



# CERTIFICATION TEST REPORT

**Report Number.** : 4790302419-E2V3

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

**Model** : SM-A136B/DSN, SM-A136B/N

**FCC ID** : A3LSMA136B

**EUT Description** : GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac 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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**TL-637**

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2022-04-01	Initial issue	Yeonhee Lim
V2	2022-04-19	Updated to address TCB's question	Yeonhee Lim
V3	2022-05-04	Add model name	Yeonhee Lim

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.

**EUT DESCRIPTION:** GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and NFC

**MODEL NUMBER:** SM-A136B/DSN, SM-A136B/N

**SERIAL NUMBER:** R3CT20631HB (CONDUCTED);  
R3CT20635PA, R3CT206350J, R3CT206378T, R3CT209QMDZ,  
R3CT209QMGB (RADIATED);

**DATE TESTED:** 2021-12-28 ~ 2022-03-23;

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 Engineer  
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(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 2(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 3(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 4(3m Full-anechoic chamber)
<input type="checkbox"/>	Chamber 5(3m Full-anechoic chamber)

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/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and NFC  
 This test report addresses the WWAN operational mode.

This report covers the Samsung models SM-A136B/DSN and SM-A136B/N.  
 These models are identical in hardware except SM-A136B/N has single SIM tray.  
 With some pre-scan, model SM-A136B/DSN 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.  
 (4790302419-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>32.00</b>	<b>1583.94</b>	<b>27.77</b>	<b>598.07</b>
		EGPRS	25.51	355.67	20.94	124.21
GSM1900	1850~1910	GPRS	<b>29.76</b>	<b>946.52</b>	<b>29.80</b>	<b>955.23</b>
		EGPRS	25.17	328.63	29.53	897.65

#### 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>24.00</b>	<b>251.39</b>	<b>19.72</b>	<b>93.71</b>
		HSDPA	23.01	199.91	18.78	75.47
Band 4	1710~1755	Rel. 99	<b>23.99</b>	<b>250.88</b>	<b>23.76</b>	<b>237.60</b>
		HSDPA	22.96	197.70	22.84	192.25
Band 2	1850~1910	Rel. 99	<b>23.96</b>	<b>248.78</b>	23.14	205.93
		HSDPA	22.97	197.97	<b>24.37</b>	<b>273.35</b>

**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>23.92</b>	<b>246.60</b>	<b>23.63</b>	<b>230.51</b>
			16QAM	22.81	191.07	22.10	162.14
			64QAM	22.00	158.42		
	1857.5 - 1902.5	15	QPSK	23.31	214.33	23.37	217.32
			16QAM	22.78	189.60	22.78	189.70
			64QAM	21.62	145.35		
	1855 - 1905	10	QPSK	23.37	217.43	22.87	193.69
			16QAM	22.80	190.66	22.02	159.26
			64QAM	21.68	147.16		
	1852.5 - 1907.5	5	QPSK	23.55	226.68	22.57	180.76
			16QAM	22.98	198.80	21.87	153.85
			64QAM	21.84	152.87		
	1851.5 - 1908.5	3	QPSK	23.36	216.96	22.59	181.60
			16QAM	22.80	190.55	21.87	153.85
			64QAM	21.66	146.59		
	1850.7 - 1909.3	1.4	QPSK	23.80	239.82	22.83	191.76
			16QAM	23.13	205.69	22.02	159.13
			64QAM	22.23	167.00		

**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	24.32	270.50	19.68	92.98
			16QAM	23.07	202.87	19.04	80.24
			64QAM	22.61	182.39		
	701.5 - 707.5	5	QPSK	<b>24.50</b>	<b>281.92</b>	<b>20.03</b>	<b>100.63</b>
			16QAM	23.95	248.31	18.53	71.35
			64QAM	22.99	198.99		
	700.5 - 714.5	3	QPSK	24.49	280.89	19.40	87.02
			16QAM	23.87	244.04	18.77	75.27
			64QAM	22.78	189.87		
	699.7 - 715.3	1.4	QPSK	24.45	278.92	19.55	90.10
			16QAM	23.83	241.82	18.02	63.35
			64QAM	22.89	194.59		



**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	23.96	249.08	18.37	68.78
			16QAM	23.31	214.13	17.43	55.39
			64QAM	22.15	164.23		
	819	10	QPSK	23.99	250.36	18.51	70.91
			16QAM	23.01	200.09	17.23	52.81
			64QAM	22.19	165.68		
	816.5 - 821.5	5	QPSK	<b>24.11</b>	<b>257.72</b>	18.57	72.02
			16QAM	23.06	202.49	17.34	54.19
			64QAM	22.37	172.53		
	815.5 - 822.5	3	QPSK	24.01	251.51	18.30	67.59
			16QAM	23.08	203.13	17.49	56.15
			64QAM	22.21	166.42		
	814.7 - 823.3	1.4	QPSK	23.99	250.68	<b>18.74</b>	<b>74.86</b>
			16QAM	23.13	205.64	17.45	55.62
			64QAM	22.13	163.41		

**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	23.77	237.966	18.94	78.34
			16QAM	22.75	188.273	17.86	61.10
			64QAM	21.58	143.880		
	829 ~ 844	10	QPSK	23.87	243.980	19.17	82.60
			16QAM	22.92	196.096	17.92	61.94
			64QAM	22.07	161.224		
	826.5 ~ 846.5	5	QPSK	<b>24.06</b>	<b>254.586</b>	<b>19.48</b>	<b>88.72</b>
			16QAM	23.17	207.585	18.06	64.03
			64QAM	22.13	163.435		
	825.5 ~ 847.5	3	QPSK	23.83	241.547	19.04	80.21
			16QAM	22.89	194.590	18.01	63.25
			64QAM	22.03	159.595		
	824.7 ~ 848.3	1.4	QPSK	23.92	246.471	19.00	79.47
			16QAM	22.97	198.012	17.89	61.52
			64QAM	22.22	166.857		

**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	23.96	249.081	<b>18.98</b>	<b>79.02</b>
			16QAM	23.31	214.128	17.63	57.91
			64QAM	22.15	164.226		
		10	QPSK	23.96	249.149	18.61	72.58
			16QAM	23.35	216.033	17.54	56.73
			64QAM	22.21	166.398		
		5	QPSK	<b>24.05</b>	<b>254.034</b>	18.97	78.86
			16QAM	23.40	218.776	17.80	60.23
			64QAM	22.38	172.841		
		3	QPSK	23.98	249.781	18.58	72.08
			16QAM	23.31	214.315	17.40	54.93
			64QAM	22.16	164.552		
		1.4	QPSK	23.95	248.044	18.79	75.65
			16QAM	23.10	203.981	17.41	55.06
			64QAM	22.32	170.570		

**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>23.71</b>	<b>234.77</b>	23.42	220.03
			16QAM	22.72	187.16	22.40	173.97
			64QAM	21.92	155.76		
	2503.5 - 2682.5	15	QPSK	23.60	229.09	23.52	23.52
			16QAM	22.48	176.82	22.40	173.84
			64QAM	21.76	150.09		
	2501 - 2685	10	QPSK	23.57	227.50	23.48	222.63
			16QAM	22.43	175.03	22.06	160.54
			64QAM	21.95	156.70		
	2498.5 - 2687.5	5	QPSK	23.45	221.18	<b>23.84</b>	<b>242.19</b>
			16QAM	22.34	171.26	22.10	162.24
			64QAM	21.98	157.63		

**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	24.27	267.02	22.75	188.15
			16QAM	23.48	222.84	22.18	165.01
			64QAM	22.49	177.42		
	1717.5 - 1772.5	15	QPSK	23.81	240.26	22.99	199.28
			16QAM	23.09	203.83	21.98	157.93
			64QAM	22.44	175.39		
	1715 - 1775	10	QPSK	23.81	240.64	23.13	205.74
			16QAM	22.82	191.54	22.28	169.17
			64QAM	22.19	165.75		
	1712.5 - 1777.5	5	QPSK	23.97	249.50	<b>23.19</b>	<b>208.37</b>
			16QAM	23.29	213.07	22.34	171.33
			64QAM	22.12	163.10		
	1711.5 - 1778.5	3	QPSK	23.87	243.55	23.07	202.56
			16QAM	22.80	190.55	22.37	172.40
			64QAM	22.23	166.95		
	1710.7 - 1779.3	1.4	QPSK	<b>24.49</b>	<b>281.19</b>	22.31	170.13
			16QAM	23.49	223.44	21.45	139.56
			64QAM	22.48	177.15		

**NR Band n5**

Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Mode	Conducted		Radiated	
					Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
n5	834 - 839	20	DFT-s OFDM	$\pi/2$ BPSK	24.16	260.62	19.07	80.63
				QPSK	24.14	259.42		
				16QAM	23.13	205.59	17.66	58.28
				64QAM	22.01	158.85		
			256QAM	20.08	101.86			
	CP-OFDM	QPSK	22.78	189.67				
	831.5 - 841.5	15	DFT-s OFDM	$\pi/2$ BPSK	24.07	255.27	<b>19.13</b>	<b>81.84</b>
				QPSK	23.97	249.46		
				16QAM	23.07	202.77	17.98	79.23
				64QAM	21.74	149.28		
			256QAM	19.88	97.27			
	CP-OFDM	QPSK	22.44	175.39				
	829 - 844	10	DFT-s OFDM	$\pi/2$ BPSK	<b>23.83</b>	<b>241.55</b>	19.07	69.98
				QPSK	23.82	240.99		
				16QAM	23.27	212.32	17.73	80.73
				64QAM	21.71	148.25		
			256QAM	19.92	98.17			
	CP-OFDM	QPSK	22.32	170.61				
	826.5 - 846.5	5	DFT-s OFDM	$\pi/2$ BPSK	24.26	266.69	19.09	58.94
				QPSK	24.25	266.07		
16QAM				23.40	218.78	17.70	80.70	
64QAM				22.07	161.06			
256QAM			20.15	103.51				
CP-OFDM	QPSK	22.61	182.39					

**NR Band n41**

FCC Part 27										
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Mode	Conducted		Radiated			
					Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]		
n41	2546.0-2640.0	100	DFT-s OFDM	$\pi/2$ BPSK	23.16	207.01	22.74	187.95		
				QPSK	23.14	206.06				
				16QAM	21.06	127.64	21.03	126.78		
				64QAM	19.62	91.62				
			256QAM	17.38	54.70					
			CP-OFDM	QPSK	20.23	105.44				
			2541.0-2645.0	90	DFT-s OFDM	$\pi/2$ BPSK	22.50	177.83	22.47	176.80
						QPSK	22.52	178.65		
	16QAM	21.01				126.18	20.96	124.88		
	64QAM	19.70				93.33				
	256QAM	17.72			59.16					
	CP-OFDM	QPSK			20.57	114.02				
	2536.0-2650.0	80			DFT-s OFDM	$\pi/2$ BPSK	22.68	185.35	22.52	178.78
						QPSK	22.53	179.06		
			16QAM	21.76		149.97	21.66	146.72		
			64QAM	21.34		136.14				
			256QAM	20.95	124.45					
			CP-OFDM	QPSK	20.95	124.45				
			2526.0-2660.0	60	DFT-s OFDM	$\pi/2$ BPSK	23.02	200.45	<b>22.80</b>	<b>190.76</b>
						QPSK	23.05	201.84		
	16QAM	21.55				142.89	21.46	140.12		
	64QAM	20.02				100.46				
	256QAM	18.34			68.23					
	CP-OFDM	QPSK			21.79	151.01				
	2521.0-2665.0	50			DFT-s OFDM	$\pi/2$ BPSK	23.04	201.37	22.19	165.61
						QPSK	23.10	204.17		
			16QAM	21.87		153.82	21.55	142.92		
			64QAM	20.22		105.20				
			256QAM	18.36	68.55					
			CP-OFDM	QPSK	21.32	135.52				
			2516.0-2670.0	40	DFT-s OFDM	$\pi/2$ BPSK	23.10	204.17	22.11	162.44
						QPSK	23.10	204.17		
	16QAM	21.41				138.36	21.36	136.68		
	64QAM	19.97				99.31				
	256QAM	17.91			61.80					
	CP-OFDM	QPSK			20.83	121.06				
	2511.0-2675.0	30			DFT-s OFDM	$\pi/2$ BPSK	22.97	198.15	22.33	170.82
						QPSK	22.99	199.07		
			16QAM	21.67		146.89	21.69	147.42		
			64QAM	20.34		108.14				
			256QAM	18.39	69.02					
			CP-OFDM	QPSK	21.21	132.13				
			2506.0-2680.0	20	DFT-s OFDM	$\pi/2$ BPSK	23.03	200.91	22.79	190.27
						QPSK	<b>23.21</b>	<b>209.41</b>		
	16QAM	21.89				154.53	21.78	150.79		
	64QAM	20.39				109.40				
	256QAM	18.67			73.62					
	CP-OFDM	QPSK			21.41	138.36				
	2503.5-2683.5	15			DFT-s OFDM	$\pi/2$ BPSK	23.04	201.37	22.61	182.44
						QPSK	23.04	201.37		
			16QAM	21.97		157.40	21.43	139.03		
			64QAM	20.38		109.14				
256QAM			18.82	76.21						
CP-OFDM			QPSK	21.42	138.68					
2501.0-2685.0			10	DFT-s OFDM	$\pi/2$ BPSK	23.04	201.37	21.90	154.77	
					QPSK	23.02	200.45			
	16QAM	21.96			157.04	21.50	141.15			
	64QAM	20.42			110.15					
	256QAM	18.52		71.12						
	CP-OFDM	QPSK		21.46	139.96					

---

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

Frequency (MHz)	Peak Gain (dBi)
GSM1900 / WCDMA Band 2 / LTE Band 2 1850 ~ 1915 MHz	-0.06
WCDMA Band 4 / LTE Band 4 / LTE Band 66 1710 ~ 1780 MHz	-0.49
GSM850 / WCDMA Band 5 / LTE Band 5 / LTE Band 26 / NR Band n5 814 ~ 849 MHz	-3.77
LTE Band 12 / LTE Band 17 699 ~ 716 MHz	-4.7
LTE Band 41 / NR Band n41 2496 ~ 2690 MHz	2.83

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## 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 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.

For all 5G NR 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  $\pi/2$  BPSK, QPSK, 16QAM, 64QAM and 256QAM modulations. It was found that BPSK and 16QAM results were worst case. SA modes was tested and worst case is reported.

### **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.

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	49
	1900.0		1	0
12	701.5	5	1	12
	707.5		1	0
	713.5		1	0
26 (Part 90)	816.5	5	1	24
	821.5		1	24
26 (Straddle)	824.0	5	1	0
26 (Part 22)	826.5	5	1	0
	831.5		1	0
	846.5		1	0
41	2506.0	20	1	49
	2593.0		1	49
	2680.0		1	99
66	1720.0	20	1	99
	1745.0		1	49
	1770.0		1	49

Highest power setting for each bands				
LTE Band	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
5	826.5	5	1	1
	836.5		1	1
	846.5		1	1
41	2546.0	100	1	137
	2593.0		1	137
	2640.0		1	137



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 B26	O	-	-	O	-	-
LTE B41	O	-	-	-	-	O
LTE B66	O	-	-	-	-	O
NR n5	O	-	-	-	O	-
NR n41	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-TA800	R37MANQ1E72SE3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02115A BWE	N/A
Charger	SAMSUNG	EP-TA200	R37KC6F39T1SE3	N/A
Data Cable	SAMSUNG	EP-DR140AWE	GH39-01999A	N/A
Earphone	SAMSUNG	GH59-15055A	EHS64AVFWE	N/A

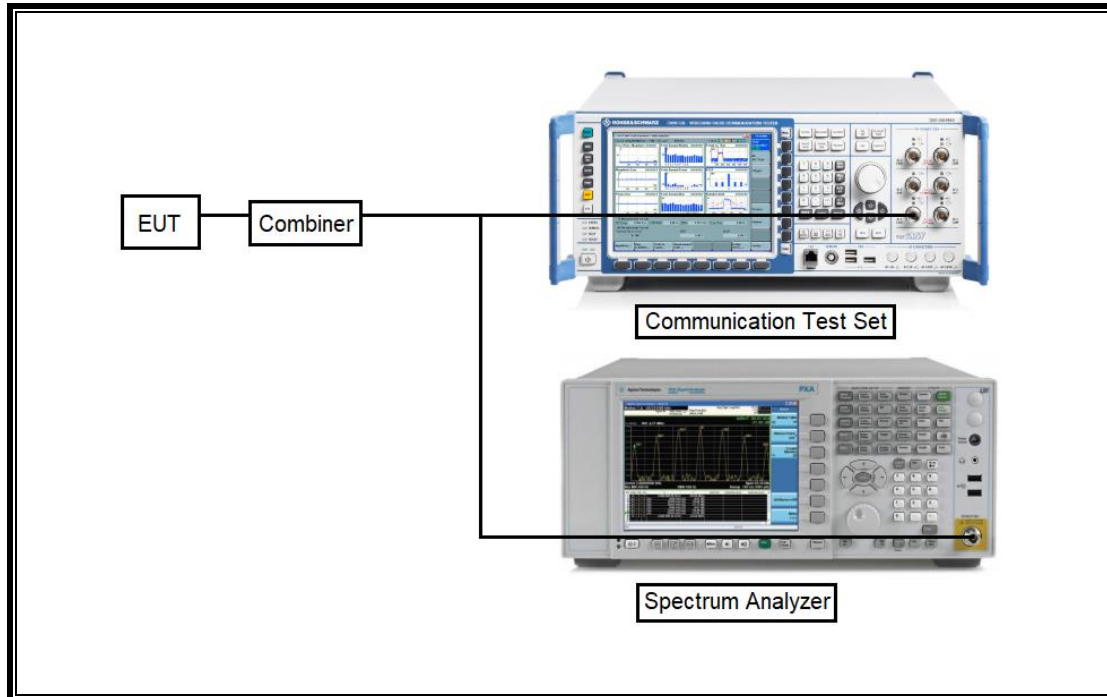
**I/O CABLE**

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C to C Type	Shielded	1.0 m	N/A
2	DC Power	1	A to C Type	Shielded	1.0 m	N/A
3	Audio	2	Mini-jack	Unshielded	0.7 m	N/A

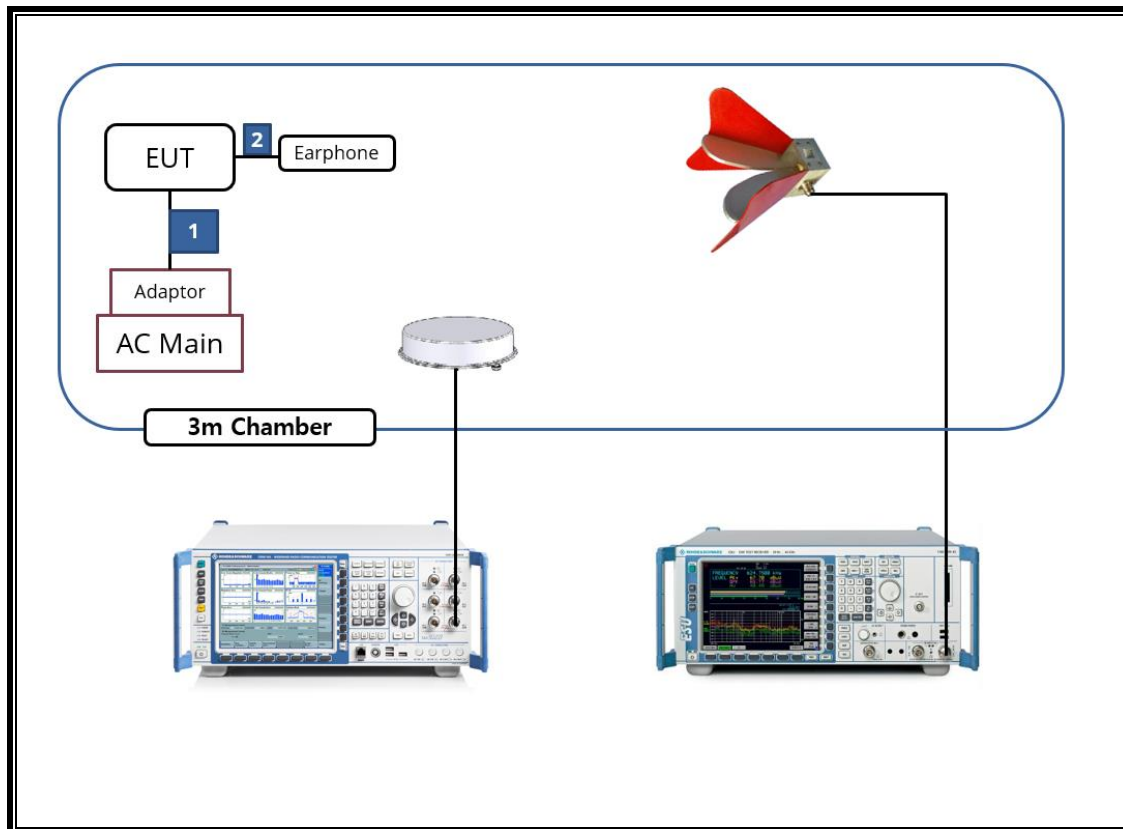
**TEST SETUP**

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	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
UXM 5G Wireless Test Platform	KEYSIGHT	E7515B	MY58120110	2023-01-07
UL Software				
Description	Manufacturer	Model	Version	
Antenna port test software	UL	CLT	Ver 3.4	
Radiated software	UL	UL EMC	Ver 9.5	
Antenna port test software (5G NR FR1)	UL	UL iM	Ver 1.06	

## 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(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 (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.

### NOTE

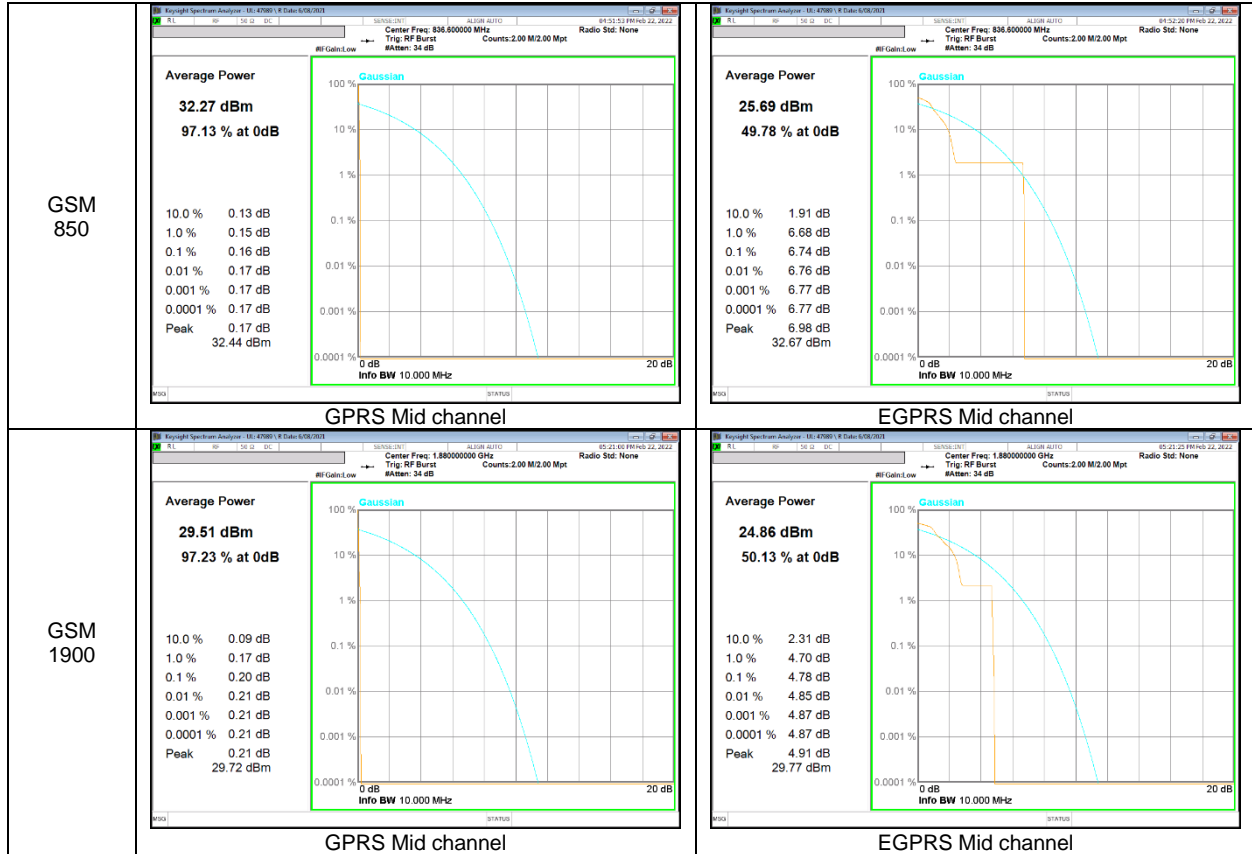
5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) and modulations ( $\pi/2$  BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

### RESULTS

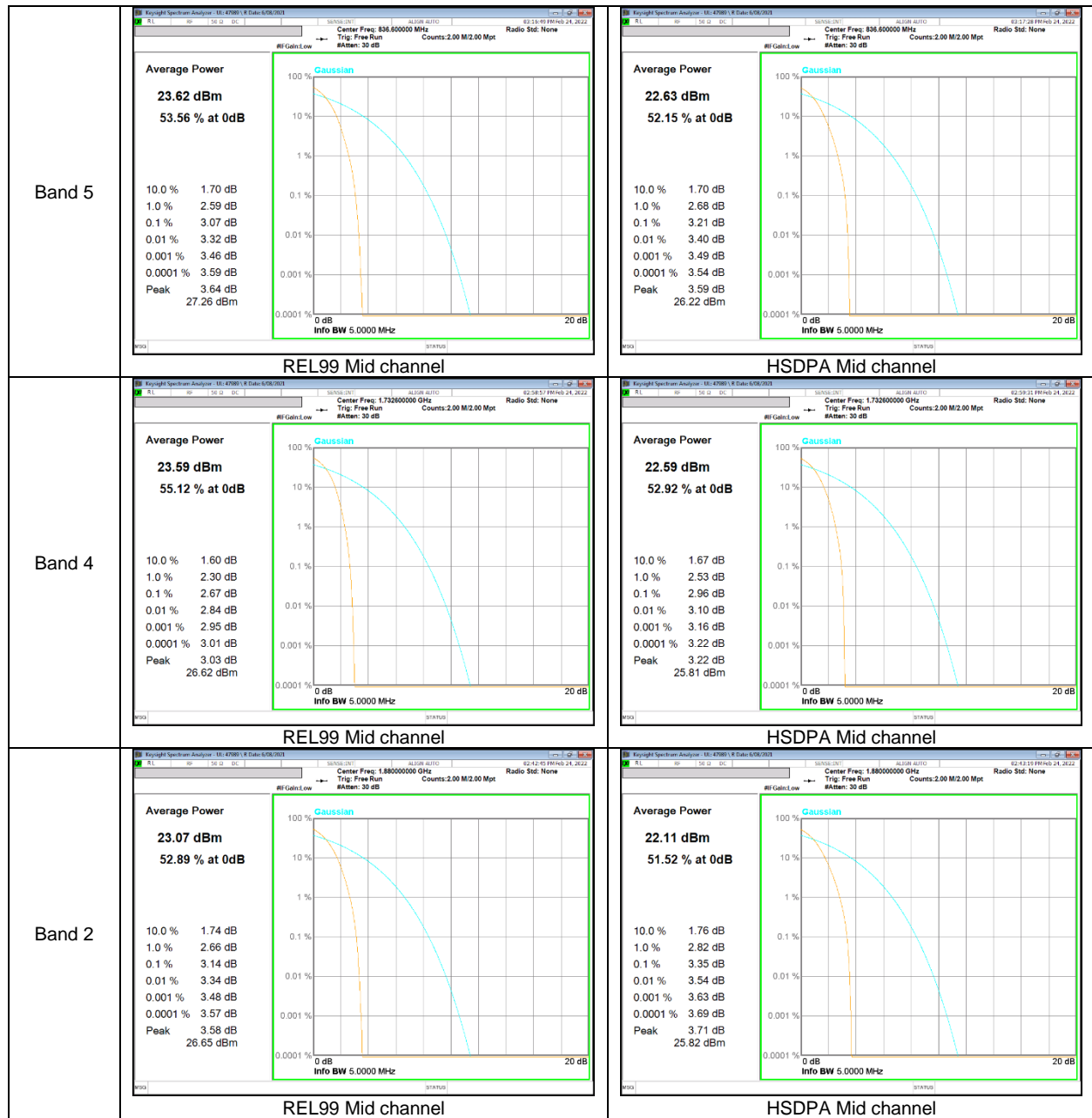
See the following pages.

## 8.1. CONDUCTED PEAK TO AVERAGE RESULT

### GSM

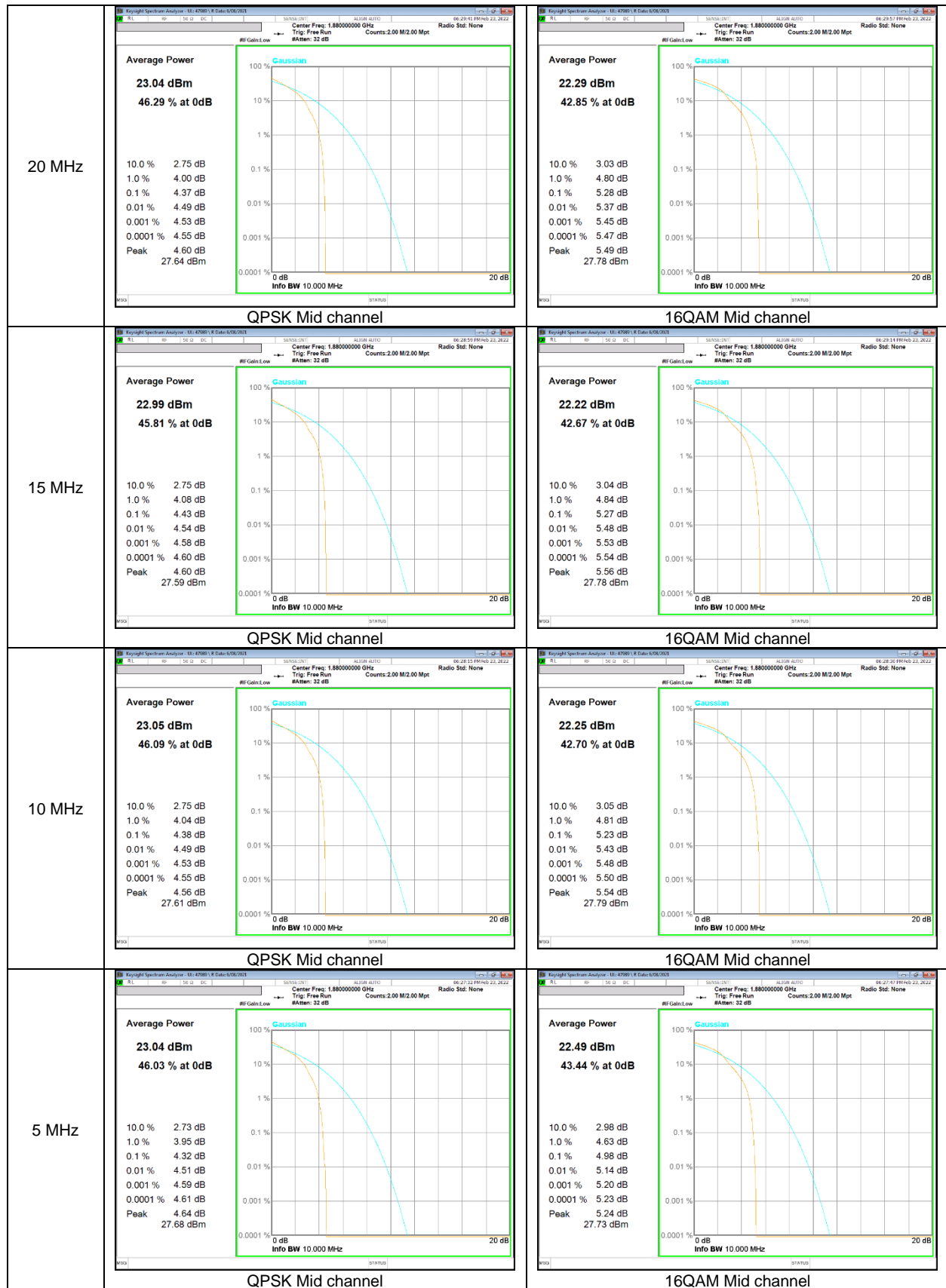


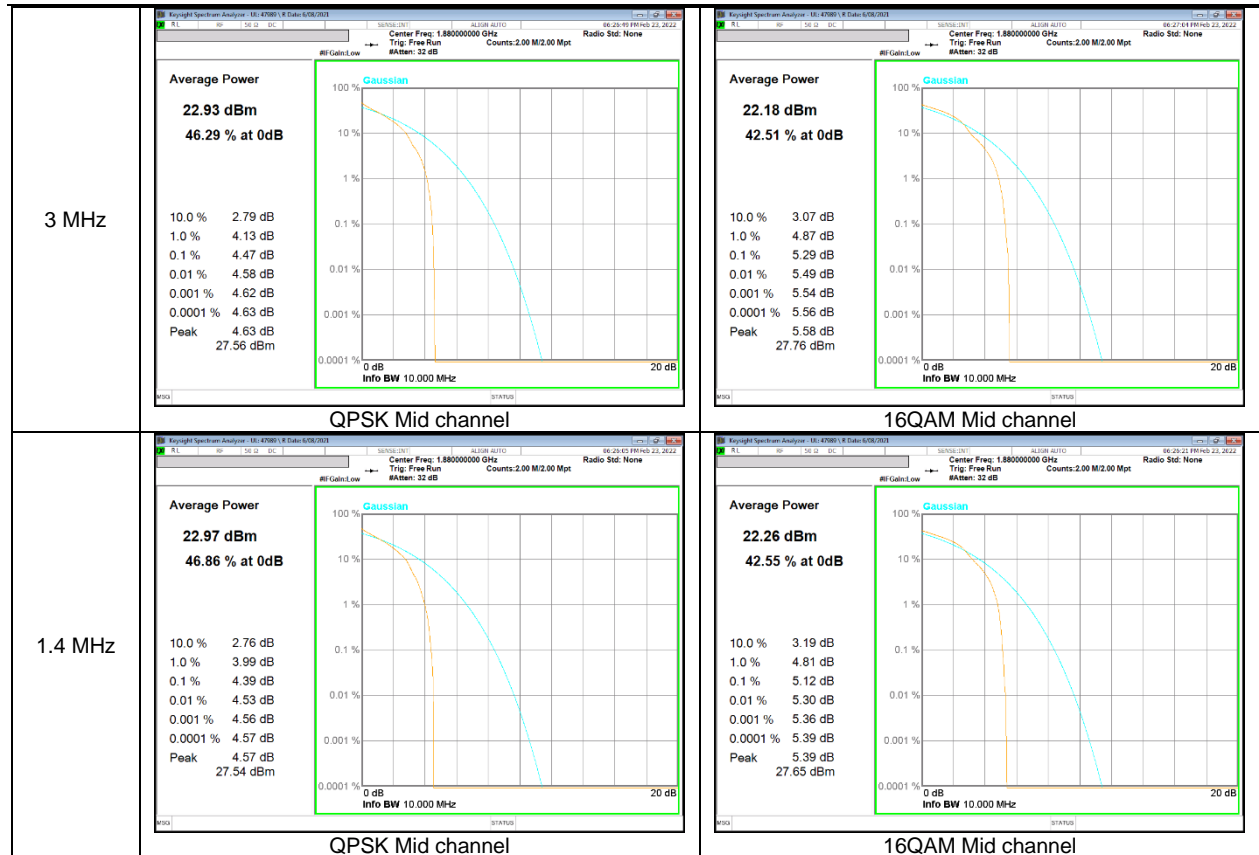
**WCDMA**



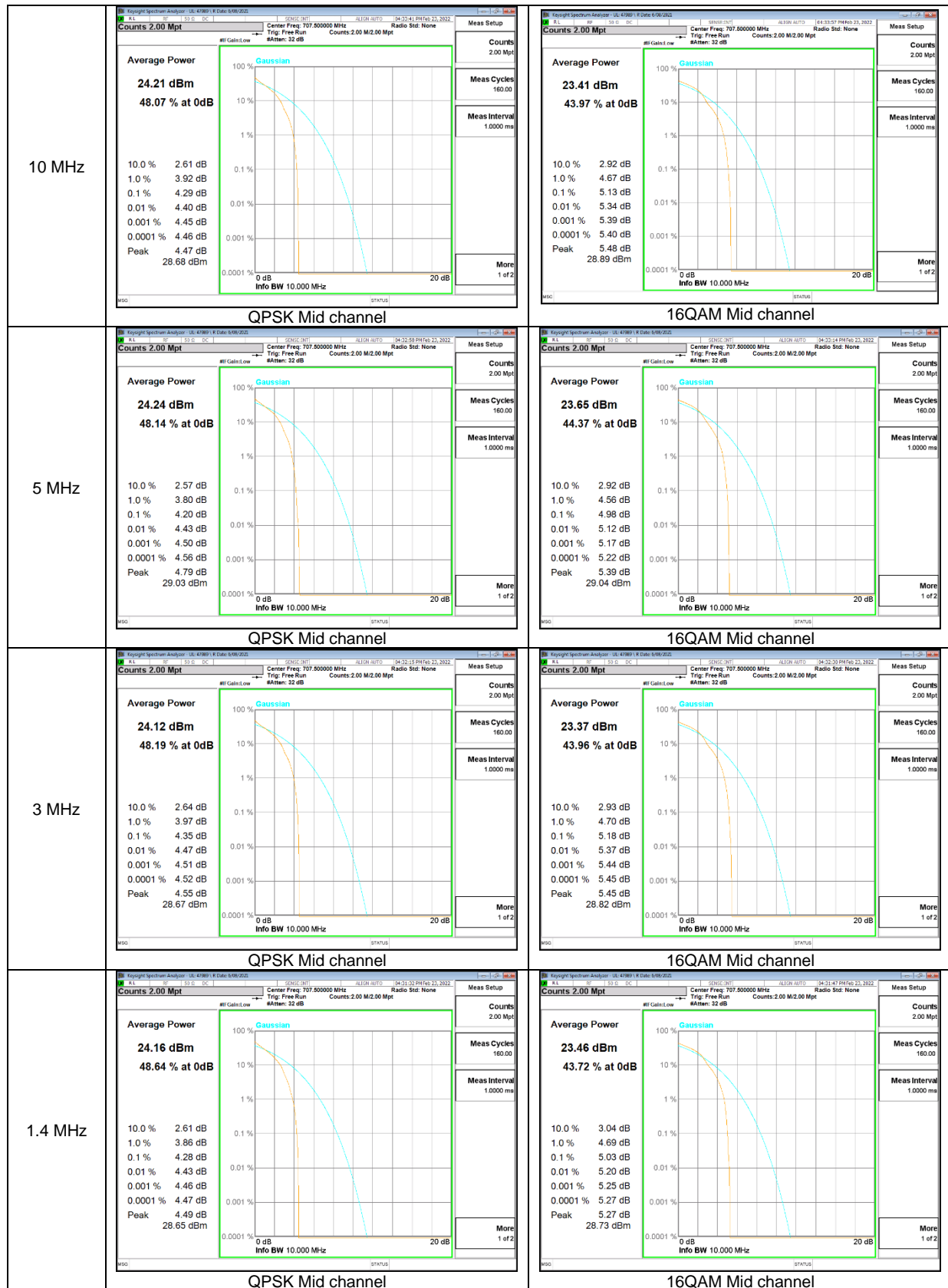


**LTE Band 2**

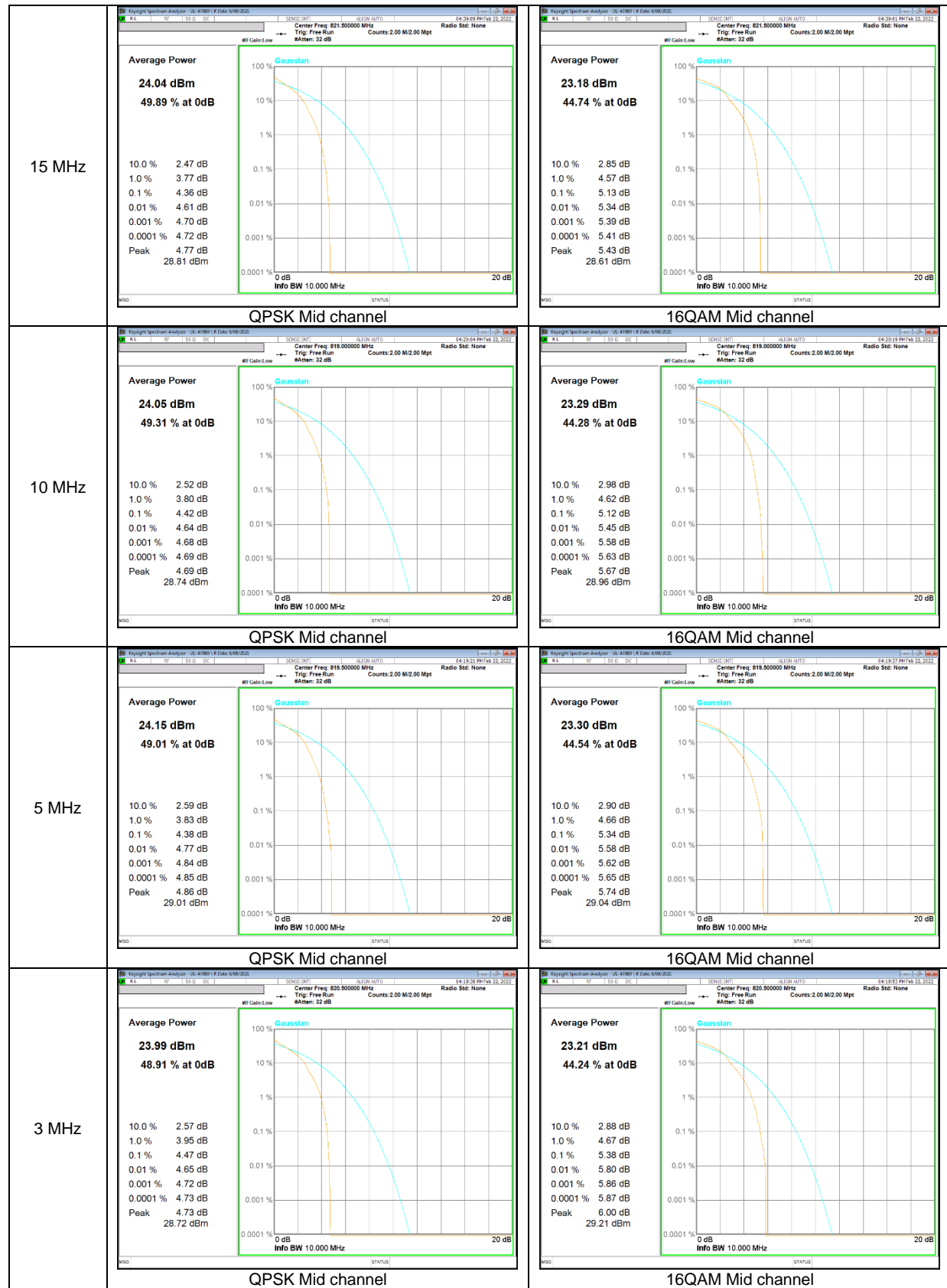


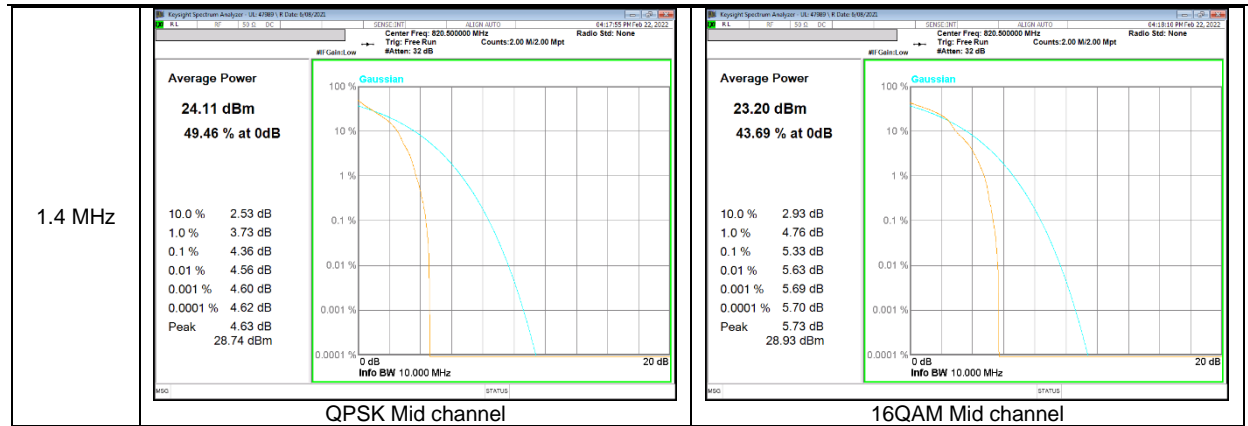


**LTE Band 12**

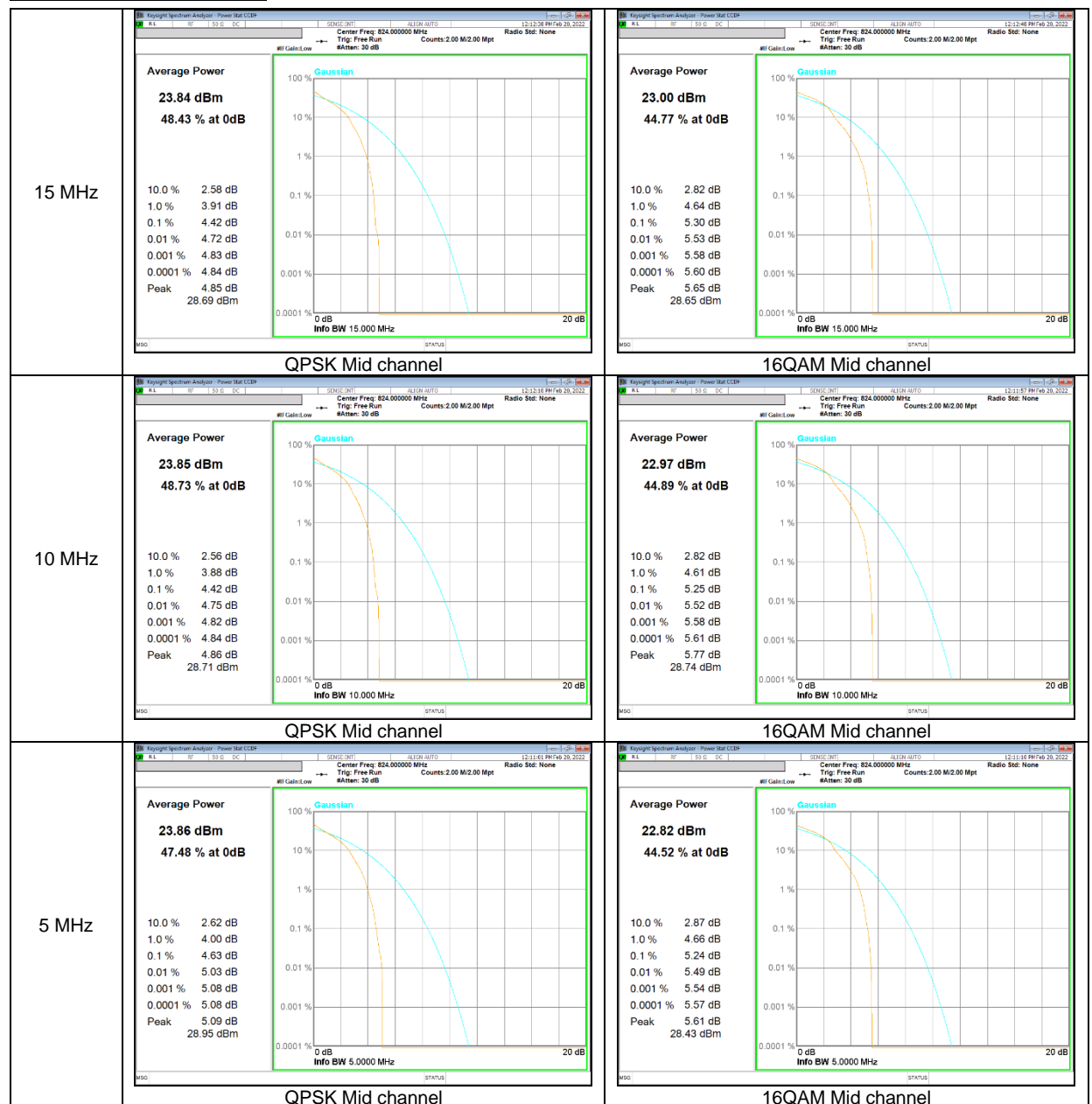


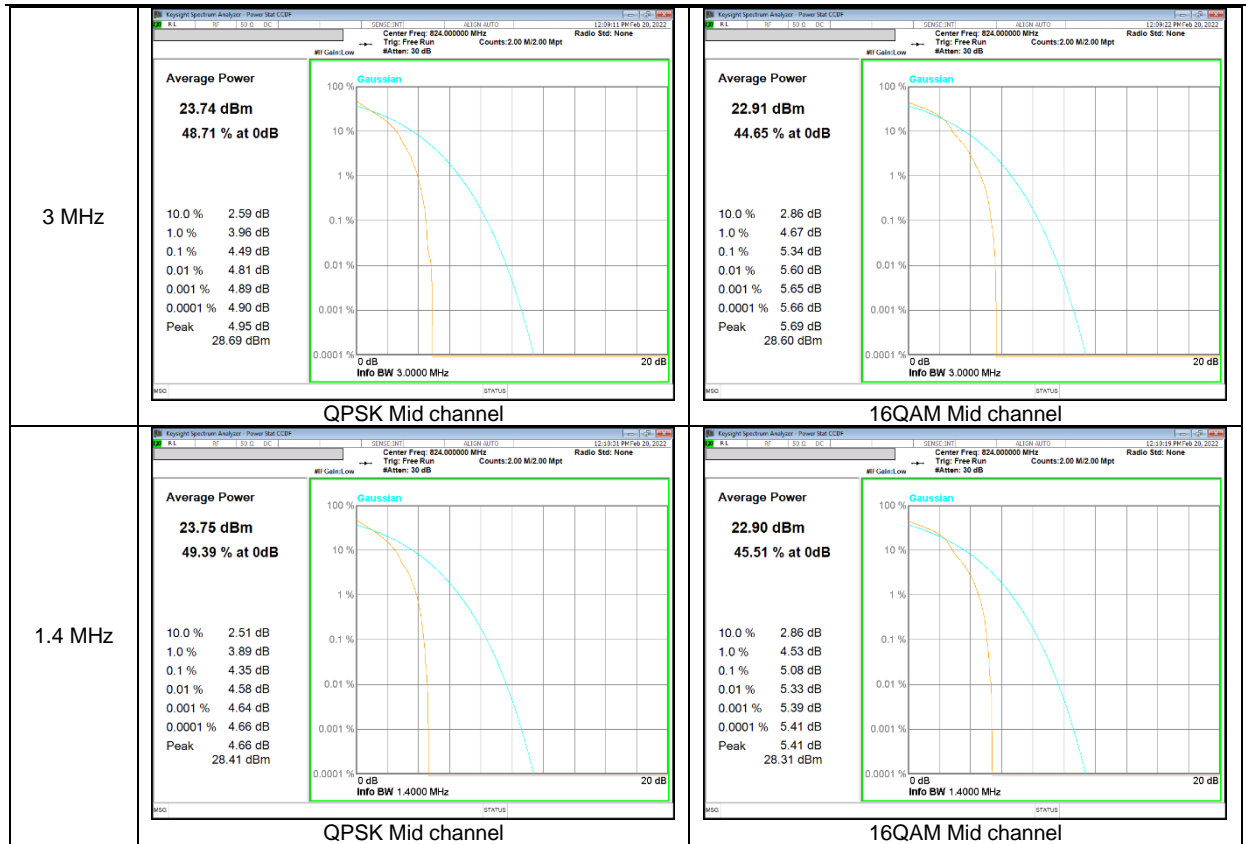
**LTE Band 26 (Part 90)**



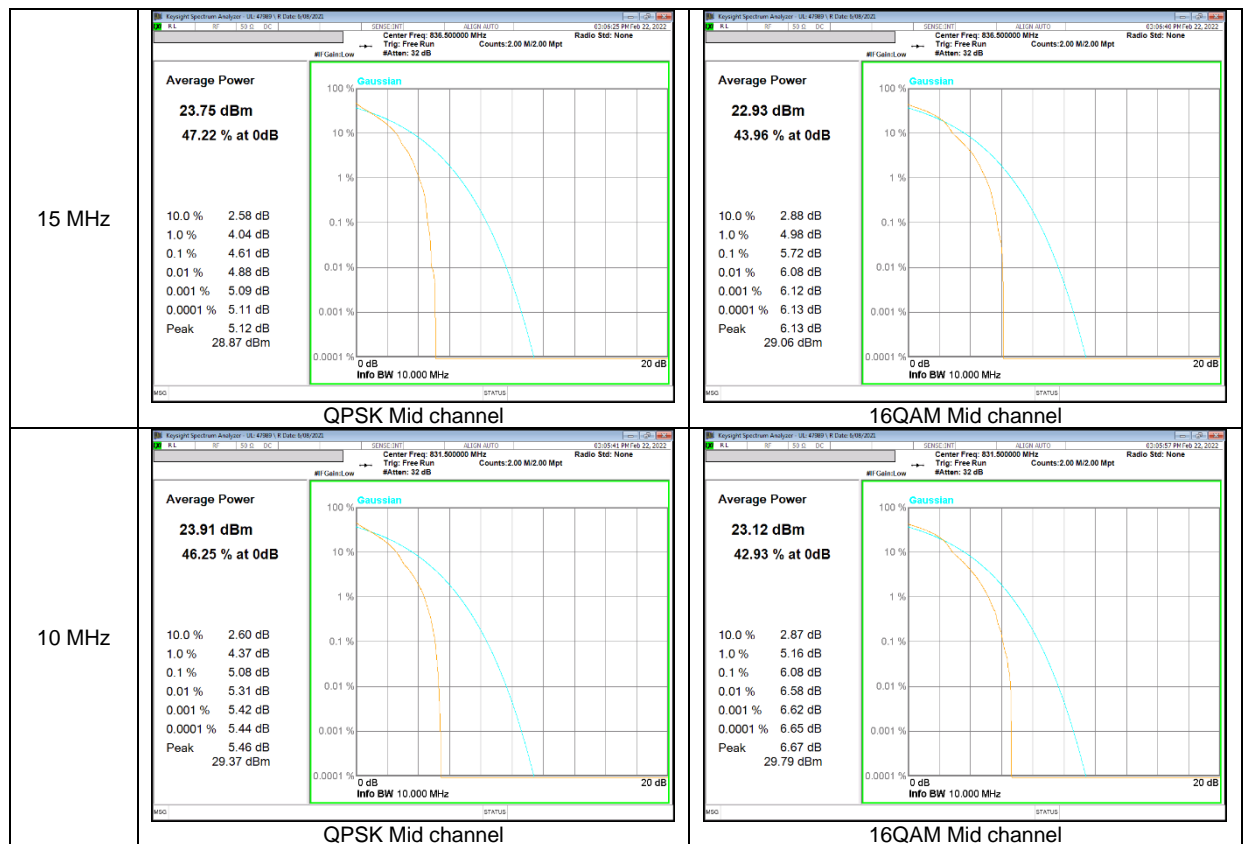


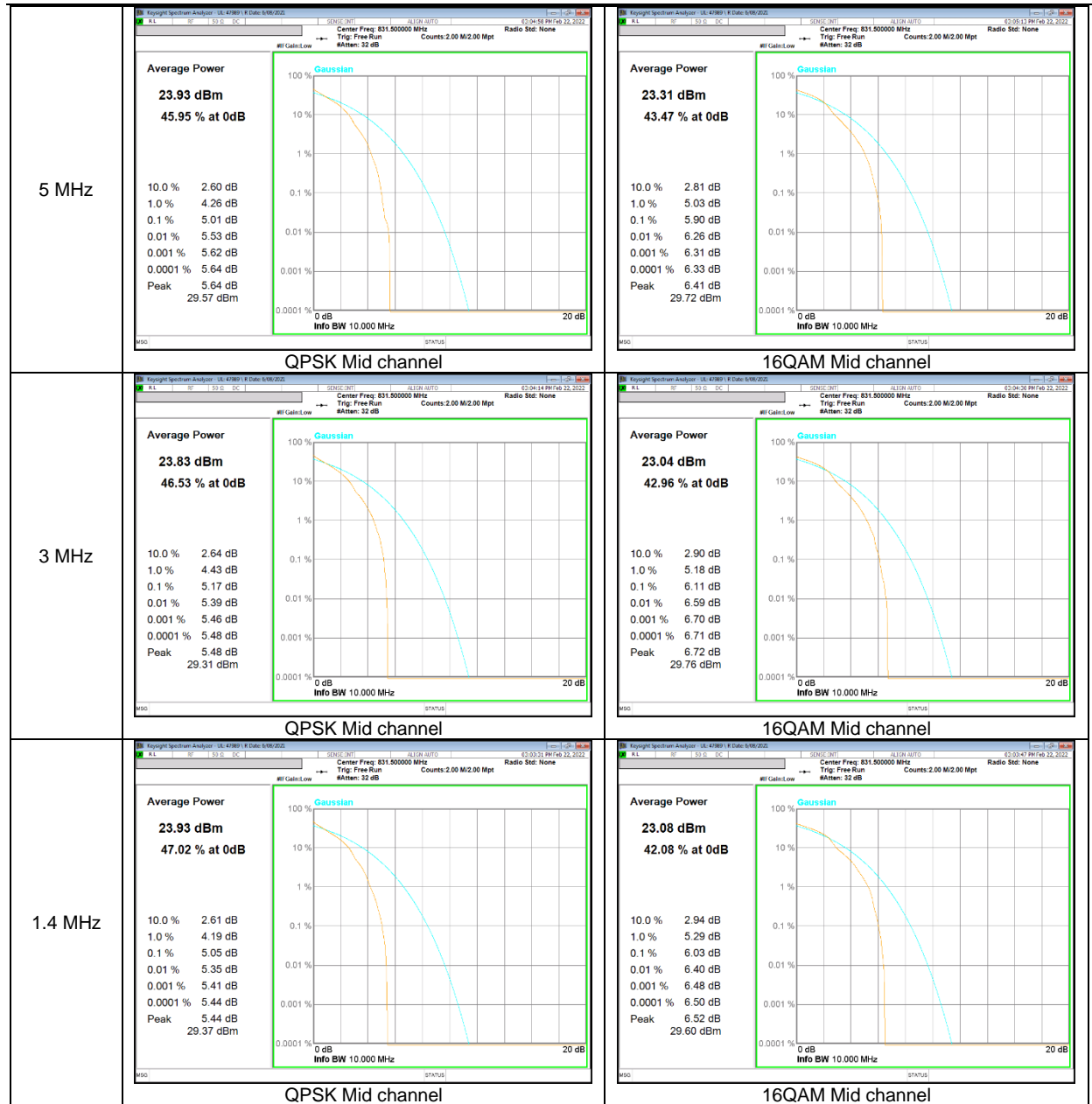
**LTE Band 26 (Straddle)**



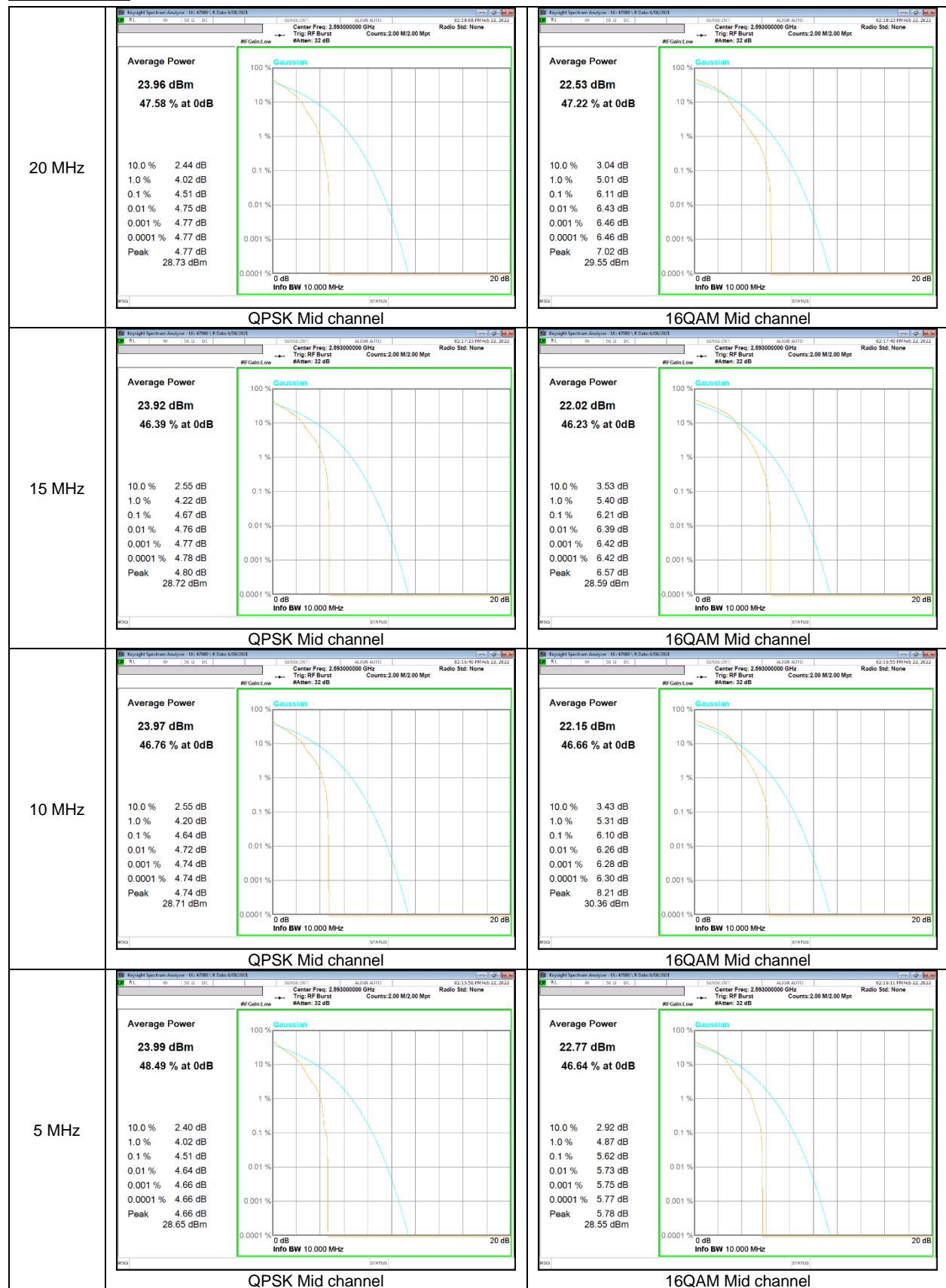


**LTE Band 26 (Part 22)**





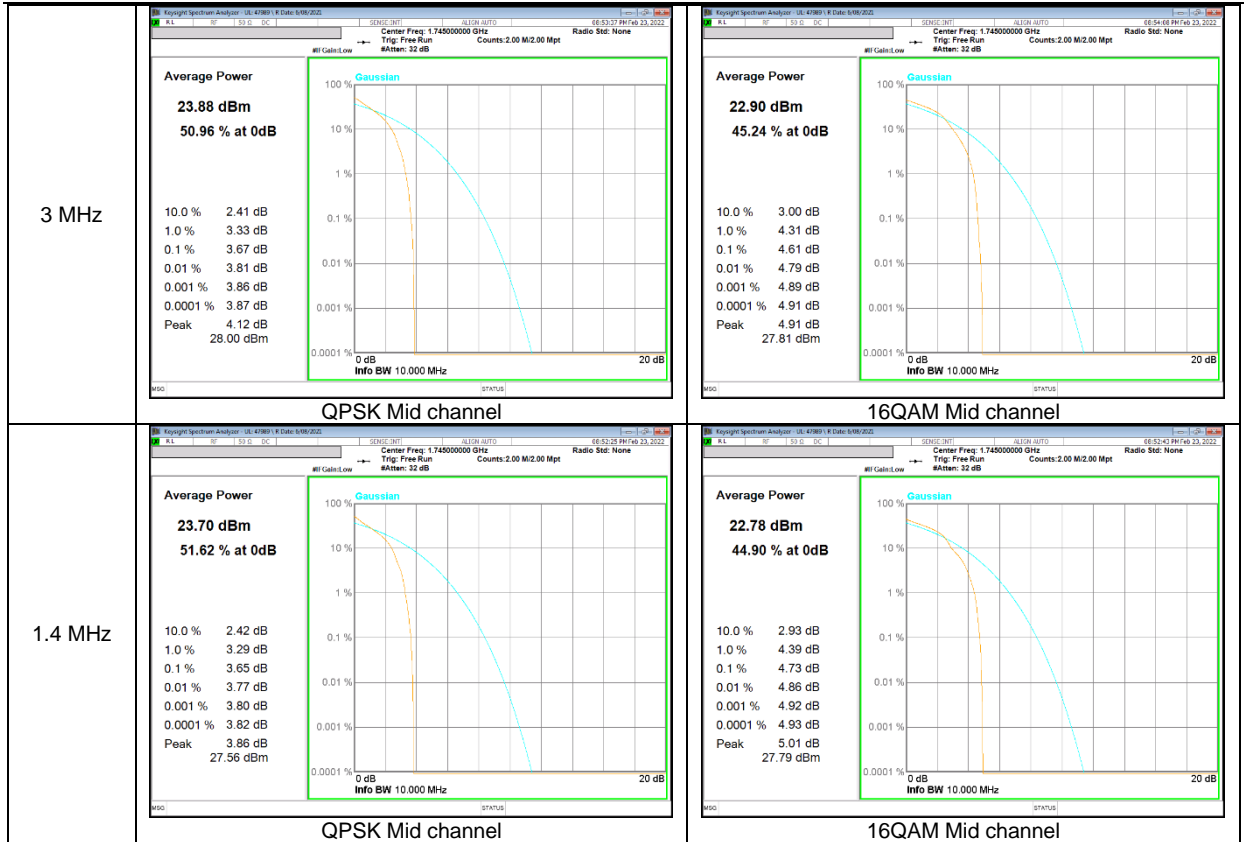
**LTE Band 41**



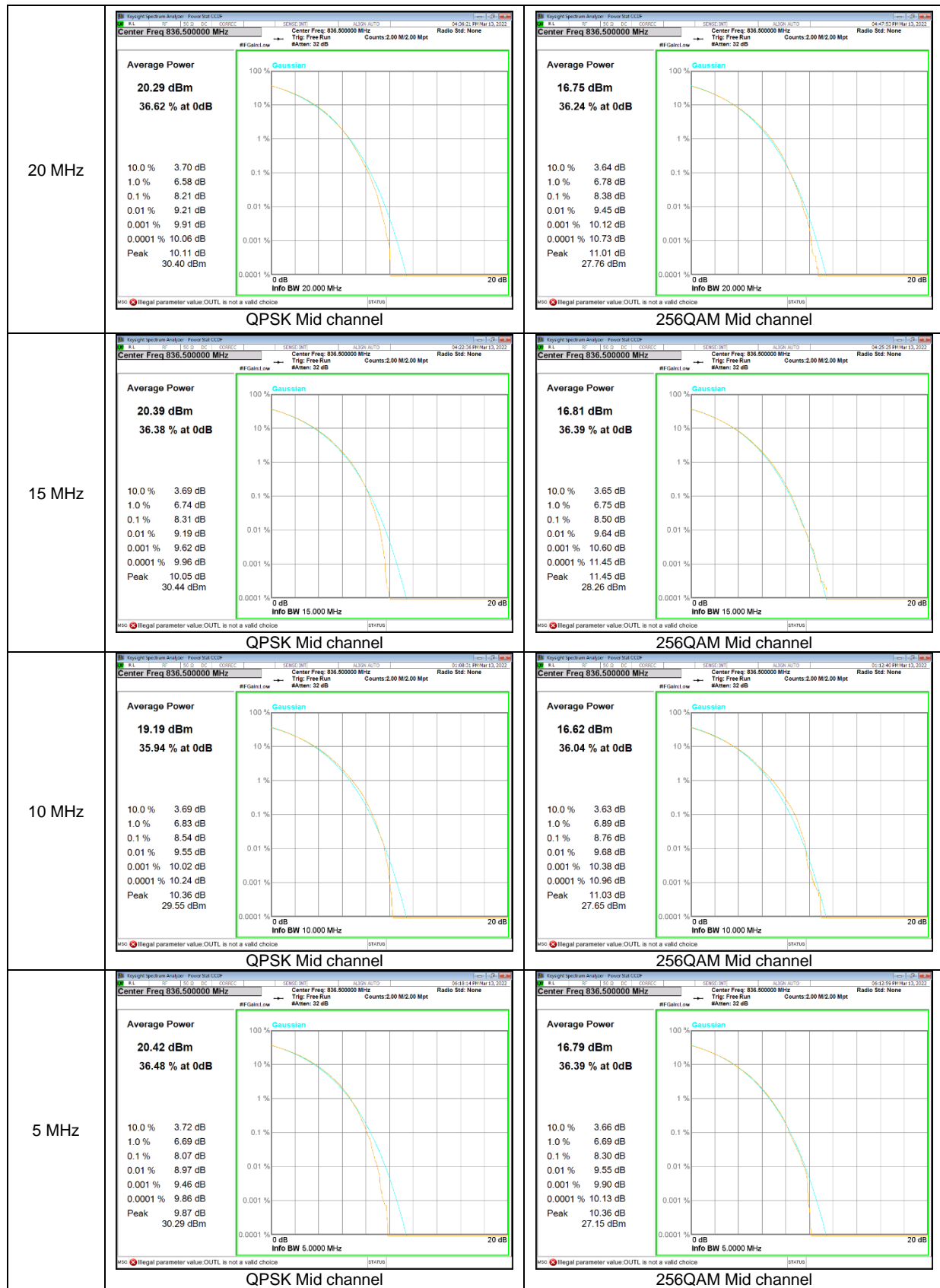


**LTE Band 66**

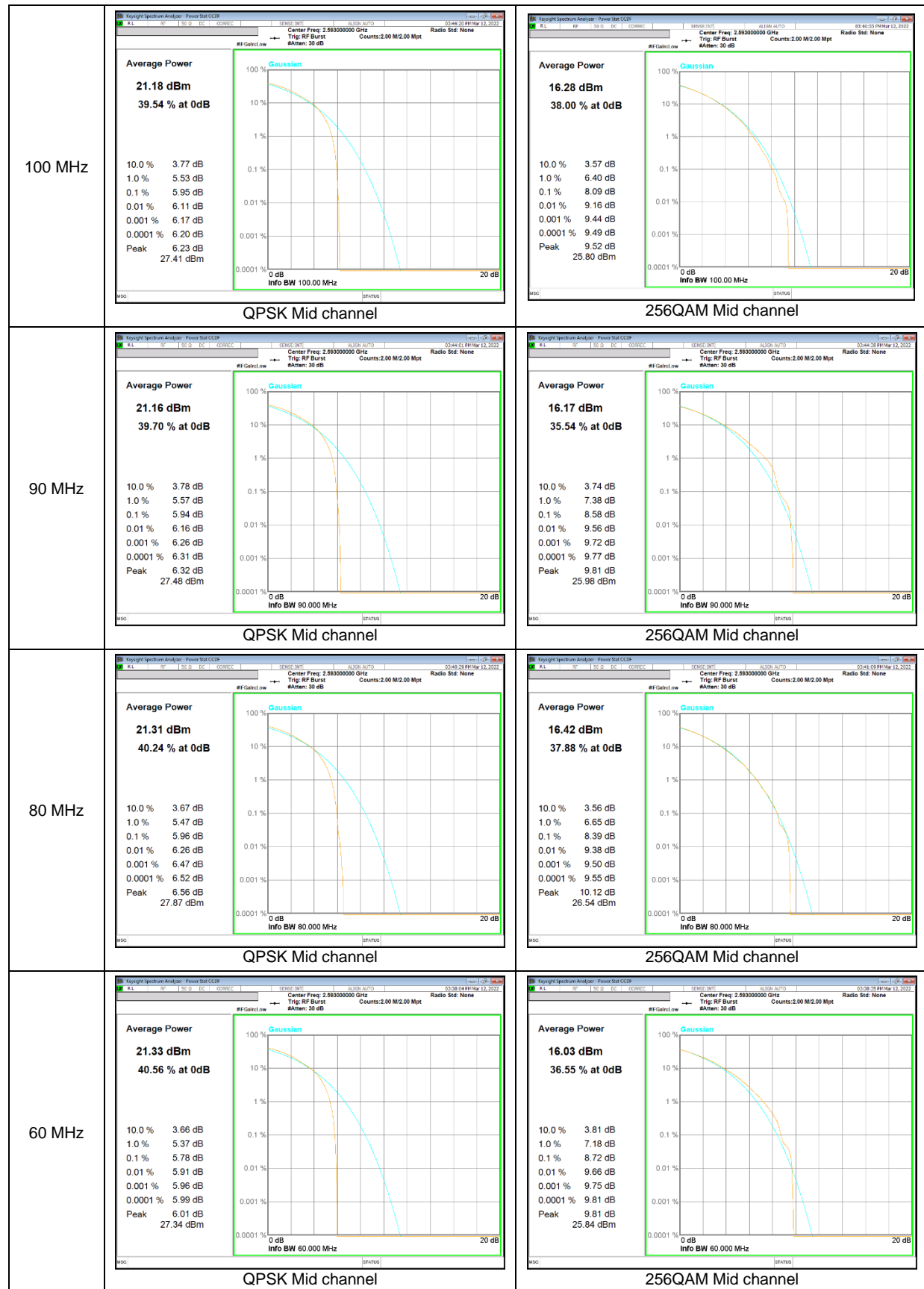




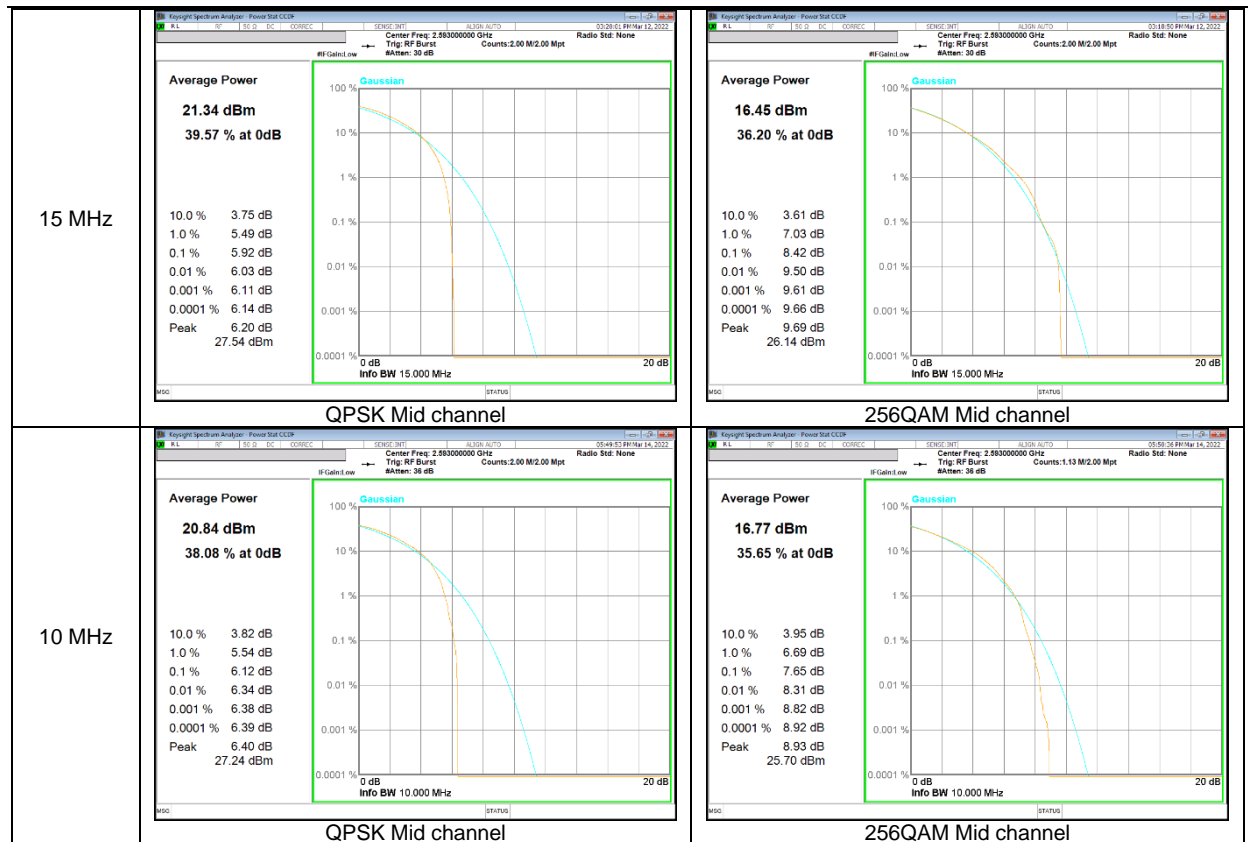
**NR Band n5 CP-OFDM**



**NR Band n41 CP-OFDM**







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## 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	241.6	318.8
	EGPRS		245.6	297.5
1900	GPRS	1880.0	243.2	322.0
	EGPRS		246.6	309.4

**- WCDMA**

Band	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
B5	Rel.99	836.6	4.150	4.642
	HSDPA		4.166	4.634
B4	Rel.99	1732.6	4.158	4.682
	HSDPA		4.149	4.675
B2	Rel.99	1880.0	4.146	4.648
	HSDPA		4.156	4.636



**- LTE Band 2**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B2	20M	QPSK	1880.0	17.883	19.050
		16QAM		17.886	19.240
	15M	QPSK	1880.0	13.417	14.460
		16QAM		13.421	14.530
	10M	QPSK	1880.0	8.975	9.749
		16QAM		8.943	9.580
	5M	QPSK	1880.0	4.486	4.915
		16QAM		4.485	4.888
	3M	QPSK	1880.0	2.685	2.914
		16QAM		2.685	2.935
	1.4M	QPSK	1880.0	1.089	1.303
		16QAM		1.094	1.292

**- LTE Band 12**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B12	10M	QPSK	707.5	8.968	9.657
		16QAM		8.946	9.685
	5M	QPSK	707.5	4.483	4.913
		16QAM		4.477	4.896
	3M	QPSK	707.5	2.688	2.910
		16QAM		2.682	2.939
	1.4M	QPSK	707.5	1.089	1.304
		16QAM		1.092	1.299

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

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26	15M	QPSK	821.5	13.396	14.520
		16QAM		13.399	14.410
	10M	QPSK	819.0	8.956	9.648
		16QAM		8.962	9.709
	5M	QPSK	819.5	4.486	4.874
		16QAM		4.470	4.852
	3M	QPSK	820.5	2.688	2.921
		16QAM		2.682	2.922
	1.4M	QPSK	820.5	1.088	1.272
		16QAM		1.091	1.293

**- LTE Band 26 (Straddle)**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26	15M	QPSK	824.0	13.411	14.620
		16QAM		13.393	14.420
	10M	QPSK		8.957	9.752
		16QAM		8.960	9.576
	5M	QPSK		4.491	4.904
		16QAM		4.481	4.870
	3M	QPSK		2.693	2.926
		16QAM		2.690	2.923
	1.4M	QPSK		1.083	1.266
		16QAM		1.090	1.296

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

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26	15M	QPSK	836.5	13.411	14.400
		16QAM		13.388	14.450
	10M	QPSK	831.5	8.959	9.732
		16QAM		8.949	9.730
	5M	QPSK	831.5	4.482	4.907
		16QAM		4.481	4.932
	3M	QPSK	831.5	2.688	2.896
		16QAM		2.682	2.932
	1.4M	QPSK	831.5	1.080	1.273
		16QAM		1.084	1.281

**- LTE Band 41**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B41	20M	QPSK	2593.0	17.875	19.990
		16QAM		17.869	19.170
	15M	QPSK	2593.0	13.406	14.500
		16QAM		13.431	14.710
	10M	QPSK	2593.0	8.976	9.939
		16QAM		8.957	9.813
	5M	QPSK	2593.0	4.494	5.168
		16QAM		4.483	4.917

**- LTE Band 66**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B66	20M	QPSK	1745.0	17.867	19.060
		16QAM		17.915	19.910
	15M	QPSK	1745.0	13.426	14.630
		16QAM		13.436	14.410
	10M	QPSK	1745.0	8.963	9.788
		16QAM		8.975	9.695
	5M	QPSK	1745.0	4.479	4.867
		16QAM		4.473	4.876
	3M	QPSK	1745.0	2.684	2.916
		16QAM		2.687	2.933
	1.4M	QPSK	1745.0	1.081	1.282
		16QAM		1.086	1.311

**- NR Band n5 CP-OFDM**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n5	20M	QPSK	836.5	18.910	19.880
		16QAM		18.895	19.820
	15M	QPSK	836.5	14.142	14.780
		16QAM		14.105	14.850
	10M	QPSK	836.5	9.292	9.882
		16QAM		9.272	9.847
	5M	QPSK	836.5	4.471	4.842
		16QAM		4.481	4.869

**- NR Band n41 CP-OFDM**

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n41	100M	QPSK	2593.0	96.649	99.630
		16QAM		96.363	99.750
	90M	QPSK	2593.0	86.664	89.290
		16QAM		86.665	89.360
	80M	QPSK	2593.0	76.731	79.380
		16QAM		76.820	79.040
	60M	QPSK	2593.0	57.044	58.980
		16QAM		57.030	59.110
	50M	QPSK	2593.0	47.033	48.780
		16QAM		47.158	48.660
	40M	QPSK	2593.0	37.533	38.880
		16QAM		37.403	38.770
	30M	QPSK	2593.0	27.912	29.320
		16QAM		27.841	28.930
	20M	QPSK	2593.0	18.270	19.370
		16QAM		18.226	19.240
	15M	QPSK	2593.0	13.607	14.680
		16QAM		13.557	14.390
	10M	QPSK	2593.0	8.583	9.335
		16QAM		8.587	9.281