

FCC Test Report

Report No.: RF180528C02E

FCC ID: M82-WISE6610N

Contains FCC ID: XMR201707BG96

Test Model: WISE-6610-N500C-A

Series Model: WISE-6610-N100-A, WISE-6610-N100C-A, WISE-6610-N500-A,
WISE-6610-N100XXXXXXXXXXXX, WISE6610N100AXXXXXXXXXXXXX,
WISE-6610-N100CXXXXXXXXXXXX,
WISE6610N100CAXXXXXXXXXXXXX,
WISE-6610-N500XXXXXXXXXXXX, WISE-6610-N500CXXXXXXXXXXXX,
WISE6610N500AXXXXXXXXXXXXX, WISE6610N500CAXXXXXXXXXXXXX
(where "X" maybe any alphanumeric character, blank or "-".) (refer to item
3.1 for more details)

Received Date: Nov. 13, 2019

Test Date: Jan. 17 ~ Feb. 14, 2020

Issued Date: Feb. 14, 2020

Applicant: ADVANTECH CO., LTD

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF180528C02E	Original release	Feb. 14, 2020

1 Certificate of Conformity

Product: Industrial LoRaWAN gateway

Brand: Advantech

Test Model: WISE-6610-N500C-A

Series Model: WISE-6610-N100-A, WISE-6610-N100C-A, WISE-6610-N500-A,
WISE-6610-N100XXXXXXXXXXXX, WISE6610N100AXXXXXXXXXXXXX,
WISE-6610-N100CXXXXXXXXXXXX, WISE6610N100CAXXXXXXXXXXXXX,
WISE-6610-N500XXXXXXXXXXXX, WISE-6610-N500CXXXXXXXXXXXX,
WISE6610N500AXXXXXXXXXXXXX, WISE6610N500CAXXXXXXXXXXXXX
(where "X" maybe any alphanumeric character, blank or "-".) (refer to item 3.1 for more details)

Sample Status: Engineering sample

Applicant: ADVANTECH CO., LTD

Test Date: Jan. 17 ~ Feb. 14, 2020

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10: 2013

This report is issued as a supplementary report of RF180528C02A. This report shall be used combined together with its original report.

Prepared by : , **Date:** Feb. 14, 2020
Polly Chien / Specialist

Approved by : , **Date:** Feb. 14, 2020
Bruce Chen / Senior Project Engineer

Note: Conducted power, radiated emission and conducted emission are performed for the addendum.
Refer to original report for the other test data.

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 -43.12dB at 0.15800MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.2dB at 55.13MHz.
15.247(d)	Antenna Port Emission	N/A	Refer to Note 1
15.247(a)(2)	6dB bandwidth	N/A	Refer to Note 1
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	N/A	Refer to Note 1
15.203	Antenna Requirement	Pass	Antenna connector is SMA Male Reverse not a standard connector.

Note:

1. Conducted power, radiated emission and conducted emission are performed for the addendum. Refer to original report for the other test data.
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) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.74 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.63 dB
	200MHz ~ 1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Industrial LoRaWAN gateway
Brand	Advantech
Test Model	WISE-6610-N500C-A
Series Model	WISE-6610-N100-A, WISE-6610-N100C-A, WISE-6610-N500-A, WISE-6610-N100XXXXXXXXXXXX, WISE6610N100AXXXXXXXXXXXXX, WISE-6610-N100CXXXXXXXXXXXX, WISE6610N100CAXXXXXXXXXXXXX, WISE-6610-N500XXXXXXXXXXXX, WISE-6610-N500CXXXXXXXXXXXX, WISE6610N500AXXXXXXXXXXXXX, WISE6610N500CAXXXXXXXXXXXXX (where "X" maybe any alphanumeric character, blank or "-".)
Model Difference	Refer to note
Status of EUT	Engineering sample
Power Supply Rating	9~36Vdc
Modulation Type	CSS
Operating Frequency	923.3~927.5MHz
Number of Channel	8
Output Power	264.850mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	1.5m non-shielded power cable without core
Cable Supplied	NA

Note:

1. This report is prepared for FCC class II permissive change. The differences compared with the original report no. RF180528C02A are adding WWAN module, changing models and main board. Therefore, test items for conducted power, radiated emission and conducted emission are performed for the addendum. Refer to original report for the other test data.
2. The following models are provided to this EUT. The model of the WISE-6610-N500C-A was chosen for final test.

Brand	Model	Description	
Advantech	WISE-6610-N100-A; WISE-6610-N100C-A; WISE-6610-N100XXXXXXXXXXXX; WISE6610N100AXXXXXXXXXXXXX; WISE-6610-N100CXXXXXXXXXXXX; WISE6610N100CAXXXXXXXXXXXXX; (where "X" maybe any alphanumeric character, blank or "-".)	Version-A/ 9-36VDC	LoRaWAN Gateway support up to 100 nodes with 915MHz
	WISE-6610-N500-A; WISE-6610-N500C-A; WISE-6610-N500XXXXXXXXXXXX; WISE-6610-N500CXXXXXXXXXXXX; WISE6610N500AXXXXXXXXXXXXX; WISE6610N500CAXXXXXXXXXXXXX; (where "X" maybe any alphanumeric character, blank or "-".)	Version-A/ 9-36VDC	LoRaWAN Gateway support up to 500 nodes with 915MHz

3. The following antenna was provided to the EUT.

Antenna Type	Antenna Connector	Brand	Model	Gain
Dipole	SMA Male Reverse	Advantech	AN0891-74S01BRS	0.41dBi

4. Spurious emission of the simultaneous operation (LoRa and WWAN) has been evaluated and no non-compliance was found.

3.2 Description of Test Modes

8 channels are provided to this EUT:

Channel	Freq. (MHz)
0	923.3
1	923.9
2	924.5
3	925.1
4	925.7
5	926.3
6	926.9
7	927.5

3.2.1 Test Mode Applicability and Tested Channel Detail

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

Where RE \geq 1G: Radiated Emission above 1GHz & Bandedge Measurement
 RE<1G: Radiated Emission below 1GHz
 PLC: Power Line Conducted Emission
 CP: Conducted power:

Note:

- The EUT had been pre-tested on the positioned of X-plane and Z-plane. The worst case was found when positioned on X-plane for EUT and Z-plane for antenna.

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	Remark
-	0 to 7	0, 7	CSS	-

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	Remark
-	0 to 7	0, 7	CSS	-

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	Remark
-	0 to 7	0	CSS	-

Conducted power:

- 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	Remark
-	0 to 7	0, 3, 7	CSS	-

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE \geq 1G	25 deg. C, 70% RH	12Vdc	Luis Lee
RE<1G	21 deg. C, 68% RH	12Vdc	Noah chang
PLC	25 deg. C, 75% RH	12Vdc	Jones Chang
CP	25 deg. C, 60% RH	12Vdc	Leo Tsai

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.

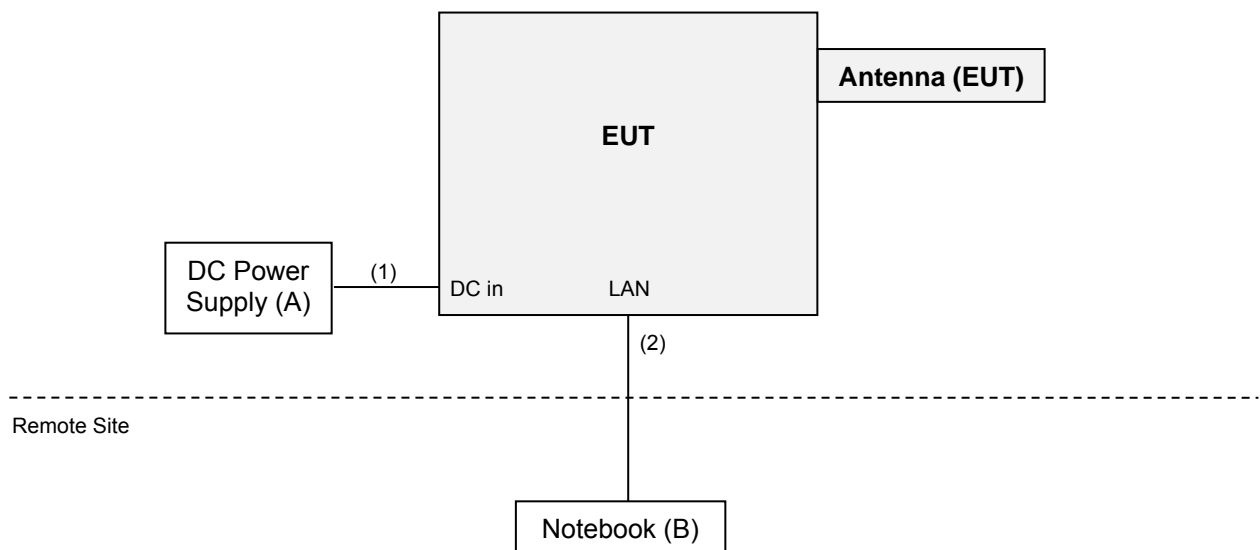
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DC power supply	Keysight	U8002A	MY56330015	NA	-
B.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-

Note:

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

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Power cable	1	1.5	N	0	Accessory of the EUT
2.	LAN cable	1	7	N	0	RJ45, Cat5e

3.3.1 Configuration of System under Test



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 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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Dec. 31, 2019	Dec. 30, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 23, 2019	Sep. 22, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	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	2944A10631	Jul. 11, 2019	Jul. 10, 2020
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jun. 11, 2019	Jun. 10, 2020
RF Coaxial Cable WORKEN With 5dB PAD	8D-FB	Cable-CH4-01	Aug. 20, 2019	Aug. 19, 2020
RF Coaxial Cable EMCI	EMC102-KM-KM-300 0	150929	Aug. 20, 2019	Aug. 19, 2020
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Aug. 20, 2019	Aug. 19, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Jul. 11, 2019	Jul. 10, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Jul. 11, 2019	Jul. 10, 2020
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190 004/MY55190007/MY55 210005	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 4.

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:

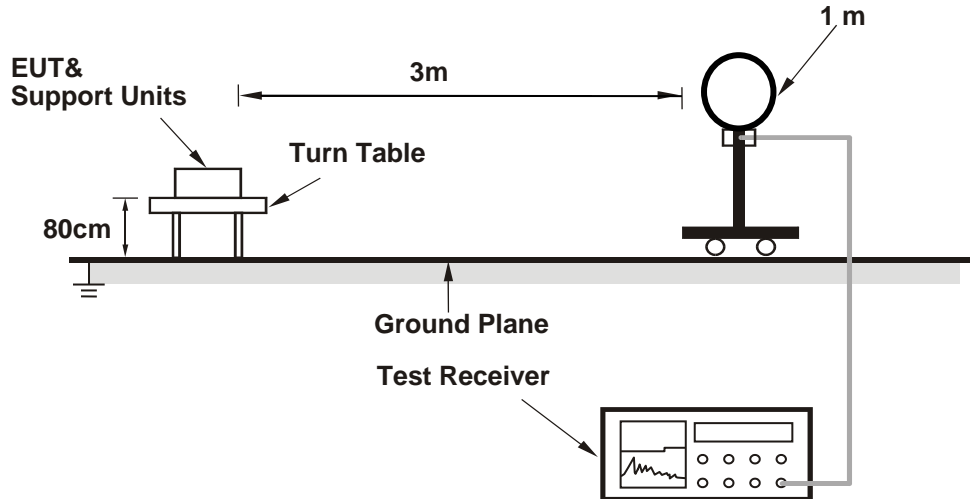
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

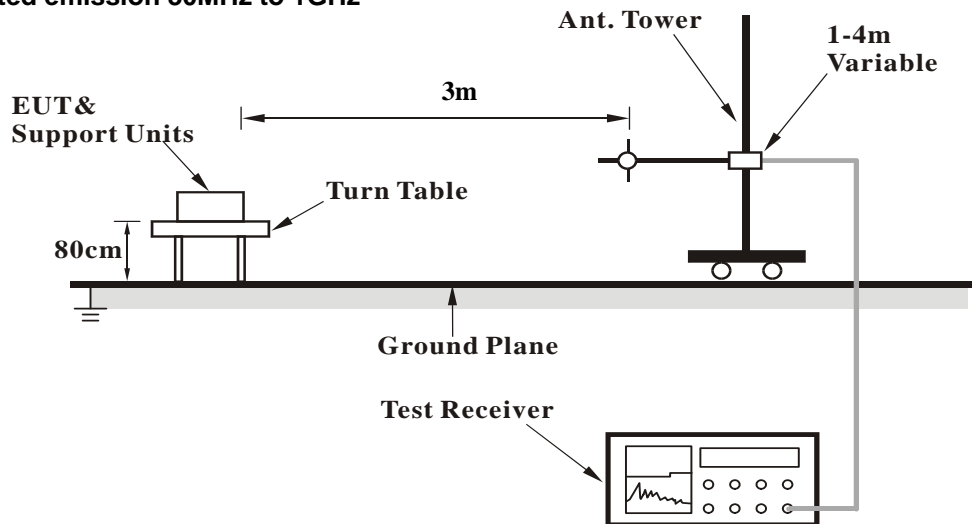
No deviation.

4.1.5 Test Setup

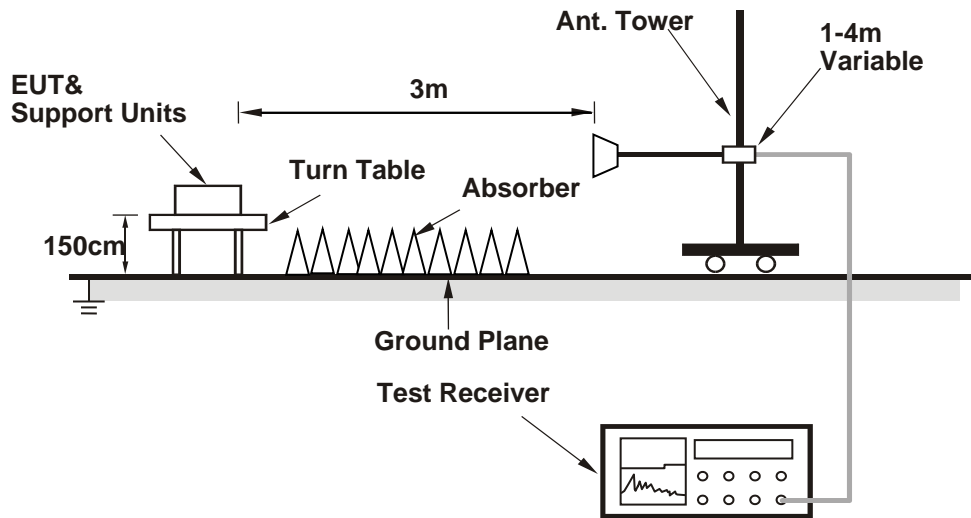
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

Above 1GHz Data:

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP) Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	104.1	-53.6	1.66 H	73	15.3	35.2
2	*923.30	124.1 QP			1.59 H	67	88.5	35.6
3	#1846.60	38.0 PK	74.0	-36.0	1.60 H	177	41.5	-3.5
4	#1846.60	34.0 AV	54.0	-20.0	1.60 H	177	37.5	-3.5
5	2769.90	36.9 PK	74.0	-37.1	1.90 H	174	35.1	1.8
6	2769.90	26.1 AV	54.0	-27.9	1.90 H	174	24.3	1.8
7	3693.20	39.6 PK	74.0	-34.4	2.10 H	130	35.2	4.4
8	3693.20	29.0 AV	54.0	-25.0	2.10 H	130	24.6	4.4

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	51.0 QP	108.5	-57.5	1.05 V	57	15.8	35.2
2	#923.30	128.5 QP			1.00 V	49	92.9	35.6
3	#1846.60	42.1 PK	74.0	-31.9	1.00 V	309	45.6	-3.5
4	#1846.60	38.2 AV	54.0	-15.8	1.00 V	309	41.7	-3.5
5	2769.90	41.2 PK	74.0	-32.8	2.37 V	254	39.4	1.8
6	2769.90	30.5 AV	54.0	-23.5	2.37 V	254	28.7	1.8
7	3693.20	42.0 PK	74.0	-32.0	1.62 V	140	37.6	4.4
8	3693.20	31.0 AV	54.0	-23.0	1.62 V	140	26.6	4.4

REMARKS:

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

CHANNEL	TX Channel 7	DETECTOR FUNCTION	Quasi-Peak (QP) Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	*927.50	116.6 QP			1.35 H	329	85.20	31.40
2	#928.00	87.7 QP	96.6	-8.9	1.34 H	333	56.30	31.40
3	#1855.00	38.6 PK	74.0	-35.4	2.58 H	144	42.0	-3.4
4	#1855.00	34.9 AV	54.0	-19.1	2.58 H	144	38.3	-3.4
5	2782.50	37.2 PK	74.0	-36.8	1.96 H	228	35.4	1.8
6	2782.50	26.1 AV	54.0	-27.9	1.96 H	228	24.3	1.8
7	3710.00	40.3 PK	74.0	-33.7	2.90 H	317	35.8	4.5
8	3710.00	29.4 AV	54.0	-24.6	2.90 H	317	24.9	4.5

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	*927.50	121.9 QP			1.42 V	295	90.50	31.40
2	#928.00	93.1 QP	101.9	-8.8	1.48 V	297	61.70	31.40
3	#1855.00	42.6 PK	74.0	-31.4	1.00 V	126	46.0	-3.4
4	#1855.00	38.7 AV	54.0	-15.3	1.00 V	126	42.1	-3.4
5	2782.50	41.2 PK	74.0	-32.8	1.32 V	250	39.4	1.8
6	2782.50	30.2 AV	54.0	-23.8	1.32 V	250	28.4	1.8
7	3710.00	44.1 PK	74.0	-29.9	2.30 V	152	39.6	4.5
8	3710.00	31.2 AV	54.0	-22.8	2.30 V	152	26.7	4.5

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.
6. " # ": The radiated frequency is out of the restricted band.

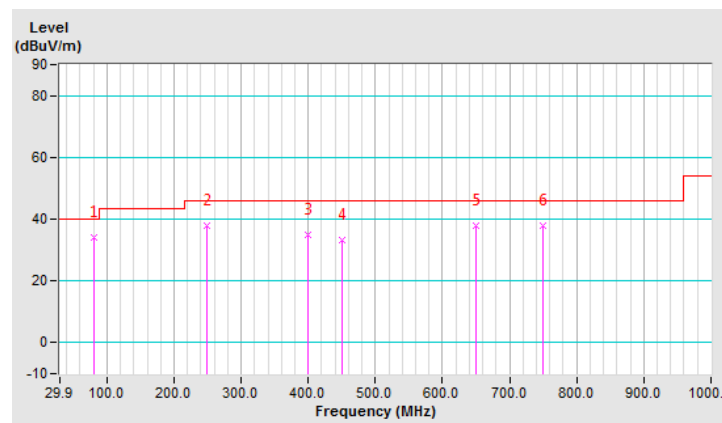
Below 1GHz data:

CHANNEL	TX Channel 0	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	80.35	34.0 QP	40.0	-6.0	1.50 H	234	46.9	-12.9
2	249.17	38.0 QP	46.0	-8.0	1.00 H	273	47.2	-9.2
3	400.52	35.0 QP	46.0	-11.0	1.00 H	131	39.9	-4.9
4	450.97	33.4 QP	46.0	-12.6	1.00 H	199	36.9	-3.5
5	650.83	37.7 QP	46.0	-8.3	2.00 H	135	36.6	1.1
6	749.79	37.9 QP	46.0	-8.1	1.00 H	139	34.0	3.9

Remarks:

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

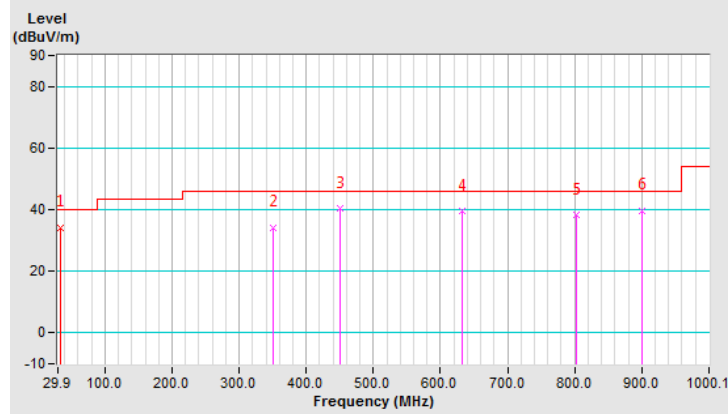


CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	33.08	34.3 QP	40.0	-5.7	1.00 V	19	44.1	-9.8
2	350.07	34.3 QP	46.0	-11.7	1.00 V	187	40.5	-6.2
3	450.97	40.3 QP	46.0	-5.7	1.00 V	132	43.8	-3.5
4	631.42	39.4 QP	46.0	-6.6	1.00 V	248	38.7	0.7
5	802.18	38.1 QP	46.0	-7.9	1.00 V	248	33.2	4.9
6	901.14	39.8 QP	46.0	-6.2	1.00 V	196	32.9	6.9

Remarks:

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

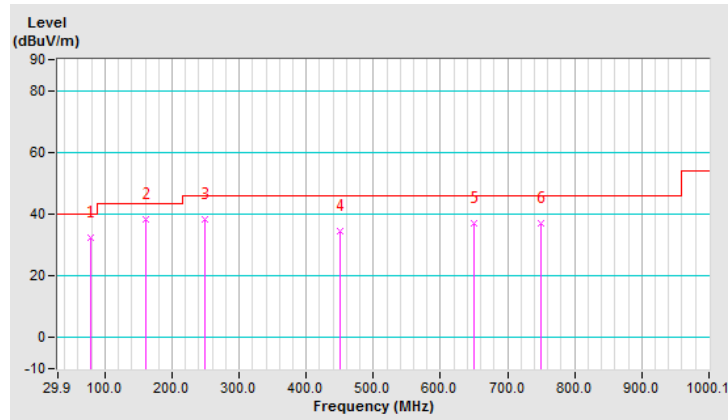


CHANNEL	TX Channel 7	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	31.84	35.9 QP	40.0	-4.1	1.00 V	356	46.0	-10.1
2	55.13	36.8 QP	40.0	-3.2	1.00 V	307	45.3	-8.5
3	450.97	40.1 QP	46.0	-5.9	1.00 V	132	43.6	-3.5
4	470.37	40.3 QP	46.0	-5.7	1.00 V	229	43.4	-3.1
5	499.48	41.0 QP	46.0	-5.0	1.00 V	141	43.7	-2.7
6	604.26	42.3 QP	46.0	-3.7	1.00 V	308	42.1	0.2

Remarks:

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

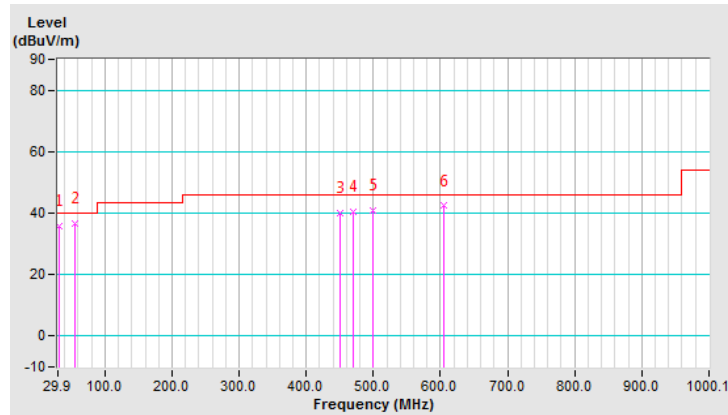


CHANNEL	TX Channel 7	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	126.92	40.6 QP	43.5	-2.9	2.00 V	297	51.10	-10.50
2	190.95	40.9 QP	43.5	-2.6	1.51 V	192	52.30	-11.40
3	254.99	34.2 QP	46.0	-11.8	1.00 V	277	43.70	-9.50
4	450.97	34.2 QP	46.0	-11.8	1.00 V	159	39.70	-5.50
5	800.24	42.2 QP	46.0	-3.8	2.00 V	359	40.30	1.90
6	961.29	39.7 QP	54.0	-14.3	1.00 V	75	35.00	4.70

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted 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	ESCI	100613	Dec. 11, 2019	Dec. 10, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2019	Sep. 04, 2020
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 21, 2019	Feb. 20, 2020
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 22, 2019	Aug. 21, 2020
Software ADT	BV ADT_Cond_ 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 1.

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

4.2.3 Test Procedures

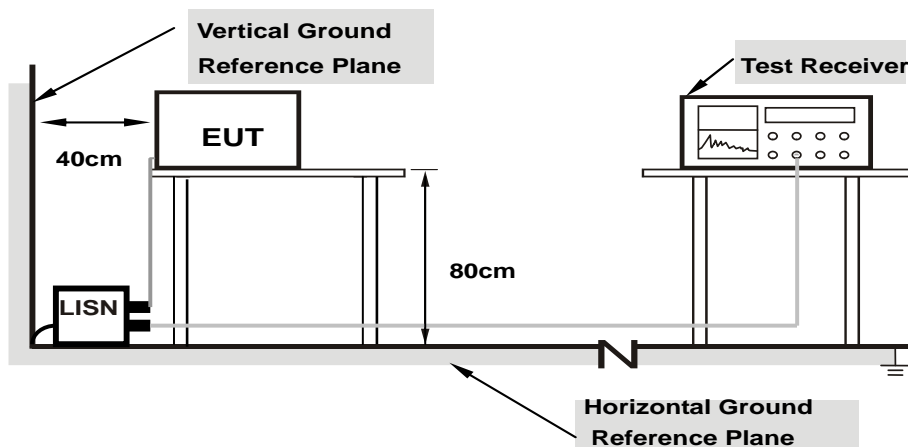
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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:**
- Support units were connected to second LISN.
 - Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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

4.2.6 EUT Operating Condition

Same as item 4.1.6.

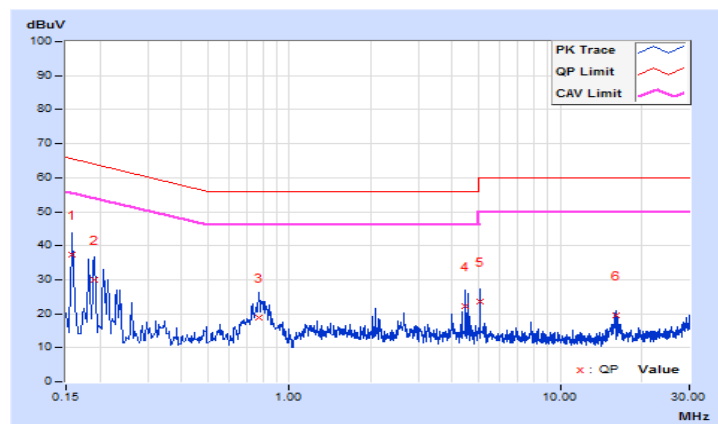
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 0		

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	0.15800	9.67	27.83	2.78	37.50	12.45	65.57
2	0.19000	9.66	20.29	0.40	29.95	10.06	64.04	54.04	-34.09	-43.98
3	0.77400	9.71	9.12	3.26	18.83	12.97	56.00	46.00	-37.17	-33.03
4	4.46200	9.85	12.41	2.37	22.26	12.22	56.00	46.00	-33.74	-33.78
5	5.05800	9.86	13.63	0.75	23.49	10.61	60.00	50.00	-36.51	-39.39
6	16.02200	9.97	9.59	5.10	19.56	15.07	60.00	50.00	-40.44	-34.93

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.

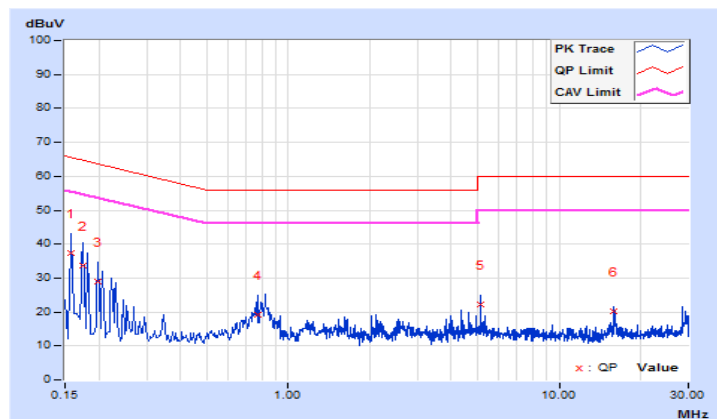


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 0		

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	0.15800	9.64	27.78	2.69	37.42	12.33	65.57
2	0.17400	9.64	23.95	1.27	33.59	10.91	64.77	54.77	-31.18	-43.86
3	0.19800	9.64	19.39	0.69	29.03	10.33	63.69	53.69	-34.66	-43.36
4	0.77000	9.68	9.57	4.06	19.25	13.74	56.00	46.00	-36.75	-32.26
5	5.15400	9.83	12.55	0.89	22.38	10.72	60.00	50.00	-37.62	-39.28
6	15.97800	10.00	10.11	5.62	20.11	15.62	60.00	50.00	-39.89	-34.38

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.

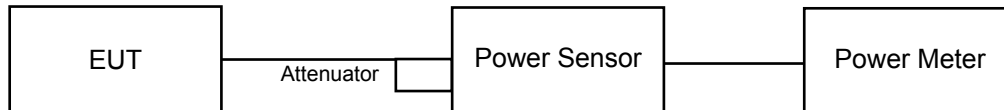


4.3 Conducted Output Power Measurement

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

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

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

4.3.7 Test Results

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
0	923.3	264.850	24.23	30.00	Pass
3	925.1	250.035	23.98	30.00	Pass
7	927.5	109.901	20.41	30.00	Pass

5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

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Web Site: www.bureauveritas-adt.com

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