



FCC CFR47 PART 22 SUBPART H
FCC CFR47 PART 24 SUBPART E
FCC CFR47 PART 27 SUBPART F
FCC CFR47 PART 27 SUBPART H
FCC CFR47 PART 27 SUBPART L
FCC CFR47 PART 27 SUBPART M
FCC CFR47 PART 90 SUBPART S

WWAN

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-N975F/DS, SM-N975F, SM-N975X

FCC ID: A3LSMN975F

REPORT NUMBER: 4789067225-E2V1

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Prepared for

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

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

MODEL NUMBER: SM-N975F/DS, SM-N975F, SM-N975X

SERIAL NUMBER: R3CM40CW0CE, R3CM40CW7RX, R3CM40CW9DH
(CONDUCTED, Original)
R3CM503RJ4R, R3CM503RHXX, R3CM40CW58E, R3CM506NLK,
R3CM506Q9KN, R3CM506Q9BW (RADIATED, Original);
R38M50ASH5W, R38M50ASH7T (Spot check)

DATE TESTED: MAY 21, 2019 – JUN 18, 2019(Original);
JUN 21, 2019 – JUN 26, 2019(Spot check);

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.

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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMN976B PCE WWAN (FCC CFR 47 Part 22,24,27,90). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMN975F shares the same enclosure and circuit board as FCC ID: A3LSMN976B. The WWAN antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMN976B remains representative of FCC ID: A3LSMN975F. The test data of FCC ID: A3LSMN976B being submitted for this application to cover WWAN features.

1.3. SPOT CHECK VERIFICATION DATA (Worst case of the ERP/EIRP and radiated spurious emissions)

Band	Test Item	Worst Mode	Fundamental Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-N976B	SM-N975F/DS		
					FCC ID : A3LSMN976B	FCC ID : A3LSMN975F		
GSM850	ERP	GPRS	848.8 MHz	38.50 dBm	28.20 dBm	27.80 dBm	-0.40 dB	
	RSE	GPRS	836.6 MHz	-13.00 dBm	-29.90 dBm	-48.50 dBm	-18.60 dB	2nd Harmonic
GSM1900	EIRP	GPRS	1880.0 MHz	33.00 dBm	31.88 dBm	30.20 dBm	-1.68 dB	
	RSE	GPRS	1880.0 MHz	-13.00 dBm	-42.40 dBm	-43.80 dBm	-1.40 dB	2nd Harmonic
WCDMA Band 2	EIRP	REL99	1880.0 MHz	33.00 dBm	21.61 dBm	21.28 dBm	-0.33 dB	
	RSE	REL99	1852.4 MHz	-13.00 dBm	-44.50 dBm	-44.30 dBm	0.20 dB	4th Harmonic
WCDMA Band 4	EIRP	HSDPA	1712.4 MHz	30.00 dBm	23.57 dBm	21.67 dBm	-1.90 dB	
	RSE	REL99	1752.6 MHz	-13.00 dBm	-47.60 dBm	-45.60 dBm	2.00 dB	4th Harmonic
WCDMA Band 5	ERP	REL99	826.4 MHz	38.50 dBm	17.88 dBm	16.81 dBm	-1.07 dB	
	RSE	REL99	846.6 MHz	-13.00 dBm	-48.60 dBm	-48.60 dBm	0.00 dB	4th Harmonic
LTE Band 5	ERP	QPSK 10M	829.0 MHz	38.50 dBm	17.42 dBm	16.59 dBm	-0.83 dB	
	RSE	QPSK 10M	836.5 MHz	-13.00 dBm	-52.90 dBm	-53.40 dBm	-0.50 dB	4th Harmonic
LTE Band 7	EIRP	QPSK 15M	2562.5 MHz	33.00 dBm	22.16 dBm	22.11 dBm	-0.05 dB	
	RSE	QPSK 20M	2535 MHz	-13.00 dBm	-37.00 dBm	-38.70 dBm	-1.70 dB	2nd Harmonic
LTE Band 12	ERP	QPSK 3M	707.5 MHz	34.80 dBm	16.49 dBm	14.99 dBm	-1.50 dB	
	RSE	QPSK 3M	707.5 MHz	-13.00 dBm	-39.40 dBm	-47.00 dBm	-7.60 dB	2nd Harmonic
LTE Band 13	ERP	QPSK 5M	779.5 MHz	34.80 dBm	17.15 dBm	16.34 dBm	-0.81 dB	
	RSE	QPSK 10M	782.0 MHz	-40.00 dBm	-43.60 dBm	-44.00 dBm	-0.40 dB	2nd Harmonic
LTE Band 25	EIRP	QPSK 1.4M	1882.5 MHz	33.00 dBm	21.14 dBm	22.29 dBm	1.15 dB	
	RSE	QPSK 20M	1860.0 MHz	-13.00 dBm	-44.50 dBm	-44.60 dBm	-0.10 dB	4th Harmonic
LTE Band 26	ERP	QPSK 10M	829.0 MHz	38.50 dBm	16.15 dBm	15.76 dBm	-0.39 dB	
	RSE	QPSK 15M	831.5 MHz	-13.00 dBm	-53.00 dBm	-54.20 dBm	-1.20 dB	4th Harmonic
LTE Band 38	EIRP	QPSK 15M	2595.0 MHz	33.00 dBm	26.23 dBm	24.43 dBm	-1.80 dB	
	RSE	QPSK 20M	2595.0 MHz	-25.00 dBm	-36.30 dBm	-36.20 dBm	0.10 dB	4th Harmonic
LTE Band 41(PC2)	EIRP	QPSK 15M	2593.0 MHz	33.00 dBm	27.16 dBm	27.29 dBm	0.13 dB	
	RSE	QPSK 5M	2593.0 MHz	-25.00 dBm	-32.70 dBm	-33.60 dBm	-0.90 dB	4th Harmonic
LTE Band 41(PC3)	EIRP	QPSK 10M	2593.0 MHz	33.00 dBm	25.25 dBm	24.86 dBm	-0.39 dB	
	RSE	QPSK 15M	2503.5 MHz	-25.00 dBm	-33.40 dBm	-35.40 dBm	-2.00 dB	4th Harmonic
LTE Band 66	EIRP	QPSK 20M	1745.0 MHz	30.00 dBm	22.92 dBm	23.51 dBm	0.59 dB	
	RSE	QPSK 20M	1745.0 MHz	-13.00 dBm	-38.60 dBm	-38.60 dBm	0.00 dB	6th Harmonic

Comparison of two models, upper deviation is within 3dB range and all test results are under FCC Technical Limits.

1.4. REFERENCE DETAIL

Reference application that contains the reused reference data in the individual test reports:

Equipment Class	Reference FCC ID (Parent)	Application Type	Reference Test report number	Exhibit Type	Variant Test Report Number	Data Re-used
PCE	A3LSMN976B	Original Grant	4789009800-E2	Test Report	4789067225-E2	All
			4789009800-E3	Test Report	4789067225-E3	All
DTS	A3LSMN976B	Original Grant	4789009800-E5 (802.11b/g/n)	Test Report	4789067225-E5 (802.11b/g/n)	All
			4789009800-E6 (802.11ax)	Test Report	4789067225-E6 (802.11ax)	All
			4789009800-E4 Bluetooth LE	Test Report	4789067225-E4 Bluetooth LE	All
DSS	A3LSMN976B	Original Grant	4789009800-E7 (Bluetooth)	Test Report	4789067225-E7 (Bluetooth)	All
NII	A3LSMN976B	Original Grant	4789009800-E8 (802.11a/n/ac)	Test Report	4789067225-E8 (802.11a/n/ac)	All
			4789009800-E9 (802.11ax)	Test Report	4789067225-E9 (802.11ax)	All
DXX	A3LSMN976B	Original Grant	4789009800-E10 (ANT+)	Test Report	4789067225-E10 (ANT+)	All
			4789009800-E11 (NFC)	Test Report	4789067225-E11 (NFC)	All
DCD	A3LSMN976B	Original Grant	4789009800-E12 (WPT)	Test Report	4789067225-E12 (WPT)	All

For this application the data reuse is summarized below for each equipment class:

Equipment Class	Reference FCC ID (Parent)	Application Type	Data Re-used
PCE	A3LSMN976B	Original Grant	All except SAR (full test), HAC (full test)
			All except SAR (full test), HAC (full test)
DTS	A3LSMN976B	Original Grant	All except SAR (full test), HAC (full test)
			All except SAR (full test), HAC (full test)
			All
DSS	A3LSMN976B	Original Grant	All except SAR (full test)
NII	A3LSMN976B	Original Grant	All except SAR (full test), HAC (full test)
			All except SAR (full test), HAC (full test)
DXX	A3LSMN976B	Original Grant	All
			All
DCD	A3LSMN976B	Original Grant	All except RF exposure

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
9. KDB 484596 D01 Referencing Test Data v01

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
☒	Chamber 1
☒	Chamber 2
☐	Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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

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

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.86 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.97 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.57 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT. This test report addresses the WWAN operational mode.

5.2. MAXIMUM OUTPUT POWER

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

Note : Conducted output power results were excerpted from RF exposure test report.(4789009800-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	34.00	2511.89	28.20	660.69
		EGPRS	27.50	562.34	21.53	142.23
GSM1900	1850~1910	GPRS	30.80	1202.26	31.88	1541.70
		EGPRS	25.70	371.54	27.70	588.84

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	25.20	331.13	17.88	61.38
		HSDPA	23.20	208.93	15.41	34.75
Band 4	1710~1755	Rel. 99	24.30	269.15	23.54	225.94
		HSDPA	24.20	263.03	23.57	227.51
Band 2	1850~1910	Rel. 99	23.80	239.88	21.61	144.88
		HSDPA	23.80	239.88	21.05	127.35

LTE Band 5

FCC Part 22							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824 ~ 849	10	QPSK	25.19	330.37	17.42	55.21
			16QAM	23.13	205.59	14.79	30.13
			64QAM	21.91	155.24		
		5	QPSK	25.17	328.85	17.26	53.21
			16QAM	23.20	208.93	14.57	28.64
			64QAM	22.02	159.22		
		3	QPSK	25.13	325.84	17.19	52.36
			16QAM	23.31	214.29	14.74	29.79
			64QAM	22.19	165.58		
		1.4	QPSK	25.14	326.59	17.40	54.95
			16QAM	23.22	209.89	14.59	28.77
			64QAM	22.64	183.65		

LTE Band 7

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 7	2500 ~ 2570	20	QPSK	24.26	266.69	22.09	161.81
			16QAM	22.71	186.64	20.66	116.41
			64QAM	21.65	146.22		
		15	QPSK	24.18	261.82	22.16	164.44
			16QAM	22.62	182.81	19.97	99.31
			64QAM	21.64	145.88		
		10	QPSK	24.25	266.07	22.09	161.81
			16QAM	22.55	179.89	19.92	98.17
			64QAM	21.43	139.00		
		5	QPSK	24.25	266.07	21.92	155.60
			16QAM	22.40	173.78	19.61	91.41
			64QAM	21.60	144.54		

LTE Band 12

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 12	699 ~ 716	10	QPSK	24.09	256.45	16.47	44.36
			16QAM	21.98	157.76	14.18	26.18
			64QAM	20.97	125.03		
		5	QPSK	24.08	255.86	16.23	41.98
			16QAM	22.18	165.20	13.90	24.55
			64QAM	21.03	126.77		
		3	QPSK	24.08	255.86	16.49	44.57
			16QAM	22.19	165.58	13.98	25.00
			64QAM	20.96	124.74		
		1.4	QPSK	24.08	255.86	16.42	43.85
			16QAM	22.03	159.59	13.43	22.03
			64QAM	20.94	124.17		

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 13

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 13	777 ~ 787	10	QPSK	24.44	277.97	16.88	48.75
			16QAM	22.24	167.49	14.23	26.49
			64QAM	21.13	129.72		
		5	QPSK	24.44	277.97	17.15	51.88
			16QAM	22.31	170.22	14.38	27.42
			64QAM	21.34	136.14		

LTE Band 25

FCC Part 24							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 25	1850 ~ 1915	20	QPSK	24.05	254.10	20.43	110.41
			16QAM	22.90	194.98	19.06	80.54
			64QAM	21.87	153.82		
		15	QPSK	24.04	253.51	20.38	109.14
			16QAM	22.90	194.98	19.22	83.56
			64QAM	21.86	153.46		
		10	QPSK	23.94	247.74	20.59	114.55
			16QAM	22.78	189.67	19.03	79.98
			64QAM	21.95	156.68		
		5	QPSK	23.89	244.91	21.09	128.53
			16QAM	23.00	199.53	19.05	80.35
			64QAM	21.87	153.82		
		3	QPSK	24.04	253.51	20.85	121.62
			16QAM	22.85	192.75	19.13	81.85
			64QAM	21.81	151.71		
		1.4	QPSK	23.85	242.66	21.14	130.02
			16QAM	22.75	188.36	19.85	96.61
			64QAM	21.76	149.97		

LTE Band 2

LTE Band 2 (Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, maximum tune-up limit of LTE Band 25 is higher than LTE Band 2 and both LTE Band 25 and LTE Band 2 channel bandwidth are same.

LTE Band 26 (Part90)

FCC Part 90							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 26	814 ~ 824	15	QPSK	24.13	258.82	16.11	40.83
			16QAM	21.80	151.36	14.29	26.85
			64QAM	20.74	118.58		
		10	QPSK	23.90	245.47	16.04	40.18
			16QAM	21.63	145.55	14.09	25.64
			64QAM	20.67	116.68		
		5	QPSK	23.85	242.66	16.27	42.36
			16QAM	21.84	152.76	13.96	24.89
			64QAM	21.01	126.18		
		3	QPSK	23.90	245.47	16.11	40.83
			16QAM	21.90	154.88	14.18	26.18
			64QAM	20.83	121.06		
		1.4	QPSK	23.95	248.31	16.19	41.59
			16QAM	21.67	146.89	14.29	26.85
			64QAM	20.75	118.85		

LTE Band 26 (Part22)

FCC Part 22							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 26	824 ~ 849	15	QPSK	24.19	262.42	16.05	40.27
			16QAM	21.87	153.82	13.88	24.43
			64QAM	21.16	130.62		
		10	QPSK	24.06	254.68	16.15	41.21
			16QAM	21.78	150.66	14.22	26.42
			64QAM	20.81	120.50		
		5	QPSK	24.01	251.77	15.44	34.99
			16QAM	21.98	157.76	13.51	22.44
			64QAM	21.09	128.53		
		3	QPSK	24.10	257.04	15.66	36.81
			16QAM	22.03	159.59	13.52	22.49
			64QAM	21.01	126.18		
		1.4	QPSK	24.18	261.82	15.64	36.64
			16QAM	22.00	158.49	13.98	25.00
			64QAM	21.11	129.12		

LTE Band 38

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 38	2570 ~ 2620	20	QPSK	22.94	196.79	25.77	377.57
			16QAM	21.99	158.12	25.12	325.09
			64QAM	20.94	124.17		
		15	QPSK	22.94	196.79	26.23	419.76
			16QAM	21.93	155.96	25.24	334.20
			64QAM	20.87	122.18		
		10	QPSK	22.89	194.54	25.32	340.41
			16QAM	21.98	157.76	24.24	265.46
			64QAM	20.91	123.31		
		5	QPSK	22.89	194.54	25.59	362.24
			16QAM	21.96	157.04	24.54	284.45
			64QAM	20.87	122.18		

LTE Band 41(PC2)

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 41	2496 ~ 2690	20	QPSK	25.77	377.57	26.39	435.51
			16QAM	24.62	289.73	26.91	490.91
			64QAM	23.97	249.46		
		15	QPSK	25.64	366.44	27.16	520.00
			16QAM	24.80	302.00	26.68	465.59
			64QAM	23.90	245.47		
		10	QPSK	25.66	368.13	26.59	456.04
			16QAM	24.72	296.48	26.76	474.24
			64QAM	23.72	235.50		
		5	QPSK	25.63	365.59	27.01	502.34
			16QAM	24.45	278.61	25.70	371.54
			64QAM	23.78	238.78		

LTE Band 41(PC3)

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 41	2496 ~ 2690	20	QPSK	22.75	188.36	24.85	305.49
			16QAM	21.92	155.60	25.04	319.15
			64QAM	20.96	124.74		
		15	QPSK	22.73	187.50	24.83	304.09
			16QAM	21.81	151.71	24.80	302.00
			64QAM	21.00	125.89		
		10	QPSK	22.73	187.50	25.25	334.97
			16QAM	21.80	151.36	25.14	326.59
			64QAM	20.57	114.02		
		5	QPSK	22.73	187.50	25.05	319.89
			16QAM	21.52	141.91	24.98	314.77
			64QAM	20.83	121.06		

LTE Band 66

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 66	1710 ~ 1780	20	QPSK	24.35	272.27	22.92	195.88
			16QAM	22.48	177.01	20.52	112.72
			64QAM	21.55	142.89		
		15	QPSK	24.12	258.23	22.42	174.58
			16QAM	22.65	184.08	20.52	112.72
			64QAM	21.56	143.22		
		10	QPSK	24.14	259.42	22.23	167.11
			16QAM	22.70	186.21	20.24	105.68
			64QAM	21.36	136.77		
		5	QPSK	24.17	261.22	22.16	164.44
			16QAM	22.56	180.30	20.13	103.04
			64QAM	21.48	140.60		
		3	QPSK	24.19	262.42	22.52	178.65
			16QAM	22.63	183.23	20.40	109.65
			64QAM	21.41	138.36		
		1.4	QPSK	24.17	261.22	22.54	179.47
			16QAM	22.51	178.24	20.23	105.44
			64QAM	21.51	141.58		

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.

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 / LTE Band 25 1850 ~ 1915 MHz	-5.91
WCDMA Band 4 / LTE Band 4 / LTE Band 66 1710 ~ 1780 MHz	-4.97
GSM850 / WCDMA Band 5 / LTE Band 5 / LTE Band 26 814 ~ 849 MHz	-3.28
LTE Band 7 2500 ~ 2570 MHz	-4.71
LTE Band 12 / LTE Band 17 699 ~ 716 MHz	-2.65
LTE Band 41 2496 ~ 2690 MHz	-4.71
LTE Band 13 777 ~ 787 MHz	-5.56
LTE Band 38 2570 ~ 2620 MHz	-4.71

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 and 64QAM modulations. It was found that QPSK and 16QAM results were worst case. All testing was performed using QPSK and 16QAM modulations to represent the worst case. However, the out of band emissions and spurious radiation were only performed on bandwidth and RB offset(with RB size 1) with the highest power in QPSK.

Highest power setting for each bands				
LTE Band	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
5	829.0	10	1	0
	836.5		1	0
	844.0		1	0
7	2510.0	20	1	0
	2535.0		1	0
	2560.0		1	99
12	700.5	3	1	8
	707.5		1	0
	714.5		1	8
13	782.0	10	1	0
25	1860.0	20	1	0
	1882.5		1	0
	1905.0		1	0
26	821.5	15	1	37
	831.5		1	37
	841.5		1	0
38	2580.0	20	1	0
	2595.0		1	0
	2610.0		1	0
41(PC2)	2498.5	5	1	0
	2593.0		1	0
	2687.5		1	24
41(PC3)	2503.5	15	1	0
	2593.0		1	0
	2682.5		1	0
66	1720.0	20	1	0
	1745.0		1	0
	1770.0		1	0

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

Band	ERP/EIRP			RSE		
	X	Y	Z	X	Y	Z
GSM850			O		O	
GSM1900	O				O	
WCDMA B5	O			O		
WCDMA B4			O			O
WCDMA B2			O			O
LTE B5	O			O		
LTE B7	O				O	
LTE B12	O				O	
LTE B13			O			O
LTE B25			O			O
LTE B26	O			O		
LTE B38	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.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37M4PW4FW1SE3	N/A
Data Cable	SAMSUNG	EP-DG977	N/A	N/A

I/O CABLE

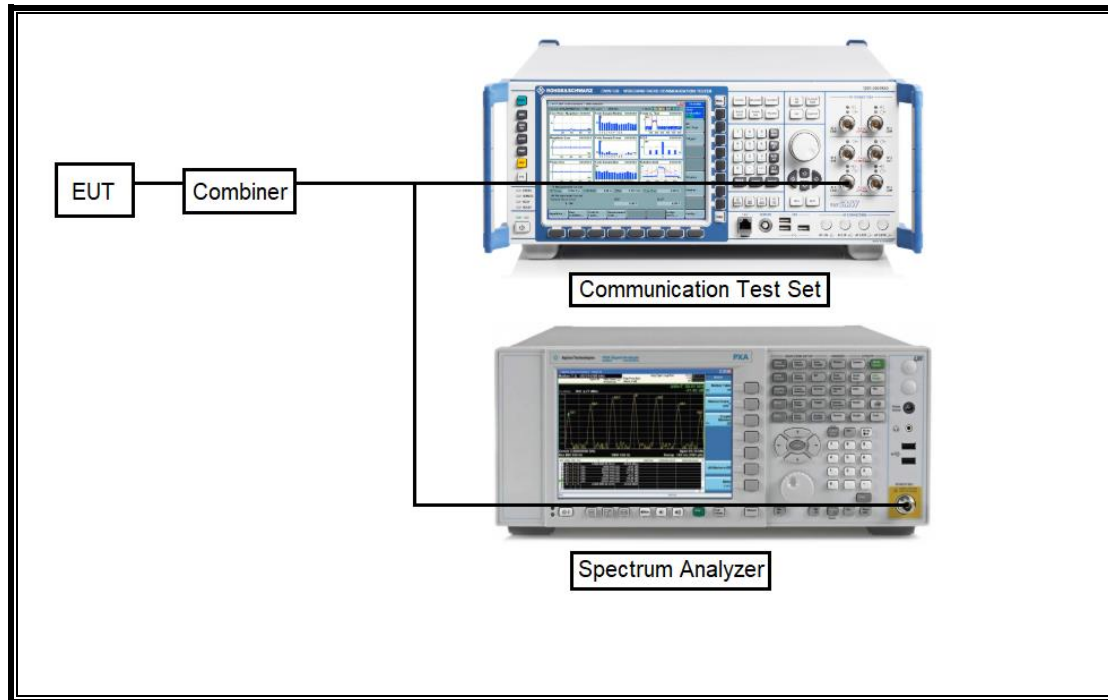
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.0m	N/A

TEST SETUP

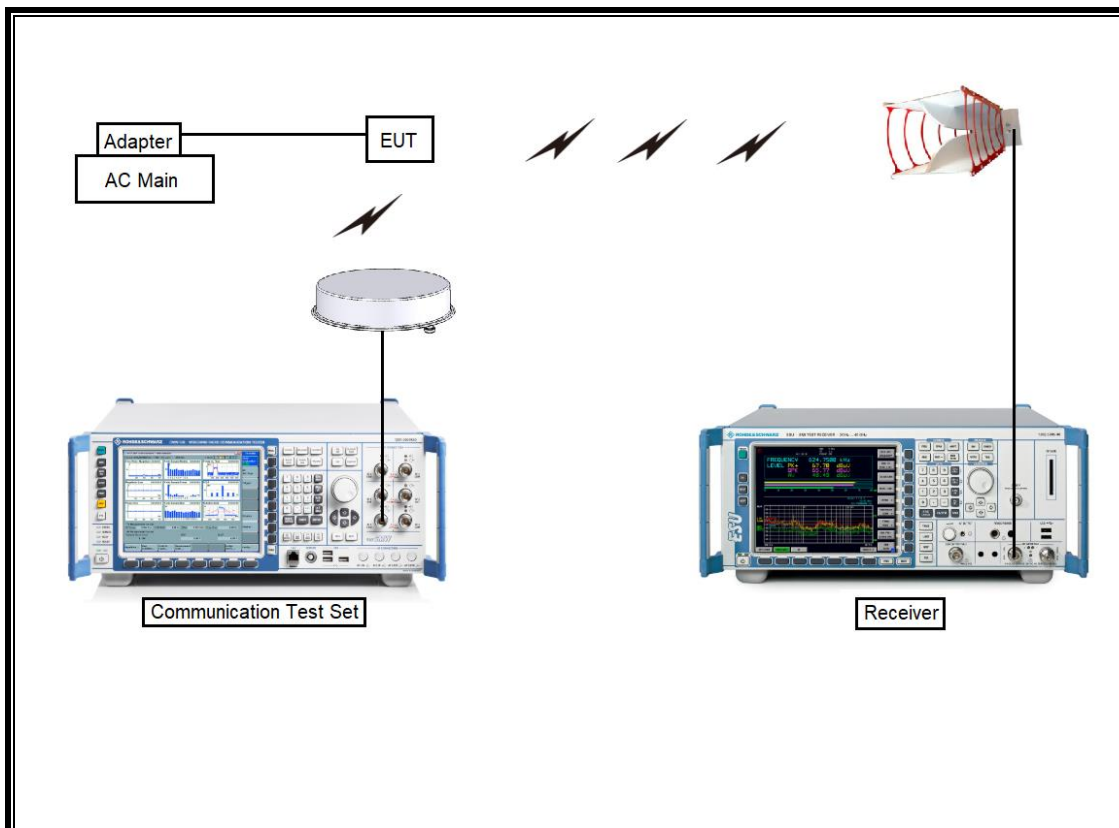
The EUT is continuously communicated with the call box during the tests.

This EUT is able to equipped with S-pen on the inside. Spot check were performed both inserted and removed condition. Because there is no deviation between the two data, all tests were performed under equipped with the S-pen.

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	06-30-19
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-14-20
Preamplifier	ETS	3116C-PA	00168841	08-09-19
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-04-20
Combiner	WEINSCHTEL	1575	2150	08-08-19
Communications Test Set	R&S	CMW500	115331	08-07-19
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-06-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-06-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	08-08-19
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	08-08-19
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	08-08-19
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	08-08-19
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	08-08-19
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	08-08-19
Attenuator	PASTERNAK	PE7087-10	A009	08-08-19
Attenuator	PASTERNAK	PE7087-10	A001	08-08-19
Attenuator	PASTERNAK	PE7087-10	A008	08-08-19
Attenuator	PASTERNAK	PE7087-10	2	08-07-19
Attenuator	PASTERNAK	PE7395-10	A011	08-08-19
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Temperature Chamber	ESPEC	SH-642	93001109	08-06-19
UL Software				
Description	Manufacturer	Model	Version	
Antenna port test software	UL	CLT	Ver 2.5	

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	-25 dBm		Pass
27.53(m) 90.691	Emission mask	Section 9.2.2		Pass
2.1046	Conducted output power	N/A		Pass
22.355 24.235 27.54 90.213	Frequency Stability	2.5PPM		Pass
22.913(a)(5)	Effective Radiated Power	38.5 dBm	Radiated	Pass
27.50(c)(10) 27.50(b)(10)		34.77 dBm		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.

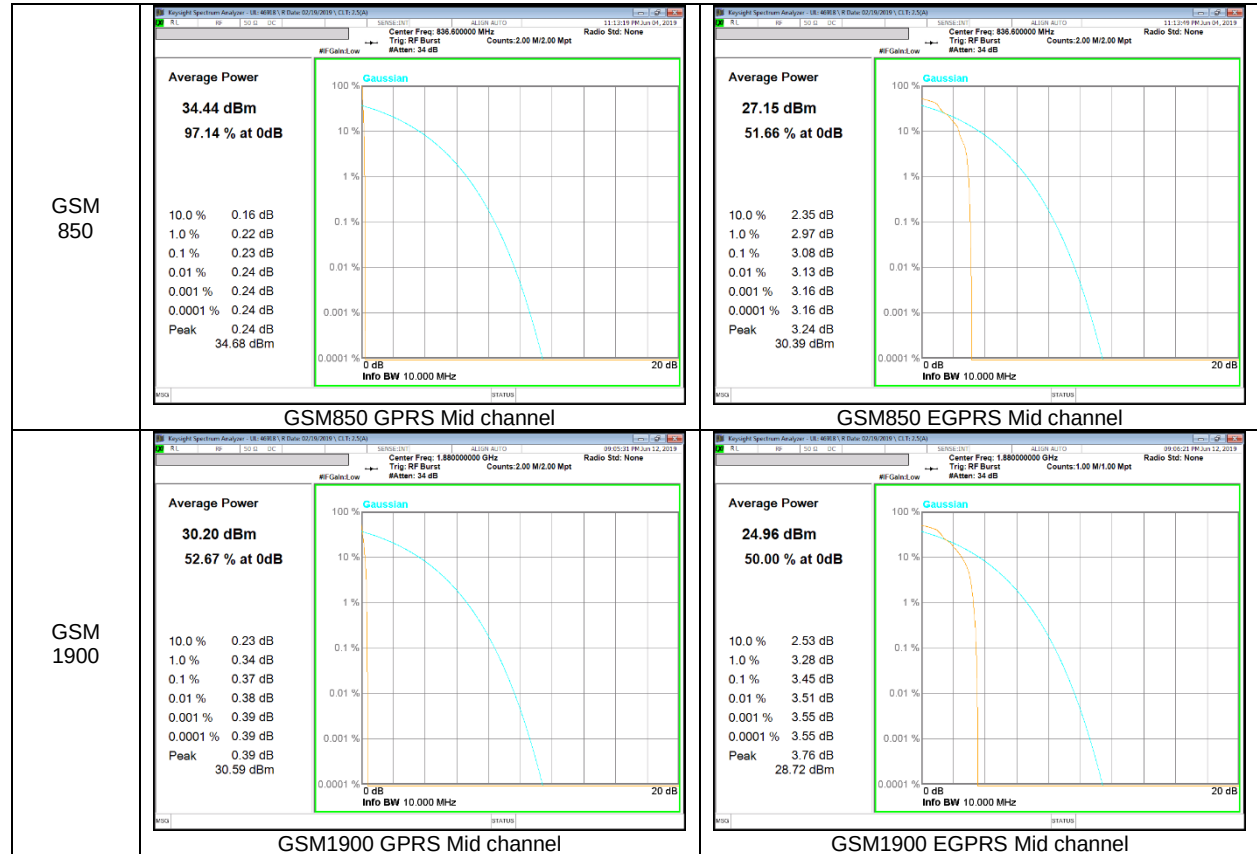
Test Spec

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.

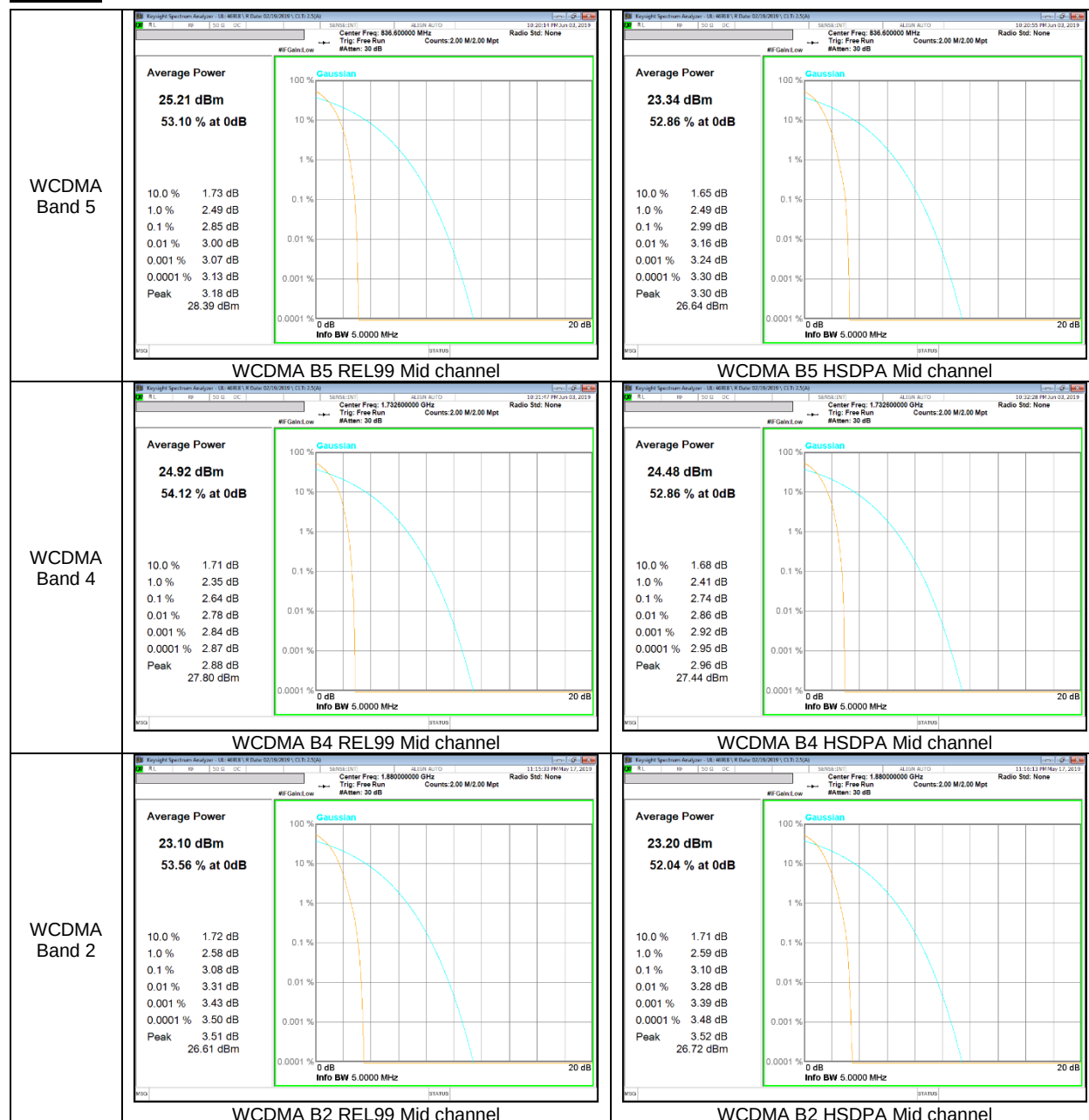
RESULTS

8.1. CONDUCTED PEAK TO AVERAGE RESULT

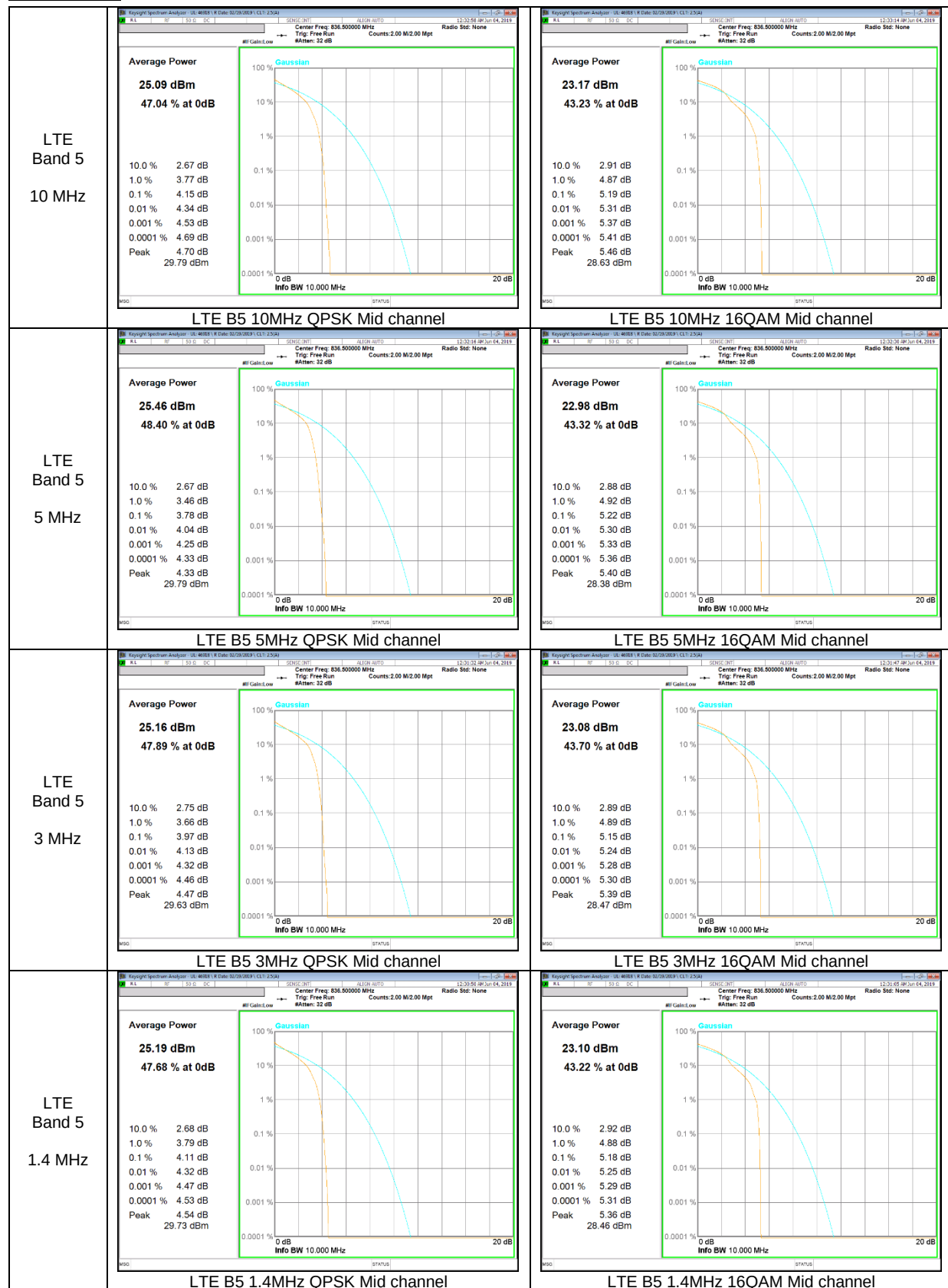
GSM



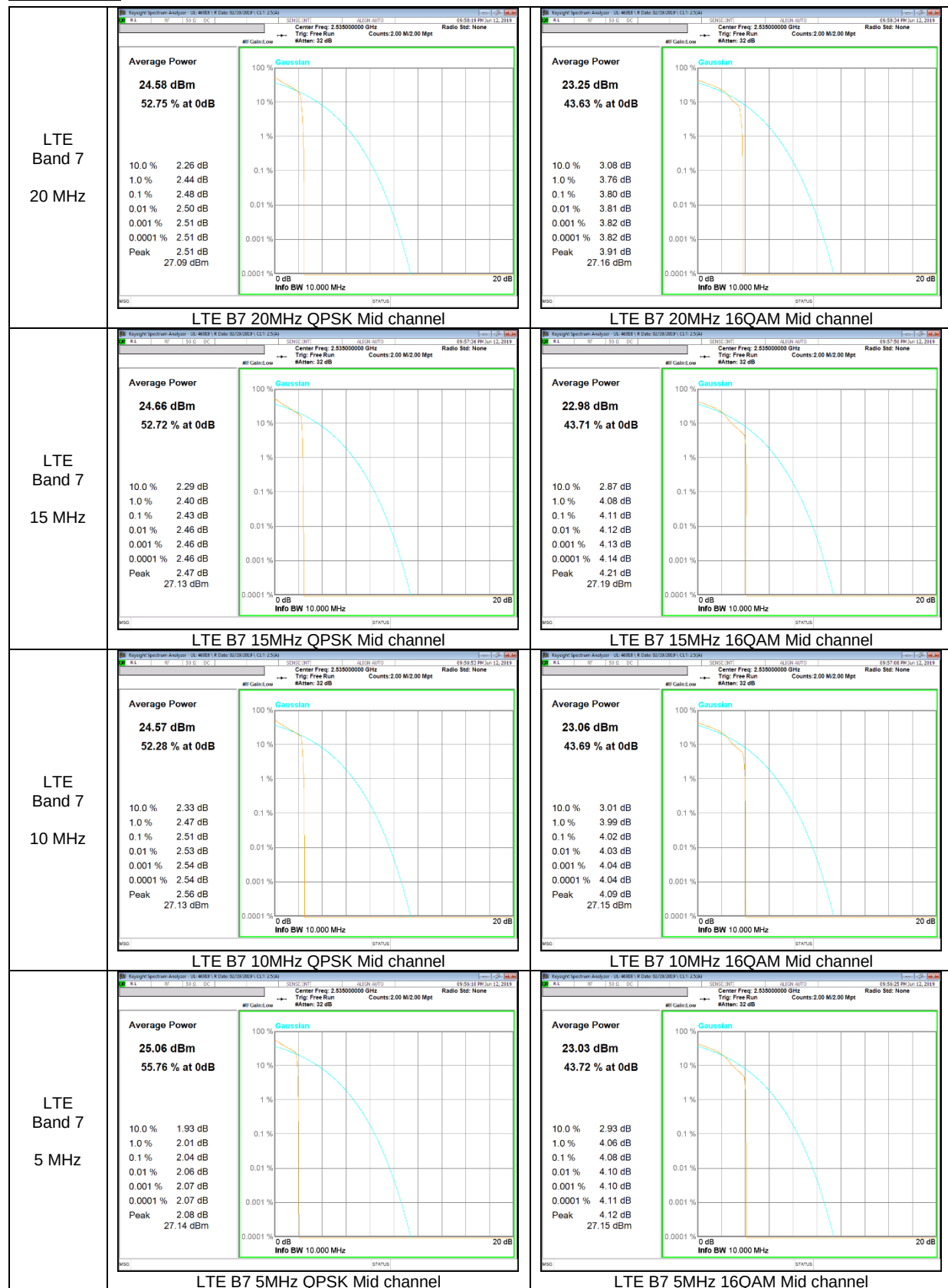
WCDMA



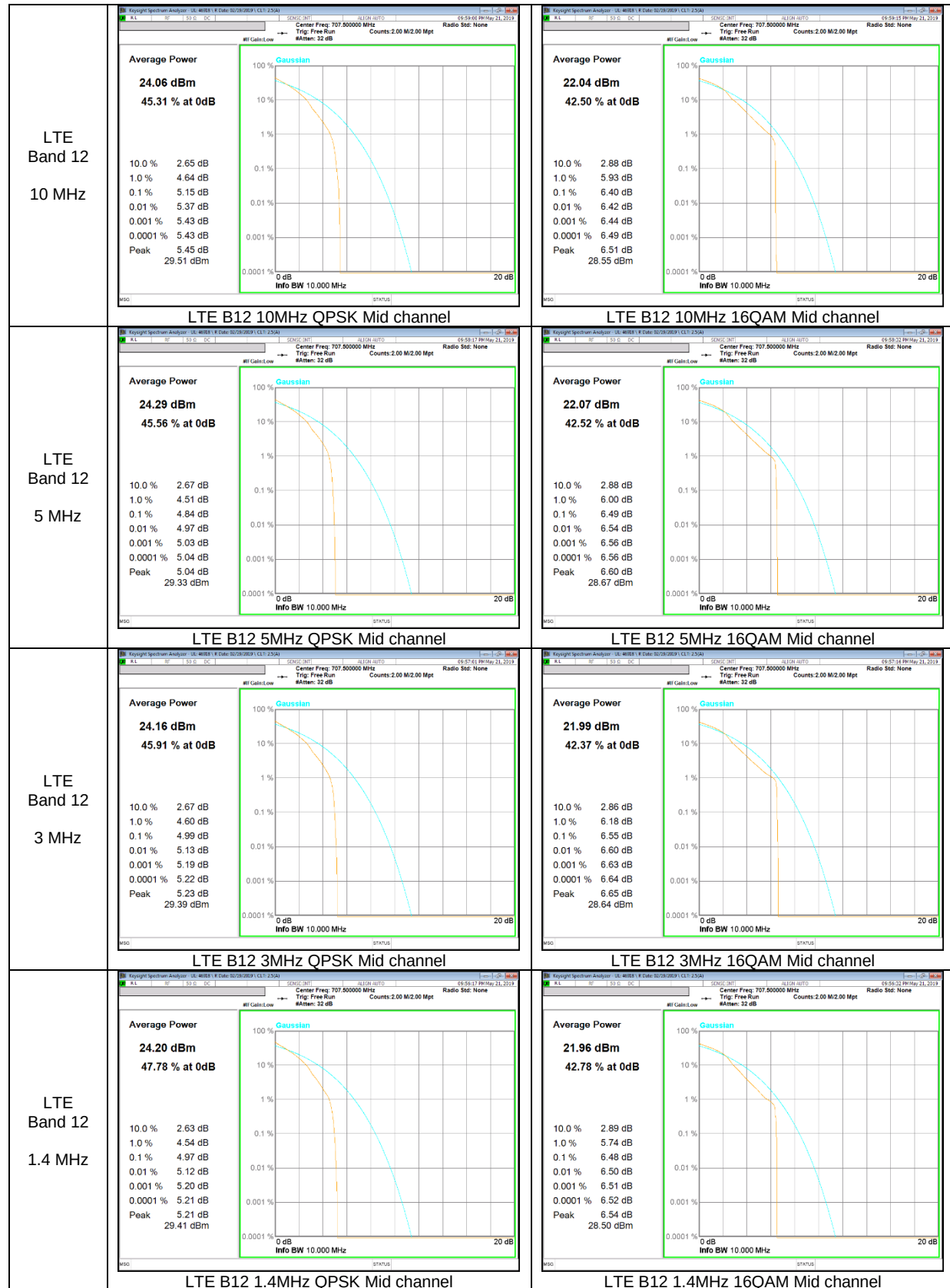
LTE Band 5



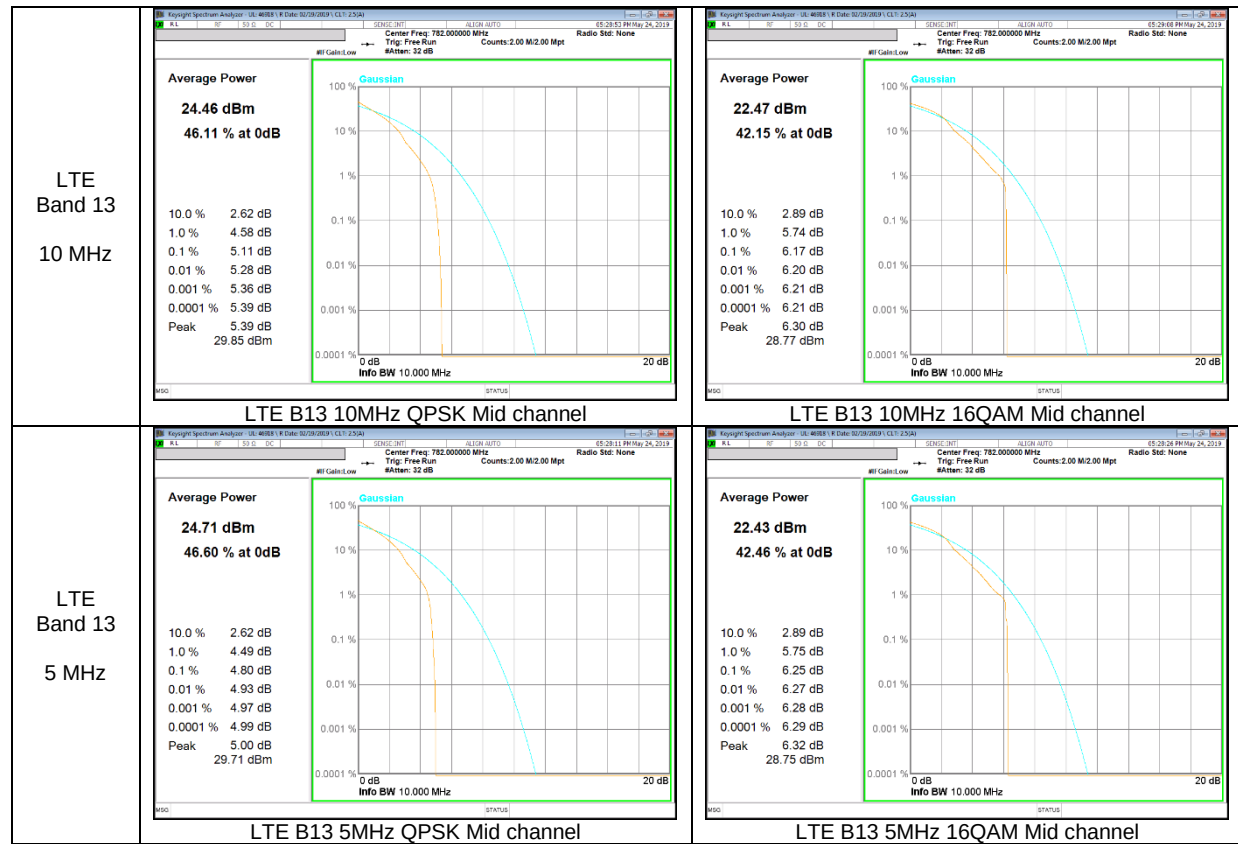
LTE Band 7



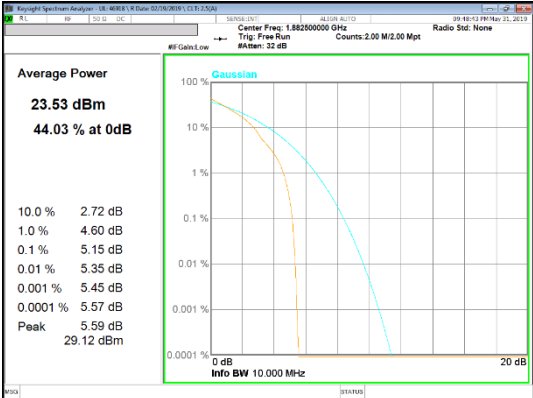
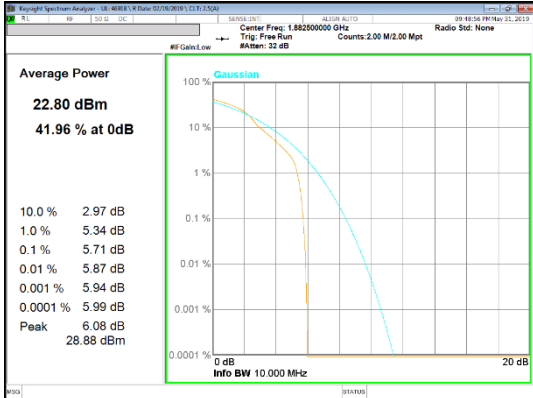
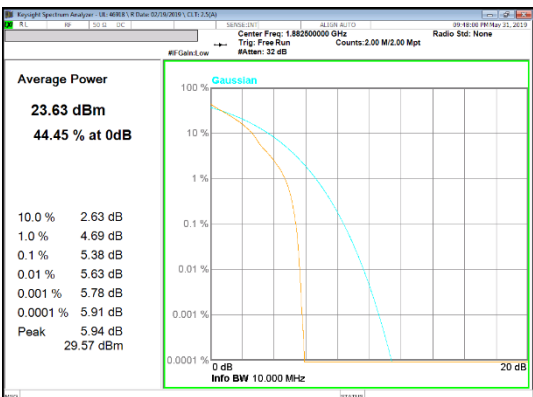
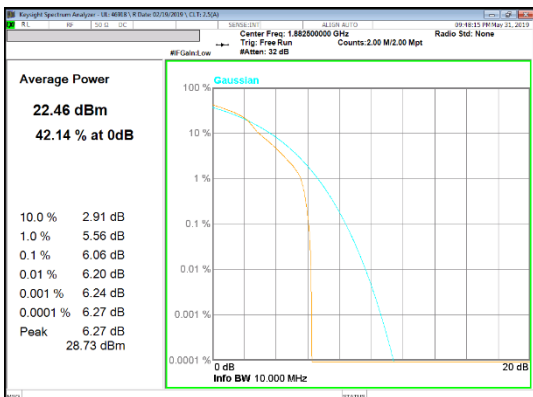
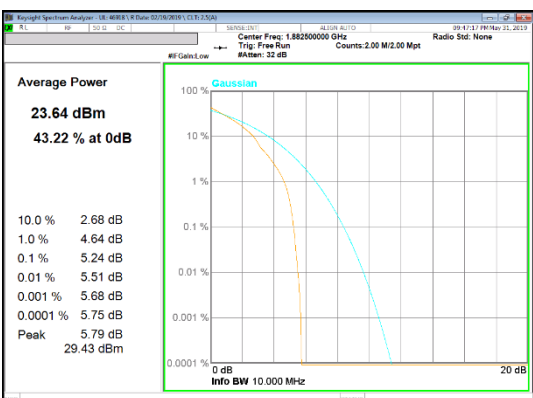
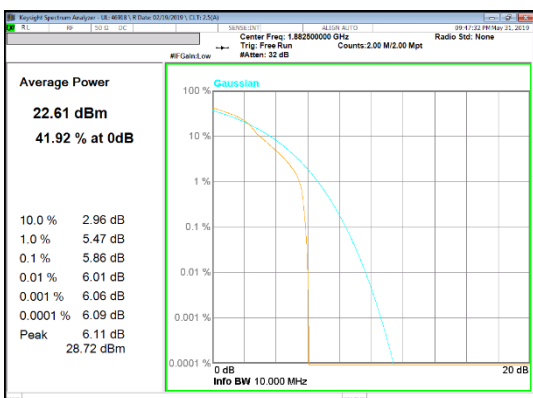
LTE Band 12

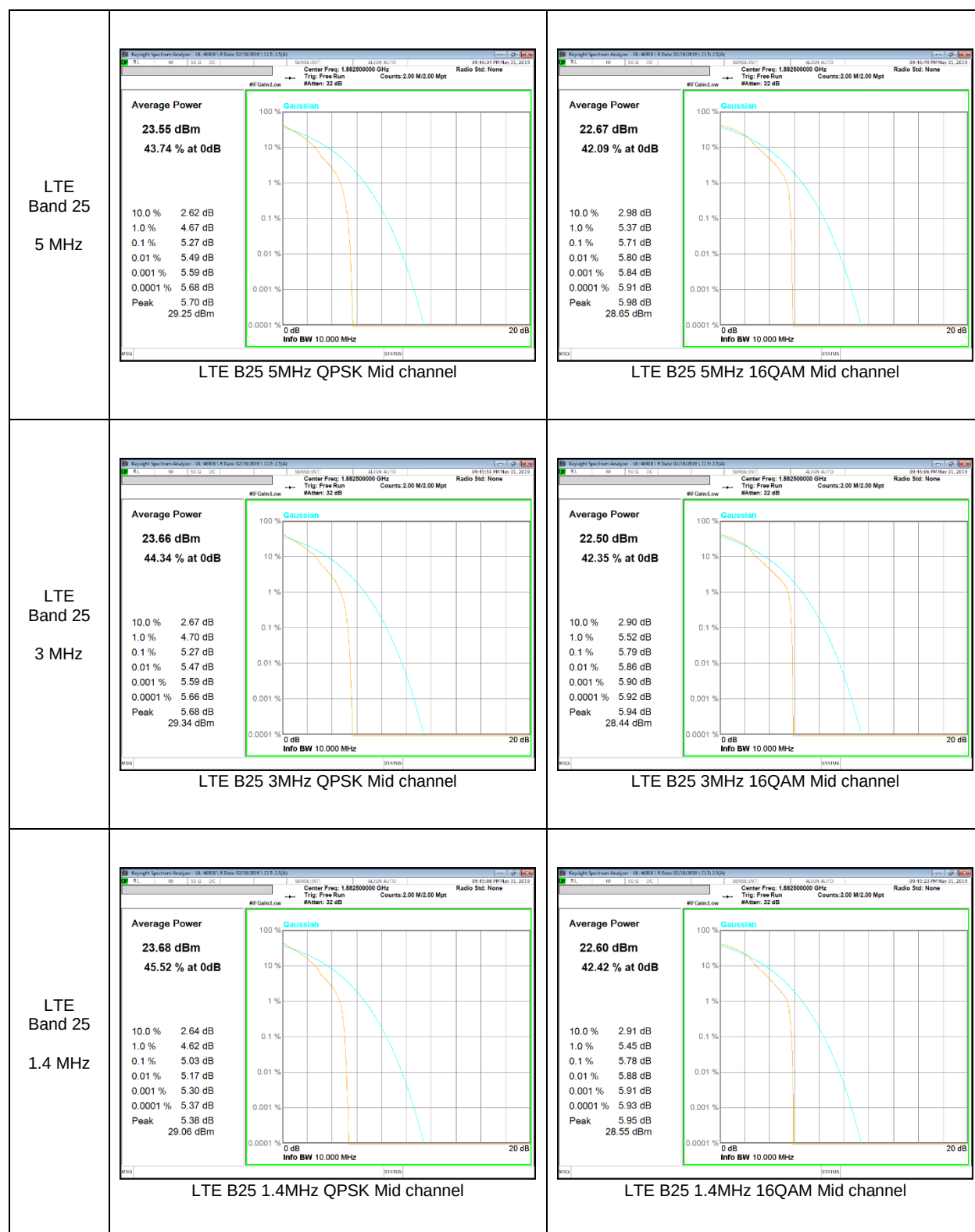


LTE Band 13

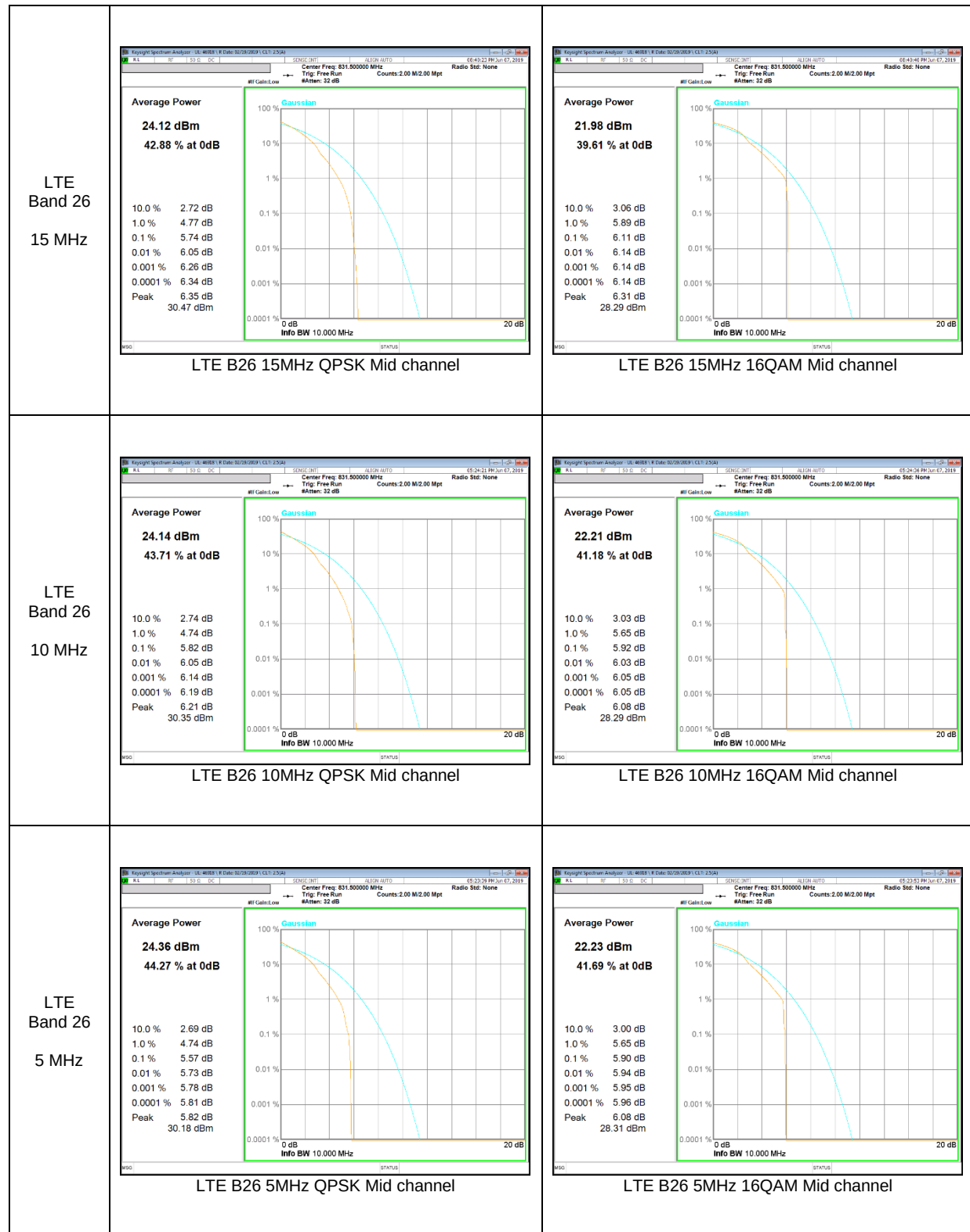


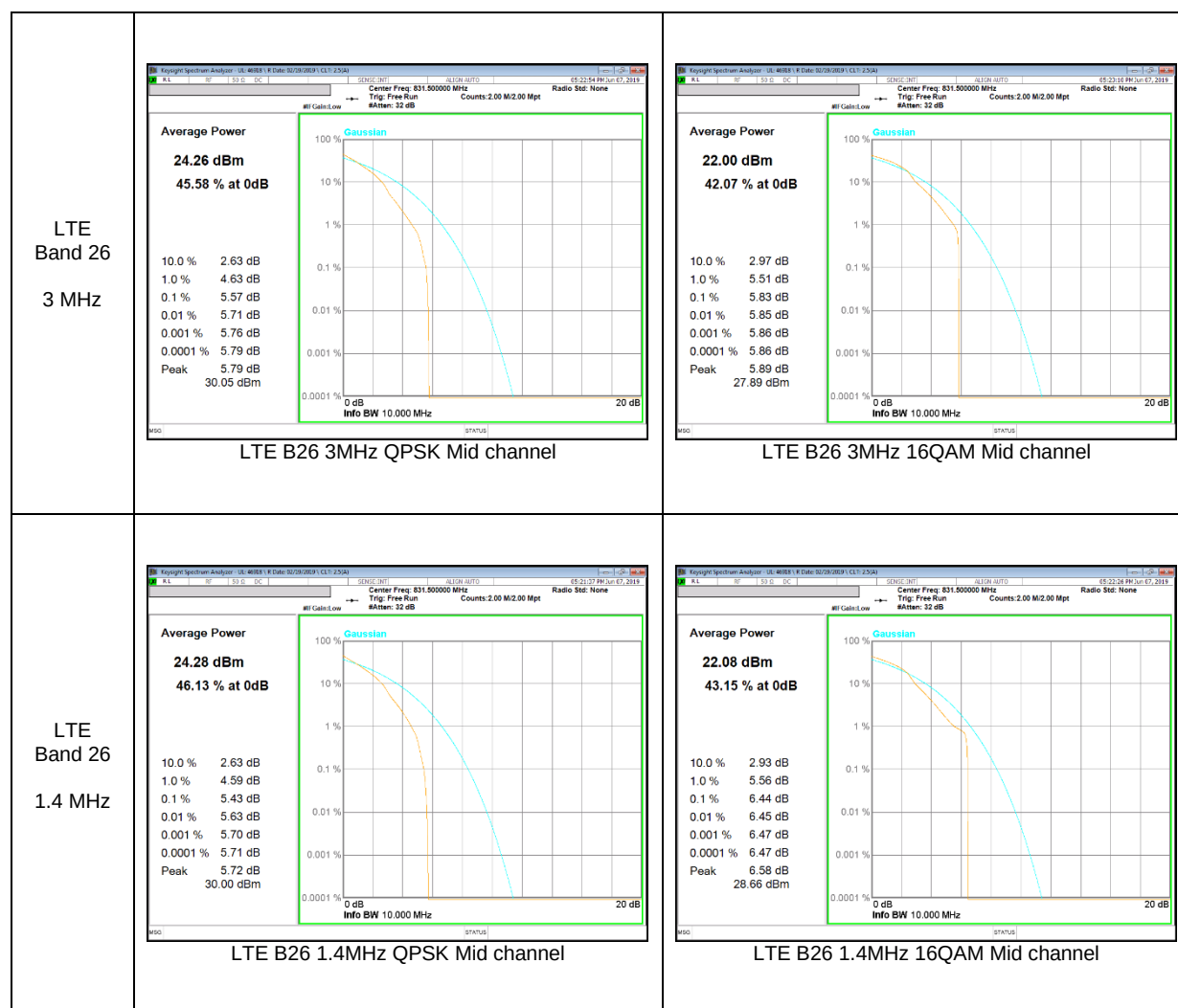
LTE Band 25

LTE Band 25 20 MHz	 Average Power 23.53 dBm 44.03 % at 0dB 10.0 % 2.72 dB 1.0 % 4.60 dB 0.1 % 5.15 dB 0.01 % 5.35 dB 0.001 % 5.45 dB 0.0001 % 5.57 dB Peak 5.59 dB 29.12 dBm LTE B25 20MHz QPSK Mid channel	 Average Power 22.80 dBm 41.96 % at 0dB 10.0 % 2.97 dB 1.0 % 5.34 dB 0.1 % 5.71 dB 0.01 % 5.87 dB 0.001 % 5.94 dB 0.0001 % 5.99 dB Peak 6.08 dB 28.88 dBm LTE B25 20MHz 16QAM Mid channel
LTE Band 25 15 MHz	 Average Power 23.63 dBm 44.45 % at 0dB 10.0 % 2.63 dB 1.0 % 4.69 dB 0.1 % 5.38 dB 0.01 % 5.63 dB 0.001 % 5.78 dB 0.0001 % 5.91 dB Peak 5.94 dB 29.57 dBm LTE B25 15MHz QPSK Mid channel	 Average Power 22.46 dBm 42.14 % at 0dB 10.0 % 2.91 dB 1.0 % 5.56 dB 0.1 % 6.06 dB 0.01 % 6.20 dB 0.001 % 6.24 dB 0.0001 % 6.27 dB Peak 6.27 dB 28.73 dBm LTE B25 15MHz 16QAM Mid channel
LTE Band 25 10 MHz	 Average Power 23.64 dBm 43.22 % at 0dB 10.0 % 2.68 dB 1.0 % 4.64 dB 0.1 % 5.24 dB 0.01 % 5.51 dB 0.001 % 5.68 dB 0.0001 % 5.75 dB Peak 5.79 dB 29.43 dBm LTE B25 10MHz QPSK Mid channel	 Average Power 22.61 dBm 41.92 % at 0dB 10.0 % 2.96 dB 1.0 % 5.47 dB 0.1 % 5.86 dB 0.01 % 6.01 dB 0.001 % 6.06 dB 0.0001 % 6.09 dB Peak 6.11 dB 28.72 dBm LTE B25 10MHz 16QAM Mid channel

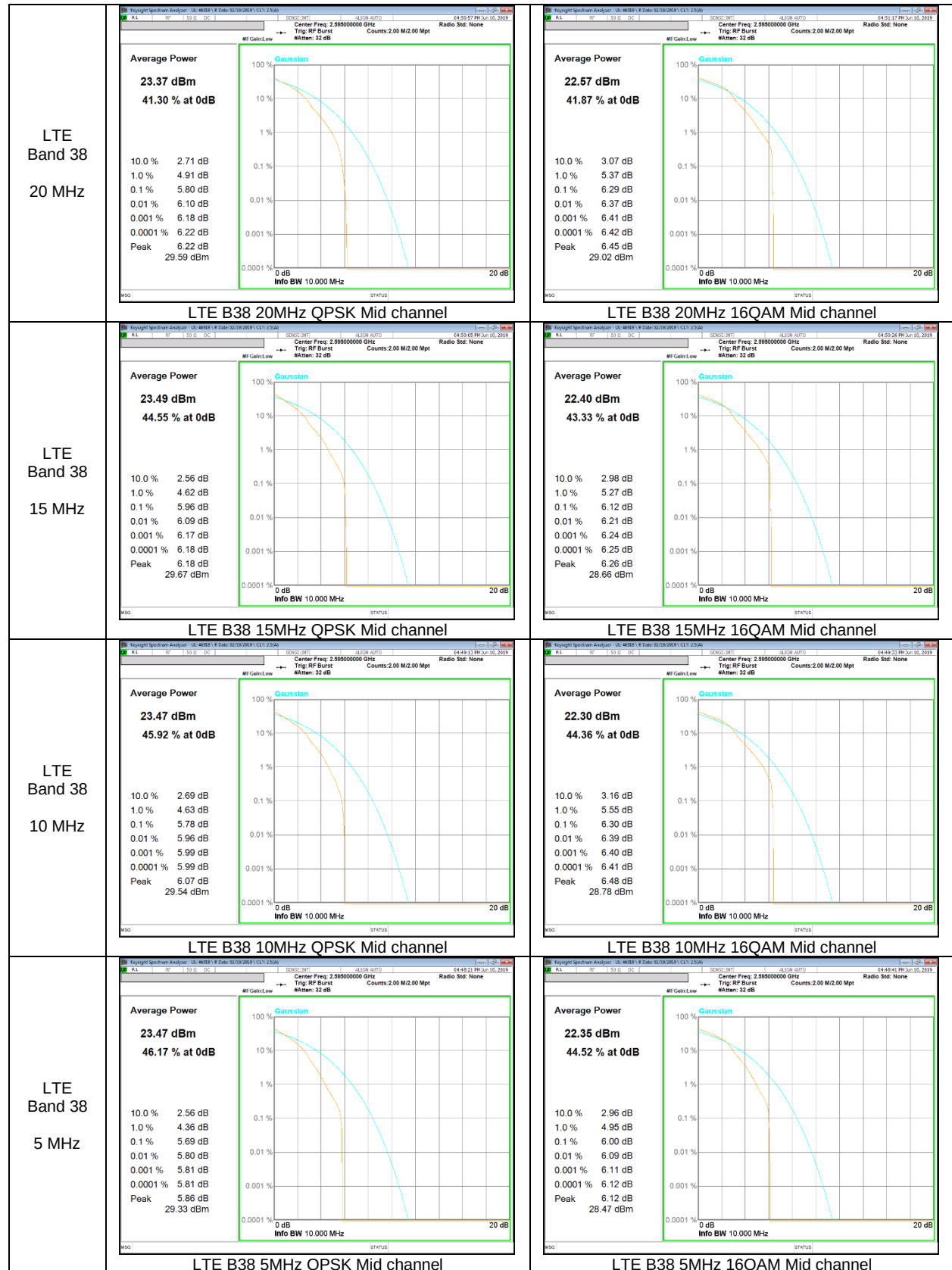


LTE Band 26

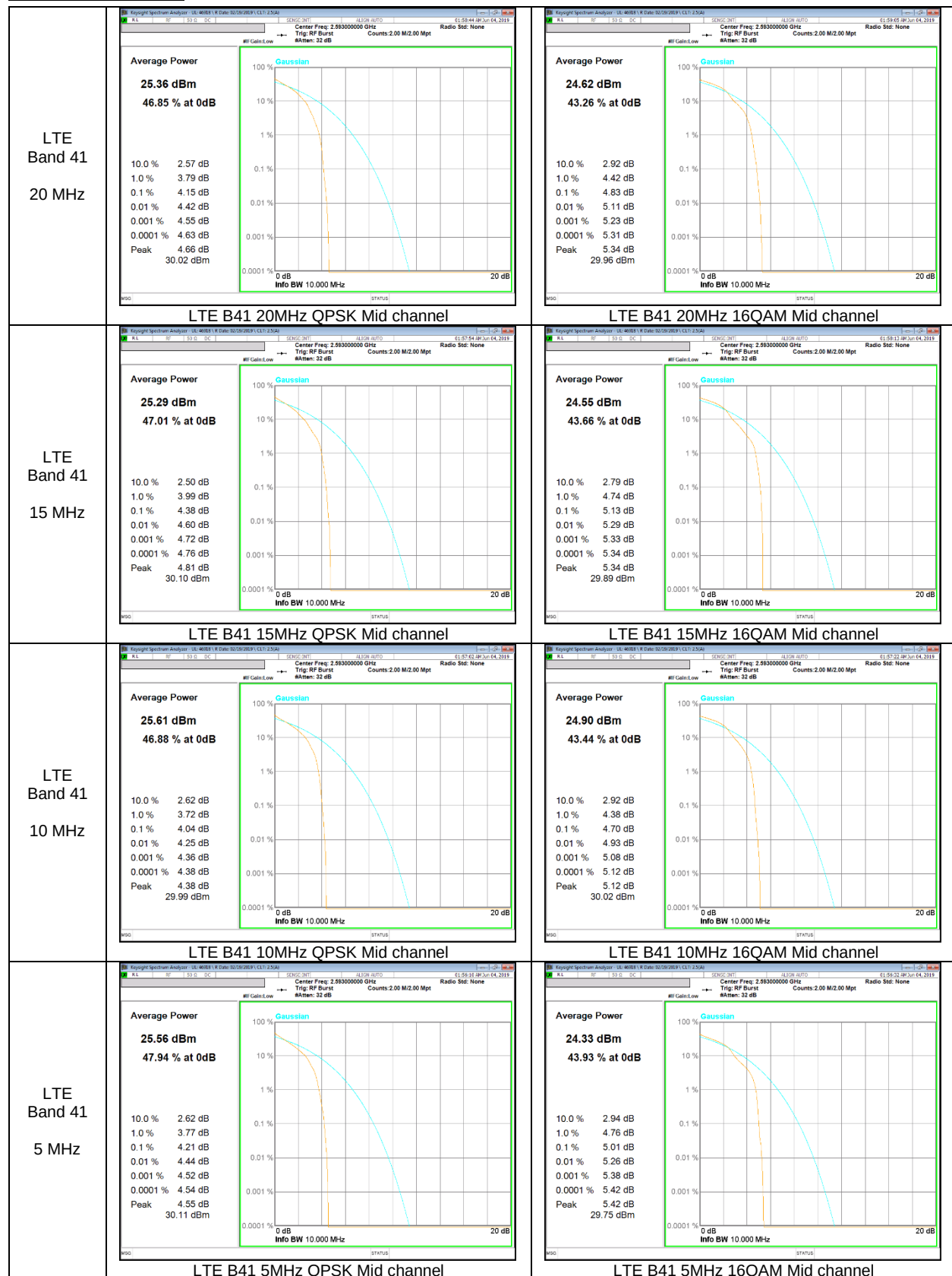




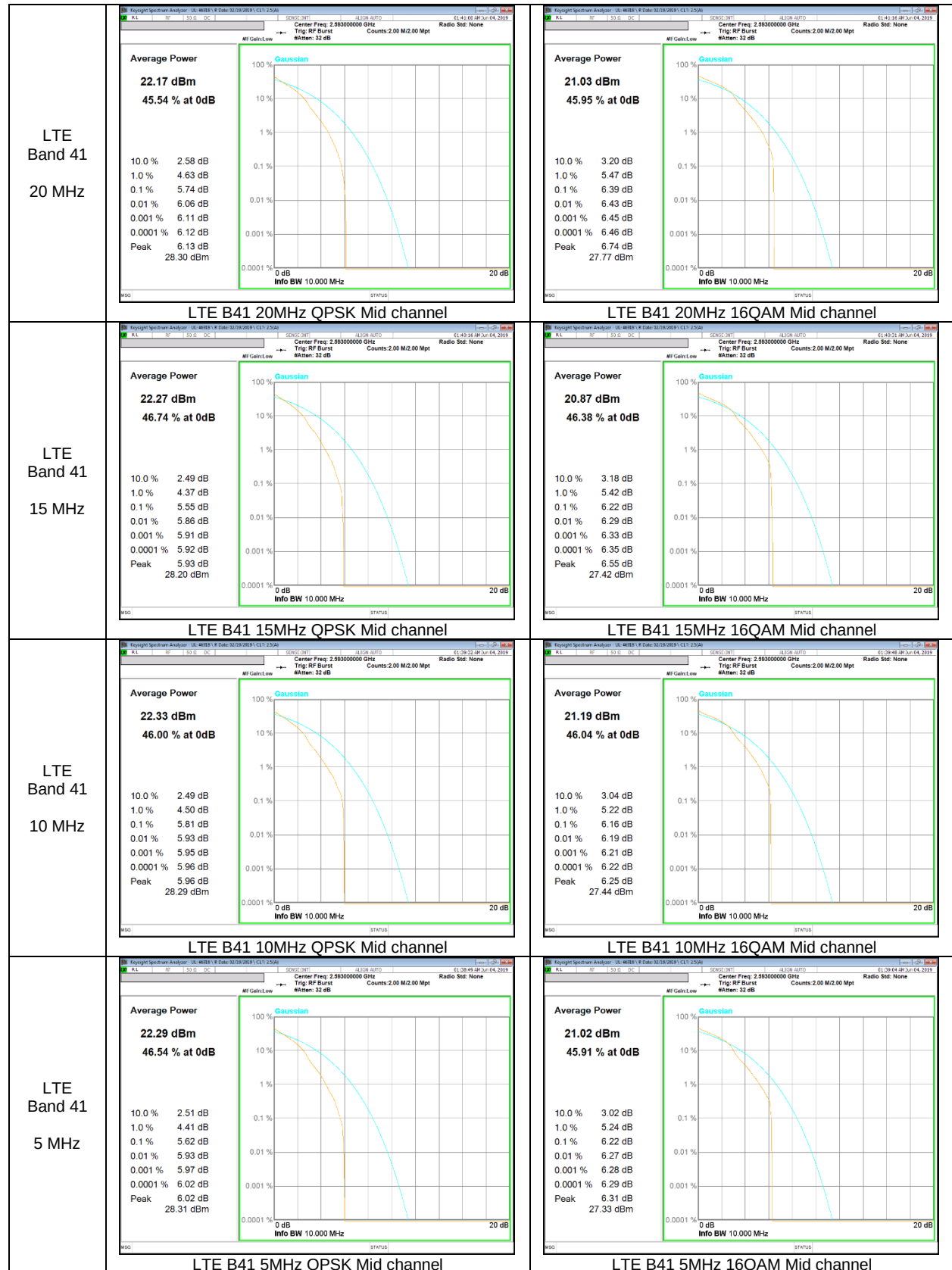
LTE Band 38



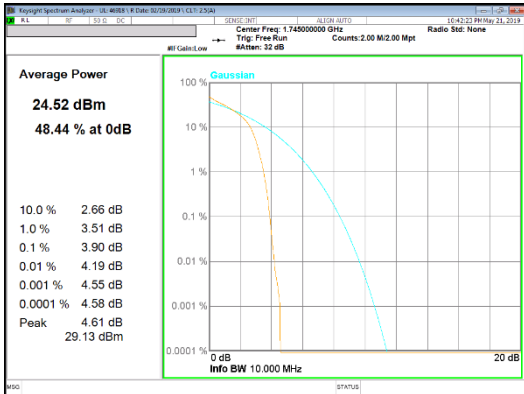
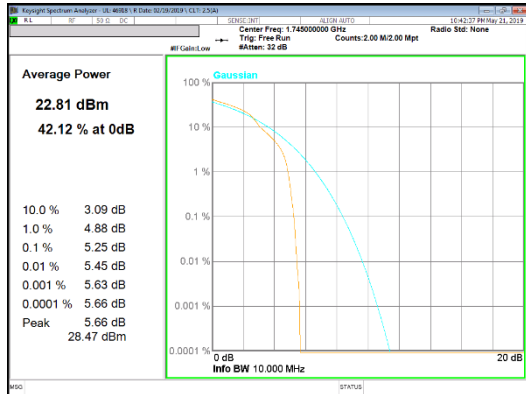
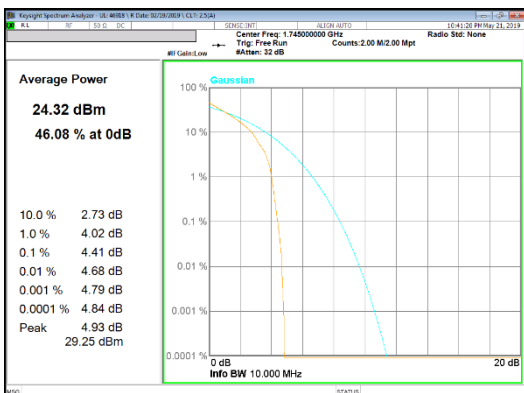
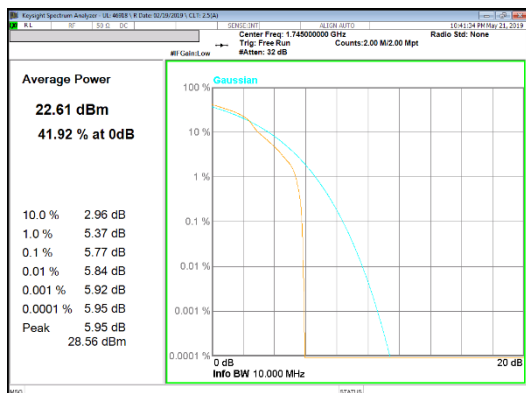
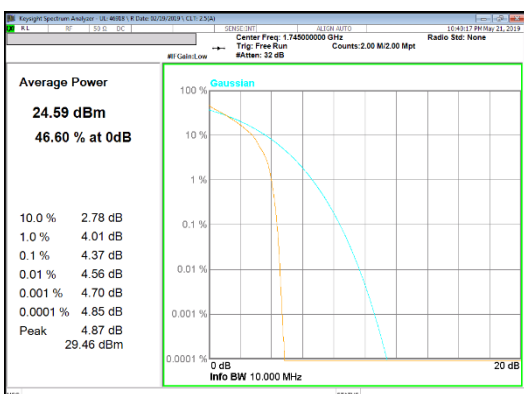
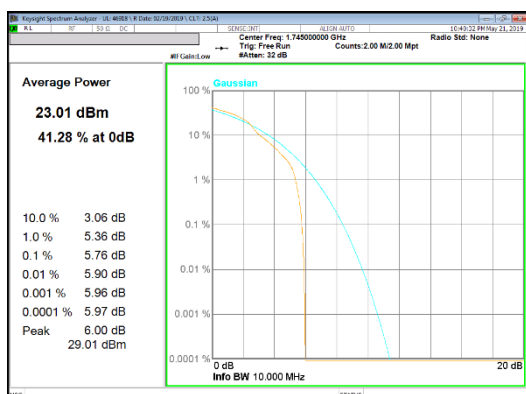
LTE Band 41(PC2)

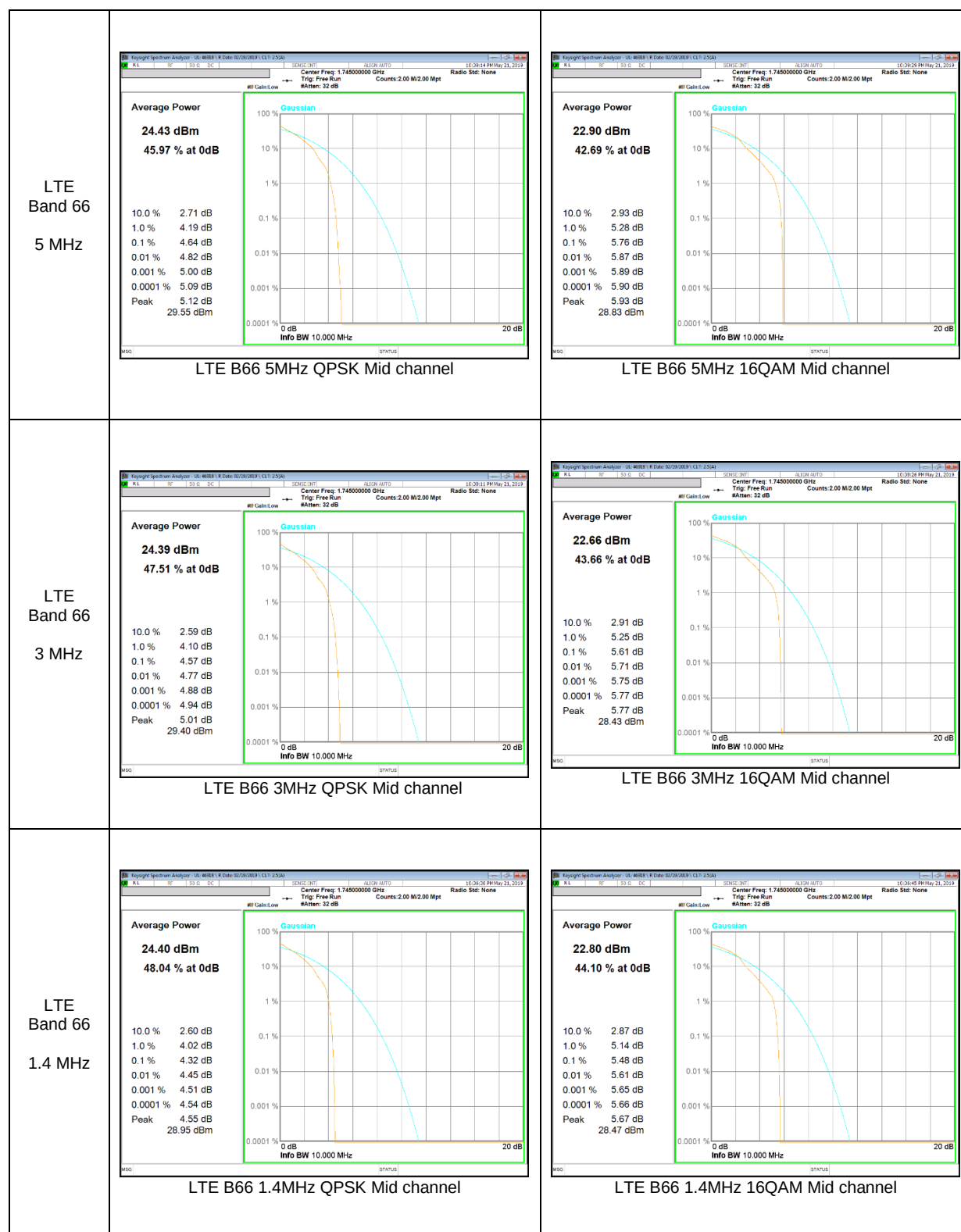


LTE Band 41(PC3)



LTE Band 66

LTE Band 66 20 MHz	 Average Power 24.52 dBm 48.44 % at 0dB <table><tr><td>10.0 %</td><td>2.66 dB</td></tr><tr><td>1.0 %</td><td>3.51 dB</td></tr><tr><td>0.1 %</td><td>3.90 dB</td></tr><tr><td>0.01 %</td><td>4.19 dB</td></tr><tr><td>0.001 %</td><td>4.55 dB</td></tr><tr><td>0.0001 %</td><td>4.58 dB</td></tr><tr><td>Peak</td><td>4.61 dB</td></tr><tr><td></td><td>29.13 dBm</td></tr></table> LTE B66 20MHz QPSK Mid channel	10.0 %	2.66 dB	1.0 %	3.51 dB	0.1 %	3.90 dB	0.01 %	4.19 dB	0.001 %	4.55 dB	0.0001 %	4.58 dB	Peak	4.61 dB		29.13 dBm	 Average Power 22.81 dBm 42.12 % at 0dB <table><tr><td>10.0 %</td><td>3.09 dB</td></tr><tr><td>1.0 %</td><td>4.88 dB</td></tr><tr><td>0.1 %</td><td>5.25 dB</td></tr><tr><td>0.01 %</td><td>5.45 dB</td></tr><tr><td>0.001 %</td><td>5.63 dB</td></tr><tr><td>0.0001 %</td><td>5.66 dB</td></tr><tr><td>Peak</td><td>5.66 dB</td></tr><tr><td></td><td>28.47 dBm</td></tr></table> LTE B66 20MHz 16QAM Mid channel	10.0 %	3.09 dB	1.0 %	4.88 dB	0.1 %	5.25 dB	0.01 %	5.45 dB	0.001 %	5.63 dB	0.0001 %	5.66 dB	Peak	5.66 dB		28.47 dBm
10.0 %	2.66 dB																																	
1.0 %	3.51 dB																																	
0.1 %	3.90 dB																																	
0.01 %	4.19 dB																																	
0.001 %	4.55 dB																																	
0.0001 %	4.58 dB																																	
Peak	4.61 dB																																	
	29.13 dBm																																	
10.0 %	3.09 dB																																	
1.0 %	4.88 dB																																	
0.1 %	5.25 dB																																	
0.01 %	5.45 dB																																	
0.001 %	5.63 dB																																	
0.0001 %	5.66 dB																																	
Peak	5.66 dB																																	
	28.47 dBm																																	
LTE Band 66 15 MHz	 Average Power 24.32 dBm 46.08 % at 0dB <table><tr><td>10.0 %</td><td>2.73 dB</td></tr><tr><td>1.0 %</td><td>4.02 dB</td></tr><tr><td>0.1 %</td><td>4.41 dB</td></tr><tr><td>0.01 %</td><td>4.68 dB</td></tr><tr><td>0.001 %</td><td>4.79 dB</td></tr><tr><td>0.0001 %</td><td>4.84 dB</td></tr><tr><td>Peak</td><td>4.93 dB</td></tr><tr><td></td><td>29.25 dBm</td></tr></table> LTE B66 15MHz QPSK Mid channel	10.0 %	2.73 dB	1.0 %	4.02 dB	0.1 %	4.41 dB	0.01 %	4.68 dB	0.001 %	4.79 dB	0.0001 %	4.84 dB	Peak	4.93 dB		29.25 dBm	 Average Power 22.61 dBm 41.92 % at 0dB <table><tr><td>10.0 %</td><td>2.96 dB</td></tr><tr><td>1.0 %</td><td>5.37 dB</td></tr><tr><td>0.1 %</td><td>5.77 dB</td></tr><tr><td>0.01 %</td><td>5.84 dB</td></tr><tr><td>0.001 %</td><td>5.92 dB</td></tr><tr><td>0.0001 %</td><td>5.95 dB</td></tr><tr><td>Peak</td><td>5.95 dB</td></tr><tr><td></td><td>28.56 dBm</td></tr></table> LTE B66 15MHz 16QAM Mid channel	10.0 %	2.96 dB	1.0 %	5.37 dB	0.1 %	5.77 dB	0.01 %	5.84 dB	0.001 %	5.92 dB	0.0001 %	5.95 dB	Peak	5.95 dB		28.56 dBm
10.0 %	2.73 dB																																	
1.0 %	4.02 dB																																	
0.1 %	4.41 dB																																	
0.01 %	4.68 dB																																	
0.001 %	4.79 dB																																	
0.0001 %	4.84 dB																																	
Peak	4.93 dB																																	
	29.25 dBm																																	
10.0 %	2.96 dB																																	
1.0 %	5.37 dB																																	
0.1 %	5.77 dB																																	
0.01 %	5.84 dB																																	
0.001 %	5.92 dB																																	
0.0001 %	5.95 dB																																	
Peak	5.95 dB																																	
	28.56 dBm																																	
LTE Band 66 10 MHz	 Average Power 24.59 dBm 46.60 % at 0dB <table><tr><td>10.0 %</td><td>2.78 dB</td></tr><tr><td>1.0 %</td><td>4.01 dB</td></tr><tr><td>0.1 %</td><td>4.37 dB</td></tr><tr><td>0.01 %</td><td>4.56 dB</td></tr><tr><td>0.001 %</td><td>4.70 dB</td></tr><tr><td>0.0001 %</td><td>4.85 dB</td></tr><tr><td>Peak</td><td>4.87 dB</td></tr><tr><td></td><td>29.46 dBm</td></tr></table> LTE B66 10MHz QPSK Mid channel	10.0 %	2.78 dB	1.0 %	4.01 dB	0.1 %	4.37 dB	0.01 %	4.56 dB	0.001 %	4.70 dB	0.0001 %	4.85 dB	Peak	4.87 dB		29.46 dBm	 Average Power 23.01 dBm 41.28 % at 0dB <table><tr><td>10.0 %</td><td>3.06 dB</td></tr><tr><td>1.0 %</td><td>5.36 dB</td></tr><tr><td>0.1 %</td><td>5.76 dB</td></tr><tr><td>0.01 %</td><td>5.90 dB</td></tr><tr><td>0.001 %</td><td>5.96 dB</td></tr><tr><td>0.0001 %</td><td>5.97 dB</td></tr><tr><td>Peak</td><td>6.00 dB</td></tr><tr><td></td><td>29.01 dBm</td></tr></table> LTE B66 10MHz 16QAM Mid channel	10.0 %	3.06 dB	1.0 %	5.36 dB	0.1 %	5.76 dB	0.01 %	5.90 dB	0.001 %	5.96 dB	0.0001 %	5.97 dB	Peak	6.00 dB		29.01 dBm
10.0 %	2.78 dB																																	
1.0 %	4.01 dB																																	
0.1 %	4.37 dB																																	
0.01 %	4.56 dB																																	
0.001 %	4.70 dB																																	
0.0001 %	4.85 dB																																	
Peak	4.87 dB																																	
	29.46 dBm																																	
10.0 %	3.06 dB																																	
1.0 %	5.36 dB																																	
0.1 %	5.76 dB																																	
0.01 %	5.90 dB																																	
0.001 %	5.96 dB																																	
0.0001 %	5.97 dB																																	
Peak	6.00 dB																																	
	29.01 dBm																																	



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 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 2

LTE Band 2 (Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, maximum tune-up limit of LTE Band 25 is higher than LTE Band 2 and both LTE Band 25 and LTE Band 2 channel bandwidth are same.

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 the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

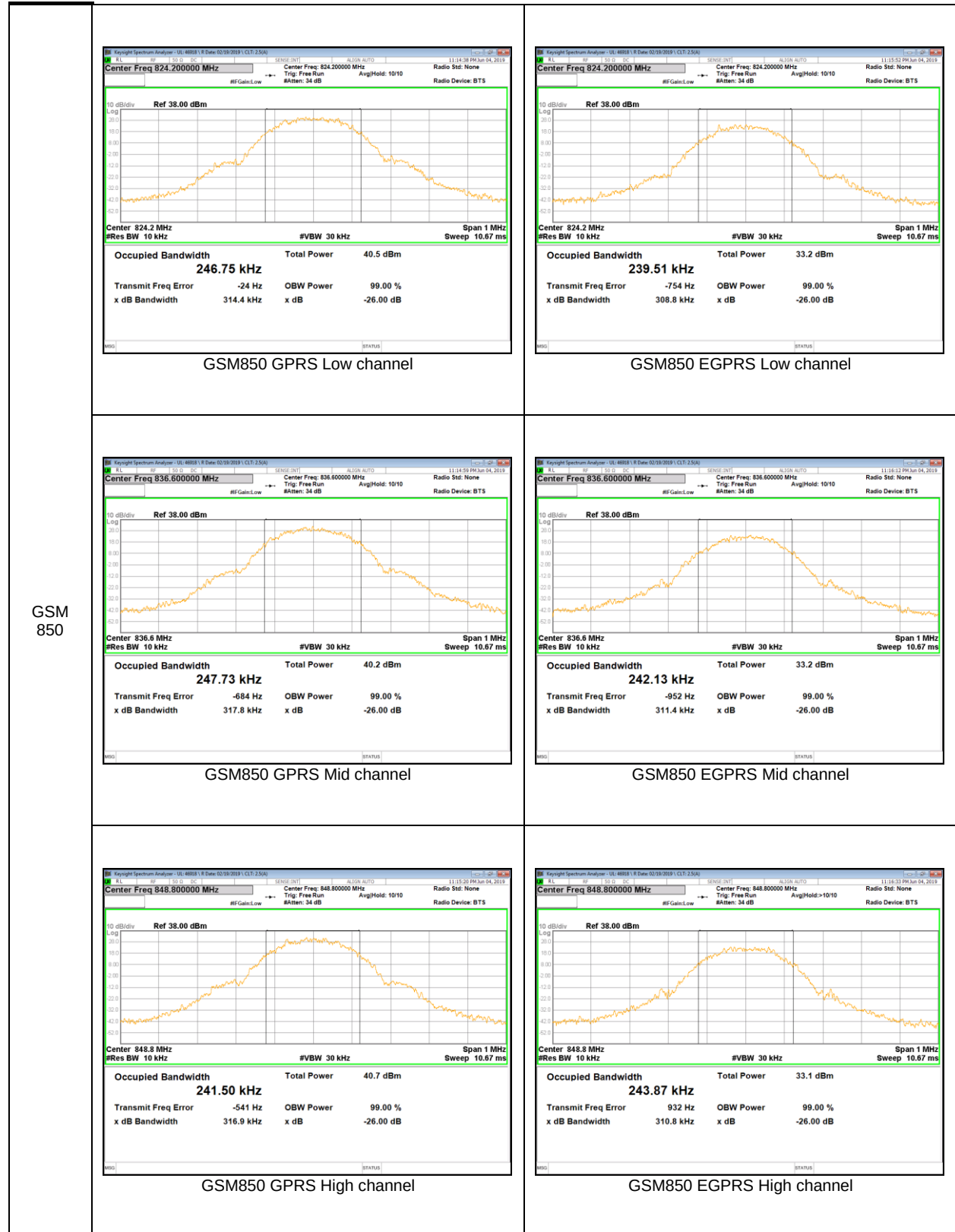
(KDB 971168 D01 Power Meas License Digital Systems v03r01)

RESULTS

See the following pages.

9.1.1. OCCUPIED BANDWIDTH RESULTS

GSM 850



GSM 1900

