



CERTIFICATION TEST REPORT

Report Number. : 12204475-E9V3

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

Model : A2098

FCC ID : BCG-E3233A

EUT Description : SMARTPHONE

Test Standard(s) : CFR47 PART 27

Date Of Issue:
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NVLAP LAB CODE 200065-0

Revision History

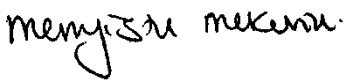
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V2	7/24/2018	Address TCB's Questions	Mengistu Mekuria
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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A2098
ID	BCG-E3233A
EUT Description	SMARTPHONE
Serial Number	C39WG035JVWF
Date Tested	MARCH 06, 2018 to JUNE 08, 2018
Applicable Standards	CFR47 PART 27
Test Results	COMPLIES
UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report. Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. 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 any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.	
Approved & Released By: 	Prepared By: 
Mengistu Mekuria Lead Test Engineer UL Verification Services Inc.	Lieu Nguyen Test Engineer UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.26:2015, FCC CFR 47 Part 2, FCC KDB 971168 D01 v03r01/ D02 v02r01, KDB 412172 D01 v01r01, Part 27.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, 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
☐ Chamber A (IC:2324B-1)	☐ Chamber D (IC:22541-1)
☐ Chamber B (IC:2324B-2)	☒ Chamber E (IC:22541-2)
☐ Chamber C (IC:2324B-3)	☐ Chamber F (IC:22541-3)
	☒ Chamber G (IC:22541-4)
	☐ Chamber H (IC:22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at [NVLAP Lab Search](#).

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \\ &\text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Radiated Disturbance, 26000 to 40000 MHz	5.24 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%.

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, TD-SCDMA, CDMA, IEEE 802.11a/b/g/n/ac, Bluetooth, GPS and NFC. All models support at least one UICC based SIM. The second SIM is either UICC based, electronic SIM (e-SIM), or second SIM is not present. The device has a built-in inductive charging receiver which is not user accessible. The rechargeable battery is not user accessible.

5.2. MAXIMUM OUTPUT POWER

ERP/EIRP LIMIT

\$2.1046, \$27.50

EIRP/ERP TEST PROCEDURE

ANSI C63.26:2015

KDB 971168 D01 Section 5.6

KDB 412172 D01 Determining ERP and EIRP v01r01.

$ERP/EIRP = P_{Meas} + GT - LC$

where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas} , typically dBW or dBm);

P_{Meas} = 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 7

Part 27 / RSS 199								
EIRP Limit (W)		2.00						
Antenna Gain (dBi)		-1.50						
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	25.0	23.50	0.224	28239	28M2G7W
	16QAM			23.9	22.40	0.174	28106	28M1D7W
	64QAM			22.8	21.30	0.135	28157	28M2D7W
20+10	QPSK	2510.0	2564.5	25.0	23.50	0.224	28138	28M1G7W
	16QAM			24.0	22.50	0.178	28047	28M0D7W
	64QAM			22.8	21.30	0.135	28081	28M1D7W
15+15	QPSK	2507.5	2562.5	25.0	23.50	0.224	28596	28M6G7W
	16QAM			24.1	22.60	0.182	28660	28M7D7W
	64QAM			22.9	21.40	0.138	28674	28M7D7W
15+20	QPSK	2507.8	2560.0	25.0	23.50	0.224	32867	32M9G7W
	16QAM			24.1	22.60	0.182	32921	32M9D7W
	64QAM			23.0	21.50	0.141	33008	33M0D7W
20+15	QPSK	2510.0	2562.2	25.0	23.50	0.224	32851	32M9G7W
	16QAM			24.4	22.90	0.195	32890	32M9D7W
	64QAM			23.3	21.80	0.151	32965	33M0D7W
20+20	QPSK	2510.0	2560.0	25.0	23.50	0.224	37763	37M8G7W
	16QAM			24.5	23.00	0.200	37796	37M8D7W
	64QAM			23.4	21.90	0.155	37807	37M8D7W

OUTPUT POWER FOR LTE BAND 41

Part 27								
EIRP Limit (W)		2.00						
Antenna Gain (dBi)		-1.50						
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	25.0	23.50	0.224	23322	23M3G7W
	16QAM			24.0	22.50	0.178	23305	23M3D7W
	64QAM			23.1	21.60	0.145	23332	23M3D7W
20+5	QPSK	2506.0	2686.7	25.0	23.50	0.224	23400	23M4G7W
	16QAM			24.1	22.60	0.182	23245	23M2D7W
	64QAM			23.2	21.70	0.148	23294	23M3D7W
10+20	QPSK	2501.5	2680.0	25.0	23.50	0.224	28097	28M1G7W
	16QAM			24.0	22.50	0.178	28137	28M1D7W
	64QAM			23.1	21.60	0.145	28112	28M1D7W
20+10	QPSK	2506.0	2684.5	25.0	23.50	0.224	28130	28M1G7W
	16QAM			24.1	22.60	0.182	28094	28M1D7W
	64QAM			23.2	21.70	0.148	28146	28M1D7W
15+15	QPSK	2503.5	2682.5	25.0	23.50	0.224	28666	28M7G7W
	16QAM			24.1	22.60	0.182	28723	28M7D7W
	64QAM			23.1	21.60	0.145	28631	28M6D7W
15+20	QPSK	2503.8	2680.0	25.0	23.50	0.224	32868	32M9G7W
	16QAM			24.1	22.60	0.182	32933	32M9D7W
	64QAM			23.1	21.60	0.145	32971	33M0D7W
20+15	QPSK	2506.0	2682.2	25.0	23.50	0.224	32787	32M8G7W
	16QAM			24.1	22.60	0.182	32966	33M0D7W
	64QAM			23.1	21.60	0.145	32922	32M9D7W
20+20	QPSK	2506.0	2680.0	25.0	23.50	0.224	37675	37M7G7W
	16QAM			24.1	22.60	0.182	37730	37M7D7W
	64QAM			23.2	21.70	0.148	37844	37M8D7W

5.3. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 0.26.01.

5.4. MAXIMUM ANTENNA GAIN

LTE Band	Frequency Range (MHz)	Ant 1 Gain (dBi)	Ant 2 Gain (dBi)	Ant 3 Gain (dBi)	Ant 4 Gain (dBi)
Band 7	2500-2570	-1.5	-5.0	-4.1	-2.3
Band 41	2496-2690	-1.5	-5.0	-3.8	-2.2

5.5. WORST-CASE CONFIGURATION AND MODE

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

The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were measured on QPSK, 16QAM and 64QAM modulations. It was found that QPSK and 16QAM results were worst case. All testing was performed using QPSK and 16QAM modulations to represent the worst case.

All conducted tests were performed at Ant 1 as worst case since it has higher output powers. Only output power and occupied bandwidth were performed on the 64QAM due to power is lower than QPSK/16QAM

Radiated test was investigated in three orthogonal orientations X/Y/Z on Ant 1/Ant 2/Ant 3/Ant 4, it was determined that X (Flatbed) orientation was the worst-case orientation for all bands on all antenna without AC/DC adapter or headphones.

Radiated spurious emissions were investigated below 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found on below 30MHz and 30MHz-1GHz.

For simultaneous transmission of multiple channels in the 2.4/5 GHz and Cellular bands, no noticeable emission was found.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
Laptop AC/DC adapter	Delta Electronic	A1343	ADP-85EBT V85
Laptop	Apple	Macbook Pro	73008ACB7XJ

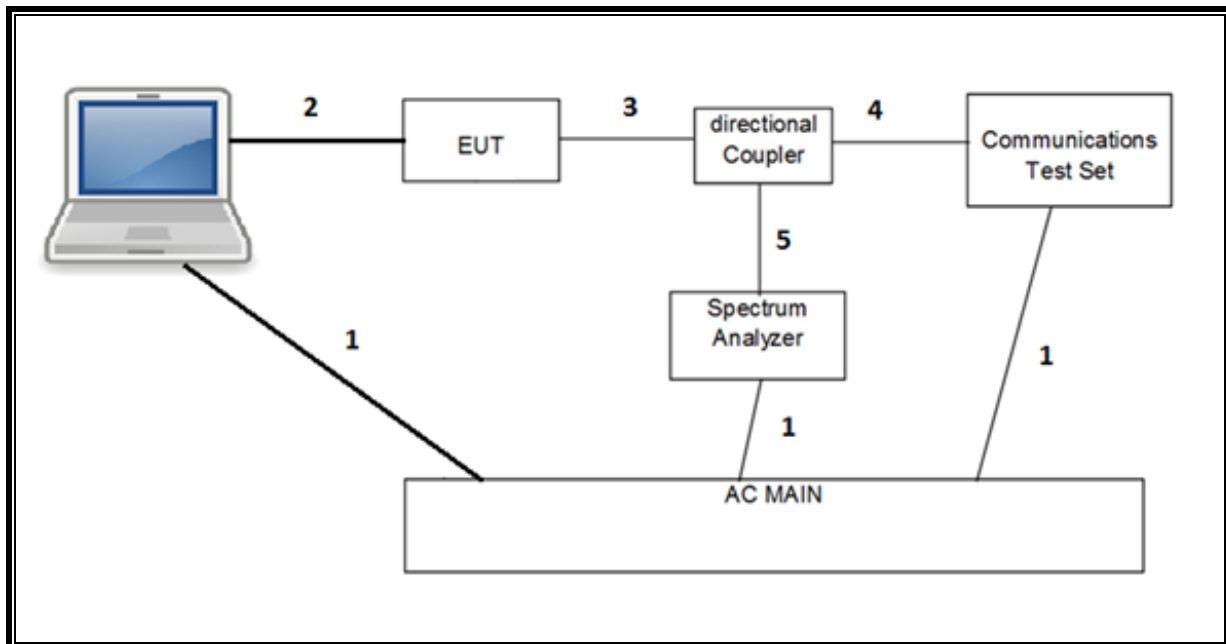
I/O CABLES (RF Conducted Test)

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

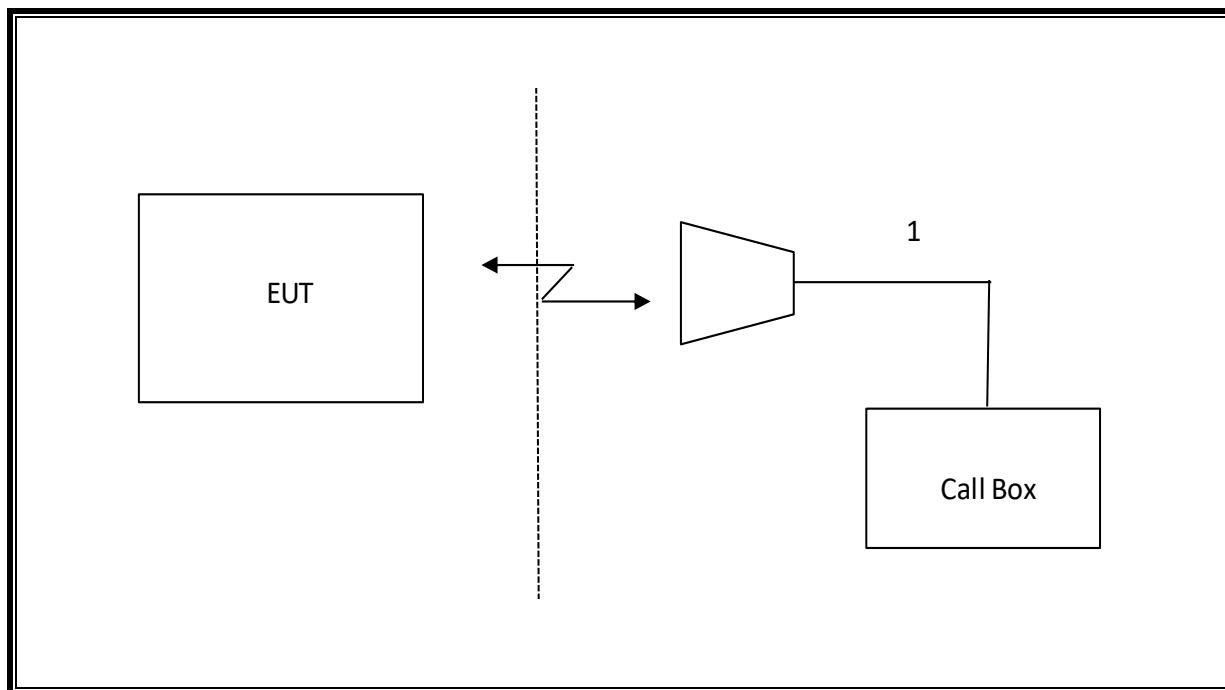
I/O CABLES (RF Radiated Test)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	RF In/Out	1	Antenna	Un-shielded	5.0m	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	ETS Lindgren	3117	T712	02/08/2019
*Antenna, Broadband Hybrid, 30MHz	Sunol Sciences	JB3	T900	05/31/2018
*Antenna, Broadband Hybrid, 30MHz	Sunol Sciences	JB3	T899	06/15/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T741	12/30/2018
Amplifier, 1 to 8GHz	Miteq	AMF-4D-01000800-30-29P	T1169	12/30/2018
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T285	06/24/2018
Spectrum Analyzer, PXA 3Hz to	Keysight	N9030A	T906	02/16/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T712	02/08/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T119	04/03/2019
*Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T407	04/14/2018
*Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T491	06/01/2018
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T834	06/01/2018
Spectrum Analyzer, PXA 3Hz to	Keysight	N9030A-544	T341	11/12/2018
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T119	04/03/2019
Filter, HPF 4GHz	MICROTRONICS	HPM13351	T1239	08/11/2018
Power Meter, P-series single channel	Keysight	N1912A	T1272	05/1/2019
Power Sensor	Keysight	N1921A	T1225	04/10/2019
Directional Coupler	KRYTAR	152610	T1537	04/27/2019
Directional Coupler	KRYTAR	152613	T1536	04/27/2019
Wideband Communication Test Set,	Rohde &	CMW500	T979	02/17/2019
Wideband Communication Test Set,	Rohde &	CMW500	T959	02/17/2019
Wideband Communication Test Set,	Rohde &	CMW500	T956	06/22/2018
Wideband Communication Test Set,	Rohde &	CMW500	T979	02/17/2019
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	09/05/2018

Note: * Indicates on equipment list above are past due of the calibration dates, However, all tests are completed before equipment expiration dates indicated above.

7. RF OUTPUT POWER VERIFICATION

RULE PART(S)

§2.1046, §27.50

MODES TESTED

- LTE Band 7
- LTE Band 41

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. Ant 1, Ant 2, Ant 3 and Ant 4

7.1.1. LTE BAND 7

ID:	10646	Date:	3/7/18
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OUTPUT POWER FOR LTE BAND 7 (10.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
10MHz / 20MHz	2505.5	2519.9	1	49	1	0	25.0	23.9	22.8	21.4	20.3	19.3
			50	0	100	0	22.8	21.8	21.6	19.0	18.0	18.1
	2525.6	2540.0	1	49	1	0	24.9	23.8	22.8	21.2	20.2	19.2
			50	0	100	0	22.9	21.9	21.7	19.1	18.1	18.1
	2545.6	2560.0	1	49	1	0	25.0	23.9	22.7	21.5	20.2	19.1
			50	0	100	0	22.9	21.9	21.8	19.1	18.2	18.2

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
10MHz / 20MHz	2505.5	2519.9	1	49	1	0	24.5	23.5	22.6	18.7	17.7	16.7
			50	0	100	0	22.2	21.2	21.2	16.4	15.3	15.3
	2525.6	2540.0	1	49	1	0	24.3	23.3	22.3	18.4	17.5	16.5
			50	0	100	0	22.2	21.2	21.2	16.3	15.3	15.4
	2545.6	2560.0	1	49	1	0	24.2	23.3	22.1	18.5	17.6	16.5
			50	0	100	0	22.2	21.2	21.3	16.5	15.6	15.5

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QAM	QPSK	16QA	64QA
20MHz / 10MHz	2510.0	2524.4	1	99	1	0	24.9	23.8	22.7	21.4	20.4	19.5
			1	0	1	49	16.1	16.2	15.8	12.9	13.0	13.2
			100	0	50	0	22.7	21.7	21.5	19.4	18.4	18.4
	2530.1	2544.5	1	99	1	0	25.0	24.0	22.8	21.5	20.5	19.6
			1	0	1	49	16.4	16.4	16.3	13.0	13.0	13.2
			100	0	50	0	22.8	21.8	21.5	19.4	18.4	18.5
	2550.1	2564.5	1	99	1	0	24.9	23.8	22.5	21.5	20.5	19.6
			1	0	1	49	16.2	16.3	16.1	13.0	13.1	13.2
			100	0	50	0	22.8	21.8	21.5	19.5	18.5	18.5

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 10MHz	2510.0	2524.4	1	99	1	0	24.5	23.5	22.4	18.6	17.6	16.7
			1	0	1	49	16.0	16.0	16.0	10.0	10.0	10.1
			100	0	50	0	22.5	21.4	21.6	16.6	15.6	15.6
	2530.1	2544.5	1	99	1	0	24.3	23.6	22.7	18.7	17.8	16.9
			1	0	1	49	16.1	16.2	16.3	10.2	10.2	10.3
			100	0	50	0	22.5	21.4	21.5	16.6	15.6	15.6
	2550.1	2564.5	1	99	1	0	24.5	23.5	22.5	18.6	17.6	16.7
			1	0	1	49	16.1	16.2	16.2	10.2	10.3	10.3
			100	0	50	0	22.4	21.4	21.5	16.7	15.7	15.7

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 15MHz	2507.5	2522.5	1	74	1	0	25.0	24.1	22.9	21.5	20.5	19.5
			75	0	75	0	22.9	21.9	21.8	19.4	18.4	18.4
	2527.5	2542.5	1	74	1	0	25.0	24.1	21.8	21.5	20.5	19.4
			75	0	75	0	22.9	22.0	22.9	19.4	18.4	18.4
	2547.5	2562.5	1	74	1	0	25.0	24.1	22.9	21.5	20.5	19.4
			75	0	75	0	23.1	22.0	21.9	19.4	18.5	18.5

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 15MHz	2507.5	2522.5	1	74	1	0	22.4	23.7	22.9	18.6	17.7	16.6
			75	0	75	0	22.6	21.5	21.6	16.5	15.5	15.5
	2527.5	2542.5	1	74	1	0	22.3	23.7	22.7	18.6	17.5	16.7
			75	0	75	0	22.5	21.6	21.6	16.5	15.5	15.5
	2547.5	2562.5	1	74	1	0	24.5	23.6	22.6	18.7	17.7	16.7
			75	0	75	0	22.6	21.5	21.5	16.8	15.7	15.8

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 20MHz	2507.8	2524.9	1	74	1	0	25.0	24.1	23.0	21.5	20.5	19.6
			75	0	100	0	22.9	21.9	21.8	19.4	18.4	18.5
	2525.3	2542.4	1	74	1	0	24.9	23.9	22.9	21.5	20.6	19.6
			75	0	100	0	23.0	22.0	21.9	19.5	18.5	18.5
	2542.9	2560.0	1	74	1	0	24.9	24.1	22.9	21.5	20.6	19.6
			75	0	100	0	23.0	22.1	21.8	19.5	18.6	18.6

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 20MHz	2507.8	2524.9	1	74	1	0	24.5	23.9	23.1	18.7	17.6	16.8
			75	0	100	0	22.7	21.7	21.8	16.6	15.5	15.5
	2525.3	2542.4	1	74	1	0	24.4	23.9	22.8	18.6	17.6	16.6
			75	0	100	0	22.8	21.8	21.8	16.5	15.5	15.5
	2542.9	2560.0	1	74	1	0	24.4	23.8	22.8	18.6	17.7	16.6
			75	0	100	0	22.8	21.7	21.7	16.7	15.6	15.7

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 15MHz	2510.0	2527.1	1	99	1	0	25.0	24.4	23.3	21.4	20.4	19.5
			100	0	75	0	22.8	22.2	22.1	19.4	18.5	18.5
	2527.6	2544.7	1	99	1	0	25.0	24.4	23.3	21.5	20.5	19.6
			100	0	75	0	23.0	22.4	22.0	19.5	18.5	18.5
	2545.1	2562.2	1	99	1	0	24.9	24.4	23.3	21.5	20.4	19.5
			100	0	75	0	23.0	22.4	22.1	19.5	18.5	18.5

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 15MHz	2510.0	2527.1	1	99	1	0	24.5	23.7	22.7	18.6	17.6	16.6
			100	0	75	0	22.7	21.7	21.7	16.6	15.7	15.7
	2527.6	2544.7	1	99	1	0	24.4	23.8	22.9	18.7	17.7	16.8
			100	0	75	0	22.7	21.8	21.7	16.7	15.6	15.6
	2545.1	2562.2	1	99	1	0	24.3	23.6	22.8	18.6	17.7	16.8
			100	0	75	0	22.7	21.7	21.8	16.7	15.7	15.7

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz/ 20MHz	2510.0	2529.8	1	99	1	0	25.0	24.3	23.4	21.5	20.5	19.6
			1	0	1	99	16.2	16.6	16.5	12.6	12.7	12.9
			100	0	100	0	23.0	22.4	22.3	19.4	18.4	18.4
	2525.1	2544.9	1	99	1	0	25.0	24.5	23.4	21.5	20.6	19.7
			1	0	1	99	16.3	16.8	16.6	12.9	12.9	13.0
			100	0	100	0	23.1	22.4	22.3	19.6	18.6	18.5
	2540.2	2560.0	1	99	1	0	25.0	24.4	23.3	21.6	20.7	19.6
			1	0	1	99	16.2	16.7	16.6	13.0	12.9	13.0
			100	0	100	0	23.1	22.5	22.4	19.6	18.6	18.6

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz/ 20MHz	2510.0	2529.8	1	99	1	0	24.4	23.9	22.7	18.7	17.8	16.8
			1	0	1	99	15.9	15.9	15.9	9.9	9.9	10.1
			100	0	100	0	22.7	21.7	21.7	16.7	15.7	15.7
	2525.1	2544.9	1	99	1	0	24.5	23.9	22.9	18.7	17.6	16.8
			1	0	1	99	16.3	16.3	16.4	10.0	10.0	10.1
			100	0	100	0	24.4	21.8	21.8	16.7	15.7	15.7
	2540.2	2560.0	1	99	1	0	24.3	23.8	22.9	18.7	17.8	16.8
			1	0	1	99	16.2	16.2	16.3	10.0	10.0	10.1
			100	0	100	0	22.8	21.8	21.8	16.8	15.8	15.8

7.1.2. LTE BAND 41

ID:	10646	Date:	3/7/18
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OUTPUT POWER FOR LTE BAND 41 (5.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
5MHz / 20MHz	2499.3	2511.0	1	24	1	0	25.0	24.0	23.1	22.5	21.4	20.1
			25	0	100	0	22.8	21.9	21.9	20.2	19.2	19.2
	2583.8	2595.5	1	24	1	0	24.0	22.9	22.1	21.9	20.8	19.9
			25	0	100	0	22.2	21.3	21.3	19.9	19.0	19.0
	2668.3	2680.0	1	24	1	0	24.3	23.6	22.7	18.3	17.9	17.8
			25	0	100	0	22.8	21.9	21.8	20.3	19.4	19.4

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
5MHz / 20MHz	2499.3	2511.0	1	24	1	0	24.5	23.1	23.1	21.7	21.0	20.1
			25	0	100	0	22.0	20.6	21.5	19.8	18.8	18.8
	2583.8	2595.5	1	24	1	0	23.2	21.7	21.7	21.1	20.1	19.2
			25	0	100	0	21.4	20.1	20.9	19.5	18.5	18.5
	2668.3	2680.0	1	24	1	0	23.8	22.4	22.4	21.6	21.0	20.1
			25	0	100	0	21.7	20.4	21.2	19.8	18.8	18.8

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 5MHz	2506.0	2517.7	1	99	1	0	25.0	24.1	23.1	22.5	21.8	21.0
			1	0	1	24	17.2	16.4	16.3	14.5	14.3	15.1
			100	0	25	0	22.8	21.8	21.9	20.4	19.8	19.8
	2590.5	2602.2	1	99	1	0	24.4	23.4	22.5	22.3	21.8	20.8
			1	0	1	24	16.9	16.3	16.4	13.6	15.2	14.3
			100	0	25	0	22.1	21.2	21.1	20.1	19.5	19.6
	2675.0	2686.7	1	99	1	0	24.9	24.0	23.2	22.6	22.1	21.4
			1	0	1	24	16.7	17.0	16.9	15.6	14.9	15.7
			100	0	25	0	22.9	21.8	21.8	20.6	20.0	20.0

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 5MHz	2506.0	2517.7	1	99	1	0	24.5	23.5	22.7	21.7	21.0	19.9
			1	0	1	24	16.9	16.5	15.9	14.3	13.9	13.4
			100	0	25	0	22.6	21.6	21.5	19.9	18.9	18.9
	2590.5	2602.2	1	99	1	0	24.1	23.3	22.2	21.6	20.7	19.9
			1	0	1	24	15.9	15.8	15.7	12.9	13.1	13.4
			100	0	25	0	21.9	20.9	20.9	19.4	18.4	18.5
	2675.0	2686.7	1	99	1	0	24.2	23.5	22.4	21.8	20.9	20.2
			1	0	1	24	15.7	16.7	16.6	14.3	13.4	14.2
			100	0	25	0	22.2	21.2	21.1	19.7	18.7	18.7

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
10MHz / 20MHz	2501.5	2515.9	1	49	1	0	25.0	24.0	23.1	22.5	21.5	20.8
			50	0	100	0	22.7	21.7	21.8	20.2	19.3	19.4
	2583.6	2598.0	1	49	1	0	24.2	23.1	22.3	22.2	21.1	20.3
			50	0	100	0	22.1	21.1	21.1	19.9	19.1	19.1
	2665.6	2680.0	1	49	1	0	24.5	23.6	22.7	22.5	21.4	20.6
			50	0	100	0	22.7	21.7	21.8	20.4	19.4	19.6

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
10MHz / 20MHz	2501.5	2515.9	1	49	1	0	24.5	23.5	22.8	21.7	20.7	19.5
			50	0	100	0	22.0	21.0	21.0	19.3	18.3	18.3
	2583.6	2598.0	1	49	1	0	23.7	22.7	21.7	21.2	20.2	19.3
			50	0	100	0	21.5	20.5	20.4	19.2	18.2	18.2
	2665.6	2680.0	1	49	1	0	24.0	23.0	22.1	20.9	20.0	19.1
			50	0	100	0	21.8	20.8	20.8	19.4	18.5	18.5

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 10MHz	2506.0	2520.4	1	99	1	0	25.0	24.0	23.1	22.3	21.3	20.5
			100	0	50	0	22.8	21.8	21.7	20.0	19.1	19.2
	2588.1	2602.5	1	99	1	0	24.4	23.5	22.5	22.0	21.1	20.3
			100	0	50	0	22.2	21.2	21.1	19.8	18.8	19.0
	2670.1	2684.5	1	99	1	0	25.0	24.1	23.2	22.5	21.6	20.9
			100	0	50	0	22.8	21.8	21.8	20.3	19.3	19.4

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 10MHz	2506.0	2520.4	1	99	1	0	24.5	23.6	22.8	21.5	20.6	19.8
			100	0	50	0	22.5	21.5	21.5	19.5	18.5	18.6
	2588.1	2602.5	1	99	1	0	24.2	23.3	22.3	21.4	20.6	19.6
			100	0	50	0	22.0	21.0	20.9	19.2	18.3	18.2
	2670.1	2684.5	1	99	1	0	24.4	23.7	22.6	21.7	20.8	20.1
			100	0	50	0	22.2	21.3	21.1	19.5	18.5	18.6

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 15MHz	2503.5	2518.5	1	74	1	0	24.9	23.9	22.9	22.2	21.1	20.2
			75	0	75	0	22.8	21.8	21.7	20.0	19.0	19.1
	2585.5	2600.5	1	74	1	0	24.4	23.4	22.3	22.0	20.9	20.0
			75	0	75	0	22.1	21.2	21.0	19.7	18.8	18.9
	2667.5	2682.5	1	74	1	0	25.0	24.1	23.1	22.5	21.7	20.6
			75	0	75	0	22.8	21.8	21.7	20.1	19.2	19.3

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 15MHz	2503.5	2518.5	1	74	1	0	24.5	23.6	22.5	21.7	20.9	19.9
			75	0	75	0	22.3	21.2	21.2	19.7	18.7	18.8
	2585.5	2600.5	1	74	1	0	23.9	23.1	22.0	21.7	20.9	19.7
			75	0	75	0	21.7	20.7	20.6	19.5	18.5	18.5
	2667.5	2682.5	1	74	1	0	24.2	23.4	22.2	21.6	21.2	20.1
			75	0	75	0	21.9	21.0	20.9	19.8	18.8	18.8

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 20MHz	2503.8	2520.9	1	74	1	0	25.0	23.9	23.0	22.4	21.3	20.3
			75	0	100	0	22.8	21.8	21.8	20.1	19.2	19.3
	2583.3	2600.4	1	74	1	0	24.4	23.4	22.4	22.2	21.2	20.1
			75	0	100	0	22.2	21.2	21.2	19.8	18.9	19.0
	2662.9	2680.0	1	74	1	0	25.0	24.1	23.1	22.5	21.6	20.8
			75	0	100	0	22.9	21.9	21.8	20.3	19.4	19.5

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 20MHz	2503.8	2520.9	1	74	1	0	24.5	22.1	22.5	21.7	21.1	20.1
			75	0	100	0	22.1	21.2	21.1	19.7	18.7	18.7
	2583.3	2600.4	1	74	1	0	24.0	23.2	22.1	21.6	20.8	19.7
			75	0	100	0	21.8	20.8	20.7	19.5	18.5	18.5
	2662.9	2680.0	1	74	1	0	24.2	23.4	22.3	21.6	21.2	20.1
			75	0	100	0	22.0	21.0	21.0	19.8	18.8	18.8

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 15MHz	2506.0	2523.1	1	99	1	0	25.0	24.0	23.0	22.3	21.3	20.6
			100	0	75	0	22.7	21.8	21.6	20.2	19.2	19.3
	2585.6	2602.7	1	99	1	0	24.3	23.4	22.2	22.0	21.2	20.3
			100	0	75	0	22.1	21.2	21.0	19.9	19.0	19.1
	2665.1	2682.2	1	99	1	0	25.0	24.1	23.1	22.5	21.7	21.0
			100	0	75	0	22.8	21.8	21.7	20.4	19.4	19.5

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 15MHz	2506.0	2523.1	1	99	1	0	24.5	23.8	22.7	21.7	20.8	19.9
			100	0	75	0	22.5	21.4	21.3	19.7	18.7	18.7
	2585.6	2602.7	1	99	1	0	24.1	23.2	22.1	21.6	20.7	19.8
			100	0	75	0	21.9	21.0	20.9	19.5	18.5	18.5
	2665.1	2682.2	1	99	1	0	24.3	23.5	22.6	21.6	21.1	20.3
			100	0	75	0	22.2	21.2	21.1	19.8	18.8	18.8

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

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 1			Ant 2		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz/ 20MHz	2506.0	2525.8	1	99	1	0	25.0	24.1	23.1	22.5	21.7	20.7
			1	0	1	99	16.1	16.3	16.2	13.7	14.0	14.0
			100	0	100	0	22.9	21.9	21.8	20.3	19.4	19.4
	2583.1	2602.9	1	99	1	0	24.4	23.4	22.4	22.3	21.4	20.5
			1	0	1	99	15.4	15.5	15.3	13.5	13.8	13.7
			100	0	100	0	22.2	21.2	21.0	20.0	19.1	19.1
	2660.2	2680.0	1	99	1	0	25.0	24.1	23.2	22.7	21.8	21.0
			1	0	1	99	16.0	16.0	16.2	13.6	13.8	14.2
			100	0	100	0	22.8	21.8	21.7	20.4	19.5	19.5
			100	0	100	0	22.8	21.8	21.7	20.4	19.5	19.5

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
			Size	Offset	Size	Offset	Ant 3			Ant 4		
							QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz/ 20MHz	2506.0	2525.8	1	99	1	0	24.5	23.3	22.7	21.7	20.8	20.0
			1	0	1	99	15.4	15.4	15.5	12.7	12.8	13.0
			100	0	100	0	22.2	21.3	21.3	19.6	18.6	18.6
	2583.1	2602.9	1	99	1	0	24.1	23.3	22.2	21.6	20.8	19.9
			1	0	1	99	15.3	15.3	15.2	12.9	13.1	13.1
			100	0	100	0	22.0	20.9	20.8	19.5	18.5	18.6
	2660.2	2680.0	1	99	1	0	24.3	23.5	22.5	21.9	21.2	20.3
			1	0	1	99	15.4	15.5	15.6	13.0	13.1	13.6
			100	0	100	0	22.2	21.1	21.1	19.8	18.8	18.8
			100	0	100	0	22.2	21.1	21.1	19.8	18.8	18.8

8. CONDUCTED TEST RESULTS

8.1. OCCUPIED BANDWIDTH

RULE PART(S)

§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.

MODES TESTED

- LTE Band 7
- LTE Band 41

RESULTS

There is no limit required and power is the same for low, middle and high channel; therefore, only middle channel was tested

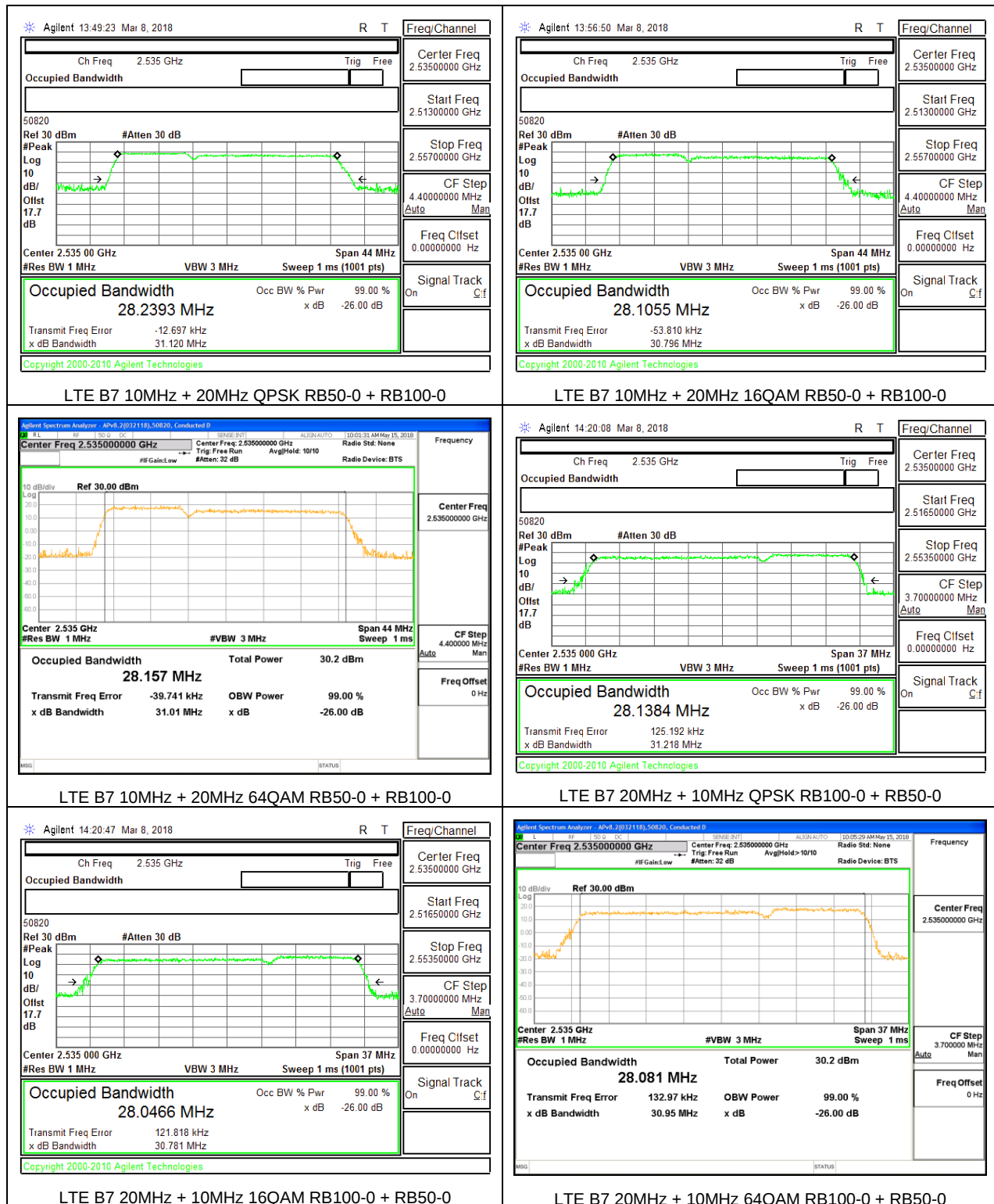
LTE BAND 7

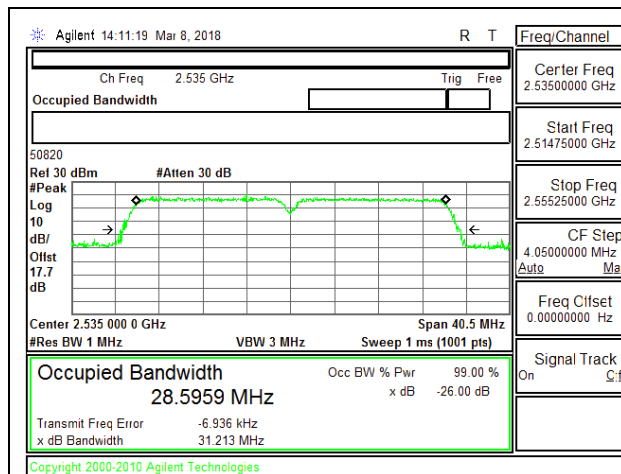
Band	Mode	RB Allocation/RB Offset	f (MHz)	99% BW (MHz)	- 26dB BW (MHz)
LTE BAND 7	10MHz + 20MHz BAND OPSK	50/0 + 100/0	2535	28.239	31.120
	10MHz + 20MHz BAND 16QAM			28.106	30.796
	10MHz + 20MHz BAND 64QAM			28.157	31.01
	20MHz + 10MHz BAND OPSK	100/0 + 50/0		28.138	31.218
	20MHz + 10MHz BAND 16QAM			28.047	30.781
	20MHz + 10MHz BAND 64QAM			28.081	30.95
	15MHz + 15MHz BAND OPSK	75/0 + 75/0		28.596	31.213
	15MHz + 15MHz BAND 16QAM			28.660	31.393
	15MHz + 15MHz BAND 64QAM			28.674	31.42
	15MHz + 20MHz BAND OPSK	75/0 + 100/0		32.867	36.268
	15MHz + 20MHz BAND 16QAM			32.921	35.961
	15MHz + 20MHz BAND 64QAM			33.008	36.41
	20MHz + 15MHz BAND OPSK	100/0 + 75/0		32.851	35.849
	20MHz + 15MHz BAND 16QAM			32.890	36.078
	20MHz + 15MHz BAND 64QAM			32.965	36.26
	20MHz + 20MHz BAND OPSK	100/0 + 100/0		37.763	41.517
	20MHz + 20MHz BAND 16QAM			37.796	41.470
	20MHz + 20MHz BAND 64QAM			37.807	41.85

LTE BAND 41

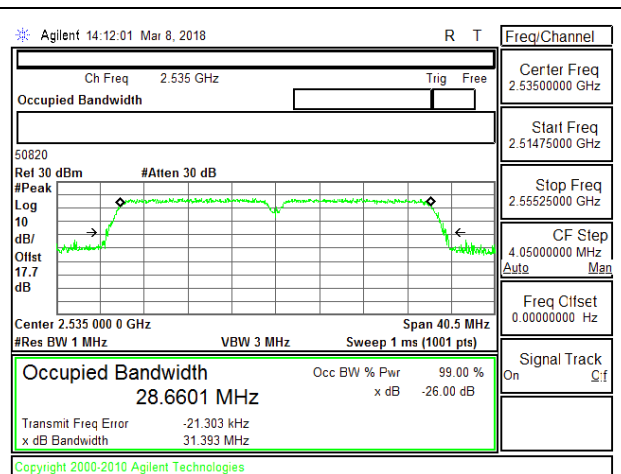
Band	Mode	RB Allocation/RB Offset	f (MHz)	99% BW (MHz)	- 26dB BW (MHz)
LTE BAND 41 (FCC)	5MHz + 20MHz BAND QPSK	25/0 + 100/0	2593	23.322	25.58
	5MHz + 20MHz BAND 16QAM			23.305	25.75
	5MHz + 20MHz BAND 64QAM			23.332	25.43
	20MHz + 5MHz BAND QPSK	100/0 + 25/0		23.400	25.53
	20MHz + 5MHz BAND 16QAM			23.245	25.46
	20MHz + 5MHz BAND 64QAM			23.294	26.21
	10MHz + 20MHz BAND QPSK	50/0 + 100/0		28.097	30.48
	10MHz + 20MHz BAND 16QAM			28.137	30.35
	10MHz + 20MHz BAND 64QAM			28.112	30.60
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.130	30.93
	20MHz + 10MHz BAND 16QAM			28.094	30.28
	20MHz + 10MHz BAND 64QAM			28.146	33.26
	15MHz + 15MHz BAND QPSK	75/0 + 75/0		28.666	30.87
	15MHz + 15MHz BAND 16QAM			28.723	31.40
	15MHz + 15MHz BAND 64QAM			28.631	33.56
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		32.868	35.97
	15MHz + 20MHz BAND 16QAM			32.933	35.64
	15MHz + 20MHz BAND 64QAM			32.971	36.16
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		32.787	35.32
	20MHz + 15MHz BAND 16QAM			32.966	35.73
	20MHz + 15MHz BAND 64QAM			32.922	36.09
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.675	40.61
	20MHz + 20MHz BAND 16QAM			37.730	40.82
	20MHz + 20MHz BAND 64QAM			37.844	48.61

8.1.1. LTE BAND 7

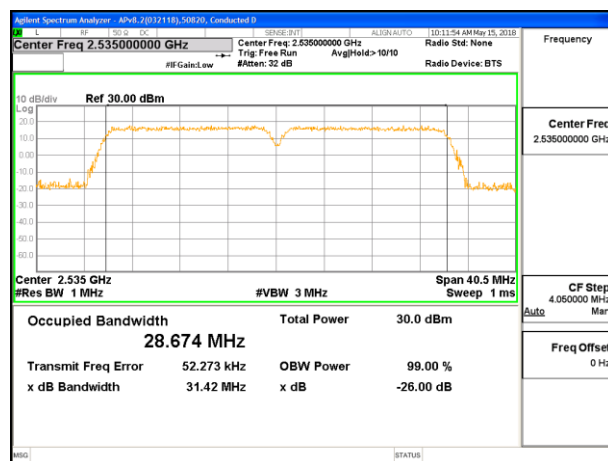




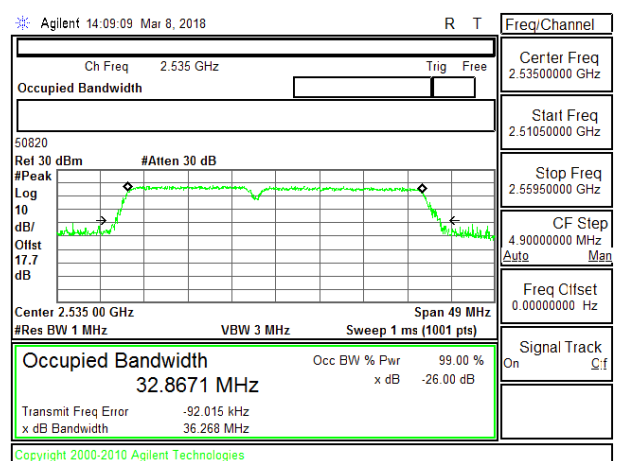
LTE B7 15MHz + 15MHz QPSK RB75-0 + RB75-0



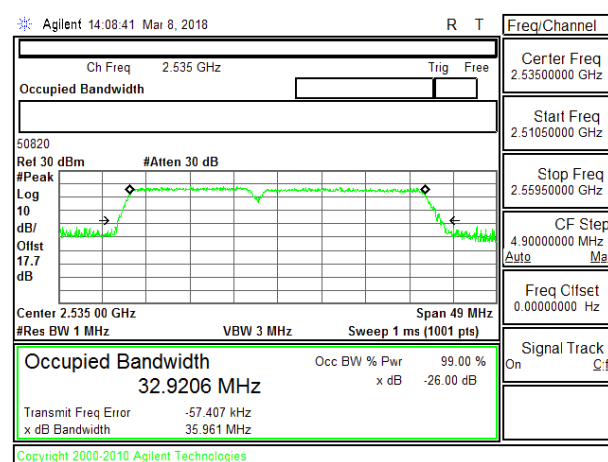
LTE B7 15MHz + 15MHz 16QAM RB75-0 + RB75-0



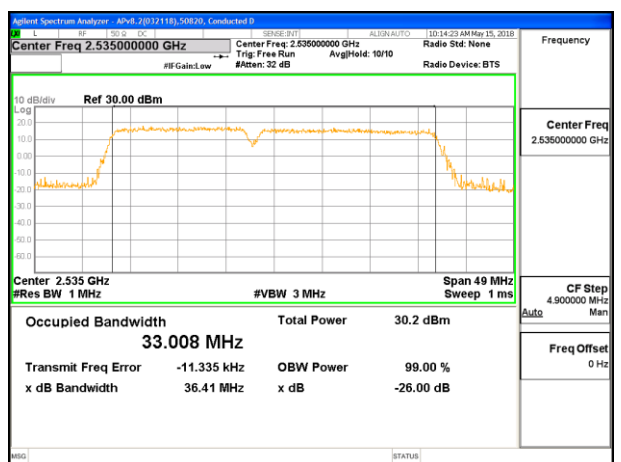
LTE B7 15MHz + 15MHz 64QAM RB75-0 + RB75-0



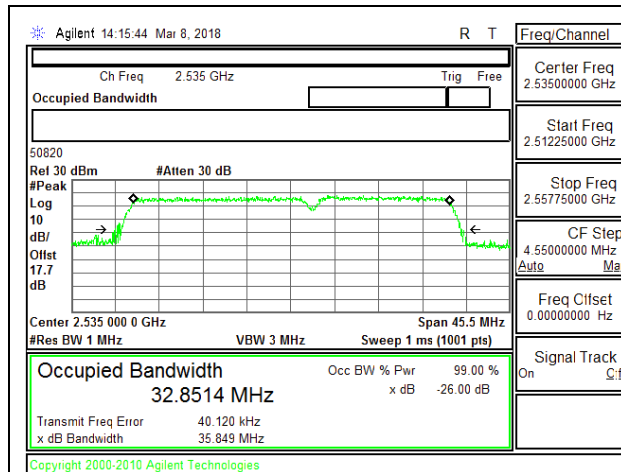
LTE B7 15MHz + 20MHz QPSK RB75-0 + RB100-0



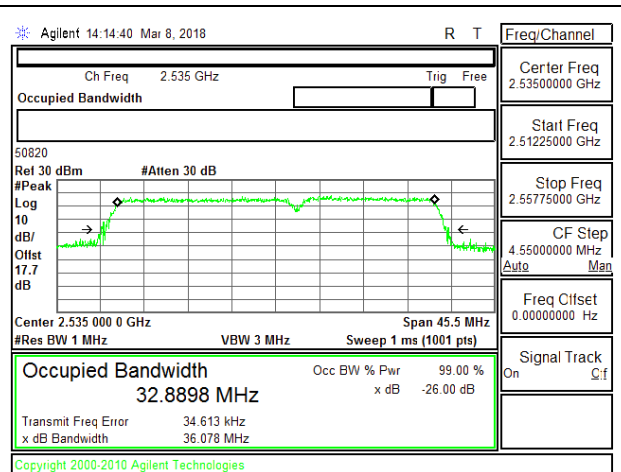
LTE B7 15MHz + 20MHz 16QAM RB75-0 + RB100-0



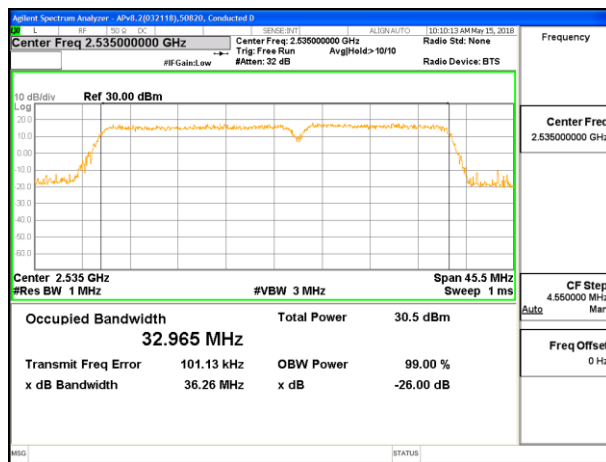
LTE B7 15MHz + 20MHz 64QAM RB75-0 + RB100-0



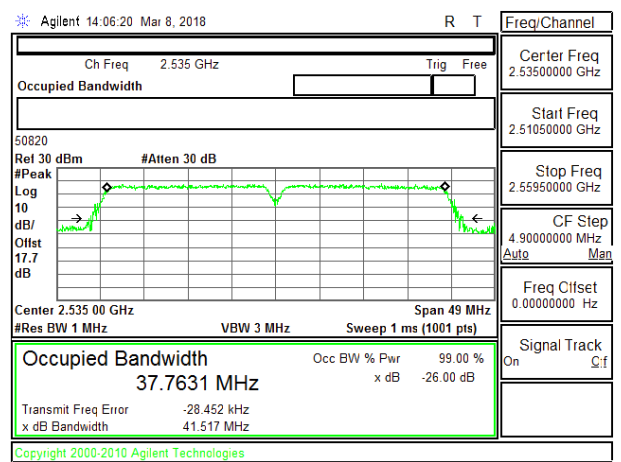
LTE B7 20MHz + 15MHz QPSK RB100-0 + RB75-0



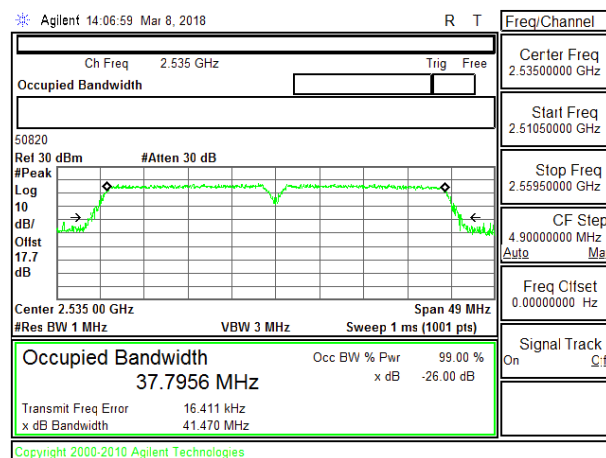
LTE B7 20MHz + 15MHz 16QAM RB100-0 + RB75-0



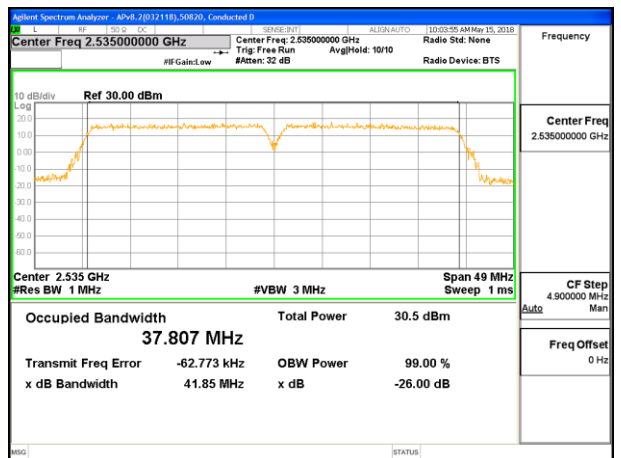
LTE B7 20MHz + 15MHz 64QAM RB100-0 + RB75-0



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



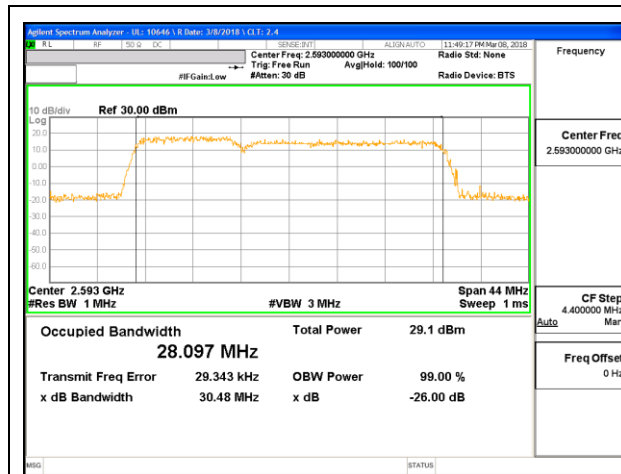
LTE B7 20MHz + 20MHz 16QAM RB100-0 + RB100-0



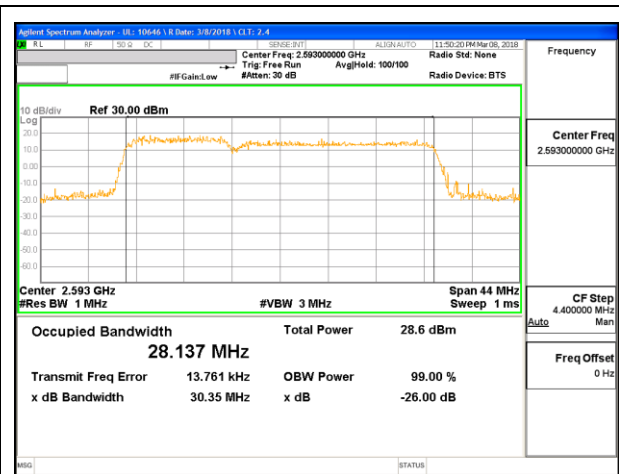
LTE B7 20MHz + 20MHz 64QAM RB100-0 + RB100-0

8.1.2. LTE BAND 41

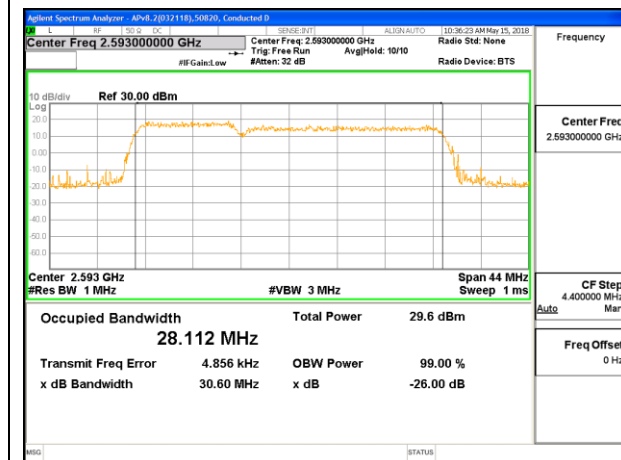




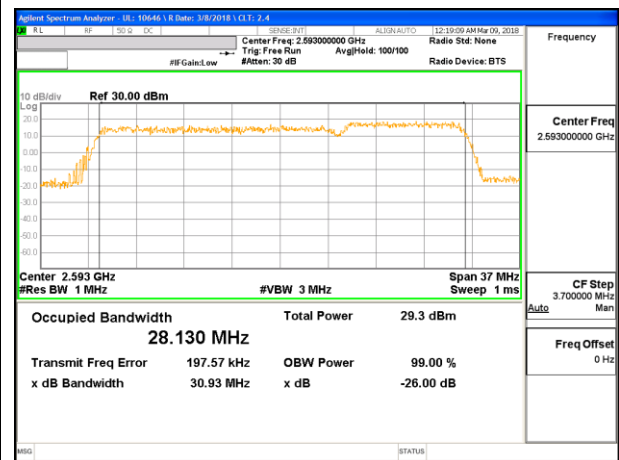
LTE B41 10MHz + 20MHz QPSK RB50-0 + RB100-0



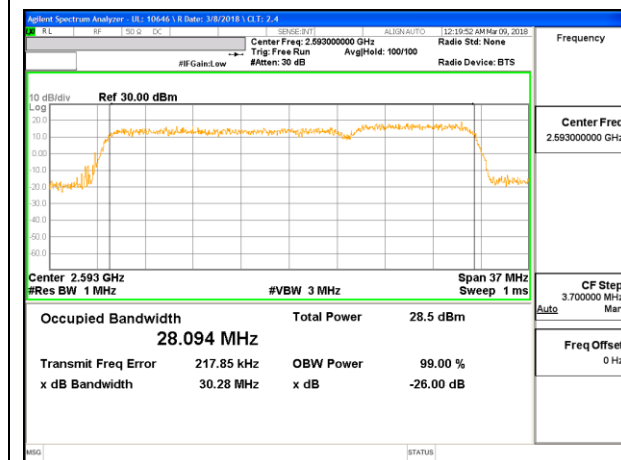
LTE B41 10MHz + 20MHz 16QAM RB50-0 + RB100-0



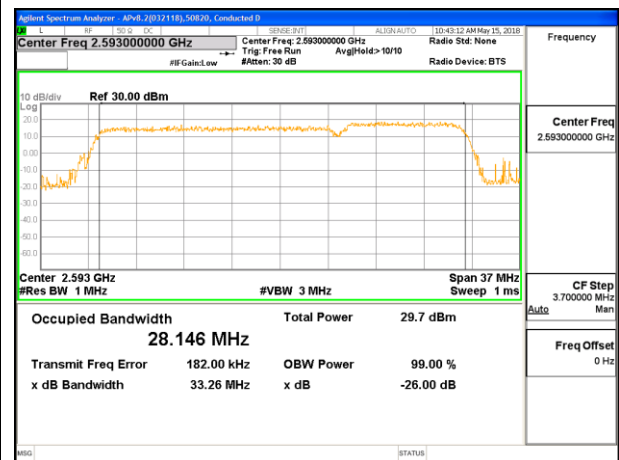
LTE B41 10MHz + 20MHz 64QAM RB50-0 + RB100-0



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



LTE B41 20MHz + 10MHz 16QAM RB100-0 + RB50-0



LTE B41 20MHz + 10MHz 64QAM RB100-0 + RB50-0





8.2. EMISSION MASK

RULE PART(S)

§2.1051, §27.53

LIMITS

§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.

TEST PROCEDURE FOR PART 27

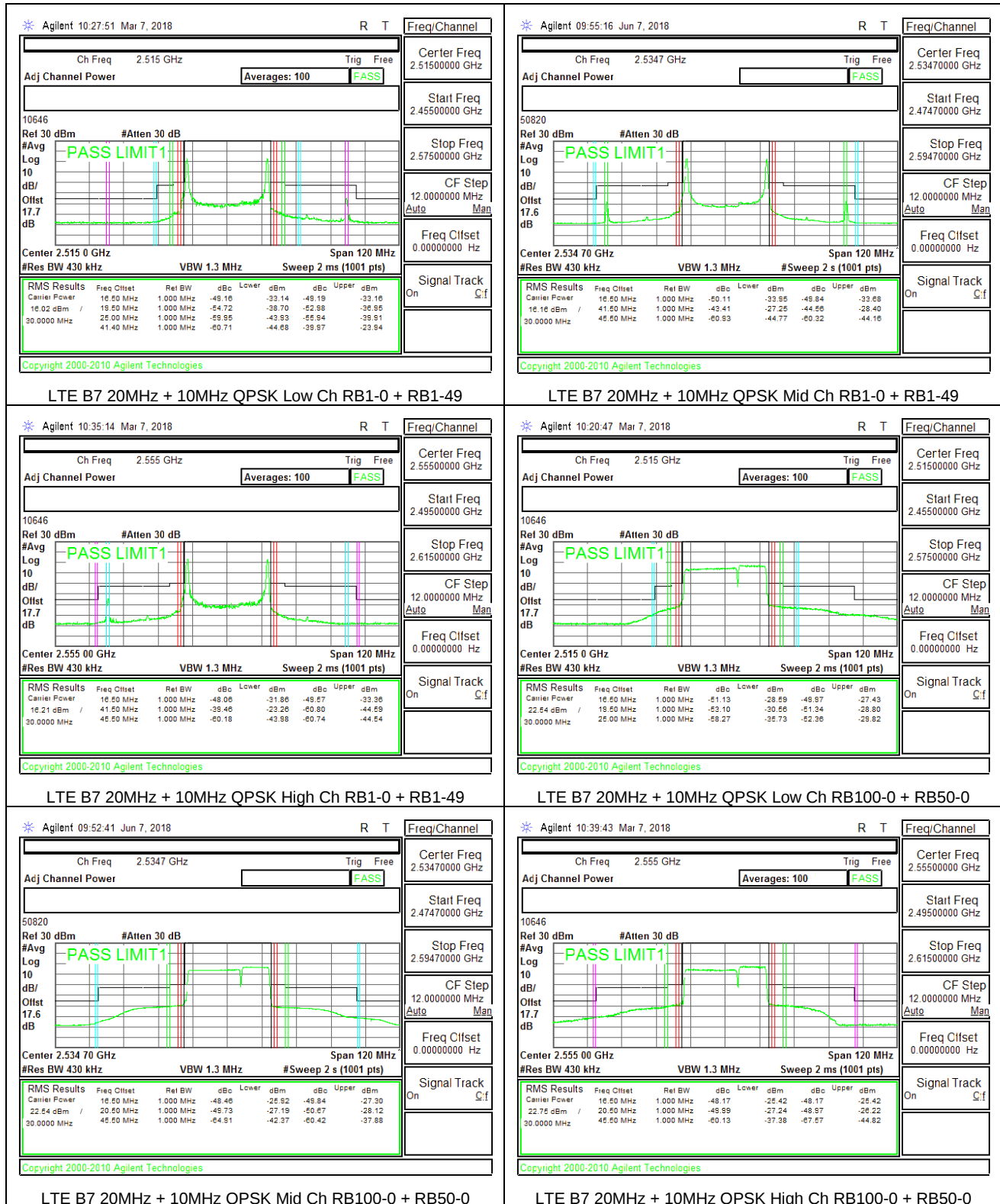
(m)(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of 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.

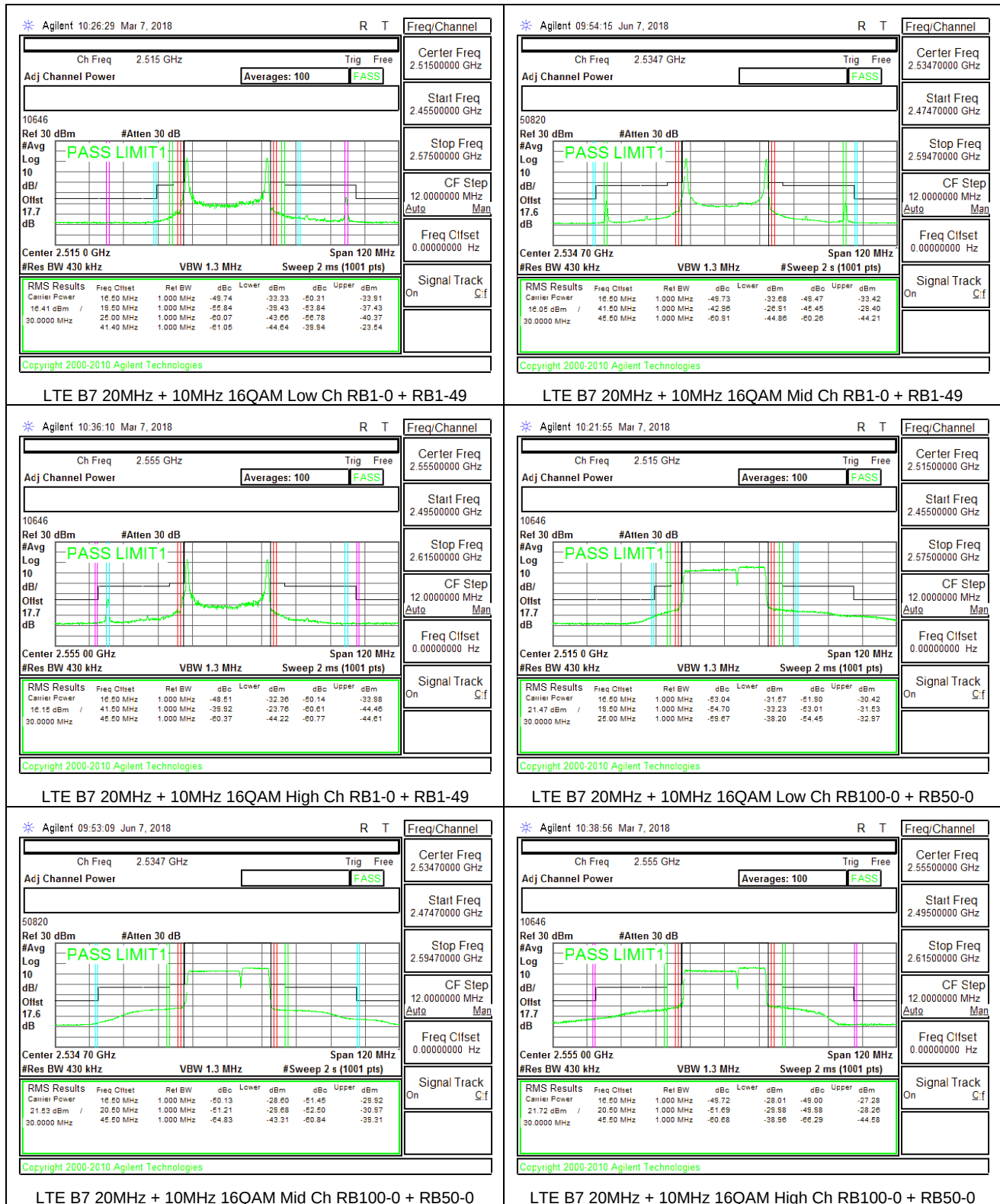
MODES TESTED

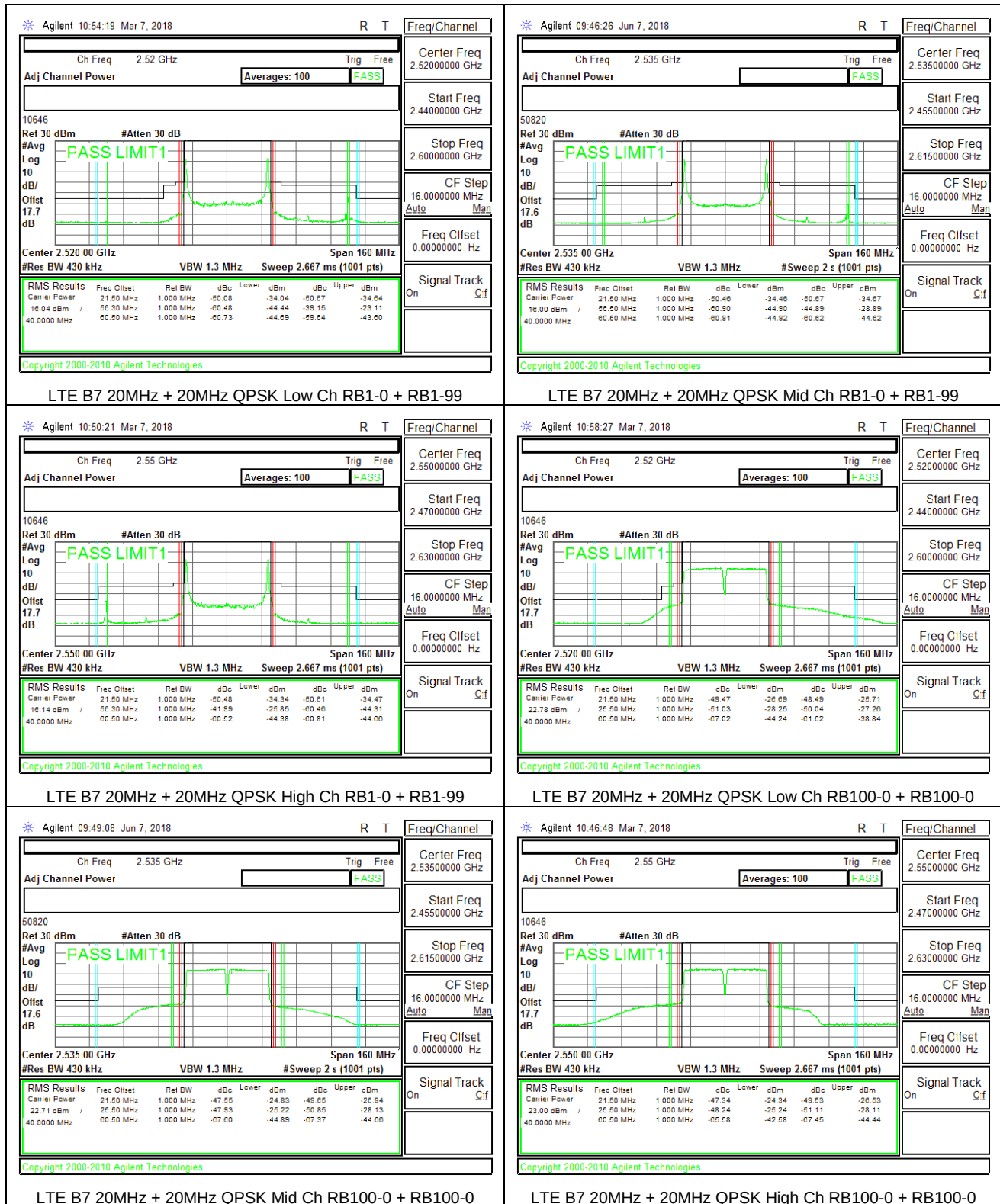
- LTE Band 7
- LTE Band 41

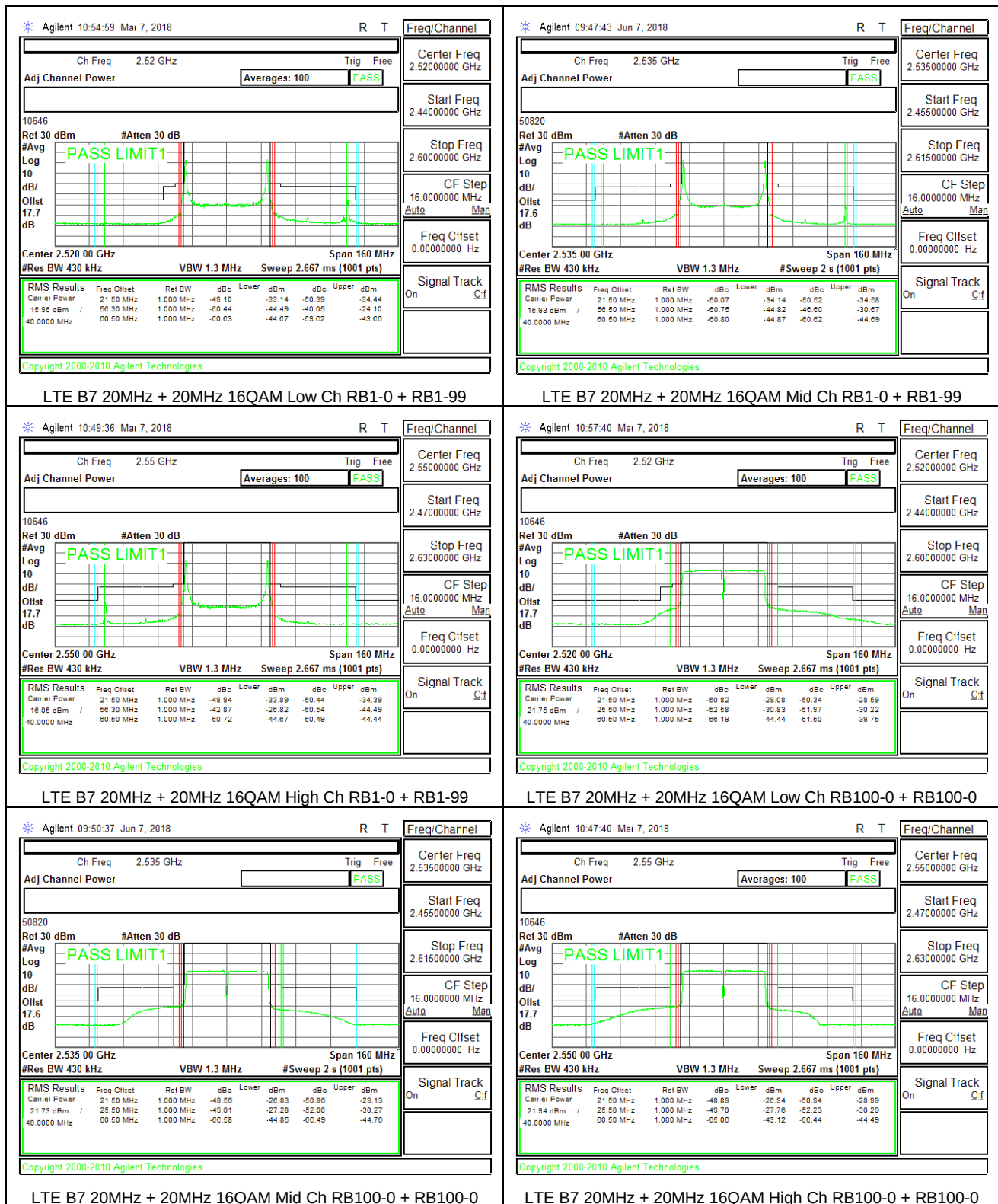
RESULTS

8.2.1. LTE BAND 7

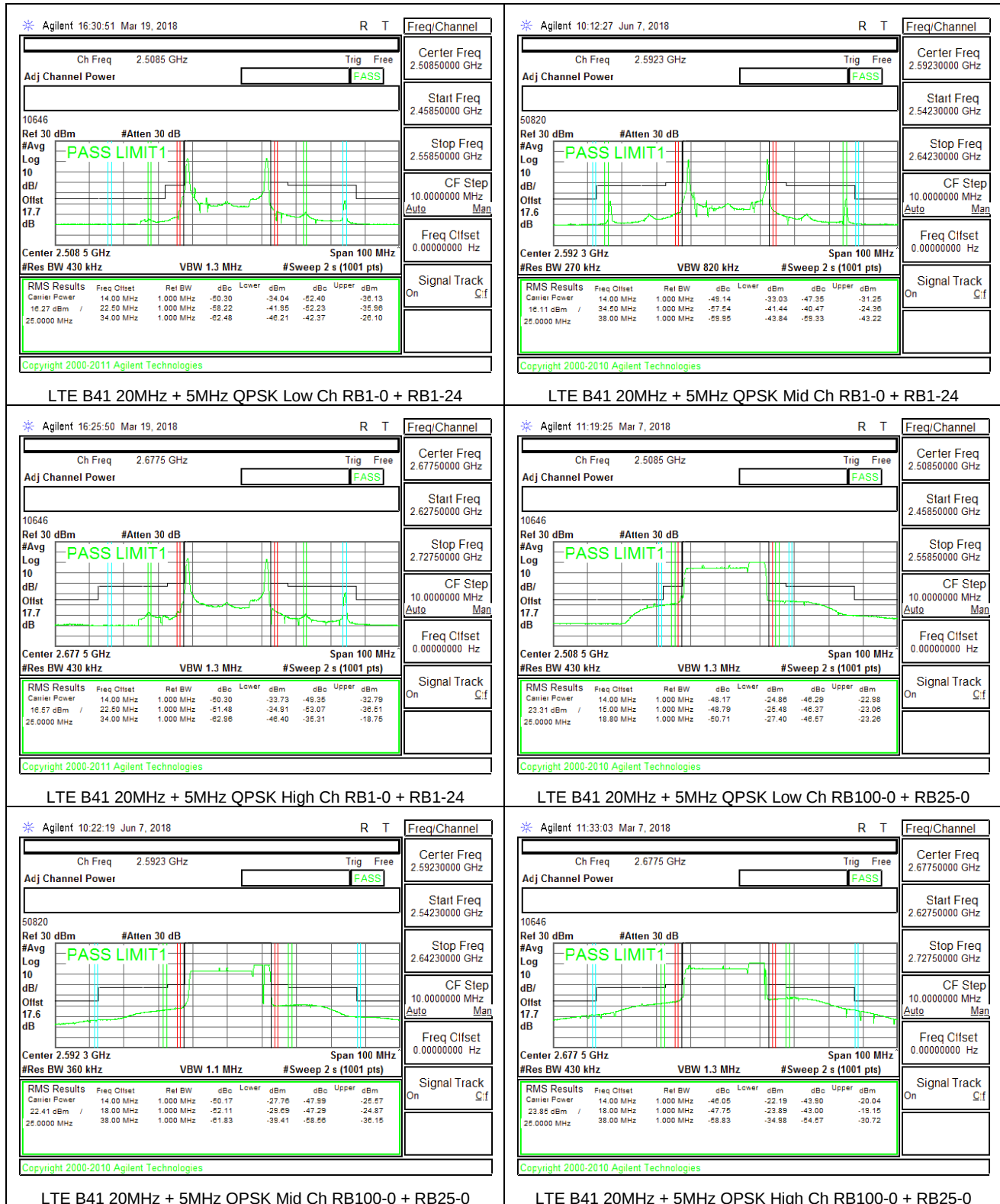


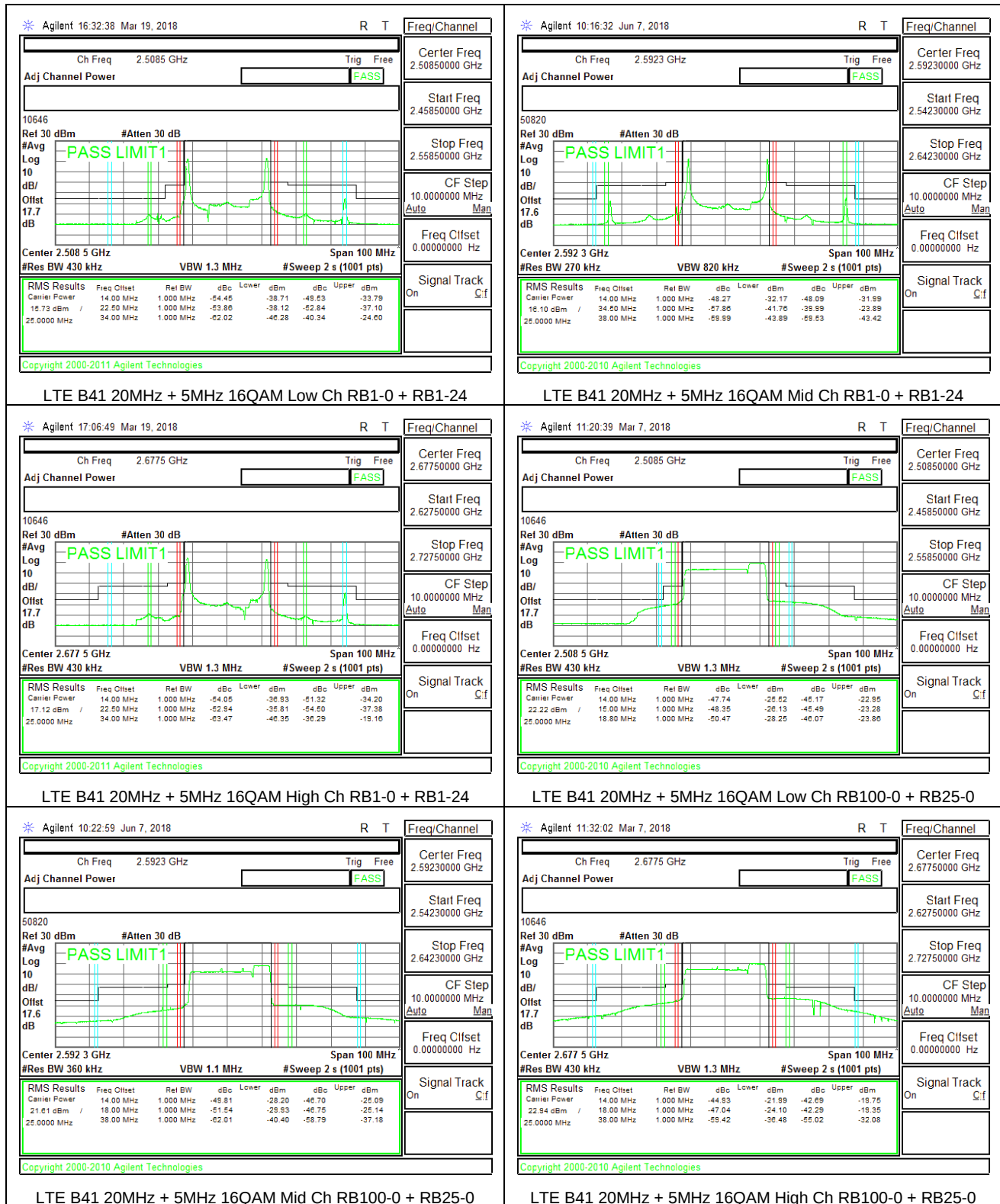


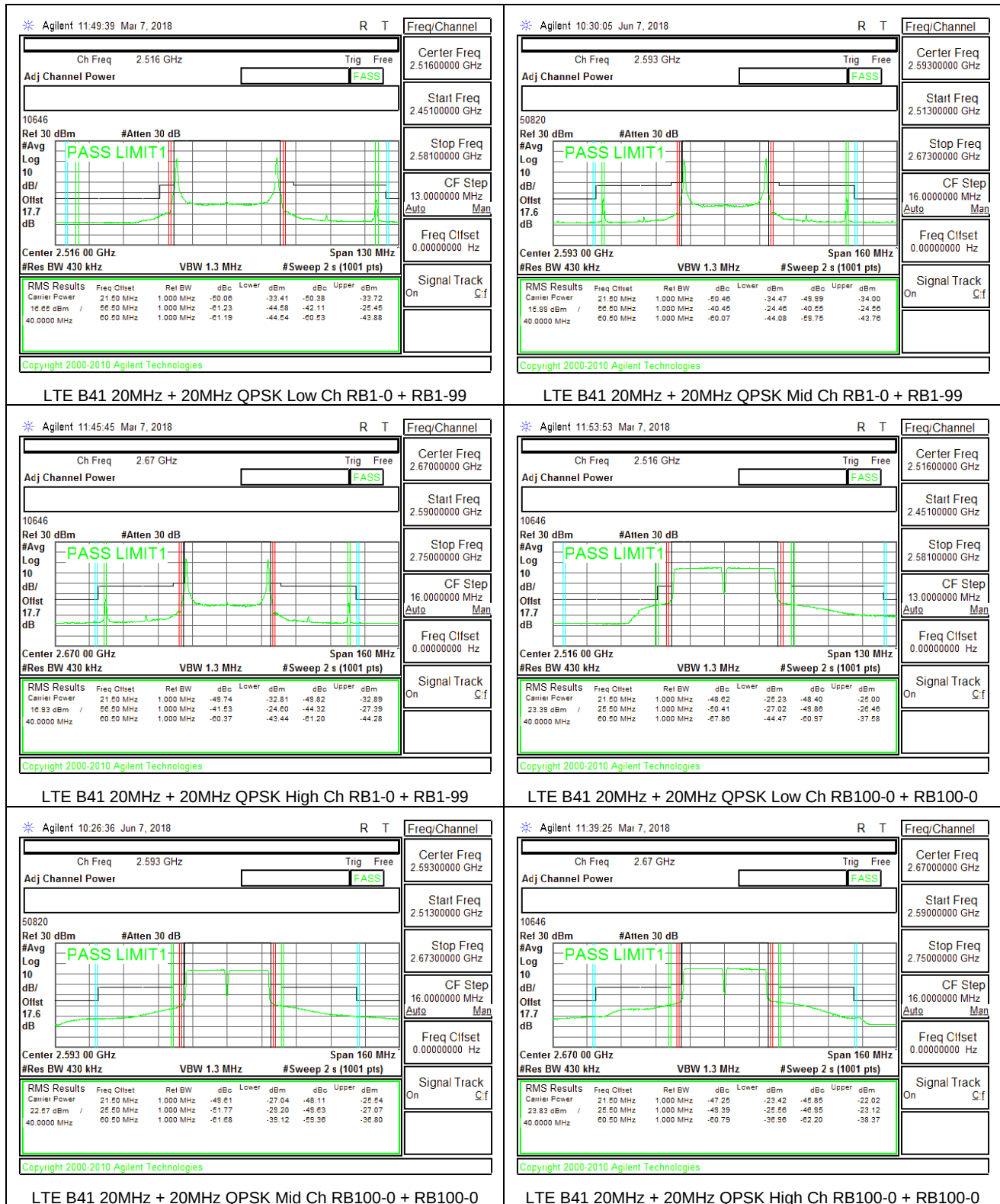


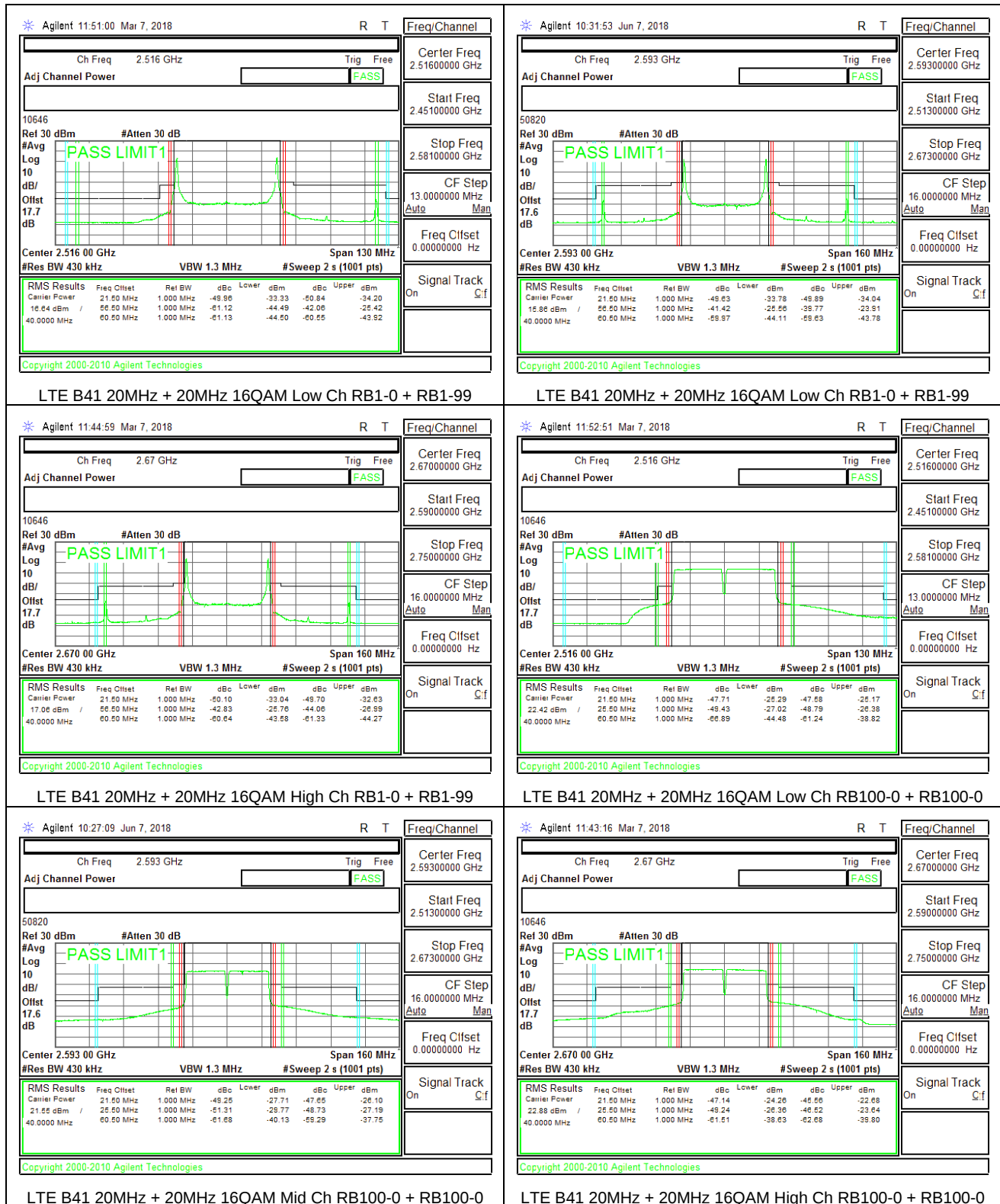


8.2.2. LTE BAND 41









8.3. OUT OF BAND EMISSIONS

RULE PART(S)

§2.1051, §27.53

LIMITS

§27.53 (m)

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

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.

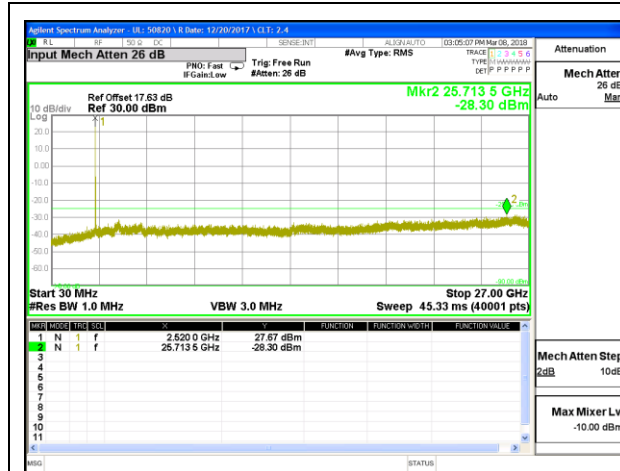
For each out of band emissions measurement:

- Set display line at -25 dBm
- 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)

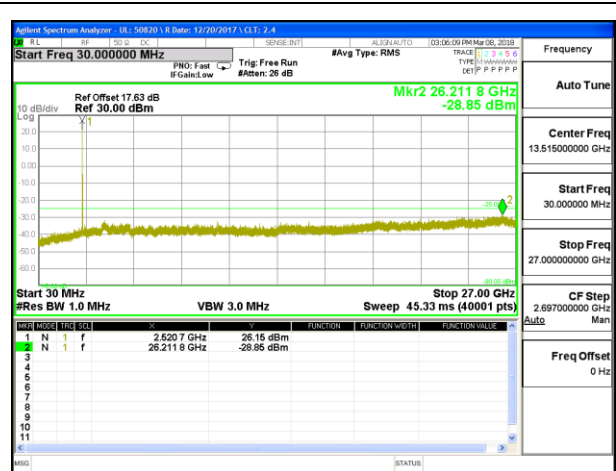
MODES TESTED

- LTE Band 7
- LTE Band 41

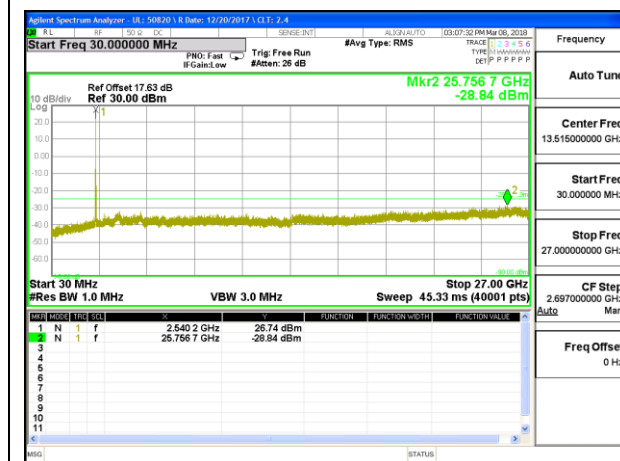
8.3.1. ANT 1, LTE BAND 7



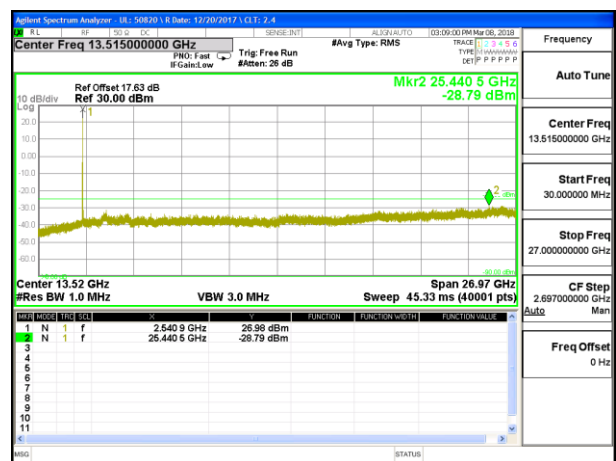
LTE B7 20MHz + 10MHz QPSK Low Ch RB1-99 + RB1-0



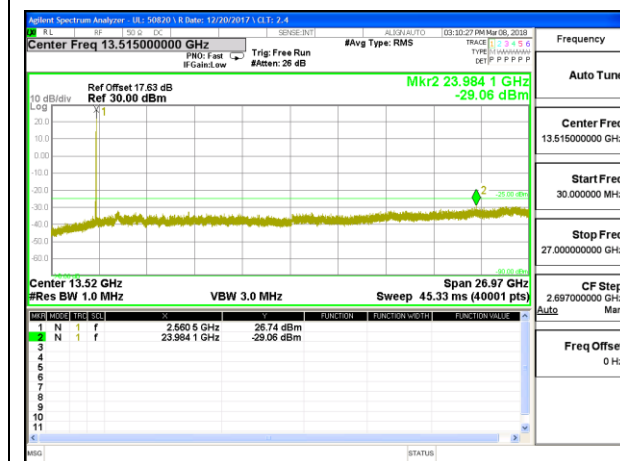
LTE B7 20MHz + 10MHz 16QAM Low Ch RB1-99 + RB1-0



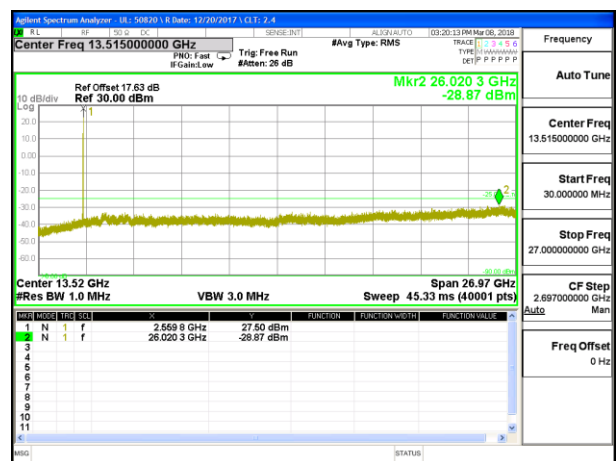
LTE B7 20MHz + 10MHz QPSK Middle Ch RB1-99 + RB1-0



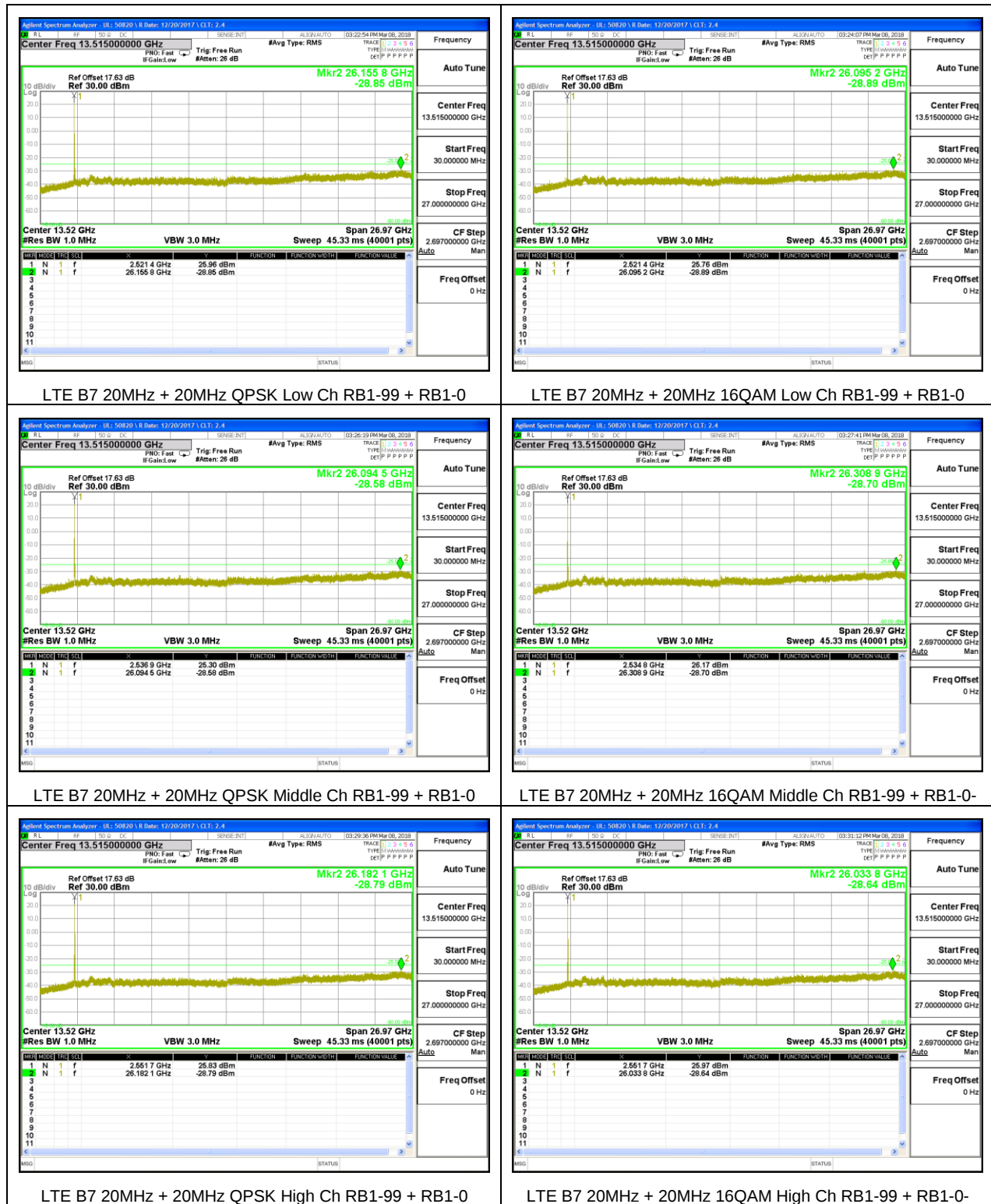
LTE B7 20MHz + 10MHz 16QAM Middle Ch RB1-99 + RB1-0



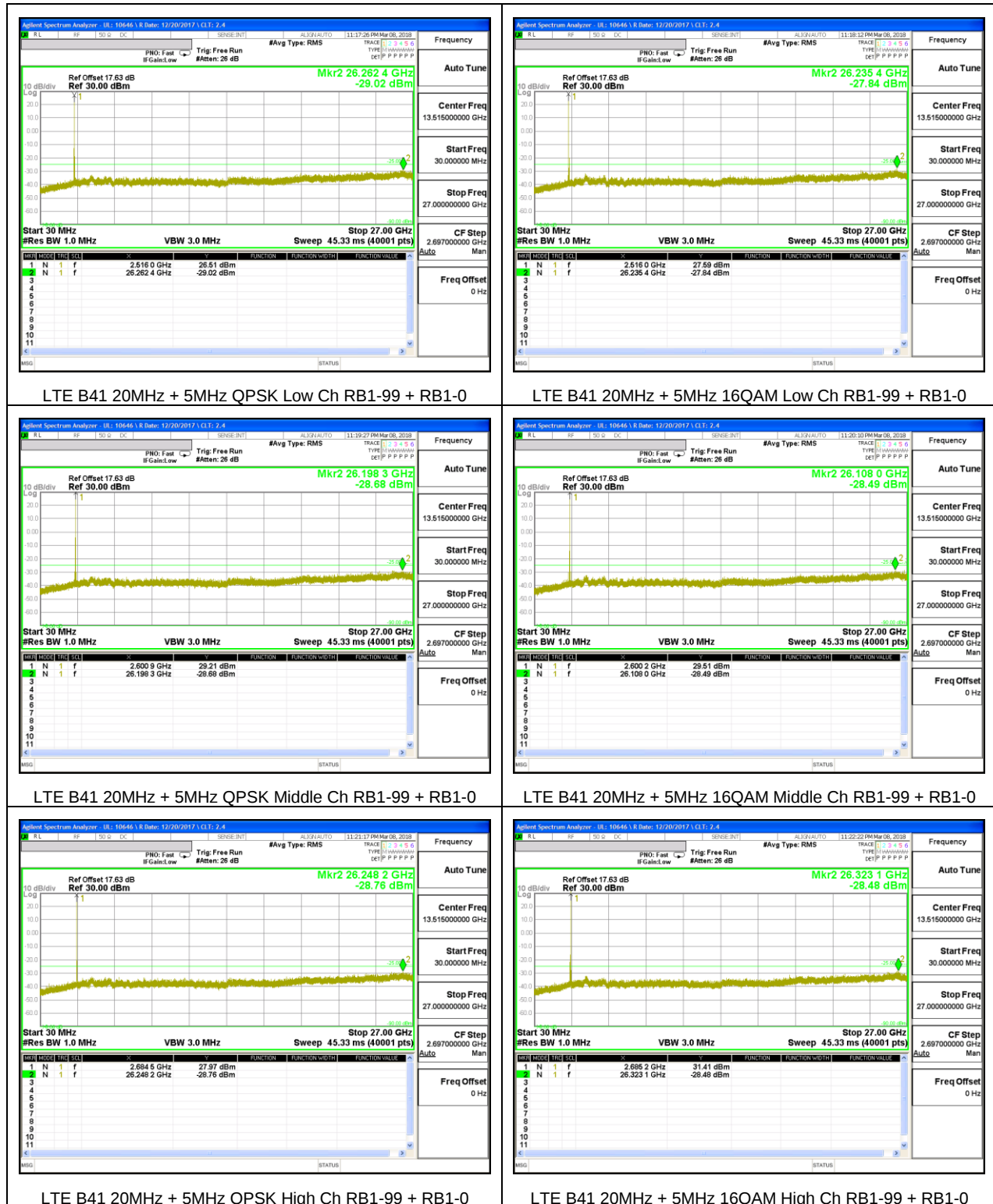
LTE B7 20MHz + 10MHz QPSK High Ch RB1-99 + RB1-0

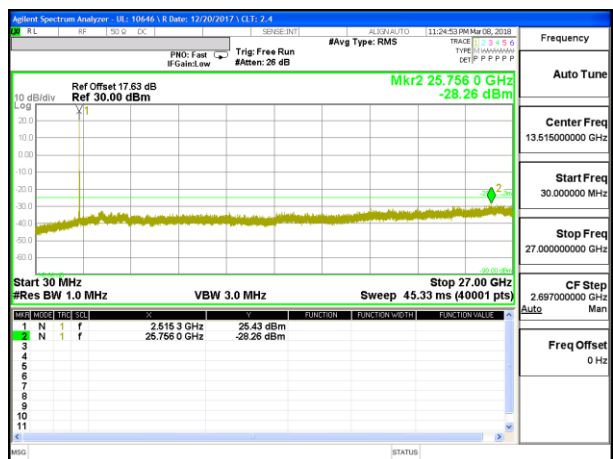


LTE B7 20MHz + 10MHz 16QAM High Ch RB1-99 + RB1-0

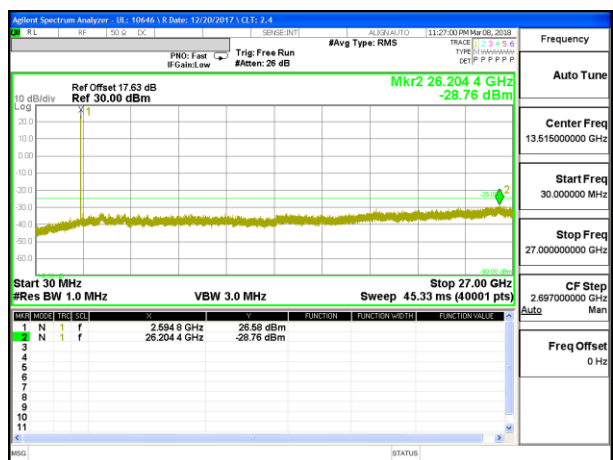


8.3.2. ANT 1, LTE BAND 41

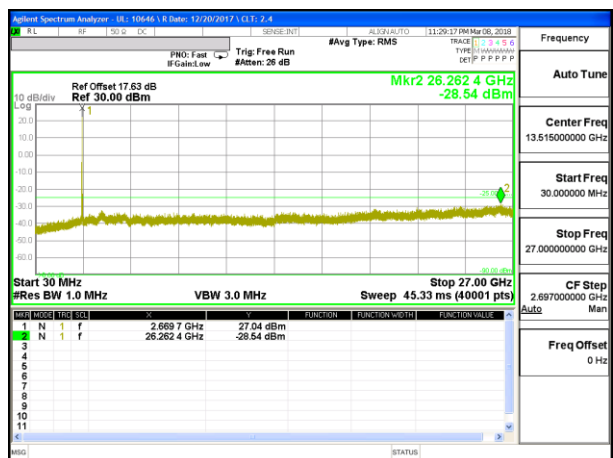




LTE B41 20MHz + 20MHz 16QAM Low Ch RB1-99 + RB1-0



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



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

8.4. FREQUENCY STABILITY

RULE PART(S)

§2.1055, §27.54

LIMITS

FCC: §27.54

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

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).

MODES TESTED

- LTE Band 7
- LTE Band 41

RESULTS

See the following pages.

8.4.1. LTE BAND 7

ID:	44353	Date:	3/26/18
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QPSK, (20MHz + 10MHz BANDWIDTH)

Limit		2500	2570	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2501.1289	2568.8729		
Extreme (50C)		2501.1289	2568.8729	79.7	0.031
Extreme (40C)		2501.1289	2568.8729	159.4	0.063
Extreme (30C)		2501.1289	2568.8729	123.8	0.049
Extreme (10C)		2501.1289	2568.8729	128.3	0.051
Extreme (0C)		2501.1289	2568.8729	115.9	0.046
Extreme (-10C)		2501.1289	2568.8729	78.1	0.031
Extreme (-20C)		2501.1289	2568.8729	128.8	0.051
Extreme (-30C)		2501.1289	2568.8729	126.8	0.050
20C	15%	2501.1289	2501.1289	47.0	0.019
	-15%	2501.1289	2501.1289	44.3	0.017
	End Point	2501.1289	2501.1289	44.5	0.018

QPSK, (20MHz + 20MHz BANDWIDTH)

Limit		2500	2570	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2501.1280	2569.3387		
Extreme (50C)		2501.1281	2569.3388	81.3	0.032
Extreme (40C)		2501.1281	2569.3388	87.6	0.035
Extreme (30C)		2501.1281	2569.3388	80.8	0.032
Extreme (10C)		2501.1281	2569.3388	91.1	0.036
Extreme (0C)		2501.1281	2569.3388	103.1	0.041
Extreme (-10C)		2501.1281	2569.3388	110.3	0.043
Extreme (-20C)		2501.1279	2569.3386	-79.9	-0.031
Extreme (-30C)		2501.1281	2569.3388	119.1	0.047
20C	15%	2501.1281	2569.3388	57.8	0.023
	-15%	2501.1281	2569.3388	52.9	0.021
	End Point	2501.1281	2569.3388	52.9	0.021

8.4.2. LTE BAND 41

ID:	44353	Date:	3/26/18
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QPSK, (20MHz + 5MHz BANDWIDTH)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2497.0473	2689.3197		
Extreme (50C)		2497.0474	2689.3197	67.6	0.026
Extreme (40C)		2497.0473	2689.3197	59.9	0.023
Extreme (30C)		2497.0473	2689.3197	50.2	0.019
Extreme (10C)		2497.0473	2689.3197	46.1	0.018
Extreme (0C)		2497.0472	2689.3196	-53.9	-0.021
Extreme (-10C)		2497.0472	2689.3196	-45.5	-0.018
Extreme (-20C)		2497.0472	2689.3196	-41.1	-0.016
Extreme (-30C)		2497.0472	2689.3196	-40.4	-0.016
20C	15%	2497.0472	2689.3196	-70.4	-0.027
	-15%	2497.0472	2689.3196	-80.4	-0.031
	End Point	2497.0472	2689.3196	-70.0	-0.027

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	2497.1253	2688.9022		
Extreme (50C)		2497.1254	2688.9023	104.9	0.040
Extreme (40C)		2497.1254	2688.9023	114.6	0.044
Extreme (30C)		2497.1254	2688.9023	107.1	0.041
Extreme (10C)		2497.1253	2688.9023	59.4	0.023
Extreme (0C)		2497.1252	2688.9022	-69.4	-0.027
Extreme (-10C)		2497.1252	2688.9021	-80.7	-0.031
Extreme (-20C)		2497.1252	2688.9021	-94.8	-0.037
Extreme (-30C)		2497.1252	2688.9022	-67.4	-0.026
20C	15%	2497.1252	2688.9021	-114.6	-0.044
	-15%	2497.1251	2688.9021	-123.1	-0.047
	End Point	2497.1252	2688.9021	-105.4	-0.041