

FCC PART 15.249
EMI MEASUREMENT AND TEST REPORT
For
Shanghai Knorvay Electronic Technology Ltd.
No.593, Chunya Road, Zhangjiang Hi-Tech Park, Shanghai 201201, P.R.China

FCC ID: HAR-N33

April 6, 2012

This Report Concerns: Original Report	Equipment Type: Wireless Presenter
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Report No.:	SHBST2012032101Y-1ER-3
Receive EUT Date/Test Date:	April 1, 2012/ April 2-6, 2012
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TABLE OF CONTENTS

1.	GENERAL INFORMATION	3
1.1.	Report information.....	3
1.2.	Measurement Uncertainty	3
2.	PRODUCT DESCRIPTION	4
2.1.	EUT Description	4
2.2.	Block Diagram of EUT Configuration.....	4
2.3.	Support Equipment List	4
2.4.	Test Conditions	4
3.	FCC ID LABEL.....	5
4.	TEST RESULTS SUMMARY	6
	Modifications	6
5.	TEST EQUIPMENT USED	7
6.	ANTENNA REQUIREMENT	8
6.1.	Standard Applicable	8
6.2.	Antenna Connected Construction	8
6.3.	Result	8
7.	CONDUCTED POWER LINE TEST.....	9
7.1.	Test Equipment	9
7.2.	Test Procedure	9
7.3.	Test Setup.....	9
7.4.	Conducted Power line Emission Limits.....	9
7.5.	Conducted Power Line Test Result.....	10
8.	RADIATED EMISSION TEST	11
8.1.	Test Equipment	11
8.2.	Test Procedure	11
8.3.	Radiated Test Setup	11
8.4.	Radiated Emission Limit.....	13
8.5.	Radiated Emission Test Result	14
9.	BAND EDGE	16
9.1.	Test Equipment	16
9.2.	Test Procedure	16
9.3.	Band Edge FCC 15.249(d) Limit.....	16
9.4.	Band Edge Test Result.....	17

1. GENERAL INFORMATION

1.1. Report information

1.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BST approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BST in any way guarantees the later performance of the product/equipment.

1.1.2. The sample/s mentioned in this report is/are supplied by Applicant, BST therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through BST, unless the applicant has authorized BST in writing to do so.

Test Facility -

The test site used to collect the radiated data is located on the address of SinTek Laboratory Co.,Ltd.

(FCC Registered Test Site Number: 963441) on

No.7, Xinshidai Industrial, Guantian Village, Shiyan Town, Baoan District, Shenzhen, Guangdong 518108, China

The Test Site is constructed and calibrated to meet the FCC requirements.

1.2. Measurement Uncertainty

Available upon request.

2. PRODUCT DESCRIPTION

2.1. EUT Description

Description : Wireless Presenter

Applicant : Shanghai Knorvay Electronic Technology Ltd.
No.593, Chunya Road, Zhangjiang Hi-Tech Park, Shanghai
201201, P.R.China

Model Number : N33, N30, N31, N71, N73, N95, V108, V158, V380, V899

Trade Name : KNORVAY

Frequency : 2415-2475MHz

Power Supply : DC 1.5V ("AAA" battery 1×)

2.2. Block Diagram of EUT Configuration



Figure 1 EUT Setup of TX mode

2.3. Support Equipment List

Name	Model No	S/N	Manufacturer	Used “ ”
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2.4. Test Conditions

Temperature: 20~25

Relative Humidity: 50~63 %

3. FCC ID LABEL

FCC ID: HAR-N33

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.

Label Location on EUT

EUT View/ FCC ID Label Location



4. TEST RESULTS SUMMARY

FCC 15 Subpart C, Paragraph 15.249

FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission	N/A
Section 15.249(a)	The fundamental field strength and the harmonics	Compliant
Section 15.209 Section 15.249(d)	Radiated Emission	Compliant
Section 15.249(d)	Band Edge	Compliant
Section 15.203	Antenna Requirement	Compliant

Remark: "N/A" means "Not applicable".

Statement: All testing was performed using the test procedures found in ANSI C63.4-2003.

Modifications

No modification was made.

5. TEST EQUIPMENT USED

Equipment/Facilities	Manufacturer	Model #	Serial no.	Date of Cal.	Cal. Interval
Cable	Resenberger	N/A	NO.1	Mar 10 , 2012	1 Year
Cable	SCHWARZBECK	N/A	NO.2	Mar 10 , 2012	1 Year
Cable	SCHWARZBECK	N/A	NO.3	Mar 10 , 2012	1 Year
LISN	Rohde & Schwarz	ESH3-Z5	100305	Mar 10 , 2012	1 Year
50 Coaxial Switch	ANRITSU CORP	MP59B	6200283933	Mar 10 , 2012	1 Year
EMI Test Receiver	Rohde & Schwarz	ESP13	100180	Oct.11,2011	1 Year
Spectrum Analyzer	Rohde & Schwarz	FSP40	100273	Sep.10,2011	1 Year
3m Semi-Anechoic Chamber	Albatross Projects	9mx6mx6m	N/A	Feb.20,2012	1 Year
Signal Generator	FLUKE	PM5418 + Y/C	LO747012	Feb.20,2012	1 Year
Signal Generator	FLUKE	PM5418TX	LO738007	Feb.20,2012	1 Year
Loop Antenna	SCHWARZBECK	FMZB1516	113	Jan.30,2012	1 Year
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	9161-4079	Sep.22,2011	1 Year
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-564	Sep.22,2011	1 Year
Horn Antenna	Schwarzbeck	BBHA9170	208 279	May 12, 2011	1 Year
Ultra Broadband Antenna	Rohde & Schwarz	HL-562	100110	June.15,2011	1 Year
AMN	Rohde & Schwarz	ESH3-Z5	100196	Oct.11,2011	1 Year
AMN	Rohde & Schwarz	ESH3-Z5	100197	Oct.11,2011	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	N/A	N/A	N/A
Power Meter	Rohde & Schwarz	NRVD	100041	Feb.20,2012	1 Year
EMI Test Receiver	Rohde & Schwarz	ESCS30	100003	Feb.20,2012	1 Year
Coaxial Cable with N-connectors	SCHWARZBECK	AK9515H	95549	Sep.22,2011	1 Year
Radio Communication Test Set	Rohde & Schwarz	CMS 54	846621/024	Feb.20,2012	1 Year
Modulation Analyzer	Hewlett-Packard	8901B	2303A00362	Feb.20,2012	1 Year
Absorbing clamp	Rohde & Schwarz	MDS-21	N/A	Oct.11,2011	1 Year

6. ANTENNA REQUIREMENT

6.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

6.2. Antenna Connected Construction

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. 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.

The antenna used in this product is SMD Ceramic Antenna. The antenna is permanently attached. Refer to the product photo.

6.3. Result

Compliance

7. CONDUCTED POWER LINE TEST

7.1. Test Equipment

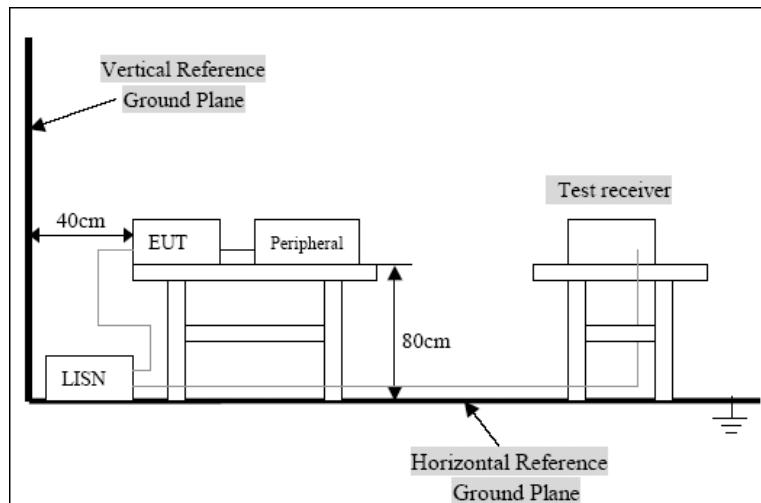
Please refer to section 5 this report.

7.2. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.).This provides a 50ohm/50uh coupling impedance for the measuring equipment.The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling impedance with 50ohm termination.

Both sides of A.C. Line are check for maximum conducted interference.In order to find the maximum emission,the relative positions of equipment and al of the interface cables must be changed according to ASIN C63.4:2003 on conducted measurement .Conducted emissions were invested over the frequency range from 0.15MHz to 30MH z using a receiver bandwidth of 9Khz.

7.3. Test Setup



For the actual test configuration,Please refer to the related items-Photos of testing

7.4. Conducted Power line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency Range (MHZ)	Class A QP/AV	Class B QP/AV
0.15-0.5	79/66	65-56/56-46
0.5-5.0	73/60	56-46
5.0-3.0	73/60	60-50

Note: In the above table, the tighter limit applies at the band edges.

7.5. Conducted Power Line Test Result

N/A.

There is no connection to AC mains. Therefore, the test is not applicable and skipped.

8. RADIATED EMISSION TEST

8.1. Test Equipment

Please refer to section 5 this report.

8.2. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Calibrated Loop antenna is used as receiving antenna for frequencies below 30MHz, Calibrated Bilog antenna is used as receiving antenna for frequencies between 30 MHz and 1 GHz, Calibrated Horn antenna is used as receiving antenna for frequencies above 1000MHz. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated emission measurement.

The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.

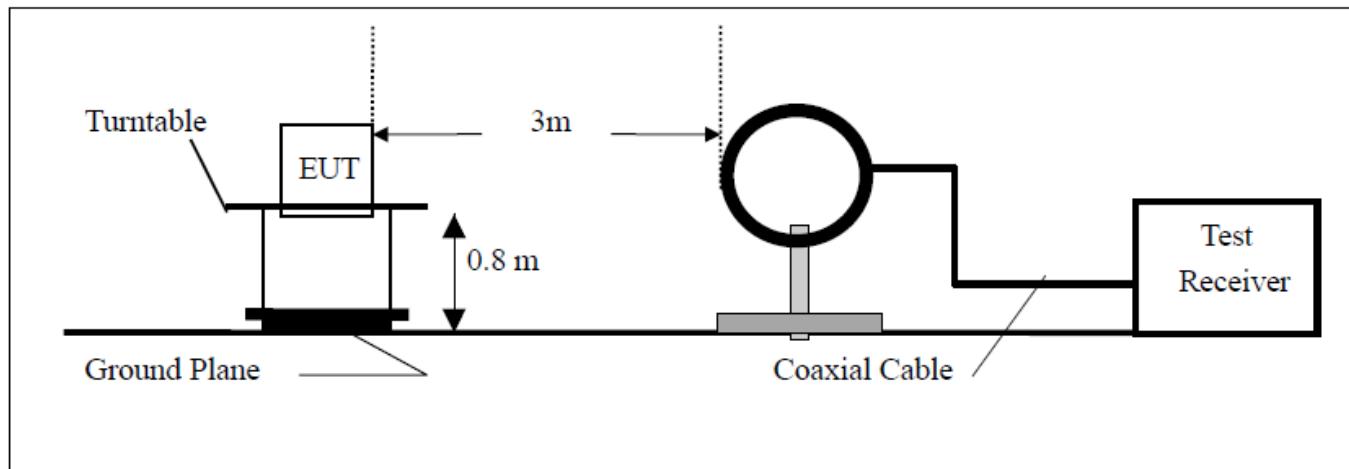
The frequency range from 9kHz to 25GHz is checked.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Peak detector and Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.

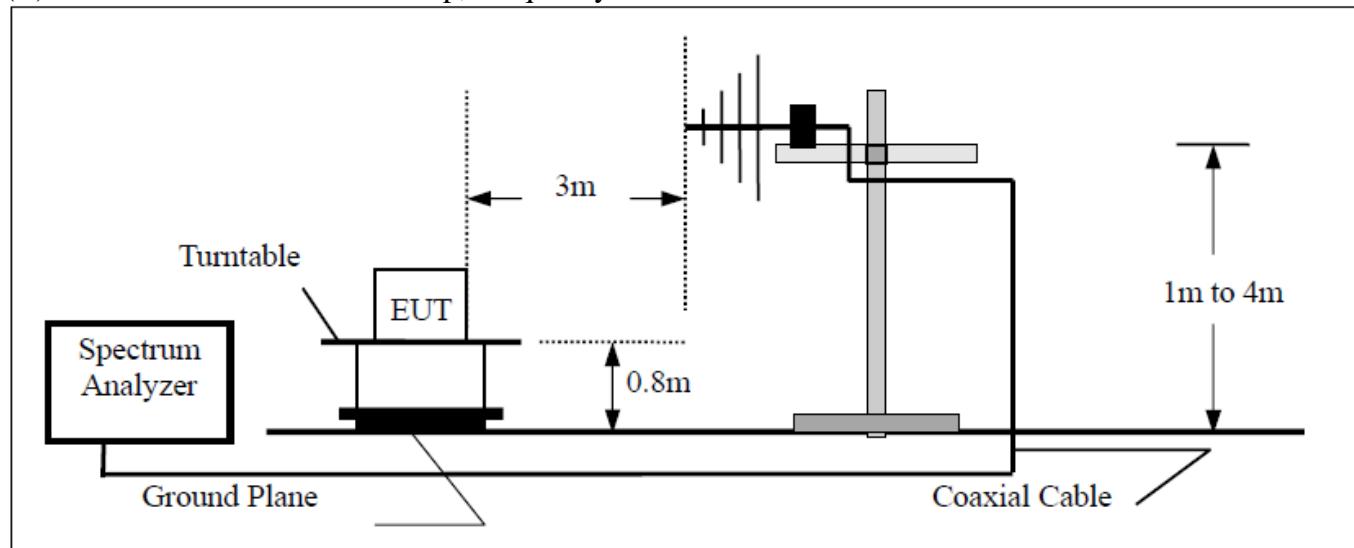
Through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit.

8.3. Radiated Test Setup

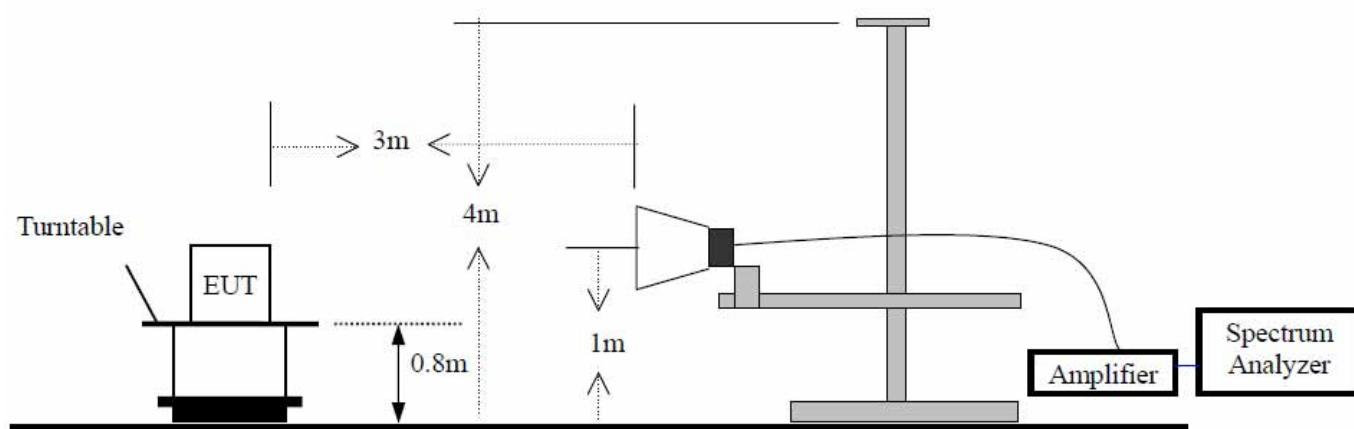
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



8.4. Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below :

A . Fundamental and Harmonics Radiated Emissions 15.249(a) Limit

Fundamental Frequency (MHZ)	Field as strength of Fundamental(3m)			Field as strength of Harmonics(3m)		
	mV/m	dBuV/m		uV/m	dBuV/m	
902~928	50	94(AV)	114(Peak)	500	54(AV)	74(Peak)
2400~2483.5	50	94(AV)	114(Peak)	500	54(AV)	74(Peak)

Note: (1) RF Voltage (dBuV)=20 log Voltage(uV)

(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

(3) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

B. Spurious Radiated Emissions.

Frequency (MHz)	Limit				The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mentioned above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
	Field Strength of Quasi-peak Value (microvolts/m)	Field Strength of Quasi-peak Value (dB μ V/m)	Measurement distance (m)		
0.009 - 0.490	2400/F(kHz)	/	300		
0.490 - 1.705	24000/F(kHz)	/	30		
1.705-30	30	29.5	30		
30 - 88	100	40	3		
88 - 216	150	43.5	3		
216 - 960	200	46	3		
Above 960	500	54	3		

Note: (1) RF Voltage (dBuV)=20 log Voltage(uV)

(2) In the Above Table, the tighter limit applies at the band edges.

(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

8.5. Radiated Emission Test Result

Pass

The frequency range from 9kHz to 25GHz is checked. The measurements greater than 20dB below the limit are not report.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Peak detector and Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.

A. Fundamental Radiated Emissions Data

CH Low

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2415	87.14/93.08	VERT	94/114	6.86/20.92
2415	85.37/91.56	HORIZ	94/114	8.63/22.44

CH Middle

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2445	86.71/92.29	VERT	94/114	7.29/21.71
2445	84.32/90.22	HORIZ	94/114	9.68/23.78

CH High

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2475	86.84/92.78	VERT	94/114	7.16/21.22
2475	84.68/90.58	HORIZ	94/114	9.32/23.42

B. Harmonics Radiated Emissions Data

CH Low

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4830.000	42.03/47.19	VERT	54.0/74.0	11.97/26.81
7245.000	37.16/42.82	VERT	54.0/74.0	16.84/31.18
4830.000	42.25/47.75	HORIZ	54.0/74.0	11.75/26.25
7245.000	36.23/41.75	HORIZ	54.0/74.0	17.77/32.25

Emissions attenuated more than 20 dB below the permissible value are not reported.

CH Middle

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4890.000	41.85/46.95	VERT	54.0/74.0	12.15/27.05
7335.000	38.62/43.44	VERT	54.0/74.0	15.38/30.56
4890.000	41.24/46.08	HORIZ	54.0/74.0	12.76/27.92
7335.000	36.11/41.28	HORIZ	54.0/74.0	17.89/32.72

Emissions attenuated more than 20 dB below the permissible value are not reported.

CH High

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4950.000	41.96/47.16	VERT	54.0/74.0	12.04/26.84
7425.000	39.02/44.32	VERT	54.0/74.0	14.98/29.68
4950.000	41.77/46.92	HORIZ	54.0/74.0	12.23/27.08
7425.000	37.68/42.16	HORIZ	54.0/74.0	16.32/31.84

Emissions attenuated more than 20 dB below the permissible value are not reported.

C. General Radiated Emissions Data

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
-	-	HORIZ	-	-
-	-	VERT	-	-

Emissions attenuated more than 20 dB below the permissible value are not reported.

9. BAND EDGE

9.1. Test Equipment

Please refer to Section 5 this report.

9.2. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz respectively.

9.3. Band Edge FCC 15.249(d) Limit

In any 100kHz 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 50dB

below that in the 100kHz bandwidth within the band that contains the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

9.4. Band Edge Test Result

Pass

TX 2415MHz

Frequency (MHz)	Result(dB μ V/m)		Limit(dB μ V/m)		Margin(dB)		Polarization
	AV	PEAK	AV	PEAK	AV	PEAK	
2394.700	34.86	40.13	54	74	19.14	33.87	Vertical
2395.000	33.07	38.25	54	74	20.93	35.75	Vertical
2394.700	33.74	38.56	54	74	20.26	35.44	Horizontal
2395.000	32.69	38.01	54	74	21.31	35.99	Horizontal

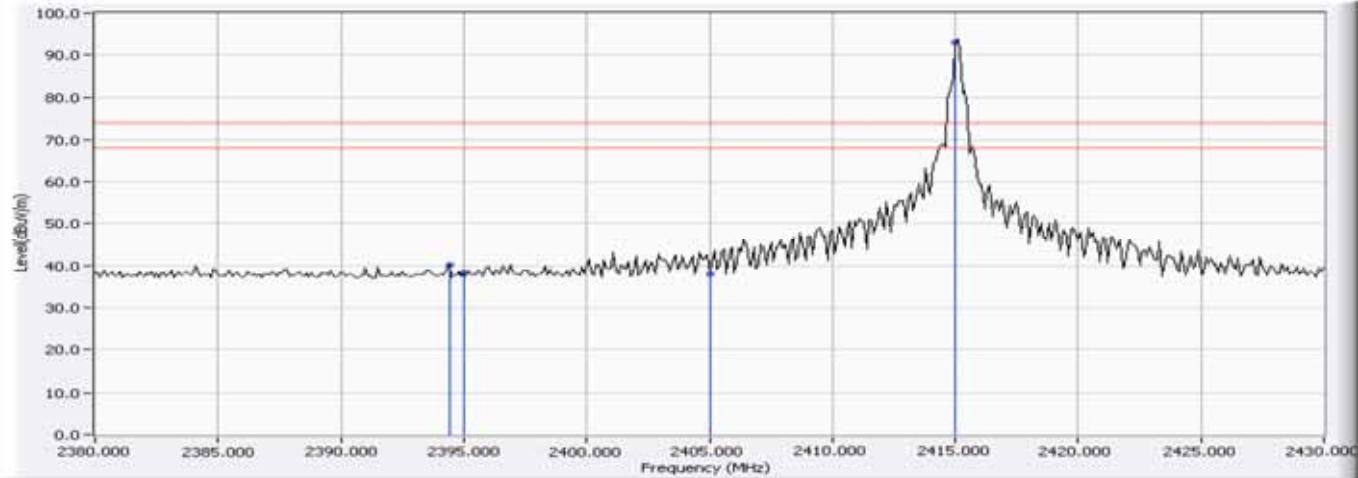
Emissions attenuated more than 20 dB below the permissible value are not reported.

TX 2475MHz

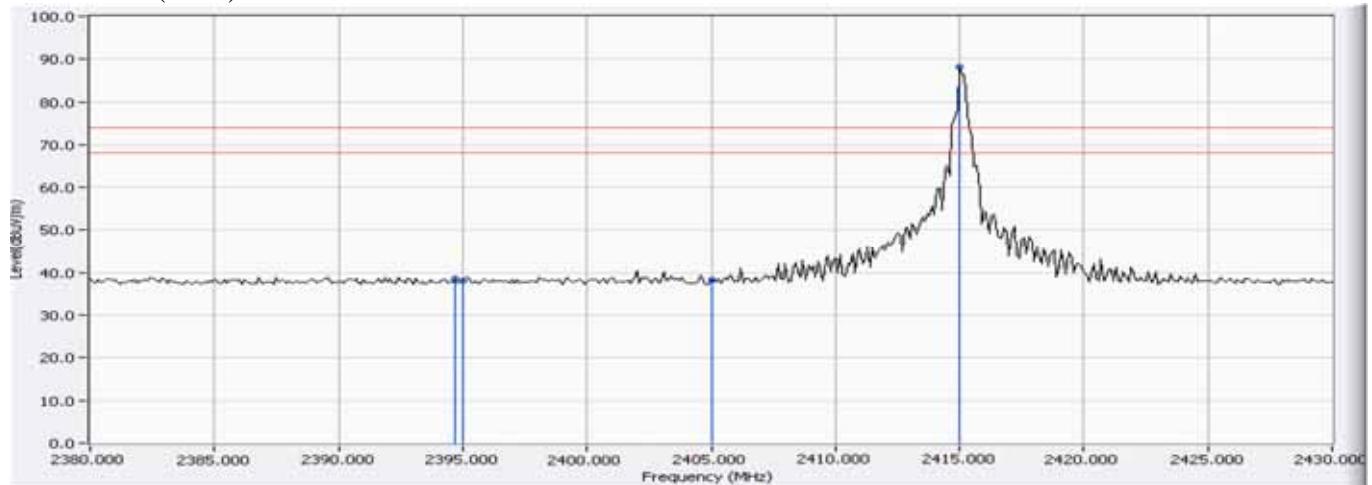
Frequency (MHz)	Result(dB μ V/m)		Limit(dB μ V/m)		Margin(dB)		Polarization
	AV	PEAK	AV	PEAK	AV	PEAK	
2483.500	35.62	41.92	54	74	18.38	32.08	Vertical
2500.000	33.81	39.09	54	74	20.19	34.91	Vertical
2483.500	32.13	37.72	54	74	21.87	36.28	Horizontal
2485.500	34.06	39.40	54	74	19.94	34.60	Horizontal
2500.000	32.48	38.71	54	74	21.52	35.29	Horizontal

Emissions attenuated more than 20 dB below the permissible value are not reported.

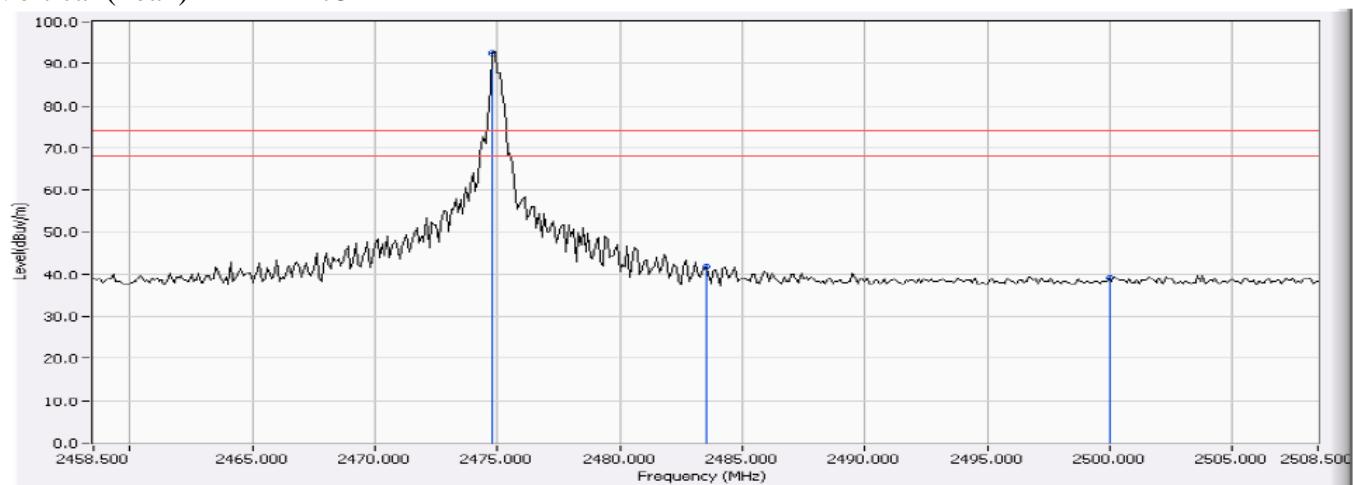
Vertical (Peak) TX 2415MHz



Horizontal (Peak) TX 2415MHz



Vertical (Peak) TX 2475MHz



Horizontal (Peak) TX 2475MHz

