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

CERTIFICATION TEST REPORT

GSM/WCDMA/LTE PHONE + BLUETOOTH and WLAN 2.4GHz b/g/n

MODEL NUMBER: SM-J110F, SM-J110F/DS, and SM-J110G/DS

FCC ID: A3LSMJ110F

REPORT NUMBER: 15I21198-E1

ISSUE DATE: JULY 9, 2015

Prepared for
SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 443-742, KOREA

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	7/9/15	Initial issue	P. Zhang

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5
2. TEST METHODOLOGY 6
3. FACILITIES AND ACCREDITATION 6
4. CALIBRATION AND UNCERTAINTY 7
4.1. MEASURING INSTRUMENT CALIBRATION 7
4.2. SAMPLE CALCULATION 7
4.3. MEASUREMENT UNCERTAINTY 7
5. EQUIPMENT UNDER TEST 8
5.1. DESCRIPTION OF EUT 8
5.2. MAXIMUM OUTPUT POWER 8
5.3. MAXIMUM OUTPUT POWER (LTE) 9
5.4. DESCRIPTION OF AVAILABLE ANTENNAS 10
5.5. DESCRIPTION OF TEST SETUP 11
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. UMTS REL 99 OUTPUT POWER RESULT 19
8.3. UMTS HSDPA 20
8.3.1. UMTS HSDPA OUTPUT POWER RESULT 20
8.4. UMTS HSUPA 21
8.4.1. UMTS HSUPA OUTPUT POWER RESULT 22
8.5. LTE OUTPUT VERIFICATION 23
8.5.1. LTE OUTPUT RESULT 23
9. PEAK TO AVERAGE RATIO 25
9.1. CONDUCTED PEAK TO AVERAGE RESULT 25
10. LIMITS AND CONDUCTED RESULTS 30
10.1. OCCUPIED BANDWIDTH 30
10.1.1. OCCUPIED BANDWIDTH RESULTS 31
10.1.2. LTE OCCUPIED BANDWIDTH RESULTS 33

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.1.1. OCCUPIED BANDWIDTH PLOTS 34
10.2. BAND EDGE EMISSIONS 39
10.2.1. BAND EDGE PLOTS 40
10.3. OUT OF BAND EMISSIONS 51
10.3.1. OUT OF BAND EMISSIONS RESULT 52
10.3.2. OUT OF BAND EMISSIONS PLOTS.....54
10.4. FREQUENCY STABILITY 58
10.4.1. FREQUENCY STABILITY RESULTS.....59
11. RADIATED TEST RESULTS 61
11.1. RADIATED POWER (ERP & EIRP).....61
11.1.1. ERP/EIRP Results.....62
11.1.2. LTE ERP/EIRP Results 63
11.1.3. ERP/EIRP PLOTS.....64
11.2. FIELD STRENGTH OF SPURIOUS RADIATION 78
11.2.1. SPURIOUS RADIATION PLOTS.....79
12. SETUP PHOTOS 93
END OF REPORT 94

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE Phone + Bluetooth and WLAN 2.4GHz b/g/n
MODEL:	SM-J110F , SM-J110F/DS, and SM-J110G/DS
SERIAL NUMBER:	2152667
DATE TESTED:	JUNE 29 – JULY 9, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 22H and 24E	PASS

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Verification Services Inc. By:

PENG ZHANG
CONSUMER TECHNOLOGY DIVISION
PROJECT LEAD
UL VERIFICATION SERVICES INC

Tested By:

STEVEN TRAN
CONSUMER TECHNOLOGY DIVISION
LAB ENGINEER
UL VERIFICATION SERVICES INC

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 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.

47173 Benicia Street	47266 Benicia Street
☒ Chamber A(IC: 2324B-1)	☐ Chamber D(IC: 2324B-4)
☒ Chamber B(IC: 2324B-2)	☐ Chamber E(IC: 2324B-5)
☒ Chamber C(IC: 2324B-3)	☐ Chamber F(IC: 2324B-6)
	☐ Chamber G(IC: 2324B-7)
	☐ Chamber H(IC: 2324B-8)

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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	3.52 dB
Radiated Disturbance, 30 to 18000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + Bluetooth and WLAN 2.4GHz b/g/n

5.2. MAXIMUM OUTPUT POWER

FCC Part 22/24						
Band	Frequency Range(MHz)	Modulation	Conducted		Radiated	
			AVG(dBm)	AVG(mW)	AVG(dBm)	AVG(mW)
GSM850	824~849	GMSK	31.8	1513.56		
	824~849	GPRS	31.8	1513.56	29.049	803.34
	824~849	EGPRS	27.6	575.44	24.221	264.3
GSM1900	1850~1910	GMSK	29.9	977.24		
	1850~1910	GPRS	29.9	977.24	32.538	1793.91
	1850~1910	EGPRS	25.4	346.74	28.65	732.82
Band 5	824~849	REL99	22.7	186.21	19.221	83.58
	824~849	HSDPA	22.6	181.97	19.171	82.62
	824~849	HSUPA	22.5	177.83		

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5.3. MAXIMUM OUTPUT POWER (LTE)

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

FCC Part 22/24							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation	Conducted		Radiated	
				AVG(dBm)	AVG(mW)	AVG(dBm)	AVG(mW)
LTE5	824~849	10MHz	QPSK	22.2	165.96	18.27	67.14
			16QAM	21.79	151.01	17.62	57.81
		5MHz	QPSK	22.25	167.88	18.30	67.61
			16QAM	21.63	145.55	17.65	58.21
		3MHz	QPSK	22.23	167.11	18.72	74.47
			16QAM	21.78	150.66	17.76	59.70
		1.4MHz	QPSK	22.18	165.20	18.70	74.13
			16QAM	21.84	152.76	17.74	59.43

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna for the [List the bands supported] with a maximum peak gain as follow:

Frequency (MHz)	Peak Gain (dBi)
GSM1900, 1850~1910MHz	0.03
Band 5, 824~849MHz	-0.77

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	Samsung	ETA810EBE	N/A	N/A
Earphone	Samsung	N/A	N/A	N/A

I/O CABLES (CONDUCTED SETUP)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	RF Out	1	Spectrum Analyzer	Shielded	None	NA
2	Antenna Port	1	EUT	Shielded	0.1m	NA
3	RF In/Out	1	Communication Test Set	Shielded	1m	NA

I/O CABLES (RADIATED SETUP)

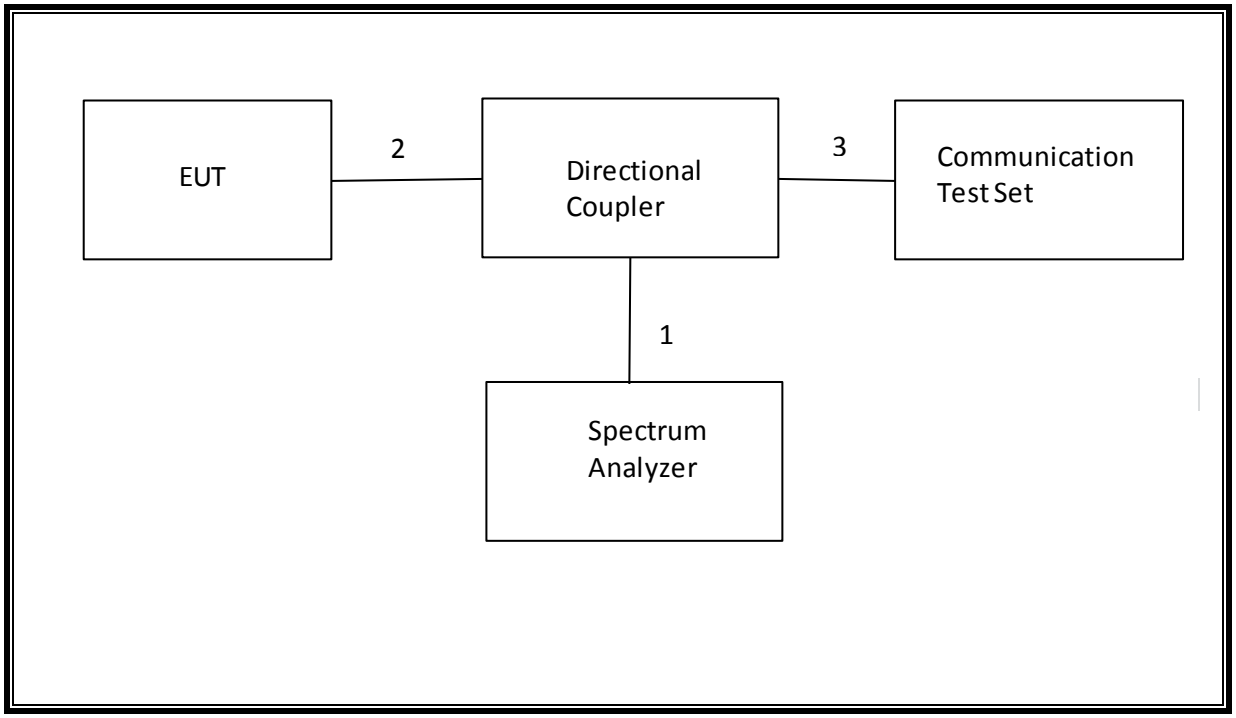
I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	USB	1	AC Adapter	Un-shielded	1.2m	No
2	Jack	1	Headset	Shielded	1m	No
3	RF In/out	1	Communication Test Set	Un-shielded	2m	Yes

TEST SETUP

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

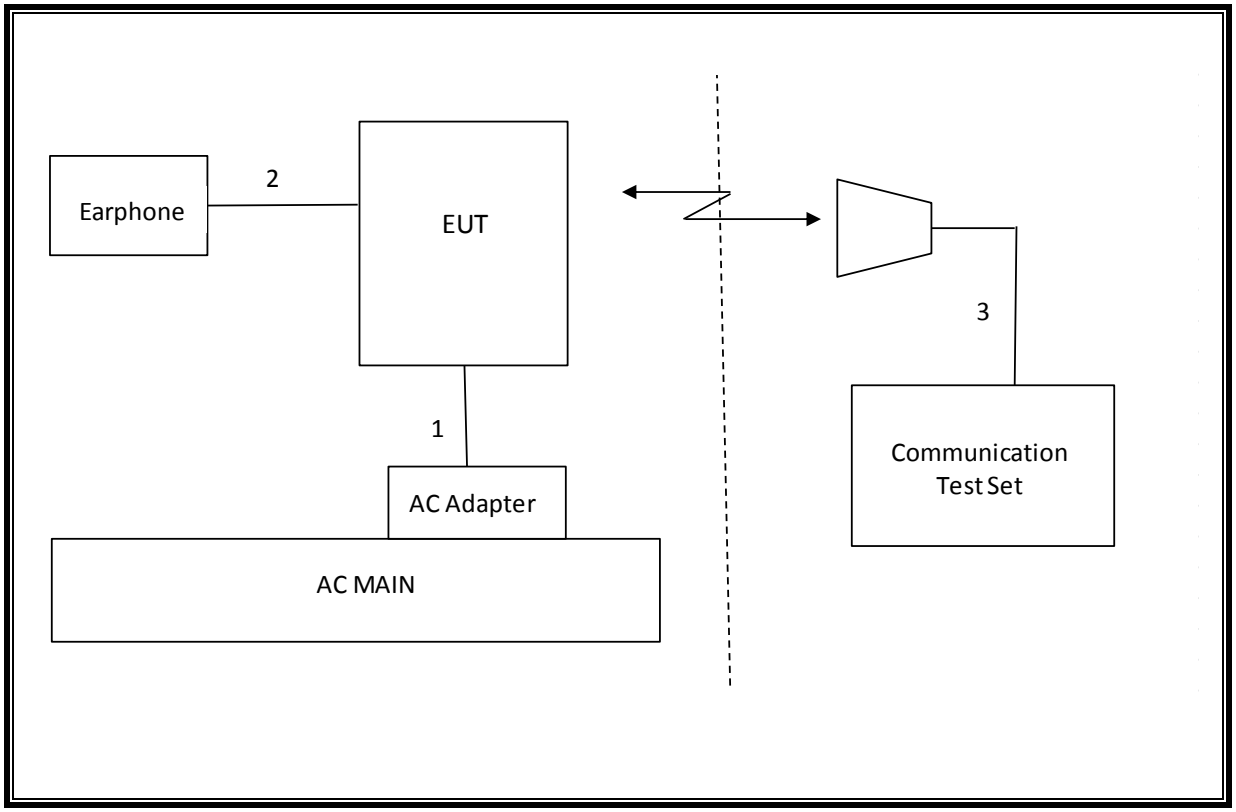
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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**	**Asset**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01179	02/26/16
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	08/14/15
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/15
Antenna, Horn, 18 GHz	EMCO	3115	C00784	10/25/15
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02687	CNR
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02688	CNR
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	01/09/16
Communications Test Set	R&S	CMW500	T159	07/02/16
DC power supply, 8 V @ 3 A or 15 V	Agilent / HP	E3610A	None	CNR
Vector signal generator, 6 GHz	Agilent / HP	E4438C	None	07/06/16
Antenna, Tuned Dipole 400~1000	ETS	3121C DB4	C00993	02/14/16
Directional Coupler	RF-Lambda	RFDC5M06G15	None	CNR
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	12/17/15
Multimeter	Fluke	26111	74320701	4/15/2016

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

7. Summary Table

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Note
2.1049	N/A	Occupied Band width (99%)	N/A	Conducted	Pass	9 MHz
22.917(a) 24.238(a) 27.53(g) 90.691	RSS-132(4.5.1) RSS-133(6.5.1) RSS-139(6.5.1)	Band Edge / Conducted Spurious Emission	-13dBm		Pass	-13.76 dBm
2.1046	N/A	Conducted output power	N/A		Pass	31.8 dBm
22.355 24.235 27.54 90.213	RSS-132(4.3) RSS-133(6.3) RSS-139(6.3) RSS-199(4.3)	Frequency Stability	2.5PPM		Pass	0.005 PPM
22.913(a)(2)	RSS-132(4.4)	Effective Radiated Power	38 dBm	Radiated	Pass	29.1 dBm
24.232(c) 27.50(h)(2)	RSS-133(6.4) RSS-199(4.4)	Equivalent Isotropic Radiated Power	33dBm		Pass	32.5 dBm
22.917(a) 24.238(a) 27.53(g)	RSS-132(4.5.1) RSS-133(6.5.1) RSS-139(6.5.1)	Radiated Spurious Emission	-13dBm		Pass	-43.9 dBm

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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 VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.1.1. GSM OUTPUT POWER RESULT

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)
GSM (Voice)	CS1	1	128	824.2	31.8
			190	836.6	31.8
			251	848.8	31.8
GPRS (GMSK)	CS1	1	128	824.2	31.8
			190	836.6	31.8
			251	848.8	31.8
EGPRS (8PSK)	MCS5	1	128	824.2	27.3
			190	836.6	27.5
			251	848.8	27.6

Note: Above conducted power are the worst cases for each mode.

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)
GSM (Voice)	CS1	1	512	1850.2	29.8
			661	1880.0	29.9
			810	1909.8	29.8
GPRS (GMSK)	CS1	1	512	1850.2	29.8
			661	1880.0	29.9
			810	1909.8	29.8
EGPRS (8PSK)	MCS5	1	512	1850.2	25.0
			661	1880.0	25.3
			810	1909.8	25.4

Note: Above conducted power are the worst cases for each mode.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.2. UMTS REL 99

TEST PROCEDURE

The following summary of these settings are illustrated below:

	Mode	Rel99
	Subtest	-
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	HSDPA FRC	Not Applicable
	HSUPA Test	Not Applicable
	Power Control Algorithm	Algorithm2
	βc	Not Applicable
	βd	Not Applicable
	βec	Not Applicable
	βc/βd	8/15
	βhs	Not Applicable
	βed	Not Applicable

8.2.1. UMTS REL 99 OUTPUT POWER RESULT

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	0	22.7
		4183	836.6	0	22.7
		4233	846.6	0	22.6

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.3. UMTS HSDPA

TEST PROCEDURE

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	Rel5 HSDPA			
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	12/15	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			

8.3.1. UMTS HSDPA OUTPUT POWER RESULT

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	22.3
		4183	836.6	0	22.6
		4233	846.6	0	22.5
	Subtest 2	4132	826.4	0	22.3
		4183	836.6	0	22.6
		4233	846.6	0	22.5
	Subtest 3	4132	826.4	0.5	21.4
		4183	836.6	0.5	21.8
		4233	846.6	0.5	21.7
	Subtest 4	4132	826.4	0.5	21.4
		4183	836.6	0.5	21.8
		4233	846.6	0.5	21.7

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.4. UMTS HSUPA

TEST PROCEDURE

The following summary of these settings are illustrated below: (ETSI TS 134.121-1 Table C.11.1)

	Mode	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	P-CPICH (dB)	-10				
	P-CCPCH (dB)	-12				
	SCH (dB)	-12				
	PICH(dB)	-15				
	DPCH (dB)	-9				
	HS-SCCH_1 (dB)	-8				
	HS-PDSCH (dB)	-3				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	Bc	11/15	6/15	15/15	2/15	15/15
	Bd	15/15	15/15	9/15	15/15	15/15
	Bec	209/225	12/15	30/15	2/15	5/15
	βc/βd	11/15	6/15	15/9	2/15	15/15
	Bhs	22/15	12/15	30/15	4/15	30/15
	βed (note1)	1309/225	94/75	47/15 47/15	56/75	134/15
	MPR	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	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				
HSUPA Specific Settings	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	Reference E-TFCIs	5	5	2	5	5
	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	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27	

Note1: βed cannot be set directly, it is set by Absolute Grant Value.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.4.1. UMTS HSUPA OUTPUT POWER RESULT

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	22.2
		4183	836.6	0	22.5
		4233	846.6	0	22.5
	Subtest 2	4132	826.4	2	21.0
		4183	836.6	2	21.0
		4233	846.6	2	21.0
	Subtest 3	4132	826.4	1	21.9
		4183	836.6	1	22.0
		4233	846.6	1	22.0
	Subtest 4	4132	826.4	2	21.0
		4183	836.6	2	21.0
		4233	846.6	2	21.0
	Subtest 5	4132	826.4	0	22.2
		4183	836.6	0	22.5
		4233	846.6	0	22.5

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.5. LTE OUTPUT VERIFICATION

8.5.1. LTE OUTPUT RESULT

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20450	20525	20600
						829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	22.10	22.20	22.18
			1	25	0	22.11	22.15	22.07
			1	49	0	22.17	22.16	22.01
			25	0	1	20.15	20.15	20.11
			25	12	1	20.11	20.14	20.03
			25	25	1	20.13	20.13	20.04
			50	0	1	20.11	20.10	20.02
		16QAM	1	0	1	21.39	21.42	21.79
			1	25	1	21.42	21.33	21.70
			1	49	1	21.35	21.36	21.64
			25	0	2	19.26	19.32	19.28
			25	12	2	19.26	19.31	19.22
			25	25	2	19.30	19.29	19.19
			50	0	2	19.19	19.25	19.15

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20425	20525	20625
						826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	22.18	22.25	22.13
			1	12	0	22.20	22.24	22.09
			1	24	0	22.23	22.23	22.01
			12	0	1	20.15	20.15	20.07
			12	7	1	20.17	20.16	20.03
			12	13	1	20.17	20.19	20.01
			25	0	1	20.16	20.18	20.01
		16QAM	1	0	1	21.41	21.63	21.47
			1	12	1	21.45	21.62	21.37
			1	24	1	21.51	21.64	21.38
			12	0	2	19.28	19.46	19.22
			12	7	2	19.29	19.47	19.23
			12	13	2	19.32	19.48	19.22
			25	0	2	19.22	19.36	19.20

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20415	20525	20635
						825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	22.09	22.23	22.00
			1	8	0	22.07	22.16	22.00
			1	14	0	22.11	22.21	21.92
			8	0	1	20.26	20.30	20.15
			8	4	1	20.24	20.31	20.17
			8	7	1	20.26	20.32	20.15
			15	0	1	20.13	20.17	20.00
		16QAM	1	0	1	21.34	21.78	21.40
			1	8	1	21.32	21.78	21.34
			1	14	1	21.38	21.83	21.29
			8	0	2	19.40	19.32	19.60
			8	4	2	19.41	19.34	19.58
			8	7	2	19.41	19.32	19.55
			15	0	2	19.27	19.39	19.18

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20407	20525	20643
						824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	22.13	22.18	21.96
			1	3	0	22.09	22.16	21.97
			1	5	0	22.12	22.22	21.94
			3	0	0	22.19	22.26	22.12
			3	1	0	22.19	22.27	22.11
			3	3	0	22.19	22.26	22.10
			6	0	1	20.26	20.32	20.14
		16QAM	1	0	1	21.68	21.84	21.35
			1	3	1	21.68	21.76	21.30
			1	5	1	21.73	21.83	21.35
			3	0	1	21.34	21.42	21.42
			3	1	1	21.34	21.38	21.43
			3	3	1	21.36	21.40	21.36
			6	0	2	19.50	19.37	19.52

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9. PEAK TO AVERAGE RATIO

Test Procedure

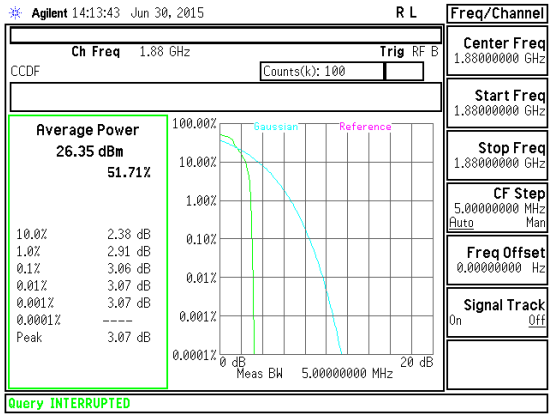
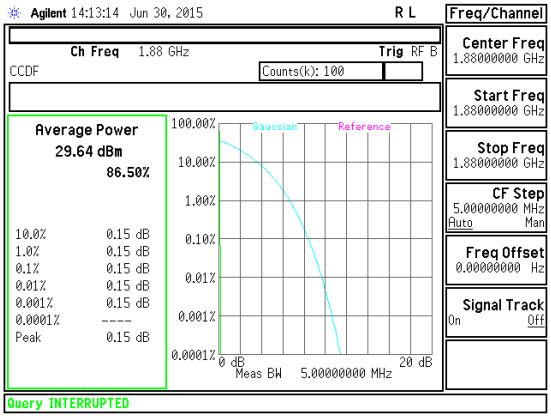
Per KDB 971168 D01 Power Meas License Digital Systems v02r02

Test Spec

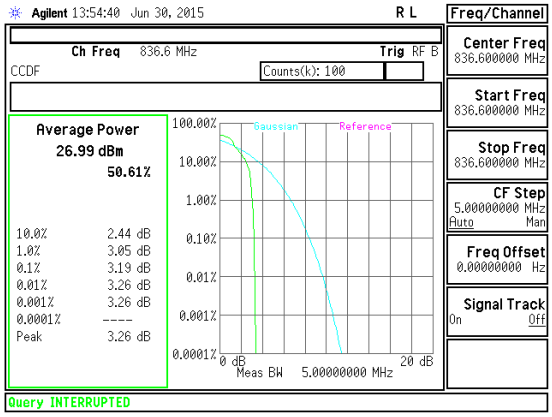
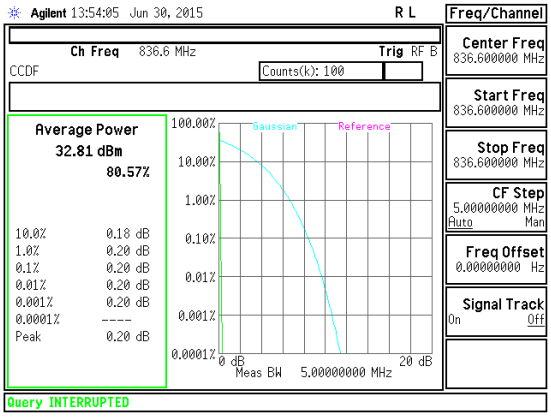
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

9.1. CONDUCTED PEAK TO AVERAGE RESULT

GSM

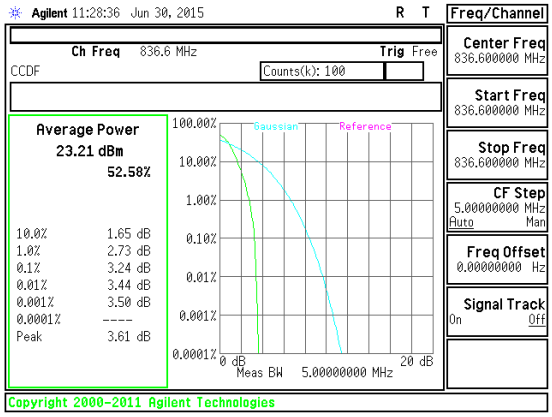
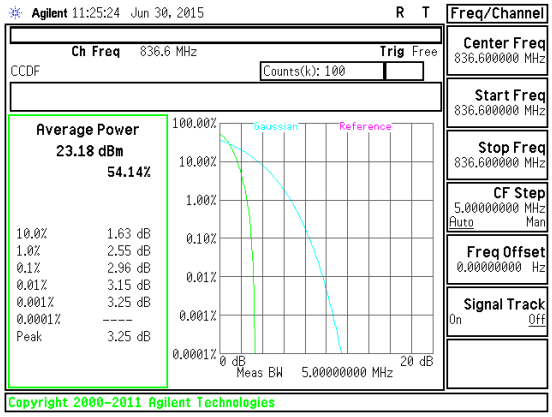
Band GSM1900	 Band GSM1900 EGPRS Mid channel	 Band GSM1900 GPRS Mid channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

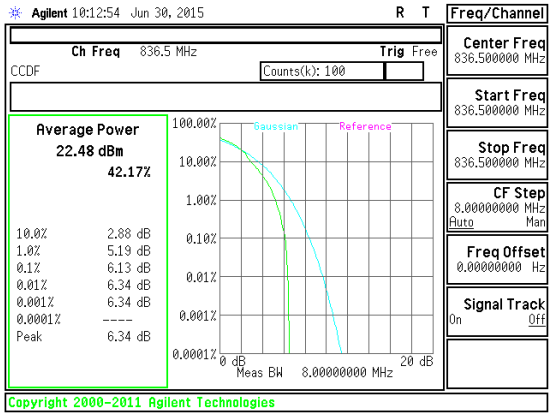
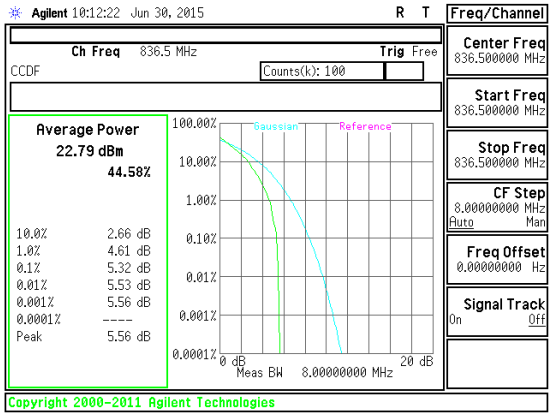
Band GSM850	 Band GSM850 EGPRS Mid channel	 Band GSM850 GPRS Mid channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

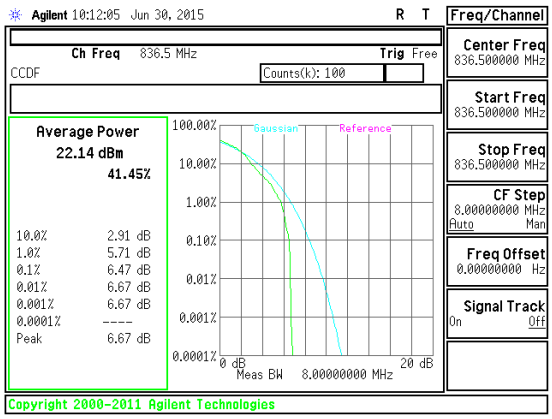
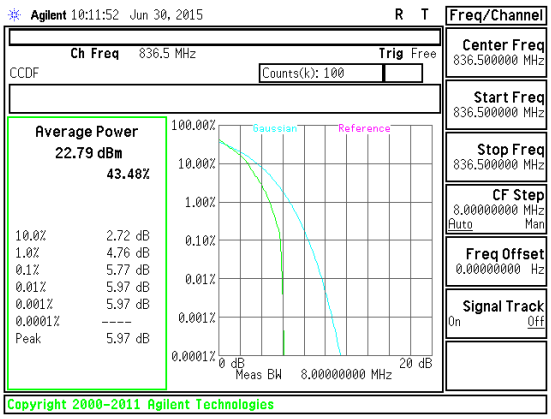
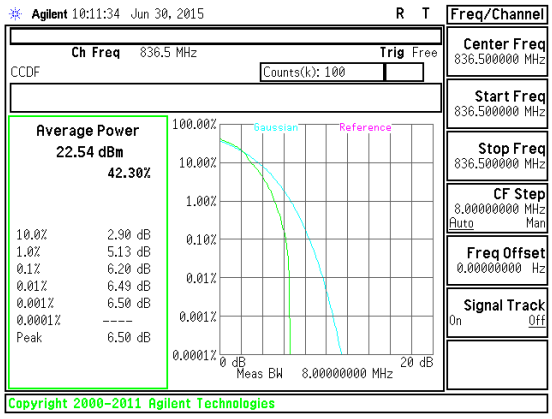
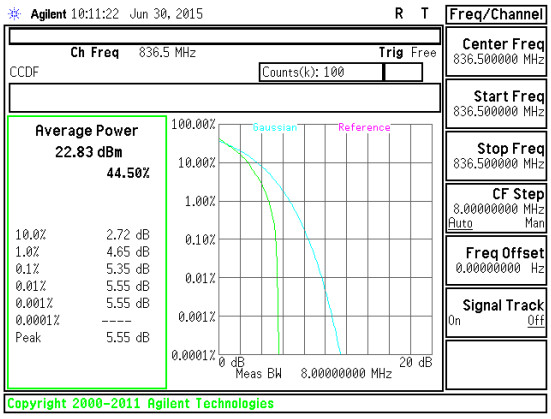
WCDMA

Band Band 5 HSDPA	 Band WCDMA B5 HSDPA	 Band WCDMA B5 REL99

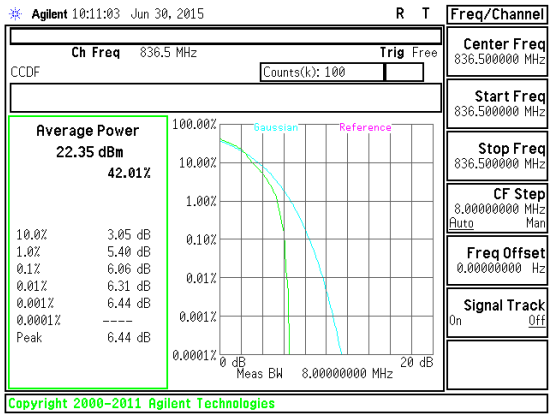
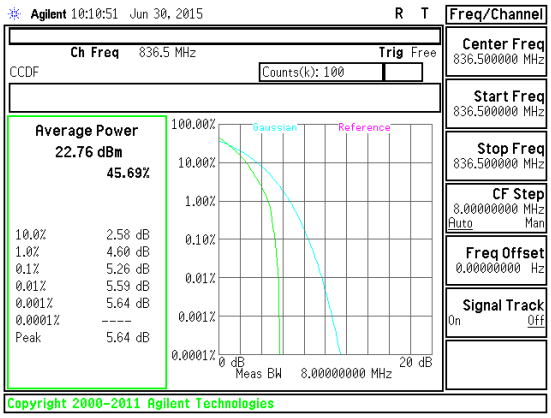
LTE Band 5

Band LTE5 10MHz	 Band LTE5 10MHz 16QAM Mid channel	 Band LTE5 10MHz QPSK Mid channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band LTE5 5MHz	 Band LTE5 5MHz 16QAM Mid channel	 Band LTE5 5MHz QPSK Mid channel
Band LTE5 3MHz	 Band LTE5 3MHz 16QAM Mid channel	 Band LTE5 3MHz QPSK Mid channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band LTE5 1.4MHz	 Band LTE5 1.4MHz 16QAM Mid channel	 Band LTE5 1.4MHz QPSK Mid channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10. LIMITS AND CONDUCTED RESULTS

10.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049
IC: RSS-132, 4.5; RSS-133, 6.5

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)

MODES TESTED

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.1.1. OCCUPIED BANDWIDTH RESULTS

GSM

Band	Mode	Channel	f (MHz)	99% BW (kHz)	-26dB (kHz)
GSM 850	GPRS	128	824.2	252.3	317.3
		190	836.6	248.9	316.2
		251	848.8	239.3	309.8
	EGPRS	128	824.2	242.4	318.8
		190	836.6	259.2	329
		251	848.8	246.5	317.2
GSM 1900	GPRS	512	1850.2	246	311.2
		661	1880	235.8	319.4
		810	1909.8	243.5	312.7
	EGPRS	512	1850.2	240.6	307.3
		661	1880	242.3	305.7
		810	1909.8	248.6	317.3

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

WCDMA

Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB (MHz)
Band 5	REL99	4132	826.4	4.104	4.693
		4183	836.6	4.133	4.71
		4233	846.6	4.119	4.689
	HSDPA	4132	826.4	4.11	4.679
		4183	836.6	4.145	4.691
		4233	846.6	4.273	4.689

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.1.2. LTE OCCUPIED BANDWIDTH RESULTS

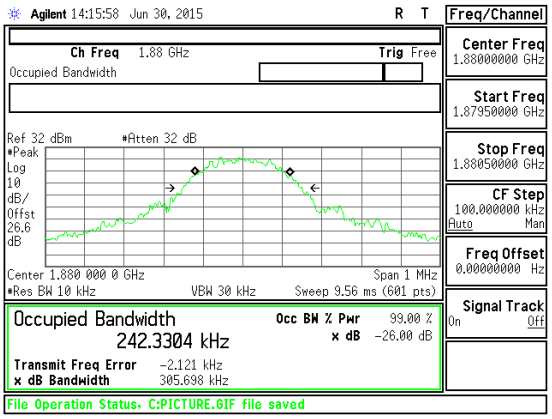
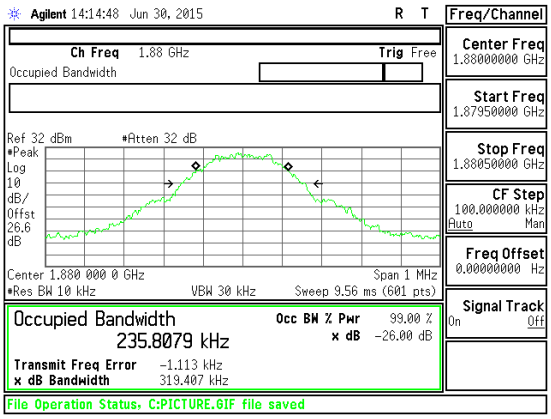
LTE Band 5

Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE5	10	16QAM	50/0	829	8.945	10.14
			50/0	836.5	9.007	10.36
			50/0	844	8.984	10.41
		QPSK	50/0	829	8.982	10.46
			50/0	836.5	9.004	10.2
			50/0	844	8.967	10.24
	5	16QAM	25/0	826.5	4.505	5.149
			25/0	836.5	4.5	5.054
			25/0	846.5	4.518	5.238
		QPSK	25/0	826.5	4.495	5.003
			25/0	836.5	4.503	5.029
			25/0	846.5	4.5	5.092
	3	16QAM	15/0	825.5	2.696	3.119
			15/0	836.5	2.689	3.123
			15/0	847.5	2.696	3.024
		QPSK	15/0	825.5	2.693	3.070
			15/0	836.5	2.695	3.135
			15/0	847.5	2.690	3.056
	1.4	16QAM	6/0	824.7	1.112	1.428
			6/0	836.5	1.085	1.358
			6/0	848.3	1.092	1.381
		QPSK	6/0	824.7	1.092	1.366
			6/0	836.5	1.092	1.398
			6/0	848.3	1.085	1.356

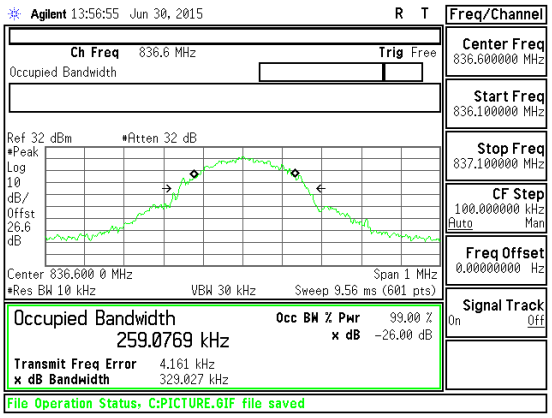
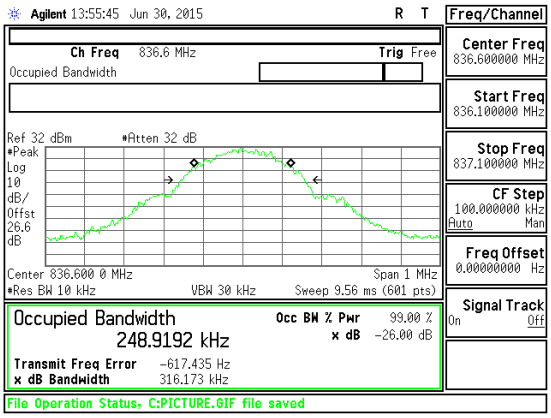
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.1.1. OCCUPIED BANDWIDTH PLOTS

GSM

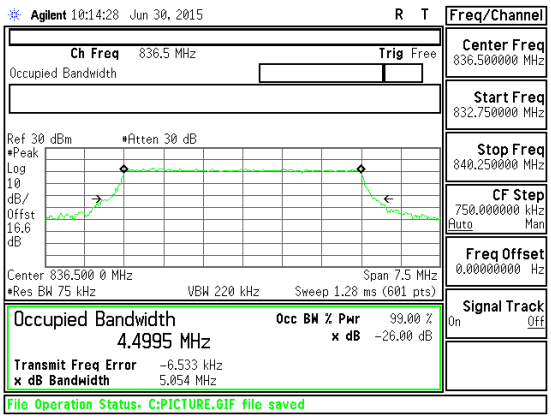
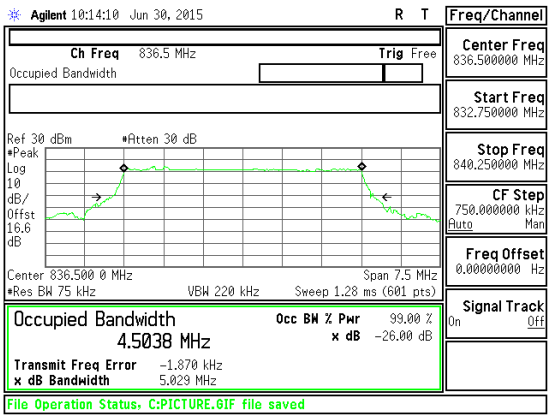
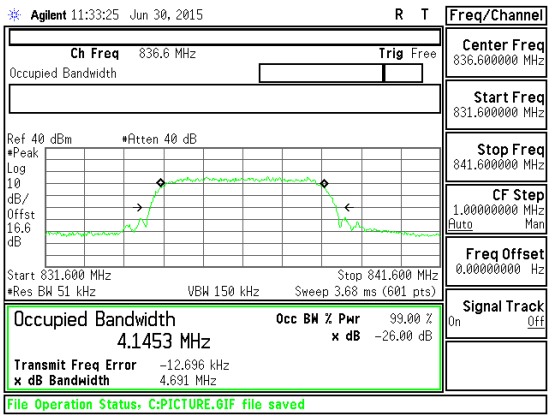
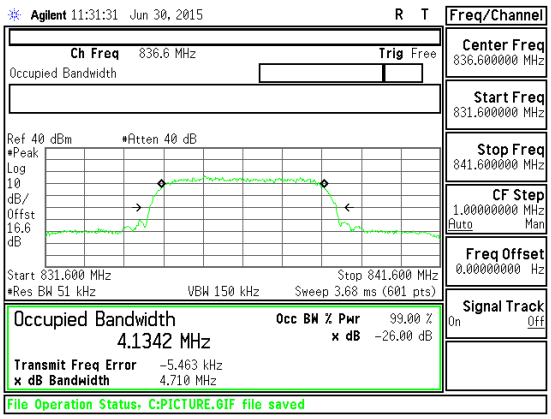
Band GSM 1900 EGPRS	 Band GSM1900 EGPRS OBW Mid channel	 Band GSM1900 GPRS OBW Mid channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band GSM 850 EGPRS	 Band GSM850 EGPRS OBW Mid channel	 Band GSM850 GPRS OBW Mid channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

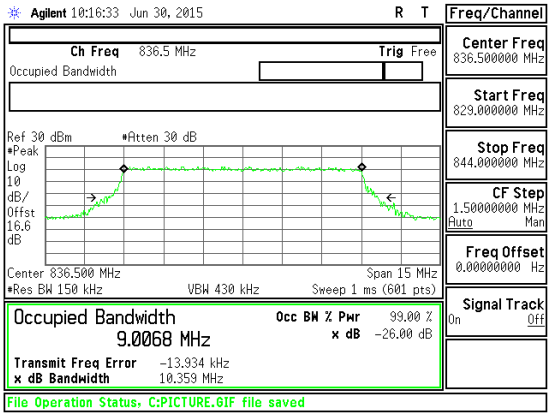
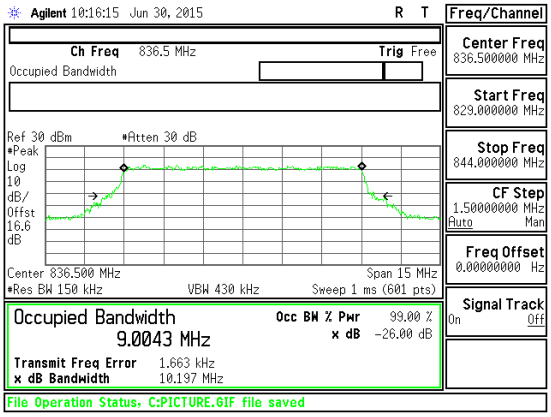
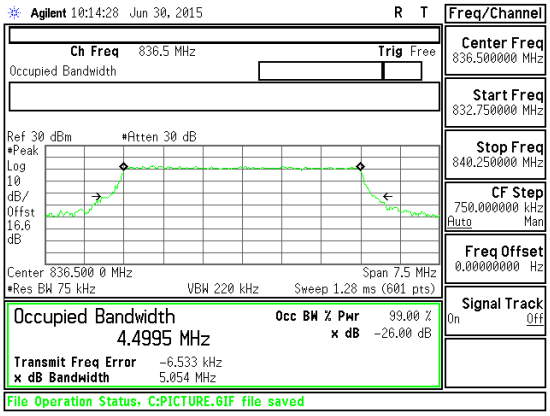
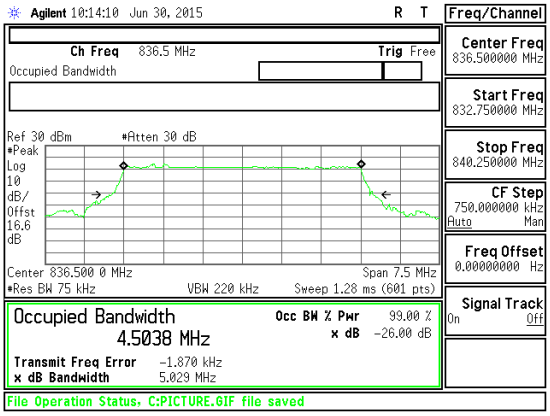
WCDMA

Band LTE5 5MHz 16QAM	 Band LTE5 5MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE5 5MHz OBW QPSK Mid Channel FRB.gif
Band Band 5 HSDPA	 Band WCDMA B5 HSDPA OBW	 Band WCDMA B5 REL99 OBW

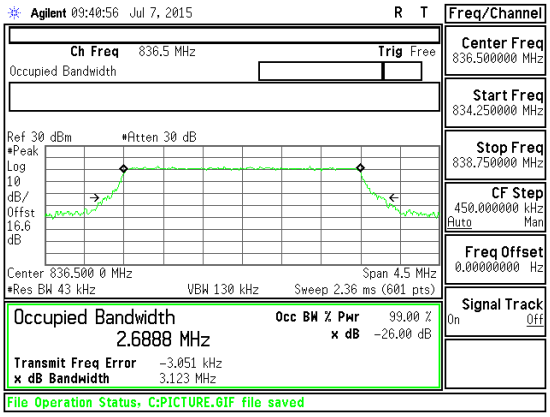
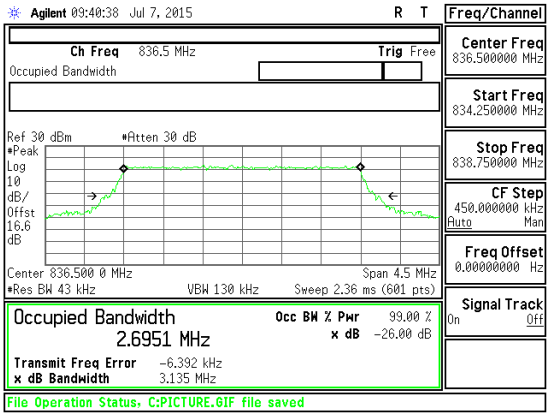
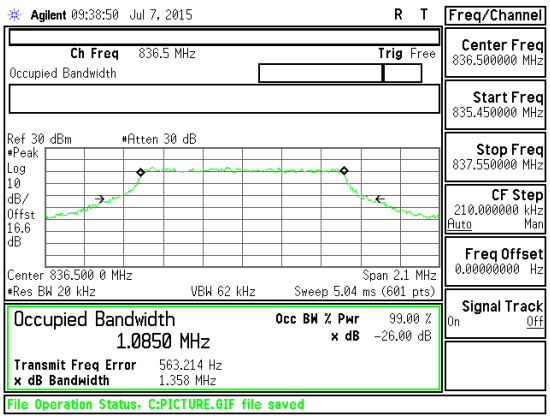
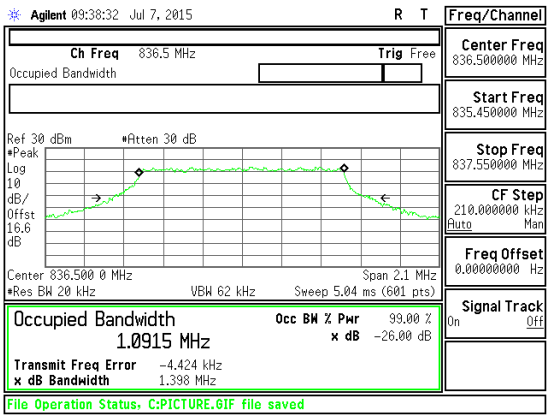
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LTE Band 5

Band LTE5 10MHz	 Band LTE5 10MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE5 10MHz OBW QPSK Mid Channel FRB.gif
Band LTE5 5MHz	 Band LTE5 5MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE5 5MHz OBW QPSK Mid Channel FRB.gif

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band LTE5 3MHz	 Band LTE5 3MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE5 3MHz OBW QPSK Mid Channel FRB.gif
Band LTE5 1.4MHz	 Band LTE5 1.4MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE5 1.4MHz OBW QPSK Mid Channel FRB.gif

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.2. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §22.359 and §24.238

LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

The transmitter output was connected to an Agilent 8960 or a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

1. Change the center frequency as shown in the table above
2. Set the span to clearly show Lower & Upper frequencies + 1MHz
3. Open screen capture application for PXA/PSA.
4. Load emission mask file
5. Press Run.

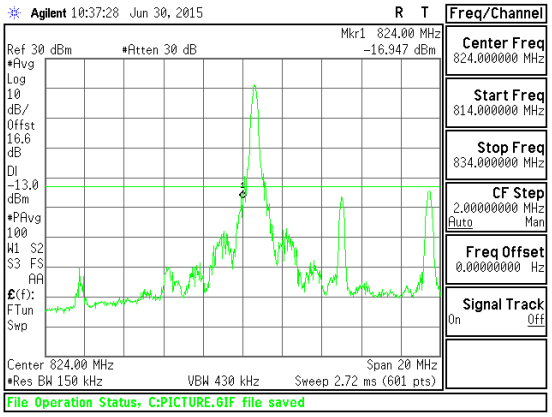
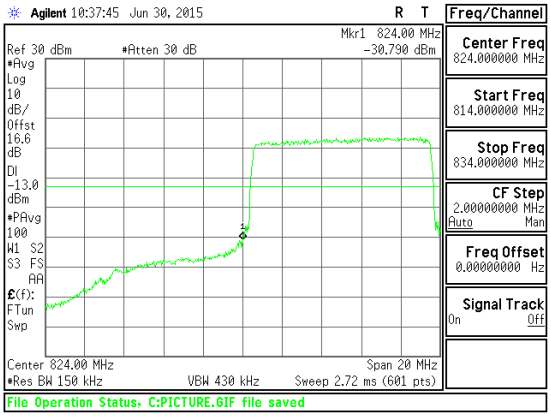
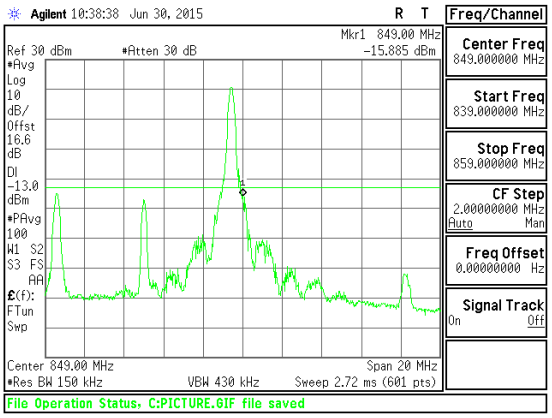
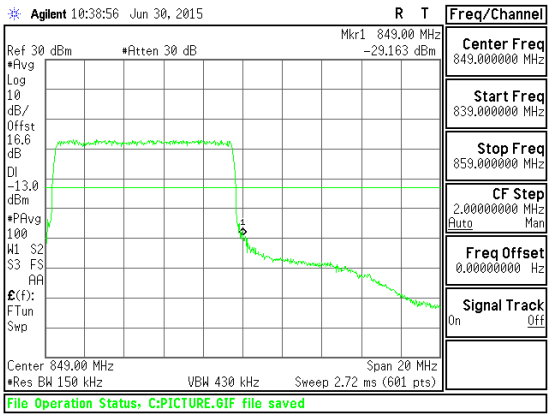
If screen capture program is not available or unable to locate the emission mask file, please contact PM or PL right away.

RESULTS

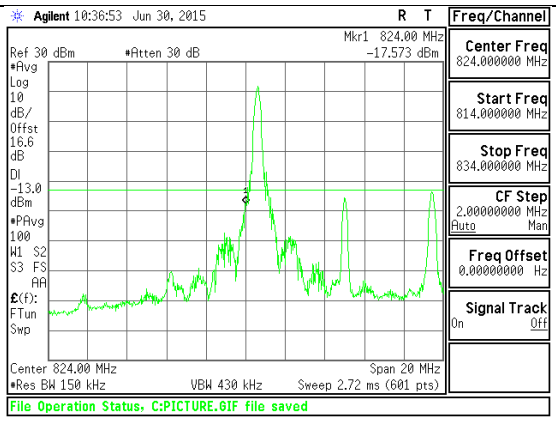
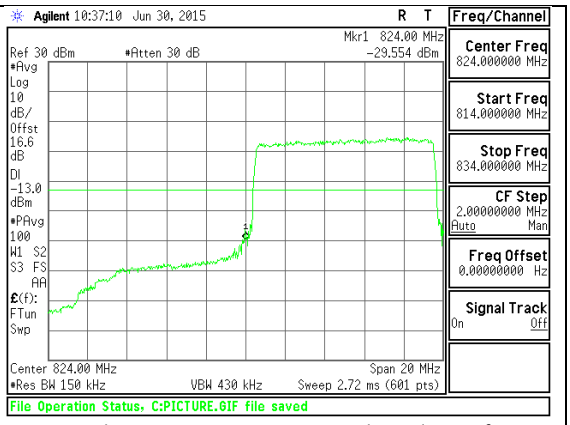
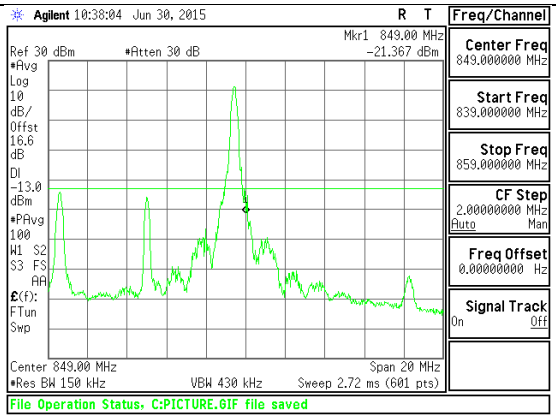
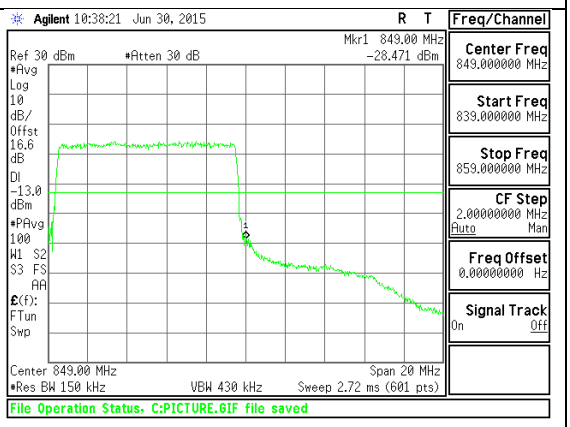
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

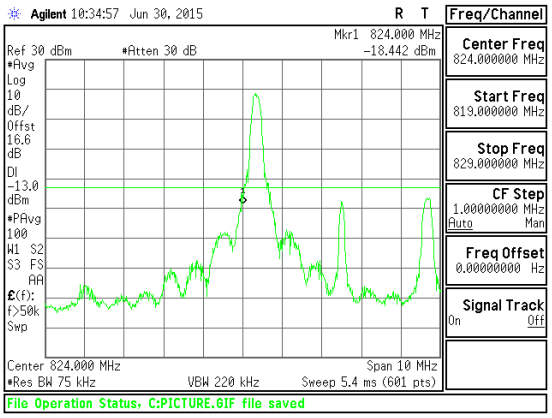
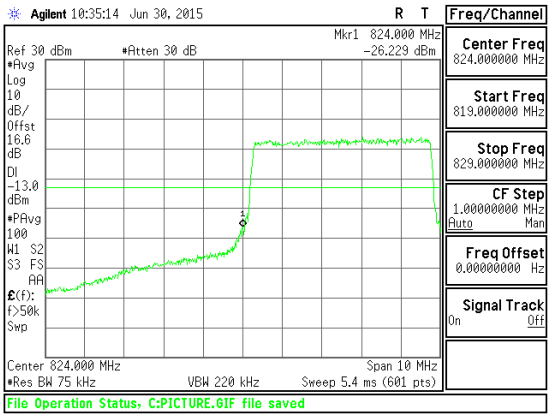
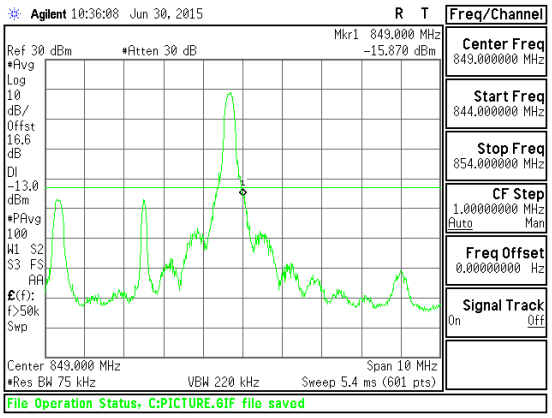
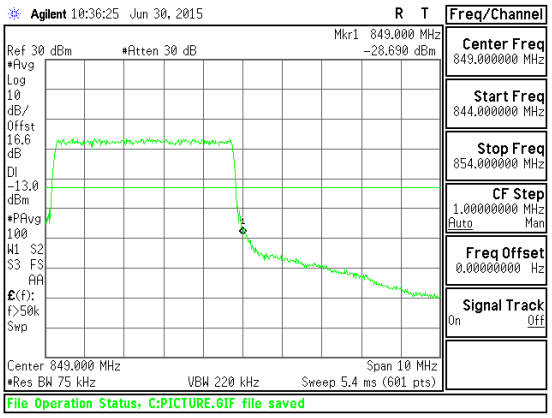
10.2.1. BAND EDGE PLOTS

Band LTE5 10MHz 16QAM	 Band LTE5 10MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 10MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 10MHz 16QAM	 Band LTE5 10MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 10MHz CBE 16QAM High Channel FRB.gif

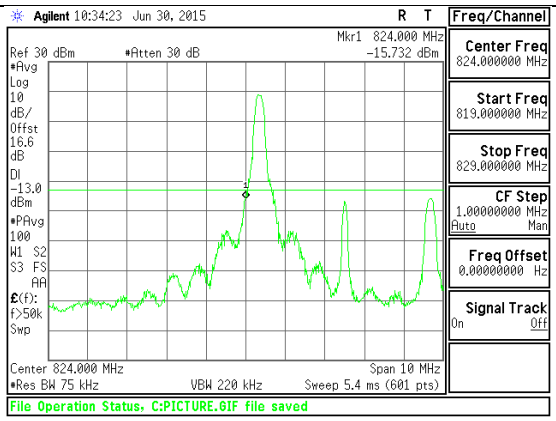
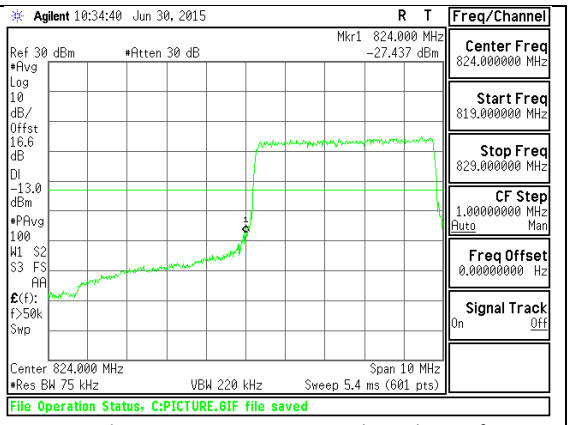
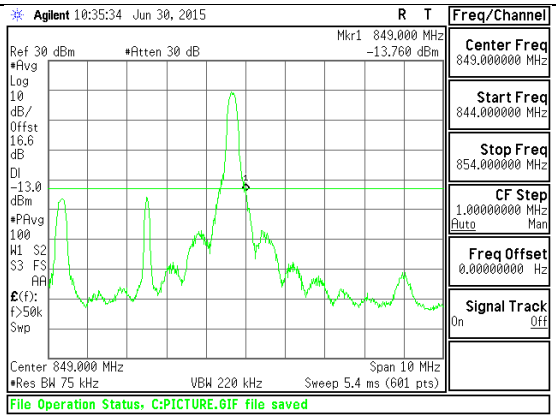
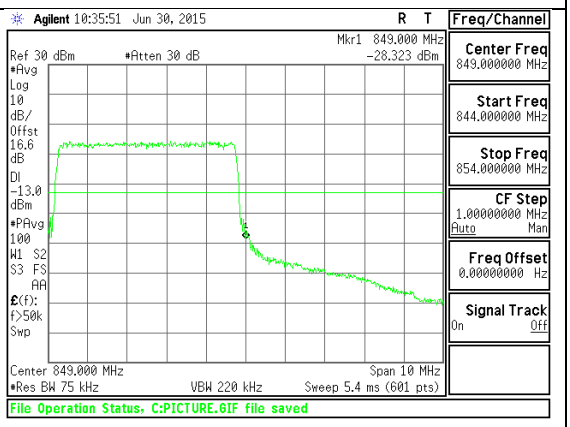
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band LTE5 10MHz QPSK	 Band LTE5 10MHz CBE QPSK Low Channel 1RB.gif	 Band LTE5 10MHz CBE QPSK Low Channel FRB.gif
Band LTE5 10MHz QPSK	 Band LTE5 10MHz CBE QPSK High Channel 1RB.gif	 Band LTE5 10MHz CBE QPSK High Channel FRB.gif

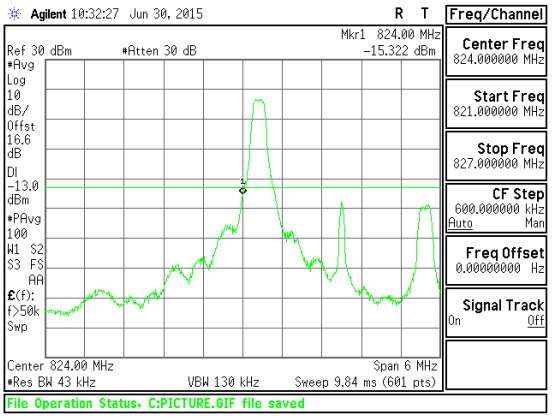
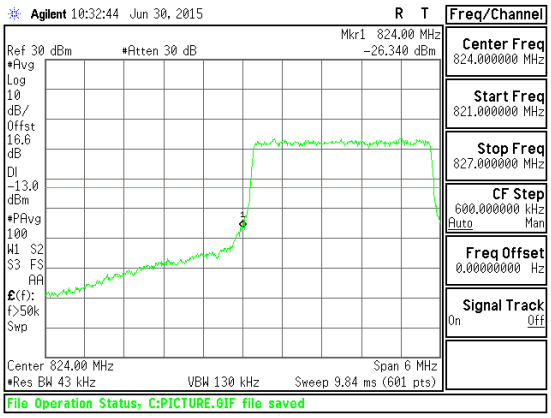
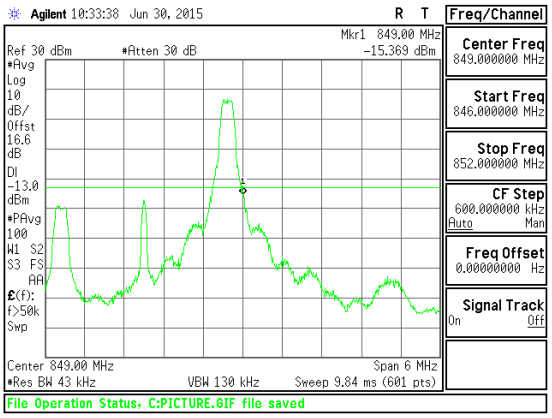
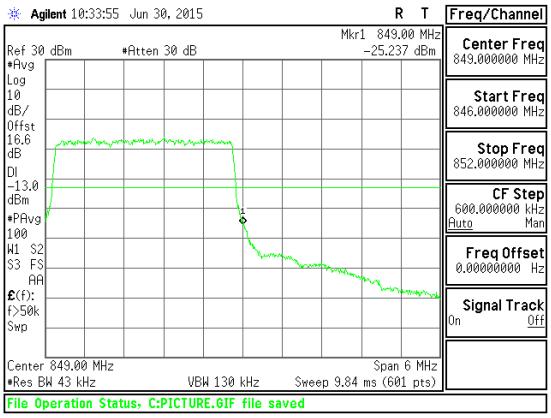
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band LTE5 5MHz 16QAM	 Band LTE5 5MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 5MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 5MHz 16QAM	 Band LTE5 5MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 5MHz CBE 16QAM High Channel FRB.gif

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

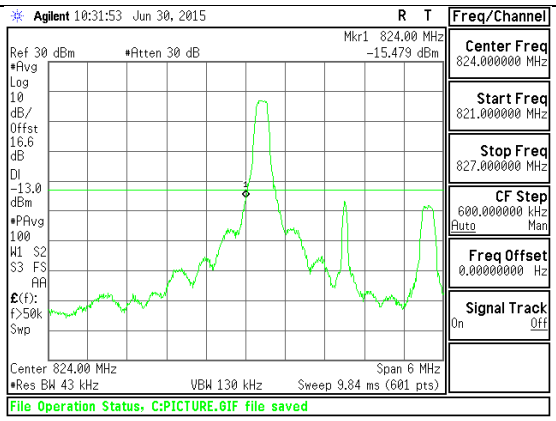
Band LTE5 5MHz QPSK	 Band LTE5 5MHz CBE QPSK Low Channel 1RB.gif	 Band LTE5 5MHz CBE QPSK Low Channel FRB.gif
Band LTE5 5MHz QPSK	 Band LTE5 5MHz CBE QPSK High Channel 1RB.gif	 Band LTE5 5MHz CBE QPSK High Channel FRB.gif

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

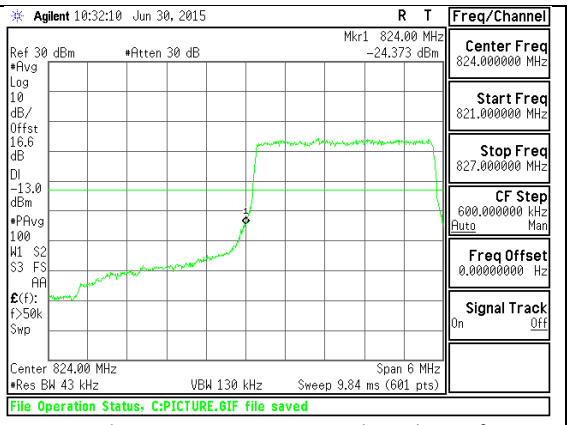
Band LTE5 3MHz 16QAM	 Band LTE5 3MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 3MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 3MHz 16QAM	 Band LTE5 3MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 3MHz CBE 16QAM High Channel FRB.gif

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band LTE5 3MHz QPSK

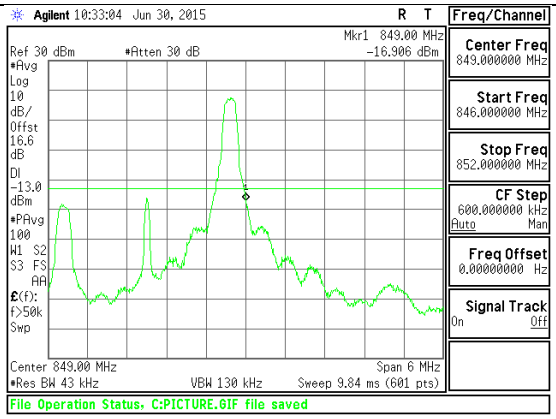


Band LTE5 3MHz CBE QPSK Low Channel 1RB.gif

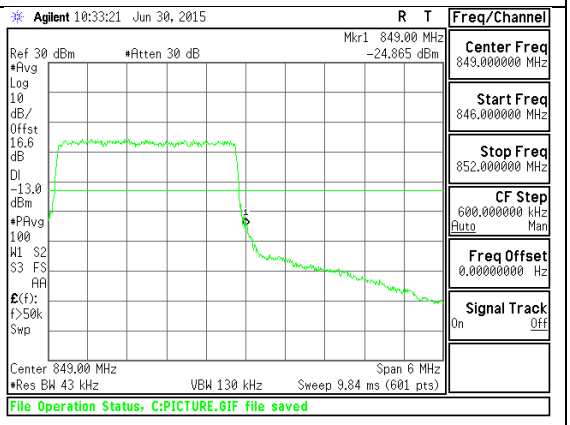


Band LTE5 3MHz CBE QPSK Low Channel FRB.gif

Band LTE5 3MHz QPSK

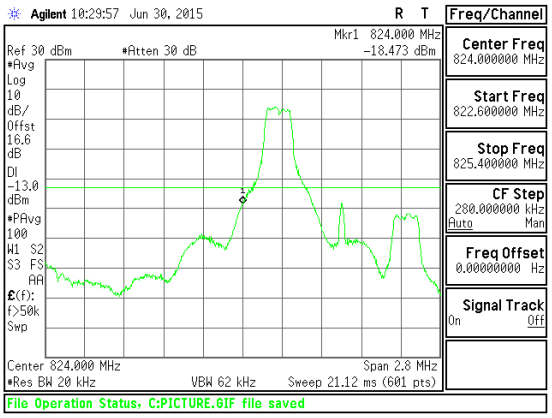
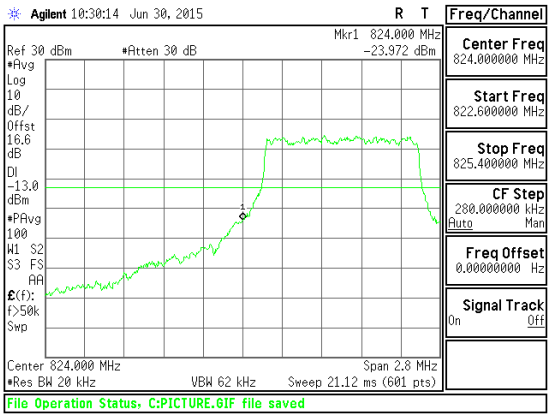
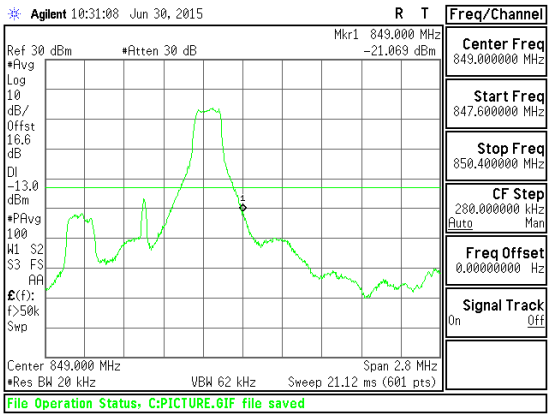
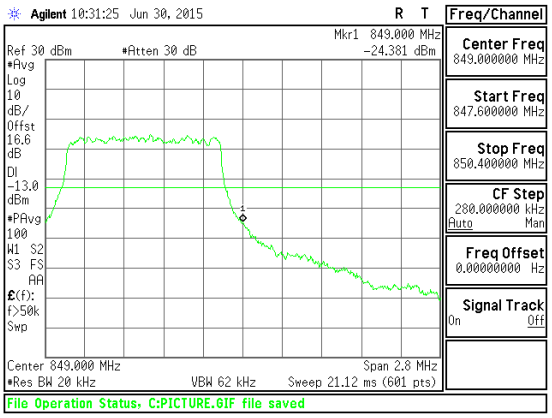


Band LTE5 3MHz CBE QPSK High Channel 1RB.gif

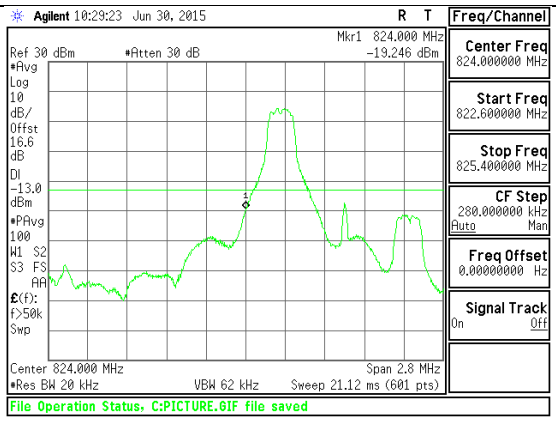
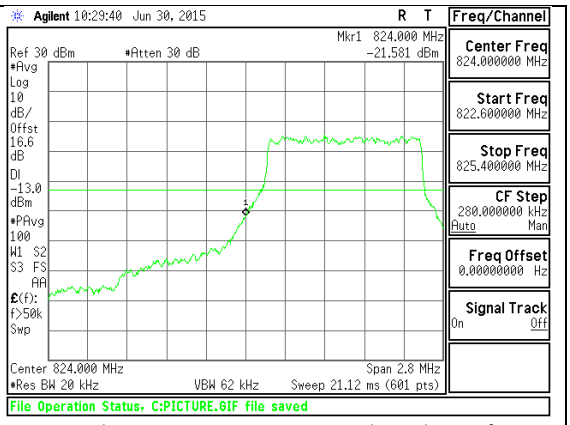
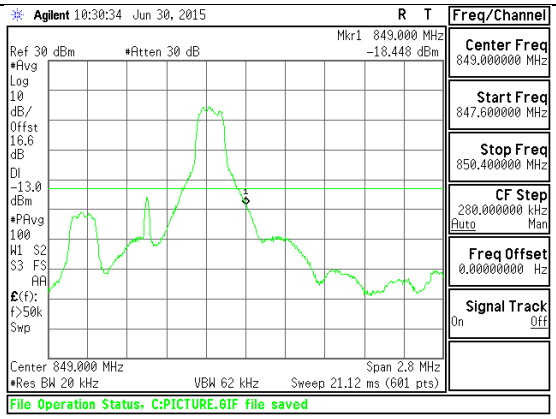
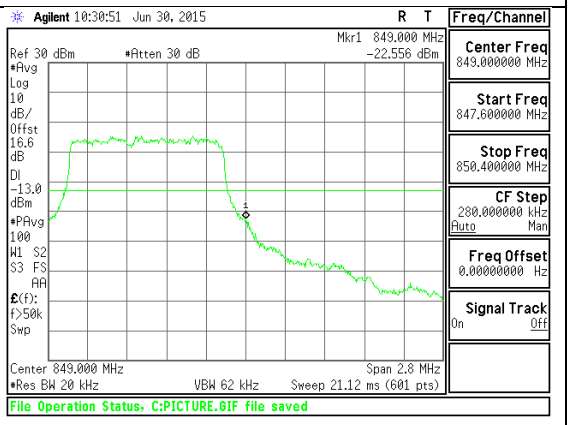


Band LTE5 3MHz CBE QPSK High Channel FRB.gif

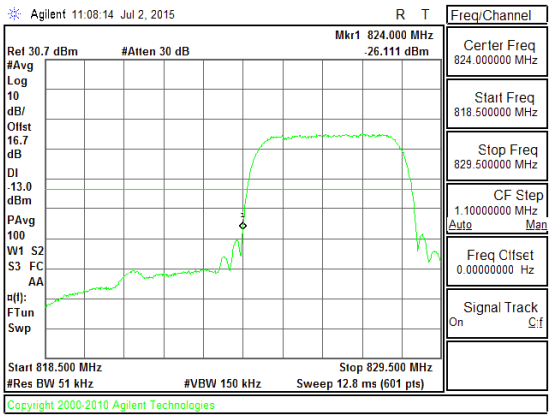
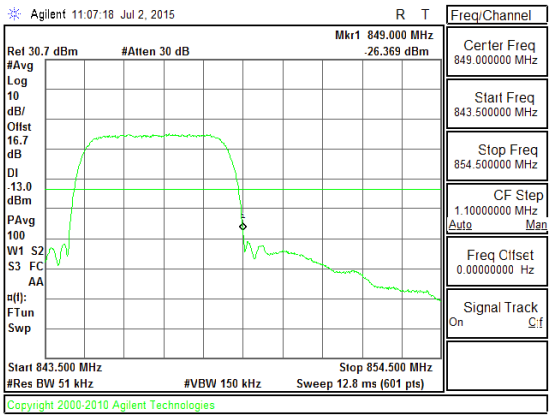
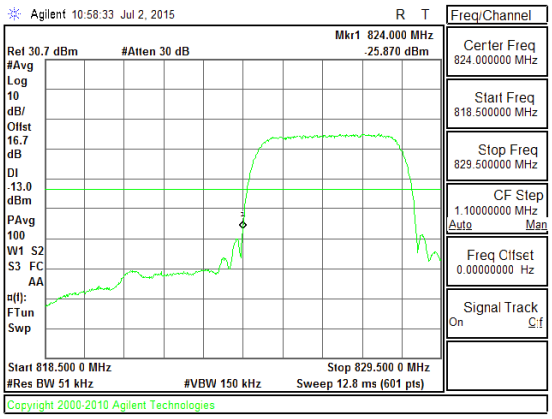
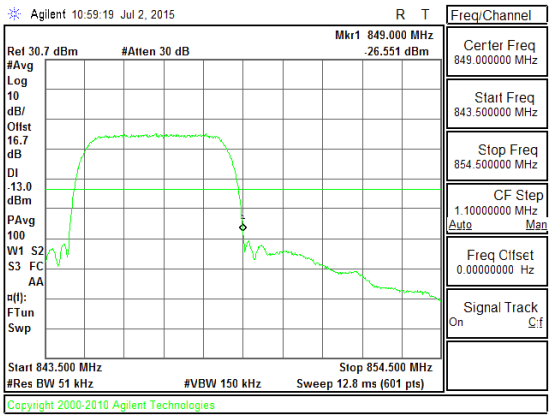
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band LTE5 1.4MHz 16QAM	 Band LTE5 1.4MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 1.4MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 1.4MHz 16QAM	 Band LTE5 1.4MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 1.4MHz CBE 16QAM High Channel FRB.gif

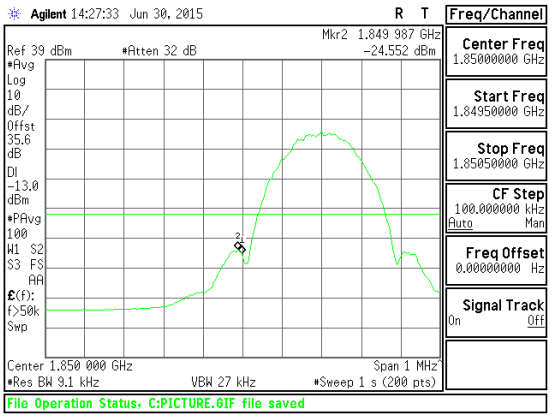
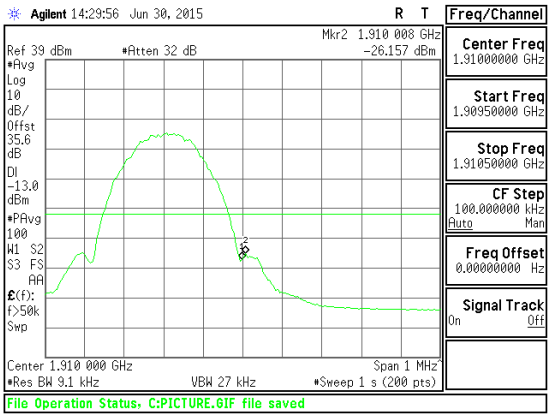
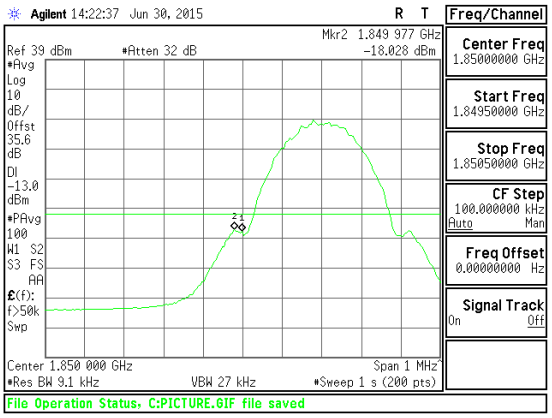
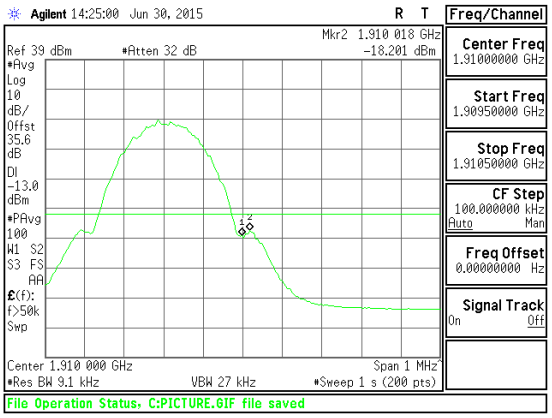
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band LTE5 1.4MHz QPSK	 Band LTE5 1.4MHz CBE QPSK Low Channel 1RB.gif	 Band LTE5 1.4MHz CBE QPSK Low Channel FRB.gif
Band LTE5 1.4MHz QPSK	 Band LTE5 1.4MHz CBE QPSK High Channel 1RB.gif	 Band LTE5 1.4MHz CBE QPSK High Channel FRB.gif

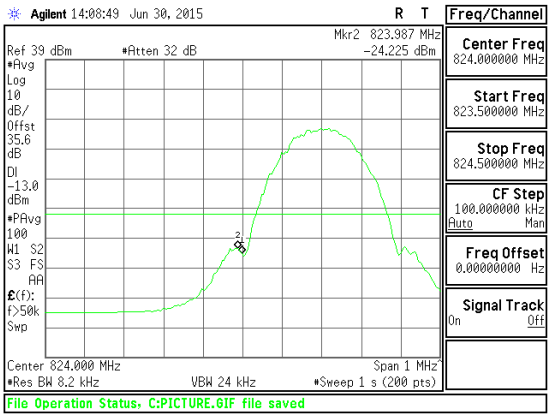
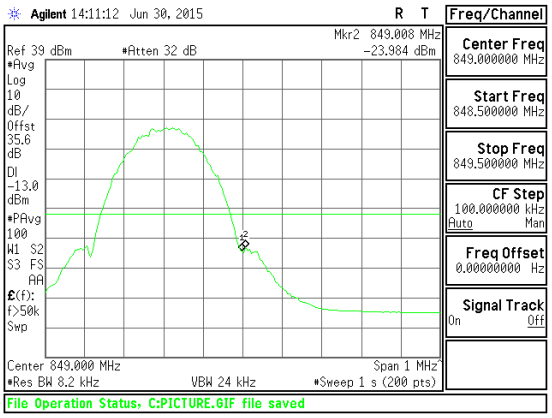
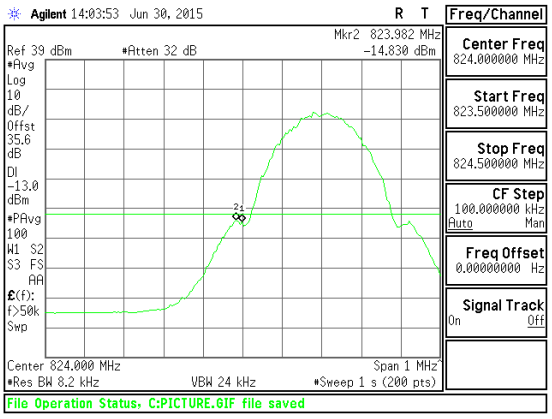
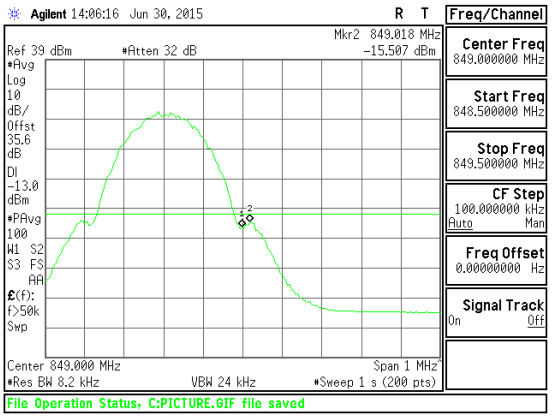
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band Band 5 HSDPA	 Band WCDMA B5 HSDPA CBE	 Band WCDMA B5 HSDPA CBE
Band Band 5 REL99	 Band WCDMA B5 REL99 CBE	 Band WCDMA B5 REL99 CBE

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band GSM1900 EGPRS	 Band GSM1900 EGPRS CBE Low channel	 Band GSM1900 EGPRS CBE High channel
Band GSM1900 GPRS	 Band GSM1900 GPRS CBE Low channel	 Band GSM1900 GPRS CBE High channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band GSM850 EGPRS	 Band GSM850 EGPRS CBE Low channel	 Band GSM850 EGPRS CBE High channel
Band GSM850 GPRS	 Band GSM850 GPRS CBE Low channel	 Band GSM850 GPRS CBE High channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238

LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

RESULTS

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.3.1. OUT OF BAND EMISSIONS RESULT

GSM

Band	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
GSM 850	GPRS	824.2	-27.21	-13	-14.21
		836.6	-27.01	-13	-14.01
		848.8	-26.52	-13	-13.52
	EGPRS	824.2	-25.33	-13	-12.33
		836.6	-26.86	-13	-13.86
		848.8	-26.46	-13	-13.46
GSM 1900	GPRS	1850.2	-25.53	-13	-12.53
		1880	-26.46	-13	-13.46
		1909.8	-26.67	-13	-13.67
	EGPRS	1850.2	-25.39	-13	-12.39
		1880	-25.60	-13	-12.60
		1909.8	-25.26	-13	-12.26

WCDMA

Band	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
Band 5	REL99	826.4	-30.08	-13	-17.08
		836.6	-29.53	-13	-16.53
		846.6	-30.03	-13	-17.03
	HSDPA	826.4	-29.79	-13	-16.79
		836.6	-26.78	-13	-13.78
		846.6	-26.98	-13	-13.98

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LTE Band 5

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE5	10	16QAM	829	-24.49	-13	-11.49
			836.5	-23.69	-13	-10.69
			844	-24.31	-13	-11.31
		QPSK	829	-24.55	-13	-11.55
			836.5	-24.26	-13	-11.26
			844	-23.04	-13	-10.04
	5	16QAM	826.5	-27.74	-13	-14.74
			836.5	-23.74	-13	-10.74
			846.5	-24.14	-13	-11.14
		QPSK	826.5	-26.71	-13	-13.71
			836.5	-24.42	-13	-11.42
			846.5	-24.27	-13	-11.27
	3	16QAM	825.5	-24.81	-13	-11.81
			836.5	-24.52	-13	-11.52
			847.5	-23.62	-13	-10.62
		QPSK	825.5	-24.62	-13	-11.62
			836.5	-24.00	-13	-11.00
			847.5	-24.04	-13	-11.04
	1.4	16QAM	824.7	-24.54	-13	-11.54
			836.5	-24.36	-13	-11.36
			848.3	-24.20	-13	-11.20
		QPSK	824.7	-24.44	-13	-11.44
			836.5	-23.25	-13	-10.25
			848.3	-23.57	-13	-10.57

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

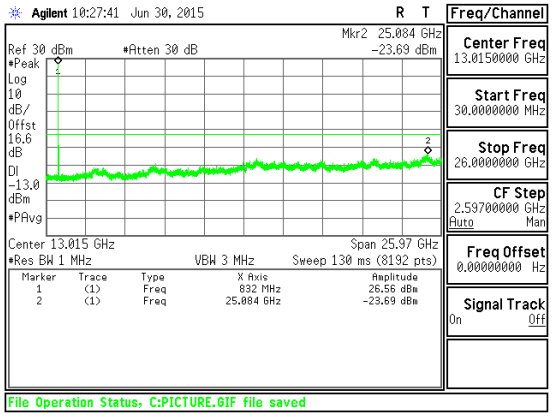
10.3.2. OUT OF BAND EMISSIONS PLOTS

Band

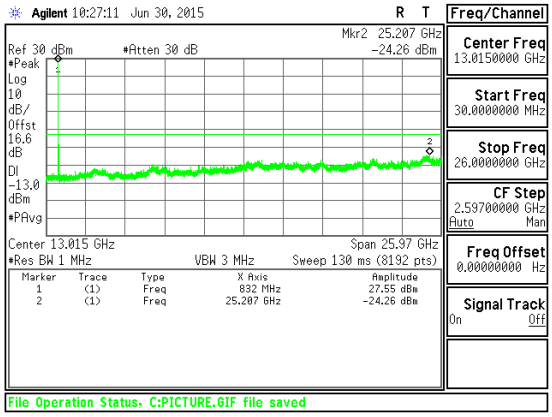
LTE5

10MHz

16QAM



Band LTE5 10MHz CSE 16QAM Mid channel



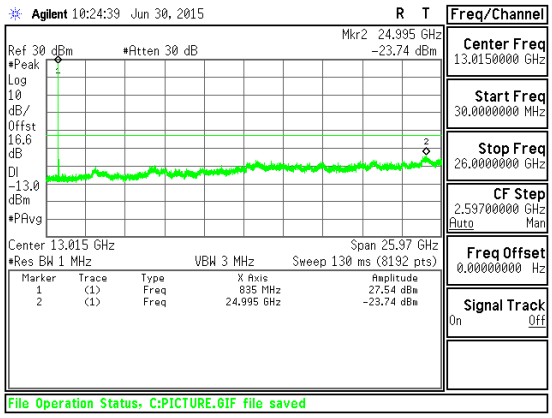
Band LTE5 10MHz CSE QPSK Mid channel

Band

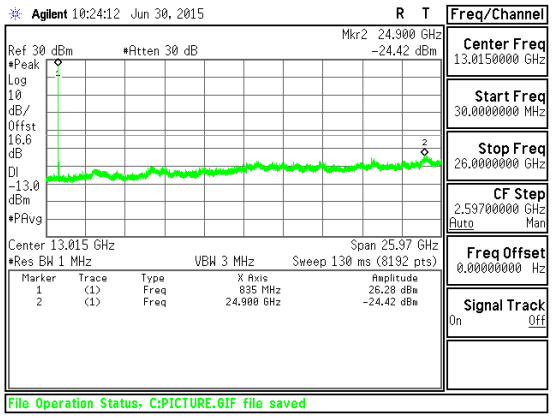
LTE5

5MHz

16QAM

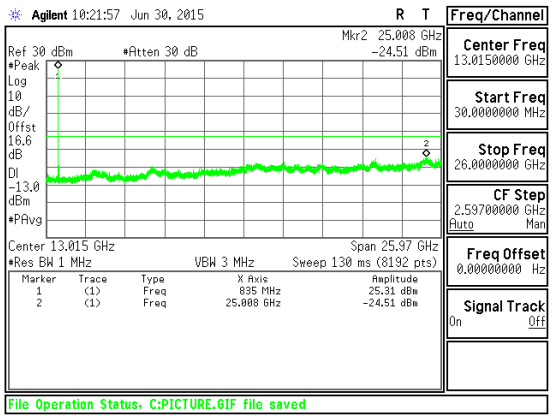
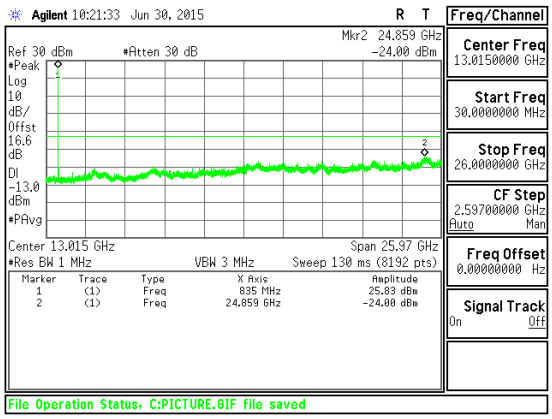


Band LTE5 5MHz CSE 16QAM Mid channel

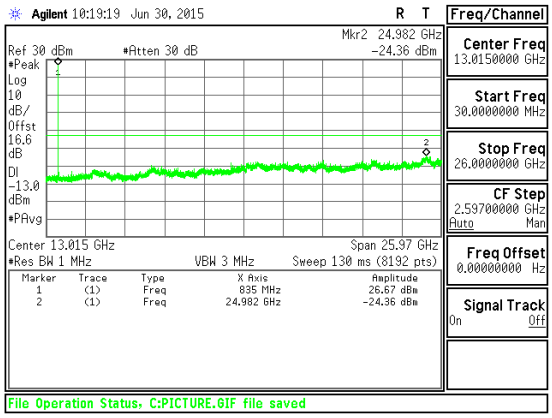
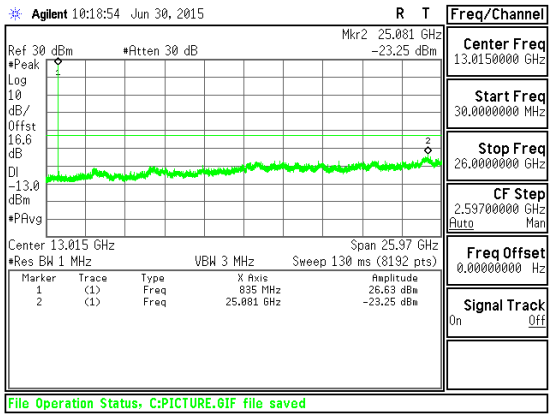


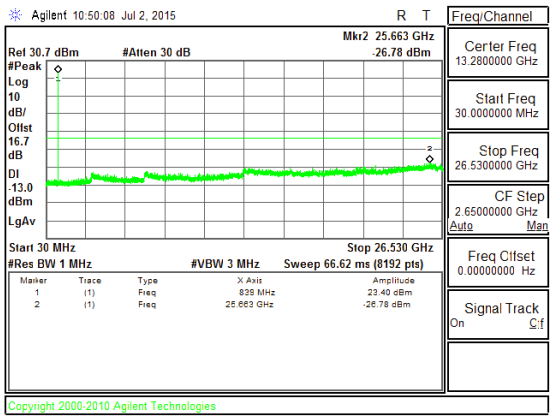
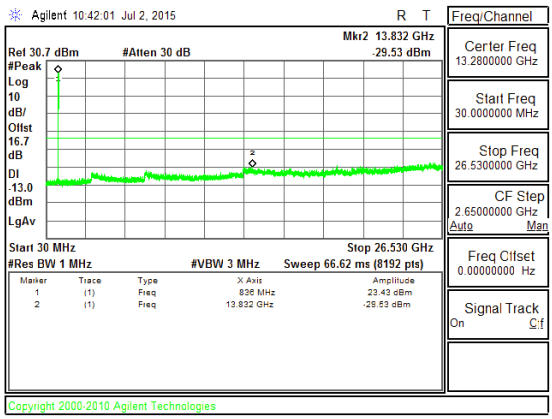
Band LTE5 5MHz CSE QPSK Mid channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

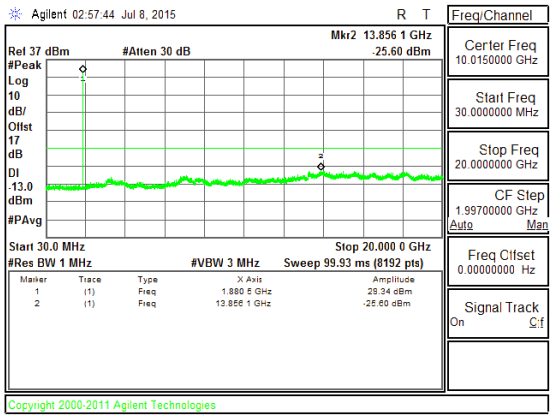
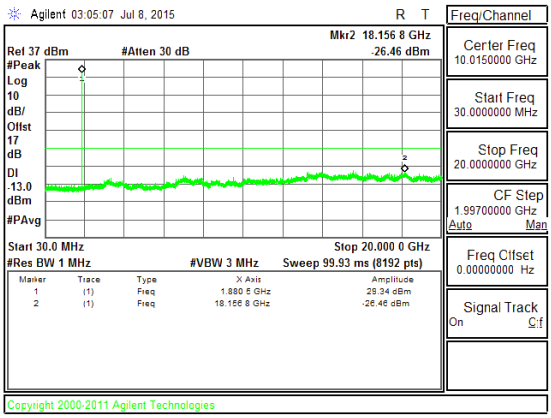
Band LTE5 3MHz 16QAM	 Band LTE5 3MHz CSE 16QAM Mid channel	 Band LTE5 3MHz CSE QPSK Mid channel

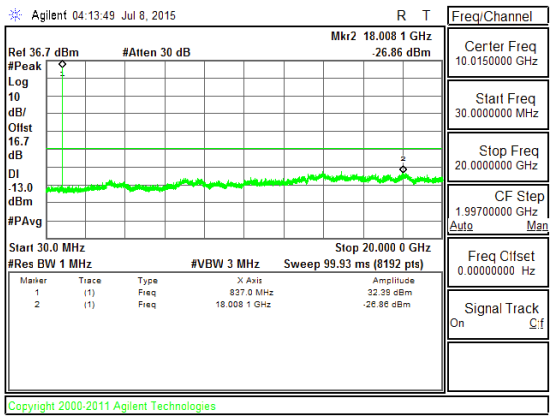
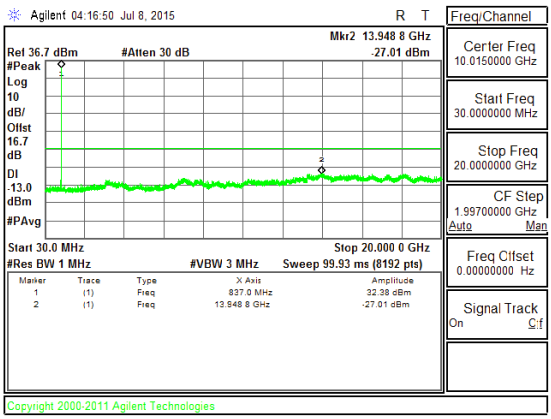
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band LTE5 1.4MHz 16QAM	 Band LTE5 1.4MHz CSE 16QAM Mid channel	 Band LTE5 1.4MHz CSE QPSK Mid channel

Band Band 5 HSDPA	 Band WCDMA B5 HSDPA CSE	 Band WCDMA B5 REL99 CSE

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band GSM1900 EGPRS	 Band GSM1900 EGPRS CSE Mid channel	 Band GSM1900 GPRS CSE Mid channel

Band GSM850 EGPRS	 Band GSM850 EGPRS CSE Mid channel	 Band GSM850 GPRS CSE Mid channel

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355 and §24.235

LIMITS

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

MODES TESTED

RESULTS

See the following pages.

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.4.1. FREQUENCY STABILITY RESULTS

GSM850 Frequency 836.6MHz

Reference Frequency: Cell Mid Channel 836.6 MHz @ 20°C Limit: to stay +- 2.5 ppm = 2091.500 Hz				
Power Supply (Vdc)	**Environment Temperature (°C)**	**Frequency Deviation Measureed with Time Elapse**		
		(MHz)	**Delta (ppm)**	**Limit (ppm)**
3.80	50	836.600013	0.005	2.5
3.80	40	836.600015	0.003	2.5
3.80	30	836.600016	0.001	2.5
3.80	***20***	**836.600018**	**0**	***2.5***
3.80	10	836.600016	0.002	2.5
3.80	0	836.600014	0.004	2.5
3.80	-10	836.600015	0.003	2.5
3.80	-20	836.600013	0.005	2.5
3.80	-30	836.600016	0.002	2.5

Reference Frequency: Cell Mid Channel 836.6 MHz @ 20°C Limit: to stay +- 2.5 ppm = 2091.500 Hz				
Power Supply (Vdc)	**Environment Temperature (°C)**	**Frequency Deviation Measureed with Time Elapse**		
		(MHz)	**Delta (ppm)**	**Limit (ppm)**
3.80	***20***	***836.600018***	***0***	***2.5***
4.37	20	836.6000156	*0.002*	2.5
3.23(End of volt)	20	836.6000149	*0.003*	2.5

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

GSM1900 Frequency 1880MHz

Reference Frequency: PCS Mid Channel 1880 MHz @ 20°C Limit: to stay +- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	**Environment Temperature (°C)**	**Frequency Deviation Measureed with Time Elapse**		
		(MHz)	**Delta (ppm)**	**Limit (ppm)**
3.80	50	1879.999979	-0.003	2.5
3.80	40	1879.999973	0.001	2.5
3.80	30	1879.999971	0.001	2.5
3.80	***20***	**1879.999974**	**0**	***2.5***
3.80	10	1879.999977	-0.001	2.5
3.80	0	1879.999979	-0.003	2.5
3.80	-10	1879.999980	-0.003	2.5
3.80	-20	1879.999978	-0.002	2.5
3.80	-30	1879.999978	-0.002	2.5

Reference Frequency: PCS Mid Channel 1880 MHz @ 20°C Limit: to stay +- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	**Environment Temperature (°C)**	**Frequency Deviation Measureed with Time Elapse**		
		(MHz)	**Delta (ppm)**	**Limit (ppm)**
3.80	***20***	***1879.999974***	***0***	***2.5***
4.37	20	1879.999972	*0.001*	2.5
3.23(End of volt)	20	1879.999972	*0.001*	2.5

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

11. RADIATED TEST RESULTS

11.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913 and §24.232

LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

TEST PROCEDURE

ANSI / TIA / EIA 603C Clause 2.2.17; PSA setting reference to 971168 D01 v02r02

For peak power measurement with a PSA:

a) Set the RBW ≥ OBW; b) Set VBW ≥ 3 × RBW; c) Set span ≥ 2 x RBW; d) Sweep time = auto couple; e) Detector = peak; f) Ensure that the number of measurement points ≥ span/RBW; g) Trace mode = max hold;

For average power measurement with a PSA:

a) Set span to at least 1.5 times the OBW; b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz; c) Set VBW ≥ 3 x RBW; d) Set number of points in sweep ≥ 2 × span / RBW; e) Sweep time = auto-couple; f) Detector = RMS (power averaging); g) Use free run trigger If burst duty cycle ≥ 98; h) Use trigger to capture bursts If burst duty cycle < 98; i) Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode. j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function.

TEST RESULTS

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

11.1.1. ERP/EIRP Results

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
Band 5	REL99	4132	826.4	19.221	83.58
		4183	836.6	18.512	70.99
		4233	846.6	18.171	65.63
	HSDPA	4132	826.4	19.171	82.62
		4183	836.6	18.448	69.95
		4233	846.6	18.191	65.93

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
GSM1900	GPRS	512	1850.2	31.843	1528.62
		661	1880	31.867	1537.09
		810	1909.8	32.538	1793.91
	EGPRS	512	1850.2	27.698	588.57
		661	1880	27.929	620.73
		810	1909.8	28.65	732.82

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
GSM850	GPRS	128	824.2	29.049	803.34
		190	836.6	28.177	657.2
		251	848.8	28.244	667.42
	EGPRS	128	824.2	24.221	264.3
		190	836.6	23.811	240.49
		251	848.8	23.761	237.74

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

11.1.2. LTE ERP/EIRP Results

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP / EIRP	
					dBm	mW
LTE5	10	QPSK	1/0	829	18.27	67.14
			1/0	836.5	18.14	65.16
			1/0	844	18.21	66.22
		16QAM	1/0	829	17.62	57.81
			1/0	836.5	17.56	57.02
			1/0	844	17.42	55.21
	5	QPSK	1/0	826.5	18.3	67.61
			1/0	836.5	18.17	65.61
			1/0	846.5	18.25	66.83
		16QAM	1/0	826.5	17.65	58.21
			1/0	836.5	17.58	57.28
			1/0	846.5	17.44	55.46
	3	QPSK	1/0	825.5	17.79	60.12
			1/0	836.5	18.15	65.31
			1/0	847.5	18.72	74.47
		16QAM	1/0	825.5	17.19	52.36
			1/0	836.5	17.58	57.28
			1/0	847.5	17.76	59.7
	1.4	QPSK	1/0	824.7	17.76	59.7
			1/0	836.5	18.16	65.46
			1/0	848.3	18.7	74.13
		16QAM	1/0	824.7	17.23	52.84
			1/0	836.5	17.56	57.02
			1/0	848.3	17.74	59.43

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

11.1.3. ERP/EIRP DATA

GSM

Band

GSM 1900

EGPRS

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R. Alegre
Configuration: EUT only
Mode: EGPRS 1900

Test Equipment:
Receiving: Horn T345, and Chamber B SMA Cables
Substitution: Horn T60 Substitution, 4ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
1850.20	12.88	V	0.9	8.1	20.13	33.0	-12.9	
1850.20	20.45	H	0.9	8.1	27.70	33.0	-5.3	
Mid Ch								
1880.00	12.87	V	0.9	8.1	20.12	33.0	-12.9	
1880.00	20.68	H	0.9	8.1	27.93	33.0	-5.1	
High Ch								
1909.80	12.82	V	0.9	8.1	20.07	33.0	-12.9	
1909.80	21.40	H	0.9	8.1	28.65	33.0	-4.4	

Rev. 3.17.11
Note: For Band 4 EIRP limit is 30dBm

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

GSM 1900

GPRS

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R. Alegre
Configuration: EUT only
Mode: GPRS 1900

Test Equipment:
Receiving: Horn T345, and Chamber B SMA Cables
Substitution: Horn T60 Substitution, 4ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
1850.20	16.67	V	0.9	8.1	23.91	33.0	-9.1	
1850.20	24.60	H	0.9	8.1	31.84	33.0	-1.2	
Mid Ch								
1880.00	16.48	V	0.9	8.1	23.73	33.0	-9.3	
1880.00	24.62	H	0.9	8.1	31.87	33.0	-1.1	
High Ch								
1909.80	16.67	V	0.9	8.1	23.92	33.0	-9.1	
1909.80	25.29	H	0.9	8.1	32.54	33.0	-0.5	

Rev. 3.17.11
Note: For Band 4 EIRP limit is 30dBm

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

GSM 850

EGPRS

High Frequency Substitution Measurement
UL Verification Services, Inc. Chamber B

Company: Samsung
Project #: 15I21198
Date: 07/02/15
Test Engineer: R. Alegre
Configuration: EUT Only
Mode: EGPRS850

Test Equipment:
Receiving: Sunol T243, and 5m Chamber B N-type Cable
Substitution: Dipole S/N: 00022117, 4ft SMA Cable (SN # 245200 001) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
824.20	15.91	V	0.9	0.0	15.01	38.5	-23.4	
824.20	25.12	H	0.9	0.0	24.22	38.5	-14.2	
Mid Ch								
836.60	15.69	V	0.9	0.0	14.79	38.5	-23.7	
836.60	24.71	H	0.9	0.0	23.81	38.5	-14.6	
High Ch								
848.80	15.63	V	0.9	0.0	14.73	38.5	-23.7	
848.80	24.66	H	0.9	0.0	23.76	38.5	-14.7	

Rev. 3.17.11
Note: For Band 13/17 ERP limit is 34.77dBm; For Band 26 limit is 50dBm

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

GSM 850

GPRS

High Frequency Substitution Measurement
UL Verification Services, Inc. Chamber B

Company: Samsung
Project #: 15I21198
Date: 07/02/15
Test Engineer: R. Alegre
Configuration: EUT Only
Mode: GPRS850

Test Equipment:
Receiving: Sunol T243, and 5m Chamber B N-type Cable
Substitution: Dipole S/N: 00022117, 4ft SMA Cable (SN # 245200 001) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
824.20	20.88	V	0.9	0.0	19.98	38.5	-18.5	
824.20	29.95	H	0.9	0.0	29.05	38.5	-9.4	
Mid Ch								
836.60	20.05	V	0.9	0.0	19.15	38.5	-19.3	
836.60	29.08	H	0.9	0.0	28.18	38.5	-10.3	
High Ch								
848.80	20.39	V	0.9	0.0	19.49	38.5	-19.0	
848.80	29.14	H	0.9	0.0	28.24	38.5	-10.2	

Rev. 3.17.11
Note: For Band 13/17 ERP limit is 34.77dBm; For Band 26 limit is 50dBm

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

WCDMA

Band

Band 5

HSDPA

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/02/15
Test Engineer: R. Alegre
Configuration: EUT only
Mode: WCDMA Band 5 HSDPA

Test Equipment:
Receiving: Sunol T243, and 3m Chamber B N-type Cable
Substitution: Dipole T273, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
826.40	11.80	V	0.9	0.0	10.95	38.5	-27.5	
826.40	20.02	H	0.9	0.0	19.17	38.5	-19.3	
Mid Ch								
836.60	10.93	V	0.9	0.0	10.08	38.5	-28.4	
836.60	19.30	H	0.9	0.0	18.45	38.5	-20.0	
High Ch								
846.60	11.27	V	0.9	0.0	10.42	38.5	-28.0	
846.60	19.04	H	0.9	0.0	18.19	38.5	-20.3	

Rev. 3.17.11
Note: For Band 13/17 ERP limit is 34.77dBm; For Band 26 limit is 50dBm

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

Band 5

REL99

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/02/15
Test Engineer: R. Alegre
Configuration: EUT only
Mode: REL99 B5 FUND

Test Equipment:
Receiving: Sunol T243, and 3m Chamber B N-type Cable
Substitution: Dipole T273, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
826.40	11.85	V	0.9	0.0	11.00	38.5	-27.4	
826.40	20.07	H	0.9	0.0	19.22	38.5	-19.2	
Mid Ch								
836.60	10.95	V	0.9	0.0	10.10	38.5	-28.3	
836.60	19.36	H	0.9	0.0	18.51	38.5	-19.9	
High Ch								
846.60	11.21	V	0.9	0.0	10.36	38.5	-28.1	
846.60	19.02	H	0.9	0.0	18.17	38.5	-20.3	

Rev. 3.17.11
Note: For Band 13/17 ERP limit is 34.77dBm; For Band 26 limit is 50dBm

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LTE Band 5

Band

LTE5

10MHz

16QAM

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/01/15
Test Engineer: R.Alegre
Configuration: EUT only
Location: Chamber B
Mode: LTE_16QAM Band 5 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Hybrid T243, and Chamber B SMA Cables
Substitution: Dipole T273, 3ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	9.29	V	0.9	0.0	8.39	38.5	-30.1	
829.00	18.52	H	0.9	0.0	17.62	38.5	-20.9	
Mid Ch								
836.50	9.31	V	0.9	0.0	8.41	38.5	-30.1	
836.50	18.46	H	0.9	0.0	17.56	38.5	-20.9	
High Ch								
844.00	9.60	V	0.9	0.0	8.70	38.5	-29.8	
844.00	18.32	H	0.9	0.0	17.42	38.5	-21.1	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

LTE5

10MHz

QPSK

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/01/15
Test Engineer: R.Alegre
Configuration: EUT only
Location: Chamber B
Mode: LTE_QPSK Band 5 Fundamentals, 10MHz Bandwidth

Test Equpment:
Receiving: Hybrid T243, and Chamber B SMA Cables
Substitution: Dipole T273, 3ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	9.95	V	0.9	0.0	9.05	38.5	-29.5	
829.00	19.17	H	0.9	0.0	18.27	38.5	-20.2	
Mid Ch								
836.50	10.28	V	0.9	0.0	9.38	38.5	-29.1	
836.50	19.04	H	0.9	0.0	18.14	38.5	-20.4	
High Ch								
844.00	10.32	V	0.9	0.0	9.42	38.5	-29.1	
844.00	19.11	H	0.9	0.0	18.21	38.5	-20.3	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

LTE5

5MHz

16QAM

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/01/15
Test Engineer: R.Alegre
Configuration: EUT only
Location: Chamber B
Mode: LTE_16QAM Band 5 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Hybrid T243, and Chamber B SMA Cables
Substitution: Dipole T273, 3ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	9.33	V	0.9	0.0	8.43	38.5	-30.1	
826.50	18.55	H	0.9	0.0	17.65	38.5	-20.9	
Mid Ch								
836.50	9.32	V	0.9	0.0	8.42	38.5	-30.1	
836.50	18.48	H	0.9	0.0	17.58	38.5	-20.9	
High Ch								
846.50	9.60	V	0.9	0.0	8.70	38.5	-29.8	
846.50	18.34	H	0.9	0.0	17.44	38.5	-21.1	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

LTE5

5MHz

QPSK

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/01/15
Test Engineer: R.Alegre
Configuration: EUT only
Location: Chamber B
Mode: LTE_QPSK Band 5 Fundamentals, 5MHz Bandwidth

Test Equpment:
Receiving: Hybrid T243, and Chamber B SMA Cables
Substitution: Dipole T273, 3ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	9.93	V	0.9	0.0	9.03	38.5	-29.5	
826.50	19.20	H	0.9	0.0	18.30	38.5	-20.2	
Mid Ch								
836.50	10.26	V	0.9	0.0	9.36	38.5	-29.1	
836.50	19.07	H	0.9	0.0	18.17	38.5	-20.3	
High Ch								
846.50	10.37	V	0.9	0.0	9.47	38.5	-29.0	
846.50	19.15	H	0.9	0.0	18.25	38.5	-20.3	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

LTE5

3MHz

16QAM

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/01/15
Test Engineer: R.Alegre
Configuration: EUT only
Location: Chamber B
Mode: LTE_16QAM Band 5 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Hybrid T243, and Chamber B SMA Cables
Substitution: Dipole T273, 3ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
825.50	9.06	V	0.9	0.0	8.16	38.5	-30.3	
825.50	18.09	H	0.9	0.0	17.19	38.5	-21.3	
Mid Ch								
836.50	9.27	V	0.9	0.0	8.37	38.5	-30.1	
836.50	18.48	H	0.9	0.0	17.58	38.5	-20.9	
High Ch								
847.50	9.50	V	0.9	0.0	8.60	38.5	-29.9	
847.50	18.66	H	0.9	0.0	17.76	38.5	-20.7	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

LTE5

3MHz

QPSK

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/01/15
Test Engineer: R.Alegre
Configuration: EUT only
Location: Chamber B
Mode: LTE_QPSK Band 5 Fundamentals, 3MHz Bandwidth

Test Equpment:
Receiving: Hybrid T243, and Chamber B SMA Cables
Substitution: Dipole T273, 3ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
825.50	9.91	V	0.9	0.0	9.01	38.5	-29.5	
825.50	18.69	H	0.9	0.0	17.79	38.5	-20.7	
Mid Ch								
836.50	9.90	V	0.9	0.0	9.00	38.5	-29.5	
836.50	19.05	H	0.9	0.0	18.15	38.5	-20.4	
High Ch								
847.50	10.40	V	0.9	0.0	9.50	38.5	-29.0	
847.50	19.62	H	0.9	0.0	18.72	38.5	-19.8	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

LTE5

1.4MHz

16QAM

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/01/15
Test Engineer: R.Alegre
Configuration: EUT only
Location: Chamber B
Mode: LTE_16QAM Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equpment:
Receiving: Hybrid T243, and Chamber B SMA Cables
Substitution: Dipole T273, 3ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	9.32	V	0.9	0.0	8.42	38.5	-30.1	
824.70	18.13	H	0.9	0.0	17.23	38.5	-21.3	
Mid Ch								
836.50	9.27	V	0.9	0.0	8.37	38.5	-30.1	
836.50	18.46	H	0.9	0.0	17.56	38.5	-20.9	
High Ch								
848.30	9.48	V	0.9	0.0	8.58	38.5	-29.9	
848.30	18.64	H	0.9	0.0	17.74	38.5	-20.8	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band

LTE5

1.4MHz

QPSK

High Frequency Substitution Measurement
UL Verification Services, Inc.

Company: Samsung
Project #: 15I21198
Date: 07/01/15
Test Engineer: R.Alegre
Configuration: EUT only
Location: Chamber B
Mode: LTE_QPSK Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Hybrid T243, and Chamber B SMA Cables
Substitution: Dipole T273, 3ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	9.94	V	0.9	0.0	9.04	38.5	-29.5	
824.70	18.66	H	0.9	0.0	17.76	38.5	-20.7	
Mid Ch								
836.50	10.28	V	0.9	0.0	9.38	38.5	-29.1	
836.50	19.06	H	0.9	0.0	18.16	38.5	-20.3	
High Ch								
848.30	10.40	V	0.9	0.0	9.50	38.5	-29.0	
848.30	19.60	H	0.9	0.0	18.70	38.5	-19.8	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

11.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917 and §24.238

LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

RESULTS

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

11.2.1. SPURIOUS RADIATION DATA

GSM

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT w/ AC Adaptor and HS
Mode: EGPRS1900 Harm

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T34 8449B	Filter 1	Part 24

Band: GSM 1900 EGPRS

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3.700	-18.2	V	3.0	35.4	1.0	-52.6	-13.0	-39.6	
5.551	-11.0	V	3.0	34.7	1.0	-44.8	-13.0	-31.8	
7.401	-13.6	V	3.0	34.9	1.0	-47.6	-13.0	-34.6	
3.700	-16.9	H	3.0	35.4	1.0	-51.3	-13.0	-38.3	
5.551	-13.4	H	3.0	34.7	1.0	-47.1	-13.0	-34.1	
7.401	-11.3	H	3.0	34.9	1.0	-45.2	-13.0	-32.2	
Mid Ch, 1880.0MHz									
3.760	-18.0	V	3.0	35.3	1.0	-52.4	-13.0	-39.4	
5.640	-13.3	V	3.0	34.7	1.0	-47.0	-13.0	-34.0	
7.520	-14.4	V	3.0	34.9	1.0	-48.3	-13.0	-35.3	
3.760	-16.9	H	3.0	35.3	1.0	-51.2	-13.0	-38.2	
5.640	-14.8	H	3.0	34.7	1.0	-48.5	-13.0	-35.5	
7.520	-12.4	H	3.0	34.9	1.0	-46.3	-13.0	-33.3	
High Ch, 1909.8MHz									
3.820	-13.2	V	3.0	35.3	1.0	-47.4	-13.0	-34.4	
5.729	-16.0	V	3.0	34.7	1.0	-49.8	-13.0	-36.8	
7.639	-12.9	V	3.0	35.0	1.0	-46.9	-13.0	-33.9	
3.820	-16.8	H	3.0	35.3	1.0	-51.1	-13.0	-38.1	
5.729	-13.2	H	3.0	34.7	1.0	-46.9	-13.0	-33.9	
7.639	-11.0	H	3.0	35.0	1.0	-44.9	-13.0	-31.9	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT w/ AC Adaptor and HS
Mode: GPRS1900 Harm

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T34 8449B	Filter 1	Part 24

Band

GSM 1900

GPRS

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3.700	-17.0	V	3.0	35.4	1.0	-51.4	-13.0	-38.4	
5.551	-10.4	V	3.0	34.7	1.0	-44.1	-13.0	-31.1	
7.401	-13.7	V	3.0	34.9	1.0	-47.7	-13.0	-34.7	
3.700	-15.8	H	3.0	35.4	1.0	-50.2	-13.0	-37.2	
5.551	-13.7	H	3.0	34.7	1.0	-47.4	-13.0	-34.4	
7.401	-11.8	H	3.0	34.9	1.0	-45.7	-13.0	-32.7	
Mid Ch, 1880.0MHz									
3.760	-17.2	V	3.0	35.3	1.0	-51.5	-13.0	-38.5	
5.640	-12.2	V	3.0	34.7	1.0	-46.0	-13.0	-33.0	
7.520	-13.8	V	3.0	34.9	1.0	-47.7	-13.0	-34.7	
3.760	-15.0	H	3.0	35.3	1.0	-49.3	-13.0	-36.3	
5.640	-14.2	H	3.0	34.7	1.0	-47.9	-13.0	-34.9	
7.520	-12.8	H	3.0	34.9	1.0	-46.8	-13.0	-33.8	
High Ch, 1909.8MHz									
3.820	-12.4	V	3.0	35.3	1.0	-46.7	-13.0	-33.7	
5.729	-15.7	V	3.0	34.7	1.0	-49.4	-13.0	-36.4	
7.639	-13.4	V	3.0	35.0	1.0	-47.4	-13.0	-34.4	
3.820	-16.0	H	3.0	35.3	1.0	-50.3	-13.0	-37.3	
5.729	-13.3	H	3.0	34.7	1.0	-47.1	-13.0	-34.1	
7.639	-10.0	H	3.0	35.0	1.0	-43.9	-13.0	-30.9	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT w/ AC Charger + HS
Mode: EGPRS850 Harm

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T34 8449B	Filter 1	Part 22

Band	f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch, 824.2MHz									
GSM 850 EGPRS	1.648	-28.0	V	3.0	37.4	1.0	-64.4	-13.0	-51.4	
	2.473	-13.1	V	3.0	36.4	1.0	-48.5	-13.0	-35.5	
	3.297	-21.3	V	3.0	35.8	1.0	-56.2	-13.0	-43.2	
	1.648	-21.9	H	3.0	37.4	1.0	-58.3	-13.0	-45.3	
	2.473	-14.2	H	3.0	36.4	1.0	-49.6	-13.0	-36.6	
	3.297	-21.0	H	3.0	35.8	1.0	-55.8	-13.0	-42.8	
	Mid Ch, 836.6MHz									
	1.673	-27.8	V	3.0	37.3	1.0	-64.1	-13.0	-51.1	
	2.510	-17.5	V	3.0	36.4	1.0	-52.9	-13.0	-39.9	
	3.346	-21.1	V	3.0	35.8	1.0	-55.8	-13.0	-42.8	
	1.673	-26.5	H	3.0	37.3	1.0	-62.9	-13.0	-49.9	
	2.510	-20.5	H	3.0	36.4	1.0	-55.8	-13.0	-42.8	
	3.346	-21.9	H	3.0	35.8	1.0	-56.6	-13.0	-43.6	
	High Ch, 848.8MHz									
	1.698	-27.4	V	3.0	37.3	1.0	-63.7	-13.0	-50.7	
	2.547	-20.4	V	3.0	36.3	1.0	-55.7	-13.0	-42.7	
	3.395	-21.3	V	3.0	35.7	1.0	-56.0	-13.0	-43.0	
	1.698	-22.4	H	3.0	37.3	1.0	-58.7	-13.0	-45.7	
	2.547	-22.4	H	3.0	36.3	1.0	-57.8	-13.0	-44.8	
	3.395	-21.3	H	3.0	35.7	1.0	-56.0	-13.0	-43.0	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT w/ AC Charger + HS
Mode: GPRS850 Harm

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T34 8449B	Filter 1	Part 22

Band	f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch, 824.2MHz									
GSM 850	1.648	-27.5	V	3.0	37.4	1.0	-63.9	-13.0	-50.9	
	2.473	-11.0	V	3.0	36.4	1.0	-46.4	-13.0	-33.4	
	3.297	-21.2	V	3.0	35.8	1.0	-56.0	-13.0	-43.0	
	1.648	-20.2	H	3.0	37.4	1.0	-56.6	-13.0	-43.6	
	2.473	-12.5	H	3.0	36.4	1.0	-47.9	-13.0	-34.9	
	3.297	-20.7	H	3.0	35.8	1.0	-55.5	-13.0	-42.5	
	Mid Ch, 836.6MHz									
	1.673	-27.1	V	3.0	37.3	1.0	-63.5	-13.0	-50.5	
	2.510	-15.5	V	3.0	36.4	1.0	-50.9	-13.0	-37.9	
	3.346	-20.8	V	3.0	35.8	1.0	-55.5	-13.0	-42.5	
	1.673	-25.9	H	3.0	37.3	1.0	-62.2	-13.0	-49.2	
	2.510	-17.0	H	3.0	36.4	1.0	-52.3	-13.0	-39.3	
	3.346	-21.8	H	3.0	35.8	1.0	-56.6	-13.0	-43.6	
	High Ch, 848.8MHz									
	1.698	-26.4	V	3.0	37.3	1.0	-62.7	-13.0	-49.7	
	2.547	-19.0	V	3.0	36.3	1.0	-54.4	-13.0	-41.4	
	3.395	-20.9	V	3.0	35.7	1.0	-55.6	-13.0	-42.6	
	1.698	-21.1	H	3.0	37.3	1.0	-57.4	-13.0	-44.4	
	2.547	-20.3	H	3.0	36.3	1.0	-55.6	-13.0	-42.6	
	3.395	-20.5	H	3.0	35.7	1.0	-55.2	-13.0	-42.2	
GPRS										

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

WCDMA

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT w/ AC Charger + HS
Mode: HSDPA_B5

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T34 8449B	Filter 1	Part 22

Band	f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Band 5 HSDPA	Low Ch, 826.4MHz									
	1.653	-27.2	V	3.0	37.4	1.0	-63.6	-13.0	-50.6	
	2.479	-22.2	V	3.0	36.4	1.0	-57.6	-13.0	-44.6	
	3.306	-20.4	V	3.0	35.8	1.0	-55.2	-13.0	-42.2	
	1.653	-26.9	H	3.0	37.4	1.0	-63.3	-13.0	-50.3	
	2.479	-25.1	H	3.0	36.4	1.0	-60.4	-13.0	-47.4	
	3.306	-20.8	H	3.0	35.8	1.0	-55.6	-13.0	-42.6	
	Mid Ch, 836.6MHz									
	1.673	-27.2	V	3.0	37.3	1.0	-63.5	-13.0	-50.5	
	2.510	-22.6	V	3.0	36.4	1.0	-58.0	-13.0	-45.0	
	3.346	-19.6	V	3.0	35.8	1.0	-54.3	-13.0	-41.3	
	1.673	-27.1	H	3.0	37.3	1.0	-63.4	-13.0	-50.4	
	2.510	-25.3	H	3.0	36.4	1.0	-60.7	-13.0	-47.7	
	3.346	-20.7	H	3.0	35.8	1.0	-55.5	-13.0	-42.5	
	High Ch, 846.6MHz									
	1.693	-26.5	V	3.0	37.3	1.0	-62.9	-13.0	-49.9	
	2.540	-21.8	V	3.0	36.3	1.0	-57.2	-13.0	-44.2	
	3.386	-20.9	V	3.0	35.7	1.0	-55.7	-13.0	-42.7	
	1.693	-26.5	H	3.0	37.3	1.0	-62.8	-13.0	-49.8	
	2.540	-25.0	H	3.0	36.3	1.0	-60.3	-13.0	-47.3	
	3.386	-21.2	H	3.0	35.7	1.0	-55.9	-13.0	-42.9	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT w/ AC Charger + HS
Mode: REL99_B5

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T34 8449B	Filter 1	Part 22

Band

Band 5

REL99

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1.653	-27.4	V	3.0	37.4	1.0	-63.7	-13.0	-50.7	
2.479	-22.5	V	3.0	36.4	1.0	-57.9	-13.0	-44.9	
3.306	-20.6	V	3.0	35.8	1.0	-55.4	-13.0	-42.4	
1.653	-26.6	H	3.0	37.4	1.0	-62.9	-13.0	-49.9	
2.479	-25.0	H	3.0	36.4	1.0	-60.4	-13.0	-47.4	
3.306	-20.8	H	3.0	35.8	1.0	-55.6	-13.0	-42.6	
Mid Ch, 836.6MHz									
1.673	-27.1	V	3.0	37.3	1.0	-63.4	-13.0	-50.4	
2.510	-22.7	V	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3.346	-20.6	V	3.0	35.8	1.0	-55.3	-13.0	-42.3	
1.673	-26.7	H	3.0	37.3	1.0	-63.0	-13.0	-50.0	
2.510	-25.2	H	3.0	36.4	1.0	-60.6	-13.0	-47.6	
3.346	-20.6	H	3.0	35.8	1.0	-55.4	-13.0	-42.4	
High Ch, 846.6MHz									
1.693	-26.7	V	3.0	37.3	1.0	-63.0	-13.0	-50.0	
2.540	-22.0	V	3.0	36.3	1.0	-57.3	-13.0	-44.3	
3.386	-20.8	V	3.0	35.7	1.0	-55.5	-13.0	-42.5	
1.693	-26.6	H	3.0	37.3	1.0	-62.9	-13.0	-49.9	
2.540	-25.1	H	3.0	36.3	1.0	-60.5	-13.0	-47.5	
3.386	-21.0	H	3.0	35.7	1.0	-55.8	-13.0	-42.8	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LTE Band 5

Band

LTE5

10MHz

16QAM

UL Verfication Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT/ AC Charger/ Headset
Location: Chamber C
Mode: LTE_16QAM Band 5 Harmonics, 10MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 829									
1658.00	-27.9	V	3.0	37.0	1.0	-63.9	-13.0	-50.9	
2487.00	-23.1	V	3.0	36.4	1.0	-58.6	-13.0	-45.6	
3316.00	-21.4	V	3.0	36.1	1.0	-56.5	-13.0	-43.5	
1658.00	-27.9	H	3.0	37.0	1.0	-64.0	-13.0	-51.0	
2487.00	-24.6	H	3.0	36.4	1.0	-60.0	-13.0	-47.0	
3316.00	-20.2	H	3.0	36.1	1.0	-55.4	-13.0	-42.4	
Mid Ch, 836.5									
1673.00	-27.4	V	3.0	37.0	1.0	-63.4	-13.0	-50.4	
2509.50	-23.4	V	3.0	36.4	1.0	-58.8	-13.0	-45.8	
3346.00	-20.4	V	3.0	36.1	1.0	-55.6	-13.0	-42.6	
1673.00	-27.2	H	3.0	37.0	1.0	-63.2	-13.0	-50.2	
2509.50	-24.9	H	3.0	36.4	1.0	-60.4	-13.0	-47.4	
3346.00	-21.4	H	3.0	36.1	1.0	-56.5	-13.0	-43.5	
High Ch, 844									
1688.00	-28.0	V	3.0	37.0	1.0	-64.0	-13.0	-51.0	
2532.00	-23.6	V	3.0	36.4	1.0	-59.0	-13.0	-46.0	
3376.00	-20.3	V	3.0	36.1	1.0	-55.4	-13.0	-42.4	
1688.00	-26.7	H	3.0	37.0	1.0	-62.7	-13.0	-49.7	
2532.00	-25.4	H	3.0	36.4	1.0	-60.8	-13.0	-47.8	
3376.00	-21.3	H	3.0	36.1	1.0	-56.3	-13.0	-43.3	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verfication Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT/ AC Charger/ Headset
Location: Chamber C
Mode: LTE_QPSK Band 5 Harmonics, 10MHz Bandwidth

Band LTE5 10MHz QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 829									
1658.00	-27.4	V	3.0	37.0	1.0	-63.5	-13.0	-50.5	
2487.00	-22.9	V	3.0	36.4	1.0	-58.4	-13.0	-45.4	
3316.00	-21.4	V	3.0	36.1	1.0	-56.5	-13.0	-43.5	
1658.00	-28.3	H	3.0	37.0	1.0	-64.3	-13.0	-51.3	
2487.00	-24.5	H	3.0	36.4	1.0	-59.9	-13.0	-46.9	
3316.00	-20.4	H	3.0	36.1	1.0	-55.5	-13.0	-42.5	
Mid Ch, 836.5									
1673.00	-26.8	V	3.0	37.0	1.0	-62.8	-13.0	-49.8	
2509.50	-23.2	V	3.0	36.4	1.0	-58.6	-13.0	-45.6	
3346.00	-20.6	V	3.0	36.1	1.0	-55.7	-13.0	-42.7	
1673.00	-26.9	H	3.0	37.0	1.0	-62.9	-13.0	-49.9	
2509.50	-24.4	H	3.0	36.4	1.0	-59.8	-13.0	-46.8	
3346.00	-21.1	H	3.0	36.1	1.0	-56.2	-13.0	-43.2	
High Ch, 844									
1688.00	-27.7	V	3.0	37.0	1.0	-63.7	-13.0	-50.7	
2532.00	-23.7	V	3.0	36.4	1.0	-59.1	-13.0	-46.1	
3376.00	-20.6	V	3.0	36.1	1.0	-55.7	-13.0	-42.7	
1688.00	-26.5	H	3.0	37.0	1.0	-62.5	-13.0	-49.5	
2532.00	-25.3	H	3.0	36.4	1.0	-60.7	-13.0	-47.7	
3376.00	-21.0	H	3.0	36.1	1.0	-56.1	-13.0	-43.1	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verfication Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT/ AC Charger/ Headset
Location: Chamber C
Mode: LTE_16QAM Band 5 Harmonics, 5MHz Bandwidth

Band LTE5 5MHz 16QAM

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5									
1653.00	-28.0	V	3.0	37.0	1.0	-64.0	-13.0	-51.0	
2479.50	-23.1	V	3.0	36.4	1.0	-58.6	-13.0	-45.6	
3306.00	-20.9	V	3.0	36.1	1.0	-56.0	-13.0	-43.0	
1653.00	-26.8	H	3.0	37.0	1.0	-62.8	-13.0	-49.8	
2479.50	-24.1	H	3.0	36.4	1.0	-59.5	-13.0	-46.5	
3306.00	-20.6	H	3.0	36.1	1.0	-55.7	-13.0	-42.7	
Mid Ch, 836.5									
1673.00	-27.4	V	3.0	37.0	1.0	-63.4	-13.0	-50.4	
2509.50	-23.3	V	3.0	36.4	1.0	-58.7	-13.0	-45.7	
3346.00	-21.9	V	3.0	36.1	1.0	-57.0	-13.0	-44.0	
1673.00	-27.3	H	3.0	37.0	1.0	-63.3	-13.0	-50.3	
2509.50	-25.1	H	3.0	36.4	1.0	-60.5	-13.0	-47.5	
3346.00	-21.2	H	3.0	36.1	1.0	-56.3	-13.0	-43.3	
High Ch, 846.5									
1693.00	-28.1	V	3.0	37.0	1.0	-64.0	-13.0	-51.0	
2539.50	-22.6	V	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3386.00	-20.8	V	3.0	36.1	1.0	-55.9	-13.0	-42.9	
1693.00	-27.5	H	3.0	37.0	1.0	-63.5	-13.0	-50.5	
2539.50	-25.3	H	3.0	36.4	1.0	-60.7	-13.0	-47.7	
3386.00	-21.0	H	3.0	36.1	1.0	-56.1	-13.0	-43.1	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verfication Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT/ AC Charger/ Headset
Location: Chamber C
Mode: LTE_QPSK Band 5 Harmonics, 5MHz Bandwidth

Band LTE5 5MHz QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5									
1653.00	-27.7	V	3.0	37.0	1.0	-63.7	-13.0	-50.7	
2479.50	-23.5	V	3.0	36.4	1.0	-58.9	-13.0	-45.9	
3306.00	-21.2	V	3.0	36.1	1.0	-56.4	-13.0	-43.4	
1653.00	-27.0	H	3.0	37.0	1.0	-63.1	-13.0	-50.1	
2479.50	-25.1	H	3.0	36.4	1.0	-60.6	-13.0	-47.6	
3306.00	-20.9	H	3.0	36.1	1.0	-56.0	-13.0	-43.0	
Mid Ch, 836.5									
1673.00	-27.4	V	3.0	37.0	1.0	-63.4	-13.0	-50.4	
2509.50	-23.6	V	3.0	36.4	1.0	-59.0	-13.0	-46.0	
3346.00	-21.2	V	3.0	36.1	1.0	-56.3	-13.0	-43.3	
1673.00	-27.0	H	3.0	37.0	1.0	-63.0	-13.0	-50.0	
2509.50	-25.1	H	3.0	36.4	1.0	-60.5	-13.0	-47.5	
3346.00	-21.8	H	3.0	36.1	1.0	-56.9	-13.0	-43.9	
High Ch, 846.5									
1693.00	-27.7	V	3.0	37.0	1.0	-63.6	-13.0	-50.6	
2539.50	-22.8	V	3.0	36.4	1.0	-58.3	-13.0	-45.3	
3386.00	-20.7	V	3.0	36.1	1.0	-55.8	-13.0	-42.8	
1693.00	-27.0	H	3.0	37.0	1.0	-63.0	-13.0	-50.0	
2539.50	-24.3	H	3.0	36.4	1.0	-59.7	-13.0	-46.7	
3386.00	-21.0	H	3.0	36.1	1.0	-56.1	-13.0	-43.1	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verfication Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT/ AC Charger/ Headset
Location: Chamber C
Mode: LTE_16QAM Band 5 Harmonics, 3MHz Bandwidth

Band LTE5 3MHz 16QAM

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 825.5									
1651.00	-26.5	V	3.0	37.0	1.0	-62.6	-13.0	-49.6	
2476.50	-22.6	V	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3302.00	-20.7	V	3.0	36.2	1.0	-55.8	-13.0	-42.8	
1651.00	-22.3	H	3.0	37.0	1.0	-58.3	-13.0	-45.3	
2476.50	-23.8	H	3.0	36.4	1.0	-59.2	-13.0	-46.2	
3302.00	-21.4	H	3.0	36.2	1.0	-56.6	-13.0	-43.6	
Mid Ch, 836.5									
1673.00	-27.8	V	3.0	37.0	1.0	-63.8	-13.0	-50.8	
2509.50	-23.7	V	3.0	36.4	1.0	-59.1	-13.0	-46.1	
3346.00	-14.4	V	3.0	36.1	1.0	-49.5	-13.0	-36.5	
1673.00	-24.8	H	3.0	37.0	1.0	-60.8	-13.0	-47.8	
2509.50	-25.0	H	3.0	36.4	1.0	-60.4	-13.0	-47.4	
3346.00	-20.3	H	3.0	36.1	1.0	-55.4	-13.0	-42.4	
High Ch, 847.5									
1695.00	-25.9	V	3.0	37.0	1.0	-61.9	-13.0	-48.9	
2542.50	-23.2	V	3.0	36.4	1.0	-58.6	-13.0	-45.6	
3390.00	-19.6	V	3.0	36.1	1.0	-54.6	-13.0	-41.6	
1695.00	-23.9	H	3.0	37.0	1.0	-59.9	-13.0	-46.9	
2542.50	-24.1	H	3.0	36.4	1.0	-59.5	-13.0	-46.5	
3390.00	-21.2	H	3.0	36.1	1.0	-56.3	-13.0	-43.3	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verfication Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT/ AC Charger/ Headset
Location: Chamber C
Mode: LTE_QPSK Band 5 Harmonics, 3MHz Bandwidth

Band LTE5 3MHz QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 825.5									
1651.00	-27.5	V	3.0	37.0	1.0	-63.5	-13.0	-50.5	
2476.50	-17.2	V	3.0	36.4	1.0	-52.6	-13.0	-39.6	
3302.00	-20.3	V	3.0	36.2	1.0	-55.5	-13.0	-42.5	
1651.00	-26.2	H	3.0	37.0	1.0	-62.3	-13.0	-49.3	
2476.50	-13.3	H	3.0	36.4	1.0	-48.7	-13.0	-35.7	
3302.00	-21.2	H	3.0	36.2	1.0	-56.4	-13.0	-43.4	
Mid Ch, 836.5									
1673.00	-27.4	V	3.0	37.0	1.0	-63.4	-13.0	-50.4	
2509.50	-22.4	V	3.0	36.4	1.0	-57.8	-13.0	-44.8	
3346.00	-19.0	V	3.0	36.1	1.0	-54.1	-13.0	-41.1	
1673.00	-26.9	H	3.0	37.0	1.0	-62.9	-13.0	-49.9	
2509.50	-18.7	H	3.0	36.4	1.0	-54.1	-13.0	-41.1	
3346.00	-21.3	H	3.0	36.1	1.0	-56.4	-13.0	-43.4	
High Ch, 847.5									
1695.00	-26.1	V	3.0	37.0	1.0	-62.1	-13.0	-49.1	
2542.50	-22.9	V	3.0	36.4	1.0	-58.3	-13.0	-45.3	
3390.00	-20.8	V	3.0	36.1	1.0	-55.9	-13.0	-42.9	
1695.00	-25.8	H	3.0	37.0	1.0	-61.8	-13.0	-48.8	
2542.50	-24.1	H	3.0	36.4	1.0	-59.5	-13.0	-46.5	
3390.00	-20.1	H	3.0	36.1	1.0	-55.2	-13.0	-42.2	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verfication Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT/ AC Charger/ Headset
Location: Chamber C
Mode: LTE_16QAM Band 5 Harmonics, 1.4MHz Bandwidth

Band LTE5 1.4MHz 16QAM

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7									
1649.40	-26.6	V	3.0	37.0	1.0	-62.6	-13.0	-49.6	
2474.10	-22.7	V	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3298.80	-20.8	V	3.0	36.2	1.0	-56.0	-13.0	-43.0	
1649.40	-22.3	H	3.0	37.0	1.0	-58.3	-13.0	-45.3	
2474.10	-24.0	H	3.0	36.4	1.0	-59.5	-13.0	-46.5	
3298.80	-21.4	H	3.0	36.2	1.0	-56.5	-13.0	-43.5	
Mid Ch, 836.5									
1673.00	-27.8	V	3.0	37.0	1.0	-63.8	-13.0	-50.8	
2509.50	-23.5	V	3.0	36.4	1.0	-58.9	-13.0	-45.9	
3346.00	-14.7	V	3.0	36.1	1.0	-49.8	-13.0	-36.8	
1673.00	-24.8	H	3.0	37.0	1.0	-60.8	-13.0	-47.8	
2509.50	-25.0	H	3.0	36.4	1.0	-60.4	-13.0	-47.4	
3346.00	-20.3	H	3.0	36.1	1.0	-55.5	-13.0	-42.5	
High Ch, 848.3									
1696.60	-25.5	V	3.0	37.0	1.0	-61.5	-13.0	-48.5	
2544.90	-23.1	V	3.0	36.4	1.0	-58.5	-13.0	-45.5	
3393.20	-19.5	V	3.0	36.1	1.0	-54.5	-13.0	-41.5	
1696.60	-23.7	H	3.0	37.0	1.0	-59.7	-13.0	-46.7	
2544.90	-24.1	H	3.0	36.4	1.0	-59.5	-13.0	-46.5	
3393.20	-21.4	H	3.0	36.1	1.0	-56.4	-13.0	-43.4	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

UL Verfication Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I21198
Date: 07/06/15
Test Engineer: R.Alegre
Configuration: EUT/ AC Charger/ Headset
Location: Chamber C
Mode: LTE_QPSK Band 5 Harmonics, 1.4MHz Bandwidth

Band LTE5 1.4MHz QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7									
1649.40	-27.7	V	3.0	37.0	1.0	-63.7	-13.0	-50.7	
2474.10	-16.9	V	3.0	36.4	1.0	-52.3	-13.0	-39.3	
3298.80	-20.5	V	3.0	36.2	1.0	-55.7	-13.0	-42.7	
1649.40	-26.3	H	3.0	37.0	1.0	-62.3	-13.0	-49.3	
2474.10	-12.2	H	3.0	36.4	1.0	-47.6	-13.0	-34.6	
3298.80	-21.4	H	3.0	36.2	1.0	-56.5	-13.0	-43.5	
Mid Ch, 836.5									
1673.00	-27.2	V	3.0	37.0	1.0	-63.2	-13.0	-50.2	
2509.50	-22.4	V	3.0	36.4	1.0	-57.8	-13.0	-44.8	
3346.00	-19.2	V	3.0	36.1	1.0	-54.3	-13.0	-41.3	
1673.00	-27.0	H	3.0	37.0	1.0	-63.0	-13.0	-50.0	
2509.50	-18.3	H	3.0	36.4	1.0	-53.7	-13.0	-40.7	
3346.00	-21.2	H	3.0	36.1	1.0	-56.3	-13.0	-43.3	
High Ch, 848.3									
1696.60	-26.0	V	3.0	37.0	1.0	-62.0	-13.0	-49.0	
2544.90	-22.9	V	3.0	36.4	1.0	-58.3	-13.0	-45.3	
3393.20	-20.7	V	3.0	36.1	1.0	-55.8	-13.0	-42.8	
1696.60	-25.6	H	3.0	37.0	1.0	-61.6	-13.0	-48.6	
2544.90	-24.0	H	3.0	36.4	1.0	-59.4	-13.0	-46.4	
3393.20	-20.2	H	3.0	36.1	1.0	-55.3	-13.0	-42.3	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.