MEASUREMENT REPORT
of
Access Point

Applicant	**:**	11Wave Technology Inc.
Model No.	**:**	PWA-645, 11WA-321A, 11WA-321AXXXX (X : 0~9, A~Z, a~z, Blank), GWA-23B
EUT	**:**	Access Point
FCC ID	**:**	QS4-321A
Report No.	**:**	W2615473

Tested by :

Training Research Co., Ltd.

TEL : 886-2-26935155 FAX : 886-2-26934440

No. 255, Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C.

CERTIFICATION

We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ANSI C63.4 (1992) as a reference. All test were conducted by ***Training Research Co., Ltd.***, 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is **in compliance with** the technical requirements set forth in the FCC Rules Part 15 Subpart B (Declaration of Conformity) and C Section 15.247.

Applicant	**:**	11Wave Technology Inc.
Applicant address	**:**	3F, No. 6 Lane 35, jihu Rd., Neihu, Taipei, Taiwan R.O.C.
EUT	**:**	Access Point
Model No.	**:**	PWA-645, 11WA-321A, 11WA-321AXXXX (X : 0~9, A~Z, a~z, Blank), GWA-23B
FCC ID	**:**	QS4-321A
Report No.	**:**	W2615473
Test Date	**:**	April 17, 2003

Prepared by: Jack Tsai _____ **Approved by:** Frank Tsai _____

Jack Tsai *Frank Tsai*

Tested by :

Training Research Co., Ltd.

TEL: 886-2-26935155 **FAX: 886-2-26934440**

255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C.

Federal Communications Commission

Declaration of Conformity

(DoC)

For the Following Equipment:

Product name : Access Point

Model name : **PWA-645, 11WA-321A, 11WA-321AXXXX (X:0~9,A~Z,a~z,Blank), GWA-23B**

Trade name : **11 Wave Technology Inc.**

Is herewith confirmed and found to comply with the requirements of CFR 47 part15 Subpart B - Unintentional Radiators regulation. The results of electromagnetic mission evaluation are shown in the **report number : W2615473**

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

Manufacturer	*USA local representative*
Company name: 11 Wave Technology Inc.	**To be determined**
Computer address: **3F, No. 6 Lane 35, jihu Rd., Neihu, Taipei, Taiwan R.O.C.**	
ZIP / Postal code **114**	
Contact person: **Ken Chen**	
Title: **R & D Manager**	
Internet e-mail address: **ken@amigo.com.tw**	
Tel / Fax: **886-2-87515588 / 886-2-26598782**	

Tables of Contents

Ⅰ. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of applicant in support that the *cable gateway* certification in accordance with Part 2 Subpart J and Part 15 Subpart A and C of the Commission's Rules and Regulations.

1.2 Description of EUT

EUT	**:**	Access Point
Model No.	**:**	PWA-645, 11WA-321A, 11WA-321AXXXX (X : 0~9, A~Z, a~z, Blank), GWA-23B
Granted FCC ID	**:**	QS4-321A
Frequency Range	**:**	2.412GHz ~ 2.462GHz
Support Channel	**:**	11 Channels
Modulation Skill	**:**	DBPSK, DQPSK, CCK
Power Type	**:**	By the Two optional Power Adaptor Adaptor1:Model:SCP48-62100; I/P:120V 60Hz, 6V 21000mA Adaptor2:Model:L5A-050210R;I/P: 120V 60Hz, 5V 21000mA
Power Cable	**:**	180cm long, non-shielded, no ferrite core
Data Cable	**:**	RJ45 cable, 30m, non-shielded, no ferrite core USB cable, 1.85m, shielded, no ferrite core

1.3 Test method

1. Using the LAN port of far-end computer and software provided by the manufacturer to control the EUT. The test is performed under those specific conditions.
2. Set different channel being tested and repeat the procedures above.
   (a) Radiated for intentional test:
   making EUT to the mode of continuous transmission
   (b) Conducted and Radiated for unintentional test:
   making EUT to the linking (Rx/Tx) mode with far support equipments

1.4 Description of Support Equipment

In order to construct the minimum testing, following equipment were used as the support units.

Notebook	**:**	**IBM Think Pad X20**
Model No.	:	2662-11T
Serial No.	:	FX-1192200/09
FCC ID	:	N/A, Doc Approved
檢磁	:	3892B565
Adaptor	**:**	**IBM**
Model No.	:	PA2450U
Serial No.	:	02K6654
FCC ID	:	N/A, Doc Approved
Power type	:	I/P: 100 ~ 240vac, 50 ~ 60 Hz, 0.5A ~ 1.2A; O/P: 16Vdc, 4.5A
Power cord	:	Non-shielded, 1.80m long, Plastic, with ferrite core
Fax/Modem	**:**	**Aceex**
Model No.	:	DM-1414
Serial No.	:	9010582
FCC ID	:	IFAXDM1414
Power type	:	120 VAC / 50 ~ 60 Hz, Switching
Power Cord	:	Non-shielded, 1.90m long, Plastic hoods, and no ferrite bead
Data Cable	:	RS-232→Shielded, 1.30m long, Metal hoods , No bead
		RJ-11Cx2→Non-shielded, 7’ long, Plastic hoods, No bead
Printer	**:**	**HP**
Model No.	:	C6464A
Serial No.	:	TH16LEB5PK
FCC ID	:	N/A, DoC Approved
檢磁	:	3892H381
Power type	:	Switching adaptor
Power cord	:	Non-shielded, 173cm long, No ferrite core
		(between adaptor and AC source)
		Non-shielded, 180cm long, with ferrite core
		(between printer and adaptor)
Data cable	:	Shielded, 1.70m long, No ferrite core

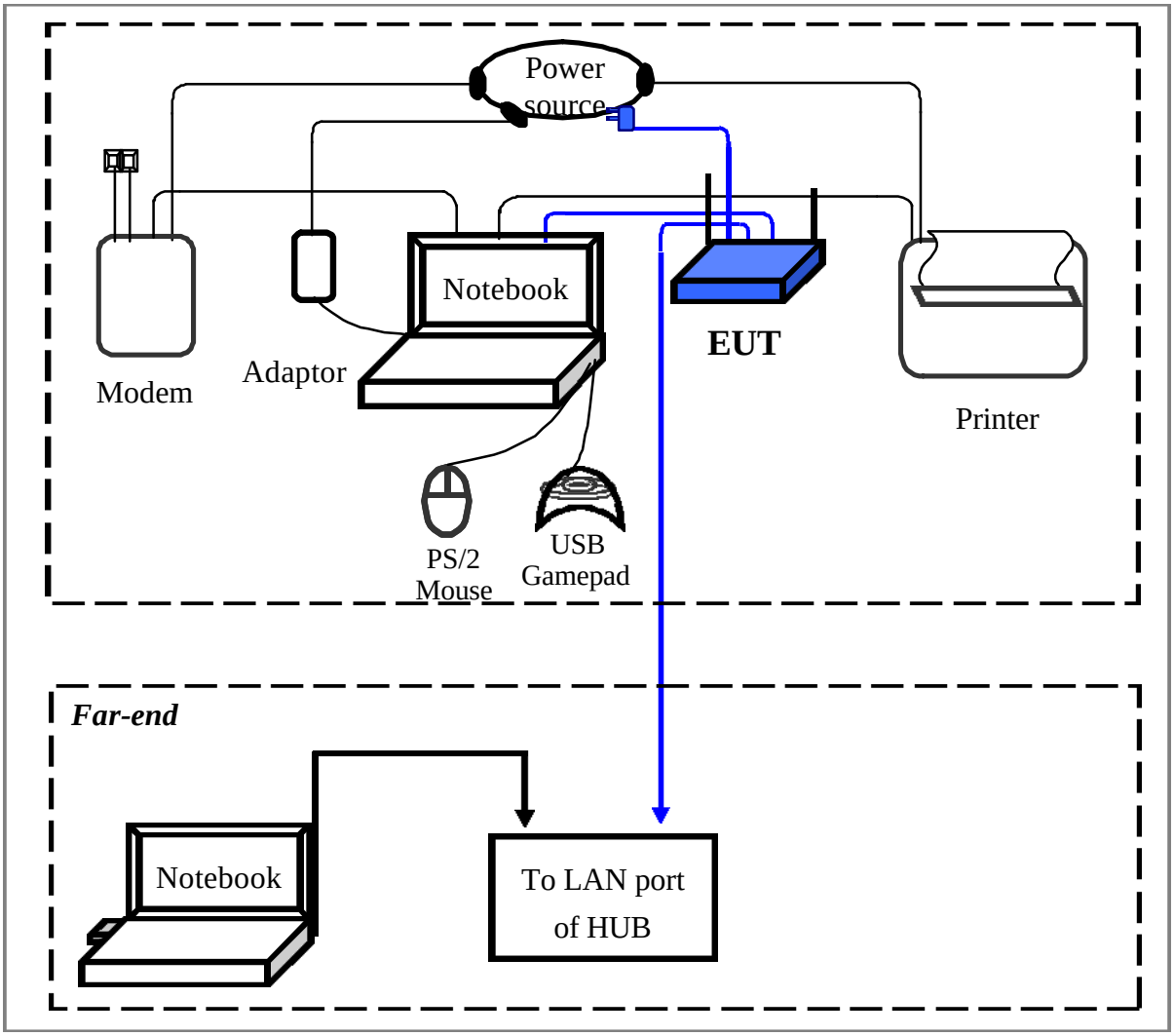
Mouse	**:**	**Logitech**
Model No.	:	M-BA47
Serial No.	:	LZE92250027
FCC ID	:	DoC Approved
檢磁	:	4872A220
Power type	:	Powered by Computer
Power Cable	:	Shielded, 1.5m long, Plastic hoods, No ferrite bead

USB

Gamepad	**:**	**Rockfire**
Model No.	:	QF-337uv
Serial No.	:	10600545, KR91379759
FCC ID	:	None (CE approval)
檢磁	:	3862A574
Power type	:	By computer
Data Cable	:	Shielded, 1.81m long, Plastic, with ferrite core

1.5 Configuration of System Under Test

(Conducted and Radiated for unintentional)



Connections of Equipment

Adaptor : *Power cable --- 180cm long, non-shielded, no ferrite core

WLAN AP : *USB cable *1 --- 185cm long, shielded, no ferrite core

*RJ45 cable *1 --- 30m long, non-shielded, no ferrite core

Notebook PC: *Parallel Port --- a printer

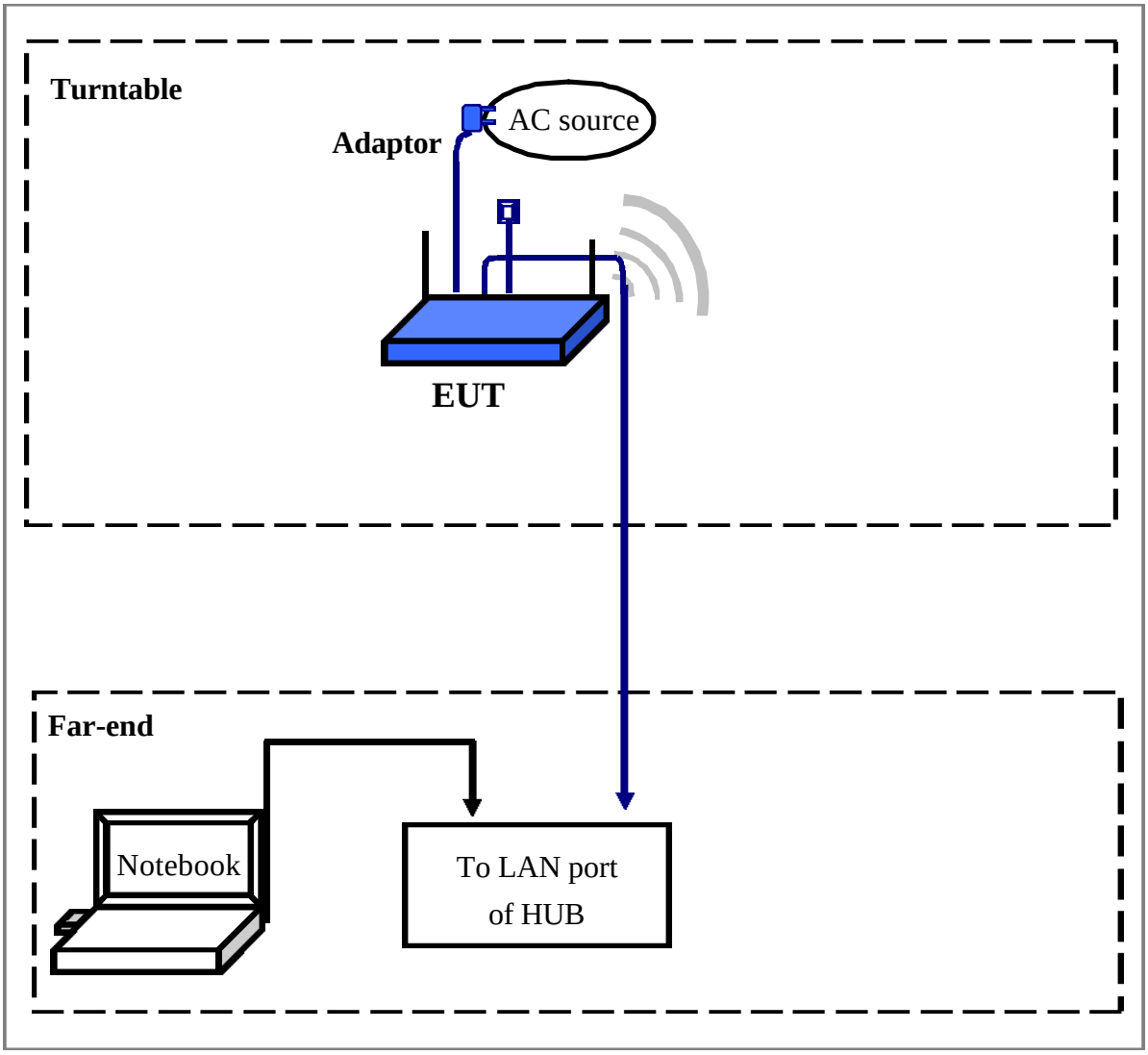
*Serial Port --- an external modem

*PS/2 Port --- a PS/2 keyboard

*USB-A Port --- a USB gamepad

*USB-B Port --- **EUT**

(Radiated of intentional)



The tests below are carried out the EUT transmitter set at high power in TDD mode. The EUT is needed to force selection of output power level and channel number.

The setting up procedure was recorded in <1.3> test method.

1.6 Verify the Frequency and Channel

Channel	Frequency (GHz)
1	2.412
2	2.417
3	2.422
4	2.427
5	2.432
6	2.437
7	2.442
8	2.447
9	2.452
10	2.457
11	2.462

Note:

1. This is for confirming that all frequencies are in 2.412GHz to 2.462GHz.
2. Section 15.31(m): Measurements on intentional radiators or receivers shall be performed at three frequencies for operating frequency range over 10 MHz.
   (The locations of these frequencies one near the top, one near the middle and one near the bottom.)
3. After test, the EUT operating frequencies are in 2.412GHz to 2.462GHz. So all the items as followed in testing report are need to test these three frequencies:
   Top: Channel – 1; Middle: Channel – 6; Bottom: Channel – 11.

1.7 Test Procedure

All measurements contained in this report were performed mainly according to the techniques described in ANSI C63.4 (1992) and the pre-setup was written on <1.3>, the detail setup was written on each test item.

1.8 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter**, **Anechoic Chamber (Registration Number: 93906)** maintained by *Training Research Co., Ltd*. 1F, No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and other test items were performed in a anechoic chamber also located at Training Research Co., Ltd.

No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

1.9 General Test Condition

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions, which the EUT was considered likely to encounter in normal use were investigated.

In test, they were set in high power and continuously transmitting mode that controlled by computer. The ch01, ch06 and ch11 of EUT were all tested. The setting up procedure is recorded on <1.3> test method.

II. Section 15.101(a): Equipment authorization of unintentional radiators

The EUT equipped with a USB bus interface and should be operated with the computer. It was categorized to *Class B personal computers and peripherals* as cannot be operated stand-alone. The authorization requires **Declaration of Conformity (DoC)** and the items required such as Sect.15.107 (Conducted limits) and Sect.15.109 (Radiated emission limits) is same as Sect.15.207 and 15.247(C).

III. Section 15.203: Antenna requirement

The EUT has an integrated antenna permanently fixed on the EUT. In addition, there is no external connector employed. The antenna requirement stated in Sect.15.203 is inapplicable to this EUT.

Ⅳ. Section 15.207: Power Line Conducted Emissions for AC Powered Units

4.1 Test Condition & Setup

The power line conducted emission measurements were performed in an anechoic chamber. The EUT was assembled on a wooden table, which is 80 centimeters high, was placed 40 centimeters from the backwall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and Line Impedance Stabilization Networks (LISNs). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer (or EMI receiver) was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPER quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 2.4.

There is a test condition applies in this test item, the test procedure description as the following: EUT transmit only:

The setting up procedure is recorded on <1.3>. Three channels were tested, one in the top (CH01), one in the middle (CH06) and the other in bottom (CH11).

4.2 List of Test Instruments

				Calibration Date	
Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/28/02	06/28/03
RF Filter Section	85460A	H P	3448A00217	06/28/02	06/28/03
LISN (EUT)	LISN-01	TRC	9912-03,04	06/04/02	06/04/03
LISN (Support E.)	LISN-01	TRC	9912-05	07/15/02	07/15/03
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	11/20/02	11/20/03

The level of confidence of 95%, the uncertainty of measurement of conducted emission is ± 2.02 dB.

4.3 Test Result of Conducted Emissions

EUT station transmit only

The following table shows a summary of the highest emissions of power line conducted emissions on the LIVE and NETURAL conductors of the EUT power cord.

Test Conditions: Testing room : Temperature : 22.3 °C Humidity : 60.7 % RH

Table 1 Test mode: Channel 1(Adaptor 1)

Power Connected Emissions					*FCC Class B*		
Conductor	***Frequency (KHz)***	***Peak (dBmV)***	***QP (dBmV)***	***Average (dBmV)***	***QP-limit (dBmV)***	***AVG-limit (dBmV)***	***Margin (dB)***
Line 1	203.00	47.73	---	---	64.49	54.49	-6.76
	323.00	44.32	---	---	61.06	51.06	-6.74
	1028.00	38.72	---	---	56.00	46.00	-7.28
	1598.00	38.18	---	---	56.00	46.00	-7.82
	2051.00	36.86	---	---	56.00	46.00	-9.14
	2820.00	35.31	---	---	56.00	46.00	-10.69
Line 2	380.00	44.13	---	---	59.43	49.43	-5.30
	569.00	37.85	---	---	56.00	46.00	-8.15
	832.00	36.17	---	---	56.00	46.00	-9.83
	1028.00	34.39	---	---	56.00	46.00	-11.61
	10190.00	32.25	---	---	60.00	50.00	-17.75
	16160.00	32.67	---	---	60.00	50.00	-17.33

NOTE:

(1) Margin = Amplitude – Limit, ***The reading amplitudes are all under limit.***

(2) A "+" sign in the margin column means the emission is OVER the Class B Limit and "–" sign of means UNDER the Class B limit

Table 2 Test mode: Channel 6

Power Connected Emissions					*FCC Class B*		
Conductor	***Frequency (KHz)***	***Peak (dBmV)***	***QP (dBmV)***	***Average (dBmV)***	***QP-limit (dBmV)***	***AVG-limit (dBmV)***	***Margin (dB)***
Line 1	386.00	46.51	44.25	40.82	59.31	49.31	-8.49
	767.00	38.11	---	---	56.00	46.00	-7.89
	1091.00	37.08	---	---	56.00	46.00	-8.92
	1411.00	37.48	---	---	56.00	46.00	-8.52
	2115.00	36.58	---	---	56.00	46.00	-9.42
	4952.00	34.91	---	---	56.00	46.00	-11.09
Line 2	204.59	52.82	45.94	38.50	64.54	54.54	-16.04
	558.00	38.49	---	---	56.00	46.00	-7.51
	774.00	36.10	---	---	56.00	46.00	-9.90
	1091.00	34.82	---	---	56.00	46.00	-11.18
	1477.00	29.98	---	---	56.00	46.00	-12.60
	13850.00	30.11	---	---	60.00	50.00	-19.89

Table 3 Test mode: Channel 11

Power Connected Emissions					*FCC Class B*		
Conductor	***Frequency (KHz)***	***Peak (dBmV)***	***QP (dBmV)***	***Average (dBmV)***	***QP-limit (dBmV)***	***AVG-limit (dBmV)***	***Margin (dB)***
Line 1	255.00	46.51	---	---	63.00	53.00	-6.49
	320.00	45.29	---	---	61.14	51.14	-5.85
	710.00	40.64	---	---	56.00	46.00	-5.36
	1091.00	37.62	---	---	56.00	46.00	-8.38
	1411.00	37.29	---	---	56.00	46.00	-8.71
	2308.00	35.96	---	---	56.00	46.00	-10.04
Line 2	334.00	44.82	---	---	60.74	50.74	-5.92
	518.00	39.85	---	---	56.00	46.00	-6.15
	774.00	35.52	---	---	56.00	46.00	-10.48
	902.00	35.26	---	---	56.00	46.00	-10.74
	1028.00	33.79	---	---	56.00	46.00	-12.21
	1411.00	29.68	---	---	56.00	46.00	-16.32

Test Conditions: Testing room : Temperature : 25.3 °C Humidity : 66.6 % RH

Table 4 Test mode: Channel 1(Adaptor 2)

Power Connected Emissions					***FCC Class B***		
Conductor	***Frequency (KHz)***	***Peak (dBmV)***	***QP (dBmV)***	***Average (dBmV)***	***QP-limit (dBmV)***	***AVG-limit (dBmV)***	***Margin (dB)***
Line 1	206.00	47.87	---	---	64.40	54.40	-6.53
	277.00	42.98	---	---	62.37	52.37	-9.39
	373.00	44.65	---	---	59.63	49.63	-4.98
	456.00	40.09	---	---	57.26	47.26	-7.17
	884.00	32.65	---	---	56.00	46.00	-13.35
	998.00	32.09	---	---	56.00	46.00	-13.91
Line 2	206.00	48.73	---	---	64.40	54.40	-5.67
	274.00	43.14	---	---	62.46	52.46	-9.32
	355.00	43.85	---	---	60.14	50.14	-6.29
	409.00	43.12	---	---	58.60	48.60	-5.48
	1017.00	35.31	---	---	56.00	46.00	-10.29
	1144.00	35.45	---	---	56.00	46.00	-10.55

NOTE:

(3) Margin = Amplitude – Limit, ***The reading amplitudes are all under limit.***

(4) A "+" sign in the margin column means the emission is OVER the Class B Limit and "–" sign of means UNDER the Class B limit

Table 5 Test mode: Channel 6

Power Connected Emissions					*FCC Class B*		
Conductor	***Frequency (KHz)***	***Peak (dBmV)***	***QP (dBmV)***	***Average (dBmV)***	***QP-limit (dBmV)***	***AVG-limit (dBmV)***	***Margin (dB)***
Line 1	208.00	49.19	---	---	64.34	54.34	-5.15
	231.00	46.02	---	---	63.69	53.69	-7.67
	366.00	43.95	---	---	59.83	49.83	-5.88
	413.00	43.62	---	---	58.49	48.49	-4.87
	850.00	32.01	---	---	56.00	46.00	-13.99
	989.00	32.07	---	---	56.00	46.00	-13.93
Line 2	203.00	48.75	---	---	64.49	54.49	-5.74
	233.00	45.29	---	---	63.63	53.63	-8.34
	352.00	43.44	---	---	60.23	50.23	-6.79
	387.00	42.74	---	---	59.23	49.23	-6.49
	1038.00	35.17	---	---	56.00	46.00	-10.83
	1155.00	35.14	---	---	56.00	46.00	-10.86

Table 6 Test mode: Channel 11

Power Connected Emissions					*FCC Class B*		
Conductor	***Frequency (KHz)***	***Peak (dBmV)***	***QP (dBmV)***	***Average (dBmV)***	***QP-limit (dBmV)***	***AVG-limit (dBmV)***	***Margin (dB)***
Line 1	203.00	48.87	---	---	64.49	54.49	-5.62
	297.00	42.74	---	---	61.80	51.80	-9.06
	348.00	42.67	---	---	60.34	50.34	-7.67
	413.00	42.86	---	---	58.49	48.49	-5.63
	858.00	32.39	---	---	56.00	46.00	-13.61
	972.00	32.42	---	---	56.00	46.00	-13.58
Line 2	208.00	48.08	---	---	64.34	54.34	-6.26
	259.00	43.55	---	---	62.89	52.89	-9.34
	370.00	43.35	---	---	59.71	49.71	-6.36
	409.00	42.96	---	---	58.60	48.60	-5.64
	998.00	35.42	---	---	56.00	46.00	-10.58
	1144.00	35.42	---	---	56.00	46.00	-10.58

V. Section 15.247 (a): Technical description of the EUT

Based on the Section 2.1, *Direct Sequence System* is a spread spectrum system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high speed code sequence dominates the "modulating function" and is the direct cause of the wide spreading of the transmitted signal. In the Exhibit, operational description demonstrates the operation principles of the Baseband processor employed by the EUT, shows that which is a complete DSSS baseband processor and meets the definition of the direct sequence spread spectrum system.