

Supplementary FCC Test Report

Report No.: RF120210E04M-4

FCC ID: UZ7WT41N0

Test Model: WT41N0

Received Date: Mar. 25, 2015

Test Date: Mar. 25 to June 24, 2015

Issued Date: July 01, 2015

Applicant: Zebra Technologies Corporation

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Manufacturer: Symbol Technologies, Inc.

Address: 1 Zebra Plaza, Holtsville, NY 11742

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Report Issue History Record of EUT (WT41N0)

Attachment No.	Issue Date	Description
120210E04	Nov. 09, 2012	Original
120210E04L	July 01, 2015	Upgrade the versions of the standard to section 15.407 under new rule
120210E04M	July 01, 2015	Added Bluetooth 4.0 (BT-LE) technology used for the EUT

Release Control Record

Issue No.	Description	Date Issued
RF120210E04M-4	Original release.	July 01, 2015



A D T

1 Certificate of Conformity

Product: Wearable Terminal

Brand: Symbol

Test Model: WT41N0

Sample Status: MASS-PRODUCTION

Applicant: Zebra Technologies Corporation

Test Date: Mar. 25 to June 24, 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 : Phoenix Huang , **Date:** July 01, 2015
Phoenix Huang / Specialist

Approved by : May Chen , **Date:** July 01, 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 -4.12dB at 0.71295MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -4.4dB at 7440.00MHz.
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.

NOTE: 1. This report is prepared for FCC Class II change. (Added Bluetooth 4.0 (BT-LE) technology used for the EUT).

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	2.86 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.43 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

Product	Wearable Terminal
Brand	Symbol
Test Model	WT41N0
Status of EUT	MASS-PRODUCTION
Power Supply Rating	DC 3.7V
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 1Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	40
Output Power	1.306mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Battery x 1
Data Cable Supplied	NA

Note:

- This report is prepared for FCC Class II change. The difference compared with the Report No.: RF120210E04M-4 design is as the following:
 - ◆ Added Bluetooth 4.0 (BT-LE) technology used for the EUT.
- According to above conditions, all test items of Bluetooth 4.0 (BT-LE) technology need to be performed. And all data was verified to meet the requirements.
- There are Bluetooth technology and WLAN technology used for the EUT.
- WLAN & BT technology can transmit at same time.
- The EUT has different versions, the relationship of testing sample versions are listed as below:

Sample No.	Brand	Model	Description
1	Symbol	WT41N0	VOW version
2			Touch version
3			Non-Touch version

- The EUT hardware/software information are as below:

Brand	Model	Description
Wearable Terminal	OS Version	07.00.2806
	OEM Version	00.17.0001
	HW Version	WT41N0_MB V3.0
Wireless(Fusion)	Part Number	31-FUSION-X2.00
	Version	X_2.00.0.0.93
XWingCon	XappVersion	X_2.00.0.0.24
BTRegTestVer4.1	Version	4.1

7. The EUT could be supplied from a cradle, power adapter and battery, the information are listed as below:

Cradle 1 (1-slot, option)	
Brand:	MOTOROLA
Model No.:	CRD4000-1000UR
Part No.:	CRD4000-1000UR
Input power :	+12V ----- 3.33A
I/O Ports:	USB Port x 1
Associated Devices:	USB cable (Part No.:25-64396-01R) Adapter x 1 (Adapter 1: Part No.: 50-14000-148R)
Adapter 1 (option)	
Brand:	HIPRO
Model No.:	HP-O2040D43
Part No.:	50-14000-148R
Input power :	100-240V, 50-60Hz, 1.5A
Output power :	+12V ----- 3.33A DC output cable (unshielded, 1.8m with one core)
Battery 1	
Brand:	SYMBOL
Part No.:	82-90005-05 Rev. A (1X LiION)
Rating:	3.7V, 2400mAh, 8.88Wh
Battery 2	
Brand:	SYMBOL
Part No.:	82-90005-04 Rev. D (2X LiION)
Rating:	3.7V, 4800mAh, 17.76Wh

8. The EUT could be supplied with one laser scanner (optional). There are four options as below:

Laser scanner 1 (option)	
Brand:	MOTOROLA
Model No.:	RS409 1D Laser scanner
Laser scanner 2 (option)	
Brand:	MOTOROLA
Model No.:	RS309 1D Laser scanner
Laser scanner 3 (option)	
Brand:	MOTOROLA
Model No.:	RS507 2D Imager scanner
Description :	Wireless link (no direct wire-link to EUT)
Laser scanner 4 (option)	
Brand:	MOTOROLA
Model No.:	RS419 scanner
Description :	Type 1: Long USB cable (Length: 2.3m) Type 2: Short USB cable (Length: 0.4m)

9. The EUT antennas information:

Bluetooth Antenna Spec			
Antenna Type	Gain (dBi)	Connector Type	Frequency range (MHz)
PIFA	1.47	NA	2400~2500
WLAN Antenna Spec.			
Antenna Type	Gain (dBi)	Connector Type	Frequency range (MHz)
PIFA	1.48 (2.4G)	NA	2400~2500
	5.7 (5G)		4900~5850

10. The EUT incorporates a SISO function.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	1TX	1RX
802.11g	6 ~ 54Mbps	1TX	1RX
802.11a	6 ~ 54Mbps	1TX	1RX
802.11n (HT20)	MCS 0~7	1TX	1RX

11. For the original test report: the EUT was pre-tested in chamber under following test modes :

Pre-test Mode	Description
Mode A	X_ plane: Sample_1 + Battery 1 + Laser scanner 1
Mode B	X_ plane: Sample_2 + Battery 1 + Laser scanner 1
Mode C	X_ plane: Sample_3 + Battery 1 + Laser scanner 1
Mode D	X_ plane: Sample_2 + Battery 2 + Laser scanner 1
Mode E	Y_ plane: Sample_2 + Battery 2 + Laser scanner 1
Mode F	Z_ plane: Sample_2 + Battery 2 + Laser scanner 1
Mode G	X_ plane: Sample_2 + Battery 2 + Laser scanner 2
Mode H	X_ plane: Sample_2 + Battery 2 + Laser scanner 4 (Short cable)
Mode I	X_ plane: Sample_2 + Battery 2 + Laser scanner 4 (Long cable)
Mode J	Sample_2 + Battery 2 + Laser scanner 4 (Long cable) + Cradle 1

Note: The worse worse radiated emission was found in **Mode J**. Therefore only the test data of the modes were recorded in this report.

12. Radiated and Conducted emission of the simultaneous operation (Bluetooth and WLAN technology) has been evaluated and no non-compliance was found.
13. 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	√	√	√	√	Cradle 1 + Battery 2

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

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	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

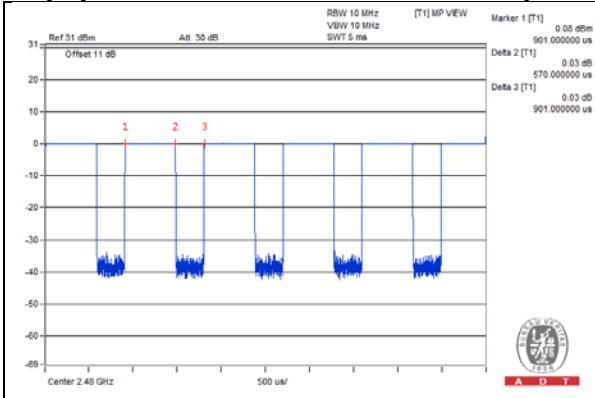
Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	24deg. C, 71%RH	120Vac, 60Hz	Weiwei Lo
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Weiwei Lo
PLC	25deg. C, 54%RH	120Vac, 60Hz	Jyunchun Lin
APCM	25deg. C, 60%RH	120Vac, 60Hz	Gary Cheng

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.

Duty cycle = $0.57 \text{ ms} / 0.901 \text{ ms} = 0.633$, Duty factor = $10 * \log(1/0.633) = 2$



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.

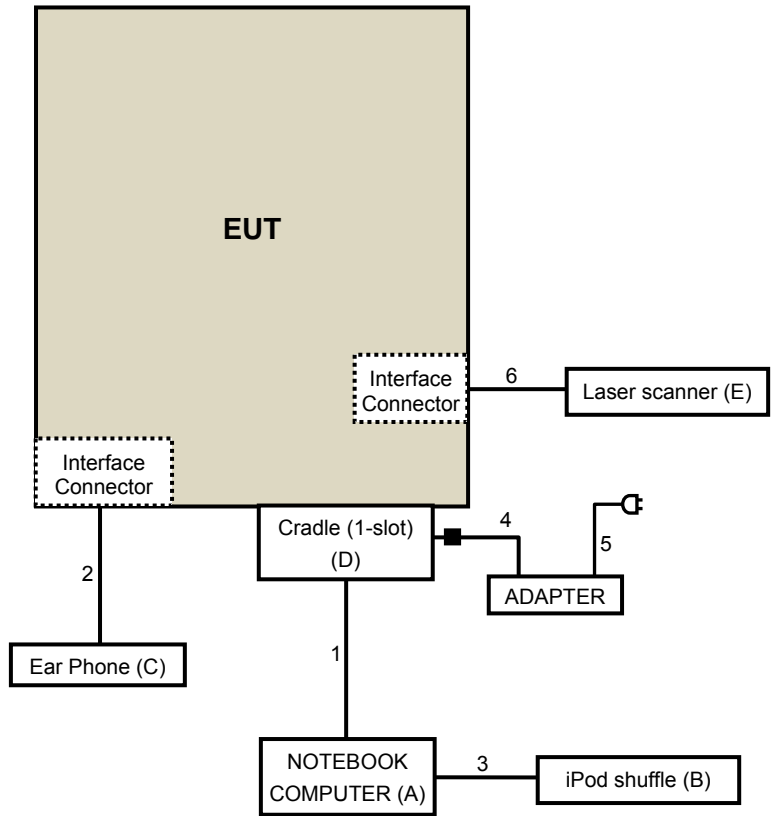
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	NOTEBOOK COMPUTER	DELL	E5430	4YV4VY1	FCC DoC	Provided by Lab
B.	iPod shuffle	Apple	MC749TA/A	CC4DMFJUDFDM	NA	Provided by Lab
C.	Ear phone	MOTOROLA	Vix	NA	NA	Supplied by Client
D.	Cradle (1-slot)	MOTOROLA	CRD4000-1000UR	NA	NA	Supplied by Client
E.	Laser scanner	MOTOROLA	RS419 scanner	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.	USB	1	1.6	Yes	0	Supplied by Client
2.	Audio	1	1.2	No	0	Supplied by Client
3.	USB	1	0.1	Yes	0	Provided by Lab
4.	DC	1	1.8	Yes	1	Supplied by Client
5.	AC	1	1.8	Yes	0	Provided by Lab
6.	Scanner	1	0.4	Yes	0	Supplied by Client

3.4.1 Configuration of System under Test



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

For Above 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210105	July 21,2014	July 20,2015
Horn_Antenna AISI	AIH.8018	000032009111 0	Feb. 09, 2015	Feb. 08, 2016
Pre-Amplifier Agilent	8449B	3008A02578	June 23, 2015	June 22, 2016
RF Cable	NA	131205 131216 131217 SNMY23684/ 4	Jan. 16, 2015	Jan. 15, 2016
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 12, 2014	Dec. 11, 2015
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Feb. 05, 2015	Feb. 04, 2016
RF Cable	NA	329751/4 RF104-204	Dec. 11, 2014	Dec. 10, 2015
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
SPECTRUM ANALYZER R&S	FSP 40	100060	May 08, 2015	May 07, 2016
Power meter Anritsu	ML2495A	1014008	Apr. 28, 2015	Apr. 27, 2016
Power sensor Anritsu	MA2411B	0917122	Apr. 28, 2015	Apr. 27, 2016

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 VCCI Site Registration No. is G-137.
5. The CANADA Site Registration No. is IC 7450H-2.
6. Tested Date: June 24, 2015

**For Below 1GHz:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	Aug. 11, 2014	Aug. 10, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Feb. 09, 2015	Feb. 08, 2016
RF Cable	8D-FB	CHHCAB-001- 1	Oct. 05, 2014	Oct. 04, 2015
		CHHCAB-001- 2		
	RF-141	CHHCAB-004	Oct. 05, 2014	Oct. 04, 2015
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. H.
3. The FCC Site Registration No. is 797305.
4. The CANADA Site Registration No. is IC 7450H-3.
5. Tested Date: June 24, 2015

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:

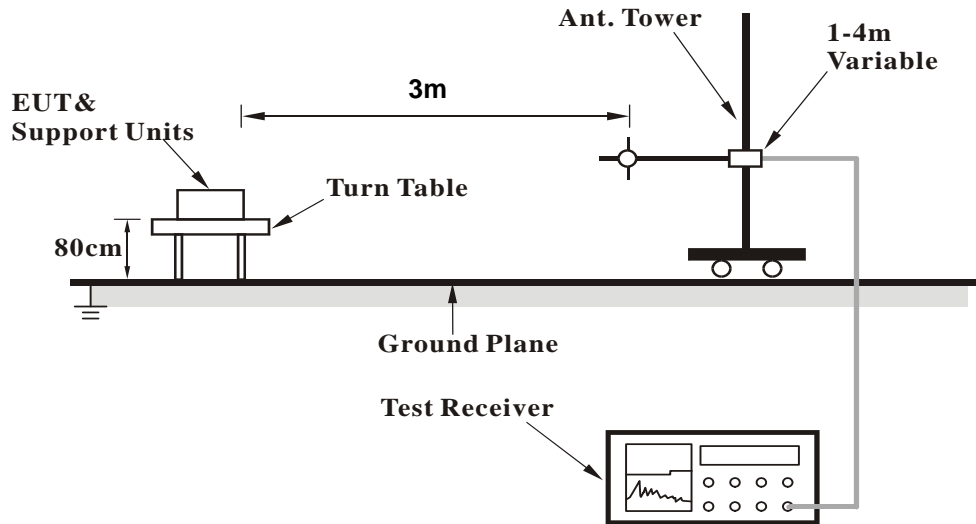
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) 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

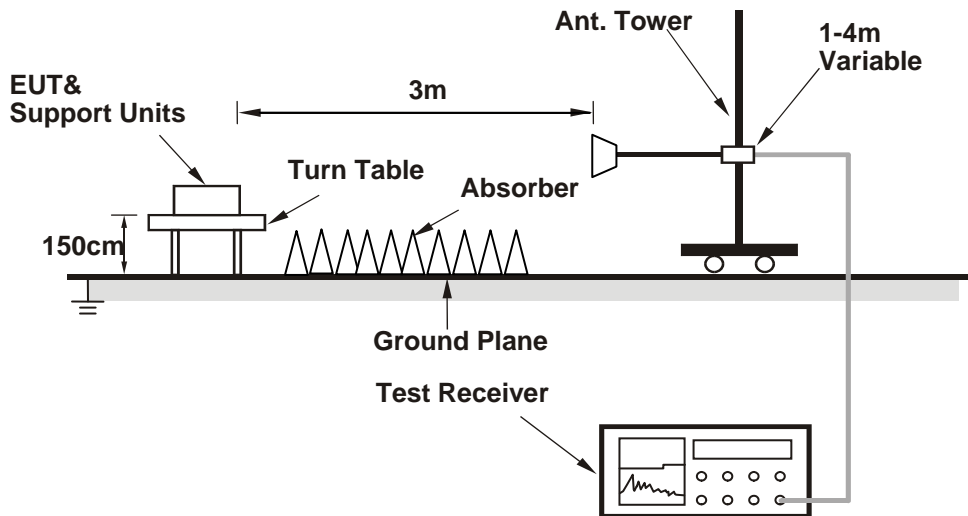
No deviation.

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

- a. Placed the EUT on the testing table.
- b. The EUT runs test program “BTRegTest” 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		Average (AV)

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	48.6 PK	74.0	-25.4	1.00 H	244	50.03	-1.43
2	2390.00	38.1 AV	54.0	-15.9	1.00 H	244	39.53	-1.43
3	*2402.00	96.6 PK			1.00 H	244	98.00	-1.40
4	*2402.00	94.9 AV			1.00 H	244	96.30	-1.40
5	4804.00	48.9 PK	74.0	-25.1	1.55 H	229	41.89	7.01
6	4804.00	40.6 AV	54.0	-13.4	1.55 H	229	33.59	7.01

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	48.5 PK	74.0	-25.5	1.00 V	261	49.93	-1.43
2	2390.00	37.8 AV	54.0	-16.2	1.00 V	261	39.23	-1.43
3	*2402.00	92.6 PK			1.00 V	261	94.00	-1.40
4	*2402.00	90.1 AV			1.00 V	261	91.50	-1.40
5	4804.00	50.2 PK	74.0	-23.8	1.54 V	170	43.19	7.01
6	4804.00	42.4 AV	54.0	-11.6	1.54 V	170	35.39	7.01

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		Average (AV)

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	96.9 PK			1.00 H	234	98.22	-1.32
2	*2440.00	95.3 AV			1.00 H	234	96.62	-1.32
3	4880.00	49.3 PK	74.0	-24.7	1.32 H	249	42.03	7.27
4	4880.00	41.1 AV	54.0	-12.9	1.32 H	249	33.83	7.27
5	7320.00	57.9 PK	74.0	-16.1	1.26 H	252	43.43	14.47
6	7320.00	47.6 AV	54.0	-6.4	1.26 H	252	33.13	14.47

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	92.5 PK			1.02 V	237	93.82	-1.32
2	*2440.00	89.8 AV			1.02 V	237	91.12	-1.32
3	4880.00	53.1 PK	74.0	-20.9	1.34 V	221	45.83	7.27
4	4880.00	43.9 AV	54.0	-10.1	1.34 V	221	36.63	7.27
5	7320.00	60.0 PK	74.0	-14.0	1.33 V	228	45.53	14.47
6	7320.00	49.4 AV	54.0	-4.6	1.33 V	228	34.93	14.47

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		Average (AV)

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	96.1 PK			1.00 H	257	97.31	-1.21
2	*2480.00	94.6 AV			1.00 H	257	95.81	-1.21
3	2483.50	48.9 PK	74.0	-25.1	1.00 H	257	50.11	-1.21
4	2483.50	38.2 AV	54.0	-15.8	1.00 H	257	39.41	-1.21
5	4960.00	49.3 PK	74.0	-24.7	1.28 H	256	41.66	7.64
6	4960.00	41.2 AV	54.0	-12.8	1.28 H	256	33.56	7.64
7	7440.00	57.5 PK	74.0	-16.5	1.28 H	266	42.99	14.51
8	7440.00	47.4 AV	54.0	-6.6	1.28 H	266	32.89	14.51

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	92.3 PK			1.00 V	249	93.51	-1.21
2	*2480.00	89.8 AV			1.00 V	249	91.01	-1.21
3	2483.50	48.1 PK	74.0	-25.9	1.00 V	249	49.31	-1.21
4	2483.50	37.5 AV	54.0	-16.5	1.00 V	249	38.71	-1.21
5	4960.00	52.6 PK	74.0	-21.4	1.30 V	211	44.96	7.64
6	4960.00	43.6 AV	54.0	-10.4	1.30 V	211	35.96	7.64
7	7440.00	60.0 PK	74.0	-14.0	1.36 V	222	45.49	14.51
8	7440.00	49.6 AV	54.0	-4.4	1.36 V	222	35.09	14.51

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	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	76.85	18.9 QP	40.0	-21.1	2.00 H	1	35.85	-16.97
2	257.71	20.6 QP	46.0	-25.4	2.00 H	1	34.32	-13.70
3	486.82	24.3 QP	46.0	-21.7	1.00 H	360	31.82	-7.48
4	648.96	24.9 QP	46.0	-21.1	1.00 H	168	28.81	-3.91
5	770.16	26.3 QP	46.0	-19.7	1.00 H	360	28.23	-1.93
6	956.98	33.2 QP	46.0	-12.8	2.00 H	37	32.04	1.16

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	77.19	23.0 QP	40.0	-17.1	2.00 V	113	40.07	-17.12
2	119.00	21.5 QP	43.5	-22.1	2.00 V	219	36.66	-15.21
3	257.76	18.1 QP	46.0	-27.9	1.00 V	1	31.83	-13.70
4	486.82	23.3 QP	46.0	-22.7	2.00 V	100	30.80	-7.48
5	791.98	27.9 QP	46.0	-18.1	2.00 V	196	29.38	-1.45
6	956.98	36.2 QP	46.0	-9.8	2.00 V	115	35.07	1.16

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	847124/029	Oct. 22, 2014	Oct. 21, 2015
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 15, 2014	Sep. 14, 2015
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100071	Nov. 10, 2014	Nov. 09, 2015
RF Cable	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 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: Mar. 25, 2015

4.2.3 Test Procedures

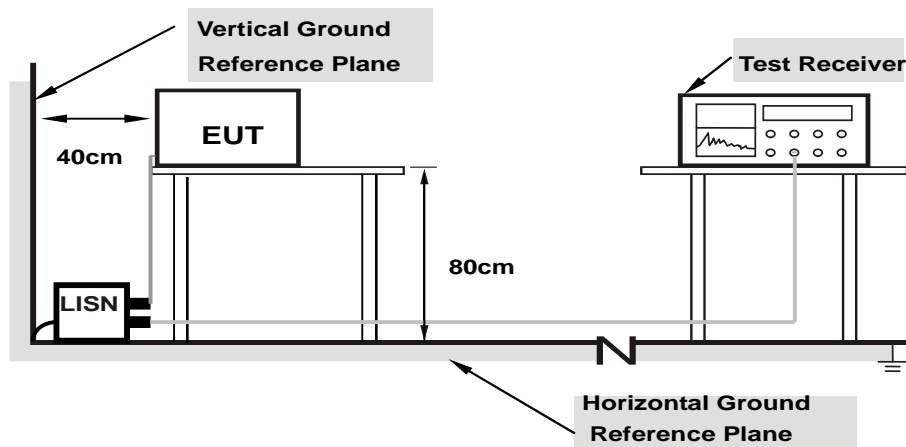
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

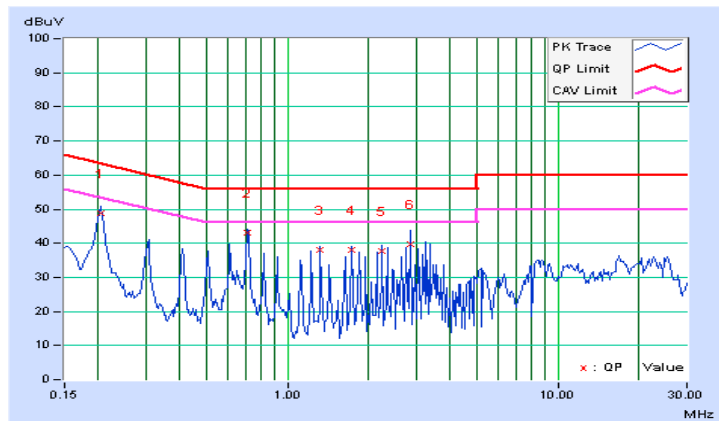
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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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	0.20448	0.09	48.85	42.08	48.94	42.17	63.43	53.43	-14.49	-11.26
2	0.71295	0.12	42.95	41.76	43.07	41.88	56.00	46.00	-12.93	-4.12
3	1.32465	0.14	37.90	35.32	38.04	35.46	56.00	46.00	-17.96	-10.54
4	1.73470	0.16	37.81	35.61	37.97	35.77	56.00	46.00	-18.03	-10.23
5	2.24328	0.18	37.54	34.56	37.72	34.74	56.00	46.00	-18.28	-11.26
6	2.85501	0.19	39.67	32.41	39.86	32.60	56.00	46.00	-16.14	-13.40

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

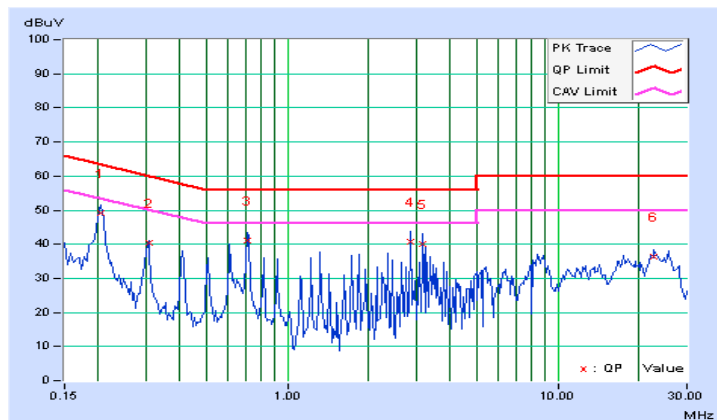


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20470	0.08	49.16	40.65	49.24	40.73	63.42	53.42	-14.18	-12.69
2	0.30625	0.09	40.35	35.11	40.44	35.20	60.07	50.07	-19.63	-14.87
3	0.71250	0.12	40.93	38.44	41.05	38.56	56.00	46.00	-14.95	-7.44
4	2.85508	0.20	40.63	30.70	40.83	30.90	56.00	46.00	-15.17	-15.10
5	3.16114	0.20	39.91	31.32	40.11	31.52	56.00	46.00	-15.89	-14.48
6	22.73248	0.81	35.65	30.60	36.46	31.41	60.00	50.00	-23.54	-18.59

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

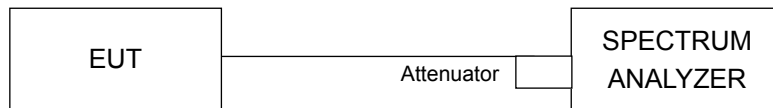


4.3 6dB Bandwidth Measurement

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 Procedures

- a. Set resolution bandwidth (RBW) = 100kHz
- b. Set the video bandwidth (VBW) $\geq 3 \times$ 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 from Test Standard

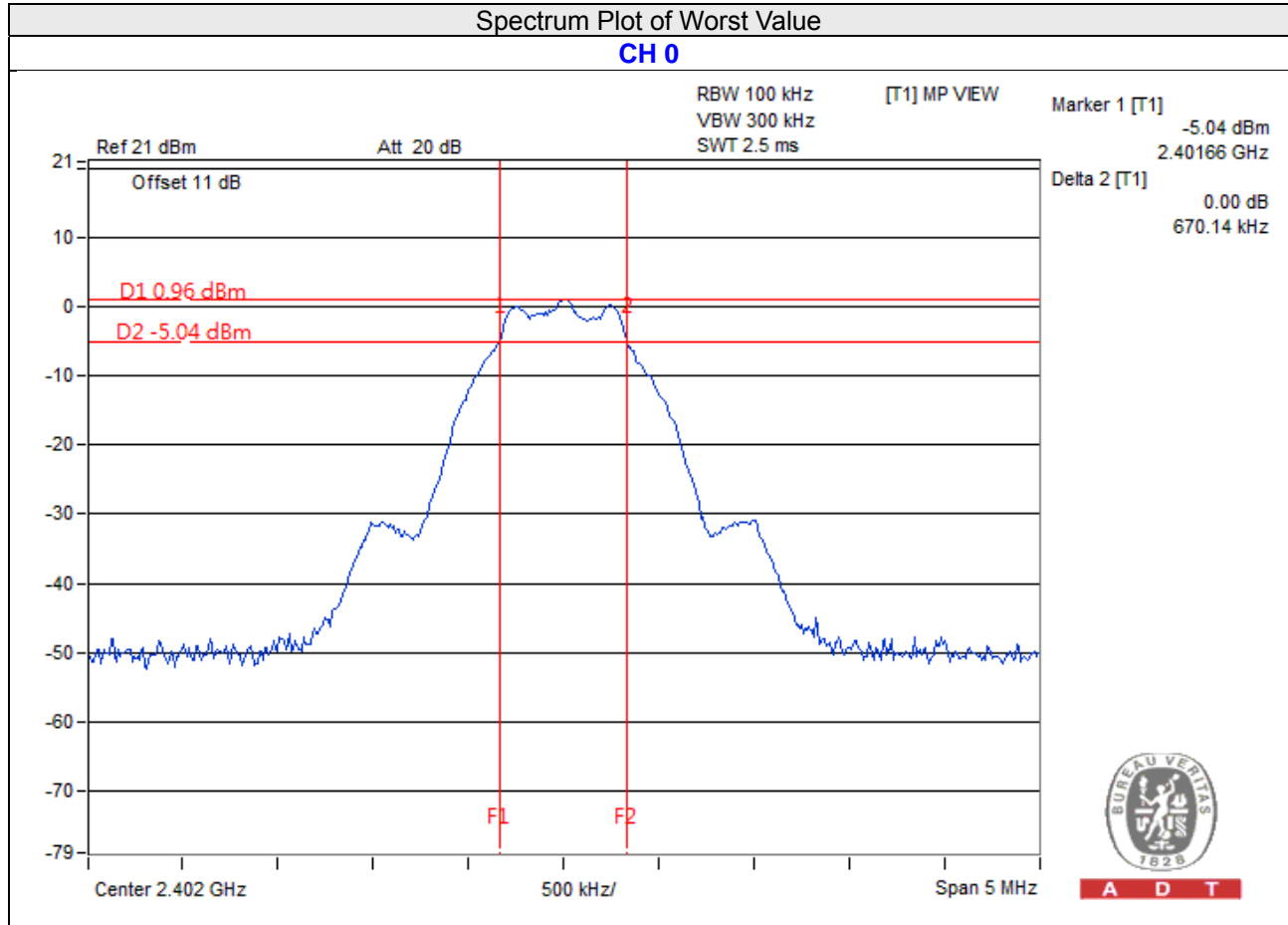
No deviation.

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 Result

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

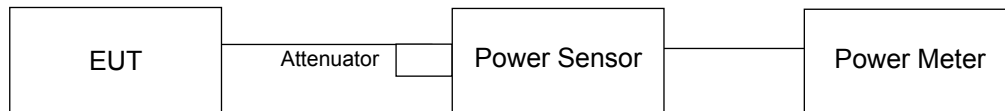


4.4 Conducted Output Power Measurement

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

The 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	1.306	1.16	30	Pass
19	2440	1.219	0.86	30	Pass
39	2480	1.028	0.12	30	Pass

FOR AVERAGE POWER

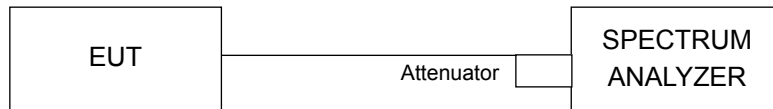
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	1.268	1.03
19	2440	1.186	0.74
39	2480	1.021	0.09

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 Procedures

- 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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d. Set the VBW $\geq 3 \times \text{RBW}$.
- 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 Conditions

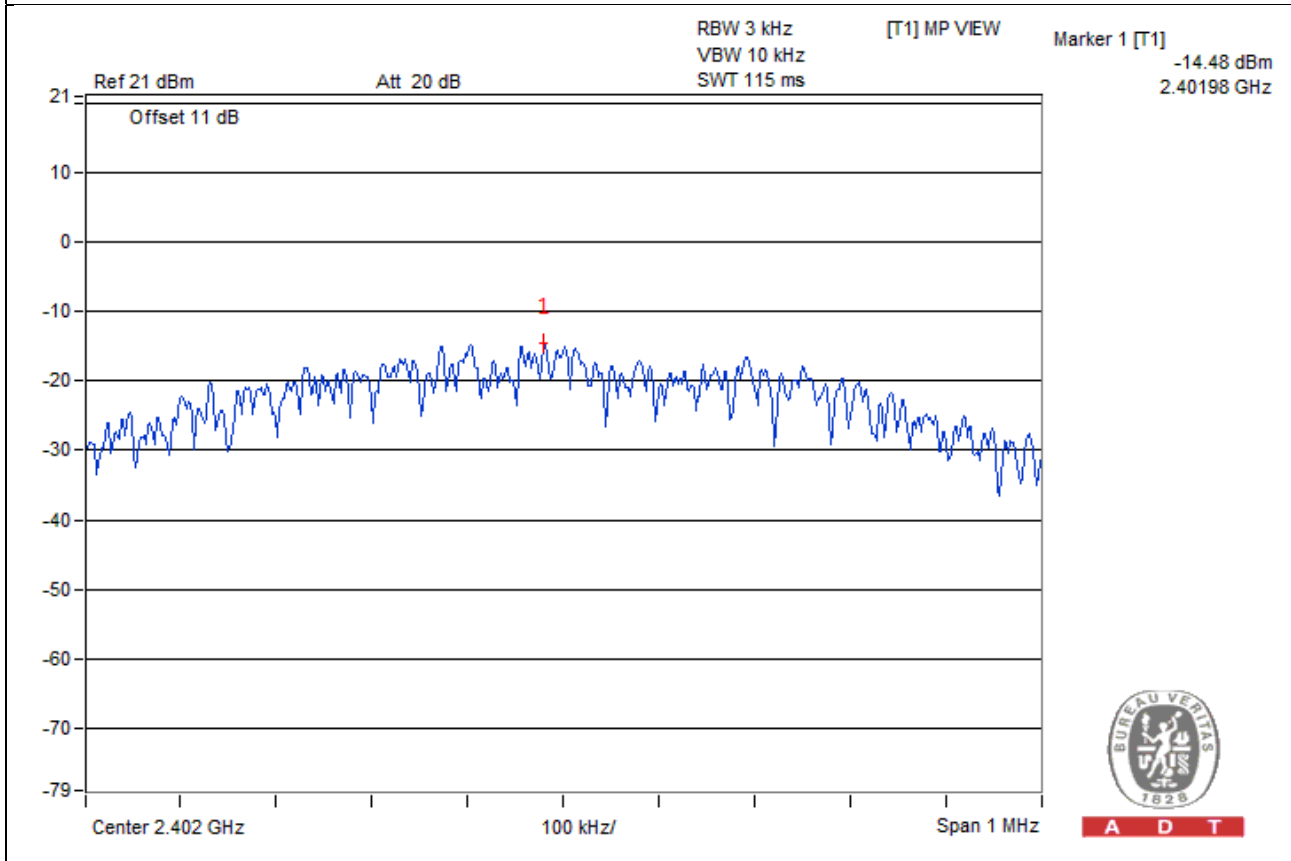
Same as Item 4.3.6

4.5.7 Test Results

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
0	2402	-14.48	8	Pass
19	2440	-14.56	8	Pass
39	2480	-15.61	8	Pass

Spectrum Plot of Worst Value

CH 0

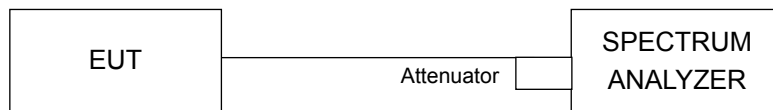


4.6 Conducted Out of Band Emission Measurement

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 Procedures

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 OOBE

1. Set RBW = 100 kHz.
2. Set VBW \geq 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

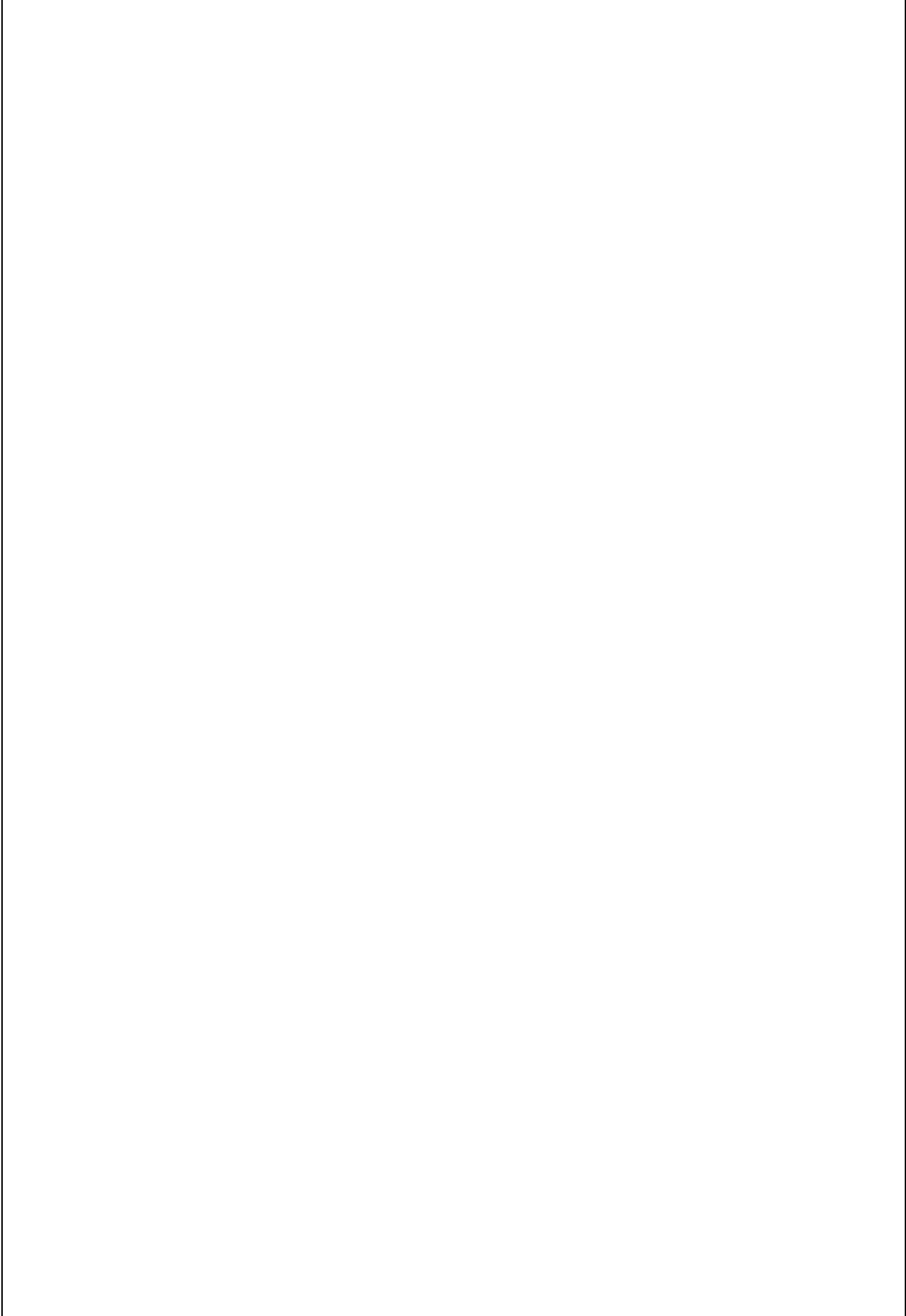
No deviation.

4.6.6 EUT Operating Conditions

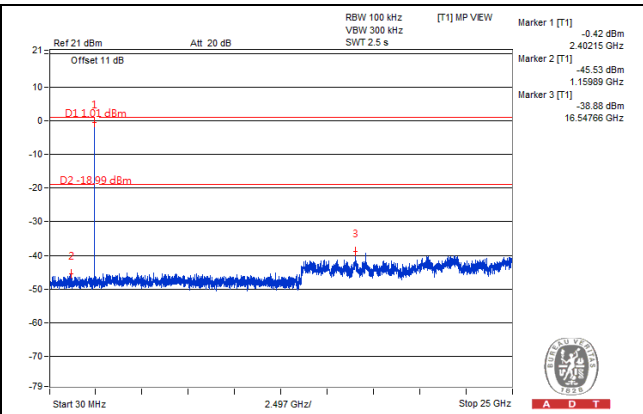
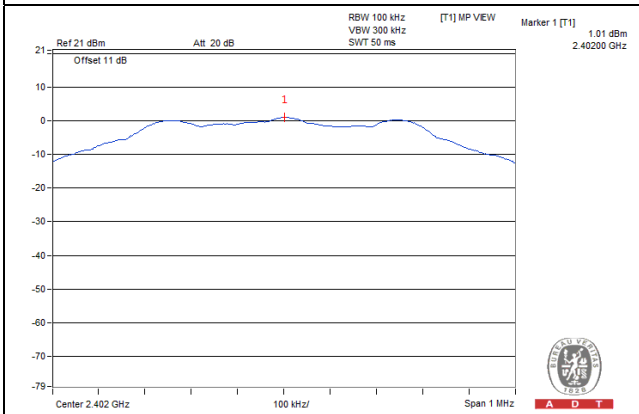
Same as Item 4.3.6

4.6.7 Test Results

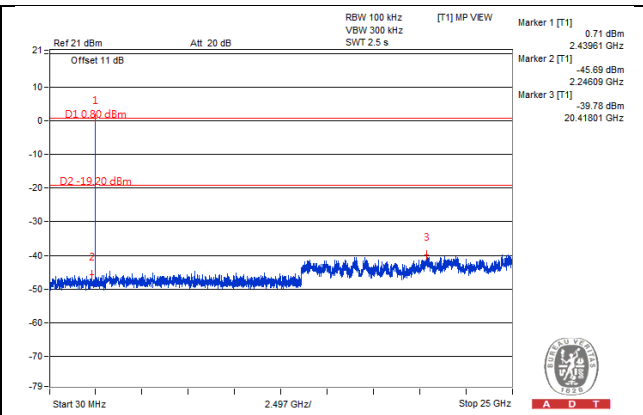
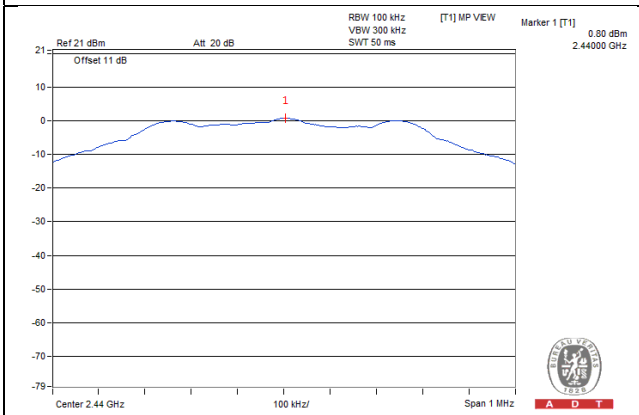
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.



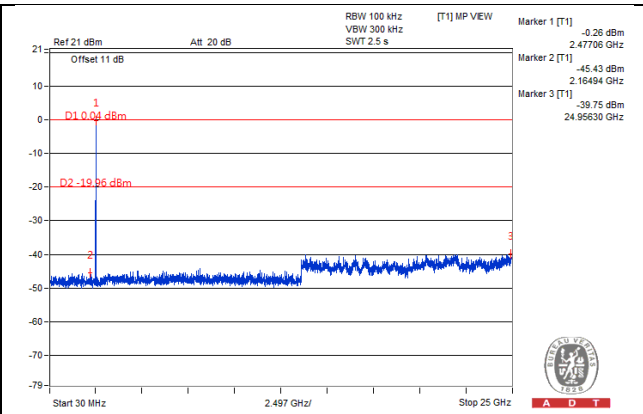
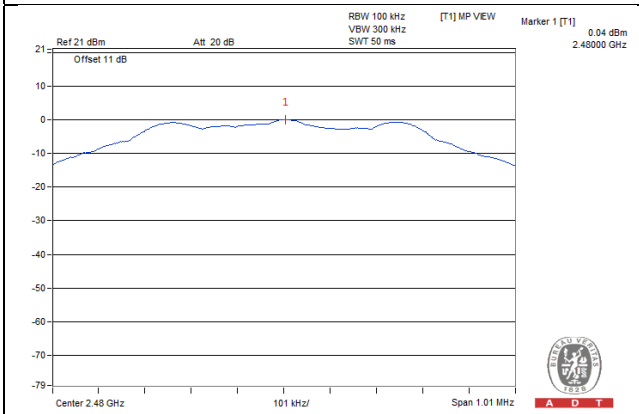
CH 0



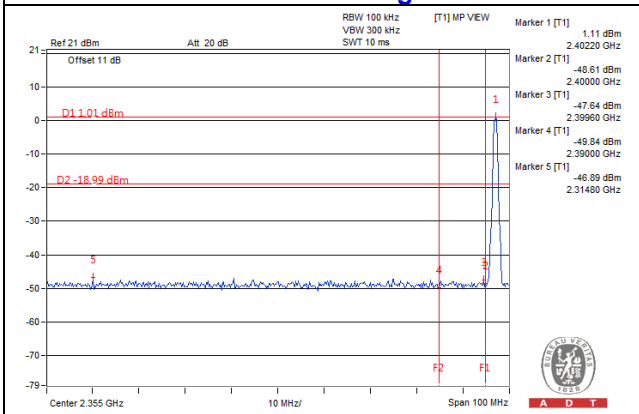
CH 19



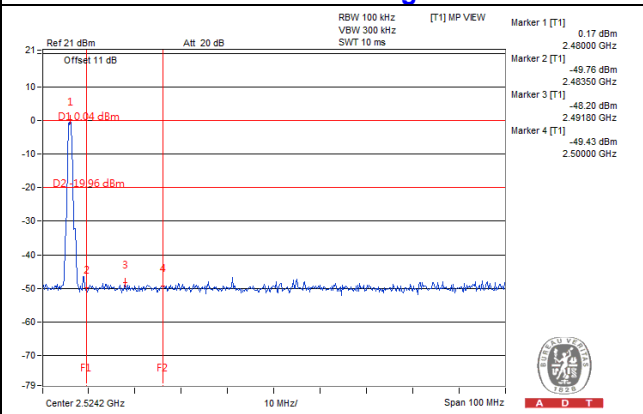
CH 39



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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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.

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