



CERTIFICATION TEST REPORT

Report Number. : 12204512-E9V2

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

Model : A2101

FCC ID : BCG-E3234A

EUT Description : SMARTPHONE

Test Standard(s) : CFR47 PART 27

Date Of Issue:
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Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888



NVLAP LAB CODE 200065-0

Revision History

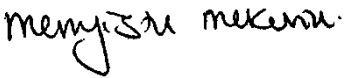
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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA. 95014, U.S.A.		
Model	A2101		
FCC ID	BCG-E3234A		
EUT Description	SMARTPHONE		
Serial Number	C39WJ001K3XV		
Date Tested	MARCH 30, 2018 to JULY 27, 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 Project 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, TIA-603-E, FCC CFR 47 Part 2, FCC KDB 971168 D01 v03r01/ D02 v02r01, Part 27. ANSI C63.26:2015

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

FCC: §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.

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

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 7

Part 27								
EIRP Limit (W)		2.00						
Antenna Gain (dBi)		-4.50						
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	20.50	0.112	28300	28M3G7W
	16QAM			24.2	19.70	0.093	28248	28M2D7W
	64QAM			22.9	18.40	0.069	28203	28M2D7W
20+10	QPSK	2510.0	2564.5	25.0	20.50	0.112	28230	28M2G7W
	16QAM			24.1	19.60	0.091	28245	28M2D7W
	64QAM			22.6	18.10	0.065	28190	28M2D7W
15+15	QPSK	2507.5	2562.5	25.0	20.50	0.112	28813	28M8G7W
	16QAM			24.1	19.60	0.091	28806	28M8D7W
	64QAM			22.8	18.30	0.068	28710	28M7D7W
15+20	QPSK	2507.8	2560.0	25.0	20.50	0.112	33061	33M1G7W
	16QAM			24.1	19.60	0.091	33026	33M0D7W
	64QAM			22.9	18.40	0.069	33038	33M0D7W
20+15	QPSK	2510.0	2562.2	24.9	20.40	0.110	33094	33M1G7W
	16QAM			24.0	19.50	0.089	32978	33M0D7W
	64QAM			22.5	18.00	0.063	32956	33M0D7W
20+20	QPSK	2510.0	2560.0	25.0	20.50	0.112	37985	38M0G7W
	16QAM			24.1	19.60	0.091	37911	37M9D7W
	64QAM			22.9	18.40	0.069	37842	37M8D7W

OUTPUT POWER FOR LTE BAND 41

Part 27								
EIRP Limit (W)		2.00						
Antenna Gain (dBi)		-4.50						
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	20.50	0.112	23528	23M5G7W
	16QAM			24.0	19.50	0.089	23467	23M5D7W
	64QAM			22.8	18.30	0.068	23558	23M6D7W
20+5	QPSK	2506.0	2686.7	25.0	20.50	0.112	23579	23M6G7W
	16QAM			24.1	19.60	0.091	23433	23M4D7W
	64QAM			23.0	18.50	0.071	23381	23M4D7W
10+20	QPSK	2501.5	2680.0	25.0	20.50	0.112	28410	28M4G7W
	16QAM			24.0	19.50	0.089	28280	28M3D7W
	64QAM			23.0	18.50	0.071	28252	28M3D7W
20+10	QPSK	2506.0	2684.5	25.0	20.50	0.112	28267	28M3G7W
	16QAM			24.1	19.60	0.091	28176	28M2D7W
	64QAM			23.0	18.50	0.071	28181	28M2D7W
15+15	QPSK	2503.5	2682.5	25.0	20.50	0.112	28918	28M9G7W
	16QAM			24.2	19.70	0.093	28716	28M7D7W
	64QAM			22.9	18.40	0.069	28824	28M8D7W
15+20	QPSK	2503.8	2680.0	25.0	20.50	0.112	33185	33M2G7W
	16QAM			24.0	19.50	0.089	32948	32M9D7W
	64QAM			22.9	18.40	0.069	33017	33M0D7W
20+15	QPSK	2506.0	2682.2	25.0	20.50	0.112	33044	33M0G7W
	16QAM			24.1	19.60	0.091	33006	33M0D7W
	64QAM			23.0	18.50	0.071	33030	33M0D7W
20+20	QPSK	2506.0	2680.0	25.0	20.50	0.112	37962	38M0G7W
	16QAM			24.1	19.60	0.091	37929	37M9D7W
	64QAM			23.1	18.60	0.072	37961	38M0D7W

5.3. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 00.28.02.

5.4. MAXIMUM ANTENNA GAIN

Please see table below:

LTE Bands	Ant 1 Gain (dBi)	Ant 2 Gain (dBi)	Ant 3 Gain (dBi)	Ant 4 Gain (dBi)
LTE Band 7, 2500 – 2570 MHz	-4.5	-4.9	-4.0	-2.6
LTE Band 41, 2496 – 2690 MHz (FCC)	-4.5	-4.9	-4.0	-2.1

5.5. WORST-CASE CONFIGURATION AND MODE

The EUT supports LTE dual carrier Bands of: Band 7, Band 38 and Band 41.

Band 38 is covered by band 41. Since band 38 is subset of band 41 and both bands are having the same target power,.

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 and 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 within 20dB of the limit.

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

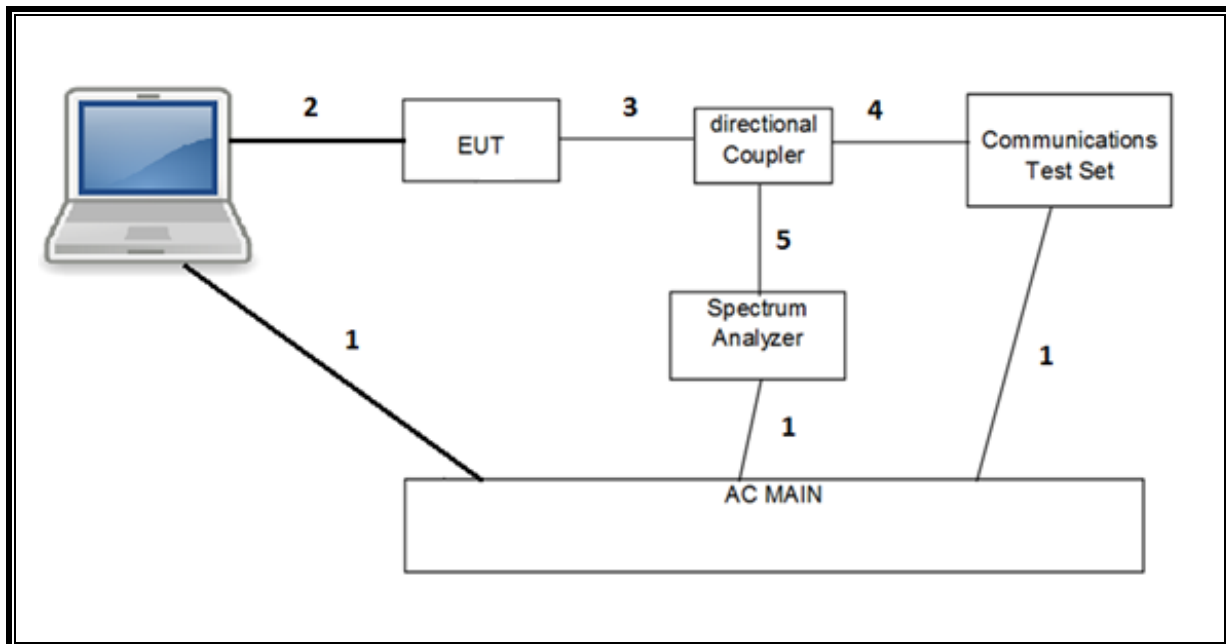
I/O CABLES (RF Conducted Test)

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

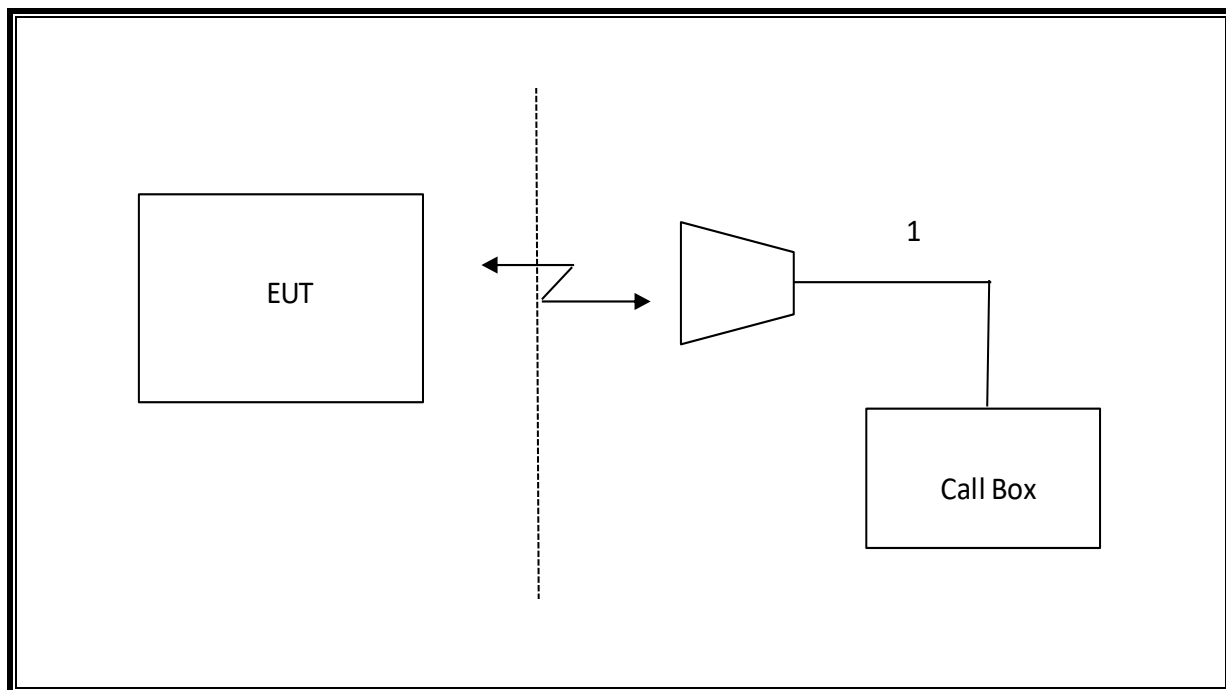
I/O CABLES (RF Radiated Test)

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 to 2000MHz	Sunol Sciences	JB3	T243	11/02/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T742	12/04/2018
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T285	07/06/2019
Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent	N9030A	T907	02/07/2019
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 44GHz	Keysight	N9030A-544	T341	11/12/2018
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T346	04/03/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T906	02/16/2019
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	T185	04/19/2019
*Amplifier, 1 to 18GHz, 35dB	Amplical	AMP1G18-35	T1569	05/31/2018
*Filter, HPF 1.2GHz	MICROTRONICS	WHKX1.2/15G-6ST	T1182	06/1/2018
Filter, HPF 4GHz	MICROTRONICS	HPM13351	T1239	08/11/2018
Filter, HPF 3.0GHz	MICROTRONICS	HPM17543	T487	12/04/2018
Power Meter, P-series single channel	Keysight	N1912A	T1272	05/1/2019
Power Sensor	Keysight	N1921A	T1225	04/10/2019
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T1154	09/05/2018
Wideband Communication Test Set	Rohde & Schwarz	CMW500	T1871	02/19/2019
Wideband Communication Test Set	Rohde & Schwarz	CMW500	T979	02/17/2019
Wideband Communication Test Set	Rohde & Schwarz	CMW500	T959	02/17/2019
*Wideband Communication Test Set	Rohde & Schwarz	CMW500	T956	06/22/2018
Antenna, Active Loop 9KHz to 30MHz	ETS-Lindgren	6502	T757	09/14/2018
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 1.7, November 2015	
Power Measurement Software	UL	UL RF	Ver 2.2, June 2017	

Note: *Testing is completed before equipment expiration date

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:	5/1/18
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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	24.2	22.9	19.9	19.0	18.1
			50	0	100	0	22.8	21.8	21.5	17.7	16.8	17.1
	2525.6	2540.0	1	49	1	0	24.4	23.4	22.1	19.3	18.2	17.2
			50	0	100	0	22.5	21.5	21.2	17.7	16.7	16.9
	2545.6	2560.0	1	49	1	0	23.5	22.8	20.7	19.9	18.9	17.9
			50	0	100	0	22.8	21.8	21.4	18.2	17.2	17.4

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
10MHz / 20MHz	2505.5	2519.9	1	49	1	0	24.5	23.5	22.2	19.5	18.5	17.6
			50	0	100	0	22.3	21.2	20.8	17.2	16.2	16.3
	2525.6	2540.0	1	49	1	0	24.1	23.1	21.7	19.5	18.6	17.6
			50	0	100	0	22.1	21.1	20.7	17.4	16.3	16.5
	2545.6	2560.0	1	49	1	0	22.9	23.1	21.6	19.5	18.5	17.9
			50	0	100	0	22.2	21.2	20.8	17.4	16.5	16.7

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	64QA	QPSK	16QA	64QA
20MHz / 10MHz	2510.0	2524.4	1	99	1	0	24.8	24.0	22.6	19.6	18.6	17.9
			1	0	1	49	16.5	16.7	16.4	11.1	11.2	11.7
			100	0	50	0	23.1	22.1	21.8	17.6	16.7	16.9
	2530.1	2544.5	1	99	1	0	24.9	23.8	22.5	19.8	18.8	17.7
			1	0	1	49	16.3	16.4	16.1	11.1	11.2	11.3
			100	0	50	0	22.8	21.8	21.4	17.6	16.6	16.7
	2550.1	2564.5	1	99	1	0	25.0	24.1	22.6	20.0	19.0	18.1
			1	0	1	49	16.6	16.8	16.4	11.6	11.8	11.9
			100	0	50	0	23.0	22.1	21.6	18.1	17.1	17.2

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
20MHz / 10MHz	2510.0	2524.4	1	99	1	0	24.4	23.6	22.1	19.3	18.5	17.3
			1	0	1	49	15.8	16.0	15.7	10.6	10.6	10.9
			100	0	50	0	22.4	21.5	21.1	17.4	16.3	16.4
	2530.1	2544.5	1	99	1	0	24.4	23.5	22.1	19.5	18.6	17.7
			1	0	1	49	15.9	16.0	15.7	11.0	11.1	11.3
			100	0	50	0	22.2	21.2	20.9	17.5	16.5	16.6
	2550.1	2564.5	1	99	1	0	24.1	23.2	21.7	19.4	18.5	17.8
			1	0	1	49	16.0	16.2	15.9	11.0	11.1	11.5
			100	0	50	0	22.4	21.4	20.9	17.5	16.4	16.7

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	22.8	19.6	18.6	17.9
			75	0	75	0	23.1	22.1	21.8	17.6	16.6	16.8
	2527.5	2542.5	1	74	1	0	24.7	23.7	22.4	19.5	18.4	17.6
			75	0	75	0	22.8	21.8	21.4	17.5	16.5	16.7
	2547.5	2562.5	1	74	1	0	24.9	24.0	22.5	19.9	19.0	18.0
			75	0	75	0	23.1	22.1	21.6	18.0	17.1	17.2

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
15MHz / 15MHz	2507.5	2522.5	1	74	1	0	24.4	23.6	22.2	19.2	18.3	17.4
			75	0	75	0	22.5	21.5	21.0	17.2	16.2	16.2
	2527.5	2542.5	1	74	1	0	24.1	23.3	21.9	19.3	18.5	17.5
			75	0	75	0	22.2	21.2	20.9	17.4	16.4	16.3
	2547.5	2562.5	1	74	1	0	24.3	23.5	21.9	19.3	18.4	17.6
			75	0	75	0	22.5	21.5	20.9	17.4	16.4	16.6

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	22.9	19.7	18.7	18.1
			75	0	100	0	23.0	22.0	21.7	17.7	16.7	17.0
	2525.3	2542.4	1	74	1	0	24.6	23.6	22.4	19.4	18.5	17.7
			75	0	100	0	22.8	21.8	21.4	17.7	16.7	16.9
	2542.9	2560.0	1	74	1	0	24.7	23.8	22.5	20.0	19.0	18.1
			75	0	100	0	23.0	22.0	21.5	18.1	17.1	17.2

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
15MHz / 20MHz	2507.8	2524.9	1	74	1	0	24.5	23.7	22.2	19.3	18.4	17.4
			75	0	100	0	22.6	21.5	21.1	17.3	16.2	16.3
	2525.3	2542.4	1	74	1	0	24.1	23.2	21.9	19.5	18.6	17.5
			75	0	100	0	22.3	21.3	20.9	17.6	16.5	16.6
	2542.9	2560.0	1	74	1	0	24.4	23.7	22.3	19.5	18.6	17.9
			75	0	100	0	22.7	21.7	21.2	17.5	16.5	16.7

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	24.7	23.8	22.5	19.5	18.6	17.8
			100	0	75	0	22.9	21.9	21.6	17.6	16.6	16.9
	2527.6	2544.7	1	99	1	0	24.6	23.7	22.2	19.7	18.7	17.8
			100	0	75	0	22.7	21.7	21.3	17.6	16.6	16.8
	2545.1	2562.2	1	99	1	0	24.9	24.0	22.4	20.0	18.9	18.0
			100	0	75	0	22.8	21.9	21.3	18.0	17.0	17.1

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	24.4	23.6	22.0	19.1	18.2	17.1
			100	0	75	0	22.5	21.5	21.2	17.2	16.2	16.3
	2527.6	2544.7	1	99	1	0	24.5	23.5	22.1	19.3	18.4	17.5
			100	0	75	0	22.4	21.3	20.9	17.4	16.4	16.4
	2545.1	2562.2	1	99	1	0	24.3	23.5	21.8	19.2	18.4	17.7
			100	0	75	0	22.7	21.6	21.2	17.4	16.4	16.6

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	24.0	22.9	20.0	19.0	18.4
			1	0	1	99	16.2	16.2	16.0	11.2	11.2	11.7
			100	0	100	0	23.0	22.0	21.7	18.0	17.0	17.2
	2525.1	2544.9	1	99	1	0	24.8	24.0	22.6	20.0	19.0	18.1
			1	0	1	99	16.1	16.2	15.8	11.3	11.4	11.7
			100	0	100	0	22.9	21.9	21.6	18.0	17.1	17.2
	2540.2	2560.0	1	99	1	0	25.0	24.1	22.7	20.3	19.3	18.2
			1	0	1	99	16.3	16.4	16.1	11.7	11.8	11.8
			100	0	100	0	23.1	22.0	21.6	18.4	17.4	17.5

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	2510.0	2529.8	1	99	1	0	24.5	23.6	22.2	19.5	18.5	17.5
			1	0	1	99	15.6	15.6	15.4	10.5	10.4	10.9
			100	0	100	0	22.5	21.4	21.1	17.5	16.4	16.5
	2525.1	2544.9	1	99	1	0	24.3	23.3	22.0	19.5	18.6	17.8
			1	0	1	99	15.7	15.8	15.3	10.9	10.9	11.3
			100	0	100	0	22.3	21.3	20.9	17.6	16.6	16.7
	2540.2	2560.0	1	99	1	0	24.4	23.6	22.0	19.6	18.7	17.8
			1	0	1	99	15.9	16.0	15.5	10.9	11.0	11.3
			100	0	100	0	22.6	21.6	21.1	17.7	16.7	16.9

7.1.2. LTE BAND 41

ID:	10646	Date:	5/5/18
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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	22.8	21.9	20.8	20.3
			25	0	100	0	23.1	22.1	21.8	20.0	19.2	19.5
	2583.8	2595.5	1	24	1	0	24.2	23.0	22.2	21.7	20.6	20.0
			25	0	100	0	22.1	21.2	20.9	19.5	18.6	18.8
	2668.3	2680.0	1	24	1	0	24.7	23.8	20.8	22.2	21.1	20.8
			25	0	100	0	22.5	21.5	21.2	19.7	18.8	19.1

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	23.6	22.5	21.9	20.8	20.3
			25	0	100	0	22.6	21.6	21.6	19.8	18.8	19.1
	2583.8	2595.5	1	24	1	0	23.7	22.6	21.3	21.6	20.4	20.3
			25	0	100	0	21.9	21.0	20.9	19.6	18.6	19.2
	2668.3	2680.0	1	24	1	0	24.3	23.4	22.5	22.5	21.8	21.3
			25	0	100	0	22.5	21.5	21.2	20.2	19.2	19.5

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	23.0	22.2	21.3	20.6
			1	0	1	24	17.6	16.5	16.7	13.3	13.4	14.4
			100	0	25	0	22.8	21.8	21.6	19.9	19.0	19.4
	2590.5	2602.2	1	99	1	0	23.9	22.9	21.7	21.5	20.5	19.9
			1	0	1	24	16.5	16.0	15.6	12.8	13.8	13.4
			100	0	25	0	22.0	21.0	20.6	19.5	18.6	18.8
	2675.0	2686.7	1	99	1	0	24.4	23.5	22.3	21.6	20.7	20.3
			1	0	1	24	16.2	16.6	16.8	14.0	12.9	13.8
			100	0	25	0	22.2	21.2	20.9	19.5	18.6	18.9

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	22.4	22.5	21.7	20.4
			1	0	1	24	15.4	16.3	16.6	13.2	13.3	13.5
			100	0	25	0	22.3	21.3	21.1	20.3	19.3	19.4
	2590.5	2602.2	1	99	1	0	23.3	22.6	21.4	21.6	20.8	20.4
			1	0	1	24	15.2	15.0	15.9	13.0	13.6	13.5
			100	0	25	0	21.2	20.2	20.1	19.6	18.6	19.2
	2675.0	2686.7	1	99	1	0	23.9	23.0	21.9	22.3	21.5	20.8
			1	0	1	24	17.1	15.8	16.0	15.1	14.1	14.0
			100	0	25	0	21.8	20.7	20.5	20.2	19.1	19.4

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	23.0	22.2	21.1	20.8
			50	0	100	0	22.9	22.0	21.7	20.1	19.1	19.5
	2583.6	2598.0	1	49	1	0	24.2	23.2	22.4	21.8	20.7	20.3
			50	0	100	0	22.0	21.0	20.8	19.5	18.6	18.8
	2665.6	2680.0	1	49	1	0	24.6	23.7	22.9	22.1	21.1	20.9
			50	0	100	0	22.3	21.3	21.0	19.7	18.7	19.2

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	2501.5	2515.9	1	49	1	0	24.5	23.4	22.3	22.3	21.3	20.7
			50	0	100	0	22.0	21.1	21.0	19.9	19.0	19.2
	2583.6	2598.0	1	49	1	0	23.4	22.4	21.6	21.8	20.8	20.7
			50	0	100	0	21.2	20.2	20.1	19.6	18.6	19.1
	2665.6	2680.0	1	49	1	0	23.9	22.9	22.2	22.5	21.6	21.3
			50	0	100	0	21.7	20.7	20.5	20.1	19.1	19.5

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	24.1	23.0	22.2	21.3	20.6
			100	0	50	0	22.8	21.7	21.6	19.9	18.9	19.3
	2588.1	2602.5	1	99	1	0	24.0	23.0	21.8	21.5	20.7	19.8
			100	0	50	0	21.8	20.9	20.5	19.2	18.4	18.5
	2670.1	2684.5	1	99	1	0	24.4	23.5	22.3	21.7	20.7	20.2
			100	0	50	0	22.1	21.2	20.8	19.5	18.5	18.9

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	23.5	22.4	22.5	21.7	20.6
			100	0	50	0	22.1	21.2	21.0	20.2	19.3	19.3
	2588.1	2602.5	1	99	1	0	23.4	22.5	21.5	21.7	20.9	20.4
			100	0	50	0	21.2	20.2	20.1	19.6	18.6	19.1
	2670.1	2684.5	1	99	1	0	24.0	23.1	21.9	22.3	21.6	20.8
			100	0	50	0	21.7	20.7	20.4	20.1	19.1	19.4

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	25.0	24.2	22.9	22.2	21.1	20.4
			75	0	75	0	22.9	22.0	21.6	20.0	19.0	19.3
	2585.5	2600.5	1	74	1	0	24.2	23.3	22.0	21.6	20.8	19.8
			75	0	75	0	22.0	21.0	20.6	19.4	18.4	18.6
	2667.5	2682.5	1	74	1	0	24.5	23.6	22.2	21.9	21.1	20.3
			75	0	75	0	22.3	21.2	21.0	19.6	18.6	19.0

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
15MHz / 15MHz	2503.5	2518.5	1	74	1	0	24.5	23.7	22.3	22.5	21.5	20.7
			75	0	75	0	22.2	21.2	21.1	20.2	19.2	19.3
	2585.5	2600.5	1	74	1	0	23.5	22.5	21.5	21.9	21.0	20.5
			75	0	75	0	21.3	20.3	20.2	19.6	18.6	19.2
	2667.5	2682.5	1	74	1	0	24.1	23.3	22.0	22.4	21.4	20.8
			75	0	75	0	21.8	20.8	20.6	20.2	19.2	19.5

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	24.0	22.9	22.2	21.2	20.7
			75	0	100	0	23.0	22.0	21.7	20.0	19.1	19.4
	2583.3	2600.4	1	74	1	0	24.3	23.3	22.2	21.8	20.9	20.0
			75	0	100	0	22.0	21.0	20.7	19.4	18.5	18.6
	2662.9	2680.0	1	74	1	0	24.6	23.7	19.5	21.9	21.1	20.4
			75	0	100	0	22.3	21.4	21.0	19.6	18.7	19.1

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	23.6	22.5	22.5	21.7	20.7
			75	0	100	0	22.3	21.3	21.2	20.0	19.0	19.2
	2583.3	2600.4	1	74	1	0	23.5	22.7	21.7	21.7	20.8	20.5
			75	0	100	0	21.3	20.3	20.2	19.6	18.6	19.1
	2662.9	2680.0	1	74	1	0	24.1	23.3	22.1	22.4	21.4	20.9
			75	0	100	0	21.9	20.9	20.6	20.2	19.2	19.5

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	24.1	23.0	22.2	21.4	20.3
			100	0	75	0	22.8	21.9	21.7	19.9	19.0	19.3
	2585.6	2602.7	1	99	1	0	24.0	23.1	22.0	21.5	20.6	19.9
			100	0	75	0	21.9	20.9	20.6	19.3	18.4	18.5
	2665.1	2682.2	1	99	1	0	24.4	23.5	22.4	21.8	20.9	20.4
			100	0	75	0	22.2	21.2	20.9	19.5	18.6	19.0

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 / 15MHz	2506.0	2523.1	1	99	1	0	24.5	23.7	22.1	22.5	21.7	20.6
			100	0	75	0	22.3	21.3	21.1	20.1	19.1	19.1
	2585.6	2602.7	1	99	1	0	23.4	22.6	21.6	21.7	20.9	20.4
			100	0	75	0	21.2	20.2	20.1	19.5	18.5	19.0
	2665.1	2682.2	1	99	1	0	24.0	23.3	22.1	22.3	21.5	20.8
			100	0	75	0	21.8	20.8	20.5	20.1	19.1	19.4

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	22.2	21.3	20.6
			1	0	1	99	16.3	16.5	16.3	13.4	13.4	13.5
			100	0	100	0	23.0	22.0	21.7	20.0	19.1	19.3
	2583.1	2602.9	1	99	1	0	24.1	23.2	22.2	21.6	20.8	20.0
			1	0	1	99	15.4	15.5	15.3	12.8	12.7	12.9
			100	0	100	0	21.9	21.0	20.6	19.4	18.4	18.6
	2660.2	2680.0	1	99	1	0	24.5	23.6	22.4	21.9	20.9	20.6
			1	0	1	99	15.5	15.6	15.6	12.8	12.8	13.3
			100	0	100	0	22.3	21.3	21.0	19.6	18.7	19.0

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/ 20MHz	2506.0	2525.8	1	99	1	0	24.5	23.7	22.6	22.5	21.5	20.7
			1	0	1	99	15.4	15.5	15.8	13.0	12.9	13.3
			100	0	100	0	22.3	21.4	21.3	20.2	19.1	19.2
	2583.1	2602.9	1	99	1	0	23.6	22.6	21.8	21.7	21.0	20.7
			1	0	1	99	14.9	15.1	15.1	12.9	13.0	13.4
			100	0	100	0	21.4	20.4	20.2	19.6	18.5	19.1
	2660.2	2680.0	1	99	1	0	24.2	23.4	22.2	22.3	21.5	20.9
			1	0	1	99	15.3	15.7	15.5	13.4	13.6	13.8
			100	0	100	0	21.9	20.8	20.6	20.1	19.2	19.5

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

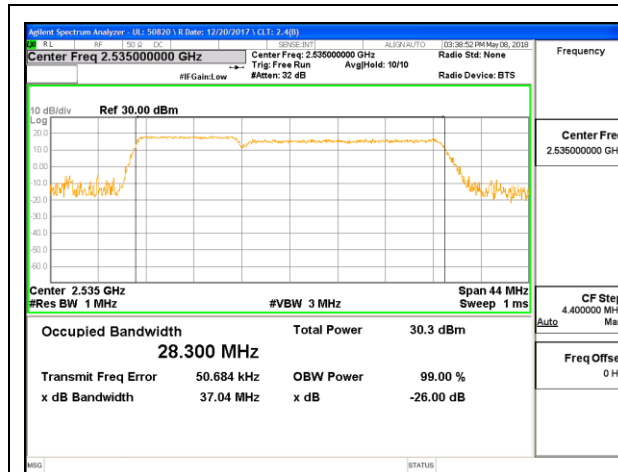
LTE BAND 7

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	28.300	37.04
	10MHz + 20MHz BAND 16QAM			28.248	34.16
	10MHz + 20MHz BAND 64QAM			28.203	31.17
	20MHz + 10MHz BAND OPSK	100/0 + 50/0		28.230	34.63
	20MHz + 10MHz BAND 16QAM			28.245	32.95
	20MHz + 10MHz BAND 64QAM			28.190	31.06
	15MHz + 15MHz BAND OPSK	75/0 + 75/0		28.813	38.50
	15MHz + 15MHz BAND 16QAM			28.806	37.70
	15MHz + 15MHz BAND 64QAM			28.710	31.49
	15MHz + 20MHz BAND OPSK	75/0 + 100/0		33.061	42.19
	15MHz + 20MHz BAND 16QAM			33.026	43.29
	15MHz + 20MHz BAND 64QAM			33.038	36.39
	20MHz + 15MHz BAND OPSK	100/0 + 75/0		33.094	39.47
	20MHz + 15MHz BAND 16QAM			32.978	41.55
	20MHz + 15MHz BAND 64QAM			32.956	36.21
	20MHz + 20MHz BAND OPSK	100/0 + 100/0		37.985	51.30
	20MHz + 20MHz BAND 16QAM			37.911	49.53
	20MHz + 20MHz BAND 64QAM			37.842	41.77

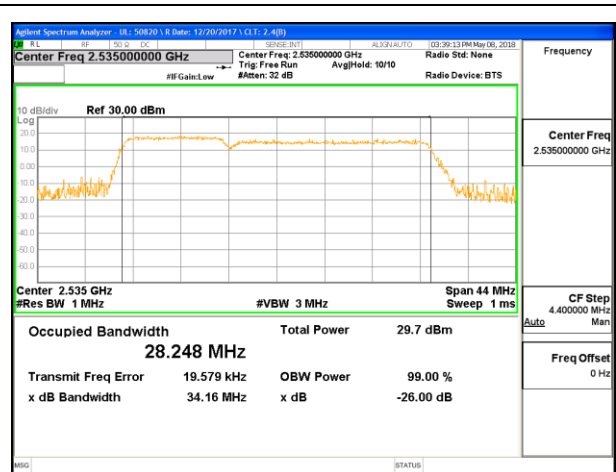
LTE BAND 41

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	23.528	34.62
	5MHz + 20MHz BAND 16QAM			23.467	33.96
	5MHz + 20MHz BAND 64QAM			23.558	31.92
	20MHz + 5MHz BAND QPSK	100/0 + 25/0		23.579	28.48
	20MHz + 5MHz BAND 16QAM			23.433	27.85
	20MHz + 5MHz BAND 64QAM			23.381	26.91
	10MHz + 20MHz BAND QPSK	50/0 + 100/0		28.410	42.42
	10MHz + 20MHz BAND 16QAM			28.280	41.33
	10MHz + 20MHz BAND 64QAM			28.252	38.21
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.267	36.43
	20MHz + 10MHz BAND 16QAM			28.176	33.12
	20MHz + 10MHz BAND 64QAM			28.181	34.65
	15MHz + 15MHz BAND QPSK	75/0 + 75/0		28.918	39.71
	15MHz + 15MHz BAND 16QAM			28.716	39.12
	15MHz + 15MHz BAND 64QAM			28.824	39.60
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		33.185	46.91
	15MHz + 20MHz BAND 16QAM			32.948	40.45
	15MHz + 20MHz BAND 64QAM			33.017	38.16
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		33.044	44.39
	20MHz + 15MHz BAND 16QAM			33.006	43.39
	20MHz + 15MHz BAND 64QAM			33.030	41.87
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.962	53.70
	20MHz + 20MHz BAND 16QAM			37.929	53.32
	20MHz + 20MHz BAND 64QAM			37.961	50.67

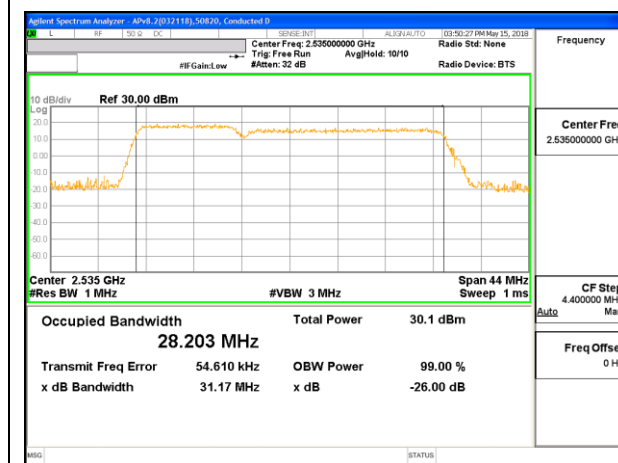
8.1.1. LTE BAND 7



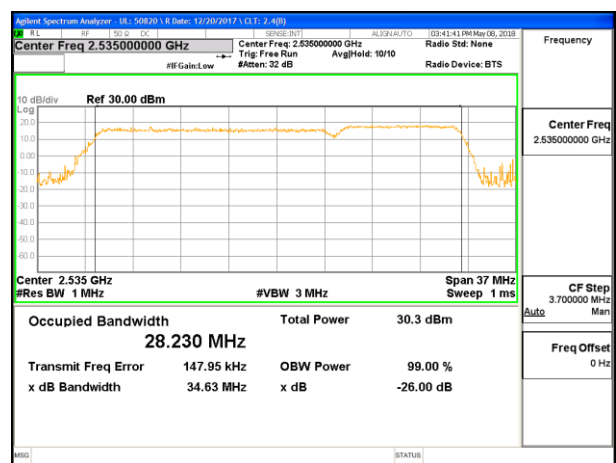
LTE B7 10MHz + 20MHz QPSK RB50-0 + RB100-0



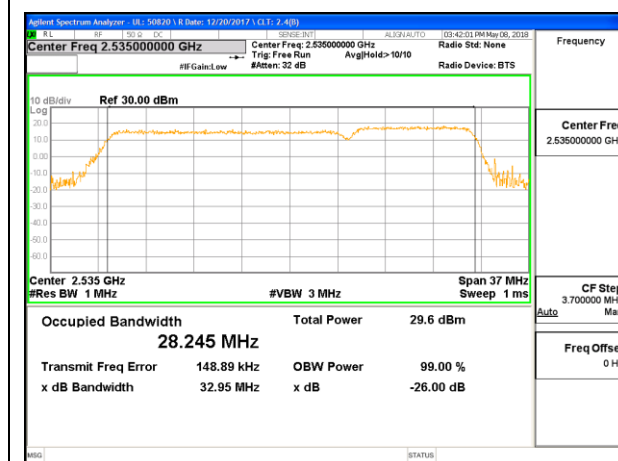
LTE B7 10MHz + 20MHz 16QAM RB50-0 + RB100-0



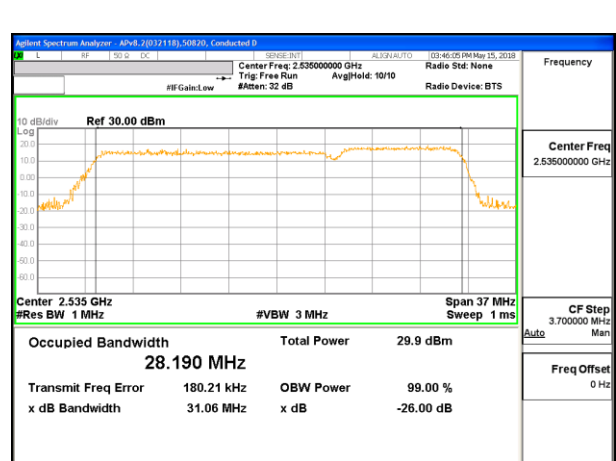
LTE B7 10MHz + 20MHz 64QAM RB50-0 + RB100-0



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



LTE B7 20MHz + 10MHz 16QAM RB100-0 + RB50-0



LTE B7 20MHz + 10MHz 64QAM RB100-0 + RB50-0





8.1.2. LTE BAND 41









8.2. EMISSION MASK

RULE PART(S)

§2.1051, §27.53

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.

TEST PROCEDURE FOR FCC PART 27

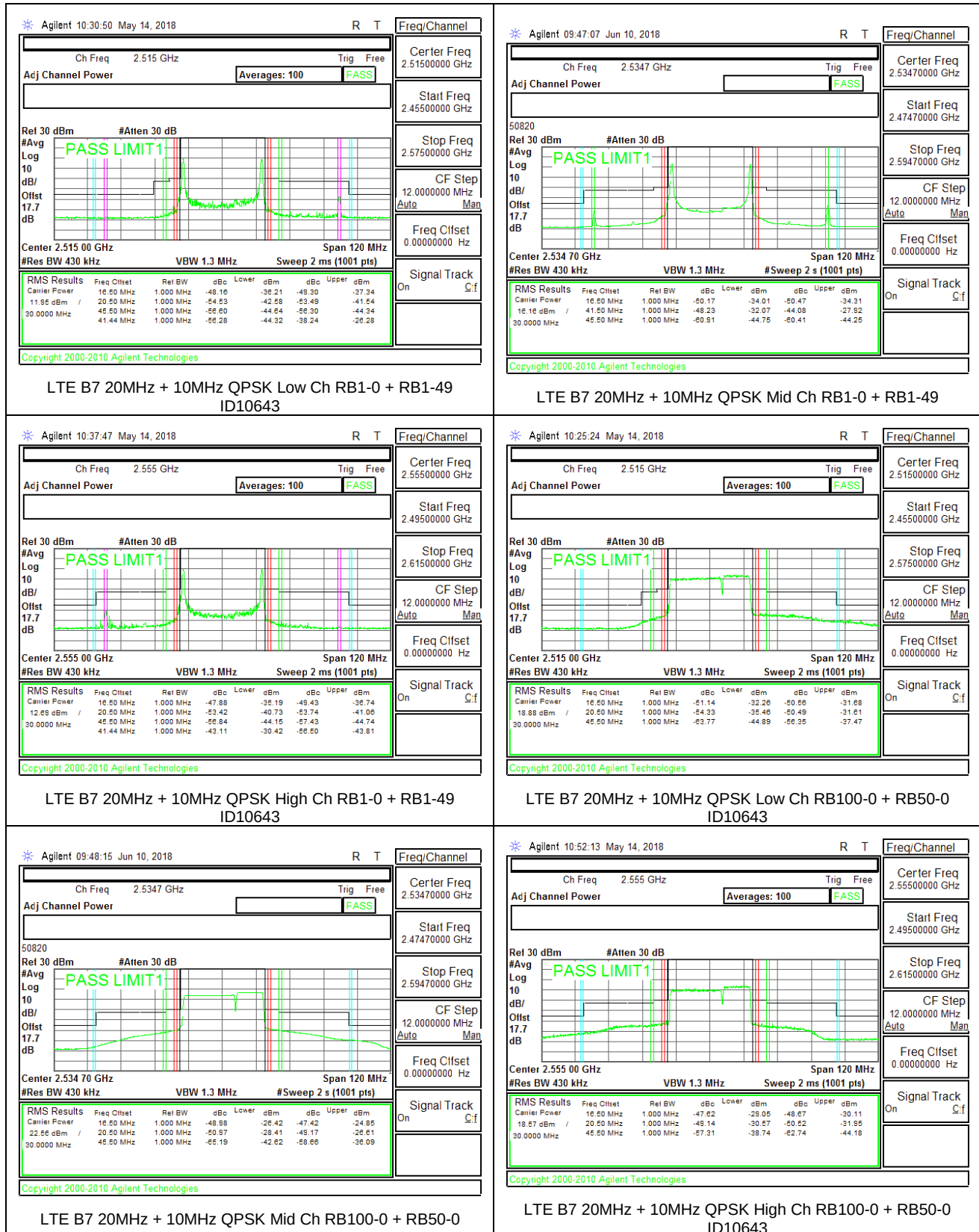
(m)(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of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

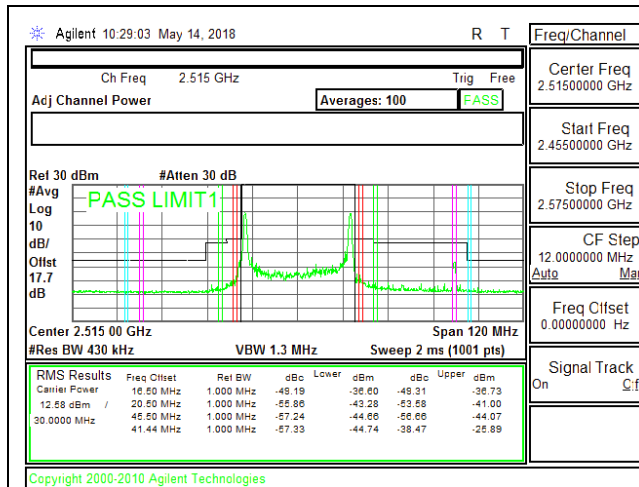
MODES TESTED

- LTE Band 7
- LTE Band 41

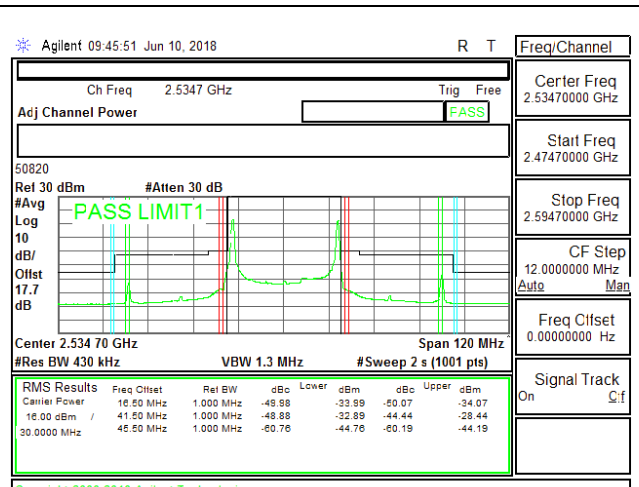
RESULTS

8.2.1. LTE BAND 7

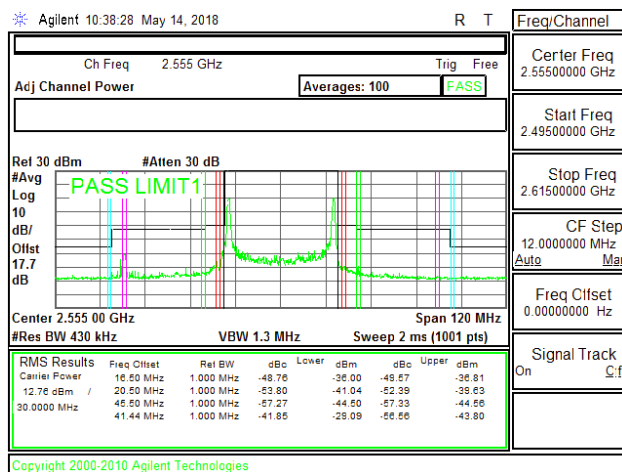




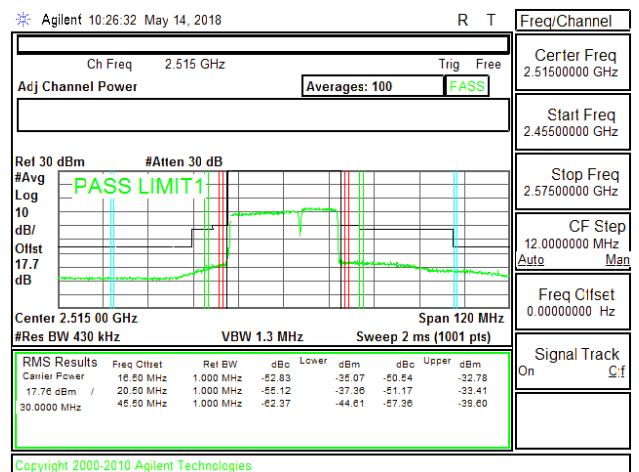
LTE B7 20MHz + 10MHz 16QAM Low Ch RB1-0 + RB1-49
ID10643



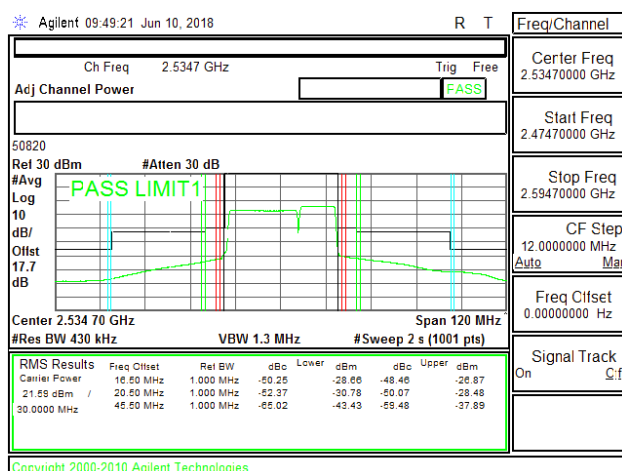
LTE B7 20MHz + 10MHz 16QAM Mid Ch RB1-0 + RB1-49



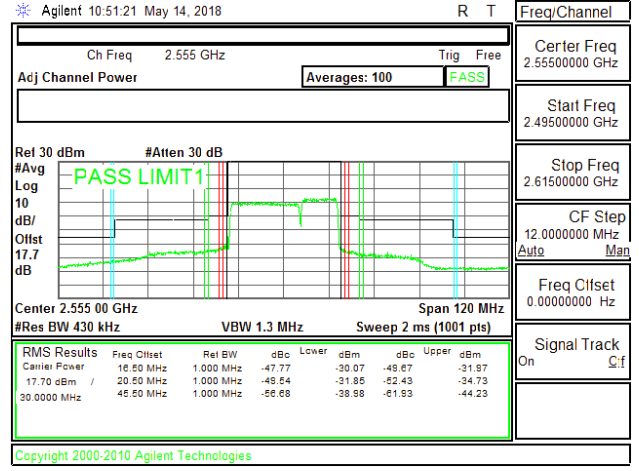
LTE B7 20MHz + 10MHz 16QAM High Ch RB1-0 + RB1-49
ID10643



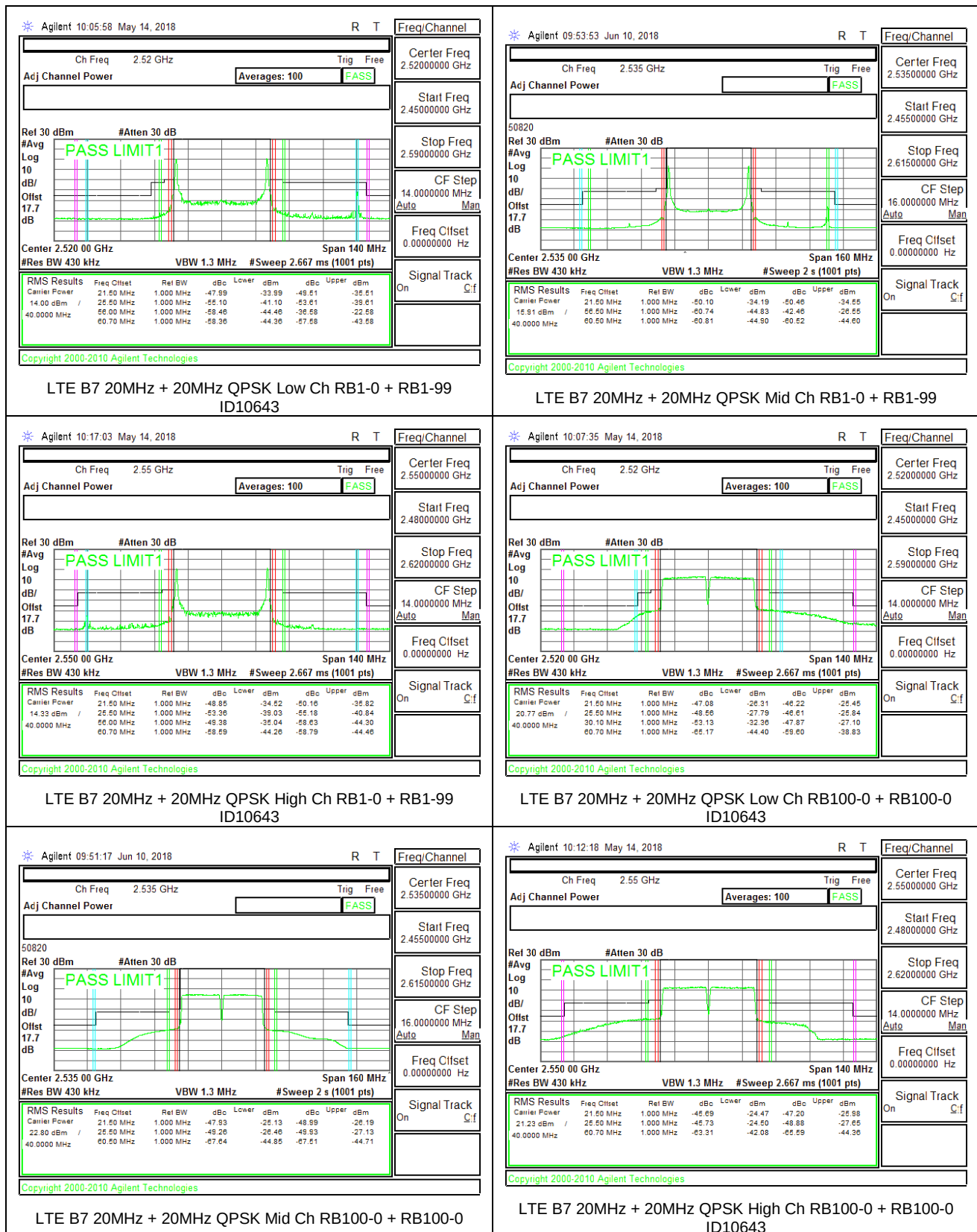
LTE B7 20MHz + 10MHz 16QAM Low Ch RB100-0 + RB50-0
ID10643

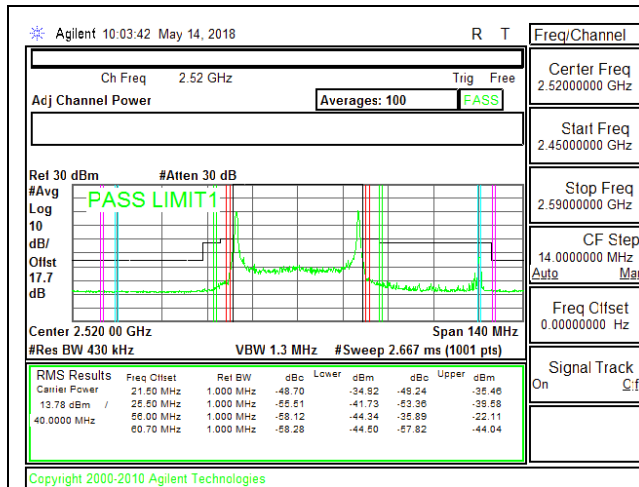


LTE B7 20MHz + 10MHz 16QAM Mid Ch RB100-0 + RB50-0

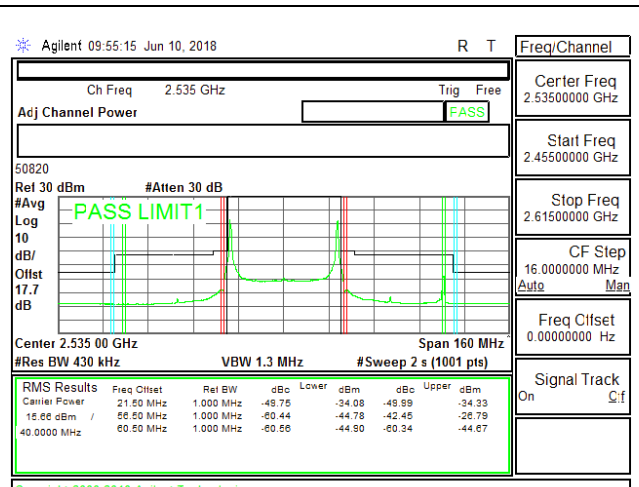


LTE B7 20MHz + 10MHz 16QAM High Ch RB100-0 + RB50-0
ID10643

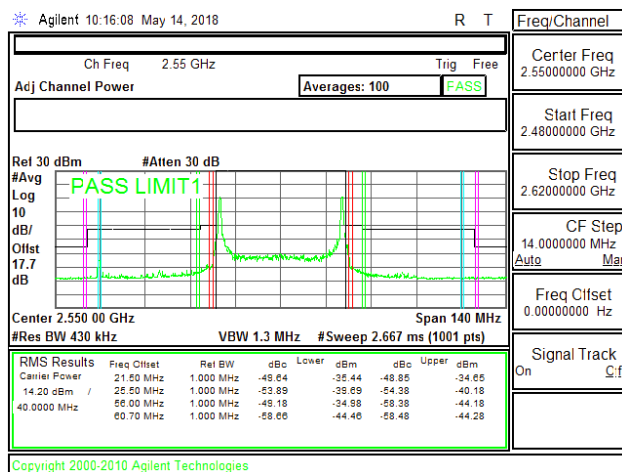




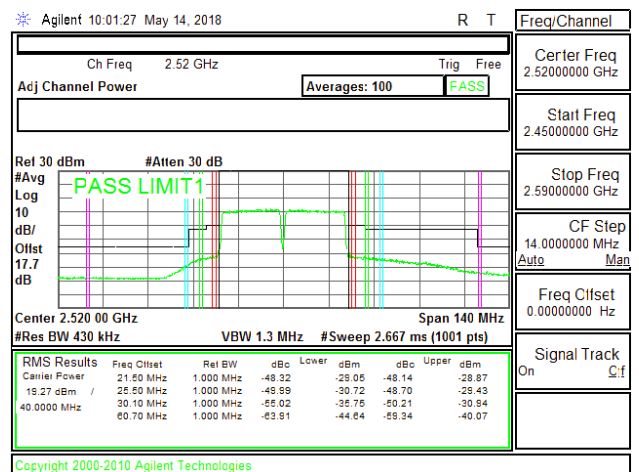
LTE B7 20MHz + 20MHz 16QAM Low Ch RB1-0 + RB1-99
ID10643



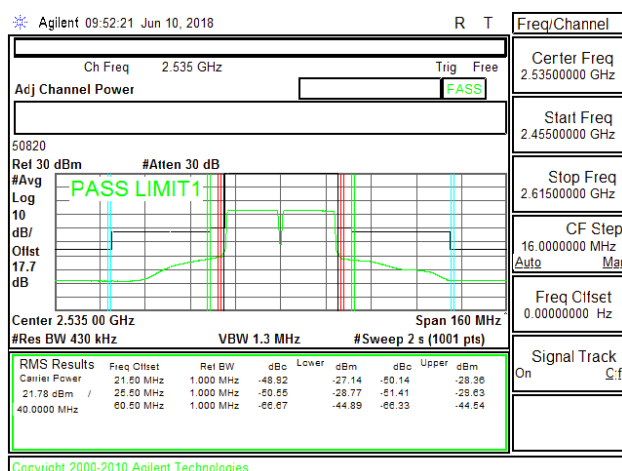
LTE B7 20MHz + 20MHz 16QAM Mid Ch RB1-0 + RB1-99



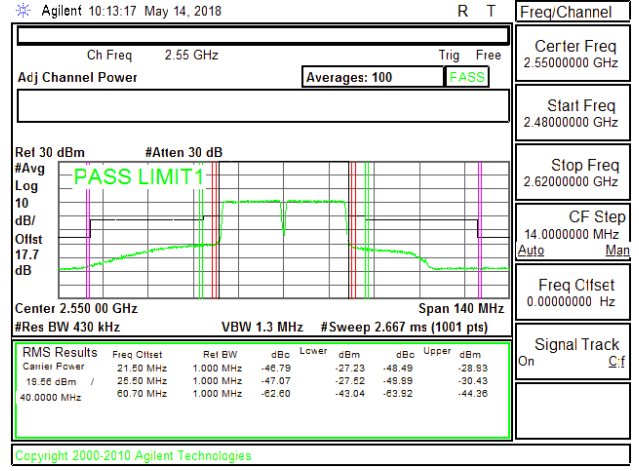
LTE B7 20MHz + 20MHz 16QAM High Ch RB1-0 + RB1-99
ID10643



LTE B7 20MHz + 20MHz 16QAM Low Ch RB100-0 + RB100-0
ID10643

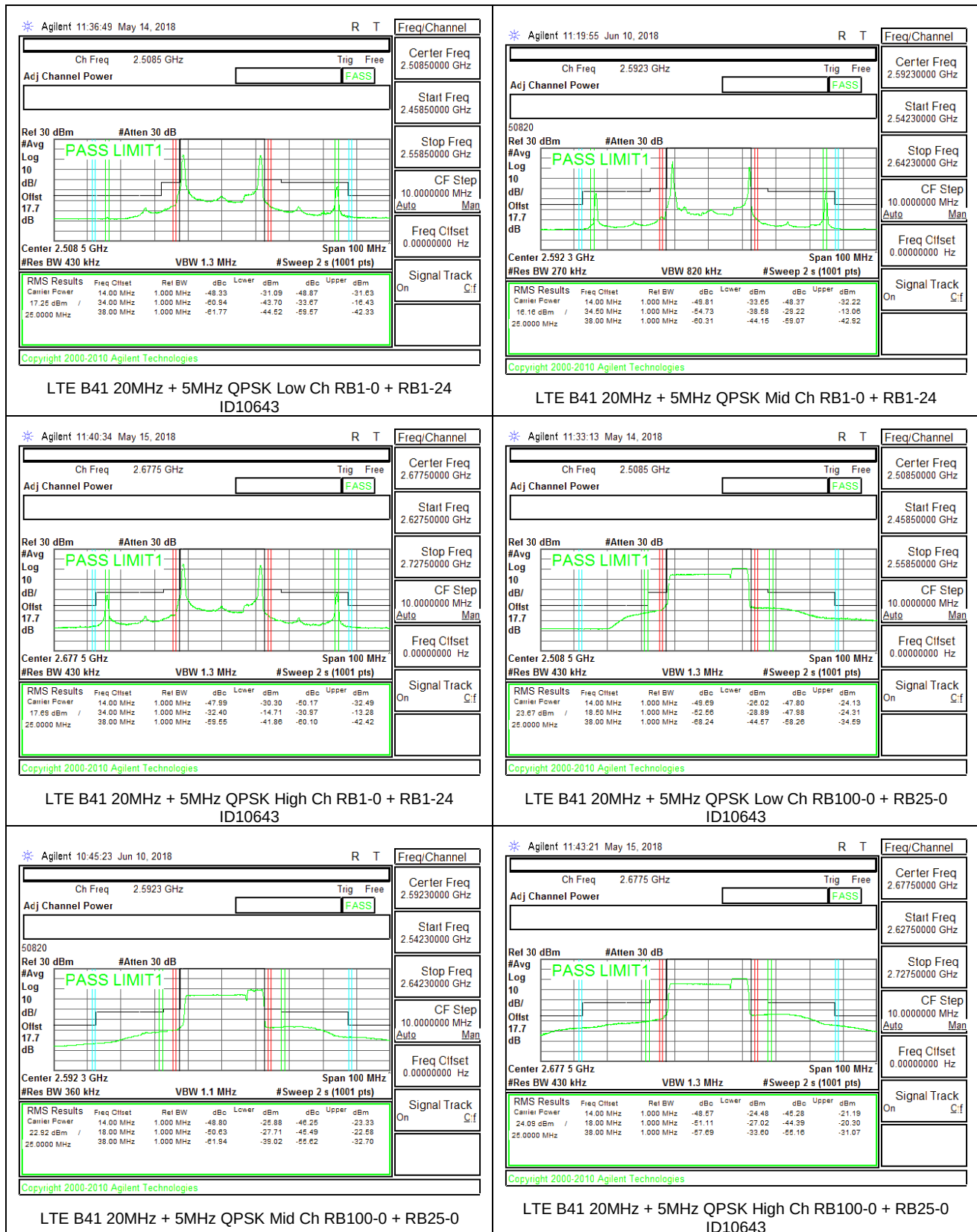


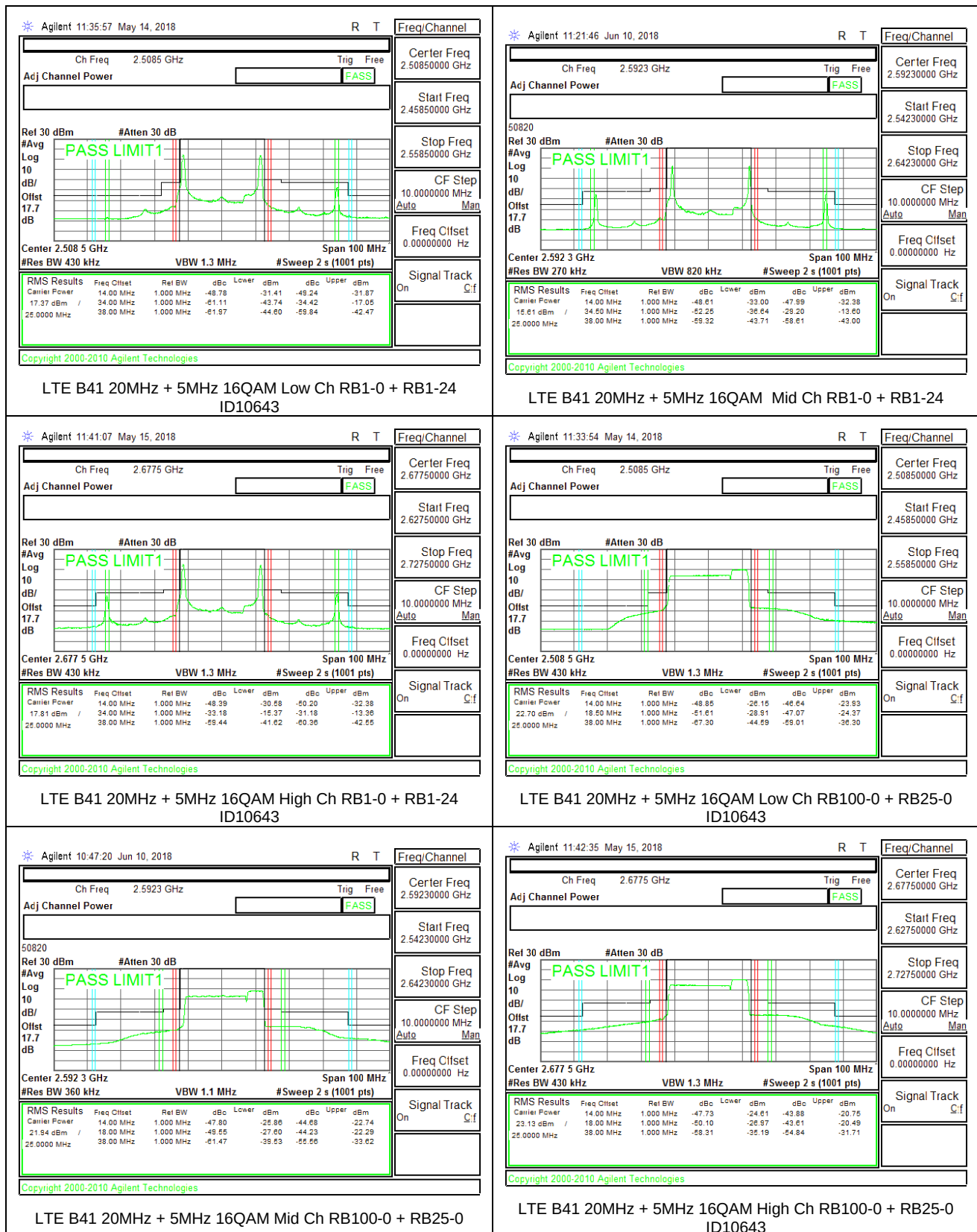
LTE B7 20MHz + 20MHz 16QAM Mid Ch RB100-0 + RB100-0



LTE B7 20MHz + 20MHz 16QAM High Ch RB100-0 + RB100-0
ID10643

8.2.2. LTE BAND 41









8.3. OUT OF BAND EMISSIONS

RULE PART(S)

§2.1051, §27.53

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.

TEST PROCEDURE

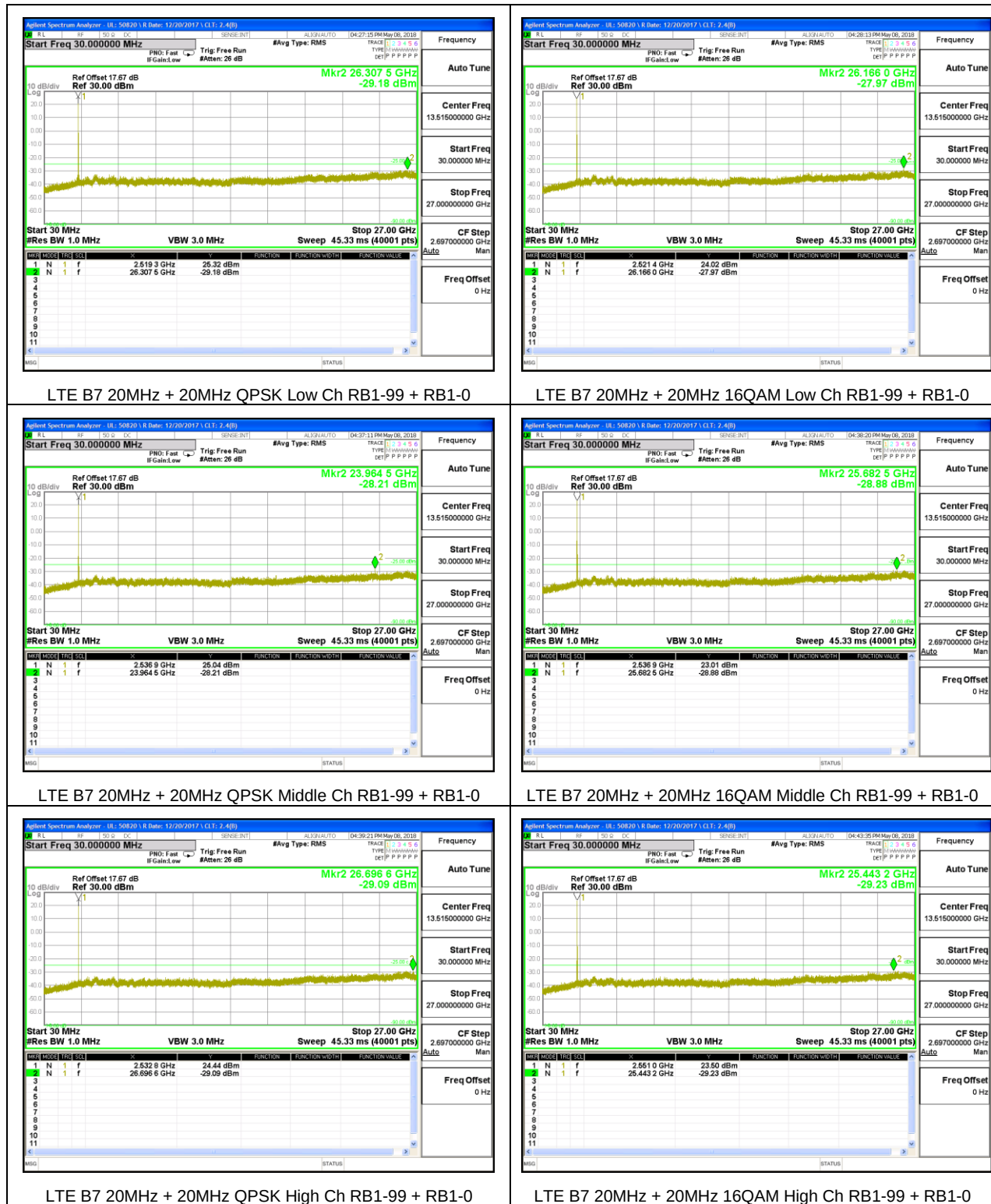
The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case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

For each out of band emissions measurement:

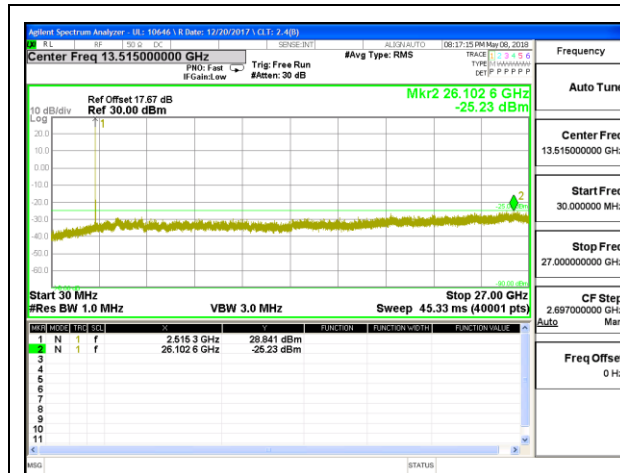
- Set display line at -25 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.
(NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

MODES TESTED

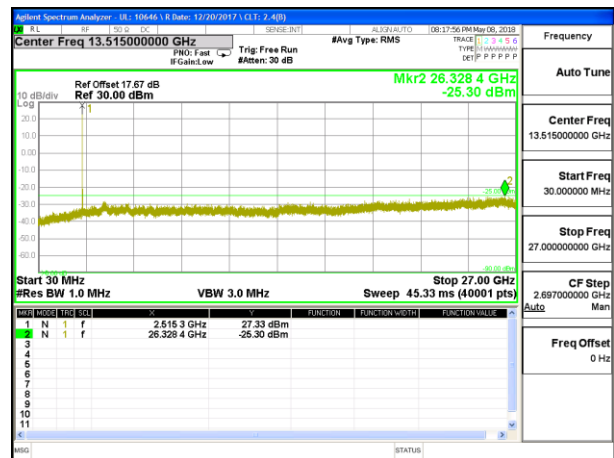
- LTE Band 7
- LTE Band 41



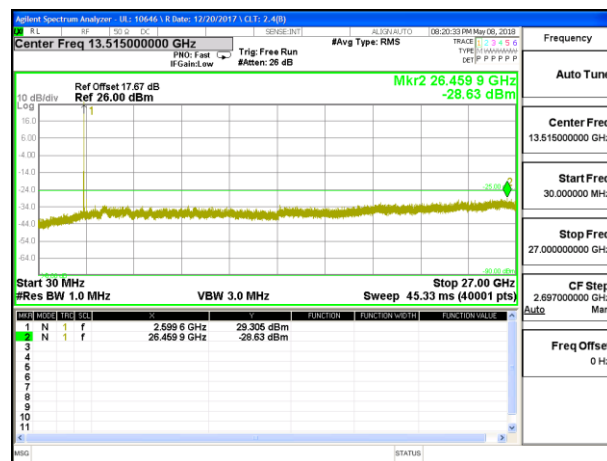
8.3.1. LTE BAND 41



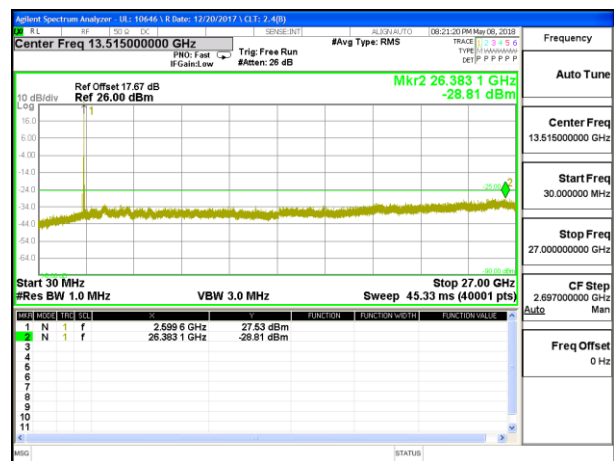
LTE B41 20MHz + 5MHz QPSK Low Ch RB1-99 + RB1-0



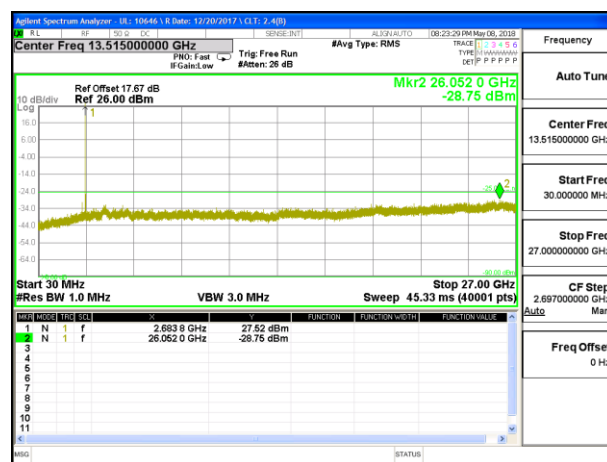
LTE B41 20MHz + 5MHz 16QAM Low Ch RB1-99 + RB1-0



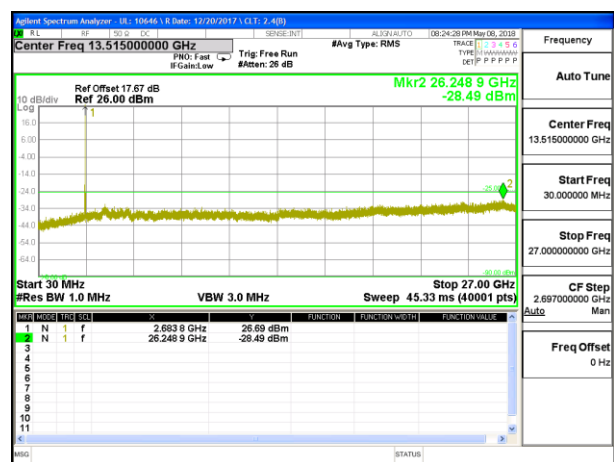
LTE B41 20MHz + 5MHz QPSK Middle Ch RB1-99 + RB1-0



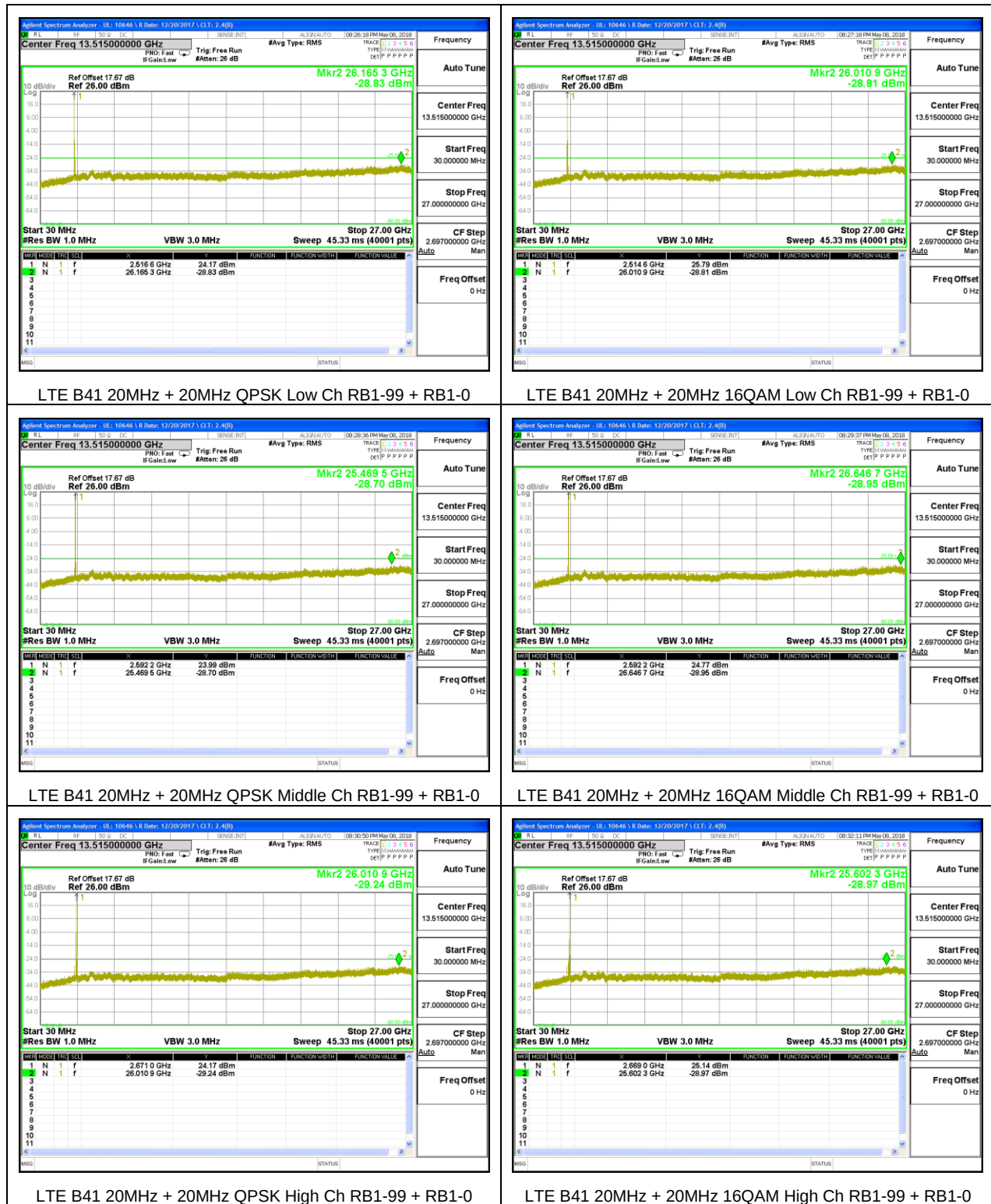
LTE B41 20MHz + 5MHz 16QAM Middle Ch RB1-99 + RB1-0



LTE B41 20MHz + 5MHz QPSK High Ch RB1-99 + RB1-0



LTE B41 20MHz + 5MHz 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:	50893	Date:	3/30/18
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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	2501.1171	2568.8991		
Extreme (50C)		2501.1171	2568.8991	60.5	0.024
Extreme (40C)		2501.1171	2568.8991	62.9	0.025
Extreme (30C)		2501.1171	2568.8991	58.9	0.023
Extreme (10C)		2501.1171	2568.8991	46.8	0.018
Extreme (0C)		2501.1171	2568.8991	32.2	0.013
Extreme (-10C)		2501.1171	2568.8991	-31.9	-0.013
Extreme (-20C)		2501.1171	2568.8991	-61.2	-0.024
Extreme (-30C)		2501.1171	2568.8991	-68.4	-0.027
20C	15%	2501.1171	2568.8991	51.6	0.020
	-15%	2501.1171	2568.8991	40.5	0.016
	End Point	2501.1171	2568.8991	42.3	0.017

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	2501.1640	2568.8641		
Extreme (50C)		2501.1640	2568.8641	94.9	0.037
Extreme (40C)		2501.1640	2568.8641	94.6	0.037
Extreme (30C)		2501.1640	2568.8641	90.4	0.036
Extreme (10C)		2501.1640	2568.8641	69.1	0.027
Extreme (0C)		2501.1640	2568.8641	36.5	0.014
Extreme (-10C)		2501.1640	2568.8641	-42.3	-0.017
Extreme (-20C)		2501.1640	2568.8641	-80.6	-0.032
Extreme (-30C)		2501.1640	2568.8641	-71.9	-0.028
20C	15%	2501.1640	2568.8641	72.4	0.029
	-15%	2501.1640	2568.8641	55.2	0.022
	End Point	2501.1640	2568.8641	61.5	0.024

8.4.2 LTE BAND 41

ID:	44366	Date:	3/30/18
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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	2496.6325	2689.3361		
Extreme (50C)		2496.6325	2689.3361	38.8	0.015
Extreme (40C)		2496.6325	2689.3361	49.4	0.019
Extreme (30C)		2496.6325	2689.3361	43.8	0.017
Extreme (10C)		2496.6325	2689.3361	-33.9	-0.013
Extreme (0C)		2496.6325	2689.3361	29.0	0.011
Extreme (-10C)		2496.6325	2689.3361	20.1	0.008
Extreme (-20C)		2496.6325	2689.3361	-24.0	-0.009
Extreme (-30C)		2496.6325	2689.3361	-18.3	-0.007
20C	15%	2496.6325	2689.3361	38.1	0.015
	-15%	2496.6325	2689.3361	33.4	0.013
	End Point	2496.6325	2689.3361	28.7	0.011

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	2496.8929	2689.6053		
Extreme (50C)		2496.8929	2689.6053	78.7	0.030
Extreme (40C)		2496.8929	2689.6053	41.2	0.016
Extreme (30C)		2496.8929	2689.6053	-31.2	-0.012
Extreme (10C)		2496.8929	2689.6053	-45.4	-0.018
Extreme (0C)		2496.8929	2689.6053	-64.0	-0.025
Extreme (-10C)		2496.8929	2689.6053	-56.1	-0.022
Extreme (-20C)		2496.8929	2689.6053	-60.0	-0.023
Extreme (-30C)		2496.8929	2689.6053	50.0	0.019
20C	15%	2496.8929	2689.6053	-38.2	-0.015
	-15%	2496.8929	2689.6053	-53.5	-0.021
	End Point	2496.8929	2689.6053	-58.8	-0.023