



# CERTIFICATION TEST REPORT

**Report Number.** : 4790047196-E2V1

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

**Model** : SM-G780G/DSM, SM-G780G/DS, SM-G780G

**FCC ID** : A3LSMG780G1

**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

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ACCREDITED

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TL-637

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Revision History

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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-G780G/DSM, SM-G780G/DS, SM-G780G

**SERIAL NUMBER:** R38R301JN3F (CONDUCTED)  
R38R301JPTN, R38R301JQQM(RADIATED);

**DATE TESTED:** 2021-08-02 ~ 2021-08-17;

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  
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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	
<input checked="" type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input type="checkbox"/>	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:

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

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

(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	3.01 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.26 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.90 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 2, Clause 4.4.3 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.

This report covers the Samsung models SM-G780G/DSM, SM-G780G/DS and SM-G780G. These models are identical in hardware except SM-G780G/DSM is supported MST and SMG780G/DS has dual SIM tray and SM-G780G has single SIM tray. All series model was same hardware thus, SM-G780G/DS(Dual SIM tray) was set for final test.

### 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.(4790047196-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	<b>32.96</b>	<b>1976.72</b>	<b>30.22</b>	<b>1051.96</b>
		EGPRS	27.65	581.72	25.28	337.29
GSM1900	1850~1910	GPRS	30.21	1049.03	29.32	855.07
		EGPRS	25.84	383.27	25.85	384.59

#### 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	<b>24.77</b>	<b>300.22</b>	20.85	121.62
		HSDPA	23.81	240.54	19.95	98.86
Band 4	1710~1755	Rel. 99	22.70	186.16	<b>22.57</b>	<b>180.72</b>
		HSDPA	21.76	149.98	21.51	141.58
Band 2	1850~1910	Rel. 99	23.20	208.97	22.44	175.39
		HSDPA	22.20	165.88	21.05	127.35

**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	22.61	182.39	22.72	187.07
			16QAM	22.14	163.65	21.74	149.28
			64QAM	21.26	133.81		
			256QAM	18.03	63.54		
		15	QPSK	22.71	186.56	22.48	177.01
			16QAM	22.21	166.22	21.44	139.32
			64QAM	21.09	128.53		
			256QAM	18.09	64.41		
		10	QPSK	22.71	186.77	22.84	192.31
			16QAM	21.82	152.11	21.81	151.71
			64QAM	21.20	131.90		
			256QAM	17.96	62.54		
		5	QPSK	<b>22.88</b>	<b>193.87</b>	<b>23.21</b>	<b>209.41</b>
			16QAM	22.19	165.68	22.41	174.18
			64QAM	20.88	122.33		
			256QAM	18.00	63.10		
		3	QPSK	22.70	186.35	22.93	196.34
			16QAM	22.03	159.71	22.09	161.81
			64QAM	21.14	130.00		
			256QAM	18.34	68.23		
		1.4	QPSK	22.74	187.85	22.99	199.07
			16QAM	22.18	165.10	21.91	155.24
			64QAM	21.08	128.13		
			256QAM	18.24	66.68		



**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	24.49	281.09	21.09	128.53
			16QAM	23.62	230.16	20.17	103.99
			64QAM	22.80	190.76		
			256QAM	20.06	101.31		
		5	QPSK	<b>24.94</b>	<b>311.96</b>	21.38	137.40
			16QAM	24.28	267.66	20.39	109.40
			64QAM	23.17	207.30		
			256QAM	20.17	104.01		
		3	QPSK	24.88	307.41	21.52	141.91
			16QAM	24.27	267.43	20.60	114.82
			64QAM	23.23	210.53		
			256QAM	20.38	109.23		
		1.4	QPSK	24.92	310.49	<b>21.62</b>	<b>145.21</b>
			16QAM	24.33	270.88	20.61	115.08
			64QAM	23.28	212.95		
			256QAM	20.14	103.34		

**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	22.81	191.05	<b>18.20</b>	<b>66.07</b>
			16QAM	22.16	164.42	17.23	52.84
			64QAM	21.30	134.79		
			256QAM	18.22	66.43		
		5	QPSK	23.11	204.86	18.10	64.57
			16QAM	22.77	189.21	17.03	50.47
			64QAM	21.56	143.17		
			256QAM	18.39	69.07		
		3	QPSK	<b>23.13</b>	<b>205.68</b>	17.94	62.23
			16QAM	22.36	172.23	17.73	59.29
			64QAM	21.35	136.39		
			256QAM	18.43	69.69		
		1.4	QPSK	23.09	203.53	18.00	63.10
			16QAM	22.54	179.63	16.96	49.66
			64QAM	21.61	145.01		
			256QAM	18.38	68.82		

**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	22.62	182.73	18.41	69.34
			16QAM	21.76	149.85	17.41	55.08
			64QAM	21.15	130.31		
			256QAM	18.18	65.74		
		5	QPSK	<b>23.03</b>	<b>200.77</b>	<b>18.56</b>	<b>71.78</b>
			16QAM	22.18	165.24	17.75	59.57
			64QAM	21.28	134.40		
			256QAM	18.15	65.30		

**LTE Band 26 (Part 90)**

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	<b>23.15</b>	<b>206.65</b>	19.35	86.10
			16QAM	22.46	176.38	18.06	63.97
			64QAM	21.36	136.87		
			256QAM	18.31	67.73		
		10	QPSK	22.93	196.33	18.67	73.62
			16QAM	22.09	161.82	17.74	59.43
			64QAM	21.26	133.58		
			256QAM	18.09	64.45		
		5	QPSK	23.00	199.49	19.32	85.51
			16QAM	22.16	164.54	18.32	67.92
			64QAM	21.38	137.36		
			256QAM	18.18	65.79		
		3	QPSK	22.95	197.09	19.20	83.18
			16QAM	22.07	161.03	18.30	67.61
			64QAM	21.15	130.27		
			256QAM	18.12	64.92		
		1.4	QPSK	23.14	205.85	<b>19.81</b>	<b>95.72</b>
			16QAM	22.45	175.80	18.63	72.95
			64QAM	21.44	139.19		
			256QAM	18.09	64.42		

**LTE Band 26 (Part 22)**

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	23.22	209.97	19.82	95.94
			16QAM	22.49	177.45	19.11	81.47
			64QAM	21.49	140.93		
			256QAM	18.50	70.72		
		10	QPSK	23.21	209.46	<b>20.31</b>	<b>107.40</b>
			16QAM	22.46	176.20	19.52	89.54
			64QAM	21.46	139.91		
			256QAM	18.32	67.87		
		5	QPSK	<b>23.25</b>	<b>211.48</b>	20.25	105.93
			16QAM	22.48	176.90	19.48	88.72
			64QAM	21.23	132.84		
			256QAM	18.32	67.91		
		3	QPSK	23.19	208.39	20.20	104.71
			16QAM	22.48	177.01	19.30	85.11
			64QAM	21.48	140.70		
			256QAM	18.40	69.17		
		1.4	QPSK	23.12	204.98	20.19	104.47
			16QAM	22.49	177.58	19.14	82.04
			64QAM	21.49	140.82		
			256QAM	18.38	68.81		

**LTE Band 26 (Straddle)**

Straddle							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 26	824	15	QPSK	<b>23.14</b>	<b>206.06</b>	19.98	99.54
			16QAM	22.54	179.47	19.08	80.91
			64QAM				
			256QAM				
		10	QPSK	23.10	204.17	20.08	101.86
			16QAM	22.29	169.43	19.39	86.90
			64QAM				
			256QAM				
		5	QPSK	23.13	205.59	19.96	99.08
			16QAM	22.38	172.98	19.05	80.35
			64QAM				
			256QAM				
		3	QPSK	22.92	195.88	<b>20.19</b>	<b>104.47</b>
			16QAM	22.19	165.58	19.17	82.60
			64QAM				
			256QAM				
		1.4	QPSK	23.13	205.59	19.80	95.50
			16QAM	22.58	181.13	18.80	75.86
			64QAM				
			256QAM				

**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	24.06	254.86	22.87	193.64
			16QAM	23.01	200.21	22.17	164.82
			64QAM	22.08	161.32		
			256QAM	19.20	83.17		
		15	QPSK	24.27	267.32	22.80	190.55
			16QAM	23.36	216.97	22.43	174.98
			64QAM	22.60	181.97		
			256QAM	19.34	85.83		
		10	QPSK	<b>24.36</b>	<b>272.82</b>	<b>22.90</b>	<b>194.98</b>
			16QAM	23.40	218.65	22.71	186.64
			64QAM	22.60	181.97		
			256QAM	19.38	86.77		
		5	QPSK	24.13	259.00	22.79	190.11
			16QAM	23.44	220.77	22.65	184.08
			64QAM	22.58	181.24		
			256QAM	19.61	91.50		

**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	22.24	167.30	<b>23.00</b>	<b>199.53</b>
			16QAM	21.93	155.85	21.77	150.31
			64QAM	20.52	112.76		
			256QAM	17.37	54.61		
		15	QPSK	22.57	180.83	22.95	197.24
			16QAM	21.98	157.73	21.88	154.17
			64QAM	21.20	131.85		
			256QAM	17.90	61.60		
		10	QPSK	22.59	181.52	22.65	184.08
			16QAM	21.83	152.26	21.41	138.36
			64QAM	21.01	126.08		
			256QAM	17.93	62.09		
		5	QPSK	<b>22.63</b>	<b>183.19</b>	22.60	181.97
			16QAM	22.07	161.06	21.71	148.25
			64QAM	20.98	125.27		
			256QAM	17.82	60.55		
		3	QPSK	22.60	181.98	22.75	188.36
			16QAM	21.99	158.19	21.48	140.60
			64QAM	20.94	124.18		
			256QAM	18.01	63.18		
		1.4	QPSK	22.57	180.72	22.68	185.35
			16QAM	22.05	160.30	21.53	142.23
			64QAM	20.98	125.25		
			256QAM	17.98	62.82		

**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	826.5	5	1	0
	836.5		1	12
	846.5		1	12
12	700.5	3	1	0
	707.5		1	0
	714.5		1	0
13	779.5	5	1	24
	782		1	24
	784.5		1	12
26 (Part 90)	821.5	15	1	74
26 (Straddle)	824	15	1	74
26 (Part 22)	826.5	5	1	12
	831.5		1	24
	846.5		1	0
41 (PC3)	2501	10	1	25
	2593		1	25
	2685		1	25
66	1712.5	5	1	0
	1745		1	0
	1777.5		1	12

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	R37M194G2J1SE3	N/A
Data Cable	SAMSUNG	EP- DG980	N/A	N/A

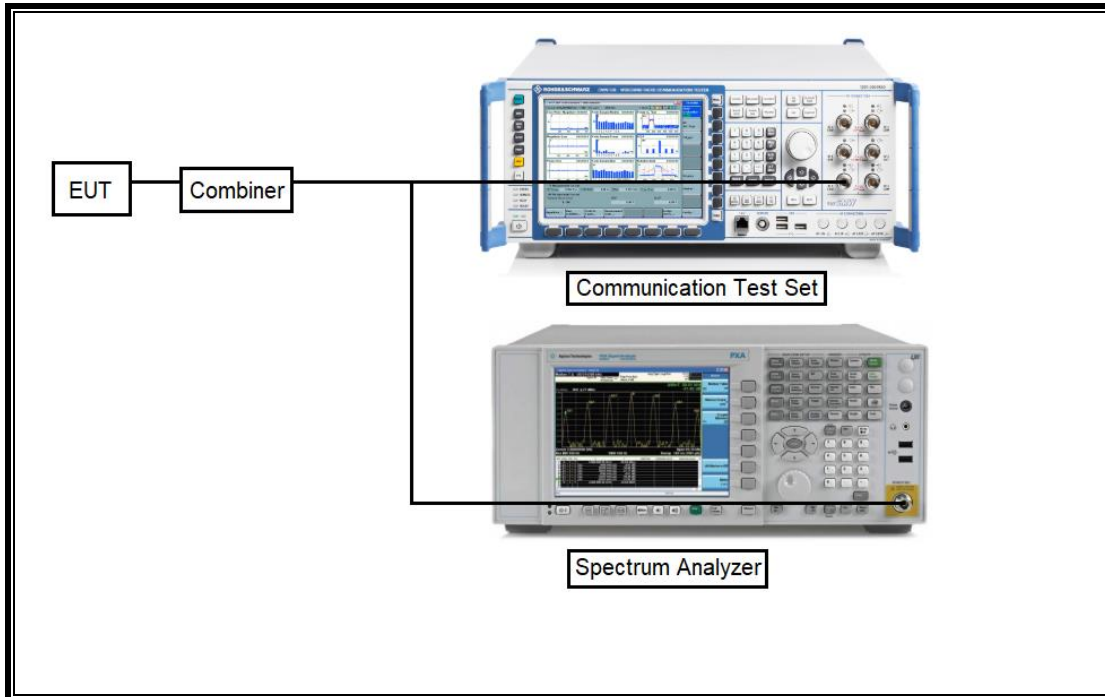
**I/O CABLE**

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	0.7 m	N/A

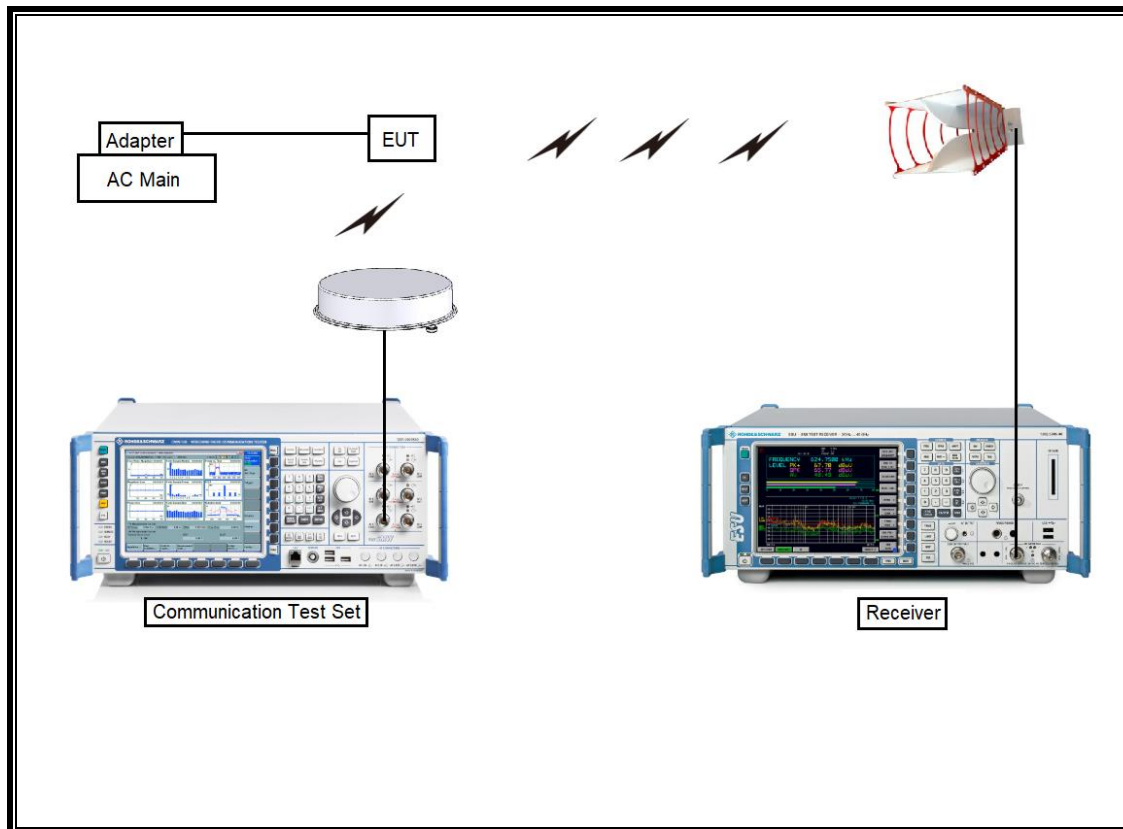
**TEST SETUP**

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	Cal Due
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121D DB4	00164753	2023/02/08
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	2022/08/04
Antenna, Horn, 40 GHz	ETS	3116C	00168645	2021/10/02
Preamplifier	ETS	3116C-PA	00168841	2022/08/04
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2022/08/19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2022/08/13
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2022/08/13
Antenna, Horn, 18 GHz	ETS	3115	00167211	2022/07/27
Antenna, Horn, 18 GHz	ETS	3115	00161451	2022/08/15
Antenna, Horn, 18 GHz	ETS	3117	00168724	2022/07/27
Antenna, Horn, 18 GHz	ETS	3117	00168717	2022/08/15
Communications Test Set	R&S	CMW500	169796	2022/01/27
DC Power Supply	Agilent / HP	E3640A	MY54226395	2022/08/02
Preamplifier, 1000 MHz	Sonoma	310N	341282	2022/08/02
Preamplifier, 1000 MHz	Sonoma	310N	370599	2022/08/02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2022/08/02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	2022/08/02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029168	2022/08/02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2022/08/02
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2022/08/04
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2022/08/04
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2022/08/02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2022/08/02
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	2022/08/03
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	2022/08/02
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	2022/08/03
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	2022/08/02
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	2022/08/03
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	2022/08/02
Attenuator	PASTERNAK	PE7087-10	A009	2022/08/03
Attenuator	PASTERNAK	PE7087-10	A001	2022/08/03
Attenuator	PASTERNAK	PE7087-10	A008	2022/08/03
Attenuator	PASTERNAK	PE7004-10	2	2022/08/02
Attenuator	PASTERNAK	PE7395-10	A011	2022/08/03
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2021/10/02
Temperature Chamber	ESPEC	SH-642	93001109	2022/08/02
Power Splitter	MINI-CIRCUITS	WA1534	UL001	2022/01/27
Power Splitter	MINI-CIRCUITS	WA1534	UL002	2022/01/27
UL Software				
Description	Manufacturer	Model	Version	
Antenna port test software	UL	CLT	Ver 3.4	
Radiated software	UL	UL EMC	Ver 9.5	

## 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	

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## 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

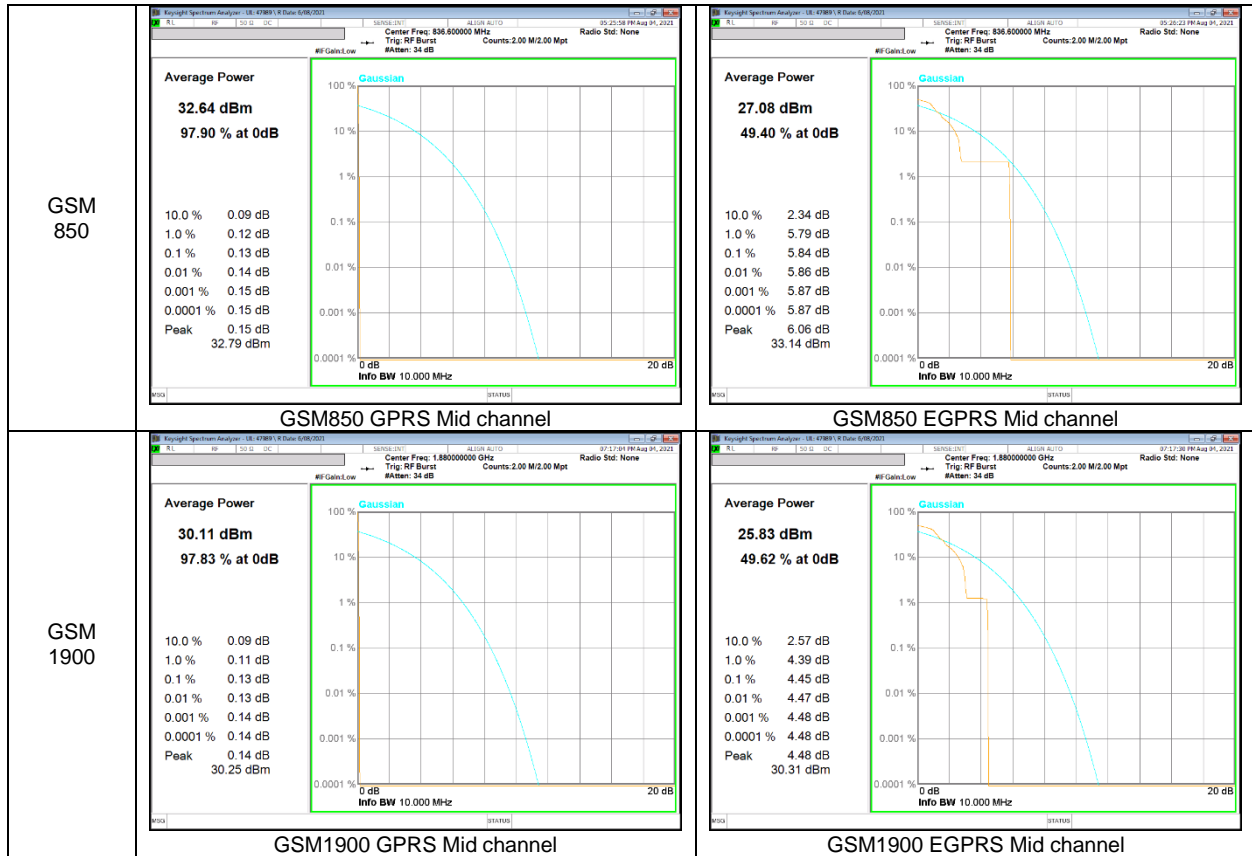
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

### RESULTS

See the following pages.

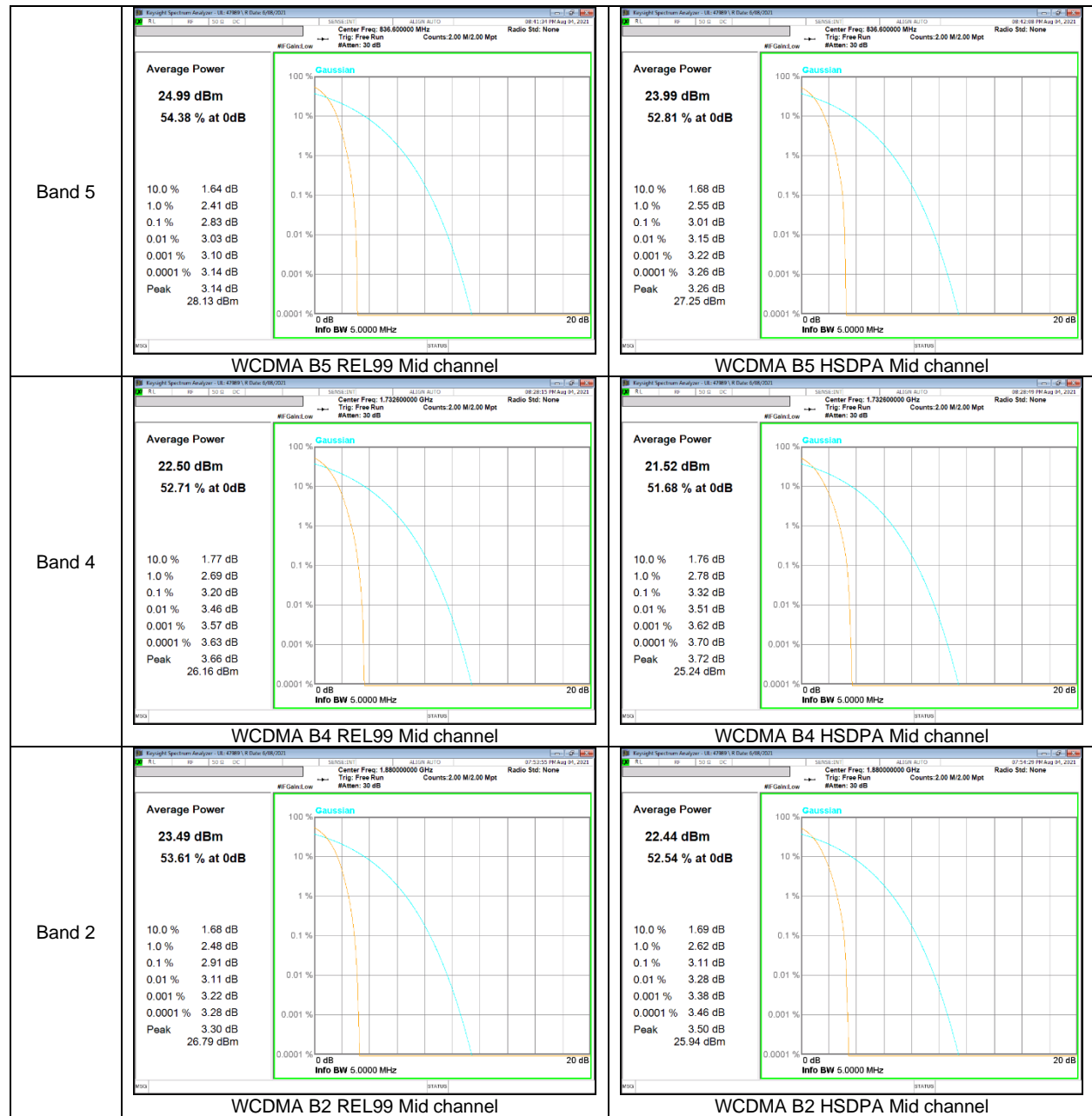
## 8.1. CONDUCTED PEAK TO AVERAGE RESULT

### GSM

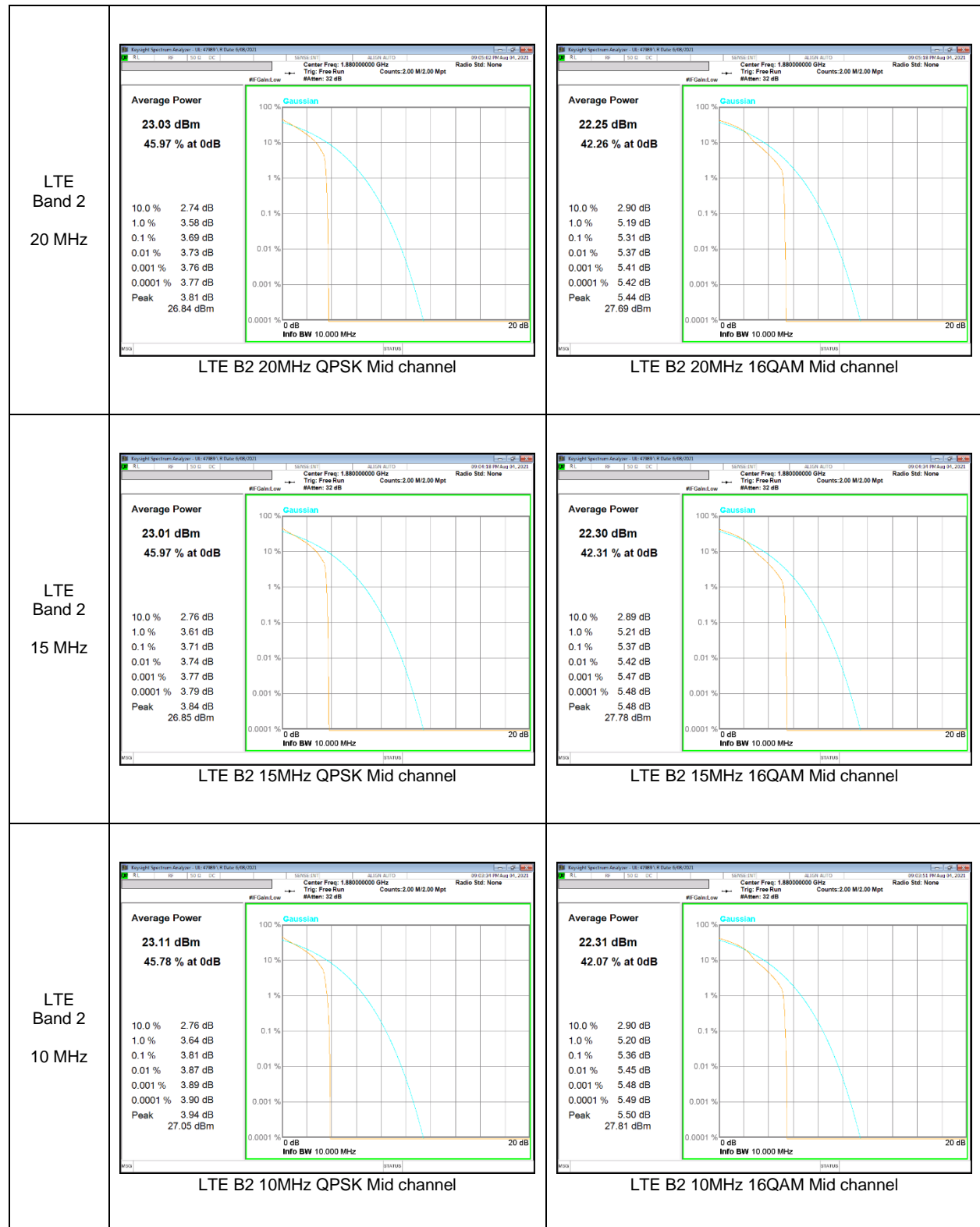


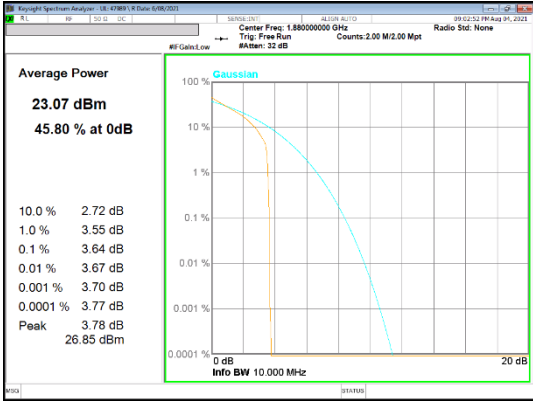
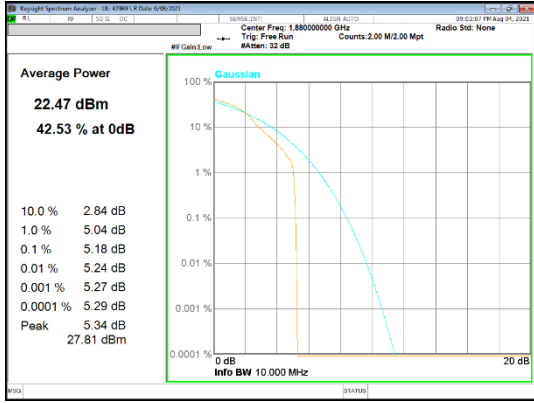
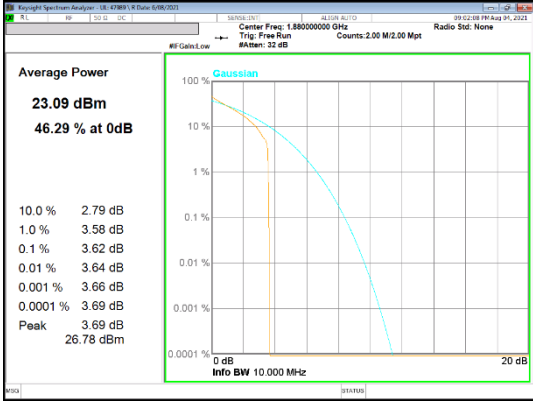
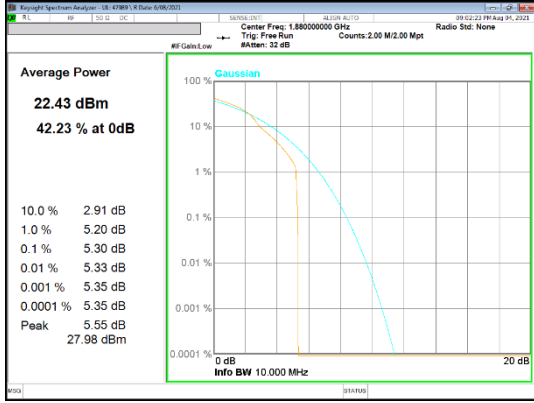
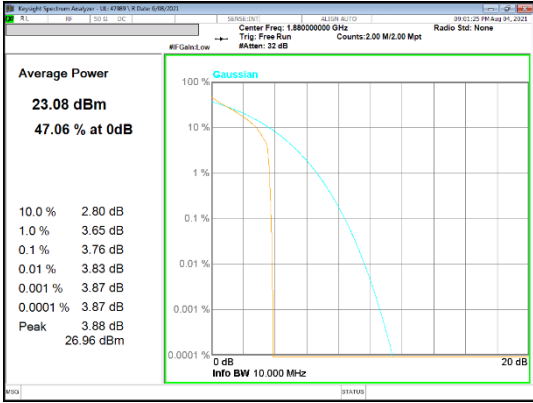
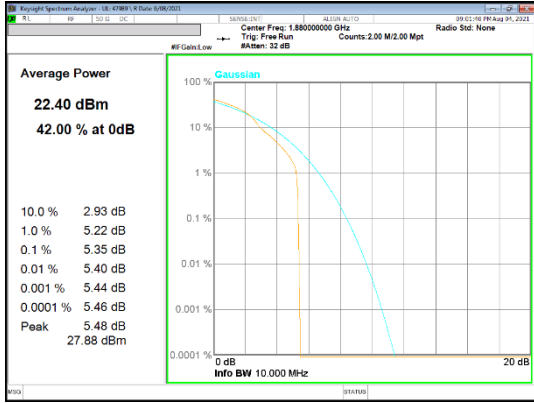


**WCDMA**

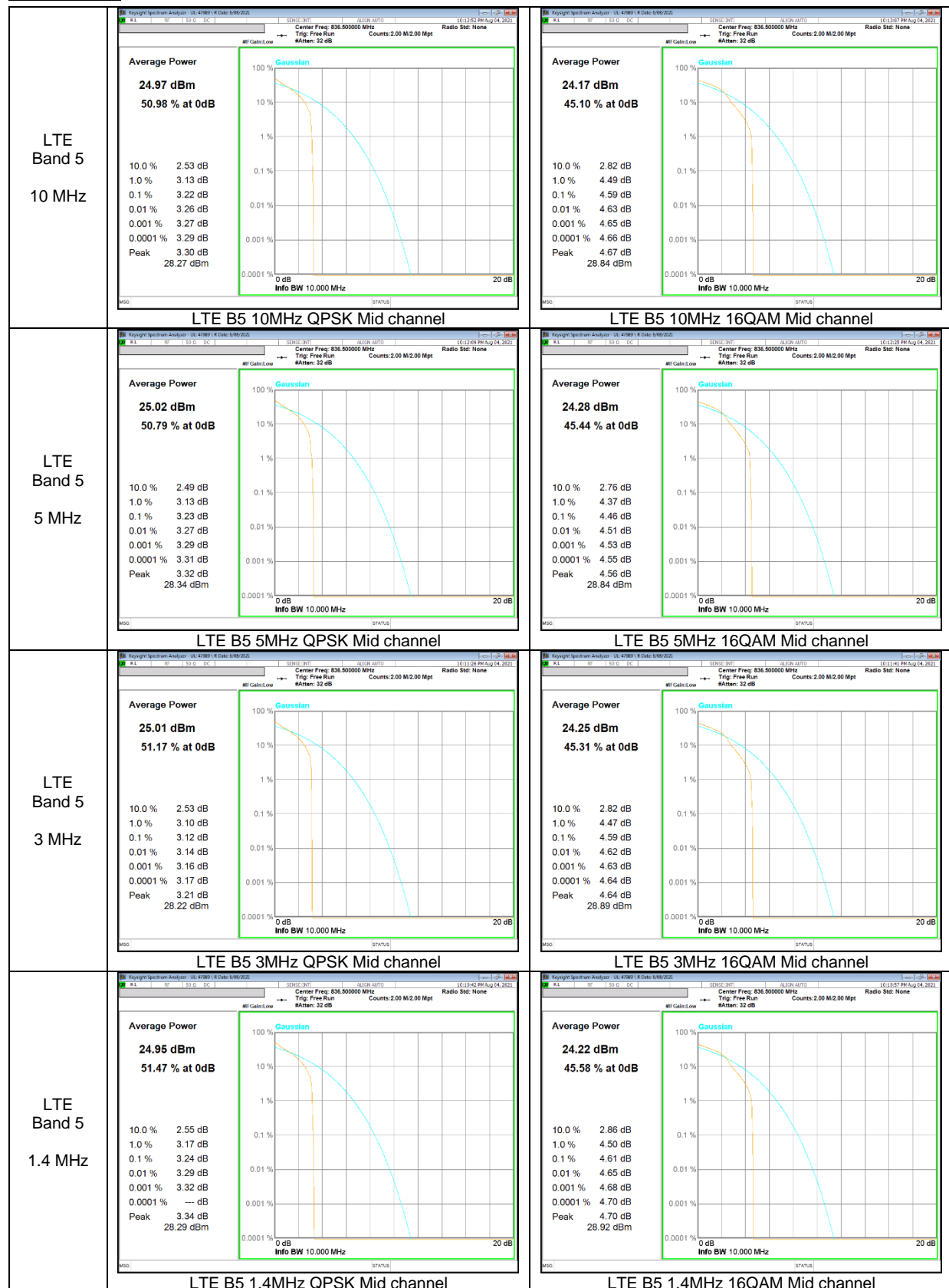


**LTE Band 2**

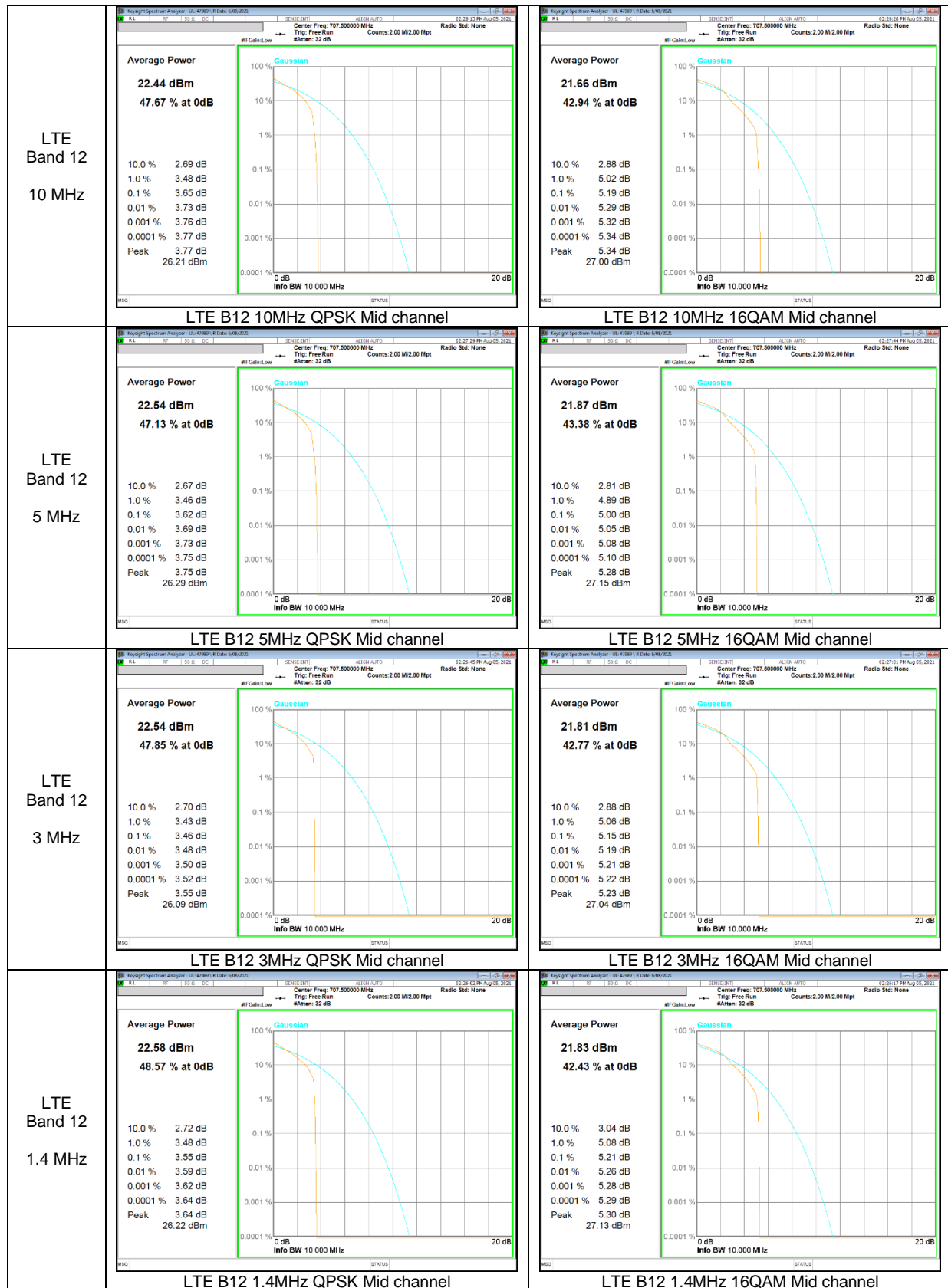


<p>LTE Band 2 5 MHz</p>	 <p><b>Average Power</b>  <b>23.07 dBm</b>  <b>45.80 % at 0dB</b></p> <p>10.0 % 2.72 dB              1.0 % 3.55 dB              0.1 % 3.64 dB              0.01 % 3.67 dB              0.001 % 3.70 dB              0.0001 % 3.77 dB              Peak 3.78 dB              26.85 dBm</p> <p>LTE B2 5MHz QPSK Mid channel</p>	 <p><b>Average Power</b>  <b>22.47 dBm</b>  <b>42.53 % at 0dB</b></p> <p>10.0 % 2.84 dB              1.0 % 5.04 dB              0.1 % 5.18 dB              0.01 % 5.24 dB              0.001 % 5.27 dB              0.0001 % 5.29 dB              Peak 5.34 dB              27.81 dBm</p> <p>LTE B2 5MHz 16QAM Mid channel</p>
<p>LTE Band 2 3 MHz</p>	 <p><b>Average Power</b>  <b>23.09 dBm</b>  <b>46.29 % at 0dB</b></p> <p>10.0 % 2.79 dB              1.0 % 3.58 dB              0.1 % 3.62 dB              0.01 % 3.64 dB              0.001 % 3.66 dB              0.0001 % 3.69 dB              Peak 3.69 dB              26.78 dBm</p> <p>LTE B2 3MHz QPSK Mid channel</p>	 <p><b>Average Power</b>  <b>22.43 dBm</b>  <b>42.23 % at 0dB</b></p> <p>10.0 % 2.91 dB              1.0 % 5.20 dB              0.1 % 5.30 dB              0.01 % 5.33 dB              0.001 % 5.35 dB              0.0001 % 5.35 dB              Peak 5.55 dB              27.98 dBm</p> <p>LTE B2 3MHz 16QAM Mid channel</p>
<p>LTE Band 2 1.4 MHz</p>	 <p><b>Average Power</b>  <b>23.08 dBm</b>  <b>47.06 % at 0dB</b></p> <p>10.0 % 2.80 dB              1.0 % 3.65 dB              0.1 % 3.76 dB              0.01 % 3.83 dB              0.001 % 3.87 dB              0.0001 % 3.87 dB              Peak 3.88 dB              26.96 dBm</p> <p>LTE B2 1.4MHz QPSK Mid channel</p>	 <p><b>Average Power</b>  <b>22.40 dBm</b>  <b>42.00 % at 0dB</b></p> <p>10.0 % 2.93 dB              1.0 % 5.22 dB              0.1 % 5.35 dB              0.01 % 5.40 dB              0.001 % 5.44 dB              0.0001 % 5.46 dB              Peak 5.48 dB              27.88 dBm</p> <p>LTE B2 1.4MHz 16QAM Mid channel</p>

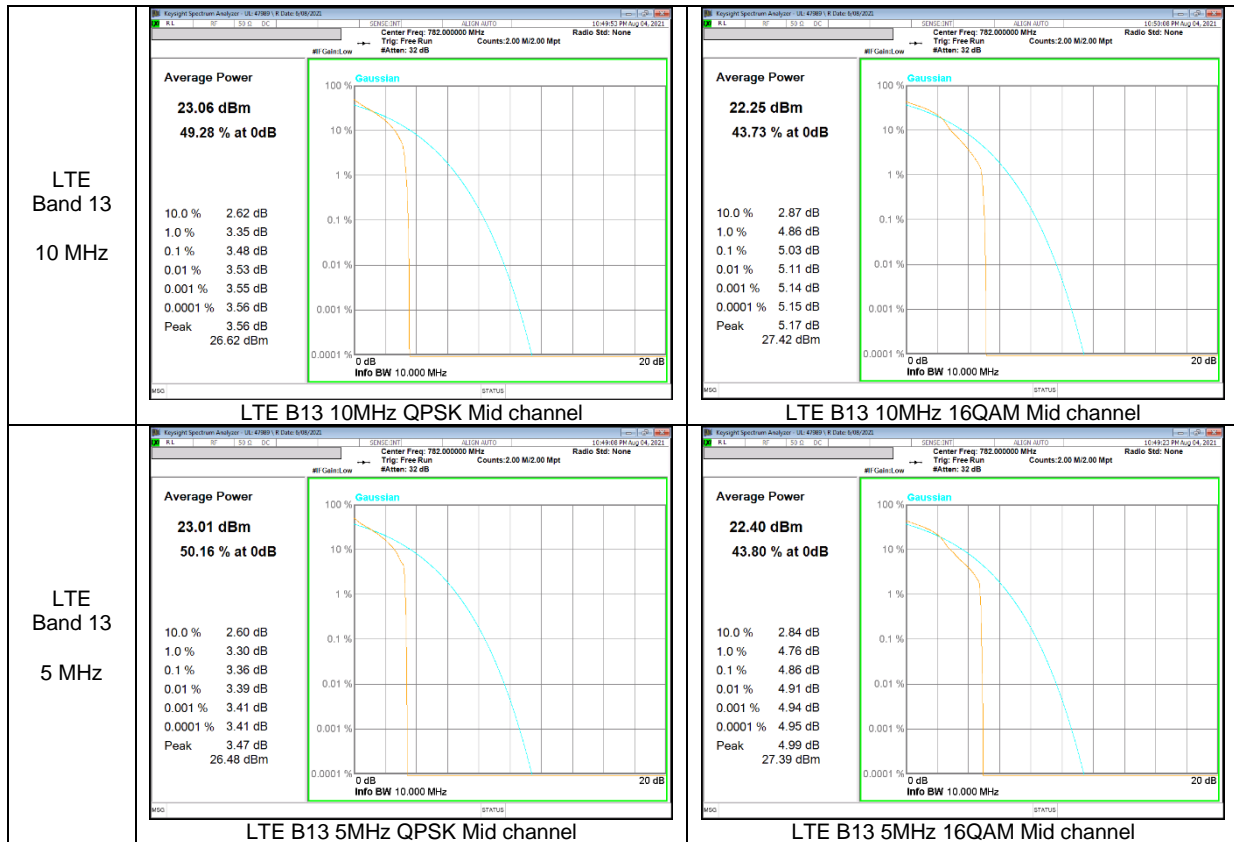
**LTE Band 5**



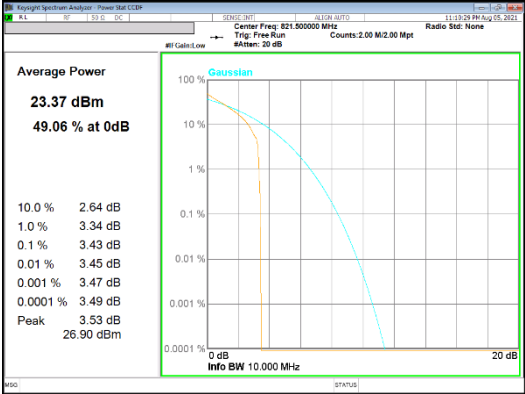
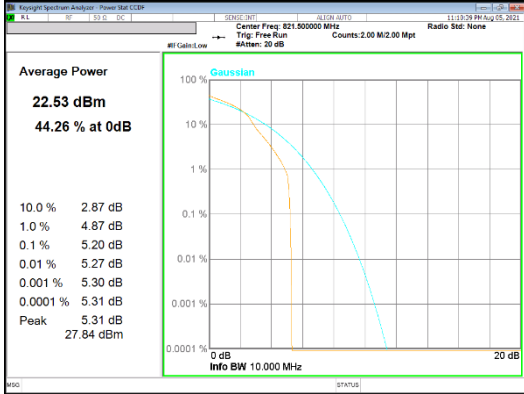
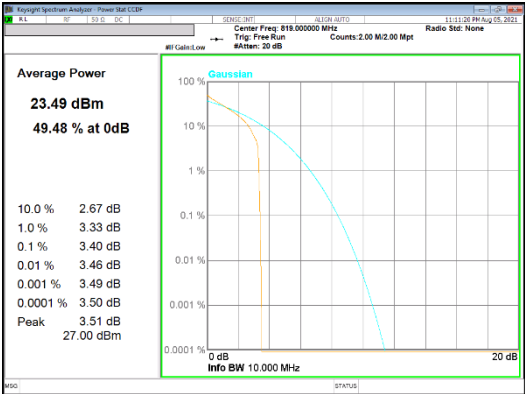
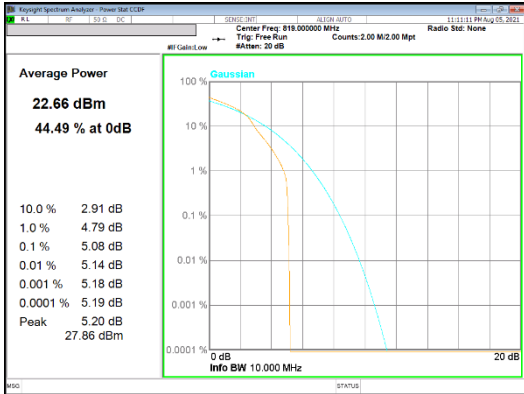
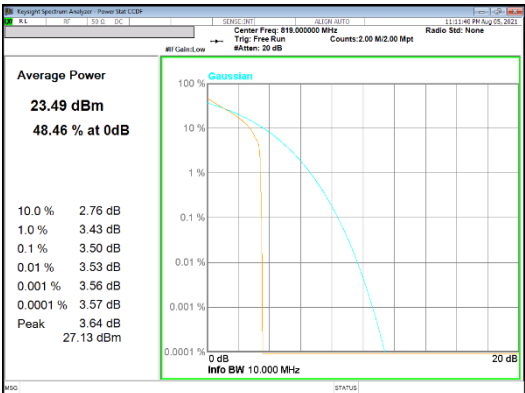
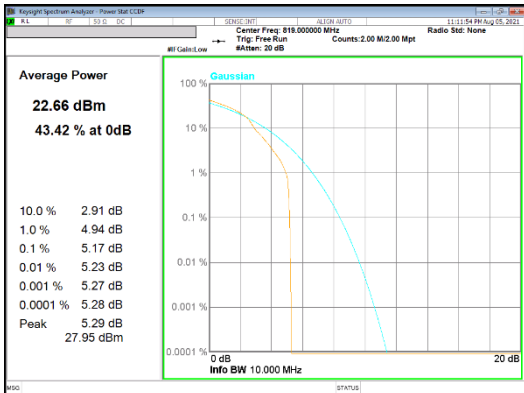
**LTE Band 12**

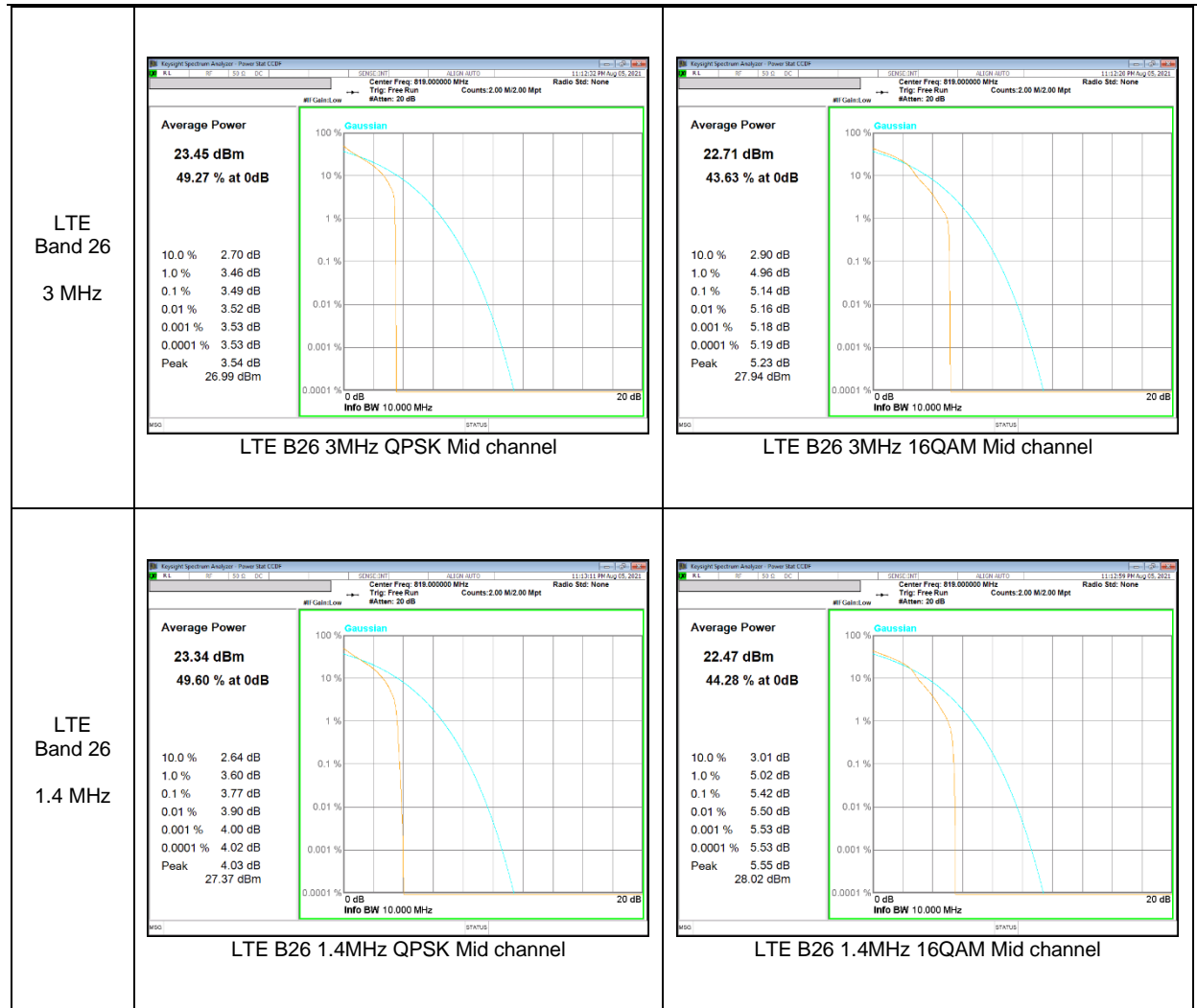


**LTE Band 13**



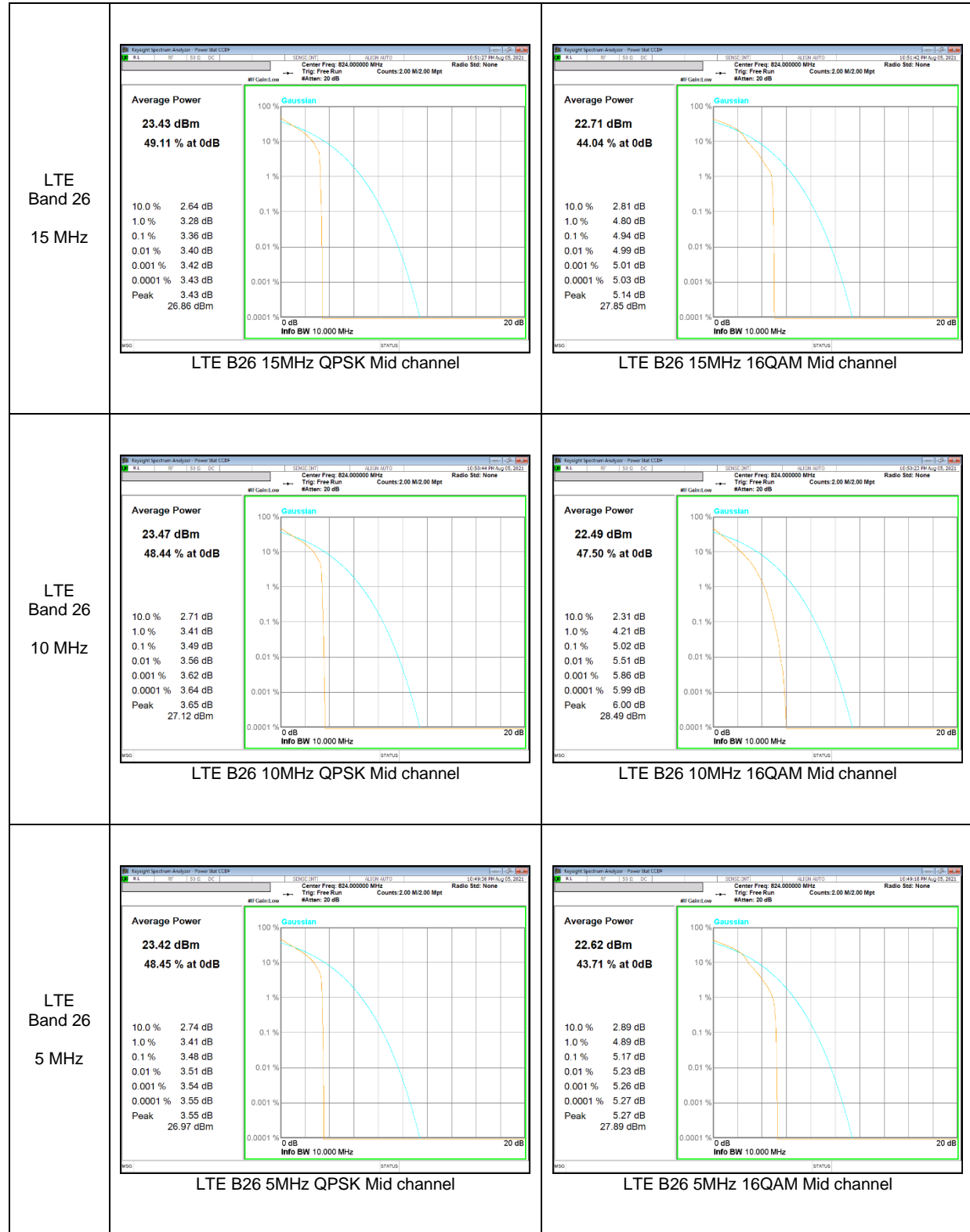
**LTE Band 26 (Part 90)**

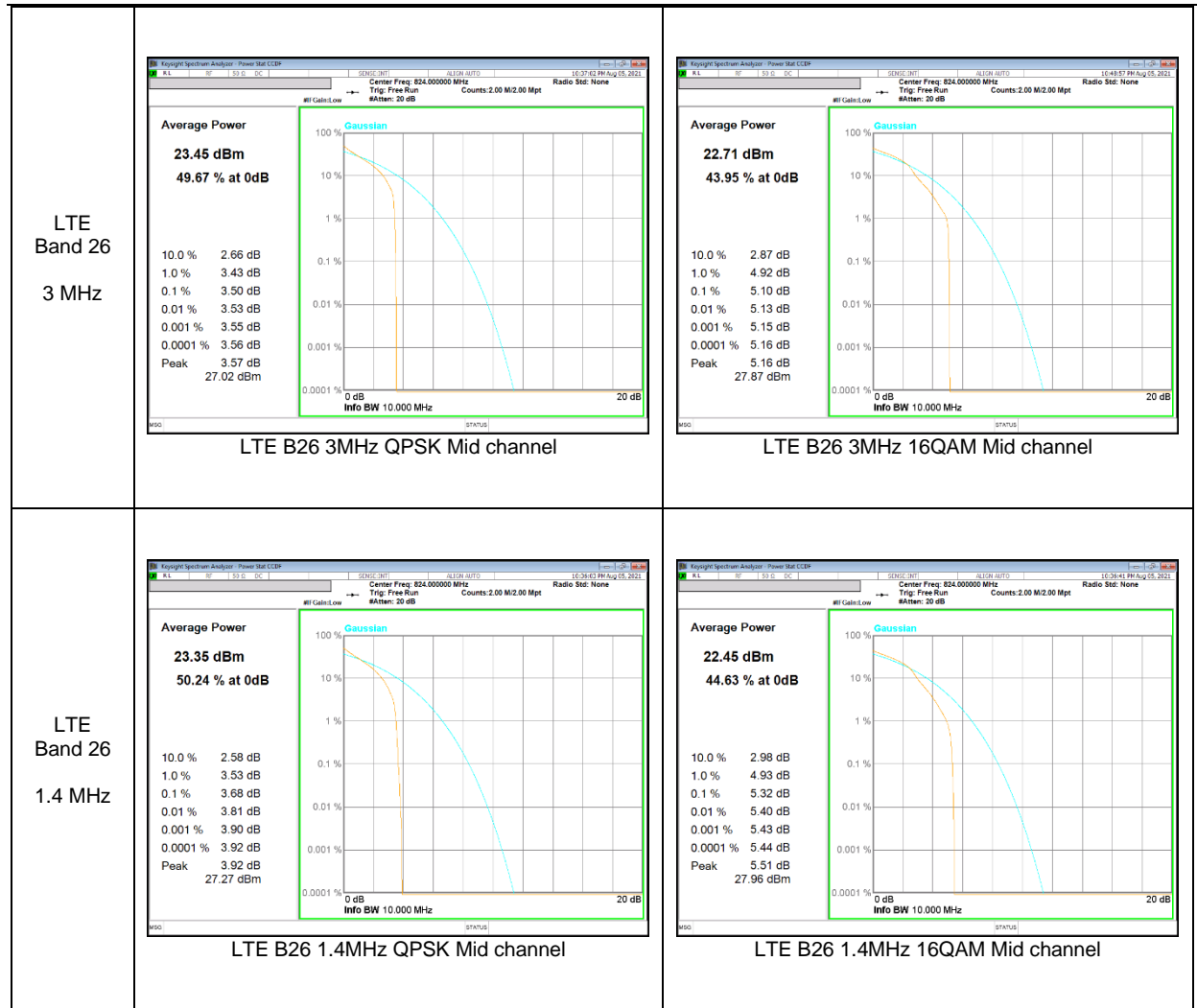
<p>LTE Band 26 15 MHz</p>	 <p>LTE B26 15MHz QPSK Mid channel</p>	 <p>LTE B26 15MHz 16QAM Mid channel</p>
<p>LTE Band 26 10 MHz</p>	 <p>LTE B26 10MHz QPSK Mid channel</p>	 <p>LTE B26 10MHz 16QAM Mid channel</p>
<p>LTE Band 26 5 MHz</p>	 <p>LTE B26 5MHz QPSK Mid channel</p>	 <p>LTE B26 5MHz 16QAM Mid channel</p>



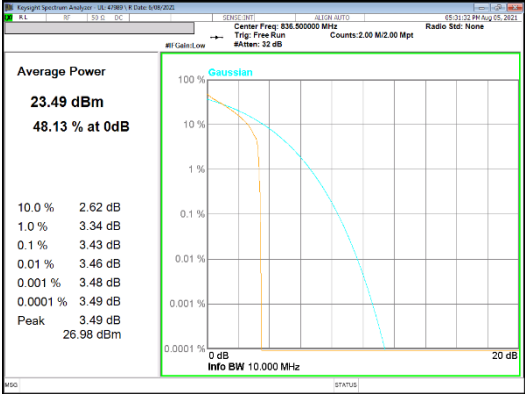
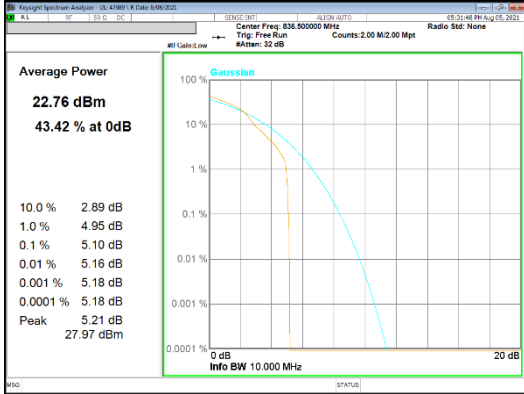
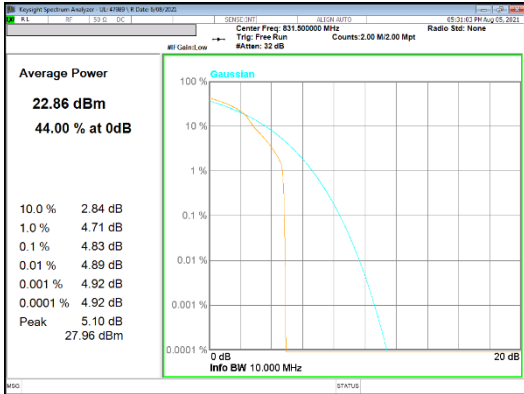


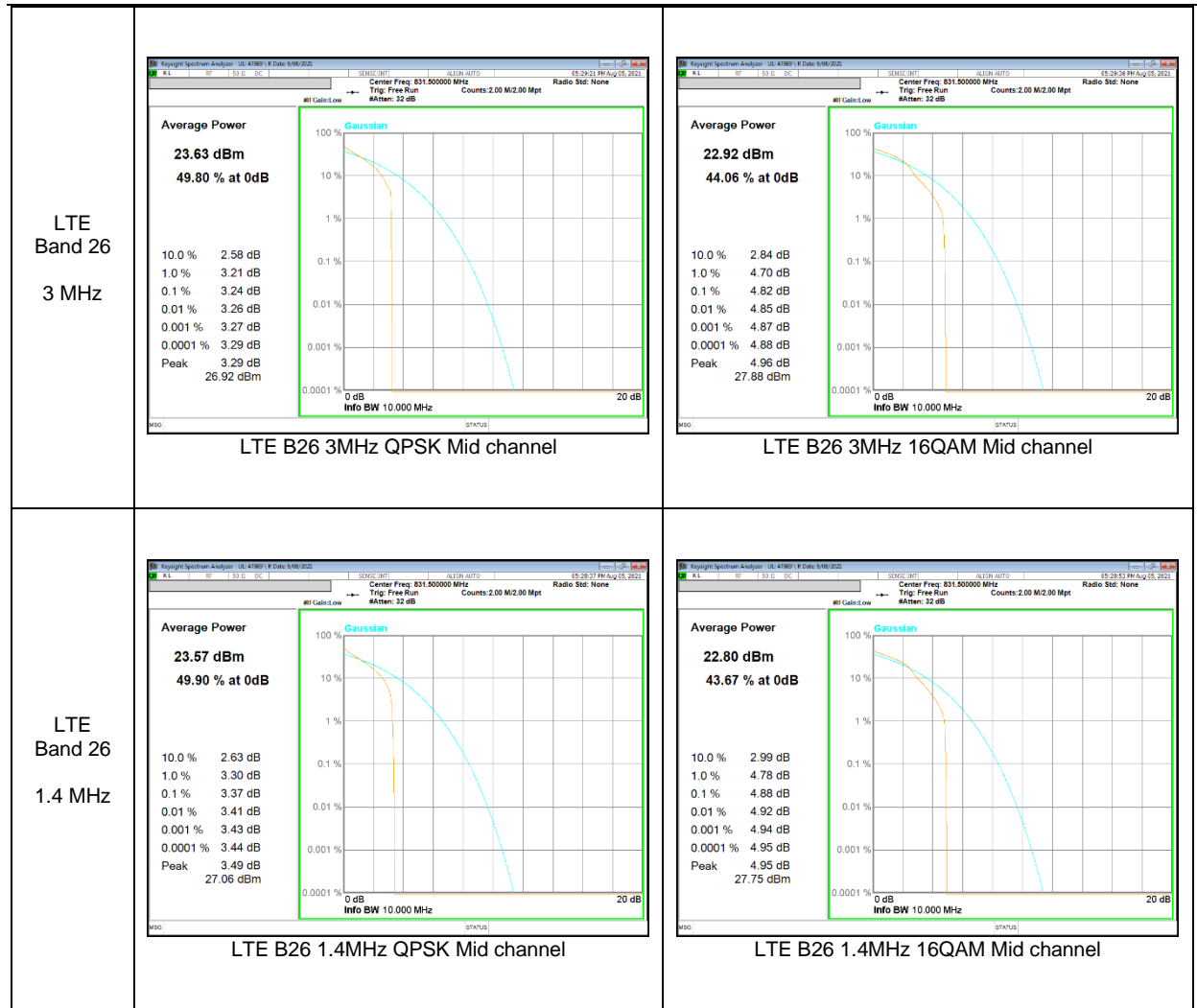
**LTE Band 26 (Straddle)**



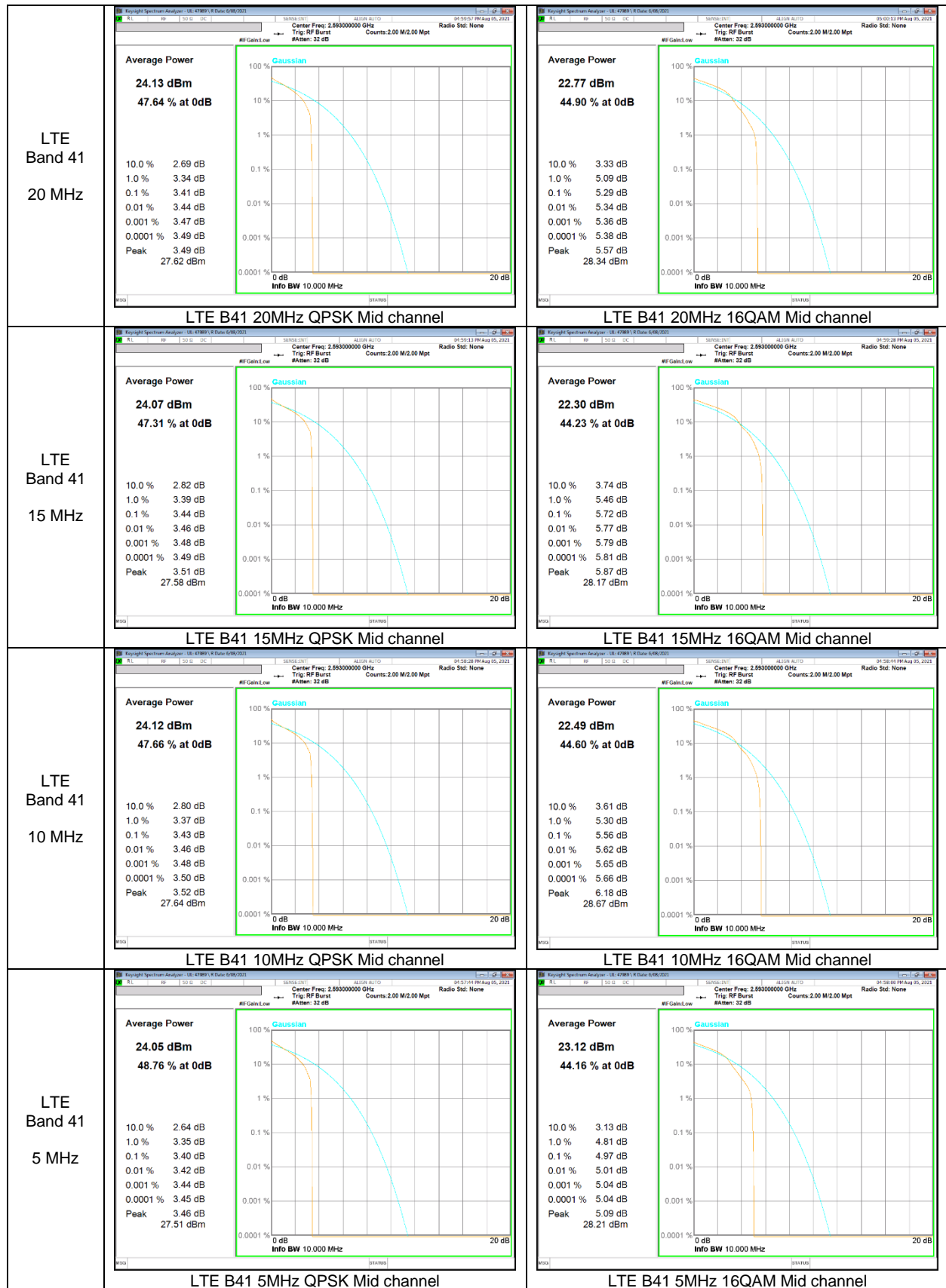


**LTE Band 26 (Part 22)**

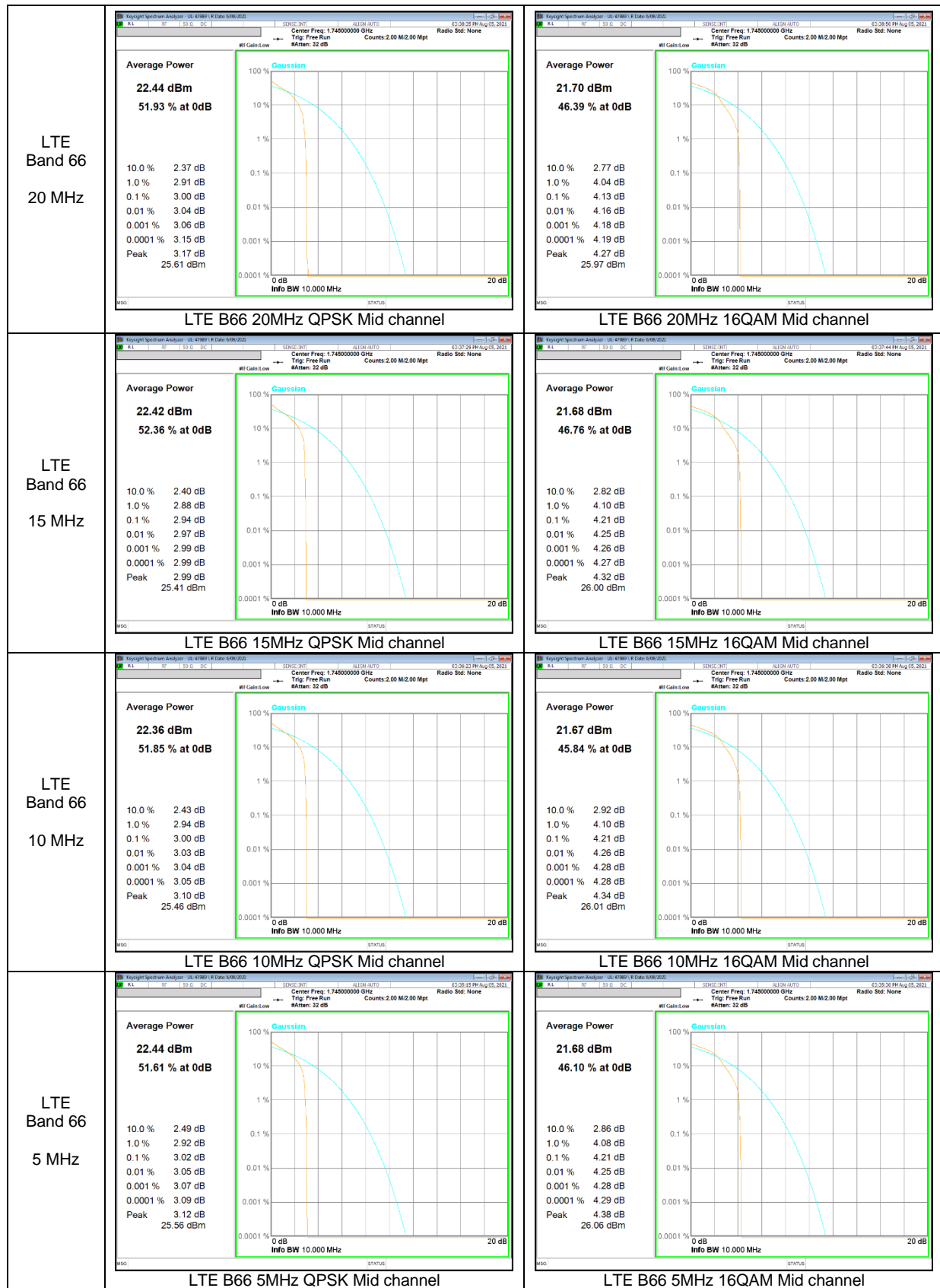
<p>LTE Band 26 15 MHz</p>	 <p>LTE B26 15MHz QPSK Mid channel</p>	 <p>LTE B26 15MHz 16QAM Mid channel</p>
<p>LTE Band 26 10 MHz</p>	 <p>LTE B26 10MHz QPSK Mid channel</p>	 <p>LTE B26 10MHz 16QAM Mid channel</p>
<p>LTE Band 26 5 MHz</p>	 <p>LTE B26 5MHz QPSK Mid channel</p>	 <p>LTE B26 5MHz 16QAM Mid channel</p>

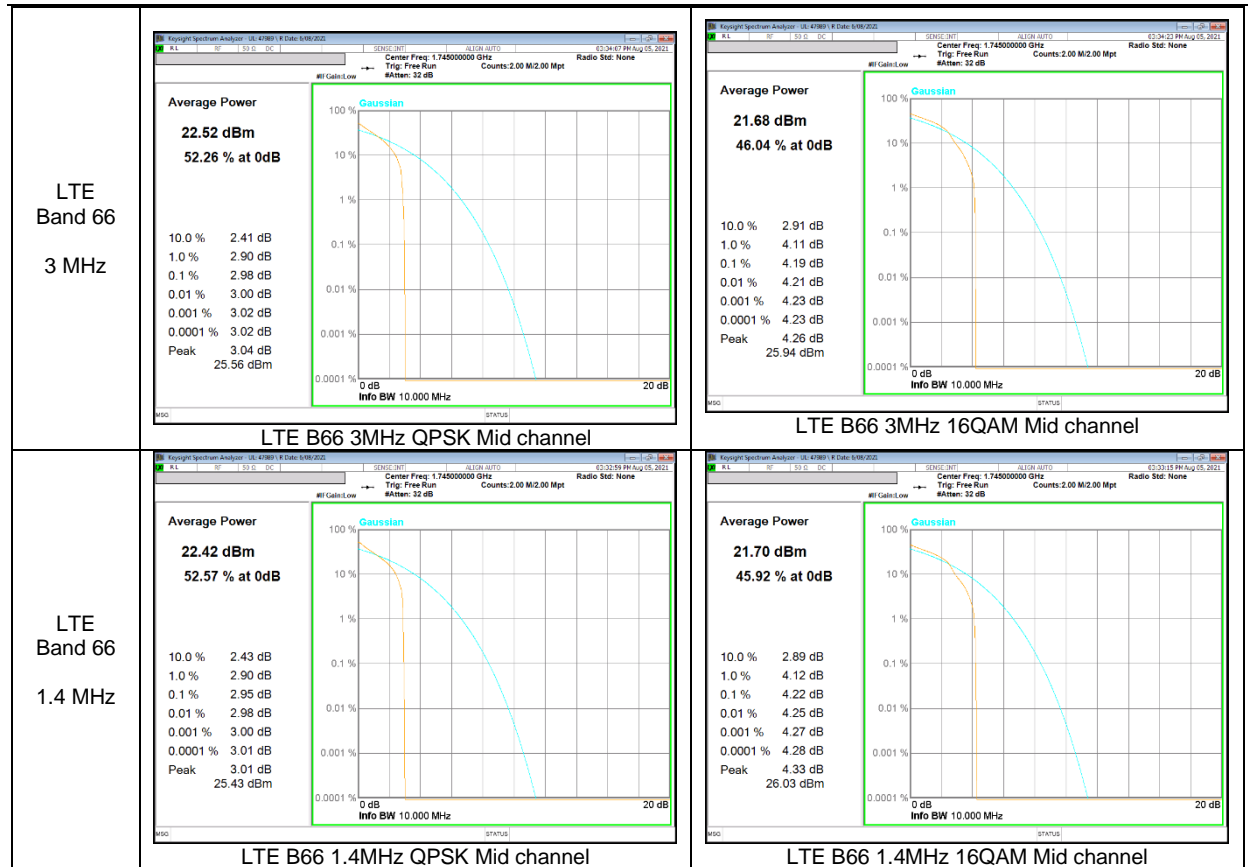


**LTE Band 41 (PC3)**



**LTE Band 66**





**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

See the following pages.

#### - GSM

Band	Modulation	f [MHz]	99% BW (kHz)	-26dB BW (kHz)
850	GPRS	836.6	243.69	319.6
	EGPRS		248.71	318.2
1900	GPRS	1880.0	243.31	319.6
	EGPRS		244.72	317.1

#### - WCDMA

Band	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
B5	Rel.99	836.6	4.141	4.691
	HSDPA		4.154	4.669
B4	Rel.99	1732.6	4.138	4.682
	HSDPA		4.145	4.689
B2	Rel.99	1880.0	4.143	4.680
	HSDPA		4.150	4.706



**LTE Band 2**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B2	20M	QPSK	1880.0	17.874	19.090
		16QAM		17.882	19.230
	15M	QPSK	1880.0	13.424	14.410
		16QAM		13.419	14.470
	10M	QPSK	1880.0	8.940	9.759
		16QAM		8.924	9.676
	5M	QPSK	1880.0	4.487	4.910
		16QAM		4.488	4.936
	3M	QPSK	1880.0	2.691	2.991
		16QAM		2.692	2.985
	1.4M	QPSK	1880.0	1.087	1.231
		16QAM		1.091	1.234

**- LTE Band 5**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B5	10M	QPSK	836.5	8.945	9.774
		16QAM		8.947	9.768
	5M	QPSK	836.5	4.486	4.905
		16QAM		4.483	4.898
	3M	QPSK	836.5	2.691	2.973
		16QAM		2.687	2.999
	1.4M	QPSK	836.5	1.085	1.227
		16QAM		1.087	1.241

**- LTE Band 12**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B12	10M	QPSK	707.5	8.922	9.743
		16QAM		8.942	9.626
	5M	QPSK	707.5	4.479	4.890
		16QAM		4.474	4.899
	3M	QPSK	707.5	2.691	2.966
		16QAM		2.686	2.988
	1.4M	QPSK	707.5	1.079	1.219
		16QAM		1.080	1.228

**- LTE Band 13**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B13	10M	QPSK	782.0	8.921	9.654
		16QAM		8.944	9.648
	5M	QPSK	782.0	4.495	4.895
		16QAM		4.483	4.926

**- LTE Band 26 (Part 90)**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 Part(90)	15M	QPSK	821.5	13.376	14.410
		16QAM		13.414	14.530
	10M	QPSK	819.0	8.941	9.769
		16QAM		8.935	9.654
	5M	QPSK	819.0	4.494	4.911
		16QAM		4.479	4.886
	3M	QPSK	819.0	2.696	3.001
		16QAM		2.692	2.994
	1.4M	QPSK	819.0	1.085	1.227
		16QAM		1.083	1.211

**- LTE Band 26 (Straddle)**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 (Straddle)	15M	QPSK	824.0	13.423	14.610
		16QAM		13.419	14.540
	10M	QPSK	824.0	8.930	9.742
		16QAM		8.924	9.641
	5M	QPSK	824.0	4.489	4.929
		16QAM		4.479	4.868
	3M	QPSK	824.0	2.692	2.954
		16QAM		2.696	2.991
	1.4M	QPSK	824.0	1.083	1.221
		16QAM		1.086	1.230

**- LTE Band 26 (Part 22)**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 (Part 22)	15M	QPSK	831.5	13.382	14.460
		16QAM		13.402	14.390
	10M	QPSK	831.5	8.942	9.736
		16QAM		8.916	9.676
	5M	QPSK	831.5	4.481	4.926
		16QAM		4.487	4.910
	3M	QPSK	831.5	2.692	2.969
		16QAM		2.690	3.006
	1.4M	QPSK	831.5	1.087	1.229
		16QAM		1.091	1.232

**- LTE Band 41**

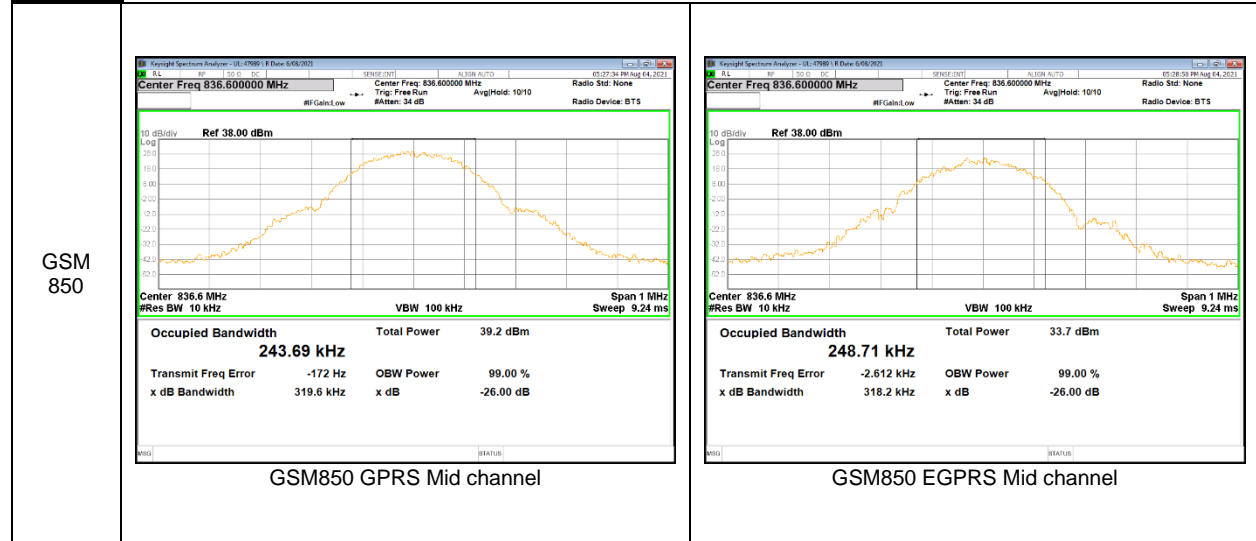
Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B41	20M	QPSK	2593.0	17.870	18.970
		16QAM		17.874	19.100
	15M	QPSK	2593.0	13.427	14.460
		16QAM		13.414	14.510
	10M	QPSK	2593.0	8.674	9.762
		16QAM		8.989	9.703
	5M	QPSK	2593.0	4.489	4.982
		16QAM		4.492	4.961

**- LTE Band 66**

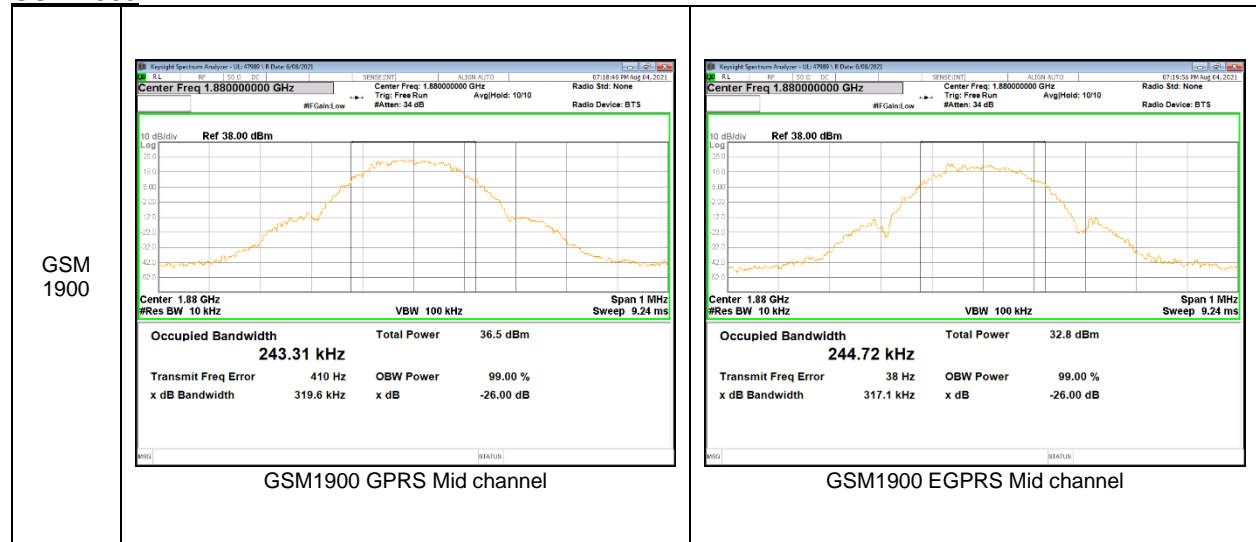
Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B66	20M	QPSK	1745.0	17.782	19.100
		16QAM		17.800	19.170
	15M	QPSK	1745.0	13.379	14.490
		16QAM		13.386	14.440
	10M	QPSK	1745.0	8.952	9.623
		16QAM		8.956	9.698
	5M	QPSK	1745.0	4.489	4.898
		16QAM		4.473	4.901
	3M	QPSK	1745.0	2.690	2.975
		16QAM		2.687	2.986
	1.4M	QPSK	1745.0	1.079	1.226
		16QAM		1.083	1.224

**9.1.1. OCCUPIED BANDWIDTH RESULTS**

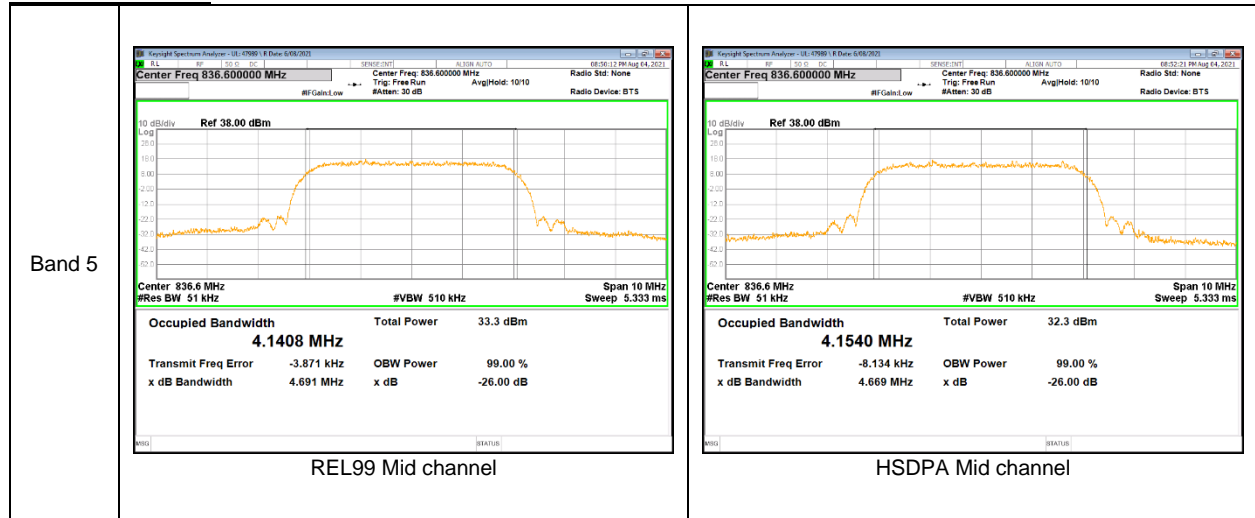
**GSM 850**



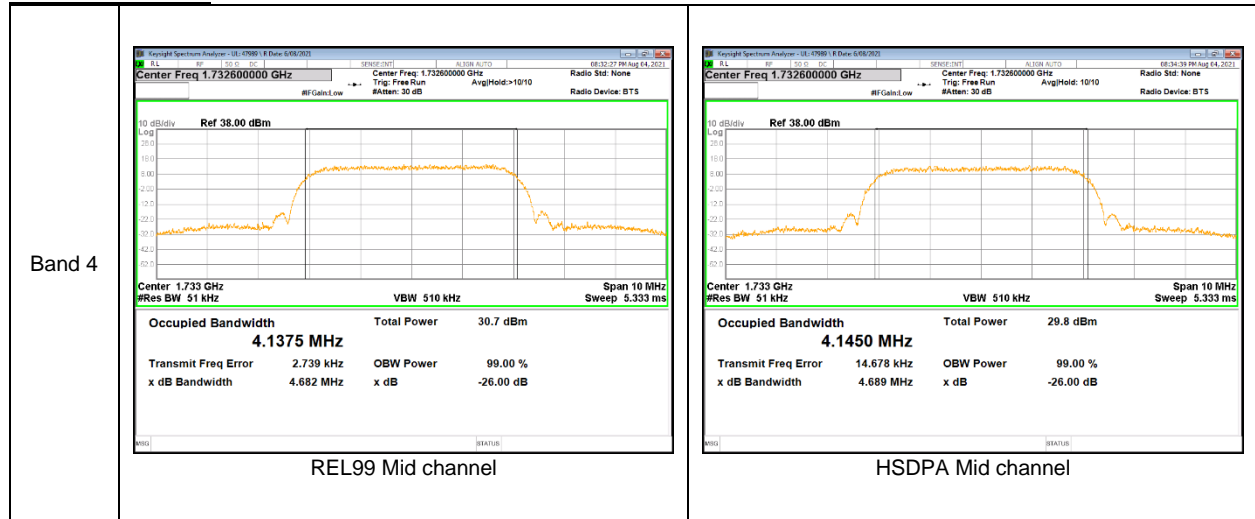
**GSM 1900**



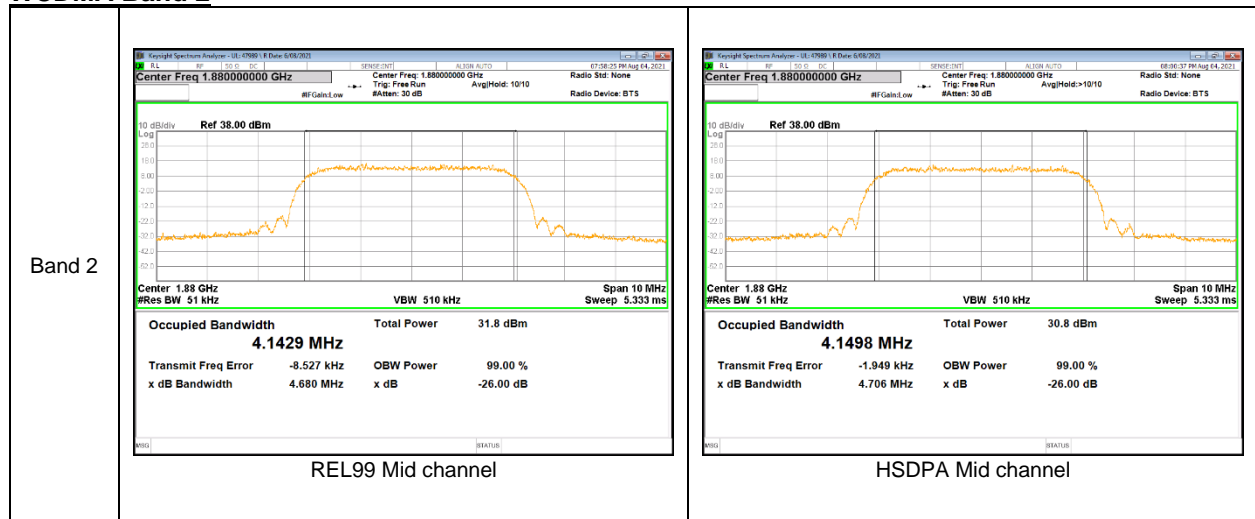
**WCDMA Band 5**



**WCDMA Band 4**



**WCDMA Band 2**



**LTE Band 2**

