

FCC Test Report (Part 22: CA mode)

Report No.: RF200605C24-16

FCC ID: V65E7110

Test Model: E7110

Received Date: Jun. 29, 2020

Test Date: Nov. 02 ~ Nov. 12, 2020

Issued Date: Nov. 19, 2020

Applicant: Kyocera Corporation % Kyocera International, Inc.

Address: 8611 Balboa Avenue, San Diego, CA 92123

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

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, Taiwan

FCC Registration / 788550 / TW0003

Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RF200605C24-16	Original release	Nov. 19, 2020

1 Certificate of Conformity

Product: Smart Phone

Brand: Kyocera

Test Model: E7110

Sample Status: Identical Prototype

Applicant: Kyocera Corporation % Kyocera International, Inc.

Test Date: Nov. 02 ~ Nov. 12, 2020

Standards: FCC Part 22, Subpart H

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

Prepared by : Pettie Chen , **Date:** Nov. 19, 2020
Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Nov. 19, 2020
Bruce Chen / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 22.913 (a)	Effective radiated power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Refer to Note 2
22.913 (d)	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
22.917	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -28.8dB at 89.04MHz.

Note:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- LTE CA mode is similar to digital modulation in LTE single frequency band, so please refer to BV CPS report no.: RF200605C24-6 R1 for the modulation characteristics data of CA mode

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.63 dB
	200MHz ~ 1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Dec. 31, 2019	Dec. 30, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 16, 2020	Sep. 15, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 11, 2019 Nov. 03, 2020	Nov. 10, 2020 Nov. 02, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Jun. 08, 2020	Jun. 07, 2021
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jun. 08, 2020	Jun. 07, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH4-01	Aug. 16, 2020	Aug. 15, 2021
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Aug. 16, 2020	Aug. 15, 2021
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Jun. 08, 2020	Jun. 07, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Standard Temperature And Humidity Chamber GIANT FORCE	GTH-120-40-CP-AR	MAA1306-019	Sep. 09, 2020	Sep. 08, 2021
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 06, 2020	Jun. 05, 2021
DC power supply	U8002A	MY56330015	NA	NA
Radio Communication Analyzer Anritsu	MT8821C	6201462755	Feb. 13, 2020	Feb. 12, 2021

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 General Information

3.1 General Description of EUT

Product	Smart Phone			
Brand	Kyocera			
Test Model	E7110			
Sample Status	Identical Prototype			
Power Supply Rating	3.85 Vdc (Battery) 5 Vdc / 9 Vdc / 12 Vdc (Adapter)			
Modulation Type	LTE: QPSK, 16QAM, 64QAM			
Operating Frequency	LTE Band 5 (CA 5B)	829.0~844.0MHz		
Max. ERP Power	LTE Band 5 (CA 5B) (10MHz+10MHz)	QPSK	16QAM	64QAM
		177.828mW (22.5dBm)	141.254mW (21.5dBm)	123.027mW (20.9dBm)
Emission Designator	LTE Band 5 (CA 5B) (10MHz+10MHz)	18M8G7D	18M7D7W	18M8D7W
Antenna Type	Monopole Antenna with -3.0 dBi gain			
Accessory Device	Refer to Note as below			
Data Cable Supplied	Refer to Note as below			

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	Kyocera	SCP-53ADT	I/P: 100-240 Vac, 50/60 Hz, 0.6 A O/P: 5 Vdc, 3 A; 9 Vdc, 3 A; 15 Vdc, 1.8 A; 20 Vdc, 1.35 A
USB Cable	Kyocera	SCP-27SDC	1.0m

2. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

4. For CA mode configuration, please consult the manufacturer to declare the test mode.

5. E-UTRA CA configuration / Bandwidth combination set.

E-UTRA CA configuration / Bandwidth combination set					
E-UTRA CA configuration	Uplink CA configurations	Component carriers in order of increasing carrier frequency		Maximum aggregated bandwidth [MHz]	Bandwidth combination set
		Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]		
CA_5B	CA_5B	5, 10	10	20	0
		10	5		

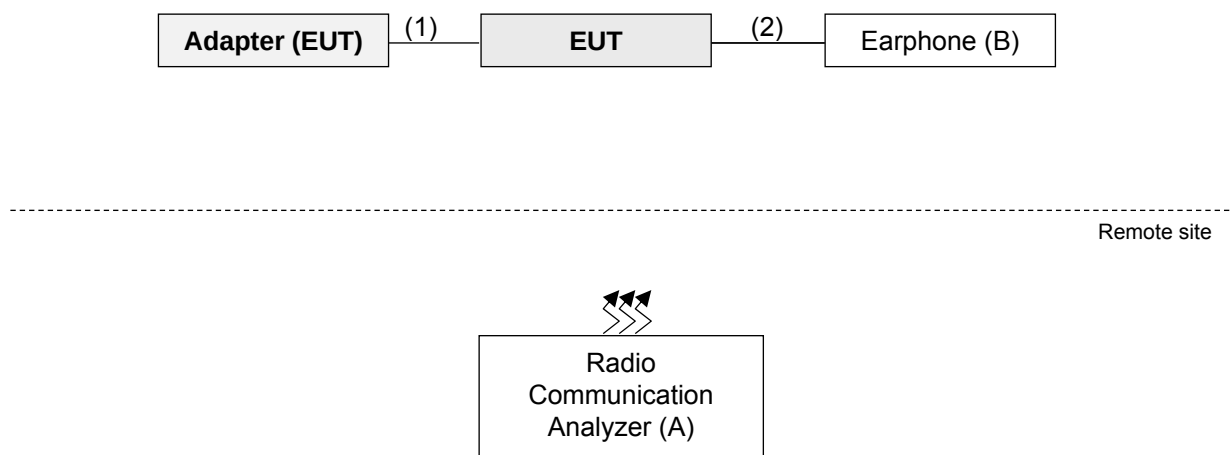
*5B is continuous CA and maximum combination is 10M+10M.

6. The EUT support the following CA Configuration.

Band Configuration
2A-5A
4A-5A
5A-66A
5B
48C
66B
66C

7. LTE CA mode is similar to digital modulation in LTE single frequency band, so please refer to BV CPS report no.: RF200605C24-6, RF200605C24-7 & RF200605C24-8 for the test data of inter Band CA mode.

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.	Radio Communication Analyzer	Anritsu	MT8821C	6261806803	NA	-
B.	Earphone	APPLE	A1748	NA	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.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB cable	1	1.0	Y	0	Accessory
2.	Audio cable	1	1.15	N	0	-

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.

LTE Band 5 (CA 5B)

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	ERP	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset 1 RB / 49 RB Offset
		20428 to 20528 20500 to 20600	20428 (826.8MHz)+ 20500 (834.0MHz), 20478 (831.8MHz)+ 20550 (839.0MHz), 20528 (836.8MHz)+ 20600 (844.0MHz)	5MHz + 10MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset 1 RB / 49 RB Offset 1 RB / 24 RB Offset
		20450 to 20550 20522 to 20622	20450 (829.0MHz)+ 20522 (836.2MHz), 20500 (834.0MHz)+ 20572 (841.2MHz), 20550 (839.0MHz)+ 20622 (846.2MHz)	10MHz + 5MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset 1 RB / 49 RB Offset 1 RB / 24 RB Offset
-	Frequency Stability	20450 to 20501 20549 to 20600	20476(831.6MHz)+ 20575(841.5MHz)	10MHz + 10MHz	QPSK	50 RB / 0 RB offset
-	Occupied Bandwidth	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK / 16QAM / 64QAM	100 RB / 0 RB offset
		20428 to 20528 20500 to 20600	20428 (826.8MHz)+ 20500 (834.0MHz), 20478 (831.8MHz)+ 20550 (839.0MHz), 20528 (836.8MHz)+ 20600 (844.0MHz)	5MHz + 10MHz	QPSK / 16QAM / 64QAM	75 RB / 0 RB offset
		20450 to 20550 20522 to 20622	20450 (829.0MHz)+ 20522 (836.2MHz), 20500 (834.0MHz)+ 20572 (841.2MHz), 20550 (839.0MHz)+ 20622 (846.2MHz)	10MHz + 5MHz	QPSK / 16QAM / 64QAM	75 RB / 0 RB offset
-	Band Edge	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK	1 RB / 49 RB Offset 1 RB / 0 RB Offset 50 RB / 0 RB offset
-	Peak to Average Ratio	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK	1 RB / 49 RB Offset 1 RB / 0 RB Offset
-	Conducted Emission	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK	1 RB / 49 RB Offset 1 RB / 0 RB Offset

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission Below 1GHz	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz)	10MHz + 10MHz	QPSK	1 RB / 49 RB Offset 1 RB / 0 RB Offset
-	Radiated Emission Above 1GHz	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK	1 RB / 49 RB Offset 1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For radiated emission below 1 GHz, choose the maximum ERP power worst mode for final test.
3. LTE CA mode is similar to digital modulation in LTE single frequency band, so please refer to BV CPS report no.: RF200605C24-6 for the modulation characteristics data of CA mode.

Test Condition:

Test Item	Environmental Conditions	Input Power (system)	Tested By
ERP	25deg. C, 70%RH	120Vac, 60Hz	Getaz Yang
Frequency Stability	25deg. C, 70%RH	120Vac, 60Hz	Getaz Yang
Occupied Bandwidth	25deg. C, 70%RH	120Vac, 60Hz	Getaz Yang
Band Edge	25deg. C, 70%RH	120Vac, 60Hz	Getaz Yang
Peak To Average Ratio	25deg. C, 70%RH	120Vac, 60Hz	Getaz Yang
Conducted Emission	25deg. C, 70%RH	120Vac, 60Hz	Getaz Yang
Radiated Emission	23deg. C, 67%RH	120Vac, 60Hz	Adair Peng

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 and References

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

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 22

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

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

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 7 watts e.r.p.

4.1.2 Test Procedures

Maximum ERP

- a. All measurements were done at low, middle and high operational frequency range. RBW is 15 MHz, 20MHz for LTE mode, VBW $\geq 3 \times$ RBW.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) 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 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. E.R.P power can be calculated from E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$. Correction Factor (includes EIRP and ERP unit conversion factor) = Antenna gain of substitution horn. – Tx cable loss. Measurement method refers to ANSI C63.26 section 5.2.7 & 5.5.3.2.

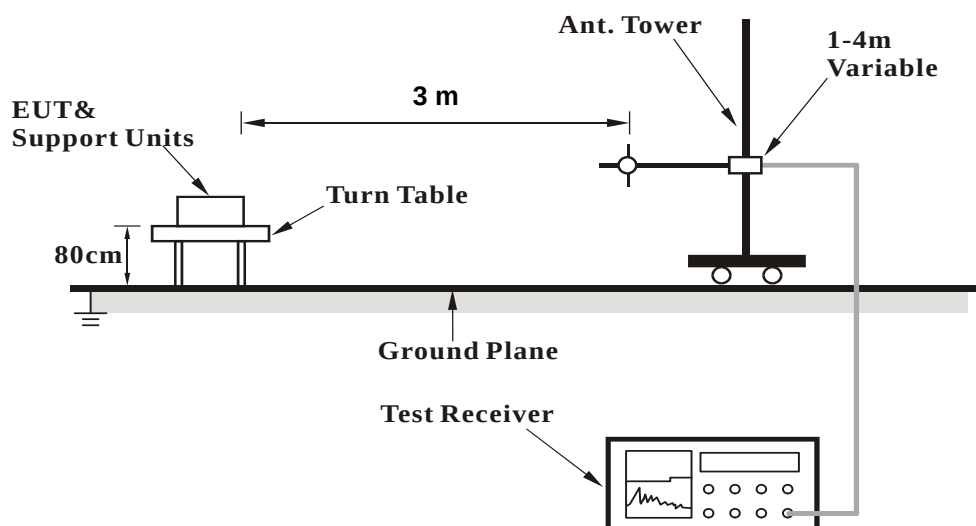
Conducted Power Measurement:

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.

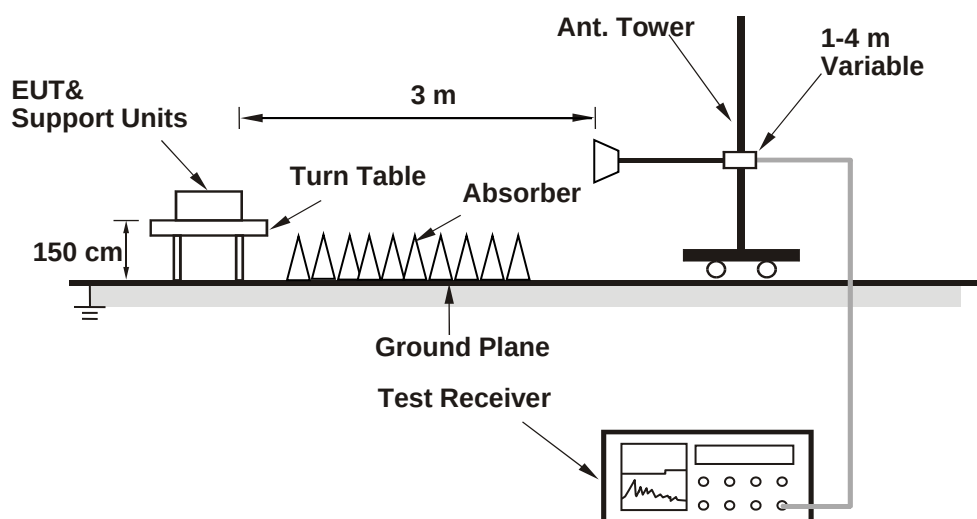
4.1.3 Test Setup

ERP Measurement:

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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)

LTE Band 5 (CA 5B)

Con- figure	Com- bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu- lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu- lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Tx Power with UL-CA Active (dBm)
		Total														
Intra Band Conti- guous	CA_5B	5	10	QPSK	1	0	20450	829	5	10	QPSK	1	49	20549	838.9	14.42
					1	49						1	0			24.76
		5	10	QPSK	1	0	20476	831.6	5	10	QPSK	1	49	20575	841.5	14.38
					1	49						1	0			24.59
		5	10	QPSK	1	0	20501	834.1	5	10	QPSK	1	49	20600	844.0	14.49
					1	49						1	0			24.75
Intra Band Conti- guous	CA_5B	5	10	QPSK	1	0	20450	829	5	5	QPSK	1	24	20522	836.2	13.29
					1	49						1	0			23.86
		5	10	QPSK	1	0	20500	834	5	5	QPSK	1	24	20572	841.2	13.50
					1	49						1	0			24.06
		5	10	QPSK	1	0	20550	839	5	5	QPSK	1	24	20622	846.2	13.49
					1	49						1	0			23.98
Intra Band Conti- guous	CA_5B	5	5	QPSK	1	0	20428	826.8	5	10	QPSK	1	49	20500	834	12.92
					1	24						1	0			23.71
		5	5	QPSK	1	0	20478	831.8	5	10	QPSK	1	49	20550	839	13.32
					1	24						1	0			24.02
		5	5	QPSK	1	0	20528	836.8	5	10	QPSK	1	49	20600	844	13.33
					1	24						1	0			24.00

Con- figure	Com- bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu- lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu- lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Tx Power with UL-CA Active (dBm)
		Total														
Intra Band Conti- guous	CA_5B	5	10	16QAM	1	0	20450	829	5	10	16QAM	1	49	20549	838.9	13.50
					1	49						1	0			24.27
		5	10	16QAM	1	0	20476	831.6	5	10	16QAM	1	49	20575	841.5	14.54
					1	49						1	0			24.01
		5	10	16QAM	1	0	20501	834.1	5	10	16QAM	1	49	20600	844	14.40
					1	49						1	0			24.07
Intra Band Conti- guous	CA_5B	5	10	16QAM	1	0	20450	829	5	5	16QAM	1	24	20522	836.2	13.31
					1	49						1	0			23.17
		5	10	16QAM	1	0	20500	834	5	5	16QAM	1	24	20572	841.2	13.55
					1	49						1	0			23.99
		5	10	16QAM	1	0	20550	839	5	5	16QAM	1	24	20622	846.2	13.41
					1	49						1	0			23.48
Intra Band Conti- guous	CA_5B	5	5	16QAM	1	0	20428	826.8	5	10	16QAM	1	49	20500	834	13.06
					1	24						1	0			23.49
		5	5	16QAM	1	0	20478	831.8	5	10	16QAM	1	49	20550	839	13.39
					1	24						1	0			23.42
		5	5	16QAM	1	0	20528	836.8	5	10	16QAM	1	49	20600	844	13.51
					1	24						1	0			23.70

Con- figure	Com- bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu- lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu- lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Tx Power with UL-CA Active (dBm)
																Total
Intra Band Conti- guous	CA_5B	5	10	64QAM	1	0	20450	829	5	10	64QAM	1	49	20549	838.9	12.48
					1	49						1	0			23.60
		5	10	64QAM	1	0	20476	831.6	5	10	64QAM	1	49	20575	841.5	13.71
					1	49						1	0			23.20
		5	10	64QAM	1	0	20501	834.1	5	10	64QAM	1	49	20600	844	13.51
					1	49						1	0			23.18
Intra Band Conti- guous	CA_5B	5	10	64QAM	1	0	20450	829	5	5	64QAM	1	24	20522	836.2	12.20
					1	49						1	0			22.00
		5	10	64QAM	1	0	20500	834	5	5	64QAM	1	24	20572	841.2	13.25
					1	49						1	0			23.12
		5	10	64QAM	1	0	20550	839	5	5	64QAM	1	24	20622	846.2	12.61
					1	49						1	0			22.43
Intra Band Conti- guous	CA_5B	5	5	64QAM	1	0	20428	826.8	5	10	64QAM	1	49	20500	834	12.20
					1	24						1	0			22.60
		5	5	64QAM	1	0	20478	831.8	5	10	64QAM	1	49	20550	839	12.55
					1	24						1	0			22.48
		5	5	64QAM	1	0	20528	836.8	5	10	64QAM	1	49	20600	844	12.54
					1	24						1	0			22.81

ERP Power (dBm)

LTE Band 5 (CA 5B)

Modulation Type: QPSK

LTE Band 5, Channel Bandwidth: 10MHz+10MHz

Mode		TX Channel 20450(829.0MHz)+20549(838.9MHz), TX Channel 20476(831.6MHz)+20575(841.5MHz), TX Channel 20501(834.1MHz)+20600(844.0MHz)					
Antenna Polarity & Test Distance : Horizontal at 3 m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	833.95	-10.00	22.30	0.20	22.50	38.50	-16.00
2	836.55	-10.20	22.10	0.20	22.30	38.50	-16.20
3	839.05	-10.30	21.90	0.30	22.20	38.50	-16.30
Antenna Polarity & Test Distance : Vertical at 3m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	833.95	-17.40	15.60	0.20	15.80	38.50	-22.70
2	836.55	-17.40	15.80	0.20	16.00	38.50	-22.50
3	839.05	-17.40	15.50	0.30	15.80	38.50	-22.70

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

Modulation Type: 16QAM

LTE Band 5, Channel Bandwidth: 10MHz+10MHz

Mode		TX Channel 20450(829.0MHz)+20549(838.9MHz), TX Channel 20476(831.6MHz)+20575(841.5MHz), TX Channel 20501(834.1MHz)+20600(844.0MHz)					
Antenna Polarity & Test Distance : Horizontal at 3 m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	833.95	-11.00	21.30	0.20	21.50	38.50	-17.00
2	836.55	-11.20	21.10	0.20	21.30	38.50	-17.20
3	839.05	-11.30	20.90	0.30	21.20	38.50	-17.30
Antenna Polarity & Test Distance : Vertical at 3m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	833.95	-18.40	14.60	0.20	14.80	38.50	-23.70
2	836.55	-18.40	14.80	0.20	15.00	38.50	-23.50
3	839.05	-18.20	14.70	0.30	15.00	38.50	-23.50

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

Modulation Type: 64QAM

LTE Band 5, Channel Bandwidth: 10MHz+10MHz

Mode		TX Channel 20450(829.0MHz)+20549(838.9MHz), TX Channel 20476(831.6MHz)+20575(841.5MHz), TX Channel 20501(834.1MHz)+20600(844.0MHz)					
Antenna Polarity & Test Distance : Horizontal at 3 m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	833.95	-11.60	20.70	0.20	20.90	38.50	-17.60
2	836.55	-11.70	20.60	0.20	20.80	38.50	-17.70
3	839.05	-11.80	20.40	0.30	20.70	38.50	-17.80
Antenna Polarity & Test Distance : Vertical at 3m							
No	Frequency (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	833.95	-18.90	14.10	0.20	14.30	38.50	-24.20
2	836.55	-18.90	14.30	0.20	14.50	38.50	-24.00
3	839.05	-18.90	14.10	0.30	14.40	38.50	-24.10

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

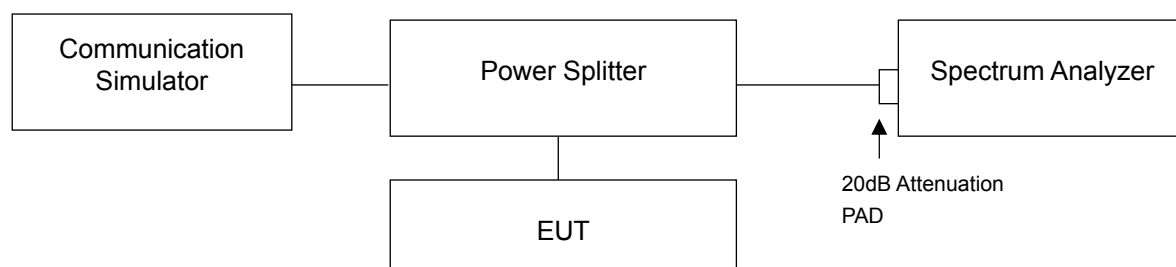
4.2 Occupied Bandwidth Measurement

4.2.1 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. Refer to ANSI C63.26 section 5.4.4. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

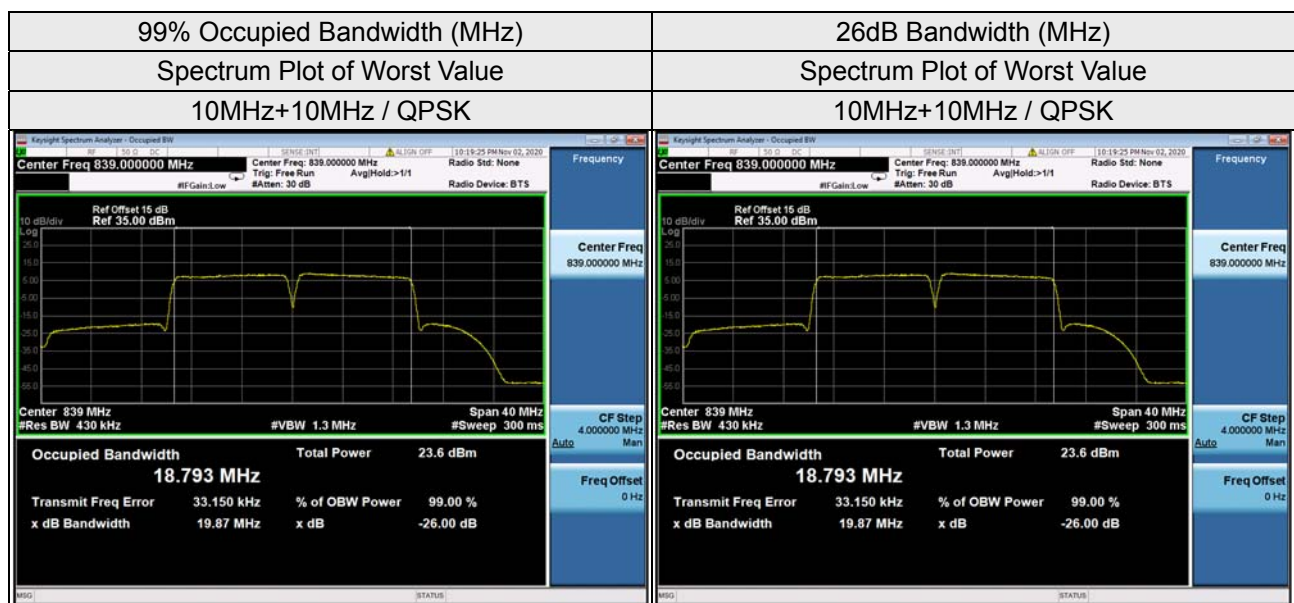
4.2.2 Test Setup



4.2.3 Test Result

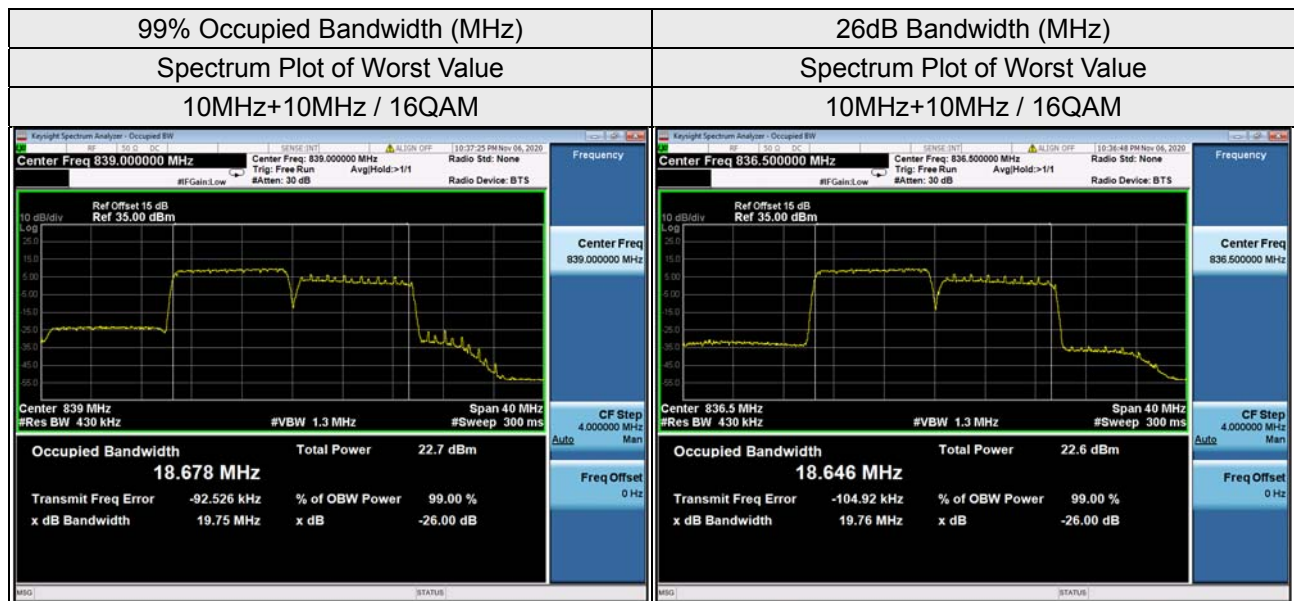
LTE Band 5 (CA 5B)

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		QPSK_Full RB	QPSK_Full RB
20450+20549	829.0+838.9	18.77	19.87
20476+20575	831.6+841.5	18.76	19.86
20501+20600	834.1+844.0	18.79	19.87



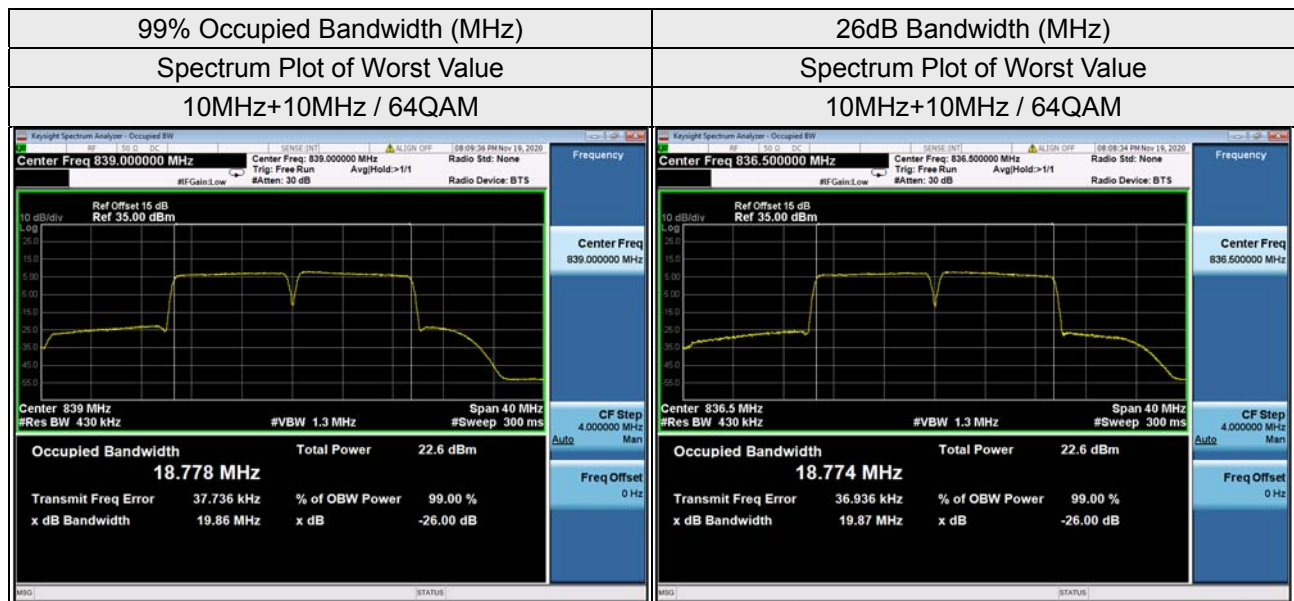
LTE Band 5 (CA 5B)

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		16QAM_Full RB	16QAM_Full RB
20450+20549	829.0+838.9	18.65	19.74
20476+20575	831.6+841.5	18.65	19.76
20501+20600	834.1+844.0	18.68	19.75



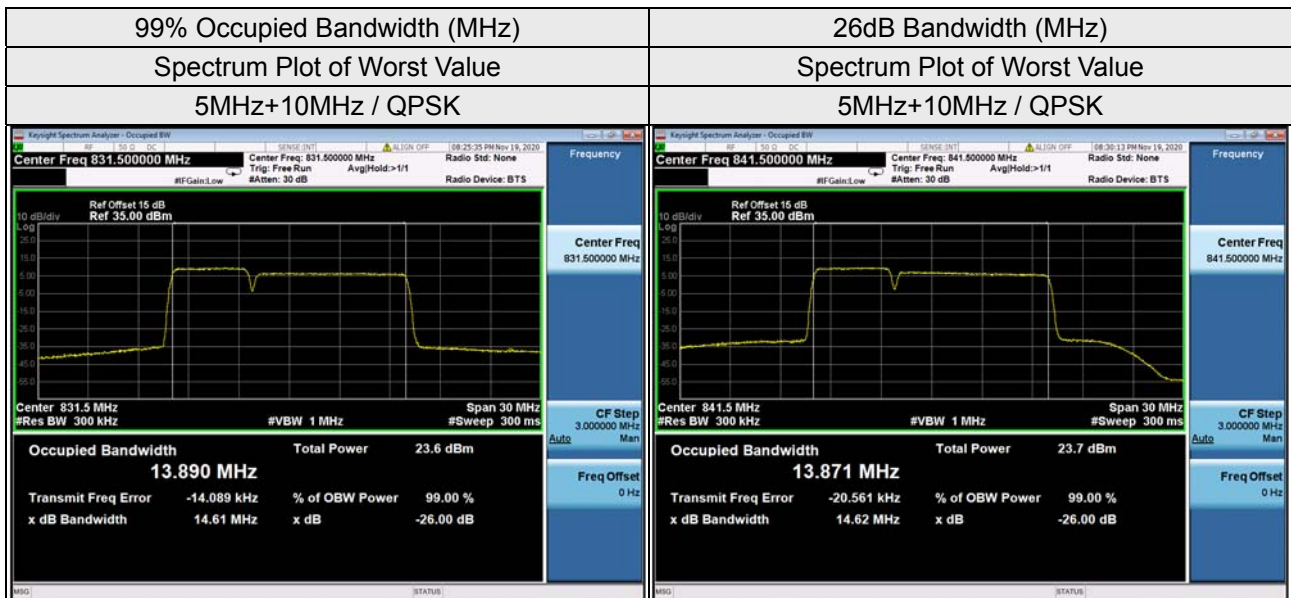
LTE Band 5 (CA 5B)

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		64QAM_Full RB	64QAM_Full RB
20450+20549	829.0+838.9	18.77	19.84
20476+20575	831.6+841.5	18.77	19.87
20501+20600	834.1+844.0	18.78	19.86



LTE Band 5 (CA 5B), Channel Bandwidth 5MHz+10MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		QPSK_Full RB	QPSK_Full RB
20428+20500	826.8+834.0	13.89	14.61
20478+20550	831.8+839.0	13.87	14.60
20528+20600	836.8+844.0	13.87	14.62



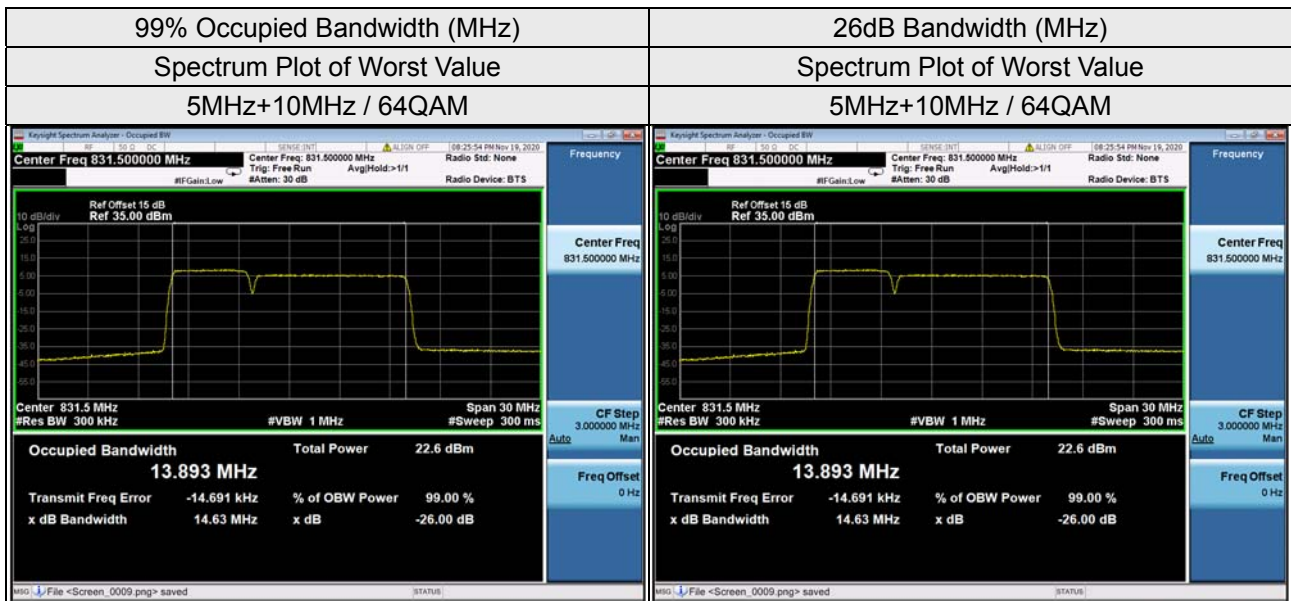
LTE Band 5 (CA 5B), Channel Bandwidth 5MHz+10MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		16QAM_Full RB	16QAM_Full RB
20428+20500	826.8+834.0	13.89	14.62
20478+20550	831.8+839.0	13.86	14.61
20528+20600	836.8+844.0	13.87	14.63



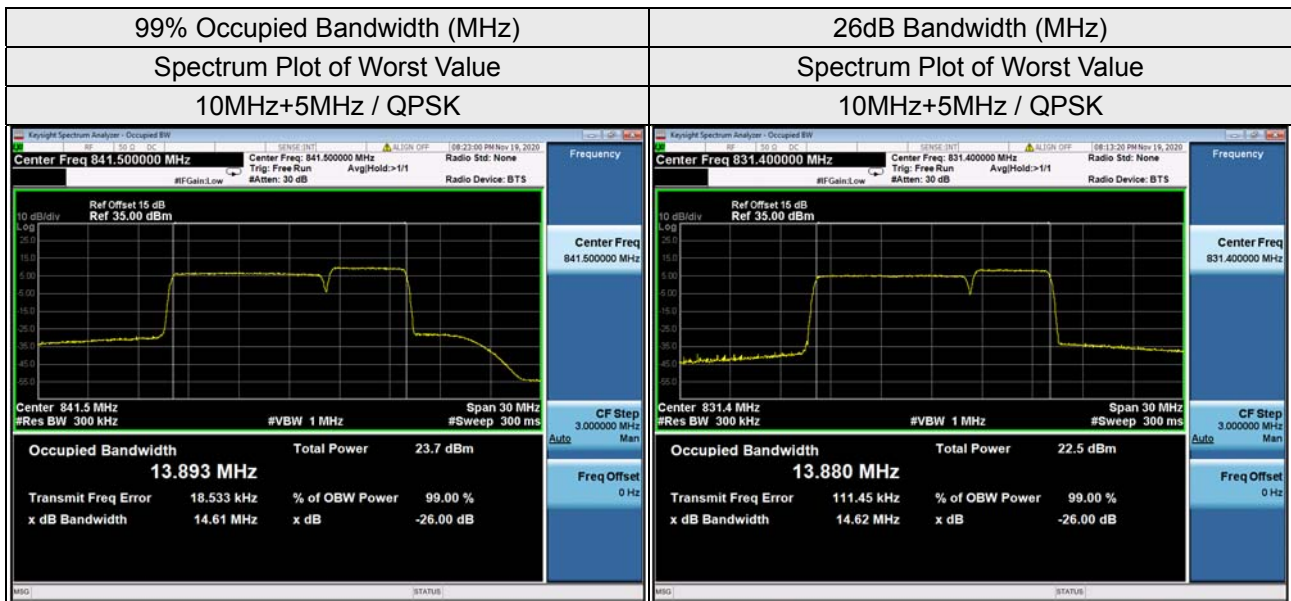
LTE Band 5 (CA 5B), Channel Bandwidth 5MHz+10MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		64QAM_Full RB	64QAM_Full RB
20428+20500	826.8+834.0	13.89	14.63
20478+20550	831.8+839.0	13.87	14.62
20528+20600	836.8+844.0	13.87	14.62



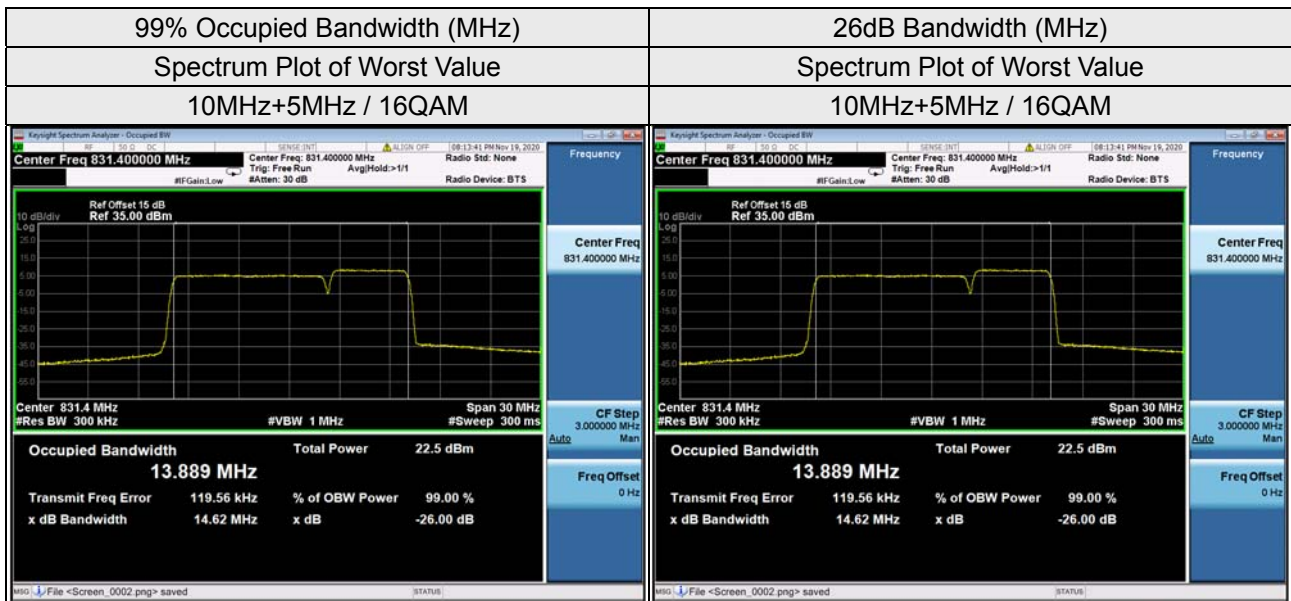
LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+5MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		QPSK_Full RB	QPSK_Full RB
20450+20522	829.0+836.2	13.88	14.62
20500+20572	834.0+841.2	13.86	14.62
20550+20622	839.0+846.2	13.89	14.61



LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+5MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		16QAM_Full RB	16QAM_Full RB
20450+20522	829.0+836.2	13.89	14.62
20500+20572	834.0+841.2	13.88	14.61
20550+20622	839.0+846.2	13.89	14.62



LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+5MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		64QAM_Full RB	64QAM_Full RB
20450+20522	829.0+836.2	13.89	14.62
20500+20572	834.0+841.2	13.87	14.61
20550+20622	839.0+846.2	13.90	14.63



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

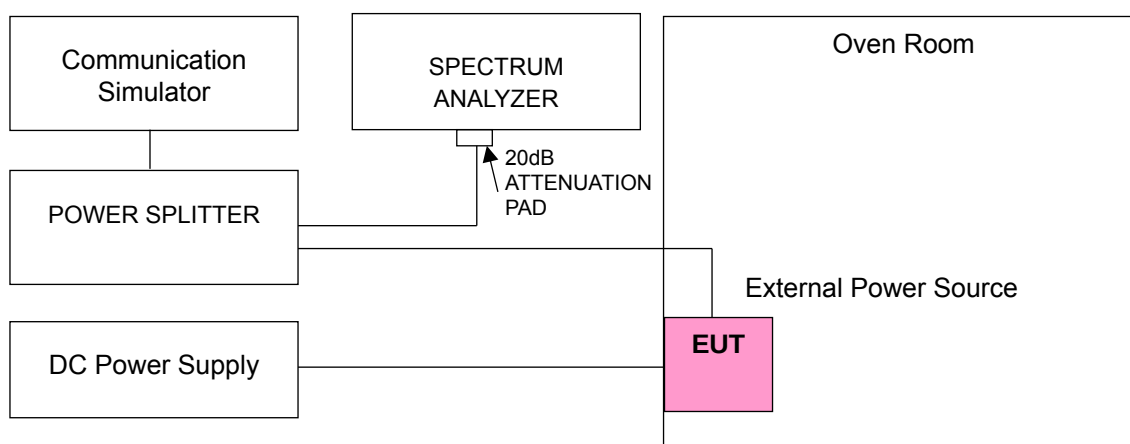
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.3.2 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 $\pm 0.5^{\circ}\text{C}$ 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.

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	831.600003	0.004	841.500004	0.004
3.45	831.600001	0.001	841.500003	0.003
4.23	831.600004	0.004	841.500004	0.005

Note: The applicant defined the normal working voltage is from 3.45Vdc to 4.23Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-20	831.600003	0.004	841.500002	0.002
-10	831.600001	0.001	841.500003	0.004
0	831.600002	0.002	841.500001	0.001
10	831.599998	-0.002	841.499997	-0.003
20	831.599998	-0.003	841.499998	-0.003
30	831.599998	-0.003	841.499997	-0.003
40	831.599997	-0.004	841.499997	-0.003
50	831.599997	-0.004	841.499998	-0.003
60	831.599997	-0.004	841.499997	-0.003

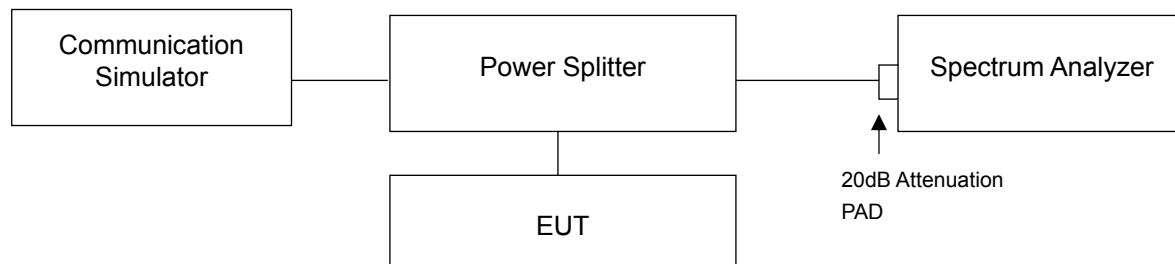
Note: When the EUT temperature is below -20°C, it will shut down and will not work.

4.4 Band Edge Measurement

4.4.1 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.

4.4.2 Test Setup



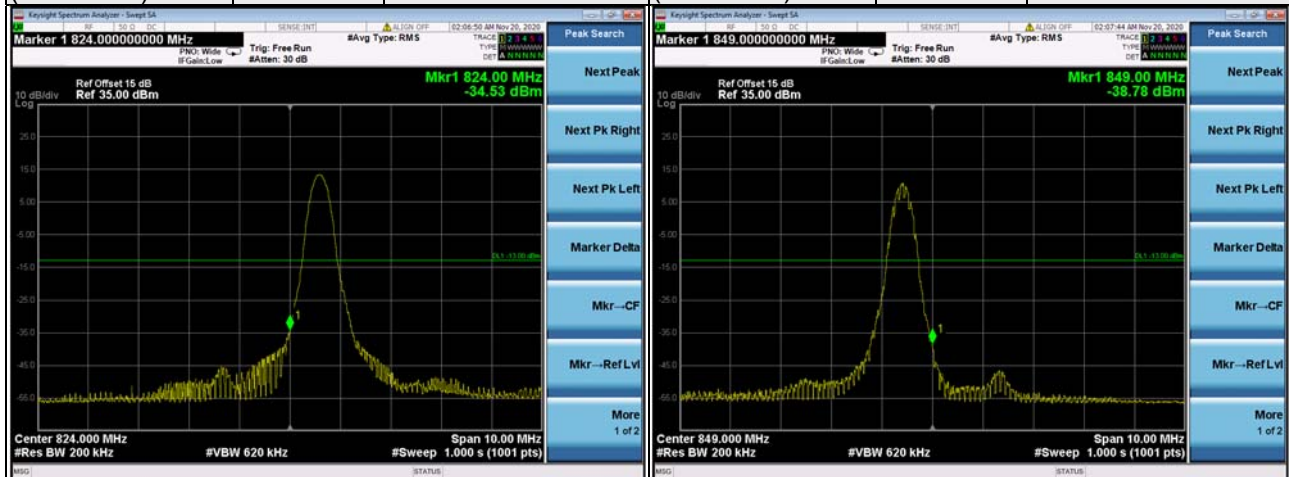
4.4.3 Test Procedures

- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 10MHz. RB of the spectrum is 200kHz and VB of the spectrum is 620kHz (LTE Channel Bandwidth 10MHz+10MHz)
- Record the max trace plot into the test report.

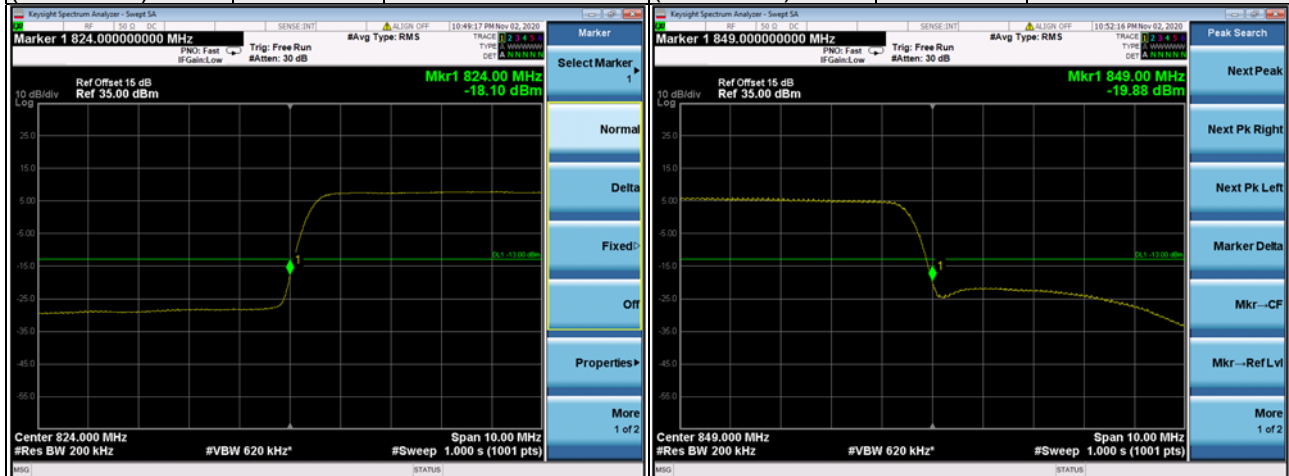
4.4.4 Test Results

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz

Channel 20450 (829.0MHz)+ Channel 20549 (838.9MHz)	QPSK	1 RB / 0 RB Offset	Channel 20501 (834.1MHz)+ Channel 20600 (844.0MHz)	QPSK	1 RB / 49 RB Offset
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Channel 20450 (829.0MHz)+ Channel 20549 (838.9MHz)	QPSK	50 RB / 0 RB Offset	Channel 20501 (834.1MHz)+ Channel 20600 (844.0MHz)	QPSK	50 RB / 0 RB Offset
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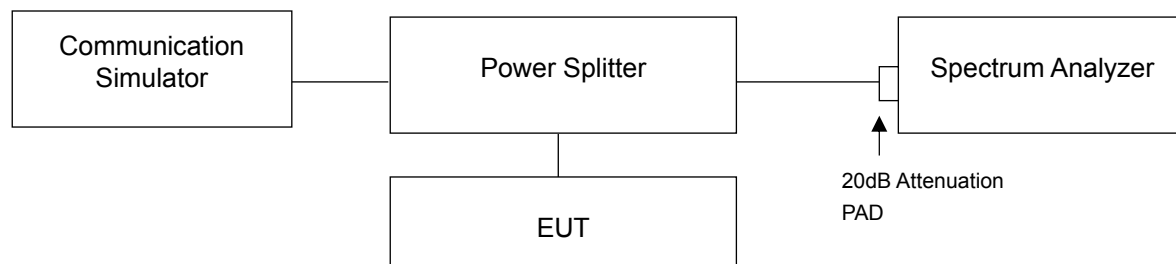


4.5 Peak to Average Ratio

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



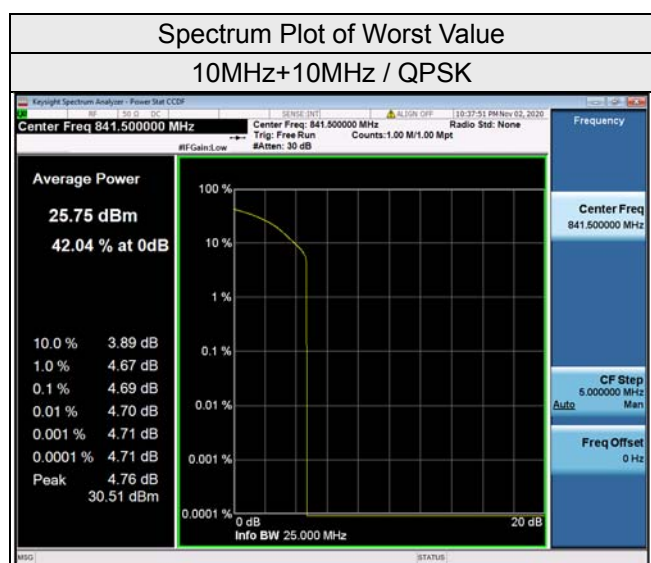
4.5.3 Test Procedures

- 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%.

4.5.4 Test Results

LTE Band 5 (CA 5B)

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz		
Channel	Frequency (MHz)	Peak To Average Ratio (dB)
		QPSK
20450+20549	829.0+838.9	4.53
20476+20575	831.6+841.5	4.69
20501+20600	834.1+844.0	4.62

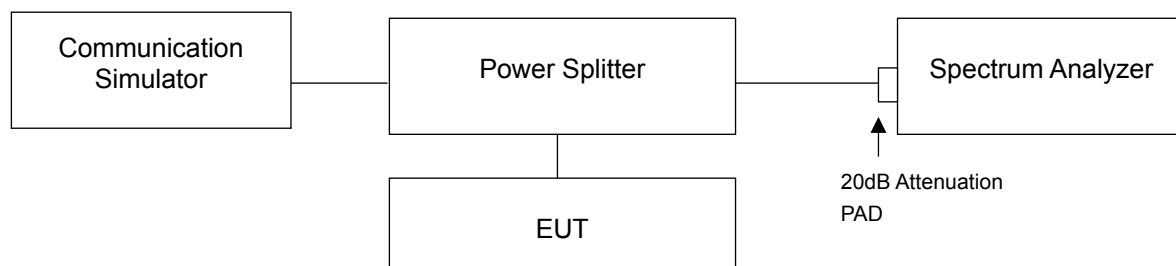


4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

The 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. The emission limit equal to -13dBm .

4.6.2 Test Setup



4.6.3 Test Procedure

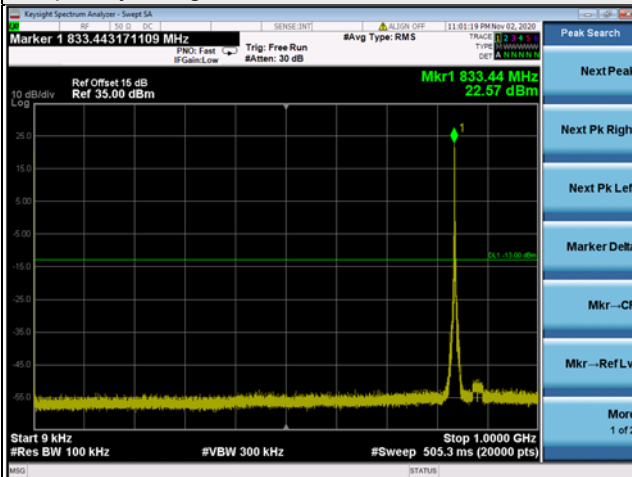
- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9kHz to 1GHz. 20dB attenuation pad is connected with spectrum. RBW=100kHz and VBW=300kHz is used for conducted emission measurement.
- Measuring frequency range is from 1GHz 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

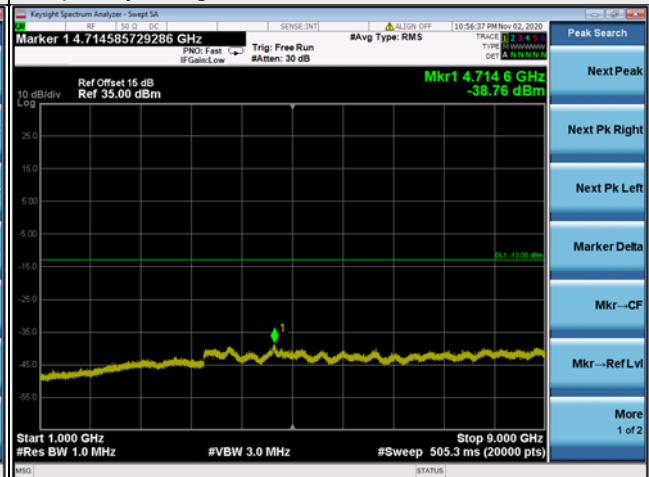
LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz

Channel 20450(829.0MHz) + Channel 20549(838.9MHz)

Frequency Range : 9kHz~1GHz

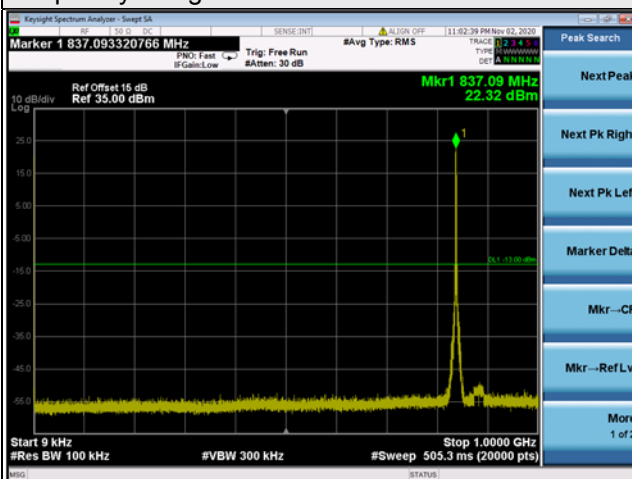


Frequency Range : 1GHz~9GHz

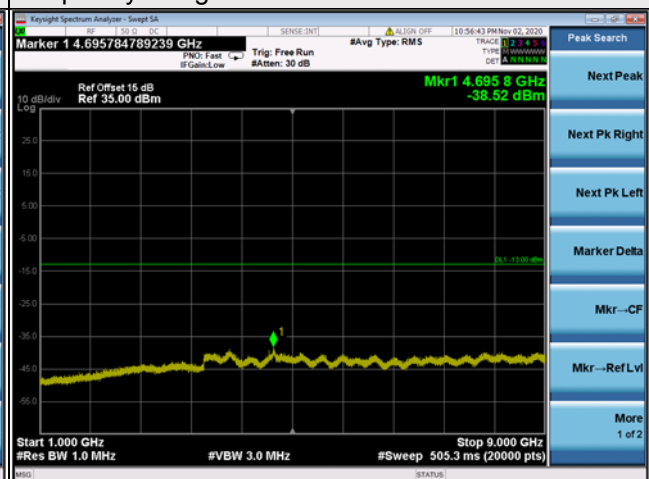


Channel 20476(831.6MHz) + Channel 20575(841.5MHz)

Frequency Range : 9kHz~1GHz

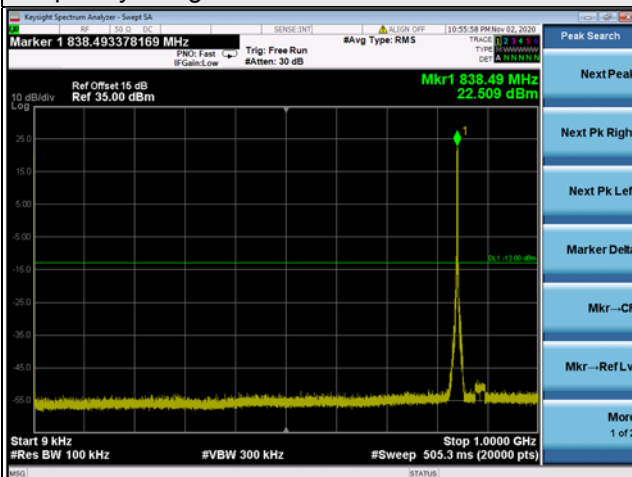


Frequency Range : 1GHz~9GHz

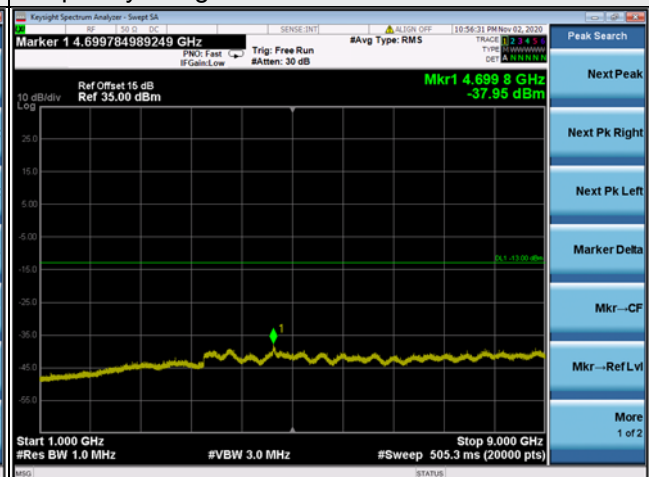


Channel 20501(834.1MHz) + Channel 20600(844.0MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~9GHz



*The 9kHz signal over the limit is from Spectrum.

4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

The 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. The emission limit equal to -13dBm .

4.7.2 Test Procedure

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) 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. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. Correction Factor (includes EIRP and ERP unit conversion factor) = Antenna gain of substitution horn. – Tx cable loss. Measurement method refers to ANSI C63.26 section 5.5.3.2.
- c. 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:

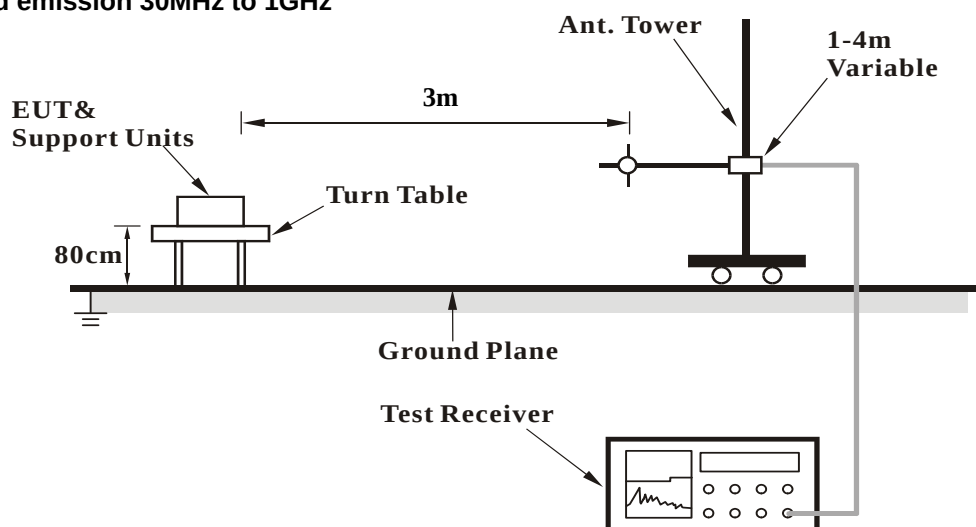
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.7.3 Deviation from Test Standard

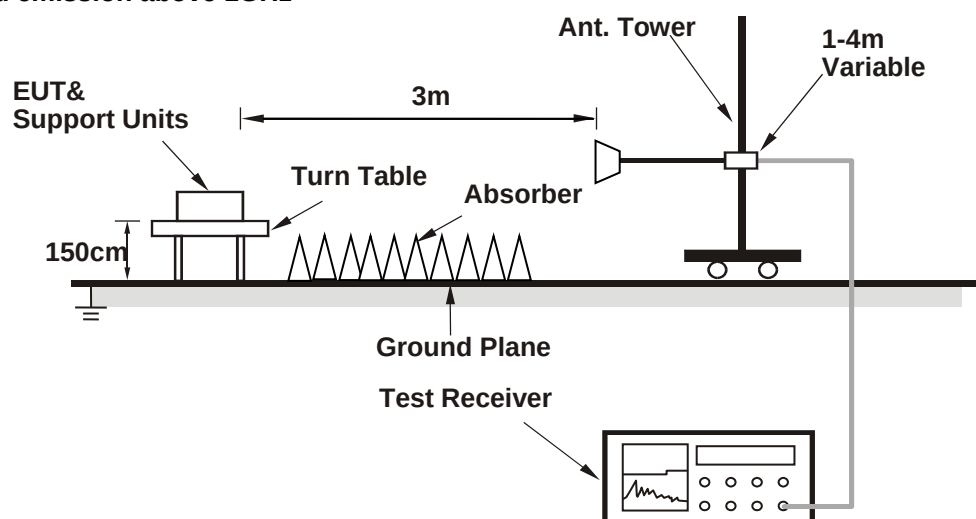
No deviation.

4.7.4 Test Setup

For radiated emission 30MHz to 1GHz



For radiated emission above 1GHz



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

4.7.5 Test Results

Below 1GHz

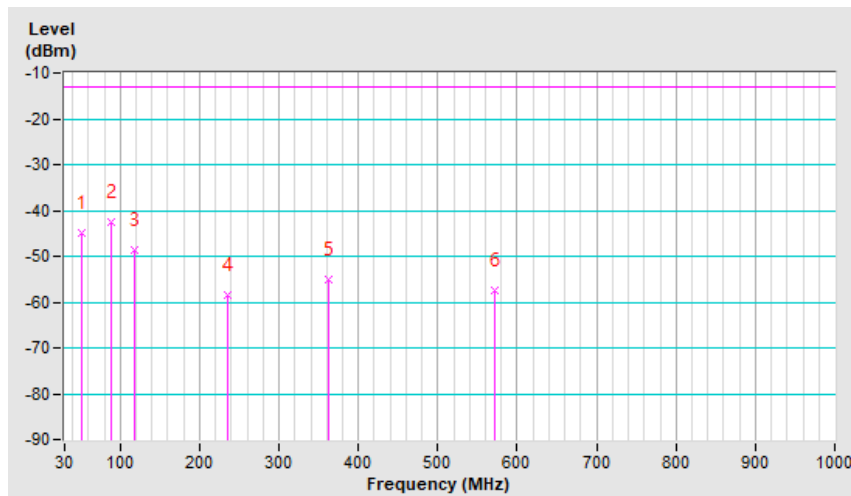
LTE Band 5 (CA 5B), Channel Bandwidth: 10MHz+10MHz

Mode	TX channel 20450(829.0MHz)+ TX channel 20549(838.9MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

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	51.09	-42.3	-35.8	-9.0	-44.8	-13.0	-31.8
2	89.04	-32.1	-43.4	0.9	-42.5	-13.0	-29.5
3	118.57	-38.4	-48.6	0.1	-48.5	-13.0	-35.5
4	235.25	-48.8	-64.0	5.4	-58.6	-13.0	-45.6
5	363.17	-50.5	-60.2	5.2	-55.0	-13.0	-42.0
6	572.64	-56.4	-61.9	4.5	-57.4	-13.0	-44.4

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

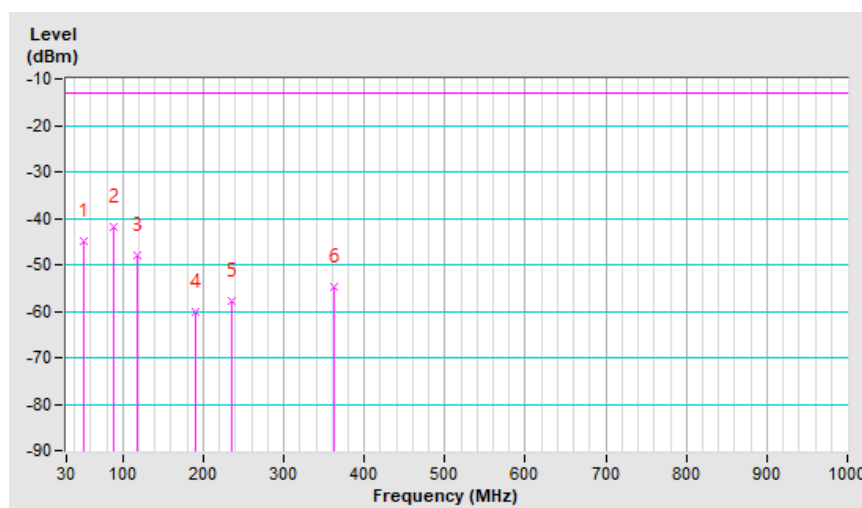


Mode	TX channel 20450(829.0MHz)+ TX channel 20549(838.9MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

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	51.09	-35.6	-36.0	-9.0	-45.0	-13.0	-32.0
2	89.04	-33.4	-42.7	0.9	-41.8	-13.0	-28.8
3	118.57	-38.9	-48.1	0.1	-48.0	-13.0	-35.0
4	190.26	-55.2	-64.5	4.2	-60.3	-13.0	-47.3
5	235.25	-53.5	-63.2	5.4	-57.8	-13.0	-44.8
6	363.17	-52.0	-59.8	5.2	-54.6	-13.0	-41.6

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).



Above 1GHz

LTE Band 5 (CA 5B), Channel Bandwidth: 10MHz+10MHz

Mode	TX channel 20450 (829.0MHz)+ TX channel 20549 (838.9MHz)	Frequency Range	1GHz ~ 10GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

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	1667.90	-56.6	-60.0	5.6	-54.4	-13.0	-41.4
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	1667.90	-58.8	-60.9	5.6	-55.3	-13.0	-42.3

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20476 (831.6MHz)+ TX channel 20575 (841.5MHz)	Frequency Range	1GHz ~ 10GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

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	1673.10	-56.1	-59.4	5.5	-53.9	-13.0	-40.9
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	1673.10	-58.5	-60.5	5.5	-55.0	-13.0	-42.0

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20501 (834.1MHz)+ TX channel 20600 (844.0MHz)	Frequency Range	1GHz ~ 10GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

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	1678.10	-56.6	-59.8	5.5	-54.3	-13.0	-41.3
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	1678.10	-59.1	-61.1	5.5	-55.6	-13.0	-42.6

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

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

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

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

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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