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

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA Phone + Bluetooth & WLAN 2.4GHz b/g/n

MODEL NUMBER: SM-G110M

FCC ID: A3LSMG110M

REPORT NUMBER: 14I18253-1 REVISION A

ISSUE DATE: JULY 17, 2014

Prepared for

SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH 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
--	07/15/14	Initial Issue	D. Coronia
A	7/17/14	Updated page 8, 13	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 6
4.1. MEASURING INSTRUMENT CALIBRATION 6
4.2. SAMPLE CALCULATION 6
4.3. MEASUREMENT UNCERTAINTY 7
5. EQUIPMENT UNDER TEST 8
5.1. DESCRIPTION OF EUT 8
5.2. MAXIMUM OUTPUT POWER 8
5.3. DESCRIPTION OF AVAILABLE ANTENNAS 9
5.4. DESCRIPTION OF TEST SETUP 10
6. TEST AND MEASUREMENT EQUIPMENT 13
7. Summary Table 14
8. RF POWER OUTPUT VERIFICATION 15
8.1. GSM/GPRS/EDGE 15
8.1.1. GSM OUTPUT POWER RESULT 16
8.2. UMTS REL 99 17
8.2.1. UMTS REL 99 OUTPUT POWER RESULT 17
8.3. UMTS HSDPA 18
8.3.1. UMTS HSDPA OUTPUT POWER RESULT 18
8.3.2. UMTS HSUPA 20
8.3.3. UMTS HSUPA OUTPUT POWER RESULT 21
9. PEAK TO AVERAGE RATIO 22
9.1. CONDUCTED PEAK TO AVERAGE RESULT 22
10. LIMITS AND CONDUCTED RESULTS 24
10.1. OCCUPIED BANDWIDTH 24
10.1.1. OCCUPIED BANDWIDTH RESULTS 25
10.1.2. OCCUPIED BANDWIDTH PLOTS 26
10.2. BAND EDGE EMISSIONS 29

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 30
10.3. OUT OF BAND EMISSIONS 33
10.3.1. OUT OF BAND EMISSIONS RESULT 34
10.3.2. OUT OF BAND EMISSIONS PLOTS.....35
10.4. FREQUENCY STABILITY 38
10.4.1. FREQUENCY STABILITY RESULTS.....39
11. RADIATED TEST RESULTS 41
11.1. RADIATED POWER (ERP & EIRP).....41
11.1.1. ERP/EIRP Results.....41
11.1.2. ERP/EIRP DATA.....43
11.2. FIELD STRENGTH OF SPURIOUS RADIATION 49
11.2.1. SPURIOUS RADIATION PLOTS.....50
12. SETUP PHOTOS 56

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.

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	**SAMSUNG ELECTRONICS CO., LTD.**
EUT DESCRIPTION:	**GSM/WCDMA Phone + Bluetooth & WLAN 2.4GHz b/g/n**
MODEL:	**SM-G110M**
SERIAL NUMBER:	**FL-261-B**
DATE TESTED:	**JULY 9-14, 2014**

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 22H, 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:

DAN CORONIA

CONSUMER TECHNOLOGY DIVISION
PROJECT LEAD
UL VERIFICATION SERVICES

Tested By:

CHARLES VERGONIO

CONSUMER TECHNOLOGY DIVISION
LAB ENGINEER
UL VERIFICATION SERVICES

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.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 22, 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	☐ Chamber D
☒ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F

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.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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

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

UL 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.

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 1000 MHz	4.94 dB

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

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. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

5.2. MAXIMUM OUTPUT POWER

FCC Part 22/24						
Band	Frequency Range(MHz)	Modulation Peak	Conducted		Radiated	
			Peak (dBm)	Peak (mW)	Peak (dBm)	Peak (mW)
GSM850	824~849	GMSK	32.5	1778.28		
	824~849	GPRS	32.5	1778.28	30.631	1156.38
GSM1900	1850~1910	GMSK	29.7	933.25		
	1850~1910	GPRS	29.7	933.25	29.40	870.96

FCC Part 22/24/27						
Band	Frequency Range(MHz)	Modulation Peak	Conducted		Radiated	
			Avg (dBm)	Avg (mW)	Avg (dBm)	Avg (mW)
Band 5	824~849	REL99	22.5	177.83	19.34	85.90
	824~849	HSDPA	22.5	177.83	18.24	66.68
	824~849	HSUPA	22.5	177.83		
Band 2	1850~1910	REL99	22.8	190.55	21.564	143.35
	1850~1910	HSDPA	22.5	177.83	20.781	119.70
	1850~1910	HSUPA	22.5	177.83		

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.

5.3. 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)
Band 5, 824~849MHz	-3.40
Band 2, 1850~1910MHz	0.94

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 TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Samsung	ETA-U90CBC	N/A	N/A
Headset	Samsung	GH59	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

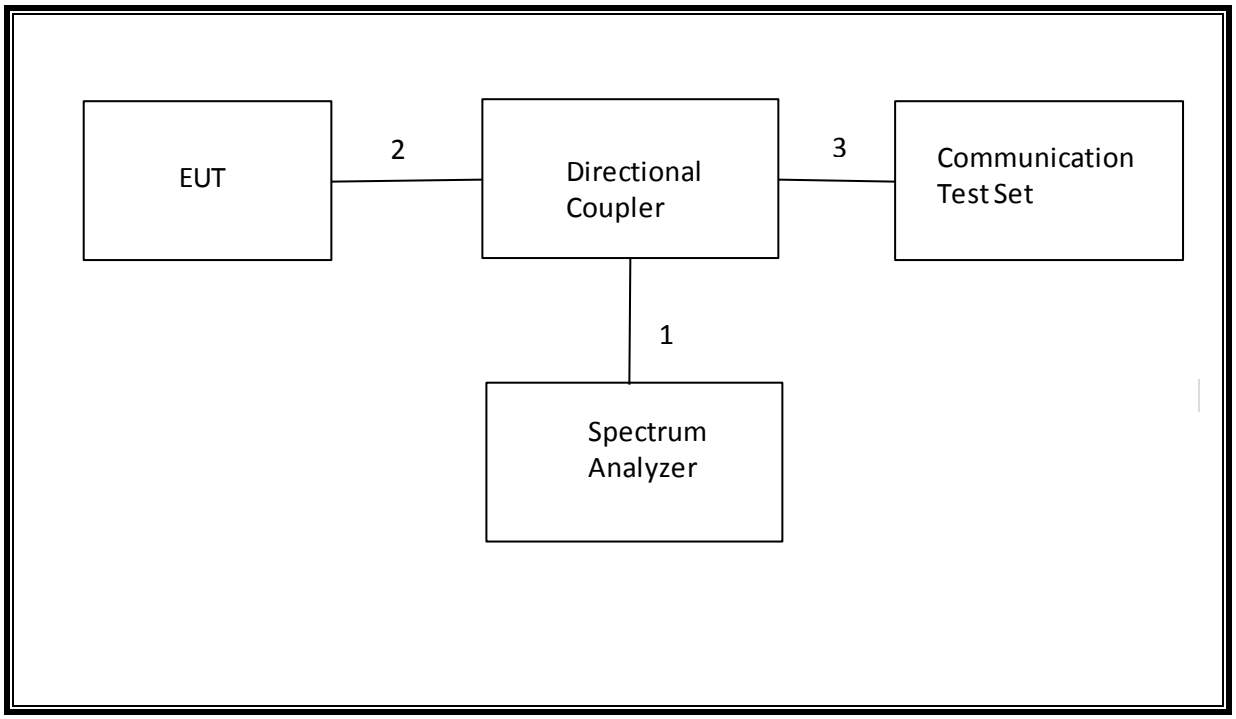
TEST SETUP

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

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.

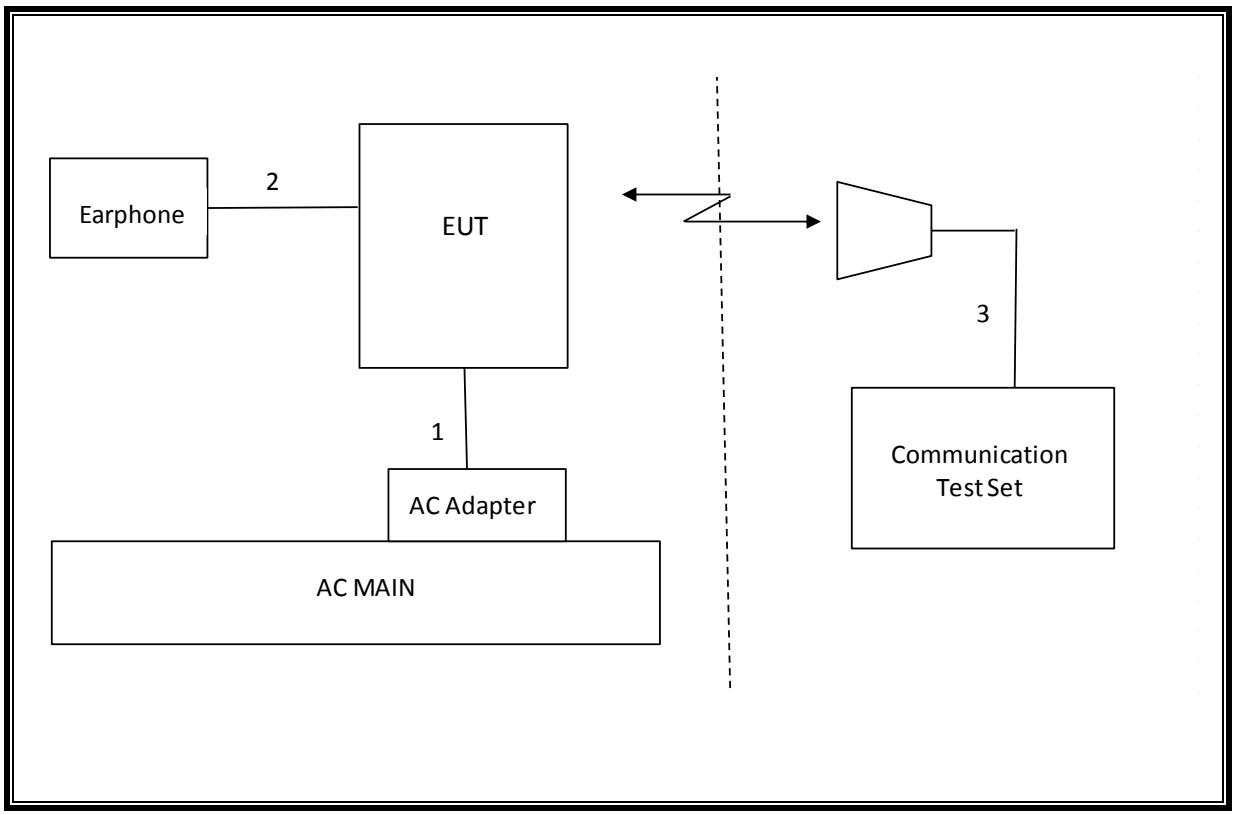
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



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.

SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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.

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	02/26/15
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	08/14/14
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/14
Antenna, Horn, 18 GHz	EMCO	3115	C00784	10/25/14
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	01/09/15
Communications Test Set	R&S	CMW500	T159	07/02/15
DC power supply, 8 V @ 3 A or 15 V	Agilent / HP	E3610A	None	CNR
Vector signal generator, 6 GHz	Agilent / HP	E4438C	None	07/06/15
Antenna, Tuned Dipole 400~1000	ETS	3121C DB4	C00993	02/14/15
Directional Coupler	RF-Lambda	RFDC5M06G15	None	CNR
Antenna, Horn,18- 26 GHz	ARA	MWH-1826/B	C00946	11/12/14

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.

7. Summary Table

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	RSS Gen	Occupied Band width (99%)	N/A	Conducted	Pass	4191KHz
22.917(a) 24.238(a)	RSS-132(4.5.1) RSS-133(6.5.1)	Band Edge / Conducted Spurious Emission	-13dBm		Pass	-14.523dBm
2.1046	N/A	Conducted output power	N/A		Pass	32.5dBm
22.355 24.235	RSS-132(4.3) RSS-133(6.3)	Frequency Stability	2.5PPM		Pass	0.038PPM
22.913(a)(2)	RSS-132(4.4)	Effective Radiated Power	38 dBm	Radiated	Pass	30.63dBm
24.232(c)	RSS-133(6.4)	Equivalent Isotropic Radiated Power	33dBm		Pass	29.40dBm
22.917(a) 24.238(a)	RSS-132(4.5.1) RSS-133(6.5.1)	Radiated Spurious Emission	-13dBm		Pass	-41.0dBm

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.

RF POWER OUTPUT VERIFICATION

7.1. 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.

7.1.1. GSM OUTPUT POWER RESULT

Band	Mode	Ch.	f(MHz)	1 time slot	2 time slot	3 time slot	4 time slot
				Peak (dBm)	Peak (dBm)	Peak (dBm)	Peak (dBm)
GSM850	GMSK	128	824.2	32.3			
		190	836.6	32.4			
		251	848.8	32.5			
	GPRS	128	824.2	32.3	29.3	27.5	25.6
		190	836.6	32.4	29.4	27.5	25.6
		251	848.8	32.5	29.4	27.5	25.6
GSM1900	GMSK	512	1850.2	29.7			
		661	1880	29.7			
		810	1909.8	29.7			
	GPRS	512	1850.2	29.7	27.9	25.7	23.8
		661	1880	29.7	28.0	25.8	24.0
		810	1909.8	29.7	28.1	26.0	24.1

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.

7.2. 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

7.2.1. UMTS REL 99 OUTPUT POWER RESULT

Band	Mode	Ch.	f(MHz)	Conducted Power (dBm)
				Avg (dBm)
Band 5	REL99	4132	826.4	22.4
		4183	836.6	22.3
		4233	846.6	22.2
Band 2	REL99	9262	1852.4	22.8
		9400	1880	22.6
		9538	1907.6	22.5

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.

7.3. UMTS HSDPA

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			

7.3.1. UMTS HSDPA OUTPUT POWER RESULT

Band	Mode	Subset	Ch.	f(MHz)	Conducted Power (dBm) Avg (dBm)
Band 5	HSDPA	1	4132	826.4	21.3
			4183	836.6	21.2
			4233	846.6	21.3
		2	4132	826.4	21.4
			4183	836.6	21.2
			4233	846.6	21.4
		3	4132	826.4	21.4
			4183	836.6	21.2
			4233	846.6	21.5
		4	4132	826.4	21.4
			4183	836.6	21.2
			4233	846.6	21.4

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.

Band 2	HSDPA	1	9262	1852.4	21.6
			9400	1880	21.6
			9538	1907.6	21.5
		2	9262	1852.4	21.8
			9400	1880	21.7
			9538	1907.6	21.5
		3	9262	1852.4	21.8
			9400	1880	21.7
			9538	1907.6	21.6
		4	9262	1852.4	21.7
			9400	1880	21.7
			9538	1907.6	21.5

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.

7.3.2. 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.

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.

7.3.3. UMTS HSUPA OUTPUT POWER RESULT

Band	Mode	Subset	Ch.	f(MHz)	Conducted Power (dBm) Avg (dBm)
Band 5	HSUPA	1	4132	826.4	20.8
			4183	836.6	20.7
			4233	846.6	20.6
		2	4132	826.4	20.1
			4183	836.6	19.9
			4233	846.6	19.9
		3	4132	826.4	21.3
			4183	836.6	21.1
			4233	846.6	21.1
		4	4132	826.4	20.5
			4183	836.6	20.5
			4233	846.6	20.5
		5	4132	826.4	22.4
			4183	836.6	22.2
			4233	846.6	22.2
Band 2	HSUPA	1	9262	1852.4	20.5
			9400	1880	20.5
			9538	1907.6	20.5
		2	9262	1852.4	20.0
			9400	1880	19.8
			9538	1907.6	19.7
		3	9262	1852.4	21.3
			9400	1880	21.1
			9538	1907.6	21.0
		4	9262	1852.4	20.4
			9400	1880	20.5
			9538	1907.6	20.4
		5	9262	1852.4	22.5
			9400	1880	22.4
			9538	1907.6	22.2

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.

8. PEAK TO AVERAGE RATIO

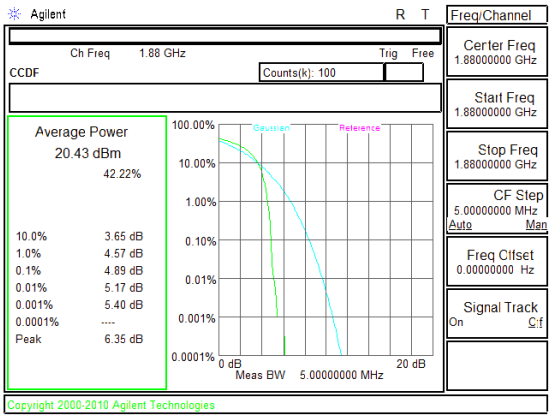
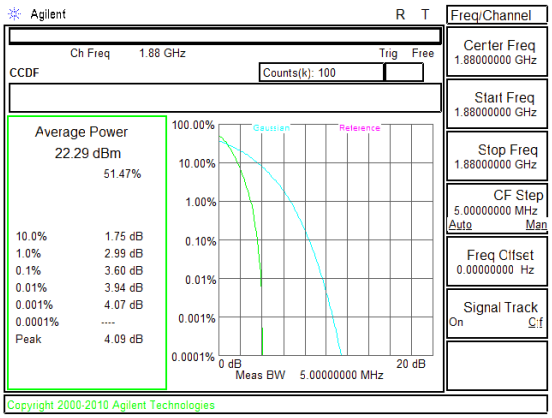
Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v02r01

Test Spec

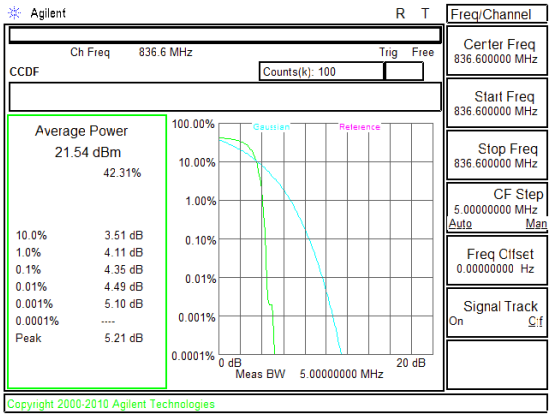
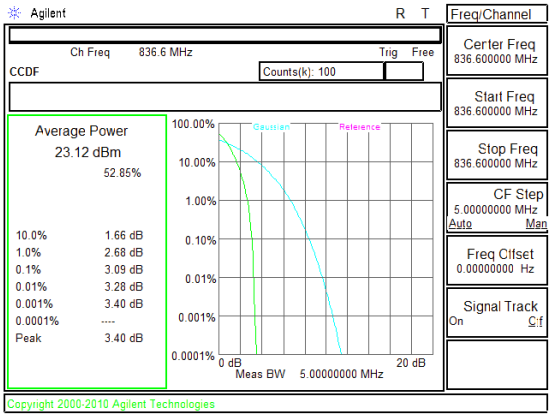
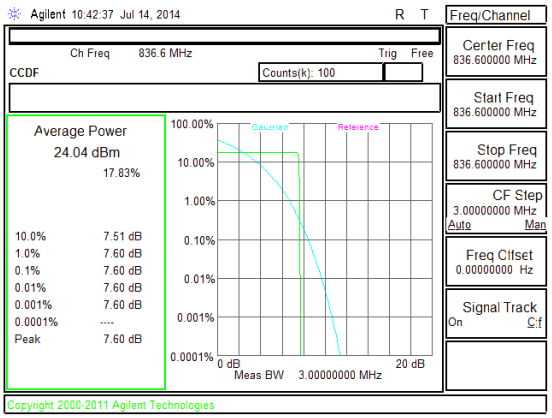
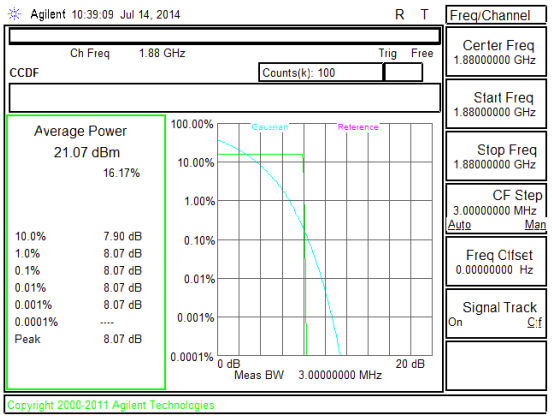
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

8.1. CONDUCTED PEAK TO AVERAGE RESULT

Band Band 2 HSDPA	 Band WCDMA B2 HSDPA	 Band WCDMA B2 REL99

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.

Band		
Band 5 HSDPA	 Band WCDMA B5 HSDPA	 Band WCDMA B5 REL99
GPRS	 GPRS850	 GPRS1900

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

9. LIMITS AND CONDUCTED RESULTS

9.1. 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 v02r01 - 06/07/2013)

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.

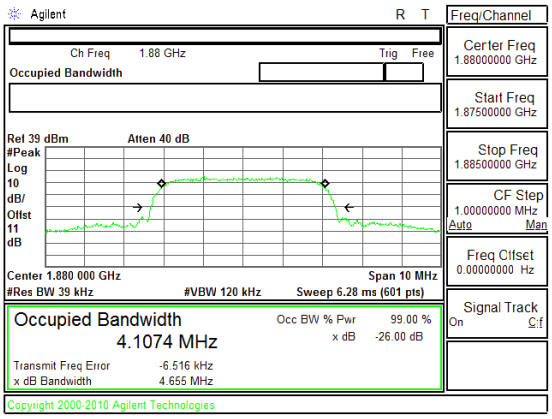
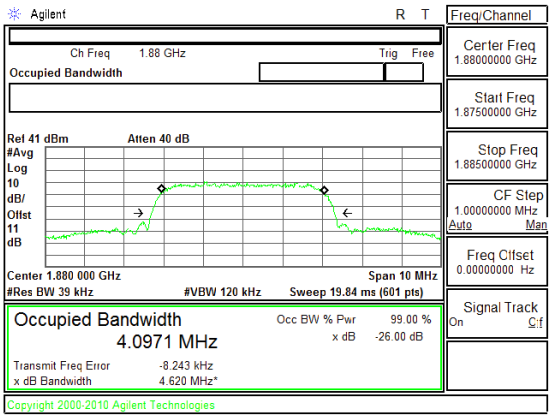
9.1.1. OCCUPIED BANDWIDTH RESULTS

Band	Mode	Channel	f (MHz)	99% BW (KHz)	-26dB BW (KHz)
GSM850	GPRS	128	824.2	252	331
		190	836.6	254	338
		251	848.8	250	334
GSM1900	GPRS	512	1850.2	254	327
		661	1880	249	325
		810	1909.8	249	328
Band 5	REL99	4132	826.4	4191	4807
		4183	836.6	4103	4662
		4233	846.6	4101	4644
	HSDPA	4132	826.4	4112	4661
		4183	836.6	4104	4650
		4233	846.6	4110	4667
Band 2	REL99	9262	1852.4	4112	4625
		9400	1880	4097	4620
		9538	1907.6	4104	4625
	HSDPA	9262	1852.4	4092	4639
		9400	1880	4107	4665
		9538	1907.6	4108	4640

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.

9.1.2. OCCUPIED BANDWIDTH PLOTS

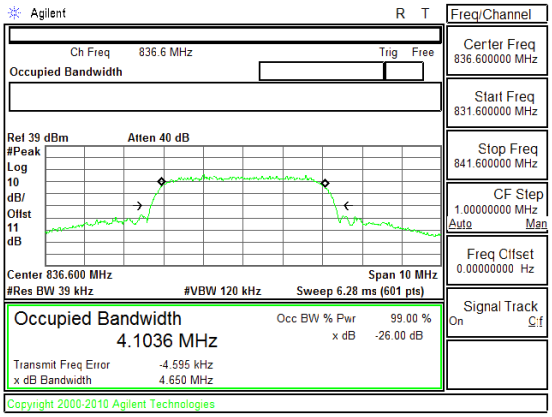
Band Band 2 HSDPA	 Band WCDMA B2 HSDPA OBW	 Band WCDMA B2 REL99 OBW

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

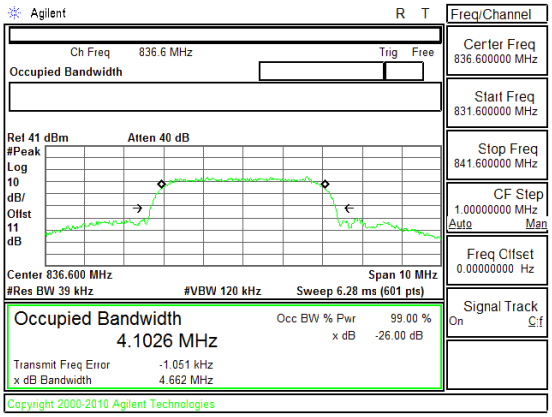
Band

Band 5

HSDPA



Band WCDMA B5 HSDPA OBW

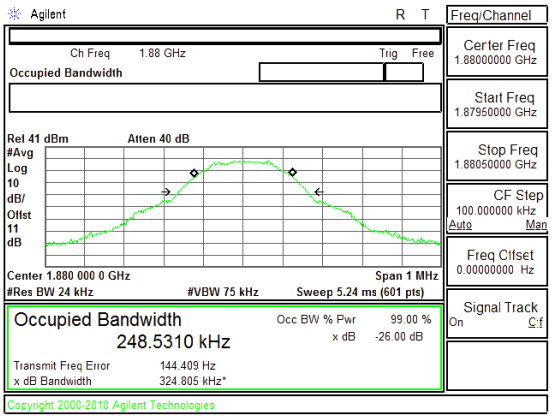


Band WCDMA B5 REL99 OBW

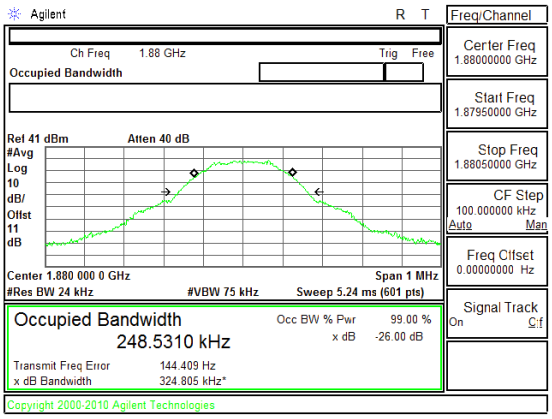
Band

GSM 1900

GPRS

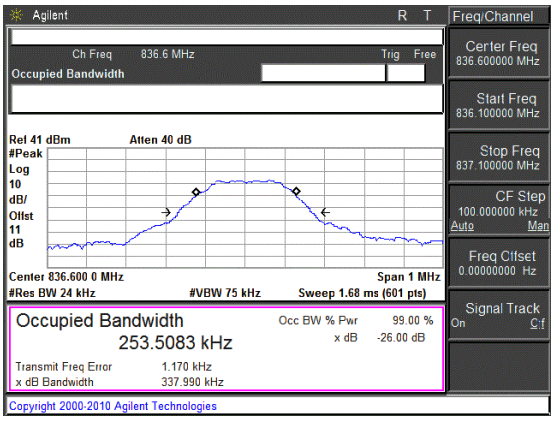
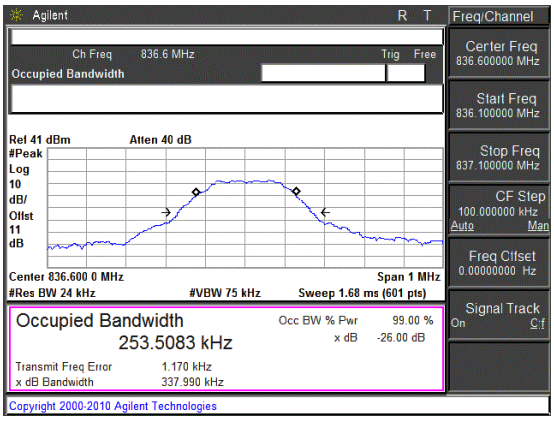


Band GSM1900 GPRS OBW Mid channel



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 GSM850 GPRS	 Band GSM850 GPRS OBW Mid channel	 Band GSM850 GPRS OBW Mid channel

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

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

9.2. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §22.359, §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

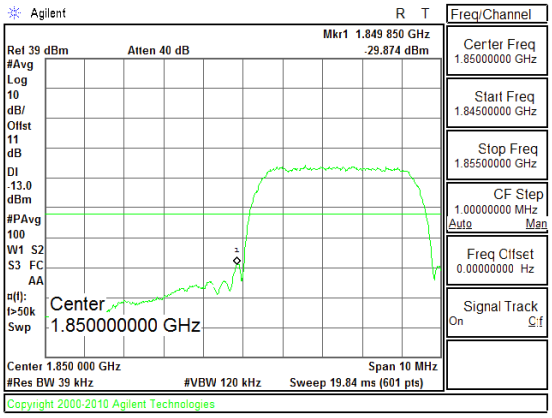
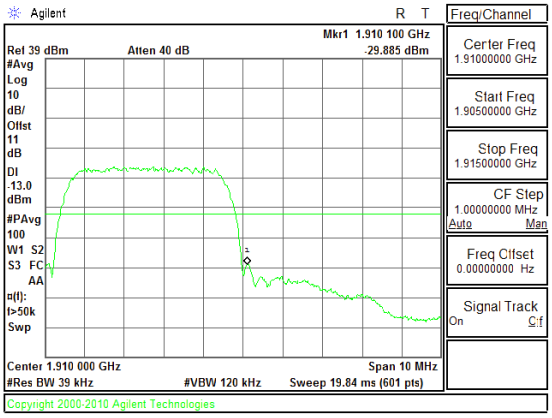
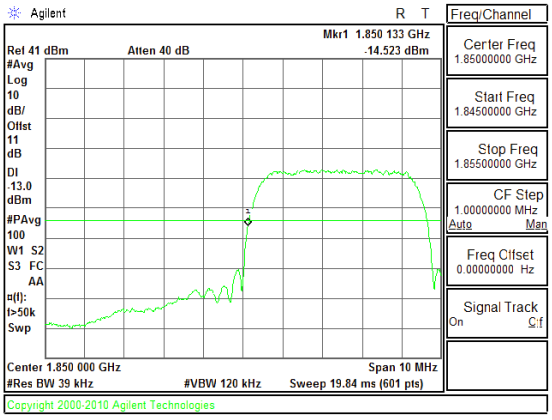
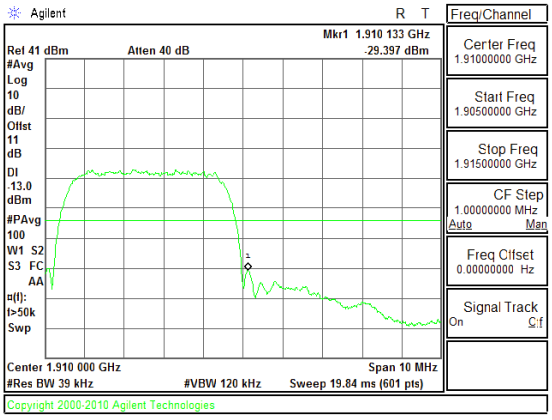
Per KDB 971168 D01 Power Meas License Digital Systems v02r01
The transmitter output was connected to an Agilent 8960 or a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

RESULTS

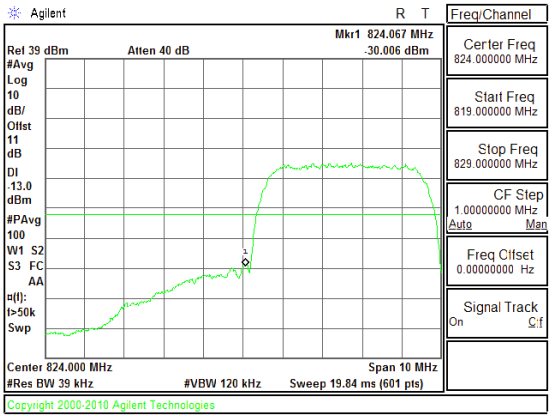
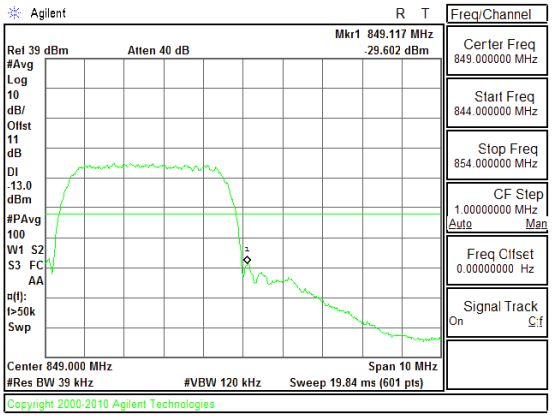
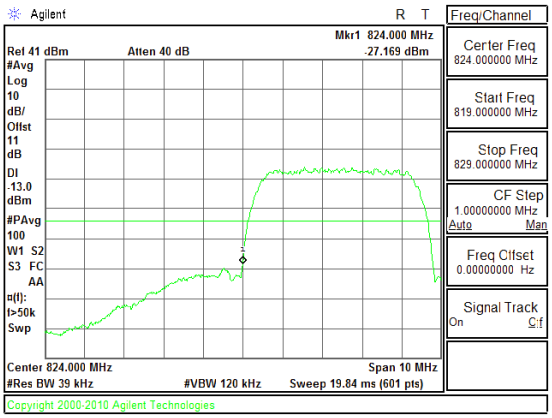
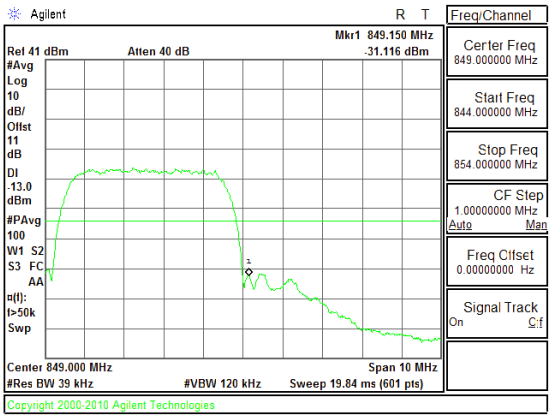
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

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

9.2.1. BAND EDGE PLOTS

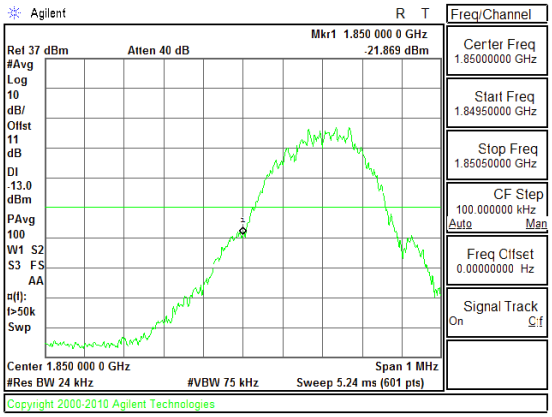
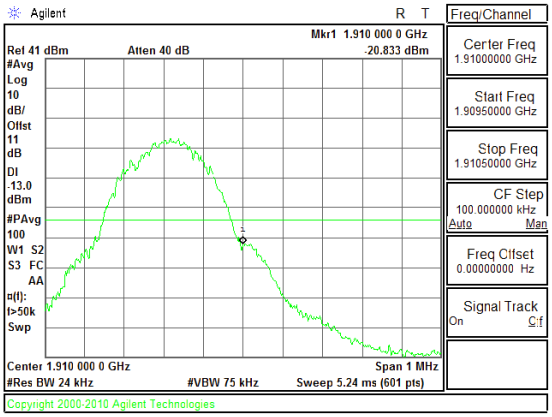
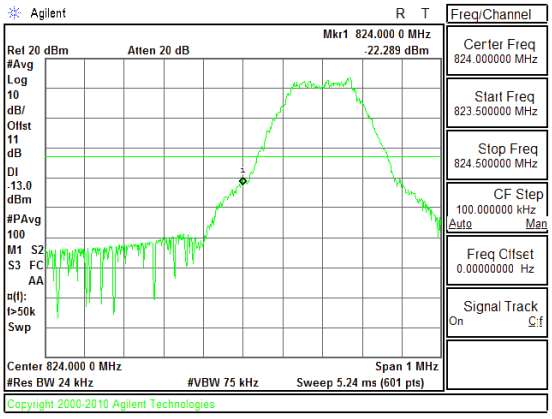
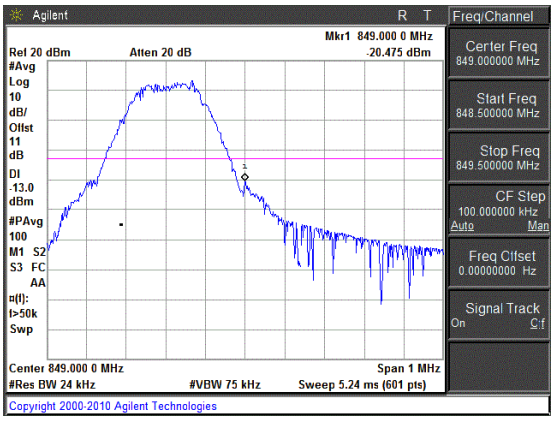
Band Band 2 HSDPA	 Band WCDMA B2 HSDPA CBE	 Band WCDMA B2 HSDPA CBE
Band Band 2 REL99	 Band WCDMA B2 REL99 CBE	 Band WCDMA B2 REL99 CBE

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

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

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

Band GSM 1900 GPRS	 Band GSM1900 GPRS CBE Low channel	 Band GSM1900 GPRS CBE High channel
Band GSM 850 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.

9.3. 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 v02r01

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.

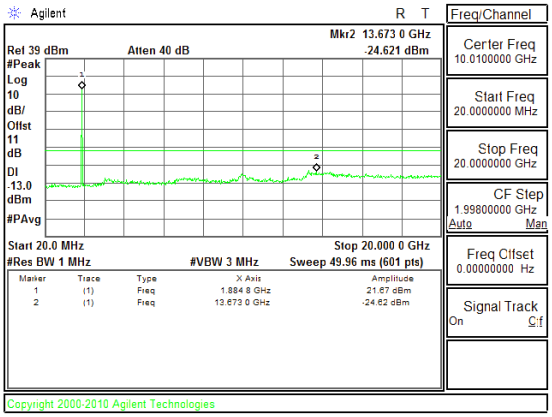
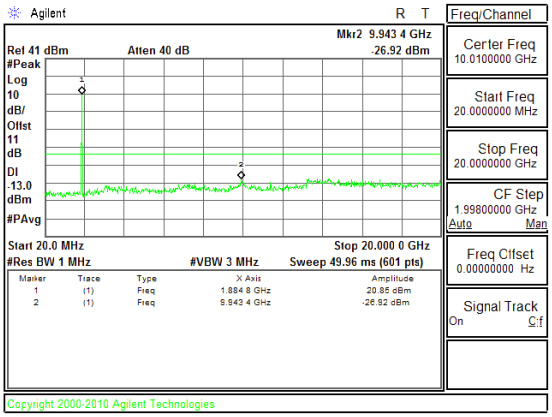
9.3.1. OUT OF BAND EMISSIONS RESULT

Band	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
GSM850	GPRS	824.2	-45.23	-13	-32.23
		836.6	-44.18	-13	-31.18
		848.8	-44.81	-13	-31.81
GSM1900	GPRS	1850.2	-25.50	-13	-12.50
		1880	-25.55	-13	-12.55
		1909.8	-24.97	-13	-11.97
Band 5	REL99	826.4	-35.81	-13	-22.81
		836.6	-35.76	-13	-22.76
		846.6	-35.02	-13	-22.02
	HSDPA	826.4	-24.63	-13	-11.63
		836.6	-24.83	-13	-11.83
		846.6	-24.45	-13	-11.45
Band 2	REL99	1852.4	-28.07	-13	-15.07
		1880	-26.92	-13	-13.92
		1907.6	-26.00	-13	-13.00
	HSDPA	1852.4	-24.05	-13	-11.05
		1880	-24.62	-13	-11.62
		1907.6	-25.42	-13	-12.42

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

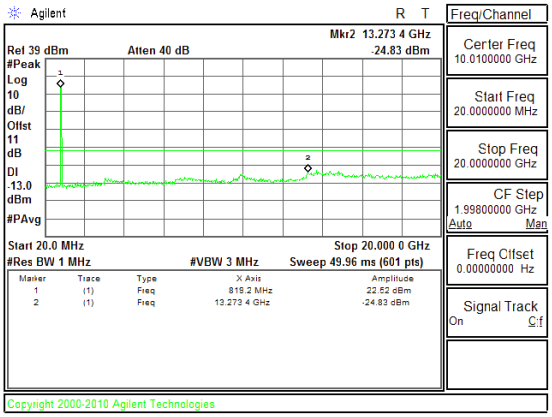
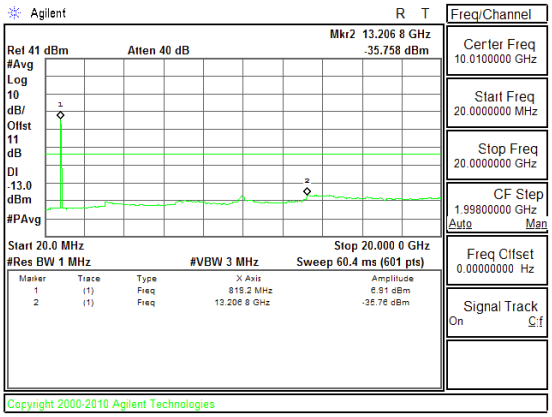
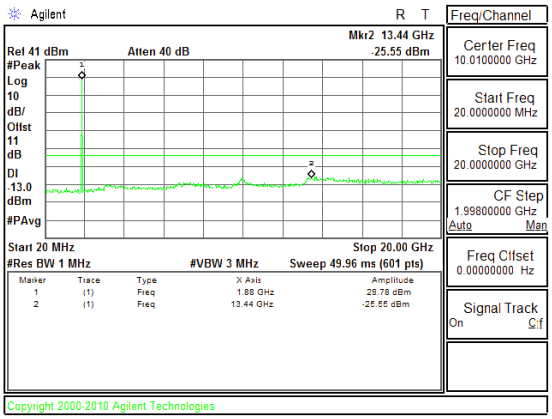
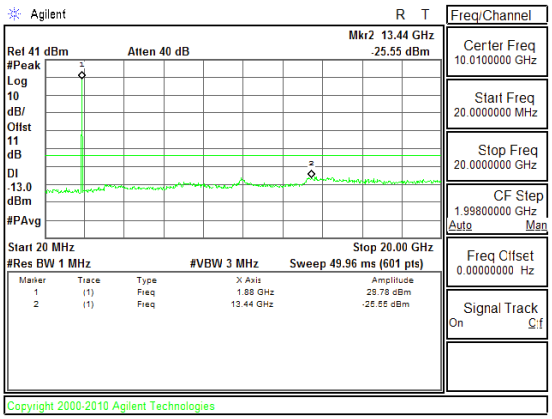
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.3.2. OUT OF BAND EMISSIONS PLOTS

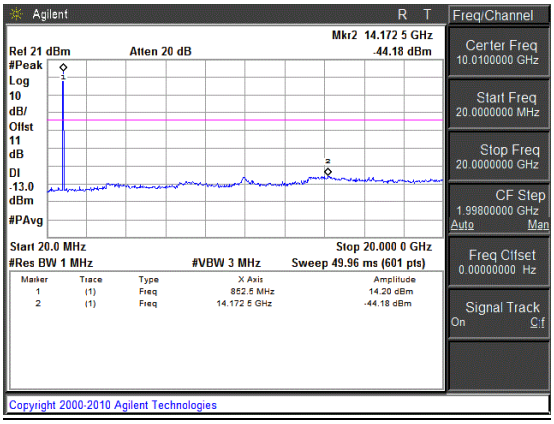
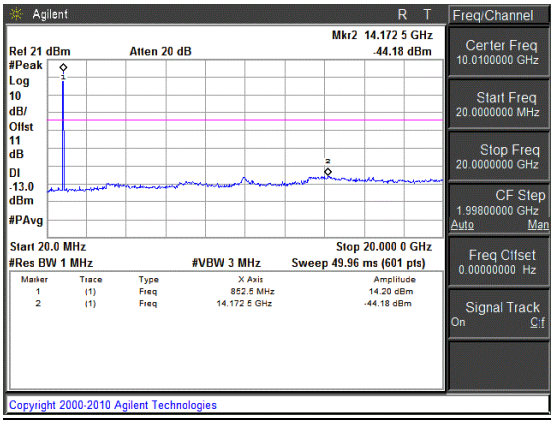
Band Band 2 HSDPA	 Band WCDMA B2 HSDPA CSE	 Band WCDMA B2 REL99 CSE

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.

Band		
Band 5 HSDPA	 Band WCDMA B5 HSDPA CSE	 Band WCDMA B5 REL99 CSE
Band GSM 1900 GPRS	 Band GSM1900 GPRS CSE Mid channel	 Band GSM1900 GPRS CSE Mid channel

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

Band GSM 850 GPRS	 Band GSM850 GPRS CSE Mid channel	 Band GSM850 GPRS CSE Mid channel

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

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

9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §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 v02r01

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.

9.4.1. FREQUENCY STABILITY RESULTS

CELL, GPRS MODULATION – MID CHANNEL

Reference Frequency: Cellular Mid Channel 836.6000246MHz @ 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	836.6000084	0.019	2.5
3.80	40	836.6000098	0.018	2.5
3.80	30	836.6000112	0.016	2.5
3.80	***20***	836.6000246	***0***	***2.5***
3.80	10	836.6000102	0.017	2.5
3.80	0	836.6000066	0.022	2.5
3.80	-10	836.5999932	0.038	2.5
3.80	-20	836.6000076	0.020	2.5
3.80	-30	836.6000091	0.019	2.5

Reference Frequency: Cellular Mid Channel 836.600025MHz @ 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***	***836.600025***	***0.00000***	***2.5***
4.30	20	836.600021	*0.00478*	2.5
3.40	20	836.600014	*0.01315*	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.

PCS, GPRS MODULATION – MID CHANNEL

Reference Frequency: PCS Mid Channel 1880.000022MHz @ 20ºC Limit: within the authorized block or +- 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	1880.000022	0.000	2.5
3.80	40	1880.000018	0.002	2.5
3.80	30	1880.000019	0.001	2.5
3.80	***20***	1880.000022	***0***	***2.5***
3.80	10	1880.000018	0.002	2.5
3.80	0	1880.000021	0.001	2.5
3.80	-10	1880.00002	0.001	2.5
3.80	-20	1880.000021	0.000	2.5
3.80	-30	1880.00002	0.001	2.5

Reference Frequency: PCS Mid Channel 1880.000022MHz @ 20ºC Limit: within the authorized block or +- 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***	1880.000022	***0***	***2.5***
4.30	20	1880.000025	*-0.002*	2.5
3.40	20	1880.000021	*0.000*	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.

10. RADIATED TEST RESULTS

10.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §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.

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

TEST PROCEDURE

ANSI / TIA / EIA 603C Clause 2.2.17

TEST RESULTS

10.1.1. ERP/EIRP Results

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
Band 2	REL99	9262	1852.4	21.564	143.35
		9400	1880	20.637	115.8
		9538	1907.6	21.255	133.51
	HSDPA	9262	1852.4	20.781	119.7
		9400	1880	19.996	99.91
		9538	1907.6	20.180	104.23

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
Band 5	REL99	4132	826.4	17.61	57.68
		4183	836.6	18.28	67.30
		4233	846.6	19.34	85.90
	HSDPA	4132	826.4	16.98	49.89
		4183	836.6	18.03	63.53
		4233	846.6	18.24	16.68

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.

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
GSM1900	GPRS	512	1850.2	29.10	812.83
		661	1880	29.40	870.96
		810	1909.8	29.08	809.10

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
GSM850	GPRS	128	824.2	30.631	1156.38
		190	836.6	30.585	1144.19
		251	848.8	30.311	1074.24

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.

10.1.2. ERP/EIRP DATA

Band

Band 2

HSDPA

High Frequency Fundamental Measurement
Compliance Certification Services Chamber A

Company: Samsung
Project #: 14I18253
Date: 07/09/14
Test Engineer: O. Stoelting, L. Lara
Configuration: EUT ONLY, X Position
Mode: WCDMA_1900 MHz_HSDPA

Test Equipment:
Receiving: T130, and Chamber A Cable (Setup this one for testing EUT)
Substitution: Horn T119 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								
1852.40	11.76	V	0.85	7.9	18.81	33.0	-14.2	
1852.40	13.73	H	0.85	7.9	20.78	33.0	-12.2	
Mid Ch								
1880.00	11.39	V	0.85	7.9	18.44	33.0	-14.6	
1880.00	12.95	H	0.85	7.9	20.00	33.0	-13.0	
High Ch								
1907.60	10.71	V	0.85	7.8	17.66	33.0	-15.3	
1907.60	13.23	H	0.85	7.8	20.18	33.0	-12.8	

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

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.

Band

Band 2

REL99

High Frequency Fundamental Measurement
Compliance Certification Services Chamber A

Company: Samsung
Project #: 14I18253
Date: 07/09/14
Test Engineer: O. Stoelting, L. Lara
Configuration: EUT ONLY, X Position
Mode: WCDMA_1900 MHz_Rel 99

Test Equipment:
Receiving: Horn T136, and Chamber A SMA Cables
Substitution: Horn T119 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								
1852.40	12.63	V	0.85	7.9	19.68	33.0	-13.3	
1852.40	14.51	H	0.85	7.9	21.56	33.0	-11.4	
Mid Ch								
1880.00	12.42	V	0.85	7.9	19.47	33.0	-13.5	
1880.00	13.59	H	0.85	7.9	20.64	33.0	-12.4	
High Ch								
1907.60	13.52	V	0.85	7.8	20.47	33.0	-12.5	
1907.60	14.31	H	0.85	7.8	21.26	33.0	-11.7	

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

UL VERIFICATION SERVICES INC.
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.

Band

Band 5

HSDPA

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

Company: Samsung
Project #: 14I18253
Date: 07/10/14
Test Engineer: K. Kedida
Configuration: EUT ONLY, X Position
Mode: WCDMA_HSDPA_850

Test Equipment:
Receiving: Sunol T243, and 5m Chamber N-type Cable (Setup this one for testing EUT)
Substitution: Dipole T416, 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	7.90	V	0.5	0.0	7.40	38.5	-31.0	
826.40	17.48	H	0.5	0.0	16.98	38.5	-21.5	
Mid Ch								
836.60	8.31	V	0.5	0.0	7.81	38.5	-30.6	
836.60	18.53	H	0.5	0.0	18.03	38.5	-20.4	
High Ch								
846.60	8.07	V	0.5	0.0	7.57	38.5	-30.9	
846.60	18.74	H	0.5	0.0	18.24	38.5	-20.2	

Rev. 3.17.11

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

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. Chamber B

Company: Samsung
Project #: 14I18253
Date: 07/10/14
Test Engineer: K. Kedida
Configuration: EUT ONLY, X Position
Mode: WCDMA_Rel99_850

Test Equipment:
Receiving: T243, and Chamber A Cable (Setup this one for testing EUT)
Substitution: Dipole T416, 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	8.10	V	0.5	0.0	7.60	38.5	-30.8	
826.40	18.11	H	0.5	0.0	17.61	38.5	-20.8	
Mid Ch								
836.60	8.48	V	0.5	0.0	7.98	38.5	-30.5	
836.60	18.78	H	0.5	0.0	18.28	38.5	-20.2	
High Ch								
846.60	9.16	V	0.5	0.0	8.66	38.5	-29.8	
846.60	19.84	H	0.5	0.0	19.34	38.5	-19.1	

Rev. 3.17.11

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

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

Band

GSM1900

GPRS

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

Company: Samsung
Project #: 14I18253
Date: 07/14/14
Test Engineer: S. Her, K. Ros, B. Liu
Configuration: EUT ONLY, X Position
Mode: GSM1900_GPRS

Test Equipment:
Receiving: Horn T345, and Chamber B SMA Cables
Substitution: Horn T72 Substitution, 4ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
1850.20	12.67	V	0.9	7.9	19.67	33.0	-13.3	
1850.20	22.10	H	0.9	7.9	29.10	33.0	-3.9	
Mid Ch								
1880.00	11.70	V	0.9	7.9	18.70	33.0	-14.3	
1880.00	22.40	H	0.9	7.9	29.40	33.0	-3.6	
High Ch								
1909.80	11.62	V	0.9	7.9	18.62	33.0	-14.4	
1909.80	22.08	H	0.9	7.9	29.08	33.0	-3.9	

Rev. 3.17.11

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.

Band

GSM850

GPRS

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

Company: Samsung
Project #: 14I18253
Date:
Test Engineer: Edward/Jude
Configuration: EUT ONLY, X Position
Mode: GSM850_GPRS

Test Equipment:
Receiving: Sunol T243, and 3m Chamber N-type Cable (Setup this one for testing EUT)
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	22.79	V	0.5	0.0	22.29	38.5	-16.2	
824.20	31.13	H	0.5	0.0	30.63	38.5	-7.8	
Mid Ch								
836.60	23.01	V	0.5	0.0	22.51	38.5	-15.9	
836.60	31.08	H	0.5	0.0	30.59	38.5	-7.9	
High Ch								
848.80	21.53	V	0.5	0.0	21.03	38.5	-17.4	
848.80	30.81	H	0.5	0.0	30.31	38.5	-8.1	

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

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

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

10.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238

LIMIT

§22.917 (e) and §24.238 (a): Out of band emissions. 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.

10.2.1. SPURIOUS RADIATION PLOTS

Band

Band 2

HSDPA

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 14I18253
Date: 07/09/14
Test Engineer: O. Stoelting, L. Lara
Configuration: X-pos. EUT w/ ac charger & HS
Mode: HSDPA_HARM_ 1900MHz

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

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3.705	-10.1	V	3.0	35.4	1.0	-44.5	-13.0	-31.5	
5.557	-13.5	V	3.0	34.7	1.0	-47.2	-13.0	-34.2	
7.409	-12.1	V	3.0	34.9	1.0	-46.0	-13.0	-33.0	
3.705	-13.1	H	3.0	35.4	1.0	-47.5	-13.0	-34.5	
5.557	-12.6	H	3.0	34.7	1.0	-46.3	-13.0	-33.3	
7.409	-10.9	H	3.0	34.9	1.0	-44.8	-13.0	-31.8	
Mid Ch, 1880MHz									
3.760	-10.8	V	3.0	35.3	1.0	-45.1	-13.0	-32.1	
5.640	-11.9	V	3.0	34.7	1.0	-45.7	-13.0	-32.7	
7.520	-9.4	V	3.0	34.9	1.0	-43.3	-13.0	-30.3	
3.760	-12.6	H	3.0	35.3	1.0	-47.0	-13.0	-34.0	
5.640	-11.2	H	3.0	34.7	1.0	-44.9	-13.0	-31.9	
7.520	-8.8	H	3.0	34.9	1.0	-42.8	-13.0	-29.8	
High Ch, 1907.6MHz									
3.815	-10.5	V	3.0	35.3	1.0	-44.8	-13.0	-31.8	
5.723	-13.1	V	3.0	34.7	1.0	-46.9	-13.0	-33.9	
7.630	-11.2	V	3.0	34.9	1.0	-45.1	-13.0	-32.1	
3.815	-14.0	H	3.0	35.3	1.0	-48.3	-13.0	-35.3	
5.723	-12.3	H	3.0	34.7	1.0	-46.0	-13.0	-33.0	
7.630	-9.9	H	3.0	34.9	1.0	-43.9	-13.0	-30.9	

Rev. 03.03.09

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.

Band

Band 2

REL99

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 14I18253
Date: 07/09/14
Test Engineer: O. Stoelting, L. Lara
Configuration: X-pos. EUT with AC charger & HS
Mode: Rel 99_HARM_ 1900MHz

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

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3.705	-6.8	V	3.0	35.4	1.0	-41.2	-13.0	-28.2	
5.557	-13.0	V	3.0	34.7	1.0	-46.7	-13.0	-33.7	
7.409	-12.0	V	3.0	34.9	1.0	-45.9	-13.0	-32.9	
3.705	-8.8	H	3.0	35.4	1.0	-43.2	-13.0	-30.2	
5.557	-12.5	H	3.0	34.7	1.0	-46.2	-13.0	-33.2	
7.409	-11.3	H	3.0	34.9	1.0	-45.2	-13.0	-32.2	
Mid Ch, 1880MHz									
3.760	-8.0	V	3.0	35.3	1.0	-42.3	-13.0	-29.3	
5.640	-11.1	V	3.0	34.7	1.0	-44.8	-13.0	-31.8	
7.520	-11.6	V	3.0	34.9	1.0	-45.5	-13.0	-32.5	
3.760	-9.3	H	3.0	35.3	1.0	-43.6	-13.0	-30.6	
5.640	-12.8	H	3.0	34.7	1.0	-46.6	-13.0	-33.6	
7.520	-9.8	H	3.0	34.9	1.0	-43.7	-13.0	-30.7	
High Ch, 1907.6MHz									
3.815	-9.9	V	3.0	35.3	1.0	-44.2	-13.0	-31.2	
5.723	-12.3	V	3.0	34.7	1.0	-46.1	-13.0	-33.1	
7.630	-11.5	V	3.0	34.9	1.0	-45.4	-13.0	-32.4	
3.815	-9.8	H	3.0	35.3	1.0	-44.1	-13.0	-31.1	
5.723	-12.1	H	3.0	34.7	1.0	-45.8	-13.0	-32.8	
7.630	-9.4	H	3.0	34.9	1.0	-43.4	-13.0	-30.4	

Rev. 03.03.09

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.

Band

Band 5

HSDPA

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 14I18253
Date: 07/09/14
Test Engineer: O. Stoelting, L. Lara
Configuration: X-pos. EUT w/ ac charger & HS
Mode: WCDMA_HSDPA_ 850

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

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.40MHz									
1.652	-17.6	V	3.0	37.4	1.0	-54.0	-13.0	-41.0	
2.479	-20.4	V	3.0	36.4	1.0	-55.8	-13.0	-42.8	
3.306	-15.2	V	3.0	35.8	1.0	-50.0	-13.0	-37.0	
1.652	-17.4	H	3.0	37.4	1.0	-53.7	-13.0	-40.7	
2.479	-18.4	H	3.0	36.4	1.0	-53.8	-13.0	-40.8	
3.306	-13.5	H	3.0	35.8	1.0	-48.3	-13.0	-35.3	
Mid Ch, 836.6MHz									
1.673	-12.2	V	3.0	37.3	1.0	-48.6	-13.0	-35.6	
2.510	-18.7	V	3.0	36.4	1.0	-54.1	-13.0	-41.1	
3.346	-9.1	V	3.0	35.8	1.0	-43.8	-13.0	-30.8	
1.673	-16.4	H	3.0	37.3	1.0	-52.7	-13.0	-39.7	
2.510	-21.9	H	3.0	36.4	1.0	-57.2	-13.0	-44.2	
3.346	-6.3	H	3.0	35.8	1.0	-41.1	-13.0	-28.1	
High Ch, 846.6MHz									
1.693	-10.6	V	3.0	37.3	1.0	-46.9	-13.0	-33.9	
2.539	-19.8	V	3.0	36.3	1.0	-55.2	-13.0	-42.2	
3.386	-7.4	V	3.0	35.7	1.0	-42.2	-13.0	-29.2	
1.693	-14.9	H	3.0	37.3	1.0	-51.2	-13.0	-38.2	
2.539	-18.6	H	3.0	36.3	1.0	-54.0	-13.0	-41.0	
3.386	-15.3	H	3.0	35.7	1.0	-50.0	-13.0	-37.0	

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

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.

Band

Band 5

REL99

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 14I18253
Date: 07/09/14
Test Engineer: O. Stoelting, L. Lara
Configuration: X-pos. EUT with AC charger & HS
Mode: WCDMA_Rel 99_ 850

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

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.40MHz									
1.652	-16.6	V	3.0	37.4	1.0	-53.0	-13.0	-40.0	
2.479	-19.3	V	3.0	36.4	1.0	-54.7	-13.0	-41.7	
3.306	-11.7	V	3.0	35.8	1.0	-46.5	-13.0	-33.5	
1.652	-16.3	H	3.0	37.4	1.0	-52.7	-13.0	-39.7	
2.479	-17.5	H	3.0	36.4	1.0	-52.9	-13.0	-39.9	
3.306	-12.0	H	3.0	35.8	1.0	-46.8	-13.0	-33.8	
Mid Ch, 836.6MHz									
1.673	-11.8	V	3.0	37.3	1.0	-48.2	-13.0	-35.2	
2.510	-19.4	V	3.0	36.4	1.0	-54.7	-13.0	-41.7	
3.346	-9.2	V	3.0	35.8	1.0	-43.9	-13.0	-30.9	
1.673	-14.2	H	3.0	37.3	1.0	-50.6	-13.0	-37.6	
2.510	-20.0	H	3.0	36.4	1.0	-55.4	-13.0	-42.4	
3.346	-12.0	H	3.0	35.8	1.0	-46.8	-13.0	-33.8	
High Ch, 846.6MHz									
1.693	-9.0	V	3.0	37.3	1.0	-45.3	-13.0	-32.3	
2.539	-20.0	V	3.0	36.3	1.0	-55.3	-13.0	-42.3	
3.386	-6.4	V	3.0	35.7	1.0	-41.1	-13.0	-28.1	
1.693	-9.6	H	3.0	37.3	1.0	-45.9	-13.0	-32.9	
2.539	-21.7	H	3.0	36.3	1.0	-57.1	-13.0	-44.1	
3.386	-7.1	H	3.0	35.7	1.0	-41.8	-13.0	-28.8	

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

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.

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 14I18253
Date: 07/09/14
Test Engineer: O. Stoelting, L. Lara
Configuration: X-pos. EUT w/ ac charger & HS
Mode: GPRS 1900

Chamber	Pre-amplifer	Filter	Limit
5m Chamber A	T343 8449B	Filter 1	Part 24

Band

GSM1900

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, 1850MHz									
3.700	-11.6	V	3.0	35.4	1.0	-46.0	-13.0	-33.0	
5.550	-12.2	V	3.0	34.7	1.0	-45.9	-13.0	-32.9	
7.400	-14.8	V	3.0	34.9	1.0	-48.7	-13.0	-35.7	
3.700	-12.2	H	3.0	35.4	1.0	-46.6	-13.0	-33.6	
5.550	-14.0	H	3.0	34.7	1.0	-47.8	-13.0	-34.8	
7.400	-13.8	H	3.0	34.9	1.0	-47.7	-13.0	-34.7	
Mid Ch, 1880.0MHz									
3.760	-10.4	V	3.0	35.3	1.0	-44.8	-13.0	-31.8	
5.640	-15.4	V	3.0	34.7	1.0	-49.1	-13.0	-36.1	
7.520	-13.9	V	3.0	34.9	1.0	-47.8	-13.0	-34.8	
3.760	-11.8	H	3.0	35.3	1.0	-46.2	-13.0	-33.2	
5.640	-14.0	H	3.0	34.7	1.0	-47.8	-13.0	-34.8	
7.520	-13.8	H	3.0	34.9	1.0	-47.7	-13.0	-34.7	
High Ch, 1909.8 MHz									
3.820	-10.7	V	3.0	35.3	1.0	-45.0	-13.0	-32.0	
5.729	-12.5	V	3.0	34.7	1.0	-46.2	-13.0	-33.2	
7.639	-10.9	V	3.0	35.0	1.0	-44.9	-13.0	-31.9	
3.820	-8.4	H	3.0	35.3	1.0	-42.7	-13.0	-29.7	
5.729	-12.0	H	3.0	34.7	1.0	-45.8	-13.0	-32.8	
7.639	-9.2	H	3.0	35.0	1.0	-43.1	-13.0	-30.1	

Rev. 03.03.09

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.

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 14I18253
Date: 07/09/14
Test Engineer: O. Stoelting, L. Lara
Configuration: X-pos EUT, Charger, HS
Mode: GPRS 850

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

Band

GSM850

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, 824.2MHz									
1.648	-15.3	V	3.0	37.4	1.0	-51.7	-13.0	-38.7	
2.473	-23.2	V	3.0	36.4	1.0	-58.6	-13.0	-45.6	
3.297	-18.5	V	3.0	35.8	1.0	-53.3	-13.0	-40.3	
1.648	-13.8	H	3.0	37.4	1.0	-50.2	-13.0	-37.2	
2.473	-25.1	H	3.0	36.4	1.0	-60.5	-13.0	-47.5	
3.297	-19.8	H	3.0	35.8	1.0	-54.6	-13.0	-41.6	
Mid Ch, 836.6MHz									
1.673	-12.9	V	3.0	37.3	1.0	-49.3	-13.0	-36.3	
2.510	-22.5	V	3.0	36.4	1.0	-57.9	-13.0	-44.9	
3.346	-17.2	V	3.0	35.8	1.0	-51.9	-13.0	-38.9	
1.673	-14.0	H	3.0	37.3	1.0	-50.3	-13.0	-37.3	
2.510	-18.6	H	3.0	36.4	1.0	-53.9	-13.0	-40.9	
3.346	-21.2	H	3.0	35.8	1.0	-56.0	-13.0	-43.0	
High Ch, 848.8MHz									
1.698	-13.4	V	3.0	37.3	1.0	-49.7	-13.0	-36.7	
2.547	-23.1	V	3.0	36.3	1.0	-58.4	-13.0	-45.4	
3.395	-18.2	V	3.0	35.7	1.0	-52.9	-13.0	-39.9	
1.698	-13.8	H	3.0	37.3	1.0	-50.1	-13.0	-37.1	
2.547	-20.0	H	3.0	36.3	1.0	-55.4	-13.0	-42.4	
3.395	-16.3	H	3.0	35.7	1.0	-51.0	-13.0	-38.0	

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

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.