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, ANT+ and NFC

MODEL NUMBER : SM-A605GN/DS, SM-A605GN

FCC ID: A3LSMA605GN

REPORT NUMBER: 4788371689-E7V1

ISSUE DATE: MAR 27, 2018

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

Prepared by
UL Korea, Ltd.
26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea
Suwon Test Site: UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433

ACCREDITED
Testing Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	03/27/18	Initial issue	Junwhan Lee

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5
1.1. INTRODUCTION OF TEST DATA REUSE 6
1.2. DIFFERENCE 6
1.3. SPOT CHECK VERIFICATION DATA 6
1.4. REFERENCE DETAIL 7
2. TEST METHODOLOGY 8
3. FACILITIES AND ACCREDITATION 8
4. CALIBRATION AND UNCERTAINTY 8
4.1. MEASURING INSTRUMENT CALIBRATION 8
4.2. SAMPLE CALCULATION 8
4.3. MEASUREMENT UNCERTAINTY 9
5. EQUIPMENT UNDER TEST 10
5.1. DESCRIPTION OF EUT 10
5.2. MAXIMUM OUTPUT POWER 10
5.3. DESCRIPTION OF AVAILABLE ANTENNAS 14
5.4. WORST-CASE ORIENTATION 15
5.5. DESCRIPTION OF TEST SETUP 15
6. TEST AND MEASUREMENT EQUIPMENT 17
7. Summary Table 18
8. PEAK TO AVERAGE RATIO 20
8.1. CONDUCTED PEAK TO AVERAGE RESULT 20
8.2. CONDUCTED PEAK TO AVERAGE PLOTS 24
9. LIMITS AND CONDUCTED RESULTS 34
9.1. OCCUPIED BANDWIDTH 34
9.1.1. OCCUPIED BANDWIDTH RESULTS 34
9.1.2. OCCUPIED BANDWIDTH PLOTS 42
9.2. BAND EDGE EMISSIONS 73
9.2.1. BAND EDGE PLOTS 84
9.2.2. EMISSION MASK PLOTS 111
9.3. OUT OF BAND EMISSIONS 115
9.3.1. OUT OF BAND EMISSIONS PLOTS 123
9.4. FREQUENCY STABILITY 153
9.4.1. FREQUENCY STABILITY RESULTS 154

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10. RADIATED TEST RESULTS 165

10.1. RADIATED POWER (ERP & EIRP) 165

10.1.1. ERP/EIRP Results 166

10.1.2. ERP/EIRP DATA 173

10.2. FIELD STRENGTH OF SPURIOUS RADIATION 204

10.2.1. SPURIOUS RADIATION PLOTS 205

11. SETUP PHOTOS 236

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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, ANT+ and NFC
MODEL NUMBER:	SM-A605GN/DS, SM-A605GN
SERIAL NUMBER:	R38K108QG5F, R38K104R4WF(RADIATED, Original); R38K104QAPL (CONDUCTED, Original); R38K10CXFRF, R38K10CXCDR (RADIATED, Spot check & Additional test); R38K10CXD5Z (CONDUCTED, Spot check & Additional test);
DATE TESTED:	FEB 22, 2018 - MAR 19, 2018 (Original) MAR 16, 2018 - MAR 27, 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
UL Korea, Ltd.

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMA605FN WWAN(FCC CFR 47 Part 22/24). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMA605GN shares the same enclosure and circuit board as FCC ID: A3LSMA605FN. The WWAN antennas and surrounding circuitry and layout regarding test data re-used bands are identical between these two units. The FCC ID: A3LSMA605GN, 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: A3LSMA605FN remains representative of FCC ID: A3LSMA605GN. The test data of FCC ID: A3LSMA605FN being submitted for this application to cover WWAN re-used bands features.

- Reuse bands - GSM850, GSM1900, WCDMA Band 5, WCDMA Band 2, LTE Band 5
- Additional test bands for FCC ID : A3LSMA605GN - WCDMA Band4, LTE Band 2, LTE Band 4 (Covered by LTE B66), LTE Band 12, LTE Band 13, LTE Band 17 (Covered by LTE Band 12), LTE Band 41, LTE Band 66.

1.3. SPOT CHECK VERIFICATION DATA

Band	Test Item	Worst Mode	Frequency	Test Limit	Original model SM-A605FN/DS Results FCC ID : A3LSMA605FN	Spot check model SM-A605GN/DS Results FCC ID : A3LSMA605GN	Deviation	Remark
GSM850	ERP	GPRS	836.6 MHz	38.50 dBm	27.04 dBm	27.95 dBm	0.91 dB	Spot check data measured on Low Ch. (824.2MHz)
	RSE	GPRS	1697.6 MHz	-13.00 dBm	-34.10 dBm	-33.70 dBm	0.40 dB	
GSM1900	EIRP	GPRS	1880 MHz	33.00 dBm	29.66 dBm	28.99 dBm	-0.67 dB	
	RSE	GPRS	7520 MHz	-13.00 dBm	-43.80 dBm	-40.80 dBm	3.00 dB	
WCDMA Band 2	EIRP	REL99	1852.4 MHz	33.00 dBm	21.40 dBm	20.46 dBm	-0.94 dB	
	RSE	HSDPA	7630 MHz	-13.00 dBm	-48.00 dBm	-45.10 dBm	2.90 dB	
WCDMA Band 5	ERP	REL99	826.4 MHz	38.50 dBm	17.93 dBm	17.64 dBm	-0.29 dB	
	RSE	REL99	3305.6 MHz	-13.00 dBm	-50.20 dBm	-49.80 dBm	0.40 dB	
LTE Band 5	EIRP	3M QPSK	825.5 MHz	38.50 dBm	16.45 dBm	16.84 dBm	0.39 dB	
	RSE	1.4M 16QAM	1696.6 MHz	-13.00 dBm	-46.20 dBm	-49.30 dBm	-3.10 dB	

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

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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	A3LSMA605FN	Grant	4788372835-E1V2	Test	FCC Report DTS WLAN All sections
			4788372835-E2V2	Test	FCC Report BLE All sections
DSS	A3LSMA605FN	Grant	4788372835-E3V2	Test	FCC Report BT / All sections
NII	A3LSMA605FN	Grant	4788372835-E4V3	Test	FCC Report UNII WLAN / All sections
DXX	A3LSMA605FN	Grant	4788372835-E5V2	Test	FCC Report ANT+ / All sections
			4788372835-E6V3	Test	FCC Report NFC / All sections
PCE	A3LSMA605FN	Grant	4788372835-E7V2	Test	FCC Report WWAN / All sections (Except Conducted Output Power)

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 22.
3. FCC CFR 47 Part 24.
4. FCC CFR 47 Part 27.
5. ANSI TIA-603-E, 2016
6. KDB 971168 D01 Power Meas License Digital Systems v03

3. FACILITIES AND ACCREDITATION

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

218 Maeyeong-ro
☒ Chamber 1
☒ Chamber 2
☒ Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at http://www.iasonline.org/PDF/TL/TL-637.pdf.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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)

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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%.

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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, ANT+ and NFC.
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.(4788371689-S1V1 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	33.6	2290.87		
		GPRS	33.6	2290.87	27.04	505.82
		EGPRS	27.2	524.81	20.78	119.67
GSM1900	1850~1910	GMSK	30.2	1047.13		
		GPRS	30.1	1023.29	29.66	924.70
		EGPRS	25.7	371.54	26.30	426.58

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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	17.93	62.09
		HSDPA	23.1	204.17	17.43	55.34
		HSUPA	23.2	208.93		
		DC-HSDPA	23.1	204.17		
Band 4	1710~1755	REL99	23.6	229.09	25.19	330.37
		HSDPA	22.6	181.97	24.11	257.63
		HSUPA	22.6	181.97		
		DC-HSDPA	22.6	181.97		
Band 2	1850~1910	REL99	23.4	218.78	21.40	138.04
		HSDPA	22.4	173.78	20.43	110.41
		HSUPA	22.5	177.83		
		DC-HSDPA	22.5	177.83		

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	24.5	281.84	16.32	42.85
			16QAM	23.4	218.78	15.50	35.48
		5	QPSK	24.5	281.84	16.08	40.55
			16QAM	23.5	223.87	15.07	32.14
		3	QPSK	24.3	269.15	16.45	44.16
			16QAM	23.7	234.42	15.42	34.83
		1.4	QPSK	24.3	269.15	13.98	25.00
			16QAM	23.6	229.09	13.14	20.61

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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	24.0	251.19	19.55	90.16
			16QAM	23.5	223.87	18.54	71.45
		15	QPSK	24.1	257.04	19.80	95.50
			16QAM	23.5	223.87	18.82	76.21
		10	QPSK	24.0	251.19	20.20	104.71
			16QAM	23.2	208.93	19.16	82.41
		5	QPSK	23.9	245.47	20.18	104.23
			16QAM	23.4	218.78	19.17	82.60
		3	QPSK	23.8	239.88	20.11	102.57
			16QAM	23.3	213.80	19.06	80.54
		1.4	QPSK	23.8	239.88	18.38	68.87
			16QAM	23.3	213.80	17.41	55.08

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	24.8	302.00	16.08	40.55
			16QAM	24.0	251.19	14.99	31.55
		5	QPSK	24.6	288.40	15.44	34.99
			16QAM	23.9	245.47	14.54	28.44
		3	QPSK	24.4	275.42	15.61	36.39
			16QAM	23.8	239.88	14.92	31.05
		1.4	QPSK	24.5	281.84	13.15	20.65
			16QAM	23.8	239.88	12.09	16.18

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.

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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	24.8	302.00	13.13	20.56
			16QAM	23.7	234.42	12.22	16.67
		5	QPSK	24.4	275.42	14.27	26.73
			16QAM	23.6	229.09	14.07	25.53

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	24.4	275.42	22.96	197.70
			16QAM	23.5	223.87	22.15	164.06
		15	QPSK	24.5	281.84	23.23	210.38
			16QAM	23.5	223.87	22.29	169.43
		10	QPSK	24.4	275.42	22.65	184.08
			16QAM	23.5	223.87	21.61	144.88
		5	QPSK	24.2	263.03	23.79	239.33
			16QAM	23.5	223.87	22.75	188.36
		3	QPSK	24.1	257.04	23.75	237.14
			16QAM	23.5	223.87	22.74	187.93
		1.4	QPSK	24.0	251.19	21.31	135.21
			16QAM	23.4	218.78	20.22	105.20

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.

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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	24.5	281.84	21.17	130.92
			16QAM	23.5	223.87	20.24	105.68
		15	QPSK	24.5	281.84	21.11	129.12
			16QAM	23.5	223.87	20.66	116.41
		10	QPSK	24.5	281.84	20.11	102.57
			16QAM	23.5	223.87	18.85	76.74
		5	QPSK	24.5	281.84	20.28	106.66
			16QAM	23.4	218.78	19.29	84.92

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	-4.45
GSM1900 / WCDMA Band 2 / LTE Band 2 1850 ~ 1910 MHz	-2.78
LTE Band 41 2496 ~ 2690 MHz	-2.58
LTE Band 12/17 699 ~ 716 MHz	-5.34
LTE Band 13 777 ~ 787 MHz	-6.24
WCDMA Band 4 / LTE Band 4/66 1710 ~ 1780 MHz	-2.75

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

5.4. WORST-CASE ORIENTATION

For GSM1900 / WCDMA Band 2 / LTE Band2 / 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 Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

For GSM850 / WCDMA Band 5 / WCDMA Band 4 / 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.

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	DW3J719AS/A- E	N/A
Data Cable	SAMSUNG	ECB-DU68WE	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

I/O CABLES

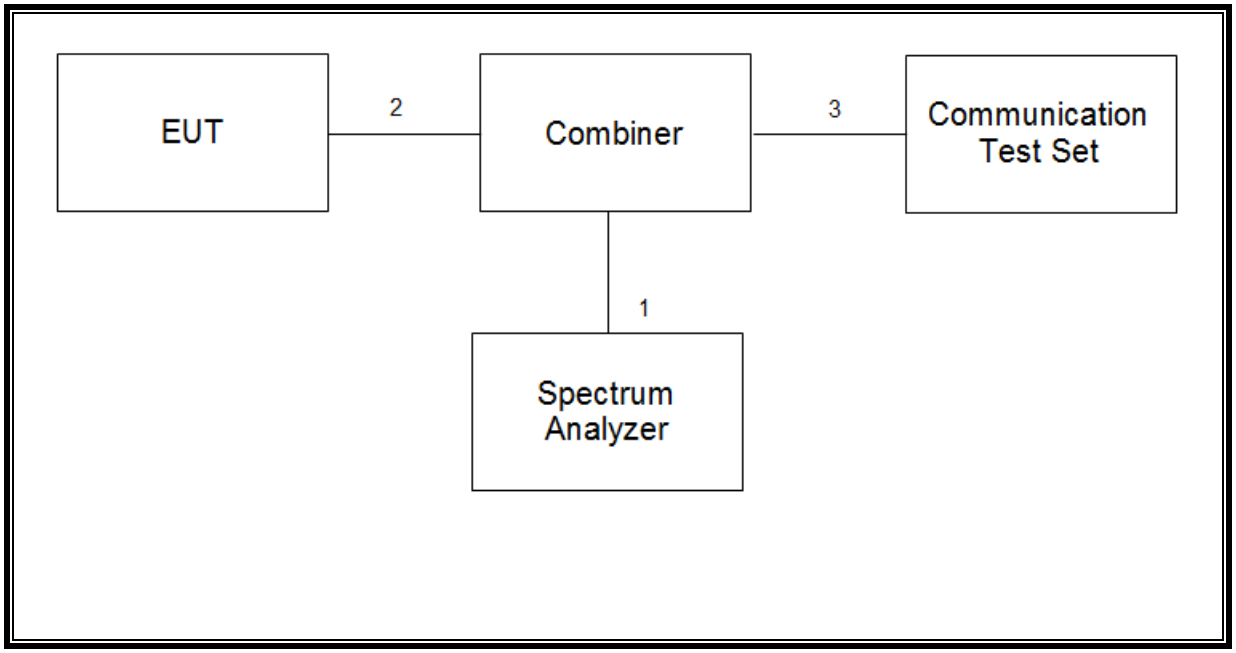
I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	2	Mini-Jack	Unshielded	1.2m	N/A

TEST SETUP

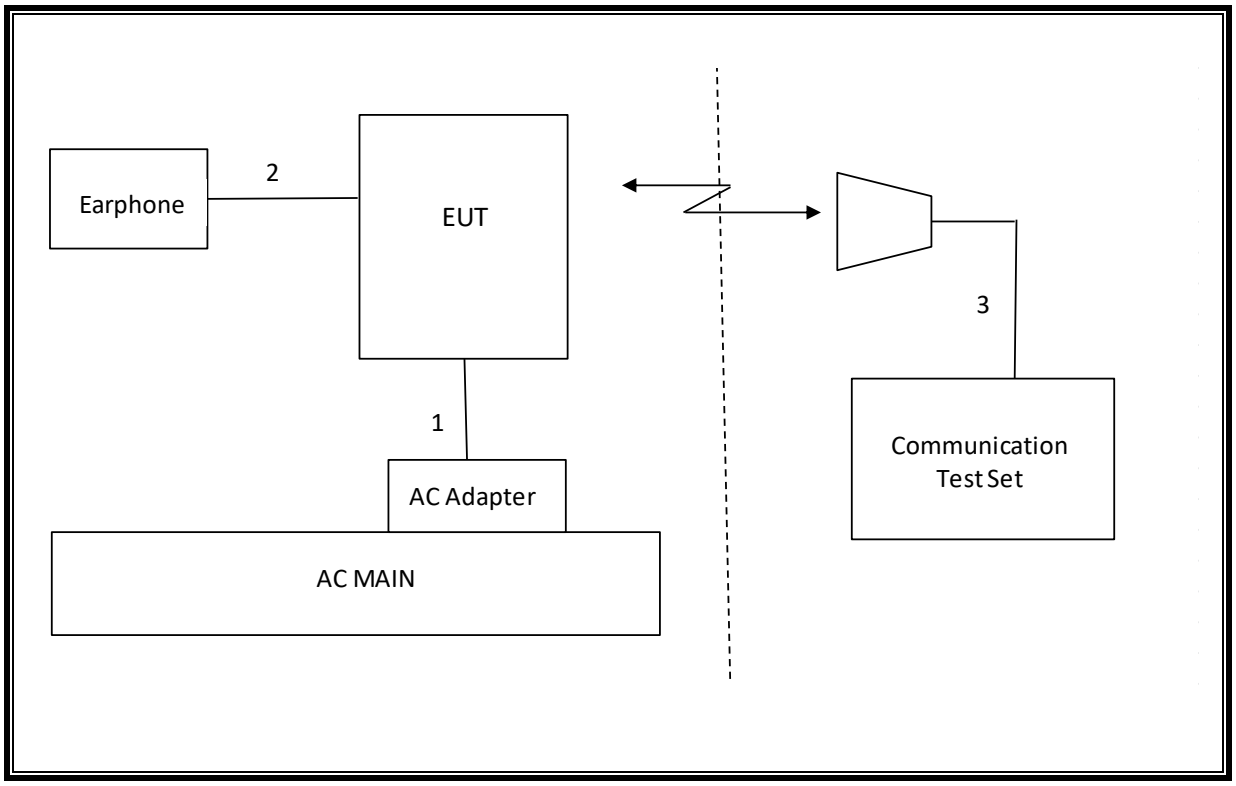
The EUT is continuously communicated to the call box during the tests.

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

7. Summary Table

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1049	Occupied Band width (99%)	N/A	Conducted	Pass
22.917(a) 24.238(a) 27.53(c),(g),(h)	Band Edge / Conducted Spurious Emission	-13dBm		Pass
27.53(m)	Conducted Spurious Emission	-25 dBm		Pass
27.53(m)	Emission mask	Section 9.2.2		Pass
2.1046	Conducted output power	N/A		Pass
22.355 24.235 27.54	Frequency Stability	2.5PPM		Pass
22.913(a)(2)	Effective Radiated Power	38.5 dBm	Radiated	Pass
27.50(b)(10)		34.77 dBm		Pass
24.232(c) 27.50(h)(2)	Equivalent Isotropic Radiated Power	33dBm		Pass
27.50(d)(4)		30dBm		Pass
22.917(a) 24.238(a) 27.53(c),(g),(h)	Radiated Spurious Emission	-13dBm		Pass
27.53(f)		-40dBm		Pass
27.53 (m)		-25dBm		Pass

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

FCC Rule Part	Frequency Range [MHz]	Output Power [W]	Frequency Tolerance	Emission Designator	Emission Bandwidth [MHz]	Communication Type
GSM						
22H	824.2 - 848.8	0.506	2.5 ppm	246KGXW		GSM850
22H	824.2 - 848.8	0.120	2.5 ppm	255KG7W		EDGE850
24E	1850.2 - 1909.8	0.925	2.5 ppm	248KGXW		GSM1900
24E	1850.2 - 1909.8	0.427	2.5 ppm	246KG7W		EDGE1900
WCDMA						
22H	826.4 - 846.6	0.062	2.5 ppm	4M13F9W		WCDMA B5
27L	1712.4 - 1752.6	0.330	2.5 ppm	4M13F9W		WCDMA B4
24E	1852.4 - 1907.6	0.138	2.5 ppm	4M16F9W		WCDMA B2
LTE Band 5						
22H	829.0 - 844.0	0.043	2.5 ppm	8M97G7W	10	QPSK
22H	829.0 - 844.0	0.035	2.5 ppm	8M97D7W	10	16QAM
22H	825.5 - 847.5	0.044	2.5 ppm	2M69G7W	3	QPSK
LTE Band 41						
27M	2506.0 - 2680.0	0.131	2.5 ppm	17M9G7W	20	QPSK
27M	2506.0 - 2680.0	0.106	2.5 ppm	17M9D7W	20	16QAM
27M	2503.5 - 2682.5	0.116	2.5 ppm	13M4D7W	15	16QAM
LTE Band 13						
27F	782	0.021	2.5 ppm	8M93G7W	10	QPSK
27F	782	0.017	2.5 ppm	8M94D7W	10	16QAM
27F	779.5 - 784.5	0.027	2.5 ppm	4M50G7W	5	QPSK
27F	779.5 - 784.5	0.026	2.5 ppm	4M49D7W	5	16QAM
LTE Band 12/17						
27H	704.0 - 711.0	0.041	2.5 ppm	8M95G7W	10	QPSK
27H	704.0 - 711.0	0.032	2.5 ppm	8M97D7W	10	16QAM
LTE Band 2						
24E	1860.0 - 1900.0	0.090	2.5 ppm	17M9G7W	20	QPSK
24E	1860.0 - 1900.0	0.071	2.5 ppm	17M9D7W	20	16QAM
24E	1855.0 - 1905.0	0.105	2.5 ppm	8M96G7W	10	QPSK
24E	1852.5 - 1907.5	0.083	2.5 ppm	4M49D7W	5	16QAM
LTE Band 4/66						
27L	1720.0 - 1770.0	0.198	2.5 ppm	17M9G7W	20	QPSK
27L	1720.0 - 1770.0	0.164	2.5 ppm	17M9D7W	20	16QAM
27L	1712.5 - 1775.5	0.239	2.5 ppm	4M50G7W	5	QPSK
27L	1712.5 - 1775.5	0.188	2.5 ppm	4M50D7W	5	16QAM

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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	0.38	13.00
			EGPRS	3.45	
GSM1900	661	1880.0	GPRS	0.41	
			EGPRS	3.52	

WCDMA

Band	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	4183	836.6	REL99	2.93	13.00
			HSDPA	3.08	
Band 4	1413	1732.6	REL99	2.90	
			HSDPA	3.07	
Band 2	9400	1880.0	REL99	2.89	
			HSDPA	3.04	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	10	20525	836.5	QPSK	3.54	13.00
				16QAM	4.29	
	5			QPSK	3.51	
				16QAM	4.27	
	3			QPSK	3.49	
				16QAM	4.32	
	1.4			QPSK	3.48	
				16QAM	4.34	

LTE Band41

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 41	20	40620	2593	QPSK	4.73	13.00
				16QAM	5.58	
	15			QPSK	4.45	
				16QAM	5.68	
	10			QPSK	4.73	
				16QAM	5.58	
	5			QPSK	4.30	
				16QAM	5.45	

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 13	10	23230	782	QPSK	3.91	13.00
				16QAM	4.64	
	5			QPSK	3.95	
				16QAM	4.68	
Band 12	10	23095	707.5	QPSK	4.42	
				16QAM	5.21	
	5			QPSK	4.50	
				16QAM	5.23	
	3			QPSK	4.40	
				16QAM	5.18	
	1.4			QPSK	4.38	
				16QAM	5.25	
Band 66	20	132322	1745.0	QPSK	4.58	
				16QAM	5.33	
	15			QPSK	4.54	
				16QAM	5.40	
	10			QPSK	4.60	
				16QAM	5.39	
	5			QPSK	4.78	
				16QAM	5.33	
	3			QPSK	4.58	
				16QAM	5.38	
	1.4			QPSK	4.54	
				16QAM	5.42	
Band 2	20	18900	1880.0	QPSK	3.58	
				16QAM	4.39	
	15			QPSK	3.58	
				16QAM	4.38	
	10			QPSK	3.58	
				16QAM	4.49	
	5			QPSK	3.74	
				16QAM	4.33	
	3			QPSK	3.57	
				16QAM	4.37	
	1.4			QPSK	3.53	
				16QAM	4.46	

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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.

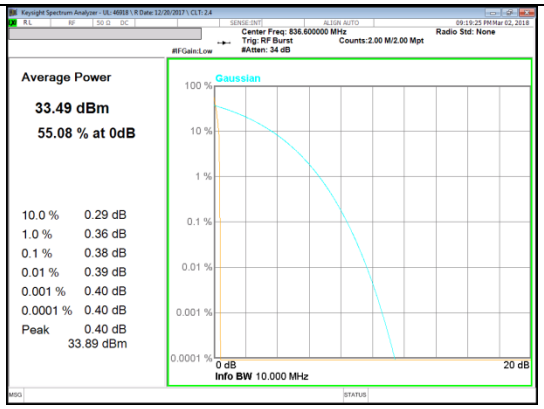
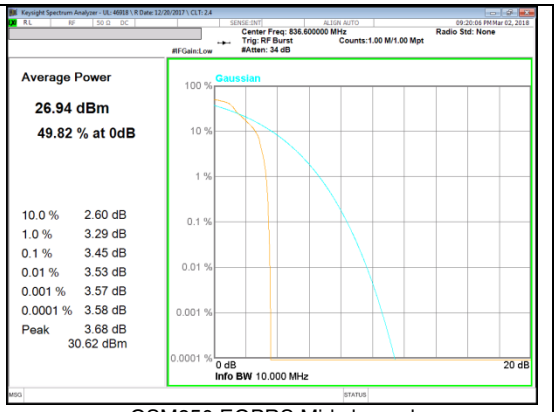
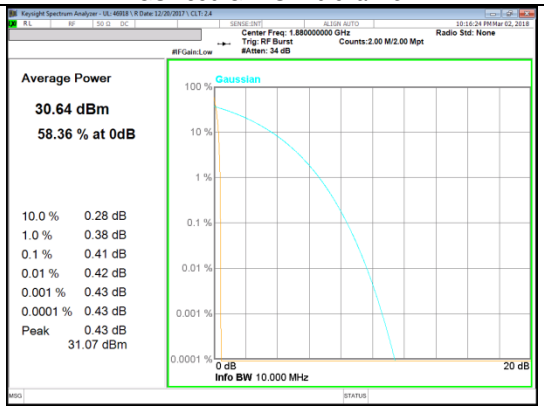
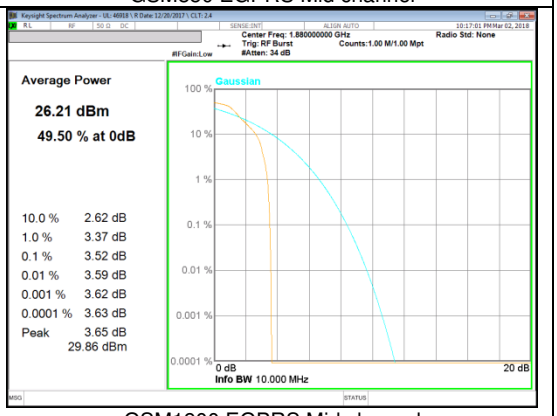
LTE Band 17

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.

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

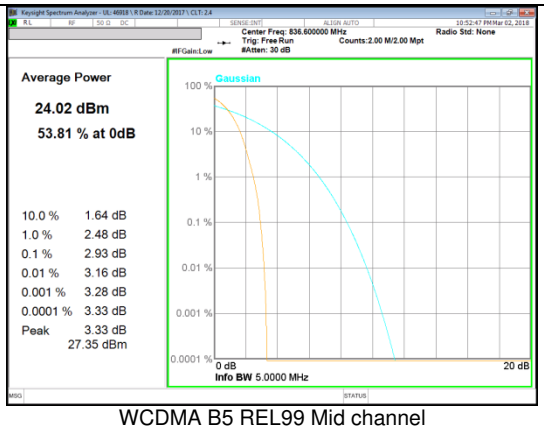
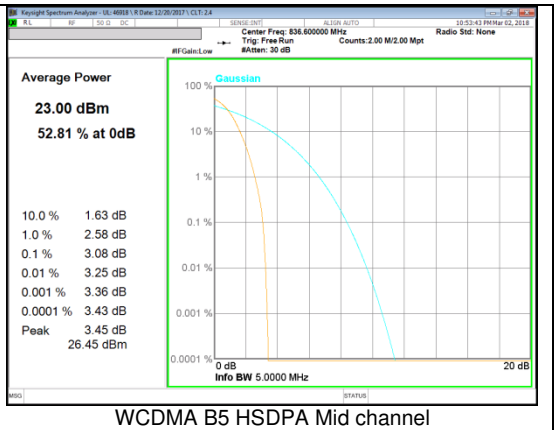
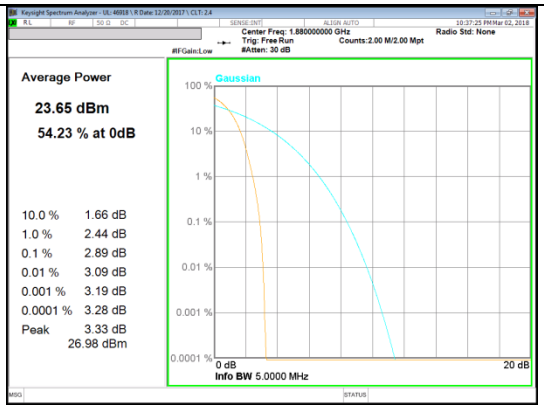
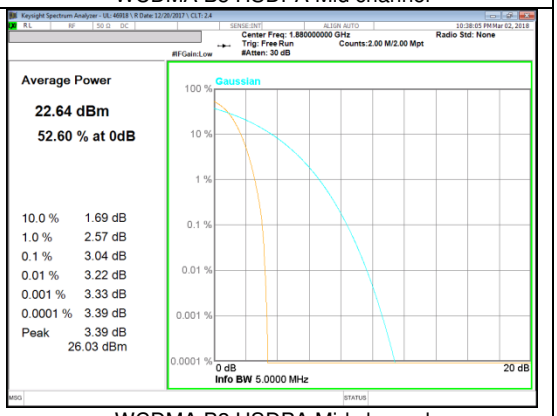
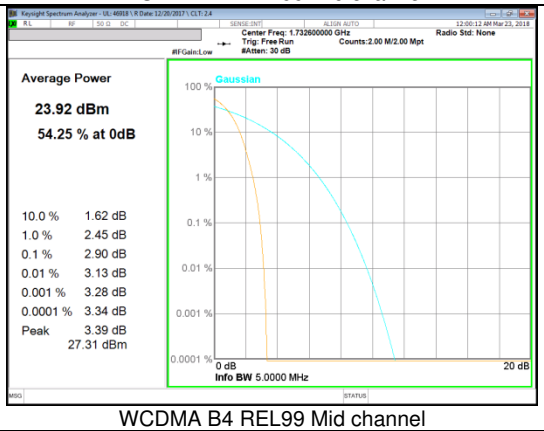
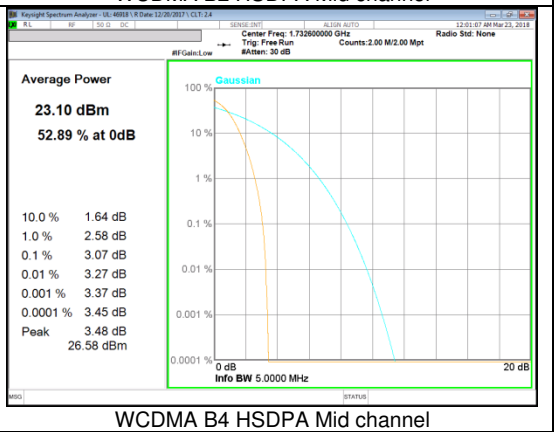
8.2. CONDUCTED PEAK TO AVERAGE PLOTS

GSM

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

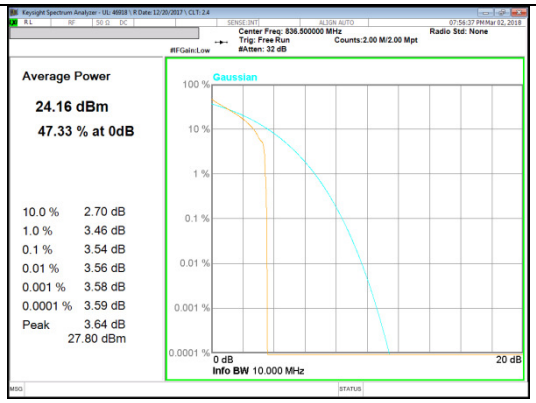
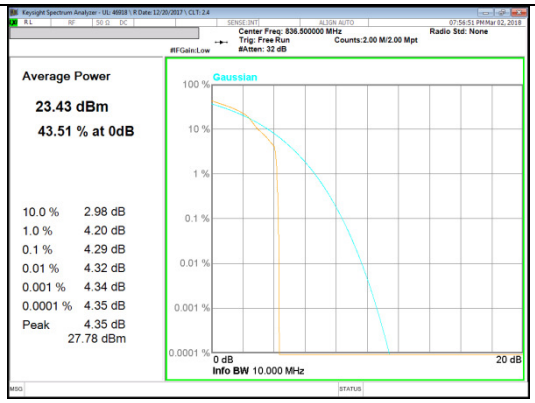
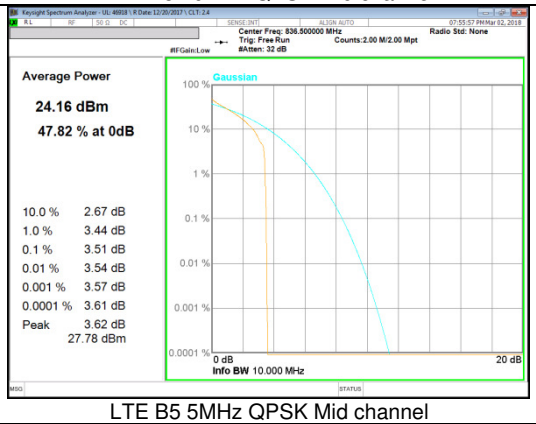
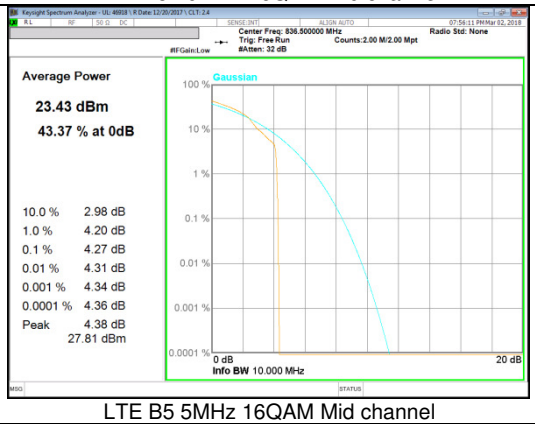
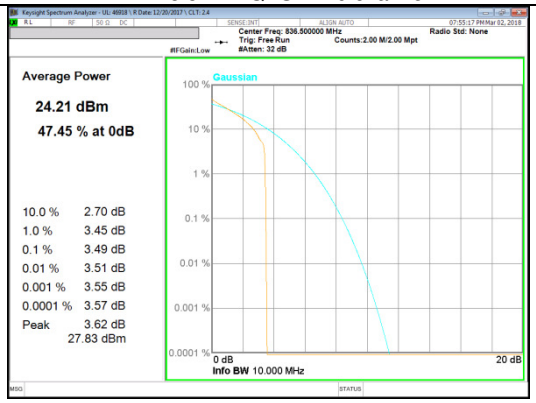
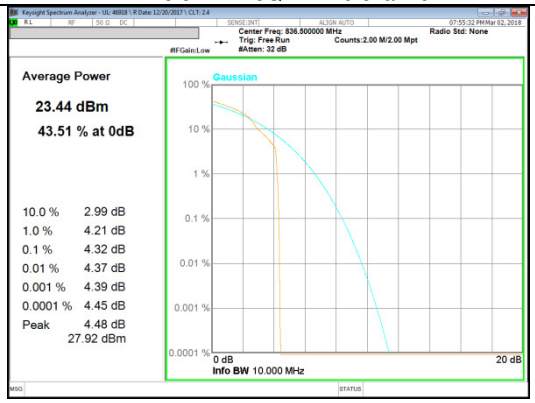
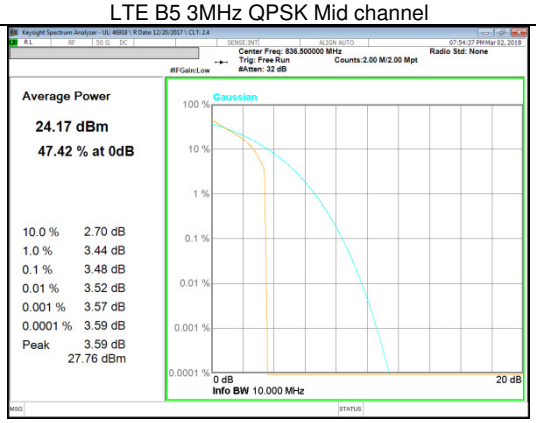
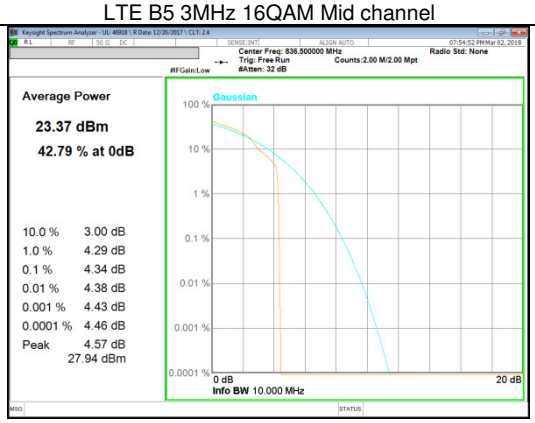
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

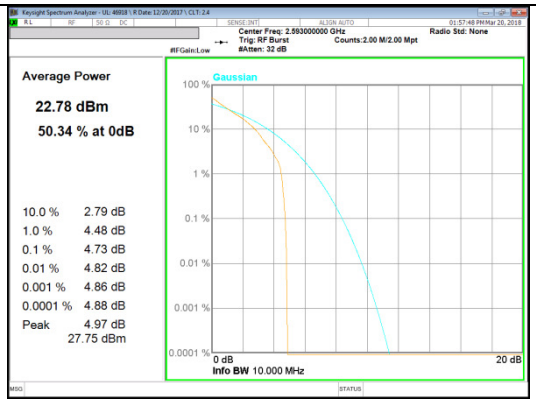
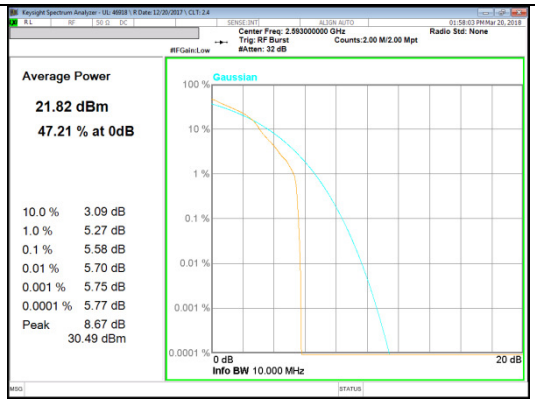
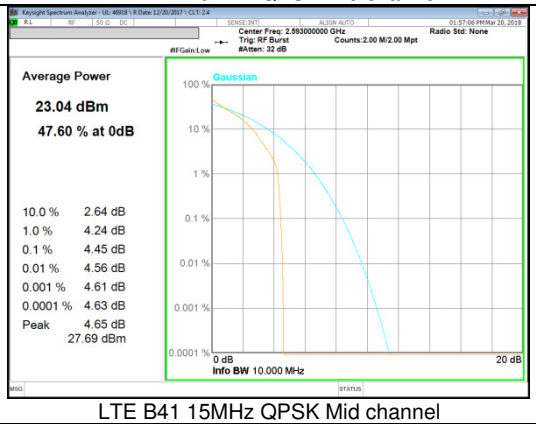
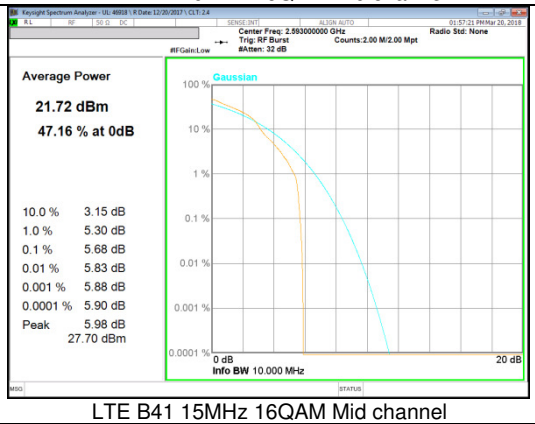
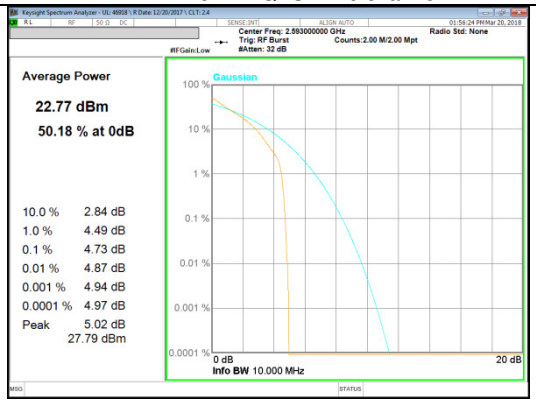
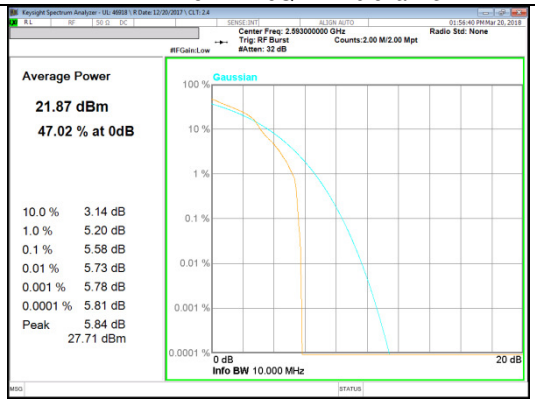
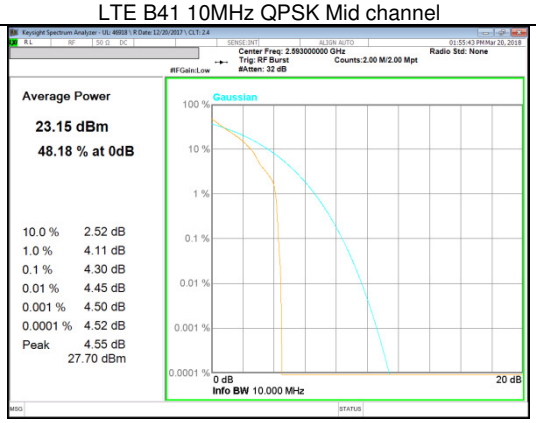
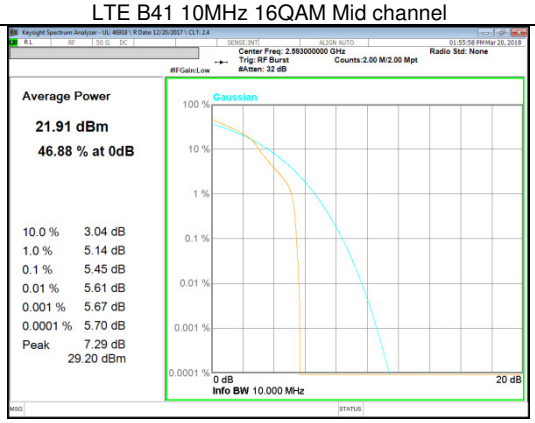
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

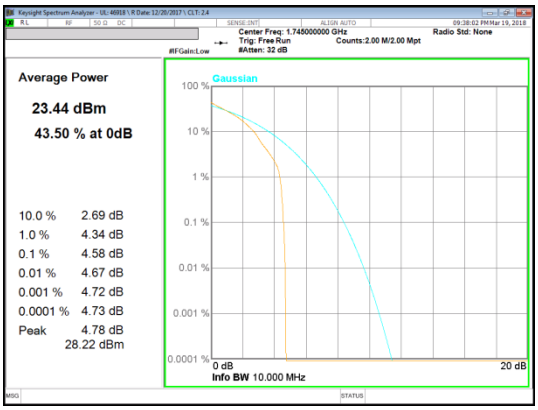
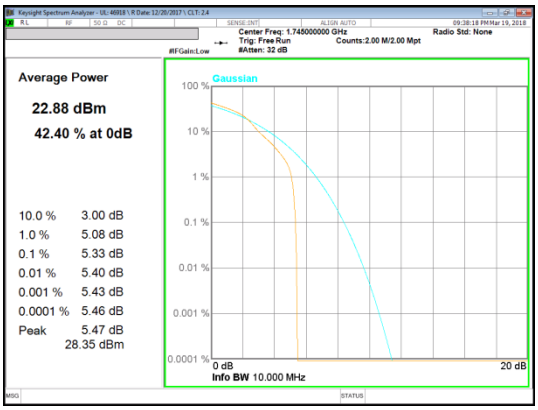
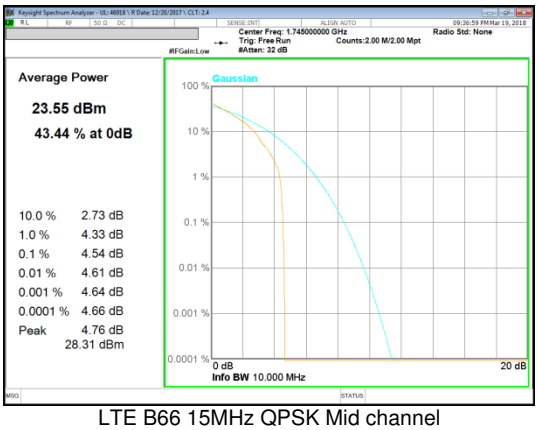
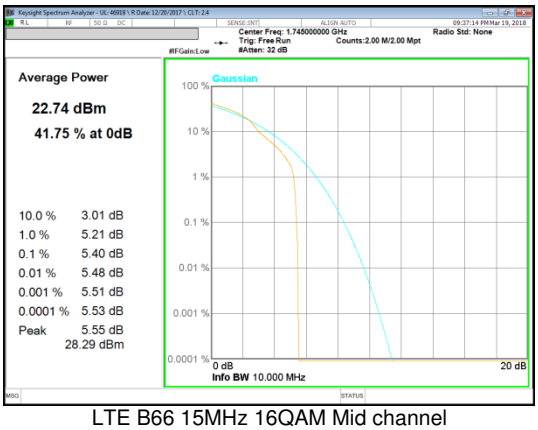
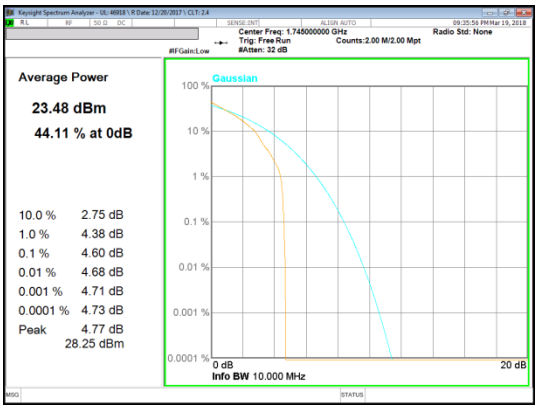
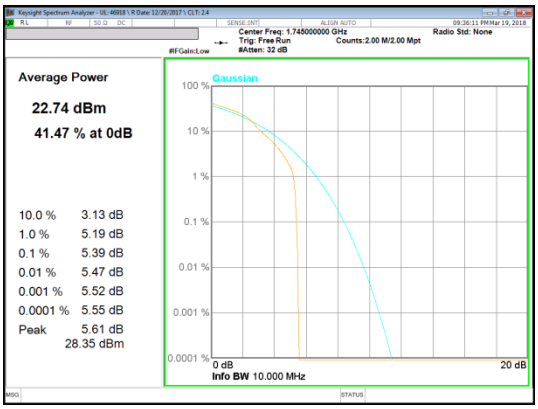
UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 41

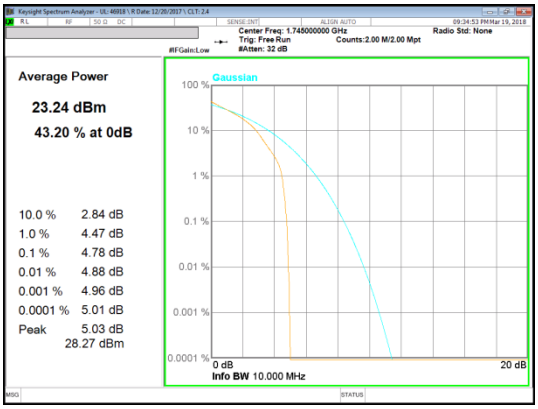
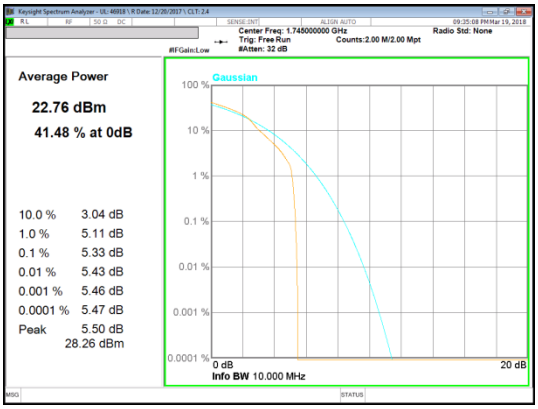
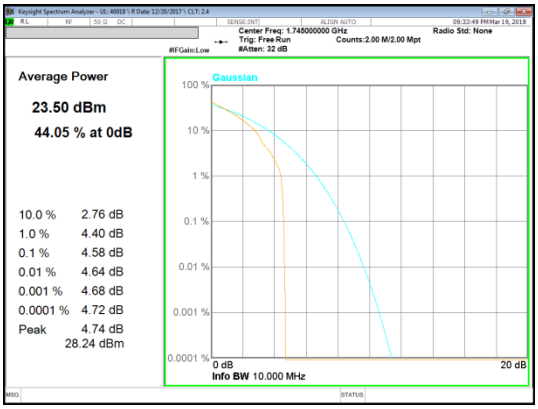
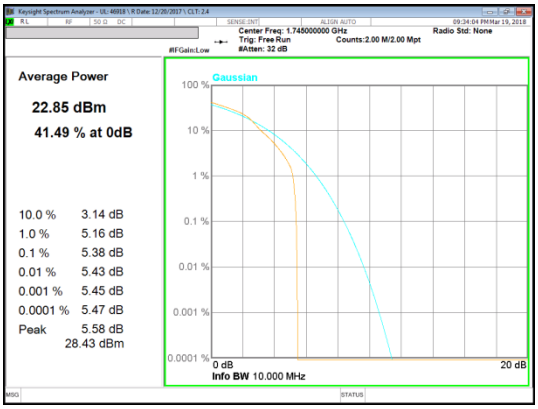
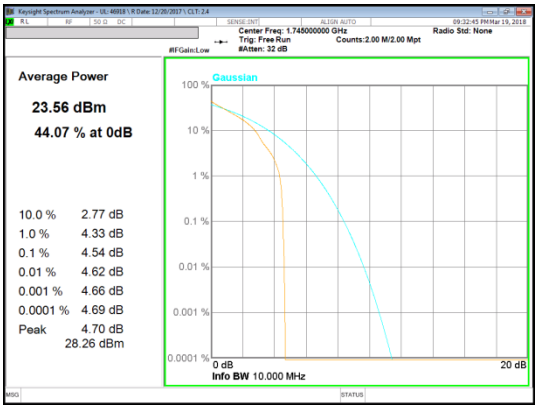
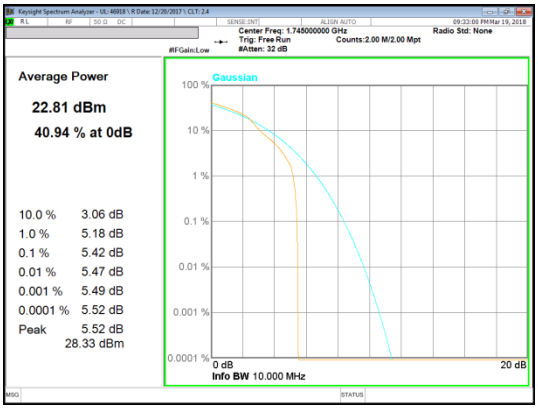
LTE Band 41 20 MHz	 LTE B41 20MHz QPSK Mid channel	 LTE B41 20MHz 16QAM Mid channel
LTE Band 41 15 MHz	 LTE B41 15MHz QPSK Mid channel	 LTE B41 15MHz 16QAM Mid channel
LTE Band 41 10 MHz	 LTE B41 10MHz QPSK Mid channel	 LTE B41 10MHz 16QAM Mid channel
LTE Band 41 5 MHz	 LTE B41 5MHz QPSK Mid channel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

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 66

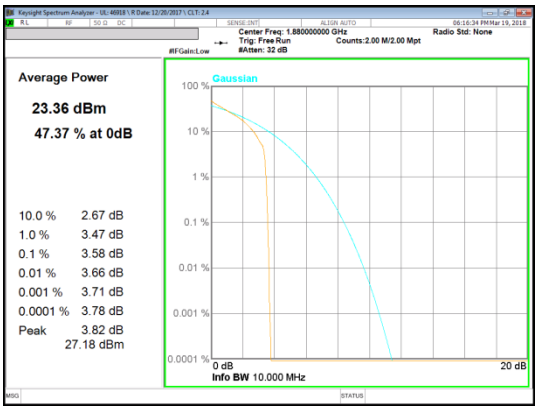
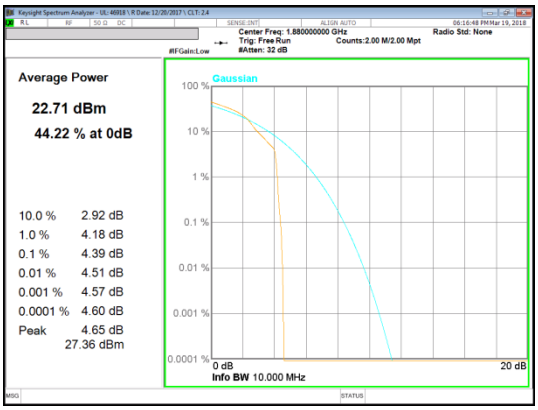
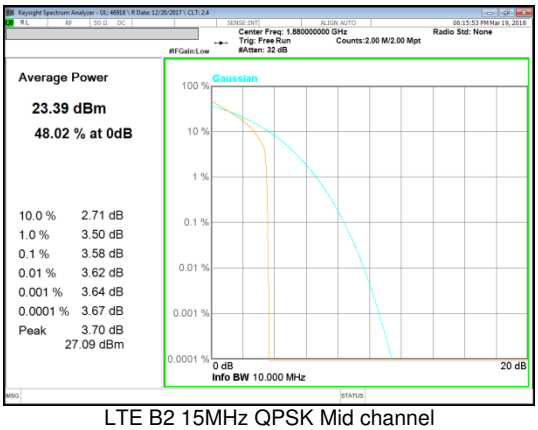
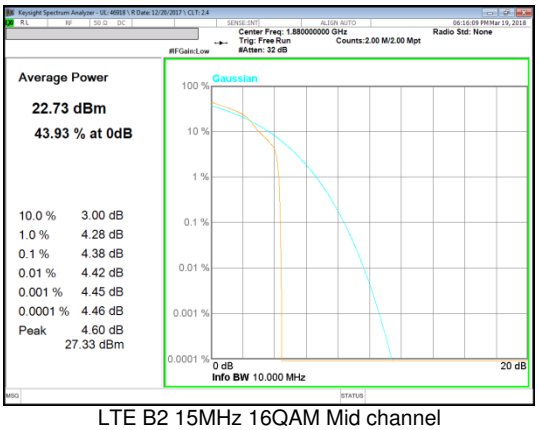
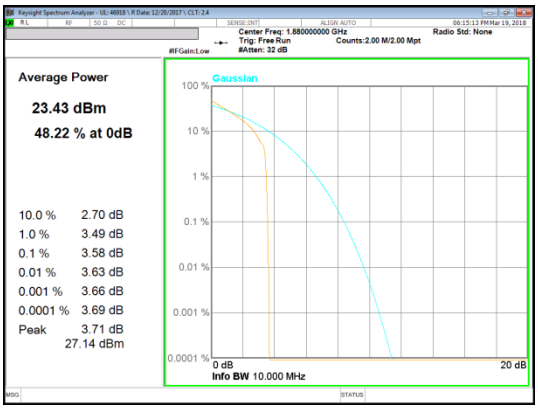
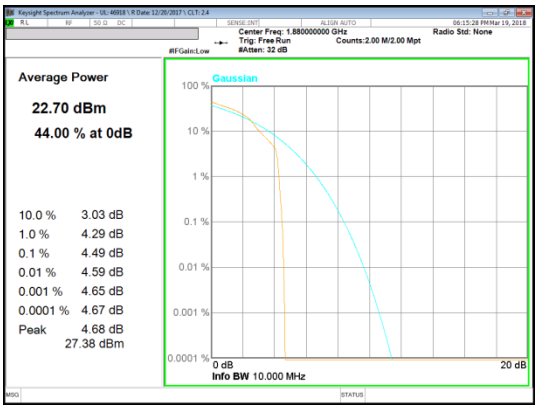
LTE Band 66 20 MHz	 LTE B66 20MHz QPSK Mid channel	 LTE B66 20MHz 16QAM Mid channel
LTE Band 66 15 MHz	 LTE B66 15MHz QPSK Mid channel	 LTE B66 15MHz 16QAM Mid channel
LTE Band 66 10 MHz	 LTE B66 10MHz QPSK Mid channel	 LTE B66 10MHz 16QAM Mid channel

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

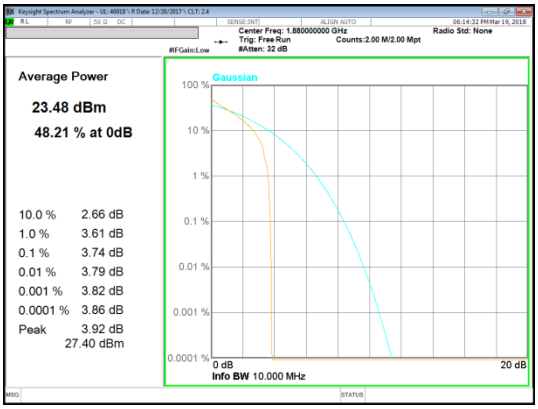
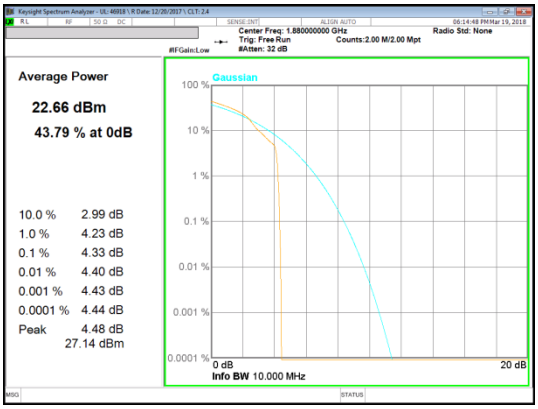
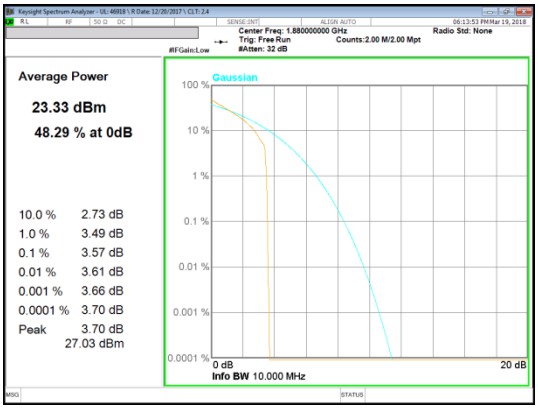
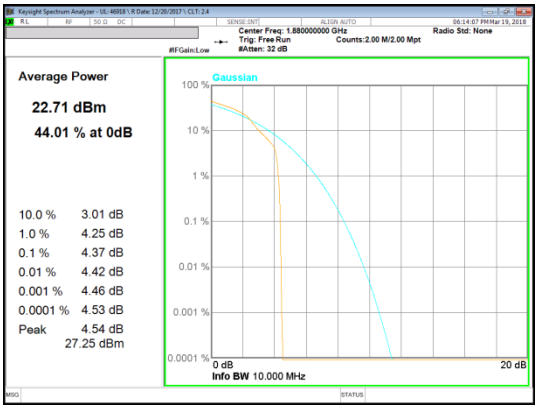
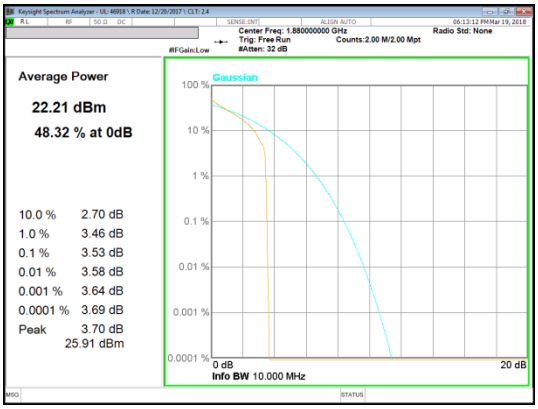
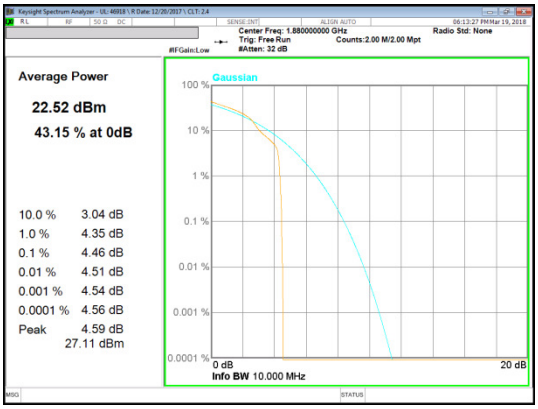
LTE Band 66 5 MHz	 LTE B66 5MHz QPSK Mid channel	 LTE B66 5MHz 16QAM Mid channel
LTE Band 66 3 MHz	 LTE B66 3MHz QPSK Mid channel	 LTE B66 3MHz 16QAM Mid channel
LTE Band 66 1.4 MHz	 LTE B66 1.4MHz QPSK Mid channel	 LTE B66 1.4MHz 16QAM Mid channel

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 2

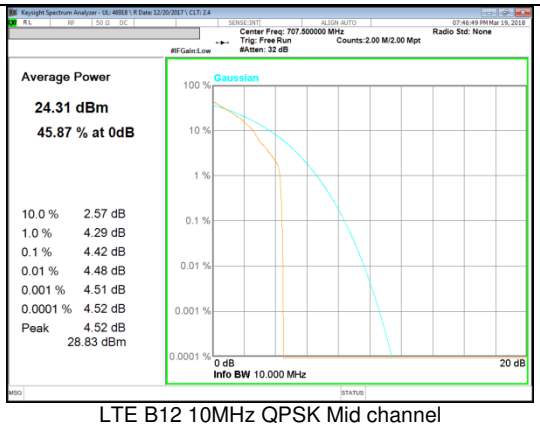
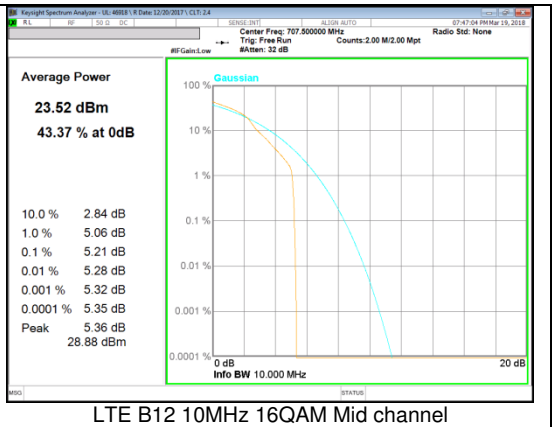
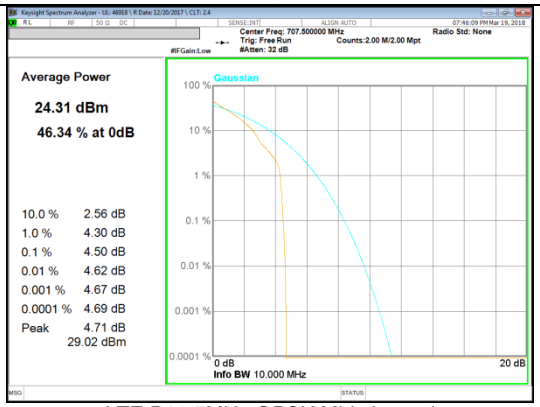
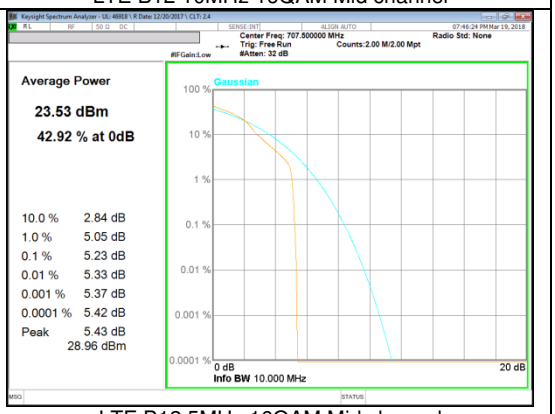
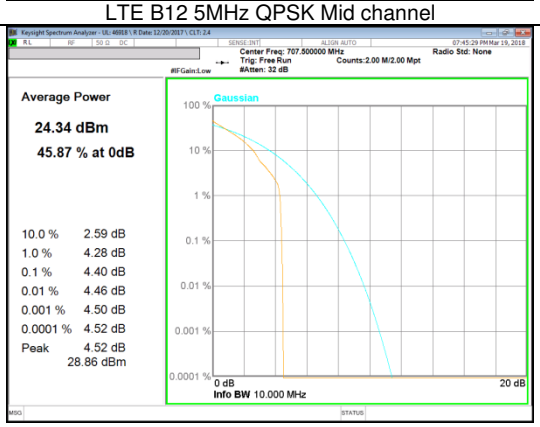
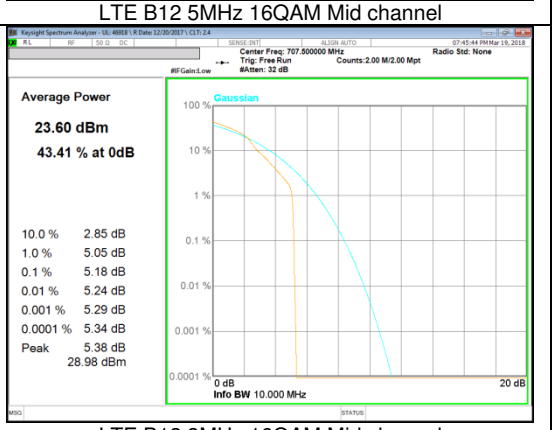
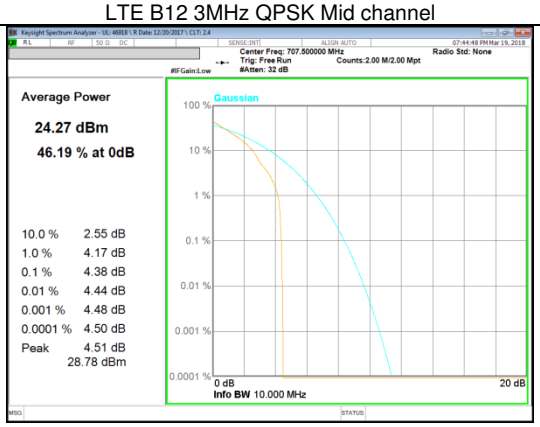
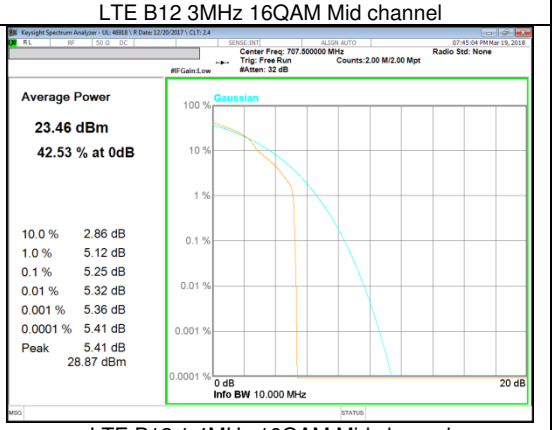
LTE Band 2 20 MHz	 LTE B2 20MHz QPSK Mid channel	 LTE B2 20MHz 16QAM Mid channel
LTE Band 2 15 MHz	 LTE B2 15MHz QPSK Mid channel	 LTE B2 15MHz 16QAM Mid channel
LTE Band 2 10 MHz	 LTE B2 10MHz QPSK Mid channel	 LTE B2 10MHz 16QAM Mid channel

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

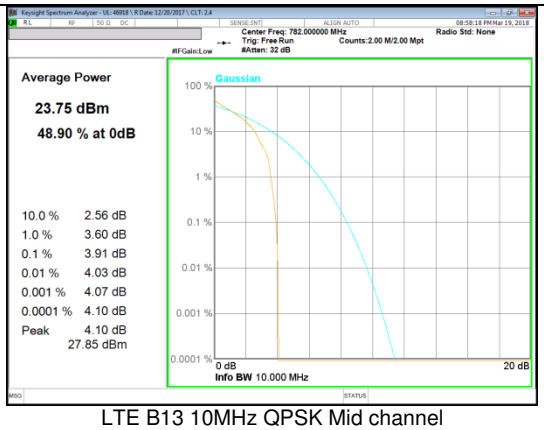
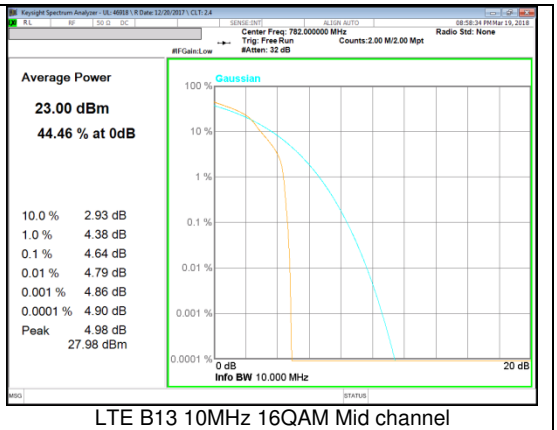
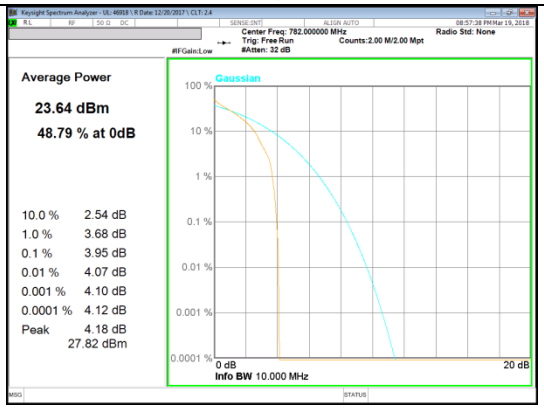
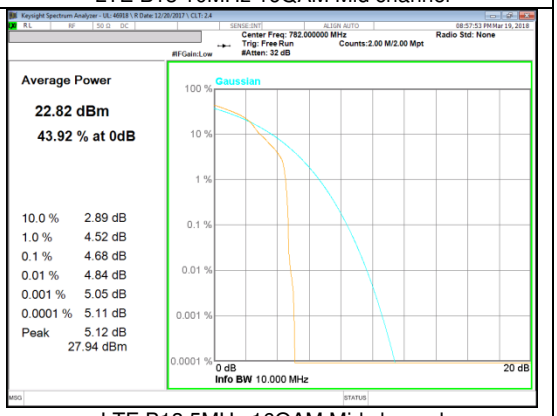
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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	244.47	315.1
		190	836.6	245.59	326.2
		251	848.8	241.08	316.9
	EGPRS	128	824.2	255.07	319.0
		190	836.6	238.34	302.6
		251	848.8	245.21	296.3
GSM1900	GPRS	512	1850.2	242.43	315.3
		661	1880.0	248.32	313.6
		810	1909.8	247.01	320.2
	EGPRS	512	1850.2	245.93	303.4
		661	1880.0	234.08	301.2
		810	1909.8	241.77	309.4

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA

Band	Mode	Channel	f [MHz]	99% BW [MHz]	26dB BW [MHz]
Band 5	REL99	4132	826.4	4.1265	4.657
		4183	836.6	4.1261	4.695
		4233	846.6	4.1333	4.680
	HSDPA	4132	826.4	4.1294	4.666
		4183	836.6	4.1271	4.696
		4233	846.6	4.1328	4.679
Band 2	REL99	9262	1852.4	4.1481	4.696
		9400	1880.0	4.1353	4.682
		9538	1907.6	4.1463	4.704
	HSDPA	9262	1852.4	4.1531	4.667
		9400	1880.0	4.1562	4.684
		9538	1907.6	4.1522	4.670
Band 4	REL99	1312	1712.4	4.1297	4.688
		1413	1732.6	4.1278	4.696
		1513	1752.6	4.1249	4.659
	HSDPA	1312	1712.4	4.1320	4.696
		1413	1732.6	4.1277	4.688
		1513	1752.6	4.1345	4.680

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 5	10	20450	829.0	QPSK	8.9549	9.768
				16QAM	8.9694	9.814
		20524	836.5	QPSK	8.9428	9.812
				16QAM	8.9557	9.780
		20599	844.0	QPSK	8.9689	9.749
				16QAM	8.9419	9.729
	5	20425	826.5	QPSK	4.4985	4.970
				16QAM	4.4927	4.985
		20524	836.5	QPSK	4.4889	4.952
				16QAM	4.4881	4.952
		20624	846.5	QPSK	4.4950	4.945
				16QAM	4.4826	4.928
	3	20415	825.5	QPSK	2.6919	2.975
				16QAM	2.6949	2.948
		20524	836.5	QPSK	2.6909	2.970
				16QAM	2.6908	2.969
		20634	847.5	QPSK	2.6931	2.979
				16QAM	2.6898	2.980
	1.4	20407	824.7	QPSK	1.0952	1.296
				16QAM	1.0834	1.283
		20524	836.5	QPSK	1.0830	1.269
				16QAM	1.0842	1.283
		20624	848.3	QPSK	1.0873	1.311
				16QAM	1.0930	1.287

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 41

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 41	20	35970	2506.0	QPSK	17.901	19.34
				16QAM	17.878	19.22
		40620	2593.0	QPSK	17.879	19.31
				16QAM	17.889	19.65
		41490	2680.0	QPSK	17.858	19.46
				16QAM	17.882	19.20
	15	39725	2503.5	QPSK	13.413	14.62
				16QAM	13.409	14.52
		40620	2593.0	QPSK	13.411	14.87
				16QAM	13.428	14.97
		41515	2682.5	QPSK	13.419	14.51
				16QAM	13.424	14.66
	10	39700	2501.0	QPSK	8.9893	9.961
				16QAM	8.9718	9.812
		40620	2593.0	QPSK	8.9346	9.834
				16QAM	8.9338	9.767
		41540	2685.0	QPSK	8.9661	9.730
				16QAM	8.9290	9.755
	5	39675	2498.5	QPSK	4.4926	4.957
				16QAM	4.4768	4.949
		40620	2593.0	QPSK	4.4975	5.139
				16QAM	4.4820	4.960
		41565	2687.5	QPSK	4.4837	4.931
				16QAM	4.4876	4.914

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 66

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 66	20	132072	1720.0	QPSK	17.882	19.37
				16QAM	17.897	19.28
		132322	1745.0	QPSK	17.900	19.31
				16QAM	17.882	19.19
		132572	1770.0	QPSK	17.843	19.11
				16QAM	17.845	19.22
	15	132047	1717.5	QPSK	13.436	14.64
				16QAM	13.429	14.53
		132322	1745.0	QPSK	13.410	14.51
				16QAM	13.404	14.53
		132597	1772.5	QPSK	13.403	14.57
				16QAM	13.420	14.45
	10	132022	1715.0	QPSK	8.9754	9.806
				16QAM	8.9515	9.809
		132322	1745.0	QPSK	8.9488	9.853
				16QAM	8.9498	9.749
		132622	1775.0	QPSK	8.9306	9.809
				16QAM	8.9256	9.791
	5	131997	1712.5	QPSK	4.5019	4.997
				16QAM	4.4950	4.986
		132322	1745.0	QPSK	4.4934	4.938
				16QAM	4.4794	4.931
		132647	1775.5	QPSK	4.4869	4.931
				16QAM	4.4810	4.916
	3	131987	1711.5	QPSK	2.6894	2.975
				16QAM	2.6938	2.981
		132322	1745.0	QPSK	2.6901	2.970
				16QAM	2.6932	2.982
		132657	1778.5	QPSK	2.6935	2.988
				16QAM	2.6960	2.975
	1.4	131979	1710.7	QPSK	1.0878	1.288
				16QAM	1.0940	1.291
		132322	1745.0	QPSK	1.0809	1.277
				16QAM	1.0832	1.285
		132665	1779.3	QPSK	1.0956	1.299
				16QAM	1.0829	1.282

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 2

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 2	20	18700	1860.0	QPSK	17.881	19.22
				16QAM	17.863	19.33
		18900	1880.0	QPSK	17.887	19.15
				16QAM	17.894	19.16
		19099	1900.0	QPSK	17.858	19.26
				16QAM	17.870	19.29
	15	18675	1857.5	QPSK	13.417	14.56
				16QAM	13.412	14.53
		18900	1880.0	QPSK	13.452	14.51
				16QAM	13.425	14.64
		19124	1902.5	QPSK	13.416	14.49
				16QAM	13.419	14.51
	10	18650	1955.0	QPSK	8.9443	9.810
				16QAM	8.9617	9.819
		18900	1880.0	QPSK	8.9606	9.830
				16QAM	8.9388	9.729
		19149	1905.0	QPSK	8.9578	9.705
				16QAM	8.9627	9.790
	5	18625	1852.5	QPSK	4.5030	4.998
				16QAM	4.4893	4.981
		18900	1880.0	QPSK	4.4869	4.930
				16QAM	4.4862	4.939
		19175	1907.5	QPSK	4.4992	4.947
				16QAM	4.4818	4.940
	3	18615	1815.5	QPSK	2.8676	2.974
				16QAM	2.6958	2.988
		18900	1880.0	QPSK	2.6934	2.973
				16QAM	2.6878	2.946
		19184	1908.5	QPSK	2.6894	2.967
				16QAM	2.6945	2.996
	1.4	18607	1850.7	QPSK	1.0957	1.296
				16QAM	1.0840	1.278
		18900	1880.0	QPSK	1.0841	1.288
				16QAM	1.0855	1.295
		19192	1909.3	QPSK	1.0922	1.324
				16QAM	1.0961	1.321

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 13

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 13	10	23230	782.0	QPSK	8.9311	9.777
				16QAM	8.9365	9.750
	5	23207	779.5	QPSK	4.4933	4.952
				16QAM	4.4856	4.960
		23230	782.0	QPSK	4.4860	4.914
				16QAM	4.4775	4.913
		23255	784.5	QPSK	4.4973	4.985
				16QAM	4.4859	4.984

LTE Band 12

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 12	10	23060	704.0	QPSK	8.9434	9.832
				16QAM	8.9428	9.726
		23095	707.5	QPSK	8.9424	9.837
				16QAM	8.9320	9.716
		23130	711.0	QPSK	8.9498	9.755
				16QAM	8.9691	9.697
	5	23035	701.5	QPSK	4.5057	5.020
				16QAM	4.4875	4.992
		23095	707.5	QPSK	4.4830	4.946
				16QAM	4.4788	4.936
		23155	713.5	QPSK	4.4947	4.936
				16QAM	4.4777	4.902
	3	23025	700.5	QPSK	2.6920	2.961
				16QAM	2.6908	2.986
		23095	707.5	QPSK	2.6867	2.967
				16QAM	2.6958	2.970
		23165	714.5	QPSK	2.6917	2.958
				16QAM	2.6855	2.966
	1.4	23017	699.7	QPSK	1.0887	1.298
				16QAM	1.0915	1.292
		23095	707.5	QPSK	1.0957	1.298
				16QAM	1.0825	1.271
		23173	715.3	QPSK	1.0818	1.268
				16QAM	1.0852	1.280

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

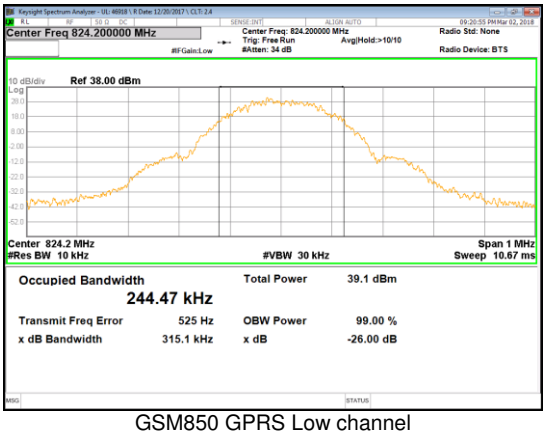
Due to frequency range and same output power setting, test was carried in LTE Band 12 to cover both LTE Band 12 and LTE Band 17.

UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

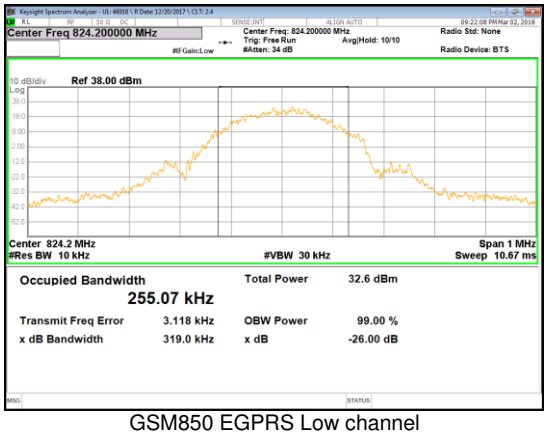
9.1.2. OCCUPIED BANDWIDTH PLOTS

GSM 850

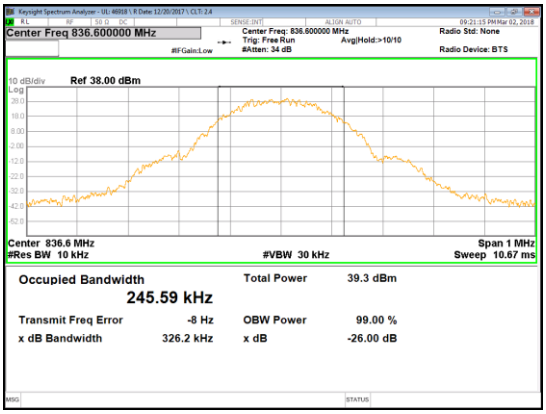
GSM 850



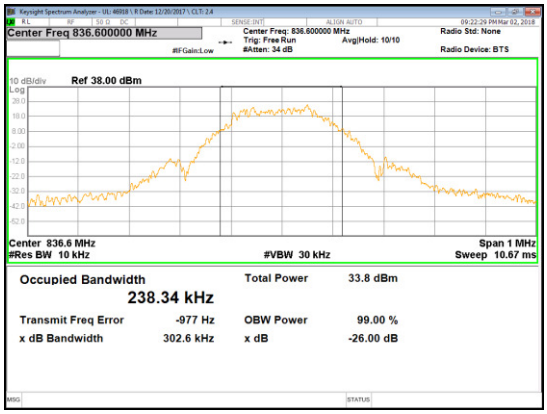
GSM850 GPRS Low channel



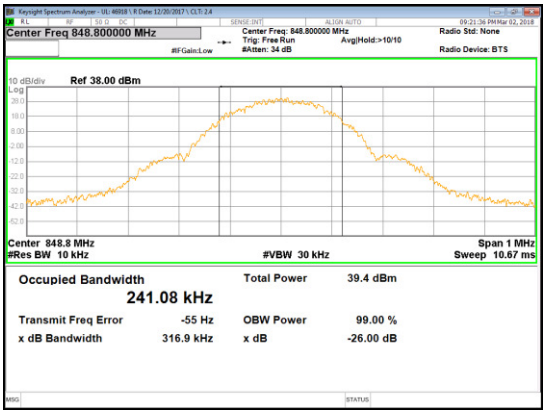
GSM850 EGPRS Low channel



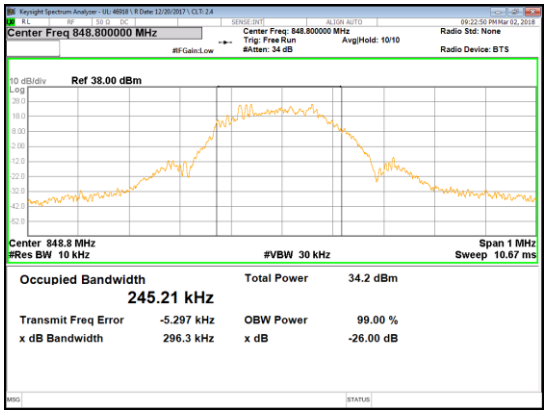
GSM850 GPRS Mid channel



GSM850 EGPRS Mid channel



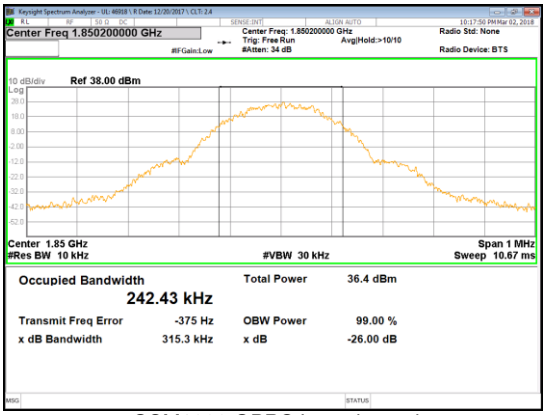
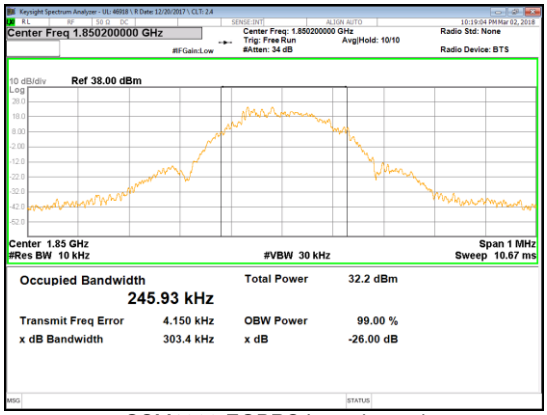
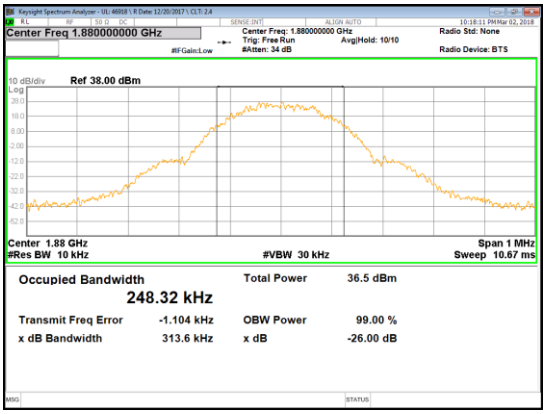
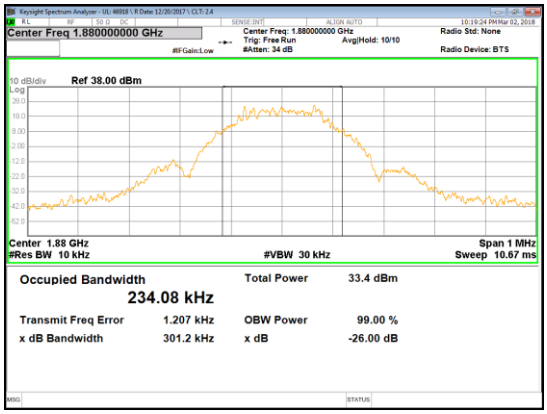
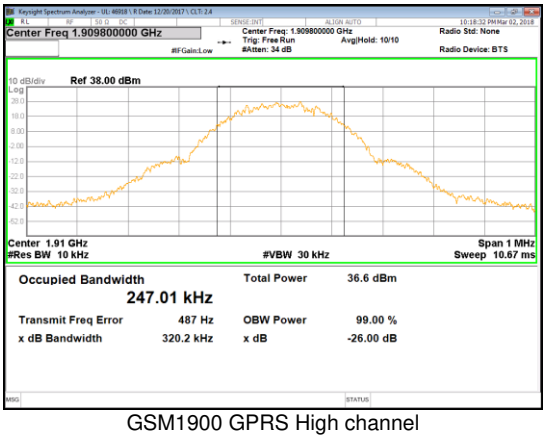
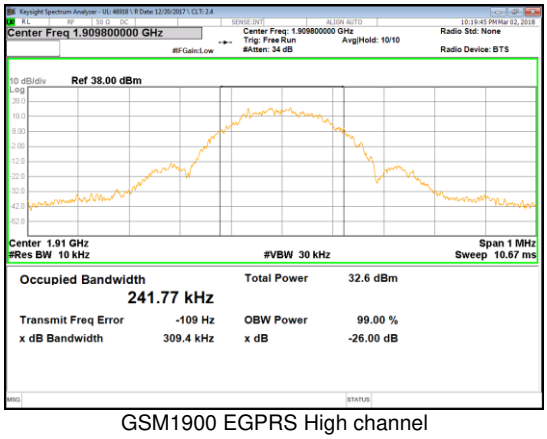
GSM850 GPRS High channel



GSM850 EGPRS High channel

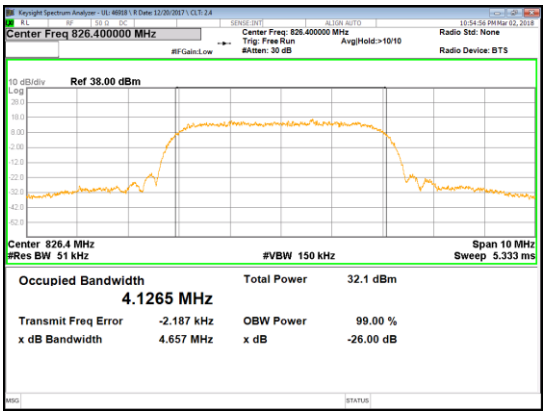
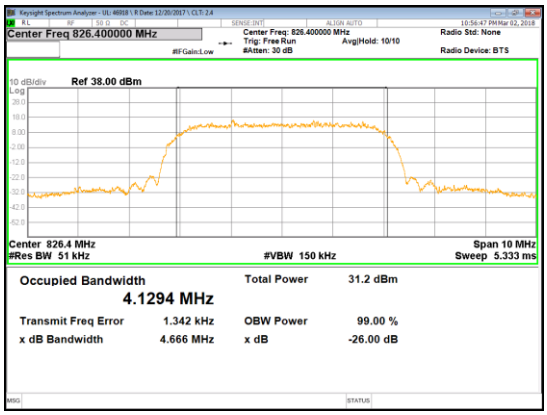
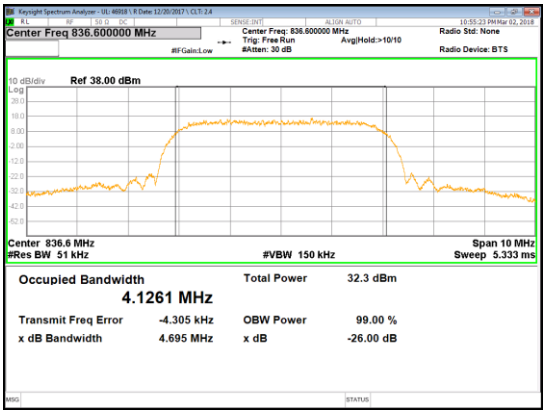
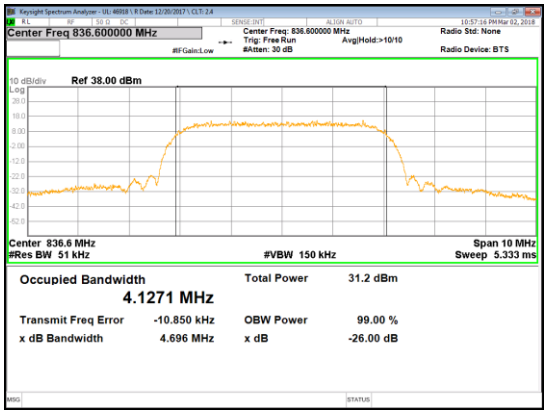
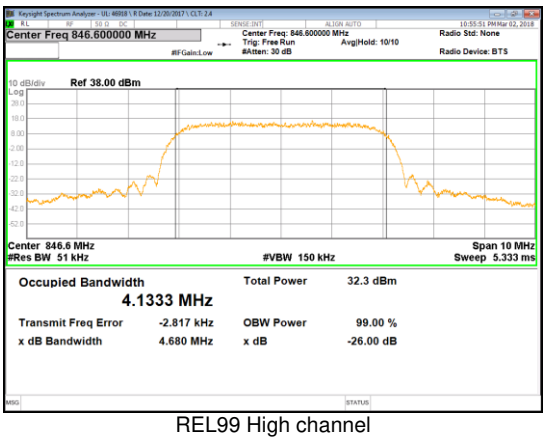
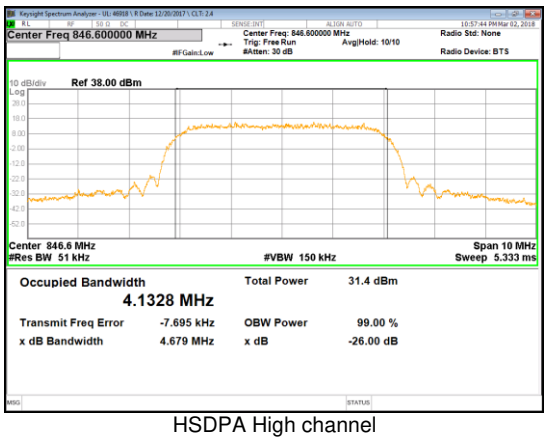
UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

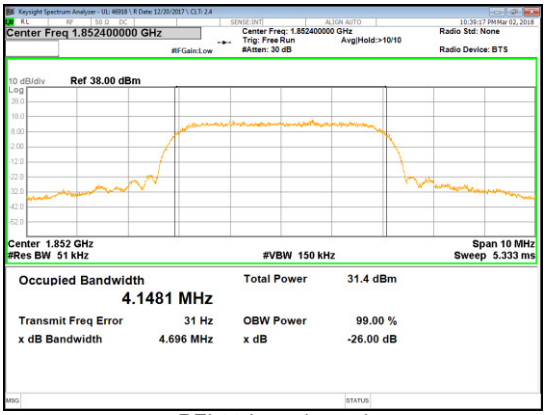
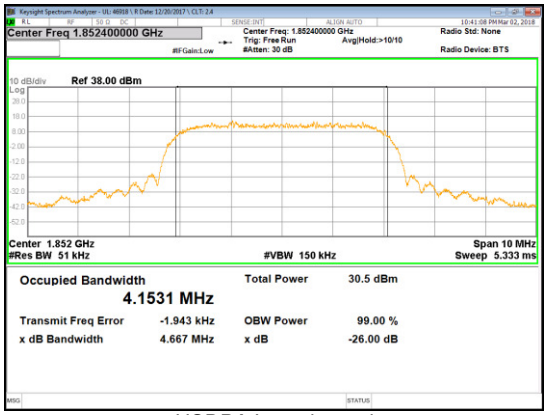
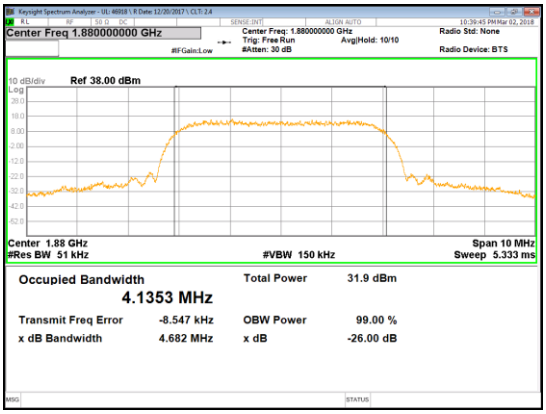
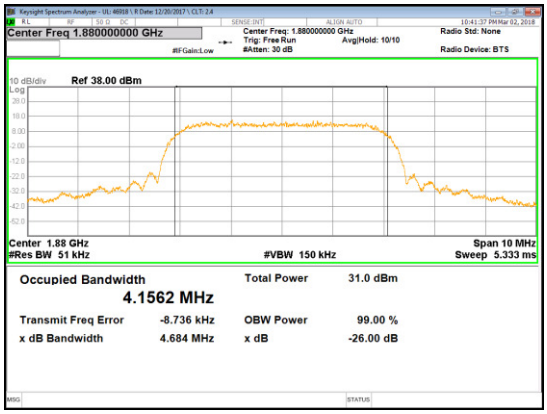
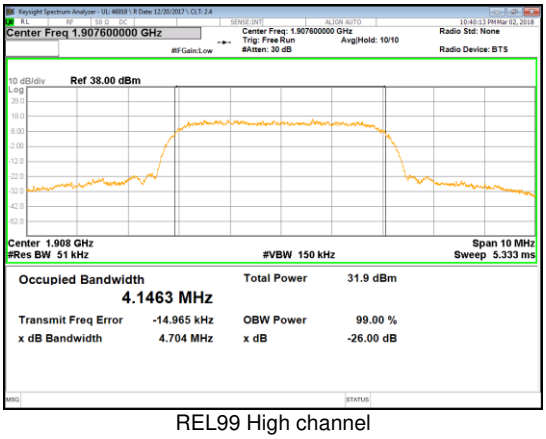
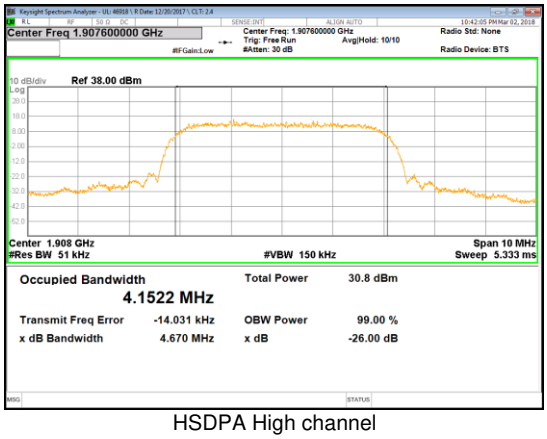
UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 5

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

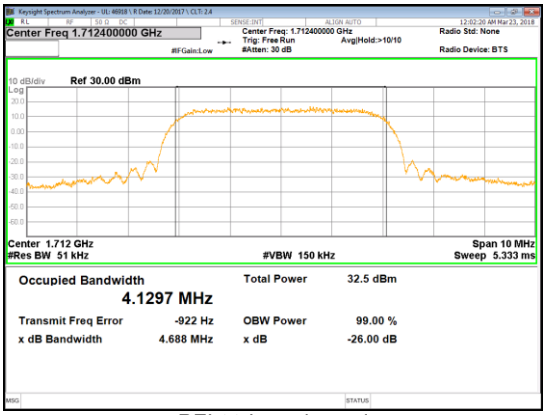
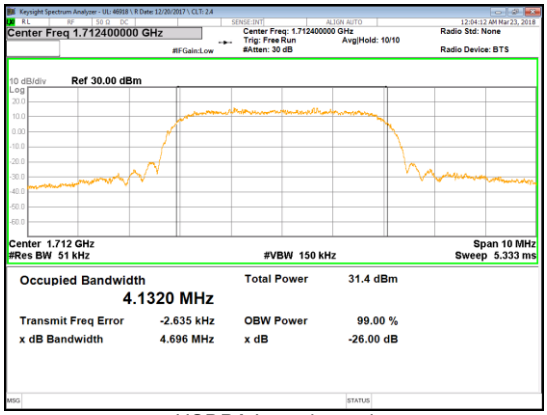
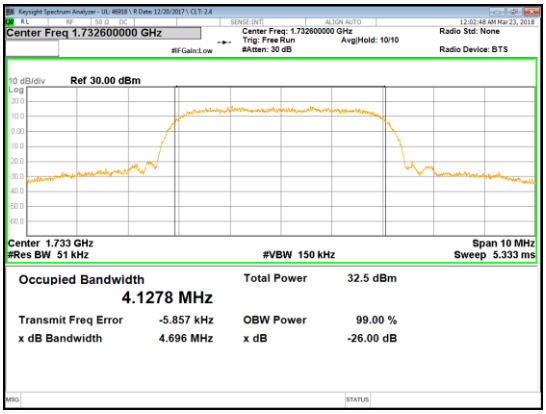
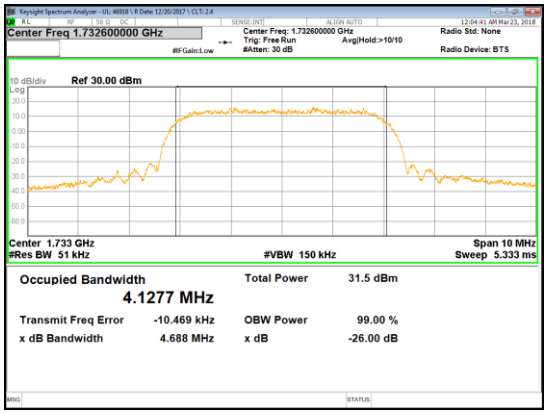
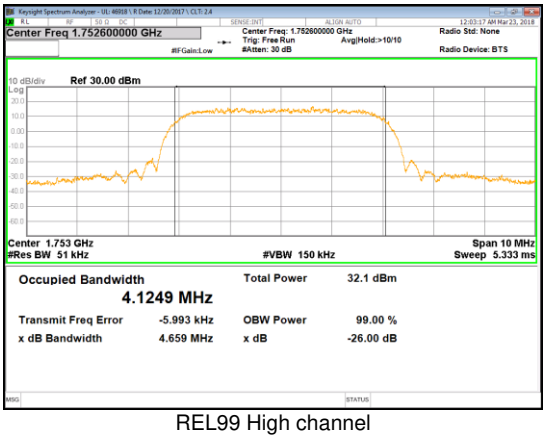
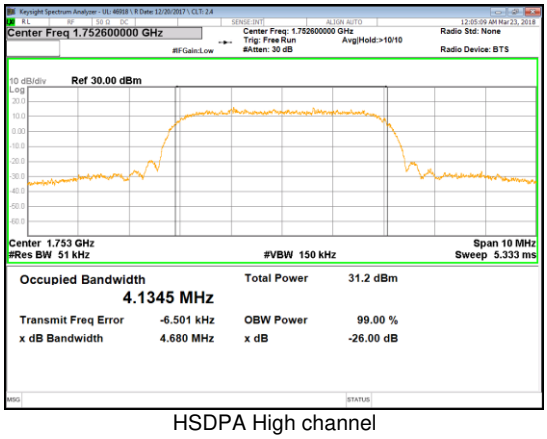
UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 2

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

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 4

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

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.