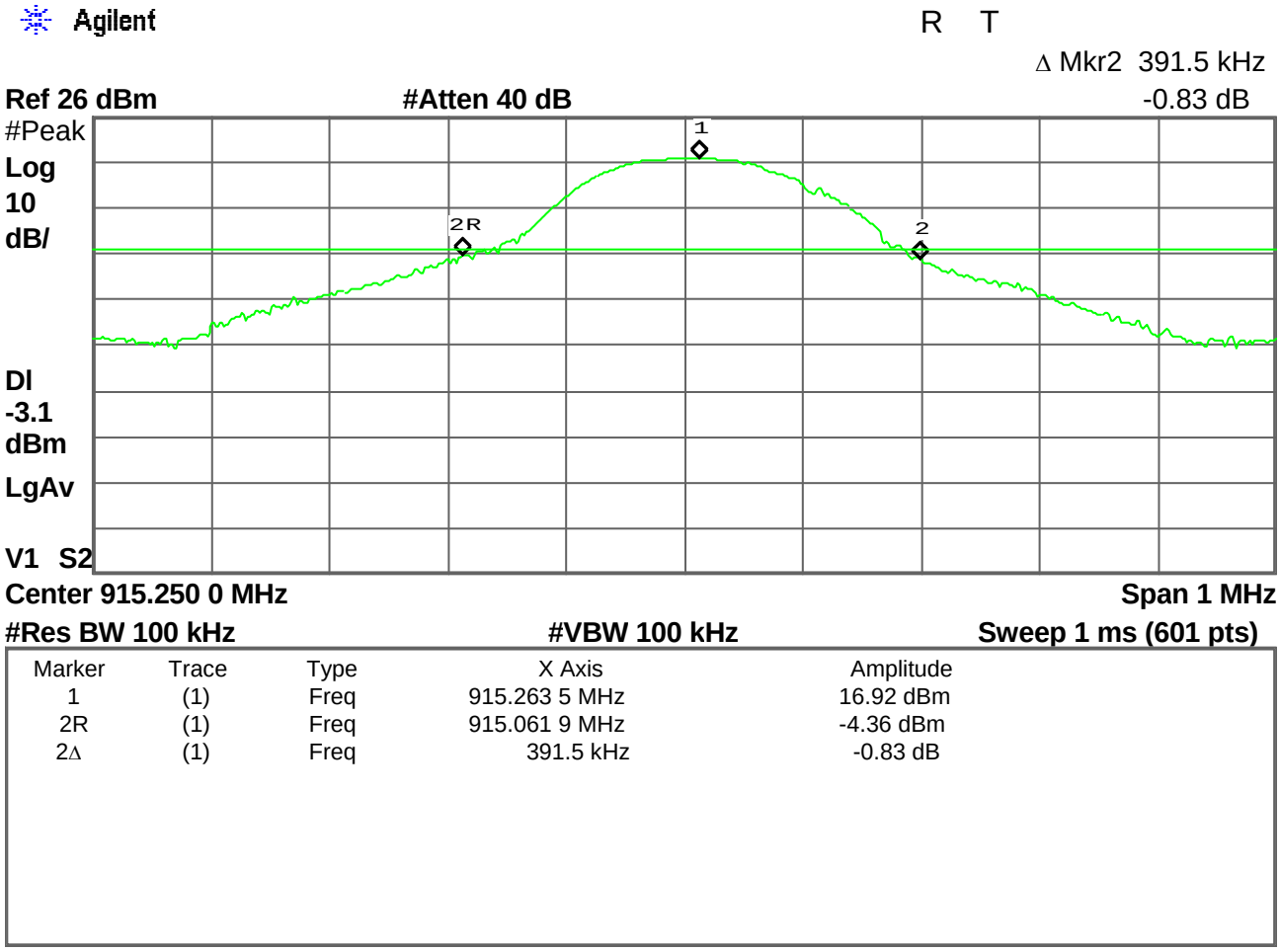
Test Date : Apr. 09, 2010 Temperature : 17℃ Humidity : 63%

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	Limit (MHz)	Chart
Low	902.750	0.335	0.5	Page 27
Mid	915.250	0.392	0.5	Page 28
High	927.250	0.326	0.5	Page 29

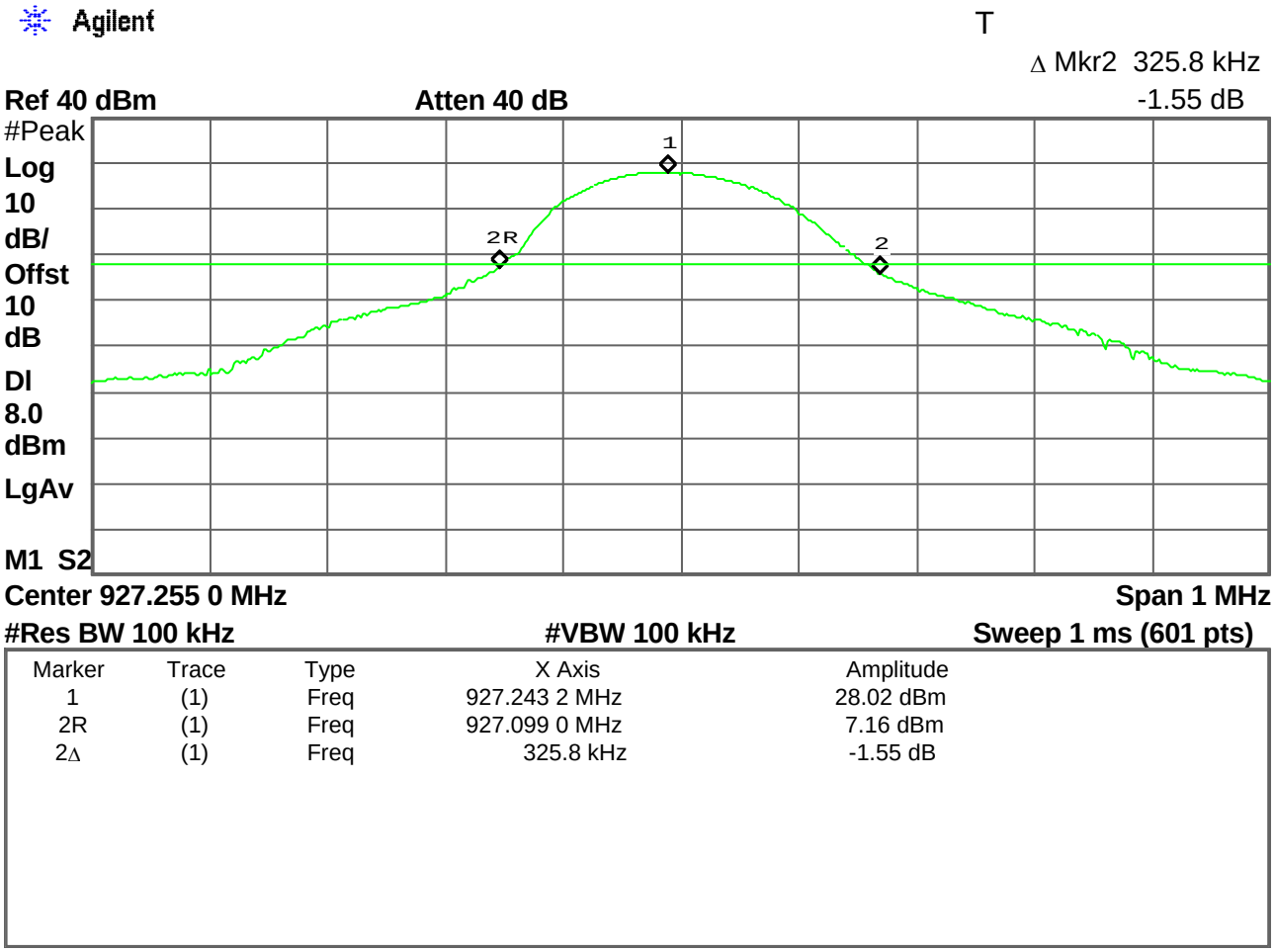
Note: Please refer to page 27 to page 29 for chart.



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	902.760 1 MHz	17.15 dBm
2R	(1)	Freq	902.585 9 MHz	-3.50 dBm
2Δ	(1)	Freq	335.4 kHz	-0.51 dB



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	915.263 5 MHz	16.92 dBm
2R	(1)	Freq	915.061 9 MHz	-4.36 dBm
2Δ	(1)	Freq	391.5 kHz	-0.83 dB



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	927.243 2 MHz	28.02 dBm
2R	(1)	Freq	927.099 0 MHz	7.16 dBm
2Δ	(1)	Freq	325.8 kHz	-1.55 dB

8 OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

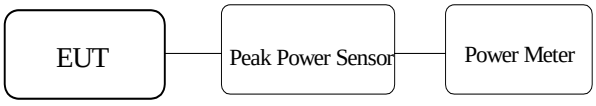
For frequency hopping systems, according to 15.247(b)(2), operating in the 902-928 MHz band: 1 watt for system employing at least 50 hopping channels; and , 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this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

If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 5. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any measured frequency within its operating range and make sure the instrument is operated in its linear range.
1. Record the level to calculate result data.
4. Repeat above procedures until all frequencies measured were complete.

Figure 5: Output power measurement configuration.



8.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Power Meter	Agilent	N1922A	11/02/2010
Peak Power Sensor	Agilent	N1912A	11/02/2010

8.4 Measurement Data

Test Date : Apr. 09, 2010 Temperature : 17℃ Humidity : 63%

Channel	Frequency (MHz)	Maximum Peak Output Power (dBm)	Maximum Peak Output Power (mW)	FCC Limit (dBm)	Chart
Low	902.750	29.35	860.994	30	-
Mid	915.250	28.85	767.361	30	-
High	927.250	28.21	662.217	30	-

The highest antenna gain is “6 dBi”, the FCC limit is 30 dBm

Note:

1. Fixed Limit = 1W=30dBm
2. If antenna gain ≦ 6dBi, FCC Limit = (Fixed Limit) dBm
3. If antenna gain > 6dBi, FCC Limit = (Fixed Limit) dBm – (highest antenna gain – 6 dBi)
4. The estimated measurement uncertainty of the result measurement is +0.92 dB/-0.94 dB (30MHz≦f≦40GHz)

9 OUT-OF-BAND RF CONDUCTED SPURIOUS EMISSION MEASUREMENT

9.1 Standard Applicable

According to 15.247(d), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set RBW 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.

9.3 Measurement Equipment

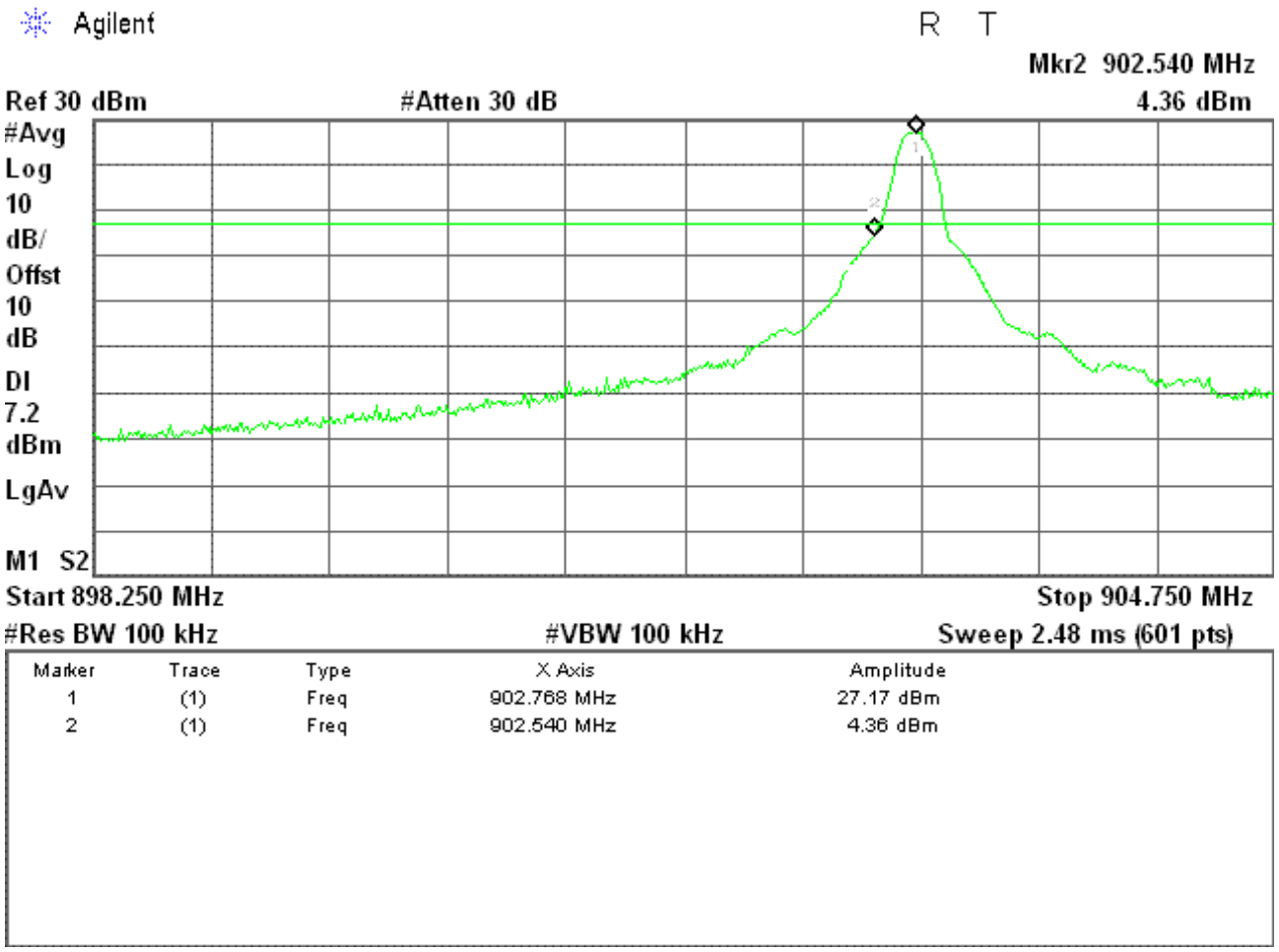
Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	E4446A	09/27/2010

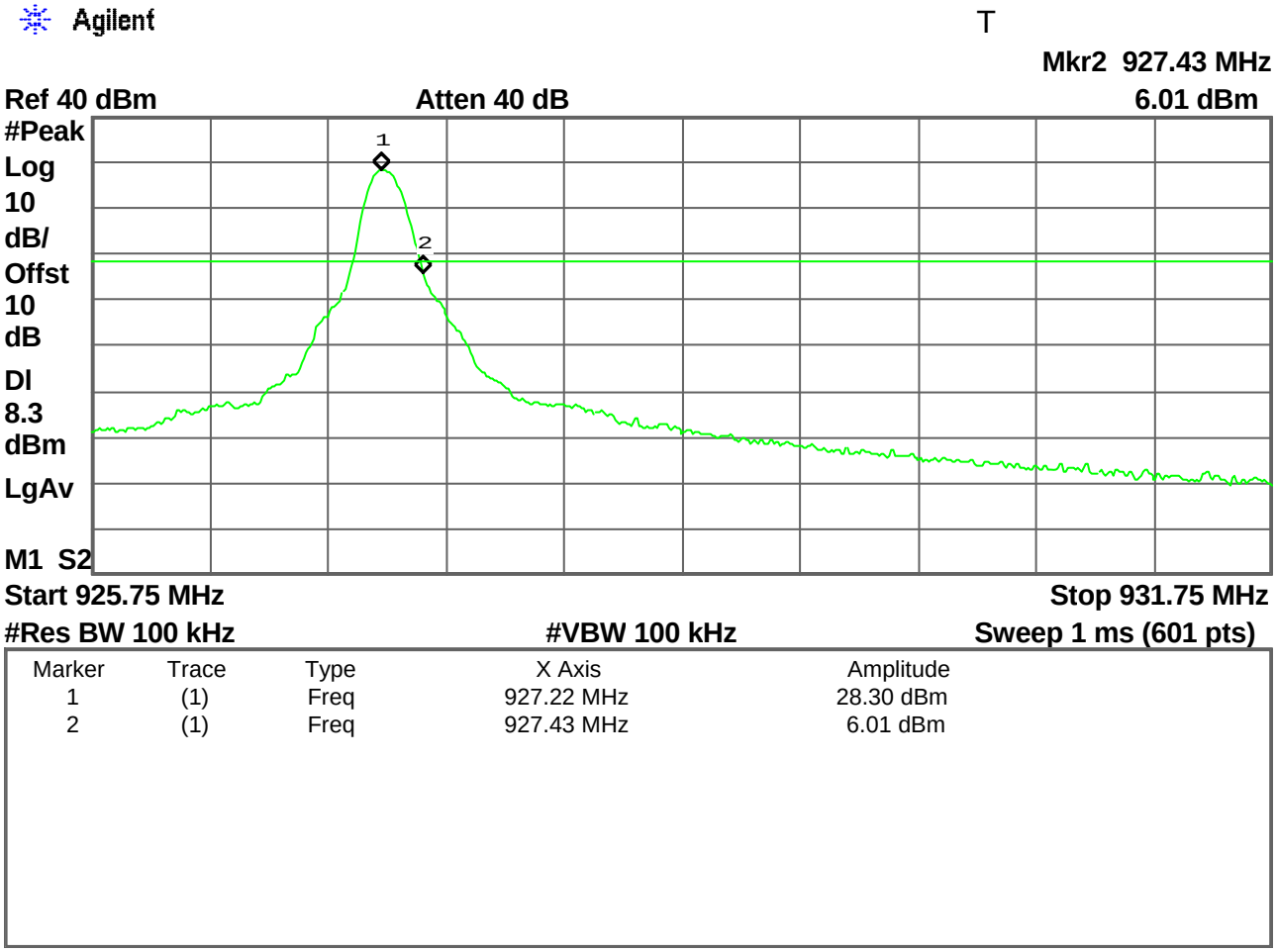
9.4 Measurement Data

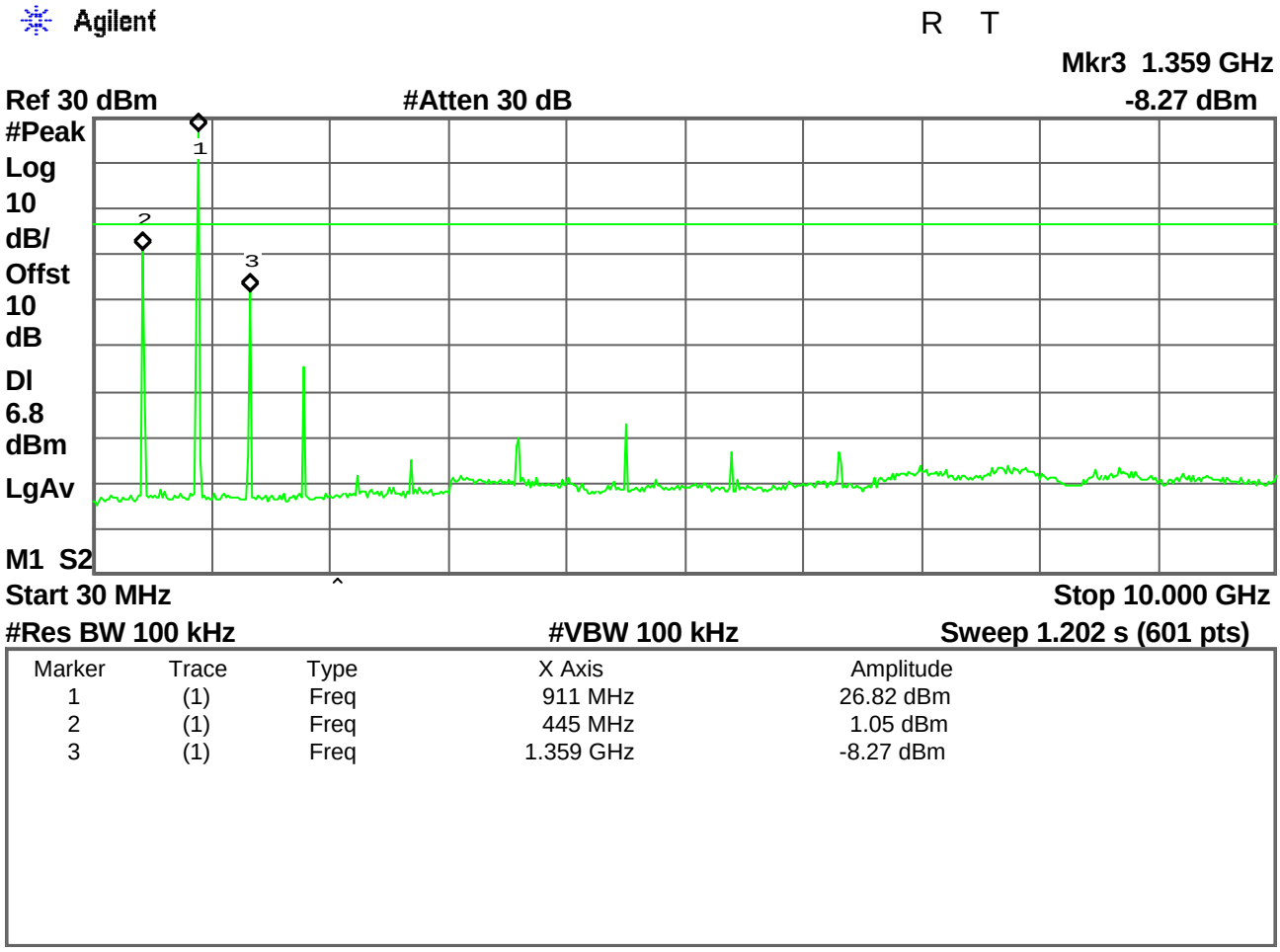
Test Date : Apr. 09, 2010 Temperature : 17℃ Humidity : 63%

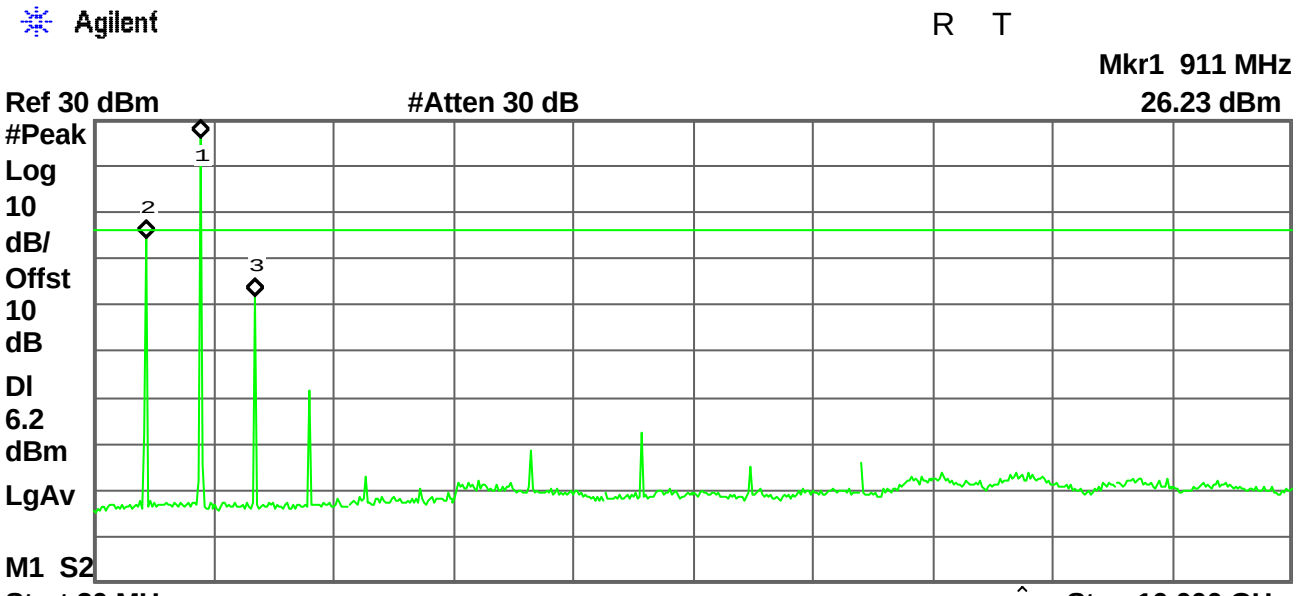
Channel	Test Frequency Range	Note	Chart
Low	897.75 MHz – 907.75 MHz	Lower Band Edge	Page 34
High	922.25 MHz – 932.25 MHz	Upper Band Edge	Page 35
Low	30 MHz - 10 GHz		Page 36
Mid	30 MHz - 10 GHz		Page 37
High	30 MHz - 10 GHz		Page 38

Note: Please refer to page 34 to page 38 for chart.

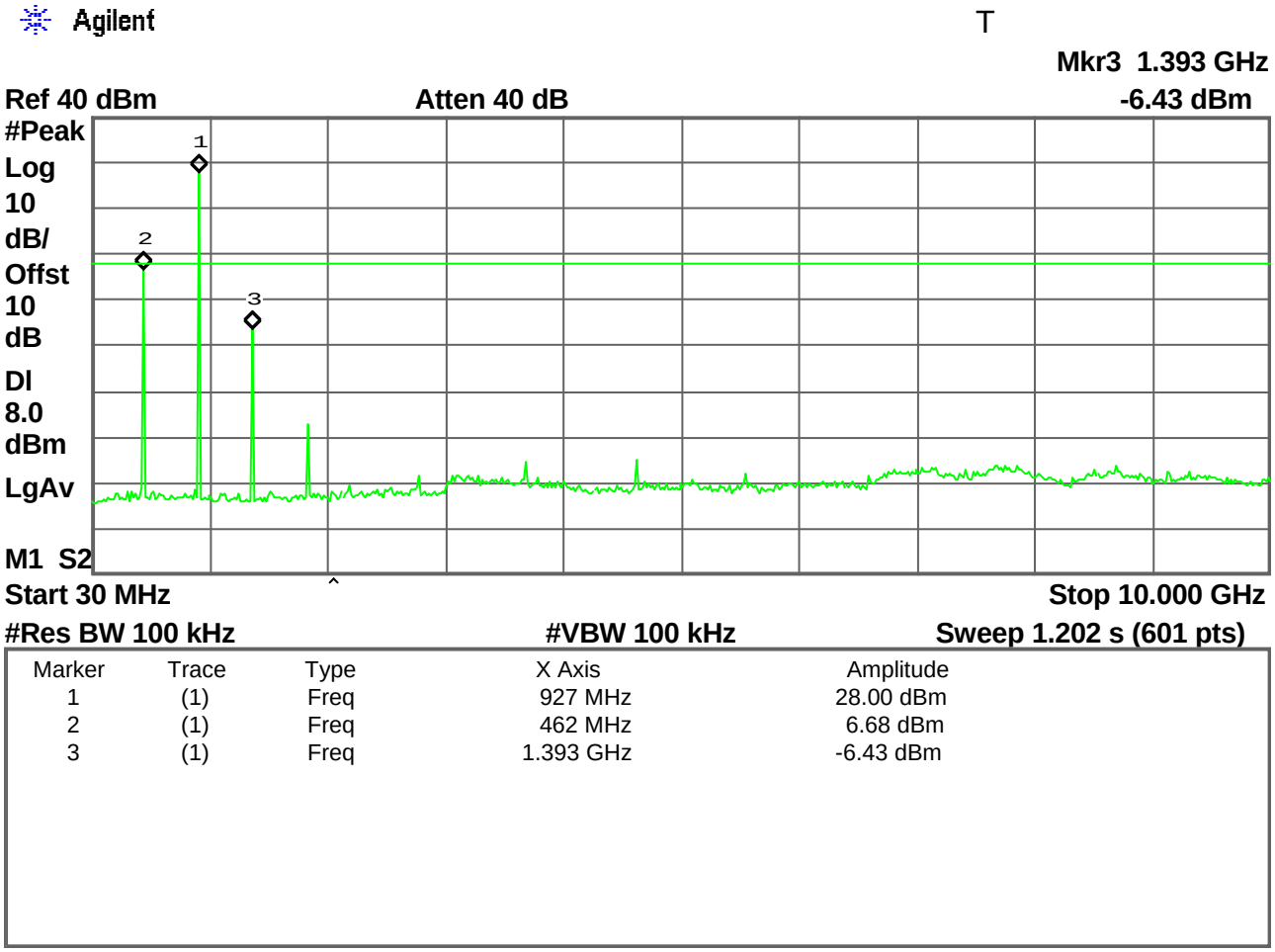

Agilent
R T
Mkr2 902.540 MHz
Ref 30 dBm
#Atten 30 dB
4.36 dBm
#Avg
Log
10
dB/
Offst
10
dB
Dl
7.2
dBm
LgAv
M1 S2
Start 898.250 MHz
Stop 904.750 MHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 2.48 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 902.768 MHz 27.17 dBm
2 (1) Freq 902.540 MHz 4.36 dBm


Agilent
T
Mkr2 927.43 MHz
Ref 40 dBm
Atten 40 dB
6.01 dBm
#Peak
Log
10
dB/
Offst
10
dB
Dl
8.3
dBm
LgAv
M1 S2
Start 925.75 MHz
Stop 931.75 MHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 1 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 927.22 MHz 28.30 dBm
2 (1) Freq 927.43 MHz 6.01 dBm


Agilent
R T
Mkr3 1.359 GHz
Ref 30 dBm
#Atten 30 dB
-8.27 dBm
#Peak
Log
10
dB/
Offst
10
dB
Dl
6.8
dBm
LgAv
M1 S2
Start 30 MHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 1.202 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 911 MHz 26.82 dBm
2 (1) Freq 445 MHz 1.05 dBm
3 (1) Freq 1.359 GHz -8.27 dBm



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	911 MHz	26.23 dBm
2	(1)	Freq	462 MHz	4.42 dBm
3	(1)	Freq	1.376 GHz	-8.02 dBm


Agilent
T
Mkr3 1.393 GHz
Ref 40 dBm
Atten 40 dB
-6.43 dBm
#Peak
Log
10
dB/
Offst
10
dB
Dl
8.0
dBm
LgAv
M1 S2
Start 30 MHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 1.202 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 927 MHz 28.00 dBm
2 (1) Freq 462 MHz 6.68 dBm
3 (1) Freq 1.393 GHz -6.43 dBm

10 NUMBER of HOPPING CHANNELS

10.1 Standard Applicable

For frequency hopping systems, According to 15.247(a)(1)(i), 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 shll not be greater than 0.4 seconds within a 10 second period.

10.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to hopping operating mode and set spectrum analyzer miximum to measure the number of hopping channels.

10.3 Measurement Equipment

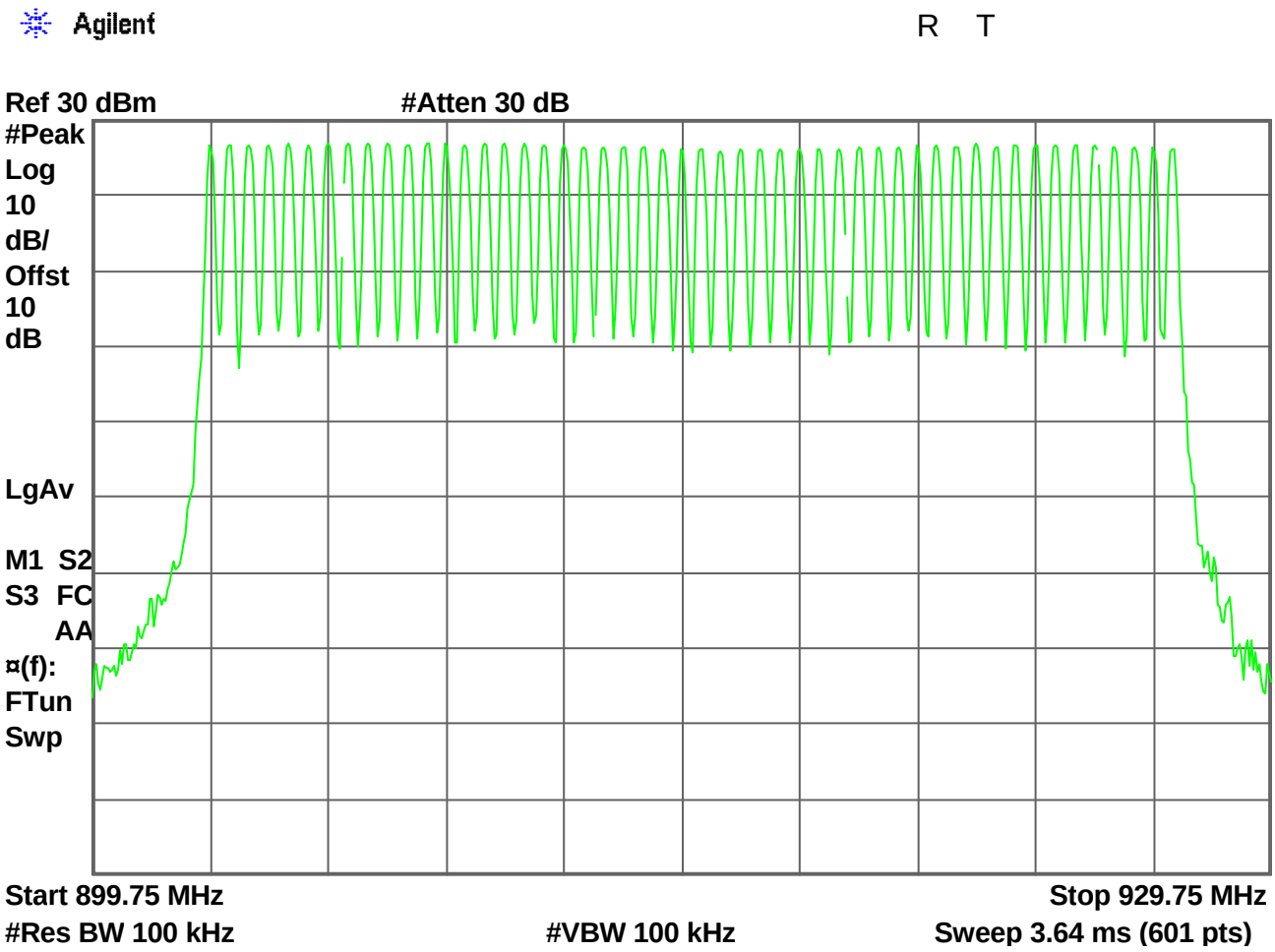
Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	E4446A	09/27/2010

10.4 Measurement Data

Test Date : Apr. 09, 2010 Temperature : 17℃ Humidity : 63%

Number of hopping channels = 50 channels

Note: Please refer to page 40 for chart.


Agilent
R T
Ref 30 dBm
#Atten 30 dB
#Peak
Log
10
dB/
Offst
10
dB
LgAv
M1 S2
S3 FC
AA
¤(f):
FTun
Swp
Start 899.75 MHz
Stop 929.75 MHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 3.64 ms (601 pts)

11 HOPPING CHANNEL CARRIER FREQUENCY SEPARATED

11.1 Standard Applicable

For frequency hopping systems, According to 15.247(a)(1), hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

11.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any measurement frequency within its operating ragne and make sure the instrument is operated in its linear range.
3. Set spectrum analyzer maximum hold to measure channel carrier frequency , then adjust channel carrier frequency to adjacent channel.
4. Repeat above procedure until all measured frequencies were complete.

11.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	E4446A	09/27/2010

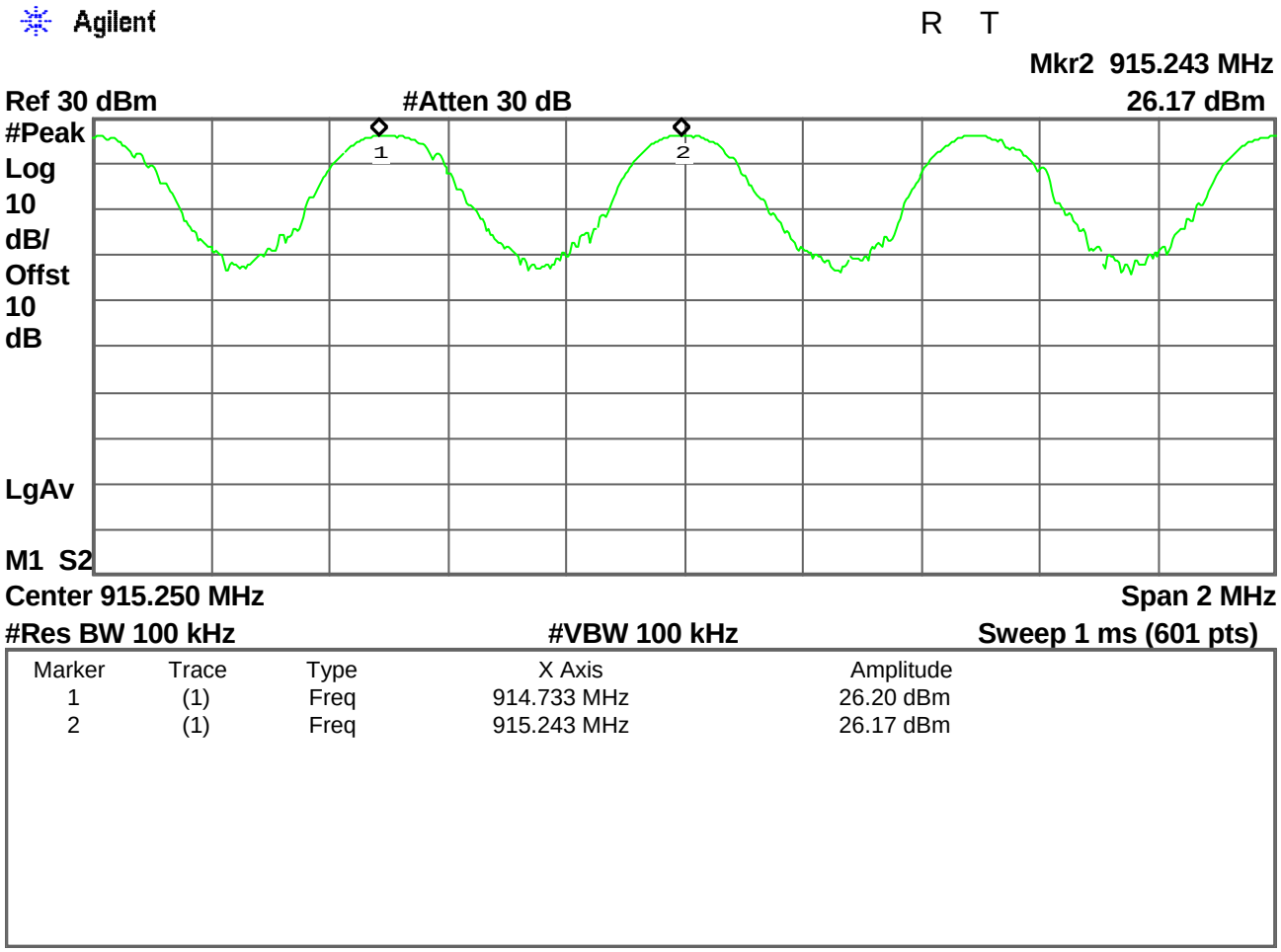
11.4 Measurement Data

Test Date : Apr. 09, 2010 Temperature : 17℃ Humidity : 63%

Channel	Frequency (MHz)	Hopping Channel Carrier Frequency Separated (MHz)	Chart
Mid	915.250	0.510	Page 43

Note: 1. Please refer to page 43 for chart.

2. CH Low, CH Mid and CH High have the same test result. Only CH Mid test result showed in the test report.



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	914.733 MHz	26.20 dBm
2	(1)	Freq	915.243 MHz	26.17 dBm

12 Dwell Time

12.1 Standard Applicable

For frequency hopping systems, According to 15.247(a)(1)(i), 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 shll not be greater than 0.4 seconds within a 10 second period.

12.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4.

12.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	E4446A	09/27/2010

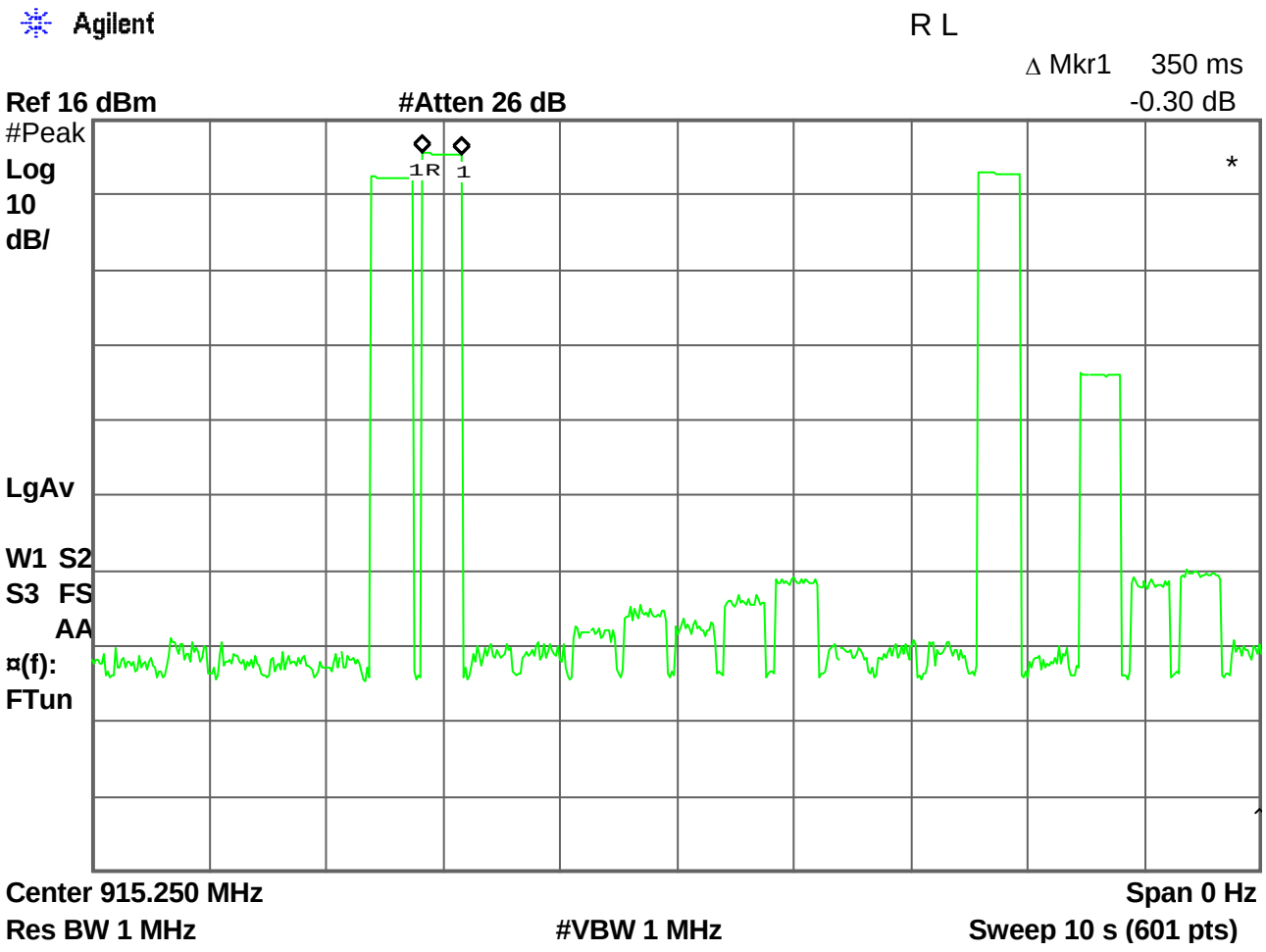
12.4 Measurement Data

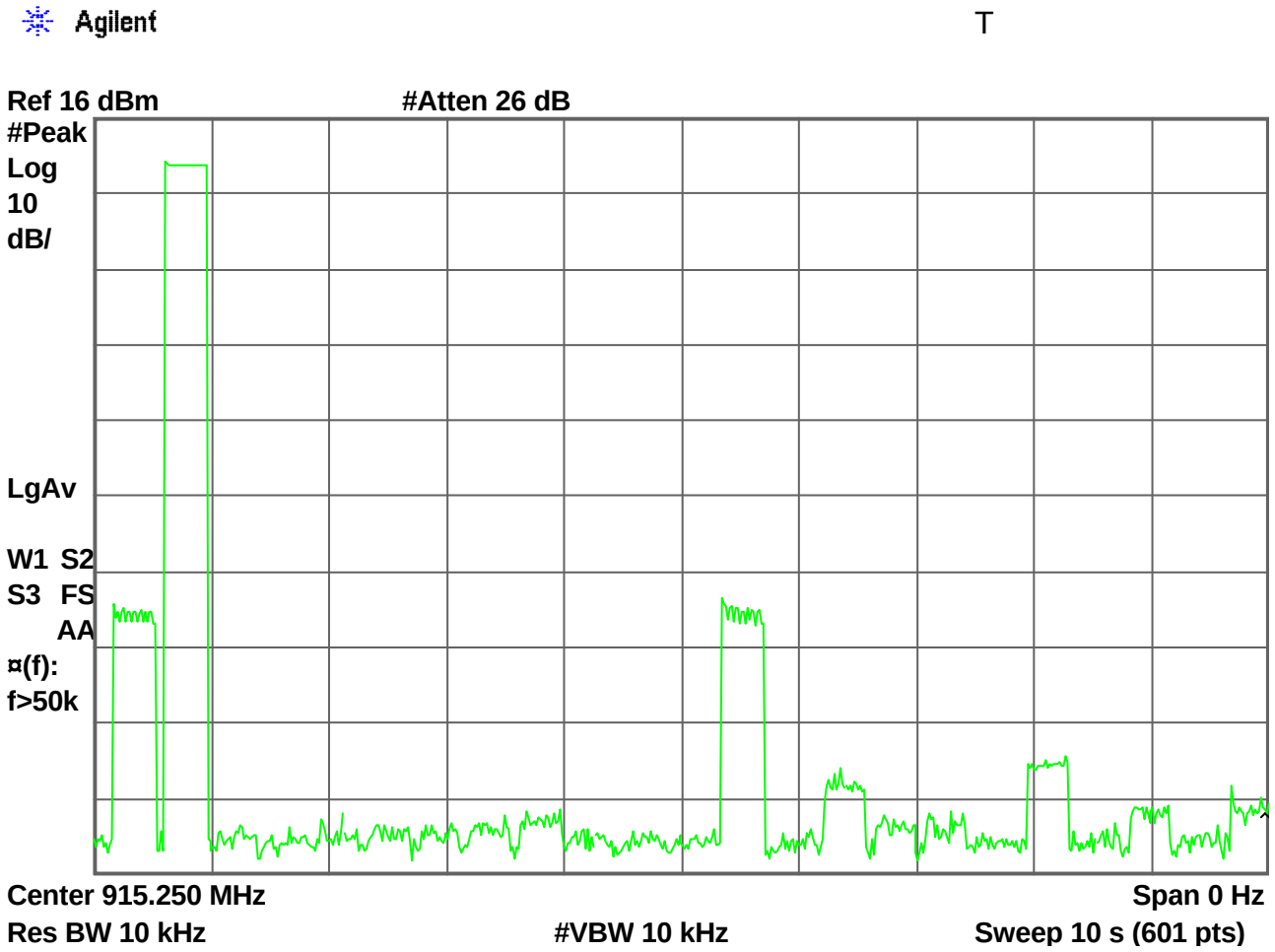
Test Date : Apr. 09, 2010 Temperature : 17℃ Humidity : 63%

Limit: 0.4 sec
Ch Mid dwell time = 350 (m) × 1 = 350 (ms)

Note: 1. Please refer to page 45 to page 46 for chart. . The main peak of CH Mid is rerified to appear one time in the Chart.

2. CH Low, CH Mid and CH High have the same test result. Only Mid test result showed in the test report.


Agilent
R L
Δ Mkr1 350 ms
-0.30 dB
Ref 16 dBm
#Atten 26 dB
#Peak
Log
10
dB/
1R 1
*
LgAv
W1 S2
S3 FS
AA
¤(f):
FTun
Center 915.250 MHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 10 s (601 pts)


Agilent
T
Ref 16 dBm
#Atten 26 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
AA
¤(f):
f>50k
Center 915.250 MHz
Span 0 Hz
Res BW 10 kHz
#VBW 10 kHz
Sweep 10 s (601 pts)