

FCC Test Report

(PART 27)

Report No.: RF150114C11-2

FCC ID: 2AA5WPAMR04LN

Test Model: PA-MR04LN

Received Date: Jan. 14, 2015

Test Date: Feb. 05 ~ Mar. 26, 2015

Issued Date: Mar. 30, 2015

Applicant: NEC Platforms, Ltd.

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

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Release Control Record

Issue No.	Description	Date Issued
RF150114C11-2	Original release.	Mar. 30, 2015

1 Certificate of Conformity

Product: AtermMR04LN

Brand: NEC

Test Model: PA-MR04LN

Sample Status: Engineering sample

Applicant: NEC Platforms, Ltd.

Test Date: Feb. 05 ~ Mar. 26, 2015

Standards: FCC Part 27, Subpart C,M

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 : Ivy Lin , **Date:** Mar. 30, 2015
Ivy Lin / Specialist

Approved by : Bruce Chen , **Date:** Mar. 30, 2015
Bruce Chen / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50(d)(4)	Equivalent Isotropically radiated power	PASS	Meet the requirement of limit.
2.1055 27.54	Frequency Stability Stay with the authorized bands of operation	PASS	Meet the requirement of limit.
2.1049 27.53(m)(6)	Emission Bandwidth	PASS	Meet the requirement of limit.
2.1051 27.53(m)(4)(6)	Band Edge Measurements	PASS	Meet the requirement of limit.
---	Peak To Average Ratio	PASS	Meet the requirement of limit.
2.1051 27.53(m)(4)(6)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 27.53(m)(4)(6)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -25.60dB at 1413.00MHz.

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 ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Test Site And Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 06, 2014	Oct. 05, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Feb. 26, 2014 Feb. 06, 2015	Feb. 25, 2015 Feb. 05, 2016
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Aug. 25, 2014	Aug. 24, 2015
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 20, 2014 Feb. 09, 2015	Feb. 19, 2015 Feb. 08, 2016
Preamplifier Agilent	8449B	3008A01961	Oct. 18, 2014	Oct. 17, 2015
Preamplifier Agilent	8447D	2944A10738	Oct. 18, 2014	Oct. 17, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309220/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250724/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295012/4	Aug. 09, 2014	Aug. 08, 2015
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table BV ADT	TT100.	TT93021704	NA	NA
Turn Table Controller BV ADT	SC100.	SC93021704	NA	NA
Mini-Circuits Power Splitter	ZN2PD-9G	NA	Apr. 25, 2014	Apr. 24, 2015
JFW 20dB attenuation	50HF-020-SMA	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 Chamber 4.
 3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 460141.
 5. The IC Site Registration No. is IC7450F-4.

3 General Information

3.1 General Description of EUT

Product	AtermMR04LN	
Brand	NEC	
Test Model	PA-MR04LN	
Status of EUT	Engineering sample	
Power Supply Rating	5Vdc (adapter) 3.8Vdc (battery)	
Modulation Type	QPSK, 16QAM	
Operating Frequency	709MHz ~ 711MHz	
Max. ERP Power	5MHz	52.119mW (17.17dBm)
	10MHz	44.055mW (16.44dBm)
Antenna Type	Inverted F antenna with -2.69dBi gain	
Antenna Connector	UFL	
Accessory Device	N/A	
Data Cable Supplied	N/A	

Note:

1. The EUT uses following adapter, battery and USB cable.

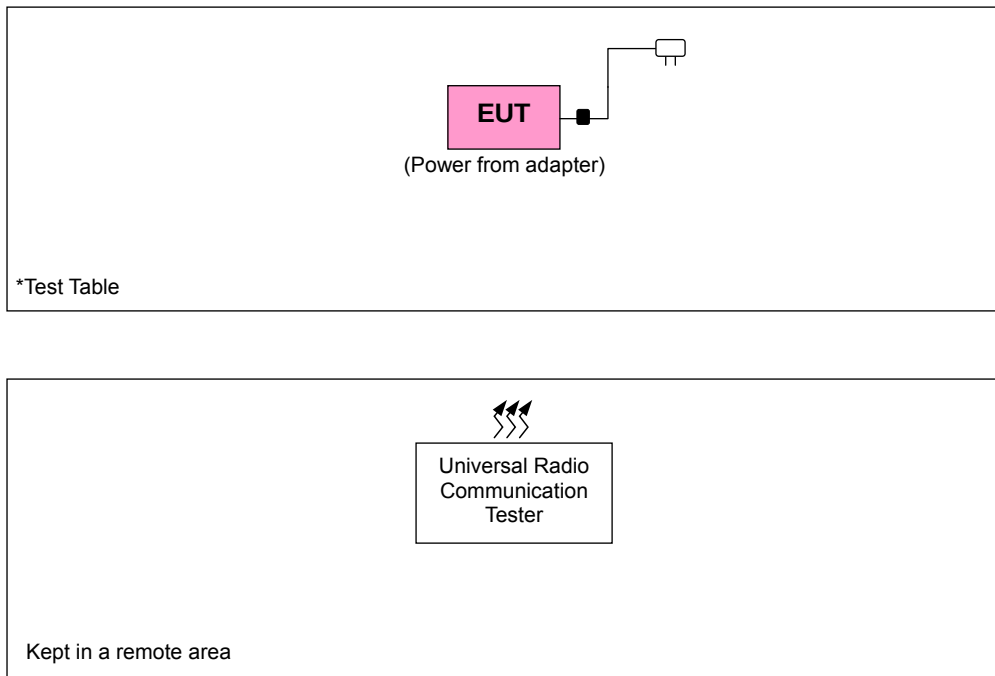
Adapter (Support unit only)		
Brand	NEC	
Model	AL1-004001-001	
Input Power	100-240Vac, 50/60Hz, 140mA	
Output Power	5Vdc, 1.0A	

Li-ion Battery (Support unit only)		
Brand	NEC	
Model	AL1-003388-001	
Input Power	3.8Vdc, 2300mAh	

USB cable (Support unit only)	1.0m non-shielded cable with one core
----------------------------------	---------------------------------------

2. 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.

3.2 Configuration of System Under Test



3.2.1 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.	Universal Radio Communication Tester	R&S	CMU200	117260	NA	-

Note:

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

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports

The worst case was found when positioned on Z-plane. Following channel(s) was (were) selected for the final test as listed below:

Test results are presented in the report as below.

Test Mode	Test Condition
A	Power from adapter
B	Power from battery

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION TYPE	MODE
A	ERP	23755 to 23825	23755, 23790, 23825	5MHz	QPSK	1 RB / 24 RB Offset
		23755 to 23825	23780, 23790, 23800	10MHz	QPSK	1 RB / 49 RB Offset
B	FREQUENCY STABILITY	23755 to 23825	23790	5MHz	QPSK	1 RB / 24 RB Offset
		23755 to 23825	23790	10MHz	QPSK	1 RB / 49 RB Offset
B	OCCUPIED BANDWIDTH	23755 to 23825	23755, 23790, 23825	5MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		23755 to 23825	23780, 23790, 23800	10MHz	QPSK, 16QAM	50 RB / 0 RB Offset
B	PEAK TO AVERAGE RATIO	23755 to 23825	23755, 23790, 23825	5MHz	QPSK, 16QAM	1 RB / 24 RB Offset
		23755 to 23825	23780, 23790, 23800	10MHz	QPSK, 16QAM	1 RB / 49 RB Offset
B	BAND EDGE	23755 to 23825	23755, 23825	5MHz	QPSK, 16QAM	1 RB / 0 RB Offset 1 RB / 24 RB Offset 25 RB / 0 RB Offset
		23755 to 23825	23780 23800	10MHz	QPSK, 16QAM	1 RB / 0 RB Offset 1 RB / 49 RB Offset 50 RB / 0 RB Offset
B	CONDCUDED EMISSION	23755 to 23825	23755, 23790, 23825	5MHz	QPSK	1 RB / 24 RB Offset
		23755 to 23825	23780, 23790, 23800	10MHz	QPSK	1 RB / 49 RB Offset
A	RADIATED EMISSION BELOW 1GHz	23755 to 23825	23755	5MHz	QPSK	1 RB / 24 RB Offset
		23755 to 23825	23780	10MHz	QPSK	1 RB / 49 RB Offset
A	RADIATED EMISSION ABOVE 1GHz	23755 to 23825	23755, 23790, 23825	5MHz	QPSK	1 RB / 24 RB Offset
		23755 to 23825	23780, 23790, 23800	10MHz	QPSK	1 RB / 49 RB Offset

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	18deg.C, 69%RH	120Vac, 60Hz	Nick Hsu
Frequency Stability	24deg.C, 64%RH	3.8Vdc	Match Tsui
Occupied Bandwidth	24deg.C, 64%RH	3.8Vdc	Match Tsui
Band Edge	24deg.C, 64%RH	3.8Vdc	Match Tsui
Peak To Average Ratio	24deg.C, 64%RH	3.8Vdc	Match Tsui
Condcudeted Emission	24deg.C, 64%RH	3.8Vdc	Match Tsui
Radiated Emission	25deg.C, 65%RH, 18deg.C, 69%RH	120Vac, 60Hz	Chris Lin, Nick Hsu

3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

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 27

ANSI/TIA/EIA-603-C 2004

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 3 watts e.r.p.

4.1.2 Test Procedures

ERP:

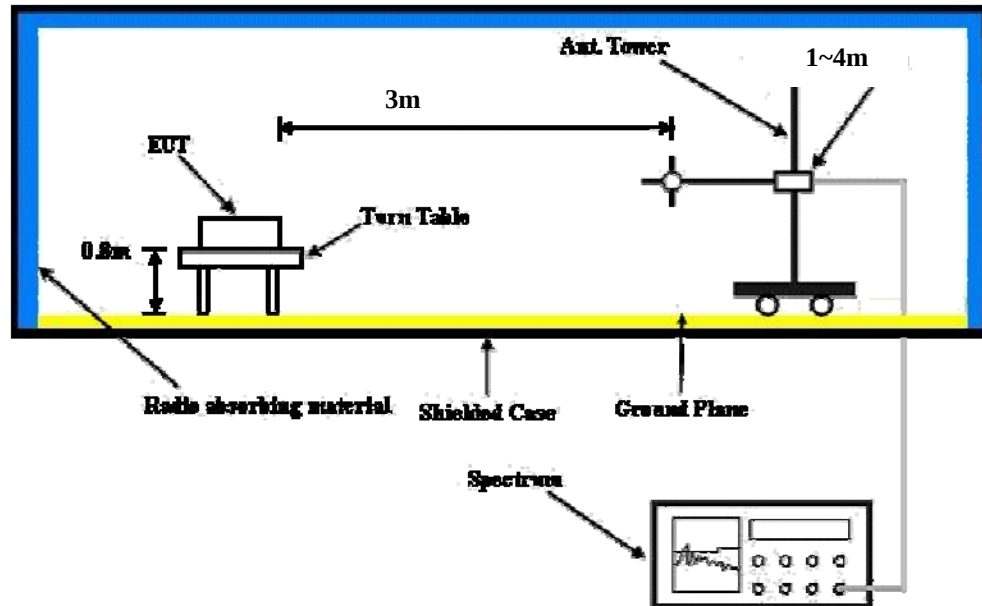
- a. All measurements were done at low, middle and high operational frequency range. RWB and VBW is 5MHz for LTE.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum 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.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G
- d. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15\text{dBi}$.

Conducted Power Measurement:

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

4.1.3 Test Setup

EIRP / ERP MEASUREMENT:



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

CONDUCTED POWER MEASUREMENT:



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

4.1.4 Test Results

CONDUCTED OUTPUT POWER (dBm)

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low CH 23755	Mid CH 23790	High CH 23825		Low CH 23755	Mid CH 23790	High CH 23825	
			706.5 MHz	710.0 MHz	713.5 MHz		706.5 MHz	710.0 MHz	713.5 MHz	
17 / 5M	1	0	21.81	21.78	21.85	0	20.77	20.74	20.81	1
	1	12	22.05	22.02	22.09	0	21.01	20.98	21.05	1
	1	24	21.97	21.94	22.01	0	20.93	20.90	20.97	1
	12	0	21.03	21.00	21.07	1	19.99	19.96	20.03	2
	12	6	21.08	21.05	21.12	1	20.04	20.01	20.08	2
	12	13	20.94	20.91	20.98	1	19.90	19.87	19.94	2
	25	0	20.97	20.94	21.01	1	19.93	19.90	19.97	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low CH 23780	Mid CH 23790	High CH 23800		Low CH 23780	Mid CH 23790	High CH 23800	
			709.0 MHz	710.0 MHz	711.0 MHz		709.0 MHz	710.0 MHz	711.0 MHz	
17 / 10M	1	0	21.92	21.89	21.96	0	20.90	20.87	20.94	1
	1	24	22.16	22.13	22.20	0	21.14	21.11	21.18	1
	1	49	22.08	22.05	22.12	0	21.06	21.03	21.10	1
	25	0	21.14	21.11	21.18	1	20.12	20.09	20.16	2
	25	12	21.19	21.16	21.23	1	20.17	20.14	20.21	2
	25	25	21.05	21.02	21.09	1	20.03	20.00	20.07	2
	50	0	21.08	21.05	21.12	1	20.06	20.03	20.10	2

ERP POWER (dBm)

CHANNEL BANDWIDTH: 5MHz QPSK

MODE		TX channel 23755					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	706.50	-13.46	16.57	-1.07	15.50	34.77	-19.27
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	706.50	-16.36	16.63	-1.07	15.56	34.77	-19.21

MODE		TX channel 23790					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	710.00	-11.76	18.24	-1.07	17.17	34.77	-17.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	710.00	-15.26	17.55	-1.07	16.48	34.77	-18.29

MODE		TX channel 23825					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	713.50	-13.31	16.90	-1.07	15.83	34.77	-18.94
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	713.50	-15.73	17.32	-1.07	16.25	34.77	-18.52

NOTE: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB)

CHANNEL BANDWIDTH: 10MHz QPSK

MODE		TX channel 23780					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	709.00	-13.55	16.41	-1.07	15.34	34.77	-19.43
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	709.00	-16.49	16.37	-1.07	15.30	34.77	-19.47

MODE		TX channel 23790					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	710.00	-14.48	15.52	-1.07	14.45	34.77	-20.32
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	710.00	-16.99	15.82	-1.07	14.75	34.77	-20.02

MODE		TX channel 23800					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	711.00	-14.90	15.15	-1.07	14.08	34.77	-20.69
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	711.00	-15.39	17.51	-1.07	16.44	34.77	-18.33

NOTE: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB)

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stability Measurement

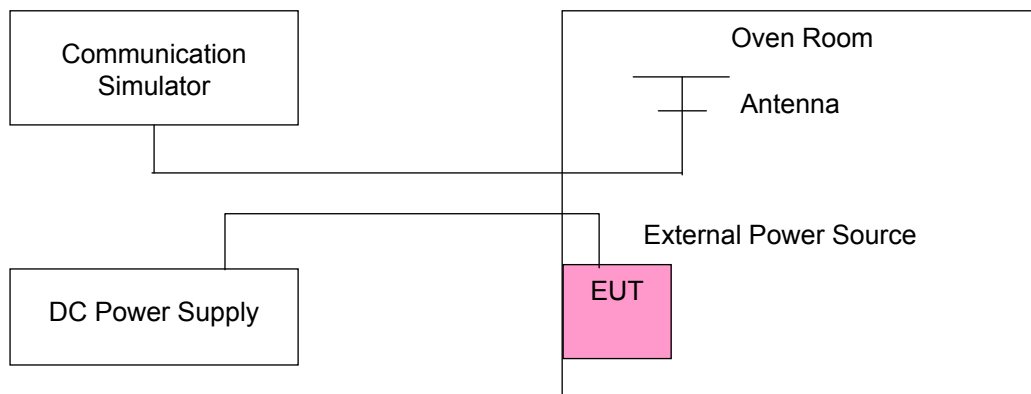
According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with specification of EUT $-30 \sim 50$.

4.2.2 Test Procedure

- 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.
- 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.
- 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 frequency error from the communication simulator.

4.2.3 Test Setup



4.2.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	Frequency Error (ppm)		Limit (ppm)
	5MHz	10MHz	
4.2	-0.018	-0.018	2.5
3.8	-0.015	-0.018	2.5
3.5	-0.017	-0.021	2.5

NOTE: The applicant defined the normal working voltage of the battery is from 3.5Vdc to 4.2Vdc.

Frequency Error vs. Temperature.

TEMP. ()	Frequency Error (ppm)		Limit (ppm)
	5MHz	10MHz	
60	-0.042	-0.048	2.5
50	-0.048	-0.044	2.5
40	-0.044	-0.038	2.5
30	-0.023	-0.030	2.5
20	-0.015	-0.018	2.5
10	-0.027	-0.025	2.5
0	-0.034	-0.037	2.5
-10	-0.052	-0.058	2.5
-20	-0.058	-0.059	2.5

4.3 Emission Bandwidth Measurement

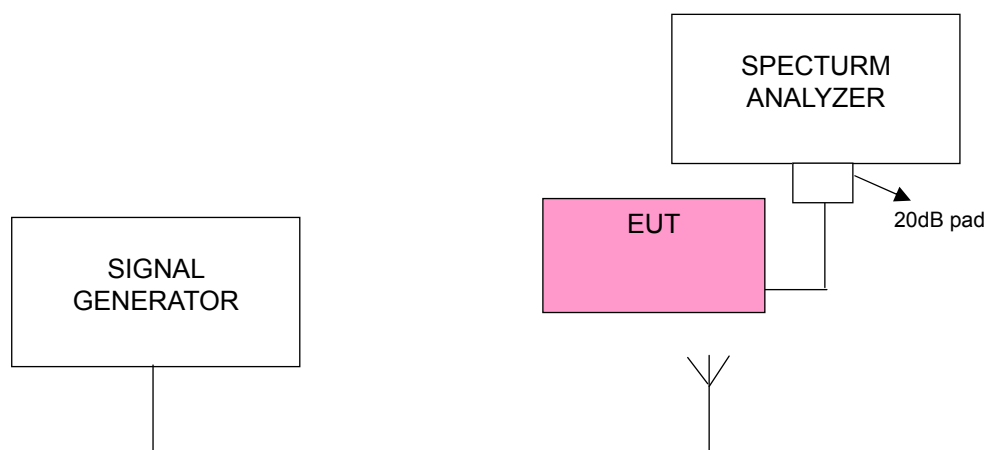
4.3.1 Limits of Emission Bandwidth Measurement

According to FCC 27.53(m)(6) specified that 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 26dB below the transmitter power.

4.3.2 Test Procedure

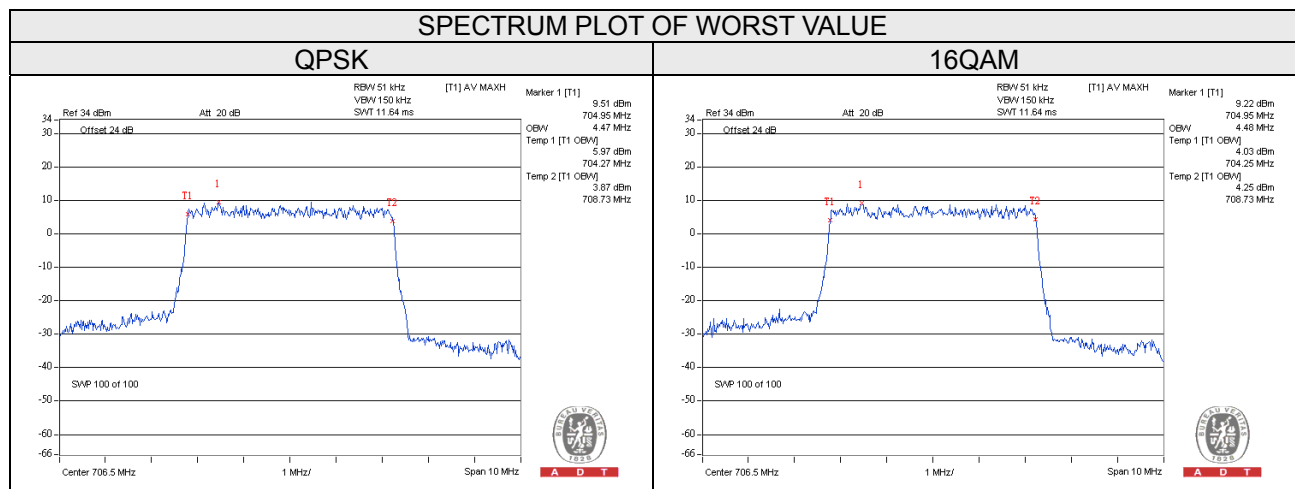
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.3.3 Test Setup



4.3.4 Test Result

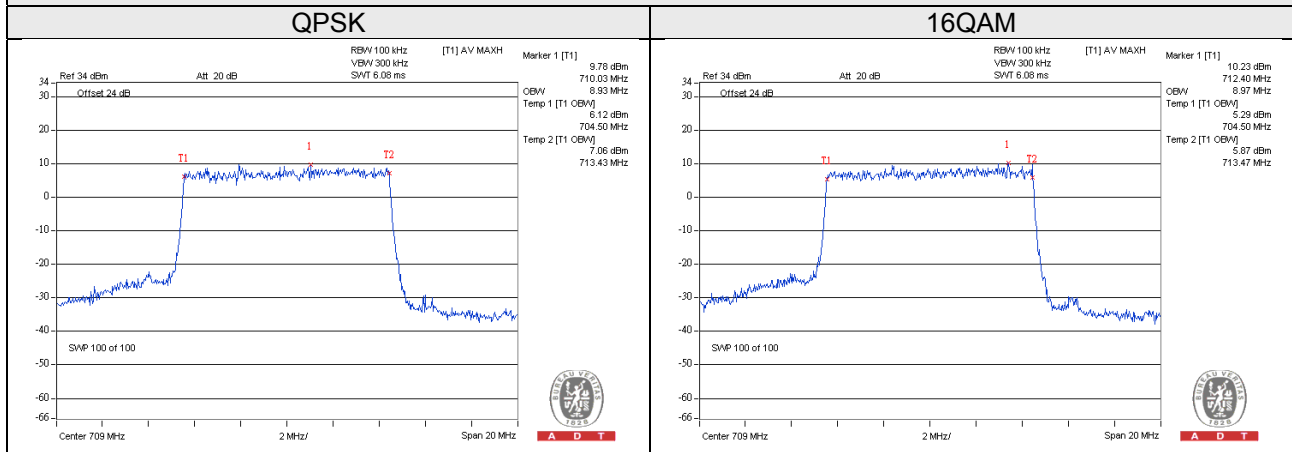
Channel Bandwidth: 5MHz			
Channel	Frequency (MHz)	QPSK	16QAM
23755	706.5	4.47	4.48
23790	710.0	4.47	4.47
23825	713.5	4.45	4.47



Channel Bandwidth: 10MHz

Channel	Frequency (MHz)	QPSK	16QAM
23780	709.0	8.93	8.97
23790	710.0	8.90	8.93
23800	711.0	8.90	8.90

SPECTRUM PLOT OF WORST VALUE

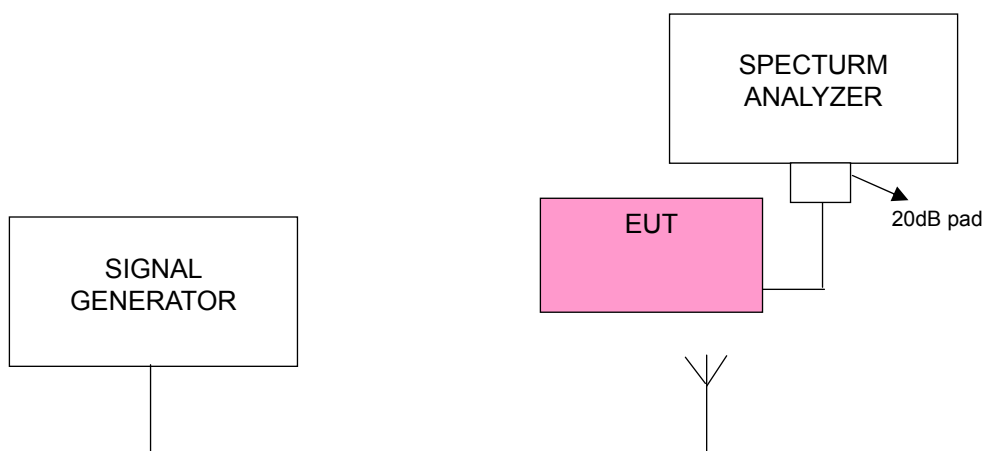


4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

According to FCC 27.53(m)(4) specified that power of any emission outside of the channel edge must be attenuated below the transmitting power (P) by a factor shall be not less than $43 + 10 \log (P)$ dB at the channel edge, the limit of emission equal to -13dBm . And $55 + 10 \log (P)$ dB at 5.5 MHz from the channel edges, the limit of emission equal to -25dBm . In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.4.2 Test Setup



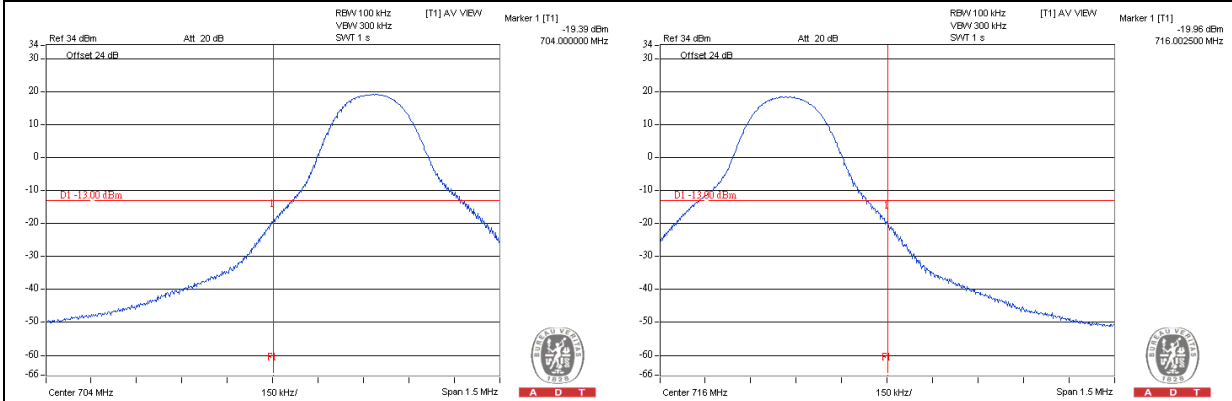
4.4.3 Test Procedures

- The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels: low, middle and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1.5MHz. RBW = 100kHz and VBW = 300kHz (Channel Bandwidth: 5MHz/ 10MHz).
- Record the max trace plot into the test report.

4.4.4 Test Results

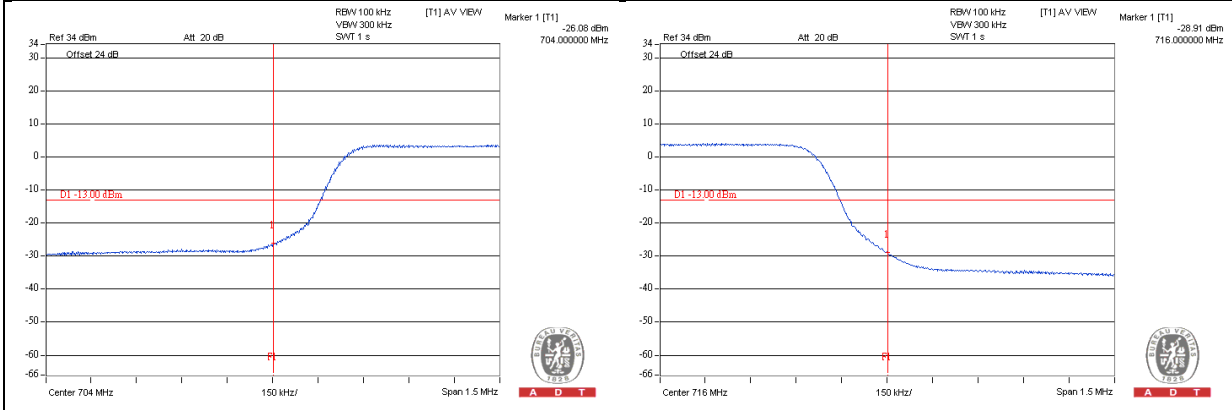
Channel Bandwidth: 5MHz / QPSK

CHANNEL	23755	1 RB / 0 RB Offset	CHANNEL	23825	1 RB / 24 RB Offset
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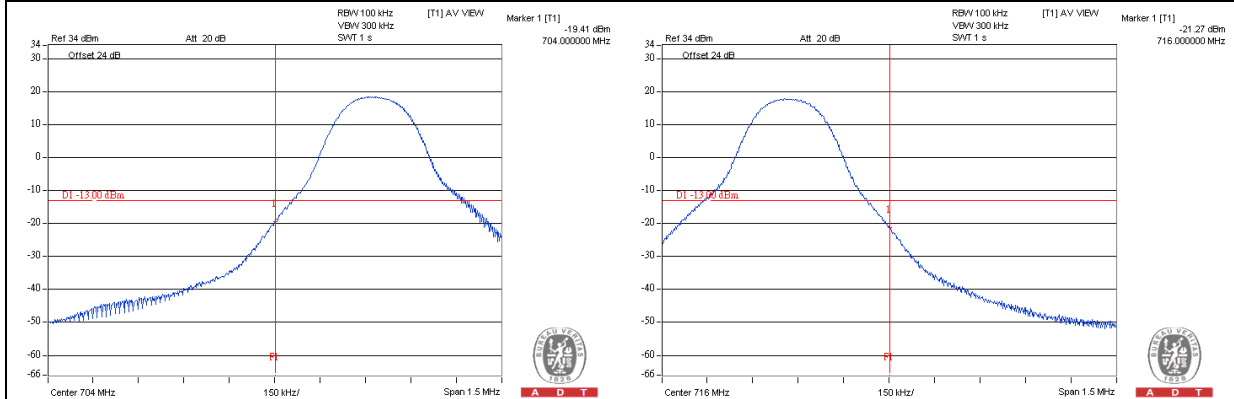
Channel Bandwidth: 5MHz / QPSK

CHANNEL	23755	25 RB / 0 RB Offset	CHANNEL	23825	25 RB / 0 RB Offset
---------	-------	---------------------	---------	-------	---------------------



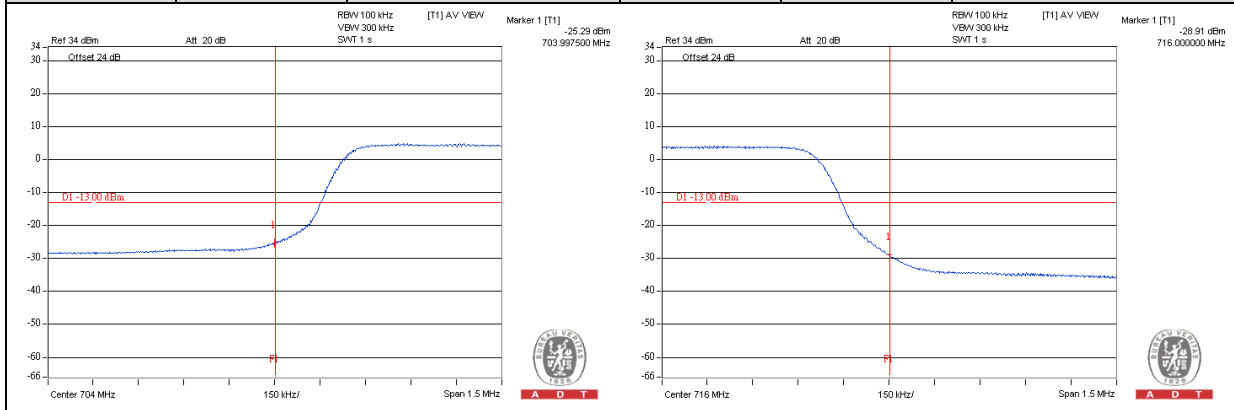
Channel Bandwidth: 5MHz / 16QAM

CHANNEL	23755	1 RB / 0 RB Offset	CHANNEL	23825	1 RB / 24 RB Offset
---------	-------	--------------------	---------	-------	---------------------



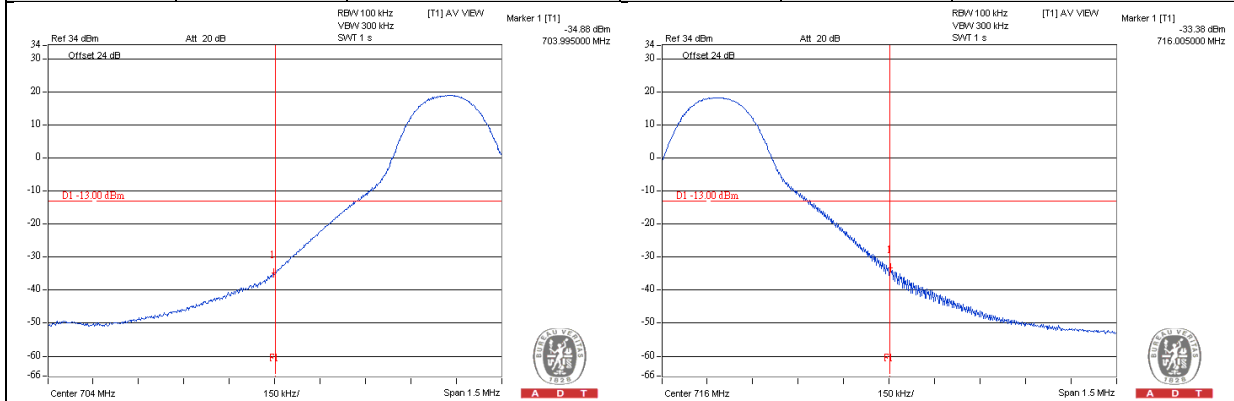
Channel Bandwidth: 5MHz / 16QAM

CHANNEL	23755	25 RB / 0 RB Offset	CHANNEL	23825	25 RB / 0 RB Offset
---------	-------	---------------------	---------	-------	---------------------



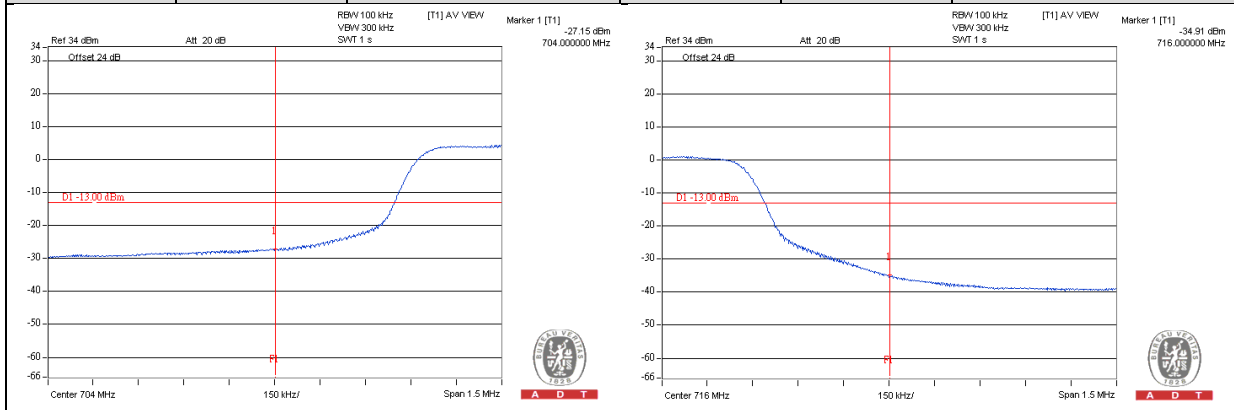
Channel Bandwidth: 10MHz / QPSK

CHANNEL	23780	1 RB / 0 RB Offset	CHANNEL	23800	1 RB / 49 RB Offset
---------	-------	--------------------	---------	-------	---------------------



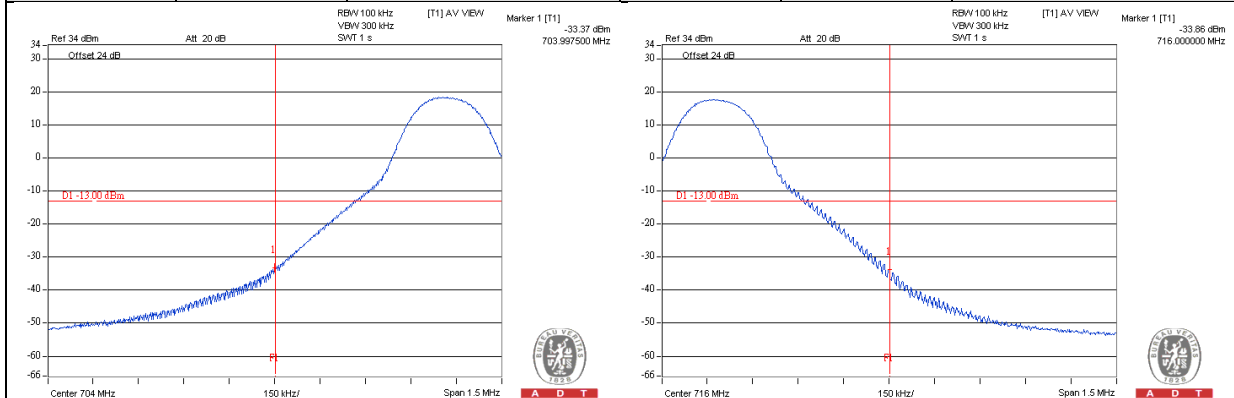
Channel Bandwidth: 10MHz / QPSK

CHANNEL	23780	50 RB / 0 RB Offset	CHANNEL	23800	50 RB / 0 RB Offset
---------	-------	---------------------	---------	-------	---------------------



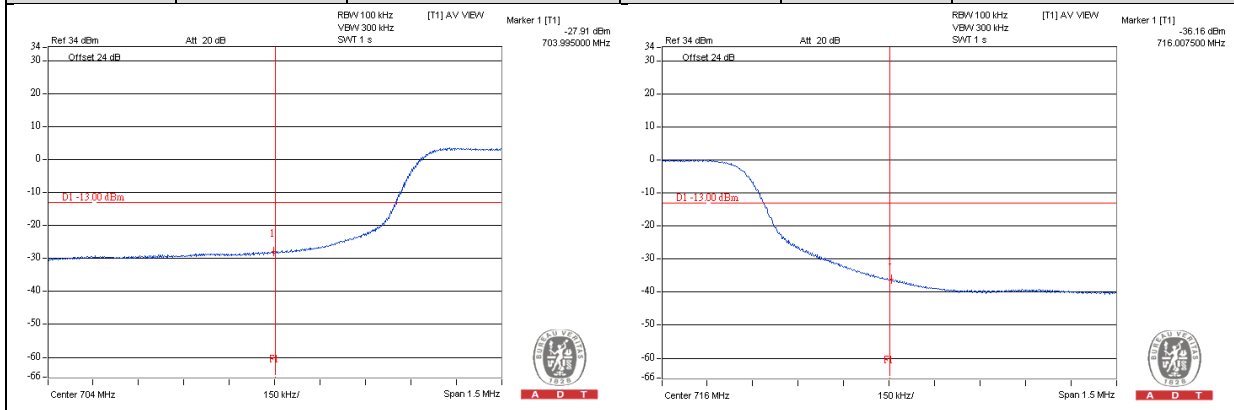
Channel Bandwidth: 10MHz / 16QAM

CHANNEL	23780	1 RB / 0 RB Offset	CHANNEL	23800	1 RB / 49 RB Offset
---------	-------	--------------------	---------	-------	---------------------



Channel Bandwidth: 10MHz / 16QAM

CHANNEL	23780	50 RB / 0 RB Offset	CHANNEL	23800	50 RB / 0 RB Offset
---------	-------	---------------------	---------	-------	---------------------

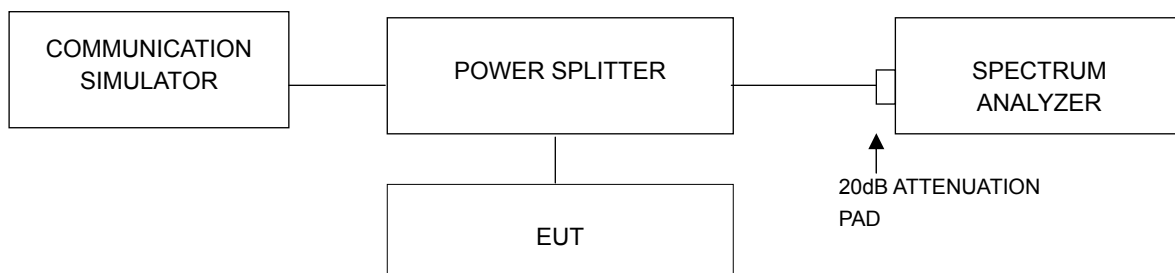


4.5 Peak To Average Ratio

4.5.1 Limits of Peak To Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

4.5.2 Test Setup

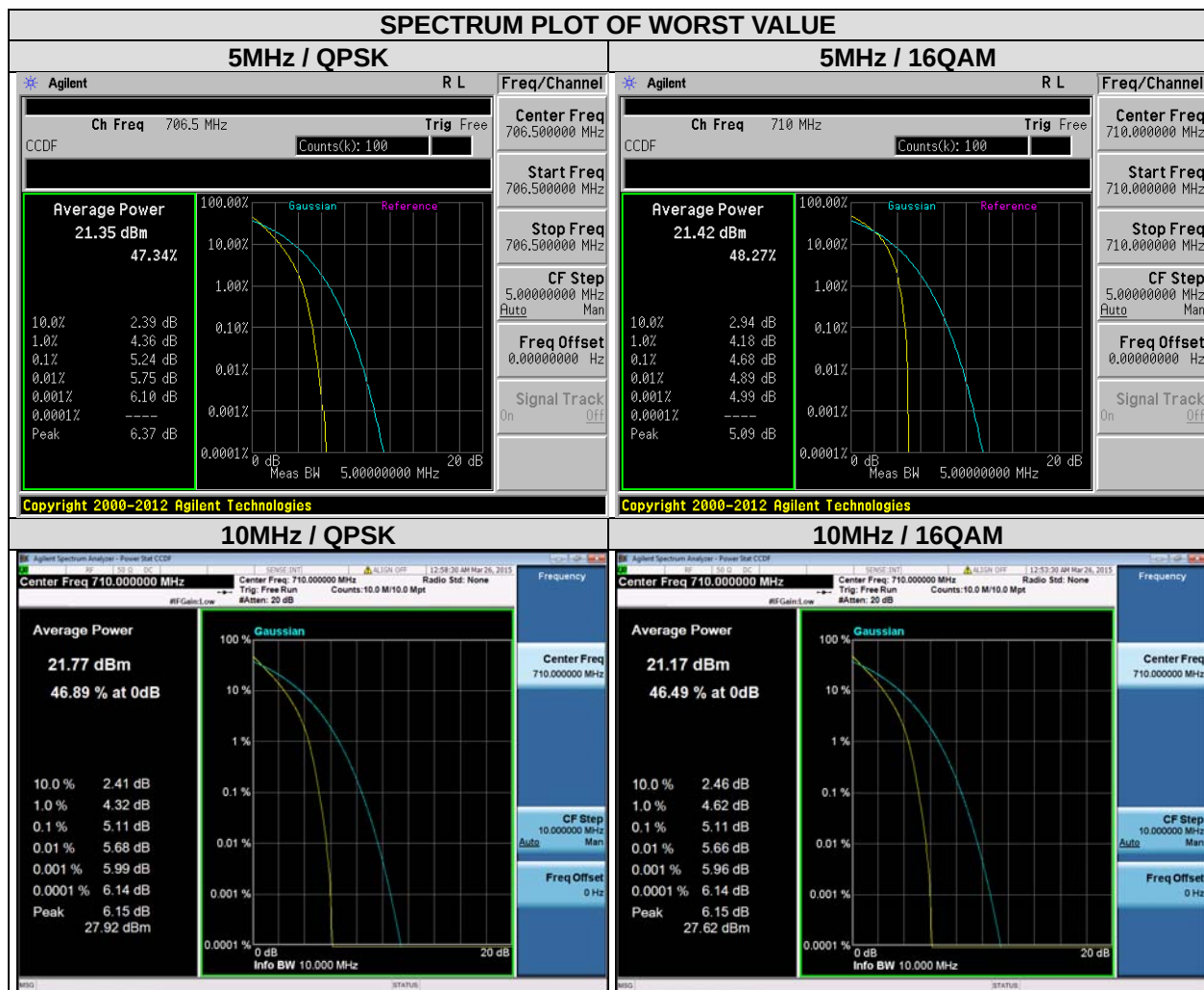


4.5.3 Test Procedures

1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

4.5.4 Test Results

CHANNEL BANDWIDTH: 5MHz				CHANNEL BANDWIDTH: 10MHz			
CHANNEL	FREQUENCY (MHz)	Peak To Average Ratio (dB)		CHANNEL	FREQUENCY (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
23755	706.5	5.24	4.68	23780	709.0	5.03	5.03
23790	710.0	5.16	4.68	23790	710.0	5.11	5.11
23825	713.5	5.06	4.61	23800	711.0	5.05	5.05

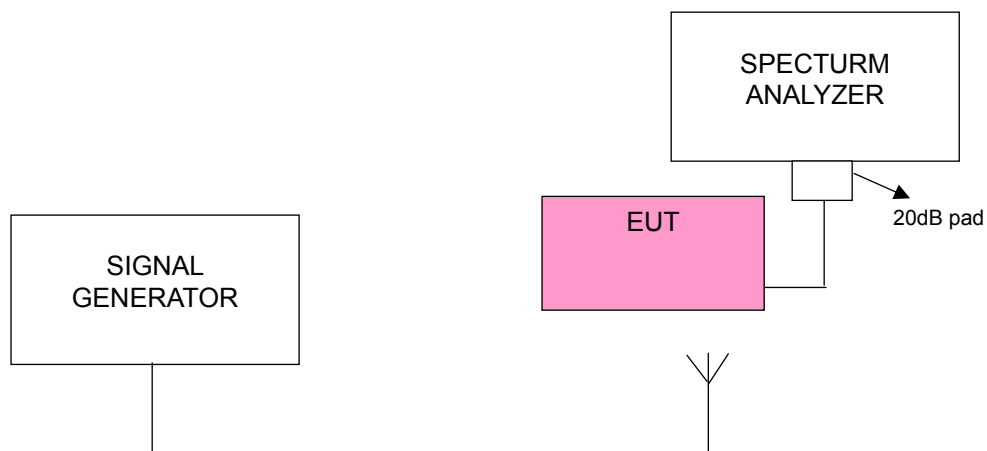


4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

In the FCC 27.53(m)(4), On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB. The emission limit equal to -13dBm .

4.6.2 Test Setup



4.6.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 9GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

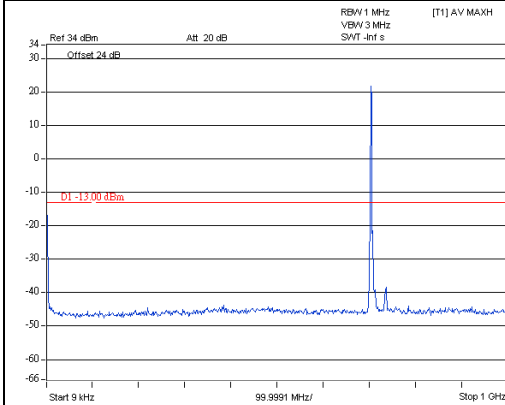
4.6.4 Test Results

Channel Bandwidth: 5MHz / QPSK

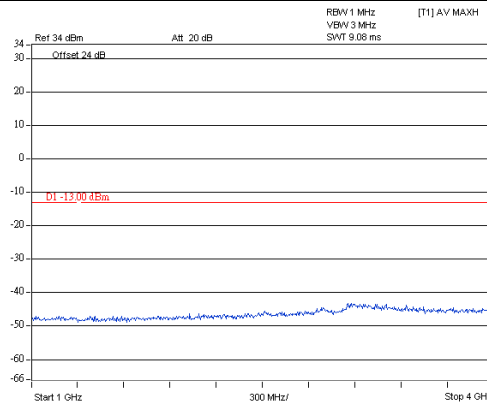
CHANNEL 23755

FREQUENCY RANGE : 9kHz~1GHz

FREQUENCY RANGE : 1GHz~4GHz



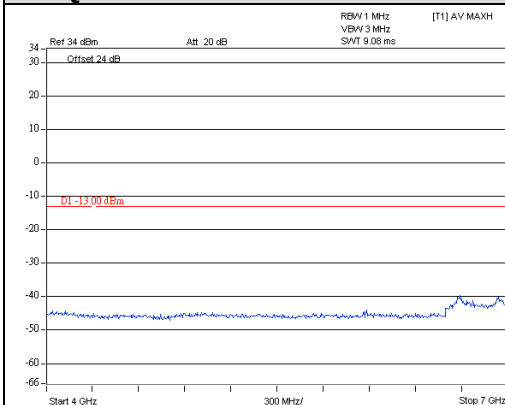
A D T



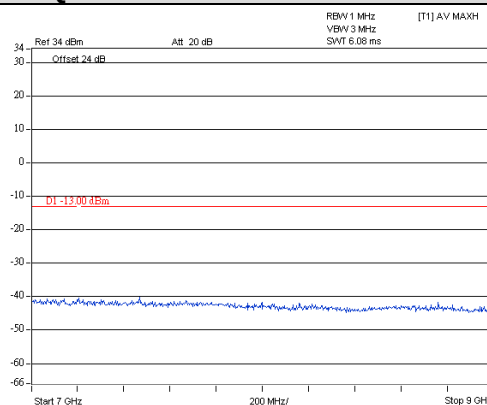
A D T

FREQUENCY RANGE : 4GHz~7GHz

FREQUENCY RANGE : 7GHz~9GHz



A D T



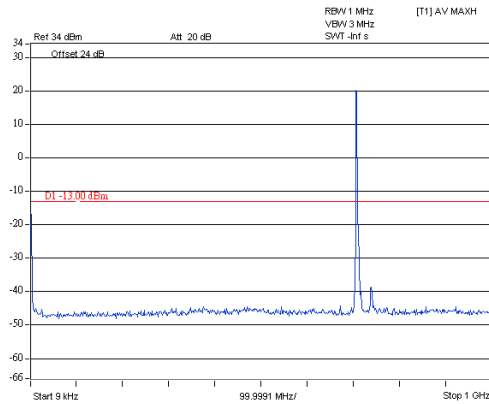
A D T

Channel Bandwidth: 5MHz / QPSK

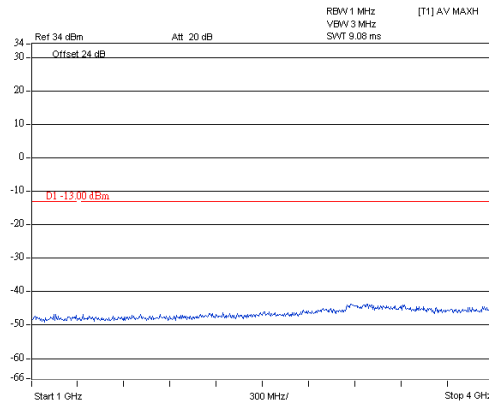
CHANNEL 23790

FREQUENCY RANGE : 9kHz~1GHz

FREQUENCY RANGE : 1GHz~4GHz



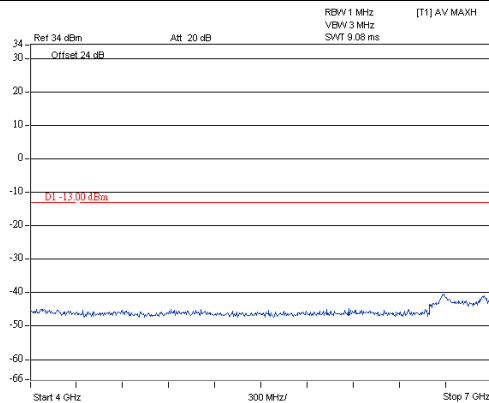
A D T



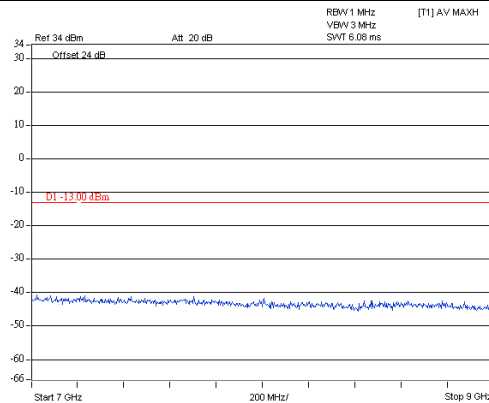
A D T

FREQUENCY RANGE : 4GHz~7GHz

FREQUENCY RANGE : 7GHz~9GHz



A D T



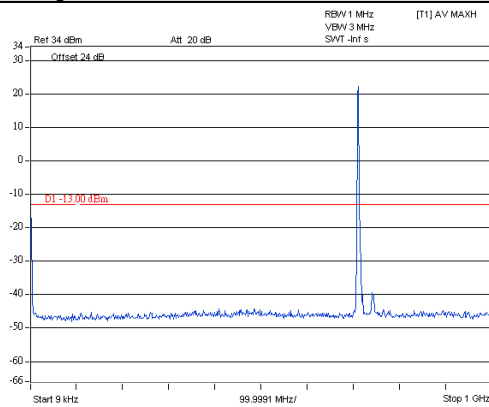
A D T

Channel Bandwidth: 5MHz / QPSK

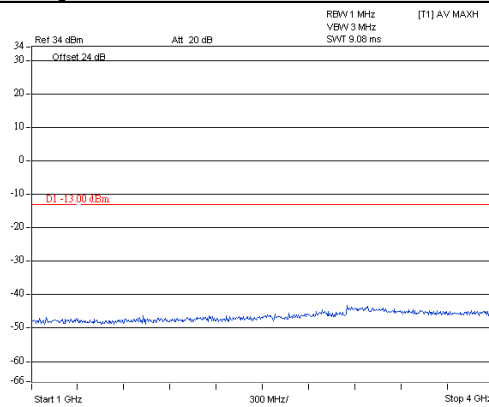
CHANNEL 23825

FREQUENCY RANGE : 9kHz~1GHz

FREQUENCY RANGE : 1GHz~4GHz



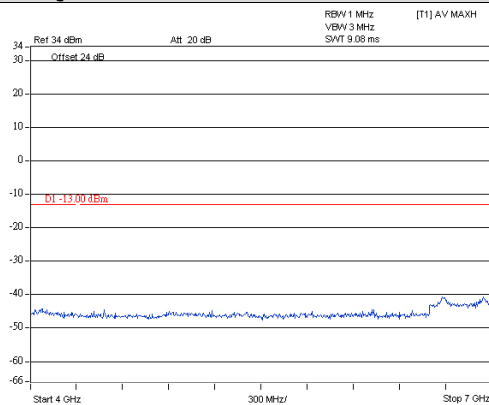
A D T



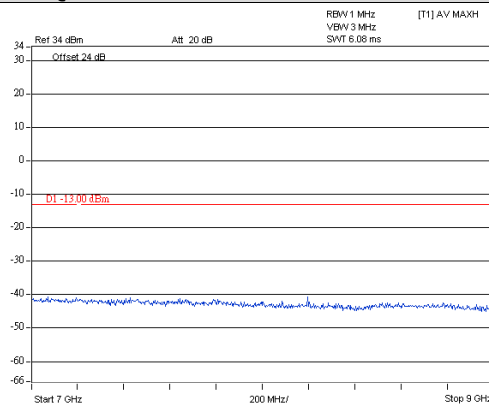
A D T

FREQUENCY RANGE : 4GHz~7GHz

FREQUENCY RANGE : 7GHz~9GHz



A D T



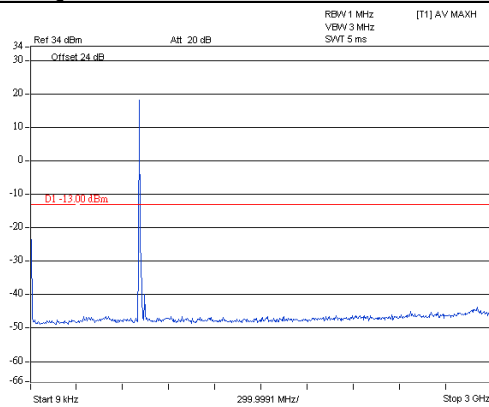
A D T

Channel Bandwidth: 10MHz / QPSK

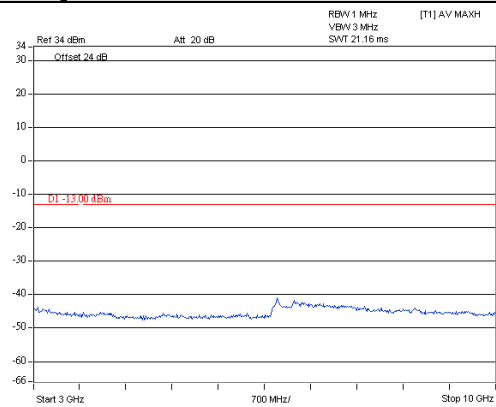
CHANNEL 23780

FREQUENCY RANGE : 9kHz~3GHz

FREQUENCY RANGE : 3GHz~10GHz

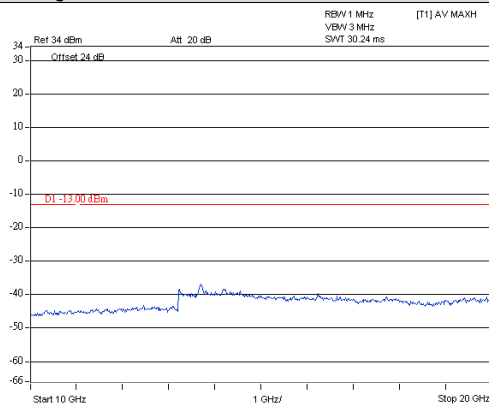


A D T



A D T

FREQUENCY RANGE : 10GHz~20GHz



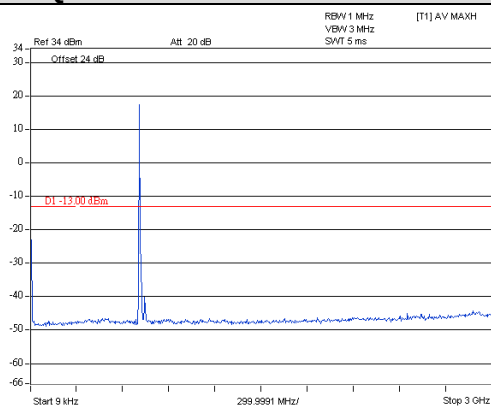
A D T

Channel Bandwidth: 10MHz / QPSK

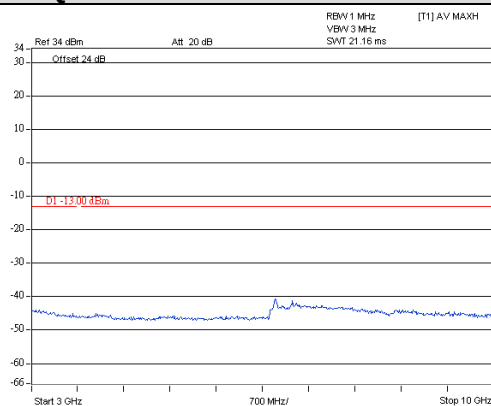
CHANNEL 23790

FREQUENCY RANGE : 9kHz~3GHz

FREQUENCY RANGE : 3GHz~10GHz

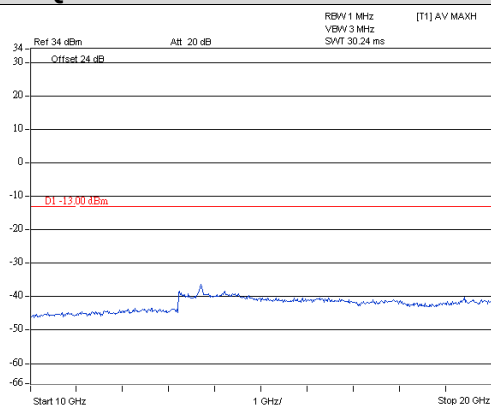


A D T



A D T

FREQUENCY RANGE : 10GHz~20GHz



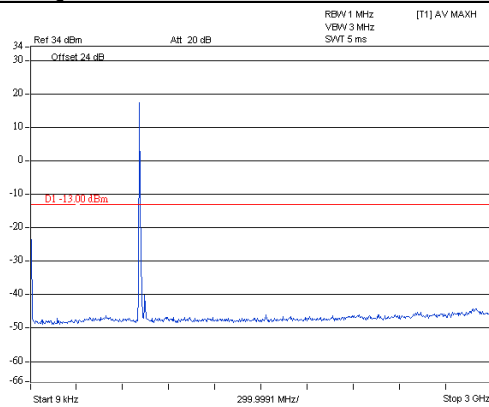
A D T

Channel Bandwidth: 10MHz / QPSK

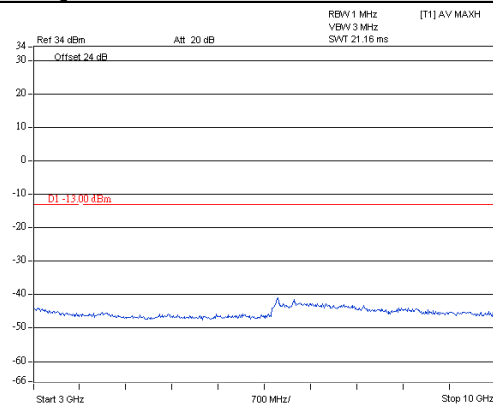
CHANNEL 23800

FREQUENCY RANGE : 9kHz~3GHz

FREQUENCY RANGE : 3GHz~10GHz

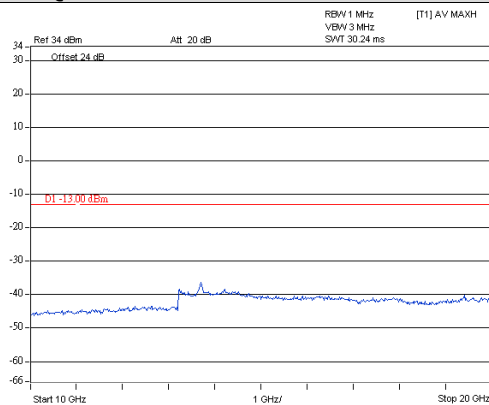


A D T



A D T

FREQUENCY RANGE : 10GHz~20GHz



A D T

4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

In the FCC 27.53(m) (4), On any frequency outside a licensee's frequency block, The power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB. The emission limit equal to -13dBm .

4.7.2 Test Procedure

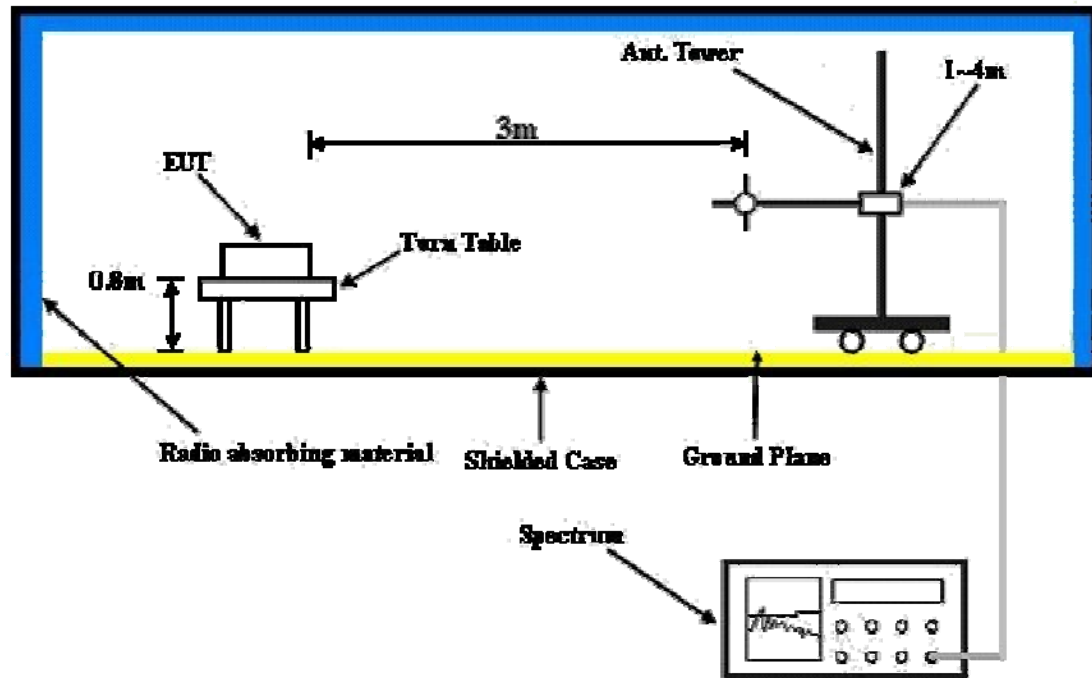
- a. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high channel of operational frequency range.)
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated 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.
- c. 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 b. Record the power level of S.G
- d. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- e. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $\text{E.R.P power} = \text{E.I.R.P power} - 2.15\text{dBi}.$

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

4.7.3 Deviation from Test Standard

No deviation.

4.7.4 Test Setup



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

4.7.5 Test Results

BELOW 1GHz

CHANNEL BANDWIDTH: 5MHz / QPSK

MODE	TX channel 23755	FREQUENCY RANGE	Below 1000 MHz
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	INPUT POWER	120Vac, 60 Hz
TESTED BY	Chris Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	45.52	-46.72	-37.54	-9.97	-47.51	-13.00	-34.51
2	140.58	-53.20	-60.63	-0.31	-60.94	-13.00	-47.94
3	352.04	-64.61	-75.13	5.22	-69.91	-13.00	-56.91
4	561.56	-62.40	-69.46	4.61	-64.85	-13.00	-51.85
5	771.08	-65.10	-66.65	4.37	-62.28	-13.00	-49.28
6	889.42	-66.62	-66.14	3.92	-62.22	-13.00	-49.22
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	45.52	-38.99	-37.54	-9.97	-47.51	-13.00	-34.51
2	161.92	-52.55	-56.09	0.63	-55.46	-13.00	-42.46
3	268.62	-62.06	-66.34	5.29	-61.05	-13.00	-48.05
4	631.40	-64.09	-66.08	4.68	-61.40	-13.00	-48.40
5	806.00	-67.58	-67.42	4.02	-63.40	-13.00	-50.40
6	967.02	-64.67	-61.57	3.91	-57.66	-13.00	-44.66

REMARKS:

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

CHANNEL BANDWIDTH: 10MHz / QPSK

MODE	TX channel 23780	FREQUENCY RANGE	Below 1000 MHz
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	INPUT POWER	120Vac, 60 Hz
TESTED BY	Chris Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M

No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	92.10	-61.96	-63.40	1.07	-62.33	-13.00	-49.33
2	123.10	-60.78	-62.11	0.01	-62.10	-13.00	-49.10
3	229.80	-68.89	-69.93	5.43	-64.50	-13.00	-51.50
4	297.70	-62.64	-63.52	5.14	-58.38	-13.00	-45.38
5	363.70	-68.25	-69.00	5.22	-63.78	-13.00	-50.78
6	743.90	-50.07	-50.20	4.71	-45.49	-13.00	-32.49

Antenna Polarity & Test Distance: Vertical at 3 M

No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	92.10	-58.52	-59.96	1.07	-58.89	-13.00	-45.89
2	123.10	-55.23	-56.56	0.01	-56.55	-13.00	-43.55
3	229.80	-62.33	-63.37	5.43	-57.94	-13.00	-44.94
4	297.70	-60.87	-61.75	5.14	-56.61	-13.00	-43.61
5	363.70	-68.43	-69.18	5.22	-63.96	-13.00	-50.96
6	743.90	-54.30	-54.43	4.71	-49.72	-13.00	-36.72

REMARKS:

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

ABOVE 1GHz

CHANNEL BANDWIDTH: 5MHz / QPSK

MODE	TX channel 23755	FREQUENCY RANGE	Above 1000 MHz
ENVIRONMENTAL CONDITIONS	18deg. C, 69%RH	INPUT POWER	120Vac, 60 Hz
TESTED BY	Nick Hsu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1413.00	-43.98	-43.35	4.75	-38.60	-13.00	-25.60
2	2119.50	-57.53	-56.22	6.36	-49.86	-13.00	-36.86
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1413.00	-47.32	-46.69	4.75	-41.94	-13.00	-28.94
2	2119.50	-60.63	-59.32	6.36	-52.96	-13.00	-39.96

REMARKS:

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

MODE	TX channel 23790	FREQUENCY RANGE	Above 1000 MHz
ENVIRONMENTAL CONDITIONS	18deg. C, 69%RH	INPUT POWER	120Vac, 60 Hz
TESTED BY	Nick Hsu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1420.00	-47.07	-46.43	4.78	-41.65	-13.00	-28.65
2	2130.00	-49.55	-48.23	6.36	-41.87	-13.00	-28.87
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1420.00	-49.60	-48.96	4.78	-44.18	-13.00	-31.18
2	2130.00	-59.02	-57.70	6.36	-51.34	-13.00	-38.34

REMARKS:

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

MODE	TX channel 23825	FREQUENCY RANGE	Above 1000 MHz
ENVIRONMENTAL CONDITIONS	18deg. C, 69%RH	INPUT POWER	120Vac, 60 Hz
TESTED BY	Nick Hsu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1427.00	-46.04	-45.39	4.81	-40.58	-13.00	-27.58
2	2140.50	-54.39	-53.06	6.36	-46.70	-13.00	-33.70
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1427.00	-49.41	-48.76	4.81	-43.95	-13.00	-30.95
2	2140.50	-56.19	-54.86	6.36	-48.50	-13.00	-35.50

REMARKS:

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

CHANNEL BANDWIDTH: 10MHz / QPSK

MODE	TX channel 23780	FREQUENCY RANGE	Above 1000 MHz
ENVIRONMENTAL CONDITIONS	18deg. C, 69%RH	INPUT POWER	120Vac, 60 Hz
TESTED BY	Nick Hsu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1418.00	-47.44	-46.80	4.77	-42.03	-13.00	-29.03
2	2127.00	-51.76	-50.45	6.37	-44.08	-13.00	-31.08
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1418.00	-50.18	-49.54	4.77	-44.77	-13.00	-31.77
2	2127.00	-57.16	-55.85	6.37	-49.48	-13.00	-36.48

REMARKS:

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

MODE	TX channel 23790	FREQUENCY RANGE	Above 1000 MHz
ENVIRONMENTAL CONDITIONS	18deg. C, 69%RH	INPUT POWER	120Vac, 60 Hz
TESTED BY	Nick Hsu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1420.00	-46.93	-46.29	4.78	-41.51	-13.00	-28.51
2	2130.00	-51.40	-50.08	6.36	-43.72	-13.00	-30.72
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1420.00	-50.24	-49.60	4.78	-44.82	-13.00	-31.82
2	2130.00	-60.04	-58.72	6.36	-52.36	-13.00	-39.36

REMARKS:

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

MODE	TX channel 23800	FREQUENCY RANGE	Above 1000 MHz
ENVIRONMENTAL CONDITIONS	18deg. C, 69%RH	INPUT POWER	120Vac, 60 Hz
TESTED BY	Nick Hsu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1422.00	-49.30	-48.66	4.79	-43.87	-13.00	-30.87
2	2133.00	-53.80	-52.48	6.36	-46.12	-13.00	-33.12
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1422.00	-50.06	-49.42	4.79	-44.63	-13.00	-31.63
2	2133.00	-60.98	-59.66	6.36	-53.30	-13.00	-40.30

REMARKS:

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

5 Pictures of Test Arrangements

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

Appendix – Information 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 accredited and approved according to ISO/IEC 17025.

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

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

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