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

WWAN

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-A600G/DS, SM-A600G

FCC ID: A3LSMA600G

REPORT NUMBER: 4788371671-E6V2

ISSUE DATE: APR 07, 2018

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

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ACCREDITED
Testing Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	03/31/18	Initial issue	Junwhan Lee
V2	04/07/18	Updated to address TCB's question	Junwhan Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n and ANT+
MODEL NUMBER:	SM-A600G/DS, SM-A600G
SERIAL NUMBER:	R38K108GMEN (RADIATED, Original); R38K108KCSL (CONDUCTED, Original); R38K108KQ3P, R38K108KC5P (RADIATED, Spot check & Additional test); R38K108KQEM (CONDUCTED, Spot check & Additional test);
DATE TESTED:	FEB 21, 2018 - MAR 13, 2018 (Original) MAR 10, 2018 - MAR 31, 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:

Junwhan Lee
Suwon Lab Engineer
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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMA600GN 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: A3LSMA600G shares the same enclosure and circuit board as FCC ID: A3LSMA6005GN. The WWAN antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMA600GN remains representative of FCC ID: A3LSMA600G. The test data of FCC ID: A3LSMA600GN being submitted for this application to cover WWAN features.

For LTE Band 66, upper deviation of emission result is over 3dB. So full test were performed for LTE band 66 newly.

- Reuse bands - GSM850, GSM1900, WCDMA Band 5, WCDMA Band 2, LTE Band 5, WCDMA Band4, LTE Band 2, LTE Band 12, LTE Band 13, LTE Band 17 (Covered by LTE Band 12), LTE Band 41.
- Additional test bands for FCC ID : A3LSMA600G - LTE Band 4 (Covered by LTE B66), LTE Band 66.

1.3. SPOT CHECK VERIFICATION DATA

Band	Test Item	Worst Mode	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-A600GN/DS Results	SM-A600G/DS Results		
					FCC ID : A3LSMA600GN	FCC ID : A3LSMA600G		
GSM850	ERP	GPRS	836.60 MHz	38.50 dBm	27.80 dBm	27.06 dBm	-0.74 dB	
	RSE	GPRS	2509.80 MHz	-13.00 dBm	-26.30 dBm	-34.30 dBm	-8.00 dB	
GSM1900	EIRP	GPRS	1850.20 MHz	33.00 dBm	27.89 dBm	27.72 dBm	-0.17 dB	
	RSE	GPRS	3819.60 MHz	-13.00 dBm	-47.60 dBm	-46.90 dBm	0.70 dB	
WCDMA Band 2	EIRP	REL99	1880.00 MHz	33.00 dBm	19.16 dBm	19.12 dBm	-0.04 dB	
	RSE	REL99	7630.40 MHz	-13.00 dBm	-44.70 dBm	-45.20 dBm	-0.50 dB	
WCDMA Band 4	EIRP	REL99	1732.60 MHz	30.00 dBm	22.43 dBm	22.59 dBm	0.16 dB	
	RSE	HSDPA	6930.40 MHz	-13.00 dBm	-49.30 dBm	-48.20 dBm	1.10 dB	
WCDMA Band 5	EIRP	REL99	826.40 MHz	38.50 dBm	17.37 dBm	17.44 dBm	0.07 dB	
	RSE	REL99	4233.00 MHz	-13.00 dBm	-36.80 dBm	-41.10 dBm	-4.30 dB	
LTE Band 2	EIRP	15M QPSK	1857.50 MHz	33.00 dBm	18.73 dBm	18.31 dBm	-0.42 dB	
	RSE	1.4M 16QAM	7637.20 MHz	-13.00 dBm	-35.70 dBm	-32.80 dBm	2.90 dB	
LTE Band 5	EIRP	5M QPSK	826.50 MHz	38.50 dBm	14.96 dBm	14.25 dBm	-0.71 dB	
	RSE	5M QPSK	4232.50 MHz	-13.00 dBm	-30.70 dBm	-33.50 dBm	-2.80 dB	
LTE Band 12	EIRP	10M QPSK	704.00 MHz	34.80 dBm	11.77 dBm	11.74 dBm	-0.03 dB	
	RSE	1.4M 16QAM	3576.50 MHz	-13.00 dBm	-33.40 dBm	-47.60 dBm	-14.20 dB	
LTE Band 13	EIRP	10M QPSK	782.00 MHz	34.80 dBm	12.01 dBm	12.21 dBm	0.20 dB	
	RSE	10M 16QAM	1564.00 MHz	-40.00 dBm	-55.90 dBm	-55.40 dBm	0.50 dB	
LTE Band 41	EIRP	20M QPSK	2593.00 MHz	34.80 dBm	18.15 dBm	17.67 dBm	-0.48 dB	
	RSE	20M 16QAM	5012.00 MHz	-25.00 dBm	-40.90 dBm	-44.70 dBm	-3.80 dB	

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	A3LSMA600GN	Grant	4788371667-E1V2	Test	FCC Report DTS WLAN / All sections (Except section 11.3 and 12)
			4788371667-E2V2	Test	FCC Report BLE All sections (Except section 11.3 and 12)
DSS	A3LSMA600GN	Grant	4788371667-E3V2	Test	FCC Report BT / All sections (Except section 11.3 and 12)
NII	A3LSMA600GN	Grant	4788371667-E4V2	Test	FCC Report UNII WALN / All sections (Except section 12 and 13)
DXX	A3LSMA600GN	Grant	4788371667-E5V2	Test	FCC Report ANT+ / All sections (Except section 7.2.5 and 8)
PCE	A3LSMA600GN	Grant	4788371667-E7V2	Test	FCC Report WWAN / All sections (Except Conducted Output Power & Test result of LTE Band 66)

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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
7. KDB 484596 D01 Referencing Test Data DR01-42712

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, DTS/UNII a/b/g/n and ANT+.
This test report addresses the WWAN operational mode.

5.2. MAXIMUM OUTPUT POWER

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

Note : Conducted output power results were excerpted from RF exposure test report.(4788371667-S1 FCC Report SAR)

GSM

FCC Part 22/24						
Band	Frequency Range	Modulation	Conducted		Radiated	
	[MHz]	Peak	Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
GSM850	824~849	GMSK	33.1	2041.74		
		GPRS	33.2	2089.30	27.80	602.56
		EGPRS	27.6	575.44	22.75	188.36
GSM1900	1850~1910	GMSK	29.9	977.24		
		GPRS	29.9	977.24	27.89	615.18
		EGPRS	25.9	389.05	24.79	301.30

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WCDMA

FCC Part 22/24/27						
Band	Frequency Range	Modulation	Conducted		Radiated	
	[MHz]	Peak	Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824~849	REL99	24.1	257.04	17.37	54.58
		HSDPA	21.5	141.25	15.55	35.89
		HSUPA	23.0	199.53		
		DC-HSDPA	21.6	144.54		
Band 4	1710~1755	REL99	22.9	194.98	22.43	174.98
		HSDPA	22.1	162.18	21.70	147.91
		HSUPA	22.9	194.98		
		DC-HSDPA	22.0	158.49		
Band 2	1850~1910	REL99	22.9	194.98	19.16	82.41
		HSDPA	22.8	190.55	18.77	75.34
		HSUPA	22.9	194.98		
		DC-HSDPA	22.8	190.55		

LTE Band 5

FCC Part 22							
Band	Frequency Range	BandWidth	Modulation	Conducted		Radiated	
	[MHz]	[MHz]	Peak	Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824 ~ 849	10	QPSK	24.1	257.04	14.72	29.65
			16QAM	21.6	144.54	13.63	23.07
		5	QPSK	24.2	263.03	14.96	31.33
			16QAM	21.7	147.91	13.80	23.99
		3	QPSK	24.4	275.42	14.55	28.51
			16QAM	22.1	162.18	13.42	21.98
		1.4	QPSK	24.3	269.15	11.91	15.52
			16QAM	21.7	147.91	10.81	12.05

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LTE Band 2

FCC Part 24							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 2	1850 ~ 1910	20	QPSK	23.6	229.09	18.33	68.08
			16QAM	21.4	138.04	17.70	58.88
		15	QPSK	23.4	218.78	18.73	74.64
			16QAM	21.4	138.04	17.73	59.29
		10	QPSK	23.5	223.87	17.40	54.95
			16QAM	21.5	141.25	16.23	41.98
		5	QPSK	23.6	229.09	17.44	55.46
			16QAM	21.3	134.90	16.67	46.45
		3	QPSK	23.3	213.80	17.76	59.70
			16QAM	21.6	144.54	16.76	47.42
		1.4	QPSK	23.7	234.42	15.94	39.26
			16QAM	21.1	128.82	14.95	31.26

LTE Band 12

Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 12	699 ~ 716	10	QPSK	23.4	218.78	11.77	15.03
			16QAM	21.2	131.83	10.36	10.86
		5	QPSK	23.7	234.42	11.46	14.00
			16QAM	21.7	147.91	10.02	10.05
		3	QPSK	23.7	234.42	11.51	14.16
			16QAM	21.8	151.36	10.05	10.12
		1.4	QPSK	23.8	239.88	9.15	8.22
			16QAM	21.8	151.36	7.70	5.89

LTE Band 17

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

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LTE Band 13

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 13	777 ~ 787	10	QPSK	23.8	239.88	12.01	15.89
			16QAM	21.6	144.54	10.91	12.33
		5	QPSK	23.7	234.42	9.49	8.89
			16QAM	21.6	144.54	9.46	8.83

LTE Band 66

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 66	1710 ~ 1780	20	QPSK	23.5	223.87	19.58	90.78
			16QAM	21.5	141.25	19.01	79.62
		15	QPSK	23.6	229.09	20.22	105.20
			16QAM	21.3	134.90	19.19	82.99
		10	QPSK	23.8	239.88	19.43	87.70
			16QAM	21.5	141.25	18.33	68.08
		5	QPSK	23.7	234.42	19.37	86.50
			16QAM	21.7	147.91	18.59	72.28
		3	QPSK	23.7	234.42	19.51	89.33
			16QAM	21.8	151.36	18.45	69.98
		1.4	QPSK	23.5	223.87	17.14	51.76
			16QAM	21.6	144.54	16.02	39.99

LTE Band 4

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

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LTE Band 41

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 41	2496-2690	20	QPSK	24.1	257.04	18.15	65.31
			16QAM	22.1	162.18	17.22	52.72
		15	QPSK	24.1	257.04	17.74	59.43
			16QAM	21.7	147.91	16.79	47.75
		10	QPSK	24.0	251.19	17.55	56.89
			16QAM	22.1	162.18	16.64	46.13
		5	QPSK	24.0	251.19	17.94	62.23
			16QAM	21.8	151.36	16.89	48.87

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	-1.63
GSM1900 / WCDMA Band 2 / LTE Band 2 1850 ~ 1910 MHz	-1.17
LTE Band 41 2496 ~ 2690 MHz	0.40
LTE Band 12/17 699 ~ 716 MHz	-2.88
LTE Band 13 777 ~ 787 MHz	-2.78
WCDMA Band 4 / LTE Band 4/66 1710 ~ 1780 MHz	0.45

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5.4. WORST-CASE ORIENTATION

For GSM1900 / WCDMA Band 2, the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

For GSM850 / WCDMA Band 4 /WCDMA Band 5 / LTE Band 5 / LTE Band41 / 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 LTE Band 2 / LTE Band 12 / LTE Band 13, the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA50EWE	DW3K115DS/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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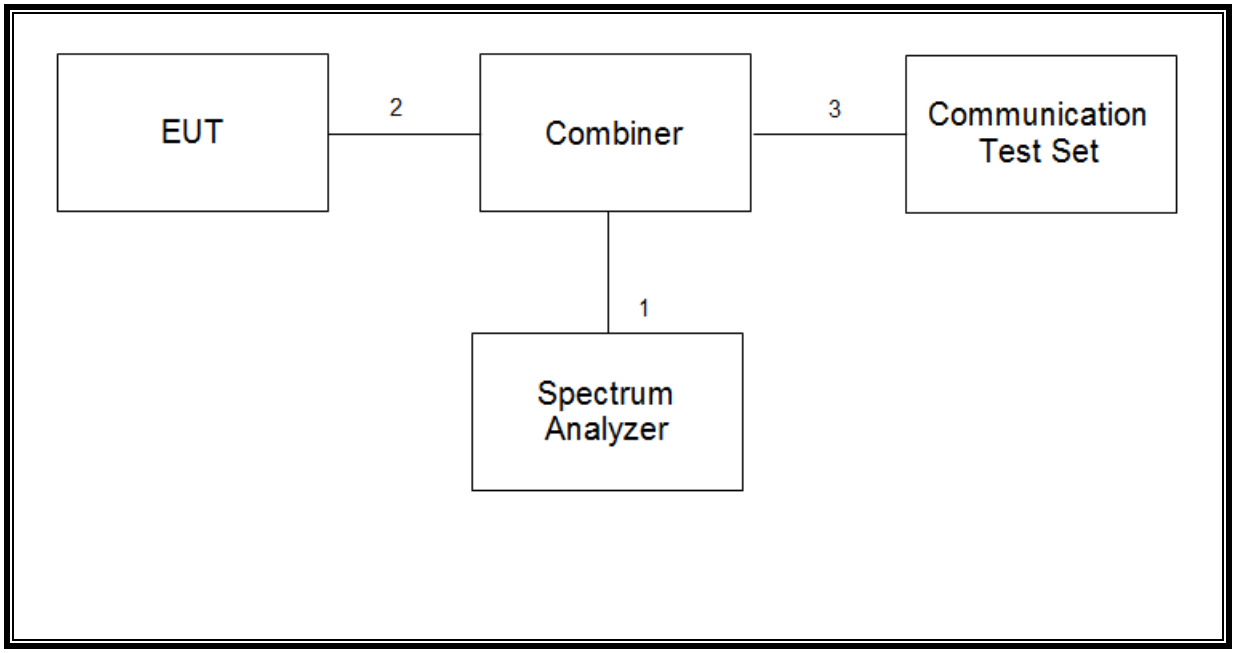
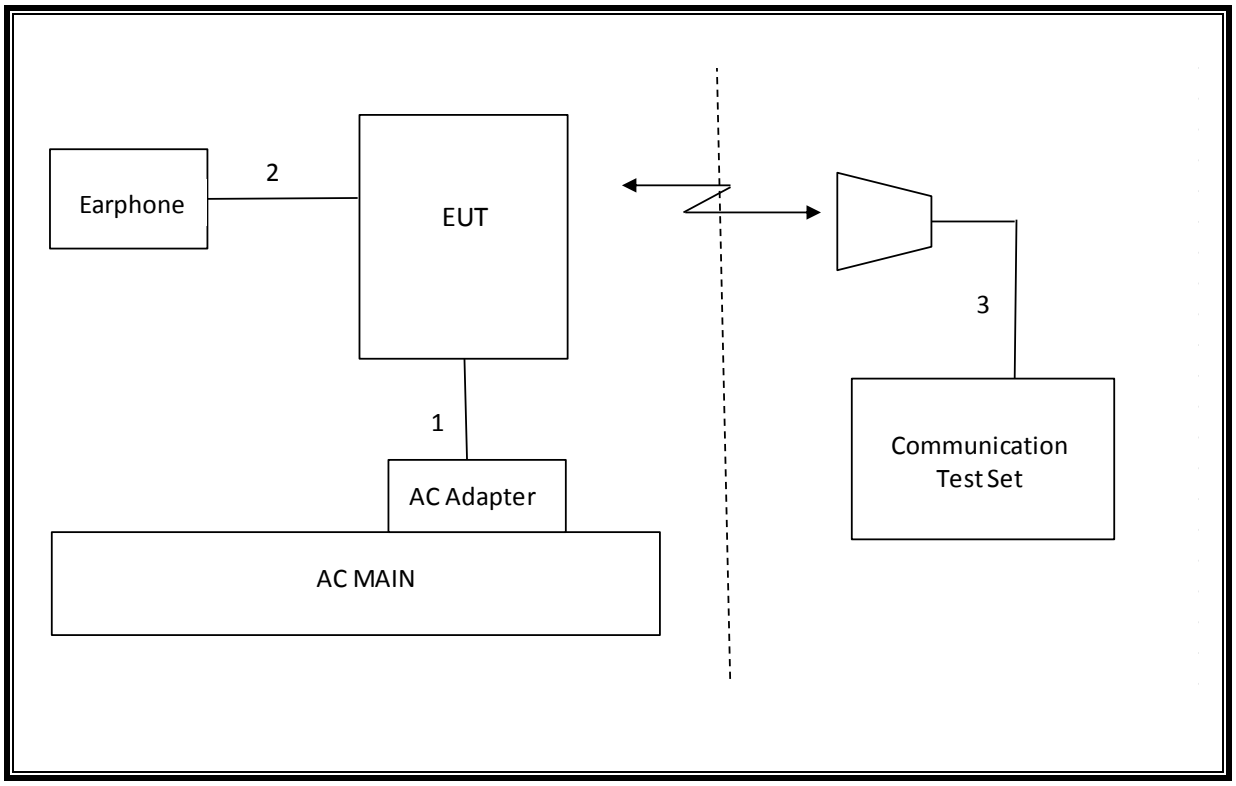
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



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) 24.238(a) 27.53(g)	Band Edge / Conducted Spurious Emission	-13dBm		Pass
27.53(m)	Conducted Spurious Emission	-25 dBm		Pass
27.53(m)	Emission mask	Section 9.2.2		Pass
2.1046	Conducted output power	N/A		Pass
22.355 24.235 27.54	Frequency Stability	2.5PPM		Pass
22.913(a)(2)	Effective Radiated Power	38.5 dBm	Radiated	Pass
27.50(b)(10)		34.77 dBm		Pass
24.232(c) 27.50(h)(2)	Equivalent Isotropic Radiated Power	33dBm		Pass
27.50(d)(4)		30dBm		Pass
22.917(a) 24.238(a) 27.53 (c),(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	0.603	2.5 ppm	243KGXW		GSM850
22H	824.2 - 848.8	0.188	2.5 ppm	239KG7W		EDGE850
24E	1850.2 - 1909.8	0.615	2.5 ppm	240KGXW		GSM1900
24E	1850.2 - 1909.8	0.301	2.5 ppm	245KG7W		EDGE1900
WCDMA						
22H	826.4 - 846.6	0.055	2.5 ppm	4M14F9W		WCDMA B5
27L	1712.4 - 1752.6	0.175	2.5 ppm	4M15F9W		WCDMA B4
24E	1852.4 - 1907.6	0.082	2.5 ppm	4M15F9W		WCDMA B2
LTE Band 5						
22H	829.0 - 844.0	0.030	2.5 ppm	8M99G7W	10	QPSK
22H	829.0 - 844.0	0.023	2.5 ppm	8M98D7W	10	16QAM
22H	826.5 - 846.5	0.031	2.5 ppm	4M50G7W	5	QPSK
22H	826.5 - 846.5	0.024	2.5 ppm	4M49D7W	5	16QAM
LTE Band 41						
27M	2506.0 - 2680.0	0.065	2.5 ppm	17M9G7W	20	QPSK
27M	2506.0 - 2680.0	0.053	2.5 ppm	17M9D7W	20	16QAM
LTE Band 13						
27F	782	0.016	2.5 ppm	8M96G7W	10	QPSK
27F	782	0.012	2.5 ppm	8M97D7W	10	16QAM
LTE Band 12/17						
27H	704.0 - 711.0	0.015	2.5 ppm	8M99G7W	10	QPSK
27H	704.0 - 711.0	0.011	2.5 ppm	8M97D7W	10	16QAM
LTE Band 2						
24E	1860.0 - 1900.0	0.068	2.5 ppm	17M9G7W	20	QPSK
24E	1860.0 - 1900.0	0.059	2.5 ppm	17M9D7W	20	16QAM
24E	1857.5 - 1902.5	0.075	2.5 ppm	13M5G7W	15	QPSK
24E	1857.5 - 1902.5	0.059	2.5 ppm	13M4D7W	15	16QAM
LTE Band 4/66						
27L	1720.0 - 1770.0	0.091	2.5 ppm	17M9G7W	20	QPSK
27L	1720.0 - 1770.0	0.080	2.5 ppm	17M9D7W	20	16QAM
27L	1717.5 - 1772.5	0.105	2.5 ppm	13M4G7W	15	QPSK
27L	1717.5 - 1772.5	0.083	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	0.31	13.00
			EGPRS	3.25	
GSM1900	661	1880.0	GPRS	0.47	
			EGPRS	3.34	

WCDMA

Band	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	4183	836.6	REL99	2.81	13.00
			HSDPA	3.24	
Band 4	1413	1732.6	REL99	2.82	
			HSDPA	3.11	
Band 2	9400	1880.0	REL99	2.93	
			HSDPA	3.17	

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LTE Band 5

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	10	20525	836.5	QPSK	4.05	13.00
				16QAM	6.36	
	5			QPSK	4.12	
				16QAM	6.21	
	3			QPSK	4.01	
				16QAM	6.11	
	1.4			QPSK	3.97	
				16QAM	6.04	

LTE Band41

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 41	20	40620	2593	QPSK	4.80	13.00
				16QAM	6.32	
	15			QPSK	4.43	
				16QAM	6.54	
	10			QPSK	4.75	
				16QAM	6.43	
	5			QPSK	4.86	
				16QAM	6.27	

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LTE

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 13	10	23230	782	QPSK	4.51	13.00
				16QAM	6.45	
	5			QPSK	4.47	
				16QAM	6.26	
Band 12	10	23095	707.5	QPSK	5.04	
				16QAM	6.93	
	5			QPSK	5.07	
				16QAM	6.80	
	3			QPSK	5.02	
				16QAM	6.92	
	1.4			QPSK	5.06	
				16QAM	6.90	
Band 66	20	132322	1745.0	QPSK	4.47	
				16QAM	6.24	
	15			QPSK	4.42	
				16QAM	6.25	
	10			QPSK	4.44	
				16QAM	6.06	
	5			QPSK	4.43	
				16QAM	6.20	
	3			QPSK	4.49	
				16QAM	6.08	
	1.4			QPSK	4.41	
				16QAM	6.14	
Band 2	20	18900	1880.0	QPSK	4.16	
				16QAM	6.03	
	15			QPSK	3.98	
				16QAM	6.18	
	10			QPSK	4.06	
				16QAM	6.02	
	5			QPSK	3.96	
				16QAM	5.95	
	3			QPSK	3.94	
				16QAM	5.83	
	1.4			QPSK	4.07	
				16QAM	5.79	

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LTE Band 4

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

LTE Band 17

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

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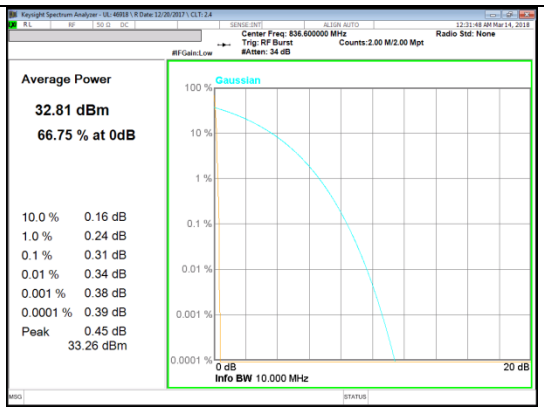
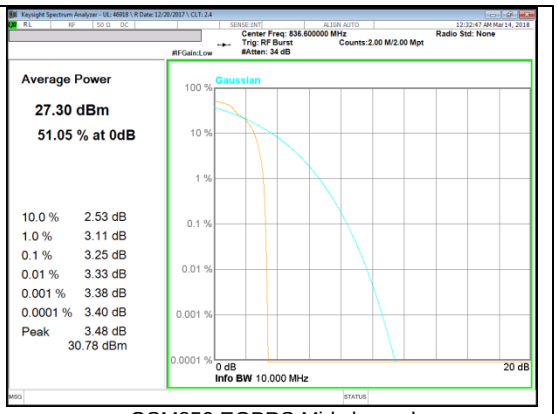
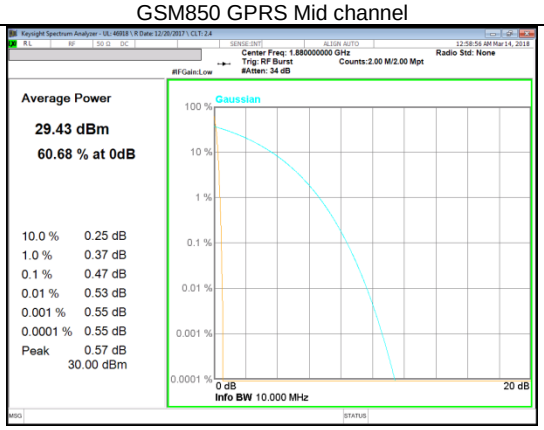
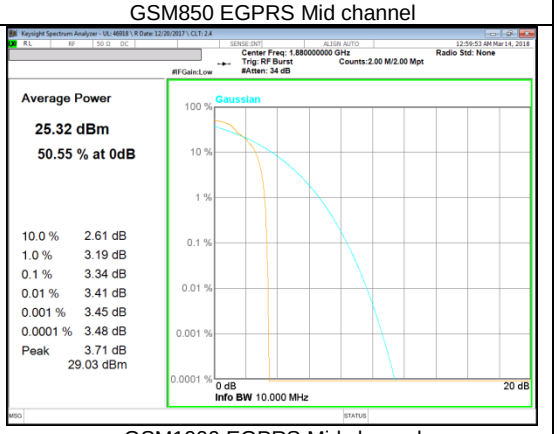
8.2. CONDUCTED PEAK TO AVERAGE PLOTS

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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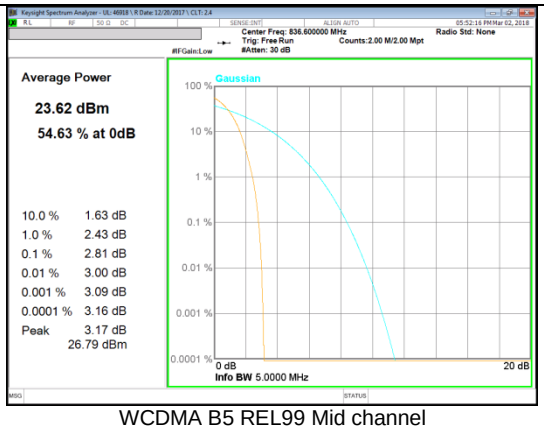
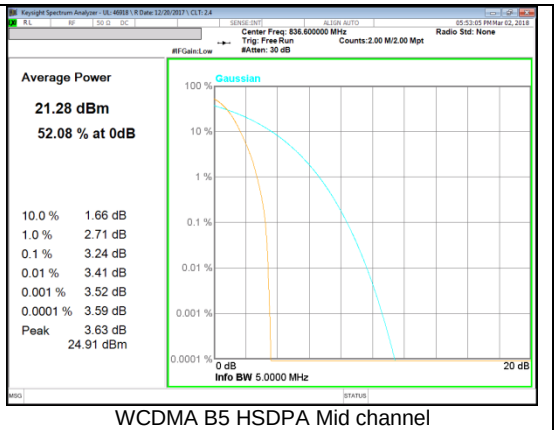
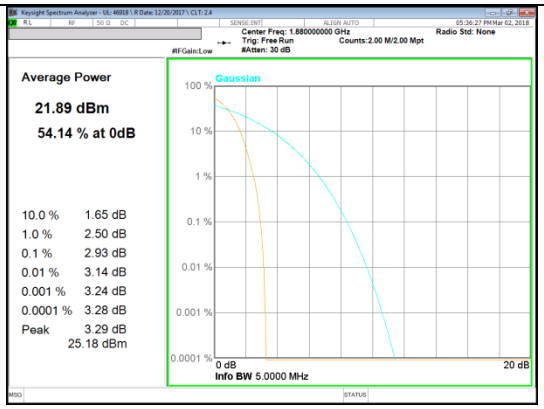
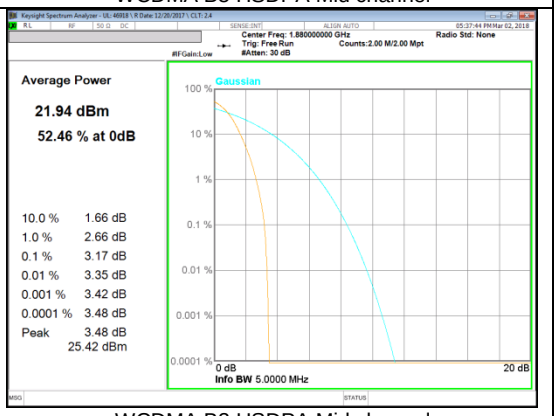
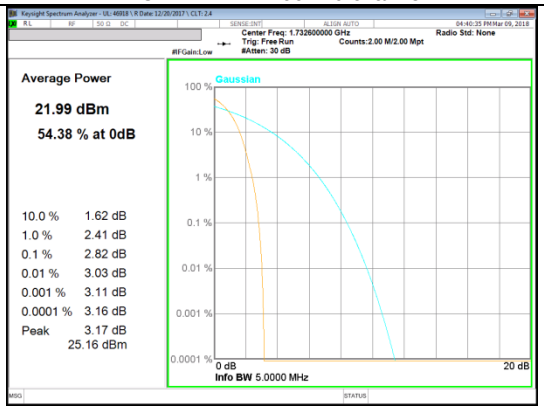
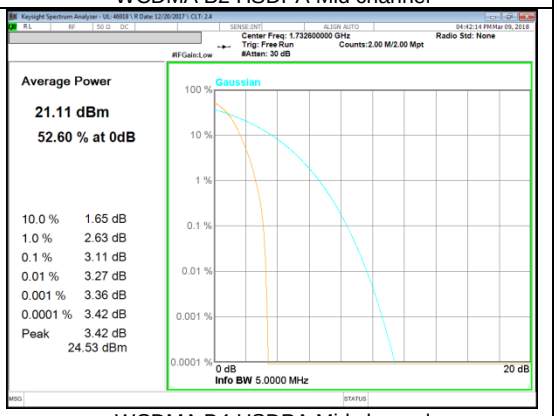
WCDMA

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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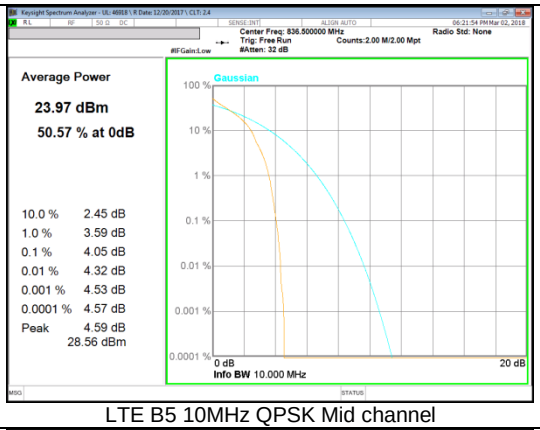
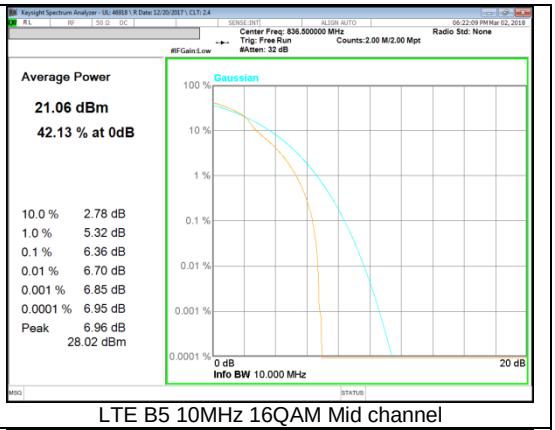
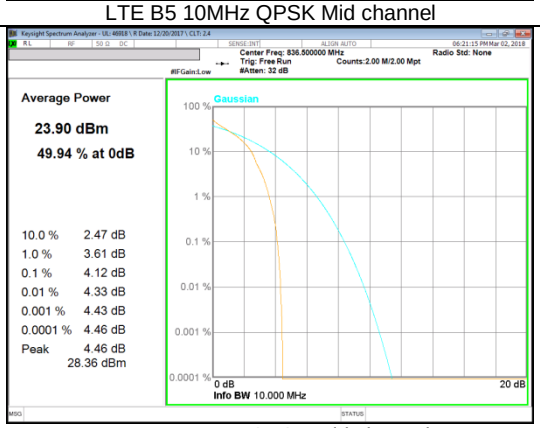
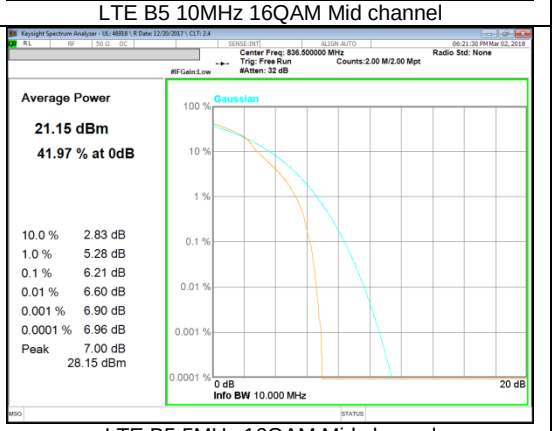
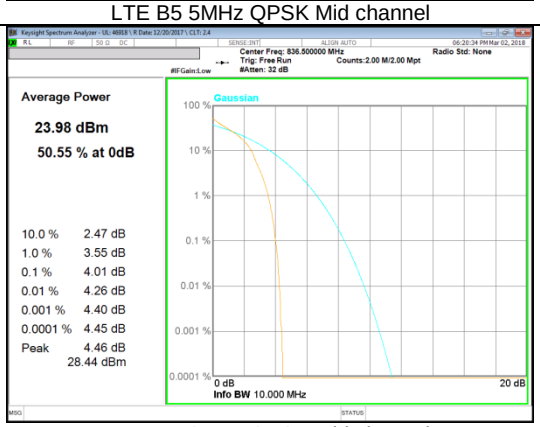
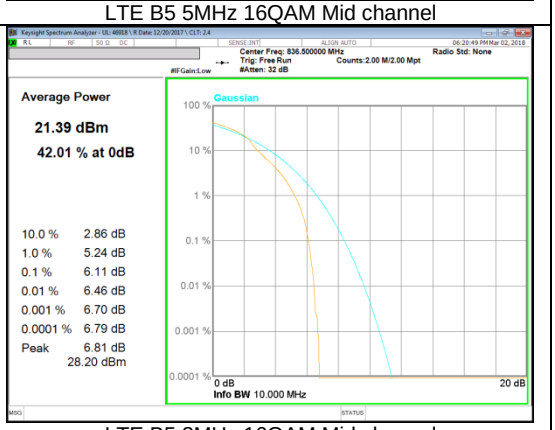
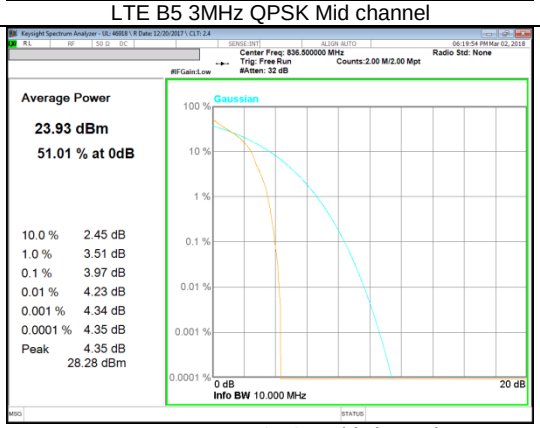
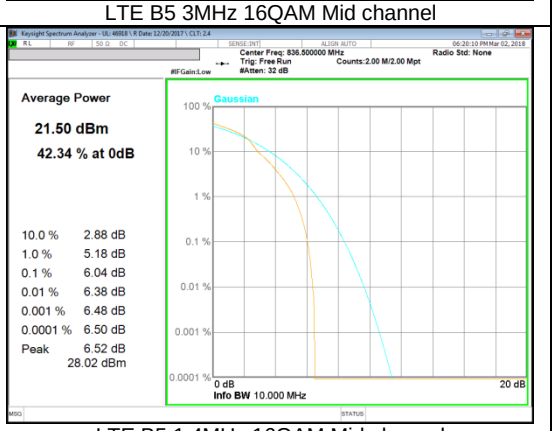
LTE Band 5

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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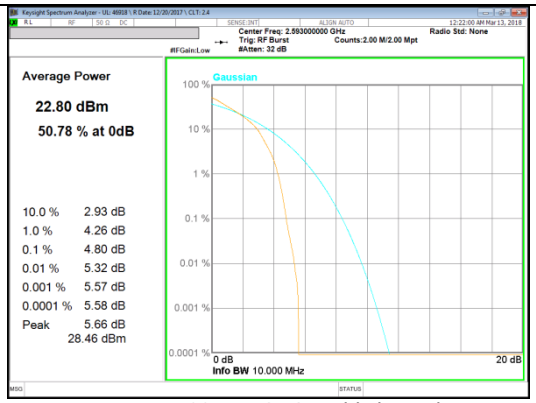
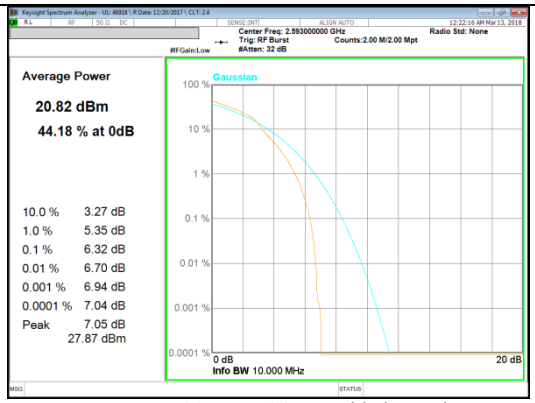
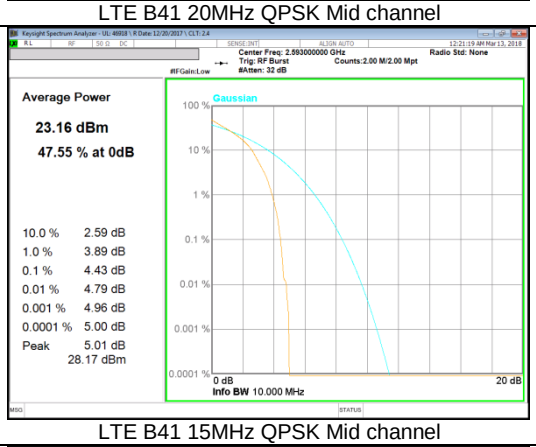
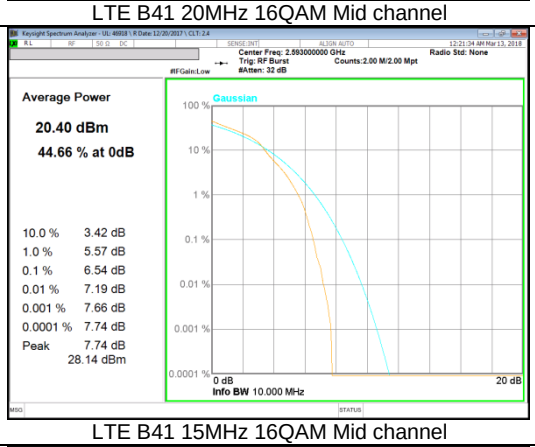
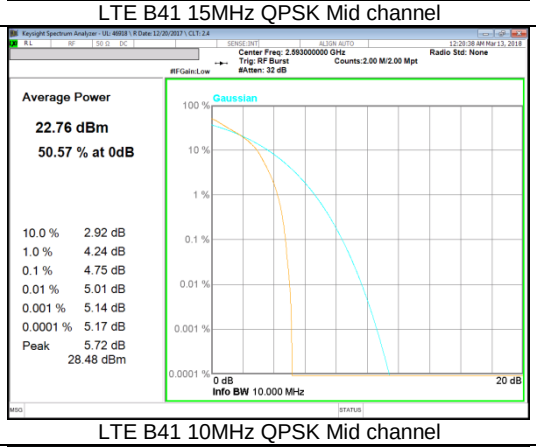
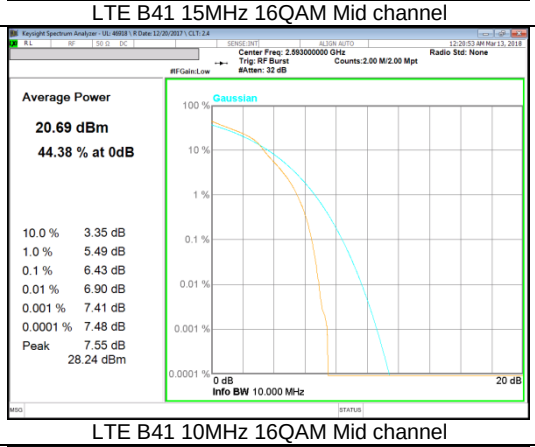
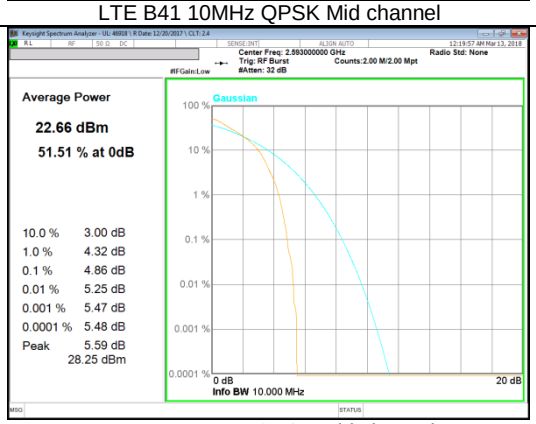
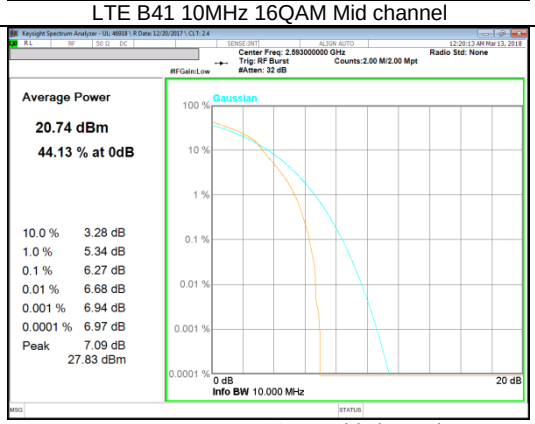
LTE Band 41

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

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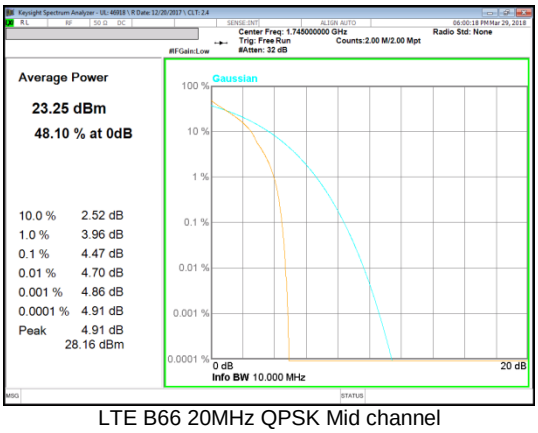
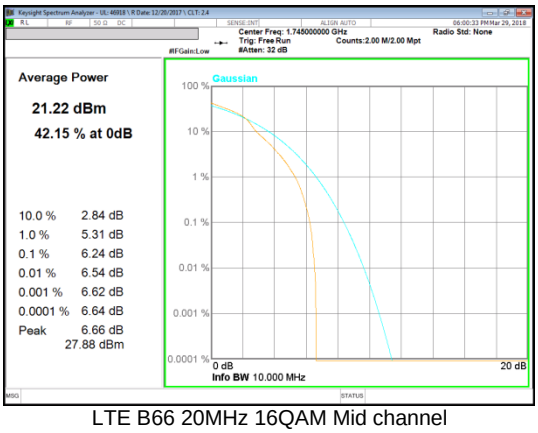
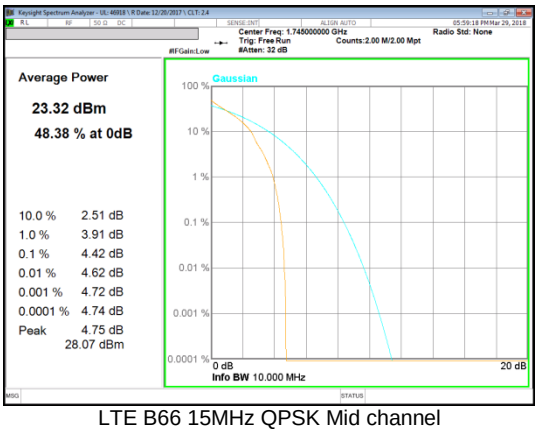
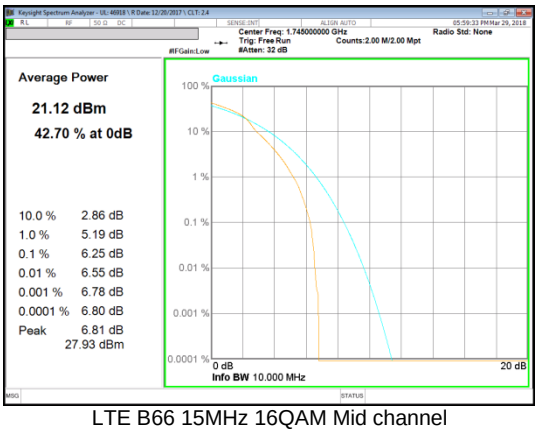
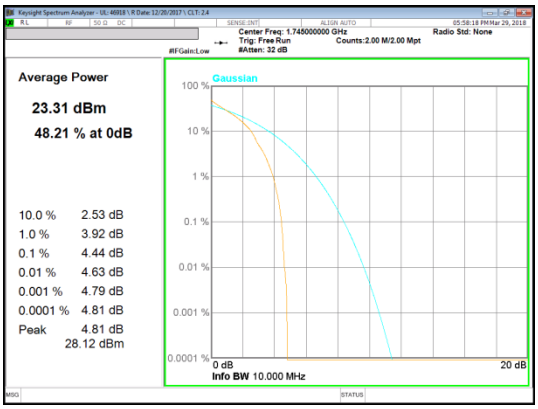
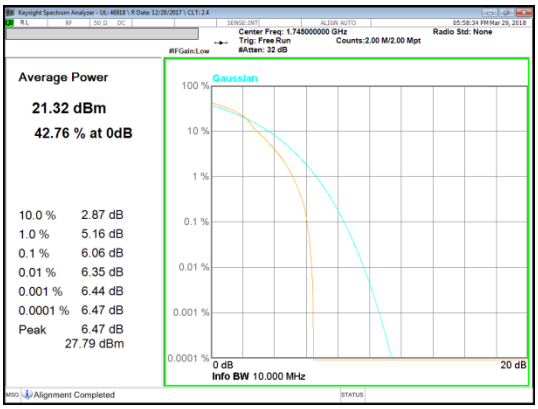
LTE Band 66

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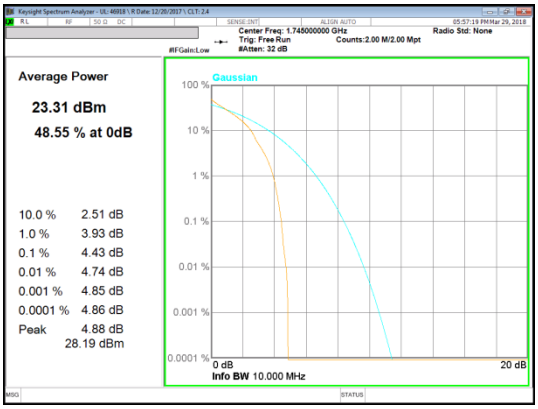
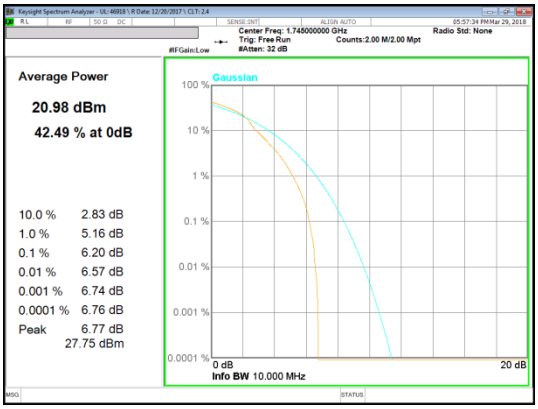
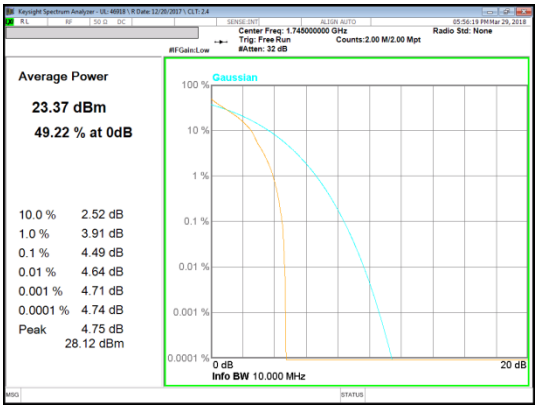
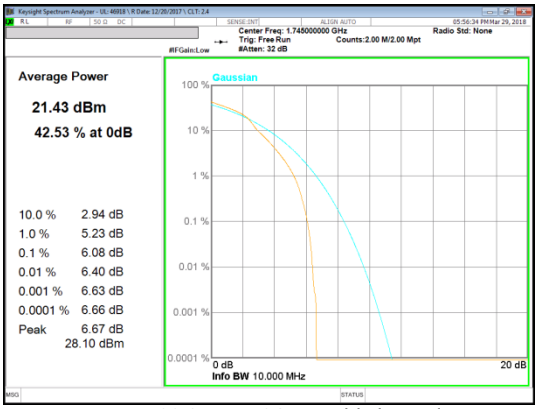
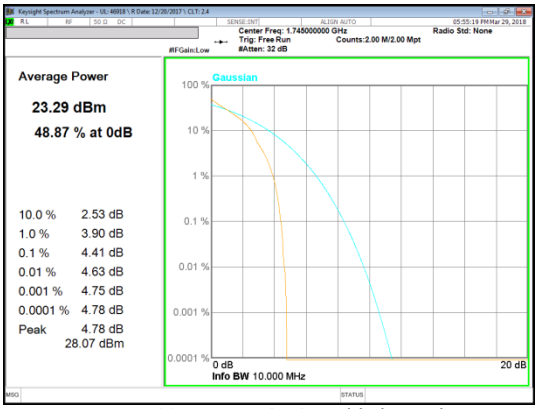
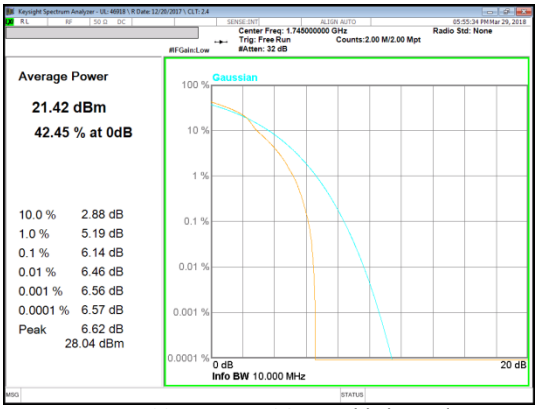
TE Band 66 5 MHz	 LTE B66 5MHz QPSK Mid channel	 LTE B66 5MHz 16QAM Mid channel
LTE Band 66 3 MHz	 LTE B66 3MHz QPSK Mid channel	 LTE B66 3MHz 16QAM Mid channel
LTE Band 66 1.4 MHz	 LTE B66 1.4MHz QPSK Mid channel	 LTE B66 1.4MHz 16QAM Mid channel

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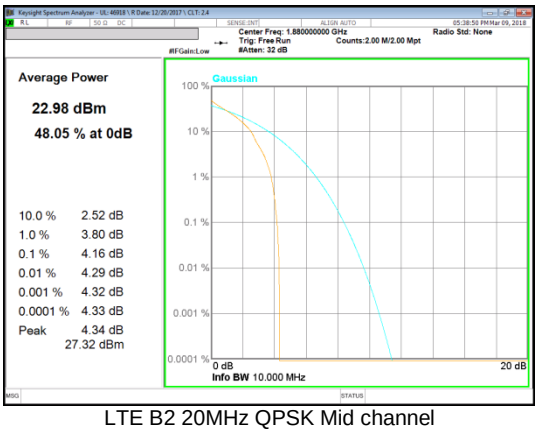
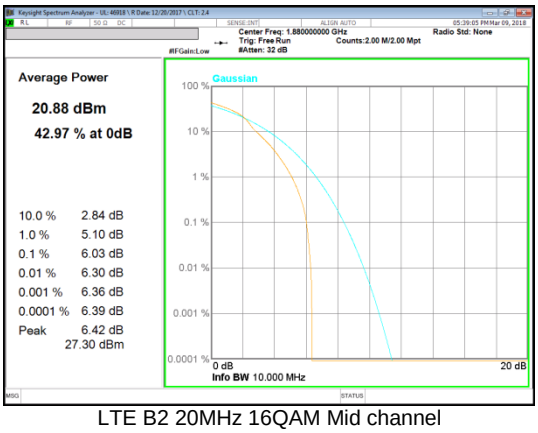
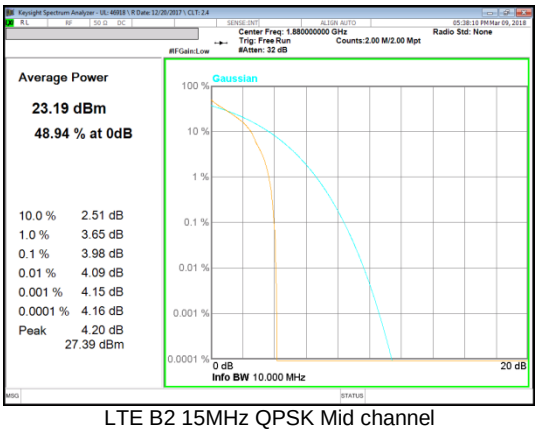
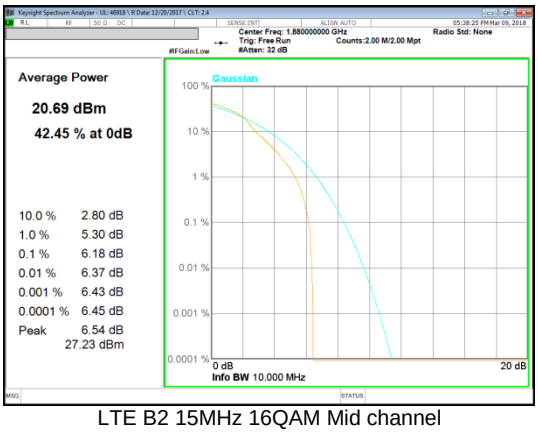
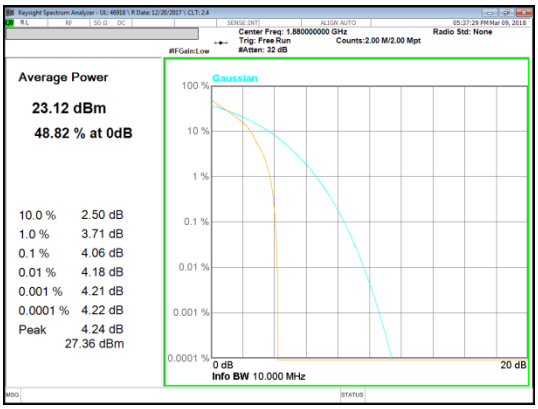
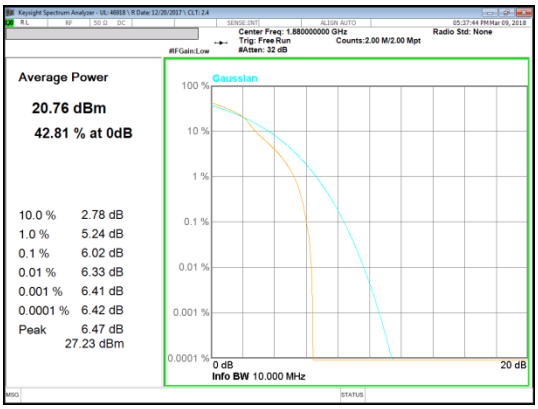
LTE Band 2

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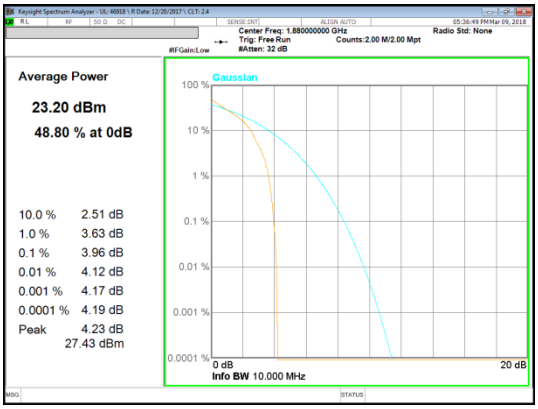
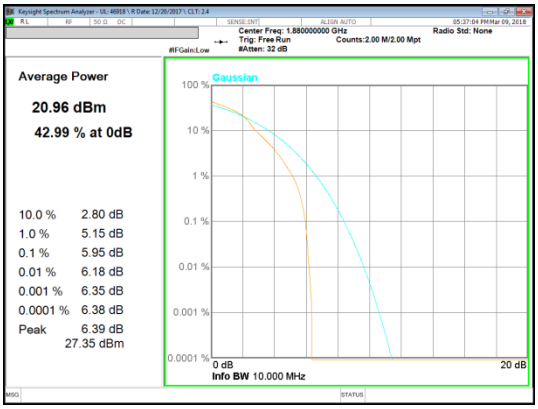
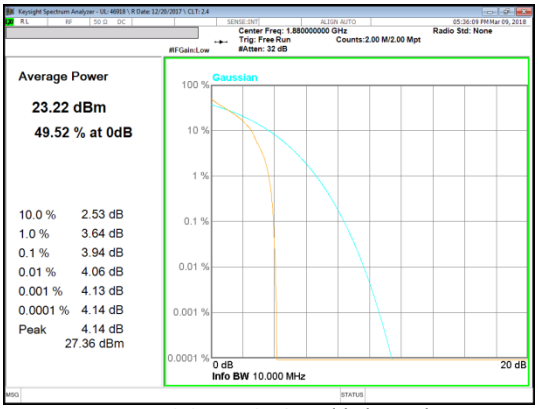
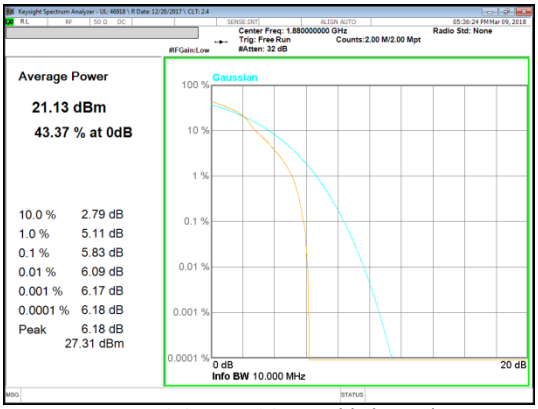
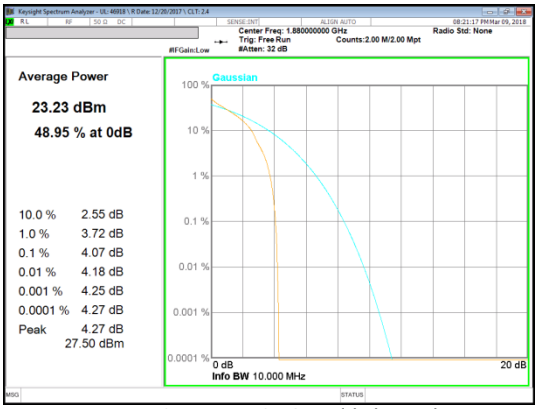
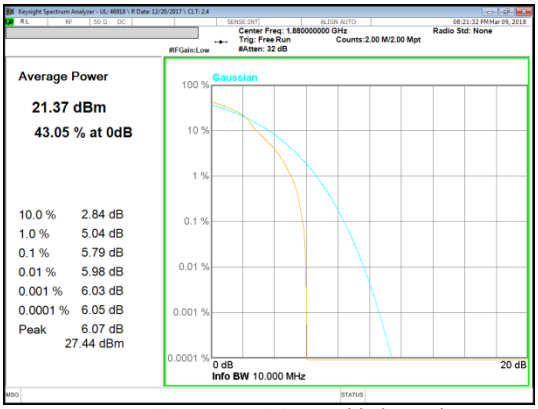
LTE Band 2 5 MHz	 LTE B2 5MHz QPSK Mid channel	 LTE B2 5MHz 16QAM Mid channel
LTE Band 2 3 MHz	 LTE B2 3MHz QPSK Mid channel	 LTE B2 3MHz 16QAM Mid channel
LTE Band 2 1.4 MHz	 LTE B2 1.4MHz QPSK Mid channel	 LTE B2 1.4MHz 16QAM Mid channel

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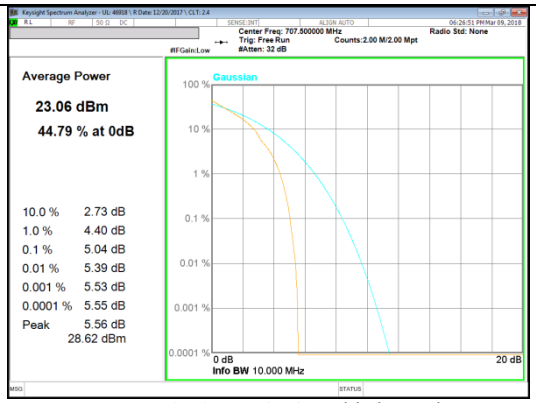
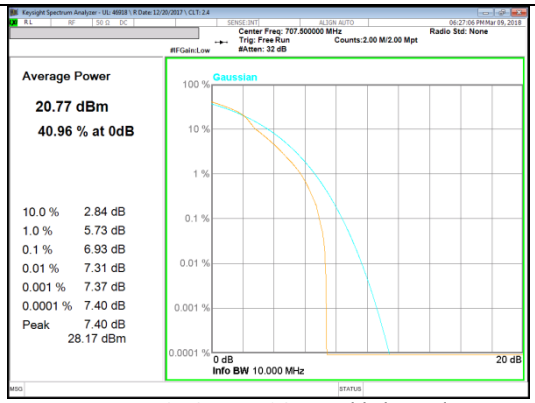
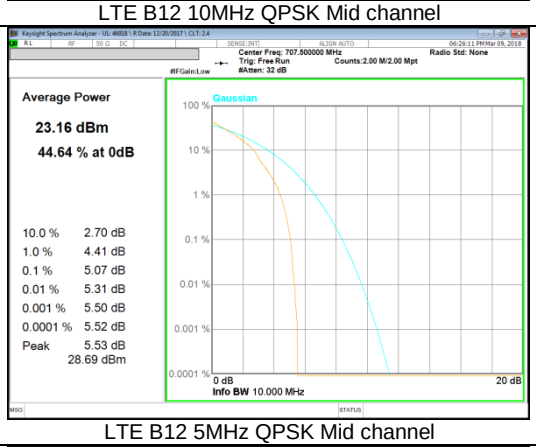
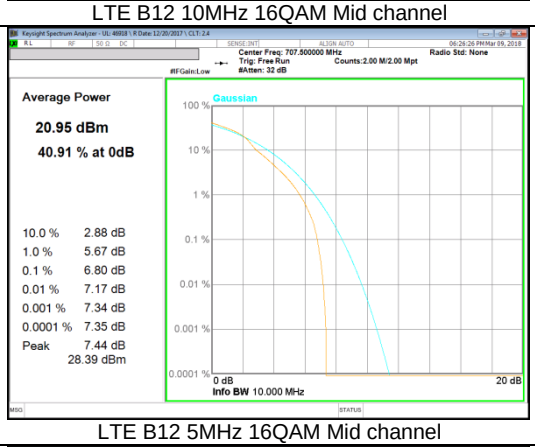
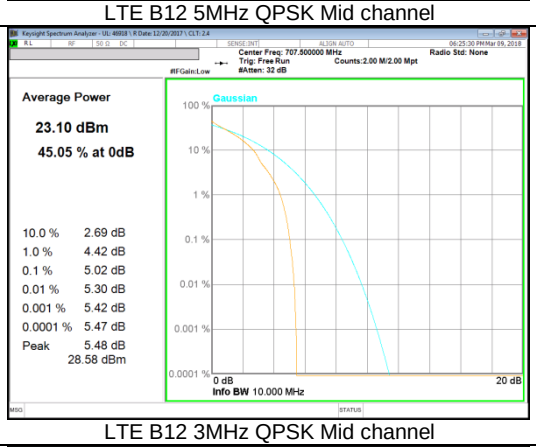
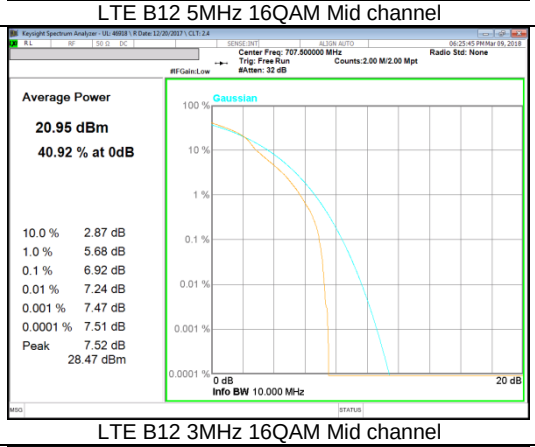
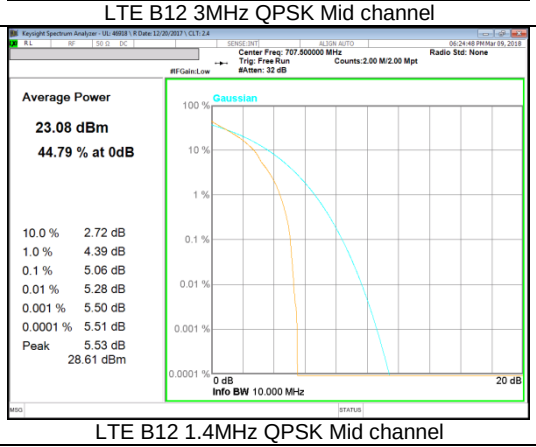
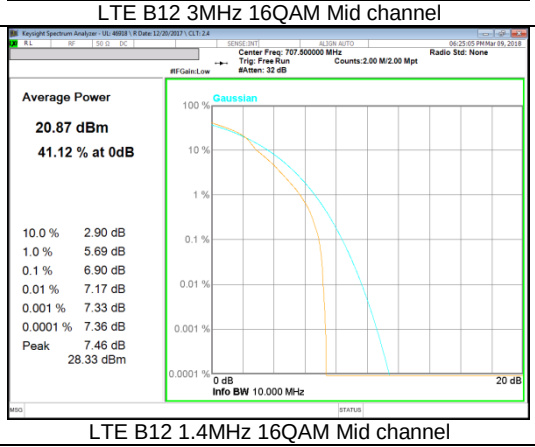
LTE Band 12

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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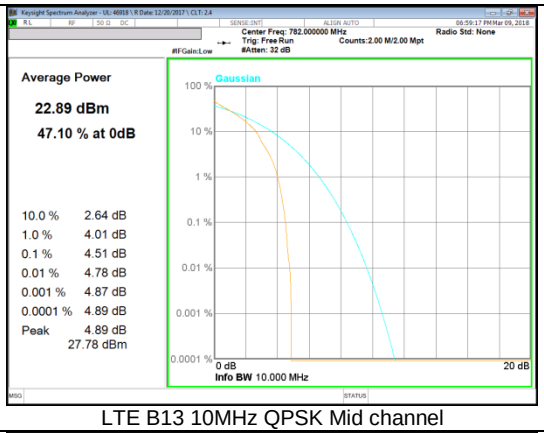
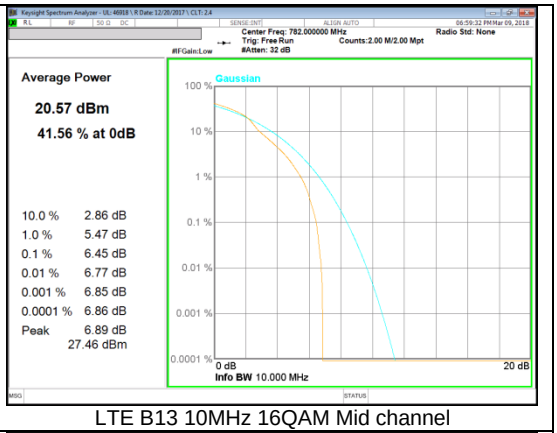
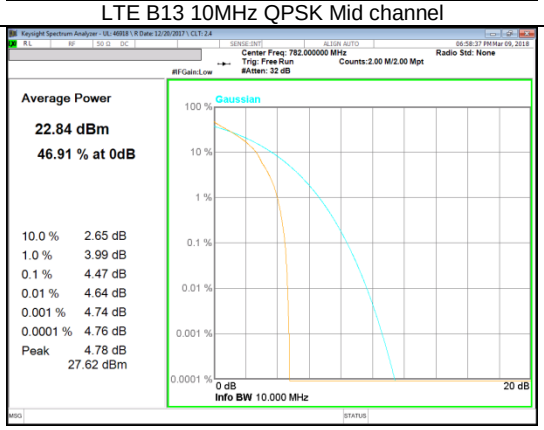
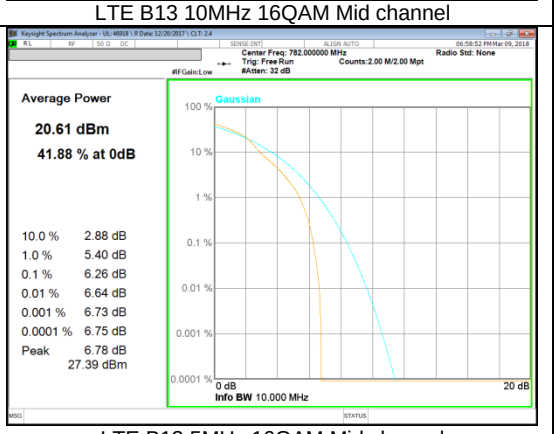
LTE Band 13

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	242.65	314.6
		190	836.6	242.26	310.1
		251	848.8	237.08	300.2
	EGPRS	128	824.2	235.00	298.5
		190	836.6	234.67	296.2
		251	848.8	238.93	297.9
GSM1900	GPRS	512	1850.2	239.02	301.1
		661	1880.0	237.74	298.0
		810	1909.8	239.81	301.3
	EGPRS	512	1850.2	235.60	298.1
		661	1880.0	233.07	301.0
		810	1909.8	245.38	303.9

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WCDMA

Band	Mode	Channel	f [MHz]	99% BW [MHz]	26dB BW [MHz]
Band 5	REL99	4132	826.4	4.1288	4.672
		4183	836.6	4.1373	4.660
		4233	846.6	4.1211	4.704
	HSDPA	4132	826.4	4.1320	4.688
		4183	836.6	4.1234	4.666
		4233	846.6	4.1386	4.696
Band 2	REL99	9262	1852.4	4.1347	4.687
		9400	1880.0	4.1354	4.700
		9538	1907.6	4.1404	4.707
	HSDPA	9262	1852.4	4.1319	4.688
		9400	1880.0	4.1464	4.713
		9538	1907.6	4.1350	4.684
Band 4	REL99	1312	1712.4	4.1376	4.701
		1413	1732.6	4.1326	4.691
		1513	1752.6	4.1450	4.705
	HSDPA	1312	1712.4	4.1402	4.700
		1413	1732.6	4.1445	4.692
		1513	1752.6	4.1384	4.661

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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	8.9800	10.30
				16QAM	8.9791	10.31
		20524	836.5	QPSK	8.9529	10.21
				16QAM	8.9381	10.12
		20599	844.0	QPSK	8.9902	10.39
				16QAM	8.9669	10.28
	5	20425	826.5	QPSK	4.4960	5.270
				16QAM	4.4867	5.203
		20524	836.5	QPSK	4.4949	5.186
				16QAM	4.4988	5.193
		20624	846.5	QPSK	4.4889	5.317
				16QAM	4.4932	5.176
	3	20415	825.5	QPSK	2.6961	3.095
				16QAM	2.6883	3.081
		20524	836.5	QPSK	2.6959	3.059
				16QAM	2.6991	3.072
		20634	847.5	QPSK	2.6963	3.087
				16QAM	2.6991	3.065
	1.4	20407	824.7	QPSK	1.0941	1.347
				16QAM	1.0925	1.417
		20524	836.5	QPSK	1.0898	1.372
				16QAM	1.0916	1.378
		20624	848.3	QPSK	1.0925	1.388
				16QAM	1.0900	1.404

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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	17.879	19.72
				16QAM	17.882	19.51
		40620	2593.0	QPSK	17.904	19.84
				16QAM	17.894	19.58
		41490	2680.0	QPSK	17.880	19.45
				16QAM	17.861	19.78
	15	39725	2503.5	QPSK	13.435	15.14
				16QAM	13.426	15.02
		40620	2593.0	QPSK	13.422	15.00
				16QAM	13.437	15.10
		41515	2682.5	QPSK	13.435	14.92
				16QAM	13.446	14.96
	10	39700	2501.0	QPSK	8.9850	10.03
				16QAM	8.9354	10.09
		40620	2593.0	QPSK	8.9617	10.13
				16QAM	8.9553	10.11
		41540	2685.0	QPSK	8.9550	10.02
				16QAM	8.9572	10.10
	5	39675	2498.5	QPSK	4.4981	5.191
				16QAM	4.4951	5.240
		40620	2593.0	QPSK	4.4952	5.281
				16QAM	4.5008	5.247
		41565	2687.5	QPSK	4.4982	5.184
				16QAM	4.4890	5.178

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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	17.867	19.59
				16QAM	17.880	19.67
		132322	1745.0	QPSK	17.863	19.54
				16QAM	17.836	19.61
		132572	1770.0	QPSK	17.852	19.52
				16QAM	17.882	19.57
	15	132047	1717.5	QPSK	13.442	15.02
				16QAM	13.464	15.20
		132322	1745.0	QPSK	13.424	15.13
				16QAM	13.443	15.03
		132597	1772.5	QPSK	13.435	15.08
				16QAM	13.446	14.94
	10	132022	1715.0	QPSK	8.9589	10.04
				16QAM	8.9682	10.06
		132322	1745.0	QPSK	8.9594	10.17
				16QAM	8.9560	10.11
		132622	1775.0	QPSK	8.9582	10.06
				16QAM	8.9621	10.20
	5	131997	1712.5	QPSK	4.4998	5.249
				16QAM	4.5025	5.301
		132322	1745.0	QPSK	4.4990	5.271
				16QAM	4.5023	5.308
		132647	1775.5	QPSK	4.4969	5.312
				16QAM	4.5012	5.234
	3	131987	1711.5	QPSK	2.7024	3.088
				16QAM	2.7118	3.109
		132322	1745.0	QPSK	2.6957	3.069
				16QAM	2.7129	3.130
		132657	1778.5	QPSK	2.7010	3.080
				16QAM	2.7045	3.115
	1.4	131979	1710.7	QPSK	1.0904	1.391
				16QAM	1.0897	1.362
		132322	1745.0	QPSK	1.0898	1.368
				16QAM	1.0893	1.352
		132665	1779.3	QPSK	1.0941	1.372
				16QAM	1.0888	1.351

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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	17.864	19.66
				16QAM	17.867	19.77
		18900	1880.0	QPSK	17.850	19.63
				16QAM	17.852	19.61
		19099	1900.0	QPSK	17.830	19.47
				16QAM	17.831	19.55
	15	18675	1857.5	QPSK	13.451	15.04
				16QAM	13.436	15.07
		18900	1880.0	QPSK	13.431	15.03
				16QAM	13.431	14.98
		19124	1902.5	QPSK	13.431	14.92
				16QAM	13.418	14.80
	10	18650	1955.0	QPSK	8.9668	10.15
				16QAM	8.9439	10.25
		18900	1880.0	QPSK	8.9482	10.11
				16QAM	8.9598	9.965
		19149	1905.0	QPSK	8.9338	9.989
				16QAM	8.9652	10.14
	5	18625	1852.5	QPSK	4.4976	5.186
				16QAM	4.5018	5.310
		18900	1880.0	QPSK	4.4981	5.377
				16QAM	4.5046	5.289
		18175	1907.5	QPSK	4.4992	5.206
				16QAM	4.5022	5.286
	3	18615	1815.5	QPSK	2.7000	3.067
				16QAM	2.7007	3.100
		18900	1880.0	QPSK	2.6999	3.084
				16QAM	2.6975	3.085
		19184	1908.5	QPSK	2.6981	3.100
				16QAM	2.6997	3.041
	1.4	18607	1850.7	QPSK	1.0914	1.389
				16QAM	1.0914	1.383
		18900	1880.0	QPSK	1.0878	1.317
				16QAM	1.0916	1.374
		19192	1909.3	QPSK	1.0921	1.335
				16QAM	1.0885	1.369

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LTE Band 13

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 13	10	23230	782.0	QPSK	8.9624	10.18
				16QAM	8.9738	10.27
	5	23207	779.5	QPSK	4.4960	5.204
				16QAM	4.4883	5.160
		23230	782.0	QPSK	4.4995	5.211
				16QAM	4.5038	5.303
		23255	784.5	QPSK	4.5079	5.313
				16QAM	4.5016	5.200

LTE Band 12

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 12	10	23060	704.0	QPSK	8.9542	10.11
				16QAM	8.9626	10.31
		23095	707.5	QPSK	8.9942	10.13
				16QAM	8.9723	10.14
		23130	711.0	QPSK	8.9516	10.16
				16QAM	8.9510	10.12
	5	23035	701.5	QPSK	4.5072	5.307
				16QAM	4.4938	5.232
		23095	707.5	QPSK	4.4998	5.266
				16QAM	4.5026	5.326
		23155	713.5	QPSK	4.4995	5.299
				16QAM	4.4995	5.224
	3	23025	700.5	QPSK	2.7007	3.047
				16QAM	2.6996	3.115
		23095	707.5	QPSK	2.7014	3.113
				16QAM	2.7013	3.068
		23165	714.5	QPSK	2.6867	3.053
				16QAM	2.6964	3.066
	1.4	23017	699.7	QPSK	1.0887	1.364
				16QAM	1.0913	1.358
		23095	707.5	QPSK	1.0889	1.339
				16QAM	1.0948	1.373
		23173	715.3	QPSK	1.0934	1.395
				16QAM	1.0937	1.370

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LTE Band 4

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

LTE Band 17

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

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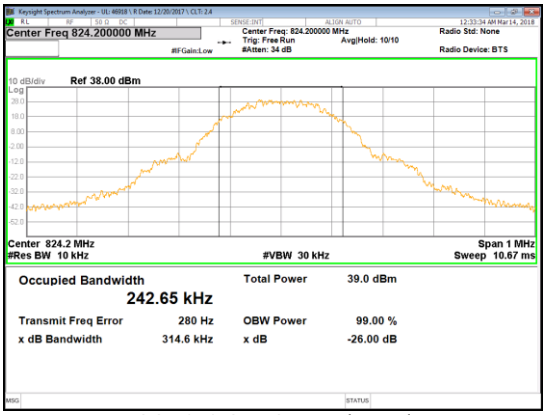
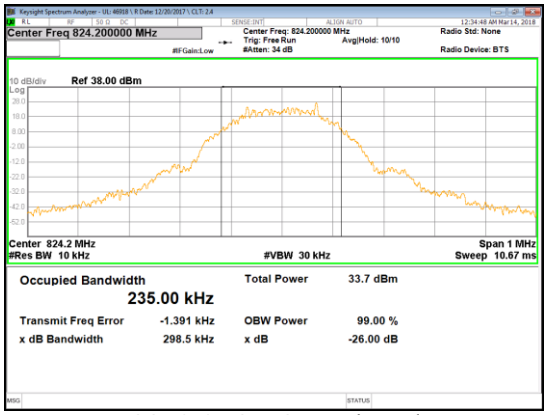
9.1.2. OCCUPIED BANDWIDTH PLOTS

GSM 850

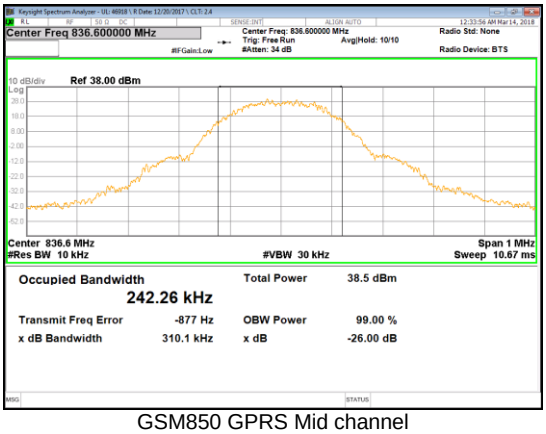
GSM 850



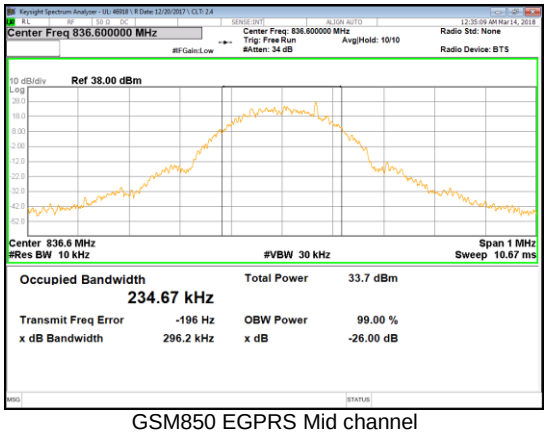
GSM850 GPRS Low channel



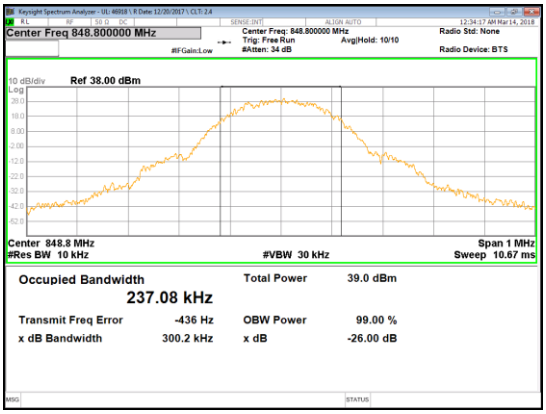
GSM850 EGPRS Low channel



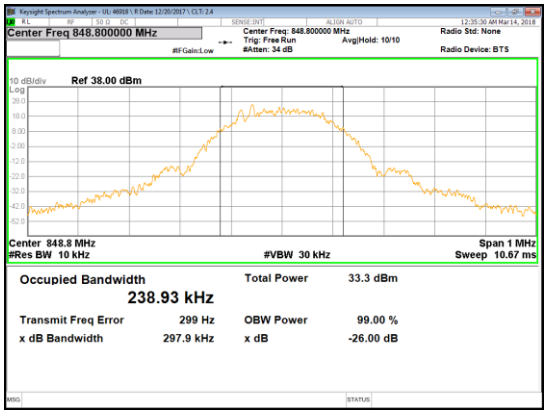
GSM850 GPRS Mid channel



GSM850 EGPRS Mid channel



GSM850 GPRS High channel



GSM850 EGPRS High channel

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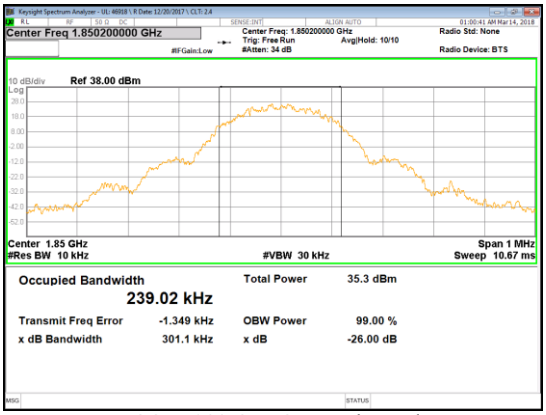
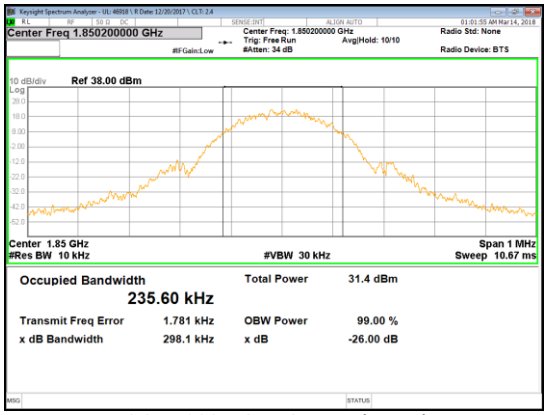
GSM 1900

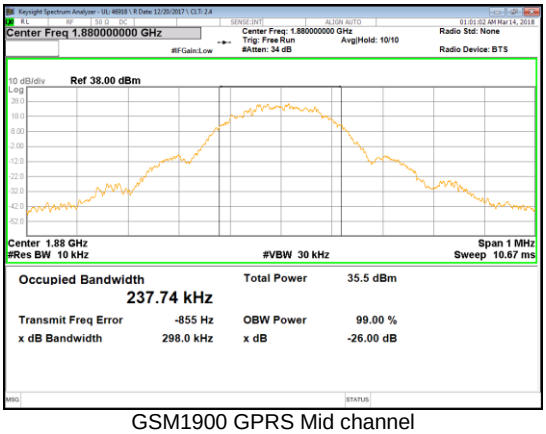
GSM 1900



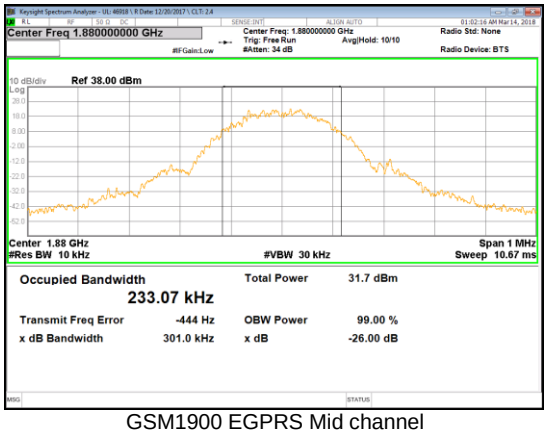
GSM1900 GPRS Low channel



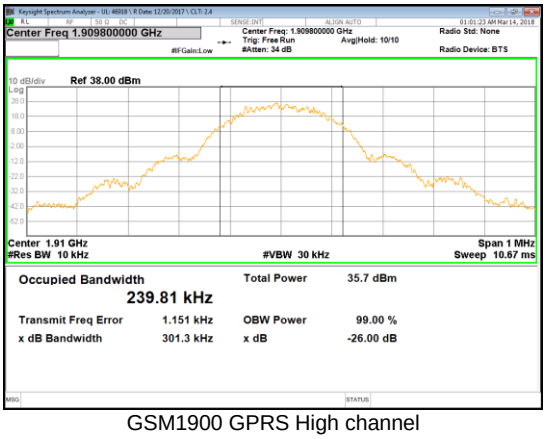
GSM1900 EGPRS Low channel



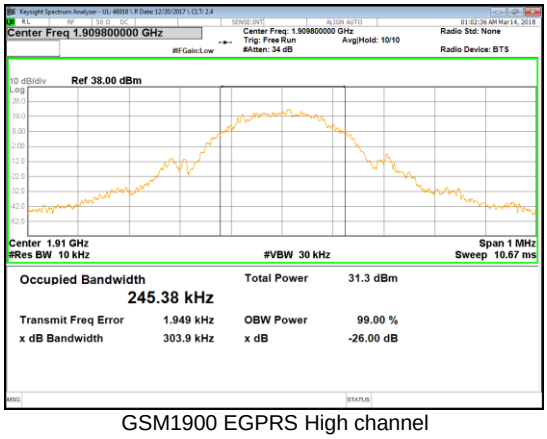
GSM1900 GPRS Mid channel



GSM1900 EGPRS Mid channel



GSM1900 GPRS High channel



GSM1900 EGPRS High channel

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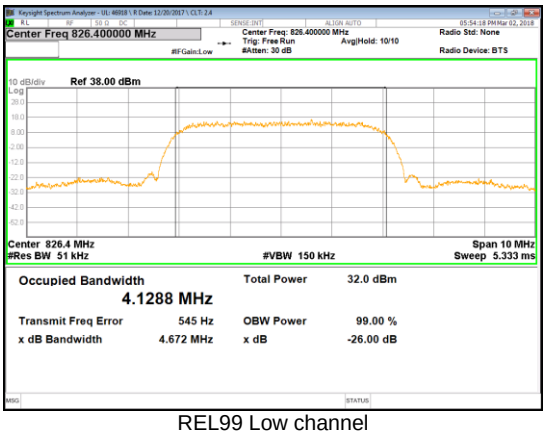
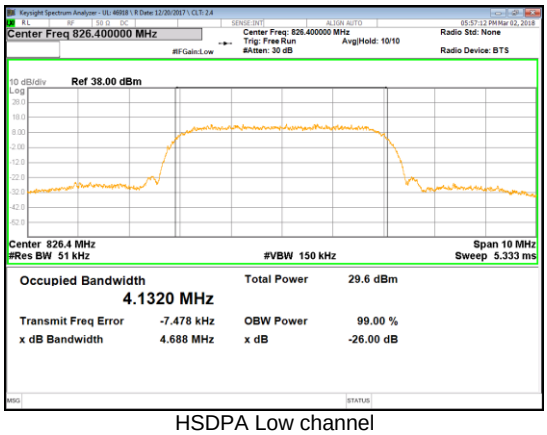
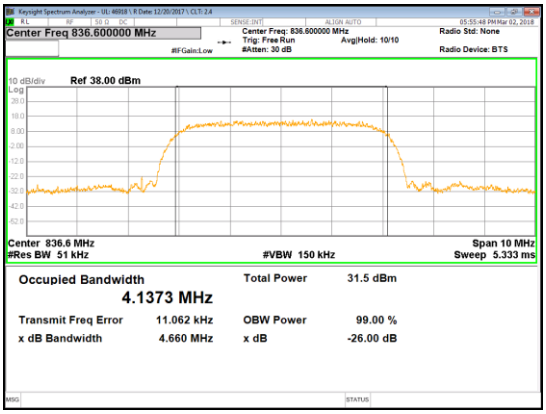
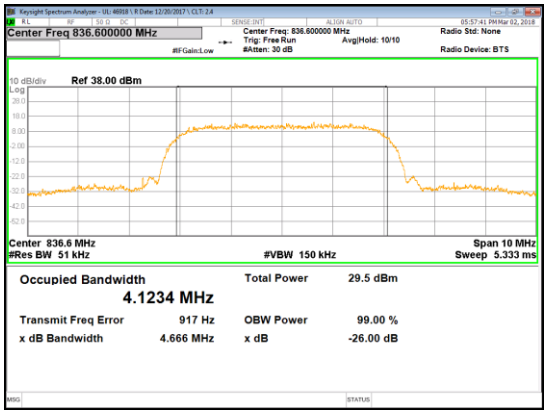
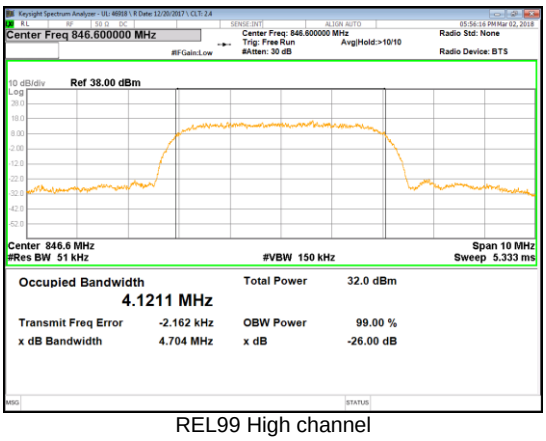
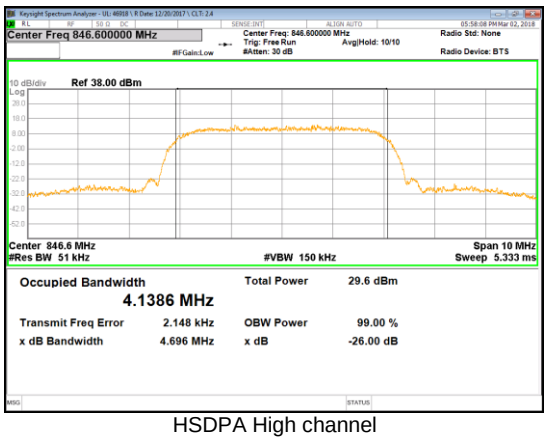
WCDMA Band 5

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

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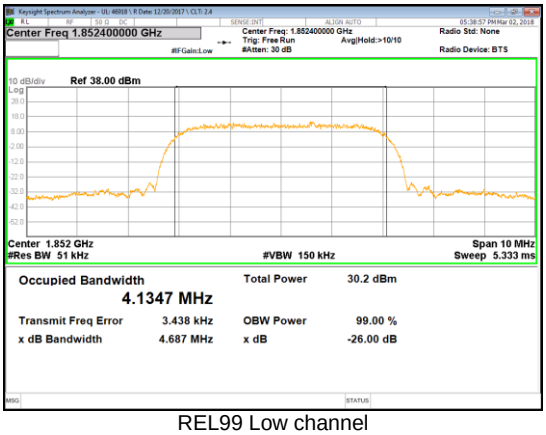
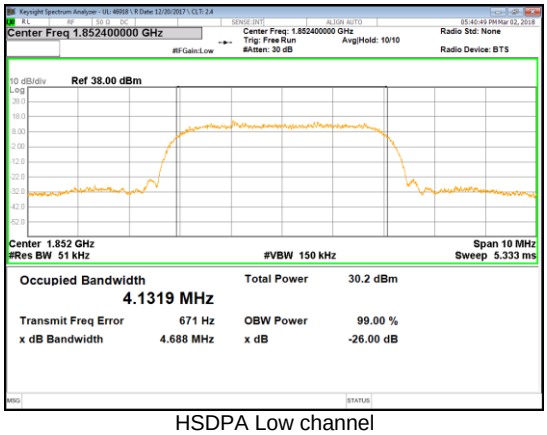
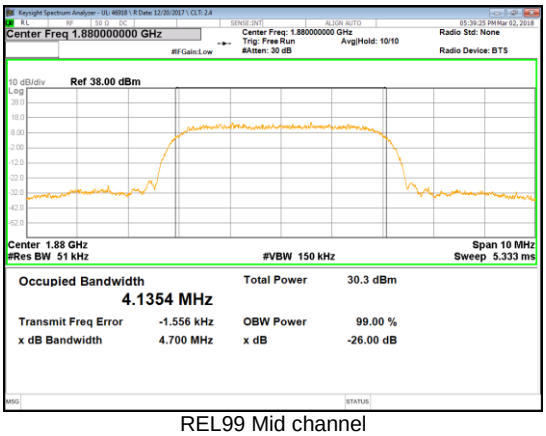
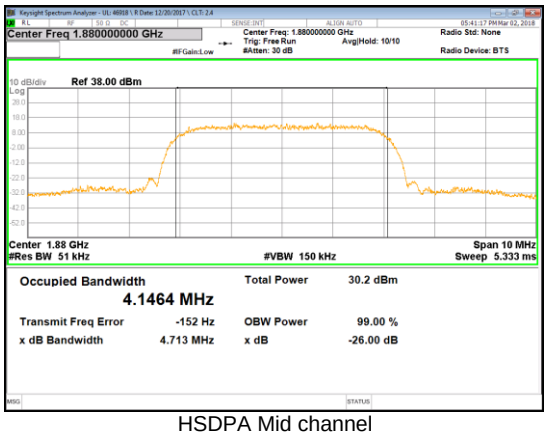
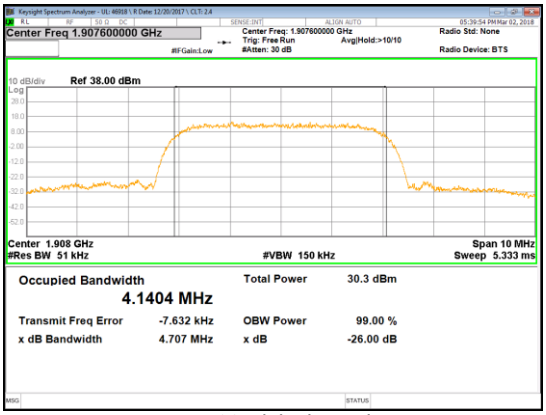
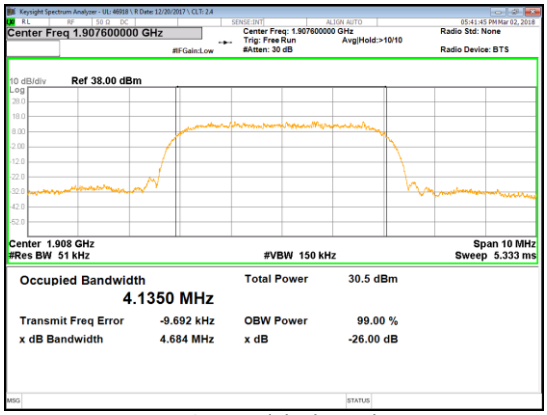
WCDMA Band 2

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

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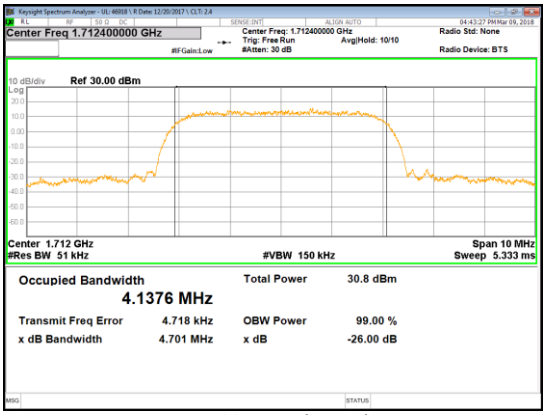
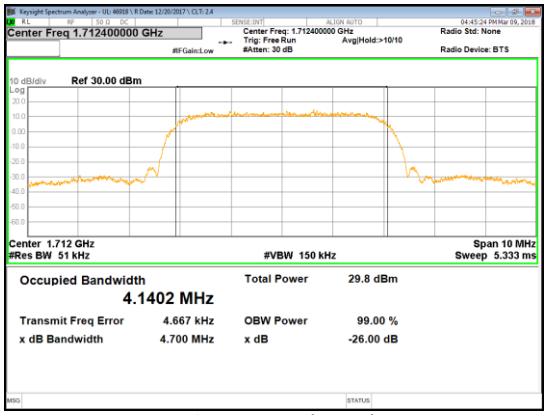
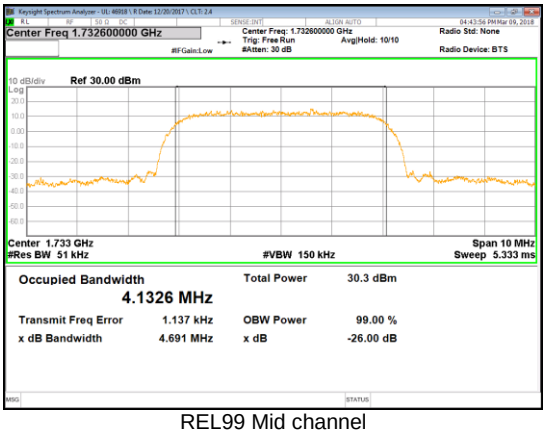
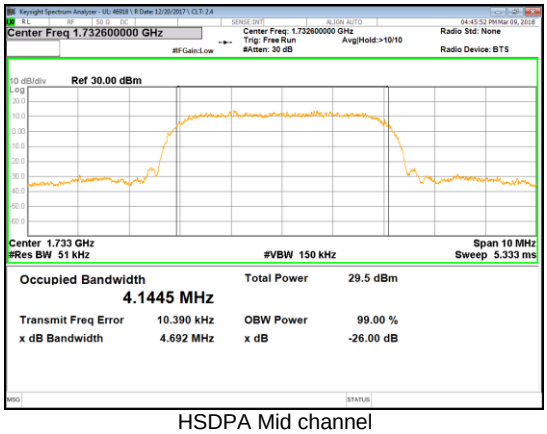
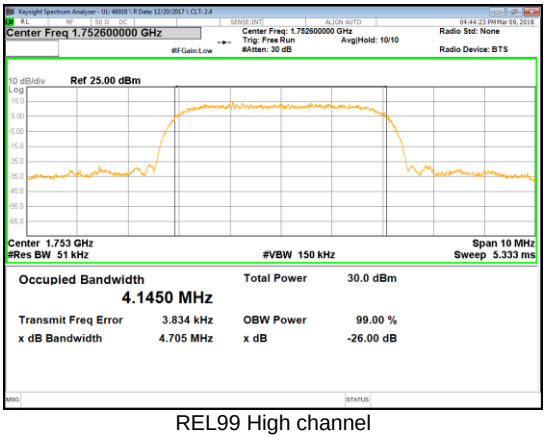
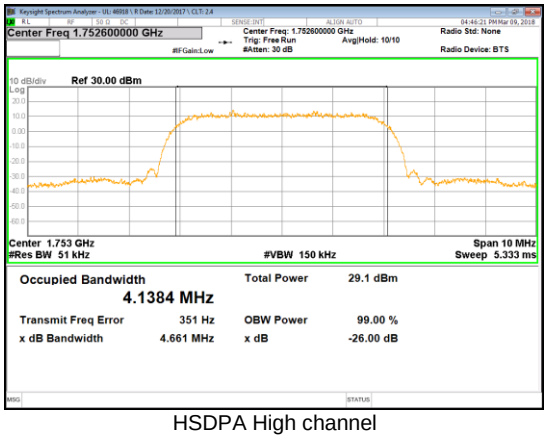
WCDMA Band 4

Band 4	 REL99 Low channel	 HSDPA Low channel
	 REL99 Mid channel	 HSDPA Mid channel
	 REL99 High channel	 HSDPA High channel

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