

Measurement Report

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Project No. : 03E0058
Report No. : FCC-P-03010
Equipment : Wireless AP
Model No. : PL9510-WAP
Applicant : DOUBLE WIN ENTERPRISE CO., LTD.
No. 300, Sec 1, Chung Feng Rd. Ping
Chen City, Taoyuan Hsien. Taiwan,
R.O.C.

Tested by :

Neutron Engineering Inc. EMC Laboratory

Data of Test :

Feb.28,2003 ~ Mar.13,2003

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Code:200145-0

Declaration

Neutron represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Assessment Authorities	ISO Guide Adopted	Test Standard/Scope/Item Acceptance
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ISO Guide 17025

FCC Part 15 Subpart B/C
IEC/CISPR22
AS/NZS 3548
CNS 13438



ISO Guide 17025

FCC Part 15 Subpart B/C
CISPR 22/EN 55022
AS/NZS 3548
VCCI -Technical Requirement
CNS 13438
SS IEC/CISPR 22
IEC/EN 61000-3-2 IEC/EN 61000-4-5
IEC/EN 61000-3-3 IEC/EN 61000-4-6
IEC/EN 61000-4-2 IEC/EN 61000-4-8
IEC/EN 61000-4-3 IEC/EN 61000-4-11
IEC/EN 61000-4-4

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1. General Information**1.1 Applicant**

Name DOUBLE WIN ENTERPRISE CO., LTD.

Address No. 300, Sec 1, Chung Feng Rd. Ping Chen City, Taoyuan Hsien. Taiwan, R.O.C.

1.2 Manufacturer

Name N/A

Address N/A

1.3 Equipment Under Tested

Name: Wireless AP

Trade Name: WIRELiNK

Model No.: PL9510-WAP

1.4 OEM Brand/Model (if applicable)

OEM Brand(s)/Model(s) except the basic model in sub-clause 1.3 is(are) the follows:

OEM Brand: Speed-Link ; Corinex ; Powernet ; Pluglink ; Asoka

Model No.: PL9510-WAP

1.5 Product Descriptions(Application/Features/Specification)

The EUT is a Wireless AP. A major technical descriptions of EUT is described as following:

Operation Frequency	2412-2462 MHz
Modulation Type	DSSS
Antenna Designation	Dipole Antenna
Antenna Gain	2.15 dBi
Transfer Rate	1 / 2 / 5.5 / 11 Mbps
Output Power	19.31 dBm (Max)
Number Of Channel	11

Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual (Attachment - E.)

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	05	2432	09	2452
02	2417	06	2437	10	2457
03	2422	07	2442	11	2462
04	2427	08	2447		

1.6 Connecting I/O Port(s)

Please refer to the User's Manual (Attachment - **E.**)

1.7 Power Supplied

Power Source: DC Voltage supplied from AC/DC adapter.

Power Cord: N/A

Power Rating: DC8 Vdc/1.3A

1.8 Products Covered (if applicable)

The sample tested including the following sub-system/module/accessory :

Sub-system/ Module/ Accessory	Model/Type No.	Int. Inst./ Ext. Cont.
Adapter	AD75	Ext.

1.9 Model Difference (Series, Versions, if any)

Except the basic model no. (model designation of the sample tested in this test report), additional model no. covered is(are) :

N/A

1.10 EUT Modifications (if applicable)

No any modification required for the EUT to comply with the standards.

1.11 Electric Block Diagram

Please refer to the Attachment – **A.**

1.12 Photos of EUT

Please refer to the Attachment – **D.**

2. RFI Emissions Measurement

2.1 Test Facility

The test facilities used to collect the test data in this report located at No.132-1, Lane 329, Sec. 2, Palain Road, Shijr City, Taipei, Taiwan.

2.2 Standard Compliance

The test data contained in this report relate only to the item(s) listed below :

FCC Part15, Subpart C / ANCI C63.4 : 1992

The composite system (including receiver and transmitter) in compliance with Subpart B is authorized under a DoC procedure.

2.3 Test Conditions and Channel

Test Channel (1)	EUT Channel	Test Frequency(MHz)
1	CH 1	2412
2	CH 6	2437
3	CH 11	2462

Note:

(1)The measurements are performed at the highest, middle, lowest available channels.

(2)Unless otherwise specified the above condition, the test was performed while EUT had its DSSS function enabled.

2.4 Test Methodolog

Both conducted and radiated testing were performed during the max. EMI emission evaluation.

Test procedures according to the technical standards : (Antenna to EUT distance is 3 m)

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.207	Conducted Emission	Class B	0.15-30	PASS
15.247 (a)(2)	Bandwidth	$\geq 500\text{KHz}$	2400-2483.5	PASS
15.247 (b)(1)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS
15.247 (c)	Antenna conducted Spurious Emission	20dB less than the peak value of fundamental frequency	30-25000	PASS
15.247 (c)	Radiated Spurious Emission	15.209(a)	30-25000	PASS
15.247 (d)	Peak Power Density	$< 8\text{dBm}$ (in any 3kHz band)	2400-2483.5	PASS

2.5 Deviations from Standard Test Method

N/A

2.6 Sample(s) Tested

The representative sample tested in this reports is(are): PL9510-WAP

Test results in this test report relate only to the sample(s) tested.

The EUT has been tested according to the following environmental condition:

Input Power	120V/60Hz
Temperature	25 °C
Relative Humidity	55 %

2.7 Measurement Instruments

Valid measurement instruments used in this report refer to **Table-1** enclosed.

2.8 Measurement Uncertainty

Measurement Uncertainty for a Level of Confidence of 95 % , $U=2 \times U_c(y)$

Radiated Emission Measurement ± 2.47 dB

Conducted Emission Measurement ± 2.29 dB

2.9 Tested System Set-Up/Configuration Details

The system was configured for testing in a typical fashion (as a user would normally use) or in-accordance with the operating configuration specified in the user's manual. A Block Diagram(please refer to the Diagram - 1) and Photos(please refer to the attachment - C) showing the set-up/configuration of system tested. In addition, **Table-2** and **Table-3** provide a detail of all equipment items and cables information used in the system tested.

Table -1 Measurement Instruments List

Item	Instruments	Mfr/Brand	Model/Type No.	Serial No.	Calibrated Date	Next Cali. Date	Note
1	LISN	EMCO	3825/2	9605-2539	2002-06-10	2003-06-09	V
2	LISN	Rolf Heine	NNB-2/16Z	98083	2002-11-01	2003-10-31	
3	LISN	Rolf Heine	NNB-2/16Z	98053	2002-11-15	2003-11-14	
4	Pulse Limiter	Electro-Metrics	EM-7600	112644	2002-12-09	2003-12-08	V
5	50Ω Terminator	N/A	N/A	N/A	2002-05-10	2003-05-09	
6	Test Cable	N/A	C01	N/A	2002-12-10	2003-12-09	V
7	Log-Bicon Antenna	MESS-ELEKTRONIK	VULB 9160	3058	2002-10-23	2003-10-22	V
8	Log-Bicon Antenna	MESS-ELEKTRONIK	VULB 9160	3060	2002-10-23	2003-10-22	
9	Log-Bicon Antenna	MESS-ELEKTRONIK	VULB 9161	4022	2002-07-25	2003-07-24	
10	Test Cable	N/A	10M_OS01	N/A	2002-12-10	2003-12-09	V
11	Test Cable	N/A	OS01-1/-2	N/A	2002-12-10	2003-12-09	V
12	Test Cable	N/A	10M_OS02	N/A	2002-12-10	2003-12-09	
13	Test Cable	N/A	OS02-1/-2/-3	N/A	2002-12-10	2003-12-09	
14	RF Switch	Anritsu	MP59B	M65982	2001-12-09	2003-12-08	V
15	Quasi-Peak Adapter	HP	85650A	2521A00844	2002-10-08	2003-04-07	
16	RF Pre-Selector	HP	85685A	2648A00417	2002-10-08	2003-04-07	
17	Spectrum Analyzer	HP	85680B	2634A03025	2002-10-08	2003-04-07	
18	Spectrum Monitor	HP	85662B	2648A13616	2002-10-08	2003-04-07	
19	Pre-Amplifier	Anritsu	MH648A	M09961	2002-12-09	2003-12-08	V
20	Spectrum Analyzer	ADVAN TEST	R3261C	81720298	2002-08-14	2003-08-13	V
21	Test Receiver	R&S	ESH3	860156/018	2002-10-22	2003-10-21	
22	Test Receiver	R&S	ESVP	860687/009	2002-12-06	2003-12-05	
23	Test Receiver	MEB	SMV41	130	2002-12-06	2003-12-05	V
24	Test Receiver	PMM	PMM 9000	4310J01002	2002-10-06	2003-10-03	
25	Test Receiver	R&S	ESMI	843977/005	2002-11-21	2003-11-20	V
26	Pre-Amplifier	R&S	ESMI-Z7	1045.5020.9801	2002-05-20	2003-05-19	V
27	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-325	2002-10-07	2003-10-06	V
28	Horn Antenna	Schwarzbeck	BBHA9170	9170-181	2002-10-07	2003-10-06	
29	Horn Antenna	EMCO	3115	9605-4803	2002-05-20	2003-05-19	
30	Signal Generator	R&S	SMT06	832080/007	2002-03-26	2003-03-25	
31	Antenna Mast	Chance Most	CMTB-1.5	N/A	N/A	N/A	V
32	Turn Table	Chance Most	CMTB-1.5	N/A	N/A	N/A	V

Remark :

(1)" ✓" indicates the instrument used in Test Report.

(2)" N/A" denotes No Model No. / Serial No. and No Calibration specified.

Diagram - 1
Block diagram showing the configuration of system tested

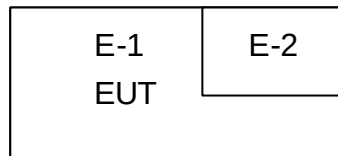


Table - 2 Equipments Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	Wireless AP	WiRELiNK	PL9510-WAP	QX4DW920290	N/A	EUT
E-2	Wireless LAN Card	WiRELiNK	WL-316C	MXF-C900924	N/A	EUT

Note:

- (1) Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment.
- (2) Unless otherwise marked as ※ in 『Remark』 column, Neutron consigns the support equipment to the tested system.
- (3) The support equipment was authorized by Declaration of Confirmation.

Table - 3 Information of Interface Cable

Item	Shielded Type	Ferrite Core	Length	Note
	N/A	N/A	N/A	

Note:

- (1) Unless otherwise marked as ※ in 『Remark』 column, Neutron consigns the support equipment to the tested system.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.10 Max.(Worst Case) RF Emission Evaluation

- (a) Both conducted and radiated testing were performed during the max. EMI emission evaluation.
- (b) The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit & receive during test. This operating condition was tested and used to collect the included data.
- (c) To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of this EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.
These operation modes were used for final testing and collecting test data included in this report.

2.11 EUT Operation

The EUT exercise program used during radiated and/or conducted emission measurement was designed to exercise the various system components in a manner similar to a typical use. The measurements are performed at the highest (CH1), middle (CH6), lowest (CH11) available channels. Unless otherwise specified the above condition, the test was performed while EUT had its DSSS function enabled.

3. Justification

3.1 Limitations

3.1.1 Power Line Conducted Emission

Measurement Frequency Range (MHz)	Mains Terminal Class A Limits (dBuV)		Mains Terminals Class B Limits (dBuV)		Note CISPR FCC Std.
	QP Mode	AV Mode	QP Mode	AV Mode	
0.15 - 0.50	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 - 5.00	73.00	60.00	56.00	46.00	CISPR
5.00 - 30.0	73.00	60.00	60.00	50.00	CISPR
0.45-1.705	60.00	N/A	48.00	N/A	FCC
1.705-30.0	69.50	N/A	48.00	N/A	FCC

Notes:

- (1). The tighter limit applies at the band edges.
- (2). The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

3.1.2 Radiated Emission Limits (Frequency Range 30MHz-1000MHz)

Measurement Frequency Range (MHz)	Quasi-Peak Mode Class A Limits (dBuV/m)		Quasi-Peak Mode Class B Limits (dBuV/m)		Note CISPR FCC Std.
	10m	30m	10m	3m	
30.00 -230.00	40.00	30.00	30.00	40.00	CISPR
230.0 -1000.0	47.00	37.00	37.00	47.00	CISPR
30.00 - 88.00	39.00	N/A	30.00	40.00	FCC
88.00 - 216.0	43.50	N/A	33.50	43.50	FCC
216.0 -960.0	46.00	N/A	36.00	46.00	FCC
above 960.0	49.50	N/A	46.00	54.00	FCC

Notes:

- (1). The tighter limit applies at the band edges.
- (2). Emission level (dBuV/m)=20log Emission level (uV/m).
- (3). A measuring distance of 10m is a primary used. However, either 3m or 10m (instead of 10m) distance may be allowed. If the distance is 3m, add 10dB to the QP-limit above. If the distance is 10m, subtract 10dB from the QP-limit above.

3.2 Measurement Justification

3.2.1 Conducted Emission

The EUT is placed on a table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-1992. Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** were made with a **Spectrum Analyzer** using **CISPR Quasi-Peak detector mode**.

The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and these signals are then Quasi Peak detector mode and/or Average detector mode re-measured.

Data of **Table - 4** lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP or AV in column of " Remark ".

If the Peak Mode measured value lower than both QP Mode and AV Mode Limit, EUT shall be deemed to compliance with both QP & AV Limits and then no additional QP Mode or AV Mode measurement performed.

If additional QP or AV Mode measurement needed, and if the QP Mode measured value compliance with the QP Mode Limit and lower than AV Mode Limit, the EUT shall be deemed to meet both QP & AV Limits and then only QP Mode was measured, but AV Mode was not performed.

3.2.2 Radiated Emission

The EUT is placed on a turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.

The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak, Peak or Average detector mode re-measured.

Data of **Table – 5** lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP or AV in column of " Remark ".

If the Peak Mode measured value compliance with and lower than Quasi Peak or Average Mode Limit, the EUT shall be deemed to meet QP/AV Limits and then no additional QP/AV Mode measurement performed.

3.2.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as **$FS = RA + AF + CL - AG$**

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor (1)

CL = Cable Attenuation Factor(Cable Loss) (1)

AG = Amplifier Gain (1)

Remark :

(1) The Correction Factor = $AF + CL - AG$, as shown in the data tables' Correction Factor column.

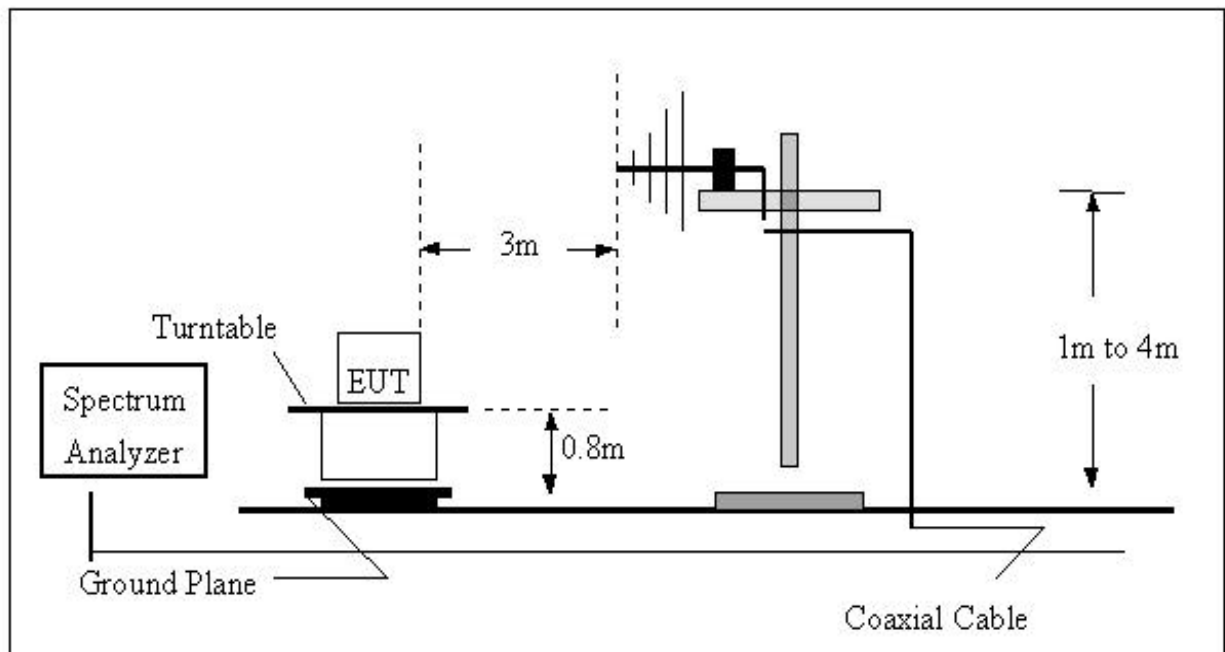
3.3 Measurement Data

Table - 4. Conducted Emission Data

Table - 5. Radiated Emission Data (30-1000MHz)

Radiated Emission Data (above 1000MHz)

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



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz

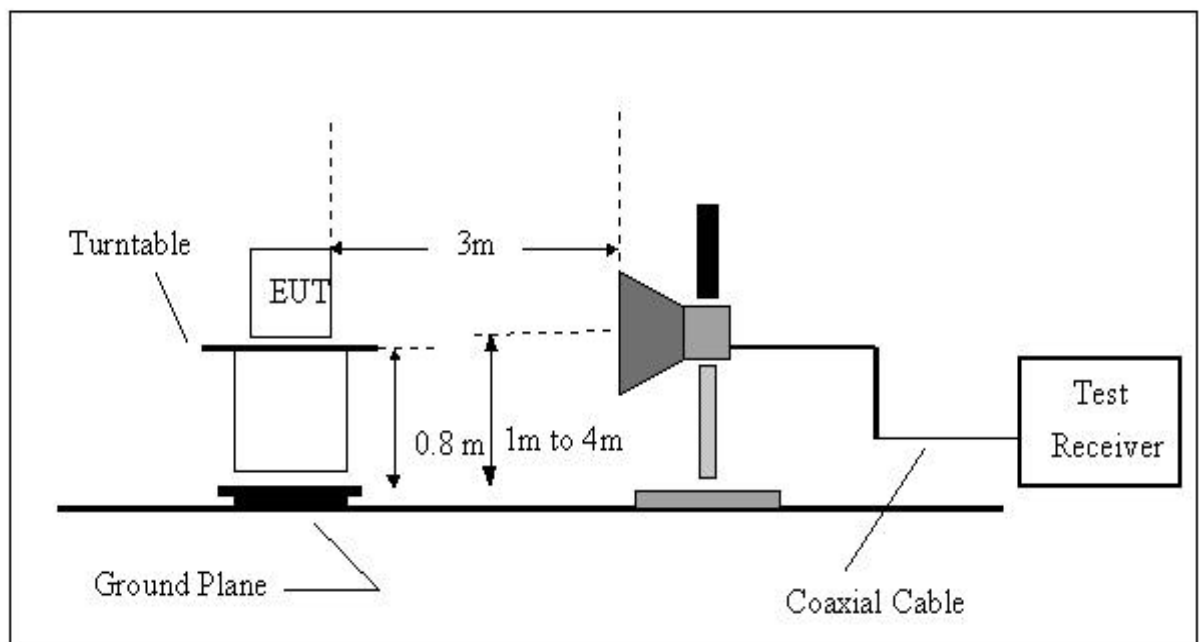


Table 4 Conducted Emission Data

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

TEST MODE CH1

Freq. (MHz)	Terminal L/N	Measured(dBuV)		Limits(dBuV)		Safe Margins (dBuV)	Note
		QP-Mode	AV-Mode	QP-Mode	AV-Mode		
0.27	Line	50.21	41.70	61.21	51.21	-9.51	(AV)
0.35	Line	41.81	*	58.96	48.96	-17.15	(QP)
0.53	Line	41.84	27.40	56.00	46.00	-14.16	(QP)
0.63	Line	40.54	*	56.00	46.00	-15.46	(QP)
7.94	Line	38.80	*	60.00	50.00	-21.20	(QP)
18.82	Line	36.94	23.01	60.00	50.00	-23.06	(QP)
0.26	Neutral	49.75	41.70	61.37	51.37	-9.67	(AV)
0.34	Neutral	39.65	*	59.13	49.13	-19.48	(QP)
0.52	Neutral	41.17	*	56.00	46.00	-14.83	(QP)
0.62	Neutral	41.44	*	56.00	46.00	-14.56	(QP)
7.85	Neutral	39.42	*	60.00	50.00	-20.58	(QP)

Remark

- (1) Reading in which marked as QP means measurements by using are Quasi-Peak Mode with Detector RBW=9KHz ; SPA setting in RBW=10KHz,VBW =10KHz, Sweep Time = 0.3 sec./MHz。 Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW=1MHz,VBW=10Hz, Sweep Time =0.3 sec./MHz。
- (2) All readings are QP Mode value unless otherwise stated AVG in column of 『Note』 . If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform。 In this case, a “ * ” marked in AVG Mode column of Interference Voltage Measured。
- (3) Measuring frequency range from 150KHz to 30MHz。
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not how in table。

Table 4 Conducted Emission Data

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

TEST MODE CH6

Freq. (MHz)	Terminal L/N	Measured(dBuV)		Limits(dBuV)		Safe Margins (dBuV)	Note
		QP-Mode	AV-Mode	QP-Mode	AV-Mode		
0.26	Line	49.13	*	61.56	51.56	-12.43	(QP)
0.51	Line	40.85	*	56.00	46.00	-15.15	(QP)
0.63	Line	36.76	*	56.00	46.00	-19.24	(QP)
7.98	Line	41.88	*	60.00	50.00	-18.12	(QP)
10.68	Line	46.63	*	60.00	50.00	-13.37	(QP)
16.66	Line	34.87	26.09	60.00	50.00	-23.91	(AV)
0.26	Neutral	49.57	40.20	61.43	51.43	-11.23	(AV)
0.51	Neutral	41.53	*	56.00	46.00	-14.47	(QP)
5.00	Neutral	40.18	*	56.00	46.00	-15.82	(QP)
7.45	Neutral	45.12	*	60.00	50.00	-14.88	(QP)
12.99	Neutral	51.60	25.74	60.00	50.00	-8.40	(QP)

Remark

- (1) Reading in which marked as QP means measurements by using are Quasi-Peak Mode with Detector RBW=9KHz ; SPA setting in RBW=10KHz,VBW =10KHz, Sweep Time = 0.3 sec./MHz。 Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW=1MHz,VBW=10Hz, Sweep Time =0.3 sec./MHz。
- (2) All readings are QP Mode value unless otherwise stated AVG in column of 『Note』 . If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform。 In this case, a “ * ” marked in AVG Mode column of Interference Voltage Measured。
- (3) Measuring frequency range from 150KHz to 30MHz。
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not how in table。

Table 4 Conducted Emission Data

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

TEST MODE CH11

Freq. (MHz)	Terminal L/N	Measured(dBuV)		Limits(dBuV)		Safe Margins (dBuV)	Note
		QP-Mode	AV-Mode	QP-Mode	AV-Mode		
0.26	Line	49.27	*	61.46	51.46	-12.19	(QP)
0.50	Line	40.99	*	56.00	46.00	-15.01	(QP)
0.85	Line	35.98	*	56.00	46.00	-20.02	(QP)
1.25	Line	34.33	*	56.00	46.00	-21.67	(QP)
7.94	Line	42.29	*	60.00	50.00	-17.71	(QP)
13.70	Line	53.85	26.94	60.00	50.00	-6.15	(QP)
20.27	Line	34.05	27.74	60.00	50.00	-22.26	(AV)
0.25	Neutral	47.84	*	61.66	51.66	-13.82	(QP)
0.50	Neutral	40.40	*	56.00	46.00	-15.60	(QP)
1.25	Neutral	32.70	*	56.00	46.00	-23.30	(QP)
9.20	Neutral	47.01	*	60.00	50.00	-12.99	(QP)

Remark

- (1) Reading in which marked as QP means measurements by using are Quasi-Peak Mode with Detector RBW=9KHz ; SPA setting in RBW=10KHz,VBW =10KHz, Sweep Time = 0.3 sec./MHz。 Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW=1MHz,VBW=10Hz, Sweep Time =0.3 sec./MHz。
- (2) All readings are QP Mode value unless otherwise stated AVG in column of 『Note』 . If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform。 In this case, a “ * ” marked in AVG Mode column of Interference Voltage Measured。
- (3) Measuring frequency range from 150KHz to 30MHz。
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not how in table。

Table 5 Radiated Emission Data (30-1000MHz)

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

The following table lists worst case data from TX / RX with various bit-rates on various channels.

Freq. (MHz)	Ant. H/V	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Safe Margin (dBuV/m)	No
113.730	V	38.65	- 16.81	21.84	43.50	- 21.66	
150.060	H	32.75	- 14.50	18.25	43.50	- 25.25	
159.210	H	31.82	- 14.62	17.20	43.50	- 26.30	
178.290	V	40.17	- 16.76	23.41	43.50	- 20.09	
191.860	V	41.02	- 17.86	23.16	43.50	- 20.34	
200.000	V	38.55	- 18.21	20.34	43.50	- 23.16	
200.000	H	39.45	- 18.21	21.24	43.50	- 22.26	
350.050	H	36.40	- 15.17	21.23	46.00	- 24.77	
475.030	V	35.42	- 12.37	23.05	46.00	- 22.95	
475.060	H	38.10	- 12.37	25.73	46.00	- 20.27	
500.030	V	37.65	- 12.16	25.49	46.00	- 20.51	
500.060	H	42.05	- 12.16	29.89	46.00	- 16.11	

Remark :

- (1) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms
- (2) All readings are Peak unless otherwise stated QP in column of 『Note』 . Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- (3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency. "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (4) Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode or QP detector mode of the emission .
- (5) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Table 5 Radiated Emission Data (above 1000MHz)

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

CH1 (2412MHz)

Freq. (MHz)	Ant.Pol. (H/V)	Peak Reading (dBuV)	AV (dBuV)	Ant/CF CF(dB)	Peak Act. (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV (dBuV/m)	NOTE
4824.0	V	-	-	-	-	-	74.00	54.00	X
7236.0	V	-	-	-	-	-	74.00	54.00	X
9648.0	V	-	-	-	-	-	74.00	54.00	X
12060.0	V	-	-	-	-	-	74.00	54.00	X
14472.0	V	-	-	-	-	-	74.00	54.00	X
16884.0	V	-	-	-	-	-	74.00	54.00	X
4824.0	H	-	-	-	-	-	74.00	54.00	X
7236.0	H	-	-	-	-	-	74.00	54.00	X
9648.0	H	-	-	-	-	-	74.00	54.00	X
12060.0	H	42.28	-	-4.55	37.73	-	74.00	54.00	X
14472.0	H	-	-	-	-	-	74.00	54.00	X
16884.0	H	-	-	-	-	-	74.00	54.00	X

Remark :

- (1) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms
- (2) All readings are Peak unless otherwise stated QP in column of 『Note』 . Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- (3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency. "F" denotes fundamental frequency; "H" denotes harmonic frequency. "E" denotes band edge frequency.
- (4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (5) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (6) EUT Orthogonal Axes :
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (7) A preamp and high pass filter were used for this test inorder to provide sufficient measurement sensitivity.

Table 5 Radiated Emission Data (above 1000MHz)

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

CH6 (2437MHz)

Freq. (MHz)	Ant.Pol. (H/V)	Peak Reading (dBuV)	AV (dBuV)	Ant/CF CF(dB)	Peak Act. (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV (dBuV/m)	NOTE
4874.0	V	47.72	-	-11.7	36.02	-	74.00	54.00	X
7311.0	V	-	-	-	-	-	74.00	54.00	X
9748.0	V	-	-	-	-	-	74.00	54.00	X
12185.0	V	-	-	-	-	-	74.00	54.00	X
14622.0	V	-	-	-	-	-	74.00	54.00	X
17059.0	V	-	-	-	-	-	74.00	54.00	X
4874.0	H	-	-	-	-	-	74.00	54.00	X
7311.0	H	-	-	-	-	-	74.00	54.00	X
9748.0	H	-	-	-	-	-	74.00	54.00	X
12185.0	H	-	-	-	-	-	74.00	54.00	X
14622.0	H	-	-	-	-	-	74.00	54.00	X
17059.0	H	-	-	-	-	-	74.00	54.00	X

Remark :

- (1) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms
- (2) All readings are Peak unless otherwise stated QP in column of 『Note』 . Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- (3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency. "F" denotes fundamental frequency; " H" denotes harmonic frequency. "E" denotes band edge frequency.
- (4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (5) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (6) EUT Orthogonal Axes :
" X" - denotes Laid on Table ; " Y" - denotes Vertical Stand ; " Z" - denotes Side Stand
- (7) A preamp and high pass filter were used for this test inorder to provide sufficient measurement sensitivity.

Table 5 Radiated Emission Data (above 1000MHz)

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

CH11 (2462MHz)

Freq. (MHz)	Ant.Pol. (H/V)	Peak Reading (dBuV)	AV (dBuV)	Ant/CF CF(dB)	Peak Act. (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV (dBuV/m)	NOTE
4924.0	V	42.92	-	-11.63	31.29	-	74.00	54.00	X
7386.0	V	-	-	-	-	-	74.00	54.00	X
9848.0	V	-	-	-	-	-	74.00	54.00	X
12310.0	V	-	-	-	-	-	74.00	54.00	X
14772.0	V	-	-	-	-	-	74.00	54.00	X
17234.0	V	-	-	-	-	-	74.00	54.00	X
4924.0	H	-	-	-	-	-	74.00	54.00	X
7386.0	H	-	-	-	-	-	74.00	54.00	X
9848.0	H	-	-	-	-	-	74.00	54.00	X
12310.0	H	-	-	-	-	-	74.00	54.00	X
14772.0	H	-	-	-	-	-	74.00	54.00	X
17234.0	H	-	-	-	-	-	74.00	54.00	X

Remark :

- (1) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms
- (2) All readings are Peak unless otherwise stated QP in column of 『Note』 . Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- (3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency. "F" denotes fundamental frequency; " H" denotes harmonic frequency. "E" denotes band edge frequency.
- (4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (5) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (6) EUT Orthogonal Axes :
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (7) A preamp and high pass filter were used for this test inorder to provide sufficient measurement sensitivity

Table 5 Radiated Emission Data (Band Edge Requirements)

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

The emission of the carrier radiated field strength is measured for channel 1 and channel 11 (Peak and AV) as following:

1. The transmitter was configured with the worst case antenna and setup to transmit at the highest channel (CH 11). Then the field strength was measured at 2483.5-2500 MHz.
2. The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel (CH 01). Then the field strength was measured at 2310-2390 MHz.

Please refer to the attachment L about the band edge emission plot.

Freq. (MHz)	Ant.Pol. (H/V)	Peak Reading (dBuV)	AV (dBuV)	Ant./CF CF(dB)	Peak Act. (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	NOTE
2385.0	V	86.34	33.63	-15.81	70.53	17.82	74.00	54.00	
2488.0	V	85.00	33.00	-16	69.00	17.00	74.00	54.00	
2386.0	H	68.90	33.35	-15.81	53.09	17.54	74.00	54.00	
2484.0	H	64.45	-	-15.96	48.49	-	74.00	54.00	

Remark :

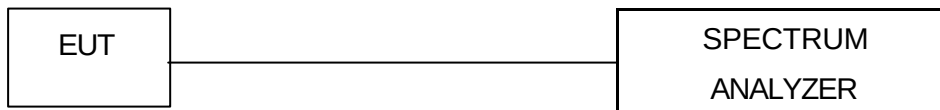
- (1) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms
- (2) "E" denotes band edge frequency.
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (4) EUT Orthogonal Axes :
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand

4 Bandwidth**4.1 Applied Standard / limit**

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

4.2 Test Setup

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
 (2) Spectrum Setting : RBW= 10KHz, VBW=30KHz, Sweep time = 200 ms.

**4.3 Test Result**

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

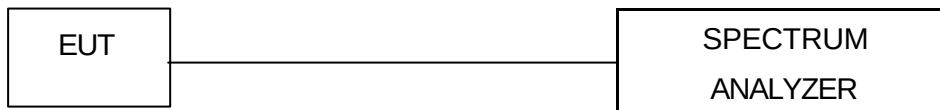
CH	CH Frequency (MHz)	Bandwidth (KHz)	LIMIT (MHz)
1	2412	11110	$\geq 500\text{KHz}$
6	2437	11130	$\geq 500\text{KHz}$
11	2462	11130	$\geq 500\text{KHz}$

5 Peak Output Power**5.1 Applied Standard / limit**

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(1)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

5.2 Test Setup

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
 (2) Spectrum Setting : RBW= 3MHz, VBW= 3MHz, Sweep time = 200 ms.

**5.3 Test Result**

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

CH	CH Frequency (MHz)	Peak Output Power (dBm)	LIMIT (dBm)	LIMIT (W)
1	2412	19.31	30	1
6	2437	19.19	30	1
11	2462	18.55	30	1

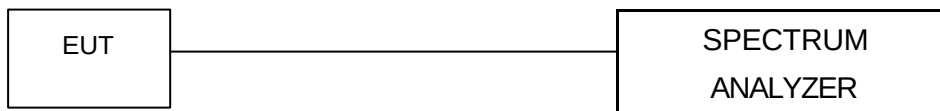
6 Antenna conducted Spurious Emission

6.1 Applied Standard / limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (c)	Antenna conducted Spurious Emission	20dB less than the peak value of fundamental frequency	30-25000	PASS

6.2 Test Setup

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- (2) Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.



6.3 Test Result

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

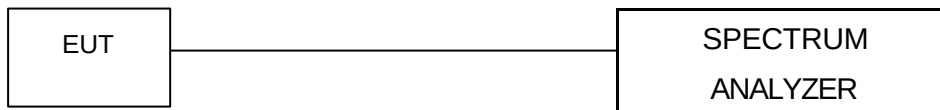
The max. radio frequency power in any 100kHz bandwidth outside the frequency band		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2110	-10.5	2463	14.26
Result			
In any 100kHz bandwidth outside the frequency band, the radio frequency power is at least 20dB below that in the 100kHz bandwidth within the band, that contains the highest lever of the desired power.			

7 Peak Power Density**7.1 Applied Standard / limit**

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (d)	Peak Power Density	< 8dBm (in any 3kHz band)	2400-2483.5	PASS

7.2 Test Setup

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
 (2) Spectrum Setting : RBW= 3KHz, VBW=100KHz, Sweep time = 200 ms.

**7.3 Test Result**

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

CH	CH Frequency (MHz)	Peak Power Density (dBm)	LIMIT (dBm)
1	2412	-10.24	8
6	2437	-10.50	8
11	2462	-11.21	8

8 RF Exposure**8.1 Applied Standard / limit**

Based upon the new TCB exclusion list published by FCC on July 2002

Frequency Range(MHz)	Limit (mw)
2402-2480	1

8.2 Test Result

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

Peak output power (dBm)	Ant Gain (dBi)	EIRP (1)		Min. separation to safety the MPE Limits (2)	Max. power density at 20cm (3)	LIMIT (mw)
		(dBm)	mW			
19.31	2.15	21.46	139.958	3.33783	0.0278521	1

NOTE:

(1) EIRP= Peak output power + Ant Gain

(2) Min. separation to safety the MPE Limits = $\sqrt{\text{EIRP}/(1\text{mW}/\text{cm}^2 \times 4 \times \pi)}$ (3) Max. power density at 20cm = $\text{EIRP}/(4 \times 20^2 \text{ cm}^2 \times \pi)$

Attachment

Table Contents

- A. Electric Block Diagram
- B. EUT Modification Description
- C. EUT Test Photos
- D. EUT Photos
- E. User' s Manual
- F. Product Labeling
- G. Bandwidth
- H. Peak Output Power
- I. Antenna conducted Spurious Emission
- J. Peak Power Density
- [K. Band Edges Requirements](#)
- [L. Laboratory Accreditation Certificate](#)

Attachment - A.

Electric Block Diagram

Attachment - B.

EUT Modification Description

Attachment - C.

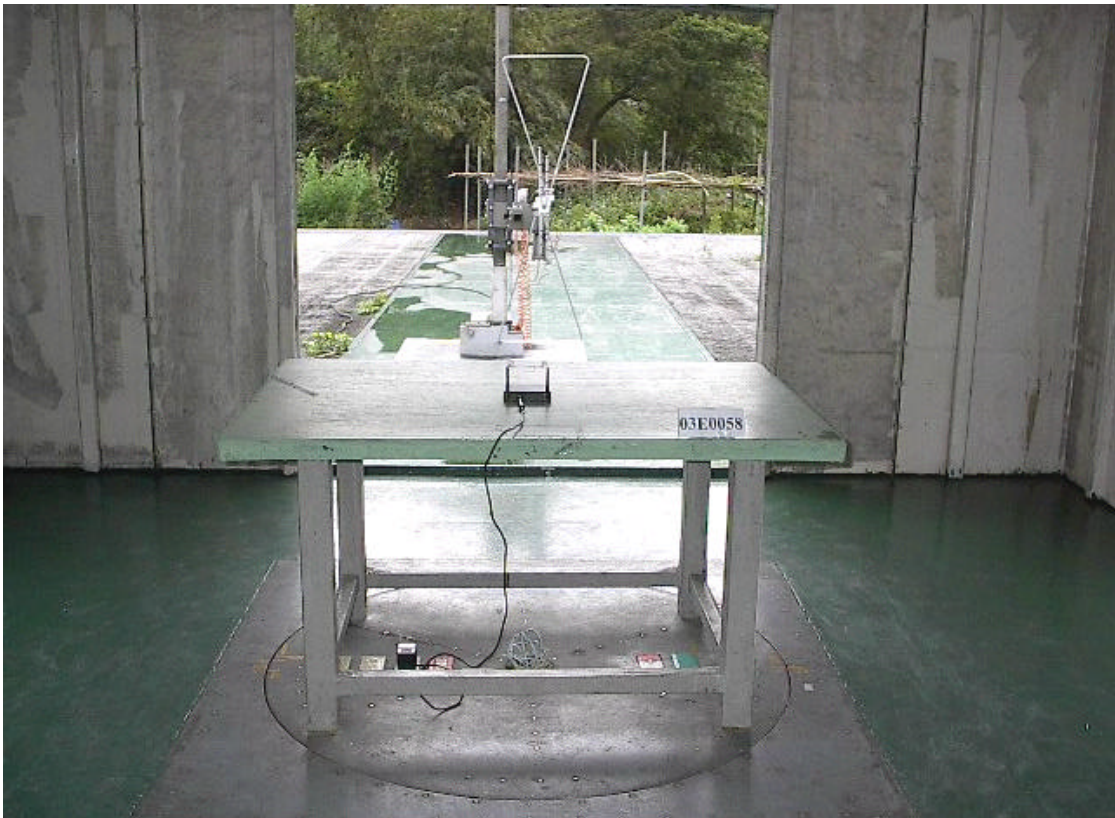
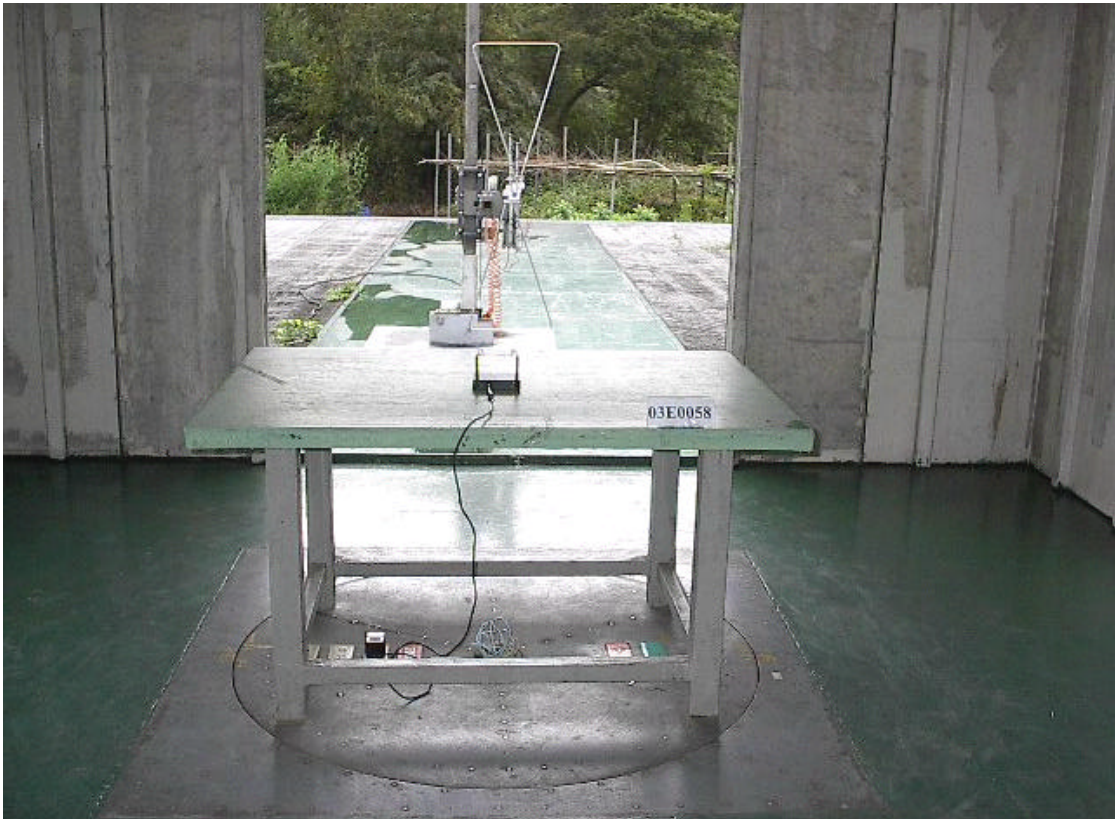
EUT Test Photos

- 1. Conducted Measurement Photos**
- 2. Radiated Measurement Photos**

1. Conducted Measurement Photos



2. Radiated Measurement Photos



Attachment – D

EUT Photos

- 1. Photo # 1 Front View**
- 2. Photo # 2 Front View / Rear View**
- 3. Photo # 3-5 Unit Partially Disassembled**
- 4. Photo # 6 Front View / Rear View**
- 5. Photo # 7 Unit Partially Disassembled**

1. Photo # 1



2. Photo # 2



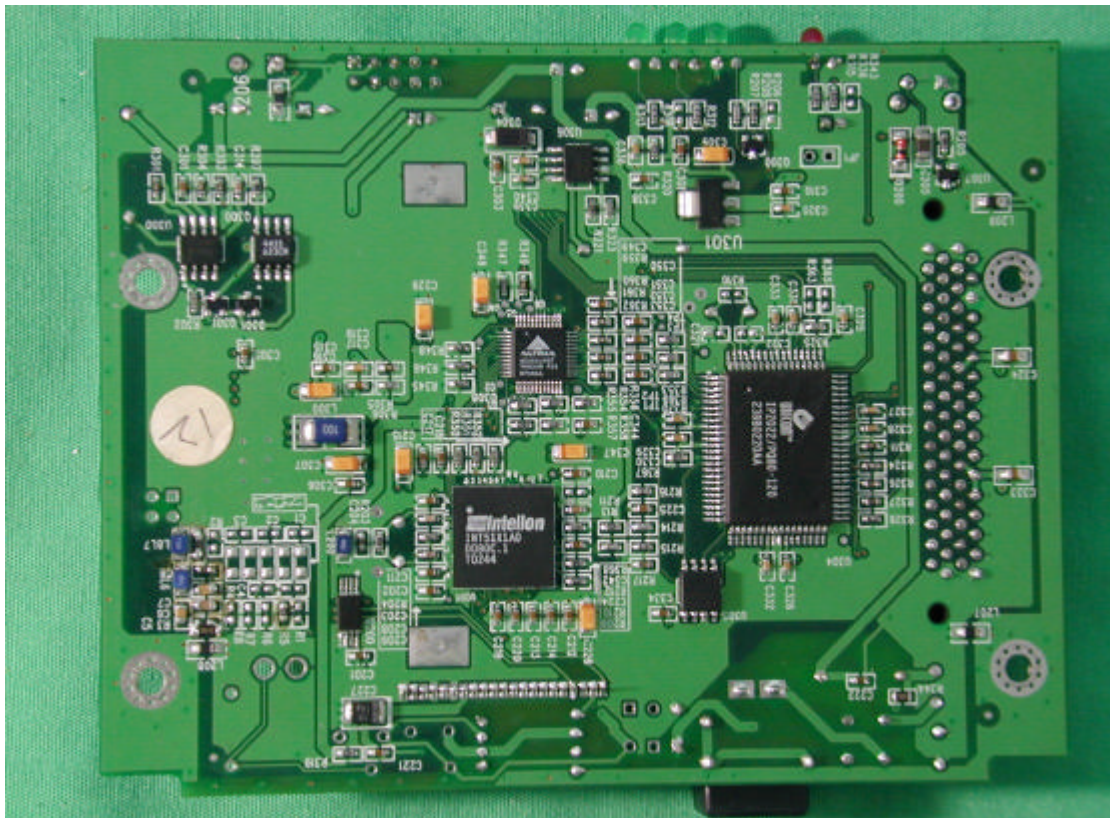
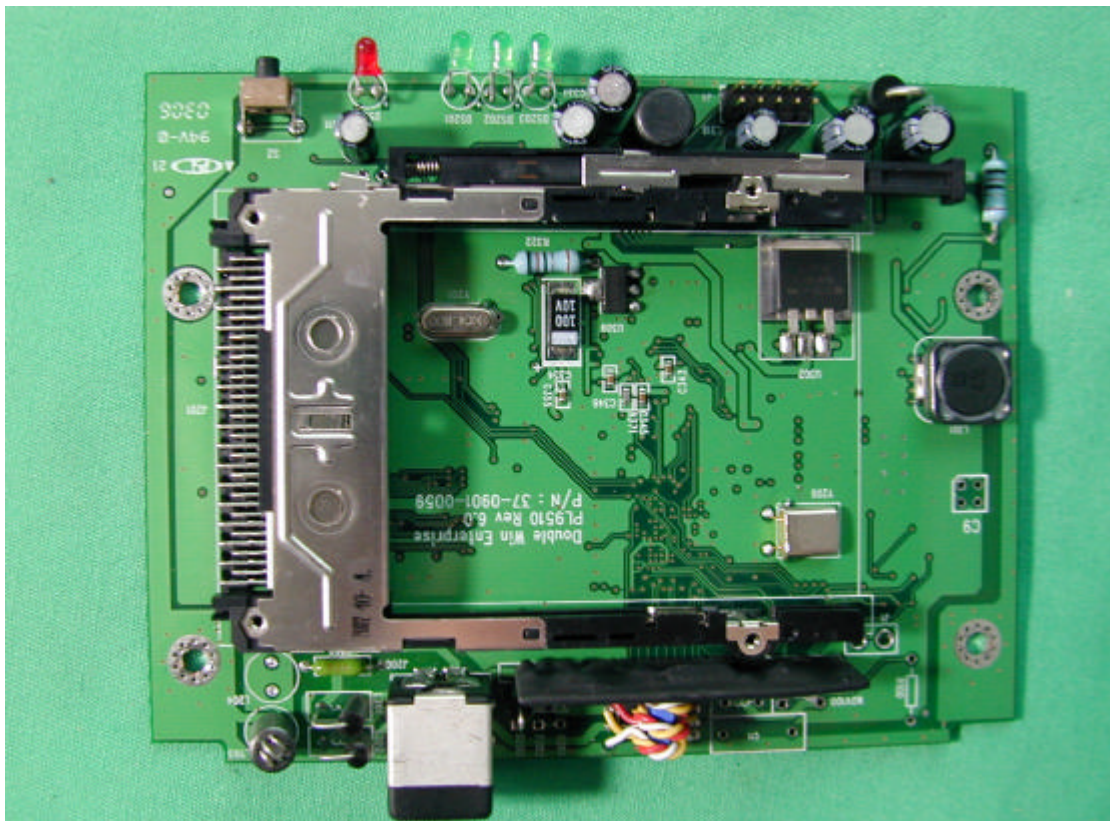
3. Photo # 3



4. Photo # 4



5. Photo # 5



6. Photo # 6



7. Photo # 7



Attachment – E

User' s Manual

Attachment - F.

Product Labeling

-- FCC ID label --

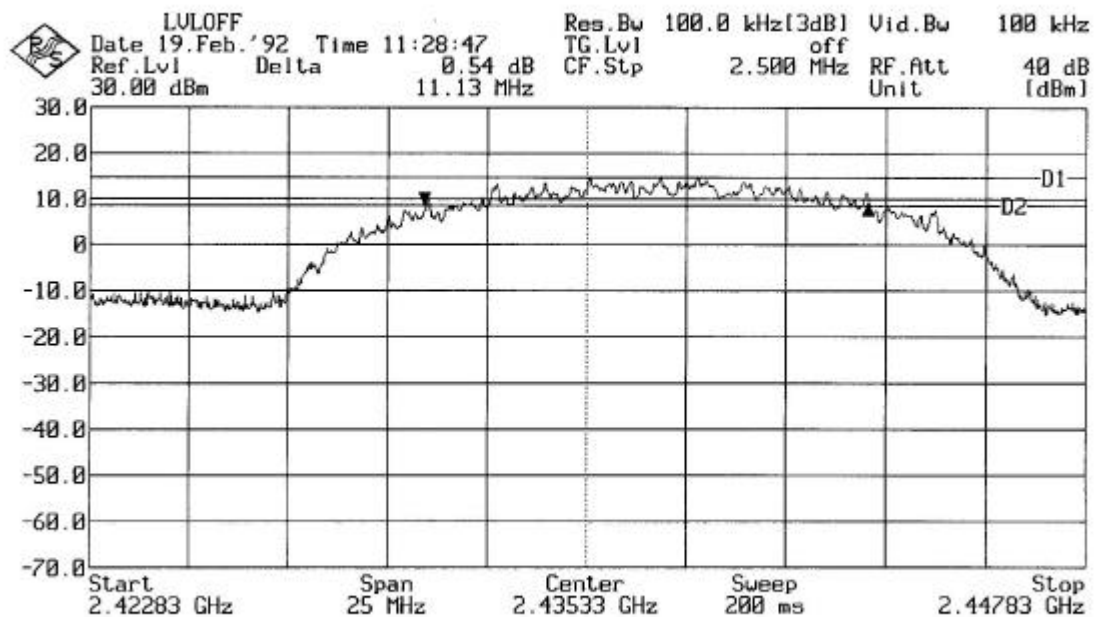
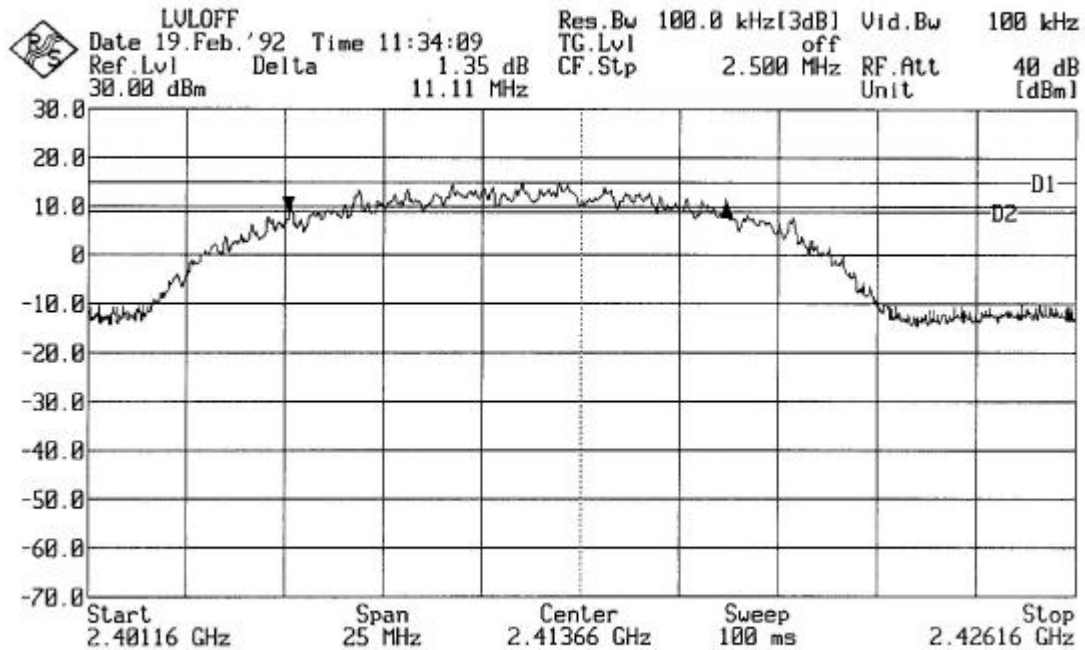


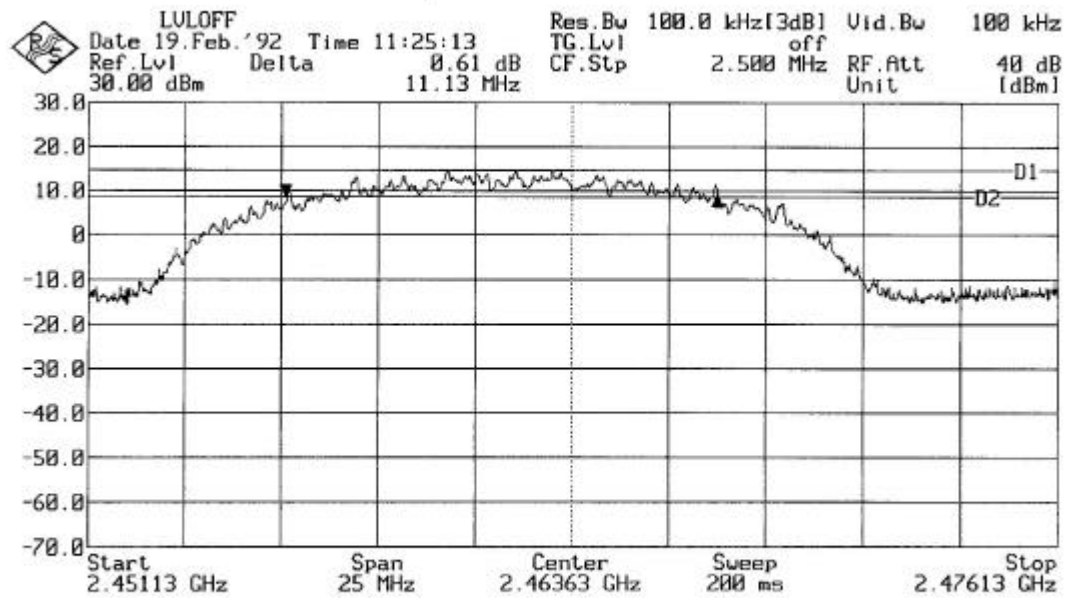
The remained portion of label statement required by FCC is attached in the user' s manual.

■ Location of Label on EUT --



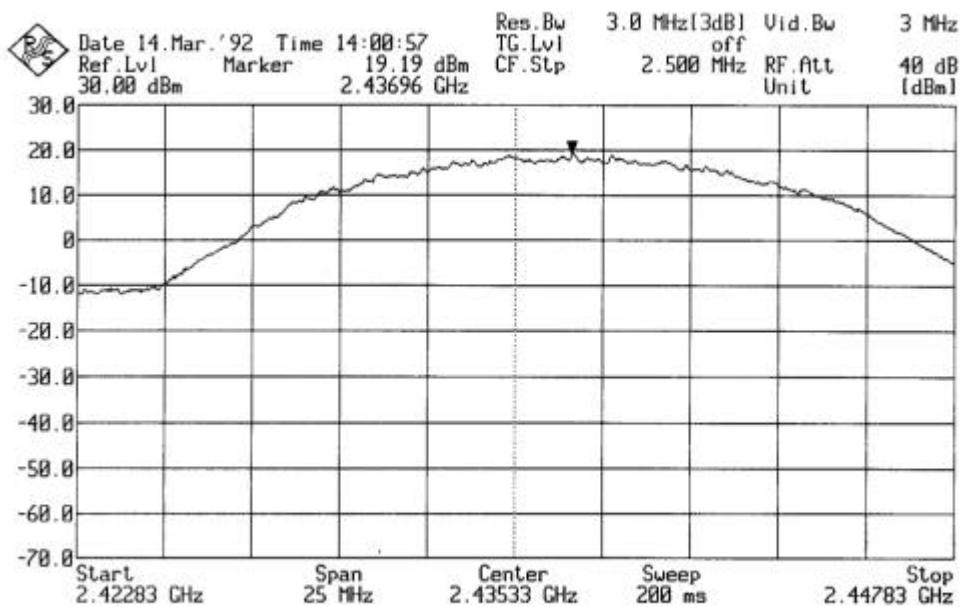
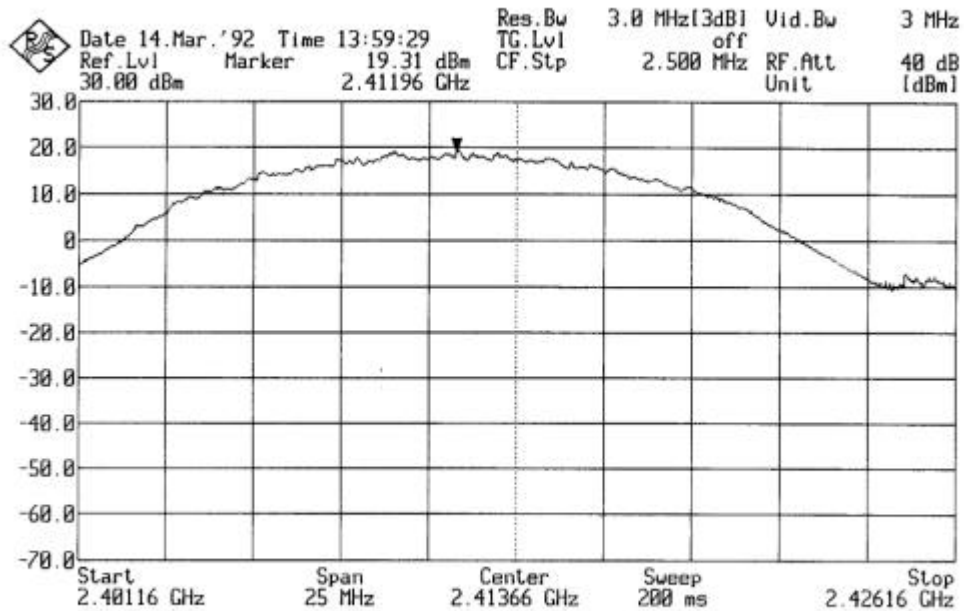
Attachment - G.
Bandwidth

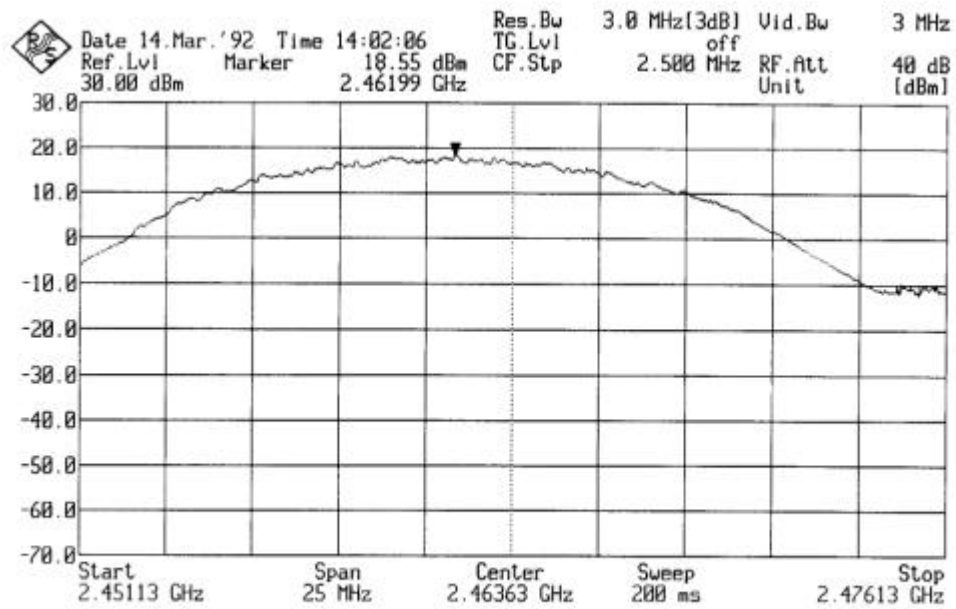




Attachment - H.

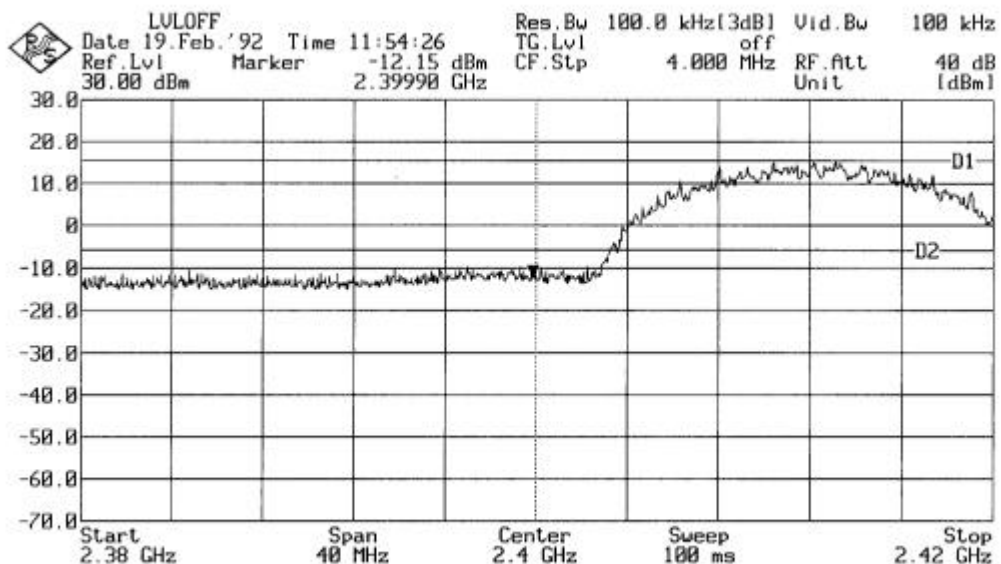
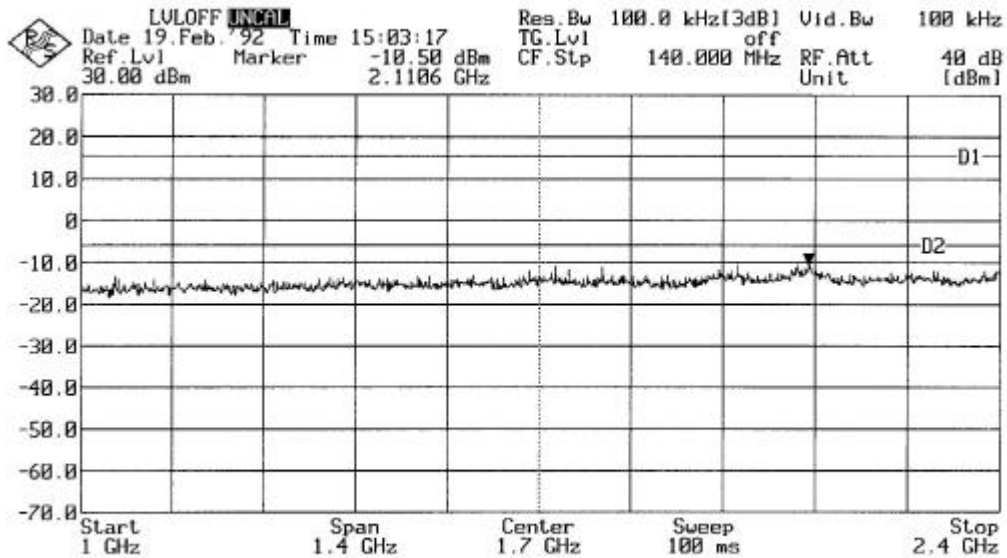
Peak Output Power

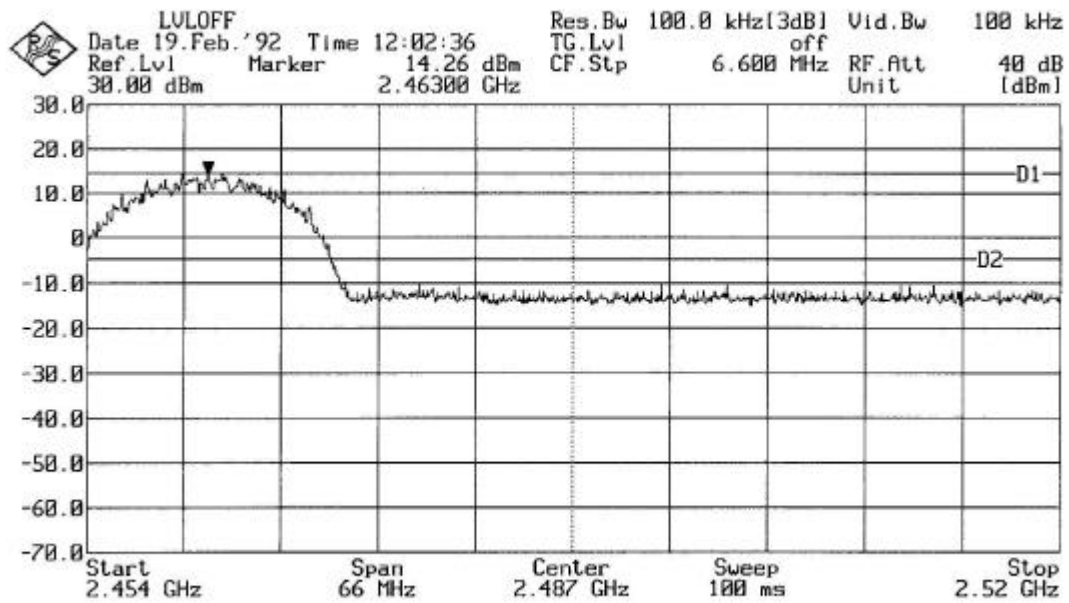




Attachment - I.

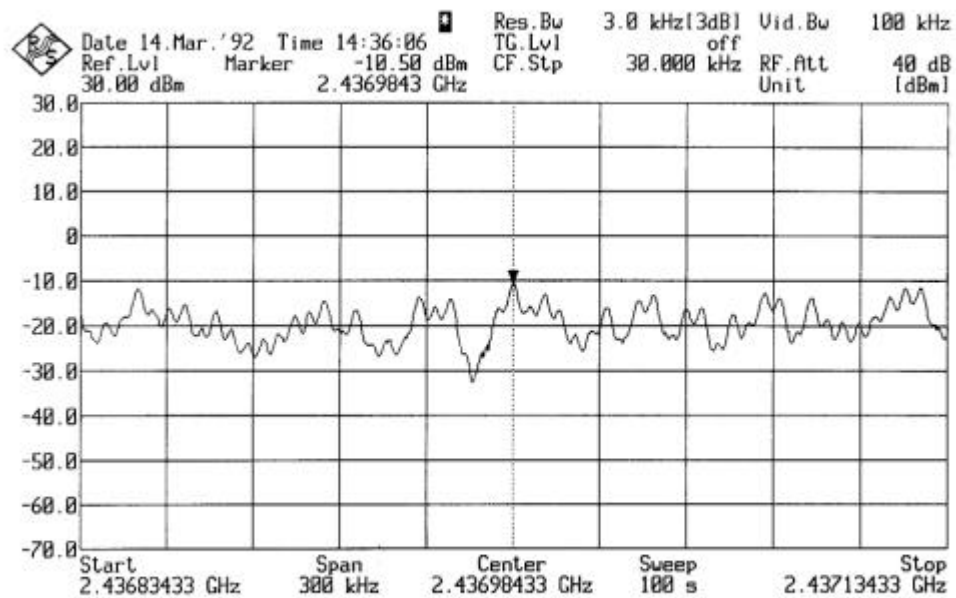
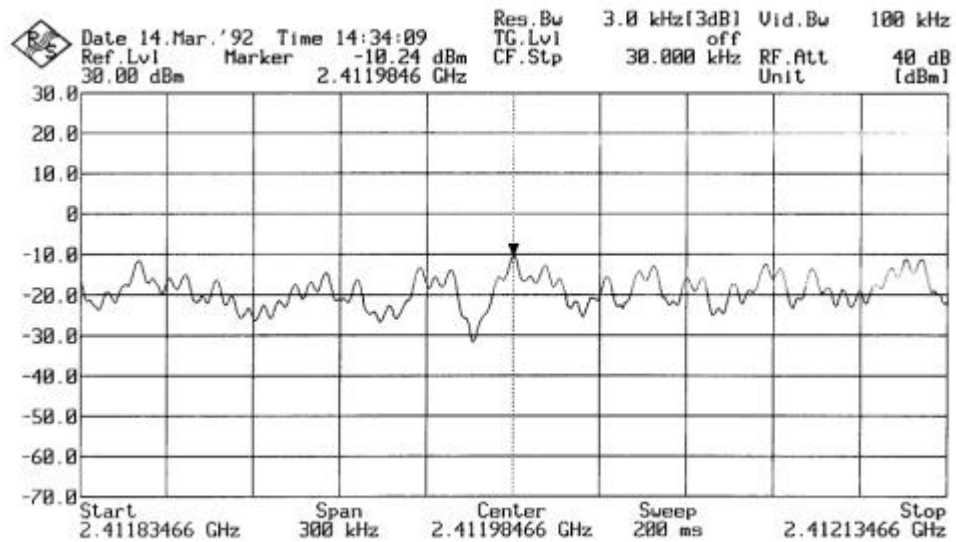
Antenna conducted Spurious Emission

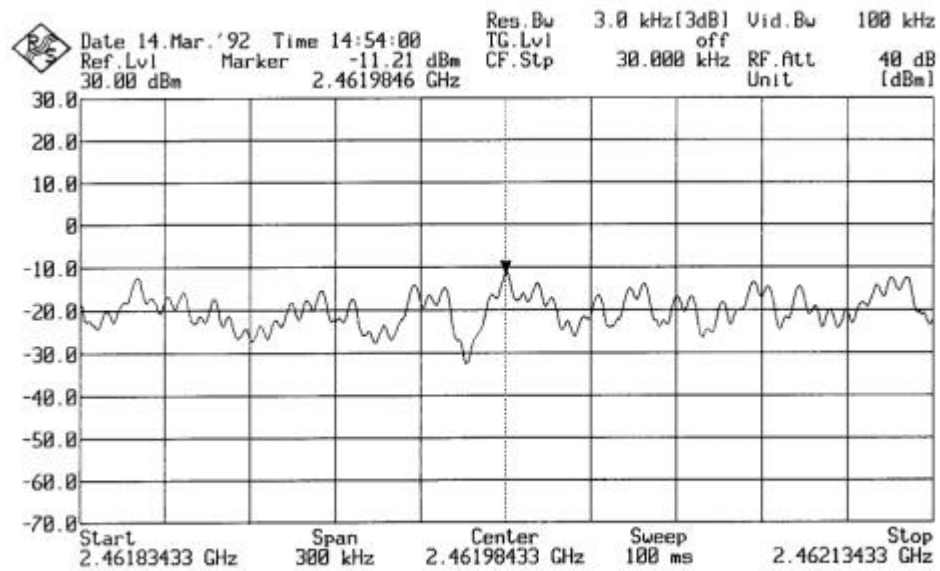




Attachment – J

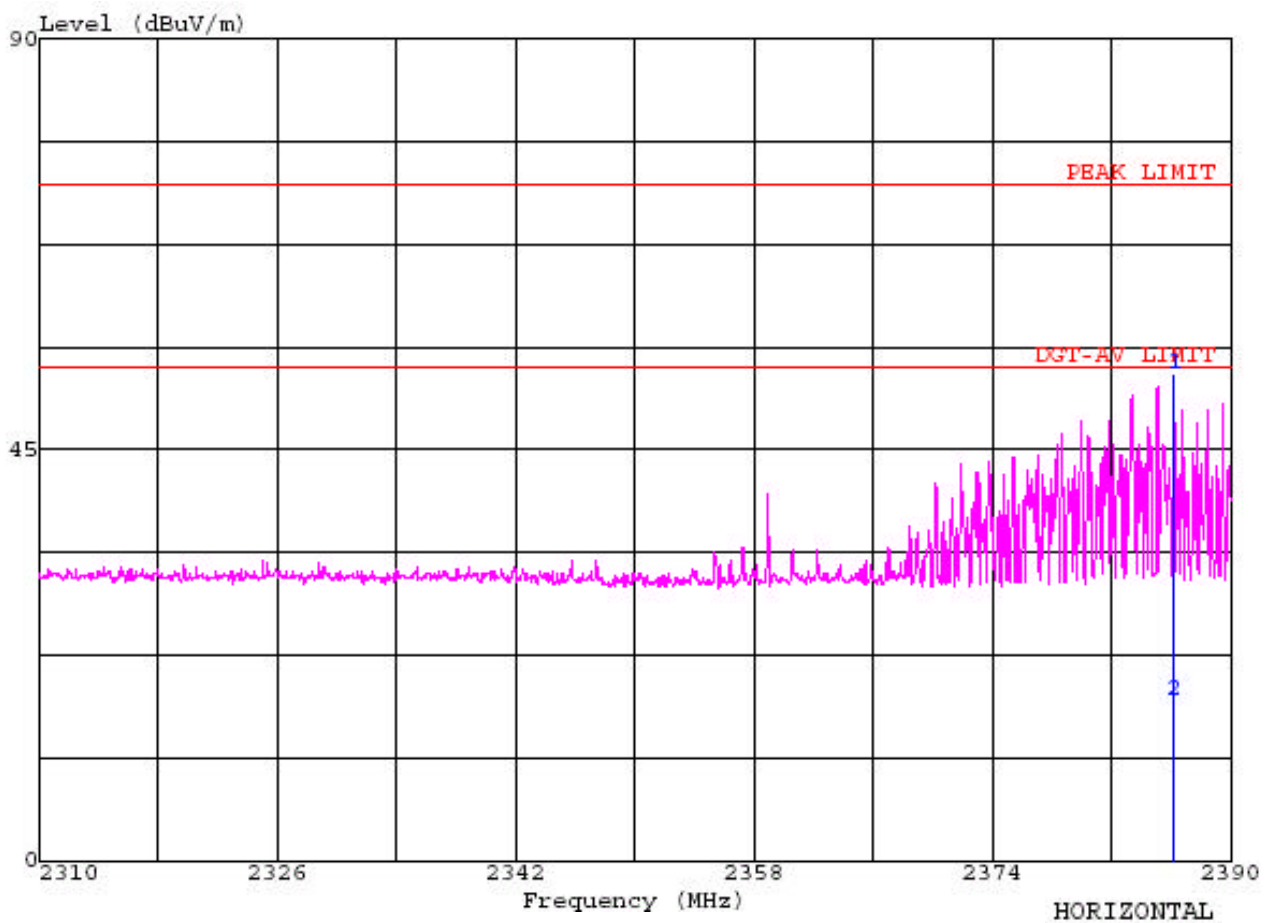
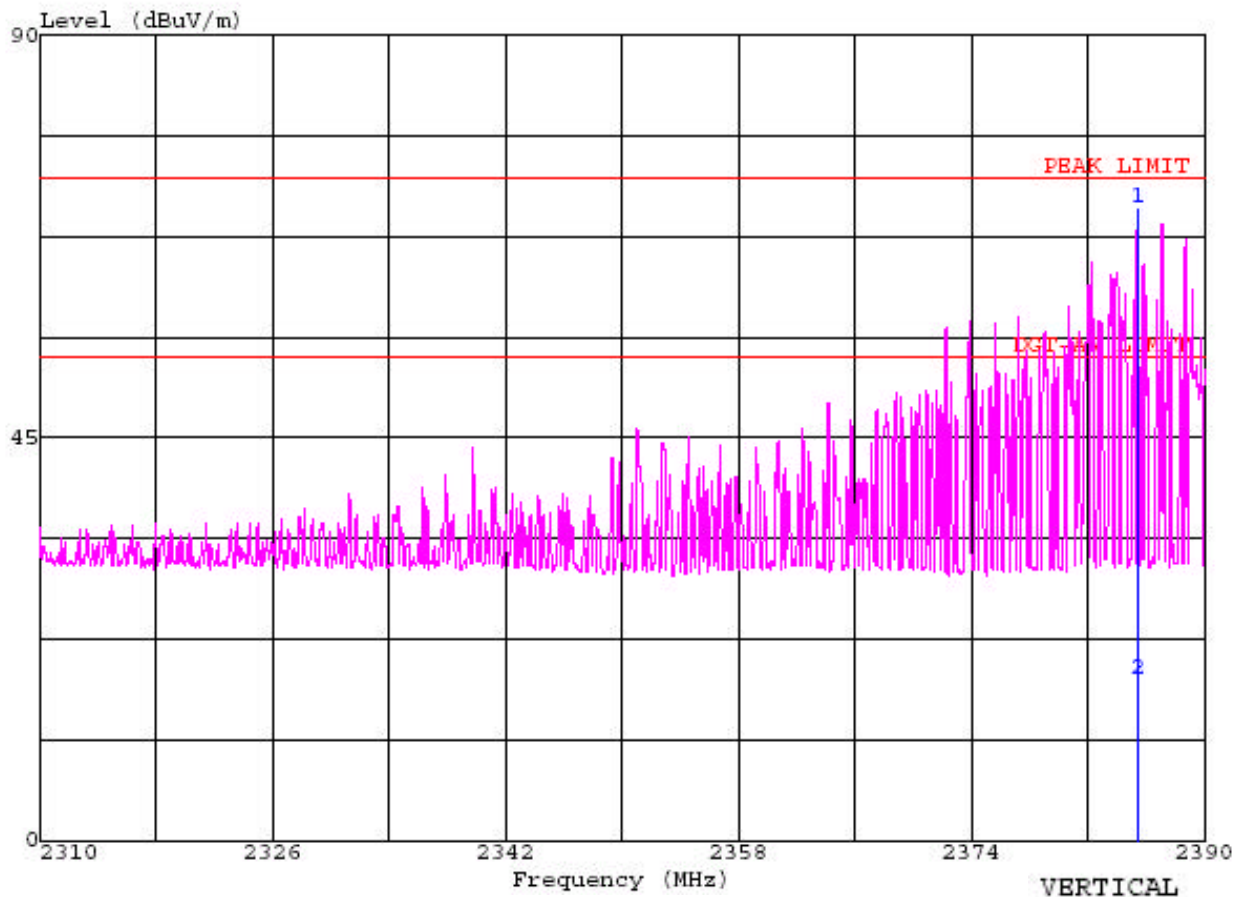
Peak Power Density

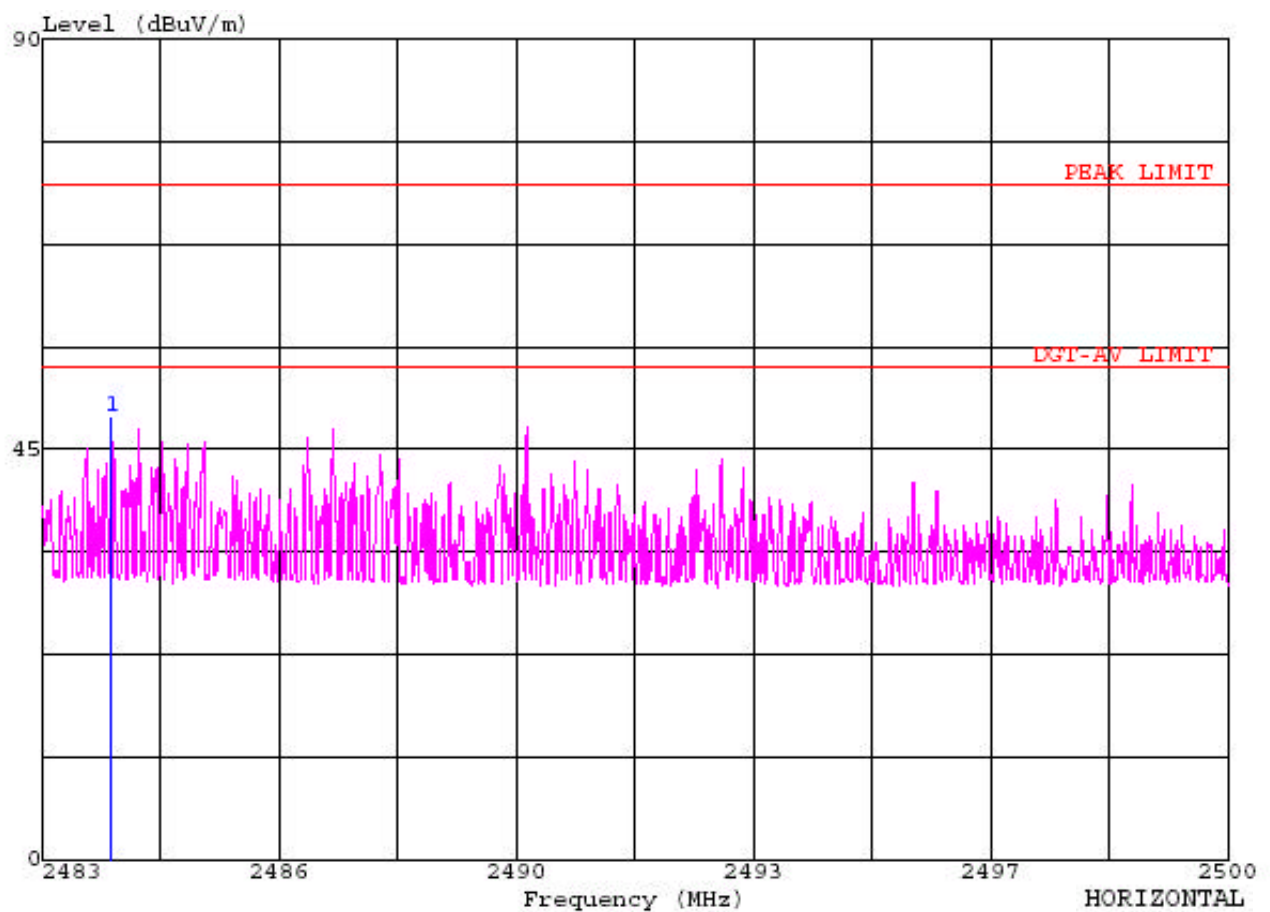
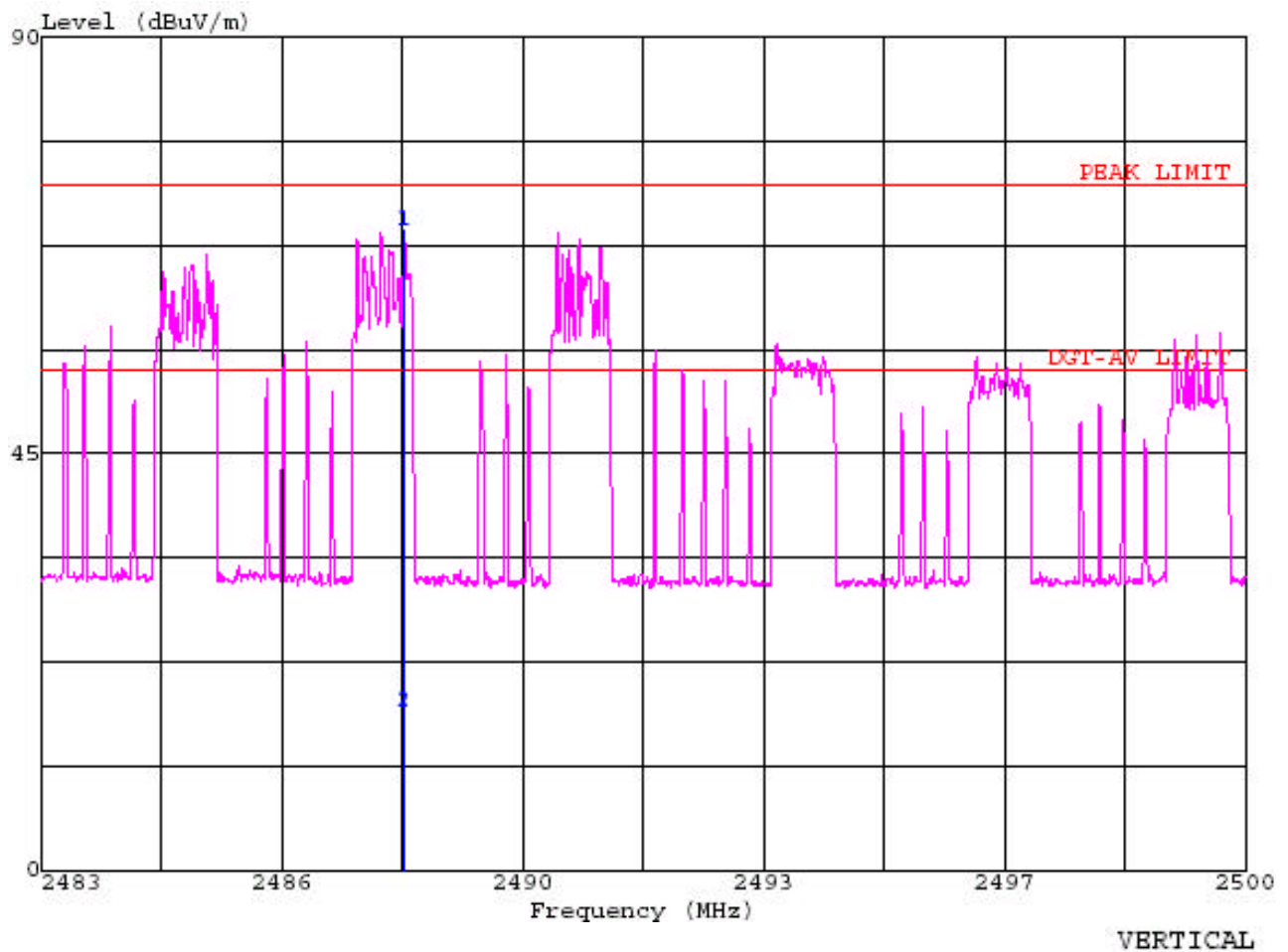




Attachment – K

Band Edges Requirements





Attachment – L

Laboratory Accreditation Certificate