ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

2.4 GHz WIRELESS KEYBOARD

MODEL NO.: KB-BTCTX

TRADE NAME: ARFA

FCC ID: O7F-RFKBTX01

REPORT NO: 020007-R

ISSUE DATE: March 18, 2002

Prepared for

ARFA Technology Inc.
5F, No. 13, Lane 235, Pao Chiao Rd.,
Hsintien, Taipei Hsien, Taiwan, R. O. C.

Prepared by

C&C LABORATORY, CO., LTD.
#B1, 1st Fl., Universal Center,
No. 183, Sec. 1, Tatung Rd., Hsi Chih,
Taipei Hsien, Taiwan, R.O.C.
TEL: (02)8642-2071~3
FAX: (02)8642-2256

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TEST REPORT CERTIFICATION

Applicant : **ARFA Technology Inc.**

Manufacturer : **CHAIN PLUS INFORMATION INC.**

Description of EUT

a) Product : **2.4 GHz WIRELESS KEYBOARD**

b) Model No. : **KB-BTCTX**

c) Power Rating : **3VDC**

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (2000)

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of C&C Laboratory Co. Ltd.

Issued Date: March 18, 2002

Approve & Authorized Signer:

Steven Wang / RF Manager

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1 GENERAL INFORMATION

1.1 Product Description

a) Product	: **2.4 GHz WIRELESS KEYBOARD**
b) Model No.	: **KB-BTCTX**
c) FCC ID	: **O7F-RFKBTX01**
d) Frequency Range	: **2404MHz to 2480MHz**
e) Channel Number	: **16 Channels**
f) Type of Modulation	: **FSK**
g) Power Rating	: **3VDC**

1.2 Characteristics of Device

The EUT is intended for transmission of wireless keyboard. There are sixteen channels for operation, and the used transmitting frequencies are 2404MHz to 2480MHz.

1.3 Test Methodology

For wireless keyboard, radiated emissions were performed according to the procedures illustrated in ANSI C63.4 (1992). Other required measurements were illustrated in separate sections of this test report for details.

1.4 Test Facility

The open area test sites and conducted measurement facilities used to collect the radiated data are located at No. 81-1, 210 Lane, Pa-de 2nd Road, Lu-Chu Hsiang, Taoyuan, Taiwan, R.O.C. The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22.

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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.

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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	Emissions µV	Emissions dBµV
0.45 - 30.0	250	48.0

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 dBµV/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.

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For intentional radiator device, per § 15.249(a), the field strength of emissions shall comply with the following :

Frequency MHz	Distance Meters	Fundamental dB μ V/m	Fundamental mV/m	Harmonic dB μ V/m	Harmonic μ V/m
902 - 928	3	94	50	54	500
2400 - 2483.5	3	94	50	54	500
5725 - 5875	3	94	50	54	500
24000 - 24250	3	108	250	68	2500

In accordance with § 15.249(d), limits shown in above table are based on average limits for frequencies above 1000 MHz, and frequencies below 1000 MHz are based on quasi peak. However, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20 dB.

(3) Spurious in Out Band Requirement

For intentional device, according to § 15.249 (c), emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits in § 15.209.

(4) Antenna Requirement

For intentional device, 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.

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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	3360-4400	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.

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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.

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3 SYSTEM TEST CONFIGURATION

3.1 Justification

All measurement were intentional to maximum the emissions from EUT by varying the connection cables, therefore, the test result is sure to meet the applicable requirement.

3.2 Devices for Tested System

Device	Manufacture	Model	FCC ID	Description
*2.4 GHz WIRELESS KEYBOARD	CHAIN PLUS INFORMATION INC.	KB-BTCTX	O7F-RFKBTX01	3VDC

Remark "*" means equipment under test.

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4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For intentional radiators, according to § 15.249 (a), operation within the frequency band of 2.4 to 2.4835 GHz, the fundamental field strength shall not exceed 94 dBuV/m and the harmonics shall not exceed 54 dBuV/m. For out band emission except for harmonics shall be comply with § 15.209 or at least attenuated by 50 dB below the level of the fundamental.

4.2 Measurement Procedure

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, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also 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 100 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 band pass filter was used to avoid pre-amplifier saturated when measure TX operation mode in frequency band above 1 GHz.
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 placement of cables associated with EUT to obtain the worse case and record the result.

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Figure 1: Frequencies measured below 1 GHz configuration

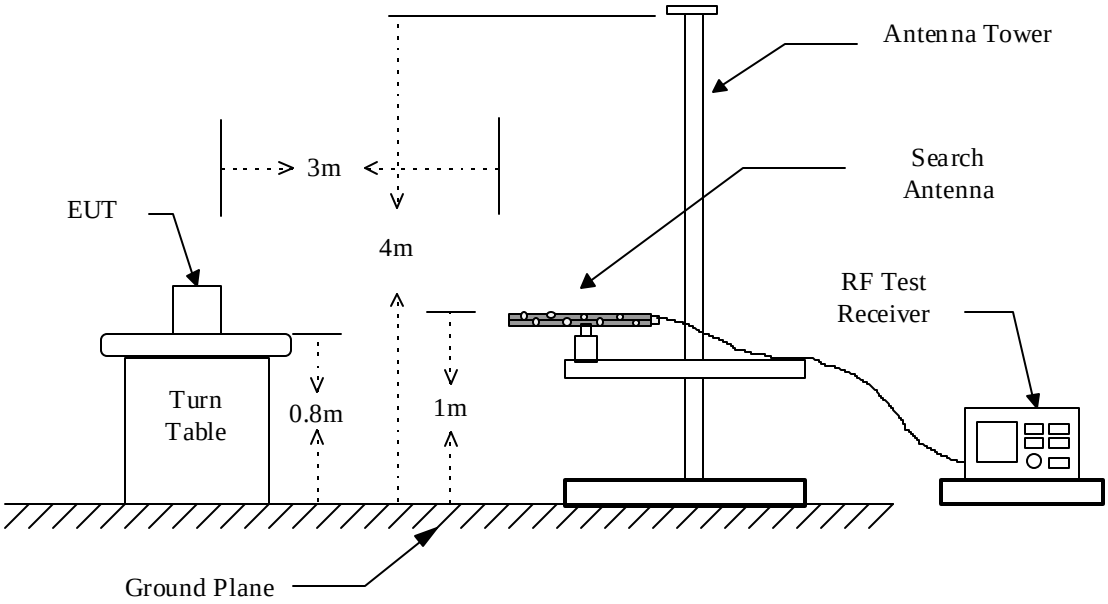
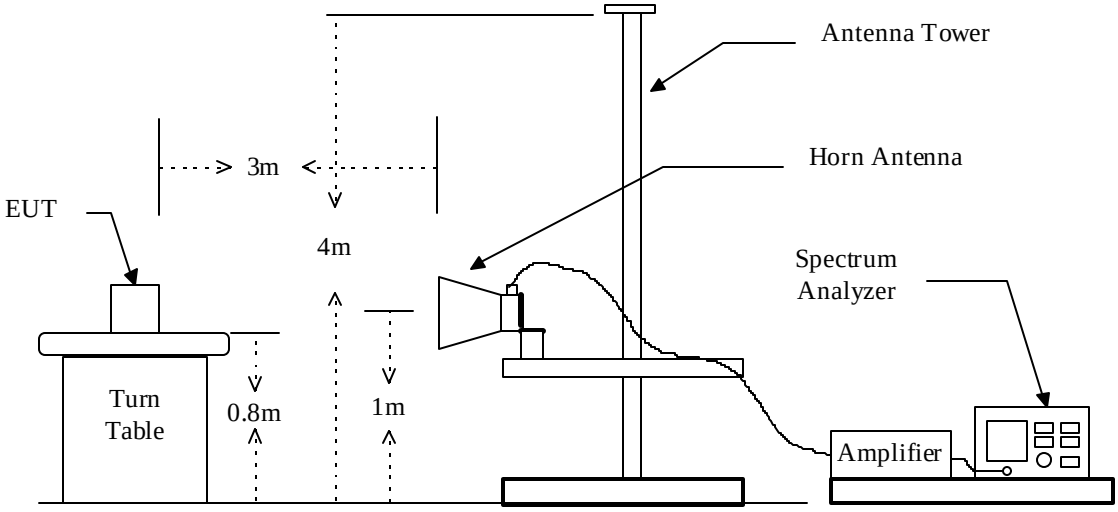


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

☒ **Open Area Test Site:** #3

Open Area Test Site # 3					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	ADVANTEST	R3261A	N/A	03/19/2002	03/18/2003
EMI Test Receiver	R&S	ESVS20	838804/004	01/05/2002	01/04/2003
Pre-Amplifier	HP	8447D	2944A09173	03/04/2002	03/03/2003
Bilog Antenna	SCHWARZBECK	VULB9163	128	02/02/2002	02/01/2003
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R	N.C.R
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R	N.C.R
RF Switch	ANRITSU	MP59B	M53867	N.C.R	N.C.R
Site NSA	C&C	N/A	N/A	11/17/2001	11/16/2002
Horn Antenna	SCHWARZBECK	BBHA 9120	D210	02/22/2002	02/21/2003
Horn Antenna	EMCO	3116	2487	08/25/2001	08/24/2002
Pre Amplifier	HP	8449B	3008A00965	10/03/2001	10/02/2002
Spectrum Analyzer	R&S	FSP30	100112	05/28/2002	05/27/2003
Hi Pass Filter	HP	84300-80038	010	08/02/2001	08/01/2002

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	120kHz	N/A
	Spectrum Analyzer	Peak	100kHz	100kHz
Above 1000	Spectrum Analyzer	Peak	1MHz	1MHz
	Spectrum Analyzer	Average	1MHz	300Hz

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4.4 Radiated Emission Data

4.4.1 Tx Portion

Operation Mode:	Transmitting Mode	Test Date:	February 26, 2002
Fundamental Frequency:	2405MHz (CH 0)	Test By:	Markba Lee
Temperature:	25 ℃	Pol:	Vertical
Humidity:	70 %		

Freq. (MHz)	Reading (dBuV)	AF (dBuV)	Closs (dB)	Pre-amp (dB)	Filter (dB)	Dist (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Mark (P/Q/A)	Pol (H/V)
2404.40	65.15	27.37	5.19	37.42	0	9.5	50.79	114.00	-63.21	P	V
2404.40	62.00	27.37	5.19	37.42	0	9.5	47.64	94.00	-46.36	A	V
4809.00*	53.97	31.85	6.29	37.05	1	9.5	46.56	74.00	-27.44	P	V
4809.00*	46.79	31.85	6.29	37.05	1	9.5	39.38	54.00	-14.62	A	V
7213.10	---	---	---	---	---	---	---	74.00	---	---	---
7213.10	---	---	---	---	---	---	---	54.00	---	---	---
9617.60	---	---	---	---	---	---	---	74.00	---	---	---
9617.60	---	---	---	---	---	---	---	54.00	---	---	---
12021.90*	---	---	---	---	---	---	---	74.00	---	---	---
12021.90*	---	---	---	---	---	---	---	54.00	---	---	---
14426.40	---	---	---	---	---	---	---	74.00	---	---	---
14426.40	---	---	---	---	---	---	---	54.00	---	---	---
16830.80	---	---	---	---	---	---	---	74.00	---	---	---
16830.80	---	---	---	---	---	---	---	54.00	---	---	---
19235.20*	---	---	---	---	---	---	---	74.00	---	---	---
19235.20*	---	---	---	---	---	---	---	54.00	---	---	---
21639.60	---	---	---	---	---	---	---	74.00	---	---	---
21639.60	---	---	---	---	---	---	---	54.00	---	---	---
24044.00	---	---	---	---	---	---	---	74.00	---	---	---
24044.00	---	---	---	---	---	---	---	54.00	---	---	---

Note :
1. Measurement was up to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter

   Insertion Loss (3.5GHz) Dist: Correction to extra plate reading to 3m-specification distance

   1M-measurement distance: -9.5dB
3. Analyzer setting P(Peak):RBW=1MHz,VBW=1MHz,A(Average):RBW=1MHz,VBW=10Hz
4. Remark "*" means that Restricted band.

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Operation Mode:	Transmitting Mode	Test Date:	February 26, 2002
Fundamental Frequency:	2405MHz (CH 0)	Test By:	Markba Lee
Temperature:	25 ℃	Pol:	Horizontal
Humidity:	70 %		

Freq.	Reading	AF	Closs	Pre-amp	Filter	Dist	Level	Limit	Margin	Mark	Pol
(MHz)	(dBuV)	(dBuV)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	FCC_B	(dB)	(P/Q/A)	(H/V)
2404.40	56.39	27.37	4.86	37.42	0	9.5	41.70	114.00	-72.30	P	H
2404.40	52.70	27.37	4.86	37.42	0	9.5	38.01	94.00	-55.99	A	H
4809.00*	47.94	31.85	7.24	37.05	1	9.5	41.48	74.00	-32.52	P	H
4809.00*	39.79	31.85	7.24	37.05	1	9.5	33.33	54.00	-20.67	A	H
7213.10	---	---	---	---	---	---	---	74.00	---	---	---
7213.10	---	---	---	---	---	---	---	54.00	---	---	---
9617.60	---	---	---	---	---	---	---	74.00	---	---	---
9617.60	---	---	---	---	---	---	---	54.00	---	---	---
12021.90*	---	---	---	---	---	---	---	74.00	---	---	---
12021.90*	---	---	---	---	---	---	---	54.00	---	---	---
14426.40	---	---	---	---	---	---	---	74.00	---	---	---
14426.40	---	---	---	---	---	---	---	54.00	---	---	---
16830.80	---	---	---	---	---	---	---	74.00	---	---	---
16830.80	---	---	---	---	---	---	---	54.00	---	---	---
19235.20*	---	---	---	---	---	---	---	74.00	---	---	---
19235.20*	---	---	---	---	---	---	---	54.00	---	---	---
21639.60	---	---	---	---	---	---	---	74.00	---	---	---
21639.60	---	---	---	---	---	---	---	54.00	---	---	---
24044.00	---	---	---	---	---	---	---	74.00	---	---	---
24044.00	---	---	---	---	---	---	---	54.00	---	---	---

Note:

1. Measurement was up to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz) Dist: Correction to extra plate reading to 3m-specification distance 1M-measurement distance: -9.5dB
3. Analyzer setting P(Peak):RBW=1MHz,VBW=1MHz,A(Average):RBW=1MHz,VBW=10Hz
4. Remark "*" means that Restricted band.

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Operation Mode:	Transmitting Mode	Test Date:	February 26, 2002
Fundamental Frequency:	2439.30MHz (CH7)	Test By:	Markba Lee
Temperature:	25 ℃	Pol:	Vertical
Humidity:	70 %		

Freq.	Reading	AF	Closs	Pre-amp	Filter	Dist	Level	Limit	Margin	Mark	Pol
(MHz)	(dBuV)	(dBuV)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	FCC_B	(dB)	(P/Q/A)	(H/V)
2439.30	65.76	27.45	5.25	37.41	0	9.5	51.55	114.00	-62.45	P	V
2439.30	62.88	27.45	5.25	37.41	0	9.5	48.67	94.00	-45.33	A	V
4878.80*	51.99	31.90	6.17	37.08	1	9.5	44.48	74.00	-29.52	P	V
4878.80*	44.61	31.90	6.17	37.08	1	9.5	37.10	54.00	-16.90	A	V
7318.46*	---	---	---	---	---	---	---	74.00	---	---	---
7318.46*	---	---	---	---	---	---	---	54.00	---	---	---
9757.20	---	---	---	---	---	---	---	74.00	---	---	---
9757.20	---	---	---	---	---	---	---	54.00	---	---	---
12197.26*	---	---	---	---	---	---	---	74.00	---	---	---
12197.26*	---	---	---	---	---	---	---	54.00	---	---	---
14635.80	---	---	---	---	---	---	---	74.00	---	---	---
14635.80	---	---	---	---	---	---	---	54.00	---	---	---
17075.10	---	---	---	---	---	---	---	74.00	---	---	---
17075.10	---	---	---	---	---	---	---	54.00	---	---	---
19514.40*	---	---	---	---	---	---	---	74.00	---	---	---
19514.40*	---	---	---	---	---	---	---	54.00	---	---	---
21953.70	---	---	---	---	---	---	---	74.00	---	---	---
21953.70	---	---	---	---	---	---	---	54.00	---	---	---
24393.00	---	---	---	---	---	---	---	74.00	---	---	---
24393.00	---	---	---	---	---	---	---	54.00	---	---	---

Note:

1. Measurement was up to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz) Dist: Correction to extra plate reading to 3m-specification distance 1M-measurement distance: -9.5dB
3. Analyzer setting P (Peak):RBW=1MHz,VBW=1MHz,A(Average):RBW=1MHz,VBW=10Hz
4. Remark "*" means that Restricted band.

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Operation Mode:	Transmitting Mode	Test Date:	February 26, 2002
Fundamental Frequency:	2439.30MHz (CH 7)	Test By:	Markba Lee
Temperature:	25 ℃	Pol:	Horizontal
Humidity:	70 %		

Freq. (MHz)	Reading (dBuV)	AF (dBuV)	Closs (dB)	Pre-amp (dB)	Filter (dB)	Dist (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Mark (P/Q/A)	Pol (H/V)
2439.30	56.69	27.45	5.25	37.41	0	9.5	42.48	114.00	-71.52	P	H
2439.30	52.78	27.45	5.25	37.41	0	9.5	38.57	94.00	-55.43	A	H
4878.80*	48.84	31.90	6.17	37.08	1	9.5	41.33	74.00	-32.67	P	H
4878.80*	39.89	31.00	6.17	37.08	1	9.5	31.48	54.00	-22.52	A	H
7318.46*	---	---	---	---	---	---	---	74.00	---	---	---
7318.46*	---	---	---	---	---	---	---	54.00	---	---	---
9757.20	---	---	---	---	---	---	---	74.00	---	---	---
9757.20	---	---	---	---	---	---	---	54.00	---	---	---
12197.26*	---	---	---	---	---	---	---	74.00	---	---	---
12197.26*	---	---	---	---	---	---	---	54.00	---	---	---
14635.80	---	---	---	---	---	---	---	74.00	---	---	---
14635.80	---	---	---	---	---	---	---	54.00	---	---	---
17075.10	---	---	---	---	---	---	---	74.00	---	---	---
17075.10	---	---	---	---	---	---	---	54.00	---	---	---
19514.40*	---	---	---	---	---	---	---	74.00	---	---	---
19514.40*	---	---	---	---	---	---	---	54.00	---	---	---
21953.70	---	---	---	---	---	---	---	74.00	---	---	---
21953.70	---	---	---	---	---	---	---	54.00	---	---	---
24393.00	---	---	---	---	---	---	---	74.00	---	---	---
24393.00	---	---	---	---	---	---	---	54.00	---	---	---

Note:

1. Measurement was up to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz) Dist: Correction to extra plate reading to 3m specification distance 1M-measurement distance: -9.5dB
3. Analyzer setting P (Peak):RBW=1MHz,VBW=1MHz,A(Average):RBW=1MHz,VBW=10Hz
4. Remark "*" means that Restricted band.

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Operation Mode:	Transmitting Mode	Test Date:	February 26, 2002
Fundamental Frequency:	2480MHz (CH 15)	Test By:	Markba Lee
Temperature:	25 ℃	Pol:	Vertical
Humidity:	70 %		

Freq. (MHz)	Reading (dBuV)	AF (dBuV)	Closs (dB)	Pre-amp (dB)	Filter (dB)	Dist (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Mark (P/Q/A)	Pol (H/V)
2479.80	64.28	27.55	5.32	37.39	0	9.5	50.26	114.00	-63.74	P	V
2479.80	63.53	27.55	5.32	37.39	0	9.5	49.51	94.00	-44.49	A	V
4959.60*	52.83	31.97	6.02	37.12	1	9.5	45.20	74.00	-28.80	P	V
4959.60*	48.74	31.97	6.20	37.12	1	9.5	41.29	54.00	-12.71	A	V
7439.80*	---	---	---	---	---	---	---	74.00	---	---	---
7439.80*	---	---	---	---	---	---	---	54.00	---	---	---
9919.20	---	---	---	---	---	---	---	74.00	---	---	---
9919.20	---	---	---	---	---	---	---	54.00	---	---	---
12399.50*	---	---	---	---	---	---	---	74.00	---	---	---
12399.50*	---	---	---	---	---	---	---	54.00	---	---	---
14878.80	---	---	---	---	---	---	---	74.00	---	---	---
14878.80	---	---	---	---	---	---	---	54.00	---	---	---
17358.60	---	---	---	---	---	---	---	74.00	---	---	---
17358.60	---	---	---	---	---	---	---	54.00	---	---	---
19838.40*	---	---	---	---	---	---	---	74.00	---	---	---
19838.40*	---	---	---	---	---	---	---	54.00	---	---	---
22318.20*	---	---	---	---	---	---	---	74.00	---	---	---
22318.20*	---	---	---	---	---	---	---	54.00	---	---	---
24798.00	---	---	---	---	---	---	---	74.00	---	---	---
24798.00	---	---	---	---	---	---	---	54.00	---	---	---

Note:

1. Measurement was up to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz) Dist: Correction to extra plate reading to 3m-specification distance 1M-measurement distance: -9.5dB
3. Analyzer setting P(Peak):RBW=1MHz,VBW=1MHz,A(Average):RBW=1MHz,VBW=10Hz
4. Remark "*" means that Restricted band.

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Operation Mode:	Transmitting Mode	Test Date:	February 26, 2002
Fundamental Frequency:	2480MHz (CH 15)	Test By:	Markba Lee
Temperature:	25 ℃	Pol:	Horizontal
Humidity:	70 %		

Freq. (MHz)	Reading (dBuV)	AF (dBuV)	Closs (dB)	Pre-amp (dB)	Filter (dB)	Dist (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Mark (P/Q/A)	Pol (H/V)
2479.80	58.05	27.55	5.32	37.39	0	9.5	44.03	114.00	-69.97	P	H
2479.80	56.03	27.55	5.32	37.39	0	9.5	42.01	94.00	-51.99	A	H
4959.60*	49.25	31.97	6.02	37.12	1	9.5	41.62	74.00	-32.38	P	H
4959.60*	42.88	31.97	6.02	37.12	1	9.5	35.25	54.00	-18.75	A	H
7439.80*	---	---	---	---	---	---	---	74.00	---	---	---
7439.80*	---	---	---	---	---	---	---	54.00	---	---	---
9919.20	---	---	---	---	---	---	---	74.00	---	---	---
9919.20	---	---	---	---	---	---	---	54.00	---	---	---
12399.50*	---	---	---	---	---	---	---	74.00	---	---	---
12399.50*	---	---	---	---	---	---	---	54.00	---	---	---
14878.80	---	---	---	---	---	---	---	74.00	---	---	---
14878.80	---	---	---	---	---	---	---	54.00	---	---	---
17358.60	---	---	---	---	---	---	---	74.00	---	---	---
17358.60	---	---	---	---	---	---	---	54.00	---	---	---
19838.40*	---	---	---	---	---	---	---	74.00	---	---	---
19838.40*	---	---	---	---	---	---	---	54.00	---	---	---
22318.20*	---	---	---	---	---	---	---	74.00	---	---	---
22318.20*	---	---	---	---	---	---	---	54.00	---	---	---
24798.00	---	---	---	---	---	---	---	74.00	---	---	---
24798.00	---	---	---	---	---	---	---	54.00	---	---	---

Note:

1. Measurement was up to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz) Dist: Correction to extra plate reading to 3m-specification distance 1M-measurement distance: -9.5dB
3. Analyzer setting P (Peak):RBW=1MHz,VBW=1MHz,A(Average):RBW=1MHz,VBW=10Hz
4. Remark "*" means that Restricted band.

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4.4.2 Other Emissions

The following test mode(s) were scanned during the preliminary test:

Mode(s):

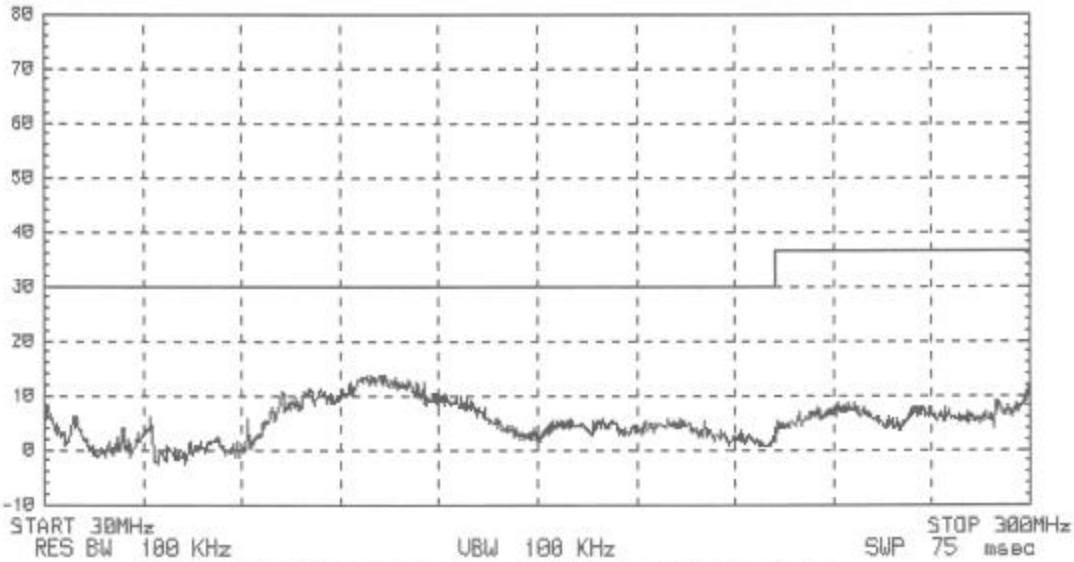
1. **CH 0 Transmitting**
2. **CH 7 Transmitting**
3. **CH 15 Transmitting**

Note:

1. The emissions level is too low to be measured.
2. Please refer to Plott as below.

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Vertical-10 M	Time:	15:16:29
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-0			File Ref.	:22733



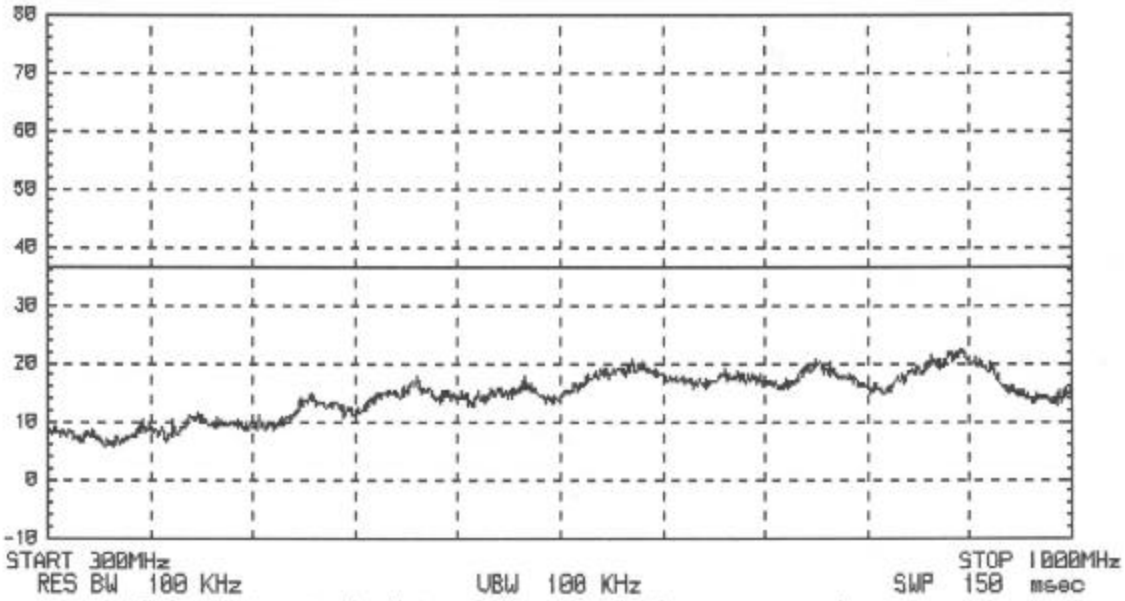
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22733

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Vertical-10 M	Time:	15:18:32
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC ---	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-0			File Ref.:	22734



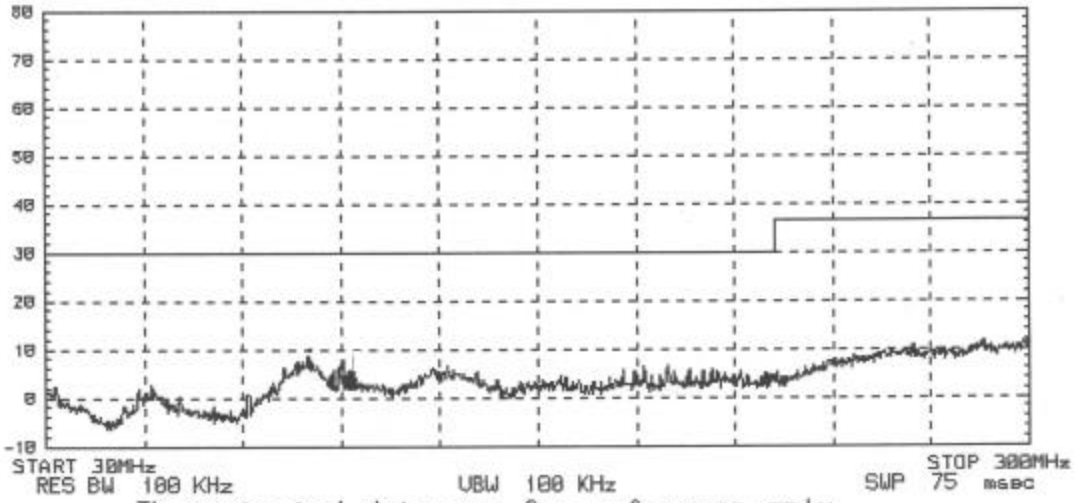
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22734

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Horizontal-10 M	Time:	15:20:53
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-8			File Ref.	:22735



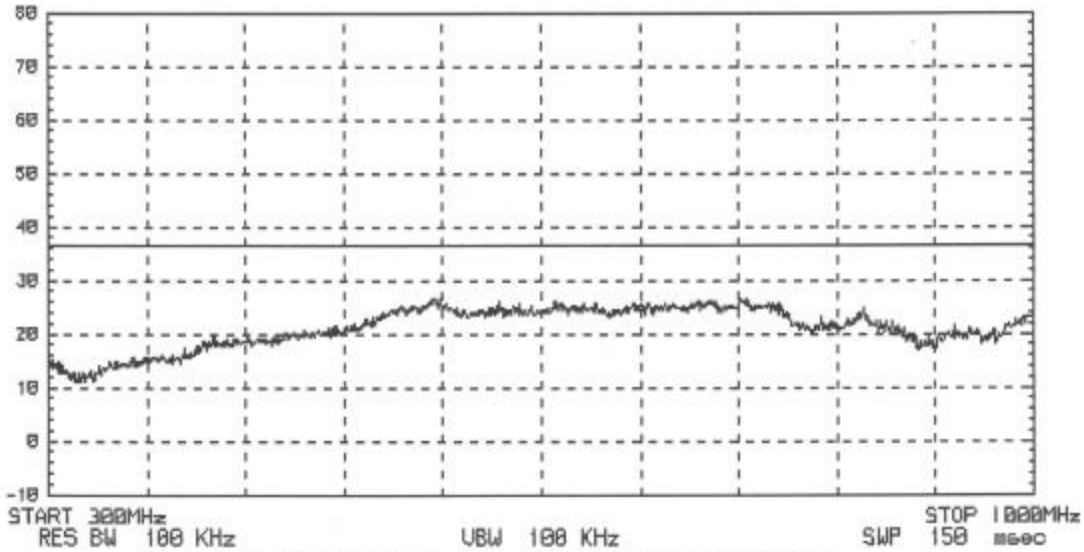
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22735

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Horizontal-10 M	Time:	15:22:54
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-8			File Ref.	:22736



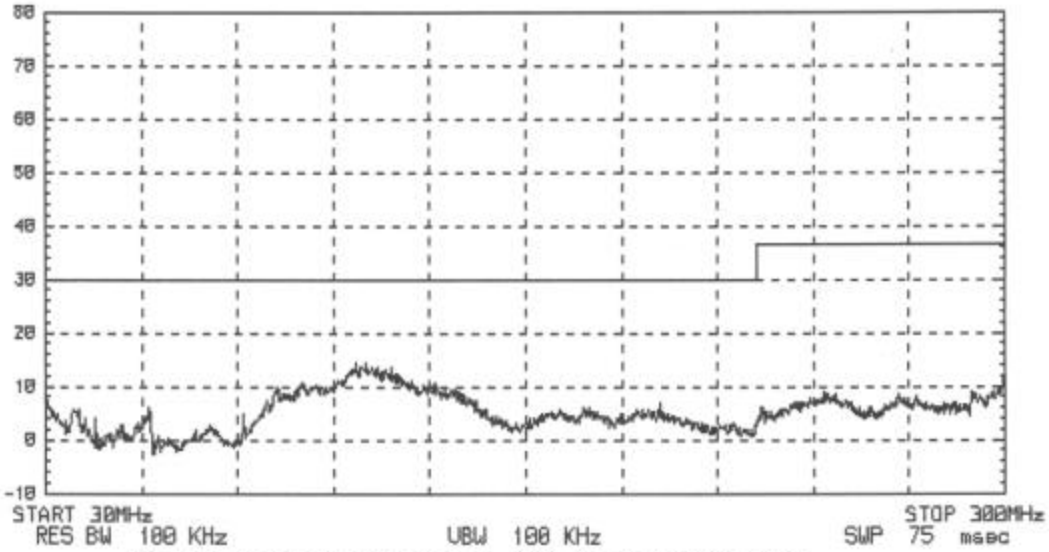
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22736

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Vertical-10 M	Time:	15:37:24
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-7			File Ref.	:22741



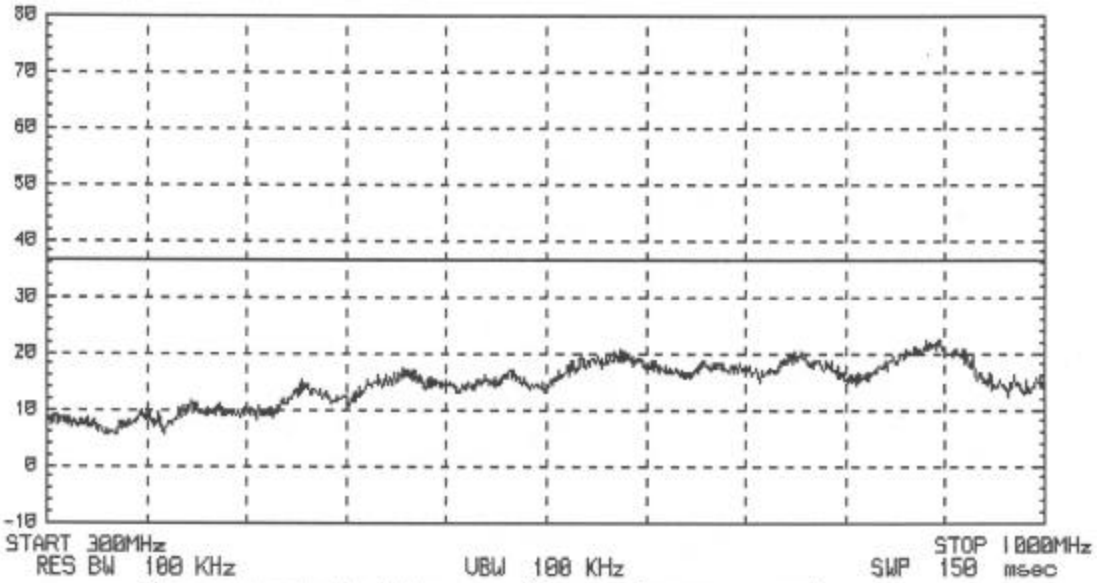
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22741

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Vertical-10 M	Time:	15:39:26
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-7			File Ref.	:22742



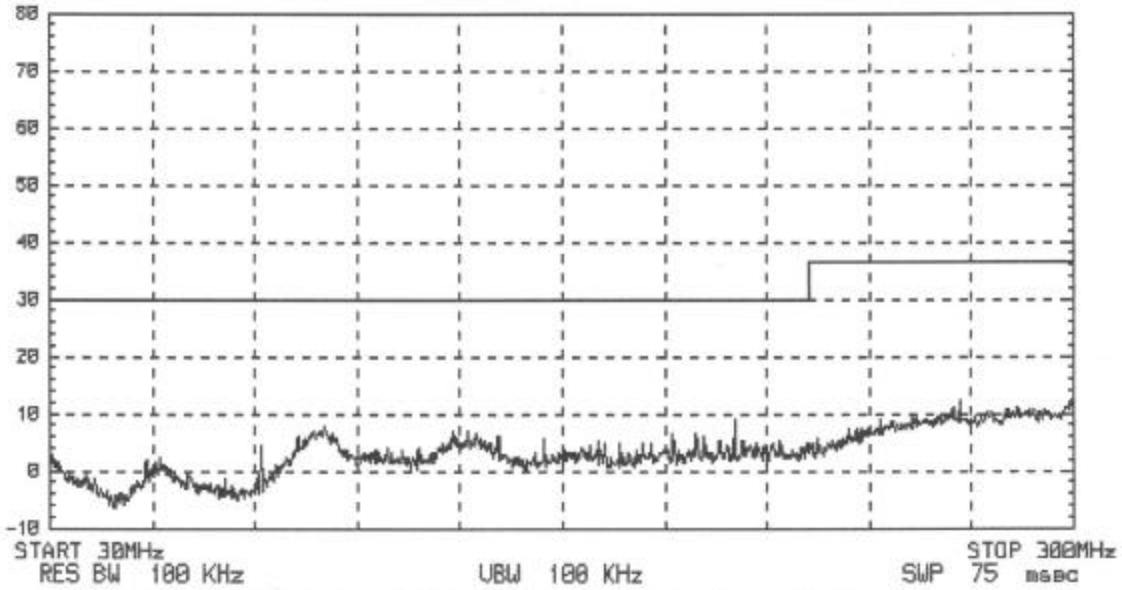
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22742

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Horizontal-10 M	Time:	15:41:43
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-7			File Ref.	:22743



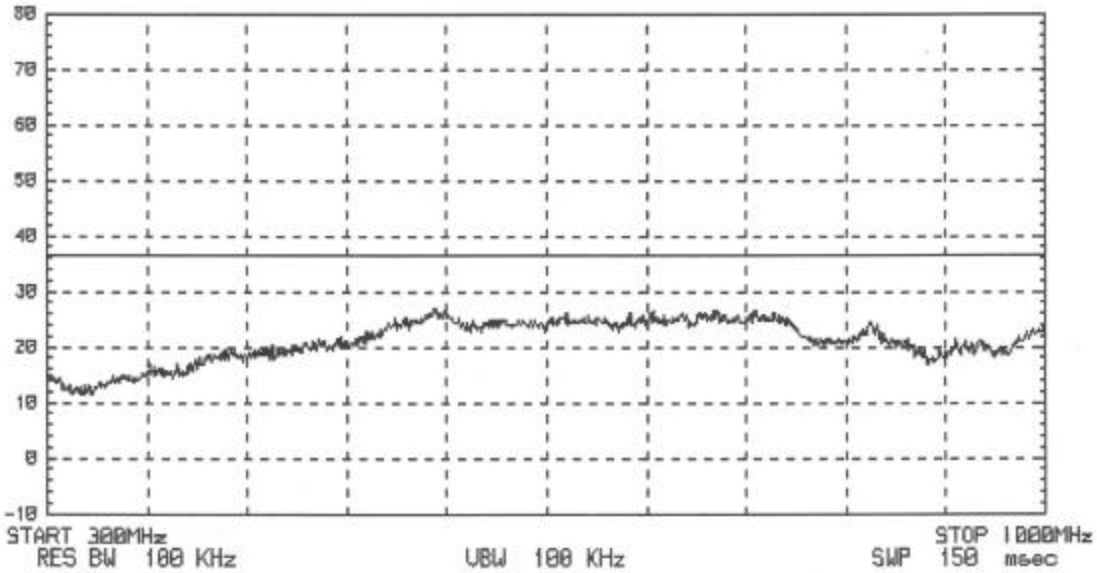
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22743

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Horizontal-10 M	Time:	15:43:44
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-7			File Ref.	:22744



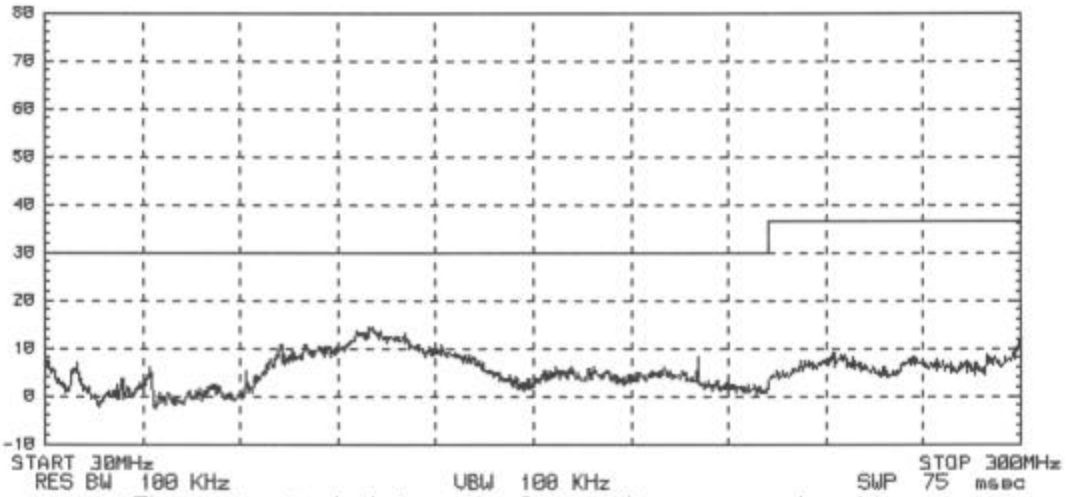
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22744

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Vertical-10 M	Time:	15:26:49
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	: .	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-15			File Ref.	:22737



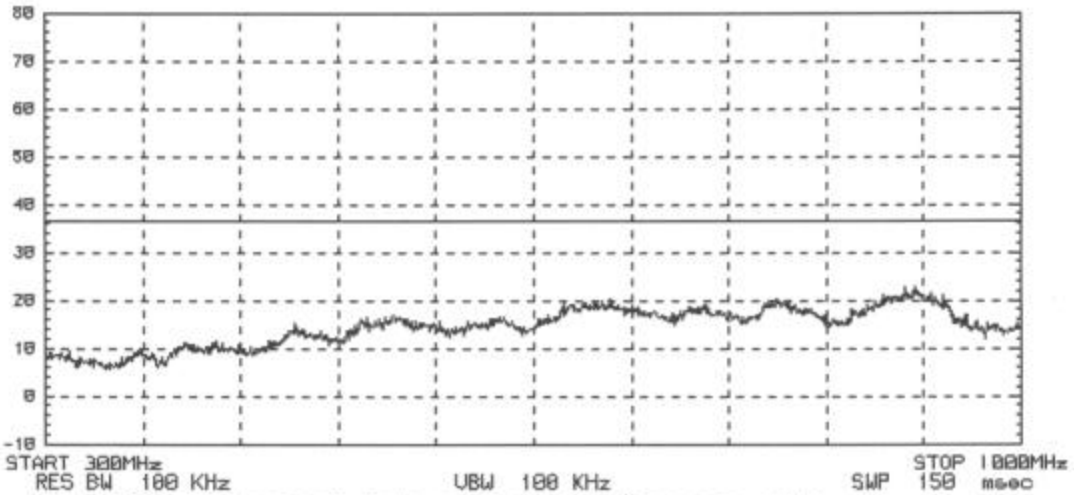
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22737

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Vertical-10 M	Time:	15:28:52
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-15			File Ref.	:22738



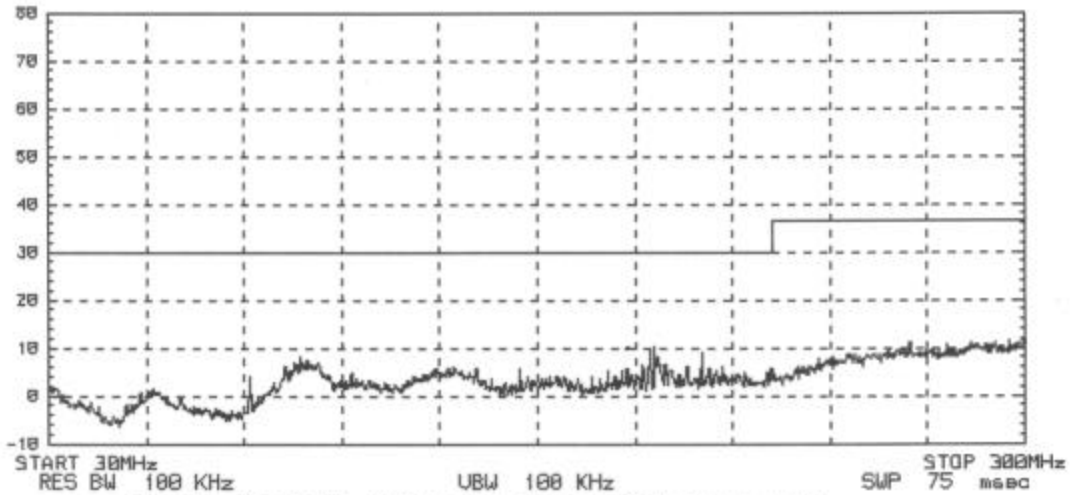
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22738

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Horizontal-10 M	Time:	15:31:10
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-15			File Ref.	:22739



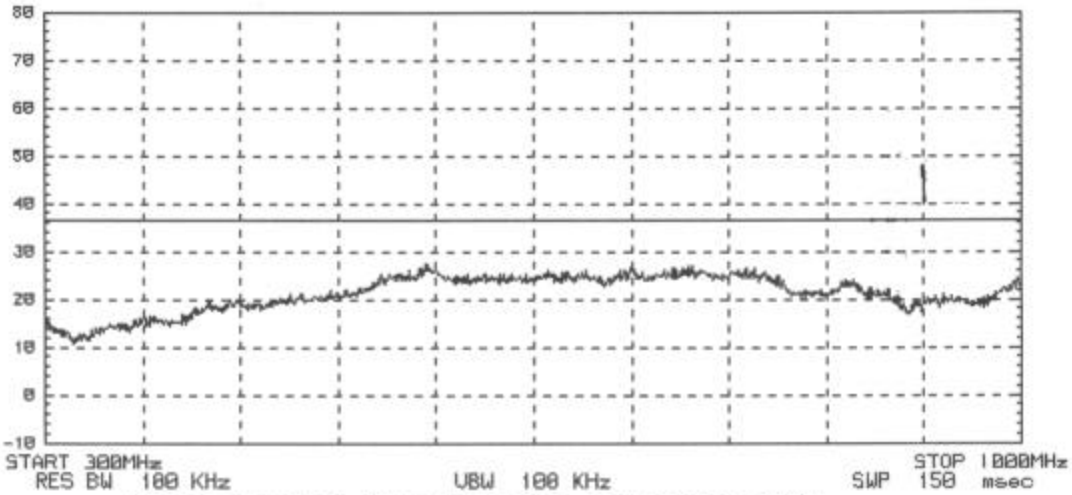
These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22739

C&C Lab.,Taiwan 966 Chamber

Customer	:ARFA	Model	:KB-BTCTX	Date:	7 Feb 2002
Antenna	:CBL 6112A	Polr.	:Horizontal-10 M	Time:	15:33:10
S.P.A.	:HP 8568B	PreAmp.	:8447D	Unit:	dBuV
Rule	:FCC	Mode	:.	Tester:	MARKBA LEE
Class	:B	Range	:1/2m Fixed H't	Scan:	Auto
Remark	:TX CH-15			File Ref.	:22740



These tested data are for reference only

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit	Margin (dB)	Warning Mark

*** End of File Ref.:22740

4.5 Field Strength Calculation

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

The basic equation calculation is as follows:

Result = Reading + Corrected Factor = Corrected Reading

Where Corrected Factor

= Antenna FACTOR + Cable Loss - Amplifier Gain

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4.6 Photos of Radiation Measuring Setup

5 CONDUCTED EMISSION MEASUREMENT

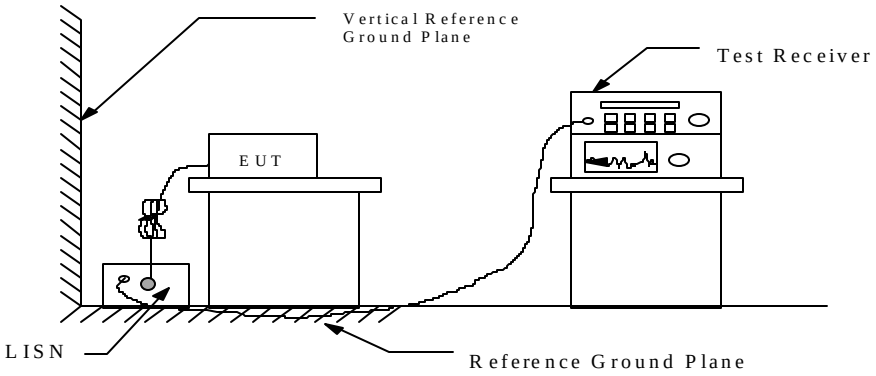
5.1 Standard Applicable

For intentional device, Line Conducted Emission Limits are in accordance to § 15.207(a), any emissions level shall not exceed 48 dBuV.

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 or 8 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 records 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

N/A. Batteries operating

5.4 Result Data Calculation

N/A. Batteries operating

5.5 Conducted Measurement Equipment

N/A. Batteries operating

5.6 Photos of Conduction Measuring Setup

N/A. Batteries operating

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6 ANTENNA REQUIREMENT

6.1 Standard Applicable

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.

6.2 Antenna Construction

The antenna is permanently mounted in RF PCB, no consideration of replacement.

7 BAND EDGES MEASUREMENT

7.1 Standard Applicable

According to 15.249(c), out band emission except for harmonics shall be comply with § 15.209 or at least attenuated by 50 dB below the level of the fundamental.

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. Position the EUT lowered and highest channel frequencies ban. 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 300 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.

7.3 Measurement Equipment

Equipment	Model No.	Serial No.	Cal. Due.
R&S Spectrum Analyzer	FSP 30	100112	05/28/2002
Pre Amplifier	HP	8449B	3008A00965
Schwarzbeck Antenna	BBHA 9120	D210	02/21/2003
Huber + Suhner low loss cable	Sucoflex 104	N/A	N/A

7.4 Measurement Data

Test Date: 2002/02/07 Temperature: 21 Humidity: 68

Note: Please refer to the plot as below.

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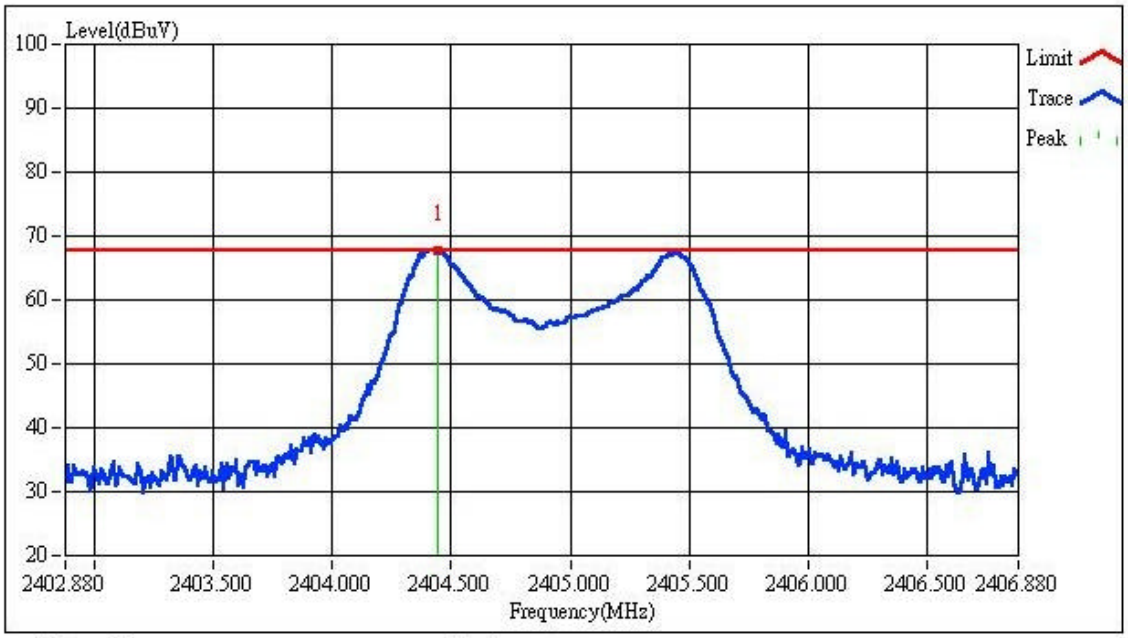


Custom Name: ARFA

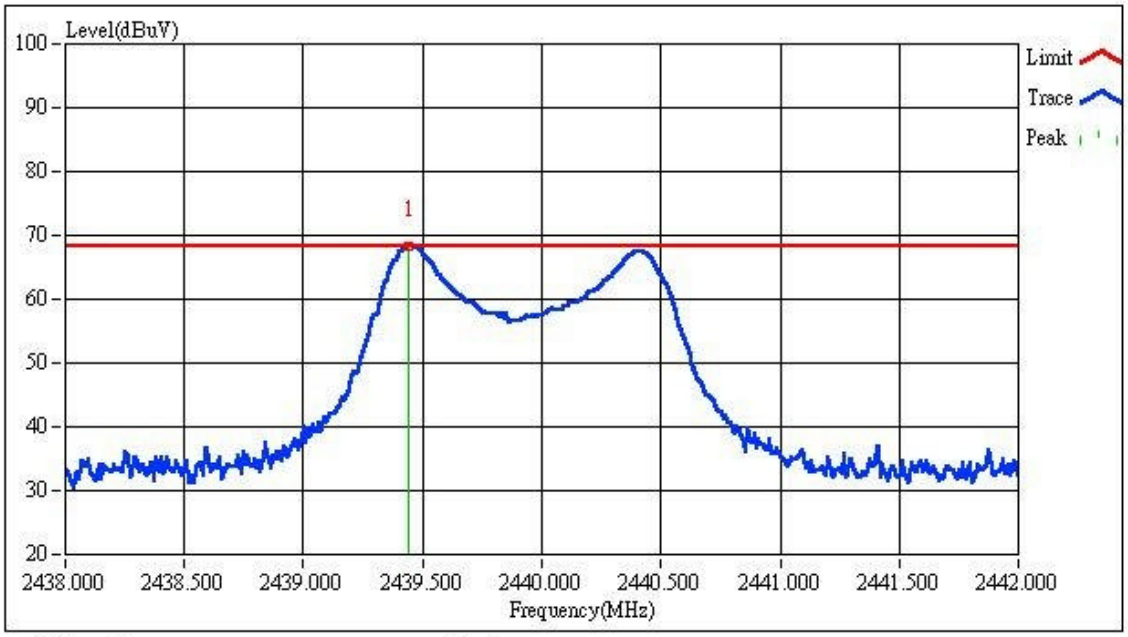
Engineer: MARKBA LEE

Model Name: KB-BTCTX

Report No.: 020007-R

Test Mode: CH-0

	Frequency(MHz)	Read Level (dBuV)	Probe (dB)	Cable Loss (dB)	Level(dBuV)
1	2404.4431	65.43	0.00	2.40	67.83



Custom Name: ARFA

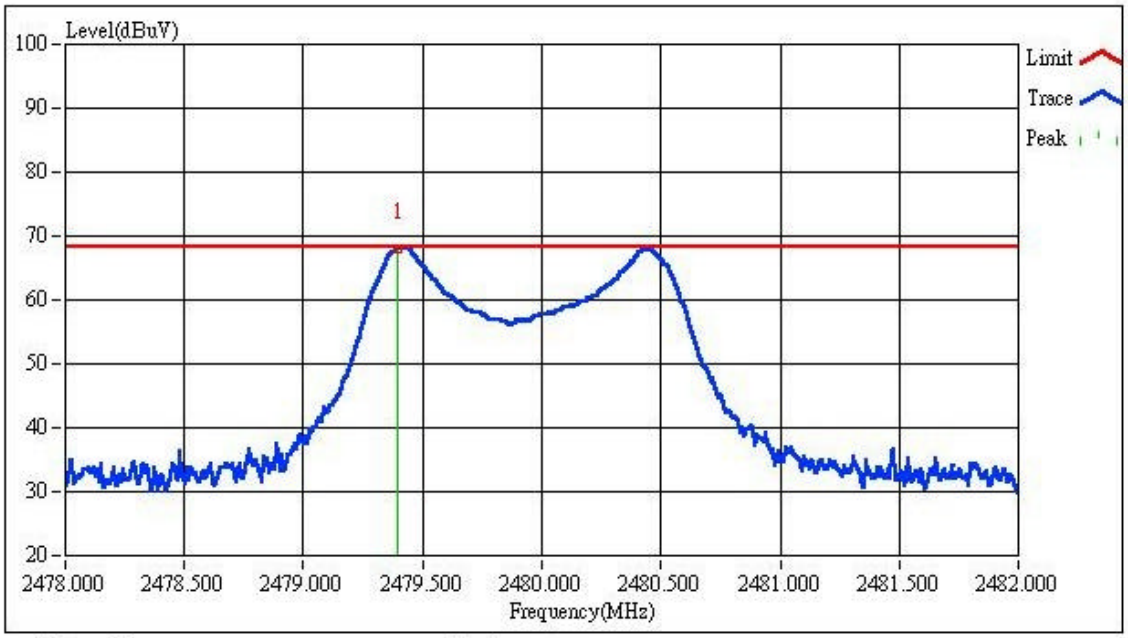
Engineer: MARKBA LEE

Model Name: KB-BTCTX

Report No.: 020007-R

Test Mode: CH-7

	Frequency(MHz)	Read Level (dBuV)	Probe (dB)	Cable Loss (dB)	Level(dBuV)
1	2439.4429	66.00	0.00	2.40	68.40



Custom Name: ARFA

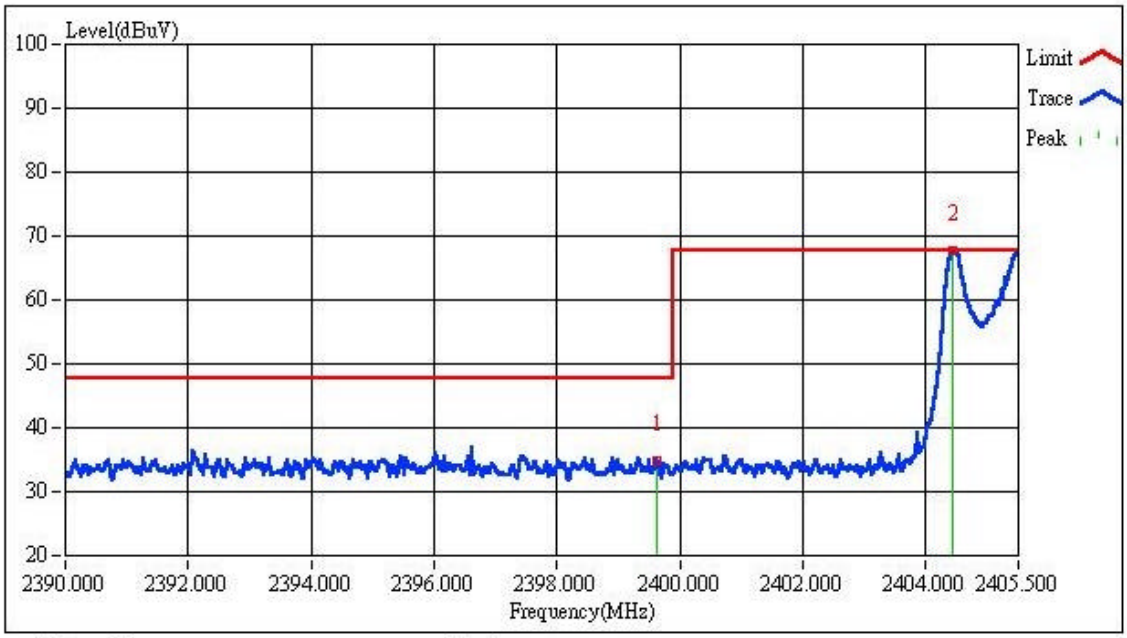
Engineer: MARKBA LEE

Model Name: KB-BTCTX

Report No.: 020007-R

Test Mode: CH-15

	Frequency(MHz)	Read Level (dBuV)	Probe (dB)	Cable Loss (dB)	Level(dBuV)
1	2479.3948	65.65	0.00	2.40	68.05



Custom Name: ARFA

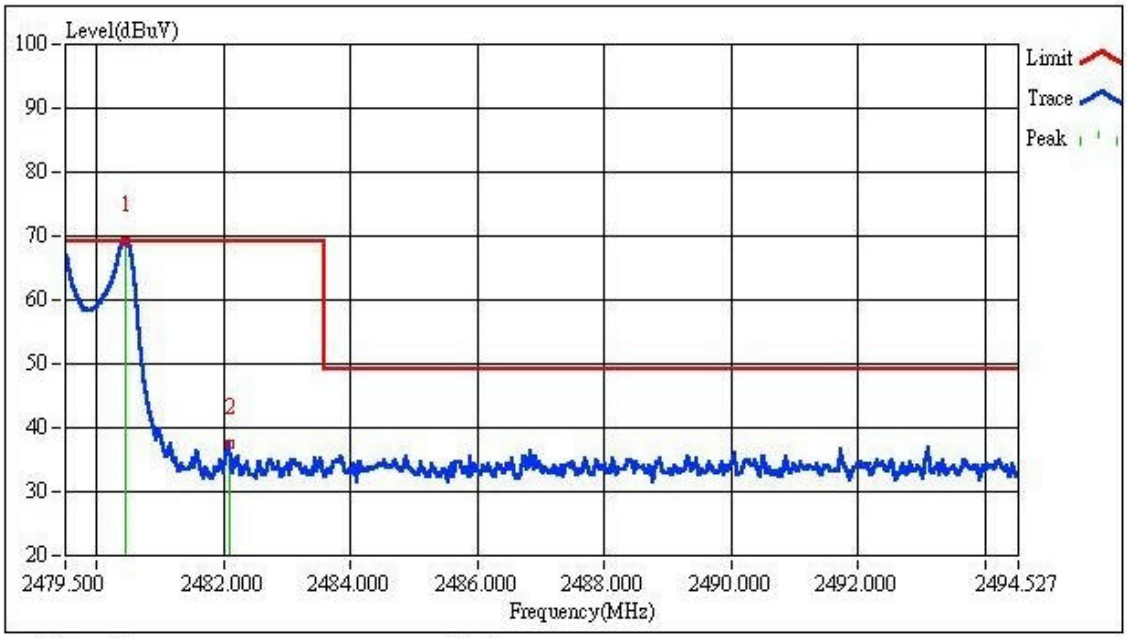
Engineer: MARKBA LEE

Model Name: KB-BTCTX

Report No.: 020007-R

Test Mode: CH-0

	Frequency(MHz)	Read Level (dBuV)	Probe (dB)	Cable Loss (dB)	Level(dBuV)
1	2399.6293	32.53	0.00	2.40	34.93
2	2404.4439	65.24	0.00	2.40	67.64



Custom Name: ARFA

Engineer: MARKBA LEE

Model Name: KB-BTCTX

Report No.: 020007-R

Test Mode: CH-15

	Frequency(MHz)	Read Level (dBuV)	Probe (dB)	Cable Loss (dB)	Level(dBuV)
1	2480.4636	66.68	0.00	2.40	69.08
2	2482.0898	35.17	0.00	2.40	37.57