FCC Test Report

(BT-LE)

Report No.:	RF120522E09N-5
FCC ID:	UZ7MC92N0
Test Model:	MC92N0
Received Date:	Mar. 23, 2015
Test Date:	Mar. 31 to Apr. 13, 2015
Issued Date:	May 13, 2015
Applicant:	Zebra Technologies Corporation
Address:	1 Zebra Plaza, Holtsville, NY 11742
Manufacturer:	Symbol Technologies, Inc.
Address:	1 Zebra Plaza, Holtsville, NY 11742
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 R.O.C.
Test Location (1):	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, 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
RF120522E09N-5	Original release.	May 13, 2015

1 Certificate of Conformity

Product:	Mobile Computer
Brand:	Symbol
Test Model:	MC92N0
Sample Status:	MASS-PRODUCTION
Applicant:	Zebra Technologies Corporation
Test Date:	Mar. 31 to Apr. 13, 2015
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2009

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:** May 13, 2015

Elsie Hsu / Specialist

Approved by : _____ , **Date:** May 13, 2015

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 -7.28dB at 0.72031MHz.
15.205 5.209 15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -5.0dB at 178.65MHz.
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	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.86 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	Mobile Computer
Brand	Symbol
Test Model	MC92N0
Status of EUT	MASS-PRODUCTION
Power Supply Rating	DC 7.4V from battery DC 12V to direct charging adapter
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 1Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	40
Output Power	2.158mW
Antenna Type	Please see Note
Antenna Connector	Please see Note
Accessory Device	Battery x 1 (Part No.: 82-111734-01)
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC Class II change. The difference compared with the Report No.: RF120522E09 design is as the following:

   ◆ Added Bluetooth 4.0 technology used for the EUT

   ◆ Added new SKU: SE4750

Original						
Scanner	With CR	Without CR	Keypad			
			53 key	43 key	33 key	28 key
SE4500	V	-	V	V	V	V
SE4500	-	V	V	V	V	V
SE4600	V	-	V	V	V	V
SE4600	-	V	V	V	V	V
SE965	V	-	V	V	V	V
SE965	-	V	V	V	V	V
SE1524	V	-	V	V	V	V
SE1524		V	V	V	V	V
Addition						
Scanner	With CR	Without CR	Keypad			
			53 key	43 key	33 key	28 key
SE4750	V	-	V	V	V	V
CR : Condensation Resistant						

   ◆ Changed the battery as below table.

Original	
Brand:	SYMBOL
Part No.:	21-65587-03
Rating:	7.4V, 2200mAh, 16.3Wh
Newly	
Brand:	SYMBOL
Part No.:	82-111734-01
Rating:	7.4V, 2400mAh, 17.76Wh

   ◆ Changed the version of EUT information as below table.

Mobile Computer	OS Version	07.00.2806
	OEM Version	00.20.0005
Wireless(Fusion)	Part Number	31-FUSION-X2.00
	Version	X_2.00.0.0.063R
XW2DMT	Version	X_2.00.0.0.28
	Fusion	X_2.00.0.0.040E
BTRegTest Ver4.1	Version	4.1

2. According to above conditions, all tests of SE4750 need to be performed. And all data was verified to meet the requirements.
3. There are Bluetooth and WLAN technology used for the EUT.
4. WLAN and Bluetooth technology can transmit at same time.
5. The associated devices(optional) of EUT information are as below:

Product	Brand	Model	S/N
28keypad	NA	KYPD-MC9XMR000-01R	40A11W40H
33keypad	NA	KYPD-MC9XMX000-01R	40B52K50A
43keypad	NA	KYPD-MC9XMT000-01R	40A11R93G
53keypad	NA	KYPD-MC9XMS000-01R	40B63U43F
Product	Brand	Model	P/N
Headset	MOTOROLA	RCH50	RCH50
Headset	VXI	VR10	50-11300-050R
Power adapter (for Direct charging)	HIPRO	HP-A0502R3D	PWRS-14000-148R
Direct charging adapter	SYMBOL	ADP9000-110R	NA
AC Line cord	NA	NA	23844-00-00R
USB cable	NA	NA	25-62166-01R

6. The EUT could be supplied with a direct charging and battery as below table:

Direct charging adapter (not for sale together)	
Brand:	SYMBOL
Part No.:	ADP9000-110R
I/O Ports:	RS232 Port * 1 RJ45 Port *2
Associated Devices:	USB cable (unshielded, 1.8m with one core) USB cable (Part No.: 25-62166-01R)
Power Adapter (for Direct charging, and not for sale together) Brand: HIPRO Model No.: HP-A0502R3D Part No.: PWRS-14000-148R Input power : 100-240V, 50-60Hz, 2.4A Output power : +12V , 4.16A AC Line cord (unshielded, 2.2m without core) (Part No.: 23844-00-00R)	
Battery	
Brand:	SYMBOL
Part No.:	82-111734-01
Rating:	7.4V, 2400mAh, 17.76Wh

7. The antennas provided to the EUT, please refer to the following table:

WLAN Antenna Spec.			
Antenna	Type	Connecter	Gain (dBi)
Lant (Aux)	PIFA	NA	4.07 (2.4GHz) 4.96 (5GHz)
Rant (Main)	PIFA	NA	6.03 (2.4GHz) 4.51 (5GHz)
Bluetooth Antenna Spec			
Type	Connecter		Gain (dBi)
Chip	NA		-3.31

Note: This report chose the max. Antenna gain to do final test.

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(Y-Z) + Scanner (SE4750) + Headset(RCH50) + Keypad(53) + Direct charging & Without CR
2	-	√	-	-	EUT(X-Y) + Scanner (SE4750) + Headset(VR10) + Keypad(43) + Direct charging & Without CR
3	√	-	-	√	EUT(Y-Z) + Scanner (SE4750) + Headset(VR10) + Keypad(43) + Direct charging & Without CR

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

NOTE: "-"means no effect.

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	0, 19, 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	0	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

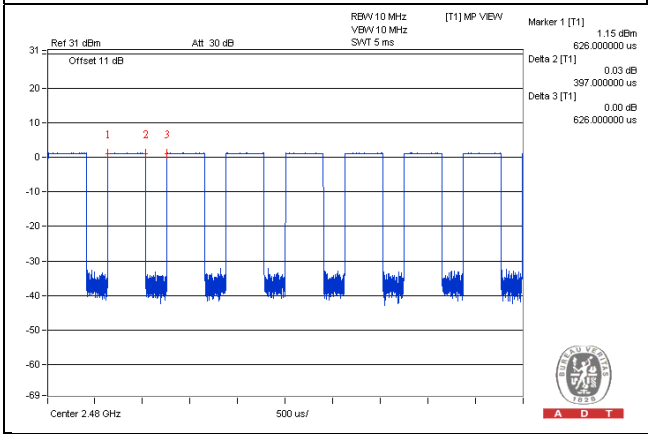
TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	22deg. C, 68%RH	120Vac, 60Hz	Robert Cheng
RE<1G	24deg. C, 71%RH	120Vac, 60Hz	Robert Cheng
PLC	25deg. C, 70%RH	120Vac, 60Hz	Eagle Chen
APCM	21deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

If duty cycle of test signal is < 98%, duty factor shall be considered.
Duty cycle = 0.397/0.626 = 0.634, Duty factor = 10 * log(1/0.634) = 2

BT-LE



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.

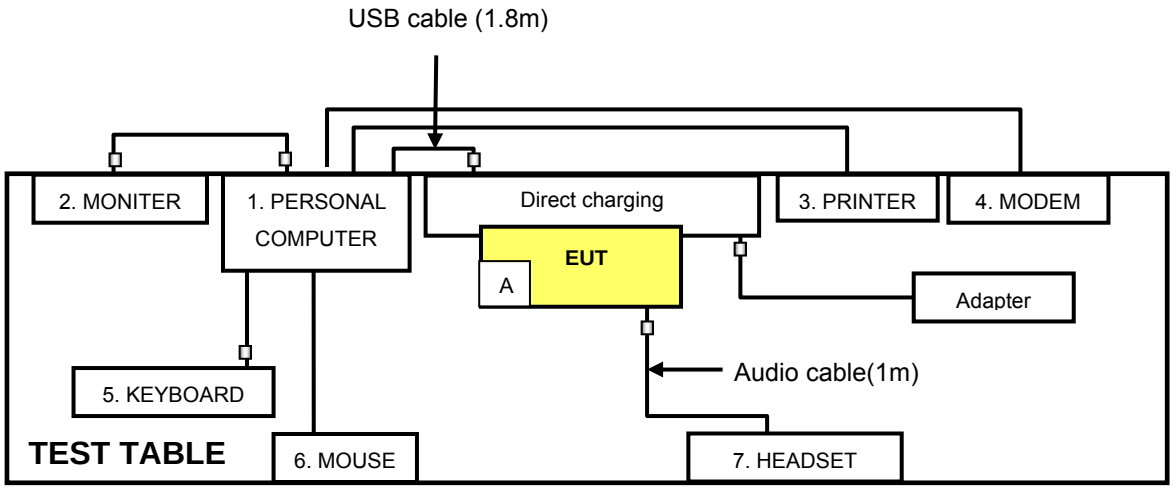
For conducted emission test					
No.	Product	Brand	Model No.	Serial No.	FCC ID
1	PERSONAL COMPUTER	DELL	DCSCMF	9KKB32S	FCC DoC
2	MONITOR	DELL	E2210Hc	CN-OG337R-64180-97S-OQDS	FCC DoC
3	PRINTER	EPSON	LQ-300+II	G88Y074083	FCC DoC
4	MODEM	ACEEX	1414	0206026778	IFAXDM1414
5	KEYBOARD	DELL	SK-8115	MY-0DJ325-71619-99B-0476	FCC DoC
6	MOUSE	DELL	M056UOA	FOROOBF9	FCC DoC
7	HEADSET	Motorola	RCH50	NA	NA
For other test items					
No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC
2	iPod shuffle	Apple	MC749TA/A	CC4DMFJUDFDM	NA
3	HEADSET	VXI	VR10	NA	NA

For conducted emission test	
No.	Signal cable description
1	USB cable (unshielded, 1.8m with one core)
2	VGA cable. (1.8m with two cores)
3	USB cable.(1.8m)
4	RS232 cable.(1.1m)
5	USB cable.(1.8m with one core)
6	USB cable.(1.8m)
7	Audio cable (1m with one core)
For other test items	
No.	Signal cable description
1	USB cable (unshielded, 1.8m with one core)
2	USB cable (shielded, 0.1m)
3	Audio cable (1.1m with one core)

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

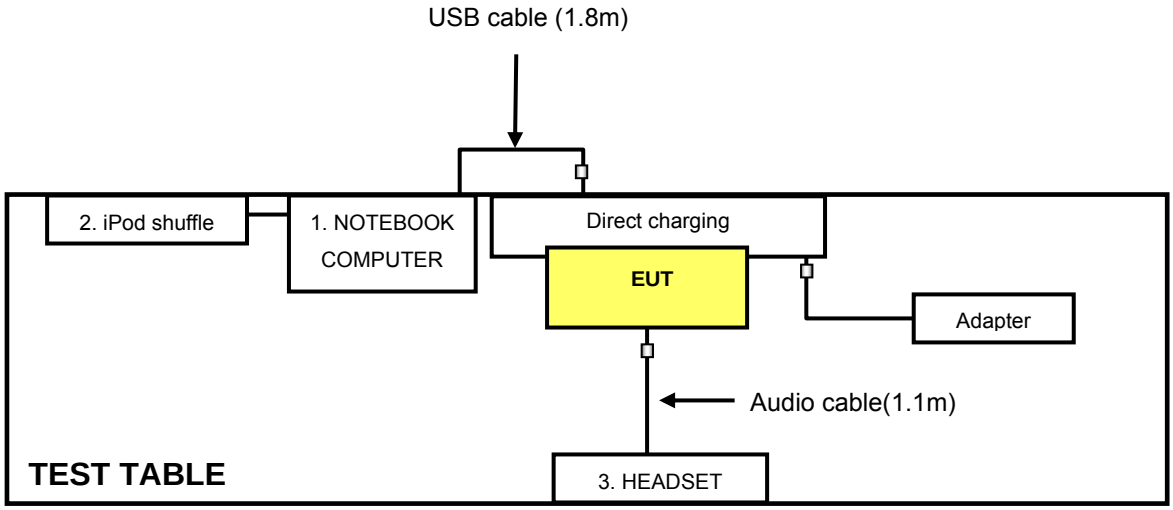
3.4.1 Configuration of System under Test

For Conducted emission test:



NOTE: 1. Item A is the SD Card.

For other test items



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)
558074 D01 DTS Meas Guidance v03r02
ANSI C63.10-2009

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

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

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
MXE EMI Receiver Agilent	N9038A	MY51210105	July 21,2014	July 20,2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-03	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Feb. 06, 2015	Feb. 05, 2016
RF Cable	NA	CHGCAB_001	Oct. 04, 2014	Oct. 03, 2015
Horn_Antenna AISI	AIH.8018	0000320091110	Aug. 27, 2014	Aug. 26, 2015
Pre-Amplifier Agilent	8449B	3008A02578	June 24, 2014	June 23, 2015
RF Cable	NA	131205 131214 SNMY23684/4	Jan. 16, 2015	Jan. 15, 2016
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Pre-Amplifier EMCI	EMC184045	980143	Jan. 16, 2015	Jan. 15, 2016
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Aug. 26, 2014	Aug. 25, 2015
RF Cable	NA	RF104-121 RF104-204	Dec. 11, 2014	Dec. 10, 2015
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Power meter Anritsu	ML2495A	1014008	Apr. 30, 2014	Apr. 29, 2015
Power sensor Anritsu	MA2411B	0917122	Apr. 30, 2014	Apr. 29, 2015

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.
7 Tested Date: Apr. 02, 2015

4.1.3 Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters 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:

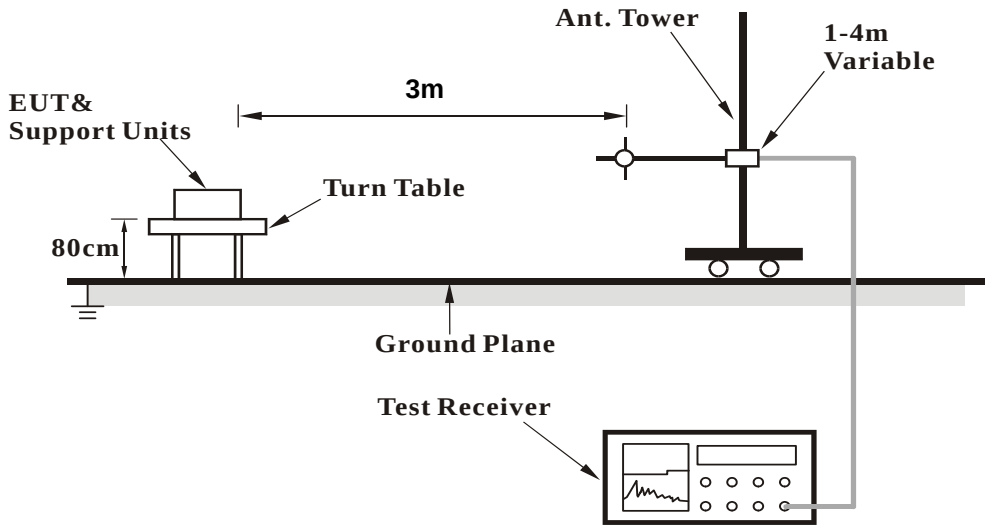
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

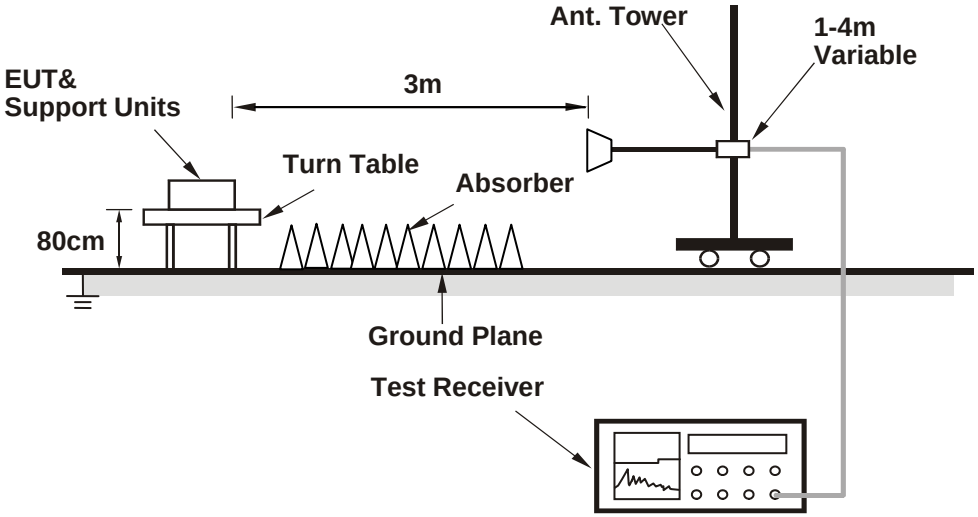
No deviation.

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. Turn on the power of EUT.
2. The communication partner run test program “MC92N0” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data：

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
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	48.2 PK	74.0	-25.8	1.05 H	101	53.78	-5.58
2	2390.00	36.8 AV	54.0	-17.2	1.05 H	101	42.38	-5.58
3	*2402.00	91.3 PK			1.05 H	101	96.84	-5.54
4	*2402.00	90.2 AV			1.05 H	101	95.74	-5.54
5	4804.00	50.7 PK	74.0	-23.3	1.20 H	65	48.40	2.30
6	4804.00	40.8 AV	54.0	-13.2	1.20 H	65	38.50	2.30
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	49.0 PK	74.0	-25.0	1.15 V	310	54.58	-5.58
2	2390.00	37.0 AV	54.0	-17.0	1.15 V	310	42.58	-5.58
3	*2402.00	93.2 PK			1.15 V	310	98.74	-5.54
4	*2402.00	89.3 AV			1.15 V	310	94.84	-5.54
5	4804.00	49.2 PK	74.0	-24.8	1.00 V	65	46.90	2.30
6	4804.00	40.3 AV	54.0	-13.7	1.00 V	65	38.00	2.30

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)
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	95.9 PK			1.09 H	115	101.22	-5.32
2	*2440.00	93.9 AV			1.09 H	115	99.22	-5.32
3	4880.00	50.6 PK	74.0	-23.4	1.18 H	73	48.07	2.53
4	4880.00	40.8 AV	54.0	-13.2	1.18 H	73	38.27	2.53
5	7320.00	58.6 PK	74.0	-15.4	1.00 H	96	48.89	9.71
6	7320.00	48.1 AV	54.0	-5.9	1.00 H	96	38.39	9.71
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	94.3 PK			1.15 V	304	99.62	-5.32
2	*2440.00	92.7 AV			1.15 V	304	98.02	-5.32
3	4880.00	49.5 PK	74.0	-24.5	1.01 V	65	46.97	2.53
4	4880.00	40.8 AV	54.0	-13.2	1.01 V	65	38.27	2.53
5	7320.00	58.3 PK	74.0	-15.7	1.54 V	63	48.59	9.71
6	7320.00	47.9 AV	54.0	-6.1	1.54 V	63	38.19	9.71

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)
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	94.8 PK			1.06 H	116	99.88	-5.08
2	*2480.00	92.8 AV			1.06 H	116	97.88	-5.08
3	2483.50	47.6 PK	74.0	-26.4	1.06 H	116	52.65	-5.05
4	2483.50	36.5 AV	54.0	-17.5	1.06 H	116	41.55	-5.05
5	4960.00	50.3 PK	74.0	-23.7	1.19 H	89	47.44	2.86
6	4960.00	40.4 AV	54.0	-13.6	1.19 H	89	37.54	2.86
7	7440.00	58.8 PK	74.0	-15.2	1.02 H	107	49.04	9.76
8	7440.00	48.0 AV	54.0	-6.0	1.02 H	107	38.24	9.76
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	93.6 PK			1.13 V	295	98.68	-5.08
2	*2480.00	91.2 AV			1.13 V	295	96.28	-5.08
3	2483.50	49.2 PK	74.0	-24.8	1.17 V	308	54.25	-5.05
4	2483.50	37.2 AV	54.0	-16.8	1.17 V	308	42.25	-5.05
5	4960.00	49.1 PK	74.0	-24.9	1.03 V	56	46.24	2.86
6	4960.00	40.5 AV	54.0	-13.5	1.03 V	56	37.64	2.86
7	7440.00	58.4 PK	74.0	-15.6	1.54 V	76	48.64	9.76
8	7440.00	47.9 AV	54.0	-6.1	1.54 V	76	38.14	9.76

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:

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	221.10	37.5 QP	46.0	-8.6	1.47 H	304	53.37	-15.92
2	317.21	39.4 QP	46.0	-6.6	1.24 H	311	51.73	-12.32
3	482.76	34.6 QP	46.0	-11.4	1.64 H	301	42.71	-8.10
4	605.81	36.0 QP	46.0	-10.0	1.24 H	311	41.22	-5.25
5	696.81	33.7 QP	46.0	-12.3	1.45 H	344	37.63	-3.96
6	757.14	37.2 QP	46.0	-8.8	1.42 H	314	40.02	-2.78
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	201.32	35.2 QP	43.5	-8.3	1.66 V	134	52.01	-16.80
2	212.30	38.3 QP	43.5	-5.2	1.64 V	100	54.63	-16.32
3	294.67	36.3 QP	46.0	-9.8	1.44 V	306	49.24	-12.99
4	319.51	37.2 QP	46.0	-8.8	1.24 V	311	49.47	-12.26
5	475.64	35.0 QP	46.0	-11.0	1.45 V	88	43.29	-8.28
6	521.21	34.1 QP	46.0	-11.9	1.66 V	77	41.27	-7.17

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

CHANNEL	TX Channel 19	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	178.34	38.2 QP	43.5	-5.3	1.24 H	211	53.14	-14.93
2	317.54	39.7 QP	46.0	-6.3	1.34 H	211	51.99	-12.31
3	482.64	34.8 QP	46.0	-11.2	1.44 H	211	42.92	-8.10
4	605.94	35.8 QP	46.0	-10.3	1.44 H	67	41.00	-5.25
5	696.34	33.2 QP	46.0	-12.8	1.24 H	200	37.21	-3.97
6	757.34	37.7 QP	46.0	-8.3	1.24 H	99	40.46	-2.78
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	196.11	35.1 QP	43.5	-8.4	1.44 V	54	51.62	-16.51
2	212.10	38.1 QP	43.5	-5.4	1.42 V	64	54.47	-16.33
3	294.51	36.1 QP	46.0	-9.9	1.24 V	245	49.11	-13.01
4	319.21	37.1 QP	46.0	-8.9	1.98 V	67	49.39	-12.28
5	475.31	35.3 QP	46.0	-10.7	1.24 V	100	43.63	-8.29
6	521.40	34.2 QP	46.0	-11.8	1.74 V	45	41.41	-7.17

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

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	**178.65**	**38.5 QP**	**43.5**	**-5.0**	**1.21 H**	**278**	**53.50**	**-14.96**
2	324.11	40.0 QP	46.0	-6.0	1.42 H	64	52.10	-12.13
3	482.21	34.5 QP	46.0	-11.5	1.24 H	275	42.65	-8.11
4	605.41	35.2 QP	46.0	-10.8	1.27 H	345	40.47	-5.26
5	696.57	33.8 QP	46.0	-12.3	1.46 H	175	37.71	-3.96
6	757.21	37.8 QP	46.0	-8.2	1.64 H	277	40.62	-2.78
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	191.31	34.6 QP	43.5	-8.9	1.22 V	96	50.70	-16.08
2	212.10	38.4 QP	43.5	-5.2	1.42 V	64	54.68	-16.33
3	294.24	36.4 QP	46.0	-9.6	1.66 V	45	49.44	-13.02
4	319.45	37.3 QP	46.0	-8.7	1.45 V	99	49.60	-12.26
5	475.45	35.5 QP	46.0	-10.5	1.75 V	85	43.83	-8.29
6	521.41	34.3 QP	46.0	-11.7	1.45 V	244	41.51	-7.17

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 ROHDE & SCHWARZ	ESCS 30	100375	Apr. 29, 2014	Apr. 28, 2015
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 15, 2014	Sep. 14, 2015
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ENV216	100071	Nov. 10, 2014	Nov. 09, 2015
RF Cable (JYEBAO)	5D-FB	COCCAB-001	Mar. 09, 2015	Mar. 08, 2016
50 ohms Terminator	N/A	EMC-03	Sep. 22, 2014	Sep. 21, 2015
50 ohms Terminator	N/A	EMC-02	Sep. 30, 2014	Sep. 29, 2015
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 Shielded Room No. C.
3 The VCCI Con C Registration No. is C-3611.
4 Tested Date: Mar. 31, 2015

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.

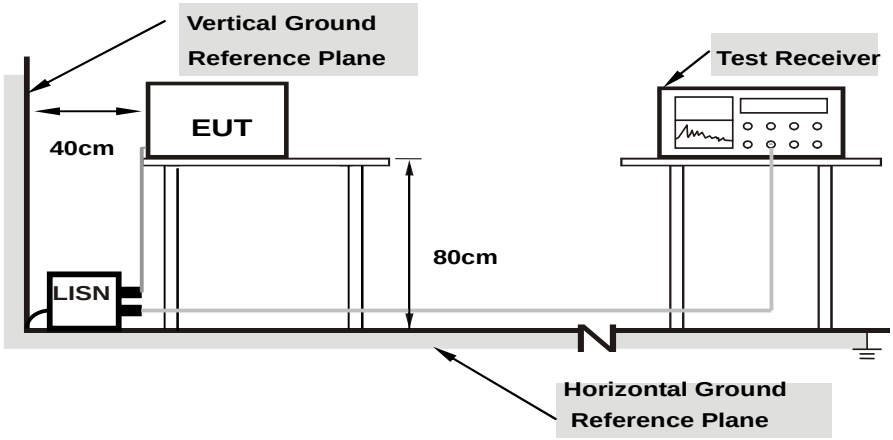
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

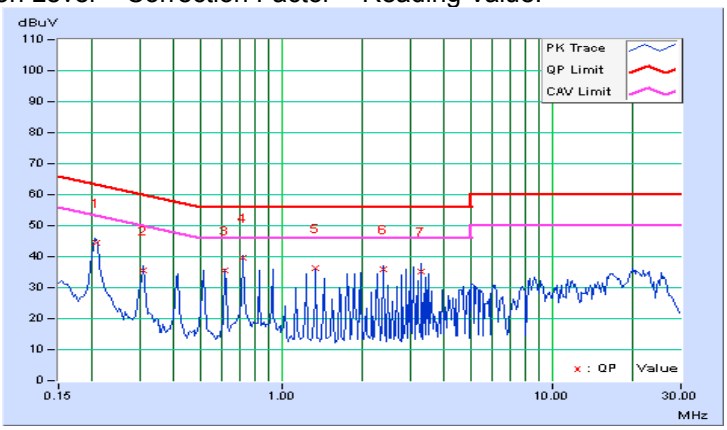
4.2.7 Test Results

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20606	0.09	44.46	38.76	44.55	38.85	63.36	53.36	-18.81	-14.51
2	0.31016	0.10	35.36	30.68	35.46	30.78	59.97	49.97	-24.51	-19.19
3	0.61875	0.11	35.32	33.96	35.43	34.07	56.00	46.00	-20.57	-11.93
4	**0.72031**	**0.12**	**39.42**	**38.60**	**39.54**	**38.72**	**56.00**	**46.00**	**-16.46**	**-7.28**
5	1.33831	0.14	36.28	34.84	36.42	34.98	56.00	46.00	-19.58	-11.02
6	2.36972	0.18	35.84	31.70	36.02	31.88	56.00	46.00	-19.98	-14.12
7	3.29688	0.20	34.92	28.38	35.12	28.58	56.00	46.00	-20.88	-17.42

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.

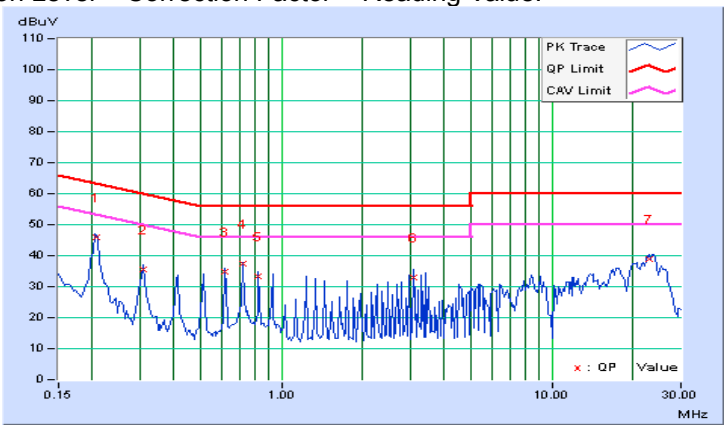


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20669	0.08	45.76	39.06	45.84	39.14	63.34	53.34	-17.50	-14.20
2	0.30912	0.09	35.40	30.00	35.49	30.09	59.99	49.99	-24.50	-19.90
3	0.61875	0.11	34.84	33.64	34.95	33.75	56.00	46.00	-21.05	-12.25
4	0.72031	0.12	37.46	36.40	37.58	36.52	56.00	46.00	-18.42	-9.48
5	0.82375	0.12	33.28	31.72	33.40	31.84	56.00	46.00	-22.60	-14.16
6	3.08984	0.20	32.92	22.70	33.12	22.90	56.00	46.00	-22.88	-23.10
7	22.85156	0.81	38.26	33.26	39.07	34.07	60.00	50.00	-20.93	-15.93

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.

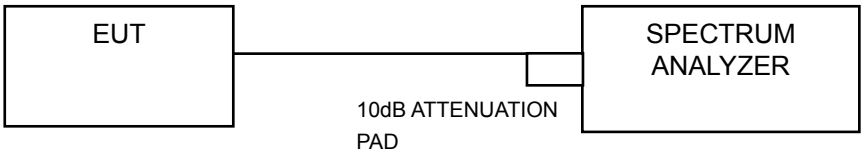


4.3 6dB Bandwidth Measurement

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.

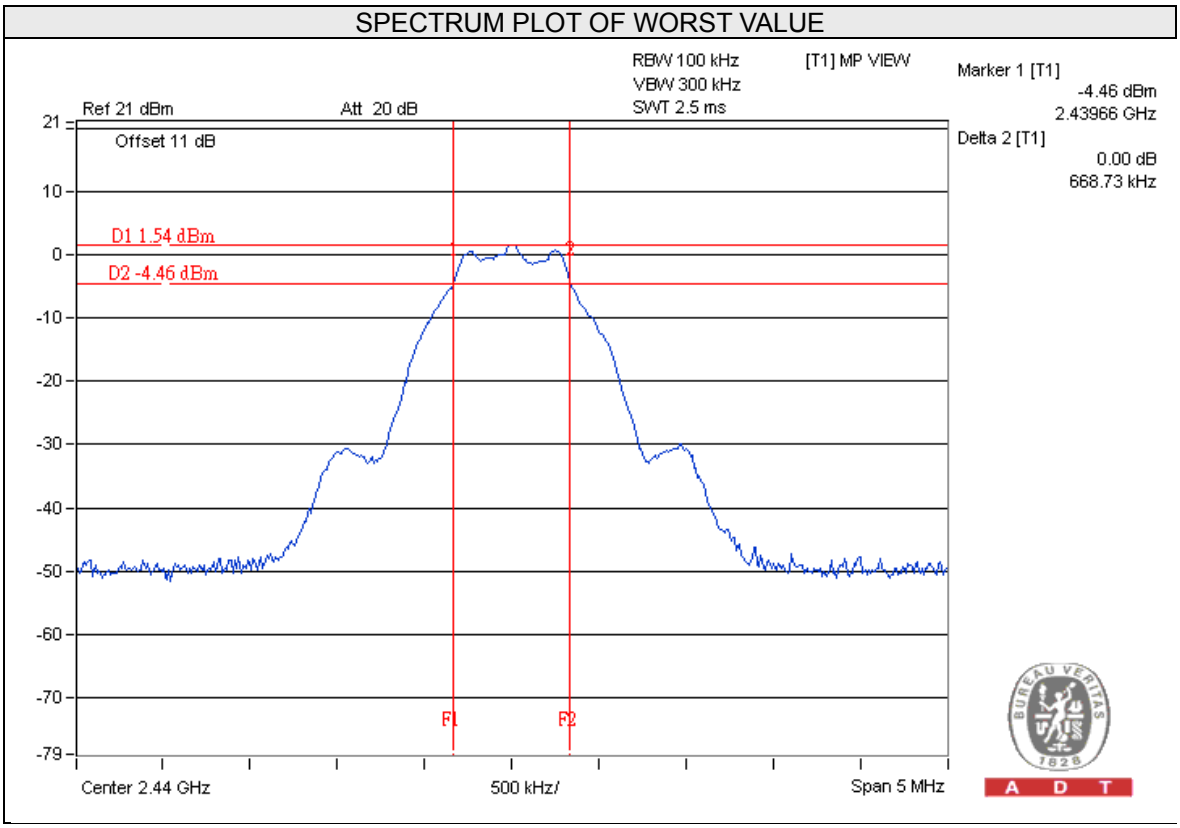
4.3.6 EUT Operating Conditions

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	0.68	0.5	PASS
19	2440	0.67	0.5	PASS
39	2480	0.67	0.5	PASS

SPECTRUM PLOT OF WORST VALUE

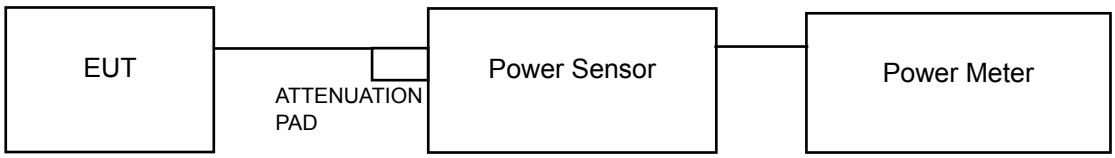


4.4 Conducted Output Power Measurement

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	2.158	3.34	30	PASS
19	2440	2.084	3.19	30	PASS
39	2480	2.094	3.21	30	PASS

FOR AVERAGE POWER

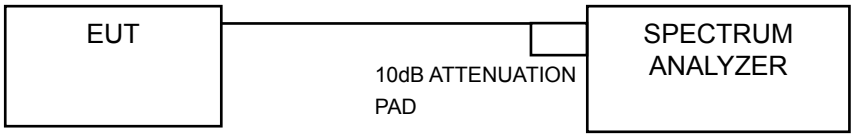
CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)
0	2402	1.799	2.55
19	2440	1.766	2.47
39	2480	1.778	2.50

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

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.

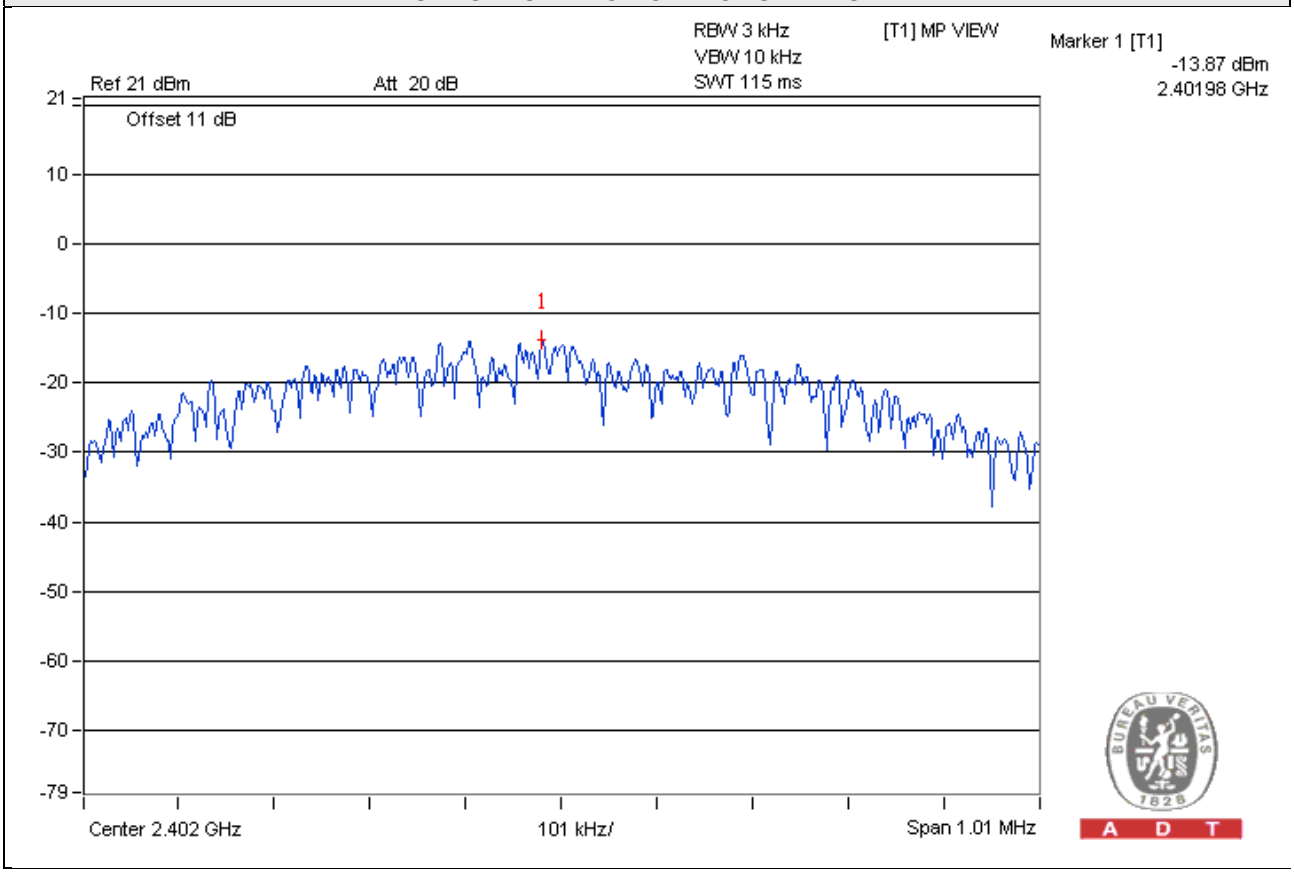
4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-13.87	8	PASS
19	2440	-13.99	8	PASS
39	2480	-13.94	8	PASS

SPECTRUM PLOT OF WORST VALUE

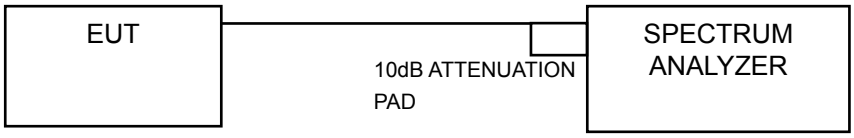


4.6 Conducted Out of Band Emission Measurement

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 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

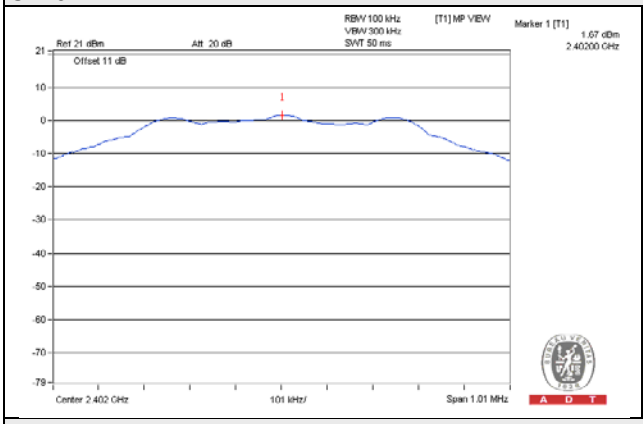
No deviation.

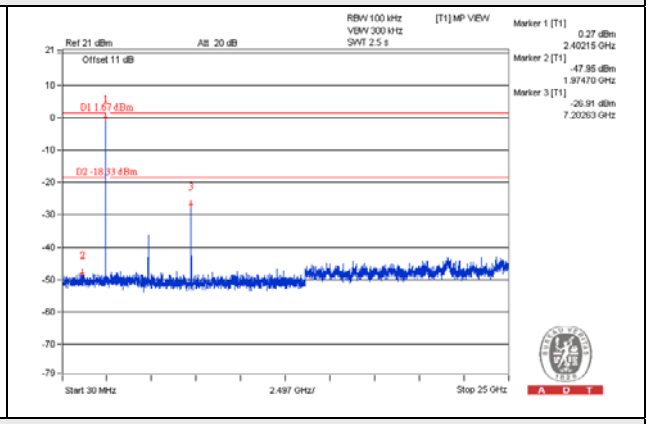
4.6.6 EUT Operating Condition

Same as Item 4.3.6

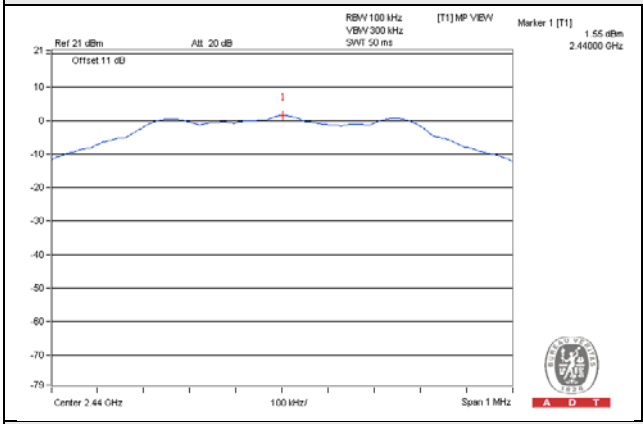
4.6.7 Test Results

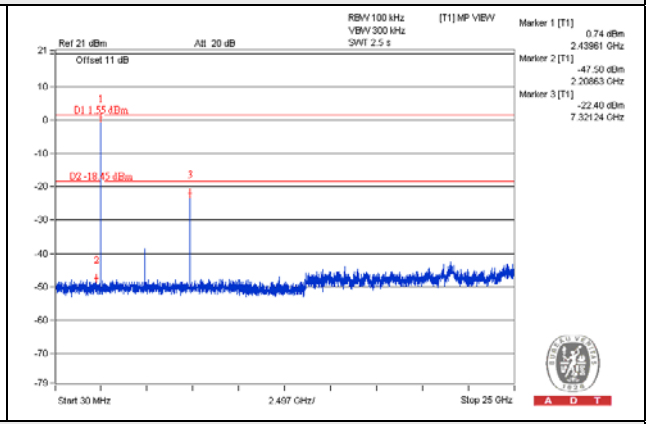
CH 0



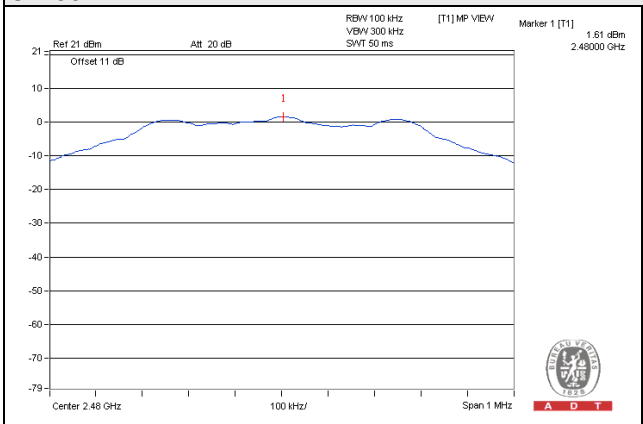


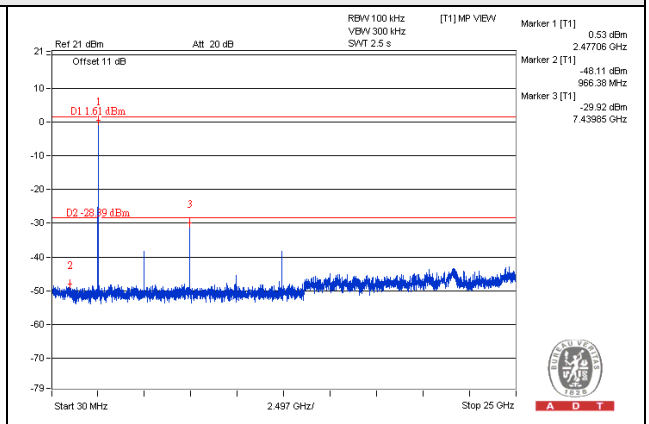
CH 19



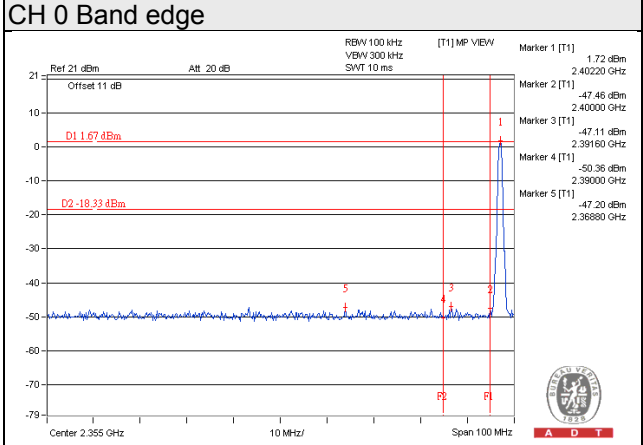


CH 39

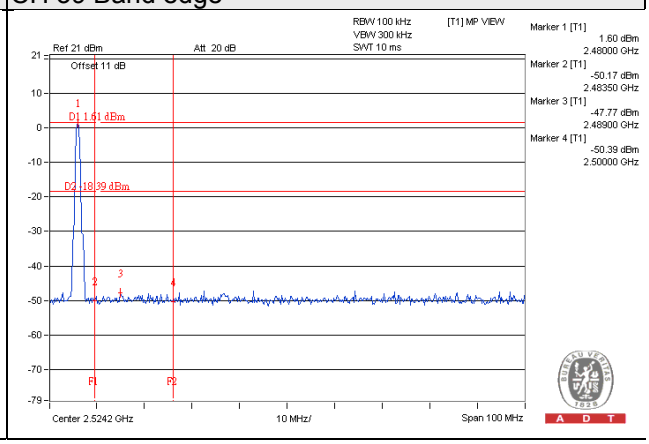




CH 0 Band edge



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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Web Site: www.bureauveritas-adt.com

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

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