FCC Test Report
(Part 96 – LTE B42/B43/B48)

Report No.:	RFBFLF-WTW-P21010278-13
FCC ID:	MSQI007D
Test Model:	ASUS_I007D
Received Date:	Jan. 04, 2021
Test Date:	Jan. 04 ~ Apr. 01, 2021
Issued Date:	Apr. 01, 2021
Applicant:	ASUSTeK COMPUTER INC.
Address:	1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
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 / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBFLF-WTW-P21010278-13	Original release	Apr. 01, 2021

1 Certificate of Conformity

Product:	EXP21 Smartphone
Brand:	ASUS
Test Model:	ASUS_I007D
Sample Status:	Engineering sample
Applicant:	ASUSTeK COMPUTER INC.
Test Date:	Jan. 04 ~ Apr. 01, 2021
Standards:	47 CFR FCC Part 96

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 : Celine Chou , **Date:** Apr. 01, 2021

Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Apr. 01, 2021

Bruce Chen / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 96			
FCC Clause	Test Item	Result	Remarks
2.1046 96.41(b)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1046 96.41(b)	Maximum Power Spectral Density	Pass	Meet the requirement of limit.
96.41(g)	Peak to Average Ration	Pass	Meet the requirement of limit.
2.1049	Emission Bandwidth	Pass	Meet the requirement of limit.
2.1055	Frequency Stability	Pass	Meet the requirement of limit.
2.1051 96.41(e)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 96.41(e)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -3.32dB at 7250.00MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	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 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	EXP21 Smartphone				
Brand	ASUS				
Test Model	ASUS_I007D				
Sample Status	Engineering sample				
Power Supply Rating	7.74 Vdc (Battery) 5 Vdc / 9 Vdc / 12 Vdc / 15Vdc / 20Vdc (Adapter)				
Modulation Type	QPSK, 16QAM, 64QAM, 256QAM				
Operating Frequency	LTE Band 42 (Channel Bandwidth 5MHz)	3552.5MHz ~ 3597.5MHz			
	LTE Band 42 (Channel Bandwidth 10MHz)	3555.0MHz ~ 3595.0MHz			
	LTE Band 42 (Channel Bandwidth 15MHz)	3557.5MHz ~ 3592.5MHz			
	LTE Band 42 (Channel Bandwidth 20MHz)	3560.0MHz ~ 3590.0MHz			
	LTE Band 43 (Channel Bandwidth 5MHz)	3652.5MHz ~ 3672.5MHz			
	LTE Band 43 (Channel Bandwidth 10MHz)	3655.0MHz ~ 3670.0MHz			
	LTE Band 43 (Channel Bandwidth 15MHz)	3657.5MHz ~ 3667.5MHz			
	LTE Band 43 (Channel Bandwidth 20MHz)	3660.0MHz ~ 3665.0MHz			
	LTE Band 48 (Channel Bandwidth 5MHz)	3552.5MHz ~ 3697.5MHz			
	LTE Band 48 (Channel Bandwidth 10MHz)	3555.0MHz ~ 3695.0MHz			
	LTE Band 48 (Channel Bandwidth 15MHz)	3557.5MHz ~ 3692.5MHz			
	LTE Band 48 (Channel Bandwidth 20MHz)	3560.0MHz ~ 3690.0MHz			
Max. EIRP Power		QPSK	16QAM	64QAM	256QAM
	LTE Band 48 (Channel Bandwidth 5MHz)	113.240mW (20.54dBm/10MHz)	91.411mW (19.61dBm/10MHz)	72.946mW (18.63dBm/10MHz)	64.863mW (18.12dBm/10MHz)
	LTE Band 48 (Channel Bandwidth 10MHz)	114.815mW (20.60dBm/10MHz)	93.972mW (19.73dBm/10MHz)	74.473mW (18.72dBm/10MHz)	60.395mW (17.81dBm/10MHz)
	LTE Band 48 (Channel Bandwidth 15MHz)	79.799mW (19.02dBm/10MHz)	63.241mW (18.01dBm/10MHz)	57.544mW (17.60dBm/10MHz)	45.290mW (16.56dBm/10MHz)
	LTE Band 48 (Channel Bandwidth 20MHz)	95.499mW (19.80dBm/10MHz)	75.858mW (18.80dBm/10MHz)	70.469mW (18.48dBm/10MHz)	56.885mW (17.55dBm/10MHz)
Max. EIRP Power (Full power)		QPSK	16QAM	64QAM	256QAM
	LTE Band 48 (Channel Bandwidth 5MHz)	113.240mW (20.54dBm/10MHz)	91.411mW (19.61dBm/10MHz)	72.946mW (18.63dBm/10MHz)	64.863mW (18.12dBm/10MHz)
	LTE Band 48 (Channel Bandwidth 10MHz)	114.815mW (20.60dBm/10MHz)	93.972mW (19.73dBm/10MHz)	74.473mW (18.72dBm/10MHz)	60.395mW (17.81dBm/10MHz)
	LTE Band 48 (Channel Bandwidth 15MHz)	101.158mW (20.05dBm/15MHz)	82.224mW (19.15dBm/15MHz)	66.834mW (18.25dBm/15MHz)	53.456mW (17.28dBm/15MHz)
	LTE Band 48 (Channel Bandwidth 20MHz)	120.226mW (20.80dBm/20MHz)	94.842mW (19.77dBm/20MHz)	72.277mW (18.59dBm/20MHz)	58.749mW (17.69dBm/20MHz)

Emission Designator		QPSK	16QAM	64QAM	256QAM
	LTE Band 48 (Channel Bandwidth 5MHz)	4M47G7D	4M46D7W	4M47D7W	4M46D7W
	LTE Band 48 (Channel Bandwidth 10MHz)	8M92G7D	8M93D7W	8M92D7W	8M92D7W
	LTE Band 48 (Channel Bandwidth 15MHz)	13M4G7D	13M4D7W	13M4D7W	13M4D7W
	LTE Band 48 (Channel Bandwidth 20MHz)	17M8G7D	17M8D7W	17M8D7W	17M9D7W
Antenna Type	Refer to Note as below				
Antenna Connector	Refer to Note as below				
Accessory Device	Refer to Note as below				
Cable Supplied	Refer to Note as below				

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	SCUD	C21P2002	Rating: 7.74Vdc, 15.2Wh
Adapter	AOHAI	A320Q-200325C-US	I/P: 100-240Vac, 50/60Hz,1.5A O/P: 5Vdc, 3A; 9Vdc, 3A; 12Vdc, 3A; 15Vdc, 3A; 20Vdc, 3.25A
Type A to Type C USB Cable	Luxshare	LA9U2026-CS-R	0.5m
Type C to Type C Cable	Luxshare	LA9UC006-CS-R	1.2m
Bluetooth Earphone	Bang & Olufsen	EQ Earbud R	FCC ID: TTUBEOPLAYEQR IC: 3775B-BEOPLAYEQR
		EQ Earbud L	FCC ID: TTUBEOPLAYEQL IC: 3775B-BEOPLAYEQL
Bluetooth Earphone Charging Case	Bang & Olufsen	EQ Charging case	I/P: 5Vdc/500mA O/P: 5Vdc/ R170mA; L170mA

2. LTE Band 48 overlaps the entire frequency range of LTE Band 42 and LTE Band 43. Therefore, test data provided in this report covers LTE Band 48 as well as LTE Band 42 and LTE Band 43.

3. The following antennas were provided to the EUT.

Ant. No.	Brand	Model	Ant. Type	Connecter	Frequency Range
Ant 0	ASUS	ZS675KW	PIFA	LCP+Ipex	610-960MHz, 1710-2690MHz
Ant 1	ASUS	ZS675KW	PIFA	LCP+Ipex	1427-1510MHz, 1710-2690MHz
Ant 2	ASUS	ZS675KW	PIFA	LCP+Ipex	610-960MHz, 1427-1510MHz, 1710-2690MHz
Ant 3	INPAQ	ZS675KW	PIFA	Ipex	1575-1610MHz, 2400-2500MHz, 5150-5850MHz, 5925-7125MHz
Ant 4	INPAQ	ZS675KW	PIFA	Ipex	1176±10MHz, 2400-2500MHz, 5150-5850MHz, 5925-7125MHz
Ant 5	INPAQ	ZS675KW	PIFA	LCP+Ipex	3300-4000MHz, 4400-5000MHz
Ant 6	INPAQ	ZS675KW	PIFA	Ipex	1427-1510MHz, 2400-2500MHz, 5150-5850MHz, 5925-7125MHz
Ant 7	INPAQ	ZS675KW	PIFA	LCP+Ipex	3300-4000MHz, 4400-5000MHz
Ant 8	ASUS	ZS675KW	PIFA	LCP+Ipex	1427-1510MHz, 1710-2690MHz
Ant 9	ASUS	ZS675KW	PIFA	LCP+Ipex	1710-2690MHz
Ant 10	INPAQ	ZS675KW	PIFA	Ipex	3300-4000MHz, 4400-5000MHz
Ant 11	INPAQ	ZS675KW	PIFA	Ipex	3300-4000MHz, 4400-5000MHz

2G / 3G Band												
Band	Freq. Range (MHz)	Gain (dBi)										
		Ant. 0	Ant. 1	Ant. 2	Ant. 3	Ant. 4	Ant. 5	Ant. 6	Ant. 7	Ant. 8	Ant. 9	Ant. 10	Ant. 11
GSM-850	824 ~ 849	-1.891		-4.526									
GSM-1900	1850 ~ 1910		-1.887	-1.394						-2.89579			
WCDMA B2	1850 ~ 1910		-1.887	-1.394						-2.89579			
WCDMA B4	1710 ~ 1755		-2.884	-3.228						-3.13552			
WCDMA B5	824 ~ 849	-1.891		-4.526									
CDMA BC0	815 ~ 849	-1.891		-4.526									
CDMA BC1	1850 ~ 1910		-1.887	-1.394						-2.89579			
CDMA BC10	806 ~ 901	-1.891		-4.526									

LTE Band												
Band	Freq. Range (MHz)	Gain (dBi)										
		Ant. 0	Ant. 1	Ant. 2	Ant. 3	Ant. 4	Ant. 5	Ant. 6	Ant. 7	Ant. 8	Ant. 9	Ant. 10	Ant. 11
LTE B2	1850 ~ 1910		-1.887	-1.394						-2.89579	-1.804		
LTE B4	1710 ~ 1755		-2.884	-3.228						-3.13552	-1.706		
LTE B5	824 ~ 849	-1.891		-4.526									
LTE B7	2500 ~ 2570		0.185	-0.657						-0.50837	-1.117		
LTE B12	698 ~ 716	-2.135		-4.343									
LTE B13	777 ~ 787	-4.37		-8.13									
LTE B14	788 ~ 798	-4.37		-7.931									
LTE B17	704 ~ 716	-2.135		-4.343									
LTE B25	1850 ~ 1915		-1.887	-1.394						-2.89579			
LTE B26	814 ~ 849	-1.891		-4.526									
LTE B30	2305 ~ 2315		-1.326	-2.669						-1.28433			
LTE B66	1710 ~ 1780		-2.884	-2.478						-3.0668	-1.685		
LTE B71	663 ~ 698	-5.741		-7.388									
T-LTE B38	2570 ~ 2620		0.724	-0.912						-0.59557			
T-LTE B40	2300 ~ 2400		-1.326	-2.669						-1.28433			
T-LTE B41	2496 ~ 2690		1.143	-0.657						-0.59557			
T-LTE B42	3400 ~ 3600						0.313		0.5277			-2.493	-0.35195
T-LTE B43	3600 ~ 3800						-0.434		0.5277			-0.477	-0.161
T-LTE B48	3550 ~ 3700						-0.434		0.5277			-0.477	-0.161
5G FR1 Band													
Band	Freq. Range (MHz)	Gain (dBi)										
		Ant. 0	Ant. 1	Ant. 2	Ant. 3	Ant. 4	Ant. 5	Ant. 6	Ant. 7	Ant. 8	Ant. 9	Ant. 10	Ant. 11
n2	1850 ~ 1910		-1.887	-1.394						-2.89579	-1.804		
n5	824 ~ 849	-1.891		-4.526									
n7	2500 ~ 2570		0.185	-0.657						-0.50837	-1.117		
n12	699 ~ 716	-2.135		-4.343									
n13	777 ~ 787	-4.37		-8.13									
n14	788 ~ 798	-4.37		-7.931									
n25	1850 ~ 1915		-1.887	-1.394						-2.89579	-1.627		
n26	814 ~ 849	-1.891		-4.526									
n30	2305 ~ 2315		-1.326	-2.669						-1.28433			
n38	2570 ~ 2620		0.724	-0.912						-0.59557	-1.3		
n41	2496 ~ 2690		1.143	-0.657						-0.59557	-0.076		
n66	1710 ~ 1780		-2.884	-2.478						-3.0668	-1.685		
n71	663 ~ 698	-5.741		-7.388									
n77	3300 ~ 4200						0.313		0.5277			2.017	0.19902
n78	3300 ~ 3800						0.313		0.5277			2.017	-0.161

* 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.

3.2 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 as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	Radiated Emission
LTE Band 48	Y-plane

LTE Band 48

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation
Maximum Output Power	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK / 16QAM / 64QAM / 256QAM
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK / 16QAM / 64QAM / 256QAM
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK / 16QAM / 64QAM / 256QAM
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK / 16QAM / 64QAM / 256QAM
Modulation characteristics	55340 to 56640	55990 (3625.0MHz)	20MHz	QPSK / 16QAM / 64QAM / 256QAM
Frequency Stability	55265 to 56715	55265 (3552.5MHz), 56715 (3697.5MHz)	5MHz	QPSK
	55290 to 56690	55290 (3555.0MHz), 56690 (3695.0MHz)	10MHz	QPSK
	55315 to 56665	55315 (3557.5MHz), 56665 (3692.5MHz)	15MHz	QPSK
	55340 to 56640	55340 (3560.0MHz), 56640 (3690.0MHz)	20MHz	QPSK
Occupied Bandwidth	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK / 16QAM / 64QAM / 256QAM
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK / 16QAM / 64QAM / 256QAM
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK / 16QAM / 64QAM / 256QAM
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK / 16QAM / 64QAM / 256QAM

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation
Peak to Average Ratio	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK / 16QAM / 64QAM / 256QAM
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK / 16QAM / 64QAM / 256QAM
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK / 16QAM / 64QAM / 256QAM
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK / 16QAM / 64QAM / 256QAM
Conducted Emission	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK
Radiated Emission Below 1GHz	55340 to 56640	55990 (3625.0MHz)	20MHz	QPSK
Radiated Emission Above 1GHz	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK

Note:

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK, 16QAM, 64QAM and 256QAM, measured value of QPSK is higher than 16QAM, 64QAM and 256QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK, 16QAM, 64QAM and 256QAM modes, the other test items were performed under QPSK mode only.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
Maximum Output Power	22deg. C, 66%RH	120Vac, 60Hz	Rex Wang
Modulation Characteristics	25deg. C, 60%RH	120Vac, 60Hz	Willy Cheng
Frequency Stability	25deg. C, 60%RH	7.74Vdc	Willy Cheng
Occupied Bandwidth	25deg. C, 60%RH	120Vac, 60Hz	Willy Cheng
Peak To Average Ratio	25deg. C, 60%RH	120Vac, 60Hz	Willy Cheng
Conducted Emission	25deg. C, 60%RH	120Vac, 60Hz	Willy Cheng
Radiated Emission	22deg. C, 66%RH	120Vac, 60Hz	Rex Wang

3.3 Description of Support Units

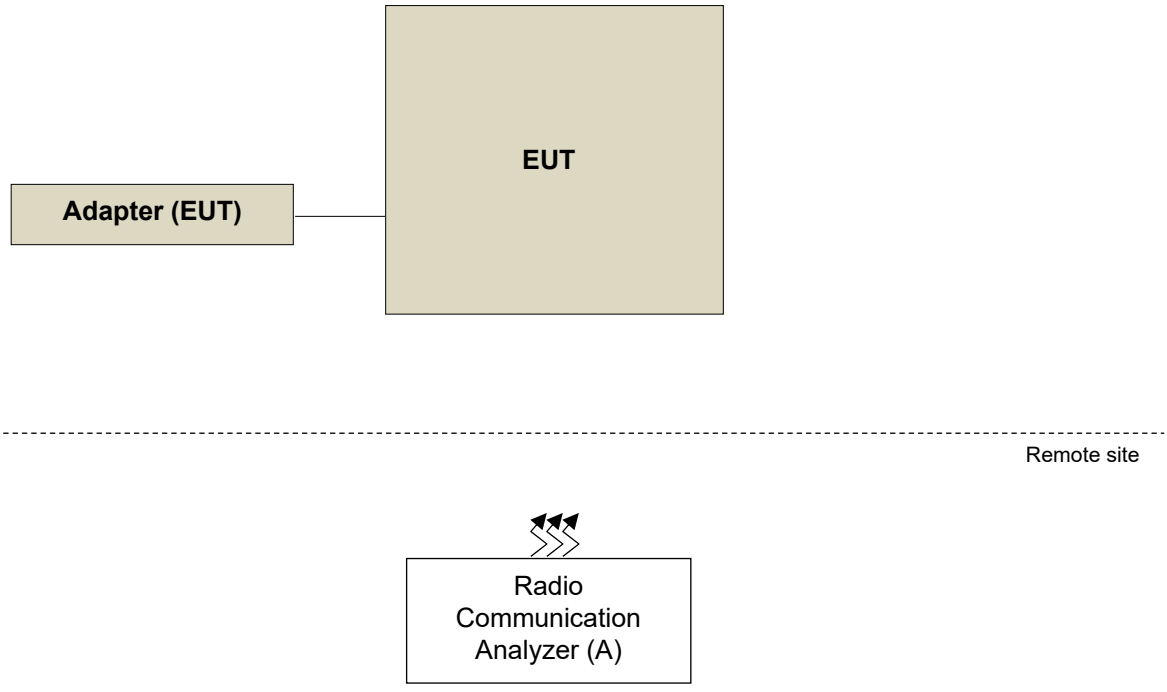
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Radio Communication Analyzer	Anritsu	MT8821C	6261806803	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.

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards and References

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

Test standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 96

ANSI/TIA/EIA-603-D-2010

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

KDB 940660 D01 Part 96 CBRS Eqpt v03

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

4 Test Types and Results

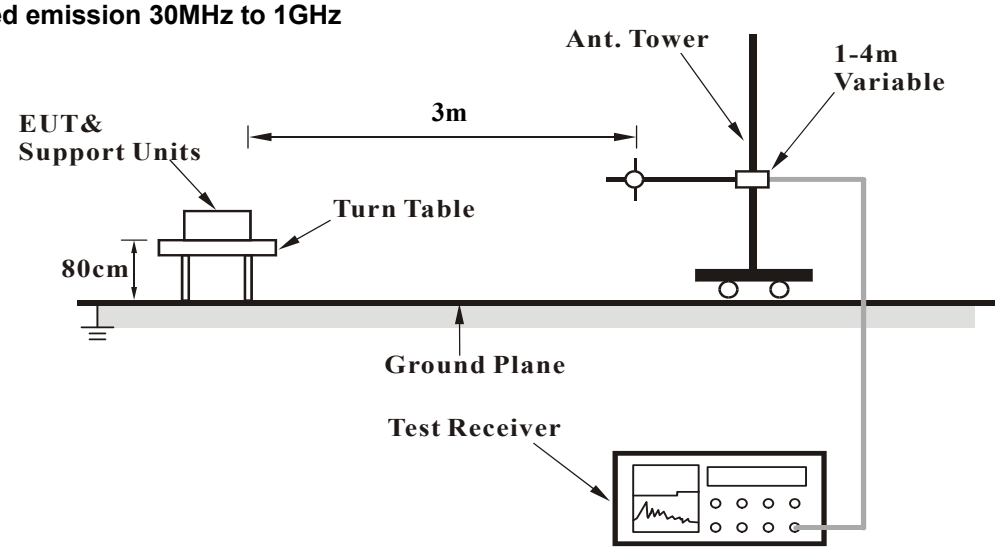
4.1 Maximum Output Power Measurement

4.1.1 Limits of Maximum Output Power Measurement

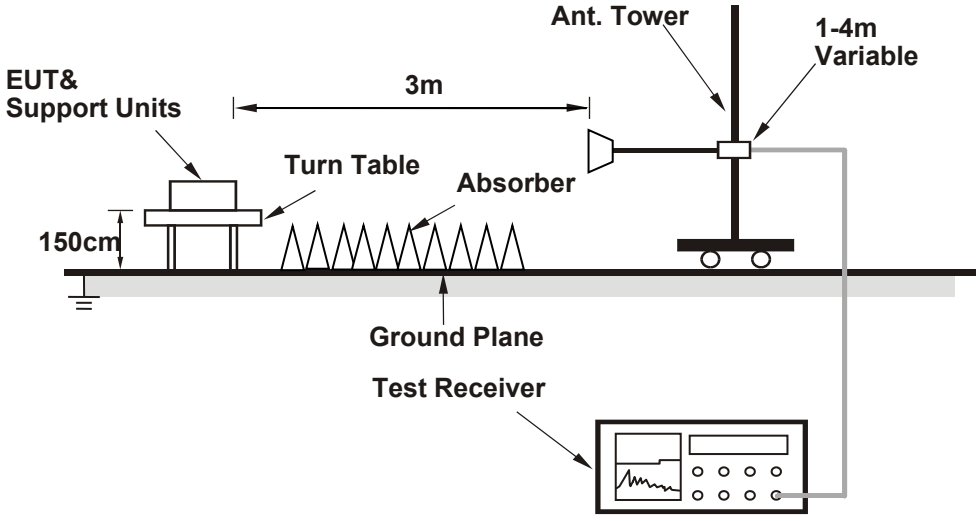
Device		Maximum EIRP (dBm/10 MHz)
☒	End User Device	23
☐	Category A CBSD	30
☐	Category B CBSD	47

4.1.2 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).

4.1.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSW43	101866	Dec. 14, 2020	Dec. 13, 2021
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2020	Nov. 24, 2021
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Jan. 18, 2020	Jan. 17, 2021
			Jan. 22, 2021	Jan. 21, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Nov. 06, 2020	Nov. 05, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 06, 2020	Nov. 05, 2021
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
			Feb. 17, 2021	Feb. 16, 2022
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
			Jan. 16, 2021	Jan. 15, 2022
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 18, 2020	Jan. 17, 2021
			Jan. 16, 2021	Jan. 15, 2022
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	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. 10, 2020	Sep. 09, 2021

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
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 Keysight	U8002A	MY56330015	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 9.

4.1.4 Test Procedures

a. Set span to at least 1.5 times the OBW.
b. Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
c. Set VBW ≥ 3 × RBW.
d. Set number of points in sweep ≥ 2 × span / RBW.
e. Sweep time = auto-couple.
f. Detector = RMS (power averaging).
g. If the EUT can be configured to transmit continuously (i.e., burst duty cycle ≥ 98%), then set the trigger to free run.
h. If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98 %), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Ensure that the sweep time is less than or equal to the transmission burst duration.
i. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
j. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
k. For per 10MHz method, channel power integrating bandwidth 10MHz is used for bandwidth 5M, 10M, 15M and 20M. For full power method, channel power integrating bandwidth 10MHz is used for bandwidth 5M, 10M, integrating bandwidth 15MHz is used for bandwidth 15M, integrating bandwidth 20MHz is used for bandwidth 20M.
l. 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.
m. EIRP = Output power level of S.G – TX cable loss + 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 power = E.I.R.P power - 2.15 dB. Correction Factor (includes EIRP and ERP unit conversion factor) = Antenna gain of substitution horn. – Tx cable loss.
n. Measurement method refers to ANSI C63.26 section 5.2.7 & 5.2.4.

4.1.5 Deviation from Test Standard

No deviation.

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

EIRP Power (dBm/10MHz)

Modulation Type: QPSK

LTE Band 48, Channel Bandwidth 5MHz

Mode	TX channel 55265, 55990, 56715

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3552.50	19.91	23.00	-3.09	2.69 H	197	81.89	-61.98
2	3625.00	20.54	23.00	-2.46	2.67 H	197	82.35	-61.81
3	3697.50	20.53	23.00	-2.47	2.66 H	302	82.21	-61.68
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3552.50	17.28	23.00	-5.72	2.32 V	339	79.26	-61.98
2	3625.00	17.83	23.00	-5.17	2.29 V	341	79.64	-61.81
3	3697.50	17.80	23.00	-5.20	2.22 V	335	79.48	-61.68

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 10MHz

Mode	TX channel 55290, 55990, 56690

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3555.00	20.60	23.00	-2.40	2.74 H	201	82.58	-61.98
2	3625.00	19.99	23.00	-3.01	2.73 H	202	81.80	-61.81
3	3695.00	20.38	23.00	-2.62	2.70 H	204	82.06	-61.68
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3555.00	18.00	23.00	-5.00	2.22 V	334	79.98	-61.98
2	3625.00	17.14	23.00	-5.86	2.27 V	336	78.95	-61.81
3	3695.00	17.78	23.00	-5.22	2.30 V	337	79.46	-61.68

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 15MHz

Mode	TX channel 55315, 55990, 56665

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	18.97	23.00	-4.03	2.69 H	197	80.94	-61.97
2	3625.00	19.02	23.00	-3.98	2.75 H	198	80.83	-61.81
3	3692.50	19.00	23.00	-4.00	2.75 H	200	80.69	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	16.22	23.00	-6.78	2.23 V	339	78.19	-61.97
2	3625.00	16.75	23.00	-6.25	2.24 V	339	78.56	-61.81
3	3692.50	16.53	23.00	-6.47	2.26 V	338	78.22	-61.69

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340, 55990, 56640

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	19.57	23.00	-3.43	2.73 H	203	81.54	-61.97
2	3625.00	19.80	23.00	-3.20	2.75 H	200	81.61	-61.81
3	3690.00	19.02	23.00	-3.98	2.66 H	202	80.71	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	16.55	23.00	-6.45	2.28 V	340	78.52	-61.97
2	3625.00	17.31	23.00	-5.69	2.27 V	339	79.12	-61.81
3	3690.00	16.55	23.00	-6.45	2.27 V	334	78.24	-61.69

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

Modulation Type: 16QAM

LTE Band 48, Channel Bandwidth 5MHz

Mode	TX channel 55265, 55990, 56715

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3552.50	19.11	23.00	-3.89	2.72 H	197	81.09	-61.98
2	3625.00	19.49	23.00	-3.51	2.68 H	198	81.30	-61.81
3	3697.50	19.61	23.00	-3.39	2.68 H	202	81.29	-61.68
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3552.50	16.08	23.00	-6.92	1.97 V	339	78.06	-61.98
2	3625.00	16.77	23.00	-6.23	2.29 V	335	78.58	-61.81
3	3697.50	16.85	23.00	-6.15	2.27 V	334	78.53	-61.68

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 10MHz

Mode	TX channel 55290, 55990, 56690

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3555.00	19.73	23.00	-3.27	2.74 H	202	81.71	-61.98
2	3625.00	18.86	23.00	-4.14	2.67 H	201	80.67	-61.81
3	3695.00	19.26	23.00	-3.74	2.66 H	360	80.94	-61.68
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3555.00	16.92	23.00	-6.08	2.27 V	336	78.90	-61.98
2	3625.00	16.11	23.00	-6.89	2.31 V	336	77.92	-61.81
3	3695.00	16.58	23.00	-6.42	2.32 V	340	78.26	-61.68

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 15MHz

Mode	TX channel 55315, 55990, 56665

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	18.00	23.00	-5.00	2.69 H	197	79.97	-61.97
2	3625.00	18.01	23.00	-4.99	2.75 H	198	79.82	-61.81
3	3692.50	17.90	23.00	-5.10	2.75 H	200	79.59	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	15.22	23.00	-7.78	2.23 V	339	77.19	-61.97
2	3625.00	15.87	23.00	-7.13	2.24 V	339	77.68	-61.81
3	3692.50	15.45	23.00	-7.55	2.26 V	338	77.14	-61.69

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340, 55990, 56640

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	18.55	23.00	-4.45	2.73 H	203	80.52	-61.97
2	3625.00	18.80	23.00	-4.20	2.75 H	200	80.61	-61.81
3	3690.00	18.00	23.00	-5.00	2.66 H	202	79.69	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	15.55	23.00	-7.45	2.28 V	340	77.52	-61.97
2	3625.00	16.23	23.00	-6.77	2.27 V	339	78.04	-61.81
3	3690.00	15.65	23.00	-7.35	2.27 V	334	77.34	-61.69

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

Modulation Type: 64QAM

LTE Band 48, Channel Bandwidth 5MHz

Mode	TX channel 55265, 55990, 56715

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3552.50	17.96	23.00	-5.04	2.69 H	201	79.94	-61.98
2	3625.00	18.63	23.00	-4.37	2.65 H	201	80.44	-61.81
3	3697.50	18.42	23.00	-4.58	2.68 H	200	80.10	-61.68
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3552.50	15.11	23.00	-7.89	2.27 V	334	77.09	-61.98
2	3625.00	15.67	23.00	-7.33	2.28 V	336	77.48	-61.81
3	3697.50	15.96	23.00	-7.04	2.23 V	335	77.64	-61.68

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 10MHz

Mode	TX channel 55290, 55990, 56690

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3555.00	18.72	23.00	-4.28	2.72 H	204	80.70	-61.98
2	3625.00	17.87	23.00	-5.13	2.65 H	197	79.68	-61.81
3	3695.00	18.33	23.00	-4.67	2.71 H	202	80.01	-61.68
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3555.00	15.91	23.00	-7.09	2.31 V	341	77.89	-61.98
2	3625.00	15.06	23.00	-7.94	2.29 V	337	76.87	-61.81
3	3695.00	15.72	23.00	-7.28	2.22 V	336	77.40	-61.68

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 15MHz

Mode	TX channel 55315, 55990, 56665

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	17.50	23.00	-5.50	2.69 H	197	79.47	-61.97
2	3625.00	17.60	23.00	-5.40	2.75 H	198	79.41	-61.81
3	3692.50	17.49	23.00	-5.51	2.75 H	200	79.18	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	14.72	23.00	-8.28	2.23 V	339	76.69	-61.97
2	3625.00	15.29	23.00	-7.71	2.24 V	339	77.10	-61.81
3	3692.50	15.04	23.00	-7.96	2.26 V	338	76.73	-61.69

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340, 55990, 56640

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	18.05	23.00	-4.95	2.73 H	203	80.02	-61.97
2	3625.00	18.48	23.00	-4.52	2.75 H	200	80.29	-61.81
3	3690.00	17.40	23.00	-5.60	2.66 H	202	79.09	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	15.01	23.00	-7.99	2.28 V	340	76.98	-61.97
2	3625.00	15.62	23.00	-7.38	2.27 V	339	77.43	-61.81
3	3690.00	15.16	23.00	-7.84	2.27 V	334	76.85	-61.69

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

Modulation Type: 256QAM

LTE Band 48, Channel Bandwidth 5MHz

Mode	TX channel 55265, 55990, 56715

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3552.50	17.33	23.00	-5.67	2.25 H	337	79.31	-61.98
2	3625.00	18.12	23.00	-4.88	2.32 H	339	79.93	-61.81
3	3697.50	17.86	23.00	-5.14	2.32 H	341	79.54	-61.68
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3552.50	14.10	23.00	-8.90	2.25 V	337	76.08	-61.98
2	3625.00	14.62	23.00	-8.38	2.32 V	339	76.43	-61.81
3	3697.50	14.93	23.00	-8.07	2.32 V	341	76.61	-61.68

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 10MHz

Mode	TX channel 55290, 55990, 56690

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3555.00	17.81	23.00	-5.19	2.73 H	200	79.79	-61.98
2	3625.00	16.75	23.00	-6.25	2.69 H	203	78.56	-61.81
3	3695.00	17.18	23.00	-5.82	2.68 H	199	78.86	-61.68
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3555.00	14.82	23.00	-8.18	2.28 V	340	76.80	-61.98
2	3625.00	14.01	23.00	-8.99	2.26 V	340	75.82	-61.81
3	3695.00	14.59	23.00	-8.41	2.25 V	338	76.27	-61.68

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 15MHz

Mode	TX channel 55315, 55990, 56665

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	16.50	23.00	-6.50	2.69 H	197	78.47	-61.97
2	3625.00	16.56	23.00	-6.44	2.75 H	198	78.37	-61.81
3	3692.50	16.49	23.00	-6.51	2.75 H	200	78.18	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	13.72	23.00	-9.28	2.23 V	339	75.69	-61.97
2	3625.00	14.29	23.00	-8.71	2.24 V	339	76.10	-61.81
3	3692.50	14.00	23.00	-9.00	2.26 V	338	75.69	-61.69

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340, 55990, 56640

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	17.05	23.00	-5.95	2.73 H	203	79.02	-61.97
2	3625.00	17.55	23.00	-5.45	2.75 H	200	79.36	-61.81
3	3690.00	16.34	23.00	-6.66	2.66 H	202	78.03	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	14.01	23.00	-8.99	2.28 V	340	75.98	-61.97
2	3625.00	14.56	23.00	-8.44	2.27 V	339	76.37	-61.81
3	3690.00	14.22	23.00	-8.78	2.27 V	334	75.91	-61.69

Remarks:

1. EIRP(dBm/10MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

EIRP Full Power (dBm/15MHz or dBm/20MHz)

Modulation Type: QPSK

LTE Band 48, Channel Bandwidth 5MHz and Channel Bandwidth 10MHz full power test data, please refer to Channel Bandwidth 5MHz and Channel Bandwidth 10MHz per 10MHz power.

LTE Band 48, Channel Bandwidth 15MHz

Mode	TX channel 55315, 55990, 56665

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/15MHz)	Limit (dBm/15MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	19.97	23.00	-3.03	2.69 H	197	81.94	-61.97
2	3625.00	20.02	23.00	-2.98	2.75 H	198	81.83	-61.81
3	3692.50	20.05	23.00	-2.95	2.75 H	200	81.74	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/15MHz)	Limit (dBm/15MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	17.17	23.00	-5.83	2.23 V	339	79.14	-61.97
2	3625.00	17.52	23.00	-5.48	2.24 V	339	79.33	-61.81
3	3692.50	17.30	23.00	-5.70	2.26 V	338	78.99	-61.69

Remarks:

1. EIRP(dBm/15MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340, 55990, 56640

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/20MHz)	Limit (dBm/20MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	20.57	23.00	-2.43	2.73 H	203	82.54	-61.97
2	3625.00	20.80	23.00	-2.20	2.75 H	200	82.61	-61.81
3	3690.00	20.22	23.00	-2.78	2.66 H	202	81.91	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/20MHz)	Limit (dBm/20MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	17.46	23.00	-5.54	2.28 V	340	79.43	-61.97
2	3625.00	18.10	23.00	-4.90	2.27 V	339	79.91	-61.81
3	3690.00	17.47	23.00	-5.53	2.27 V	334	79.16	-61.69

Remarks:

1. EIRP(dBm/20MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

Modulation Type: 16QAM

LTE Band 48, Channel Bandwidth 5MHz and Channel Bandwidth 10MHz full power test data, please refer to Channel Bandwidth 5MHz and Channel Bandwidth 10MHz per 10MHz power.

LTE Band 48, Channel Bandwidth 15MHz

Mode	TX channel 55315, 55990, 56665

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/15MHz)	Limit (dBm/15MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	18.98	23.00	-4.02	2.73 H	201	80.95	-61.97
2	3625.00	18.82	23.00	-4.18	2.65 H	198	80.63	-61.81
3	3692.50	19.15	23.00	-3.85	2.71 H	203	80.84	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/15MHz)	Limit (dBm/15MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	16.17	23.00	-6.83	2.23 V	336	78.14	-61.97
2	3625.00	16.57	23.00	-6.43	2.29 V	338	78.38	-61.81
3	3692.50	16.26	23.00	-6.74	2.24 V	334	77.95	-61.69

Remarks:

1. EIRP(dBm/15MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340, 55990, 56640

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/20MHz)	Limit (dBm/20MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	19.51	23.00	-3.49	2.71 H	201	81.48	-61.97
2	3625.00	19.77	23.00	-3.23	2.74 H	199	81.58	-61.81
3	3690.00	19.20	23.00	-3.80	2.69 H	198	80.89	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/20MHz)	Limit (dBm/20MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	16.49	23.00	-6.51	2.22 V	334	78.46	-61.97
2	3625.00	17.09	23.00	-5.91	2.29 V	337	78.90	-61.81
3	3690.00	16.53	23.00	-6.47	2.25 V	340	78.22	-61.69

Remarks:

1. EIRP(dBm/20MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

Modulation Type: 64QAM

LTE Band 48, Channel Bandwidth 5MHz and Channel Bandwidth 10MHz full power test data, please refer to Channel Bandwidth 5MHz and Channel Bandwidth 10MHz per 10MHz power.

LTE Band 48, Channel Bandwidth 15MHz

Mode	TX channel 55315, 55990, 56665

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/15MHz)	Limit (dBm/15MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	18.02	23.00	-4.98	2.72 H	203	79.99	-61.97
2	3625.00	17.83	23.00	-5.17	2.75 H	198	79.64	-61.81
3	3692.50	18.25	23.00	-4.75	2.68 H	201	79.94	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/15MHz)	Limit (dBm/15MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	15.02	23.00	-7.98	2.32 V	340	76.99	-61.97
2	3625.00	15.74	23.00	-7.26	2.23 V	341	77.55	-61.81
3	3692.50	15.07	23.00	-7.93	2.25 V	340	76.76	-61.69

Remarks:

1. EIRP(dBm/15MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340, 55990, 56640

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/20MHz)	Limit (dBm/20MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	18.34	23.00	-4.66	2.70 H	198	80.31	-61.97
2	3625.00	18.59	23.00	-4.41	2.70 H	204	80.40	-61.81
3	3690.00	18.17	23.00	-4.83	2.71 H	200	79.86	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/20MHz)	Limit (dBm/20MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	15.57	23.00	-7.43	2.31 V	341	77.54	-61.97
2	3625.00	15.91	23.00	-7.09	2.24 V	339	77.72	-61.81
3	3690.00	15.53	23.00	-7.47	2.32 V	339	77.22	-61.69

Remarks:

1. EIRP(dBm/20MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

Modulation Type: 256QAM

LTE Band 48, Channel Bandwidth 5MHz and Channel Bandwidth 10MHz full power test data, please refer to Channel Bandwidth 5MHz and Channel Bandwidth 10MHz per 10MHz power.

LTE Band 48, Channel Bandwidth 15MHz

Mode	TX channel 55315, 55990, 56665

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/15MHz)	Limit (dBm/15MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	17.01	23.00	-5.99	2.66 H	204	78.98	-61.97
2	3625.00	16.64	23.00	-6.36	2.72 H	201	78.45	-61.81
3	3692.50	17.28	23.00	-5.72	2.65 H	204	78.97	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/15MHz)	Limit (dBm/15MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3557.50	14.09	23.00	-8.91	2.27 V	341	76.06	-61.97
2	3625.00	14.89	23.00	-8.11	2.30 V	335	76.70	-61.81
3	3692.50	13.96	23.00	-9.04	2.30 V	340	75.65	-61.69

Remarks:

1. EIRP(dBm/15MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340, 55990, 56640

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm/20MHz)	Limit (dBm/20MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	17.50	23.00	-5.50	2.67 H	201	79.47	-61.97
2	3625.00	17.69	23.00	-5.31	2.72 H	204	79.50	-61.81
3	3690.00	17.36	23.00	-5.64	2.69 H	200	79.05	-61.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm/20MHz)	Limit (dBm/20MHz)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3560.00	14.60	23.00	-8.40	2.22 V	338	76.57	-61.97
2	3625.00	14.73	23.00	-8.27	2.22 V	338	76.54	-61.81
3	3690.00	14.36	23.00	-8.64	2.31 V	334	76.05	-61.69

Remarks:

1. EIRP(dBm/20MHz) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

4.2.2 Test Setup

4.2.3 Test Instruments

Refer to section 4.4.3 to get information of above instrument.

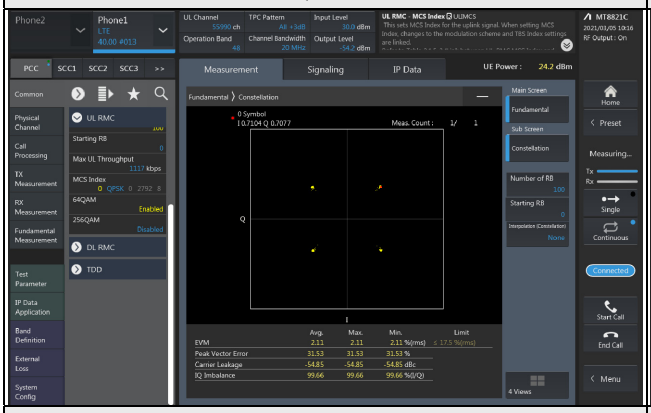
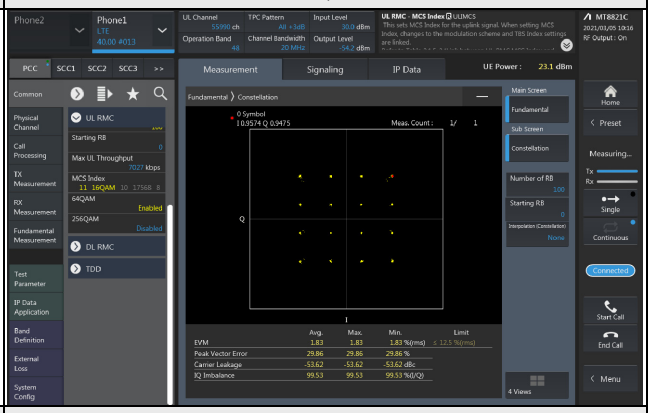
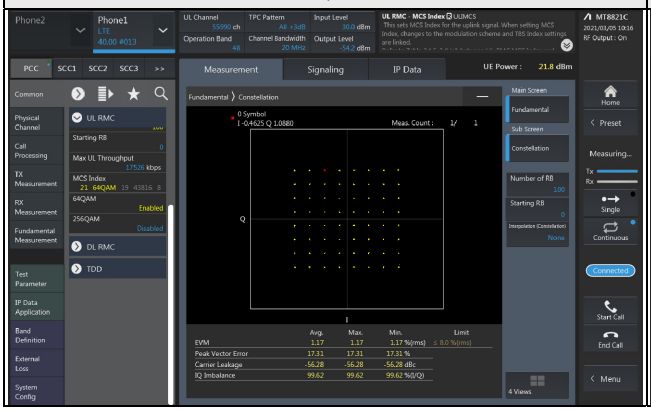
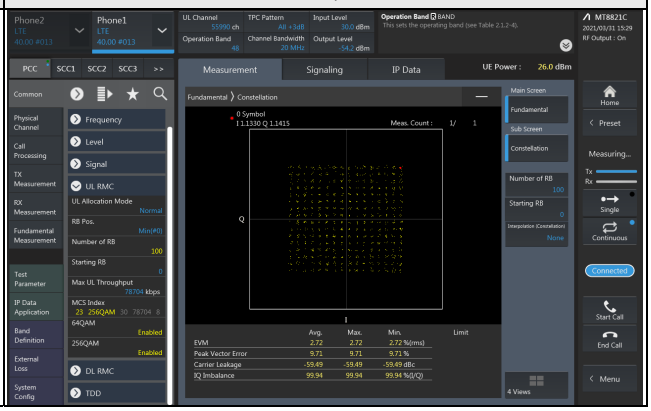
4.2.4 Deviation fromTest Standard

No deviation.

4.2.5 EUT Operating Conditions

Connect the EUT to Communication Simulator via the antenna connector, The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

4.2.6 Test Results

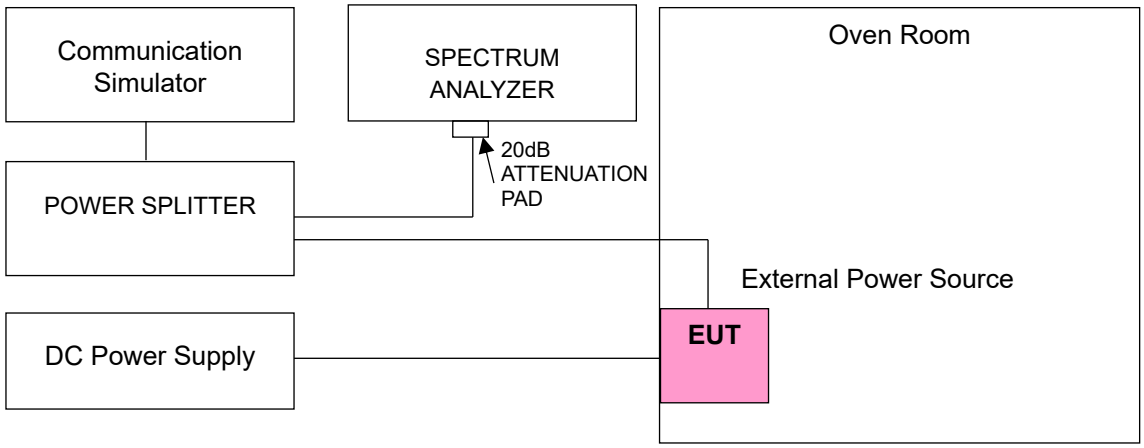
Spectrum Plot of Measurement Value	
Channel: 55990 / Frequency (MHz): 3625.0MHz	
QPSK	16QAM
	
64QAM	256QAM
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stabiliity Measurement

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

4.3.2 Test Setup



4.3.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Radio Communication Analyzer Anritsu	MT8820C	6201010284	Dec. 28, 2020	Dec. 27, 2021
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Dec. 24, 2020	Dec. 23, 2021
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2020	Jun. 22, 2021
DC Power Supply Topward	6306A	727263	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.

4.3.4 Test Procedure

a. 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.

b. 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.

c. 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.

4.3.5 Test Results

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 48, Channel Bandwidth: 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.74	3652.500001	0.000	3697.500005	0.001
6.58	3652.500005	0.001	3697.500005	0.001
8.90	3652.500003	0.001	3697.500003	0.001

Note: The applicant defined the normal working voltage is from 6.58Vdc to 8.90Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 48, Channel Bandwidth: 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3652.500001	0.000	3697.500005	0.001
-20	3652.500002	0.001	3697.500001	0.000
-10	3652.500005	0.001	3697.500002	0.001
0	3652.500003	0.001	3697.500003	0.001
10	3652.500005	0.001	3697.500004	0.001
20	3652.499999	0.000	3697.499998	-0.001
30	3652.499995	-0.001	3697.499999	0.000
40	3652.499995	-0.001	3697.499996	-0.001
50	3652.499997	-0.001	3697.499997	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 48, Channel Bandwidth: 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.74	3555.000004	0.001	3695.000002	0.001
6.58	3555.000002	0.001	3695.000003	0.001
8.90	3555.000005	0.001	3695.000004	0.001

Note: The applicant defined the normal working voltage is from 6.58Vdc to 8.90Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 48, Channel Bandwidth: 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3555.000002	0.001	3695.000002	0.001
-20	3555.000002	0.001	3695.000005	0.001
-10	3555.000001	0.000	3695.000002	0.001
0	3555.000004	0.001	3695.000003	0.001
10	3555.000004	0.001	3695.000003	0.001
20	3554.999995	-0.001	3694.999997	-0.001
30	3554.999999	0.000	3694.999995	-0.001
40	3554.999998	-0.001	3694.999997	-0.001
50	3554.999999	0.000	3694.999997	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 48, Channel Bandwidth: 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.74	3557.500002	0.001	3692.500001	0.000
6.58	3557.500001	0.000	3692.500003	0.001
8.90	3557.500003	0.001	3692.500002	0.001

Note: The applicant defined the normal working voltage is from 6.58Vdc to 8.90Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 48, Channel Bandwidth: 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3557.500003	0.001	3692.500004	0.001
-20	3557.500002	0.001	3692.500003	0.001
-10	3557.500001	0.000	3692.500002	0.001
0	3557.500003	0.001	3692.500003	0.001
10	3557.500004	0.001	3692.500003	0.001
20	3557.499998	-0.001	3692.499998	-0.001
30	3557.499997	-0.001	3692.499997	-0.001
40	3557.499998	-0.001	3692.499999	0.000
50	3557.499998	-0.001	3692.499996	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 48, Channel Bandwidth: 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.74	3560.000002	0.001	3690.000005	0.001
6.58	3560.000002	0.001	3690.000005	0.001
8.90	3560.000004	0.001	3690.000003	0.001

Note: The applicant defined the normal working voltage is from 6.58Vdc to 8.90Vdc.

Frequency Error vs. Temperature

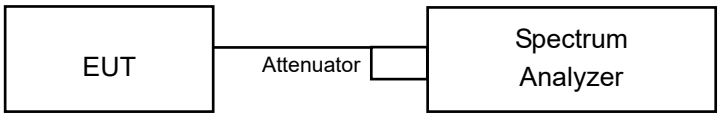
Temp. (℃)	LTE Band 48, Channel Bandwidth: 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3560.000005	0.001	3690.000005	0.001
-20	3560.000002	0.001	3690.000001	0.000
-10	3560.000003	0.001	3690.000004	0.001
0	3560.000004	0.001	3690.000003	0.001
10	3560.000003	0.001	3690.000004	0.001
20	3559.999998	-0.001	3689.999996	-0.001
30	3559.999996	-0.001	3689.999996	-0.001
40	3559.999997	-0.001	3689.999997	-0.001
50	3559.999997	-0.001	3689.999995	-0.001

4.4 Emission Bandwidth Measurement

4.4.1 Limits of Emission Bandwidth Measurement

Reference only

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.4.4 Test Procedure

Occupied Bandwdith & 26dBc Bandwidth

1. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
2. The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.
3. Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
   NOTE—Step 1), step 2), and step 3) may require iteration to adjust within the specified tolerances.
4. The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “−X dB” requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
5. Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
6. Determine the reference value by either of the following:
   a) Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
   b) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier.
7. Determine the “−X dB amplitude” as equal to (Reference Value − X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.

4.4.5 Deviation fromTest Standard

No deviation.

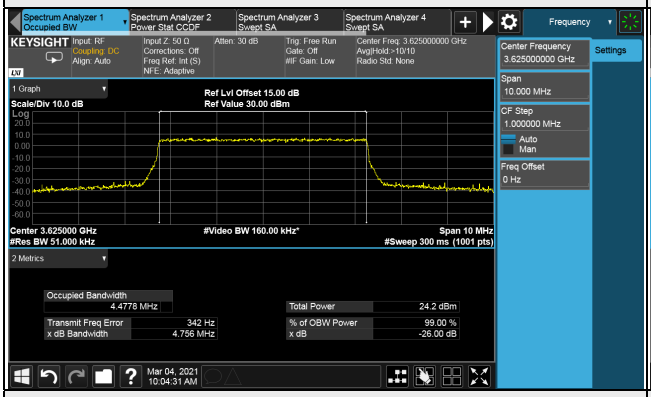
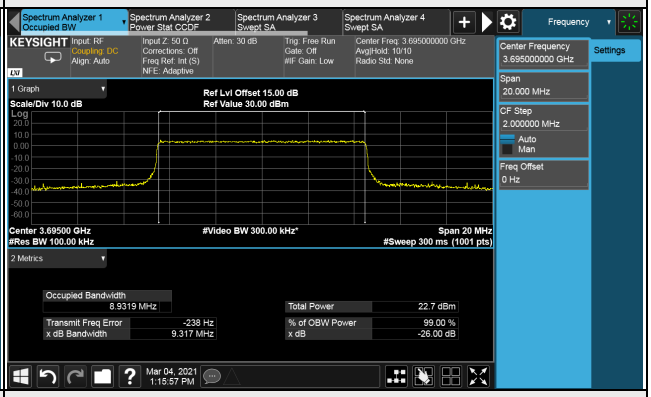
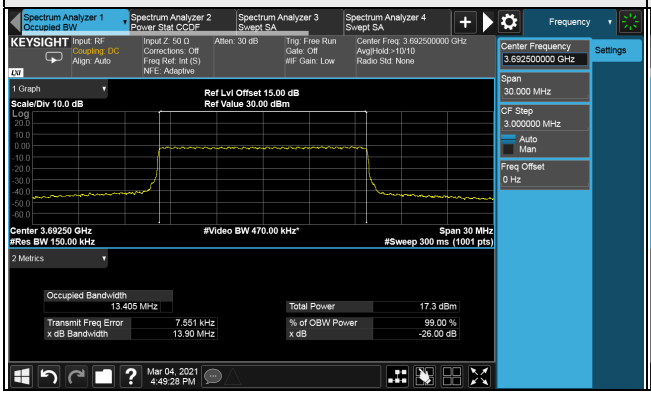
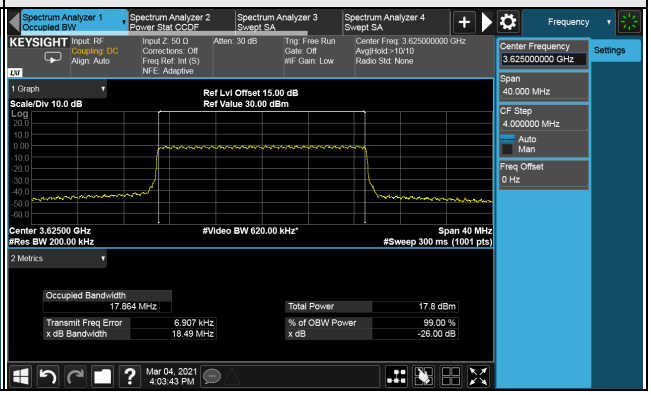
4.4.6 EUT Operating Conditions

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

4.4.7 Test Result

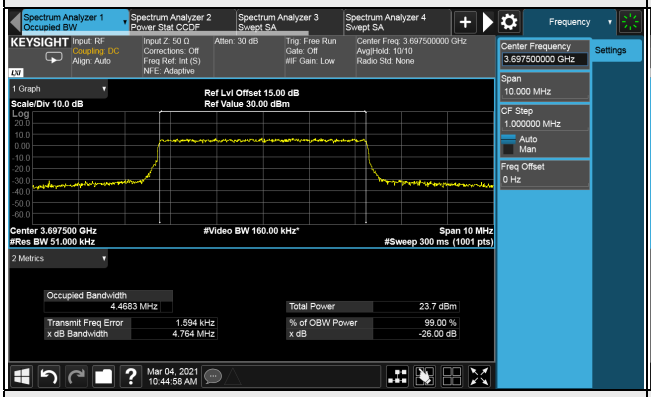
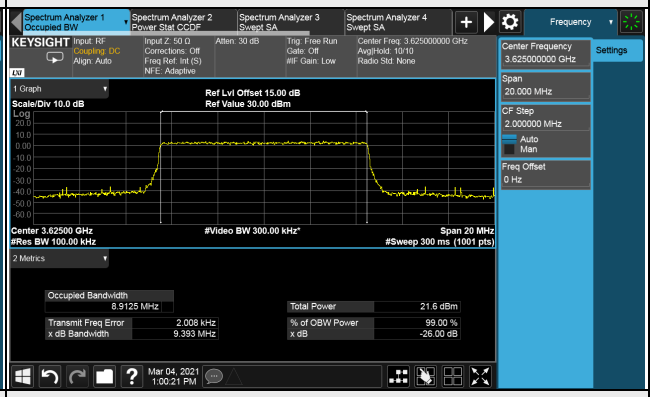
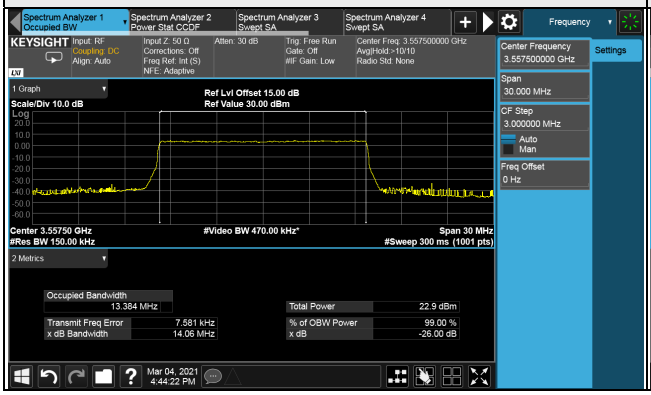
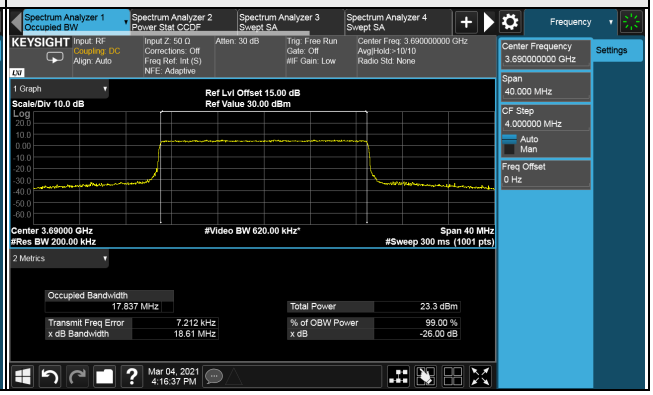
Occupied Bandwidth

LTE Band 48, Channel Bandwidth 5MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55265	3552.5	4.47	4.46	4.47	4.46
55990	3625.0	4.47	4.46	4.47	4.45
56715	3697.5	4.46	4.45	4.47	4.45
LTE Band 48, Channel Bandwidth 10MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55290	3555.0	8.91	8.92	8.92	8.90
55990	3625.0	8.92	8.91	8.91	8.91
56690	3695.0	8.92	8.93	8.92	8.92
LTE Band 48, Channel Bandwidth 15MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55315	3557.5	13.39	13.39	13.38	13.38
55990	3625.0	13.38	13.39	13.38	13.37
56665	3692.5	13.37	13.38	13.38	13.40
LTE Band 48, Channel Bandwidth 20MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55340	3560.0	17.82	17.83	17.83	17.83
55990	3625.0	17.83	17.84	17.83	17.86
56640	3690.0	17.83	17.83	17.84	17.85

Spectrum Plot of Worst Value	
5MHz / QPSK	10MHz / 16QAM
	
15MHz / 256QAM	20MHz / 256QAM
	

26dB Bandwidth

LTE Band 48, Channel Bandwidth 5MHz					
Channel	Frequency (MHz)	26dB Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55265	3552.5	4.75	4.75	4.71	4.71
55990	3625.0	4.75	4.75	4.70	4.70
56715	3697.5	4.76	4.73	4.70	4.69
LTE Band 48, Channel Bandwidth 10MHz					
Channel	Frequency (MHz)	26dB Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55290	3555.0	9.31	9.33	9.29	9.29
55990	3625.0	9.33	9.35	9.39	9.31
56690	3695.0	9.31	9.31	9.35	9.30
LTE Band 48, Channel Bandwidth 15MHz					
Channel	Frequency (MHz)	26dB Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55315	3557.5	13.96	14.02	14.06	13.91
55990	3625.0	13.98	13.93	13.86	13.91
56665	3692.5	13.86	13.91	14.05	13.90
LTE Band 48, Channel Bandwidth 20MHz					
Channel	Frequency (MHz)	26dB Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55340	3560.0	18.52	18.53	18.53	18.48
55990	3625.0	18.53	18.52	18.59	18.49
56640	3690.0	18.52	18.61	18.59	18.49

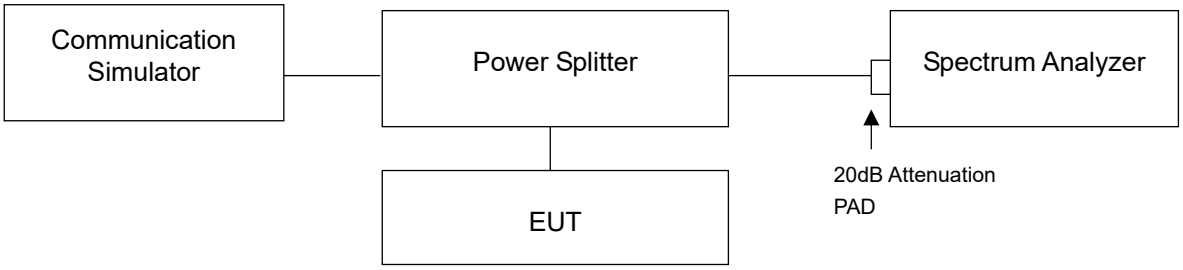
Spectrum Plot of Worst Value	
5MHz / QPSK	10MHz / 64QAM
	
15MHz / 64QAM	20MHz / 16QAM
	

4.5 Peak to Average Ratio Measurement

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 Instruments

Refer to section 4.4.3 to get information of above instrument.

4.5.4 Test Procedures

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

4.5.5 Deviation from Test Standard

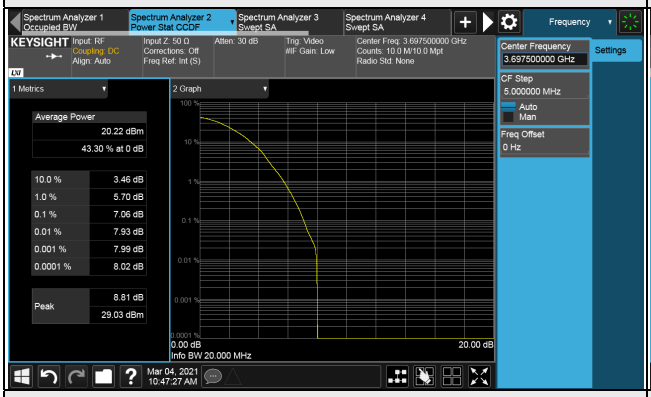
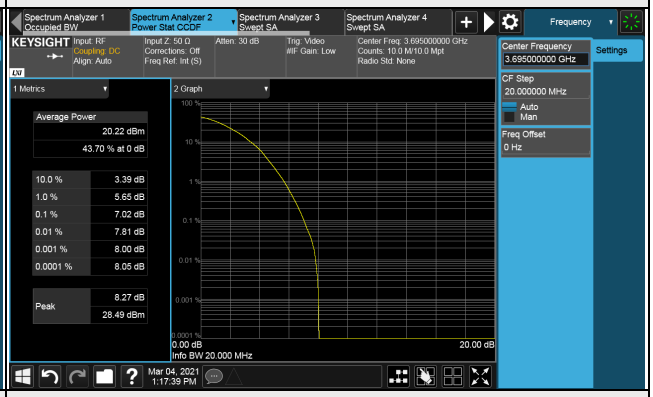
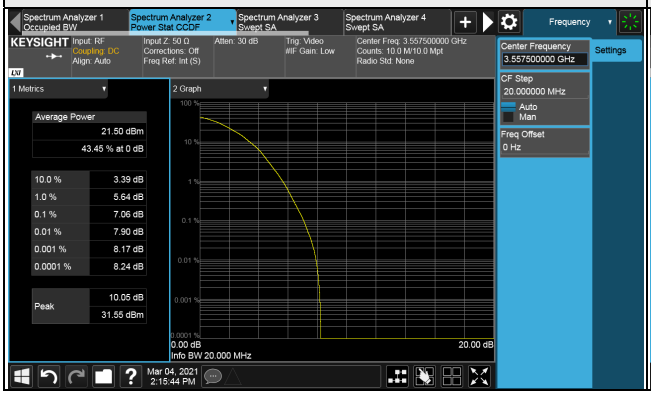
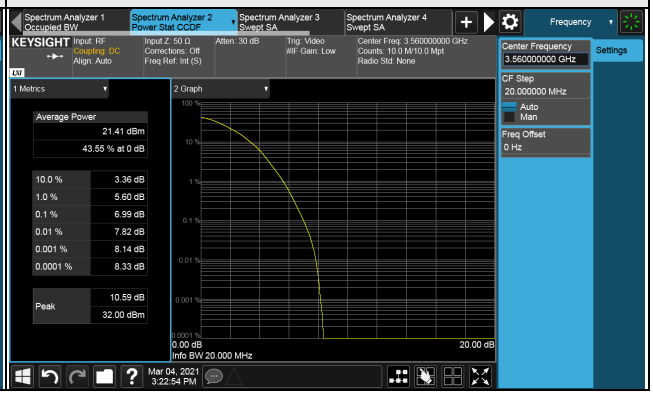
No deviation.

4.5.6 EUT Operating Conditions

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

4.5.7 Test Results

LTE Band 48, Channel Bandwidth 5MHz					
Channel	Frequency (MHz)	Peak To Average Ratio (dB)			
		QPSK	16QAM	64QAM	256QAM
55265	3552.5	5.77	6.49	6.74	6.96
55990	3625.0	5.58	6.58	7.00	6.90
56715	3697.5	5.15	6.05	7.06	6.82
LTE Band 48, Channel Bandwidth 10MHz					
Channel	Frequency (MHz)	Peak To Average Ratio (dB)			
		QPSK	16QAM	64QAM	256QAM
55290	3555.0	5.54	6.57	6.95	6.90
55990	3625.0	5.50	6.23	6.97	6.82
56690	3695.0	5.30	6.15	7.02	6.92
LTE Band 48, Channel Bandwidth 15MHz					
Channel	Frequency (MHz)	Peak To Average Ratio (dB)			
		QPSK	16QAM	64QAM	256QAM
55315	3557.5	5.76	6.62	7.06	6.96
55990	3625.0	5.53	6.49	6.95	6.93
56665	3692.5	5.42	6.18	6.98	6.92
LTE Band 48, Channel Bandwidth 20MHz					
Channel	Frequency (MHz)	Peak To Average Ratio (dB)			
		QPSK	16QAM	64QAM	256QAM
55340	3560.0	5.65	6.42	6.99	6.97
55990	3625.0	5.42	6.28	6.82	6.69
56640	3690.0	5.39	6.24	6.91	6.97

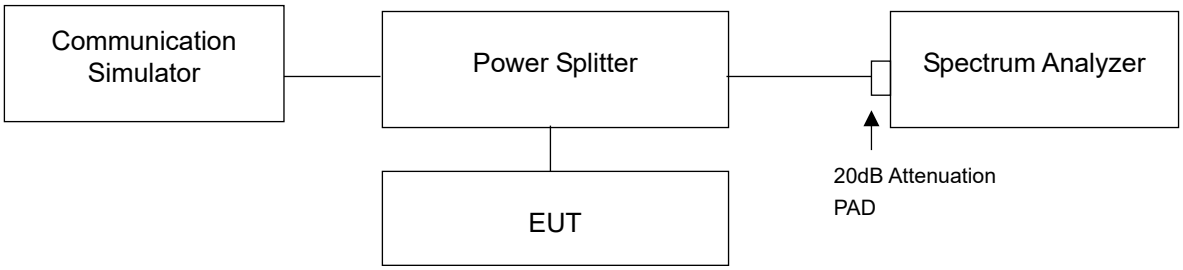
Spectrum Plot of Worst Value	
5MHz / 64QAM	10MHz / 64QAM
	
15MHz / 64QAM	20MHz / 64QAM
	

4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

Power of any emissions outside the Fundamental	Limit
Within 0-10MHz above the Assigned Channel	-13 dBm/MHz
Within 0-10MHz below the Assigned Channel	
Greater than 10MHz above the Assigned Channel	-25 dBm/MHz
Greater than 10MHz below the Assigned Channel	
Power of any emission below 3530MHz	-40 dBm/MHz
Power of any emission above 3720MHz	

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.4.3 to get information of above instrument.

4.6.4 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range are from 9 kHz to 40GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.
c. Measuring frequency band edge, 20dB attenuation pad is connected with spectrum. 1% of the fundamental emission bandwidth is used for conducted emission measurement.
d. For 5 MHz and 10 MHz channel BW mode, extend the 1% range from 1M to 2M above and below the channel edge and then reduce the limit further by 10 log (1000/100)=10dB (i.e. total -13 + -10=-23dB) to compensate for the integration from 100k to 1M.

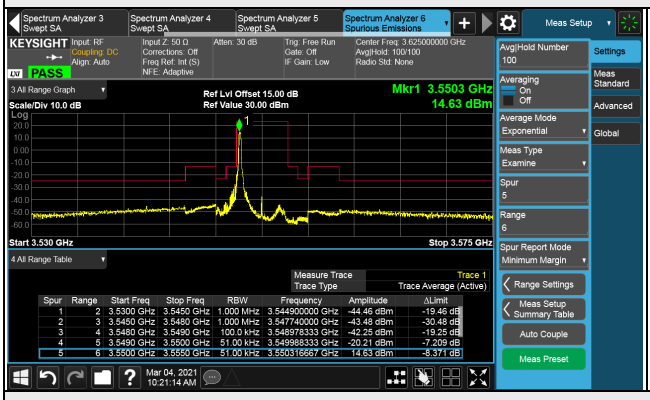
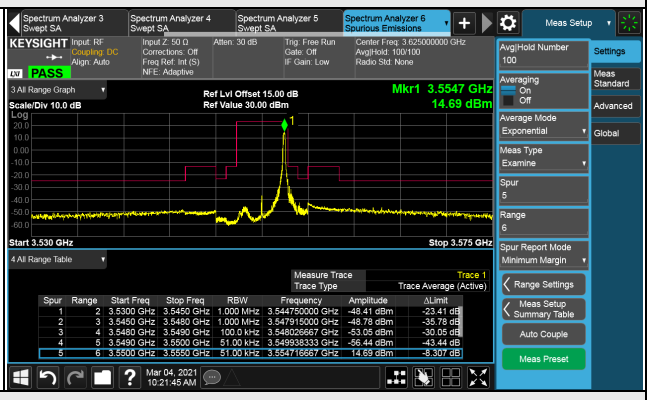
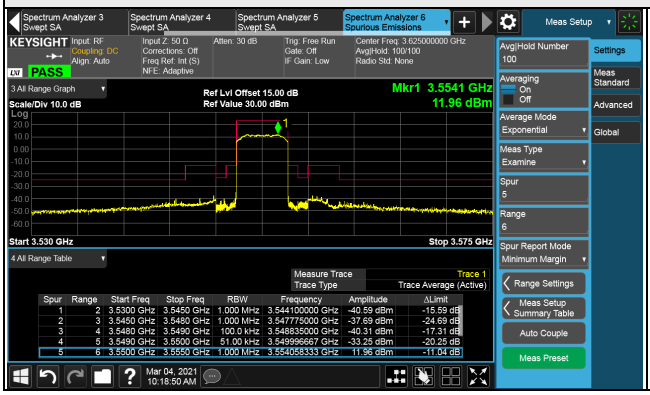
4.6.5 Deviation fromTest Standard

No deviation.

4.6.6 EUT Operating Conditions

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

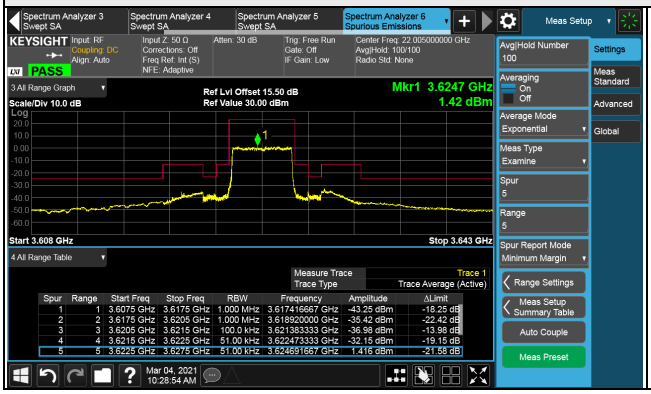
4.6.7 Test Results

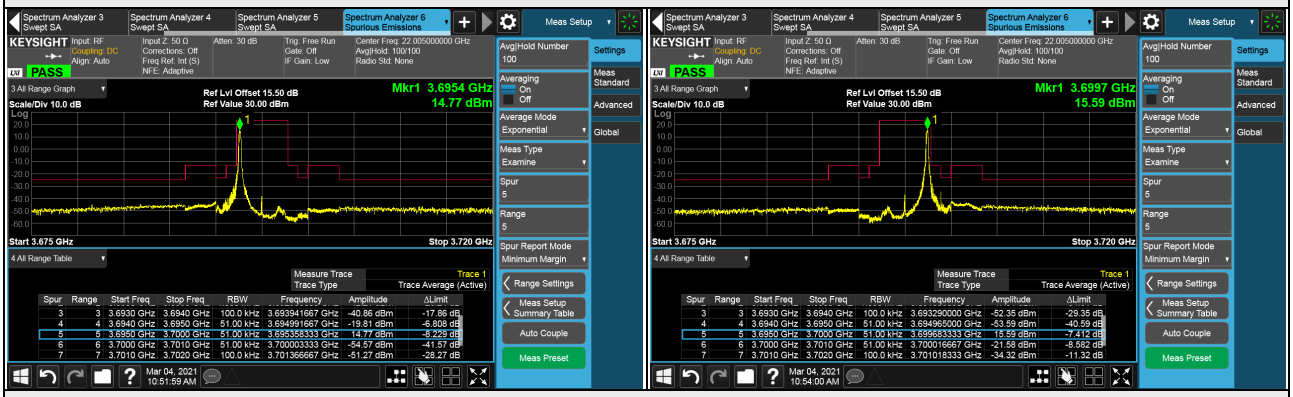
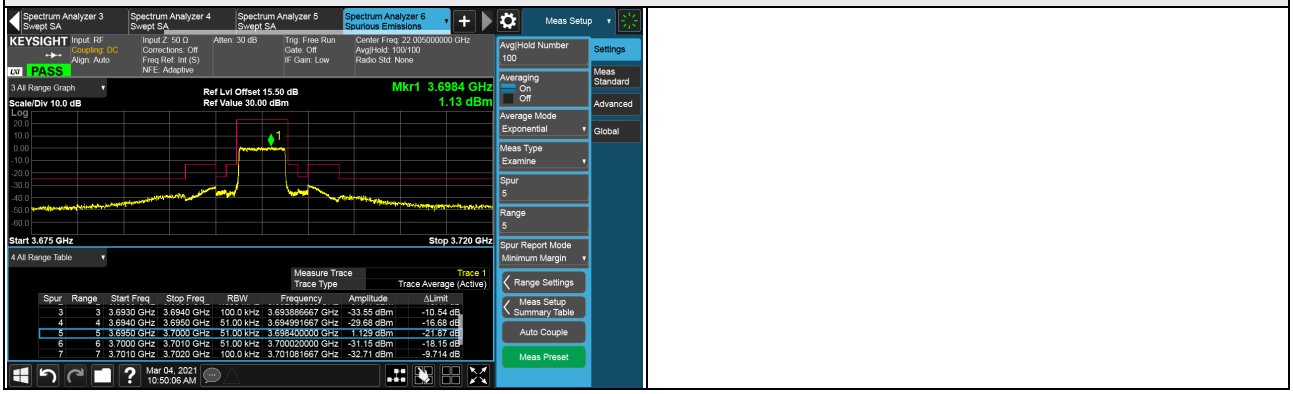
LTE Band 48, Channel Bandwidth 5MHz
Channel 55265 (3552.5MHz)
1RB
 
Full RB


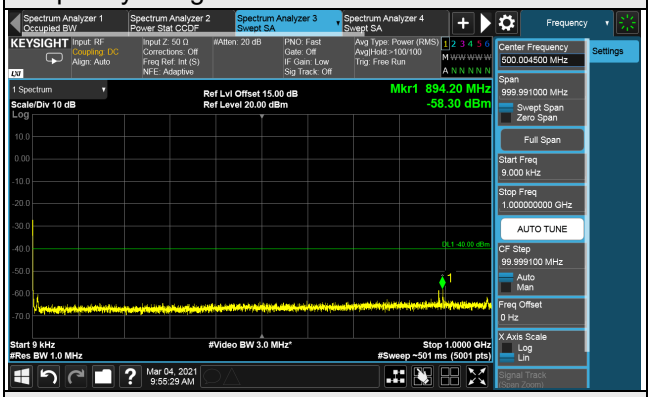
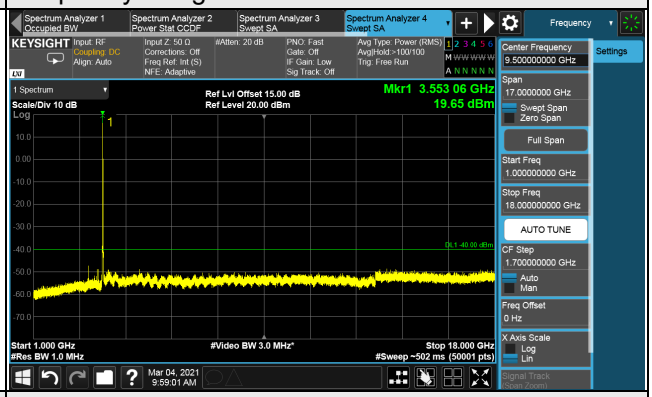
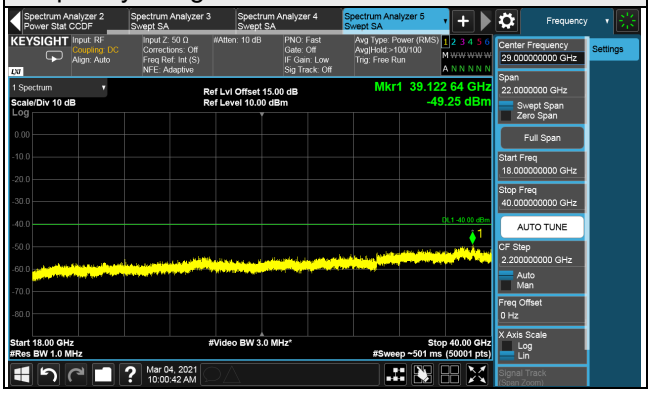
Channel 55990 (3625.0MHz)

1RB

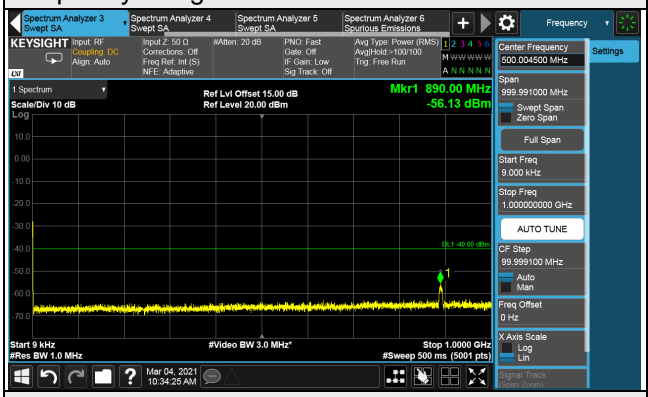
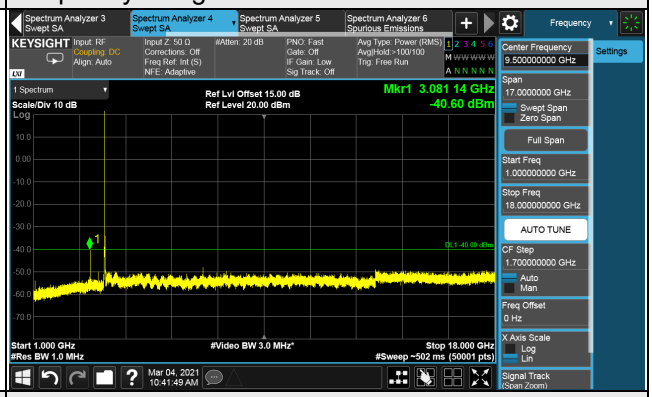
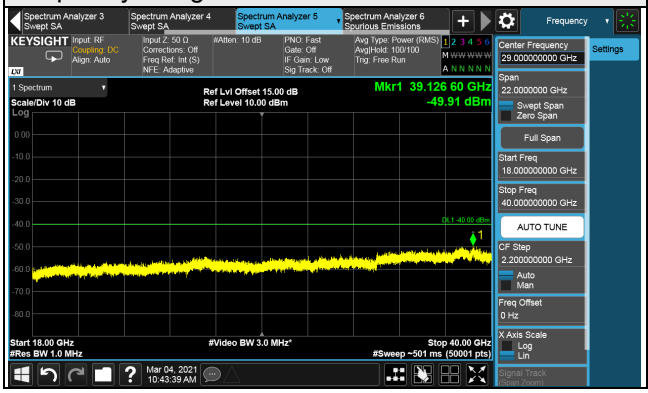
Full RB



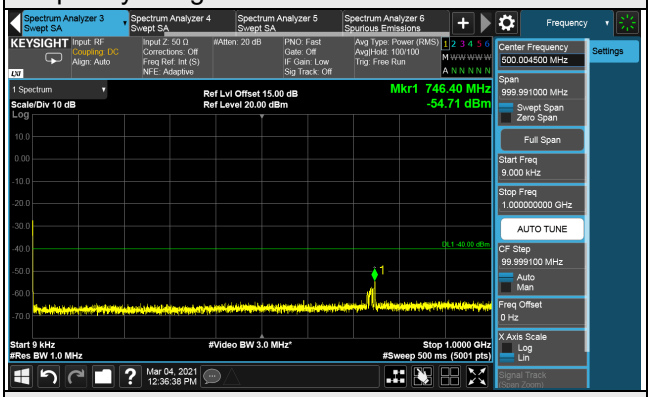
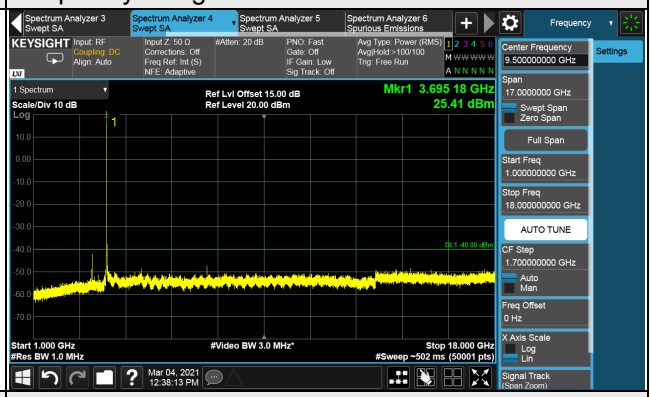
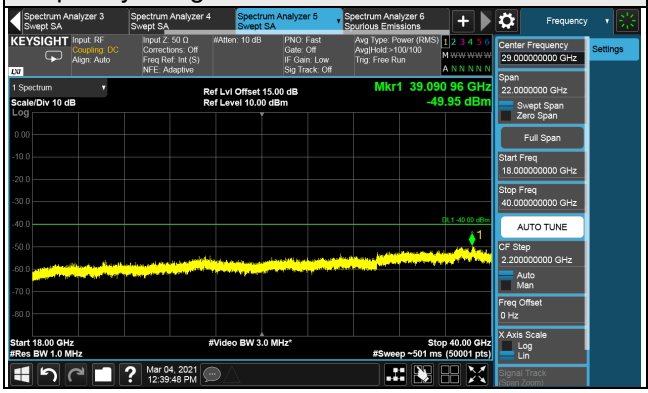
Channel 56715 (3697.5MHz)
1RB

Full RB


LTE Band 48, Channel Bandwidth 5MHz	
Channel 55265 (3552.5MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 18GHz
	
Frequency Range : 18GHz ~ 40GHz	
	

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

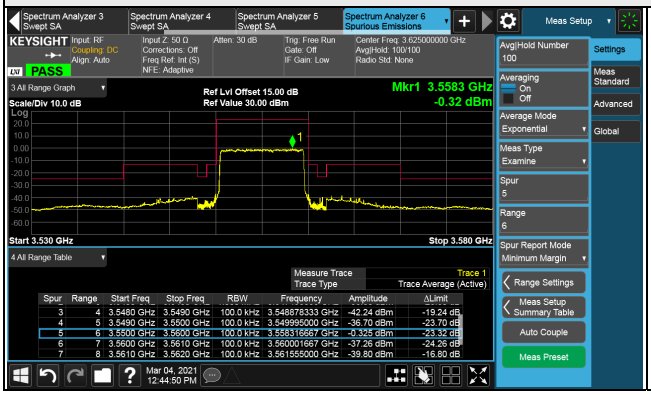
LTE Band 48, Channel Bandwidth 5MHz	
Channel 55990 (3625.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 18GHz
	
Frequency Range : 18GHz ~ 40GHz	
	

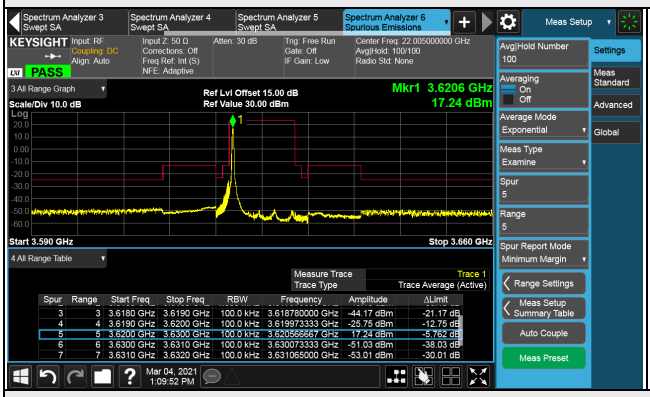
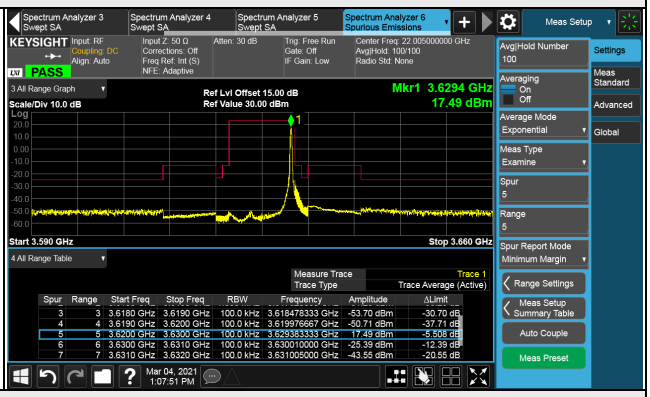
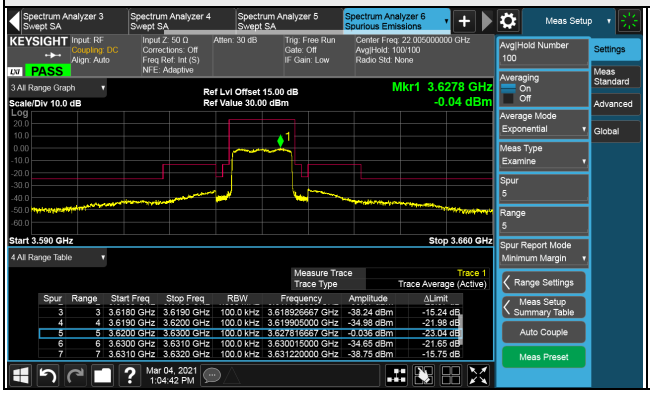
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 5MHz	
Channel 56715 (3697.50MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 18GHz
	
Frequency Range : 18GHz ~ 40GHz	
	

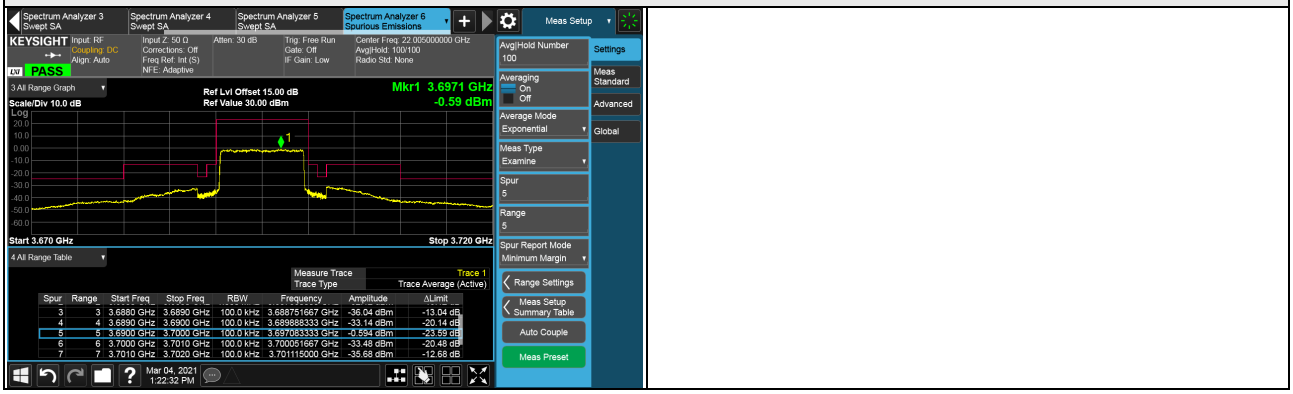
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

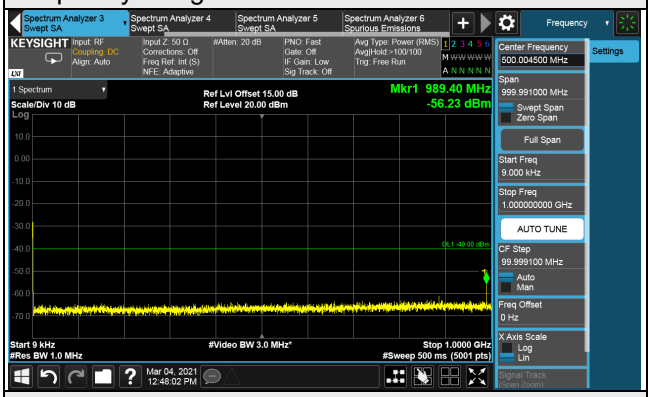
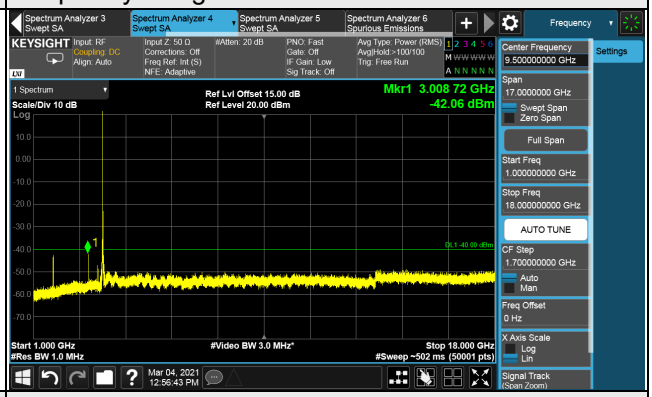
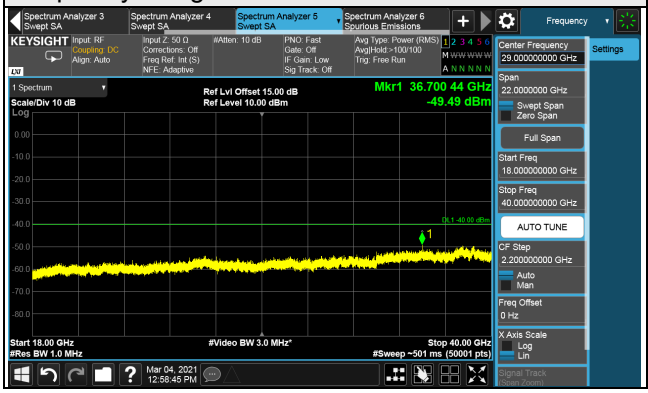
LTE Band 48, Channel Bandwidth 10MHz
Channel 55290 (3555.0MHz)
1RB

Full RB


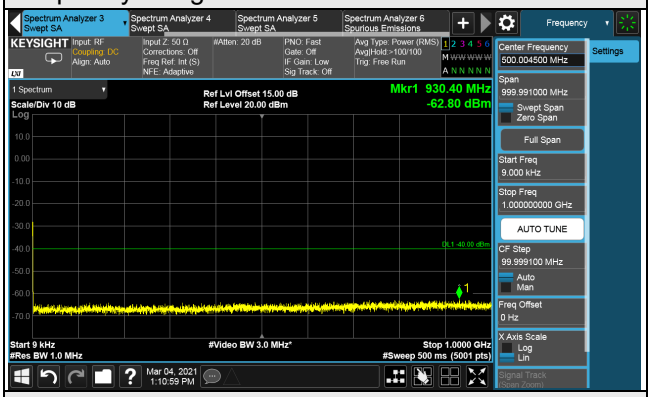
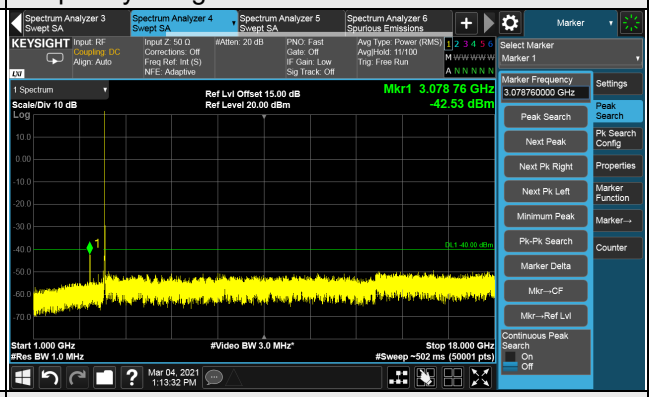
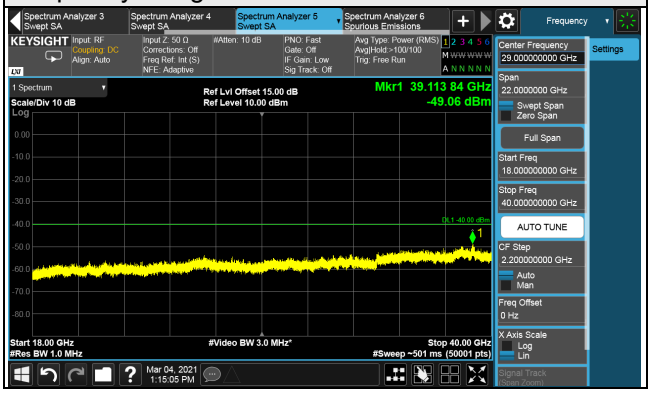
Channel 55990 (3625.00MHz)	
1RB	
	
Full RB	
	

Channel 56690 (3695.0MHz)
1RB

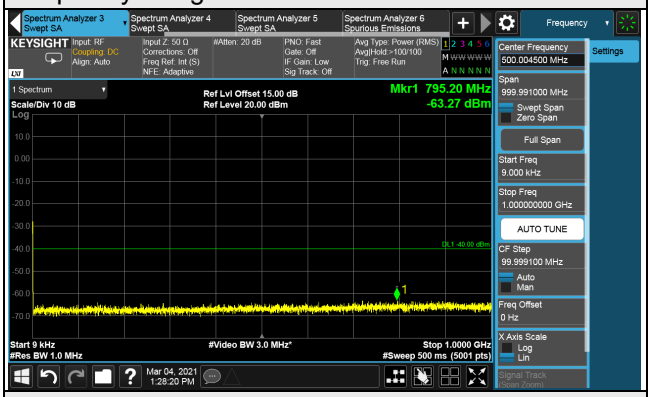
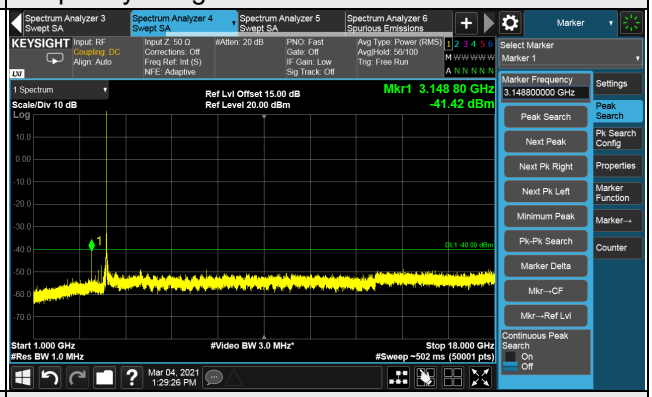
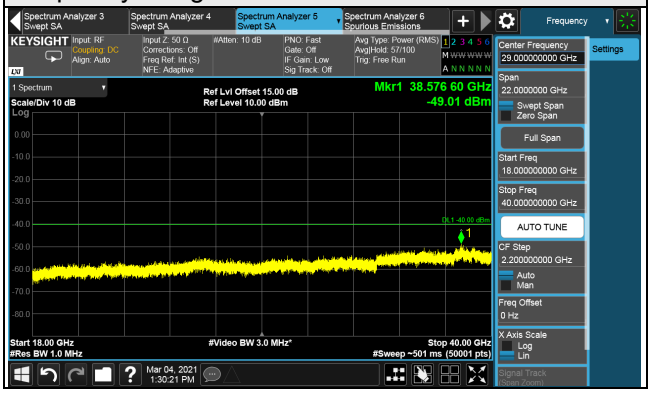
Full RB


LTE Band 48, Channel Bandwidth 10MHz	
Channel 55290 (3555.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 18GHz
	
Frequency Range : 18GHz ~ 40GHz	
	

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 10MHz	
Channel 55990 (3625.00MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 18GHz
	
Frequency Range : 18GHz ~ 40GHz	
	

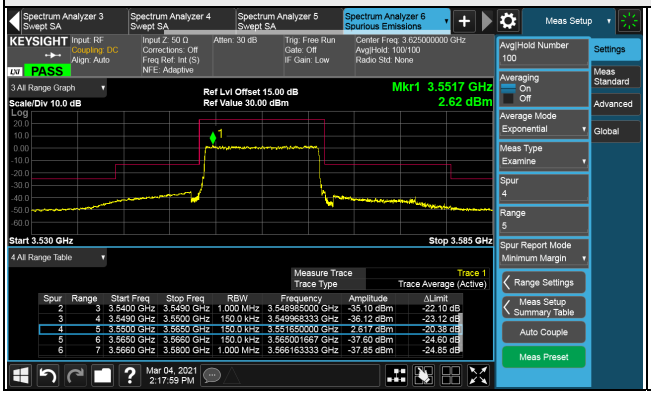
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

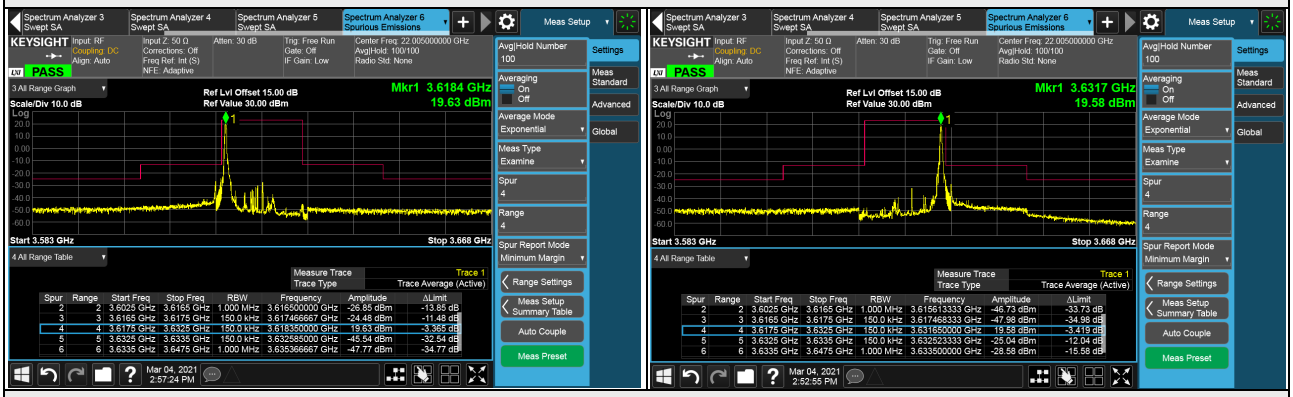
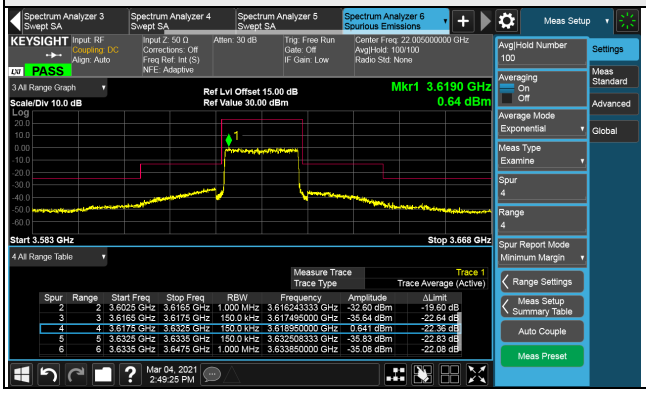
LTE Band 48, Channel Bandwidth 10MHz	
Channel 56690 (3695.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 18GHz
	
Frequency Range : 18GHz ~ 40GHz	
	

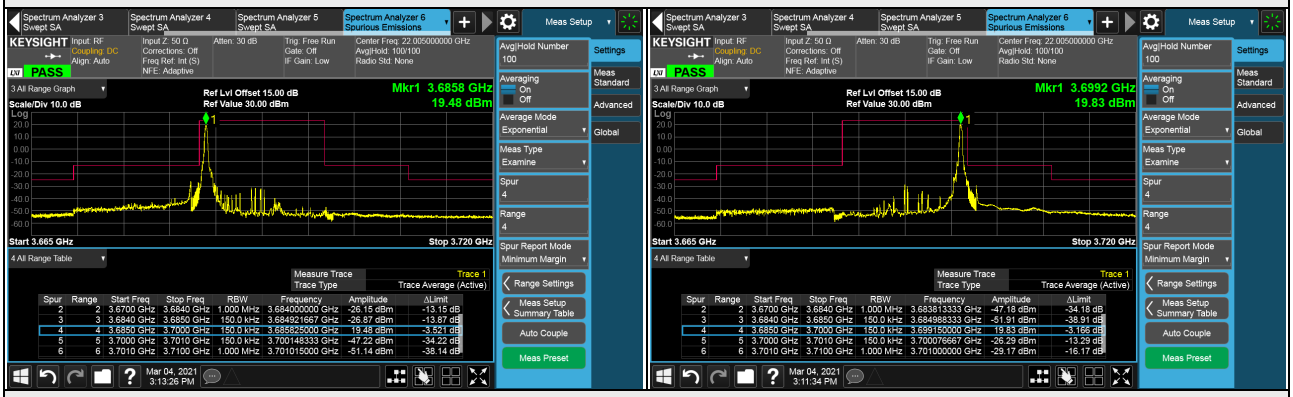
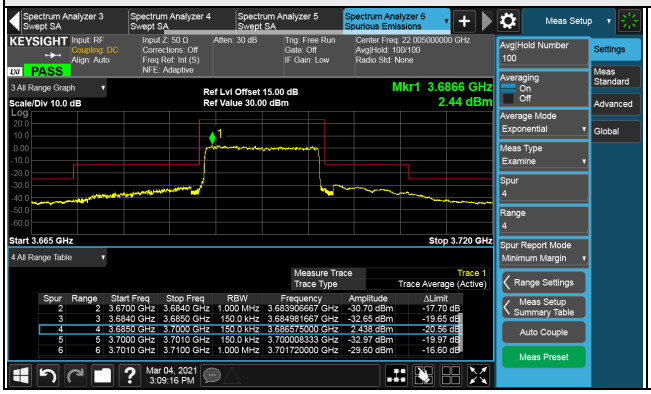
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

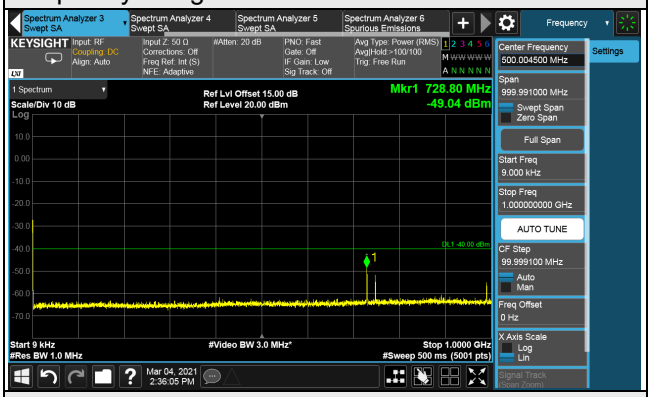
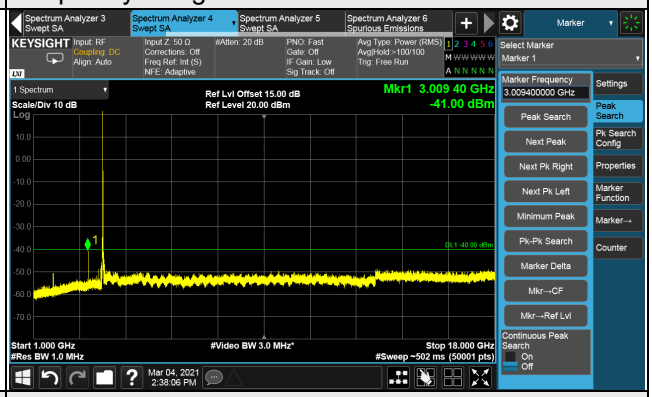
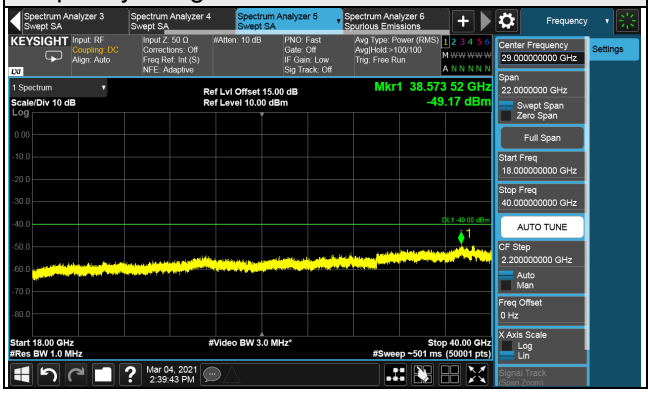
LTE Band 48, Channel Bandwidth 15MHz
Channel 55315 (3557.50MHz)
1RB

Full RB

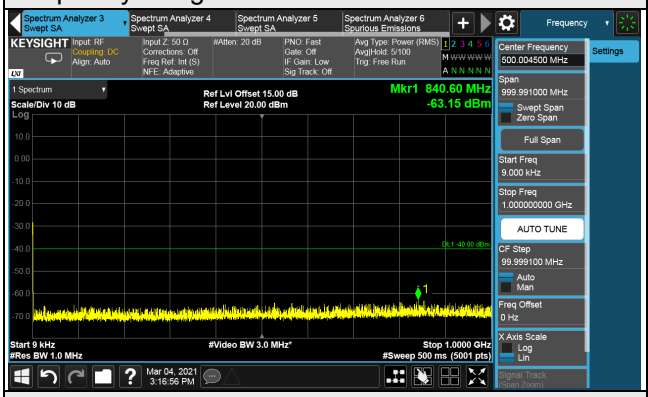
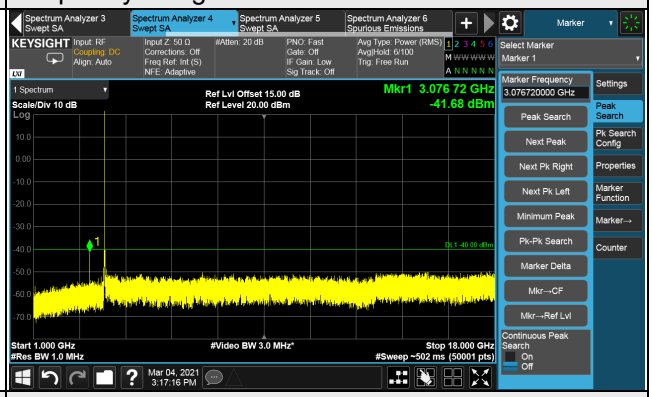
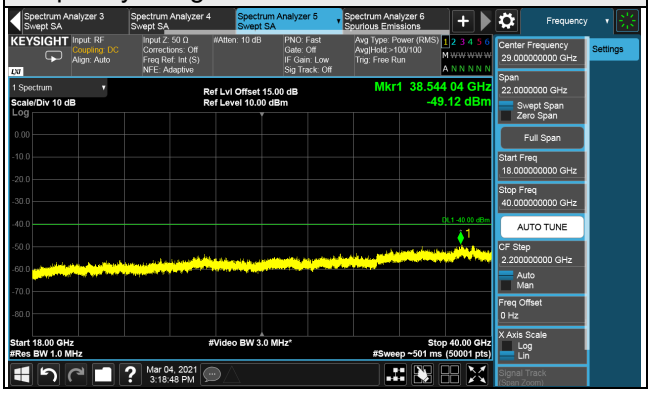


Channel 55990 (3625.0MHz)
1RB

Full RB


Channel 56665 (3692.5MHz)
1RB

Full RB


LTE Band 48, Channel Bandwidth 15MHz	
Channel 55315 (3557.50MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 18GHz
	
Frequency Range : 18GHz ~ 40GHz	
	

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 15MHz	
Channel 55990 (3625.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 18GHz
	
Frequency Range : 18GHz ~ 40GHz	
	

Note: The signal at 9 kHz is IF signal from spectrum analyzer.