



# CERTIFICATION TEST REPORT

**Report Number.** : 4790215265-E2V2

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

**Model** : SM-A135M/DS, SM-A135M

**FCC ID** : A3LSMA135M

**EUT Description** : GSM/WCDMA/LTE Phone + BT/BLE and DTS/UNII a/b/g/n/ac

**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:**

2022-02-10

**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**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2022-02-08	Initial issue	Yeonhee Lim
V2	2022-02-10	Updated to address TCB's question	Yeonhee Lim

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>4</b>
<b>2. TEST METHODOLOGY .....</b>	<b>5</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>5</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>6</b>
4.1. <i>MEASURING INSTRUMENT CALIBRATION.....</i>	6
4.2. <i>SAMPLE CALCULATION.....</i>	6
4.3. <i>MEASUREMENT UNCERTAINTY .....</i>	6
4.4. <i>DECISION RULE .....</i>	6
<b>5. EQUIPMENT UNDER TEST.....</b>	<b>7</b>
5.1. <i>DESCRIPTION OF EUT.....</i>	7
5.2. <i>MAXIMUM OUTPUT POWER.....</i>	7
5.3. <i>DESCRIPTION OF AVAILABLE ANTENNAS .....</i>	12
5.4. <i>WORST-CASE ORIENTATION.....</i>	13
5.5. <i>DESCRIPTION OF TEST SETUP.....</i>	15
<b>6. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>17</b>
<b>7. SUMMARY TABLE.....</b>	<b>18</b>
<b>8. PEAK TO AVERAGE RATIO .....</b>	<b>19</b>
8.1. <i>CONDUCTED PEAK TO AVERAGE RESULT.....</i>	20
<b>9. LIMITS AND CONDUCTED RESULTS .....</b>	<b>33</b>
9.1. <i>OCCUPIED BANDWIDTH.....</i>	33
9.1.1. <i>OCCUPIED BANDWIDTH RESULTS .....</i>	37
9.2. <i>BAND EDGE EMISSIONS .....</i>	50
9.2.1. <i>BAND EDGE RESULT.....</i>	53
9.2.2. <i>EMISSION MASK RESULT .....</i>	82
9.3. <i>OUT OF BAND EMISSIONS.....</i>	107
9.3.1. <i>OUT OF BAND EMISSIONS RESULT.....</i>	109
9.4. <i>FREQUENCY STABILITY.....</i>	121
9.4.1. <i>FREQUENCY STABILITY RESULTS .....</i>	122
9.5. <i>RADIATED POWER (ERP &amp; EIRP) .....</i>	128
9.5.1. <i>ERP/EIRP Results .....</i>	129
9.5.2. <i>ERP/EIRP DATA .....</i>	135
9.6. <i>FIELD STRENGTH OF SPURIOUS RADIATION.....</i>	172
9.6.1. <i>SPURIOUS RADIATION PLOTS .....</i>	174

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.  
**EUT DESCRIPTION:** GSM/WCDMA/LTE Phone + BT/BLE and DTS/UNII a/b/g/n/ac  
**MODEL NUMBER:** SM-A135M/DS, SM-A135M  
**SERIAL NUMBER:** R3CR90Y677T, R38RBO0DN1V (CONDUCTED);  
R3CR90Y67BD, R38RB00EJYD (RADIATED);  
**DATE TESTED:** 2021-12-28 ~ 2022-02-10;

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:



Seokhwan Hong  
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	3.02 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.05 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.78 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.58 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 and DTS/UNII a/b/g/n/ac.  
 This test report addresses the WWAN operational mode.

This report covers the Samsung models SM-A135M/DS and SM-A135M.  
 These models are identical in hardware except SM-A135M has single SIM tray.  
 With some pre-scan, model SM-A135M/DS 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.  
 (4790215265-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>32.4</b>	<b>1737.80</b>	29.42	874.98
		EGPRS	26.5	446.68	24.58	287.08
GSM1900	1850~1910	GPRS	31.4	1380.38	<b>31.15</b>	<b>1303.17</b>
		EGPRS	25.8	380.19	25.67	368.98

#### WCDMA

FCC Part 22/24/27						
Band	Frequency Range [MHz]	Modulation	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824~849	Rel. 99	<b>25.0</b>	<b>316.23</b>	21.51	141.58
		HSDPA	22.6	181.97	19.00	79.43
Band 4	1710~1755	Rel. 99	24.4	275.42	<b>23.06</b>	<b>202.30</b>
		HSDPA	22.3	169.82	21.37	137.09
Band 2	1850~1910	Rel. 99	23.9	245.47	22.85	192.75
		HSDPA	22.8	190.55	21.86	153.46

**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	1860 - 1900	20	QPSK	<b>24.0</b>	<b>251.19</b>	21.43	139.00
			16QAM	23.1	204.17	20.22	105.20
	1857.5 - 1902.5	15	QPSK	24.0	251.19	22.20	165.96
			16QAM	23.0	199.53	21.06	127.64
	1855 - 1905	10	QPSK	23.9	245.47	23.35	216.27
			16QAM	22.8	190.55	22.30	169.82
	1852.5 - 1907.5	5	QPSK	23.8	239.88	23.44	220.80
			16QAM	22.8	190.55	22.33	171.00
	1851.5 - 1908.5	3	QPSK	24.0	251.19	23.45	221.31
			16QAM	22.9	194.98	22.42	174.58
	1850.7 - 1909.3	1.4	QPSK	23.9	245.47	<b>23.78</b>	<b>238.78</b>
			16QAM	22.9	194.98	22.25	167.88

**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	704 - 711	10	QPSK	24.5	281.84	<b>20.11</b>	<b>102.57</b>
			16QAM	23.3	213.80	18.70	74.13
	701.5 - 707.5	5	QPSK	24.7	295.12	19.01	79.62
			16QAM	23.6	229.09	18.45	69.98
	700.5 - 714.5	3	QPSK	24.7	295.12	18.97	78.89
			16QAM	23.6	229.09	18.09	64.42
	699.7 - 715.3	1.4	QPSK	<b>24.8</b>	<b>302.00</b>	19.24	83.95
			16QAM	23.8	239.88	18.36	68.55

**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	782	10	QPSK	24.8	302.00	20.53	112.98
			16QAM	23.7	234.42	19.29	84.92
	779.5 - 784.5	5	QPSK	<b>24.8</b>	<b>302.00</b>	<b>20.93</b>	<b>123.88</b>
			16QAM	23.7	234.42	19.46	88.31



**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	821.5	15	QPSK	24.5	281.84	18.88	77.27
			16QAM	23.3	213.80	18.11	64.71
	819	10	QPSK	<b>25.0</b>	<b>316.23</b>	19.35	86.10
			16QAM	23.6	229.09	18.34	68.23
	816.5 - 821.5	5	QPSK	24.8	302.00	19.41	87.30
			16QAM	23.4	218.78	18.68	73.79
	815.5 - 822.5	3	QPSK	24.9	309.03	<b>19.61</b>	<b>91.41</b>
			16QAM	23.4	218.78	18.80	75.86
	814.7 - 823.3	1.4	QPSK	24.9	309.03	19.25	84.14
			16QAM	23.8	239.88	18.98	79.07

**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	831.5 ~ 841.5	15	QPSK	24.8	302.00	18.76	75.16
			16QAM	23.8	239.88	18.46	70.15
	829 ~ 844	10	QPSK	<b>25.0</b>	<b>316.23</b>	<b>20.56</b>	<b>113.76</b>
			16QAM	23.8	239.88	19.20	83.18
	826.5 ~ 846.5	5	QPSK	24.9	309.03	20.32	107.65
			16QAM	23.7	234.42	18.96	78.70
	825.5 ~ 847.5	3	QPSK	24.9	309.03	19.69	93.11
			16QAM	23.7	234.42	18.38	68.87
	824.7 ~ 848.3	1.4	QPSK	25.0	316.23	20.21	104.95
			16QAM	24.0	251.19	18.94	78.34

**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	24.5	281.84	<b>19.10</b>	<b>81.28</b>
			16QAM	23.3	213.80	17.58	57.28
		10	QPSK	24.6	288.40	18.88	77.27
			16QAM	23.6	229.09	18.41	69.34
		5	QPSK	24.5	281.84	18.82	76.21
			16QAM	23.4	218.78	17.52	56.49
		3	QPSK	<b>24.6</b>	<b>288.40</b>	18.48	70.47
			16QAM	23.6	229.09	17.48	55.98
		1.4	QPSK	24.5	281.84	18.83	76.38
			16QAM	23.5	223.87	17.51	56.36

**LTE Band 41**

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 41	2506 - 2680	20	QPSK	<b>24.3</b>	<b>269.15</b>	<b>25.23</b>	<b>333.43</b>
			16QAM	23.1	204.17	23.62	230.14
	2503.5 - 2682.5	15	QPSK	24.2	263.03	24.26	266.69
			16QAM	23.3	213.80	23.97	249.46
	2501 - 2685	10	QPSK	24.2	263.03	24.45	278.61
			16QAM	23.0	199.53	23.68	233.35
	2498.5 - 2687.5	5	QPSK	24.2	263.03	24.99	315.50
			16QAM	23.1	204.17	24.06	254.68

**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	1720 - 1770	20	QPSK	25.0	316.23	23.89	244.91
			16QAM	24.0	251.19	22.57	180.72
	1717.5 - 1772.5	15	QPSK	25.0	316.23	<b>24.04</b>	<b>253.51</b>
			16QAM	24.0	251.19	22.47	176.60
	1715 - 1775	10	QPSK	24.9	309.03	23.63	230.67
			16QAM	23.9	245.47	22.78	189.67
	1712.5 - 1777.5	5	QPSK	24.9	309.03	23.61	229.61
			16QAM	23.9	245.47	22.38	172.98
	1711.5 - 1778.5	3	QPSK	25.0	316.23	23.47	222.33
			16QAM	23.7	234.42	22.26	168.27
	1710.7 - 1779.3	1.4	QPSK	<b>25.1</b>	<b>323.59</b>	23.60	229.09
			16QAM	24.0	251.19	22.30	169.82

### 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	-0.38
WCDMA Band 4 / LTE Band 4 / LTE Band 66 1710 ~ 1780 MHz	-1.01
GSM850 / WCDMA Band 5 / LTE Band 5 / LTE Band 26 814 ~ 849 MHz	-2.16
LTE Band 12 / LTE Band 17 699 ~ 716 MHz	-3.30
LTE Band 41 2496 ~ 2690 MHz	3.65
LTE Band 13 777 ~ 787 MHz	-2.95

### 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 modulations. 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	1860.0	20	1	0
	1880.0		1	0
	1900.0		1	0
12	699.7	1.4	1	0
	707.5		1	5
	715.3		1	5
13	779.5	5	1	12
	782.0		1	24
	784.5		1	0
26 (Part 90)	819.0	10	1	0
26 (Straddle)	824.0	3	1	0
26 (Part 22)	829.0	10	1	0
	831.5		1	0
	844.0		1	0
41	2506.0	20	1	0
	2593.0		1	0
	2680.0		1	49
66	1710.7	1.4	1	0
	1745.0		1	5
	1779.3		1	3

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 B12	-	O	-	O	-	-
LTE B13	O	-	-	-	O	-
LTE B26	O	-	-	O	-	-
LTE B41	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.

**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 5**

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 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.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacture	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA200	R37NATQGS55DK3	N/A
Data Cable	SAMSUNG	EP- DR140AWE	N/A	N/A

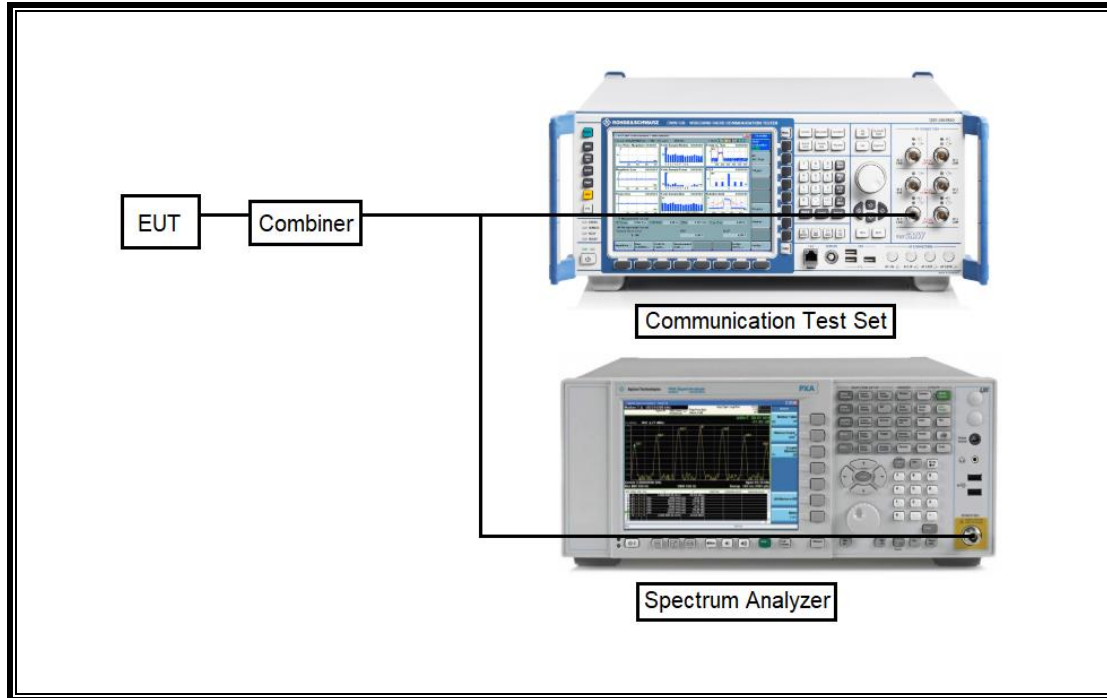
### I/O CABLE

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	1.0 m	N/A

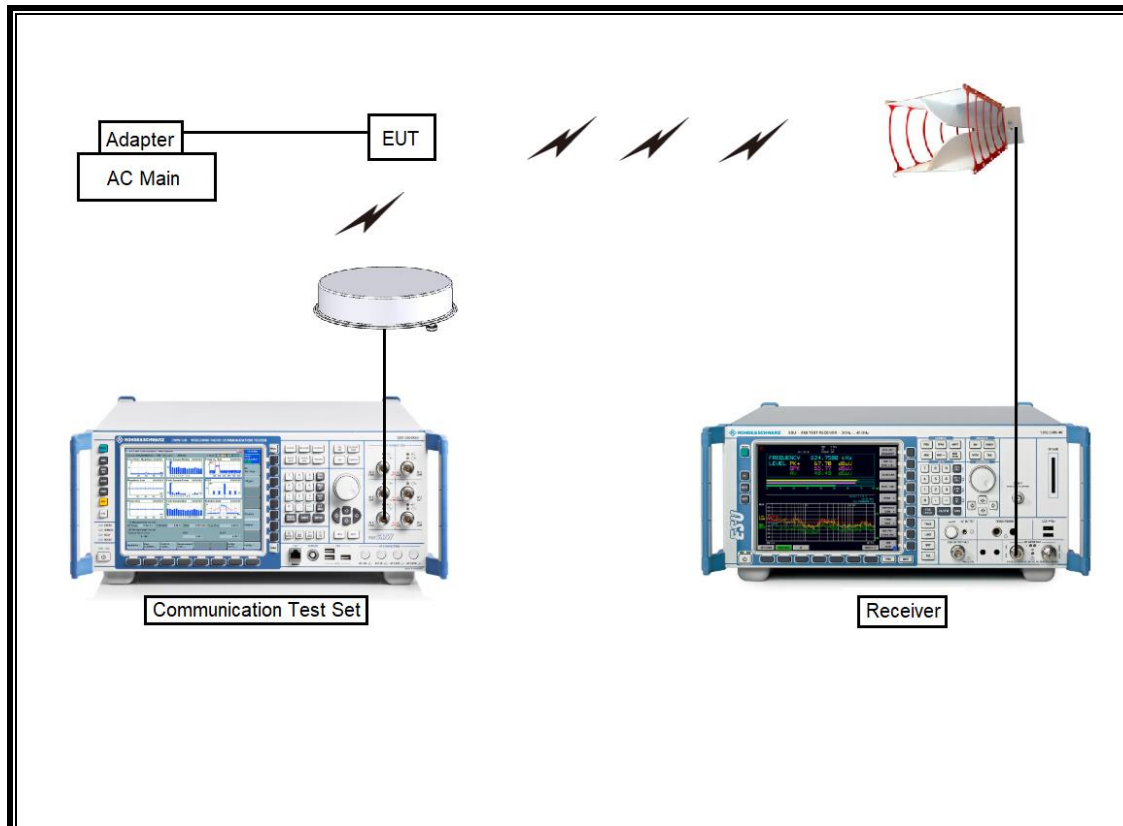
### TEST SETUP

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	2023-10-13
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	2023-01-07
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	2023-10-06
Temperature Chamber	ESPEC	SH-642	93001109	2022-08-02
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2023-01-11
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2023-01-11
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
90.635(b)		50 dBm		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
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

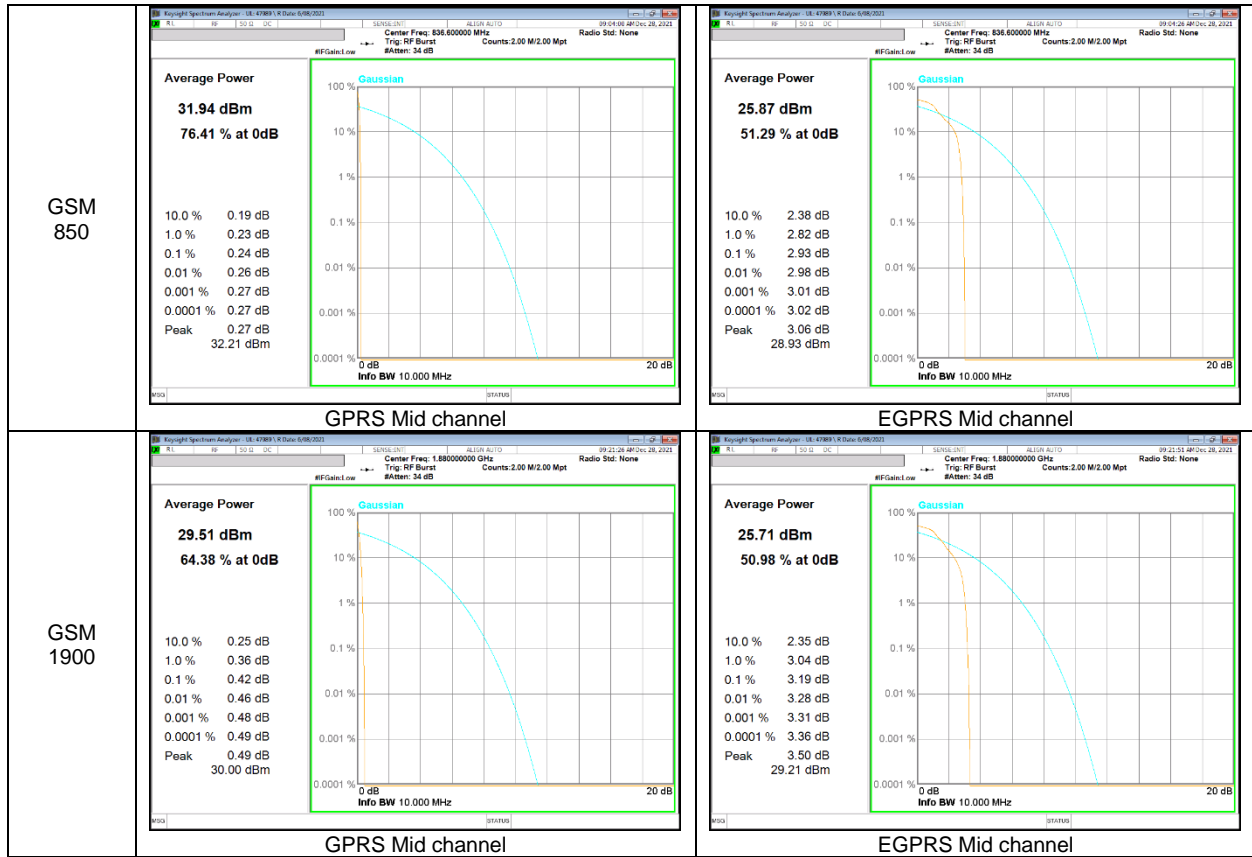
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

### RESULTS

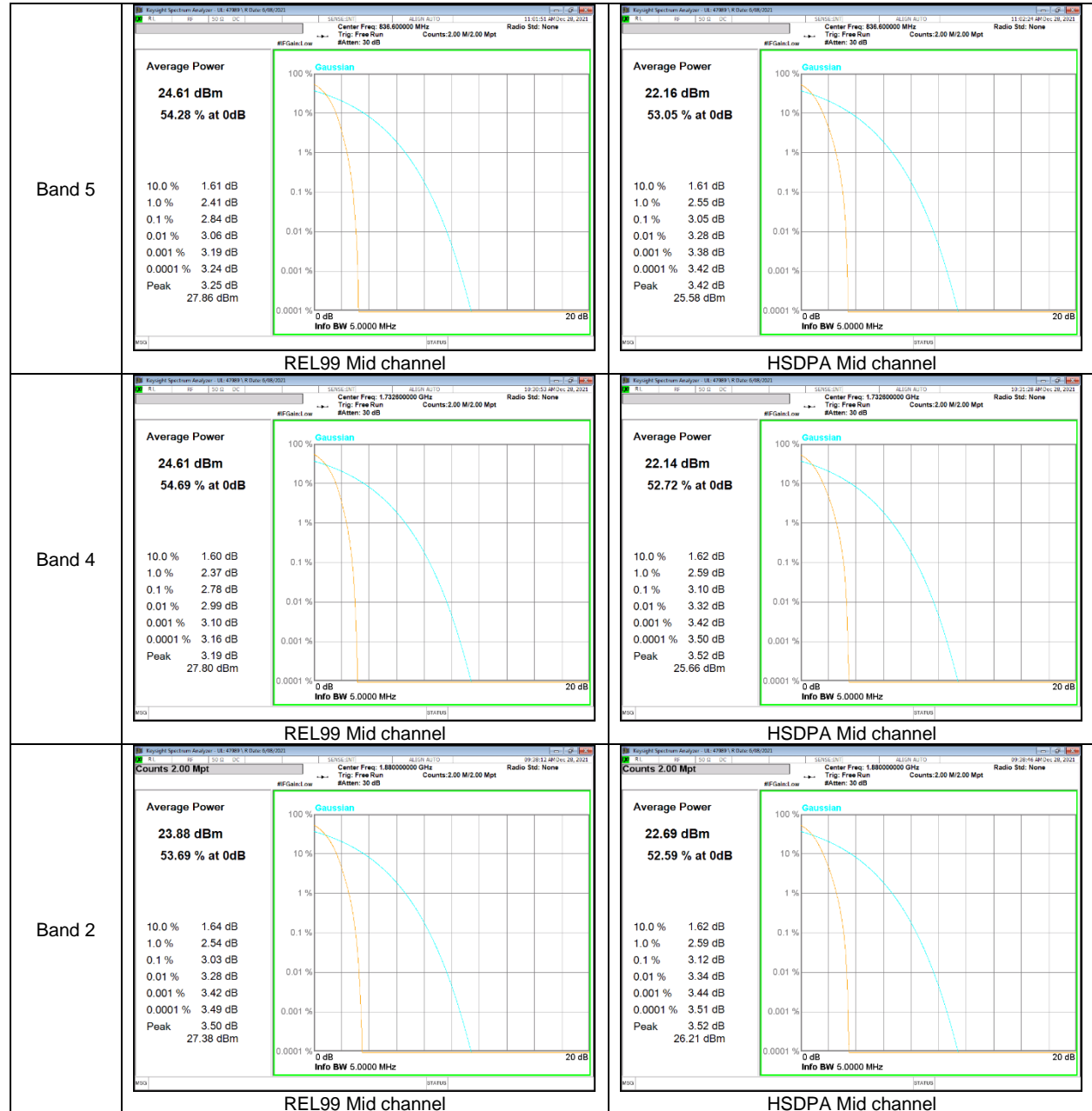
See the following pages.

## 8.1. CONDUCTED PEAK TO AVERAGE RESULT

### GSM

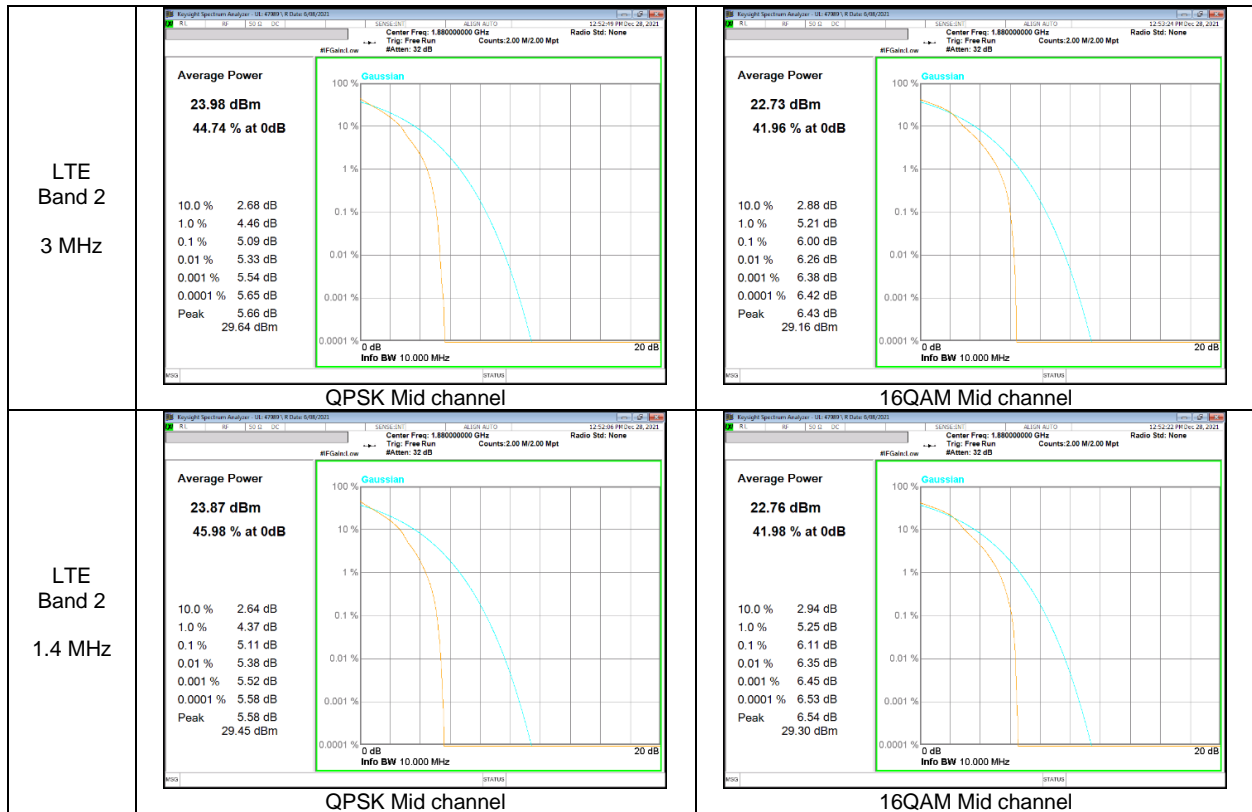


**WCDMA**

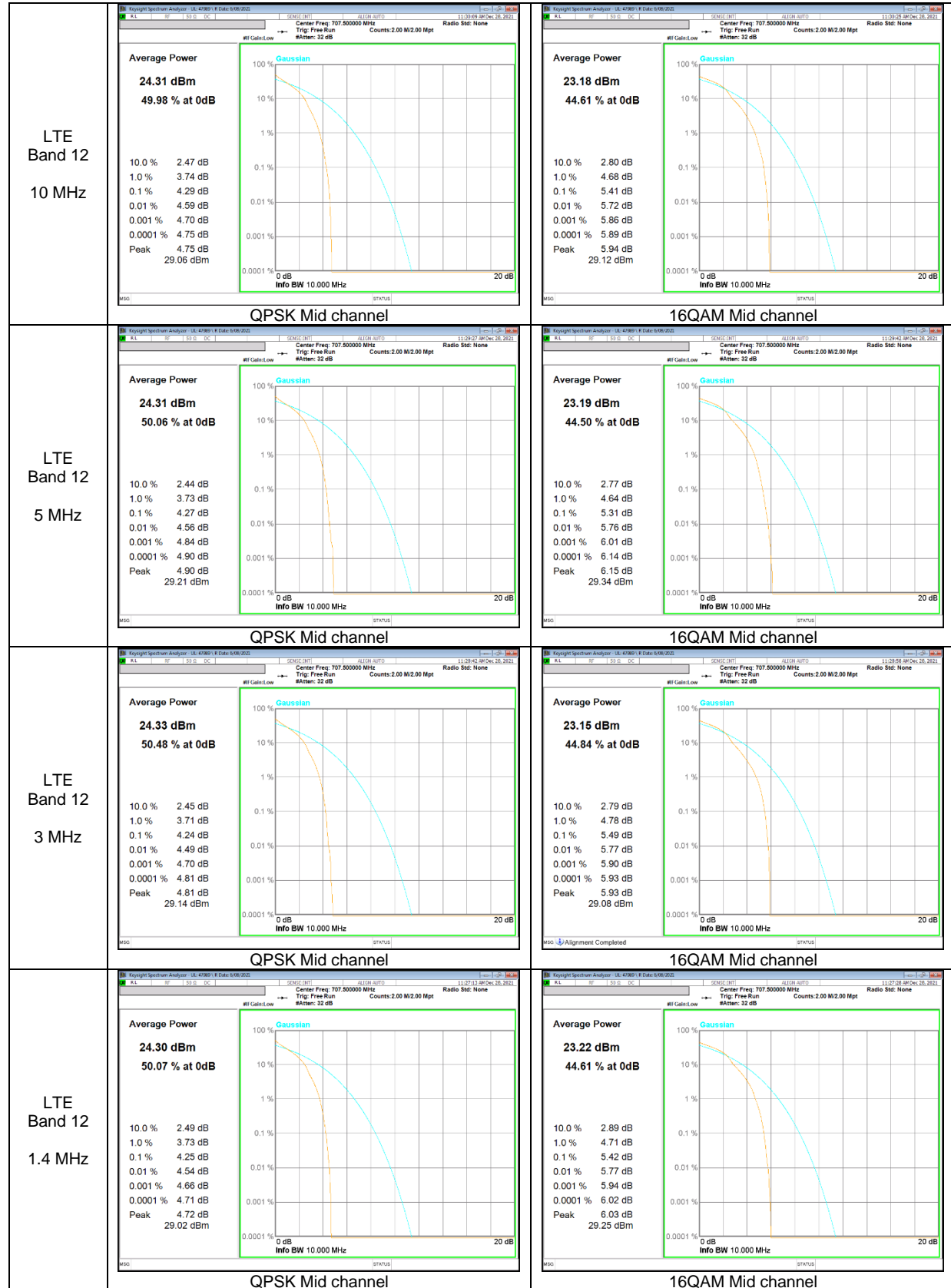


**LTE Band 2**

<p>LTE Band 2 20 MHz</p>	<p><b>QPSK Mid channel</b></p>	<p><b>16QAM Mid channel</b></p>
<p>LTE Band 2 15 MHz</p>	<p><b>QPSK Mid channel</b></p>	<p><b>16QAM Mid channel</b></p>
<p>LTE Band 2 10 MHz</p>	<p><b>QPSK Mid channel</b></p>	<p><b>16QAM Mid channel</b></p>
<p>LTE Band 2 5 MHz</p>	<p><b>QPSK Mid channel</b></p>	<p><b>16QAM Mid channel</b></p>

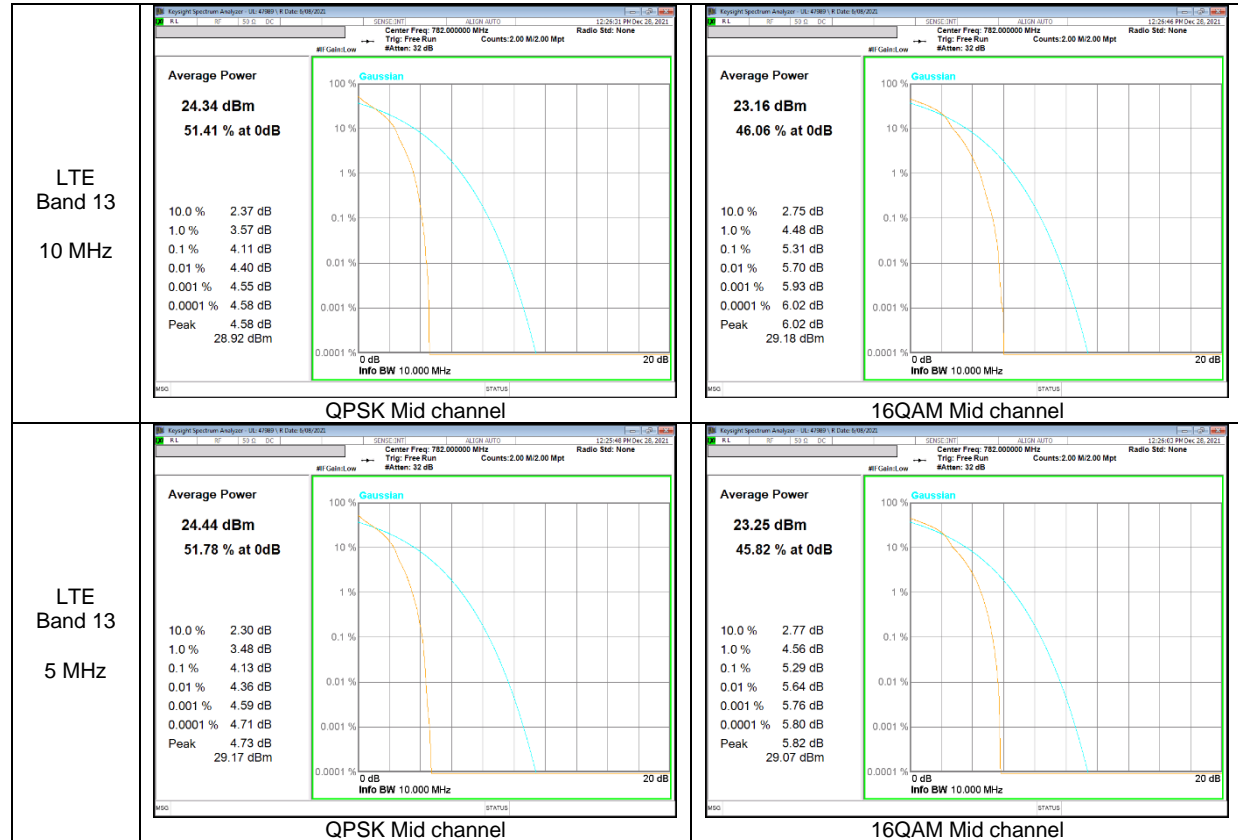


**LTE Band 12**

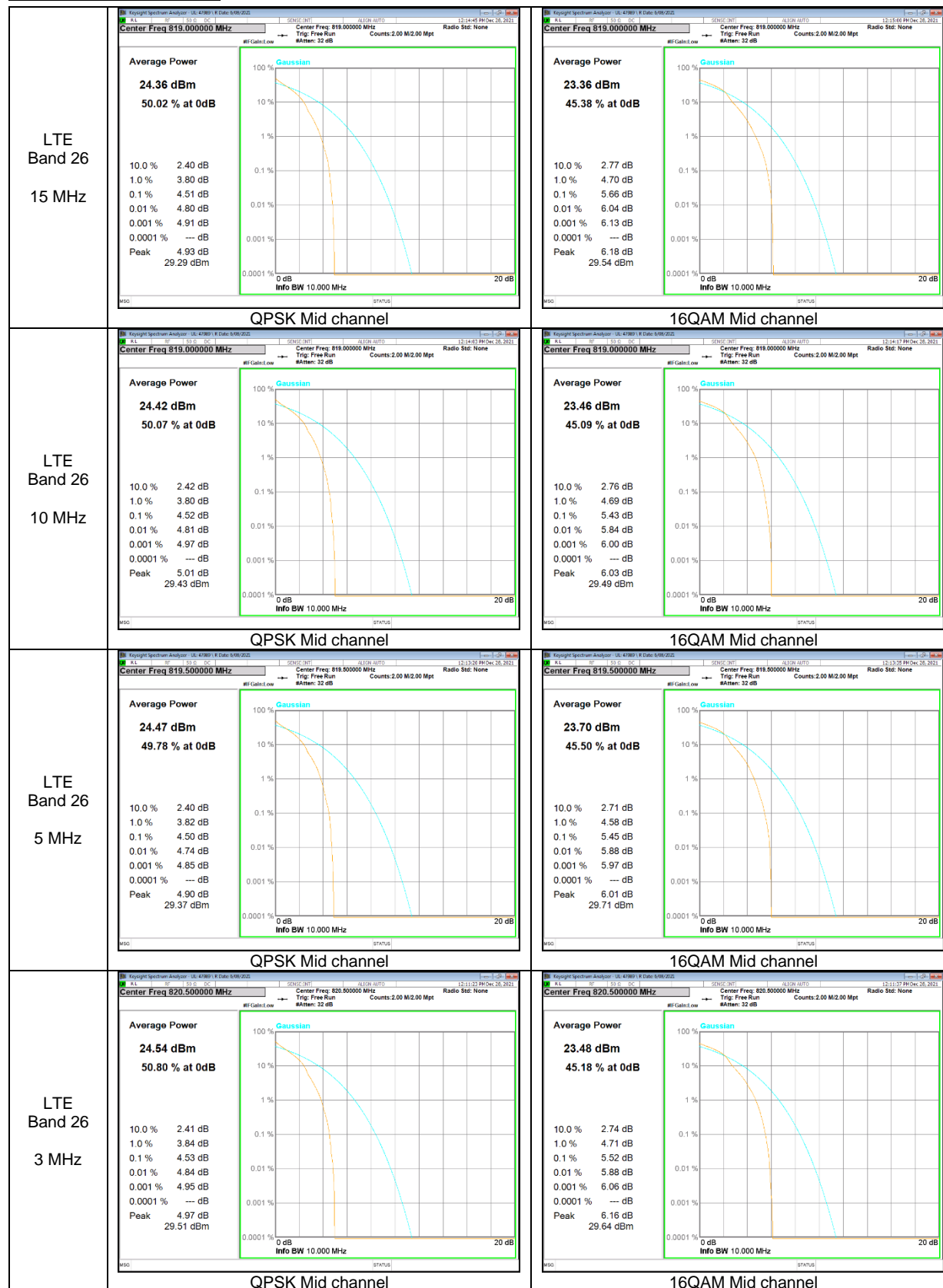


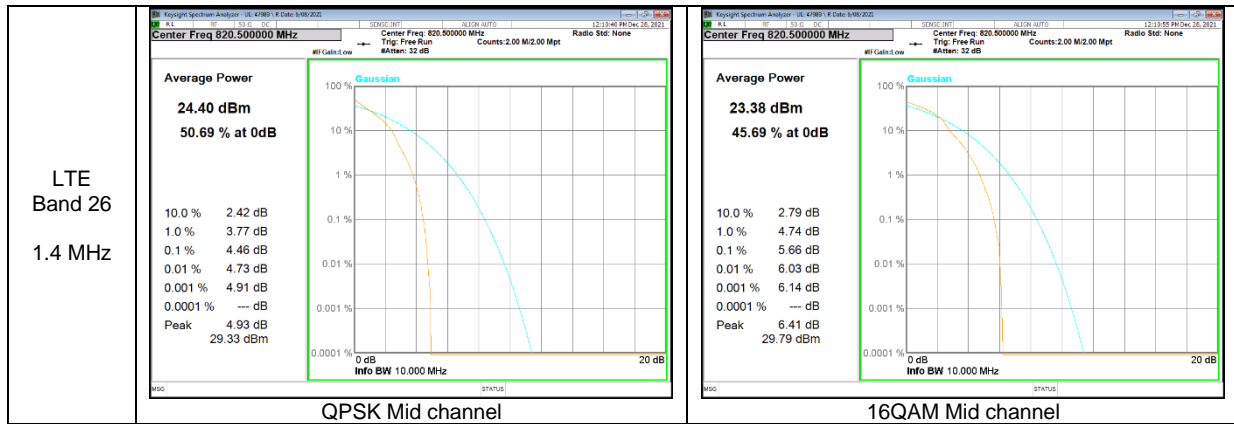


**LTE Band 13**

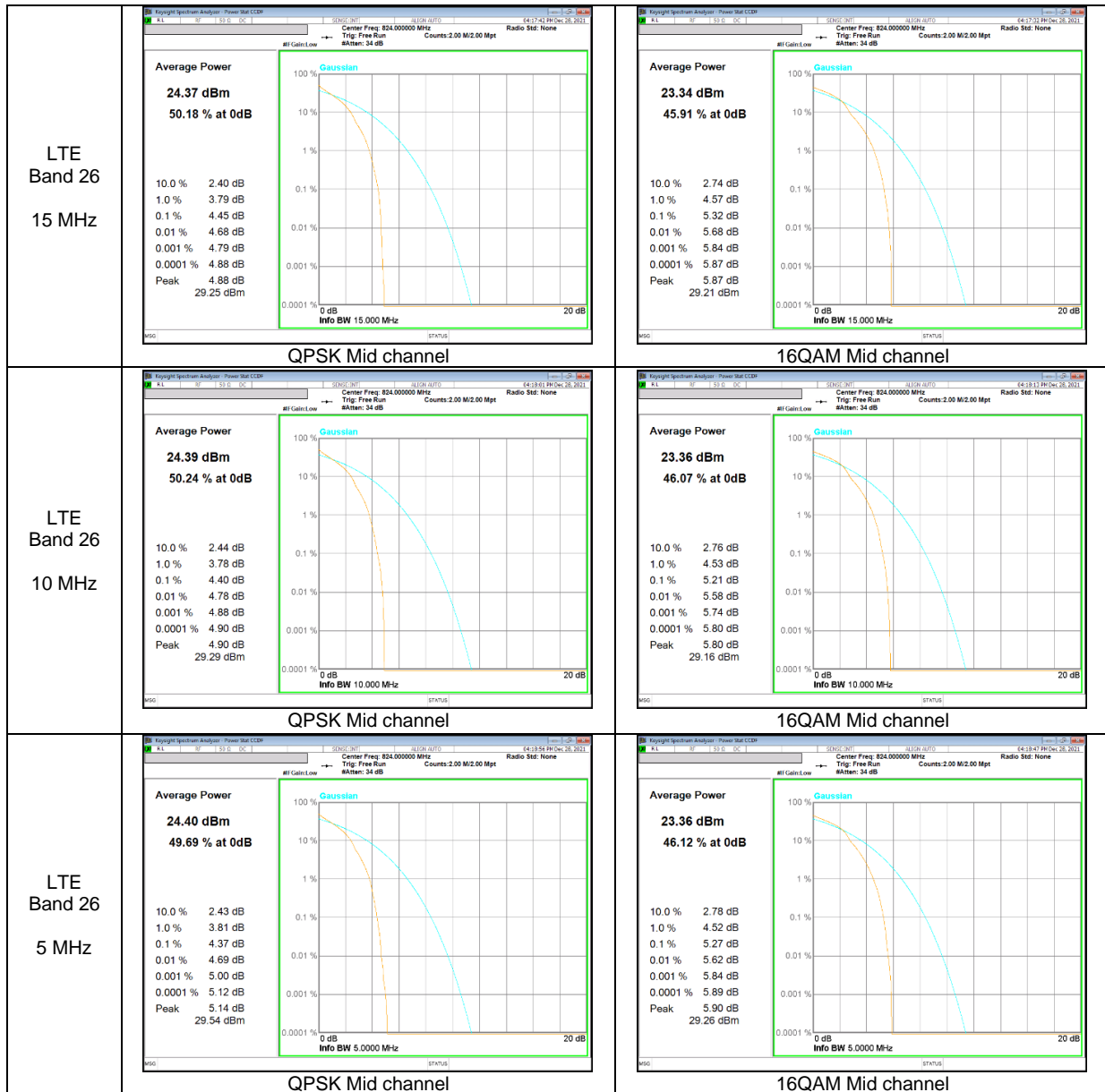


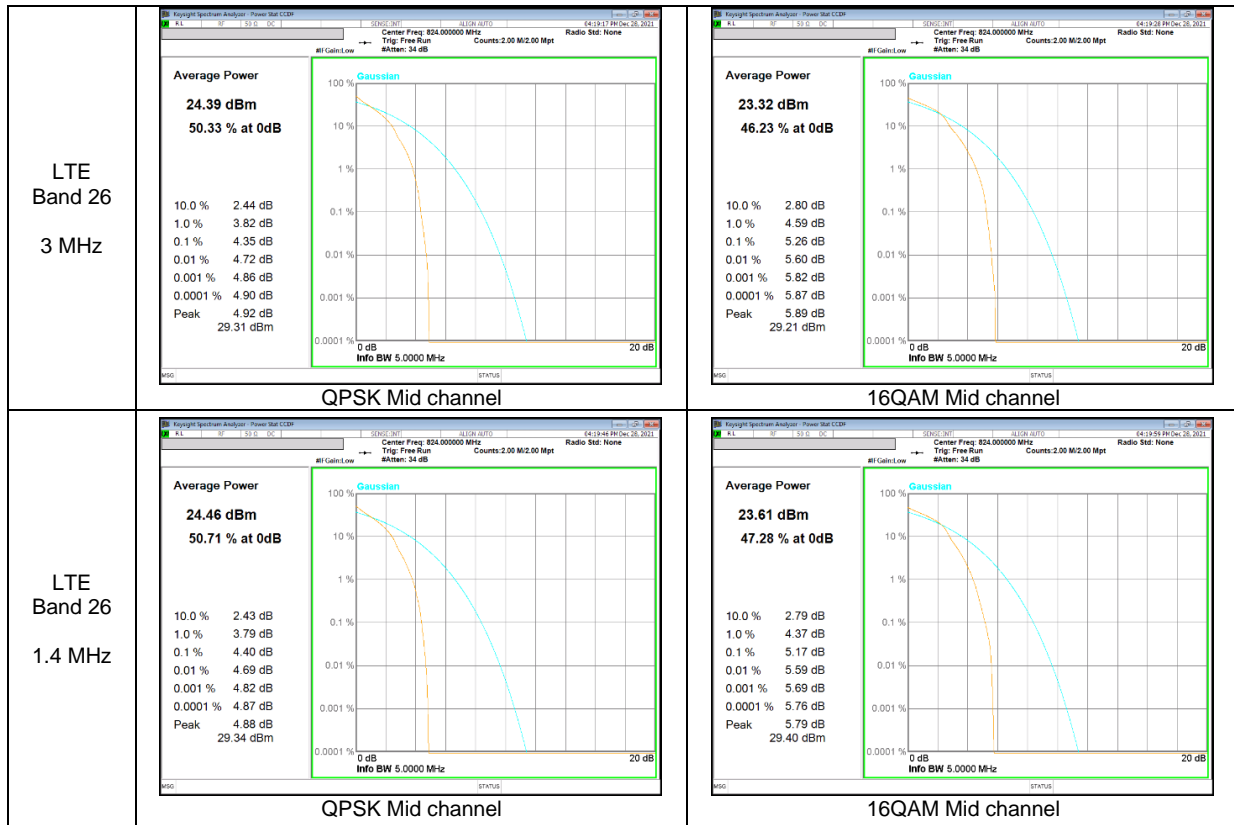
**LTE Band 26 (Part 90)**



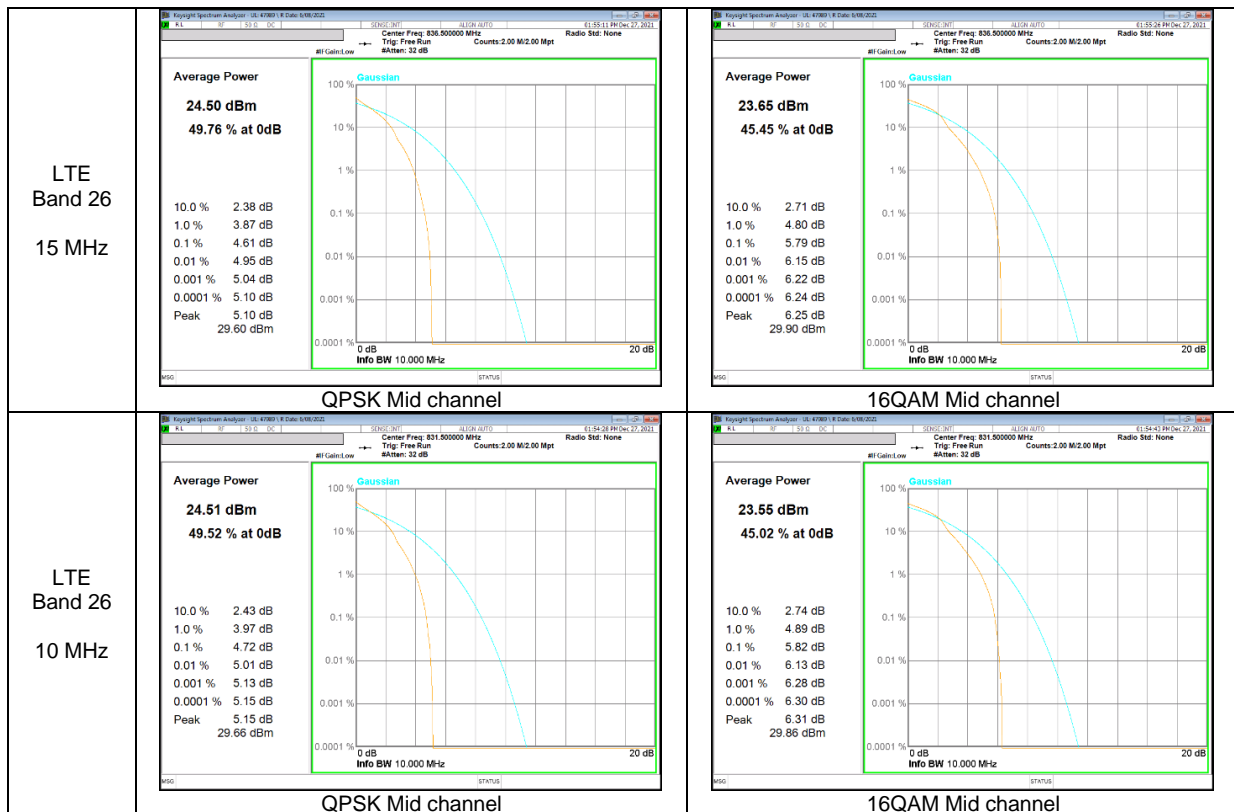


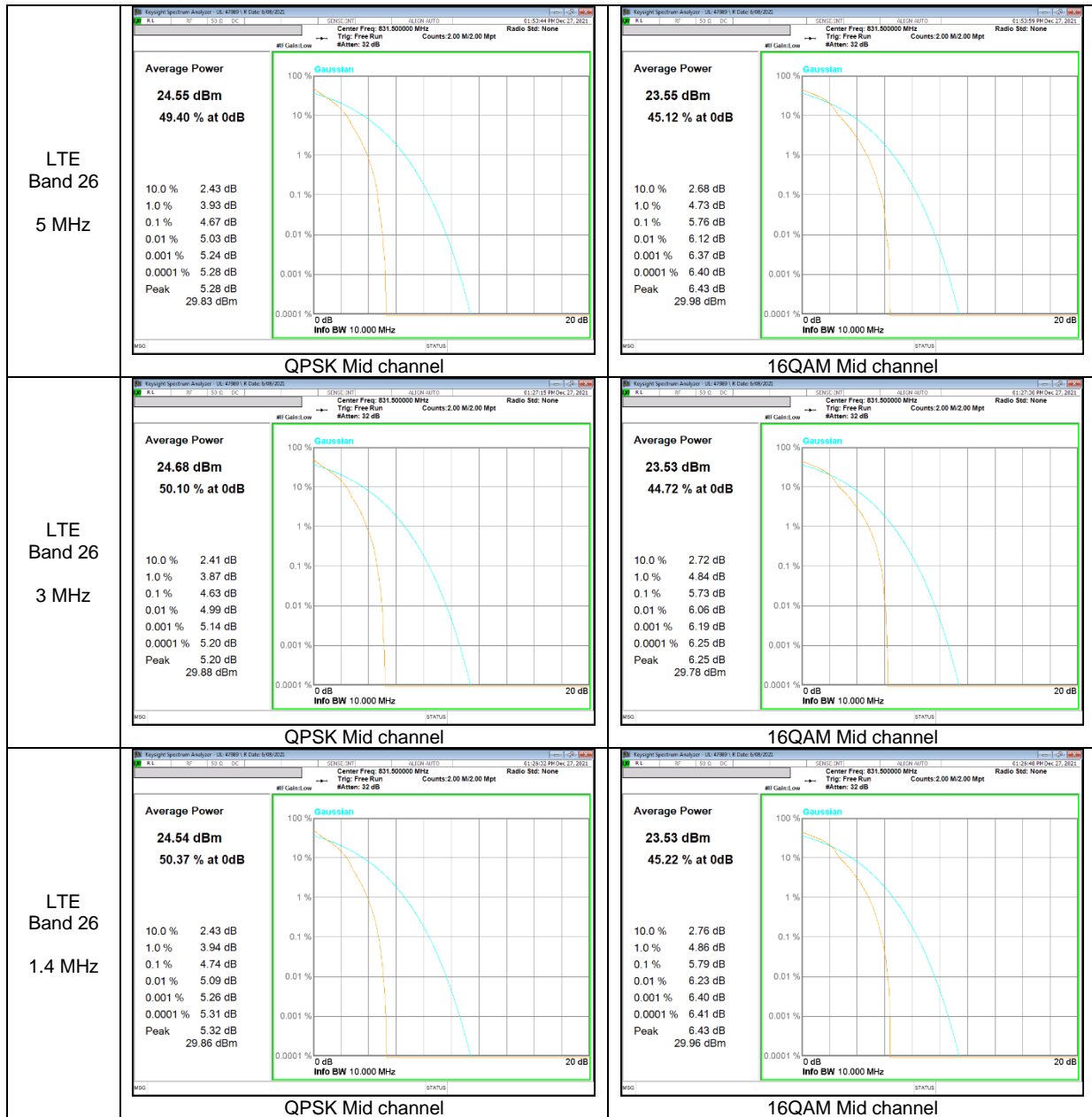
**LTE Band 26 (Straddle)**



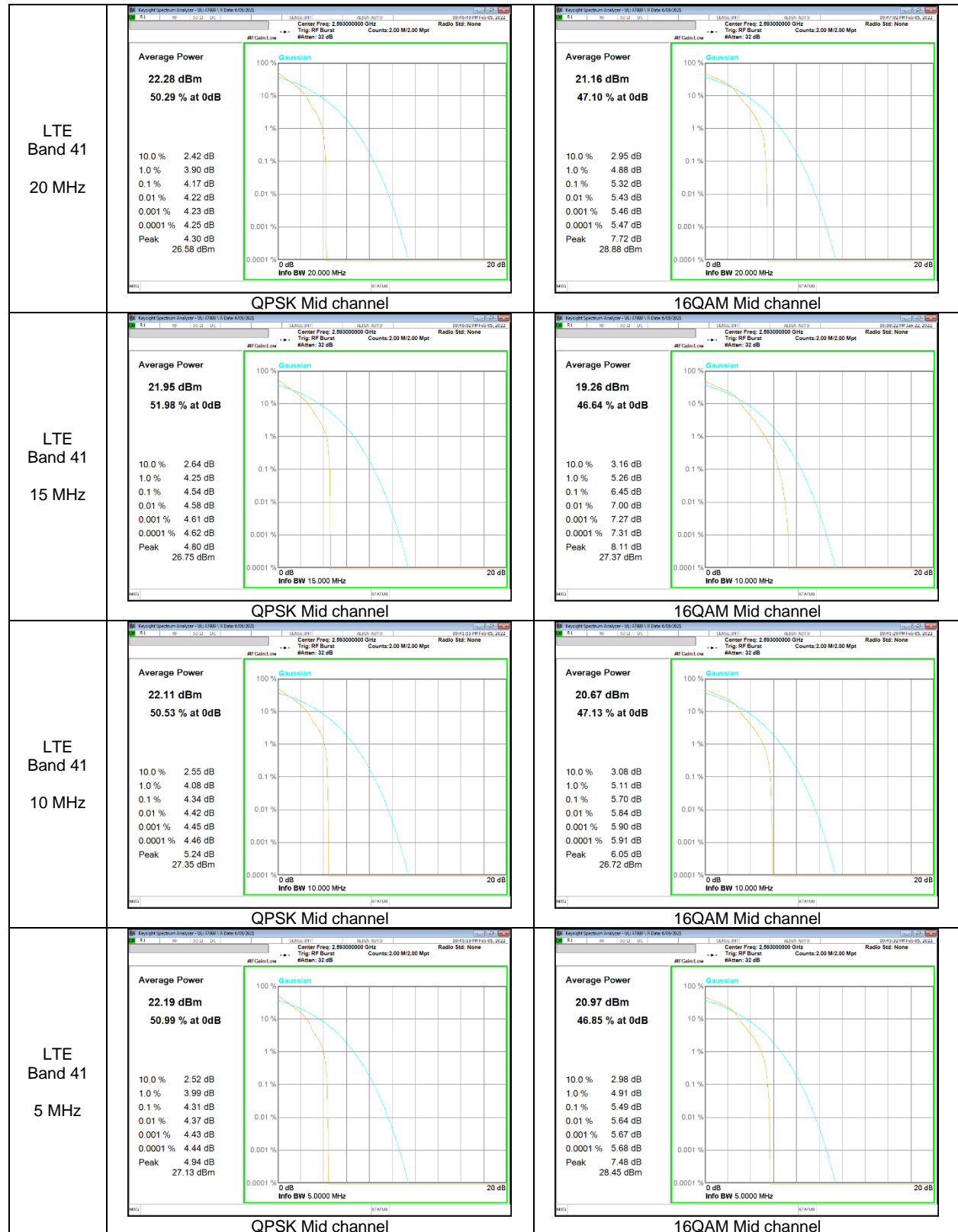


**LTE Band 26 (Part 22)**

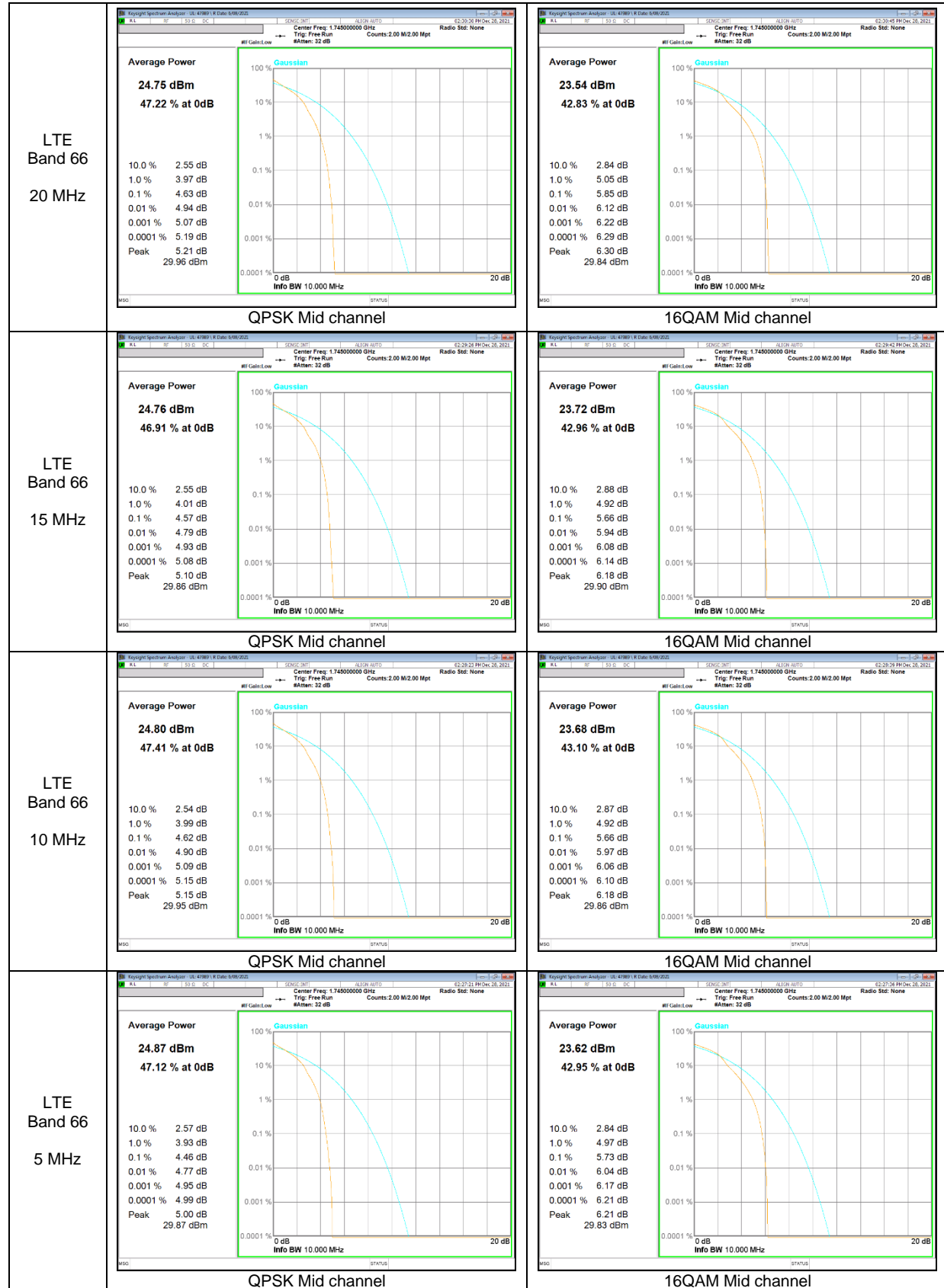


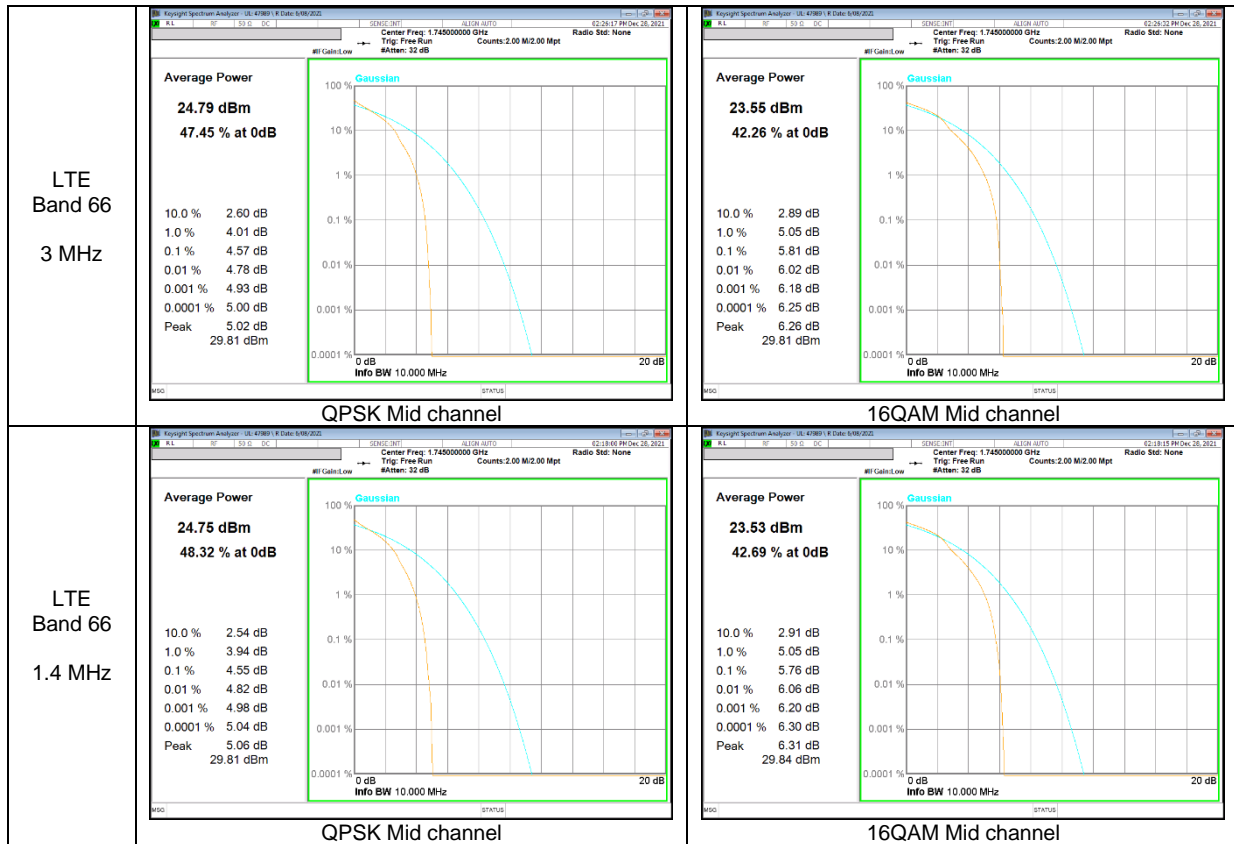


**LTE Band 41**



**LTE Band 66**







## 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	243.00	320.9
	EGPRS		252.03	322.2
1900	GPRS	1880.0	247.06	308.3
	EGPRS		250.20	323.1

#### - WCDMA

Band	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
B5	Rel.99	836.6	4.132	4.705
	HSDPA		4.149	4.696
B4	Rel.99	1732.6	4.140	4.736
	HSDPA		4.144	4.715
B2	Rel.99	1880.0	4.136	4.704
	HSDPA		4.142	4.706

**- LTE Band 2**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B2	20M	QPSK	1880.0	17.855	19.65
		16QAM		17.886	19.75
	15M	QPSK	1880.0	13.422	15.07
		16QAM		13.409	15.15
	10M	QPSK	1880.0	8.950	10.22
		16QAM		8.956	10.17
	5M	QPSK	1880.0	4.495	5.252
		16QAM		4.498	5.244
	3M	QPSK	1880.0	2.704	3.093
		16QAM		2.695	3.078
	1.4M	QPSK	1880.0	1.084	1.312
		16QAM		1.088	1.305

**- LTE Band 12**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B12	10M	QPSK	707.5	8.978	10.18
		16QAM		8.951	10.25
	5M	QPSK	707.5	4.502	5.391
		16QAM		4.496	5.268
	3M	QPSK	707.5	2.696	3.074
		16QAM		2.709	3.062
	1.4M	QPSK	707.5	1.088	1.280
		16QAM		1.093	1.325

**- LTE Band 13**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B13	10M	QPSK	782.0	8.955	10.02
		16QAM		8.964	10.14
	5M	QPSK	782.0	4.495	5.166
		16QAM		4.501	5.244

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

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 Part(90)	15M	QPSK	819.0	13.422	15.22
		16QAM		13.442	15.15
	10M	QPSK	819.0	8.958	10.09
		16QAM		8.964	10.30
	5M	QPSK	819.5	4.494	5.249
		16QAM		4.499	5.266
	3M	QPSK	820.5	2.699	3.079
		16QAM		2.697	3.111
	1.4M	QPSK	820.5	1.086	1.297
		16QAM		1.088	1.314

**- LTE Band 26 (Straddle)**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 (Straddle)	15M	QPSK	824.0	13.436	15.12
		16QAM		13.421	15.01
	10M	QPSK	824.0	8.966	10.29
		16QAM		8.971	10.29
	5M	QPSK	824.0	4.490	5.365
		16QAM		4.503	5.251
	3M	QPSK	824.0	2.696	3.086
		16QAM		2.691	3.068
	1.4M	QPSK	824.0	1.089	1.324
		16QAM		1.090	1.318

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

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 (Part 22)	15M	QPSK	836.5	13.448	15.00
		16QAM		13.437	15.17
	10M	QPSK	831.5	8.977	10.31
		16QAM		8.952	10.17
	5M	QPSK	831.5	4.495	5.198
		16QAM		4.498	5.183
	3M	QPSK	831.5	2.699	3.050
		16QAM		2.697	3.062
	1.4M	QPSK	831.5	1.090	1.308
		16QAM		1.087	1.303

**- LTE Band 41**

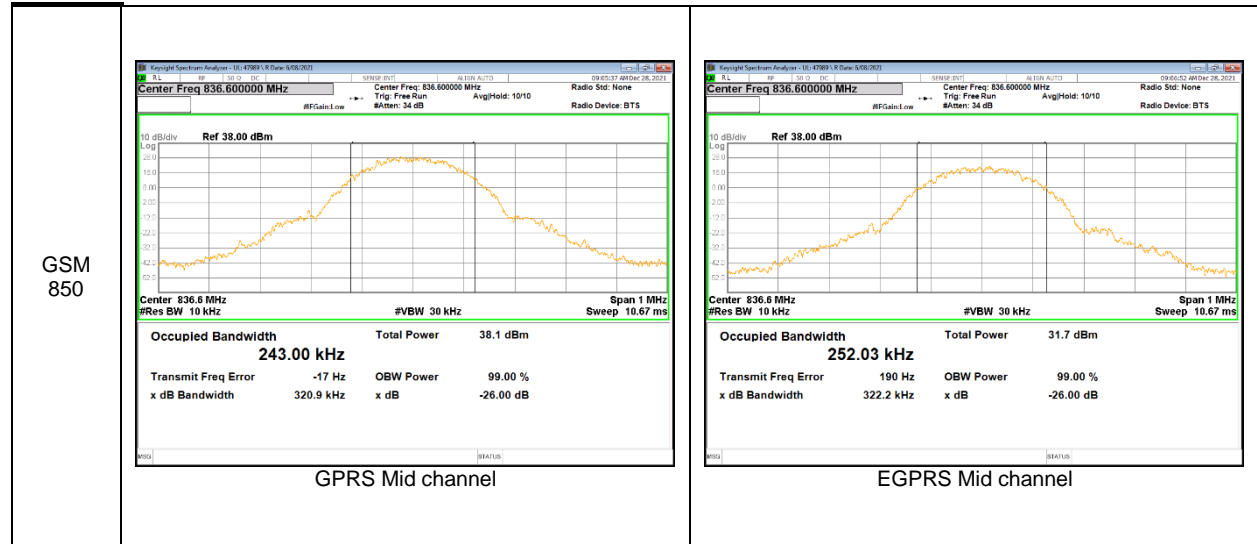
Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B41	20M	QPSK	2593.0	17.877	19.71
		16QAM		17.874	19.50
	15M	QPSK	2593.0	13.420	15.12
		16QAM		13.429	15.05
	10M	QPSK	2593.0	8.972	10.20
		16QAM		8.971	10.09
	5M	QPSK	2593.0	4.502	5.292
		16QAM		4.496	5.186

**- LTE Band 66**

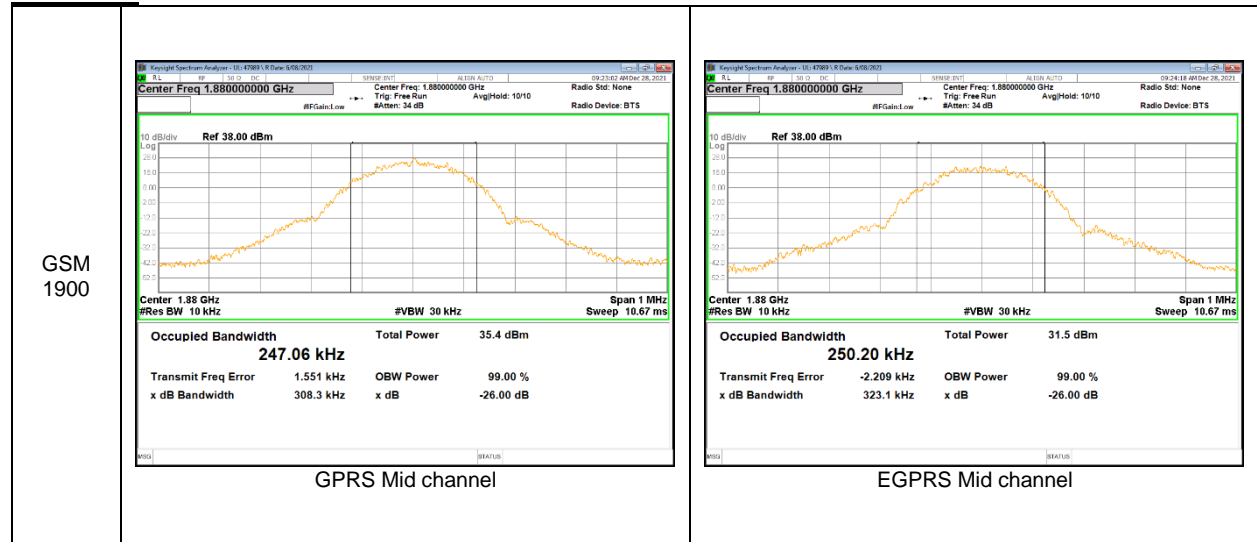
Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B66	20M	QPSK	1745.0	17.879	19.59
		16QAM		17.887	19.67
	15M	QPSK	1745.0	13.459	15.14
		16QAM		13.423	15.15
	10M	QPSK	1745.0	8.950	10.29
		16QAM		8.967	10.14
	5M	QPSK	1745.0	4.499	5.137
		16QAM		4.492	5.321
	3M	QPSK	1745.0	2.699	3.059
		16QAM		2.696	3.061
	1.4M	QPSK	1745.0	1.082	1.306
		16QAM		1.089	1.312

### 9.1.1. OCCUPIED BANDWIDTH RESULTS

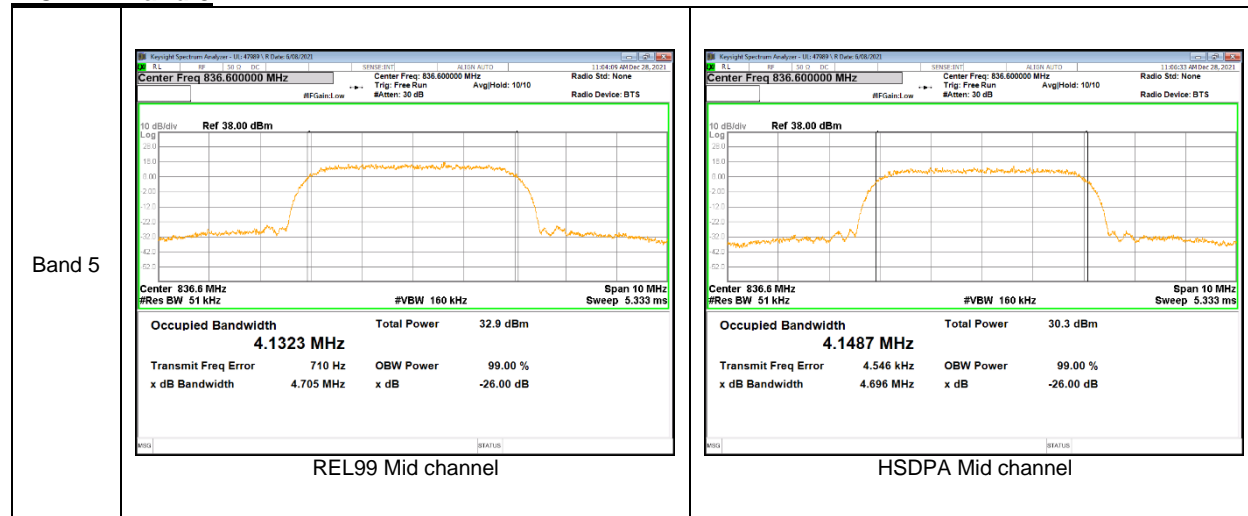
#### GSM 850



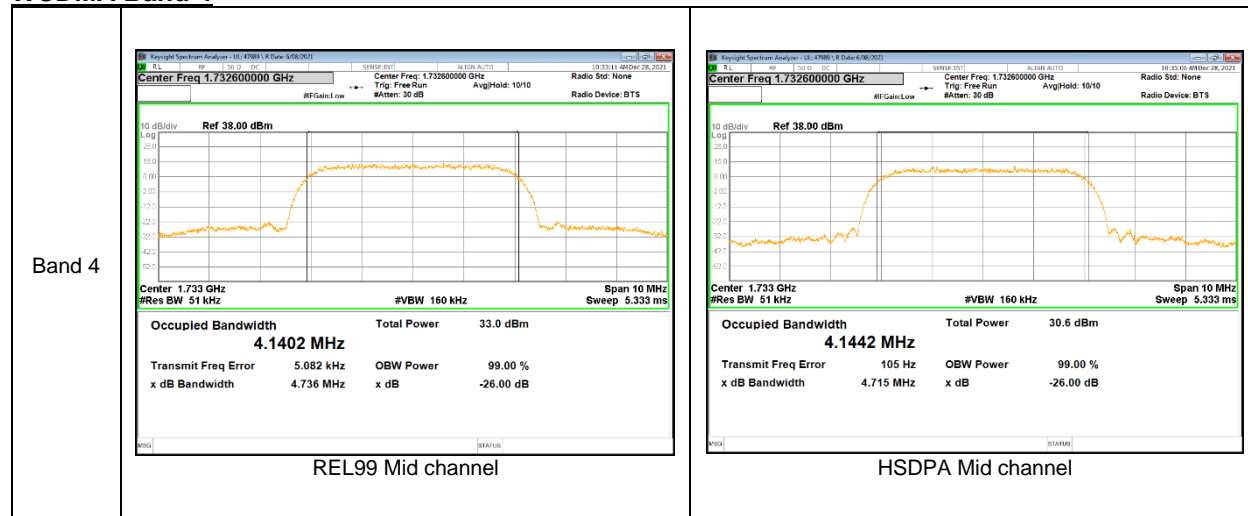
#### GSM 1900



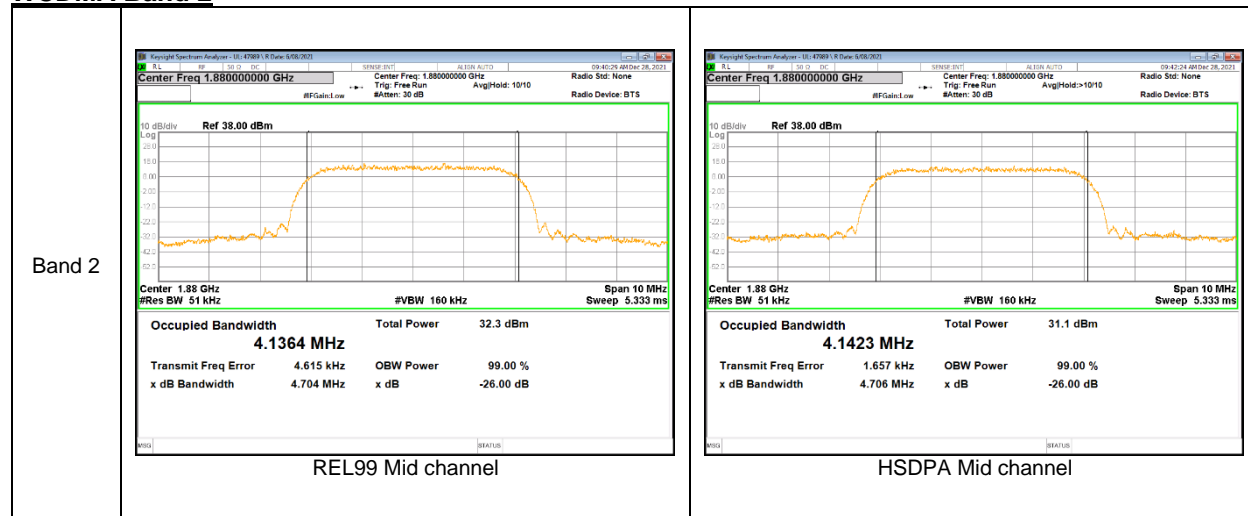
**WCDMA Band 5**



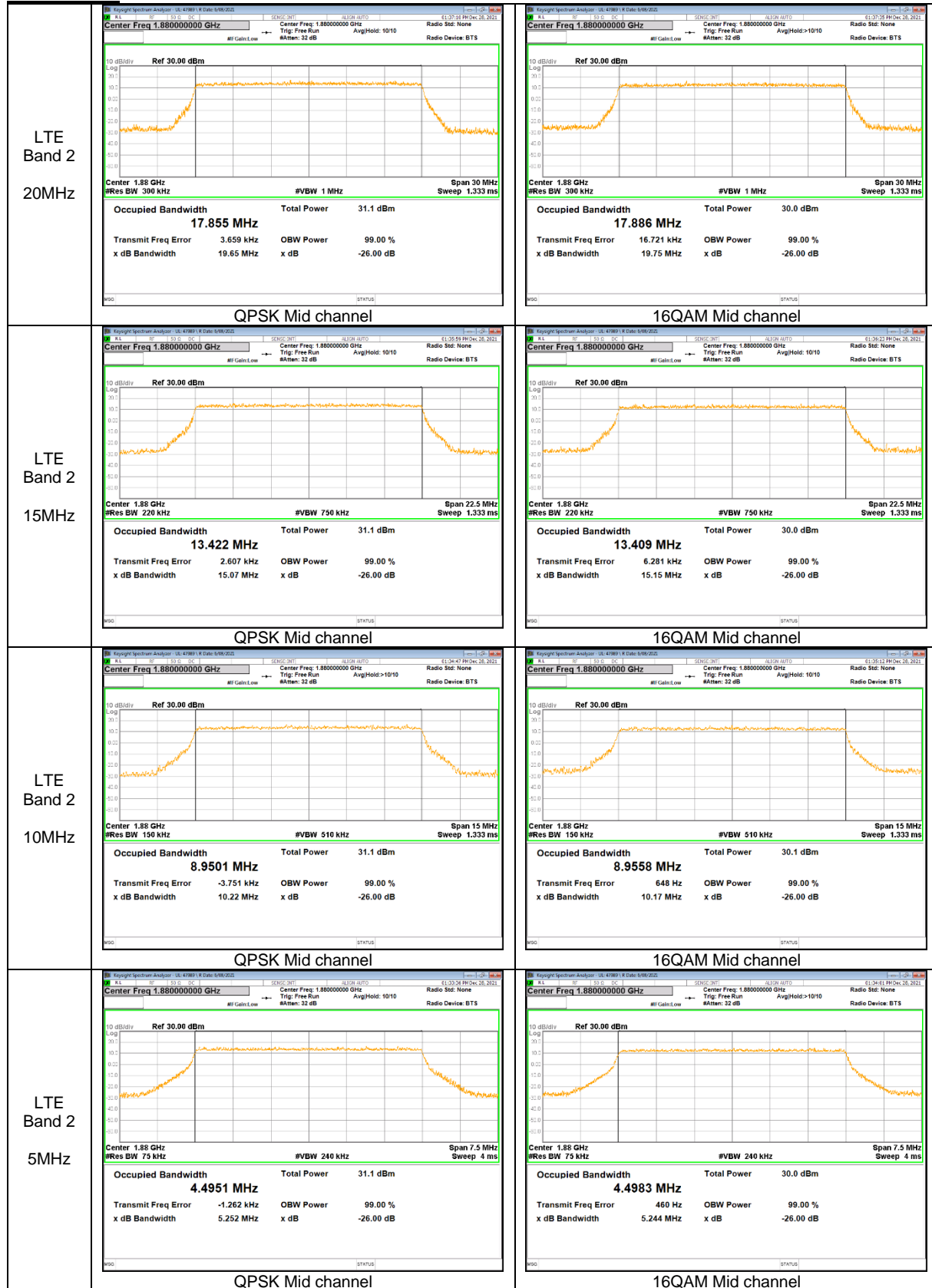
**WCDMA Band 4**



**WCDMA Band 2**



**LTE Band 2**





LTE Band 12

