FCC TEST REPORT (ZigBee)

REPORT NO.:	RF991006E03-1 R1
MODEL NO.:	REN301Z-xx, TEI301Z-xx, TES301Z-xx
FCC ID:	LDK-TEI301Z
RECEIVED:	Oct. 06 2010
TESTED:	Oct. 14 to 26, 2010
ISSUED:	Feb. 08, 2011
APPLICANT:	Cisco Systems Inc.
ADDRESS:	170 West Tasman Drive, San Jose, CA 95134-1706, USA.
ISSUED BY:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
LAB ADDRESS:	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan
TEST LOCATION (1):	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan
TEST LOCATION (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

Table of Contents

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	NA	Jan. 19, 2011
RF991006E03-1 R1	Modified the product name of the EUT	Feb. 08, 2011

1 CERTIFICATION

PRODUCT :	IP Managed Services Home Gateway
BRAND NAME :	Cisco
MODEL NO. :	REN301Z-xx, TEI301Z-xx, TES301Z-xx
TESTED :	Oct. 14 to 26, 2010
TEST SAMPLE :	MASS-PRODUCTION
APPLICANT :	Cisco Systems Inc.
STANDARDS :	FCC Part 15, Subpart C (Section 15.249) ANSI C63.4-2003 ANSI C63.10-2009

The above equipment (Model: TEI301Z-NA) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Sunny Wen , **DATE:** *Feb. 08, 2011*
(Sunny Wen, Specialist)

TECHNICAL ACCEPTANCE : , **DATE:** *Feb. 08, 2011*
(Hank Chung, Deputy Manager)

APPROVED BY : , **DATE:** *Feb. 08, 2011*
(May Chen, Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
Standard Paragraph	**Test Type**	**Result**	**Remark**
15.207	Conducted Emission Test	PASS	Minimum passing margin is -11.50dB at 0.181MHz
15.249	Radiated Emission Test	PASS	Minimum passing margin is -2.1dB at 41.96MHz
15.249	Conducted - Out Band Measurement	PASS	Meet the requirement of limit

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	**Value**
Conducted emission	2.45 dB
Radiated emissions (30MHz-1GHz) – Chamber H	3.76 dB
Radiated emissions (1GHz-18GHz) – Chamber G	2.19 dB
Radiated emissions (18GHz-40GHz) – Chamber G	2.56 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	IP Managed Services Home Gateway
MODEL NO.	REN301Z-xx, TEI301Z-xx, TES301Z-xx
FCC ID	LDK-TEI301Z
POWER SUPPLY	DC 12V from adapter
MODULATION TYPE	O-QPSK
TRANSFER RATE	250kbps
NUMBER OF CHANNEL	16
ANTENNA TYPE	Chip antenna without connector (antenna gain 0.5dBi)
DATA CABLE	NA
I/O PORTS	**For Model No.: REN301Z-xx** USB port x 2 Ethernet (10/100/1000Mbps) port x 4 Internet (10/100/1000Mbps) port x 1
	For Model No.: TEI301Z-xx, TES301Z-xx USB port x 2 Ethernet (10/100/1000Mbps) port x 4 Internet (10/100/1000Mbps) port x 1 PHONE port x 2
ASSOCIATED DEVICES	Adapter

NOTE:

1. There are ZigBee technology and WLAN technology used for the EUT. <the WLAN test data please refer "RF991006E03">

2. The EUT has below model names, which are identical to each other in all aspects except for the following table:

Model No.	Basic Function	Add Function-1	Add Function-2	Add Function-3
		FXS x 2ch	SIM controller	Internal ZigBee
REN301Z-XX	Yes	-	-	Yes
TEI301Z-XX	Yes	Yes	Yes	Yes
TES301Z-XX	Yes	Yes	-	Yes
Note : The " xx " of Model Names could be 0~9, A~Z, a~z or blank				

From the above models, model: **TEI301Z-NA** was selected as model for the test and its data was recorded in this report.

3. The EUT could be supplied with a power adapter and following two different model names could be chosen::

Adapter 1	
Brand:	DELTA
Model No.:	EADP-30RB A
Input power :	100-240V, 50/60Hz, 1A AC input cable (unshielded, 0.3m)
Output power :	12V, 2.5A DC output cable (unshielded, 1.5m)
Adapter 2	
Brand:	PHIHONG
Model No.:	PSA24A-120
Input power :	100-240V, 50/60Hz, 0.6A
Output power :	12V, 2.0A DC output cable (unshielded, 1.5m)

4. The EUT was pre-tested under the following modes:

Pre-test Mode	Description
Mode A	Level-set (Put on tabletop) with adapter 1
Mode B	**Level-set (Put on tabletop) with adapter 2**
Mode C	**Tower-set (Wall-mounted) with adapter 2**

From the above modes, the worst radiated emission (below 1GHz) mode was found in **Mode C**. And the worst radiated emission (above 1GHz) mode was found in **Mode B**. Therefore the test data of the modes were recorded in this report.

5. The above EUT information was declared by the manufacturer and for more detailed feature descriptions, please refer to the manufacturer's

specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

Sixteen channels are provided to this EUT.

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	2405	5	2425	9	2445	13	2465
2	2410	6	2430	10	2450	14	2470
3	2415	7	2435	11	2455	15	2475
4	2420	8	2440	12	2460	16	2480

NOTE:

1. Below 1 GHz, the channel 1, 8, and 16 were pre-tested in chamber. The channel 1, worst case one, was chosen for final test.
2. Above 1 GHz, the channel 1, 8, and 16 were tested individually.

3.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	PLC	RE < 1G	RE ³ 1G	OB	
A	√	-	-	-	Level-set (Put on tabletop) with adapter 1
B	√	-	√	√	Level-set (Put on tabletop) with adapter 2
C	-	√	-	-	Tower-set (Wall-mounted) with adapter 2

Where **PLC:** Power Line Conducted Emission **RE < 1G:** Radiated Emission below 1GHz

RE ³ 1G: Radiated Emission above 1GHz **OB:** Conducted Out-Band Emission measurement

POWER LINE CONDUCTED EMISSION TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
WORSE CHANNEL		

RADIATED EMISSION TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 16	1	O-QPSK

RADIATED EMISSION TEST (ABOVE 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 16	1, 8, 16	O-QPSK

CONDUCTED OUT-BAND EMISSION MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 16	1, 8, 16	O-QPSK

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
PLC	28deg. C, 60%RH, 1015 hPa	120Vac, 60Hz	Timmy Hu
RE³1G	22deg. C, 71%RH, 1012 hPa	120Vac, 60Hz	Eric Lee
RE<1G	21deg. C, 70%RH, 1015 hPa	120Vac, 60Hz	Eric Lee
OB	25deg. C, 60%RH, 1015 hPa	120Vac, 60Hz	Rex Huang

3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (Section 15.249)
ANSI C63.4: 2003
ANSI C63.10: 2009

All tests have been performed and recorded as per the above standards.

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

3.5 DESCRIPTION OF SUPPORT UNITS

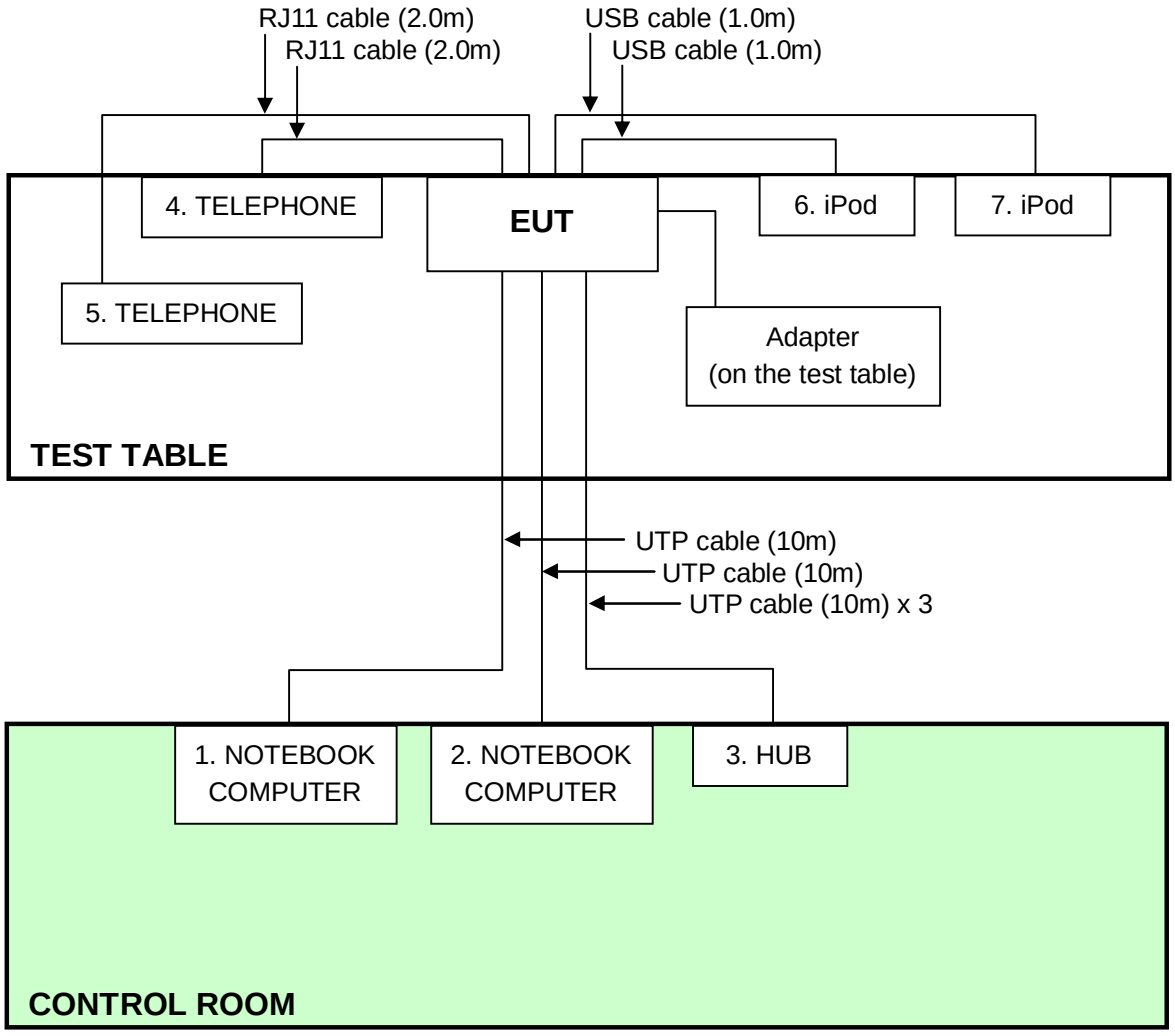
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC
2	NOTEBOOK COMPUTER	DELL	PP32LA	GSLB32S	FCC DoC
3	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC
4	TELEPHONE	WONDER	WD-303	6C17FA00515	NA
5	TELEPHONE	WONDER	WD-303	6C17FA00774	NA
6	iPod	Apple	A1137	6U6078FMUPR	FCC DoC
7	iPod	Apple	A1137	5K7170JBUPR	FCC DoC

No.	Signal cable description
1	10 m UTP cable.
2	10 m UTP cable.
3	10 m UTP cable.
4	2.0 m wrapped unshielded wire, terminated via drain wire, with 3.5 mm phone plug, w/o core.
5	2.0 m wrapped unshielded wire, terminated via drain wire, with 3.5 mm phone plug, w/o core.
6	1.0 m shielded cable, terminated with USB connector, w/o core.
7	1.0 m shielded cable, terminated with USB connector, w/o core.

Note: 1. All power cords of the above support units are unshielded (1.8m).

3.6 CONFIGURATION OF SYSTEM UNDER TEST



4 TEST PROCEDURES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15-0.5 0.5-5 5-30	66 to 56 56 60	56 to 46 46 50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. All emanations from a class B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

Tested Date: Oct. 14

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver	ESCS 30	100375	Mar. 09, 2010	Mar. 08, 2011
Line-Impedance Stabilization Network (for EUT)	NSLK 8127	8127-522	Sep. 08, 2010	Sep. 07, 2011
Line-Impedance Stabilization Network (for Peripheral)	ESH3-Z5	848773/004	Oct. 26, 2009	Oct. 25, 2010
RF Cable (JYEBAO)	5DFB	COBCAB-001	Nov. 24, 2009	Nov. 23, 2010
50 ohms Terminator	50	3	Oct. 28, 2009	Oct. 27, 2010
Software	BV ADT_Cond_V7.3.7	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
3 The VCCI Con C Registration No. is C-3611.

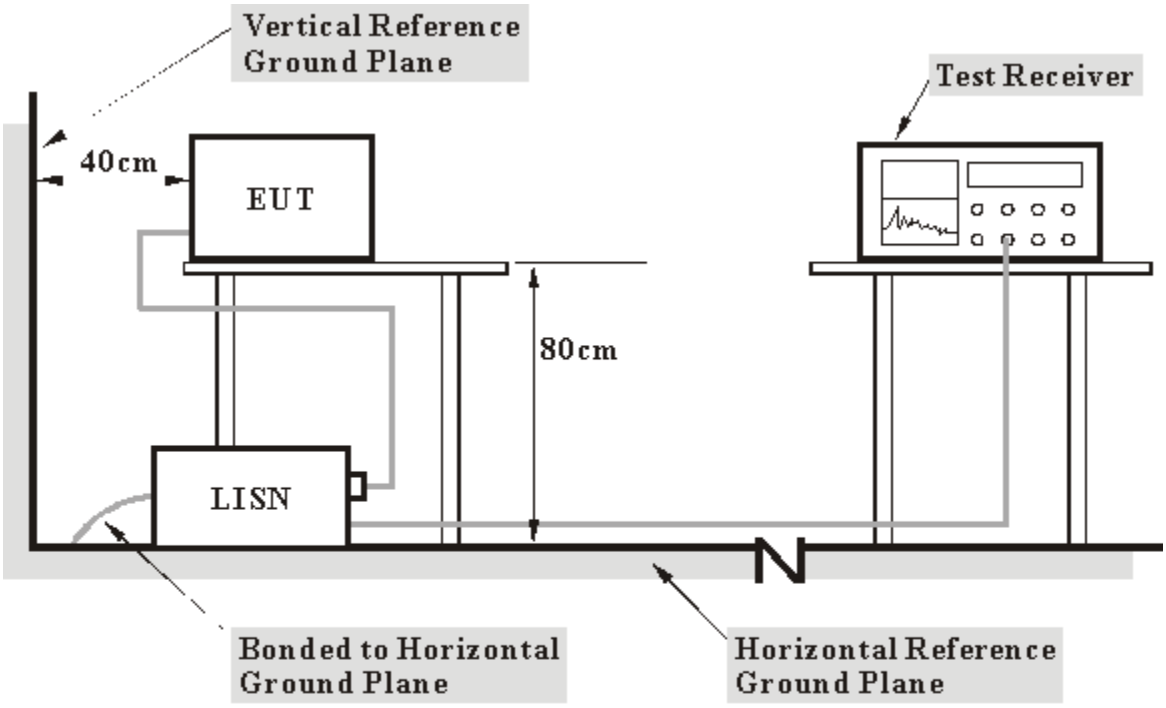
4.1.3 TEST PROCEDURES

a. The EUT/HOST was placed 0.4 meters from the conducting wall of the shielded room with EUT/HOST being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT/HOST were checked for maximum conducted interference.

c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported

4.1.4 TEST SETUP



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.5 EUT OPERATING CONDITIONS

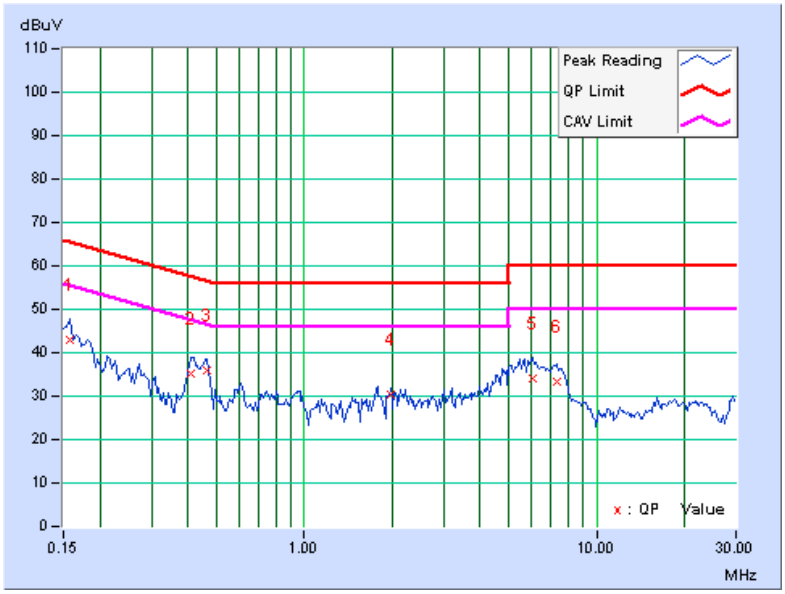
1. Placed the EUT on testing table.
2. Prepared other computer systems (support units 1 ~ 2) to act as communication partners and placed them outside of testing area.
3. The communication partners ran test program “Telnet command” to enable EUT under transmission/receiving condition continuously at specific channel frequency via UTP cables.

4.1.6 TEST RESULTS (ADAPTER 1)

PHASE	Line (L)	6DB BANDWIDTH	9 kHz

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.158	9.72	33.15	-	42.87	-	65.58	55.58	-22.71	-
2	0.412	9.75	25.31	-	35.06	-	57.61	47.61	-22.55	-
3	0.463	9.75	26.19	-	35.94	-	56.65	46.65	-20.71	-
4	1.973	9.77	20.56	-	30.33	-	56.00	46.00	-25.67	-
5	6.016	9.86	24.19	-	34.05	-	60.00	50.00	-25.95	-
6	7.313	9.89	23.37	-	33.26	-	60.00	50.00	-26.74	-

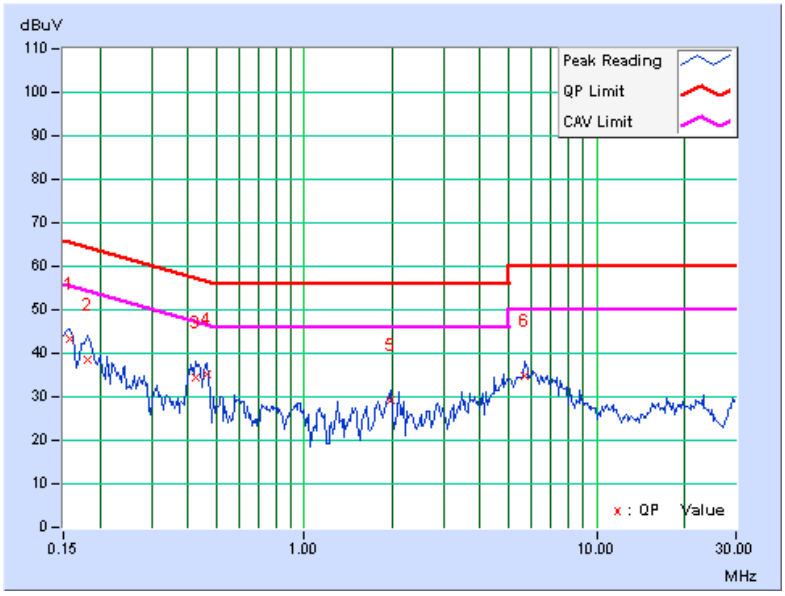
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



PHASE	Neutral (N)	6DB BANDWIDTH	9 kHz

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.158	9.72	33.49	-	43.21	-	65.58	55.58	-22.37	-
2	0.181	9.73	28.61	-	38.34	-	64.43	54.43	-26.09	-
3	0.423	9.75	24.66	-	34.41	-	57.38	47.38	-22.97	-
4	0.463	9.75	25.34	-	35.09	-	56.65	46.65	-21.56	-
5	1.973	9.77	19.49	-	29.26	-	56.00	46.00	-26.74	-
6	5.680	9.86	24.79	-	34.65	-	60.00	50.00	-25.35	-

REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.

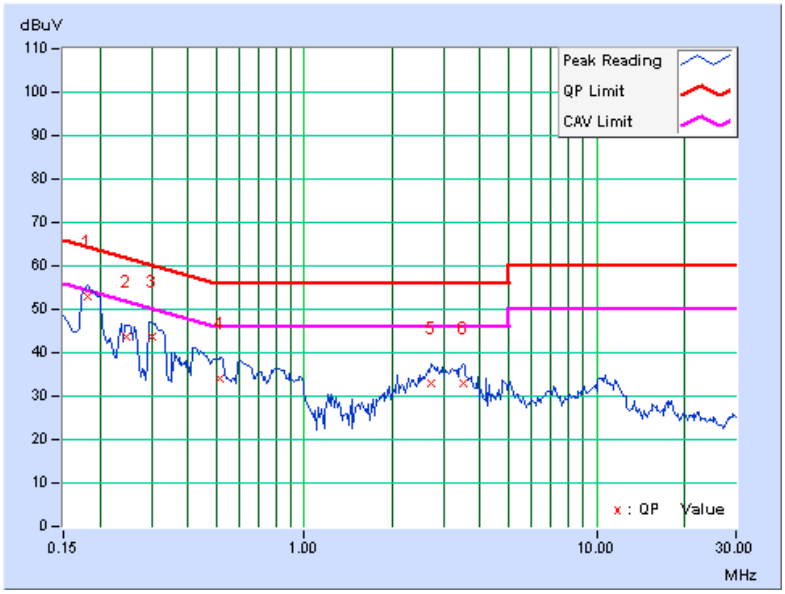


4.1.7 TEST RESULTS (ADAPTER 2)

PHASE	Line (L)	6DB BANDWIDTH	9 kHz

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.181**	**9.73**	**43.20**	**-**	**52.93**	**-**	**64.43**	**54.43**	**-11.50**	**-**
2	0.248	9.74	33.81	-	43.55	-	61.84	51.84	-18.28	-
3	0.302	9.75	34.08	-	43.83	-	60.18	50.18	-16.35	-
4	0.517	9.75	24.16	-	33.91	-	56.00	46.00	-22.09	-
5	2.715	9.78	23.15	-	32.93	-	56.00	46.00	-23.07	-
6	3.508	9.79	23.24	-	33.03	-	56.00	46.00	-22.97	-

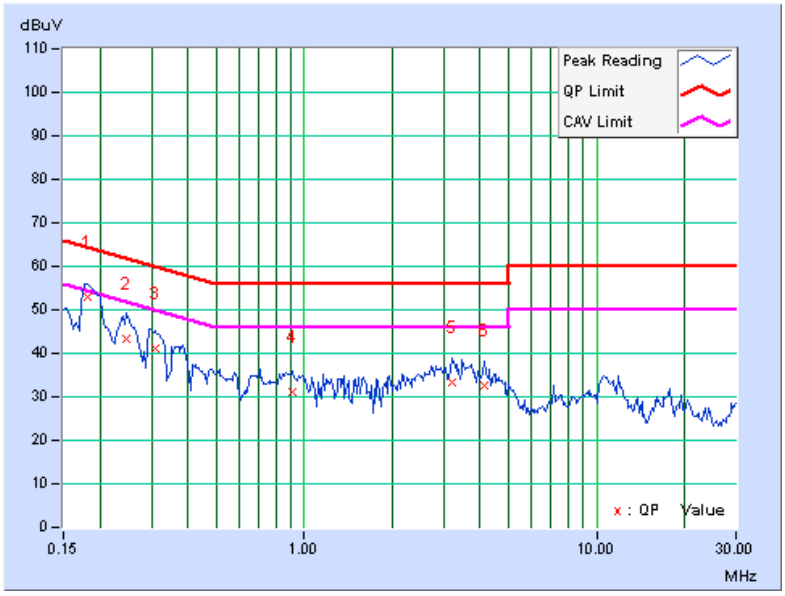
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



PHASE	Neutral (N)	6DB BANDWIDTH	9 kHz

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.181	9.73	43.17	-	52.90	-	64.43	54.43	-11.53	-
2	0.248	9.74	33.63	-	43.37	-	61.84	51.84	-18.46	-
3	0.310	9.75	31.26	-	41.01	-	59.97	49.97	-18.96	-
4	0.912	9.76	21.41	-	31.17	-	56.00	46.00	-24.83	-
5	3.199	9.79	23.64	-	33.43	-	56.00	46.00	-22.57	-
6	4.156	9.81	22.77	-	32.58	-	56.00	46.00	-23.42	-

REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.249 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBuV/m)	
	Peak	Average
2400 ~ 2483.5	114	94
	Field Strength of Harmonics (dBuV/m)	
	74	54

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
2. Section 15.205 restricted bands of operation shall compliance with the limits in Section 15.209.

4.2.2 TEST INSTRUMENTS

For below 1GHz test, tested data: Oct. 26

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250253	Aug. 23, 2010	Aug. 22, 2011
Agilent Pre-Selector	N9039A	MY46520310	Aug. 23, 2010	Aug. 22, 2011
Agilent Signal Generator	N5181A	MY49060347	July 30, 2010	July 29, 2011
LIG NEX1 Test Receiver	ER-265	L09068005	Oct. 25, 2010	Oct. 24, 2011
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-04	Nov. 18, 2009	Nov. 17, 2010
Agilent Pre-Amplifier	8449B	3008A02465	Mar. 01, 2010	Feb. 28, 2011
Miteq Pre-Amplifier	AFS33-18002650-30-8P-44	881786	NA	NA
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-361	Apr. 28, 2010	Apr. 27, 2011
AISI Horn_Antenna	AIH.8018	0000220091110	Nov. 16, 2009	Nov. 15, 2010
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 08, 2010	Oct. 07, 2011
RF CABLE	NA	RF104-205 RF104-207 RF104-208	Dec. 24, 2009	Dec. 23, 2010
RF Cable	NA	CHHCAB_001	NA	NA
Software	ADT_Radiated_V8.7.05	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.

For above 1GHz test

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250254	July 14, 2010	July 13, 2011
Agilent Pre-Selector	N9039A	MY46520311	July 14, 2010	July 13, 2011
Agilent Signal Generator	N5181A	MY49060517	July 14, 2010	July 13, 2011
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-03	Nov. 18, 2009	Nov. 17, 2010
Agilent Pre-Amplifier	8449B	3008A02578	July 05, 2010	July 04, 2011
Miteq Pre-Amplifier	AFS33-18002650-30-8P-44	881786	NA	NA
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-360	Apr. 29, 2010	Apr. 28, 2011
AISI Horn_Antenna	AIH.8018	0000320091110	Nov. 16, 2009	Nov. 15, 2010
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 08, 2010	Oct. 07, 2011
RF CABLE	NA	RF104-201 RF104-203 RF104-204	Dec. 24, 2009	Dec. 23, 2010
RF Cable	NA	CHGCAB_001	NA	NA
Software	ADT_Radiated_V8.7.05	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.

4.2.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

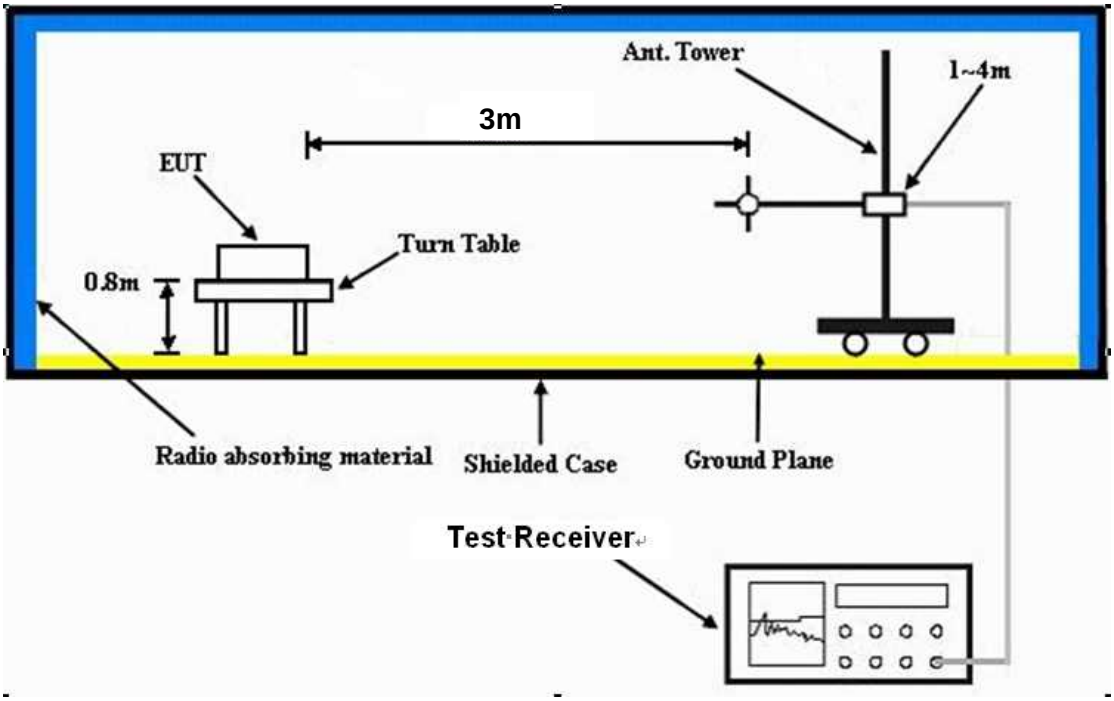
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6

4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	**FREQUENCY RANGE**	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	**DETECTOR FUNCTION**	Quasi-Peak
ENVIRONMENTAL CONDITIONS	21deg. C, 70%RH 1015 hPa	**TESTED BY**	Eric Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	124.97	37.3 QP	43.5	-6.2	1.50 H	116	24.19	13.13
2	204.91	35.0 QP	43.5	-8.5	1.50 H	234	23.61	11.38
3	211.07	37.0 QP	43.5	-6.5	1.00 H	218	25.40	11.60
4	250.03	36.9 QP	46.0	-9.1	1.00 H	75	23.94	12.95
5	270.16	40.2 QP	46.0	-5.9	1.00 H	220	26.41	13.74
6	609.32	37.4 QP	46.0	-8.6	1.25 H	187	14.74	22.62
7	703.11	37.0 QP	46.0	-9.1	1.00 H	251	13.50	23.45
8	937.47	42.7 QP	46.0	-3.3	1.25 H	113	15.78	26.91
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	**41.96**	**37.9 QP**	**40.0**	**-2.1**	**1.25 V**	**360**	**23.14**	**14.79**
2	57.71	31.8 QP	40.0	-8.2	1.00 V	170	18.46	13.35
3	90.16	33.2 QP	43.5	-10.3	1.50 V	167	23.54	9.64
4	105.20	34.6 QP	43.5	-8.9	1.00 V	19	23.88	10.69
5	197.45	35.2 QP	43.5	-8.3	1.25 V	133	23.81	11.40
6	937.47	42.2 QP	46.0	-3.8	2.00 V	360	15.27	26.91

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

ABOVE 1GHz DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK)
ENVIRONMENTAL CONDITIONS	22deg. C, 71%RH 1015 hPa	TESTED BY	Eric Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2381.40	61.3 PK	74.0	-12.7	1.35 H	64	29.67	31.63
2	2381.40	36.3 AV	54.0	-17.7	1.35 H	64	4.67	31.63
3	*2405.00	93.3 PK	114.0	-20.7	1.33 H	62	61.59	31.71
4	*2405.00	68.3 AV	94.0	-25.7	1.33 H	62	36.59	31.71
5	4810.00	50.9 PK	74.0	-23.1	1.11 H	88	11.98	38.92
6	4810.00	25.9 AV	54.0	-28.1	1.11 H	88	-13.02	38.92
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2396.80	58.4 PK	74.0	-15.6	1.30 V	311	26.72	31.68
2	2396.80	33.4 AV	54.0	-20.6	1.30 V	311	1.72	31.68
3	*2405.00	85.0 PK	114.0	-29.0	1.29 V	320	53.29	31.71
4	*2405.00	60.0 AV	94.0	-34.0	1.29 V	320	28.29	31.71
5	4810.00	46.4 PK	74.0	-27.6	1.02 V	304	7.48	38.92
6	4810.00	21.4 AV	54.0	-32.6	1.02 V	304	-17.52	38.92

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
20 log (Duty cycle) = 20 log (1.3 ms / 23.2 ms) = -25.0 dB
Please see page 28 for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 8	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK)
ENVIRONMENTAL CONDITIONS	22deg. C, 71%RH 1015 hPa	TESTED BY	Eric Lee

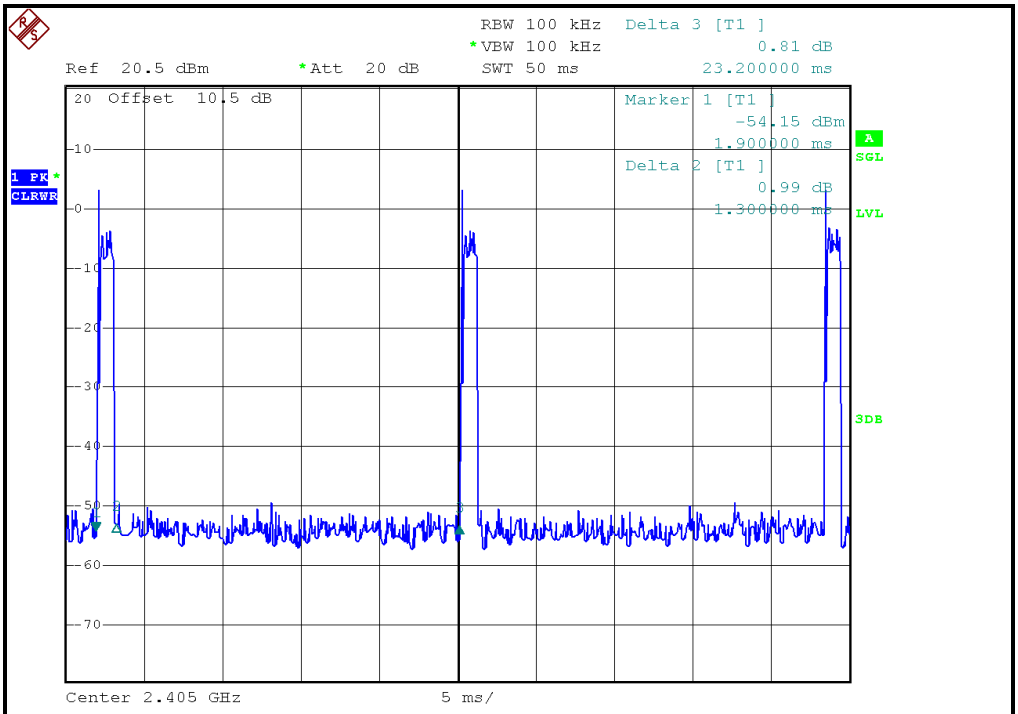
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	93.2 PK	114.0	-20.8	1.33 H	50	61.38	31.82
2	*2440.00	68.2 AV	94.0	-25.8	1.33 H	50	36.38	31.82
3	4880.00	47.1 PK	74.0	-26.9	1.06 H	80	7.94	39.16
4	4880.00	22.1 AV	54.0	-31.9	1.06 H	80	-17.06	39.16
5	7320.00	50.8 PK	74.0	-23.2	1.10 H	71	4.17	46.63
6	7320.00	25.8 AV	54.0	-28.2	1.10 H	71	-20.83	46.63
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	86.1 PK	114.0	-27.9	1.30 V	341	54.28	31.82
2	*2440.00	61.1 AV	94.0	-32.9	1.30 V	341	29.28	31.82
3	4880.00	46.3 PK	74.0	-27.7	1.01 V	322	7.14	39.16
4	4880.00	21.3 AV	54.0	-32.7	1.01 V	322	-17.86	39.16
5	7320.00	50.7 PK	74.0	-23.3	1.08 V	91	4.07	46.63
6	7320.00	25.7 AV	54.0	-28.3	1.08 V	91	-20.93	46.63

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
20 log (Duty cycle) = 20 log (1.3 ms / 23.2 ms) = -25.0 dB
Please see page 28 for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 16	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK)
ENVIRONMENTAL CONDITIONS	22deg. C, 71%RH 1015 hPa	TESTED BY	Eric Lee

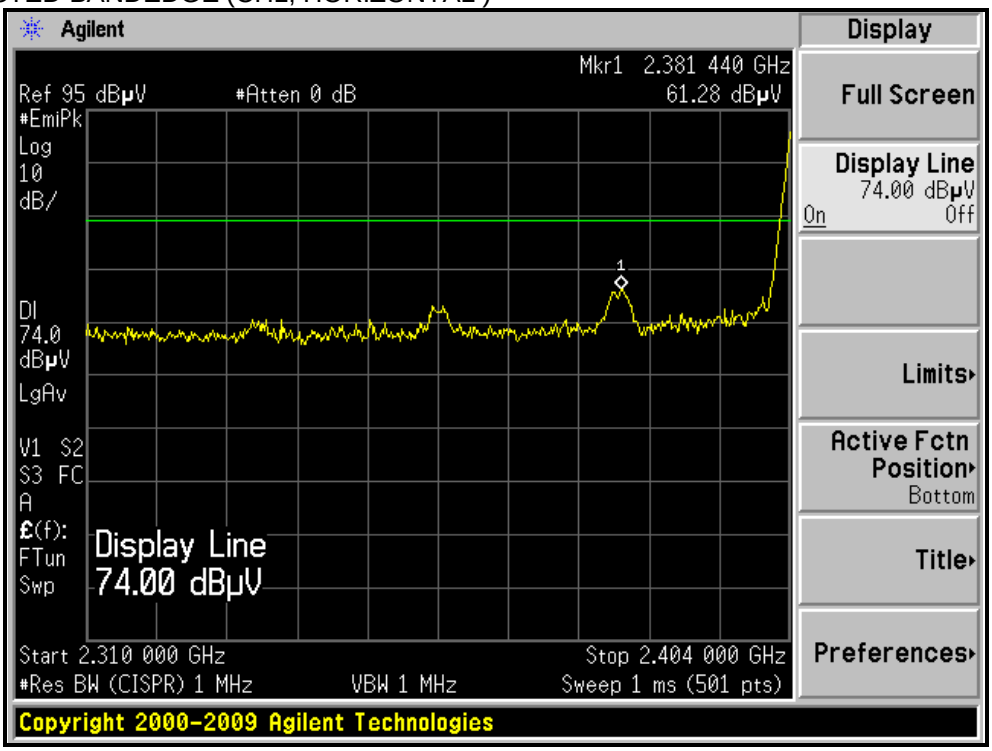
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	92.8 PK	114.0	-21.2	1.31 H	42	60.85	31.95
2	*2480.00	67.8 AV	94.0	-26.2	1.31 H	42	35.85	31.95
3	2483.50	60.5 PK	74.0	-13.5	1.32 H	48	28.53	31.97
4	2483.50	35.5 AV	54.0	-18.5	1.32 H	48	3.53	31.97
5	4960.00	47.6 PK	74.0	-26.4	1.14 H	50	8.18	39.42
6	4960.00	22.6 AV	54.0	-31.4	1.14 H	50	-16.82	39.42
7	7440.00	50.9 PK	74.0	-23.1	1.29 H	61	4.34	46.56
8	7440.00	25.9 AV	54.0	-28.1	1.29 H	61	-20.66	46.56
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	85.3 PK	114.0	-28.7	1.29 V	333	53.35	31.95
2	*2480.00	60.3 AV	94.0	-33.7	1.29 V	333	28.35	31.95
3	2483.50	58.0 PK	74.0	-16.0	1.30 V	321	26.03	31.97
4	2483.50	33.0 AV	54.0	-21.0	1.30 V	321	1.03	31.97
5	4960.00	46.6 PK	74.0	-27.4	1.02 V	298	7.18	39.42
6	4960.00	21.6 AV	54.0	-32.4	1.02 V	298	-17.82	39.42
7	7440.00	50.8 PK	74.0	-23.2	1.09 V	287	4.24	46.56
8	7440.00	25.8 AV	54.0	-28.2	1.09 V	287	-20.76	46.56

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
20 log (Duty cycle) = 20 log (1.3 ms / 23.2 ms) = -25.0 dB
Please see page 28 for plotted duty.

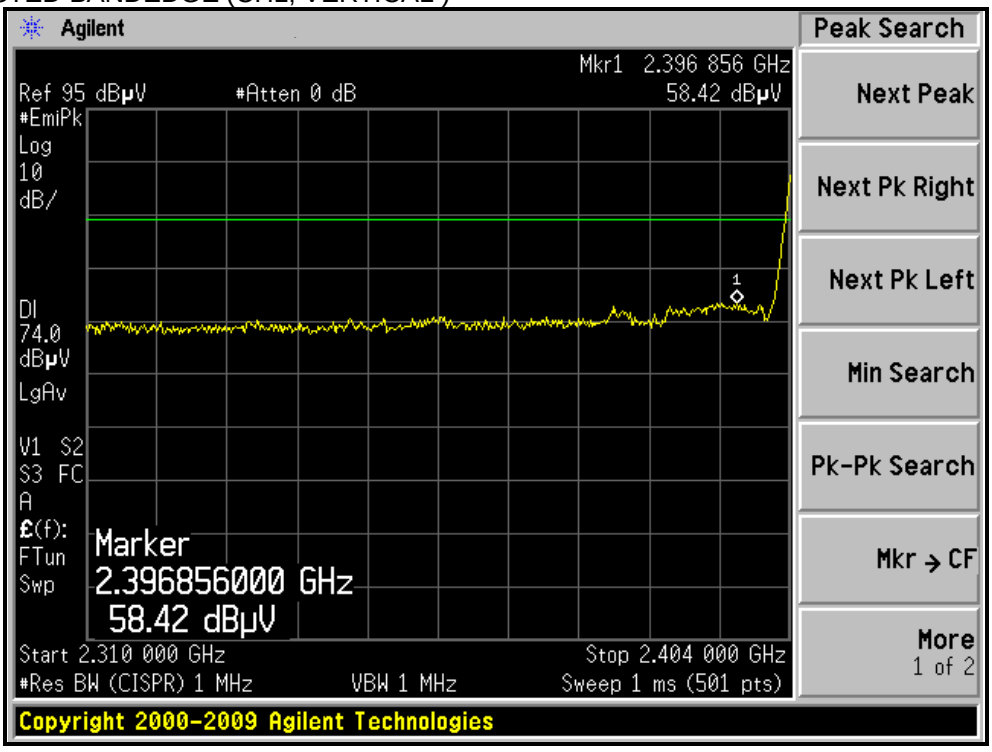


20 log (Duty cycle) = 20 log (1.3 ms / 23.2 ms) = -25.0 dB

RESTRICTED BANDEDGE (CH1, HORIZONTAL)

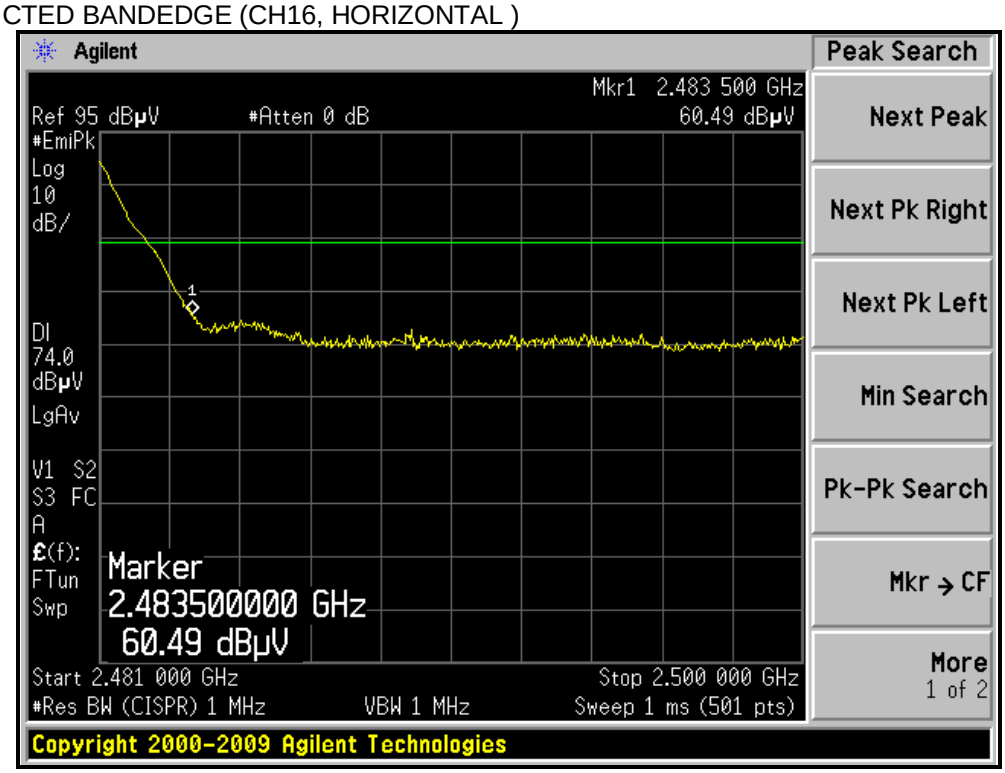


RESTRICTED BANDEDGE (CH1, VERTICAL)

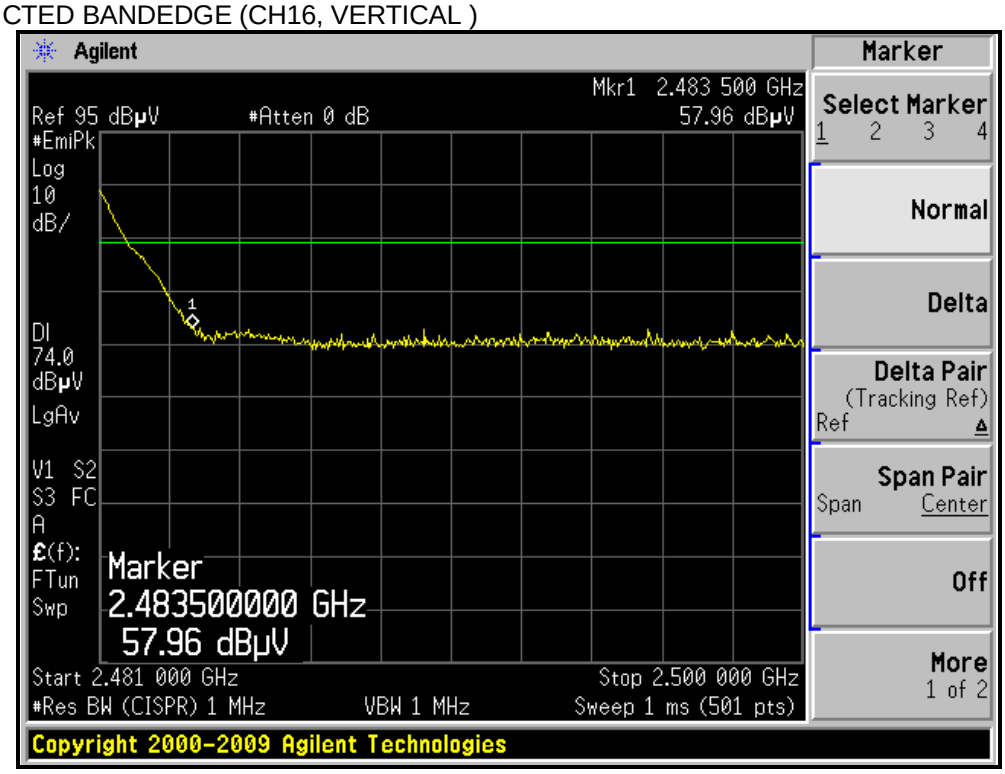


* The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle). And it meets the requirement of limit.

RESTRICTED BANDEDGE (CH16, HORIZONTAL)



RESTRICTED BANDEDGE (CH16, VERTICAL)



* The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle). And it meets the requirement of limit.

4.3 CONDUCTED - OUT BAND MEASUREMENT

4.3.1 LIMITS OF CONDUCTED - OUT BAND MEASUREMENT

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 18, 2009	Dec. 17, 2010

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span from band edge. The band edges was measured and recorded.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

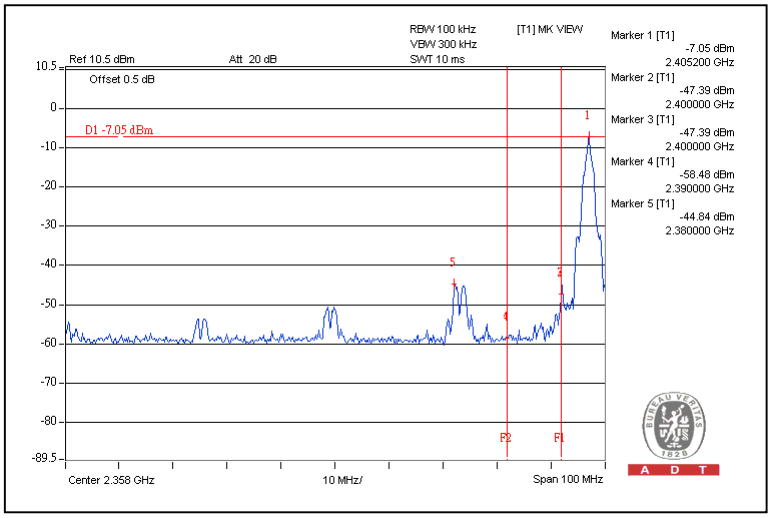
4.3.5 EUT OPERATING CONDITION

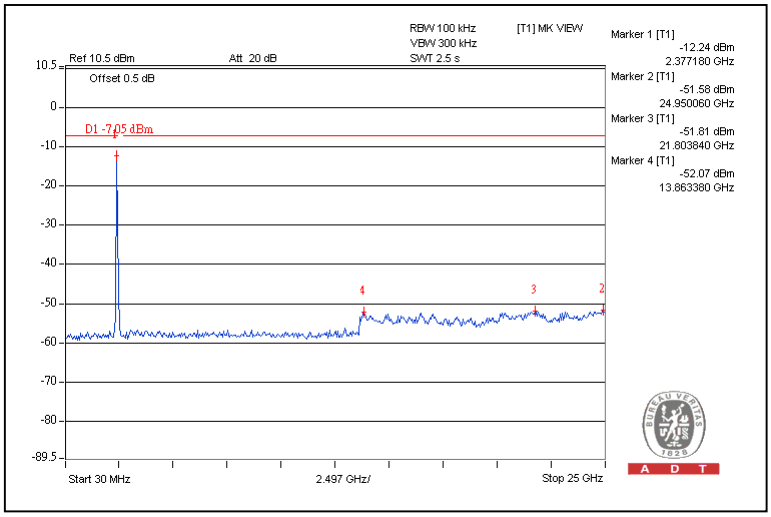
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.6 TEST RESULTS

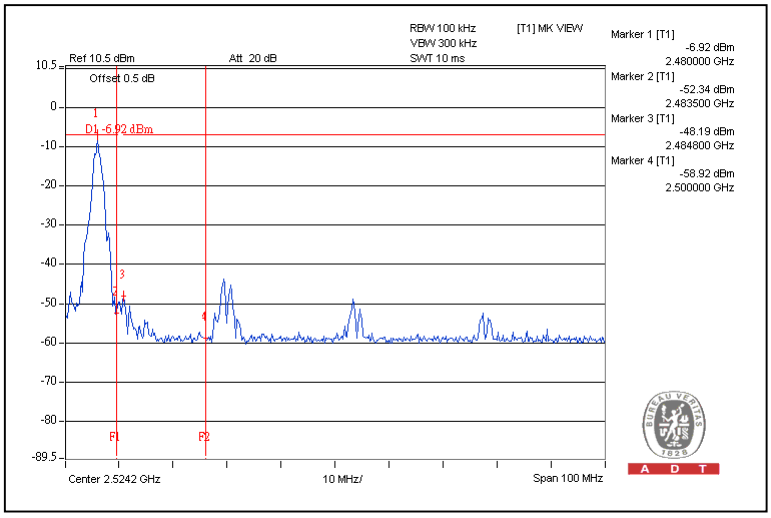
Emissions radiated outside of the specified frequency bands, please refer below pages for met the requirement of the general radiated emission limits in § 15.209.

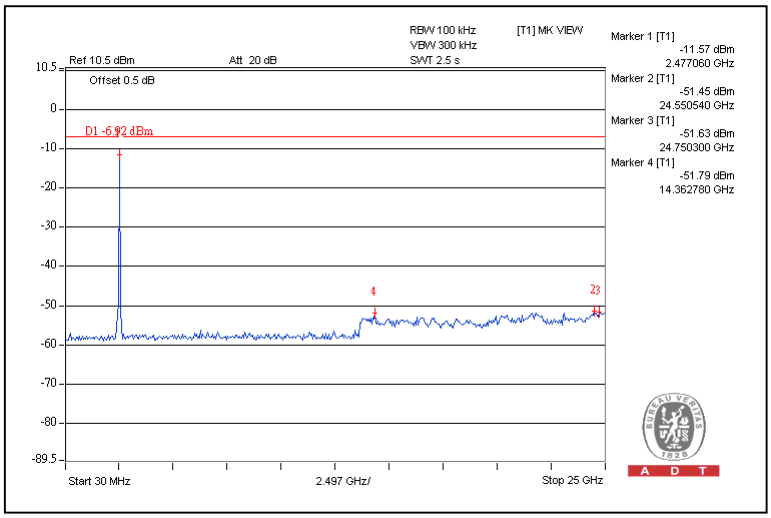
CH1





CH12


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MK VIEW
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
D1 -6.92 dBm
Marker 1 [T1]
-6.92 dBm
2.480000 GHz
Marker 2 [T1]
-52.34 dBm
2.483500 GHz
Marker 3 [T1]
-48.19 dBm
2.484800 GHz
Marker 4 [T1]
-58.92 dBm
2.500000 GHz
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
F1
F2
Center 2.5242 GHz
10 MHz/
Span 100 MHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
D1 -6.92 dBm
Marker 1 [T1]
-11.57 dBm
2.477060 GHz
Marker 2 [T1]
-51.45 dBm
24.550540 GHz
Marker 3 [T1]
-51.63 dBm
24.750300 GHz
Marker 4 [T1]
-51.79 dBm
14.362780 GHz
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Start 30 MHz
2.497 GHz/
Stop 25 GHz

5 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025:

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

Email: service@adt.com.tw
Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.

6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

--- END ---