FCC Test Report (BT-LE)

Report No.:	RF160509E03-3
FCC ID:	MQT-200I15YXF
Test Model:	xCE_E200I-15YXF
Series Model:	xCE_E200I-15NXF, xCE_E200I-15YXX, xCE_E200I-15NXX
Received Date:	May 09, 2016
Test Date:	May 20 to June 07, 2016
Issued Date:	Aug. 12, 2016
Applicant:	XAC AUTOMATION CORP.
Address:	4F, No. 30, INDUSTRY E. RD. IX, SCIENCE-BASED INDUSTRIAL PARK,HSINCHU,TAIWAN
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
RF160509E03-3	Original release.	Aug. 12, 2016

1 Certificate of Conformity

Product:	Terminal
Brand:	XAC
Test Model:	xCE_E200I-15YXF
Series Model:	xCE_E200I-15NXF, xCE_E200I-15YXX, xCE_E200I-15NXX
Sample Status:	ENGINEERING SAMPLE
Applicant:	XAC AUTOMATION CORP.
Test Date:	May 20 to June 07, 2016
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10: 2013

The above equipment 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 : _____ , **Date:** Aug. 12, 2016

Claire Kuan / Specialist

Approved by : _____ , **Date:** Aug. 12, 2016

May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -3.02dB at 0.43906MHz.
15.205 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -1.9dB at 4804.00MHz.
15.247(d)	Antenna Port Emission	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	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.83 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.37 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.65 dB
	6GHz ~ 18GHz	3.88 dB
	18GHz ~ 40GHz	4.11 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-LE)

Product	Terminal
Brand	XAC
Test Model	xCE_E200I-15YXF
Series Model	xCE_E200I-15NXF, xCE_E200I-15YXX, xCE_E200I-15NXX
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 24V
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 1Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	40
Output Power	4.121mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter (Optional) x 1
Data Cable Supplied	NA

Note:

1. All models are listed as below.

Brand	Model	Difference	
XAC	xCE_E200I-15YXF	with Modem	with camera
	xCE_E200I-15YXX		without camera
	xCE_E200I-15NXF	without Modem	with camera
	xCE_E200I-15NXX		without camera

From the above models, model: xCE_E200I-15YXF was the worst case and it was selected as representative model for the test and its data was recorded in this report.

2. There are WLAN and Bluetooth technology used for the EUT.
3. For WLAN: 2.4GHz & 5GHz technology cannot transmit at same time.
4. WLAN and Bluetooth coexistence mode:

Condition	**Technology**	
1	WLAN (2.4GHz)	Bluetooth
2	WLAN (5GHz)	Bluetooth
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.		

5. The EUT power needs to be supplied from one power adapter, the information is as below table:

Brand	Model No.	Spec.
FSP GROUP INC	FSP060-DAAN2	Input: 100-240Vac, 1.5A, 50-60Hz Output: 24V, 2.5A DC cable: unshielded, 1.5m with one core

6. The antenna provided to the EUT, please refer to the following table:

Brand	Model	Antenna Type	Connecter Type	Antenna Gain(dBi)	Frequency range
INPAQ	ACM3-5036-A1-CC-S	Chip	NA	3	2.4~2.4835GHz 5.15~5.85GHz

7. The EUT was pre-tested under following test modes:

Pre-test Mode	Description
Mode A	Adapter (FSP060-DAAN2)
Mode B	Print + Adapter (FSP120-AAAN2)

The worst radiated emission was found in **Mode A**. Therefore only the test data of the modes were recorded in this report.

8. 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≥1G	RE<1G	PLC	APCM	
1	√	√	√	√	EUT with Adapter (FSP060-DAAN2)
2	-	-	√	-	EUT with Print + Adapter (FSP120-AAAN2)

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE: 1. "-"means no effect.
2. The EUT's monitor had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane.**

Radiated Emission Test (Above 1GHz):

☒ 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	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1

Radiated Emission Test (Below 1GHz):

☒ 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	DATA RATE (Mbps)
0 to 39	39	GFSK	1

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	DATA RATE (Mbps)
0 to 39	39	GFSK	1

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ 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	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	JyunChun Lin
RE<1G	23deg. C, 67%RH	120Vac, 60Hz	JyunChun Lin
PLC	24deg. C, 59%RH 23deg. C, 79%RH	120Vac, 60Hz	Bear Lee Arthur Yang
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 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.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	iPod	Apple	MD778TA/A	CC4JMCMXF4T1	NA	Prodived by Lab
B.	iPod	Apple	MD778TA/A	CC4JMJU0F4T1	NA	Prodived by Lab
C.	iPod	Apple	MD778TA/A	CC4JD4CDF4T1	NA	Provided by Lab
D.	iPod	Apple	MD778TA/A	CC4JMJV2F4T1	NA	Prodived by Lab
E.	iPod	Apple	MD778TA/A	CC4JMJTYF4T1	NA	Prodived by Lab
F.	Notebook computer	DELL	PP32LA	GSLB32S	FCC DoC	Provided by Lab
G.	Earphone	XAC	TP72-SA	NA	NA	Supplied by client
H.	Micro SD	Sandisk	2G	NA	NA	Provided by Lab
I.	Adapter	FSP GROUP INC	FSP060-DAAN2	NA	NA	Supplied by client
J.	Print	XAC	TP72-SA	NA	NA	Supplied by client
K.	Adapter	FSP GROUP INC	FSP120-AAAN2	NA	NA	Supplied by client

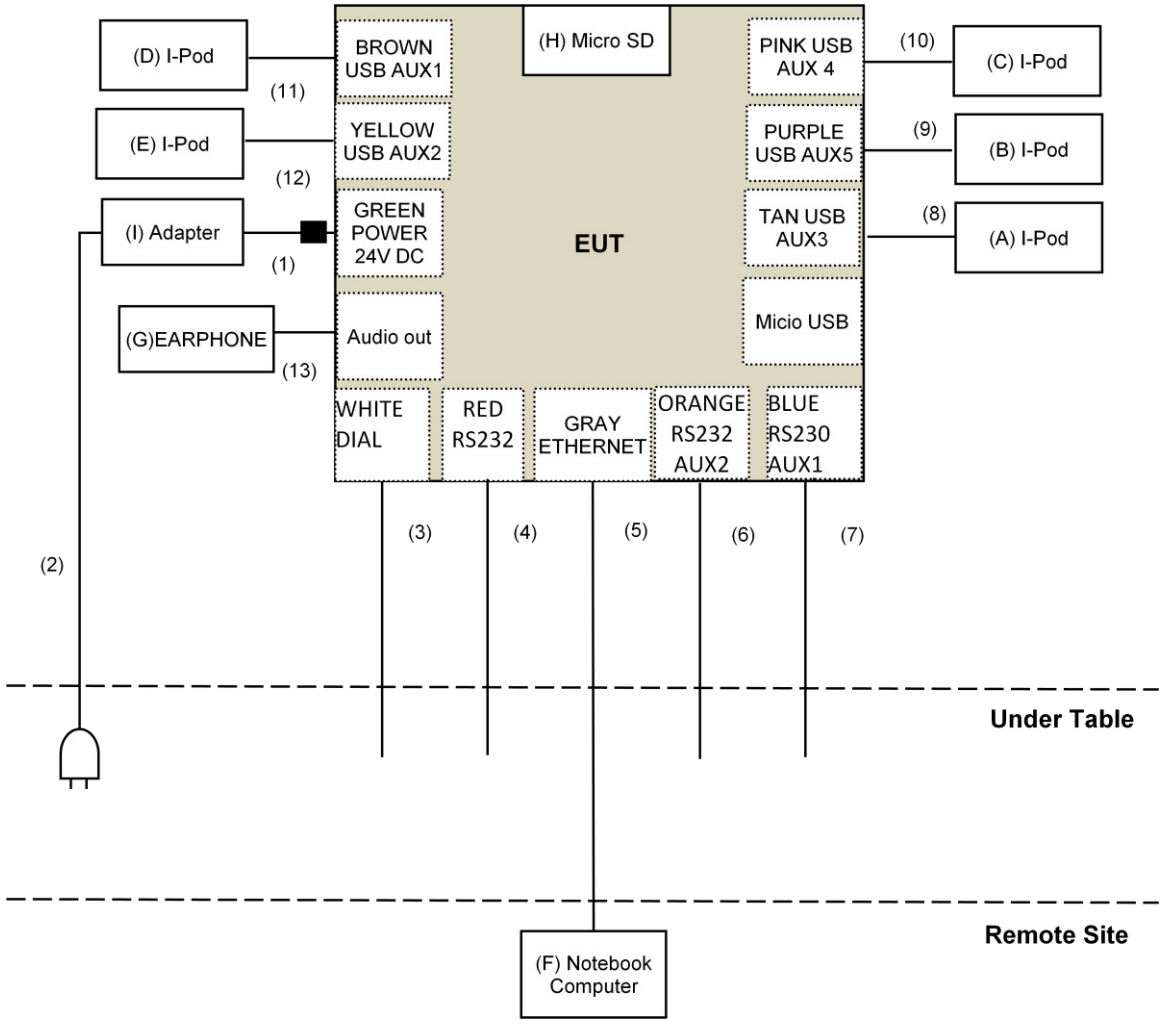
Note:

1. All power cords of the above support units are non-shielded (1.8m).

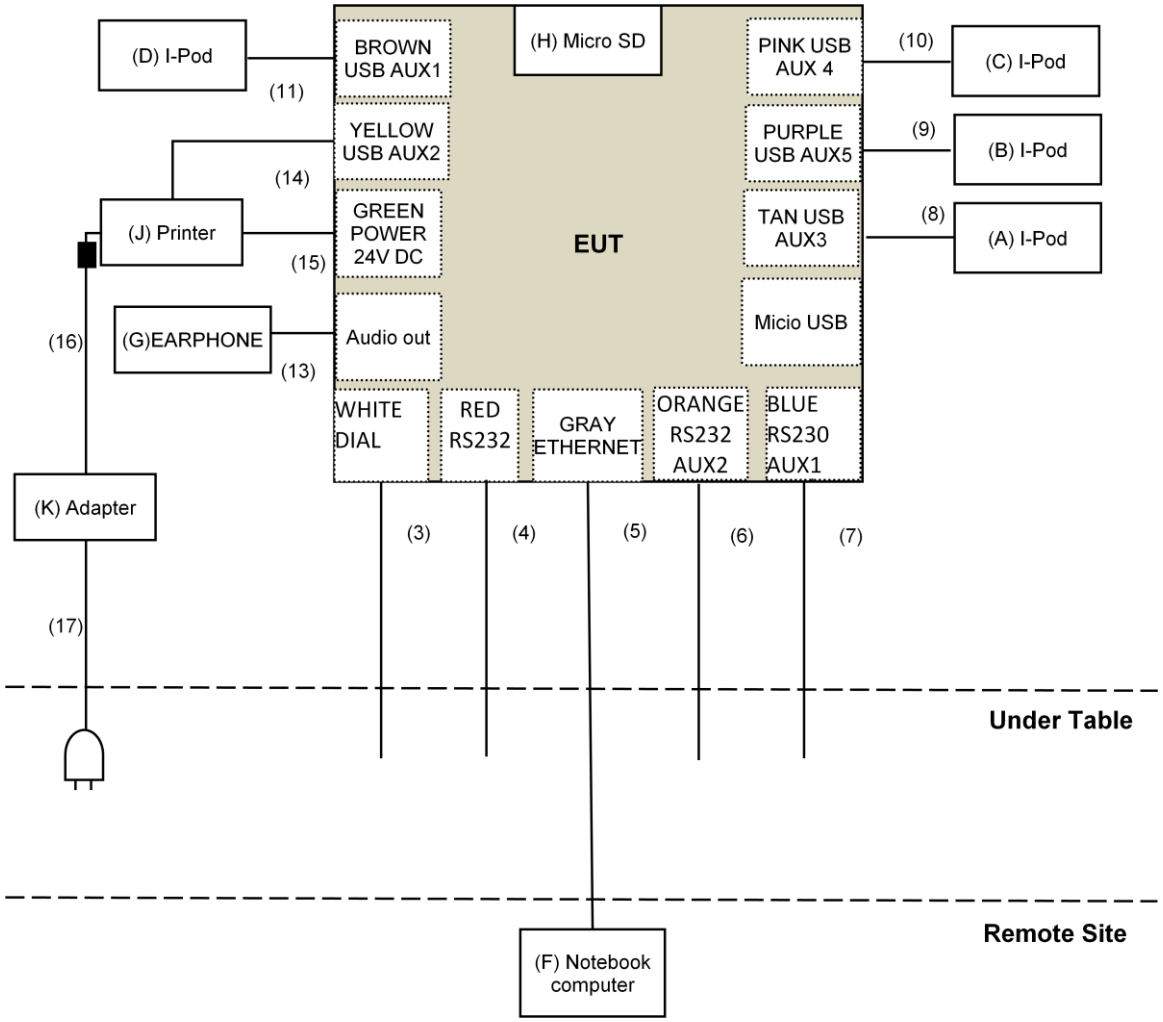
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC	1	1.5	No	1	Supplied by client
2.	AC	1	1.8	No	0	Supplied by client
3.	RJ 11	1	1.5	No	0	Supplied by client
4.	RJ11 To RS232	1	1.5	No	0	Supplied by client
5.	RJ45	1	10	No	0	Provided by Lab
6.	RJ11 To RS232	1	1.5	No	0	Supplied by client
7.	RJ11 To RS232	1	1.5	No	0	Supplied by client
8.	USB	1	0.1	Yes	0	Provided by Lab
9.	USB	1	0.1	Yes	0	Provided by Lab
10.	USB	1	0.1	Yes	0	Provided by Lab
11.	USB	1	0.1	Yes	0	Provided by Lab
12.	USB	1	0.1	Yes	0	Provided by Lab
13.	Audio	1	1.3	No	0	Provided by Lab
14.	USB	1	1.8	Yes	0	Supplied by client
15.	DC	1	1	No	0	Supplied by client
16.	DC	1	1.5	No	1	Supplied by client
17.	AC	1	1.8	No	0	Supplied by client

3.3.1 Configuration of System under Test

ADAPTER MODE

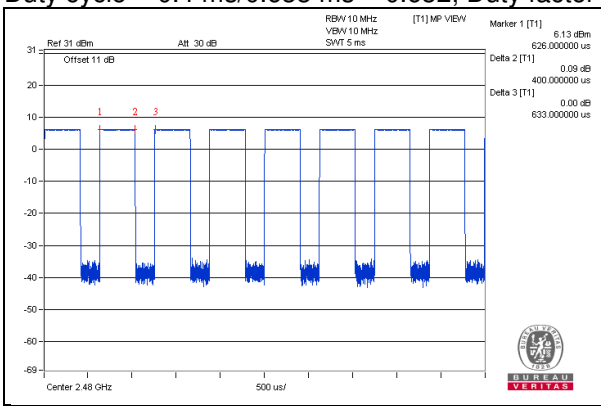


PRINT MODE


(D) I-Pod
(11)
BROWN
USB AUX1
(H) Micro SD
PINK USB
AUX 4
(10)
(C) I-Pod
YELLOW
USB AUX2
PURPLE
USB AUX5
(9)
(B) I-Pod
(14)
(J) Printer
GREEN
POWER
24V DC
EUT
TAN USB
AUX3
(8)
(A) I-Pod
(15)
(16)
(G)EARPHONE
Audio out
Micio USB
(13)
WHITE
DIAL
RED
RS232
GRAY
ETHERNET
ORANGE
RS232
AUX2
BLUE
RS230
AUX1
(K) Adapter
(3)
(4)
(5)
(6)
(7)
(17)
Under Table
Remote Site
(F) Notebook
computer

3.4 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.
Duty cycle = 0.4 ms/0.633 ms = 0.632, Duty factor = 10 * log(1/0.632) = 2



3.5 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)
KDB 558074 D01 DTS Meas Guidance v03r05
ANSI C63.10-2013

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

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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210105	July 24, 2015	July 23, 2016
Pre-Amplifier(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2014	Dec. 15, 2016
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 18, 2016	Jan. 17, 2017
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-03	Nov. 11, 2015	Nov. 10, 2016
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Jan. 04, 2016	Jan. 03, 2017
RF Cable	8D-FB	CHGCAB-001-1 CHGCAB-001-2	Oct. 03, 2015	Oct. 02, 2016
	RF-141	CHGCAB-004	Oct. 03, 2015	Oct. 02, 2016
Horn_Antenna AISI	AIH.8018	0000320091110	Jan. 19, 2016	Jan. 18, 2017
Pre-Amplifier Agilent	8449B	3008A02578	June 23, 2015	June 22, 2016
RF Cable	NA	131205 131216 131217 SNMY23684/4	Jan. 15, 2016	Jan. 14, 2017
Spectrum Analyzer Agilent	E4446A	MY48250254	Nov. 25, 2015	Nov. 24, 2016
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 11, 2015	Dec. 10, 2016
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Jan. 18, 2016	Jan. 17, 2017
RF Cable	SUCOFLEX 102	36442/2 36434/2	Dec. 10, 2015	Dec.09, 2016
Software	ADT_Radiated_V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	CM100	NA	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-WD01	NA	NA
Spectrum Analyzer R&S	FSP40	100060	May 11, 2016	May 10, 2017

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 966 Chamber No. G.
3. The FCC Site Registration No. is 966073.
4. The CANADA Site Registration No. is IC 7450H-2.
5. Tested Date: May 20 to June 07, 2016

4.1.3 Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. 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 height of antenna 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

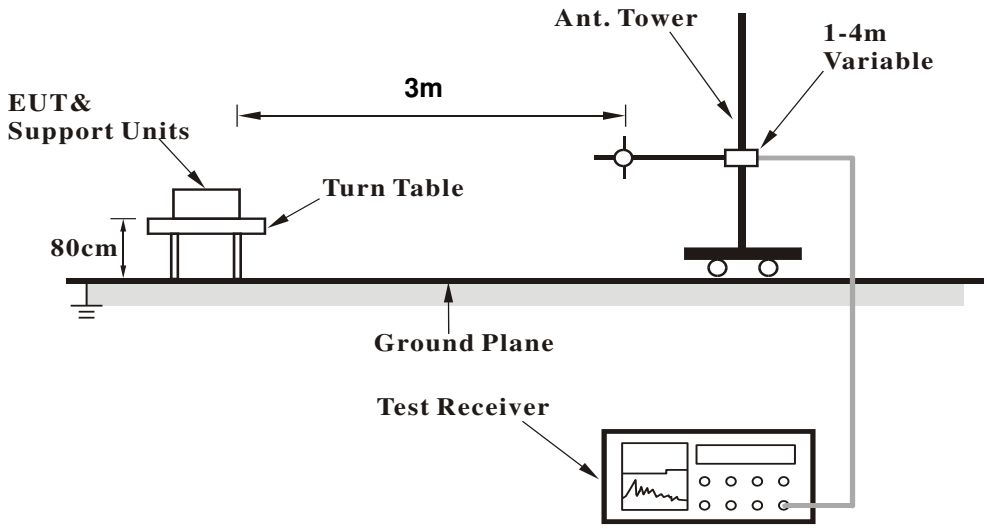
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

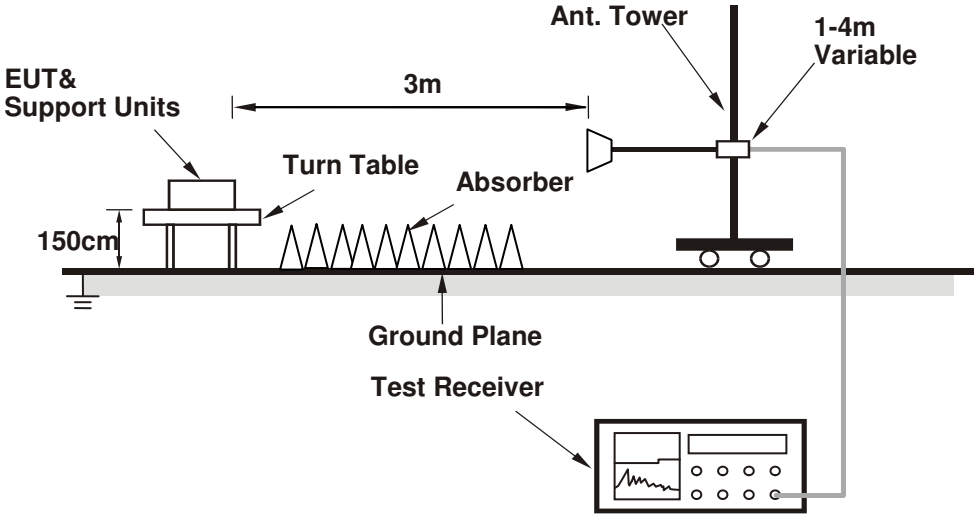
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Conditions

1. Connect the EUT with the support unit F (Notebook Computer) which is placed on remote site.
2. The communication partner run test program “Run hypertrm terminal paste command” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

BT_LE-GFSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	55.1 PK	74.0	-18.9	1.60 H	241	54.5	0.6
2	2390.00	37.5 AV	54.0	-16.5	1.60 H	241	36.9	0.6
3	*2402.00	99.5 PK			1.60 H	241	98.8	0.7
4	*2402.00	97.8 AV			1.60 H	241	97.1	0.7
5	4804.00	56.0 PK	74.0	-18.0	1.77 H	339	46.9	9.1
6	4804.00	47.8 AV	54.0	-6.2	1.77 H	339	38.7	9.1
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	55.6 PK	74.0	-18.4	2.19 V	112	55.0	0.6
2	2390.00	37.9 AV	54.0	-16.1	2.19 V	112	37.3	0.6
3	*2402.00	102.8 PK			2.19 V	112	102.1	0.7
4	*2402.00	101.5 AV			2.19 V	112	100.8	0.7
5	4804.00	58.6 PK	74.0	-15.4	1.67 V	29	49.5	9.1
6	**4804.00**	**52.1 AV**	**54.0**	**-1.9**	**1.67 V**	**29**	**43.0**	**9.1**

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 19	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	100.6 PK			1.59 H	250	99.8	0.8
2	*2440.00	99.1 AV			1.59 H	250	98.3	0.8
3	4880.00	55.5 PK	74.0	-18.5	1.78 H	331	46.1	9.4
4	4880.00	47.4 AV	54.0	-6.6	1.78 H	331	38.0	9.4
5	7320.00	58.3 PK	74.0	-15.7	1.58 H	325	41.9	16.4
6	7320.00	46.3 AV	54.0	-7.7	1.58 H	325	29.9	16.4
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	103.9 PK			1.29 V	345	103.1	0.8
2	*2440.00	102.8 AV			1.29 V	345	102.0	0.8
3	4880.00	58.1 PK	74.0	-15.9	1.64 V	14	48.7	9.4
4	4880.00	51.7 AV	54.0	-2.3	1.64 V	14	42.3	9.4
5	7320.00	58.4 PK	74.0	-15.6	1.58 V	298	42.0	16.4
6	7320.00	46.7 AV	54.0	-7.3	1.58 V	298	30.3	16.4

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	101.0 PK			1.72 H	3	100.1	0.9
2	*2480.00	99.4 AV			1.72 H	3	98.5	0.9
3	2483.50	51.8 PK	74.0	-22.2	1.72 H	3	50.9	0.9
4	2483.50	40.2 AV	54.0	-13.8	1.72 H	3	39.3	0.9
5	4960.00	56.1 PK	74.0	-17.9	1.76 H	328	46.6	9.5
6	4960.00	47.8 AV	54.0	-6.2	1.76 H	328	38.3	9.5
7	7440.00	58.2 PK	74.0	-15.8	1.60 H	321	42.2	16.0
8	7440.00	46.2 AV	54.0	-7.8	1.60 H	321	30.2	16.0
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	104.3 PK			1.70 V	113	103.4	0.9
2	*2480.00	103.1 AV			1.70 V	113	102.2	0.9
3	2483.50	52.7 PK	74.0	-21.3	1.70 V	113	51.8	0.9
4	2483.50	41.7 AV	54.0	-12.3	1.70 V	113	40.8	0.9
5	4960.00	58.5 PK	74.0	-15.5	1.68 V	28	49.0	9.5
6	4960.00	52.0 AV	54.0	-2.0	1.68 V	28	42.5	9.5
7	7440.00	58.3 PK	74.0	-15.7	1.55 V	300	42.3	16.0
8	7440.00	46.3 AV	54.0	-7.7	1.55 V	300	30.3	16.0

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) – Pre-Amplifier 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 Data:

BT_LE-GFSK

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	Below 1GHz		

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	176.01	33.5 QP	43.5	-10.0	2.00 H	68	42.5	-9.0
2	480.01	41.3 QP	46.0	-4.7	1.00 H	113	43.1	-1.8
3	544.03	40.1 QP	46.0	-5.9	1.50 H	234	40.7	-0.6
4	584.04	40.1 QP	46.0	-5.9	1.50 H	360	39.8	0.3
5	640.03	41.3 QP	46.0	-4.7	1.50 H	14	39.5	1.8
6	680.07	40.9 QP	46.0	-5.1	2.00 H	316	38.7	2.2
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	448.02	41.9 QP	46.0	-4.1	1.00 V	329	44.3	-2.4
2	544.03	42.6 QP	46.0	-3.4	1.00 V	360	43.2	-0.6
3	640.03	40.2 QP	46.0	-5.8	1.00 V	143	38.4	1.8
4	656.04	40.3 QP	46.0	-5.7	1.00 V	158	38.5	1.8
5	688.05	40.4 QP	46.0	-5.6	1.50 V	0	38.1	2.3
6	726.02	41.2 QP	46.0	-4.8	1.50 V	0	38.4	2.8

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) – Pre-Amplifier 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 (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	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 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	100375	May 09, 2016	May 08, 2017
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 01, 2015	Aug. 31, 2016
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 11, 2015	June 10, 2016
RF Cable	5D-FB	COCCAB-001	Mar. 08, 2016	Mar. 07, 2017
10 dB PAD Mini-Circuits	HAT-10+	CONATT-002	Sep. 14, 2015	Sep. 13, 2016
50 ohms Terminator	N/A	EMC-03	Sep. 23, 2015	Sep. 22, 2016
50 ohms Terminator	N/A	EMC-02	Oct. 01, 2015	Sep. 30, 2016
50 ohms Terminator	E1-011315	13	Dec. 11 2015	Dec. 10 2016
Software BVADT	BVADT_Cond_ V7.3.7.3	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 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. Tested Date: May 24 to June 06, 2016

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.

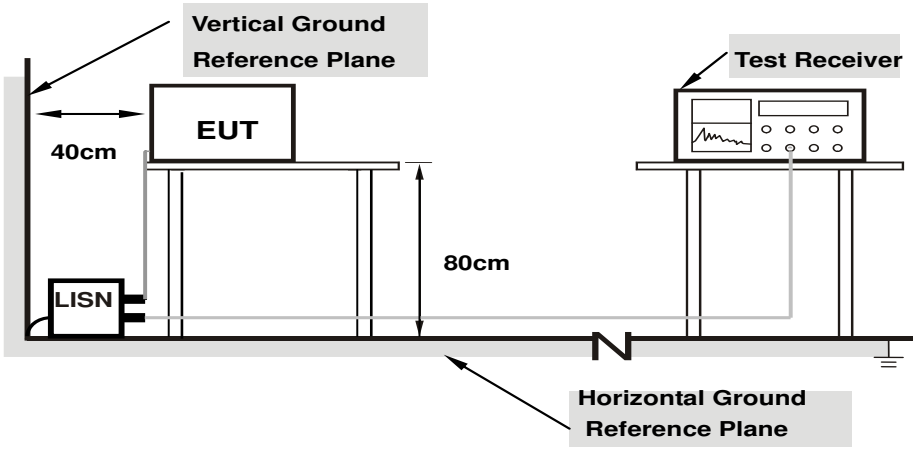
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

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.

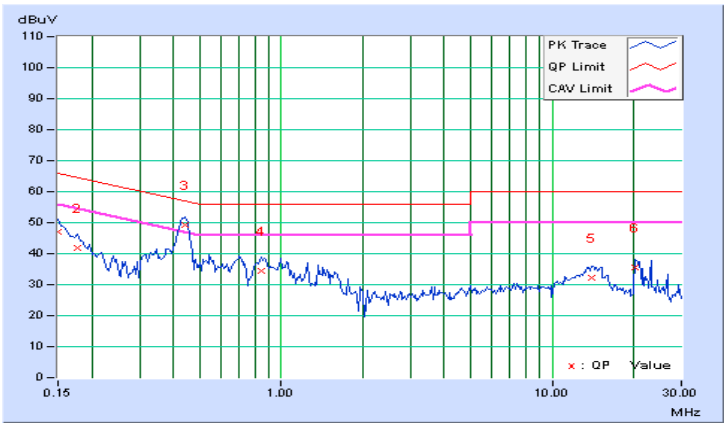
4.2.7 Test Results (Mode 1)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.32	36.84	22.50	47.16	32.82	66.00	56.00	-18.84	-23.18
2	0.17734	10.30	31.60	17.78	41.90	28.08	64.61	54.61	-22.71	-26.53
3	0.43906	10.30	39.08	33.03	49.38	43.33	57.08	47.08	-7.70	-3.75
4	0.84922	10.25	24.26	20.53	34.51	30.78	56.00	46.00	-21.49	-15.22
5	14.04688	10.74	21.50	16.03	32.24	26.77	60.00	50.00	-27.76	-23.23
6	20.32031	10.96	24.65	22.50	35.61	33.46	60.00	50.00	-24.39	-16.54

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

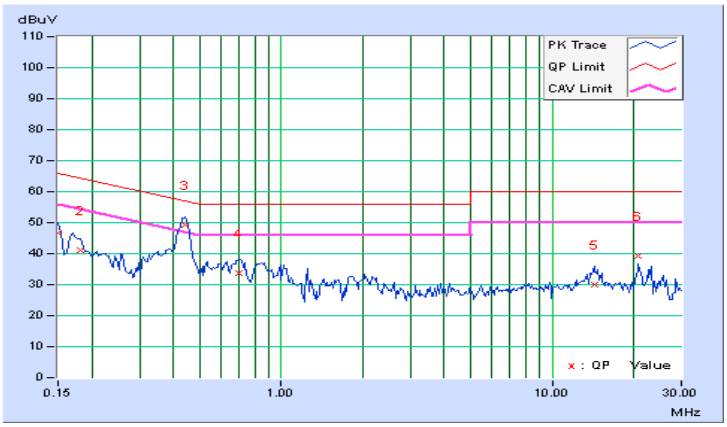


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.30	36.35	22.70	46.65	33.00	66.00	56.00	-19.35	-23.00
2	0.18125	10.28	30.67	17.58	40.95	27.86	64.43	54.43	-23.48	-26.57
3	**0.43906**	**10.28**	**38.90**	**33.78**	**49.18**	**44.06**	**57.08**	**47.08**	**-7.90**	**-3.02**
4	0.70078	10.25	23.37	19.07	33.62	29.32	56.00	46.00	-22.38	-16.68
5	14.27344	10.77	19.14	12.09	29.91	22.86	60.00	50.00	-30.09	-27.14
6	20.80859	11.00	28.41	26.36	39.41	37.36	60.00	50.00	-20.59	-12.64

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



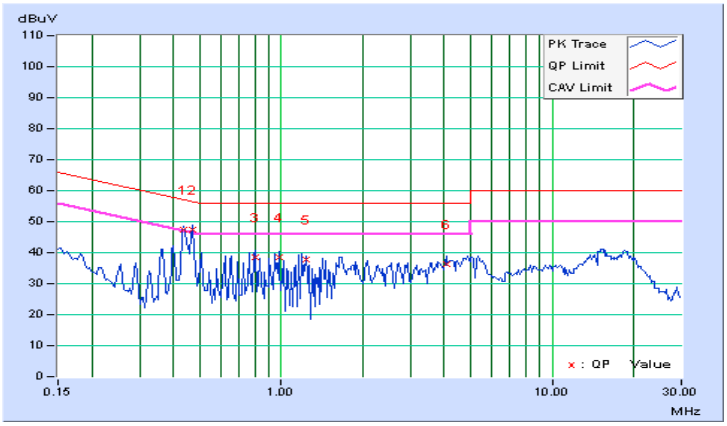
4.2.8 Test Results (Mode 2)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.43516	10.30	37.14	32.22	47.44	42.52	57.15	47.15	-9.71	-4.63
2	0.47031	10.29	36.96	31.97	47.25	42.26	56.51	46.51	-9.26	-4.25
3	0.79844	10.25	28.11	22.42	38.36	32.67	56.00	46.00	-17.64	-13.33
4	0.97813	10.23	28.13	22.80	38.36	33.03	56.00	46.00	-17.64	-12.97
5	1.23438	10.24	27.48	20.45	37.72	30.69	56.00	46.00	-18.28	-15.31
6	4.05859	10.43	25.87	19.02	36.30	29.45	56.00	46.00	-19.70	-16.55

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

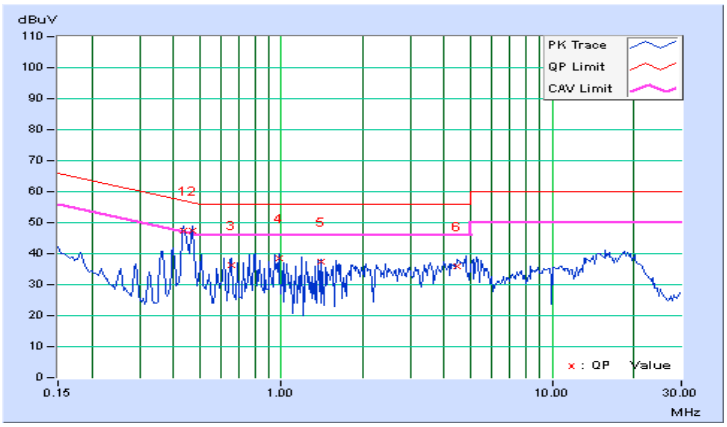


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.43516	10.28	37.00	32.20	47.28	42.48	57.15	47.15	-9.87	-4.67
2	0.47031	10.27	37.02	31.99	47.29	42.26	56.51	46.51	-9.22	-4.25
3	0.65391	10.25	26.00	20.45	36.25	30.70	56.00	46.00	-19.75	-15.30
4	0.97813	10.22	28.15	22.76	38.37	32.98	56.00	46.00	-17.63	-13.02
5	1.41016	10.24	27.25	20.72	37.49	30.96	56.00	46.00	-18.51	-15.04
6	4.45703	10.45	25.46	14.96	35.91	25.41	56.00	46.00	-20.09	-20.59

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

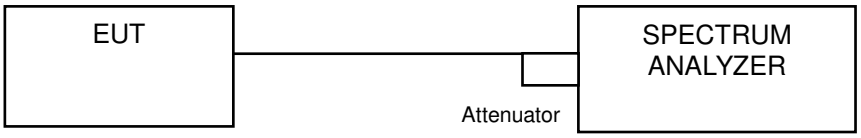


4.3 6dB Bandwidth Measurement

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

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. 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 fromTest Standard

No deviation.

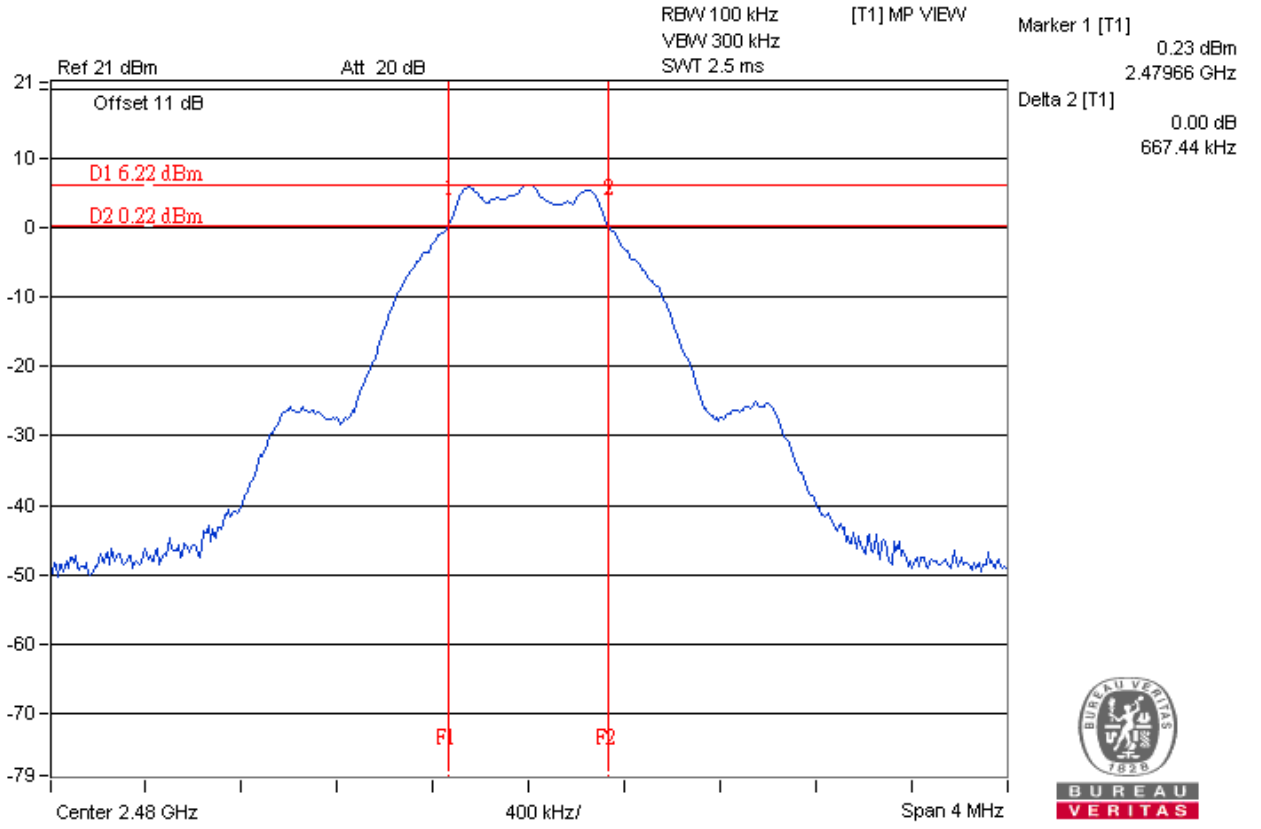
4.3.6 EUT Operating Conditions

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 Result

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.67	0.5	PASS
19	2440	0.66	0.5	PASS
39	2480	0.66	0.5	PASS

Spectrum Plot of Worst Value
CH 39

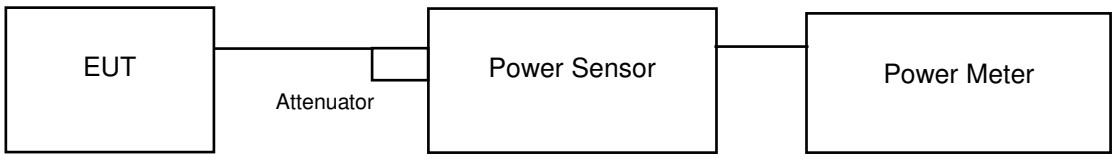


4.4 Conducted Output Power Measurement

4.4.1 Limits OF Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 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 / average power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak / average power sensor. Record the 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

FOR PEAK POWER

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	3.304	5.19	30	Pass
19	2440	3.698	5.68	30	Pass
39	2480	4.121	6.15	30	Pass

FOR AVERAGE POWER

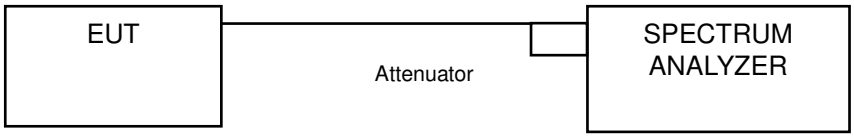
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	2.754	4.40
19	2440	3.35	5.25
39	2480	3.698	5.68

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 4.4.3 to get information of above instrument.

4.5.4 Test Procedure

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.5 Deviation from Test Standard

No deviation.

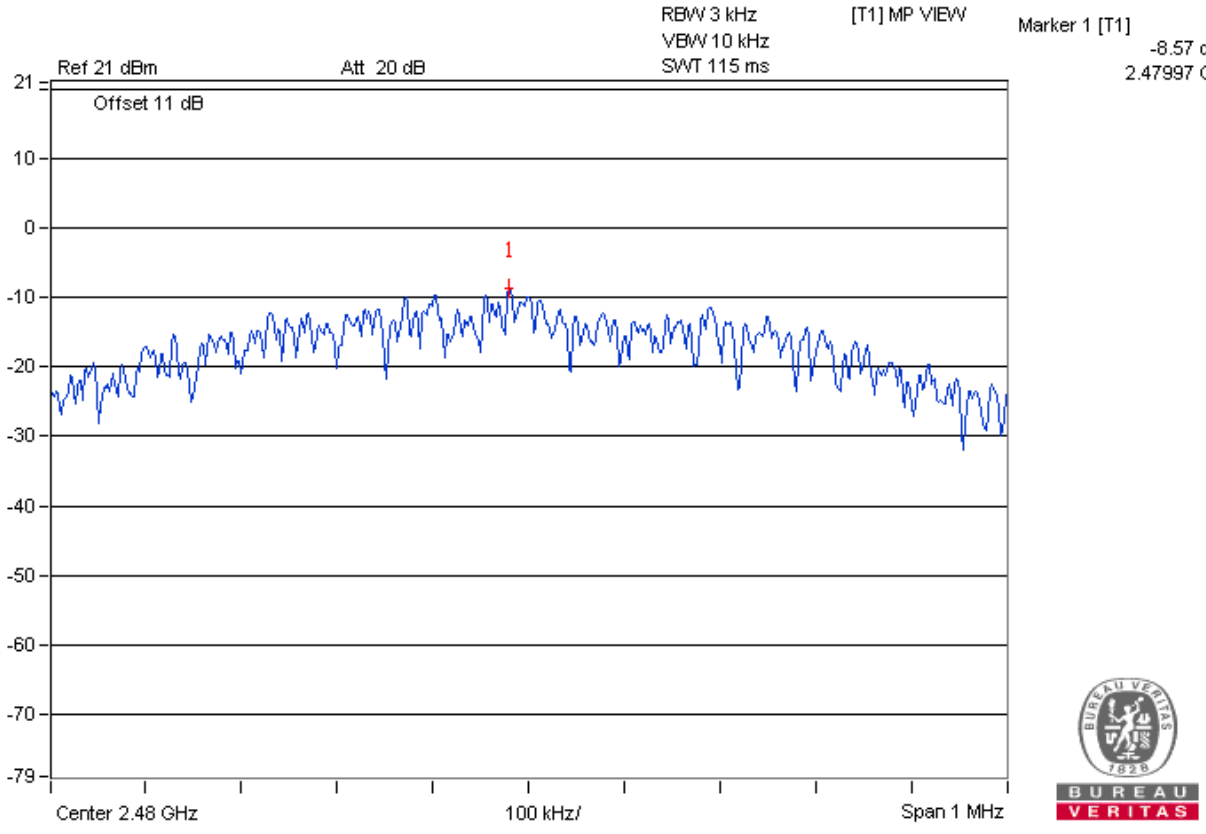
4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-10.09	8	Pass
19	2440	-9.18	8	Pass
39	2480	-8.57	8	Pass

Spectrum Plot of Worst Value
CH 39

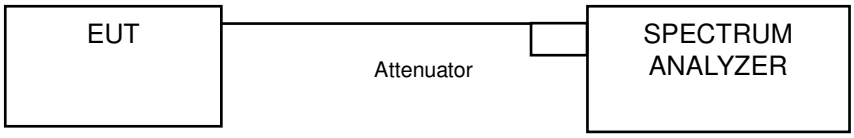


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted 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 4.4.3 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 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 OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

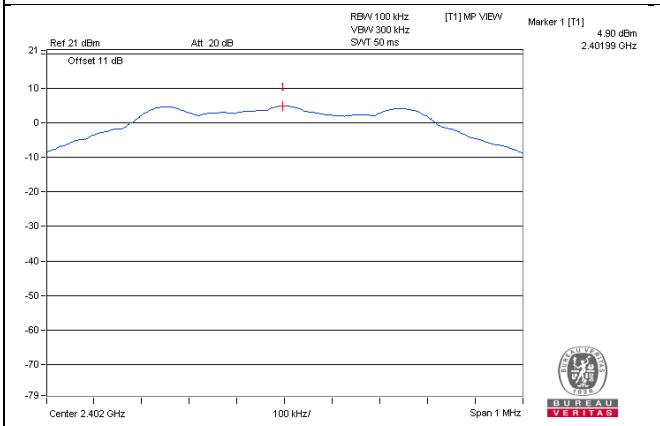
No deviation.

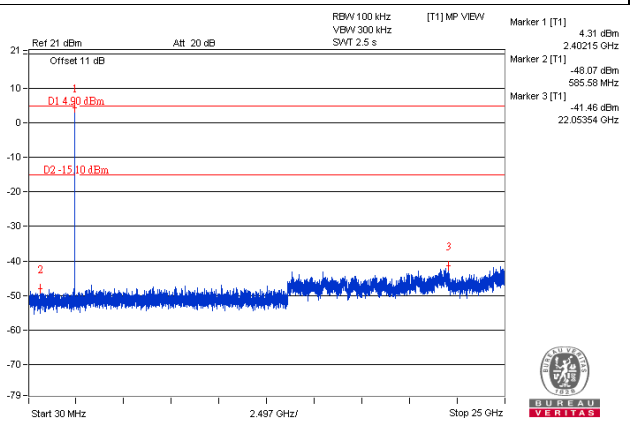
4.6.6 EUT Operating Condition

Same as Item 4.3.6

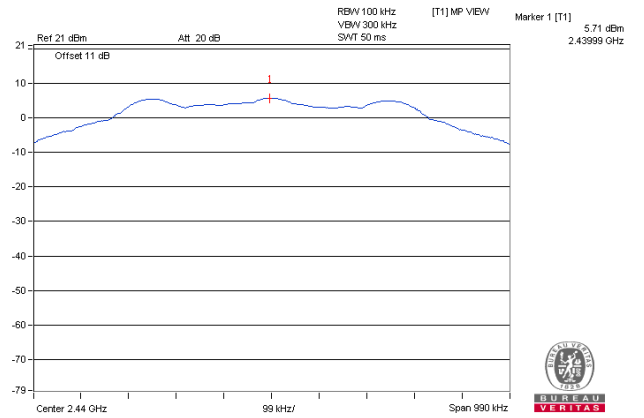
4.6.7 Test Results

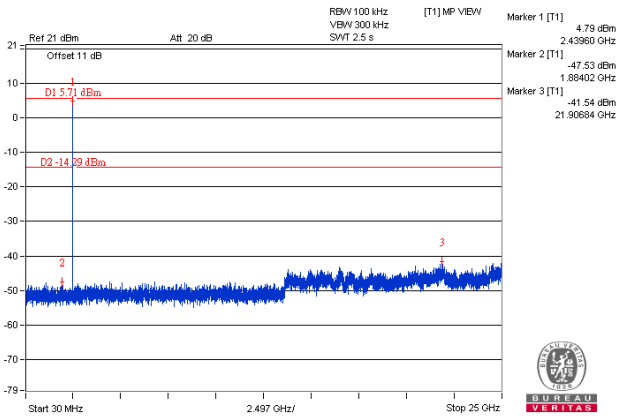
CH 0



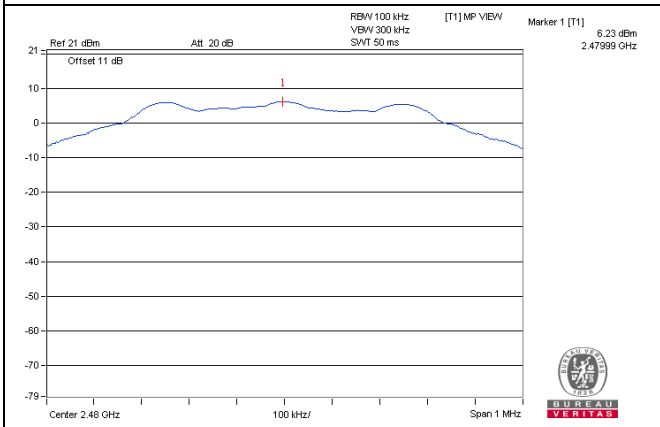


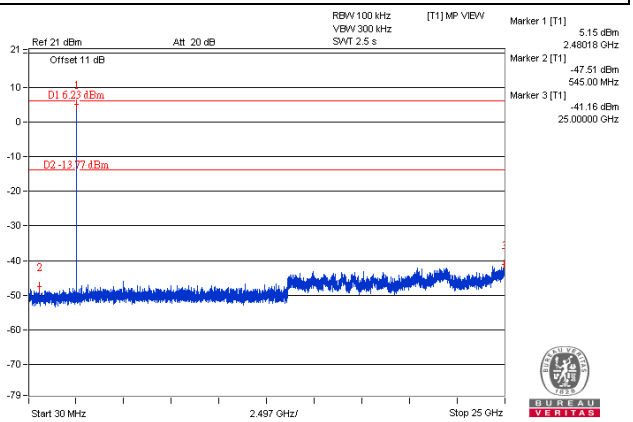
CH 19



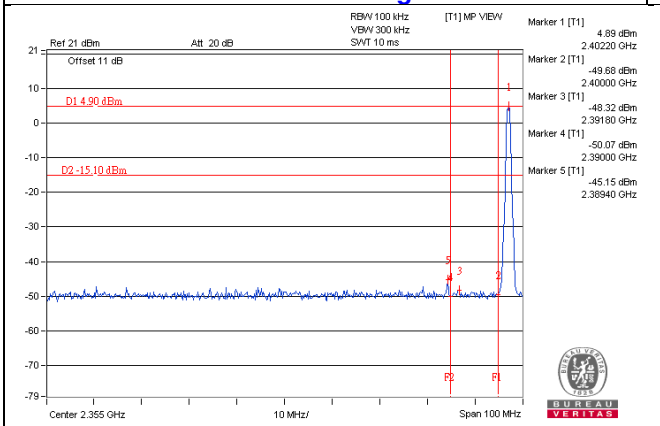


CH 39

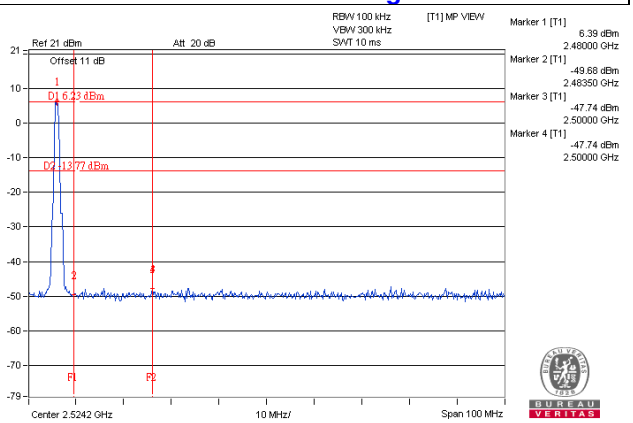




CH 0 Band edge



CH 39 Band edge



5 Pictures of Test Arrangements

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

Appendix – 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:

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

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