

FCC Test Report

Report No.: RFBDYS-WTW-P24060726 R1

FCC ID: 2AWUU6095001

Test Model: BP52-HW-NA

Series Model: BP52-HW-UK, BP52-HW-EU, BP52-HW-AU

(Refer to item 3.1 for more details)

Received Date: 2024/6/29

Test Date: 2024/7/17 ~ 2024/8/13

Issued Date: 2024/10/25

Applicant: Verkada Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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FCC Registration / 788550 / TW0003 (For Test Location (1))

Designation Number: 281270 / TW0032 (For Test Location (2))



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Release Control Record

Issue No.	Description	Date Issued
RFBDYS-WTW-P24060726	Original release	2024/9/12
RFBDYS-WTW-P24060726 R1	Revise brand and model of power cord	2024/10/25

1 Certificate of Conformity

Product: 32-Zone Alarm Panel

Brand: Verkada

Test Model: BP52-HW-NA

Series Model: BP52-HW-UK, BP52-HW-EU, BP52-HW-AU
(Refer to item 3.1 for more details)

Sample Status: Engineering sample

Applicant: Verkada Inc.

Test Date: 2024/7/17 ~ 2024/8/13

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 : Pettie Chen, **Date:** 2024/10/25
Pettie Chen / Senior Specialist

Approved by : Jeremy Lin, **Date:** 2024/10/25
Jeremy Lin / 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 -1.25dB at 2.80200MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.7dB at 64.92MHz.
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	Antenna connector is SMA. (The device is professionally installed.)

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

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.00 dB
	30MHz ~ 100MHz	2.93 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.76 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	32-Zone Alarm Panel
Brand	Verkada
Test Model	BP52-HW-NA
Series Model	BP52-HW-UK, BP52-HW-EU, BP52-HW-AU
Model Difference	Marketing purpose
Sample Status	Engineering sample
Power Supply Rating	100-240Vac, 50-60Hz 25.6Vdc from battery
Modulation Type	OQPSK
Operating Frequency	915 ~ 915.7MHz
Number of Channel	21
Channel Spacing	35kHz
Output Power	109.144mW (20.38dBm)
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	Refer to note
Cable Supplied	NA

Note:

1. The EUT uses following accessory and support unit.

AC power cord (Accessory)		
Brand	Model	Specification
TIANLI	TLPS-500V-A471- 03P(KS) NONE	AC Input: 125 Vac / 250 Vac; 50 Hz ~ 60 Hz; 10 A
Battery (Support Unit)		
Brand	Model	Specification
Verkada	ACC-VBX-200WH	Rating: 202.24WHr, 7.9Ah, 25.6V Nominal output voltage
PoE Load (Support Unit)		
Brand	Model	Specification
NA	NA	Rating: 15W

2. The antenna information is listed as below.

Antenna Type	Connector Type	Gain (dBi)
Dipole	SMA	1.88

*Detail antenna specification please refer to antenna photos/or drawings, including antenna dimensions.

3.2 Description of Test Modes

21 channels are provided to this EUT:

Channel	Freq. (MHz)
0	915.000
1	915.035
2	915.070
3	915.105
4	915.140
5	915.175
6	915.210
7	915.245
8	915.280
9	915.315
10	915.350
11	915.385
12	915.420
13	915.455
14	915.490
15	915.525
16	915.560
17	915.595
18	915.630
19	915.665
20	915.700

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement

PLC: Power Line Conducted Emission

RE<1G: Radiated Emission below 1GHz

APCM: Antenna Port Conducted Measurement

Radiated Emission Test (Above 1GHz):

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	0 to 20	10	OQPSK

Radiated Emission Test (Below 1GHz):

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	0 to 20	10	OQPSK

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 Type
-	0 to 20	10	OQPSK

Antenna Port Conducted Measurement:

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	0 to 20	10	OQPSK

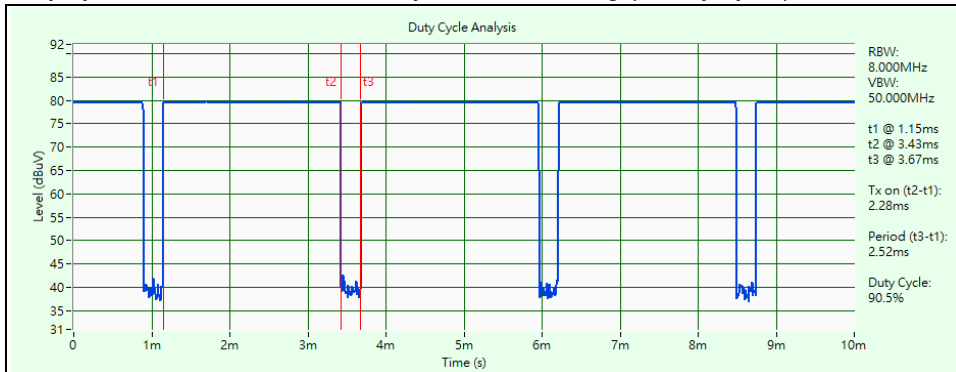
Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	23 deg. C, 66 % RH	120 Vac, 60 Hz	Charles Hsiao
RE<1G	23 deg. C, 66 % RH	120 Vac, 60 Hz	Charles Hsiao
PLC	25 deg. C, 75% RH	120 Vac, 60 Hz	Rex Wang
APCM	25 deg. C, 60% RH	120 Vac, 60 Hz	Wayne Lin, Henry Hsu

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98%, duty factor is required.

Duty cycle = $2.28/2.52 = 0.905$, duty factor = $10 * \log (1/\text{Duty cycle}) = 0.43 \text{ dB}$



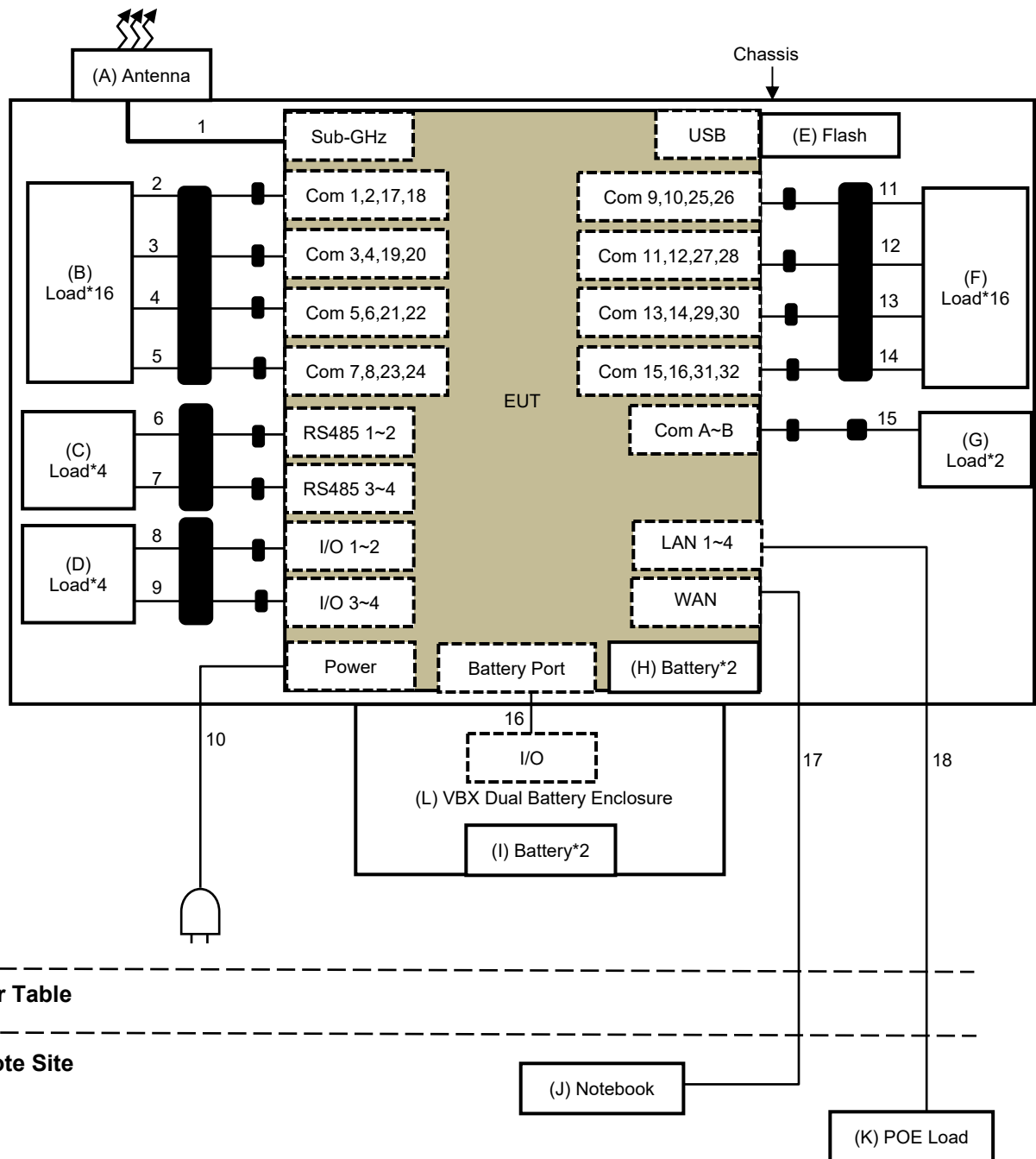
3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Antenna	INPAQ	RFDPA161500SMUB802	NA	NA	Supplied by applicant
B	Load*16	NA	NA	NA	NA	Supplied by applicant
C	Load*4	NA	NA	NA	NA	Supplied by applicant
D	Load*4	NA	NA	NA	NA	Supplied by applicant
E	Flash	Transcend	JetFlash 700	NA	NA	Provided by Lab
F	Load*16	NA	NA	NA	NA	Supplied by applicant
G	Load*2	NA	NA	NA	NA	Supplied by applicant
H	Battery*2	Verkada	ACC-VBX-200WH	NA	NA	Supplied by applicant
I	Battery*2	Verkada	ACC-VBX-200WH	NA	NA	Supplied by applicant
J	Notebook	HP	11-u018TU	8CG70505V9	NA	Provided by Lab
K	POE Load	NA	NA	NA	NA	Supplied by applicant
L	VBX Dual Battery Enclosure	Verkada	ACC-VBX-ENC	NA	NA	Supplied by applicant

No.	Cable Descriptions	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Qty.)	Remark
1	Antenna	1	0.3	Yes	0	Supplied by applicant
2	DC	8	0.4	No	2	Supplied by applicant
3	DC	8	0.4	No	2	Supplied by applicant
4	DC	8	0.4	No	2	Supplied by applicant
5	DC	8	0.4	No	2	Supplied by applicant
6	DC	4	0.4	No	2	Supplied by applicant
7	DC	4	1.5	No	2	Supplied by applicant
8	DC	4	1.5	No	2	Supplied by applicant
9	DC	4	1.5	No	2	Supplied by applicant
10	Power	1	1.8	No	0	Supplied by applicant
11	DC	8	0.4	No	2	Supplied by applicant
12	DC	8	0.4	No	2	Supplied by applicant
13	DC	8	0.4	No	2	Supplied by applicant
14	DC	8	0.4	No	2	Supplied by applicant
15	DC	4	1.5	No	2	Supplied by applicant
16	Power	1	1	No	0	Supplied by applicant
17	Cat.5e	1	10	No	0	Provided by Lab
18	Cat.5e	4	10	No	0	Provided by Lab

3.4.1 Configuration of System under Test



3.5 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 30dB 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.	Calibrated Date	Calibrated Until
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-515BSN	NA	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208676	NA	NA
MXE EMI Receiver Agilent	N9038A	MY52260177	2023/9/15	2024/9/14
EXA Signal Analyzer Agilent	N9010A	MY52220207	2023/12/28	2024/12/27
Loop Antenna TESEQ	HLA 6121	64095	2023/09/23	2024/09/22
Loop Antenna Electro-Metrics	EM-6879	269	2023/9/23	2024/9/22
Preamplifier EMCI	EMC001340	980201	2023/9/27	2024/9/26
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-9000	201251(with PAD)	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-3000	201249	2024/1/15	2025/1/14
Preamplifier EMCI	EMC330N	980798	2024/1/15	2025/1/14
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-1214	2023/10/17	2024/10/16
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-500	201248	2024/1/15	2025/1/14
Horn Antenna RFSPIN	DRH18-E	210104A18E	2023/11/12	2024/11/11
Preamplifier Agilent	83017A	MY39501357	2024/6/12	2025/6/11
RF Coaxial Cable EMCI	EMC104-SM-SM-3000	201241	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMC104-SM-SM-1000	210103	2024/1/15	2025/1/14
Preamplifier EMCI	EMC184045SE	980788	2024/1/15	2025/1/14
Horn Antenna Schwarzbeck	BBHA 9170	9170-1049	2023/11/12	2024/11/11
RF Coaxial Cable EMCI	EMC101G-KM-KM-5000	201261	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMC101G-KM-KM-3000	201258	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMC101G-KM-KM-2000	201254	2024/1/15	2025/1/14
Boresight antenna tower fixture BV	BAF-02	5	NA	NA

Notes:

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 RF Chamber 9.

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

Note:

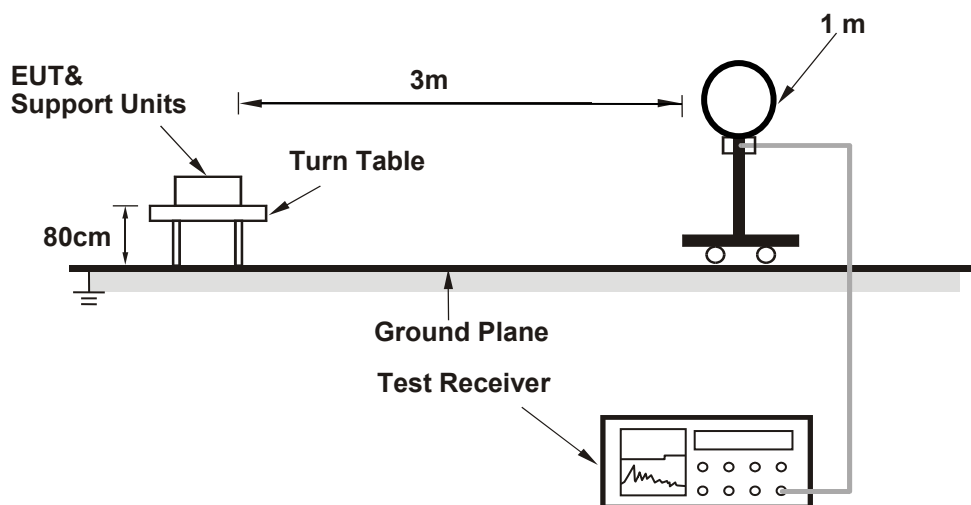
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

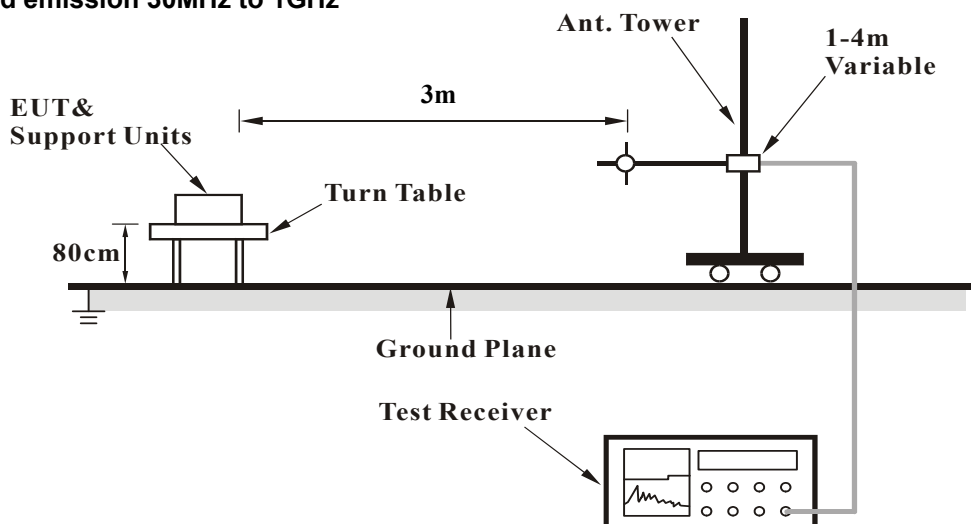
No deviation.

4.1.5 Test Setup

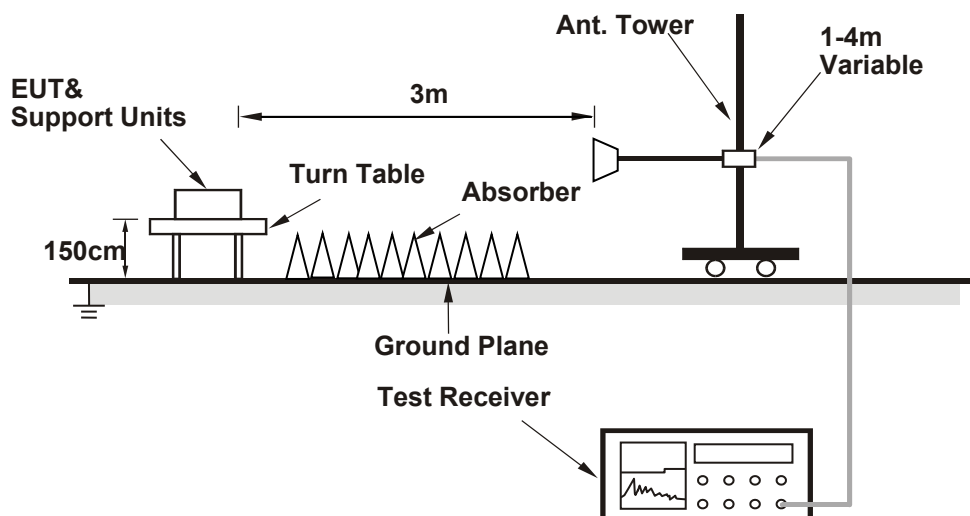
For Radiated emission below 30MHz



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

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

4.1.7 Test Results

CHANNEL	TX Channel 10	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	915.35MHz		

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	902.00	50.5 QP	84.7	-34.2	1.00 H	135	20.6	29.9
2	915.35	114.7 QP			1.00 H	135	84.5	30.2
3	928.00	50.7 QP	84.7	-34.0	1.00 H	135	20.4	30.3

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	902.00	50.4 QP	84.2	-33.8	1.10 V	68	20.5	29.9
2	915.35	114.2 QP			1.10 V	68	84.0	30.2
3	928.00	50.6 QP	84.2	-33.6	1.10 V	68	20.3	30.3

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.

Above 1GHz Data

CHANNEL	TX Channel 10	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 10GHz		

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	2746.05	47.8 PK	74.0	-26.2	1.61 H	224	45.5	2.3
2	2746.05	40.2 AV	54.0	-13.8	1.61 H	224	37.9	2.3
3	3661.40	45.1 PK	74.0	-28.9	1.27 H	302	39.8	5.3
4	3661.40	35.6 AV	54.0	-18.4	1.27 H	302	30.3	5.3
5	4576.75	49.4 PK	74.0	-24.6	1.55 H	117	40.7	8.7
6	4576.75	40.0 AV	54.0	-14.0	1.55 H	117	31.3	8.7
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	2746.05	49.6 PK	74.0	-24.4	1.39 V	271	47.3	2.3
2	2746.05	43.5 AV	54.0	-10.5	1.39 V	271	41.2	2.3
3	3661.40	46.0 PK	74.0	-28.0	1.53 V	28	40.7	5.3
4	3661.40	35.4 AV	54.0	-18.6	1.53 V	28	30.1	5.3
5	4576.75	49.8 PK	74.0	-24.2	2.08 V	270	41.1	8.7
6	4576.75	40.4 AV	54.0	-13.6	2.08 V	270	31.7	8.7

Remarks:

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

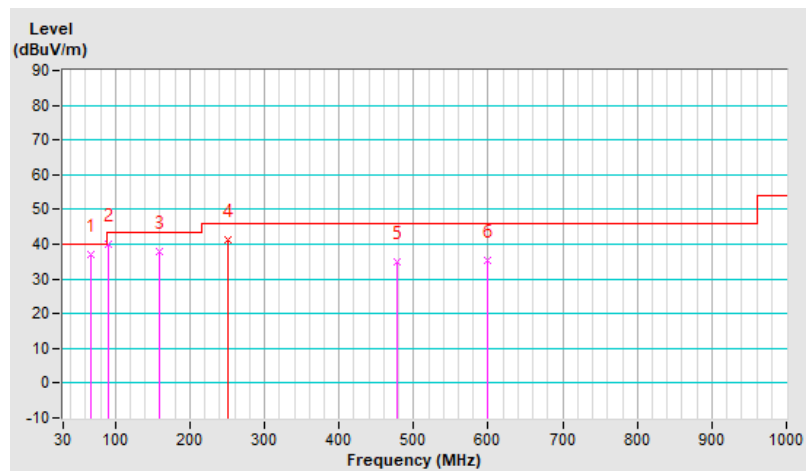
Below 1GHz worst-case data:

CHANNEL	TX Channel 10	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	67.83	37.0 QP	40.0	-3.0	1.99 H	174	51.6	-14.6
2	90.14	40.1 QP	43.5	-3.4	1.99 H	16	59.1	-19.0
3	159.98	37.9 QP	43.5	-5.6	1.99 H	97	51.1	-13.2
4	250.19	41.3 QP	46.0	-4.7	1.00 H	112	55.6	-14.3
5	478.14	35.0 QP	46.0	-11.0	1.49 H	212	43.1	-8.1
6	598.42	35.5 QP	46.0	-10.5	1.49 H	143	41.2	-5.7

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

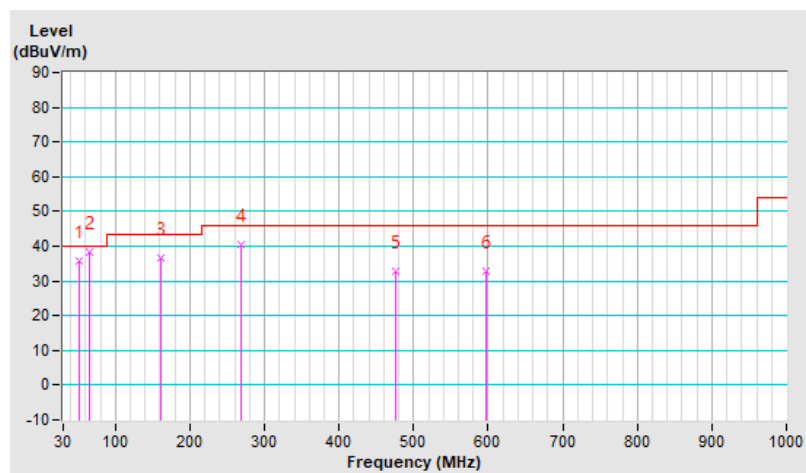


CHANNEL	TX Channel 10	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	52.31	35.9 QP	40.0	-4.1	1.00 V	2	48.9	-13.0
2	64.92	38.3 QP	40.0	-1.7	1.00 V	334	52.6	-14.3
3	160.95	36.4 QP	43.5	-7.1	1.00 V	60	49.5	-13.1
4	268.62	40.3 QP	46.0	-5.7	1.00 V	134	54.0	-13.7
5	475.23	32.7 QP	46.0	-13.3	1.99 V	251	40.8	-8.1
6	597.45	33.0 QP	46.0	-13.0	1.50 V	192	38.7	-5.7

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



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
EMI Test Receiver R&S	ESCI	100613	2023/12/4	2024/12/3
RF Coaxial Cable Woken	5D-FB	Cable-cond1-01	2024/1/6	2025/1/5
Fixed Attenuator Mini-Circuits	HAT-10+	PAD-COND1-01	2024/1/6	2025/1/5
LISN R&S	ENV216	101826	2024/3/25	2025/3/24
LISN R&S	ESH3-Z5	100311	2023/9/6	2024/9/5
Software BVADT	BVADT_Cond_ V7.4.1.0	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 1 (Conduction 1).

3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

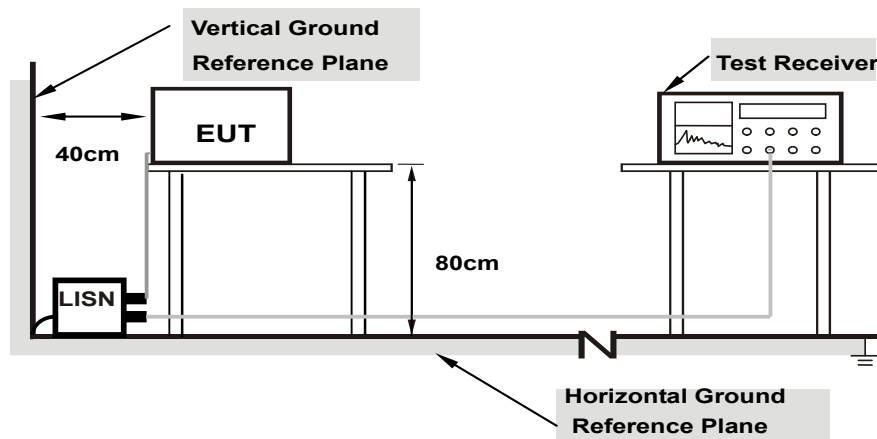
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

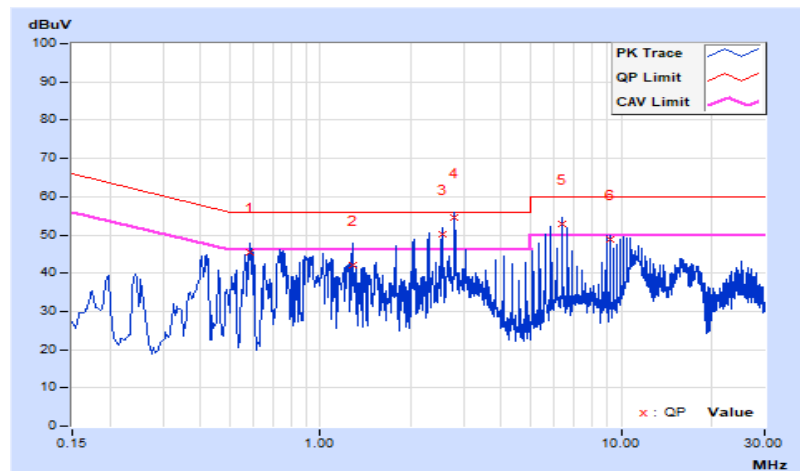
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 10		

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	0.58565	10.44	34.87	26.77	45.31	37.21	56.00	46.00	-10.69	-8.79
2	1.27800	10.45	31.77	23.39	42.22	33.84	56.00	46.00	-13.78	-12.16
3	2.55400	10.46	39.61	25.19	50.07	35.65	56.00	46.00	-5.93	-10.35
4	2.80200	10.48	44.04	30.28	54.52	40.76	56.00	46.00	-1.48	-5.24
5	6.37000	10.55	42.23	28.31	52.78	38.86	60.00	50.00	-7.22	-11.14
6	9.17400	10.58	38.29	23.88	48.87	34.46	60.00	50.00	-11.13	-15.54

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.

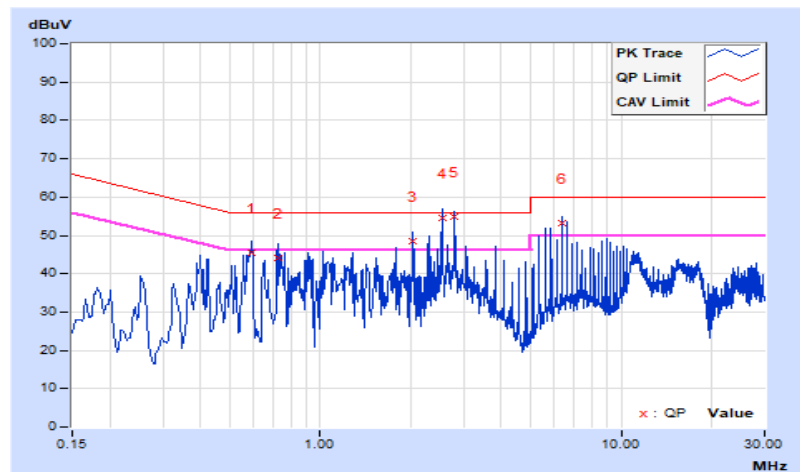


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 10		

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	0.59400	10.47	34.97	26.69	45.44	37.16	56.00	46.00	-10.56	-8.84
2	0.72200	10.48	33.66	27.20	44.14	37.68	56.00	46.00	-11.86	-8.32
3	2.03800	10.47	38.08	23.92	48.55	34.39	56.00	46.00	-7.45	-11.61
4	2.55000	10.50	44.20	29.12	54.70	39.62	56.00	46.00	-1.30	-6.38
5	2.80200	10.51	44.24	30.59	54.75	41.10	56.00	46.00	-1.25	-4.90
6	6.37000	10.60	42.74	28.78	53.34	39.38	60.00	50.00	-6.66	-10.62

Remarks:

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

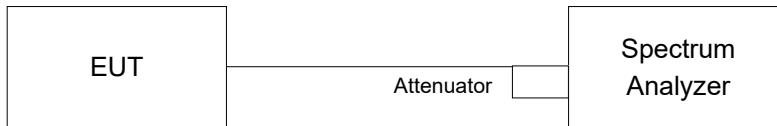


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 100kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.3.5 Deviation from Test Standard

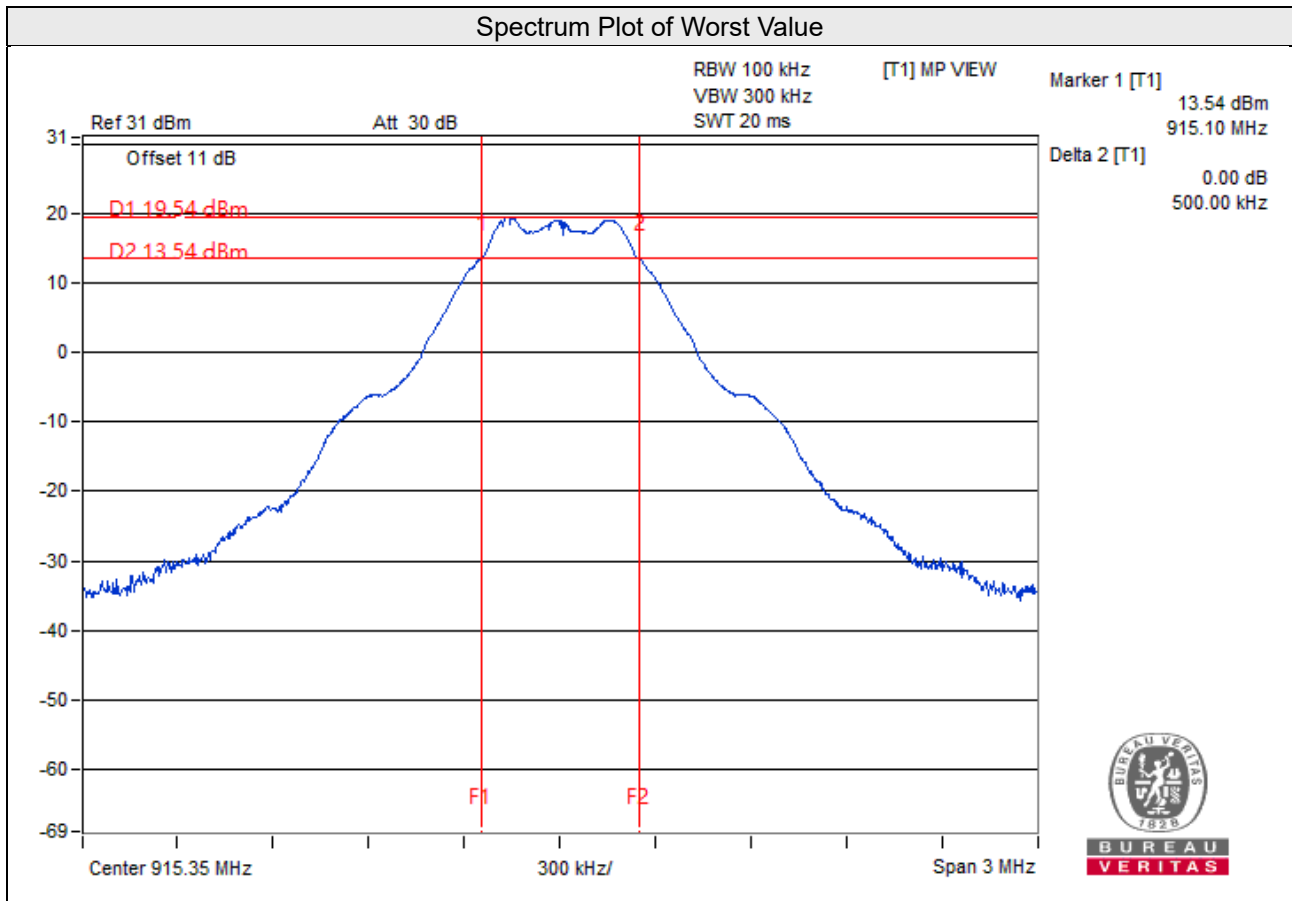
No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at the channel frequencies individually.

4.3.7 Test Result

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
10	915.35	0.5	0.5	Pass

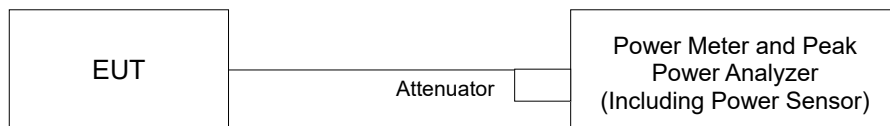


4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 902 ~ 928 MHz bands: 1 Watt (30dBm)

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as item 4.3.6.

4.4.7 Test Results

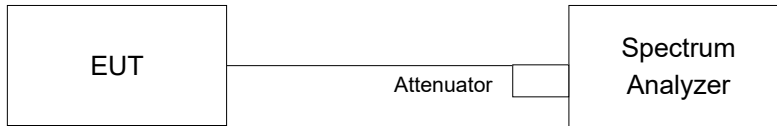
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
10	915.35	109.144	20.38	30.00	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$.
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.

4.5.5 Deviation from Test Standard

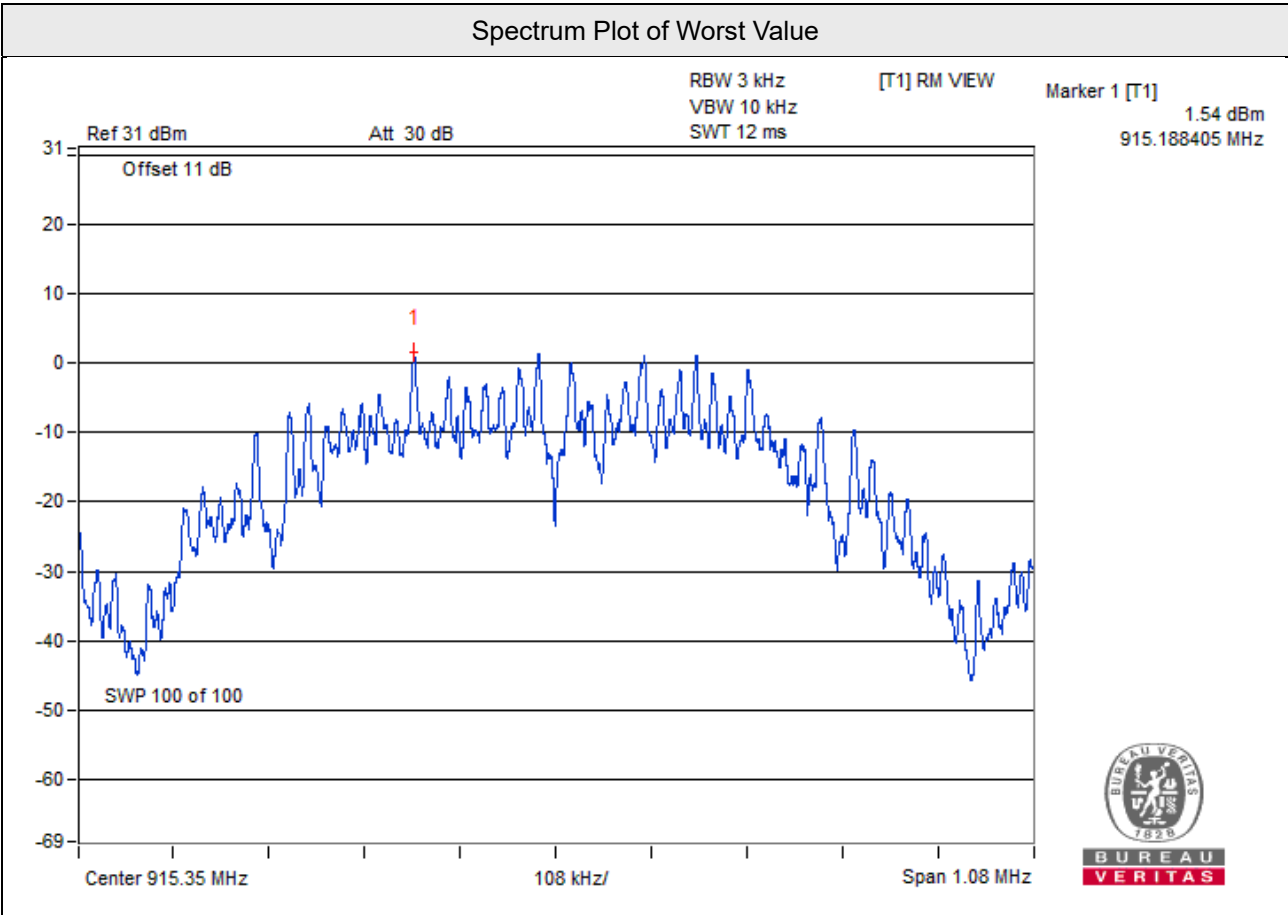
No deviation.

4.5.6 EUT Operating Condition

Same as item 4.3.6

4.5.7 Test Results

Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	Duty Factor (dB)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
10	915.35	1.54	0.43	1.98	8.00	Pass

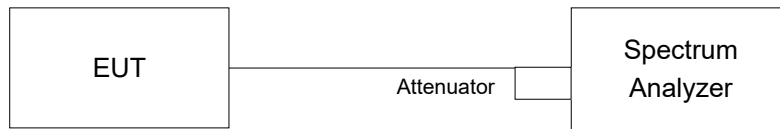


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOB

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

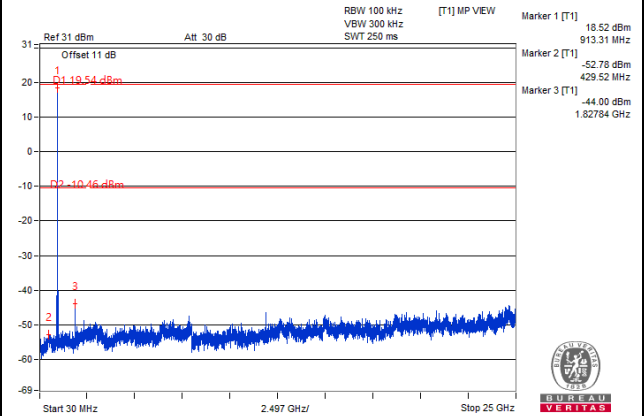
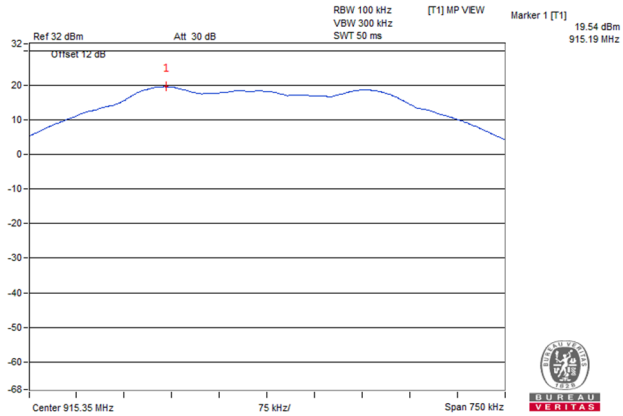
Same as item 4.3.6

4.6.7 Test Results

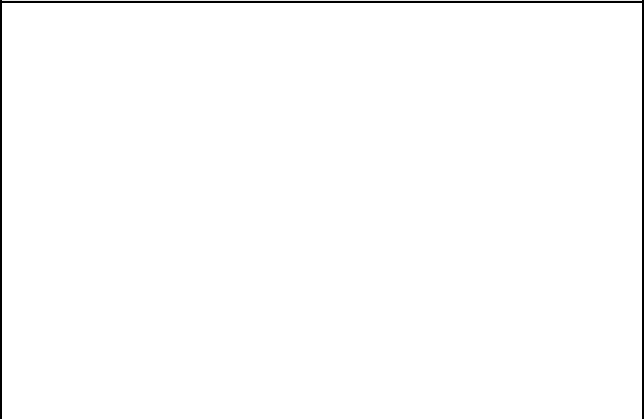
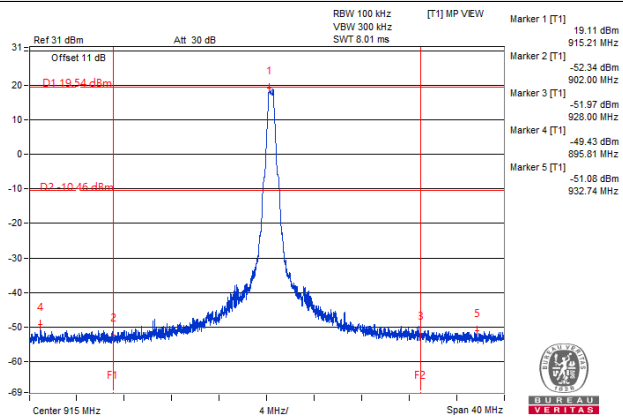
The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

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.

CH 10



Band edge



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: <http://ee.bureauveritas.com.tw>

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

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