



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

WWAN

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-J720M/DS, SM-J720M

FCC ID: A3LSMJ720M

REPORT NUMBER: 4788364119-E6V2

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ACCREDITED*

Testing
Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	03/19/18	Initial issue	Junwhan Lee
V2	03/27/18	Updated to address TCB's question	Junwhan Lee

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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 and ANT+

MODEL NUMBER: SM-J720M/DS, SM-J720M

SERIAL NUMBER: R38K10A6F9Z, R38K10A6FSE (RADIATED, Original);
R38K10A6GEM (CONDUCTED, Original);
R38K204GQND, R38K204GSHX
(RADIATED, Spot check & Additional test);
R38K10BCS5W (CONDUCTED, Spot check & Additional test);

DATE TESTED: FEB 09, 2018 - FEB 28, 2018 (Original)
FEB 28, 2018 - MAR 09, 2018 (Spot check & Additional test)

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.

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Tested By:



Junwhan Lee
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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMJ720F WWAN(FCC CFR 47 Part 22/24). 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: A3LSMJ720M shares the same enclosure and circuit board as FCC ID: A3LSMTJ720F. The WWAN antennas and surrounding circuitry and layout are identical between these two units.(Only non-US band portion were changed.)

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMJ720F remains representative of FCC ID: A3LSMJ720M. The test data of FCC ID: A3LSMJ720F being submitted for this application to cover WWAN features.
(Test data for the additional band were performed newly.)

Also SM-J720M/DS and SM-J720M are same hardware, but for different number of SIM card slot.SM-J720M has one slot and SM-J720M/DS is dual SIM version.
SM-J720M/DS used for the additional and spot check tests.

1.3. SPOT CHECK VERIFICATION DATA

Band	Test Item	Worst Mode	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-J720F/DS Results FCC ID : A3LSMJ720F	SM-J720M/DS Results FCC ID : A3LSMJ720M		
GSM850	ERP	GPRS	848.80 MHz	38.50 dBm	31.09 dBm	29.61 dBm	-1.48 dB	
	RSE	GPRS	2509.80 MHz	-13.00 dBm	-36.60 dBm	-43.10 dBm	-6.50 dB	
GSM1900	EIRP	GPRS	1880.00 MHz	33.00 dBm	25.93 dBm	25.78 dBm	-0.15 dB	
	RSE	GPRS	5640.00 MHz	-13.00 dBm	-47.50 dBm	-47.80 dBm	-0.30 dB	
WCDMA Band 2	EIRP	REL99	1852.40 MHz	33.00 dBm	19.41 dBm	20.16 dBm	0.75 dB	
	RSE	REL99	3704.80 MHz	-13.00 dBm	-41.90 dBm	-43.90 dBm	-2.00 dB	
WCDMA Band 5	ERP	REL99	826.40 MHz	38.50 dBm	20.50 dBm	20.14 dBm	-0.36 dB	
	RSE	REL99	1652.80 MHz	-13.00 dBm	-51.30 dBm	-51.60 dBm	-0.30 dB	
LTE Band 5	ERP	10M QPSK	829.00 MHz	38.50 dBm	17.59 dBm	17.82 dBm	0.23 dB	
	RSE	1.4M QPSK	2509.50 MHz	-13.00 dBm	-64.00 dBm	-63.66 dBm	0.34 dB	
LTE Band 7	EIRP	15M QPSK	2562.50 MHz	33.00 dBm	20.55 dBm	21.09 dBm	0.54 dB	
	RSE	10M QPSK	10260.00 MHz	-25.00 dBm	-30.90 dBm	-32.00 dBm	-1.10 dB	
LTE Band 41	ERP	5M QPSK	2687.50 MHz	33.00 dBm	19.05 dBm	18.81 dBm	-0.24 dB	
	RSE	15M QPSK	10372.00 MHz	-25.00 dBm	-34.80 dBm	-34.40 dBm	0.40 dB	

Comparison of two models, higher 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.

Equipment Class	Reference FCC ID	Type Grant/Permissive Change	Reference Application	Folder Test/RF Exposure	Report Title / Section
DTS	A3LSMJ720F	Grant	4788334019-E1V3	Test	FCC Report DTS WLAN All sections
			4788334019-E2V2	Test	FCC Report BLE All sections
DSS	A3LSMJ720F	Grant	4788334019-E3V3	Test	FCC Report BT / All sections
NII	A3LSMJ720F	Grant	4788334019-E4V2	Test	FCC Report UNII WALN / All sections
DXX	A3LSMJ720F	Grant	4788334019-E5V3	Test	FCC Report ANT+ / All sections
PCE	A3LSMJ720F	Grant	4788334019-E6V2	Test	FCC Report WWAN / All sections (Except Conducted Output Power)

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 TIA-603-E, 2016
6. KDB 971168 D01 Power Meas License Digital Systems v03

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

5.2. MAXIMUM OUTPUT POWER

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

Note : Conducted output power results were excerpted from RF exposure test report.(4788364119-S1V3 FCC Report SAR)

GSM

FCC Part 22/24						
Band	Frequency Range	Modulation	Conducted		Radiated	
	[MHz]		Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
GSM850	824~849	GMSK	32.6	1819.70		
		GPRS	32.5	1778.28	31.09	1285.29
		EGPRS	27.8	602.56	24.06	254.68
GSM1900	1850~1910	GMSK	30.5	1122.02		
		GPRS	30.5	1122.02	25.93	391.74
		EGPRS	26.7	467.74	23.28	212.81

WCDMA

FCC Part 22/24						
Band	Frequency Range	Modulation	Conducted		Radiated	
	[MHz]		Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824~849	REL99	24.0	251.19	20.50	112.20
		HSDPA	22.3	169.82	19.41	87.30
		HSUPA	24.0	251.19		
		DC-HSDPA	22.2	165.96		
Band 4	1710~1755	REL99	23.8	239.88	22.59	181.55
		HSDPA	22.2	165.96	21.84	152.76
		HSUPA	23.8	239.88		
		DC-HSDPA	22.2	165.96		
Band 2	1850~1910	REL99	24.0	251.19	19.96	99.08
		HSDPA	22.6	181.97	17.80	60.26
		HSUPA	24.0	251.19		
		DC-HSDPA	22.5	177.83		

LTE Band 2

FCC Part 24							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 2	1850 ~ 1910	20	QPSK	23.9	245.47	17.07	50.93
			16QAM	21.9	154.88	16.16	41.30
		15	QPSK	23.9	245.47	15.91	38.99
			16QAM	21.8	151.36	14.92	31.05
		10	QPSK	23.9	245.47	16.56	45.29
			16QAM	21.9	154.88	15.59	36.22
		5	QPSK	23.8	239.88	16.88	48.75
			16QAM	21.8	151.36	15.91	38.99
		3	QPSK	23.8	239.88	16.44	44.06
			16QAM	21.8	151.36	15.44	34.99
		1.4	QPSK	23.7	234.42	14.35	27.23
			16QAM	21.8	151.36	13.44	22.08

LTE Band 5

FCC Part 22							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824 ~ 849	10	QPSK	23.7	234.42	17.59	57.41
			16QAM	21.5	141.25	16.55	45.19
		5	QPSK	23.7	234.42	17.18	52.24
			16QAM	21.6	144.54	15.98	39.63
		3	QPSK	23.9	245.47	17.13	51.64
			16QAM	22.0	158.49	16.05	40.27
		1.4	QPSK	23.8	239.88	16.05	40.27
			16QAM	21.8	151.36	14.31	26.98

LTE Band 7

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 7	2500-2570	20	QPSK	23.9	245.47	20.24	105.68
			16QAM	21.6	144.54	19.21	83.37
		15	QPSK	23.8	239.88	20.55	113.50
			16QAM	21.4	138.04	19.52	89.54
		10	QPSK	23.7	234.42	19.47	88.51
			16QAM	21.2	131.83	18.39	69.02
		5	QPSK	24.3	269.15	19.68	92.90
			16QAM	21.7	147.91	18.65	73.28

LTE Band 12

Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 12	699 ~ 716	10	QPSK	23.7	234.42	15.51	35.56
			16QAM	21.5	141.25	14.56	28.58
		5	QPSK	23.6	229.09	15.63	36.56
			16QAM	21.6	144.54	14.67	29.31
		3	QPSK	23.7	234.42	15.19	33.04
			16QAM	21.6	144.54	14.16	26.06
		1.4	QPSK	23.9	245.47	13.52	22.49
			16QAM	21.9	154.88	12.62	18.28

LTE Band 17

Due to frequency range and same output power setting, test was carried in LTE Band 12 to cover both LTE Band 12 and LTE Band 17.

LTE Band 13

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 13	777 ~ 787	10	QPSK	23.7	234.42	15.05	31.99
			16QAM	21.7	147.91	13.99	25.06
		5	QPSK	23.6	229.09	15.87	38.64
			16QAM	21.6	144.54	14.84	30.48

LTE Band 66

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 66	1710 ~ 1780	20	QPSK	23.8	239.88	20.17	103.99
			16QAM	21.5	141.25	20.01	100.23
		15	QPSK	23.8	239.88	20.17	103.99
			16QAM	21.9	154.88	19.18	82.79
		10	QPSK	23.6	229.09	18.61	72.61
			16QAM	21.4	138.04	17.58	57.28
		5	QPSK	23.8	239.88	18.48	70.47
			16QAM	22.0	158.49	17.47	55.85
		3	QPSK	23.9	245.47	18.15	65.31
			16QAM	21.9	154.88	17.08	51.05
		1.4	QPSK	23.6	229.09	17.01	50.23
			16QAM	21.5	141.25	16.13	41.02

LTE Band 4

Due to frequency range and same output power setting, test was carried in LTE Band 66 to cover both LTE Band 66 and LTE Band 4.

LTE Band 41

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 41	2496-2690	20	QPSK	23.5	223.87	17.32	53.95
			16QAM	21.2	131.83	16.32	42.85
		15	QPSK	23.5	223.87	17.85	60.95
			16QAM	21.7	147.91	18.56	71.78
		10	QPSK	23.4	218.78	18.75	74.99
			16QAM	21.2	131.83	17.84	60.81
		5	QPSK	23.4	218.78	19.05	80.35
			16QAM	21.0	125.89	18.19	65.92

LTE Band 38

Due to frequency range and same output power setting, test was carried in LTE Band 41 to cover both LTE Band 41 and LTE Band 38.

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)
GSM850 / WCDMA Band 5 / LTE Band 5 824 ~ 849 MHz	-3.8
GSM1900 / WCDMA Band 2 / LTE Band 2 1850 ~ 1910 MHz	-1.7
LTE Band 38/41 2496 ~ 2690 MHz	-1.4
LTE Band 7 2500 ~ 2570 MHz	-1.4
LTE Band 12/17 699 ~ 716 MHz	-6.3
LTE Band 13 777 ~ 787 MHz	-3.79
WCDMA Band 4 / LTE Band 4/66 1710 ~ 1780 MHz	-2.7

5.4. WORST-CASE ORIENTATION

For GSM1900 / WCDMA Band 2 / WCDMA Band 4 / LTE Band 2 / LTE Band 7 / LTE Band 41 / LTE Band 66, 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; therefore, all final radiated testing was performed with the EUT in X orientation.

For GSM850 / WCDMA Band 5 / LTE Band 5 / LTE Band 12 / LTE Band 13 / LTE Band 17, 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; therefore, all final radiated testing was performed with the EUT in Z 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)

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA50EWE	DK5J112VS/A- E	N/A
Data Cable	SAMSUNG	ECB-DU68WE	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

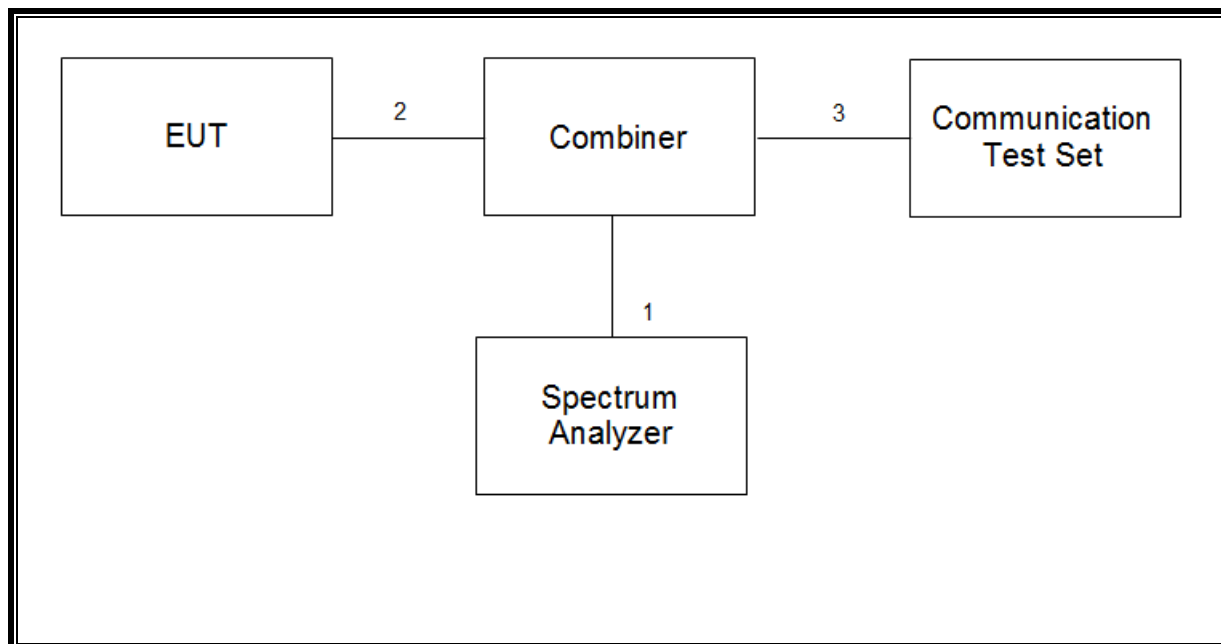
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	2	Mini-Jack	Unshielded	1.2m	N/A

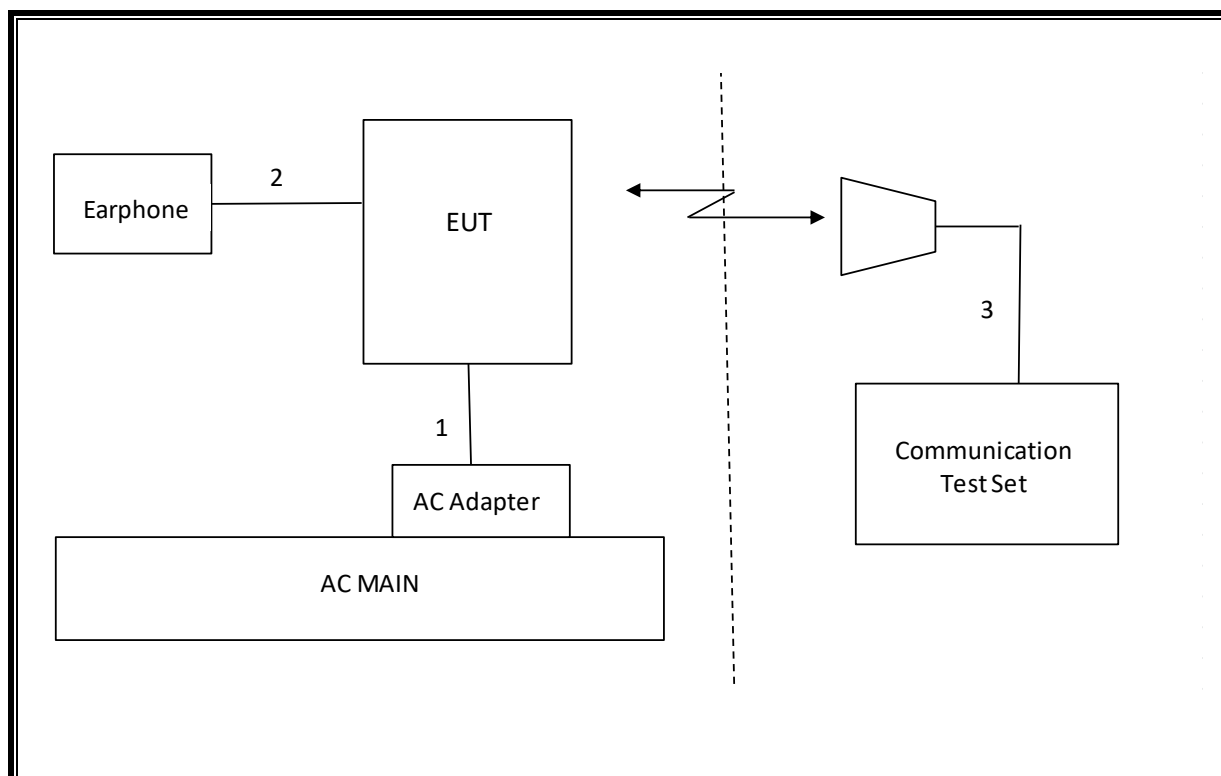
TEST SETUP

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	11-13-19
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-31-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-31-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	09-14-19
Antenna, Horn, 18 GHz	ETS	3115	00167211	10-14-18
Antenna, Horn, 18 GHz	ETS	3115	00161451	03-10-19
Antenna, Horn, 18 GHz	ETS	3117	00168724	05-31-19
Antenna, Horn, 18 GHz	ETS	3117	00205959	11-29-18
Antenna, Horn, 18 GHz	ETS	3117	00168717	05-31-19
Combiner	WEINSCHTEL	1575	2152	08-08-18
Communications Test Set	R&S	CMW500	115331	08-07-18
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-07-18
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-09-18
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-10-18
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-18
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-08-18
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-11-18
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-08-18
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-08-18
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-08-18
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-08-18
EMI Test Receive, 44 GHz	R&S	ESW40	101590	08-09-18
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	08-09-18
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	08-08-18
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	08-09-18
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	08-08-18
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	08-09-18
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	08-08-18
Attenuator	PASTERNAK	PE7087-10	A009	08-08-18
Attenuator	PASTERNAK	PE7087-10	A001	08-08-18
Attenuator	PASTERNAK	PE7087-10	A008	08-08-18
Attenuator	PASTERNAK	PE7087-10	2	08-10-18
Attenuator	PASTERNAK	PE7395-10	A011	02-12-19
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Temperature Chamber	ESPEC	SH-642	93001109	08-08-18
UL Software				
Description	Manufacturer	Model	Version	
Antenna port test software	UL	CLT	Ver 2.2 / 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		Pass
22.355 24.235 27.54	Frequency Stability	2.5PPM		Pass
22.913(a)(2)	Effective Radiated Power	38.5 dBm	Radiated	Pass
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

FCC Rule Part	Frequency Range [MHz]	Output Power [W]	Frequency Tolerance	Emission Designator	Emission Bandwidth [MHz]	Communication Type
GSM						
22H	824.2 - 848.8	1.285	2.5 ppm	246KGXW		GSM850
22H	824.2 - 848.8	0.255	2.5 ppm	246KG7W		EDGE850
24E	1850.2 - 1909.8	0.392	2.5 ppm	246KGXW		GSM1900
24E	1850.2 - 1909.8	0.213	2.5 ppm	250KG7W		EDGE1900
WCDMA						
22H	826.4 - 846.6	0.112	2.5 ppm	4M14F9W		WCDMA B5
27L	1712.4 - 1752.6	0.182	2.5 ppm	4M15F9W		WCDMA B4
24E	1852.4 - 1907.6	0.099	2.5 ppm	4M14F9W		WCDMA B2
LTE Band 5						
22H	829.0 - 844.0	0.057	2.5 ppm	8M97G7W	10	QPSK
22H	829.0 - 844.0	0.045	2.5 ppm	8M98D7W	10	16QAM
LTE Band 7						
27M	2510.0 - 2560.0	0.106	2.5 ppm	17M9G7W	20	QPSK
27M	2510.0 - 2560.0	0.083	2.5 ppm	17M9D7W	20	16QAM
27M	2507.5 - 2562.5	0.114	2.5 ppm	13M4G7W	15	QPSK
27M	2507.5 - 2562.5	0.090	2.5 ppm	13M4D7W	15	16QAM
LTE Band 41/38						
27M	2506.0 - 2680.0	0.054	2.5 ppm	17M9G7W	20	QPSK
27M	2506.0 - 2680.0	0.043	2.5 ppm	17M9D7W	20	16QAM
27M	2503.5 - 2682.5	0.072	2.5 ppm	13M4D7W	15	16QAM
27M	2498.5 - 2687.5	0.080	2.5 ppm	4M49G7W	5	QPSK
LTE Band 13						
27F	782	0.032	2.5 ppm	8M95G7W	10	QPSK
27F	782	0.025	2.5 ppm	8M93D7W	10	16QAM
27F	779.5 - 784.5	0.039	2.5 ppm	4M51G7W	5	QPSK
27F	779.5 - 784.5	0.030	2.5 ppm	4M50D7W	5	16QAM
LTE Band 12/17						
27H	704.0 - 711.0	0.036	2.5 ppm	8M97G7W	10	QPSK
27H	704.0 - 711.0	0.029	2.5 ppm	8M97D7W	10	16QAM
27H	701.5 - 713.5	0.037	2.5 ppm	4M50G7W	5	QPSK
27H	701.5 - 713.5	0.029	2.5 ppm	4M50D7W	5	16QAM
LTE Band 2						
24E	1860.0 - 1900.0	0.051	2.5 ppm	17M9G7W	20	QPSK
24E	1860.0 - 1900.0	0.041	2.5 ppm	17M9D7W	20	16QAM
LTE Band 4/66						
27L	1720.0 - 1745.0	0.104	2.5 ppm	17M9G7W	20	QPSK
27L	1720.0 - 1745.0	0.100	2.5 ppm	17M9D7W	20	16QAM

8. PEAK TO AVERAGE RATIO

Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v03;

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.

8.1. CONDUCTED PEAK TO AVERAGE RESULT

GSM

Band	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
GSM850	190	836.6	GPRS	0.45	13.00
			EGPRS	3.54	
GSM1900	661	1880.0	GPRS	0.41	
			EGPRS	2.91	

WCDMA

Band	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	4183	836.6	REL99	3.08	13.00
			HSDPA	3.10	
Band 4	1413	1732.6	REL99	2.97	
			HSDPA	3.05	
Band 2	9400	1880.0	REL99	3.08	
			HSDPA	3.27	

LTE Band 5

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	10	20525	836.5	QPSK	5.58	13.00
				16QAM	7.02	
	5			QPSK	5.58	
				16QAM	7.02	
	3			QPSK	5.63	
				16QAM	7.12	
	1.4			QPSK	5.56	
				16QAM	7.17	

LTE Band 7

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 7	20	21100	2535	QPSK	4.45	13.00
				16QAM	6.16	
	15			QPSK	4.36	
				16QAM	6.16	
	10			QPSK	4.35	
				16QAM	6.11	
	5			QPSK	4.27	
				16QAM	6.11	

LTE Band41

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 41	20	40620	2593	QPSK	5.00	13.00
				16QAM	6.95	
	15			QPSK	5.22	
				16QAM	6.65	
	10			QPSK	5.23	
				16QAM	6.75	
	5			QPSK	5.20	
				16QAM	6.96	

LTE Band 38

Due to frequency range and same output power setting, test was carried in LTE Band 41 to cover both LTE Band 41 and LTE Band 38.

LTE

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 13	10	23230	782	QPSK	5.01	13.00
				16QAM	6.79	
	5			QPSK	4.97	
				16QAM	6.67	
Band 12	10	23095	707.5	QPSK	5.50	
				16QAM	7.13	
	5			QPSK	5.56	
				16QAM	7.06	
	3			QPSK	5.42	
				16QAM	7.08	
	1.4			QPSK	5.33	
				16QAM	6.96	
Band 66	20	132322	1745.0	QPSK	5.28	
				16QAM	6.79	
	15			QPSK	5.17	
				16QAM	6.69	
	10			QPSK	5.09	
				16QAM	6.56	
	5			QPSK	5.07	
				16QAM	6.79	
	3			QPSK	5.20	
				16QAM	7.06	
1.4	QPSK	5.19				
	16QAM	6.69				
Band 2	20	18900	1880.0	QPSK	4.95	
				16QAM	6.55	
	15			QPSK	4.82	
				16QAM	6.76	
	10			QPSK	4.83	
				16QAM	6.73	
	5			QPSK	4.96	
				16QAM	6.56	
	3			QPSK	4.92	
				16QAM	6.68	
1.4	QPSK	4.99				
	16QAM	6.58				

LTE Band 4

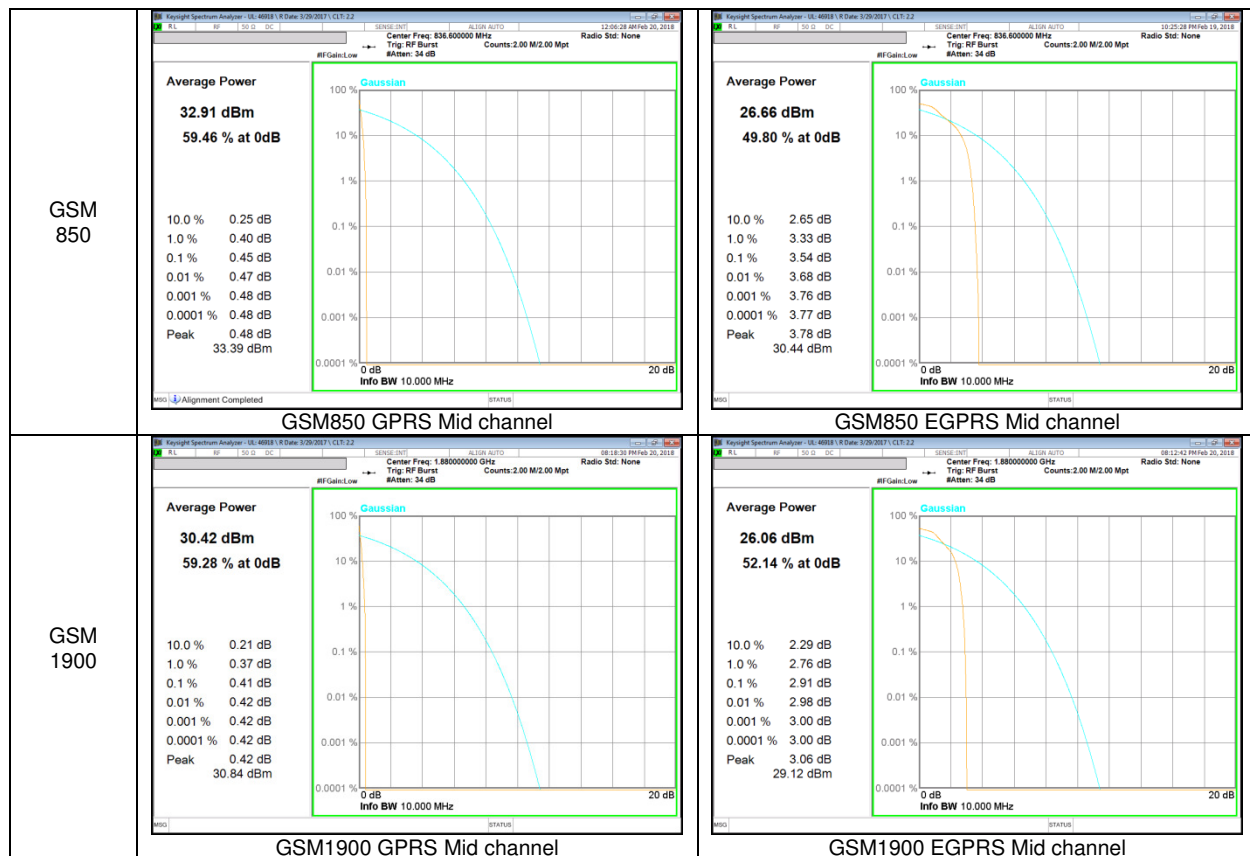
Due to frequency range and same output power setting, test was carried in LTE Band 66 to cover both LTE Band 66 and LTE Band 4.

LTE Band 17

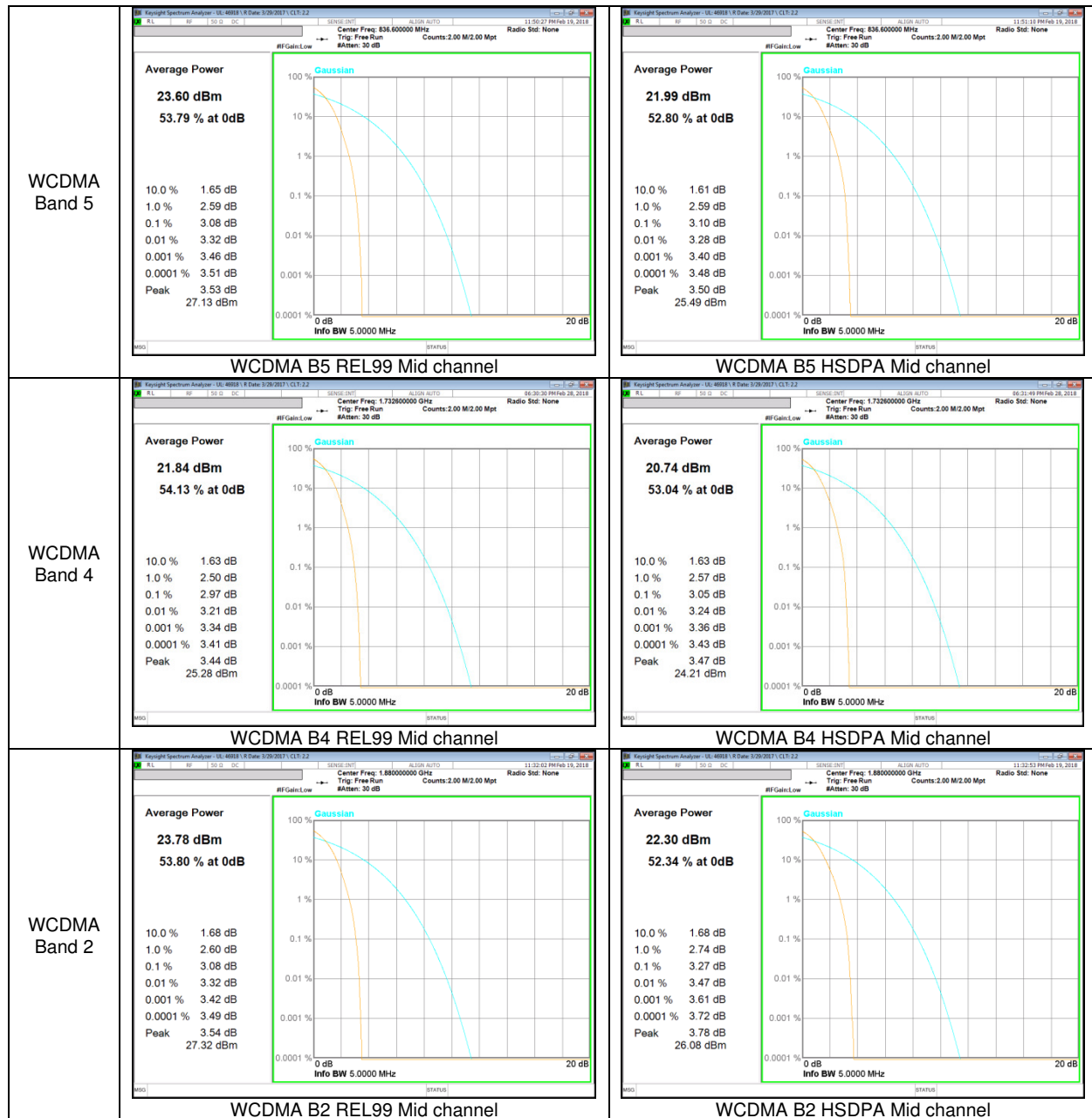
Due to frequency range and same output power setting, test was carried in LTE Band 12 to cover both LTE Band 12 and LTE Band 17.

8.2. CONDUCTED PEAK TO AVERAGE PLOTS

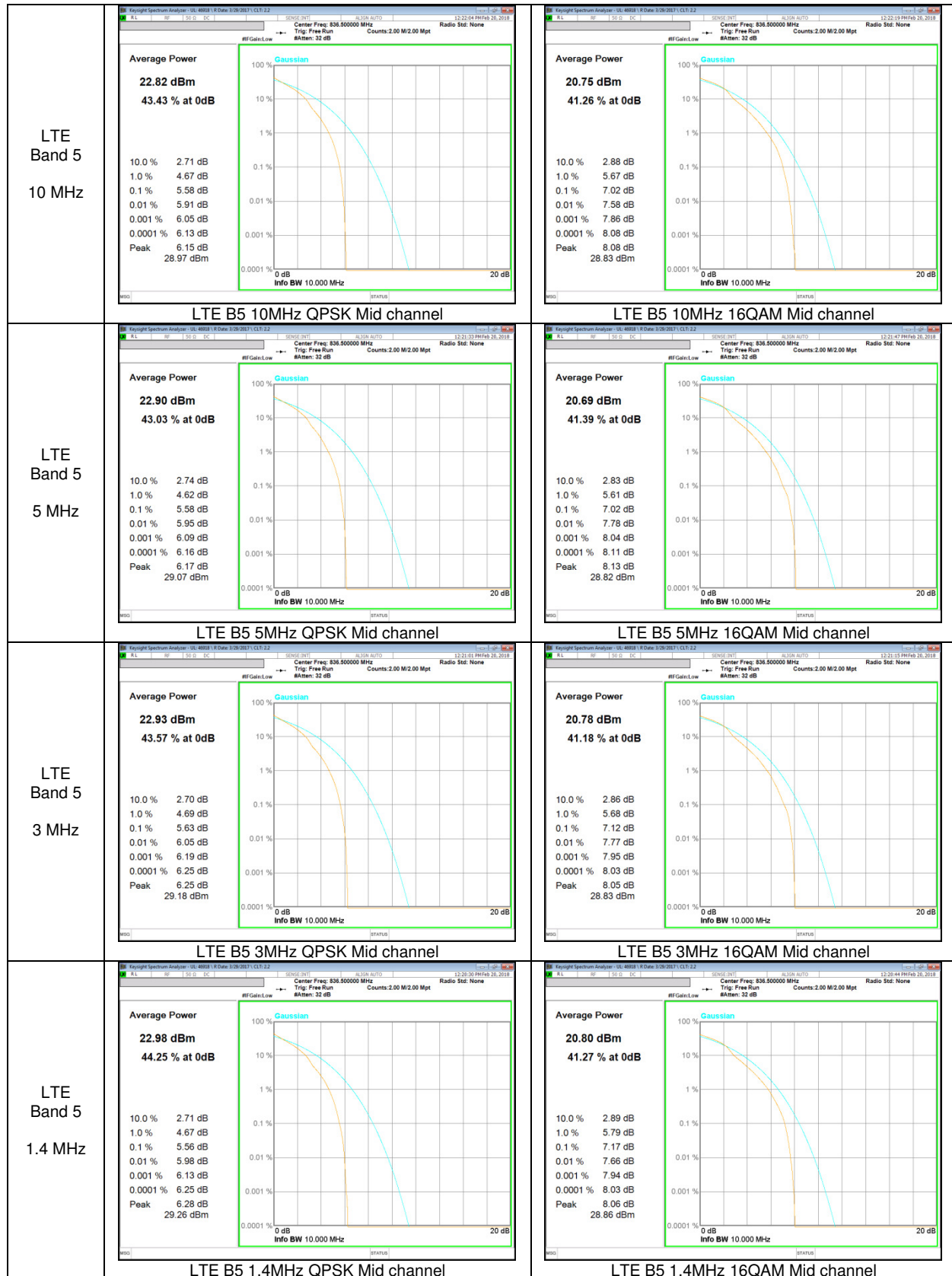
GSM



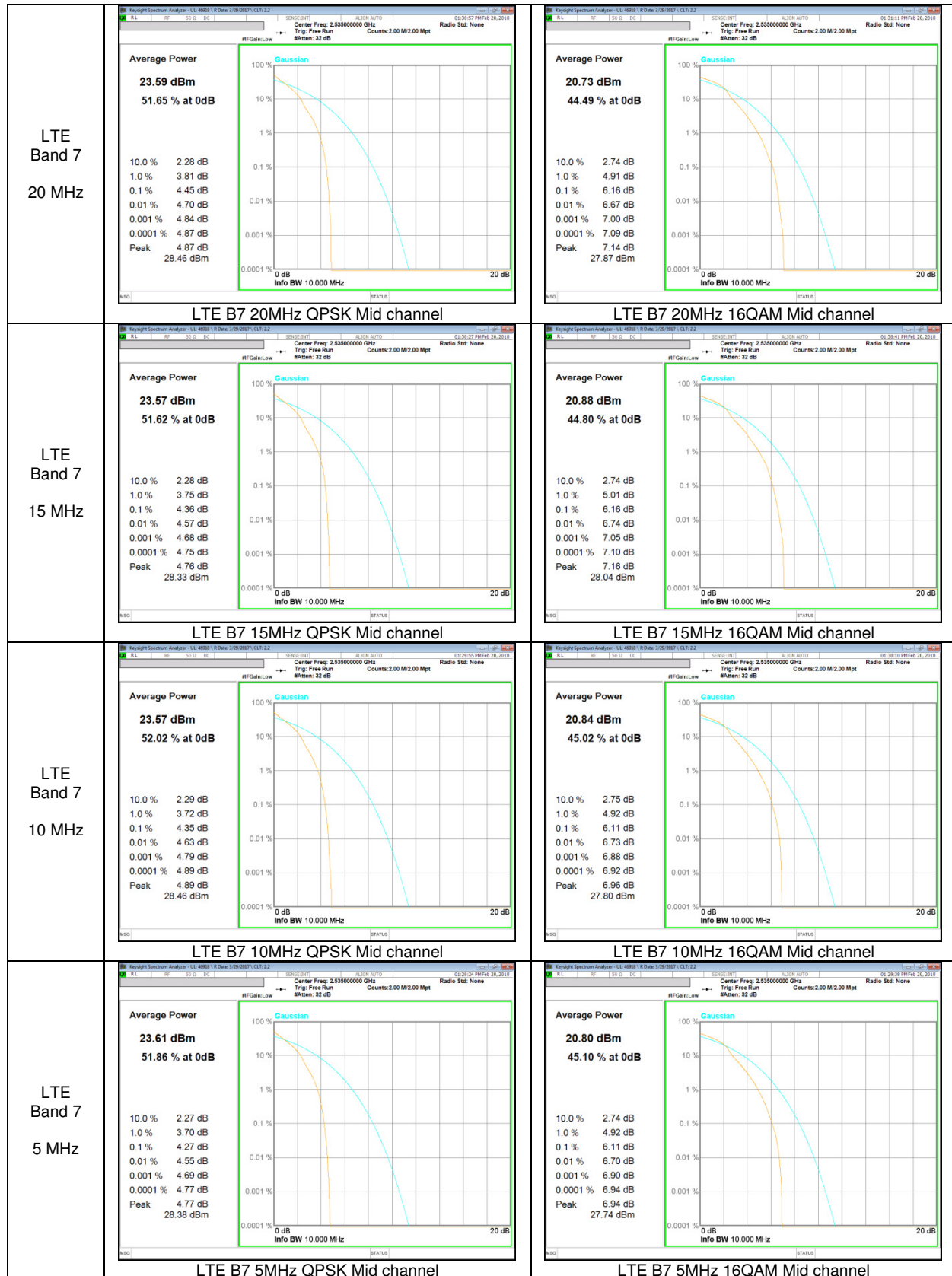
WCDMA



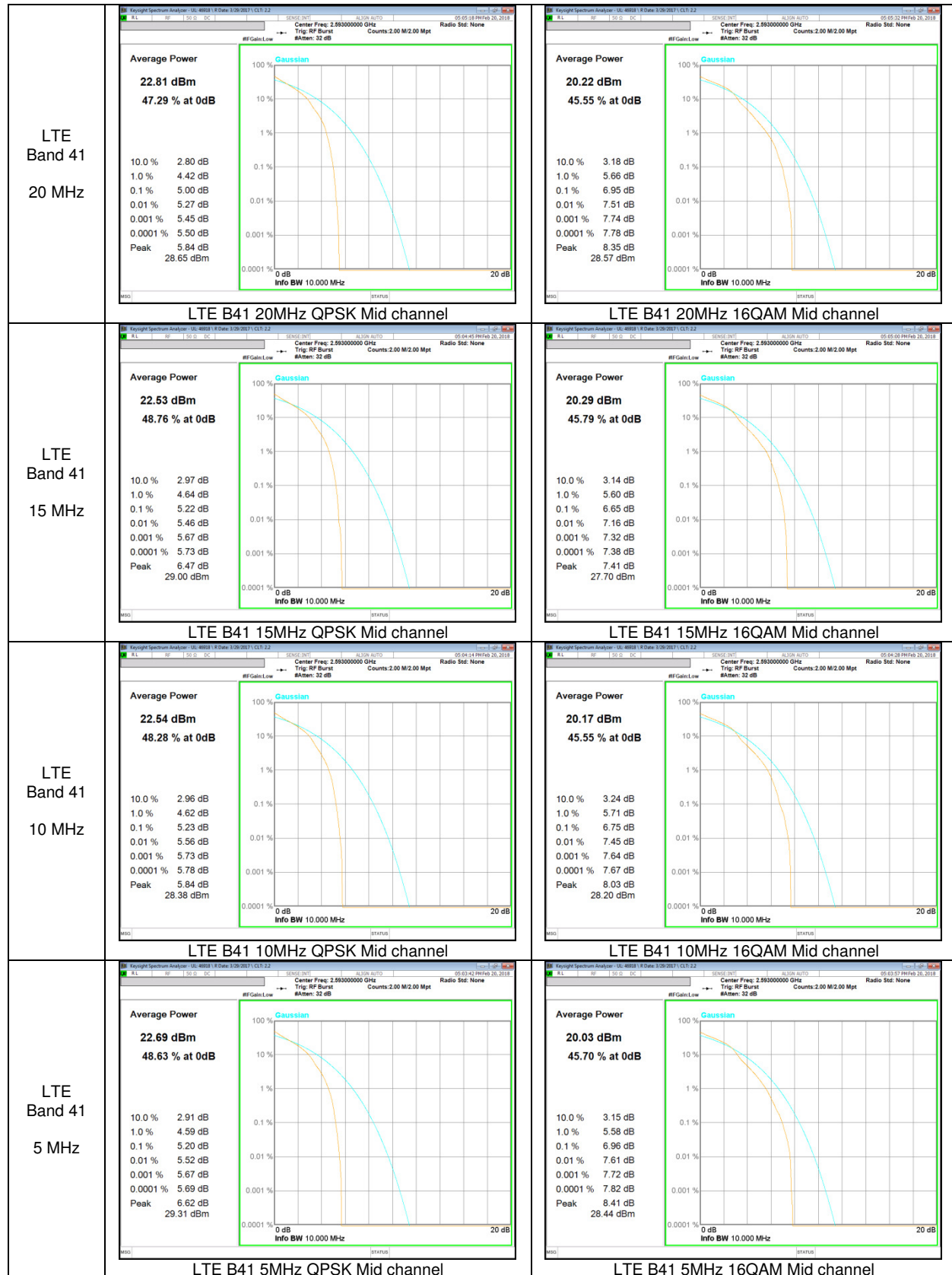
LTE Band 5



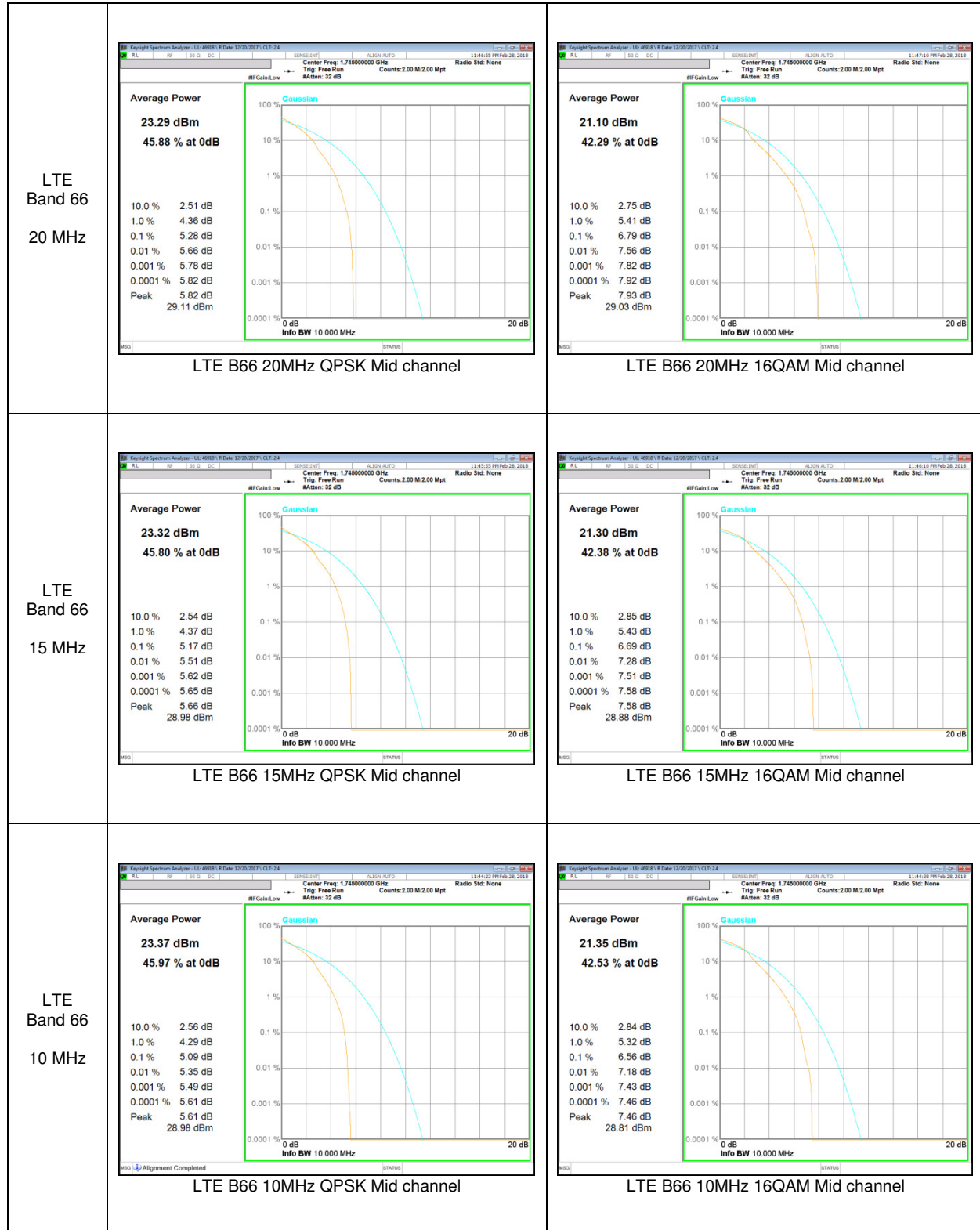
LTE Band 7

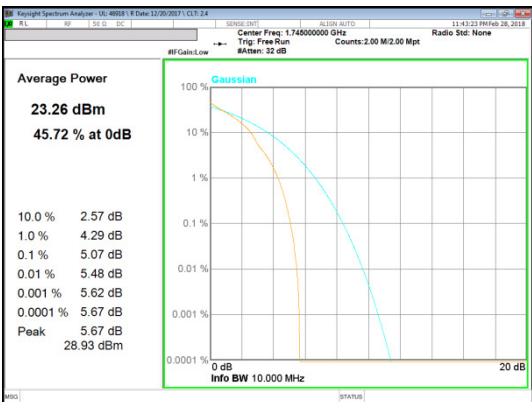
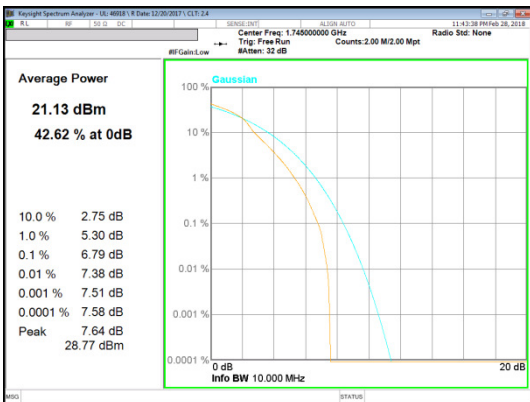
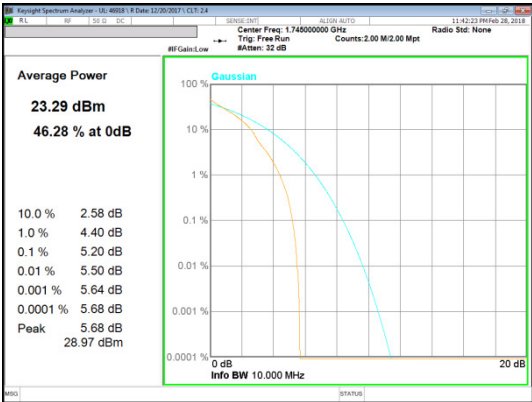
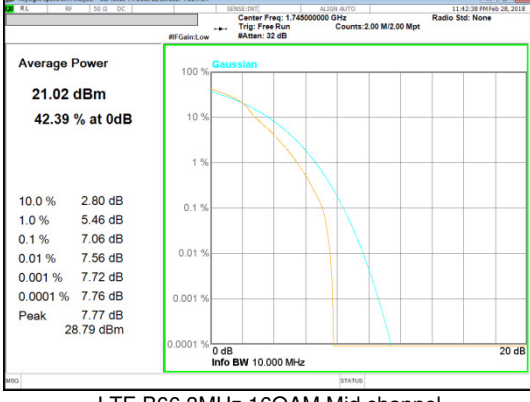
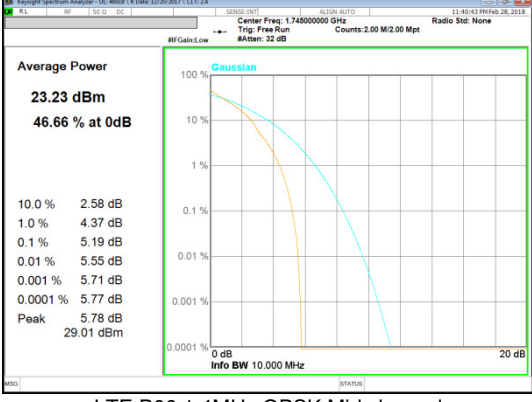
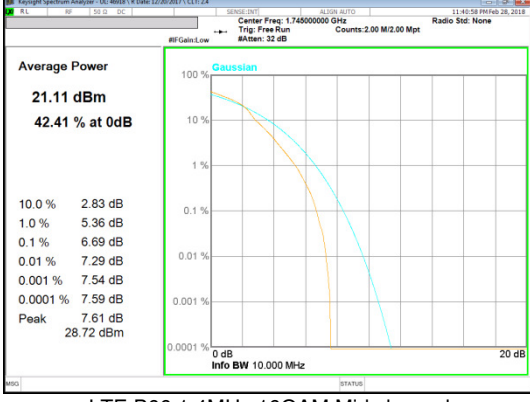


LTE Band 41

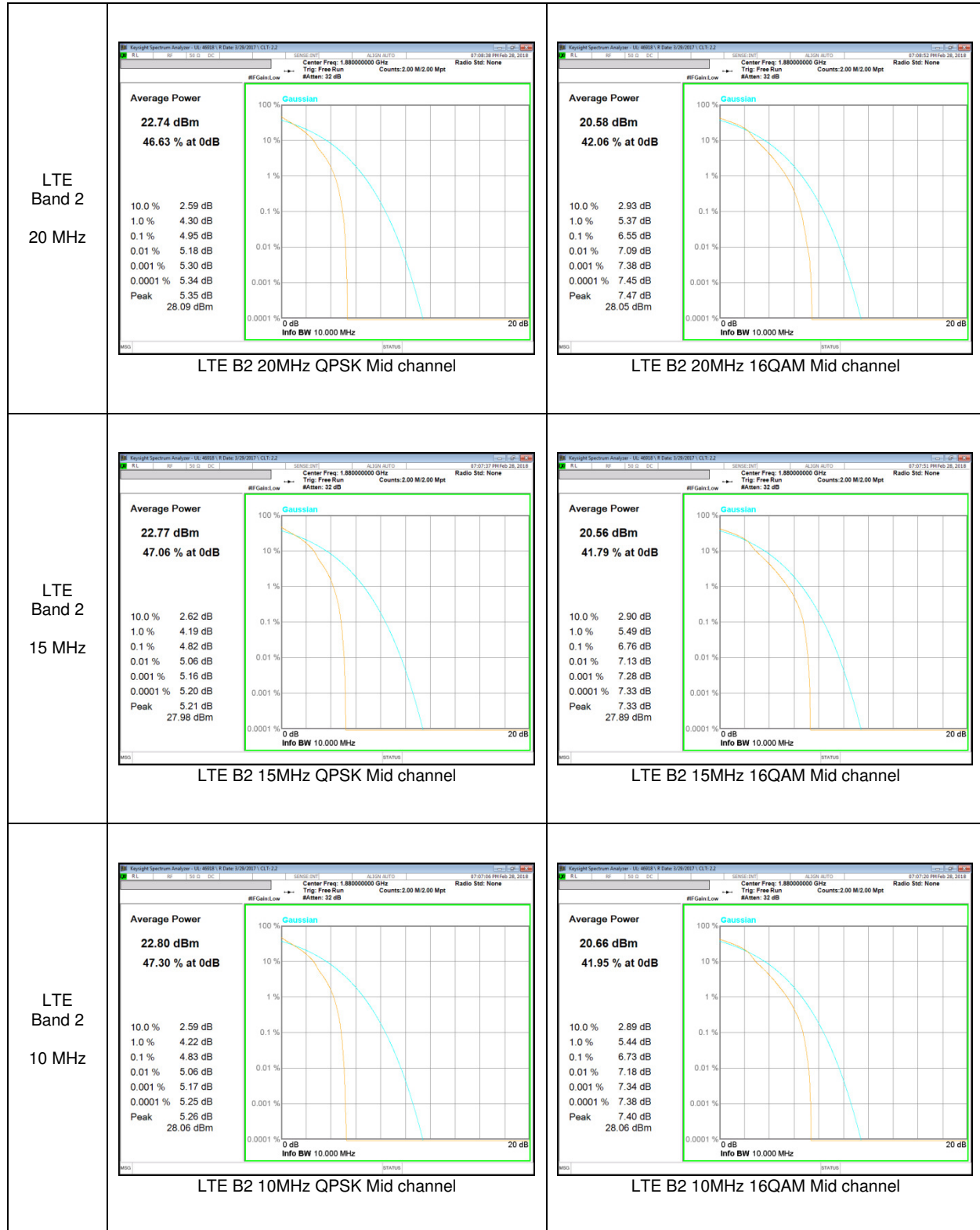


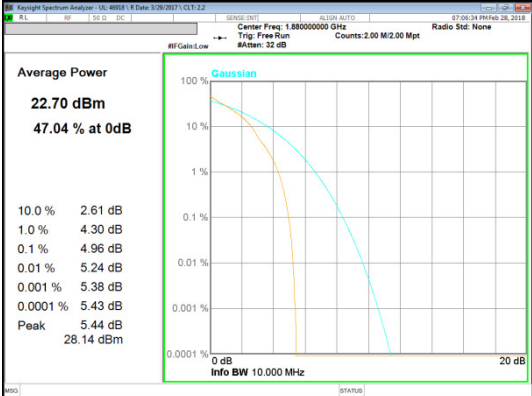
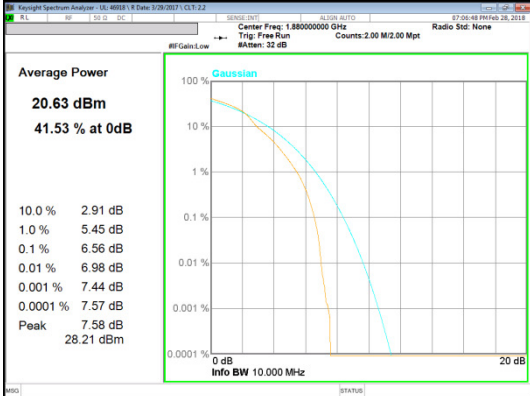
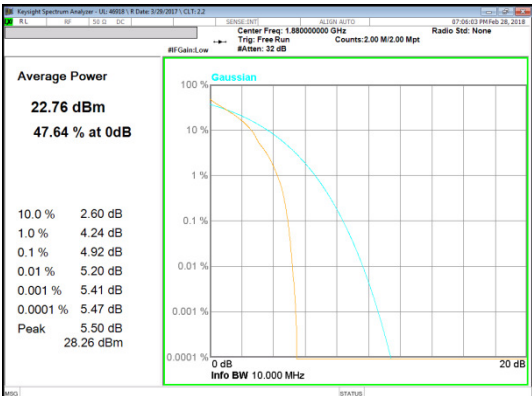
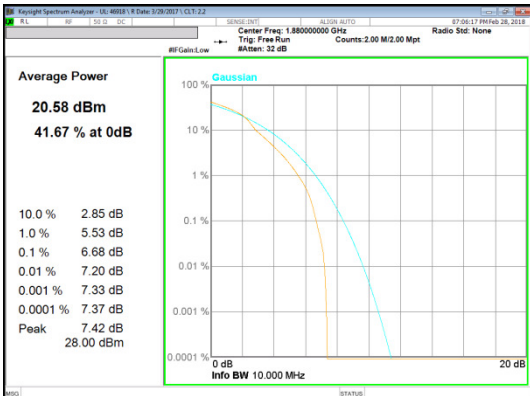
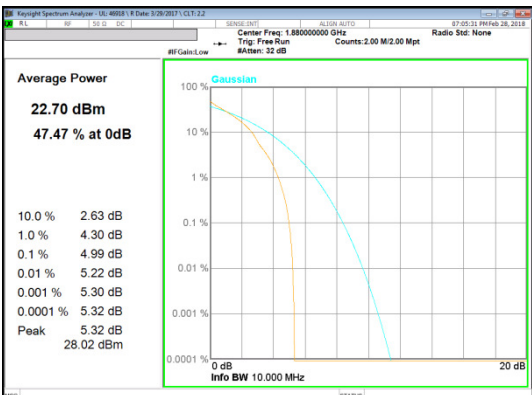
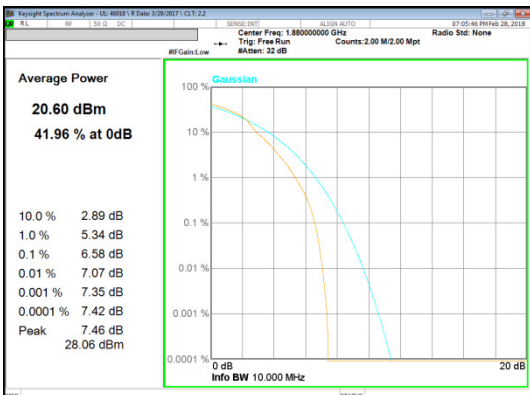
LTE Band 66



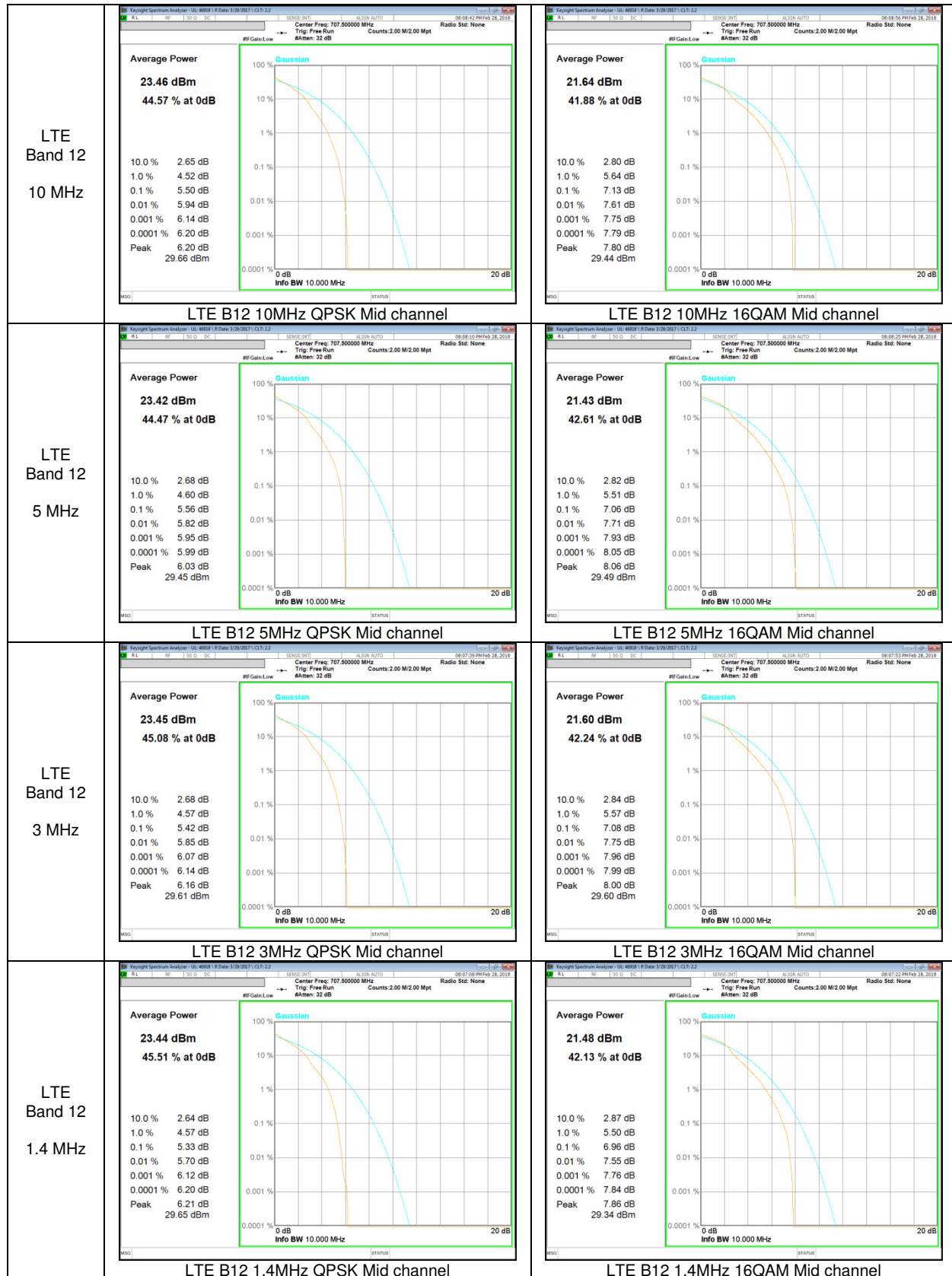
LTE Band 66 5 MHz	 Average Power 23.26 dBm 45.72 % at 0dB 10.0 % 2.57 dB 1.0 % 4.29 dB 0.1 % 5.07 dB 0.01 % 5.48 dB 0.001 % 5.62 dB 0.0001 % 5.67 dB Peak 28.93 dBm LTE B66 5MHz QPSK Mid channel	 Average Power 21.13 dBm 42.62 % at 0dB 10.0 % 2.75 dB 1.0 % 5.30 dB 0.1 % 6.79 dB 0.01 % 7.38 dB 0.001 % 7.51 dB 0.0001 % 7.58 dB Peak 28.77 dBm LTE B66 5MHz 16QAM Mid channel
LTE Band 66 3 MHz	 Average Power 23.29 dBm 46.28 % at 0dB 10.0 % 2.58 dB 1.0 % 4.40 dB 0.1 % 5.20 dB 0.01 % 5.50 dB 0.001 % 5.64 dB 0.0001 % 5.68 dB Peak 28.97 dBm LTE B66 3MHz QPSK Mid channel	 Average Power 21.02 dBm 42.39 % at 0dB 10.0 % 2.80 dB 1.0 % 5.46 dB 0.1 % 7.06 dB 0.01 % 7.56 dB 0.001 % 7.72 dB 0.0001 % 7.76 dB Peak 28.79 dBm LTE B66 3MHz 16QAM Mid channel
LTE Band 66 1.4 MHz	 Average Power 23.23 dBm 46.66 % at 0dB 10.0 % 2.58 dB 1.0 % 4.37 dB 0.1 % 5.19 dB 0.01 % 5.55 dB 0.001 % 5.71 dB 0.0001 % 5.77 dB Peak 29.01 dBm LTE B66 1.4MHz QPSK Mid channel	 Average Power 21.11 dBm 42.41 % at 0dB 10.0 % 2.83 dB 1.0 % 5.36 dB 0.1 % 6.69 dB 0.01 % 7.29 dB 0.001 % 7.54 dB 0.0001 % 7.59 dB Peak 28.72 dBm LTE B66 1.4MHz 16QAM Mid channel

LTE Band 2

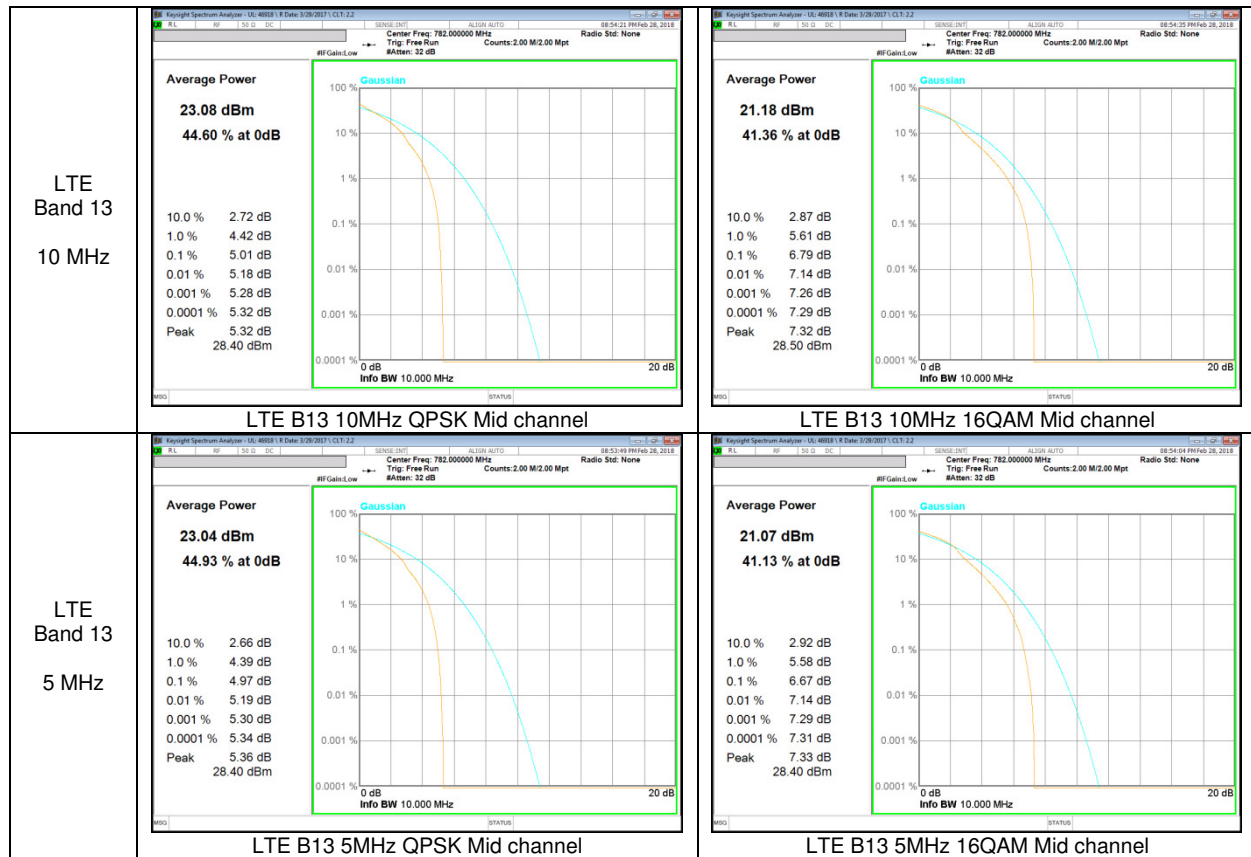


LTE Band 2 5 MHz	 LTE B2 5MHz QPSK Mid channel	 LTE B2 5MHz 16QAM Mid channel
LTE Band 2 3 MHz	 LTE B2 3MHz QPSK Mid channel	 LTE B2 3MHz 16QAM Mid channel
LTE Band 2 1.4 MHz	 LTE B2 1.4MHz QPSK Mid channel	 LTE B2 1.4MHz 16QAM Mid channel

LTE Band 12



LTE Band 13



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 v03)

9.1.1. OCCUPIED BANDWIDTH RESULTS

GSM

Band	Mode	Channel	f [MHz]	99% BW [KHz]	26dB BW [KHz]
GSM850	GPRS	128	824.2	237.89	312.7
		190	836.6	243.83	316.6
		251	848.8	246.09	309.9
	EGPRS	128	824.2	246.44	305.5
		190	836.6	245.24	306.4
		251	848.8	243.40	310.4
GSM1900	GPRS	512	1850.2	244.86	320.3
		661	1880.0	239.58	311.9
		810	1909.8	245.95	312.4
	EGPRS	512	1850.2	242.50	301.3
		661	1880.0	250.17	320.8
		810	1909.8	242.54	322.9

WCDMA

Band	Mode	Channel	f [MHz]	99% BW [MHz]	26dB BW [MHz]
Band 5	REL99	4132	826.4	4.1385	4.686
		4183	836.6	4.1406	4.683
		4233	846.6	4.1314	4.678
	HSDPA	4132	826.4	4.1302	4.702
		4183	836.6	4.1377	4.691
		4233	846.6	4.1408	4.659
Band 2	REL99	9262	1852.4	4.1302	4.684
		9400	1880.0	4.1313	4.688
		9538	1907.6	4.1160	4.689
	HSDPA	9262	1852.4	4.1378	4.669
		9400	1880.0	4.1302	4.683
		9538	1907.6	4.1282	4.662
Band 4	REL99	1312	1712.4	4.1357	4.710
		1413	1732.6	4.1474	4.681
		1513	1752.6	4.1431	4.714
	HSDPA	1312	1712.4	4.1486	4.683
		1413	1732.6	4.1354	4.680
		1513	1752.6	4.1433	4.680

LTE Band 5

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 5	10	20450	829.0	QPSK	8.9693	10.15
				16QAM	8.9505	10.12
		20524	836.5	QPSK	8.9548	10.12
				16QAM	8.9413	10.27
		20599	844.0	QPSK	8.9565	10.24
				16QAM	8.9750	10.13
	5	20425	826.5	QPSK	4.4977	5.236
				16QAM	4.5031	5.294
		20524	836.5	QPSK	4.4946	5.214
				16QAM	4.4938	5.253
		20624	846.5	QPSK	4.5094	5.243
				16QAM	4.5065	5.337
	3	20415	825.5	QPSK	2.7010	3.088
				16QAM	2.6999	3.028
		20524	836.5	QPSK	2.7002	3.082
				16QAM	2.6997	3.044
		20634	847.5	QPSK	2.7080	3.078
				16QAM	2.7007	3.107
	1.4	20407	824.7	QPSK	1.0946	1.279
				16QAM	1.0877	1.323
		20524	836.5	QPSK	1.0849	1.310
				16QAM	1.0870	1.311
		20624	848.3	QPSK	1.0866	1.288
				16QAM	1.0880	1.285

LTE Band 7

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 7	20	20850	2510	QPSK	17.877	19.78
				16QAM	17.875	19.73
		21100	2535	QPSK	17.856	19.66
				16QAM	17.855	19.60
		21350	2560	QPSK	17.881	19.73
				16QAM	17.859	19.53
	15	20825	2507.5	QPSK	13.443	15.02
				16QAM	13.434	14.87
		21100	2535	QPSK	13.416	15.16
				16QAM	13.423	15.24
		21375	2562.5	QPSK	13.418	15.19
				16QAM	13.427	14.95
	10	20800	2505	QPSK	8.9602	10.34
				16QAM	8.9479	10.09
		21100	2535	QPSK	8.9655	10.17
				16QAM	8.9702	10.22
		21400	2565	QPSK	8.9536	10.14
				16QAM	8.9686	10.48
	5	20775	2502.5	QPSK	4.4901	5.243
				16QAM	4.5010	5.225
		21100	2535	QPSK	4.4937	5.226
				16QAM	4.5014	5.368
		21425	2567.5	QPSK	4.5022	5.290
				16QAM	4.4998	5.299

LTE Band 41

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 41	20	35970	2506.0	QPSK	17.871	19.88
				16QAM	17.869	19.68
		40620	2593.0	QPSK	17.908	19.64
				16QAM	17.846	19.67
		41490	2680.0	QPSK	17.881	19.56
				16QAM	17.878	19.81
	15	39725	2503.5	QPSK	13.427	14.98
				16QAM	13.409	15.05
		40620	2593.0	QPSK	13.435	15.23
				16QAM	13.410	15.17
		41515	2682.5	QPSK	13.421	15.11
				16QAM	13.413	14.81
	10	39700	2501.0	QPSK	8.9396	10.16
				16QAM	8.9405	10.12
		40620	2593.0	QPSK	8.9557	10.60
				16QAM	8.9767	10.12
		41540	2685.0	QPSK	8.9540	10.15
				16QAM	8.9662	10.34
	5	39675	2498.5	QPSK	4.4879	5.181
				16QAM	4.4906	5.213
		40620	2593.0	QPSK	4.4926	5.260
				16QAM	4.4975	5.208
		41565	2687.5	QPSK	4.4941	5.229
				16QAM	4.4952	5.284

LTE Band 38

Due to frequency range and same output power setting, test was carried in LTE Band 41 to cover both LTE Band 41 and LTE Band 38.

LTE Band 66

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 66	20	132072	1720.0	QPSK	17.882	19.70
				16QAM	17.888	19.65
		132322	1745.0	QPSK	17.854	19.59
				16QAM	17.891	19.81
		132572	1770.0	QPSK	17.914	20.03
				16QAM	17.864	19.42
	15	132047	1717.5	QPSK	13.450	15.21
				16QAM	13.435	15.09
		132322	1745.0	QPSK	13.438	14.91
				16QAM	13.435	15.03
		132597	1772.5	QPSK	13.436	15.17
				16QAM	13.427	15.22
	10	132022	1715.0	QPSK	8.9641	10.26
				16QAM	8.9638	10.17
		132322	1745.0	QPSK	8.9618	10.23
				16QAM	8.9567	10.12
		132622	1775.0	QPSK	8.9767	10.06
				16QAM	8.9632	10.05
	5	131997	1712.5	QPSK	4.4975	5.180
				16QAM	4.4996	5.328
		132322	1745.0	QPSK	4.4984	5.236
				16QAM	4.5126	5.264
		132647	1775.5	QPSK	4.4964	5.289
				16QAM	4.5009	5.293
	3	131987	1711.5	QPSK	2.6960	3.064
				16QAM	2.6966	3.090
		132322	1745.0	QPSK	2.6964	3.066
				16QAM	2.6959	3.060
		132657	1778.5	QPSK	2.7043	3.085
				16QAM	2.6980	3.065
	1.4	131979	1710.7	QPSK	1.0864	1.289
				16QAM	1.0867	1.326
		132322	1745.0	QPSK	1.0849	1.291
				16QAM	1.0865	1.301
		132665	1779.3	QPSK	1.0871	1.302
				16QAM	1.0869	1.275

LTE Band 2

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 2	20	18700	1860.0	QPSK	17.898	19.88
				16QAM	17.868	19.70
		18900	1880.0	QPSK	17.847	19.72
				16QAM	17.855	19.69
		19099	1900.0	QPSK	17.931	19.84
				16QAM	17.911	19.73
	15	18675	1857.5	QPSK	13.442	14.94
				16QAM	13.417	14.93
		18900	1880.0	QPSK	13.413	15.03
				16QAM	13.419	15.03
		19124	1902.5	QPSK	13.444	15.08
				16QAM	13.459	15.11
	10	18650	1955.0	QPSK	8.9656	10.20
				16QAM	8.9510	10.22
		18900	1880.0	QPSK	8.9475	10.10
				16QAM	8.9618	10.08
		19149	1905.0	QPSK	8.9484	10.24
				16QAM	8.9641	10.31
	5	18625	1852.5	QPSK	4.4992	5.351
				16QAM	4.4931	5.250
		18900	1880.0	QPSK	4.4966	5.179
				16QAM	4.4974	5.197
		18175	1907.5	QPSK	4.5003	5.351
				16QAM	4.5000	5.308
	3	18615	1815.5	QPSK	2.6926	3.041
				16QAM	2.7025	3.083
		18900	1880.0	QPSK	2.7030	3.122
				16QAM	2.6981	3.075
		19184	1908.5	QPSK	2.6988	3.050
				16QAM	2.6970	3.057
	1.4	18607	1850.7	QPSK	1.0875	1.276
				16QAM	1.0874	1.312
		18900	1880.0	QPSK	1.0825	1.282
				16QAM	1.0907	1.304
		19192	1909.3	QPSK	1.0842	1.292
				16QAM	1.0892	1.295

LTE Band 13

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 13	10	23230	782.0	QPSK	8.9538	10.14
				16QAM	8.9283	10.18
	5	23207	779.5	QPSK	4.5053	5.443
				16QAM	4.5010	5.297
		23230	782.0	QPSK	4.4989	5.250
				16QAM	4.5015	5.174
		23255	784.5	QPSK	4.4942	5.239
				16QAM	4.5011	5.288

LTE Band 12

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 12	10	23060	704.0	QPSK	8.9723	10.09
				16QAM	8.9696	10.30
		23095	707.5	QPSK	8.9380	10.15
				16QAM	8.9438	10.05
		23130	711.0	QPSK	8.9590	10.13
				16QAM	8.9537	10.10
	5	23035	701.5	QPSK	4.5037	5.323
				16QAM	4.5021	5.248
		23095	707.5	QPSK	4.4940	5.154
				16QAM	4.4933	5.292
		23155	713.5	QPSK	4.4994	5.286
				16QAM	4.4900	5.174
	3	23025	700.5	QPSK	2.6994	3.068
				16QAM	2.6988	3.084
		23095	707.5	QPSK	2.6923	3.073
				16QAM	2.6988	3.063
		23165	714.5	QPSK	2.6961	3.083
				16QAM	2.6962	3.077
	1.4	23017	699.7	QPSK	1.0865	1.290
				16QAM	1.0837	1.272
		23095	707.5	QPSK	1.0902	1.292
				16QAM	1.0896	1.317
		23173	715.3	QPSK	1.0936	1.342
				16QAM	1.0849	1.303

LTE Band 4

Due to frequency range and same output power setting, test was carried in LTE Band 66 to cover both LTE Band 66 and LTE Band 4.

LTE Band 17

Due to frequency range and same output power setting, test was carried in LTE Band 12 to cover both LTE Band 12 and LTE Band 17.

9.1.2. OCCUPIED BANDWIDTH PLOTS

GSM 850



GSM 1900



WCDMA Band 5

