

Supplemental “Transmit Simultaneously” Test Report

Report No.: RF180614E09-4

FCC ID: PY318100406

Test Model: Otter

Received Date: June 14, 2018

Test Date: June 29 to July 07, 2018

Issued Date: July 19, 2018

Applicant: NETGEAR, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 723255 / TW2022



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Release Control Record

Issue No.	Description	Date Issued
RF180614E09-4	Original release.	July 19, 2018

1 Certificate of Conformity

Product: WiFi Device

Brand: NETGEAR

Test Model: Otter

Sample Status: ENGINEERING SAMPLE

Applicant: NETGEAR, Inc.

Test Date: June 29 to July 07, 2018

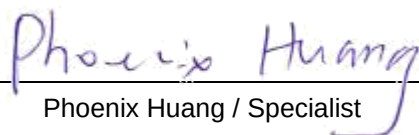
Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)

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 EMC characteristics under the conditions specified in this report.

Prepared by :


Phoenix Huang / Specialist

Date:

July 19, 2018

Approved by :


May Chen / Manager

Date:

July 19, 2018

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C, E (SECTION 15.247, 15.407)			
FCC Clause	Test Item	Result	Remarks
15.207 15.407(b)(6)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -21.65dB at 12.19141MHz.
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.9dB at 4874.00MHz.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.53 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.08 dB
	6GHz ~ 18GHz	4.98 dB
	18GHz ~ 40GHz	5.19 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	WiFi Device
Brand	NETGEAR
Test Model	Otter
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	19Vdc from power adapter
Modulation Type	WLAN: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode only BT-EDR: GFSK, $\pi/4$ -DQPSK, 8DPSK BT-LE: GFSK
Modulation Technology	WLAN: DSSS, OFDM BT-EDR: FHSS BT-LE: DTS
Transfer Rate	WLAN: 802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 600Mbps 802.11ac: up to 866.7Mbps BT-EDR: up to 3Mbps BT-LE: up to 1Mbps
Operating Frequency	WLAN: 2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.18 ~ 5.24GHz, 5.745 ~ 5.825GHz BT-EDR: 2.402 ~ 2.480GHz BT-LE: 2.402 ~ 2.480GHz
Number of Channel	WLAN: 2.4GHz: 802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 9 802.11n (HT40), 802.11ac (VHT40): 4 802.11ac (VHT80): 2 BT-EDR: 79 BT-LE: 40
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x1
Data Cable Supplied	NA

Note:

1. There are WLAN and Bluetooth technology used for the EUT. The EUT has below radios as following table:

Radio 1	Radio 2	Radio 3
WLAN (2.4GHz) + WLAN (5GHz HB)	WLAN (5GHz LB)	Bluetooth

2. Simultaneously transmission condition.

Condition	Technology
1	WLAN (2.4GHz) + WLAN (5GHz) + Bluetooth

3. The EUT could be supplied from a power adapter as following table:

No.	Brand	Model No.	P/N	Spec.
1	NETGEAR	AD2003F10	332-11039-01	Input: 100-120Vac, 1.5A, 50/60Hz Output: 19V, 3.16A DC output cable (unshielded, 1.8m)
2	NETGEAR	2ABS060K 1 NJ	332-11043-01	Input: 100-120Vac, 1.7A, 50/60Hz Output: 19V, 3.16A DC output cable (unshielded, 1.8m)

Note: From the above models, the worst radiated emission test was found in **Adapter 2**. Therefore only the test data of the modes were recorded in this report.

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

For WLAN					
Antenna No.	Ant. Gain (dBi) (include cable loss)	Frequency range (GHz)	Antenna Type	Connector Type	Cable Length (mm)
Dual band (Black)	3.46	2.4 ~ 2.4835	Dipole	i-pex(MHF)	214
	2.99	5.15~5.25			
	2.99	5.25~5.35			
Dual band (Red)	2.73	2.4 ~ 2.4835	Dipole	i-pex(MHF)	156
	2.44	5.15~5.25			
	2.44	5.25~5.35			
5G Antenna (Blue)	3.31	5.47~5.725	Dipole	i-pex(MHF)	125
	2.65	5.725~5.85			
5G Antenna (Yellow)	2.26	5.47~5.725	Dipole	i-pex(MHF)	70
	3.24	5.725~5.85			
For Bluetooth					
Antenna No.	Ant. Gain (dBi) (include cable loss)	Frequency range (GHz)	Antenna Type	Connector Type	Cable Length (mm)
Antenna (White)	3.32	2.4 ~ 2.5	PIFA	i-pex(MHF)	200

5. The EUT incorporates a MIMO function.

2.4GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	2TX	2RX
802.11g	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
5GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT20)	MCS0~8 Nss=1	2TX	2RX
	MCS0~8 Nss=2	2TX	2RX
802.11ac (VHT40)	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX
802.11ac (VHT80)	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX

Note: All of modulation mode support beamforming function except 802.11a/b/g modulation mode.

6. 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.

3.1.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	OB	
1	√	√	√	√	With Adapter 2
2	-	-	√	-	With Adapter 1

Where **RE≥1G**: Radiated Emission above 1GHz

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

OB: Conducted Out-Band Emission Measurement

Note: "-" means no effect.

Radiated Emission Test (Above 1GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
802.11b +	1 to 11	6	OFDMA	BPSK
802.11a +	36 to 48	40	OFDMA	BPSK
802.11ac (VHT40) +	149 to 165	159	OFDM	BPSK
BT-LE	0 to 39	39	DTS	GFSK

Radiated Emission Test (Below 1GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
802.11b +	1 to 11	6	OFDMA	BPSK
802.11a +	36 to 48	40	OFDMA	BPSK
802.11ac (VHT40) +	149 to 165	159	OFDM	BPSK
BT-LE	0 to 39	39	DTS	GFSK

Power Line Conducted Emission Test:

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
802.11b +	1 to 11	6	OFDMA	BPSK
802.11a +	36 to 48	40	OFDMA	BPSK
802.11ac (VHT40) +	149 to 165	159	OFDM	BPSK
BT-LE	0 to 39	39	DTS	GFSK

Conducted Out-Band Emission Measurement:

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
802.11b + 802.11a	1 to 11	6	OFDMA	BPSK
	36 to 48	40	OFDMA	BPSK

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE $\geq$ 1G	22deg. C, 67%RH	120Vac, 60Hz	Andy Ho
RE<1G	22deg. C, 68%RH	120Vac, 60Hz	Andy Ho
PLC	25deg. C, 75%RH	120Vac, 60Hz	Andy Ho
	23deg. C, 74%RH		
OB	21deg. C, 60%RH	120Vac, 60Hz	Nick Chen

3.2 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.

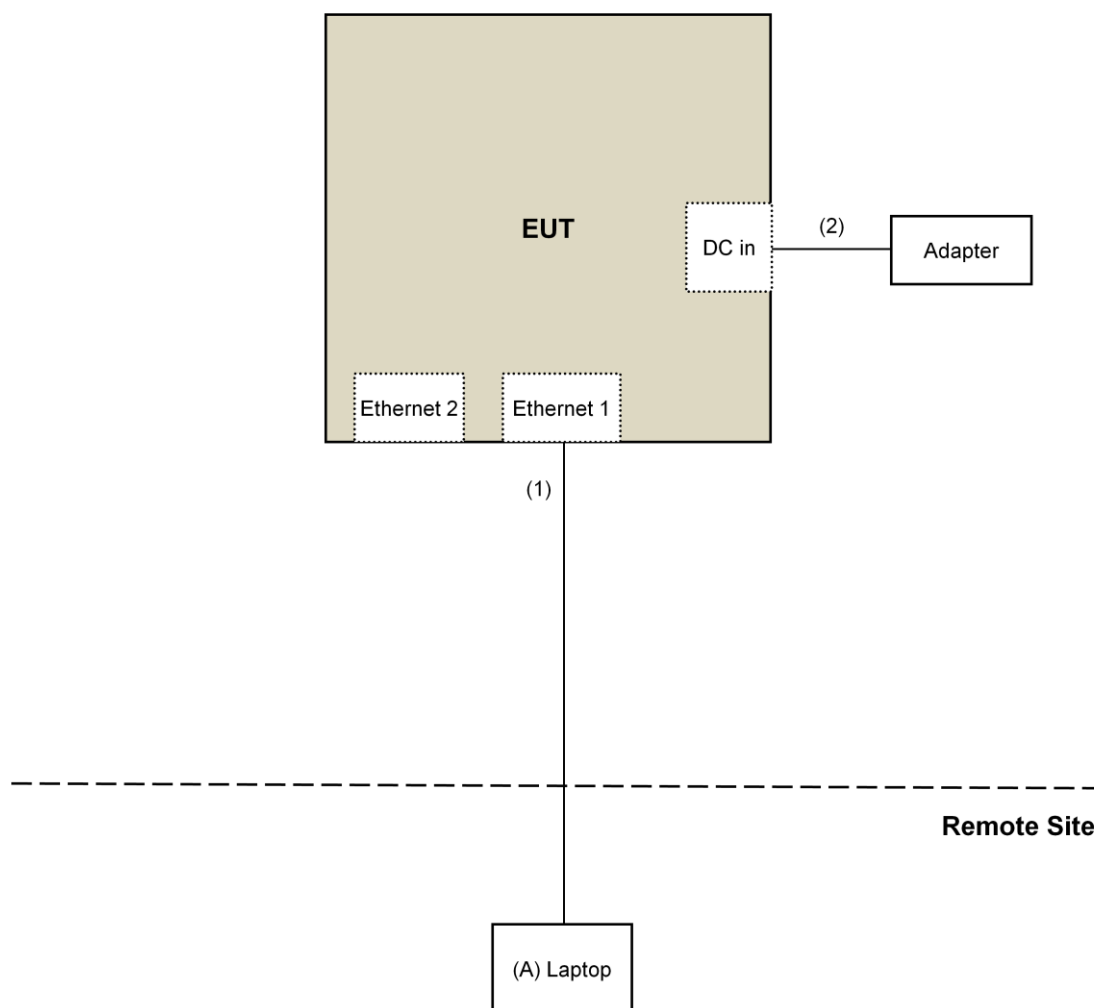
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab

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.	RJ-45 Cable	1	10	No	0	Provided by Lab
2.	DC Cable	1	1.8	No	0	Supplied by client

3.2.1 Configuration of System under Test



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:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 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 (dBuV/m)	AV:54 (dBuV/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(dBuV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	☒ 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(dBuV/m) ^{*1} PK:105.2 (dBuV/m) ^{*2} PK: 110.8(dBuV/m) ^{*3} PK:122.2 (dBuV/m) ^{*4}
	☐ 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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	July 12, 2017	July 11, 2018
Pre-Amplifier EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna ^(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 15, 2018	Jan. 14, 2019
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	May 05, 2018	May 04, 2019
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-3-1 966-3-2 966-3-3	Mar. 20, 2018	Mar. 19, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Oct. 03, 2017	Oct. 02, 2018
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160922 150317 150322	Jan. 29, 2018	Jan. 28, 2019
Spectrum Analyzer Keysight	N9030A	MY54490679	July 25, 2017	July 24, 2018
Pre-Amplifier EMCI	EMC184045SE	980386	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
RF Cable	EMC102-KM-KM-1200	160924	Jan. 29, 2018	Jan. 28, 2019
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The CANADA Site Registration No. is 20331-1
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: July 04 to 07, 2018

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. 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.
- 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. 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.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz

- a. 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.
- 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 detects 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:

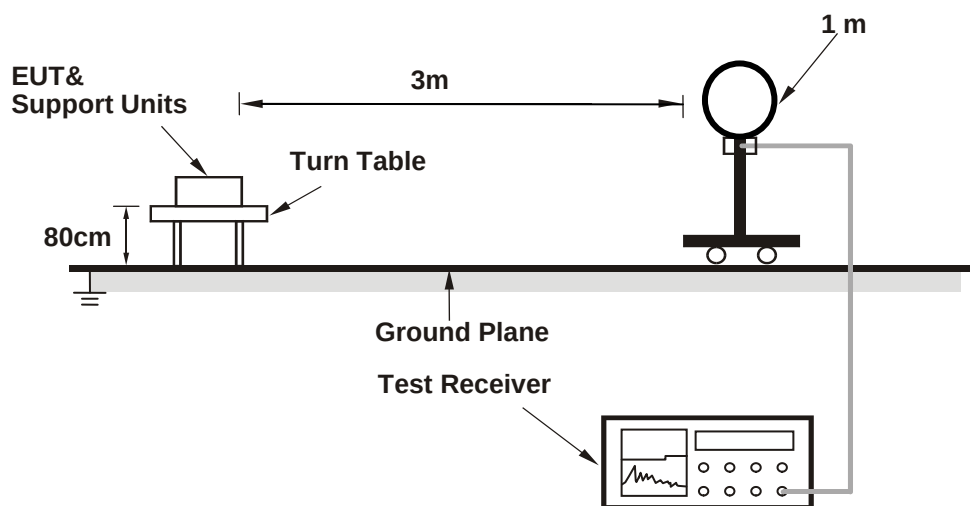
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

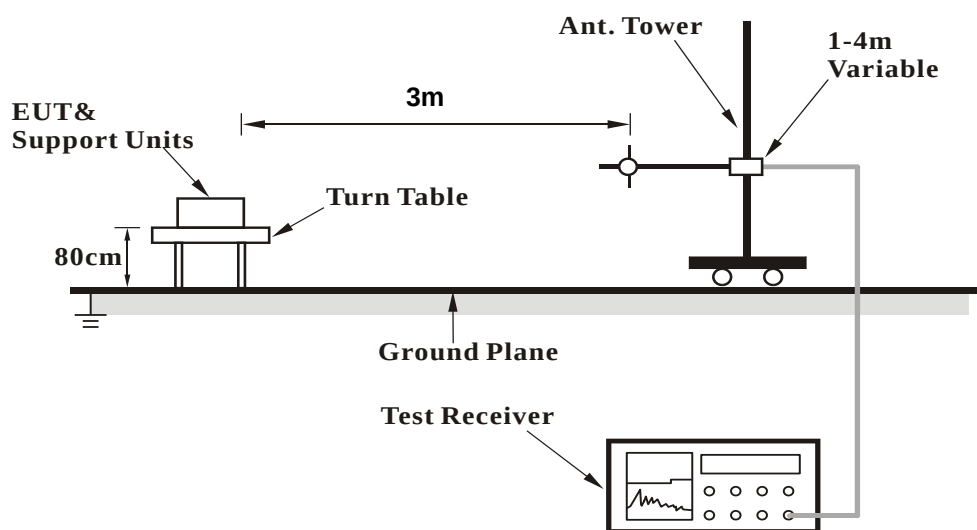
No deviation.

4.1.5 Test Setup

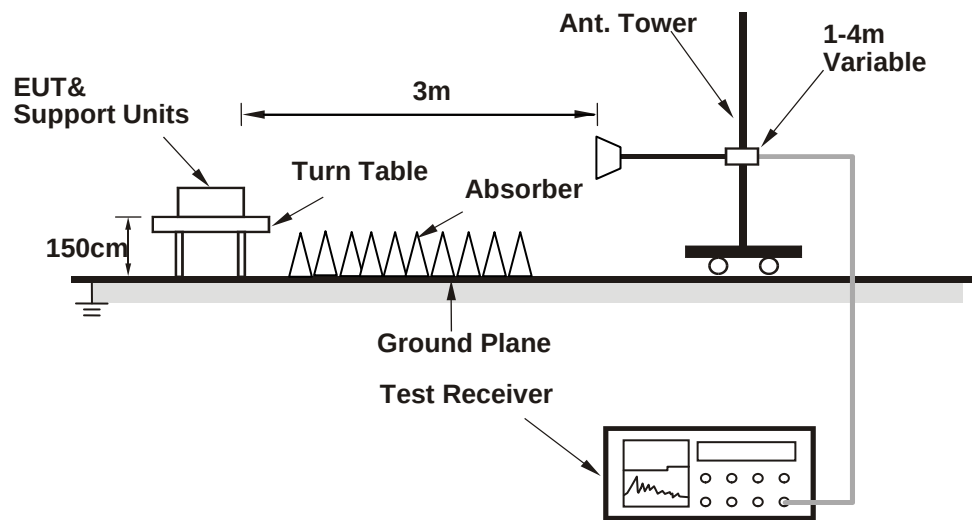
For Radiated emission below 30MHz



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

- Connected the EUT with the Laptop which is placed on remote site.
- Controlling software (WiFi: QDART-Connectivity (1.0.40) / BT: telnet pasted BT.txt command) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data

FREQUENCY RANGE	1GHz ~ 40GHz	DETECTOR FUNCTION	Peak (PK) 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	4874.00	51.4 PK	74.0	-22.6	2.76 H	146	49.8	1.6
2	4874.00	49.8 AV	54.0	-4.2	2.76 H	146	48.2	1.6
3	4960.00	40.3 PK	74.0	-33.7	1.33 H	61	38.4	1.9
4	4960.00	33.5 AV	54.0	-20.5	1.33 H	61	31.6	1.9
5	7311.00	52.2 PK	74.0	-21.8	1.43 H	273	44.5	7.7
6	7311.00	48.3 AV	54.0	-5.7	1.43 H	273	40.6	7.7
7	7440.00	50.1 PK	74.0	-23.9	1.94 H	38	42.2	7.9
8	7440.00	41.9 AV	54.0	-12.1	1.94 H	38	34.0	7.9
9	#10400.00	48.3 PK	74.0	-25.7	1.56 H	200	36.1	12.2
10	#10400.00	36.0 AV	54.0	-18.0	1.56 H	200	23.8	12.2
11	11590.00	51.3 PK	74.0	-22.7	1.01 H	252	38.9	12.4
12	11590.00	39.8 AV	54.0	-14.2	1.01 H	252	27.4	12.4
13	15600.00	48.4 PK	74.0	-25.6	1.55 H	218	35.5	12.9
14	15600.00	37.3 AV	54.0	-16.7	1.55 H	218	24.4	12.9
15	#17385.00	55.6 PK	74.0	-18.4	1.37 H	181	39.4	16.2
16	#17385.00	43.1 AV	54.0	-10.9	1.37 H	181	26.9	16.2

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	4874.00	54.5 PK	74.0	-19.5	1.43 V	159	52.9	1.6
2	4874.00	53.1 AV	54.0	-0.9	1.43 V	159	51.5	1.6
3	4960.00	45.6 PK	74.0	-28.4	1.80 V	156	43.7	1.9
4	4960.00	37.7 AV	54.0	-16.3	1.80 V	156	35.8	1.9
5	7311.00	55.9 PK	74.0	-18.1	1.32 V	207	48.2	7.7
6	7311.00	52.3 AV	54.0	-1.7	1.32 V	207	44.6	7.7
7	7440.00	51.9 PK	74.0	-22.1	1.27 V	174	44.0	7.9
8	7440.00	43.4 AV	54.0	-10.6	1.27 V	174	35.5	7.9
9	#10400.00	46.3 PK	74.0	-27.7	1.45 V	148	34.1	12.2
10	#10400.00	35.0 AV	54.0	-19.0	1.45 V	148	22.8	12.2
11	11590.00	50.1 PK	74.0	-23.9	1.70 V	85	37.7	12.4
12	11590.00	38.8 AV	54.0	-15.2	1.70 V	85	26.4	12.4
13	15600.00	47.3 PK	74.0	-26.7	1.54 V	228	34.4	12.9
14	15600.00	36.0 AV	54.0	-18.0	1.54 V	228	23.1	12.9
15	#17385.00	54.4 PK	74.0	-19.6	1.48 V	162	38.2	16.2
16	#17385.00	40.8 AV	54.0	-13.2	1.48 V	162	24.6	16.2

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " # ": The radiated frequency is out of the restricted band.

Below 1GHz Data:

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
------------------------	-------------	--------------------------	-----------------

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	125.05	38.4 QP	43.5	-5.1	2.40 H	171	47.7	-9.3
2	270.33	32.6 QP	46.0	-13.4	3.00 H	141	40.6	-8.0
3	466.50	37.6 QP	46.0	-8.4	2.43 H	226	40.3	-2.7
4	570.30	33.8 QP	46.0	-12.2	1.50 H	264	34.5	-0.7
5	760.01	26.9 QP	46.0	-19.1	1.50 H	291	23.5	3.4
6	780.01	27.9 QP	46.0	-18.1	1.50 H	238	24.2	3.7
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	38.22	29.4 QP	40.0	-10.6	1.00 V	331	37.9	-8.5
2	270.30	41.2 QP	46.0	-4.8	1.00 V	56	49.2	-8.0
3	344.26	39.3 QP	46.0	-6.7	1.10 V	241	45.1	-5.8
4	491.72	41.3 QP	46.0	-4.7	1.24 V	59	43.5	-2.2
5	760.00	42.1 QP	46.0	-3.9	1.52 V	271	38.7	3.4
6	766.66	33.4 QP	46.0	-12.6	1.42 V	73	29.8	3.6

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	Nov. 01, 2017	Oct. 31, 2018
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Nov. 15, 2017	Nov. 14, 2018
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 04, 2018	June 03, 2019
50 ohms Terminator	N/A	EMC-02	Sep. 22, 2017	Sep. 21, 2018
RF Cable	5D-FB	COCCAB-001	Sep. 29, 2017	Sep. 28, 2018
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 16, 2018	Mar. 15, 2019
Software BVADT	BVADT_Cond_ V7.3.7.4	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 Conduction 1.
3. Tested Date: June 29 to July 04, 2018

4.2.3 Test Procedures

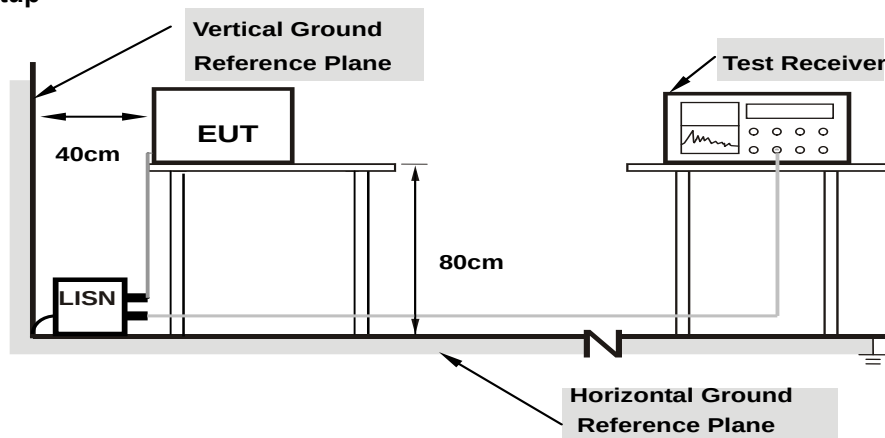
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

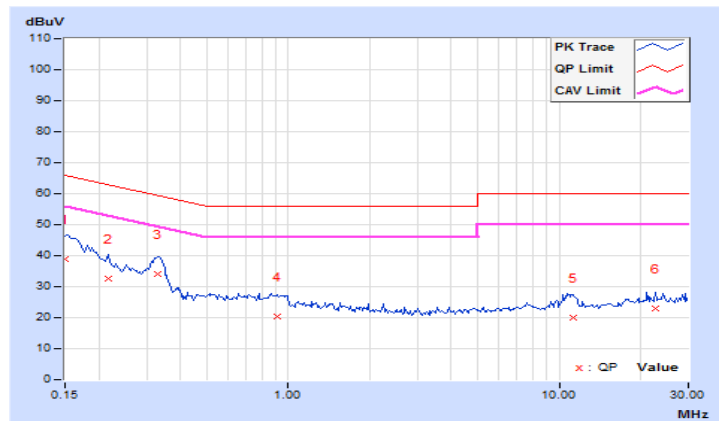
4.2.7 Test Results (Mode 1)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBUV)		Emission Level (dBUV)		Limit (dBUV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.05	28.96	10.34	39.01	20.39	66.00	56.00	-26.99	-35.61
2	0.21641	10.07	22.63	7.62	32.70	17.69	62.96	52.96	-30.26	-35.27
3	0.32969	10.10	23.84	13.10	33.94	23.20	59.46	49.46	-25.52	-26.26
4	0.91563	10.16	10.30	2.67	20.46	12.83	56.00	46.00	-35.54	-33.17
5	11.26563	10.80	9.27	-1.20	20.07	9.60	60.00	50.00	-39.93	-40.40
6	22.64063	11.43	11.43	5.57	22.86	17.00	60.00	50.00	-37.14	-33.00

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

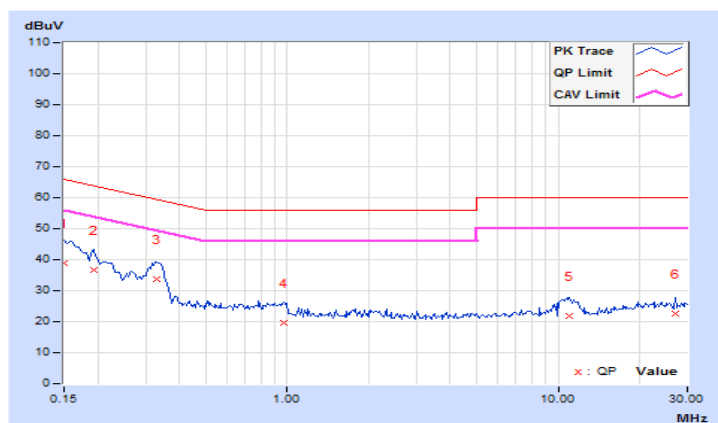


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.95	29.01	10.28	38.96	20.23	66.00	56.00	-27.04	-35.77
2	0.19297	9.97	26.52	9.94	36.49	19.91	63.91	53.91	-27.42	-34.00
3	0.32969	10.00	23.72	13.32	33.72	23.32	59.46	49.46	-25.74	-26.14
4	0.97031	10.04	9.74	2.43	19.78	12.47	56.00	46.00	-36.22	-33.53
5	11.00000	10.60	11.09	1.04	21.69	11.64	60.00	50.00	-38.31	-38.36
6	27.16797	11.26	11.20	4.43	22.46	15.69	60.00	50.00	-37.54	-34.31

Remarks:

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



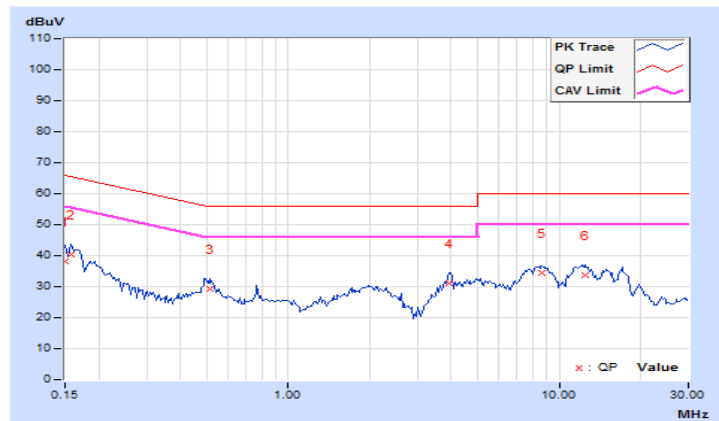
4.2.8 Test Results (Mode 2)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBUV)		Emission Level (dBUV)		Limit (dBUV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.05	28.20	10.75	38.25	20.80	66.00	56.00	-27.75	-35.20
2	0.15781	10.05	30.21	15.16	40.26	25.21	65.58	55.58	-25.32	-30.37
3	0.51328	10.13	19.30	10.57	29.43	20.70	56.00	46.00	-26.57	-25.30
4	3.94922	10.34	20.66	12.22	31.00	22.56	56.00	46.00	-25.00	-23.44
5	8.67188	10.63	23.69	17.48	34.32	28.11	60.00	50.00	-25.68	-21.89
6	12.48438	10.88	22.86	17.33	33.74	28.21	60.00	50.00	-26.26	-21.79

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

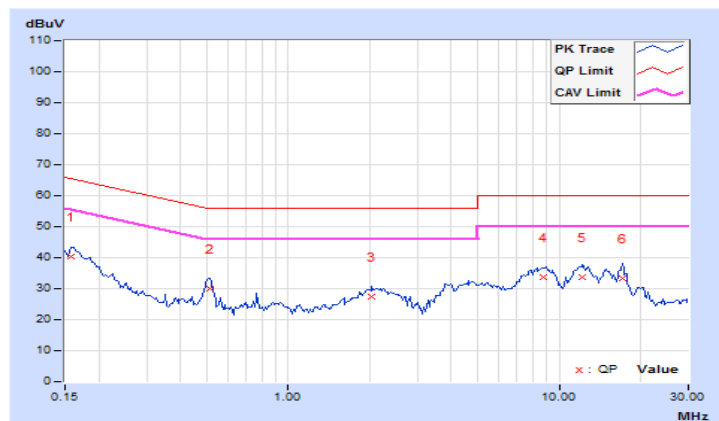


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	9.96	30.55	13.19	40.51	23.15	65.58	55.58	-25.07	-32.43
2	0.51719	10.02	20.08	11.48	30.10	21.50	56.00	46.00	-25.90	-24.50
3	2.03125	10.10	17.28	11.55	27.38	21.65	56.00	46.00	-28.62	-24.35
4	8.70313	10.46	23.42	17.78	33.88	28.24	60.00	50.00	-26.12	-21.76
5	12.19141	10.68	23.17	17.67	33.85	28.35	60.00	50.00	-26.15	-21.65
6	17.08984	10.99	22.31	16.79	33.30	27.78	60.00	50.00	-26.70	-22.22

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

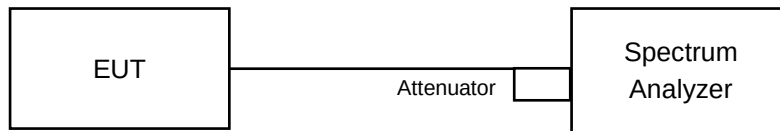


4.3 Conducted Out of Band Emission Measurement

4.3.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

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

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. 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.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

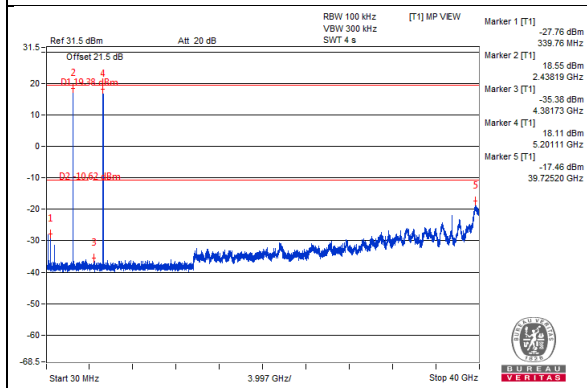
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Results

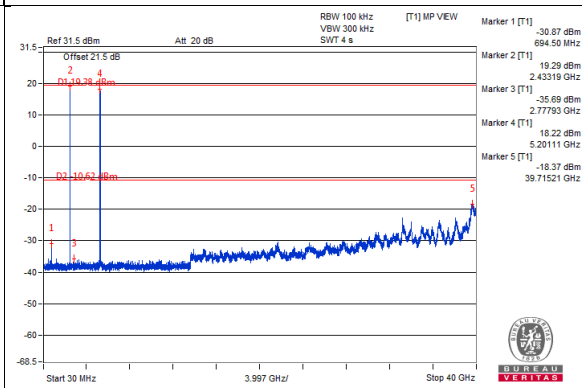
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

2.4GHz_802.11b CH6+5GHz_802.11a CH40

Chain 0



Chain 1



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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Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

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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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