FCC CFR47 PART 27 SUBPART M

WWAN Uplink Carrier Aggregation

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT

MODEL NUMBER : SM-N975F/DS, SM-N975F, SM-N975X

FCC ID: A3LSMN975F

REPORT NUMBER: 4789067225-E3V1

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Prepared for
SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Prepared by
UL Korea, Ltd.
26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea
Suwon Test Site: UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433

ACCREDITED
Testing Laboratory

TL-637

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V1	06/27/19	Initial issue	Junwhan Lee

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT
MODEL NUMBER:	SM-N975F/DS, SM-N975F, SM-N975X
SERIAL NUMBER:	R3CM40CW0CE, R3CM40CW7RX, R3CM40CW9DH (CONDUCTED, Original) R3CM503RJ4R, R3CM503RHXX, R3CM40CW58E, R3CM506NLK, R3CM506Q9KN, R3CM506Q9BW (RADIATED, Original);
DATE TESTED:	JUN 07, 2019 – JUN 17, 2019(Original); JUN 21, 2019 – JUN 26, 2019(Spot check);

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 27M	Pass

UL Korea, Ltd. 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 Korea, Ltd. 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 Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. 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 IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

SungGil Park
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMN976B PCE WWAN Uplink Carrier Aggregation (FCC CFR 47 Part 27). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMN975F shares the same enclosure and circuit board as FCC ID: A3LSMN976B. The WWAN antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMN976B remains representative of FCC ID: A3LSMN975F. The test data of FCC ID: A3LSMN976B being submitted for this application to cover WWAN features.

1.3. SPOT CHECK VERIFICATION DATA

(Worst case of the radiated spurious emissions)

Band	Test Item	Worst Mode	Fundamental Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-N976B	SM-N975F/DS		
					FCC ID : A3LSMN976B	FCC ID : A3LSMN975F		
LTE Band 7C	RSE	QPSK PCC : 20MHz SCC : 20MHz	PCC : 2510MHz SCC : 2529.8MHz	-25.00 dBm	-44.30 dBm	-41.90 dBm	2.40 dB	2nd Harmonic
LTE Band 38C	RSE	QPSK PCC : 15MHz SCC : 15MHz	PCC : 2577.5MHz SCC : 2592.5MHz	-25.00 dBm	-38.40 dBm	-40.8 dBm	-2.40 dB	4th Harmonic

Comparison of two models, upper deviation is within 3dB range and all test results are under FCC Technical Limits.

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1.4. REFERENCE DETAIL

Reference application that contains the reused reference data in the individual test reports:

Equipment Class	Reference FCC ID (Parent)	Application Type	Reference Test report number	Exhibit Type	Variant Test Report Number	Data Re-used
PCE	A3LSMN976B	Original Grant	4789009800-E2	Test Report	4789067225-E2	All
			4789009800-E3	Test Report	4789067225-E3	All
DTS	A3LSMN976B	Original Grant	4789009800-E5 (802.11b/g/n)	Test Report	4789067225-E5 (802.11b/g/n)	All
			4789009800-E6 (802.11ax)	Test Report	4789067225-E6 (802.11ax)	All
			4789009800-E4 Bluetooth LE	Test Report	4789067225-E4 Bluetooth LE	All
DSS	A3LSMN976B	Original Grant	4789009800-E7 (Bluetooth)	Test Report	4789067225-E7 (Bluetooth)	All
NII	A3LSMN976B	Original Grant	4789009800-E8 (802.11a/n/ac)	Test Report	4789067225-E8 (802.11a/n/ac)	All
			4789009800-E9 (802.11ax)	Test Report	4789067225-E9 (802.11ax)	All
DXX	A3LSMN976B	Original Grant	4789009800-E10 (ANT+)	Test Report	4789067225-E10 (ANT+)	All
			4789009800-E11 (NFC)	Test Report	4789067225-E11 (NFC)	All
DCD	A3LSMN976B	Original Grant	4789009800-E12 (WPT)	Test Report	4789067225-E12 (WPT)	All

For this application the data reuse is summarized below for each equipment class:

Equipment Class	Reference FCC ID (Parent)	Application Type	Data Re-used
PCE	A3LSMN976B	Original Grant	All except SAR (full test), HAC (full test)
			All except SAR (full test), HAC (full test)
DTS	A3LSMN976B	Original Grant	All except SAR (full test), HAC (full test)
			All except SAR (full test), HAC (full test)
			All
DSS	A3LSMN976B	Original Grant	All except SAR (full test)
NII	A3LSMN976B	Original Grant	All except SAR (full test), HAC (full test)
			All except SAR (full test), HAC (full test)
DXX	A3LSMN976B	Original Grant	All
			All
DCD	A3LSMN976B	Original Grant	All except RF exposure

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 27.
3. ANSI TIA-603-E, 2016
4. ANSI C63.26, 2015
5. KDB 971168 D01 Power Meas License Digital Systems v03r01
6. KDB 484596 D01 Referencing Test Data v01

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do,16675, Korea. Line conducted emissions are measured only at the 218 address. 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.

218 Maeyeong-ro
☒ Chamber 1
☒ Chamber 2
☐ Chamber 3

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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:

EIRP = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss(between the SG and substitution antenna) + Substitution Antenna Factor (dBi)

ERP = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss(between the SG and substitution antenna)

(Path loss = Signal generator output – PSA reading with substitution antenna)

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4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.86 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.97 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.57 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT. This test report addresses the WWAN Uplink Carrier Aggregation operational mode.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum average radiated EIRP output powers as follows:

LTE Band 7C (Uplink CA)

Part 27	
EIRP Limit (dBm)	33.00
Antenna Gain (dBi)	-4.71

Bandwidth (MHz)	Frequency Range (MHz)	Modulation	OUTPUT POWER			
			Conducted Average (dBm)	EIRP Average (dBm)		Margin (dB)
				dBm	mW	
15+10	2500-2570	QPSK	23.41	18.70	74.13	-14.30
		16QAM	22.85	18.14	65.16	-14.86
		64QAM	20.94	16.23	41.98	-16.77
10+20		QPSK	23.61	18.90	77.62	-14.10
		16QAM	23.40	18.69	73.96	-14.31
		64QAM	21.12	16.41	43.75	-16.59
15+15		QPSK	23.57	18.86	76.91	-14.14
		16QAM	23.01	18.30	67.61	-14.70
		64QAM	21.20	16.49	44.57	-16.51
20+10		QPSK	23.45	18.74	74.82	-14.26
		16QAM	23.01	18.30	67.61	-14.70
		64QAM	21.26	16.55	45.19	-16.45
15+20		QPSK	23.58	18.87	77.09	-14.13
		16QAM	23.05	18.34	68.23	-14.66
		64QAM	21.09	16.38	43.45	-16.62
20+15		QPSK	23.50	18.79	75.68	-14.21
		16QAM	23.04	18.33	68.08	-14.67
		64QAM	21.11	16.40	43.65	-16.60
20+20		QPSK	23.68	18.97	78.89	-14.03
		16QAM	23.21	18.50	70.79	-14.50
		64QAM	21.34	16.63	46.03	-16.37

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LTE Band 38C (Uplink CA)

Part 27	
EIRP Limit (dBm)	33.00
Antenna Gain (dBi)	-4.71

Bandwidth (MHz)	Frequency Range (MHz)	Modulation	OUTPUT POWER			
			Conducted Average (dBm)	EIRP Average (dBm)		Margin (dB)
				dBm	mW	
15+15	2570-2620	QPSK	23.09	18.38	68.87	-14.62
		16QAM	22.28	17.57	57.15	-15.43
		64QAM	20.04	15.33	34.12	-17.67
20+20		QPSK	23.04	18.33	68.08	-14.67
		16QAM	21.96	17.25	53.09	-15.75
		64QAM	20.02	15.31	33.96	-17.69

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5.3. RF OUTPUT POWER VERIFICATION (CONDUCTED AND EIRP)

RULE PART(S)

FCC: §2.1046, §27.50

EIRP LIMIT

FCC: §27.50(h)

(h) The following power limits shall apply in the BRS and EBS:
(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

TEST PROCEDURE

TIA-603-E Clause 2.2.17
KDB 971168 Section 5.6

ERP/EIRP = PMeas + GT − LC
where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);
PMeas = measured transmitter output power or PSD, in dBm or dBW;
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.2

RESULTS

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:

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OUTPUT POWER FOR LTE BAND 7C (15.0MHz + 10.0MHz)

Antenna Gain (dBi)	-4.71								
Bandwidth	PCC Frequency (MHz)	SCC Frequency (MHz)	PCC RB	PCC RB	SCC RB	SCC RB	Conducted Average (dBm)		
			Size	Offset	Size	Offset	QPSK	16QAM	64QAM
15MHz / 10MHz	2507.5	2519.5	1	74	1	0	23.41	22.85	20.94
			1	0	1	49	15.51	15.54	15.56
			75	0	50	0	21.69	20.67	20.71
	2527.5	2539.5	1	74	1	0	23.33	22.66	20.86
			1	0	1	49	15.54	15.60	15.62
			75	0	50	0	21.74	20.70	20.66
	2552.5	2564.5	1	74	1	0	23.18	22.54	20.78
			1	0	1	49	15.39	15.44	15.46
			75	0	50	0	21.52	20.56	20.53

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

Antenna Gain (dBi)	-4.71								
Bandwidth	PCC Frequency (MHz)	SCC Frequency (MHz)	PCC RB	PCC RB	SCC RB	SCC RB	Conducted Average (dBm)		
			Size	Offset	Size	Offset	QPSK	16QAM	64QAM
10MHz / 20MHz	2505.5	2519.9	1	49	1	0	23.55	22.78	20.76
			1	0	1	99	15.41	15.40	15.30
			50	0	100	0	21.62	20.63	20.57
	2525.6	2540.0	1	49	1	0	23.61	23.40	21.12
			1	0	1	99	15.49	16.01	15.57
			50	0	100	0	21.71	20.68	20.71
	2545.6	2560.0	1	49	1	0	23.54	23.04	20.91
			1	0	1	99	15.41	15.76	15.61
			50	0	100	0	21.54	20.57	20.50

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

Antenna Gain (dBi)	-4.71								
Bandwidth	PCC Frequency (MHz)	SCC Frequency (MHz)	PCC RB	PCC RB	SCC RB	SCC RB	Conducted Average (dBm)		
			Size	Offset	Size	Offset	QPSK	16QAM	64QAM
15MHz / 15MHz	2507.5	2522.5	1	74	1	0	23.57	22.91	21.20
			1	0	1	74	15.54	15.47	15.60
			75	0	75	0	21.75	20.73	20.68
	2527.5	2542.5	1	74	1	0	23.51	23.01	21.09
			1	0	1	74	15.58	15.85	15.73
			75	0	75	0	21.78	20.74	20.72
	2547.5	2562.5	1	74	1	0	23.46	22.99	20.83
			1	0	1	74	15.47	15.77	15.53
			75	0	75	0	21.64	20.64	20.65

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

Antenna Gain (dBi)	-4.71								
Bandwidth	PCC Frequency (MHz)	SCC Frequency (MHz)	PCC RB	PCC RB	SCC RB	SCC RB	Conducted Average (dBm)		
			Size	Offset	Size	Offset	QPSK	16QAM	64QAM
20MHz / 10MHz	2510.0	2524.4	1	99	1	0	23.45	23.01	21.26
			1	0	1	49	15.64	15.69	15.84
			100	0	50	0	21.68	20.67	20.66
	2530.1	2544.5	1	99	1	0	23.25	22.68	20.79
			1	0	1	49	15.57	15.78	15.64
			100	0	50	0	21.66	20.64	20.61
	2550.1	2564.5	1	99	1	0	23.19	22.58	20.72
			1	0	1	49	15.44	15.62	15.36
			100	0	50	0	21.51	20.49	20.46

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

Antenna Gain (dBi)	-4.71								
Bandwidth	PCC Frequency (MHz)	SCC Frequency (MHz)	PCC RB	PCC RB	SCC RB	SCC RB	Conducted Average (dBm)		
			Size	Offset	Size	Offset	QPSK	16QAM	64QAM
15MHz / 20MHz	2507.8	2524.9	1	74	1	0	23.58	22.79	20.97
			1	0	1	99	15.55	15.42	15.29
			75	0	100	0	21.80	20.76	20.69
	2525.30	2542.40	1	74	1	0	23.56	22.98	21.09
			1	0	1	99	15.57	15.78	15.66
			75	0	100	0	21.83	20.83	20.81
	2542.9	2560.0	1	74	1	0	23.35	23.05	21.02
			1	0	1	99	15.48	15.65	15.58
			75	0	100	0	21.70	20.68	20.65

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

Antenna Gain (dBi)	-4.71								
Bandwidth	PCC Frequency (MHz)	SCC Frequency (MHz)	PCC RB	PCC RB	SCC RB	SCC RB	Conducted Average (dBm)		
			Size	Offset	Size	Offset	QPSK	16QAM	64QAM
20MHz / 15MHz	2510.0	2527.1	1	99	1	0	23.50	23.04	21.11
			1	0	1	74	15.72	15.82	15.71
			100	0	75	0	21.73	20.71	20.65
	2527.6	2544.7	1	99	1	0	23.37	22.94	21.04
			1	0	1	74	15.66	15.71	15.88
			100	0	75	0	21.69	20.68	20.65
	2545.1	2562.2	1	99	1	0	23.24	22.82	20.77
			1	0	1	74	15.46	15.63	15.57
			100	0	75	0	21.53	20.55	20.51

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

Antenna Gain (dBi)	-4.71								
Bandwidth	PCC Frequency (MHz)	SCC Frequency (MHz)	PCC RB	PCC RB	SCC RB	SCC RB	Conducted Average (dBm)		
			Size	Offset	Size	Offset	QPSK	16QAM	64QAM
20MHz / 20MHz	2510.0	2529.8	1	99	1	0	23.68	23.21	21.34
			1	0	1	99	15.65	15.76	15.84
			100	0	100	0	21.79	20.78	20.73
	2525.1	2544.9	1	99	1	0	23.55	22.94	20.89
			1	0	1	99	15.58	15.75	15.65
			100	0	100	0	21.73	20.73	20.66
	2540.2	2560.0	1	99	1	0	23.45	22.95	21.05
			1	0	1	99	15.57	15.75	15.61
			100	0	100	0	21.63	20.58	20.57

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OUTPUT POWER FOR LTE BAND 38C (15.0MHz + 15.0MHz)

Antenna Gain (dBi)	-4.71								
Bandwidth	PCC Frequency (MHz)	SCC Frequency (MHz)	PCC RB	PCC RB	SCC RB	SCC RB	Conducted Average (dBm)		
			Size	Offset	Size	Offset	QPSK	16QAM	64QAM
15MHz / 15MHz	2577.5	2592.5	1	74	1	0	22.83	21.93	19.69
			1	0	1	74	14.32	14.48	14.29
			75	0	75	0	20.69	19.70	19.66
	2587.5	2602.5	1	74	1	0	23.05	21.77	20.04
			1	0	1	74	14.36	14.14	14.44
			75	0	75	0	20.91	19.90	19.87
	2597.5	2612.5	1	74	1	0	23.09	22.28	20.04
			1	0	1	74	14.54	14.68	14.42
			75	0	75	0	20.91	19.94	19.90

OUTPUT POWER FOR LTE BAND 38C (20.0MHz + 20.0MHz)

Antenna Gain (dBi)	-4.71								
Bandwidth	PCC Frequency (MHz)	SCC Frequency (MHz)	PCC RB	PCC RB	SCC RB	SCC RB	Conducted Average (dBm)		
			Size	Offset	Size	Offset	QPSK	16QAM	64QAM
20MHz / 20MHz	2580.0	2599.8	1	99	1	0	22.84	21.75	19.92
			1	0	1	99	14.23	14.26	14.31
			100	0	100	0	20.66	19.58	19.57
	2585.1	2604.9	1	99	1	0	23.01	21.82	20.02
			1	0	1	99	14.37	14.27	14.39
			100	0	100	0	20.69	19.66	19.64
	2590.2	2610.0	1	99	1	0	23.04	21.96	19.90
			1	0	1	99	14.35	14.35	14.26
			100	0	100	0	20.70	16.74	19.66

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5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a internal antenna for the [List the bands supported] with a maximum peak gain as follow:

Frequency (MHz)	Peak Gain (dBi)
LTE Band 38 2570 ~ 2620 MHz	-4.71
LTE Band 7 2500 ~ 2570 MHz	-4.71

5.5. WORST-CASE ORIENTATION

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. However, the out of band emissions and spurious radiation were only performed on bandwidth and RB offset(with RB size 1) with the highest power in QPSK.

Highest power setting for each bands					
LTE Band	**Component Carrier**	**Frequency (MHz)**	**Bandwidth (MHz)**	**RB size**	**RB offset**
7 (Uplink CA)	PCC	2510.0	20	1	99
	SCC	2529.8	20	1	0
38 (Uplink CA)	PCC	2597.5	15	1	49
	SCC	2612.5	15	1	0

- Radiated spurious emissions
For LTE CA_7C, the spurious emissions was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation.

For LTE CA_38C the spurious emissions was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation.

Note : The EUT attached with travel adapter for the worst case condition. The EUT is continuously communicated with the call box during the tests.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA800	R37M4PW4FW1SE3	N/A
Data Cable	SAMSUNG	EP-DG977	N/A	N/A

I/O CABLE

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC Power	1	C Type	Shielded	1.0m	N/A

TEST SETUP

The EUT is continuously communicated to the call box during the tests.

This EUT is able to equipped with S-pen on the inside. Spot check were performed both inserted and removed condition. Because there is no deviation between the two data, all tests were performed under equipped with the S-pen.

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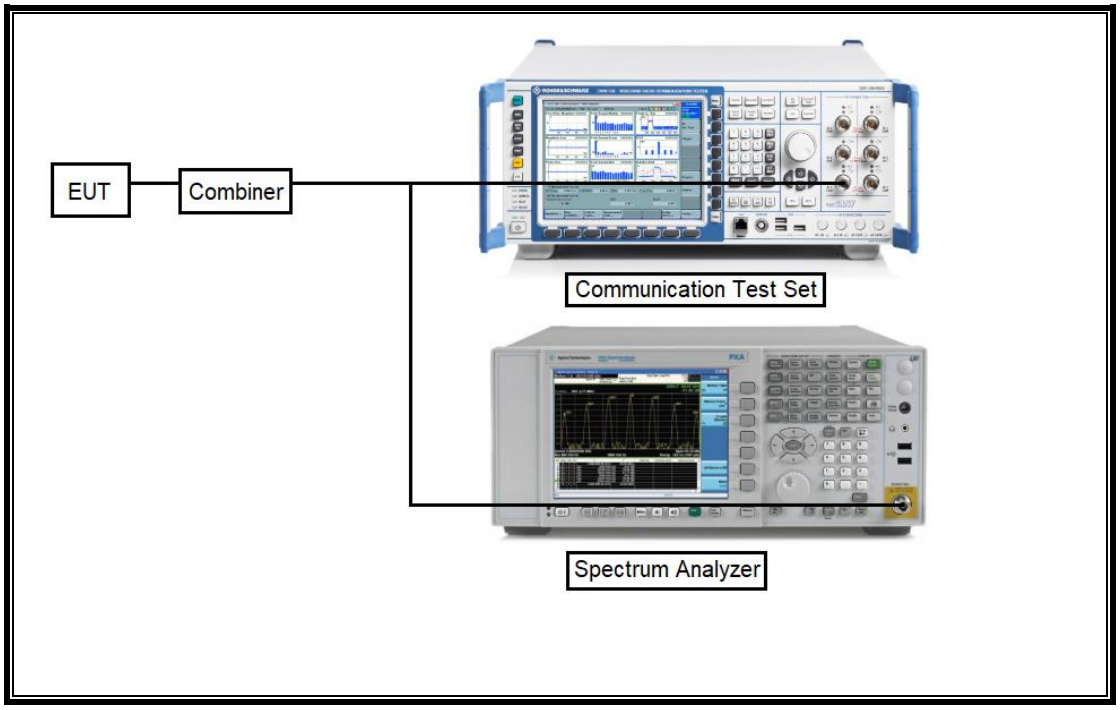
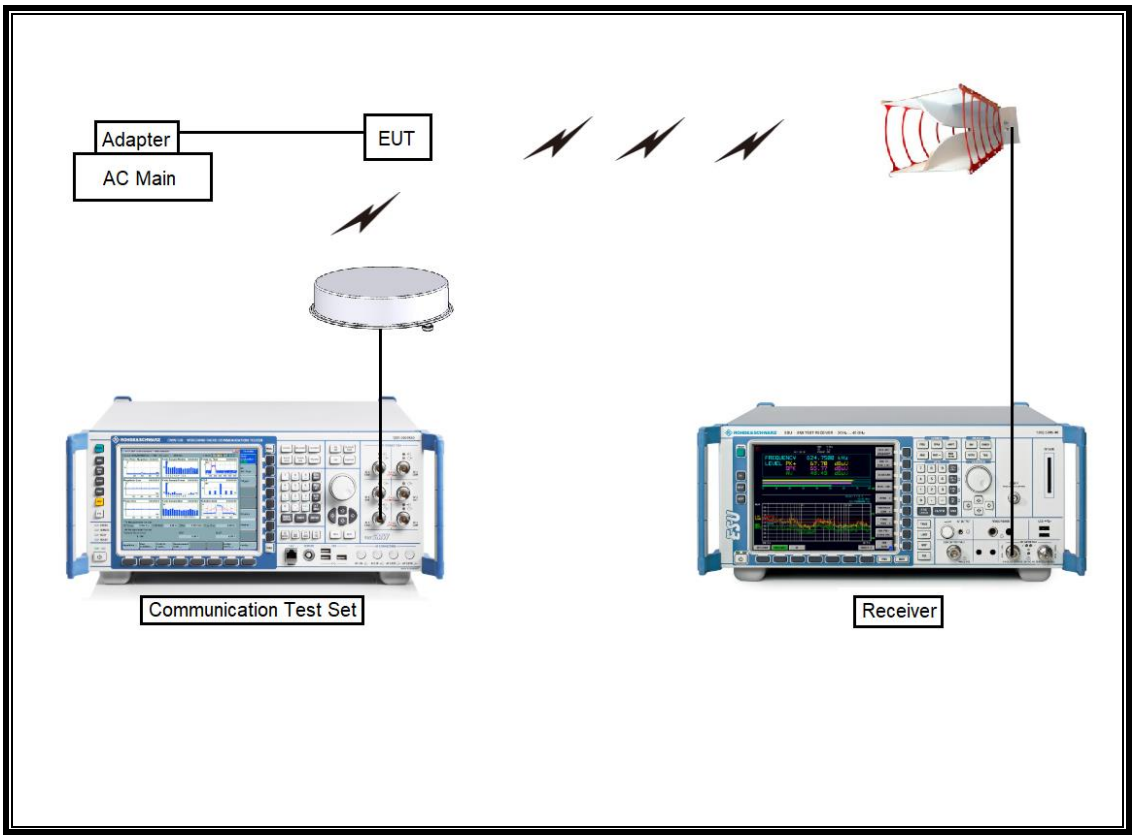
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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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**	**S/N**	**Cal Due**
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121D DB4	00164753	06-30-19
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-14-20
Preamplifier	ETS	3116C-PA	00168841	08-09-19
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-04-20
Combiner	WEINSCHEL	1575	2150	08-08-19
Communications Test Set	R&S	CMW500	115331	08-07-19
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-06-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-06-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	08-08-19
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	08-08-19
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	08-08-19
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	08-08-19
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	08-08-19
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	08-08-19
Attenuator	PASTERNACK	PE7087-10	A009	08-08-19
Attenuator	PASTERNACK	PE7087-10	A001	08-08-19
Attenuator	PASTERNACK	PE7087-10	A008	08-08-19
Attenuator	PASTERNACK	PE7087-10	2	08-07-19
Attenuator	PASTERNACK	PE7395-10	A011	08-08-19
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Temperature Chamber	ESPEC	SH-642	93001109	08-06-19
UL Software				
Description	**Manufacturer**	**Model**	**Version**	
Antenna port test software	UL	CLT	Ver 2.5	

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7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1049	Occupied Band width (99%)	N/A	Conducted	Pass
27.53(m)	Conducted Spurious Emission	-25 dBm		Pass
27.53(m)	Emission mask	Section 7.2		Pass
2.1046	Conducted output power	N/A		Pass
27.50(h)(2)	Equivalent Isotropic Radiated Power	33dBm	Radiated	Pass
27.53 (m)	Radiated Spurious Emission	-25dBm		Pass

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7. LIMITS AND CONDUCTED RESULTS

7.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

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

(KDB 971168 D01 Power Meas License Digital Systems v03r01)

RESULTS

See the following pages.

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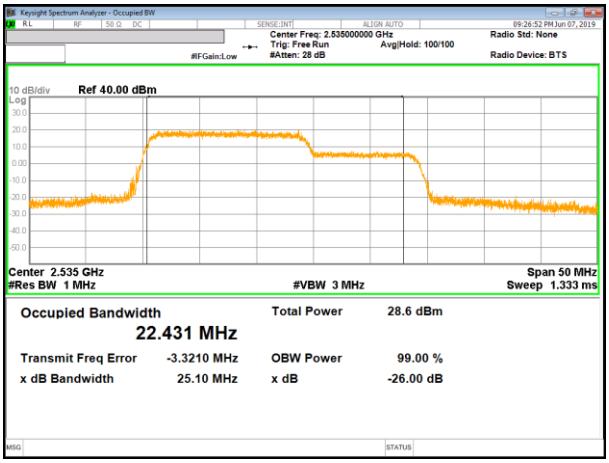
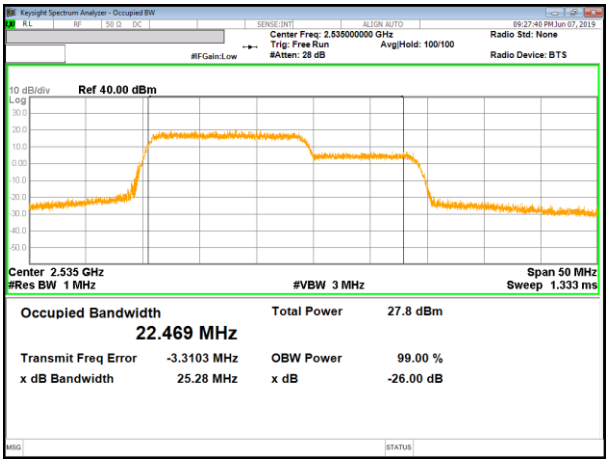
7.1.1. OCCUPIED BANDWIDTH RESULTS

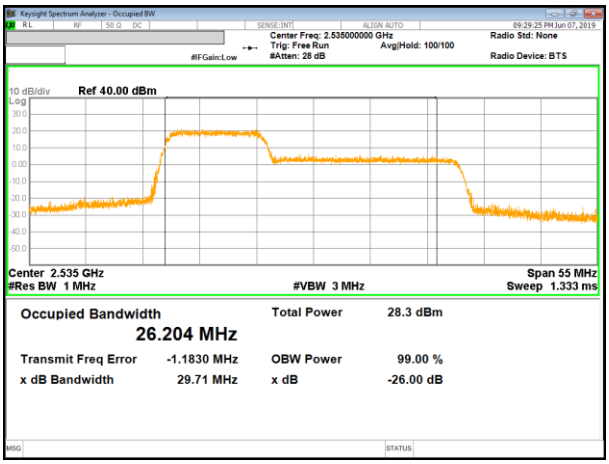
LTE Band 7C (UL CA)



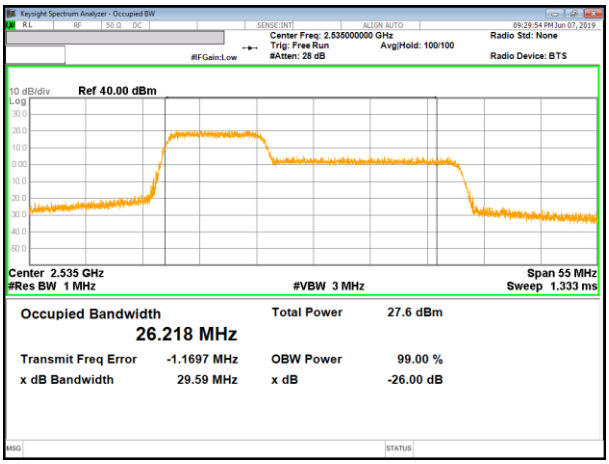
LTE B7 15MHz + 10MHz QPSK RB75-0 + RB50-0



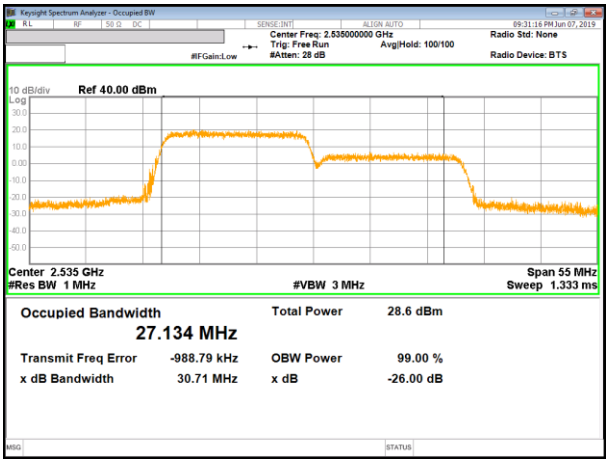
LTE B7 15MHz + 10MHz 16QAM RB75-0 + RB50-0



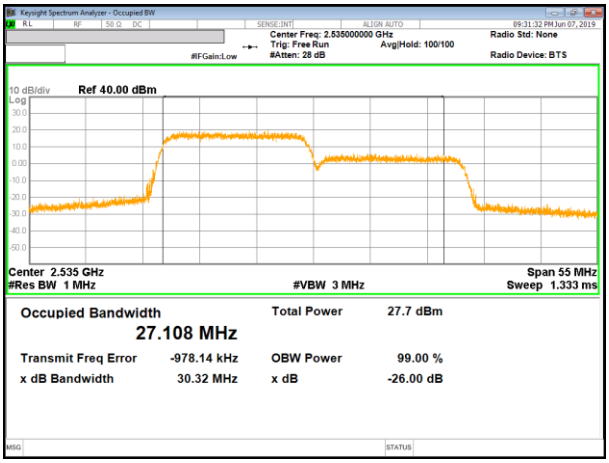
LTE B7 10MHz + 20MHz QPSK RB50-0 + RB100-0



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



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



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

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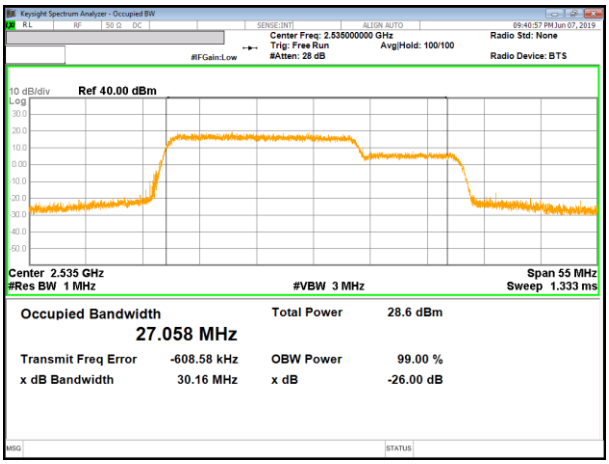
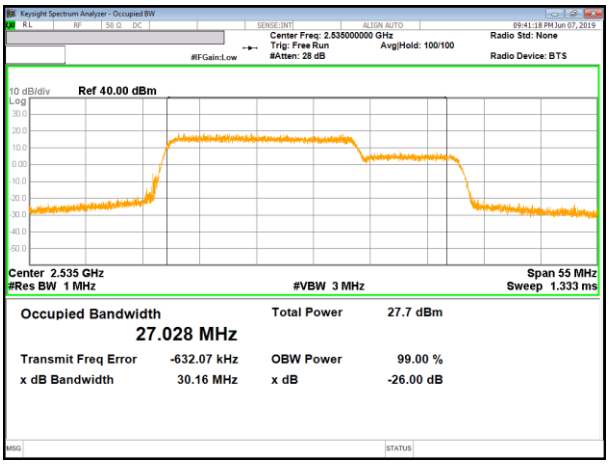
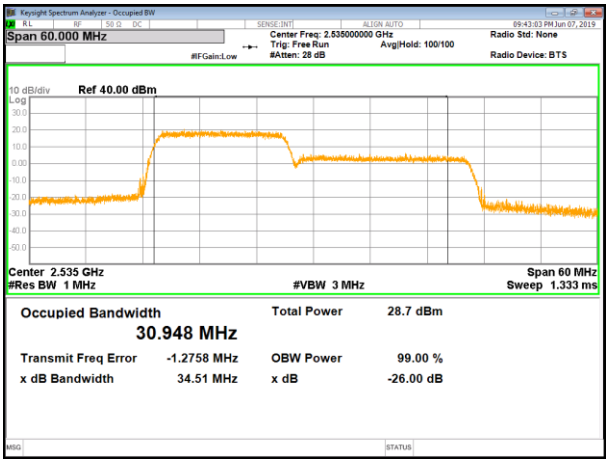


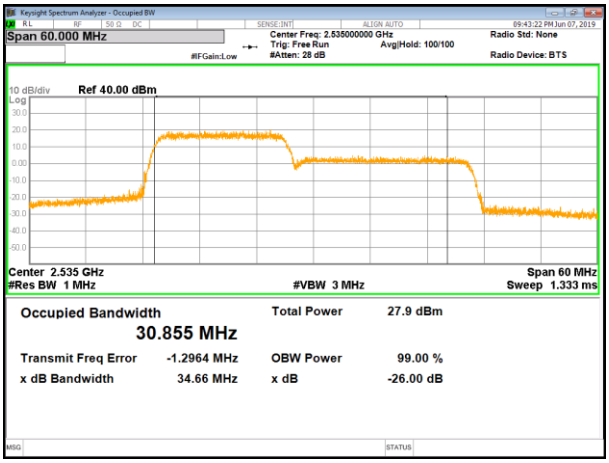
LTE B7 20MHz + 10MHz QPSK RB100-0 + RB50-0



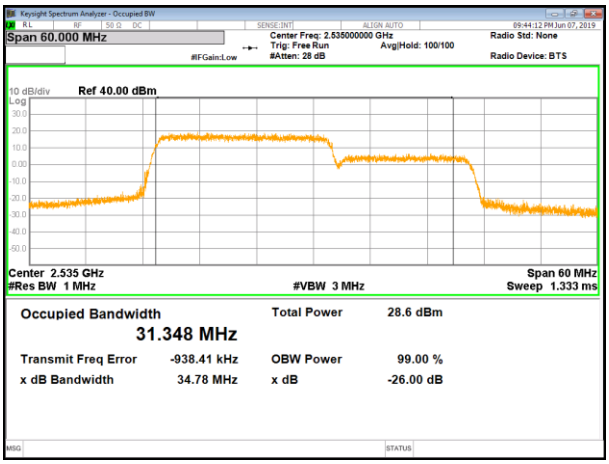
LTE B7 20MHz + 10MHz 16QAM RB100-0 + RB50-0



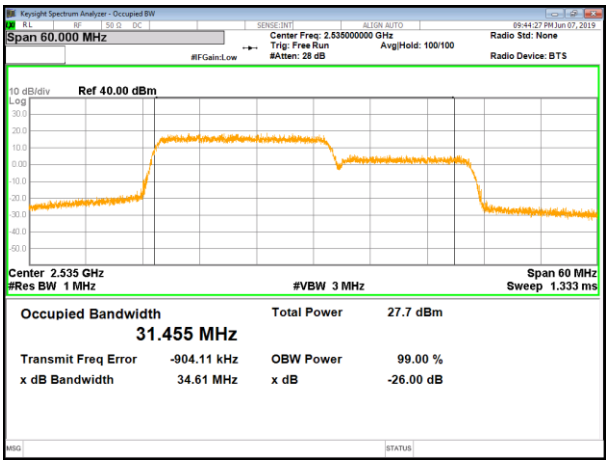
LTE B7 15MHz + 20MHz QPSK RB75-0 + RB100-0



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



LTE B77 20MHz + 15MHz QPSK RB100-0 + RB75-0



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

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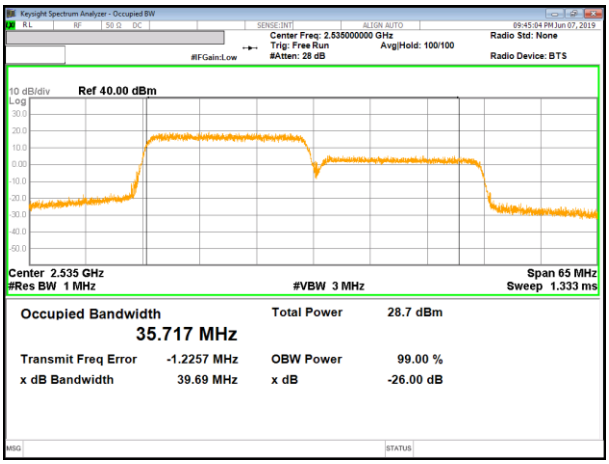
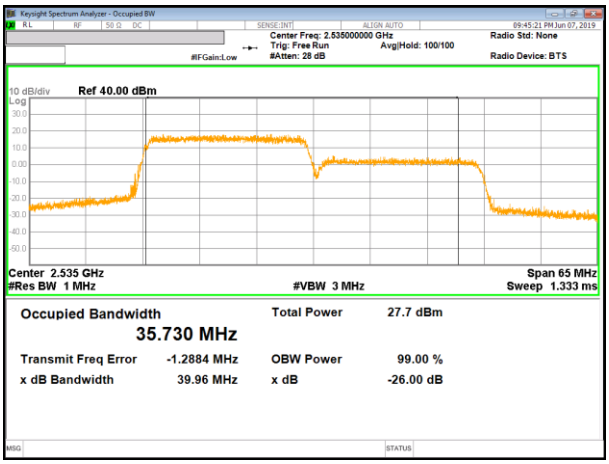
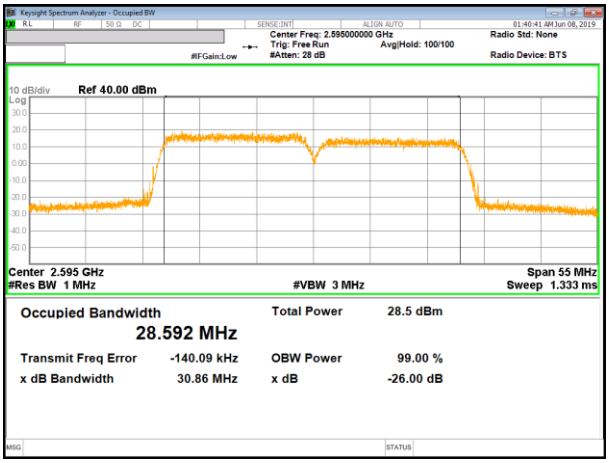


LTE B7 20MHz + 20MHz QPSK RB100-0 + RB100-0

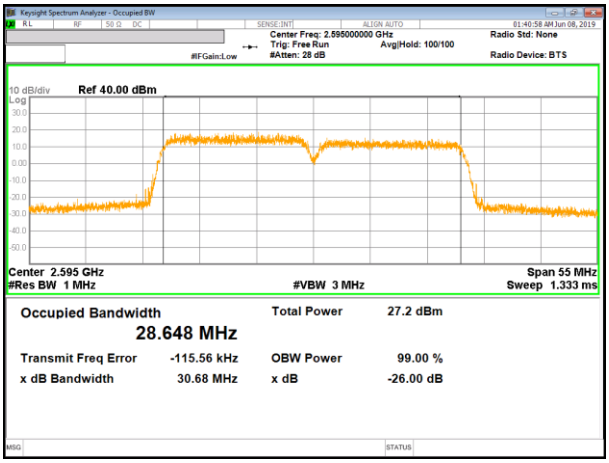


LTE B7 20MHz + 20MHz 16QAM RB100-0 + RB100-0

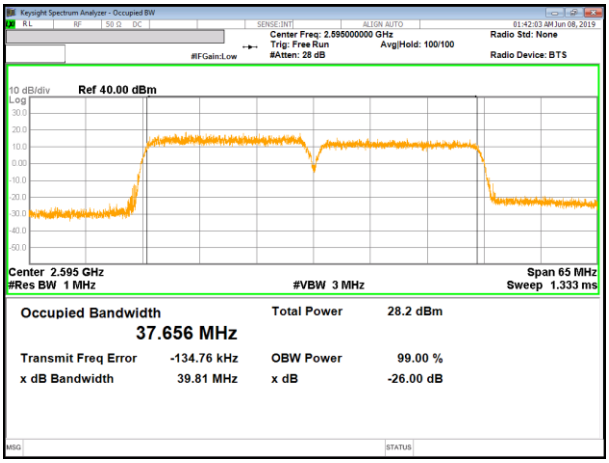
LTE Band 38C (UL CA)



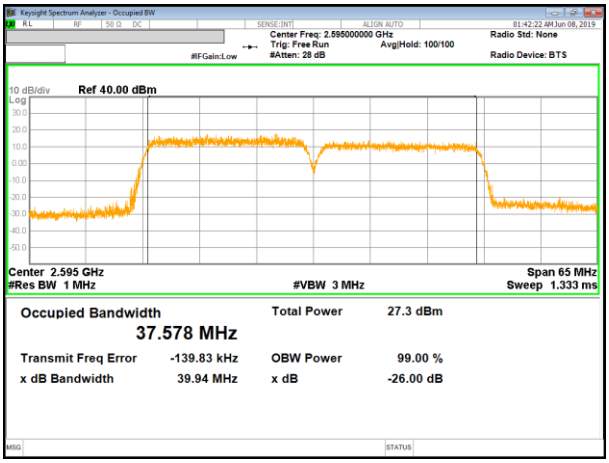
LTE B38 15MHz + 15MHz QPSK RB75-0 + RB75-0



LTE B38 15MHz + 15MHz 16QAM RB75-0 + RB75-0



LTE B38 20MHz + 20MHz QPSK RB100-0 + RB100-0



LTE B38 20MHz + 20MHz 16QAM RB100-0 + RB100-0

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7.2. EMISSION MASK

RULE PART(S)

FCC: §27. 53

LIMITS

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

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

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01
The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

NOTE1

LTE Band 38 - Duty cycle correction factor(2.22dB) already applied on the plot.

RESULTS

See the following pages.

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LTE 7

Bandwidth	Mode	Ch.	RB Status	Side Trace	Level [dBm]	Limit [dBm]
15 MHz / 10 MHz	QPSK	Low	1RB	Lower Trace 1	-34.58	-10.00
				Lower Trace 2	-48.22	-13.00
				Lower Trace 3	-51.10	-25.00
			FRB	Lower Trace 1	-25.16	-10.00
				Lower Trace 2	-28.40	-13.00
				Lower Trace 3	-33.84	-25.00
		High	1RB	Upper Trace 1	-44.27	-10.00
				Upper Trace 2	-26.69	-13.00
				Upper Trace 3	-51.81	-25.00
			FRB	Upper Trace 1	-31.46	-10.00
				Upper Trace 2	-34.38	-13.00
				Upper Trace 3	-48.37	-25.00
	16QAM	Low	1RB	Lower Trace 1	-34.21	-10.00
				Lower Trace 2	-48.33	-13.00
				Lower Trace 3	-51.07	-25.00
			FRB	Lower Trace 1	-25.38	-10.00
				Lower Trace 2	-28.26	-13.00
				Lower Trace 3	-35.95	-25.00
		High	1RB	Upper Trace 1	-44.52	-10.00
				Upper Trace 2	-30.30	-13.00
				Upper Trace 3	-51.85	-25.00
			FRB	Upper Trace 1	-32.18	-10.00
				Upper Trace 2	-34.79	-13.00
				Upper Trace 3	-48.35	-25.00

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LTE 7(Continue)

Bandwidth	Mode	Ch.	RB Status	Side Trace	Level [dBm]	Limit [dBm]
10 MHz / 20 MHz	QPSK	Low	1RB	Lower Trace 1	-36.97	-10.00
				Lower Trace 2	-47.97	-13.00
				Lower Trace 3	-51.85	-25.00
			FRB	Lower Trace 1	-23.82	-10.00
				Lower Trace 2	-25.64	-13.00
				Lower Trace 3	-31.54	-25.00
		High	1RB	Upper Trace 1	-47.68	-10.00
				Upper Trace 2	-35.21	-13.00
				Upper Trace 3	-52.40	-25.00
			FRB	Upper Trace 1	-37.73	-10.00
				Upper Trace 2	-39.51	-13.00
				Upper Trace 3	-52.39	-25.00
	16QAM	Low	1RB	Lower Trace 1	-36.84	-10.00
				Lower Trace 2	-48.04	-13.00
				Lower Trace 3	-51.88	-25.00
			FRB	Lower Trace 1	-23.98	-10.00
				Lower Trace 2	-26.16	-13.00
				Lower Trace 3	-33.25	-25.00
		High	1RB	Upper Trace 1	-47.96	-10.00
				Upper Trace 2	-35.61	-13.00
				Upper Trace 3	-52.37	-25.00
			FRB	Upper Trace 1	-38.23	-10.00
				Upper Trace 2	-39.79	-13.00
				Upper Trace 3	-52.35	-25.00

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Bandwidth	Mode	Ch.	RB Status	Side Trace	Level [dBm]	Limit [dBm]
15 MHz / 15 MHz	QPSK	Low	1RB	Lower Trace 1	-26.80	-10.00
				Lower Trace 2	-48.12	-13.00
				Lower Trace 3	-51.96	-25.00
			FRB	Lower Trace 1	-22.17	-10.00
				Lower Trace 2	-25.24	-13.00
				Lower Trace 3	-30.51	-25.00
		High	1RB	Upper Trace 1	-39.56	-10.00
				Upper Trace 2	-38.68	-13.00
				Upper Trace 3	-52.42	-25.00
			FRB	Upper Trace 1	-33.40	-10.00
				Upper Trace 2	-36.41	-13.00
				Upper Trace 3	-52.34	-25.00
	16QAM	Low	1RB	Lower Trace 1	-27.54	-10.00
				Lower Trace 2	-48.20	-13.00
				Lower Trace 3	-52.05	-25.00
			FRB	Lower Trace 1	-22.85	-10.00
				Lower Trace 2	-25.42	-13.00
				Lower Trace 3	-32.69	-25.00
		High	1RB	Upper Trace 1	-39.30	-10.00
				Upper Trace 2	-38.71	-13.00
				Upper Trace 3	-52.39	-25.00
			FRB	Upper Trace 1	-34.76	-10.00
				Upper Trace 2	-37.26	-13.00
				Upper Trace 3	-52.31	-25.00

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Bandwidth	Mode	Ch.	RB Status	Side Trace	Level [dBm]	Limit [dBm]
20 MHz / 10 MHz	QPSK	Low	1RB	Lower Trace 1	-37.68	-10.00
				Lower Trace 2	-49.00	-13.00
				Lower Trace 3	-52.03	-25.00
			FRB	Lower Trace 1	-23.57	-10.00
				Lower Trace 2	-25.71	-13.00
				Lower Trace 3	-32.18	-25.00
		High	1RB	Upper Trace 1	-43.75	-10.00
				Upper Trace 2	-37.87	-13.00
				Upper Trace 3	-52.40	-25.00
			FRB	Upper Trace 1	-31.23	-10.00
				Upper Trace 2	-34.04	-13.00
				Upper Trace 3	-52.27	-25.00
	16QAM	Low	1RB	Lower Trace 1	-37.32	-10.00
				Lower Trace 2	-49.03	-13.00
				Lower Trace 3	-52.02	-25.00
			FRB	Lower Trace 1	-24.12	-10.00
				Lower Trace 2	-25.89	-13.00
				Lower Trace 3	-33.33	-25.00
		High	1RB	Upper Trace 1	-44.16	-10.00
				Upper Trace 2	-38.31	-13.00
				Upper Trace 3	-52.30	-25.00
			FRB	Upper Trace 1	-32.37	-10.00
				Upper Trace 2	-35.30	-13.00
				Upper Trace 3	-52.31	-25.00

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Bandwidth	Mode	Ch.	RB Status	Side Trace	Level [dBm]	Limit [dBm]
15 MHz / 20 MHz	QPSK	Low	1RB	Lower Trace 1	-31.79	-10.00
				Lower Trace 2	-48.12	-13.00
				Lower Trace 3	-51.80	-25.00
			FRB	Lower Trace 1	-24.41	-10.00
				Lower Trace 2	-27.64	-13.00
				Lower Trace 3	-31.67	-25.00
		High	1RB	Upper Trace 1	-45.58	-10.00
				Upper Trace 2	-51.14	-13.00
				Upper Trace 3	-52.39	-25.00
			FRB	Upper Trace 1	-32.86	-10.00
				Upper Trace 2	-35.24	-13.00
				Upper Trace 3	-52.34	-25.00
	16QAM	Low	1RB	Lower Trace 1	-31.29	-10.00
				Lower Trace 2	-48.08	-13.00
				Lower Trace 3	-51.95	-25.00
			FRB	Lower Trace 1	-24.83	-10.00
				Lower Trace 2	-27.36	-13.00
				Lower Trace 3	-33.67	-25.00
		High	1RB	Upper Trace 1	-45.58	-10.00
				Upper Trace 2	-51.14	-13.00
				Upper Trace 3	-52.39	-25.00
			FRB	Upper Trace 1	-35.60	-10.00
				Upper Trace 2	-36.88	-13.00
				Upper Trace 3	-52.28	-25.00

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Bandwidth	Mode	Ch.	RB Status	Side Trace	Level [dBm]	Limit [dBm]
20 MHz / 15 MHz	QPSK	Low	1RB	Lower Trace 1	-37.07	-10.00
				Lower Trace 2	-48.34	-13.00
				Lower Trace 3	-52.17	-25.00
			FRB	Lower Trace 1	-25.56	-10.00
				Lower Trace 2	-27.69	-13.00
				Lower Trace 3	-33.29	-25.00
		High	1RB	Upper Trace 1	-44.21	-10.00
				Upper Trace 2	-50.93	-13.00
				Upper Trace 3	-52.25	-25.00
			FRB	Upper Trace 1	-31.02	-10.00
				Upper Trace 2	-34.00	-13.00
				Upper Trace 3	-52.31	-25.00
	16QAM	Low	1RB	Lower Trace 1	-36.61	-10.00
				Lower Trace 2	-48.29	-13.00
				Lower Trace 3	-52.17	-25.00
			FRB	Lower Trace 1	-25.61	-10.00
				Lower Trace 2	-27.58	-13.00
				Lower Trace 3	-34.27	-25.00
		High	1RB	Upper Trace 1	-43.88	-10.00
				Upper Trace 2	-51.05	-13.00
				Upper Trace 3	-52.37	-25.00
			FRB	Upper Trace 1	-32.92	-10.00
				Upper Trace 2	-34.93	-13.00
				Upper Trace 3	-52.34	-25.00

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Bandwidth	Mode	Ch.	RB Status	Side Trace	Level [dBm]	Limit [dBm]
20 MHz / 20 MHz	QPSK	Low	1RB	Lower Trace 1	-35.74	-10.00
				Lower Trace 2	-48.70	-13.00
				Lower Trace 3	-51.98	-25.00
			FRB	Lower Trace 1	-25.39	-10.00
				Lower Trace 2	-28.23	-13.00
				Lower Trace 3	-34.07	-25.00
		High	1RB	Upper Trace 1	-46.39	-10.00
				Upper Trace 2	-51.15	-13.00
				Upper Trace 3	-52.31	-25.00
			FRB	Upper Trace 1	-33.36	-10.00
				Upper Trace 2	-35.40	-13.00
				Upper Trace 3	-52.26	-25.00
	16QAM	Low	1RB	Lower Trace 1	-35.63	-10.00
				Lower Trace 2	-48.69	-13.00
				Lower Trace 3	-52.05	-25.00
			FRB	Lower Trace 1	-25.58	-10.00
				Lower Trace 2	-27.82	-13.00
				Lower Trace 3	-34.98	-25.00
		High	1RB	Upper Trace 1	-46.69	-10.00
				Upper Trace 2	-51.18	-13.00
				Upper Trace 3	-52.32	-25.00
			FRB	Upper Trace 1	-34.67	-10.00
				Upper Trace 2	-36.73	-13.00
				Upper Trace 3	-52.25	-25.00

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Bandwidth	Mode	Ch.	RB Status	Side Trace	Level [dBm]	Limit [dBm]
15 MHz / 15 MHz	QPSK	Low	1RB	Lower Trace 1	-29.92	-10.00
				Lower Trace 2	-22.52	-13.00
				Lower Trace 3	-48.89	-25.00
			FRB	Lower Trace 1	-26.49	-10.00
				Lower Trace 2	-29.73	-13.00
				Lower Trace 3	-41.30	-25.00
		High	1RB	Upper Trace 1	-33.70	-10.00
				Upper Trace 2	-24.04	-13.00
				Upper Trace 3	-49.34	-25.00
			FRB	Upper Trace 1	-29.24	-10.00
				Upper Trace 2	-33.77	-13.00
				Upper Trace 3	-42.19	-25.00
	16QAM	Low	1RB	Lower Trace 1	-30.68	-10.00
				Lower Trace 2	-22.05	-13.00
				Lower Trace 3	-48.90	-25.00
			FRB	Lower Trace 1	-26.28	-10.00
				Lower Trace 2	-31.30	-13.00
				Lower Trace 3	-41.05	-25.00
		High	1RB	Upper Trace 1	-34.00	-10.00
				Upper Trace 2	-23.66	-13.00
				Upper Trace 3	-49.25	-25.00
			FRB	Upper Trace 1	-29.90	-10.00
				Upper Trace 2	-34.08	-13.00
				Upper Trace 3	-42.83	-25.00

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Bandwidth	Mode	Ch.	RB Status	Side Trace	Level [dBm]	Limit [dBm]
20 MHz / 20 MHz	QPSK	Low	1RB	Lower Trace 1	-37.43	-10.00
				Lower Trace 2	-22.53	-13.00
				Lower Trace 3	-49.89	-25.00
			FRB	Lower Trace 1	-32.24	-10.00
				Lower Trace 2	-35.54	-13.00
				Lower Trace 3	-43.86	-25.00
		High	1RB	Upper Trace 1	-39.21	-10.00
				Upper Trace 2	-24.25	-13.00
				Upper Trace 3	-49.91	-25.00
			FRB	Upper Trace 1	-30.57	-10.00
				Upper Trace 2	-31.49	-13.00
				Upper Trace 3	-45.36	-25.00
	16QAM	Low	1RB	Lower Trace 1	-38.00	-10.00
				Lower Trace 2	-22.19	-13.00
				Lower Trace 3	-50.01	-25.00
			FRB	Lower Trace 1	-31.36	-10.00
				Lower Trace 2	-35.26	-13.00
				Lower Trace 3	-44.57	-25.00
		High	1RB	Upper Trace 1	-39.81	-10.00
				Upper Trace 2	-25.20	-13.00
				Upper Trace 3	-49.96	-25.00
			FRB	Upper Trace 1	-31.56	-10.00
				Upper Trace 2	-32.88	-13.00
				Upper Trace 3	-46.07	-25.00

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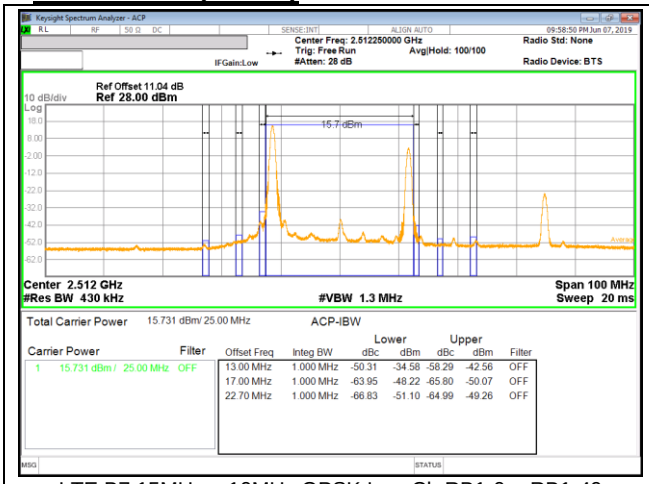
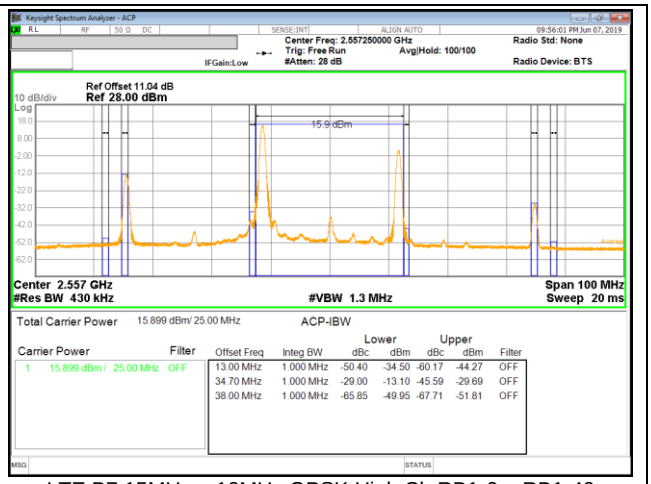
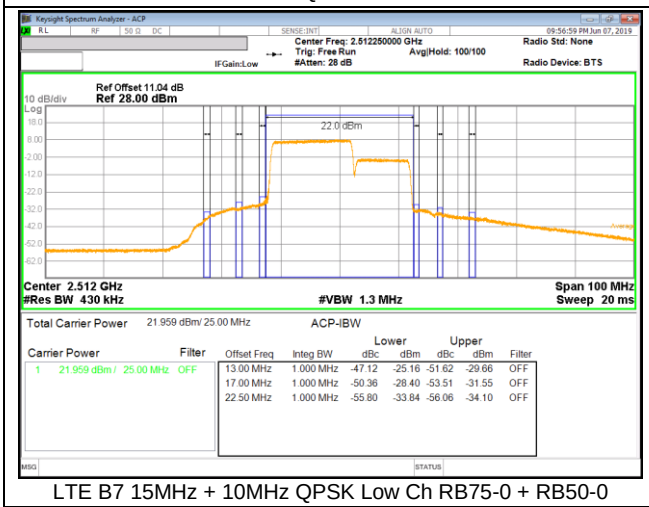
LTE Band 7C(UL CA)



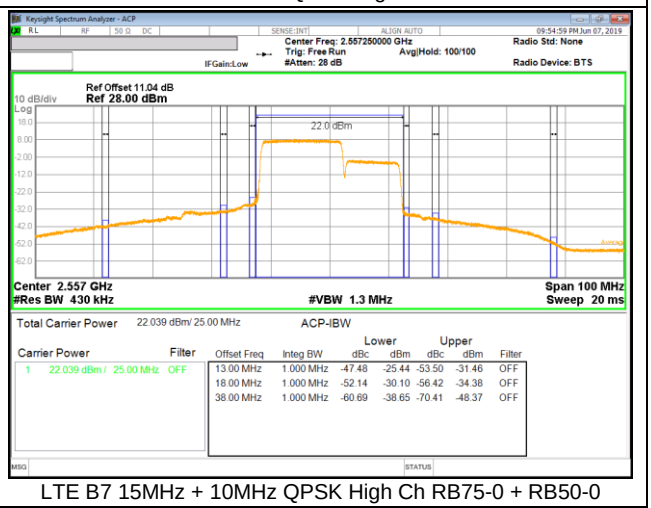
LTE B7 15MHz + 10MHz QPSK Low Ch RB1-0 + RB1-49



LTE B7 15MHz + 10MHz QPSK High Ch RB1-0 + RB1-49



LTE B7 15MHz + 10MHz QPSK Low Ch RB75-0 + RB50-0



LTE B7 15MHz + 10MHz QPSK High Ch RB75-0 + RB50-0

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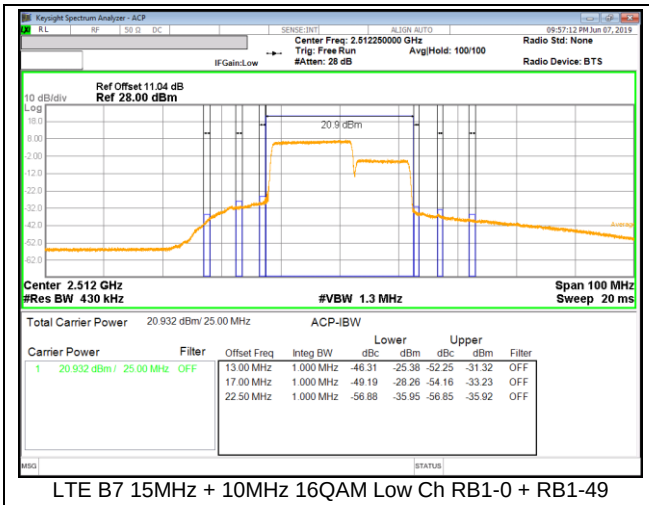
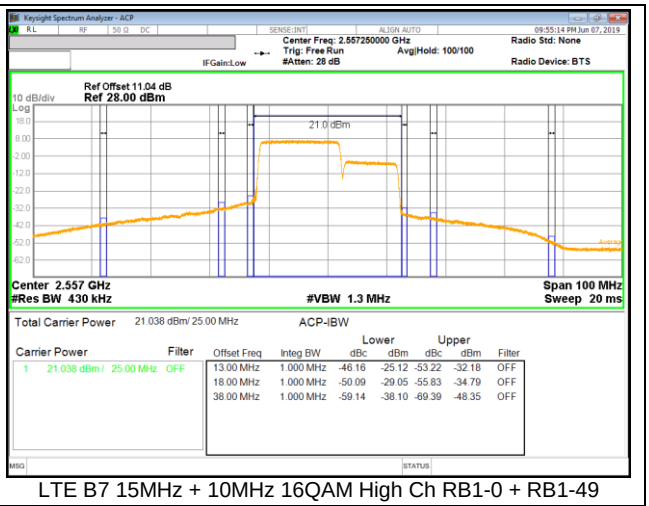
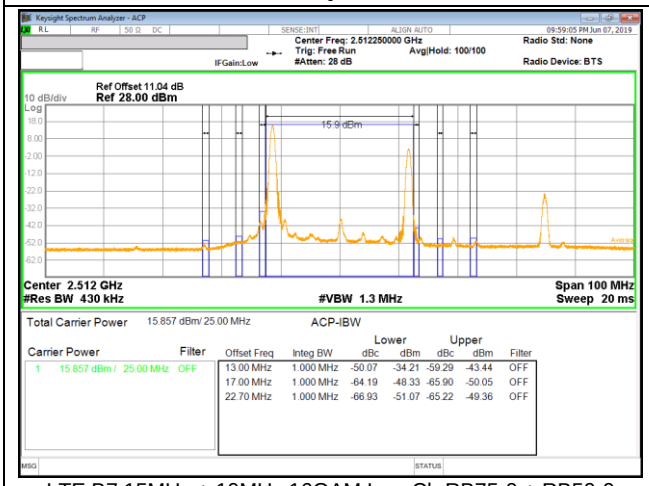


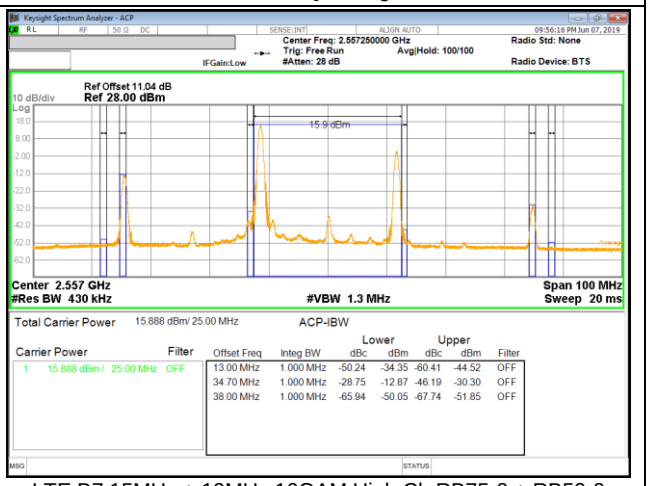
LTE B7 15MHz + 10MHz 16QAM Low Ch RB1-0 + RB1-49



LTE B7 15MHz + 10MHz 16QAM High Ch RB1-0 + RB1-49



LTE B7 15MHz + 10MHz 16QAM Low Ch RB75-0 + RB50-0



LTE B7 15MHz + 10MHz 16QAM High Ch RB75-0 + RB50-0

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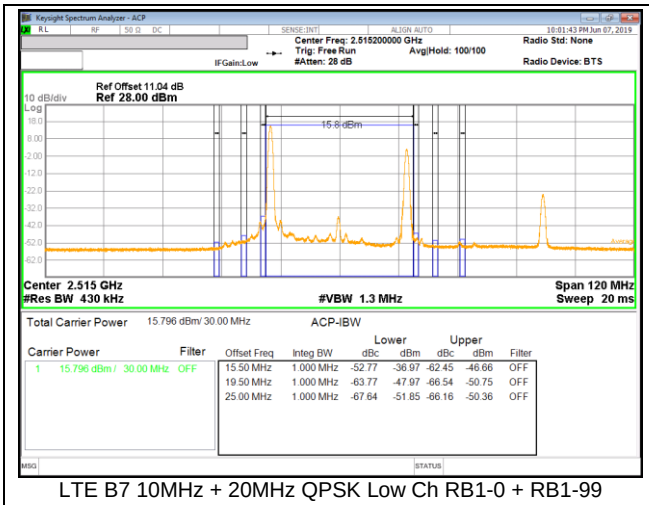
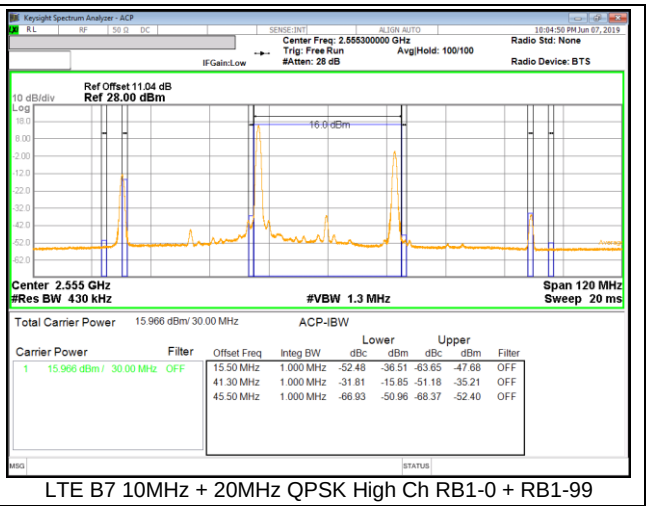
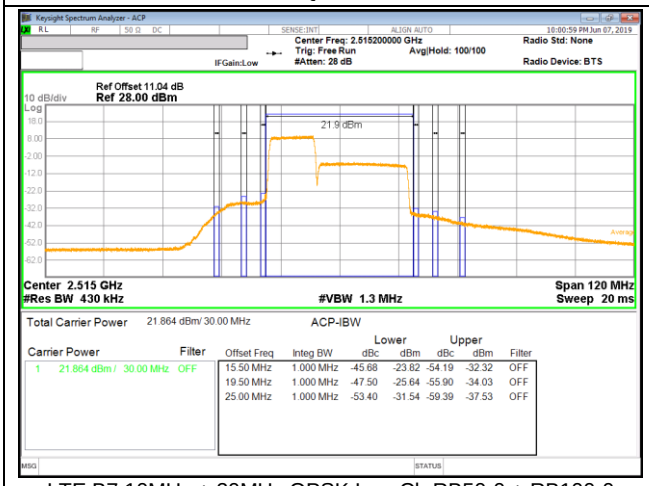


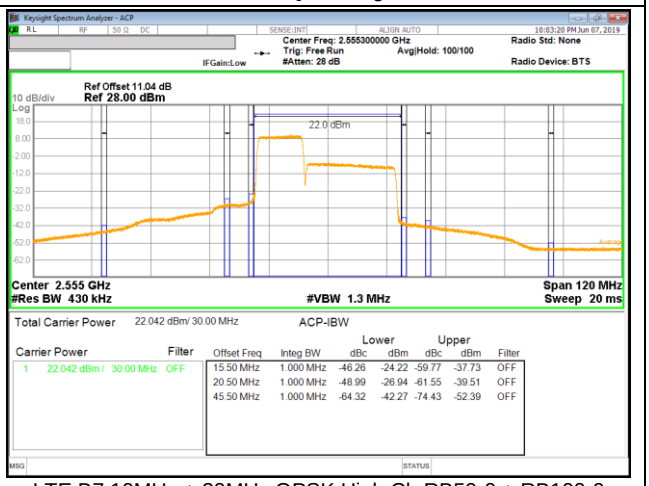
LTE B7 10MHz + 20MHz QPSK Low Ch RB1-0 + RB1-99



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



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



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

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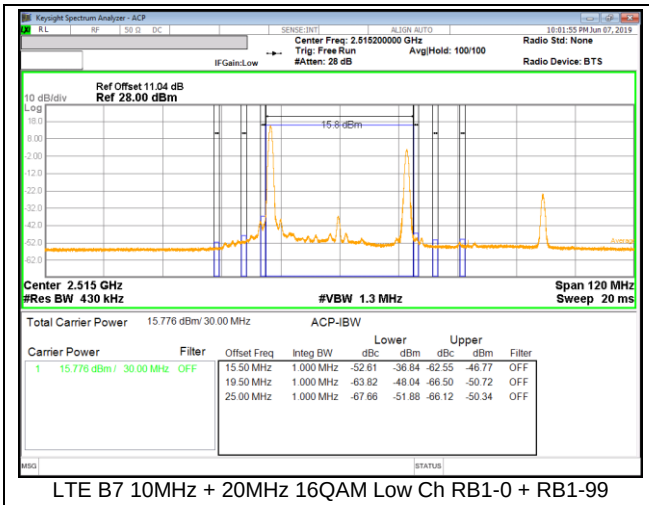
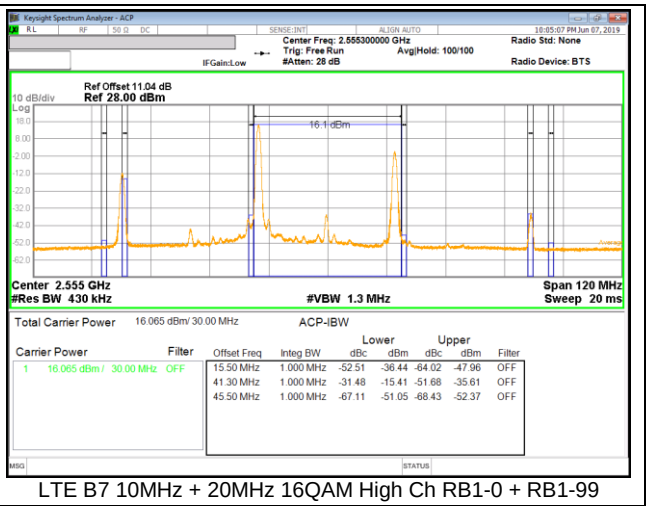
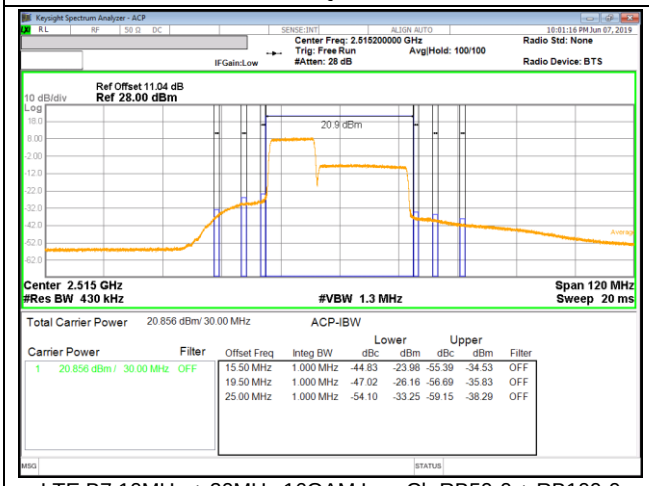


LTE B7 10MHz + 20MHz 16QAM Low Ch RB1-0 + RB1-99



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



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

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

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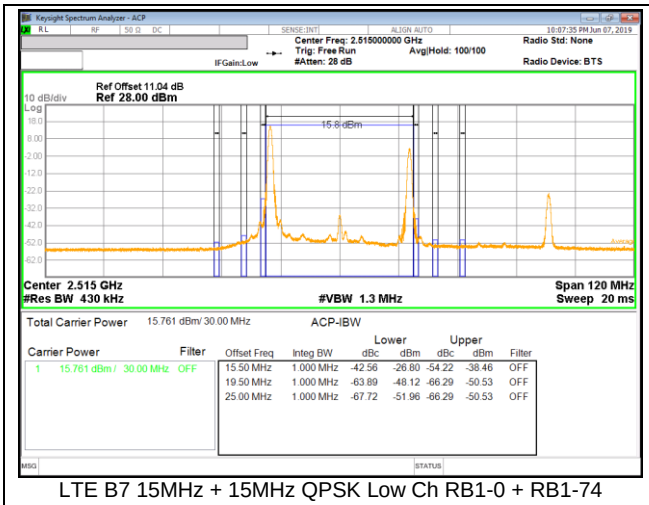
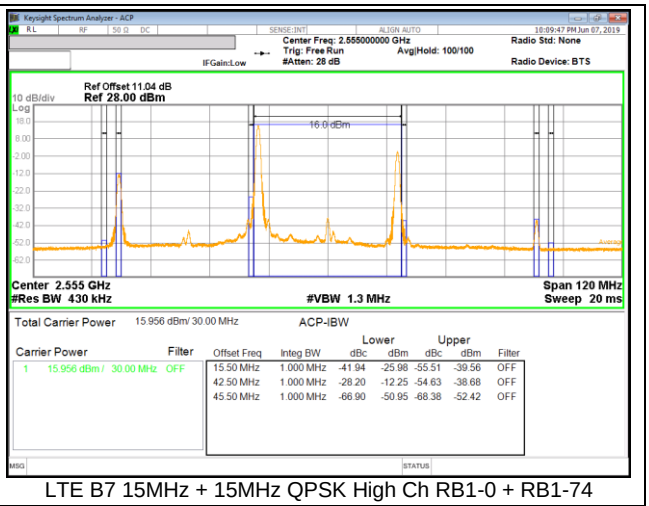
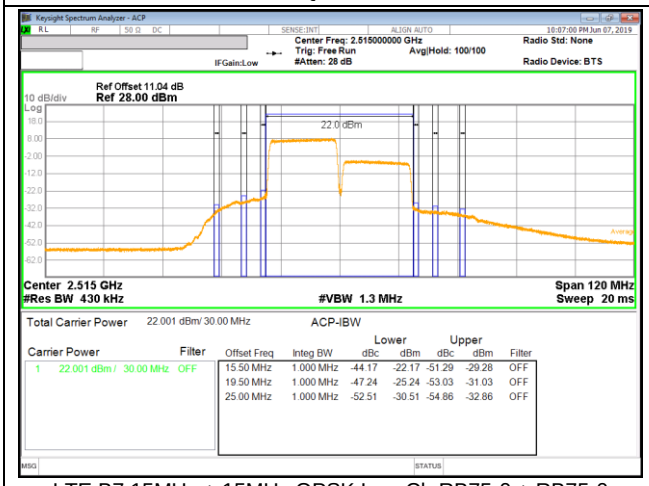


LTE B7 15MHz + 15MHz QPSK Low Ch RB1-0 + RB1-74



LTE B7 15MHz + 15MHz QPSK High Ch RB1-0 + RB1-74



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

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

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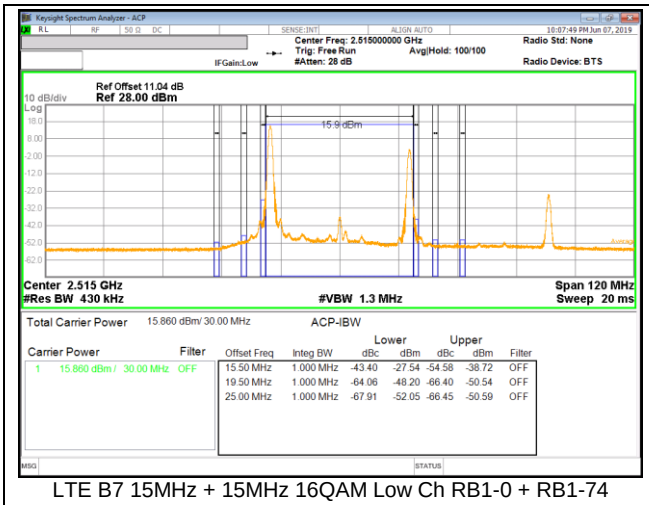
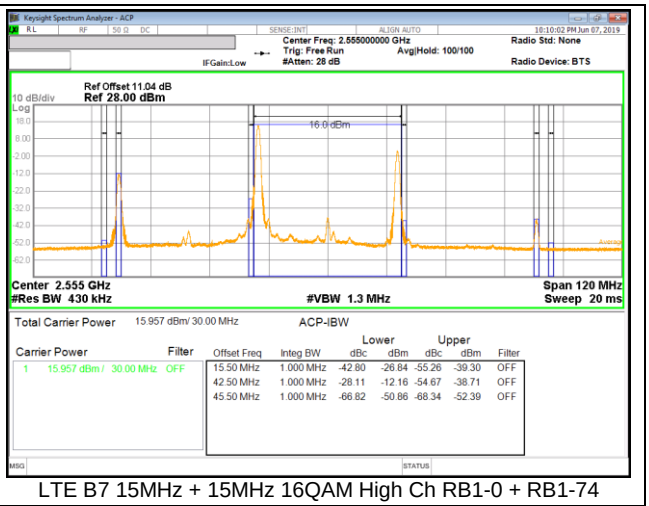
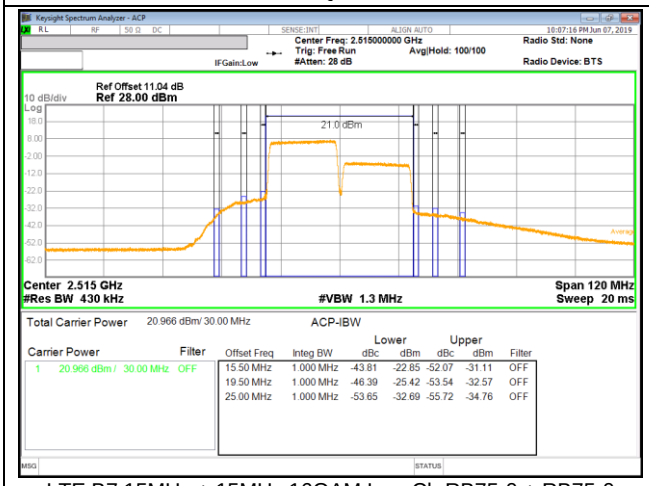


LTE B7 15MHz + 15MHz 16QAM Low Ch RB1-0 + RB1-74



LTE B7 15MHz + 15MHz 16QAM High Ch RB1-0 + RB1-74



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

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

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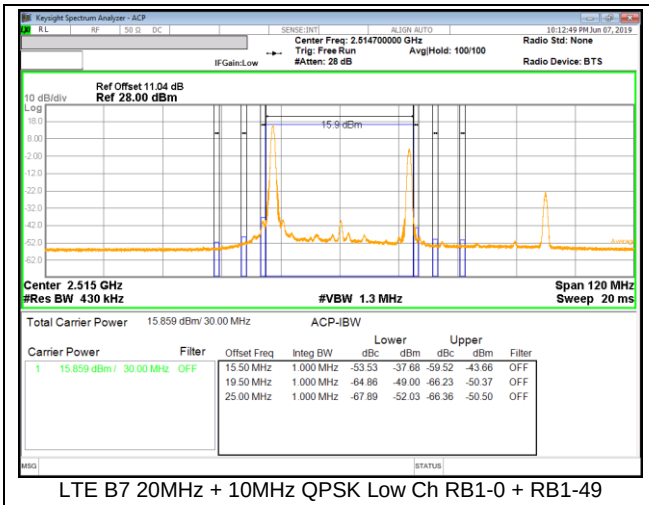
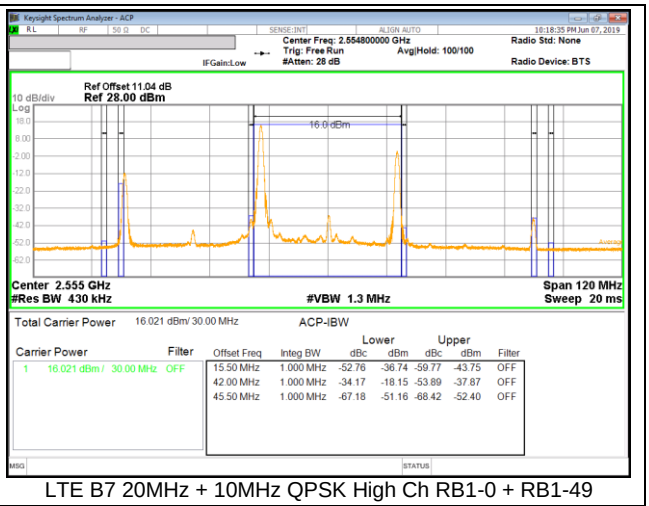
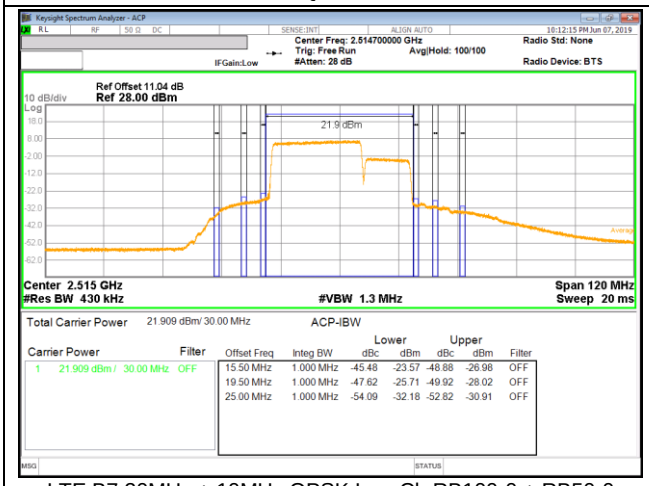


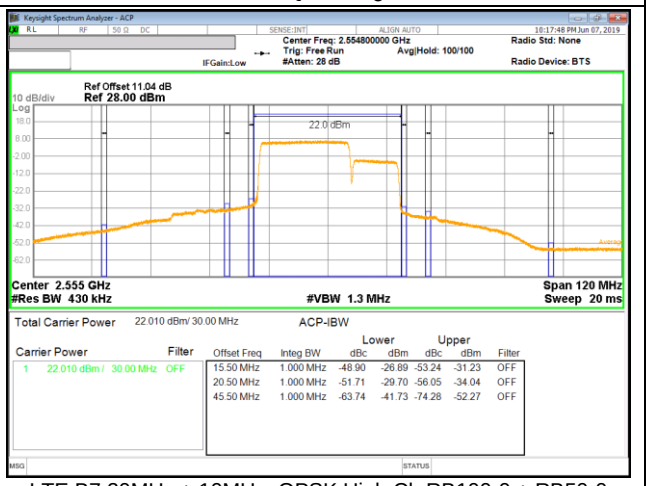
LTE B7 20MHz + 10MHz QPSK Low Ch RB1-0 + RB1-49



LTE B7 20MHz + 10MHz QPSK High Ch RB1-0 + RB1-49



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



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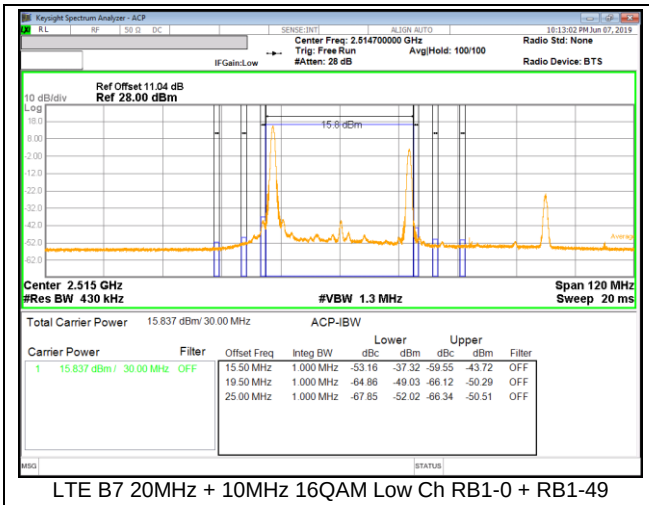
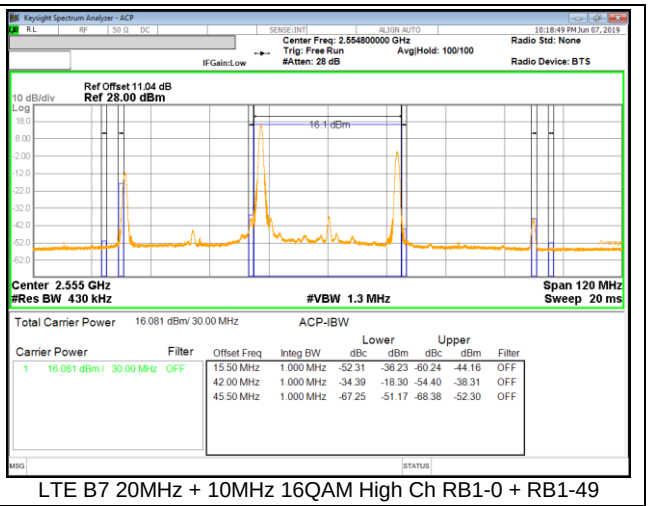
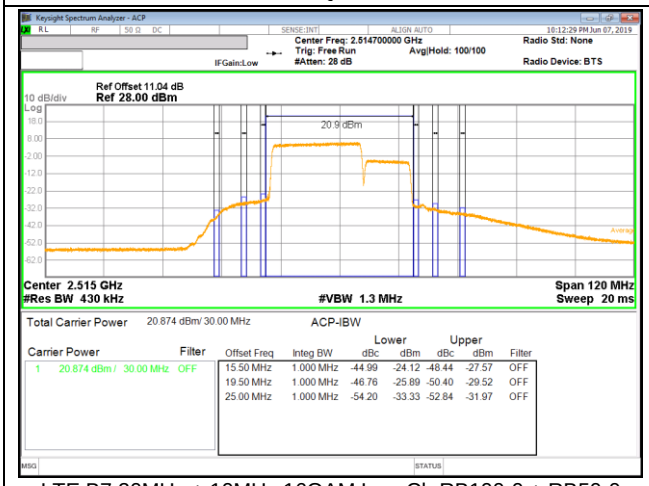


LTE B7 20MHz + 10MHz 16QAM Low Ch RB1-0 + RB1-49



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



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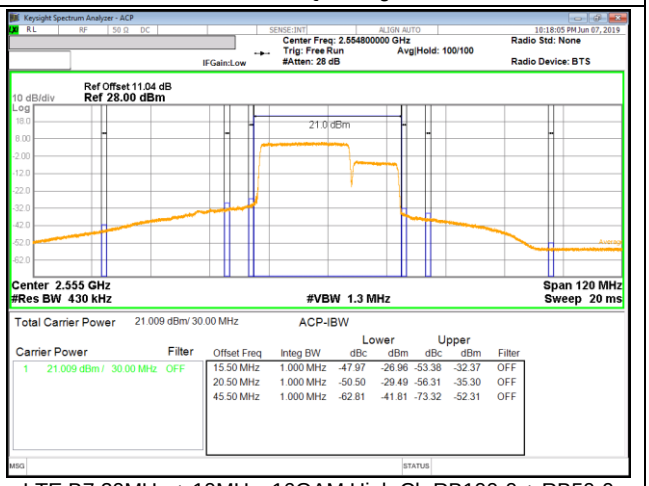

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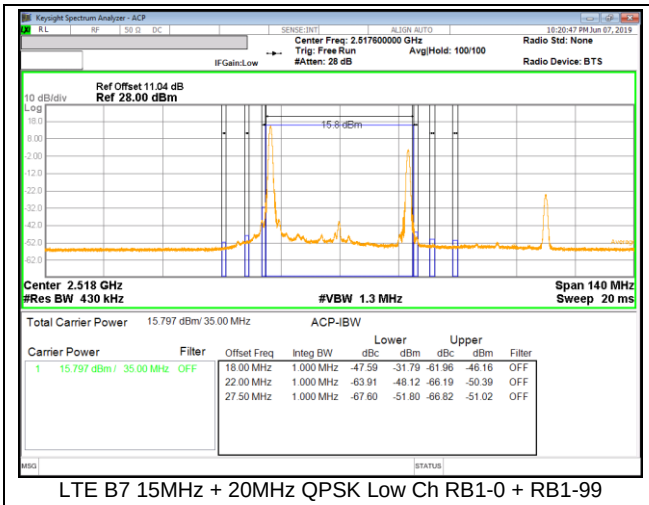
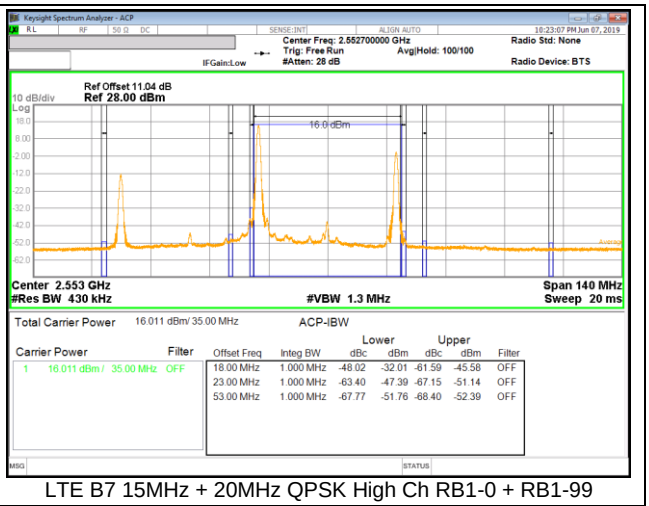


LTE B7 15MHz + 20MHz QPSK Low Ch RB1-0 + RB1-99



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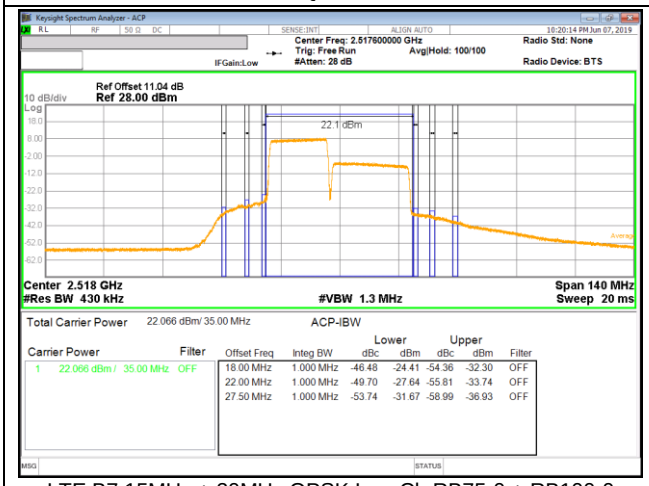
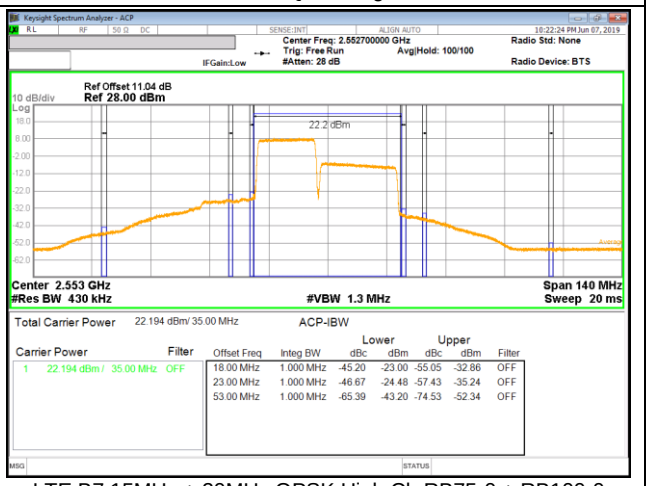


LTE B7 15MHz + 20MHz QPSK Low Ch RB75-0 + RB100-0



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

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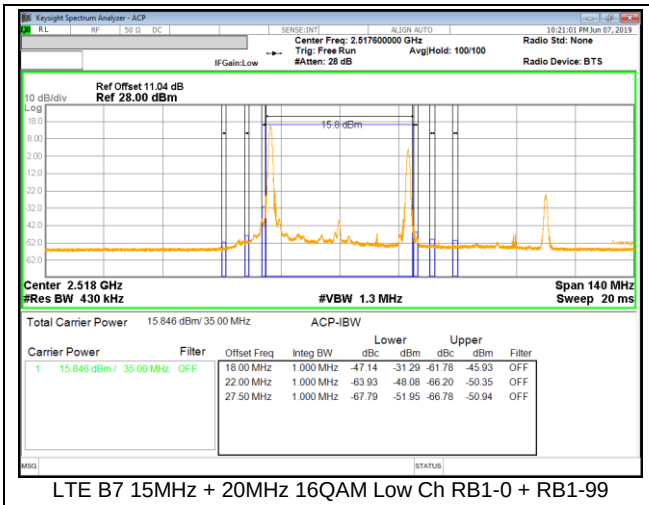
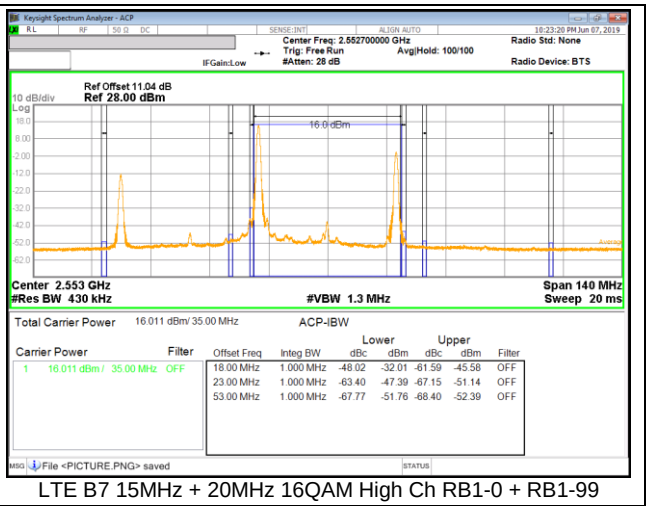
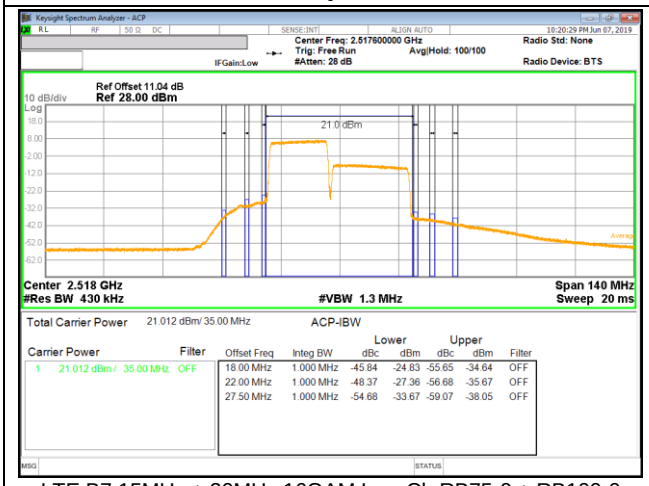


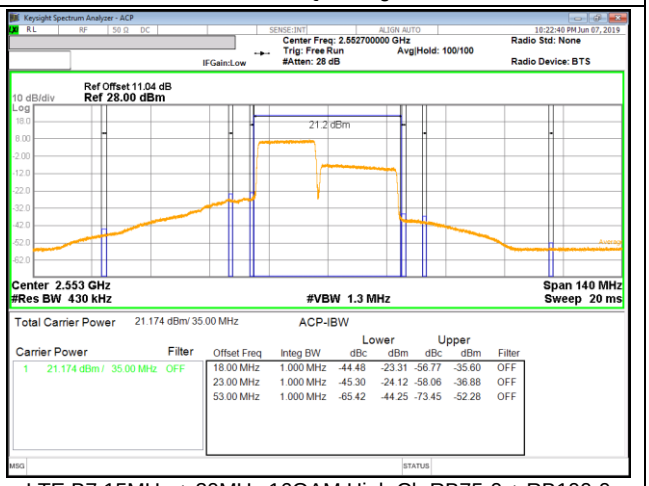
LTE B7 15MHz + 20MHz 16QAM Low Ch RB1-0 + RB1-99



LTE B7 15MHz + 20MHz 16QAM High Ch RB1-0 + RB1-99



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



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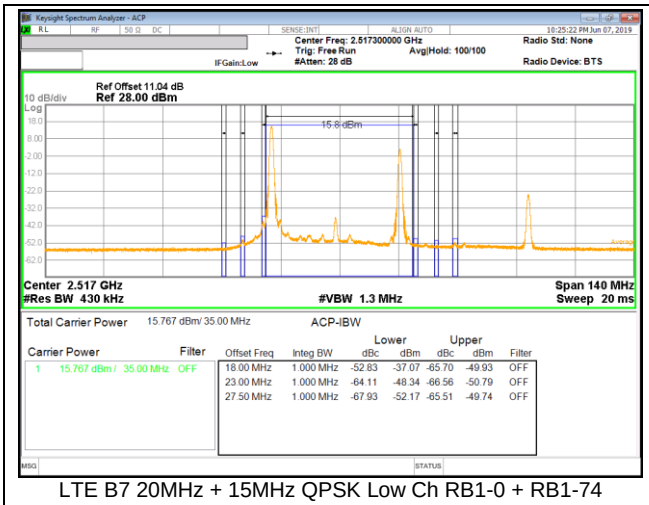
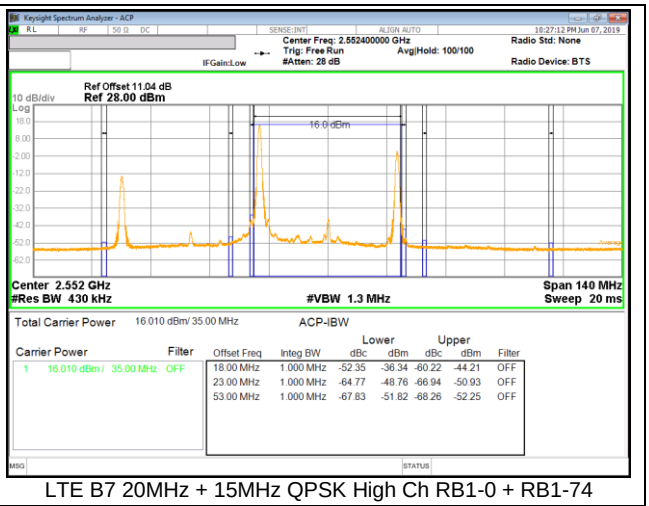


LTE B7 20MHz + 15MHz QPSK Low Ch RB1-0 + RB1-74



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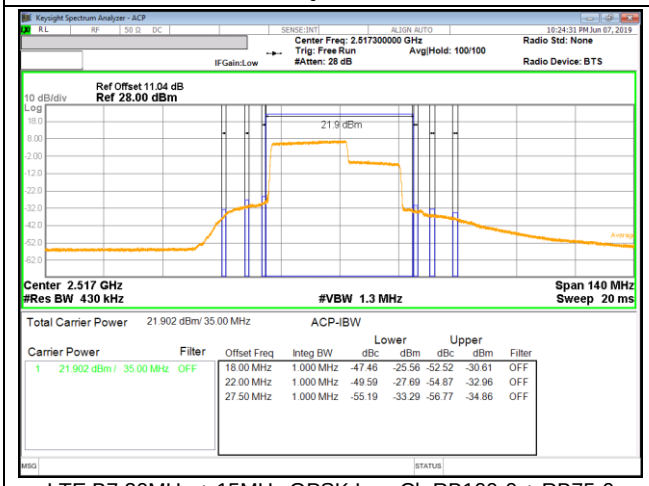

LTE B7 20MHz + 15MHz QPSK Low Ch RB100-0 + RB75-0

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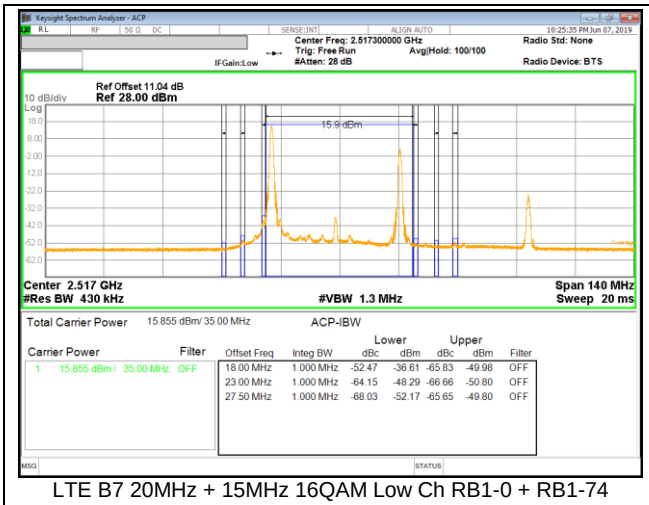

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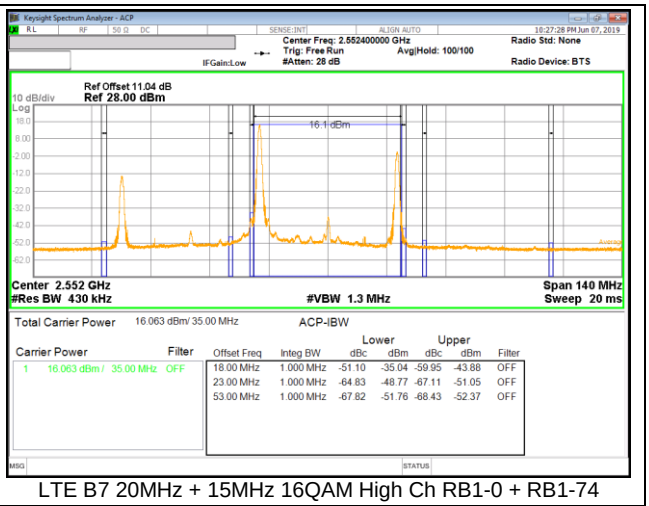

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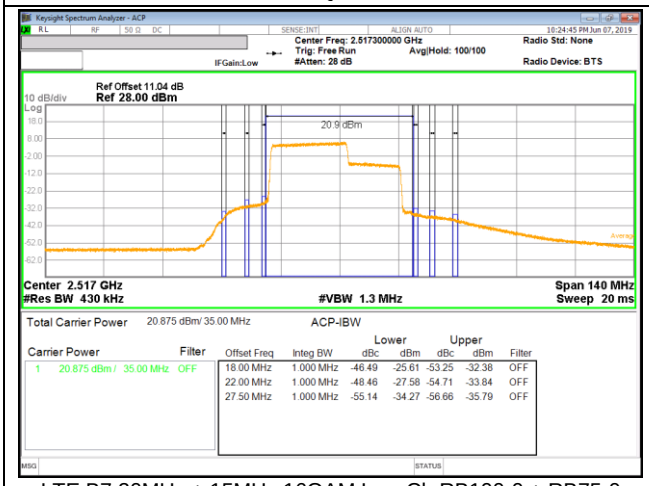
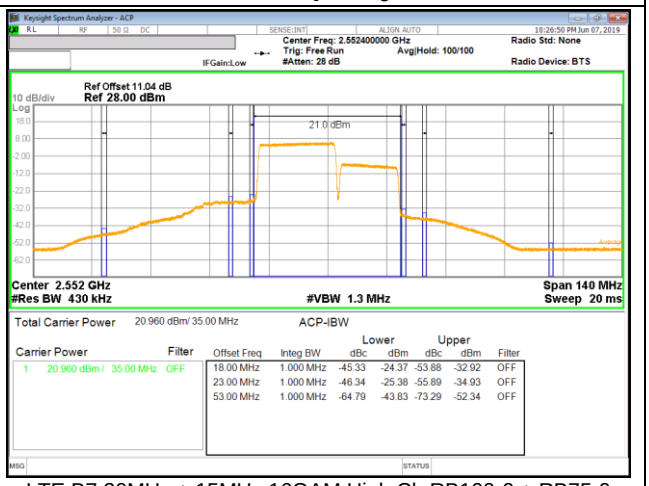


LTE B7 20MHz + 15MHz 16QAM Low Ch RB100-0 + RB75-0



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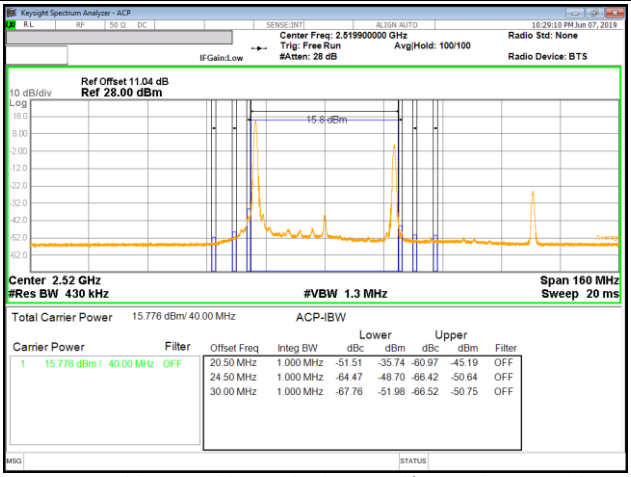

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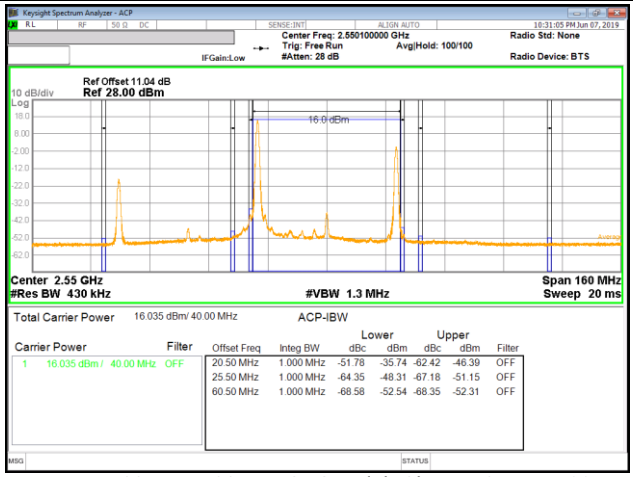

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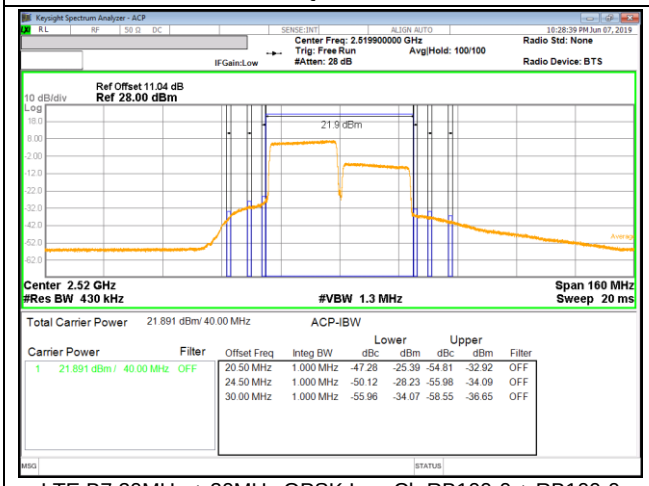

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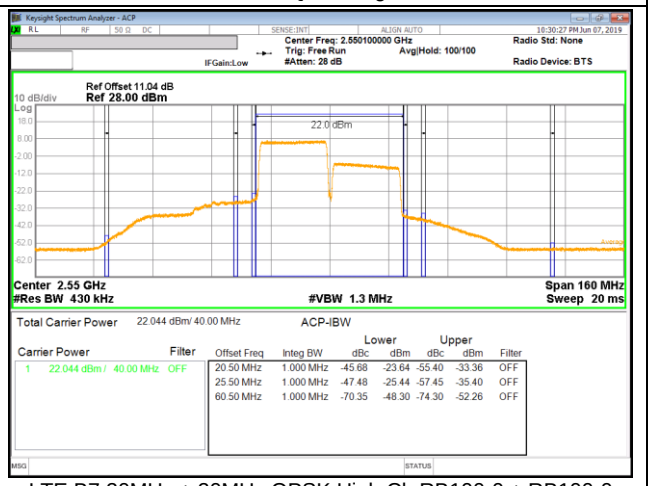

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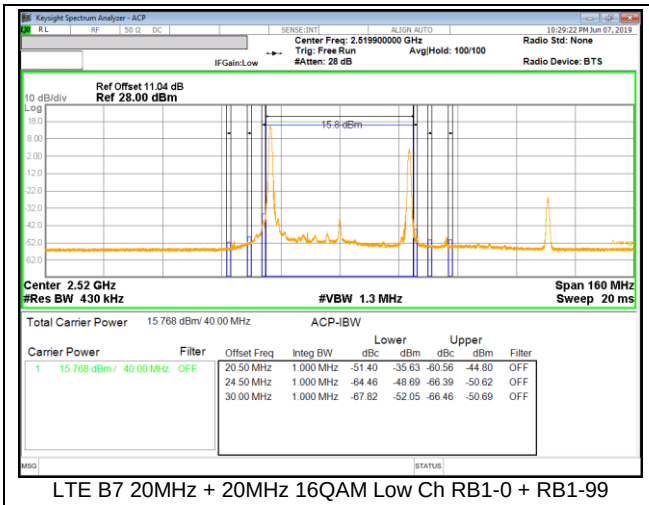

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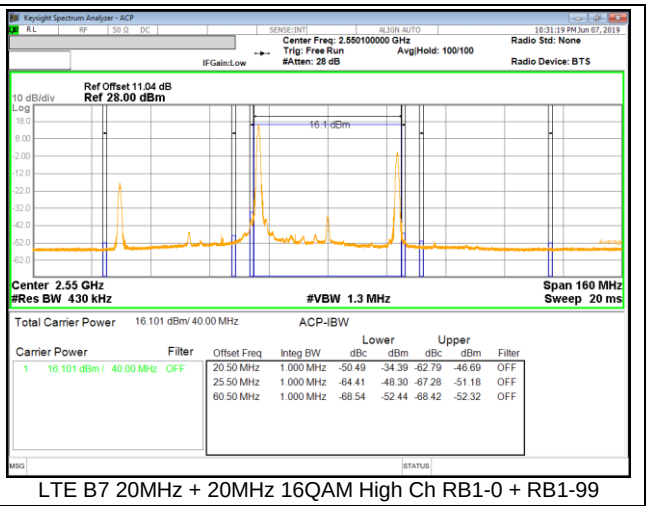

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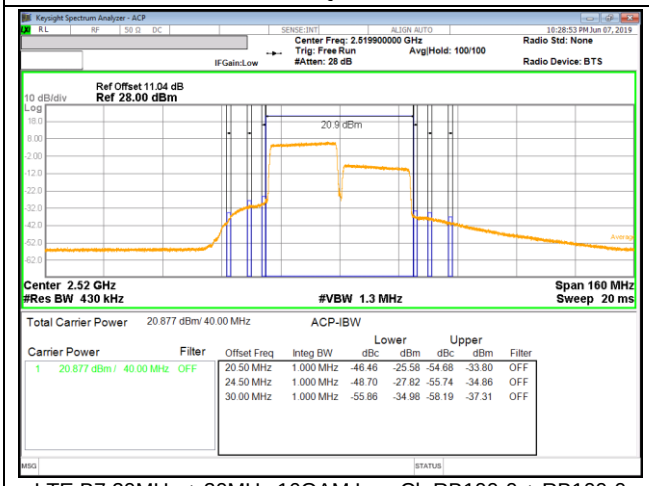

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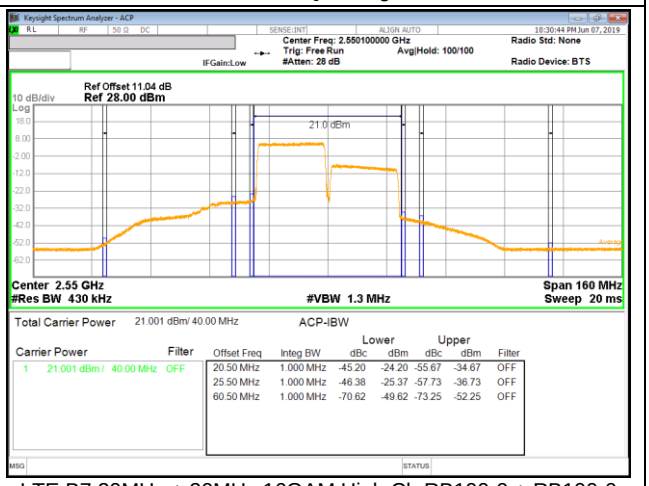

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