



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

WWAN

CERTIFICATION TEST REPORT

FOR

WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac

MODEL NUMBER : SM-W737Y

FCC ID: A3LSMW737Y

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TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	12/05/18	Initial issue	Hoonpyo Lee
V2	12/07/18	Updated about the TCB's question	Hoonpyo Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac

MODEL NUMBER: SM-W737Y

SERIAL NUMBER: BNZ3R32KA0007AN (RADIATED)
BNZ3R32KA0002RY (CONDUCTED)

DATE TESTED: OCT 15, 2018 - OCT 22, 2018

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



SungGil Park
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Hoonpyo Lee
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. ANSI C63.26, 2015
6. 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	
☒	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, Below 1GHz	3.86 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac.
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:

WCDMA

FCC Part 22/24				
Band	Frequency Range	Modulation	Radiated	
	[MHz]		Avg [dBm]	Avg [mW]
Band 5	824~849	REL99	20.84	121.34
		HSDPA	19.68	92.90
Band 4	1710~1755	REL99	23.70	234.42
		HSDPA	22.68	185.35
Band 2	1850~1910	REL99	24.82	303.39
		HSDPA	23.61	229.61

LTE Band 2

FCC Part 24					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Radiated	
				Avg [dBm]	Avg [mW]
Band 2	1850 ~ 1910	20	QPSK	22.83	191.87
			16QAM	21.86	153.46
		15	QPSK	22.62	182.81
			16QAM	21.82	152.05
		10	QPSK	22.98	198.61
			16QAM	22.25	167.88
		5	QPSK	22.01	158.85
			16QAM	21.79	151.01
		3	QPSK	21.79	151.01
			16QAM	20.75	118.85
		1.4	QPSK	22.90	194.98
			16QAM	21.81	151.71

LTE Band 4

FCC Part 27					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Radiated	
				Avg [dBm]	Avg [mW]
Band 4	1710 ~ 1755	20	QPSK	24.72	296.48
			16QAM	23.76	237.68
		15	QPSK	24.67	293.09
			16QAM	23.64	231.21
		10	QPSK	24.73	297.17
			16QAM	23.79	239.33
		5	QPSK	24.50	281.84
			16QAM	23.46	221.82
		3	QPSK	24.49	281.19
			16QAM	23.40	218.78
		1.4	QPSK	24.50	281.84
			16QAM	23.43	220.29

LTE Band 5

FCC Part 24					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Radiated	
				Avg [dBm]	Avg [mW]
Band 5	824 ~ 849	10	QPSK	21.27	133.97
			16QAM	20.74	118.58
		5	QPSK	21.15	130.32
			16QAM	20.75	118.85
		3	QPSK	21.49	140.93
			16QAM	20.95	124.45
		1.4	QPSK	21.22	132.43
			16QAM	20.73	118.30

LTE Band 13

FCC Part 27					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Radiated	
				Avg [dBm]	Avg [mW]
Band 13	777 ~ 787	10	QPSK	20.69	117.22
			16QAM	19.86	96.83
		5	QPSK	21.02	126.47
			16QAM	19.98	99.54

LTE Band 17

FCC Part 27					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Radiated	
				Avg [dBm]	Avg [mW]
Band 17	704 ~ 716	10	QPSK	17.18	52.24
			16QAM	16.07	40.46
		5	QPSK	17.35	54.33
			16QAM	15.85	38.46

LTE Band 41

FCC Part 27					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Radiated	
				Avg [dBm]	Avg [mW]
Band 41	2496 - 2690	20	QPSK	29.49	889.20
			16QAM	30.45	1109.17
		15	QPSK	29.76	946.24
			16QAM	30.56	1137.63
		10	QPSK	29.26	843.33
			16QAM	30.77	1193.99
		5	QPSK	29.28	847.23
			16QAM	28.69	739.61

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)
WCDMA Band 2 / LTE Band 2 1850 ~ 1910 MHz	2.5
WCDMA Band 5 / LTE Band 5 824 ~ 849 MHz	0.2
LTE Band 4 1710 ~ 1780 MHz	-0.1
LTE Band 13 777 ~ 787 MHz	-1.2
LTE Band 17 704~ 716 MHz	-3.8
LTE Band 41 2496 ~ 2690 MHz	1.8

5.4. WORST-CASE ORIENTATION

Following modes should be considered as worst-case scenario for all other measurements.

- 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	Channel (MHz)	Bandwidth (MHz)	RB size	RB offset
2	1857.5	15	1	0
	1880		1	0
	1902.5		1	0
4	1717.5	15	1	0
	1732.5		1	0
	1747.5		1	0
5	825.5	3	1	8
	836.5		1	8
	847.5		1	8
13	779.5	5	1	0
	782		1	0
	784.5		1	0
17	706.5	5	1	0
	710		1	24
	713.5		1	12
41	2506	20	1	0
	2593		1	0
	2680		1	0

- ERP/EIRP

For WCDMA Band 4 / LTE Band 4 / LTE Band 17 / LTE Band 41, the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation.

For WCDMA Band 2 / WCDMA Band 5 / LTE Band 2 / LTE Band 5 / LTE Band 13, the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation.

- Radiated spurious emissions

For LTE Band 5 / LTE Band 41, the spurious emissions was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation.

For LTE Band 17, the spurious emissions was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation.

For WCDMA Band 4 / WCDMA Band 2 / LTE Band 2 / LTE Band 4, the spurious emissions was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation.

For WCDMA Band 5 / LTE Band 13, the spurious emissions was investigated in three orthogonal orientations X, Y and Z, but it was determined that the EUT with keyboard configuration was worst-case orientation.

Note : All radiated spurious tests were performed connected with earphone and charger for evaluation of worst case mode.(For erp/eirp tests, the EUT didn't connected with earphone and charger)

Additionally, all radiated tests were investigated equipped with keyboard configuration also, it was reported only the worst case data.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA3000	R37K5J20EF3SE3	N/A
Data Cable	SAMSUNG	EP-DW720CWE	N/A	N/A
Earphone	SAMSUNG	EO-EG920BW	N/A	N/A
Keyboard	SAMSUNG	EJ-CW730	N/A	N/A

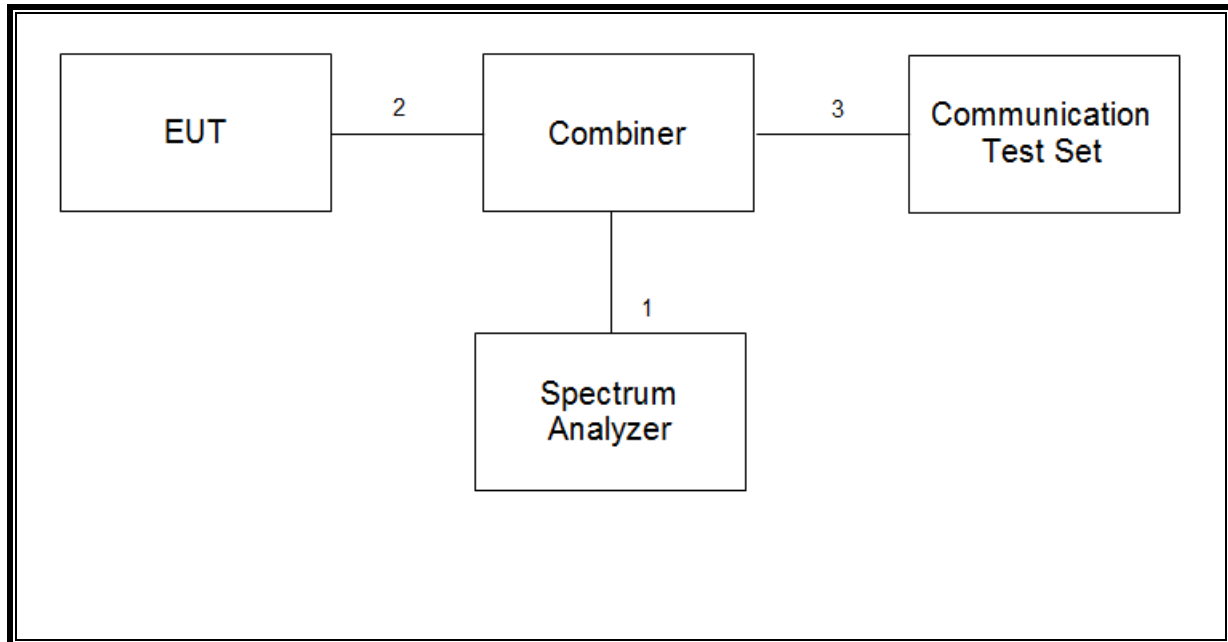
I/O CABLES

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	1.1m	N/A
2	Audio	2	Mini-Jack	Unshielded	1.2m	N/A

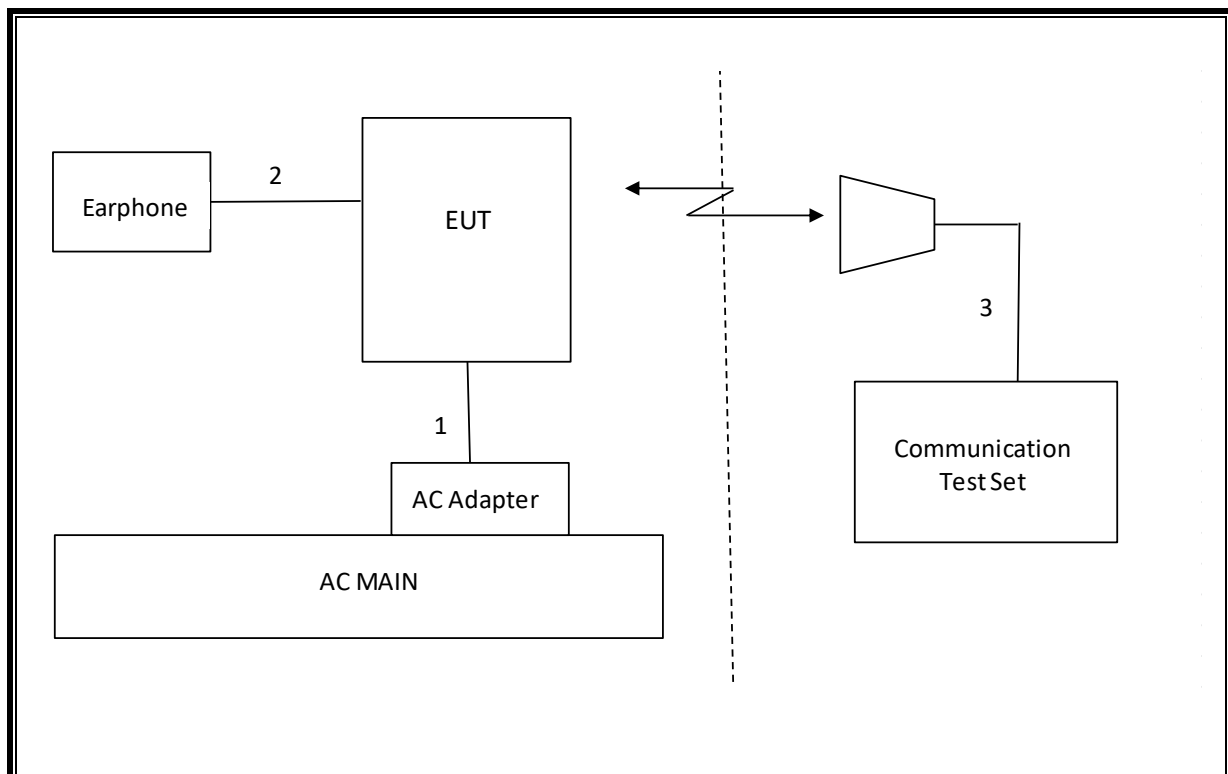
TEST SETUP

The EUT is continuously communicated to 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	06-30-19
Antenna, Horn, 40 GHz	ETS	3116C	00166155	12-04-19
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	2152	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
EMI Test Receive, 44 GHz	R&S	ESW40	101590	08-06-19
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	O10	08-08-19
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	O11	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 2.4	

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)	Band Edge / Conducted Spurious Emission	-13dBm		Pass
27.53(m)	Conducted Spurious Emission	-25 dBm		Pass
27.53(m)	Emission mask	Section 9.2.2		Pass
2.1046	Conducted output power	N/A		See the RF exposure test report. (4788715722-S1 FCC Report SAR)
22.355 24.235 27.54	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)	Radiated Spurious Emission	-13dBm		Pass
27.53(f)		-40dBm		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.

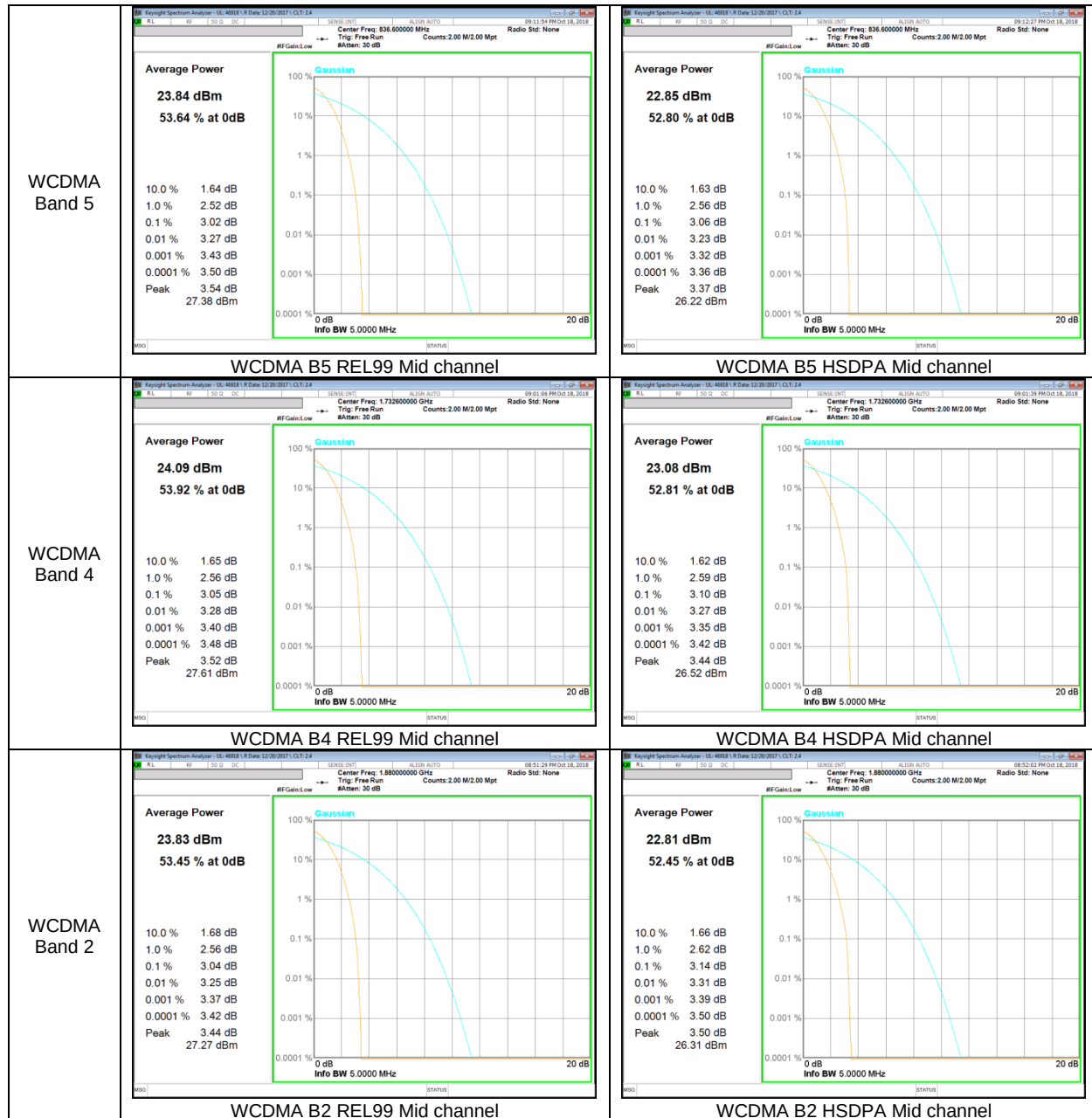
Test Spec

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.

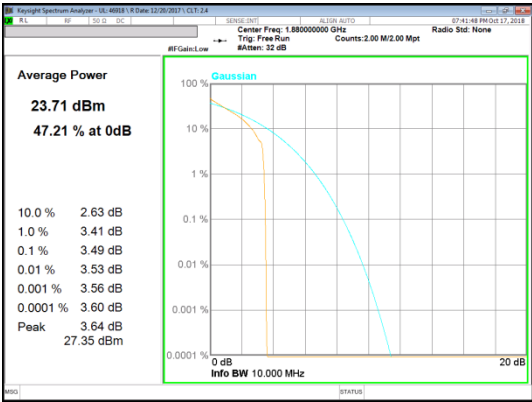
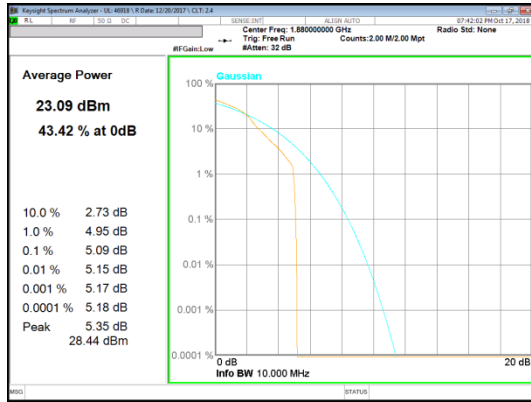
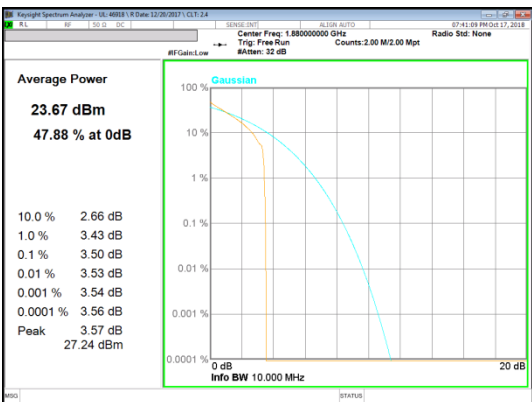
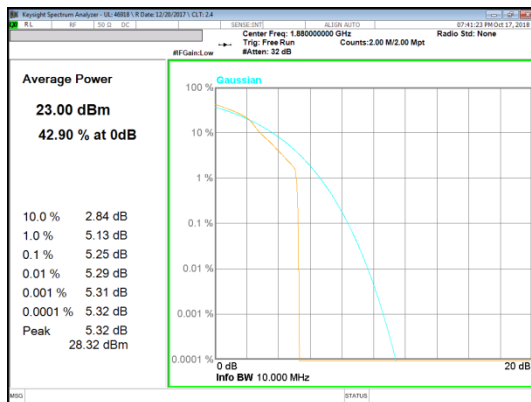
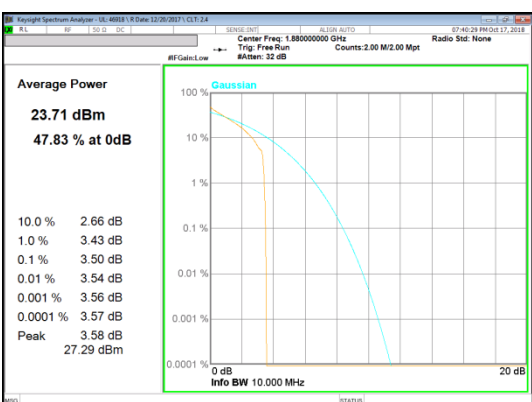
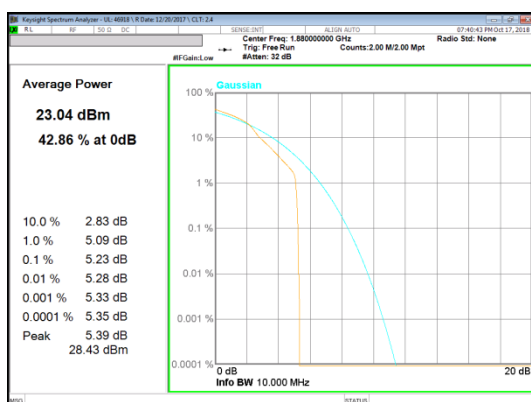
RESULTS

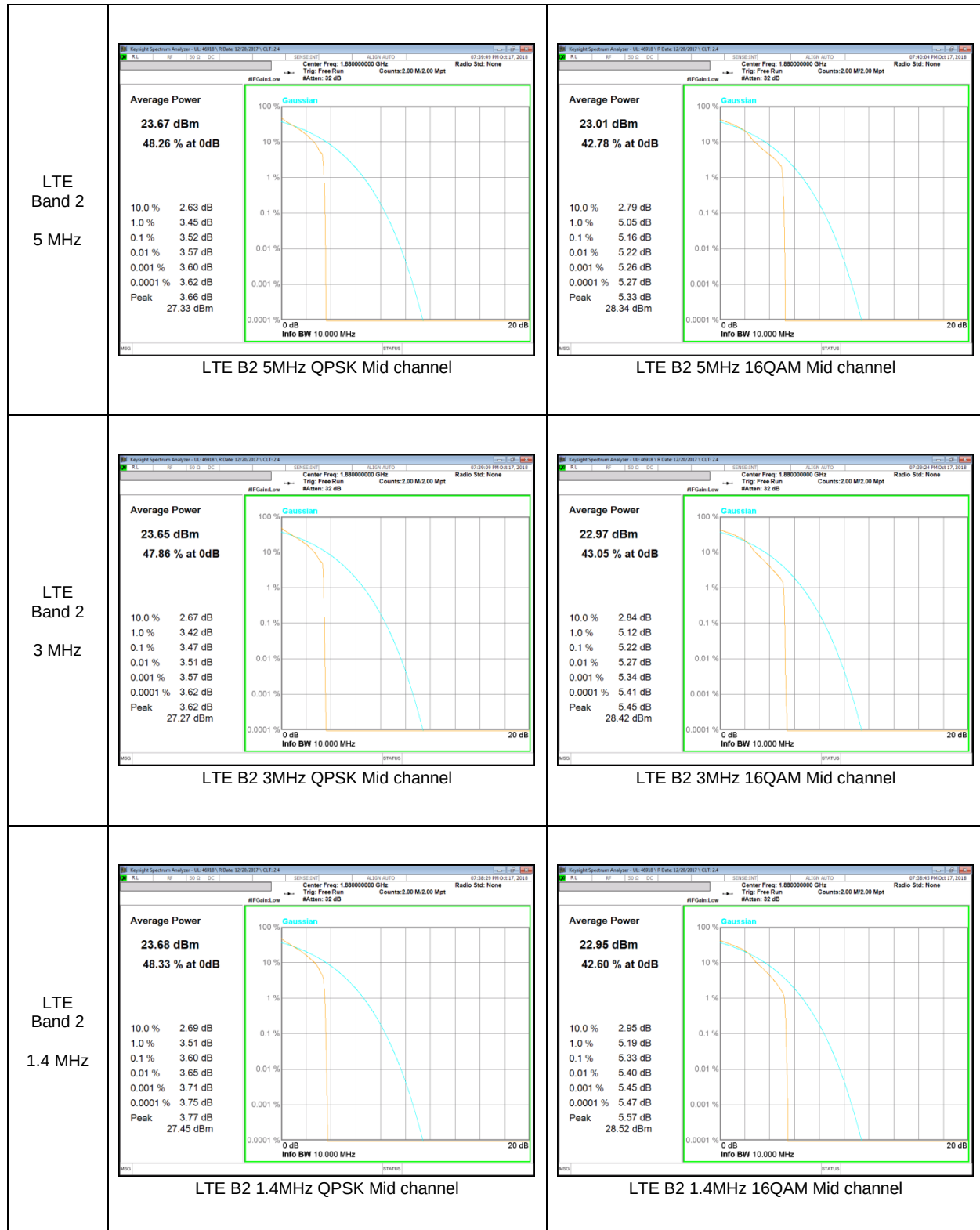
8.1. CONDUCTED PEAK TO AVERAGE RESULT

WCDMA

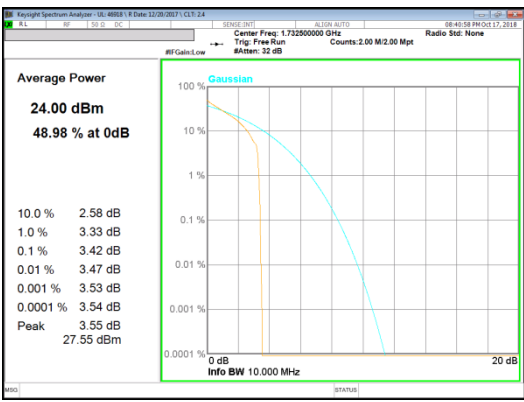
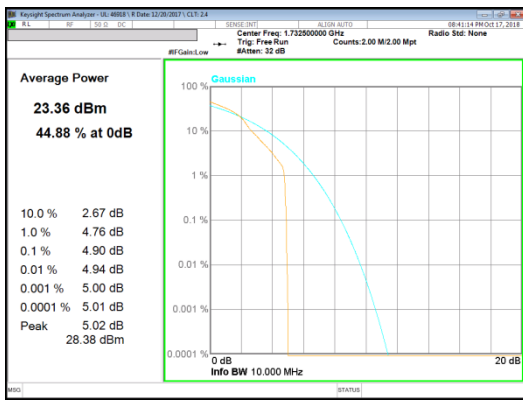
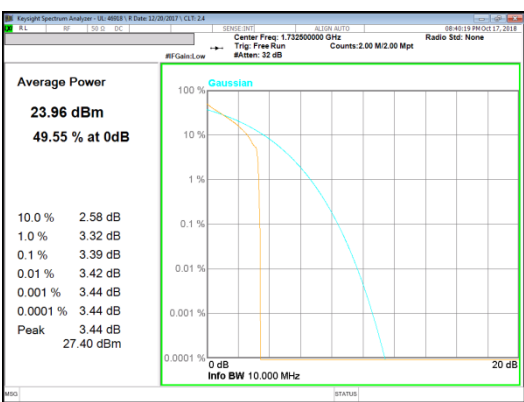
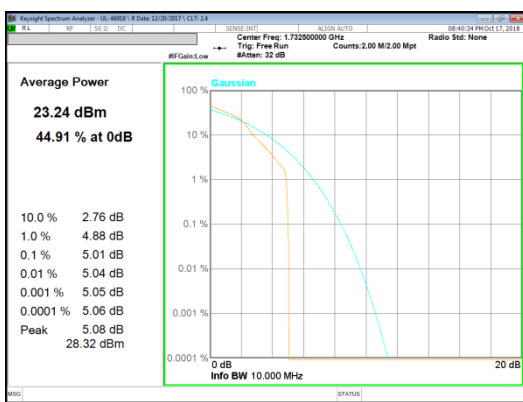
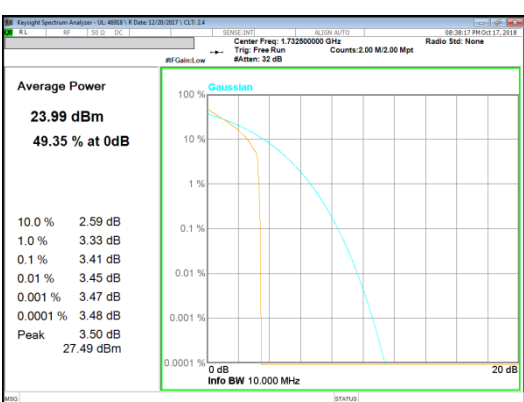
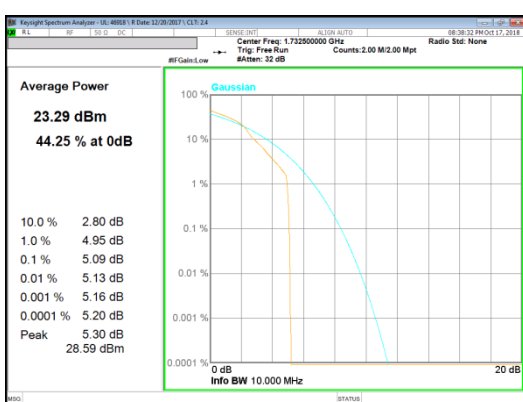


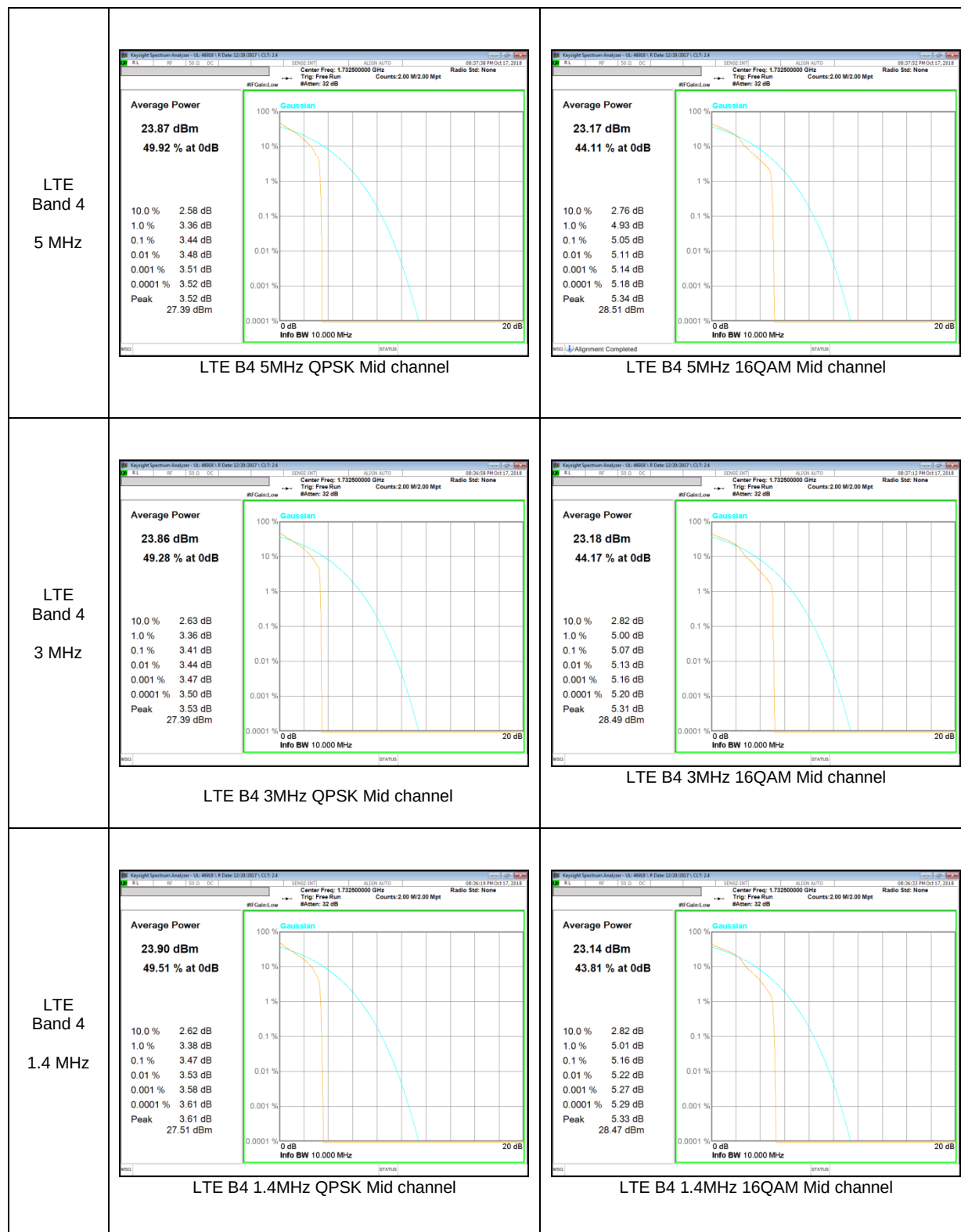
LTE Band 2

LTE Band 2 20 MHz	 Average Power 23.71 dBm 47.21 % at 0dB 10.0 % 2.63 dB 1.0 % 3.41 dB 0.1 % 3.49 dB 0.01 % 3.53 dB 0.001 % 3.56 dB 0.0001 % 3.60 dB Peak 3.64 dB 27.35 dBm LTE B2 20MHz QPSK Mid channel	 Average Power 23.09 dBm 43.42 % at 0dB 10.0 % 2.73 dB 1.0 % 4.95 dB 0.1 % 5.09 dB 0.01 % 5.15 dB 0.001 % 5.17 dB 0.0001 % 5.18 dB Peak 5.35 dB 28.44 dBm LTE B2 20MHz 16QAM Mid channel
LTE Band 2 15 MHz	 Average Power 23.67 dBm 47.88 % at 0dB 10.0 % 2.66 dB 1.0 % 3.43 dB 0.1 % 3.50 dB 0.01 % 3.53 dB 0.001 % 3.54 dB 0.0001 % 3.56 dB Peak 3.57 dB 27.24 dBm LTE B2 15MHz QPSK Mid channel	 Average Power 23.00 dBm 42.90 % at 0dB 10.0 % 2.84 dB 1.0 % 5.13 dB 0.1 % 5.25 dB 0.01 % 5.29 dB 0.001 % 5.31 dB 0.0001 % 5.32 dB Peak 5.32 dB 28.32 dBm LTE B2 15MHz 16QAM Mid channel
LTE Band 2 10 MHz	 Average Power 23.71 dBm 47.83 % at 0dB 10.0 % 2.66 dB 1.0 % 3.43 dB 0.1 % 3.50 dB 0.01 % 3.54 dB 0.001 % 3.56 dB 0.0001 % 3.57 dB Peak 3.58 dB 27.29 dBm LTE B2 10MHz QPSK Mid channel	 Average Power 23.04 dBm 42.86 % at 0dB 10.0 % 2.83 dB 1.0 % 5.09 dB 0.1 % 5.23 dB 0.01 % 5.28 dB 0.001 % 5.33 dB 0.0001 % 5.35 dB Peak 5.39 dB 28.43 dBm LTE B2 10MHz 16QAM Mid channel

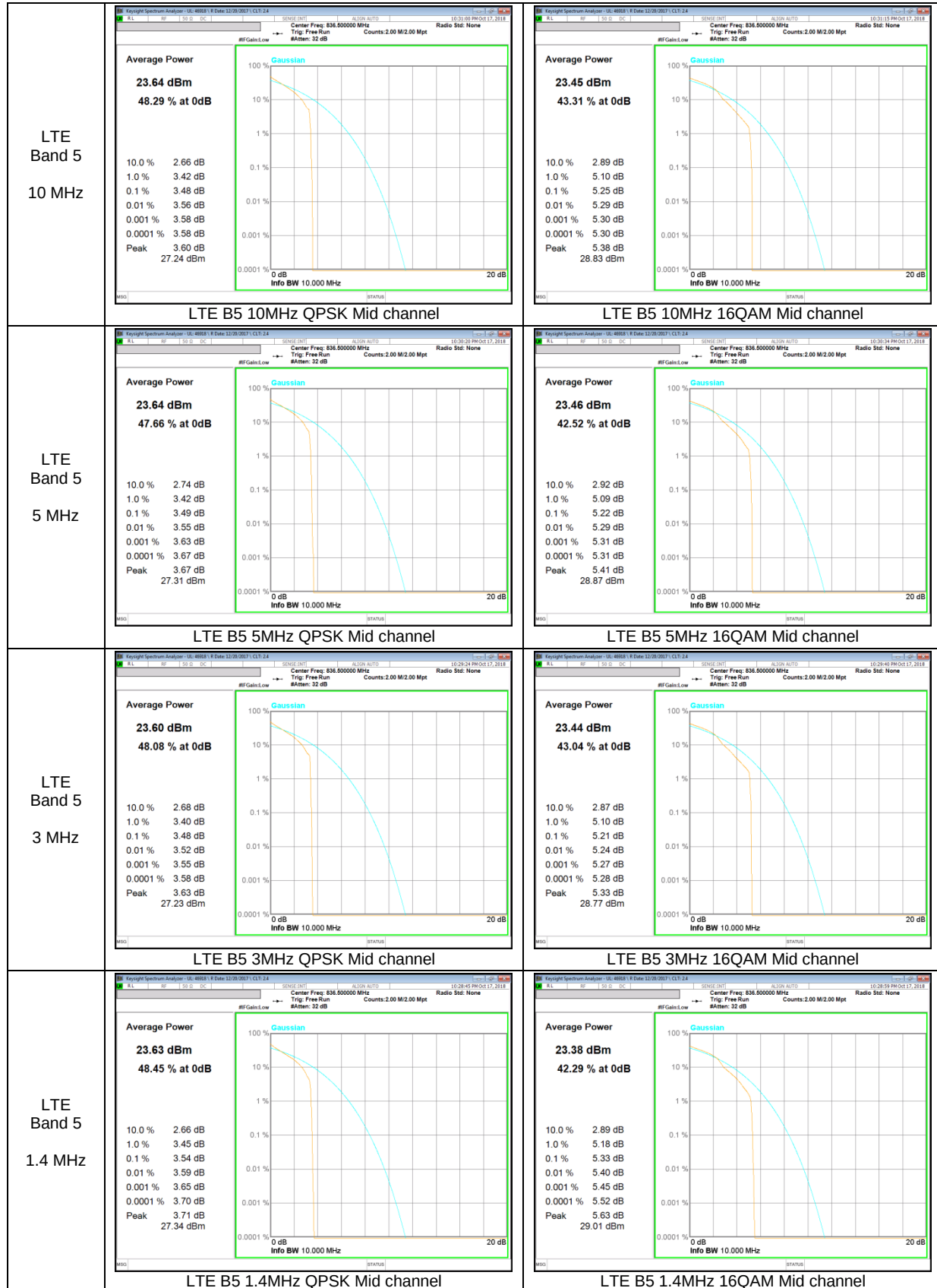


LTE Band 4

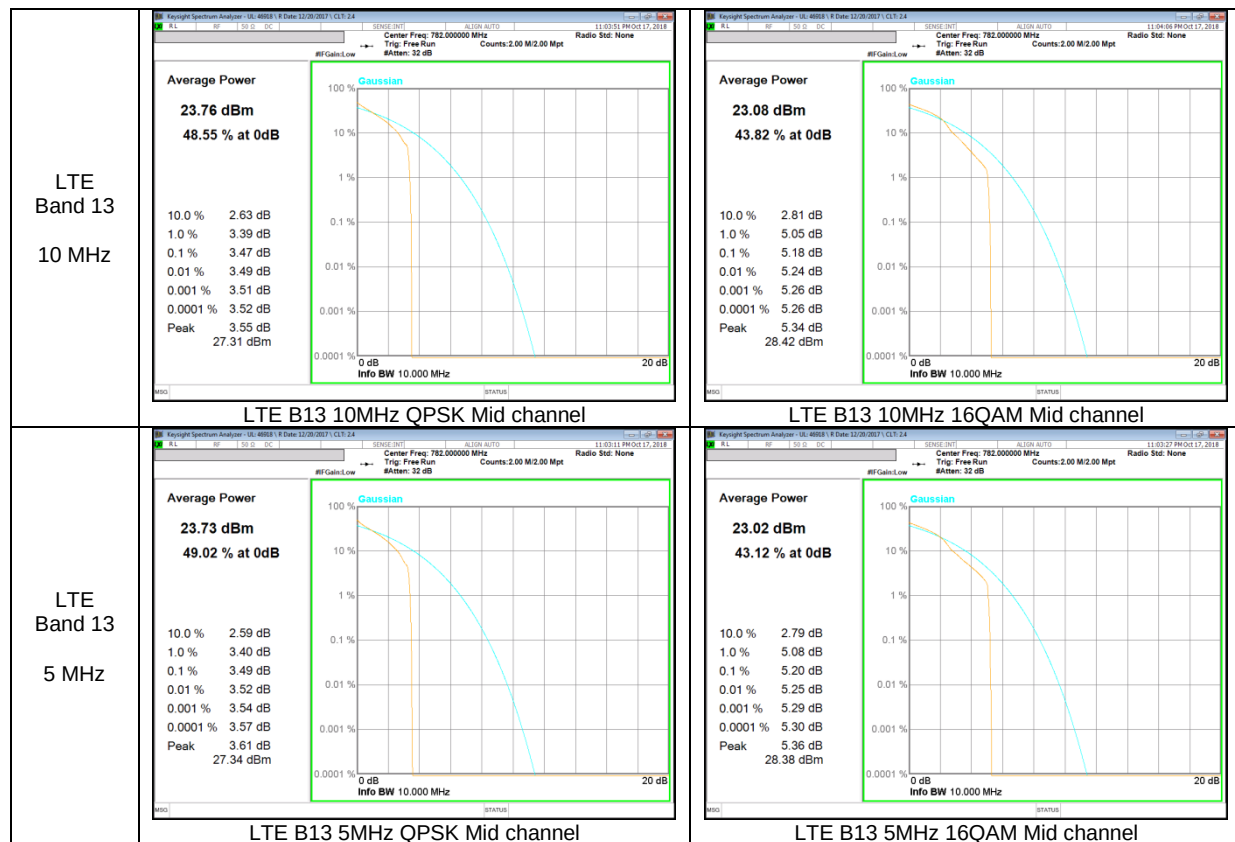
LTE Band 4 20 MHz	 Average Power 24.00 dBm 48.98 % at 0dB 10.0 % 2.58 dB 1.0 % 3.33 dB 0.1 % 3.42 dB 0.01 % 3.47 dB 0.001 % 3.53 dB 0.0001 % 3.54 dB Peak 3.55 dB 27.55 dBm LTE B4 20MHz QPSK Mid channel	 Average Power 23.36 dBm 44.88 % at 0dB 10.0 % 2.67 dB 1.0 % 4.76 dB 0.1 % 4.90 dB 0.01 % 4.94 dB 0.001 % 5.00 dB 0.0001 % 5.01 dB Peak 5.02 dB 28.38 dBm LTE B4 20MHz 16QAM Mid channel
LTE Band 4 15 MHz	 Average Power 23.96 dBm 49.55 % at 0dB 10.0 % 2.58 dB 1.0 % 3.32 dB 0.1 % 3.39 dB 0.01 % 3.42 dB 0.001 % 3.44 dB 0.0001 % 3.44 dB Peak 3.44 dB 27.40 dBm LTE B4 15MHz QPSK Mid channel	 Average Power 23.24 dBm 44.91 % at 0dB 10.0 % 2.76 dB 1.0 % 4.88 dB 0.1 % 5.01 dB 0.01 % 5.04 dB 0.001 % 5.05 dB 0.0001 % 5.06 dB Peak 5.08 dB 28.32 dBm LTE B4 15MHz 16QAM Mid channel
LTE Band 4 10 MHz	 Average Power 23.99 dBm 49.35 % at 0dB 10.0 % 2.59 dB 1.0 % 3.33 dB 0.1 % 3.41 dB 0.01 % 3.45 dB 0.001 % 3.47 dB 0.0001 % 3.48 dB Peak 3.50 dB 27.49 dBm LTE B4 10MHz QPSK Mid channel	 Average Power 23.29 dBm 44.25 % at 0dB 10.0 % 2.80 dB 1.0 % 4.95 dB 0.1 % 5.09 dB 0.01 % 5.13 dB 0.001 % 5.16 dB 0.0001 % 5.20 dB Peak 5.30 dB 28.59 dBm LTE B4 10MHz 16QAM Mid channel



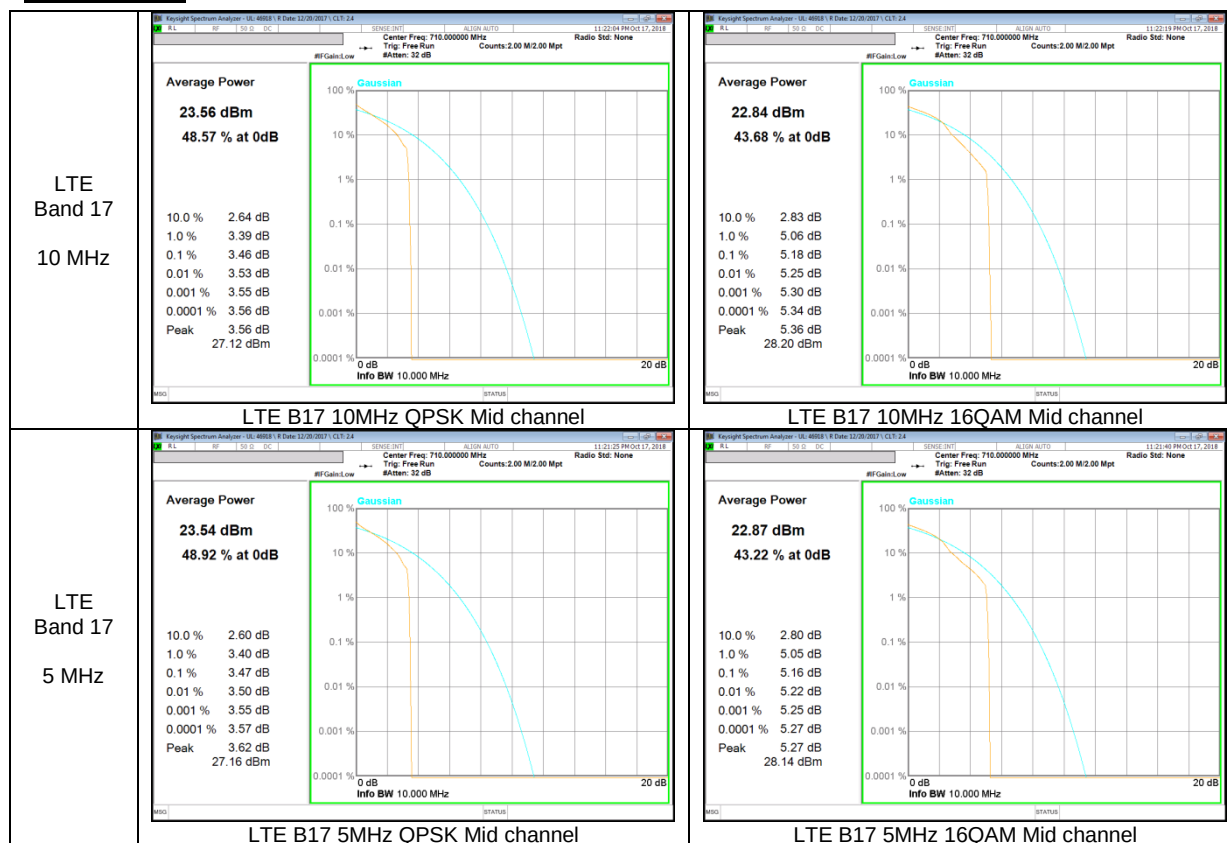
LTE Band 5



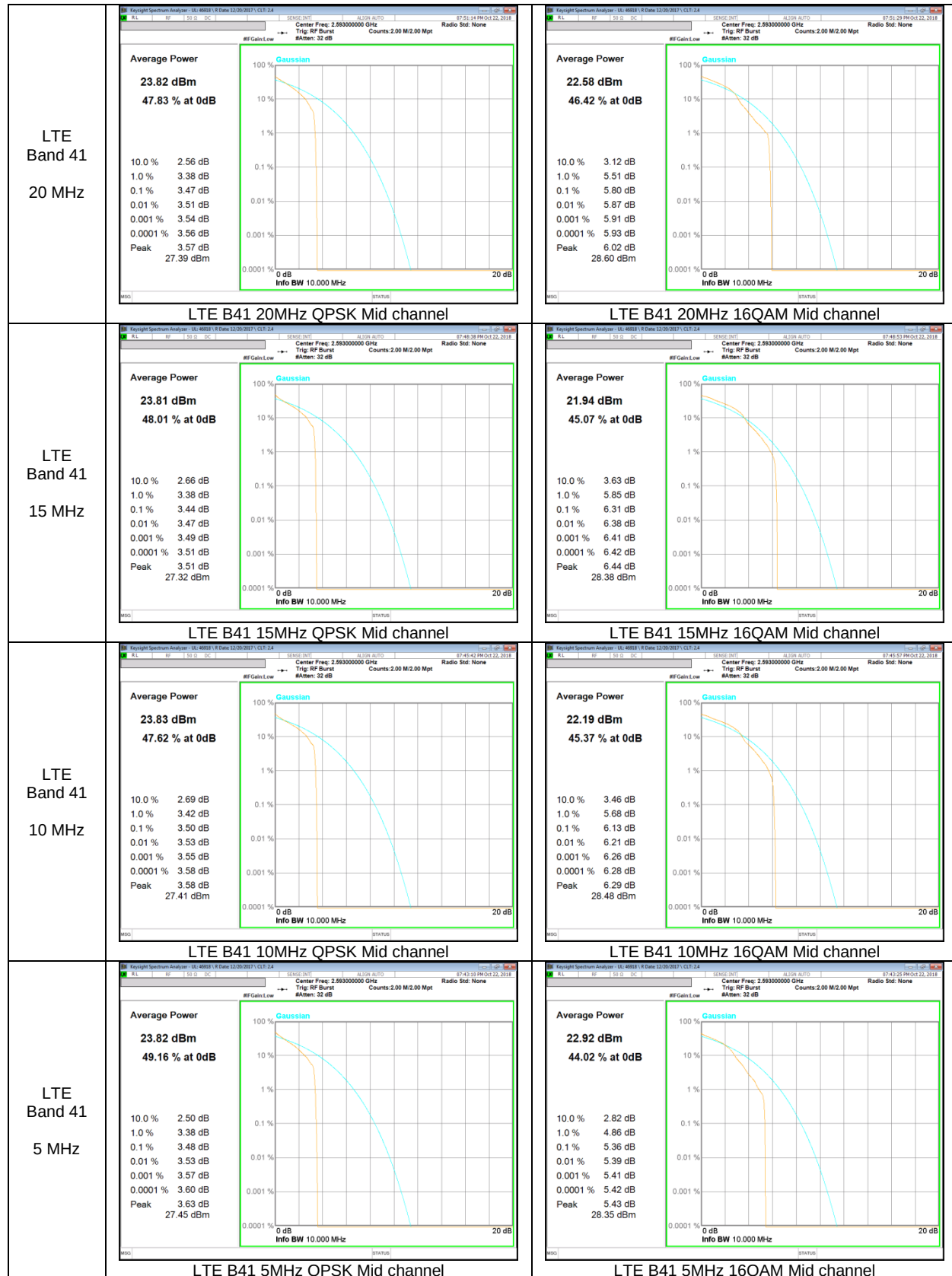
LTE Band 13



LTE Band 17



LTE Band 41



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.

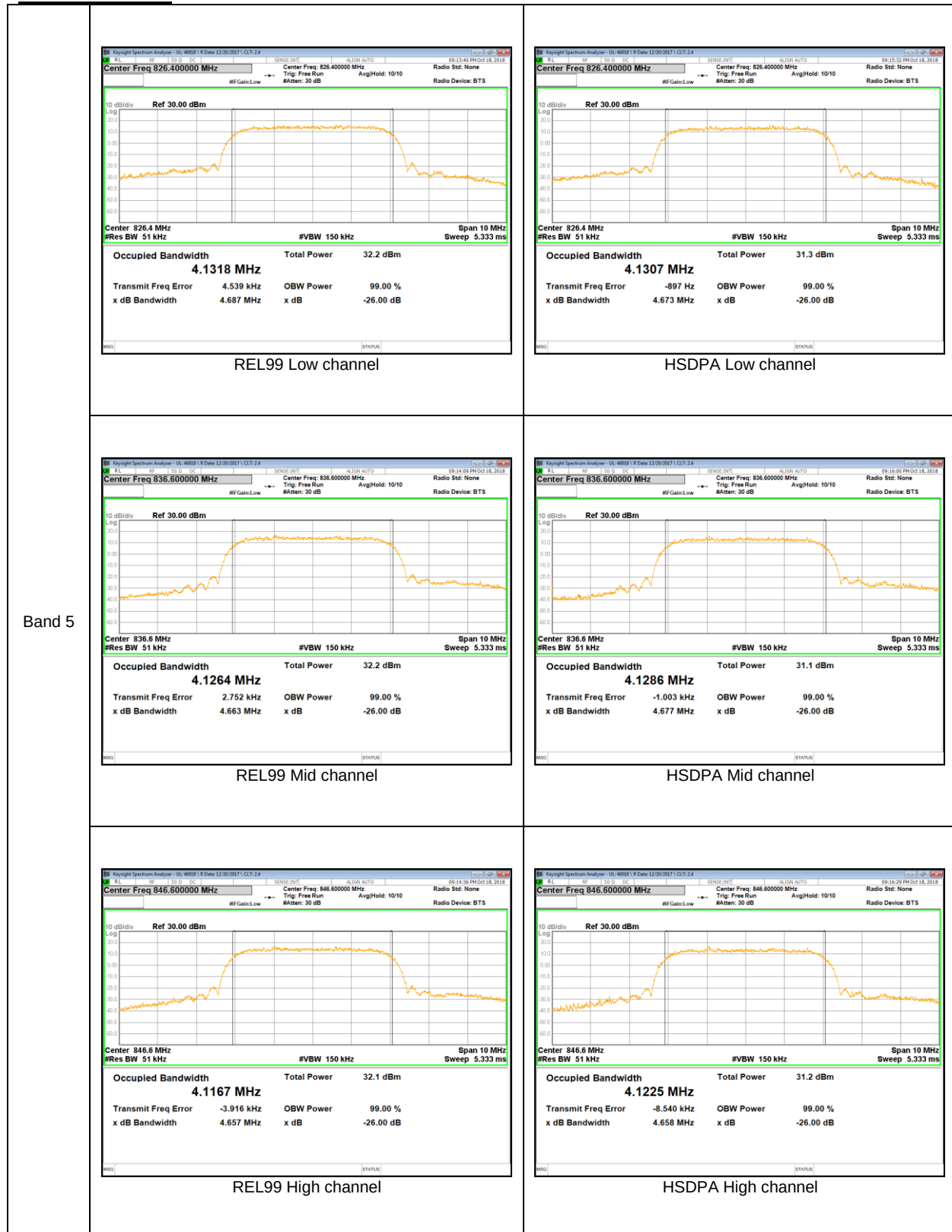
(KDB 971168 D01 Power Meas License Digital Systems v03r01)

RESULTS

See the following pages.

9.1.1. OCCUPIED BANDWIDTH PLOTS

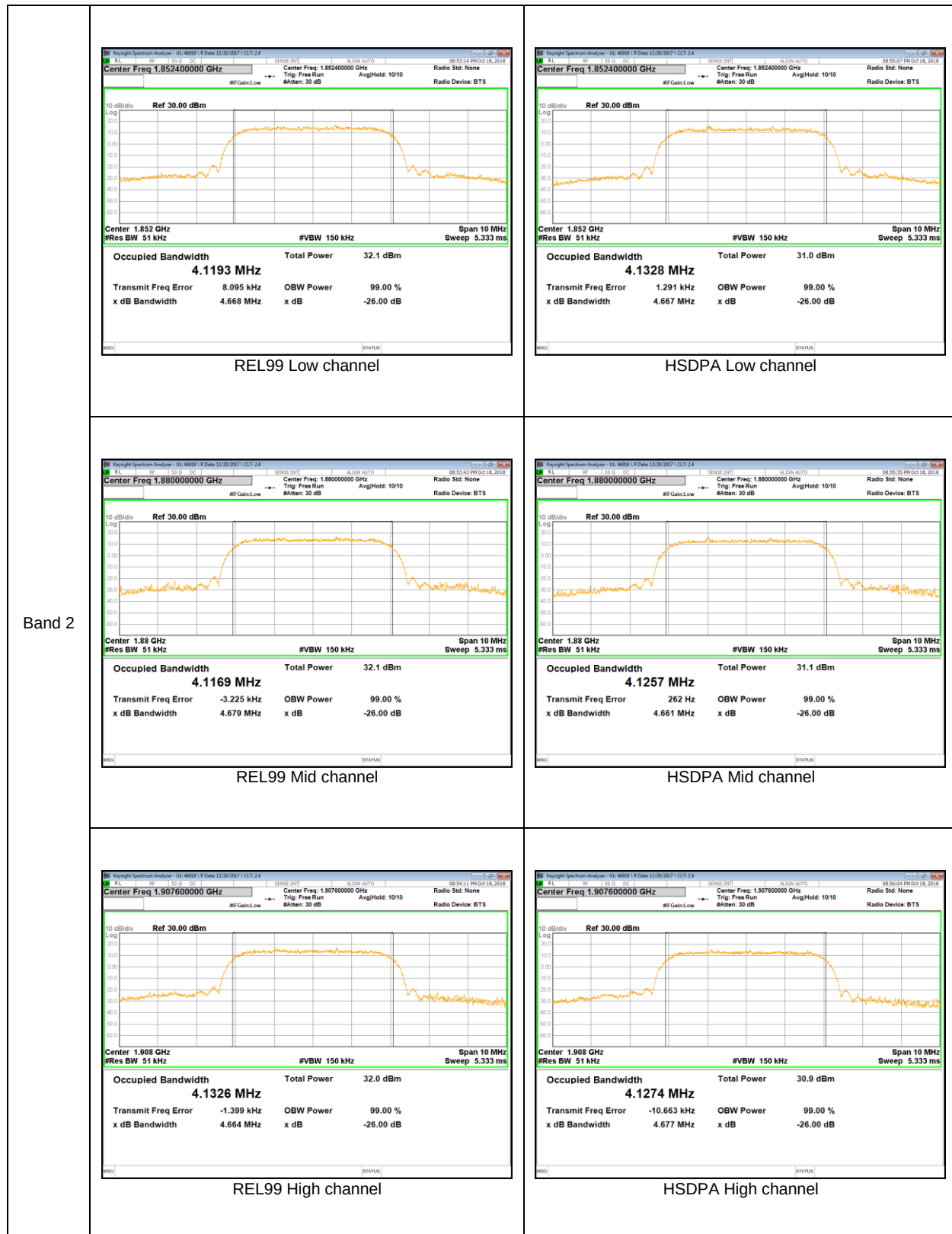
WCDMA Band 5



WCDMA Band 4



WCDMA Band 2



LTE Band 2

