TEST REPORT

Report Number. : 13259319-E10V3

Applicant	:	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	:	A2407, A2408, AND A2409
FCC ID	:	BCG-E3547A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC CFR47 22H, 27L, 27M, and 96

Date Of Issue:
SEPTEMBER 27, 2020

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

NVLAP Lab code: 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	9/17/2020	Initial Review	Mengistu Mekuria
V2	9/20/2020	Addressed TCB Question	Mengistu Mekuria
V3	9/27/2020	Addressed TCB Question	Sintia Andrean

TABLE OF CONTENTS

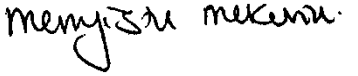
1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A2407, A2408, AND A2409
FCC ID	BCG-E3547A
EUT Description	SMARTPHONE
Serial Number	MODEL (A2407, A2408, A2409): C07029201GUPRW13 (Conducted) and G6TD203Y04HT (Radiated)
Date Tested	MAY 19, 2020 to SEPTEMBER 16, 2020
Applicable Standards	FCC CFR47 22H, 27L, 27M, and 96
Test Results	COMPLIES

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released By:	Prepared By:
	
Mengistu Mekuria Lead Test Engineer UL Verification Services Inc.	John Thompson Laboratory Engineer UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the following:

- ANSI C63.26:2015
- FCC CFR 47 Part 2, Part 22, Part 27 and Part 96
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01. Determining ERP and EIRP

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street	47658 Kato Road
☐ Chamber A	☐ Chamber D	☐ Chamber I
☒ Chamber B	☐ Chamber E	☐ Chamber J
☐ Chamber C	☐ Chamber F	☐ Chamber K
	☐ Chamber G	☐ Chamber L
	☐ Chamber H	☐ Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code: 2324A.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB
Occupied Channel Bandwidth	±0.39 %
Temperature	±0.9 °C
Supply voltages	±0.45 %
Time	±0.02 %

Uncertainty figures are valid to a confidence level of 95%.

4.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and WPT. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

5.2. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID BCG-E3545A and FCC ID BCG-E3546A to cover variant model FCC ID BCG-E3547A. The major difference between the parent/reference model and the variant model is the depopulation in the variant model of the mmWave transmitter. All other circuitry and features are identical. The data reuse test plan was approved via manufacturer KDB inquiry.

5.3. MODEL DIFFERENCES

The manufacturer hereby declares the following for models A2341, A2406, A2407, A2408 and A2409.

A2341, A2406, A2407, A2408 and A2409.are highly similar, with the only difference being the supported cellular bands.

They have the same PCB layout, design, common components, antennas, antenna locations and housing cases.

More specifically, their cellular modem, Wi-Fi, BT, NFC, WPT and UWB transmitters are identical, and removal of cellular bands is done by software and depopulation of band-specific components associated with the removed bands.

A2407, A2408 and A2409 are allocated for marketing and logistic purposes only. Spot check verification has been done on model A2407 in accordance with the test plan approved via KDB inquiry. Comparison of the models, upper deviation is within 3dB range and all tests are under FCC/ ISED Technical Limits. The test reports for model A2341 and model A2406 ANT2 RSE test results may be applied as representative to models A2407, A2408 and A2409.

5.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device model A2407, A2408, A2409, FCC ID: BCG-E3547A for antenna port power and radiated spurious emission tests in accordance with the Test Plan that was approved via KDB inquiry.

A2407, A2408, A2409 Spotcheck Results								
Technology	Worst Mode	Test Item	Channel	Measured Frequency MHz	Original Model: A2341 FCC ID: BCG-3545A	Sub Model: A2407, A2408, A2409 FCC ID: BCG-E3547A	Delta (dB)	Remarks
LTE5CA	QPSK @ 1-49RB&1-0RB	ERP	Mid	831.6/ 841.5	18.55	18.55	0.00	
	QPSK @ 1-49RB&1-0RB	RSE	Mid	3438.9	-52.34	-50.66	1.68	Noise Floor Level
LTE7CA	QPSK @ 1-99RB&1-0RB	EIRP	High	2540.2/ 2560	24.80	24.72	-0.08	
	QPSK @ 1-99RB&1-0RB	RSE	Mid	12272.9	-40.07	-41.67	-1.60	Noise Floor Level

5.5. REFERENCE DETAIL

Reference application that contains the reused reference data.

Equipment Class	Reference FCC ID	Reference Application	Report Title/Section
PCE, CBE	BCG-E3545A	13259315-E10	FCC LTE Carrier Aggregation Report / All Sections except Radiated spurious emission on Ant 2
	BCG-E3546A	13336566-E10	FCC LTE Carrier Aggregation Report Radiated spurious emission on Ant2

5.6. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 0.28.03-1.

5.7. MAXIMUM ANTENNA GAIN

Please see table below:

LTE Bands	Antenna Gain (dBi)						
	ANT 1	ANT 2	ANT 3	ANT 4	ANT 7	ANT 8	ANT 9
LTE Band 5, 824 – 849 MHz	-5.0	-5.5	NA	NA	NA	NA	NA
LTE Band 7, 2500 – 2570 MHz	-2.7	-0.3	-0.2	-2.1	NA	NA	NA
LTE Band 41, 2496 – 2690 MHz	-1.9	-0.3	-0.2	-1.7	NA	NA	NA
LTE Band 48, 3550 – 3700 MHz	NA	NA	NA	-3.3	-3	-4.8	-3.1

5.8. WORST-CASE CONFIGURATION AND MODE

The EUT supports LTE dual carrier Bands of: Band 5, Band 7, Band 41 and Band 48.

The worst-case scenario for all measurements is based on an engineering evaluation and QPSK was observed as the worst one and set for all conducted and radiated. Conducted tests were performed on the worst case antenna because it has the highest conducted power. ANT1 is the worst case for all bands except Band 48. For band 48 ANT7 is the worst case antenna.

The EUT was investigated in three orthogonal orientations X/Y/Z on all ANT 1, ANT2, ANT3, ANT4, ANT7, ANT8 and ANT 9 antennas to determine the worst case orientation. The following table exabit the worst case orientation for different frequency bands. The full tests of the EUT have made upon the orientations that shown in the table below.

Bands	ANT1	ANT2	ANT3	ANT4	ANT7	ANT8	ANT9
Cell (850MHz)	X	Y	N/A	N/A	N/A	N/A	N/A
Band 7, 41	Y	Y	X	X	N/A	N/A	N/A
Band 48	N/A	N/A	N/A	X	Y	X	X

For Band Edge and Emission Mask: The highest bandwidth combo was tested. The RB combinations were selected such that the signal is active closest to the band limit, as this is the worst case.

For Out of Band Emissions: The highest bandwidth combination was tested. The highest power RB combination was selected as worst case.

Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

For interband transmission of multiple channels in different antenna combination in Cellular bands, tests were conducted for various configurations having the highest power, least separation in frequencies and widest operation bandwidths. No noticeable new emission was found.

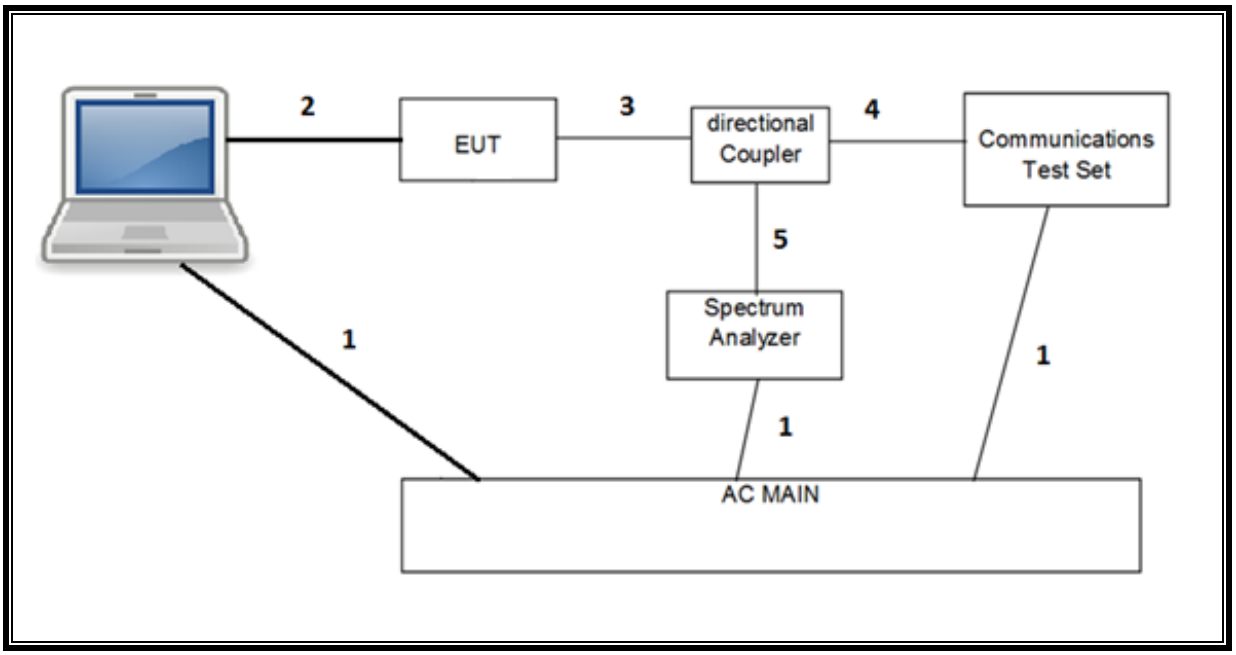
5.9. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT					
Description	**Manufacturer**	**Model**	**Serial Number**		**FCC ID/ DoC**
Laptop	Apple	A1398	C02PM012G3QD		QDS-BRCM1069
Laptop AC/DC adapter	Liteon Technology	PA-1450-BA1	B123		N/A

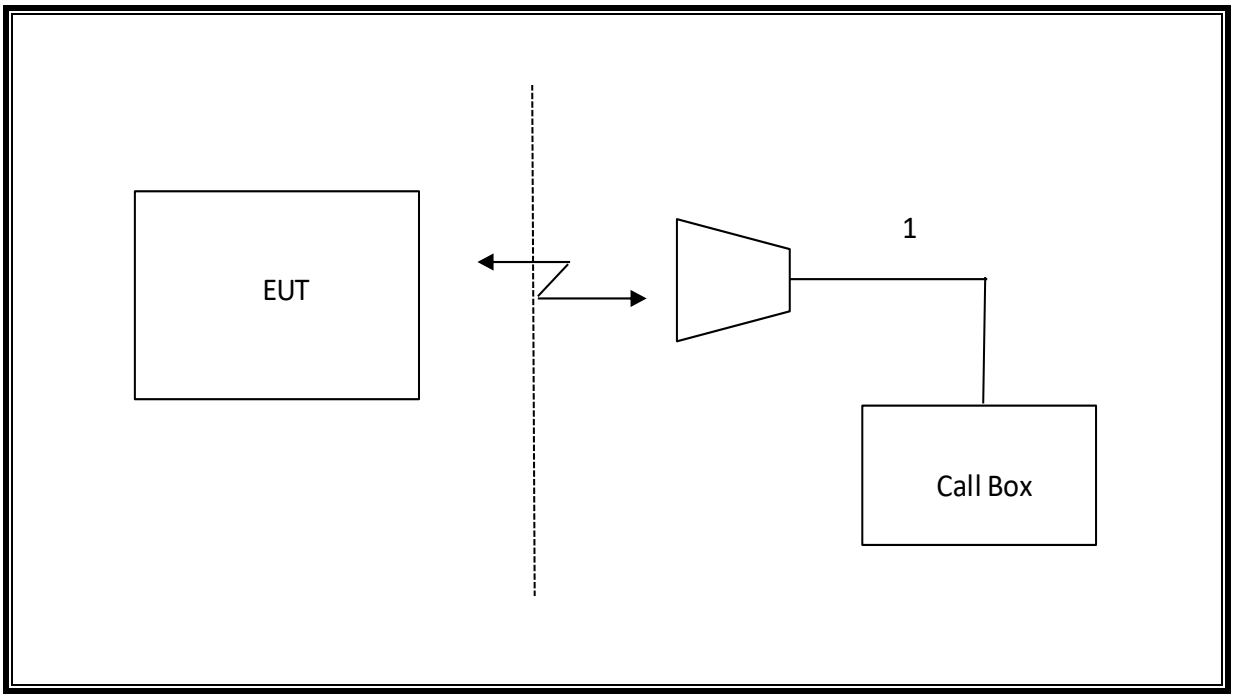
I/O CABLES (RF CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	3	US 115V	Un-shielded	2.0	N/A
2	USB	1	DC	Un-shielded	1.0	N/A
3	RF In/Out	1	EUT	Un-shielded	0.6	N/A
4	RF In/Out	1	Communication Test Set	Un-shielded	1.2	N/A
5	RF In/Out	1	Barrel	N/A	N/A	N/A

I/O CABLES (RF RADIATED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	RF In/Out	1	Antenna	Un-shielded	5.0	N/A

CONDUCTED SETUP



RADIATED SETUP



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Horn 1-18GHz	A.H. Systems, Inc.	SAS-571	T961	01/25/2021
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T136	07/07/2021
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T407	05/20/2021
Amplifier, 1 to 18GHz	MITEQ	AFS42-00101800-25-S-42	T931	05/11/2021
Amplifier, 1 to 18GHz	MITEQ	AFS42-00101800-25-S-42	T1165	08/10/2021
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0180176	07/14/2021
Filter, BRF 2495 to 2690MHz	MICRO-TRONICS	BRM50709-02	T1790	06/23/2021
Filter, BRF 1850 – 1910 MHz	Micro-Tronics	BRM50714-02	T1796	06/23/2021
Filter, BRF 824 – 848 MHz	Micro-Tronics	BRM20025	PRE0191180	06/23/2021
*Directional Coupler	KRYTAR	152610	T1161	08/14/2020
Spectrum Analyzer, PXA 3Hz to 44GHZ	Keysight	N9030A	T340	01/22/2021
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T907	01/22/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T260	02/19/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T959	02/19/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T1871	02/25/2021
Power Meter, P-series single channel	Keysight	N1912A	T1245	01/22/2021
Power Sensor	Keysight	N1921A	T1225	02/23/2021
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 7.6, November 11, 2017	
Power Measurement Software	UL	UL RF	Ver 2.7, 2019	
Radiated test software	UL	UL RF	Ver 9.5 June 15, 2019	

NOTES:

* Testing is completed before equipment expiration date.

7. SETUP PHOTOS

Please refer to 13259315-EP1 for setup photos

Appendix A – Reference Test Report 13259315-E10

Attached is the test report (13259315-E10) containing the reference data from the parent model as detailed in section 5.5.

TEST REPORT

Report Number : 13259315-E10V3

Applicant	:	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014
Model	:	A2341
FCC ID	:	BCG-E3545A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC CFR47 22H, 27L, 27M, and 96

Date Of Issue:
SEPTEMBER 25, 2020

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

NVLAP TESTING

NVLAP Lab code: 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	9/18/2020	Initial Review	Mengistu Mekuria
V2	9/19/2020	Addressed TCB Questions	Mengistu Mekuria
V3	9/25/2020	Addressed TCB Questions	Sintia Andrean

TABLE OF CONTENTS

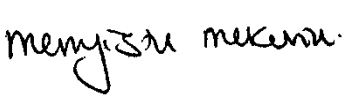
1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014
Model	A2341
FCC ID	BCG-E3545A
EUT Description	SMARTPHONE
Serial Number	MODEL(A2341) C07029200A0P55J5 & C07028700HJP55M5 (Conducted) and G6TD201H04PR (Radiated)
Date Tested	MAY 19, 2017 to SEPTEMBER 16, 2020
Applicable Standards	FCC CFR47 22H, 27L, 27M, and 96
Test Results	COMPLIES

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released By:	Prepared By:
	
Mengistu Mekuria Lead Test Engineer UL Verification Services Inc.	John Thompson Laboratory Engineer UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the following:

- ANSI C63.26:2015
- FCC CFR 47 Part 2, Part 22, Part 27 and Part 96
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01. Determining ERP and EIRP

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street	47658 Kato Road
☒ Chamber A	☐ Chamber D	☐ Chamber I
☒ Chamber B	☐ Chamber E	☐ Chamber J
☐ Chamber C	☐ Chamber F	☐ Chamber K
	☐ Chamber G	☐ Chamber L
	☐ Chamber H	☐ Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code: 2324A.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB
Occupied Channel Bandwidth	±0.39 %
Temperature	±0.9 °C
Supply voltages	±0.45 %
Time	±0.02 %

Uncertainty figures are valid to a confidence level of 95%.

4.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and WPT. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

5.2. MAXIMUM OUTPUT POWER

ERP/EIRP TEST PROCEDURE

ANSI C63.26:2015
KDB 971168 D01 Section 5.6

ERP/EIRP = PMeas + GT − LC
where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);
PMeas = measured transmitter output power or PSD, in dBm or dBW;
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted and ERP/EIRP output powers as follows:

OUTPUT POWER FOR LTE BAND 5

Part 22H	
ERP Limit (W)	7.00
Antenna Gain (dBi)	-5.00

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	ERP Average (dBm)	ERP Average (W)	99% BW (kHz)	Emission Designator
5+10	QPSK	826.5	844.0	25.70	18.55	0.072	13884	13M9G7W
	16QAM			24.80	17.65	0.058	13857	13M9D7W
10+5	QPSK	829.0	846.5	25.70	18.55	0.072	13863	13M9G7W
	16QAM			24.70	17.55	0.057	13822	13M8D7W
10+10	QPSK	829.0	844.0	25.70	18.55	0.072	18727	18M7G7W
	16QAM			24.70	17.55	0.057	18743	18M7D7W

OUTPUT POWER FOR LTE BAND 7

Part 27 / RSS 199	
EIRP Limit (W)	2.00
Antenna Gain (dBi)	-0.20

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
10+20	QPSK	2505.5	2560.0	25.00	24.80	0.302	28021	28M0G7W
	16QAM			23.94	23.74	0.237	28059	28M1D7W
20+10	QPSK	2510.0	2564.5	25.00	24.80	0.302	28051	28M1G7W
	16QAM			24.09	23.89	0.245	28150	28M2D7W
15+15	QPSK	2507.5	2562.5	25.00	24.80	0.302	28710	28M7G7W
	16QAM			24.14	23.94	0.248	28608	28M6D7W
15+20	QPSK	2507.8	2560.0	25.00	24.80	0.302	32858	32M9G7W
	16QAM			24.00	23.80	0.240	32802	32M8D7W
20+15	QPSK	2510.0	2562.2	25.00	24.80	0.302	32979	33M0G7W
	16QAM			24.09	23.89	0.245	32866	32M9D7W
20+20	QPSK	2510.0	2560.0	25.00	24.80	0.302	37667	37M7G7W
	16QAM			24.05	23.85	0.243	37702	37M7D7W

OUTPUT POWER FOR LTE BAND 41

Part 27	
EIRP Limit (W)	2.00
Antenna Gain (dBi)	-0.20

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
5+20	QPSK	2499.3	2680.0	26.00	25.80	0.380	23267	23M3G7W
	16QAM			25.10	24.90	0.309	23199	23M2D7W
20+5	QPSK	2506.0	2686.7	26.00	25.80	0.380	23259	23M3G7W
	16QAM			25.48	25.28	0.337	23233	23M2D7W
10+20	QPSK	2501.5	2680.0	26.00	25.80	0.380	27978	28M0G7W
	16QAM			25.01	24.81	0.303	27901	27M9D7W
20+10	QPSK	2506.0	2684.5	26.00	25.80	0.380	28086	28M1G7W
	16QAM			25.45	25.25	0.335	28023	28M0D7W
15+15	QPSK	2503.5	2682.5	26.00	25.80	0.380	28618	28M6G7W
	16QAM			24.64	24.44	0.278	28590	28M6D7W
15+20	QPSK	2503.8	2680.0	26.00	25.80	0.380	32817	32M8G7W
	16QAM			25.13	24.93	0.311	32787	32M8D7W
20+15	QPSK	2506.0	2682.2	26.00	25.80	0.380	32845	32M8G7W
	16QAM			24.82	24.62	0.290	32924	32M9D7W
20+20	QPSK	2506.0	2680.0	26.00	25.80	0.380	37610	37M6G7W
	16QAM			24.94	24.74	0.298	37561	37M6D7W

OUTPUT POWER FOR LTE BAND 48

Part 96	
EIRP Limit (W)/ 10MHz	0.20
Antenna Gain (dBi)	-3.00

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
5+20	QPSK	3553.3	3690.0	23.10	20.10	0.102	23332	23M3G7W
	16QAM			23.05	20.05	0.101	23301	23M3D7W
20+5	QPSK	3560.0	3696.7	23.10	20.10	0.102	23388	23M4G7W
	16QAM			22.98	19.98	0.100	23363	23M4D7W
10+20	QPSK	3555.5	3690.0	23.60	20.60	0.115	28028	28M0G7W
	16QAM			23.51	20.51	0.112	27977	28M0D7W
20+10	QPSK	3560.0	3694.5	23.60	20.60	0.115	28052	28M1G7W
	16QAM			23.50	20.50	0.112	28004	28M0D7W
15+20	QPSK	3557.8	3690.0	24.10	21.10	0.129	33928	33M9G7W
	16QAM			23.90	20.90	0.123	32845	32M8D7W
20+15	QPSK	3560.0	3692.2	24.10	21.10	0.129	32834	32M8G7W
	16QAM			24.09	21.09	0.128	32912	32M9D7W
20+20	QPSK	3560.0	3690.0	24.10	21.10	0.129	37730	37M7G7W
	16QAM			24.09	21.09	0.129	37793	37M8D7W

5.3. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 0.28.03-1.

5.4. MAXIMUM ANTENNA GAIN

Please see table below:

LTE Bands	Antenna Gain (dBi)						
	ANT 1	ANT 2	ANT 3	ANT 4	ANT 7	ANT 8	ANT 9
LTE Band 5, 824 – 849 MHz	-5.0	-6.4	NA	NA	NA	NA	NA
LTE Band 7, 2500 – 2570 MHz	-2.7	-0.6	-0.2	-2.1	NA	NA	NA
LTE Band 41, 2496 – 2690 MHz	-1.9	-0.6	-0.2	-1.7	NA	NA	NA
LTE Band 48, 3550 – 3700 MHz	NA	NA	NA	-3.3	-3	-4.8	-3.1

5.5. WORST-CASE CONFIGURATION AND MODE

The EUT supports LTE dual carrier Bands of: Band 5, Band 7, Band 41 and Band 48.

The worst-case scenario for all measurements is based on an engineering evaluation and QPSK was observed as the worst one and set for all conducted and radiated. Output power measurements were measured on QPSK, 16QAM, 64QAM, and 256QAM modulations. For testing purposes emissions on sections 8 and 9 were measured while QPSK was set at or above target power for all bands. Conducted tests were performed on the worst case antenna because it has the highest conducted power. ANT1 is the worst case for all bands except Band 48. For band 48 ANT7 is the worst case antenna.

The EUT was investigated in three orthogonal orientations X/Y/Z on all ANT 1, ANT2, ANT3, ANT4, ANT7, ANT8 and ANT 9 antennas to determine the worst case orientation. The following table exabit the worst case orientation for different frequency bands. The full tests of the EUT have made upon the orientations that shown in the table below.

Bands	ANT1	ANT2	ANT3	ANT4	ANT7	ANT8	ANT9
Cell (850MHz)	X	X	N/A	N/A	N/A	N/A	N/A
Band 7, 41	Y	Z	X	X	N/A	N/A	N/A
Band 48	N/A	N/A	N/A	X	Y	X	X

For Band Edge and Emission Mask: The highest bandwidth combo was tested. The RB combinations were selected such that the signal is active closest to the band limit, as this is the worst case.

For Out of Band Emissions: The highest bandwidth combination was tested. The highest power RB combination was selected as worst case.

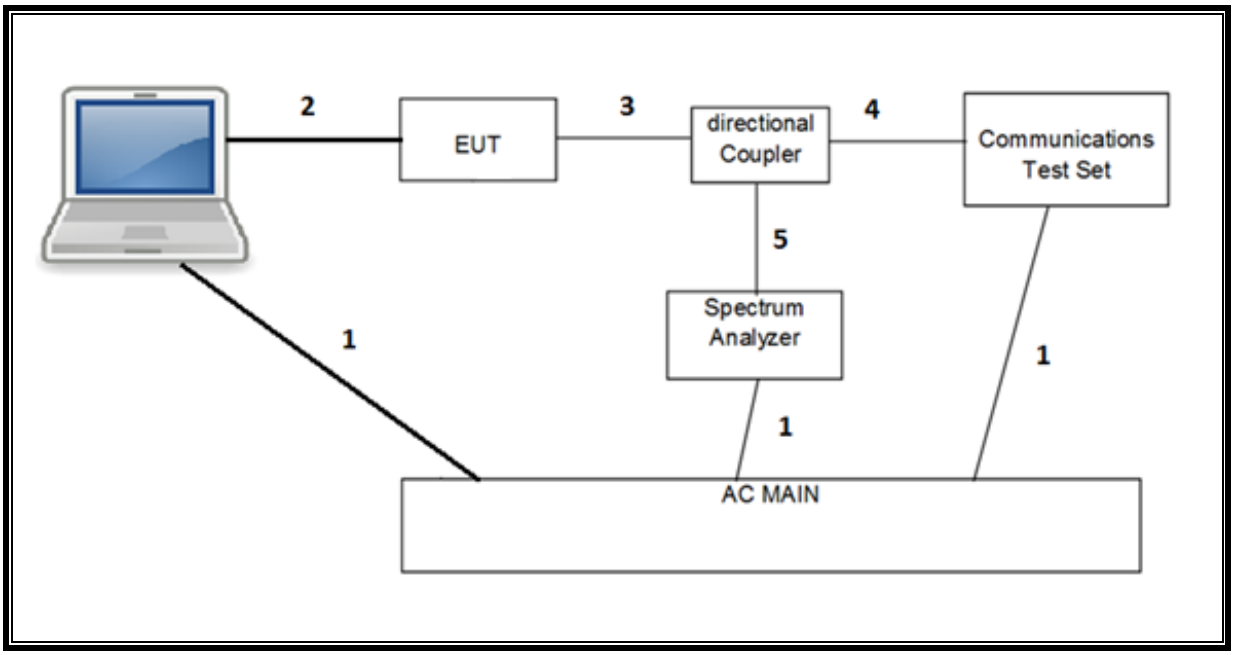
Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

For interband transmission of multiple channels in different antenna combination in Cellular bands, tests were conducted for various configurations having the highest power, least separation in frequencies and widest operation bandwidths. No noticeable new emission was found.

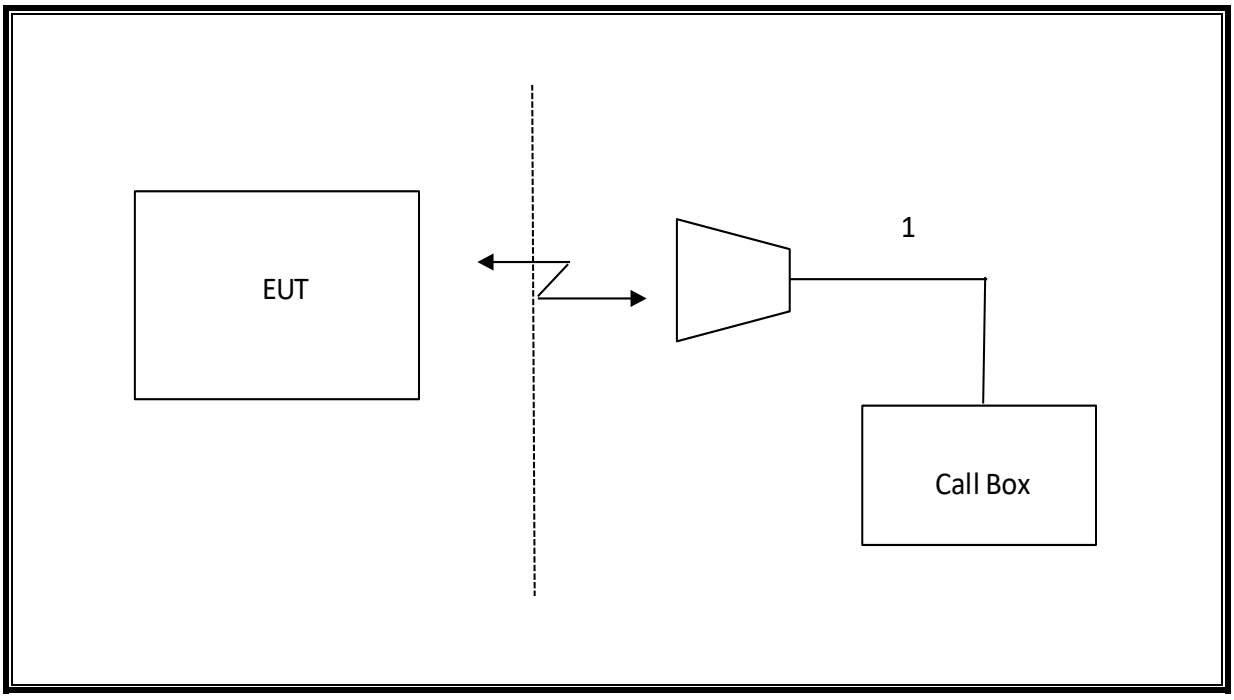
5.6. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT						
Description		**Manufacturer**	**Model**	**Serial Number**		**FCC ID/ DoC**
Laptop		Apple	A1398	C02PM012G3QD		QDS-BRCM1069
Laptop AC/DC adapter		Liteon Technology	PA-1450-BA1	B123		N/A
I/O CABLES (RF CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	3	US 115V	Un-shielded	2.0	N/A
2	USB	1	DC	Un-shielded	1.0	N/A
3	RF In/Out	1	EUT	Un-shielded	0.6	N/A
4	RF In/Out	1	Communication Test Set	Un-shielded	1.2	N/A
5	RF In/Out	1	Barrel	N/A	N/A	N/A
I/O CABLES (RF RADIATED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	RF In/Out	1	Antenna	Un-shielded	5.0	N/A

CONDUCTED SETUP



RADIATED SETUP



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Horn 1-18GHz	A.H. Systems, Inc.	SAS-571	T962	01/25/2021
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T346	07/20/2021
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T136	07/07/2021
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T407	05/20/2021
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	PRE0184052	11/12/2020
*Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	PRE0181575	09/05/2020
Antenna, Active Loop 9KHz to 30MHz	ETS-Lindgren	6502	T757	10/01/2020
Antenna Horn, 18 to 26GHz	ARA	SWH-28	T125	04/17/2021
Antenna, Horn 26-40GHz	ARA	MWH-2640/B	PRE0182203	04/17/2021
*Amplifier, 1 to 18GHz	MITEQ	AFS42-00101800-25-S-42	T1165	05/18/2020
Amplifier, 1 to 18GHz	MITEQ	AFS42-00101800-25-S-42	PRE0181078	05/06/2021
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	PRE0180176	07/14/2021
Amplifier, 100KHz to 1GHz, 32dB	Keysight	8447D	T15	10/26/2020
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	PRE0180175	05/29/2020
Pre-Amp 18-26GHz	Agilent Technology	8449B	T404	04/08/2021
Amplifier, 26-40GHz	Miteq	TTA2640	T1864	04/08/2021
Filter, BRF 680MHz 1GHz	MICRO-TRONICS	BRM19870	PRE0183134	12/02/2020
Filter, BRF 1850 – 1910 MHz	Micro-Tronics	BRM50714-02	T1796	06/23/2021
Filter, BRF 824 – 848 MHz	Micro-Tronics	BRM20025	PRE0191180	06/23/2021
Filter, BRF 1710 to 1785MHz, 9GHz	MICRO-TRONICS	BRM50713-02	T1794	06/23/2021
Filter, BRF 2495 to 2690MHz	MICRO-TRONICS	BRM50709-02	T1790	06/23/2021
Filter, HPF 1.2 GHz	MICRO-TRONICS	MICRO-TRONICS	T1737	06/23/2021
*Directional Coupler	KRYTAR	152610	T1536	06/09/2020
*Directional Coupler	KRYTAR	152610	T1161	08/14/2020
*Directional Coupler	KRYTAR	152613	T1537	06/08/2020
Spectrum Analyzer, PXA 3Hz to 44GHZ	Keysight	N9030A	T340	01/22/2021
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1454	07/15/2021
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T907	01/22/2021
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight	N9030A	T908	05/05/2021
Spectrum Analyzer, PSA, 3Hz to 26.5GHz	Keysight	E4440A	T198	01/28/2021
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight	E4440A	T200	01/24/2021
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179522	02/18/2021
Wireless Communications Test Set, 8960 Series 10	Agilent	E5515C	T211	02/18/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T948	08/10/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T1871	02/25/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T972	02/24/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T260	02/19/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T959	02/19/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	163287	10/23/2020
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	12/22/2020
Environmental Chamber	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T1154	12/22/2020
Power Meter, P-series single channel	Keysight	N1912A	T1245	01/22/2021
Power Sensor	Keysight	N1921A	T1225	02/23/2021
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 7.6, November 11, 2017	
Power Measurement Software	UL	UL RF	Ver 2.7, 2019	
Radiated test software	UL	UL RF	Ver 9.5 June 15, 2019	

NOTES:

* Testing is completed before equipment expiration date.

7. RF OUTPUT POWER VERIFICATION

RULE PART(S)

FCC: §2.1046, §27.50

RESULT

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted output powers as follows:

7.1. LTE BAND 5

Test Engineer ID:	10646	Test Date:	8/27/2020

OUTPUT POWER FOR LTE BAND 5 (5.0MHz + 10.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)							
							ANT 1				ANT 2			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
5MHz / 10MHz	826.5	833.7	1	24	1	0	25.68	**24.80**	23.32	20.62	**24.50**	**23.61**	**22.56**	19.57
			25	0	50	0	23.82	22.87	22.82	20.84	22.65	21.64	21.61	**19.73**
	831.6	838.8	1	24	1	0	**25.70**	24.64	**23.56**	20.77	24.46	23.48	22.52	19.55
			25	0	50	0	23.84	22.83	22.84	20.84	22.60	21.61	21.57	19.71
	836.8	844.0	1	24	1	0	25.62	24.75	23.09	20.78	24.46	23.39	21.89	19.57
			25	0	50	0	23.83	22.85	22.31	**20.85**	22.59	21.60	21.61	19.65

OUTPUT POWER FOR LTE BAND 5 (10.0MHz + 5.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)							
							ANT 1				ANT 2			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
10MHz/ 5MHz	829.0	836.2	1	49	1	0	25.58	**24.70**	**23.41**	20.81	**24.50**	23.37	**22.52**	19.67
			50	0	25	0	23.78	22.80	22.78	**20.88**	22.66	21.69	21.65	**19.75**
	834.3	841.5	1	49	1	0	25.57	24.54	23.20	20.77	24.45	23.44	21.74	19.58
			50	0	25	0	23.80	22.81	22.69	20.85	22.66	21.66	21.63	19.74
	839.3	846.5	1	49	1	0	**25.70**	24.62	22.86	20.85	24.50	**23.50**	21.62	19.74
			50	0	25	0	23.76	22.76	22.35	20.88	22.64	21.65	21.32	19.73

OUTPUT POWER FOR LTE BAND 5 (10.0MHz + 10.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)							
							ANT 1				ANT 2			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
10MHz/ 10MHz	829.0	838.9	1	49	1	0	25.60	24.58	**23.47**	20.82	24.45	23.41	**22.58**	19.63
			1	0	1	49	15.37	15.25	15.35	15.42	14.20	14.10	14.27	14.27
			50	0	50	0	23.86	22.88	22.85	20.92	22.68	21.68	21.69	19.75
	831.5	841.4	1	49	1	0	**25.70**	24.64	23.36	20.78	**24.50**	23.33	21.94	19.53
			1	0	1	49	15.30	15.28	15.21	15.33	14.17	14.11	14.24	14.16
			50	0	50	0	23.82	22.88	22.84	**20.94**	22.68	21.72	21.37	**19.75**
	834.1	844.0	1	49	1	0	25.60	**24.70**	23.20	20.82	24.42	**23.49**	22.11	19.59
			1	0	1	49	15.27	15.38	15.28	15.36	14.11	14.41	14.21	14.28
			50	0	50	0	23.86	22.86	22.84	20.92	22.66	21.68	21.66	19.74

7.2. LTE BAND 7

Test Engineer ID:	10646	Test Date:	8/27/2020

OUTPUT POWER FOR LTE BAND 7 (10.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
10MHz / 20MHz	2505.5	2519.9	1	49	1	0	24.65	23.67	22.77	19.82	21.67	20.72	19.82	16.94	24.10	23.14	22.17	19.04	21.45	20.49	19.56	15.02
			50	0	100	0	22.66	21.66	21.64	19.72	19.76	18.77	18.83	16.85	22.04	21.05	21.07	18.93	19.42	18.43	18.43	13.65
	2525.6	2540.0	1	49	1	0	**25.70**	24.56	**23.58**	20.62	**22.80**	21.70	20.80	**18.00**	**25.00**	**23.94**	**23.06**	19.90	**22.50**	21.40	**20.63**	**17.63**
			50	0	100	0	23.66	22.66	22.66	**20.68**	20.85	19.84	19.86	17.97	23.01	22.03	22.04	**19.98**	20.53	19.55	19.57	17.60
	2545.6	2560.0	1	49	1	0	25.56	**24.57**	23.41	20.63	22.72	**21.78**	**20.87**	17.79	24.84	23.84	22.81	19.89	22.49	**21.48**	20.48	17.55
			50	0	100	0	23.62	22.63	22.65	20.65	20.77	19.77	19.82	17.88	22.86	21.84	21.85	19.83	20.53	19.54	19.56	17.59

OUTPUT POWER FOR LTE BAND 7 (20.0MHz + 10.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 10MHz	2510.0	2524.4	1	99	1	0	24.74	23.70	22.76	19.70	21.74	20.79	19.75	16.74	24.21	23.23	22.31	19.30	21.52	20.59	19.61	16.63
			100	0	50	0	22.77	21.77	21.77	19.83	19.78	18.84	18.83	16.88	22.20	21.19	21.22	19.33	19.52	18.51	18.53	16.59
	2530.1	2544.5	1	99	1	0	25.68	**24.73**	23.20	20.70	**22.80**	**21.82**	20.42	17.97	**25.00**	**24.09**	**23.10**	20.15	22.49	**21.66**	20.54	17.53
			100	0	50	0	23.78	22.78	22.78	**20.82**	20.85	19.87	19.89	**17.99**	23.12	22.12	22.15	**20.27**	20.56	19.57	19.59	**17.66**
	2550.1	2564.5	1	99	1	0	**25.70**	24.71	**23.82**	20.81	22.66	21.75	**20.76**	17.94	24.91	23.96	22.92	20.02	**22.50**	21.46	**20.65**	17.48
			100	0	50	0	23.72	22.70	22.75	20.75	20.74	19.75	19.77	17.87	22.92	21.95	21.94	20.07	20.53	19.55	19.55	17.53

OUTPUT POWER FOR LTE BAND 7 (15.0MHz + 15.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
15MHz / 15MHz	2507.5	2522.5	1	74	1	0	24.65	23.86	22.83	19.76	21.76	20.80	19.68	16.88	24.24	23.22	22.38	19.41	21.52	20.50	19.60	16.58
			75	0	75	0	22.73	21.75	21.77	19.78	19.83	18.86	18.86	16.89	22.27	21.27	21.25	19.34	19.53	18.52	18.55	16.53
	2527.5	2542.5	1	74	1	0	**25.70**	24.69	23.51	20.68	**22.80**	**21.80**	20.63	**18.00**	**25.00**	**24.14**	**23.17**	20.27	22.45	**21.56**	**20.60**	**17.61**
			75	0	75	0	23.72	22.74	22.74	20.76	20.93	19.93	19.95	18.00	23.18	22.20	22.22	**20.33**	20.55	19.57	19.62	17.60
	2547.5	2562.5	1	74	1	0	25.65	**24.70**	**23.74**	**20.79**	22.76	21.79	**20.86**	17.81	24.93	23.94	23.04	20.17	**22.50**	21.51	20.58	17.50
			75	0	75	0	23.69	22.70	22.73	20.72	20.87	19.89	19.91	17.91	23.00	22.01	22.04	20.15	20.55	19.59	19.62	17.57

OUTPUT POWER FOR LTE BAND 7 (15.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
15MHz / 20MHz	2507.8	2524.9	1	74	1	0	24.75	23.83	22.01	19.65	21.77	20.81	19.91	16.82	24.21	23.32	22.35	19.47	21.50	20.50	19.65	16.63
			75	0	100	0	22.76	21.76	21.76	19.53	19.81	18.83	18.81	16.87	22.11	21.11	21.16	19.20	19.48	18.50	18.49	16.48
	2525.3	2542.4	1	74	1	0	25.58	**24.73**	**23.30**	20.43	**22.80**	21.79	**20.93**	17.90	**25.00**	**24.00**	**23.14**	20.13	22.48	**21.60**	20.63	17.56
			75	0	100	0	23.75	22.76	22.69	**20.56**	20.86	19.89	19.89	**17.98**	23.17	22.19	22.19	**20.25**	20.55	19.56	19.60	**17.57**
	2542.9	2560.0	1	74	1	0	**25.70**	24.64	23.23	20.44	22.72	**21.81**	20.80	17.89	24.99	23.97	23.08	20.15	**22.50**	21.51	**20.64**	17.46
			75	0	100	0	23.69	22.69	22.69	20.49	20.83	19.84	19.88	17.92	23.00	22.00	22.03	20.08	20.54	19.55	19.56	17.54

OUTPUT POWER FOR LTE BAND 7 (20.0MHz + 15.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 15MHz	2510.0	2527.1	1	99	1	0	24.61	23.67	22.70	19.58	21.51	20.55	19.73	16.64	24.20	23.26	22.25	19.41	21.52	20.62	19.55	16.49
			100	0	75	0	22.71	21.73	21.71	19.67	19.64	18.65	18.64	16.73	22.16	21.18	21.22	19.25	19.50	18.52	18.51	16.50
	2527.6	2544.7	1	99	1	0	25.63	24.66	23.35	20.63	**22.80**	**21.84**	20.39	**17.82**	**25.00**	**24.09**	**23.09**	20.07	**22.50**	21.45	20.58	**17.59**
			100	0	75	0	23.72	22.74	22.74	**20.74**	20.69	19.71	19.73	17.82	23.14	22.12	22.16	**20.24**	20.56	19.58	19.61	17.57
	2545.1	2562.2	1	99	1	0	**25.70**	**24.91**	**23.47**	20.69	22.60	21.61	**20.70**	17.77	24.95	24.04	22.94	19.92	22.47	**21.55**	**20.59**	17.53
			100	0	75	0	23.68	22.69	22.69	20.62	20.65	19.67	19.66	17.72	22.94	21.95	21.96	20.05	20.53	19.53	19.58	17.54

OUTPUT POWER FOR LTE BAND 7 (20.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz/ 20MHz	2510.0	2529.8	1	99	1	0	24.53	23.69	21.98	19.72	21.68	20.73	19.74	16.91	24.18	23.22	22.24	19.43	21.52	20.55	19.56	16.71
			1	0	1	99	15.68	15.69	15.82	15.66	12.83	12.92	12.92	12.90	14.93	14.80	15.09	15.17	12.40	12.48	12.39	12.70
			100	0	100	0	22.65	21.66	21.64	19.65	19.76	18.76	18.76	16.80	22.07	21.08	21.08	19.19	19.48	18.47	18.49	16.47
	2525.1	2544.9	1	99	1	0	25.61	24.62	**23.49**	20.59	**22.80**	**21.99**	20.60	17.86	24.97	**24.05**	**23.07**	20.08	**22.50**	**21.51**	20.55	17.54
			1	0	1	99	16.87	17.03	16.89	16.88	13.89	13.95	13.89	14.04	16.29	16.31	16.40	16.31	13.73	13.78	14.02	13.66
			100	0	100	0	23.69	22.69	22.73	20.68	20.82	19.82	19.84	**17.92**	23.11	22.08	22.12	**20.22**	20.59	19.61	19.60	**17.58**
	2540.2	2560.0	1	99	1	0	**25.70**	**24.80**	23.21	**20.78**	22.74	21.80	**20.88**	17.89	**25.00**	24.04	22.95	20.00	22.49	21.48	**20.59**	17.39
			1	0	1	99	16.73	16.78	16.68	16.96	13.82	13.97	13.84	14.11	15.92	15.99	15.89	16.01	13.67	13.77	13.82	13.61
			100	0	100	0	23.62	22.63	22.66	20.63	20.74	19.75	19.77	17.83	22.89	21.88	21.92	20.02	20.53	19.52	19.55	17.53

7.3. LTE BAND 41

Test Engineer ID:	10646	Test Date:	8/26/2020

OUTPUT POWER FOR LTE BAND 41 (5.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
5MHz / 20MHz	2499.3	2511.0	1	24	1	0	22.41	22.43	22.70	21.75	19.32	19.54	19.33	19.51	20.66	20.68	20.52	20.95	18.76	18.64	18.85	18.94
			25	0	100	0	22.55	22.58	22.52	22.60	19.68	19.71	19.71	19.80	20.93	20.92	20.92	21.00	19.19	19.20	19.18	19.01
	2583.8	2595.5	1	24	1	0	**27.70**	26.10	24.93	22.52	24.80	**23.32**	22.11	19.99	**26.00**	24.38	23.41	21.23	**24.20**	**22.71**	21.99	19.32
			25	0	100	0	25.87	24.87	24.88	22.81	22.95	21.98	21.94	20.01	24.07	23.09	23.12	21.21	22.34	21.35	21.38	19.35
	2668.3	2680.0	1	24	1	0	27.70	**26.32**	**25.65**	22.72	**24.80**	23.20	**22.34**	19.08	26.00	**25.10**	**24.14**	20.82	24.20	22.70	**22.12**	18.99
			25	0	100	0	25.94	24.93	24.83	**22.91**	23.00	22.02	21.98	**20.07**	24.69	23.68	22.69	**21.86**	22.39	21.39	21.42	**19.47**

OUTPUT POWER FOR LTE BAND 41 (20.0MHz + 5.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 5MHz	2506.0	2517.7	1	99	1	0	27.20	**26.67**	25.18	**23.30**	24.10	**23.65**	22.09	19.94	26.00	**25.48**	23.25	**22.11**	24.00	**23.27**	21.63	**19.81**
			100	0	25	0	23.32	23.39	23.35	23.25	20.26	20.23	20.28	**20.13**	22.06	22.07	22.05	22.11	20.21	20.21	20.18	19.79
	2590.5	2602.2	1	99	1	0	27.70	26.20	**25.80**	22.69	24.80	23.36	21.98	19.91	26.00	24.50	**24.06**	21.16	24.20	22.77	21.63	19.24
			100	0	25	0	25.87	24.89	24.89	22.79	23.01	22.00	21.98	20.00	24.09	23.13	23.16	21.26	22.36	21.37	21.42	19.35
	2675.0	2686.7	1	99	1	0	**27.70**	26.27	25.19	22.91	**24.80**	23.28	**22.39**	20.05	**26.00**	24.56	23.29	21.02	**24.20**	22.77	**22.03**	19.39
			100	0	25	0	25.80	24.79	24.80	22.80	22.91	21.94	21.94	19.91	24.11	23.17	22.95	21.30	22.25	21.22	21.24	19.28

OUTPUT POWER FOR LTE BAND 41 (10.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
10MHz / 20MHz	2501.5	2515.9	1	49	1	0	22.40	22.45	22.33	22.70	19.53	19.52	19.42	19.80	20.71	20.72	20.61	20.94	18.99	19.06	19.19	19.20
			50	0	100	0	22.61	22.60	22.62	22.65	19.71	19.72	19.71	19.76	20.92	20.95	20.93	21.00	19.11	19.16	19.13	18.97
	2583.6	2598.0	1	49	1	0	**27.70**	**26.32**	**26.00**	**22.98**	24.80	**23.46**	22.70	**20.17**	**26.00**	24.59	**24.34**	21.32	24.20	**22.72**	**22.39**	19.39
			50	0	100	0	25.92	24.93	24.89	22.94	23.02	22.07	22.03	20.06	24.19	23.20	23.24	21.37	22.43	21.49	21.51	**19.45**
	2665.6	2680.0	1	49	1	0	27.70	26.25	24.80	22.88	**24.80**	23.33	**22.74**	20.05	26.00	**25.01**	23.35	21.24	**24.20**	22.69	21.58	19.33
			50	0	100	0	25.93	24.94	24.67	22.97	23.04	22.07	22.04	20.11	24.31	23.43	22.42	**21.49**	22.35	21.39	21.38	19.41

OUTPUT POWER FOR LTE BAND 41 (20.0MHz + 10.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 10MHz	2506.0	2520.4	1	99	1	0	27.15	**26.64**	25.24	**23.39**	24.10	**23.57**	**22.42**	20.02	26.00	**25.44**	**24.33**	21.41	24.10	**23.47**	**22.03**	19.90
			100	0	50	0	23.38	23.40	23.35	23.38	20.34	20.35	20.34	**20.22**	22.10	22.15	22.14	**22.23**	20.32	20.35	20.31	**19.90**
	2588.1	2602.5	1	99	1	0	27.70	26.22	**25.81**	22.78	24.80	23.38	21.83	19.94	26.00	24.51	24.09	21.25	24.20	22.78	21.85	19.57
			100	0	50	0	25.88	24.91	24.88	22.90	23.03	22.09	22.02	20.05	24.20	23.23	23.22	21.37	22.41	21.45	21.42	19.47
	2670.1	2684.5	1	99	1	0	**27.70**	26.29	25.08	22.92	**24.80**	23.36	22.35	20.03	**26.00**	24.55	23.33	21.38	**24.20**	22.78	21.76	19.40
			100	0	50	0	25.87	24.85	24.83	22.88	22.87	21.87	21.90	19.89	24.30	23.31	22.61	21.46	22.31	21.34	21.31	19.33

OUTPUT POWER FOR LTE BAND 41 (15.0MHz + 15.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
15MHz / 15MHz	2503.5	2518.5	1	74	1	0	27.70	26.24	24.74	22.75	24.80	23.34	22.18	19.98	26.00	24.52	23.40	21.28	24.20	**23.17**	21.43	**19.90**
			75	0	75	0	22.87	22.90	22.92	22.92	20.08	20.05	20.12	20.03	21.18	21.21	21.22	21.30	19.86	19.90	19.98	19.63
	2585.5	2600.5	1	74	1	0	**27.70**	26.09	**25.56**	22.80	24.80	**23.43**	22.35	**20.09**	26.00	24.46	**23.90**	21.29	24.20	22.81	**22.16**	19.30
			75	0	75	0	25.88	24.91	24.90	22.87	23.05	22.04	22.02	20.04	24.28	23.28	23.34	21.46	22.43	21.48	21.46	19.43
	2667.5	2682.5	1	74	1	0	27.70	**26.29**	25.02	22.88	**24.80**	23.38	**22.53**	19.98	**26.00**	**24.64**	23.52	**21.60**	**24.20**	22.72	21.28	19.35
			75	0	75	0	26.00	24.95	24.88	**22.95**	22.99	22.00	22.02	20.02	24.31	23.37	22.33	21.53	22.39	21.38	21.41	19.43

OUTPUT POWER FOR LTE BAND 41 (15.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
15MHz / 20MHz	2503.8	2520.9	1	74	1	0	27.70	**26.28**	24.93	22.95	24.80	23.40	22.02	19.97	26.00	24.68	23.29	21.59	24.20	**23.28**	21.66	**19.82**
			75	0	100	0	22.90	22.96	22.96	**22.96**	20.20	20.20	20.21	**20.15**	21.37	21.42	21.42	21.51	19.92	19.99	19.96	19.65
	2583.3	2600.4	1	74	1	0	27.70	26.13	**25.61**	22.77	24.80	**23.47**	22.64	20.11	**26.00**	24.49	23.90	21.28	24.20	22.68	**22.13**	19.39
			75	0	100	0	25.89	24.94	24.93	22.93	23.10	22.15	22.11	20.06	24.30	23.30	23.37	21.51	22.38	21.41	21.43	19.36
	2662.9	2680.0	1	74	1	0	**27.70**	26.09	25.26	22.65	**24.80**	23.35	**22.66**	19.97	26.00	**25.13**	**24.45**	**21.62**	**24.20**	22.67	21.67	19.25
			75	0	100	0	25.79	24.81	24.47	22.75	23.02	22.05	22.04	20.04	24.52	23.52	22.59	21.59	22.40	21.40	21.43	19.42

OUTPUT POWER FOR LTE BAND 41 (20.0MHz + 15.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 15MHz	2506.0	2523.1	1	99	1	0	27.70	26.22	24.79	**23.05**	24.80	**23.45**	22.40	19.92	26.00	**24.82**	22.60	21.37	24.20	**23.35**	20.50	**20.16**
			100	0	75	0	22.98	22.94	22.92	22.94	20.21	20.18	20.21	**20.14**	21.51	21.45	21.51	**21.54**	20.12	20.16	20.17	19.84
	2585.6	2602.7	1	99	1	0	27.70	26.22	**25.78**	22.85	24.80	23.35	22.07	19.91	26.00	24.65	**24.11**	21.22	24.20	22.75	**22.09**	19.24
			100	0	75	0	25.95	24.97	24.96	22.86	23.11	22.10	22.11	20.05	24.29	23.30	23.34	21.45	22.43	21.44	21.47	19.37
	2665.1	2682.2	1	99	1	0	**27.70**	**26.31**	24.87	22.65	**24.80**	23.34	**22.40**	19.79	**26.00**	24.68	22.35	21.20	**24.20**	22.69	21.89	19.27
			100	0	75	0	25.90	24.95	24.81	22.88	22.89	21.95	21.94	19.96	24.38	23.39	22.38	21.41	22.45	21.47	21.47	19.47

OUTPUT POWER FOR LTE BAND 41 (20.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 1				ANT 2				ANT 3				ANT 4			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz/ 20MHz	2506.0	2525.8	1	99	1	0	27.70	26.23	25.07	**22.99**	24.80	**23.52**	21.41	20.23	26.00	24.81	22.67	**21.65**	**24.20**	**23.35**	20.64	**20.02**
			1	0	1	99	14.96	14.21	13.92	13.34	12.11	12.18	10.18	10.37	13.19	13.02	12.54	12.18	11.97	11.14	12.05	10.45
			100	0	100	0	22.96	22.99	22.97	22.96	20.31	20.31	20.31	20.25	21.51	21.52	21.52	21.55	20.25	20.26	20.28	19.94
	2583.1	2602.9	1	99	1	0	**27.70**	26.15	**25.78**	22.78	**24.80**	23.36	22.25	20.13	**26.00**	24.63	**24.12**	21.26	24.20	22.73	21.94	19.19
			1	0	1	99	19.26	18.94	17.89	17.72	15.42	15.43	15.74	15.38	16.18	16.10	16.22	16.16	14.42	14.06	14.20	14.06
			100	0	100	0	25.92	24.96	24.89	22.86	23.10	22.13	22.06	20.05	24.41	23.40	23.41	21.52	22.39	21.42	21.46	19.35
	2660.2	2680.0	1	99	1	0	27.70	**26.27**	24.70	22.67	24.80	23.34	**22.70**	20.57	26.00	**24.94**	23.30	21.52	24.20	22.79	**22.16**	19.29
			1	0	1	99	18.46	18.02	18.00	18.32	15.70	15.23	14.91	14.91	14.80	14.86	14.96	14.70	13.60	13.83	13.71	13.78
			100	0	100	0	25.95	24.96	24.75	22.86	23.15	22.17	22.19	**20.67**	24.42	23.39	22.41	21.52	22.41	21.48	21.48	19.46

7.4. LTE BAND 48

Test Engineer ID:	10646	Test Date:	8/26/2020

OUTPUT POWER FOR LTE BAND 48 (5.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 7				ANT 4				ANT 9				ANT 8			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
5MHz / 20MHz	3553.3	3565.0	1	24	1	0	19.60	19.30	19.49	18.95	16.64	16.36	16.14	16.90	19.40	19.31	19.30	18.67	17.70	17.22	17.43	17.55
			25	0	100	0	13.21	13.24	13.15	13.11	10.24	10.25	10.24	10.24	13.04	13.03	12.96	12.96	11.30	11.32	11.35	11.25
	3615.8	3627.5	1	24	1	0	**23.10**	**23.05**	**22.56**	20.14	**20.40**	**20.09**	**19.92**	17.40	**22.51**	**22.32**	**22.90**	**20.10**	**21.10**	**21.20**	**20.92**	18.20
			25	0	100	0	21.31	21.29	21.23	**20.21**	18.40	18.39	18.44	**17.41**	20.78	20.78	20.76	19.67	19.27	19.31	19.30	**18.26**
	3678.3	3690.0	1	24	1	0	18.97	19.60	18.86	19.14	16.90	16.54	16.74	16.72	19.25	18.52	18.53	19.40	17.57	17.12	17.61	17.70
			25	0	100	0	13.84	13.83	13.70	13.66	10.61	10.59	10.65	10.60	12.99	12.97	12.85	12.83	11.30	11.31	11.31	11.26

OUTPUT POWER FOR LTE BAND 48 (20.0MHz + 5.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 7				ANT 4				ANT 9				ANT 8			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 5MHz	3560.0	3571.7	1	99	1	0	19.38	19.20	19.41	19.60	16.76	16.80	17.20	17.00	19.23	19.24	19.31	19.40	17.32	17.37	17.70	17.44
			100	0	25	0	12.09	12.08	11.97	12.55	9.95	9.97	9.99	9.94	12.55	12.56	12.48	12.43	10.61	10.60	10.58	10.55
	3622.5	3634.2	1	99	1	0	**23.10**	**22.98**	**23.09**	20.26	**20.50**	**20.31**	**20.49**	17.32	**22.90**	**22.89**	**22.82**	19.72	**21.20**	**21.12**	**21.19**	18.08
			100	0	25	0	21.22	21.22	21.25	**20.49**	18.56	18.56	18.55	**17.54**	20.92	20.92	20.92	**19.89**	19.31	19.29	19.30	**18.24**
	3685.0	3696.7	1	99	1	0	19.01	19.09	18.92	19.60	17.12	17.20	17.06	17.17	19.06	19.05	19.40	19.26	17.59	17.68	17.52	17.70
			100	0	25	0	12.05	12.05	12.00	12.39	10.13	10.14	10.17	10.14	12.26	12.25	12.14	12.18	10.65	10.65	10.72	10.64

OUTPUT POWER FOR LTE BAND 48 (10.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 7				ANT 4				ANT 9				ANT 8			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
10MHz / 20MHz	3555.5	3569.9	1	49	1	0	18.70	18.85	18.75	19.10	16.34	16.40	16.32	16.37	18.89	18.90	18.80	18.89	17.02	16.98	17.10	17.20
			50	0	100	0	13.91	13.81	13.81	13.83	11.40	11.44	11.42	11.41	13.95	13.89	13.90	13.88	12.08	12.11	12.07	11.98
	3615.6	3630.0	1	49	1	0	**23.60**	**23.51**	**23.49**	**20.33**	**20.84**	**20.90**	**20.39**	**17.40**	**23.28**	**23.40**	**23.16**	20.00	**21.69**	**21.70**	**21.25**	**18.42**
			50	0	100	0	20.68	20.71	20.67	20.18	17.87	17.88	17.92	17.40	20.50	20.51	20.51	**20.01**	18.78	18.82	18.79	18.30
	3675.6	3690.0	1	49	1	0	19.02	19.06	19.10	19.01	16.20	16.27	16.28	16.40	18.80	18.83	18.90	18.90	17.08	17.20	17.07	17.06
			50	0	100	0	14.21	14.06	14.08	14.10	11.38	11.39	11.39	11.40	14.00	13.89	13.86	13.87	12.33	12.36	12.30	12.25

OUTPUT POWER FOR LTE BAND 48 (20.0MHz + 10.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 7				ANT 4				ANT 9				ANT 8			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 10MHz	3560.0	3574.4	1	99	1	0	18.64	18.66	19.10	18.89	16.22	16.24	16.60	16.39	18.90	18.90	18.83	18.85	16.82	16.85	17.20	16.90
			100	0	50	0	13.89	13.80	13.78	13.76	11.44	11.47	11.44	11.45	14.00	13.94	13.94	13.90	12.10	12.16	12.10	11.93
	3620.1	3634.5	1	99	1	0	**23.60**	**23.50**	**23.08**	19.99	**21.10**	**20.96**	**20.54**	17.47	**23.40**	**23.38**	**23.25**	19.92	**21.70**	**21.64**	**21.22**	18.11
			100	0	50	0	20.63	20.67	20.64	**20.07**	18.05	18.08	18.08	**17.56**	20.45	20.46	20.47	**19.96**	18.76	18.77	18.77	**18.18**
	3680.1	3694.5	1	99	1	0	19.05	19.10	18.98	19.08	16.55	16.60	16.47	16.60	18.86	18.74	18.90	18.77	17.17	17.20	17.10	17.20
			100	0	50	0	14.04	13.94	13.95	13.94	11.55	11.57	11.57	11.56	14.05	13.91	13.95	13.93	12.19	12.23	12.20	12.07

OUTPUT POWER FOR LTE BAND 48 (15.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 7				ANT 4				ANT 9				ANT 8			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
15MHz / 20MHz	3557.8	3574.9	1	74	1	0	19.04	19.08	19.04	19.10	16.23	16.31	16.57	16.29	18.77	18.82	18.77	18.90	17.01	17.11	17.03	17.20
			75	0	100	0	14.13	14.05	14.07	14.03	11.33	11.38	11.40	11.35	13.92	13.84	13.86	13.86	12.24	12.24	12.22	12.10
	3615.3	3632.4	1	74	1	0	**24.10**	**23.90**	**23.42**	**20.26**	**21.43**	**21.57**	**20.41**	**17.51**	**23.73**	**23.90**	**23.13**	**20.11**	**22.20**	**22.12**	**21.04**	**18.22**
			75	0	100	0	20.64	20.62	20.62	20.04	17.90	17.95	17.98	17.40	20.46	20.43	20.45	19.92	18.68	18.71	18.74	18.17
	3672.9	3690.0	1	74	1	0	18.86	19.10	18.94	18.98	16.38	16.49	16.34	16.57	18.82	18.90	18.85	18.87	16.90	16.97	17.20	17.16
			75	0	100	0	14.12	14.01	14.01	14.00	11.51	11.56	11.53	11.53	13.95	13.83	13.85	13.85	12.07	12.10	12.08	12.00

OUTPUT POWER FOR LTE BAND 48 (20.0MHz + 15.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 7				ANT 4				ANT 9				ANT 8			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 15MHz	3560.0	3577.1	1	99	1	0	18.62	18.63	19.10	18.88	16.28	16.30	16.11	16.27	18.46	18.43	18.90	18.64	16.79	16.81	17.20	16.97
			100	0	75	0	13.84	13.75	13.78	13.78	11.32	11.35	11.32	11.30	13.75	13.69	13.67	13.70	12.06	12.07	12.04	11.93
	3617.6	3634.7	1	99	1	0	**24.10**	**24.09**	**23.17**	20.05	**21.30**	**21.30**	**20.79**	**17.39**	**23.85**	**23.90**	**22.91**	19.89	**22.20**	**22.16**	**21.21**	18.17
			100	0	75	0	20.69	20.73	20.68	**20.16**	17.82	17.85	17.89	17.37	20.45	20.48	20.45	**19.94**	18.73	18.76	18.74	**18.24**
	3675.1	3692.2	1	99	1	0	18.59	18.63	19.10	18.93	16.30	16.16	16.29	16.19	18.82	18.85	18.77	18.90	17.16	17.20	17.08	16.96
			100	0	75	0	13.83	13.70	13.72	13.78	11.53	11.54	11.52	11.51	13.86	13.76	13.81	13.75	12.18	12.21	12.22	12.11

OUTPUT POWER FOR LTE BAND 48 (20.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm)													
							ANT 7				ANT 4				ANT 9				ANT 8			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz/ 20MHz	3560.0	3579.8	1	99	1	0	20.60	20.44	20.57	**20.28**	17.53	17.52	18.00	17.29	20.35	20.40	20.28	19.94	18.69	18.70	18.63	18.25
			1	0	1	99	6.82	6.84	6.86	6.94	3.90	3.92	4.19	4.10	6.69	6.73	6.64	6.83	4.98	5.01	4.91	5.13
			100	0	100	0	14.21	14.14	14.19	14.09	11.19	11.25	11.21	11.22	13.88	13.78	13.83	13.83	12.22	12.24	12.25	12.14
	3615.1	3634.9	1	99	1	0	**24.10**	**24.09**	**23.04**	19.92	**21.50**	**21.40**	**20.51**	**17.70**	**23.90**	**23.85**	**23.26**	**20.09**	**22.20**	**22.16**	**21.58**	**18.32**
			1	0	1	99	13.56	13.50	13.45	13.39	10.83	10.86	10.93	10.81	13.47	13.53	13.19	13.57	11.72	11.74	11.14	11.66
			100	0	100	0	20.57	20.56	20.58	20.08	18.04	18.02	18.05	17.49	20.55	20.57	20.57	20.04	18.81	18.80	18.79	18.31
	3670.2	3690.0	1	99	1	0	20.18	20.19	20.60	19.94	17.92	18.00	17.83	17.11	20.04	20.06	20.40	19.69	18.65	18.64	18.70	18.09
			1	0	1	99	6.33	6.60	6.16	6.81	4.16	4.19	4.13	4.10	6.28	6.28	6.53	6.31	4.98	4.91	5.02	4.91
			100	0	100	0	13.88	13.75	13.73	13.80	11.40	11.41	11.39	11.37	13.68	13.57	13.58	13.57	12.28	12.31	12.30	12.20

8. CONDUCTED TEST RESULTS

8.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the middle channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

RESULTS

There is no limit required and power is the same for low, middle and high channel; therefore, only middle channel was tested. Only QPSK plots are reported to show setting parameter complies with testing method/procedure.

LTE BAND 5

Band	Mode	RB Allocation/RB Offset	f (MHz)	99% BW (MHz)	- 26dB BW (MHz)
	5MHz + 10MHz BAND QPSK	25/0 + 50/0	836.5	13.884	14.47
	5MHz + 10MHz BAND 16QAM			13.857	14.38
	5MHz + 10MHz BAND 64QAM			13.835	14.488
	10MHz + 5MHz BAND QPSK	50/0 + 25/0		13.863	14.396
	10MHz + 5MHz BAND 16QAM			13.822	14.47
	10MHz + 5MHz BAND 64QAM			13.762	14.30
	10MHz + 10MHz BAND QPSK	50/0 + 50/0		18.727	19.56
	10MHz + 10MHz BAND 16QAM			18.743	19.90
	10MHz + 10MHz BAND 64QAM			18.74	19.74

LTE BAND 7

Band	Mode	RB Allocation/RB Offset	f (MHz)	99% BW (MHz)	- 26dB BW (MHz)
LTE BAND 7	10MHz + 20MHz BAND QPSK	50/0 + 100/0	2535	28.021	32.03
	10MHz + 20MHz BAND 16QAM			28.059	31.09
	10MHz + 20MHz BAND 64QAM			28.114	30.11
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.051	31.22
	20MHz + 10MHz BAND 16QAM			28.150	31.82
	20MHz + 10MHz BAND 64QAM			28.123	30.18
	15MHz + 15MHz BAND QPSK	75/0 + 75/0		28.710	34.12
	15MHz + 15MHz BAND 16QAM			28.608	33.47
	15MHz + 15MHz BAND 64QAM			28.653	30.97
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		32.858	35.18
	15MHz + 20MHz BAND 16QAM			32.802	35.26
	15MHz + 20MHz BAND 64QAM			32.930	35.16
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		32.979	37.54
	20MHz + 15MHz BAND 16QAM			32.866	35.42
	20MHz + 15MHz BAND 64QAM			32.895	35.21
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.667	41.77
	20MHz + 20MHz BAND 16QAM			37.702	40.99
	20MHz + 20MHz BAND 64QAM			37.670	40.22

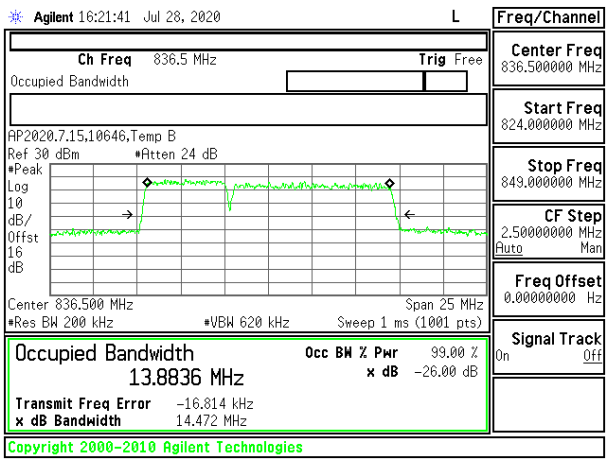
LTE BAND 41

Band	Mode	RB Allocation/RB Offset	f (MHz)	99% BW (MHz)	- 26dB BW (MHz)
LTE BAND 41 (FCC)	5MHz + 20MHz BAND QPSK	25/0 + 100/0	2593	23.267	25.12
	5MHz + 20MHz BAND 16QAM			23.199	24.89
	5MHz + 20MHz BAND 64QAM			23.219	24.93
	20MHz + 5MHz BAND QPSK	100/0 + 25/0		23.259	24.99
	20MHz + 5MHz BAND 16QAM			23.233	25.04
	20MHz + 5MHz BAND 64QAM			23.252	24.92
	10MHz + 20MHz BAND QPSK	50/0 + 100/0		27.978	30.05
	10MHz + 20MHz BAND 16QAM			27.901	29.92
	10MHz + 20MHz BAND 64QAM			27.882	29.84
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.086	30.22
	20MHz + 10MHz BAND 16QAM			28.023	30.03
	20MHz + 10MHz BAND 64QAM			27.995	30.01
	15MHz + 15MHz BAND QPSK	75/0 + 75/0		28.618	30.84
	15MHz + 15MHz BAND 16QAM			28.590	30.93
	15MHz + 15MHz BAND 64QAM			28.582	30.84
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		32.817	35.00
	15MHz + 20MHz BAND 16QAM			32.787	34.89
	15MHz + 20MHz BAND 64QAM			32.708	34.93
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		32.845	35.08
	20MHz + 15MHz BAND 16QAM			32.924	35.19
	20MHz + 15MHz BAND 64QAM			32.864	34.98
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.610	40.24
	20MHz + 20MHz BAND 16QAM			37.561	39.92
	20MHz + 20MHz BAND 64QAM			37.651	40.20

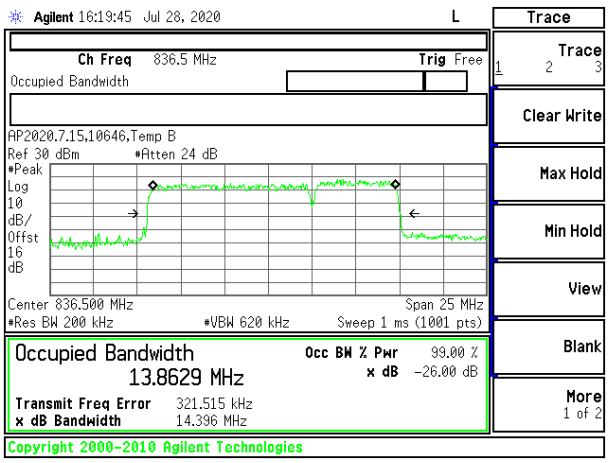
LTE BAND 48

Band	Mode	RB Allocation/RB Offset	f (MHz)	99% BW (MHz)	- 26dB BW (MHz)
LTE BAND 48 (FCC)	5MHz + 20MHz BAND QPSK	25/0 + 100/0	3625	23.332	25.01
	5MHz + 20MHz BAND 16QAM			23.301	24.90
	5MHz + 20MHz BAND 64QAM			23.205	24.82
	20MHz + 5MHz BAND QPSK	100/0 + 25/0		23.388	25.13
	20MHz + 5MHz BAND 64QAM			23.363	25.14
	20MHz + 5MHz BAND 16QAM			23.334	25.07
	10MHz + 20MHz BAND QPSK	50/0 + 100/0		28.028	29.90
	10MHz + 20MHz BAND 16QAM			27.977	29.81
	10MHz + 20MHz BAND 64QAM			28.041	30.05
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.052	30.05
	20MHz + 10MHz BAND 16QAM			28.004	30.04
	20MHz + 10MHz BAND 64QAM			28.019	29.97
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		33.928	34.93
	15MHz + 20MHz BAND 16QAM			32.845	34.92
	15MHz + 20MHz BAND 64QAM			32.953	35.03
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		32.834	35.03
	20MHz + 15MHz BAND 16QAM			32.912	34.95
	20MHz + 15MHz BAND 64QAM			32.918	35.02
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.730	39.98
	20MHz + 20MHz BAND 16QAM			37.793	39.84
	20MHz + 20MHz BAND 64QAM			37.633	39.87

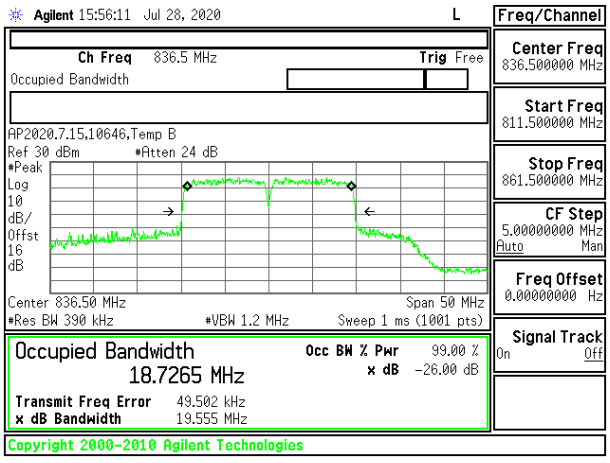
8.1.1. LTE BAND 5



LTE B5 5MHz + 10MHz QPSK RB25-0 + RB50-0

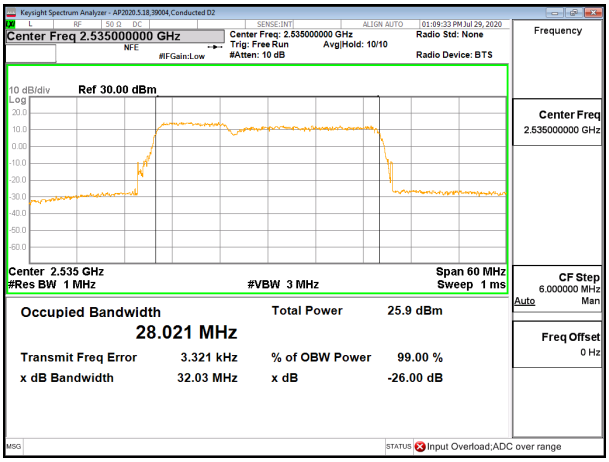


LTE B5 10MHz + 5MHz QPSK RB50-0 + RB25-0

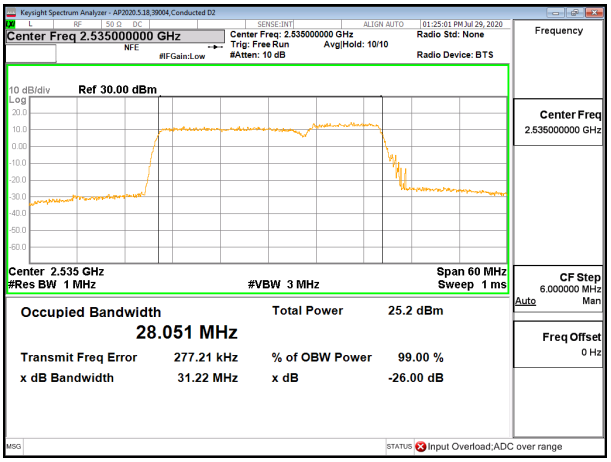


LTE B5 10MHz + 10MHz QPSK RB50-0 + RB50-0

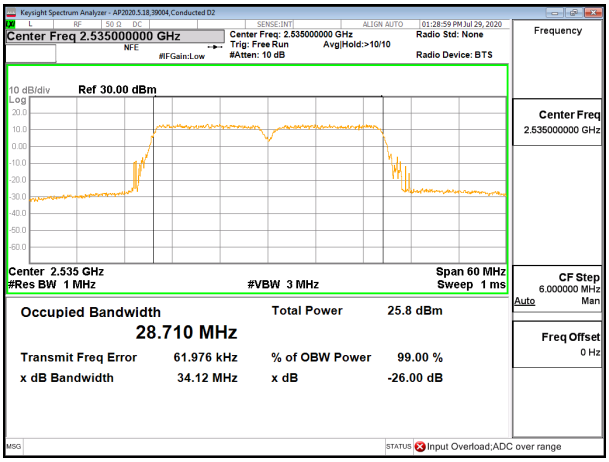
8.1.2. LTE BAND 7



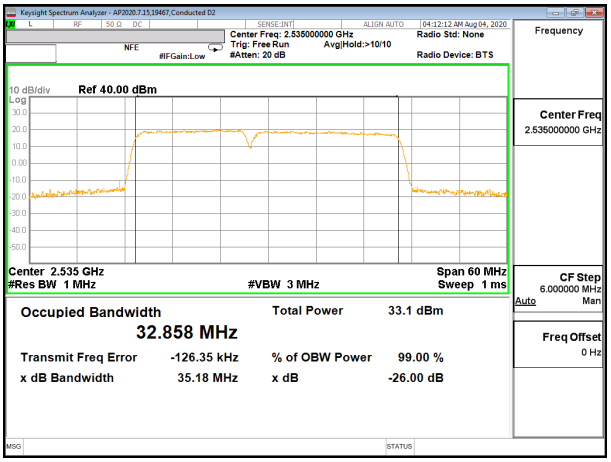
LTE B7 10MHz + 20MHz QPSK RB50-0 + RB100-0



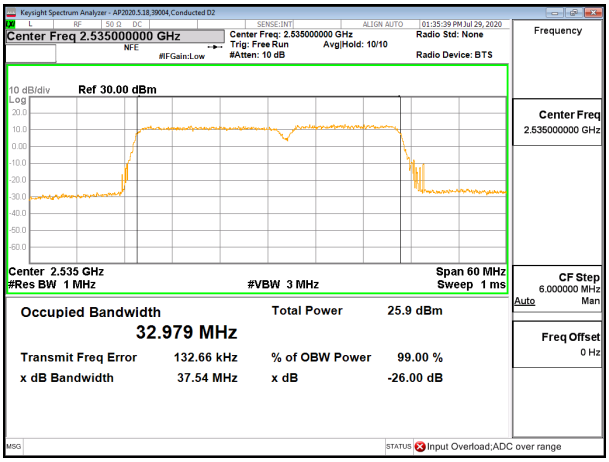
LTE B7 20MHz + 10MHz QPSK RB100-0 + RB50-0



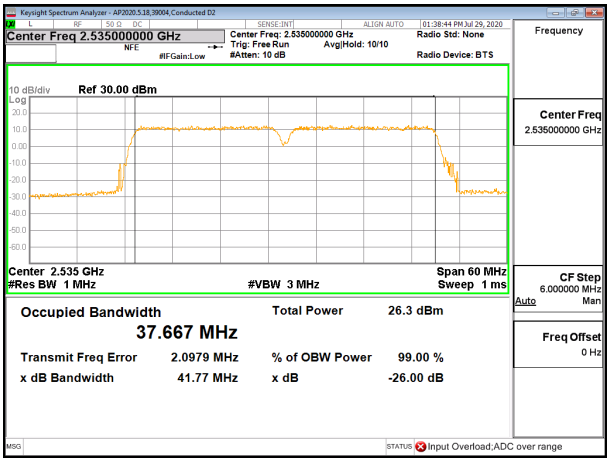
LTE B7 15MHz + 15MHz QPSK RB75-0 + RB75-0



LTE B7 15MHz + 20MHz QPSK RB75-0 + RB100-0

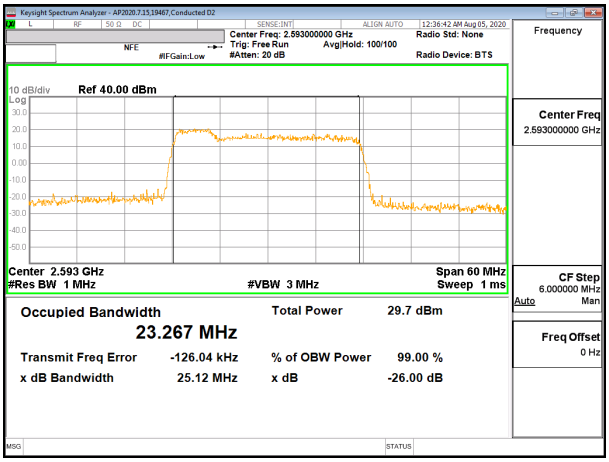


LTE B7 20MHz + 15MHz QPSK RB100-0 + RB75-0

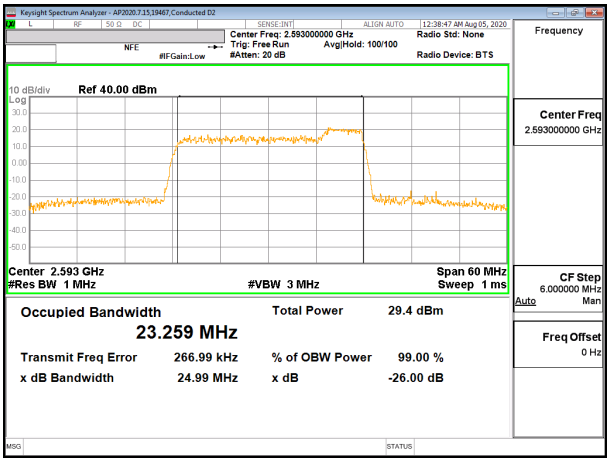


LTE B7 20MHz + 20MHz QPSK RB100-0 + RB100-0

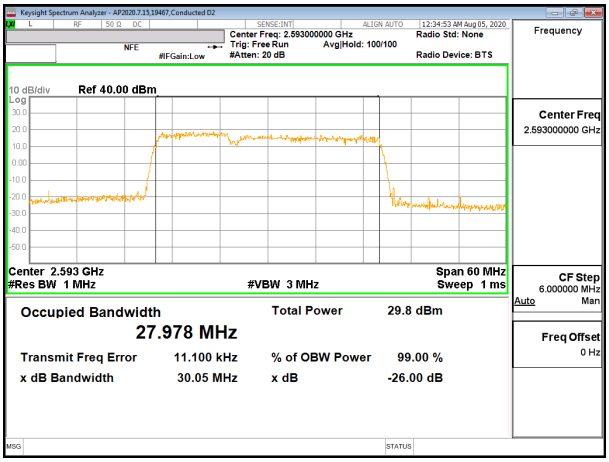
8.1.3. LTE BAND 41



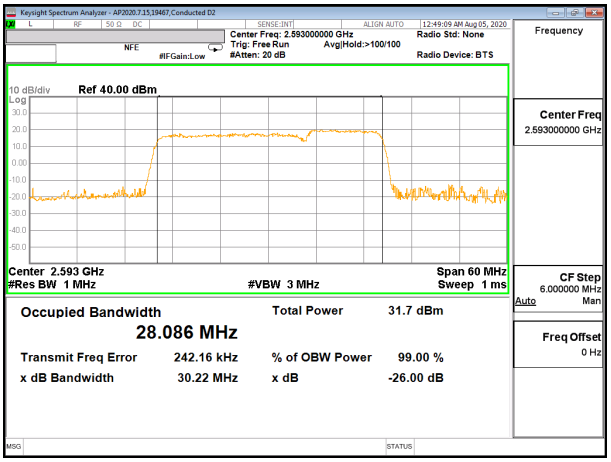
LTE B41 5MHz + 20MHz QPSK RB25-0 + RB100-0



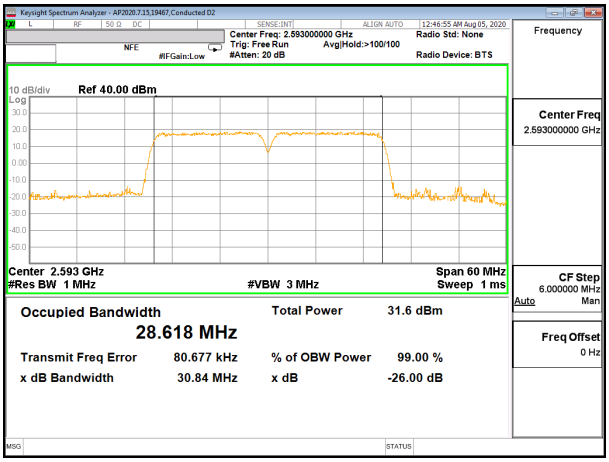
LTE B41 20MHz + 5MHz QPSK RB100-0 + RB25-0



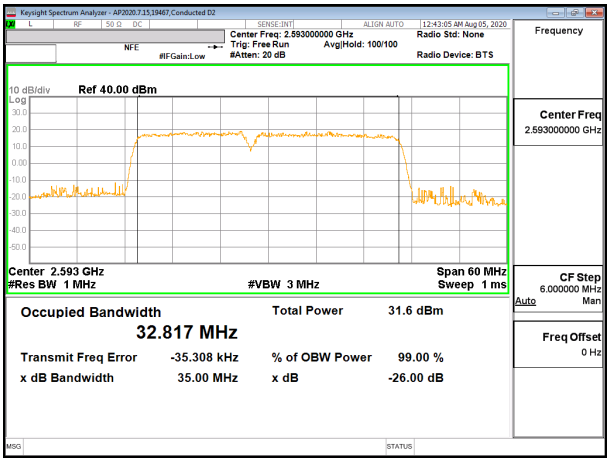
LTE B41 10MHz + 20MHz QPSK RB50-0 + RB100-0



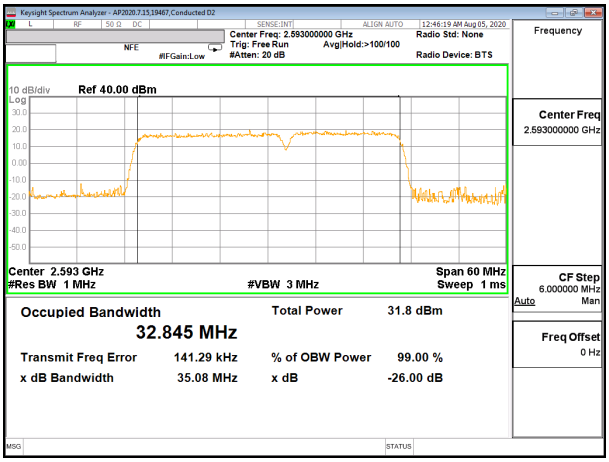
LTE B41 20MHz + 10MHz QPSK RB100-0 + RB50-0



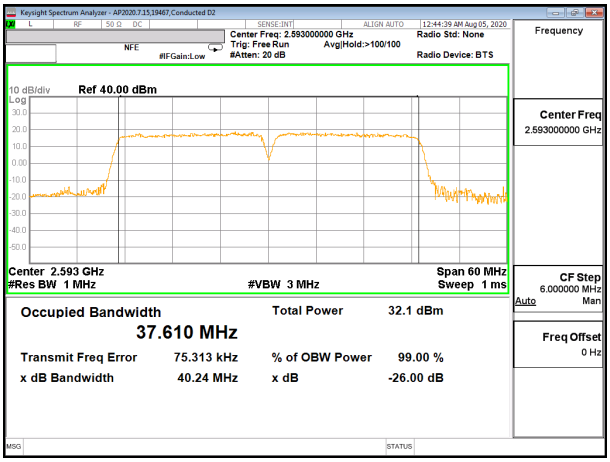
LTE B41 15MHz + 15MHz QPSK RB75-0 + RB75-0



LTE B41 15MHz + 20MHz QPSK RB75-0 + RB100-0

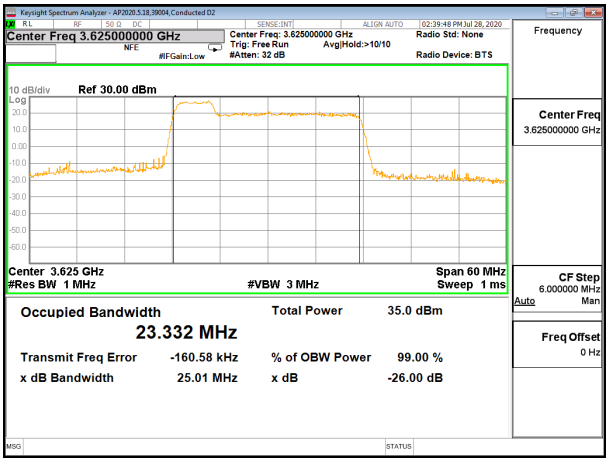


LTE B41 20MHz + 15MHz QPSK RB100-0 + RB75-0

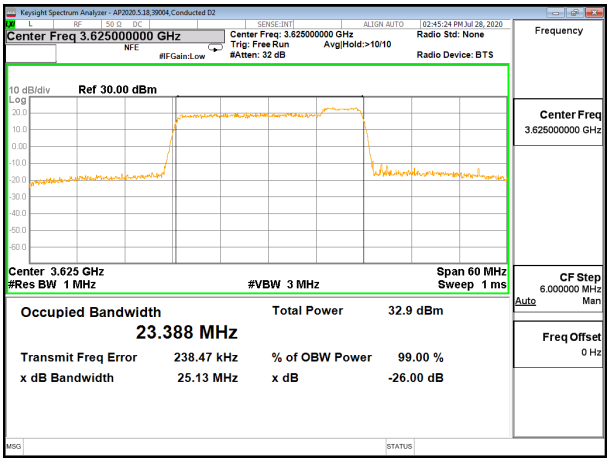


LTE B41 20MHz + 20MHz QPSK RB100-0 + RB100-0

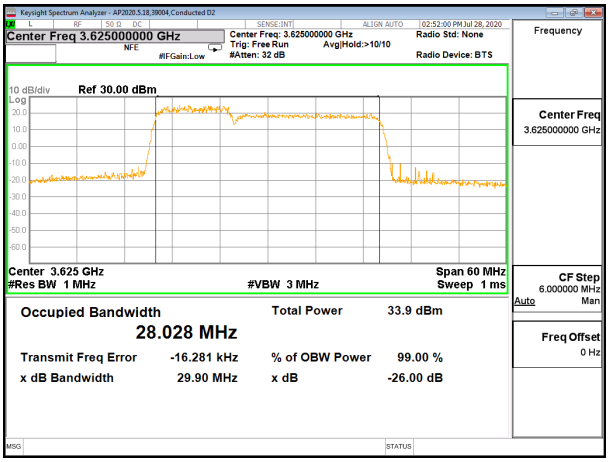
8.1.4. LTE BAND 48



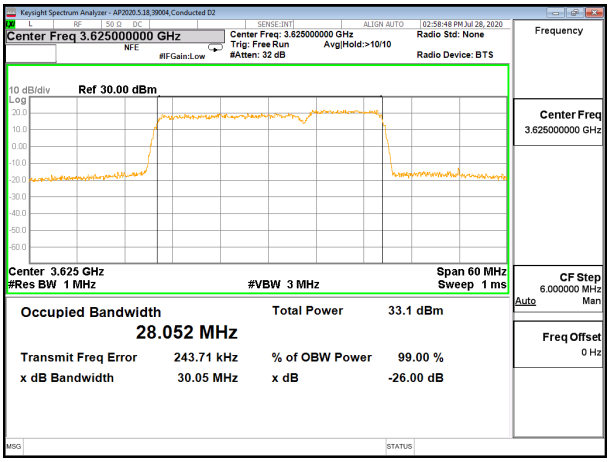
LTE B48 5MHz + 20MHz QPSK RB25-0 + RB100-0



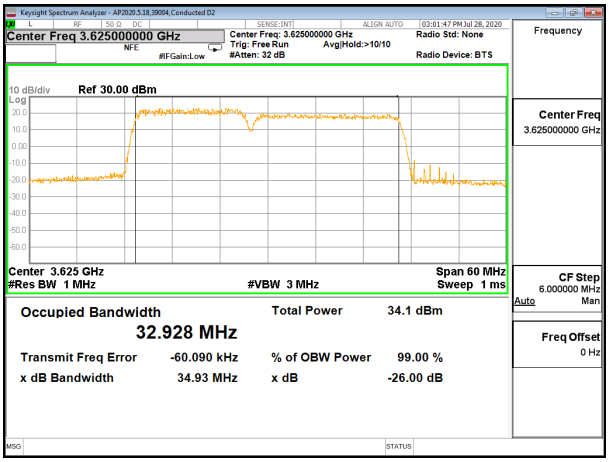
LTE B48 20MHz + 5MHz QPSK RB100-0 + RB25-0



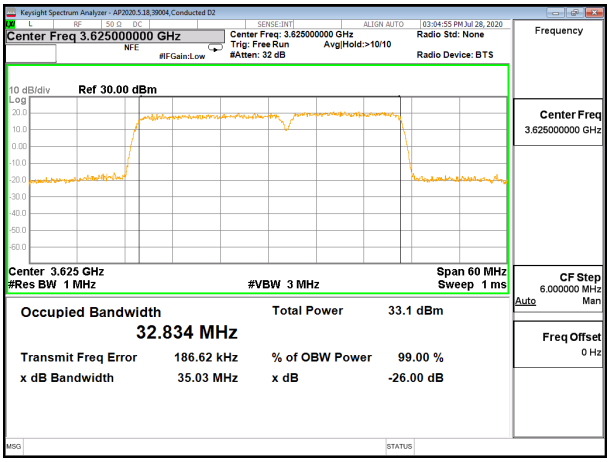
LTE B48 10MHz + 20MHz QPSK RB50-0 + RB100-0



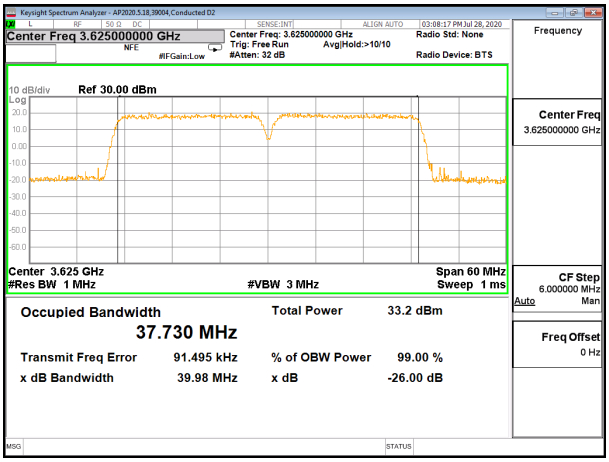
LTE B48 20MHz + 10MHz QPSK RB100-0 + RB50-0



LTE B48 15MHz + 20MHz QPSK RB75-0 + RB100-0



LTE B48 20MHz + 15MHz QPSK RB100-0 + RB75-0



LTE B48 20MHz + 20MHz QPSK RB100-0 + RB100-0

8.2. BAND EDGE AND EMISSION MASK

TEST PROCEDURE

The transmitter output was connected to a R&S CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency.
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

TEST PROCEDURE FOR FCC PART 27

(m)(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, 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; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

TEST PROCEDURE FOR FCC PART 96

(3)Measurement procedure.
(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full reference bandwidth (i.e.,1 MHz or 1 percent of emission bandwidth, as specified). The fundamental emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring unwanted emissions to demonstrate compliance with the limits, the CBSD and End User Device nominal carrier frequency/channel shall be adjusted as close to the licensee's authorized frequency block edges, both upper and lower, as the design permits.

(iii) Compliance with emission limits shall be demonstrated using either average (RMS)-detected or peak-detected power measurement techniques.

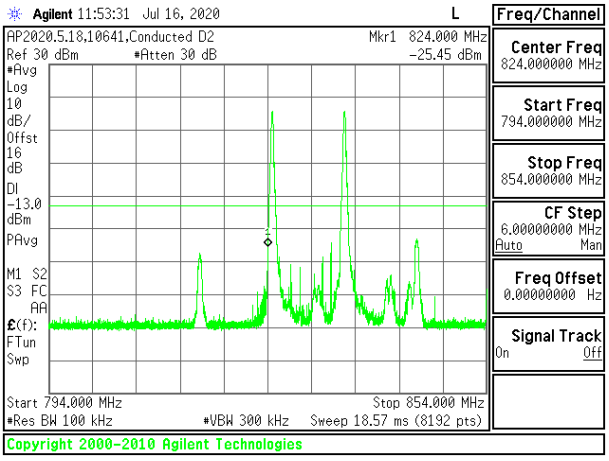
RESULTS

Both maximum + maximum bandwidth combinations of QPSK and 16QAM modes are tested, QPSK results are reported as worst case.

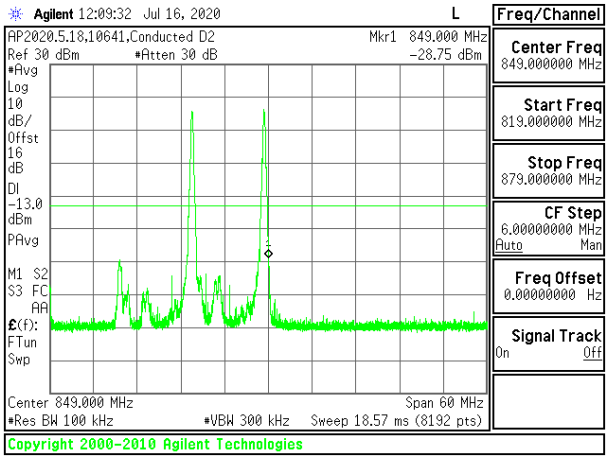
8.2.1. LTE BAND 5

LIMITS

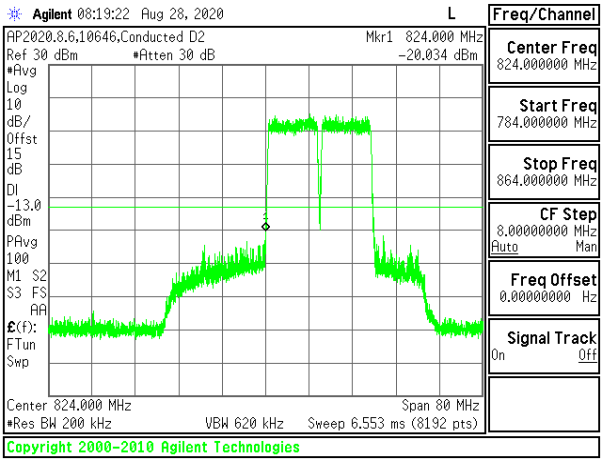
FCC: §22.917
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.



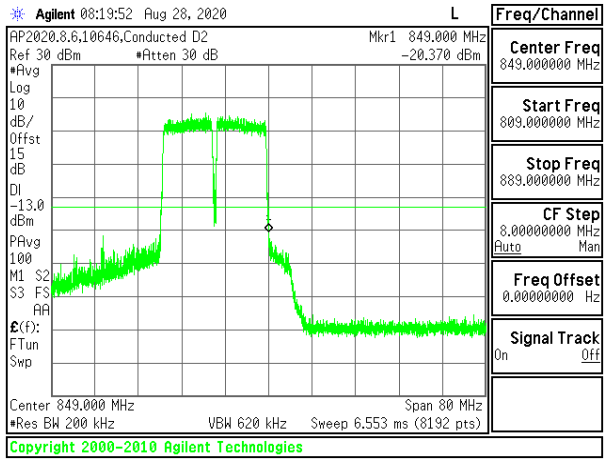
LTE B5 10MHz + 10MHz QPSK Low Ch RB1-0 + RB1-0



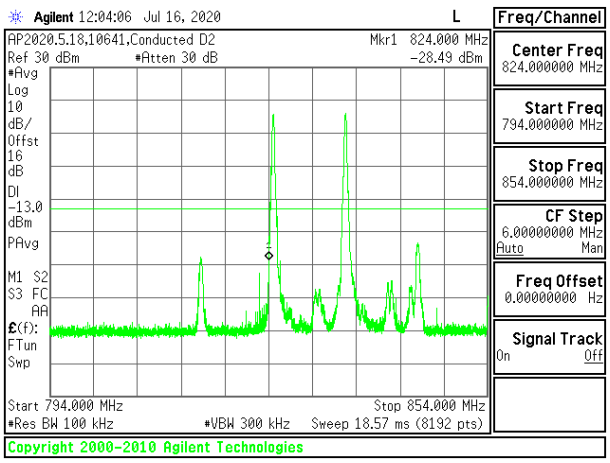
LTE B5 10MHz + 10MHz QPSK High Ch RB1-49 + RB1-49



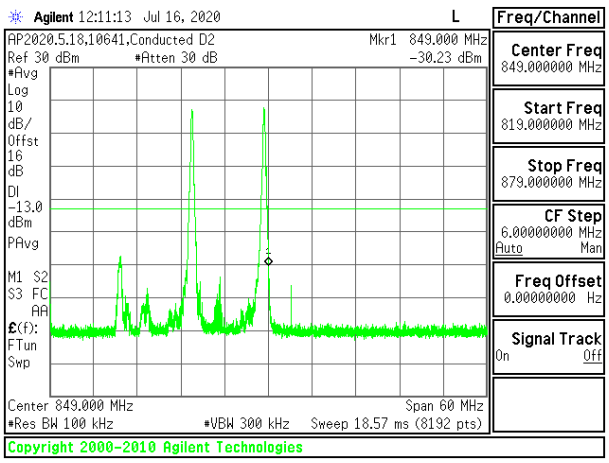
LTE B5 10MHz + 10MHz QPSK Low Ch RB50-0 + RB50-0



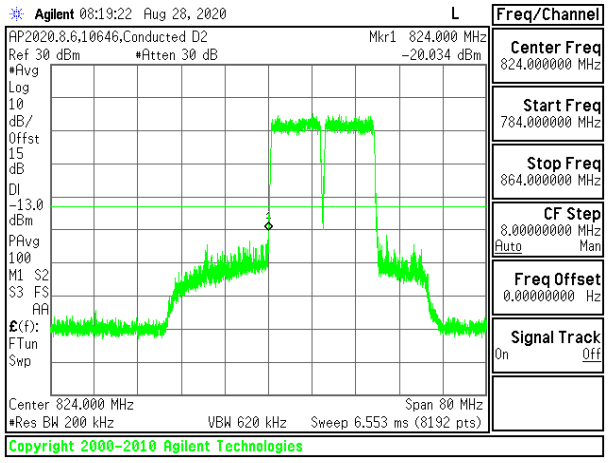
LTE B5 10MHz + 10MHz QPSK High Ch RB50-0 + RB50-0



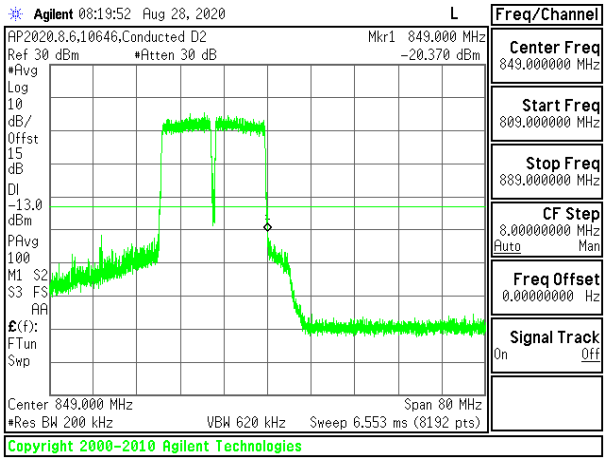
LTE B5 10MHz + 10MHz 16QAM Low Ch RB1-0 + RB1-0



LTE B5 10MHz + 10MHz 16QAM High Ch RB1-49 + RB1-49



LTE B5 10MHz + 10MHz 16QAM Low Ch RB50-0 + RB50-0

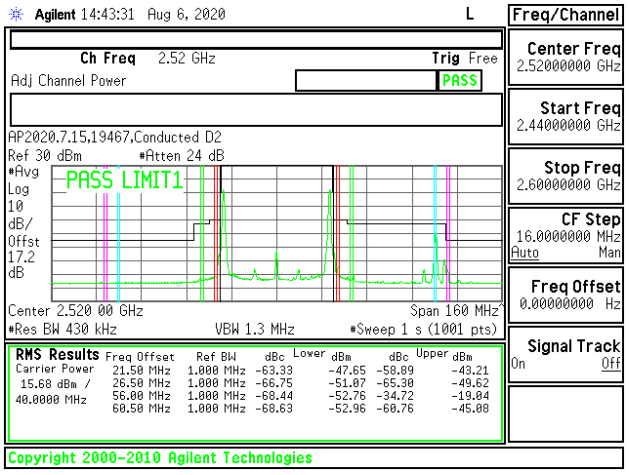


LTE B5 10MHz + 10MHz 16QAM High Ch RB50-0 + RB50-0

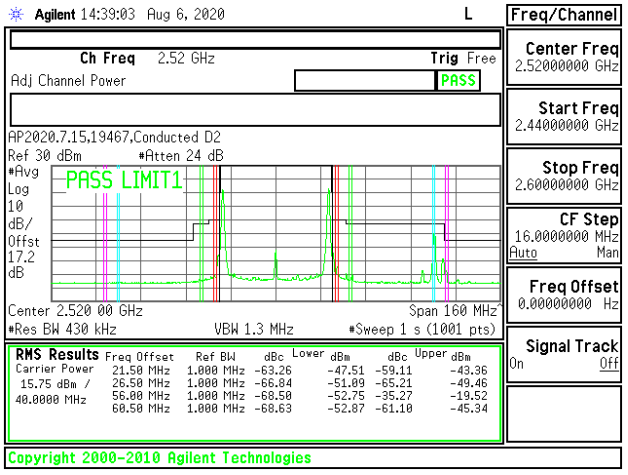
8.2.2. LTE BAND 7

LIMITS

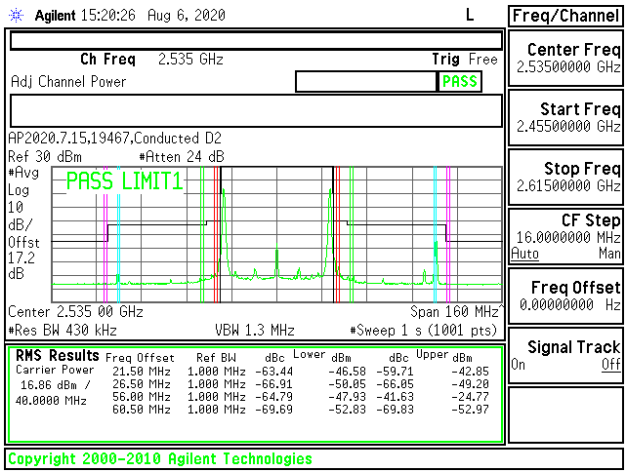
FCC: §27.53(m)(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.



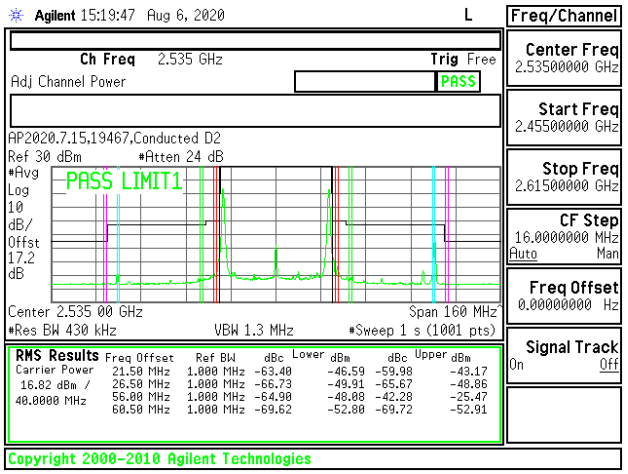
LTE B7 20MHz + 20MHz QPSK Low Ch RB1-0 + RB1-99



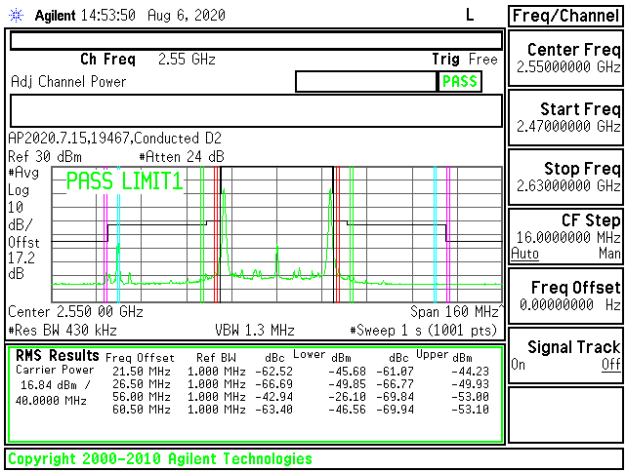
LTE B7 20MHz + 20MHz 16QAM Low Ch RB1-0 + RB1-99



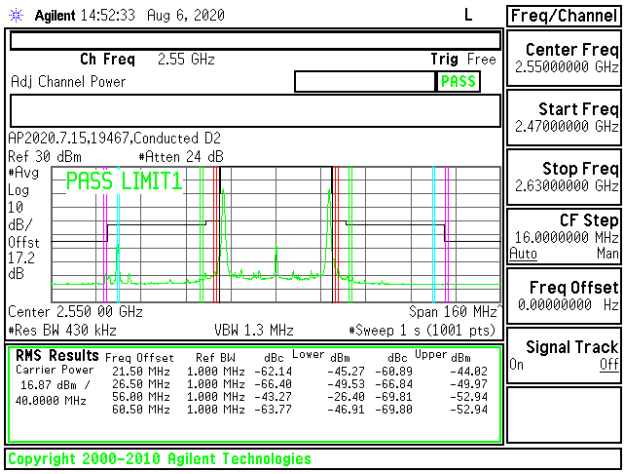
LTE B7 20MHz + 20MHz QPSK Mid Ch RB1-0 + RB1-99



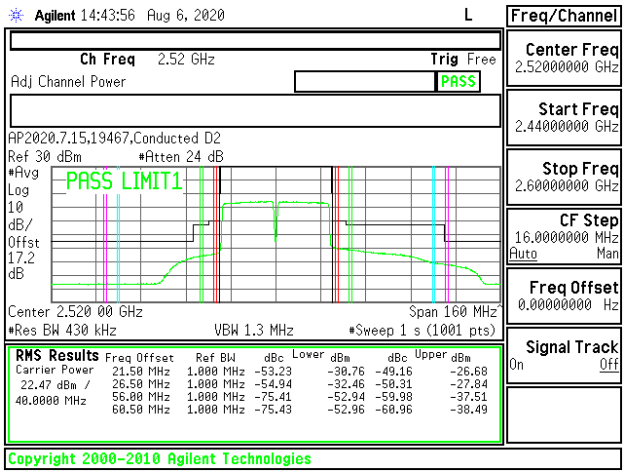
LTE B7 20MHz + 20MHz 16QAM Mid Ch RB1-0 + RB1-99



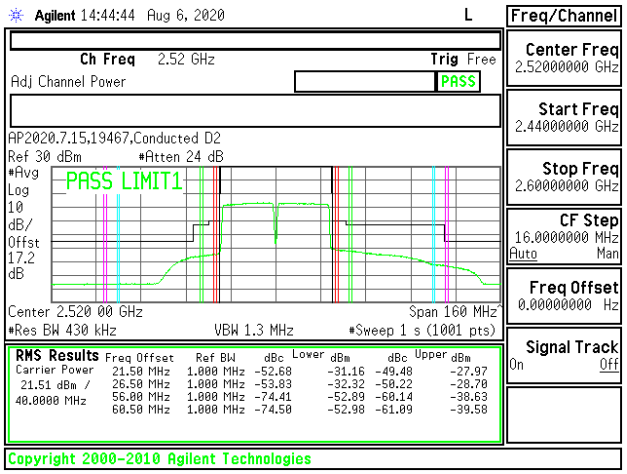
LTE B7 20MHz + 20MHz QPSK High Ch RB1-0 + RB1-99



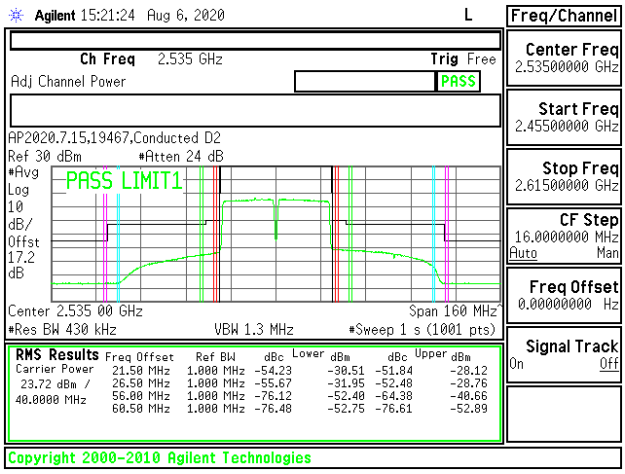
LTE B7 20MHz + 20MHz 16QAM High Ch RB1-0 + RB1-99



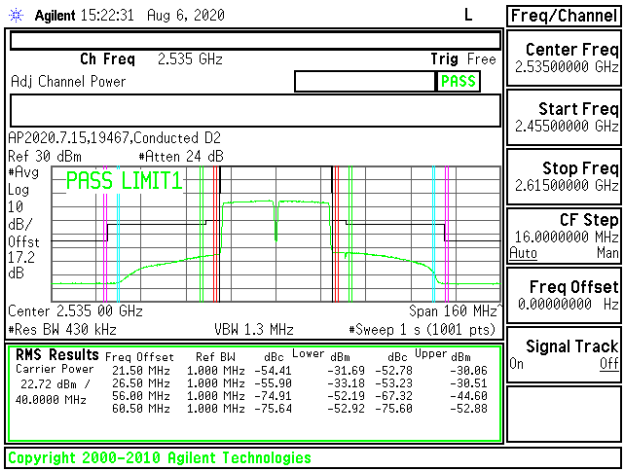
LTE B7 20MHz + 20MHz QPSK Low Ch RB100-0 + RB100-0



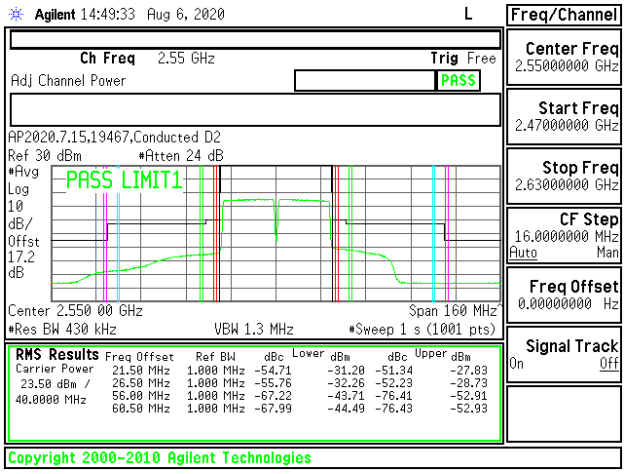
LTE B7 20MHz + 20MHz 16QAM Low Ch RB100-0 + RB100-0



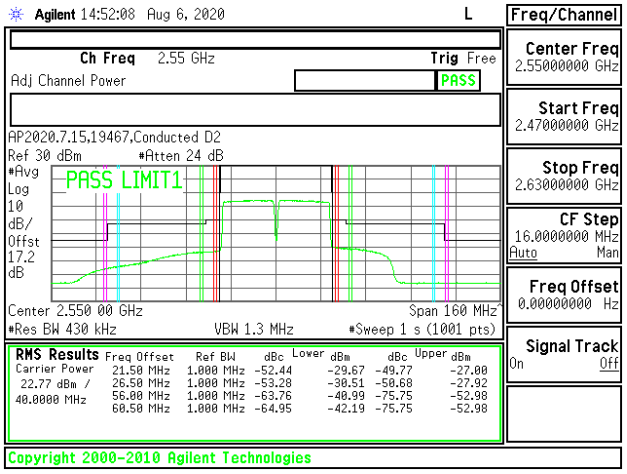
LTE B7 20MHz + 20MHz QPSK Mid Ch RB100-0 + RB100-0



LTE B7 20MHz + 20MHz 16QAM Mid Ch RB100-0 + RB100-0



LTE B7 20MHz + 20MHz QPSK High Ch RB100-0 + RB100-0

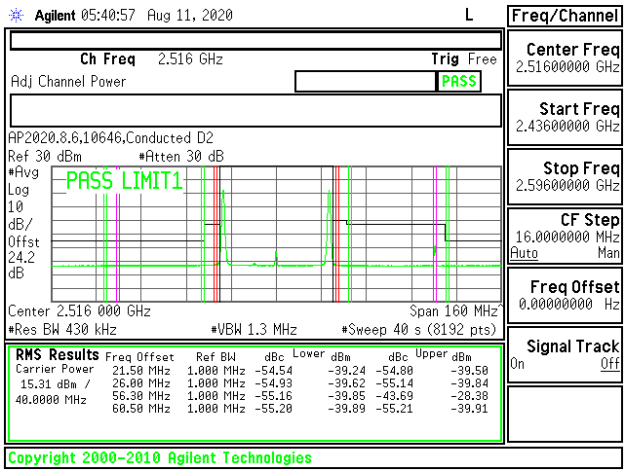


LTE B7 20MHz + 20MHz 16QAM High Ch RB100-0 + RB100-0

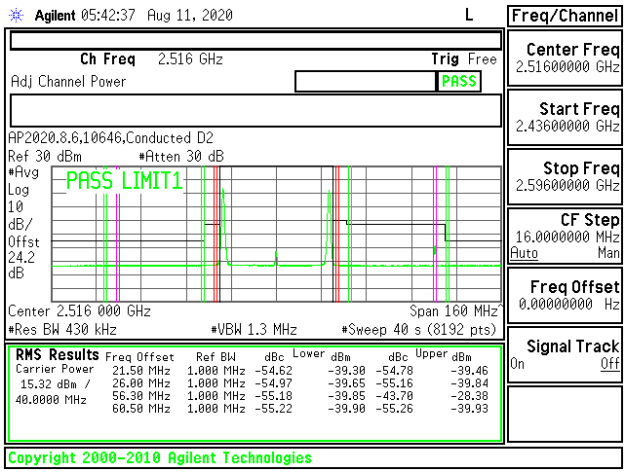
8.2.3. LTE BAND 41

LIMITS

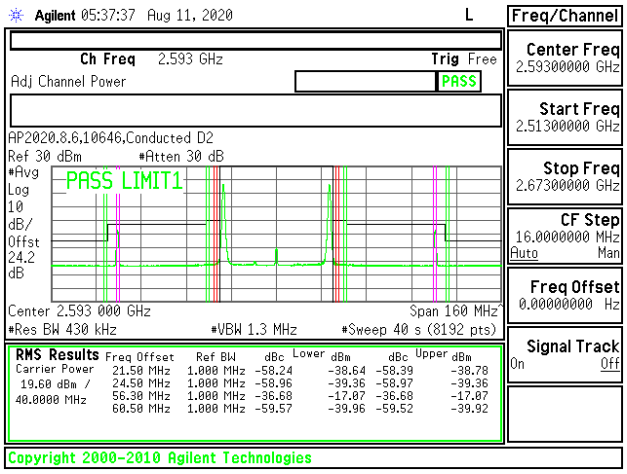
FCC: §27.53(m)(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.



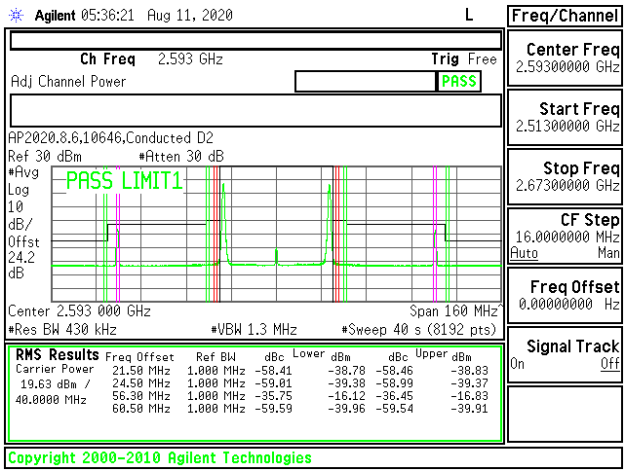
LTE B41 20MHz + 20MHz QPSK Low Ch RB1-0 + RB1-99



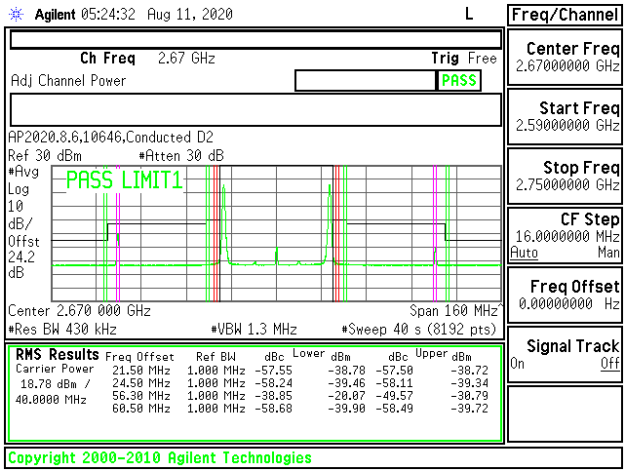
LTE B41 20MHz + 20MHz 16QAM Low Ch RB1-0 + RB1-99



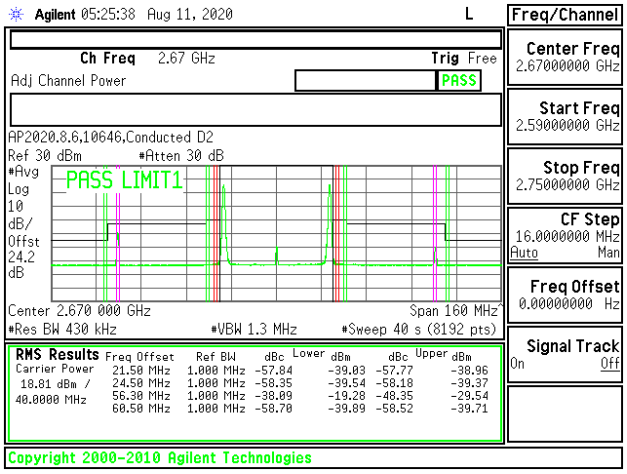
LTE B41 20MHz + 20MHz QPSK Mid Ch RB1-0 + RB1-99



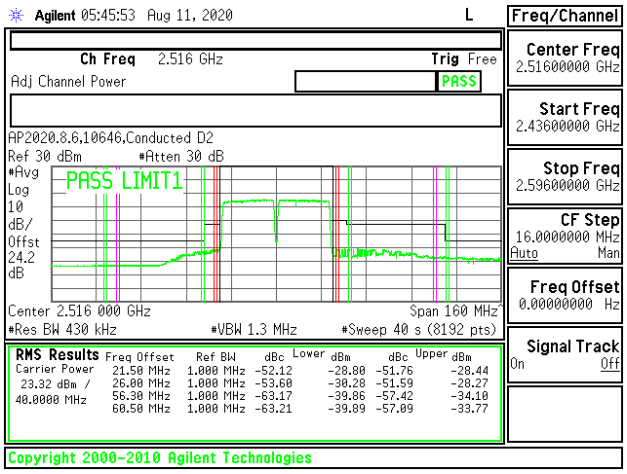
LTE B41 20MHz + 20MHz 16QAM Mid Ch RB1-0 + RB1-99



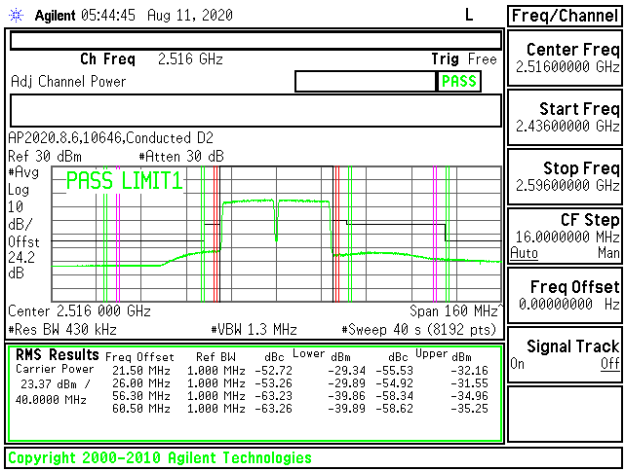
LTE B41 20MHz + 20MHz QPSK High Ch RB1-0 + RB1-99



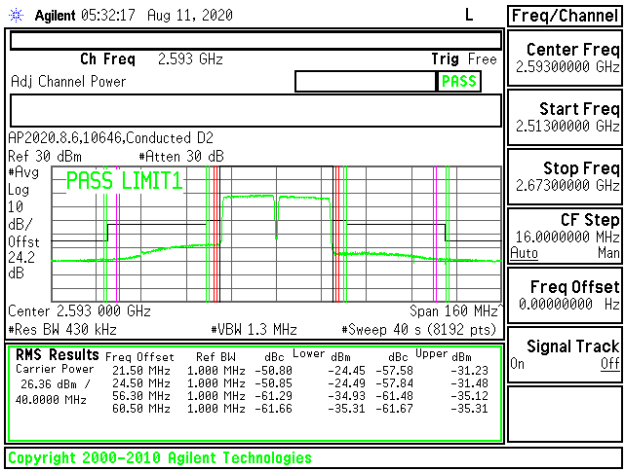
LTE B41 20MHz + 20MHz 16QAM High Ch RB1-0 + RB1-99



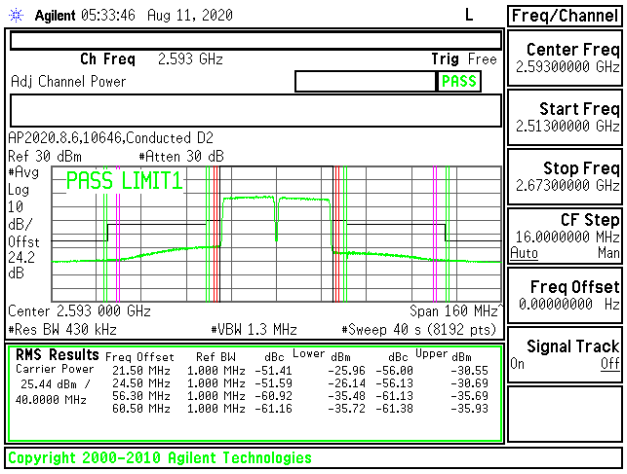
LTE B41 20MHz + 20MHz QPSK Low Ch RB100-0 + RB100-0



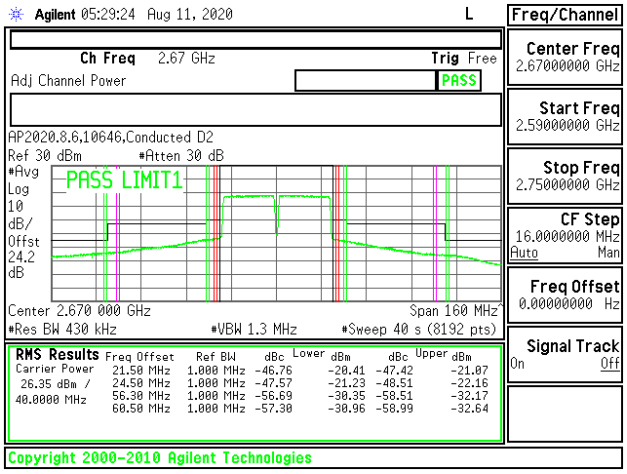
LTE B41 20MHz + 20MHz 16QAM Low Ch RB100-0 + RB100-0



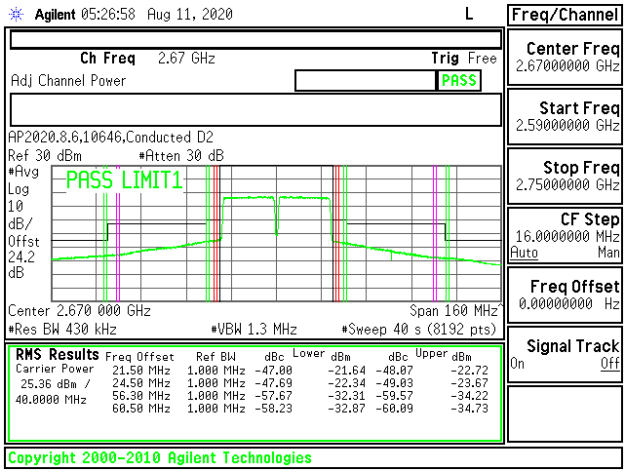
LTE B41 20MHz + 20MHz QPSK Mid Ch RB100-0 + RB100-0



LTE B41 20MHz + 20MHz 16QAM Mid Ch RB100-0 + RB100-0



LTE B41 20MHz + 20MHz QPSK High Ch RB100-0 + RB100-0



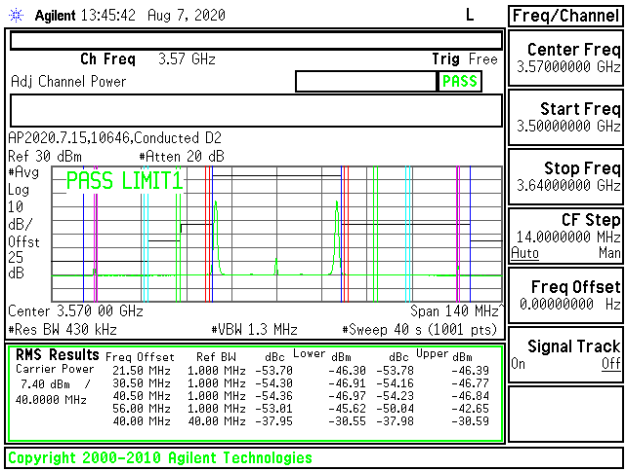
LTE B41 20MHz + 20MHz 16QAM High Ch RB100-0 + RB100-0

8.2.4. LTE BAND 48

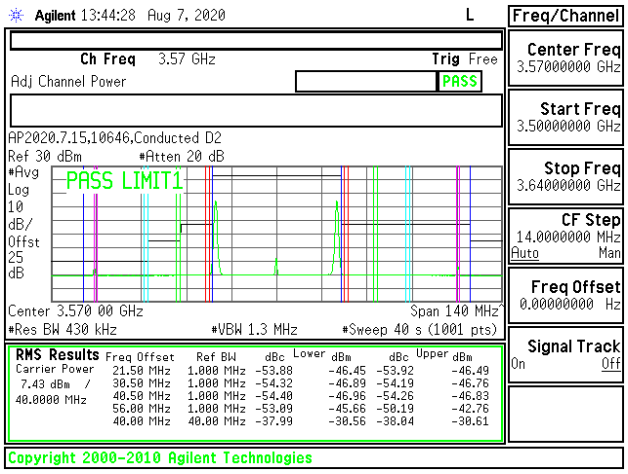
LIMITS

FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(1) General protection levels
(ii) Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

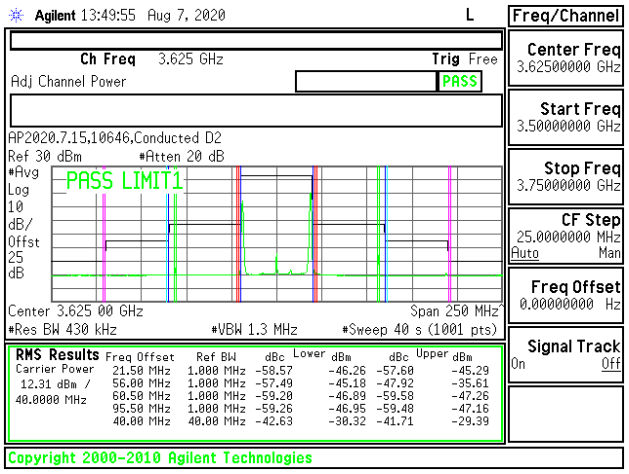
(2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.
licensees.



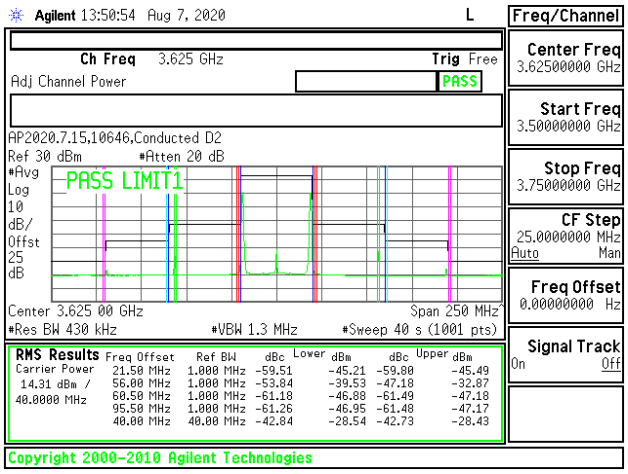
LTE B48 20MHz + 20MHz QPSK Low Ch RB1-0 + RB1-99



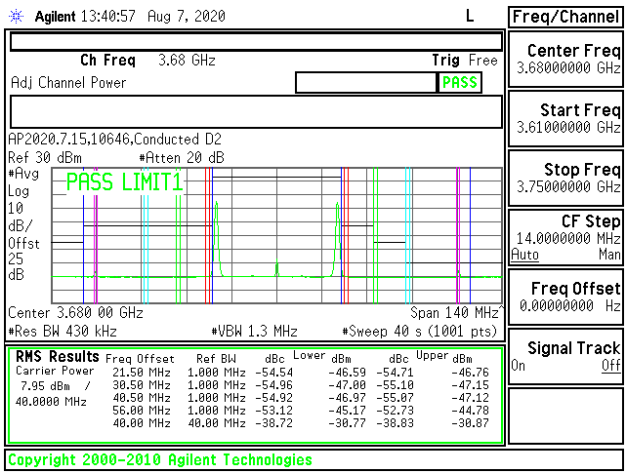
LTE B48 20MHz + 20MHz 16QAM Low Ch RB1-0 + RB1-99



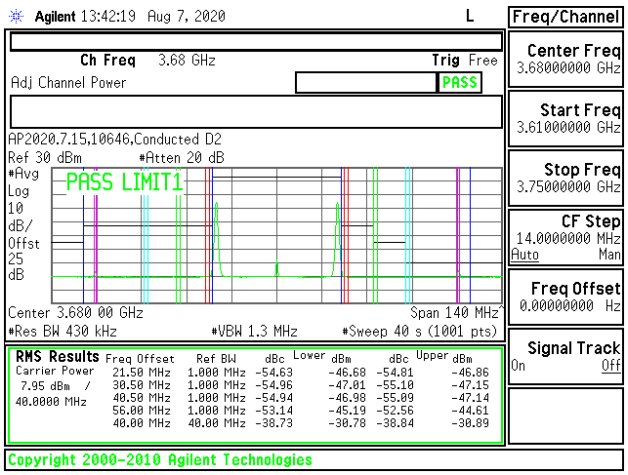
LTE B48 20MHz + 20MHz QPSK Mid Ch RB1-0 + RB1-99



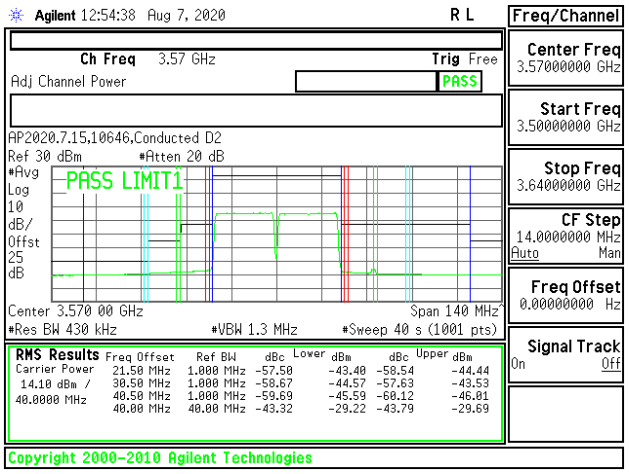
LTE B48 20MHz + 20MHz 16QAM Mid Ch RB1-0 + RB1-99



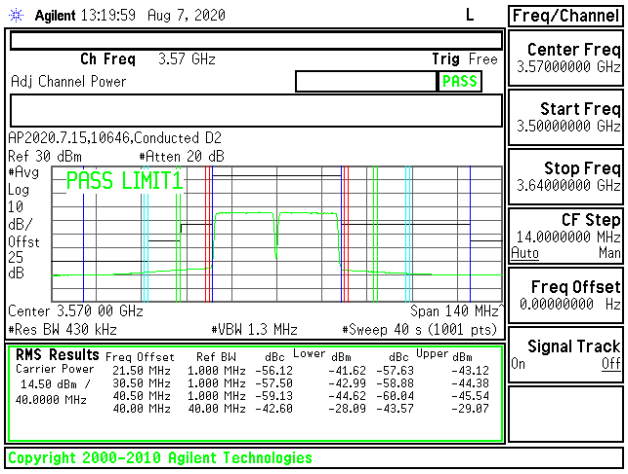
LTE B48 20MHz + 20MHz QPSK High Ch RB1-0 + RB1-99



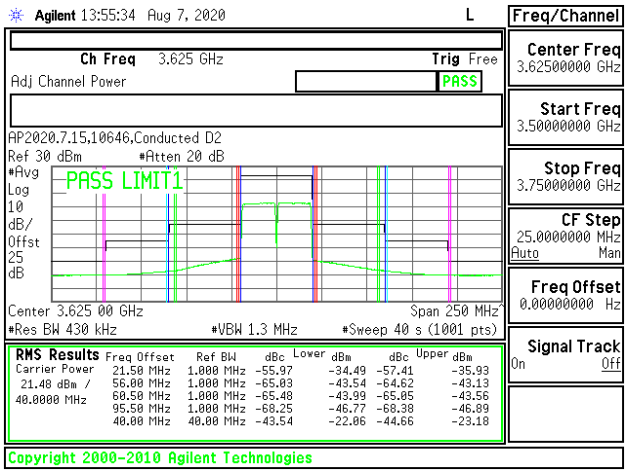
LTE B48 20MHz + 20MHz 16QAM High Ch RB1-0 + RB1-99



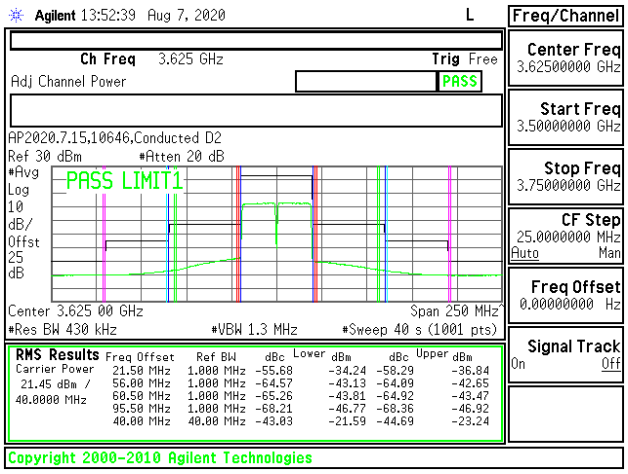
LTE B48 20MHz + 20MHz QPSK Low Ch RB100-0 + RB100-0



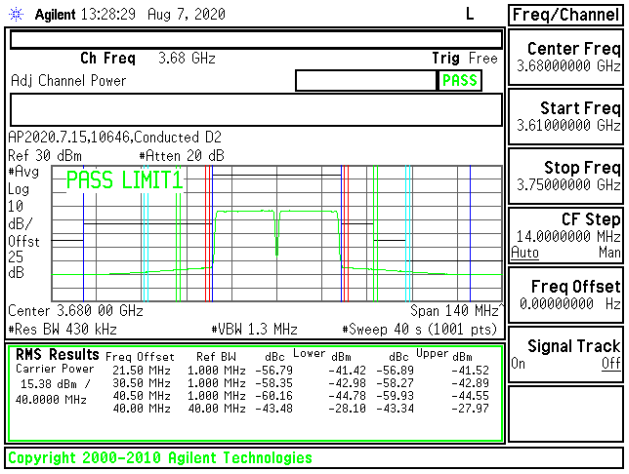
LTE B48 20MHz + 20MHz 16QAM Low Ch RB100-0 + RB100-0



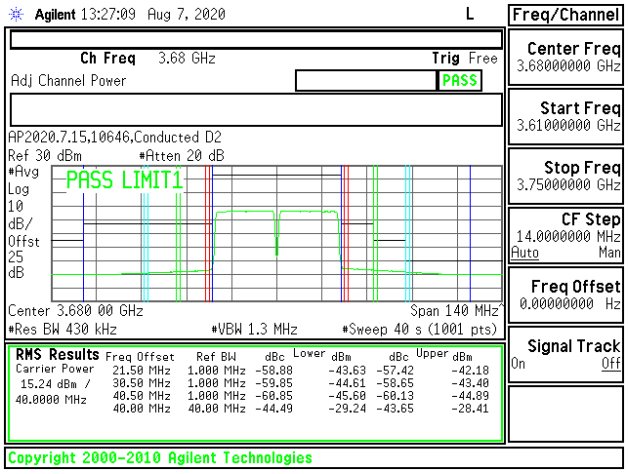
LTE B48 20MHz + 20MHz QPSK Mid Ch RB100-0 + RB100-0



LTE B48 20MHz + 20MHz 16QAM Mid Ch RB100-0 + RB100-0



LTE B48 20MHz + 20MHz QPSK High Ch RB100-0 + RB100-0



LTE B48 20MHz + 20MHz 16QAM High Ch RB100-0 + RB100-0

8.3. OUT OF BAND EMISSIONS

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- Set display line at -13 dBm to band 5 and -25 dBm to band 7 and 41
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz. (NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

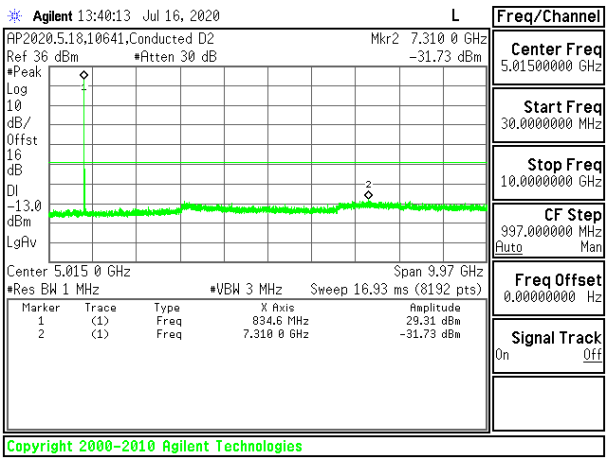
RESULTS

Both maximum + maximum bandwidth combinations of QPSK and 16QAM modes are tested, QPSK results are reported as worst case.

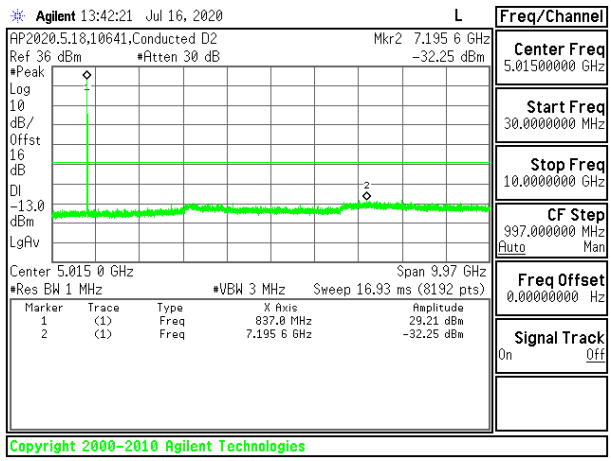
8.3.1. LTE BAND 5

LIMITS

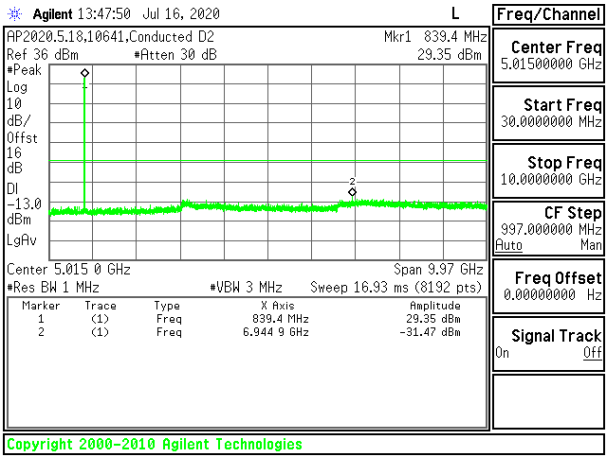
FCC: §22.917
The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



LTE B5 10MHz + 10MHz QPSK Low Ch RB1-49 + RB1-0



LTE B5 10MHz + 10MHz QPSK Middle Ch RB1-49 + RB1-0



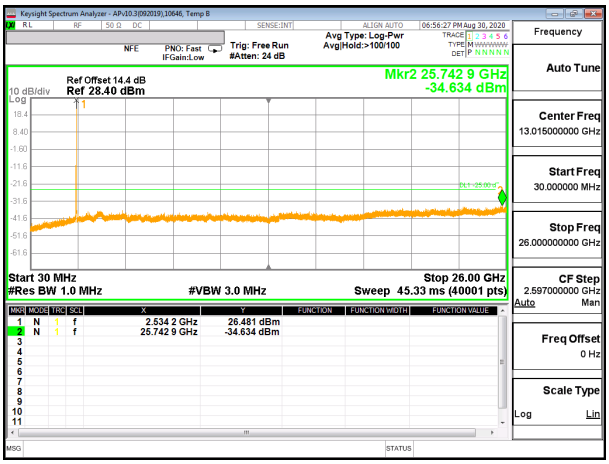
LTE B5 10MHz + 10MHz QPSK High Ch RB1-49 + RB1-0

8.3.2. LTE BAND 7

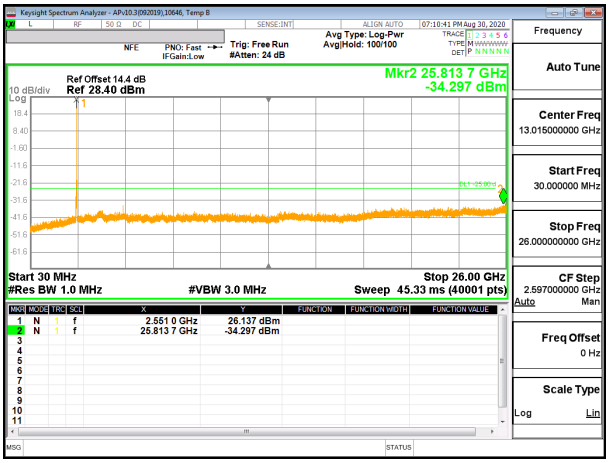
LIMITS

FCC: §27.53 (m)
The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.

LTE B7 20MHz + 20MHz QPSK Low Ch RB1-99 + RB1-0



LTE B7 20MHz + 20MHz QPSK Middle Ch RB1-99 + RB1-0

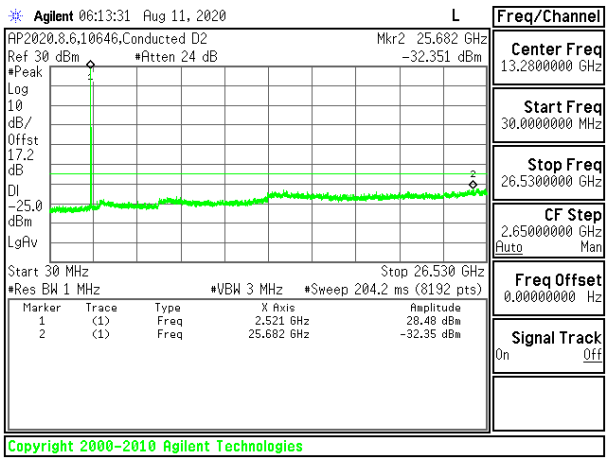


LTE B7 20MHz + 20MHz QPSK High Ch RB1-99 + RB1-0

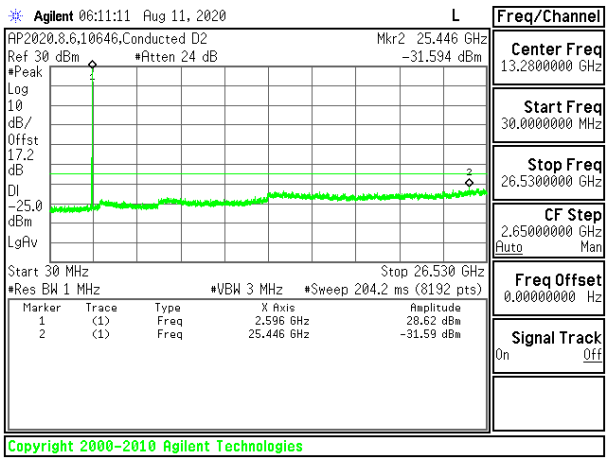
8.3.3. LTE BAND 41

LIMITS

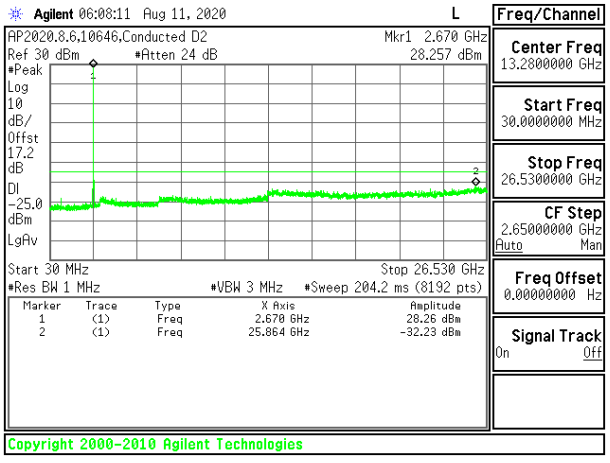
FCC: §27.53 (m)
The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.



LTE B41 20MHz + 20MHz QPSK Low Ch RB1-99 + RB1-0



LTE B41 20MHz + 20MHz QPSK Middle Ch RB1-99 + RB1-0



LTE B41 20MHz + 20MHz QPSK High Ch RB1-99 + RB1-0

8.3.4. LTE BAND 48

LIMITS

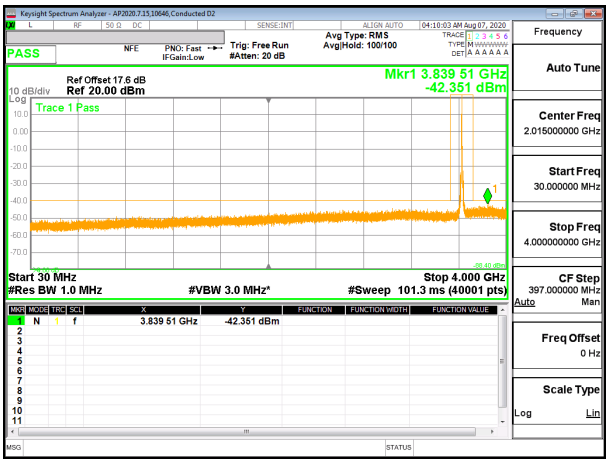
FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

LTE B48 20MHz + 20MHz QPSK Low Ch RB1-99 + RB1-0

30MHz-4GHz

LTE B48 20MHz + 20MHz QPSK Low Ch RB1-99 + RB1-0

4GHz-40GHz

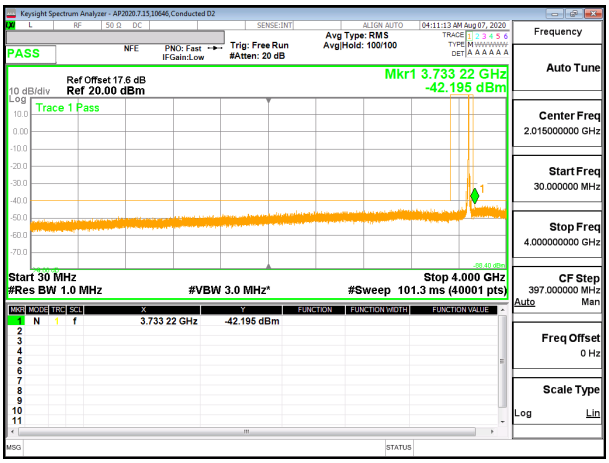


LTE B48 20MHz + 20MHz QPSK Mid Ch RB1-99 + RB1-0

30MHz-4GHz

LTE B48 20MHz + 20MHz QPSK Mid Ch RB1-99 + RB1-0

4GHz-40GHz



LTE B48 20MHz + 20MHz QPSK High Ch RB1-99 + RB1-0

30MHz-4GHz

LTE B48 20MHz + 20MHz QPSK High Ch RB1-99 + RB1-0

4GHz-40GHz

8.4. FREQUENCY STABILITY

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = −30°C to +50°C
- Voltage = (85% - 115%)

  Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.
  End Voltage, 3.2VDC.

Frequency Stability vs Temperature:
The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

Frequency Stability vs Voltage:
The peak frequency error is recorded (worst-case).

RESULTS

See the following pages.

8.4.1. LTE BAND 5

LIMITS

FCC §22.355
The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

Test Engineer ID:	19178	Test Date:	7/25/2020

QPSK, (10MHz + 10MHz BANDWIDTH)

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	824.5276	848.4931		
Extreme (50C)		824.5276	848.4931	14.3	0.017
Extreme (40C)		824.5276	848.4930	-24.8	-0.030
Extreme (30C)		824.5276	848.4930	-17.2	-0.021
Extreme (10C)		824.5276	848.4931	-2.8	-0.003
Extreme (0C)		824.5276	848.4930	-19.8	-0.024
Extreme (-10C)		824.5276	848.4931	31.7	0.038
Extreme (-20C)		824.5276	848.4930	-32.0	-0.038
Extreme (-30C)		824.5277	848.4931	37.1	0.044
20C	15%	824.5276	848.4931	0.2	0.000
	-15%	824.5276	848.4931	-3.7	-0.004
	End Point	824.5276	848.4931	1.0	0.001

8.4.2. LTE BAND 7

LIMITS

FCC: §27.54
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Engineer ID:	19178	Test Date:	7/25/2020

QPSK, (20MHz + 20MHz BANDWIDTH)

Limit		2500	2570	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2501.0535	2568.9219		
Extreme (50C)		2501.0534	2568.9219	-32.1	-0.013
Extreme (40C)		2501.0535	2568.9220	38.5	0.015
Extreme (30C)		2501.0535	2568.9219	23.3	0.009
Extreme (10C)		2501.0534	2568.9219	-11.5	-0.005
Extreme (0C)		2501.0534	2568.9219	-29.9	-0.012
Extreme (-10C)		2501.0534	2568.9219	-57.5	-0.023
Extreme (-20C)		2501.0534	2568.9218	-69.8	-0.028
Extreme (-30C)		2501.0534	2568.9218	-74.9	-0.030
20C	15%	2501.0535	2568.9219	11.3	0.004
	-15%	2501.0535	2568.9219	2.0	0.001
	End Point	2501.0535	2568.9219	13.8	0.005

8.4.3. LTE BAND 41

LIMITS

FCC: §27.54
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Engineer ID:	19178	Test Date:	7/25/2020

QPSK, (20MHz + 20MHz BANDWIDTH)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2496.7142	2689.1375		
Extreme (50C)		2496.7142	2689.1375	21.2	0.008
Extreme (40C)		2496.7143	2689.1375	32.3	0.012
Extreme (30C)		2496.7142	2689.1375	15.0	0.006
Extreme (10C)		2496.7142	2689.1375	-22.2	-0.009
Extreme (0C)		2496.7142	2689.1374	-61.5	-0.024
Extreme (-10C)		2496.7141	2689.1374	-75.2	-0.029
Extreme (-20C)		2496.7141	2689.1374	-84.0	-0.032
Extreme (-30C)		2496.7141	2689.1374	-72.3	-0.028
20C	15%	2496.7142	2689.1375	11.8	0.005
	-15%	2496.7142	2689.1375	-14.8	-0.006
	End Point	2496.7142	2689.1375	-12.5	-0.005

8.4.4. LTE BAND 48

Test Engineer ID:	19177	Test Date:	7/25/2020

QPSK, (20MHz + 20MHz BANDWIDTH)

Limit		3550	3700	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	3551.2646	3699.7385		
Extreme (50C)		3551.2646	3699.7385	21.2	0.006
Extreme (40C)		3551.2646	3699.7385	29.2	0.008
Extreme (30C)		3551.2646	3699.7385	16.8	0.005
Extreme (10C)		3551.2645	3699.7385	-21.0	-0.006
Extreme (0C)		3551.2645	3699.7385	-49.0	-0.014
Extreme (-10C)		3551.2645	3699.7384	-82.8	-0.023
Extreme (-20C)		3551.2645	3699.7384	-91.6	-0.025
Extreme (-30C)		3551.2645	3699.7384	-85.4	-0.024
20C	15%	3551.2645	3699.7385	-12.5	-0.003
	-15%	3551.2645	3699.7385	-12.8	-0.004
	End Point	3551.2645	3699.7385	-13.7	-0.004

8.5. PEAK-TO-AVERAGE POWER RATIO

LIMIT

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

RESULT

Test was performed on Antenna 1; full resource block (FRB) for each bandwidth was used to measure as the worst case. The results from all CCDF measurements are passed with 13dB peak-to-average ratio criteria.

8.5.1. LTE BAND 5

Test Engineer ID:	39004	Test Date:	7/29/2020

Band	Bandwidth (MHz)	PCC f (MHz)	SCC1 f (MHz)	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
					Peak	Average	
Band 5	5MHz / 10MHz	831.8	839.0	QPSK	31.68	24.21	7.47
				16QAM	31.69	22.23	9.46
	10MHz / 5MHz	834.3	841.5	QPSK	31.57	24.18	7.39
				16QAM	31.46	23.23	8.23
	10MHz / 10MHz	831.6	831.5	QPSK	31.77	24.24	7.53
				16QAM	31.77	23.19	8.58
Duty Cycle Correction Factor (dB) =			0.00				
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor							

8.5.2. LTE BAND 7

Test Engineer ID:	39004	Test Date:	7/29/2020

Band	Bandwidth (MHz)	PCC f (MHz)	SCC1 f (MHz)	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
					Peak	Average	
Band 7	10MHz / 20MHz	2525.6	2540.0	QPSK	31.74	22.94	8.80
				16QAM	32.04	23.91	8.13
	20MHz / 10MHz	2530.1	2544.5	QPSK	31.93	23.98	7.95
				16QAM	31.61	22.85	8.76
	15 MHz / 15MHz	2527.5	2542.5	QPSK	32.10	23.99	8.11
				16QAM	31.84	22.94	8.90
	15MHz / 20MHz	2525.3	2542.4	QPSK	32.06	23.92	8.14
				16QAM	31.83	22.89	8.94
	20MHz / 15MHz	2527.6	2544.7	QPSK	31.80	23.84	7.96
				16QAM	31.73	22.95	8.78
	20MHz / 20MHz	2525.1	2544.9	QPSK	31.92	23.88	8.04
				16QAM	31.64	22.9	8.74
Duty Cycle Correction Factor (dB) =			0.00				
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor							

8.5.3. LTE BAND 41

Test Engineer ID:	39004	Test Date:	7/29/2020

Band	Bandwidth (MHz)	PCC f (MHz)	SCC1 f (MHz)	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
					Peak	Average	
Band 41 (FCC)	5MHz / 20MHz	2583.8	2595.5	QPSK	30.05	16.56	6.49
				16QAM	29.50	15.39	7.11
	20MHz / 5MHz	2590.5	2602.2	QPSK	30.30	16.84	6.46
				16QAM	29.91	15.75	7.16
	10MHz / 20MHz	2583.6	2598.0	QPSK	30.31	16.41	6.90
				16QAM	30.09	15.42	7.67
	20MHz / 10MHz	2588.1	2602.5	QPSK	30.28	16.6	6.68
				16QAM	29.83	15.4	7.43
	15MHz / 15MHz	2585.5	2600.5	QPSK	30.19	16.45	6.74
				16QAM	29.99	15.52	7.47
	15MHz / 20MHz	2583.3	2600.4	QPSK	29.93	16.19	6.74
				16QAM	29.83	15.34	7.49
	20MHz / 15MHz	2585.6	2602.7	QPSK	30.12	16.43	6.69
				16QAM	29.88	15.51	7.37
	20MHz / 20MHz	2583.1	2602.9	QPSK	30.13	16.42	6.71
				16QAM	29.61	15.25	7.36
Duty Cycle Correction Factor (dB) =			7.00				
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor							

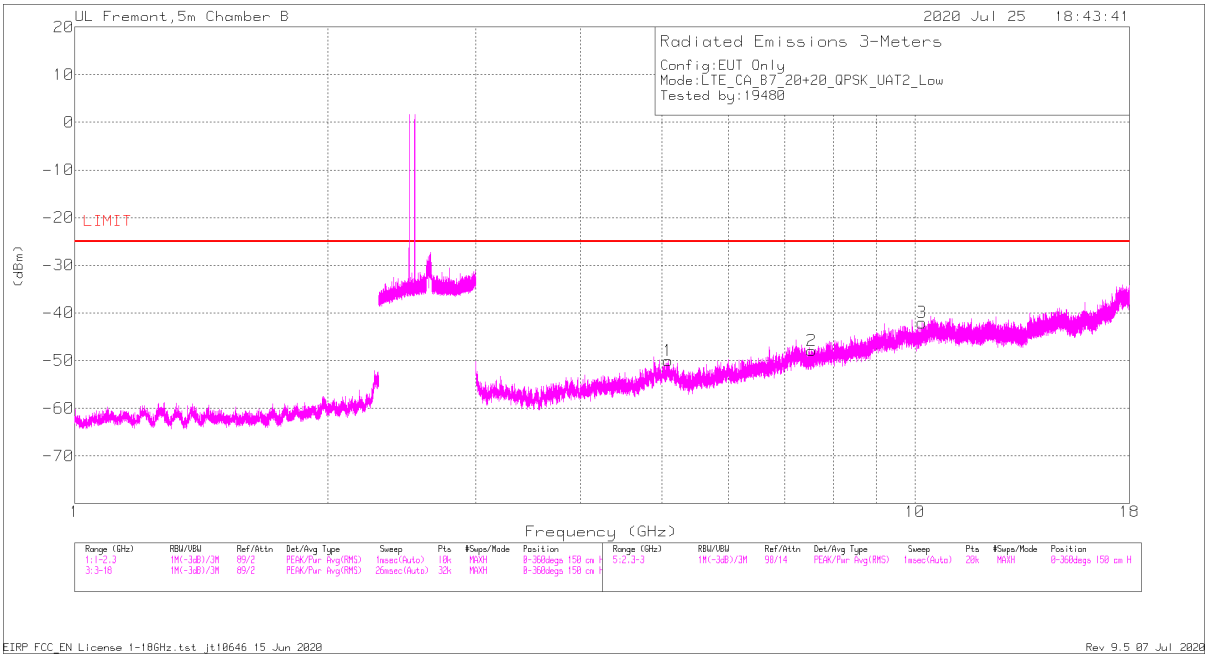
8.5.4. LTE BAND 48

Test Engineer ID:	39004	Test Date:	7/29/2020

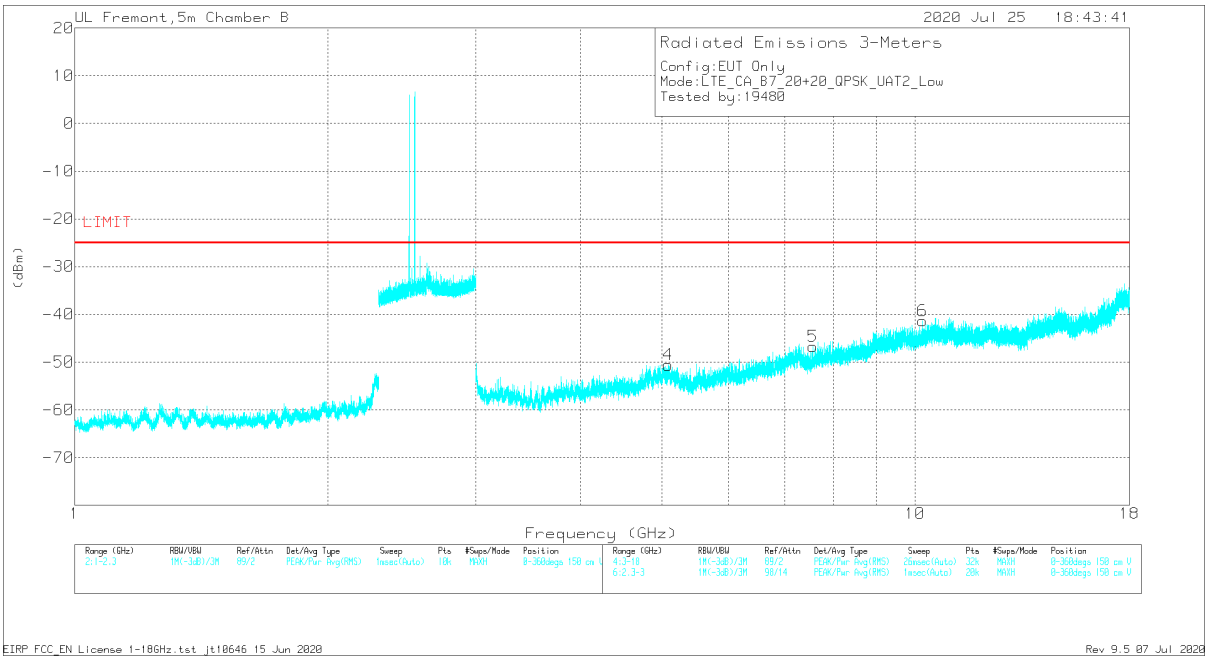
Band	Bandwidth (MHz)	PCC f (MHz)	SCC1 f (MHz)	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
					Peak	Average	
Band 41 (FCC)	5MHz / 20MHz	3615.8	3627.5	QPSK	30.26	19.46	8.60
				16QAM	29.85	18.59	9.06
	20MHz / 5MHz	3622.5	3634.2	QPSK	29.64	19.88	7.56
				16QAM	29.57	18.79	8.58
	10MHz / 20MHz	3615.6	3630.0	QPSK	29.83	19.91	7.72
				16QAM	29.58	18.98	8.40
	20MHz / 10MHz	3620.1	3634.5	QPSK	30.40	19.89	8.31
				16QAM	29.49	18.95	8.34
	15MHz / 20MHz	3615.3	3632.4	QPSK	30.30	18.80	9.30
				16QAM	30.10	18.03	9.87
	20MHz / 15MHz	3617.6	3634.7	QPSK	29.97	19.92	7.85
				16QAM	29.65	18.85	8.60
	20MHz / 20MHz	3615.1	3634.9	QPSK	30.23	19.88	8.15
				16QAM	29.97	18.94	8.83
Duty Cycle Correction Factor (dB) =			2.20				
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor							

9. RADIATED TEST RESULTS

9.1. Example Plot



Horizontal Polarity



Vertical Polarity

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
4	5.08172	36.21	Pk	33.8	-26.2	.8	-95.2	-50.59	-25	-25.59	V
1	5.08219	36.79	Pk	33.8	-26.2	.8	-95.2	-50.01	-25	-25.01	H
2	7.53469	33.88	Pk	36.9	-23.8	.3	-95.2	-47.92	-25	-22.92	H
5	7.55813	35.47	Pk	36.8	-24.1	.3	-95.2	-46.73	-25	-21.73	V
3	10.18969	33.55	Pk	38.6	-19.7	.7	-95.2	-42.05	-25	-17.05	H
6	10.21266	34.13	Pk	38.7	-19.9	.9	-95.2	-41.37	-25	-16.37	V

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
5.07967	38.53	Pk	33.8	-26.1	.7	-95.2	-48.27	-25	-23.27	V
5.08446	38.82	Pk	33.8	-26.2	.8	-95.2	-47.98	-25	-22.98	H
7.53119	36.16	Pk	36.9	-23.8	.3	-95.2	-45.64	-25	-20.64	H
7.55557	36.03	Pk	36.8	-24	.3	-95.2	-46.07	-25	-21.07	V
10.19275	35.01	Pk	38.6	-19.7	.7	-95.2	-40.59	-25	-15.59	H
10.21178	34.28	Pk	38.7	-19.9	.9	-95.2	-41.22	-25	-16.22	V

Pk - Peak detector

9.2. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz, ANT1

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

Maximum + maximum bandwidth combinations of QPSK mode was tested, QPSK results are reported as worst case.

9.2.1. LTE BAND 5

LIMIT

FCC: §22.917(a)
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.

QPSK LTE BAND 5 (10.0MHZ + 10.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/25/2020
Test Engineer:	19480
Configuration:	EUT Only
Mode:	Band 5 QPSK 10+10MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	HPF 1.2GHz T1737 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 829MHz + 838.9MHz										
1.66784	40.8	Pk	25	-30.4	.7	-95.2	-59.1	-13	-46.1	H
1.67212	40.14	Pk	25	-30.4	.7	-95.2	-59.76	-13	-46.76	V
2.50033	40.2	Pk	29	-29.3	.6	-95.2	-54.7	-13	-41.7	V
2.5028	40.26	Pk	29	-29.3	.6	-95.2	-54.64	-13	-41.64	H
3.32771	39.36	Pk	31	-28.2	.6	-95.2	-52.44	-13	-39.44	V
3.32965	38.76	Pk	31	-28.2	.6	-95.2	-53.04	-13	-40.04	H
Mid Channel, 831.6MHz + 841.5MHz										
1.67274	40.81	Pk	25	-30.4	.7	-95.2	-59.09	-13	-46.09	H
1.67291	41.06	Pk	25	-30.4	.7	-95.2	-58.84	-13	-45.84	V
2.50764	39.97	Pk	29.1	-29.3	.7	-95.2	-54.73	-13	-41.73	H
2.51036	41.35	Pk	29.1	-29.3	.7	-95.2	-53.35	-13	-40.35	V
3.43784	38.86	Pk	30.5	-27.9	.5	-95.2	-53.24	-13	-40.24	H
3.43888	39.76	Pk	30.5	-27.9	.5	-95.2	-52.34	-13	-39.34	V
High Channel, 834.1MHz + 844MHz										
1.67874	40.15	Pk	24.9	-30.4	.7	-95.2	-59.85	-13	-46.85	H
1.6794	39.9	Pk	24.9	-30.4	.7	-95.2	-60.1	-13	-47.1	V
2.51374	39.32	Pk	29.1	-29.3	.7	-95.2	-55.38	-13	-42.38	V
2.51769	41.69	Pk	29.2	-29.3	.8	-95.2	-52.81	-13	-39.81	H
3.35197	37.84	Pk	31	-28.1	.6	-95.2	-53.86	-13	-40.86	V
3.35967	37.66	Pk	30.9	-28.1	.6	-95.2	-54.14	-13	-41.14	H

9.2.2. LTE BAND 7

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 7 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/25/2020
Test Engineer:	19480
Configuration:	EUT Only
Mode:	Band 7 QPSK 20+20MHz
Chamber #:	Chamber A

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
5.0862	38.5	Pk	33.8	-26.2	.8	-95.2	-48.3	-25	-23.3	V
5.10086	38.22	Pk	33.9	-26.4	.8	-95.2	-48.68	-25	-23.68	H
7.55315	36.51	Pk	36.9	-24	.3	-95.2	-45.49	-25	-20.49	H
7.56211	36.31	Pk	36.8	-24.1	.4	-95.2	-45.79	-25	-20.79	V
10.12894	34.73	Pk	38.4	-19.9	.7	-95.2	-41.27	-25	-16.27	V
10.17552	34.94	Pk	38.6	-19.7	.6	-95.2	-40.76	-25	-15.76	H
Mid Channel, 2525.1MHz + 2544.9MHz										
5.03009	37.63	Pk	33.7	-26	.7	-95.2	-49.17	-25	-24.17	H
5.17903	37.45	Pk	33.7	-26.5	.7	-95.2	-49.85	-25	-24.85	V
7.6114	35.78	Pk	36.9	-23.7	.4	-95.2	-45.82	-25	-20.82	V
7.65726	35.84	Pk	37	-23.4	.3	-95.2	-45.46	-25	-20.46	H
10.19175	35.33	Pk	38.6	-19.7	.7	-95.2	-40.27	-25	-15.27	V
10.23203	34.88	Pk	38.8	-19.6	.8	-95.2	-40.32	-25	-15.32	H
High Channel, 2540.2MHz + 2560MHz										
5.06649	38.11	Pk	33.8	-26.2	.6	-95.2	-48.89	-25	-23.89	H
5.08801	38.24	Pk	33.8	-26.2	.8	-95.2	-48.56	-25	-23.56	V
7.54753	35.88	Pk	36.9	-23.9	.3	-95.2	-46.02	-25	-21.02	H
7.61415	36.78	Pk	36.9	-23.7	.4	-95.2	-44.82	-25	-19.82	V
10.18108	34.91	Pk	38.6	-19.7	.6	-95.2	-40.79	-25	-15.79	H
10.30936	34.18	Pk	39	-19.4	.6	-95.2	-40.82	-25	-15.82	V

9.2.3. LTE BAND 41

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 41 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/23/2020
Test Engineer:	50822
Configuration:	EUT Only
Mode:	Band 41FCC QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2506MHz + 2525.8MHz										
4.77761	38.03	Pk	32.9	-27.1	.6	-95.2	-50.77	-25	-25.77	V
5.22005	37.32	Pk	33.5	-26.3	1	-95.2	-49.68	-25	-24.68	H
5.71587	36.43	Pk	33	-25.4	.6	-95.2	-50.57	-25	-25.57	H
7.26618	35.92	Pk	37.2	-23.4	.5	-95.2	-44.98	-25	-19.98	H
7.7399	35.63	Pk	37.1	-23.5	.3	-95.2	-45.67	-25	-20.67	V
8.05601	35.65	Pk	37.1	-22.8	.4	-95.2	-44.85	-25	-19.85	V
Mid Channel, 2583.1MHz + 2602.9MHz										
5.02261	37.64	Pk	33.7	-25.9	.7	-95.2	-49.06	-25	-24.06	H
5.16178	37.51	Pk	33.8	-26.4	.7	-95.2	-49.59	-25	-24.59	V
6.47878	36.41	Pk	35	-24.7	.4	-95.2	-48.09	-25	-23.09	V
7.19855	36.61	Pk	37.1	-23.9	.4	-95.2	-44.99	-25	-19.99	H
9.70891	34.5	Pk	38.7	-20.1	.8	-95.2	-41.3	-25	-16.3	H
11.27496	33.45	Pk	39.1	-19.7	1	-95.2	-41.35	-25	-16.35	V
High Channel, 2660.2MHz + 2680MHz										
4.8984	37.56	Pk	33.3	-26.5	.9	-95.2	-49.94	-25	-24.94	H
5.58744	37.65	Pk	33.2	-25.9	.5	-95.2	-49.75	-25	-24.75	V
7.32561	36.41	Pk	37	-23.6	.3	-95.2	-45.09	-25	-20.09	H
7.91431	36.01	Pk	37.2	-22.6	.3	-95.2	-44.29	-25	-19.29	V
10.55997	34.35	Pk	39.5	-19.5	.7	-95.2	-40.15	-25	-15.15	V
11.11386	34.32	Pk	39.2	-19.7	.9	-95.2	-40.48	-25	-15.48	H

9.3. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz, ANT2

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

Maximum + maximum bandwidth combinations of QPSK mode was tested, QPSK results are reported as worst case.

9.3.1. LTE BAND 5

LIMIT

FCC: §22.917(a)
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.

QPSK LTE BAND 5 (10.0MHZ + 10.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/26/2020
Test Engineer:	19480
Configuration:	EUT Only
Mode:	Band 5 QPSK 10+10MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	HPF 1.2GHz T1737 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 829MHz + 838.9MHz										
1.66718	41	Pk	25	-30.5	.7	-95.2	-59	-13	-46	H
1.67009	40.8	Pk	25	-30.4	.7	-95.2	-59.1	-13	-46.1	V
2.49873	39.82	Pk	29	-29.2	.6	-95.2	-54.98	-13	-41.98	V
2.5017	49.45	Pk	29	-29.3	.6	-95.2	-45.45	-13	-32.45	H
3.33513	38.82	Pk	31.1	-28.2	.6	-95.2	-52.88	-13	-39.88	H
3.33935	38.47	Pk	31	-28.2	.6	-95.2	-53.33	-13	-40.33	V
Mid Channel, 831.6MHz + 841.5MHz										
1.67203	40.6	Pk	25	-30.4	.7	-95.2	-59.3	-13	-46.3	H
1.67614	40.4	Pk	25	-30.4	.7	-95.2	-59.5	-13	-46.5	V
2.50725	39.84	Pk	29.1	-29.3	.7	-95.2	-54.86	-13	-41.86	H
2.5084	39.79	Pk	29.1	-29.3	.7	-95.2	-54.91	-13	-41.91	V
3.44295	39.24	Pk	30.4	-27.9	.5	-95.2	-52.96	-13	-39.96	V
3.44318	38.74	Pk	30.4	-27.9	.5	-95.2	-53.46	-13	-40.46	H
High Channel, 834.1MHz + 844MHz										
1.6723	41.58	Pk	25	-30.4	.7	-95.2	-58.32	-13	-45.32	H
1.67932	40.48	Pk	24.9	-30.4	.7	-95.2	-59.52	-13	-46.52	V
2.51338	39.4	Pk	29.1	-29.3	.7	-95.2	-55.3	-13	-42.3	H
2.5147	39.87	Pk	29.2	-29.3	.7	-95.2	-54.73	-13	-41.73	V
3.35422	38.84	Pk	31	-28.1	.6	-95.2	-52.86	-13	-39.86	V
3.35581	37.81	Pk	31	-28	.6	-95.2	-53.79	-13	-40.79	H

9.3.2. LTE BAND 7

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 7 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/25/2020
Test Engineer:	19480
Configuration:	EUT Only
Mode:	Band 7 QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
5.07967	38.53	Pk	33.8	-26.1	.7	-95.2	-48.27	-25	-23.27	V
5.08446	38.82	Pk	33.8	-26.2	.8	-95.2	-47.98	-25	-22.98	H
7.53119	36.16	Pk	36.9	-23.8	.3	-95.2	-45.64	-25	-20.64	H
7.55557	36.03	Pk	36.8	-24	.3	-95.2	-46.07	-25	-21.07	V
10.19275	35.01	Pk	38.6	-19.7	.7	-95.2	-40.59	-25	-15.59	H
10.21178	34.28	Pk	38.7	-19.9	.9	-95.2	-41.22	-25	-16.22	V
Mid Channel, 2525.1MHz + 2544.9MHz										
5.08718	38.46	Pk	33.8	-26.2	.8	-95.2	-48.34	-25	-23.34	H
5.14743	37.86	Pk	33.8	-26.3	.8	-95.2	-49.04	-25	-24.04	V
7.61091	35.95	Pk	36.9	-23.7	.4	-95.2	-45.65	-25	-20.65	V
7.6177	35.94	Pk	36.9	-23.6	.4	-95.2	-45.56	-25	-20.56	H
10.36956	34.57	Pk	39.2	-19.4	.8	-95.2	-40.03	-25	-15.03	V
10.37259	34.24	Pk	39.2	-19.3	.8	-95.2	-40.26	-25	-15.26	H
High Channel, 2540.2MHz + 2560MHz										
5.09854	38.09	Pk	33.9	-26.4	.8	-95.2	-48.81	-25	-23.81	V
5.10181	41.11	Pk	33.9	-26.4	.8	-95.2	-45.79	-25	-20.79	H
7.64852	35.94	Pk	36.9	-23.5	.3	-95.2	-45.56	-25	-20.56	V
7.65158	35.43	Pk	36.9	-23.4	.3	-95.2	-45.97	-25	-20.97	H
10.19933	34.17	Pk	38.7	-19.8	.8	-95.2	-41.33	-25	-16.33	V
10.20112	34.2	Pk	38.7	-19.9	.8	-95.2	-41.4	-25	-16.4	H

9.3.3. LTE BAND 41

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 41 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/24/2020
Test Engineer:	50822
Configuration:	EUT Only
Mode:	Band 41FCC QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2506MHz + 2525.8MHz										
4.95957	37.39	Pk	33.5	-26	.6	-95.2	-49.71	-25	-24.71	H
5.5719	36.38	Pk	33.2	-26	.3	-95.2	-51.32	-25	-26.32	V
8.44093	35.62	Pk	37.5	-22.3	.3	-95.2	-44.08	-25	-19.08	V
8.47126	36.47	Pk	37.4	-22.3	.3	-95.2	-43.33	-25	-18.33	H
9.72069	35.16	Pk	38.6	-20	.8	-95.2	-40.64	-25	-15.64	V
9.72462	34.46	Pk	38.7	-20	.8	-95.2	-41.24	-25	-16.24	H
Mid Channel, 2583.1MHz + 2602.9MHz										
4.73684	37.24	Pk	32.6	-27	.5	-95.2	-51.86	-25	-26.86	V
5.09987	37.62	Pk	33.9	-26.4	.8	-95.2	-49.28	-25	-24.28	H
5.207	36.98	Pk	33.6	-26.3	.9	-95.2	-50.02	-25	-25.02	V
7.01524	35.98	Pk	36.4	-24	.2	-95.2	-46.62	-25	-21.62	V
7.90591	35.01	Pk	37.3	-22.5	.4	-95.2	-44.99	-25	-19.99	H
9.09599	34.62	Pk	38.7	-21.3	.4	-95.2	-42.78	-25	-17.78	H
High Channel, 2660.2 + 2680MHz										
5.01452	37.48	Pk	33.7	-26	.8	-95.2	-49.22	-25	-24.22	V
5.19638	36.79	Pk	33.7	-26.3	.8	-95.2	-50.21	-25	-25.21	H
6.77974	35.57	Pk	35.9	-24.6	.5	-95.2	-47.83	-25	-22.83	H
7.15398	36.13	Pk	36.9	-23.9	.4	-95.2	-45.67	-25	-20.67	V
8.98555	34.62	Pk	38.5	-21.3	.5	-95.2	-42.88	-25	-17.88	H
10.61345	34.91	Pk	39.5	-19.6	.7	-95.2	-39.69	-25	-14.69	V

9.4. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz, ANT3

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

Maximum + maximum bandwidth combinations of QPSK mode was tested, QPSK results are reported as worst case.

9.4.1. LTE BAND 7

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 7 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/25/2020
Test Engineer:	45528
Configuration:	EUT Only
Mode:	Band 7 QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
5.33807	36.42	Pk	33.2	-26.5	.6	-95.2	-51.48	-25	-26.48	H
5.33847	36.77	Pk	33.2	-26.5	.6	-95.2	-51.13	-25	-26.13	V
7.5582	36.05	Pk	36.8	-24.1	.3	-95.2	-46.15	-25	-21.15	H
7.55914	35.86	Pk	36.8	-24.1	.3	-95.2	-46.34	-25	-21.34	V
10.07947	34.2	Pk	38.4	-20.1	.6	-95.2	-42.1	-25	-17.1	V
10.08084	33.62	Pk	38.4	-20.1	.6	-95.2	-42.68	-25	-17.68	H
Mid Channel, 2525.1MHz + 2544.9MHz										
5.07125	37.57	Pk	33.8	-26.1	.7	-95.2	-49.23	-25	-24.23	V
5.07182	44.01	Pk	33.8	-26.1	.7	-95.2	-42.79	-25	-17.79	H
7.60383	37.44	Pk	36.9	-23.7	.4	-95.2	-44.16	-25	-19.16	V
7.60499	35.45	Pk	37	-23.7	.4	-95.2	-46.05	-25	-21.05	H
10.13853	34.11	Pk	38.4	-19.9	.7	-95.2	-41.89	-25	-16.89	H
10.13985	35.39	Pk	38.4	-19.9	.7	-95.2	-40.61	-25	-15.61	V
High Channel, 2540.2MHz + 2560MHz										
5.10081	37.97	Pk	33.9	-26.4	.8	-95.2	-48.93	-25	-23.93	V
5.10178	38.19	Pk	33.9	-26.4	.8	-95.2	-48.71	-25	-23.71	H
7.64857	35.62	Pk	36.9	-23.5	.3	-95.2	-45.88	-25	-20.88	H
7.65071	35.71	Pk	36.9	-23.4	.3	-95.2	-45.69	-25	-20.69	V
10.19987	34	Pk	38.7	-19.8	.8	-95.2	-41.5	-25	-16.5	V
10.20066	34.57	Pk	38.7	-19.8	.8	-95.2	-40.93	-25	-15.93	H

9.4.2. LTE BAND 41

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 41 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/25/2020
Test Engineer:	50822
Configuration:	EUT Only
Mode:	Band 41FCC QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2506MHz + 2525.8MHz										
5.01285	37.21	Pk	33.7	-26	.8	-95.2	-49.49	-25	-24.49	V
5.03081	38.12	Pk	33.7	-26	.7	-95.2	-48.68	-25	-23.68	H
7.14972	35.02	Pk	36.8	-24	.4	-95.2	-46.98	-25	-21.98	V
7.19896	35.41	Pk	37.1	-23.9	.4	-95.2	-46.19	-25	-21.19	H
10.42793	33.11	Pk	39.4	-19.3	.8	-95.2	-41.19	-25	-16.19	V
10.46796	34.16	Pk	39.4	-19.6	.7	-95.2	-40.54	-25	-15.54	H
Mid Channel, 2583.1MHz + 2602.9MHz										
5.08634	38.39	Pk	33.8	-26.2	.8	-95.2	-48.41	-25	-23.41	H
5.15767	37.85	Pk	33.8	-26.4	.8	-95.2	-49.15	-25	-24.15	V
6.77436	36.73	Pk	35.9	-24.7	.5	-95.2	-46.77	-25	-21.77	H
7.26492	35.81	Pk	37.1	-23.4	.5	-95.2	-45.19	-25	-20.19	V
9.93334	34.59	Pk	38.4	-19.8	.7	-95.2	-41.31	-25	-16.31	V
9.94318	34.19	Pk	38.3	-19.9	.6	-95.2	-42.01	-25	-17.01	H
High Channel, 2660.2MHz + 2680MHz										
5.61429	36.81	Pk	33.2	-26	.7	-95.2	-50.49	-25	-25.49	H
5.80534	35.73	Pk	33.4	-25.4	.9	-95.2	-50.57	-25	-25.57	V
8.90441	34.97	Pk	37.9	-21.6	.5	-95.2	-43.43	-25	-18.43	H
9.60822	34.16	Pk	38.8	-20	.6	-95.2	-41.64	-25	-16.64	V
10.22429	34.21	Pk	38.7	-19.8	.9	-95.2	-41.19	-25	-16.19	V
10.63273	33.99	Pk	39.5	-19.4	.5	-95.2	-40.61	-25	-15.61	H

9.5. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz, ANT4

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

Maximum + maximum bandwidth combinations of QPSK mode was tested, QPSK results are reported as worst case.

9.5.1. LTE BAND 7

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 7 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/25/2020
Test Engineer:	50822
Configuration:	EUT Only
Mode:	Band 7 QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
4.95832	38.7	Pk	33.5	-26	.6	-95.2	-48.4	-25	-23.4	H
5.09054	38.24	Pk	33.9	-26.2	.8	-95.2	-48.46	-25	-23.46	V
7.68242	36.06	Pk	37	-23.3	.5	-95.2	-44.94	-25	-19.94	V
8.095	35.88	Pk	37.1	-22.5	.3	-95.2	-44.42	-25	-19.42	H
10.13946	34.65	Pk	38.4	-19.9	.7	-95.2	-41.35	-25	-16.35	V
11.24614	34.52	Pk	39.1	-19.9	.9	-95.2	-40.58	-25	-15.58	H
Mid Channel, 2525.1MHz + 2544.9MHz										
5.16428	37.7	Pk	33.7	-26.5	.7	-95.2	-49.6	-25	-24.6	H
5.2198	37.66	Pk	33.5	-26.3	1	-95.2	-49.34	-25	-24.34	V
7.33714	36.38	Pk	36.9	-23.7	.3	-95.2	-45.32	-25	-20.32	H
7.66646	35.52	Pk	36.9	-23.4	.3	-95.2	-45.88	-25	-20.88	V
11.77846	35.15	Pk	39.3	-20.1	.7	-95.2	-40.15	-25	-15.15	V
12.27287	34.43	Pk	40.3	-20.1	.5	-95.2	-40.07	-25	-15.07	H
High Channel, 2540.2MHz + 2560MHz										
5.09757	38.06	Pk	33.9	-26.3	.8	-95.2	-48.74	-25	-23.74	H
5.33798	37.12	Pk	33.2	-26.5	.6	-95.2	-50.78	-25	-25.78	V
7.27207	35.36	Pk	37.2	-23.4	.4	-95.2	-45.64	-25	-20.64	V
7.43001	35.31	Pk	36.8	-23.9	.3	-95.2	-46.69	-25	-21.69	H
11.16606	33.75	Pk	39.1	-19.8	.6	-95.2	-41.55	-25	-16.55	V
12.51958	34.36	Pk	40	-20.4	.4	-95.2	-40.84	-25	-15.84	H

9.5.2. LTE BAND 41

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 41 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/24/2020
Test Engineer:	50822
Configuration:	EUT Only
Mode:	Band 41FCC QPSK 20+20
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBm)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2506MHz + 2525.8MHz										
4.91539	37.9	Pk	33.4	-26.5	1.1	-95.2	-49.3	-25	-24.3	H
5.9966	38.51	Pk	34.4	-25.7	.7	-95.2	-47.29	-25	-22.29	V
7.07443	37.4	Pk	36.6	-23.8	.6	-95.2	-44.4	-25	-19.4	H
7.90459	35.08	Pk	37.3	-22.5	.4	-95.2	-44.92	-25	-19.92	V
9.3002	34.52	Pk	38.8	-21	.5	-95.2	-42.38	-25	-17.38	H
9.99951	34.3	Pk	38.3	-19.7	.5	-95.2	-41.8	-25	-16.8	V
Mid Channel, 2583.1MHz + 2602.9MHz										
4.64257	38.02	Pk	32.3	-27.1	.4	-95.2	-51.58	-25	-26.58	V
5.29247	37.58	Pk	33.4	-26.5	.4	-95.2	-50.32	-25	-25.32	H
7.06566	35.92	Pk	36.7	-23.9	.7	-95.2	-45.78	-25	-20.78	H
7.72065	35.71	Pk	37.1	-23.4	.3	-95.2	-45.49	-25	-20.49	V
11.79112	34.12	Pk	39.5	-20.1	.8	-95.2	-40.88	-25	-15.88	V
11.81619	34.25	Pk	39.2	-19.9	.8	-95.2	-40.85	-25	-15.85	H
High Channel, 2660.2MHz + 2680MHz										
4.89999	37.99	Pk	33.3	-26.5	1	-95.2	-49.41	-25	-24.41	H
5.02707	38.14	Pk	33.7	-26.1	.7	-95.2	-48.76	-25	-23.76	V
7.07377	36.19	Pk	36.6	-23.8	.6	-95.2	-45.61	-25	-20.61	V
7.27207	35.53	Pk	37.2	-23.4	.4	-95.2	-45.47	-25	-20.47	H
10.47081	34.31	Pk	39.5	-19.6	.7	-95.2	-40.29	-25	-15.29	V
10.58019	34.7	Pk	39.5	-19.4	.9	-95.2	-39.5	-25	-14.5	H

9.5.3. LTE BAND 48

LIMIT

FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(2) Additional protection levels. Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

QPSK LTE BAND 48((20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/27/2020
Test Engineer:	19410
Configuration:	EUT Only
Mode:	Band 48 QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	T1792 3400-3800MHz BRF	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 3560MHz + 3579.8MHz										
4.90429	31.71	RMS	33.3	-26.5	-95.2	-56.09	-40	-16.09	V	4.90429
5.06906	32.06	RMS	33.8	-26.1	-95.2	-54.94	-40	-14.94	H	5.06906
6.35448	30.28	RMS	34.6	-24.9	-95.2	-54.62	-40	-14.62	H	6.35448
6.41037	30.46	RMS	34.8	-24.9	-95.2	-54.34	-40	-14.34	V	6.41037
7.66778	29.98	RMS	36.9	-23.3	-95.2	-50.92	-40	-10.92	V	7.66778
7.79151	29.51	RMS	37.2	-23.4	-95.2	-51.19	-40	-11.19	H	7.79151
Mid Channel, 3615.1MHz + 3634.9MHz										
4.99817	30.95	RMS	33.6	-25.9	-95.2	-55.95	-40	-15.95	H	4.99817
4.99942	31.11	RMS	33.6	-26	-95.2	-55.89	-40	-15.89	V	4.99942
6.18712	31.16	RMS	34.6	-25.7	-95.2	-54.64	-40	-14.64	V	6.18712
6.1966	31.2	RMS	34.5	-25.7	-95.2	-54.7	-40	-14.7	H	6.1966
7.07099	29.81	RMS	36.7	-23.8	-95.2	-51.89	-40	-11.89	H	7.07099
7.08842	29.4	RMS	36.7	-23.6	-95.2	-52.2	-40	-12.2	V	7.08842
High Channel, 3670.2MHz + 3690MHz										
5.07289	32.1	RMS	33.8	-26.1	-95.2	-54.8	-40	-14.8	V	5.07289
5.07742	31.91	RMS	33.8	-26.1	-95.2	-54.99	-40	-14.99	H	5.07742
7.12056	29.41	RMS	36.8	-23.8	-95.2	-52.29	-40	-12.29	V	7.12056
7.13965	30.54	RMS	36.9	-23.9	-95.2	-51.06	-40	-11.06	H	7.13965
10.70553	27.51	RMS	39.3	-19.5	-95.2	-47.39	-40	-7.39	H	10.70553
11.00438	27.84	RMS	39.4	-19.5	-95.2	-46.76	-40	-6.76	V	11.00438

9.6. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz, ANT7

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

Maximum + maximum bandwidth combinations of QPSK mode was tested, QPSK results are reported as worst case.

9.6.1. LTE BAND 48

LIMIT

FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(2) Additional protection levels. Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

QPSK LTE BAND 48 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/26/2020
Test Engineer:	19480
Configuration:	EUT Only
Mode:	Band 48 QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	T1792 3400-3800MHz BRF	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 3560MHz + 3579.8MHz										
7.13823	30.2	RMS	36.8	-24	.6	-95.2	-51.6	-40	-11.6	H
7.14156	31.55	RMS	36.9	-23.9	.6	-95.2	-50.05	-40	-10.05	V
10.70847	28.31	RMS	39.3	-19.5	.5	-95.2	-46.59	-40	-6.59	H
10.7092	28.12	RMS	39.3	-19.5	.5	-95.2	-46.78	-40	-6.78	V
14.27568	29.8	RMS	41.2	-21.2	.7	-95.2	-44.7	-40	-4.7	H
14.28402	29.73	RMS	41.2	-21.1	.7	-95.2	-44.67	-40	-4.67	V
Mid Channel, 3615.1MHz + 3634.9MHz										
7.21207	30.57	RMS	37.1	-23.6	.6	-95.2	-50.53	-40	-10.53	H
7.22057	29.63	RMS	37.1	-23.5	.5	-95.2	-51.47	-40	-11.47	V
10.96414	28.09	RMS	39.4	-19.4	.6	-95.2	-46.51	-40	-6.51	V
11.00077	27.68	RMS	39.4	-19.5	.7	-95.2	-46.92	-40	-6.92	H
13.60035	29.53	RMS	40.3	-21.4	.6	-95.2	-46.17	-40	-6.17	V
13.71124	29.04	RMS	40.5	-21.3	.7	-95.2	-46.26	-40	-6.26	H
High Channel, 3670.2MHz + 3690MHz										
7.25812	29.68	RMS	37.2	-23.5	.6	-95.2	-51.22	-40	-11.22	H
7.26815	29.8	RMS	37.2	-23.4	.6	-95.2	-51	-40	-11	V
10.57845	27.41	RMS	39.5	-19.4	.6	-95.2	-47.09	-40	-7.09	H
11.02101	27.7	RMS	39.4	-19.5	.6	-95.2	-47.00	-40	-7.00	V
12.38719	27.95	RMS	40.2	-20.3	1.1	-95.2	-46.25	-40	-6.25	V
12.5898	28.14	RMS	39.9	-20.5	.9	-95.2	-46.76	-40	-6.76	H

9.7. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz, ANT8

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

Maximum + maximum bandwidth combinations of QPSK mode was tested, QPSK results are reported as worst case.

9.7.1. LTE BAND 48

LIMIT

FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(2) Additional protection levels. Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

QPSK LTE BAND 48((20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13259315
Date:	7/27/2020
Test Engineer:	19206
Configuration:	EUT Only
Mode:	Band 48 QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	T1792 3400-3800MHz BRF	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 3560MHz + 3579.8MHz										
5.54882	31.29	RMS	33.2	-26.2	.3	-95.2	-56.61	-40	-16.61	H
5.70636	30.92	RMS	33	-25.4	.5	-95.2	-56.18	-40	-16.18	V
6.59528	29.86	RMS	35.6	-24.5	.6	-95.2	-53.64	-40	-13.64	H
6.75465	29.8	RMS	35.8	-24.8	.6	-95.2	-53.8	-40	-13.8	V
9.18618	28.42	RMS	38.7	-21	.6	-95.2	-48.48	-40	-8.48	V
9.38226	28.45	RMS	38.7	-20.8	.6	-95.2	-48.25	-40	-8.25	H
Mid Channel, 3615.1MHz + 3634.9MHz										
4.89386	31.89	RMS	33.3	-26.5	.7	-95.2	-55.81	-40	-15.81	H
5.08021	31.83	RMS	33.8	-26.1	.5	-95.2	-55.17	-40	-15.17	V
7.20771	30.06	RMS	37.1	-23.8	.6	-95.2	-51.24	-40	-11.24	H
7.45307	29.28	RMS	36.8	-23.8	.5	-95.2	-52.42	-40	-12.42	V
8.35141	29.71	RMS	37.5	-22.6	.8	-95.2	-49.79	-40	-9.79	H
8.75284	29.08	RMS	37.5	-21.8	.9	-95.2	-49.52	-40	-9.52	V
High Channel, 3670.2MHz + 3690MHz										
5.00652	31.45	RMS	33.7	-25.9	.6	-95.2	-55.35	-40	-15.35	V
5.01458	31.68	RMS	33.7	-26	.6	-95.2	-55.22	-40	-15.22	H
7.67123	29.84	RMS	36.9	-23.3	.8	-95.2	-50.96	-40	-10.96	H
8.03487	29.96	RMS	37.1	-22.6	.8	-95.2	-49.94	-40	-9.94	V
9.72947	27.97	RMS	38.7	-19.9	.6	-95.2	-47.83	-40	-7.83	V
9.747	28.13	RMS	38.7	-19.9	.6	-95.2	-47.67	-40	-7.67	H

9.8. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz, ANT9

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

Maximum + maximum bandwidth combinations of QPSK mode was tested, QPSK results are reported as worst case.

9.8.1. LTE BAND 48

LIMIT

FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(2) Additional protection levels. Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

QPSK LTE BAND 48((20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13179116
Date:	7/26/2020
Test Engineer:	19206
Configuration:	EUT Only
Mode:	Band 48 QPSK 20+20MHz
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	T1792 3400-3800MHz BRF	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 3560MHz + 3579.8MHz										
4.82648	32.04	RMS	33.1	-26.9	.5	-95.2	-56.46	-40	-16.46	H
5.09397	31.79	RMS	33.9	-26.3	.5	-95.2	-55.31	-40	-15.31	V
7.29412	29.39	RMS	37.1	-23.1	.6	-95.2	-51.21	-40	-11.21	V
7.37768	29	RMS	36.9	-23.9	.7	-95.2	-52.5	-40	-12.5	H
9.06538	28.87	RMS	38.6	-21.4	.8	-95.2	-48.33	-40	-8.33	V
9.13298	28.52	RMS	38.7	-21.2	.8	-95.2	-48.38	-40	-8.38	H
Mid Channel, 3615.1MHz + 3634.9MHz										
7.24903	20.24	Av	37.2	-23.6	.6	-95.2	-60.76	-40	-20.76	H
10.87652	18.21	Av	39.3	-19.4	.5	-95.2	-56.59	-40	-16.59	H
14.50071	19.79	Av	41.4	-21.4	.8	-95.2	-54.61	-40	-14.61	H
7.25189	20.28	Av	37.2	-23.6	.6	-95.2	-60.72	-40	-20.72	V
10.87438	18.16	Av	39.3	-19.5	.5	-95.2	-56.74	-40	-16.74	V
14.4995	19.71	Av	41.4	-21.4	.8	-95.2	-54.69	-40	-14.69	V
High Channel, 3670.2MHz + 3690MHz										
4.89168	31.34	RMS	33.3	-26.5	.6	-95.2	-56.46	-40	-16.46	H
5.00823	32.08	RMS	33.6	-25.9	.6	-95.2	-54.82	-40	-14.82	V
6.59111	30.99	RMS	35.5	-24.5	.6	-95.2	-52.61	-40	-12.61	H
6.59259	30.4	RMS	35.6	-24.5	.6	-95.2	-53.1	-40	-13.1	V
9.10159	28.11	RMS	38.7	-21.2	.9	-95.2	-48.69	-40	-8.69	H
9.41803	28.02	RMS	38.7	-20.7	.9	-95.2	-48.28	-40	-8.28	V

10. SETUP PHOTOS

Please refer to 13259315-EP1 for setup photos

END OF REPORT

Appendix B – Reference Test Report 13336566-E10

Attached is the test report (13336566-E10) containing the reference data from the parent model as detailed in section 5.5.

TEST REPORT

Report Number : 13336566-E10V3

Applicant	:	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	:	A2406
FCC ID	:	BCG-E3546A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC CFR47 22H, 27L, 27M, and 96

Date Of Issue:
SEPTEMBER 27, 2020

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

NVLAP TESTING

NVLAP Lab code: 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	9/17/2020	Initial Review	Mengistu Mekuria
V2	9/20/2020	Addressed TCB Questions	Mengistu Mekuria
V3	9/27/2020	Addressed TCB Questions	Sintia Andrean

TABLE OF CONTENTS

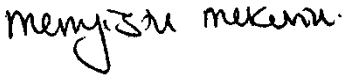
1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A2406
FCC ID	BCG-E3546A
EUT Description	SMARTPHONE
Serial Number	MODEL (A2406): C07028600PMP5585 & C07029200BHP55J5 (Conducted) and G6TD200504RR (Radiated)
Date Tested	MAY 19, 2017 to AUGUST 31, 2020
Applicable Standards	FCC CFR47 22H, 27L, 27M, and 96
Test Results	COMPLIES

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released By:	Prepared By:
	
Mengistu Mekuria Lead Test Engineer UL Verification Services Inc.	John Thompson Laboratory Engineer UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the following:

- ANSI C63.26:2015
- FCC CFR 47 Part 2, Part 22, Part 27 and Part 96
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01. Determining ERP and EIRP

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street	47658 Kato Road
☐ Chamber A	☐ Chamber D	☐ Chamber I
☒ Chamber B	☐ Chamber E	☐ Chamber J
☐ Chamber C	☐ Chamber F	☐ Chamber K
	☐ Chamber G	☐ Chamber L
	☐ Chamber H	☐ Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code: 2324A.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB
Occupied Channel Bandwidth	±0.39 %
Temperature	±0.9 °C
Supply voltages	±0.45 %
Time	±0.02 %

Uncertainty figures are valid to a confidence level of 95%.

4.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and WPT. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

5.2. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID BCG-E3545A to cover variant model FCC ID BCG-E3546A. The major difference between the parent/reference model and the variant model is the depopulation in the variant model of the mmWave transmitter. All other circuitry and features are identical. The data reuse test plan was approved via manufacturer KDB inquiry.

5.3. MODEL DIFFERENCES

The manufacturer hereby declares the following for models A2341 and A2406.

A A2341 and A2406 are highly similar, with the only difference being the supported cellular bands.

They have the same PCB layout, design, common components, antennas, antenna locations and housing cases.

More specifically, their cellular modem, Wi-Fi, BT, NFC, WPT and UWB transmitters are identical, and removal of cellular bands is done by software and depopulation of band-specific components associated with the removed bands.

Spot check verification and additional full radiated spurious emission test on ANT2 have been done on model A2406 in accordance with the test plan approved via KDB inquiry. Comparison of the models, upper deviation is within 3dB range and all tests are under FCC/ISED Technical Limits. The results documented for model A2341 may be applied as representative to model A2406.

5.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device model A2406, FCC ID: BCG-E3546A for antenna port power and radiated spurious emission tests in accordance with the Test Plan that was approved via KDB inquiry.

A2406 Spotcheck Results								
Technology	Worst Mode	Test Item	Channel	Measured Frequency MHz	Original Model: A2341 FCC ID: BCG-3545A	Sub Model: A2406 FCC ID: BCG-E3546A	Delta (dB)	Remarks
LTE5CA	QPSK @ 1-49RB&1-0RB	ERP	Mid	831.6/ 841.5	18.55	18.55	0.0	
	QPSK @ 1-49RB&1-0RB	RSE	Low	3438.9	-52.34	-51.34	-5.9	Noise Floor Level
LTE7CA	QPSK @ 1-99RB&1-0RB	EIRP	High	2540.2/ 2560	24.80	24.80	0.0	
	QPSK @ 1-99RB&1-0RB	RSE	Mid	12272.9	-40.07	-41.11	-1.1	Noise Floor Level

5.5. REFERENCE DETAIL

Reference application that contains the reused reference data.

Equipment Class	Reference FCC ID	Reference Application	Report Title/Section
PCE, CBE	BCG-E3545A	13259315-E10	FCC LTE Carrier Aggregation Report / All Sections except Radiated spurious on Ant 2

5.6. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 0.28.03-1.

5.7. MAXIMUM ANTENNA GAIN

Please see table below:

LTE Bands	Antenna Gain (dBi)						
	ANT 1	ANT 2	ANT 3	ANT 4	ANT 7	ANT 8	ANT 9
LTE Band 5, 824 – 849 MHz	-5.0	-5.5	NA	NA	NA	NA	NA
LTE Band 7, 2500 – 2570 MHz	-2.7	-0.3	-0.2	-2.1	NA	NA	NA
LTE Band 41, 2496 – 2690 MHz	-1.9	-0.3	-0.2	-1.7	NA	NA	NA
LTE Band 48, 3550 – 3700 MHz	NA	NA	NA	-3.3	-3	-4.8	-3.1

5.8. WORST-CASE CONFIGURATION AND MODE

The EUT supports LTE dual carrier Bands of: Band 5, Band 7, Band 41 and Band 48.

The worst-case scenario for all measurements is based on an engineering evaluation and QPSK was observed as the worst one and set for all conducted and radiated. Conducted tests were performed on the worst case antenna because it has the highest conducted power. ANT1 is the worst case for all bands except Band 48. For band 48 ANT7 is the worst case antenna.

The EUT was investigated in three orthogonal orientations X/Y/Z on all ANT 1, ANT2, ANT3, ANT4, ANT7, ANT8 and ANT 9 antennas to determine the worst case orientation. The following table exabit the worst case orientation for different frequency bands. The full tests of the EUT have made upon the orientations that shown in the table below.

Bands	ANT1	ANT2	ANT3	ANT4	ANT7	ANT8	ANT9
Cell (850MHz)	X	X	N/A	N/A	N/A	N/A	N/A
Band 7, 41	Y	Z	X	X	N/A	N/A	N/A
Band 48	N/A	N/A	N/A	X	Y	X	X

For Band Edge and Emission Mask: The highest bandwidth combo was tested. The RB combinations were selected such that the signal is active closest to the band limit, as this is the worst case.

For Out of Band Emissions: The highest bandwidth combination was tested. The highest power RB combination was selected as worst case.

Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

For interband transmission of multiple channels in different antenna combination in Cellular bands, tests were conducted for various configurations having the highest power, least separation in frequencies and widest operation bandwidths. No noticeable new emission was found.

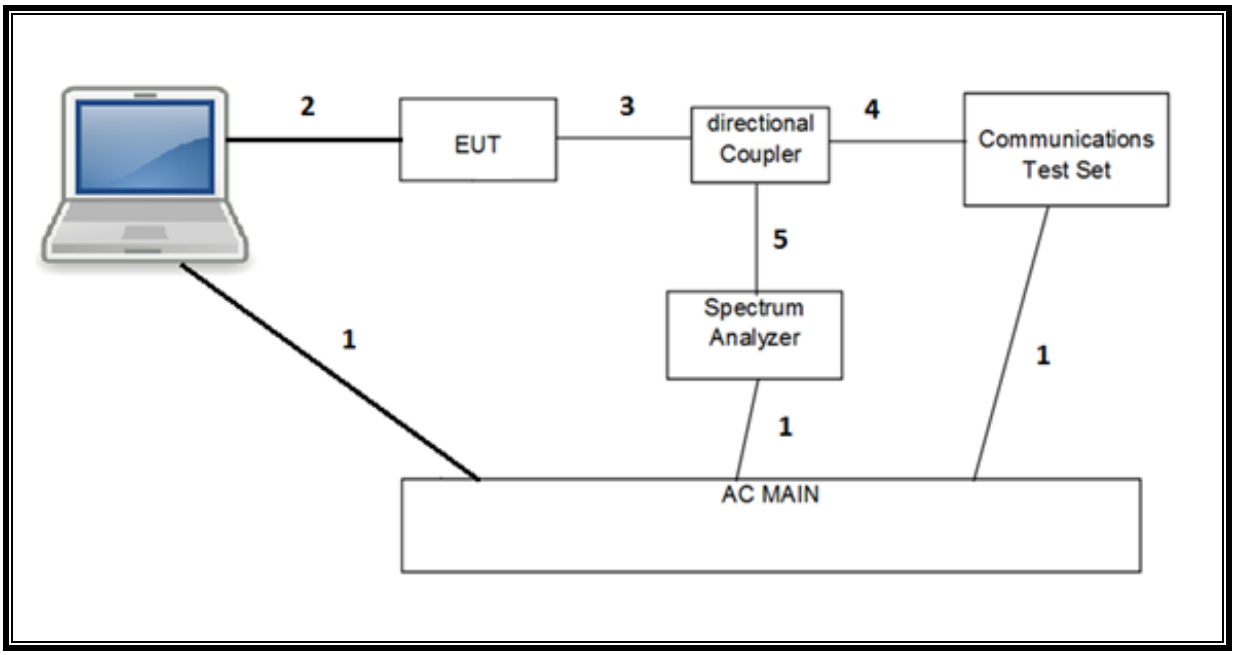
5.9. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT					
Description	**Manufacturer**	**Model**	**Serial Number**		**FCC ID/ DoC**
Laptop	Apple	A1398	C02PM012G3QD		QDS-BRCM1069
Laptop AC/DC adapter	Liteon Technology	PA-1450-BA1	B123		N/A

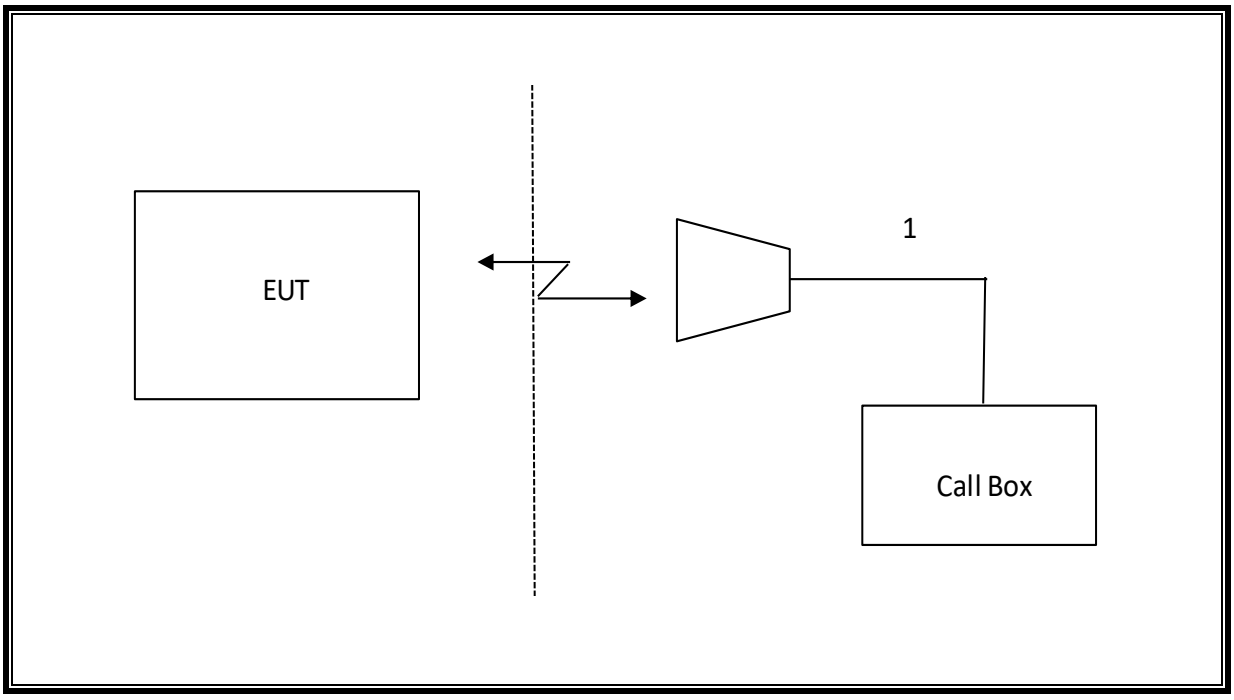
I/O CABLES (RF CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	3	US 115V	Un-shielded	2.0	N/A
2	USB	1	DC	Un-shielded	1.0	N/A
3	RF In/Out	1	EUT	Un-shielded	0.6	N/A
4	RF In/Out	1	Communication Test Set	Un-shielded	1.2	N/A
5	RF In/Out	1	Barrel	N/A	N/A	N/A

I/O CABLES (RF RADIATED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	RF In/Out	1	Antenna	Un-shielded	5.0	N/A

CONDUCTED SETUP



RADIATED SETUP



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Horn 1-18GHz	A.H. Systems, Inc.	SAS-571	T961	01/25/2021
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T136	07/07/2021
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T407	05/20/2021
Amplifier, 1 to 18GHz	MITEQ	AFS42-00101800-25-S-42	T931	05/11/2021
Amplifier, 1 to 18GHz	MITEQ	AFS42-00101800-25-S-42	T1165	08/10/2021
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0180176	07/14/2021
Filter, BRF 2495 to 2690MHz	MICRO-TRONICS	BRM50709-02	T1790	06/23/2021
Filter, BRF 1850 – 1910 MHz	Micro-Tronics	BRM50714-02	T1796	06/23/2021
Filter, BRF 824 – 848 MHz	Micro-Tronics	BRM20025	PRE0191180	06/23/2021
*Directional Coupler	KRYTAR	152610	T1161	08/14/2020
Spectrum Analyzer, PXA 3Hz to 44GHZ	Keysight	N9030A	T340	01/22/2021
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T907	01/22/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T260	02/19/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T959	02/19/2021
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T1871	02/25/2021
Power Meter, P-series single channel	Keysight	N1912A	T1245	01/22/2021
Power Sensor	Keysight	N1921A	T1225	02/23/2021
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 7.6, November 11, 2017	
Power Measurement Software	UL	UL RF	Ver 2.7, 2019	
Radiated test software	UL	UL RF	Ver 9.5 June 15, 2019	

NOTES:

* Testing is completed before equipment expiration date.

7. RADIATED TEST RESULTS

7.1. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz, ANT2

TEST PROCEDURE

KDB 971168 D01 v03r01/D02 v02/r01

RESULTS

Maximum + maximum bandwidth combinations of QPSK mode was tested, QPSK results are reported as worst case.

7.1.1. LTE BAND 5

LIMIT

FCC: §22.917(a)
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.

QPSK LTE BAND 5 (10.0MHZ + 10.0MHZ BANDWIDTH)

Project #:	13336566
Date:	8/7/2020
Test Engineer:	19206
Configuration:	EUT Only
Mode:	Band 5 QPSK 10+10
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	HPF 1.2GHz T1737 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 829MHz + 838.9MHz										
1.66616	40.6	Pk	25	-30.5	.8	-95.2	-59.3	-13	-46.3	H
1.66773	40.58	Pk	25	-30.5	.7	-95.2	-59.42	-13	-46.42	V
2.50017	40.3	Pk	29	-29.3	.6	-95.2	-54.6	-13	-41.6	H
2.50374	40.85	Pk	29	-29.3	.6	-95.2	-54.05	-13	-41.05	V
3.33673	38.22	Pk	31.1	-28.2	.6	-95.2	-53.48	-13	-40.48	H
3.33785	38.19	Pk	31.1	-28.2	.6	-95.2	-53.51	-13	-40.51	V
Mid Channel, 831.6MHz + 841.5MHz										
1.8656	40.83	Pk	26.1	-30	.6	-95.2	-57.67	-13	-44.67	V
1.86797	41.07	Pk	26.1	-30.1	.6	-95.2	-57.53	-13	-44.53	H
2.55437	39.61	Pk	29.3	-29.2	.6	-95.2	-54.89	-13	-41.89	V
2.56573	39.5	Pk	29.3	-29.2	.5	-95.2	-55.1	-13	-42.1	H
3.25874	39.52	Pk	31.3	-28.2	.5	-95.2	-52.08	-13	-39.08	V
3.26176	39.33	Pk	31.3	-28.3	.5	-95.2	-52.37	-13	-39.37	H
High Channel, 834.1MHz + 844MHz										
1.67795	41.01	Pk	24.9	-30.4	.7	-95.2	-58.99	-13	-45.99	V
1.67884	40.48	Pk	24.9	-30.4	.7	-95.2	-59.52	-13	-46.52	H
2.51516	39.89	Pk	29.2	-29.3	.7	-95.2	-54.71	-13	-41.71	V
2.51555	39.64	Pk	29.2	-29.3	.7	-95.2	-54.96	-13	-41.96	H
3.3555	38.76	Pk	31	-28	.6	-95.2	-52.84	-13	-39.84	V
3.35671	38.32	Pk	31	-28	.6	-95.2	-53.28	-13	-40.28	H

7.1.2. LTE BAND 7

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 7 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13336566
Date:	8/22/2020
Test Engineer:	19497
Configuration:	EUT Only
Mode:	Band 7 QPSK 20+20
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	HPF 1.2GHz T1737 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
5.03829	36.93	Pk	33.7	-26.2	.6	-95.2	-50.17	-25	-25.17	V
5.04195	36.86	Pk	33.7	-26.2	.6	-95.2	-50.24	-25	-25.24	H
7.56046	35.23	Pk	36.8	-24.1	.3	-95.2	-46.97	-25	-21.97	V
7.56098	34.57	Pk	36.8	-24.1	.4	-95.2	-47.53	-25	-22.53	H
10.07947	33.9	Pk	38.4	-20.1	.6	-95.2	-42.4	-25	-17.4	V
10.0812	34.15	Pk	38.4	-20.1	.6	-95.2	-42.15	-25	-17.15	H
Mid Channel, 2525.1MHz + 2544.9MHz										
5.0866	37.37	Pk	34.4	-26	.8	-95.2	-48.63	-25	-23.63	H
5.10514	38.84	Pk	34.5	-26.3	.8	-95.2	-47.36	-25	-22.36	V
7.6359	34.95	Pk	35.9	-22.4	.4	-95.2	-46.35	-25	-21.35	H
7.66109	36.61	Pk	35.8	-22.3	.3	-95.2	-44.79	-25	-19.79	V
10.17772	33.45	Pk	37.5	-20.3	.6	-95.2	-43.95	-25	-18.95	H
10.19778	34.49	Pk	37.6	-20.4	.8	-95.2	-42.71	-25	-17.71	V
High Channel, 2540.2MHz + 2560MHz										
5.09942	37.3	Pk	33.9	-26.4	.8	-95.2	-49.6	-25	-24.6	V
5.10165	38.87	Pk	33.9	-26.4	.8	-95.2	-48.03	-25	-23.03	H
7.64915	35.6	Pk	36.9	-23.5	.3	-95.2	-45.9	-25	-20.9	H
7.65063	36.52	Pk	36.9	-23.4	.3	-95.2	-44.88	-25	-19.88	V
10.20011	34.39	Pk	38.7	-19.8	.8	-95.2	-41.11	-25	-16.11	V
10.20195	33.59	Pk	38.7	-19.9	.8	-95.2	-42.01	-25	-17.01	H

7.1.3. LTE BAND 41

LIMIT

FCC: §27.53 (m)
At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 41 (20.0MHZ + 20.0MHZ BANDWIDTH)

Project #:	13336566
Date:	8/22/2020
Test Engineer:	19497
Configuration:	EUT Only
Mode:	Band 41 QPSK 20+20
Chamber #:	Chamber A

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T962 (dB/m)	Amp/Cbl (dB)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2506MHz + 2525.8MHz										
5.03034	38.66	Pk	33.7	-26	.7	-95.2	-48.14	-25	-23.14	H
5.03083	37.98	Pk	33.7	-26	.7	-95.2	-48.82	-25	-23.82	V
7.54618	35.78	Pk	36.9	-23.9	.3	-95.2	-46.12	-25	-21.12	V
7.54675	36.34	Pk	36.9	-23.9	.3	-95.2	-45.56	-25	-20.56	H
10.06163	33.8	Pk	38.4	-19.9	.7	-95.2	-42.2	-25	-17.2	H
10.06489	35.9	Pk	38.4	-19.9	.7	-95.2	-40.1	-25	-15.1	V
Mid Channel, 2583.1MHz + 2602.9MHz										
5.17975	38.12	Pk	34.6	-26.1	.7	-95.2	-47.88	-25	-22.88	V
5.19789	37.76	Pk	34.6	-25.8	.9	-95.2	-47.74	-25	-22.74	H
7.78495	34.5	Pk	36	-22.4	.4	-95.2	-46.7	-25	-21.7	H
7.79872	34.94	Pk	36	-22.3	.4	-95.2	-46.16	-25	-21.16	V
10.37912	33.14	Pk	37.7	-19.9	.8	-95.2	-43.46	-25	-18.46	H
10.41574	34.26	Pk	37.7	-19.5	.8	-95.2	-41.94	-25	-16.94	V
High Channel, 2660.2MHz + 2680MHz										
5.34039	37.43	Pk	33.2	-26.5	.6	-95.2	-50.47	-25	-25.47	V
5.34116	37.9	Pk	33.1	-26.6	.6	-95.2	-50.2	-25	-25.2	H
8.01079	35.04	Pk	37.1	-22.9	.3	-95.2	-45.66	-25	-20.66	H
8.01133	35.52	Pk	37.1	-22.9	.3	-95.2	-45.18	-25	-20.18	V
10.68005	34.36	Pk	39.4	-19.5	.5	-95.2	-40.44	-25	-15.44	H
10.68093	34.26	Pk	39.4	-19.5	.5	-95.2	-40.54	-25	-15.54	V

8. SETUP PHOTOS

Please refer to 13259315-EP1 for setup photos

End of the report