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 and DTS b/g/n

MODEL NUMBER : SM-J600G/DS, SM-J600G

FCC ID: A3LSMJ600G

REPORT NUMBER: 4788397759-E4V2

ISSUE DATE: APR 13, 2018

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

Prepared by
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ACCREDITED
Testing Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	04/10/18	Initial issue	Hoonpyo Lee
V2	04/13/18	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-J600G/DS, SM-J600G
SERIAL NUMBER:	R38K20GLBMB, R38K20GLBNH (RADIATED, Original); R38K20GLBSY (CONDUCTED, Original); R38K20GQ12X (RADIATED, Spot check & Additional test); R38K20GQ16L (CONDUCTED, Additional test);
DATE TESTED:	MAR 28, 2018 - APR 09, 2018 (Original) APR 04, 2018 – APR 10, 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.

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.

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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMJ600F WWAN(FCC CFR 47 Part 22/24/27). 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: A3LSMJ600G shares the same enclosure and circuit board as FCC ID: A3LSMJ600F. The WWAN antennas and surrounding circuitry and layout regarding test data re-used bands are identical between these two units. The FCC ID: A3LSMJ600G, some components for additional bands newly mounted and additional bands enabled by SW. Difference for these two units, PED document described in details.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMJ600F remains representative of FCC ID: A3LSMJ600G. The test data of FCC ID: A3LSMJ600F being submitted for this application to cover WWAN re-used bands features.

- Reuse bands - GSM850, GSM1900, WCDMA Band 5, WCDMA Band4, WCDMA Band 2, LTE Band 2, LTE Band 5, LTE Band 4 (Covered by LTE B66), LTE Band 12, LTE Band 17 (Covered by LTE Band 12), LTE Band 66.

- Additional test bands for FCC ID : A3LSMJ600G - LTE Band 13, LTE Band 41.

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1.3. SPOT CHECK VERIFICATION DATA

Band	Test Item	Worst Mode	Frequency (MHz)	Test Limit	Original model SM-J600F/DS Results FCC ID : A3LSMJ600F	Spot check model SM-J600G/DS Results FCC ID : A3LSMJ600G	Deviation	Remark
GSM850	ERP	GPRS	836.6	38.50 dBm	27.87 dBm	28.33 dBm	0.46 dB	
	RSE	GPRS	824.1	-13.00 dBm	-40.60 dBm	-41.50 dBm	-0.90 dB	2nd Harmonic
GSM1900	EIRP	GPRS	1909.8	33.00 dBm	30.13 dBm	30.36 dBm	0.23 dB	
	RSE	GPRS	1850.2	-13.00 dBm	-47.60 dBm	-48.10 dBm	-0.50 dB	3rd Harmonic
WCDMA Band 2	EIRP	REL99	1880.0	33.00 dBm	21.53 dBm	20.72 dBm	-0.81 dB	
	RSE	HSDPA	1880.0	-13.00 dBm	-41.30 dBm	-41.00 dBm	0.30 dB	2nd Harmonic
WCDMA Band 4	EIRP	REL99	1732.6	30.00 dBm	20.84 dBm	20.70 dBm	-0.14 dB	
	RSE	REL99	1752.6	-13.00 dBm	-42.90 dBm	-42.40 dBm	0.50 dB	3rd Harmonic
WCDMA Band 5	ERP	REL99	846.6	38.50 dBm	18.04 dBm	17.92 dBm	-0.12 dB	
	RSE	REL99	846.6	-13.00 dBm	-39.70 dBm	-37.60 dBm	2.10 dB	3rd Harmonic
LTE Band 2	EIRP	20M QPSK	1900.0	33.00 dBm	22.55 dBm	22.33 dBm	-0.22 dB	
	RSE	1.4 16QAM	1850.7	-13.00 dBm	-32.10 dBm	-35.70 dBm	-3.60 dB	2nd Harmonic
LTE Band 5	ERP	10M QPSK	844.0	38.50 dBm	17.19 dBm	16.26 dBm	-0.93 dB	
	RSE	3M QPSK	847.5	-13.00 dBm	-53.40 dBm	-54.90 dBm	-1.50 dB	2nd Harmonic
LTE Band 12	ERP	10M QPSK	711.0	34.80 dBm	13.20 dBm	12.25 dBm	-0.95 dB	
	RSE	3M 16QAM	700.5	-13.00 dBm	-49.10 dBm	-48.20 dBm	0.90 dB	2nd Harmonic
LTE Band 66	EIRP	15M QPSK	1717.5	30.00 dBm	22.22 dBm	21.20 dBm	-1.02 dB	
	RSE	20M QPSK	1745.0	-13.00 dBm	-36.60 dBm	-37.00 dBm	-0.40 dB	3rd Harmonic

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

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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 Tittle / Section
DTS	A3LSMJ600F	Grant	4788397760-E1V2	Test	FCC Report DTS WLAN / All sections
			4788397760-E2V2	Test	FCC Report BLE All sections
DSS	A3LSMJ600F	Grant	4788397760-E3V2	Test	FCC Report BT / All sections
PCE	A3LSMJ600F	Grant	4788397760-E4V2	Test	FCC Report WWAN / All sections

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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

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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 = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss(between the SG and substitution antenna) + Substitution Antenna Factor (dBi)

ERP = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss(between the SG and substitution antenna)

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

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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%.

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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 [MHz]	Modulation	Radiated	
			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

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WCDMA

FCC Part 22/24				
Band	Frequency Range [MHz]	Modulation	Radiated	
			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

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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.

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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.

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LTE Band 13

FCC Part 27					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Radiated	
				Avg [dBm]	Avg [mW]
Band 13	777 ~ 787	10	QPSK	15.46	35.16
			16QAM	14.49	28.12
		5	QPSK	15.18	32.96
			16QAM	14.19	26.24

LTE Band 41

FCC Part 27					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Radiated	
				Avg [dBm]	Avg [mW]
Band 41	2496-2690	20	QPSK	20.01	100.23
			16QAM	19.11	81.47
		15	QPSK	20.18	104.23
			16QAM	19.22	83.56
		10	QPSK	19.75	94.41
			16QAM	18.92	77.98
		5	QPSK	19.66	92.47
			16QAM	18.89	77.45

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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
LTE Band 41 2496 ~ 2690 MHz	-0.4
LTE Band 13 777 ~ 787 MHz	-2.9

5.4. WORST-CASE ORIENTATION

For GSM1900 / WCDMA Band 2 / LTE Band2 / WCDMA Band 4 / LTE Band 12 / 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 13 the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; 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)

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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.

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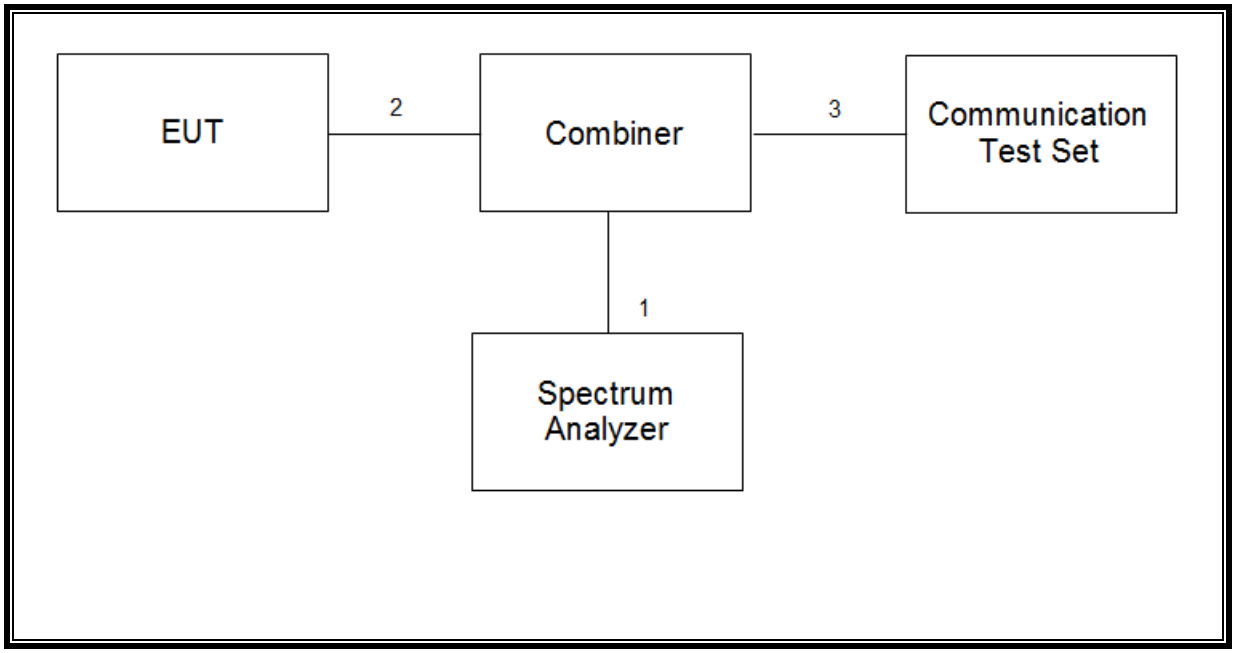
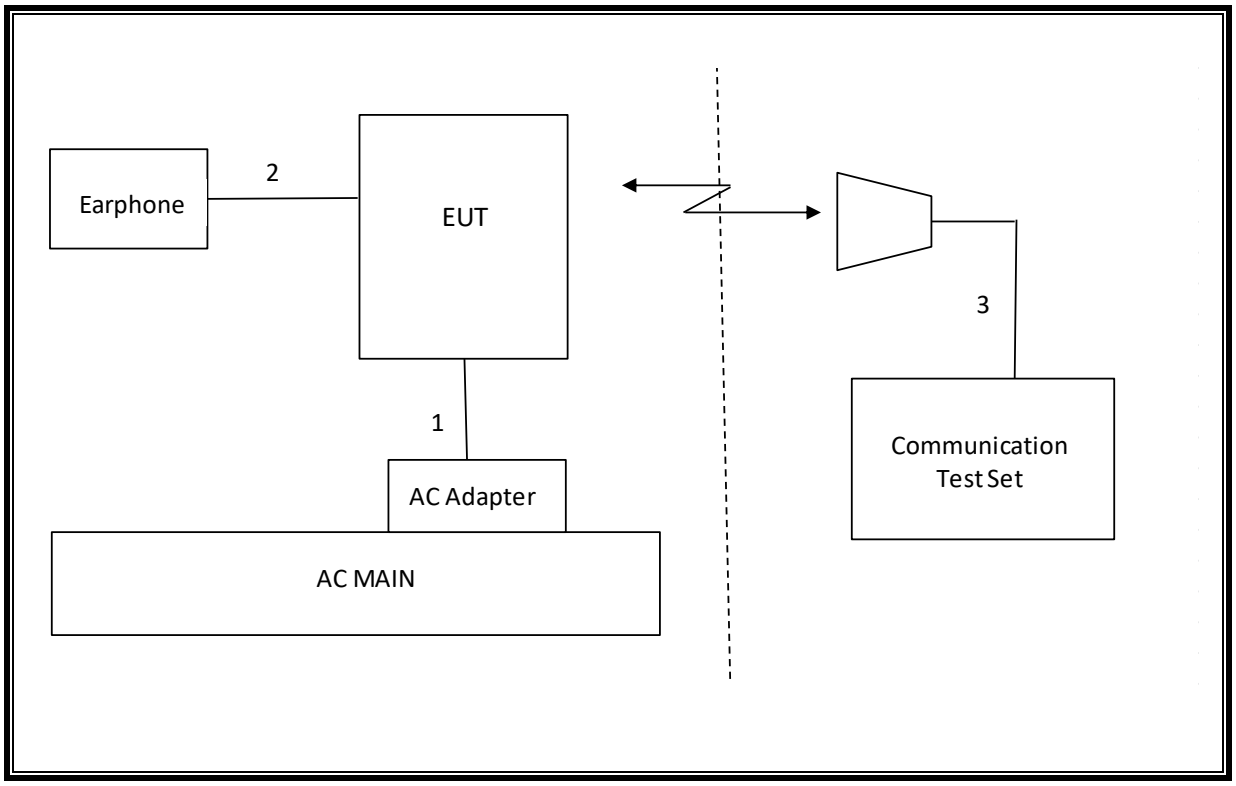
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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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	WEINSCHEL	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	PASTERNACK	PE7087-10	A009	08-08-18
Attenuator	PASTERNACK	PE7087-10	A001	08-08-18
Attenuator	PASTERNACK	PE7087-10	A008	08-08-18
Attenuator	PASTERNACK	PE7087-10	2	08-10-18
Attenuator	PASTERNACK	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	

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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(c),(g),(h)	Band Edge / Conducted Spurious Emission	-13dBm		Pass
27.53(m)	Conducted Spurious Emission	-25 dBm		Pass
27.53(m)	Emission mask	Section 9.2.2		Pass
2.1046	Conducted output power	N/A		See the RF exposure test report. (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	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(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		Pass
27.53(f)		-40dBm		Pass
27.53(m)		-25dBm		Pass

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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 41						
27M	2506.0 - 2680.0	0.100	2.5 ppm	17M92G7W	20	QPSK
27M	2506.0 - 2680.0	0.081	2.5 ppm	17M86D7W	20	16QAM
27M	2503.5 - 2682.5	0.104	2.5 ppm	13M44G7W	15	QPSK
27M	2503.5 - 2682.5	0.084	2.5 ppm	13M45D7W	15	16QAM
LTE Band 13						
27F	782	0.035	2.5 ppm	8M96G7W	10	QPSK
27F	782	0.028	2.5 ppm	8M96D7W	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

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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	

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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	
Band 13	10	23230	782	QPSK	4.44	
				16QAM	5.64	
	5			QPSK	4.35	
				16QAM	5.44	

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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.

LTE Band41

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 41	20	40620	2593	QPSK	5.70	13.00
				16QAM	6.86	
	15			QPSK	5.91	
				16QAM	6.52	
	10			QPSK	6.11	
				16QAM	6.95	
	5			QPSK	6.05	
				16QAM	6.89	

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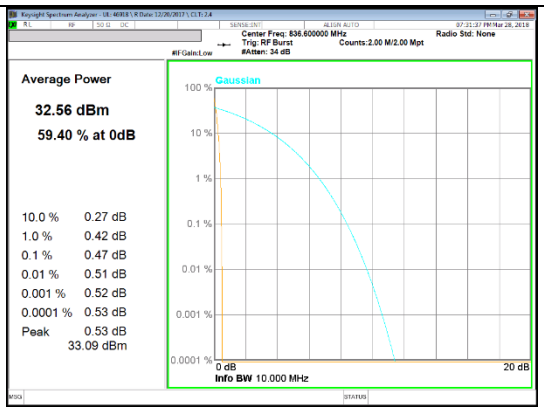
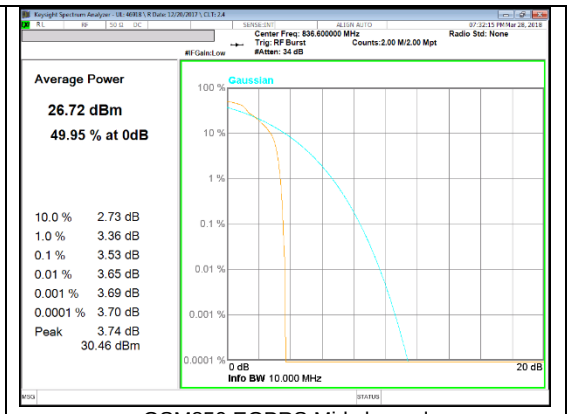
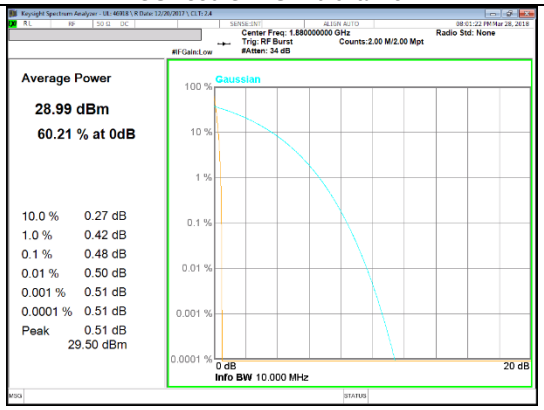
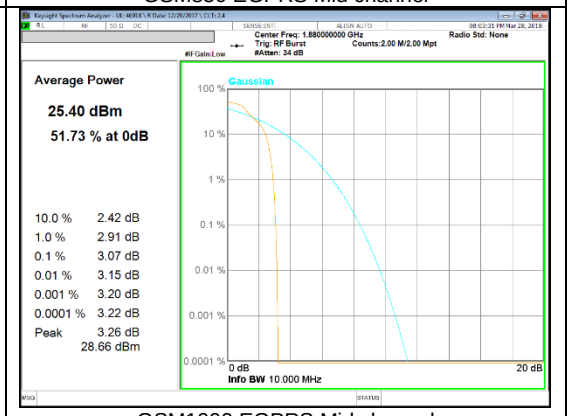
8.2. CONDUCTED PEAK TO AVERAGE PLOTS

GSM

GSM 850	 GSM850 GPRS Mid channel	 GSM850 EGPRS Mid channel
GSM 1900	 GSM1900 GPRS Mid channel	 GSM1900 EGPRS Mid channel

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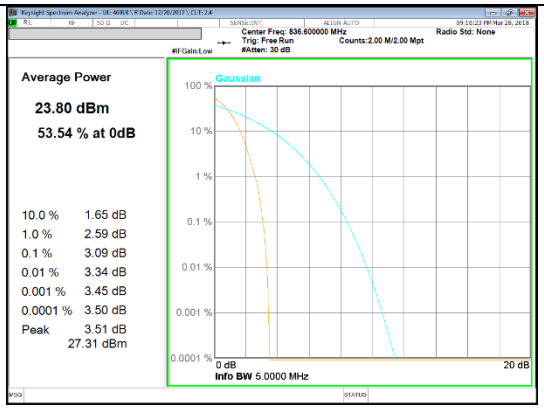
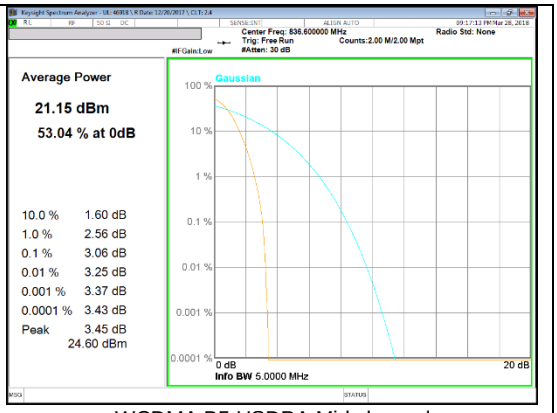
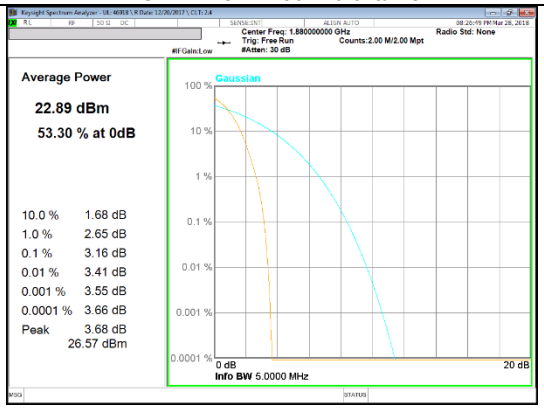
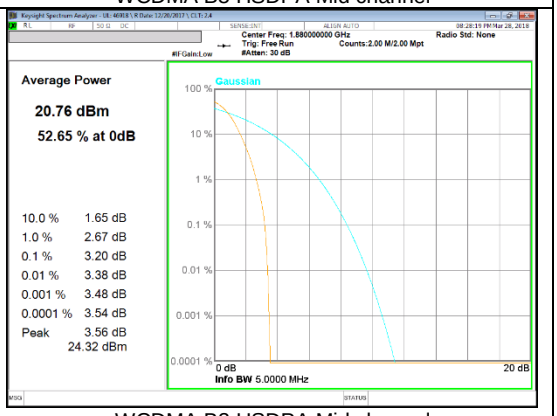
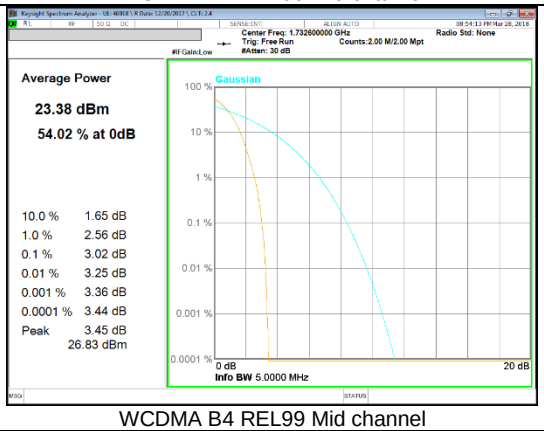
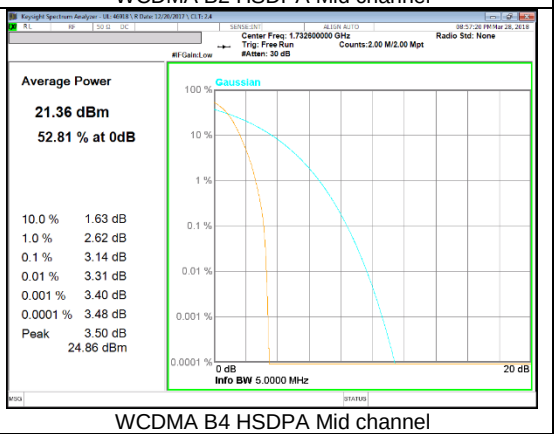
WCDMA

WCDMA Band 5	 WCDMA B5 REL99 Mid channel	 WCDMA B5 HSDPA Mid channel
WCDMA Band 2	 WCDMA B2 REL99 Mid channel	 WCDMA B2 HSDPA Mid channel
WCDMA Band 4	 WCDMA B4 REL99 Mid channel	 WCDMA B4 HSDPA Mid channel

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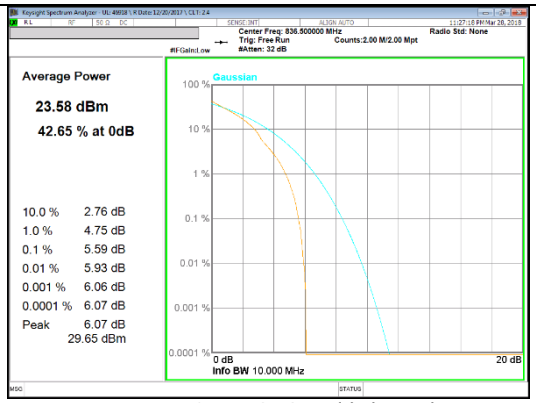
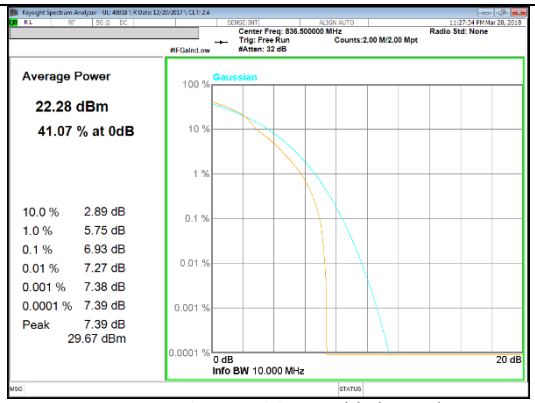
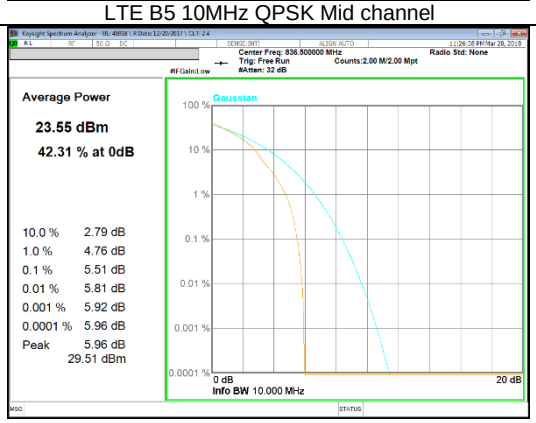
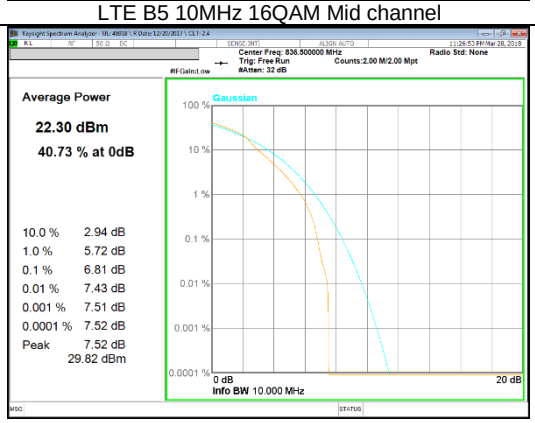
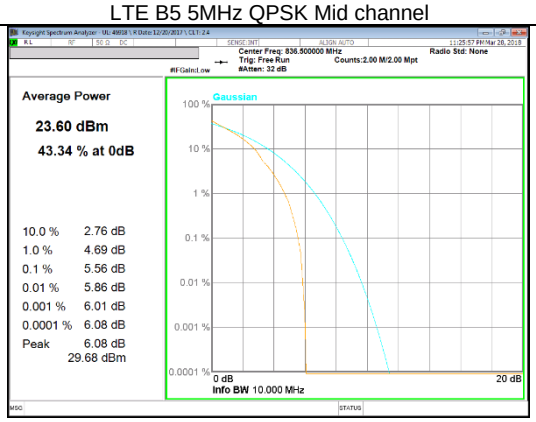
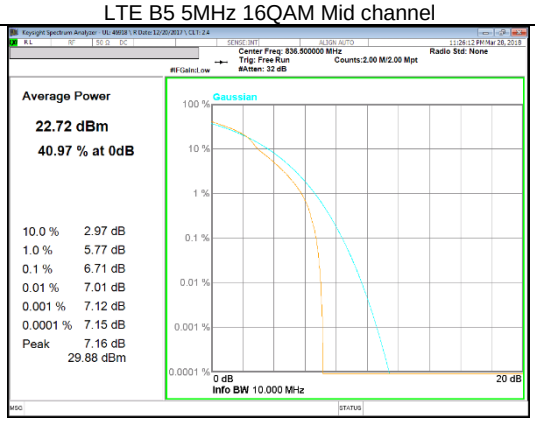
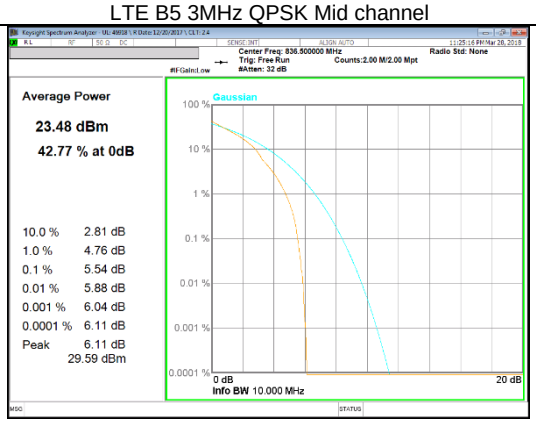
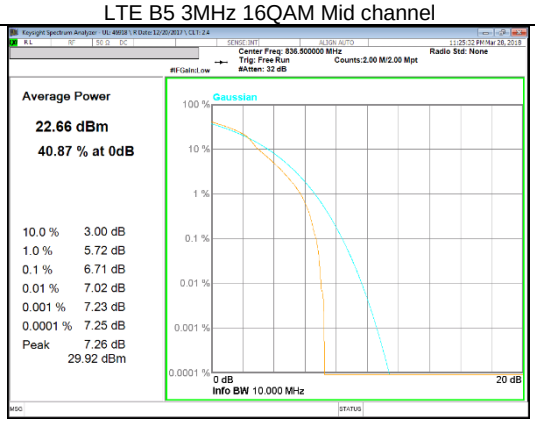
LTE Band 5

LTE Band 5 10 MHz	 LTE B5 10MHz QPSK Mid channel	 LTE B5 10MHz 16QAM Mid channel
LTE Band 5 5 MHz	 LTE B5 5MHz QPSK Mid channel	 LTE B5 5MHz 16QAM Mid channel
LTE Band 5 3 MHz	 LTE B5 3MHz QPSK Mid channel	 LTE B5 3MHz 16QAM Mid channel
LTE Band 5 1.4 MHz	 LTE B5 1.4MHz QPSK Mid channel	 LTE B5 1.4MHz 16QAM Mid channel

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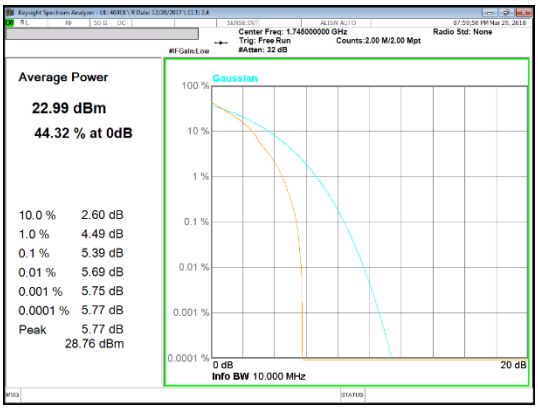
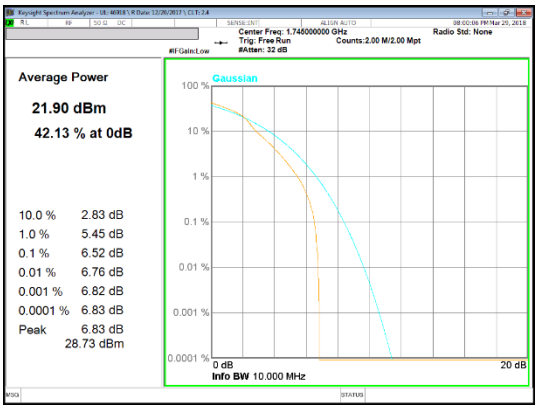
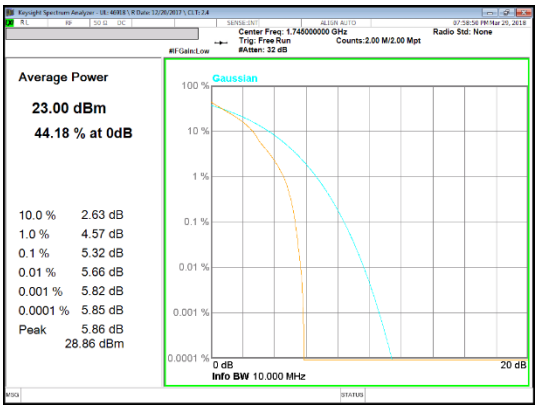
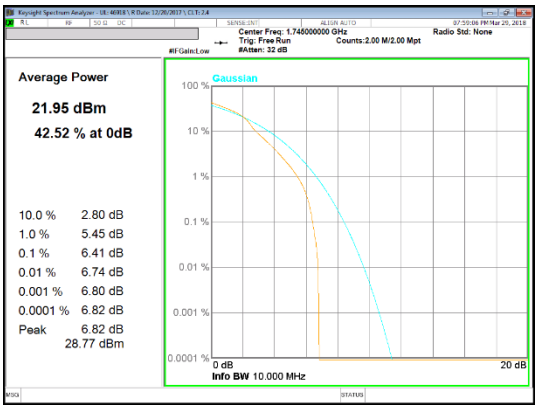
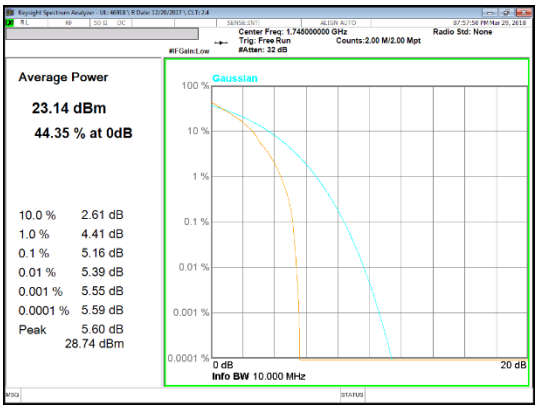
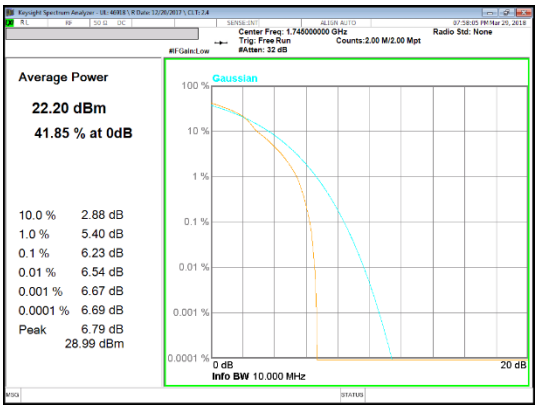
LTE Band 66

LTE Band 66 20 MHz	 LTE B66 20MHz QPSK Mid channel	 LTE B66 20MHz 16QAM Mid channel
LTE Band 66 15 MHz	 LTE B66 15MHz QPSK Mid channel	 LTE B66 15MHz 16QAM Mid channel
LTE Band 66 10 MHz	 LTE B66 10MHz QPSK Mid channel	 LTE B66 10MHz 16QAM Mid channel

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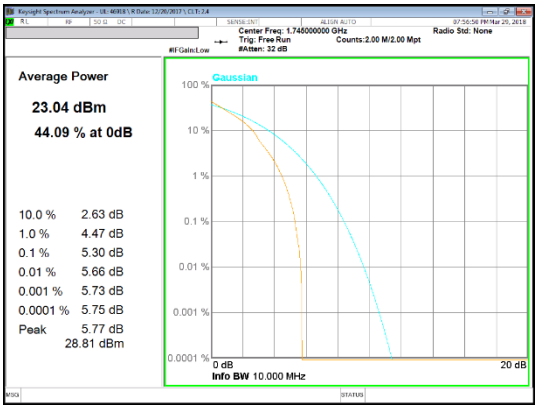
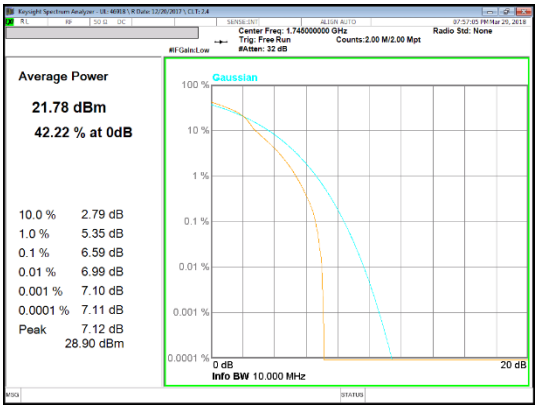
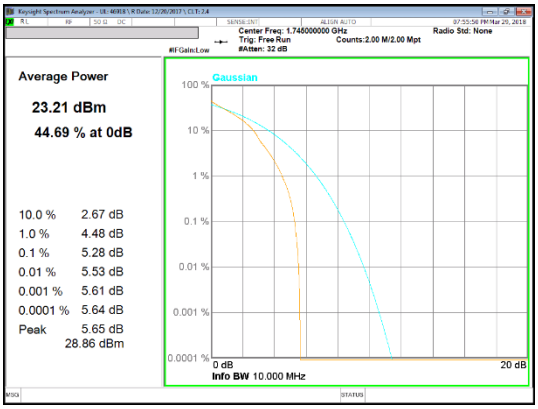
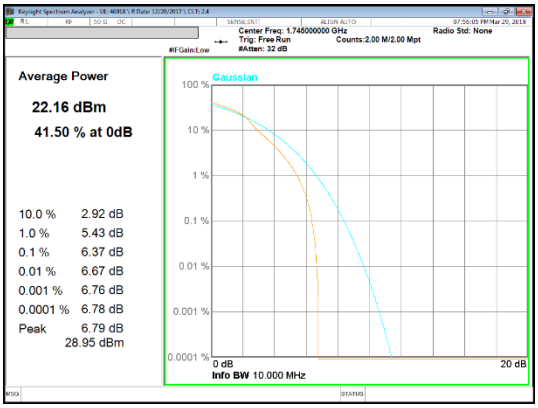
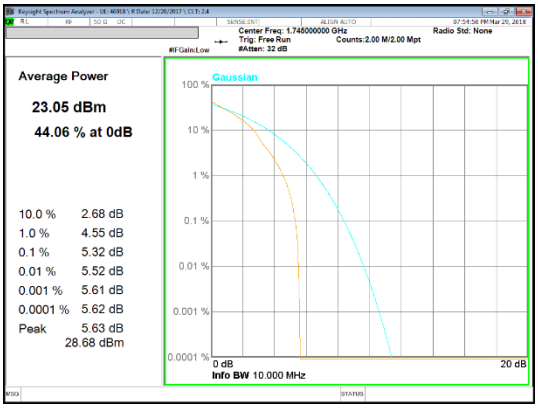
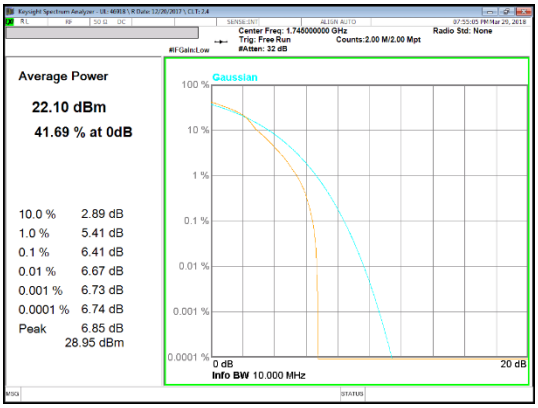
LTE Band 66 5 MHz	 LTE B66 5MHz QPSK Mid channel	 LTE B66 5MHz 16QAM Mid channel
LTE Band 66 3 MHz	 LTE B66 3MHz QPSK Mid channel	 LTE B66 3MHz 16QAM Mid channel
LTE Band 66 1.4 MHz	 LTE B66 1.4MHz QPSK Mid channel	 LTE B66 1.4MHz 16QAM Mid channel

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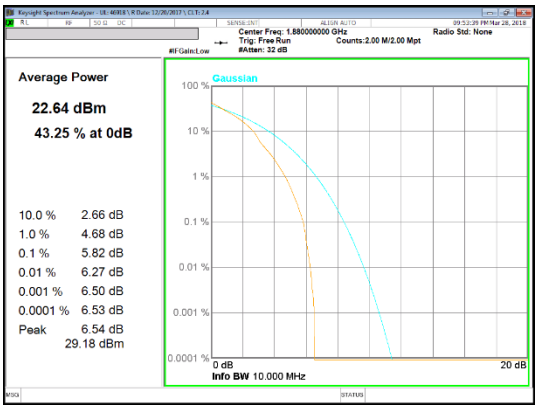
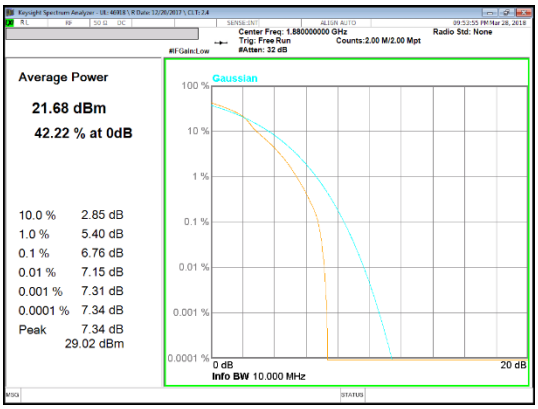
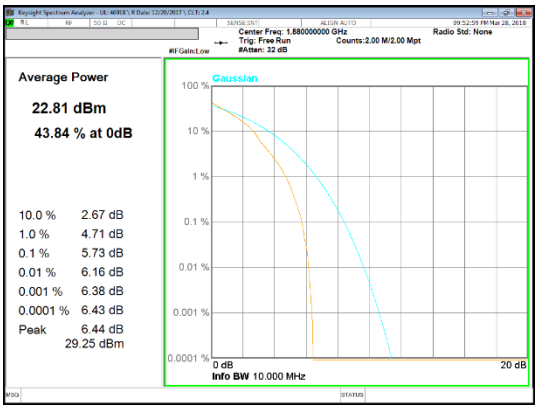
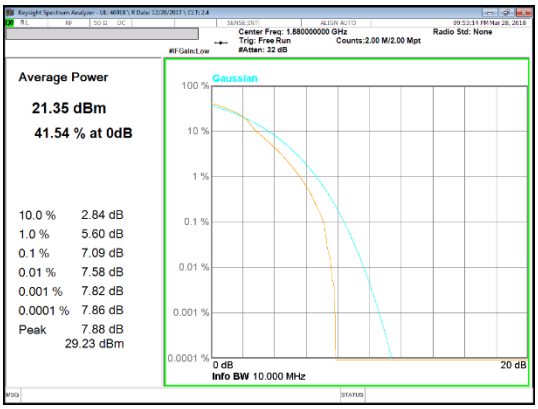
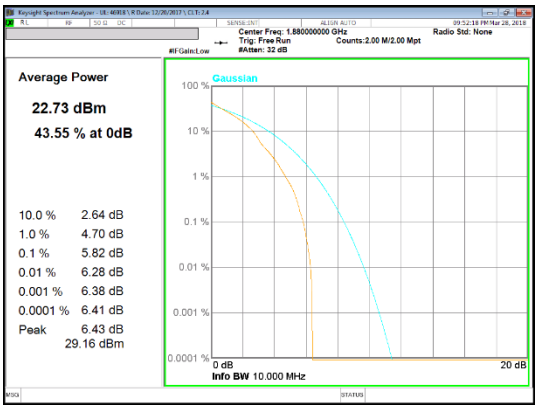
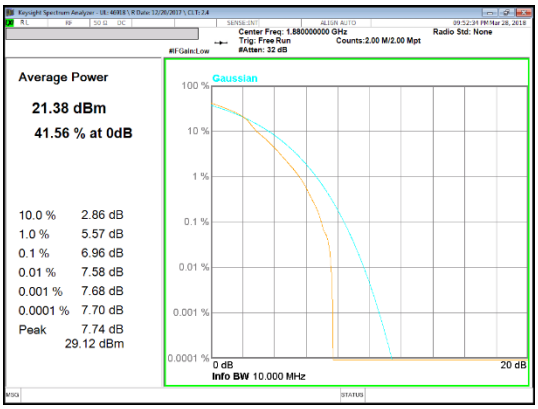
LTE Band 2

LTE Band 2 20 MHz	 LTE B2 20MHz QPSK Mid channel	 LTE B2 20MHz 16QAM Mid channel
LTE Band 2 15 MHz	 LTE B2 15MHz QPSK Mid channel	 LTE B2 15MHz 16QAM Mid channel
LTE Band 2 10 MHz	 LTE B2 10MHz QPSK Mid channel	 LTE B2 10MHz 16QAM Mid channel

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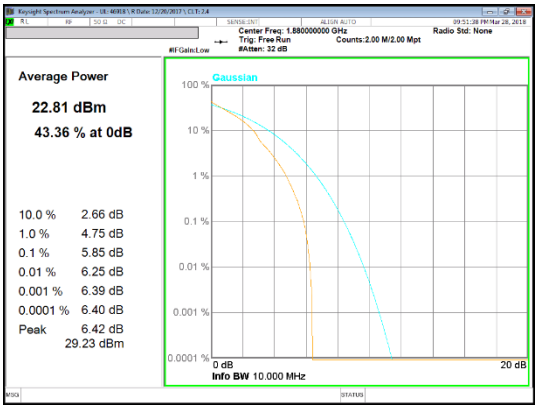
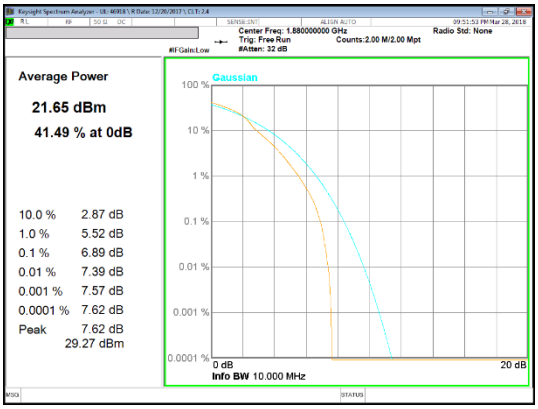
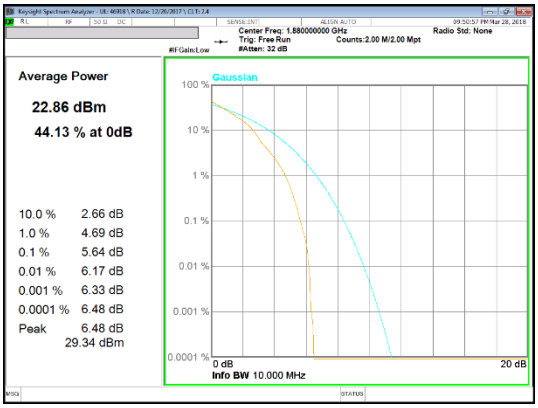
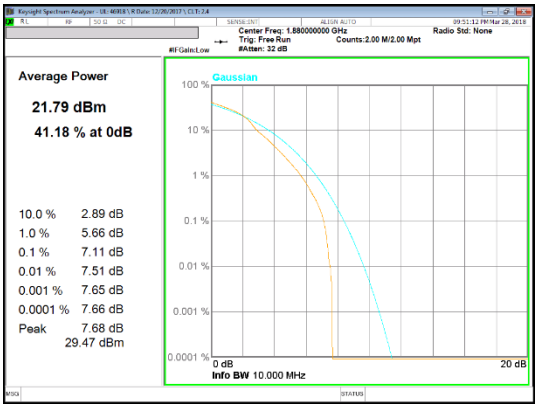
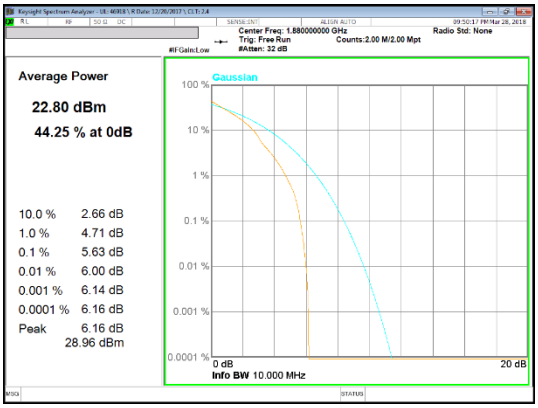
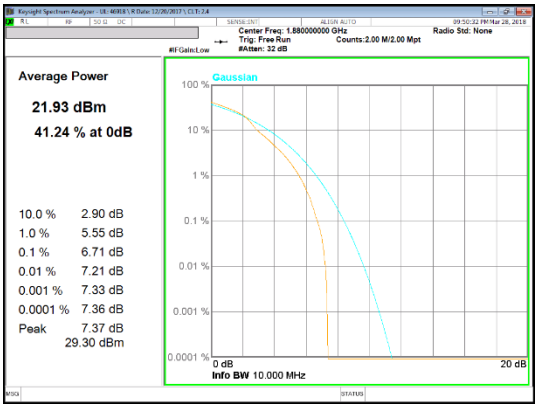
LTE Band 2 5 MHz	 LTE B2 5MHz QPSK Mid channel	 LTE B2 5MHz 16QAM Mid channel
LTE Band 2 3 MHz	 LTE B2 3MHz QPSK Mid channel	 LTE B2 3MHz 16QAM Mid channel
LTE Band 2 1.4 MHz	 LTE B2 1.4MHz QPSK Mid channel	 LTE B2 1.4MHz 16QAM Mid channel

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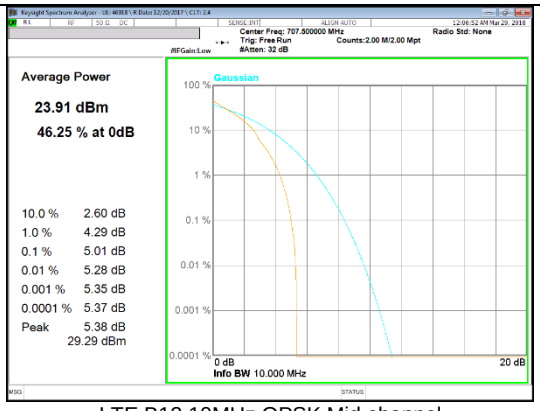
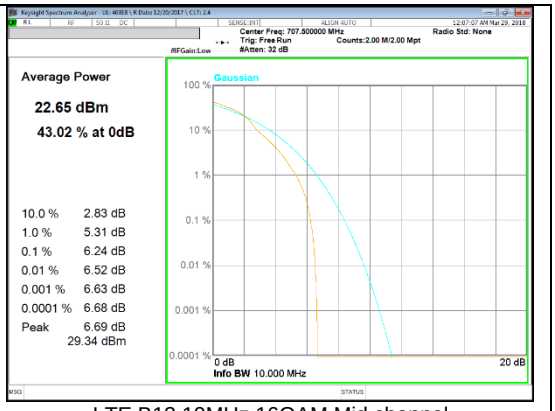
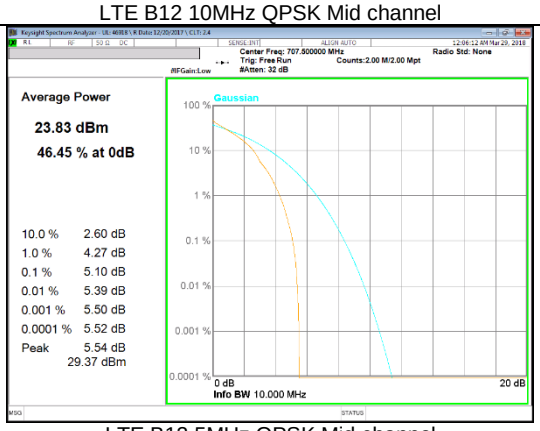
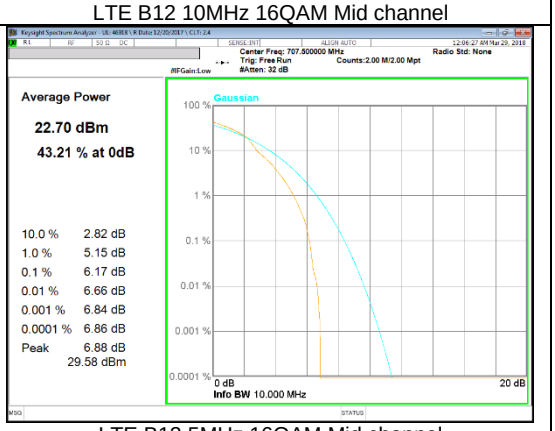
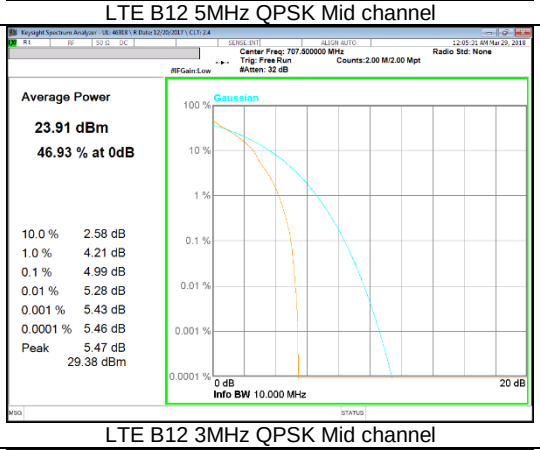
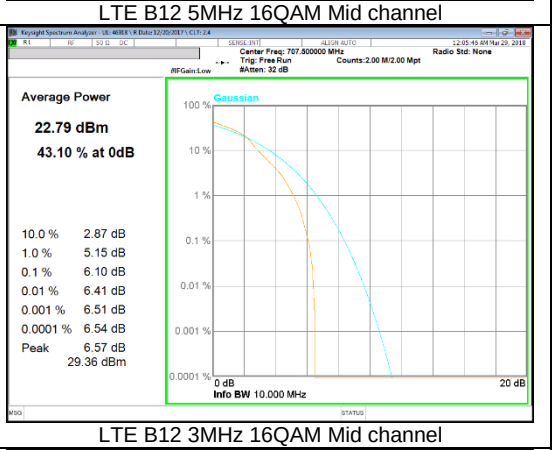
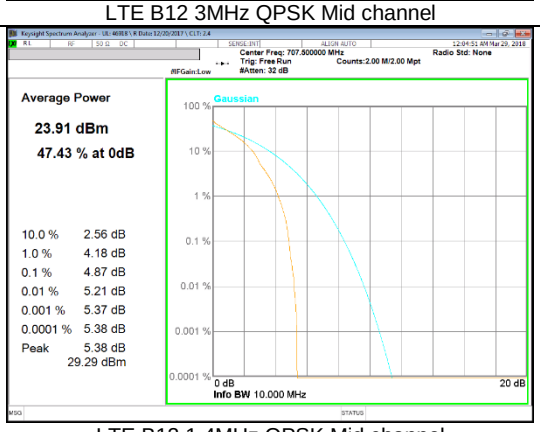
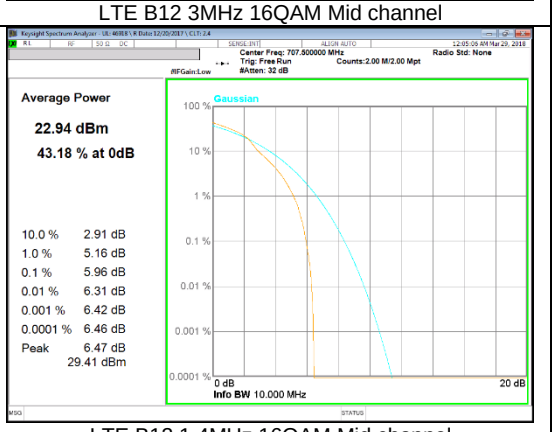
LTE Band 12

LTE Band 12 10 MHz	 LTE B12 10MHz QPSK Mid channel	 LTE B12 10MHz 16QAM Mid channel
LTE Band 12 5 MHz	 LTE B12 5MHz QPSK Mid channel	 LTE B12 5MHz 16QAM Mid channel
LTE Band 12 3 MHz	 LTE B12 3MHz QPSK Mid channel	 LTE B12 3MHz 16QAM Mid channel
LTE Band 12 1.4 MHz	 LTE B12 1.4MHz QPSK Mid channel	 LTE B12 1.4MHz 16QAM Mid channel

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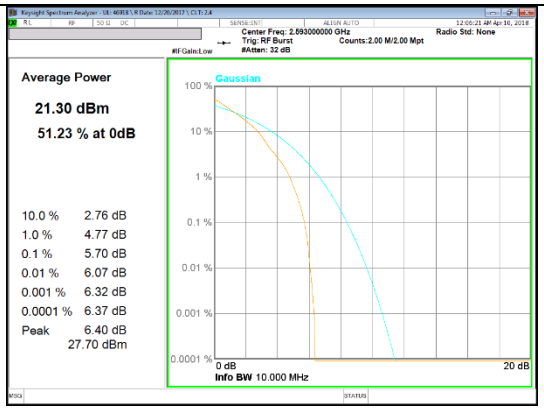
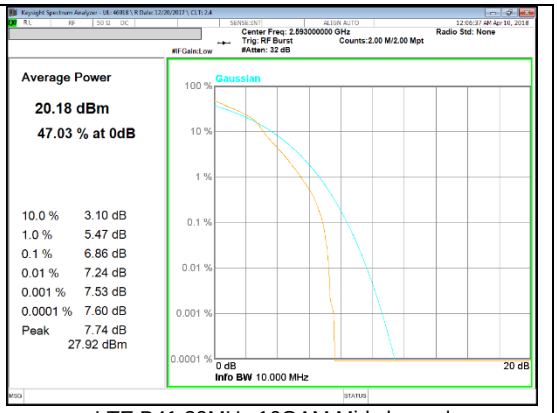
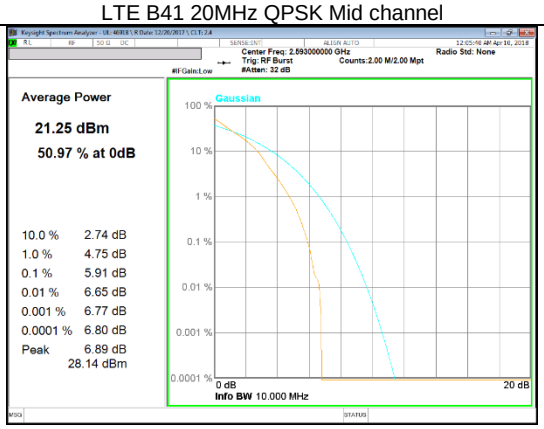
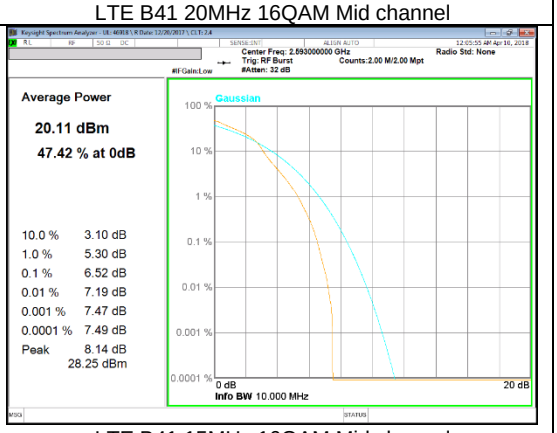
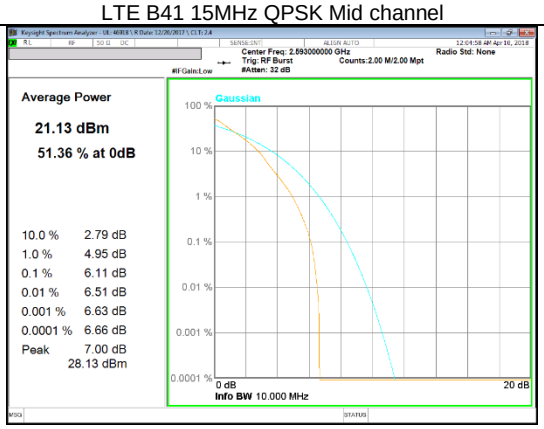
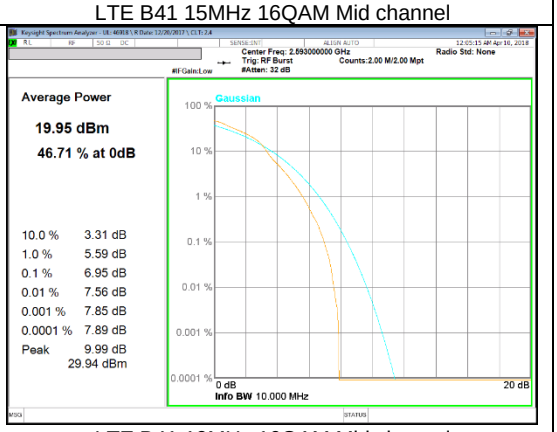
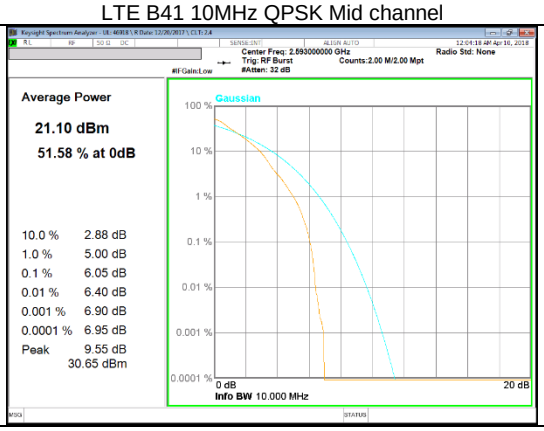
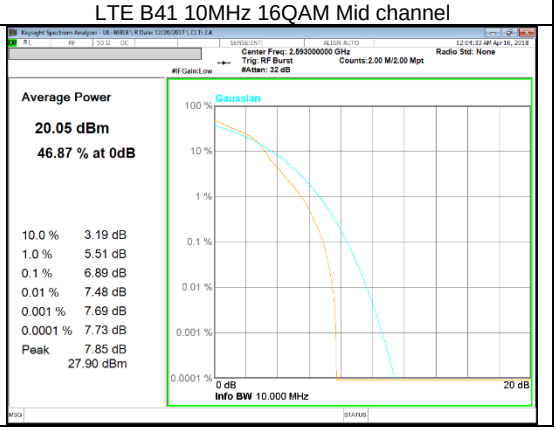
LTE Band 41

LTE Band 41 20 MHz	 LTE B41 20MHz QPSK Mid channel	 LTE B41 20MHz 16QAM Mid channel
LTE Band 41 15 MHz	 LTE B41 15MHz QPSK Mid channel	 LTE B41 15MHz 16QAM Mid channel
LTE Band 41 10 MHz	 LTE B41 10MHz QPSK Mid channel	 LTE B41 10MHz 16QAM Mid channel
LTE Band 41 5 MHz		

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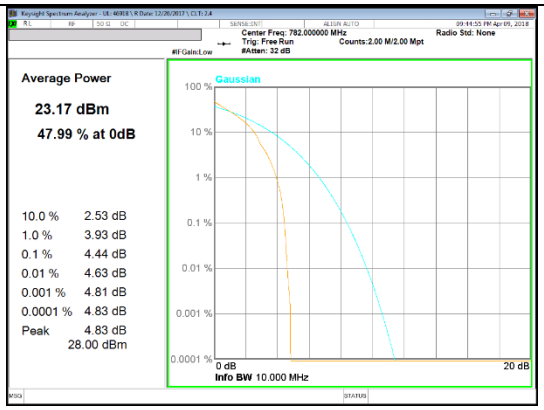
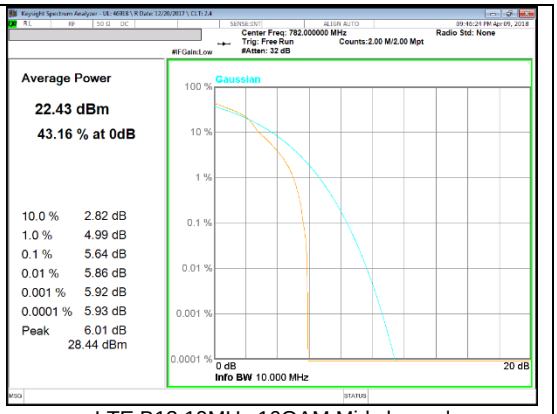
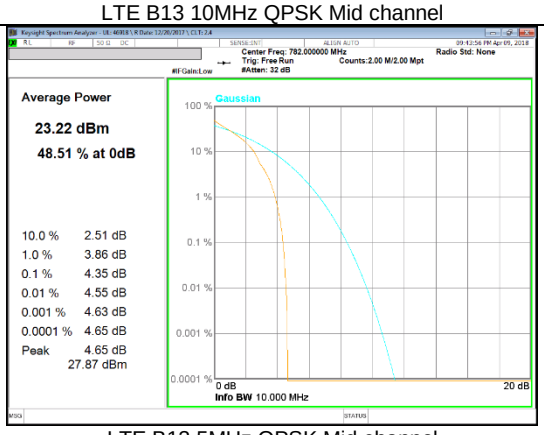
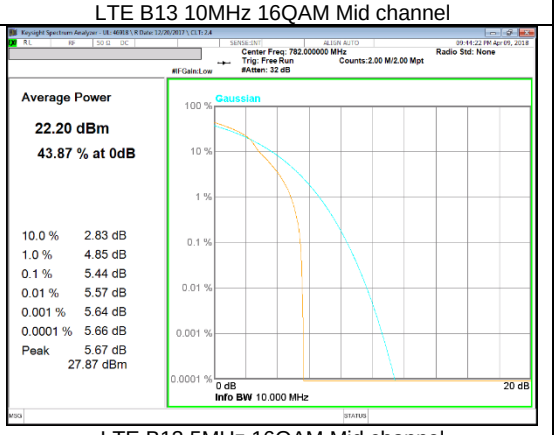
	LTE B41 5MHz QPSK Mid channel	LTE B41 5MHz 16QAM Mid channel

LTE Band 13

LTE Band 13 10 MHz	 LTE B13 10MHz QPSK Mid channel	 LTE B13 10MHz 16QAM Mid channel
LTE Band 13 5 MHz	 LTE B13 5MHz QPSK Mid channel	 LTE B13 5MHz 16QAM Mid channel

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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

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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

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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

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LTE Band 66

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 66	20	132072	1720.0	QPSK	17.874	19.700
				16QAM	17.874	19.600
		132322	1745.0	QPSK	17.876	19.660
				16QAM	17.853	19.470
		132572	1770.0	QPSK	17.881	19.690
				16QAM	17.839	19.600
	15	132047	1717.5	QPSK	13.439	15.460
				16QAM	13.456	15.050
		132322	1745.0	QPSK	13.446	15.030
				16QAM	13.465	15.290
		132597	1772.5	QPSK	13.445	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

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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

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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.

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LTE Band 41

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 41	20	35970	2506.0	QPSK	17.836	20.76
				16QAM	17.832	19.53
		40620	2593.0	QPSK	17.890	19.64
				16QAM	17.861	19.51
		41490	2680.0	QPSK	17.924	19.70
				16QAM	17.861	19.43
	15	39725	2503.5	QPSK	13.444	15.03
				16QAM	13.413	14.89
		40620	2593.0	QPSK	13.426	15.80
				16QAM	13.430	14.99
		41515	2682.5	QPSK	13.428	14.94
				16QAM	13.448	15.00
	10	39700	2501.0	QPSK	8.9623	10.18
				16QAM	8.9441	10.10
		40620	2593.0	QPSK	8.9550	10.16
				16QAM	8.9655	10.55
		41540	2685.0	QPSK	8.9520	10.05
				16QAM	8.9561	10.09
	5	39675	2498.5	QPSK	4.4853	5.254
				16QAM	4.4899	5.229
		40620	2593.0	QPSK	4.4910	5.184
				16QAM	4.5006	5.222
		41565	2687.5	QPSK	4.4997	5.284
				16QAM	4.4988	5.278

LTE Band 13

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 13	10	23230	782.0	QPSK	8.9586	10.24
				16QAM	8.9585	10.14
	5	23207	779.5	QPSK	4.4936	5.208
				16QAM	4.4923	5.141
		23230	782.0	QPSK	4.4965	5.200
				16QAM	4.5109	5.253
		23255	784.5	QPSK	4.4984	5.320
				16QAM	4.5016	5.314

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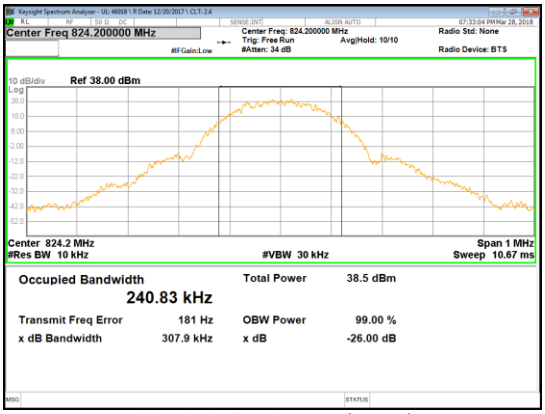
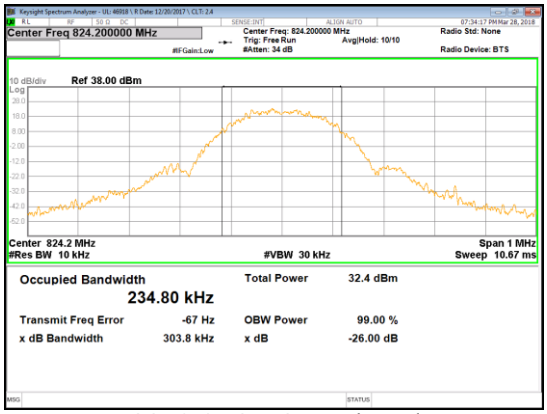
9.1.2. OCCUPIED BANDWIDTH PLOTS

GSM 850

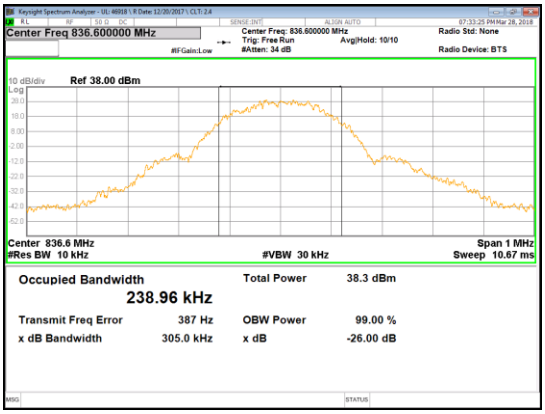
GSM 850



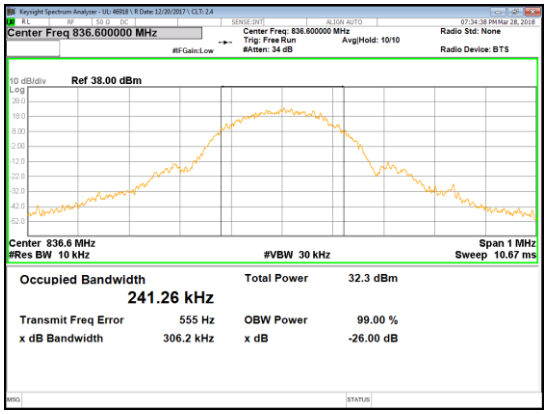
GSM850 GPRS Low channel



GSM850 EGPRS Low channel



GSM850 GPRS Mid channel



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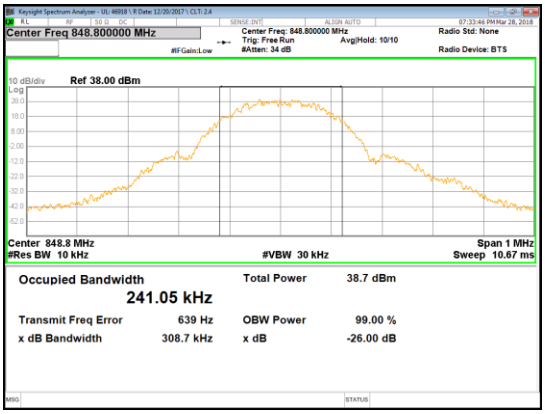
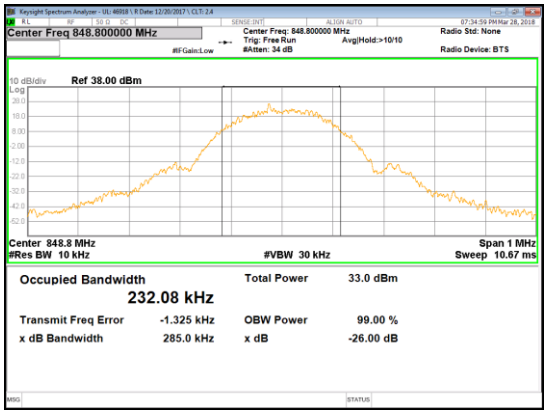


GSM850 GPRS High channel



GSM850 EGPRS High channel

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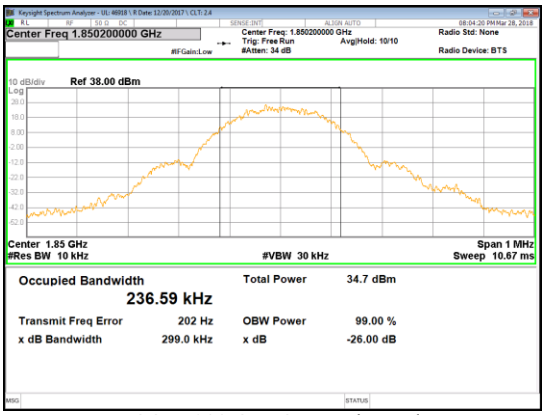
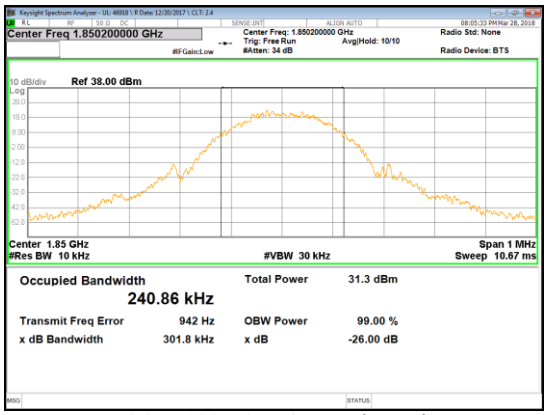
GSM 1900

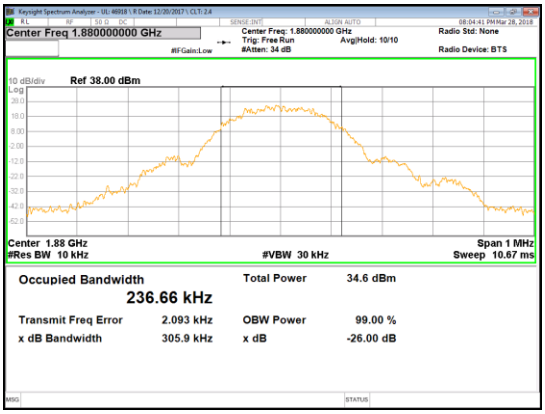
GSM 1900



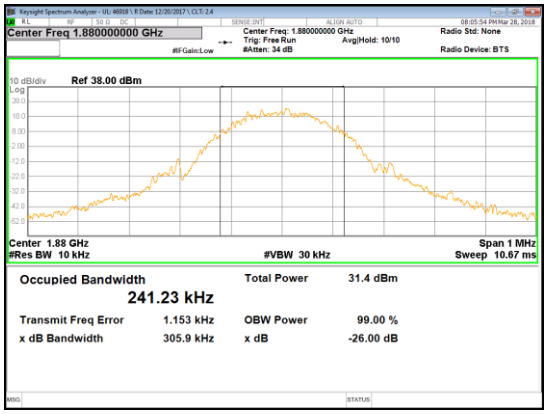
GSM1900 GPRS Low channel



GSM1900 EGPRS Low channel



GSM1900 GPRS Mid channel



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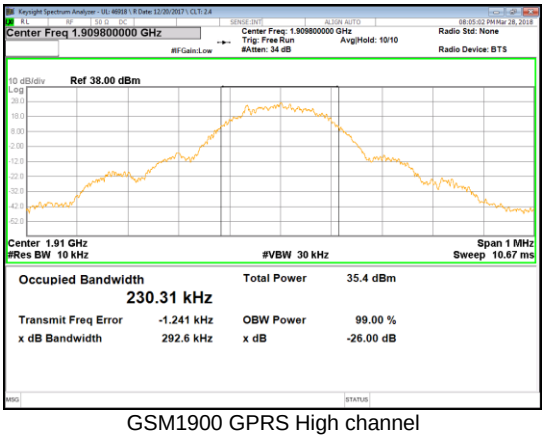
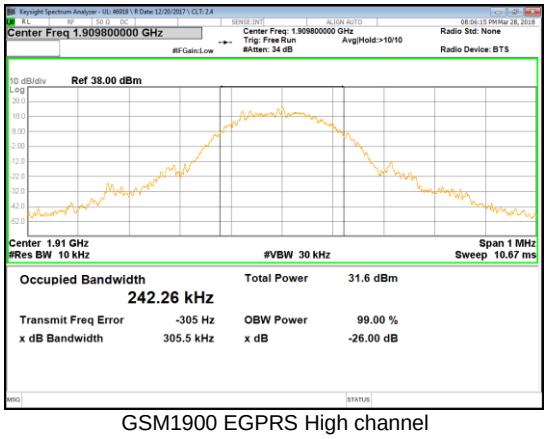


GSM1900 GPRS High channel



GSM1900 EGPRS High channel

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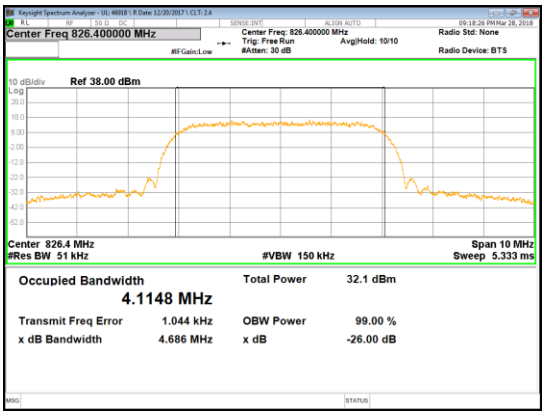
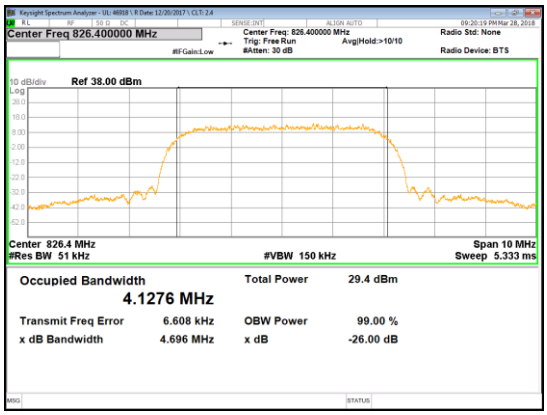
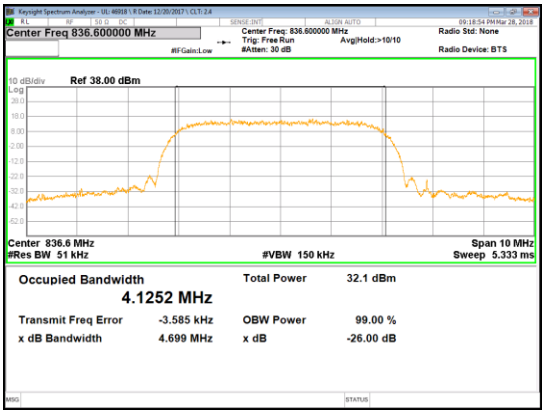
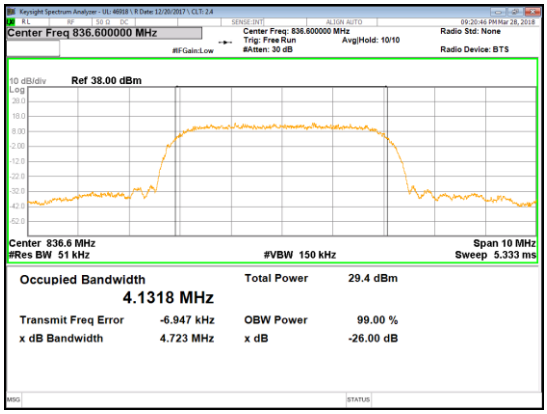
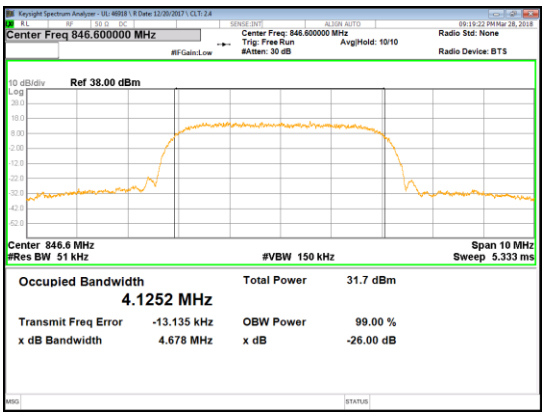
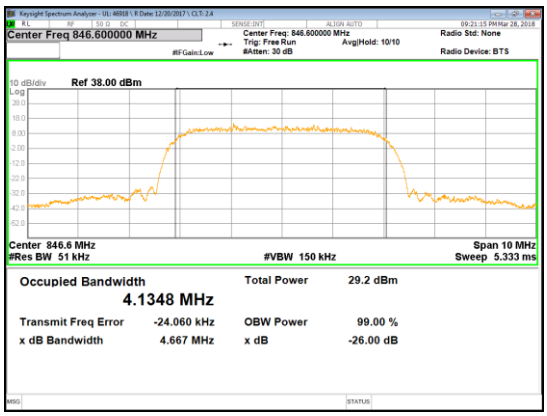
WCDMA Band 5

Band 5	 REL99 Low channel	 HSDPA Low channel
	 REL99 Mid channel	 HSDPA Mid channel
	 REL99 High channel	 HSDPA High channel

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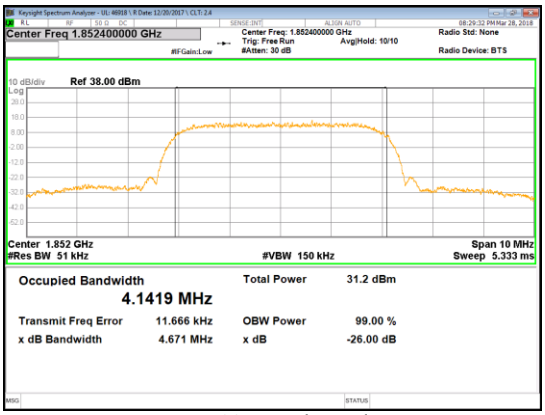
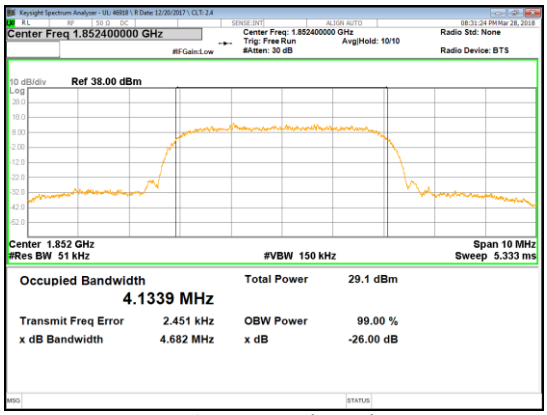
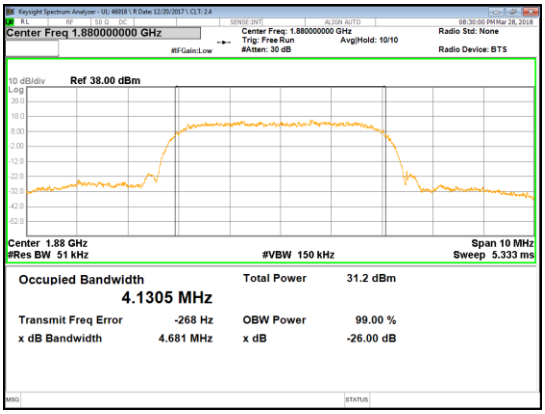
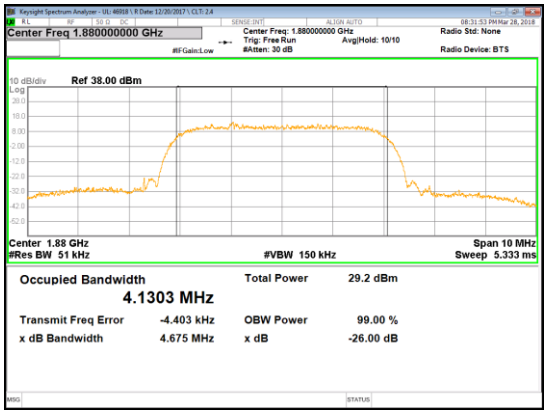
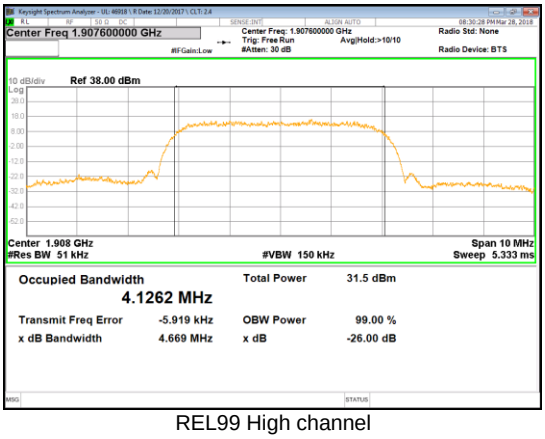
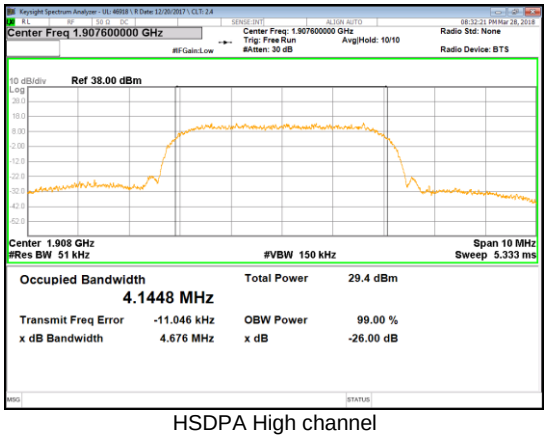
WCDMA Band 2

Band 2	 REL99 Low channel	 HSDPA Low channel
	 REL99 Mid channel	 HSDPA Mid channel
	 REL99 High channel	 HSDPA High channel

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