

Partial FCC Test Report (Spot Check)

Report No.: RF200424C06-6

FCC ID: 2ARXKVHE09-4GL

Test Model: VHE09-4GL

Series Model: VHE09XXXXX (X=A-Z, 0-9, blank or "-")

Received Date: Apr. 24, 2020

Test Date: Jun. 02 ~ Jun. 11, 2020

Issued Date: Jun. 17, 2020

Applicant: Veea Inc

Address: 164 E 83rd Street, New York NY, 10028, 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:



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Release Control Record

Issue No.	Description	Date Issued
RF200424C06-6	Original release.	Jun. 17, 2020

1 Certificate of Conformity

Product: veeaHub

Brand: 

Test Model: VHE09-4GL

Series Model: VHE09XXXXX (X=A-Z, 0-9, blank or "-")

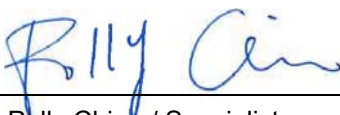
Sample Status: Engineering sample

Applicant: Veea Inc

Test Date: Jun. 02 ~ Jun. 11, 2020

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
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 :  , **Date:** Jun. 17, 2020
Polly Chien / Specialist

Approved by :  , **Date:** Jun. 17, 2020
Bruce Chen / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -0.67dB at 0.52017MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -5.3dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Chip antenna: No antenna connector is used. PIFA antenna: Antenna connector is U.FL not a standard connector.

Note:

1. This report is a partial report. Therefore, only Output Power, AC Power Conducted Emission and Radiated Emissions above 1GHz were verified and recorded in this report. Other testing data please refer to the original BV CPS report no.: RF181115C24-7.
2. 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) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 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	veeaHub
Brand	veeaHub 
Test Model	VHE09-4GL
Series Model	VHE09XXXXX (X=A-Z, 0-9, blank or "-")
Model Difference	Marketing purposes
Sample Status	Engineering sample
Nominal Voltage	48Vdc (Adapter and PoE)
Modulation Type	GFSK
Transfer Rate	LE 4.0: 1Mbps LE 5.0: 2Mbps
Operating Frequency	2402~2480MHz
Number of Channel	40
Channel Spacing	2MHz
Output Power	LE 4.0: 0.2965mW LE 5.0: 0.2904mW
Antenna Type	Chip antenna with 6dBi gain PIFA antenna with 2.2dBi gain
Antenna Connector	Chip antenna: NA PIFA antenna: U.FL
Accessory Device	Adapter
Cable Supplied	NA

Note:

1. This report is a supplementary report to the original BV CPS report no.: RF181115C24-7. Exhibit prepared for FCC Spot Check Verification report, the format, test items and amount of spot-check test data are decided by applicant's engineering judgment, for more details please refer to declaration letter exhibit. Therefore, only Output Power, AC Power Conducted Emission and Radiated Emissions above 1GHz were verified and recorded in this report. AC Power Conducted Emission and Radiated Emission tests according to original report radiated emission worst channel.
2. The EUT uses following adapter and PoE. (Support unit)

Adapter	
Brand	EDAC Power Electronics Co., Ltd.
Model	EA1062SGR-480
Input Power	100-240Vac ~2.5A, 50-60Hz
Output Power	48Vdc / 1.35A
Power Line	1.2m DC cable with one core

PoE	
Model	APOE02-WM
Output Power	48Vdc

3. The EUT with Chip antenna (with maximum gain) was chosen for the Conducted Output Power Measurement test.
4. WLAN, zigbee, Bluetooth and LoRa technology can transmit at same time.
5. 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.

3.2 Description of Test Modes

40 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to			Description	
	RE $\geq$ 1G	PLC	P	Antenna	Power
A1	√	√	√	Chip Antenna	Power from adapter
A2	-	√	-		Power from PoE
B1	√	√	-	PIFA Antenna	Power from adapter
B2	-	√	-		Power from PoE

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement
P: Conducted Output Power Measurement
PLC: Power Line Conducted Emission

Note:

1. The antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Y-plane.
2. The EUT with Chip antenna (with maximum gain) was chosen for the Conducted Output Power Measurement test.

Radiated Emission Test (Above 1GHz):

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A1, B1	0 to 39	39	GFSK	1

Power Line Conducted Emission Test:

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A1, A2, B1, B2	0 to 39	39	GFSK	1

Conducted Output Power Measurement:

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A1	0 to 39	0, 19, 39	GFSK	1, 2

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	23 deg. C, 67% RH	120Vac, 60Hz	Adair Peng
PLC	25 deg. C, 68% RH	120Vac, 60Hz 48Vdc	Jones Chang
P	25 deg. C, 60% RH	120Vac, 60Hz	Jisyoung Wang

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.

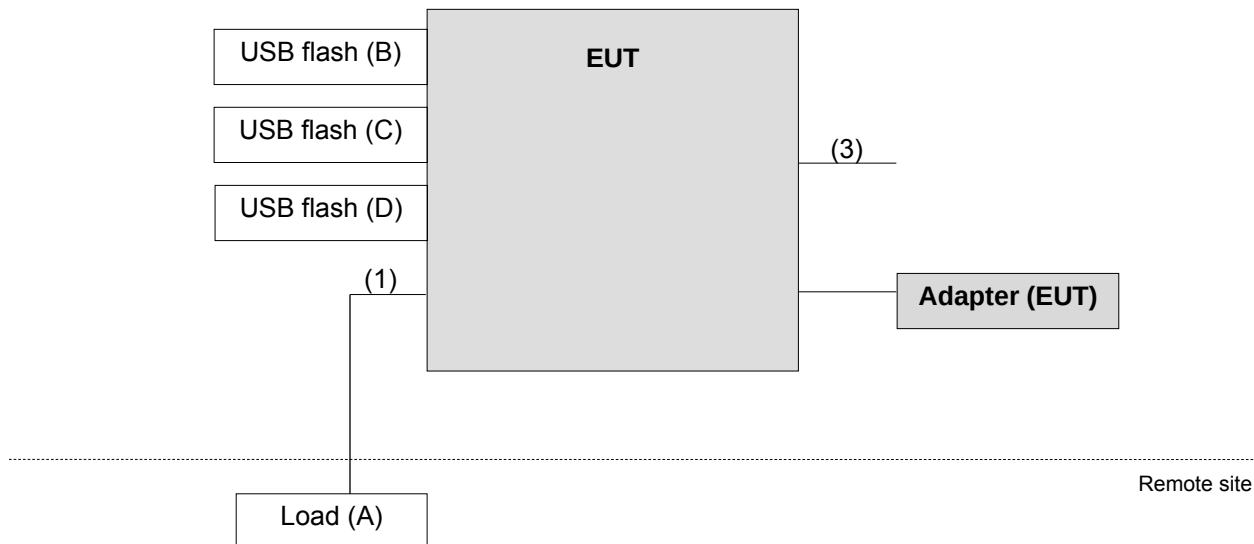
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Load	NA	NA	NA	NA	-
B.	USB Flash	HP	v250W	04	NA	-
C.	USB Flash	HP	v250W	05	NA	-
D.	USB Flash	HP	v250W	09	NA	-
E.	PoE	NA	APOE02-WM	NA	NA	Provided by manufacturer

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

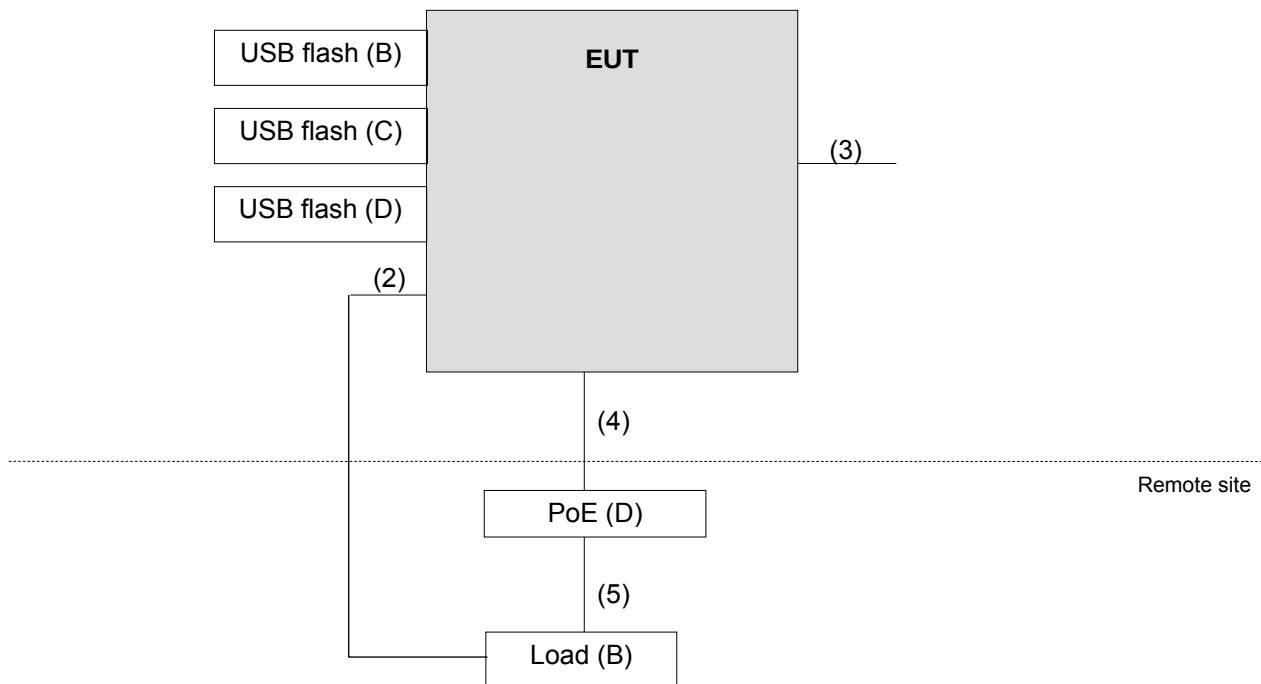
ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN cable	2	1.5	N	0	RJ45, Cat5e
2.	LAN cable	1	1.5	N	0	RJ45, Cat5e
3.	Console cable	1	2	N	0	-
4.	LAN cable	1	1.5	N	0	RJ45, Cat5e
5.	LAN cable	1	1.5	N	0	RJ45, Cat5e

3.3.1 Configuration of System under Test

Test Mode A1, B1



Test Mode A2, B2



3.4 General Description of Applied Standards and References

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)

ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

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. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Dec. 31, 2019	Dec. 30, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 10, 2019	Jun. 09, 2020
			Jun. 09, 2020	Jun. 08, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	9120D	209	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna TESEQ	HLA 6121	45745	Jul. 01, 2019	Jun. 30, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 20, 2019	Aug. 19, 2020
Preamplifier KEYSIGHT (Above 1GHz)	8449B	3008A01976	Aug. 20, 2019	Aug. 19, 2020
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH3-01	Aug. 20, 2019	Aug. 19, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 20, 2019	Aug. 19, 2020
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-S M-8000	Cable-CH3-03 (309224+170907)	Aug. 20, 2019	Aug. 19, 2020
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY5519 0004/MY55190007/MY 55210005	Jul. 15, 2019	Jul. 14, 2020

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 3.

4.1.3 Test Procedures

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 detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

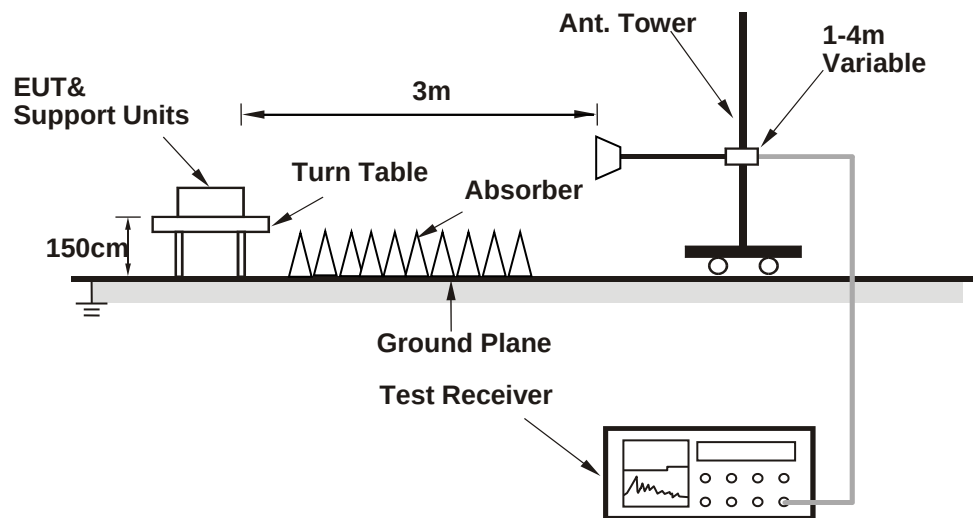
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

BT LE 4.0

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz	TEST MODE	A1

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	80.7 PK			1.72 H	343	48.3	32.4
2	*2480.00	77.7 AV			1.72 H	343	45.3	32.4
3	2483.50	58.7 PK	74.0	-15.3	1.72 H	343	26.3	32.4
4	2483.50	46.7 AV	54.0	-7.3	1.72 H	343	14.3	32.4
5	4960.00	46.5 PK	74.0	-27.5	1.88 H	53	42.4	4.1
6	4960.00	33.2 AV	54.0	-20.8	1.88 H	53	29.1	4.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	79.3 PK			3.25 V	352	46.9	32.4
2	*2480.00	76.7 AV			3.25 V	352	44.3	32.4
3	2483.50	23.0 PK	74.0	-51.0	3.25 V	352	26.4	-3.4
4	2483.50	11.1 AV	54.0	-42.9	3.25 V	352	14.5	-3.4
5	4960.00	46.4 PK	74.0	-27.6	3.19 V	33	42.3	4.1
6	4960.00	33.3 AV	54.0	-20.7	3.19 V	33	29.2	4.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz	TEST MODE	B1

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	85.8 PK			2.04 H	325	53.4	32.4
2	*2480.00	83.6 AV			2.04 H	325	51.2	32.4
3	2483.50	64.8 PK	74.0	-9.2	2.04 H	325	32.4	32.4
4	2483.50	48.7 AV	54.0	-5.3	2.04 H	325	16.3	32.4
5	4960.00	46.4 PK	74.0	-27.6	1.92 H	53	42.3	4.1
6	4960.00	33.3 AV	54.0	-20.7	1.92 H	53	29.2	4.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	86.1 PK			1.70 V	311	53.7	32.4
2	*2480.00	83.9 AV			1.70 V	311	51.5	32.4
3	2483.50	58.7 PK	74.0	-15.3	1.70 V	311	26.3	32.4
4	2483.50	47.0 AV	54.0	-7.0	1.70 V	311	14.6	32.4
5	4960.00	46.3 PK	74.0	-27.7	1.92 V	243	42.2	4.1
6	4960.00	33.3 AV	54.0	-20.7	1.92 V	243	29.2	4.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102412	Feb. 17, 2020	Feb. 16, 2021
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 05, 2019	Sep. 04, 2020
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 20, 2020	Jan. 19, 2021
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 13, 2019	Aug. 12, 2020
Software ADT	BV ADT_Conc_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Shielded Room 2 (Conduction 2).

3. The VCCI Site Registration No. is C-12047.

4.2.3 Test Procedures

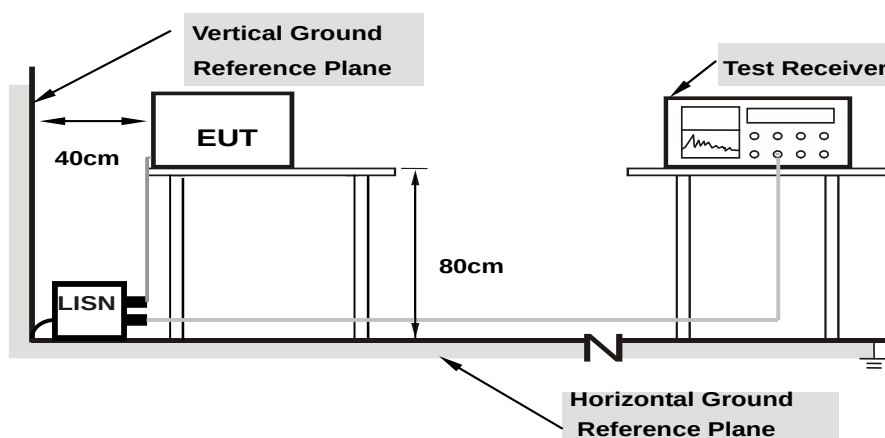
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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 item 4.1.6.

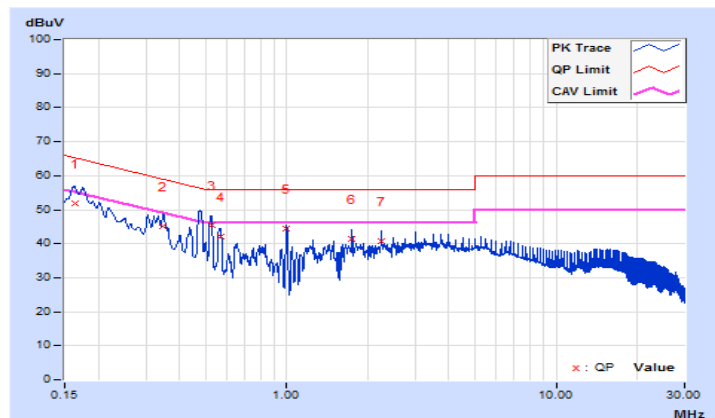
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A1		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16307	10.25	41.53	28.09	51.78	38.34	65.31	55.31	-13.53	-16.97
2	0.34791	10.31	34.84	30.52	45.15	40.83	59.01	49.01	-13.86	-8.18
3	0.52575	10.34	35.06	31.42	45.40	41.76	56.00	46.00	-10.60	-4.24
4	0.56850	10.35	31.61	27.59	41.96	37.94	56.00	46.00	-14.04	-8.06
5	1.00032	10.42	34.14	31.01	44.56	41.43	56.00	46.00	-11.44	-4.57
6	1.74975	10.46	31.03	28.69	41.49	39.15	56.00	46.00	-14.51	-6.85
7	2.24925	10.49	30.38	27.38	40.87	37.87	56.00	46.00	-15.13	-8.13

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.

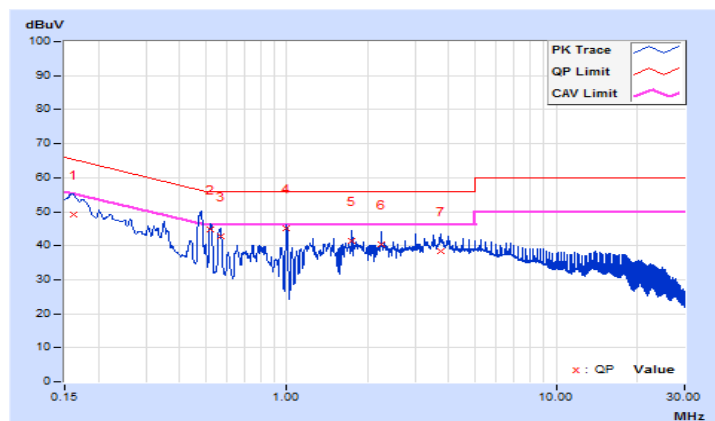


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A1		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
	[MHz]	(dB)	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16125	10.23	38.84	20.05	49.07	30.28	65.40	55.40	-16.33	-25.12
2	0.52350	10.32	34.33	32.90	44.65	43.22	56.00	46.00	-11.35	-2.78
3	0.56850	10.33	32.34	29.48	42.67	39.81	56.00	46.00	-13.33	-6.19
4	1.00032	10.42	34.53	31.07	44.95	41.49	56.00	46.00	-11.05	-4.51
5	1.74975	10.46	31.10	28.67	41.56	39.13	56.00	46.00	-14.44	-6.87
6	2.24925	10.49	30.07	27.48	40.56	37.97	56.00	46.00	-15.44	-8.03
7	3.74526	10.60	27.80	23.11	38.40	33.71	56.00	46.00	-17.60	-12.29

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.

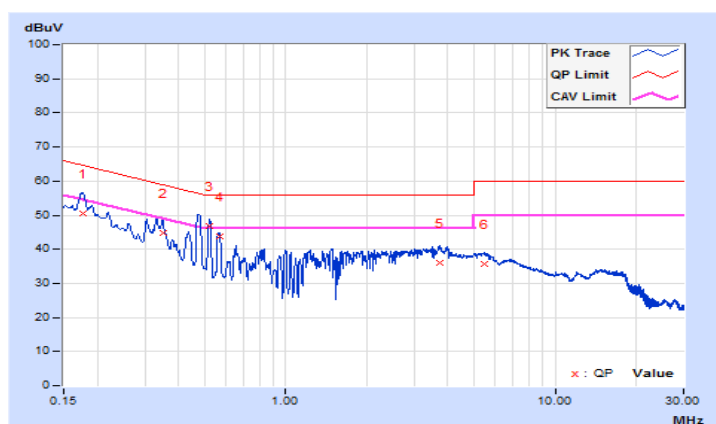


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A2		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17700	10.26	40.38	29.82	50.64	40.08	64.63	54.63	-13.99	-14.55
2	0.35025	10.31	34.50	29.40	44.81	39.71	58.96	48.96	-14.15	-9.25
3	0.52246	10.34	36.42	34.32	46.76	44.66	56.00	46.00	-9.24	-1.34
4	0.56625	10.35	33.43	31.73	43.78	42.08	56.00	46.00	-12.22	-3.92
5	3.73425	10.58	25.42	16.75	36.00	27.33	56.00	46.00	-20.00	-18.67
6	5.50050	10.63	24.95	13.97	35.58	24.60	60.00	50.00	-24.42	-25.40

Remarks:

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

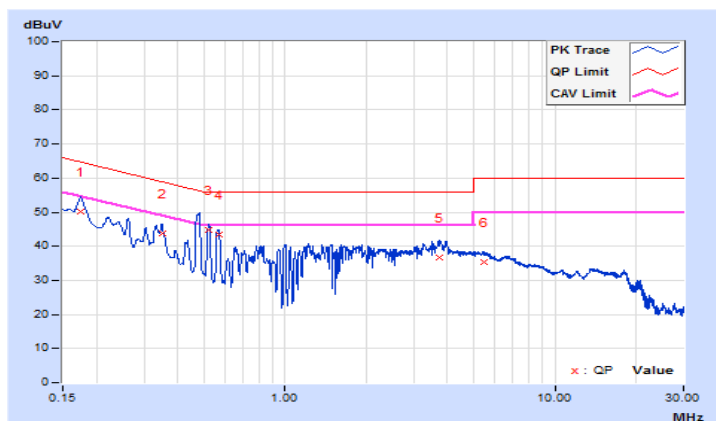


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A2		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17466	10.23	39.93	30.57	50.16	40.80	64.74	54.74	-14.58	-13.94
2	0.34975	10.29	33.41	28.12	43.70	38.41	58.97	48.97	-15.27	-10.56
3	0.51971	10.32	34.59	33.71	44.91	44.03	56.00	46.00	-11.09	-1.97
4	0.56625	10.33	33.21	31.82	43.54	42.15	56.00	46.00	-12.46	-3.85
5	3.73200	10.60	26.01	16.20	36.61	26.80	56.00	46.00	-19.39	-19.20
6	5.44200	10.67	24.66	15.05	35.33	25.72	60.00	50.00	-24.67	-24.28

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.

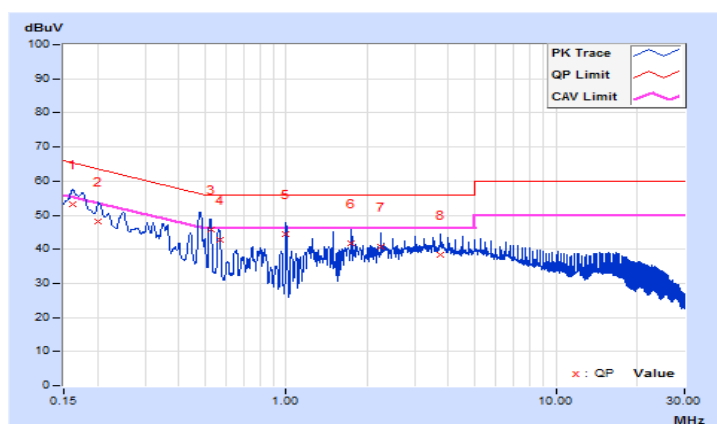


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B1		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16125	10.25	43.08	29.99	53.33	40.24	65.40	55.40	-12.07	-15.16
2	0.20175	10.27	37.88	25.07	48.15	35.34	63.54	53.54	-15.39	-18.20
3	0.52523	10.34	35.52	32.85	45.86	43.19	56.00	46.00	-10.14	-2.81
4	0.56625	10.35	32.55	31.32	42.90	41.67	56.00	46.00	-13.10	-4.33
5	1.00032	10.42	34.02	30.87	44.44	41.29	56.00	46.00	-11.56	-4.71
6	1.74975	10.46	31.39	28.51	41.85	38.97	56.00	46.00	-14.15	-7.03
7	2.24925	10.49	30.31	27.08	40.80	37.57	56.00	46.00	-15.20	-8.43
8	3.74526	10.58	27.78	23.08	38.36	33.66	56.00	46.00	-17.64	-12.34

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.

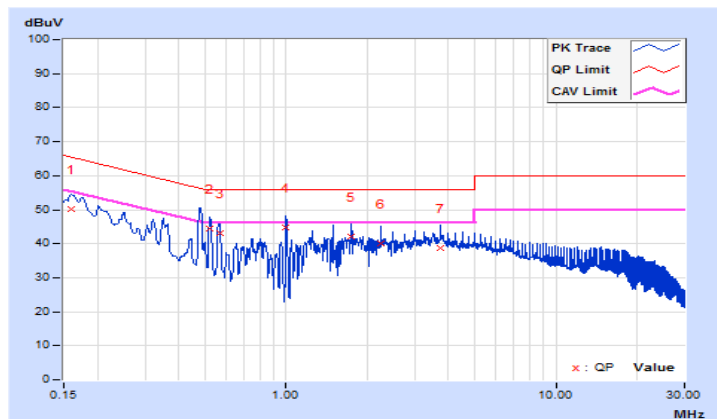


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B1		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
	[MHz]	(dB)	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15900	10.23	40.02	24.43	50.25	34.66	65.52	55.52	-15.27	-20.86
2	0.52350	10.32	34.14	33.17	44.46	43.49	56.00	46.00	-11.54	-2.51
3	0.56625	10.33	32.81	31.84	43.14	42.17	56.00	46.00	-12.86	-3.83
4	1.00032	10.42	34.45	32.88	44.87	43.30	56.00	46.00	-11.13	-2.70
5	1.74750	10.46	31.55	20.20	42.01	30.66	56.00	46.00	-13.99	-15.34
6	2.24700	10.49	29.46	28.25	39.95	38.74	56.00	46.00	-16.05	-7.26
7	3.74526	10.60	28.20	25.35	38.80	35.95	56.00	46.00	-17.20	-10.05

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.

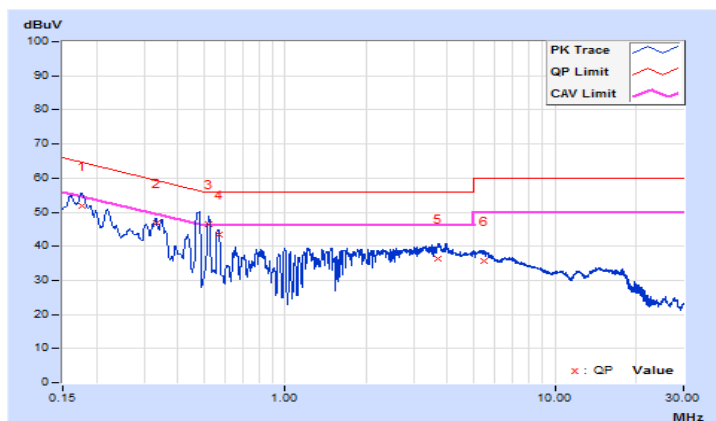


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B2		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17605	10.26	41.68	31.81	51.94	42.07	64.67	54.67	-12.73	-12.60
2	0.33225	10.30	36.42	31.15	46.72	41.45	59.39	49.39	-12.67	-7.94
3	0.52017	10.34	35.99	34.99	46.33	45.33	56.00	46.00	-9.67	-0.67
4	0.56625	10.35	33.02	31.63	43.37	41.98	56.00	46.00	-12.63	-4.02
5	3.66900	10.58	25.72	14.68	36.30	25.26	56.00	46.00	-19.70	-20.74
6	5.50050	10.63	25.01	13.59	35.64	24.22	60.00	50.00	-24.36	-25.78

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.

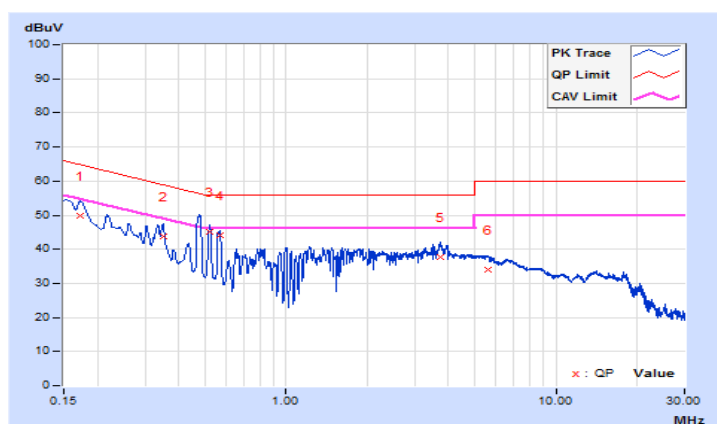


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B2		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17237	10.23	39.72	31.90	49.95	42.13	64.85	54.85	-14.90	-12.72
2	0.34975	10.29	33.55	29.90	43.84	40.19	58.97	48.97	-15.13	-8.78
3	0.52109	10.32	34.87	33.80	45.19	44.12	56.00	46.00	-10.81	-1.88
4	0.56625	10.33	33.67	31.96	44.00	42.29	56.00	46.00	-12.00	-3.71
5	3.74100	10.60	27.12	16.95	37.72	27.55	56.00	46.00	-18.28	-18.45
6	5.63550	10.67	23.33	11.83	34.00	22.50	60.00	50.00	-26.00	-27.50

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.

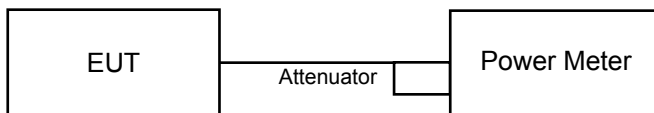


4.3 Conducted Output Power Measurement

4.3.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

For Peak Power

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

For Average Power

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value..

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as item 4.3.6.

4.3.7 Test Results

For Peak Power

BT LE 4.0

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	0.2965	-5.28	30	Pass
19	2440	0.2489	-6.04	30	Pass
39	2480	0.2075	-6.83	30	Pass

BT LE 5.0

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	0.2904	-5.37	30	Pass
19	2440	0.2466	-6.08	30	Pass
39	2480	0.2089	-6.80	30	Pass

For Average Power

BT LE 4.0

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	0.2931	-5.33
19	2440	0.2449	-6.11
39	2480	0.2018	-6.95

BT LE 5.0

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	0.2864	-5.43
19	2440	0.2427	-6.15
39	2480	0.2183	-6.61

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:

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Web Site: www.bureauveritas-adt.com

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

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