



CERTIFICATION TEST REPORT

Report Number. : 12204447-E9V3

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

Model : A2097

FCC ID : BCG-E3232A

EUT Description : SMARTPHONE

Test Standard(s) : CFR47 PART 27

Date Of Issue:
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	7/13/2018	Initial Review	Ellen Chu
V2	7/19/2018	Update Based on TCB Feedback	Mengistu Mekuria
V3	8/17/2018	Update Power Table	John Thompson

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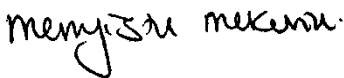
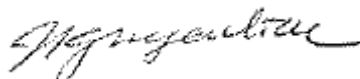
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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A2097
FCC ID	BCG-E3232A
EUT Description	SMARTPHONE
Serial Number	C39WF03CJW1D
Date Tested	MARCH 07, 2018 to JUNE 19, 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, CFR 47 Part 2, KDB 971168 D01 v03r01/ D02 v01, 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

\$2.1046, \$27.50

EIRP/ERP TEST PROCEDURE

ANSI C63.26:2015

KDB 971168 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

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	24.9	23.43	0.220	27916	27M9G7W
	16QAM			24.1	22.61	0.182	27930	27M9D7W
	64QAM			23.1	21.60	0.145	28177	28M2D7W
20+10	QPSK	2510.0	2564.5	25.0	23.50	0.224	27930	27M9G7W
	16QAM			24.0	22.47	0.177	27914	27M9D7W
	64QAM			22.8	21.34	0.136	28134	28M1D7W
15+15	QPSK	2507.5	2562.5	25.0	23.47	0.223	28502	28M5G7W
	16QAM			24.1	22.56	0.180	28495	28M5D7W
	64QAM			23.0	21.46	0.140	28643	28M6D7W
15+20	QPSK	2507.8	2560.0	25.0	23.48	0.223	32708	32M7G7W
	16QAM			24.1	22.55	0.180	32695	32M7D7W
	64QAM			23.0	21.50	0.141	32903	32M9D7W
20+15	QPSK	2510.0	2562.2	25.0	23.47	0.222	32755	32M8G7W
	16QAM			24.1	22.60	0.182	32758	32M8D7W
	64QAM			22.8	21.29	0.135	32976	33M0D7W
20+20	QPSK	2510.0	2560.0	24.9	23.44	0.221	37527	37M5G7W
	16QAM			24.0	22.49	0.178	37569	37M6D7W
	64QAM			22.9	21.41	0.138	37878	37M9D7W

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	23.48	0.223	23285	23M3G7W
	16QAM			24.0	22.51	0.178	23319	23M3D7W
	64QAM			23.1	21.64	0.146	23430	23M4D7W
20+5	QPSK	2506.0	2686.7	24.9	23.43	0.220	23383	23M4G7W
	16QAM			24.0	22.50	0.178	23315	23M3D7W
	64QAM			23.1	21.56	0.143	23373	23M4D7W
10+20	QPSK	2501.5	2680.0	25.0	23.47	0.222	28032	28M0G7W
	16QAM			24.0	22.52	0.179	28064	28M1D7W
	64QAM			23.4	21.89	0.154	28203	28M2D7W
20+10	QPSK	2506.0	2684.5	24.9	23.44	0.221	28039	28M0G7W
	16QAM			24.1	22.56	0.180	28027	28M0D7W
	64QAM			23.5	22.01	0.159	28139	28M1D7W
15+15	QPSK	2503.5	2682.5	25.0	23.47	0.222	28626	28M6G7W
	16QAM			24.1	22.57	0.181	28721	28M7D7W
	64QAM			23.5	21.96	0.157	28686	28M7D7W
15+20	QPSK	2503.8	2680.0	24.9	23.43	0.220	32852	32M9G7W
	16QAM			24.0	22.55	0.180	32918	32M9D7W
	64QAM			23.6	22.13	0.163	32925	32M9D7W
20+15	QPSK	2506.0	2682.2	24.9	23.43	0.220	32851	32M9G7W
	16QAM			24.0	22.55	0.180	32852	32M9D7W
	64QAM			23.5	22.01	0.159	32985	33M0D7W
20+20	QPSK	2506.0	2680.0	25.0	23.50	0.224	37652	37M7G7W
	16QAM			24.2	22.71	0.187	37710	37M7D7W
	64QAM			23.7	22.20	0.166	37789	37M8D7W

5.3. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 0.26.01.

5.4. MAXIMUM ANTENNA GAIN

LTE Bands	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.

Conducted tests were performed on Ant 1 as the 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

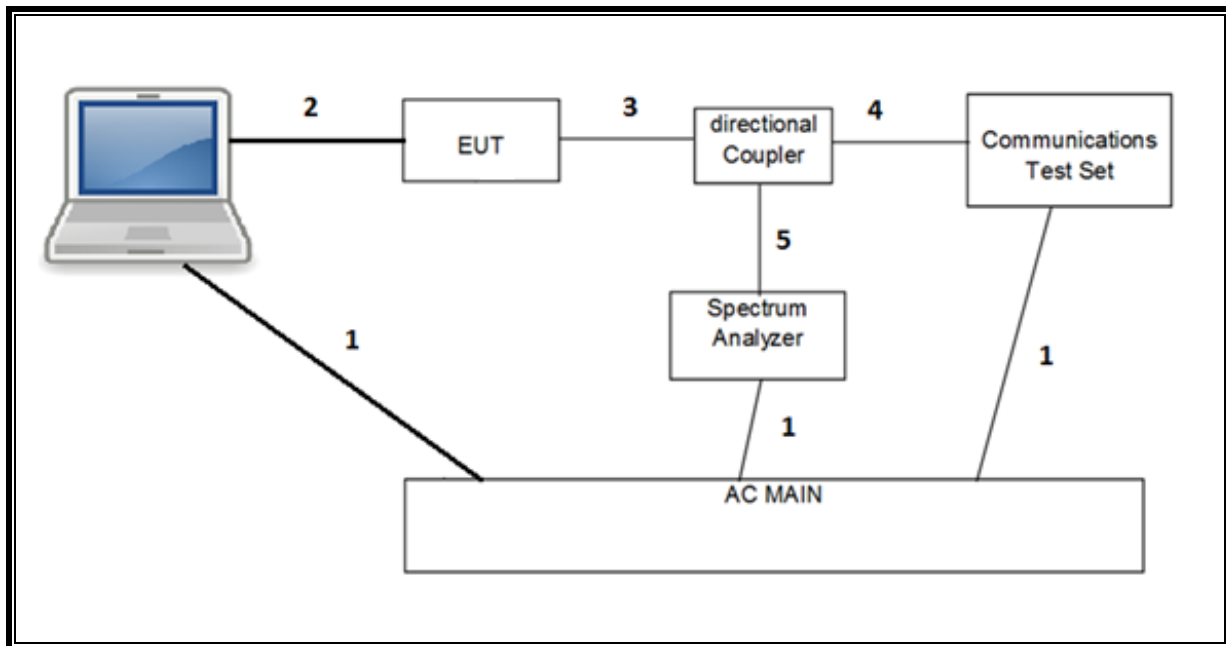
I/O CABLES (RF Conducted Test)

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

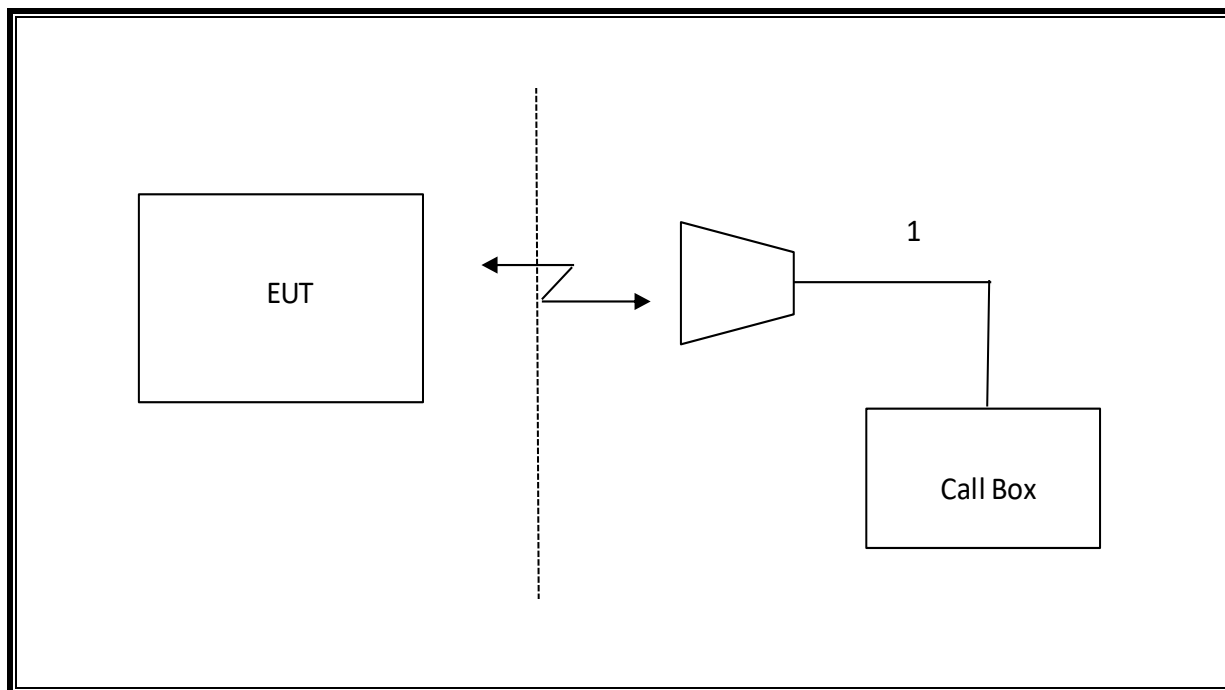
I/O CABLES (RF Radiated Test)

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 to 2000MHz	Sunol Sciences	JB3	T900	05/31/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T741	12/30/2018
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T285	06/24/2018
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T906	02/16/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T119	04/03/2019
*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	T119	04/03/2019
*Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T407	04/14/2018
Power Meter, P-series single channel	Keysight	N1912A	T1272	05/01/2019
Power Sensor	Keysight	N1921A	T1225	04/10/2019
Chamber Environment	EMCO	6502	T35	12/15/2018
Antenna, Active Loop 9KHz to 30MHz	EMCO	6502	T35	12/15/2018
*Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	T956	06/22/2018
*Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	T260	06/07/2018
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	T1871	02/19/2019
Directional Coupler	KRYTAR	152610	T1537	04/27/2019
Directional Coupler	KRYTAR	152613	T1536	04/27/2019
Band 71 Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent (Keysight) Technologies	E4446A	T123	10/28/2018
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 1.7, November 2015	
Power Measurement Software	UL	UL RF	Ver 2.2, June 2017	

NOTES: * Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

7. RF OUTPUT POWER VERIFICATION

RULE PART(S)

FCC: §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	24.9	24.1	23.1	21.5	20.6	19.5
			50	0	100	0	22.8	21.8	21.8	19.2	18.3	18.3
	2525.6	2540.0	1	49	1	0	24.8	23.7	22.7	21.4	20.4	19.3
			50	0	100	0	23.0	22.0	21.8	19.3	18.2	18.3
	2545.6	2560.0	1	49	1	0	24.9	24.1	22.8	20.9	20.1	19.0
			50	0	100	0	23.0	22.0	21.9	19.3	18.4	18.3

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
10MHz / 20MHz	2505.5	2519.9	1	49	1	0	24.5	23.9	23.0	18.7	17.7	16.7
			50	0	100	0	22.4	21.4	21.7	16.4	15.4	15.4
	2525.6	2540.0	1	49	1	0	24.4	23.6	22.8	18.5	17.6	16.7
			50	0	100	0	22.4	21.4	21.7	16.4	15.3	15.4
	2545.6	2560.0	1	49	1	0	24.5	23.6	22.5	18.3	17.4	16.4
			50	0	100	0	22.8	21.8	21.8	16.5	15.5	15.6

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	23.9	22.6	21.1	20.2	19.3
			1	0	1	49	16.2	16.3	16.1	12.6	12.9	12.9
			100	0	50	0	22.8	21.8	21.7	19.2	18.2	18.2
	2530.1	2544.5	1	99	1	0	25.0	24.0	22.8	21.1	20.4	19.2
			1	0	1	49	16.5	16.5	16.3	12.8	12.8	12.7
			100	0	50	0	23.0	21.9	21.8	19.2	18.3	18.3
	2550.1	2564.5	1	99	1	0	24.9	23.9	22.8	21.0	20.3	19.4
			1	0	1	49	16.5	16.5	16.4	12.8	12.9	12.9
			100	0	50	0	23.0	22.0	21.7	19.3	18.3	18.3

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
20MHz / 10MHz	2510.0	2524.4	1	99	1	0	24.5	23.7	22.6	18.5	17.6	16.6
			1	0	1	49	16.1	16.2	16.3	10.0	10.0	10.2
			100	0	50	0	22.7	21.7	21.7	16.6	15.6	15.7
	2530.1	2544.5	1	99	1	0	24.4	23.8	22.8	18.6	17.7	16.9
			1	0	1	49	16.3	16.3	16.5	10.1	10.2	10.3
			100	0	50	0	22.7	21.7	21.7	16.6	15.6	15.6
	2550.1	2564.5	1	99	1	0	24.4	23.8	22.6	18.6	17.8	16.8
			1	0	1	49	16.4	16.4	16.4	10.2	10.3	10.3
			100	0	50	0	22.8	21.8	21.8	16.7	15.7	15.8
			100	0	50	0	22.8	21.8	21.8	16.7	15.7	15.8

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	24.9	23.9	22.8	21.3	20.5	19.6
			75	0	75	0	22.9	21.9	21.8	21.4	18.6	18.6
	2527.5	2542.5	1	74	1	0	25.0	24.0	23.0	21.3	20.7	19.6
			75	0	75	0	23.0	22.0	21.9	19.6	18.6	18.6
	2547.5	2562.5	1	74	1	0	24.9	24.1	22.7	21.3	20.6	19.6
			75	0	75	0	23.1	22.1	21.9	19.6	18.7	18.7

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	24.5	23.8	22.8	18.6	17.7	16.8
			75	0	75	0	22.8	21.7	21.7	16.7	15.6	15.7
	2527.5	2542.5	1	74	1	0	24.3	23.9	22.6	18.6	17.8	16.7
			75	0	75	0	22.7	21.7	21.7	16.6	15.6	15.6
	2547.5	2562.5	1	74	1	0	24.4	23.8	22.6	18.6	17.8	16.7
			75	0	75	0	22.8	21.8	21.8	16.7	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	24.9	24.0	22.9	21.4	20.7	19.8
			75	0	75	0	23.1	22.1	21.9	19.6	18.7	18.6
	2525.3	2542.4	1	74	1	0	25.0	24.1	23.0	21.3	20.7	19.8
			75	0	75	0	23.1	22.1	22.0	19.6	18.7	18.7
	2542.9	2560.0	1	74	1	0	25.0	24.0	22.9	21.3	20.6	19.6
			75	0	75	0	23.2	22.2	22.0	19.7	18.8	18.8

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	23.8	22.9	18.6	17.6	16.7
			75	0	100	0	22.7	21.7	21.7	16.6	15.6	15.7
	2525.3	2542.4	1	74	1	0	24.4	23.8	22.8	18.5	17.7	16.6
			75	0	100	0	22.8	21.8	21.8	16.6	15.5	15.6
	2542.9	2560.0	1	74	1	0	24.4	23.7	22.7	18.5	17.6	16.6
			75	0	100	0	22.9	21.9	21.8	16.6	15.7	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	74	1	0	24.8	23.9	22.8	21.5	20.5	19.6
			75	0	75	0	22.9	21.9	21.9	19.6	18.6	18.6
	2527.6	2544.7	1	74	1	0	25.0	24.1	22.8	21.3	20.6	19.8
			75	0	75	0	23.0	22.0	21.9	19.7	18.7	18.7
	2545.1	2562.2	1	74	1	0	24.9	24.1	22.7	21.3	20.5	19.7
			75	0	75	0	23.1	22.1	21.9	19.7	18.8	18.8

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	24.3	23.7	22.6	18.6	17.6	16.8
			100	0	75	0	22.4	21.7	21.7	16.7	15.8	15.9
	2527.6	2544.7	1	99	1	0	24.4	23.9	22.7	18.7	17.9	17.0
			100	0	75	0	22.4	21.8	21.7	16.8	15.8	15.8
	2545.1	2562.2	1	99	1	0	24.5	23.9	22.7	18.7	17.8	17.0
			100	0	75	0	22.6	21.9	21.9	16.8	15.9	15.9

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	24.9	23.9	22.8	21.5	20.7	19.8
			1	0	1	99	16.1	16.2	16.0	12.9	13.0	13.2
			100	0	100	0	23.0	21.9	21.9	19.7	18.7	18.7
	2525.1	2544.9	1	99	1	0	24.9	24.0	22.9	21.4	20.7	19.9
			1	0	1	99	16.3	16.3	16.3	13.1	13.1	13.1
			100	0	100	0	23.0	22.0	21.9	19.7	18.8	18.8
	2540.2	2560.0	1	99	1	0	24.8	23.9	22.7	21.5	20.6	19.7
			1	0	1	99	16.1	16.2	16.0	13.0	13.0	13.1
			100	0	100	0	23.0	22.0	21.7	19.8	18.8	18.7

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	23.8	22.8	18.7	17.8	16.8
			1	0	1	99	16.0	15.9	16.1	9.8	9.8	10.0
			100	0	100	0	22.7	21.7	21.7	16.8	15.7	15.8
	2525.1	2544.9	1	99	1	0	24.4	24.0	22.9	18.7	17.8	16.8
			1	0	1	99	16.2	16.3	16.3	10.0	10.0	10.0
			100	0	100	0	22.9	21.8	21.8	16.7	15.7	15.8
	2540.2	2560.0	1	99	1	0	24.4	23.8	22.8	18.6	17.6	16.7
			1	0	1	99	16.2	16.2	16.2	9.9	10.0	10.0
			100	0	100	0	22.9	21.9	21.9	16.8	15.8	15.8

7.1.1. 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	22.3	21.6	20.5
			25	0	100	0	22.8	21.9	21.8	20.5	19.6	19.6
	2583.8	2595.5	1	24	1	0	24.3	23.3	22.1	22.2	21.4	20.4
			25	0	100	0	22.7	21.7	21.5	20.3	19.4	19.4
	2668.3	2680.0	1	24	1	0	24.7	23.8	22.9	22.2	21.6	21.3
			25	0	100	0	23.0	22.0	21.9	20.7	19.8	19.8

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	23.4	23.1	20.8	19.7	18.7
			25	0	100	0	22.2	21.2	21.5	18.3	17.3	17.3
	2583.8	2595.5	1	24	1	0	24.1	23.1	22.4	20.5	19.5	19.3
			25	0	100	0	21.7	20.7	21.0	18.1	17.0	17.0
	2668.3	2680.0	1	24	1	0	24.2	23.3	22.5	20.6	20.6	20.5
			25	0	100	0	21.7	20.8	21.0	18.2	17.3	17.3

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	24.7	23.8	22.8	22.3	21.7	20.8
			1	0	1	24	17.5	16.1	16.4	13.5	14.1	14.3
			100	0	25	0	22.6	21.6	21.6	20.0	19.5	19.5
	2590.5	2602.2	1	99	1	0	24.6	23.6	22.5	22.0	21.5	20.6
			1	0	1	24	16.9	16.7	15.7	13.3	15.1	14.4
			100	0	25	0	22.5	21.5	21.3	19.8	19.3	19.3
	2675.0	2686.7	1	99	1	0	24.9	24.0	23.1	22.5	21.8	21.2
			1	0	1	24	17.6	16.6	16.6	13.7	15.1	14.5
			100	0	25	0	22.8	21.8	21.6	20.2	19.7	19.7

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	23.3	23.0	20.7	20.0	19.0
			1	0	1	24	16.7	16.6	16.5	12.0	12.3	12.2
			100	0	25	0	22.3	21.4	21.9	18.8	17.9	17.8
	2590.5	2602.2	1	99	1	0	23.9	22.9	22.5	20.5	19.6	18.7
			1	0	1	24	16.1	16.0	15.8	11.9	12.1	12.4
			100	0	25	0	21.6	20.7	21.3	18.3	17.4	17.4
	2675.0	2686.7	1	99	1	0	23.9	23.0	22.7	20.5	19.7	18.8
			1	0	1	24	15.0	16.0	16.5	11.9	12.1	12.5
			100	0	25	0	21.7	20.6	21.2	18.4	17.4	17.4

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	24.8	23.7	22.9	22.1	21.8	20.7
			50	0	100	0	22.6	21.6	21.6	19.9	19.5	19.5
	2583.6	2598.0	1	49	1	0	24.6	23.6	22.7	21.9	21.5	20.7
			50	0	100	0	22.4	21.5	21.3	19.6	19.3	19.3
	2665.6	2680.0	1	49	1	0	25.0	24.0	23.0	22.2	21.7	21.1
			50	0	100	0	22.7	21.8	21.6	20.0	19.7	19.7

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	23.4	21.5	20.8	19.9
			50	0	100	0	22.0	21.0	21.6	19.4	18.4	18.4
	2583.6	2598.0	1	49	1	0	23.8	22.8	22.7	21.1	20.2	19.3
			50	0	100	0	21.5	20.5	21.2	19.2	18.2	18.3
	2665.6	2680.0	1	49	1	0	23.9	23.0	22.8	21.5	20.5	19.7
			50	0	100	0	21.5	20.6	21.2	19.3	18.3	18.3

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	24.8	23.8	22.9	22.3	21.7	20.8
			100	0	50	0	22.6	21.6	21.6	20.4	19.5	19.4
	2588.1	2602.5	1	99	1	0	24.6	23.7	22.5	22.4	21.5	20.6
			100	0	50	0	22.4	21.5	21.3	20.3	19.3	19.3
	2670.1	2684.5	1	99	1	0	24.9	24.1	23.1	22.2	21.9	21.1
			100	0	50	0	22.7	21.8	21.6	20.5	19.6	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
20MHz / 10MHz	2506.0	2520.4	1	99	1	0	24.5	23.9	23.5	21.5	20.7	19.9
			100	0	50	0	22.7	21.6	22.2	19.6	18.5	18.6
	2588.1	2602.5	1	99	1	0	24.4	23.5	23.0	21.4	20.5	19.6
			100	0	50	0	22.1	21.2	21.8	19.2	18.2	18.2
	2670.1	2684.5	1	99	1	0	24.4	23.5	23.2	21.5	20.6	19.9
			100	0	50	0	22.1	21.2	21.7	19.3	18.3	18.2

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	24.8	23.8	22.8	22.3	22.3	20.3
			75	0	75	0	22.6	21.6	21.6	20.0	19.2	19.1
	2585.5	2600.5	1	74	1	0	24.6	23.7	22.7	22.1	21.3	20.1
			75	0	75	0	22.4	21.4	21.3	19.8	19.0	18.9
	2667.5	2682.5	1	74	1	0	25.0	24.1	23.0	22.5	21.8	20.5
			75	0	75	0	22.7	21.8	21.7	20.2	19.4	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	23.8	23.5	21.5	20.9	19.8
			75	0	75	0	22.7	21.7	22.1	19.5	18.5	18.5
	2585.5	2600.5	1	74	1	0	24.4	23.6	23.0	21.4	20.6	19.4
			75	0	75	0	22.1	21.2	21.6	21.4	18.2	18.2
	2667.5	2682.5	1	74	1	0	24.4	23.7	22.9	21.3	20.8	19.7
			75	0	75	0	22.2	21.2	21.6	19.3	18.3	18.3

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	24.8	23.7	22.8	22.1	21.0	20.0
			75	0	100	0	22.6	21.6	21.6	19.8	18.9	18.9
	2583.3	2600.4	1	74	1	0	24.6	23.7	22.6	21.9	21.0	19.8
			75	0	100	0	22.4	21.4	21.3	19.6	18.7	18.6
	2662.9	2680.0	1	74	1	0	25.0	24.0	23.0	22.3	21.4	20.2
			75	0	100	0	22.7	21.7	21.6	20.0	19.0	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 / 20MHz	2503.8	2520.9	1	74	1	0	24.5	24.0	23.6	21.5	20.9	20.0
			75	0	100	0	22.6	21.6	22.1	19.5	18.5	18.5
	2583.3	2600.4	1	74	1	0	24.4	23.5	23.2	21.6	20.7	19.5
			75	0	100	0	24.3	21.2	21.7	19.3	18.3	18.3
	2662.9	2680.0	1	74	1	0	24.4	23.7	23.2	21.3	20.9	19.9
			75	0	100	0	22.2	21.3	21.8	19.4	18.4	18.4

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	24.7	23.9	22.9	22.1	21.3	20.3
			100	0	75	0	22.6	21.6	21.7	19.9	19.0	19.0
	2585.6	2602.7	1	99	1	0	24.6	23.7	22.6	21.9	21.0	20.0
			100	0	75	0	22.4	21.4	21.4	19.7	18.8	18.8
	2665.1	2682.2	1	99	1	0	24.9	24.0	23.2	22.3	21.3	20.5
			100	0	75	0	22.7	21.8	21.7	20.0	19.1	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
20MHz / 15MHz	2506.0	2523.1	1	99	1	0	24.5	24.0	23.5	21.5	21.0	19.9
			100	0	75	0	22.4	21.6	22.2	19.3	18.6	18.5
	2585.6	2602.7	1	99	1	0	24.1	23.5	23.1	21.1	20.5	19.7
			100	0	75	0	21.9	21.2	21.8	19.0	18.3	18.3
	2665.1	2682.2	1	99	1	0	24.2	23.7	23.3	21.2	20.7	19.9
			100	0	75	0	21.9	21.2	21.8	19.1	18.4	18.4

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	24.8	23.8	23.0	22.3	21.4	20.4
			1	0	1	99	15.8	15.9	16.0	13.4	13.6	13.8
			100	0	100	0	22.6	21.6	21.7	20.2	19.2	19.2
	2583.1	2602.9	1	99	1	0	24.6	23.7	22.7	22.1	21.1	20.3
			1	0	1	99	15.7	15.8	15.7	13.2	13.4	13.5
			100	0	100	0	22.5	21.5	21.4	19.9	18.9	18.9
	2660.2	2680.0	1	99	1	0	25.0	24.2	23.3	22.5	21.5	20.7
			1	0	1	99	15.9	16.2	16.3	13.5	13.6	13.8
			100	0	100	0	22.7	21.8	21.8	20.1	19.2	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
20MHz/ 20MHz	2506.0	2525.8	1	99	1	0	24.5	23.9	23.7	21.4	21.1	20.1
			1	0	1	99	15.8	15.9	16.4	12.6	12.9	13.0
			100	0	100	0	22.6	21.6	22.2	19.6	18.6	18.6
	2583.1	2602.9	1	99	1	0	24.3	23.7	23.2	21.3	20.6	19.7
			1	0	1	99	15.7	15.8	16.2	12.8	13.0	13.1
			100	0	100	0	22.2	21.2	21.9	19.3	18.4	18.4
	2660.2	2680.0	1	99	1	0	24.3	23.8	23.5	21.7	20.8	20.1
			1	0	1	99	15.7	15.8	16.5	12.7	12.7	13.1
			100	0	100	0	22.4	21.4	21.9	19.4	18.4	18.4

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

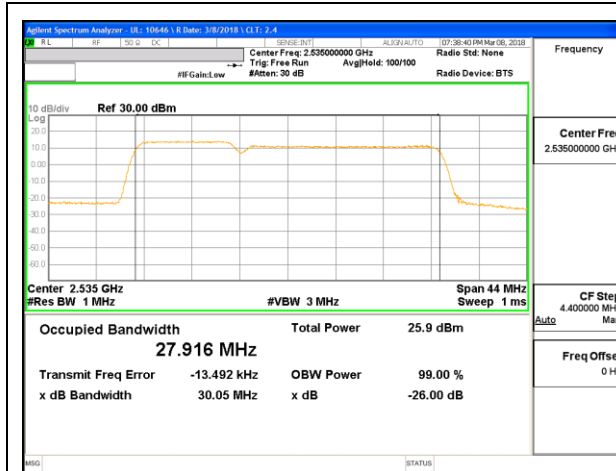
LTE BAND 7

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	27.916	30.05
	10MHz + 20MHz BAND 16QAM			27.930	30.09
	10MHz + 20MHz BAND 64QAM			28.177	30.97
	20MHz + 10MHz BAND OPSK	100/0 + 50/0		27.930	30.10
	20MHz + 10MHz BAND 16QAM			27.914	30.12
	20MHz + 10MHz BAND 64QAM			28.134	31.16
	15MHz + 15MHz BAND OPSK	75/0 + 75/0		28.502	30.79
	15MHz + 15MHz BAND 16QAM			28.495	30.74
	15MHz + 15MHz BAND 64QAM			28.643	31.40
	15MHz + 20MHz BAND OPSK	75/0 + 100/0		32.708	35.19
	15MHz + 20MHz BAND 16QAM			32.695	35.11
	15MHz + 20MHz BAND 64QAM			32.903	35.96
	20MHz + 15MHz BAND OPSK	100/0 + 75/0		32.755	35.12
	20MHz + 15MHz BAND 16QAM			32.758	35.05
	20MHz + 15MHz BAND 64QAM			32.976	36.12
	20MHz + 20MHz BAND OPSK	100/0 + 100/0		37.527	40.06
	20MHz + 20MHz BAND 16QAM			37.569	40.34
	20MHz + 20MHz BAND 64QAM			37.878	41.95

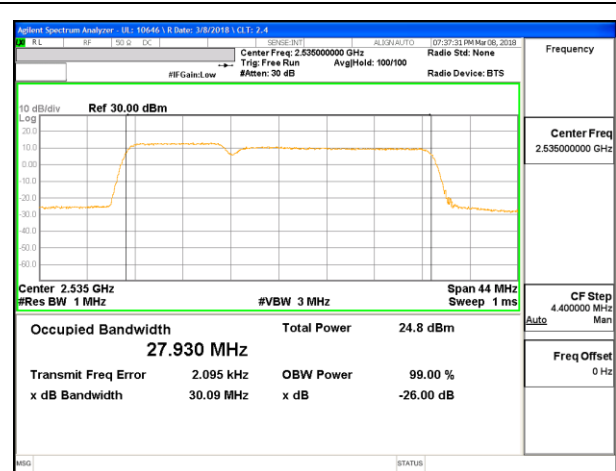
LTE BAND 41

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	23.285	26.06
	5MHz + 20MHz BAND 16QAM			23.319	25.50
	5MHz + 20MHz BAND 64QAM			23.430	27.44
	20MHz + 5MHz BAND QPSK	100/0 + 25/0		23.383	25.95
	20MHz + 5MHz BAND 16QAM			23.315	25.02
	20MHz + 5MHz BAND 64QAM			23.373	27.40
	10MHz + 20MHz BAND QPSK	50/0 + 100/0		28.032	31.14
	10MHz + 20MHz BAND 16QAM			28.064	30.09
	10MHz + 20MHz BAND 64QAM			28.203	34.96
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.039	30.47
	20MHz + 10MHz BAND 16QAM			28.027	30.76
	20MHz + 10MHz BAND 64QAM			28.139	33.44
	15MHz + 15MHz BAND QPSK	75/0 + 75/0		28.626	30.73
	15MHz + 15MHz BAND 16QAM			28.721	31.28
	15MHz + 15MHz BAND 64QAM			28.686	31.57
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		32.852	35.38
	15MHz + 20MHz BAND 16QAM			32.918	35.74
	15MHz + 20MHz BAND 64QAM			32.925	35.89
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		32.851	39.07
	20MHz + 15MHz BAND 16QAM			32.852	35.76
	20MHz + 15MHz BAND 64QAM			32.985	35.96
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.652	40.69
	20MHz + 20MHz BAND 16QAM			37.710	40.84
	20MHz + 20MHz BAND 64QAM			37.789	43.19

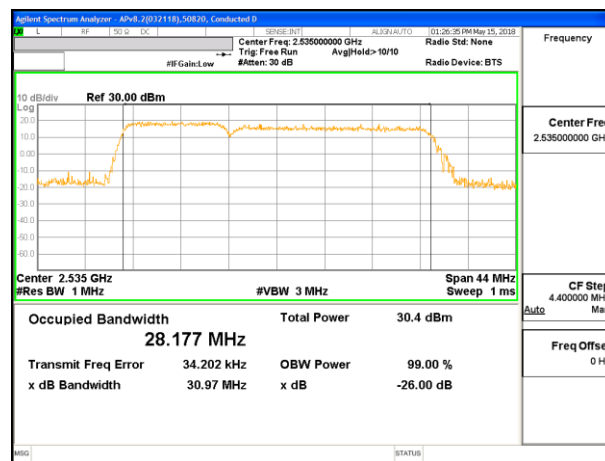
8.1.1. LTE BAND 7



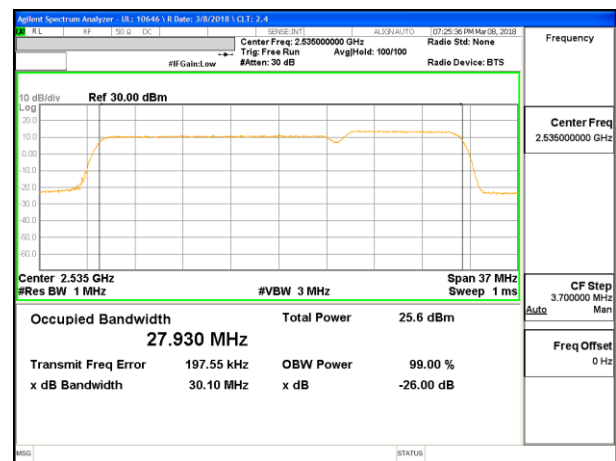
LTE B7 10MHz + 20MHz QPSK RB50-0 + RB100-0



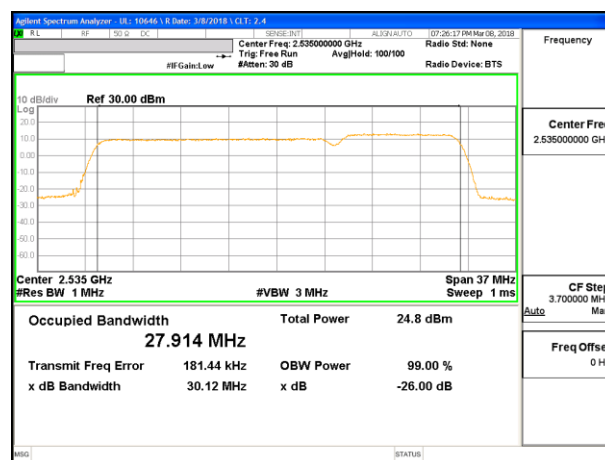
LTE B7 10MHz + 20MHz 16QAM RB50-0 + RB100-0



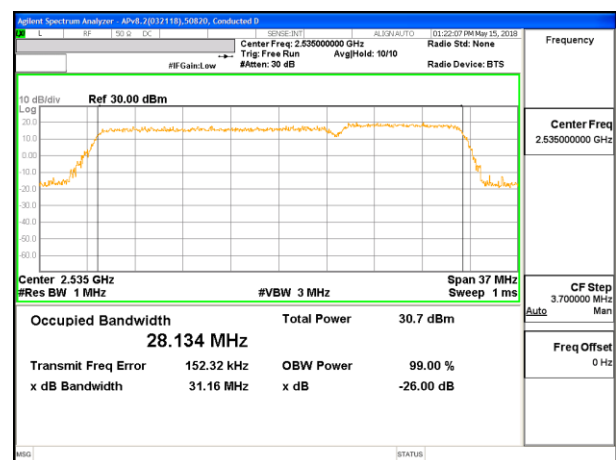
LTE B7 10MHz + 20MHz 64QAM RB50-0 + RB100-0



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



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

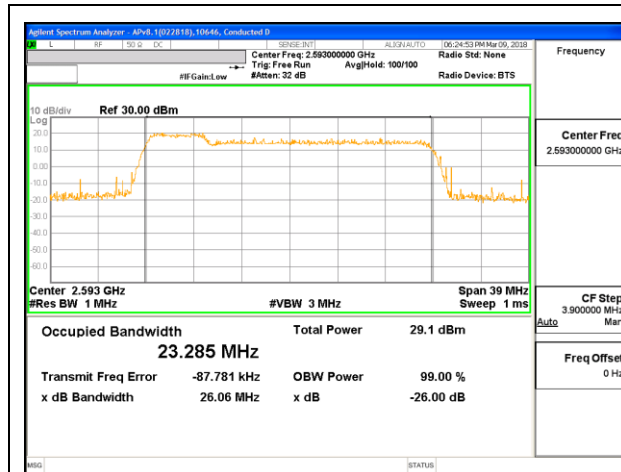


LTE B7 20MHz + 10MHz 64QAM RB100-0 + RB50-0

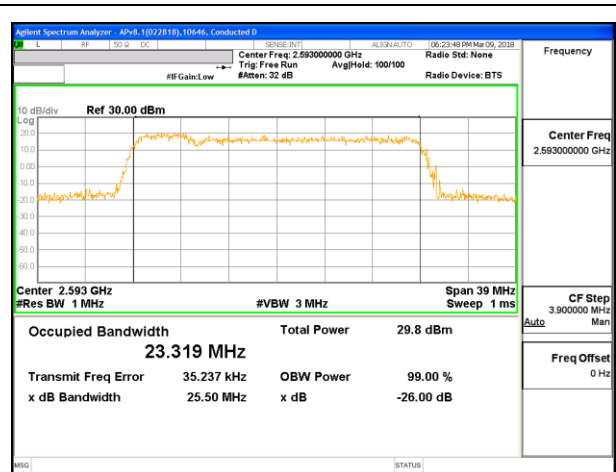




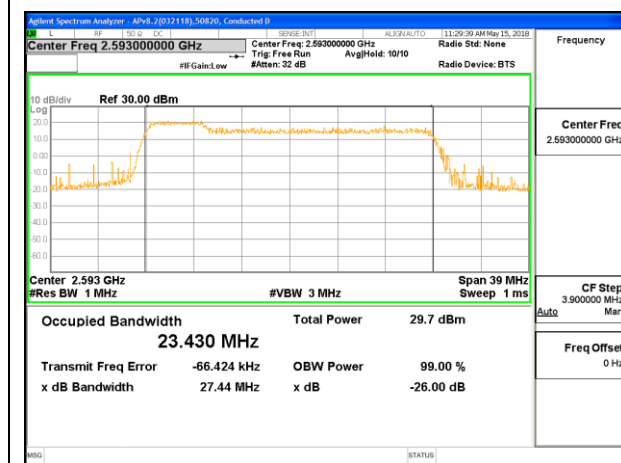
8.1.2. LTE BAND 41



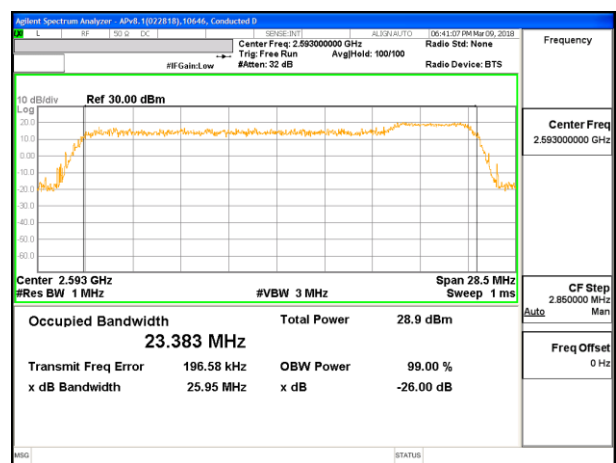
LTE B41 5MHz + 20MHz QPSK RB25-0 + RB100-0



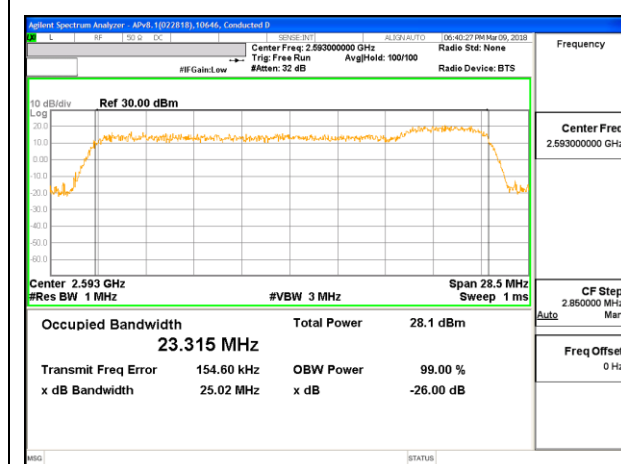
LTE B41 5MHz + 20MHz 16QAM RB25-0 + RB100-0



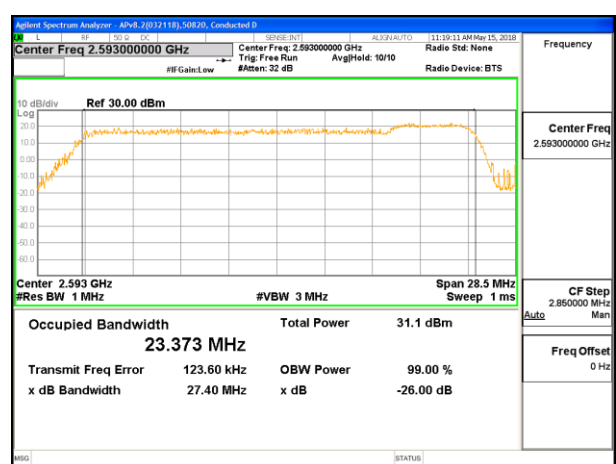
LTE B41 5MHz + 20MHz 64QAM RB25-0 + RB100-0



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



LTE B41 20MHz + 5MHz 16QAM RB100-0 + RB25-0



LTE B41 20MHz + 5MHz 64QAM RB100-0 + RB25-0







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 FCC PART 27

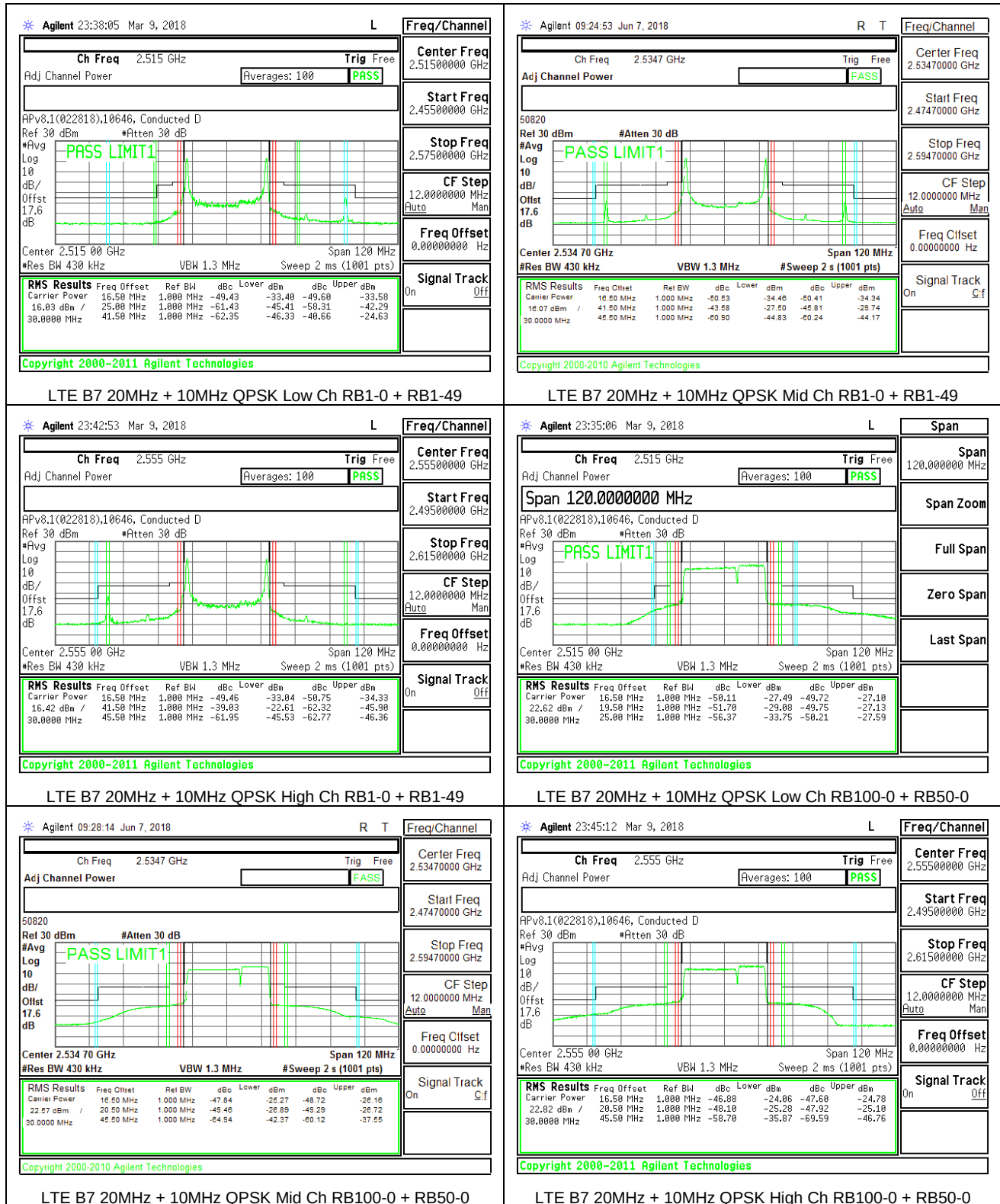
(m)(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of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

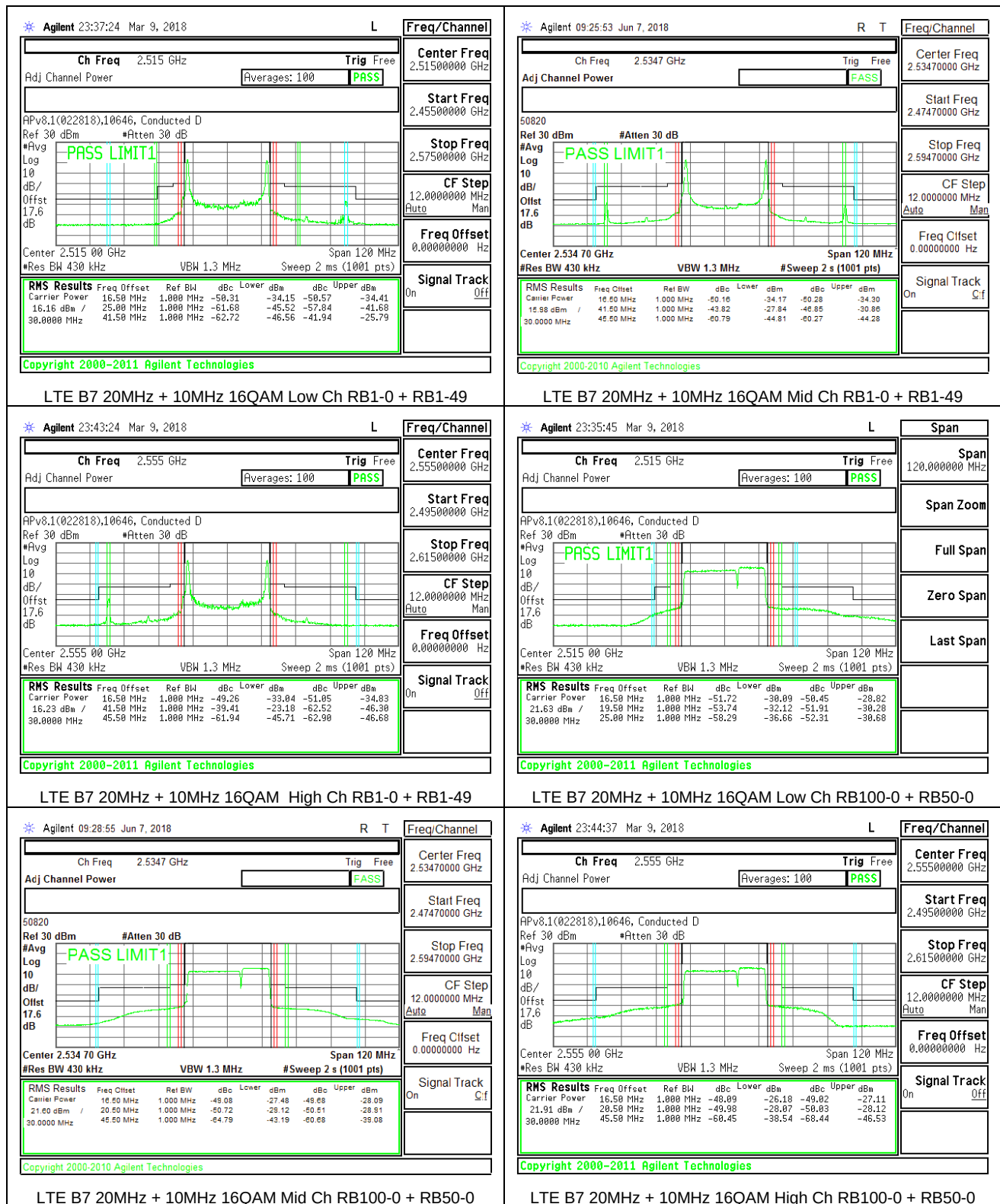
MODES TESTED

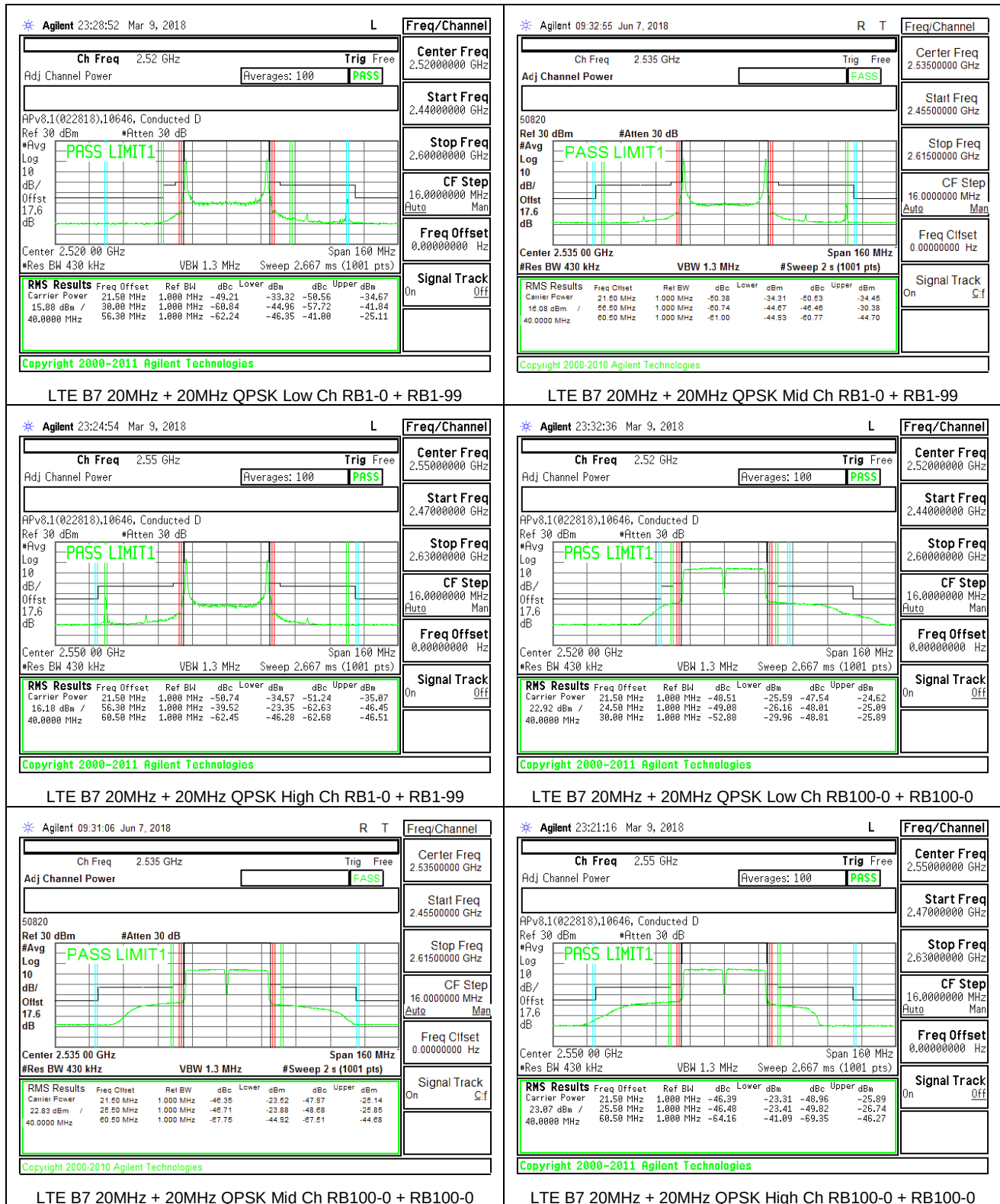
- LTE Band 7
- LTE Band 41

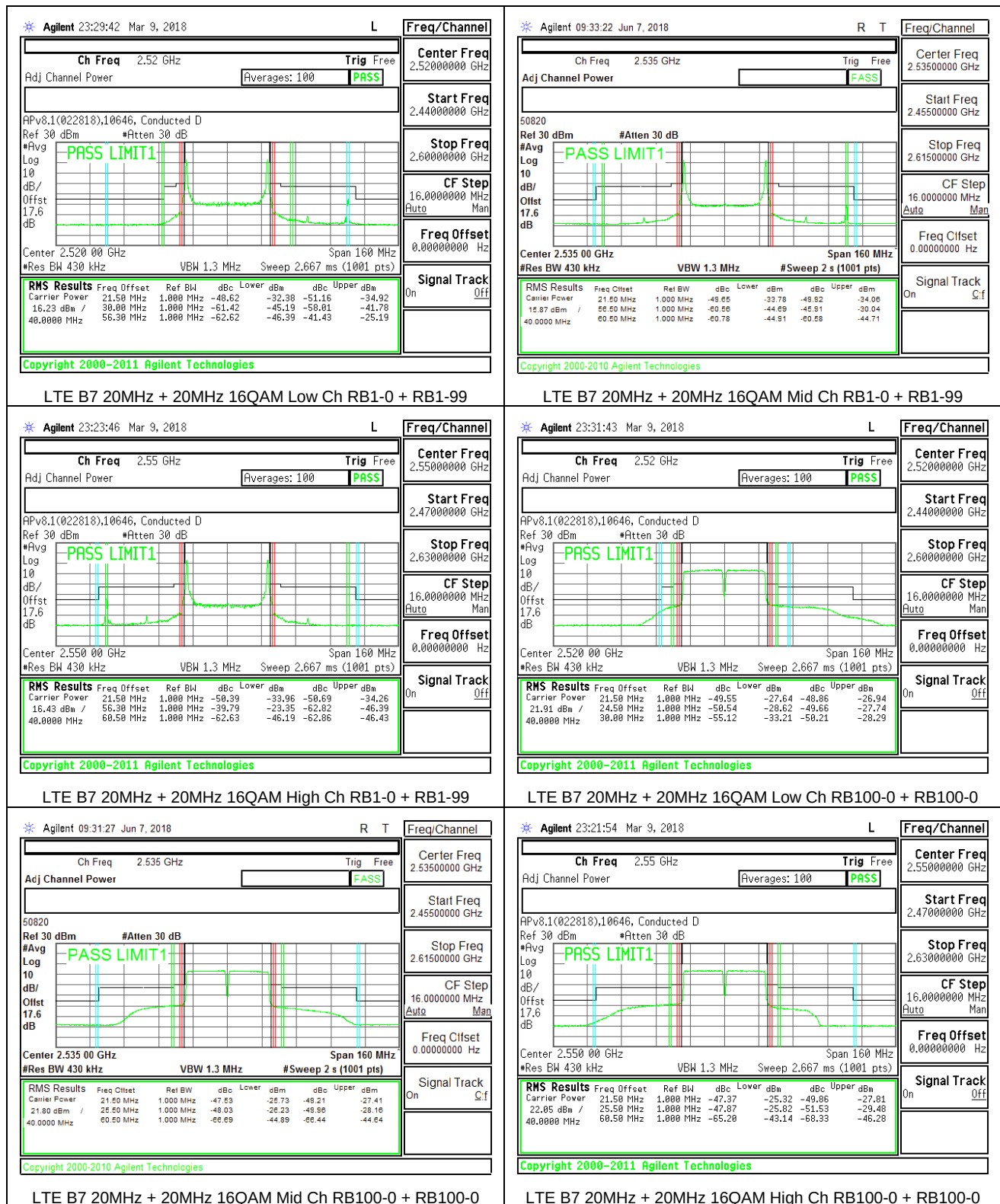
RESULTS

8.2.1. LTE BAND 7

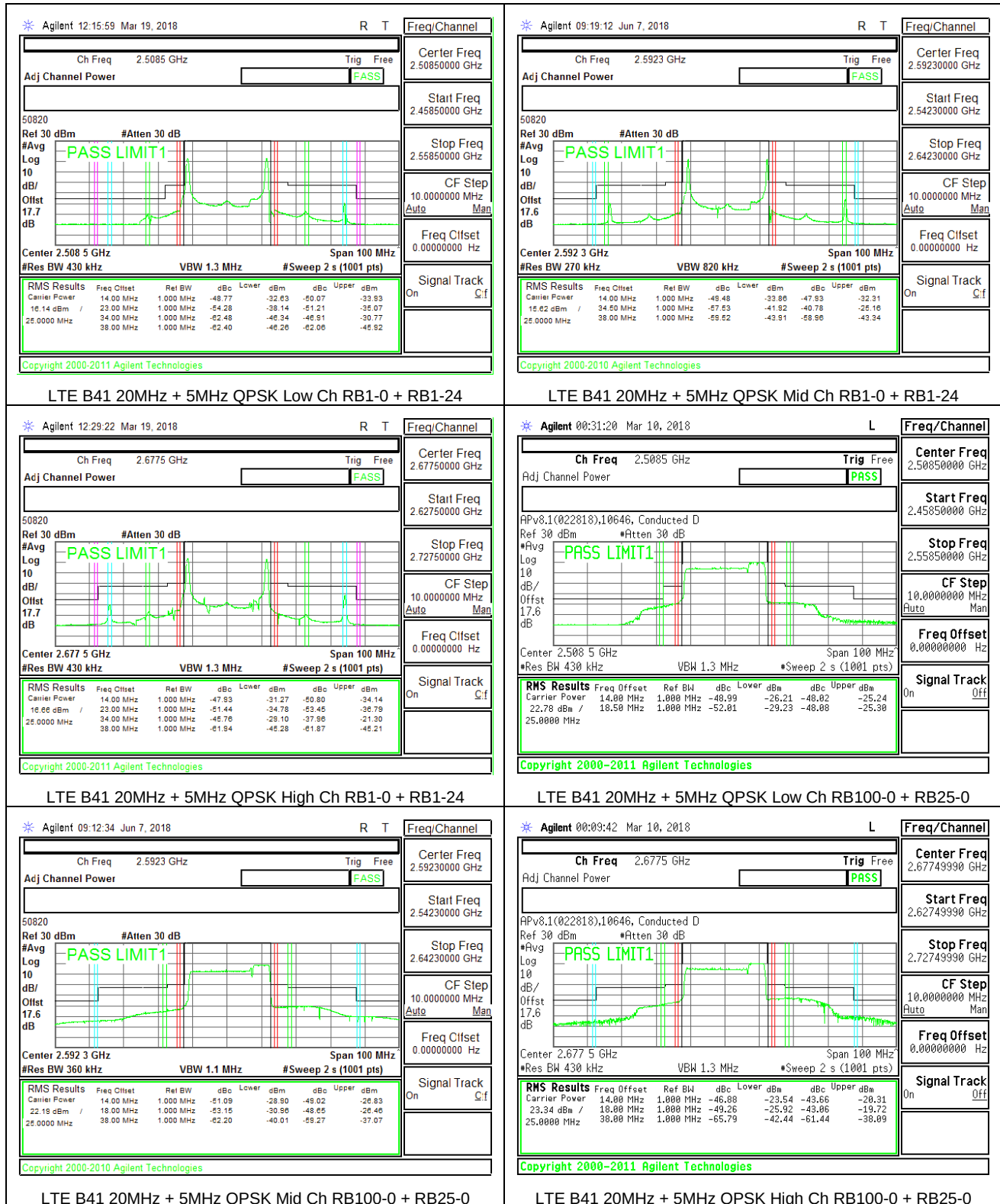


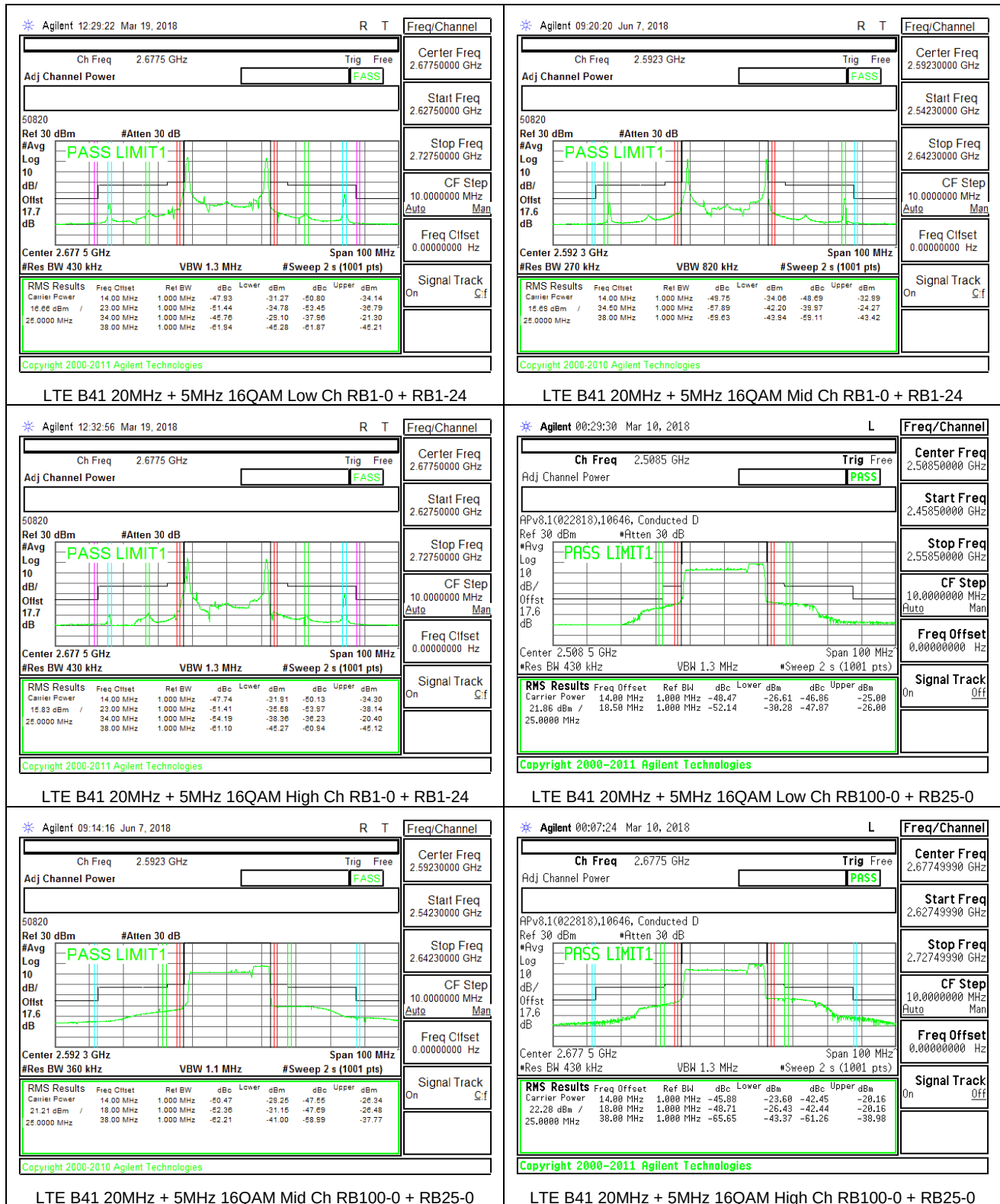


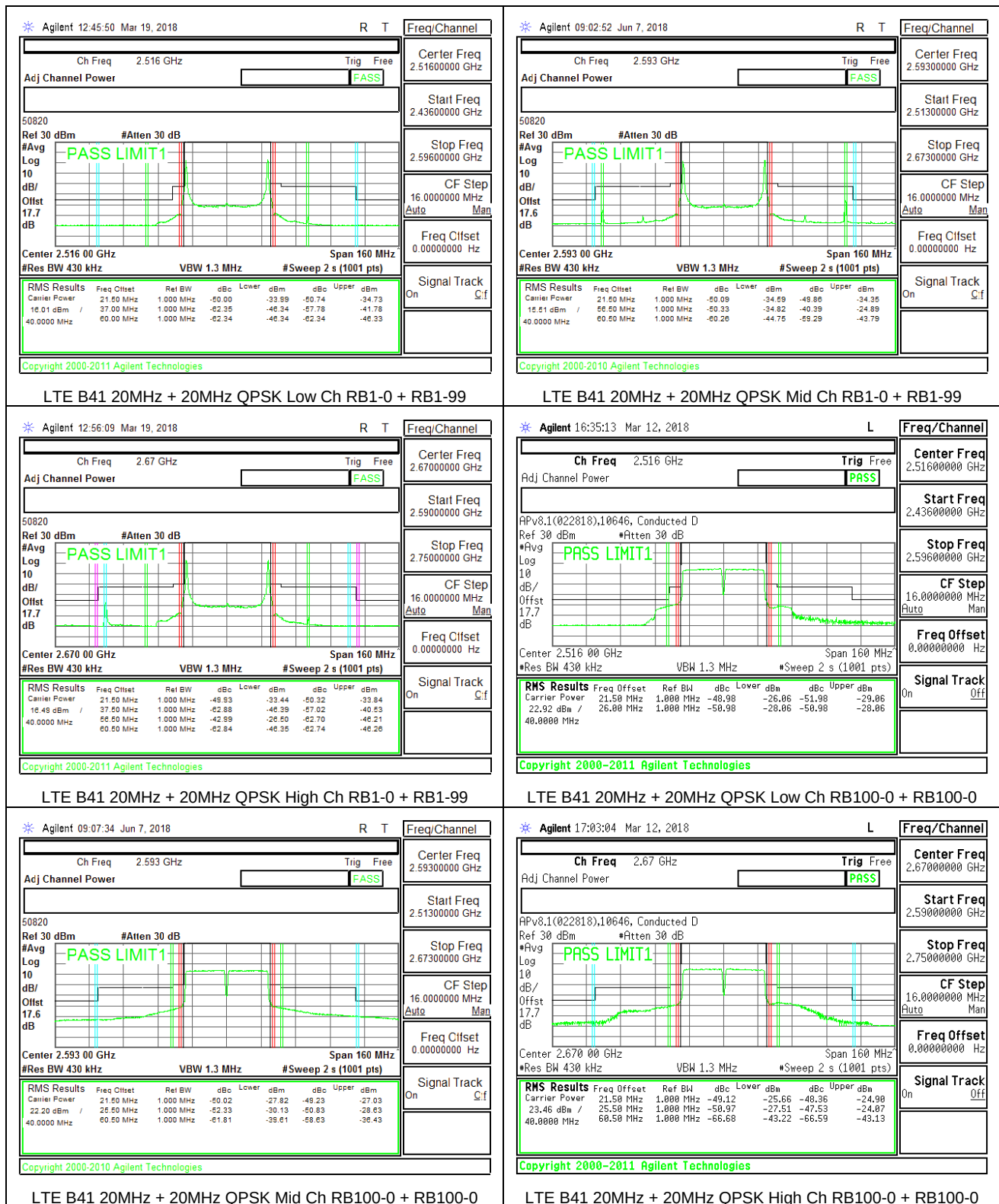


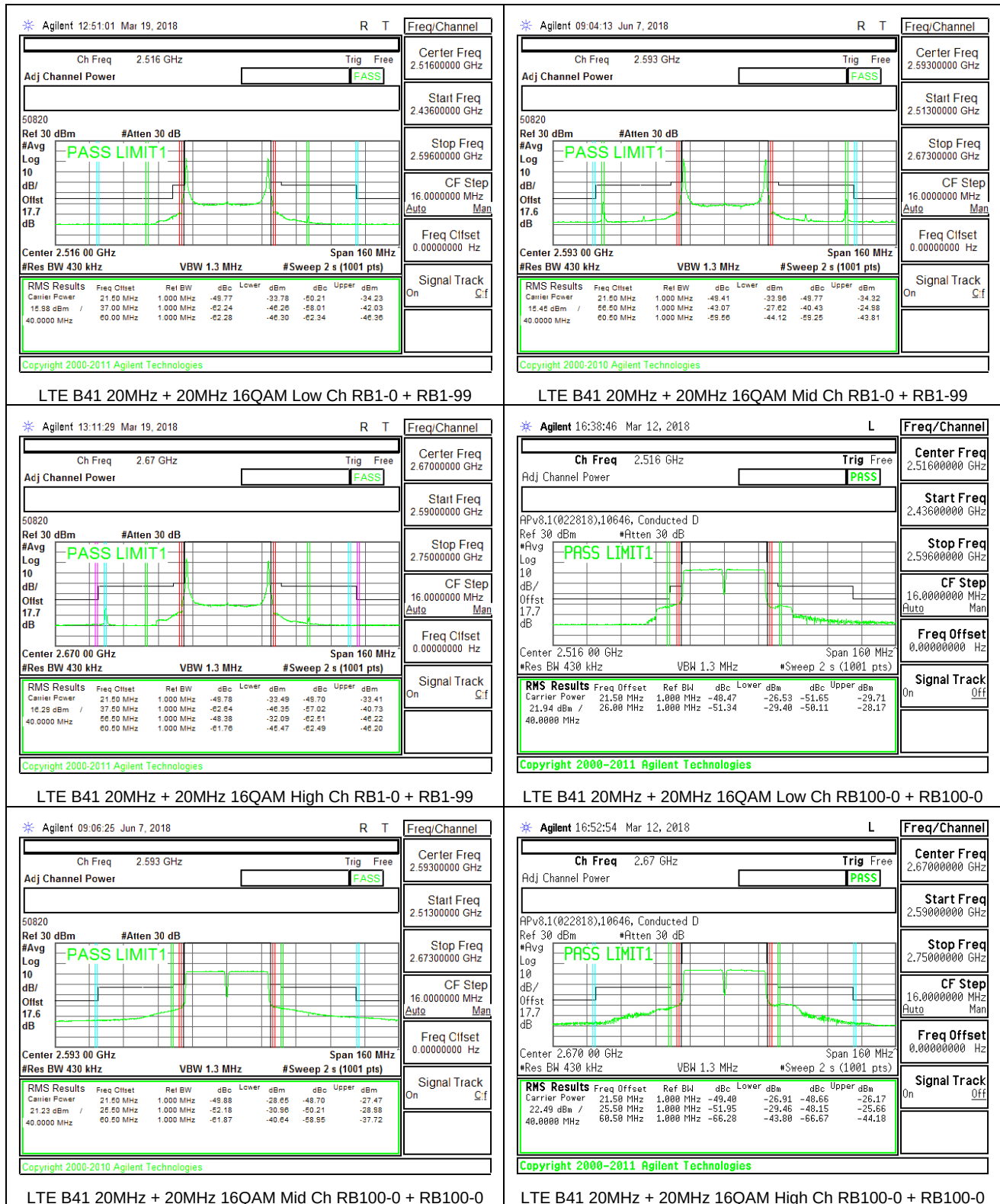


8.2.2. LTE BAND 41









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.

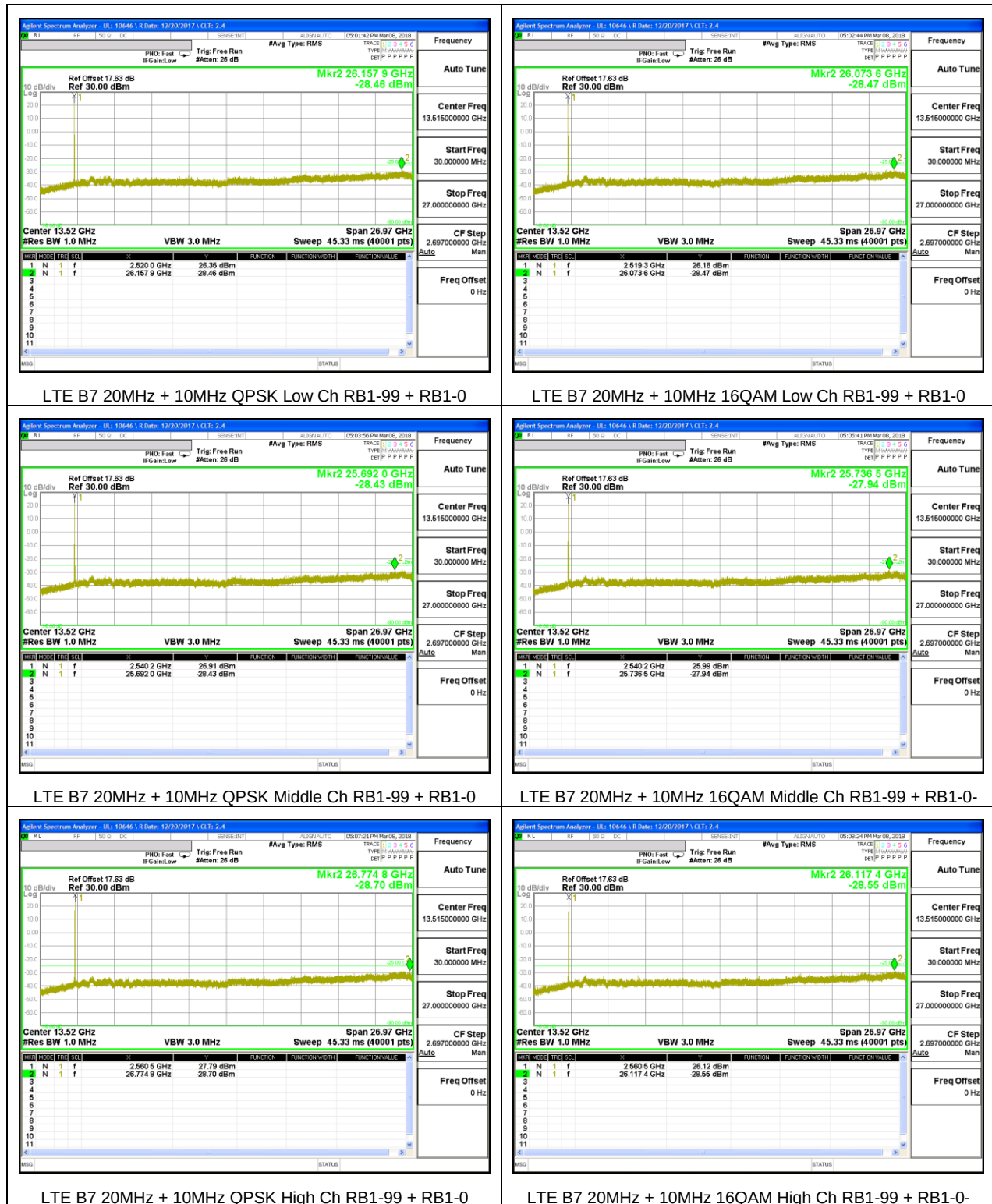
For each out of band emissions measurement:

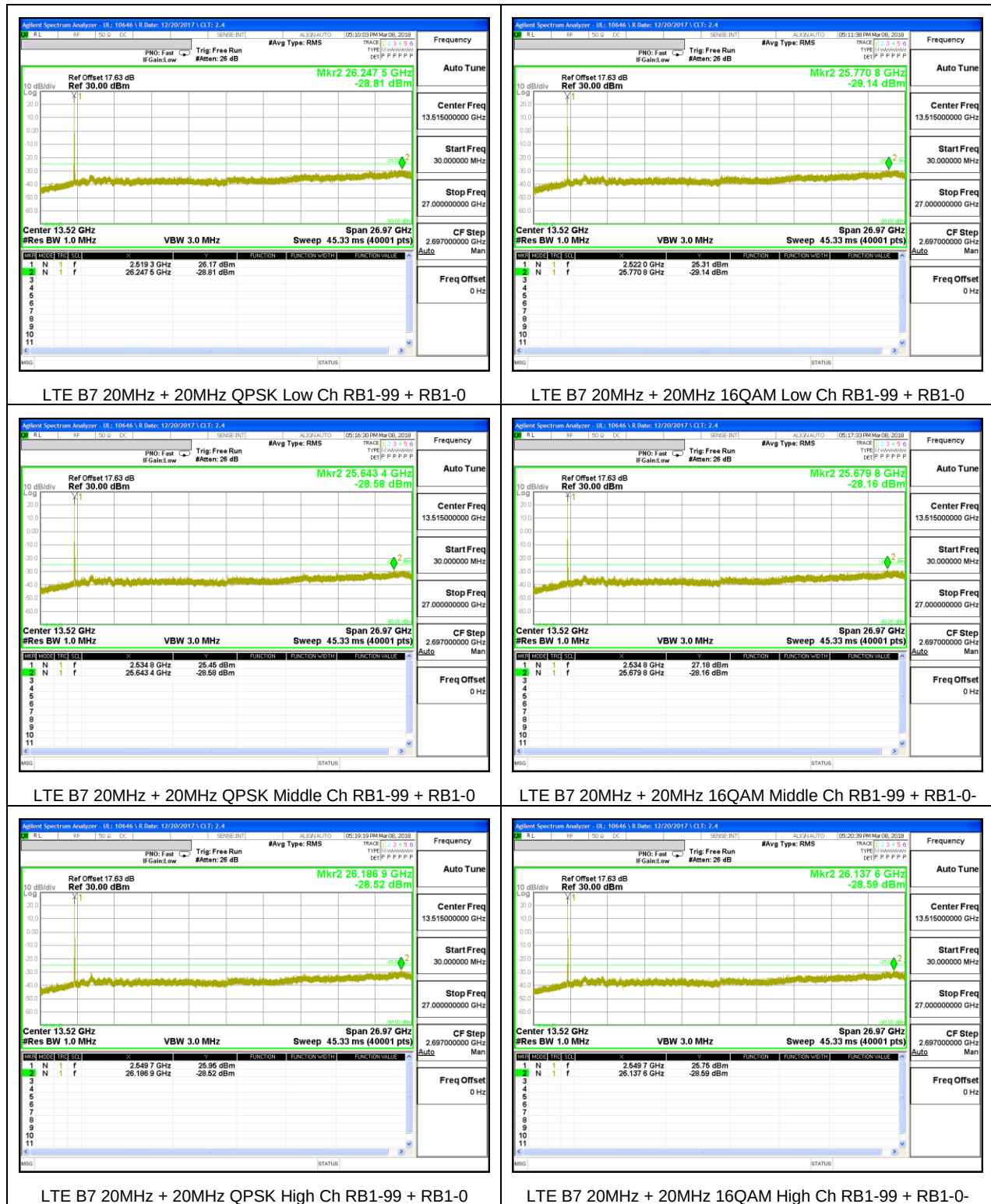
- Set display line at -25 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.
(NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

MODES TESTED

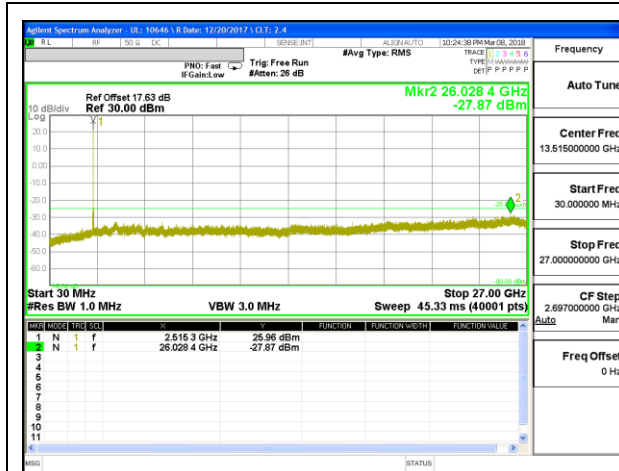
- LTE Band 7
- LTE Band 41

8.3.1. ANT 1, LTE BAND 7

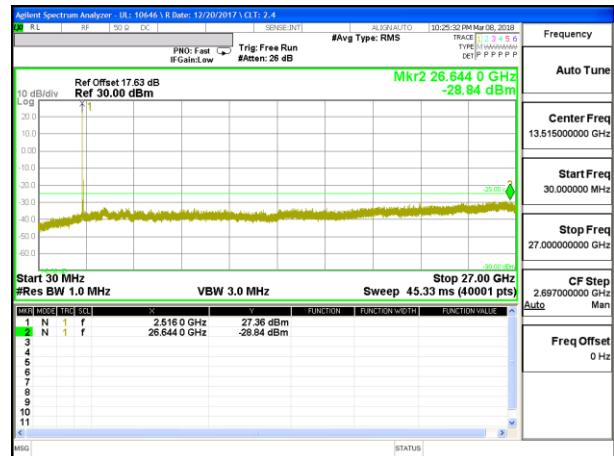




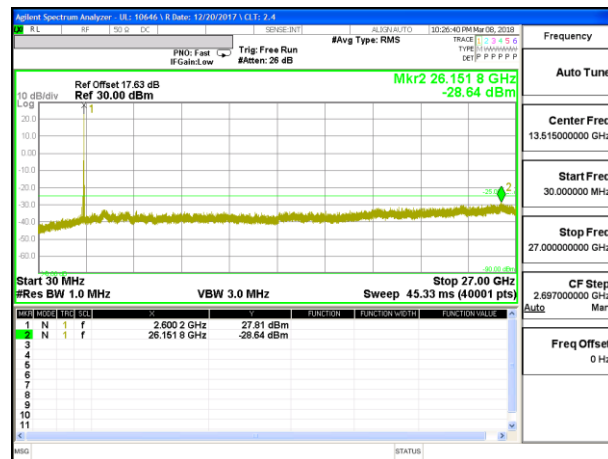
8.3.2. ANT 1, LTE BAND 41



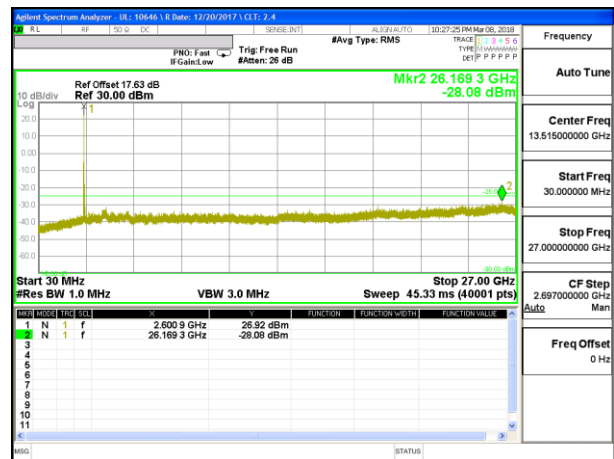
LTE B41 20MHz + 5MHz QPSK Low Ch RB1-99 + RB1-0



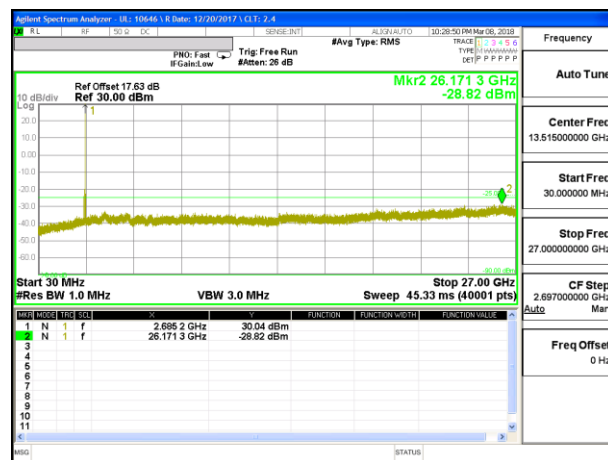
LTE B41 20MHz + 5MHz 16QAM Low Ch RB1-99 + RB1-0



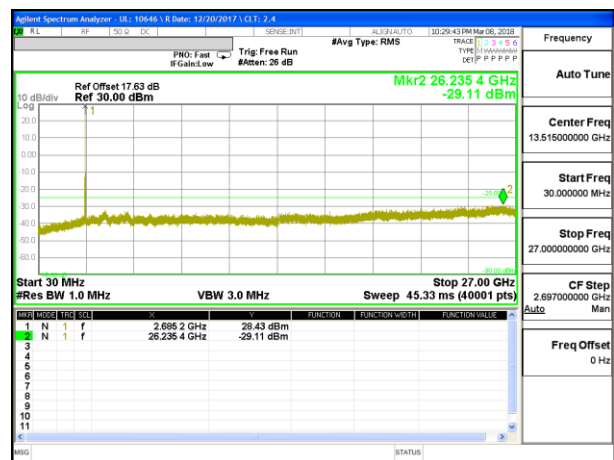
LTE B41 20MHz + 5MHz QPSK Middle Ch RB1-99 + RB1-0



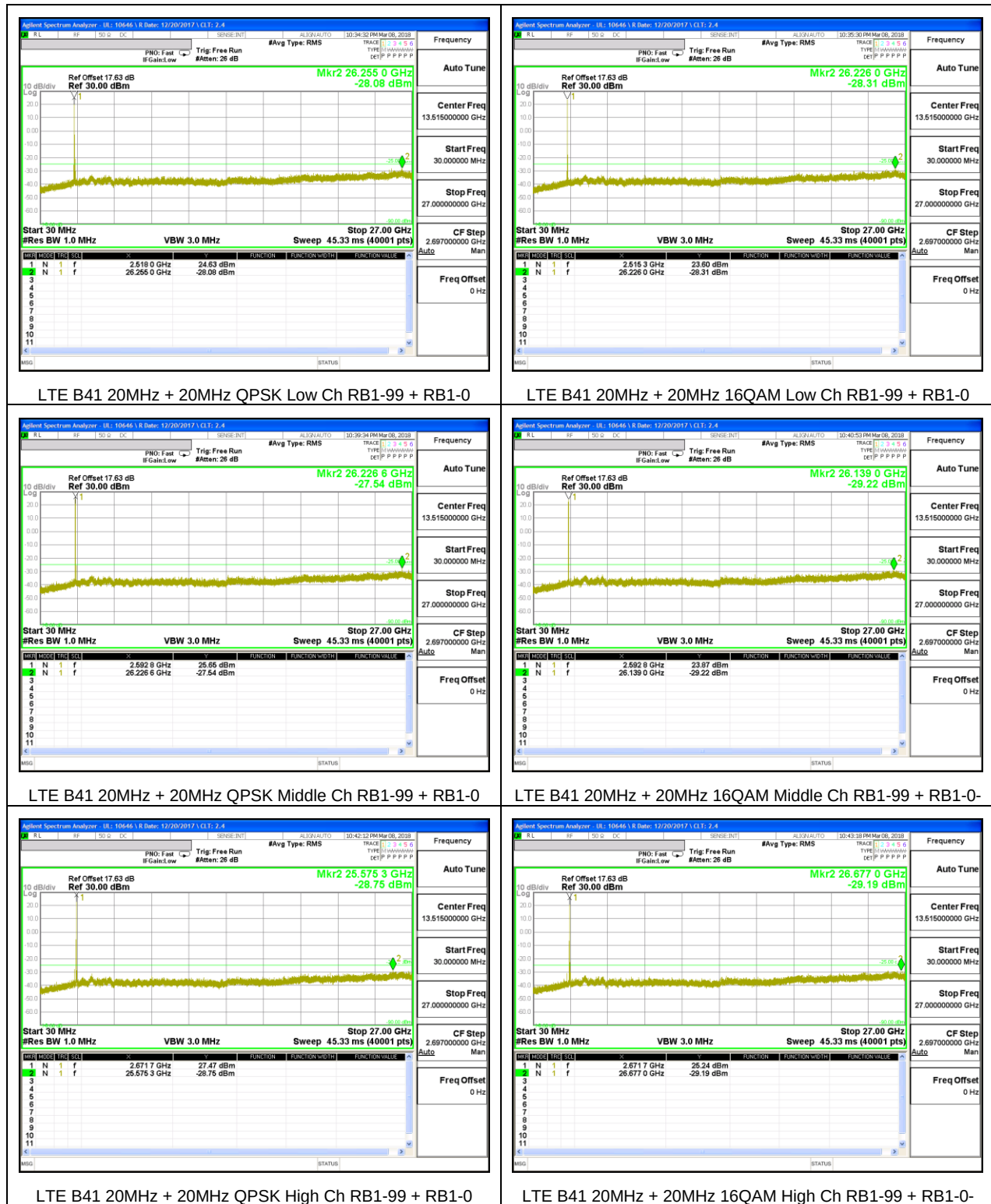
LTE B41 20MHz + 5MHz 16QAM Middle Ch RB1-99 + RB1-0



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



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



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

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

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

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

LTE B41 20MHz + 20MHz QPSK High 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

§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:	3/23/18
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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	2501.1192	2568.9042		
Extreme (50C)		2501.1192	2568.9042	51.0	0.020
Extreme (40C)		2501.1192	2568.9042	51.1	0.020
Extreme (30C)		2501.1192	2568.9042	48.8	0.019
Extreme (10C)		2501.1192	2568.9042	-21.9	-0.009
Extreme (0C)		2501.1192	2568.9042	-33.4	-0.013
Extreme (-10C)		2501.1192	2568.9042	-42.7	-0.017
Extreme (-20C)		2501.1192	2568.9042	-58.4	-0.023
Extreme (-30C)		2501.1192	2568.9042	-42.4	-0.017
20C	15%	2501.1192	2568.9042	36.1	0.014
	-15%	2501.1192	2568.9042	30.0	0.012
	End Point	2501.1192	2568.9042	35.0	0.014

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	2501.2100	2568.8987		
Extreme (50C)		2501.2100	2568.8987	90.2	0.036
Extreme (40C)		2501.2100	2568.8987	87.9	0.035
Extreme (30C)		2501.2100	2568.8987	76.0	0.030
Extreme (10C)		2501.2100	2568.8987	35.1	0.014
Extreme (0C)		2501.2100	2568.8987	-46.6	-0.018
Extreme (-10C)		2501.2100	2568.8987	-66.4	-0.026
Extreme (-20C)		2501.2100	2568.8987	-77.8	-0.031
Extreme (-30C)		2501.2100	2568.8987	-66.4	-0.026
20C	15%	2501.2100	2568.8987	45.6	0.018
	-15%	2501.2100	2568.8987	38.8	0.015
	End Point	2501.2100	2568.8987	42.4	0.017

8.4.2. LTE BAND 41

ID:	44366	Date:	3/29/18
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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	2497.0095	2689.4087		
Extreme (50C)		2497.0095	2689.4087	65.0	0.025
Extreme (40C)		2497.0095	2689.4087	75.0	0.029
Extreme (30C)		2497.0095	2689.4087	67.3	0.026
Extreme (10C)		2497.0095	2689.4087	54.0	0.021
Extreme (0C)		2497.0095	2689.4087	-50.5	-0.019
Extreme (-10C)		2497.0095	2689.4087	-51.9	-0.020
Extreme (-20C)		2497.0095	2689.4087	-121.5	-0.047
Extreme (-30C)		2497.0095	2689.4087	-140.3	-0.054
20C	15%	2497.0095	2689.4087	29.4	0.011
	-15%	2497.0095	2689.4087	30.9	0.012
	End Point	2497.0095	2689.4087	22.9	0.009

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	2496.8471	2688.9075		
Extreme (50C)		2496.8471	2688.9075	102.9	0.040
Extreme (40C)		2496.8471	2688.9075	106.0	0.041
Extreme (30C)		2496.8471	2688.9075	115.6	0.045
Extreme (10C)		2496.8471	2688.9075	60.8	0.023
Extreme (0C)		2496.8471	2688.9075	-54.0	-0.021
Extreme (-10C)		2496.8471	2688.9075	-137.0	-0.053
Extreme (-20C)		2496.8471	2688.9075	-161.8	-0.062
Extreme (-30C)		2496.8471	2688.9075	-152.1	-0.059
20C	15%	2496.8471	2688.9075	-29.5	-0.011
	-15%	2496.8471	2688.9075	-38.9	-0.015
	End Point	2496.8471	2688.9075	-29.7	-0.011