



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

WWAN

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE and DTS b/g/n

MODEL NUMBER : SM-J600F/DS, SM-J600F

FCC ID: A3LSMJ600F

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

*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	04/09/18	Initial issue	Hoonpyo Lee
V2	04/11/18	Updated to address TCB's question	Hoonpyo Lee

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.  
**EUT DESCRIPTION:** GSM/WCDMA/LTE Phone + BT/BLE and DTS b/g/n  
**MODEL NUMBER:** SM-J600F/DS, SM-J600F  
**SERIAL NUMBER:** R38K20GLBMB, R38K20GLBNH (RADIATED);  
R38K20GLBSY (CONDUCTED);  
**DATE TESTED:** MAR 28, 2018 - APR 09, 2018

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



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 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	
<input checked="" type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input checked="" 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/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:

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

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

(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	2.32 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 and DTS b/g/n.  
 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:

#### **GSM**

FCC Part 22/24				
Band	Frequency Range	Modulation	Radiated	
	[MHz]		Avg [dBm]	Avg [mW]
GSM850	824~849	GMSK		
		GPRS	27.87	612.35
		EGPRS	23.82	240.99
GSM1900	1850~1910	GMSK		
		GPRS	30.13	1030.39
		EGPRS	27.41	550.81



**WCDMA**

FCC Part 22/24				
Band	Frequency Range	Modulation	Radiated	
	[MHz]		Avg [dBm]	Avg [mW]
Band 5	824~849	REL99	18.04	63.68
		HSDPA	15.86	38.55
		HSUPA		
		DC-HSDPA		
Band 4	1710~1755	REL99	20.84	121.34
		HSDPA	19.84	96.38
		HSUPA		
		DC-HSDPA		
Band 2	1850~1910	REL99	21.53	142.23
		HSDPA	19.11	81.47
		HSUPA		
		DC-HSDPA		

**LTE Band 5**

FCC Part 22					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Radiated	
				Avg [dBm]	Avg [mW]
Band 5	824 ~ 849	10	QPSK	17.19	52.36
			16QAM	16.18	41.50
		5	QPSK	16.63	46.03
			16QAM	15.67	36.90
		3	QPSK	16.59	45.60
			16QAM	15.59	36.22
		1.4	QPSK	14.54	28.44
			16QAM	14.09	25.64

**LTE Band 2**

FCC Part 24					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Radiated	
				Avg [dBm]	Avg [mW]
Band 2	1850 ~ 1910	20	QPSK	22.55	179.89
			16QAM	21.60	144.54
		15	QPSK	22.04	159.96
			16QAM	21.04	127.06
		10	QPSK	22.17	164.82
			16QAM	21.15	130.32
		5	QPSK	21.71	148.25
			16QAM	20.70	117.49
		3	QPSK	19.25	84.14
			16QAM	18.30	67.61
		1.4	QPSK	19.14	82.04
			16QAM	18.22	66.37

**LTE Band 12**

Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Radiated	
				Avg [dBm]	Avg [mW]
Band 12	699 ~ 716	10	QPSK	13.20	20.89
			16QAM	11.74	14.93
		5	QPSK	12.98	19.86
			16QAM	11.55	14.29
		3	QPSK	12.86	19.32
			16QAM	11.42	13.87
		1.4	QPSK	10.77	11.94
			16QAM	9.84	9.64

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 66**

FCC Part 27					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Radiated	
				Avg [dBm]	Avg [mW]
Band 66	1710 ~ 1780	20	QPSK	21.83	152.41
			16QAM	20.85	121.62
		15	QPSK	22.22	166.72
			16QAM	21.17	130.92
		10	QPSK	21.50	141.25
			16QAM	20.48	111.69
		5	QPSK	20.88	122.46
			16QAM	19.77	94.84
		3	QPSK	20.97	125.03
			16QAM	20.60	114.82
		1.4	QPSK	19.13	81.85
			16QAM	18.02	63.39

**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)
GSM850 / WCDMA Band 5 / LTE Band 5 824 ~ 849 MHz	-1.6
GSM1900 / WCDMA Band 2 / LTE Band 2 1850 ~ 1910 MHz	-0.2
LTE Band 12/17 699 ~ 716 MHz	-9.7
WCDMA Band 4 / LTE Band 4/66 1710 ~ 1780 MHz	-4.0

### 5.4. WORST-CASE ORIENTATION

For GSM1900 / WCDMA Band 2 / LTE Band2 / WCDMA Band 4 / LTE Band 12 / 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 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	ETA0U83EWE	RT2K117oS/A-E	N/A
Data Cable	SAMSUNG	ECB-DU68WE	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

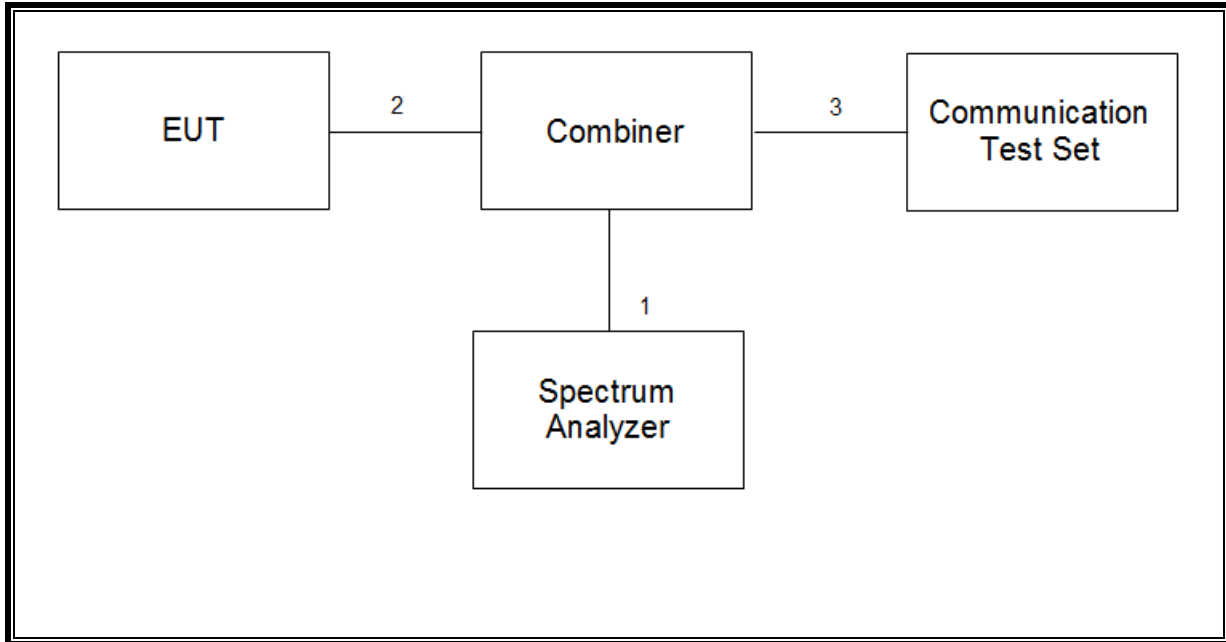
### I/O CABLES

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

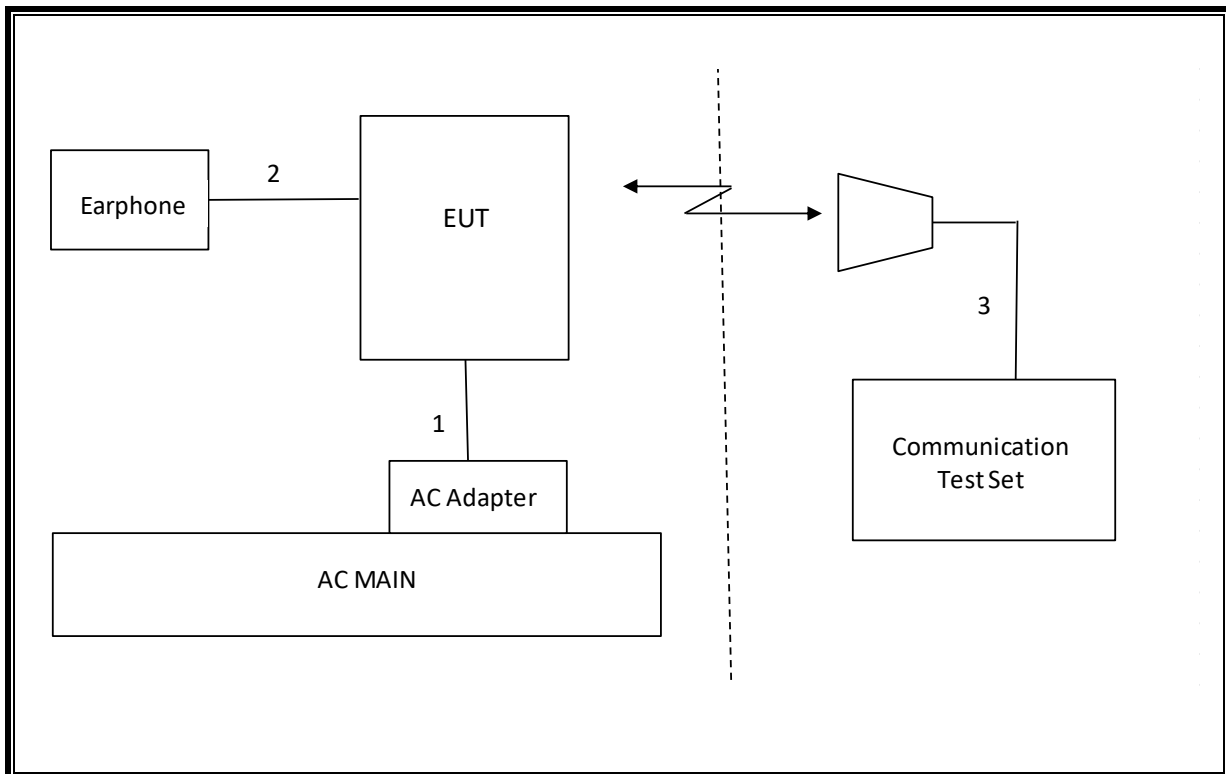
### TEST SETUP

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 2.4	

## 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) 22.359(a) 24.238(a) 27.53(g),(h)	Band Edge / Conducted Spurious Emission	-13dBm		Pass
2.1046	Conducted output power	N/A		See the RF exposure test report. (4788397760-S1 FCC Report SAR)
22.355 24.235 27.54	Frequency Stability	2.5PPM		Pass
22.913(a)(2)	Effective Radiated Power	38.5 dBm		Pass
24.232 ( c )	Equivalent Isotropic Radiated Power	33dBm	Radiated	Pass
27.50 ( c )		34.8dBm		Pass
27.50(d)(4)		30dBm		Pass
22.917(a) 24.238(a) 27.53(c),(g),(h)		Radiated Spurious Emission		-13dBm



FCC Rule Part	Frequency Range [MHz]	Output Power [W]	Frequency Tolerance	Emission Designator	Emission Bandwidth [MHz]	Communication Type
GSM						
22H	824.2 - 848.8	0.612	2.5 ppm	241KGXW		GSM850
22H	824.2 - 848.8	0.241	2.5 ppm	241KG7W		EDGE850
24E	1850.2 - 1909.8	1.030	2.5 ppm	237KGXW		GSM1900
24E	1850.2 - 1909.8	0.551	2.5 ppm	242KG7W		EDGE1900
WCDMA						
22H	826.4 - 846.6	0.064	2.5 ppm	4M13F9W		WCDMA B5
27L	1712.4 - 1752.6	0.121	2.5 ppm	4M14F9W		WCDMA B4
24E	1852.4 - 1907.6	0.142	2.5 ppm	4M14F9W		WCDMA B2
LTE Band 5						
22H	829.0 - 844.0	0.052	2.5 ppm	8M97G7W	10	QPSK
22H	829.0 - 844.0	0.042	2.5 ppm	8M97D7W	10	16QAM
LTE Band 12/17						
27H	704.0 - 711.0	0.021	2.5 ppm	8M99G7W	10	QPSK
27H	704.0 - 711.0	0.015	2.5 ppm	8M96D7W	10	16QAM
LTE Band 2						
24E	1860.0 - 1900.0	0.180	2.5 ppm	17M9G7W	20	QPSK
24E	1860.0 - 1900.0	0.145	2.5 ppm	17M9D7W	20	16QAM
LTE Band 4/66						
27L	1720.0 - 1770.0	0.152	2.5 ppm	17M9G7W	20	QPSK
27L	1720.0 - 1770.0	0.122	2.5 ppm	17M9D7W	20	16QAM
27L	1717.5 - 1747.5	0.167	2.5 ppm	13M4G7W	15	QPSK
27L	1717.5 - 1747.5	0.131	2.5 ppm	13M5D7W	15	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	0.47	13.00
			EGPRS	3.53	
GSM1900	661	1880.0	GPRS	0.48	
			EGPRS	3.07	

#### WCDMA

Band	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	4183	836.6	REL99	3.09	13.00
			HSDPA	3.06	
Band 4	1413	1732.6	REL99	3.16	
			HSDPA	3.20	
Band 2	9400	1880.0	REL99	3.02	
			HSDPA	3.14	

**LTE**

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	10	20525	836.5	QPSK	5.59	13.00
				16QAM	6.93	
	5			QPSK	5.51	
				16QAM	6.81	
	3			QPSK	5.56	
				16QAM	6.71	
	1.4			QPSK	5.54	
				16QAM	6.71	
Band 12	10	23095	707.5	QPSK	5.01	
				16QAM	6.24	
	5			QPSK	5.10	
				16QAM	6.17	
	3			QPSK	4.99	
				16QAM	6.10	
	1.4			QPSK	4.87	
				16QAM	5.96	
Band 66	20	132322	1745.0	QPSK	5.39	
				16QAM	6.52	
	15			QPSK	5.32	
				16QAM	6.41	
	10			QPSK	5.16	
				16QAM	6.23	
	5			QPSK	5.30	
				16QAM	6.59	
	3			QPSK	5.28	
				16QAM	6.37	
	1.4			QPSK	5.32	
				16QAM	6.41	

**LTE**

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 2	20	18900	1880.0	QPSK	5.82	13.00
				16QAM	6.76	
	15			QPSK	5.73	
				16QAM	7.09	
	10			QPSK	5.82	
				16QAM	6.96	
	5			QPSK	5.85	
				16QAM	6.89	
	3			QPSK	5.64	
				16QAM	7.11	
	1.4			QPSK	5.63	
				16QAM	6.71	

**LTE Band 4**

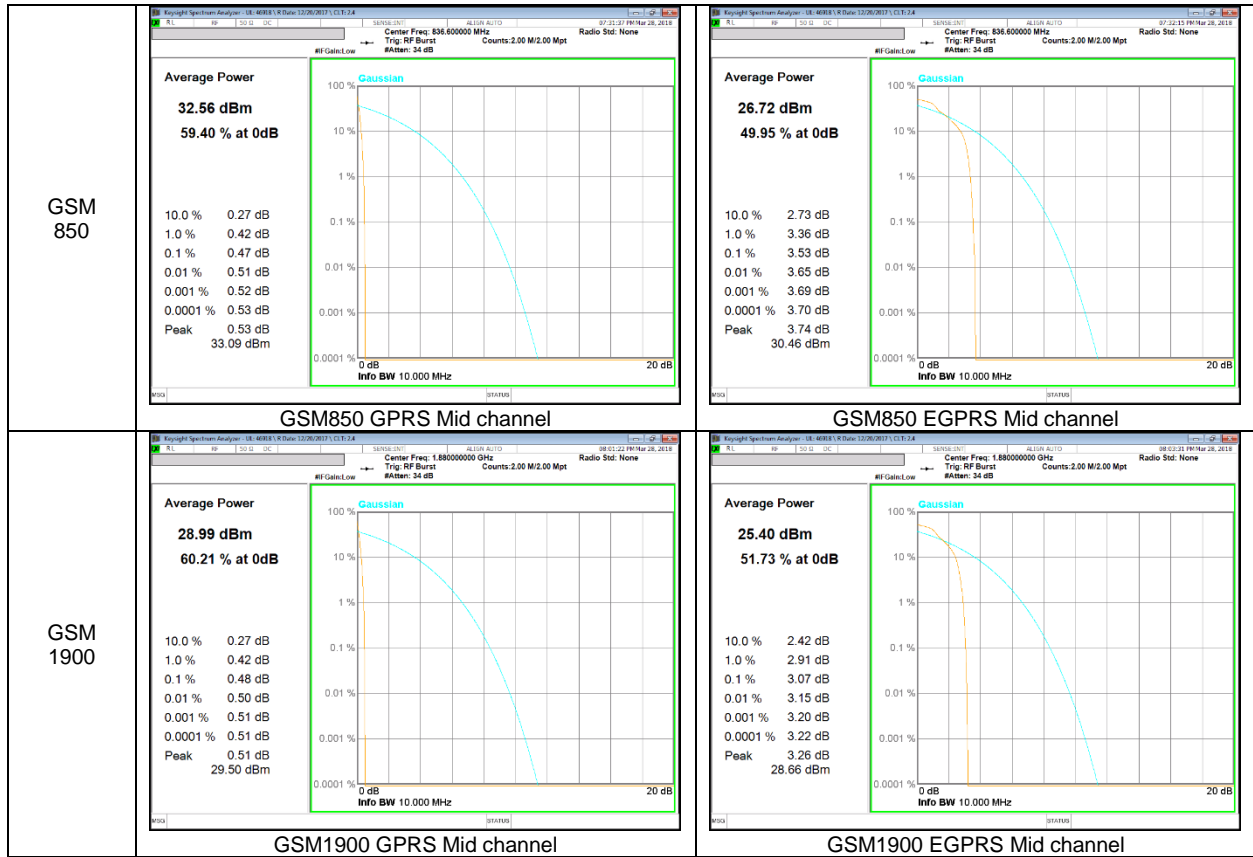
LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

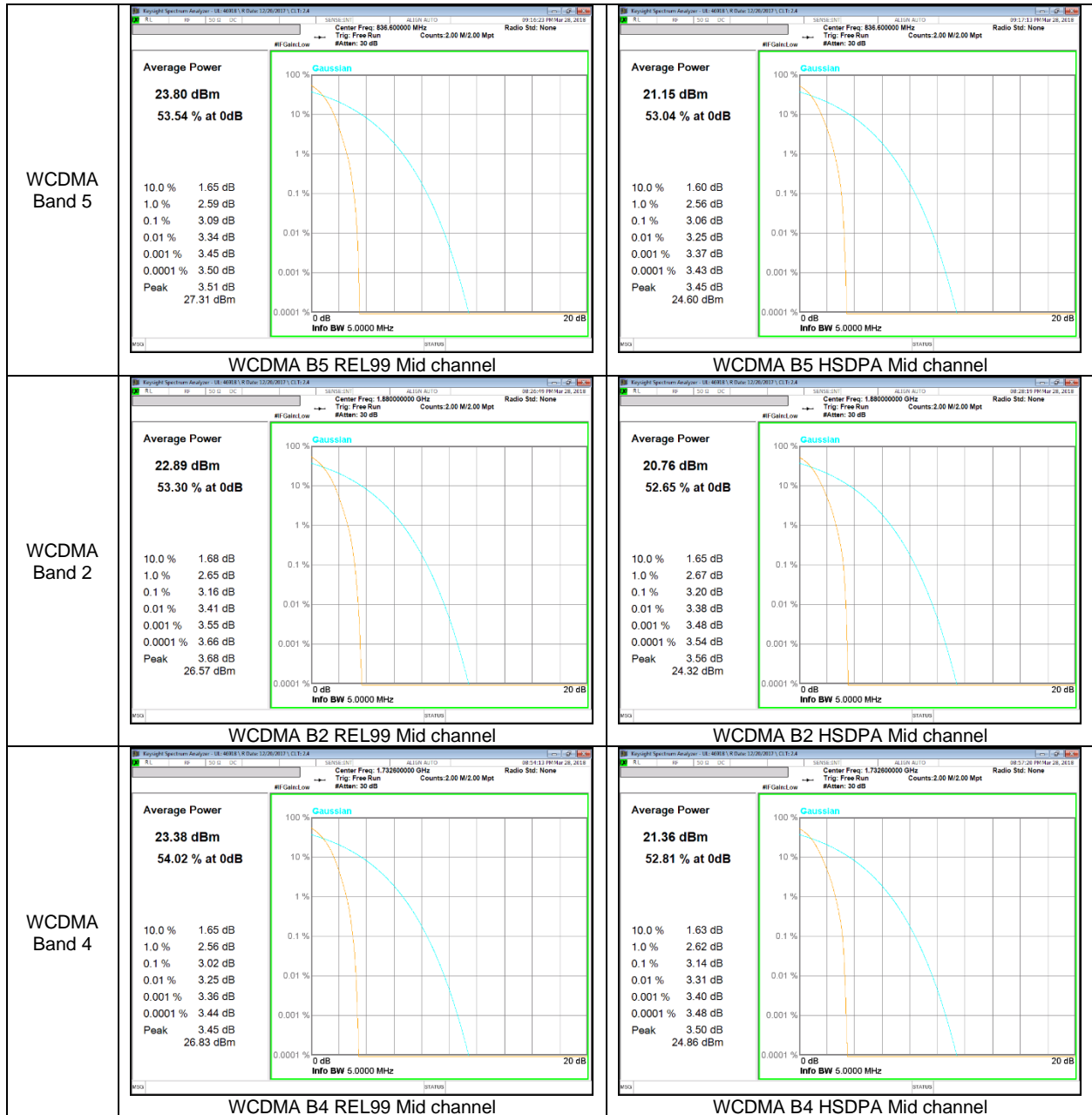
LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

## 8.2. CONDUCTED PEAK TO AVERAGE PLOTS

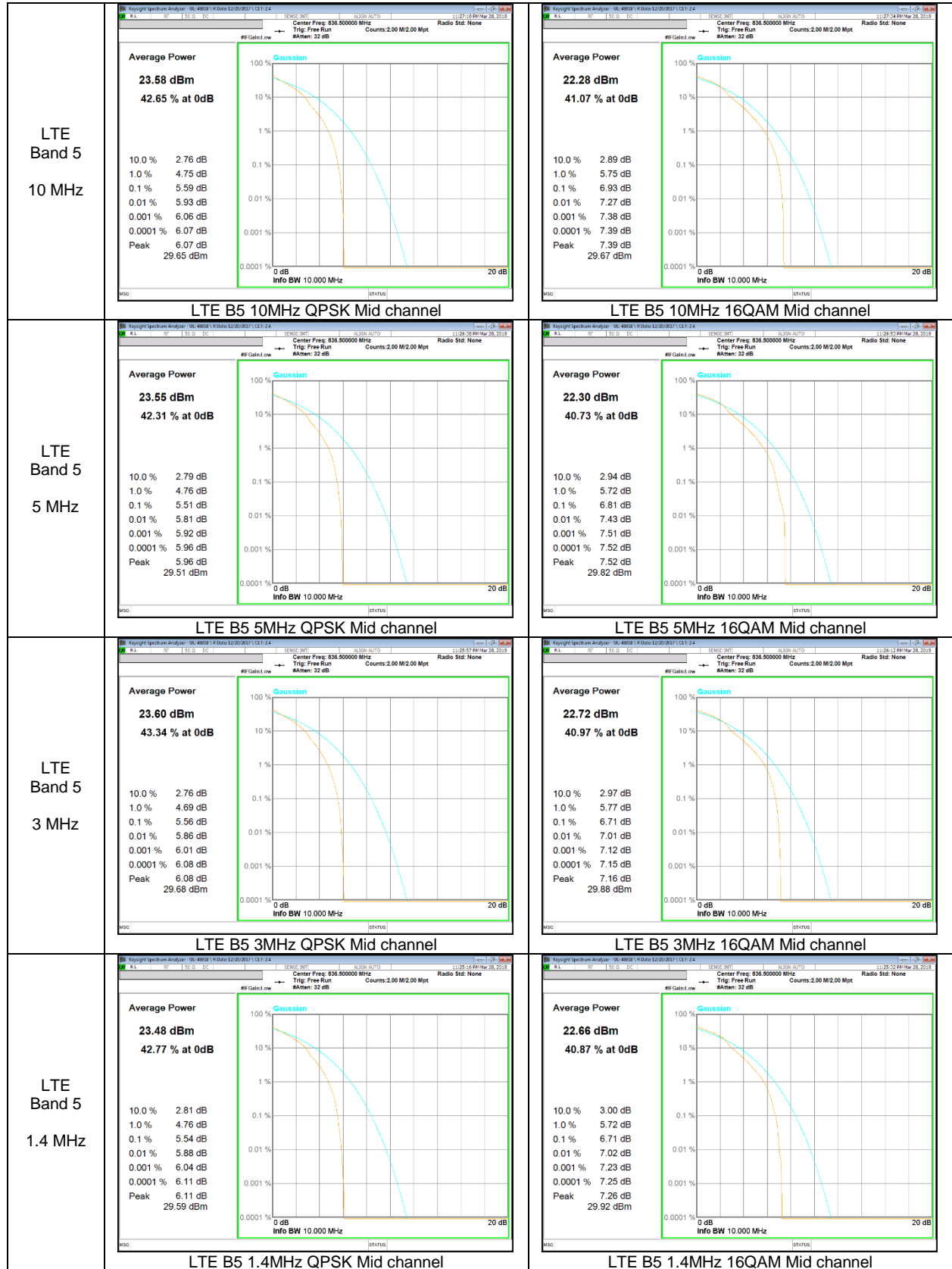
### GSM



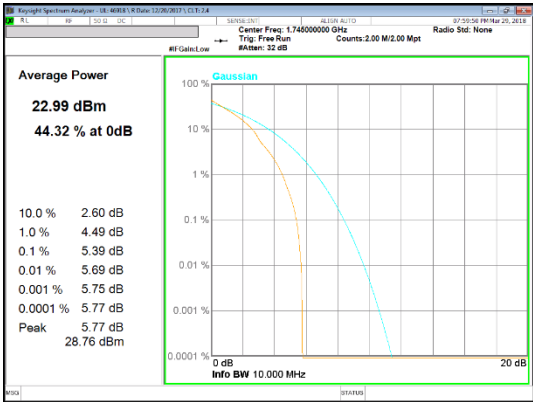
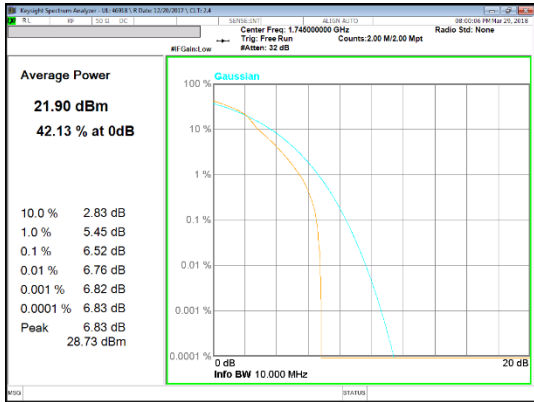
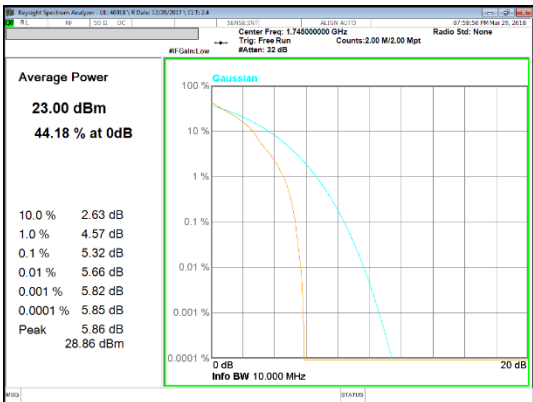
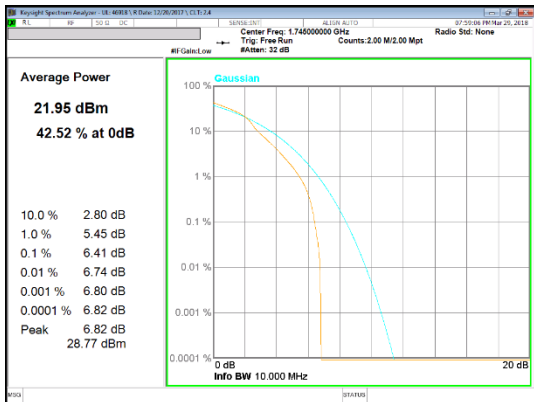
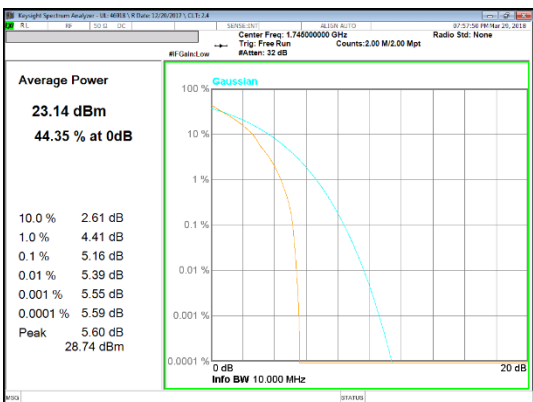
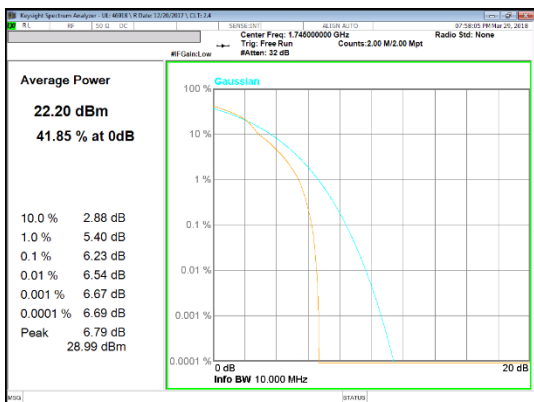
**WCDMA**



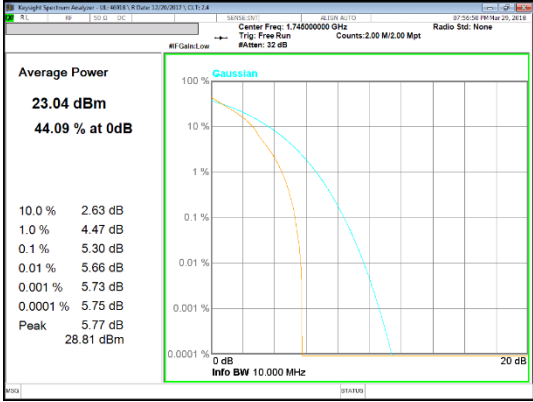
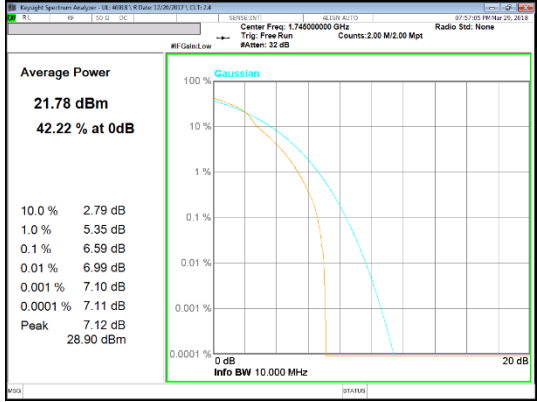
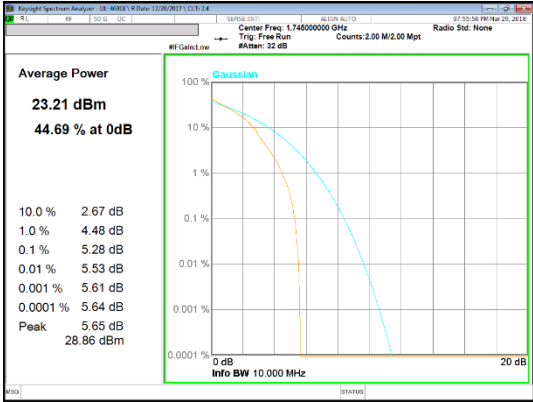
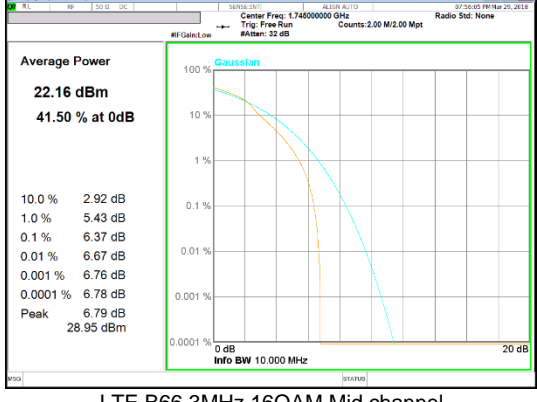
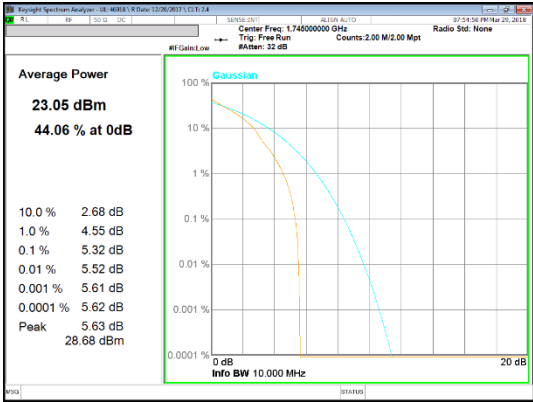
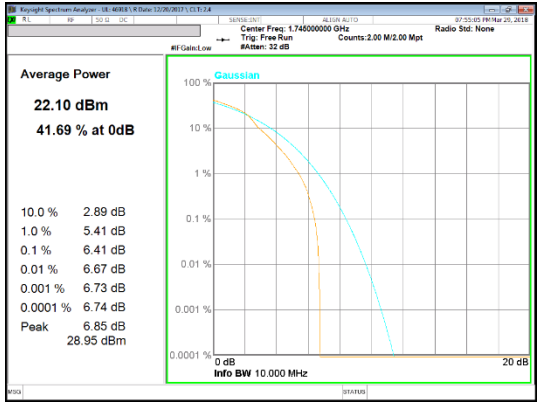
**LTE Band 5**



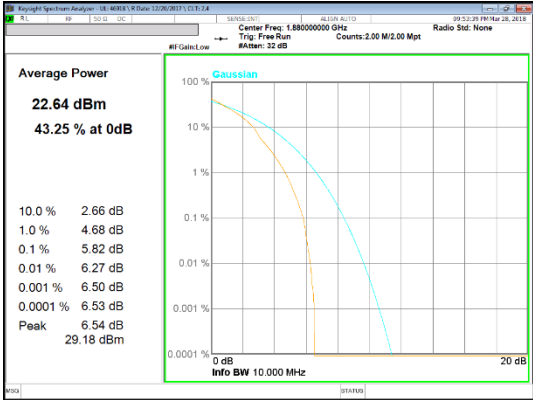
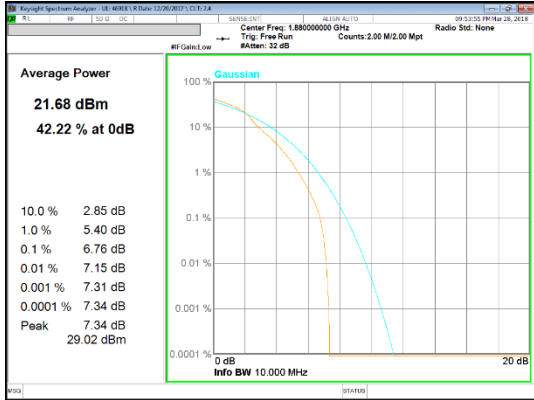
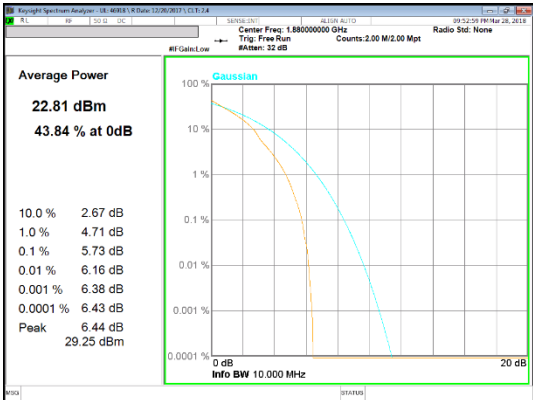
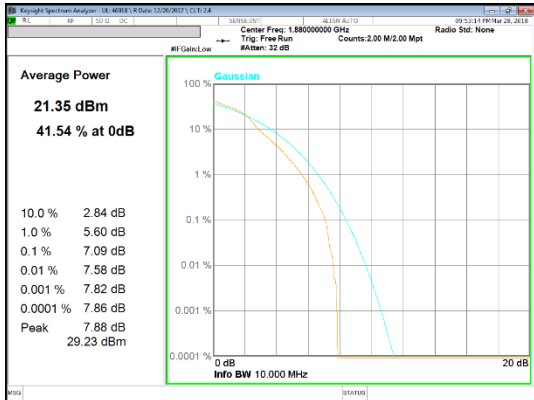
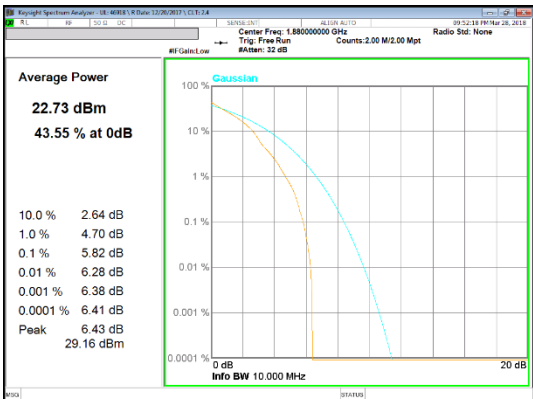
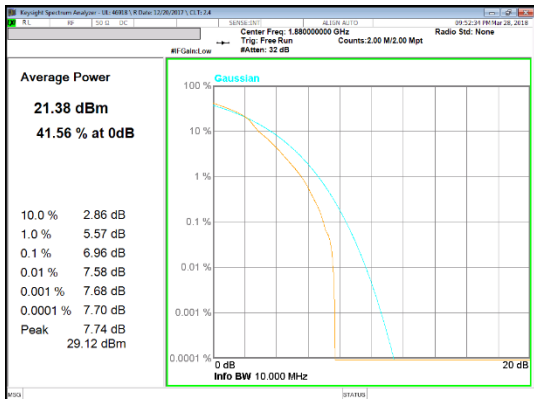
**LTE Band 66**

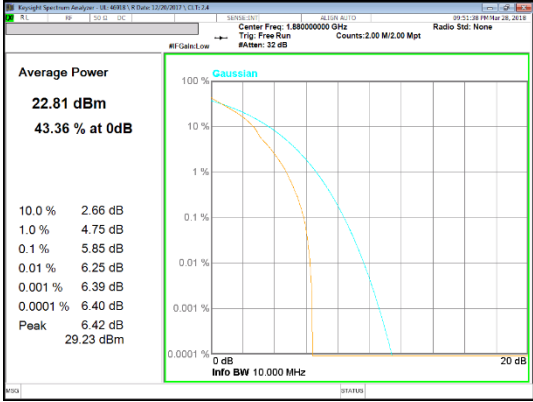
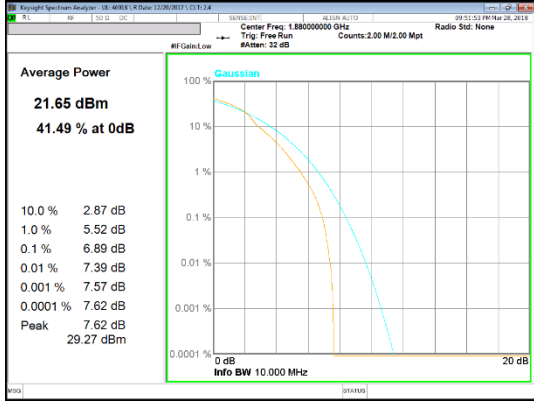
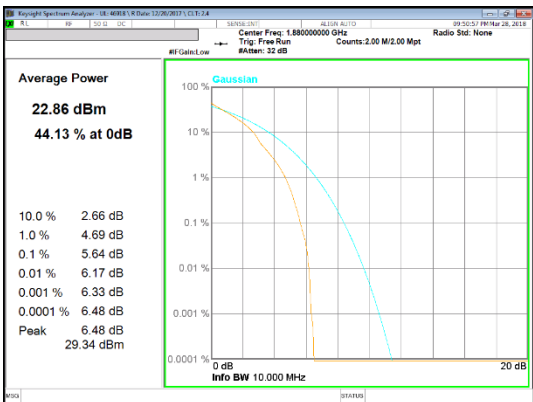
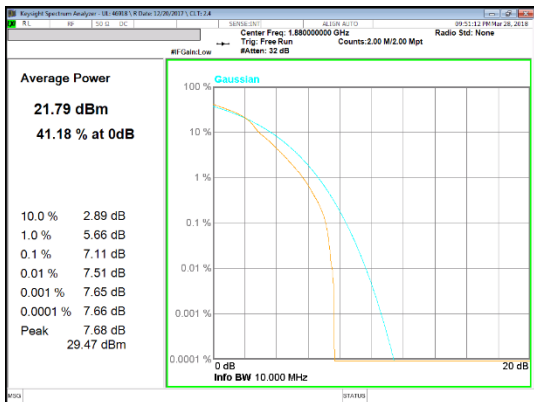
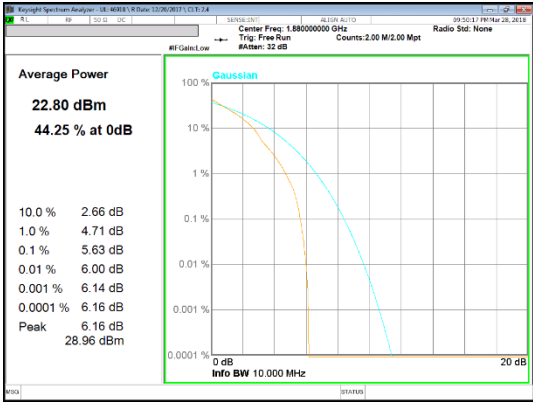
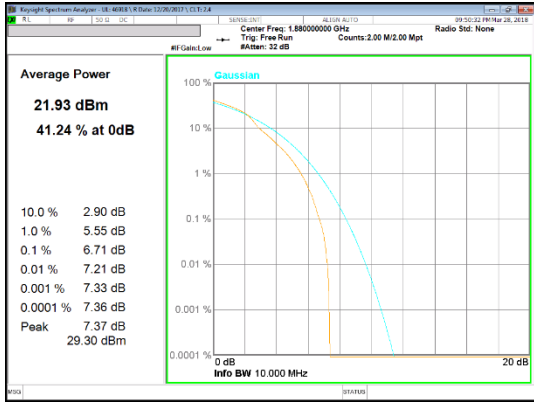
<p>LTE Band 66 20 MHz</p>	 <p>Average Power <b>22.99 dBm</b> 44.32 % at 0dB</p> <p>10.0 % 2.60 dB 1.0 % 4.49 dB 0.1 % 5.39 dB 0.01 % 5.69 dB 0.001 % 5.75 dB 0.0001 % 5.77 dB Peak 5.77 dB 28.76 dBm</p> <p>LTE B66 20MHz QPSK Mid channel</p>	 <p>Average Power <b>21.90 dBm</b> 42.13 % at 0dB</p> <p>10.0 % 2.83 dB 1.0 % 5.45 dB 0.1 % 6.52 dB 0.01 % 6.76 dB 0.001 % 6.82 dB 0.0001 % 6.83 dB Peak 6.83 dB 28.73 dBm</p> <p>LTE B66 20MHz 16QAM Mid channel</p>
<p>LTE Band 66 15 MHz</p>	 <p>Average Power <b>23.00 dBm</b> 44.18 % at 0dB</p> <p>10.0 % 2.63 dB 1.0 % 4.57 dB 0.1 % 5.32 dB 0.01 % 5.66 dB 0.001 % 5.82 dB 0.0001 % 5.85 dB Peak 5.86 dB 28.86 dBm</p> <p>LTE B66 15MHz QPSK Mid channel</p>	 <p>Average Power <b>21.95 dBm</b> 42.52 % at 0dB</p> <p>10.0 % 2.80 dB 1.0 % 5.45 dB 0.1 % 6.41 dB 0.01 % 6.74 dB 0.001 % 6.80 dB 0.0001 % 6.82 dB Peak 6.82 dB 28.77 dBm</p> <p>LTE B66 15MHz 16QAM Mid channel</p>
<p>LTE Band 66 10 MHz</p>	 <p>Average Power <b>23.14 dBm</b> 44.35 % at 0dB</p> <p>10.0 % 2.61 dB 1.0 % 4.41 dB 0.1 % 5.16 dB 0.01 % 5.39 dB 0.001 % 5.55 dB 0.0001 % 5.59 dB Peak 5.60 dB 28.74 dBm</p> <p>LTE B66 10MHz QPSK Mid channel</p>	 <p>Average Power <b>22.20 dBm</b> 41.85 % at 0dB</p> <p>10.0 % 2.88 dB 1.0 % 5.40 dB 0.1 % 6.23 dB 0.01 % 6.54 dB 0.001 % 6.67 dB 0.0001 % 6.69 dB Peak 6.79 dB 28.99 dBm</p> <p>LTE B66 10MHz 16QAM Mid channel</p>



<p>LTE Band 66 5 MHz</p>	 <p>LTE B66 5MHz QPSK Mid channel</p>	 <p>LTE B66 5MHz 16QAM Mid channel</p>
<p>LTE Band 66 3 MHz</p>	 <p>LTE B66 3MHz QPSK Mid channel</p>	 <p>LTE B66 3MHz 16QAM Mid channel</p>
<p>LTE Band 66 1.4 MHz</p>	 <p>LTE B66 1.4MHz QPSK Mid channel</p>	 <p>LTE B66 1.4MHz 16QAM Mid channel</p>

**LTE Band 2**

<p>LTE Band 2 20 MHz</p>	 <p>Average Power <b>22.64 dBm</b> 43.25 % at 0dB</p> <p>10.0 % 2.66 dB 1.0 % 4.68 dB 0.1 % 5.82 dB 0.01 % 6.27 dB 0.001 % 6.50 dB 0.0001 % 6.53 dB Peak 6.54 dB 29.18 dBm</p> <p>LTE B2 20MHz QPSK Mid channel</p>	 <p>Average Power <b>21.68 dBm</b> 42.22 % at 0dB</p> <p>10.0 % 2.85 dB 1.0 % 5.40 dB 0.1 % 6.76 dB 0.01 % 7.15 dB 0.001 % 7.31 dB 0.0001 % 7.34 dB Peak 7.34 dB 29.02 dBm</p> <p>LTE B2 20MHz 16QAM Mid channel</p>
<p>LTE Band 2 15 MHz</p>	 <p>Average Power <b>22.81 dBm</b> 43.84 % at 0dB</p> <p>10.0 % 2.67 dB 1.0 % 4.71 dB 0.1 % 5.73 dB 0.01 % 6.16 dB 0.001 % 6.38 dB 0.0001 % 6.43 dB Peak 6.44 dB 29.25 dBm</p> <p>LTE B2 15MHz QPSK Mid channel</p>	 <p>Average Power <b>21.35 dBm</b> 41.54 % at 0dB</p> <p>10.0 % 2.84 dB 1.0 % 5.60 dB 0.1 % 7.09 dB 0.01 % 7.58 dB 0.001 % 7.82 dB 0.0001 % 7.86 dB Peak 7.88 dB 29.23 dBm</p> <p>LTE B2 15MHz 16QAM Mid channel</p>
<p>LTE Band 2 10 MHz</p>	 <p>Average Power <b>22.73 dBm</b> 43.55 % at 0dB</p> <p>10.0 % 2.64 dB 1.0 % 4.70 dB 0.1 % 5.82 dB 0.01 % 6.28 dB 0.001 % 6.38 dB 0.0001 % 6.41 dB Peak 6.43 dB 29.16 dBm</p> <p>LTE B2 10MHz QPSK Mid channel</p>	 <p>Average Power <b>21.38 dBm</b> 41.56 % at 0dB</p> <p>10.0 % 2.86 dB 1.0 % 5.57 dB 0.1 % 6.96 dB 0.01 % 7.58 dB 0.001 % 7.68 dB 0.0001 % 7.70 dB Peak 7.74 dB 29.12 dBm</p> <p>LTE B2 10MHz 16QAM Mid channel</p>

<p>LTE Band 2 5 MHz</p>	 <p>Average Power <b>22.81 dBm</b> 43.36 % at 0dB</p> <table border="1"> <tr><td>10.0 %</td><td>2.66 dB</td></tr> <tr><td>1.0 %</td><td>4.75 dB</td></tr> <tr><td>0.1 %</td><td>5.85 dB</td></tr> <tr><td>0.01 %</td><td>6.25 dB</td></tr> <tr><td>0.001 %</td><td>6.39 dB</td></tr> <tr><td>0.0001 %</td><td>6.40 dB</td></tr> <tr><td>Peak</td><td>6.42 dB</td></tr> <tr><td></td><td>29.23 dBm</td></tr> </table> <p>LTE B2 5MHz QPSK Mid channel</p>	10.0 %	2.66 dB	1.0 %	4.75 dB	0.1 %	5.85 dB	0.01 %	6.25 dB	0.001 %	6.39 dB	0.0001 %	6.40 dB	Peak	6.42 dB		29.23 dBm	 <p>Average Power <b>21.65 dBm</b> 41.49 % at 0dB</p> <table border="1"> <tr><td>10.0 %</td><td>2.87 dB</td></tr> <tr><td>1.0 %</td><td>5.52 dB</td></tr> <tr><td>0.1 %</td><td>6.89 dB</td></tr> <tr><td>0.01 %</td><td>7.39 dB</td></tr> <tr><td>0.001 %</td><td>7.57 dB</td></tr> <tr><td>0.0001 %</td><td>7.62 dB</td></tr> <tr><td>Peak</td><td>7.62 dB</td></tr> <tr><td></td><td>29.27 dBm</td></tr> </table> <p>LTE B2 5MHz 16QAM Mid channel</p>	10.0 %	2.87 dB	1.0 %	5.52 dB	0.1 %	6.89 dB	0.01 %	7.39 dB	0.001 %	7.57 dB	0.0001 %	7.62 dB	Peak	7.62 dB		29.27 dBm
10.0 %	2.66 dB																																	
1.0 %	4.75 dB																																	
0.1 %	5.85 dB																																	
0.01 %	6.25 dB																																	
0.001 %	6.39 dB																																	
0.0001 %	6.40 dB																																	
Peak	6.42 dB																																	
	29.23 dBm																																	
10.0 %	2.87 dB																																	
1.0 %	5.52 dB																																	
0.1 %	6.89 dB																																	
0.01 %	7.39 dB																																	
0.001 %	7.57 dB																																	
0.0001 %	7.62 dB																																	
Peak	7.62 dB																																	
	29.27 dBm																																	
<p>LTE Band 2 3 MHz</p>	 <p>Average Power <b>22.86 dBm</b> 44.13 % at 0dB</p> <table border="1"> <tr><td>10.0 %</td><td>2.66 dB</td></tr> <tr><td>1.0 %</td><td>4.69 dB</td></tr> <tr><td>0.1 %</td><td>5.64 dB</td></tr> <tr><td>0.01 %</td><td>6.17 dB</td></tr> <tr><td>0.001 %</td><td>6.33 dB</td></tr> <tr><td>0.0001 %</td><td>6.48 dB</td></tr> <tr><td>Peak</td><td>6.48 dB</td></tr> <tr><td></td><td>29.34 dBm</td></tr> </table> <p>LTE B2 3MHz QPSK Mid channel</p>	10.0 %	2.66 dB	1.0 %	4.69 dB	0.1 %	5.64 dB	0.01 %	6.17 dB	0.001 %	6.33 dB	0.0001 %	6.48 dB	Peak	6.48 dB		29.34 dBm	 <p>Average Power <b>21.79 dBm</b> 41.18 % at 0dB</p> <table border="1"> <tr><td>10.0 %</td><td>2.89 dB</td></tr> <tr><td>1.0 %</td><td>5.66 dB</td></tr> <tr><td>0.1 %</td><td>7.11 dB</td></tr> <tr><td>0.01 %</td><td>7.51 dB</td></tr> <tr><td>0.001 %</td><td>7.65 dB</td></tr> <tr><td>0.0001 %</td><td>7.66 dB</td></tr> <tr><td>Peak</td><td>7.68 dB</td></tr> <tr><td></td><td>29.47 dBm</td></tr> </table> <p>LTE B2 3MHz 16QAM Mid channel</p>	10.0 %	2.89 dB	1.0 %	5.66 dB	0.1 %	7.11 dB	0.01 %	7.51 dB	0.001 %	7.65 dB	0.0001 %	7.66 dB	Peak	7.68 dB		29.47 dBm
10.0 %	2.66 dB																																	
1.0 %	4.69 dB																																	
0.1 %	5.64 dB																																	
0.01 %	6.17 dB																																	
0.001 %	6.33 dB																																	
0.0001 %	6.48 dB																																	
Peak	6.48 dB																																	
	29.34 dBm																																	
10.0 %	2.89 dB																																	
1.0 %	5.66 dB																																	
0.1 %	7.11 dB																																	
0.01 %	7.51 dB																																	
0.001 %	7.65 dB																																	
0.0001 %	7.66 dB																																	
Peak	7.68 dB																																	
	29.47 dBm																																	
<p>LTE Band 2 1.4 MHz</p>	 <p>Average Power <b>22.80 dBm</b> 44.25 % at 0dB</p> <table border="1"> <tr><td>10.0 %</td><td>2.66 dB</td></tr> <tr><td>1.0 %</td><td>4.71 dB</td></tr> <tr><td>0.1 %</td><td>5.63 dB</td></tr> <tr><td>0.01 %</td><td>6.00 dB</td></tr> <tr><td>0.001 %</td><td>6.14 dB</td></tr> <tr><td>0.0001 %</td><td>6.16 dB</td></tr> <tr><td>Peak</td><td>6.16 dB</td></tr> <tr><td></td><td>28.96 dBm</td></tr> </table> <p>LTE B2 1.4MHz QPSK Mid channel</p>	10.0 %	2.66 dB	1.0 %	4.71 dB	0.1 %	5.63 dB	0.01 %	6.00 dB	0.001 %	6.14 dB	0.0001 %	6.16 dB	Peak	6.16 dB		28.96 dBm	 <p>Average Power <b>21.93 dBm</b> 41.24 % at 0dB</p> <table border="1"> <tr><td>10.0 %</td><td>2.90 dB</td></tr> <tr><td>1.0 %</td><td>5.55 dB</td></tr> <tr><td>0.1 %</td><td>6.71 dB</td></tr> <tr><td>0.01 %</td><td>7.21 dB</td></tr> <tr><td>0.001 %</td><td>7.33 dB</td></tr> <tr><td>0.0001 %</td><td>7.36 dB</td></tr> <tr><td>Peak</td><td>7.37 dB</td></tr> <tr><td></td><td>29.30 dBm</td></tr> </table> <p>LTE B2 1.4MHz 16QAM Mid channel</p>	10.0 %	2.90 dB	1.0 %	5.55 dB	0.1 %	6.71 dB	0.01 %	7.21 dB	0.001 %	7.33 dB	0.0001 %	7.36 dB	Peak	7.37 dB		29.30 dBm
10.0 %	2.66 dB																																	
1.0 %	4.71 dB																																	
0.1 %	5.63 dB																																	
0.01 %	6.00 dB																																	
0.001 %	6.14 dB																																	
0.0001 %	6.16 dB																																	
Peak	6.16 dB																																	
	28.96 dBm																																	
10.0 %	2.90 dB																																	
1.0 %	5.55 dB																																	
0.1 %	6.71 dB																																	
0.01 %	7.21 dB																																	
0.001 %	7.33 dB																																	
0.0001 %	7.36 dB																																	
Peak	7.37 dB																																	
	29.30 dBm																																	

**LTE Band 12**



## 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	240.83	307.9
		190	836.6	238.96	305.0
		251	848.8	241.05	308.7
	EGPRS	128	824.2	234.80	303.8
		190	836.6	241.26	306.2
		251	848.8	232.08	285.0
GSM1900	GPRS	512	1850.2	236.59	299.0
		661	1880.0	236.66	305.9
		810	1909.8	230.31	292.6
	EGPRS	512	1850.2	240.86	301.8
		661	1880.0	241.23	305.9
		810	1909.8	242.26	305.5

**WCDMA**

Band	Mode	Channel	f [MHz]	99% BW [MHz]	26dB BW [MHz]
Band 5	REL99	4132	826.4	4.1148	4.686
		4183	836.6	4.1252	4.699
		4233	846.6	4.1252	4.678
	HSDPA	4132	826.4	4.1276	4.696
		4183	836.6	4.1318	4.723
		4233	846.6	4.1348	4.667
Band 2	REL99	9262	1852.4	4.1419	4.671
		9400	1880.0	4.1305	4.681
		9538	1907.6	4.1262	4.669
	HSDPA	9262	1852.4	4.1339	4.682
		9400	1880.0	4.1303	4.675
		9538	1907.6	4.1448	4.676
Band 4	REL99	1312	1712.4	4.1221	4.668
		1413	1732.6	4.1311	4.703
		1513	1752.6	4.1312	4.689
	HSDPA	1312	1712.4	4.1442	4.688
		1413	1732.6	4.1205	4.668
		1513	1752.6	4.1304	4.701

**LTE Band 5**

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 5	10	20450	829.0	QPSK	8.9640	10.080
				16QAM	8.9552	10.050
		20524	836.5	QPSK	8.9686	10.340
				16QAM	8.9521	10.210
		20599	844.0	QPSK	8.9683	9.905
				16QAM	8.9622	10.260
	5	20425	826.5	QPSK	4.4954	5.236
				16QAM	4.4935	5.239
		20524	836.5	QPSK	4.5044	5.358
				16QAM	4.5016	5.192
		20624	846.5	QPSK	4.4972	5.232
				16QAM	4.4962	5.212
	3	20415	825.5	QPSK	2.6974	3.058
				16QAM	2.6980	3.092
		20524	836.5	QPSK	2.7060	3.102
				16QAM	2.6993	3.065
		20634	847.5	QPSK	2.7043	3.112
				16QAM	2.6995	3.063
	1.4	20407	824.7	QPSK	1.0867	1.349
				16QAM	1.0959	1.386
		20524	836.5	QPSK	1.0861	1.320
				16QAM	1.0939	1.348
		20624	848.3	QPSK	1.0890	1.358
				16QAM	1.0899	1.385

**LTE Band 66**

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 66	20	132072	1720.0	QPSK	17.8740	19.700
				16QAM	17.8740	19.600
		132322	1745.0	QPSK	17.8760	19.660
				16QAM	17.8530	19.470
		132572	1770.0	QPSK	17.8810	19.690
				16QAM	17.8390	19.600
	15	132047	1717.5	QPSK	13.4390	15.460
				16QAM	13.4560	15.050
		132322	1745.0	QPSK	13.4460	15.030
				16QAM	13.4650	15.290
		132597	1772.5	QPSK	13.4450	15.230
				16QAM	13.449	15.080
	10	132022	1715.0	QPSK	8.9592	10.270
				16QAM	8.9616	10.100
		132322	1745.0	QPSK	8.9632	10.110
				16QAM	8.9508	10.140
		132622	1775.0	QPSK	8.9504	9.917
				16QAM	8.9413	10.250
	5	131997	1712.5	QPSK	4.5028	5.247
				16QAM	4.5056	5.227
		132322	1745.0	QPSK	4.4959	5.299
				16QAM	4.5059	5.239
		132647	1775.5	QPSK	4.4976	5.221
				16QAM	4.4973	5.302
	3	131987	1711.5	QPSK	2.7044	3.107
				16QAM	2.7020	3.045
		132322	1745.0	QPSK	2.7081	3.081
				16QAM	2.6986	3.087
		132657	1778.5	QPSK	2.7047	3.092
				16QAM	2.7017	3.066
	1.4	131979	1710.7	QPSK	1.0901	1.409
				16QAM	1.0971	1.413
		132322	1745.0	QPSK	1.0916	1.360
				16QAM	1.0959	1.398
		132665	1779.3	QPSK	1.0903	1.403
				16QAM	1.0939	1.369



**LTE Band 2**

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 2	20	18700	1860.0	QPSK	17.869	19.660
				16QAM	17.855	19.720
		18900	1880.0	QPSK	17.880	19.670
				16QAM	17.871	19.640
		19099	1900.0	QPSK	17.853	19.600
				16QAM	17.818	19.480
	15	18675	1857.5	QPSK	13.426	15.120
				16QAM	13.434	15.200
		18900	1880.0	QPSK	13.433	15.110
				16QAM	13.445	15.280
		19124	1902.5	QPSK	13.438	14.880
				16QAM	13.439	14.970
	10	18650	1955.0	QPSK	8.9408	10.230
				16QAM	8.9410	10.110
		18900	1880.0	QPSK	8.9494	9.995
				16QAM	8.9519	10.310
		19149	1905.0	QPSK	8.9450	10.230
				16QAM	8.9554	10.220
	5	18625	1852.5	QPSK	4.4916	5.231
				16QAM	4.5039	5.238
		18900	1880.0	QPSK	4.4950	5.226
				16QAM	4.4994	5.228
		19175	1907.5	QPSK	4.4957	5.331
				16QAM	4.4993	5.223
	3	18615	1815.5	QPSK	2.6928	3.056
				16QAM	2.7020	3.124
		18900	1880.0	QPSK	2.7112	3.073
				16QAM	2.7034	3.057
		19184	1908.5	QPSK	2.7065	3.075
				16QAM	2.6974	3.023
	1.4	18607	1850.7	QPSK	1.0875	1.348
				16QAM	1.0925	1.369
18900		1880.0	QPSK	1.0901	1.354	
			16QAM	1.0879	1.372	
19192		1909.3	QPSK	1.0899	1.361	
			16QAM	1.0946	1.392	

**LTE Band 12**

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 12	10	23060	704.0	QPSK	8.9931	10.130
				16QAM	8.9601	10.320
		23095	707.5	QPSK	8.9187	10.080
				16QAM	8.9303	9.988
		23130	711.0	QPSK	8.9567	10.140
				16QAM	8.9344	10.120
	5	23035	701.5	QPSK	4.5021	5.270
				16QAM	4.5025	5.250
		23095	707.5	QPSK	4.4976	5.301
				16QAM	4.5061	5.216
		23155	713.5	QPSK	4.4943	5.163
				16QAM	4.4981	5.226
	3	23025	700.5	QPSK	2.6984	3.090
				16QAM	2.7024	3.097
		23095	707.5	QPSK	2.6973	3.049
				16QAM	2.7040	3.100
		23165	714.5	QPSK	2.7033	3.087
				16QAM	2.6986	3.053
	1.4	23017	699.7	QPSK	1.0899	1.352
				16QAM	1.0887	1.361
		23095	707.5	QPSK	1.0893	1.375
				16QAM	1.0897	1.378
		23173	715.3	QPSK	1.0907	1.376
				16QAM	1.0914	1.387

**LTE Band 4**

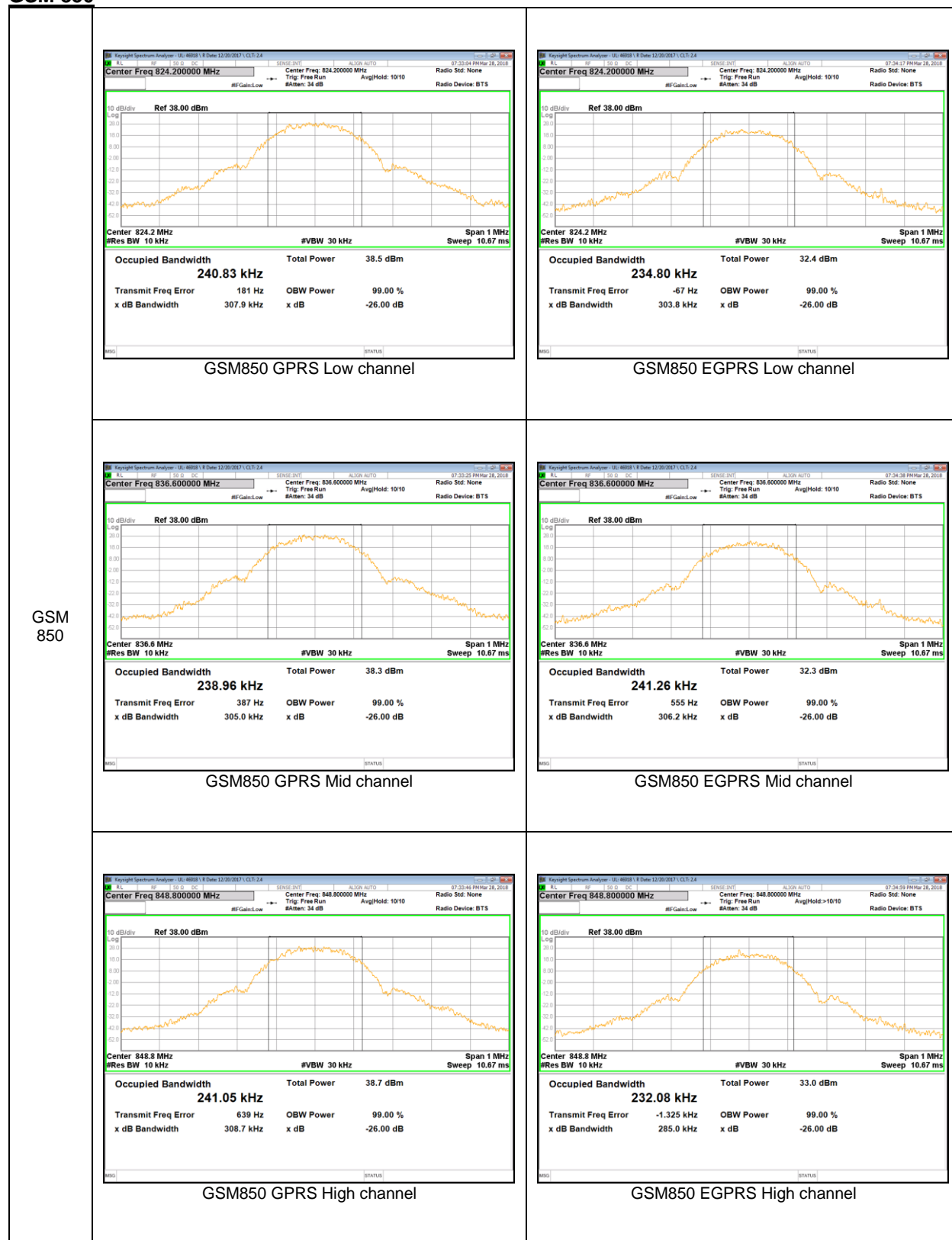
LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

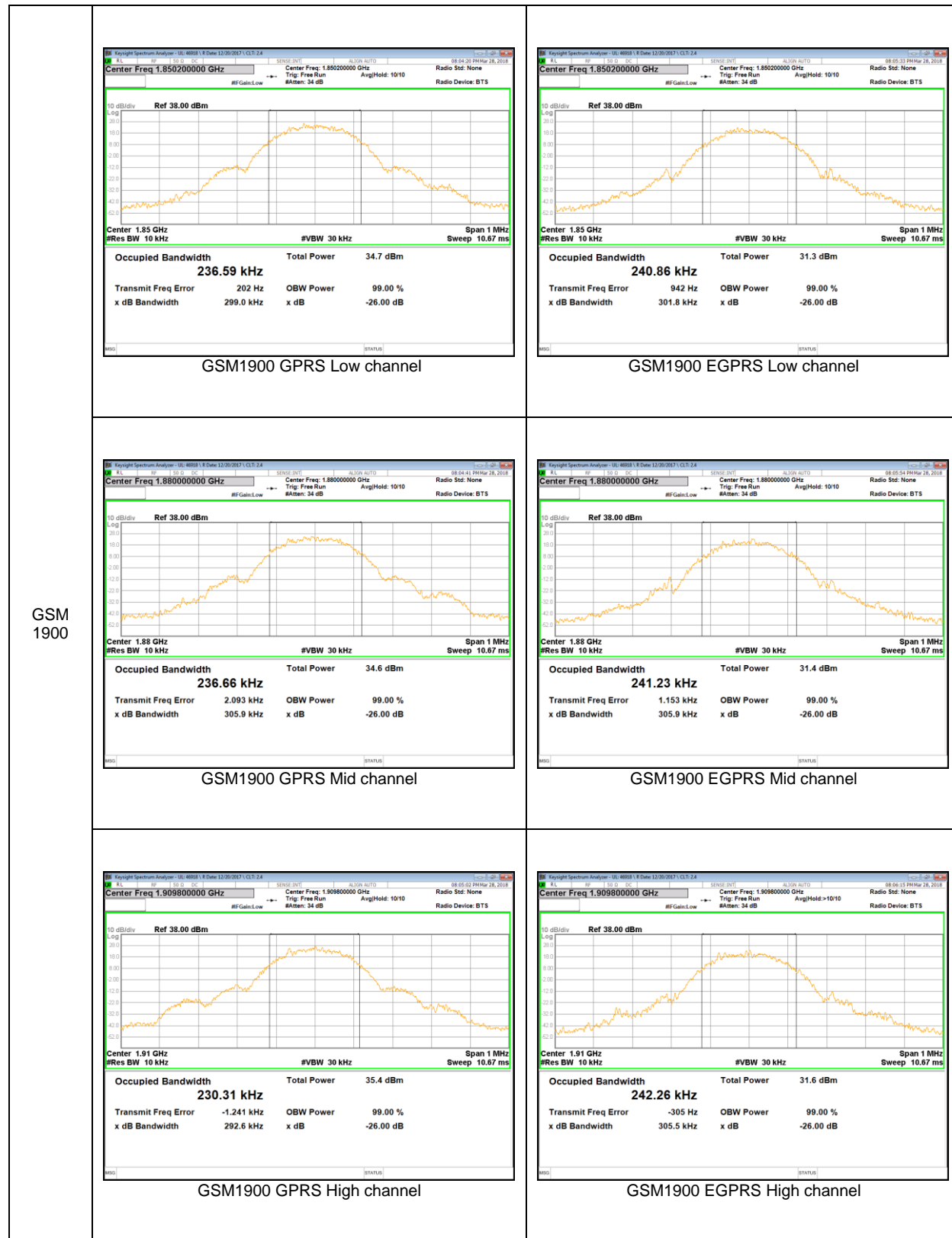
LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

### 9.1.2. OCCUPIED BANDWIDTH PLOTS

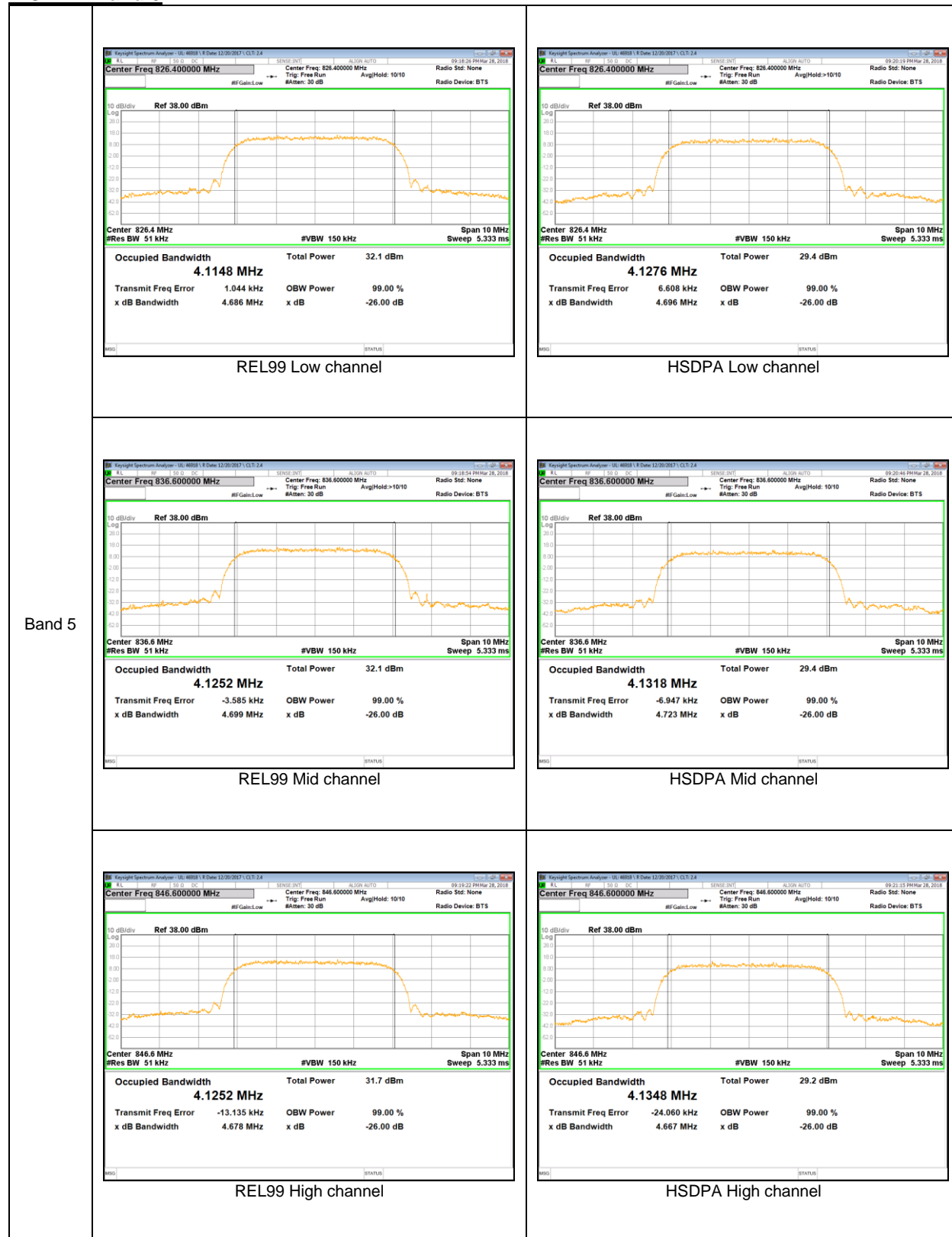
#### GSM 850



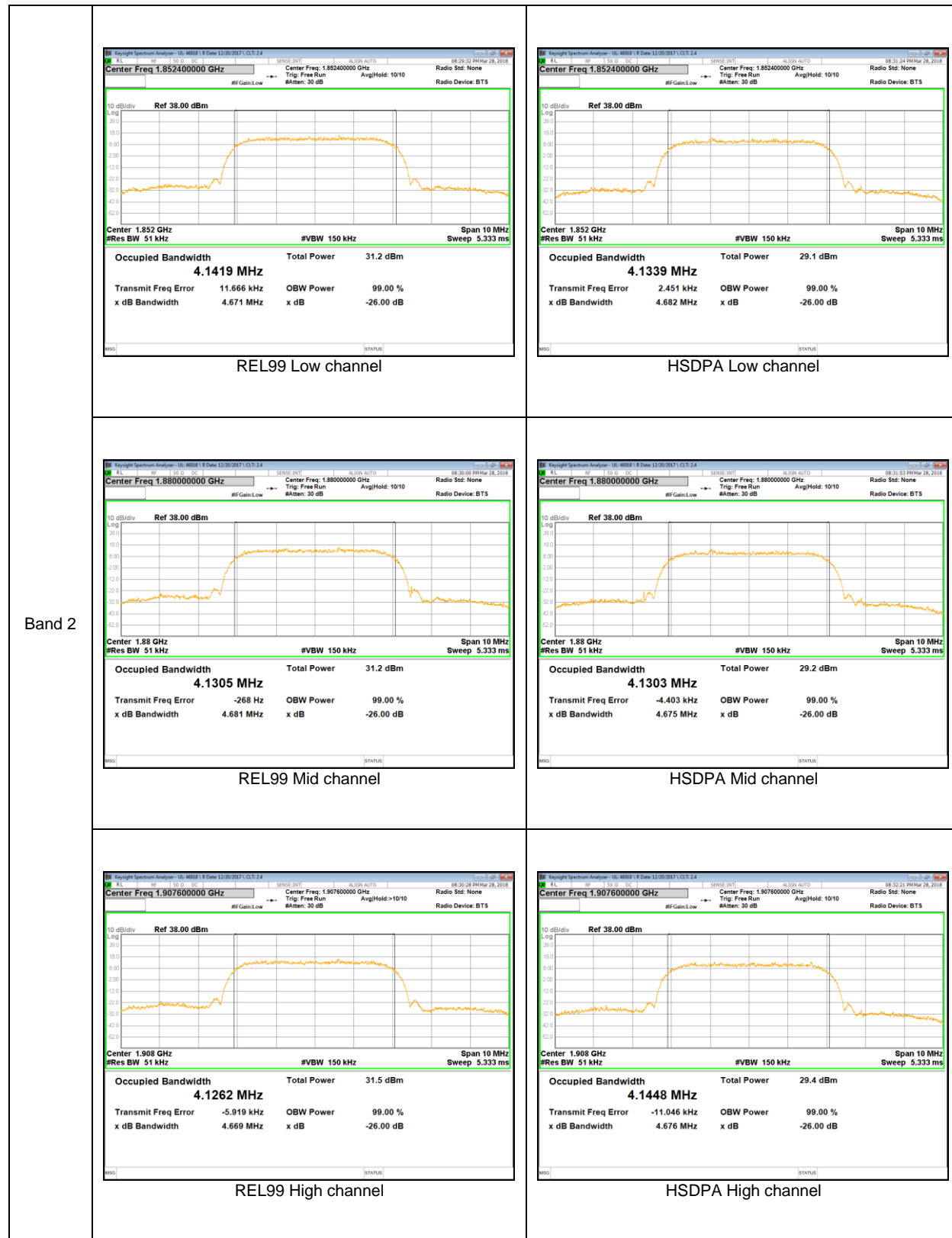
**GSM 1900**



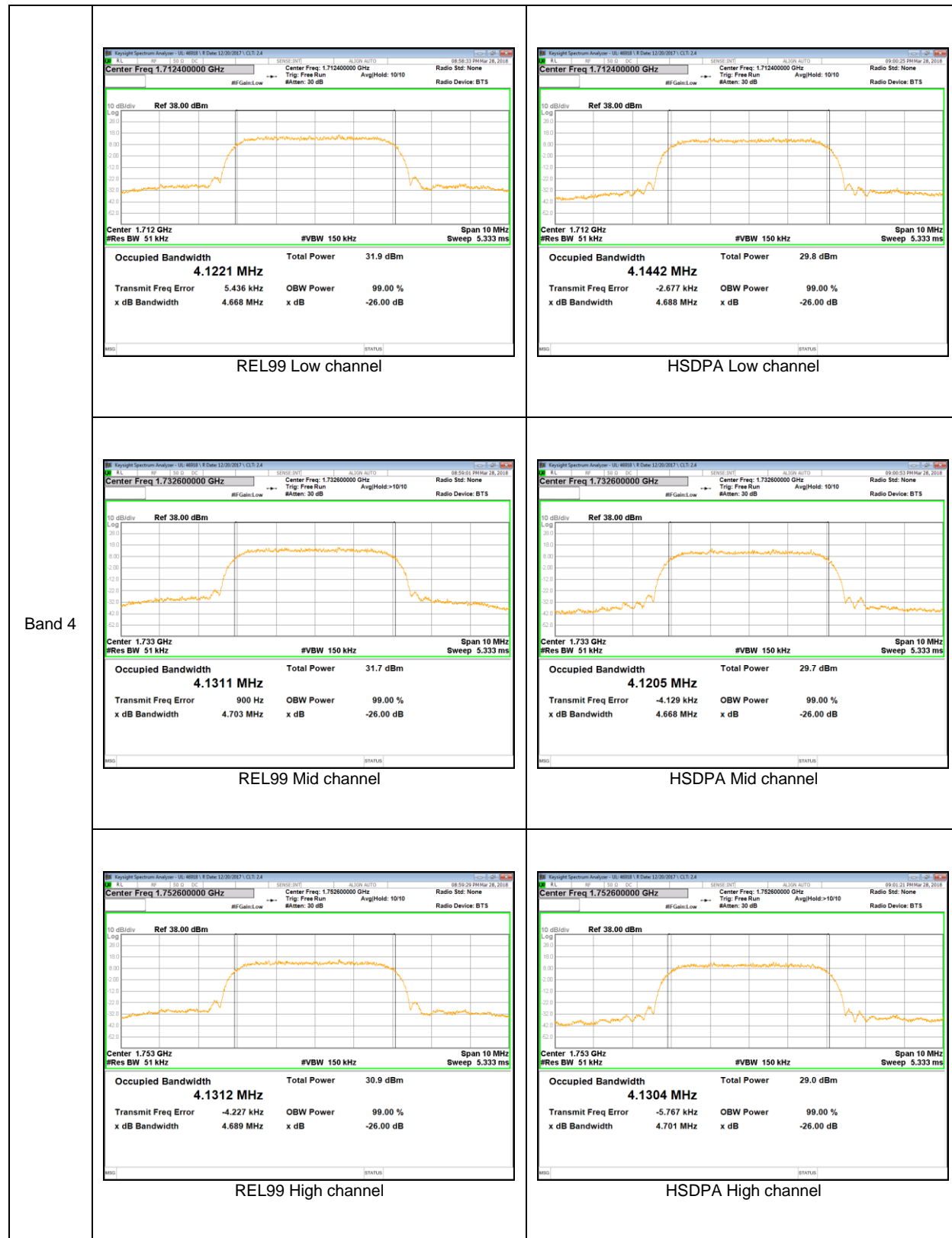
**WCDMA Band 5**



**WCDMA Band 2**



**WCDMA Band 4**



**LTE Band 5**

