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

WWAN

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Cellular Module

MODEL NUMBER : LTM100, LTM100D

FCC ID: 2ABA2LTM100

REPORT NUMBER: 16K23790-E1V3

ISSUE DATE: SEP 21, 2016

Prepared for
WISOL CO., LTD.
531-7, Gajang-ro, Osan-si
Gyeonggi-do, 18103, Korea

Prepared by
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
TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	09/19/16	Initial issue	Junwhan Lee
V2	09/21/16	Revised section 5, 10, 11	Junwhan Lee
V3	09/21/16	Revised section 5, 6	Junwhan Lee

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

2. TEST METHODOLOGY 6

3. FACILITIES AND ACCREDITATION 6

4. CALIBRATION AND UNCERTAINTY 6

4.1. MEASURING INSTRUMENT CALIBRATION 6

4.2. SAMPLE CALCULATION 6

4.3. MEASUREMENT UNCERTAINTY 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. MAXIMUM OUTPUT POWER (GSM) 7

5.3. MAXIMUM OUTPUT POWER (WCDMA) 8

5.4. MAXIMUM OUTPUT POWER (LTE) 9

5.5. DESCRIPTION OF TEST SETUP 13

6. TEST AND MEASUREMENT EQUIPMENT 14

7. Summary Table 15

8. RF POWER OUTPUT VERIFICATION 16

8.1. GSM/GPRS/EDGE 16

8.1.1. GSM OUTPUT POWER RESULT 17

8.2. UMTS REL 99 19

8.2.1. WCDMA OUTPUT POWER RESULT 23

8.3. LTE OUTPUT VERIFICATION 26

8.3.1. LTE OUTPUT POWER RESULT 27

9. PEAK TO AVERAGE RATIO 32

9.1. CONDUCTED PEAK TO AVERAGE RESULT 32

9.2. CONDUCTED PEAK TO AVERAGE PLOTS 34

10. LIMITS AND CONDUCTED RESULTS 41

10.1. OCCUPIED BANDWIDTH 41

10.1.1. OCCUPIED BANDWIDTH RESULTS 41

10.1.2. OCCUPIED BANDWIDTH PLOTS 46

10.2. BAND EDGE EMISSIONS 67

10.2.1. BAND EDGE PLOTS 73

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.

10.3. OUT OF BAND EMISSIONS 92
10.3.1. OUT OF BAND EMISSIONS RESULT 92
10.3.2. OUT OF BAND EMISSIONS PLOTS 97
10.4. FREQUENCY STABILITY 118
10.4.1. FREQUENCY STABILITY RESULTS 119
11. RADIATED TEST RESULTS 127
11.1. FIELD STRENGTH OF SPURIOUS RADIATION 127
11.1.1. SPURIOUS RADIATION PLOTS 128
12. SETUP PHOTOS 149

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:	WISOL CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE Cellular Module
MODEL NUMBER:	LTM100, LTM100D
IMEI NUMBER:	351777080000084, 351777080000092 (RADIATED); 351777080000076, 351777080000100 (CONDUCTED)
DATE TESTED:	AUG 04, 2016 - SEP 20, 2016

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

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

CY Choi
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.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-D, FCC CFR 47 Part 2, FCC CFR 47 Part 22, FCC CFR Part 24 and FCC CFR Part 27.

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

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)

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	4.14 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 Cellular Module.

Model name LTM100 is only module type product and Model name LTM100D include module type with B2B connector.

5.2. MAXIMUM OUTPUT POWER (GSM)

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

FCC Part 22/24				
Band	Frequency Range	Modulation	Conducted	
	[MHz]	Peak	Avg [dBm]	Avg [mW]
GSM850	824~849	GMSK	32.49	1774.19
		GPRS	32.47	1766.04
GSM1900	1850~1910	GMSK	29.77	948.42
		GPRS	29.80	954.99

FCC Part 22/24							
Band	Frequency Range	Modulation	Conducted	Antenna gain	ERP/EIRP		Limit
	[MHz]	Peak	Avg [dBm]	dBi	Avg [dBm]	Avg [mW]	Avg [dBm]
GSM850	824~849	GMSK	32.49	2.151	32.491	1774.60	38.45
		GPRS	32.47	2.151	32.471	1766.44	38.45
GSM1900	1850~1910	GMSK	29.77	3.196	32.966	1979.70	33.00
		GPRS	29.80	3.196	32.996	1993.43	33.00

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

5.3. MAXIMUM OUTPUT POWER (WCDMA)

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

FCC Part 22/24/27				
Band	Frequency Range	Modulation	Conducted	
	[MHz]	Peak	Avg [dBm]	Avg [mW]
Band 5	824~849	REL99	24.13	258.82
		HSDPA	23.22	209.89
		HSUPA	23.02	200.45
		DC-HSDPA	23.13	205.59
Band 4	1710~1755	REL99	23.70	234.42
		HSDPA	22.66	184.50
		HSUPA	22.60	181.97
		DC-HSDPA	22.65	184.08
Band 2	1850~1910	REL99	24.36	272.90
		HSDPA	23.37	217.27
		HSUPA	23.40	218.78
		DC-HSDPA	23.32	214.78

FCC Part 22/24/27							
Band	Frequency Range	Modulation	Conducted	Antenna gain	ERP/EIRP		Limit
	[MHz]	Peak	Avg [dBm]	dBi	Avg [dBm]	Avg [mW]	Avg [dBm]
Band 5	824~849	REL99	24.13	2.151	24.131	258.88	38.45
		HSDPA	23.22	2.151	23.221	209.94	38.45
		HSUPA	23.02	2.151	23.021	200.49	38.45
		DC-HSDPA	23.13	2.151	23.131	205.64	38.45
Band 4	1710~1755	REL99	23.70	3.964	27.664	583.98	30.00
		HSDPA	22.66	3.964	26.624	459.62	30.00
		HSUPA	22.60	3.964	26.564	453.31	30.00
		DC-HSDPA	22.65	3.964	26.614	458.56	30.00
Band 2	1850~1910	REL99	24.36	3.196	27.556	569.64	33.00
		HSDPA	23.37	3.196	26.566	453.52	33.00
		HSUPA	23.40	3.196	26.596	456.67	33.00
		DC-HSDPA	23.32	3.196	26.516	448.33	33.00

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

5.4. MAXIMUM OUTPUT POWER (LTE)

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

LTE Band 5

FCC Part 22					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted	
				Avg [dBm]	Avg [mW]
Band 5	824 ~ 849	10	QPSK	23.08	203.24
			16QAM	22.47	176.60
		5	QPSK	23.14	206.06
			16QAM	22.18	165.20
		3	QPSK	23.30	213.80
			16QAM	22.38	172.98
		1.4	QPSK	23.28	212.81
			16QAM	22.36	172.19

FCC Part 22								
Band	Frequency Range	BandWidth	Modulation	Conducted	Antenna gain	ERP		Limit
	[MHz]	[MHz]	Peak	Avg [dBm]	dBi	Avg [dBm]	Avg [mW]	Avg [dBm]
Band 5	824 ~ 849	10	QPSK	23.08	2.151	23.081	203.28	38.45
			16QAM	22.47	2.151	22.471	176.64	38.45
		5	QPSK	23.14	2.151	23.141	206.11	38.45
			16QAM	22.18	2.151	22.181	165.23	38.45
		3	QPSK	23.30	2.151	23.301	213.85	38.45
			16QAM	22.38	2.151	22.381	173.02	38.45
		1.4	QPSK	23.28	2.151	23.281	212.86	38.45
			16QAM	22.36	2.151	22.361	172.23	38.45

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

FCC Part 27					
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation Peak	Conducted Avg [dBm]	Conducted Avg [mW]
Band 4	1710 ~ 1755	20	QPSK	23.13	205.59
			16QAM	21.67	146.89
		15	QPSK	23.17	207.49
			16QAM	22.13	163.31
		10	QPSK	22.99	199.07
			16QAM	22.13	163.31
		5	QPSK	23.38	217.77
			16QAM	21.68	147.23
		3	QPSK	22.99	199.07
			16QAM	21.94	156.31
		1.4	QPSK	23.29	213.30
			16QAM	22.12	162.93

FCC Part 27								
Band	Frequency Range	BandWidth	Modulation	Conducted	Antenna gain	ERP/EIRP		Limit
	[MHz]	[MHz]	Peak	Avg [dBm]	dBi	Avg [dBm]	Avg [mW]	Avg [dBm]
Band 4	1710 ~ 1755	20	QPSK	23.13	3.964	27.094	512.15	30.00
			16QAM	21.67	3.964	25.634	365.93	30.00
		15	QPSK	23.17	3.964	27.134	516.89	30.00
			16QAM	22.13	3.964	26.094	406.82	30.00
		10	QPSK	22.99	3.964	26.954	495.91	30.00
			16QAM	22.13	3.964	26.094	406.82	30.00
		5	QPSK	23.38	3.964	27.344	542.50	30.00
			16QAM	21.68	3.964	25.644	366.78	30.00
		3	QPSK	22.99	3.964	26.954	495.91	30.00
			16QAM	21.94	3.964	25.904	389.40	30.00
		1.4	QPSK	23.29	3.964	27.254	531.37	30.00
			16QAM	22.12	3.964	26.084	405.88	30.00

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 Avg [dBm]	Conducted Avg [mW]
Band 2	1850 ~ 1910	20	QPSK	22.98	198.61
			16QAM	22.17	164.82
		15	QPSK	23.31	214.29
			16QAM	22.50	177.83
		10	QPSK	23.22	209.89
			16QAM	22.46	176.20
		5	QPSK	23.34	215.77
			16QAM	21.95	156.68
		3	QPSK	23.11	204.64
			16QAM	21.94	156.31
		1.4	QPSK	23.06	202.30
			16QAM	21.99	158.12

FCC Part 24								
Band	Frequency Range	BandWidth	Modulation	Conducted	Antenna gain	ERP/EIRP		Limit
	[MHz]	[MHz]	Peak	Avg [dBm]	dBi	Avg [dBm]	Avg [mW]	Avg [dBm]
Band 2	1850 ~ 1910	20	QPSK	22.98	3.196	26.176	414.57	33.00
			16QAM	22.17	3.196	25.366	344.03	33.00
		15	QPSK	23.31	3.196	26.506	447.30	33.00
			16QAM	22.50	3.196	25.696	371.19	33.00
		10	QPSK	23.22	3.196	26.416	438.13	33.00
			16QAM	22.46	3.196	25.656	367.79	33.00
		5	QPSK	23.34	3.196	26.536	450.40	33.00
			16QAM	21.95	3.196	25.146	327.04	33.00
		3	QPSK	23.11	3.196	26.306	427.17	33.00
			16QAM	21.94	3.196	25.136	326.29	33.00
		1.4	QPSK	23.06	3.196	26.256	422.28	33.00
			16QAM	21.99	3.196	25.186	330.07	33.00

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.

DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a dipole 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	2.151
GSM1900 / WCDMA Band 2 / LTE Band 2 1850 ~ 1910 MHz	3.196
WCDMA Band 4 / LTE Band 4 1710 ~ 1755 MHz	3.964

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

5.5. DESCRIPTION OF TEST SETUP

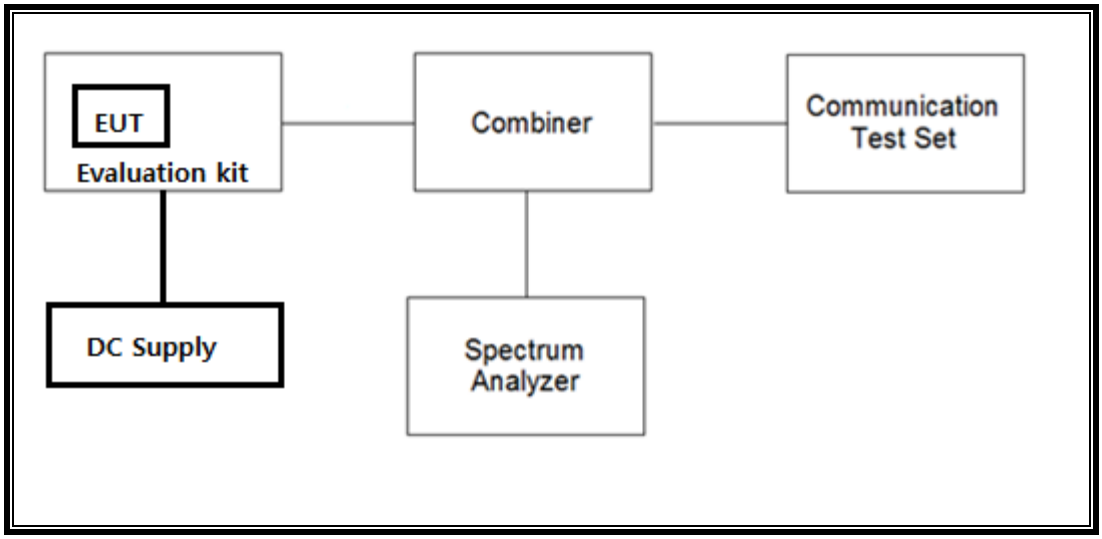
SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Evaluation kit	WISOL CO., LTD	EV1LTM100	N/A	N/A

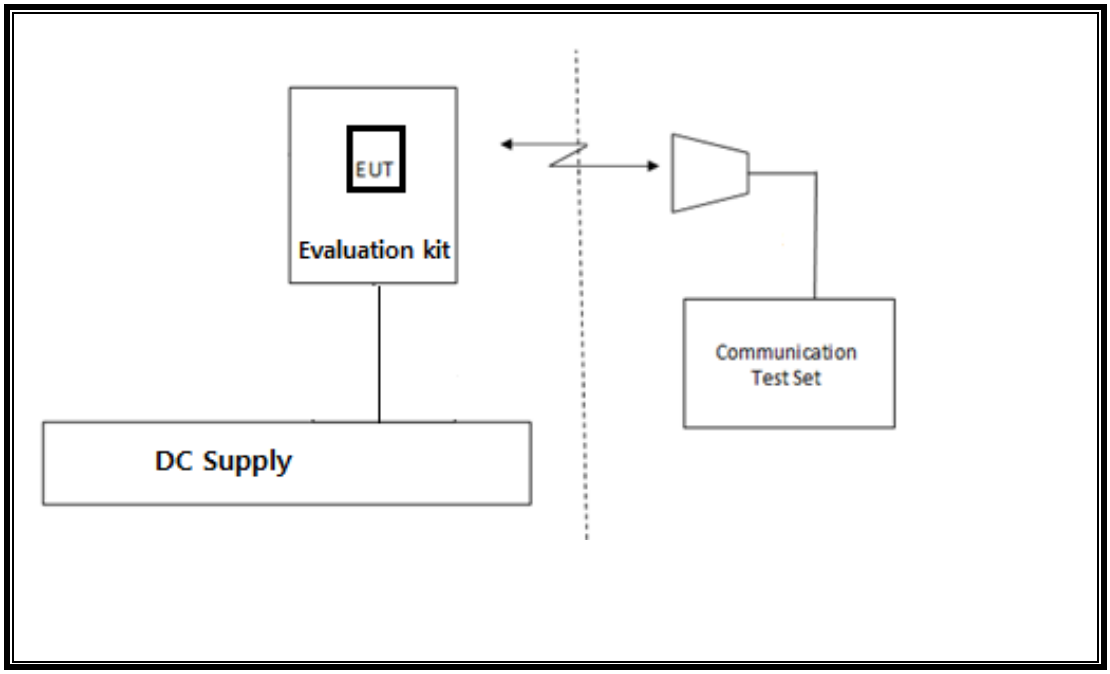
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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	07-28-17
Antenna, Horn, 40 GHz	ETS	3116C	00166155	11-30-17
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	12-15-17
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	11-17-16
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	04-25-17
Antenna, Horn, 18 GHz	ETS	3115	00161451	05-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168724	06-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168717	06-17-17
Combiner	WEINSCHEL	1575	2152	08-20-16 08-16-17
Communications Test Set	R&S	CMW500	150312	08-18-16 08-17-17
Communications Test Set	R&S	CMW500	115331	08-18-16 08-17-17
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-18-16 08-16-17
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-18-16 08-17-17
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-18-16 08-16-17
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-18-16 08-16-17
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-19-16 08-17-17
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-19-16 08-16-17
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-19-16 08-17-17
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-19-16 08-16-17
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	08-18-16 08-17-17
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	08-18-16 08-17-17
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	08-18-16 08-17-17
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	08-18-16 08-17-17
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	08-18-16 08-17-17
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	08-18-16 08-17-17
Attenuator	PASTERNACK	PE7087-10	A009	08-19-16 08-16-17

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	Note
2.1049	Occupied Band width (99%)	N/A	Conducted	Pass	17.867 MHz
22.917(a) 24.238(a) 27.53(g)	Band Edge / Conducted Spurious Emission	-13dBm		Pass	-15.911 dBm
2.1046	Conducted output power	N/A		Pass	32.49 dBm
22.355 24.235 27.54	Frequency Stability	2.5PPM		Pass	0.012PPM
22.913(a)(2)	Effective Radiated Power	38.45 dBm	Radiated	Pass	32.491 dBm
24.232(c)	Equivalent Isotropic Radiated Power	33dBm		Pass	32.996 dBm
27.50(d)(4)		30dBm		Pass	34.641 dBm
22.917(a) 24.238(a) 27.53(g)	Radiated Spurious Emission	-13dBm		Pass	-30.6 dBm

FCC Rule Part	Frequency Range [MHz]	Output Power [W]	Frequency Tolerance	Emission Designator	Emission Bandwidth [MHz]	Communication Type
GSM						
22H	824.2 - 848.8	1.774	2.5 ppm	246KGXW		GSM850
24E	1850.2 - 1909.8	0.955	2.5 ppm	247KGXW		GSM1900
WCDMA						
22H	826.4 - 846.6	0.259	2.5 ppm	4M15F9W		WCDMA
27L	1712.4 - 1752.6	0.234	2.5 ppm	4M14F9W		WCDMA
24E	1852.4 - 1907.6	0.273	2.5 ppm	4M14F9W		WCDMA
LTE Band 2						
24E	1860.0 - 1900.0	0.199	2.5 ppm	17M8G7W	20	QPSK
24E	1860.0 - 1900.0	0.165	2.5 ppm	17M8D7W	20	16QAM
24E	1857.5 - 1902.5	0.178	2.5 ppm	13M4D7W	15	16QAM
24E	1852.5 - 1907.5	0.216	2.5 ppm	4M49G7W	5	QPSK
LTE Band 4						
27L	1720.0 - 1745.0	0.206	2.5 ppm	17M9G7W	20	QPSK
27L	1720.0 - 1745.0	0.147	2.5 ppm	17M9D7W	20	16QAM
27L	1717.5 - 1747.5	0.163	2.5 ppm	13M4D7W	15	16QAM
27L	1712.5 - 1752.5	0.218	2.5 ppm	4M49G7W	5	QPSK
LTE Band 5						
22H	829.0 - 844.0	0.203	2.5 ppm	8M96G7W	10	QPSK
22H	829.0 - 844.0	0.177	2.5 ppm	8M96D7W	10	16QAM
22H	825.5 - 847.5	0.214	2.5 ppm	2M70G7W	3	QPSK

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

8. RF POWER OUTPUT VERIFICATION

8.1. GSM/GPRS/EDGE

Function: Menu select > GSM Mobile Station > GSM 850/900/1800/1900
Press Connection control to choose the different menus
Press RESET > choose all to reset all settings
Connection Press Signal Off to turn off the signal and change settings
Network Support > GSM+GPRS or GSM+EGPRS
Main Service > Packet Data
Service selection > Test Mode A – Auto Slot Config. off
MS Signal Press Slot Config bottom on the right twice to select and change the number of time slots and power setting
> Slot configuration > Uplink/Gamma
> 33 dBm for GPRS 850/900
> 30 dBm for GPRS1800/1900
BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel
Frequency Offset > + 0 Hz
Mode > BCCH and TCH
BCCH Level > -85 dBm (May need to adjust if link is not stable)
BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]
Channel Type > Off
P0> 4 dB
Slot Config > Unchanged (if already set under MS Signal)
TCH > choose desired test channel
Hopping > Off
Main Timeslot > 3 (Default)
Network Coding Scheme > CS4 (GPRS) and MCS5 ~ MCS9 (EGPRS)
Bit Stream > 2E9-1PSR Bit Pattern
AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input
Connection Press Signal On to turn on the signal and change settings

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.

8.1.1. GSM OUTPUT POWER RESULT

GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. [MHz]	Max. Power	
						Burst Pwr [dBm]	Frame Pwr [dBm]
850	GSM (Voice)	CS1	1	128	824.2	32.40	23.37
				190	836.6	32.49	23.46
				251	848.8	32.28	23.25
	GPRS (GMSK)	CS1	1	128	824.2	32.39	23.36
				190	836.6	32.47	23.44
				251	848.8	32.29	23.26
			2	128	824.2	30.95	24.93
				190	836.6	31.13	25.11
				251	848.8	30.86	24.84
			3	128	824.2	29.92	25.66
				190	836.6	30.12	25.86
				251	848.8	30.12	25.86
			4	128	824.2	28.97	25.96
				190	836.6	29.01	26.00
				251	848.8	29.16	26.15

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

GSM1900 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. [MHz]	Max. Power	
						Burst Pwr [dBm]	Frame Pwr [dBm]
1900	GSM (Voice)	CS1	1	512	1850.2	29.23	20.20
				661	1880.0	29.31	20.28
				810	1909.8	29.77	20.78
	GPRS (GMSK)	CS1	1	512	1850.2	29.28	20.25
				661	1880.0	29.31	20.28
				810	1909.8	29.80	20.82
			2	512	1850.2	27.62	21.60
				661	1880.0	28.28	22.26
				810	1909.8	28.37	22.35
			3	512	1850.2	26.75	22.49
				661	1880.0	27.21	22.95
				810	1909.8	27.31	23.05
			4	512	1850.2	25.62	22.61
				661	1880.0	26.00	22.99
				810	1909.8	26.19	23.18

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.

8.2. UMTS REL 99

Release 99 Setup Procedures used to establish the test signals

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs=βhs/βc	30/15			

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.

HSPA (HSDPA & HSUPA) Setup Procedures used to establish the test signals

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2 kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/βd	11/15	6/15	15/9	2/15	15/1
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	1309/225	94/75	47/15	56/75	47/15
	CM (dB)	1	3	2	3	1
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	Ahs = βhs/βc	30/15				
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
	Reference E-TFCI	81	81	81	81	81
	Reference E-TFCI PO	27	27	27	27	27
	Maximum Channelisation Codes	2xSF2				SF4

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

DC-HSDPA Setup Procedures used to establish the test signals

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH _Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

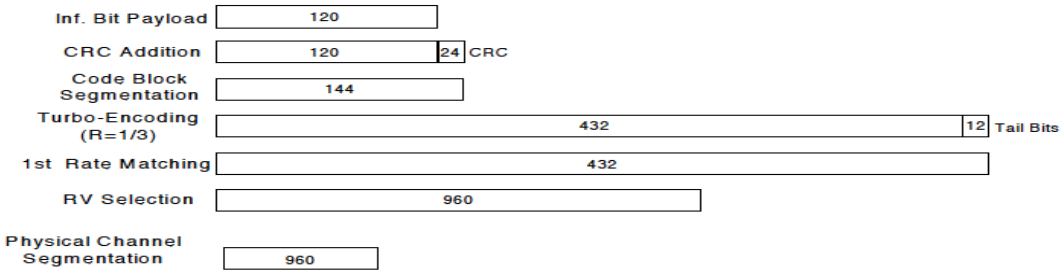


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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.

The following 4 Sub-tests for HSDPA were completed according to Release 8 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm2			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			
	βc/βd	2/15	11/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs = βhs/ βc	30/15			

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

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

8.2.1. WCDMA OUTPUT POWER RESULT

WCDMA Band 5 Measured Results

Band	Mode		UL Ch No.	Freq. [MHz]	MPR [dB]	Avg Pwr [dBm]
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	0	23.70
			4183	836.6	0	23.63
			4233	846.6	0	24.13
	HSDPA	Subtest 1	4132	826.4	0	22.78
			4183	836.6	0	22.84
			4233	846.6	0	23.22
		Subtest 2	4132	826.4	0	22.50
			4183	836.6	0	22.50
			4233	846.6	0	22.83
		Subtest 3	4132	826.4	0.5	22.28
			4183	836.6	0.5	22.33
			4233	846.6	0.5	22.64
		Subtest 4	4132	826.4	0.5	22.27
			4183	836.6	0.5	22.38
			4233	846.6	0.5	22.67
	HSUPA	Subtest 1	4132	826.4	0	22.57
			4183	836.6	0	22.66
			4233	846.6	0	22.95
		Subtest 2	4132	826.4	2	22.10
			4183	836.6	2	21.46
			4233	846.6	2	21.30
		Subtest 3	4132	826.4	1	21.70
			4183	836.6	1	21.51
			4233	846.6	1	21.89
		Subtest 4	4132	826.4	2	21.32
			4183	836.6	2	22.03
			4233	846.6	2	21.88
		Subtest 5	4132	826.4	0	22.73
			4183	836.6	0	22.85
			4233	846.6	0	23.02
	DC-HSDPA	Subtest 1	4132	826.4	0	22.58
			4183	836.6	0	22.76
			4233	846.6	0	23.13
		Subtest 2	4132	826.4	0	22.50
			4183	836.6	0	22.54
			4233	846.6	0	22.70
		Subtest 3	4132	826.4	0.5	22.27
			4183	836.6	0.5	22.48
			4233	846.6	0.5	22.61
		Subtest 4	4132	826.4	0.5	22.31
			4183	836.6	0.5	22.45
			4233	846.6	0.5	22.59

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

WCDMA Band 4 Measured Results

Band	Mode		UL Ch No.	Freq. [MHz]	MPR [dB]	Avg Pwr [dBm]
W-CDMA Band IV	Rel 99	RMC, 12.2 kbps	1312	1712.4	0	23.44
			1413	1732.6	0	23.49
			1513	1752.6	0	23.70
	HSDPA	Subtest 1	1312	1712.4	0	22.56
			1413	1732.6	0	22.56
			1513	1752.6	0	22.66
		Subtest 2	1312	1712.4	0	22.40
			1413	1732.6	0	22.10
			1513	1752.6	0	22.30
		Subtest 3	1312	1712.4	0.5	21.98
			1413	1732.6	0.5	21.92
			1513	1752.6	0.5	22.11
		Subtest 4	1312	1712.4	0.5	21.98
			1413	1732.6	0.5	21.92
			1513	1752.6	0.5	22.11
	HSUPA	Subtest 1	1312	1712.4	0	22.31
			1413	1732.6	0	22.06
			1513	1752.6	0	22.51
		Subtest 2	1312	1712.4	2	20.81
			1413	1732.6	2	21.08
			1513	1752.6	2	21.15
		Subtest 3	1312	1712.4	1	21.27
			1413	1732.6	1	21.28
			1513	1752.6	1	21.40
		Subtest 4	1312	1712.4	2	21.10
			1413	1732.6	2	21.73
			1513	1752.6	2	21.75
		Subtest 5	1312	1712.4	0	22.38
			1413	1732.6	0	22.43
			1513	1752.6	0	22.60
	DC-HSDPA	Subtest 1	1312	1712.4	0	22.27
			1413	1732.6	0	22.43
			1513	1752.6	0	22.65
		Subtest 2	1312	1712.4	0	22.07
			1413	1732.6	0	22.20
			1513	1752.6	0	22.31
		Subtest 3	1312	1712.4	0.5	21.99
			1413	1732.6	0.5	21.88
			1513	1752.6	0.5	22.12
		Subtest 4	1312	1712.4	0.5	21.87
			1413	1732.6	0.5	21.97
			1513	1752.6	0.5	22.21

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

WCDMA Band 2 Measured Results

Band	Mode		UL Ch No.	Freq. [MHz]	MPR [dB]	Avg Pwr [dBm]
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	0	24.24
			9400	1880.0	0	24.36
			9538	1907.6	0	23.51
	HSDPA	Subtest 1	9262	1852.4	0	23.37
			9400	1880.0	0	23.20
			9538	1907.6	0	22.57
		Subtest 2	9262	1852.4	0	22.77
			9400	1880.0	0	22.80
			9538	1907.6	0	22.10
		Subtest 3	9262	1852.4	0.5	22.78
			9400	1880.0	0.5	22.69
			9538	1907.6	0.5	22.07
		Subtest 4	9262	1852.4	0.5	22.72
			9400	1880.0	0.5	22.72
			9538	1907.6	0.5	22.02
	HSUPA	Subtest 1	9262	1852.4	0	23.40
			9400	1880.0	0	23.18
			9538	1907.6	0	22.47
		Subtest 2	9262	1852.4	2	21.72
			9400	1880.0	2	21.82
			9538	1907.6	2	21.48
		Subtest 3	9262	1852.4	1	22.04
			9400	1880.0	1	21.96
			9538	1907.6	1	21.62
		Subtest 4	9262	1852.4	2	21.92
			9400	1880.0	2	22.23
			9538	1907.6	2	21.74
		Subtest 5	9262	1852.4	0	23.23
			9400	1880.0	0	23.25
			9538	1907.6	0	22.59
	DC-HSDPA	Subtest 1	9262	1852.4	0	23.10
			9400	1880.0	0	23.32
			9538	1907.6	0	22.51
		Subtest 2	9262	1852.4	0	22.89
			9400	1880.0	0	22.95
			9538	1907.6	0	22.21
		Subtest 3	9262	1852.4	0.5	22.66
			9400	1880.0	0.5	22.75
			9538	1907.6	0.5	22.11
		Subtest 4	9262	1852.4	0.5	22.64
			9400	1880.0	0.5	22.72
			9538	1907.6	0.5	22.08

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.

8.3. LTE OUTPUT VERIFICATION

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.
UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signalling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-
Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.					

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.

8.3.1. LTE OUTPUT POWER RESULT

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	22.49	22.80	22.94
			1	25	0	22.72	22.71	22.90
			1	49	0	22.63	22.64	23.08
			25	0	1	21.61	21.95	22.03
			25	12	1	21.76	21.93	22.06
			25	25	1	21.79	21.94	22.10
			50	0	1	21.63	21.88	21.99
		16QAM	1	0	1	21.63	21.70	21.79
			1	25	1	21.76	22.47	21.94
			1	49	1	21.68	21.82	22.28
			25	0	2	20.79	20.86	21.12
			25	12	2	20.92	20.88	21.14
			25	25	2	20.96	21.04	21.16
			50	0	2	20.65	20.91	21.03

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	22.63	22.72	22.87
			1	12	0	22.89	22.91	23.14
			1	24	0	22.70	22.82	23.13
			12	0	1	21.69	21.86	21.95
			12	7	1	21.70	21.96	22.08
			12	13	1	21.65	21.94	22.18
			25	0	1	21.67	21.85	22.05
		16QAM	1	0	1	21.49	21.55	21.97
			1	12	1	21.14	21.96	21.67
			1	24	1	20.90	21.60	22.18
			12	0	2	20.68	20.76	21.00
			12	7	2	20.73	20.92	21.04
			12	13	2	20.72	20.94	21.07
			25	0	2	20.67	21.04	21.09

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	22.66	22.82	23.30
			1	8	0	22.77	22.89	23.05
			1	14	0	22.68	22.89	23.19
			8	0	1	21.76	21.86	22.11
			8	4	1	21.55	21.83	22.14
			8	7	1	21.74	21.89	22.21
			15	0	1	21.74	21.86	22.09
		16QAM	1	0	1	21.72	21.67	21.51
			1	8	1	21.69	22.01	22.38
			1	14	1	21.76	21.86	22.11
			8	0	2	20.80	20.93	20.75
			8	4	2	20.68	21.01	20.96
			8	7	2	20.76	21.07	21.04
			15	0	2	20.62	21.12	21.11

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	22.81	22.97	23.13
			1	3	0	22.83	22.93	23.18
			1	5	0	22.87	22.95	23.17
			3	0	0	22.74	22.79	23.17
			3	1	0	22.81	22.79	23.28
			3	3	0	22.73	22.96	23.11
			6	0	1	21.78	21.94	22.13
		16QAM	1	0	1	21.73	21.84	22.10
			1	3	1	21.84	21.92	22.06
			1	5	1	21.65	21.79	22.21
			3	0	1	21.48	22.02	22.35
			3	1	1	21.48	22.13	22.34
			3	3	1	21.80	22.32	22.36
			6	0	2	20.80	20.83	21.37

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

LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20050	20175	20300
						1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0	22.33	22.75	22.55
			1	49	0	22.59	23.09	23.13
			1	99	0	22.20	22.61	22.90
			50	0	1	21.52	21.54	21.92
			50	24	1	21.61	21.73	22.06
			50	50	1	21.58	21.76	21.93
			100	0	1	21.54	21.60	22.07
		16QAM	1	0	1	21.60	21.29	21.65
			1	49	1	21.67	21.38	21.60
			1	99	1	21.09	21.11	21.58
			50	0	2	20.47	20.55	20.87
			50	24	2	20.67	20.78	21.01
			50	50	2	20.55	20.78	20.80
			100	0	2	20.54	20.58	20.98
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20025	20175	20325
						1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	22.56	22.47	22.77
			1	37	0	22.70	22.75	23.17
			1	74	0	22.43	22.51	22.79
			36	0	1	21.59	21.60	22.01
			36	20	1	21.53	21.66	21.98
			36	39	1	21.41	21.71	21.99
			75	0	1	21.39	21.55	21.97
		16QAM	1	0	1	21.64	21.53	21.78
			1	37	1	22.13	22.00	21.90
			1	74	1	21.32	21.29	21.95
			36	0	2	20.56	20.61	20.85
			36	20	2	20.45	20.67	20.83
			36	39	2	20.42	20.81	20.85
			75	0	2	20.50	20.44	20.96
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20000	20175	20350
						1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	22.39	22.55	22.89
			1	25	0	22.50	22.59	22.90
			1	49	0	22.33	22.45	22.99
			25	0	1	21.56	21.55	21.99
			25	12	1	21.47	21.49	21.98
			25	25	1	21.43	21.65	21.98
			50	0	1	21.43	21.61	21.97
		16QAM	1	0	1	21.52	21.31	21.71
			1	25	1	21.60	22.13	21.75
			1	49	1	21.36	21.38	21.36
			25	0	2	20.81	20.50	21.11
			25	12	2	20.67	20.62	21.06
			25	25	2	20.57	20.63	21.20
			50	0	2	20.42	20.63	21.03

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

LTE Band 4 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						19975	20175	20375
						1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	22.57	22.46	22.82
			1	12	0	22.70	22.78	23.38
			1	24	0	22.51	22.60	23.14
			12	0	1	21.52	21.53	22.16
			12	7	1	21.61	21.60	22.11
			12	13	1	21.63	21.67	22.11
			25	0	1	21.52	21.57	22.15
		16QAM	1	0	1	21.49	21.54	21.64
			1	12	1	21.17	21.51	21.68
			1	24	1	20.96	21.66	21.65
			12	0	2	20.48	20.51	21.10
			12	7	2	20.47	20.52	21.02
			12	13	2	20.50	20.53	21.25
			25	0	2	20.72	20.69	20.98
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						19965	20175	20385
						1711.5 MHz	1732.5 MHz	1753.5 MHz
LTE Band 4	3	QPSK	1	0	0	22.52	22.54	22.69
			1	8	0	22.66	22.66	22.99
			1	14	0	22.51	22.58	22.84
			8	0	1	21.55	21.49	22.05
			8	4	1	21.63	21.57	22.00
			8	7	1	21.67	21.64	21.98
			15	0	1	21.66	21.69	21.94
		16QAM	1	0	1	21.65	21.35	21.65
			1	8	1	21.57	21.51	21.94
			1	14	1	21.32	21.41	21.78
			8	0	2	20.58	20.19	20.63
			8	4	2	20.72	20.33	20.65
			8	7	2	20.62	20.44	20.67
			15	0	2	20.33	20.75	20.94
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						19957	20175	20393
						1710.7 MHz	1732.5 MHz	1754.3 MHz
LTE Band 4	1.4	QPSK	1	0	0	22.55	22.47	22.87
			1	3	0	22.56	22.56	23.12
			1	5	0	22.64	22.55	23.29
			3	0	0	22.52	22.36	23.03
			3	1	0	22.54	22.42	22.95
			3	3	0	22.53	22.53	22.94
			6	0	1	21.56	21.66	22.06
		16QAM	1	0	1	21.54	21.26	21.90
			1	3	1	21.81	21.33	22.12
			1	5	1	21.72	21.35	21.87
			3	0	1	21.69	21.09	21.63
			3	1	1	21.73	21.34	21.60
			3	3	1	21.73	21.57	21.57
			6	0	2	20.86	20.36	21.05

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 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						1860 MHz	1880 MHz	1900 MHz
LTE Band 2	20	QPSK	1	0	0	22.76	22.93	22.54
			1	49	0	22.86	22.98	22.65
			1	99	0	22.76	22.69	22.26
			50	0	1	22.03	22.14	21.65
			50	24	1	22.06	22.08	21.56
			50	50	1	22.06	21.89	21.48
			100	0	1	22.01	21.97	21.53
		16QAM	1	0	1	22.09	22.08	21.57
			1	49	1	22.17	22.16	21.35
			1	99	1	21.72	21.27	21.00
			50	0	2	21.18	21.02	20.74
			50	24	2	21.26	20.86	20.77
			50	50	2	21.17	21.04	20.39
			100	0	2	21.07	21.01	20.66

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						1857.5 MHz	1880 MHz	1902.5 MHz
LTE Band 2	15	QPSK	1	0	0	22.69	23.13	22.45
			1	37	0	23.31	23.13	22.67
			1	74	0	22.71	22.75	22.57
			36	0	1	22.01	22.15	21.56
			36	20	1	22.09	22.06	21.62
			36	39	1	22.01	21.90	21.51
			75	0	1	22.09	21.89	21.44
		16QAM	1	0	1	22.37	22.06	21.82
			1	37	1	22.47	22.30	21.85
			1	74	1	22.50	21.72	20.90
			36	0	2	21.01	21.11	20.73
			36	20	2	21.11	21.10	20.78
			36	39	2	21.04	20.85	20.58
			75	0	2	21.09	20.93	20.41

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	22.92	22.93	22.69
			1	25	0	23.08	23.01	22.69
			1	49	0	23.22	22.66	22.48
			25	0	1	22.10	22.05	21.43
			25	12	1	22.09	21.99	21.48
			25	25	1	22.03	21.82	21.39
			50	0	1	22.11	21.97	21.49
		16QAM	1	0	1	21.98	22.02	21.46
			1	25	1	22.46	21.92	21.53
			1	49	1	22.20	21.17	21.51
			25	0	2	21.19	21.14	20.67
			25	12	2	21.11	21.03	20.86
			25	25	2	20.99	20.99	20.57
			50	0	2	21.12	20.92	20.57

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

LTE Band 2 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	23.08	22.67	22.39
			1	12	0	23.34	22.69	22.63
			1	24	0	23.16	22.59	22.16
			12	0	1	22.15	22.04	21.48
			12	7	1	22.15	21.91	21.38
			12	13	1	22.09	21.97	21.37
			25	0	1	22.08	21.94	21.42
		16QAM	1	0	1	21.92	21.64	21.46
			1	12	1	21.95	21.93	21.25
			1	24	1	21.61	21.49	20.93
			12	0	2	20.99	20.98	20.56
			12	7	2	21.11	20.92	20.43
			12	13	2	20.95	20.93	20.52
			25	0	2	20.96	21.04	20.69

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						1851.5 MHz	1880 MHz	1908.5 MHz
LTE Band 2	3	QPSK	1	0	0	23.00	22.91	22.35
			1	8	0	23.11	23.08	22.53
			1	14	0	23.00	22.88	22.15
			8	0	1	21.97	22.00	21.48
			8	4	1	21.98	21.97	21.43
			8	7	1	22.08	21.97	21.37
			15	0	1	22.08	21.95	21.37
		16QAM	1	0	1	21.93	21.73	21.38
			1	8	1	21.94	21.62	21.51
			1	14	1	21.86	21.71	21.35
			8	0	2	21.11	20.92	20.70
			8	4	2	21.14	20.81	20.61
			8	7	2	21.14	21.01	20.56
			15	0	2	21.01	20.90	20.69

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						18607	18900	19193
						1850.7 MHz	1880 MHz	1909.3 MHz
LTE Band 2	1.4	QPSK	1	0	0	22.88	22.89	22.45
			1	3	0	23.06	23.02	22.44
			1	5	0	22.97	22.97	22.39
			3	0	0	22.80	22.82	22.55
			3	1	0	22.99	22.86	22.41
			3	3	0	22.86	22.97	22.40
			6	0	1	21.88	22.01	21.48
		16QAM	1	0	1	21.75	21.99	21.47
			1	3	1	21.79	21.95	21.56
			1	5	1	21.73	21.82	21.35
			3	0	1	21.65	21.82	21.95
			3	1	1	21.58	21.93	21.99
			3	3	1	21.66	21.94	21.93
			6	0	2	20.91	20.87	20.63

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.

9. PEAK TO AVERAGE RATIO

Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v02r02;

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.

9.1. CONDUCTED PEAK TO AVERAGE RESULT

GSM

Band	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
GSM850	190	836.6	GPRS	0.36	13.00
GSM1900	661	1880.0	GPRS	0.28	

WCDMA

Band	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	4183	836.6	REL99	2.78	13.00
			HSDPA	2.99	
Band 4	1413	1732.6	REL99	3.00	
			HSDPA	3.15	
Band 2	9400	1880.0	REL99	2.85	
			HSDPA	3.06	

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

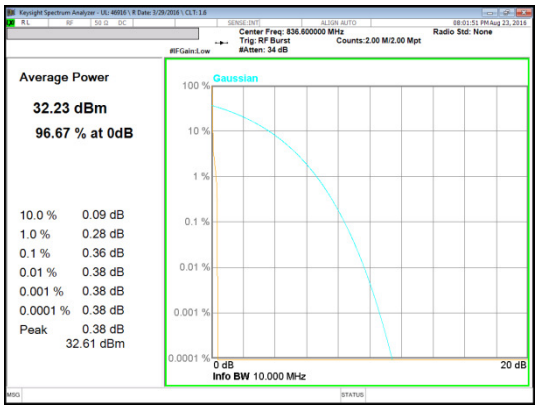
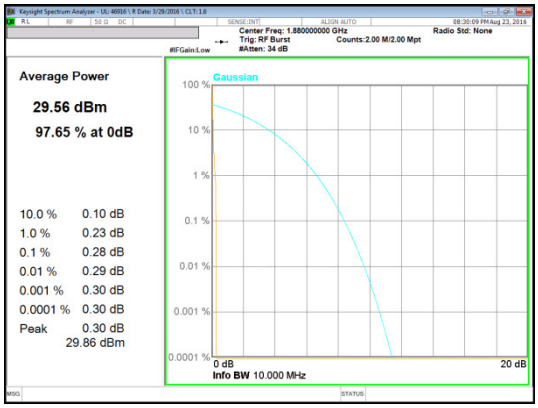
LTE

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	10	20525	836.5	QPSK	3.08	13.00
				16QAM	3.63	
	5			QPSK	3.14	
				16QAM	3.92	
	3			QPSK	3.22	
				16QAM	3.73	
	1.4			QPSK	3.16	
				16QAM	3.94	
Band 4	20	20174	1732.5	QPSK	4.43	
				16QAM	4.42	
	15			QPSK	4.51	
				16QAM	5.19	
	10			QPSK	4.39	
				16QAM	5.33	
	5			QPSK	4.41	
				16QAM	5.32	
	3			QPSK	4.42	
				16QAM	5.22	
	1.4			QPSK	5.53	
				16QAM	5.37	
Band 2	20	18900	1880.0	QPSK	3.14	
				16QAM	3.93	
	15			QPSK	3.26	
				16QAM	3.77	
	10			QPSK	3.29	
				16QAM	3.82	
	5			QPSK	3.21	
				16QAM	4.07	
	3			QPSK	3.30	
				16QAM	4.01	
	1.4			QPSK	3.29	
				16QAM	4.06	

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

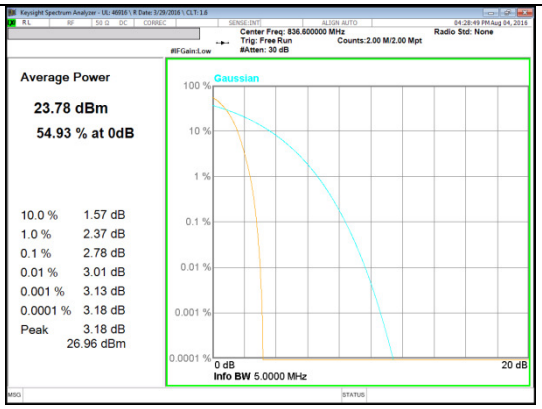
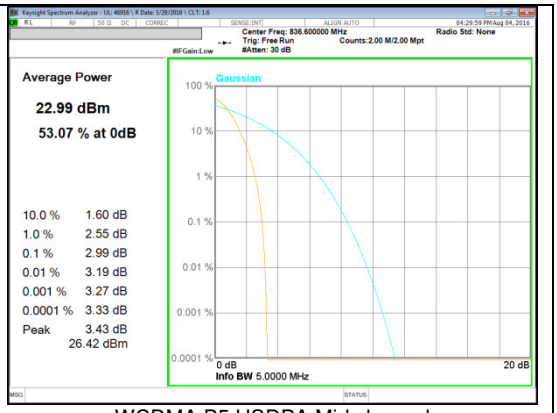
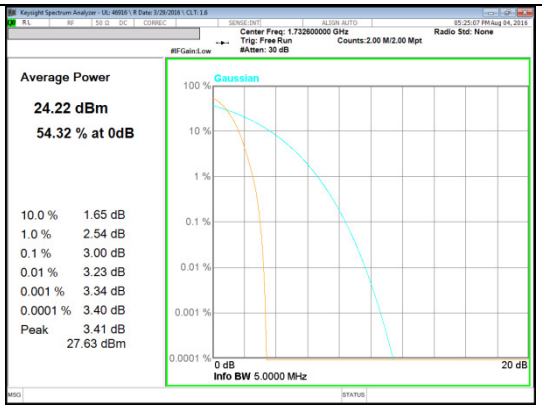
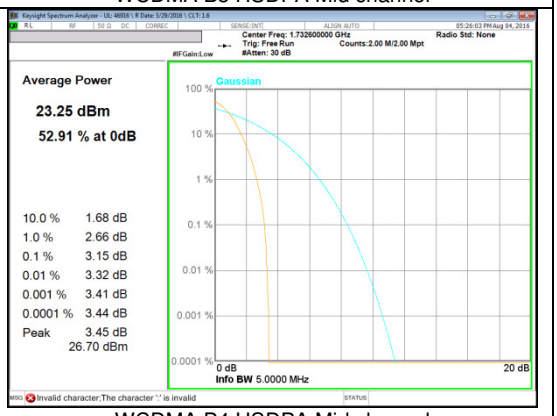
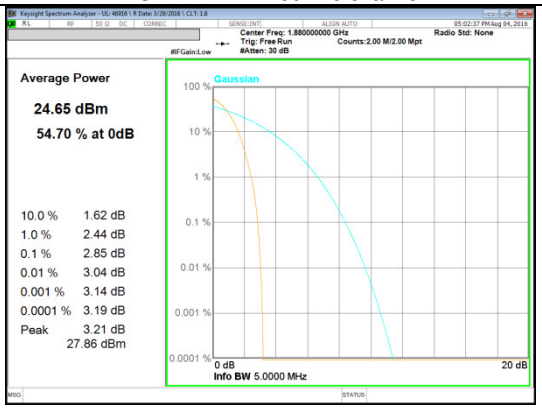
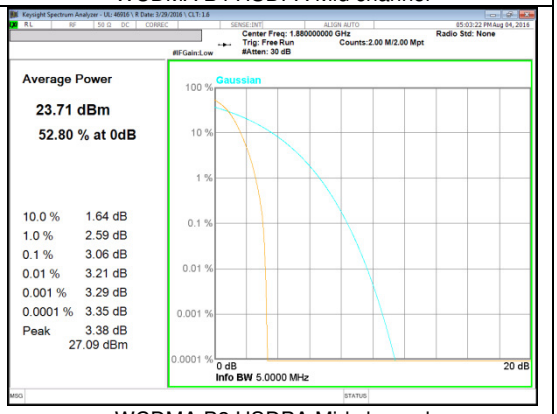
9.2. CONDUCTED PEAK TO AVERAGE PLOTS

GSM

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

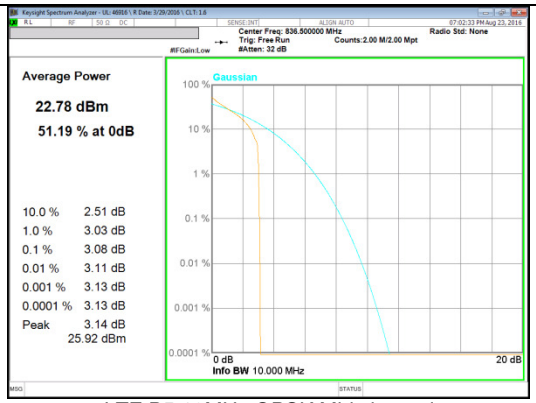
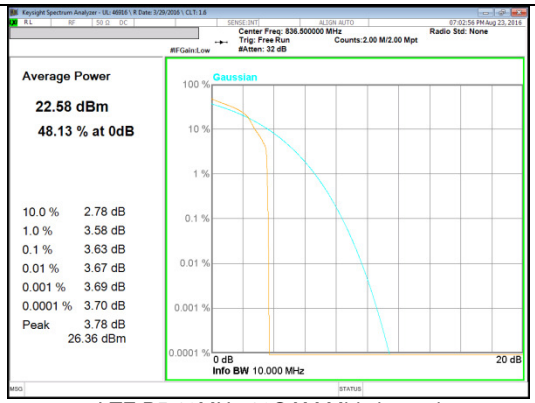
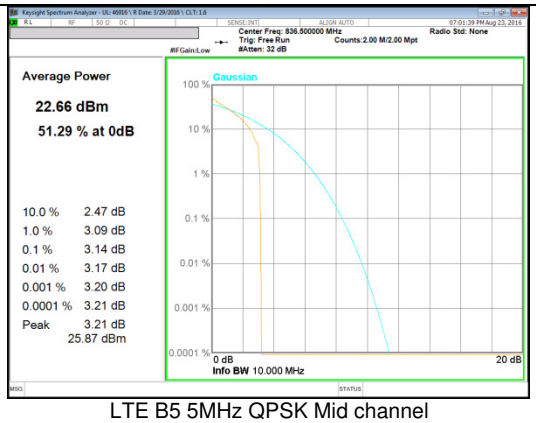
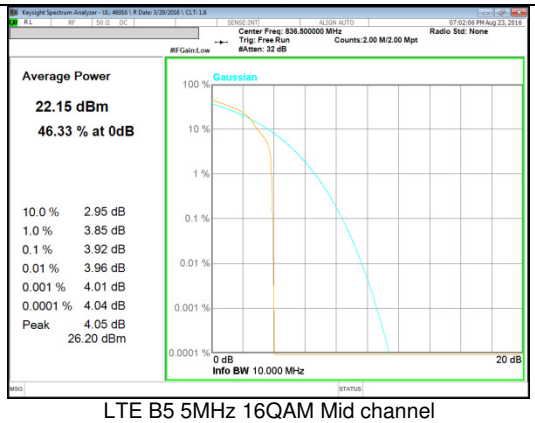
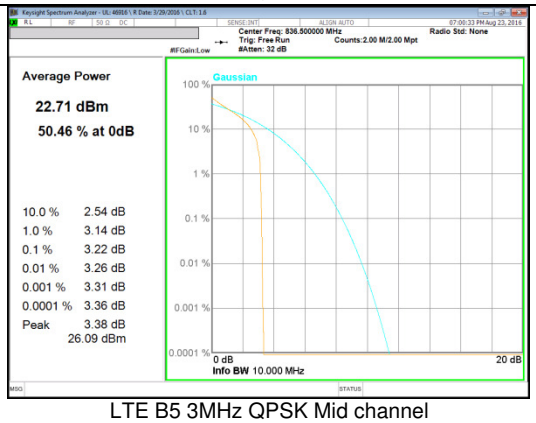
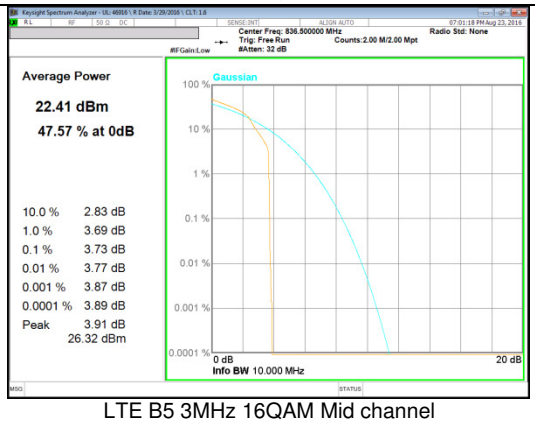
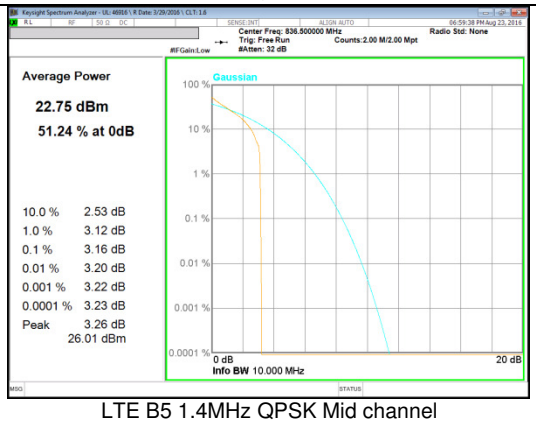
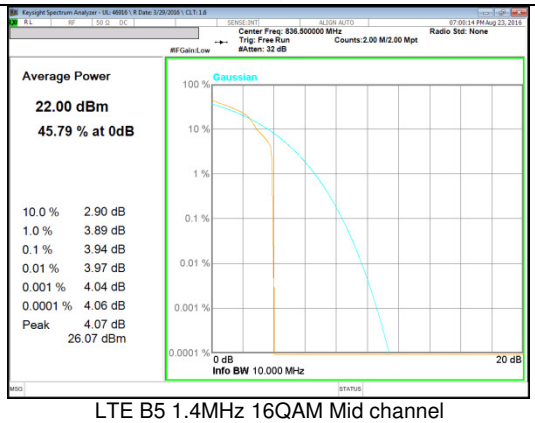
UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_22/24/27
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA

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

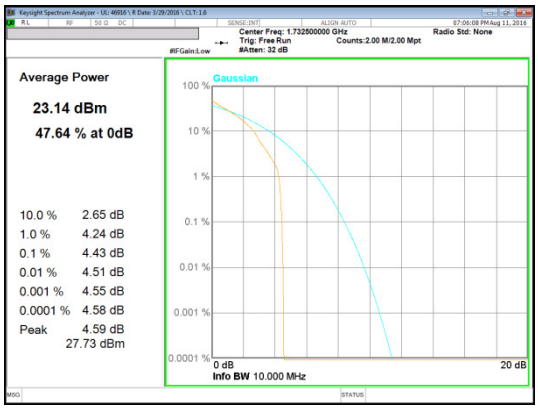
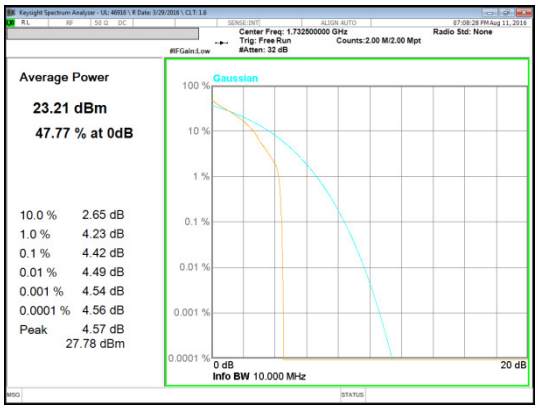
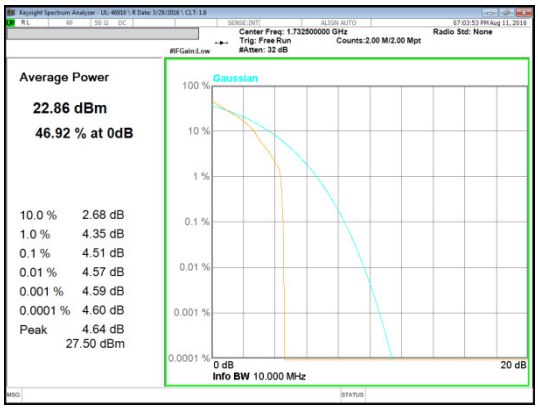
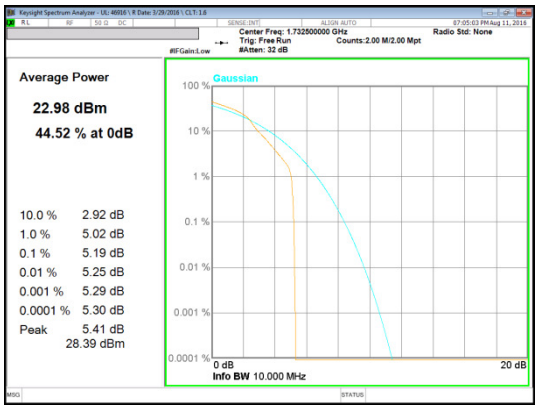
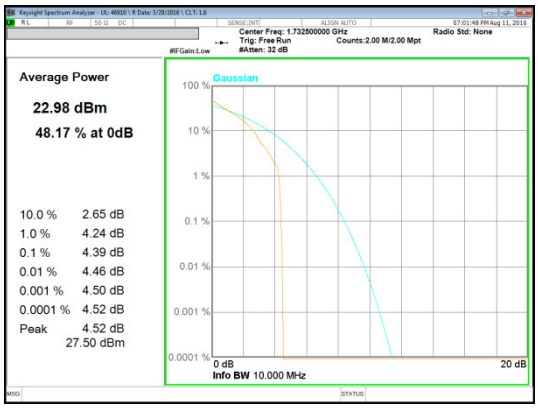
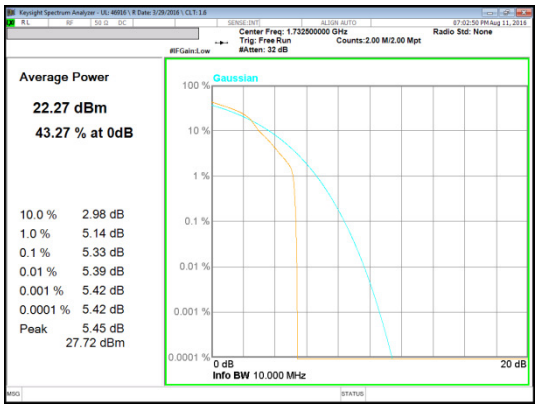
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5

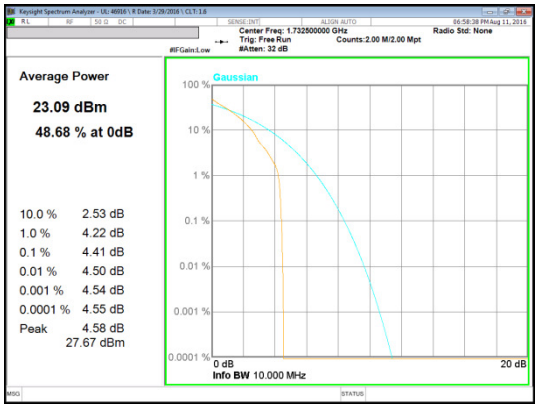
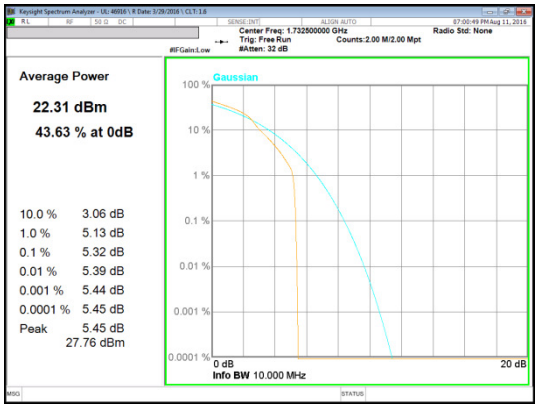
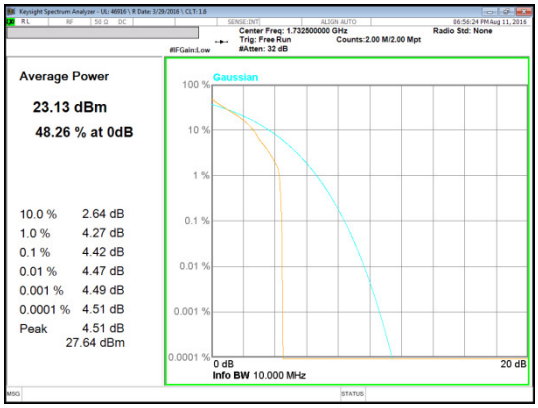
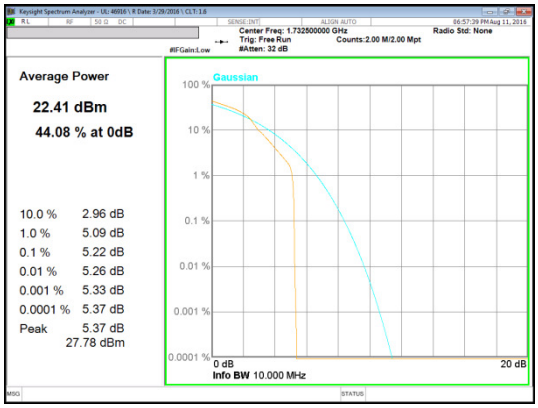
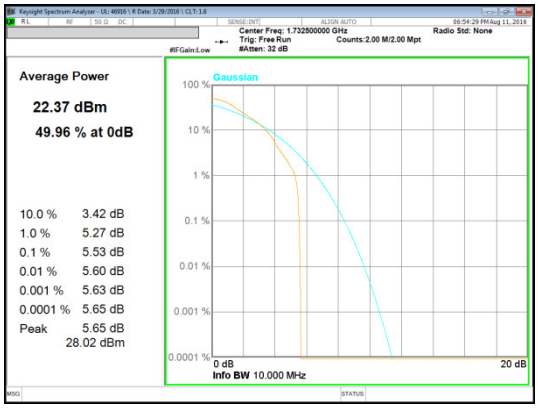
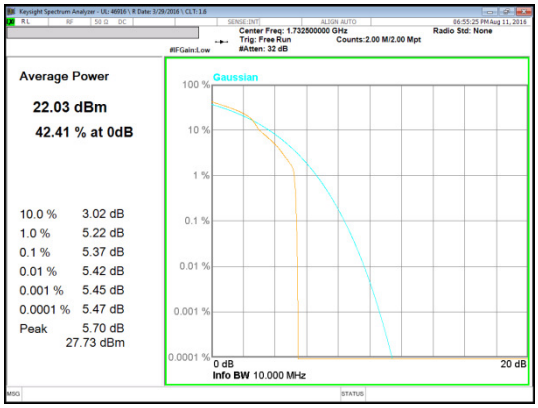
LTE Band 5 10 MHz	 LTE B5 10MHz QPSK Mid channel	 LTE B5 10MHz 16QAM Mid channel
LTE Band 5 5 MHz	 LTE B5 5MHz QPSK Mid channel	 LTE B5 5MHz 16QAM Mid channel
LTE Band 5 3 MHz	 LTE B5 3MHz QPSK Mid channel	 LTE B5 3MHz 16QAM Mid channel
LTE Band 5 1.4 MHz	 LTE B5 1.4MHz QPSK Mid channel	 LTE B5 1.4MHz 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 4

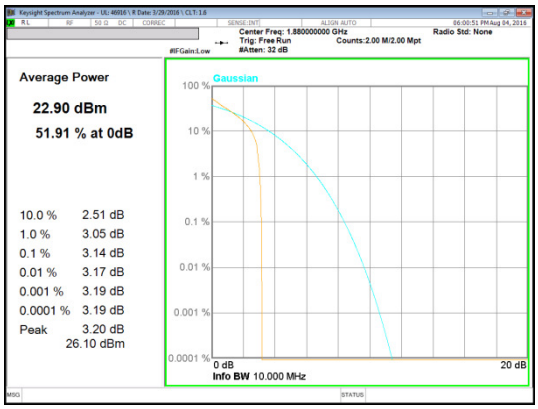
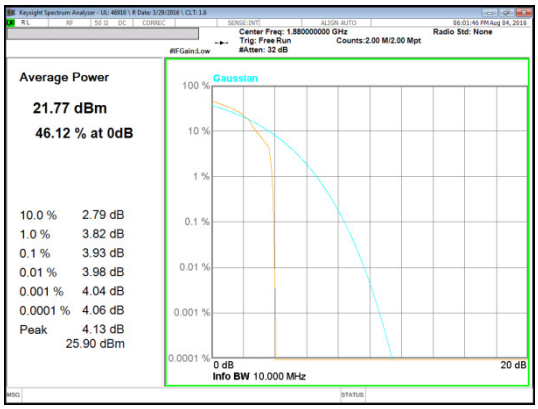
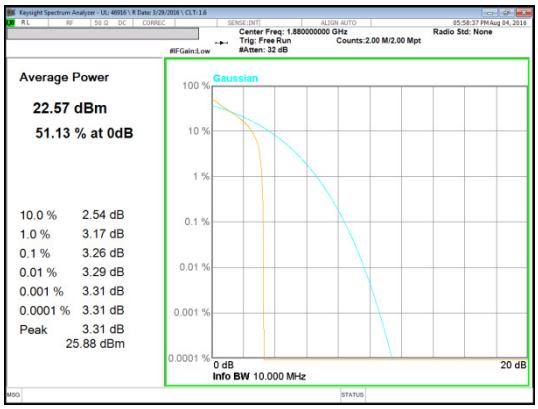
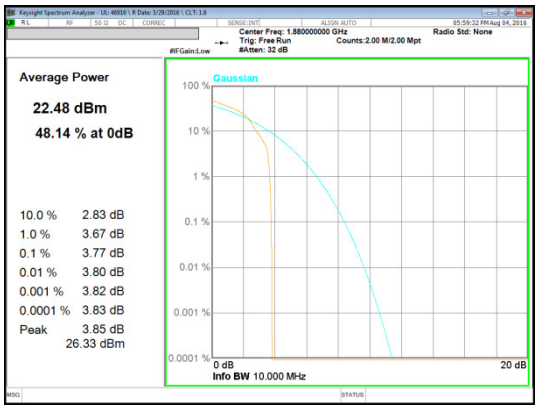
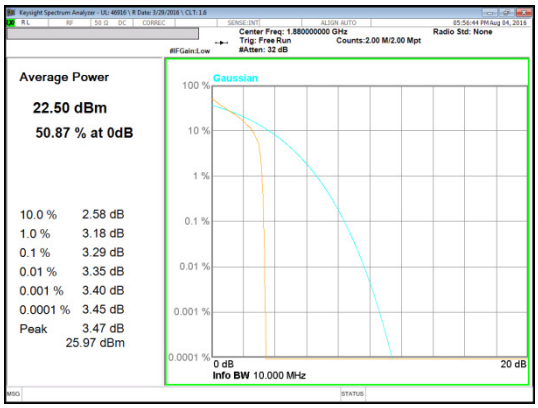
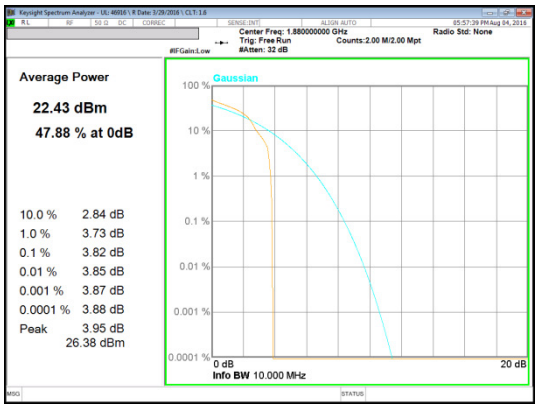
LTE Band 4 20 MHz	 LTE B4 20MHz QPSK Mid channel	 LTE B4 20MHz 16QAM Mid channel
LTE Band 4 15 MHz	 LTE B4 15MHz QPSK Mid channel	 LTE B4 15MHz 16QAM Mid channel
LTE Band 4 10 MHz	 LTE B4 10MHz QPSK Mid channel	 LTE B4 10MHz 16QAM Mid channel

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

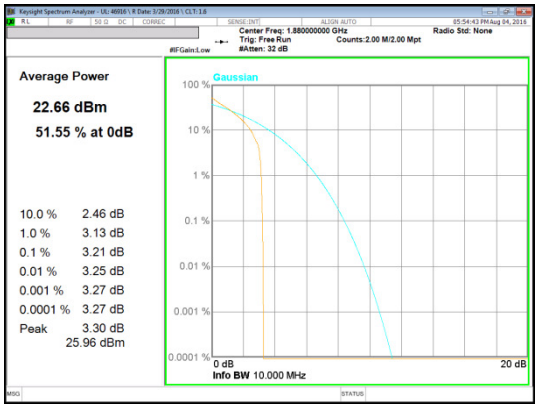
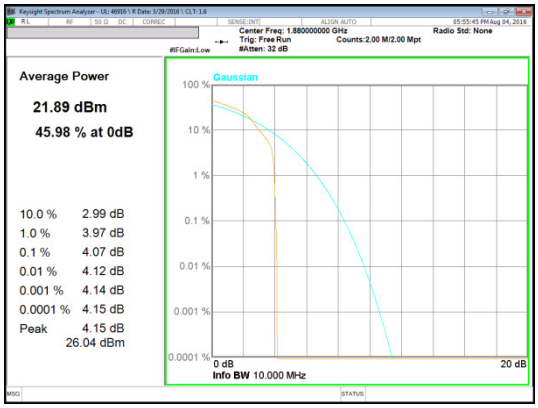
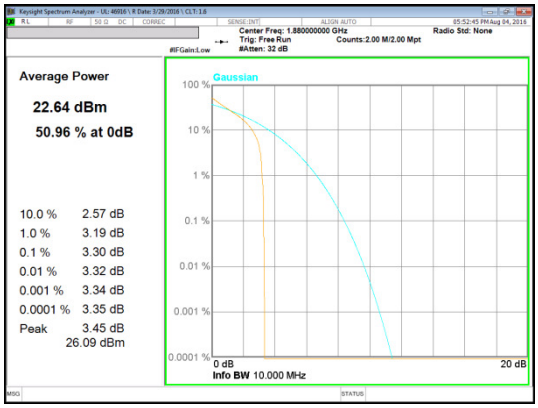
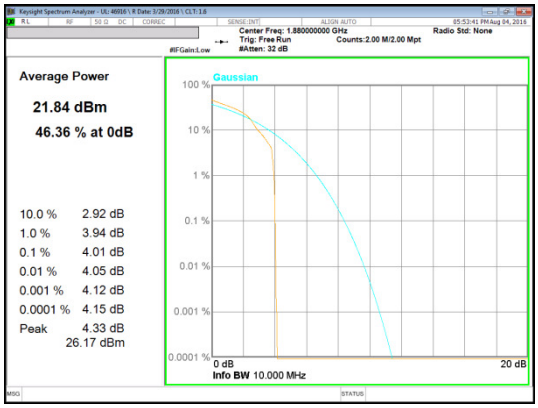
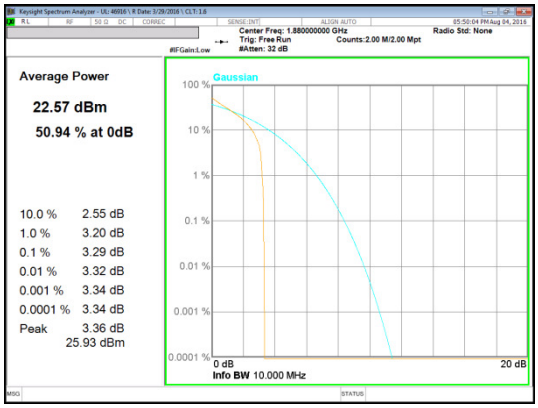
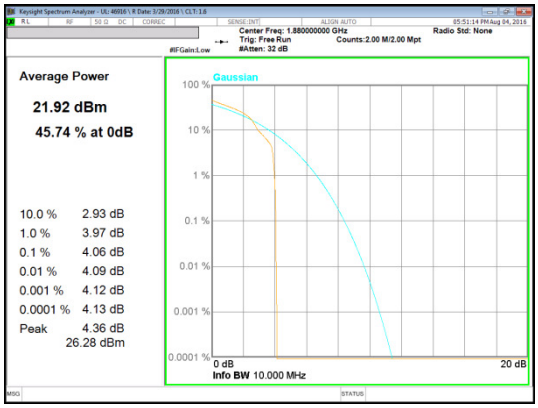
LTE Band 4 5 MHz	 LTE B4 5MHz QPSK Mid channel	 LTE B4 5MHz 16QAM Mid channel
LTE Band 4 3 MHz	 LTE B4 3MHz QPSK Mid channel	 LTE B4 3MHz 16QAM Mid channel
LTE Band 4 1.4 MHz	 LTE B4 1.4MHz QPSK Mid channel	 LTE B4 1.4MHz 16QAM Mid channel

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

LTE Band 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.

10. LIMITS AND CONDUCTED RESULTS

10.1. 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 v02r02)

10.1.1. OCCUPIED BANDWIDTH RESULTS

GSM

Band	Mode	Channel	f [MHz]	99% BW [KHz]	26dB BW [KHz]
GSM850	GPRS	128	824.2	244.90	312.7
		190	836.6	244.55	302.0
		251	848.8	245.79	312.0
GSM1900	GPRS	512	1850.2	245.29	321.3
		661	1880.0	246.93	316.5
		810	1909.8	246.45	318.5

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	4.1374	4.669
		4183	836.6	4.1234	4.701
		4233	846.6	4.1435	4.664
	HSDPA	4132	826.4	4.1460	4.663
		4183	836.6	4.1202	4.665
		4233	846.6	4.1339	4.668
Band 4	REL99	1312	1712.4	4.1232	4.677
		1413	1732.6	4.1243	4.672
		1513	1752.6	4.1246	4.667
	HSDPA	1312	1712.4	4.1256	4.656
		1413	1732.6	4.1361	4.663
		1513	1752.6	4.1322	4.648
Band 2	REL99	9262	1852.4	4.1230	4.675
		9400	1880.0	4.1233	4.692
		9538	1907.6	4.1136	4.723
	HSDPA	9262	1852.4	4.1286	4.634
		9400	1880.0	4.1413	4.675
		9538	1907.6	4.1013	4.660

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	99% BW [MHz]	26dB BW [MHz]
Band 5	10	20450	829.0	QPSK	8.9597	9.805
				16QAM	8.9512	9.767
		20524	836.5	QPSK	8.9354	9.711
				16QAM	8.9121	9.779
		20599	844.0	QPSK	8.9530	9.694
				16QAM	8.9645	9.790
	5	20425	826.5	QPSK	4.4906	4.949
				16QAM	4.4926	4.964
		20524	836.5	QPSK	4.4844	4.951
				16QAM	4.4899	4.923
		20624	846.5	QPSK	4.4918	4.955
				16QAM	4.4947	4.999
	3	20415	825.5	QPSK	2.6955	2.967
				16QAM	2.6993	2.963
		20524	836.5	QPSK	2.6888	2.981
				16QAM	2.6910	2.951
		20634	847.5	QPSK	2.7024	2.972
				16QAM	2.6909	2.978
	1.4	20407	824.7	QPSK	1.0846	1.276
				16QAM	1.0936	1.307
		20524	836.5	QPSK	1.0861	1.280
				16QAM	1.0852	1.296
		20624	848.3	QPSK	1.0804	1.269
				16QAM	1.0846	1.281

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

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 4	20	20050	1720.0	QPSK	17.865	19.21
				16QAM	17.867	19.21
		20174	1732.5	QPSK	17.833	19.17
				16QAM	17.830	19.12
		20299	1745.0	QPSK	17.847	19.33
				16QAM	17.848	19.33
	15	20025	1717.5	QPSK	13.412	14.71
				16QAM	13.440	14.69
		20174	1732.5	QPSK	13.373	14.53
				16QAM	13.379	14.56
		20324	1747.5	QPSK	13.390	14.60
				16QAM	13.385	14.57
	10	20000	1715.0	QPSK	8.9482	9.776
				16QAM	8.9478	9.800
		20174	1732.5	QPSK	8.9208	9.858
				16QAM	8.9326	9.798
		20349	1750.0	QPSK	8.9165	9.748
				16QAM	8.9397	9.781
	5	19975	1712.5	QPSK	4.4901	4.941
				16QAM	4.4909	4.916
		20174	1732.5	QPSK	4.4924	4.991
				16QAM	4.4943	4.995
		20374	1752.5	QPSK	4.4842	4.966
				16QAM	4.4892	4.955
	3	19965	1711.5	QPSK	2.6927	2.964
				16QAM	2.7011	2.950
		20174	1732.5	QPSK	2.6972	2.942
				16QAM	2.6956	2.951
		20384	1753.5	QPSK	2.6943	2.959
				16QAM	2.6926	2.957
	1.4	19957	1710.7	QPSK	1.0852	1.275
				16QAM	1.0869	1.267
		20174	1732.5	QPSK	1.0906	1.266
				16QAM	1.0915	1.269
		20392	1754.3	QPSK	1.0849	1.269
				16QAM	1.0854	1.274

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.

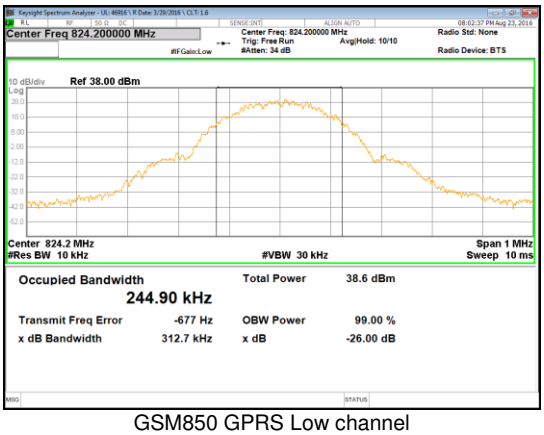
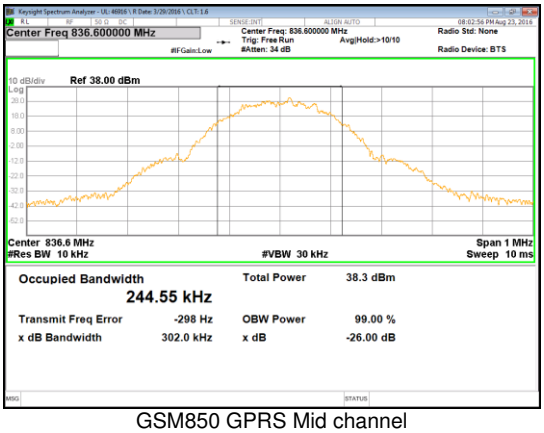
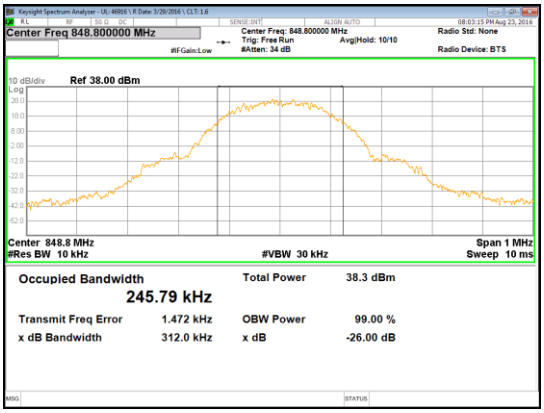
LTE Band 2

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 2	20	18700	1860.0	QPSK	17.835	19.15
				16QAM	17.847	19.27
		18900	1880.0	QPSK	17.790	19.13
				16QAM	17.794	19.26
		19099	1900.0	QPSK	17.803	19.25
				16QAM	17.796	19.14
	15	18675	1857.5	QPSK	13.408	14.57
				16QAM	13.388	14.53
		18900	1880.0	QPSK	13.374	14.58
				16QAM	13.366	14.48
		19124	1902.5	QPSK	13.348	14.47
				16QAM	13.352	14.37
	10	18650	1855.0	QPSK	8.9452	9.625
				16QAM	8.9305	9.827
		18900	1880.0	QPSK	8.9437	9.772
				16QAM	8.9108	9.831
		19149	1905.0	QPSK	8.9159	9.708
				16QAM	8.9395	9.731
	5	18625	1852.5	QPSK	4.4933	4.935
				16QAM	4.4953	4.973
		18900	1880.0	QPSK	4.4921	4.985
				16QAM	4.4948	4.986
		18175	1907.5	QPSK	4.4807	4.938
				16QAM	4.4912	5.020
	3	18615	1851.5	QPSK	2.6907	2.950
				16QAM	2.6933	2.986
		18900	1880.0	QPSK	2.6930	2.977
				16QAM	2.6875	2.975
		19184	1908.5	QPSK	2.6960	2.974
				16QAM	2.6899	2.968
	1.4	18607	1850.7	QPSK	1.0841	1.272
				16QAM	1.0847	1.288
		18900	1880.0	QPSK	1.0802	1.281
				16QAM	1.0852	1.289
		19192	1909.3	QPSK	1.0846	1.305
				16QAM	1.0930	1.310

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.

10.1.2. OCCUPIED BANDWIDTH PLOTS

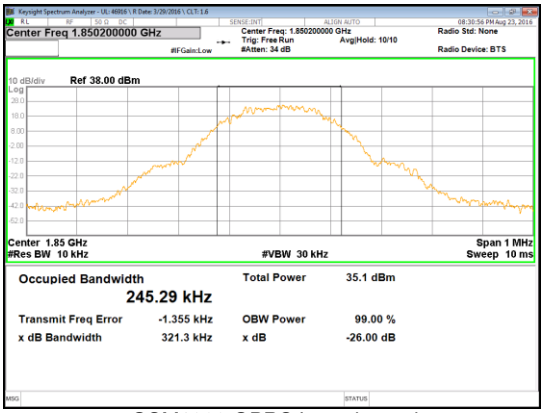
GSM 850

GSM	 GSM850 GPRS Low channel
	 GSM850 GPRS Mid channel
	 GSM850 GPRS High channel

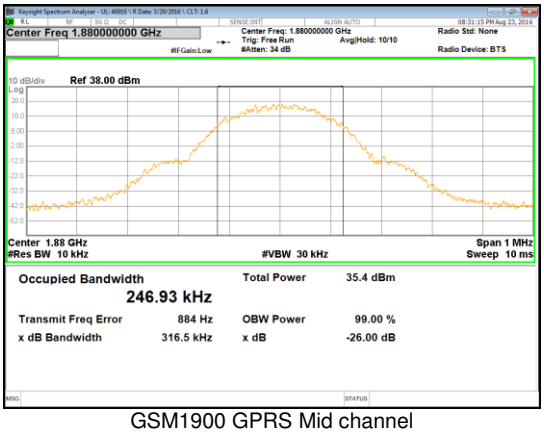
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

GSM 1900

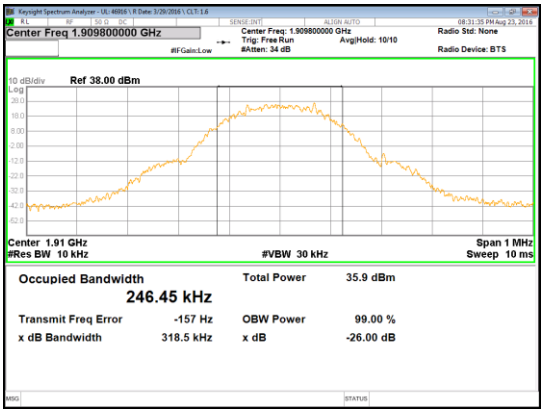
GSM



GSM1900 GPRS Low channel



GSM1900 GPRS Mid channel

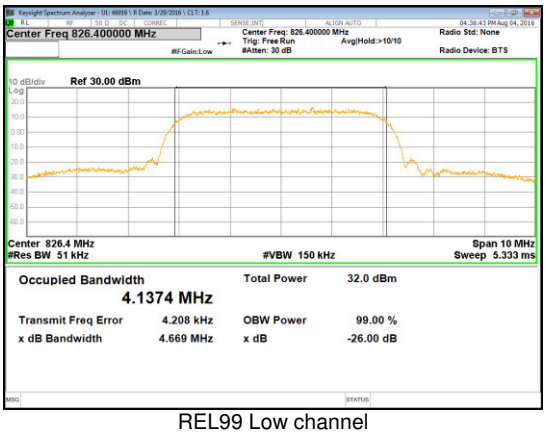


GSM1900 GPRS High channel

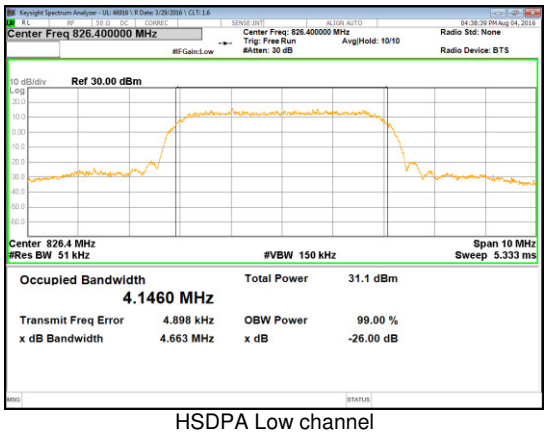
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 5

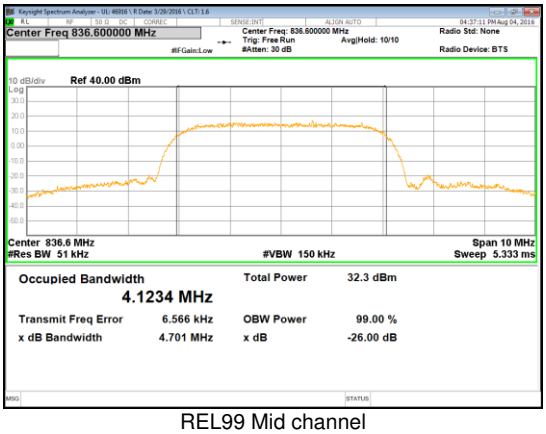
Band 5



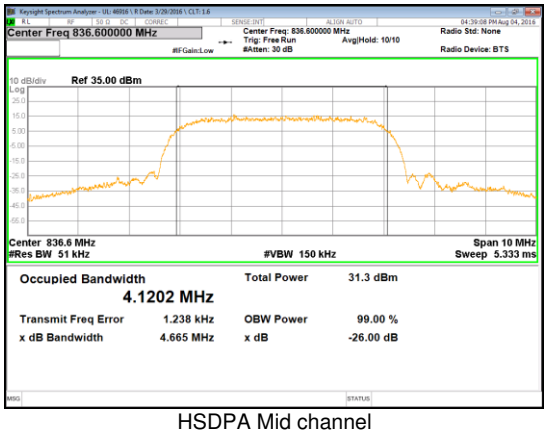
REL99 Low channel



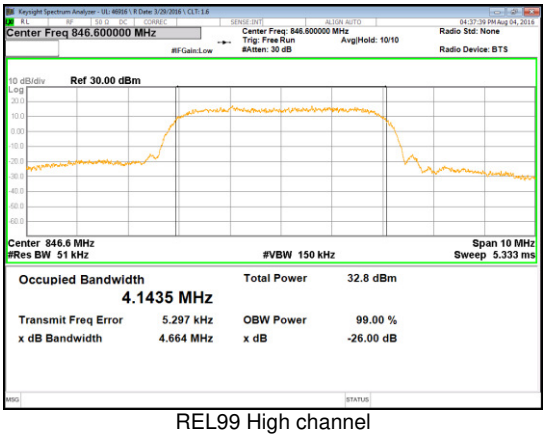
HSDPA Low channel



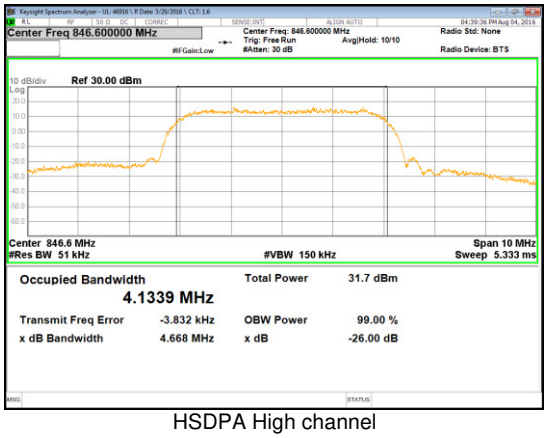
REL99 Mid channel



HSDPA Mid channel



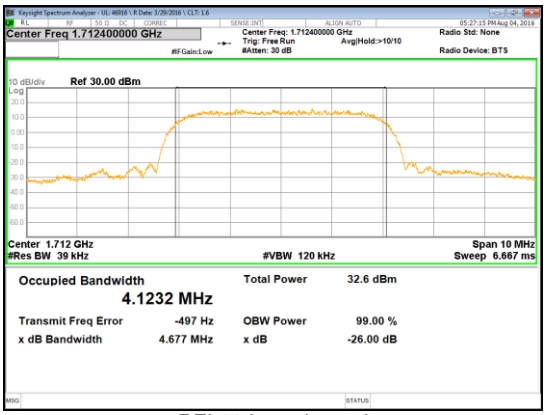
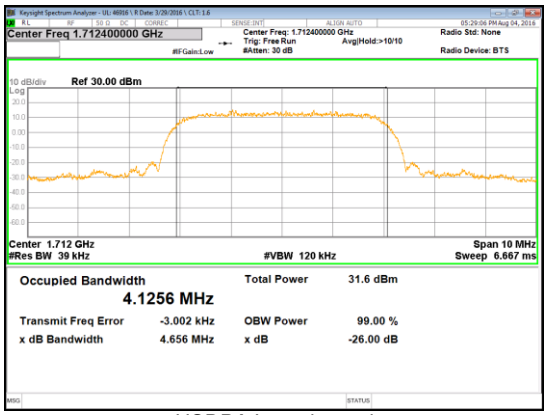
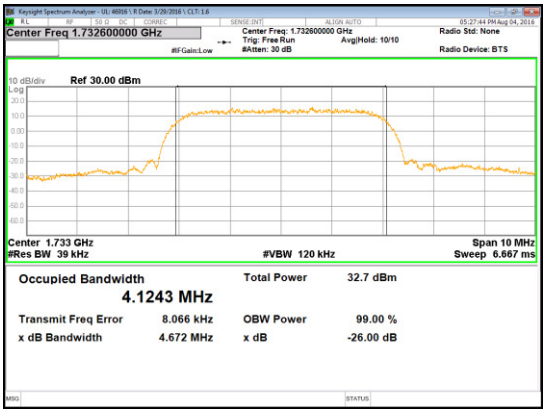
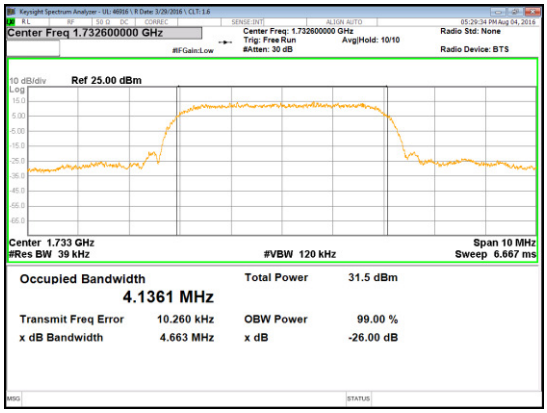
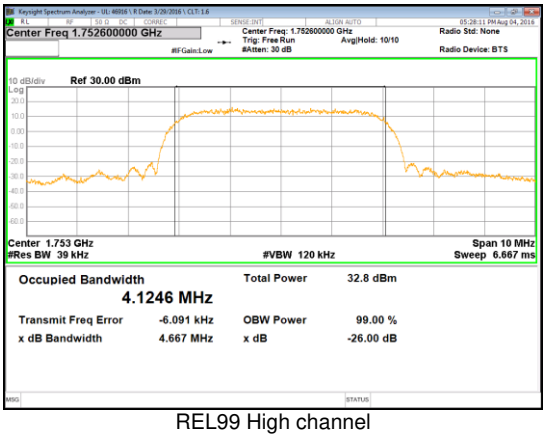
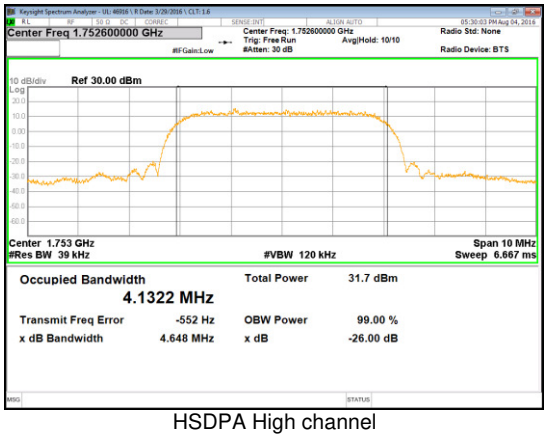
REL99 High channel



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.

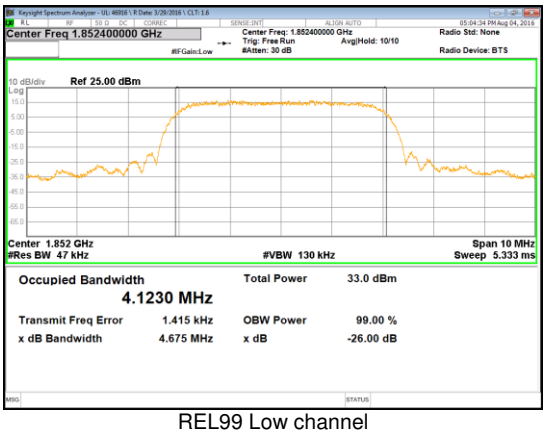
WCDMA Band 4

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

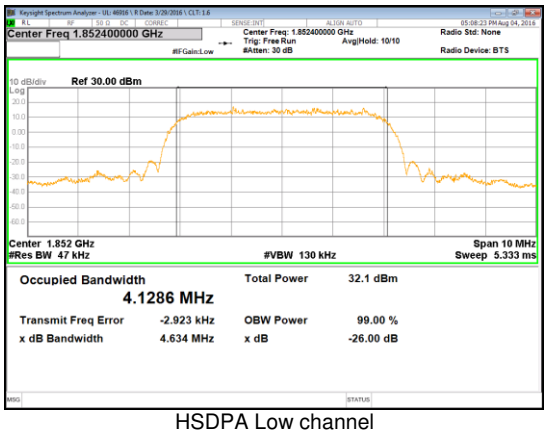
UL Korea, Ltd. Confidential
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

WCDMA Band 2

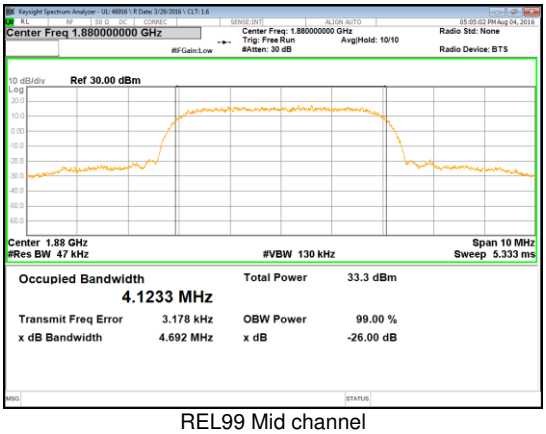
Band 2



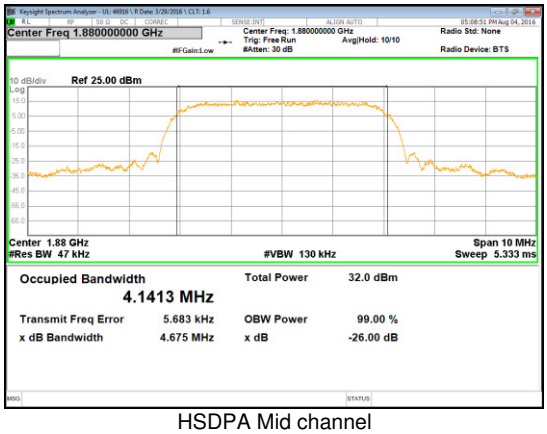
REL99 Low channel



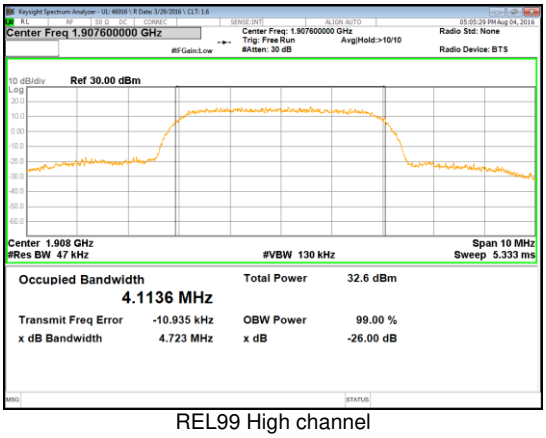
HSDPA Low channel



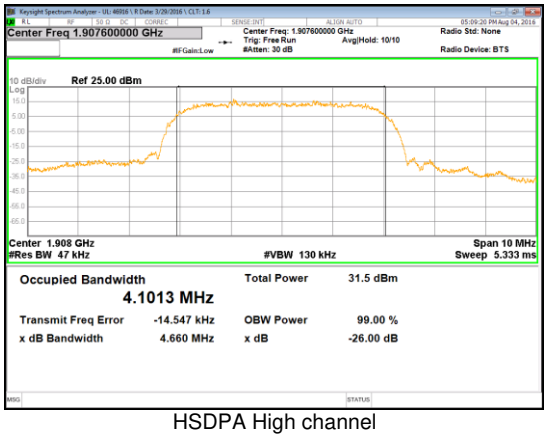
REL99 Mid channel



HSDPA Mid channel



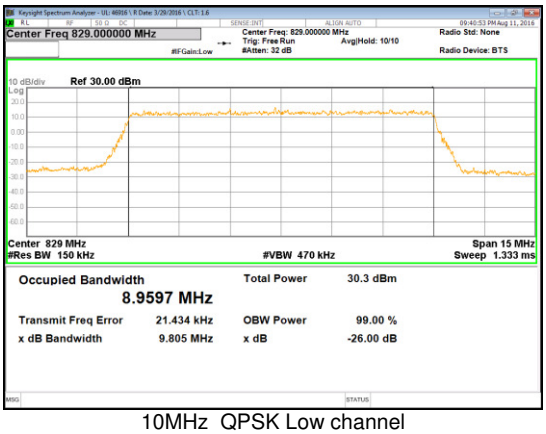
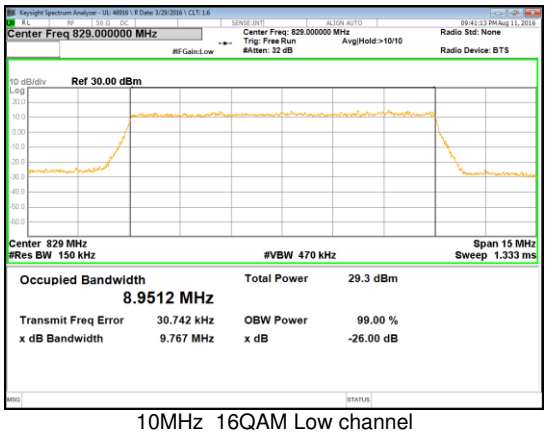
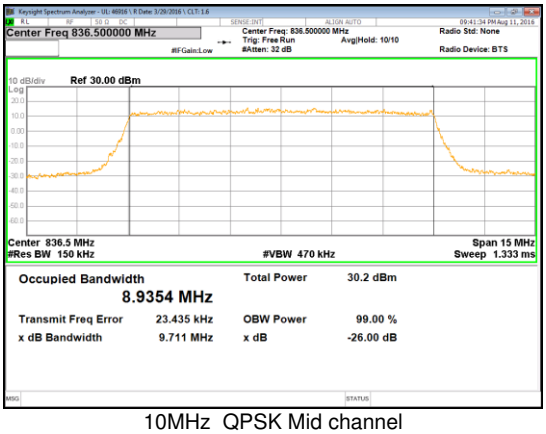
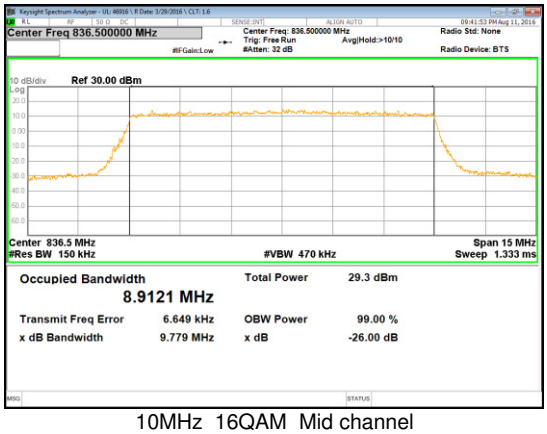
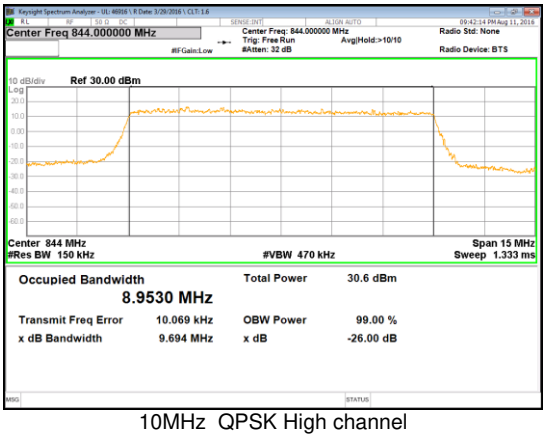
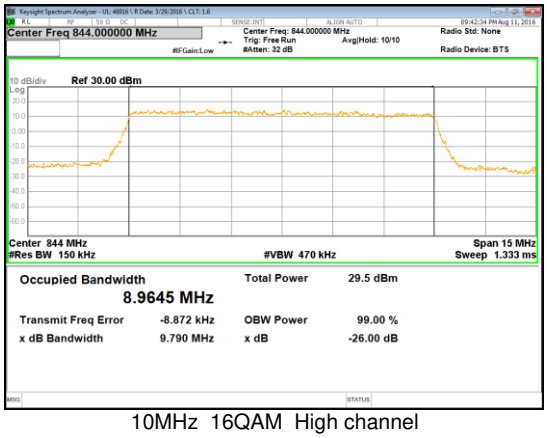
REL99 High channel



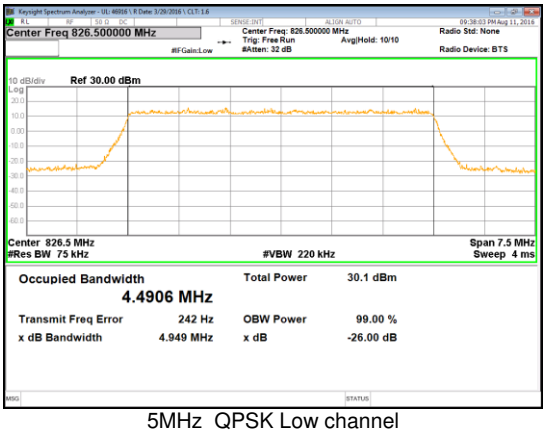
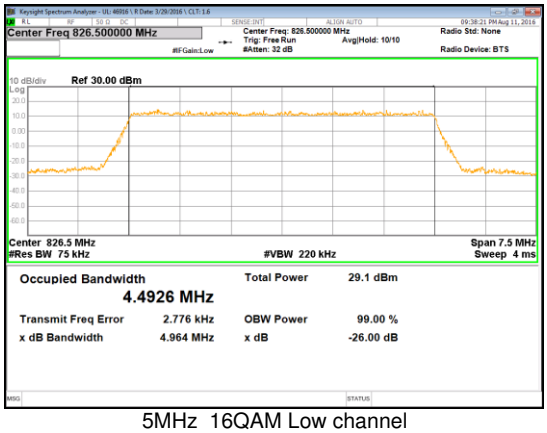
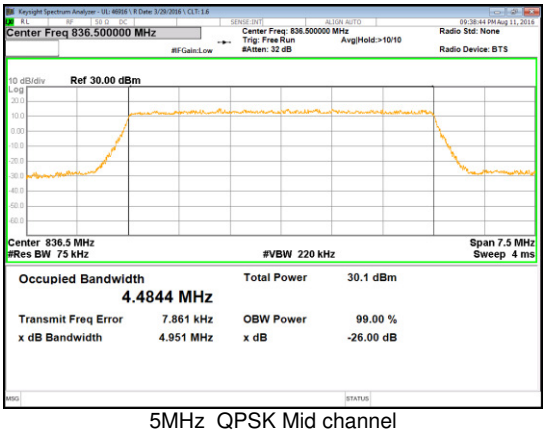
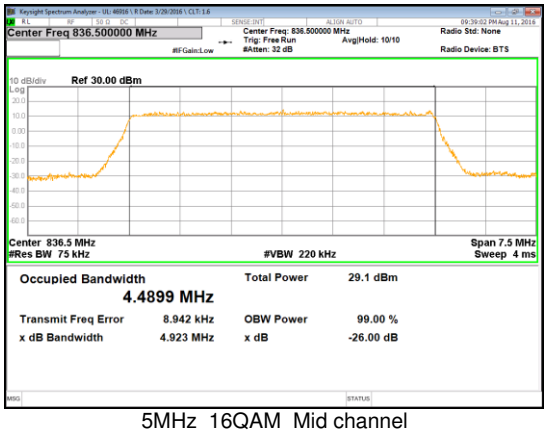
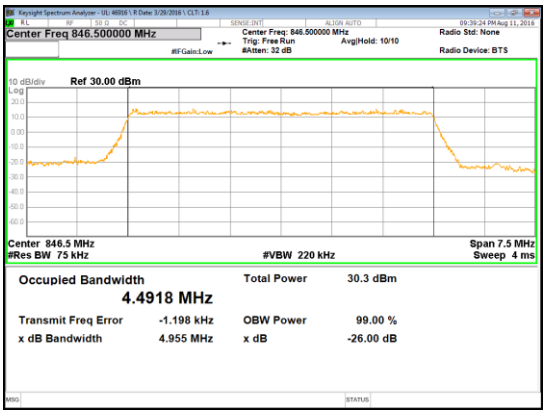
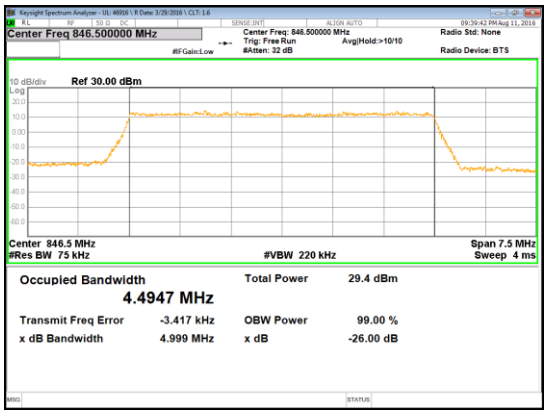
HSDPA High channel

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.

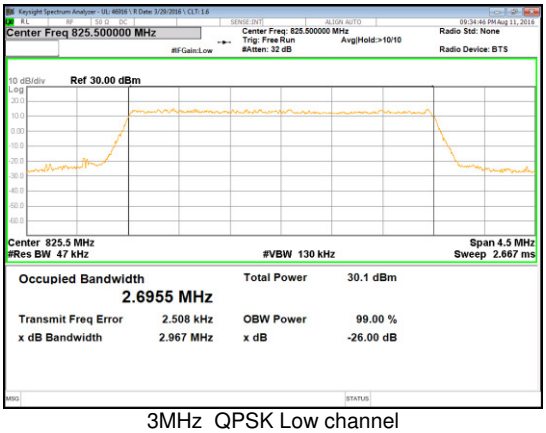
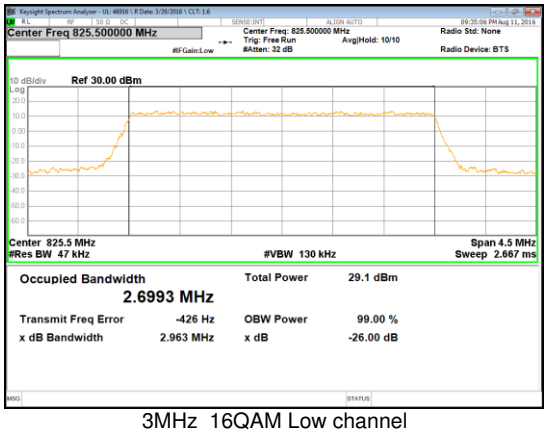
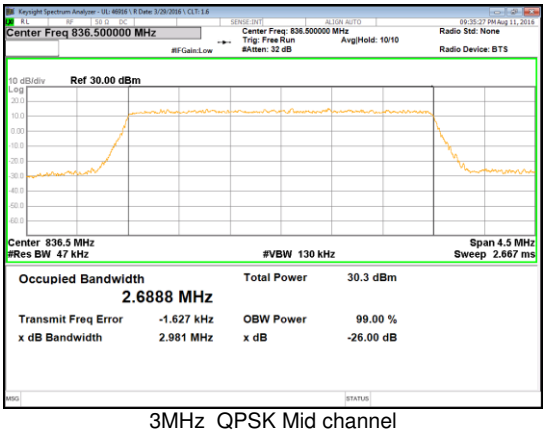
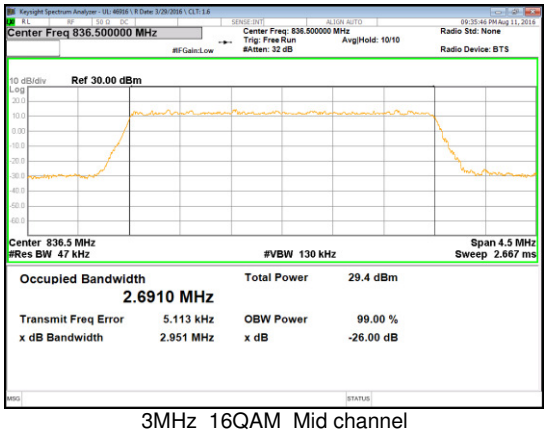
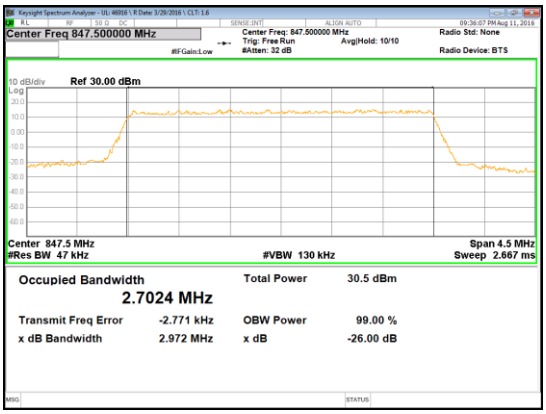
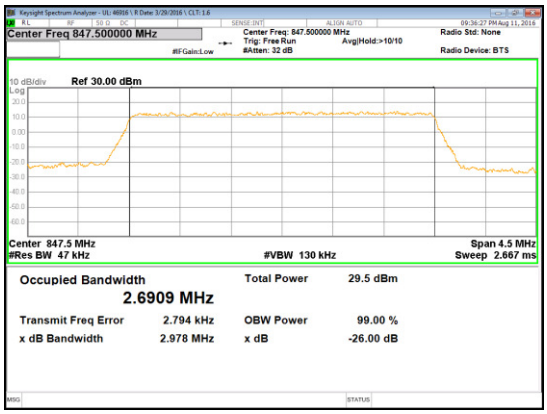
LTE Band 5

Band 5 10MHz	 10MHz QPSK Low channel	 10MHz 16QAM Low channel
	 10MHz QPSK Mid channel	 10MHz 16QAM Mid channel
	 10MHz QPSK High channel	 10MHz 16QAM 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.

Band 5 5MHz	 5MHz QPSK Low channel	 5MHz 16QAM Low channel
	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel
	 5MHz QPSK High channel	 5MHz 16QAM 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.

Band 5 3MHz	 3MHz QPSK Low channel	 3MHz 16QAM Low channel
	 3MHz QPSK Mid channel	 3MHz 16QAM Mid channel
	 3MHz QPSK High channel	 3MHz 16QAM High channel

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