



CERTIFICATION TEST REPORT

Report Number. : 4790160849-E2V2

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

Model : SM-A536E/DS, SM-A536E

FCC ID : A3LSMA536E

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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ACCREDITED

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TL-637

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
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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: SM-A536E/DS, SM-A536E
SERIAL NUMBER: 55605a9d3e257ece, 55605aa085257ece, R3CRA0RNRXV, R3CRA0RNGXZ (CONDUCTED); R32RA00376L, R3CRA0RNSAA, R3CRA0RS2RK (RADIATED);
DATE TESTED: 2021-12-01 ~ 2021-12-29;

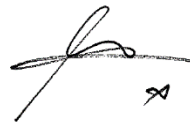
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 22H, 24E, 27H, 27L, 27F, 27M and 90S	Pass

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:

Tested By:



Seokhwan Hong
Suwon Lab Engineer
UL Korea, Ltd.

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/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-A536E/DS and SM-A536E.
 These models are identical in hardware except SM-A536E has single SIM tray.
 With some pre-scan, model SM-A536E/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.
 (4790160849-S1 FCC Report SAR)

GSM

FCC Part 22/24						
Band	Frequency Range [MHz]	Modulation	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
GSM850	824~849	GPRS	33.2	2089.30	31.03	1267.65
		EGPRS	26.8	478.63	26.72	469.89
GSM1900	1850~1910	GPRS	29.4	870.96	28.62	727.78
		EGPRS	23.8	239.88	26.58	454.99

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	22.7	186.21	21.21	132.13
		HSDPA	22.7	186.21	20.02	100.46
Band 4	1710~1755	Rel. 99	24.5	281.84	22.74	187.93
		HSDPA	23.7	234.42	22.73	187.50
Band 2	1850~1910	Rel. 99	24.2	263.03	21.22	132.43
		HSDPA	23.5	223.87	21.30	134.90

LTE Band 2 (Main ANT)

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	23.5	223.87	21.78	150.66
			16QAM	21.7	147.91	19.83	96.16
			64QAM	20.5	112.20		
			256QAM	19.8	95.50		
	1857.5 - 1902.5	15	QPSK	23.3	213.80	21.90	154.88
			16QAM	21.8	151.36	19.56	90.36
			64QAM	20.6	114.82		
			256QAM	19.6	91.20		
	1855 - 1905	10	QPSK	23.4	218.78	21.63	145.55
			16QAM	21.9	154.88	19.59	90.99
			64QAM	20.5	112.20		
			256QAM	19.8	95.50		
	1852.5 - 1907.5	5	QPSK	23.5	223.87	21.00	125.89
			16QAM	21.8	151.36	19.66	92.47
			64QAM	20.5	112.20		
			256QAM	19.9	97.72		
	1851.5 - 1908.5	3	QPSK	23.5	223.87	21.56	143.22
			16QAM	21.7	147.91	19.80	95.50
			64QAM	20.7	117.49		
			256QAM	19.7	93.33		
1850.7 - 1909.3	1.4	QPSK	23.6	229.09	22.40	173.78	
		16QAM	21.8	151.36	19.63	91.83	
		64QAM	20.6	114.82			
		256QAM	19.7	93.33			

LTE Band 2 (Sub ANT)

FCC Part 24							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated (Spot-Check)	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 2	1860 - 1900	20	QPSK	22.5	177.83	21.55	142.89
			16QAM	21.9	154.88	20.31	107.40
			64QAM	21.6	144.54		
			256QAM	17.4	54.95		
	1857.5 - 1902.5	15	QPSK	22.5	177.83		
			16QAM	22.0	158.49		
			64QAM	20.8	120.23		
			256QAM	18.4	69.18		
	1855 - 1905	10	QPSK	22.4	173.78		
			16QAM	21.6	144.54		
			64QAM	20.7	117.49		
			256QAM	17.7	58.88		
	1852.5 - 1907.5	5	QPSK	22.4	173.78		
			16QAM	21.9	154.88		
			64QAM	20.4	109.65		
			256QAM	17.6	57.54		
	1851.5 - 1908.5	3	QPSK	22.3	169.82		
			16QAM	21.5	141.25		
			64QAM	20.6	114.82		
			256QAM	18.0	63.10		
1850.7 - 1909.3	1.4	QPSK	22.4	173.78			
		16QAM	21.7	147.91			
		64QAM	20.4	109.65			
		256QAM	17.5	56.23			

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	24.1	257.04	19.19	82.99
			16QAM	22.4	173.78	16.95	49.55
			64QAM	21.0	125.89		
			256QAM	20.2	104.71		
	701.5 - 707.5	5	QPSK	24.1	257.04	19.29	84.92
			16QAM	22.5	177.83	17.09	51.17
			64QAM	21.3	134.90		
			256QAM	20.4	109.65		
	700.5 - 714.5	3	QPSK	24.1	257.04	19.12	81.66
			16QAM	22.6	181.97	17.01	50.23
			64QAM	21.2	131.83		
			256QAM	20.3	107.15		
	699.7 - 715.3	1.4	QPSK	24.2	263.03	19.28	84.72
			16QAM	22.7	186.21	16.61	45.81
			64QAM	21.4	138.04		
			256QAM	20.4	109.65		

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	23.9	245.47	20.73	118.30
			16QAM	22.0	158.49	18.12	64.86
			64QAM	21.0	125.89		
			256QAM	20.0	100.00		
	779.5 - 784.5	5	QPSK	24.0	251.19	20.62	115.35
			16QAM	22.3	169.82	18.45	69.98
			64QAM	21.1	128.82		
			256QAM	20.3	107.15		

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	23.2	208.93	22.26	168.27
			16QAM	21.5	141.25	20.20	104.71
			64QAM	20.2	104.71		
			256QAM	19.4	87.10		
	819	10	QPSK	23.2	208.93	21.67	146.89
			16QAM	21.2	131.83	20.30	107.15
			64QAM	20.5	112.20		
			256QAM	19.2	83.18		
	816.5 - 821.5	5	QPSK	23.4	218.78	21.92	155.60
			16QAM	21.7	147.91	19.98	99.54
			64QAM	20.2	104.71		
			256QAM	19.5	89.13		
	815.5 - 822.5	3	QPSK	23.3	213.80	22.07	161.06
			16QAM	21.9	154.88	20.23	105.44
			64QAM	20.3	107.15		
			256QAM	19.3	85.11		
	814.7 - 823.3	1.4	QPSK	23.6	229.09	20.82	120.78
			16QAM	21.8	151.36	18.60	72.44
			64QAM	20.9	123.03		
			256QAM	19.4	87.10		

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	23.4	218.78	20.81	120.50
			16QAM	21.6	144.54	18.87	77.09
			64QAM	20.3	107.15		
			256QAM	19.4	87.10		
	829 ~ 844	10	QPSK	23.1	204.17	20.62	115.35
			16QAM	21.6	144.54	18.74	74.82
			64QAM	20.1	102.33		
			256QAM	19.4	87.10		
	826.5 ~ 846.5	5	QPSK	23.3	213.80	20.60	114.82
			16QAM	21.6	144.54	18.51	70.96
			64QAM	20.1	102.33		
			256QAM	19.4	87.10		
	825.5 ~ 847.5	3	QPSK	23.2	208.93	20.75	118.85
			16QAM	21.5	141.25	18.63	72.95
			64QAM	20.3	107.15		
			256QAM	19.4	87.10		
	824.7 ~ 848.3	1.4	QPSK	23.4	218.78	20.78	119.67
			16QAM	21.5	141.25	19.61	91.41
			64QAM	20.4	109.65		
			256QAM	19.4	87.10		

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	23.3	213.80	20.50	112.20
			16QAM	21.6	144.54	18.65	73.28
			64QAM	20.5	112.20		
			256QAM	19.6	91.20		
		10	QPSK	23.3	213.80	20.43	110.41
			16QAM	21.8	151.36	18.27	67.14
			64QAM	20.4	109.65		
			256QAM	19.6	91.20		
		5	QPSK	23.4	218.78	20.43	110.41
			16QAM	21.9	154.88	18.30	67.61
			64QAM	20.4	109.65		
			256QAM	19.4	87.10		
		3	QPSK	23.4	218.78	20.29	106.91
			16QAM	21.7	147.91	18.17	65.61
			64QAM	20.8	120.23		
			256QAM	19.8	95.50		
		1.4	QPSK	23.7	234.42	20.25	105.93
			16QAM	21.6	144.54	18.33	68.08
			64QAM	21.0	125.89		
			256QAM	19.5	89.13		

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	23.9	245.47	22.29	169.43
			16QAM	22.1	162.18	20.60	114.82
			64QAM	20.9	122.74		
			256QAM	20.2	104.71		
	2503.5 - 2682.5	15	QPSK	24.1	257.04	23.10	204.17
			16QAM	21.9	154.88	21.29	134.59
			64QAM	21.2	131.83		
			256QAM	20.1	102.33		
	2501 - 2685	10	QPSK	24.1	257.04	22.79	190.11
			16QAM	22.0	158.49	21.37	137.09
			64QAM	21.2	131.83		
			256QAM	20.0	100.00		
	2498.5 - 2687.5	5	QPSK	24.0	251.19	22.66	184.50
			16QAM	22.0	158.49	20.91	123.31
			64QAM	21.0	125.89		
			256QAM	20.0	100.00		

LTE Band 66 (Main ANT)

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	24.3	269.15	22.23	167.11
			16QAM	22.3	169.82	20.05	101.16
			64QAM	20.8	120.23		
			256QAM	20.4	109.65		
	1717.5 - 1772.5	15	QPSK	24.5	281.84	22.37	172.58
			16QAM	22.8	190.55	20.42	110.15
			64QAM	21.5	141.25		
			256QAM	20.3	107.15		
	1715 - 1775	10	QPSK	24.5	281.84	22.52	178.65
			16QAM	22.9	194.98	20.41	109.90
			64QAM	21.4	138.04		
			256QAM	20.5	112.20		
	1712.5 - 1777.5	5	QPSK	24.5	281.84	22.56	180.30
			16QAM	22.8	190.55	20.73	118.30
			64QAM	21.1	128.82		
			256QAM	20.1	102.33		
	1711.5 - 1778.5	3	QPSK	24.4	275.42	22.06	160.69
			16QAM	22.8	190.55	19.68	92.90
			64QAM	21.6	144.54		
			256QAM	20.6	114.82		
1710.7 - 1779.3	1.4	QPSK	24.2	263.03	22.49	177.42	
		16QAM	22.4	173.78	21.08	128.23	
		64QAM	21.4	138.04			
		256QAM	20.7	117.49			

LTE Band 66 (Sub ANT)

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated (Spot-Check)	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 66	1720 - 1770	20	QPSK	22.7	186.21	22.09	161.81
			16QAM	21.9	154.88	21.47	140.28
			64QAM	21.0	125.89		
			256QAM	18.1	64.57		
	1717.5 - 1772.5	15	QPSK	22.7	186.21		
			16QAM	21.8	151.36		
			64QAM	21.1	128.82		
			256QAM	18.1	64.57		
	1715 - 1775	10	QPSK	22.5	177.83		
			16QAM	21.7	147.91		
			64QAM	20.9	123.03		
			256QAM	18.0	63.10		
	1712.5 - 1777.5	5	QPSK	22.6	181.97		
			16QAM	21.7	147.91		
			64QAM	20.9	123.03		
			256QAM	18.0	63.10		
	1711.5 - 1778.5	3	QPSK	22.5	177.83		
			16QAM	21.8	151.36		
			64QAM	20.7	117.49		
			256QAM	17.8	60.26		
1710.7 - 1779.3	1.4	QPSK	22.4	173.78			
		16QAM	21.6	144.54			
		64QAM	20.6	114.82			
		256QAM	17.9	61.66			

NR Band 5

FCC Part 22								
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	23.6	229.09		
				QPSK	23.6	229.09	21.25	133.35
				16QAM	22.0	158.49	19.05	80.35
				64QAM	20.3	107.15		
				256QAM	18.2	66.07		
	CP-OFDM	QPSK	22.9	194.98				
	831.5 - 841.5	15	DFT-s OFDM	$\pi/2$ BPSK	23.4	218.78		
				QPSK	23.5	223.87	19.47	88.51
				16QAM	21.7	147.91	19.17	82.60
				64QAM	20.4	109.65		
				256QAM	18.3	67.61		
	CP-OFDM	QPSK	22.9	194.98				
	829 - 844	10	DFT-s OFDM	$\pi/2$ BPSK	23.6	229.09		
				QPSK	23.6	229.09	17.13	51.64
				16QAM	21.9	154.88	16.03	40.09
				64QAM	20.2	104.71		
				256QAM	18.3	67.61		
	CP-OFDM	QPSK	22.9	194.98				
	826.5 - 846.5	5	DFT-s OFDM	$\pi/2$ BPSK	23.5	223.87		
				QPSK	23.5	223.87	18.85	76.74
16QAM				21.9	154.88	17.95	62.37	
64QAM				20.7	117.49			
256QAM				18.3	67.61			
CP-OFDM	QPSK	22.9	194.98					

NR Band 66 (Main ANT)

FCC Part 27									
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Mode	Conducted		Radiated		
					Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]	
n66	1720 - 1770	20	DFT-s OFDM	$\pi/2$ BPSK	24.9	309.03			
				QPSK	24.9	309.03	22.31	170.22	
				16QAM	23.7	234.42	21.66	146.55	
				64QAM	22.3	169.82			
				256QAM	20.3	107.15			
				CP-OFDM	QPSK	22.9	194.98		
	1717.5 - 1772.5	15	DFT-s OFDM	$\pi/2$ BPSK	24.6	288.40			
				QPSK	24.6	288.40	23.72	235.50	
				16QAM	23.7	234.42	23.50	223.87	
				64QAM	22.3	169.82			
				256QAM	20.2	104.71			
				CP-OFDM	QPSK	23.4	218.78		
	1715 - 1775	10	DFT-s OFDM	$\pi/2$ BPSK	24.4	275.42			
				QPSK	24.1	257.04	23.16	207.01	
				16QAM	23.8	239.88	22.98	198.61	
				64QAM	22.3	169.82			
				256QAM	20.3	107.15			
				CP-OFDM	QPSK	23.4	218.78		
	1712.5 - 1777.5	5	DFT-s OFDM	$\pi/2$ BPSK	24.4	275.42			
				QPSK	24.2	263.03	22.62	182.81	
16QAM				23.8	239.88	22.51	178.24		
64QAM				22.3	169.82				
256QAM				20.3	107.15				
			CP-OFDM	QPSK	23.4	218.78			

NR Band 66 (Sub ANT)

FCC Part 27									
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Mode	Conducted		Radiated (Spot-Check)		
					Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]	
n66	1720 - 1770	20	DFT-s OFDM	$\pi/2$ BPSK	23.0	199.53			
				QPSK	23.0	199.53			
				16QAM	21.9	154.88			
				64QAM	20.1	102.33			
				256QAM	18.2	66.07			
				CP-OFDM	QPSK	20.9	123.03		
	1717.5 - 1772.5	15	DFT-s OFDM	$\pi/2$ BPSK	23.0	199.53			
				QPSK	23.0	199.53	18.57	71.94	
				16QAM	21.7	147.91	18.02	63.39	
				64QAM	20.3	107.15			
				256QAM	18.3	67.61			
				CP-OFDM	QPSK	21.1	128.82		
	1715 - 1775	10	DFT-s OFDM	$\pi/2$ BPSK	22.9	194.98			
				QPSK	22.9	194.98			
				16QAM	21.8	151.36			
				64QAM	20.4	109.65			
				256QAM	18.4	69.18			
				CP-OFDM	QPSK	21.4	138.04		
	1712.5 - 1777.5	5	DFT-s OFDM	$\pi/2$ BPSK	22.8	190.55			
				QPSK	22.8	190.55			
16QAM				22.0	158.49				
64QAM				20.2	104.71				
256QAM				18.3	67.61				
			CP-OFDM	QPSK	21.3	134.90			

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)	Max Gain (dBi)
GSM1900 / WCDMA Band 2 / LTE Band 2 1850 ~ 1915 MHz	-5.3 (Main ANT) -5.7 (Sub ANT)
WCDMA Band 4 / LTE Band 4 1710 ~ 1780 MHz	-5.2 (Main ANT) -5.5(Sub ANT)
LTE Band 66 / NR Band 66 1710 ~ 1780 MHz	-5.3 (Main ANT) -5.1(Sub ANT)
GSM850 / WCDMA Band 5 / LTE Band 5 / LTE Band 26 / NR Band 5 814 ~ 849 MHz	-6.5
LTE Band 12 / LTE Band 17 699 ~ 716 MHz	-6.2
LTE Band 13 777 ~ 787 MHz	-6.3
LTE Band 41 2496 ~ 2690 MHz	-4.8

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.

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 QPSK and 16QAM results were worst case.

Both NSA and SA modes were tested and worst case is reported.

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 conducted power in QPSK

Both 'Main ANT' and 'Sub ANT' were tested and the worst case of either 'Main ANT' or 'Sub ANT' is reported.

Highest power setting for each bands				
LTE Band	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
2 (Main ANT)	1850.7	1.4	1	5
	1880.0		1	0
	1909.3		1	0
2 (Sub ANT)	1860.0	20	1	0
	1880.0		1	0
	1900.0		1	0
12	699.7	1.4	1	5
	707.5		1	0
	715.3		1	0
13	779.5	5	1	0
	782.0		1	24
	784.5		1	24
26 (Part 90)	814.7	1.4	1	0
	823.3		1	0
26 (Straddle)	824.0	1.4	1	0
26 (Part 22)	831.5	15	1	0
	841.5		1	0
41	2503.5	15	1	0
	2593.0		1	0
	2682.5		1	0
66 (Main ANT)	1710.7	5	1	24
	1745.0		1	24
	1779.3		1	24
66 (Sub ANT)	1720.0	20	1	0
	1745.0		1	0
	1770.0		1	0

NR Band	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
5	829.0	10	1	50
	836.5		1	50
	844.0		1	26
66 (Main ANT)	1720.0	20	1	104
	1745.0		1	53
	1770.0		1	53
66 (Sub ANT)	1717.5	15	1	40
	1745.0		1	77
	1772.5		1	77

For LTE anchor, the band with highest output power was chosen among the possible combinations with NR Bands.

NR Band	LTE Band
5	2, 66
66	2, 5

i. Worst Axis Condition

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 (Main ANT)	O	-	-	-	-	O
LTE B2 (Sub ANT)	-	-	O	-	-	O
LTE B12	-	-	O	-	O	-
LTE B13	-	-	O	-	-	O
LTE B26	-	-	O	-	-	O
LTE B41	O	-	-	-	-	O
LTE B66 (Main ANT)	-	O	-	O	-	-
LTE B66 (Sub ANT)	O	-	-	-	O	-
NR n5	-	-	O	-	-	O
NR n66 (Main ANT)	O	-	-	O	-	-
NR n66 (Sub ANT)	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 2 (Sub Antenna)

Sub Antenna of LTE Band 2 (Frequency range: 1850-1910 MHz) is covered by Main Antenna of LTE Band 2 (Frequency range: 1850-1910 MHz) due to overlapping frequency range, lower maximum tune-up limit and same channel bandwidth

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: 824-849 MHz, FCC Part 22) 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.

LTE Band 66 (Sub Antenna)

Sub Antenna of LTE Band 66 (Frequency range: 1710-1780 MHz) is covered by Main Antenna of LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, lower maximum tune-up limit and same channel bandwidth

NR Band 66 (Sub Antenna)

Sub Antenna of NR Band 66 (Frequency range: 1710-1780 MHz) is covered by Main Antenna of NR Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, lower 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-TA800	R37N3MAH988DK3	N/A
Data Cable	SAMSUNG	EP- DN980	N/A	N/A

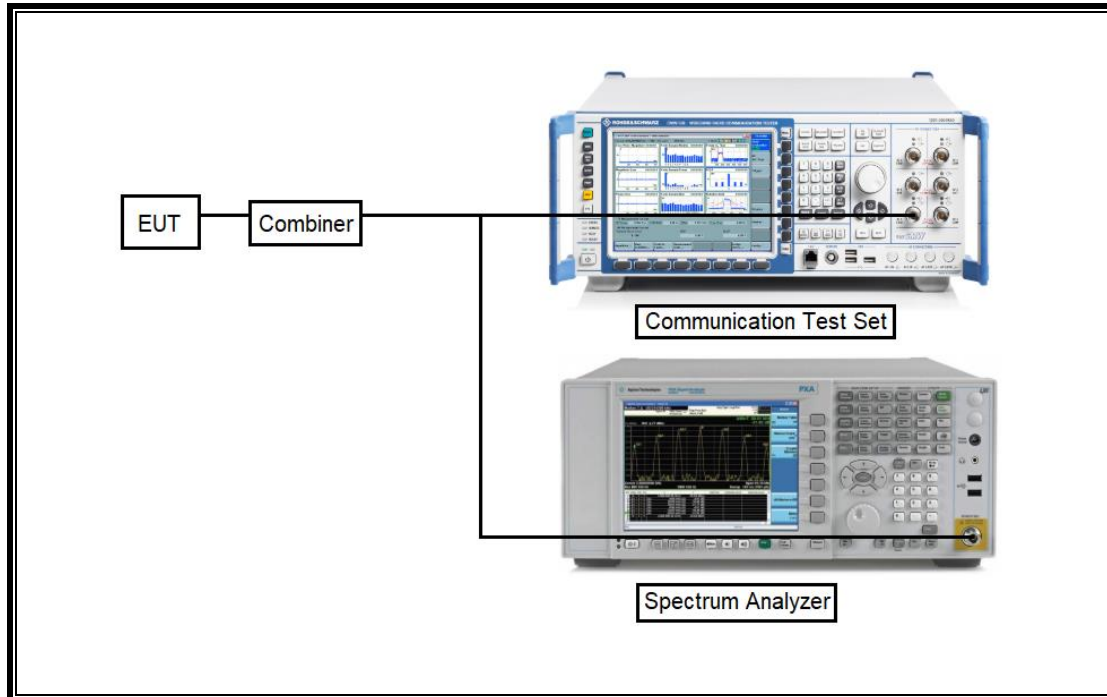
I/O CABLE

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

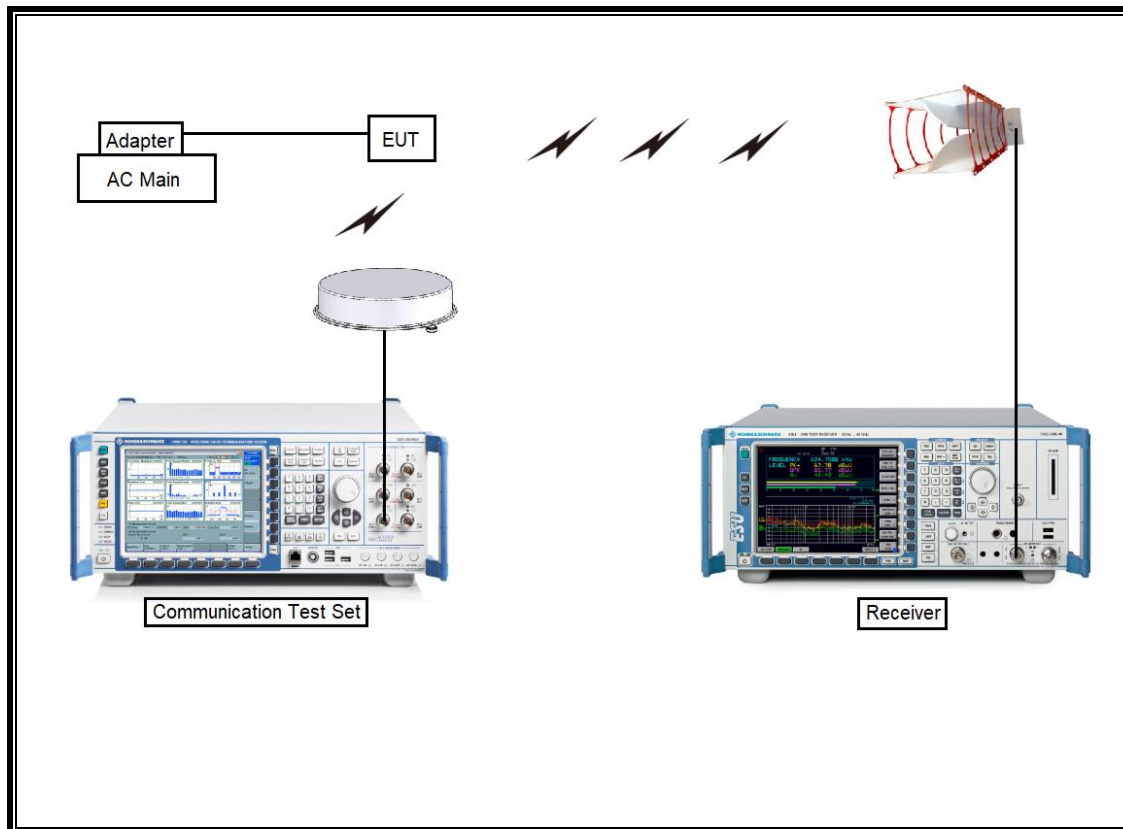
TEST SETUP

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	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	2023-10-06
Temperature Chamber	ESPEC	SH-642	93001109	2022-08-02
Power Divider	AEROFLEX/WEINSCHEL	1594	1668	2022-08-03
Power Splitter	MINI-CIRCUITS	WA1534	UL001	2022-01-27
Power Splitter	MINI-CIRCUITS	WA1534	UL002	2022-01-27
UXM 5G Wireless Test Platform	KEYSIGHT	E7515B	MY58120110	2022-01-13
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 1.04	

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		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.

NOTE

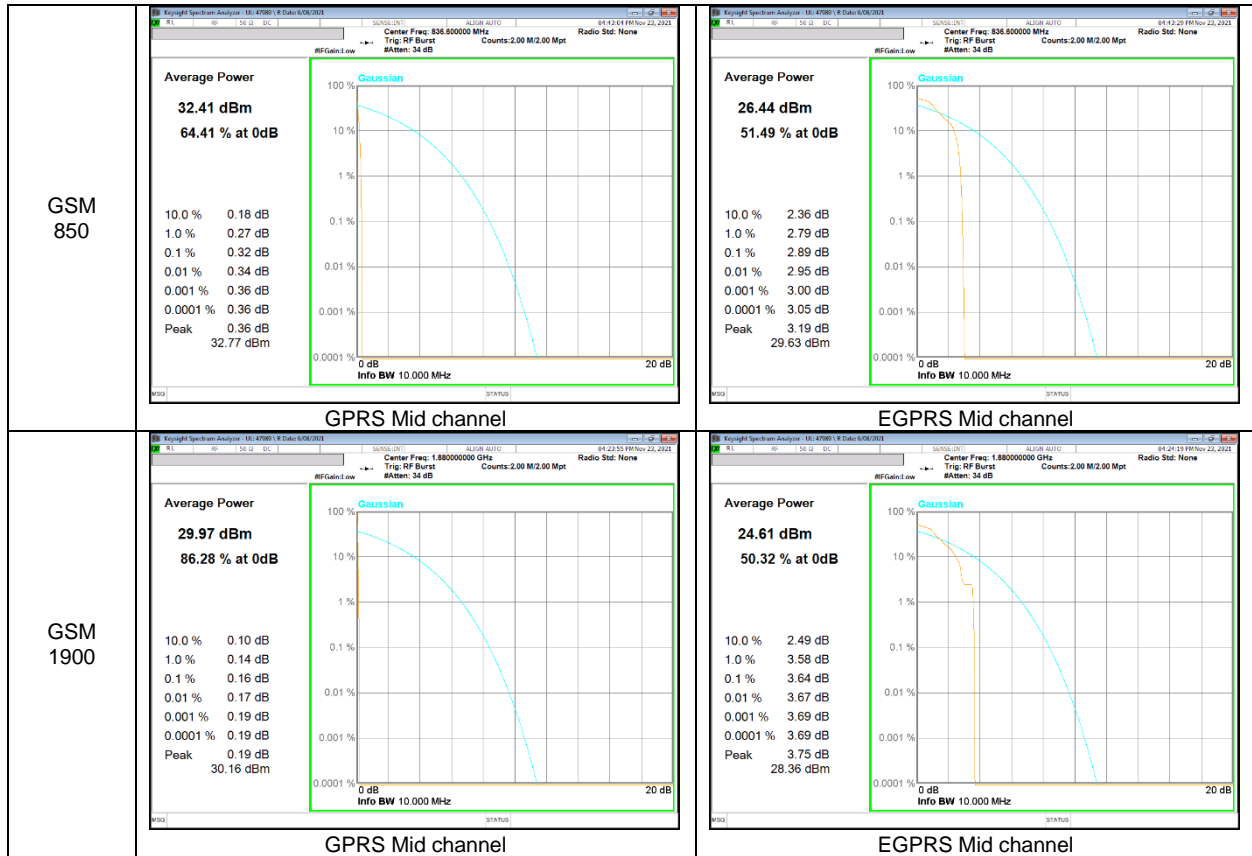
5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) and modulations ($\pi/2$ BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

RESULTS

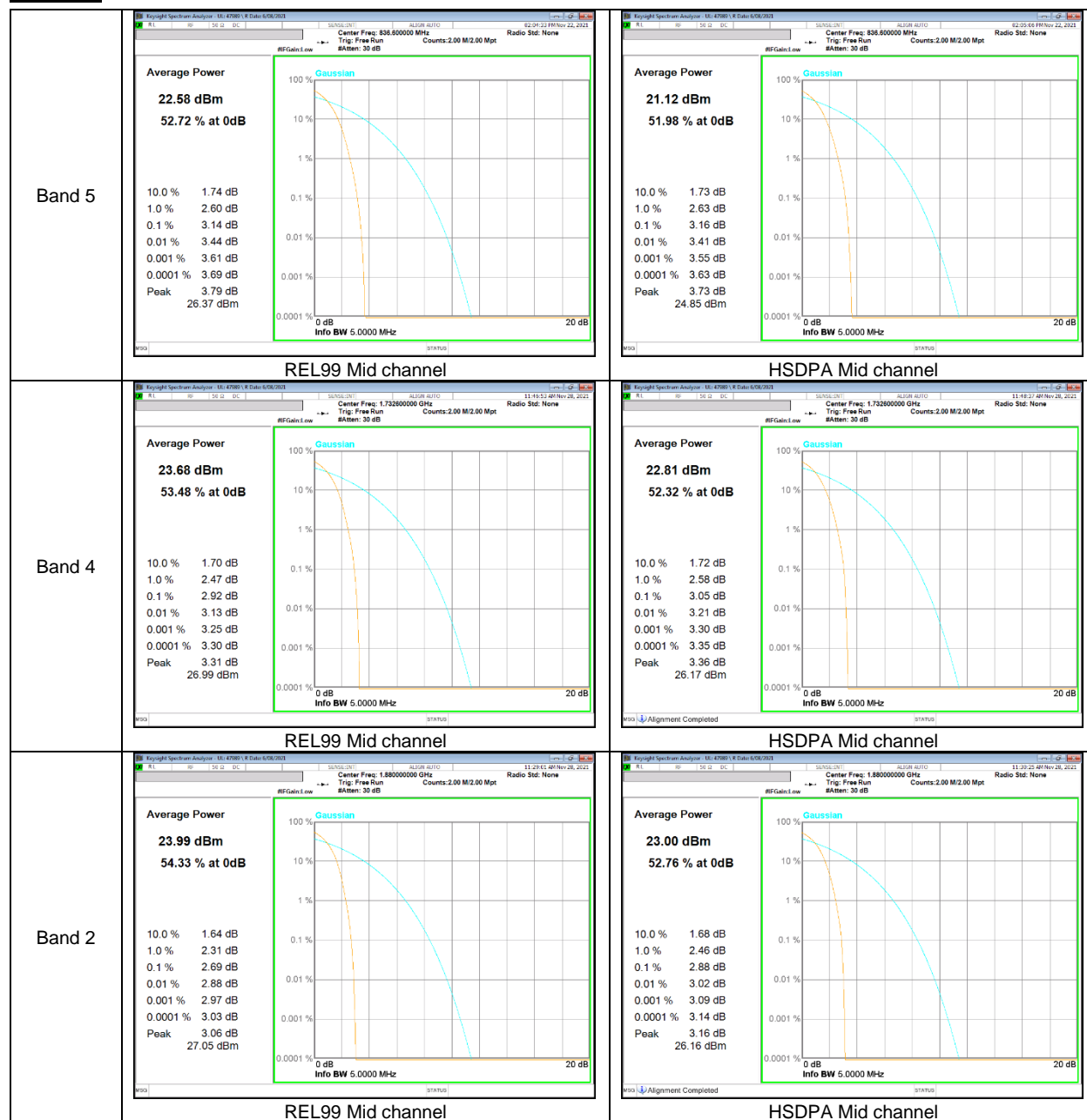
See the following pages.

8.1. CONDUCTED PEAK TO AVERAGE RESULT

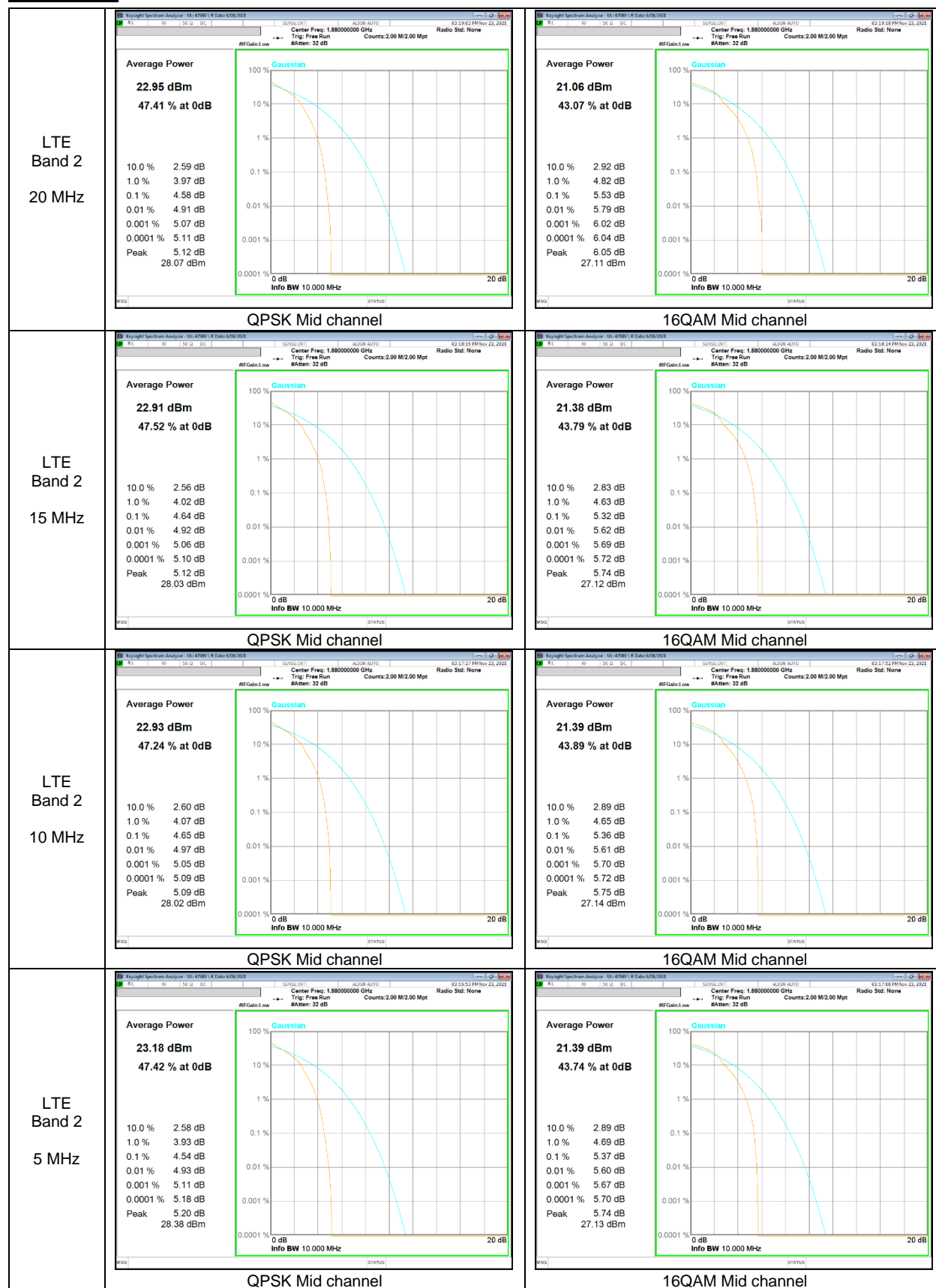
GSM

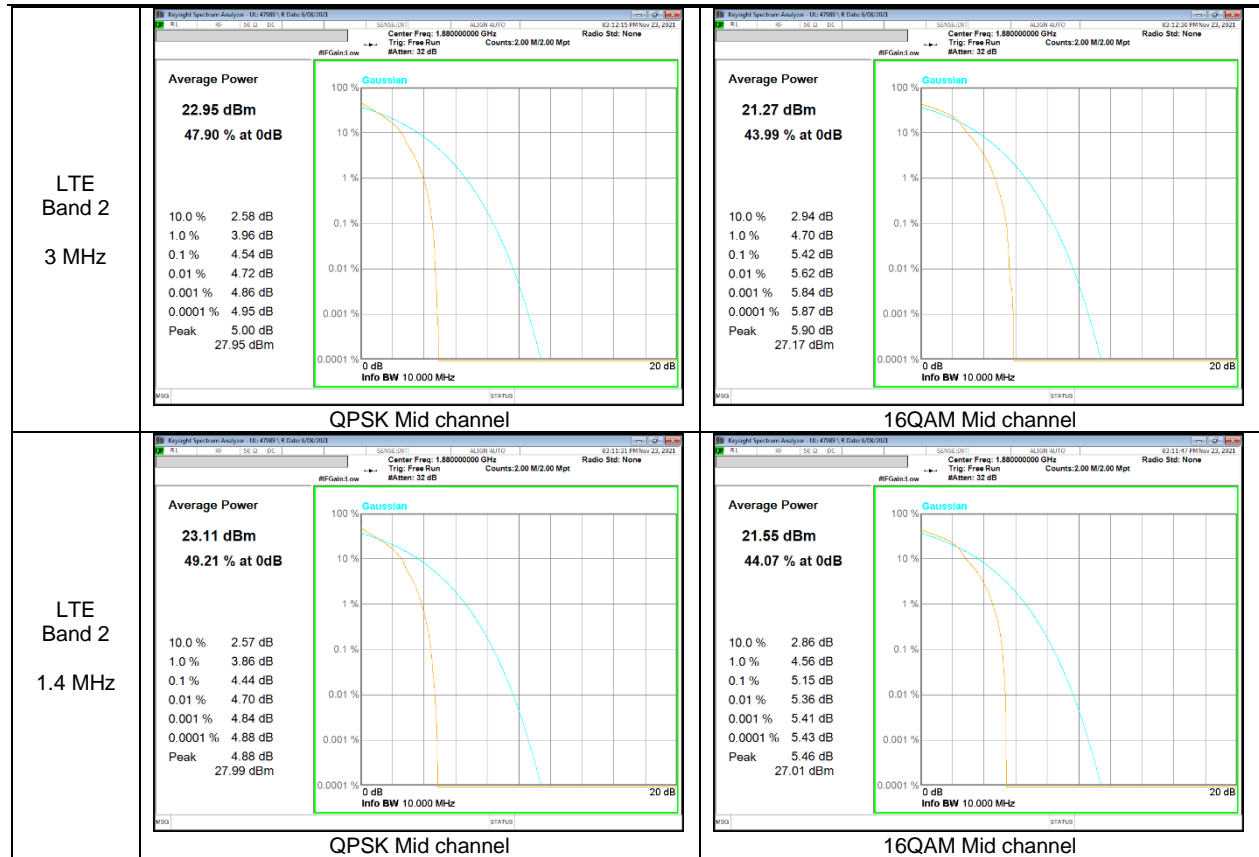


WCDMA



LTE Band 2

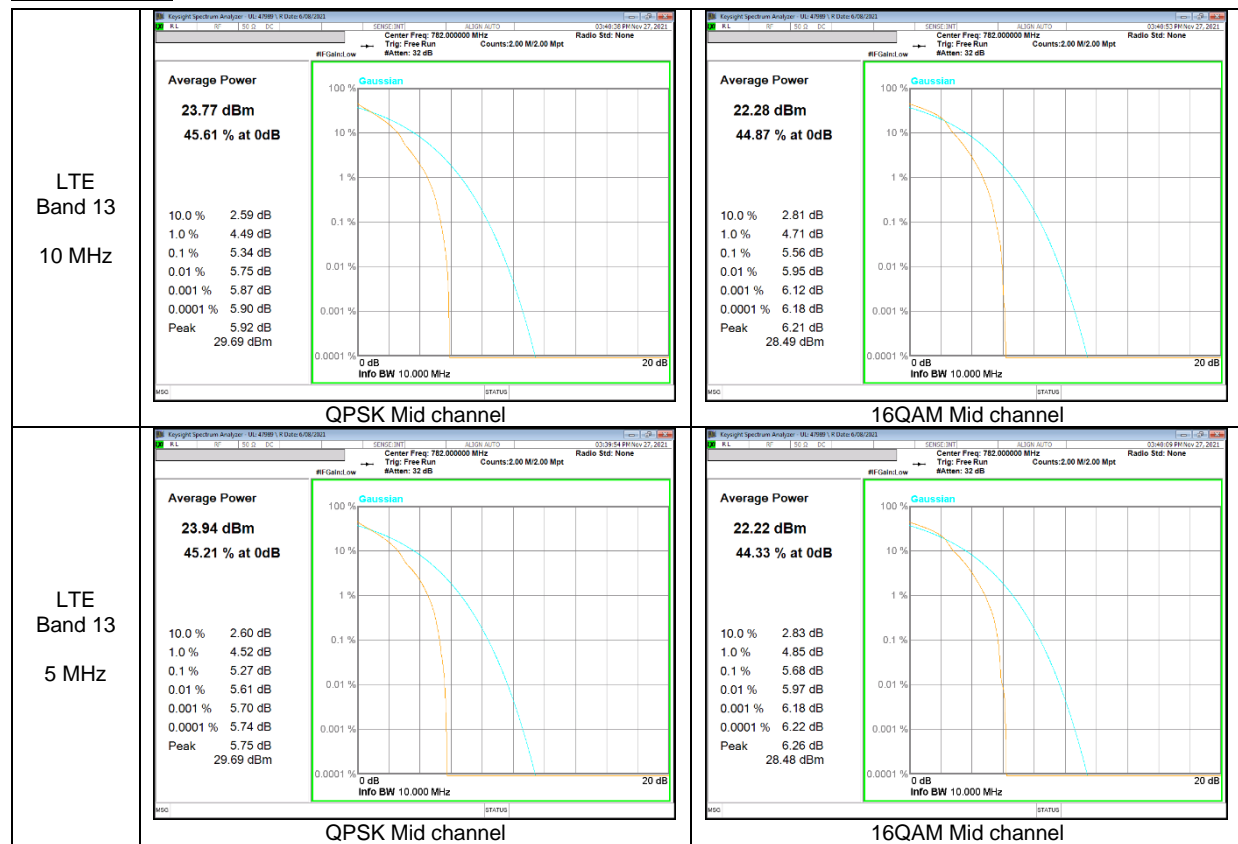




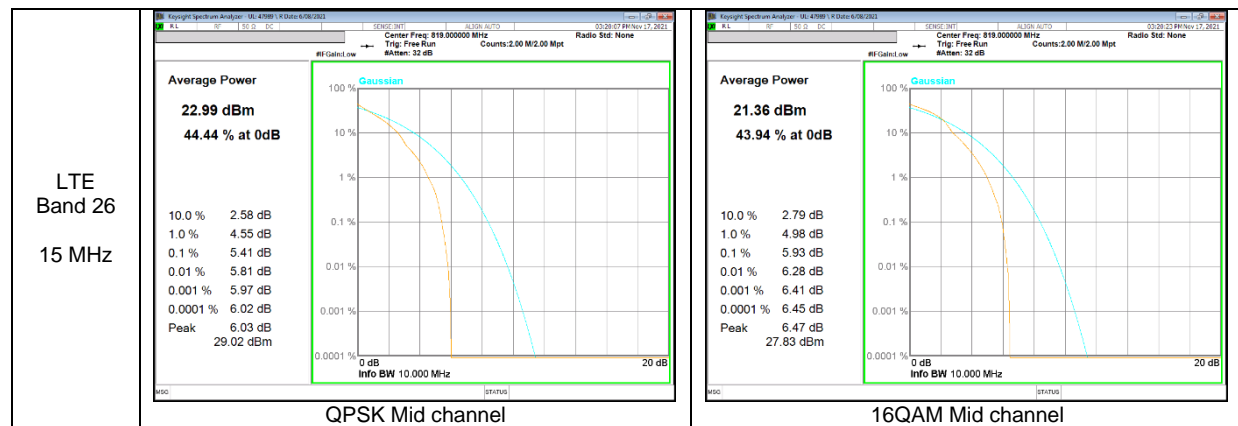
LTE Band 12

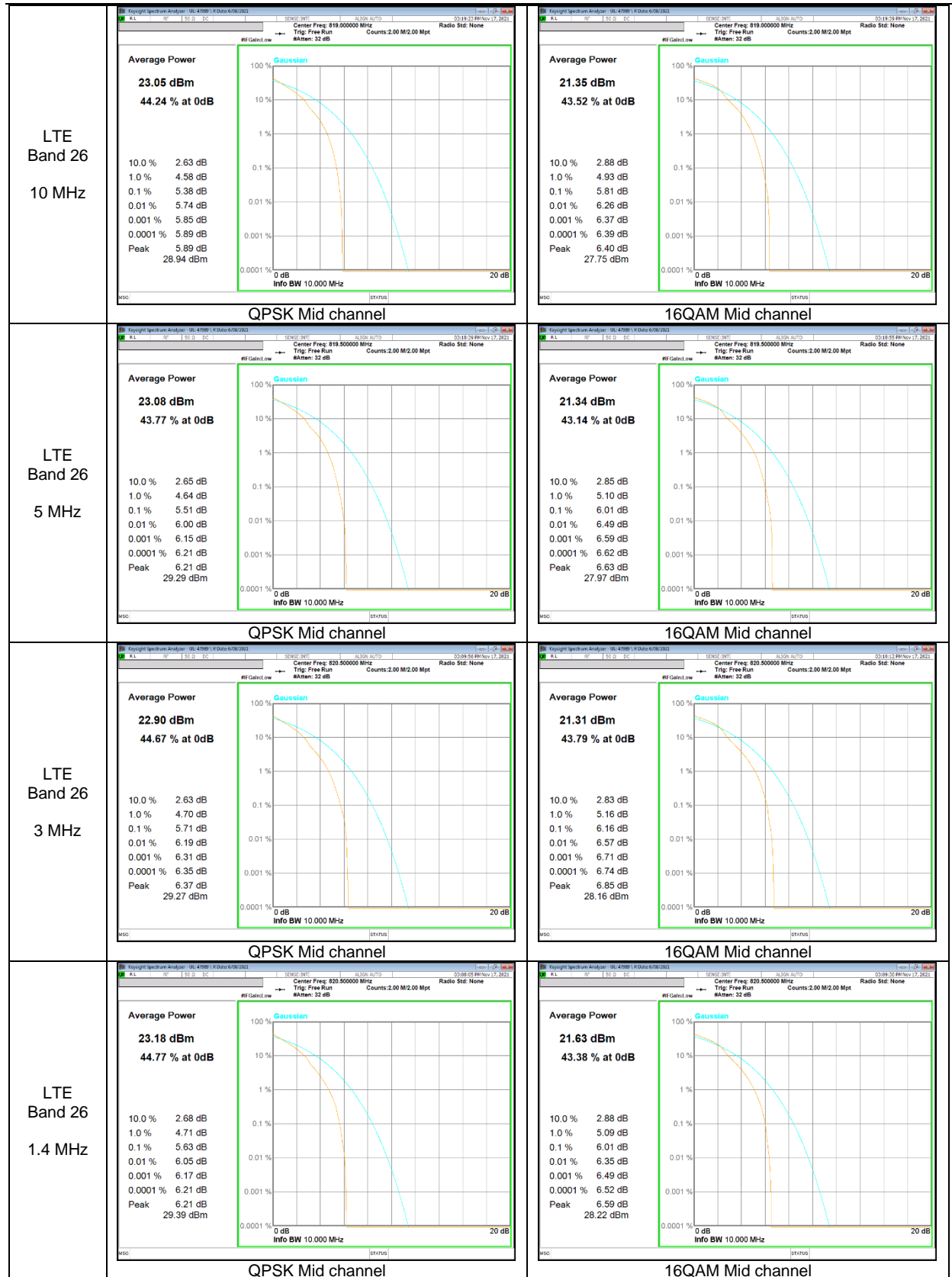


LTE Band 13

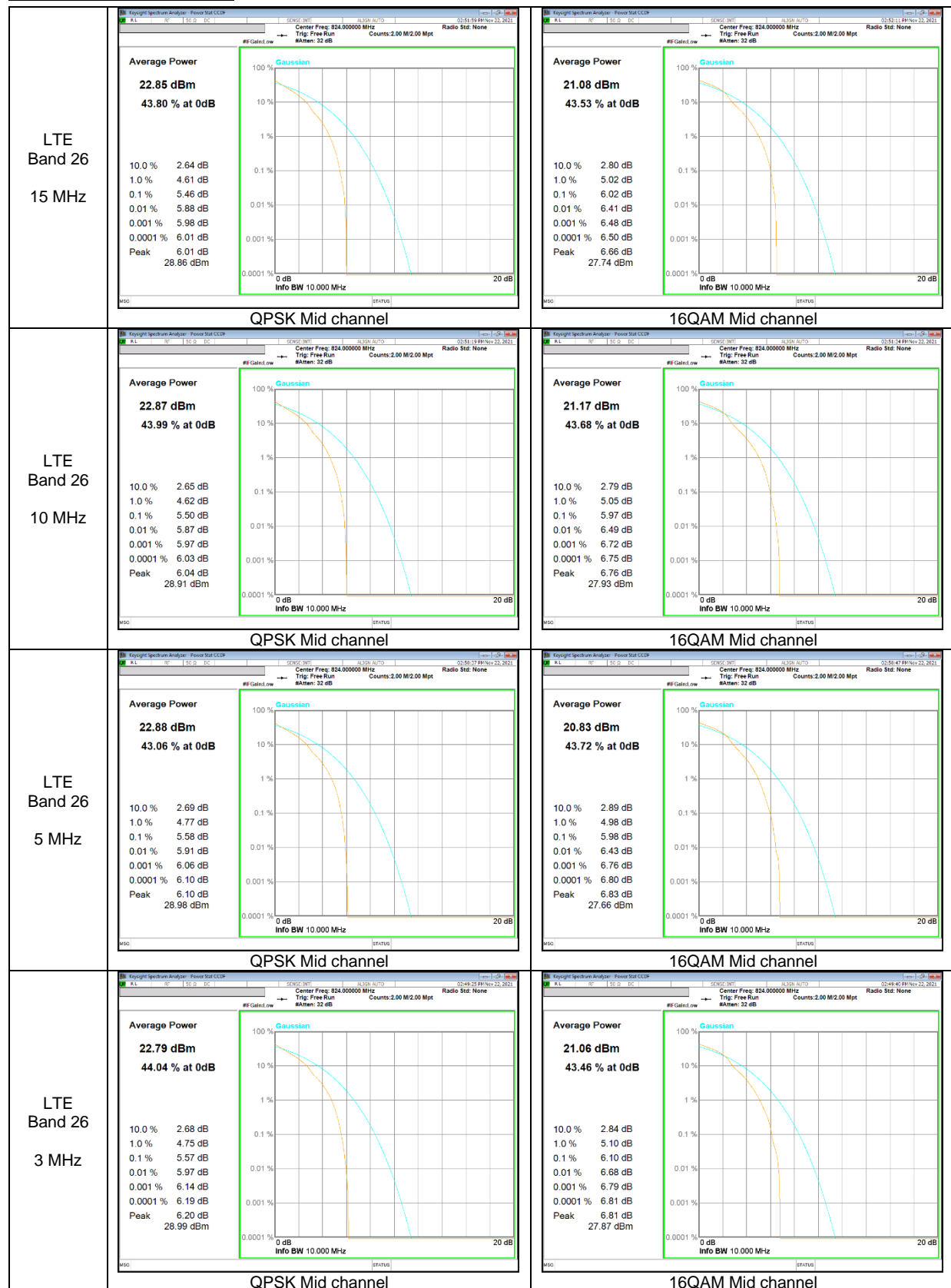


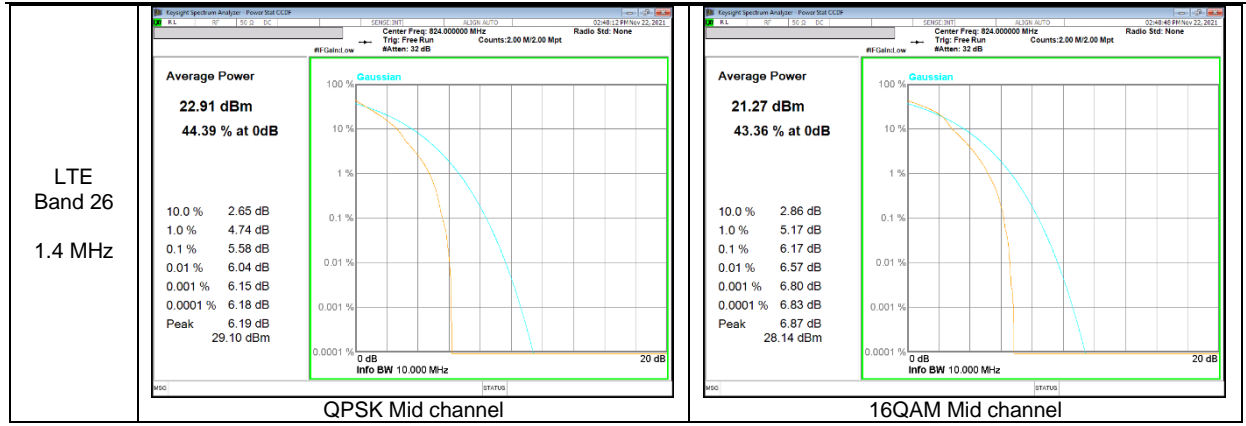
LTE Band 26 (Part 90)



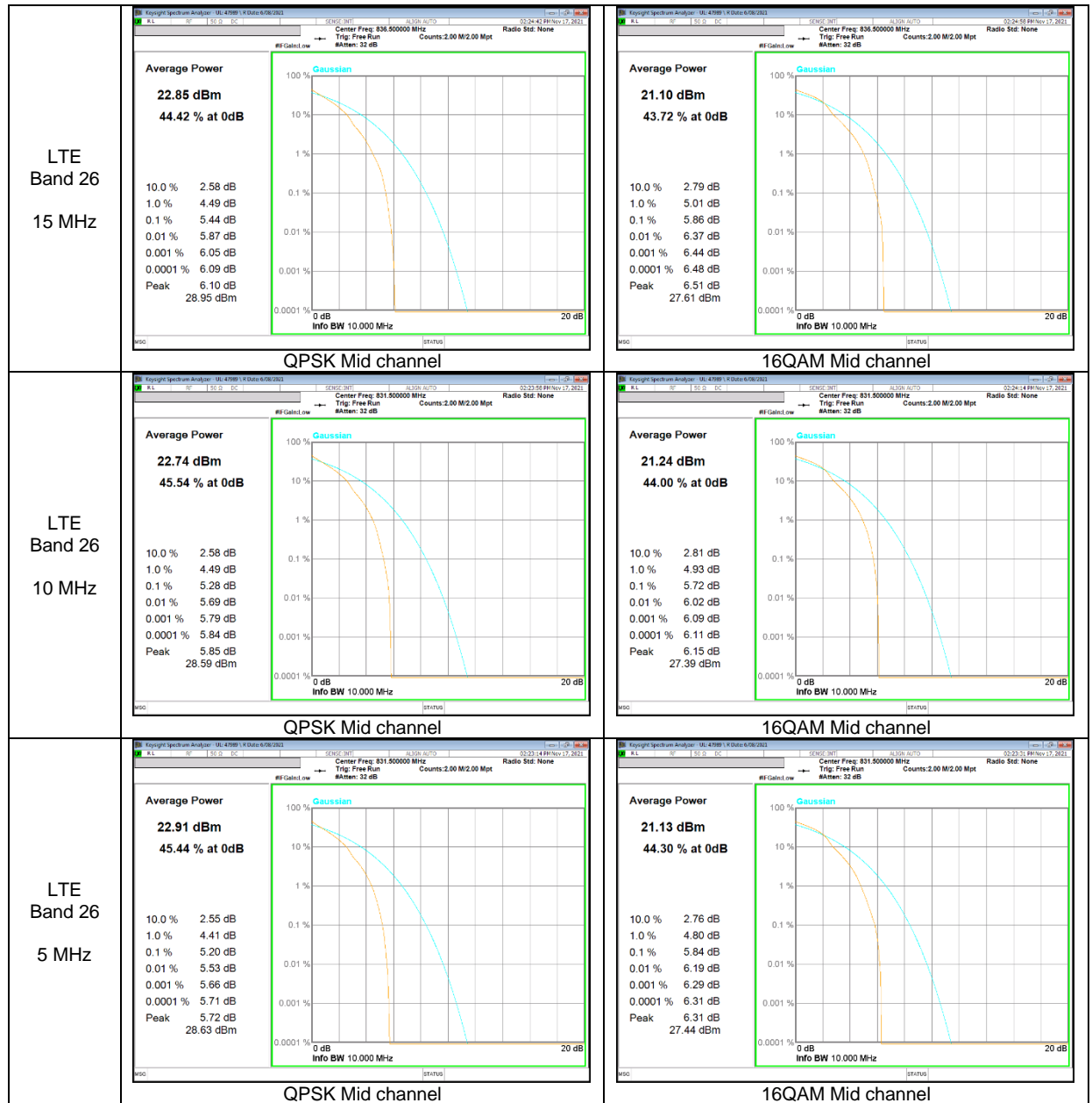


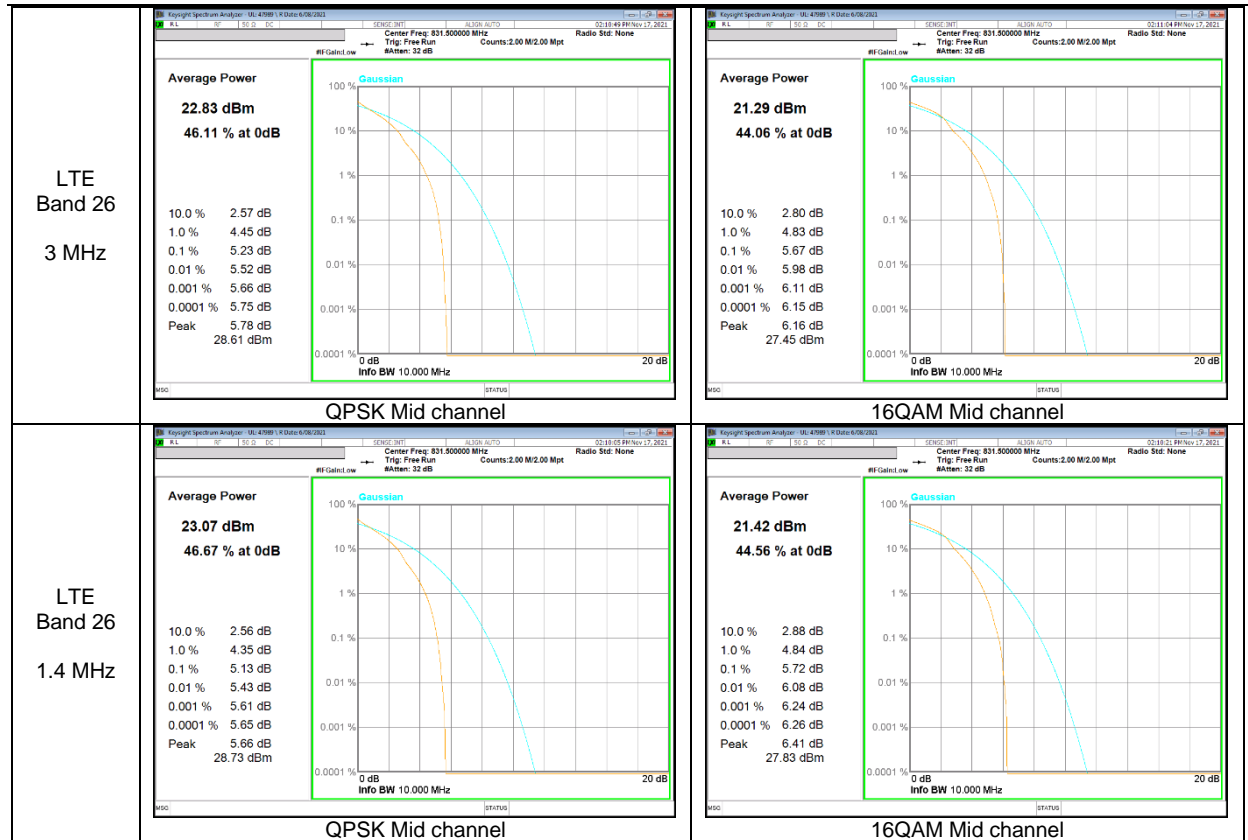
LTE Band 26 (Straddle)



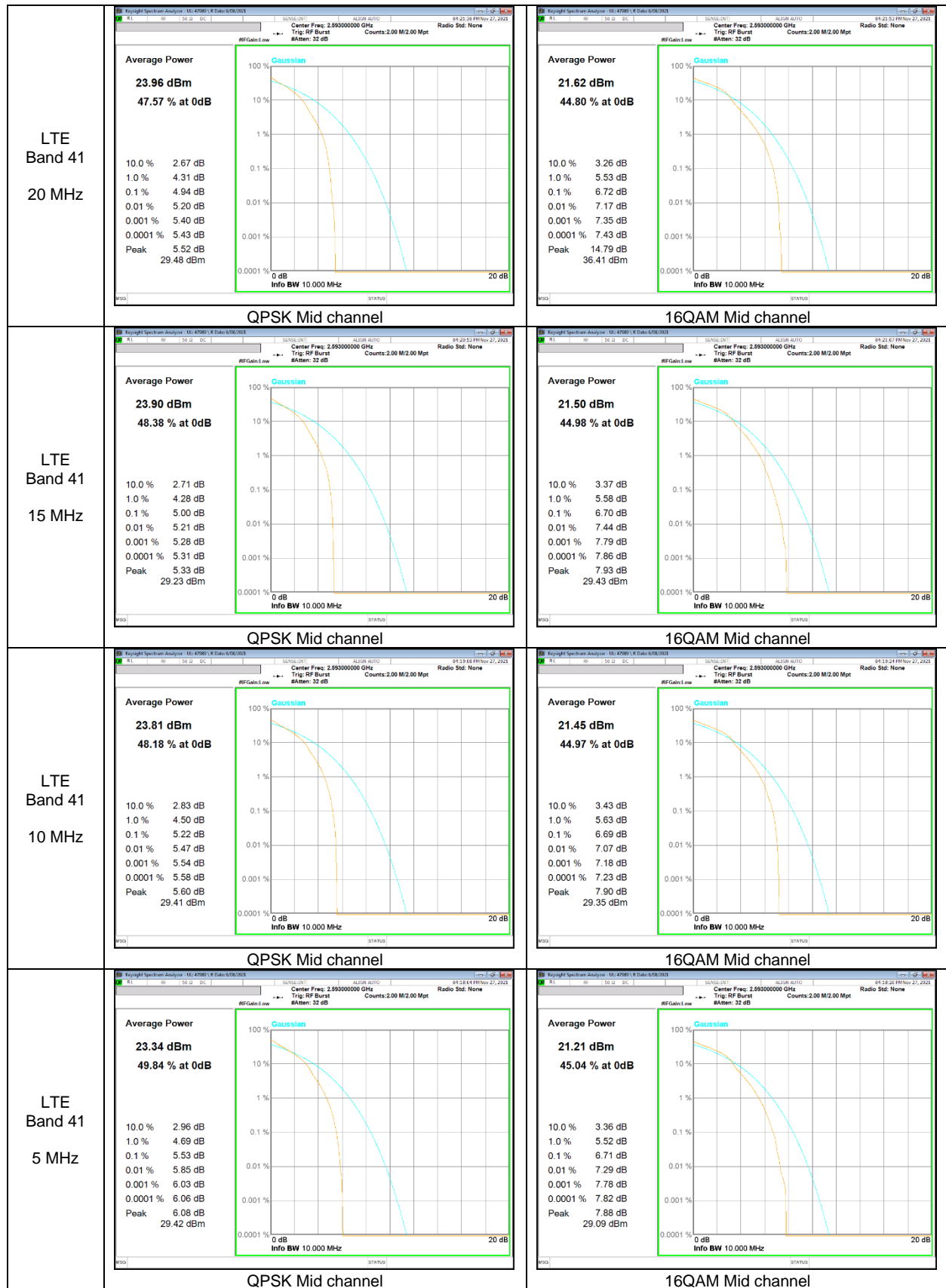


LTE Band 26 (Part 22)

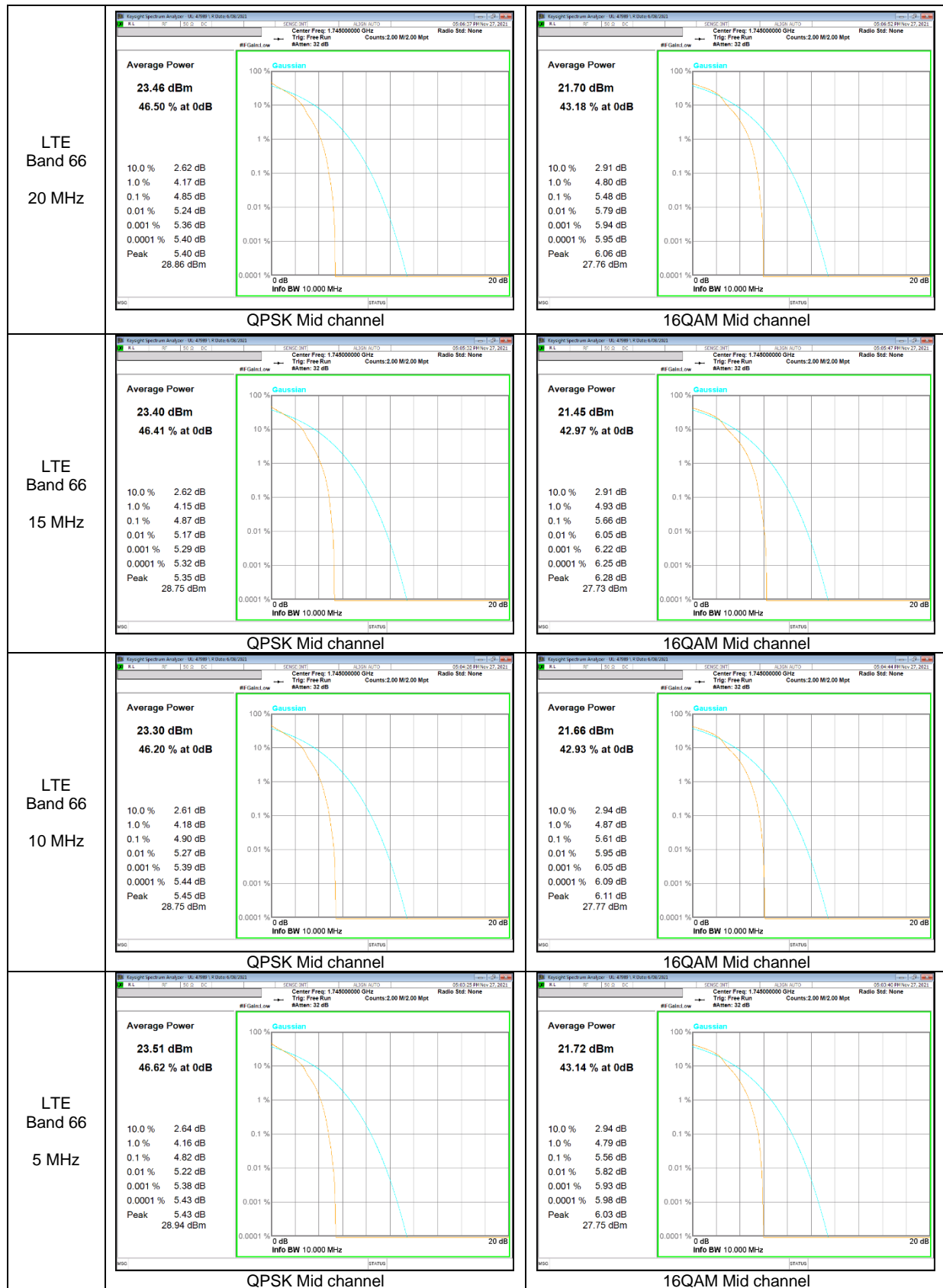


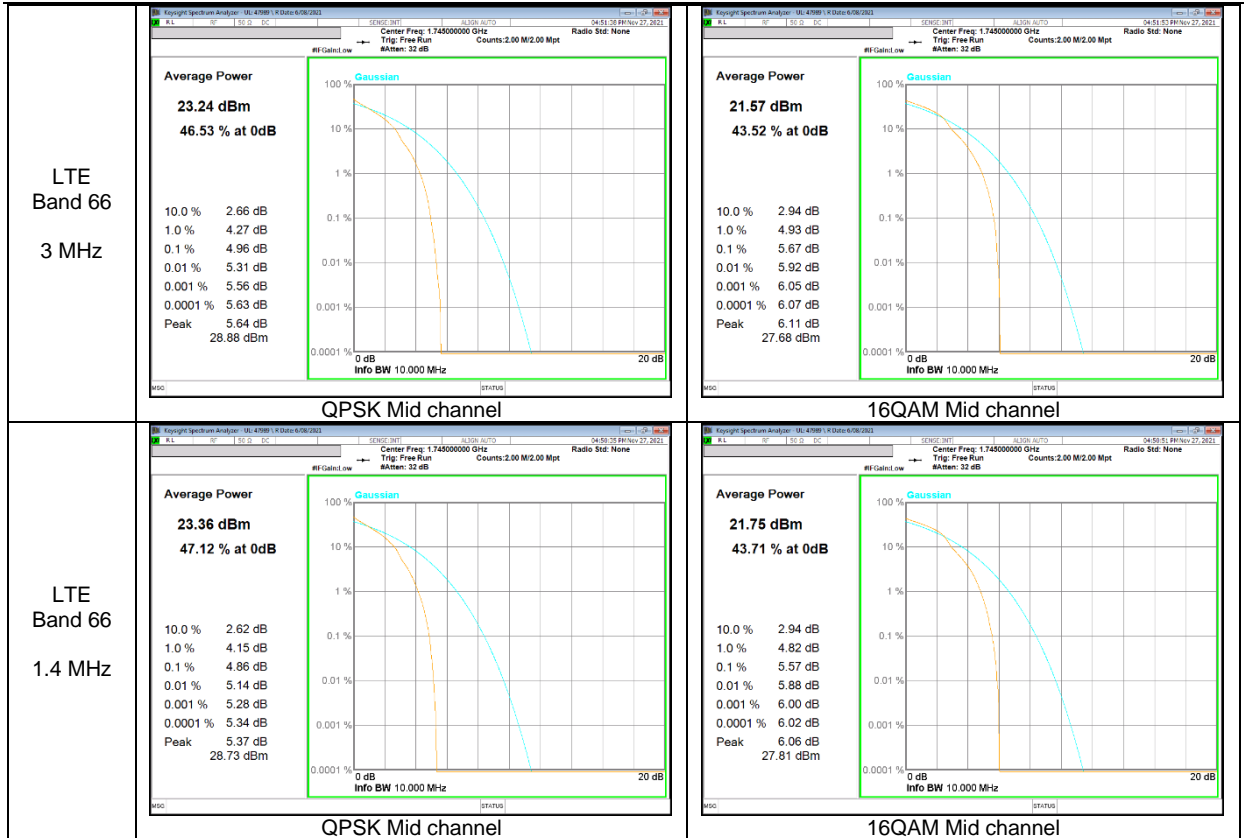


LTE Band 41

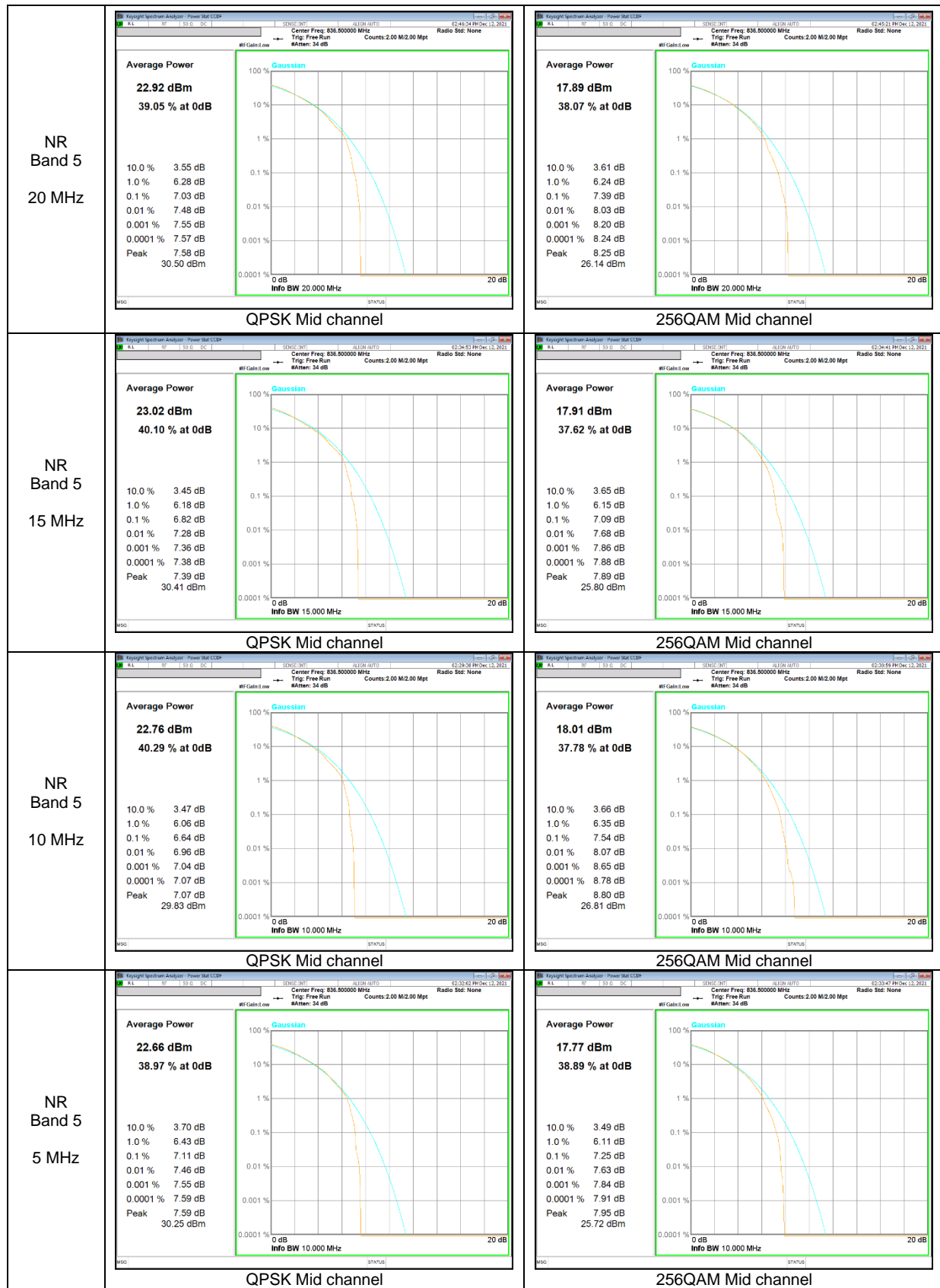


LTE Band 66

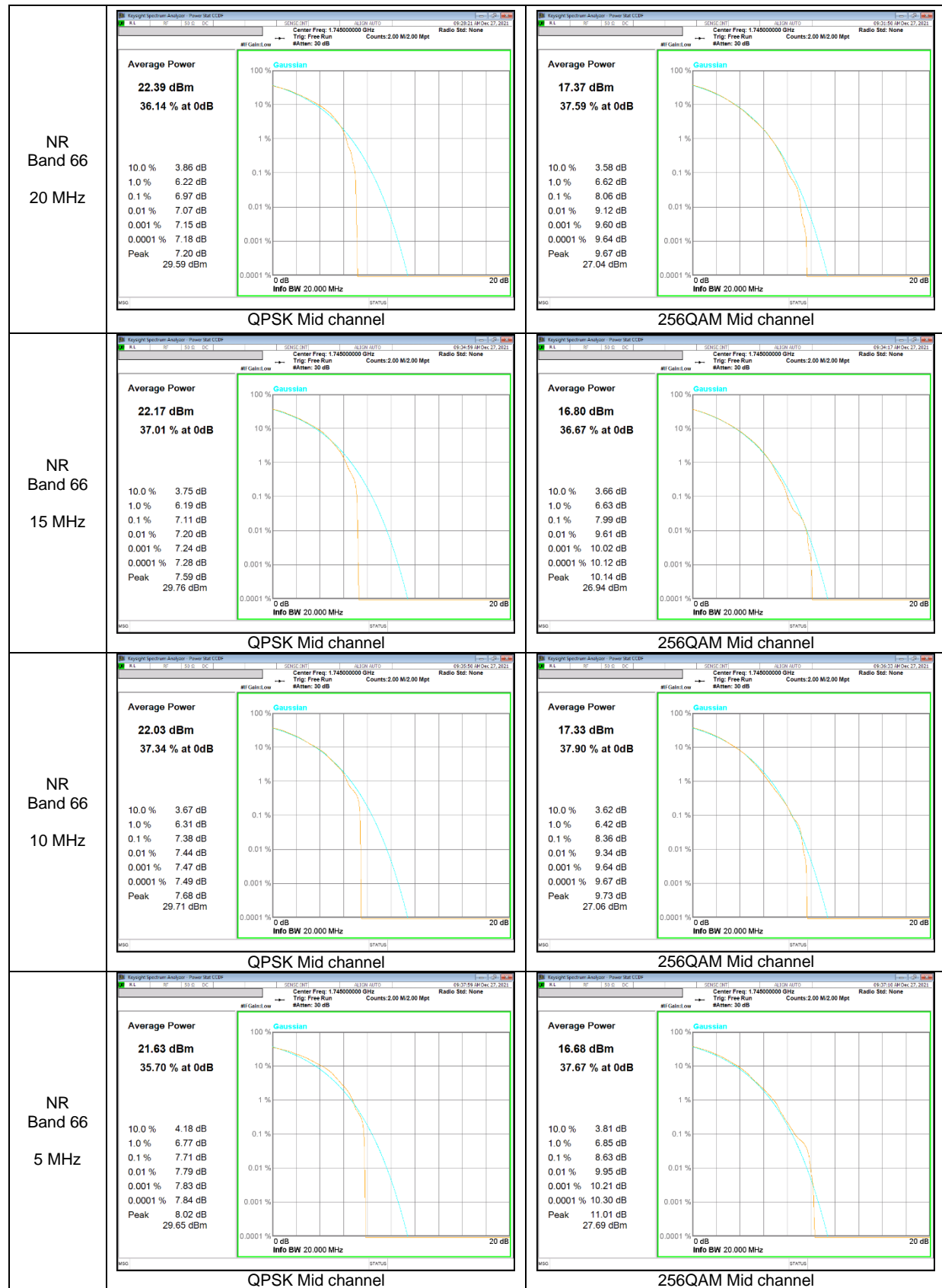




NR Band 5 CP-OFDM



NR Band 66 CP-OFDM



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)

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.

- GSM

Band	Modulation	f [MHz]	99% BW (kHz)	-26dB BW (kHz)
850	GPRS	836.6	247.75	315.6
	EGPRS		246.18	316.5
1900	GPRS	1880.0	246.94	319.8
	EGPRS		245.79	311.5

- WCDMA

Band	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
B5	Rel.99	836.6	4.179	4.711
	HSDPA		4.177	4.708
B4	Rel.99	1732.6	4.170	4.728
	HSDPA		4.174	4.707
B2	Rel.99	1880.0	4.188	4.753
	HSDPA		4.193	4.724

- LTE Band 2

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B2	20M	QPSK	1880.0	17.863	19.81
		16QAM		17.879	19.41
	15M	QPSK	1880.0	13.424	15.12
		16QAM		13.425	15.00
	10M	QPSK	1880.0	8.983	10.34
		16QAM		8.970	10.36
	5M	QPSK	1880.0	4.502	5.179
		16QAM		4.505	5.310
	3M	QPSK	1880.0	2.701	3.031
		16QAM		2.699	3.075
	1.4M	QPSK	1880.0	1.089	1.302
		16QAM		1.083	1.302

- LTE Band 12

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B12	10M	QPSK	707.5	8.965	10.44
		16QAM		8.957	10.36
	5M	QPSK	707.5	4.487	5.282
		16QAM		4.499	5.210
	3M	QPSK	707.5	2.696	3.082
		16QAM		2.700	3.108
	1.4M	QPSK	707.5	1.088	1.286
		16QAM		1.091	1.326

- LTE Band 13

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B13	10M	QPSK	782.0	8.973	10.29
		16QAM		8.979	10.31
	5M	QPSK	782.0	4.503	5.326
		16QAM		4.504	5.164

- LTE Band 26 (Part 90)

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 Part(90)	15M	QPSK	821.5	13.440	15.03
		16QAM		13.441	14.99
	10M	QPSK	819.0	8.999	10.25
		16QAM		8.987	10.25
	5M	QPSK	819.0	4.505	5.216
		16QAM		4.502	5.234
	3M	QPSK	819.0	2.696	3.080
		16QAM		2.702	3.066
	1.4M	QPSK	819.0	1.089	1.317
		16QAM		1.086	1.289

- LTE Band 26 (Straddle)

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 (Straddle)	15M	QPSK	824.0	13.399	14.83
		16QAM		13.425	14.97
	10M	QPSK	824.0	8.969	10.40
		16QAM		8.978	10.28
	5M	QPSK	824.0	4.508	5.292
		16QAM		4.496	5.227
	3M	QPSK	824.0	2.703	3.087
		16QAM		2.697	3.101
	1.4M	QPSK	824.0	1.084	1.292
		16QAM		1.086	1.295

- LTE Band 26 (Part 22)

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 (Part 22)	15M	QPSK	831.5	13.442	15.16
		16QAM		13.440	14.98
	10M	QPSK	831.5	8.979	10.26
		16QAM		8.977	10.26
	5M	QPSK	831.5	4.496	5.319
		16QAM		4.507	5.244
	3M	QPSK	831.5	2.696	3.107
		16QAM		2.705	3.042
	1.4M	QPSK	831.5	1.086	1.282
		16QAM		1.084	1.276

- LTE Band 41

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B41	20M	QPSK	2593.0	17.884	19.65
		16QAM		17.888	19.59
	15M	QPSK	2593.0	13.419	15.01
		16QAM		13.405	14.94
	10M	QPSK	2593.0	8.998	10.26
		16QAM		8.985	10.11
	5M	QPSK	2593.0	4.502	5.329
		16QAM		4.486	5.231

- LTE Band 66

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B66	20M	QPSK	1745.0	17.840	19.65
		16QAM		17.867	19.83
	15M	QPSK	1745.0	13.401	15.14
		16QAM		13.421	14.92
	10M	QPSK	1745.0	8.982	10.28
		16QAM		8.992	10.19
	5M	QPSK	1745.0	4.502	5.251
		16QAM		4.505	5.244
	3M	QPSK	1745.0	2.707	3.075
		16QAM		2.705	3.055
	1.4M	QPSK	1745.0	1.093	1.304
		16QAM		1.089	1.317

- NR Band 5 CP-OFDM

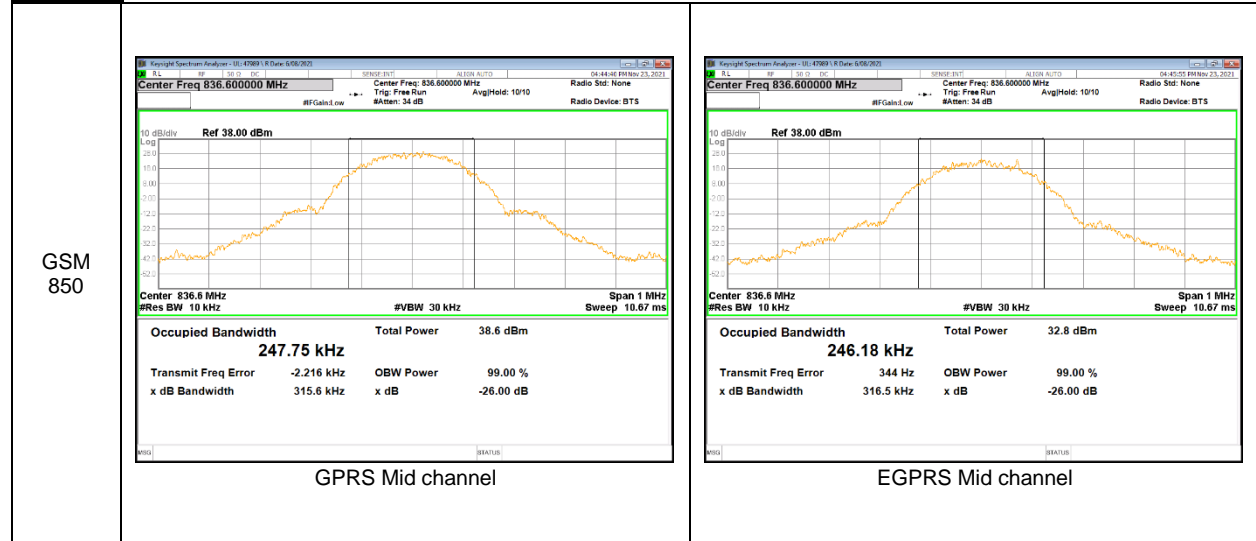
Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n5	20M	QPSK	836.5	19.019	21.13
		16QAM		18.957	20.78
	15M	QPSK	836.5	14.147	15.44
		16QAM		14.164	15.20
	10M	QPSK	836.5	9.338	10.41
		16QAM		9.379	10.44
	5M	QPSK	836.5	4.529	5.497
		16QAM		4.520	5.418

- NR Band 66 CP-OFDM

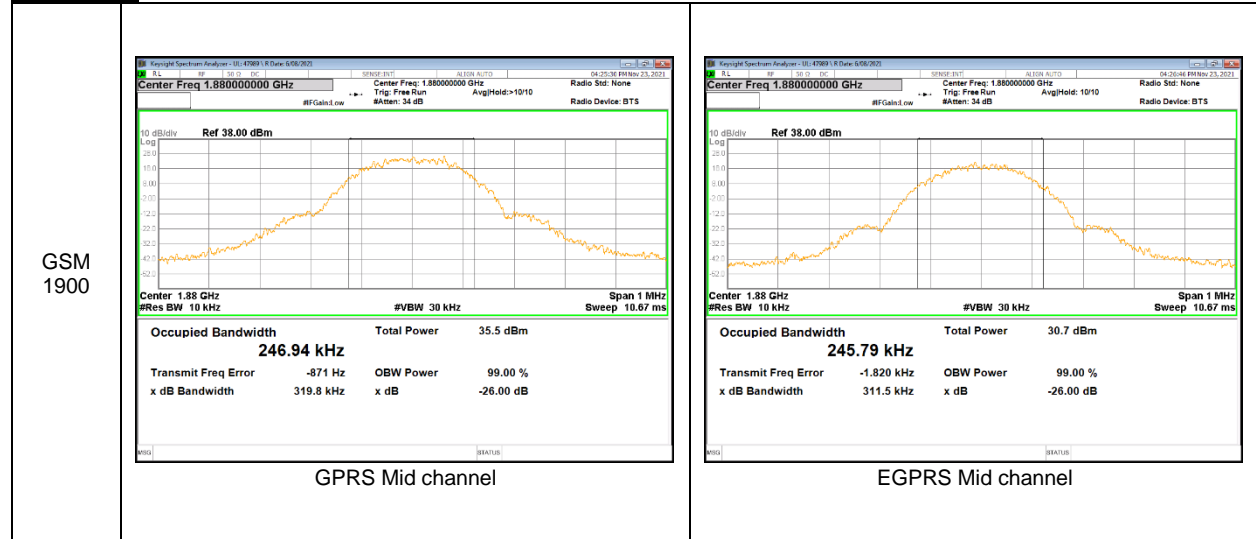
Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n66	20M	QPSK	1745.0	18.893	20.71
		16QAM		18.914	20.87
	15M	QPSK	1745.0	14.111	15.20
		16QAM		14.124	15.13
	10M	QPSK	1745.0	9.310	10.34
		16QAM		9.319	10.24
	5M	QPSK	1745.0	4.494	5.249
		16QAM		4.488	5.252

9.1.1. OCCUPIED BANDWIDTH RESULTS

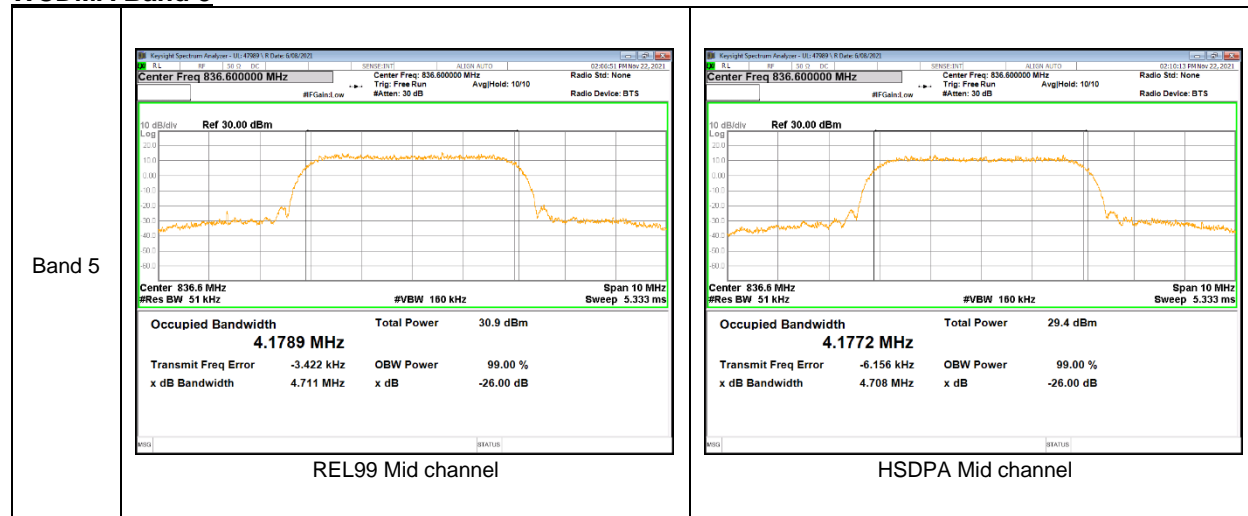
GSM 850



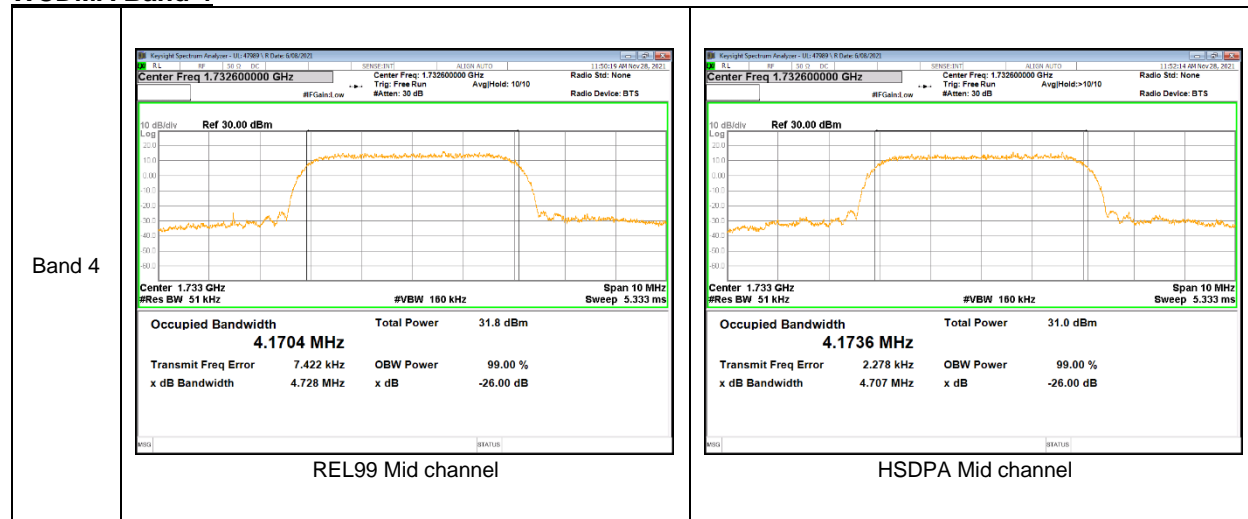
GSM 1900



WCDMA Band 5



WCDMA Band 4



WCDMA Band 2

