MEASUREMENT REPORT
of
WIRELESS LAN

Applicant	**:**	Macromate Corp.
Model No.	**:**	MAP-811E
EUT	**:**	Wireless Bridge Router
FCC ID	**:**	LZU-MAP-811E-
Report No.	**:**	MA115757

Test by :

Training Research Co., Ltd.

TEL：886-2-26935155 FAX：886-2-26934440

2, Lane 194, Huan-Ho Street, Hsichih, 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.***, 2, Lane 194, Huan-Ho Street, Hsichih, 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 C Section 15.247.

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Test Date	:	February 19, 2001

Prepared by: Miro Chueh *Miro Chueh*

Approved by: Frank Tsai *Frank Tsai*

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Ⅰ. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a wireless lan 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	**:**	Wireless Bridge Router
Model No.	**:**	MAP-811E
FCC ID	**:**	LZU-MAP-811E-
Frequency Range	**:**	2.412 GHz ~ 2.462GHz
Support Channel	**:**	11 Channel
Modulation Skill	**:**	DBPSK, DQPSK, CCK
Power Type	**:**	AC to DC Switching Adapter
		Input: 100 ~ 240Vac, 50/60Hz, 30VA
		Output: 6Vdc, 2A
Power Cable	**:**	Non-shielded, 180cm long, No bead
Data Cable	**:**	RJ45: Non-shielded, 10 meter , No ferrite bead
Applicant	**:**	Macromate Corp.
		8F, Universal Center, No. 179, Sec. 1, Ta-Tung Road,
		Hsi-Chih, Taipei Hsien 221, Taiwan, R.O.C.

1.3 Description of Support Equipment

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

Notebook	**:**	**IBM Think Pad X20**
Type No.	:	2662-11T
Serial No.	:	FX-11922 00/09
FCC ID	:	Doc Approved
檢磁		:3892B565

AC Adaptor	**:**	**IBM**
Model No.	:	PA2450U
Serial No.	:	02K6654
FCC ID	:	Doc Approved
Power Core	:	Non-shielded, 180cm long, Plastic hoods, with ferrite bead
Power type	:	100 ~ 240VAC, 50 ~ 60Hz, 0.5A ~ 1.2A / 16Vdc, 4.5A

HUB	**:**	**Cameo Communications, Inc.**
Model No.	:	SOHO-SW16A
Serial No.	:	N/A
Power Type	:	Switch
FCC ID	:	N/A, DOC Approved
Power cord	:	Non-shielded, 1.95m long, Plastic, No ferrite core

USB Ethernet Lan	**:**	**Netgear**
Model No.	:	FA101
Serial No.	:	N/A
Power Type	:	By PC
FCC ID	:	N/A, DOC Approved

1.4 Configuration of System Under Test

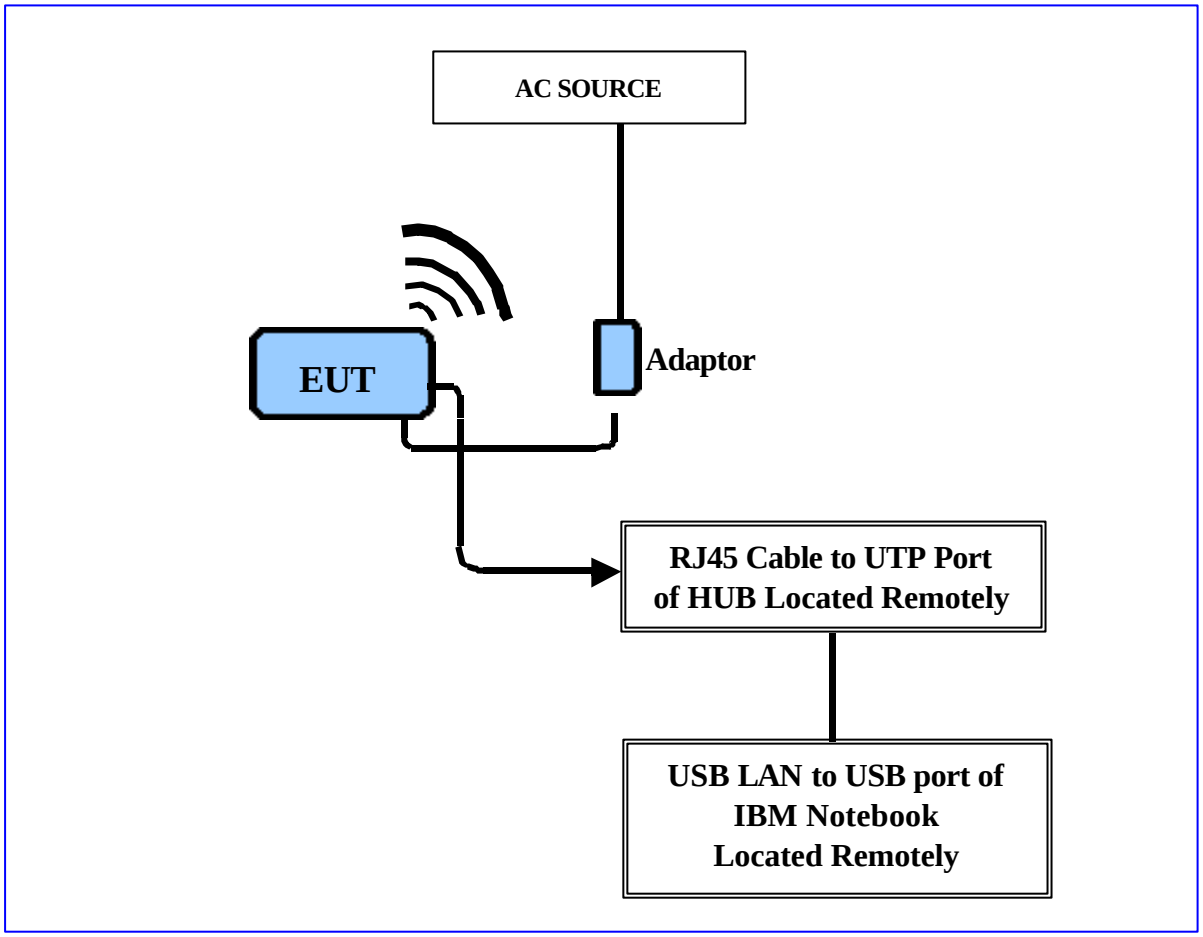


Fig. 1 Configuration of system under test

The tests below are run with the EUT transmitter set at high power in TDD mode. A USB lan from a USB port of notebook computer to the ethernet hub then UTP port of hub connected to UTP port of EUT by RJ45 cable. The EUT is needed to force selection of output power level and channel number by notebook computer.

The setting up procedure was recorded in Appendix A.

1.5 Verify the Frequency and Channel

1.5.1 Verify the Frequency Pairs

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 sure 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.

1.6 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 Appendix A, the detail setup was written on each test item.

1.7 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. 2, Lane 194, Huan-Ho Street, Hsichih, 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. 2, Lane 194, Huan-Ho Street, Hsichih, 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.

1.8 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 was 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 notebook computer. The ch01, ch06 and ch11 of EUT were all tested. The setting up procedure is recorded on Appendix A.

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

2.1 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 450 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 apply in this test item, the test procedure description as the following:

1. EUT transmit only:
   Using the USB lan to USB port of Notebook PC and software to control the EUT through ethernet hub. Then making access to the mode of continuous transmission and set testing channel. Three channels were tested, one in the top (CH01), one in the middle (CH06) and the other in bottom (CH11).
2. Idle state (Rx mode)

The setting up procedure is recorded on Appendix A.

2.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	10/18/00	10/18/01
RF Filter Section	85460A	H P	3448A00217	10/18/00	10/18/01
LISN (EUT)	LISN-01	TRC	9912-03,04	12/09/00	12/09/01
LISN (Support E.)	LISN-01	TRC	9912-05	01/04/00	01/04/01
Switch/Control Unit (< 30MHz)	3488A	HP	N/A	11/20/00	11/20/01
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	11/20/00	11/20/01

2.3 Test configuration

Conducted Emissions Test Placement

2.4 Test Result of Conducted Emissions

2.4.1 EUT station transmit only

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

Table 1 Power Line Conducted Emissions (Channel 1)

Power Connected Emissions				*FCC Class B*	
Conductor	***Frequency (KHz)***	***Peak Amplitude (dB μV)***	***QP Amplitude (dB μV)***	***Limit (dB μV)***	***Margin (dB)***
Line 1	1015.00	41.22	###.##	48.00	-6.78
	1199.00	41.02	###.##	48.00	-6.98
	1232.00	42.15	###.##	48.00	-5.85
	1507.00	40.53	###.##	48.00	-7.47
	1545.00	41.12	###.##	48.00	-6.88
	2130.00	42.83	###.##	48.00	-5.17
	2390.00	41.45	###.##	48.00	-6.55
	2770.00	42.62	###.##	48.00	-5.38
	2890.00	43.86	###.##	48.00	-4.14
	3050.00	40.71	###.##	48.00	-7.29
Line 2	818.00	44.82	###.##	48.00	-3.18
	857.00	44.47	###.##	48.00	-3.53
	991.00	43.97	###.##	48.00	-4.03
	1027.00	43.48	###.##	48.00	-4.52
	2220.00	42.73	###.##	48.00	-5.27
	2280.00	42.76	###.##	48.00	-5.24
	2710.00	43.31	###.##	48.00	-4.69
	2810.00	45.13	###.##	48.00	-2.87
	2890.00	43.81	###.##	48.00	-4.19
	3030.00	46.87	###.##	48.00	-1.13

NOTE:

1. Margin = Peak Amplitude - 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 Power Line Conducted Emissions (Channel 6)

Power Connected Emissions				*FCC Class B*	
Conductor	***Frequency (KHz)***	***Peak Amplitude (dB μV)***	***QP Amplitude (dB μV)***	***Limit (dB μV)***	***Margin (dB)***
Line 1	769.00	41.76	###.##	48.00	-6.24
	818.00	42.86	###.##	48.00	-5.14
	739.00	43.27	###.##	48.00	-4.73
	1027.00	43.17	###.##	48.00	-4.83
	2390.00	43.25	###.##	48.00	-4.75
	2730.00	44.74	###.##	48.00	-3.26
	2810.00	42.56	###.##	48.00	-5.44
	2890.00	45.46	###.##	48.00	-2.54
	3030.00	45.71	###.##	48.00	-2.29
	3190.00	42.23	###.##	48.00	-5.77
Line 2	1545.00	40.75	###.##	48.00	-7.25
	1646.00	42.89	###.##	48.00	-5.11
	1713.00	43.13	###.##	48.00	-4.87
	2030.00	41.77	###.##	48.00	-6.23
	2090.00	42.63	###.##	48.00	-5.37
	2190.00	42.45	###.##	48.00	-5.55
	2460.00	40.61	###.##	48.00	-7.39
	2730.00	41.36	###.##	48.00	-6.64
	2890.00	49.43	36.39	48.00	-11.61
	3030.00	45.61	###.##	48.00	-2.39

****The reading amplitudes are all under limit.***

Table 3 Power Line Conducted Emissions (Channel 11)

Power Connected Emissions				*FCC Class B*	
Conductor	***Frequency (KHz)***	***Peak Amplitude (dB μV)***	***QP Amplitude (dB μV)***	***Limit (dB μV)***	***Margin (dB)***
Line 1	1497.00	43.24	###.##	48.00	-4.76
	1635.00	40.84	###.##	48.00	-7.16
	1713.00	41.58	###.##	48.00	-6.42
	2120.00	40.65	###.##	48.00	-7.35
	2310.00	40.47	###.##	48.00	-7.53
	2470.00	42.43	###.##	48.00	-5.57
	2710.00	40.44	###.##	48.00	-7.56
	2870.00	42.54	###.##	48.00	-5.46
	2970.00	42.63	###.##	48.00	-5.37
	3050.00	40.91	###.##	48.00	-7.09
Line 2	684.00	42.51	###.##	48.00	-5.49
	857.00	44.37	###.##	48.00	-3.63
	972.00	42.82	###.##	48.00	-5.18
	1021.00	43.99	###.##	48.00	-4.01
	1478.00	42.98	###.##	48.00	-5.02
	2310.00	43.49	###.##	48.00	-4.51
	2390.00	43.65	###.##	48.00	-4.35
	2730.00	43.24	###.##	48.00	-4.76
	2950.00	43.59	###.##	48.00	-4.41
	3050.00	44.68	###.##	48.00	-3.32

****The reading amplitudes are all under limit.***

Ⅲ. Section 15.247(a)(2): Bandwidth for Direct Sequence System.

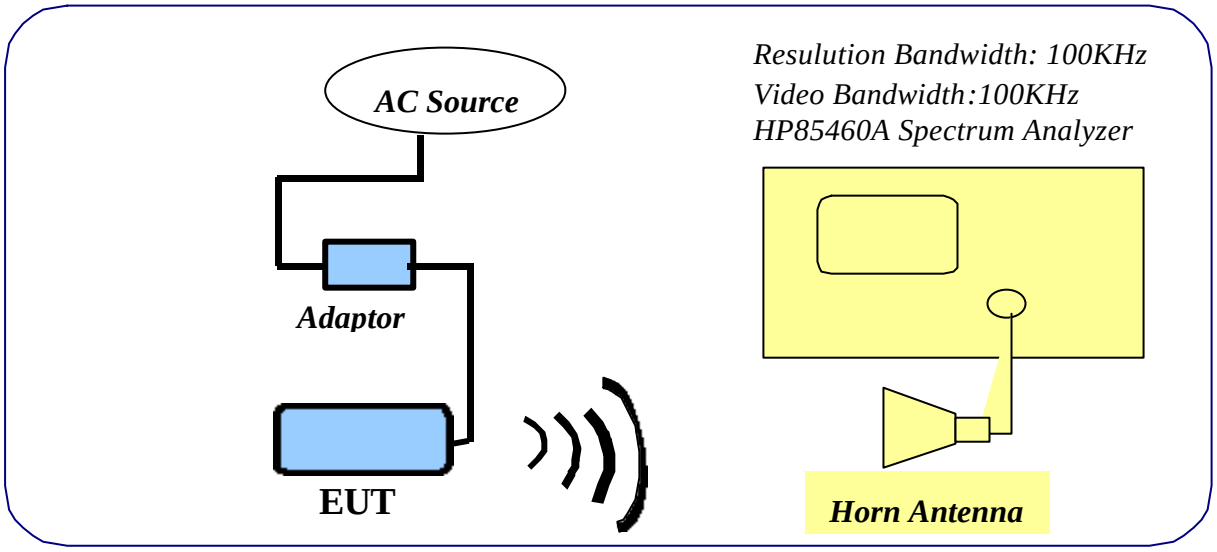
3.1 Test Condition & Setup

The transmitter bandwidth measurements were performed in an anechoic chamber. The EUT was placed on a wooded table, which is 0.8 meters height. The EUT was set to transmit continuously. Various channels were also investigated to find the maximum occupied bandwidth. The minimum 6 dB bandwidth shall be at least 500 KHz.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 KHz. Set the span>> RBW. The detector function was set to peak and hold mode to clearly observe the components.

Setting up procedure is written on Appendix A.

3.2 Test Instruments Configuration



P.S.: A USB lan to USB port from notebook computer to control the EUT at maximal power output and channel Number.

Test Configuration of Bandwidth for Direct Sequence System

3.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	10/18/00	10/18/01
RF Filter Section	85460A	H P	3448A00217	10/18/00	10/18/01
Horn Antenna	3115	EMCO	9704 – 5178	08/15/00	08/15/01

3.4 Test Result of Bandwidth

Bandwidth of Channel 1

Bandwidth	:	10.50 MHz
The min. 6 dB BW at least	:	500 KHz

Bandwidth of Channel 6

Bandwidth	:	10.25 MHz
The min. 6 dB BW at least	:	500 KHz

Bandwidth of Channel 11

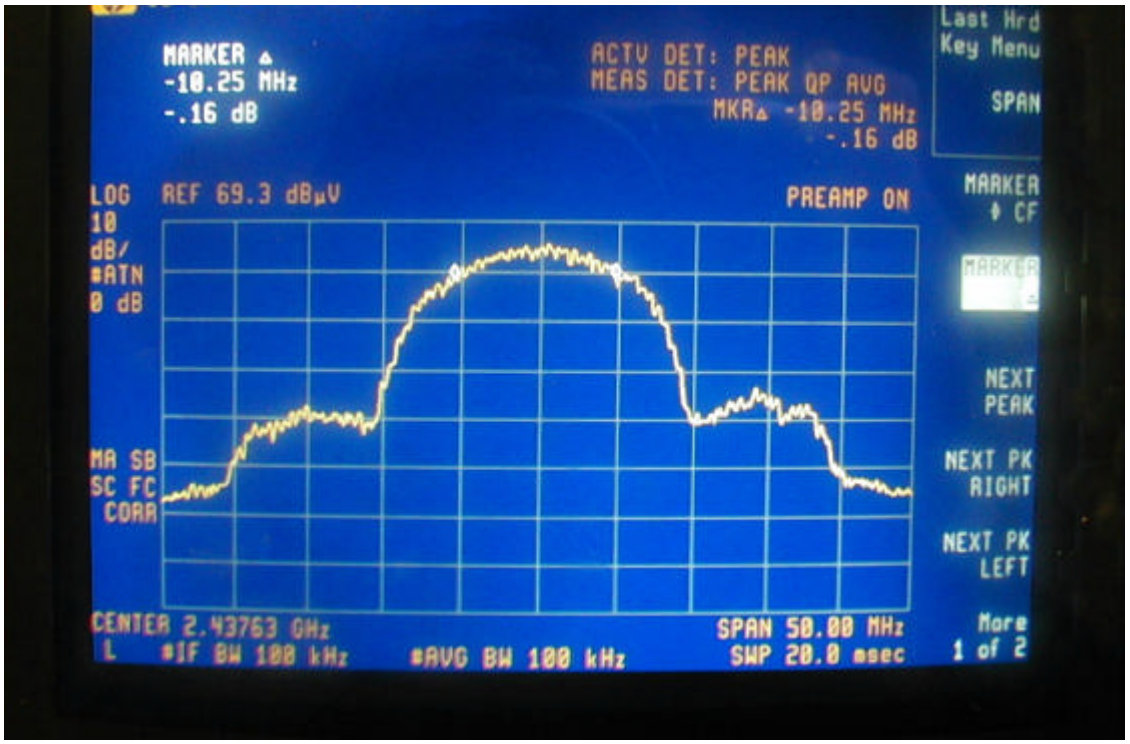
Bandwidth	:	10.13 MHz
The min. 6 dB BW at least	:	500 KHz

Note:

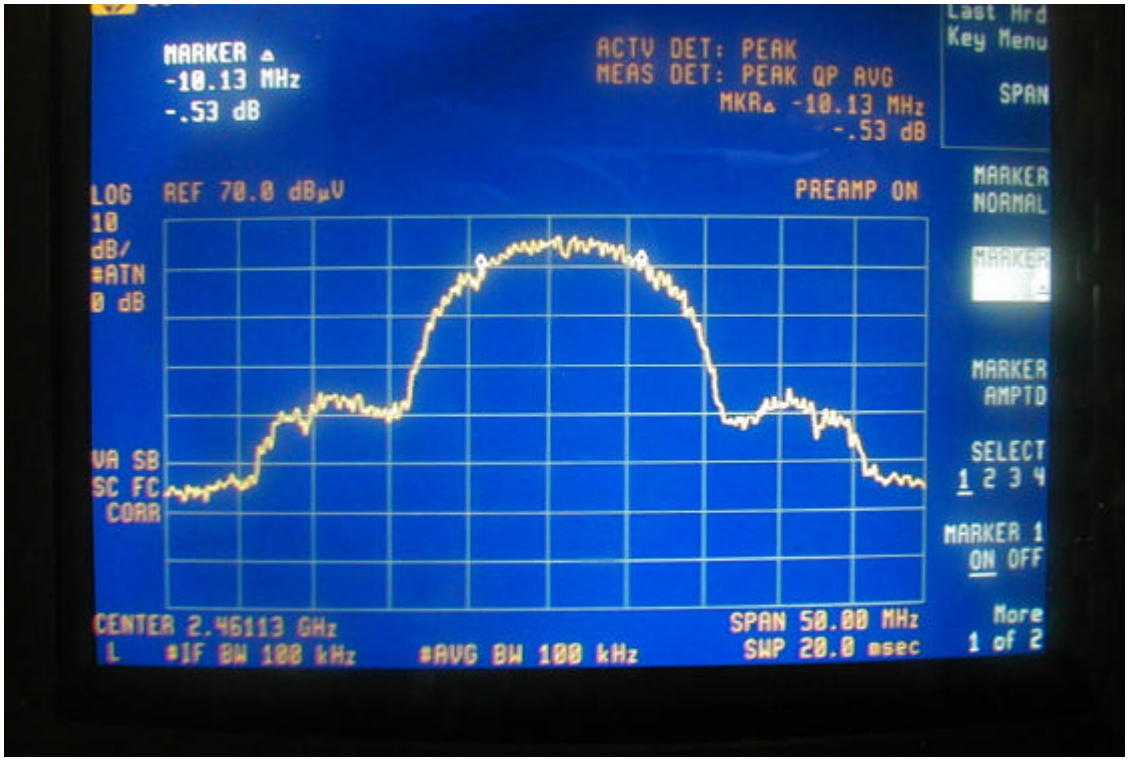
1. The data in the above table are summarizing the following attachment spectrum analyzer hard copy.
2. The attachments follow page.

Bandwidth of Channel 1: 10.50 MHz

Bandwidth of Channel 6: 10.25 MHz



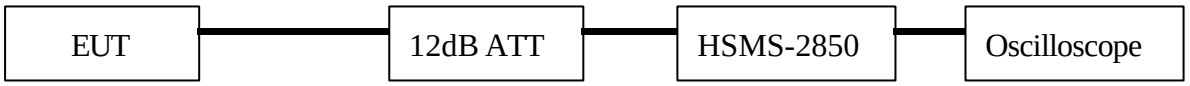
Bandwidth of Channel 11: 10.13 MHz



Ⅳ. Section 15.247(B): Power Output

4.1 Test Condition & Setup

1.



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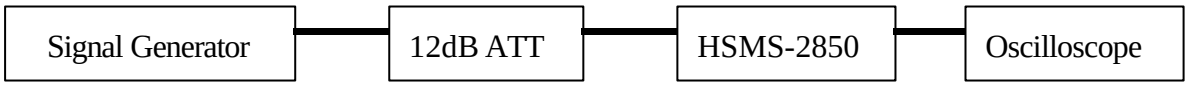


1. The output of the transmitter thought 12dB attenuator and terminated by Schottkey Detector Diode (Hewlett- Packard HSMS-2850)
2. The output of the Shocttkey Diode Detector connected to the vertical channel of an oscilloscope. The observed trace of the oscilloscope shall be recorded as "A".
3. The combination of the diode detector and the oscilloscope capable of faithfully reproducing the envelop peaks and the duty cycle of the transmitter output signal.
4. The transmitter replaced by a signal generator . The output frequency of the signal made equal to the center of the frequency range occupied by the transmitter and unmodulated.
5. The output of the signal generator raised to reach the peak of trace "A" and then replace the 12 dB attenuator and Schottkey Detector Diode by power meter, measure the signal generator output level record as x mW.
6. The signal generator output level XmW is the transmitter output peak power. Recording the following.

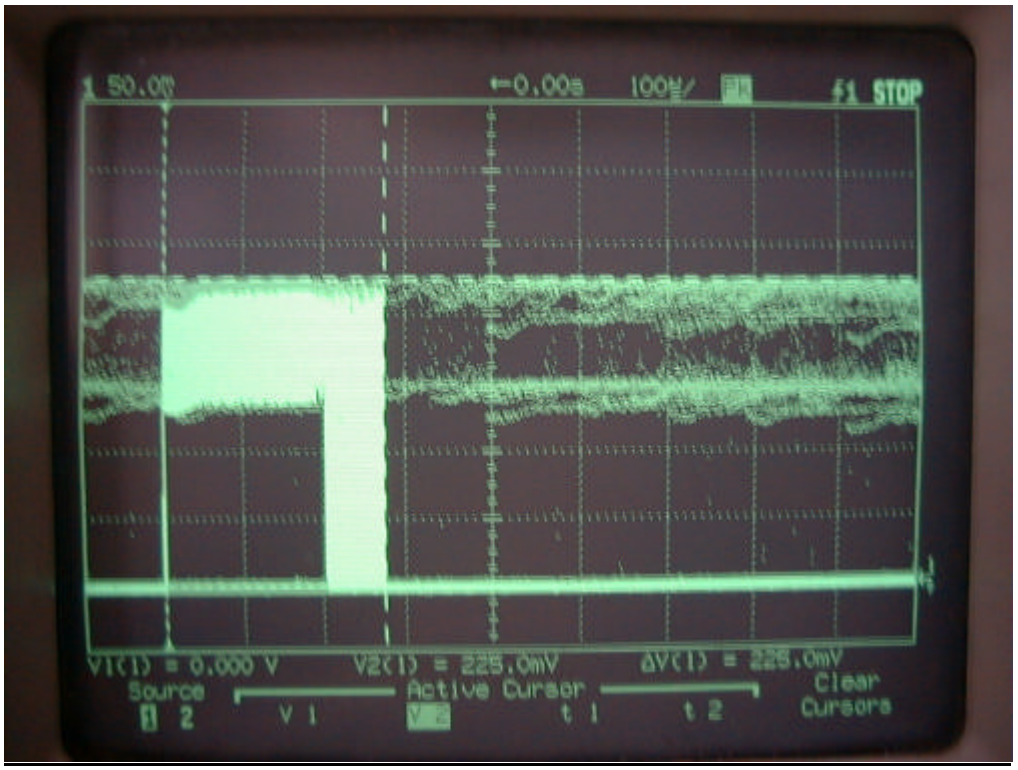
4.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Oscilloscope	54600A	H P		10/18/00	10/18/01
Signal Generator	83711A	H P	3429A00434	10/18/00	10/18/01
Shocttkey Diode	HSMS-2850	H P			
Attenuator	MCL BW-S6W2	Mini-Circuits			

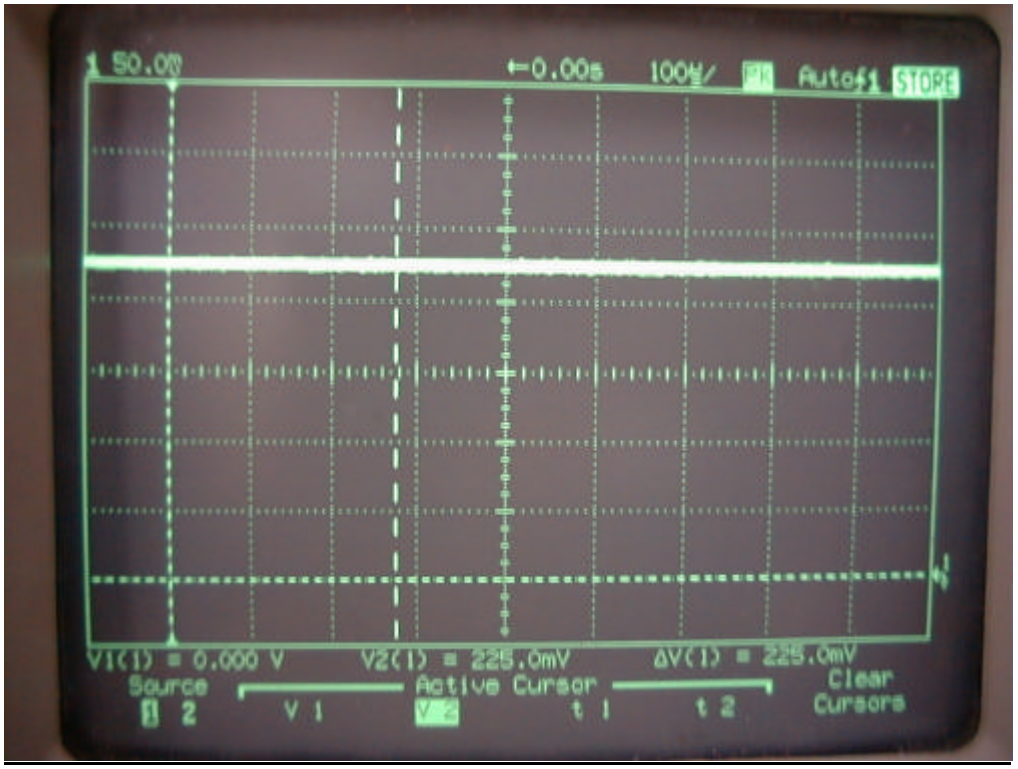
4.3 Test Result

Channel	Output peak power (mw)
CH1	38.81
CH6	39.81
CH11	39.90

Oscilloscope set in Autostore mode use data V function measure the Peak Output Voltage.



Adjust CW Signal Generator output level until the same data V Voltage is reaching.



Ⅴ. Section 15.247 (C)(2): Spurious Emissions (Radiated)

5.1 Test Condition & Setup

The EUT was placed in an anechoic chamber and scanned at 3 meter distance to determine its emission characteristics. The physical arrangement of the EUT 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, directivity, and frequency. The exact system configuration, which produced the highest emissions was noted so it could be reproduced later during the final tests. This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT.

Final radiation measurements were made on a three-meter, anechoic chamber. The EUT system was placed on a nonconductive turntable, which is 0.8 meters height, top surface 1.0 x 1.5 meter.

The spectrum was examined from 30 MHz to 1000 MHz using an Hewlett Packard 85460A EMI Receiver, Schaffner whole range Bi-Log antenna (Model No.: CBL6141A) is used to measure frequency from 30 MHz to 1GHz.The final test is used the spectrum HP 85460A and spectrum was examined from 1GHz to 18GHz using an Hewlett Packard 8564E Spectrum Analyzer, EMCO Horn Antenna (Model 3115) for 1G ~ 18GHz.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. There are two spectrum analyzers use on this testing, HP 85460A for frequency 30MHz to 1000MHz, and 8564E for frequency 1GHz to 18GHz. No post-detector video filters were used in the test. The spectrum analyzer's 6dB bandwidth was set to 120KHz (spectrum was examined from 30 MHz to 1000 MHz), the spectrum analyzer's 6 dB bandwidth was set to 1 MHz (spectrum was examined from 1GHz to 18GHz) and the analyzer was operated in the maximum hold mode.

There is a test condition apply in this test item, the test procedure description as the following:

(1) EUT transmit only:

Using the USB lan to USB port of Notebook PC and software to control the EUT through ethernet hub.Then making access to the mode of continuous transmission. Three channels is tested, one in the top (CH01), one in the middle (CH06) and the other in bottom (CH11).

With the transmitter operating from a AC source and using the internal of EUT, radiates spurious emissions falling within the restricted bands of 15.209 were measured at operating frequencies corresponding to low, mid and high channels in the 2400 ~ 2483.5 MHz band.

The actual field intensity in decibels referenced to 1 microvolt per meter (dBμV/m) is determined by algebraically adding the measured reading in dBμV, the antenna factor (dB), and cable loss (dB) at the appropriate frequency.

For frequency between 30MHz to 1000MHz

FIa (dBuV/m) = FIr (dBμV) – Correction Factors

FIa : Actual Field Intensity

FIr : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

For frequency between 1 GHz to 18 GHz

FIa (dBμV/m) = FIr (dBμV) + Correction Factor

FIa : Actual Field Intensity

FIr : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

The setting up procedure is recorded on Appendix A.

5.2 List of Test Instruments

Instrument Name	Model No	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	10/18/00	10/18/01
RF Filter Section	85460A	H P	3448A00217	10/18/00	10/18/01
Switch/Control Unit (> 30MHz)	3488A	H P	N/A	11/20/00	11/20/01
Auto Switch Box (> 30MHz)	ASB-01	TRC	9904-01	11/20/00	11/20/01
Spectrum Analyzer	8564E	H P	US36433002	08/13/00	08/13/01
Microwave Preamplifier	83051A	H P	3232A00347	08/13/00	08/13/01
Horn Antenna	3115	EMCO	9704 – 5178	08/15/00	08/15/01

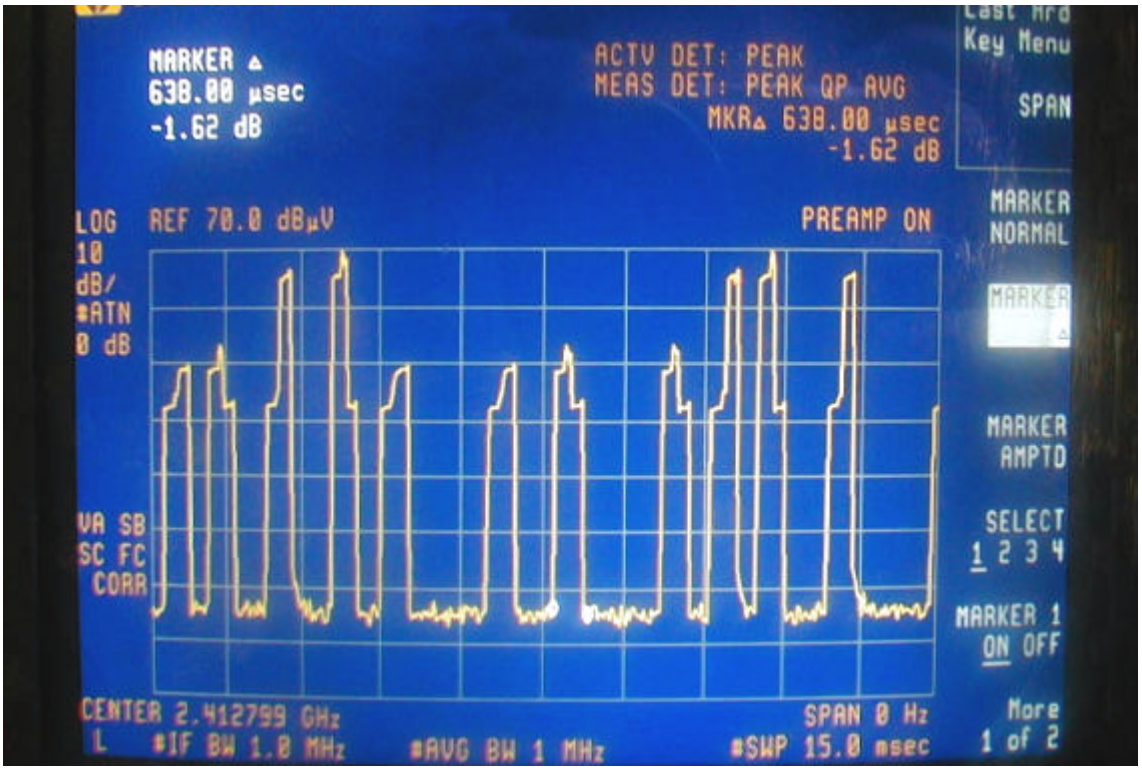
5.2.1 Duty Cycle Factor Measurement

The duty cycle factor measurement is performed in a shield enclosure. The test condition and setup is as same as paragraph Ⅲ. Set the RB = 1MHz, VB=1MHz, and span = 0 MHz. Link the EUT, then get the Time of duty and cycle as follow page.

Total pulse time is

0.600+0.637+0.712+0.638+0.638+0.600+0.600+0.562+0.750+0.600+0.712+0.113 = 7.163 mS

The duty cycle factor = 20 log (T_{duty} / T_{cycle}) = 20 log (7.163/ 15) = – 11.086


MARKER Δ
638.00 µsec
-1.62 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 638.00 µsec
-1.62 dB
Key Menu
SPAN
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBµV
PREAMP ON
MARKER
NORMAL
MARKER
AMPTD
SELECT
1 2 3 4
MARKER 1
ON OFF
More
1 of 2
VA SB
SC FC
CORR
CENTER 2.412799 GHz
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SPAN 0 Hz
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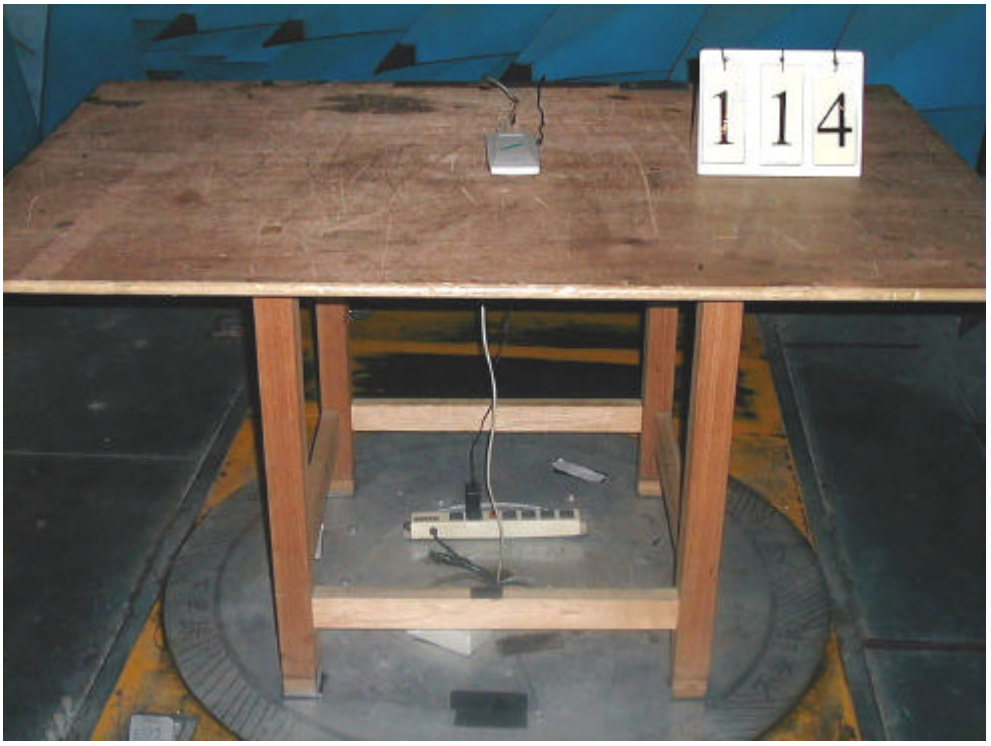
5.3 Test Instruments Configuration



Front View of the Test Configuration

Rear View of the Test Configuration

The test configuration for frequency between 1GHz to 18GHz is same as above.

5.4 Test Result of Second Harmonic

Set the spectrum RB= 3 MHz, VB = 3MHz and span = 5MHz. The correction factors of the second harmonic is the second harmonic must lower 20 dB than the fundamental.

FCC ID : LZU-MAP-811E-
EUT : Wireless Bridge Router

Table 5 Second Harmonic Attendation

Channel	*Fundamental (MHz)*	*Fundamental (dBmV/m)*	*2nd Harmonic (GHz)*	*2nd Harmonic (dBmV/m)*	*Result (F/H dB)*	*Limit (dB)*	*Margin (dB)*
CH 1	2.412	103.14	4.060	40.13	27.41	20.00	7.41
CH 6	2.437	103.53	4.100	40.46	27.47	20.00	7.47
CH 11	2.462	100.84	4.150	44.90	20.34	20.00	0.34

Note:

1. The 2nd Harmonic is comply with 15.209.
2. Result = Fundamental – 2nd Harmonic must over 20 dB and comply with 15.209.

5.5 Test Result of Spurious Radiated Emissions

5.5.1 EUT's transmit only

The highest peak values of radiated emissions form the EUT at various antenna heights, antenna polarizations, EUT orientation, etc. are recorded on the following.

FCC ID : LZU-MAP-811E-
EUT : Wireless Bridge Router

Test Conditions: Testing room : Temperature : 26 ° C Humidity : 73 % RH
Testing site : Temperature : 31 ° C Humidity : 75 % RH

Table 6 Radiated Emissions For 30MHz 1GHz [CH 1, Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (MHz)	*Amplitude (dBmV/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBmV/m)*	*Limit (dBmV/m)*	*Margin (dB)*
36.999	0.70	2.46	144	-21.46	22.16	40.00	-17.84
154.379	17.94	1.00	121	-14.60	32.54	43.50	-10.96
211.450	18.60	1.00	127	-14.22	32.82	43.50	-10.68
509.988	9.73	2.46	94	-21.17	30.90	46.00	-15.10
639.984	11.43	1.00	74	-24.03	35.46	46.00	-10.54
759.983	10.90	1.00	76	-26.29	37.19	46.00	-8.81
***							

Note:

1. Margin = Corrected Amplitude – Limit.
2. Peak Amplitude – Correction Factors = Corrected Amplitude

Table 7 Radiated Emissions For 1GHz 18GHz [CH 1, Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
4.060	44.27	1.00	221	-5.64	38.63	54.00	-15.37
7.220	33.41	1.00	76	9.72	43.13	54.00	-10.87
8.140	32.07	1.00	49	9.72	41.79	54.00	-12.21
***							

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected

***Above emissions of 14.5GHz, they are all under the limits more than twenty dB in Test Site.**

Table 8 Radiated Emissions For 30MHz 1GHz [CH 1, Vertical]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (MHz)	*Amplitude (dBmV/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBmV/m)*	*Limit (dBmV/m)*	*Margin (dB)*
30.001	12.41	1.00	129	-23.79	36.20	40.00	-3.80
48.003	18.25	1.00	22	-15.73	33.98	40.00	-6.02
209.997	12.71	1.00	11	-14.22	26.93	43.50	-16.57
509.990	10.88	1.00	32	-22.10	32.98	46.00	-13.02
599.987	13.18	1.00	113	-23.56	36.74	46.00	-9.26
719.985	8.91	1.00	131	-25.81	34.72	46.00	-11.28
***							

Table 9 Radiated Emissions For 1GHz 18GHz [CH 1, Vertical]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
4.060	45.77	1.00	359	-5.64	40.13	54.00	-13.87
7.220	33.24	1.00	167	9.72	42.96	54.00	-11.04
8.140	33.41	1.00	52	9.72	43.13	54.00	-10.87
11.840	32.24	1.00	94	9.72	41.96	54.00	-12.04
***							

***Above emissions of 14.5GHz, they are all under the limits more than twenty dB in Test Site.**

Table 10 Radiated Emissions For 30MHz 1GHz [CH 6, Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (MHz)	*Amplitude (dBmV/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBmV/m)*	*Limit (dBmV/m)*	*Margin (dB)*
154.369	17.10	1.00	125	-14.60	31.70	43.50	-11.80
209.998	20.11	1.00	114	-14.08	34.19	43.50	-9.31
269.991	18.50	1.00	152	-15.50	34.00	46.00	-12.00
352.002	11.74	1.00	81	-18.25	29.99	46.00	-16.01
599.987	13.70	1.00	84	-23.25	36.95	46.00	-9.05
759.987	11.47	1.00	72	-26.29	37.76	46.00	-8.24
***							

Table 11 Radiated Emissions For 1GHz 18GHz [CH 6, Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
4.100	46.10	1.00	97	-5.64	40.46	54.00	-13.54
7.320	32.91	1.00	46	9.72	42.63	54.00	-11.37
11.670	31.74	1.00	189	9.72	41.46	54.00	-12.54
12.640	32.07	1.00	209	9.72	41.79	54.00	-12.21
***							

***Above emissions of 14.5GHz, they are all under the limits more than twenty dB in Test Site.**

Table 12 Radiated Emissions For 30MHz 1GHz [CH 6, Vertical]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (MHz)	*Amplitude (dBmV/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBmV/m)*	*Limit (dBmV/m)*	*Margin (dB)*
30.001	11.86	1.00	11	-23.79	35.65	40.00	-4.35
48.003	18.70	1.00	1	-15.73	34.43	40.00	-5.57
209.997	13.39	1.00	13	-14.22	27.61	43.50	-15.89
509.989	11.11	1.00	32	-22.10	33.21	46.00	-12.79
599.988	13.14	1.00	109	-23.56	36.70	46.00	-9.30
719.983	8.71	2.46	50	-25.81	34.52	46.00	-11.48
***							

Table 13 Radiated Emissions For 1GHz 18GHz [CH 6, Vertical]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
4.100	46.10	1.00	64	-5.64	40.46	54.00	-13.54
7.320	37.91	1.00	159	9.72	47.63	54.00	-6.37
8.24	31.57	1.00	247	9.72	41.29	54.00	-12.71
10.15	31.91	1.00	66	9.72	41.63	54.00	-12.37
11.67	31.91	1.00	8	9.72	41.63	54.00	-12.37
***							

***Above emissions of 14.5GHz, they are all under the limits more than twenty dB in Test Site.**

Table 14 Radiated Emissions For 30MHz 1GHz [CH11, Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (MHz)	*Amplitude (dBmV/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBmV/m)*	*Limit (dBmV/m)*	*Margin (dB)*
154.359	16.89	1.00	112	-14.60	31.49	43.50	-12.01
209.998	19.78	1.00	112	-14.08	33.86	43.50	-9.64
269.993	18.22	1.00	128	-15.50	33.72	46.00	-12.28
352.695	13.03	1.00	78	-18.25	31.28	46.00	-14.72
599.992	13.70	1.00	88	-23.25	36.95	46.00	-9.05
759.987	11.69	1.00	68	-26.29	37.98	46.00	-8.02
***							

Table 15 Radiated Emissions For 1GHz 18GHz [CH 11, Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
4.150	50.54	1.00	27	-5.64	44.90	54.00	-9.10
7.390	31.51	1.00	169	9.72	41.23	54.00	-12.77
10.150	31.68	1.00	280	9.72	41.40	54.00	-12.60
14.420	31.07	1.00	173	9.72	40.79	54.00	-13.21
***							

***Above emissions of 14.5GHz, they are all under the limits more than twenty dB in Test Site.**

Table 16 Radiated Emissions For 30MHz 1GHz [CH 11, Vertical]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (MHz)	*Amplitude (dBmV/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBmV/m)*	*Limit (dBmV/m)*	*Margin (dB)*
30.002	11.54	1.00	149	-23.79	35.33	40.00	-4.67
48.007	18.28	1.00	3	-15.73	34.01	40.00	-5.99
209.998	13.37	1.00	12	-14.22	27.59	43.50	-15.91
484.001	18.73	1.00	115	-21.46	40.19	46.00	-5.81
549.990	11.11	1.00	2	-24.04	35.15	46.00	-10.85
599.989	13.23	1.00	131	-23.56	36.79	46.00	-9.21
595.977	4.12	1.00	42	-30.13	34.25	46.00	-11.75
***							

Table 17 Radiated Emissions For 1GHz 18GHz [CH 11, Vertical]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
4.150	46.06	1.00	27	-5.64	40.42	54.00	-13.58
7.390	30.20	1.00	169	9.72	39.92	54.00	-14.08
8.360	30.70	1.00	280	9.72	40.42	54.00	-13.58
14.420	31.03	1.00	173	9.72	40.75	54.00	-13.25
***							

Above emissions of 14.5GHz, they are all under the limits more than twenty dB in Test Site.

Ⅵ. Section 15.247(d): Power Spectral Density

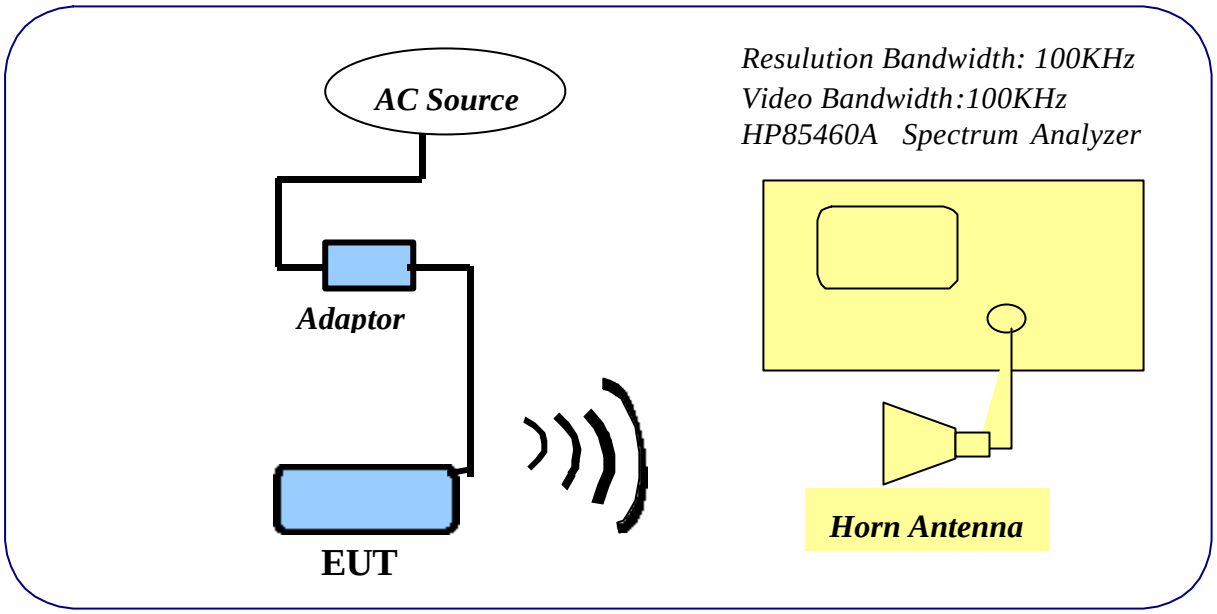
6.1 Test Condition & Setup

The tests below are running with the EUT transmitter set at high power in TDD mode .A mini-pci port from a notebook computer to the EUT. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. A horn antenna was connected with the spectrum analyzer.

The EUT is tested in open field site. Put EUT on the middle of a wooden table. Set spectrum analyzer RBW = 3 KHz, VBW > RBW (e.g. VBW = 10 KHz), Span = 2 MHz. Turn around the table to find maximum emission. Then set the Span = 300 KHz and sweep time = 100 sec . Peak the maximum emission again. The peak level measured must be no greater than + 8dBm.

The setting up procedure is recorded on Appendix A.

6.2 Test Instruments Configuration



P.S.A USB lan to USB port from notebook computer to control the EUT at maximal power output and channel Number.

Test Configuration of Power Spectral Density

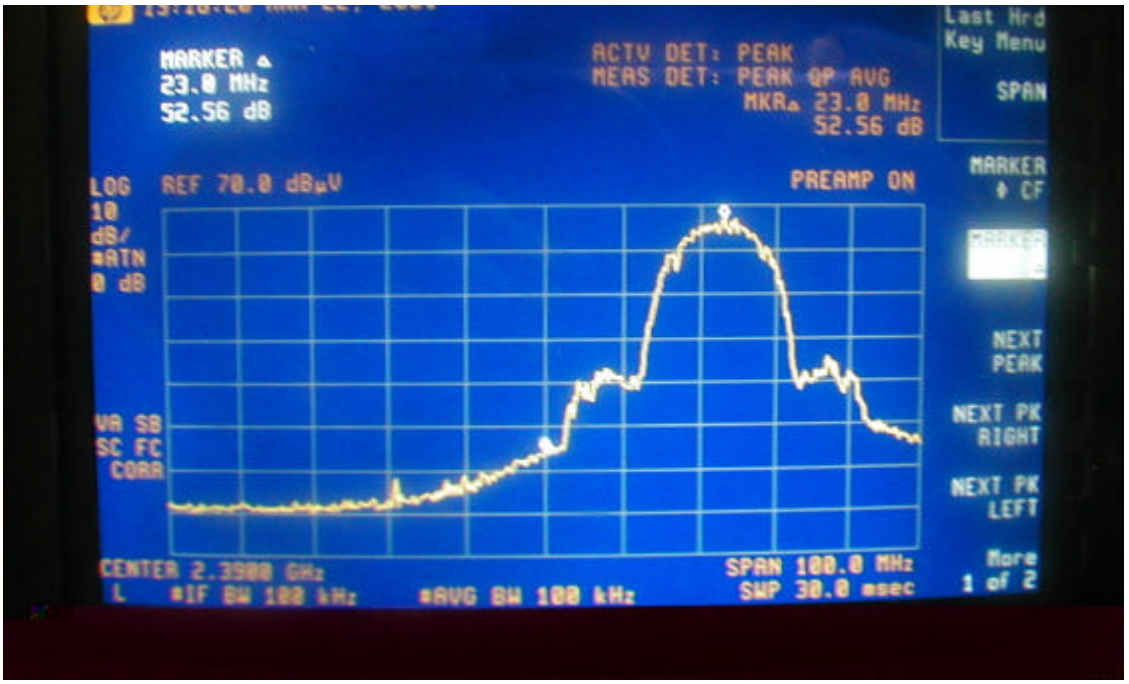
6.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	10/18/00	10/18/01
RF Filter Section	85460A	H P	3448A00217	10/18/00	10/18/01
Horn Antenna	3115	EMCO	9704 – 5178	08/15/00	08/15/01

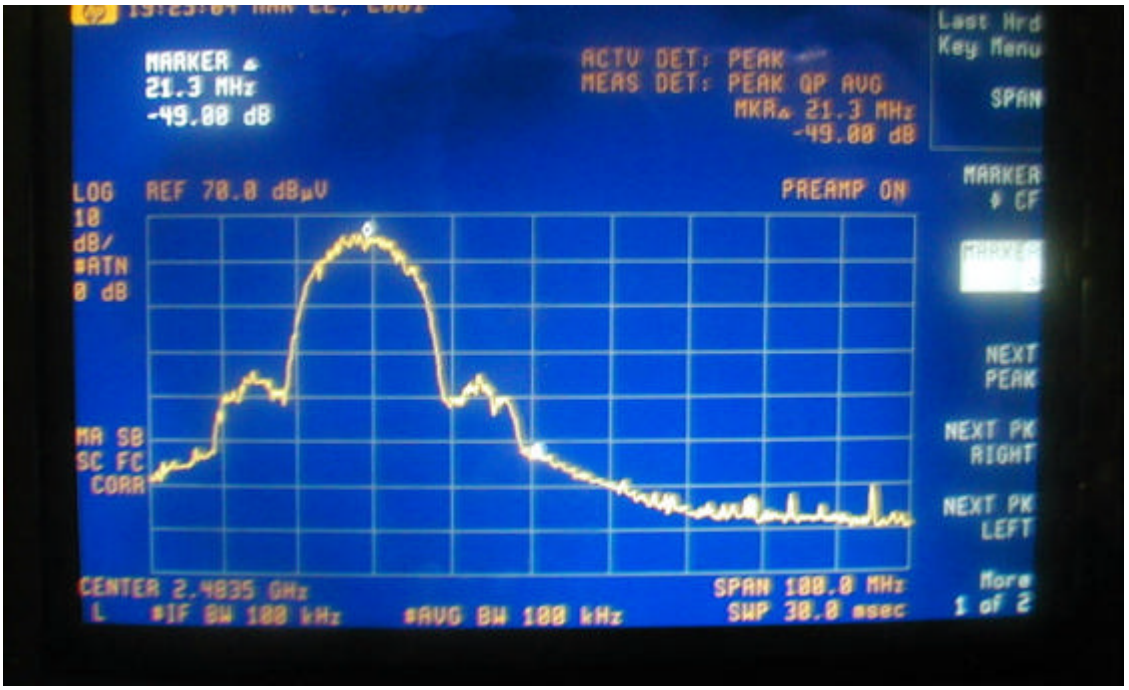
6.4 Required of Carrier frequency

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 id § 15.209(a), whichever results in the lesser attenuation.

Test Condition & Setup: same as 3.1



Reading peak value 14.43 dBuV + Corrected factor 35.6dB = 50.03dBuV/m < limited Limited: 53.90 dBuV/m



Reading peak value 16.61 dBuV + Corrected factor 35.6dB = 52.21 dBuV/m < limited Limited: 53.90 dBuV/m

6.5 Test Result of Power spectral density

The following table shows a summary of the highest power out of UT.

FCC ID : LZU-MAP-811E-

Channel	*Frequency (GHz)*	*Ppr (dBuV)*	*CF (dB)*	*Ppq (dBm)*	*Limit (dB)*	*Margin (dB)*
CH 01	2.411	51.61	35.60	-8.02	8.00	-16.02
CH 06	2.438	50.82	35.60	-8.81	8.00	-16.81
CH 11	2.462	50.37	35.60	-9.26	8.00	-17.26

Note:

1. The attachment follow by this page and there is no page number.
2. Ppr: spectrum read power density (using peak search mode), CF: correct factor, Ppq: actual peak power density in the spread spectrum band.
3. Ppq = Ppr + CF
4. Effective Radiation Power (E.R.P.) = $(E\ d)^2 / 30G$

"E" is the measured maximum field strength in V/m utilizing the maximum hold mode RBW (3KHz)

"G" is the numeric gain of the transmitting antenna over an isotropic radiator (1.00).

"d" is the distance in meters from which the field strength was measured (3M).

Example: the Max Radiation Emission = 51.61 + (35.60) = 87.21 dBμV/m

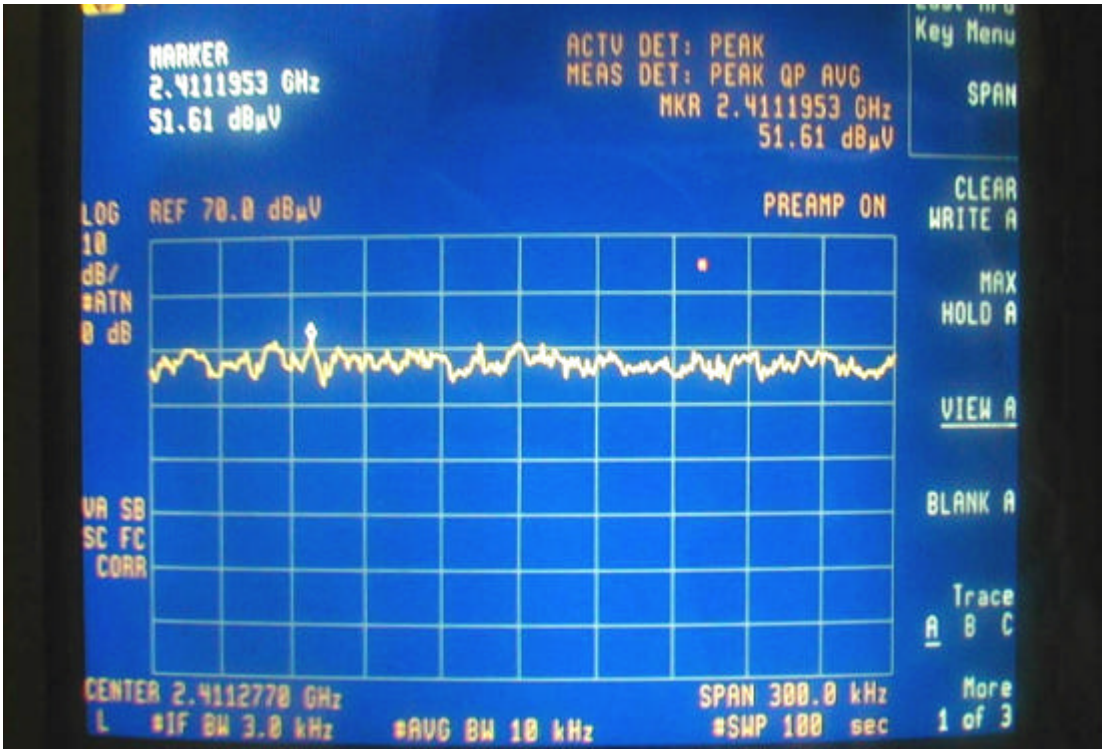
$10^{(87.21/20)} \times 10^{-6} = 0.022935$ V

E.R.P. = $(0.022935 \times 3)^2 / 30 = 0.157805$ mW

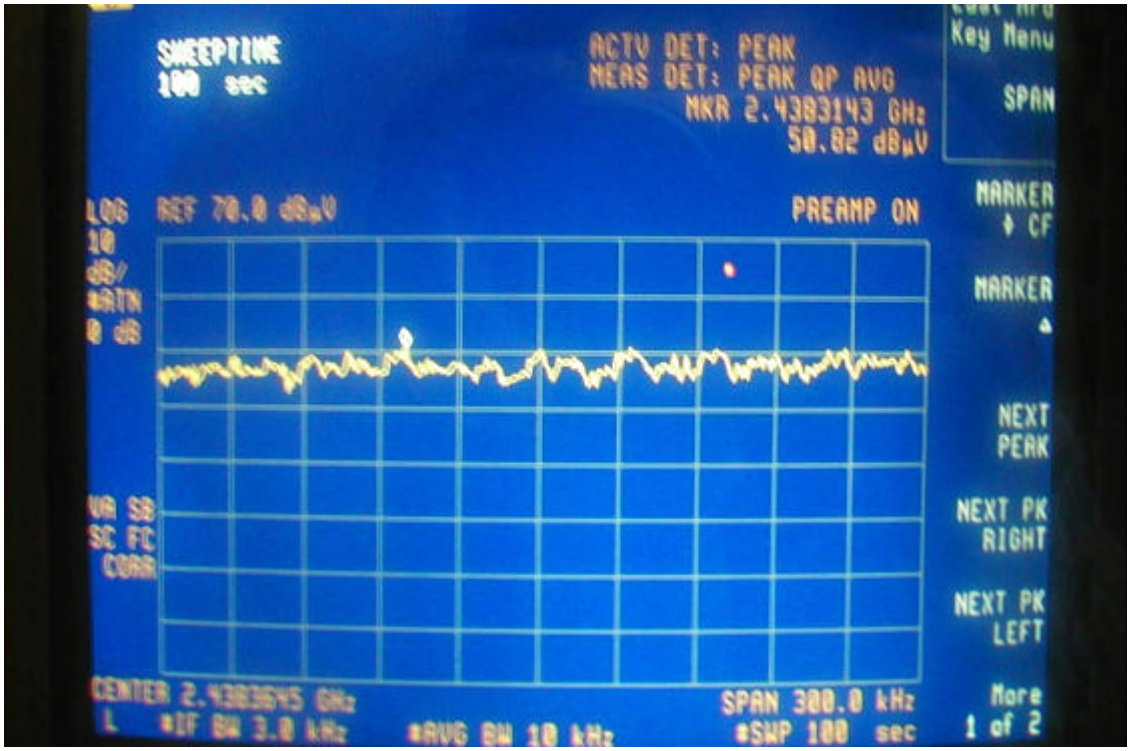
= 10 x log (0.157805 mW/1mW)

= -8.019 dBm

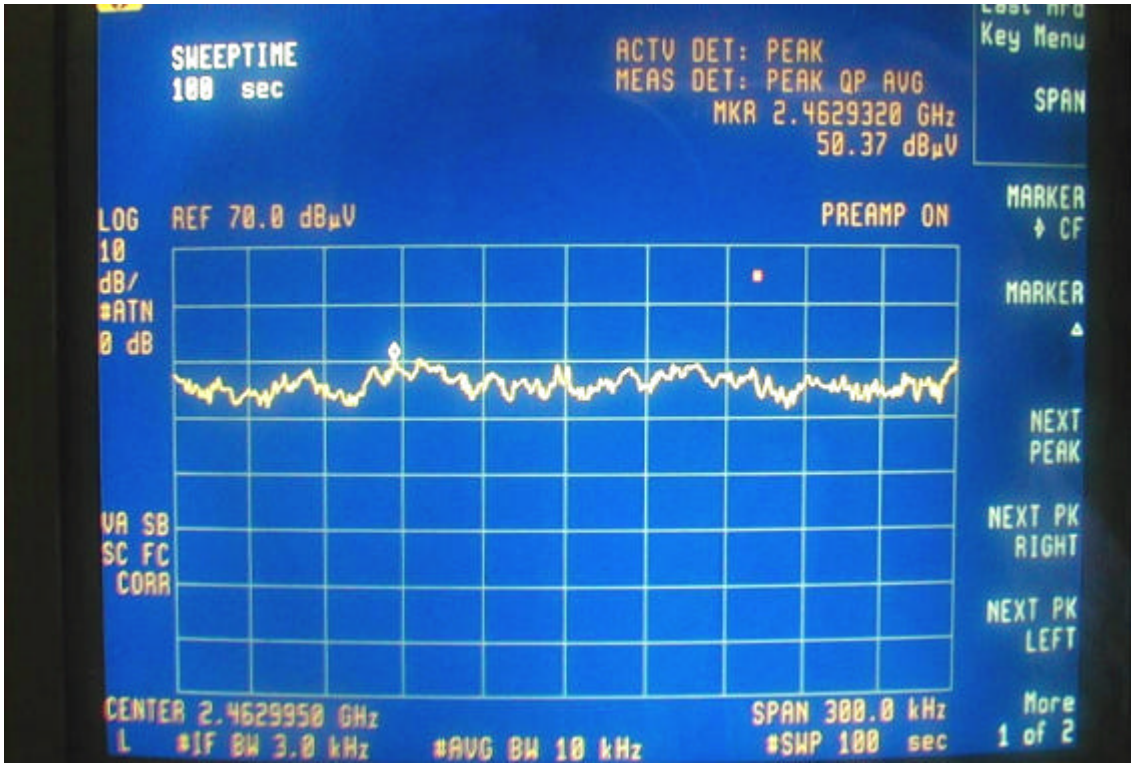
Power Spectral Density of Channel 01



Power Spectral Density of Channel 06



Power Spectral Density of Channel 11



Appendix A

Setting up Procedure

1. The UTP port EUT connected to ethernet hub which connect to USB port of notebook computer through USB lan. Using the bcated remotely USB lan to lan port of notebook computer and software to control the EUT
2. Use the software that is given by the customer and operated in the windows or DOS to control the EUT's continuous transmission.
3. Then making access to the mode of continuous transmission and set testing channel.

Appendix B

Antenna Spec.

Patch Antenna Specification :

Model No: XI _300 _ANT.
Patch Antenna Specification

No	Items	Specifications
1	RF frequency band	2.4 ~ 2.5 GHz
2	Transmission power	100mW Accuracy: less than +20% and more than -50%
3	RF Output connector	MMCX(R) connector
4	Output impedance	50Ω
5	VSWR	Less than 1.5
6	Antenna peak gain and directivity	0 dBI (peak)Typ. ; 2 dBI(max) Azimuth: Omni ; Elevation: Double Oval
7	Polarization	Horizontal
8	Antenna shape	λ/4 – Patch antenna
9	Temperature range	0°C ~ +50°C
10	Notice	

Appendix C

The antenna of the device is fixed outside of EUT, the user can not remove it freely without any tools from outside the device. This is comply with the FCC rules part 15.203

Appendix D

RF Exposure Calculations

From FCC 1.1310 table 1A, the maximum permissible RF exposure for an uncontrolled environment is $1mW/cm^2$. The Electric field generated for a $1mW/cm^2$ exposure (S) is calculated as follows:

$S = E^2 / Z$

Where:

S = Power density

E = Electric field

Z = Impedance.

$E = \sqrt{S \times Z}$

$1mW/cm^2 = 10\ W/m^2$

The impedance of free space is 337 ohms, where E and H fields are perpendicular.

Thus:

$E = \sqrt{10 \times 377} = 61.4$ V/m which is equivalent to $1mW/cm^2$

Using the relationship between Electric field E, Power in watts P, and distance in meters d, the corresponding

Antenna numeric gain G and the transmitter output power and solving for d,

$$d = \frac{\sqrt{P_{eak} \times 30 \times G}}{E}$$

The Numeric gain G of antenna with a gain specified in dB is determined by:

$G = Log^{-1}$ (dB gain/10)

$G = Log^{-1}$ (2.0/10) = 1.584

Notice in Installation Manual:

While installing and operating this transmitter and antenna combination the radio frequency exposure limit of $1mW/cm^2$ may be exceeded at distances close to the antennas installed. Therefore, the user must maintain a minimum distance of 20 cm from the antenna at all time.

The table in follow page identifies the distances where the 1mW/cm ^{2} exposure limits may be exceeded during continuous transmission using the antenna

Antenna Type	Gain (dBi)	Gain Numeric	Peak Output Power (mW)	Calculated RF Exposure Separation Distance (cm)	Minimum RF Exposure Separation Distance (cm)
Dipole	2.0	1.584	0.002	1.547	20

Measurement of MPE

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Filed Strength (H) (A/m)	Power Density (S) (mW/cm2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
(A) Limits for Occupational/Controlled Exposure				
300-1500	--	--	f/300	30
1500-100,000	--	--	5	30
(B) Limits for General Population/Uncontrolled Exposure				
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30
Test Result of EUT			0.0100	30

Setting up Procedure: (See Appendix A)

List of Test Instruments:

Instrument Name	Model No	Brand	Serial No.	Last time	Next time
EM Radiation Monitor	EMC-20	WG	Y-0026	05/11/2000	05/11/2001
E-Field Sensor 3GHz	TYP-8	WG	Z-0001	05/08/2000	05/08/2001

Picture of Test: