



# CERTIFICATION TEST REPORT

**Report Number.** : 4789354096-E2V2

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

**Model** : SM-P615

**FCC ID** : A3LSMP615

**EUT Description** : GSM/WCDMA/LTE Tablet + BT/BLE, DTS/UNII a/b/g/n/ac and  
ANT+

**Test Standard(s)** : FCC CFR47 PART 22 SUBPART H  
FCC CFR47 PART 24 SUBPART E  
FCC CFR47 PART 27 SUBPART H  
FCC CFR47 PART 27 SUBPART L

**Date Of Issue:**

March 10, 2020

**Prepared by:**

UL Korea, Ltd.

26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea

Suwon Test Site: UL Korea, Ltd. Suwon Laboratory

218 Maeyeong-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16675, Korea

TEL: (031) 337-9902

FAX: (031) 213-5433



ACCREDITED

Testing Laboratory

TL-637

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	03/05/20	Initial issue	Sungeun Lee
V2	03/10/20	Updated to address TCB's question	Sungeun Lee

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>4</b>
<b>2. TEST METHODOLOGY .....</b>	<b>5</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>5</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>6</b>
4.1. MEASURING INSTRUMENT CALIBRATION.....	6
4.2. SAMPLE CALCULATION.....	6
4.3. MEASUREMENT UNCERTAINTY .....	6
4.4. DECISION RULE .....	6
<b>5. EQUIPMENT UNDER TEST .....</b>	<b>7</b>
5.1. DESCRIPTION OF EUT.....	7
5.2. MAXIMUM OUTPUT POWER.....	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS .....	11
5.4. WORST-CASE ORIENTATION.....	12
5.5. DESCRIPTION OF TEST SETUP .....	14
<b>6. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>16</b>
<b>7. SUMMARY TABLE.....</b>	<b>17</b>
<b>8. PEAK TO AVERAGE RATIO .....</b>	<b>18</b>
8.1. CONDUCTED PEAK TO AVERAGE RESULT.....	19
<b>9. LIMITS AND CONDUCTED RESULTS .....</b>	<b>28</b>
9.1. OCCUPIED BANDWIDTH.....	28
9.1.1. OCCUPIED BANDWIDTH RESULTS .....	29
9.2. BAND EDGE EMISSIONS .....	40
9.2.1. BAND EDGE RESULT.....	42
9.3. OUT OF BAND EMISSIONS.....	66
9.3.1. OUT OF BAND EMISSIONS RESULT.....	67
9.4. FREQUENCY STABILITY.....	77
9.4.1. FREQUENCY STABILITY RESULTS .....	78
<b>10. RADIATED TEST RESULTS .....</b>	<b>83</b>
10.1. RADIATED POWER (ERP & EIRP) .....	83
10.1.1. ERP/EIRP Results.....	84
10.1.2. ERP/EIRP DATA .....	91
10.2. FIELD STRENGTH OF SPURIOUS RADIATION.....	116
10.2.1. SPURIOUS RADIATION PLOTS.....	117

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.  
**EUT DESCRIPTION:** GSM/WCDMA/LTE Tablet + BT/BLE, DTS/UNII a/b/g/n/ac and ANT+  
**MODEL NUMBER:** SM-P615  
**SERIAL NUMBER:** R32N1004Z2N (CONDUCTED)  
R32N1001W6X, R32N1001W5K, R32N1003QGX (RADIATED);  
**DATE TESTED:** JAN 29, 2020 – MAR 05, 2020;

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



Junwhan Lee  
Suwon Lab Engineer  
UL Korea, Ltd.

Tested By:



Sungeun 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 TIA-603-E, 2016
6. ANSI C63.26, 2015
7. KDB 971168 D01 Power Meas License Digital Systems v03r01

## 3. FACILITIES AND ACCREDITATION

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

218 Maeyeong-ro	
<input checked="" type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input type="checkbox"/>	Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/wp-content/uploads/2017/05/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:

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

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

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

### 4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.35 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.49 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.82 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.49 dB

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

### 4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The The EUT is a GSM/WCDMA/LTE Tablet + BT/BLE, DTS/UNII a/b/g/n/ac and ANT+. 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.(4789354096-S1 FCC Report SAR)

#### **GSM**

FCC Part 22/24						
Band	Frequency Range [MHz]	Modulation	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
GSM850	824~849	GPRS	<b>32.76</b>	<b>1886.91</b>	<b>33.46</b>	<b>2218.20</b>
		EGPRS	26.54	451.00	28.36	685.49
GSM1900	1850~1910	GPRS	29.33	856.69	30.62	1153.45
		EGPRS	25.38	345.43	28.90	776.25

#### **WCDMA**

FCC Part 22/24/27						
Band	Frequency Range [MHz]	Modulation	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824~849	Rel. 99	<b>23.76</b>	<b>237.91</b>	23.75	237.14
		HSDPA	23.73	235.90	23.73	236.05
Band 4	1710~1755	Rel. 99	23.29	213.42	24.91	309.74
		HSDPA	23.28	213.04	24.93	311.17
Band 2	1850~1910	Rel. 99	23.12	205.21	25.98	396.28
		HSDPA	23.17	207.34	<b>26.13</b>	<b>410.20</b>

**LTE Band 2**

FCC Part 24							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 2	1850 ~ 1910	20	QPSK	22.70	186.01	25.12	325.09
			16QAM	21.53	142.10	23.55	226.46
			64QAM	20.77	119.39		
		15	QPSK	22.71	186.75	25.09	322.85
			16QAM	21.71	148.20	23.72	235.50
			64QAM	20.63	115.67		
		10	QPSK	22.75	188.58	25.40	346.74
			16QAM	21.55	142.83	23.87	243.78
			64QAM	20.63	115.72		
		5	QPSK	22.65	184.22	25.21	331.89
			16QAM	21.56	143.16	23.97	249.46
			64QAM	20.80	120.22		
		3	QPSK	22.80	190.73	<b>25.48</b>	<b>353.18</b>
			16QAM	21.74	149.19	24.00	251.19
			64QAM	20.50	112.18		
		1.4	QPSK	<b>22.85</b>	<b>192.66</b>	25.14	326.59
			16QAM	21.85	153.15	24.03	252.93
			64QAM	20.72	117.96		

**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	23.60	228.88	<b>24.21</b>	<b>263.63</b>
			16QAM	22.56	180.40	23.10	204.17
			64QAM	21.34	136.23		
		5	QPSK	23.66	232.20	23.98	250.03
			16QAM	22.37	172.45	22.59	181.55
			64QAM	21.44	139.44		
		3	QPSK	23.60	228.93	24.04	253.51
			16QAM	22.63	183.36	23.18	207.97
			64QAM	21.26	133.61		
		1.4	QPSK	<b>23.67</b>	<b>232.77</b>	23.81	240.44
			16QAM	22.51	178.35	22.63	183.23
			64QAM	21.80	151.37		



**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	23.56	226.83	<b>17.91</b>	<b>61.80</b>
			16QAM	22.34	171.48	16.27	42.36
			64QAM	21.59	144.32		
		5	QPSK	23.47	222.50	17.76	59.70
			16QAM	22.31	170.21	16.64	46.13
			64QAM	21.44	139.44		
		3	QPSK	23.58	228.18	17.60	57.54
			16QAM	22.30	169.93	16.48	44.46
			64QAM	21.41	138.32		
		1.4	QPSK	<b>23.59</b>	<b>228.40</b>	17.42	55.21
			16QAM	22.45	175.77	16.38	43.45
			64QAM	21.65	146.13		

**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	<b>23.40</b>	<b>218.61</b>	<b>25.69</b>	<b>370.68</b>
			16QAM	22.26	168.44	24.37	273.53
			64QAM	21.32	135.60		
		15	QPSK	23.36	216.78	25.50	354.81
			16QAM	21.97	157.49	24.22	264.24
			64QAM	21.26	133.78		
		10	QPSK	23.36	216.60	25.62	364.75
			16QAM	21.94	156.38	24.20	263.03
			64QAM	21.26	133.61		
		5	QPSK	23.23	210.27	25.20	331.13
			16QAM	22.10	162.08	23.76	237.68
			64QAM	21.15	130.31		
		3	QPSK	23.30	213.99	25.18	329.61
			16QAM	21.85	153.17	24.05	254.10
			64QAM	21.15	130.31		
		1.4	QPSK	23.20	208.90	25.18	329.61
			16QAM	22.21	166.24	24.08	255.86
			64QAM	21.35	136.58		

**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.

**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.

### 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 1850 ~ 1910 MHz	-4.9
WCDMA Band 4 / LTE Band 4 / LTE Band 66 1710 ~ 1780 MHz	-5.6
GSM850 / WCDMA Band 5 / LTE Band 5 824 ~ 849 MHz	-4.5
LTE Band 12 / LTE Band 17 699 ~ 716 MHz	-8.2

## 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 and 16QAM modulations. 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
2	1850.7	1.4	1	0
	1880		1	0
	1909.3		1	5
5	824.7	1.4	1	0
	836.5		1	0
	848.3		1	0
12	699.7	1.4	1	0
	707.5		1	5
	715.3		1	0
66	1720	20	1	0
	1745		1	0
	1770		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 B2	O	-	-	O	-	-
LTE B5	-	O	-	-	-	O
LTE B12	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 and earphone 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-TA50EWE	EP-DT725BWE	N/A
Data Cable	SAMSUNG	EP-DR140AWE	N/A	N/A
Earphone	SAMSUNG	EHS64AVFWE	N/A	N/A

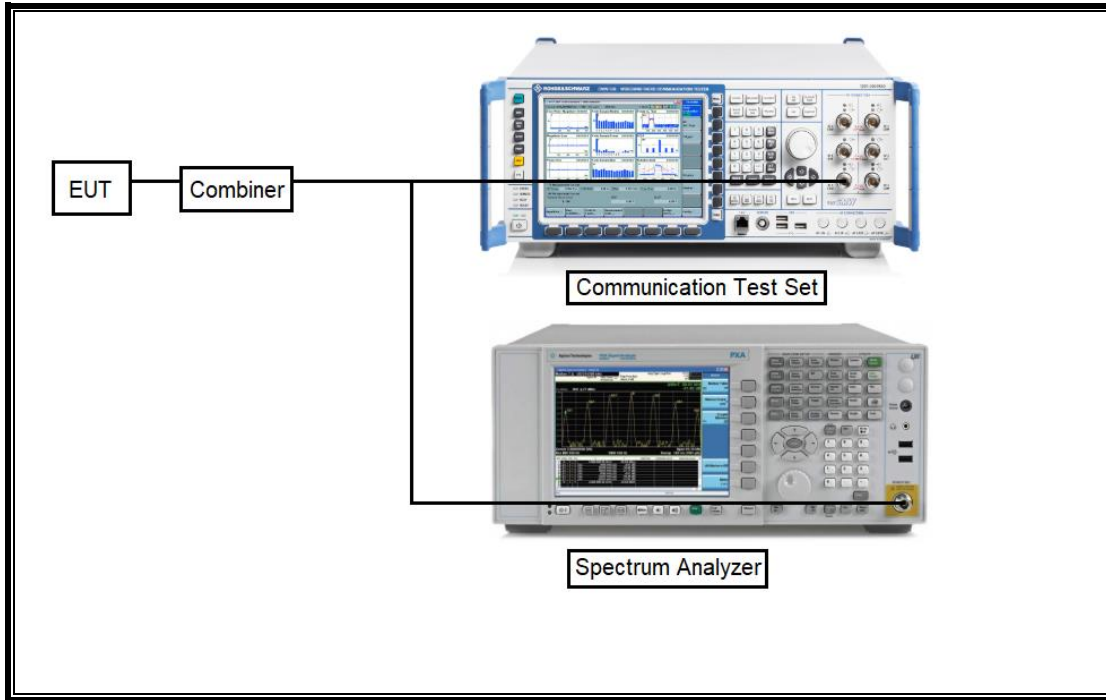
### I/O CABLE

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

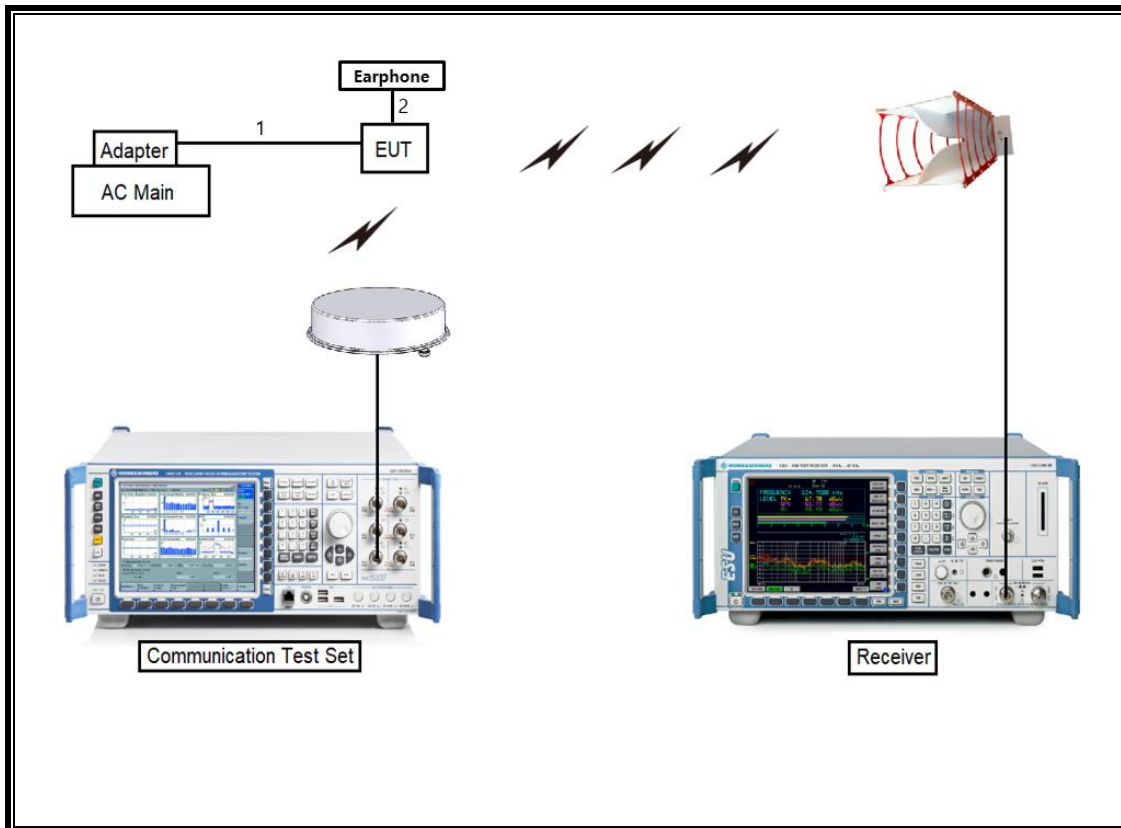
### TEST SETUP

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

**SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)**



**SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121D DB4	00164753	01-30-21
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-13-20
Preamplifier	ETS	3116C-PA	00168841	08-08-20
Antenna, Horn, 40 GHz	ETS	3116C	00168645	10-02-21
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	08-08-20
Communications Test Set	R&S	CMW500	115331	08-05-20
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-06-20
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-05-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-06-20
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-20
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-20
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-20
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	08-05-20
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	08-05-20
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	08-05-20
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	08-05-20
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	08-05-20
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	08-05-20
Attenuator	PASTERNAK	PE7087-10	A009	08-08-20
Attenuator	PASTERNAK	PE7087-10	A001	08-08-20
Attenuator	PASTERNAK	PE7087-10	A008	08-08-20
Attenuator	PASTERNAK	PE7087-10	2	08-08-20
Attenuator	PASTERNAK	PE7395-10	A011	08-08-20
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21
Temperature Chamber	ESPEC	SH-642	93001109	08-05-20
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(g),(h)	Band Edge / Conducted Spurious Emission	-13dBm		Pass
2.1046	Conducted output power	N/A		Pass
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(b)(10)		34.77 dBm		Pass
24.232(c)	Equivalent Isotropic Radiated Power	33dBm		Pass
27.50(d)(4)		30dBm		Pass
22.917(a) 24.238(a) 27.53 (g),(h)	Radiated Spurious Emission	-13dBm		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.

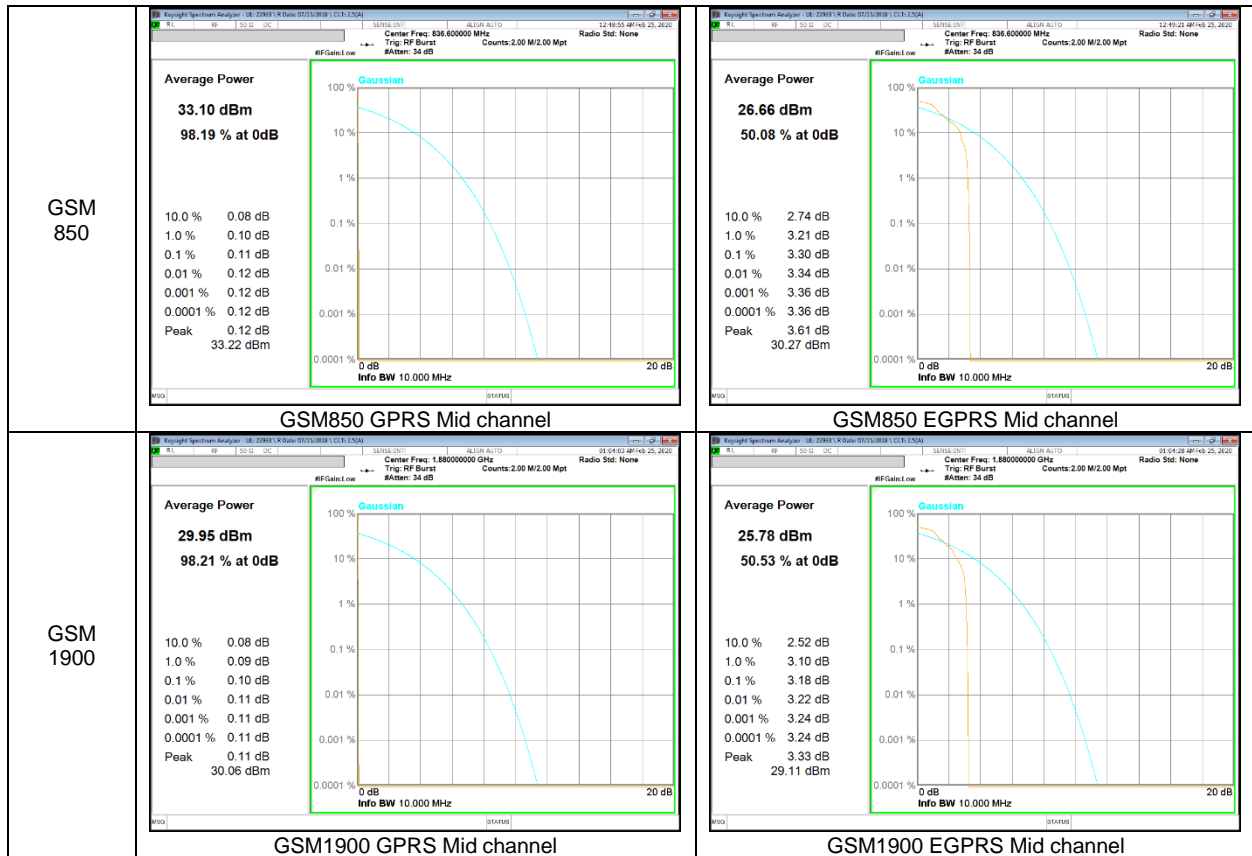
### Test Specification

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.

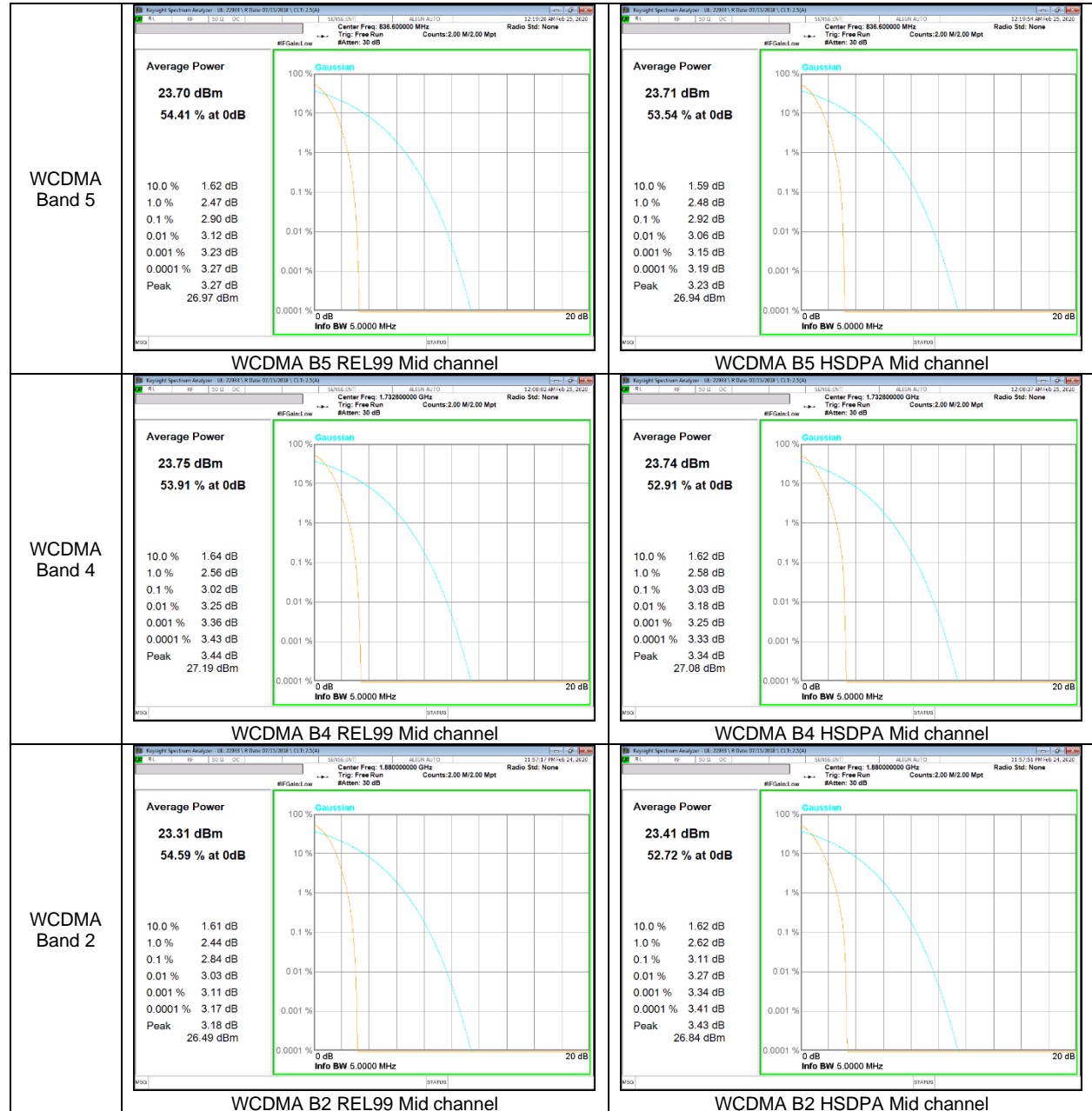
## RESULTS

## 8.1. CONDUCTED PEAK TO AVERAGE RESULT

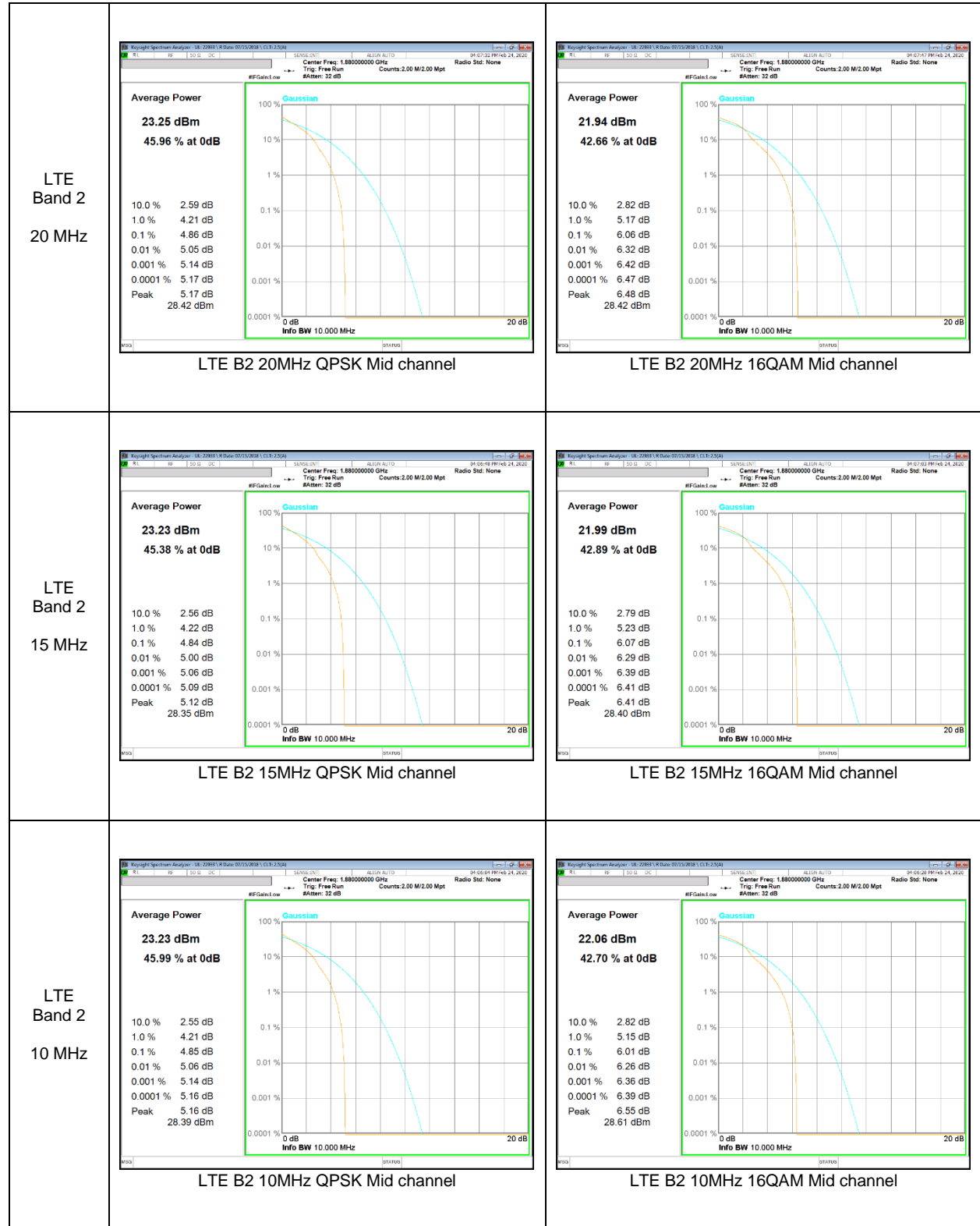
### GSM

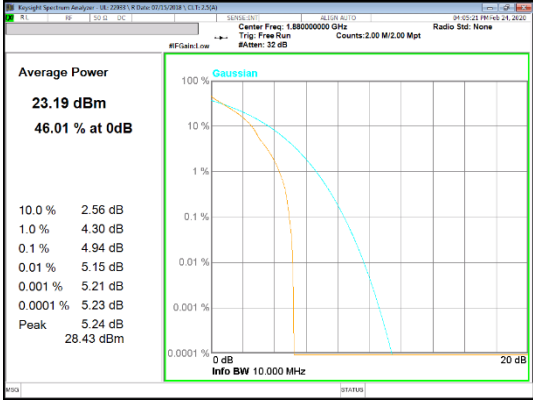
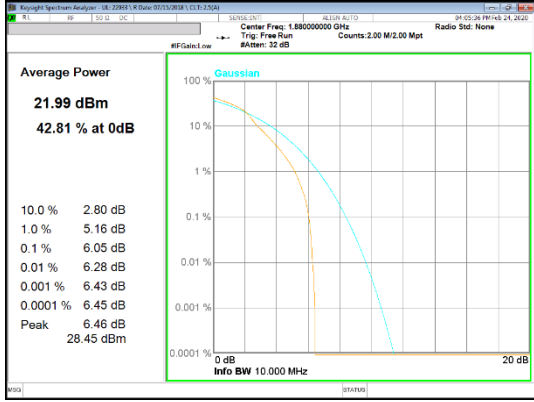
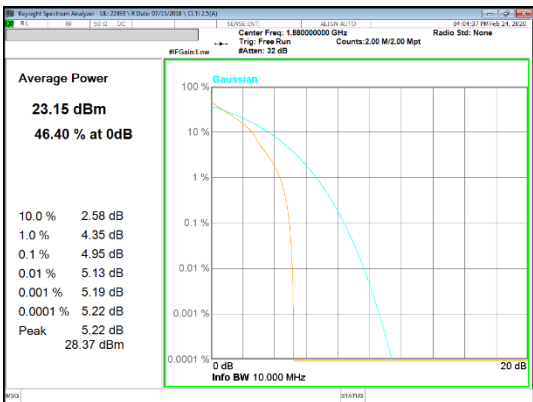
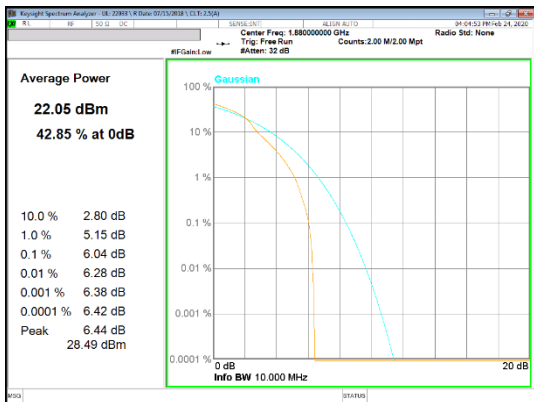
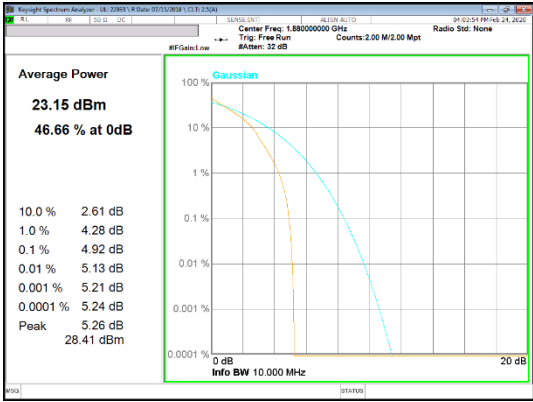
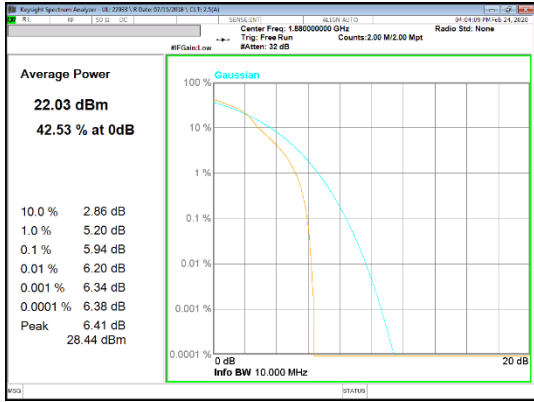


**WCDMA**

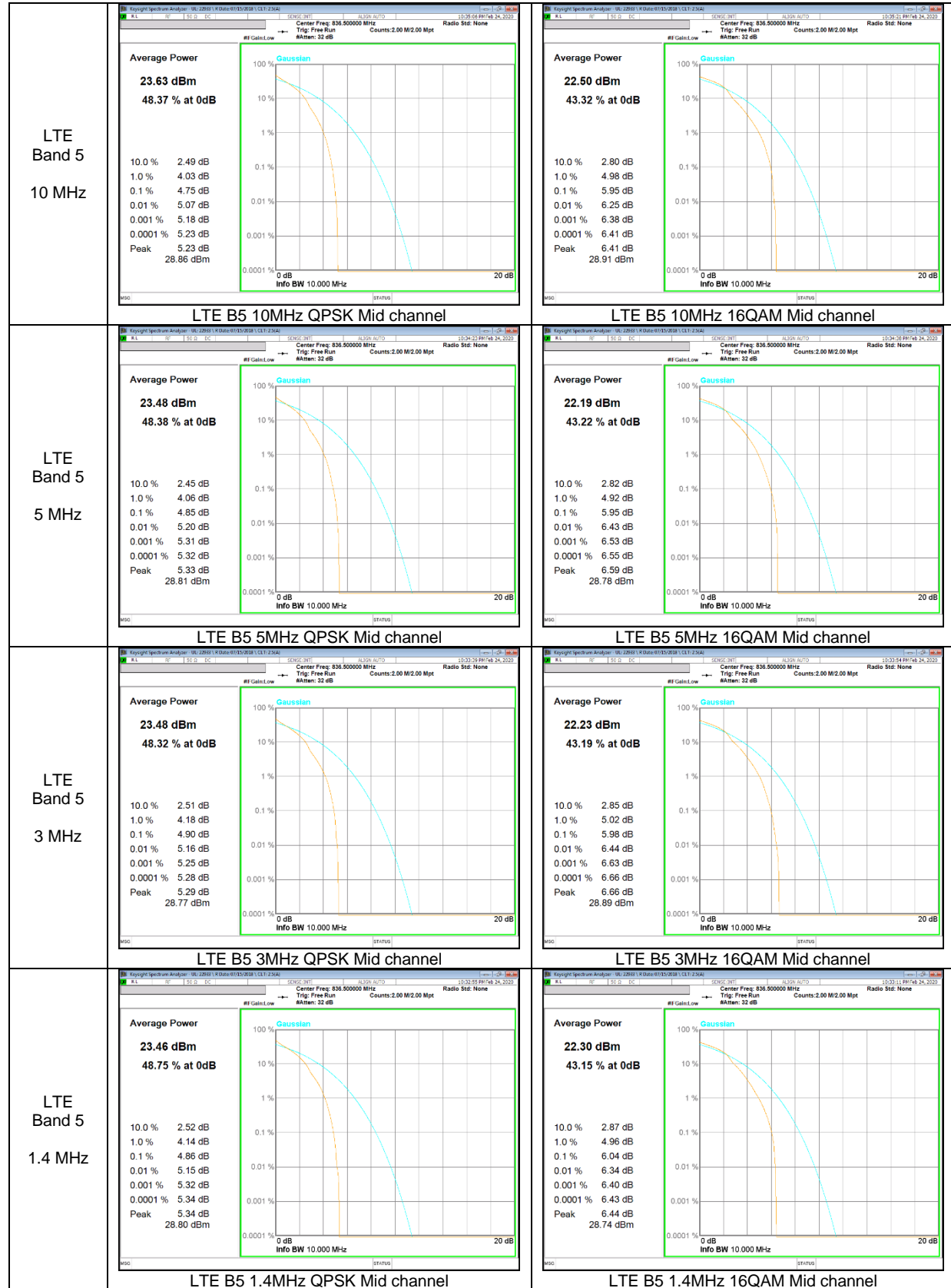


**LTE Band 2**

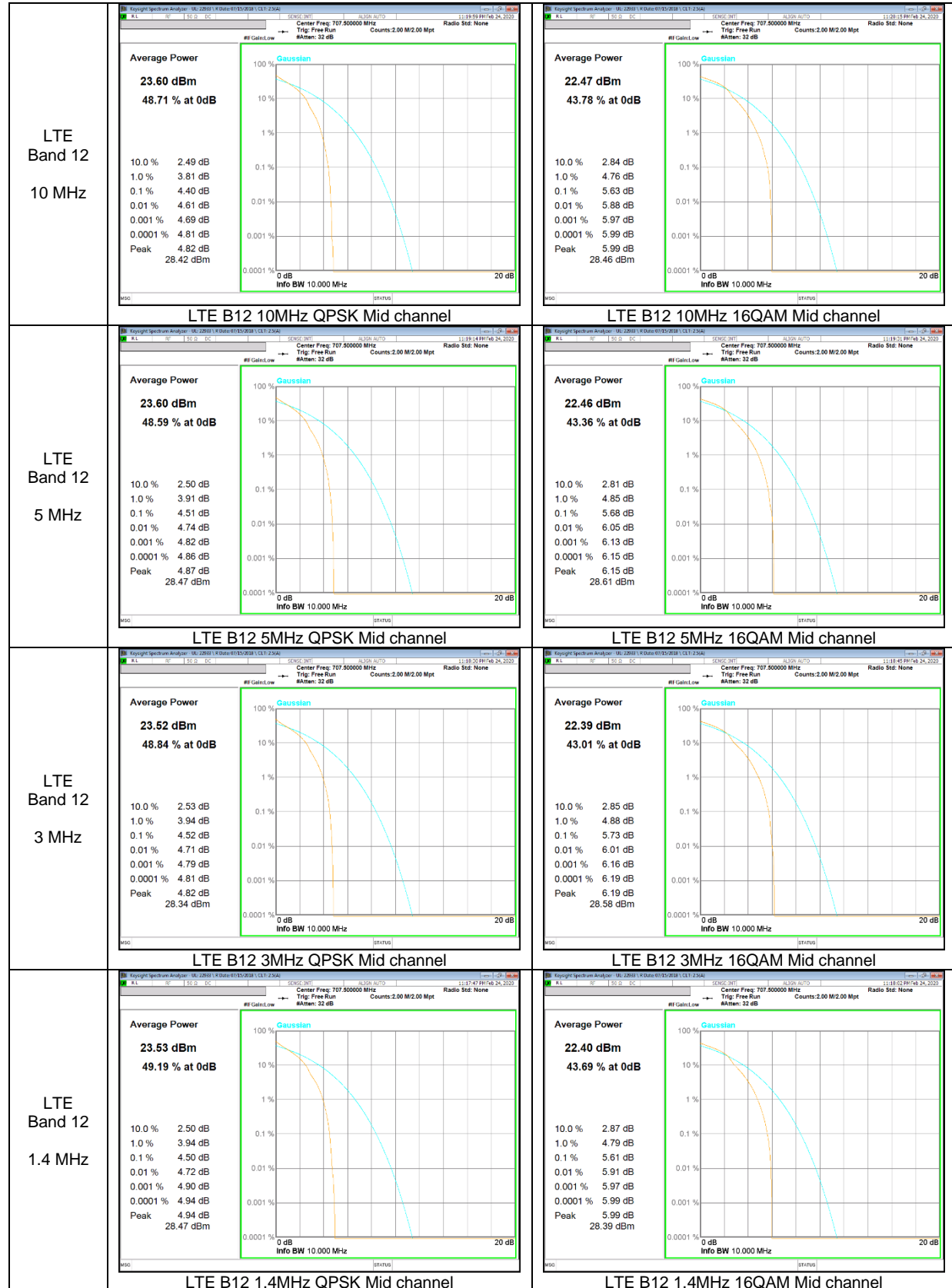


<p>LTE Band 2 5 MHz</p>	 <p>LTE B2 5MHz QPSK Mid channel</p>	 <p>LTE B2 5MHz 16QAM Mid channel</p>
<p>LTE Band 2 3 MHz</p>	 <p>LTE B2 3MHz QPSK Mid channel</p>	 <p>LTE B2 3MHz 16QAM Mid channel</p>
<p>LTE Band 2 1.4 MHz</p>	 <p>LTE B2 1.4MHz QPSK Mid channel</p>	 <p>LTE B2 1.4MHz 16QAM Mid channel</p>

**LTE Band 5**

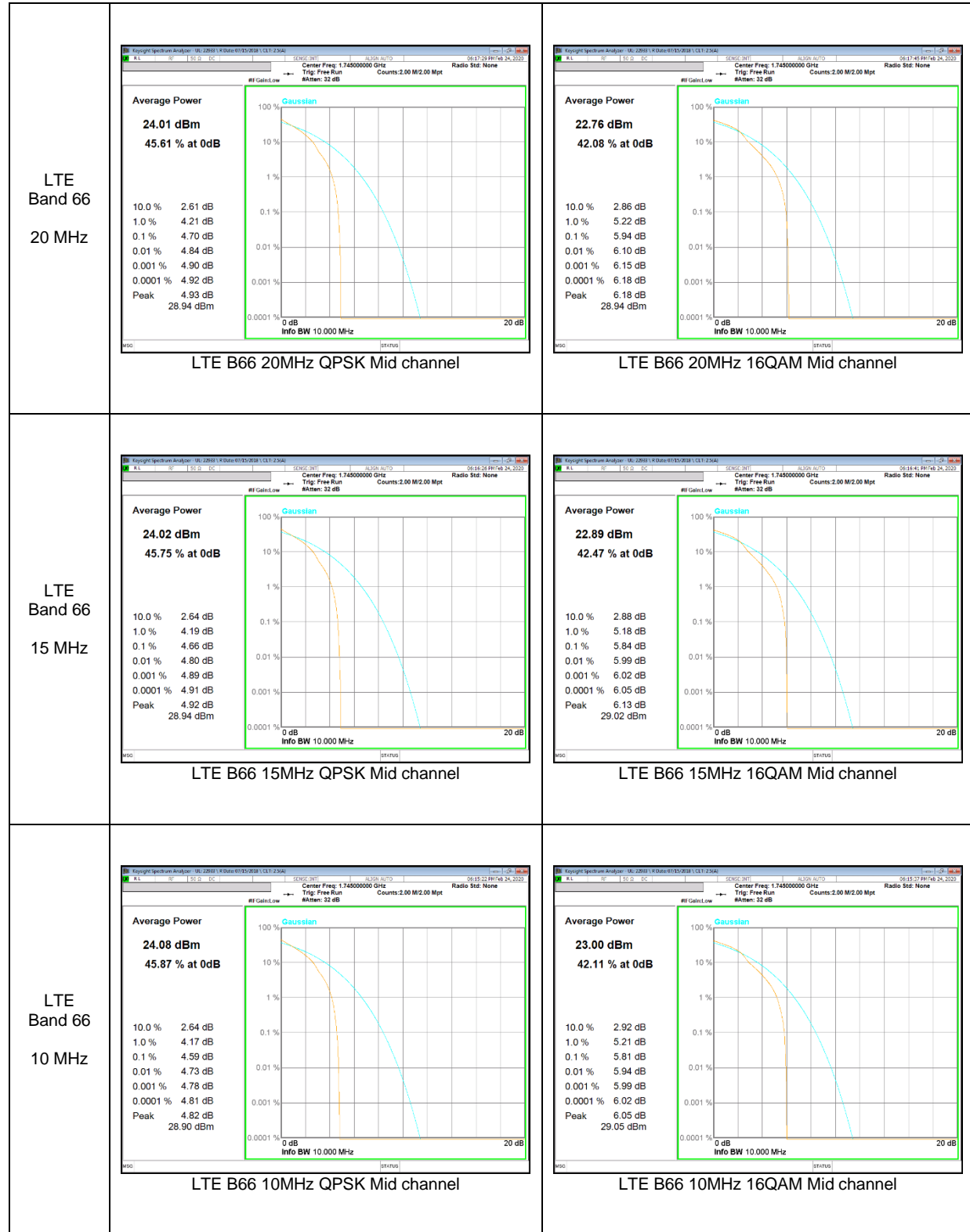


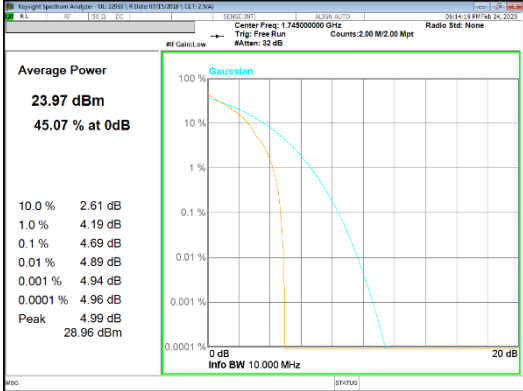
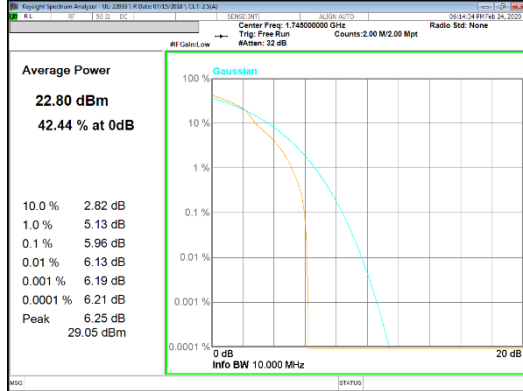
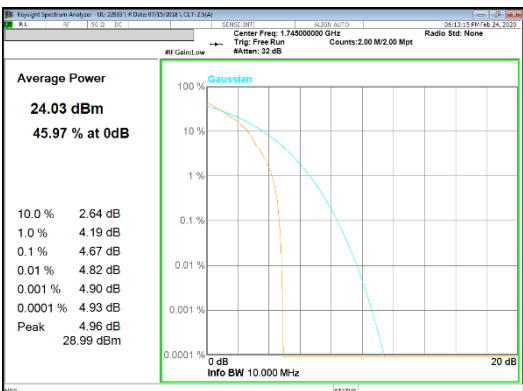
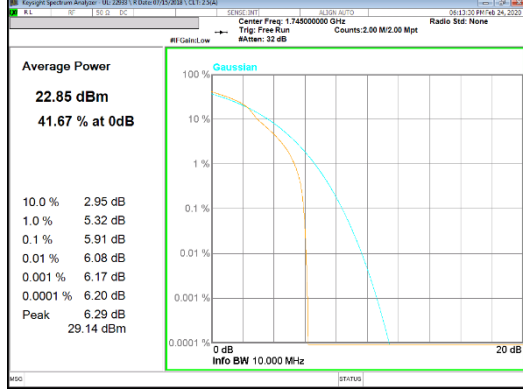
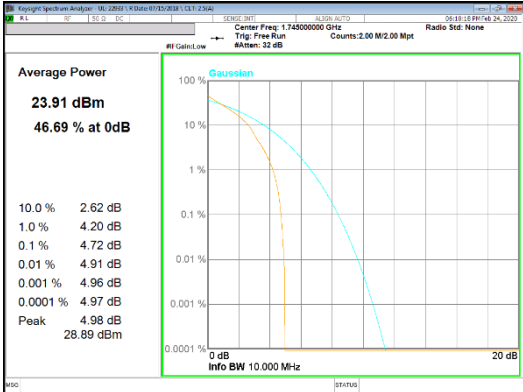
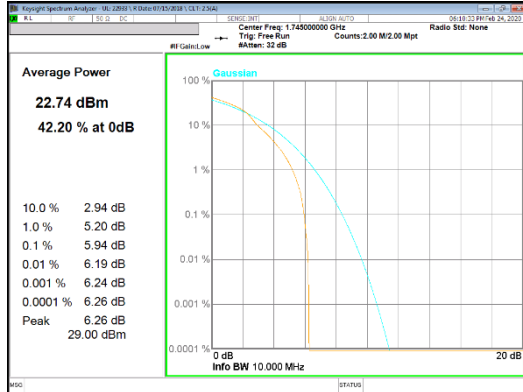
**LTE Band 12**





**LTE Band 66**



<p>LTE Band 66  5 MHz</p>	 <p>Average Power <b>23.97 dBm</b> 45.07 % at 0dB</p> <p>10.0 % 2.61 dB 1.0 % 4.19 dB 0.1 % 4.69 dB 0.01 % 4.89 dB 0.001 % 4.94 dB 0.0001 % 4.96 dB Peak 4.99 dB 28.96 dBm</p> <p>LTE B66 5MHz QPSK Mid channel</p>	 <p>Average Power <b>22.80 dBm</b> 42.44 % at 0dB</p> <p>10.0 % 2.82 dB 1.0 % 5.13 dB 0.1 % 5.96 dB 0.01 % 6.13 dB 0.001 % 6.19 dB 0.0001 % 6.21 dB Peak 6.25 dB 29.05 dBm</p> <p>LTE B66 5MHz 16QAM Mid channel</p>
<p>LTE Band 66  3 MHz</p>	 <p>Average Power <b>24.03 dBm</b> 45.97 % at 0dB</p> <p>10.0 % 2.64 dB 1.0 % 4.19 dB 0.1 % 4.67 dB 0.01 % 4.82 dB 0.001 % 4.90 dB 0.0001 % 4.93 dB Peak 4.96 dB 28.99 dBm</p> <p>LTE B66 3MHz QPSK Mid channel</p>	 <p>Average Power <b>22.85 dBm</b> 41.67 % at 0dB</p> <p>10.0 % 2.95 dB 1.0 % 5.32 dB 0.1 % 5.91 dB 0.01 % 6.08 dB 0.001 % 6.17 dB 0.0001 % 6.20 dB Peak 6.29 dB 29.14 dBm</p> <p>LTE B66 3MHz 16QAM Mid channel</p>
<p>LTE Band 66  1.4 MHz</p>	 <p>Average Power <b>23.91 dBm</b> 46.69 % at 0dB</p> <p>10.0 % 2.62 dB 1.0 % 4.20 dB 0.1 % 4.72 dB 0.01 % 4.91 dB 0.001 % 4.96 dB 0.0001 % 4.97 dB Peak 4.98 dB 28.89 dBm</p> <p>LTE B66 1.4MHz QPSK Mid channel</p>	 <p>Average Power <b>22.74 dBm</b> 42.20 % at 0dB</p> <p>10.0 % 2.94 dB 1.0 % 5.20 dB 0.1 % 5.94 dB 0.01 % 6.19 dB 0.001 % 6.24 dB 0.0001 % 6.26 dB Peak 6.26 dB 29.00 dBm</p> <p>LTE B66 1.4MHz 16QAM Mid channel</p>

**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 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.

## 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.

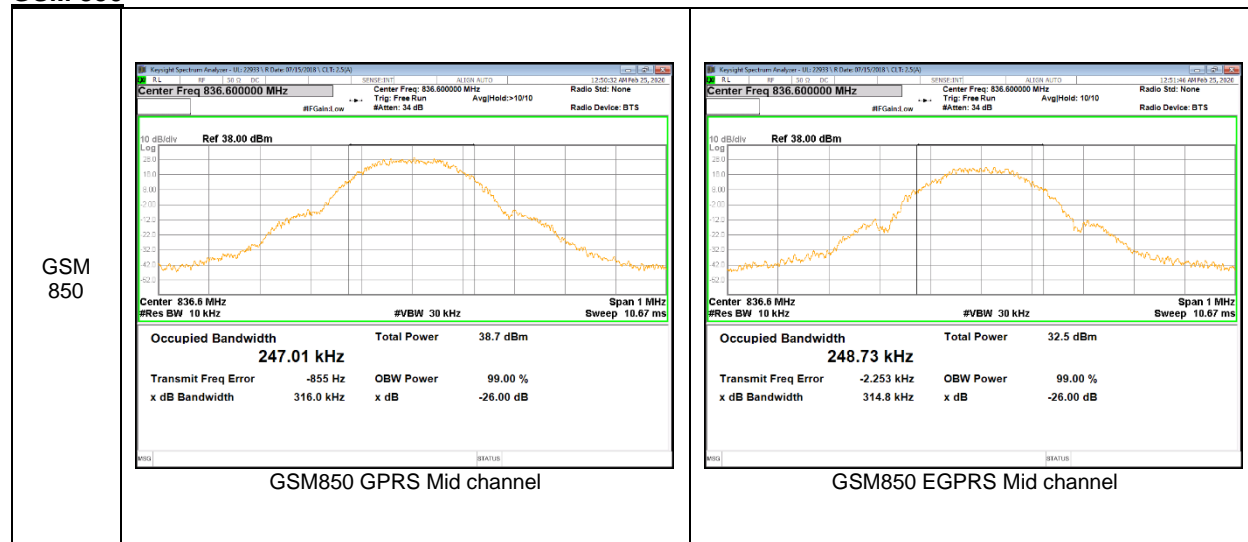
(KDB 971168 D01 Power Meas License Digital Systems v03r01)

#### RESULTS

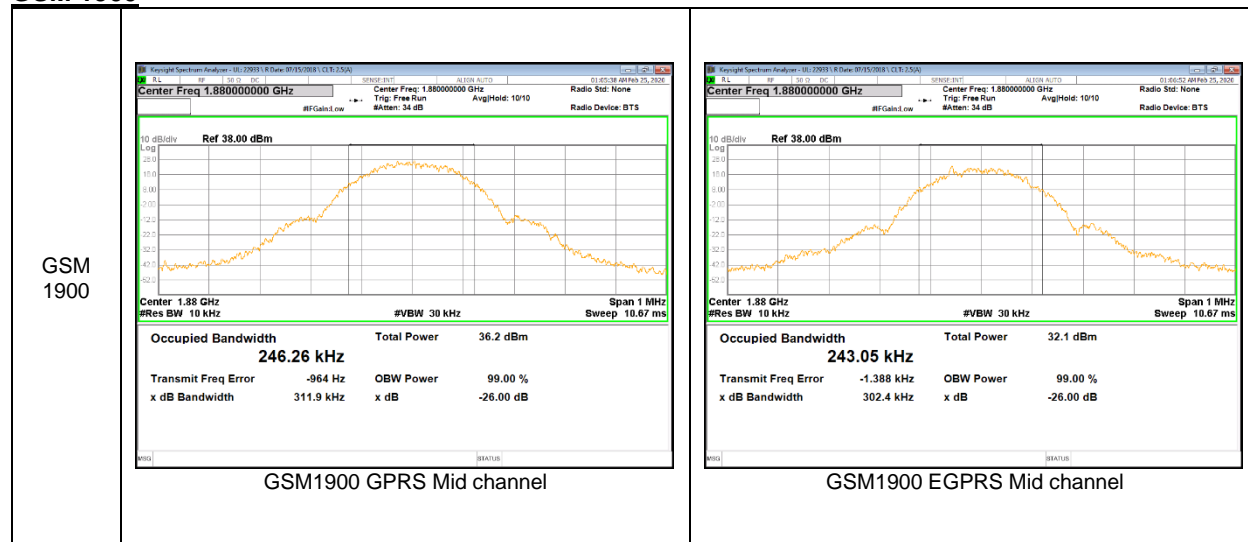
See the following pages.

### 9.1.1. OCCUPIED BANDWIDTH RESULTS

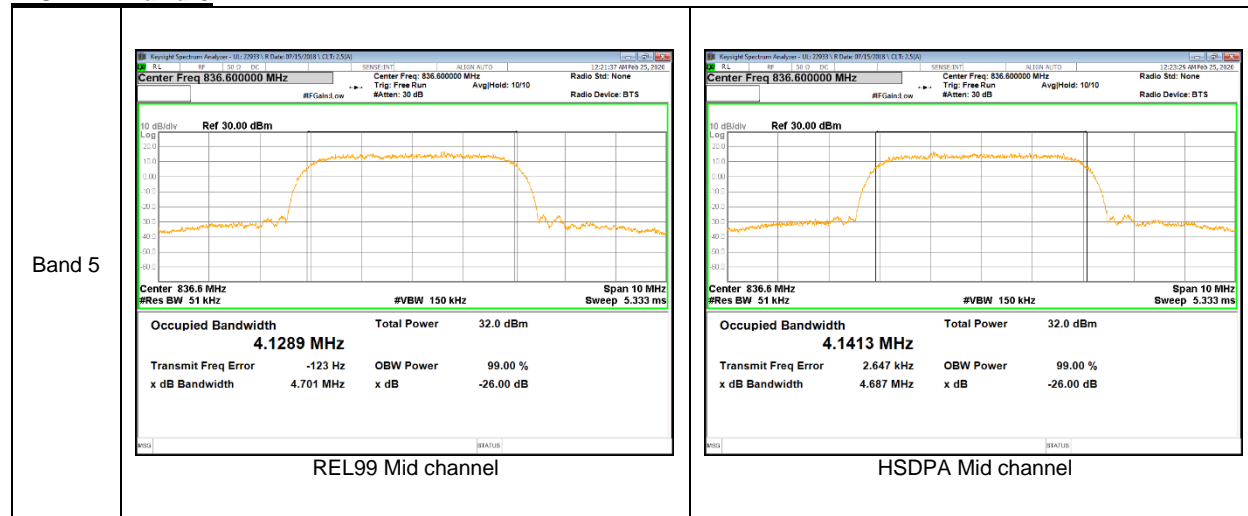
#### GSM 850



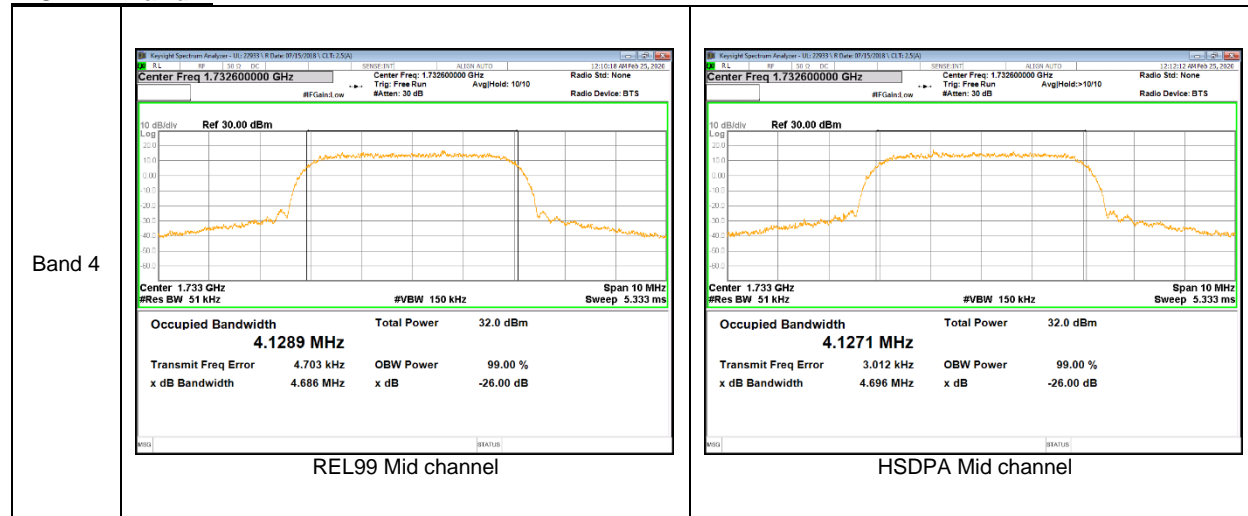
#### GSM 1900



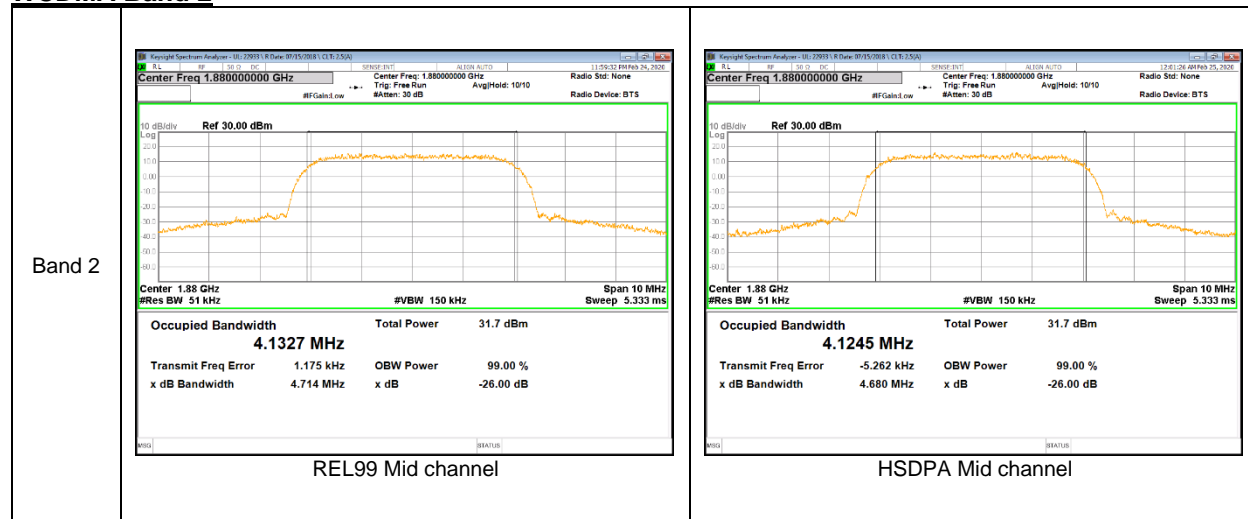
**WCDMA Band 5**



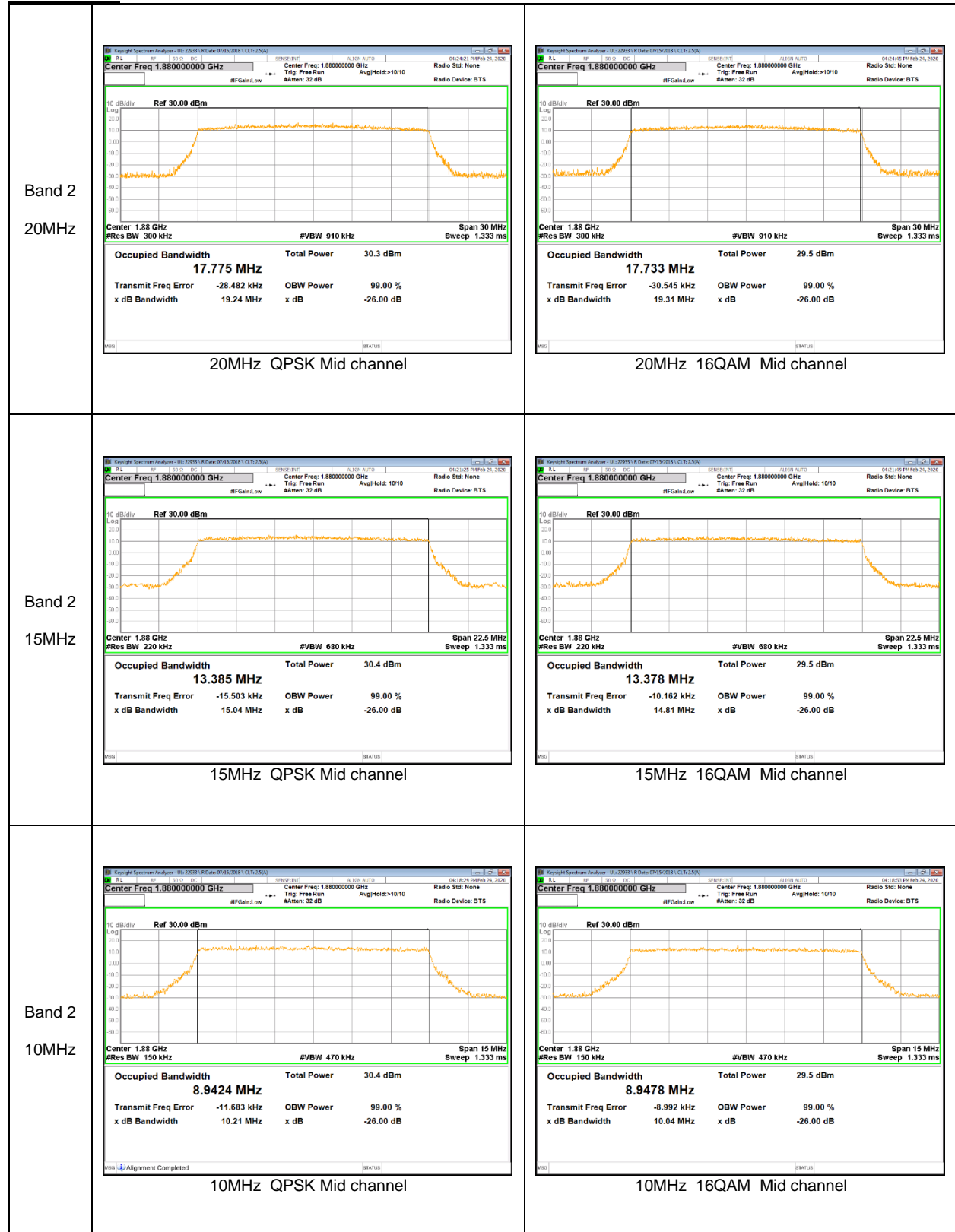
**WCDMA Band 4**

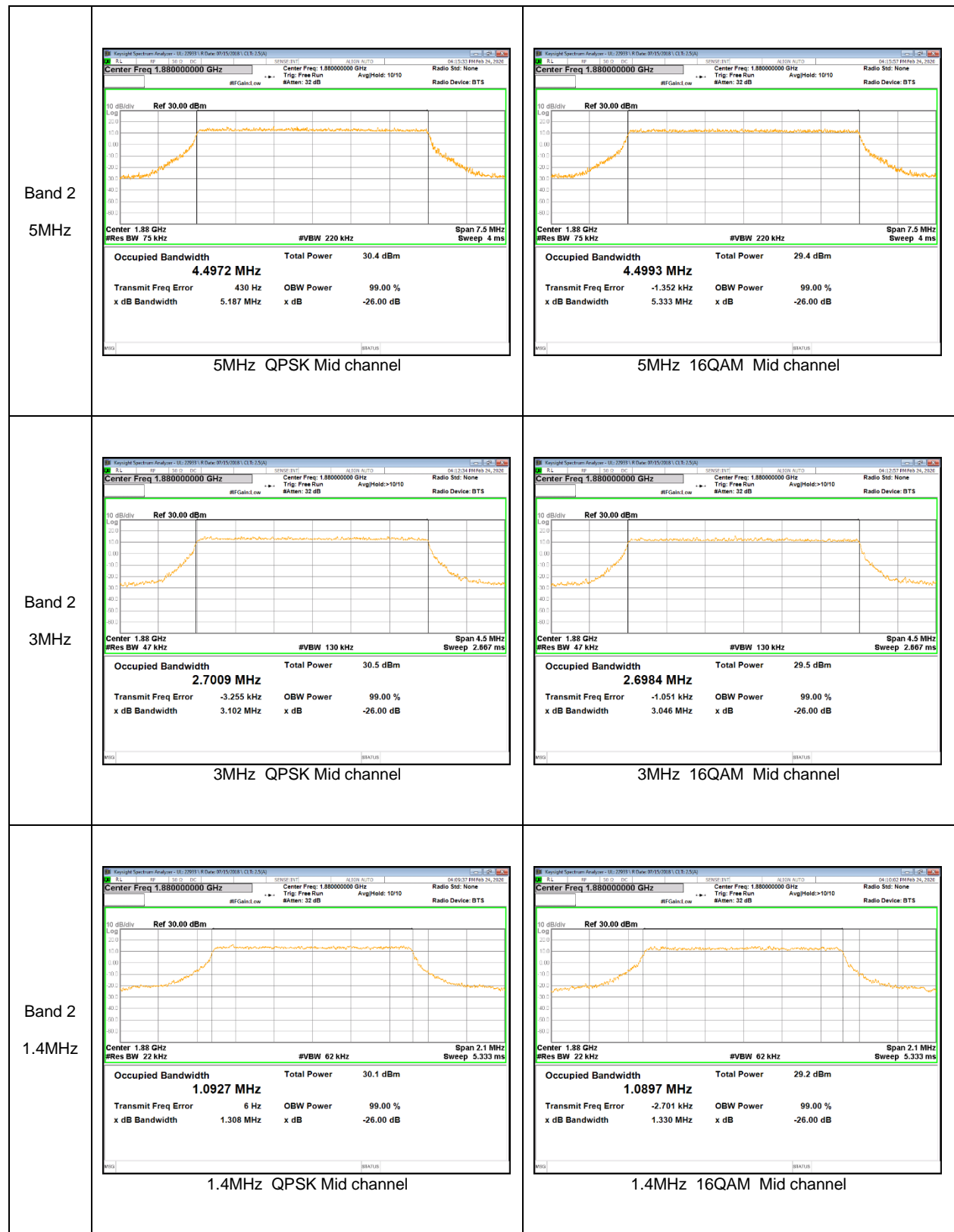


**WCDMA Band 2**



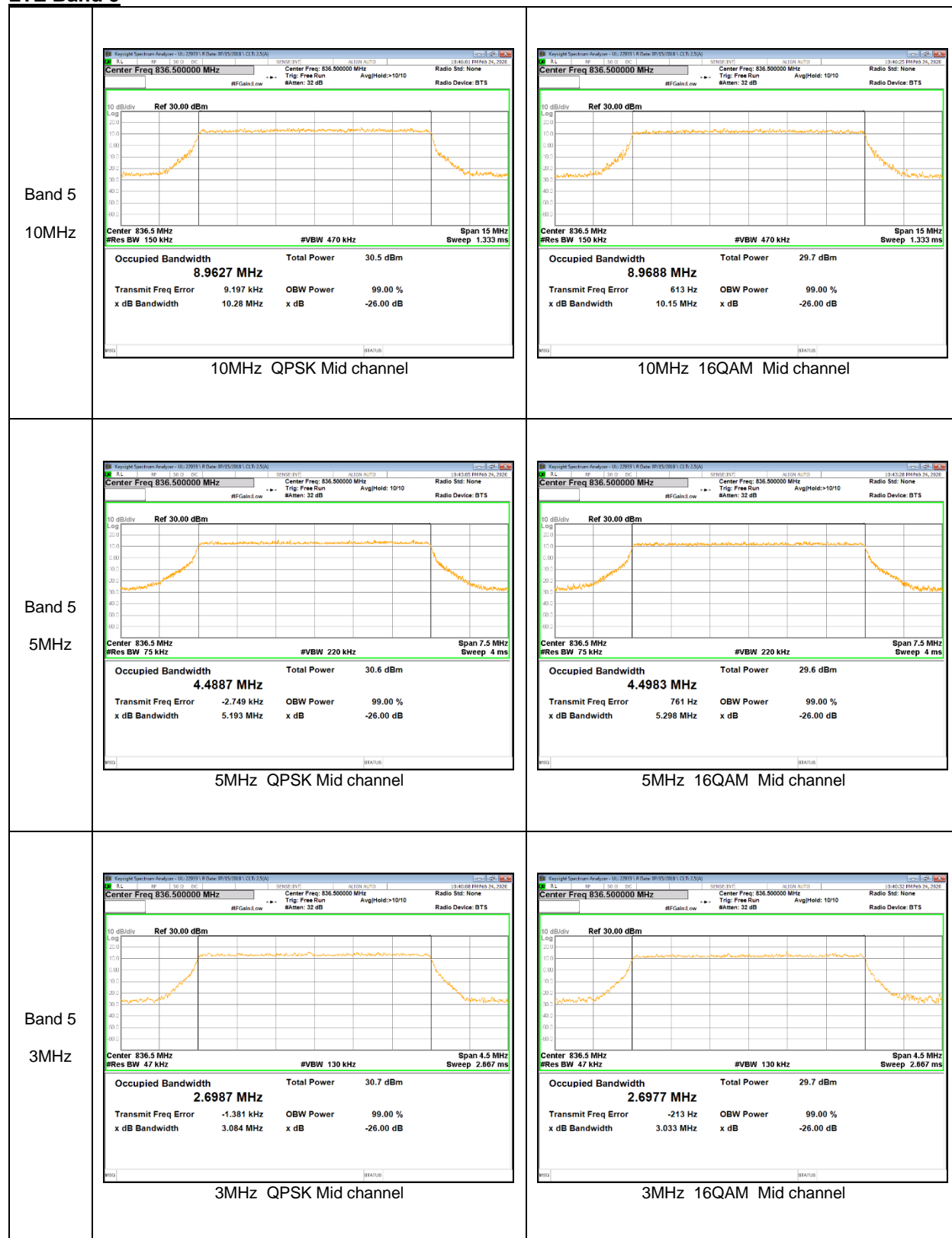
**LTE Band 2**

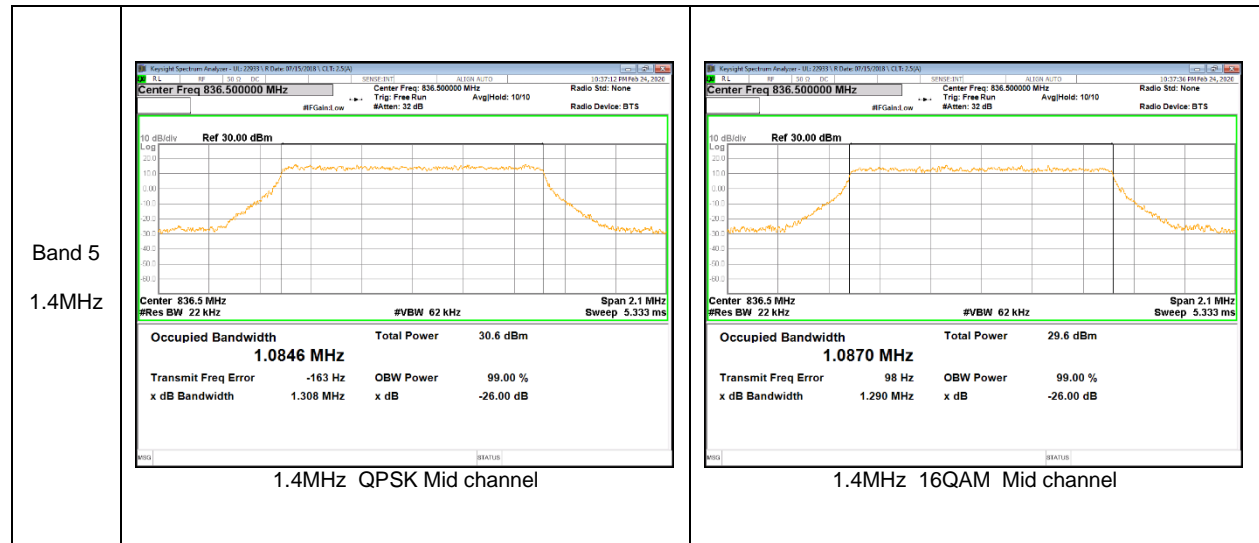




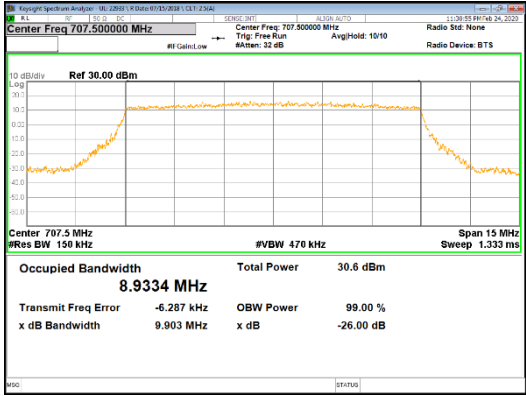
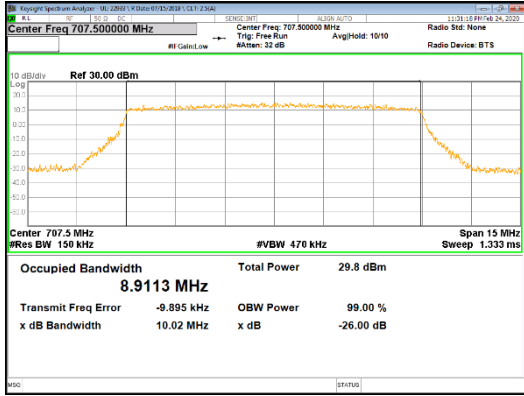
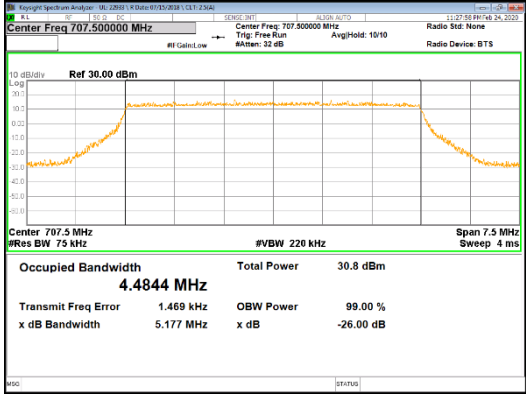
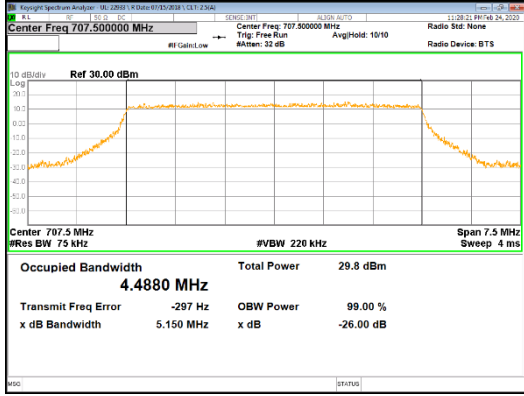
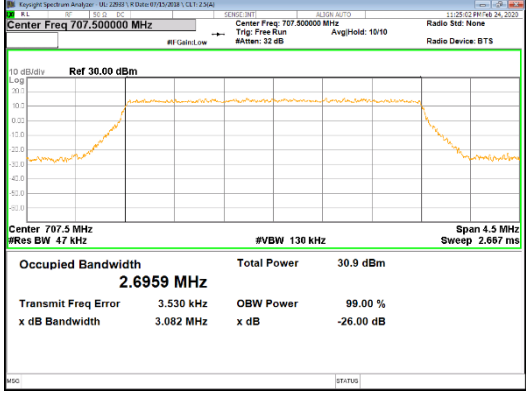
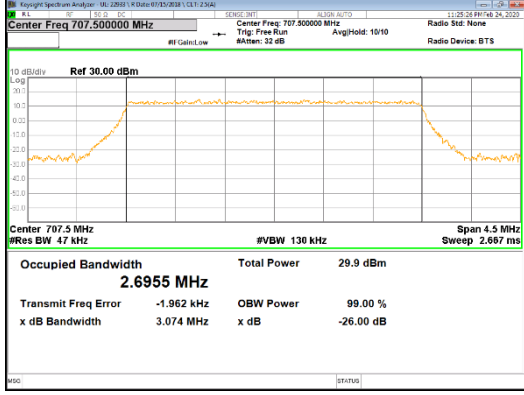


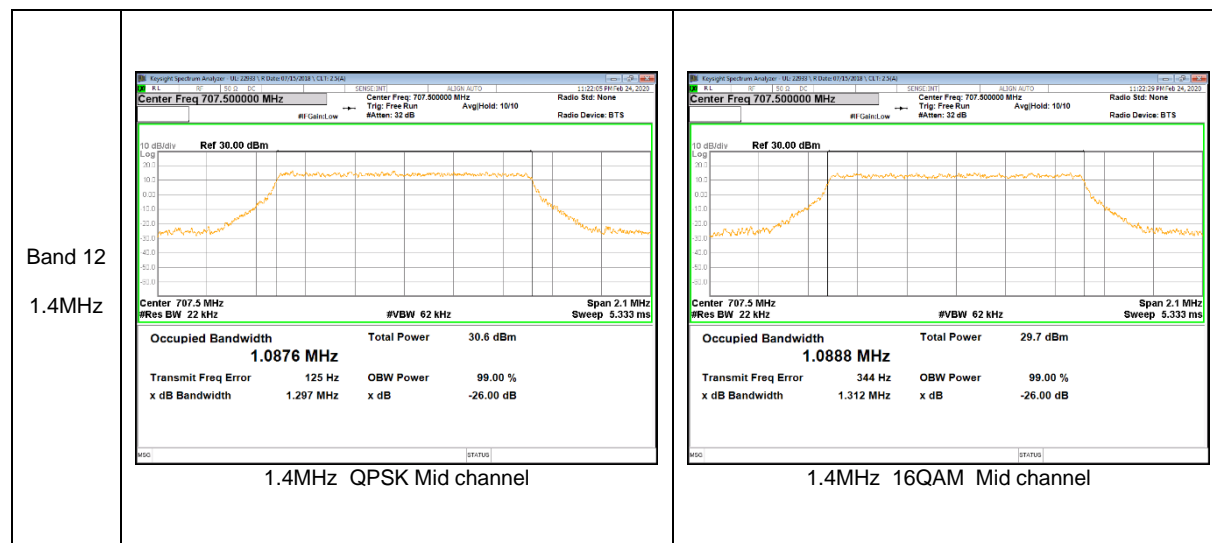
**LTE Band 5**



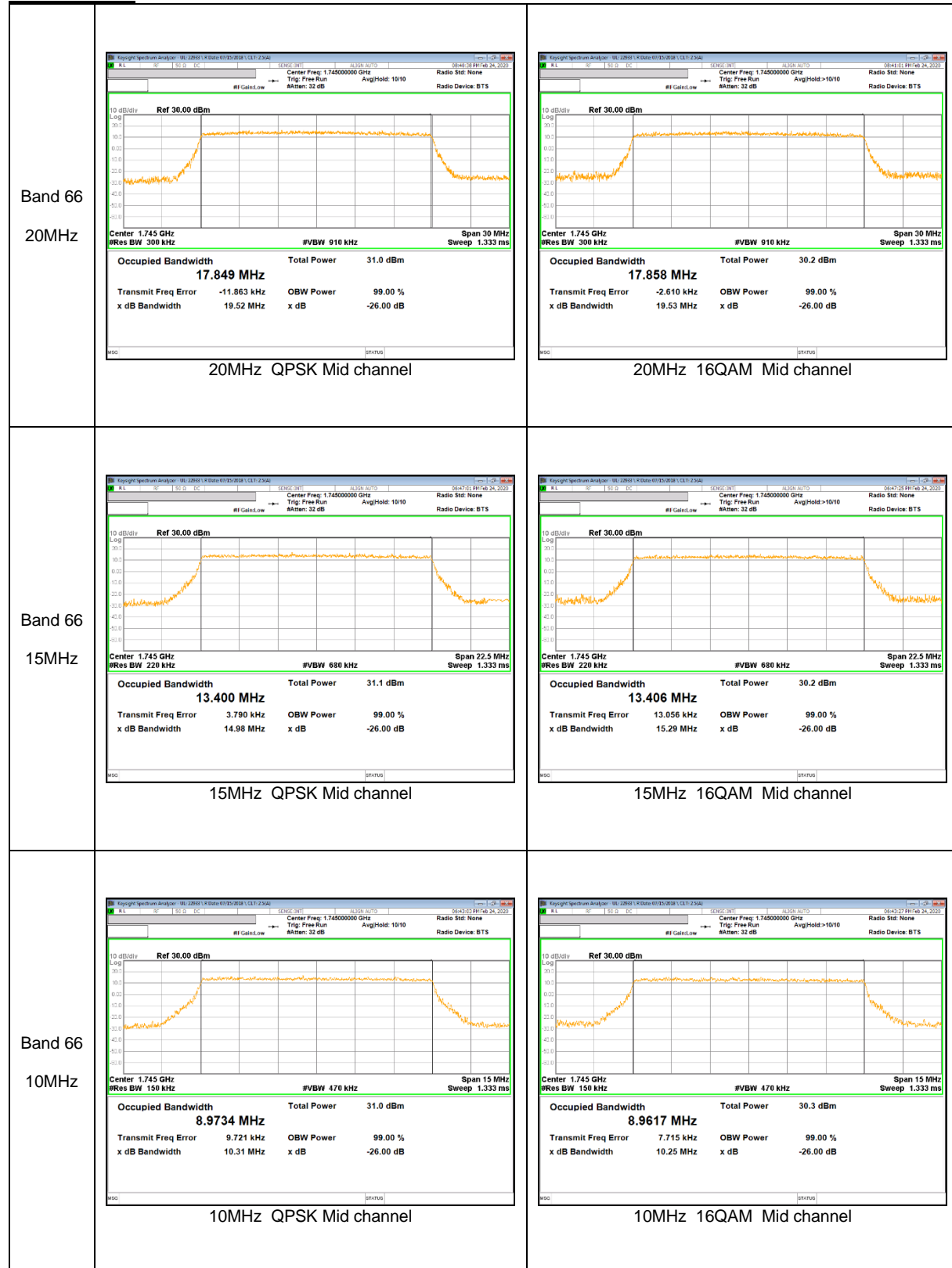


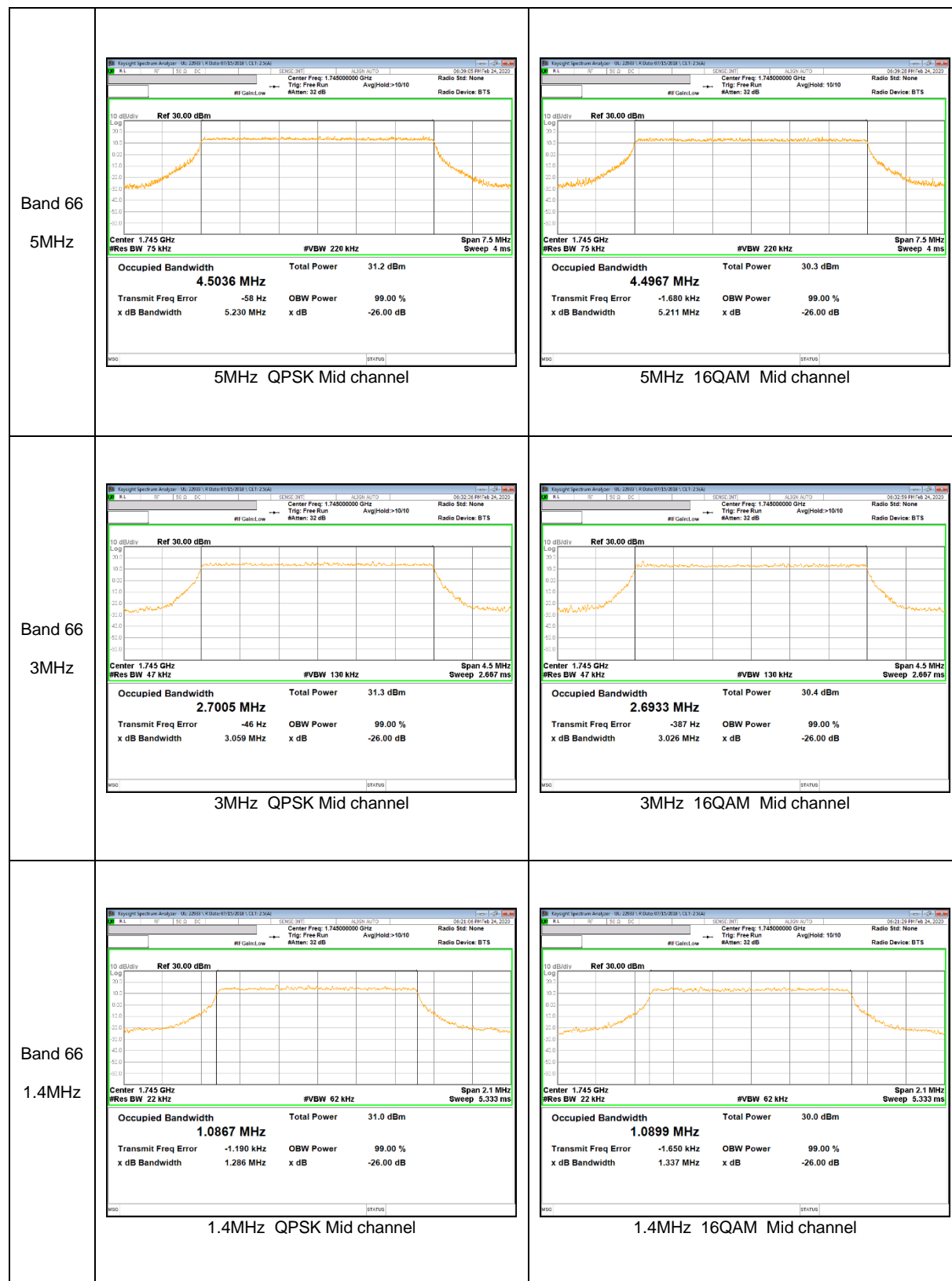
**LTE Band 12**

<p>Band 12 10MHz</p>	 <p>Center Freq 707.500000 MHz</p> <p>Center Freq 707.5 MHz #Res BW 150 kHz</p> <p>Occupied Bandwidth <b>8.9334 MHz</b></p> <p>Total Power 30.6 dBm</p> <p>Transmit Freq Error -6.287 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 9.903 MHz</p> <p>x dB -26.00 dB</p> <p>10MHz QPSK Mid channel</p>	 <p>Center Freq 707.500000 MHz</p> <p>Center Freq 707.5 MHz #Res BW 150 kHz</p> <p>Occupied Bandwidth <b>8.9113 MHz</b></p> <p>Total Power 29.8 dBm</p> <p>Transmit Freq Error -9.895 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 10.02 MHz</p> <p>x dB -26.00 dB</p> <p>10MHz 16QAM Mid channel</p>
<p>Band 12 5MHz</p>	 <p>Center Freq 707.500000 MHz</p> <p>Center Freq 707.5 MHz #Res BW 75 kHz</p> <p>Occupied Bandwidth <b>4.4844 MHz</b></p> <p>Total Power 30.8 dBm</p> <p>Transmit Freq Error 1.469 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 5.177 MHz</p> <p>x dB -26.00 dB</p> <p>5MHz QPSK Mid channel</p>	 <p>Center Freq 707.500000 MHz</p> <p>Center Freq 707.5 MHz #Res BW 75 kHz</p> <p>Occupied Bandwidth <b>4.4880 MHz</b></p> <p>Total Power 29.8 dBm</p> <p>Transmit Freq Error -297 Hz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 5.150 MHz</p> <p>x dB -26.00 dB</p> <p>5MHz 16QAM Mid channel</p>
<p>Band 12 3MHz</p>	 <p>Center Freq 707.500000 MHz</p> <p>Center Freq 707.5 MHz #Res BW 47 kHz</p> <p>Occupied Bandwidth <b>2.6959 MHz</b></p> <p>Total Power 30.9 dBm</p> <p>Transmit Freq Error 3.530 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 3.082 MHz</p> <p>x dB -26.00 dB</p> <p>3MHz QPSK Mid channel</p>	 <p>Center Freq 707.500000 MHz</p> <p>Center Freq 707.5 MHz #Res BW 47 kHz</p> <p>Occupied Bandwidth <b>2.6955 MHz</b></p> <p>Total Power 29.9 dBm</p> <p>Transmit Freq Error -1.962 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 3.074 MHz</p> <p>x dB -26.00 dB</p> <p>3MHz 16QAM Mid channel</p>



**LTE Band 66**





**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 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.

## 9.2. BAND EDGE EMISSIONS

### RULE PART(S)

FCC: §22.359, §24.238, §27.53(g), (h)

### LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB.

(h) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

### 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 band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

### GSM

- a) Set the RBW = 1 ~ 5% of OBW(GSM850 – 8.2KHz, GSM1900 – 9.1KHz)
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = 1S ;
- e) Detector = RMS;
- f) Ensure that the number of measurement points  $\geq 2 \times$  Span/RBW;
- g) Trace mode = Average(100);
- h) Add duty cycle correction factor (9dB)

### WCDMA/LTE

- a) Set the RBW = 1 ~ 1.5 % of OBW(Typically limited to a minimum RBW of 1% of the OBW)
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = Auto;



- e) Detector = RMS;
- f) Ensure that the number of measurement points  $\geq 2 \cdot \text{Span} / \text{RBW}$ ;
- g) Trace mode = Average (100);

## **RESULTS**

See the following pages.

### 9.2.1. BAND EDGE RESULT

#### GSM

