

FCC Test Report

(Part 90 – LTE Band 14)

Report No.: RF141118C01-8

FCC ID: AZ489FT7062

Test Model: LEX L10

Received Date: Dec. 16, 2014

Test Date: Dec. 25, 2014 ~ Mar. 26, 2015

Issued Date: Mar. 27, 2015

Applicant: Motorola Solutions Inc

Address: 1301 East Algonquin Road, Schaumburg, Illinois 60196

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

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A D T

Release Control Record

Issue No.	Description	Date Issued
RF141118C01-8	Original release	Mar. 27, 2015

1 Certificate of Conformity

Product: Smart phone

Brand: Motorola Solutions Inc

Test Model: LEX L10

Sample Status: Prototype

Applicant: Motorola Solutions Inc

Test Date: Dec. 25, 2014 ~ Mar. 26, 2015

Standards: FCC Part 90, Subpart R

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 : Celine Chou , **Date:** Mar. 27, 2015
Celine Chou / Specialist

Approved by : Bruce Chen , **Date:** Mar. 27, 2015
Bruce Chen / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 90 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 90.542(a)(7)	Maximum Peak Output Power Limit: max. 3 watts e.r.p peak power	PASS	Meet the requirement of limit.
2.1055 90.539	Frequency Stability	PASS	Meet the requirement of limit.
2.1049	Occupied Bandwidth	PASS	Meet the requirement of limit.
90.210(n)	Emission Mask	PASS	Meet the requirement of limit.
90.543(e)	Band Edge Measurements	PASS	Meet the requirement of limit.
---	Peak To Average Ratio	PASS	Meet the requirement of limit.
2.1051 90.543(e)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1051 90.543(e)(2)	Emission in the 769–775 MHz and 799–805 MHz band	PASS	Meet the requirement of limit.
2.1053 90.543(e)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -42.29dB at 39.70MHz.
2.1053 90.543(f)	Emissions in the band 1559–1610 MHz	PASS	Meet the requirement of limit. Minimum passing margin is -40.43dB at 1586.00MHz.

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) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
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
Spectrum Analyzer ROHDE & SCHWARZ	FSU 43	100115	Dec. 18, 2014	Dec. 17, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Feb. 26, 2014	Feb. 25, 2015
			Feb. 26, 2015	Feb. 25, 2016
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-404	Jan. 05, 2014	Jan. 04, 2015
			Jan. 05, 2015	Jan. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 17, 2014	Feb. 16, 2015
			Feb. 17, 2015	Feb. 16, 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 IC 7450F-4.

3 General Information

3.1 General Description of EUT

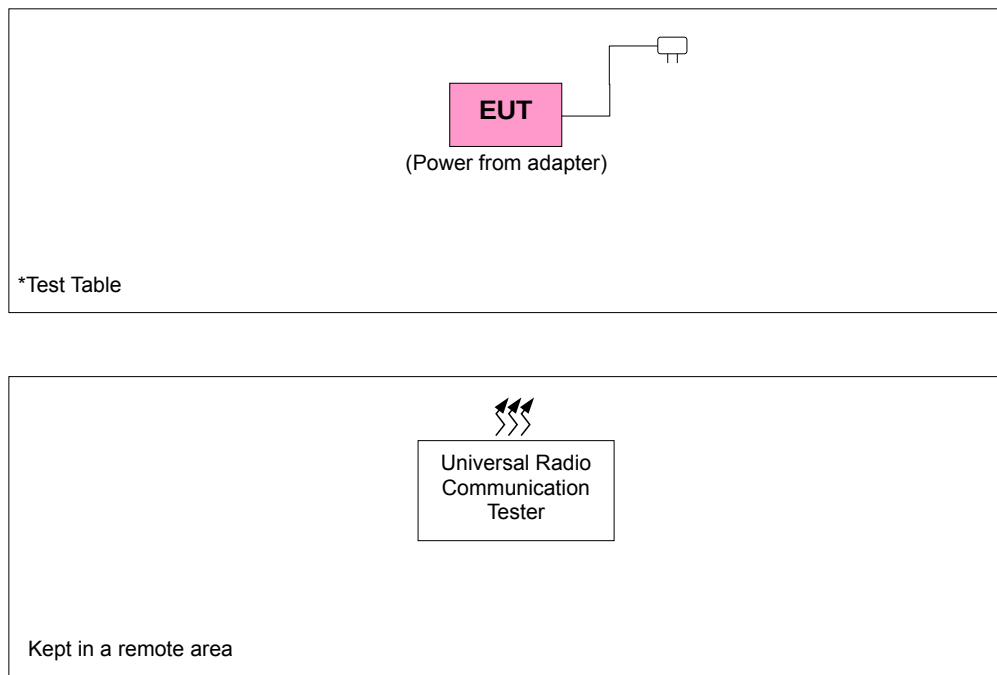
Product	Smart phone	
Brand	Motorola Solutions Inc	
Test Model	LEX L10	
Status of EUT	Prototype	
Power Supply Rating	3.7Vdc (Battery) 5Vdc (Adapter)	
Mode of operation	LTE Band 14	
Modulation Type	QPSK, 16QAM	
Operating Frequency	Channel Bandwidth 5MHz	795.50MHz
	Channel Bandwidth 10MHz	793MHz
Max. ERP Power	Channel Bandwidth 5MHz	229.087mW (23.60dBm)
	Channel Bandwidth 10MHz	125.893mW (21.00dBm)
Antenna Type	Inverted-L with parasitic element antenna with -1.13dBi gain	
Antenna Connector	Coaxial connector with switch	
Accessory Device	Refer to Note for more details	
Data Cable Supplied	Refer to Note for more details	
SW Version	M8974AAAAANLYD4050.1	
HW Version	MSM-8974-1-990BPNSP-TR-01-0-AB	

Note:

1. The EUT contains following accessory devices and data cable.

Item	Brand	Model or P/N	Specification
Rechargeable Lithium ion battery	MOTOROLA	PMNN4472A	3.7Vdc, 2340mAh, 8.7Wh
Rechargeable Lithium ion battery	MOTOROLA	PMNN4475A	3.7Vdc, 4560mAh, 16.9Wh
ITE power supply	MOTOROLA	IU08-2050120-WP (P/N: HKTN4008A)	I/P: 100-240Vac, 50-60Hz, 0.2A O/P: 5Vdc, 1.2A
USB cable (CABLE: ES400 USB SYNC AND CHARGE)	N/A	P/N: CKN6969A	1.4m shielded cable without core
Holster	N/A	P/N: HKLN4618A	-

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.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1	Universal Radio Communication Tester	R&S	CMU200	123112	NA

NO.	Signal Cable Description Of The Above Support Units
1	NA

Note:

1. All power cords of the above support units are non shielded (1.8m).
2. Item 1 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 X-plane. Following channel(s) was (were) selected for the final test as listed below:

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
ERP	23355	23355	5MHz	QPSK, 16QAM	1 RB / 0 RB Offset
	23330	23330	10MHz	QPSK, 16QAM	1 RB / 0 RB Offset
Frequency Stability	23355	23355	5MHz	QPSK	1 RB / 0 RB Offset
	23330	23330	10MHz	QPSK	1 RB / 0 RB Offset
Occupied Bandwidth	23355	23355	5MHz	QPSK, 16QAM	1 RB / 0 RB Offset
	23330	23330	10MHz	QPSK, 16QAM	1 RB / 0 RB Offset
Emission Mask	23355	23355	5MHz	QPSK, 16QAM	1RB Lower 1RB Upper 50% RB 100% RB
	23330	23330	10MHz	QPSK, 16QAM	1RB Lower 1RB Upper 50% RB 100% RB
Band Edge	23355	23355	5MHz	QPSK	1 RB / 0 RB Offset 1 RB / 24 RB Offset 25 RB / 0 RB Offset
	23330	23330	10MHz	QPSK	1 RB / 0 RB Offset 1 RB / 49 RB Offset 50 RB / 0 RB Offset
Peak To Average Ratio	23355	23355	5MHz	QPSK, 16QAM	1 RB / 0 RB Offset
	23330	23330	10MHz	QPSK, 16QAM	1 RB / 0 RB Offset
Conducted Emission	23355	23355	5MHz	QPSK	1 RB / 0 RB Offset
	23330	23330	10MHz	QPSK	1 RB / 0 RB Offset
Radiated Emission Below 1GHz	23355	23355	5MHz	QPSK	1 RB / 0 RB Offset
	23330	23330	10MHz	QPSK	1 RB / 0 RB Offset
Radiated Emission Above 1GHz	23355	23355	5MHz	QPSK	1 RB / 0 RB Offset
	23330	23330	10MHz	QPSK	1 RB / 0 RB Offset

NOTE: The conducted output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only ERP, Occupied Bandwidth, Emission Mask and Peak To Average Ratio had been tested under QPSK and 16QAM modes, the others test items were performed under QPSK mode only.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	24deg. C, 63%RH	120Vac, 60Hz	Chris Lin
Frequency Stability	24deg. C, 64%RH	3.7Vdc	Match Tsui
Occupied Bandwidth	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Emission Mask	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Band Edge	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Peak To Average Ratio	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Conducted Emission	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Radiated Emission	24deg. C, 63%RH	120Vac, 60Hz	Chris Lin

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 90

KDB 971168 D01 Power Meas License Digital Systems v02r02

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

Per FCC Part 90.542(a)(6)(7),

Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

4.1.2 Test Procedures

EIRP / ERP Measurement:

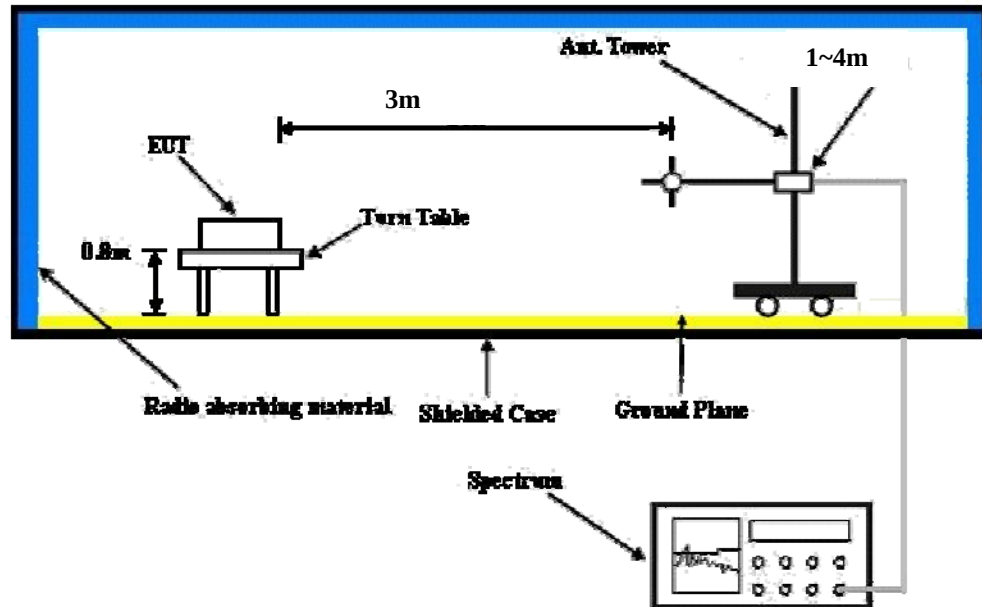
- a. The EUT was set up for the maximum power with LTE link data modulation. The power was measured with Agilent Spectrum Analyzer. All measurements were done at 1 channel. RWB is 1MHz and VBW is 3MHz.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed 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:

The EUT was set up for the maximum power with LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

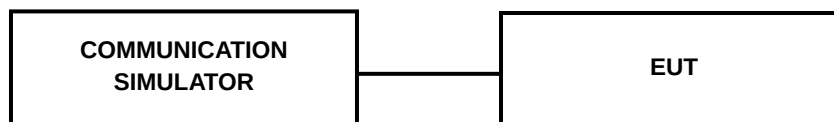
4.1.3 Test Setup

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	16QAM
			High CH 23355	High CH 23355
			795.5MHz	795.5MHz
14 / 5M	1	0	23.63	22.61
	1	12	23.50	22.48
	1	24	23.55	22.53
	12	0	22.49	21.47
	12	6	22.43	21.41
	12	13	22.46	21.44
	25	0	22.47	21.45
Band / BW	RB Size	RB Offset	QPSK	16QAM
			Mid CH 23330	Mid CH 23330
			793MHz	793MHz
14 / 10M	1	0	23.69	22.67
	1	24	23.61	22.59
	1	49	23.63	22.61
	25	0	22.61	21.60
	25	12	22.59	21.57
	25	25	22.58	21.56
	50	0	22.60	21.58

ERP Power (dBm)

For Channel Bandwidth:

5MHz QPSK

MODE		TX channel 23355					
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	795.50	-7.14	24.32	-0.72	23.60	34.77	-11.17
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	795.50	-15.06	17.40	-0.72	16.68	34.77	-18.09

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

5MHz 16QAM

MODE		TX channel 23355					
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	795.50	-7.64	23.82	-0.72	23.10	34.77	-11.67
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	795.50	-15.56	16.90	-0.72	16.18	34.77	-18.59

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

For Channel Bandwidth:

10MHz QPSK

MODE		TX channel 23330					
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	793.00	-9.87	21.76	-0.76	21.00	34.77	-13.77
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	793.00	-15.31	17.19	-0.76	16.43	34.77	-18.34

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

10MHz 16QAM

MODE		TX channel 23330					
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	793.00	-10.37	21.26	-0.76	20.50	34.77	-14.27
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	793.00	-15.81	16.69	-0.76	15.93	34.77	-18.84

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

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stability Measurement

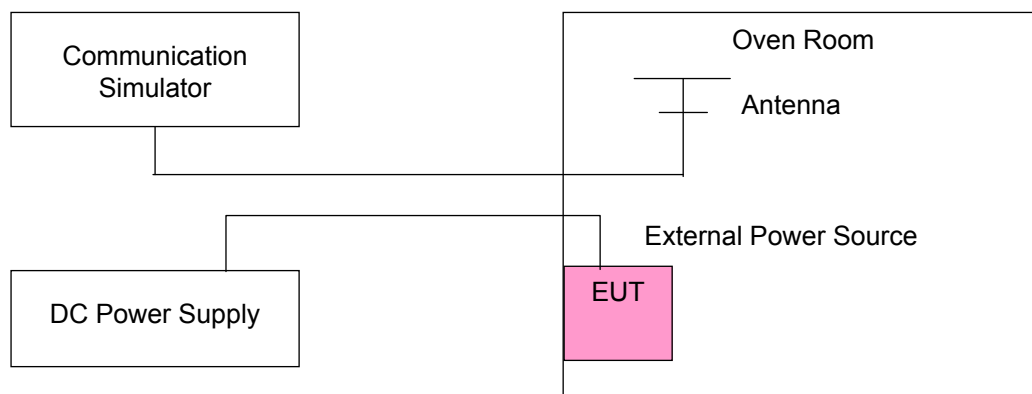
The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

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 °C 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)
	5M	10M	
4.25	-0.014	-0.016	1.25
3.70	-0.016	-0.013	1.25
3.45	-0.016	-0.011	1.25

NOTE: The applicant defined the normal working voltage of the battery is from 3.45Vdc to 4.25Vdc.

Frequency Error vs. Temperature.

TEMP. (°C)	Frequency Error (ppm)		Limit (ppm)
	5M	10M	
60	-0.035	-0.026	1.25
50	-0.036	-0.025	1.25
40	-0.033	-0.021	1.25
30	-0.024	-0.016	1.25
20	-0.016	-0.013	1.25
10	-0.019	-0.018	1.25
0	-0.024	-0.024	1.25
-10	-0.030	-0.030	1.25
-20	-0.039	-0.037	1.25

4.3 Occupied Bandwidth Measurement

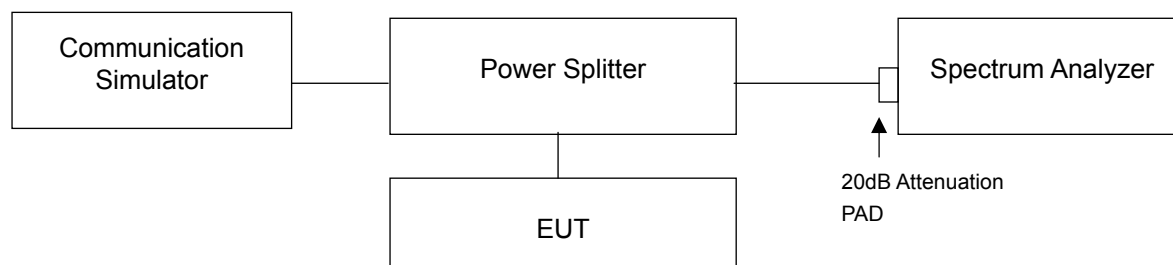
4.3.1 Limits of Occupied Bandwidth Measurement

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

4.3.2 Test Procedure

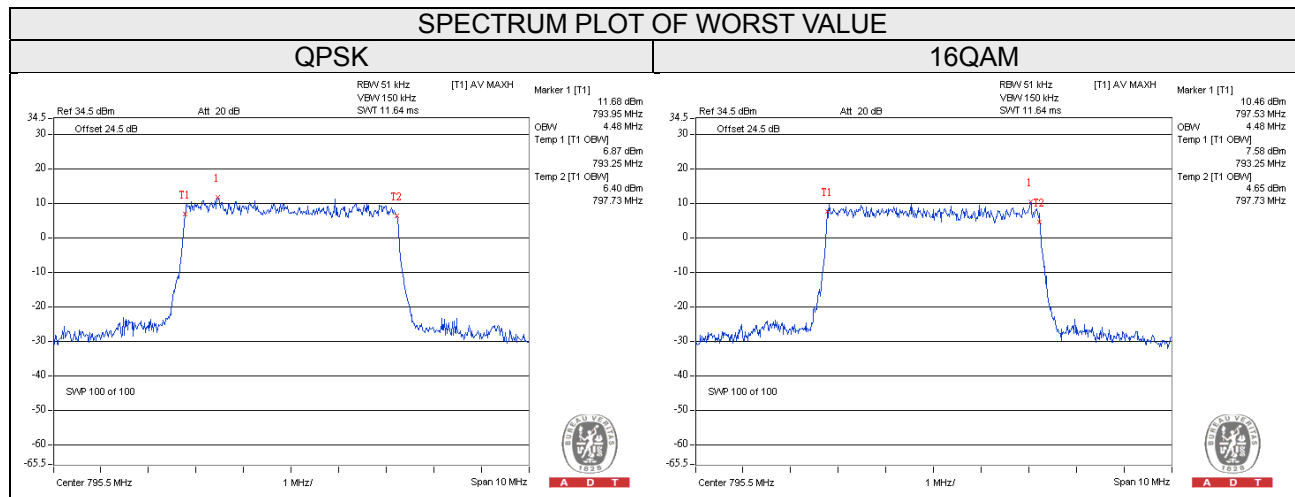
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range, RB of the spectrum is 1% of occupied bnadwidth and VB of the spectrum is 3 times RBW. The communication simulator station system controlled a EUT to export maximum output 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

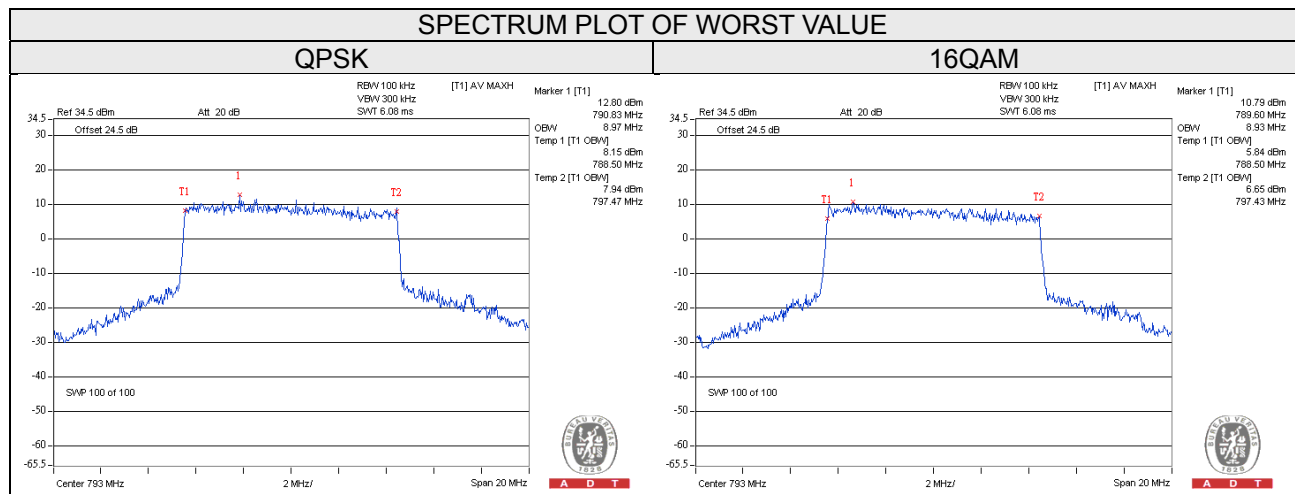


4.3.4 Test Result

Channel Bandwidth: 5MHz			
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		QPSK	16QAM
23355	795.5	4.48	4.48



Channel Bandwidth: 10MHz			
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		QPSK	16QAM
23330	793.0	8.97	8.93



4.4 Emission Mask Measurement

4.4.1 Limits of Emission Mask Measurement

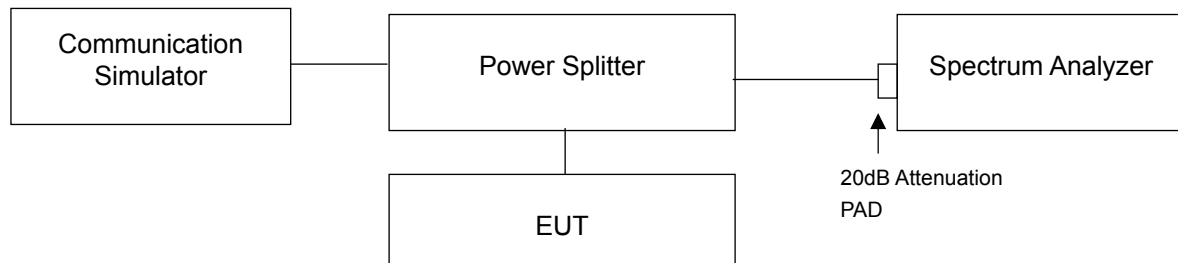
Per 90.210(n), Emission mask shall comply with 90.210(b)

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB

4.4.2 Test Procedures

- a. The power was measured with Agilent Spectrum Analyzer. All measurements were done at 1 channel, RB of the spectrum is 100kHz and VB of the spectrum is 300kHz.
- b. The measurement used the power splitter via EUT RF power connector between signal generator and spectrum analyzer.
- c. Record the test plot.

4.4.3 Test Setup

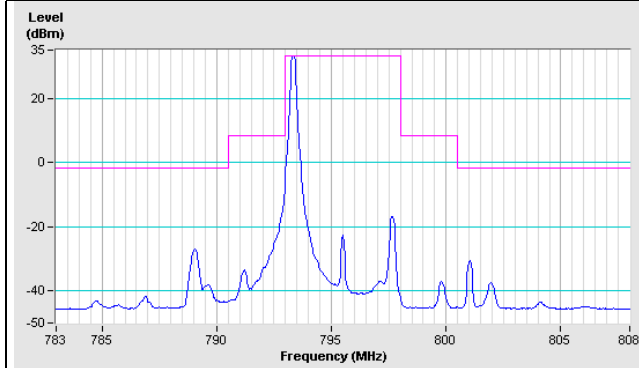


4.4.4 Test Results

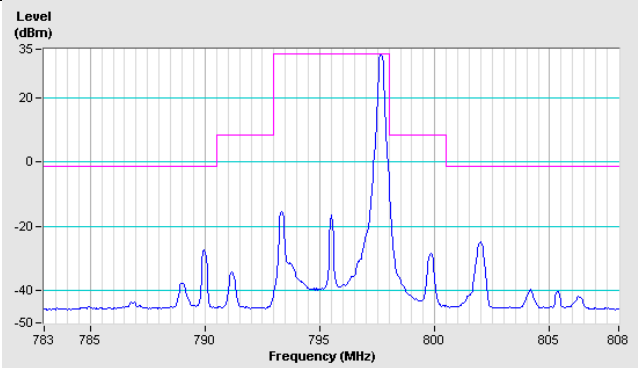
Channel: 23355 (Channel Bandwidth: 5MHz)

QPSK

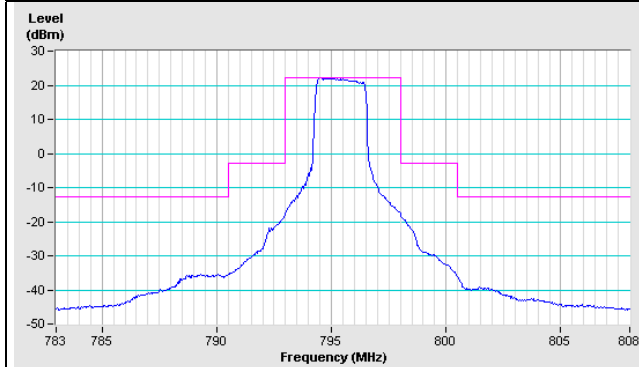
1RB Lower



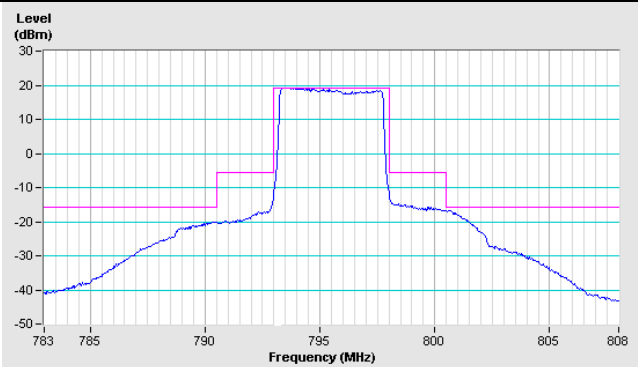
1RB Upper



50% RB



100% RB

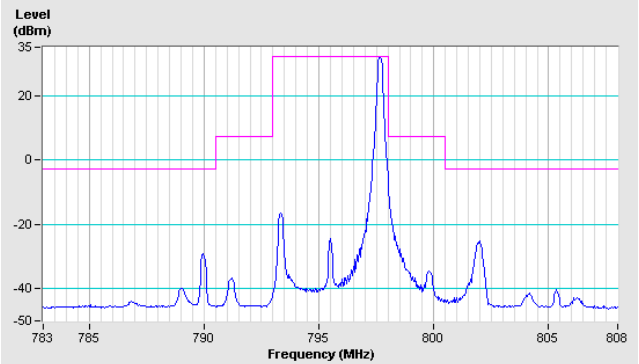
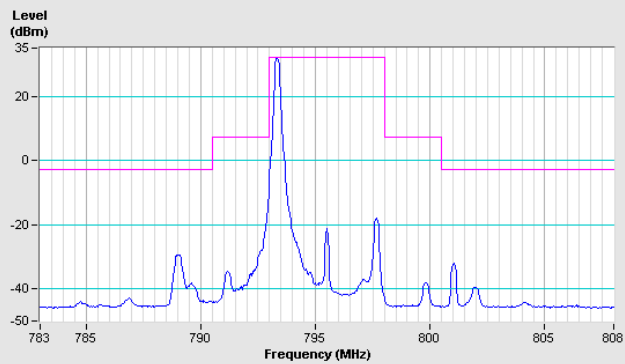


Channel: 23355 (Channel Bandwidth: 5MHz)

16QAM

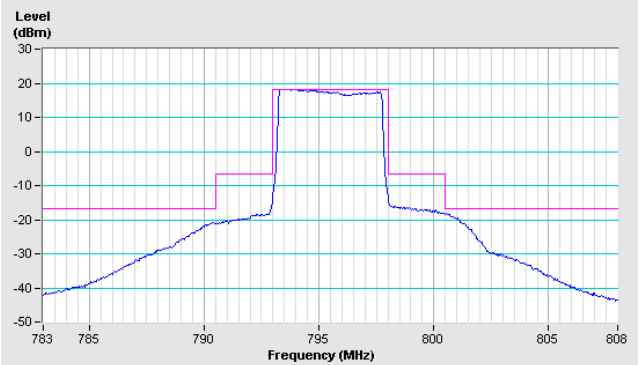
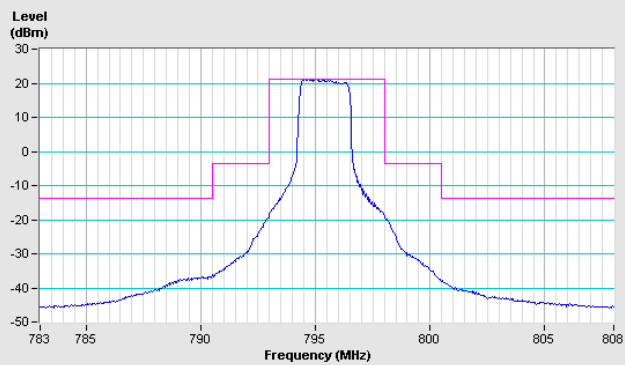
1RB Lower

1RB Upper



50% RB

100% RB

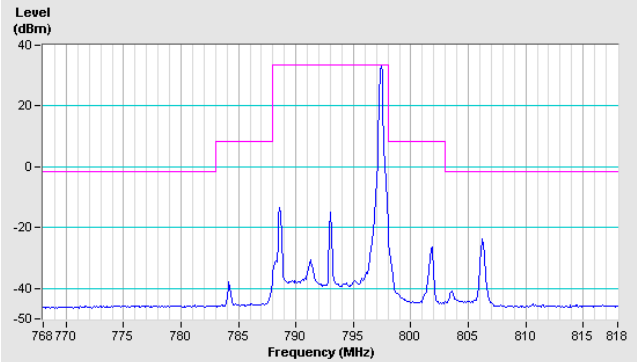
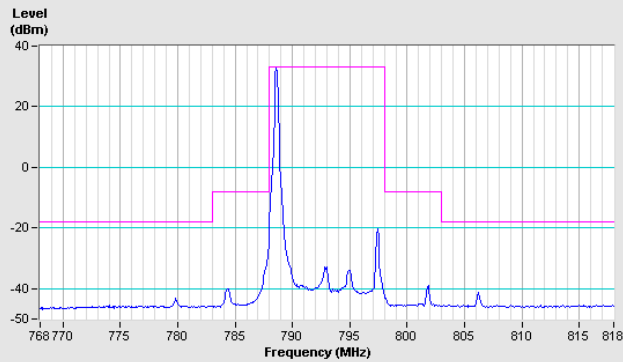


Channel: 23330 (Channel Bandwidth: 10MHz)

QPSK

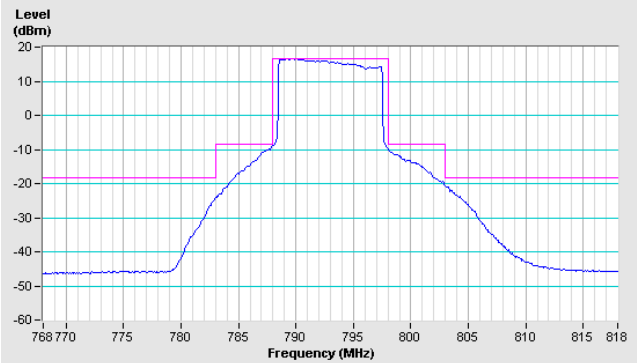
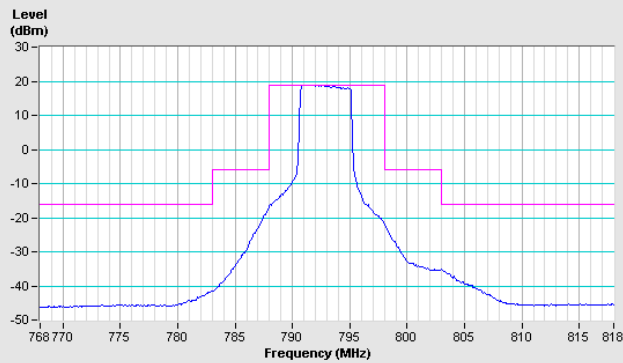
1RB Lower

1RB Upper



50% RB

100% RB

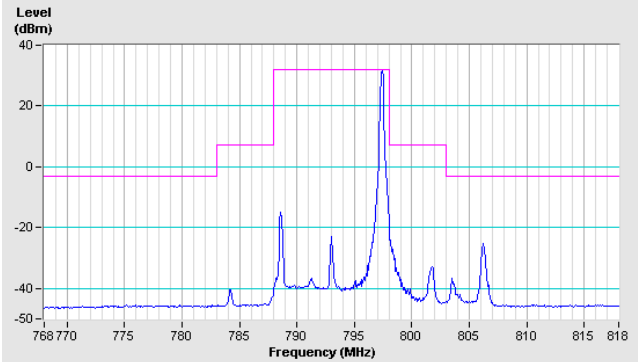
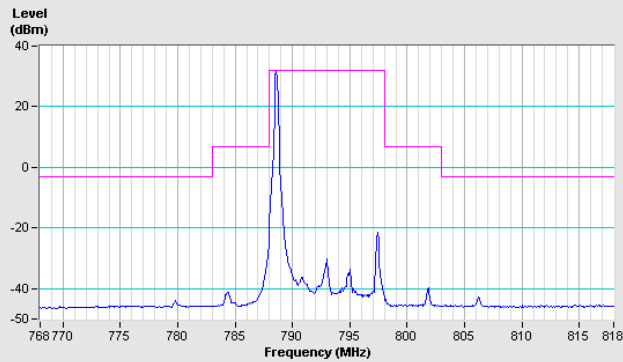


Channel: 23330 (Channel Bandwidth: 10MHz)

16QAM

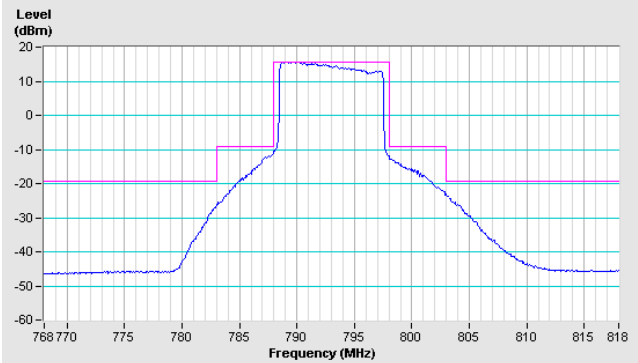
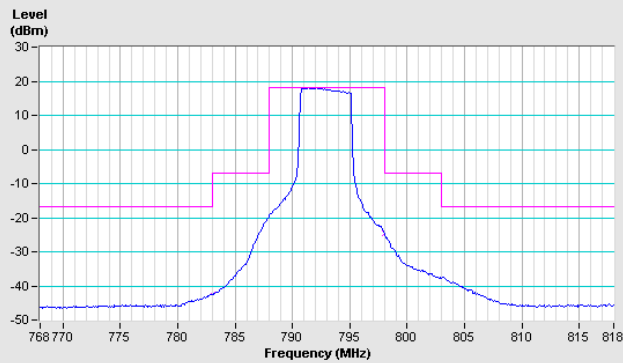
1RB Lower

1RB Upper



50% RB

100% RB

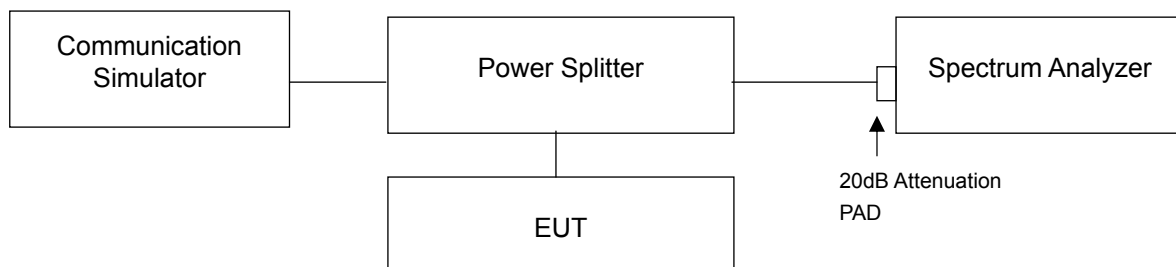


4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz 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.

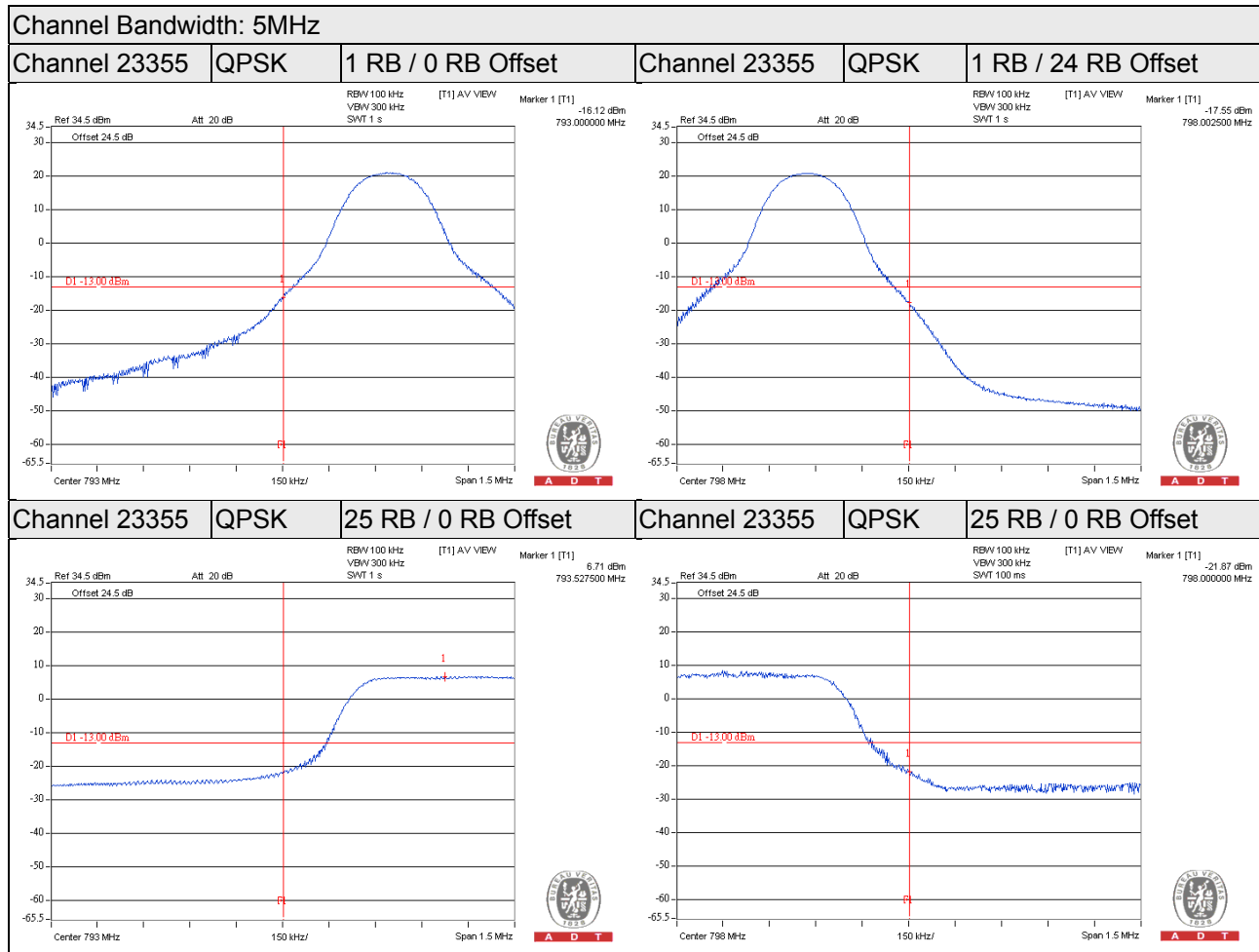
4.5.2 Test Setup



4.5.3 Test Procedures

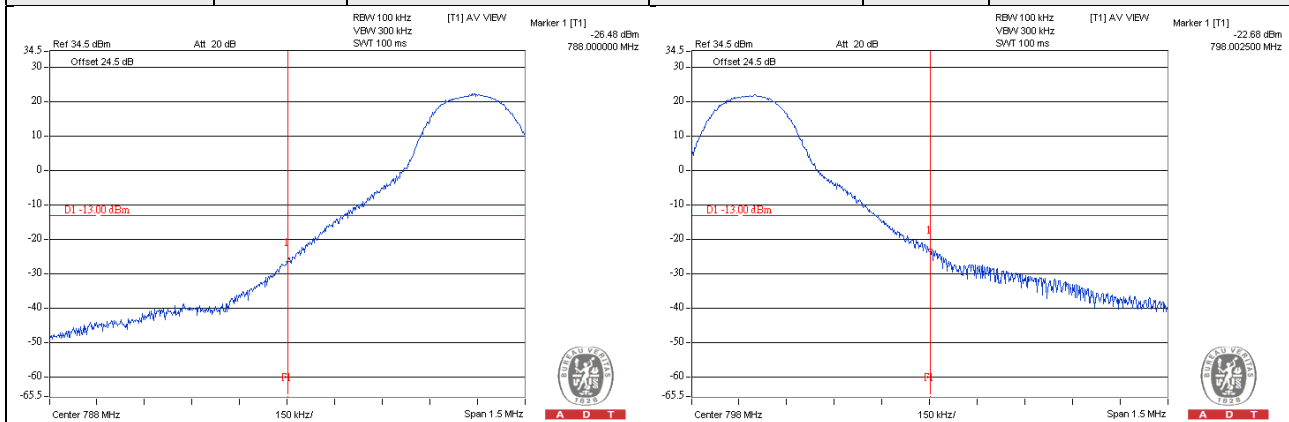
- All measurements were done at low and high operational frequency range.
- The band edge measurement used the power splitter via EUT RF power connector between signal generator and spectrum analyzer. This splitter loss, attenuator loss and cable loss are the worst loss 21 dB in the transmitted path track.
- The center frequency of spectrum is the band edge frequency and span is 1.5MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz.
- Record the max trace plot into the test report.

4.5.4 Test Results

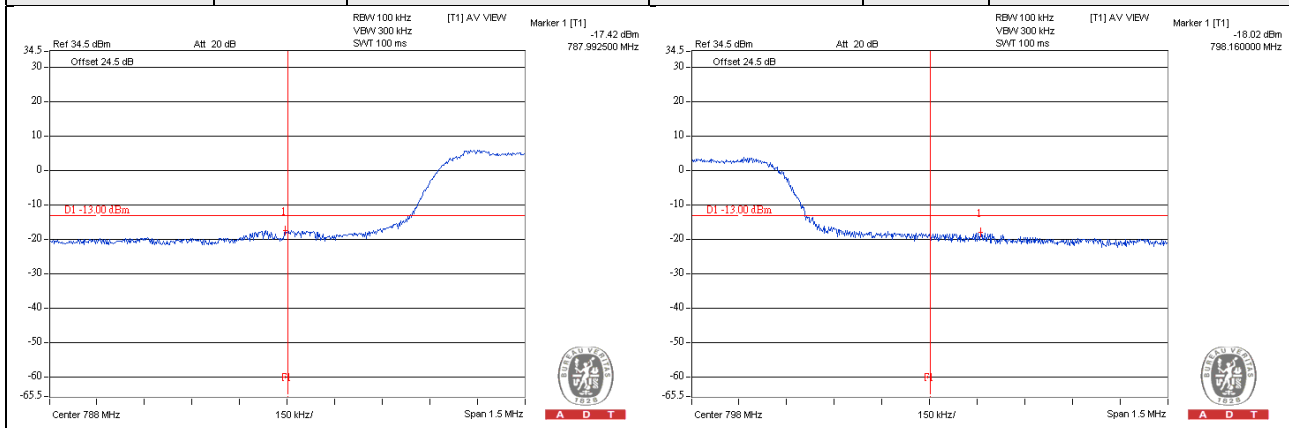


Channel Bandwidth: 10MHz

Channel 23330	QPSK	1 RB / 0 RB Offset	Channel 23330	QPSK	1 RB / 49 RB Offset
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Channel 23330	QPSK	50 RB / 0 RB Offset	Channel 23330	QPSK	50 RB / 0 RB Offset
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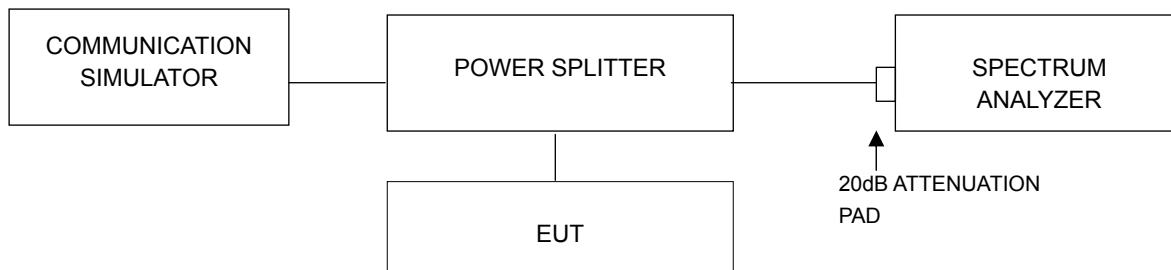


4.6 Peak to Average Ratio

4.6.1 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

4.6.2 Test Setup

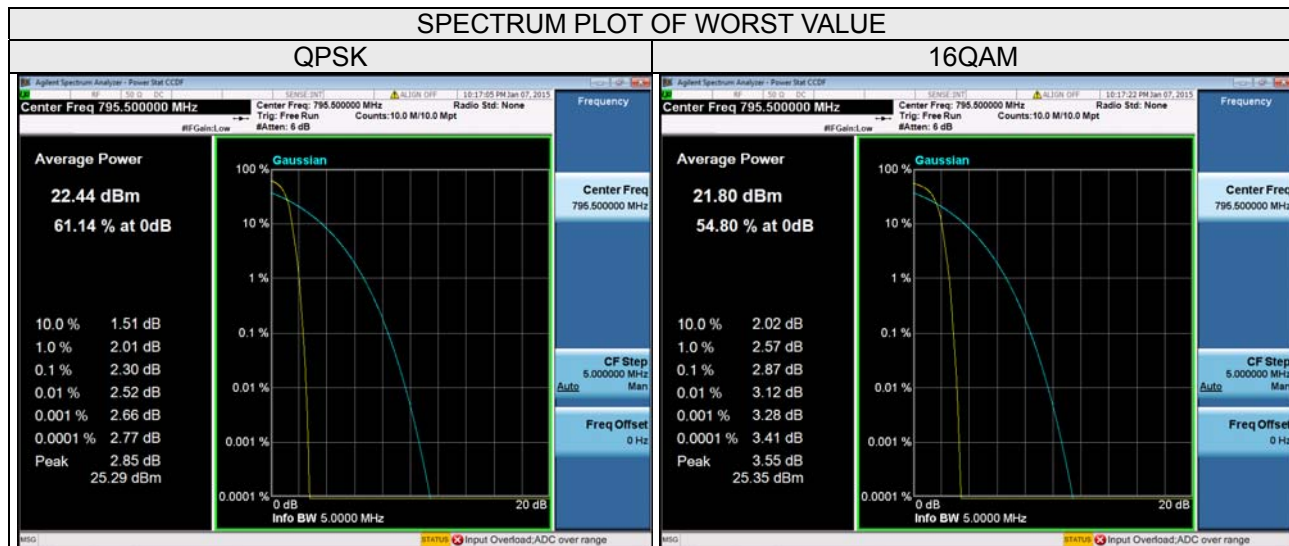


4.6.3 Test Procedures

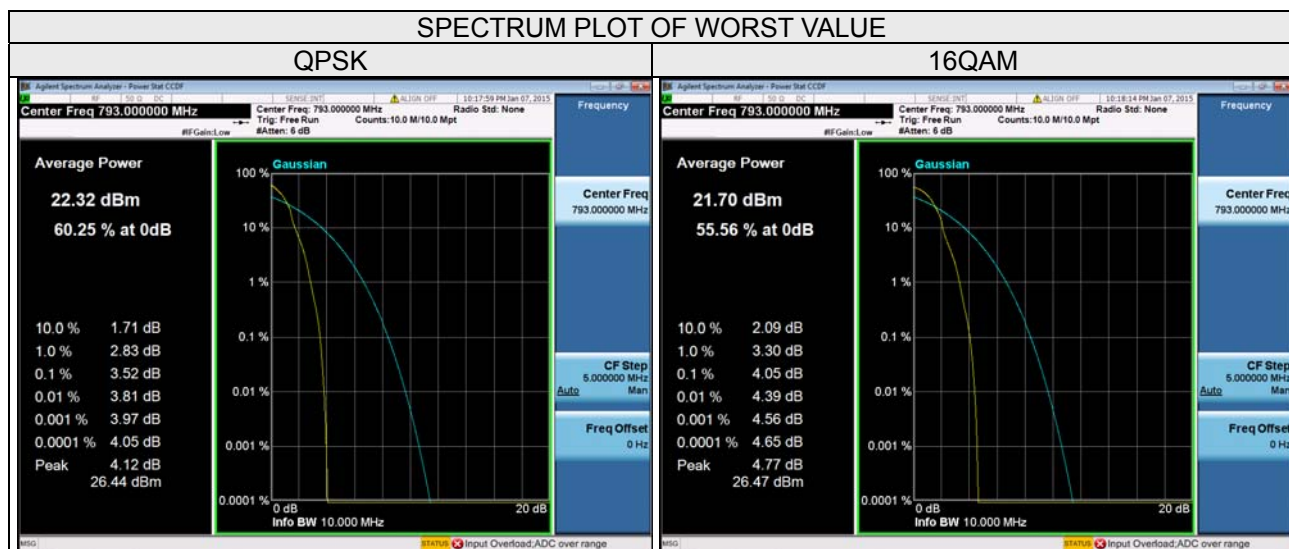
- Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
- Set the number of counts to a value that stabilizes the measured CCDF curve;
- Record the maximum PAPR level associated with a probability of 0.1%.

4.6.4 Test Results

Channel Bandwidth: 5MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
23355	795.5	2.30	2.87



Channel Bandwidth: 10MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
23330	793.0	3.52	4.05



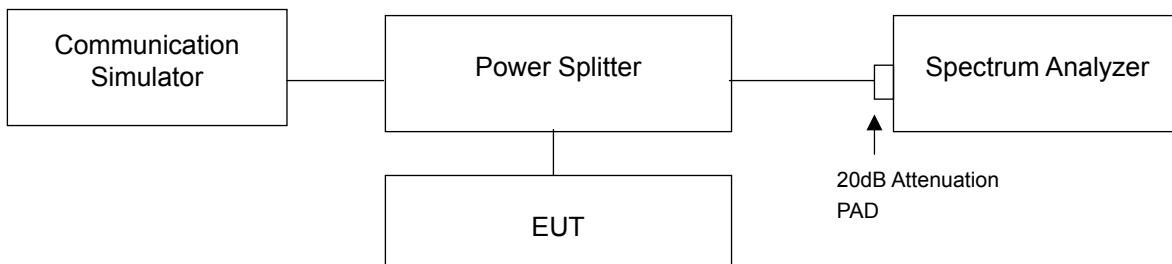
4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13dBm .

On all frequencies between 769 – 775 MHz and 799 – 805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.

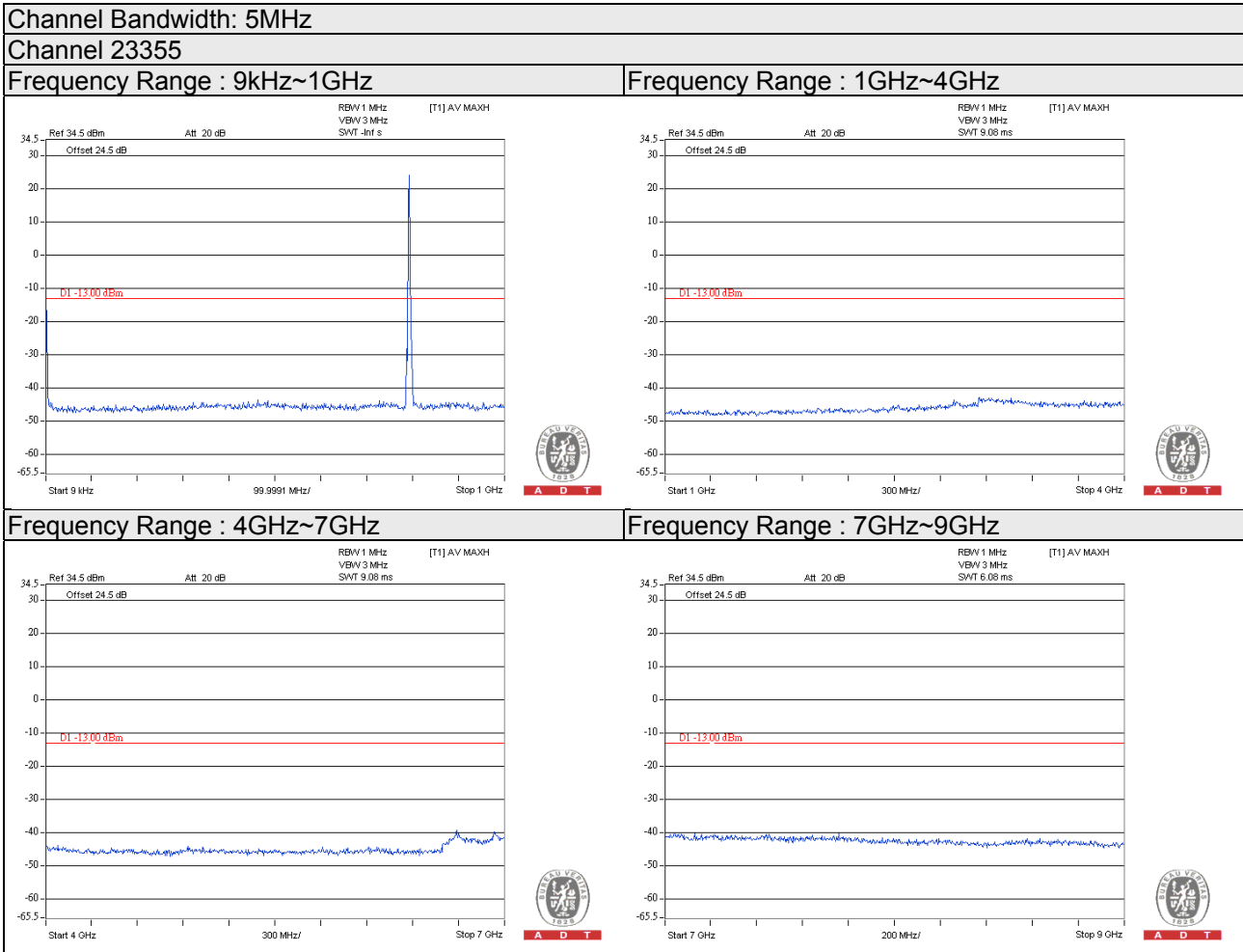
4.7.2 Test Setup



4.7.3 Test Procedure

- The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with Agilent Spectrum Analyzer.
- The conducted spurious emission used the power splitter via EUT RF power connector between signal generator and spectrum analyzer.
- When the spectrum scanned from 9kHz to 9GHz, it shall be connected to the band reject filter attenuated the carried frequency. The spectrum set RB=1MHz, VB=3MHz.

4.7.4 Test Results

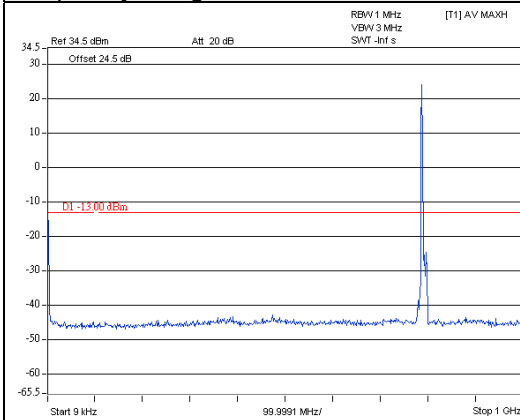


Channel Bandwidth: 10MHz

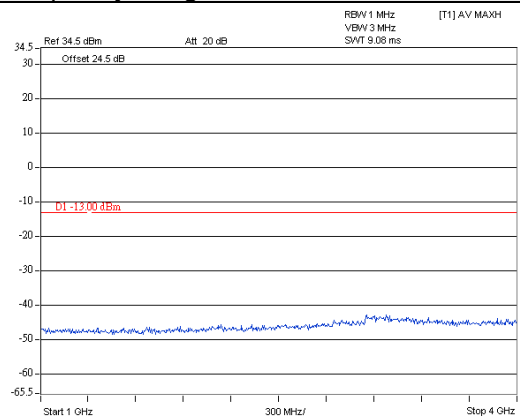
Channel 23330

Frequency Range : 9kHz~1GHz

Frequency Range : 1GHz~4GHz



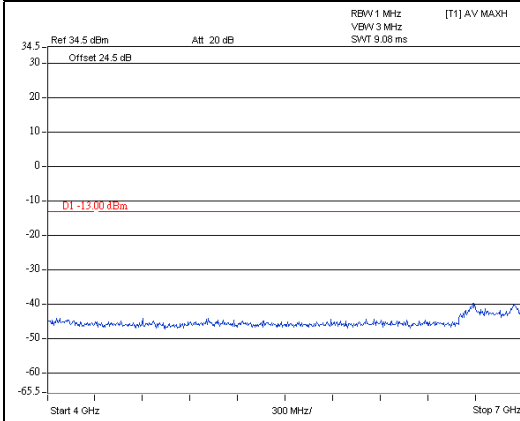
A D T



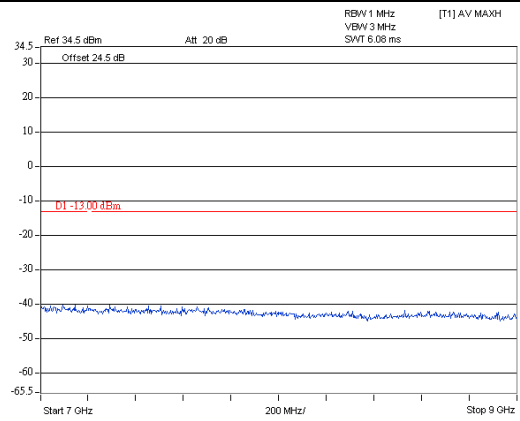
A D T

Frequency Range : 4GHz~7GHz

Frequency Range : 7GHz~9GHz



A D T



A D T

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

- (1) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13dBm
- (2) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

4.8.2 Test Procedure

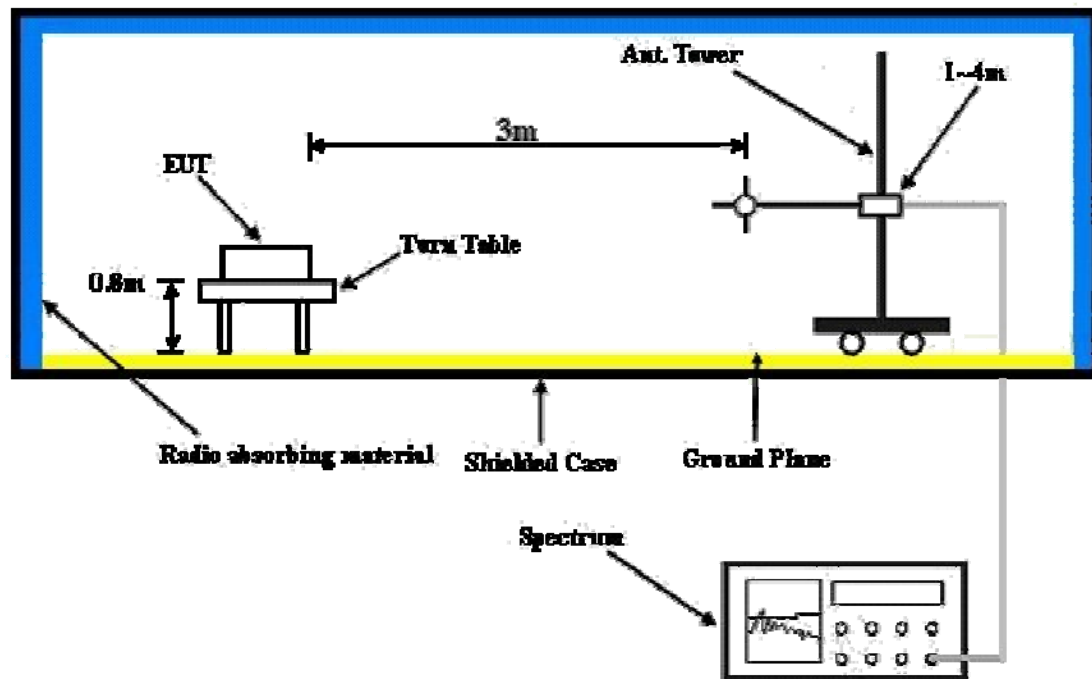
- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. 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 a. Record the power level of S.G
- c. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $\text{E.R.P power} = \text{E.I.R.P power} - 2.15\text{dBi}.$

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

4.8.3 Deviation from Test Standard

No deviation.

4.8.4 Test Setup



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

4.8.5 Test Results

Below 1GHz

Channel Bandwidth: 5MHz

Mode	TX channel 23355	Frequency Range	Below 1000 MHz
Environmental Conditions	24deg. C, 63%RH	Input Power	120Vac, 60Hz
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	70.75	-56.14	-59.16	-4.75	-63.91	-13.00	-50.91
2	181.83	-48.67	-59.23	3.15	-56.08	-13.00	-43.08
3	321.00	-54.22	-64.75	5.15	-59.60	-13.00	-46.60
4	377.23	-56.60	-64.39	5.24	-59.15	-13.00	-46.15
5	441.90	-56.91	-63.44	5.12	-58.32	-13.00	-45.32
6	937.71	-65.98	-63.20	3.92	-59.28	-13.00	-46.28
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	77.80	-52.20	-56.85	-2.38	-59.23	-13.00	-46.23
2	138.43	-57.03	-60.36	-0.29	-60.65	-13.00	-47.65
3	253.52	-53.38	-63.02	5.38	-57.64	-13.00	-44.64
4	612.20	-58.93	-60.10	4.52	-55.58	-13.00	-42.58
5	801.71	-65.06	-62.04	4.02	-58.02	-13.00	-45.02
6	938.23	-71.10	-65.19	3.92	-61.27	-13.00	-48.27

Remarks:

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



A D T

Channel Bandwidth: 10MHz

Mode	TX channel 23330	Frequency Range	Below 1000 MHz
Environmental Conditions	24deg. C, 63%RH	Input Power	120Vac, 60Hz
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	39.70	-59.90	-48.83	-10.93	-59.76	-13.00	-46.76
2	187.14	-46.19	-60.79	3.84	-56.95	-13.00	-43.95
3	307.42	-55.93	-67.96	5.15	-62.81	-13.00	-49.81
4	375.32	-60.18	-69.29	5.23	-64.06	-13.00	-51.06
5	800.18	-66.61	-67.49	4.02	-63.47	-13.00	-50.47
6	980.60	-68.61	-66.90	3.93	-62.97	-13.00	-49.97
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	39.70	-45.15	-44.36	-10.93	-55.29	-13.00	-42.29
2	159.98	-55.66	-58.75	0.39	-58.36	-13.00	-45.36
3	266.68	-57.48	-61.94	5.31	-56.63	-13.00	-43.63
4	404.42	-61.79	-70.18	5.26	-64.92	-13.00	-51.92
5	629.46	-67.47	-69.38	4.66	-64.72	-13.00	-51.72
6	937.92	-64.57	-61.84	3.92	-57.92	-13.00	-44.92

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

Channel Bandwidth: 5MHz

Mode	TX channel 23355	Frequency Range	Above 1000MHz
Environmental Conditions	24deg. C, 63%RH	Input Power	120Vac, 60Hz
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	1588.50	-56.74	-60.24	5.34	-54.90	-13.00	-41.90
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	1588.50	-57.13	-58.88	5.34	-53.54	-13.00	-40.54

Remarks:

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



Channel Bandwidth: 10MHz

Mode	TX channel 23330	Frequency Range	Above 1000MHz
Environmental Conditions	24deg. C, 63%RH	Input Power	120Vac, 60Hz
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	1586.00	-56.41	-59.87	5.33	-54.54	-13.00	-41.54
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	1586.00	-57.01	-58.76	5.33	-53.43	-13.00	-40.43

Remarks:

1. Output Power (dBm) = S.G 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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Email: service.adt@tw.bureauveritas.com

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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