

FCC TEST REPORT (BLUETOOTH LE4.0)

REPORT NO.: RF120820C06-2
MODEL NO.: F-02E
FCC ID: VQK-F02E
RECEIVED: Aug. 20, 2012
TESTED: Nov. 14 ~ Nov. 21, 2012
ISSUED: Nov. 30, 2012

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF120820C06-2	Original release	Nov. 30, 2012

1. CERTIFICATION

PRODUCT: Mobile Phone
MODEL NO.: F-02E
BRAND: Xi
APPLICANT: FUJITSU LIMITED
TESTED: Nov. 14 ~ Nov. 21, 2012
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10-2009

The above equipment (model: F-02E) 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 : Ivy Lin , DATE : Nov. 30, 2012

Ivy Lin / Specialist

APPROVED BY : Ken Liu , DATE : Nov. 30, 2012

Ken Liu / Manager

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.36dB at 3.94141MHz.
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -4.5dB at 2390.00MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

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:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Mobile Phone
MODEL NO.	F-02E
POWER SUPPLY	3.8Vdc (Battery) 5.0Vdc (Adapter or host equipment)
MODULATION TYPE	GFSK
TRANSFER RATE	1Mbps
OPERATING FREQUENCY	2402 ~ 2480MHz
NUMBER OF CHANNEL	40
CHANNEL SPACING	2MHz
OUTPUT POWER	0.98mW
ANTENNA TYPE	$\lambda/4$ Monopole antenna with -8.5dBi gain
ANTENNA CONNECTOR	N/A
DATA CABLE	N/A
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Battery

NOTE:

- The EUT contains the following accessory.

ITEM	BRAND	MODEL	SPECIFICATION
Battery	Fujitsu Limited	F28	Rating: 3.8Vdc, 2420mA

- The following accessories are support units only.

ITEM	BRAND	MODEL	DESCRIPTION
Adapter	NTT docomo	AC Adaptor 04	I/P: 100-240Vac, 200mA O/P: 5.0Vdc, 1800mA 1.0m DC cable with 2 cores.
USB cable	NA	NA	1.1m cable

- SW version is R04.8.
- HW version is V3.1.0.
- IMEI Code: 353579050028147.
- The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

40 channels are provided to this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	-	√	Power from battery
B	-	√	√	-	Power from adapter
C	-	√	-	-	Power from host equipment

Where **RE \geq 1G**: Radiated Emission above 1GHz
PLC: Power Line Conducted Emission

RE<1G: Radiated Emission below 1GHz
APCM: Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Y-plane.

RADIATED EMISSION TEST (ABOVE 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	PACKET TYPE
B	0 to 39	0, 19, 39	GFSK	1.0

RADIATED EMISSION TEST (BELOW 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	PACKET TYPE
A, B, C	0 to 39	39	GFSK	1.0

POWER LINE CONDUCTED EMISSION TEST:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	PACKET TYPE
B	0 to 39	39	GFSK	1.0

ANTENNA PORT CONDUCTED 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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	PACKET TYPE
A	0 to 39	0, 19, 39	GFSK	1.0

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE \geq 1G	24deg. C, 64%RH	120Vac, 60Hz	Sun Lin
RE<1G	24deg. C, 64%RH	3.8Vdc, 120Vac, 60Hz	Antony Lee
PLC	24deg. C, 65%RH	120Vac, 60Hz	Antony Lee
APCM	24deg. C, 64%RH	3.8Vdc	Match Tsui

3.3 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 (15.247)

ANSI C63.10-2009

558074 D01 DTS Meas Guidance v01

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

3.4 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	DELL	E5420	33MLMQ1	NA
2	EARPHONE	PHILIPS	SBC HL125	NA	NA

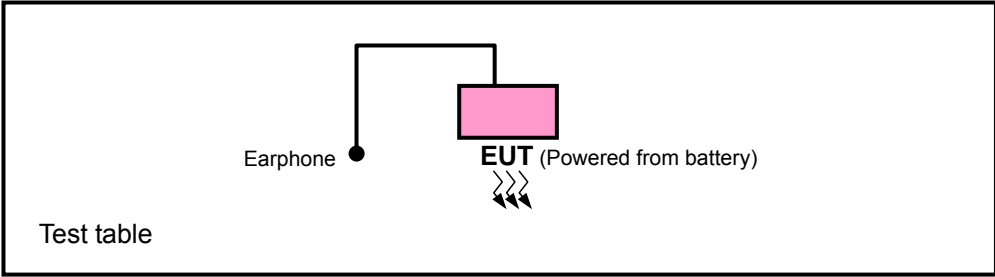
NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.1m USB cable
2	1.2 m wrapped shielded wire, terminated with 3.5mm phone plug via drain wire, w/o core.

NOTE:

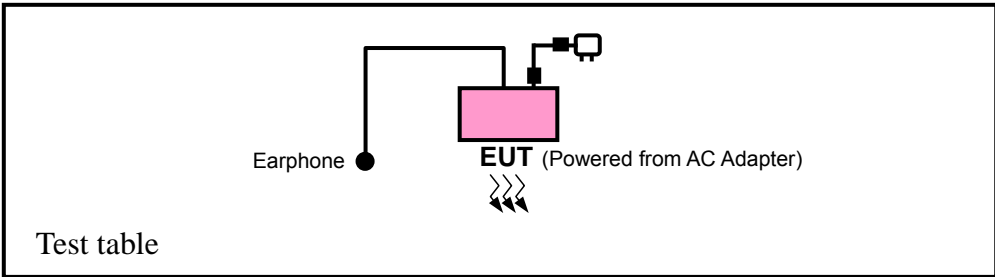
1. All power cords of the above support units are non shielded (1.8m).
2. 1.1 USB cable was provided by the client.

3.4.1 CONFIGURATION OF SYSTEM UNDER TEST

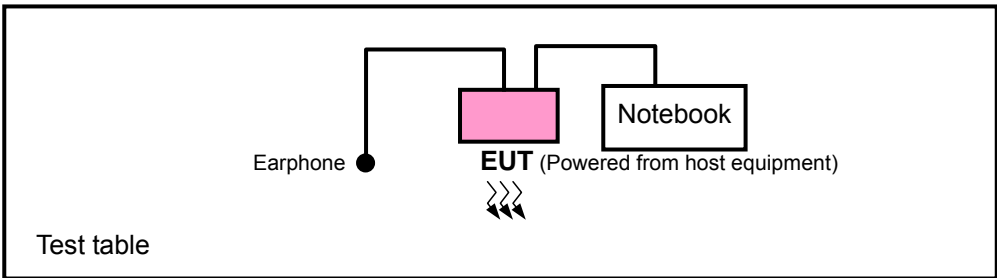
Test Mode A



Test Mode B



Test Mode C



4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. 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.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100744	Apr. 19, 2012	Apr. 18, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jan. 30, 2012	Jan. 29, 2013
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Apr. 03, 2012	Apr. 02, 2013
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-563	Sep. 12, 2012	Sep. 11, 2013
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 11, 2012	Jul. 10, 2013
Preamplifier Agilent	8449B	3008A01911	Oct. 25, 2012	Oct. 24, 2013
Preamplifier Agilent	8447D	2944A10638	Oct. 25, 2012	Oct. 24, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295013/4 283403/4	Aug. 28, 2012	Aug. 27, 2013
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Aug. 11, 2012	Aug. 10, 2013
Software	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn Table Controller EMCO	2090	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 HwaYa Chamber 9.
 3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 460141.
 5. The IC Site Registration No. is IC 7450F-4.

4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

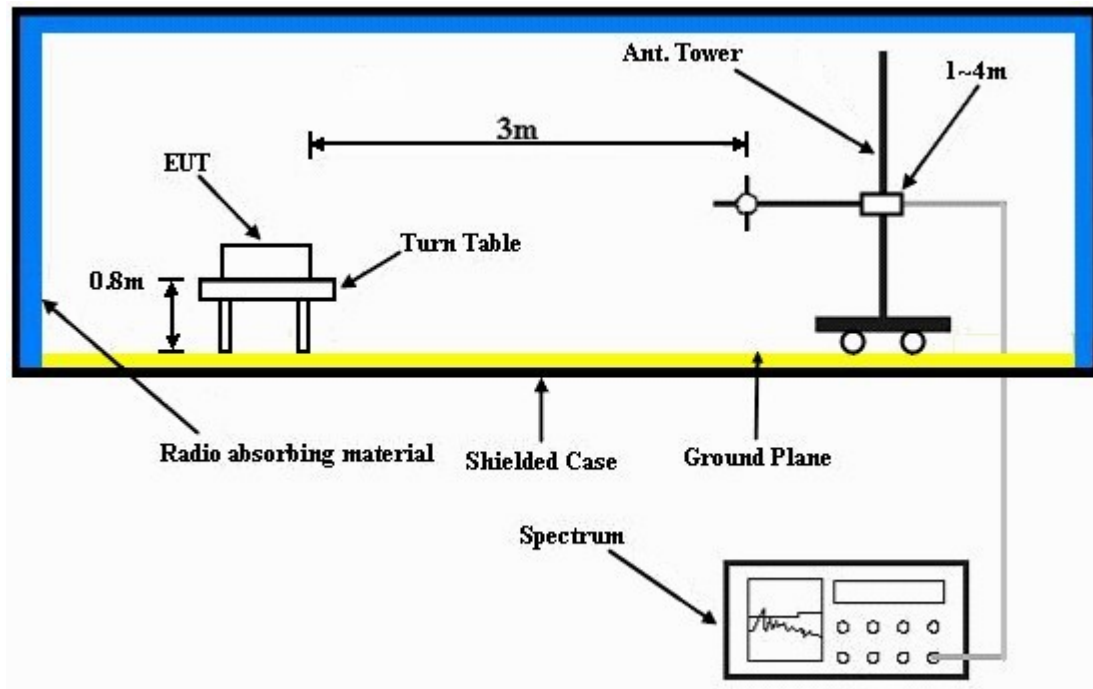
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT OPERATING CONDITIONS

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 TEST RESULTS

ABOVE 1GHz DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH	TESTED BY	Sun Lin

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	2390.00	54.2 PK	74.0	-19.8	1.28 H	245	23.30	30.90
2	2390.00	44.5 AV	54.0	-9.5	1.28 H	245	13.60	30.90
3	*2402.00	77.8 PK			1.28 H	245	46.80	31.00
4	*2402.00	73.9 AV			1.28 H	245	42.90	31.00
5	4804.00	47.3 PK	74.0	-26.7	1.00 H	105	10.20	37.10
6	4804.00	37.0 AV	54.0	-17.0	1.00 H	105	-0.10	37.10
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	2390.00	54.7 PK	74.0	-19.3	1.00 V	13	23.80	30.90
2	2390.00	44.3 AV	54.0	-9.7	1.00 V	13	13.40	30.90
3	*2402.00	79.6 PK			1.00 V	13	48.60	31.00
4	*2402.00	76.1 AV			1.00 V	13	45.10	31.00
5	4804.00	49.1 PK	74.0	-24.9	1.00 V	25	12.00	37.10
6	4804.00	39.7 AV	54.0	-14.3	1.00 V	25	2.60	37.10

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 19	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH	TESTED BY	Sun Lin

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	76.1 PK			1.33 H	345	45.00	31.10
2	*2440.00	73.1 AV			1.33 H	345	42.00	31.10
3	4880.00	49.0 PK	74.0	-25.0	1.23 H	81	11.80	37.20
4	4880.00	39.8 AV	54.0	-14.2	1.23 H	81	2.60	37.20
5	7320.00	51.9 PK	74.0	-22.1	1.00 H	55	8.30	43.60
6	7320.00	38.6 AV	54.0	-15.4	1.00 H	55	-5.00	43.60
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	78.4 PK			1.02 V	350	47.30	31.10
2	*2440.00	75.3 AV			1.02 V	350	44.20	31.10
3	4880.00	50.2 PK	74.0	-23.8	1.02 V	42	13.00	37.20
4	4880.00	42.8 AV	54.0	-11.2	1.02 V	42	5.60	37.20
5	7320.00	52.3 PK	74.0	-21.7	1.00 V	252	8.70	43.60
6	7320.00	38.8 AV	54.0	-15.2	1.00 V	252	-4.80	43.60

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH	TESTED BY	Sun Lin

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	76.4 PK			1.29 H	237	45.10	31.30
2	*2480.00	73.3 AV			1.29 H	237	42.00	31.30
3	2483.50	55.6 PK	74.0	-18.4	1.29 H	237	24.30	31.30
4	2483.50	44.8 AV	54.0	-9.2	1.29 H	237	13.50	31.30
5	4960.00	48.6 PK	74.0	-25.4	1.01 H	77	11.20	37.40
6	4960.00	39.8 AV	54.0	-14.2	1.01 H	77	2.40	37.40
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	77.0 PK			1.00 V	2	45.70	31.30
2	*2480.00	74.0 AV			1.00 V	2	42.70	31.30
3	2483.50	56.8 PK	74.0	-17.2	1.00 V	3	25.50	31.30
4	2483.50	44.7 AV	54.0	-9.3	1.00 V	3	13.40	31.30
5	4960.00	50.7 PK	74.0	-23.3	1.00 V	45	13.30	37.40
6	4960.00	42.8 AV	54.0	-11.2	1.00 V	45	5.40	37.40

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.

BELOW 1GHz WORST-CASE DATA :

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH	TESTED BY	Antony Lee
TEST MODE	A		

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	53.28	19.7 QP	40.0	-20.3	1.00 H	251	6.40	13.30
2	189.08	22.2 QP	43.5	-21.3	1.25 H	6	10.20	12.00
3	243.40	23.1 QP	46.0	-22.9	1.25 H	17	10.40	12.70
4	515.00	26.8 QP	46.0	-19.2	1.25 H	9	6.30	20.50
5	544.10	26.9 QP	46.0	-19.1	1.25 H	17	5.70	21.20
6	831.22	28.8 QP	46.0	-17.2	1.50 H	36	3.20	25.60
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	53.28	21.5 QP	40.0	-18.5	1.25 V	254	8.20	13.30
2	107.60	25.8 QP	43.5	-17.7	1.00 V	104	15.60	10.20
3	134.76	23.4 QP	43.5	-20.1	1.00 V	78	10.40	13.00
4	189.08	25.2 QP	43.5	-18.3	1.00 V	13	13.20	12.00
5	243.40	23.0 QP	46.0	-23.0	1.00 V	272	10.30	12.70
6	846.74	29.2 QP	46.0	-16.8	1.00 V	256	3.40	25.80

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH	TESTED BY	Antony Lee
TEST MODE	B		

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	53.28	18.0 QP	40.0	-22.0	1.50 H	87	4.70	13.30
2	140.58	17.6 QP	43.5	-25.9	1.25 H	308	4.10	13.50
3	189.08	21.9 QP	43.5	-21.6	1.50 H	223	9.90	12.00
4	243.40	21.7 QP	46.0	-24.3	1.25 H	173	9.00	12.70
5	544.10	26.6 QP	46.0	-19.4	1.00 H	3	5.40	21.20
6	823.46	28.4 QP	46.0	-17.6	1.25 H	319	2.80	25.60
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	107.60	25.0 QP	43.5	-18.5	1.50 V	165	14.80	10.20
2	134.76	24.1 QP	43.5	-19.4	1.25 V	5	11.10	13.00
3	189.08	24.8 QP	43.5	-18.7	1.00 V	231	12.80	12.00
4	243.40	24.5 QP	46.0	-21.5	1.00 V	276	11.80	12.70
5	295.78	20.6 QP	46.0	-25.4	1.00 V	334	5.90	14.70
6	741.98	26.8 QP	46.0	-19.2	1.50 V	5	2.90	23.90

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 64%RH	TESTED BY	Antony Lee
TEST MODE	C		

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	99.84	36.3 QP	43.5	-7.2	1.50 H	107	27.00	9.30
2	142.52	37.2 QP	43.5	-6.3	1.25 H	101	23.70	13.50
3	206.54	33.9 QP	43.5	-9.6	1.25 H	110	22.50	11.40
4	239.52	36.2 QP	46.0	-9.8	1.00 H	96	23.60	12.60
5	431.58	29.3 QP	46.0	-16.7	1.50 H	124	11.00	18.30
6	664.38	34.9 QP	46.0	-11.1	1.50 H	237	12.20	22.70
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	31.94	33.9 QP	40.0	-6.1	1.00 V	104	21.80	12.10
2	97.90	34.9 QP	43.5	-8.6	1.25 V	264	25.80	9.10
3	142.52	35.6 QP	43.5	-7.9	1.00 V	67	22.10	13.50
4	165.80	32.6 QP	43.5	-10.9	1.00 V	110	19.00	13.60
5	200.72	27.3 QP	43.5	-16.2	1.00 V	97	16.20	11.10
6	666.32	32.0 QP	46.0	-14.0	1.50 V	155	9.30	22.70

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.

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

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

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Nov. 09, 2012	Nov. 08, 2013
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 29, 2011	Dec. 28, 2012
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Dec. 30, 2011	Dec. 29, 2012
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 06, 2012	Jul. 05, 2013
Software ADT	BV ADT_Cond_ V7.3.7.3	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 HwaYa Shielded Room 2.
 3. The VCCI Site Registration No. is C-2047.

4.2.3 TEST PROCEDURES

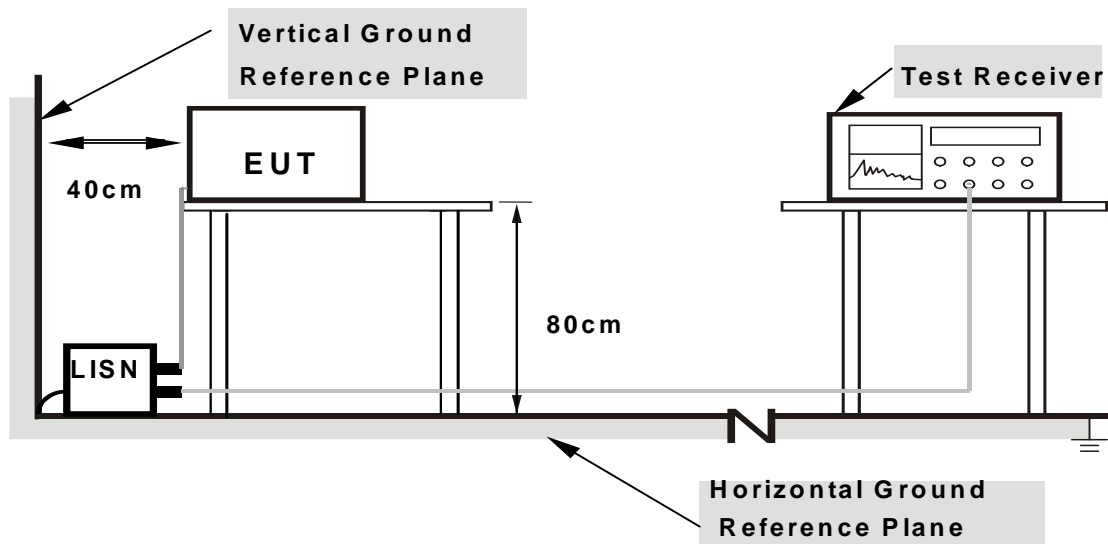
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



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

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

4.2.7 TEST RESULTS

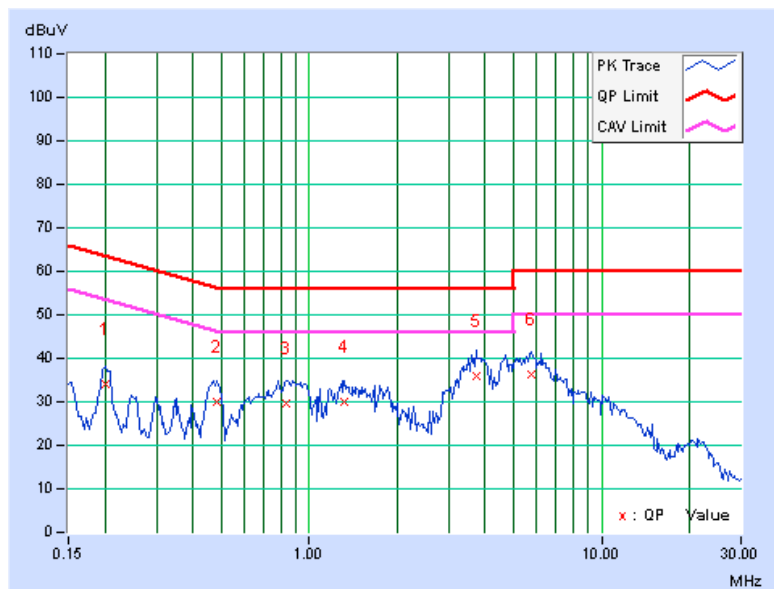
CONDUCTED WORST CASE DATA:

PHASE	Line 1	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20078	0.15	34.00	26.92	34.15	27.07	63.58	53.58	-29.43	-26.51
2	0.48203	0.17	29.66	20.98	29.83	21.15	56.30	46.30	-26.47	-25.15
3	0.83750	0.18	29.36	20.86	29.54	21.04	56.00	46.00	-26.46	-24.96
4	1.32422	0.21	29.82	21.34	30.03	21.55	56.00	46.00	-25.97	-24.45
5	3.71875	0.33	35.53	26.37	35.86	26.70	56.00	46.00	-20.14	-19.30
6	5.74219	0.37	35.81	31.29	36.18	31.66	60.00	50.00	-23.82	-18.34

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

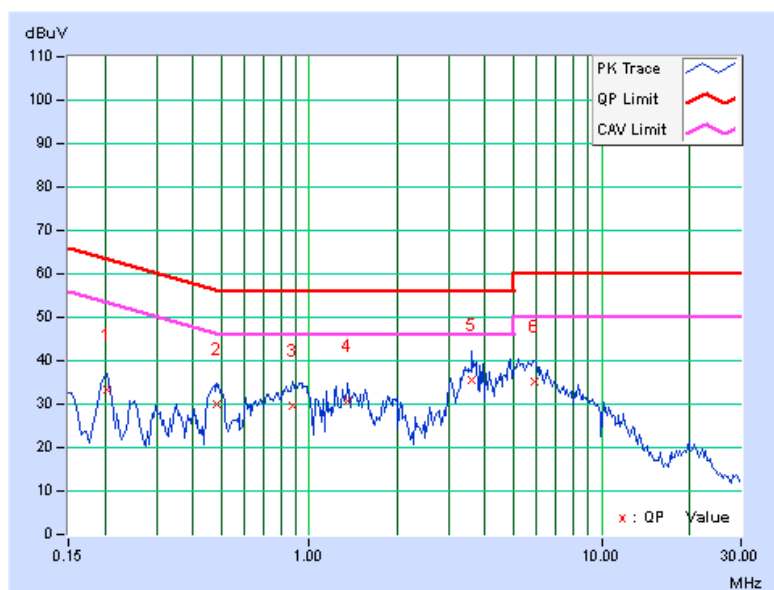


PHASE	Line 2	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20469	0.14	33.17	24.78	33.31	24.92	63.42	53.42	-30.11	-28.50
2	0.48203	0.16	29.78	21.28	29.94	21.44	56.30	46.30	-26.36	-24.86
3	0.87266	0.18	29.56	21.18	29.74	21.36	56.00	46.00	-26.26	-24.64
4	1.35938	0.22	30.42	22.28	30.64	22.50	56.00	46.00	-25.36	-23.50
5	3.61328	0.33	35.20	26.24	35.53	26.57	56.00	46.00	-20.47	-19.43
6	5.92578	0.39	34.98	29.60	35.37	29.99	60.00	50.00	-24.63	-20.01

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

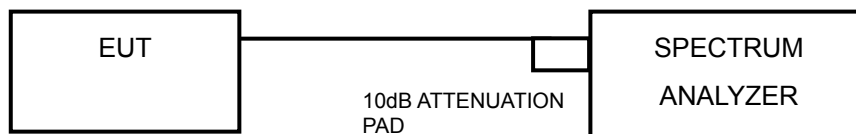


4.3 6dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST SETUP



4.3.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.3.4 TEST PROCEDURE

1. Set resolution bandwidth (RBW) = approximately 1% of the emission bandwidth
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
3. Trace mode = max hold.
4. Sweep = auto couple.
5. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

4.3.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 TEST RESULTS

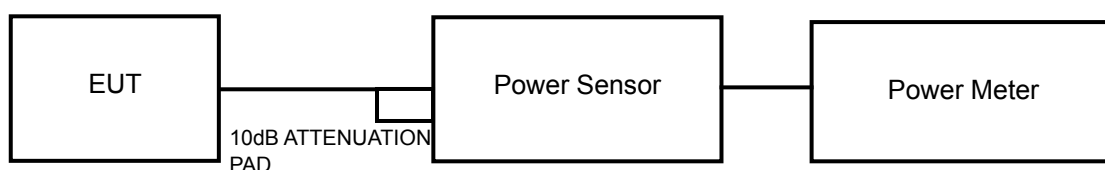
CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (kHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	674	0.5	PASS
19	2440	662	0.5	PASS
39	2480	672	0.5	PASS

4.4 CONDUCTED OUTPUT POWER

4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

For systems using digital modulation in the 2400–2483.5 MHz: 1 Watt (30dBm)

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.4.4 TEST PROCEDURES

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the peak power level.

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6.

4.4.7 TEST RESULTS

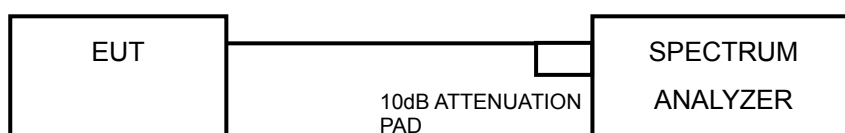
CHANNEL	FREQUENCY (MHz)	PEAK POWER (mW)	PEAK POWER (dBm)	LIMIT (dBm)	PASS/FAIL
0	2402	0.78	-1.10	30	PASS
19	2440	0.85	-0.73	30	PASS
39	2480	0.98	-0.09	30	PASS

4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.5.4 TEST PROCEDURE

- Set the RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
- Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
- Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(3 \text{ kHz}/100\text{kHz})$

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

Same as Item 4.3.6

4.5.7 TEST RESULTS

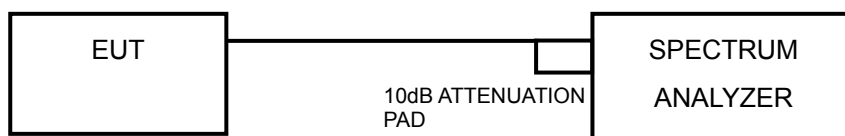
Channel	FREQ. (MHz)	PSD (dBm/100kHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-1.41	-16.64	8	PASS
19	2440	-1.06	-16.29	8	PASS
39	2480	-0.39	-15.62	8	PASS

4.6 CONDUCTED OUT OF BAND EMISSION MEASUREMENT

4.6.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 TEST SETUP



4.6.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.6.4 TEST PROCEDURE

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW \geq 300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITION

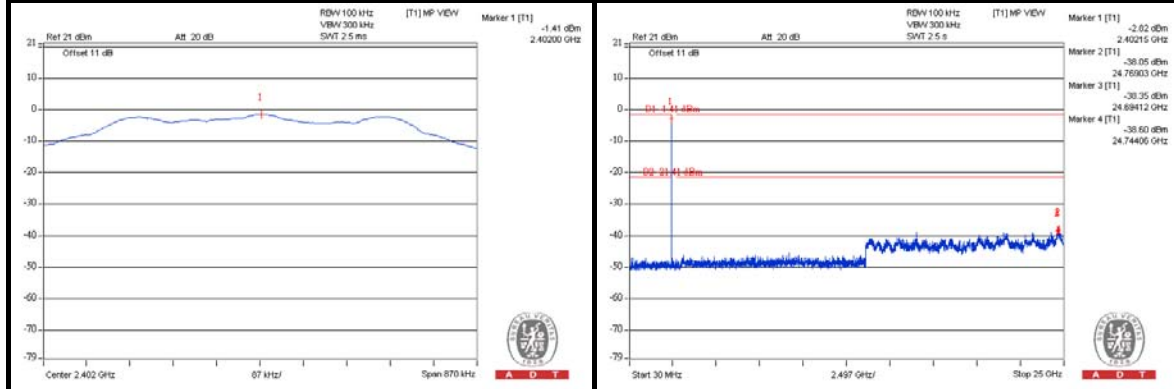
Same as Item 4.3.6

4.6.7 TEST RESULTS

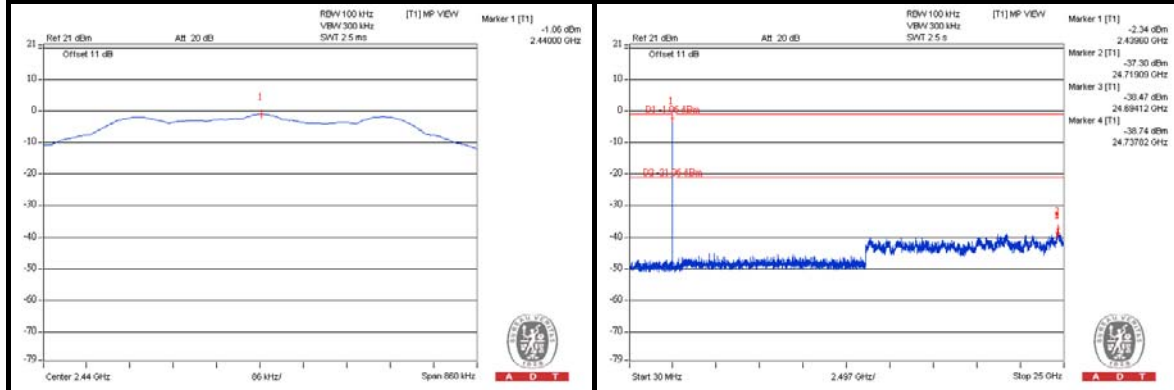
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

4.6.8 TEST RESULTS

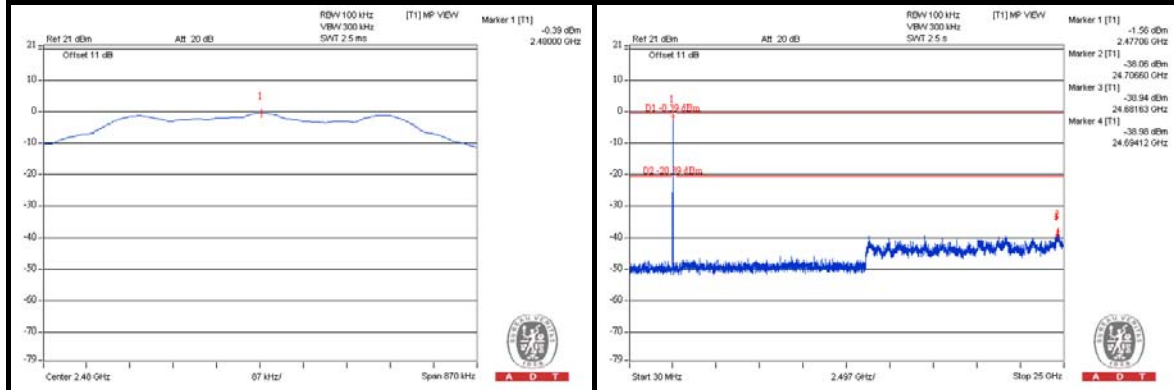
CH 0



CH 19



CH 39



5. PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

6. 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.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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

No modifications were made to the EUT by the lab during the test.

--- END ---