Prüfbericht - Nr.: *Test Report No.:*	**15021507 001**	**Seite 1 von 28** *Page 1 of 28*
Auftraggeber: *Client:*	**Hearth & Home Technologies Inc.** 20802 Kensington Blvd. Lakeville, MN 55044 USA	
Gegenstand der Prüfung: *Test item:*	**Remote Control for Electric Room Heater**	
Bezeichnung: *Identification:*	**4050-105**	**Serien-Nr.:** *Serial No.:* **N/A**
Wareneingangs-Nr.: *Receipt No.:*	**153069102**	**Eingangsdatum:** *Date of receipt:* **05.12.2006**
Prüfort: *Testing location:*	**Refer to section 1.1**	
Prüfgrundlage: *Test specification:*	**FCC Part 15, Subpart C**	
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test item passed the test specification(s).*	
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (Shanghai) Co., Ltd.**	

geprüft/ *tested by:*			**kontrolliert**/ *reviewed by:*		
08.03.2007	Kong Xiangming/PE	Kong Xiangming	08.03.2007	Lu Xinhua/Reviewer	Lu Xinhua
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges/ *Other Aspects:* **FCC ID ULERCT2F**

Abkürzungen:				*Abbreviations:*			
	P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*
	F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*
	N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*
	N/T	=	*nicht getestet*		*N/T*	=	*not tested*

TEST SUMMARY

5.1.1 RADIATED EMISSION OF CARRIER FREQUENCY
Result:
Passed

5.1.2 SPURIOUS RADIATED EMISSIONS
Result:
Passed

5.1.3 BANDWIDTH MEASUREMENT
Result:
Passed

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1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Shanghai) Laboratory
Address: Building 2, No. 777 Guangzhong Road West, Shanghai 200072, P.R. China

The used test equipments below 1GHz are in accordance with CISPR 16-1 series standards for measurement of radio interference.

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

No.	Equipment	Model	Serial no.	Cal. due date
1..	Spectrum analyzer	FSP30	100192	21.06.2007
2..	EMI test receiver	ESCI	100280	03.12.2007
3.	Broadband antenna	BTA-H	040005H	20.03.2008
4.	Double ridged broadband horn antenna	BBHA 9120 D	9120D-433	21.06.2007
5.	DC power supplier	0-60V/2A	0502073	08.08.2007
6.	Broadband coaxial preamplifier	BBV 9718	9718-012	12.04.2008

2 General Product Information

2.1 Product Function and Intended Use

The equipment under test (EUT) is a transmitter for the electric room heater operating at 433.920MHz.
The transmitter has two push-to-operate switches that will automatically and immediately deactivate the transmitter when the switch is released, hence transmitter will cease operating within not more than 5 seconds of being released.

FCC ID ULERCT2F

Model	Product description
4050-105	Remote Control For Electric Room Heater

2.2 Circuit Description

One 12V battery is used in this board, special IC HS2262A for remote control is used as main control circuit which was processed with CMOS and is also a remote control coding circuit, whose datum and address are coded into series strand codes. The datum is coded with the high level of HS2262A digit pin controlled by the two trigger switches, and then the codes are sent out through 433.92MHz carrier by high frequency oscillator.

2.3 Ratings and System Details

		Transmitter
Frequency range	:	433.920MHz
Crystal tolerance		+/-100kHz
Number of channels	:	1
Type of antenna	:	Integral antenna
Power supply	:	DC 12V
Ports	:	None
Protection Class	:	III

2.4 Independent Operation Modes

The basic operation modes are:
- Remote Control: It has a push to operate switch and is under manual control at all transmission time. It will cease transmission immediately when the switch is released. The EUT has two control buttons to control the heating function and flame system of the room heater.

For further information refer to User Manual.

2.5 Submitted Documents

The submitted documents are listed as follow:

- Circuit diagram
- Block diagram
- User manual
- Label artwork

2.6 Related Submittal(s) Grants

This is a single application for certification of the transmitter.

3 Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

3.2 Test Operation and Test Software

Test operation should refer to test methodology.

- There was no special software to exercise the device.

3.3 Special Accessories and Auxiliary Equipment

None.

3.4 Countermeasures to achieve EMC Compliance

The test sample, which has been tested, contained the noise suppression parts as described in the Circuit Diagram or the Technical Construction File. No additional measures were employed to achieve compliance.

4 Test Methodology

4.1 Radiated Emission

The radiated emission measurements were performed according to the procedures in ANSI C63.4-2003.

The equipment under test (EUT) was placed on an 80 cm high turntable, and measurement distance is 3 meters. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

4.2 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the EMI test receiver or spectrum analyzer to the factors associated with antenna correction factor, cable loss and preamplifier.

The equation is expressed as follow:

FS = R + AF + CF– PA

Where FS = Field strength in dBuV/m at 3 meters.
R = Reading of spectrum analyzer in dBuV.
AF = Antenna factor in dB/m.
CF = Cable attenuation Factor in dB.
PA = Preamplifier factor in dB.

5 Test Result

5.1.1 Radiated Emission of Carrier Frequency

Result:	**Passed**

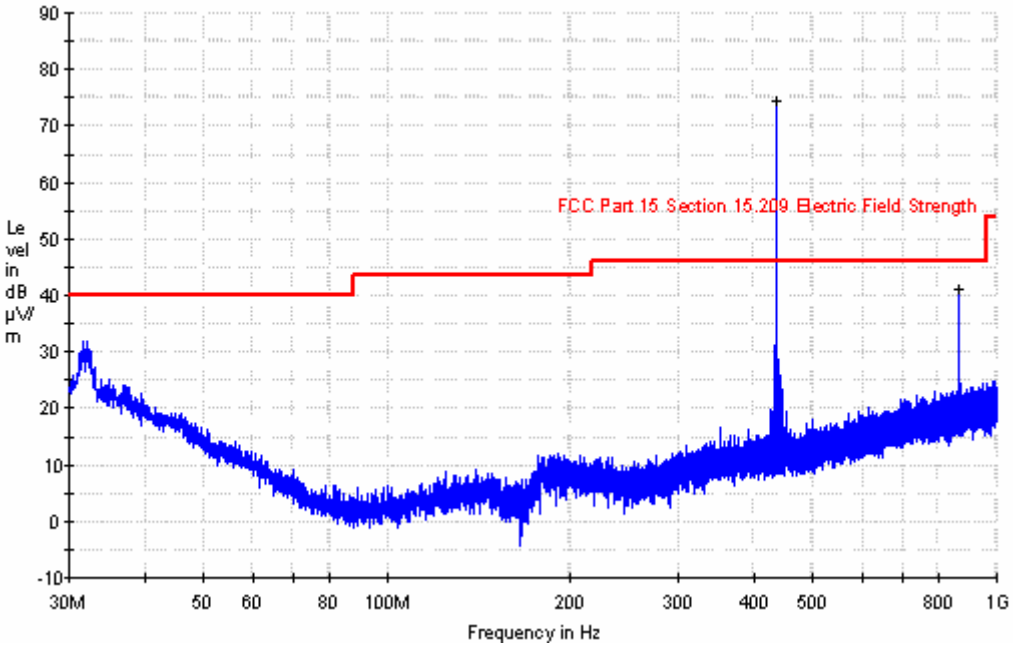
Date of testing : 26.02.2007
Test specification : FCC Part 15 Section 15.231(b)(1) and (b)(2)
Test Method : ANSI 63.4-2003
Measurement location : Semi-anechoic chamber
Detector function : Quasi-peak
Measurement BW : 120 kHz
Supply voltage : DC 12V

Limit Section 15.231(b)

Frequency with in the band (MHz)	Quasi-peak Emission	
	(Microvolt/meter)	(dBµV/m)
433.920	10996	80.8

The following figures and tables were those measured by an automatic measuring system. In the following figures, "+" means quasi-peak result which was measured in final measurement.

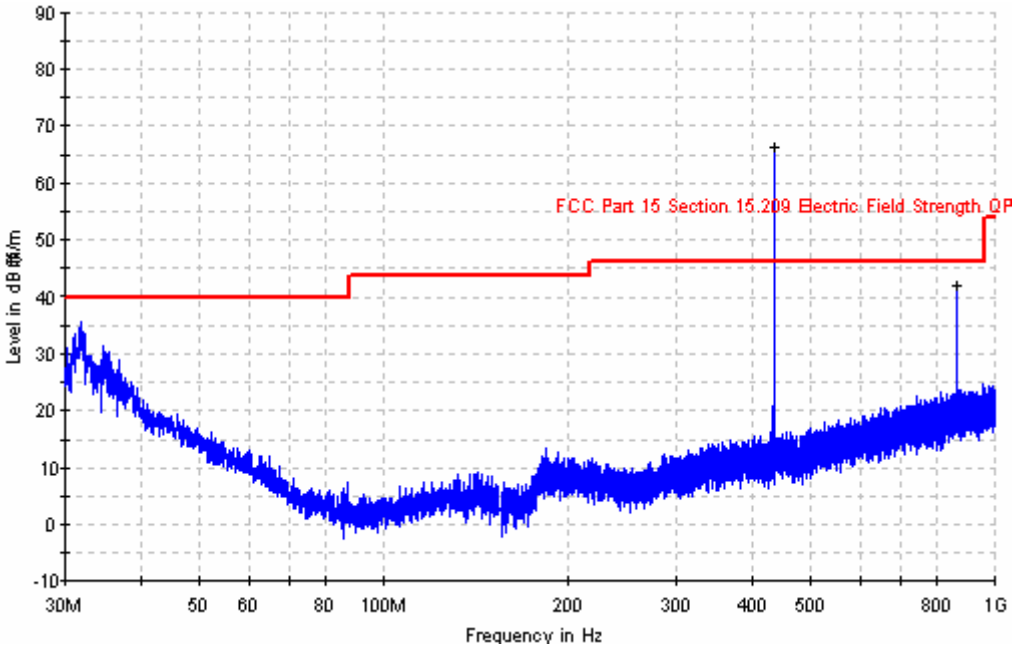
Figure 1: Spectral diagrams and measurement results below 1GHz, Horizontal polarization



Final quasi-peak measurement result:

Frequency (MHz)	Quasi-Peak (dBµV/m)	Corr. (dB)	Limit (dBµV/m)	Margin (dB)	Polarization
433.906	74.5	0.6	80.8	6.3	H

Figure 2: Spectral diagrams and measurement results below 1GHz, Vertical polarization



Final quasi-peak measurement result:

Frequency (MHz)	Quasi-Peak (dBµV/m)	Corr. (dB)	Limit (dBµV/m)	Margin (dB)	Polarization
433.906	66.1	0.6	80.8	14.7	V

5.1.2 Spurious Radiated Emissions

Result:	**Passed**

Date of testing	:	26.02.2007-27.02.2007
Test specification	:	FCC Part 15 Section 15.231(b)(1) and (b)(3)
Test method	:	ANSI 63.4-2003
Measurement location	:	Semi-anechoic chamber
Measurement distance	:	3m
Detector	:	Quasi-peak(30-1000MHz)/Peak, Average(1000MHz-4500MHz)
Measurement BW	:	120 kHz(below 1GHz), 1MHz(above 1GHz)
Supply voltage	:	DC 12V
Measuring frequency range	:	30-4500MHz

Limit Section 15.231(b)

Frequency (MHz)	Field strength (microvolt/meter)	Field strength (dBμV/m)	Measurement distance (meters)
433.920	1099	20*log(1099) = 60.8	3

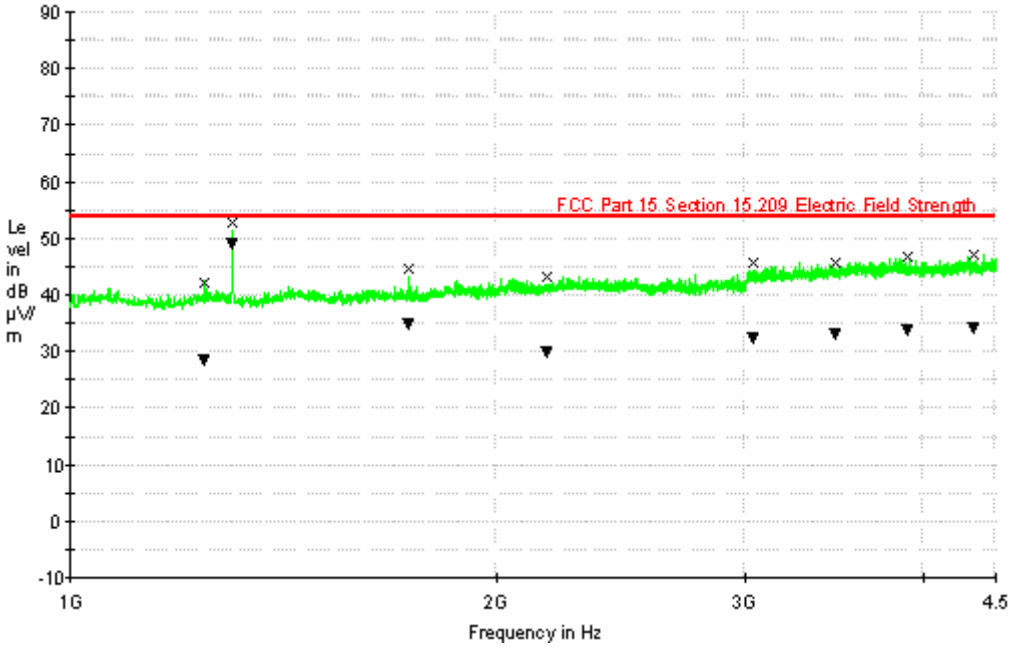
Limit Section 15.209

Frequency (MHz)	Field strength (microvolt/meter)	Field strength (dBμV/m)	Measurement distance (meters)
30-88	100	20*log(100) = 40.0	3
88-216	150	20*log(150) = 43.5	3
216-960	200	20*log(200) = 46.0	3
Above 960	500	20*log(500) = 54.0	3

Note: Higher limits of above two tables apply except for restricted bands.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector and above 1000 MHz are based on the measurements employing an average detector.
The following figures and tables were those measured by an automatic measuring system. In final measurement, quasi-peak value were measured and listed respectively where they had a maximum in previous scanning survey below 1000MHz. And above 1000MHz, average emission measurements are employed. According to section 15.35(b), when average radiated emission measurements are specified, including emission measurement below 1000MHz, there also is limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated. In the following figures, "×" means Peak value and "▾" means average value result which was measured in final measurement.

Figure 3: Spectral diagrams and measurement results above 1GHz, Horizontal polarization

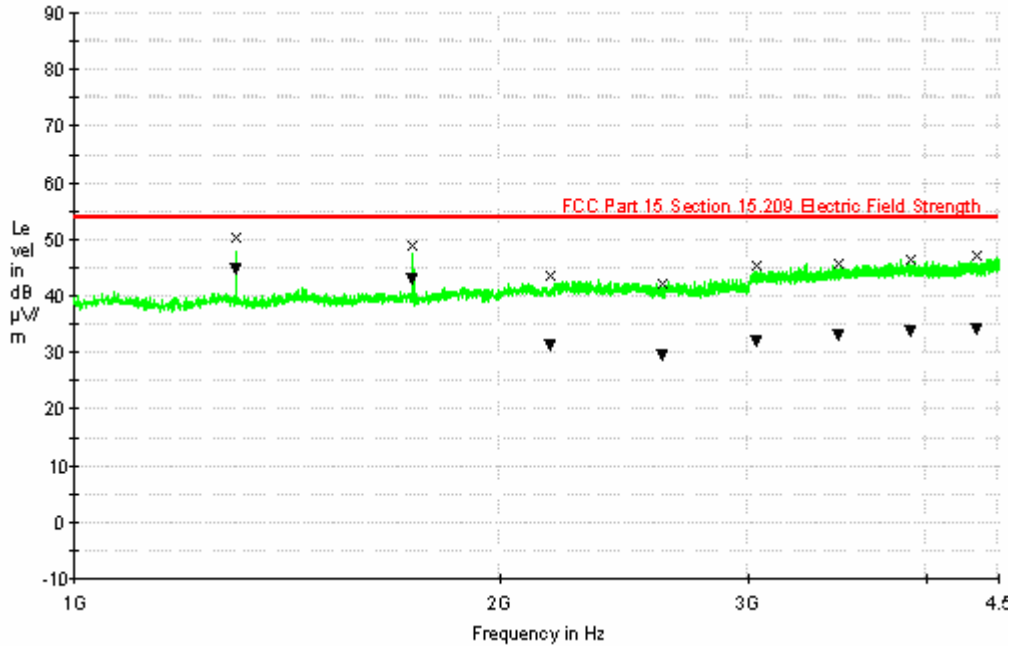


Final measurement result:

Frequency (MHz)	QP/AV result (dBµV/m)	Peak result (dBµV/m)	Corr. (dB)	Limit(QP/AV detector) (dBµV/m)	Limit(Peak detector) (dBµV/m)	Margin(QP/AV detector) (dB)	Margin(Peak detector) (dB)	Polarization
867.875	41.2	N/A	9.2	60.8	80.8	19.6	N/A	H
1245.000	28.3	42.1	-1.0	60.8	80.8	22.5	38.7	H
*1301.875	48.7	52.9	-0.5	54.0	74.0	5.3	21.1	H
1735.000	34.7	44.5	1.2	60.8	80.8	26.1	36.3	H
2169.531	29.9	43.2	4.6	60.8	80.8	30.9	37.6	H
2603.438	29.7	42.4	6.7	60.8	80.8	31.1	38.4	H
3037.344	32.1	45.7	8.0	60.8	80.8	28.7	35.1	H
3471.250	33.1	45.6	9.4	60.8	80.8	27.7	35.2	H
*3905.156	33.7	46.8	11.5	54.0	74.0	20.3	27.2	H
*4339.063	34.1	47.0	13.6	54.0	74.0	19.9	27	H

Remarks:
'*' indicates the frequency of the emissions falling into the restricted band.
Frequency below 1GHz with quasi-peak detector, refer to figure 1 for detail.

Figure 4: Spectral diagrams and measurement results above 1GHz, Vertical polarization



Final measurement result:

Frequency (MHz)	QP/AV result (dBµV/m)	Peak result (dBµV/m)	Corr. (dB)	Limit(QP/AV detector) (dBµV/m)	Limit(Peak detector) (dBµV/m)	Margin(QP/AV detector) (dB)	Margin(Peak detector) (dB)	Polarization
867.875	41.7	N/A	9.2	60.8	80.8	19.1	N/A	V
*1301.020	44.7	50.2	-0.6	54.0	74.0	9.3	23.8	V
1735.875	43.0	48.9	1.3	60.8	80.8	17.8	31.9	V
2169.875	31.0	43.5	4.6	60.8	80.8	29.8	37.3	V
2603.875	29.5	42.1	6.7	60.8	80.8	31.3	38.7	V
3037.875	31.9	45.3	8.0	60.8	80.8	28.9	35.5	V
3471.875	32.8	45.8	9.4	60.8	80.8	28	35	V
*3905.000	33.5	46.3	11.5	54.0	74.0	20.5	27.7	V
*4339.875	33.9	47.1	13.6	54.0	74.0	20.1	26.9	V

Remarks:
'*' indicates the frequency of the emissions falling into the restricted band.
Frequency below 1GHz with quasi-peak detector, refer to figure 2 for detail.

5.1.3 Bandwidth Measurement

Result:	**Passed**

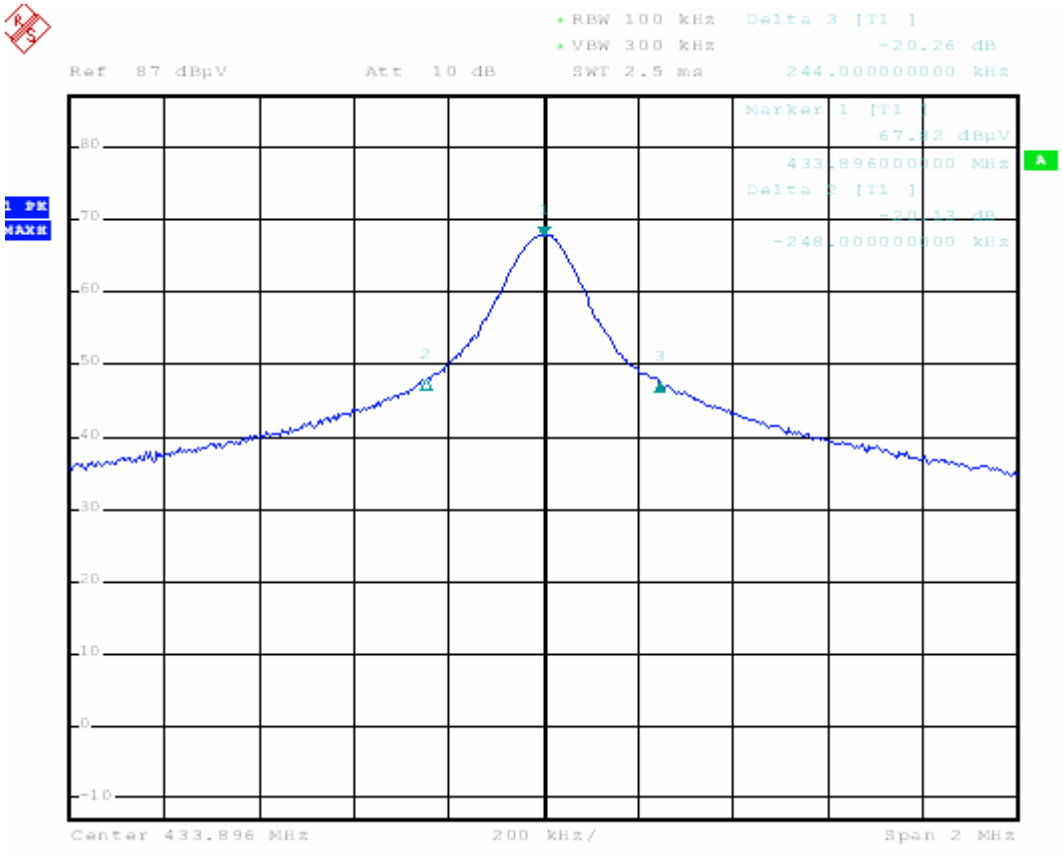
Date of testing : 28.02.2007
Test specification : FCC Part 15 section 231(c)
Port of testing : Coupling
Detector function : Peak
Supply voltage : DC 12V

Limit Section 15.231(c)

The bandwidth of the emission shall be no wider than 0.25% if the centre frequency for devices operating above 70MHz and below 900MHz.

The 20dB bandwidth shall be no wider than 0.25% (1.08MHz) of the centre frequency 433.896MHz.
From the result, it shows that the 20dB points of the lower edge and upper edge are 248 kHz and 244 kHz respectively apart from the centre frequency. Hence it is deemed to fulfill the requirement.

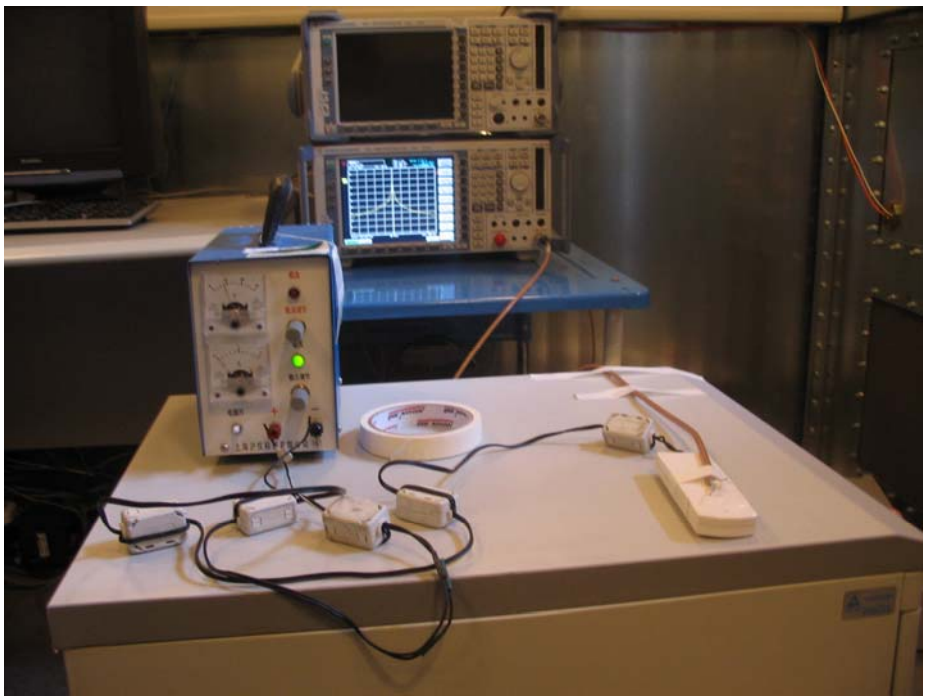
Figure 5: Spectral Diagrams for bandwidth measurement result



6 Photographs of the Test Set-Up

Photograph 1: Set-up for radiated emissions

Photograph 2: Set-up for bandwidth measurement



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