FCC Test Report (Part 30)

Report No.:	RF181015C09-5 R1
FCC ID:	PY318300428
Test Model:	MR5000
Received Date:	Oct. 15, 2018
Test Date:	Nov. 16 to Dec. 16, 2018
Issued Date:	Dec. 17, 2018
Applicant:	NETGEAR INC.
Address:	350 East Plumeria Drive, San Jose, CA 95134, USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location :	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RF181015C09-5	Original release.	Nov. 19, 2018
RF181015C09-5 R1	Retest EIRP/ Emission Bandwidth/Spurious Emission items due to disabling the array antenna module 1 and module 3; firmware update;	Dec. 17, 2018

1 Certificate of Conformity

Product: 5G MHS Travel Router

Brand: Netgear

Test Model: MR5000

Sample Status: ENGINEERING SAMPLE

Applicant: NETGEAR INC.

Test Date: Nov. 16 to Dec. 16, 2018

Standards: 47 CFR FCC Part 30

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Wendy Wu , **Date:** Dec. 17, 2018

Wendy Wu / Specialist

Approved by : , **Date:** Dec. 17, 2018

May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 30				
FCC Clause	Test Item	Test Result	Test Condition	Remarks
2.1047	Modulation characteristics	Pass	-	Meet the requirement
2.1049	Emission Bandwidth	Pass	Radiated	Meet the requirement of limit.
30.202	EIRP	Pass		Meet the requirement of limit.
2.1051 30.203	Out-of-Band Spurious Emission	Pass		Meet the requirement of limit. Minimum passing margin is -2.5dB at 112.94856MHz.
2.1053 30.203	Out-of-Band Emission at the Band Edge	Pass		Meet the requirement of limit.
2.1055	Frequency Stability	Pass		Meet the requirement of limit.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	30MHz ~ 1000MHz	5.53 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.08 dB
	6GHz ~ 18GHz	4.98 dB
	18GHz ~ 40GHz	5.19 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	5G MHS Travel Router
Brand	Netgear
Test Model	MR5000
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	5Vdc from power adapter or 5Vdc from USB interface or 3.85V dc from battery
Modulation Type	QPSK, 16QAM, 64QAM
Operating Frequency	37.649 ~ 39.950 GHz
Supported Channel Bandwidth	100MHz
Supported Carrier Component	1CC
Max. E.I.R.P. Power (RMS)	14.98dBm
Antenna Type	Refer to Note
Antenna Connector	NA
Accessory Device	Adapter x1 , Battery x1
Data Cable Supplied	USB cable x 1 (Shielded, 0.95m)
Antenna Information	There are three QTM's 5G array antenna modules, and each 5G array antenna module consists of two sub-arrays. 1. One 1x4 Dipole Antenna Sub-Array Single-polarized dipole antennas, Omni-directional individually but directional when all 4 active depending on phase. 2. One 1x4 Patch Antenna Sub-Array Cross-polarized patch antennas, patch antenna +/- 45 degrees vertical or horizontal at full gain (falls off 90 degrees). The dipole sub-array and patch sub-array cannot transmit simultaneously, only 1 sub-array active at one time. These three 5G arrays antenna modules do not operate simultaneously of each other. The purpose of the three spatially separated 5G arrays is for spatial diversity. As for beam-steering/beam-forming mechanism, the product's beam formation selects between dipole or patch array, the wide beam-width on the best array, sweeps begin to improve link, and beam-width then reduces on best beam location. For this version, the array antenna module 1 and module 3 are disabled by software. Only array antenna module 2 on right side of the device is active. Only patch array antenna of module 2 on the right side of the device is active, the dipole array antenna of module 2 is disabled. The location of the antenna module 2 is shown in the following note.6

Note:

1. Simultaneously transmission condition.

Condition	Technology		
1	WLAN 2.4GHz 1Tx	WLAN 5GHz 1Tx	WWAN or 5G NR
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.			

2. The EUT contains three radio modules for millimeter wave , the module 1 and module 3 are disabled by software. Only module 2 on right side of the device is active, therefore module 2 was used for the final testing.

Millimeter wave radio module	
Radio Module	Status
Module 1 (Bottom Side)	Disable
Module 2 (Right Side)	Active
Module 3 (Top Side)	Disable

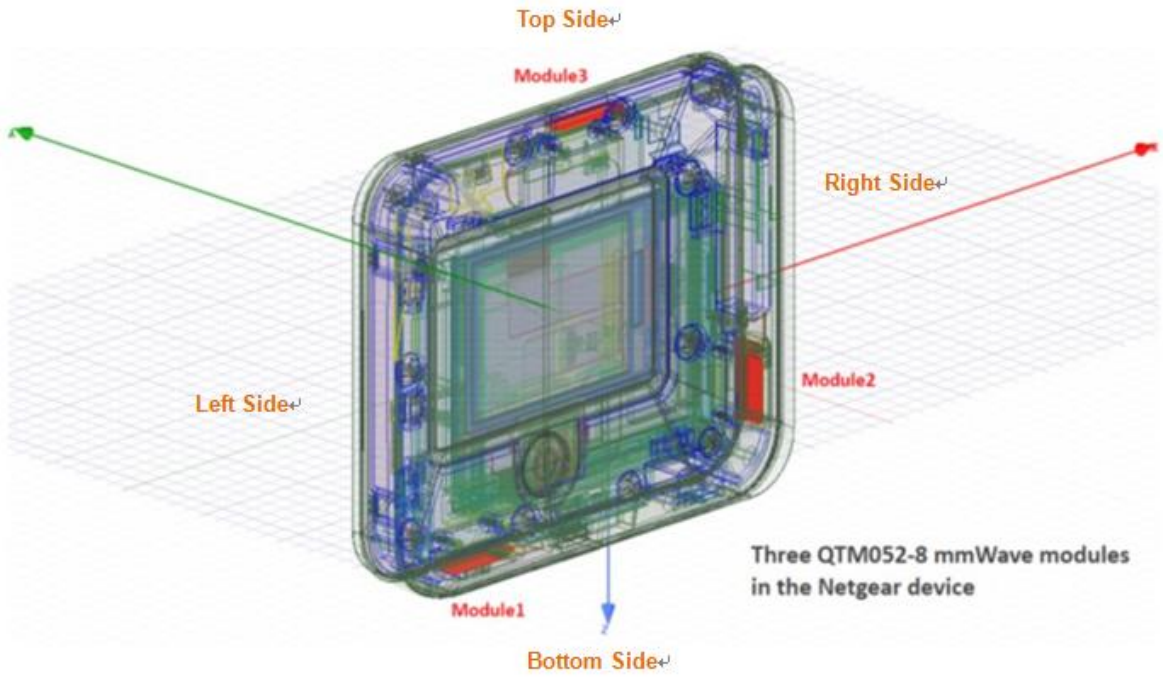
3. Only two beams are supported: one beam is vertically polarized and the other one is horizontally polarized. These two beams are from the same 5GNR module which is the only operational one. These two beams are pointing at the same direction, only the polarities are different.

   According to the above operation mode, both modes were investigated and the worst case scenario was identified. The worst case data were presented in test report.

4. The EUT must be supplied with a power adapter or battery as following table:

Items	Brand	Model No.	P/N No.	Spec.
Adapter	NETGEAR	AD2122F20	332-11106-01	Input: 100-240V~50/60Hz 0.5A Output: 5V / 2.0A or 9V /1.8A
Battery	NETGEAR	W-10a	308-10084-01	3.85V dc 5040mAh

5. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
6. <Antenna Location>



3.2 Description of Test Modes

Channel Bandwidth (MHz)	Channel
100	2239991
	2260003
	2278337

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO							DESCRIPTION
	MC	EB	EIRP	RE≥1G	RE<1G	OOB	FS	
-	√	√	√	√	√	√	√	-

Where **MC:** Modulation characteristics **EB:** Emission Bandwidth
EIRP: Effective Isotropically Radiated Power **RE≥1G:** Radiated Emission above 1GHz
RE<1G: Radiated Emission below 1GHz **OOB**: Out-of-Band Emission at the Band Edge
FS: Frequency Stability

Modulation characteristics 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.

TESTED CHANNEL	MODULATION	MODE
M	QPSK / 16QAM / 64QAM	Full RB

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.

TESTED CHANNEL	MODULATION	MODE
L, M, H	QPSK	1RB / 32RB offset

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.

TESTED CHANNEL	MODULATION	MODE
L, M, H	QPSK	1RB / 32RB offset

Out-of-Band Emission at the Band Edge:

☒ 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.

TESTED CHANNEL	MODULATION	MODE
L	QPSK	1RB / 0RB offset Full RB
H	QPSK	1RB / 65RB offset Full RB

EIRP 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.

TESTED CHANNEL	MODULATION	MODE
L, M, H	QPSK / 16QAM / 64QAM	1RB / 0RB offset 1RB / 32RB offset 1RB / 65RB offset Full RB

Frequency Stability 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.

TESTED CHANNEL	MODULATION	MODE
M	QPSK	-

Emission Bandwidth 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.

TESTED CHANNEL	MODULATION	MODE
L	QPSK / 16QAM / 64QAM	1RB / 0RB offset Full RB

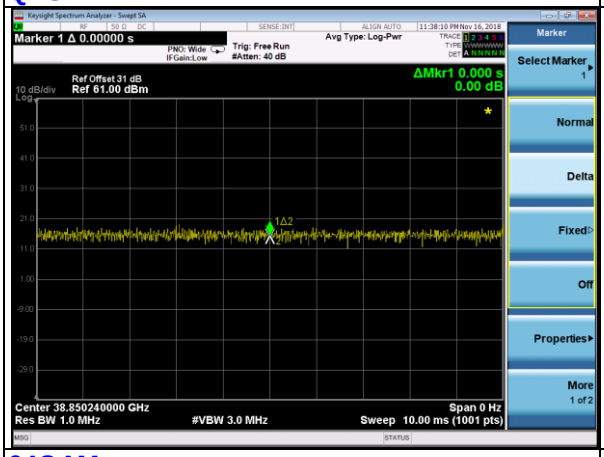
Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
MC	24deg. C, 64%RH	120Vac, 60Hz	Weiwei Lo
EIRP	24deg. C, 64%RH	120Vac, 60Hz	Weiwei Lo
FS	24deg. C, 64%RH	120Vac, 60Hz	Weiwei Lo
EB	24deg. C, 64%RH	120Vac, 60Hz	Weiwei Lo
RE≥1G	23deg. C, 64%RH	120Vac, 60Hz	Weiwei Lo
RE<1G	23deg. C, 64%RH	120Vac, 60Hz	Weiwei Lo
OOB	23deg. C, 64%RH	120Vac, 60Hz	Weiwei Lo

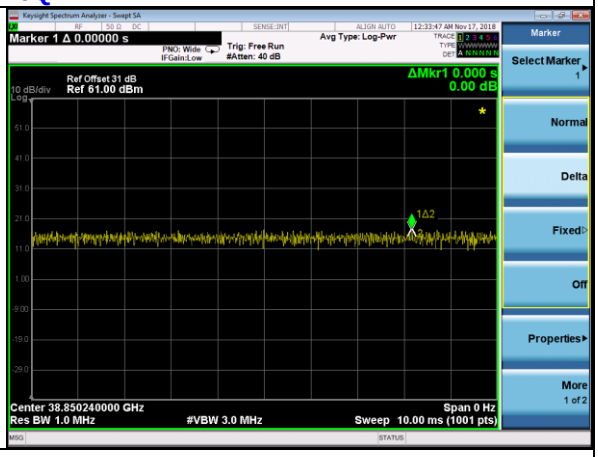
3.3 Duty Cycle of Test Signal

Duty cycle of test signal is 100 %.

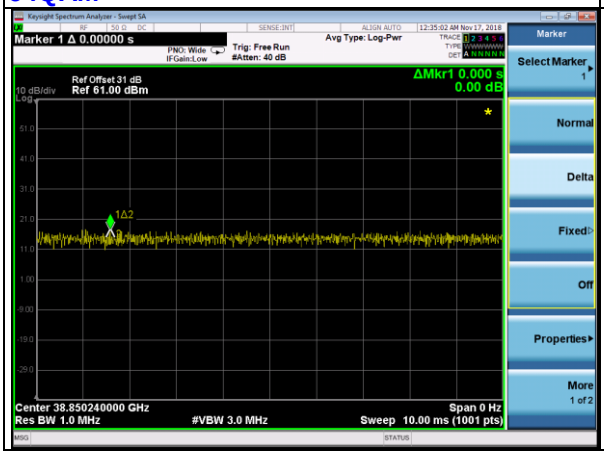
QPSK



16QAM



64QAM



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.

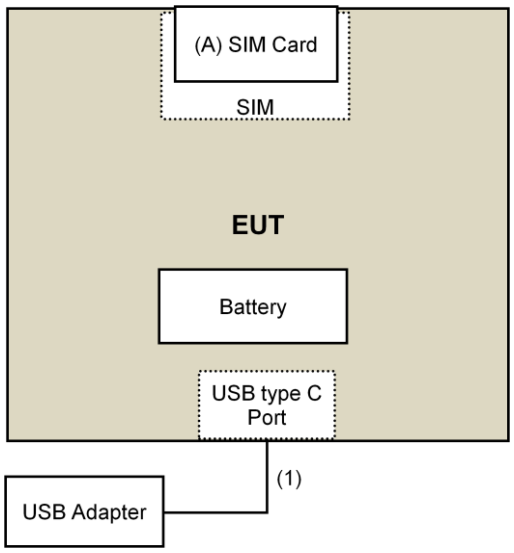
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	SIM Card	R&S	CMW-Z05	NA	NA	Provided by Lab

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB type C Cable	1	1	Yes	0	Supplied by client

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 30

ANSI 63.26-2015

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

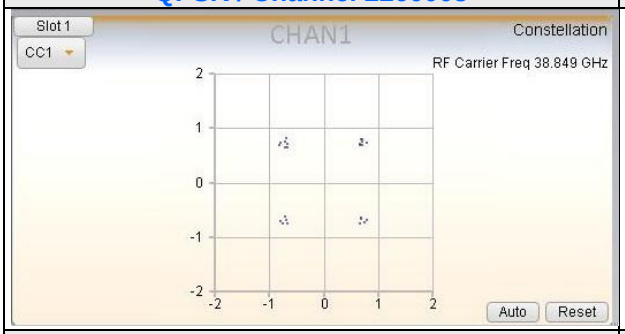
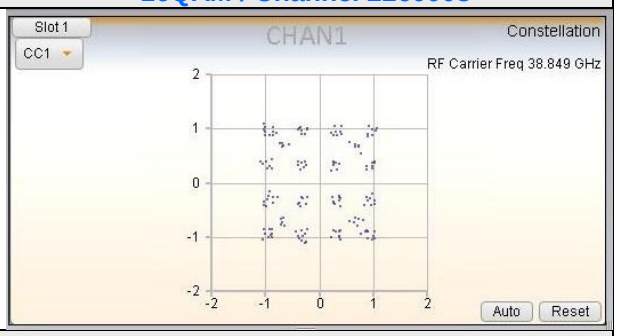
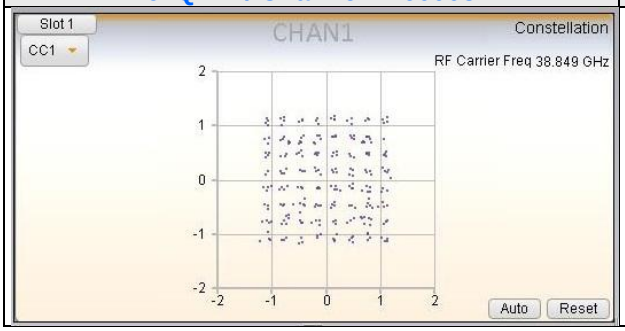
4 Test Types and Results

4.1 Modulation characteristics

4.1.1 Limits of Modulation characteristics

N/A

4.1.2 Results

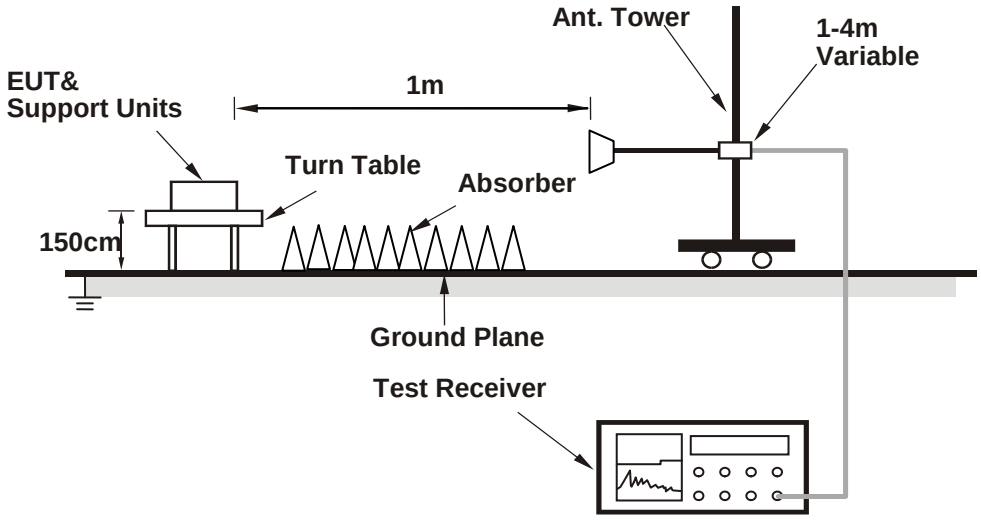
QPSK / Channel 2260003	16QAM / Channel 2260003
	
64QAM / Channel 2260003	
	

4.2 Equivalent Isotropic Radiated Power (EIRP) Measurement

4.2.1 Limits of EIRP Measurement

Device		Maximum Limit of EIRP
☐	Fixed and Base Stations	EIRP 75dBm/100MHz (sum of all antenna elements)
☒	Mobile Stations	EIRP 43dBm (sum of all antenna elements)
☐	Transportable Stations	EIRP 55dBm (sum of all antenna elements)

4.2.2 Test Setup



4.2.3 Test Instruments

For Frequency Stability Measurement:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	July 12, 2018	July 11, 2019
Power meter Anritsu	ML2495A	1014008	May 09, 2018	May 08, 2019
Power sensor Anritsu	MA2411B	0917122	May 09, 2018	May 08, 2019
AC Power Source Extech Electronics	6205	1440452	NA	NA
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	Jan. 10, 2018	Jan. 09, 2019
True RMS Clamp Meter FLUKE	325	31130711WS	May 22, 2018	May 21, 2019

Note:

1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: Nov. 16, 2018

For below 40GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	July 12, 2018	July 11, 2019
Pre-Amplifier EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna(*) Electro-Metrics	EM-6879	269	Sep. 07, 2018	Sep. 06, 2019
RF Cable	NA	LOOPCAB-001	Jan. 15, 2018	Jan. 14, 2019
RF Cable	NA	LOOPCAB-002	Jan. 15, 2018	Jan. 14, 2019
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	May 05, 2018	May 04, 2019
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 22, 2018	Nov. 21, 2019
RF Cable	8D	966-3-1	Mar. 20, 2018	Mar. 19, 2019
RF Cable	8D	966-3-2	Mar. 20, 2018	Mar. 19, 2019
RF Cable	8D	966-3-3	Mar. 20, 2018	Mar. 19, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Sep. 27, 2018	Sep. 26, 2019
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Nov. 25, 2018	Nov. 24, 2019
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-1200	160922	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-2000	150317	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-5000	150322	Jan. 29, 2018	Jan. 28, 2019
Spectrum Analyzer Keysight	N9030A	MY54490679	July 23, 2018	July 22, 2019
Pre-Amplifier EMCI	EMC184045SE	980386	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Nov. 25, 2018	Nov. 24, 2019
RF Cable	EMC102-KM-KM-1200	160924	Jan. 29, 2018	Jan. 28, 2019
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Spectrum Analyzer KEYSIGHT	N9030B	MY57140938	Feb 22, 2018	Feb. 21, 2019

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. *The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The CANADA Site Registration No. is 20331-1
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: Dec. 16, 2018

For Above 40GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Agilent	E4446A	MY48250254	Nov. 14, 2018	Nov. 13, 2019
*Harmonic Mixer (33~55GHz) OML	M22HWD	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Horn Antenna (33~55GHz) OML	M22RH	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Harmonic Mixer (50~75GHz) OML	M15RH	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Horn Antenna (50~75GHz) OML	M15HWD	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Harmonic Mixer (75~110GHz) OML	M10HWD	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Horn Antenna (75~110GHz) OML	M10RH	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Harmonic Mixer (110~170GHz) OML	M06RH	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Horn Antenna(110~170GHz) OML	M06HWD	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Harmonic Mixer (140~220GHz) OML	M05HWD	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Horn Antenna (140~220GHz) OML	M05RH	110215-1	Oct. 17, 2017	Oct. 16, 2019
*Diplexer EMCI	DPL26	DPL26_01	Oct. 17, 2017	Oct. 16, 2019
*Diplexer EMCI	DPL26	DPL26_02	Oct. 17, 2017	Oct. 16, 2019
*Precision 30dB Attenuator Keysight	11708A	MY55260015	Oct. 17, 2017	Oct. 16, 2019
*WR15CH Conical Horn Keysight	WR15CH	WR15CH-01	Oct. 17, 2017	Oct. 16, 2019
*WR10CH Conical Horn Keysight	WR10CH	WR10CH-01	Oct. 17, 2017	Oct. 16, 2019
*Millimeter-Wave Signal Generator Frequency Extension Module (50~75 GHz) Keysight	E8257DV15	US54250106	Oct. 17, 2017	Oct. 16, 2019
*Millimeter-Wave Signal Generator Frequency Extension Module (75~110 GHz) Keysight	E8257DV10	US53250009	Oct. 17, 2017	Oct. 16, 2019
PSG analog signal generator Keysight	E8257D	MY53401987	June 26, 2018	June 25, 2019
Antenna Tower & Turn Table CT	NA	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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The CANADA Site Registration No. is 20331-1
6. Tested Date: Dec. 16, 2018

4.2.4 Test Procedures

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m(below or equal 1GHz) and/or 1.5m(above 1GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.

b. The substitution antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value " of step a. Record the power level of S.G

c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

Note: Measurements were taken in the far field of the mm-Wave test signal based on the formula: R ≥ (2D^2) / wavelength.

Measurement Distance

Measurement Frequency range	Far Field calculation distance	Measurement Distance (Far field)
Below 18GHz	0.05m	3m
18GHz to 40GHz	0.12m	1m
40GHz to 200GHz	0.12m to 0.59m	1m
Note: EUT Antenna Dimension is 21mm length, 2.2mm thick and 6.7mm high.		

4.2.5 Test Settings

a. Radiated power measurements were performed using the spectrum analyzer's channel power measurement function.

b. Set the RBW =1~5% of the anticipated OBW, and the VBW ≥ 3 x RBW.

c. Set spectrum analyzer detection mode to RMS

d. Span = 2x to 3x the OBW

e. No. of sweep points ≥ 2 x span / RBW

f. Trigger is set to "free run" for test signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less that or equal to the transmission burst duration.

g. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signal with burst transmission, the "gating" function was enabled to ensure that measurements were performed during times in which the transmitter is operating at its maximum power.

h. Trace mode = trace averaging (RMS) over 100 sweeps.

i. The trace was allowed to stabilize.

4.2.6 Deviation from Test Standard

No deviation.

4.2.7 EUT Operating Conditions

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

4.2.8 Test Results

Beam_Horizontally polarized:

QPSK

1RB / 0RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.26	-4.31	19.27	14.96	43.00	-28.04
2260003	38850.24	-51.62	-3.63	18.50	14.87	43.00	-28.13
2278337	39950.28	-52.07	-2.75	17.42	14.67	43.00	-28.33

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 32RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.25	-4.30	19.27	14.97	43.00	-28.03
2260003	38850.24	-51.66	-3.67	18.50	14.83	43.00	-28.17
2278337	39950.28	-51.98	-2.66	17.42	14.76	43.00	-28.24

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 65RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.30	-4.35	19.27	14.92	43.00	-28.08
2260003	38850.24	-51.65	-3.66	18.50	14.84	43.00	-28.16
2278337	39950.28	-52.75	-3.43	17.42	13.99	43.00	-29.01

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Full RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.72	-4.77	19.27	14.50	43.00	-28.50
2260003	38850.24	-51.91	-3.92	18.50	14.58	43.00	-28.42
2278337	39950.28	-52.89	-3.57	17.42	13.85	43.00	-29.15

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

16QAM

1RB / 0RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.40	-4.45	19.27	14.82	43.00	-28.18
2260003	38850.24	-51.97	-3.98	18.50	14.52	43.00	-28.48
2278337	39950.28	-52.11	-2.79	17.42	14.63	43.00	-28.37

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 32RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.39	-4.44	19.27	14.83	43.00	-28.17
2260003	38850.24	-51.86	-3.87	18.50	14.63	43.00	-28.37
2278337	39950.28	-52.10	-2.78	17.42	14.64	43.00	-28.36

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 65RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.49	-4.54	19.27	14.73	43.00	-28.27
2260003	38850.24	-51.67	-3.68	18.50	14.82	43.00	-28.18
2278337	39950.28	-52.81	-3.49	17.42	13.93	43.00	-29.07

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Full RB:

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.84	-4.89	19.27	14.38	43.00	-28.62
2260003	38850.24	-52.25	-4.26	18.50	14.24	43.00	-28.76
2278337	39950.28	-52.99	-3.67	17.42	13.75	43.00	-29.25

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

64QAM

1RB / 0RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.44	-4.49	19.27	14.78	43.00	-28.22
2260003	38850.24	-51.66	-3.67	18.50	14.83	43.00	-28.17
2278337	39950.28	-53.11	-3.79	17.42	13.63	43.00	-29.37

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 32RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.49	-4.54	19.27	14.73	43.00	-28.27
2260003	38850.24	-51.66	-3.67	18.50	14.83	43.00	-28.17
2278337	39950.28	-52.24	-2.92	17.42	14.50	43.00	-28.5

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 65RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.37	-4.42	19.27	14.85	43.00	-28.15
2260003	38850.24	-51.74	-3.75	18.50	14.75	43.00	-28.25
2278337	39950.28	-53.36	-4.04	17.42	13.38	43.00	-29.62

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Full RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.77	-4.82	19.27	14.45	43.00	-28.55
2260003	38850.24	-52.11	-4.12	18.50	14.38	43.00	-28.62
2278337	39950.28	-53.50	-4.18	17.42	13.24	43.00	-29.76

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Beam_Vertically polarized:

QPSK

1RB / 0RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.25	-4.30	19.27	14.97	43.00	-28.03
2260003	38850.24	-51.60	-3.61	18.50	14.89	43.00	-28.11
2278337	39950.28	-52.01	-2.69	17.42	14.73	43.00	-28.27

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 32RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.24	-4.29	19.27	14.98	43.00	-28.02
2260003	38850.24	-51.56	-3.57	18.50	14.93	43.00	-28.07
2278337	39950.28	-51.82	-2.50	17.42	14.92	43.00	-28.08

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 65RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.24	-4.29	19.27	14.98	43.00	-28.02
2260003	38850.24	-51.56	-3.57	18.50	14.93	43.00	-28.07
2278337	39950.28	-51.97	-2.65	17.42	14.77	43.00	-28.23

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Full RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.66	-4.71	19.27	14.56	43.00	-28.44
2260003	38850.24	-51.84	-3.85	18.50	14.65	43.00	-28.35
2278337	39950.28	-52.29	-2.97	17.42	14.45	43.00	-28.55

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

16QAM

1RB / 0RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.39	-4.44	19.27	14.83	43.00	-28.17
2260003	38850.24	-51.87	-3.88	18.50	14.62	43.00	-28.38
2278337	39950.28	-51.90	-2.58	17.42	14.84	43.00	-28.16

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 32RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.39	-4.44	19.27	14.83	43.00	-28.17
2260003	38850.24	-51.64	-3.65	18.50	14.85	43.00	-28.15
2278337	39950.28	-52.07	-2.75	17.42	14.67	43.00	-28.33

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 65RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.43	-4.48	19.27	14.79	43.00	-28.21
2260003	38850.24	-51.64	-3.65	18.50	14.85	43.00	-28.15
2278337	39950.28	-52.61	-3.29	17.42	14.13	43.00	-28.87

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Full RB:

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.68	-4.73	19.27	14.54	43.00	-28.46
2260003	38850.24	-52.07	-4.08	18.50	14.42	43.00	-28.58
2278337	39950.28	-52.85	-3.53	17.42	13.89	43.00	-29.11

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

64QAM

1RB / 0RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.43	-4.48	19.27	14.79	43.00	-28.21
2260003	38850.24	-51.63	-3.64	18.50	14.86	43.00	-28.14
2278337	39950.28	-52.41	-3.09	17.42	14.33	43.00	-28.67

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 32RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.37	-4.42	19.27	14.85	43.00	-28.15
2260003	38850.24	-51.66	-3.67	18.50	14.83	43.00	-28.17
2278337	39950.28	-52.14	-2.82	17.42	14.60	43.00	-28.4

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

1RB / 65RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.33	-4.38	19.27	14.89	43.00	-28.11
2260003	38850.24	-51.74	-3.75	18.50	14.75	43.00	-28.25
2278337	39950.28	-52.40	-3.08	17.42	14.34	43.00	-28.66

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Full RB

Channel No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2239991	37649.52	-51.57	-4.62	19.27	14.65	43.00	-28.35
2260003	38850.24	-52.06	-4.07	18.50	14.43	43.00	-28.57
2278337	39950.28	-52.54	-3.22	17.42	14.20	43.00	-28.8

Remarks:
1. The EIRP was evaluated on vertical and horizontal polarization, the worst case is Horizontal polarization.
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Low Channel / QPSK 1RB_32

Middle Channel / QPSK 1RB_32

High Channel / QPSK 1RB_32

4.3 Emission Bandwidth Measurement

4.3.1 Limit of Emission Bandwidth Measurement

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

4.3.2 Test Setup

Refer to section 4.1.2

4.3.3 Test Instruments

Refer to section 4.2.3 to get information of above instrument.

4.3.4 Test Procedure

1. The spectrum analyzer's automatic bandwidth measurement function was used to perform the 99% occupied bandwidth and the 26 dB bandwidth measurement.
2. Set the RBW =1~5% of the anticipated OBW, and the VBW≥3 x RBW.
3. Set spectrum analyzer detection mode to peak, and the trace mode to max hold
4. Sweep = auto couple
5. Record the test plots and test results.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

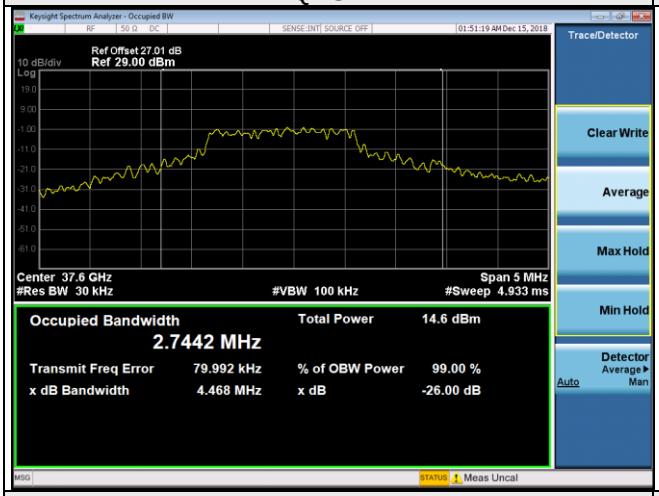
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

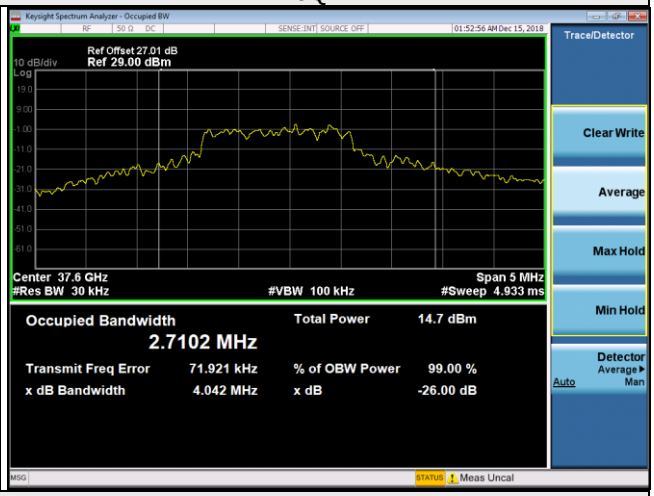
1RB / 0RB

Channel	Freq. (MHz)	Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
2239991	37649.52	2.74	2.71	1.85

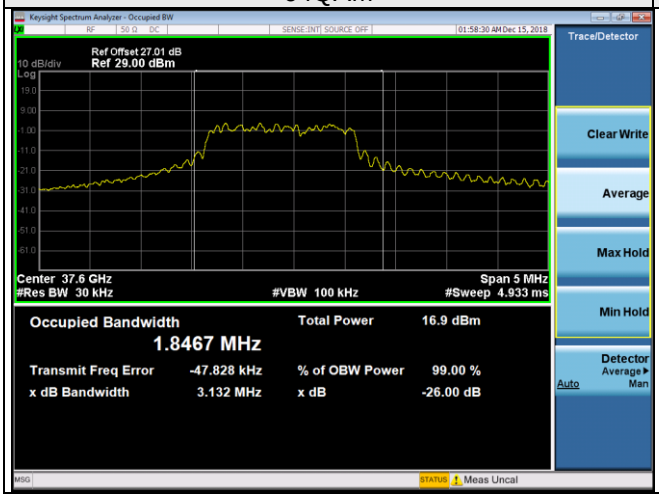
QPSK



16QAM



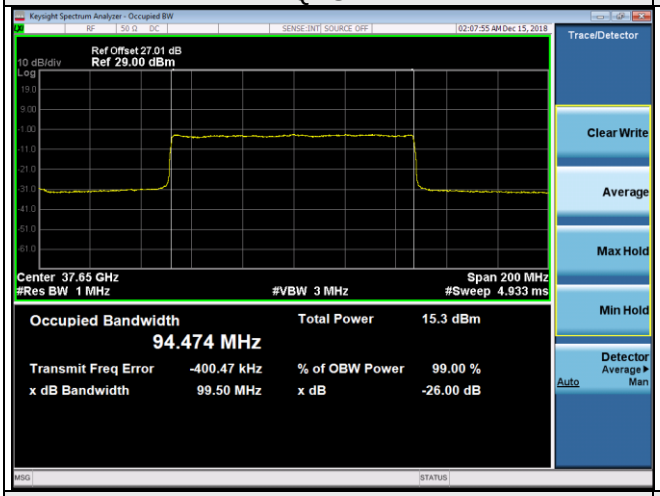
64QAM



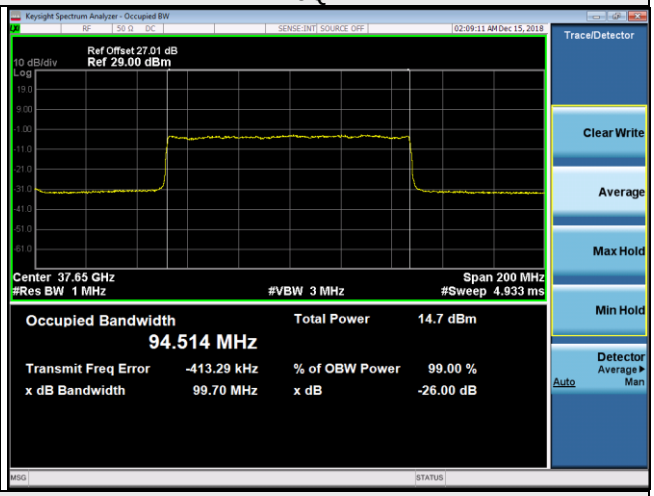
Full RB

Channel	Freq. (MHz)	Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
2239991	37649.52	94.47	94.51	94.46

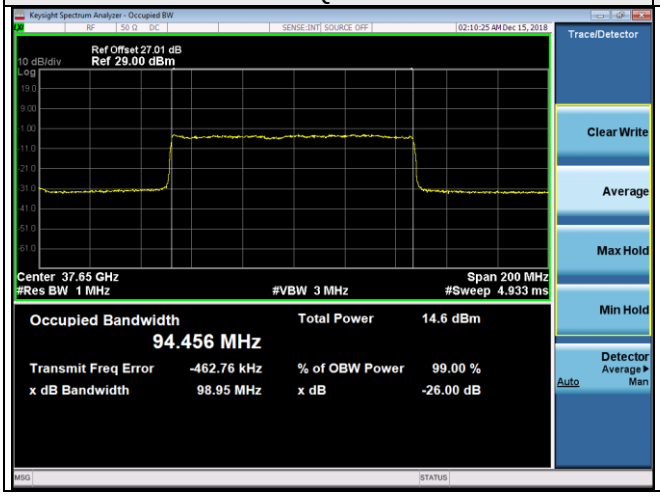
QPSK



16QAM



64QAM



4.4 Out-of-Band Spurious Emission Measurement

4.4.1 Limits of Out-of-Band Spurious Emission Measurement

The conductive power or the total radiated power of any emission outside a licensee's frequency block shall be −13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be −5 dBm/MHz or lower.

4.4.2 Test Instruments

Refer to section 4.2.3 to get information of above instrument.

4.4.3 Test Procedures

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

Note:

1. The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

2. Measurements were taken in the far field of the mm-Wave test signal based on the formula: R ≥ (2D^2) / wavelength.

Measurement Distance

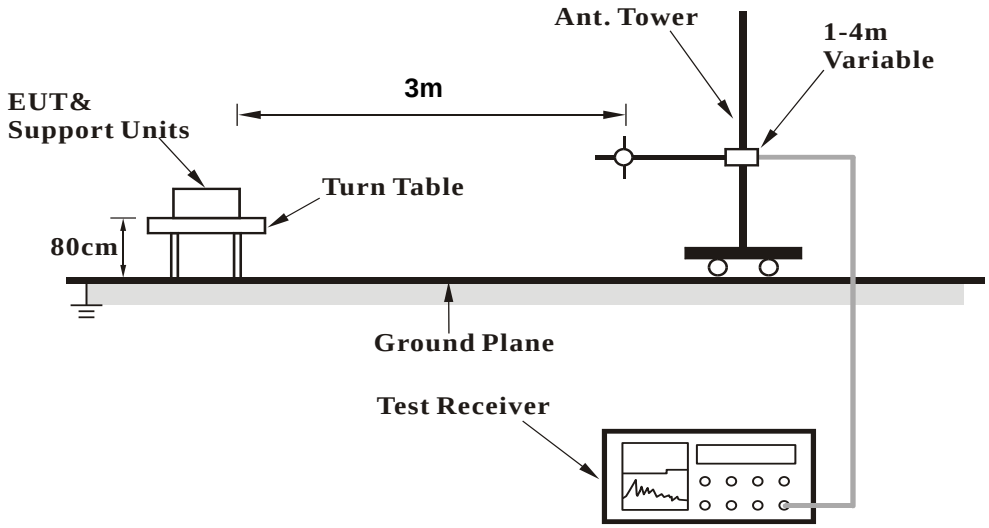
Measurement Frequency range	Far Field calculation distance	Measurement Distance (Far field)
Below 18GHz	0.05m	3m
18GHz to 40GHz	0.12m	1m
40GHz to 200GHz	0.12m to 0.59m	1m
Note: EUT Antenna Dimension is 21mm length, 2.2mm thick and 6.7mm high.		

4.4.4 Deviation from Test Standard

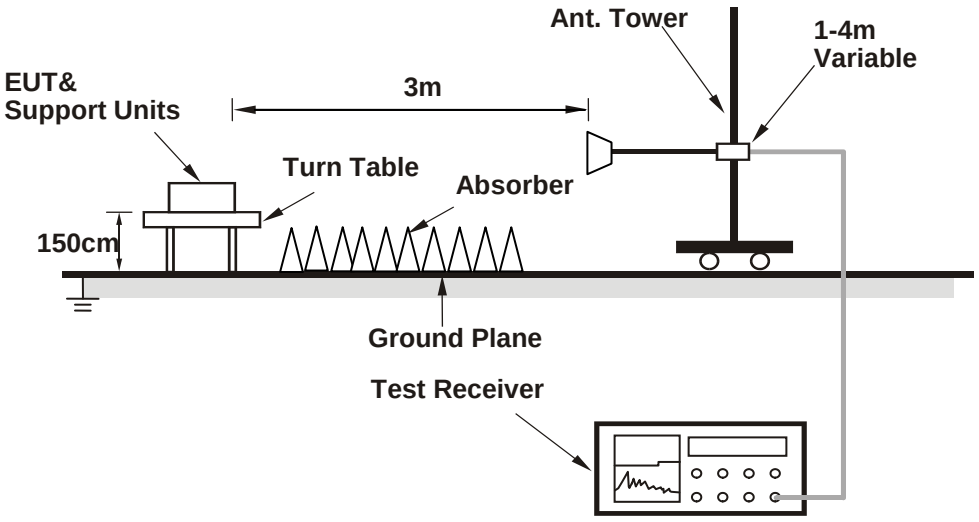
No deviation.

4.4.5 Test Set Up

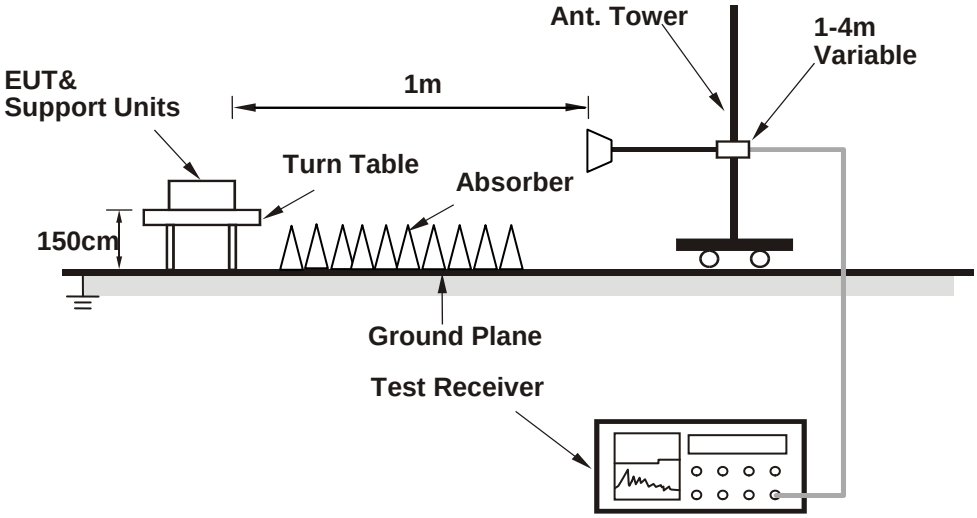
<Frequency Range below 1GHz>



<Frequency Range 1GHz ~ 18GHz>



<Frequency Range above 18GHz>



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

4.4.6 EUT Operating Conditions

a. Connected the Adapter to EUT.
b. Prepared notebook to act as communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
d. The communication partner sent data to EUT by command "PING".

4.4.7 Test Results

Below 1GHz Data:

Mode	channel 2239991	Frequency Range	Below 1000 MHz

Antenna Polarity & Test Distance: Horizontal at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	81.26	-61.3	-13	-48.3	2.22 H	326.53	34.0	47.1	-13.2
2	120.03	-57.4	-13	-44.4	1.24 H	331.66	37.8	47.4	-9.6
3	216.32	-62.9	-13	-49.9	7.73 H	300.82	32.3	43.7	-11.4
4	321.6	-64.3	-13	-51.3	1.57 H	175.82	30.9	37.4	-6.5
5	429.72	-63.6	-13	-50.6	5.56 H	290.66	31.6	35.3	-3.7
6	650	-63.9	-13	-50.9	1.85 H	120.76	31.3	29.9	1.5
Antenna Polarity & Test Distance: Vertical at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.89	-60.2	-13	-47.2	5.55 V	270.94	35.0	43.9	-8.9
2	81	-61.7	-13	-48.7	3.22 V	87.82	33.6	46.4	-12.9
3	120.02	-61.7	-13	-48.7	7.73 V	234.92	33.6	43.4	-9.9
4	451.77	-62.2	-13	-49.2	5.52 V	117.85	33.0	36.1	-3.1
5	753.24	-61.5	-13	-48.5	1.09 V	264.83	33.7	30.9	2.9
6	796.61	-59.3	-13	-46.3	5.57 V	286.69	36.0	33.0	3.0
1	32.89	-60.2	-13	-47.2	5.55 V	270.94	35.0	43.9	-8.9

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	channel 2260003	Frequency Range	Below 1000 MHz

Antenna Polarity & Test Distance: Horizontal at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	80.87	-61.7	-13	-48.7	1.79 H	326.22	33.5	46.7	-13.2
2	119.93	-57.7	-13	-44.7	9.99 H	331.56	37.5	47.0	-9.4
3	215.93	-63.3	-13	-50.3	5.58 H	300.56	31.9	43.2	-11.3
4	321.41	-64.3	-13	-51.3	1.17 H	175.65	30.9	37.2	-6.3
5	429.36	-63.7	-13	-50.7	2.26 H	290.49	31.5	35.0	-3.5
6	649.52	-63.9	-13	-50.9	1.53 H	120.6	31.3	29.6	1.7
Antenna Polarity & Test Distance: Vertical at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.79	-60.4	-13	-47.4	3.39 V	270.7	34.9	43.9	-9.0
2	80.78	-61.8	-13	-48.8	3.00 V	87.33	33.5	46.4	-12.9
3	119.82	-61.9	-13	-48.9	5.54 V	234.53	33.3	43.0	-9.7
4	451.49	-62.3	-13	-49.3	3.3 V	117.78	33.0	36.0	-3.0
5	753.14	-61.9	-13	-48.9	9.93 V	264.53	33.4	30.5	2.8
6	796.37	-59.7	-13	-46.7	3.31 V	286.51	35.6	32.5	3.0
1	32.79	-60.4	-13	-47.4	3.39 V	270.7	34.9	43.9	-9.0

Remarks:

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

Mode	channel 2278337	Frequency Range	Below 1000 MHz

Antenna Polarity & Test Distance: Horizontal at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	80.93	-61.5	-13	-48.5	1.83 H	326.17	33.8	46.9	-13.1
2	119.72	-57.6	-13	-44.6	9.96 H	331.53	37.7	47.2	-9.5
3	216.05	-63.4	-13	-50.4	5.54 H	300.53	31.9	43.6	-11.7
4	321.56	-64.5	-13	-51.5	1.13 H	175.47	30.8	37.3	-6.6
5	429.54	-63.8	-13	-50.8	4.41 H	290.51	31.5	35.3	-3.8
6	649.62	-64.2	-13	-51.2	1.71 H	120.42	31.0	29.6	1.4
Antenna Polarity & Test Distance: Vertical at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.48	-60.4	-13	-47.4	3.30 V	270.46	34.9	43.7	-8.8
2	80.73	-62.0	-13	-49	2.84 V	87.54	33.3	46.1	-12.8
3	119.82	-62.0	-13	-49	4.41 V	234.62	33.2	43.1	-9.9
4	451.34	-62.3	-13	-49.3	3.35 V	117.47	32.9	35.9	-3.0
5	752.83	-61.8	-13	-48.8	1.05 V	264.8	33.5	30.9	2.6
6	796.49	-59.7	-13	-46.7	3.39 V	286.45	35.6	32.8	2.8
1	32.48	-60.4	-13	-47.4	3.30 V	270.46	34.9	43.7	-8.8

Remarks:

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

Above 1GHz Data:

Mode	channel 2239991	Frequency Range	1GHz ~ 18GHz

Antenna Polarity & Test Distance: Horizontal at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2028.46	-49.9	-13	-36.9	9.98 H	216.84	45.3	49.4	-4.1
2	5111.32	-50.0	-13	-37	5.52 H	287.94	45.3	43.0	2.3
3	7354.69	-43.6	-13	-30.6	2.37 H	348.91	51.6	43.7	7.9
4	9358.83	-42.7	-13	-29.7	1.57 H	322.91	52.6	42.5	10.1
5	12146.32	-40.6	-13	-27.6	1.88 H	341.67	54.7	42.3	12.3
6	14264.85	-38.8	-13	-25.8	1.19 H	220.85	56.5	40.7	15.8
Antenna Polarity & Test Distance: Vertical at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1199.51	-45.9	-13	-32.9	1.12 V	98.91	49.4	55.8	-6.4
2	3197.51	-48.3	-13	-35.3	1.38 V	289.88	46.9	48.8	-1.9
3	4761.88	-50.2	-13	-37.2	1.91 V	292.88	45.0	43.6	1.4
4	5999.57	-42.0	-13	-29	1.16 V	271.71	53.3	50.3	3.0
5	8979.64	-42.5	-13	-29.5	2.85 V	133.92	52.8	43.4	9.4
6	11626.88	-40.9	-13	-27.9	2.88 V	1.6	54.3	41.8	12.5

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	channel 2260003	Frequency Range	1GHz ~ 18GHz

Antenna Polarity & Test Distance: Horizontal at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2030.12	-52.0	-13	-39	5.50 H	277.78	43.2	47.7	-4.5
2	3305.67	-53.0	-13	-40	9.95 H	161.61	42.2	44.0	-1.8
3	5198.53	-48.9	-13	-35.9	2.25 H	258.96	46.4	44.1	2.2
4	7304.66	-43.9	-13	-30.9	1.09 H	292.66	51.3	43.6	7.7
5	10087.99	-41.3	-13	-28.3	1.74 H	354.86	54.0	42.5	11.5
6	14595.73	-38.7	-13	-25.7	1.24 H	213.52	56.5	41.0	15.5
Antenna Polarity & Test Distance: Vertical at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2420.27	-51.1	-13	-38.1	1.16 V	150.91	44.2	46.8	-2.6
2	4365.9	-50.3	-13	-37.3	1.80 V	359.85	45.0	44.7	0.3
3	5999.4	-43.0	-13	-30	1.68 V	276.94	52.3	48.8	3.5
4	9022.91	-42.6	-13	-29.6	1.76 V	359.99	52.7	43.1	9.5
5	11698.81	-41.1	-13	-28.1	1.19 V	284.54	54.2	41.9	12.3
6	13312.11	-41.5	-13	-28.5	2.45 V	351.91	53.8	40.1	13.7

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	channel 2278337	Frequency Range	1GHz ~ 18GHz

Antenna Polarity & Test Distance: Horizontal at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2031.35	-52.3	-13	-39.3	5.57 H	254.93	42.9	47.3	-4.4
2	4594.64	-49.7	-13	-36.7	5.56 H	296.68	45.5	44.1	1.5
3	7182.04	-43.9	-13	-30.9	2.30 H	254.67	51.3	43.4	7.9
4	9288.1	-43.4	-13	-30.4	7.76 H	398.65	51.9	41.6	10.3
5	11766.88	-40.8	-13	-27.8	8.88 H	316.55	54.4	42.2	12.2
6	14598.17	-39.0	-13	-26	8.86 H	232.55	56.3	40.5	15.8
Antenna Polarity & Test Distance: Vertical at 3 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1575.25	-51.6	-13	-38.6	2.07 V	21.76	43.6	49.3	-5.6
2	3187.13	-51.2	-13	-38.2	1.73 V	287.78	44.1	45.2	-1.1
3	4366.19	-49.4	-13	-36.4	1.49 V	229.51	45.9	45.2	0.6
4	7963.61	-43.2	-13	-30.2	1.49 V	320.52	52.0	43.2	8.9
5	10848.25	-42.4	-13	-29.4	1.87 V	145.69	52.9	39.6	13.3
6	14745.66	-39.1	-13	-26.1	1.18 V	97.7	56.1	40.9	15.3

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	channel 2239991	Frequency Range	18GHz ~ 40GHz

Antenna Polarity & Test Distance: Horizontal at 1 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	20968.72	-47.8	-13	-34.8	1.49 H	308.65	47.5	58.3	-10.9
2	21656.04	-48.0	-13	-35	1.21 H	325	47.2	57.0	-9.8
3	25915.97	-47.5	-13	-34.5	1.31 H	154.54	47.7	55.2	-7.5
4	31072.58	-39.0	-13	-26	1.41 H	216.74	56.2	64.9	-8.7
5	34482.89	-45.8	-13	-32.8	1.33 H	359.81	49.5	59.4	-9.9
5	38869.19	-40.9	-13	-27.9	1.15 H	110.57	54.4	58.2	-3.8
Antenna Polarity & Test Distance: Vertical at 1 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	21237.59	-51.4	-13	-38.4	1.14 V	316.66	43.8	54.3	-10.5
2	25589.98	-50.1	-13	-37.1	1.30 V	317.68	45.1	53.2	-8.0
3	31072.26	-45.7	-13	-32.7	1.02 V	254.91	49.6	58.2	-8.6
4	33406.59	-51.5	-13	-38.5	1.13 V	337.79	43.8	53.8	-10.0
5	35558.39	-49.2	-13	-36.2	1.20 V	320.64	46.0	55.5	-9.5
5	39006.68	-46.6	-13	-33.6	1.44 V	251.96	48.7	52.7	-4.0

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	channel 2260003	Frequency Range	18GHz ~ 40GHz

Antenna Polarity & Test Distance: Horizontal at 1 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	19445.74	-50.5	-13	-37.5	1.16 H	8.97	44.8	56.6	-11.9
2	21743.42	-49.0	-13	-36	1.33 H	1.89	46.2	56.0	-9.8
3	24983.5	-49.6	-13	-36.6	1.26 H	9.86	45.7	53.3	-7.7
4	27669.12	-48.1	-13	-35.1	1.54 H	220.53	47.2	56.0	-8.8
5	31072.76	-41.0	-13	-28	1.21 H	146.78	54.2	63.2	-9.0
6	39190.56	-41.6	-13	-28.6	1.10 H	301.71	53.6	57.5	-3.8
Antenna Polarity & Test Distance: Vertical at 1 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	18208.98	-51.8	-13	-38.8	9.96 V	257.66	43.4	56.4	-12.9
2	21858.2	-55.9	-13	-42.9	1.08 V	149.58	39.3	49.4	-10.0
3	27333.94	-51.5	-13	-38.5	1.39 V	232.71	43.7	52.1	-8.4
4	30125.62	-57.7	-13	-44.7	1.28 V	135.74	37.6	46.8	-9.3
5	35243.3	-56.7	-13	-43.7	1.05 V	73.82	38.5	48.6	-10.0
6	38906.47	-51.5	-13	-38.5	1.31 V	220.84	43.7	42.2	1.5

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	channel 2278337	Frequency Range	18GHz ~ 40GHz

Antenna Polarity & Test Distance: Horizontal at 1 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	21211.03	-49.0	-13	-36	1.23 H	94.93	46.2	56.9	-10.7
2	23920.82	-49.0	-13	-36	1.36 H	270.57	46.2	55.6	-9.4
3	26743.45	-46.6	-13	-33.6	1.32 H	215.58	48.7	56.2	-7.5
4	31072.57	-38.4	-13	-25.4	1.01 H	232.61	56.9	65.3	-8.4
5	34634.4	-46.5	-13	-33.5	1.29 H	319.83	48.8	58.2	-9.5
6	39493.87	-40.7	-13	-27.7	1.47 H	315.89	54.6	57.7	-3.1
Antenna Polarity & Test Distance: Vertical at 1 M									
No.	Freq. (MHz)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)
1	18195.97	-52.6	-13	-39.6	9.94 V	213.91	42.7	55.6	-12.9
2	21883.89	-57.6	-13	-44.6	1.01 V	166.65	37.7	47.5	-9.9
3	27325.33	-53.4	-13	-40.4	1.24 V	137.96	41.9	50.5	-8.7
4	28851.87	-58.5	-13	-45.5	1.20 V	259.54	36.7	46.1	-9.3
5	35040.07	-63.1	-13	-50.1	1.19 V	97.93	32.1	41.9	-9.8
6	38882.03	-58.2	-13	-45.2	1.40 V	356.87	37.1	40.8	-3.8

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	channel 2239991	Frequency Range	40GHz ~ 200GHz

Antenna Polarity & Test Distance: Horizontal at 1M					
No.	Freq. Range (GHz)	Raw Value (dBm/MHz)	EIRP Level (dBm/MHz)	Margin (dB)	EIRP Limit (dBm/MHz)
1	75.29904	-67.1	-20.5	-7.5	-13
2	**112.94856**	**-65.8**	**-15.5**	**-2.5**	**-13**
Antenna Polarity & Test Distance: Vertical at 1 M					
No.	Freq. Range (GHz)	Raw Value (dBm/MHz)	EIRP Level (dBm/MHz)	Margin (dB)	EIRP Limit (dBm/MHz)
1	75.29904	-67.3	-20.7	-7.7	-13
2	112.94856	-67.1	-16.8	-3.8	-13

Mode	channel 2260003	Frequency Range	40GHz ~ 200GHz

Antenna Polarity & Test Distance: Horizontal at 1M					
No.	Freq. Range (GHz)	Raw Value (dBm/MHz)	EIRP Level (dBm/MHz)	Margin (dB)	EIRP Limit (dBm/MHz)
1	77.70048	-65.9	-19.4	-6.4	-13
2	116.55072	-66.3	-15.7	-2.7	-13
Antenna Polarity & Test Distance: Vertical at 1 m					
No.	Freq. Range (GHz)	Raw Value (dBm/MHz)	EIRP Level (dBm/MHz)	Margin (dB)	EIRP Limit (dBm/MHz)
1	77.70048	-66.1	-19.6	-6.6	-13
2	116.55072	-67.3	-16.7	-3.7	-13

Mode	channel 2278337	Frequency Range	40GHz ~ 200GHz

Antenna Polarity & Test Distance: Horizontal at 1M					
No.	Freq. Range (GHz)	Raw Value (dBm/MHz)	EIRP Level (dBm/MHz)	Margin (dB)	EIRP Limit (dBm/MHz)
1	79.90056	-67.1	-20.5	-7.5	-13
2	119.85084	-66.8	-16.0	-3.0	-13
Antenna Polarity & Test Distance: Vertical at 1 M					
No.	Freq. Range (GHz)	Raw Value (dBm/MHz)	EIRP Level (dBm/MHz)	Margin (dB)	EIRP Limit (dBm/MHz)
1	79.90056	-66.7	-20.1	-7.1	-13
2	119.85084	-67.9	-17.1	-4.1	-13

4.5 Out-of-Band Emission at the Band Edge Measurement

4.5.1 Limits of Out-of Band Emission at the Band Edge Measurement

The conductive power or the total radiated power of any emission outside a licensee's frequency block shall be −13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be −5 dBm/MHz or lower.

4.5.2 Test Instruments

Refer to section 4.5.2.

4.5.3 Test Procedures

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m(below or equal 1GHz) and/or 1.5m(above 1GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
b. The substitution antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value " of step a. Record the power level of S.G.
c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15dBi.
e. The requirements in 30.203 are expressed in terms of conductive power, and then conducted power will be calculated by EIRP-Array Gain.
f. Antenna Gain Information at the Band Edge :

The following antenna gain information is provided to demonstrate the antenna performance of the 37~40 GHz band. These antenna gains were subtracted from the measured E.I.R.P levels at lower and upper band edge frequencies to determine an equivalent conductive power that was compared directly with the part 30.203 limits.

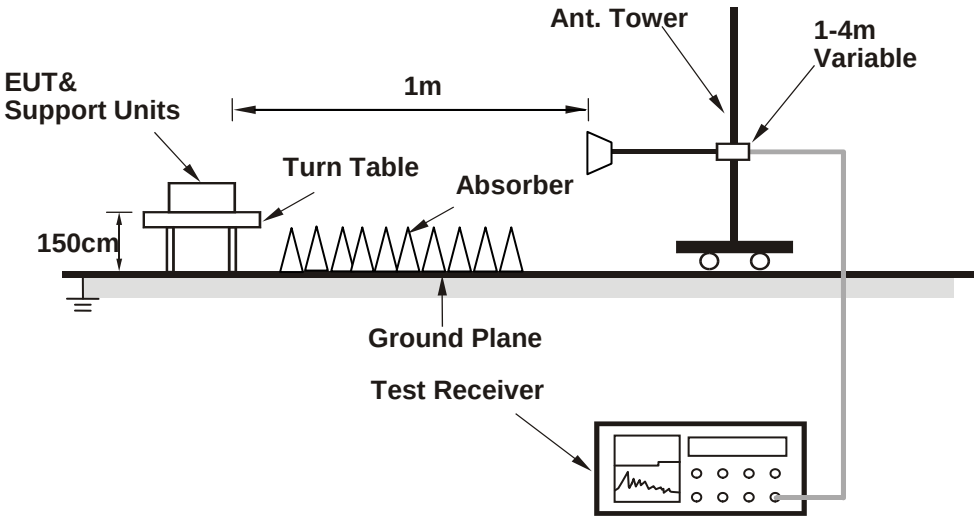
Frequency (GHz)	Gain (dBi)
37	10.60
37.5	10.95
38	11.27
38.5	11.10
39	10.90
39.5	10.70
40	10.51

Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.5.4 Deviation from Test Standard

No deviation.

4.5.5 Test Set Up



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

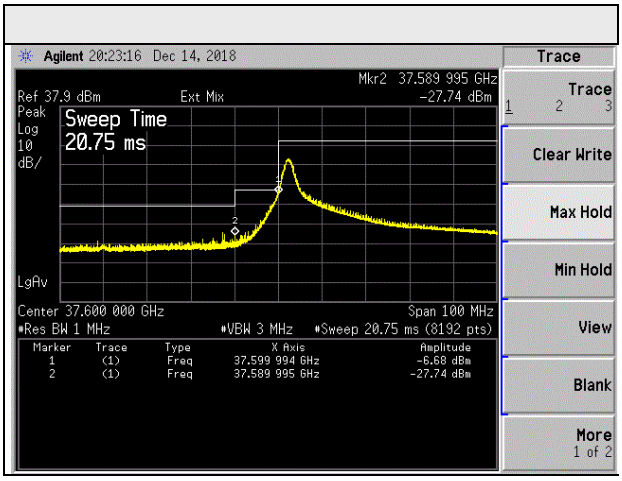
4.5.6 EUT Operating Conditions

a. Connected the Adapter to EUT.
b. Prepared notebook to act as communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
d. The communication partner sent data to EUT by command "PING".

4.5.7 Test Results

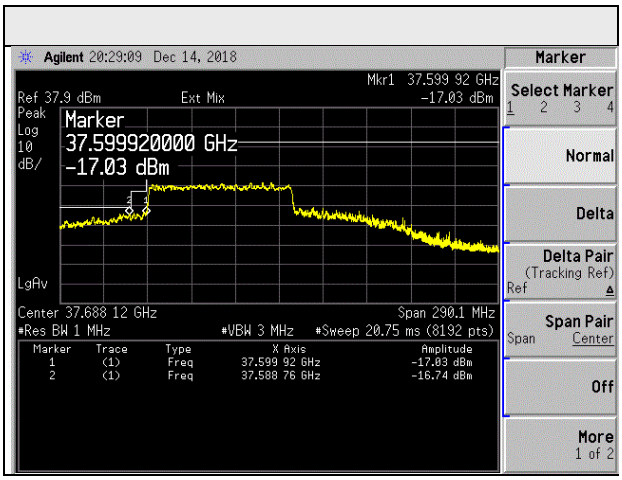
Channel 2239991						
QPSK / 1RB 0RB						
Frequency (GHz)	EIRP Value (dBm)	Array Gain (dBi)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
37.599994	-6.68	10.6	-17.28	-5	-1.68	Pass
37.589995	-27.74	10.6	-38.34	-13	-14.74	Pass

Note: The Conducted Power = EIRP-Array Gain



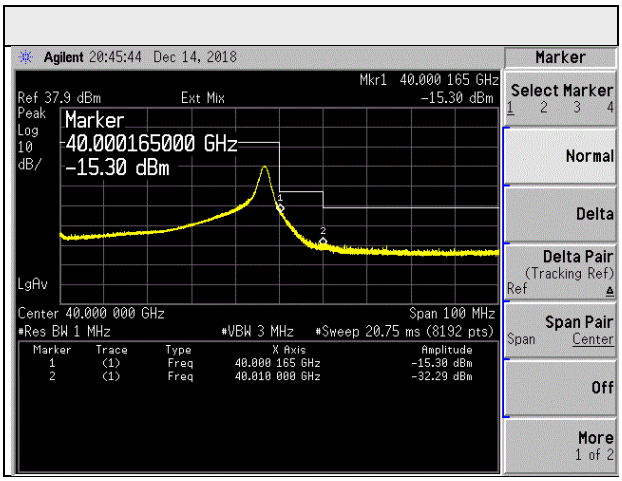
Channel 2239991						
QPSK / Full RB						
Frequency (GHz)	EIRP Value (dBm)	Array Gain (dBi)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
37.59992	-17.03	10.6	-27.63	-5	-12.03	Pass
37.58876	-16.74	10.6	-27.34	-13	-3.74	Pass

Note: The Conducted Power = EIRP-Array Gain



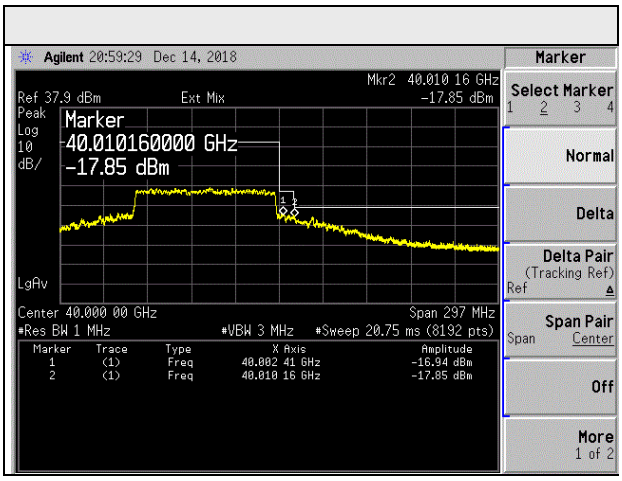
Channel 2278337						
QPSK / 1RB 65RB						
Frequency (GHz)	EIRP Value (dBm)	Array Gain (dBi)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
40.000165	-15.3	10.51	-25.81	-5	-10.3	Pass
40.010000	-32.29	10.51	-42.8	-13	-19.29	Pass

Note: The Conducted Power = EIRP-Array Gain



Channel 2278337						
QPSK / Full RB						
Frequency (GHz)	EIRP Value (dBm)	Array Gain (dBi)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
40.00241	-16.94	10.51	-27.45	-5	-11.94	Pass
40.01016	-17.85	10.51	-28.36	-13	-4.85	Pass

Note: The Conducted Power = EIRP-Array Gain



4.6 Frequency Stability Measurement

4.6.1 Limits of Frequency Stability Measurement

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency band.

4.6.2 Test Procedure

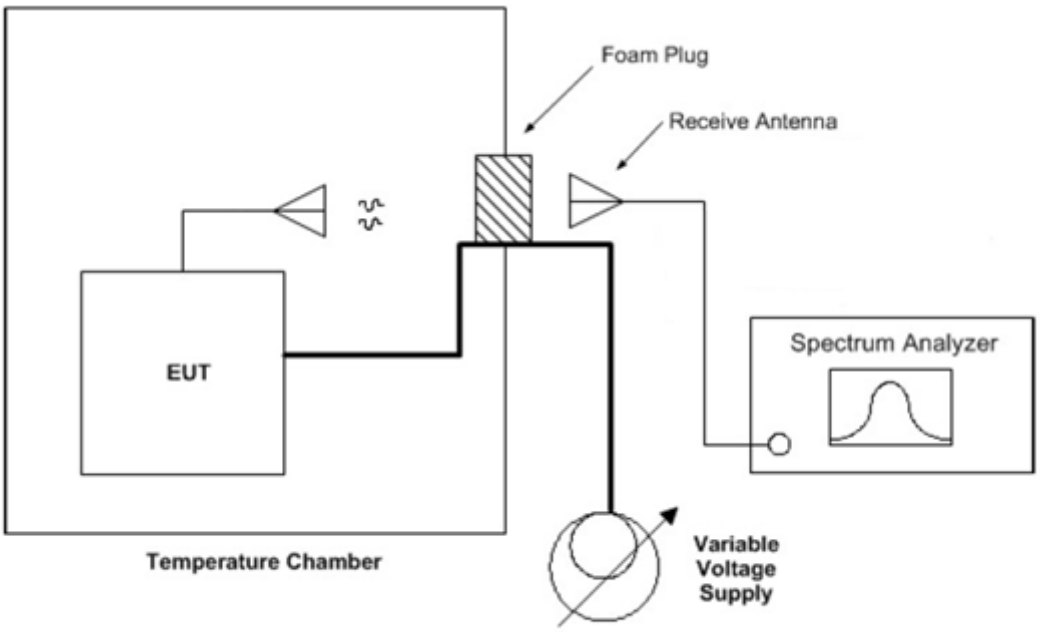
b. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

c. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.

d. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5 ℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

NOTE: The frequency error was recorded from the communication simulator.

4.6.3 Test Setup



4.6.4 Test Results

Frequency Stability Versus Temp.			
TEMP. (℃)	**Power Supply (Vac)**	**Measured Frequency (MHz)**	**Pass/Fail**
50	120	38850.240023	Pass
40	120	38850.240033	Pass
30	120	38850.240037	Pass
20	120	38850.240033	Pass
10	120	38850.240025	Pass
0	120	38850.240028	Pass
-10	120	38850.240021	Pass
-20	120	38850.240020	Pass
-30	120	38850.240035	Pass

Frequency Stability Versus Voltage			
TEMP. (℃)	**Power Supply (Vac)**	**Measured Frequency(MHz)**	**Pass/Fail**
20	138	38850.240025	Pass
	102	38850.240047	Pass

5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

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

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

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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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