

FCC Test Report

(Co-Located)

Report No.: RFBFPJ-WTW-P20090576-3

FCC ID: SWX-USWMC

Contains FCC ID: SWX-HL7800

Test Model: USW-Mission-Critical

Received Date: Sep. 25, 2020

Test Date: Feb. 08, 2021 ~ Feb. 18, 2021

Issued Date: Mar. 08, 2021

Applicant: Ubiquiti Inc.

Address: 685 Third Avenue, New York, New York 10017 USA

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

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

**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBFPJ-WTW-P20090576-3	Original Release	Mar. 08, 2021

1 Certificate of Conformity

Product: UniFi Network Mission Critical

Brand:  or  or 

Test Model: USW-Mission-Critical

Sample Status: Engineering Sample

Applicant: Ubiquiti Inc.

Test Date: Feb. 08, 2021 ~ Feb. 18, 2021

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

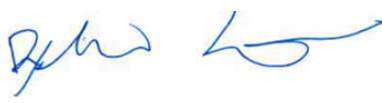
ANSI C63.10:2013

FCC Part 24, Subpart E

FCC Part 27, Subpart C, H, F, L

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 :  , **Date:** Mar. 08, 2021
Vera Huang / Specialist

Approved by :  , **Date:** Mar. 08, 2021
Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013 FCC Part 24, Subpart E FCC Part 27, Subpart C, H, F, L			
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -1.4 dB at 61.60 MHz & 61.04 MHz
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -19.3 dB at 60.07 MHz.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -22.3 dB at 51.34 MHz.

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) (±)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	UniFi Network Mission Critical				
Brand					
Test Model (HVIN)	USW-Mission-Critical				
Status of EUT	Engineering Sample				
Power Supply Rating	100 – 240 Vac 48 Vdc (DC power supply)				
Modulation Type	LTE	QPSK, 16QAM			
	BT LE	GFSK			
Operating Frequency	LTE	LTE Band 2	Channel Bandwidth: 1.4 MHz	1850.7 ~ 1909.3 MHz	
			Channel Bandwidth: 3 MHz	1851.5 ~ 1908.5 MHz	
			Channel Bandwidth: 5 MHz	1852.5 ~ 1907.5 MHz	
			Channel Bandwidth: 10 MHz	1855.0 ~ 1905.0 MHz	
			Channel Bandwidth: 15 MHz	1857.5 ~ 1902.5 MHz	
			Channel Bandwidth: 20 MHz	1860.0 ~ 1900.0 MHz	
		LTE Band 4	Channel Bandwidth: 1.4 MHz	1710.7 ~ 1754.3 MHz	
			Channel Bandwidth: 3 MHz	1711.5 ~ 1753.5 MHz	
			Channel Bandwidth: 5 MHz	1712.5 ~ 1752.5 MHz	
			Channel Bandwidth: 10 MHz	1715.0 ~ 1750.0 MHz	
			Channel Bandwidth: 15 MHz	1717.5 ~ 1747.5 MHz	
			Channel Bandwidth: 20 MHz	1720.0 ~ 1745.0 MHz	
		LTE Band 12	Channel Bandwidth: 1.4 MHz	699.7 ~ 715.3 MHz	
			Channel Bandwidth: 3 MHz	700.5 ~ 714.5 MHz	
			Channel Bandwidth: 5 MHz	701.5 ~ 713.5 MHz	
			Channel Bandwidth: 10 MHz	704.0 ~ 711.0 MHz	
		LTE Band 13	Channel Bandwidth: 5 MHz	779.5 ~ 784.5 MHz	
			Channel Bandwidth: 10 MHz	782.0 MHz	
	BT LE	2402 ~ 2480 MHz			
Number of Channel	BT LE: 40				
Antenna Type	LTE 2	IFA Antenna with 3.1 dBi gain			
	LTE 4	IFA Antenna with 1.5 dBi gain			
	LTE 12	IFA Antenna with 0 dBi gain			
	LTE 13	IFA Antenna with 1.7 dBi gain			
	BT LE	Dipole antenna with 3.81 dBi gain			
Antenna Connector	N/A				
Accessory Device	N/A				
Data Cable Supplied	N/A				

Note:

1. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
2. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

BT LE:

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 $\geq$ 1G	RE<1G	
-	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz **RE<1G**: Radiated Emission below 1 GHz

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
-	BT LE + LTE Band 2	2402 ~ 2480 、 1860.0 ~ 1900.0	0 to 39 、 18700 to 19100	19 + 18900	GFSK 、 QPSK
	BT LE + LTE Band 4	2402 ~ 2480 、 1720.0 ~ 1745.0	0 to 39 、 20050 to 20300	19 + 20175	GFSK 、 QPSK

Radiated Emission Test (Below 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.

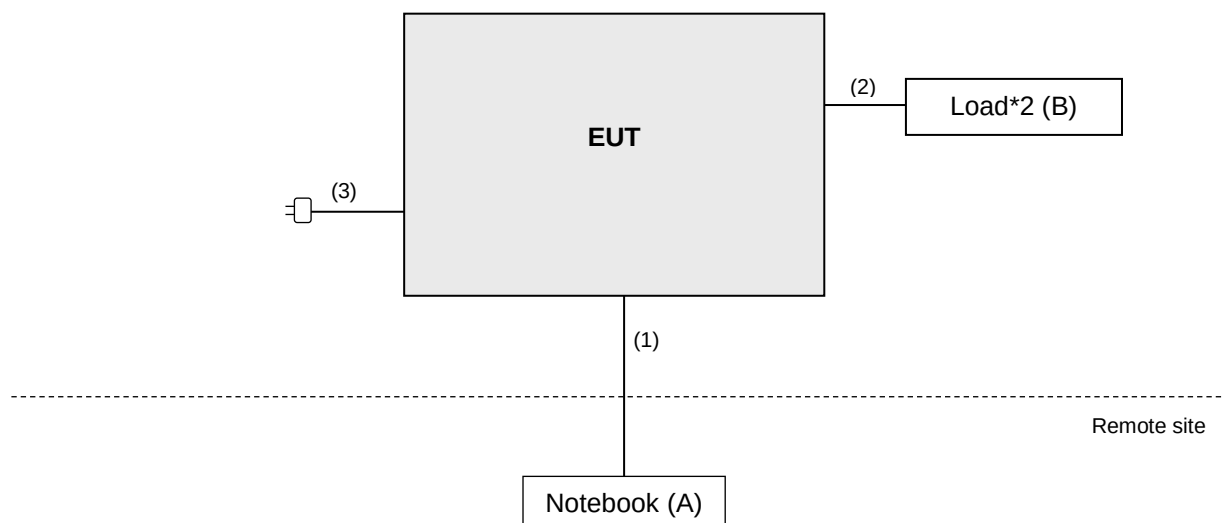
EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	BT LE + LTE Band 2	2402 ~ 2480 、 1860.0 ~ 1900.0	0 to 39 、 18700 to 19100	19 + 18900	GFSK 、 QPSK
-	BT LE + LTE Band 4	2402 ~ 2480 、 1720.0 ~ 1745.0	0 to 39 、 20050 to 20300	19 + 20175	GFSK 、 QPSK

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	22 deg. C, 66 % RH	120 Vac, 60 Hz	Greg Lin
RE<1G	22 deg. C, 66 % RH	120 Vac, 60 Hz	Greg Lin

3.3 Description of Support Units

Configuration of System under Test



ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Notebook	Lenovo	81A4	YD02TWF5	FCC Doc Approved	-
B	Load * 2	N/A	N/A	N/A	NA	-
C	DC Power Supply	Topward	33010D	807748	N/A	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN Cable	1	10	N	0	-
2.	LAN Cable	8	1.5	N	0	-
3.	Power Cable	1	1	Y	0	-

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:

Test Standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

FCC 47 CFR Part 2

FCC 47 CFR Part 24

FCC 47 CFR Part 27

ANSI 63.26-2015

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

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

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

For BT LE

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 20 dB below the highest level of the desired power:
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 1000 MHz, 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 20 dB under any condition of modulation.

For LTE

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit is equal to -13 dBm.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 06, 2020	Nov. 05, 2021
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Loop Antenna EMCI	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
			Feb. 17, 2021	Feb. 16, 2022
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM- SM8000	CABLE-CH9-02 (248780+171006)	Jan. 16, 2021	Jan. 15, 2022
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9- (250795/4)	Jan. 16, 2021	Jan. 15, 2022
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55 190004/MY551900 07/MY55210005	Jul. 13, 2020	Jul. 12, 2021

- 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 HwaYa Chamber 9.

4.1.3 Test Procedures

For BT LE

For Radiated Emission below 30 MHz

- 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 9 kHz at frequency below 30 MHz.

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) 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 detected 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 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
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 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10 Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1 GHz. (RBW = 1 MHz, VBW = 3 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

For LTE

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G.
- c. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}.$

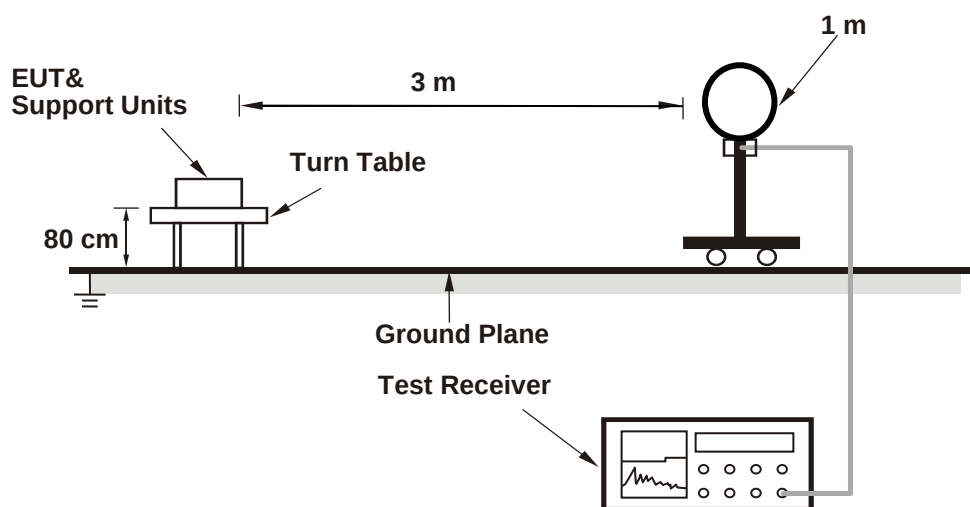
Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.1.4 Deviation from Test Standard

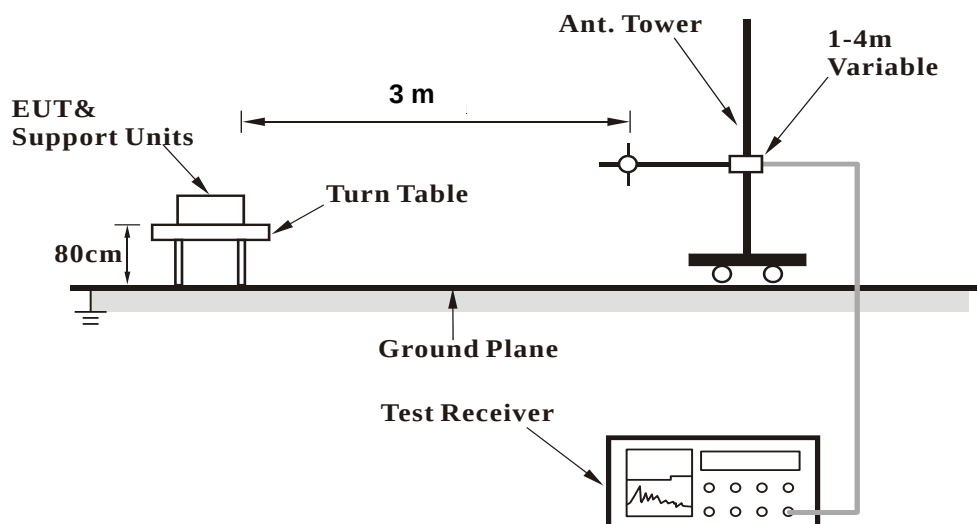
No deviation.

4.1.5 Test Set Up

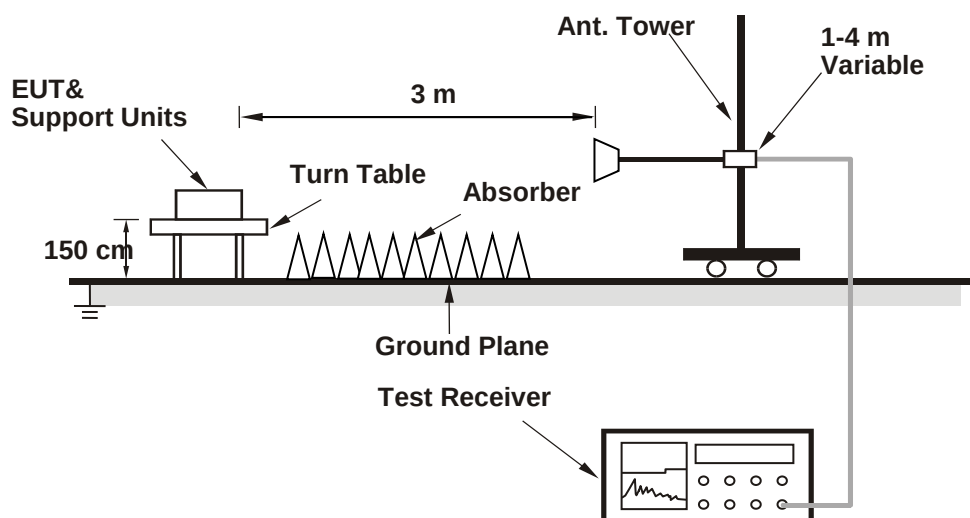
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1 GHz Data :

BT LE + LTE Band 2

CHANNEL	CH 19 + CH 18900	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	#2440.00	99.9 PK			2.54 H	338	68.8	31.1
2	#2440.00	99.0 AV			2.54 H	338	67.9	31.1
3	4880.00	43.6 PK	74.0	-30.4	2.57 H	11	41.6	2.0
4	4880.00	36.2 AV	54.0	-17.8	2.57 H	11	34.2	2.0
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	#2440.00	98.3 PK			2.47 V	321	67.2	31.1
2	#2440.00	97.3 AV			2.47 V	321	66.2	31.1
3	4880.00	44.4 PK	74.0	-29.6	1.52 V	16	42.4	2.0
4	4880.00	36.2 AV	54.0	-17.8	1.52 V	16	34.2	2.0

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.
5. " * ": Fundamental frequency.

BT LE + LTE Band 4

CHANNEL	CH 19 + CH 20175	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	#2440.00	100.0 PK			2.52 H	338	68.9	31.1
2	#2440.00	98.9 AV			2.52 H	338	67.8	31.1
3	4880.00	43.4 PK	74.0	-30.6	2.53 H	9	41.4	2.0
4	4880.00	35.9 AV	54.0	-18.1	2.53 H	9	33.9	2.0
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	#2440.00	98.2 PK			2.42 V	309	67.1	31.1
2	#2440.00	97.1 AV			2.42 V	309	66.0	31.1
3	4880.00	44.5 PK	74.0	-29.5	1.52 V	17	42.5	2.0
4	4880.00	36.4 AV	54.0	-17.6	1.52 V	17	34.4	2.0

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.
5. " * ": Fundamental frequency.

LTE Band 2 + BT LE

CHANNEL	CH 18900 + CH 19	FREQUENCY RANGE	1GHz ~ 20GHz
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Antenna Polarity & Test Distance : Horizontal at 3 m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3760.00 (PK)	-54.50	-46.00	1.30	-44.70	-13.00	-31.70
2	5640.00 (PK)	-56.60	-43.60	1.30	-42.30	-13.00	-29.30
Antenna Polarity & Test Distance : Vertical at 3m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3760.00 (PK)	-49.80	-41.50	1.30	-40.20	-13.00	-27.20
2	5640.00 (PK)	-57.40	-45.50	1.30	-44.20	-13.00	-31.20

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

LTE Band 4 + BT LE

CHANNEL	CH 20175 + CH 19	FREQUENCY RANGE	1GHz ~ 18GHz
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Antenna Polarity & Test Distance : Horizontal at 3 m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3465.00 (PK)	-54.60	-46.20	1.40	-44.80	-13.00	-31.80
2	5197.50 (PK)	-61.90	-50.30	1.40	-48.90	-13.00	-35.90
Antenna Polarity & Test Distance : Vertical at 3m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3465.00 (PK)	-46.70	-38.90	1.40	-37.50	-13.00	-24.50
2	5197.50 (PK)	-53.50	-41.30	1.40	-39.90	-13.00	-26.90

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

9 kHz ~ 30 MHz Data:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

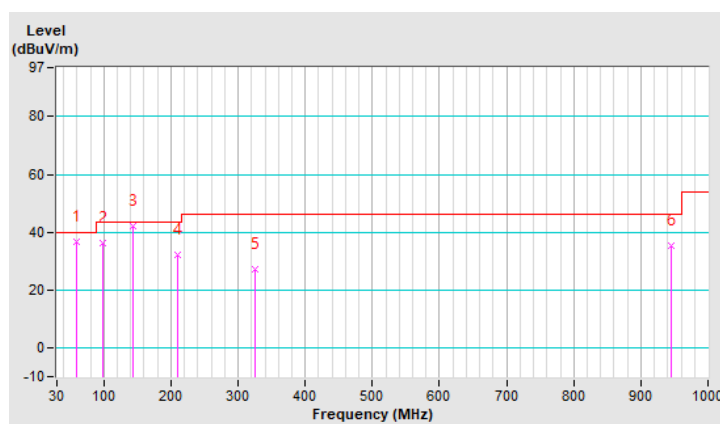
BT LE + LTE Band 2

CHANNEL	CH 19 + CH 18900	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	60.07	36.8 QP	40.0	-3.2	1.50 H	286	46.1	-9.3
2	97.90	36.3 QP	43.5	-7.2	1.00 H	96	49.8	-13.5
3	142.52	42.0 QP	43.5	-1.5	1.25 H	121	50.6	-8.6
4	210.42	32.0 QP	43.5	-11.5	1.25 H	100	43.0	-11.0
5	324.88	27.2 QP	46.0	-18.8	1.00 H	272	33.4	-6.2
6	945.68	35.3 QP	46.0	-10.7	1.50 H	213	29.5	5.8

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.

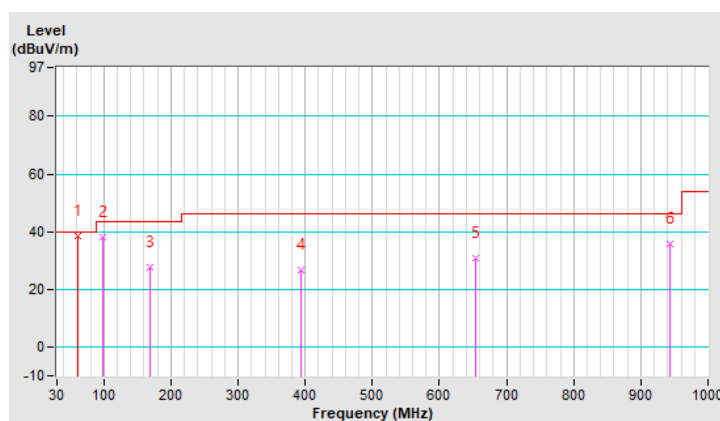


CHANNEL	CH 19 + CH 18900	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	61.60	38.6 QP	40.0	-1.4	1.25 V	166	48.3	-9.7
2	97.90	38.1 QP	43.5	-5.4	1.00 V	145	51.6	-13.5
3	168.71	27.7 QP	43.5	-15.8	1.25 V	18	36.3	-8.6
4	392.78	26.7 QP	46.0	-19.3	1.00 V	166	31.5	-4.8
5	654.68	31.0 QP	46.0	-15.0	1.50 V	121	30.7	0.3
6	943.74	35.9 QP	46.0	-10.1	1.25 V	288	30.1	5.8

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.



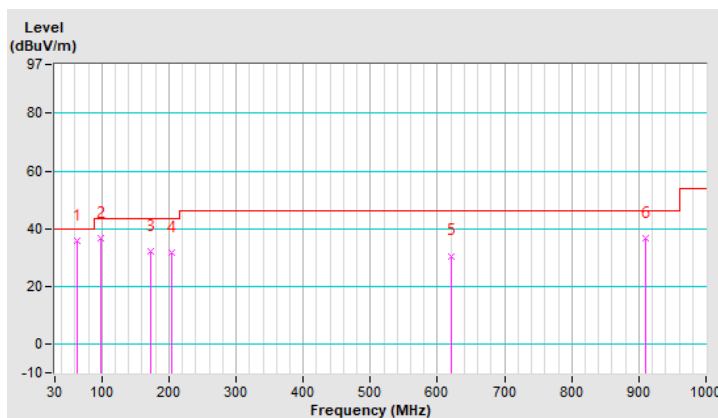
BT LE + LTE Band 4

CHANNEL	CH 19 + CH 20175	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	62.98	35.9 QP	40.0	-4.1	1.25 H	104	45.4	-9.5
2	97.90	36.5 QP	43.5	-7.0	1.00 H	87	50.0	-13.5
3	173.56	32.2 QP	43.5	-11.3	1.50 H	58	41.2	-9.0
4	204.60	31.6 QP	43.5	-11.9	1.25 H	99	42.7	-11.1
5	619.76	30.6 QP	46.0	-15.4	1.00 H	242	30.7	-0.1
6	909.79	36.9 QP	46.0	-9.1	1.00 H	22	31.5	5.4

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.

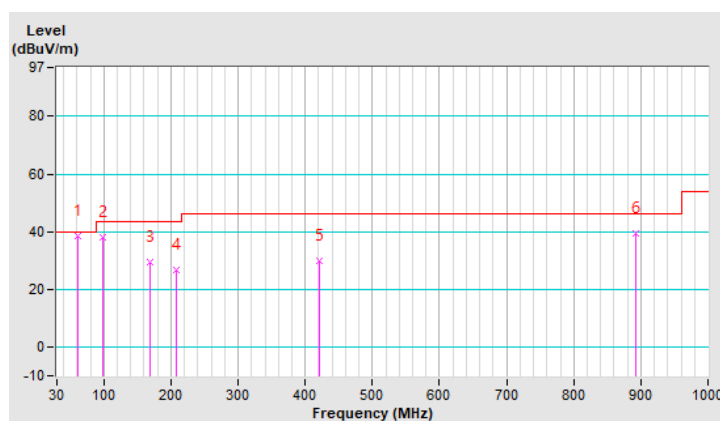


CHANNEL	CH 19 + CH 20175	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	61.04	38.6 QP	40.0	-1.4	1.25 V	230	48.3	-9.7
2	97.90	38.0 QP	43.5	-5.5	1.00 V	160	51.5	-13.5
3	168.71	29.3 QP	43.5	-14.2	1.00 V	9	37.9	-8.6
4	207.51	26.5 QP	43.5	-17.0	1.50 V	340	37.6	-11.1
5	421.88	30.1 QP	46.0	-15.9	1.00 V	42	34.3	-4.2
6	892.33	39.6 QP	46.0	-6.4	1.25 V	305	34.9	4.7

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 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.



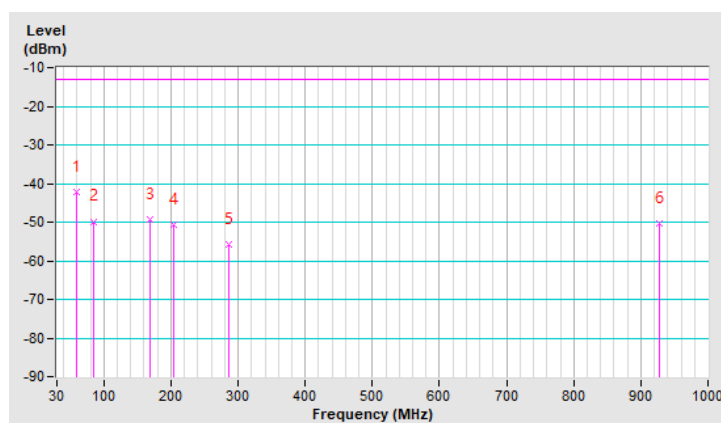
LTE Band 2 + BT LE

CHANNEL	CH 18900 + CH 19	FREQUENCY RANGE	Below 1G
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Antenna Polarity & Test Distance : Horizontal at 3 m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	60.07	-37.40	-38.80	-3.40	-42.20	-13.00	-29.20
2	85.29	-43.40	-50.10	0.30	-49.80	-13.00	-36.80
3	168.71	-42.60	-46.60	-2.80	-49.40	-13.00	-36.40
4	204.60	-42.60	-48.60	-2.00	-50.60	-13.00	-37.60
5	286.08	-51.90	-54.00	-1.70	-55.70	-13.00	-42.70
6	928.22	-58.40	-53.80	3.60	-50.20	-13.00	-37.20

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

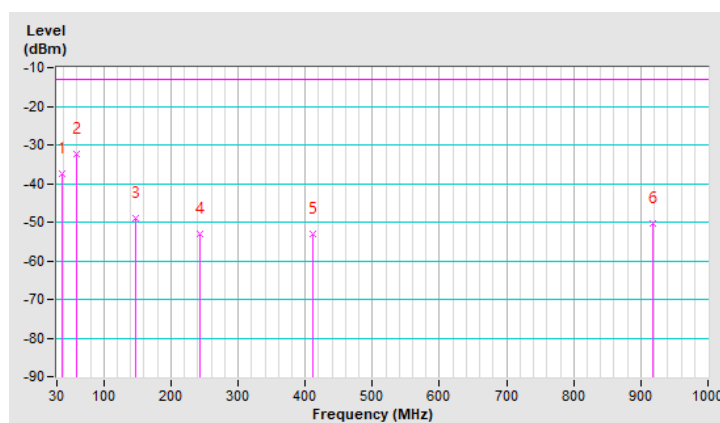


CHANNEL	CH 18900 + CH 19	FREQUENCY RANGE	Below 1G
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Antenna Polarity & Test Distance : Vertical at 3m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	37.76	-28.10	-22.80	-14.70	-37.50	-13.00	-24.50
2	60.07	-25.50	-28.90	-3.40	-32.30	-13.00	-19.30
3	147.37	-46.90	-46.10	-2.90	-49.00	-13.00	-36.00
4	242.43	-51.60	-51.70	-1.40	-53.10	-13.00	-40.10
5	412.18	-52.60	-56.30	3.30	-53.00	-13.00	-40.00
6	917.55	-58.80	-53.90	3.60	-50.30	-13.00	-37.30

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



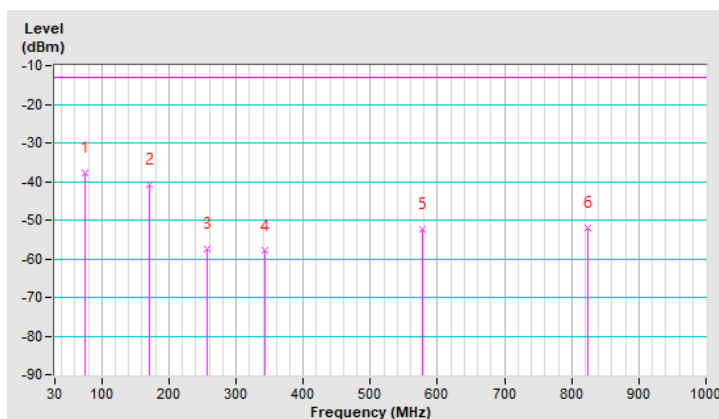
LTE Band 4 + BT LE

CHANNEL	CH 20175 + CH 19	FREQUENCY RANGE	Below 1G
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Antenna Polarity & Test Distance : Horizontal at 3 m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	74.62	-32.00	-37.90	0.10	-37.80	-13.00	-24.80
2	171.62	-33.90	-38.10	-2.90	-41.00	-13.00	-28.00
3	256.01	-52.20	-55.90	-1.50	-57.40	-13.00	-44.40
4	343.31	-54.50	-62.00	4.00	-58.00	-13.00	-45.00
5	578.05	-53.20	-56.00	3.70	-52.30	-13.00	-39.30
6	824.43	-58.90	-56.00	3.90	-52.10	-13.00	-39.10

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

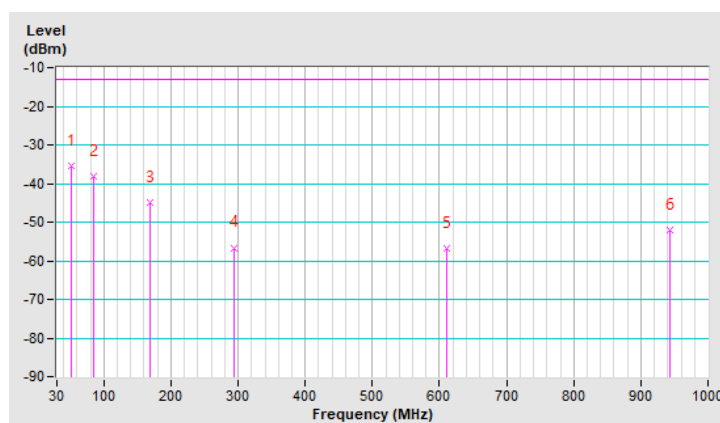


CHANNEL	CH 20175 + CH 19	FREQUENCY RANGE	Below 1G
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Antenna Polarity & Test Distance : Vertical at 3m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	51.34	-28.10	-28.00	-7.30	-35.30	-13.00	-22.30
2	84.32	-33.20	-38.60	0.40	-38.20	-13.00	-25.20
3	169.68	-41.60	-42.00	-2.80	-44.80	-13.00	-31.80
4	293.84	-56.80	-54.80	-1.80	-56.60	-13.00	-43.60
5	610.06	-61.30	-60.40	3.70	-56.70	-13.00	-43.70
6	943.74	-61.10	-55.70	3.70	-52.00	-13.00	-39.00

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



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 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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