



TEST REPORT

Report Number. : 13389132-E10V2

Applicant : APPLE, INC
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

Model : A2411, A2412, AND A2413

FCC ID : BCG-E3550A

EUT Description : SMARTPHONE

Test Standard(s) : FCC CFR47 22H, 27L, 27M, and 96

Date Of Issue:
OCTOBER 02, 2020

Prepared by:
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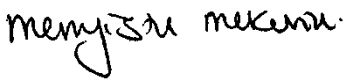
Revision History

Rev.	Issue Date	Revisions	Revised By
V1	9/25/2020	Initial Review	Mengistu Mekuria
V2	10/2/2020	Addressed TCB Questions	Mengistu Mekuria

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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A2411, A2412, AND A2413
FCC ID	BCG-E3550A
EUT Description	SMARTPHONE
Serial Number	MODEL (A2411, A2412, A2413) C07029700DEP5625 (Conducted) and G6TD401N06R1 (Radiated)
Date Tested	JULY 01, 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-E3548A and FCC ID BCG-E3549A to cover variant model FCC ID BCG-E3550A. 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 A2342, A2410, A2411, A2412 and A2413.

A2342, A2410, A2411, A2412 and A2413 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.

A2411, A2412 and A2413 are allocated for marketing and logistic purposes only. Spot check verification has been done on model A2411 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 A2342 and model A2410 ANT2 RSE test results may be applied as representative to models A2411, A2412 and A2413.

5.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device model A2411, A2412, A2413, FCC ID: BCG-E3550A for antenna port power and radiated spurious emission tests in accordance with the Test Plan that was approved via KDB inquiry.

A2411, A2412, A2413 Spotcheck Results								
Technology	Worst Mode	Test Item	Channel	Measured	Original Model: A2432	Sub Model: A2411, A2412, A2413	Delta (dB)	Remarks
				Frequency (MHz)	FCC ID: BCG-E3548A	FCC ID: BCG-E3550A		
LTE 5CA	QPSK @ 1-49RB&1-0RB	ERP	Low	829 / 838.9	18.25 dBm	18.25 dBm	0.00	
	QPSK @ 1-49RB&1-0RB	RSE	Low	4753.1	-50.62 dBm	-53.01 dBm	-2.39	Noise Floor Level
LTE 7CA	QPSK @ 1-99RB&1-0RB	EIRP	Mid	2525.1/ 2544.9	23.7 dBm	23.7 dBm	0	
	QPSK @ 1-99RB&1-0RB	RSE	High	10577.38	-39.78 dBm	-43.62 dBm	-3.84	Noise Floor Level
LTE 41CA	QPSK @ 1-99RB&1-0RB	EIRP	Low	2506/ 2525.8	24.7 dBm	24.7 dBm	0	
LTE 48CA	QPSK @ 1-99RB&1-0RB	EIRP	Mid	3617.6/ 3634.7	21.2 dBm	21.04 dBm	-0.16	

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-E3548A	13335182-E10	FCC LTE Carrier Aggregation Report / All Sections except Radiated spurious emission on Ant 2
	BCG-E3549A	13131738-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	-5.3	-4.9	NA	NA	NA	NA	NA
LTE Band 7, 2500 – 2570 MHz	-2.0	-1.5	-1.1	-0.2	NA	NA	NA
LTE Band 41, 2496 – 2690 MHz	-2.0	-1.1	0	-0.2	NA	NA	NA
LTE Band 48, 3550 – 3700 MHz	NA	NA	NA	-3.0	-4.9	-4.9	-3.0

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. Output power measurements were measured on QPSK, 16QAM, 64QAM, and 256QAM modulations. 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 exhibit 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)	Y	X	N/A	N/A	N/A	N/A	N/A
Band 7, 41	Y	Y	Y	X	N/A	N/A	N/A
Band 48	N/A	N/A	N/A	X	Y	X	Y

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.

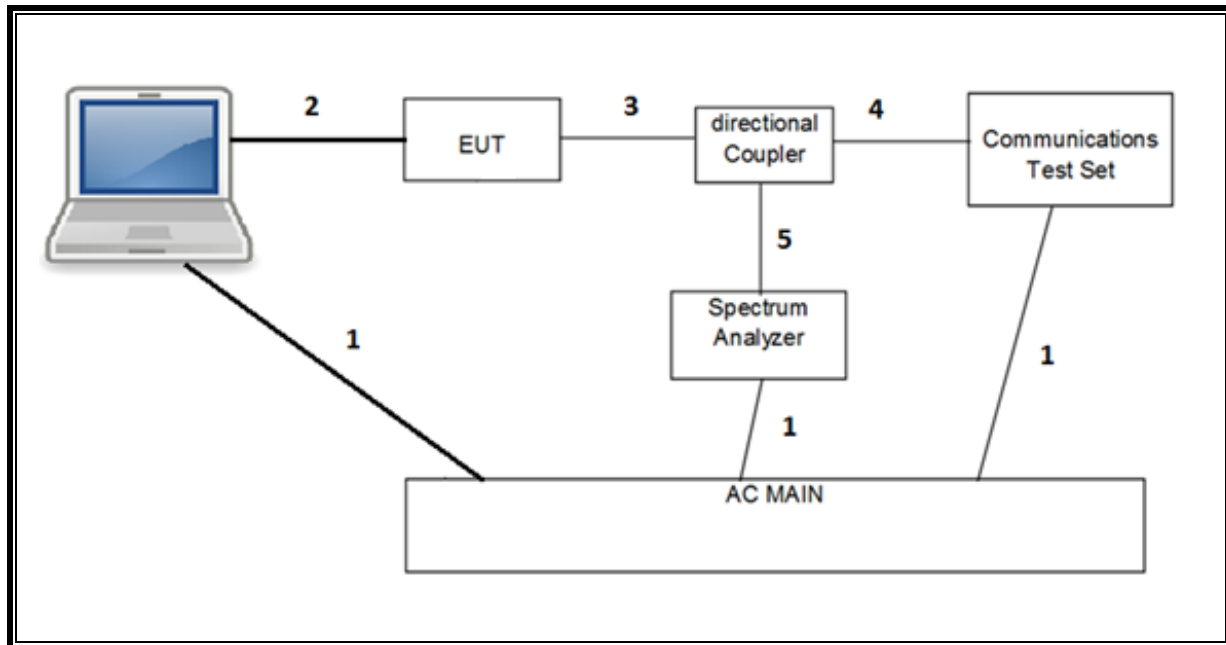
Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

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.

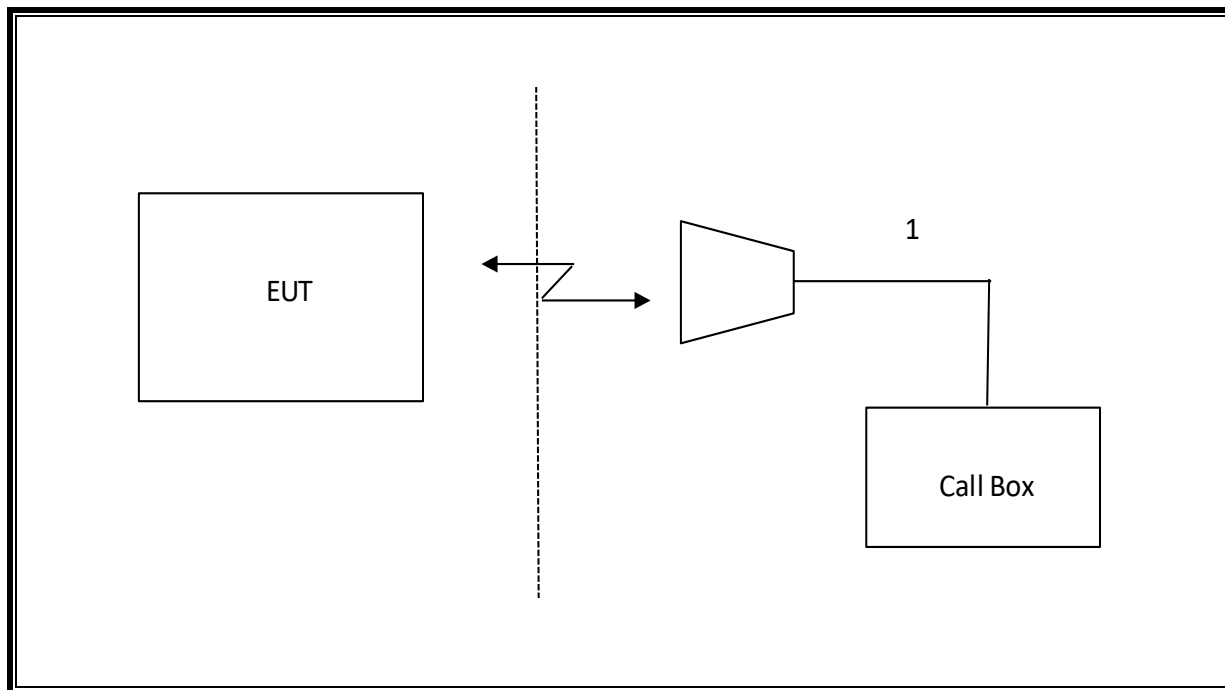
5.9. DESCRIPTION OF TEST SETUP

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	Shielded	0.6	N/A
4	RF In/Out	1	Communication Test Set	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	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 13335182-EP1 for setup photos

Appendix A – Reference Test Report 13335182-E10

Attached is the test report (13335182-E10) containing the reference data from the parent model as detailed in section 5.5.



TEST REPORT

Report Number : 13335182-E10V2

Applicant : APPLE, INC
1 APPLE PARK WAY

CUPERTINO, CA 95014

Model : A2342

FCC ID : BCG-E3548A

EUT Description : SMARTPHONE

Test Standard(s) : FCC CFR47 22H, 27L, 27M AND 96

Date Of Issue:
OCTOBER 02, 2020

Prepared by:
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Revision History



NVLAP Lab code: 200065-0

Rev.	Issue Date	Revisions	Revised By
V1	10/2/2020	Initial Review	Mengistu Mekuria
V2	10/2/2020	Updated Antenna gains and EIRP table for Band 48	John Thompson

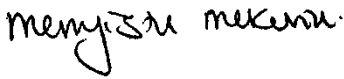
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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014
Model	A2342
FCC ID	BCG-E3548A
EUT Description	SMARTPHONE
Serial Number	MODEL (A2342): C0703040074P5635 (Conducted), G6TD402N06PY (Radiated)
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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:

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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

$$\text{ERP/EIRP} = \text{PMeas} + \text{GT} - \text{LC}$$

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)		-5.30						
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	25.7	18.25	0.067	13871.1	13M9G7W
	16QAM			24.8	17.34	0.054	13865.7	13M9D7W
10+5	QPSK	829.0	846.5	25.7	18.25	0.067	13843.0	13M8G7W
	16QAM			24.7	17.29	0.054	13863.7	13M9D7W
10+10	QPSK	829.0	844.0	25.7	18.25	0.067	18769.7	18M8G7W
	16QAM			24.7	17.23	0.053	18825.5	18M8D7W

OUTPUT POWER FOR LTE BAND 7

Part 27 / RSS 199								
EIRP Limit (W)		2.00						
Antenna Gain (dBi)		-2.00						
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	25.7	23.70	0.234	27964.7	28M0G7W
	16QAM			24.7	22.69	0.186	29897	29M9D7W
20+10	QPSK	2510.0	2564.5	25.7	23.70	0.234	28044.7	28M0G7W
	16QAM			24.8	22.75	0.188	27999.8	28M0D7W
15+15	QPSK	2507.5	2562.5	25.7	23.70	0.234	28662.1	28M7G7W
	16QAM			24.7	22.69	0.186	28511.5	28M5D7W
15+20	QPSK	2507.8	2560.0	25.7	23.70	0.234	32887.9	32M9G7W
	16QAM			24.7	22.73	0.187	32846.4	32M8D7W
20+15	QPSK	2510.0	2562.2	25.7	23.70	0.234	32830.8	32M8G7W
	16QAM			24.8	22.77	0.189	32854.6	32M9D7W
20+20	QPSK	2510.0	2560.0	25.7	23.70	0.234	37655.7	37M7G7W
	16QAM			24.8	22.82	0.191	37655.7	37M7D7W

OUTPUT POWER FOR LTE BAND 41

Part 27								
EIRP Limit (W)		2.00						
Antenna Gain (dBi)		0.00						
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	2499.3	2680.0	21.6	21.59	0.144	22758.5	22M8G7W
	16QAM			21.0	21.03	0.127	22851.3	22M9D7W
20+5	QPSK	2506.0	2686.7	21.7	21.70	0.148	22804	22M8G7W
	16QAM			21.2	21.17	0.131	22736.5	22M7D7W
10+20	QPSK	2501.5	2680.0	24.5	24.53	0.284	27599.6	27M6G7W
	16QAM			23.6	23.60	0.229	27506.7	27M5D7W
20+10	QPSK	2506.0	2684.5	24.7	24.70	0.295	28237	28M2G7W
	16QAM			23.8	23.77	0.238	28122.1	28M1D7W
15+15	QPSK	2503.5	2682.5	24.7	24.70	0.295	32470.3	32M5G7W
	16QAM			23.8	23.76	0.238	32586.3	32M6D7W
15+20	QPSK	2503.8	2680.0	24.7	24.70	0.295	32470.3	32M5G7W
	16QAM			23.8	23.76	0.238	32586.3	32M6D7W
20+15	QPSK	2506.0	2682.2	24.7	24.70	0.295	32422.5	32M4G7W
	16QAM			23.9	23.89	0.245	32390.9	32M4D7W
20+20	QPSK	2506.0	2680.0	24.7	24.70	0.295	37315.5	37M3G7W
	16QAM			23.9	23.85	0.243	37279.7	37M3D7W

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	23.0	19.99	0.100	23286.1	23M3G7W
	16QAM			22.9	19.91	0.098	23316.3	23M3D7W
20+5	QPSK	3560.0	3696.7	23.1	20.14	0.103	23265.5	23M3G7W
	16QAM			23.3	20.25	0.106	23256.9	23M3D7W
10+20	QPSK	3555.5	3690.0	23.5	20.48	0.112	28023.9	28M0G7W
	16QAM			23.5	20.46	0.111	28001.7	28M0D7W
20+10	QPSK	3560.0	3694.5	23.7	20.73	0.118	28043.5	28M0G7W
	16QAM			23.6	20.64	0.116	27914.2	27M9D7W
15+20	QPSK	3557.8	3690.0	24.1	21.11	0.129	32768.1	32M8G7W
	16QAM			23.9	20.88	0.122	32852.8	32M9D7W
20+15	QPSK	3560.0	3692.2	24.2	21.20	0.132	32812.2	32M8G7W
	16QAM			24.2	21.16	0.131	32717.5	32M7D7W
20+20	QPSK	3560.0	3690.0	24.1	21.11	0.129	37770.5	37M8G7W
	16QAM			24.2	21.16	0.131	37752.9	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 and 5G NR Bands	Antenna Gain (dBi)						
	ANT 1	ANT 2	ANT 3	ANT 4	ANT 7	ANT 8	ANT 9
LTE Band 5, 5G NR Band n5, 824 – 849 MHz	-5.3	-5.0	NA	NA	NA	NA	NA
LTE Band 7, 2500 – 2570 MHz	-2.0	-2.4	-1.1	-0.2	NA	NA	NA
LTE Band 41, 5G NR Band n41, 2496 – 2690 MHz	-2.0	-1.7	0.0	-0.2	NA	NA	NA
LTE Band 48, 3550 – 3700 MHz	NA	NA	NA	-3.0	-4.9	-4.9	-3.0

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 exhibit 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)	Y	Z	N/A	N/A	N/A	N/A	N/A
Band 7, 41	Y	Z	Z	X	N/A	N/A	N/A
Band 48	N/A	N/A	N/A	X	Y	Z	Z

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.

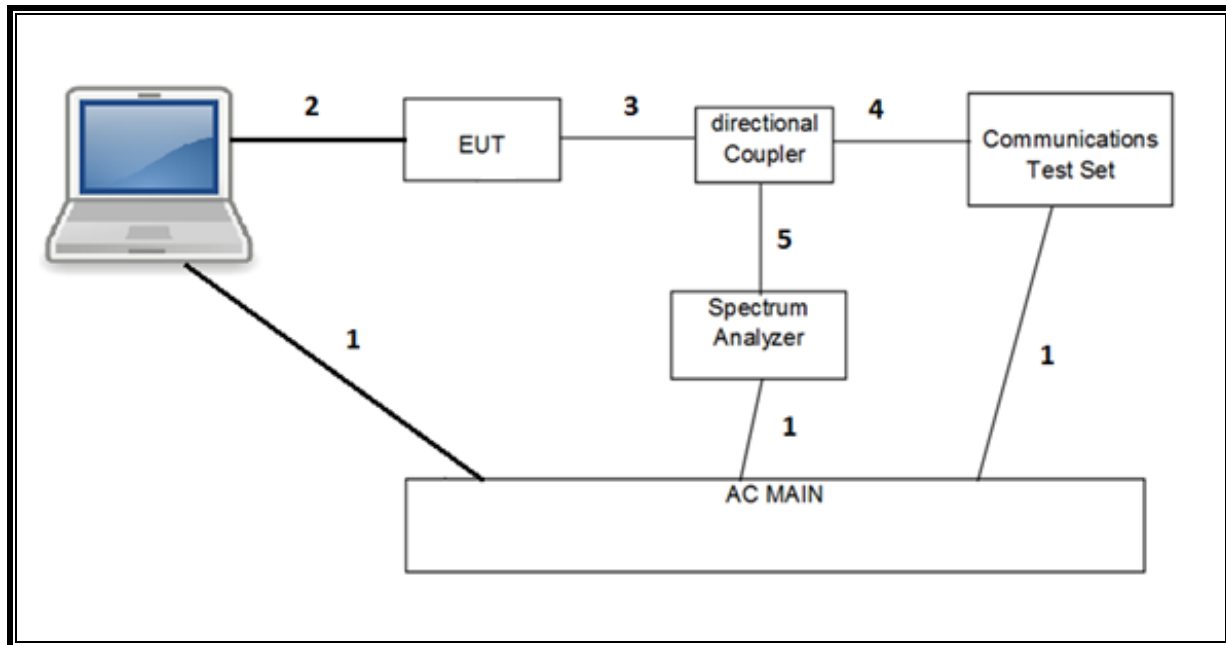
Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

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.

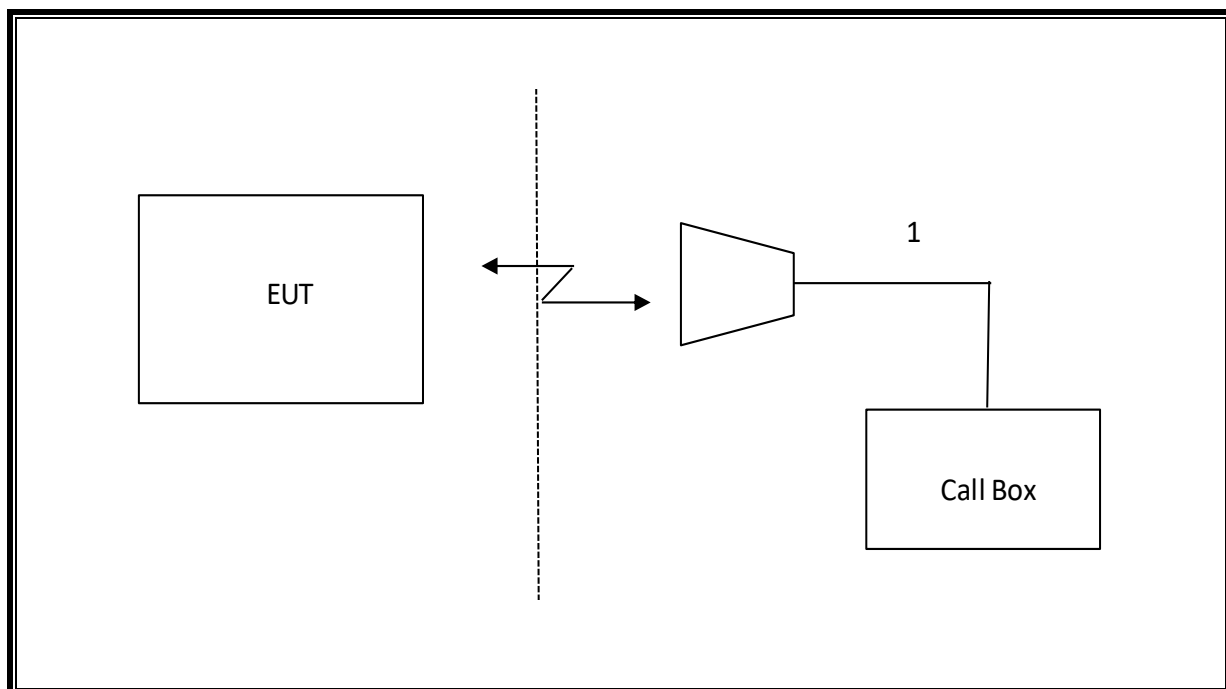
5.6. DESCRIPTION OF TEST SETUP

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
RSS199 §4.4

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:	9/1/2020
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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	25.62	24.79	23.36	20.76	23.90	22.83	21.62	18.82
			25	0	50	0	23.86	22.87	22.89	20.87	21.98	20.97	21.04	18.98
	831.6	838.8	1	24	1	0	25.69	24.70	23.68	20.73	23.80	22.89	21.94	18.95
			25	0	50	0	23.83	22.82	22.86	20.86	21.99	21.02	21.01	18.96
	836.8	844.0	1	24	1	0	25.70	24.76	23.26	20.69	23.86	22.81	21.04	18.83
			25	0	50	0	23.85	22.87	22.89	20.89	22.00	20.99	21.05	19.00

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	25.56	24.56	23.34	20.60	23.90	22.84	21.68	18.97
			50	0	25	0	23.68	22.67	22.72	20.70	22.05	21.03	21.06	19.00
	834.3	841.5	1	49	1	0	25.70	24.57	23.02	20.73	23.88	23.03	22.11	18.99
			50	0	25	0	23.72	22.74	22.75	20.77	22.01	21.02	21.05	19.01
	839.3	846.5	1	49	1	0	25.66	24.74	22.89	20.84	23.90	23.13	21.81	18.96
			50	0	25	0	23.74	22.77	22.77	20.77	22.02	21.02	21.04	18.97

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	25.70	24.60	23.33	20.74	23.63	22.57	21.49	18.68
			1	0	1	49	15.24	15.33	15.21	15.39	13.32	13.19	13.30	13.16
			50	0	50	0	23.78	22.81	22.83	20.81	21.76	20.76	20.82	18.77
			1	49	1	0	25.60	24.68	23.44	20.76	23.90	22.65	20.45	18.73
	831.5	841.4	1	0	1	49	15.26	15.43	15.27	15.30	13.23	13.12	13.23	13.22
			50	0	50	0	23.79	22.80	22.82	20.83	21.75	20.76	20.78	18.75
			1	49	1	0	25.60	24.64	23.26	20.67	23.59	22.64	20.33	18.79
			1	0	1	49	15.21	15.15	15.36	15.22	13.14	12.91	13.34	13.17
	834.1	844.0	50	0	50	0	23.81	22.81	22.83	20.83	21.75	20.76	20.78	18.74

7.2. LTE BAND 7

Test Engineer ID:	10646	Test Date:	9/1/2020
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OUTPUT POWER FOR LTE BAND 7 (10.0MHz + 20.0MHz)

Bandwidth	PCC	SCC1	PCC	PCC	SCC1	SCC1	Conducted Average (dBm)															
	Frequency (MHz)	Frequency (MHz)	RB	RB	RB	RB	ANT 1				ANT 2				ANT 3				ANT 4			
			Size	Offset	Size	Offset	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	24.76	23.79	22.83	19.74	21.83	20.70	19.36	16.93	23.44	22.42	21.56	18.62	21.25	20.35	19.33	16.35
			50	0	100	0	22.84	21.83	21.80	19.78	19.95	18.96	18.98	16.96	22.59	21.60	20.60	18.62	19.35	18.36	18.37	16.41
	2525.6	2540.0	1	49	1	0	25.70	24.69	23.79	20.63	22.75	21.80	21.00	17.85	24.55	23.60	22.79	19.69	22.20	21.12	20.32	17.18
			50	0	100	0	23.84	22.85	22.88	20.80	21.02	20.03	20.06	18.02	22.84	21.84	21.89	19.85	20.34	19.35	19.39	17.35
	2545.6	2560.0	1	49	1	0	25.66	24.68	23.60	20.74	22.80	21.82	20.88	17.90	24.70	23.70	22.81	19.73	22.16	21.16	20.23	17.23
			50	0	100	0	23.85	22.85	22.89	20.84	20.99	20.01	20.04	18.01	22.87	21.87	21.91	19.87	20.29	19.28	19.34	17.32

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	24.66	23.68	22.64	19.71	21.54	20.64	19.77	16.66	23.62	22.76	21.82	18.84	21.24	20.45	19.35	16.44
			100	0	50	0	22.74	21.75	21.75	19.74	19.83	18.81	18.86	16.86	21.71	20.75	20.73	18.76	19.40	18.41	18.42	16.44
			1	99	1	0	25.70	24.75	23.77	20.71	22.80	21.78	20.78	17.94	24.69	23.82	22.82	19.71	22.20	21.13	20.32	17.24
	2530.1	2544.5	100	0	50	0	23.84	22.85	22.82	20.83	20.91	19.92	19.94	17.92	22.89	21.88	21.90	19.88	20.36	19.40	19.41	17.39
			1	99	1	0	25.68	24.75	23.81	20.63	22.67	21.76	20.82	17.78	24.70	23.75	22.85	19.73	22.04	21.11	20.27	17.13
			100	0	50	0	23.82	22.84	22.84	20.80	20.90	19.92	19.91	17.92	22.88	21.89	21.91	19.89	20.29	19.30	19.33	17.32

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	24.57	23.53	22.65	19.52	21.59	20.63	19.69	16.74	23.67	22.67	21.71	18.73	21.24	20.23	19.31	16.30
			75	0	75	0	22.70	21.75	21.72	19.73	19.79	18.81	18.83	16.83	21.66	20.65	20.70	18.67	19.35	18.37	18.38	16.38
	2527.5	2542.5	1	74	1	0	25.63	24.67	23.70	20.71	22.80	21.74	20.86	17.82	24.70	23.66	22.74	19.76	22.20	21.14	20.29	17.22
			75	0	75	0	23.80	22.81	22.85	20.79	20.90	19.90	19.93	17.91	22.84	21.87	21.92	19.89	20.35	19.34	19.39	17.37
	2547.5	2562.5	1	74	1	0	25.70	24.69	23.76	20.76	22.69	21.70	20.80	17.74	24.58	23.64	22.83	19.66	22.17	21.13	20.30	17.14
			75	0	75	0	23.81	22.84	22.86	20.79	20.87	19.89	19.91	17.89	22.87	21.88	21.91	19.87	20.27	19.30	19.32	17.31

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	24.57	23.67	22.75	19.55	21.64	20.69	19.86	16.79	23.58	22.63	21.72	18.72	21.12	20.26	19.40	16.31
			75	0	100	0	22.79	21.81	21.79	19.55	19.92	18.92	18.95	16.97	21.71	20.72	20.74	18.72	19.41	18.43	18.41	16.43
			1	74	1	0	25.67	24.68	23.74	20.63	22.78	21.80	20.96	17.89	24.60	23.73	22.77	19.75	22.19	21.19	20.24	17.17
	2525.3	2542.4	75	0	100	0	23.86	22.87	22.92	20.81	20.98	20.03	20.03	18.03	22.88	21.92	21.92	19.90	20.40	19.41	19.45	17.40
			1	74	1	0	25.70	24.73	23.82	20.76	22.80	21.80	20.87	17.74	24.70	23.76	22.85	19.63	22.20	21.29	20.31	17.28
			75	0	100	0	23.87	22.89	22.89	20.85	20.99	19.97	20.02	18.00	22.90	21.89	21.93	19.88	20.35	19.37	19.37	17.37

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	24.57	23.61	22.71	19.49	21.60	20.71	19.81	16.64	23.76	22.84	21.81	18.80	21.08	20.24	19.38	16.25
			100	0	75	0	22.76	21.74	21.75	19.77	19.84	18.84	18.88	16.89	21.76	20.77	20.75	18.76	19.40	18.40	18.41	16.45
			1	99	1	0	25.70	24.77	23.71	20.77	22.80	21.88	20.80	17.99	24.70	23.74	22.78	19.79	22.19	21.27	20.22	17.32
	2527.6	2544.7	100	0	75	0	23.85	22.87	22.87	20.84	20.95	19.98	19.98	18.02	22.90	21.94	21.94	19.92	20.40	19.42	19.41	17.43
			1	99	1	0	25.67	24.72	23.77	20.68	22.78	21.71	20.83	17.82	24.60	23.65	22.87	19.72	22.20	21.23	20.28	17.26
			100	0	75	0	23.82	22.83	22.86	20.80	20.93	19.93	19.98	17.96	22.90	21.91	21.94	19.92	20.33	19.34	19.36	17.35

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	24.62	23.62	22.72	19.55	21.67	20.93	19.93	16.82	23.53	22.75	21.71	18.59	21.11	20.52	19.35	16.23
			1	0	1	99	15.77	15.55	15.46	15.52	13.30	13.09	13.01	13.46	14.87	14.96	14.98	14.87	12.62	12.63	12.65	12.56
			100	0	100	0	22.89	21.87	21.88	19.85	19.92	18.94	18.95	16.98	21.71	20.67	20.69	18.72	19.38	18.38	18.39	16.42
	2525.1	2544.9	1	99	1	0	25.70	24.82	23.82	20.73	22.70	21.75	20.87	17.68	24.70	23.81	22.67	19.72	22.15	21.21	20.22	17.28
			1	0	1	99	16.37	16.20	16.02	16.07	14.25	14.43	14.51	14.46	16.28	16.33	16.35	16.39	13.83	13.86	13.94	13.98
			100	0	100	0	23.73	22.78	22.80	20.92	21.01	19.98	20.02	18.02	22.84	21.85	21.85	19.85	20.39	19.42	19.41	17.41
	2540.2	2560.0	1	99	1	0	25.61	24.64	23.74	20.57	22.80	21.89	20.88	17.75	24.66	23.63	22.76	19.74	22.20	21.22	20.27	17.23
			1	0	1	99	16.73	16.49	16.41	16.01	14.35	14.47	14.46	14.61	16.30	16.34	16.37	16.24	13.62	13.54	13.50	13.34
			100	0	100	0	23.90	22.86	22.90	20.92	20.99	20.00	20.05	18.00	22.83	21.84	21.85	19.84	20.31	19.37	19.34	17.35

7.3. LTE BAND 41

Test Engineer ID:	10646	Test Date:	9/1/2020
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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			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
5MHz / 20MHz	2499.3	2511.0	1	24	1	0	22.54	22.06	22.60	20.79	19.65	19.14	19.66	18.00	21.16	20.69	20.39	19.34
			25	0	100	0	22.70	22.22	22.19	20.71	19.80	19.33	19.30	17.84	21.59	21.03	21.13	19.60
	2583.8	2595.5	1	24	1	0	22.28	21.89	22.09	20.58	19.41	19.00	19.18	17.71	21.26	20.72	21.38	19.57
			25	0	100	0	22.63	22.13	22.06	20.59	19.65	19.19	19.19	17.75	21.45	21.01	20.98	19.47
	2668.3	2680.0	1	24	1	0	22.29	21.74	21.49	20.45	19.35	18.81	18.61	17.56	20.93	20.55	20.73	19.22
			25	0	100	0	22.45	21.92	22.00	20.46	19.52	19.02	19.10	17.61	21.24	20.69	20.71	19.24

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			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 5MHz	2506.0	2517.7	1	99	1	0	22.65	22.02	22.05	20.53	19.60	19.17	19.08	17.56	21.57	21.17	21.18	19.70
			100	0	25	0	22.48	22.07	22.14	20.68	19.80	19.09	19.26	17.70	21.70	21.06	21.24	19.69
	2590.5	2602.2	1	99	1	0	22.52	22.18	22.15	20.67	19.67	19.12	19.17	17.76	21.46	21.03	21.11	19.61
			100	0	25	0	22.51	22.07	22.09	20.55	19.61	19.33	19.22	17.72	21.59	21.02	21.17	19.68
	2675.0	2686.7	1	99	1	0	22.52	22.18	22.08	20.51	19.72	19.29	19.16	17.73	21.42	20.89	20.82	19.43
			100	0	25	0	22.70	22.17	22.00	20.67	19.70	19.17	19.22	17.67	21.33	20.79	20.90	19.40

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			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
10MHz / 20MHz	2501.5	2515.9	1	49	1	0	25.70	24.65	23.49	20.76	22.80	21.83	21.05	17.90	24.53	23.60	22.71	20.05
			50	0	100	0	21.85	21.86	21.88	20.91	19.11	19.13	19.12	18.16	20.80	20.82	20.82	19.88
	2583.6	2598.0	1	49	1	0	25.58	24.51	23.87	20.59	22.74	21.79	20.97	18.25	24.32	23.22	22.10	19.42
			50	0	100	0	21.76	21.78	21.77	20.77	18.93	19.02	18.99	18.10	20.53	20.54	19.53	17.78
	2665.6	2680.0	1	49	1	0	25.40	24.46	23.63	20.83	22.65	21.51	20.49	17.80	24.04	23.07	22.31	19.08
			50	0	100	0	21.63	21.60	21.68	20.66	18.78	18.83	18.84	17.93	20.20	20.24	20.23	19.27

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			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
20MHz / 10MHz	2506.0	2520.4	1	99	1	0	25.66	24.66	23.79	20.72	22.67	21.92	20.99	17.96	24.70	23.77	22.90	19.87
			100	0	50	0	23.87	22.84	22.87	20.88	21.05	20.11	20.09	18.12	22.85	21.83	21.86	19.90
	2588.1	2602.5	1	99	1	0	25.70	24.84	23.82	21.00	22.80	21.93	20.92	18.16	24.14	23.26	22.26	19.44
			100	0	50	0	23.83	22.82	22.86	20.86	20.93	19.95	20.02	18.00	22.34	21.36	21.43	19.36
	2670.1	2684.5	1	99	1	0	25.41	24.44	24.03	20.61	22.62	21.64	21.21	17.83	23.93	22.94	22.52	19.19
			100	0	50	0	23.63	22.66	22.69	20.59	20.77	19.85	19.85	17.84	22.11	21.15	21.08	19.11

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			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
15MHz / 15MHz	2503.5	2518.5	1	74	1	0	25.63	24.65	23.88	20.66	22.76	21.80	20.90	17.88	24.70	23.76	23.04	19.89
			75	0	75	0	23.89	22.97	22.88	20.85	21.08	20.11	20.17	18.12	22.91	21.97	21.92	19.94
	2585.5	2600.5	1	74	1	0	25.70	24.72	23.68	21.01	22.80	21.84	20.82	18.19	24.35	23.36	22.37	19.61
			75	0	75	0	23.78	22.82	22.89	20.84	20.94	19.95	20.04	18.04	22.49	21.55	21.62	19.58
	2667.5	2682.5	1	74	1	0	25.48	24.38	23.32	20.53	22.64	21.56	20.42	17.75	24.06	23.00	21.91	19.15
			75	0	75	0	23.63	22.68	22.72	20.73	20.80	19.84	19.86	17.91	22.24	21.34	21.37	19.36

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			
							QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
15MHz / 20MHz	2503.8	2520.9	1	74	1	0	25.70	24.70	23.98	20.73	22.71	21.79	20.89	17.81	24.70	23.76	23.07	19.87
			75	0	100	0	21.88	22.02	21.95	20.89	19.07	19.11	19.09	18.15	20.91	21.01	20.96	19.97
	2583.3	2600.4	1	74	1	0	25.69	24.76	23.71	21.02	22.80	21.83	20.80	18.13	24.35	23.36	22.38	19.65
			75	0	100	0	21.85	21.85	21.93	20.89	18.91	18.94	19.01	18.02	20.53	20.53	20.65	19.59
	2662.9	2680.0	1	74	1	0	25.52	24.44	23.32	20.63	22.60	21.51	20.42	17.70	24.12	23.01	21.91	19.21
			75	0	100	0	21.66	21.71	21.73	20.78	18.78	18.79	18.79	17.83	20.25	20.29	20.34	19.38

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	25.70	24.80	23.73	20.96	22.80	21.82	20.94	17.86	24.70	23.89	22.91	19.83	22.20	21.33	20.27	17.53
			100	0	75	0	23.85	22.93	22.87	20.86	21.04	20.01	20.06	18.09	22.82	21.81	21.88	19.89	20.32	19.33	19.40	17.35
	2585.6	2602.7	1	99	1	0	25.56	24.58	24.12	20.78	22.72	21.83	20.82	18.09	24.03	23.22	22.18	19.39	21.46	20.46	20.01	16.70
			100	0	75	0	23.74	22.77	22.78	20.75	20.87	19.92	19.96	17.99	22.33	21.39	21.38	19.34	19.73	18.71	18.75	16.70
	2665.1	2682.2	1	99	1	0	25.44	24.45	23.55	20.47	22.55	21.58	21.09	17.73	23.88	22.86	22.39	19.13	21.27	20.20	19.40	16.27
			100	0	75	0	23.62	22.63	22.65	20.65	20.76	19.78	19.79	17.75	22.04	21.08	21.13	19.05	19.46	18.44	18.47	16.53

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	25.69	24.65	23.81	20.68	22.80	21.82	20.93	17.89	24.70	23.85	22.90	19.80	22.20	21.22	20.34	17.22
			1	0	1	99	15.41	15.35	15.55	15.34	12.54	12.48	12.62	12.49	14.06	13.98	14.17	13.98	11.82	11.81	11.98	11.79
			100	0	100	0	22.92	21.92	21.89	20.90	20.03	19.06	19.08	18.12	21.80	20.83	20.79	19.88	19.36	18.37	18.38	17.37
			1	99	1	0	25.70	24.79	23.74	20.91	22.70	21.81	20.82	18.04	24.10	23.16	22.17	19.32	21.57	20.70	19.67	16.87
	2583.1	2602.9	1	0	1	99	15.27	15.43	15.32	15.50	12.35	12.45	12.39	12.65	13.91	14.02	13.95	14.11	11.43	11.56	11.48	11.70
			100	0	100	0	22.84	21.85	21.88	20.83	19.91	18.91	18.95	17.97	21.34	20.35	20.41	19.33	18.76	17.75	17.80	16.74
			1	99	1	0	25.40	24.39	23.87	20.38	22.55	21.53	21.02	17.63	23.82	22.81	22.36	19.03	21.19	20.21	19.78	16.38
			1	0	1	99	15.02	15.01	15.56	15.30	12.14	12.13	12.60	12.40	13.57	13.50	13.97	13.74	10.99	10.96	11.43	11.24
	2660.2	2680.0	1	0	1	99	15.02	15.01	15.56	15.30	12.14	12.13	12.60	12.40	13.57	13.50	13.97	13.74	10.99	10.96	11.43	11.24
			100	0	100	0	22.65	21.62	21.66	20.63	19.74	18.75	18.77	17.76	21.05	20.07	20.07	19.13	18.39	17.49	17.44	16.40

7.4. LTE BAND 48

Test Engineer ID:	10646	Test Date:	9/1/2020
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OUTPUT POWER FOR LTE BAND 48 (5.0MHz + 20.0MHz)

Bandwidth	PCC	SCC1	PCC	PCC	SCC1	SCC1	Conducted Average (dBm)															
	Frequency	Frequency	RB	RB	RB	RB	ANT 7				ANT 4				ANT 9				ANT 8			
	(MHz)	(MHz)	Size	Offset	Size	Offset	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	19.67	19.64	19.83	19.80	16.43	16.38	16.09	16.53	19.29	19.26	19.73	19.44	16.41	16.36	16.10	16.51
			25	0	100	0	13.55	13.56	13.40	13.40	10.33	10.30	10.38	10.30	12.99	13.00	13.01	13.00	10.12	10.11	10.16	10.10
	3615.8	3627.5	1	24	1	0	23.41	23.40	23.15	20.59	19.88	19.87	20.44	17.14	22.99	22.91	23.10	20.08	19.90	19.92	20.44	17.19
			25	0	100	0	21.67	21.64	21.68	20.69	18.12	18.13	18.10	17.09	21.12	21.10	21.08	20.10	18.15	18.13	18.13	17.12
	3678.3	3690.0	1	24	1	0	19.90	19.91	20.39	20.13	16.77	16.73	16.91	16.94	19.39	19.29	19.04	19.49	16.45	16.25	16.51	16.58
			25	0	100	0	13.64	13.63	13.59	13.61	10.46	10.46	10.47	10.48	13.06	13.03	13.11	13.11	10.05	10.06	10.02	10.08

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	20.43	20.23	20.44	20.25	17.04	16.90	17.07	17.23	19.98	19.90	20.06	19.89	17.12	16.94	17.13	16.94
			100	0	25	0	13.57	13.62	13.51	13.48	10.28	10.34	10.37	10.29	13.06	13.07	13.12	13.12	10.15	10.16	10.18	10.15
	3622.5	3634.2	1	99	1	0	23.76	23.67	23.71	20.92	20.10	20.10	20.64	17.35	23.14	23.25	23.18	20.38	20.15	20.21	20.20	17.34
			100	0	25	0	21.68	21.68	21.75	20.70	18.16	18.19	18.18	17.18	21.13	21.15	21.19	20.17	18.14	18.19	18.21	17.17
	3685.0	3696.7	1	99	1	0	20.45	20.42	20.89	20.66	17.37	17.20	17.41	17.23	19.98	19.94	20.41	20.15	16.92	16.91	17.42	17.23
			100	0	25	0	13.58	13.62	13.55	13.56	10.46	10.53	10.51	10.50	13.02	13.07	13.09	13.07	10.03	10.05	10.05	10.05

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	19.23	19.26	19.37	19.55	15.98	15.99	16.07	16.30	18.85	18.79	18.62	18.91	16.01	16.03	16.13	16.33
			50	0	100	0	14.56	14.44	14.49	14.46	11.34	11.35	11.38	11.29	14.07	14.12	14.10	14.10	11.17	11.19	11.18	11.24
	3615.6	3630.0	1	49	1	0	24.13	23.84	23.30	20.61	20.47	20.37	19.76	17.03	23.48	23.46	23.24	20.02	20.60	20.38	19.78	17.06
			50	0	100	0	21.20	21.18	21.18	20.67	17.66	17.65	17.65	17.15	20.63	20.62	20.68	20.19	17.69	17.66	17.67	17.19
	3675.6	3690.0	1	49	1	0	19.49	19.45	19.68	19.41	16.32	16.23	16.50	16.27	18.95	19.03	19.10	19.29	15.96	15.91	16.16	15.93
			50	0	100	0	14.65	14.65	14.68	14.64	11.49	11.49	11.52	11.55	14.10	14.13	14.13	14.15	11.11	11.10	11.10	11.10

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	19.35	19.32	19.44	19.28	16.04	15.92	16.09	15.95	18.99	18.91	19.07	18.94	16.06	16.04	16.15	16.02
			100	0	50	0	14.64	14.55	14.54	14.53	11.32	11.39	11.34	11.31	14.08	14.16	14.13	14.13	11.20	11.21	11.21	11.21
	3620.1	3634.5	1	99	1	0	24.21	24.16	23.69	20.94	20.73	20.81	20.25	17.42	23.73	23.64	23.19	20.53	20.65	20.73	20.18	17.37
			100	0	50	0	21.19	21.20	21.26	20.74	17.71	17.73	17.73	17.20	20.66	20.68	20.71	20.23	17.72	17.74	17.76	17.22
	3680.1	3694.5	1	99	1	0	19.41	19.42	19.93	19.61	16.31	16.29	16.81	16.61	18.94	18.97	19.43	19.12	15.93	15.95	16.42	16.18
			100	0	50	0	14.60	14.60	14.59	14.63	11.45	11.51	11.53	11.55	14.05	14.10	14.10	14.14	11.08	11.11	11.08	11.14

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	19.25	19.22	19.36	19.21	15.91	15.89	16.08	15.90	18.92	19.00	18.90	19.21	15.99	16.00	16.16	15.98
			75	0	100	0	14.62	14.53	14.52	14.49	11.35	11.35	11.34	11.31	14.07	14.15	14.13	14.10	11.19	11.16	11.20	11.20
	3615.3	3632.4	1	74	1	0	24.63	24.58	23.58	20.94	21.00	21.10	20.01	17.38	24.11	23.88	22.86	20.09	21.05	21.15	20.03	17.36
			75	0	100	0	21.14	21.19	21.19	20.67	17.65	17.66	17.69	17.17	20.68	20.68	20.68	20.17	17.66	17.73	17.70	17.18
	3672.9	3690.0	1	74	1	0	19.48	19.39	19.29	19.55	16.28	16.20	16.11	16.40	18.92	18.93	19.05	18.94	15.91	15.89	15.79	16.03
			75	0	100	0	14.64	14.67	14.68	14.69	11.51	11.53	11.52	11.55	14.13	14.12	14.15	14.18	11.13	11.14	11.10	11.14

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	19.34	19.26	19.40	19.29	15.98	15.86	16.08	15.91	18.97	18.87	19.04	18.90	16.05	15.96	16.13	16.01
			100	0	75	0	14.66	14.55	14.56	14.54	11.35	11.39	11.38	11.35	14.12	14.16	14.15	14.17	11.19	11.22	11.22	11.28
	3617.6	3634.7	1	99	1	0	24.70	24.61	23.72	20.94	21.14	21.20	20.17	17.36	24.20	24.16	23.19	20.39	21.15	21.20	20.17	17.38
			100	0	75	0	21.18	21.18	21.24	20.77	17.70	17.70	17.75	17.20	20.70	20.69	20.70	20.22	17.71	17.72	17.80	17.24
	3675.1	3692.2	1	99	1	0	19.41	19.43	19.90	19.64	16.27	16.28	16.77	16.52	18.93	18.96	19.40	19.12	15.95	15.92	16.42	16.19
			100	0	75	0	14.59	14.62	14.63	14.67	11.47	11.48	11.49	11.58	14.08	14.14	14.16	14.14	11.09	11.13	11.12	11.15

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			
							OPSK	16QAM	64QAM	256QAM	OPSK	16QAM	64QAM	256QAM	OPSK	16QAM	64QAM	256QAM	OPSK	16QAM	64QAM	256QAM
20MHz/ 20MHz	3560.0	3579.8	1	99	1	0	20.83	20.71	20.91	20.25	17.47	17.35	17.48	17.09	20.45	20.30	20.48	19.87	17.51	17.39	17.61	17.01
			1	0	1	99	7.70	7.68	7.82	7.59	4.32	4.34	4.71	4.42	7.13	7.16	7.29	7.06	4.15	4.16	4.25	4.10
			100	0	100	0	14.67	14.58	14.57	14.58	11.30	11.36	11.33	11.36	14.11	14.18	14.17	14.17	11.21	11.20	11.16	11.26
			1	99	1	0	24.69	24.62	23.69	20.91	21.00	21.00	20.09	17.00	24.11	24.16	23.17	20.37	21.12	21.15	20.18	17.35
	3615.1	3634.9	1	0	1	99	13.85	14.23	14.14	14.35	10.73	10.78	10.89	10.76	13.55	13.66	13.64	13.86	10.08	10.20	10.12	10.70
			100	0	100	0	21.18	21.23	21.24	20.74	17.77	17.71	17.70	17.24	20.68	20.66	20.71	20.17	17.72	17.76	17.75	17.22
			1	99	1	0	20.94	20.92	21.40	20.71	17.98	18.05	17.90	17.59	20.43	20.42	20.87	20.31	17.44	17.41	17.99	17.26
			1	0	1	99	7.62	7.61	8.07	7.77	4.47	4.61	4.52	4.68	7.09	7.09	7.52	7.24	4.07	4.10	4.49	4.37
	3670.2	3690.0	100	0	100	0	14.64	14.67	14.67	14.72	11.51	11.51	11.55	11.59	14.09	14.16	14.13	14.23	11.12	11.17	11.12	11.22
			1	99	1	0	20.94	20.92	21.40	20.71	17.98	18.05	17.90	17.59	20.43	20.42	20.87	20.31	17.44	17.41	17.99	17.26
			1	0	1	99	7.62	7.61	8.07	7.77	4.47	4.61	4.52	4.68	7.09	7.09	7.52	7.24	4.07	4.10	4.49	4.37
			100	0	100	0	14.64	14.67	14.67	14.72	11.51	11.51	11.55	11.59	14.09	14.16	14.13	14.23	11.12	11.17	11.12	11.22

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)
LTE BAND 5	5MHz + 10MHz BAND QPSK	25/0 + 50/0	836.5	13.8711	14.666
	5MHz + 10MHz BAND 16QAM			13.8657	14.615
	5MHz + 10MHz BAND 64QAM			13.8747	14.586
	10MHz + 5MHz BAND QPSK	50/0 + 25/0		13.8430	14.643
	10MHz + 5MHz BAND 16QAM			13.8637	14.605
	10MHz + 5MHz BAND 64QAM			13.8633	14.559
	10MHz + 10MHz BAND QPSK	50/0 + 50/0		18.7697	19.878
	10MHz + 10MHz BAND 16QAM			18.8255	19.878
	10MHz + 10MHz BAND 64QAM			18.7881	19.935

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	27.9647	30.068
	10MHz + 20MHz BAND 16QAM			29.897	29.897
	10MHz + 20MHz BAND 64QAM			27.9992	30.031
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.0447	30.112
	20MHz + 10MHz BAND 16QAM			27.9998	30.154
	20MHz + 10MHz BAND 64QAM			27.9998	30.033
	15MHz + 15MHz BAND QPSK	75/0 + 75/0		28.6621	30.798
	15MHz + 15MHz BAND 16QAM			28.5115	30.645
	15MHz + 15MHz BAND 64QAM			28.5192	30.671
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		32.8879	35.194
	15MHz + 20MHz BAND 16QAM			32.8464	35.152
	15MHz + 20MHz BAND 64QAM			32.8321	35.143
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		32.8308	35.183
	20MHz + 15MHz BAND 16QAM			32.8546	35.036
	20MHz + 15MHz BAND 64QAM			32.7724	35.053
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.6582	40.242
	20MHz + 20MHz BAND 16QAM			37.6557	40.189
	20MHz + 20MHz BAND 64QAM			37.6507	40.213

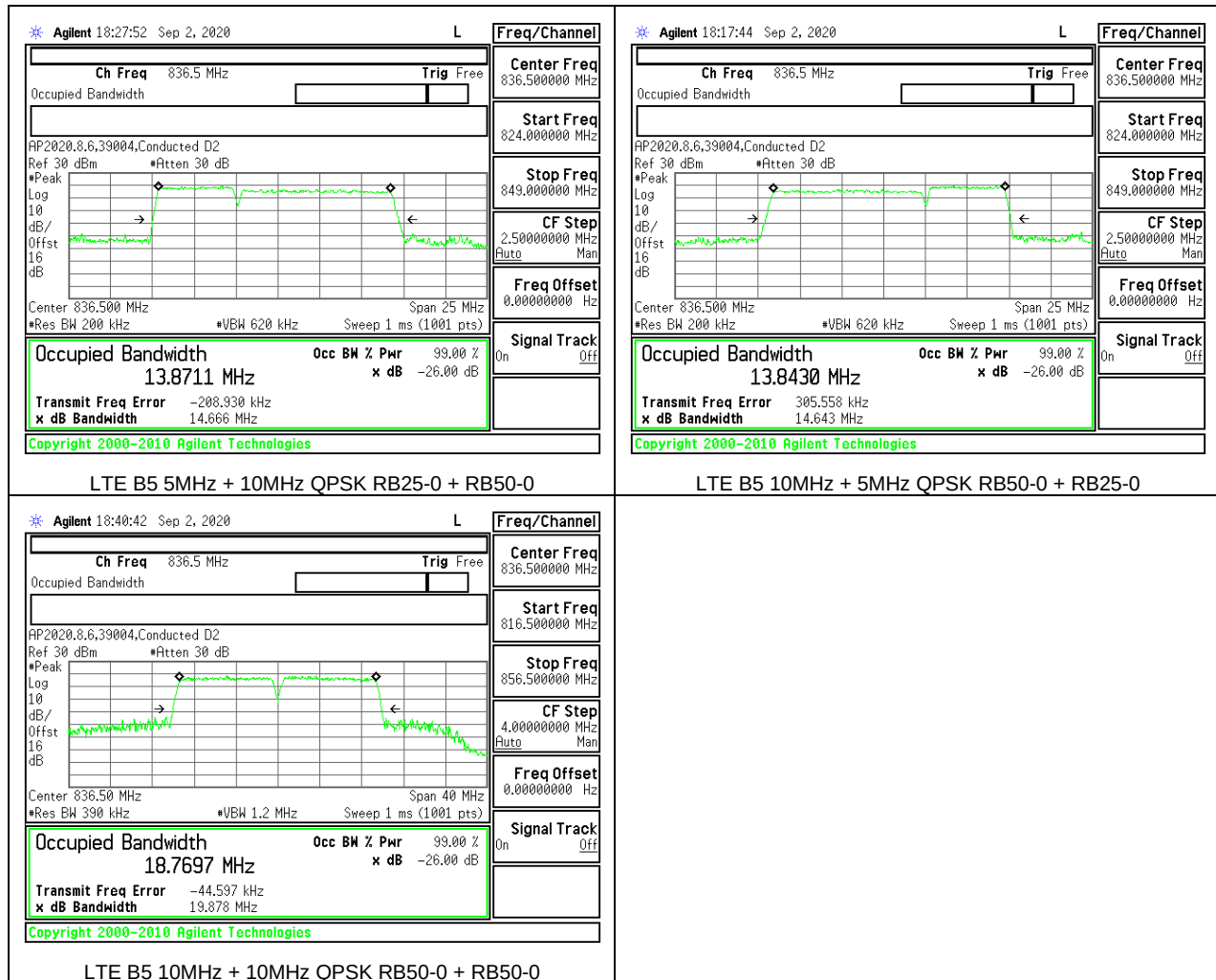
LTE BAND 41

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	22.7585	23.704
	5MHz + 20MHz BAND 16QAM			22.8513	23.743
	5MHz + 20MHz BAND 64QAM			22.8638	23.714
	20MHz + 5MHz BAND QPSK	100/0 + 25/0		22.8040	23.724
	20MHz + 5MHz BAND 16QAM			22.7365	23.765
	20MHz + 5MHz BAND 64QAM			22.7845	23.707
	10MHz + 20MHz BAND QPSK	50/0 + 100/0		27.5950	28.753
	10MHz + 20MHz BAND 16QAM			27.5858	29.686
	10MHz + 20MHz BAND 64QAM			27.6853	28.730
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		27.5996	28.452
	20MHz + 10MHz BAND 16QAM			27.5067	28.643
	20MHz + 10MHz BAND 64QAM			27.6074	28.721
	15MHz + 15MHz BAND QPSK	75/0 + 75/0		28.2370	29.322
	15MHz + 15MHz BAND 16QAM			28.1221	29.517
	15MHz + 15MHz BAND 64QAM			28.2370	29.488
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		32.4703	33.835
	15MHz + 20MHz BAND 16QAM			32.5863	33.766
	15MHz + 20MHz BAND 64QAM			32.4503	33.551
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		32.4225	33.693
	20MHz + 15MHz BAND 16QAM			32.3909	33.716
	20MHz + 15MHz BAND 64QAM			32.4798	34.187
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.3155	38.767
	20MHz + 20MHz BAND 16QAM			37.2797	38.778
	20MHz + 20MHz BAND 64QAM			37.0359	38.750

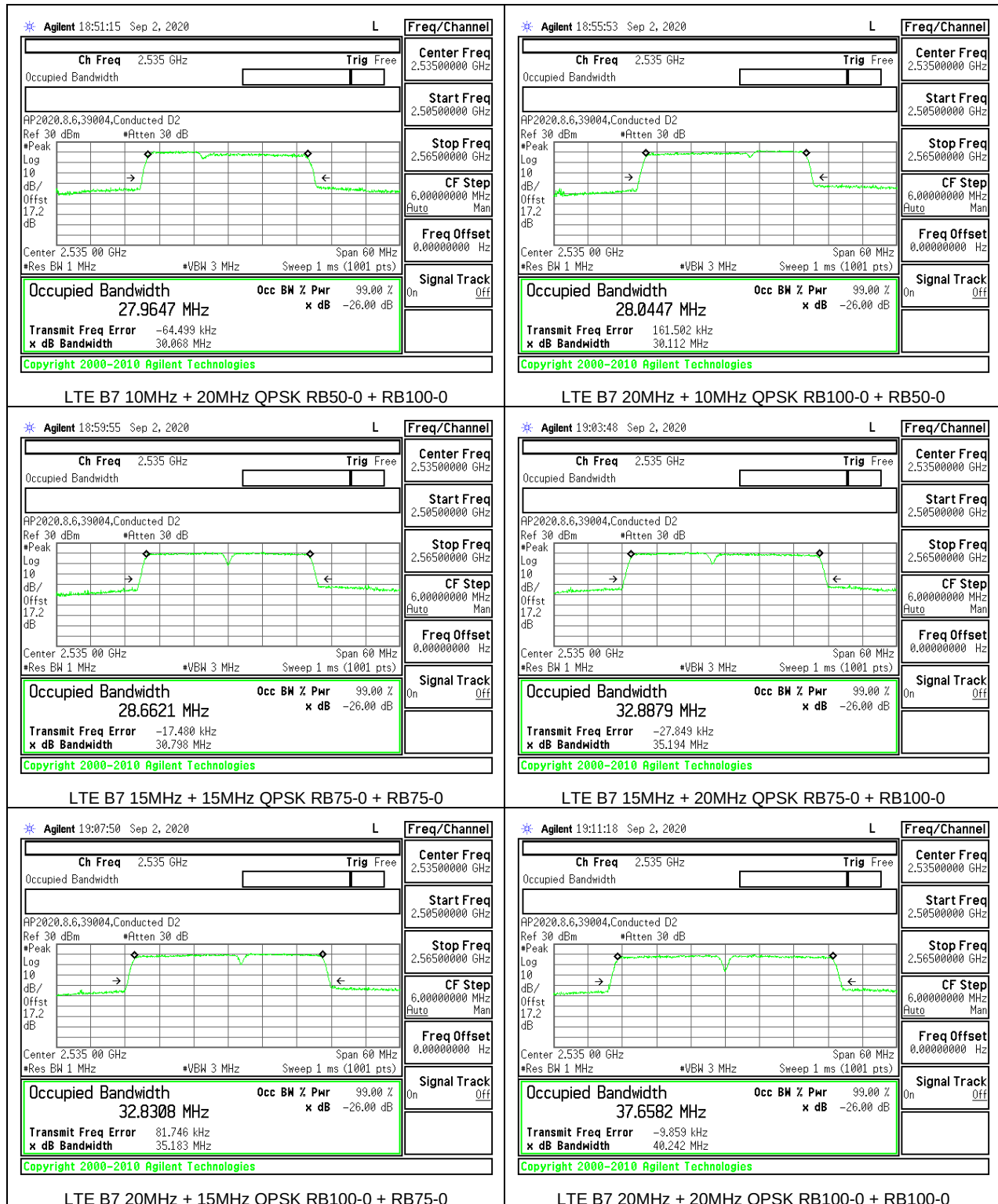
LTE BAND 48

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	23.2861	25.148
	5MHz + 20MHz BAND 16QAM			23.3163	25.093
	5MHz + 20MHz BAND 64QAM			23.2562	24.989
	20MHz + 5MHz BAND QPSK	100/0 + 25/0		23.2655	25.047
	20MHz + 5MHz BAND 64QAM			23.2569	24.909
	20MHz + 5MHz BAND 16QAM			23.1752	24.844
	10MHz + 20MHz BAND QPSK	50/0 + 100/0		28.0239	30.009
	10MHz + 20MHz BAND 16QAM			28.0017	30.140
	10MHz + 20MHz BAND 64QAM			28.0745	29.973
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.0435	30.065
	20MHz + 10MHz BAND 16QAM			27.9142	30.151
	20MHz + 10MHz BAND 64QAM			27.9818	30.063
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		32.7681	34.957
	15MHz + 20MHz BAND 16QAM			32.8528	35.157
	15MHz + 20MHz BAND 64QAM			32.6790	35.118
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		32.8122	35.045
	20MHz + 15MHz BAND 16QAM			32.7175	34.945
	20MHz + 15MHz BAND 64QAM			32.7804	34.916
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.7705	40.138
	20MHz + 20MHz BAND 16QAM			37.7529	40.060
	20MHz + 20MHz BAND 64QAM			37.6079	40.011

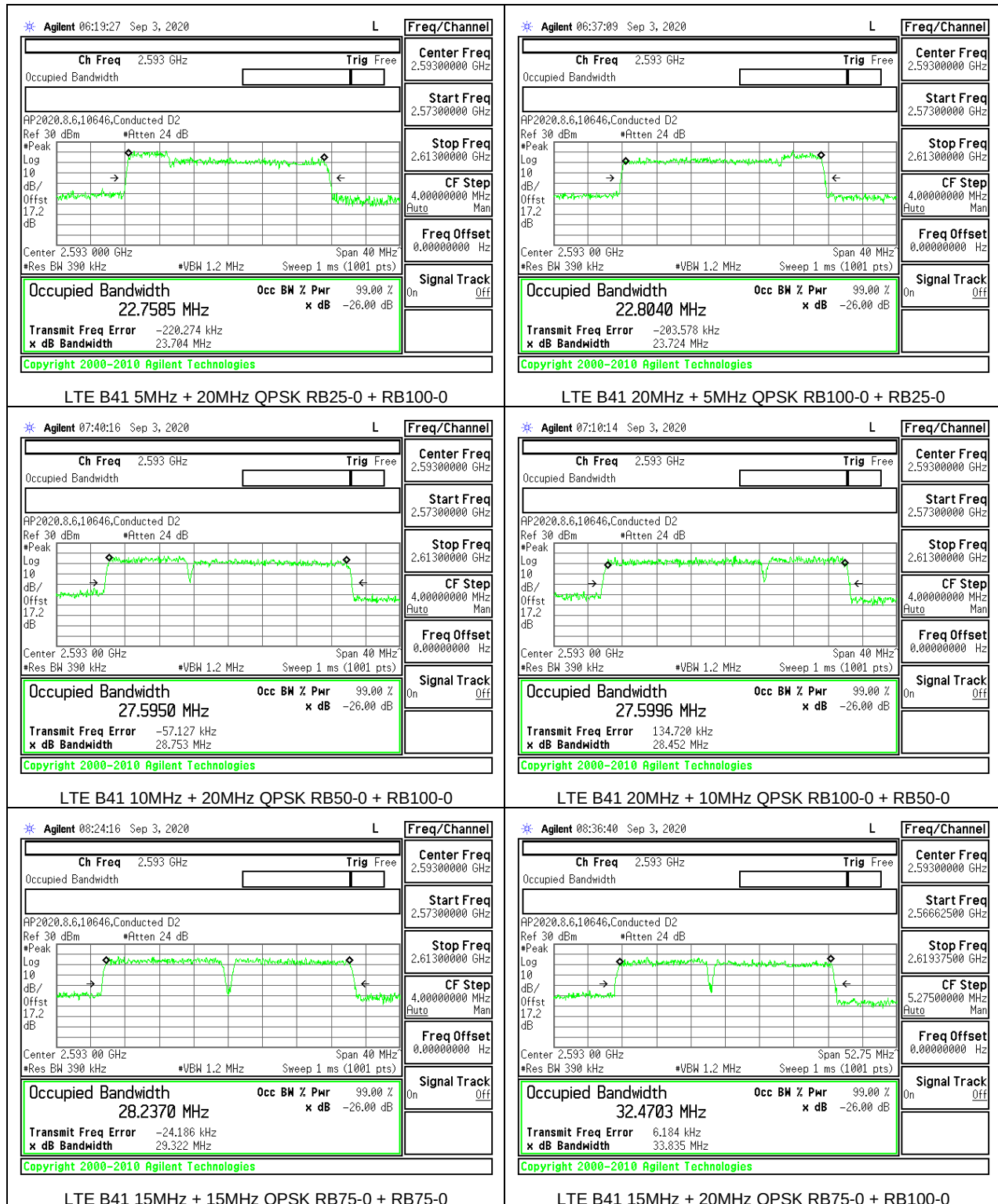
8.1.1.LTE BAND 5

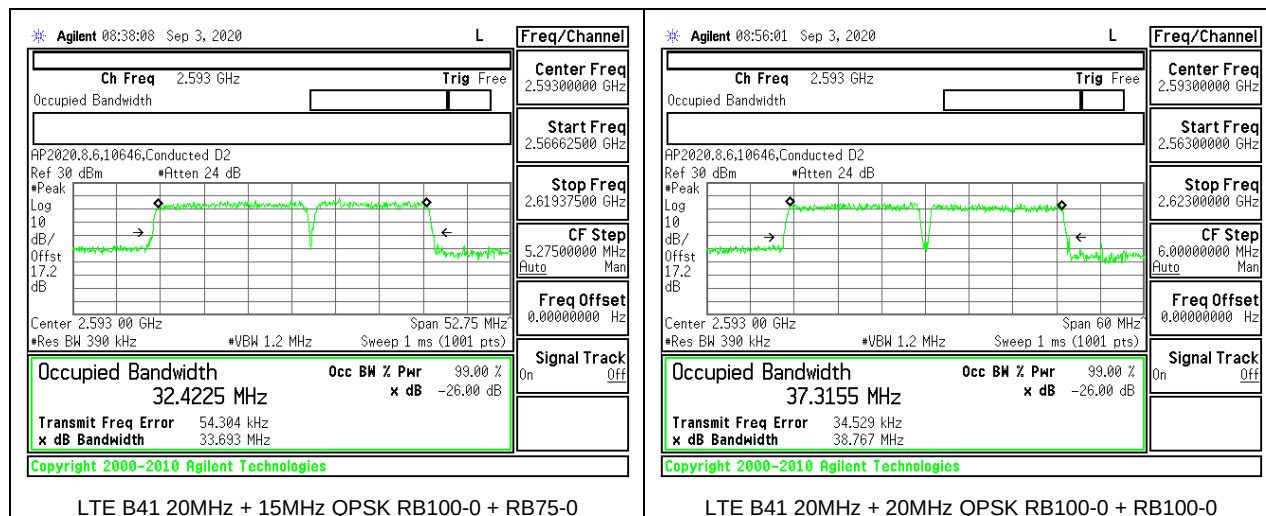


8.1.2. LTE BAND 7

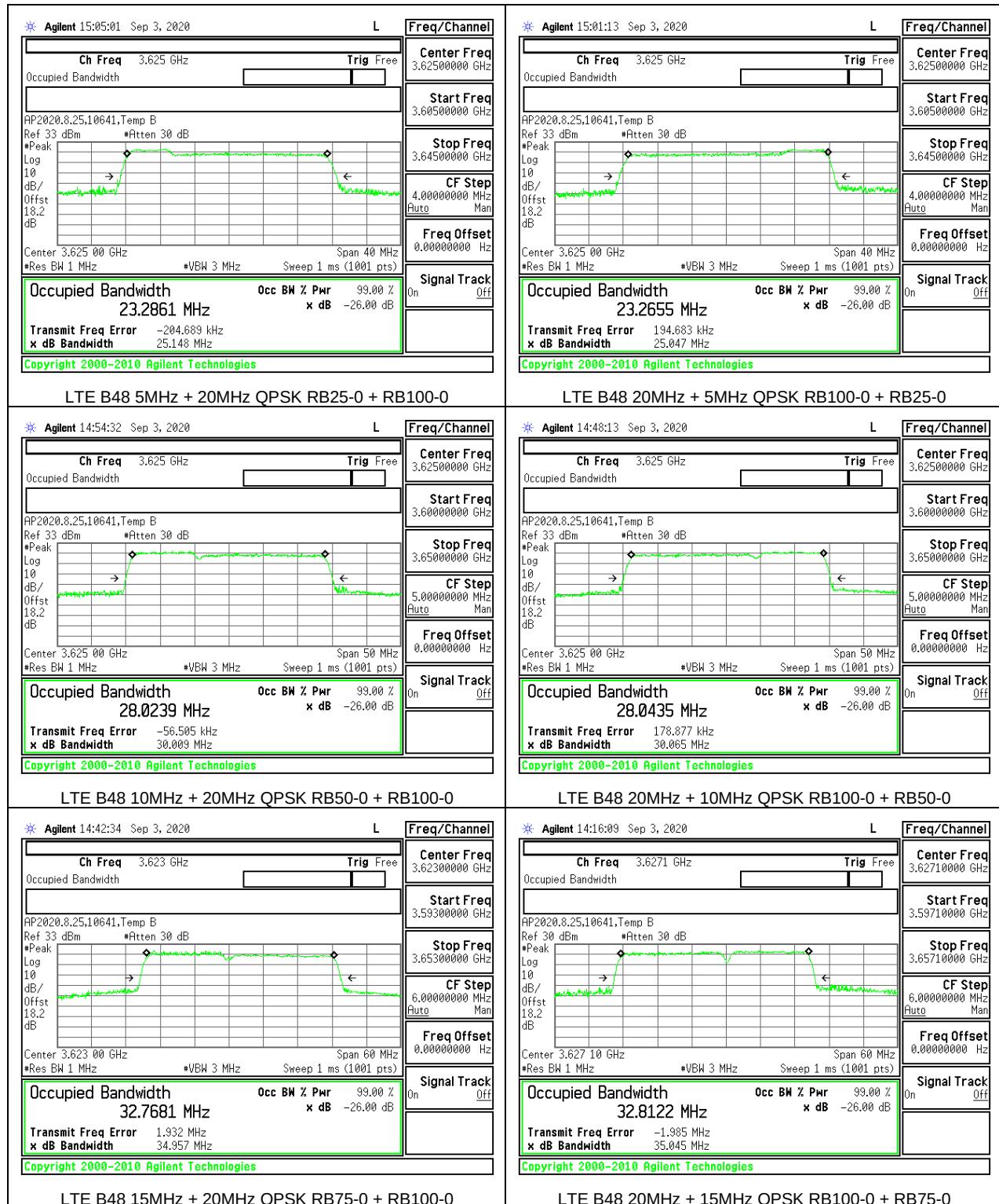


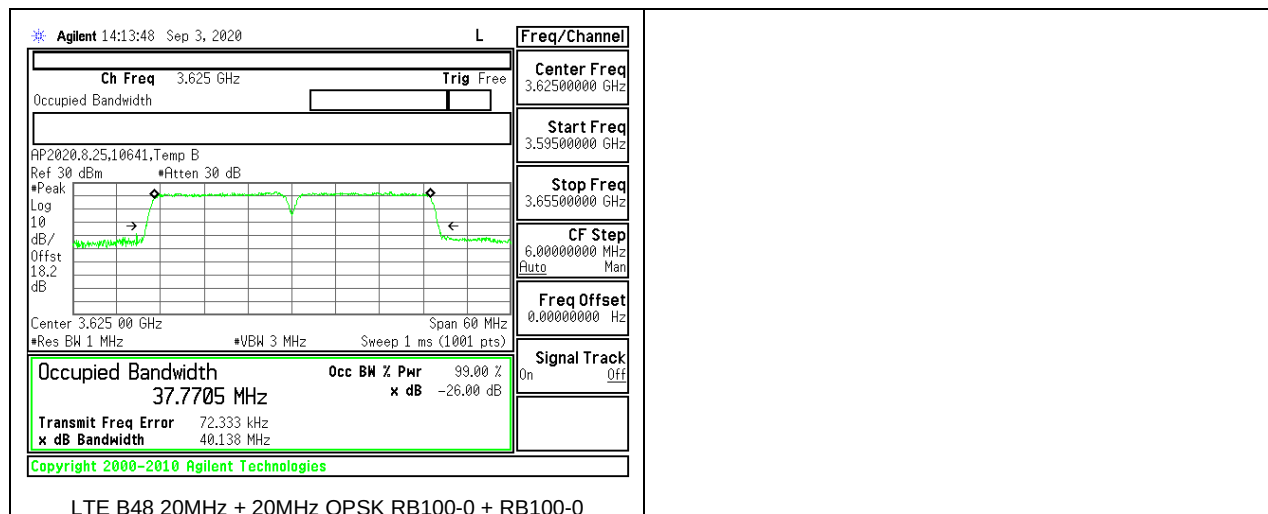
8.1.1. LTE BAND 41





8.1.2. LTE BAND 48





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.

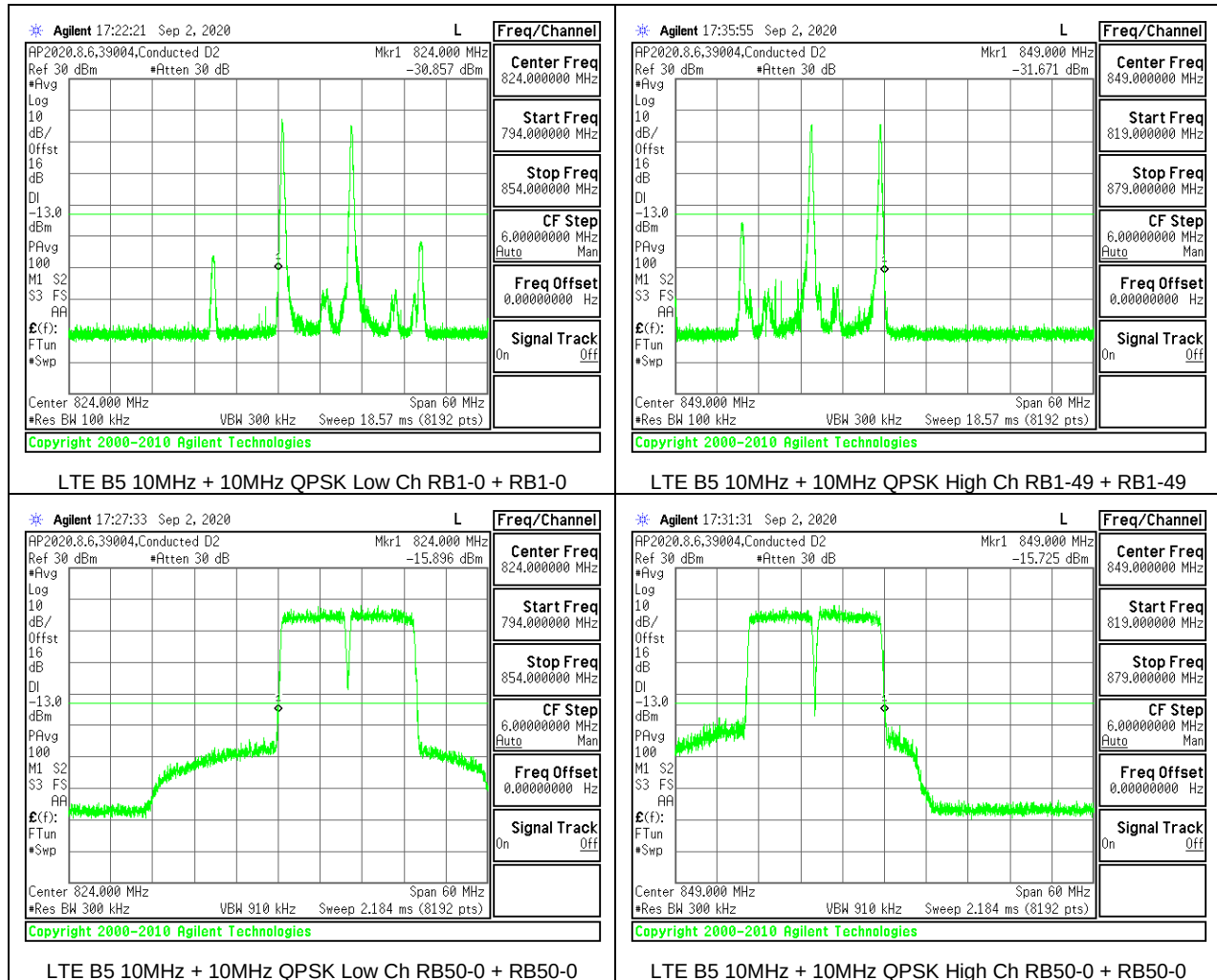
RESULTS

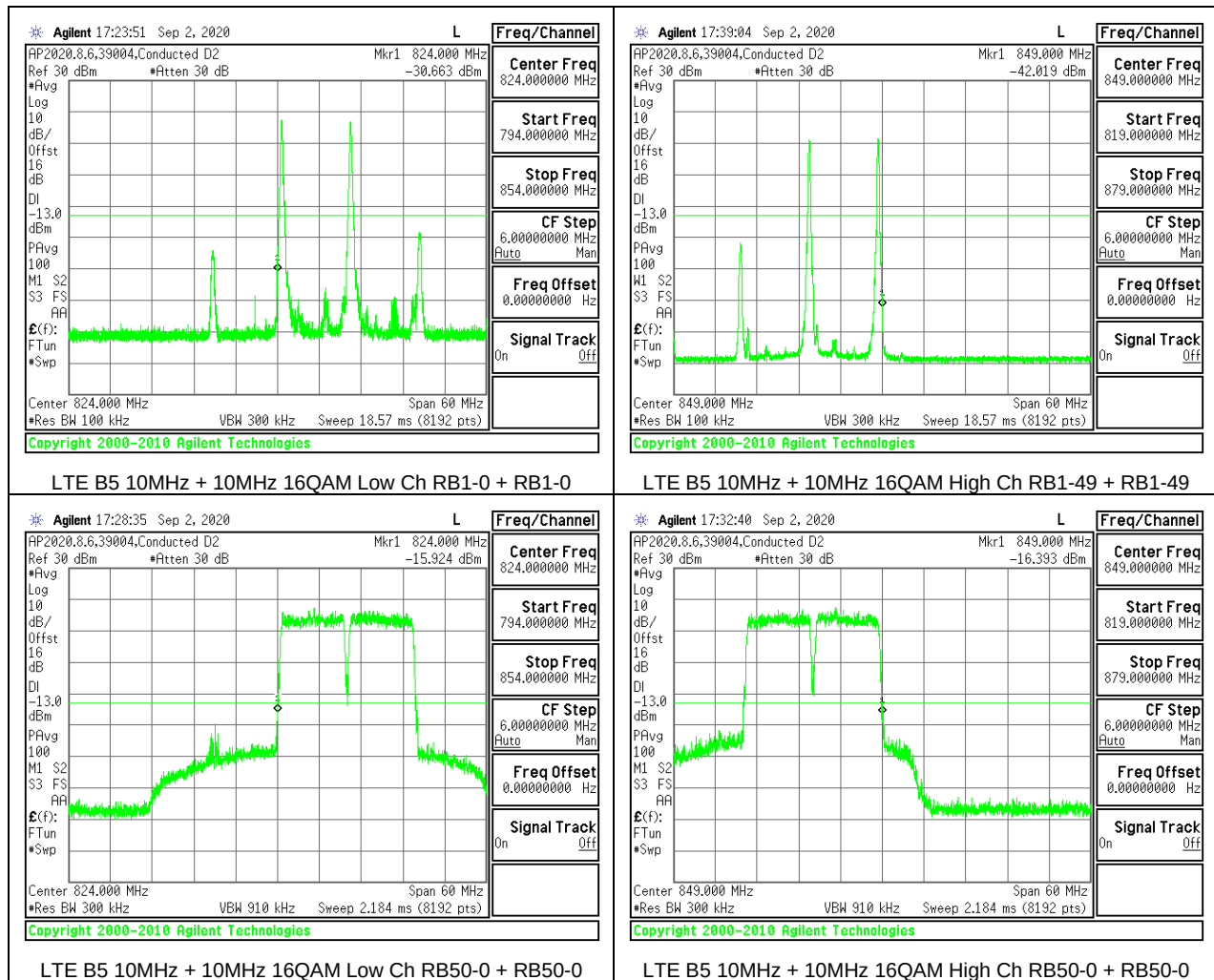
8.2.1.LTE BAND 5

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.

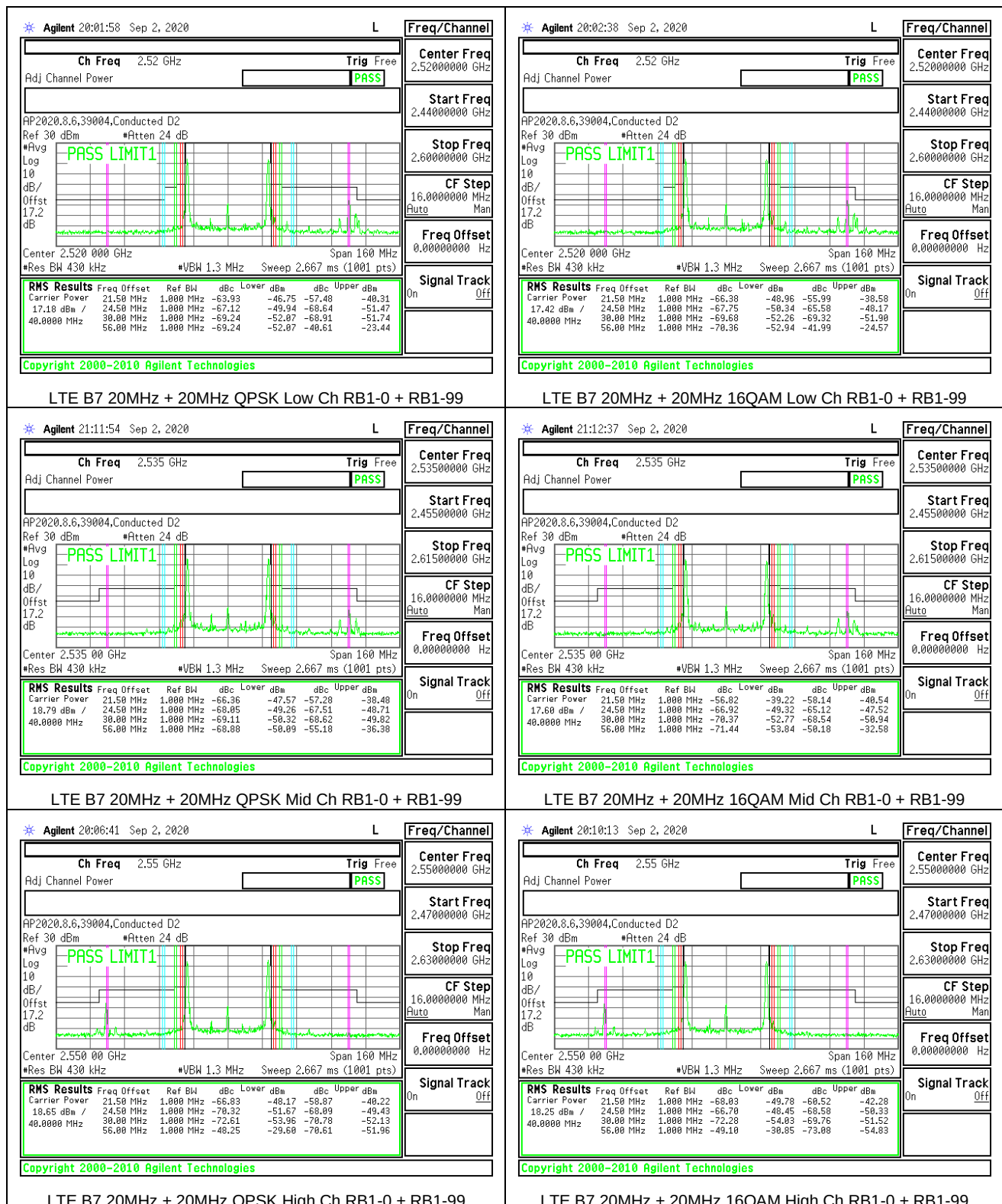


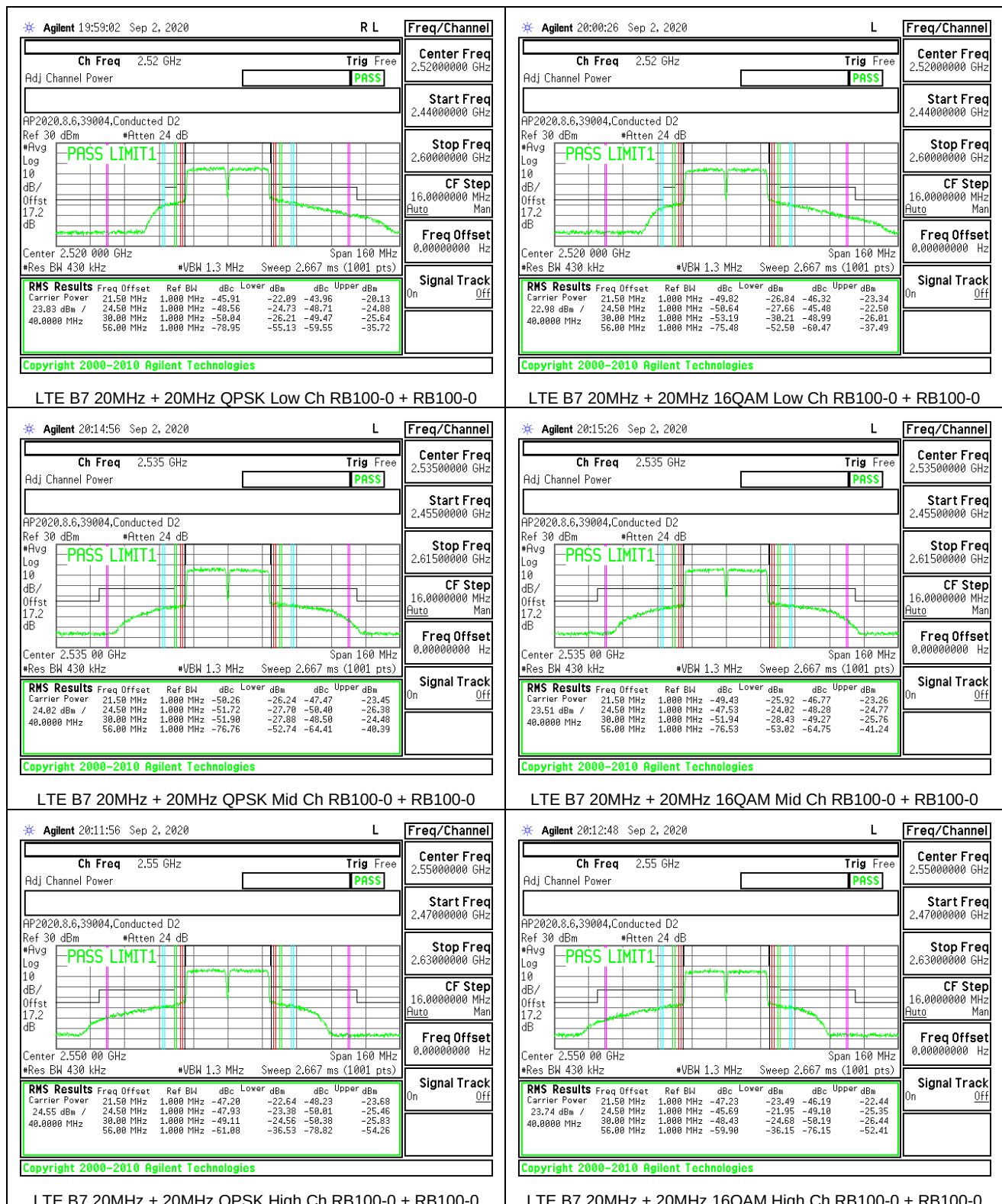


8.2.2. LTE BAND 7

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 than $43 + 10 \log (P)$ 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.

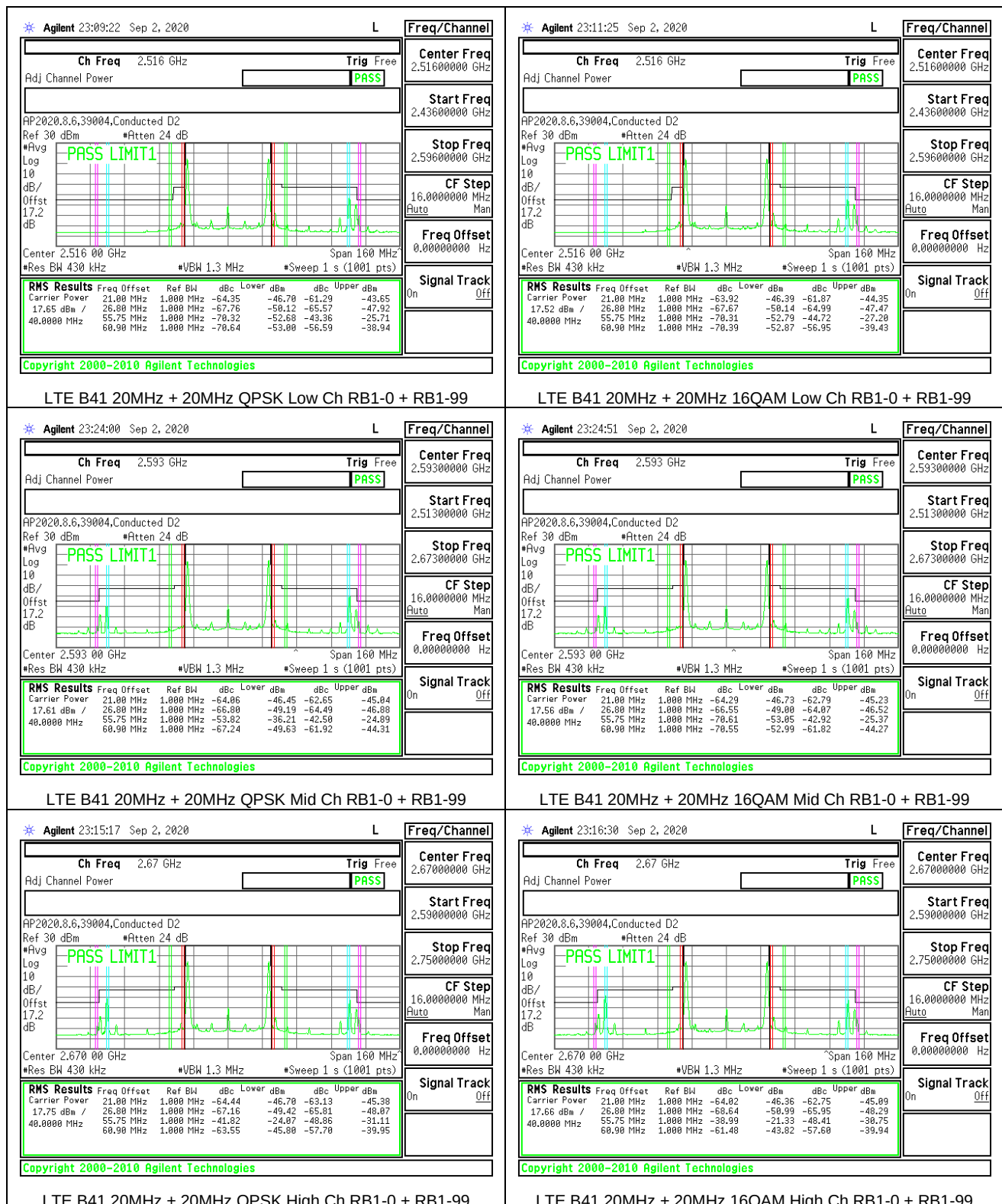


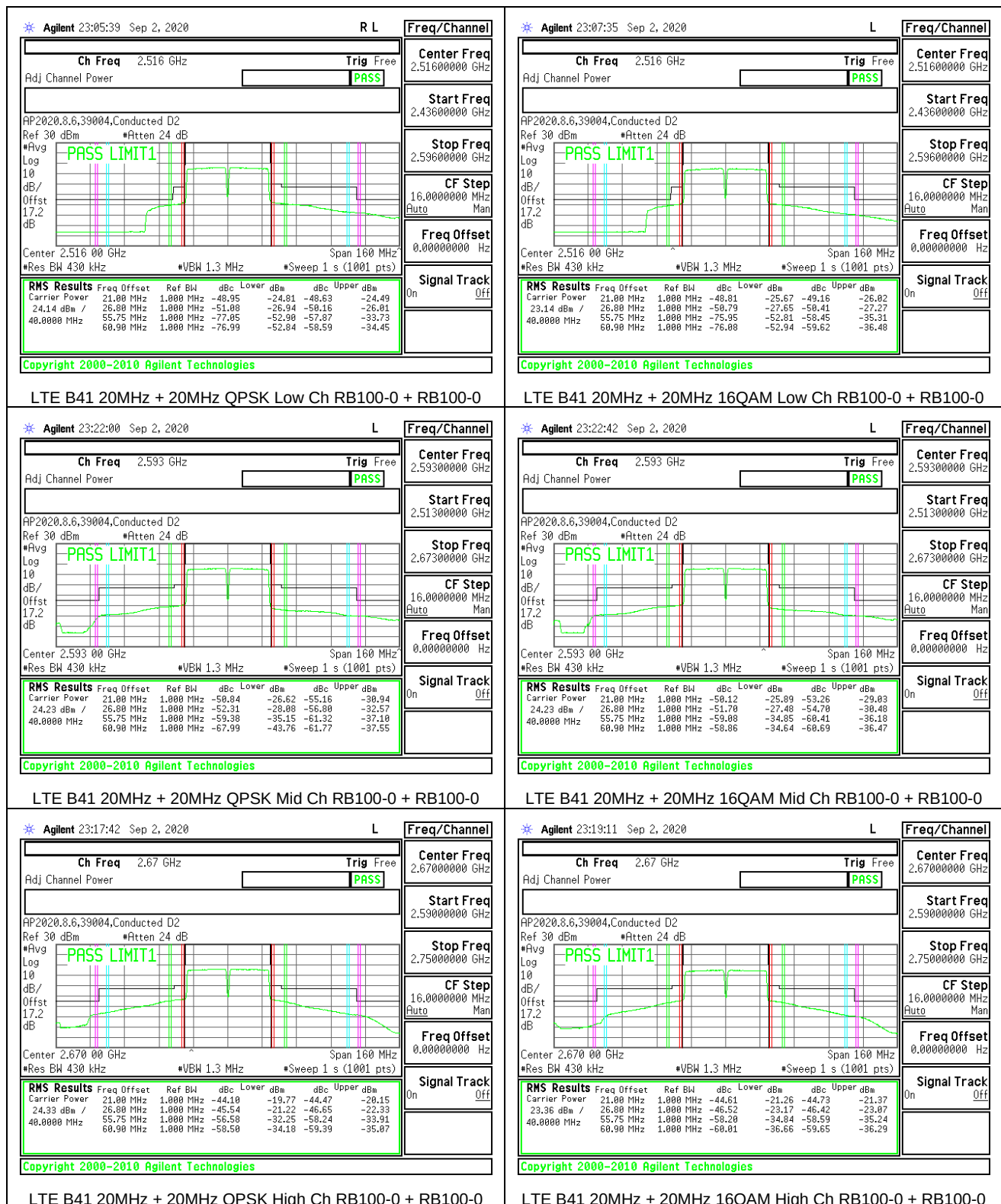


8.2.3. LTE BAND 41

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 than $43 + 10 \log (P)$ 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.





8.2.4. LTE BAND 48

LIMITS

FCC: §96.41

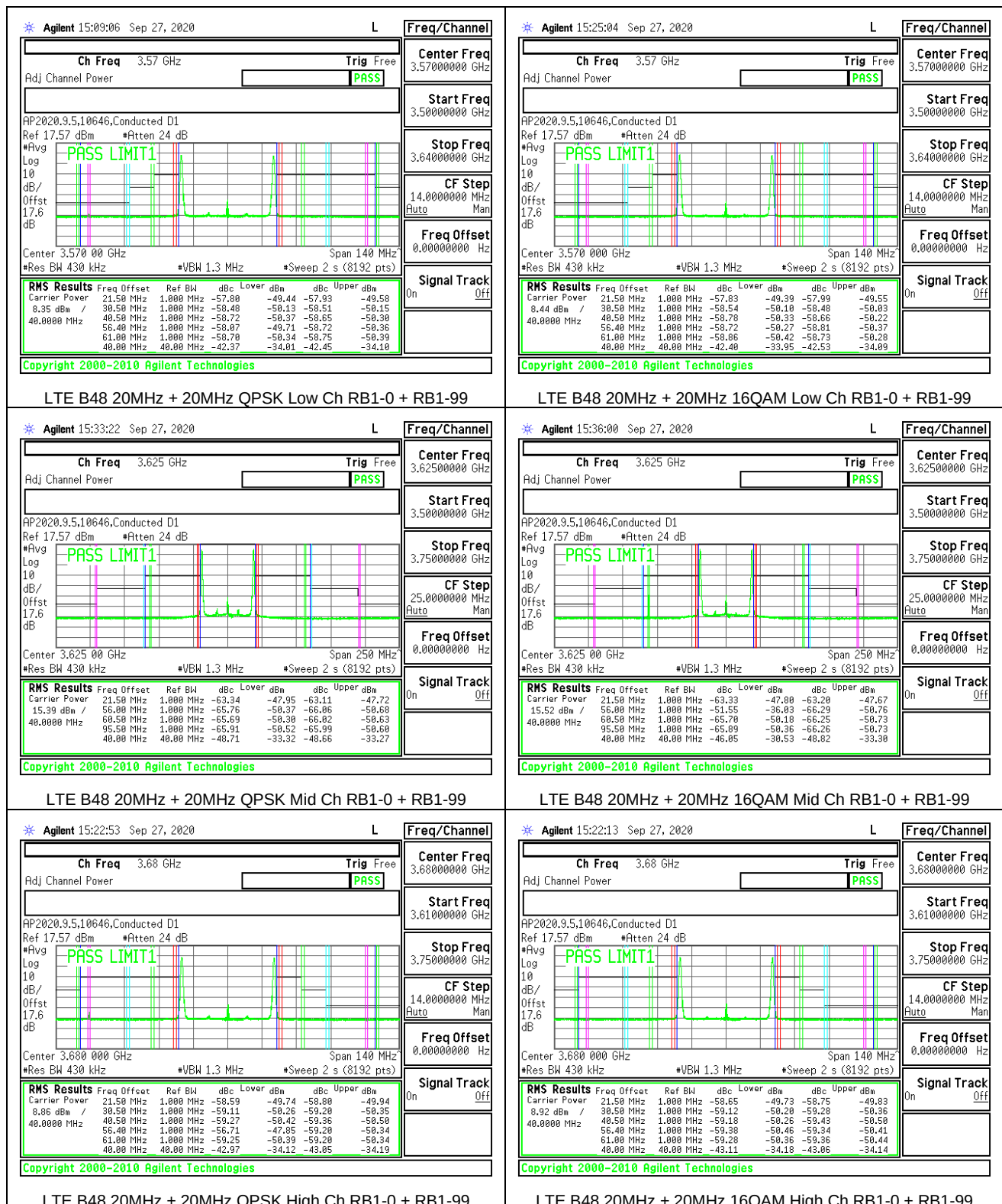
(e) 3.5 GHz Emissions and Interference Limits—

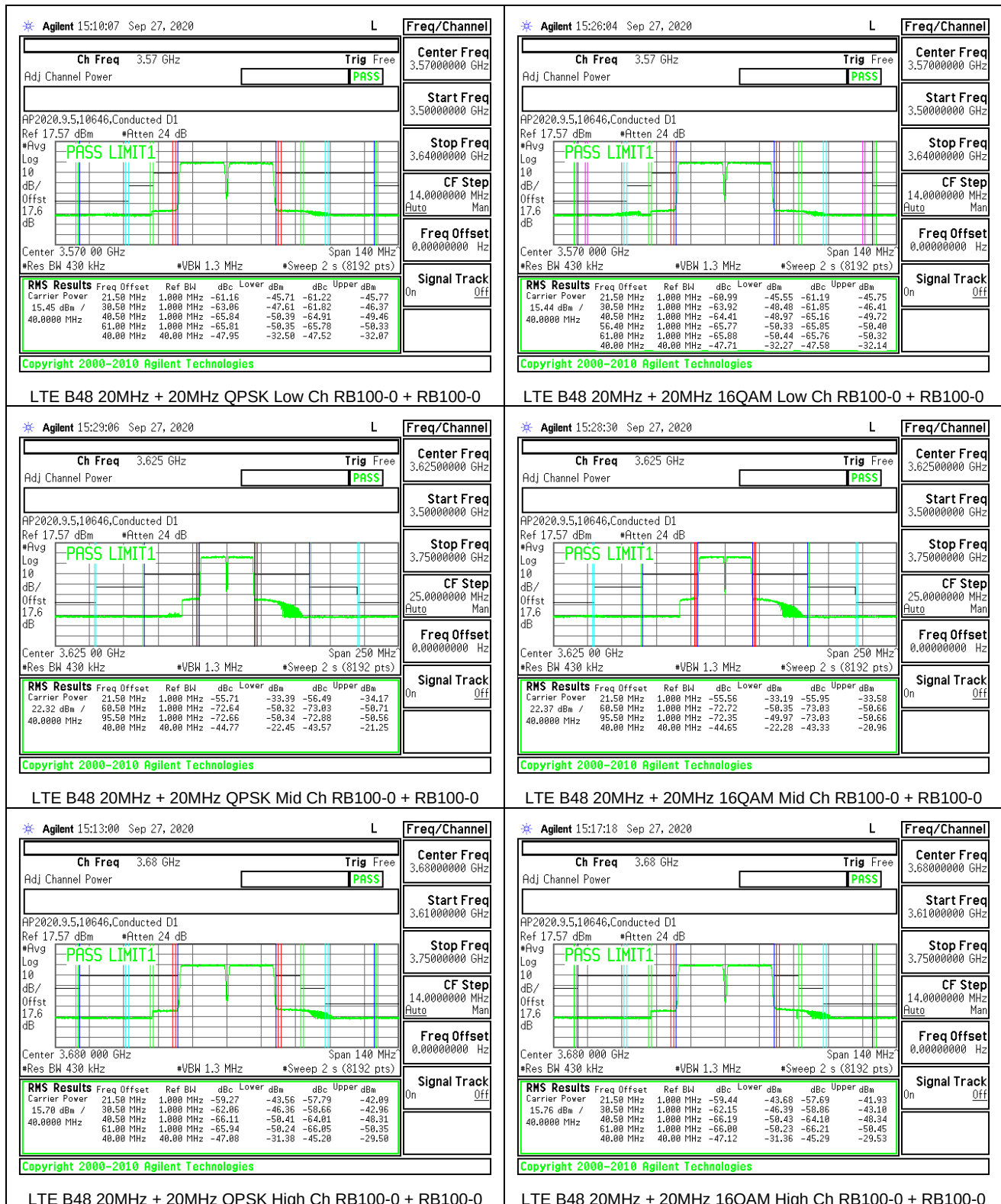
(1) General protection levels

(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 -40 dBm/MHz.

licensees.





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)

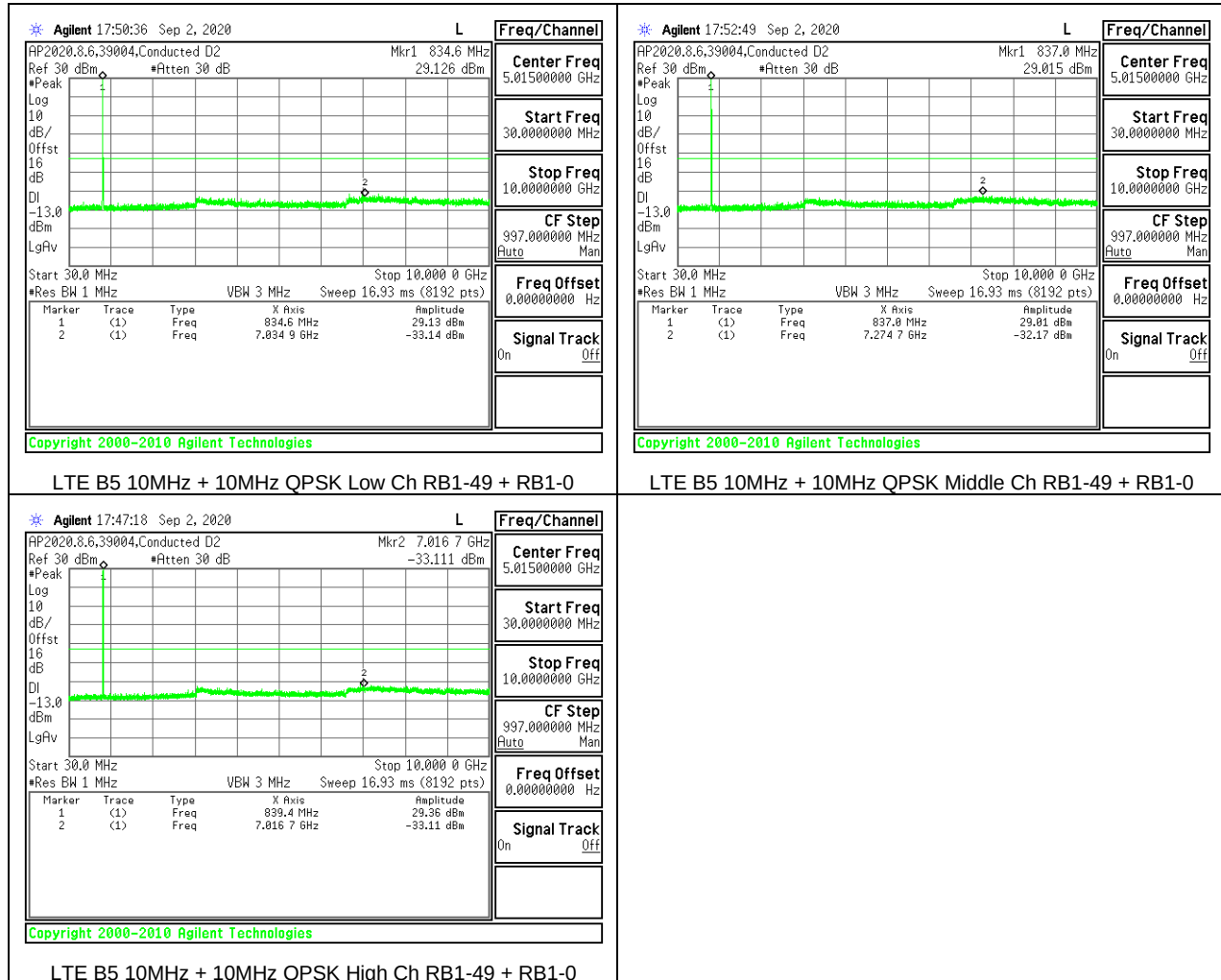
RESULTS

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.

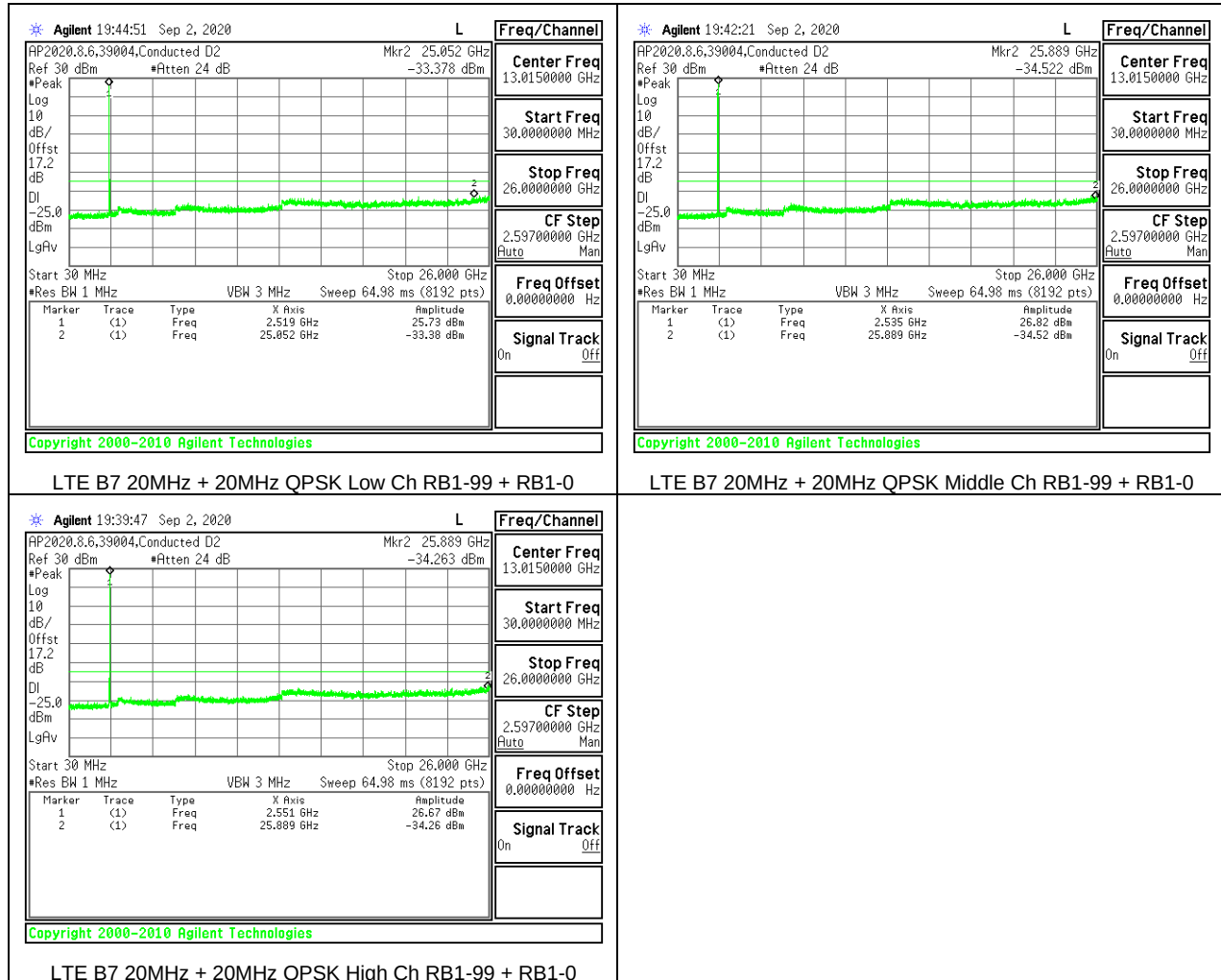


8.3.2. LTE BAND 7

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.

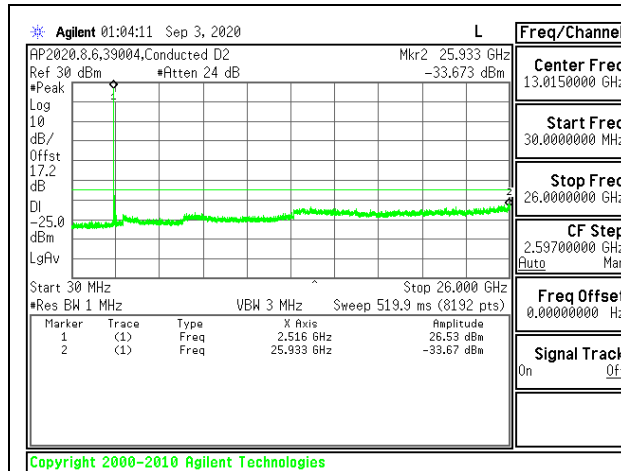


8.3.3.LTE BAND 41

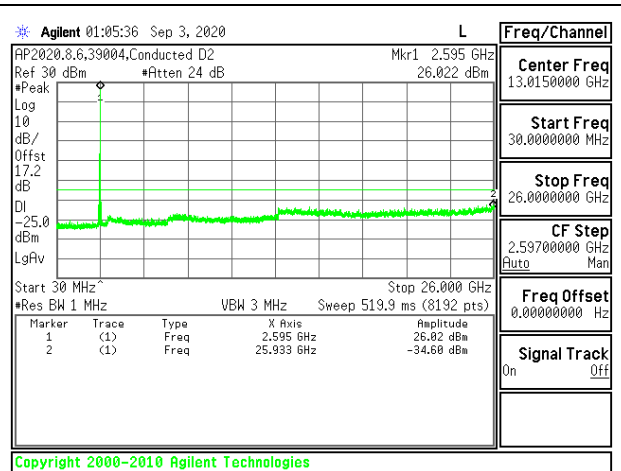
LIMITS

FCC: §27.53 (m)

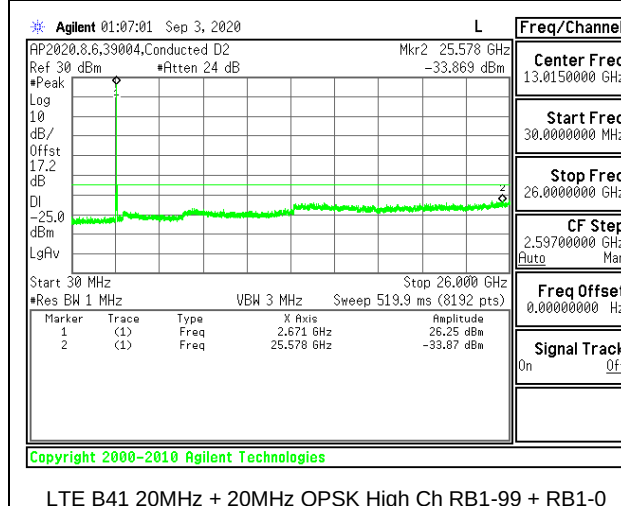
The minimum permissible attenuation level of any spurious emissions is $55 + 10 \log (P)$ dB where transmitting power (P) in Watts.



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

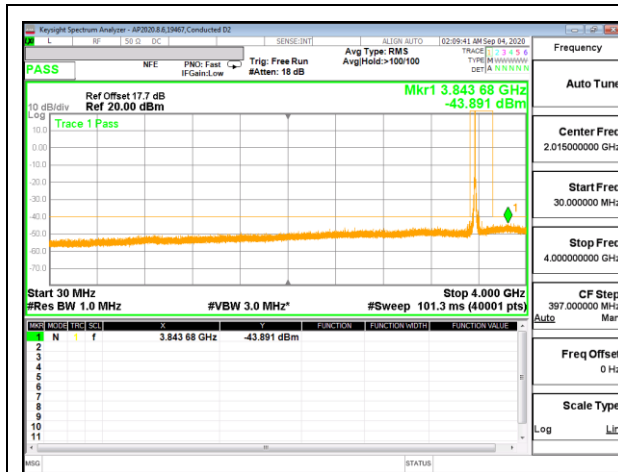
8.3.4. LTE BAND 48

LIMITS

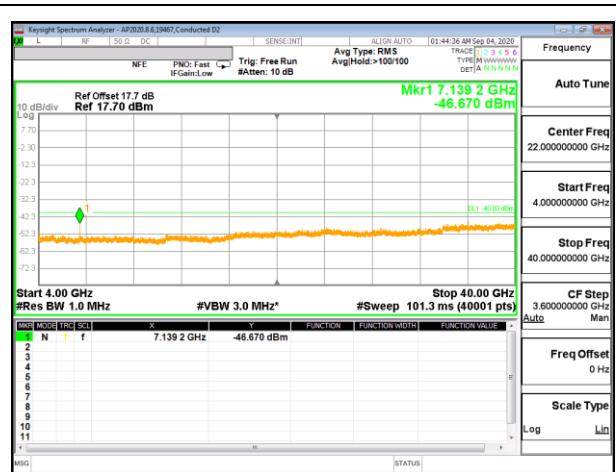
FCC: §96.41

(e) 3.5 GHz Emissions and Interference Limits—

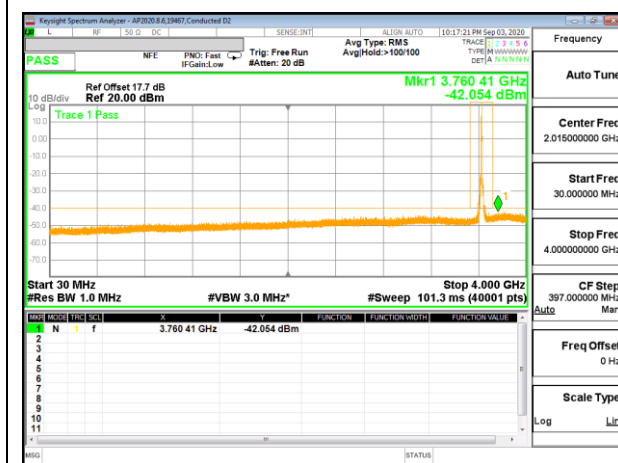
(2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed -25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz.



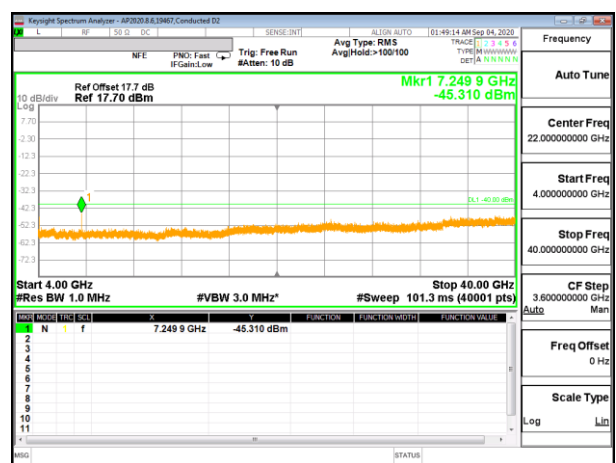
LTE B48 20MHz + 20MHz QPSK Low Ch RB1-99 + RB1-0
30MHz-4GHz



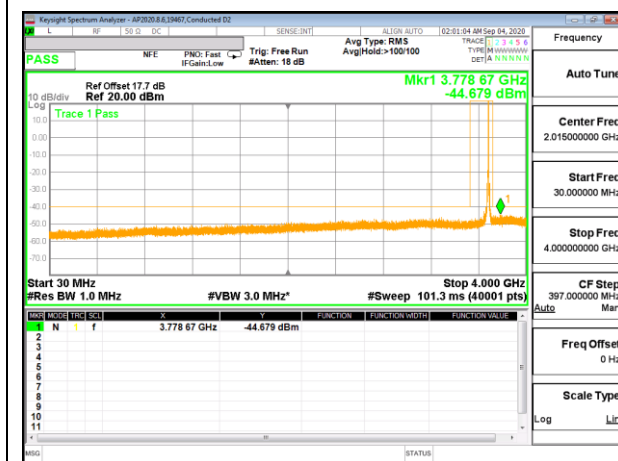
LTE B48 20MHz + 20MHz QPSK Low Ch RB1-99 + RB1-0
4GHz-40GHz



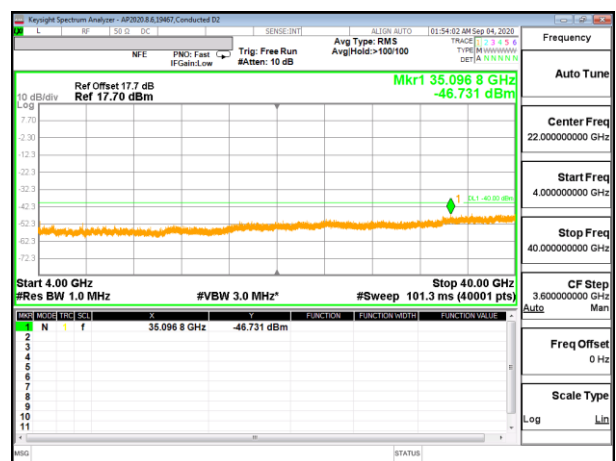
LTE B48 20MHz + 20MHz QPSK Mid Ch RB1-99 + RB1-0
30MHz-4GHz



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 placed inside a temperature chamber. The temperature is set to 20°C 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 +50°C 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:	38602	Test Date:	7/30/2020
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QPSK, (10MHz + 10MHz BANDWIDTH)

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	824.5446	848.4691		
Extreme (50C)		824.5446	848.4691	28.8	0.034
Extreme (40C)		824.5446	848.4691	24.7	0.030
Extreme (30C)		824.5446	848.4691	21.8	0.026
Extreme (10C)		824.5446	848.4691	19.3	0.023
Extreme (0C)		824.5446	848.4691	12.7	0.015
Extreme (-10C)		824.5446	848.4691	2.5	0.003
Extreme (-20C)		824.5446	848.4691	-11.2	-0.013
Extreme (-30C)		824.5446	848.4691	-18.4	-0.022
20C	15%	824.5446	848.4691	20.5	0.025
	-15%	824.5446	848.4691	14.6	0.017
	End Point	824.5446	848.4691	15.5	0.019

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:	38602	Test Date:	7/30/2020
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QPSK, (20MHz + 20MHz BANDWIDTH)

Limit		2500	2570	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2501.0572	2568.9620		
Extreme (50C)		2501.0572	2568.9620	47.3	0.019
Extreme (40C)		2501.0572	2568.9620	38.2	0.015
Extreme (30C)		2501.0572	2568.9620	27.4	0.011
Extreme (10C)		2501.0572	2568.9620	23.5	0.009
Extreme (0C)		2501.0572	2568.9620	21.2	0.008
Extreme (-10C)		2501.0572	2568.9620	3.9	0.002
Extreme (-20C)		2501.0572	2568.9620	-11.3	-0.004
Extreme (-30C)		2501.0572	2568.9620	-24.8	-0.010
20C	15%	2501.0572	2568.9620	25.3	0.010
	-15%	2501.0572	2568.9620	17.4	0.007
	End Point	2501.0572	2568.9620	20.6	0.008

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:	38602	Test Date:	7/30/2020
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QPSK, (20MHz + 20MHz BANDWIDTH)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2496.8283	2689.0811		
Extreme (50C)		2496.8283	2689.0811	31.3	0.012
Extreme (40C)		2496.8283	2689.0811	17.4	0.007
Extreme (30C)		2496.8283	2689.0811	1.8	0.001
Extreme (10C)		2496.8283	2689.0811	-35.7	-0.014
Extreme (0C)		2496.8283	2689.0811	-44.1	-0.017
Extreme (-10C)		2496.8283	2689.0811	11.2	0.004
Extreme (-20C)		2496.8283	2689.0811	-20.1	-0.008
Extreme (-30C)		2496.8283	2689.0811	-33.4	-0.013
20C	15%	2496.8283	2689.0811	-19.4	-0.007
	-15%	2496.8283	2689.0811	-38.5	-0.015
	End Point	2496.8283	2689.0811	-41.7	-0.016

8.4.4. LTE BAND 48

Test Engineer ID:	38602	Test Date:	7/31/2020
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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	3550.3252	3699.1514		
Extreme (50C)		3550.3253	3699.1515	50.4	0.014
Extreme (40C)		3550.3252	3699.1514	46.5	0.013
Extreme (30C)		3550.3252	3699.1514	42.2	0.012
Extreme (10C)		3550.3253	3699.1515	55.2	0.015
Extreme (0C)		3550.3252	3699.1514	46.4	0.013
Extreme (-10C)		3550.3252	3699.1514	-35.1	-0.010
Extreme (-20C)		3550.3252	3699.1514	-37.3	-0.010
Extreme (-30C)		3550.3252	3699.1514	-42.5	-0.012
20C	15%	3550.3252	3699.1514	36.7	0.010
	-15%	3550.3252	3699.1514	32.5	0.009
	End Point	3550.3252	3699.1514	29.7	0.008

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:	10646	Test Date:	9/5/2020
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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	32.18	24.7	7.48
				16QAM	32.23	23.7	8.53
	10MHz / 5MHz	834.3	841.5	QPSK	32.03	24.76	7.27
				16QAM	32.13	23.78	8.35
	10MHz / 10MHz	831.6	831.5	QPSK	32.11	24.71	7.40
				16QAM	32.02	23.71	8.31
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:	10646	Test Date:	9/2/2020
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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	32.04	24.05	7.99
				16QAM	31.96	23.08	8.88
	20MHz / 10MHz	2530.1	2544.5	QPSK	32.37	24.09	8.28
				16QAM	32.24	23.11	9.13
	15 MHz / 15MHz	2527.5	2542.5	QPSK	32.37	24.09	8.28
				16QAM	32.26	23.09	9.17
	15MHz / 20MHz	2525.3	2542.4	QPSK	32.18	24.05	8.13
				16QAM	32.17	23.09	9.08
	20MHz / 15MHz	2527.6	2544.7	QPSK	32.26	24.05	8.21
				16QAM	32.10	23.09	9.01
	20MHz / 20MHz	2525.1	2544.9	QPSK	32.51	24.04	8.47
				16QAM	32.26	23.14	9.12
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:	10646	Test Date:	9/2/2020
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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	31.66	18.33	6.33
				16QAM	31.71	17.38	7.33
	20MHz / 5MHz	2590.5	2602.2	QPSK	31.35	18.36	5.99
				16QAM	31.40	17.37	7.03
	10MHz / 20MHz	2583.6	2598.0	QPSK	31.63	18.38	6.25
				16QAM	31.66	17.39	7.27
	20MHz / 10MHz	2588.1	2602.5	QPSK	31.40	18.38	6.02
				16QAM	31.43	17.4	7.03
	15MHz / 15MHz	2585.5	2600.5	QPSK	31.55	18.3	6.25
				16QAM	31.55	17.34	7.21
	15MHz / 20MHz	2583.3	2600.4	QPSK	31.60	18.37	6.23
				16QAM	31.65	17.41	7.24
	20MHz / 15MHz	2585.6	2602.7	QPSK	33.73	18.44	8.29
				16QAM	33.17	17.42	8.75
	20MHz / 20MHz	2583.1	2602.9	QPSK	33.71	19.02	7.69
				16QAM	33.00	18.06	7.94
Duty Cycle Correction Factor (dB) =			7.00				
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor							

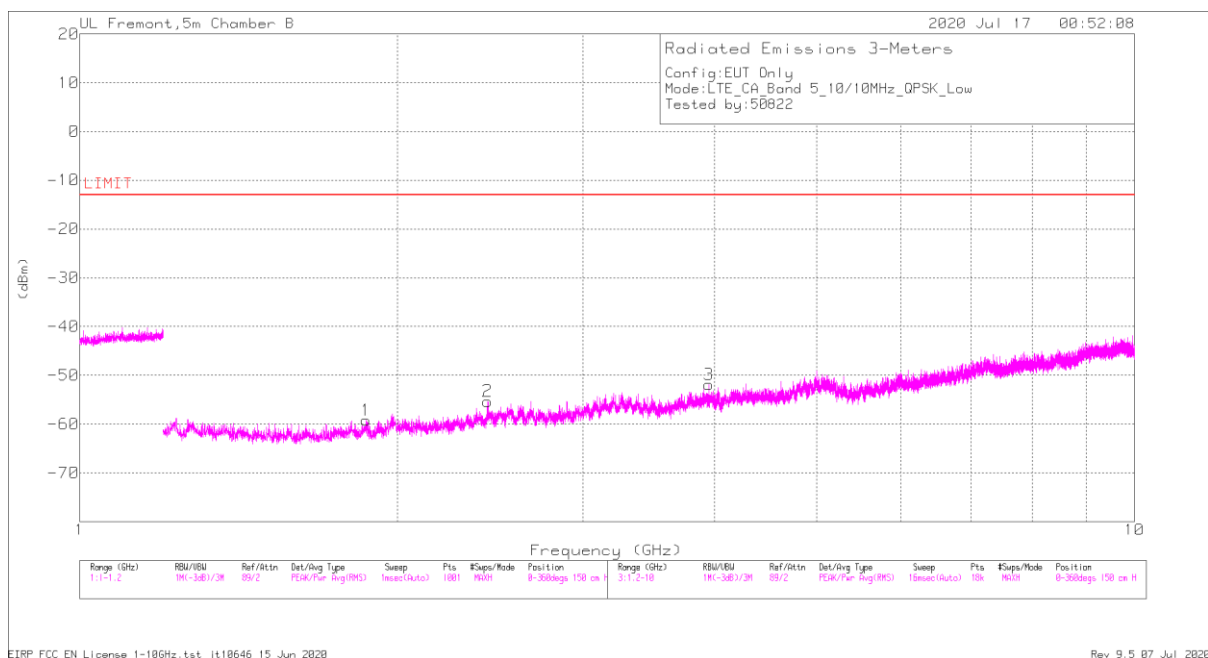
8.5.4.LTE BAND 48

Test Engineer ID:	10641	Test Date:	9/4/2020
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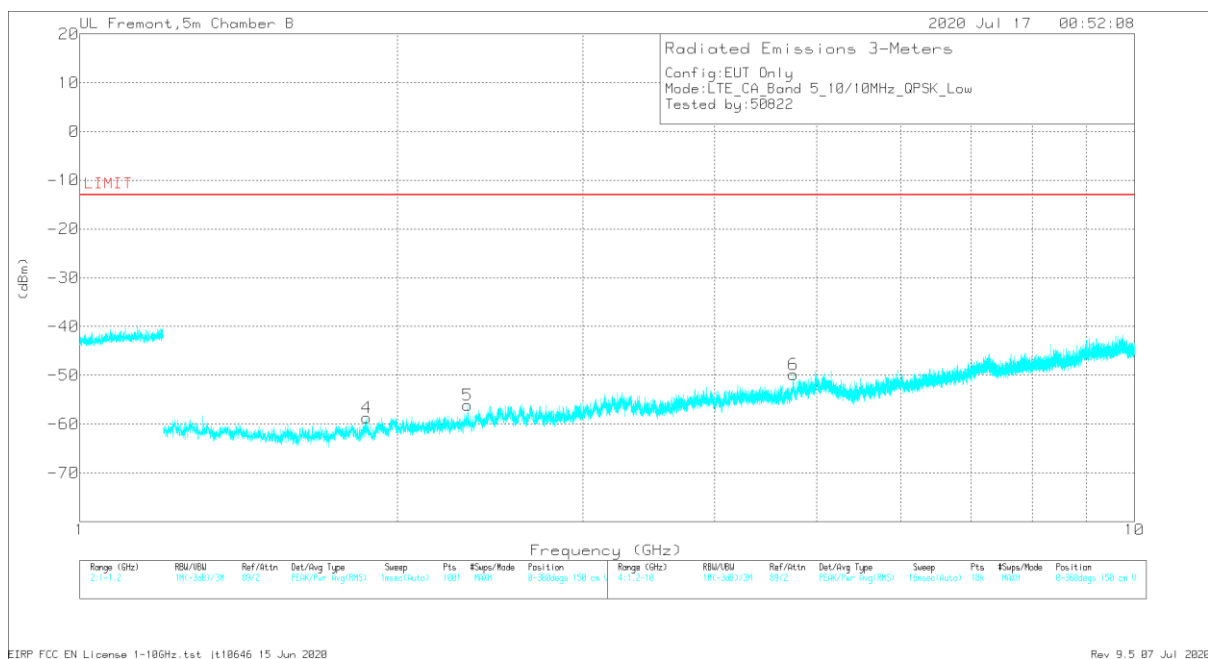
Band	Bandwidth (MHz)	PCC f (MHz)	SCC1 f (MHz)	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
					Peak	Average	
Band 41 (FCC)	5MHz / 20MHz	3615.8	3627.5	QPSK	27.39	13.22	7.17
				16QAM	27.80	13.40	7.40
	20MHz / 5MHz	3622.5	3634.2	QPSK	27.41	13.41	7.00
				16QAM	27.97	13.46	7.51
	10MHz / 20MHz	3615.6	3630.0	QPSK	29.19	15.38	6.81
				16QAM	30.24	15.38	7.86
	20MHz / 10MHz	3620.1	3634.5	QPSK	29.39	15.38	7.01
				16QAM	30.09	15.41	7.68
	15MHz / 20MHz	3615.3	3632.4	QPSK	29.32	15.33	6.99
				16QAM	29.74	15.35	7.39
	20MHz / 15MHz	3617.6	3634.7	QPSK	29.17	15.36	6.81
				16QAM	29.64	15.34	7.30
	20MHz / 20MHz	3615.1	3634.9	QPSK	29.02	15.29	6.73
				16QAM	29.48	15.35	7.13
Duty Cycle Correction Factor (dB) =			7.00				
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)	HPF 1.2GHz T1737 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
1	1.86733	39.38	Pk	26.1	-30.1	.6	-95.2	-59.22	-13	-46.22	H
2	2.43787	40.01	Pk	28.8	-29.4	.5	-95.2	-55.29	-13	-42.29	H
3	3.94707	38.68	Pk	31.6	-27.6	.6	-95.2	-51.92	-13	-38.92	H
4	1.87076	39.82	Pk	26.1	-30	.6	-95.2	-58.68	-13	-45.68	V
5	2.33324	40.04	Pk	27.9	-29.5	.6	-95.2	-56.16	-13	-43.16	V
6	4.75276	38.92	Pk	32.7	-26.8	.5	-95.2	-49.88	-13	-36.88	V

Pk - Peak detector

Radiated Emissions

Marker	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
1	1.86913	40.5	Pk	26.1	-30.1	.6	-95.2	-58.1	-13	-45.1	H
2	2.43623	39.75	Pk	28.8	-29.4	.5	-95.2	-55.55	-13	-42.55	H
3	3.94986	37.82	Pk	31.6	-27.6	.6	-95.2	-52.78	-13	-39.78	H
4	1.87197	40.32	Pk	26.1	-30	.6	-95.2	-58.18	-13	-45.18	V
5	2.33396	40.57	Pk	27.9	-29.5	.6	-95.2	-55.63	-13	-42.63	V
6	4.7531	38.18	Pk	32.7	-26.8	.5	-95.2	-50.62	-13	-37.62	V

Pk - Peak detector

EIRP FCC_EN License 1-10GHz.tst jt10646 15 Jun 2020
Rev 9.5 07 Jul 2020

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

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

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 #:	13335182
Date:	7/17/2020
Test Engineer:	50822
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										
1.86913	40.5	Pk	26.1	-30.1	.6	-95.2	-58.1	-13	-45.1	H
1.87197	40.32	Pk	26.1	-30	.6	-95.2	-58.18	-13	-45.18	V
2.33396	40.57	Pk	27.9	-29.5	.6	-95.2	-55.63	-13	-42.63	V
2.43623	39.75	Pk	28.8	-29.4	.5	-95.2	-55.55	-13	-42.55	H
3.94986	37.82	Pk	31.6	-27.6	.6	-95.2	-52.78	-13	-39.78	H
4.7531	38.18	Pk	32.7	-26.8	.5	-95.2	-50.62	-13	-37.62	V
Mid Channel, 831.6MHz + 841.5MHz										
1.68265	40.39	Pk	25	-30.4	.7	-95.2	-59.51	-13	-46.51	H
1.70145	41.41	Pk	25.1	-30.4	.6	-95.2	-58.49	-13	-45.49	V
2.193	39.87	Pk	27.2	-29.7	.6	-95.2	-57.23	-13	-44.23	H
2.39137	40.08	Pk	28.4	-29.5	.6	-95.2	-55.62	-13	-42.62	V
3.27038	39.1	Pk	31.3	-28.2	.7	-95.2	-52.3	-13	-39.3	H
3.50537	38.35	Pk	30.2	-27.7	.8	-95.2	-53.55	-13	-40.55	V
High Channel, 834.1MHz + 844MHz										
1.75104	41.76	Pk	25.6	-30.2	.7	-95.2	-57.34	-13	-44.34	H
1.81658	41.22	Pk	25.9	-30.1	.6	-95.2	-57.58	-13	-44.58	V
2.38706	40.02	Pk	28.4	-29.5	.6	-95.2	-55.68	-13	-42.68	V
2.67471	39.82	Pk	29.2	-28.9	.6	-95.2	-54.48	-13	-41.48	H
3.20535	39.08	Pk	31.3	-28.4	.6	-95.2	-52.62	-13	-39.62	H
3.8266	38.83	Pk	31	-27.7	.4	-95.2	-52.67	-13	-39.67	V

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 #:	13335182
Date:	7/17/2020
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)	HPF 1.2GHz T1737 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
5.0314	38.43	Pk	33.7	-26	.7	-95.2	-48.37	-25	-23.37	V
5.06904	37.44	Pk	33.8	-26.1	.7	-95.2	-49.36	-25	-24.36	H
6.58726	36.01	Pk	35.5	-24.5	.5	-95.2	-47.69	-25	-22.69	H
6.95612	36.33	Pk	36.4	-24.4	.5	-95.2	-46.37	-25	-21.37	V
9.48872	34.26	Pk	38.9	-20.8	.5	-95.2	-42.34	-25	-17.34	H
10.82779	34.16	Pk	39.3	-19.4	.5	-95.2	-40.64	-25	-15.64	V
Mid Channel, 2525.1MHz + 2544.9MHz										
4.33018	37.66	Pk	31.9	-26.9	.3	-95.2	-52.24	-25	-27.24	V
4.57971	37.8	Pk	32	-27.1	.5	-95.2	-52	-25	-27	H
6.89327	36.5	Pk	36.3	-24.5	.4	-95.2	-46.5	-25	-21.5	V
7.27223	35.78	Pk	37.2	-23.4	.4	-95.2	-45.22	-25	-20.22	H
9.05278	35.03	Pk	38.7	-21.3	.3	-95.2	-42.47	-25	-17.47	V
10.59651	34.34	Pk	39.5	-19.8	.9	-95.2	-40.26	-25	-15.26	H
High Channel, 2540.2MHz + 2560MHz										
4.89896	38.71	Pk	33.3	-26.5	1	-95.2	-48.69	-25	-23.69	H
5.11175	37.44	Pk	33.9	-26.5	.8	-95.2	-49.56	-25	-24.56	V
7.27925	35.66	Pk	37.1	-23.2	.4	-95.2	-45.24	-25	-20.24	H
7.86358	35.07	Pk	37.3	-22.8	.3	-95.2	-45.33	-25	-20.33	V
10.40603	33.59	Pk	39.3	-19.7	.8	-95.2	-41.21	-25	-16.21	V
10.81448	34.11	Pk	39.3	-19.5	.6	-95.2	-40.69	-25	-15.69	H

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 #:	13335182
Date:	7/17/2020
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										
5.02126	37.86	Pk	33.7	-25.9	.7	-95.2	-48.84	-25	-23.84	V
5.02802	38.8	Pk	33.7	-26.1	.7	-95.2	-48.1	-25	-23.1	H
7.07212	35.49	Pk	36.6	-23.8	.6	-95.2	-46.31	-25	-21.31	H
7.13804	36.41	Pk	36.8	-24	.4	-95.2	-45.59	-25	-20.59	V
10.46407	33.57	Pk	39.5	-19.6	.7	-95.2	-41.03	-25	-16.03	H
11.79566	34.66	Pk	39.4	-20.1	.8	-95.2	-40.44	-25	-15.44	V
Mid Channel, 2583.1MHz + 2602.9MHz										
4.25578	38.43	Pk	31.7	-27	.4	-95.2	-51.67	-25	-26.67	V
5.16891	37.65	Pk	33.7	-26.5	.7	-95.2	-49.65	-25	-24.65	H
6.23063	37.6	Pk	34.5	-25.7	.8	-95.2	-48	-25	-23	H
7.07766	36.39	Pk	36.6	-23.8	.5	-95.2	-45.51	-25	-20.51	V
9.3375	35.54	Pk	38.7	-20.8	.5	-95.2	-41.26	-25	-16.26	H
10.76766	33.71	Pk	39.3	-19.4	.9	-95.2	-40.69	-25	-15.69	V
High Channel, 2660.2MHz + 2680MHz										
4.93371	37.56	Pk	33.4	-26.1	1	-95.2	-49.34	-25	-24.34	H
5.0227	38.43	Pk	33.7	-25.9	.7	-95.2	-48.27	-25	-23.27	H
7.00726	37.83	Pk	36.6	-24.3	.2	-95.2	-44.87	-25	-19.87	H
7.14989	35.88	Pk	36.8	-24	.4	-95.2	-46.12	-25	-21.12	V
9.91993	34.83	Pk	38.3	-19.8	.8	-95.2	-41.07	-25	-16.07	V
10.22403	34.78	Pk	38.7	-19.8	.9	-95.2	-40.62	-25	-15.62	H

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

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

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 #:	13335182
Date:	7/18/2020
Test Engineer:	50822
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										
1.85809	40.19	Pk	26	-30.1	.6	-95.2	-58.51	-13	-45.51	V
1.93662	39.79	Pk	26.5	-30	.5	-95.2	-58.41	-13	-45.41	H
2.54555	39.53	Pk	29.2	-29.2	.7	-95.2	-54.97	-13	-41.97	H
2.72117	39.01	Pk	29	-28.9	.5	-95.2	-55.59	-13	-42.59	V
3.25975	39.52	Pk	31.3	-28.3	.5	-95.2	-52.18	-13	-39.18	H
3.4411	38.88	Pk	30.4	-27.9	.5	-95.2	-53.32	-13	-40.32	V
Mid Channel, 831.6MHz + 841.5MHz										
1.31051	41.16	Pk	25.4	-30.9	1.2	-95.2	-58.34	-13	-45.34	H
1.6889	41.4	Pk	25	-30.4	.7	-95.2	-58.5	-13	-45.5	V
2.53717	40.58	Pk	29.3	-29.3	.8	-95.2	-53.82	-13	-40.82	V
2.5534	39.65	Pk	29.3	-29.2	.6	-95.2	-54.85	-13	-41.85	H
3.37734	38.79	Pk	30.8	-28.1	.6	-95.2	-53.11	-13	-40.11	H
3.69314	38.38	Pk	30.3	-27.6	.8	-95.2	-53.32	-13	-40.32	V
High Channel, 834.1MHz + 844MHz										
1.77611	39.84	Pk	25.9	-30.2	.6	-95.2	-59.06	-13	-46.06	H
1.85923	40.3	Pk	26	-30.1	.6	-95.2	-58.4	-13	-45.4	V
2.31725	39.96	Pk	27.7	-29.5	.6	-95.2	-56.44	-13	-43.44	H
2.39485	40.14	Pk	28.4	-29.5	.5	-95.2	-55.66	-13	-42.66	V
3.26904	39.57	Pk	31.3	-28.2	.6	-95.2	-51.93	-13	-38.93	H
4.15469	38.72	Pk	31.8	-27.2	.7	-95.2	-51.18	-13	-38.18	V

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 #:	13335182
Date:	7/18/2020
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)	HPF 1.2GHz T1737 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
4.97781	37.07	Pk	33.6	-26	.6	-95.2	-49.93	-25	-24.93	H
4.97826	37.47	Pk	33.6	-26	.6	-95.2	-49.53	-25	-24.53	V
7.06513	35.66	Pk	36.7	-23.9	.7	-95.2	-46.04	-25	-21.04	H
7.21986	35.49	Pk	37.1	-23.6	.3	-95.2	-45.91	-25	-20.91	V
8.97423	35.27	Pk	38.4	-21.4	.4	-95.2	-42.53	-25	-17.53	V
9.29797	35.76	Pk	38.7	-21	.5	-95.2	-41.24	-25	-16.24	H
Mid Channel, 2525.1MHz + 2544.9MHz										
4.84694	38.31	Pk	33.2	-27.1	.6	-95.2	-50.19	-25	-25.19	H
5.08862	37.68	Pk	33.8	-26.2	.8	-95.2	-49.12	-25	-24.12	V
7.28007	35.87	Pk	37.1	-23.2	.4	-95.2	-45.03	-25	-20.03	V
7.66577	36.08	Pk	37	-23.4	.3	-95.2	-45.22	-25	-20.22	H
10.43848	33.94	Pk	39.4	-19.3	.8	-95.2	-40.36	-25	-15.36	H
10.89259	34.19	Pk	39.4	-19.3	.6	-95.2	-40.31	-25	-15.31	V
High Channel, 2540.2MHz + 2560MHz										
3.60194	39.09	Pk	30.1	-27.9	.5	-95.2	-53.41	-25	-28.41	V
3.93178	38.15	Pk	31.6	-27.6	.4	-95.2	-52.65	-25	-27.65	H
5.5173	37.81	Pk	33.2	-26	.9	-95.2	-49.29	-25	-24.29	V
5.78549	36.6	Pk	33.2	-25.3	.7	-95.2	-50	-25	-25	H
5.82963	36.98	Pk	33.5	-25.6	.7	-95.2	-49.62	-25	-24.62	V
7.07759	36.03	Pk	36.6	-23.8	.5	-95.2	-45.87	-25	-20.87	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 #:	13335182
Date:	7/18/2020
Test Engineer:	19480
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										
5.02737	38.35	Pk	33.7	-26.1	.7	-95.2	-48.55	-25	-23.55	V
5.0292	38.27	Pk	33.7	-26	.7	-95.2	-48.53	-25	-23.53	H
7.54644	35.98	Pk	36.9	-23.9	.3	-95.2	-45.92	-25	-20.92	H
7.55305	35.83	Pk	36.9	-24	.3	-95.2	-46.17	-25	-21.17	V
10.06533	34.54	Pk	38.4	-19.9	.7	-95.2	-41.46	-25	-16.46	H
10.06565	34.46	Pk	38.4	-19.9	.7	-95.2	-41.54	-25	-16.54	V
Mid Channel, 2583.1MHz + 2602.9MHz										
5.18599	37.39	Pk	33.6	-26.4	.8	-95.2	-49.81	-25	-24.81	H
5.19077	36.97	Pk	33.7	-26.3	.8	-95.2	-50.03	-25	-25.03	V
7.78372	35.87	Pk	37.2	-23.3	.4	-95.2	-45.03	-25	-20.03	H
7.78665	36.67	Pk	37.2	-23.4	.4	-95.2	-44.33	-25	-19.33	V
10.36944	34.42	Pk	39.2	-19.4	.8	-95.2	-40.18	-25	-15.18	H
10.37488	34.18	Pk	39.2	-19.3	.8	-95.2	-40.32	-25	-15.32	V
High Channel, 2660.2MHz + 2680MHz										
5.33894	37.48	Pk	33.2	-26.5	.6	-95.2	-50.42	-25	-25.42	V
5.34243	37.43	Pk	33.1	-26.6	.6	-95.2	-50.67	-25	-25.67	H
8.01034	35.21	Pk	37.1	-22.9	.3	-95.2	-45.49	-25	-20.49	V
8.01699	35.49	Pk	37.1	-22.8	.3	-95.2	-45.11	-25	-20.11	H
10.67614	35.02	Pk	39.4	-19.6	.5	-95.2	-39.88	-25	-14.88	V
10.67774	34.22	Pk	39.4	-19.6	.5	-95.2	-40.68	-25	-15.68	H

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

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

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 #:	13335182
Date:	7/21/2020
Test Engineer:	19206
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)	HPF 1.2GHz T1737 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
5.01385	37.44	Pk	33.7	-25.9	.8	-95.2	-49.16	-25	-24.16	V
5.09524	37.69	Pk	33.9	-26.3	.8	-95.2	-49.11	-25	-24.11	H
7.14052	35.98	Pk	36.9	-23.9	.4	-95.2	-45.82	-25	-20.82	H
7.14334	36.4	Pk	36.9	-24	.4	-95.2	-45.5	-25	-20.5	V
10.49795	33.96	Pk	39.5	-19.3	.6	-95.2	-40.44	-25	-15.44	H
10.51478	33.73	Pk	39.5	-19.4	.6	-95.2	-40.77	-25	-15.77	V
Mid Channel, 2525.1MHz + 2544.9MHz										
4.95017	37.39	Pk	33.4	-26	.7	-95.2	-49.71	-25	-24.71	V
5.09503	38.02	Pk	33.9	-26.3	.8	-95.2	-48.78	-25	-23.78	H
7.18804	36.31	Pk	36.9	-24	.4	-95.2	-45.59	-25	-20.59	V
7.27261	35.97	Pk	37.2	-23.3	.4	-95.2	-44.93	-25	-19.93	H
10.56358	34.07	Pk	39.6	-19.4	.8	-95.2	-40.13	-25	-15.13	V
10.62454	34.56	Pk	39.5	-19.5	.6	-95.2	-40.04	-25	-15.04	H
High Channel, 2540.2MHz + 2560MHz										
5.01148	38.45	Pk	33.7	-26	.8	-95.2	-48.25	-25	-23.25	H
5.09073	38.25	Pk	33.9	-26.2	.8	-95.2	-48.45	-25	-23.45	V
7.2108	35.81	Pk	37.1	-23.7	.4	-95.2	-45.59	-25	-20.59	V
7.21723	36.01	Pk	37.2	-23.6	.3	-95.2	-45.29	-25	-20.29	H
10.45271	33.36	Pk	39.4	-19.3	.7	-95.2	-41.04	-25	-16.04	H
10.57738	34.42	Pk	39.5	-19.4	.9	-95.2	-39.78	-25	-14.78	V

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 #:	13335182
Date:	7/19/2020
Test Engineer:	19480
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										
5.02433	38.57	Pk	33.7	-25.9	.7	-95.2	-48.13	-25	-23.13	V
5.02728	38.78	Pk	33.7	-26.1	.7	-95.2	-48.12	-25	-23.12	H
7.5493	36.24	Pk	36.9	-24	.3	-95.2	-45.76	-25	-20.76	H
7.56021	36.17	Pk	36.8	-24.1	.3	-95.2	-46.03	-25	-21.03	V
10.06482	34.95	Pk	38.4	-19.9	.7	-95.2	-41.05	-25	-16.05	H
10.07299	34.66	Pk	38.4	-20	.7	-95.2	-41.44	-25	-16.44	V
Mid Channel, 2583.1MHz + 2602.9MHz										
5.18548	37.07	Pk	33.6	-26.4	.8	-95.2	-50.13	-25	-25.13	V
5.19	37.53	Pk	33.7	-26.3	.8	-95.2	-49.47	-25	-24.47	H
7.78262	36.18	Pk	37.2	-23.3	.3	-95.2	-44.82	-25	-19.82	V
7.78538	36.19	Pk	37.2	-23.4	.4	-95.2	-44.81	-25	-19.81	H
10.38066	34.28	Pk	39.2	-19.3	.8	-95.2	-40.22	-25	-15.22	V
10.3871	34.82	Pk	39.2	-19.4	.8	-95.2	-39.78	-25	-14.78	H
High Channel, 2660.2MHz + 2680MHz										
5.32965	37.48	Pk	33.2	-26.5	.8	-95.2	-50.22	-25	-25.22	V
5.3468	37.79	Pk	33.1	-26.6	.5	-95.2	-50.41	-25	-25.41	H
8.00806	35.37	Pk	37.1	-22.9	.3	-95.2	-45.33	-25	-20.33	V
8.01301	35.9	Pk	37.1	-22.9	.3	-95.2	-44.8	-25	-19.8	H
10.68511	34.79	Pk	39.3	-19.4	.5	-95.2	-40.01	-25	-15.01	V
10.68534	34.9	Pk	39.3	-19.4	.5	-95.2	-39.9	-25	-14.9	H

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

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

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 #:	13335182
Date:	7/21/2020
Test Engineer:	19206
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)	HPF 1.2GHz T1737 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
4.99468	37.25	Pk	33.6	-25.9	.7	-95.2	-49.55	-25	-24.55	H
5.09375	38.18	Pk	33.9	-26.3	.8	-95.2	-48.62	-25	-23.62	V
7.26195	35.56	Pk	37.1	-23.5	.5	-95.2	-45.54	-25	-20.54	H
7.57679	35.51	Pk	36.9	-24	.5	-95.2	-46.29	-25	-21.29	V
9.73832	34.25	Pk	38.6	-19.8	.7	-95.2	-41.45	-25	-16.45	H
9.74634	34.83	Pk	38.7	-19.9	.6	-95.2	-40.97	-25	-15.97	V
Mid Channel, 2525.1MHz + 2544.9MHz										
5.08267	37.13	Pk	33.8	-26.2	.8	-95.2	-49.67	-25	-24.67	V
5.09254	37.27	Pk	33.9	-26.3	.8	-95.2	-49.53	-25	-24.53	H
7.27597	35.23	Pk	37.1	-23.2	.4	-95.2	-45.67	-25	-20.67	H
7.28707	34.82	Pk	37.2	-23.1	.4	-95.2	-45.88	-25	-20.88	V
10.3796	33.43	Pk	39.2	-19.3	.8	-95.2	-41.07	-25	-16.07	H
10.75114	33.91	Pk	39.3	-19.4	.8	-95.2	-40.59	-25	-15.59	V
High Channel, 2540.2MHz + 2560MHz										
4.78332	38.06	Pk	32.9	-27.2	.7	-95.2	-50.74	-25	-25.74	V
4.79102	37.7	Pk	33	-27.1	.8	-95.2	-50.8	-25	-25.8	H
7.29202	35.51	Pk	37.1	-23.2	.4	-95.2	-45.39	-25	-20.39	H
7.30663	35.88	Pk	37.1	-23.3	.3	-95.2	-45.22	-25	-20.22	V
10.65437	35.1	Pk	39.4	-19.7	.5	-95.2	-39.9	-25	-14.9	V
10.77478	33.97	Pk	39.3	-19.5	.9	-95.2	-40.53	-25	-15.53	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 #:	13335182
Date:	7/20/2020
Test Engineer:	19206
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										
5.04629	37.69	Pk	33.8	-26.2	.6	-95.2	-49.31	-25	-24.31	H
5.04861	37.53	Pk	33.8	-26.1	.6	-95.2	-49.37	-25	-24.37	V
7.27909	35.51	Pk	37.1	-23.2	.4	-95.2	-45.39	-25	-20.39	V
7.30478	35.54	Pk	37.1	-23.3	.4	-95.2	-45.46	-25	-20.46	H
10.58957	34.22	Pk	39.5	-19.7	.9	-95.2	-40.28	-25	-15.28	H
10.63649	33.85	Pk	39.4	-19.4	.5	-95.2	-40.85	-25	-15.85	V
Mid Channel, 2583.1MHz + 2602.9MHz										
5.01348	37.55	Pk	33.7	-26	.8	-95.2	-49.15	-25	-24.15	V
5.02423	37.45	Pk	33.7	-25.9	.7	-95.2	-49.25	-25	-24.25	H
7.2036	35.93	Pk	37.1	-23.8	.4	-95.2	-45.57	-25	-20.57	H
7.38874	35.14	Pk	36.9	-24.1	.4	-95.2	-46.86	-25	-21.86	V
10.18739	33.99	Pk	38.6	-19.7	.7	-95.2	-41.61	-25	-16.61	V
10.44385	34.17	Pk	39.4	-19.2	.8	-95.2	-40.03	-25	-15.03	H
High Channel, 2660.2MHz + 2680MHz										
5.02963	37.39	Pk	33.7	-26	.7	-95.2	-49.41	-25	-24.41	H
5.04967	37.28	Pk	33.8	-26.1	.6	-95.2	-49.62	-25	-24.62	V
7.06662	35.96	Pk	36.7	-23.8	.7	-95.2	-45.64	-25	-20.64	V
7.08443	35.38	Pk	36.7	-23.7	.5	-95.2	-46.32	-25	-21.32	H
10.3685	34.77	Pk	39.2	-19.4	.8	-95.2	-39.83	-25	-14.83	H
10.48346	33.63	Pk	39.5	-19.5	.7	-95.2	-40.87	-25	-15.87	V

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 #:	13335182
Date:	8/05/2020
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										
5.00121	31.92	RMS	33.6	-26	.6	-95.2	-55.08	-40	-15.08	V
5.00384	31.31	RMS	33.7	-25.9	.6	-95.2	-55.49	-40	-15.49	H
6.44218	30.36	RMS	34.8	-24.9	.5	-95.2	-54.44	-40	-14.44	H
6.56754	30.02	RMS	35.4	-24.5	.6	-95.2	-53.68	-40	-13.68	V
8.10839	29.17	RMS	37.2	-22.6	.6	-95.2	-50.83	-40	-10.83	H
8.47809	29.59	RMS	37.5	-22.1	.7	-95.2	-49.51	-40	-9.51	V
Mid Channel, 3615.1MHz + 3634.9MHz										
4.93272	31.5	RMS	33.4	-26.2	.5	-95.2	-56	-40	-16	V
4.9886	31.52	RMS	33.6	-26	.5	-95.2	-55.58	-40	-15.58	H
6.31827	30.24	RMS	34.6	-24.5	.5	-95.2	-54.36	-40	-14.36	H
6.51622	29.97	RMS	35.2	-24.2	.5	-95.2	-53.73	-40	-13.73	V
7.65959	29.21	RMS	37	-23.4	.6	-95.2	-51.79	-40	-11.79	H
7.71329	29.25	RMS	37	-23.4	.7	-95.2	-51.65	-40	-11.65	V
High Channel, 3670.2MHz + 3690MHz										
4.99219	31.94	RMS	33.6	-26	.5	-95.2	-55.16	-40	-15.16	H
5.00689	31.82	RMS	33.7	-25.9	.6	-95.2	-54.98	-40	-14.98	V
6.31023	30.31	RMS	34.5	-24.8	.5	-95.2	-54.69	-40	-14.69	H
6.312	30.3	RMS	34.5	-24.8	.5	-95.2	-54.7	-40	-14.7	V
7.07423	30.17	RMS	36.6	-23.8	.6	-95.2	-51.63	-40	-11.63	V
7.30341	29.89	RMS	37.1	-23.3	.6	-95.2	-50.91	-40	-10.91	H

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

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

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 #:	13335182
Date:	8/04/2020
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										
5.0014	31.77	RMS	33.6	-26	.6	-95.2	-55.23	-40	-15.23	V
5.06438	31.54	RMS	33.9	-26.2	.5	-95.2	-55.46	-40	-15.46	H
6.00011	30.92	RMS	34.5	-25.7	.5	-95.2	-54.98	-40	-14.98	V
6.01362	31.06	RMS	34.5	-25.6	.5	-95.2	-54.74	-40	-14.74	H
7.85219	29.24	RMS	37.3	-22.7	.7	-95.2	-50.66	-40	-10.66	V
7.893	30.25	RMS	37.3	-22.7	1	-95.2	-49.35	-40	-9.35	H
Mid Channel, 3615.1MHz + 3634.9MHz										
4.8677	31.9	RMS	33.2	-26.8	.6	-95.2	-56.3	-40	-16.3	H
5.06369	31.79	RMS	33.9	-26.1	.5	-95.2	-55.11	-40	-15.11	V
6.57089	29.67	RMS	35.4	-24.4	.6	-95.2	-53.93	-40	-13.93	H
6.81787	29.98	RMS	36	-24.8	.4	-95.2	-53.62	-40	-13.62	V
7.83932	29.23	RMS	37.2	-22.7	.6	-95.2	-50.87	-40	-10.87	H
7.96583	29.22	RMS	37.2	-22.9	.6	-95.2	-51.08	-40	-11.08	V
High Channel, 3670.2MHz + 3690MHz										
5.05771	31.72	RMS	33.8	-26.1	.4	-95.2	-55.38	-40	-15.38	H
5.06438	31.47	RMS	33.9	-26.2	.5	-95.2	-55.53	-40	-15.53	V
6.50915	30.5	RMS	35.2	-24.4	.5	-95.2	-53.4	-40	-13.4	H
6.57435	29.7	RMS	35.5	-24.3	.6	-95.2	-53.7	-40	-13.7	V
7.91235	29.56	RMS	37.2	-22.6	.6	-95.2	-50.44	-40	-10.44	V
8.09912	29.31	RMS	37.2	-22.5	.6	-95.2	-50.59	-40	-10.59	H

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

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

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 #:	13335182
Date:	8/5/2020
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										
4.99336	31.53	RMS	33.6	-26	.6	-95.2	-55.47	-40	-15.47	V
4.99368	31.22	RMS	33.6	-26	.6	-95.2	-55.78	-40	-15.78	H
5.75548	30.66	RMS	33.1	-25.2	.4	-95.2	-56.24	-40	-16.24	V
6.00234	31.14	RMS	34.4	-25.6	.5	-95.2	-54.76	-40	-14.76	H
7.11433	29.49	RMS	36.7	-23.6	.5	-95.2	-52.11	-40	-12.11	V
7.2752	29.42	RMS	37.1	-23.3	.5	-95.2	-51.48	-40	-11.48	H
Mid Channel, 3615.1MHz + 3634.9MHz										
4.92861	31.52	RMS	33.4	-26.3	.5	-95.2	-56.08	-40	-16.08	H
5.06588	32.43	RMS	33.8	-26.2	.5	-95.2	-54.67	-40	-14.67	V
6.30833	30.19	RMS	34.5	-24.8	.5	-95.2	-54.81	-40	-14.81	H
6.50827	29.53	RMS	35.2	-24.4	.5	-95.2	-54.37	-40	-14.37	V
7.26453	29.78	RMS	37.1	-23.4	.6	-95.2	-51.12	-40	-11.12	V
7.27937	29.42	RMS	37.1	-23.2	.5	-95.2	-51.38	-40	-11.38	H
High Channel, 3670.2MHz + 3690MHz										
5.17998	31.58	RMS	33.7	-26.4	.6	-95.2	-55.72	-40	-15.72	V
5.18647	33.09	RMS	33.6	-26.4	.6	-95.2	-54.31	-40	-14.31	H
6.50621	29.91	RMS	35.3	-24.4	.5	-95.2	-53.89	-40	-13.89	V
6.63703	30.11	RMS	35.7	-24.8	.4	-95.2	-53.79	-40	-13.79	H
7.59026	29.44	RMS	36.9	-23.8	.8	-95.2	-51.86	-40	-11.86	V
7.65911	29.2	RMS	37	-23.4	.6	-95.2	-51.8	-40	-11.8	H

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

TEST PROCEDURE

KDB 971168 D01/D02 v02r01

RESULTS

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 #:	13335182
Date:	8/5/2020
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										
4.9909	31.99	RMS	33.6	-26	.5	-95.2	-55.11	-40	-15.11	V
5.05954	31.87	RMS	33.8	-26.1	.5	-95.2	-55.13	-40	-15.13	H
6.44185	30.47	RMS	34.8	-24.9	.5	-95.2	-54.33	-40	-14.33	H
6.44946	30.52	RMS	34.9	-24.8	.5	-95.2	-54.08	-40	-14.08	V
8.15747	29.03	RMS	37.3	-22.9	.6	-95.2	-51.17	-40	-11.17	H
8.28983	29.42	RMS	37.5	-22.7	.5	-95.2	-50.48	-40	-10.48	V
Mid Channel, 3615.1MHz + 3634.9MHz										
4.92706	32.11	RMS	33.4	-26.3	.5	-95.2	-55.49	-40	-15.49	H
5.00729	31.28	RMS	33.7	-25.9	.6	-95.2	-55.52	-40	-15.52	V
6.32208	30.51	RMS	34.5	-24.5	.5	-95.2	-54.19	-40	-14.19	H
6.43888	30.86	RMS	34.8	-24.9	.5	-95.2	-53.94	-40	-13.94	V
7.90025	29.2	RMS	37.3	-22.6	.9	-95.2	-50.4	-40	-10.4	V
7.90085	29.27	RMS	37.3	-22.6	.9	-95.2	-50.33	-40	-10.33	H
High Channel, 3670.2MHz + 3690MHz										
4.81031	32.46	RMS	33	-27	.5	-95.2	-56.24	-40	-16.24	V
5.06605	32.04	RMS	33.8	-26.2	.5	-95.2	-55.06	-40	-15.06	H
6.5916	30.32	RMS	35.5	-24.5	.6	-95.2	-53.28	-40	-13.28	H
6.89774	30.55	RMS	36.4	-24.5	.6	-95.2	-52.15	-40	-12.15	V
7.89894	29.51	RMS	37.3	-22.6	.9	-95.2	-50.09	-40	-10.09	V
7.91333	28.84	RMS	37.2	-22.6	.6	-95.2	-51.16	-40	-11.16	H

10. SETUP PHOTOS

Please refer to 13335182-EP1V1 for setup photos

END OF REPORT

Appendix B – Reference Test Report 13131738-E10

Attached is the test report (13131738-E10) containing the reference data from the parent model as detailed in section 5.5.



TEST REPORT

Report Number : 13131738-E10V2

Applicant : APPLE, INC
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

Model : A2410

FCC ID : BCG-E3549A

EUT Description : SMARTPHONE

Test Standard(s) : FCC CFR47 22H, 27L, 27M, and 96

Date Of Issue:
OCTOBER 02, 2020

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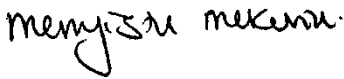
Revision History

Rev.	Issue Date	Revisions	Revised By
V1	9/24/2020	Initial Review	Mengistu Mekuria
V2	10/2/2020	Addressed TCB Questions	Mengistu Mekuria

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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A2410
FCC ID	BCG-E3549A
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-E3548A to cover variant model BCG-E3549A. 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 A2342 and A2410.

A2342 and A2410 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 A2410 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 Technical Limits. The results documented for model A2342 may be applied as representative to model A2410.

5.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device model A2410, FCC ID: BCG-E3549A for antenna port power and radiated spurious emission tests in accordance with the Test Plan that was approved via KDB inquiry.

A2410 Spotcheck Results								
Technology	Worst Mode	Test Item	Channel	Measured	Original Model: A2432	Sub Model: A2410	Delta (dB)	Remarks
				Frequency MHz	FCC ID: BCG-E3548A	FCC ID: BCG-E3549A		
LTE 5CA	QPSK @ 1-49RB&1-0RB	ERP	Low	829 / 838.9	18.25 dBm	18.25 dBm	0.00	
	QPSK @ 1-49RB&1-0RB	RSE	Low	4753.1	-50.62 dBm	-52.09 dBm	-1.47	Noise Floor Level
LTE 7CA	QPSK @ 1-99RB&1-0RB	EIRP	Mid	2525.1/ 2544.9	23.7 dBm	23.7 dBm	0	
	QPSK @ 1-99RB&1-0RB	RSE	High	10577.38	-39.78 dBm	-39.52 dBm	0.26	Noise Floor Level
LTE 41CA	QPSK @ 1-99RB&1-0RB	EIRP	Low	2506/ 2525.8	24.7 dBm	24.5 dBm	-0.2	
LTE 48CA	QPSK @ 1-99RB&1-0RB	EIRP	Mid	3617.6/ 3634.7	21.2 dBm	21.12 dBm	-0.08	

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-E3548A	13335182-E10	FCC LTE Carrier Aggregation Report / All Sections except 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	-5.3	-4.9	NA	NA	NA	NA	NA
LTE Band 7, 2500 – 2570 MHz	-2.0	-1.5	-1.1	-0.2	NA	NA	NA
LTE Band 41, 2496 – 2690 MHz	-2.0	-1.1	0	-0.2	NA	NA	NA
LTE Band 48, 3550 – 3700 MHz	NA	NA	NA	-3.0	-4.9	-4.9	-3.0

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. Output power measurements were measured on QPSK, 16QAM, 64QAM, and 256QAM modulations. 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 exhibit 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	Y	X	N/A	N/A	N/A
Band 48	N/A	N/A	N/A	X	Y	X	Y

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.

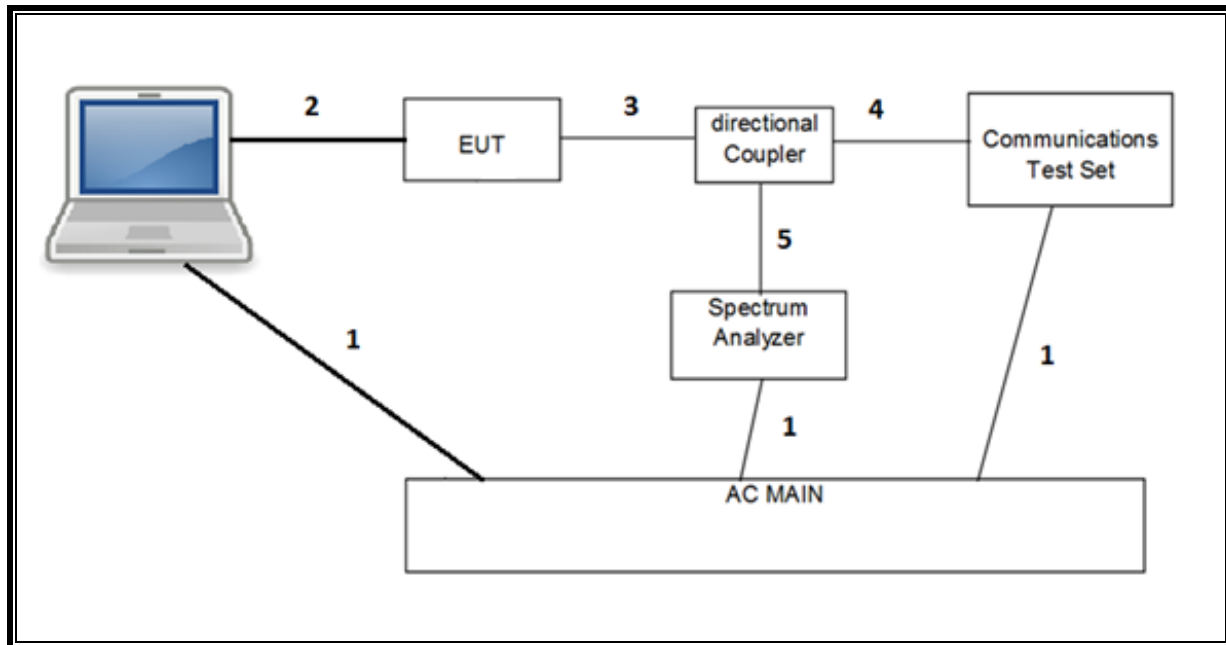
Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

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.

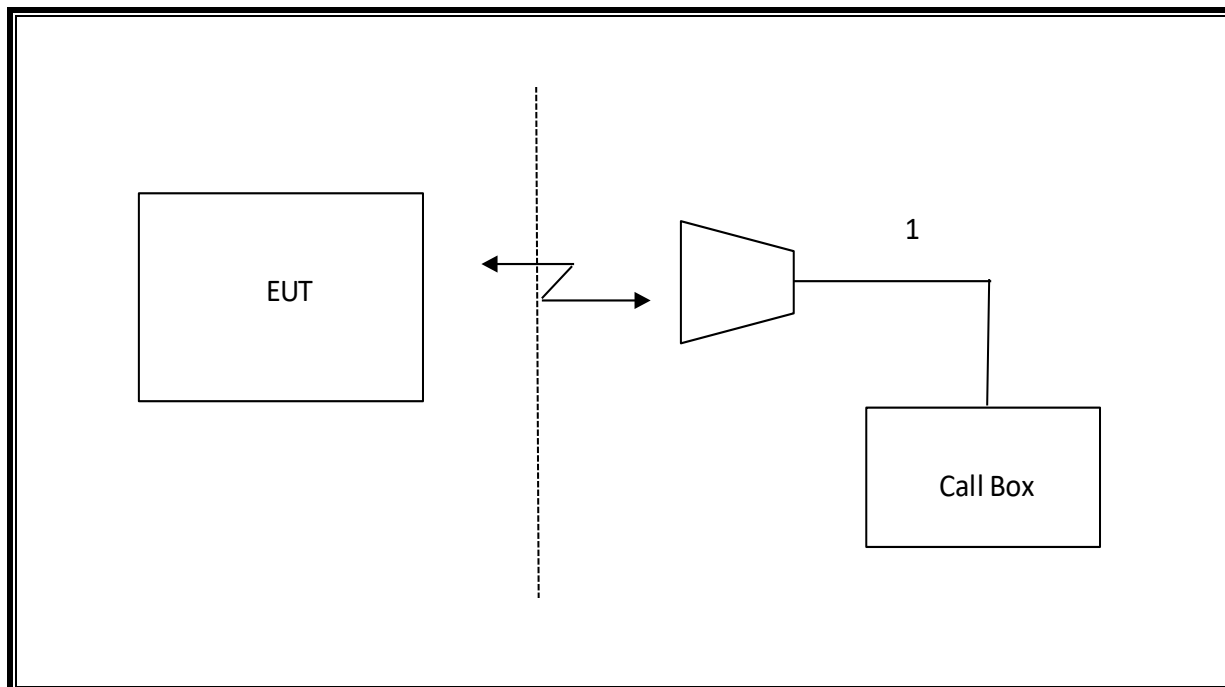
5.9. DESCRIPTION OF TEST SETUP

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

All tests above 1GHz were done with a Resolution Bandwidth of 1MHz, and a Video Bandwidth of 3MHz.

RESULTS

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 #:	13131738
Date:	8/26/2020
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										
1.70375	41.46	Pk	25.2	-30.3	.6	-95.2	-58.24	-13	-45.24	H
1.72928	41.35	Pk	25.3	-30.4	.7	-95.2	-58.25	-13	-45.25	V
2.49806	40.8	Pk	29	-29.2	.6	-95.2	-54	-13	-41	V
2.50146	42.39	Pk	29	-29.3	.6	-95.2	-52.51	-13	-39.51	H
3.67573	39.35	Pk	30.2	-27.8	.7	-95.2	-52.75	-13	-39.75	H
3.78874	39.91	Pk	30.8	-27.8	.6	-95.2	-51.69	-13	-38.69	V
Mid Channel, 831.6MHz + 841.5MHz										
1.64327	41.24	Pk	25	-30.4	.7	-95.2	-58.66	-13	-45.66	V
1.65266	42.06	Pk	24.9	-30.4	.8	-95.2	-57.84	-13	-44.84	H
2.71817	39.79	Pk	29.1	-28.9	.5	-95.2	-54.71	-13	-41.71	V
2.84669	39.29	Pk	28.8	-28.7	.7	-95.2	-55.11	-13	-42.11	H
3.89093	38.74	Pk	31.4	-27.5	.6	-95.2	-51.96	-13	-38.96	V
3.96028	38.81	Pk	31.5	-27.7	.6	-95.2	-51.99	-13	-38.99	H
High Channel, 834.1MHz + 844MHz										
1.64817	42	Pk	24.9	-30.4	.8	-95.2	-57.9	-13	-44.9	H
1.65444	41.72	Pk	24.9	-30.4	.8	-95.2	-58.18	-13	-45.18	V
2.61646	41.37	Pk	29.2	-29.1	.6	-95.2	-53.13	-13	-40.13	H
2.62122	41.16	Pk	29.2	-29.1	.6	-95.2	-53.34	-13	-40.34	V
3.61397	38.39	Pk	30.1	-27.8	.6	-95.2	-53.91	-13	-40.91	V
3.6985	39.39	Pk	30.3	-27.6	.8	-95.2	-52.31	-13	-39.31	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 #:	13131738
Date:	8/25/2020
Test Engineer:	50822
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)	BRF 2495-2690MHz T1790 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
Low Channel, 2510MHz + 2529.8MHz										
4.96542	38.23	Pk	33.5	-26	.5	-95.2	-48.97	-25	-23.97	H
4.96578	37.9	Pk	33.5	-26	.5	-95.2	-49.3	-25	-24.3	V
7.34275	35.66	Pk	37	-23.7	.4	-95.2	-45.84	-25	-20.84	H
7.5607	35.87	Pk	36.8	-24.1	.4	-95.2	-46.23	-25	-21.23	V
10.36863	34	Pk	39.2	-19.4	.8	-95.2	-40.6	-25	-15.6	H
10.69766	34.8	Pk	39.4	-19.4	.5	-95.2	-39.9	-25	-14.9	V
Mid Channel, 2525.1MHz + 2544.9MHz										
5.04919	37.32	Pk	33.8	-26.1	.6	-95.2	-49.58	-25	-24.58	V
5.07003	37.54	Pk	33.8	-26.1	.7	-95.2	-49.26	-25	-24.26	H
7.26236	36.16	Pk	37.1	-23.5	.5	-95.2	-44.94	-25	-19.94	V
7.28	35.38	Pk	37.1	-23.2	.4	-95.2	-45.52	-25	-20.52	H
9.71238	34.31	Pk	38.7	-20.1	.8	-95.2	-41.49	-25	-16.49	V
10.69656	33.99	Pk	39.4	-19.4	.5	-95.2	-40.71	-25	-15.71	H
High Channel, 2540.2MHz + 2560MHz										
5.07646	38.51	Pk	33.8	-26.1	.7	-95.2	-48.29	-25	-23.29	H
5.14826	37.85	Pk	33.8	-26.3	.8	-95.2	-49.05	-25	-24.05	V
7.08154	36.48	Pk	36.7	-23.7	.5	-95.2	-45.22	-25	-20.22	V
7.21134	37.77	Pk	37.1	-23.7	.4	-95.2	-43.63	-25	-18.63	H
10.78673	34.47	Pk	39.3	-19.7	.8	-95.2	-40.33	-25	-15.33	V
11.12679	34.19	Pk	39.2	-19.7	.8	-95.2	-40.71	-25	-15.71	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.

RESULTS

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

Project #:	13131738
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										
5.08463	38.18	Pk	33.8	-26.2	.8	-95.2	-48.62	-25	-23.62	H
5.10176	37.9	Pk	33.9	-26.4	.8	-95.2	-49	-25	-24	V
7.07581	36.36	Pk	36.6	-23.8	.6	-95.2	-45.44	-25	-20.44	H
7.1334	36.19	Pk	36.7	-24	.4	-95.2	-45.91	-25	-20.91	V
10.96044	34.03	Pk	39.4	-19.4	.9	-95.2	-40.27	-25	-15.27	H
10.97295	33.97	Pk	39.5	-19.5	.8	-95.2	-40.43	-25	-15.43	V
Mid Channel, 2583.1MHz + 2602.9MHz										
5.06284	37.04	Pk	33.9	-26.1	.6	-95.2	-49.76	-25	-24.76	V
5.10491	38.05	Pk	34	-26.4	.8	-95.2	-48.75	-25	-23.75	H
7.28501	35.39	Pk	37.1	-23.1	.4	-95.2	-45.41	-25	-20.41	H
7.32165	35.1	Pk	37	-23.5	.3	-95.2	-46.3	-25	-21.3	V
10.29101	34.19	Pk	39	-19.6	.7	-95.2	-40.91	-25	-15.91	H
10.37999	34.55	Pk	39.2	-19.3	.8	-95.2	-39.95	-25	-14.95	V
High Channel, 2660.2MHz + 2680MHz										
5.07869	38.09	Pk	33.8	-26.1	.7	-95.2	-48.71	-25	-23.71	H
5.21189	37.97	Pk	33.6	-26.3	1	-95.2	-48.93	-25	-23.93	V
7.06843	36.17	Pk	36.7	-23.8	.7	-95.2	-45.43	-25	-20.43	H
7.16139	36.63	Pk	36.9	-24	.4	-95.2	-45.27	-25	-20.27	V
10.52167	34.54	Pk	39.5	-19.6	.5	-95.2	-40.26	-25	-15.26	V
10.97498	34.37	Pk	39.5	-19.6	.8	-95.2	-40.13	-25	-15.13	H

8. SETUP PHOTOS

Please refer to 13335182-EP1 for setup photos

End of the report