

FCC Test Report (Co-Located)

Report No.: RFBCUG-WTW-P22010682D-6

FCC ID: B32UX7002W

Model No.: UX700-ML-2

Received Date: 2022/12/16

Test Date: 2023/3/22 ~ 2023/3/31

Issued Date: 2023/4/18

Applicant: Verifone, Inc.

Address: 1400 West Stanford Ranch Road Suite 150 Rocklin CA 95765 USA

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, TAIWAN

FCC Registration / 788550 / TW0003
Designation Number:



This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty.....	5
2.2 Modification Record	5
3 General Information	6
3.1 General Description of EUT	6
3.2 Description of Test Modes.....	8
3.2.1 Test Mode Applicability and Tested Channel Detail.....	10
3.3 Description of Support Units	11
3.3.1 Configuration of System under Test	12
3.4 General Description of Applied Standards	13
4 Test Types and Results	14
4.1 Radiated Emission and Bandedge Measurement.....	14
4.1.1 Limits of Radiated Emission and Bandedge Measurement	14
4.1.2 Test Instruments	15
4.1.3 Test Procedures.....	17
4.1.4 Deviation from Test Standard	18
4.1.5 Test Setup.....	18
4.1.6 EUT Operating Conditions.....	19
4.1.7 Test Results	20
4.2 Conducted Out of Band Emission Measurement.....	26
4.2.1 Limits of Conducted Out of Band Emission Measurement	26
4.2.2 Test Setup.....	26
4.2.3 Test Instruments	26
4.2.4 Test Procedure	26
4.2.5 Deviation from Test Standard	26
4.2.6 EUT Operating Condition	26
4.2.7 Test Results	27
5 Pictures of Test Arrangements	28
Appendix – Information of the Testing Laboratories	29

Release Control Record

Issue No.	Description	Date Issued
RFBCUG-WTW-P22010682D-6	Original release	2023/4/18

1 Certificate of Conformity

Product: Point of Sale Terminal

Brand: Verifone

Test Model: UX700-ML-2

Sample Status: Engineering sample

Applicant: Verifone, Inc.

Test Date: 2023/3/22 ~ 2023/3/31

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
47 CFR FCC Part 15, Subpart E (Section 15.407)
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 RF characteristics under the conditions specified in this report.

Prepared by : Gina Liu , **Date:** 2023/4/18
Gina Liu / Specialist

Approved by : Jeremy Lin , **Date:** 2023/4/18
Jeremy Lin / Project Engineer

2 Summary of Test Results

Applied Standard:	47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407)		
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/ 5/6/9)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -3.0dB at 690.57MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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) (\pm)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.99 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Point of Sale Terminal	
Brand	Verifone	
Model No.	UX700-WBU-2	
Status of EUT	Engineering sample	
Power Supply Rating	9-43Vdc, 2.4A-0.5A	
Modulation Type	WLAN	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
	BT EDR	GFSK, $\pi/4$ -DQPSK, 8DPSK
	BT LE	GFSK
Transfer Rate	WLAN	802.11b: 11/5.5/2/1 Mbps 802.11g: 54/48/36/24/18/12/9/6 Mbps 802.11a: 54/48/36/24/18/12/9/6 Mbps 802.11n: up to 72.2 Mbps (For 2.4GHz Band) 802.11n: up to 150 Mbps (For 5GHz Band) 802.11ac: up to 433.3 Mbps
	BT EDR	1/2/3Mbps
	BT LE	1Mbps
Operating Frequency	WLAN	2.4GHz: 2412 ~ 2462 MHz 5.0GHz: 5180 ~ 5320 MHz, 5500 ~ 5720 MHz, 5745 ~ 5825 MHz
	BT EDR	2402 ~ 2480 MHz
	BT LE	2402 ~ 2480 MHz
Number of Channel	WLAN	2412 ~ 2462 MHz: 802.11b, 802.11g, 802.11n (HT20): 11 5180 ~ 5240 MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5260 ~ 5320 MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5500 ~ 5720 MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 12 802.11n (HT40), 802.11ac (VHT40): 6 802.11ac (VHT80): 3 5745 ~ 5825 MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
	BT EDR	79
	BT LE	40

Output Power	WLAN	2412 ~ 2462 MHz: 38.548 mW (15.86 dBm) 5.18 GHz ~ 5.24 GHz : 32.734 mW (15.15 dBm) 5.26 GHz ~ 5.32 GHz : 39.811 mW (16 dBm) 5.5 GHz ~ 5.72 GHz : 34.674 mW (15.4 dBm) 5.745 GHz ~ 5.825 GHz : 21.478 mW (13.32 dBm)
	BT EDR	8.81 mW (9.45 dBm)
	BT LE	1.589 mW (2.01 dBm)
Antenna Type	WLAN	2.4GHz: Dipole antenna with 2.60dBi gain 5GHz: Dipole antenna with 3.60dBi gain
	BT EDR	Dipole antenna with 2.60dBi gain
	BT LE	Dipole antenna with 2.60dBi gain
Antenna Connector	ipex(MHF)	
Accessory Device	Refer to external photo	
Cable Supplied	Refer to external photo	

Note:

1. The EUT provides 1 completed transmitter and 1 receiver.

2.4 GHz Band		
Modulation Mode	Tx & Rx Configuration	
802.11b	1TX	1RX
802.11g	1TX	1RX
802.11n (HT20)	1TX	1RX
5 GHz Band		
Modulation Mode	Tx & Rx Configuration	
802.11a	1TX	1RX
802.11n (HT20)	1TX	1RX
802.11n (HT40)	1TX	1RX
802.11ac (VHT20)	1TX	1RX
802.11ac (VHT40)	1TX	1RX
802.11ac (VHT80)	1TX	1RX

2. The accessory devices of EUT, please refer to external photo.
3. 2.4GHz & BT or 5GHz & BT technology can transmit at same time.
4. Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.
5. 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

For 2412 ~ 2462MHz:

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

For 5180 ~ 5320MHz:

8 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	52	5260 MHz
40	5200 MHz	56	5280 MHz
44	5220 MHz	60	5300 MHz
48	5240 MHz	64	5320 MHz

4 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	54	5270 MHz
46	5230 MHz	62	5310 MHz

2 channels are provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz

For 5500 ~ 5720MHz:

12 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
100	5500 MHz	124	5620 MHz
104	5520 MHz	128	5640 MHz
108	5540 MHz	132	5660 MHz
112	5560 MHz	136	5680 MHz
116	5580 MHz	140	5700 MHz
120	5600 MHz	144	5720 MHz

6 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
102	5510 MHz	126	5630 MHz
110	5550 MHz	134	5670 MHz
118	5590 MHz	142	5710 MHz

3 channels are provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
106	5530 MHz	138	5690 MHz
122	5610 MHz		

For 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

2 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775 MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to			Description
	RE \geq 1G	RE<1G	OB	
-	√	√	√	-

Where RE \geq 1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz
OB: Conducted Out-Band Emission Measurement

Note: After pre-tested all adapters (Model: 2AAJ012F, 2ABL018F) and found Adapter (2ABL018F) was the worst. Therefore only Adapter (2ABL018F) was for the final test and presented in the test report.

Radiated Emission Test (Above 1 GHz):

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

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	802.11b + BT EDR	2412-2462	1 to 11	6 + 0	DSSS
		2402-2480	0 to 78		GFSK
-	802.11n (HT20) + BT EDR	5180-5240	36 to 48	36 + 0	OFDM
		2402-2480	0 to 78		GFSK

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.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	802.11b + BT EDR	2412-2462	1 to 11	6 + 0	DSSS
		2402-2480	0 to 78		GFSK
-	802.11n (HT20) + BT EDR	5180-5240	36 to 48	36 + 0	OFDM
		2402-2480	0 to 78		GFSK

Conducted Out-Band Emission Measurement:

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

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	802.11b + BT EDR	2412-2462	1 to 11	6 + 0	DSSS
		2402-2480	0 to 78		GFSK
-	802.11n (HT20) + BT EDR	5180-5240	36 to 48	36 + 0	OFDM
		2402-2480	0 to 78		GFSK

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE \geq 1G	24 deg. C, 65% RH	120Vac, 60Hz	Randy Wu
RE<1G	24 deg. C, 65% RH	120Vac, 60Hz	Randy Wu
OB	24 deg. C, 65% RH	120Vac, 60Hz	Randy Wu

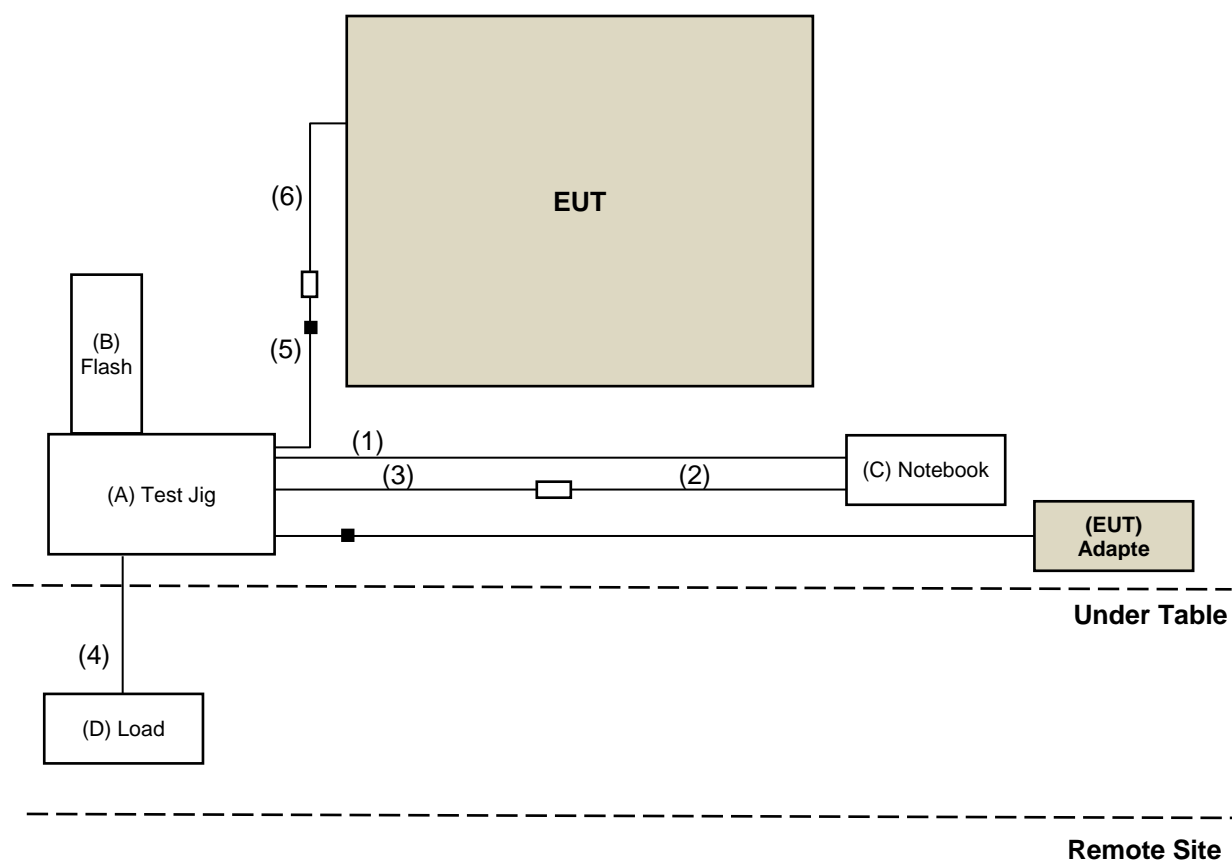
3.3 Description of Support Units

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	Test Jig	NA	NA	NA	NA	Provided by manufacturer
B	Flash	SanDisk	SDDDC3-032G	NA	NA	Provided by Lab
C	Notebook	Lenovo	20J4 MD A003TW	PF-11H9AK	NA	Provided by Lab
D	Load	NA	NA	NA	NA	-

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB Cable	1	1.0	Y	0	Supplied by applicant
2	RS232 to A Cable	1	1.0	N	0	Provided by Lab
3	LAN to RS232 Cable	1	1.0	N	0	Supplied by applicant
4	LAN Cable	1	1.5	N	0	RJ45, Cat5e
5	USB Cable	1	1.5	Y	1	Supplied by applicant
6	USB Cable	1	0.3	Y	0	Supplied by applicant

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

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

Test Standard:

FCC Part 15, Subpart C (15.247)

FCC Part 15, Subpart E (15.407)

ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 Meas Guidance v05r02

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

All test items have been performed as a reference to the above KDB test guidance.

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.

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.

Limits of unwanted emission out of the restricted bands

Applicable To			Limit	
789033 D02 General UNII Test Procedure New Rules v02r01			Field Strength at 3m	
			PK: 74 (dBμV/m)	AV: 54 (dBμV/m)
Frequency Band	Applicable To		EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)		PK: -27 (dBm/MHz)	PK: 68.2(dBμV/m)
5250~5350 MHz	15.407(b)(2)			
5470~5725 MHz	15.407(b)(3)			
5725~5850 MHz	<input checked="" type="checkbox"/>	15.407(b)(4)(i)	PK: -27 (dBm/MHz) ^{*1} PK: 10 (dBm/MHz) ^{*2} PK: 15.6 (dBm/MHz) ^{*3} PK: 27 (dBm/MHz) ^{*4}	PK: 68.2(dBμV/m) ^{*1} PK: 105.2 (dBμV/m) ^{*2} PK: 110.8(dBμV/m) ^{*3} PK: 122.2 (dBμV/m) ^{*4}
	<input type="checkbox"/>	15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
^{*1} beyond 75 MHz or more above of the band edge.			^{*2} below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.	
^{*3} below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.			^{*4} from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.	

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \text{ } \mu\text{V/m, where P is the eirp (Watts).}$$

4.1.2 Test Instruments

Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	MFA-515BSN	N/A	N/A	N/A
Bi-log Broadband Antenna Schwarzbeck	VULB9168	9168-1214	2022/10/20	2023/10/19
Loop Antenna EMCI	EM-6879	269	2022/9/19	2023/9/18
Loop Antenna TESEQ	HLA 6121	45745	2022/7/27	2023/7/26
MXA Signal Analyzer KEYSIGHT	N9020B	MY60110513	2022/12/26	2023/12/25
MXE EMI Receiver KEYSIGHT	N9038B	MY60180018	2023/2/7	2024/2/6
Pre-amplifier EMCI	EMC001340	980201	2022/9/23	2023/9/22
Pre_Amplifier EMCI	EMC330N	980798	2023/1/16	2024/1/15
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	2023/1/7	2024/1/6
	EMCCFD400-NM-NM-500	201248	2023/1/16	2024/1/15
	EMCCFD400-NM-NM-3000	201249	2023/1/16	2024/1/15
	EMCCFD400-NM-NM-9000	201251(with PAD)	2023/1/16	2024/1/15
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MFT-201SS	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802BS	MF780208676	N/A	N/A

Notes:

1. The test was performed in WM - 966 chamber 9.
2. Tested Date: 2023/3/31

Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	MFA-515BSN	N/A	N/A	N/A
Horn Antenna RFSPIN	DRH18-E	210104A18E	2022/11/13	2023/11/12
Horn Antenna Schwarzbeck	BBHA 9170	9170-1048	2022/11/13	2023/11/12
MXA Signal Analyzer KEYSIGHT	N9020B	MY60110513	2022/12/26	2023/12/25
MXE EMI Receiver KEYSIGHT	N9038B	MY60180018	2023/2/7	2024/2/6
Pre-Amplifier EMCI	EMC 012645	980115	2022/10/1	2023/9/30
Pre_Amplifier EMCI	EMC184045SE	980786	2023/1/16	2024/1/15
RF Coaxial Cable EMCI	EMC101G-KM-KM- 2000	201253	2023/1/16	2024/1/15
	EMC101G-KM-KM- 3000	201258	2023/1/16	2024/1/15
	EMC101G-KM-KM- 5000	201261	2023/1/16	2024/1/15
	EMC104-SM-SM-1000	210103	2023/1/16	2024/1/15
	EMC104-SM-SM-3000	201232	2023/1/16	2024/1/15
	EMC104-SM-SM-9000	201244	2023/1/16	2024/1/15
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MFT-201SS	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802BS	MF780208676	N/A	N/A

Notes:

1. The test was performed in WM - 966 chamber 9.
2. Tested Date: 2023/3/22

4.1.3 Test Procedures

For Radiated emission below 30MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- 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.
- 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:

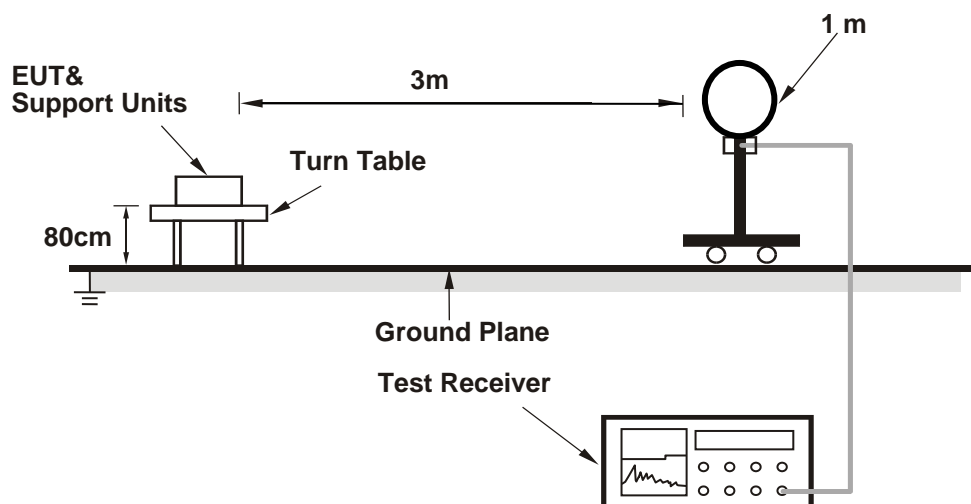
- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
- 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. (For 5G 802.11n (HT20): RBW = 1MHz, VBW = 1kHz, For 2.4G 802.11b: RBW = 1MHz, VBW = 10Hz)
- For BT: Fundamental frequency and band edge & harmonic:
The average value of fundamental frequency is :average value = peak value + $20 \cdot \log(\text{Duty cycle})$ where the duty cycle correction factor is calculated from following formula:
 $20 \cdot \log(\text{Duty cycle}) = 20 \cdot \log(0.029) = -30.8 \text{ dB}$, please refer to the plotted duty.
- All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

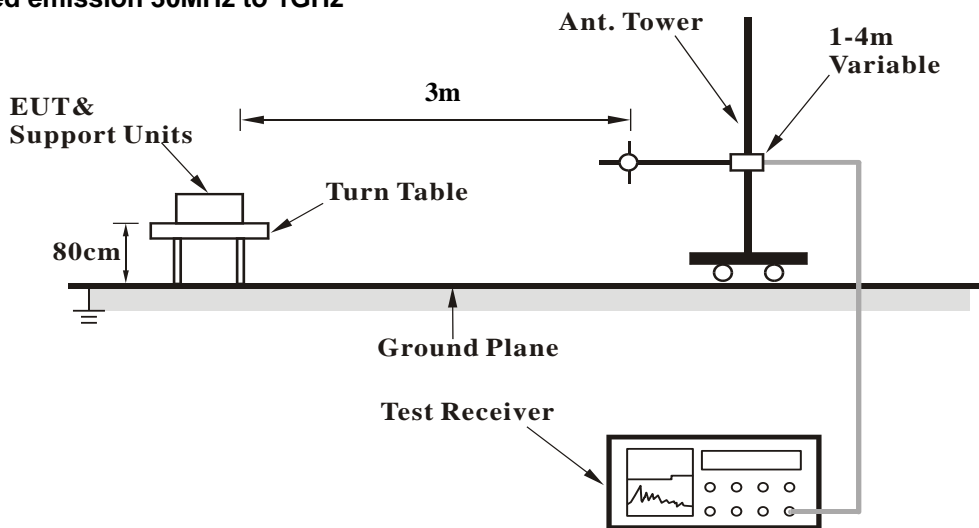
No deviation.

4.1.5 Test Setup

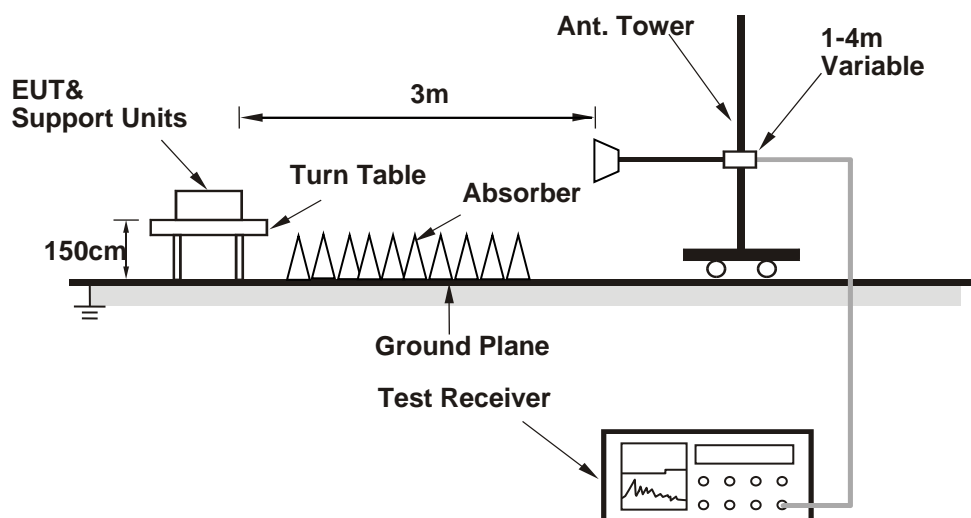
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

RF Mode	TX 802.11b + BT EDR	Channel	CH 6 : 2437 MHz + CH 0 : 2402 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (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	58.1 PK	74.0	-15.9	1.18 H	85	25.4	32.7
2	2390.00	44.2 AV	54.0	-9.8	1.18 H	85	11.5	32.7
3	*2402.00	70.6 PK			1.18 H	85	74.3	-3.7
4	*2402.00	39.8 AV			1.18 H	85	43.5	-3.7
5	*2437.00	112.4 PK			1.00 H	92	79.7	32.7
6	*2437.00	108.7 AV			1.00 H	92	76.0	32.7
7	4804.00	47.2 PK	74.0	-26.8	1.21 H	52	43.6	3.6
8	4804.00	16.4 AV	54.0	-37.6	1.21 H	52	12.8	3.6
9	4874.00	49.0 PK	74.0	-25.0	1.02 H	52	45.3	3.7
10	4874.00	39.1 AV	54.0	-14.9	1.02 H	52	35.4	3.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (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	57.8 PK	74.0	-16.2	1.66 V	82	25.1	32.7
2	2390.00	44.0 AV	54.0	-10.0	1.66 V	82	11.3	32.7
3	*2402.00	96.6 PK			1.66 V	82	64.0	32.6
4	*2402.00	65.8 AV			1.66 V	82	33.2	32.6
5	*2437.00	102.0 PK			1.04 V	122	69.3	32.7
6	*2437.00	98.8 AV			1.04 V	122	66.1	32.7
7	4804.00	47.6 PK	74.0	-26.4	1.55 V	63	44.0	3.6
8	4804.00	17.1 AV	54.0	-36.9	1.55 V	63	13.5	3.6
9	4874.00	49.1 PK	74.0	-24.9	1.24 V	255	45.4	3.7
10	4874.00	39.3 AV	54.0	-14.7	1.24 V	255	35.6	3.7

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. For BT: The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
20 log(Duty cycle) = 20 log(2.9 ms / 100 ms) = -30.8 dB

RF Mode	TX 802.11n (HT20) + BT EDR	Channel	CH 36 : 5180 MHz + CH 0 : 2402 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (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	58.1 PK	74.0	-15.9	1.22 H	87	25.4	32.7
2	2390.00	44.0 AV	54.0	-10.0	1.22 H	87	11.3	32.7
3	*2402.00	107.3 PK			1.22 H	87	74.7	32.6
4	*2402.00	76.5 AV			1.22 H	87	43.9	32.6
5	4804.00	47.1 PK	74.0	-26.9	1.33 H	58	43.5	3.6
6	4804.00	16.3 AV	54.0	-37.7	1.33 H	58	12.7	3.6
7	5150.00	68.8 PK	74.0	-5.2	1.00 H	41	65.2	3.6
8	5150.00	50.8 AV	54.0	-3.2	1.00 H	41	47.2	3.6
9	*5180.00	109.7 PK			1.00 H	41	68.5	41.2
10	*5180.00	101.9 AV			1.00 H	41	60.7	41.2
11	#10360.00	56.3 PK			1.22 H	52	47.6	8.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (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	58.0 PK	74.0	-16.0	1.58 V	93	25.3	32.7
2	2390.00	44.0 AV	54.0	-10.0	1.58 V	93	11.3	32.7
3	*2402.00	96.6 PK			1.58 V	93	64.0	32.6
4	*2402.00	65.8 AV			1.58 V	93	33.2	32.6
5	4804.00	47.0 PK	74.0	-27.0	1.52 V	96	43.4	3.6
6	4804.00	16.2 AV	54.0	-37.8	1.52 V	96	12.6	3.6
7	5150.00	64.0 PK	74.0	-10.0	1.00 V	92	60.4	3.6
8	5150.00	50.4 AV	54.0	-3.6	1.00 V	92	46.8	3.6
9	*5180.00	106.6 PK			1.00 V	92	65.4	41.2
10	*5180.00	99.5 AV			1.00 V	92	58.3	41.2
11	#10360.00	55.8 PK			1.04 V	88	47.1	8.7

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.
5. " * " : Fundamental frequency.
6. For BT: The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
20 log(Duty cycle) = 20 log(2.9 ms / 100 ms) = -30.8 dB
7. " # " : The radiated frequency is out of the restricted band, the limit was restricted at the Conducted Out of Band Emissions.

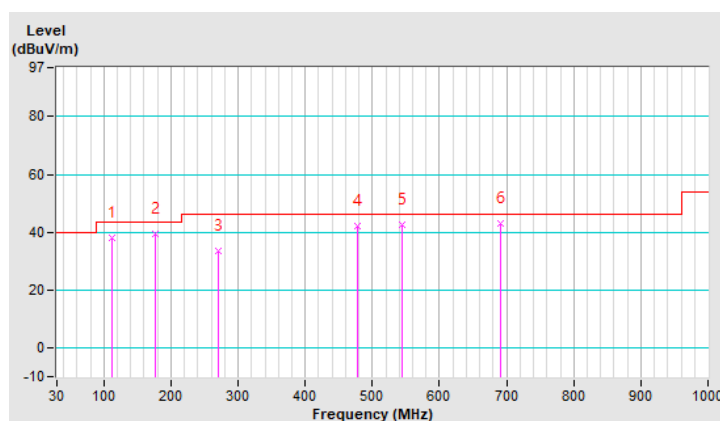
Below 1GHz data

RF Mode	TX 802.11b + BT EDR	Channel	CH 6 : 2437 MHz + CH 0 : 2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	111.48	38.0 QP	43.5	-5.5	1.49 H	207	53.6	-15.6
2	176.47	39.4 QP	43.5	-4.1	1.49 H	286	53.0	-13.6
3	269.59	33.5 QP	46.0	-12.5	1.49 H	143	46.7	-13.2
4	477.17	42.2 QP	46.0	-3.8	1.99 H	296	50.1	-7.9
5	544.10	42.7 QP	46.0	-3.3	1.49 H	292	49.7	-7.0
6	690.57	43.0 QP	46.0	-3.0	1.00 H	293	47.2	-4.2

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

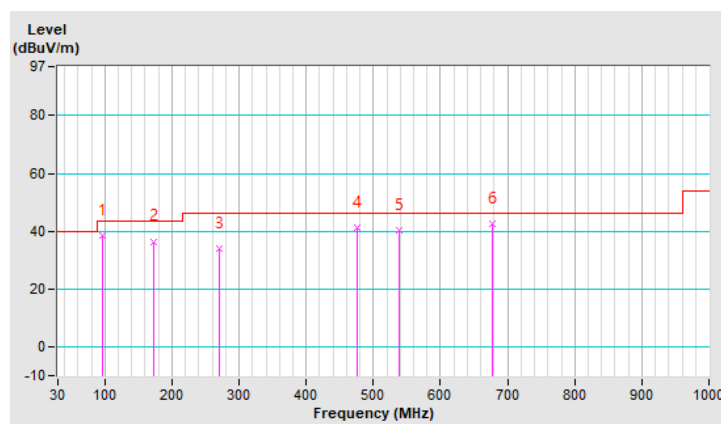


RF Mode	TX 802.11b + BT EDR	Channel	CH 6 : 2437 MHz + CH 0 : 2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	95.96	38.3 QP	43.5	-5.2	2.00 V	124	56.1	-17.8
2	172.59	36.5 QP	43.5	-7.0	1.01 V	218	49.7	-13.2
3	269.59	33.8 QP	46.0	-12.2	1.51 V	177	47.0	-13.2
4	476.20	41.3 QP	46.0	-4.7	1.01 V	100	49.2	-7.9
5	538.28	40.3 QP	46.0	-5.7	1.01 V	139	47.3	-7.0
6	677.96	42.7 QP	46.0	-3.3	1.01 V	5	47.1	-4.4

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

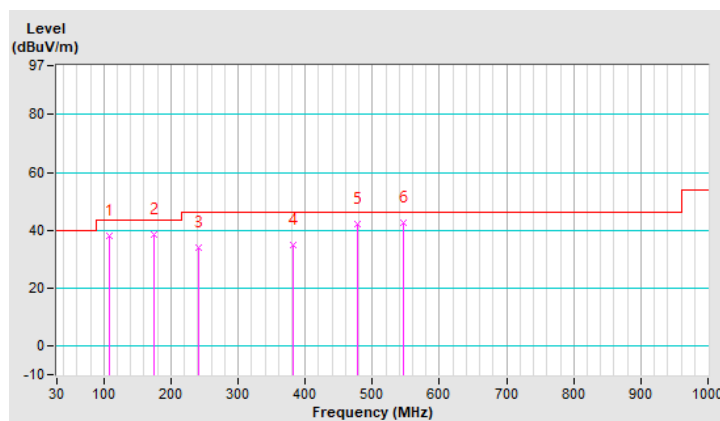


RF Mode	TX 802.11n (HT20) + BT EDR	Channel	CH 36 : 5180 MHz + CH 0 : 2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	108.57	38.2 QP	43.5	-5.3	1.51 H	214	54.0	-15.8
2	174.53	38.5 QP	43.5	-5.0	1.01 H	249	51.8	-13.3
3	240.49	33.8 QP	46.0	-12.2	1.01 H	129	48.0	-14.2
4	382.11	34.8 QP	46.0	-11.2	1.01 H	304	45.0	-10.2
5	477.17	42.2 QP	46.0	-3.8	2.00 H	284	50.1	-7.9
6	547.01	42.8 QP	46.0	-3.2	1.51 H	292	49.6	-6.8

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

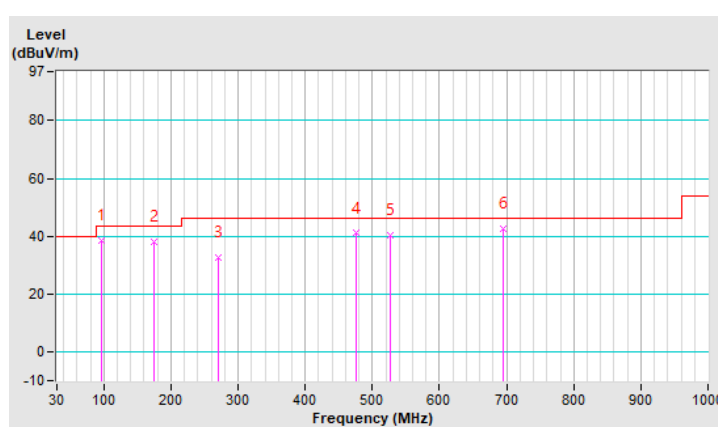


RF Mode	TX 802.11n (HT20) + BT EDR	Channel	CH 36 : 5180 MHz + CH 0 : 2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	95.96	38.6 QP	43.5	-4.9	1.99 V	151	56.4	-17.8
2	175.50	38.1 QP	43.5	-5.4	1.00 V	284	51.6	-13.5
3	269.59	32.6 QP	46.0	-13.4	1.99 V	5	45.8	-13.2
4	475.23	41.0 QP	46.0	-5.0	1.00 V	106	48.9	-7.9
5	527.61	40.3 QP	46.0	-5.7	1.00 V	130	47.4	-7.1
6	694.45	42.5 QP	46.0	-3.5	1.00 V	2	46.5	-4.0

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Out of Band Emission Measurement

4.2.1 Limits of Conducted Out of Band Emission Measurement

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

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW \geq 300 kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

4.2.5 Deviation from Test Standard

No deviation.

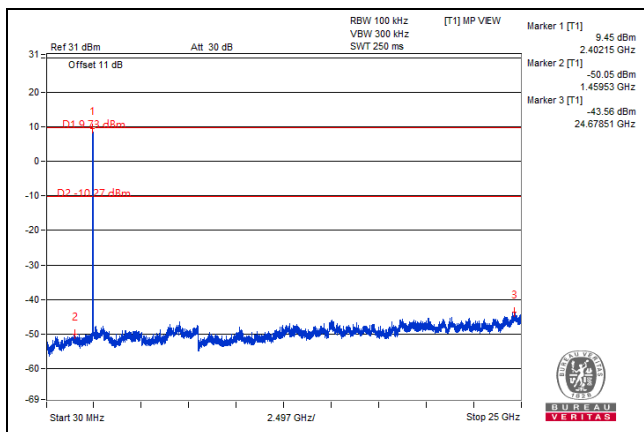
4.2.6 EUT Operating Condition

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

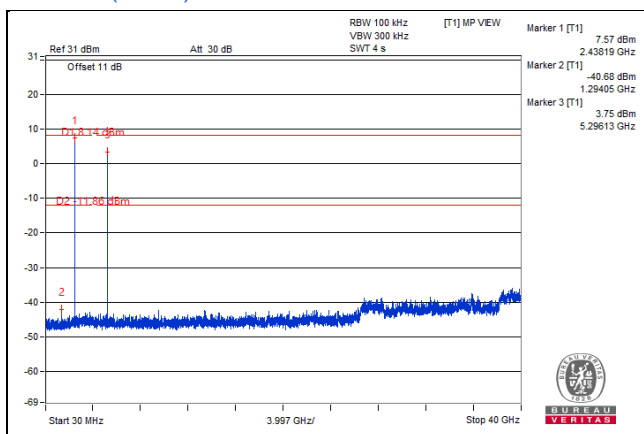
4.2.7 Test Results

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.

802.11b + BT EDR



802.11n (HT20) + BT EDR



5 Pictures of Test Arrangements

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

Appendix – Information of 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 FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety

Tel: 886-3-3183232

Fax: 886-3-3270892

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.

--- END ---