



CERTIFICATION TEST REPORT

Report Number. : 4789555428-E2V2

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

Model : SM-G781B/DS, SM-G781B

FCC ID : A3LSMG781B

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

Test Standard(s) : FCC CFR47 PART 22 SUBPART H
FCC CFR47 PART 24 SUBPART E
FCC CFR47 PART 27 SUBPART F,H,L,M
FCC CFR47 PART 90 SUBPART S

Date Of Issue:
August 27, 2020

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Testing Laboratory
TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	08/14/20	Initial issue	Yeonhee Lim
V1	08/27/20	Updated to address TCB's question	Yeonhee Lim

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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, WPT and NFC

MODEL NUMBER: SM-G781B/DS, SM-G781B

SERIAL NUMBER: R3CN704KAMF, R3CN704L6QK (CONDUCTED)
R3CN704KA3M, R3CN704L6MN (RADIATED);

DATE TESTED: July 22, 2020 – August 27, 2020;

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 22H, 24E, 27H, 27L, 27F, 27M and 90S	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:



Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Yeonhee Lim
Suwon Lab Technician
UL Korea, Ltd.

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 22.
3. FCC CFR 47 Part 24.
4. FCC CFR 47 Part 27.
5. FCC CFR 47 Part 90.
6. ANSI TIA-603-E, 2016
7. ANSI C63.26, 2015
8. KDB 971168 D01 Power Meas License Digital Systems v03r01

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

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

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:

$$\text{EIRP} = \text{PSA reading with EUT worst orientation (dBm)} + \text{Path loss (dB)} - \text{cable loss (between the SG and substitution antenna)} + \text{Substitution Antenna Factor (dBi)}$$

$$\text{ERP} = \text{PSA reading with EUT worst orientation (dBm)} + \text{Path loss (dB)} - \text{cable loss (between the SG and substitution antenna)}$$

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

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	2.35 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.96 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.82 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.49 dB

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

4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

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, WPT and NFC.
This test report addresses the WWAN operational mode.

5.2. MAXIMUM OUTPUT POWER

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

Note : Conducted output power results were excerpted from RF exposure test report.(4789555428-S1 FCC Report SAR)

GSM

FCC Part 22/24						
Band	Frequency Range [MHz]	Modulation	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
GSM850	824~849	GPRS	33.09	2037.56	28.54	714.50
		EGPRS	27.39	547.95	23.03	200.91
GSM1900	1850~1910	GPRS	30.16	1037.40	27.97	626.61
		EGPRS	25.60	362.79	24.10	257.04

WCDMA

FCC Part 22/24						
Band	Frequency Range [MHz]	Modulation	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824~849	Rel. 99	24.62	289.73	19.66	92.47
		HSDPA	23.62	229.92	19.19	82.99
Band 4	1710~1755	Rel. 99	23.36	216.71	25.22	332.66
		HSDPA	22.35	171.71	24.51	282.49
Band 2	1850~1910	Rel. 99	23.46	221.82	21.24	133.05
		HSDPA	22.47	176.68	20.02	100.46

LTE Band 2

FCC Part 24							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 2	1850 ~ 1910	20	QPSK	22.88	194.07	21.24	133.05
			16QAM	22.43	175.14	20.35	108.39
			64QAM	21.48	140.67		
			256QAM	17.85	60.96		
		15	QPSK	22.89	194.65	20.97	125.03
			16QAM	22.29	169.43	19.89	97.50
			64QAM	21.56	143.24		
			256QAM	17.99	63.02		
		10	QPSK	22.85	192.65	20.94	124.17
			16QAM	22.25	167.91	19.94	98.63
			64QAM	21.44	139.31		
			256QAM	18.16	65.54		
		5	QPSK	22.96	197.69	21.19	131.52
			16QAM	22.38	173.02	20.08	101.86
			64QAM	21.31	135.14		
			256QAM	17.80	60.32		
		3	QPSK	22.82	191.27	20.99	125.60
			16QAM	22.23	167.12	20.09	102.09
			64QAM	21.30	134.93		
			256QAM	18.09	64.47		
		1.4	QPSK	22.85	192.73	20.94	124.17
			16QAM	22.13	163.47	19.83	96.16
			64QAM	21.38	137.36		
			256QAM	17.78	59.92		

LTE Band 5

FCC Part 22							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824 ~ 849	10	QPSK	24.61	289.36	20.90	123.03
			16QAM	23.99	250.71	20.23	105.44
			64QAM	22.95	197.12		
			256QAM	19.96	99.03		
		5	QPSK	24.61	289.11	20.86	121.90
			16QAM	24.03	253.17	20.07	101.62
			64QAM	22.98	198.53		
			256QAM	19.59	90.91		
		3	QPSK	24.58	287.06	21.05	127.35
			16QAM	24.03	253.21	20.09	102.09
			64QAM	22.92	195.76		
			256QAM	19.95	98.85		
		1.4	QPSK	24.57	286.32	20.57	114.02
			16QAM	23.95	248.37	19.32	85.51
			64QAM	23.03	200.87		
			256QAM	19.69	93.12		

LTE Band 12

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 12	699 ~ 716	10	QPSK	22.91	195.24	16.82	48.08
			16QAM	22.24	167.34	15.67	36.90
			64QAM	21.32	135.53		
			256QAM	18.29	67.50		
		5	QPSK	23.04	201.38	16.87	48.64
			16QAM	22.39	173.28	15.96	39.45
			64QAM	21.43	138.84		
			256QAM	18.05	63.83		
		3	QPSK	22.87	193.44	16.95	49.55
			16QAM	22.24	167.36	16.07	40.46
			64QAM	21.27	133.94		
			256QAM	18.31	67.74		
		1.4	QPSK	22.82	191.62	16.93	49.32
			16QAM	22.26	168.42	15.98	39.63
			64QAM	21.34	136.02		
			256QAM	17.95	62.42		

LTE Band 13

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 13	777 ~ 787	10	QPSK	22.71	186.76	17.77	59.84
			16QAM	22.10	162.01	16.89	48.87
			64QAM	20.89	122.78		
			256QAM	18.07	64.16		
		5	QPSK	22.80	190.62	17.89	61.52
			16QAM	22.23	167.08	17.03	50.47
			64QAM	21.09	128.39		
			256QAM	18.20	66.14		

LTE Band 26 (Part90)

FCC Part 90							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 26	814 ~ 824	15	QPSK	22.69	185.97	17.28	53.46
			16QAM	22.17	164.63	16.16	41.30
			64QAM	21.21	131.99		
			256QAM	18.09	64.37		
		10	QPSK	22.68	185.54	17.17	52.12
			16QAM	21.83	152.35	16.42	43.85
			64QAM	20.84	121.43		
			256QAM	18.03	63.56		
		5	QPSK	22.74	188.06	17.32	53.95
			16QAM	21.88	154.29	16.44	44.06
			64QAM	21.04	127.01		
			256QAM	18.01	63.29		
		3	QPSK	22.68	185.22	17.39	54.83
			16QAM	21.83	152.44	16.33	42.95
			64QAM	20.99	125.63		
			256QAM	18.13	64.99		
		1.4	QPSK	22.66	184.36	17.46	55.72
			16QAM	21.83	152.25	16.56	45.29
			64QAM	21.21	131.99		
			256QAM	18.12	64.94		

LTE Band 26 (Part22)

FCC Part 22							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 26	824 ~ 849	15	QPSK	22.64	183.58	18.57	71.94
			16QAM	22.10	162.00	17.81	60.39
			64QAM	20.98	125.22		
			256QAM	18.25	66.84		
		10	QPSK	22.81	191.15	18.54	71.45
			16QAM	22.19	165.48	17.46	55.72
			64QAM	21.14	129.93		
			256QAM	18.41	69.42		
		5	QPSK	22.85	192.81	19.01	79.62
			16QAM	22.39	173.26	17.82	60.53
			64QAM	21.12	129.36		
			256QAM	18.12	64.91		
		3	QPSK	22.74	187.86	19.15	82.22
			16QAM	22.17	164.83	18.49	70.63
			64QAM	21.14	129.99		
			256QAM	18.34	68.31		
		1.4	QPSK	22.75	188.47	19.26	84.33
			16QAM	22.13	163.36	17.82	60.53
			64QAM	20.98	125.24		
			256QAM	18.05	63.86		

LTE Band 41(PC3)

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 41	2496 ~ 2690	20	QPSK	24.68	293.76	23.87	243.78
			16QAM	23.64	231.45	24.32	270.40
			64QAM	22.91	195.55		
			256QAM	18.80	75.80		
		15	QPSK	24.39	275.08	23.84	242.10
			16QAM	23.54	225.79	23.78	238.78
			64QAM	22.07	161.10		
			256QAM	18.77	75.29		
		10	QPSK	24.50	281.52	24.86	306.20
			16QAM	23.76	237.45	24.36	272.90
			64QAM	22.07	161.10		
			256QAM	18.92	77.95		
		5	QPSK	24.61	288.76	24.39	274.79
			16QAM	23.72	235.34	24.70	295.12
			64QAM	22.55	179.89		
			256QAM	18.86	77.00		

LTE Band 66

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 66	1710 ~ 1780	20	QPSK	22.54	179.33	21.19	131.52
			16QAM	22.23	167.04	20.56	113.76
			64QAM	21.19	131.40		
			256QAM	17.96	62.58		
		15	QPSK	22.57	180.72	21.38	137.40
			16QAM	21.79	151.10	20.51	112.46
			64QAM	21.04	127.16		
			256QAM	18.17	65.65		
		10	QPSK	22.64	183.54	21.64	145.88
			16QAM	22.06	160.52	20.54	113.24
			64QAM	21.02	126.56		
			256QAM	18.24	66.73		
		5	QPSK	22.68	185.40	21.87	153.82
			16QAM	22.21	166.18	20.47	111.43
			64QAM	20.99	125.49		
			256QAM	17.95	62.36		
		3	QPSK	22.81	190.89	21.61	144.88
			16QAM	21.91	155.23	20.72	118.03
			64QAM	21.16	130.66		
			256QAM	18.19	65.85		
		1.4	QPSK	22.66	184.59	21.44	139.32
			16QAM	21.94	156.18	20.54	113.24
			64QAM	20.93	123.82		
			256QAM	18.05	63.81		

LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

5.3. 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)
GSM1900 / WCDMA Band 2 / LTE Band 2 1850 ~ 1915 MHz	-4.61
WCDMA Band 4 / LTE Band 4 / LTE Band 66 1710 ~ 1780 MHz	-5.30
GSM850 / WCDMA Band 5 / LTE Band 5 / LTE Band 26 814 ~ 849 MHz	-6.40
LTE Band 12 / LTE Band 17 699 ~ 716 MHz	-6.13
LTE Band 41 2496 ~ 2690 MHz	-5.78
LTE Band 13 777 ~ 787 MHz	-6.13

5.4. WORST-CASE ORIENTATION

Following modes should be considered as worst-case scenario for all other measurements.

- GSM GPRS/EGPRS
- UMTS REL 99/HSDPA

For all LTE Bands, 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, 64QAM, 256QAM 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	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
2	1852.5	5	1	12
	1880		1	12
	1907.5		1	0
5	829	10	1	0
	836.5		1	49
	844		1	0
12	701.5	5	1	0
	707.5		1	24
	713.5		1	0
13	779.5	5	1	0
	782		1	12
	784.5		1	0
26 (Part 90)	815.5	3	1	0
	822.5			8
26 (Part 22)	826.5	5	1	24
	831.5		1	24
	846.5		1	0
41(PC3)	2501	10	1	25
	2593		1	25
	2685		1	25
66	1711.5	3	1	0
	1745		1	0
	1778.5		1	0

The fundamental and radiated spurious emission were investigated in three orthogonal orientations X, Y and Z, it was determined that below orientation was worst-case orientation for each band.

Band	ERP/EIRP			RSE		
	X	Y	Z	X	Y	Z
GSM850	-	-	O	-	O	-
GSM1900	-	-	O	-	O	-
WCDMA B5	-	-	O	-	-	O
WCDMA B4	O	-	-	O	-	-
WCDMA B2	O	-	-	O	-	-
LTE B2	-	-	O	O	-	-
LTE B5	-	-	O	-	-	O
LTE B12	O	-	-	O	-	-
LTE B13	O	-	-	O	-	-
LTE B26	-	-	O	-	-	O
LTE B41(PC3)	-	-	O	O	-	-
LTE B66	O	-	-	O	-	-

Note : For ERP/EIRP testing, the EUT didn't attached with travel adapter. But radiated spurious testing, the EUT attached with travel adapter for the worst case condition. The EUT is continuously communicated with the call box during the tests.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacture	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA200	R37MCQS5HH1DK3	N/A
Data Cable	SAMSUNG	EP-DR140ABE	N/A	N/A
Earphone	SAMSUNG	GH59-15252A	N/A	N/A

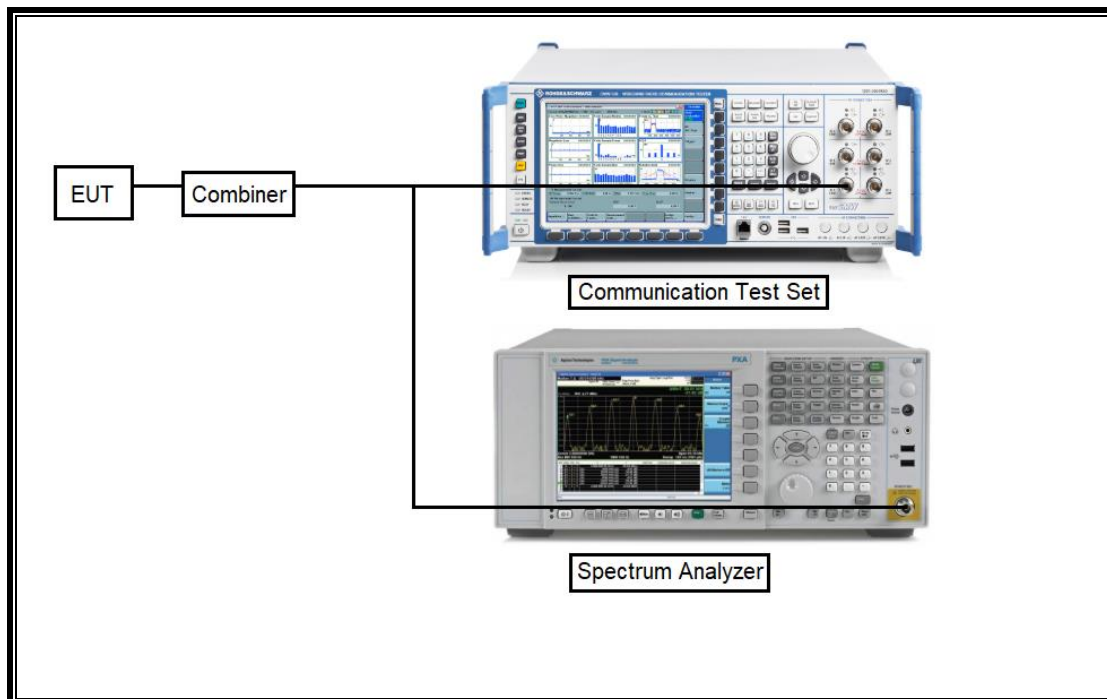
I/O CABLE

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

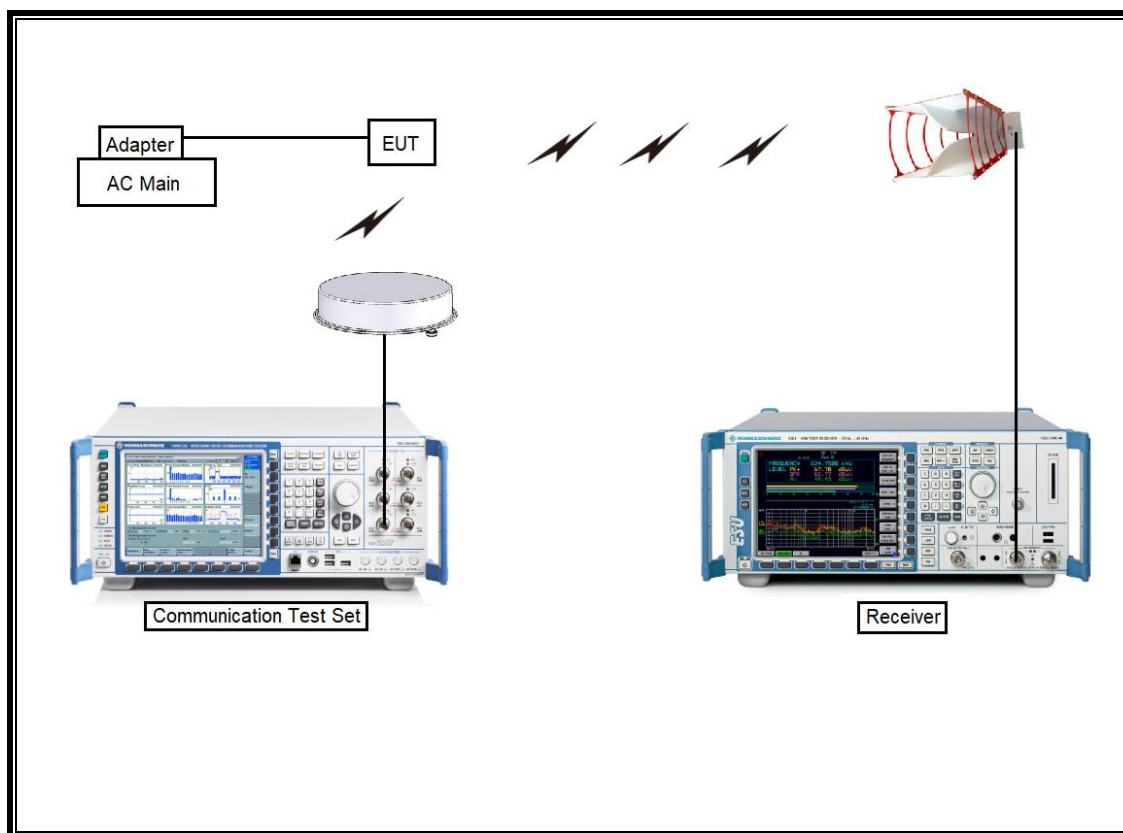
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST 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	S/N	Next Cal. Date	
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121D DB4	00164753	01-31-21	
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	110367-0003	N/A	
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A	
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-13-20	08-04-22
Preamplifier	ETS	3116C-PA	00168841	08-08-20	08-06-21
Antenna, Horn, 40 GHz	ETS	3116C	00168645	10-02-21	
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845(Note1)	08-04-20	08-13-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749(Note1)	08-04-20	08-13-22
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20	07-27-22
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20	07-27-22
Communications Test Set	R&S	CMW500	115331	08-05-20	08-03-21
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-06-20	08-05-21
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-05-20	08-03-21
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-05-20	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-06-20	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-06-20	08-03-21
Spectrum Analyzer	Keysight	N9030A	MY54490312	08-06-20	08-05-21
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-20	08-03-21
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-20	08-03-21
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A	
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	08-05-20	08-05-21
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	08-05-20	08-05-21
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	O10	08-05-20	08-05-21
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	O11	08-05-20	08-05-21
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	08-05-20	08-05-21
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	08-05-20	08-05-21
Attenuator	PASTERNAK	PE7087-10	A009	08-08-20	08-05-21
Attenuator	PASTERNAK	PE7087-10	A001	08-08-20	08-03-21
Attenuator	PASTERNAK	PE7087-10	A008	08-08-20	08-03-21
Attenuator	PASTERNAK	PE7087-10	A007	08-08-20	08-03-21
Attenuator	PASTERNAK	PE7395-10	A011	08-08-20	08-05-21
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21	
Temperature Chamber	ESPEC	SH-642	93001109	08-05-20	08-04-21
Power Splitter	MINI-CIRCUITS	WA1534	UL001	02-05-21	02-05-21
Power Splitter	MINI-CIRCUITS	WA1534	UL002	02-05-21	02-05-21
UL Software					
Description	Manufacturer	Model	Version		
Antenna port test software	UL	CLT	Ver 2.5		

Note. The above antenna was not used for testing from August 4th to August 13th.

7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1049	Occupied Band width (99%)	N/A	Conducted	Pass
22.917(a) 24.238(a) 27.53(c),(g),(h) 90.691	Band Edge / Conducted Spurious Emission	-13dBm		Pass
27.53(m)	Conducted Spurious Emission	-25dBm		Pass
27.53(m) 90.691	Emission mask	Section 9.2.2		Pass
2.1046	Conducted output power	N/A		Pass
22.355 24.235 27.54 90.213	Frequency Stability	2.5PPM		Pass
22.913(a)(5)	Effective Radiated Power	38.5dBm	Radiated	Pass
90.635(b)		50 dBm		Pass
27.50(c)(10) 27.50(b)(10)		34.77dBm		Pass
24.232(c) 27.50(h)(2)	Equivalent Isotropic Radiated Power	33dBm		Pass
27.50(d)(4)		30dBm		Pass
22.917(a) 24.238(a) 27.53 (c),(g),(h) 90.691	Radiated Spurious Emission	-13dBm		Pass
27.53 (m)		-25dBm		Pass

8. PEAK TO AVERAGE RATIO

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 PAR were measured on the Spectrum Analyzer.

Test Spec

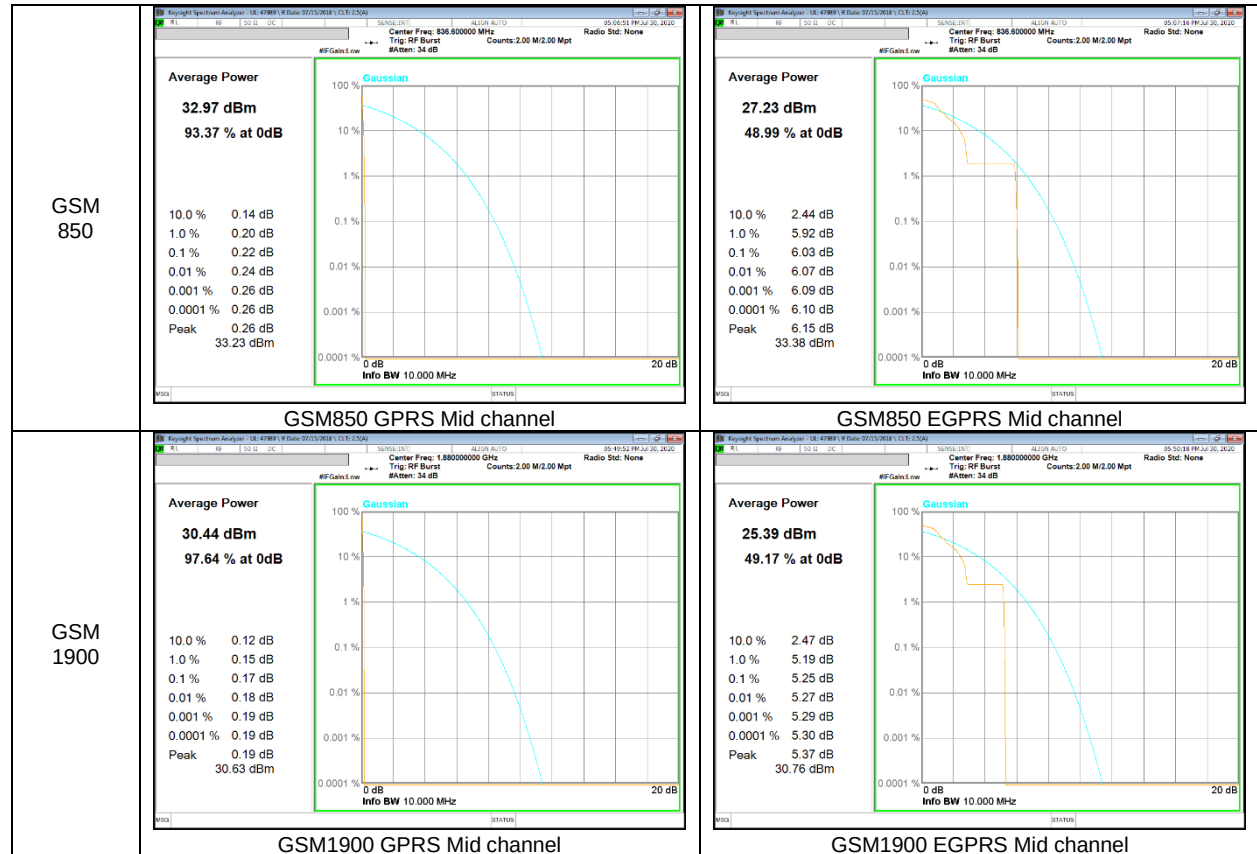
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

RESULTS

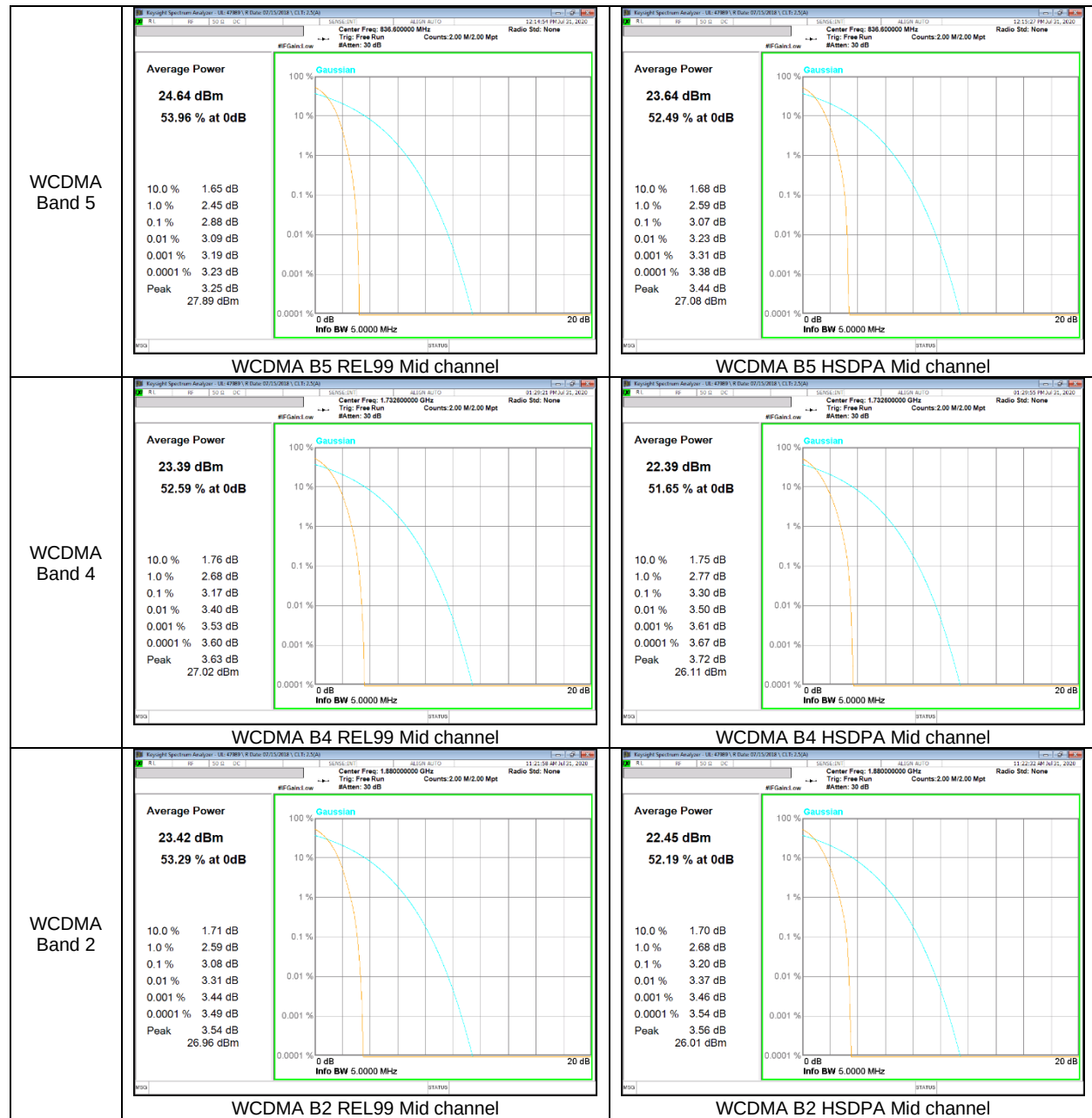
See the following pages.

8.1. CONDUCTED PEAK TO AVERAGE RESULT

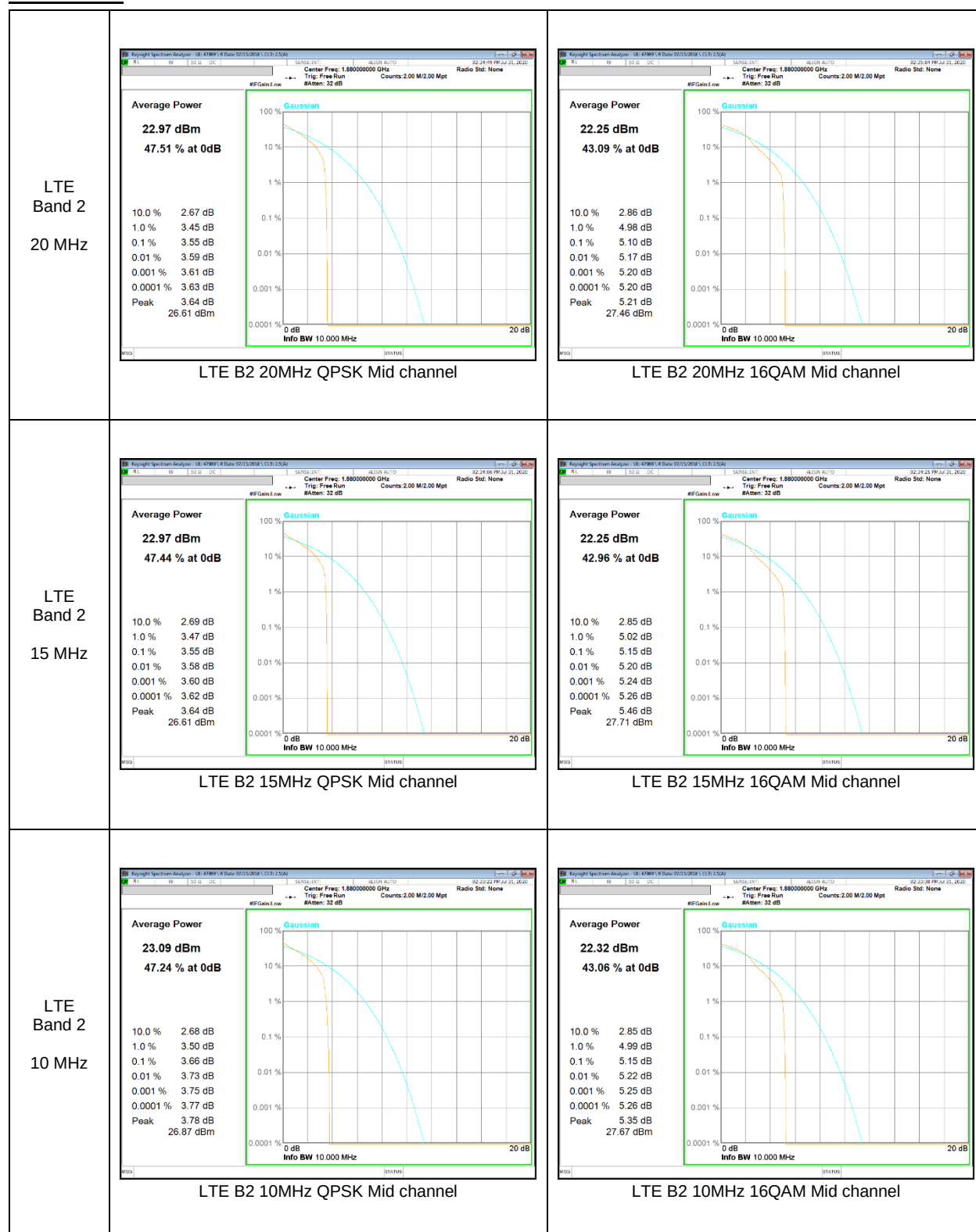
GSM

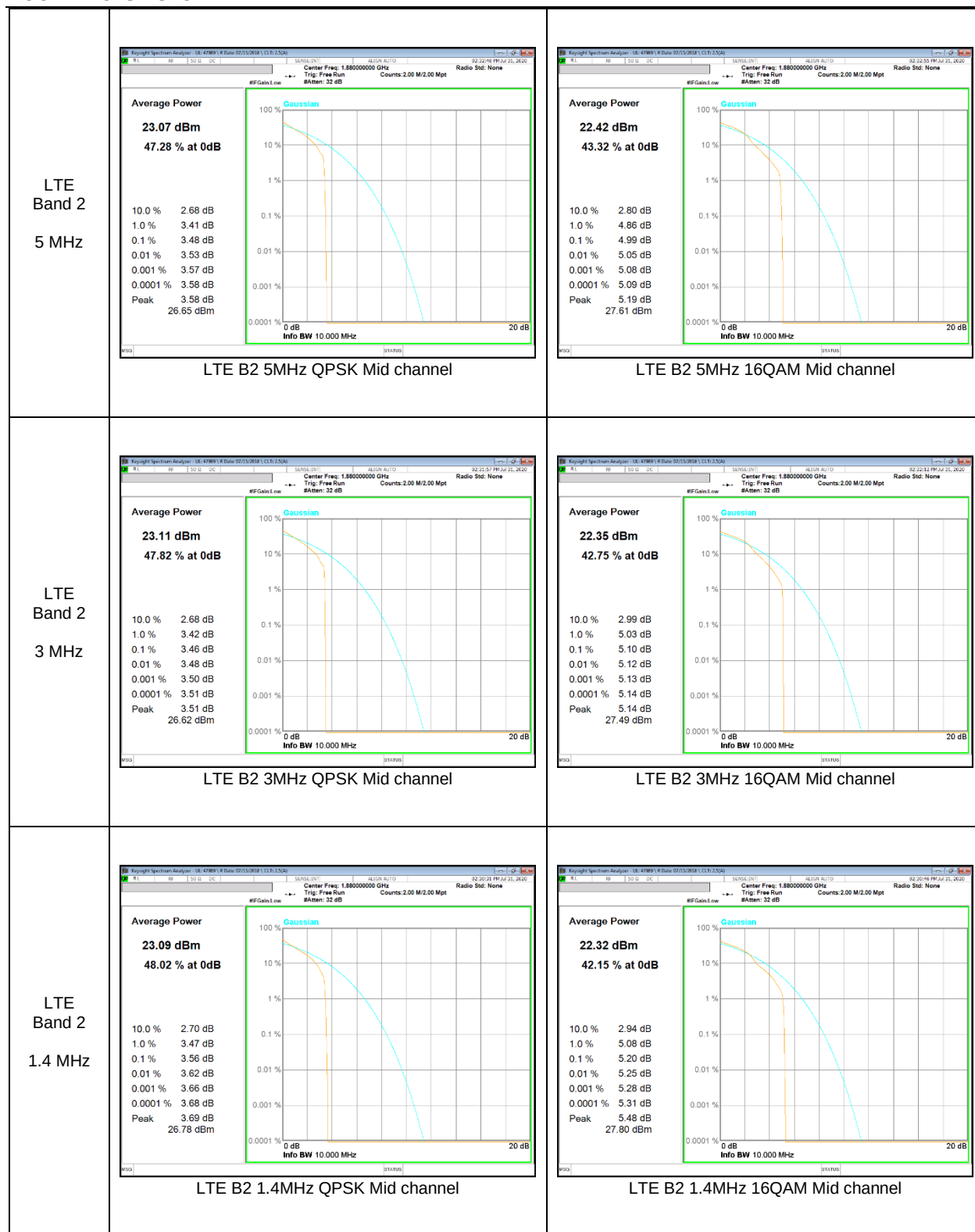


WCDMA

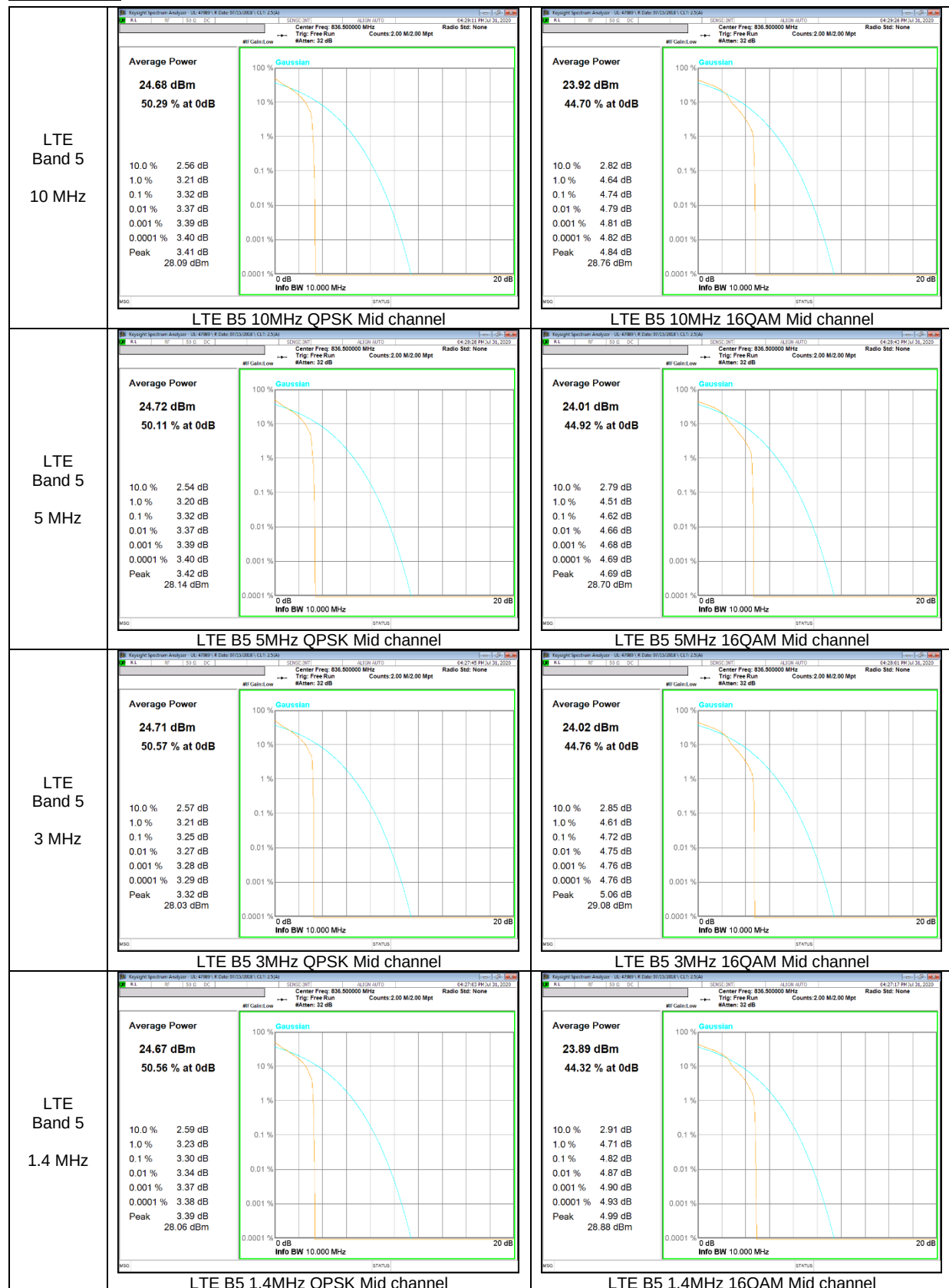


LTE Band 2





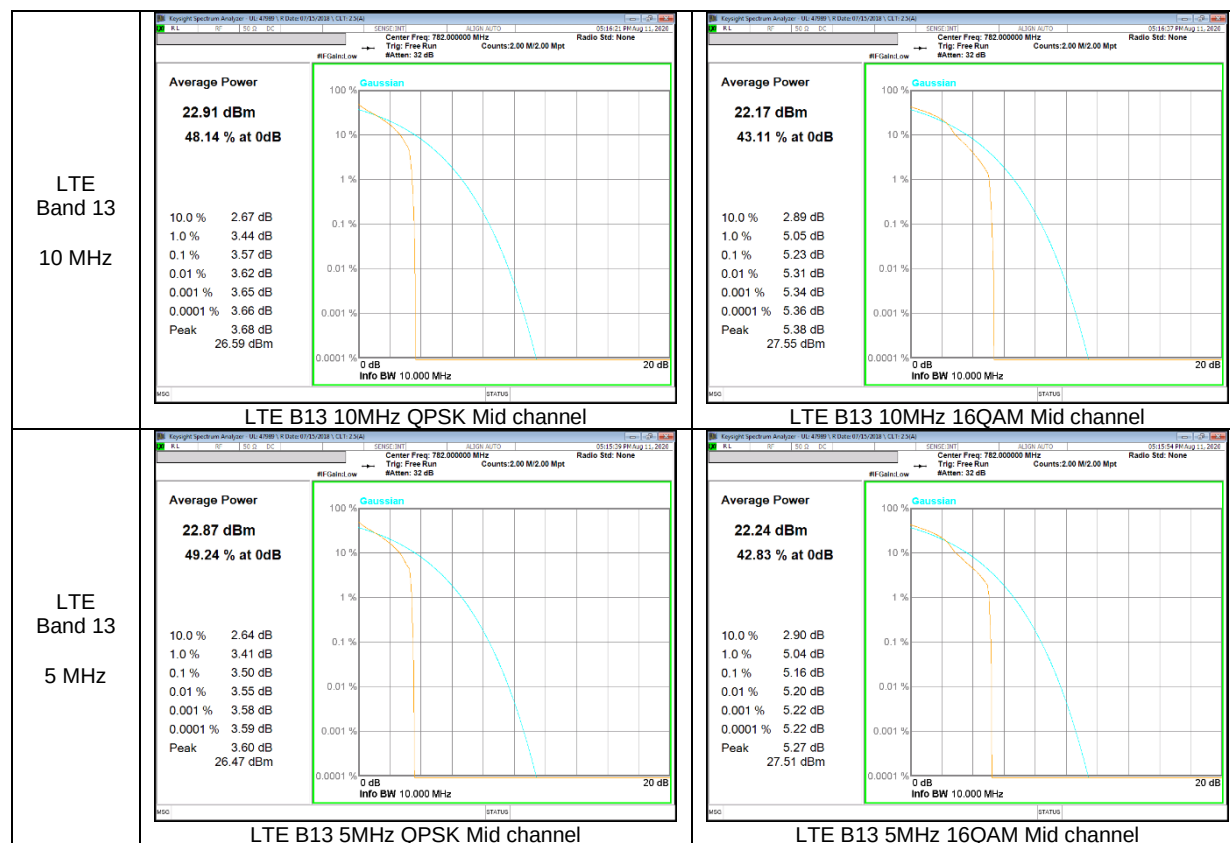
LTE Band 5



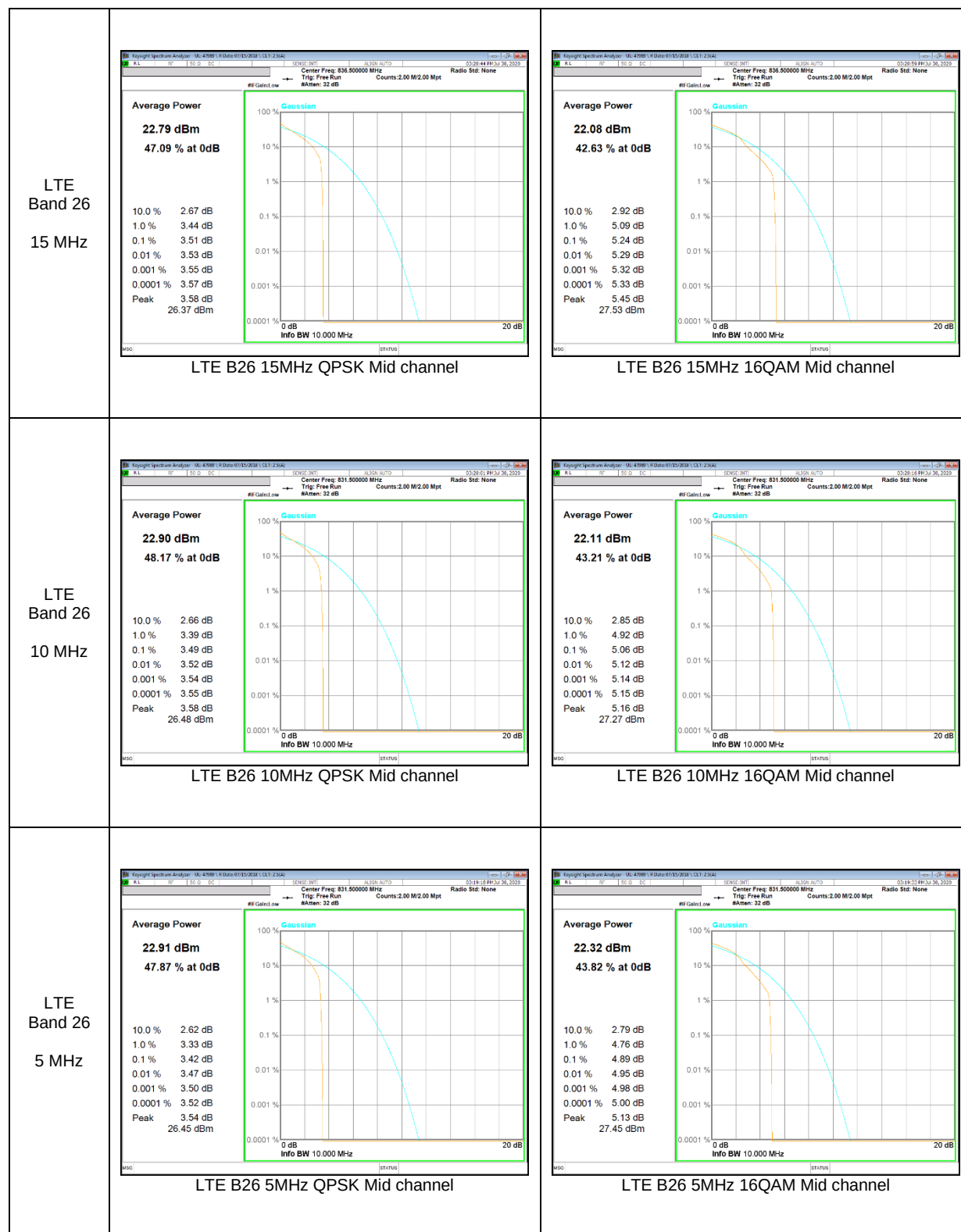
LTE Band 12

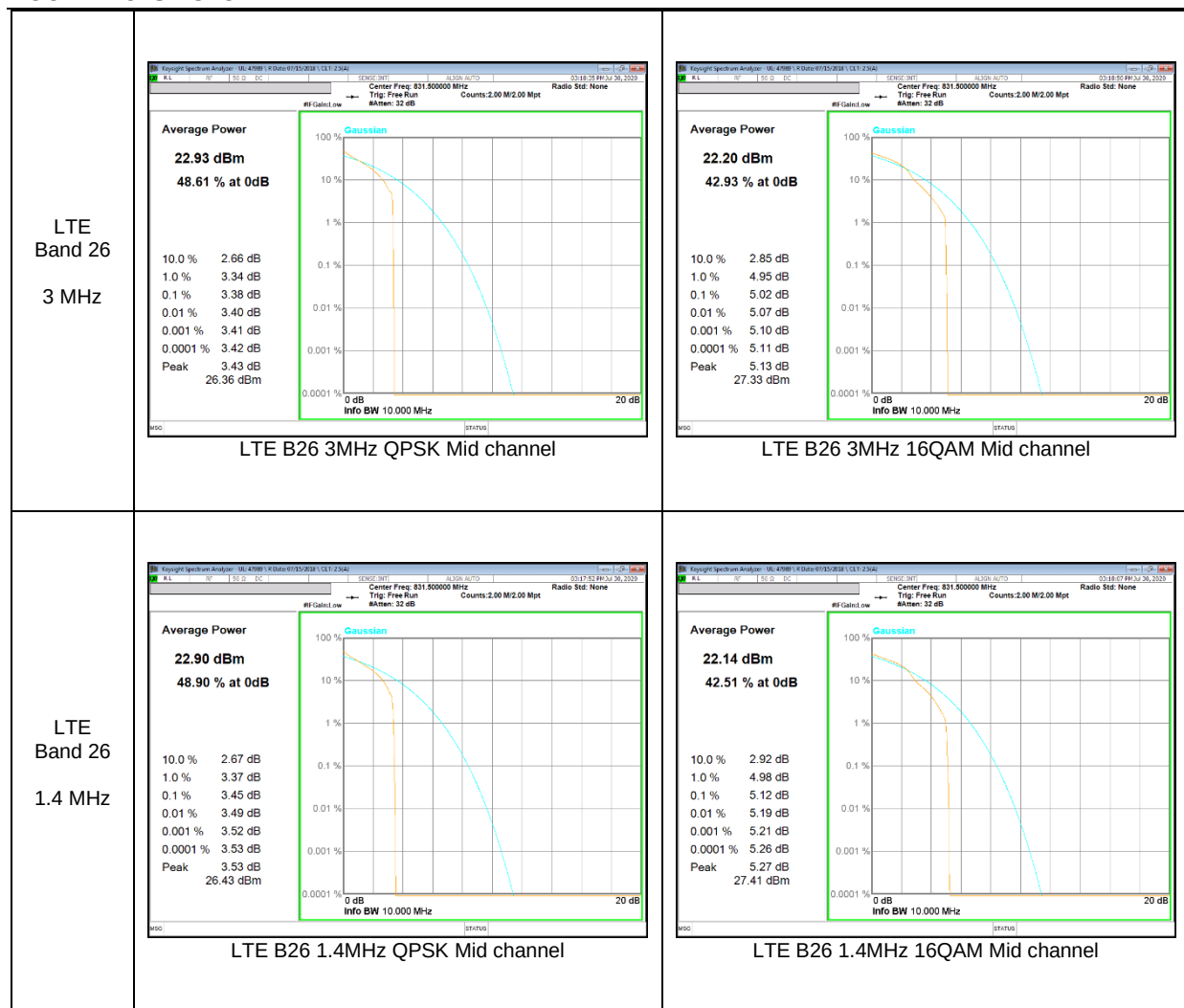


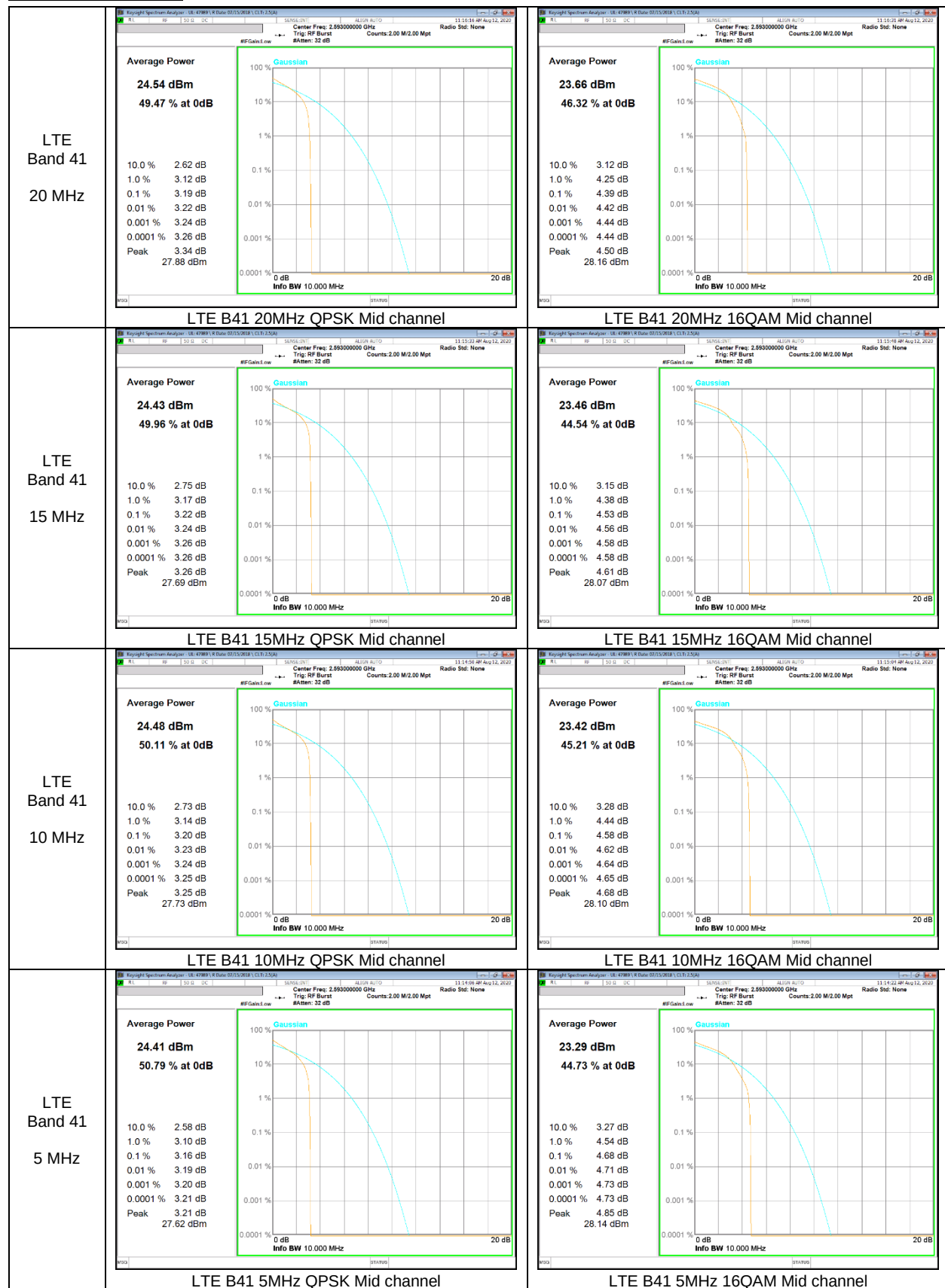
LTE Band 13



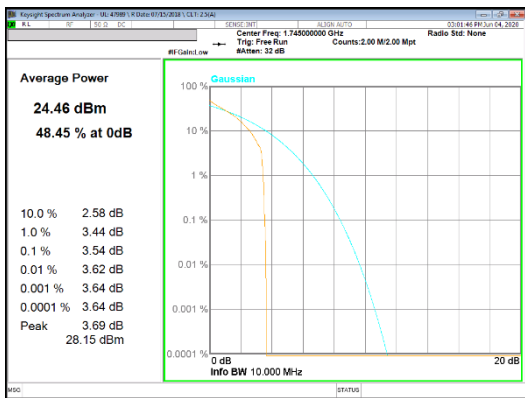
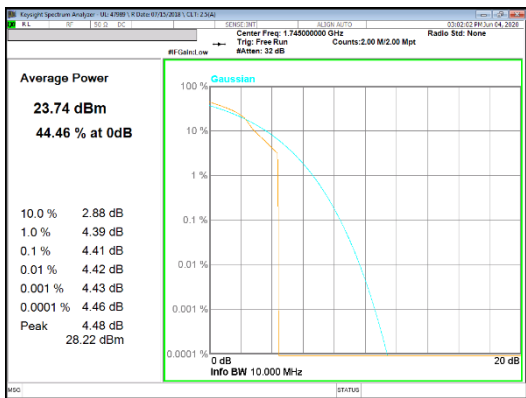
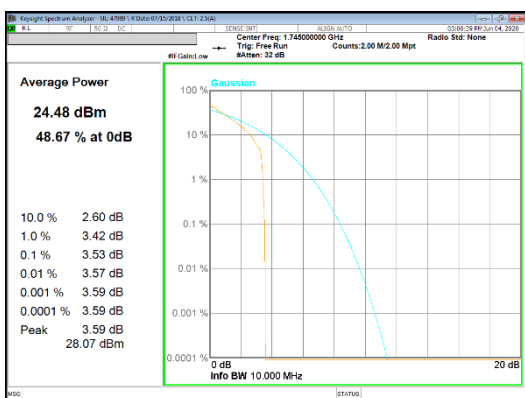
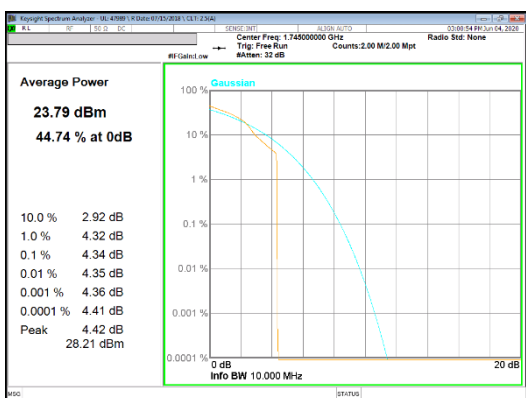
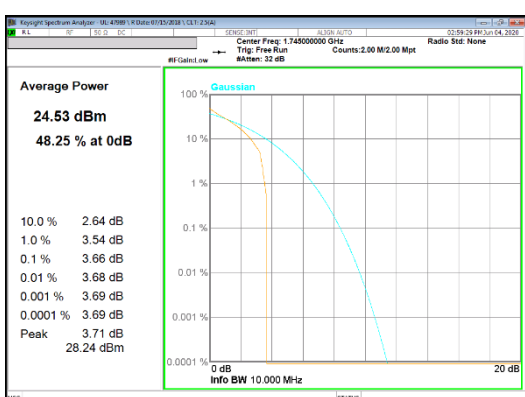
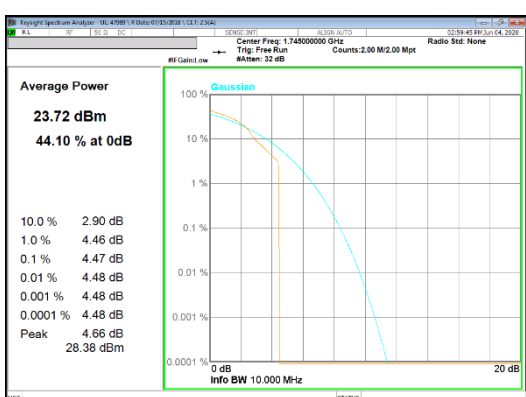
LTE Band 26

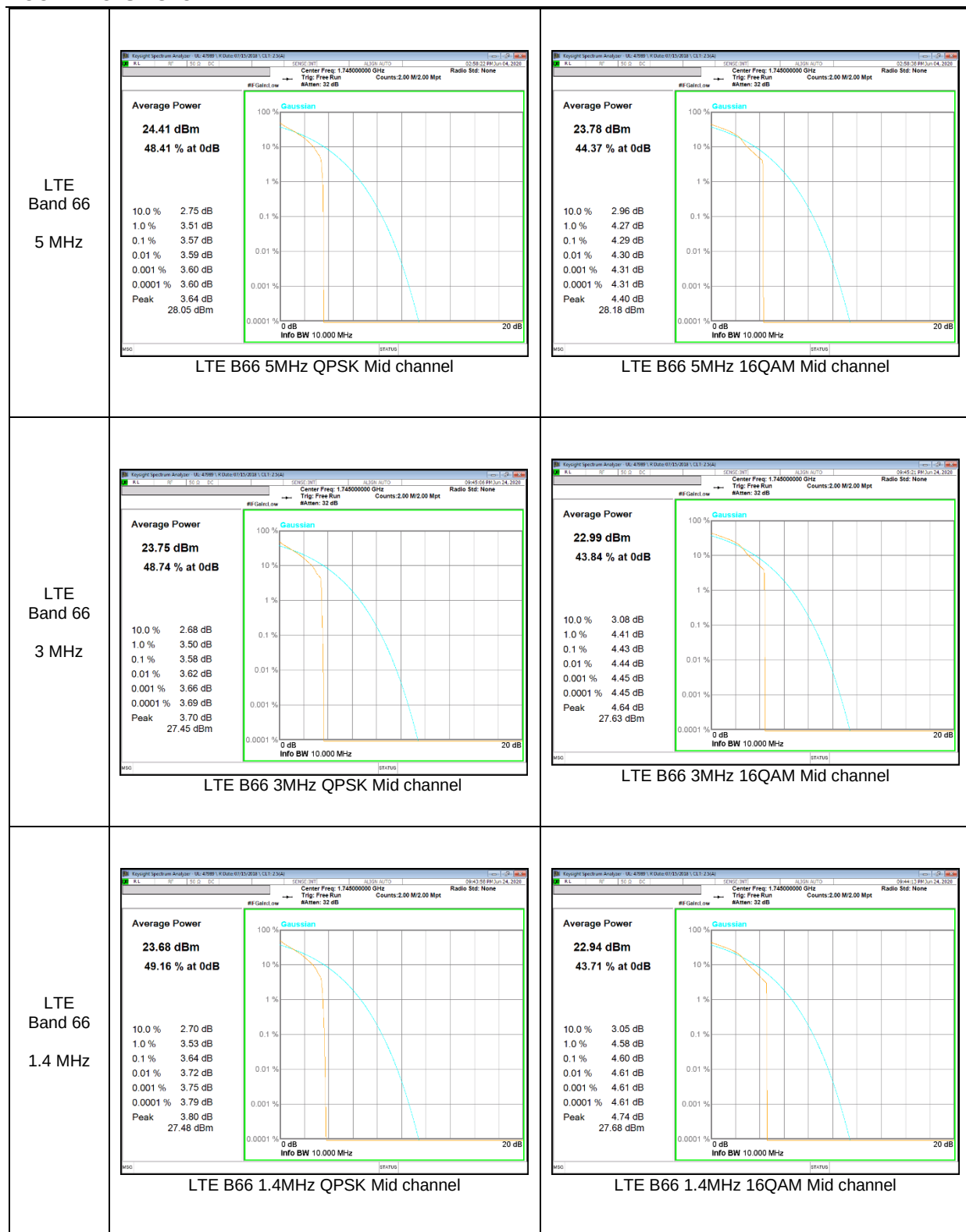




LTE Band 41(PC3)

LTE Band 66

LTE Band 66 20 MHz	 Average Power 24.46 dBm 48.45 % at 0dB <table><tr><td>10.0 %</td><td>2.58 dB</td></tr><tr><td>1.0 %</td><td>3.44 dB</td></tr><tr><td>0.1 %</td><td>3.54 dB</td></tr><tr><td>0.01 %</td><td>3.62 dB</td></tr><tr><td>0.001 %</td><td>3.64 dB</td></tr><tr><td>0.0001 %</td><td>3.64 dB</td></tr><tr><td>Peak</td><td>3.69 dB</td></tr><tr><td>Peak</td><td>28.15 dBm</td></tr></table> LTE B66 20MHz QPSK Mid channel	10.0 %	2.58 dB	1.0 %	3.44 dB	0.1 %	3.54 dB	0.01 %	3.62 dB	0.001 %	3.64 dB	0.0001 %	3.64 dB	Peak	3.69 dB	Peak	28.15 dBm	 Average Power 23.74 dBm 44.46 % at 0dB <table><tr><td>10.0 %</td><td>2.88 dB</td></tr><tr><td>1.0 %</td><td>4.39 dB</td></tr><tr><td>0.1 %</td><td>4.41 dB</td></tr><tr><td>0.01 %</td><td>4.42 dB</td></tr><tr><td>0.001 %</td><td>4.43 dB</td></tr><tr><td>0.0001 %</td><td>4.46 dB</td></tr><tr><td>Peak</td><td>4.48 dB</td></tr><tr><td>Peak</td><td>28.22 dBm</td></tr></table> LTE B66 20MHz 16QAM Mid channel	10.0 %	2.88 dB	1.0 %	4.39 dB	0.1 %	4.41 dB	0.01 %	4.42 dB	0.001 %	4.43 dB	0.0001 %	4.46 dB	Peak	4.48 dB	Peak	28.22 dBm
10.0 %	2.58 dB																																	
1.0 %	3.44 dB																																	
0.1 %	3.54 dB																																	
0.01 %	3.62 dB																																	
0.001 %	3.64 dB																																	
0.0001 %	3.64 dB																																	
Peak	3.69 dB																																	
Peak	28.15 dBm																																	
10.0 %	2.88 dB																																	
1.0 %	4.39 dB																																	
0.1 %	4.41 dB																																	
0.01 %	4.42 dB																																	
0.001 %	4.43 dB																																	
0.0001 %	4.46 dB																																	
Peak	4.48 dB																																	
Peak	28.22 dBm																																	
LTE Band 66 15 MHz	 Average Power 24.48 dBm 48.67 % at 0dB <table><tr><td>10.0 %</td><td>2.60 dB</td></tr><tr><td>1.0 %</td><td>3.42 dB</td></tr><tr><td>0.1 %</td><td>3.53 dB</td></tr><tr><td>0.01 %</td><td>3.57 dB</td></tr><tr><td>0.001 %</td><td>3.59 dB</td></tr><tr><td>0.0001 %</td><td>3.59 dB</td></tr><tr><td>Peak</td><td>3.59 dB</td></tr><tr><td>Peak</td><td>28.07 dBm</td></tr></table> LTE B66 15MHz QPSK Mid channel	10.0 %	2.60 dB	1.0 %	3.42 dB	0.1 %	3.53 dB	0.01 %	3.57 dB	0.001 %	3.59 dB	0.0001 %	3.59 dB	Peak	3.59 dB	Peak	28.07 dBm	 Average Power 23.79 dBm 44.74 % at 0dB <table><tr><td>10.0 %</td><td>2.92 dB</td></tr><tr><td>1.0 %</td><td>4.32 dB</td></tr><tr><td>0.1 %</td><td>4.34 dB</td></tr><tr><td>0.01 %</td><td>4.35 dB</td></tr><tr><td>0.001 %</td><td>4.36 dB</td></tr><tr><td>0.0001 %</td><td>4.41 dB</td></tr><tr><td>Peak</td><td>4.42 dB</td></tr><tr><td>Peak</td><td>28.21 dBm</td></tr></table> LTE B66 15MHz 16QAM Mid channel	10.0 %	2.92 dB	1.0 %	4.32 dB	0.1 %	4.34 dB	0.01 %	4.35 dB	0.001 %	4.36 dB	0.0001 %	4.41 dB	Peak	4.42 dB	Peak	28.21 dBm
10.0 %	2.60 dB																																	
1.0 %	3.42 dB																																	
0.1 %	3.53 dB																																	
0.01 %	3.57 dB																																	
0.001 %	3.59 dB																																	
0.0001 %	3.59 dB																																	
Peak	3.59 dB																																	
Peak	28.07 dBm																																	
10.0 %	2.92 dB																																	
1.0 %	4.32 dB																																	
0.1 %	4.34 dB																																	
0.01 %	4.35 dB																																	
0.001 %	4.36 dB																																	
0.0001 %	4.41 dB																																	
Peak	4.42 dB																																	
Peak	28.21 dBm																																	
LTE Band 66 10 MHz	 Average Power 24.53 dBm 48.25 % at 0dB <table><tr><td>10.0 %</td><td>2.64 dB</td></tr><tr><td>1.0 %</td><td>3.54 dB</td></tr><tr><td>0.1 %</td><td>3.66 dB</td></tr><tr><td>0.01 %</td><td>3.68 dB</td></tr><tr><td>0.001 %</td><td>3.69 dB</td></tr><tr><td>0.0001 %</td><td>3.69 dB</td></tr><tr><td>Peak</td><td>3.71 dB</td></tr><tr><td>Peak</td><td>28.24 dBm</td></tr></table> LTE B66 10MHz QPSK Mid channel	10.0 %	2.64 dB	1.0 %	3.54 dB	0.1 %	3.66 dB	0.01 %	3.68 dB	0.001 %	3.69 dB	0.0001 %	3.69 dB	Peak	3.71 dB	Peak	28.24 dBm	 Average Power 23.72 dBm 44.10 % at 0dB <table><tr><td>10.0 %</td><td>2.90 dB</td></tr><tr><td>1.0 %</td><td>4.46 dB</td></tr><tr><td>0.1 %</td><td>4.47 dB</td></tr><tr><td>0.01 %</td><td>4.48 dB</td></tr><tr><td>0.001 %</td><td>4.48 dB</td></tr><tr><td>0.0001 %</td><td>4.48 dB</td></tr><tr><td>Peak</td><td>4.66 dB</td></tr><tr><td>Peak</td><td>28.38 dBm</td></tr></table> LTE B66 10MHz 16QAM Mid channel	10.0 %	2.90 dB	1.0 %	4.46 dB	0.1 %	4.47 dB	0.01 %	4.48 dB	0.001 %	4.48 dB	0.0001 %	4.48 dB	Peak	4.66 dB	Peak	28.38 dBm
10.0 %	2.64 dB																																	
1.0 %	3.54 dB																																	
0.1 %	3.66 dB																																	
0.01 %	3.68 dB																																	
0.001 %	3.69 dB																																	
0.0001 %	3.69 dB																																	
Peak	3.71 dB																																	
Peak	28.24 dBm																																	
10.0 %	2.90 dB																																	
1.0 %	4.46 dB																																	
0.1 %	4.47 dB																																	
0.01 %	4.48 dB																																	
0.001 %	4.48 dB																																	
0.0001 %	4.48 dB																																	
Peak	4.66 dB																																	
Peak	28.38 dBm																																	



LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

9. LIMITS AND CONDUCTED RESULTS

9.1. 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 middle channel in each band. The -26dB bandwidth was also measured and recorded.

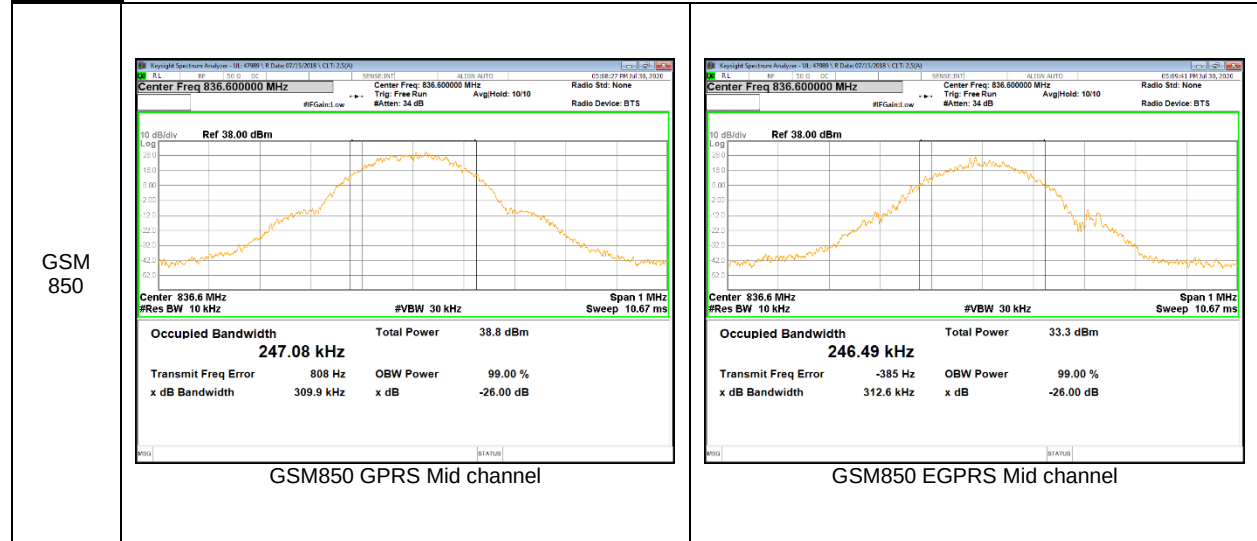
(KDB 971168 D01 Power Meas License Digital Systems v03r01)

RESULTS

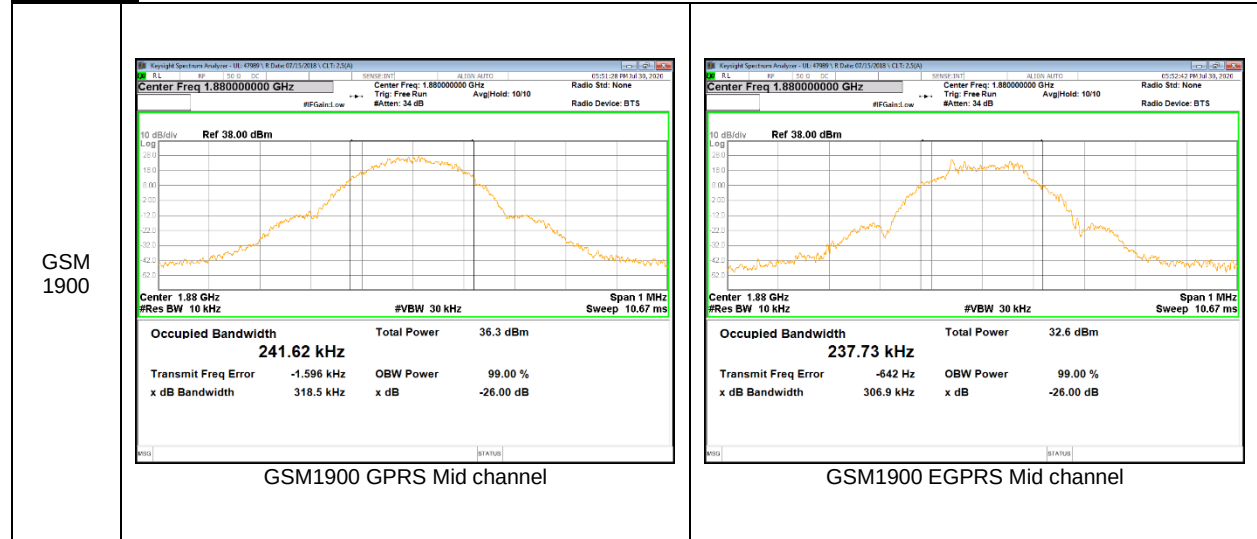
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9.1.1. OCCUPIED BANDWIDTH RESULTS

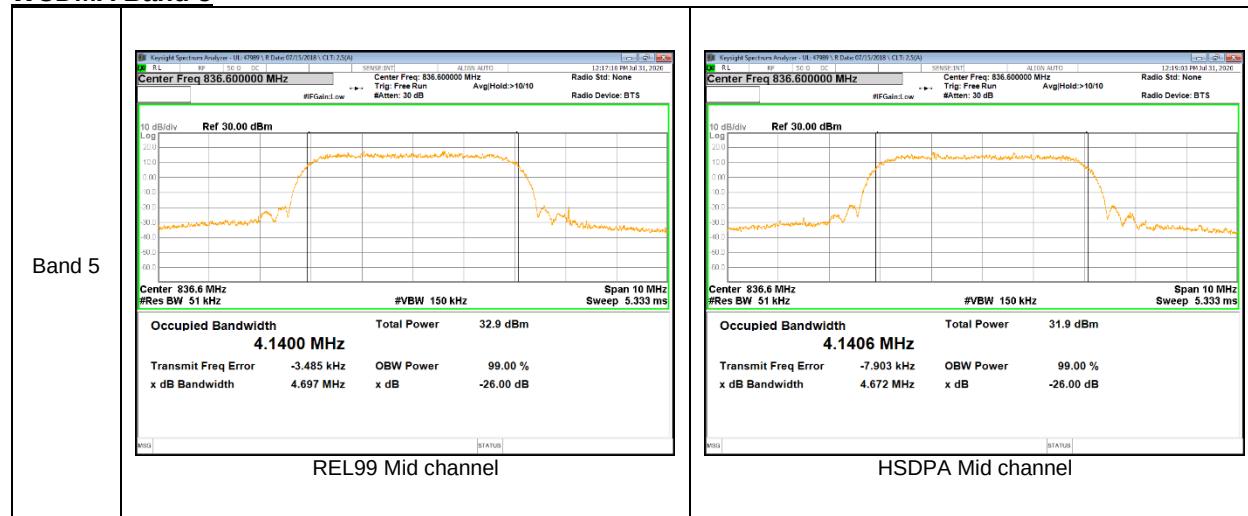
GSM 850



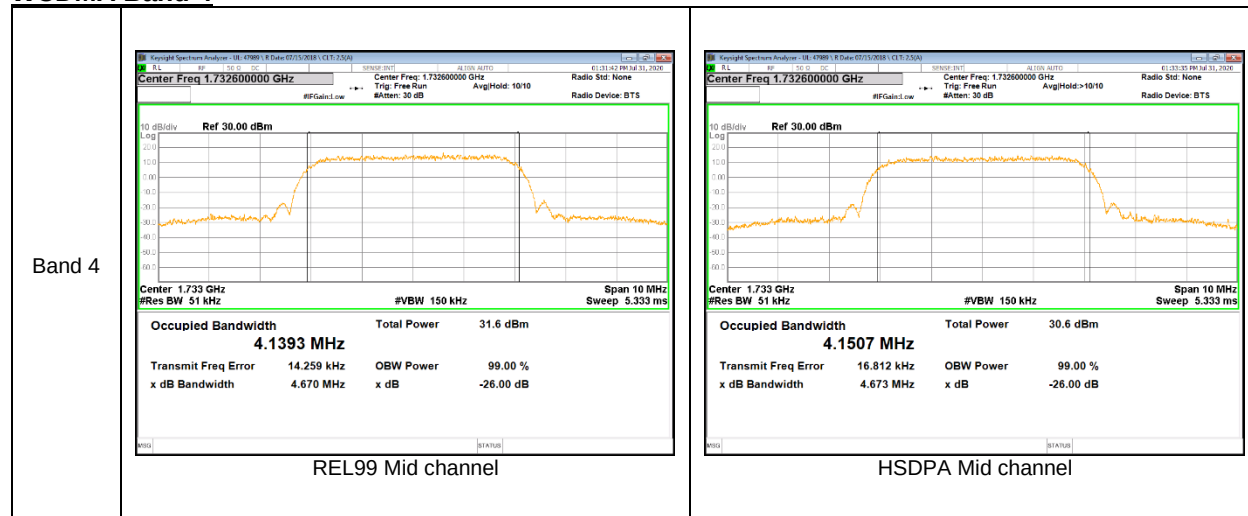
GSM 1900



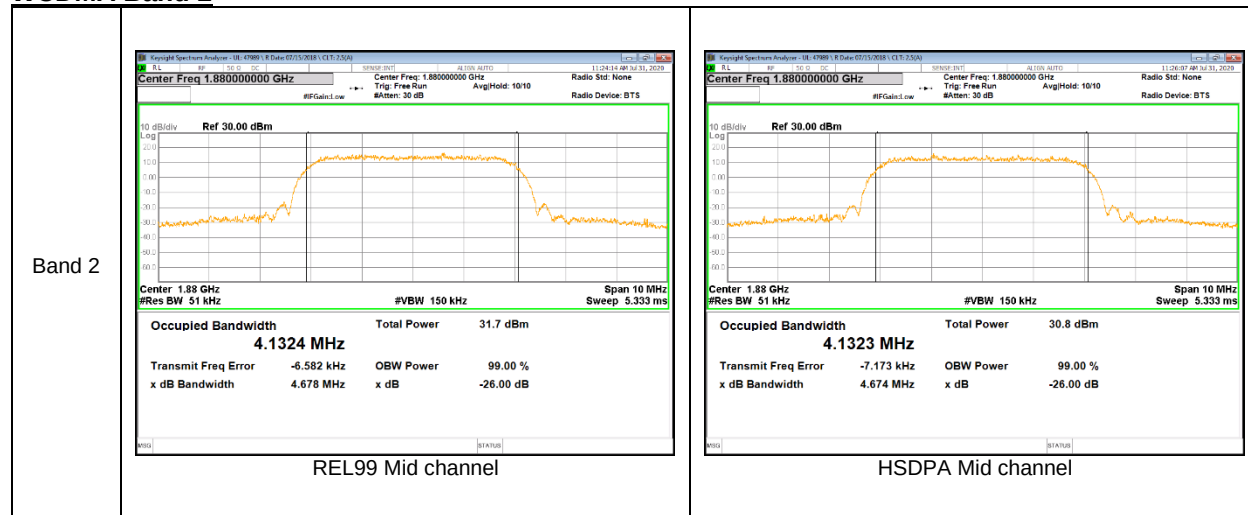
WCDMA Band 5



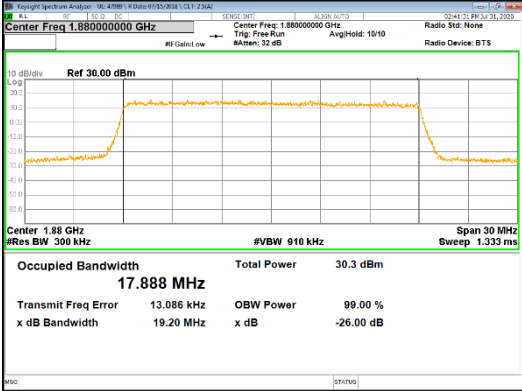
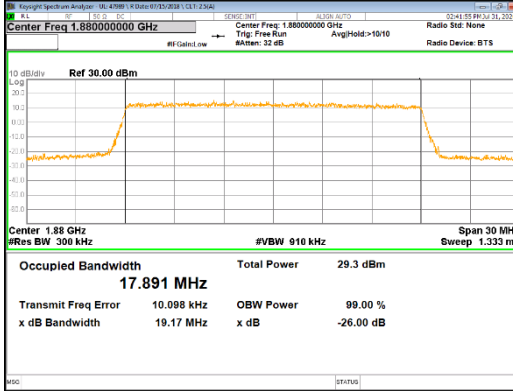
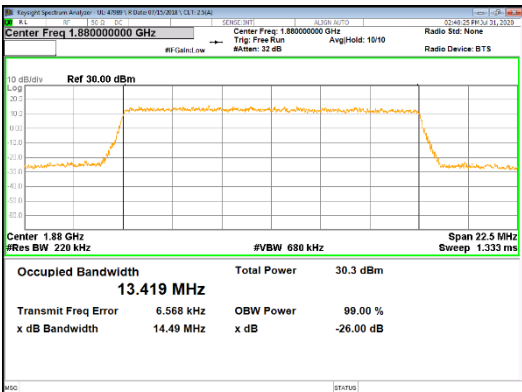
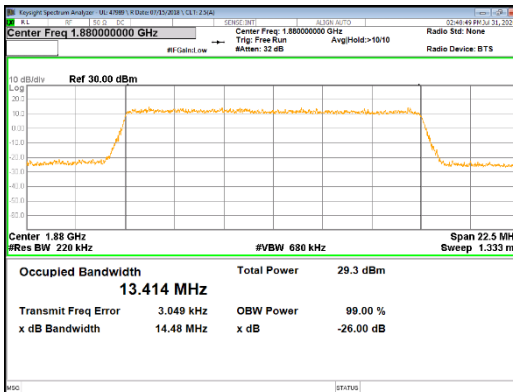
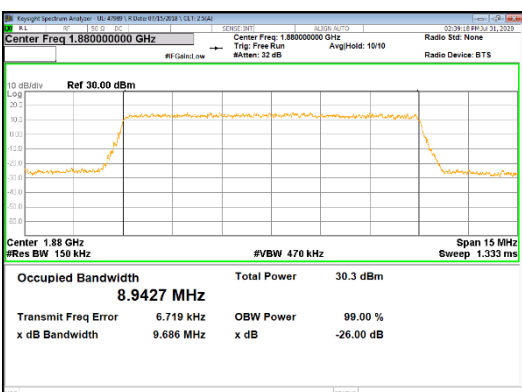
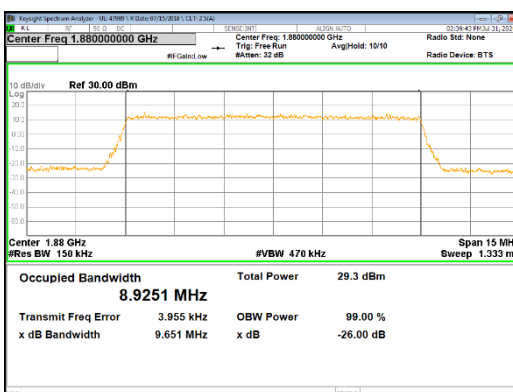
WCDMA Band 4

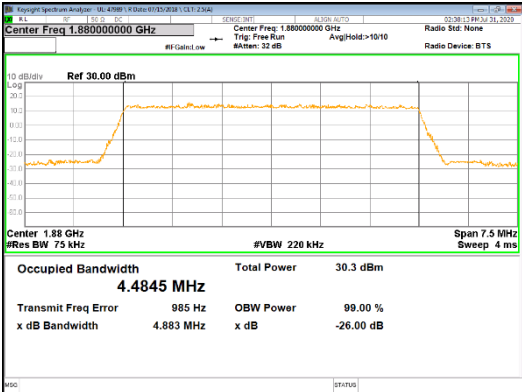
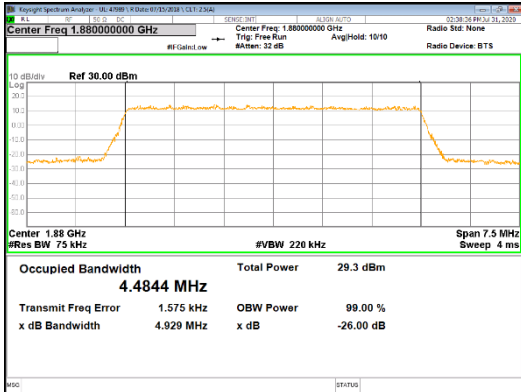
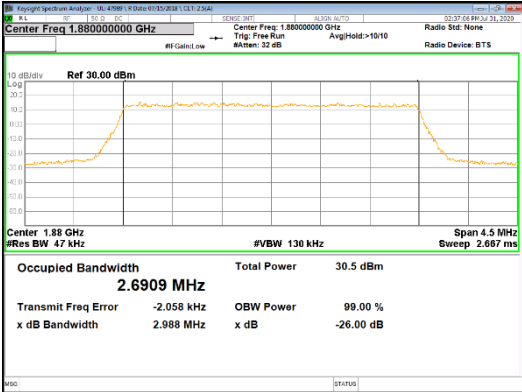
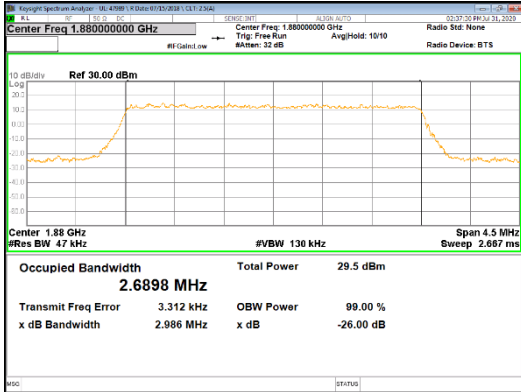
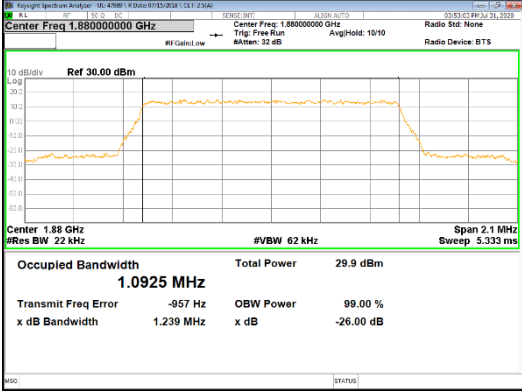
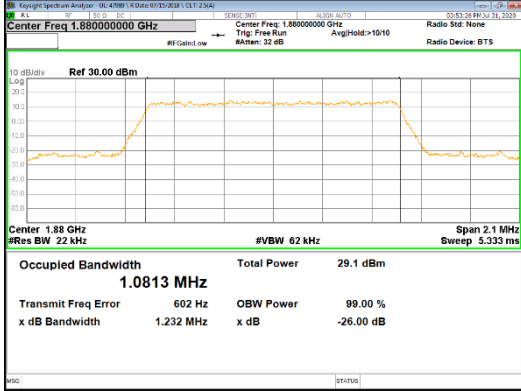


WCDMA Band 2

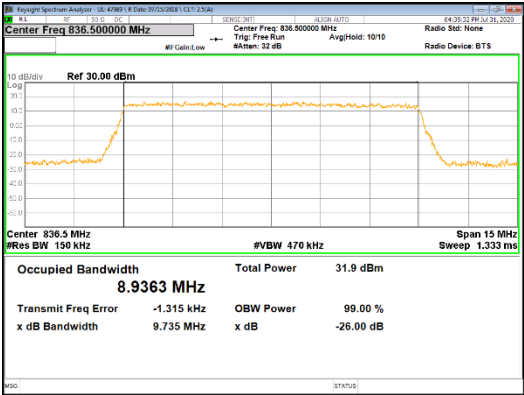
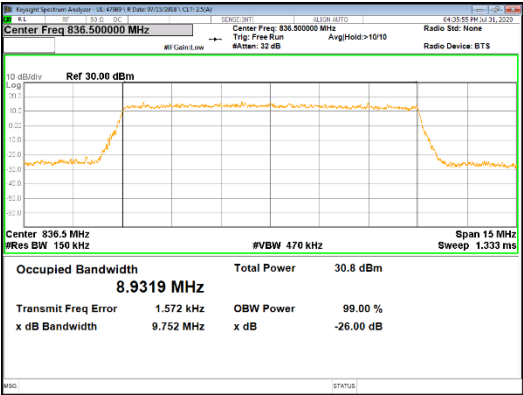
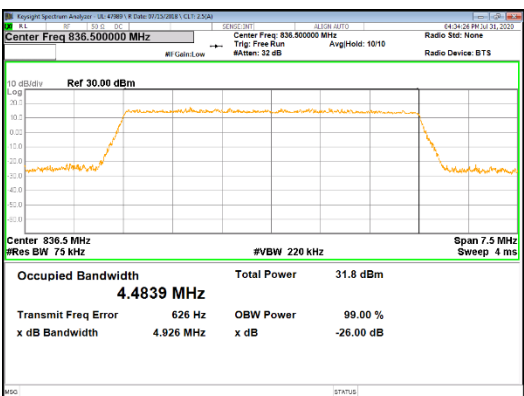
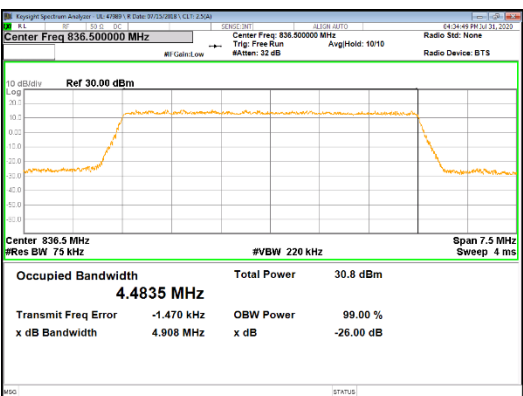
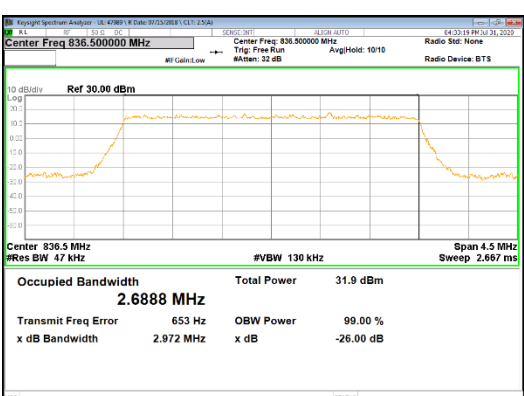
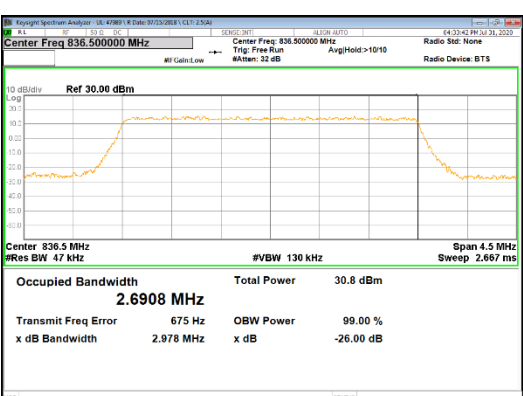


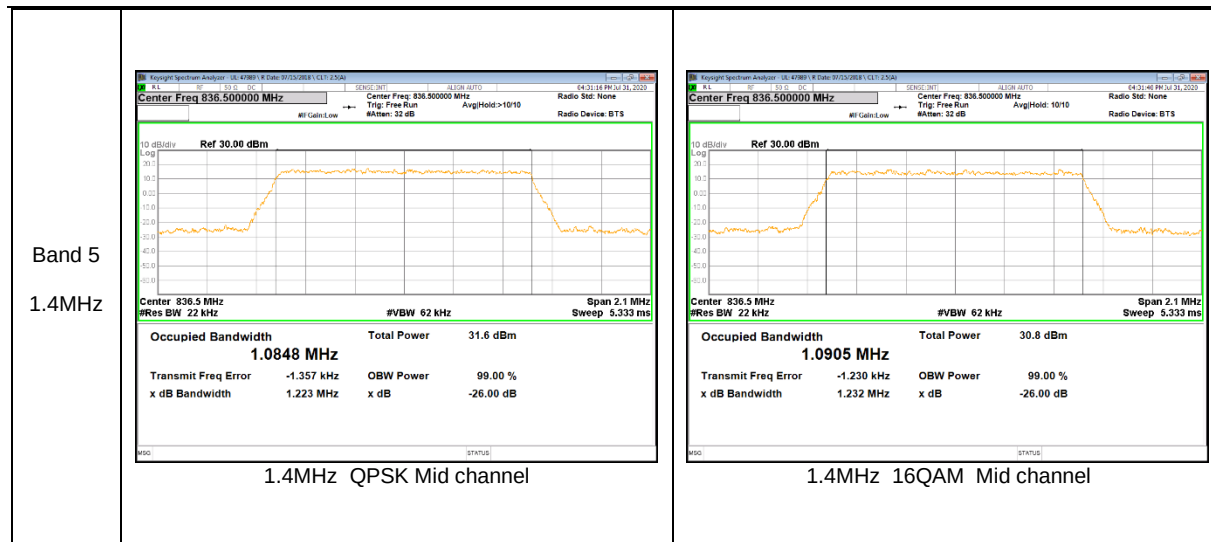
LTE Band 2

Band 2 20MHz	 20MHz QPSK Mid channel	 20MHz 16QAM Mid channel
Band 2 15MHz	 15MHz QPSK Mid channel	 15MHz 16QAM Mid channel
Band 2 10MHz	 10MHz QPSK Mid channel	 10MHz 16QAM Mid channel

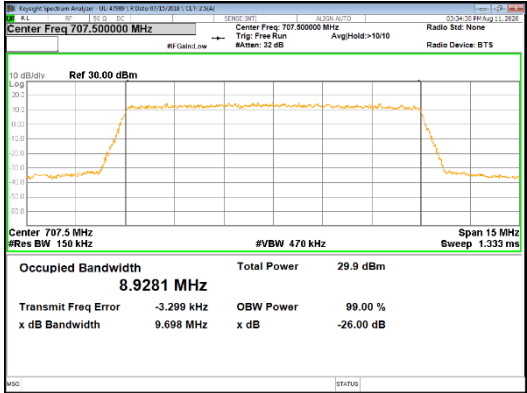
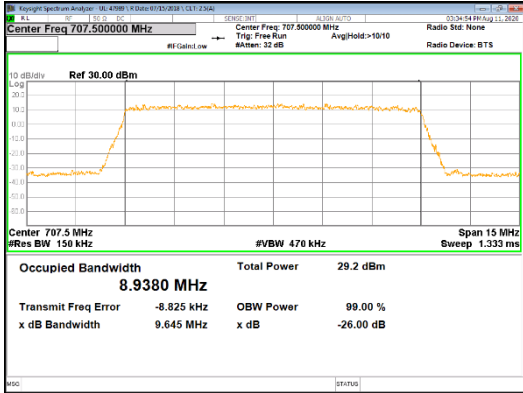
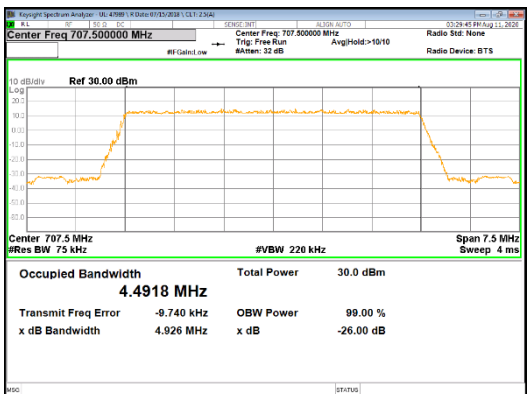
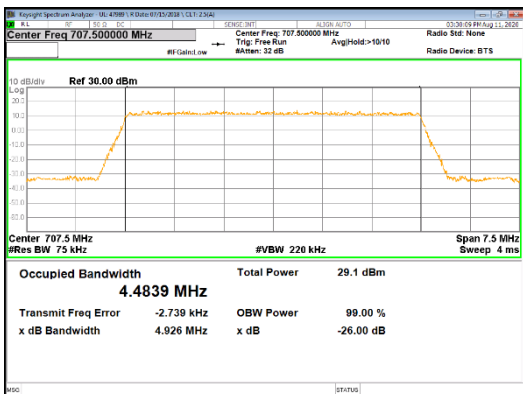
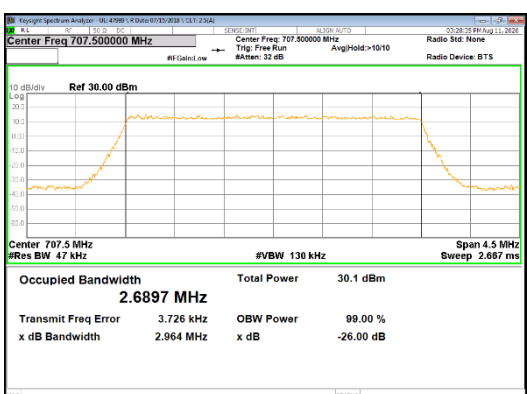
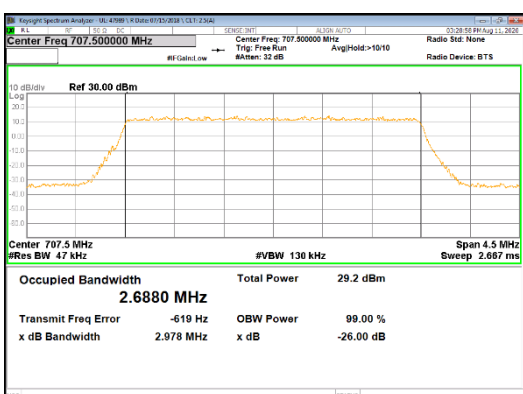
Band 2 5MHz	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel
Band 2 3MHz	 3MHz QPSK Mid channel	 3MHz 16QAM Mid channel
Band 2 1.4MHz	 1.4MHz QPSK Mid channel	 1.4MHz 16QAM Mid channel

LTE Band 5

Band 5 10MHz	 10MHz QPSK Mid channel	 10MHz 16QAM Mid channel
Band 5 5MHz	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel
Band 5 3MHz	 3MHz QPSK Mid channel	 3MHz 16QAM Mid channel



LTE Band 12

Band 12 10MHz	 10MHz QPSK Mid channel	 10MHz 16QAM Mid channel
Band 12 5MHz	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel
Band 12 3MHz	 3MHz QPSK Mid channel	 3MHz 16QAM Mid channel

