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

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + Bluetooth & WLAN (2.4GHz), ANT+ and NFC

MODEL NUMBER: SM-A300G DS and SM-A300G

FCC ID: A3LSMA300G

REPORT NUMBER: 14I18889-E1 Revision A

ISSUE DATE: OCTOBER 10, 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
--	9/26/14	Initial Issue	P. Zhang
A	10/10/14	Revised FCC IDs Removed Declaration Information from Section 7	P. Zhang

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. 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 18
8.2.1. UMTS REL 99 OUTPUT POWER RESULT 18
8.3. UMTS HSDPA 19
8.3.1. UMTS HSDPA OUTPUT POWER RESULT 20
8.3.2. UMTS HSUPA 21
8.3.3. UMTS HSUPA OUTPUT POWER RESULT 22
8.3.4. DC-HSDPA 23
8.4. LTE OUTPUT VERIFICATION 26
8.4.1. LTE OUTPUT RESULT 26
9. PEAK TO AVERAGE RATIO 30
9.1. CONDUCTED PEAK TO AVERAGE RESULT 31
10. LIMITS AND CONDUCTED RESULTS 38

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. OCCUPIED BANDWIDTH 38
10.1.1. OCCUPIED BANDWIDTH RESULTS 39
10.1.2. LTE OCCUPIED BANDWIDTH RESULTS 41
10.1.1. OCCUPIED BANDWIDTH PLOTS 42
10.2. BAND EDGE EMISSIONS 50
10.2.1. BAND EDGE PLOTS 51
10.3. OUT OF BAND EMISSIONS 63
10.3.1. OUT OF BAND EMISSIONS RESULT 64
10.3.2. OUT OF BAND EMISSIONS PLOTS 66
10.4. FREQUENCY STABILITY 74
10.4.1. FREQUENCY STABILITY RESULTS 75
11. RADIATED TEST RESULTS 77
11.1. RADIATED POWER (ERP & EIRP) 77
11.1.1. ERP/EIRP Results 78
11.1.2. LTE ERP/EIRP Results 80
11.1.3. ERP/EIRP PLOTS 81
11.2. FIELD STRENGTH OF SPURIOUS RADIATION 97
11.2.1. SPURIOUS RADIATION PLOTS 98
12. SETUP PHOTOS 118

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/LTE Phone + Bluetooth, WLAN DTS b/g/n & ANT+ & NFC**

MODEL: **SM-A300G/DS**

SERIAL NUMBER: **1961989 (Radiated), 1961987 (Conducted)**

DATE TESTED: **September 22- September 25, 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:

PENG ZHANG
CONSUMER TECHNOLOGY DIVISION
PROJECT LEAD
UL Verification Services Inc.

Tested By:

DANIEL SOPER
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, 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)

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%.

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 + WLAN DTS (b,g,n), Bluetooth, ANT+, and NFC.

5.2. MAXIMUM OUTPUT POWER

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

FCC Part 22/24						
Band	Frequency Range(MHz)	Modulation Peak	Conducted		Radiated	
			Avg (dBm)	Avg (mW)	Avg (dBm)	Avg (mW)
GSM850	824~849	GMSK	33.5	2238.72		
	824~849	GPRS	33.5	2238.72	31.03	1267.94
	824~849	EGPRS	27.5	562.34	27.69	588.44
GSM1900	1850~1910	GMSK	30.9	1230.27		
	1850~1910	GPRS	30.9	1230.27	26.30	426.58
	1850~1910	EGPRS	26.5	446.68	21.97	204.6

FCC Part 22/24						
Band	Frequency Range(MHz)	Modulation Peak	Conducted		Radiated	
			Avg (dBm)	Avg (mW)	Avg (dBm)	Avg (mW)
Band 5	824~849	REL99	23.5	223.87	20.911	123.34
	824~849	HSDPA	23.1	204.17	20.271	106.44
	824~849	HSUPA	23.1	204.17		
Band 2	1850~1910	REL99	23.5	223.87	16.91	49.09
	1850~1910	HSDPA	22.9	194.98	16.84	48.31
	1850~1910	HSUPA	22.4	173.78		

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 27 (10MHz Bandwidth)							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation Peak	Conducted		Radiated	
				Avg (dBm)	Avg (mW)	Avg (dBm)	Avg (mW)
LTE5	824~849	10MHz	QPSK	23.00	177.83	18.6	72.44
	824~849	10MHz	16QAM	22.50	199.53	17.9	61.67

FCC Part 27 (5MHz Bandwidth)							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation Peak	Conducted		Radiated	
				Avg (dBm)	Avg (mW)	Avg (dBm)	Avg (mW)
LTE5	824~849	5MHz	QPSK	23.4	218.78	18.93	78.18
	824~849	5MHz	16QAM	22.3	169.82	18.12	64.88

FCC Part 27 (10MHz Bandwidth)							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation Peak	Conducted		Radiated	
				Avg (dBm)	Avg (mW)	Avg (dBm)	Avg (mW)
LTE5	824~849	3MHz	QPSK	23.30	213.80	19.93	98.4
	824~849	3MHz	16QAM	21.80	151.36	18.79	75.7

FCC Part 27 (5MHz Bandwidth)							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation Peak	Conducted		Radiated	
				Avg (dBm)	Avg (mW)	Avg (dBm)	Avg (mW)
LTE5	824~849	1.4MHz	QPSK	23.20	208.93	19.13	81.87
	824~849	1.4MHz	16QAM	22.30	169.82	18.3	67.62

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)
GSM850, 824~849MHz	-2.2
GSM1900, 1850~1910MHz	-3.2
Band 5, 824~849MHz	-2.2
Band 2, 1850~1910MHz	-3.2
LTE5, 824~849MHz	-2.2

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	ETA0U83EWE	N/A	N/A
Earphone	Samsung	EHS64AVFWE	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)

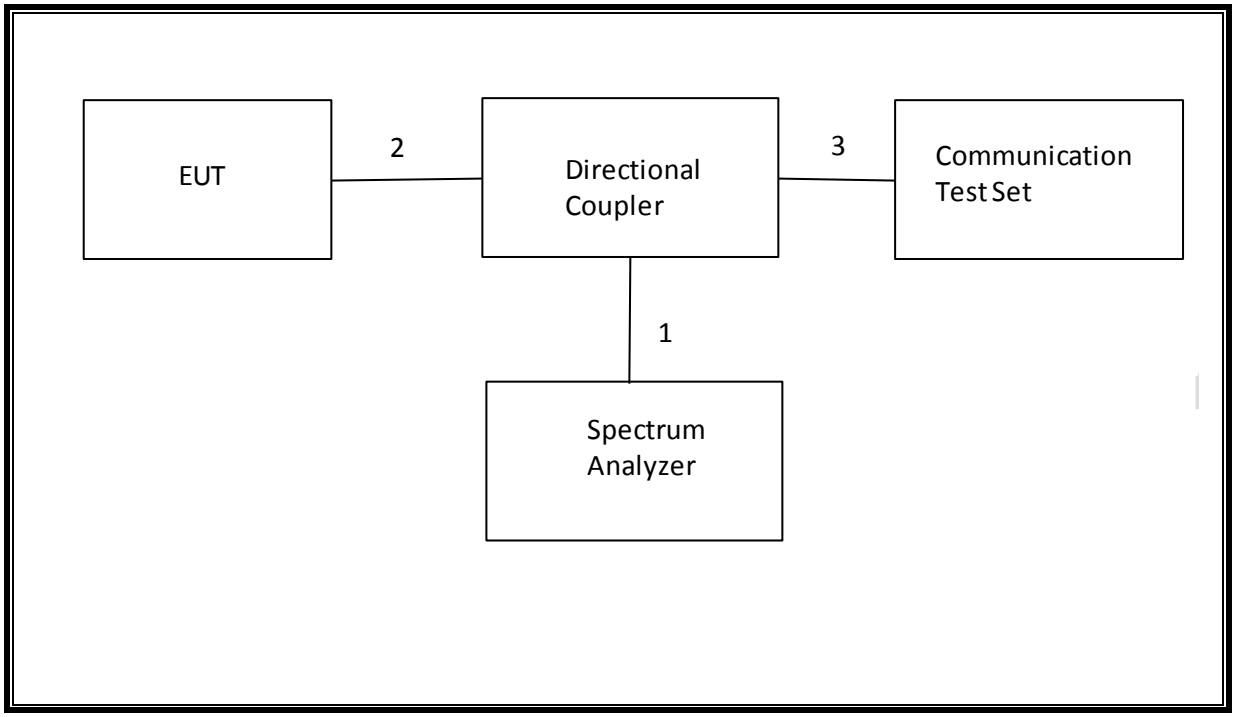
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	USB	1	AC Adapter	Un-shielded	1.2m	No
2	Jack	1	Headset	Shielded	1m	No
3	RF In/out	1	Communication Test Set	Un-shielded	2m	Yes

TEST SETUP

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

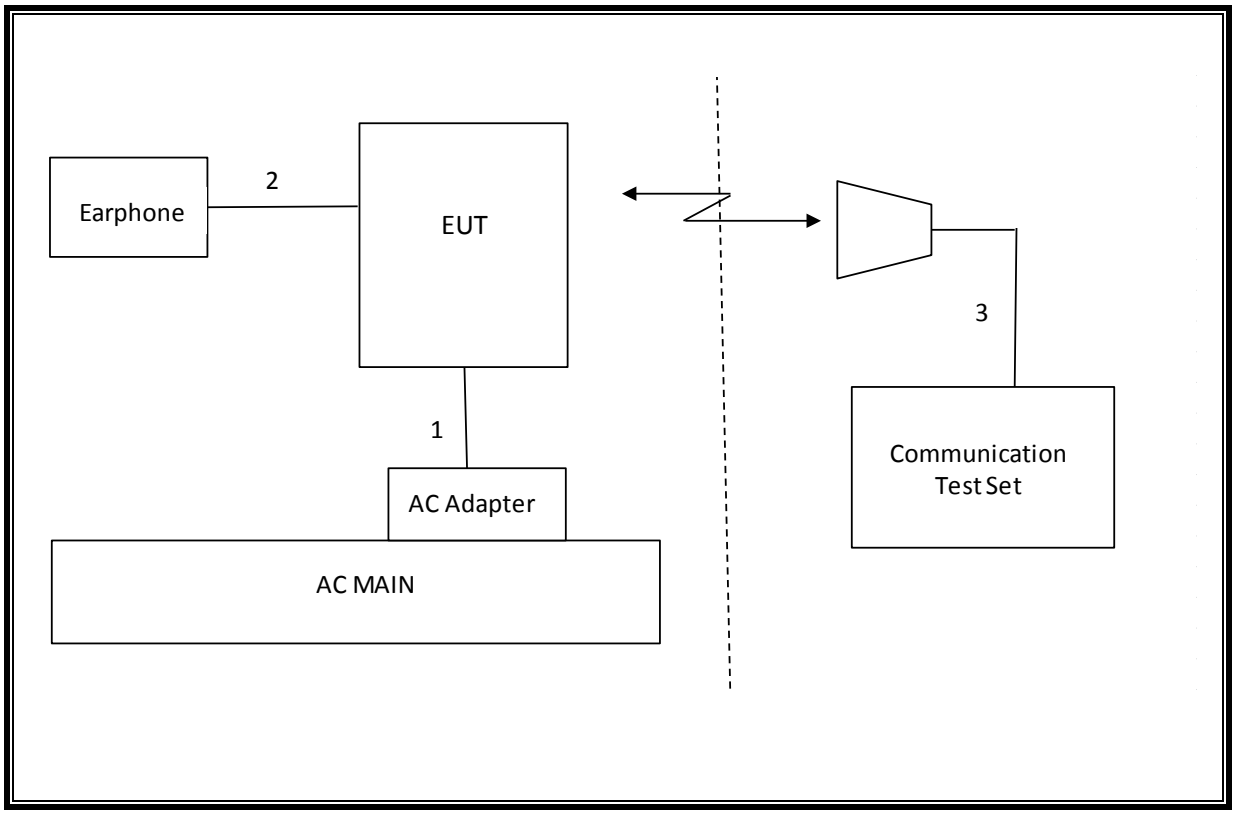
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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	02/26/15
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	08/14/15
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, 26.5 GHz	ARA	MWH-1826/B	C00589	12/17/14

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	Worse Case
2.1049	N/A	Occupied Band width (99%)	N/A	Conducted	Pass	.242 MHz
22.917(a) 24.238(a)	RSS-132(4.5.1) RSS-133(6.5.1)	Band Edge / Conducted Spurious Emission	-13dBm		Pass	-13.22 dBm
2.1046	N/A	Conducted output power	N/A		Pass	dBm
22.355 24.235	RSS-132(4.3) RSS-133(6.3)	Frequency Stability	2.5PPM		Pass	.007PPM
22.913(a)(2)	RSS-132(4.4)	Effective Radiated Power	38 dBm	Radiated	Pass	31.03 dBm
24.232(c)	RSS-133(6.4)	Equivalent Isotropic Radiated Power	33dBm		Pass	23.98 dBm
22.917(a) 24.238(a)	RSS-132(4.5.1) RSS-133(6.5.1)	Radiated Spurious Emission	-13dBm		Pass	-40.9 dBm

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

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

Band	Mode	Ch.	f(MHz)	1 time slot	2 time slot	3 time slot	4 time slot
				Avg (dBm)	Avg (dBm)	Avg (dBm)	Avg (dBm)
GSM850	GMSK	128	824.2	33.5			
		190	836.6	33.5			
		251	848.8	33.5			
	GPRS	128	824.2	33.5	30.3	29.0	27.5
		190	836.6	33.5	30.6	29.0	27.8
		251	848.8	33.5	30.6	29.0	28.0
	EGPRS	128	824.2	27.5	26.0	24.2	24.0
		190	836.6	27.5	26.0	24.2	24.0
		251	848.8	27.5	26.1	24.2	24.0
GSM1900	GMSK	512	1850.2	30.6			
		661	1880	30.9			
		810	1909.8	30.9			
	GPRS	512	1850.2	30.6	28.2	26.4	26.1
		661	1880	30.9	28.5	26.7	26.4
		810	1909.8	30.9	28.3	26.5	26.2
	EGPRS	512	1850.2	26.5	24.9	22.5	22.3
		661	1880	26.5	25.0	22.5	22.6
		810	1909.8	26.5	25.0	22.5	22.4

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	Ch.	f(MHz)	Conducted Power (dBm)
				Avg (dBm)
Band 5	REL99	4132	826.4	23.5
		4183	836.6	23.5
		4233	846.6	23.2
Band 2	REL99	9262	1852.4	23.5
		9400	1880	23.5
		9538	1907.6	23.5

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

8.3. 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			

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

8.3.1. UMTS HSDPA OUTPUT POWER RESULT

Band	Mode	Subset	Ch.	f(MHz)	Conducted Power (dBm)
					Avg (dBm)
Band 5	HSDPA	1	4132	826.4	23.1
			4183	836.6	23.0
			4233	846.6	23.0
		2	4132	826.4	22.6
			4183	836.6	22.6
			4233	846.6	22.5
		3	4132	826.4	22.1
			4183	836.6	22.0
			4233	846.6	21.9
		4	4132	826.4	22.1
			4183	836.6	22.0
			4233	846.6	21.9
Band 2	HSDPA	1	9262	1852.4	22.9
			9400	1880	22.9
			9538	1907.6	23.1
		2	9262	1852.4	22.3
			9400	1880	22.3
			9538	1907.6	22.5
		3	9262	1852.4	21.8
			9400	1880	21.8
			9538	1907.6	22.0
		4	9262	1852.4	21.8
			9400	1880	21.8
			9538	1907.6	22.0

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

8.3.2. 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.

8.3.3. UMTS HSUPA OUTPUT POWER RESULT

Band	Mode	Subset	Ch.	f(MHz)	Conducted Power (dBm) Avg (dBm)
Band 5	HSUPA	1	4132	826.4	23.0
			4183	836.6	22.9
			4233	846.6	22.9
		2	4132	826.4	21.8
			4183	836.6	21.6
			4233	846.6	21.8
		3	4132	826.4	21.8
			4183	836.6	21.8
			4233	846.6	22.0
		4	4132	826.4	22.3
			4183	836.6	22.2
			4233	846.6	22.3
		5	4132	826.4	22.3
			4183	836.6	22.3
			4233	846.6	22.3
Band 2	HSUPA	1	9262	1852.4	22.4
			9400	1880	22.4
			9538	1907.6	22.9
		2	9262	1852.4	21.5
			9400	1880	21.6
			9538	1907.6	21.8
		3	9262	1852.4	21.5
			9400	1880	21.5
			9538	1907.6	21.7
		4	9262	1852.4	22.0
			9400	1880	21.9
			9538	1907.6	22.2
		5	9262	1852.4	22.0
			9400	1880	22.0
			9538	1907.6	22.2

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

8.3.4. DC-HSDPA

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

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

Table E.5.0: Levels for HSDPA connection setup

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

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

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

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

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

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

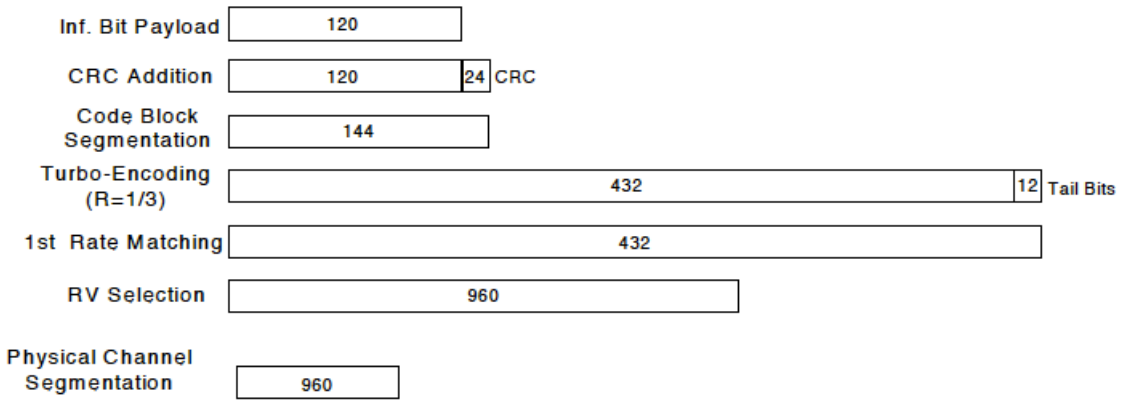


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

	Mode	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 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	Algorithm2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			

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.

	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR	0	0	0.5	0.5
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs = βhs/ βc	30/15			

Up commands are set continuously to set the UE to Max power.

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

8.4. LTE OUTPUT VERIFICATION

8.4.1. LTE OUTPUT RESULT

Band	Frequency	Modulation	BW (MHz)	RB Size	RB Offset	Average Power (dBm)
LTE5	829	QPSK	10	1	0	23.00
				1	24	22.80
				1	49	22.50
				25	0	22.20
				25	11	22.20
				25	24	22.20
				50	0	22.10
	829	16QAM		1	0	21.60
				1	24	21.50
				1	49	21.50
				25	0	21.30
				25	11	21.30
				25	24	21.30
				50	0	21.20
	836.5	QPSK		1	0	23.00
				1	24	22.70
				1	49	22.60
				25	0	22.20
				25	11	22.20
				25	24	22.20
				50	0	22.10
	836.5	16QAM		1	0	22.40
				1	24	22.40
				1	49	22.50
				25	0	21.30
				25	11	21.20
				25	24	21.20
				50	0	21.00
	844	QPSK		1	0	22.50
				1	24	22.20
				1	49	23.00
				25	0	22.10
				25	11	22.10
				25	24	22.00
				50	0	22.00
	844	16QAM		1	0	21.80
				1	24	21.80
				1	49	21.70
				25	0	21.20
				25	11	21.30
				25	24	21.20
				50	0	21.00

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	Frequency	Modulation	BW (MHz)	RB Size	RB Offset	Average Power
LTE5	826.5	QPSK	5	1	0	23.40
				1	11	23.40
				1	24	23.40
				12	0	22.20
				12	5	22.20
				12	11	22.30
				25	0	22.20
	826.5	16QAM		1	0	22.20
				1	11	22.20
				1	24	22.30
				12	0	21.20
				12	5	21.20
				12	11	21.20
				25	0	21.20
	836.5	QPSK		1	0	23.30
				1	11	23.10
				1	24	23.20
				12	0	22.20
				12	5	22.10
				12	11	22.20
				25	0	21.10
	836.5	16QAM		1	0	21.10
				1	11	21.10
				1	24	21.10
				12	0	21.20
				12	5	21.20
				12	11	21.20
				25	0	21.20
	846.5	QPSK		1	0	23.10
				1	11	23.20
				1	24	23.20
				12	0	22.10
				12	5	22.10
				12	11	22.10
				25	0	22.10
	846.5	16QAM		1	0	22.30
				1	11	21.10
				1	24	21.10
				12	0	21.20
				12	5	21.10
				12	11	21.10
				25	0	21.10

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

Band	Frequency	Modulation	BW (MHz)	RB Size	RB Offset	Average Power
LTE5	825.5	QPSK	3	1	0	23.30
				1	7	23.10
				1	14	23.10
				7	0	22.30
				7	2	22.20
				7	6	22.20
				15	0	22.20
	825.5	16QAM		1	0	21.80
				1	7	21.80
				1	14	21.80
				7	0	21.40
				7	2	21.30
				7	6	21.20
				15	0	21.30
	836.5	QPSK		1	0	23.00
				1	7	23.00
				1	14	23.00
				7	0	22.20
				7	2	22.20
				7	6	22.10
				15	0	22.10
	836.5	16QAM		1	0	21.80
				1	7	21.70
				1	14	21.80
				7	0	21.22
				7	2	21.20
				7	6	21.20
				15	0	21.20
	847.5	QPSK		1	0	23.00
				1	7	23.00
				1	14	23.00
				7	0	22.00
				7	2	22.00
				7	6	22.10
				15	0	22.00
	847.5	16QAM		1	0	21.40
				1	7	21.30
				1	14	21.30
				7	0	21.00
				7	2	21.00
				7	6	21.00
				15	0	21.00

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

Band	Frequency (MHz)	Modulation	BW (MHz)	RB Size	RB Offset	Average Power
LTE5	824.7	QPSK	1.4	1	0	23.20
				1	2	23.20
				1	5	23.20
				3	0	23.20
				3	0	23.20
				3	2	23.20
				6	0	22.30
	824.7	16QAM		1	0	21.40
				1	2	22.40
				1	5	22.40
				3	0	22.30
				3	0	22.30
				3	2	22.20
				6	0	21.10
	836.5	QPSK		1	0	23.00
				1	2	23.00
				1	5	23.00
				3	0	23.00
				3	0	23.00
				3	2	23.00
				6	0	22.10
	836.5	16QAM		1	0	21.40
				1	2	21.40
				1	5	21.40
				3	0	22.20
				3	0	22.20
				3	2	22.20
				6	0	21.30
	848.3	QPSK		1	0	23.00
				1	2	23.00
				1	5	23.00
				3	0	22.90
				3	0	22.90
				3	2	22.90
				6	0	22.10
	848.3	16QAM		1	0	21.60
				1	2	21.50
				1	5	21.50
				3	0	22.10
				3	0	22.10
				3	2	22.10
				6	0	21.10

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

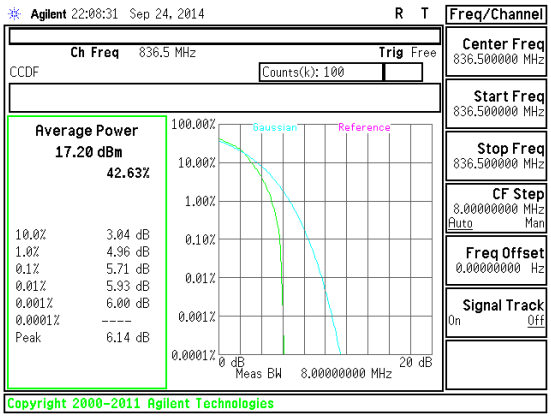
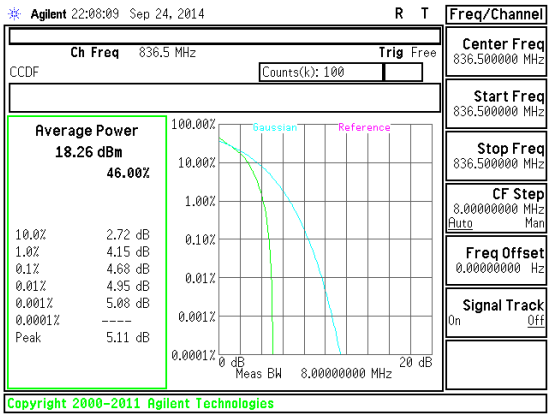
Per KDB 971168 D01 Power Meas License Digital Systems v02r01

Test Spec

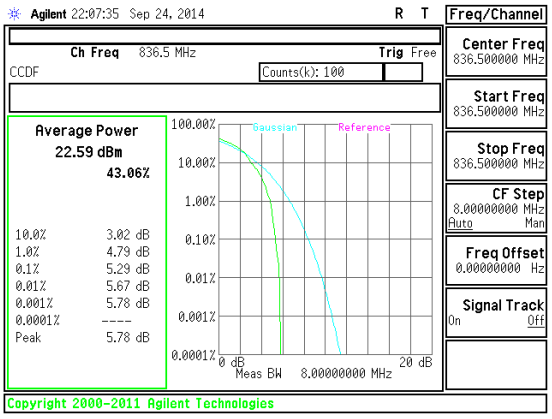
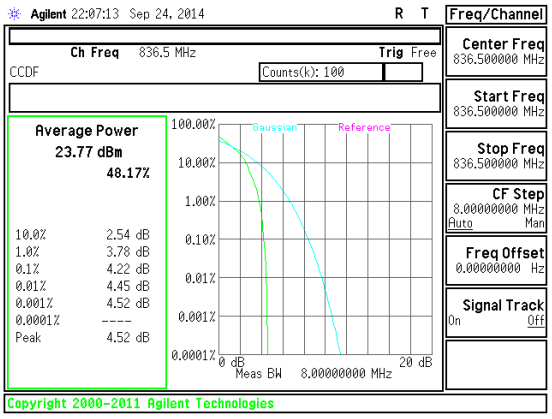
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

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

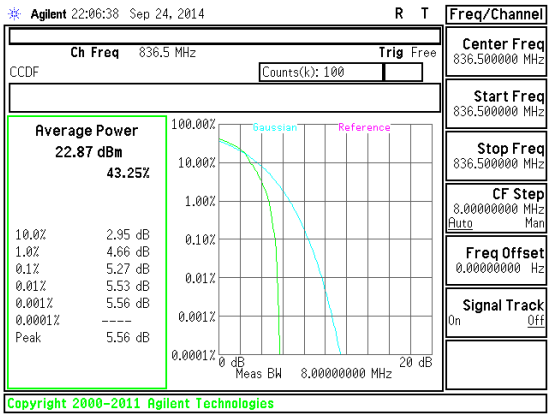
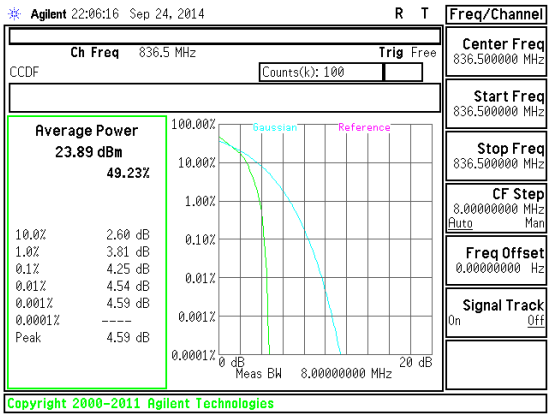
9.1. CONDUCTED PEAK TO AVERAGE RESULT

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

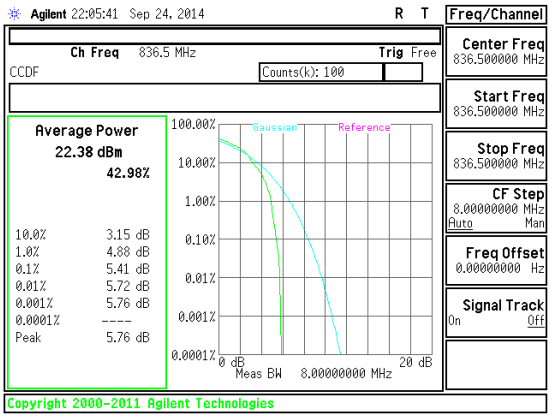
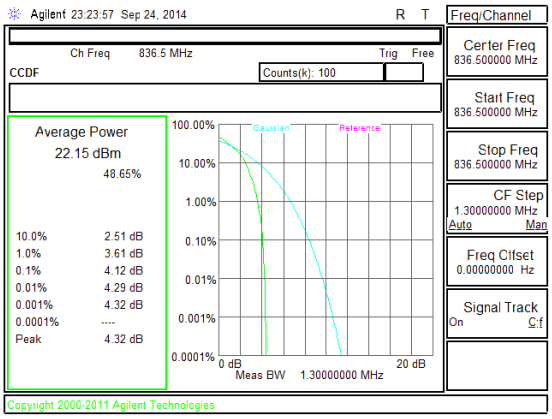
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

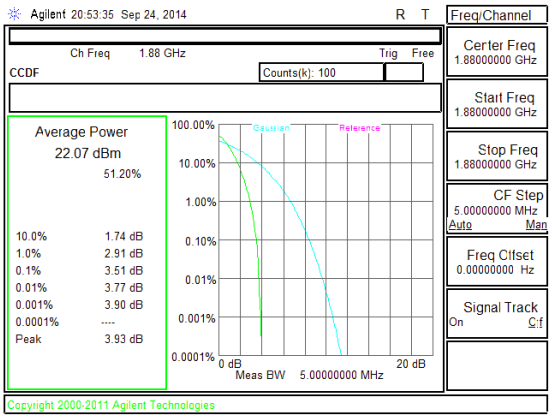
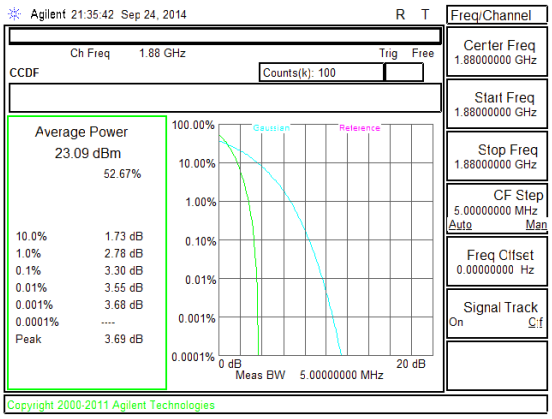
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

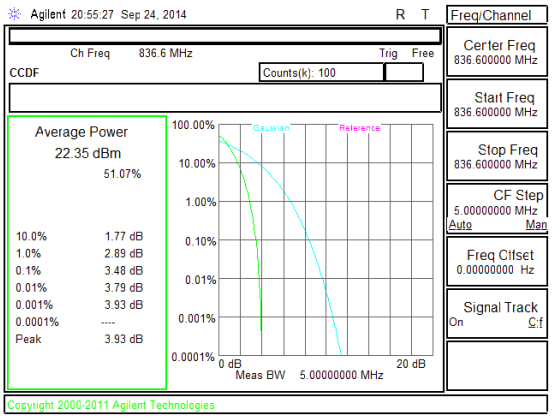
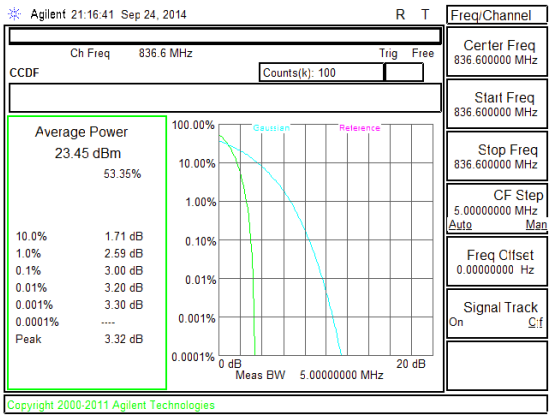
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

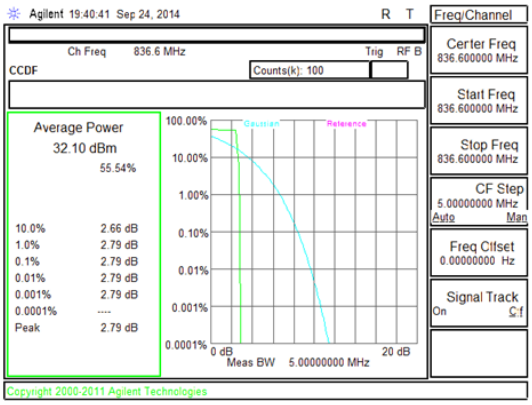
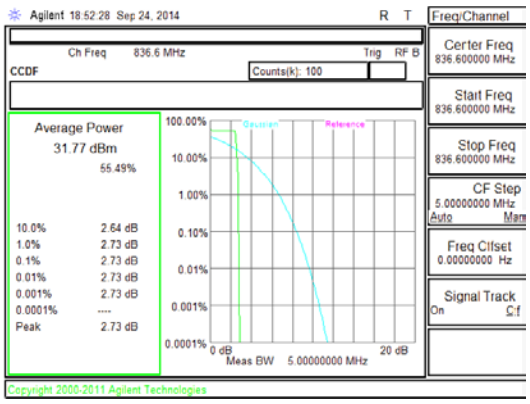
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

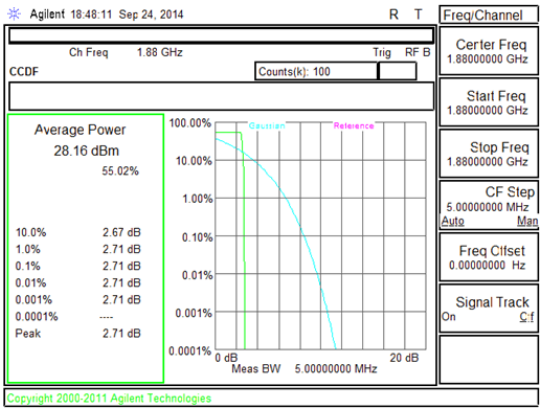
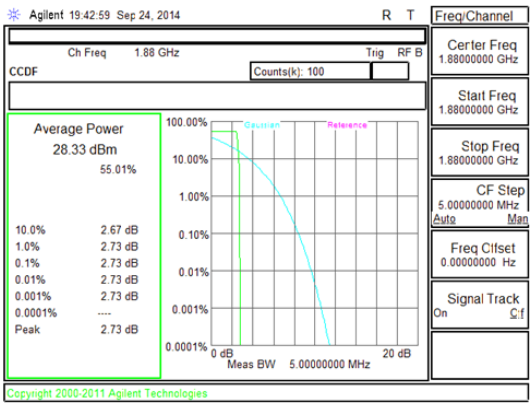
Band Band 2 HSDPA	 Band WCDMA B2 HSDPA	 Band WCDMA B2 REL99

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

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

GSM 850	 GSM 850 GPRS	 GSM 850 EGPRS

GSM 1900	 GSM 1900 GPRS	 GSM 1900 EGPRS

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 v02r01 - 06/07/2013)

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 OCCUPIED BANDWIDTH RESULTS

Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
GSM850	GMSK	128	824.2		
		190	836.6		
		251	848.8		
	GPRS	128	824.2	0.243	0.323
		190	836.6	0.249	0.325
		251	848.8	0.245	0.314
	EGPRS	128	824.2	0.246	0.320
		190	836.6	0.245	0.320
		251	848.8	0.243	0.319
GSM1900	GMSK	512	1850.2		
		661	1880		
		810	1909.8		
	GPRS	512	1850.2	0.244	0.315
		661	1880	0.243	0.315
		810	1909.8	0.251	0.321
	EGPRS	512	1850.2	0.246	0.322
		661	1880	0.242	0.320
		810	1909.8	0.244	0.322

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

WCDMA OCCUPIED BANDWIDTH RESULTS

Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
Band 5	REL99	4132	826.4	4.160	4.61
		4183	836.6	4.151	4.636
		4233	846.6	4.149	4.63
	HSDPA	4132	826.4	4.169	4.609
		4183	836.6	4.148	4.625
		4233	846.6	4.144	4.616
	HSUPA	4132	826.4		
		4183	836.6		
		4233	846.6		
Band 2	REL99	9262	1852.4	4.157	4.63
		9400	1880	4.136	4.669
		9538	1907.6	4.151	4.648
	HSDPA	9262	1852.4	4.154	4.639
		9400	1880	4.158	4.618
		9538	1907.6	4.159	4.62
	HSUPA	9262	1852.4		
		9400	1880		
		9538	1907.6		

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

Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW (KHz)
LTE5	10	QPSK	50/0	829	8.943	9.714
			50/0	836.5	8.946	9.721
			50/0	844	8.939	9.754
		16QAM	50/0	829	8.962	9.663
			50/0	836.5	8.922	9.720
			50/0	844	8.934	9.709

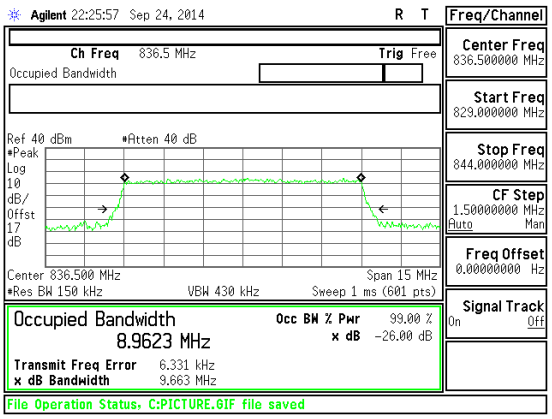
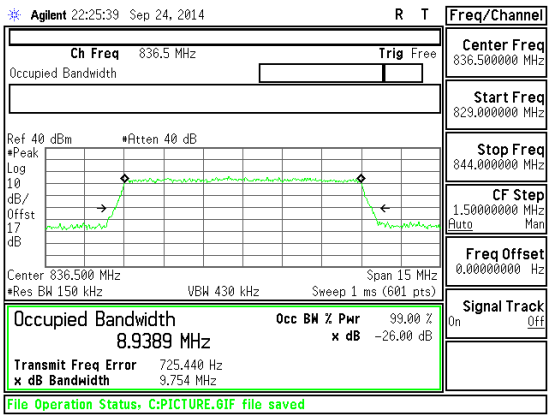
Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW (KHz)
LTE5	5	QPSK	25/0	826.5	4.502	4.864
			25/0	836.5	4.485	4.897
			25/0	846.5	4.491	4.990
		16QAM	25/0	826.5	4.493	4.935
			25/0	836.5	4.495	4.924
			25/0	846.5	4.490	4.949

Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW (KHz)
LTE5	3	QPSK	15/0	825.5	2.680	2.972
			15/0	836.5	2.682	2.958
			15/0	847.5	2.677	2.950
		16QAM	15/0	825.5	2.681	2.941
			15/0	836.5	2.695	2.976
			15/0	847.5	2.693	2.967

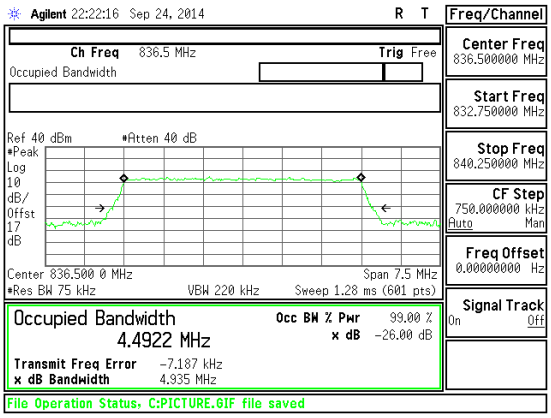
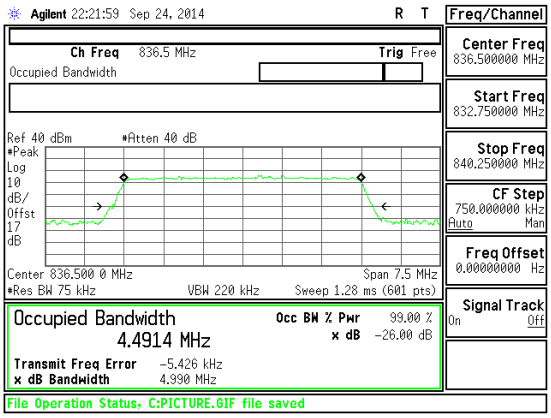
Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW (KHz)
LTE5	1.4	QPSK	6/0	824.7	1.076	1.237
			6/0	836.5	1.080	1.285
			6/0	848.3	1.080	1.271
		16QAM	6/0	824.7	1.086	1.278
			6/0	836.5	1.087	1.267
			6/0	848.3	1.086	1.278

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

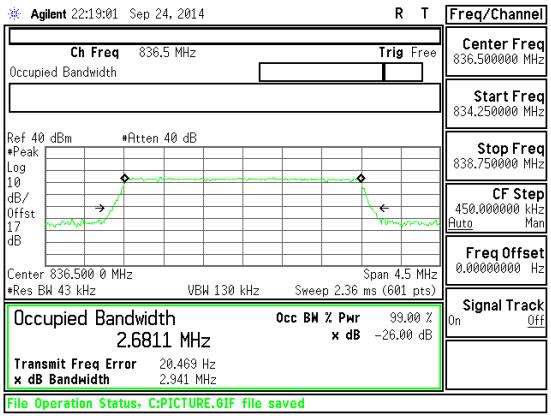
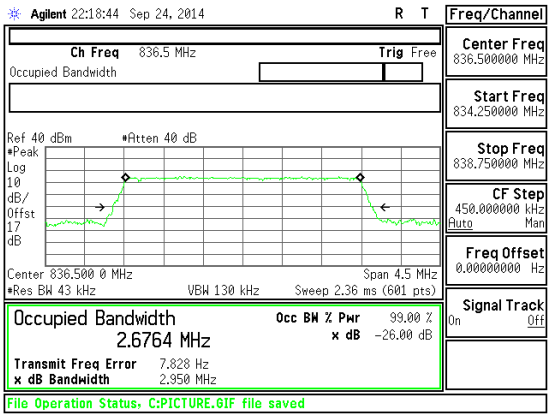
10.1.1. OCCUPIED BANDWIDTH PLOTS

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

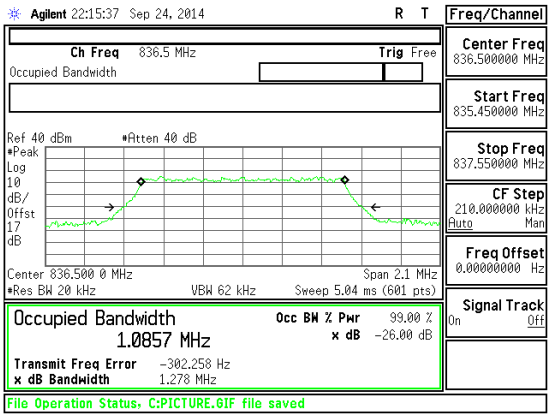
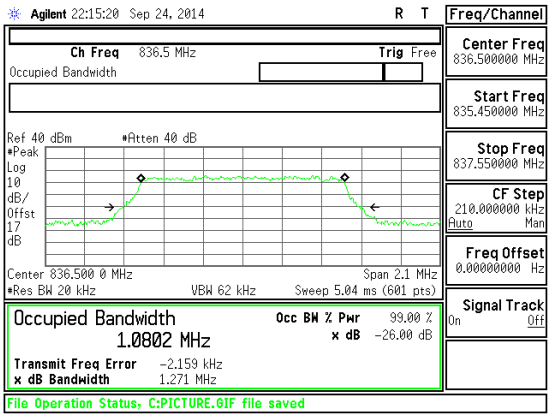
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

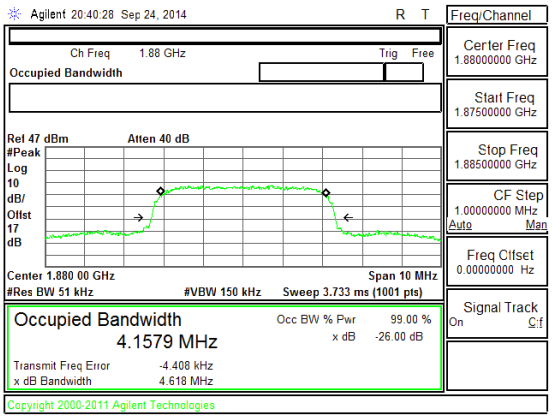
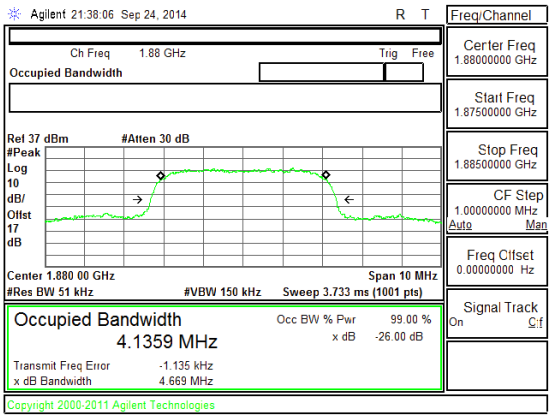
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

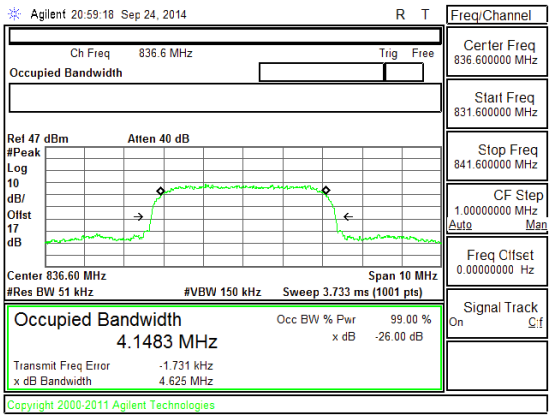
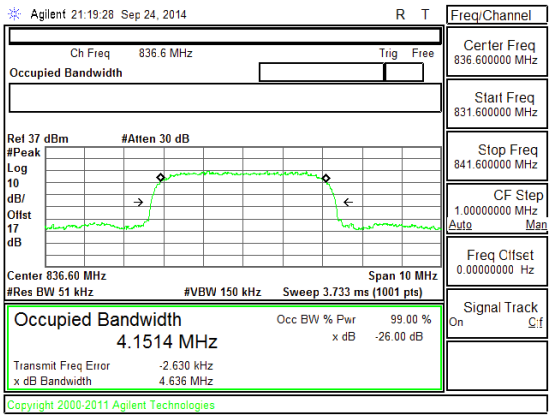
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

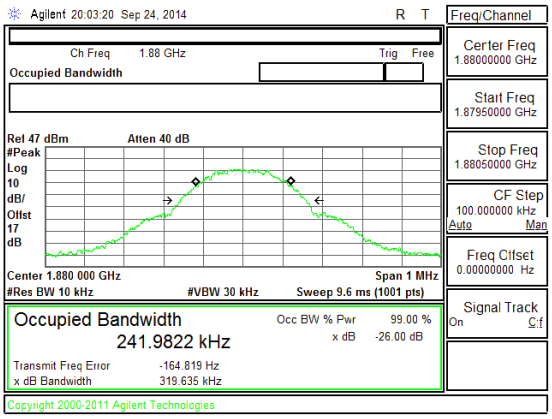
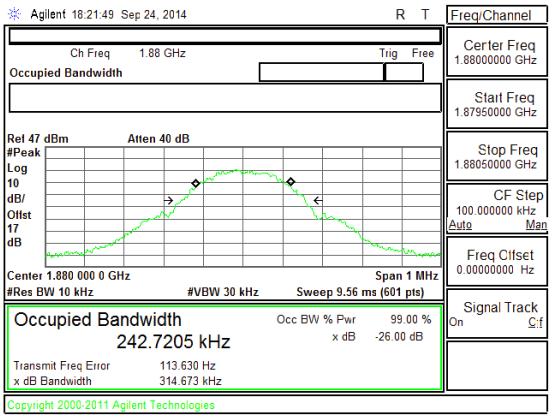
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

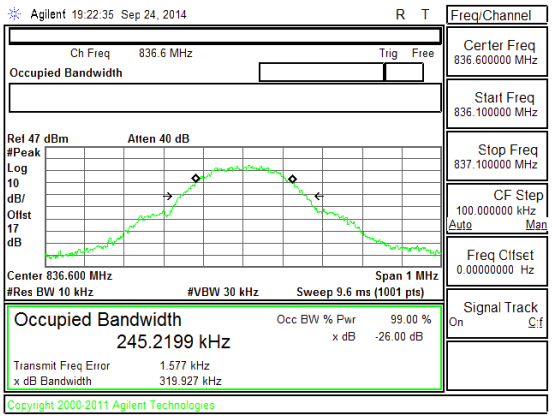
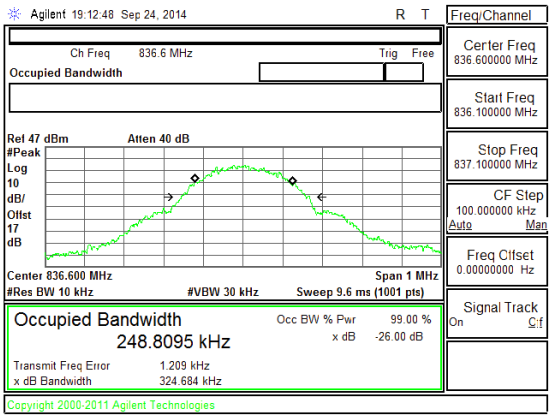
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

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

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.

10.2. 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.

Part 27: (m)(4) For mobile station, the attenuation factor shall be not less than 43+10Log(P)dB at the channel edge and (55+10Log(P)dB) at 5.5MHz from the channel edges.

Part 90:
(a)(1)For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
(a)(2)For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz. {NOTE: Use 100 kHz reference bandwidth.}

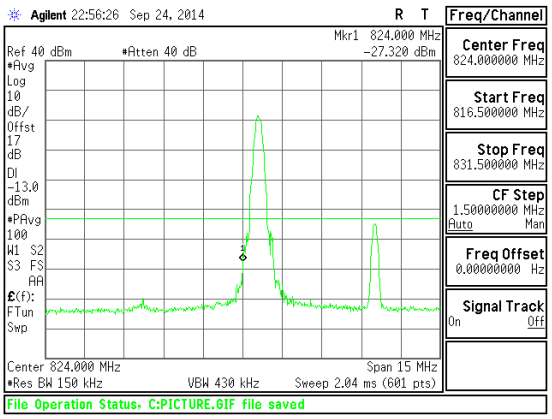
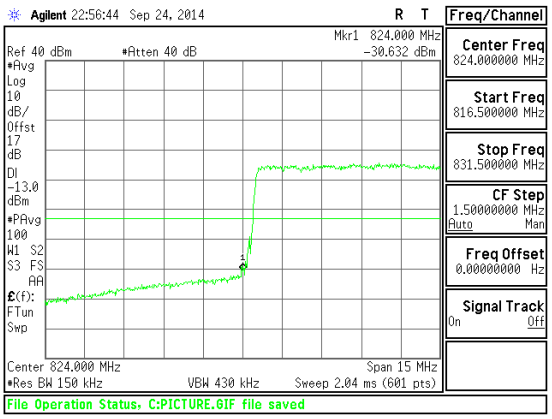
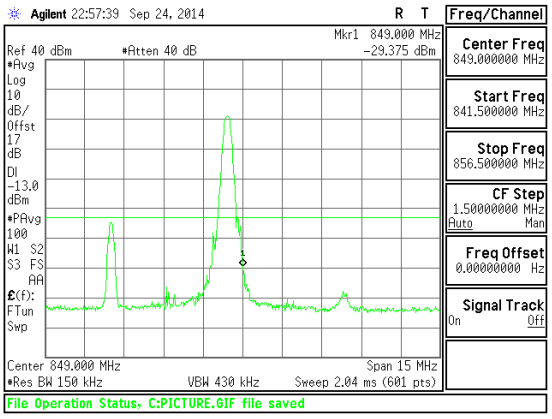
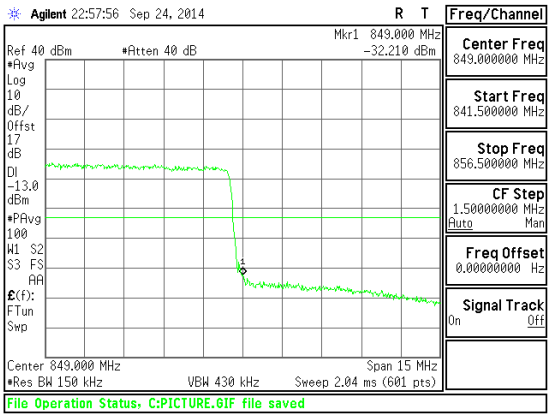
TEST PROCEDURE

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.

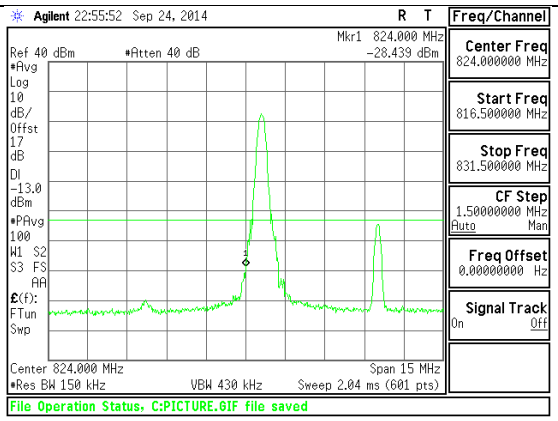
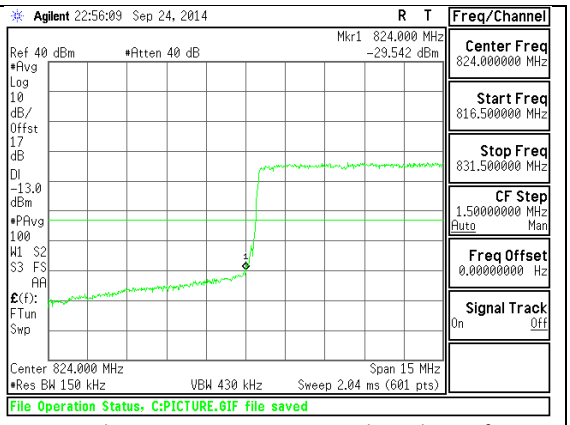
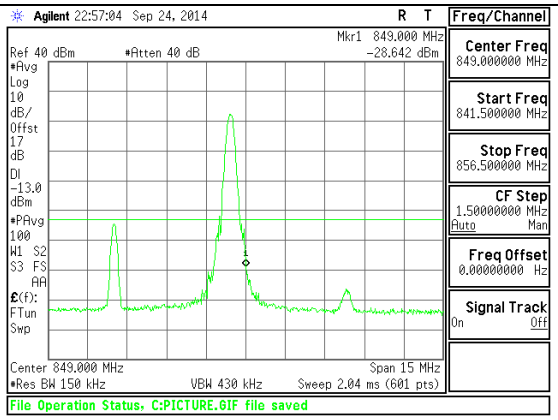
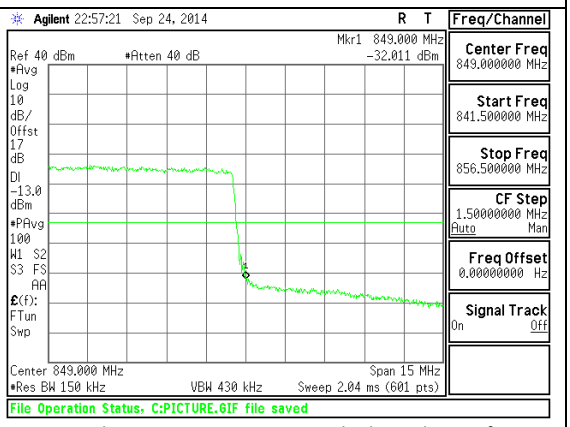
RESULTS

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

10.2.1. BAND EDGE PLOTS

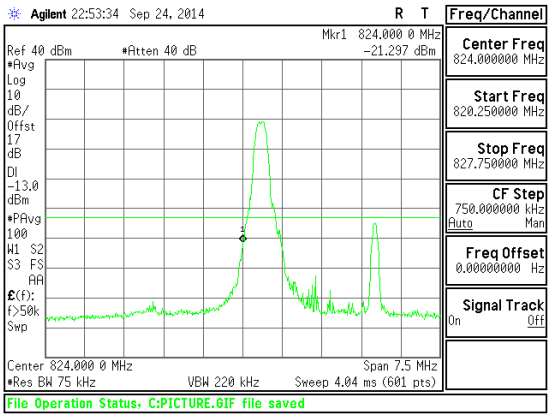
Band LTE5 10MHz 16QAM	 Band LTE5 10MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 10MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 10MHz 16QAM	 Band LTE5 10MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 10MHz CBE 16QAM High Channel FRB.gif

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

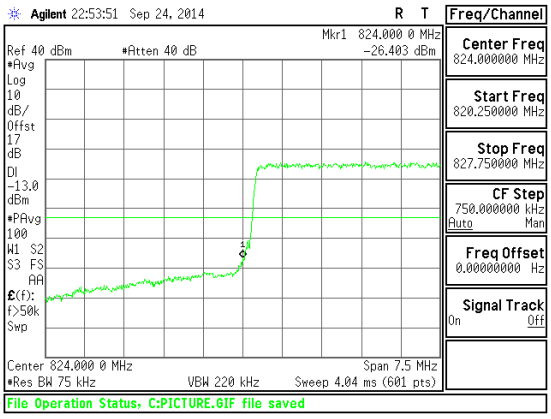
Band LTE5 10MHz QPSK	 Band LTE5 10MHz CBE QPSK Low Channel 1RB.gif	 Band LTE5 10MHz CBE QPSK Low Channel FRB.gif
Band LTE5 10MHz QPSK	 Band LTE5 10MHz CBE QPSK High Channel 1RB.gif	 Band LTE5 10MHz CBE QPSK High Channel FRB.gif

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

Band LTE5 5MHz 16QAM

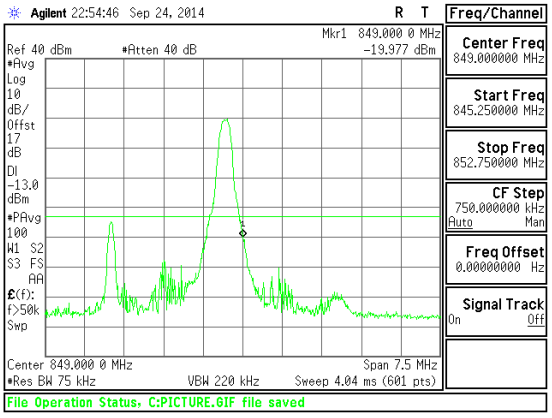


Band LTE5 5MHz CBE 16QAM Low Channel 1RB.gif

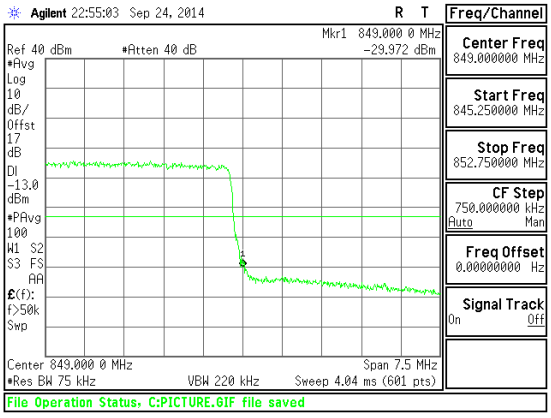


Band LTE5 5MHz CBE 16QAM Low Channel FRB.gif

Band LTE5 5MHz 16QAM



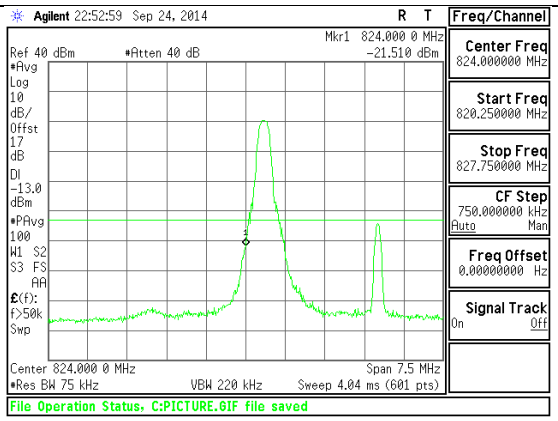
Band LTE5 5MHz CBE 16QAM High Channel 1RB.gif



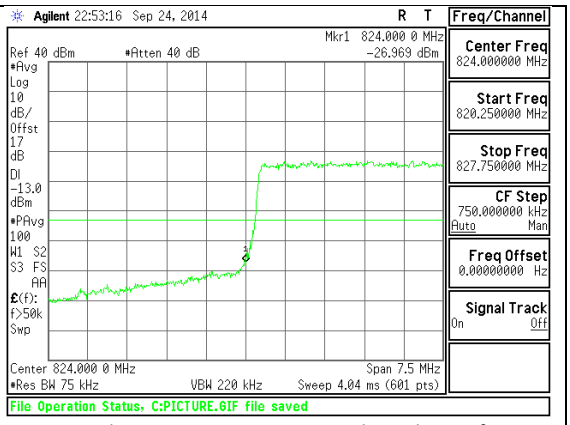
Band LTE5 5MHz CBE 16QAM High Channel FRB.gif

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 LTE5 5MHz QPSK

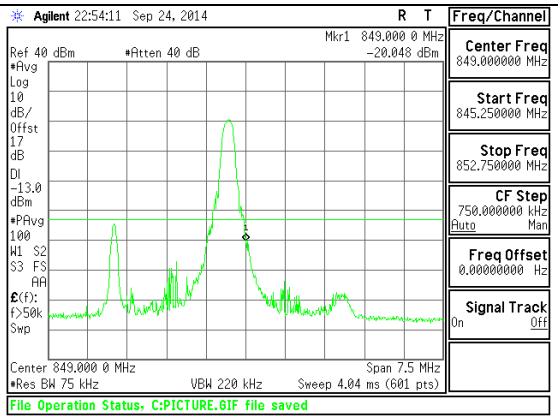


Band LTE5 5MHz CBE QPSK Low Channel 1RB.gif

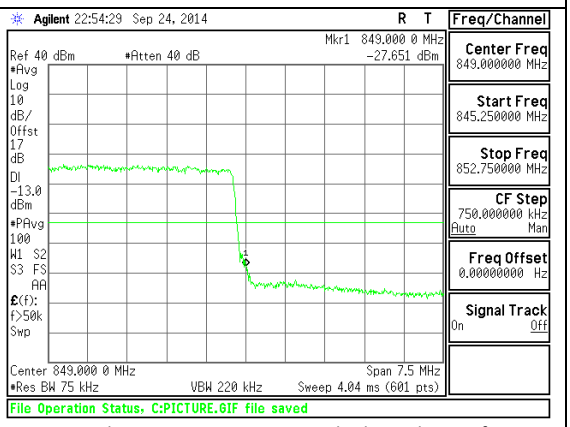


Band LTE5 5MHz CBE QPSK Low Channel FRB.gif

Band LTE5 5MHz QPSK



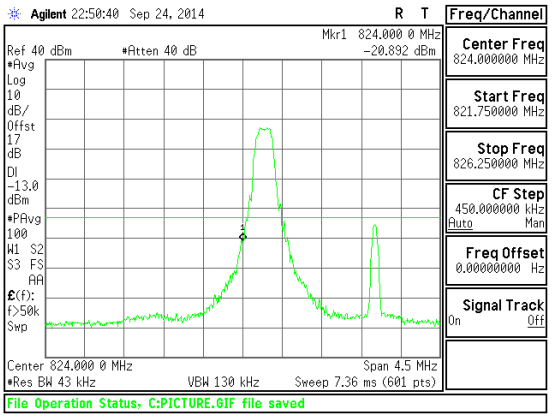
Band LTE5 5MHz CBE QPSK High Channel 1RB.gif



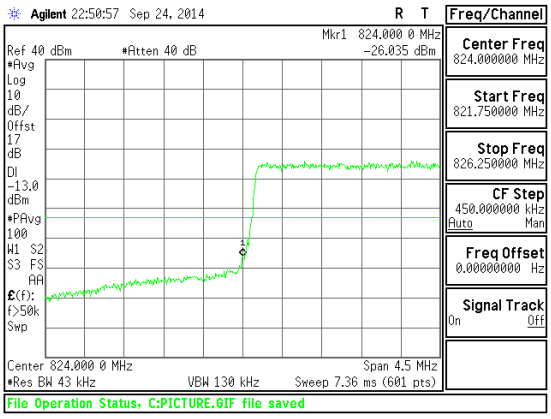
Band LTE5 5MHz CBE QPSK High Channel FRB.gif

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

Band LTE5 3MHz 16QAM

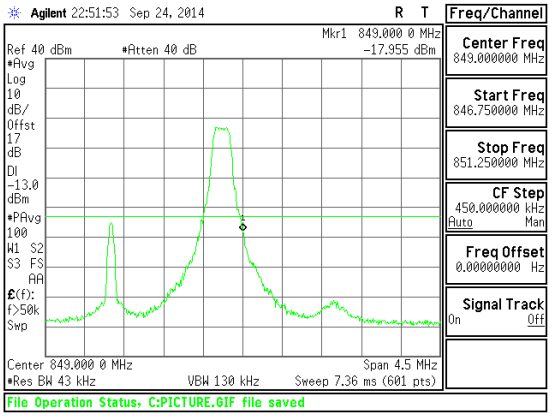


Band LTE5 3MHz CBE 16QAM Low Channel 1RB.gif

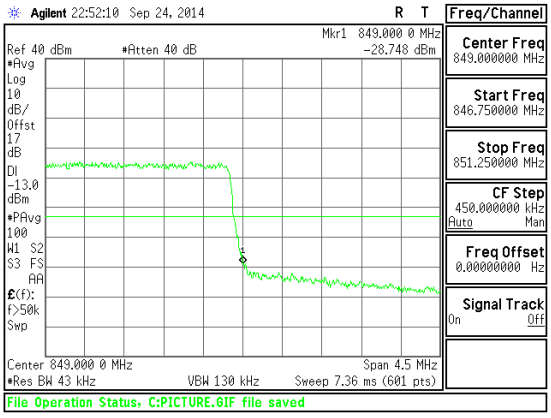


Band LTE5 3MHz CBE 16QAM Low Channel FRB.gif

Band LTE5 3MHz 16QAM



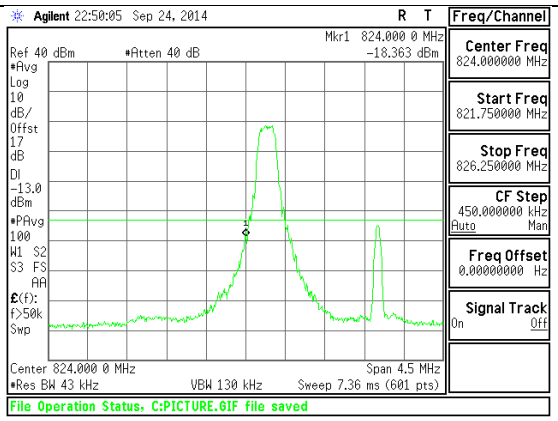
Band LTE5 3MHz CBE 16QAM High Channel 1RB.gif



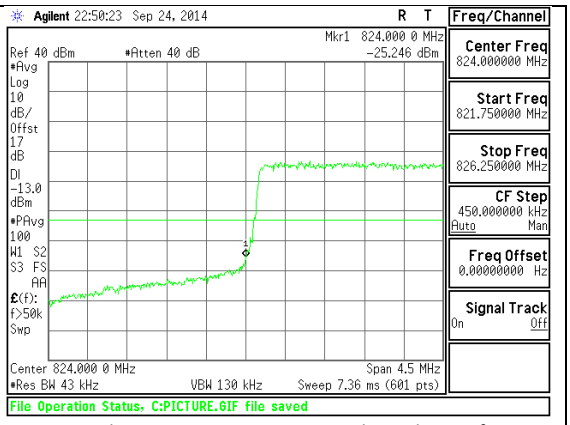
Band LTE5 3MHz CBE 16QAM High Channel FRB.gif

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

Band LTE5 3MHz QPSK

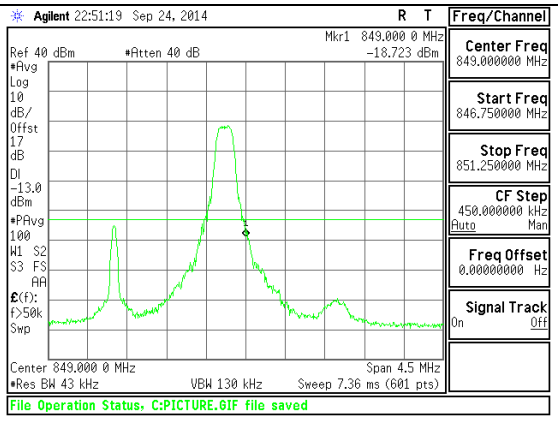


Band LTE5 3MHz CBE QPSK Low Channel 1RB.gif

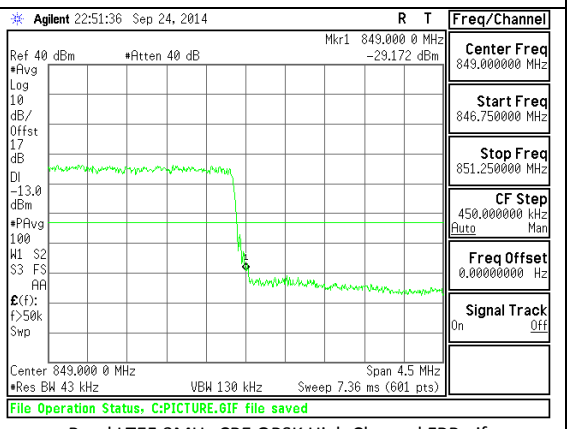


Band LTE5 3MHz CBE QPSK Low Channel FRB.gif

Band LTE5 3MHz QPSK

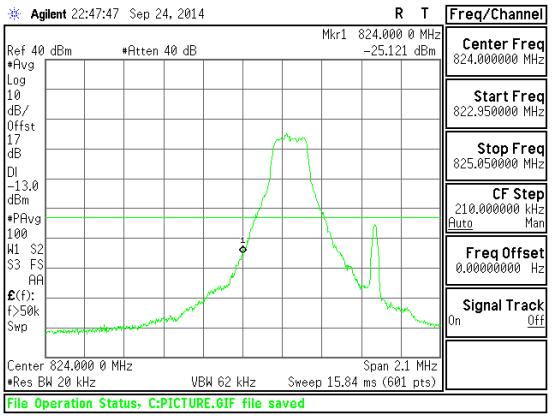
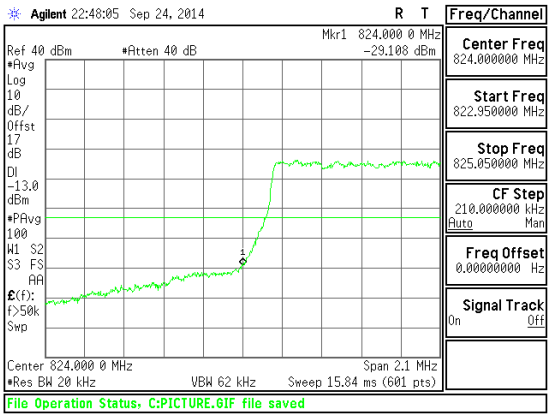
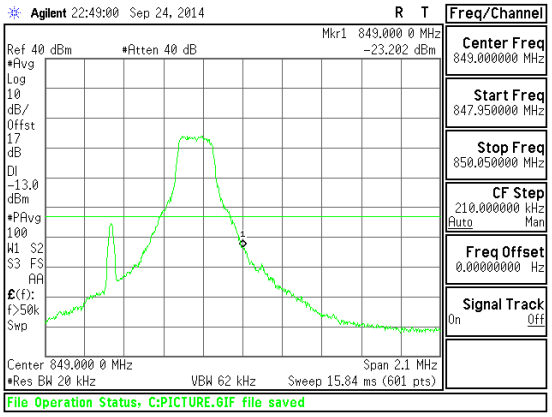
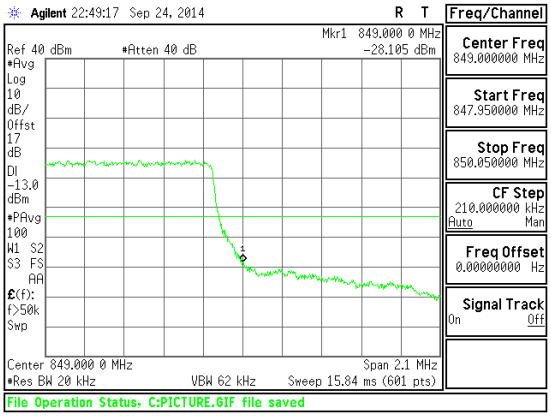


Band LTE5 3MHz CBE QPSK High Channel 1RB.gif



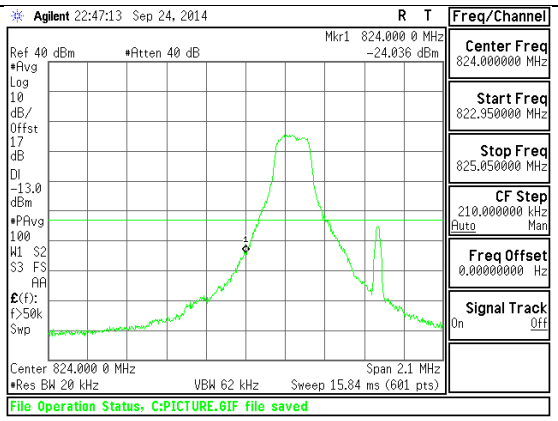
Band LTE5 3MHz CBE QPSK High Channel FRB.gif

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

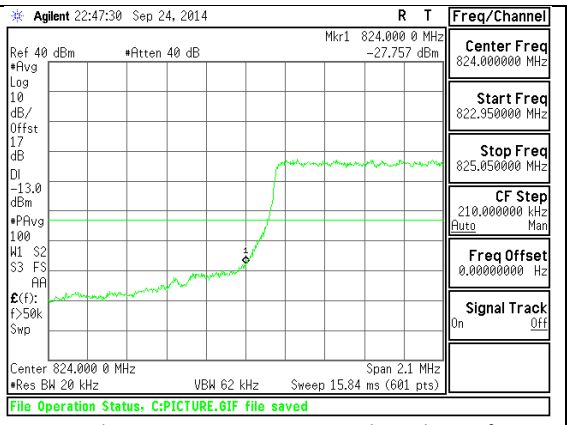
Band LTE5 1.4MHz 16QAM	 Band LTE5 1.4MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 1.4MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 1.4MHz 16QAM	 Band LTE5 1.4MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 1.4MHz CBE 16QAM High Channel FRB.gif

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

Band LTE5 1.4MHz QPSK

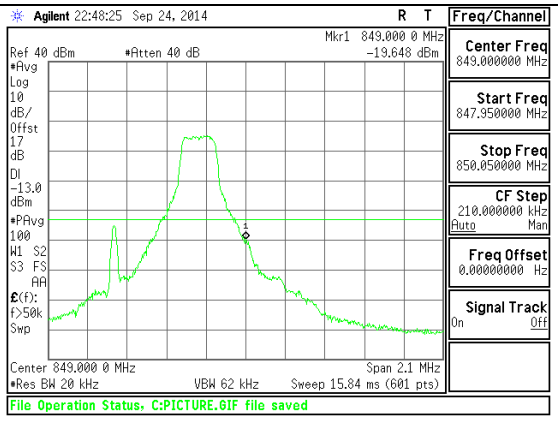


Band LTE5 1.4MHz CBE QPSK Low Channel 1RB.gif

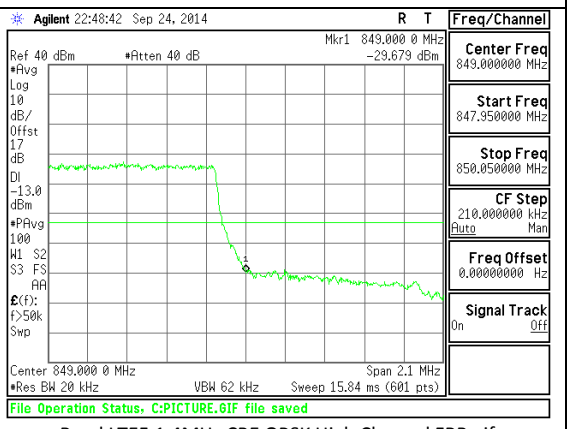


Band LTE5 1.4MHz CBE QPSK Low Channel FRB.gif

Band LTE5 1.4MHz QPSK

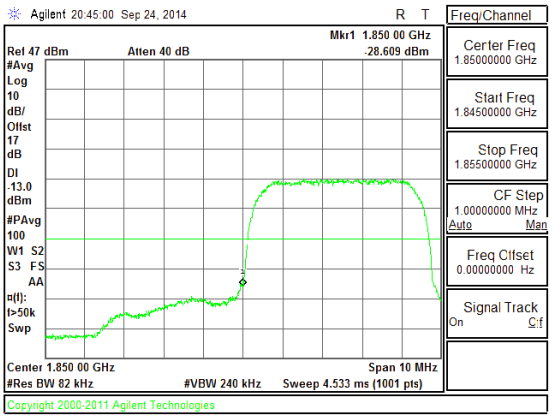
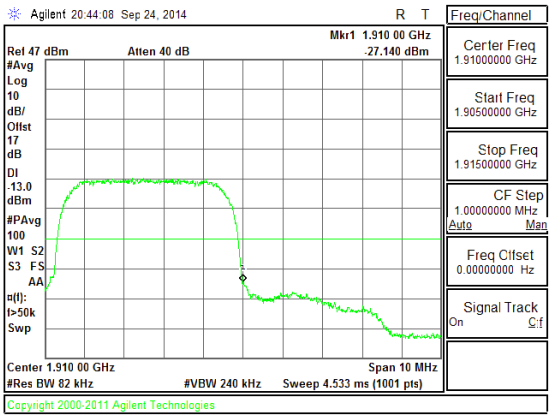
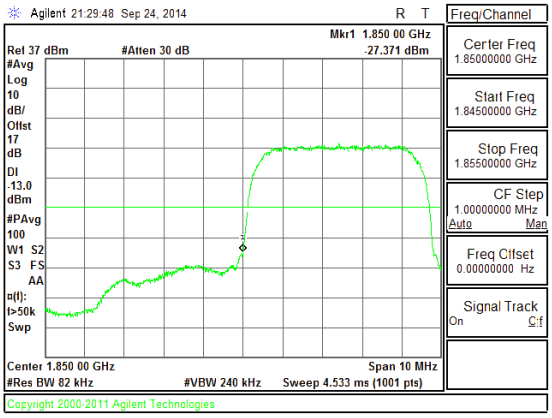
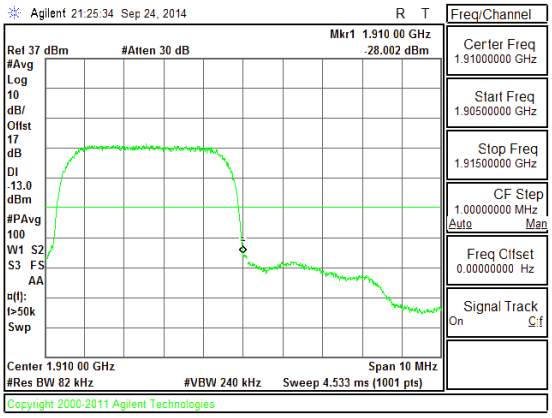


Band LTE5 1.4MHz CBE QPSK High Channel 1RB.gif

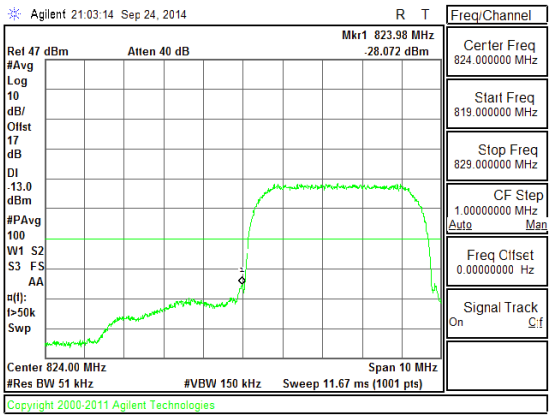
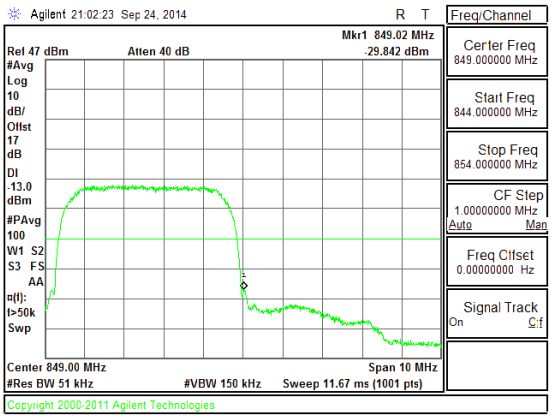
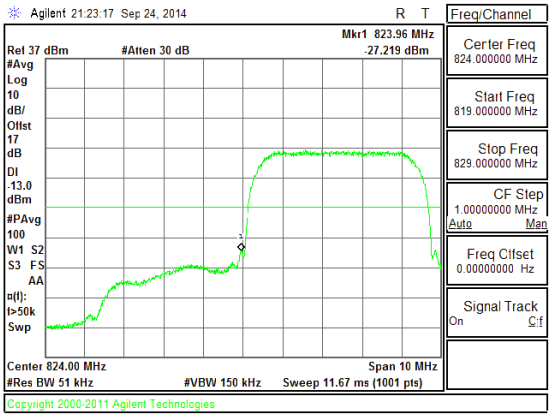
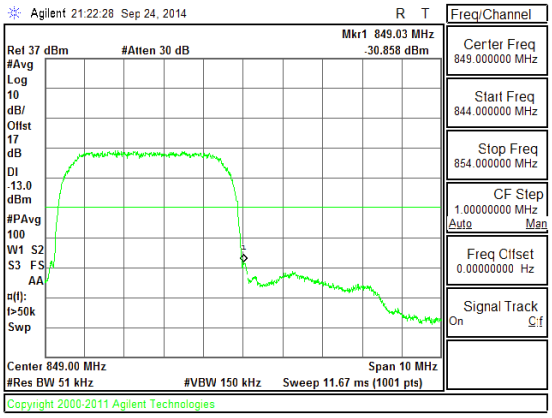


Band LTE5 1.4MHz CBE QPSK High Channel FRB.gif

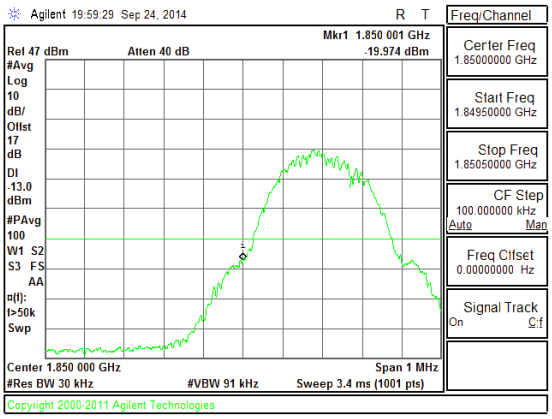
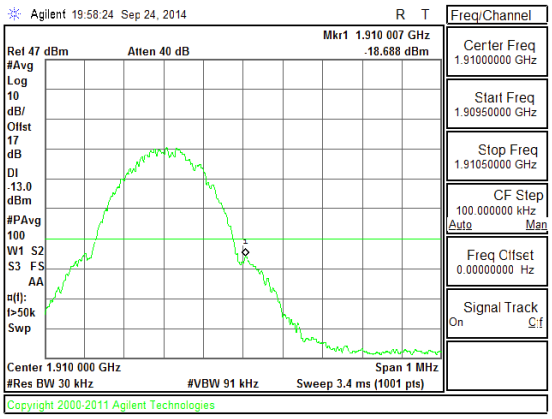
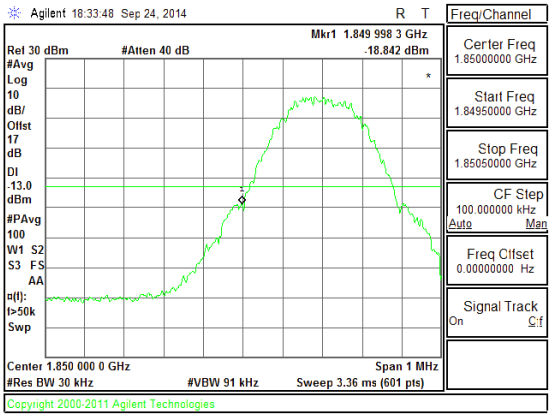
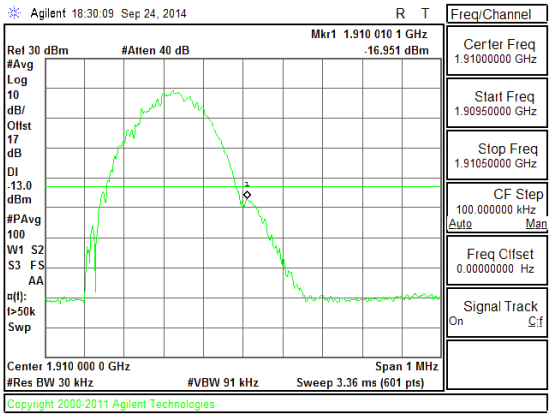
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band Band 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

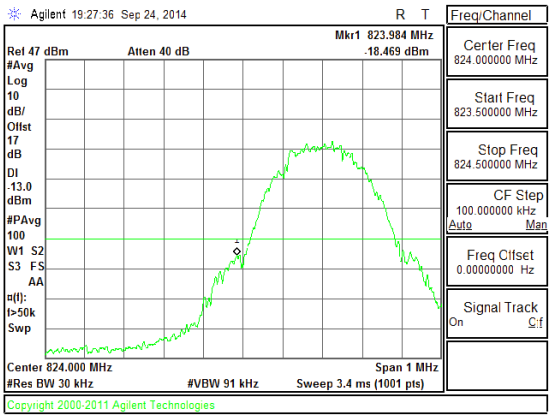
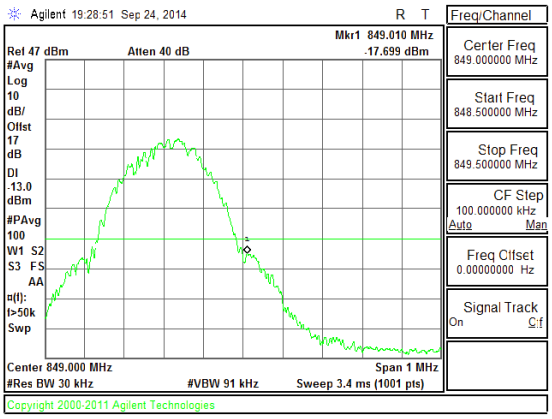
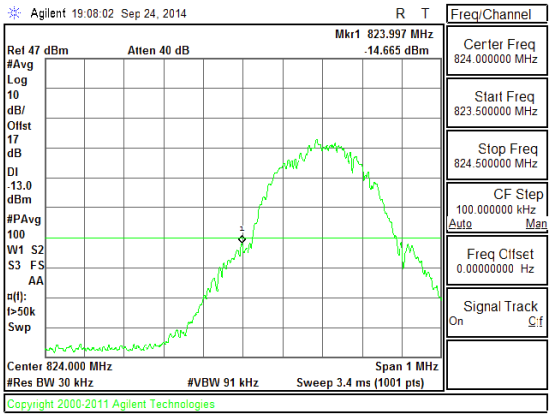
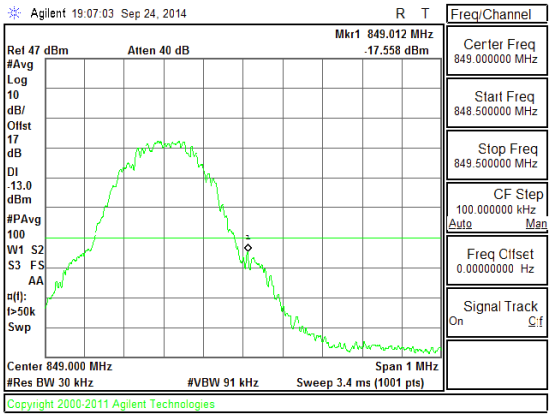
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

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

Band GSM 1900 EGPRS	 Band GSM1900 EGPRS CBE Low channel	 Band GSM1900 EGPRS CBE High channel
Band GSM 1900 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 GSM 850 EGPRS	 Band GSM850 EGPRS CBE Low channel	 Band GSM850 EGPRS 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.

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.

Part 27: (m)(4) For mobile station, the attenuation factor shall be not less than 43+10Log(P)dB at the channel edge and (55+10Log(P)dB) at 5.5MHz from the channel edges.

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

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

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE5	10	QPSK	829	-14.41	-13	-1.41
			836.5	-13.76	-13	-0.76
			844	-13.67	-13	-1.8
		16QAM	829	-14.72	-13	-1.72
			836.5	-13.67	-13	-1.2
			844	-13.25	-13	-0.25

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE5	5	QPSK	826.5	-13.61	-13	-0.61
			836.5	-14.43	-13	-1.43
			846.5	-13.5	-13	-0.5
		16QAM	826.5	-14.05	-13	-1.05
			836.5	-14.33	-13	-1.33
			846.5	-13.43	-13	-0.43

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE5	3	QPSK	825.5	-14.36	-13	-1.36
			836.5	-14.36	-13	-1.36
			847.5	-14.31	-13	-1.31
		16QAM	825.5	-13.75	-13	-0.75
			836.5	-14	-13	-1
			847.5	-13.22	-13	-0.22

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE5	1.4	QPSK	824.7	-14.35	-13	-1.35
			836.5	-14.13	-13	-1.13
			848.3	-14.3	-13	-1.3
		16QAM	824.7	-14.32	-13	-1.32
			836.5	-14.33	-13	-1.33
			848.3	-13.46	-13	-0.46

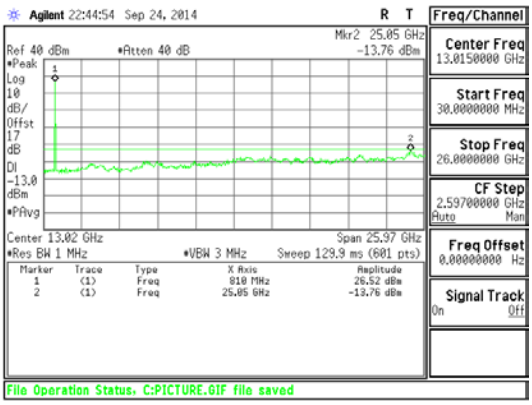
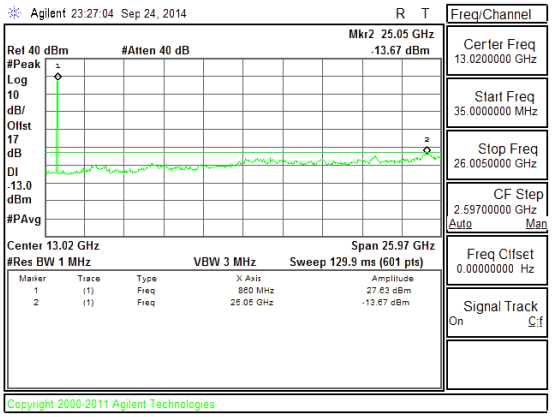
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Band	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
GSM850	GPRS	824.2	-26.92	-13	-13.92
		836.6	-26.7	-13	-13.7
		848.8	-26.91	-13	-13.91
	EGPRS	824.2	-26.24	-13	-13.24
		836.6	-25.92	-13	-12.92
		848.8	-25.78	-13	-12.78
GSM1900	GPRS	1850.2	-16.51	-13	-3.51
		1880	-16.41	-13	-3.41
		1909.8	-15.38	-13	-2.38
	EGPRS	1850.2	-17.02	-13	-4.02
		1880	-16.04	-13	-3.04
		1909.8	-16.92	-13	-3.92

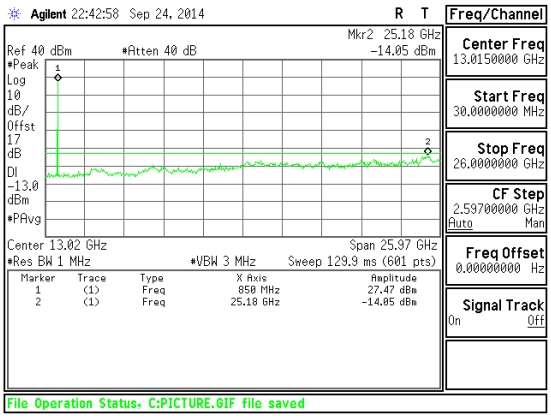
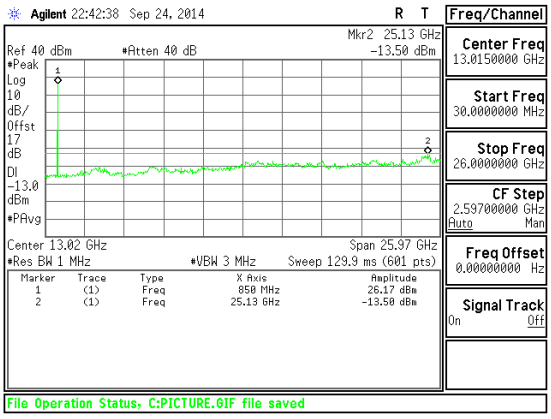
Band	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
Band 5	REL99	826.4	-26.82	-13	-13.82
		836.6	-26.84	-13	-13.84
		846.6	-26.4	-13	-13.4
	HSDPA	826.4	-27.31	-13	-14.31
		836.6	-26.92	-13	-13.92
		846.6	-27.42	-13	-14.42
Band 2	REL99	1852.4	-26.58	-13	-13.58
		1880	-26.49	-13	-13.49
		1907.6	-26.67	-13	-13.67
	HSDPA	1852.4	-16.07	-13	-3.07
		1880	-17.18	-13	-4.18
		1907.6	-17.36	-13	-4.36

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

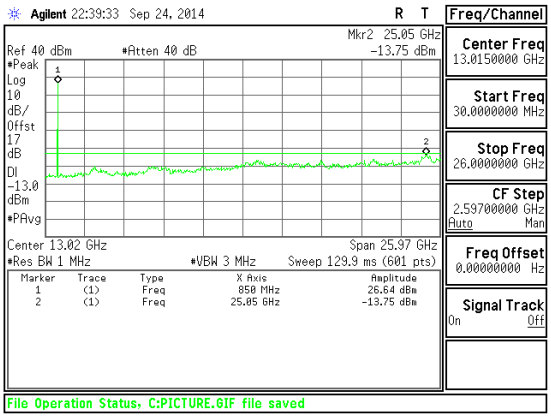
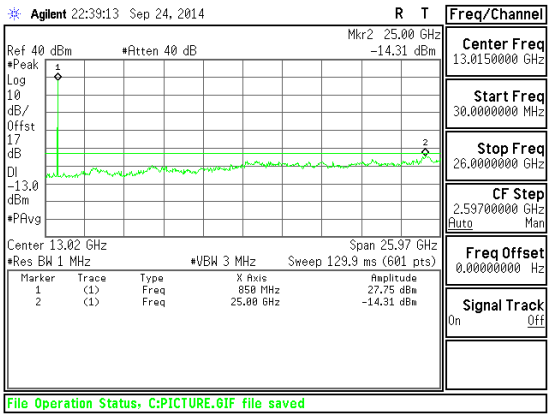
10.3.2. OUT OF BAND EMISSIONS PLOTS

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

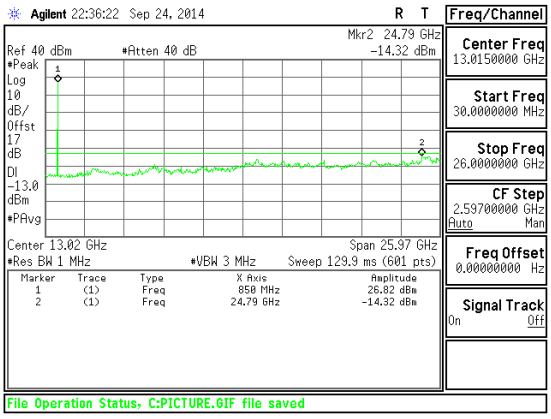
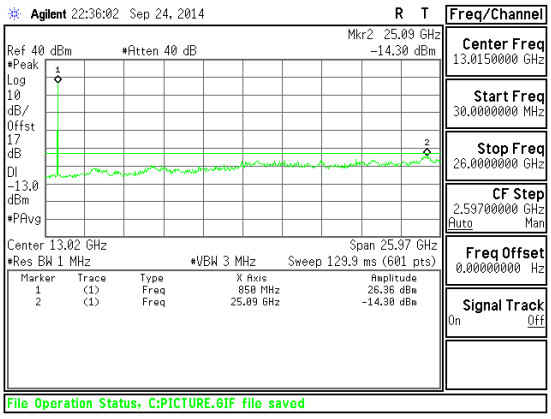
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

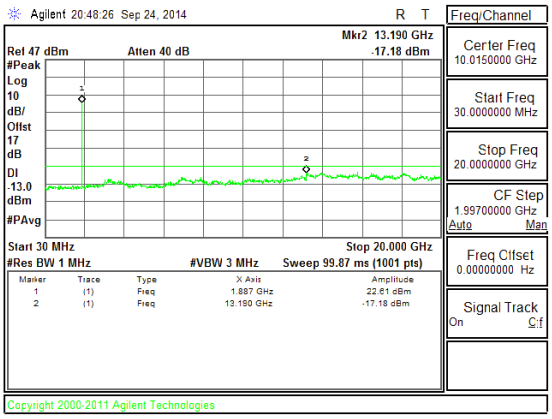
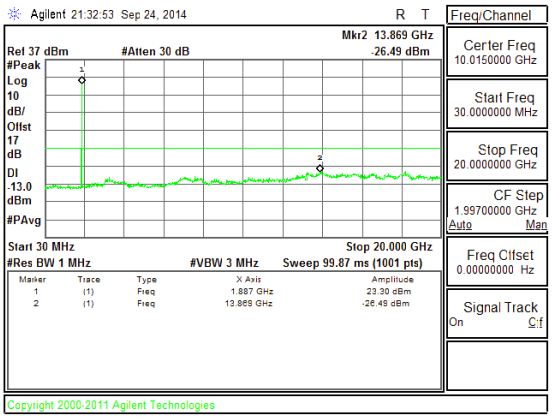
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

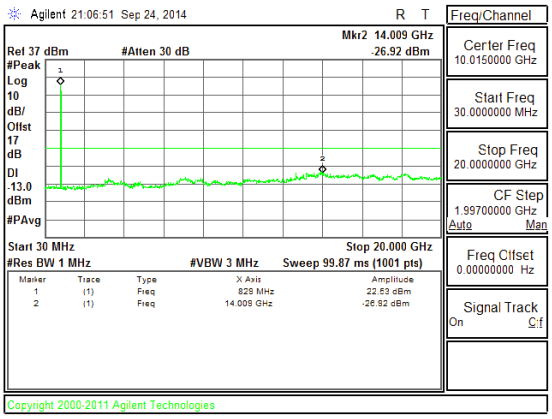
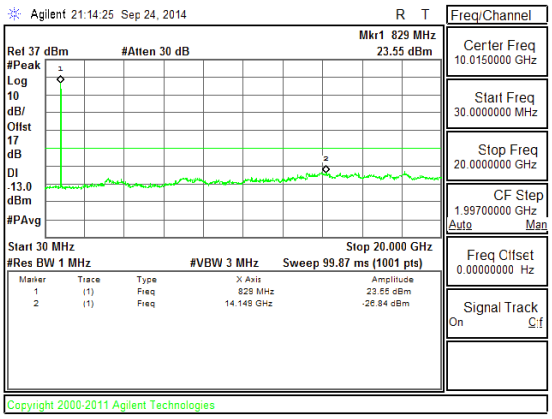
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

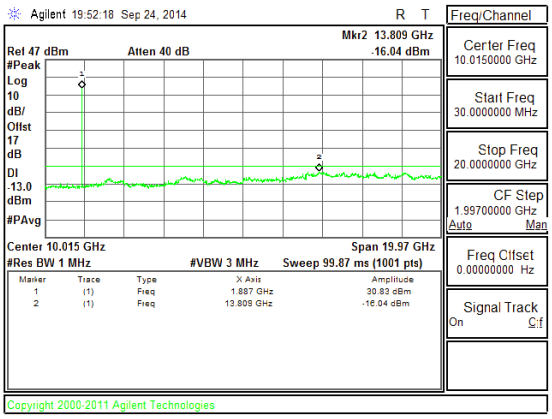
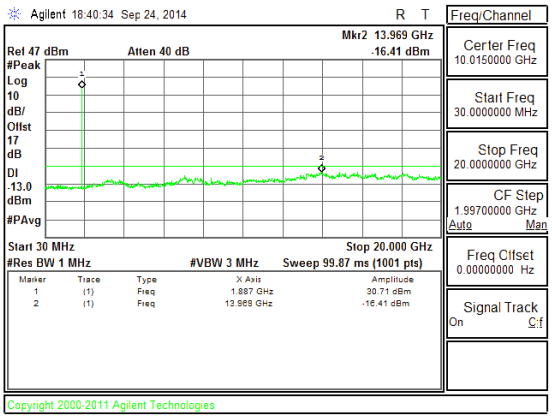
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

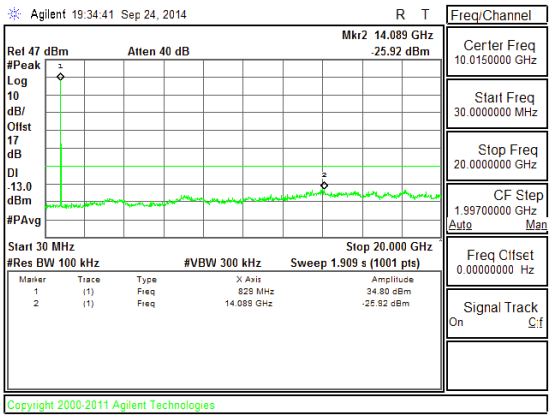
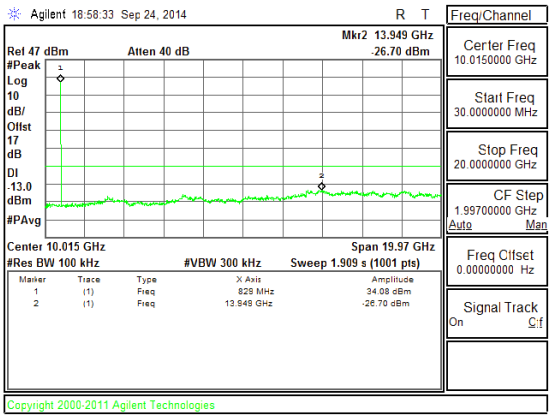
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

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

Band GSM 1900 EGPRS	 Band GSM1900 EGPRS 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 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, §24.235, §27.54 and §90.213

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

MODES TESTED

RESULTS

See the following pages.

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

10.4.1. FREQUENCY STABILITY RESULTS

GPRS 1900, Channel 661 Freq: 1880MHz– MID CHANNEL

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	1879.999990	0.001	2.5
3.80	40	1879.999989	0.001	2.5
3.80	30	1879.999989	0.002	2.5
3.80	***20***	**1879.999992**	**0**	***2.5***
3.80	10	1879.999987	0.002	2.5
3.80	0	1879.999992	0.000	2.5
3.80	-10	1879.999989	0.001	2.5
3.80	-20	1879.999986	0.003	2.5
3.80	-30	1879.999993	-0.001	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***	***1879.999992***	***0***	***2.5***
4.30	20	1879.999988	*0.002*	2.5
3.20	20	1879.999995	*-0.002*	2.5

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

GPRS 850 CELL BAND, – MID CHANNEL190, Frequency 836.6MHz

Reference Frequency: Cell Mid Channel 836.6 MHz @ 20ºC Limit: +- 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	836.599986	0.000	2.5
3.80	40	836.599987	-0.001	2.5
3.80	30	836.599987	-0.001	2.5
3.80	***20***	***836.599986***	***0***	***2.5***
3.80	10	836.599989	-0.004	2.5
3.80	0	836.599987	-0.001	2.5
3.80	-10	836.599987	-0.001	2.5
3.80	-20	836.599987	-0.001	2.5
3.80	-30	836.599985	0.001	2.5

Reference Frequency: Cell Mid Channel 836.6 MHz @ 20ºC Limit: +- 2.5 ppm = 2091.500 Hz				
Power Supply (Vdc)	Environment Temperature (*C)	Frequency Deviation Measureed with Time Elapse		
			Delta (ppm)	Limit (ppm)
3.80	***20***	***836.599986***	***0.00000***	***2.5***
4.30	20	836.599986	*0.00000*	2.5
3.20	20	836.599992	*-0.00717*	2.5

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, §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; PSA setting reference to 971168 D01 v02r01

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.

MODES TESTED

TEST RESULTS

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 2	REL99	9262	1852.4	15.85	38.46
		9400	1880	16.91	49.09
		9538	1907.6	16.33	42.95
	HSDPA	9262	1852.4	15.06	32.06
		9400	1880	16.84	48.31
		9538	1907.6	15.51	35.56
	HSUPA	9262	1852.4		
		9400	1880		
		9538	1907.6		

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
Band 5	REL99	4132	826.4	20.911	123.34
		4183	836.6	19.891	97.52
		4233	846.6	19.347	86.04
	HSDPA	4132	826.4	20.271	106.44
		4183	836.6	18.891	77.46
		4233	846.6	18.547	71.56
	HSUPA	4132	826.4		
		4183	836.6		
		4233	846.6		

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
GSM1900	GMSK	512	1850.2		
		661	1880		
		810	1909.8		
	GPRS	512	1850.2	22.96	197.7
		661	1880	26.30	426.58
		810	1909.8	23.11	204.6
	EGPRS	512	1850.2	21.28	134.3
		661	1880	21.97	204.6
		810	1909.8	21.78	134.3

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.

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
GSM850	GMSK	128	824.2		
		190	836.6		
		251	848.8		
	GPRS	128	824.2	30.27	1064.39
		190	836.6	31.03	1267.94
		251	848.8	30.79	1201.43
	EGPRS	128	824.2	27.30	537.16
		190	836.6	27.18	522.52
		251	848.8	27.69	588.44

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	17.50	56.25
			1/0	836.5	18.30	67.62
			1/0	844	18.6	72.44
		16QAM	1/0	829	16.30	42.67
			1/0	836.5	17.50	56.25
			1/0	844	17.90	61.67

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP / EIRP	
					dBm	mW
LTE5	5	QPSK	1/0	826.5	18.02	63.4
			1/0	836.5	18.93	78.18
			1/0	846.5	18.55	71.63
		16QAM	1/0	826.5	17.32	53.96
			1/0	836.5	18.12	64.88
			1/0	846.5	17.27	53.35

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP / EIRP	
					dBm	mW
LTE5	3	QPSK	1/0	825.5	18.30	67.6
			1/0	836.5	19.15	82.2
			1/0	847.5	19.93	98.4
		16QAM	1/0	825.5	17.38	54.71
			1/0	836.5	18.22	66.39
			1/0	847.5	18.79	75.7

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP / EIRP	
					dBm	mW
LTE5	1.4	QPSK	1/0	824.7	18.30	67.62
			1/0	836.5	18.80	75.88
			1/0	848.3	19.13	81.87
		16QAM	1/0	824.7	17.50	56.25
			1/0	836.5	17.67	58.49
			1/0	848.3	18.30	67.62

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

11.1.3. ERP/EIRP PLOTS

Band

LTE5

10MHz

16QAM

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: Dante/Kiya
Configuration: X-pos EUT
Mode: LTE5 10M 16QAM

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								
829.00	6.27	V	0.9	0.0	5.37	38.5	-33.1	
829.00	17.20	H	0.9	0.0	16.30	38.5	-22.1	
Mid Ch								
836.50	8.40	V	0.9	0.0	7.50	38.5	-31.0	
836.50	18.40	H	0.9	0.0	17.50	38.5	-20.9	
High Ch								
844.00	5.00	V	0.9	0.0	4.10	38.5	-34.3	
844.00	18.80	H	0.9	0.0	17.90	38.5	-20.5	

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

LTE5

10MHz

QPSK

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: Dante/Kiya
Configuration: X-pos EUT
Mode: LTE5 10M QPSK, Sample 1956394

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								
829.00	7.47	V	0.9	0.0	6.57	38.5	-31.9	
829.00	18.40	H	0.9	0.0	17.50	38.5	-20.9	
Mid Ch								
836.50	9.00	V	0.9	0.0	8.10	38.5	-30.4	
836.50	19.20	H	0.9	0.0	18.30	38.5	-20.1	
High Ch								
844.00	66.60	V	0.9	0.0	65.70	38.5	27.3	
844.00	19.50	H	0.9	0.0	18.60	38.5	-19.8	

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

LTE5

5MHz

16QAM

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: J. GOMEZ
Configuration: X-pos EUT
Mode: LTE5 5MHz 16QAM

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								
826.50	4.68	V	0.9	0.0	3.78	38.5	-34.7	
826.50	18.22	H	0.9	0.0	17.32	38.5	-21.1	
Mid Ch								
836.50	8.54	V	0.9	0.0	7.64	38.5	-30.8	
836.50	19.02	H	0.9	0.0	18.12	38.5	-20.3	
High Ch								
846.50	7.67	V	0.9	0.0	6.77	38.5	-31.7	
846.50	18.17	H	0.9	0.0	17.27	38.5	-21.2	

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.

Band

LTE5

5MHz

QPSK

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: J. GOMEZ
Configuration: X-pos EUT
Mode: LTE5 5MHz QPSK

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								
826.50	5.69	V	0.9	0.0	4.79	38.5	-33.7	
826.50	18.92	H	0.9	0.0	18.02	38.5	-20.4	
Mid Ch								
836.50	9.33	V	0.9	0.0	8.43	38.5	-30.0	
836.50	19.83	H	0.9	0.0	18.93	38.5	-19.5	
High Ch								
846.50	8.50	V	0.9	0.0	7.60	38.5	-30.8	
846.50	19.45	H	0.9	0.0	18.55	38.5	-19.9	

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

LTE5

3MHz

16QAM

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: D. Soper
Configuration: X-pos EUT
Mode: LTE5 3M 16QAM

Test Equipment:
Receiving: Sunol T185, 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								
825.50	4.81	V	0.9	0.0	3.91	38.5	-34.5	
825.50	18.28	H	0.9	0.0	17.38	38.5	-21.1	
Mid Ch								
836.50	8.27	V	0.9	0.0	7.37	38.5	-31.1	
836.50	19.12	H	0.9	0.0	18.22	38.5	-20.2	
High Ch								
847.50	5.31	V	0.9	0.0	4.41	38.5	-34.0	
847.50	19.69	H	0.9	0.0	18.79	38.5	-19.7	

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

LTE5

3MHz

QPSK

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: D. Soper
Configuration: X-pos EUT
Mode: LTE5 3M QPSK

Test Equipment:
Receiving: Sunol T185, 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								
826.50	5.77	V	0.9	0.0	4.87	38.5	-33.6	
826.50	19.20	H	0.9	0.0	18.30	38.5	-20.1	
Mid Ch								
836.50	8.21	V	0.9	0.0	7.31	38.5	-31.1	
836.50	20.05	H	0.9	0.0	19.15	38.5	-19.3	
High Ch								
846.50	6.35	V	0.9	0.0	5.45	38.5	-33.0	
846.50	20.83	H	0.9	0.0	19.93	38.5	-18.5	

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

LTE5

1.4MHz

16QAM

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: D. Soper
Configuration: X-pos EUT
Mode: LTE5 1.4MHz QPSK

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								
824.70	9.65	V	0.9	0.0	8.75	38.5	-29.7	
824.70	18.40	H	0.9	0.0	17.50	38.5	-20.9	
Mid Ch								
836.50	9.32	V	0.9	0.0	8.42	38.5	-30.0	
836.50	18.57	H	0.9	0.0	17.67	38.5	-20.8	
High Ch								
848.30	9.70	V	0.9	0.0	8.80	38.5	-29.6	
848.30	19.20	H	0.9	0.0	18.30	38.5	-20.1	

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

LTE5

1.4MHz

QPSK

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: D. Soper
Configuration: X-pos EUT
Mode: LTE5 1.4MHz QPSK

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								
824.70	10.44	V	0.9	0.0	9.54	38.5	-28.9	
824.70	19.20	H	0.9	0.0	18.30	38.5	-20.1	
Mid Ch								
836.50	10.28	V	0.9	0.0	9.38	38.5	-29.1	
836.50	19.70	H	0.9	0.0	18.80	38.5	-19.6	
High Ch								
848.30	10.38	V	0.9	0.0	9.48	38.5	-29.0	
848.30	20.03	H	0.9	0.0	19.13	38.5	-19.3	

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 2

HSDPA

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: L. Lara
Configuration: Y-pos EUT (SN: 1961988)
Mode: WCDMA_1900 MHz_HSDPA

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59, 8ft SMA Cable (SN # 245185 003) 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	8.05	V	0.85	7.86	15.06	33.0	-17.9	
1852.40	5.42	H	0.85	7.86	12.43	33.0	-20.6	
Mid Ch								
1880.00	9.83	V	0.85	7.86	16.84	33.0	-16.2	
1880.00	1.75	H	0.85	7.86	8.76	33.0	-24.2	
High Ch								
1907.60	8.50	V	0.85	7.86	15.51	33.0	-17.5	
1907.60	5.49	H	0.85	7.86	12.50	33.0	-20.5	

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

Band 2

REL99

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

Company: Samsung
Project #: 14I18889
Date: 9/23/2014 & 09/24/2014
Test Engineer: R. Alegre L. Lara
Configuration: Y-pos EUT (SN: 1961988)
Mode: WCDMA_1900 MHz_Rel 99

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59, 8ft SMA Cable (SN # 245185 003) 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	8.84	V	0.85	7.86	15.85	33.0	-17.2	
1852.40	6.45	H	0.85	7.86	13.46	33.0	-19.5	
Mid Ch								
1880.00	9.90	V	0.85	7.86	16.91	33.0	-16.1	
1880.00	6.49	H	0.85	7.86	13.50	33.0	-19.5	
High Ch								
1907.60	9.32	V	0.85	7.86	16.33	33.0	-16.7	
1907.60	6.57	H	0.85	7.86	13.58	33.0	-19.4	

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

Band 5

HSDPA

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: L. Lara
Configuration: X-pos EUT (SN: 1961988)
Mode: WCDMA Band 5 HSDPA

Test Equipment:
Receiving: Sunol T185, and Chamber C N-type Cable
Substitution: Dipole T416, 8ft 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	7.43	V	0.9	0.0	6.53	38.5	-32.0	
826.40	21.17	H	0.9	0.0	20.27	38.5	-18.2	
Mid Ch								
836.60	6.04	V	0.9	0.0	5.14	38.5	-33.3	
836.60	19.79	H	0.9	0.0	18.89	38.5	-19.6	
High Ch								
846.60	7.49	V	0.9	0.0	6.59	38.5	-31.9	
846.60	19.45	H	0.9	0.0	18.55	38.5	-19.9	

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. Chamber C

Company: Samsung
Project #: 14I18889
Date: 9/23/2014 & 09/24/2014
Test Engineer: R. Alegre & L. Lara
Configuration: X-pos EUT (SN: 1961988)
Mode: WCDMA Band 5 Rel 99

Test Equipment:
Receiving: Sunol T185, and Chamber C N-type Cable
Substitution: Dipole T416, 8ft 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	8.52	V	0.9	0.0	7.62	38.5	-30.9	
826.40	21.81	H	0.9	0.0	20.91	38.5	-17.6	
Mid Ch								
836.60	5.87	V	0.9	0.0	4.97	38.5	-33.5	
836.60	20.79	H	0.9	0.0	19.89	38.5	-18.6	
High Ch								
846.60	7.68	V	0.9	0.0	6.78	38.5	-31.7	
846.60	20.25	H	0.9	0.0	19.35	38.5	-19.1	

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

1900

EGPRS

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

Company: Samsung
Project #: 14I18889
Date: 09/25/14
Test Engineer: L. Lara
Configuration: Y-pos EUT (SN: 1961990)
Mode: EGPRS 1900

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59 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								
1850.20	14.27	V	0.85	7.86	21.28	33.0	-11.7	
1850.20	10.37	H	0.85	7.86	17.38	33.0	-15.6	
Mid								
1880.00	14.96	V	0.85	7.86	21.97	33.0	-11.0	
1880.00	10.05	H	0.85	7.86	17.06	33.0	-15.9	
High								
1909.80	14.77	V	0.85	7.86	21.78	33.0	-11.2	
1909.80	10.88	H	0.85	7.86	17.89	33.0	-15.1	

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. Chamber B

Company: Samsung
Project #: 14I18889
Date: 09/23/14
Test Engineer: R. Alegre
Configuration: Y-pos EUT (SN: 19619988)
Mode: GPRS 1900

Test Equipment:
Receiving: Horn T345, and Chamber B SMA Cables
Substitution: Horn T963 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								
Mid								
1880.00	14.59	V	0.85	7.90	21.64	33.0	-11.4	
1880.00	19.25	H	0.85	7.90	26.30	33.0	-6.7	
High								

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

GSM

850

EGPRS

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

Company: Samsung
Project #: 14I18889
Date: 09/24/14
Test Engineer: L. Lara
Configuration: X-pos EUT (SN: 1961988)
Mode: EGPRS850

Test Equipment:
Receiving: Sunol T185, and Chamber C N-type Cable
Substitution: Dipole T416, 8ft 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								
824.20	15.93	V	0.9	0.0	15.03	38.5	-23.4	
824.20	28.20	H	0.9	0.0	27.30	38.5	-11.1	
Mid Ch								
836.60	15.80	V	0.9	0.0	14.90	38.5	-23.5	
836.60	28.08	H	0.9	0.0	27.18	38.5	-11.3	
High Ch								
848.80	18.11	V	0.9	0.0	17.21	38.5	-21.2	
848.80	28.60	H	0.9	0.0	27.70	38.5	-10.8	

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 C

Company: Samsung
Project #: 14I18889
Date: 9/23/2014 & 9/24/2014
Test Engineer: R. Alegre /L. Lara
Configuration: X-pos EUT (SN: 1961988)
Mode: GPRS850

Test Equipment:
Receiving: Sunol T185, and Chamber C N-type Cable
Substitution: Dipole T416, 8ft 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								
824.20	20.48	V	0.9	0.0	19.58	38.5	-18.9	
824.20	31.17	H	0.9	0.0	30.27	38.5	-8.2	
Mid Ch								
836.60	20.12	V	0.9	0.0	19.22	38.5	-19.2	
836.60	31.93	H	0.9	0.0	31.03	38.5	-7.4	
High Ch								
848.80	21.68	V	0.9	0.0	20.78	38.5	-17.7	
848.80	31.70	H	0.9	0.0	30.80	38.5	-7.7	

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.

11.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §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.

Part 27: (m)(4) For mobile station, the attenuation factor shall be not less than 43+10Log(P)dB at the channel edge and (55+10Log(P)dB) at 5.5MHz from the channel edges.

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

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

11.2.1. SPURIOUS RADIATION PLOTS

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

Company: Samsung
Project #: 14I18889
Date: 09/25/14
Test Engineer: O. Stoelting
Configuration: EUT w/ AC Adaptor + HS, X-pos
Mode: LTE5 16QAM 10MHz Harm

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

Band
LTE5
10MHz
16QAM

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 829MHz									
1.658	-24.5	V	3.0	37.4	1.0	-60.9	-13.0	-47.9	
2.487	-22.4	V	3.0	36.4	1.0	-57.8	-13.0	-44.8	
3.316	-9.7	V	3.0	35.8	1.0	-44.5	-13.0	-31.5	
1.658	-21.8	H	3.0	37.4	1.0	-58.2	-13.0	-45.2	
2.487	-23.6	H	3.0	36.4	1.0	-59.0	-13.0	-46.0	
3.316	-18.3	H	3.0	35.8	1.0	-53.1	-13.0	-40.1	
Mid Ch, 836.5MHz									
1.673	-19.0	V	3.0	37.3	1.0	-55.4	-13.0	-42.4	
2.510	-21.8	V	3.0	36.4	1.0	-57.2	-13.0	-44.2	
3.346	-16.1	V	3.0	35.8	1.0	-50.9	-13.0	-37.9	
1.673	-18.1	H	3.0	37.3	1.0	-54.4	-13.0	-41.4	
2.510	-24.3	H	3.0	36.4	1.0	-59.6	-13.0	-46.6	
3.346	-16.6	H	3.0	35.8	1.0	-51.3	-13.0	-38.3	
High Ch, 844MHz									
1.688	-21.9	V	3.0	37.3	1.0	-58.3	-13.0	-45.3	
2.532	-21.0	V	3.0	36.3	1.0	-56.4	-13.0	-43.4	
3.376	-12.2	V	3.0	35.7	1.0	-47.0	-13.0	-34.0	
1.688	-20.6	H	3.0	37.3	1.0	-57.0	-13.0	-44.0	
2.532	-20.0	H	3.0	36.3	1.0	-55.4	-13.0	-42.4	
3.376	-20.2	H	3.0	35.7	1.0	-54.9	-13.0	-41.9	

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 #: 14I18889
Date: 09/25/14
Test Engineer: O. Stoelting
Configuration: EUT w/ AC Adaptor + HS, X-pos
Mode: LTE5 QPSK 10MHz Harm

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

Band: LTE5 10MHz QPSK

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 829MHz									
1.658	-24.1	V	3.0	37.4	1.0	-60.5	-13.0	-47.5	
2.487	-20.7	V	3.0	36.4	1.0	-56.1	-13.0	-43.1	
3.316	-11.2	V	3.0	35.8	1.0	-46.0	-13.0	-33.0	
1.658	-22.0	H	3.0	37.4	1.0	-58.4	-13.0	-45.4	
2.487	-24.2	H	3.0	36.4	1.0	-59.5	-13.0	-46.5	
3.316	-19.1	H	3.0	35.8	1.0	-53.8	-13.0	-40.8	
Mid Ch, 836.5MHz									
1.673	-17.9	V	3.0	37.3	1.0	-54.3	-13.0	-41.3	
2.510	-21.7	V	3.0	36.4	1.0	-57.1	-13.0	-44.1	
3.346	-16.2	V	3.0	35.8	1.0	-51.0	-13.0	-38.0	
1.673	-18.4	H	3.0	37.3	1.0	-54.7	-13.0	-41.7	
2.510	-24.2	H	3.0	36.4	1.0	-59.5	-13.0	-46.5	
3.346	-17.2	H	3.0	35.8	1.0	-52.0	-13.0	-39.0	
High Ch, 844MHz									
1.688	-20.7	V	3.0	37.3	1.0	-57.1	-13.0	-44.1	
2.532	-22.3	V	3.0	36.3	1.0	-57.6	-13.0	-44.6	
3.376	-11.8	V	3.0	35.7	1.0	-46.6	-13.0	-33.6	
1.688	-20.3	H	3.0	37.3	1.0	-56.7	-13.0	-43.7	
2.532	-19.5	H	3.0	36.3	1.0	-54.9	-13.0	-41.9	
3.376	-20.1	H	3.0	35.7	1.0	-54.8	-13.0	-41.8	

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 #: 14I18889
Date: 09/25/14
Test Engineer: O. Stoelting
Configuration: EUT w/ AC Adaptor + HS, X-pos
Mode: LTE5 16QAM 5MHz Harm

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

Band

LTE5

5MHz

16QAM

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5MHz									
1.653	-20.5	V	3.0	37.4	1.0	-56.9	-13.0	-43.9	
2.480	-18.7	V	3.0	36.4	1.0	-54.0	-13.0	-41.0	
3.306	-14.7	V	3.0	35.8	1.0	-49.5	-13.0	-36.5	
1.653	-18.6	H	3.0	37.4	1.0	-54.9	-13.0	-41.9	
2.480	-23.2	H	3.0	36.4	1.0	-58.6	-13.0	-45.6	
3.306	-17.2	H	3.0	35.8	1.0	-52.0	-13.0	-39.0	
Mid Ch, 836.5MHz									
1.673	-16.1	V	3.0	37.3	1.0	-52.4	-13.0	-39.4	
2.510	-19.5	V	3.0	36.4	1.0	-54.8	-13.0	-41.8	
3.346	-17.5	V	3.0	35.8	1.0	-52.3	-13.0	-39.3	
1.673	-14.2	H	3.0	37.3	1.0	-50.6	-13.0	-37.6	
2.510	-19.8	H	3.0	36.4	1.0	-55.2	-13.0	-42.2	
3.346	-18.2	H	3.0	35.8	1.0	-53.0	-13.0	-40.0	
High Ch, 846.5MHz									
1.693	-21.1	V	3.0	37.3	1.0	-57.4	-13.0	-44.4	
2.540	-20.8	V	3.0	36.3	1.0	-56.2	-13.0	-43.2	
3.386	-19.1	V	3.0	35.7	1.0	-53.9	-13.0	-40.9	
1.693	-21.7	H	3.0	37.3	1.0	-58.0	-13.0	-45.0	
2.540	-20.7	H	3.0	36.3	1.0	-56.1	-13.0	-43.1	
3.386	-16.7	H	3.0	35.7	1.0	-51.4	-13.0	-38.4	

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 #: 14I18889
Date: 09/25/14
Test Engineer: O. Stoelting
Configuration: EUT w/ AC Adaptor + HS, X-pos
Mode: LTE5 QPSK 5MHz Harm

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

Band: LTE5 5MHz QPSK

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5MHz									
1.653	-20.2	V	3.0	37.4	1.0	-56.6	-13.0	-43.6	
2.480	-19.0	V	3.0	36.4	1.0	-54.4	-13.0	-41.4	
3.306	-14.3	V	3.0	35.8	1.0	-49.1	-13.0	-36.1	
1.653	-18.7	H	3.0	37.4	1.0	-55.1	-13.0	-42.1	
2.480	-21.8	H	3.0	36.4	1.0	-57.1	-13.0	-44.1	
3.306	-17.4	H	3.0	35.8	1.0	-52.2	-13.0	-39.2	
Mid Ch, 836.5MHz									
1.673	-15.8	V	3.0	37.3	1.0	-52.1	-13.0	-39.1	
2.510	-21.5	V	3.0	36.4	1.0	-56.8	-13.0	-43.8	
3.346	-17.0	V	3.0	35.8	1.0	-51.8	-13.0	-38.8	
1.673	-14.3	H	3.0	37.3	1.0	-50.7	-13.0	-37.7	
2.510	-19.6	H	3.0	36.4	1.0	-54.9	-13.0	-41.9	
3.346	-18.7	H	3.0	35.8	1.0	-53.4	-13.0	-40.4	
High Ch, 846.5MHz									
1.693	-20.8	V	3.0	37.3	1.0	-57.1	-13.0	-44.1	
2.540	-22.1	V	3.0	36.3	1.0	-57.4	-13.0	-44.4	
3.386	-19.1	V	3.0	35.7	1.0	-53.8	-13.0	-40.8	
1.693	-21.8	H	3.0	37.3	1.0	-58.1	-13.0	-45.1	
2.540	-20.8	H	3.0	36.3	1.0	-56.2	-13.0	-43.2	
3.386	-16.8	H	3.0	35.7	1.0	-51.5	-13.0	-38.5	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: LTE5 16QAM 3MHz Harm

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 22

Band
LTE5
3MHz
16QAM

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 825.5MHz									
1.651	-27.0	V	3.0	37.4	1.0	-63.4	-13.0	-50.4	
2.477	-22.5	V	3.0	36.4	1.0	-57.9	-13.0	-44.9	
3.302	-19.8	V	3.0	35.8	1.0	-54.6	-13.0	-41.6	
1.651	-27.3	H	3.0	37.4	1.0	-63.6	-13.0	-50.6	
2.477	-24.1	H	3.0	36.4	1.0	-59.5	-13.0	-46.5	
3.302	-19.8	H	3.0	35.8	1.0	-54.6	-13.0	-41.6	
Mid Ch, 836.5MHz									
1.673	-26.1	V	3.0	37.3	1.0	-62.4	-13.0	-49.4	
2.510	-22.5	V	3.0	36.4	1.0	-57.9	-13.0	-44.9	
3.346	-19.6	V	3.0	35.8	1.0	-54.3	-13.0	-41.3	
1.673	-26.7	H	3.0	37.3	1.0	-63.0	-13.0	-50.0	
2.510	-24.2	H	3.0	36.4	1.0	-59.6	-13.0	-46.6	
3.346	-19.8	H	3.0	35.8	1.0	-54.6	-13.0	-41.6	
High Ch, 847.5MHz									
1.695	-27.0	V	3.0	37.3	1.0	-63.3	-13.0	-50.3	
2.543	-22.0	V	3.0	36.3	1.0	-57.3	-13.0	-44.3	
3.390	-20.1	V	3.0	35.7	1.0	-54.8	-13.0	-41.8	
1.695	-27.0	H	3.0	37.3	1.0	-63.3	-13.0	-50.3	
2.543	-24.0	H	3.0	36.3	1.0	-59.4	-13.0	-46.4	
3.390	-20.8	H	3.0	35.7	1.0	-55.5	-13.0	-42.5	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: LTE5 QPSK 3MHz Harm

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 22

Band

LTE5

3MHz

QPSK

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 825.5MHz									
1.651	-26.5	V	3.0	37.4	1.0	-62.9	-13.0	-49.9	
2.477	-22.3	V	3.0	36.4	1.0	-57.6	-13.0	-44.6	
3.302	-19.6	V	3.0	35.8	1.0	-54.4	-13.0	-41.4	
1.651	-26.7	H	3.0	37.4	1.0	-63.0	-13.0	-50.0	
2.477	-23.9	H	3.0	36.4	1.0	-59.3	-13.0	-46.3	
3.302	-19.8	H	3.0	35.8	1.0	-54.6	-13.0	-41.6	
Mid Ch, 836.5MHz									
1.673	-26.1	V	3.0	37.3	1.0	-62.5	-13.0	-49.5	
2.510	-22.3	V	3.0	36.4	1.0	-57.7	-13.0	-44.7	
3.346	-19.6	V	3.0	35.8	1.0	-54.3	-13.0	-41.3	
1.673	-26.5	H	3.0	37.3	1.0	-62.9	-13.0	-49.9	
2.510	-24.3	H	3.0	36.4	1.0	-59.6	-13.0	-46.6	
3.346	-19.5	H	3.0	35.8	1.0	-54.3	-13.0	-41.3	
High Ch, 847.5MHz									
1.695	-26.9	V	3.0	37.3	1.0	-63.2	-13.0	-50.2	
2.543	-21.8	V	3.0	36.3	1.0	-57.1	-13.0	-44.1	
3.390	-19.5	V	3.0	35.7	1.0	-54.2	-13.0	-41.2	
1.695	-27.0	H	3.0	37.3	1.0	-63.3	-13.0	-50.3	
2.543	-23.8	H	3.0	36.3	1.0	-59.2	-13.0	-46.2	
3.390	-19.7	H	3.0	35.7	1.0	-54.4	-13.0	-41.4	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: LTE5 1.4MHz 16QAM HARM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 22

Band
LTE5
1.4MHz
16QAM

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7MHz									
1.649	-26.3	V	3.0	37.4	1.0	-62.7	-13.0	-49.7	
2.474	-21.6	V	3.0	36.4	1.0	-57.0	-13.0	-44.0	
3.299	-16.3	V	3.0	35.8	1.0	-51.1	-13.0	-38.1	
1.649	-27.2	H	3.0	37.4	1.0	-63.6	-13.0	-50.6	
2.474	-21.2	H	3.0	36.4	1.0	-56.6	-13.0	-43.6	
3.299	-20.0	H	3.0	35.8	1.0	-54.8	-13.0	-41.8	
Mid Ch, 836.5MHz									
1.673	-26.4	V	3.0	37.3	1.0	-62.7	-13.0	-49.7	
2.510	-20.1	V	3.0	36.4	1.0	-55.4	-13.0	-42.4	
3.346	-17.2	V	3.0	35.8	1.0	-52.0	-13.0	-39.0	
1.673	-25.3	H	3.0	37.3	1.0	-61.7	-13.0	-48.7	
2.510	-23.8	H	3.0	36.4	1.0	-59.1	-13.0	-46.1	
3.346	-19.8	H	3.0	35.8	1.0	-54.6	-13.0	-41.6	
High Ch, 848.3MHz									
1.697	-26.9	V	3.0	37.3	1.0	-63.2	-13.0	-50.2	
2.545	-21.7	V	3.0	36.3	1.0	-57.0	-13.0	-44.0	
3.393	-19.5	V	3.0	35.7	1.0	-54.2	-13.0	-41.2	
1.697	-27.0	H	3.0	37.3	1.0	-63.3	-13.0	-50.3	
2.545	-24.2	H	3.0	36.3	1.0	-59.5	-13.0	-46.5	
3.393	-20.4	H	3.0	35.7	1.0	-55.1	-13.0	-42.1	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: LTE5 1.4MHz QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 22

Band: LTE5 1.4MHz QPSK

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7MHz									
1.649	-26.7	V	3.0	37.4	1.0	-63.1	-13.0	-50.1	
2.474	-20.6	V	3.0	36.4	1.0	-56.0	-13.0	-43.0	
3.299	-15.8	V	3.0	35.8	1.0	-50.6	-13.0	-37.6	
1.649	-16.3	H	3.0	37.4	1.0	-52.7	-13.0	-39.7	
2.474	-20.8	H	3.0	36.4	1.0	-56.2	-13.0	-43.2	
3.299	-19.6	H	3.0	35.8	1.0	-54.4	-13.0	-41.4	
Mid Ch, 836.5MHz									
1.673	-25.1	V	3.0	37.3	1.0	-61.4	-13.0	-48.4	
2.510	-19.6	V	3.0	36.4	1.0	-55.0	-13.0	-42.0	
3.346	-16.6	V	3.0	35.8	1.0	-51.4	-13.0	-38.4	
1.673	-24.6	H	3.0	37.3	1.0	-61.0	-13.0	-48.0	
2.510	-23.9	H	3.0	36.4	1.0	-59.2	-13.0	-46.2	
3.346	-19.8	H	3.0	35.8	1.0	-54.5	-13.0	-41.5	
High Ch, 848.3MHz									
1.697	-26.5	V	3.0	37.3	1.0	-62.8	-13.0	-49.8	
2.545	-21.5	V	3.0	36.3	1.0	-56.9	-13.0	-43.9	
3.393	-18.6	V	3.0	35.7	1.0	-53.3	-13.0	-40.3	
1.697	-26.7	H	3.0	37.3	1.0	-63.0	-13.0	-50.0	
2.545	-23.9	H	3.0	36.3	1.0	-59.2	-13.0	-46.2	
3.393	-20.6	H	3.0	35.7	1.0	-55.3	-13.0	-42.3	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: HSDPA B2

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 24

Band

Band 2

HSDPA

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	-18.3	V	3.0	35.4	1.0	-52.7	-13.0	-39.7	
5.557	-16.4	V	3.0	34.7	1.0	-50.1	-13.0	-37.1	
7.410	-10.0	V	3.0	34.9	1.0	-43.9	-13.0	-30.9	
3.705	-18.6	H	3.0	35.4	1.0	-53.0	-13.0	-40.0	
5.557	-14.9	H	3.0	34.7	1.0	-48.6	-13.0	-35.6	
7.410	-11.3	H	3.0	34.9	1.0	-45.3	-13.0	-32.3	
Mid Ch, 1880MHz									
3.760	-19.5	V	3.0	35.3	1.0	-53.8	-13.0	-40.8	
5.640	-16.4	V	3.0	34.7	1.0	-50.2	-13.0	-37.2	
7.520	-11.3	V	3.0	34.9	1.0	-45.2	-13.0	-32.2	
3.760	-19.0	H	3.0	35.3	1.0	-53.3	-13.0	-40.3	
5.640	-15.4	H	3.0	34.7	1.0	-49.1	-13.0	-36.1	
7.520	-11.4	H	3.0	34.9	1.0	-45.3	-13.0	-32.3	
High Ch, 1907.6MHz									
3.815	-14.8	V	3.0	35.3	1.0	-49.1	-13.0	-36.1	
5.723	-13.8	V	3.0	34.7	1.0	-47.6	-13.0	-34.6	
7.630	-8.1	V	3.0	34.9	1.0	-42.1	-13.0	-29.1	
3.815	-18.0	H	3.0	35.3	1.0	-52.3	-13.0	-39.3	
5.723	-14.5	H	3.0	34.7	1.0	-48.2	-13.0	-35.2	
7.630	-11.4	H	3.0	34.9	1.0	-45.3	-13.0	-32.3	

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 #: 14I18889
Date: 09/24/14
Test Engineer: Jude Semana
Configuration: EUT w/ AC Adaptor + HS, Y-pos
Mode: REL99 B2

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 24

Band

Band 2

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, 1852.4MHz									
3.705	-25.0	V	3.0	35.4	1.0	-59.4	-13.0	-46.4	
5.557	-22.2	V	3.0	34.7	1.0	-55.9	-13.0	-42.9	
7.410	-17.7	V	3.0	34.9	1.0	-51.6	-13.0	-38.6	
3.705	-24.9	H	3.0	35.4	1.0	-59.3	-13.0	-46.3	
5.557	-21.3	H	3.0	34.7	1.0	-55.0	-13.0	-42.0	
7.410	-16.8	H	3.0	34.9	1.0	-50.8	-13.0	-37.8	
Mid Ch, 1880MHz									
3.760	-24.9	V	3.0	35.3	1.0	-59.2	-13.0	-46.2	
5.640	-21.9	V	3.0	34.7	1.0	-55.6	-13.0	-42.6	
7.520	-20.7	V	3.0	34.9	1.0	-54.6	-13.0	-41.6	
3.760	-24.9	H	3.0	35.3	1.0	-59.3	-13.0	-46.3	
5.640	-21.7	H	3.0	34.7	1.0	-55.4	-13.0	-42.4	
7.520	-19.7	H	3.0	34.9	1.0	-53.6	-13.0	-40.6	
High Ch, 1907.6MHz									
3.815	-24.3	V	3.0	35.3	1.0	-58.6	-13.0	-45.6	
5.723	-22.6	V	3.0	34.7	1.0	-56.3	-13.0	-43.3	
7.630	-20.3	V	3.0	34.9	1.0	-54.3	-13.0	-41.3	
3.815	-24.8	H	3.0	35.3	1.0	-59.1	-13.0	-46.1	
5.723	-21.6	H	3.0	34.7	1.0	-55.4	-13.0	-42.4	
7.630	-19.7	H	3.0	34.9	1.0	-53.7	-13.0	-40.7	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: HSDPA B2

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 24

Band

Band 2

HSDPA

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	-18.3	V	3.0	35.4	1.0	-52.7	-13.0	-39.7	
5.557	-16.4	V	3.0	34.7	1.0	-50.1	-13.0	-37.1	
7.410	-10.0	V	3.0	34.9	1.0	-43.9	-13.0	-30.9	
3.705	-18.6	H	3.0	35.4	1.0	-53.0	-13.0	-40.0	
5.557	-14.9	H	3.0	34.7	1.0	-48.6	-13.0	-35.6	
7.410	-11.3	H	3.0	34.9	1.0	-45.3	-13.0	-32.3	
Mid Ch, 1880MHz									
3.760	-19.5	V	3.0	35.3	1.0	-53.8	-13.0	-40.8	
5.640	-16.4	V	3.0	34.7	1.0	-50.2	-13.0	-37.2	
7.520	-11.3	V	3.0	34.9	1.0	-45.2	-13.0	-32.2	
3.760	-19.0	H	3.0	35.3	1.0	-53.3	-13.0	-40.3	
5.640	-15.4	H	3.0	34.7	1.0	-49.1	-13.0	-36.1	
7.520	-11.4	H	3.0	34.9	1.0	-45.3	-13.0	-32.3	
High Ch, 1907.6MHz									
3.815	-14.8	V	3.0	35.3	1.0	-49.1	-13.0	-36.1	
5.723	-13.8	V	3.0	34.7	1.0	-47.6	-13.0	-34.6	
7.630	-8.1	V	3.0	34.9	1.0	-42.1	-13.0	-29.1	
3.815	-18.0	H	3.0	35.3	1.0	-52.3	-13.0	-39.3	
5.723	-14.5	H	3.0	34.7	1.0	-48.2	-13.0	-35.2	
7.630	-11.4	H	3.0	34.9	1.0	-45.3	-13.0	-32.3	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: HSDPA B5

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 22

Band

Band 5

HSDPA

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	-27.7	V	3.0	37.4	1.0	-64.1	-13.0	-51.1	
2.479	-22.9	V	3.0	36.4	1.0	-58.3	-13.0	-45.3	
3.306	-20.8	V	3.0	35.8	1.0	-55.6	-13.0	-42.6	
1.653	-27.2	H	3.0	37.4	1.0	-63.5	-13.0	-50.5	
2.479	-24.6	H	3.0	36.4	1.0	-59.9	-13.0	-46.9	
3.306	-19.6	H	3.0	35.8	1.0	-54.4	-13.0	-41.4	
Mid Ch, 836.6MHz									
1.673	-27.5	V	3.0	37.3	1.0	-63.8	-13.0	-50.8	
2.510	-23.5	V	3.0	36.4	1.0	-58.9	-13.0	-45.9	
3.346	-18.9	V	3.0	35.8	1.0	-53.7	-13.0	-40.7	
1.673	-27.7	H	3.0	37.3	1.0	-64.0	-13.0	-51.0	
2.510	-24.8	H	3.0	36.4	1.0	-60.1	-13.0	-47.1	
3.346	-20.5	H	3.0	35.8	1.0	-55.2	-13.0	-42.2	
High Ch, 846.6MHz									
1.693	-27.1	V	3.0	37.3	1.0	-63.4	-13.0	-50.4	
2.540	-23.2	V	3.0	36.3	1.0	-58.6	-13.0	-45.6	
3.386	-21.2	V	3.0	35.7	1.0	-55.9	-13.0	-42.9	
1.693	-27.7	H	3.0	37.3	1.0	-64.0	-13.0	-51.0	
2.540	-24.4	H	3.0	36.3	1.0	-59.8	-13.0	-46.8	
3.386	-21.5	H	3.0	35.7	1.0	-56.2	-13.0	-43.2	

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 #: 14I18889
Date: 09/24/14
Test Engineer: Jude Semana
Configuration: EUT w/ AC Adaptor + HS, Y-pos
Mode: REL99 B5

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	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	-30.9	V	3.0	37.4	1.0	-67.2	-13.0	-54.2	
2.479	-25.5	V	3.0	36.4	1.0	-60.9	-13.0	-47.9	
3.306	-26.3	V	3.0	35.8	1.0	-61.1	-13.0	-48.1	
1.653	-31.3	H	3.0	37.4	1.0	-67.7	-13.0	-54.7	
2.479	-27.6	H	3.0	36.4	1.0	-62.9	-13.0	-49.9	
3.306	-26.5	H	3.0	35.8	1.0	-61.3	-13.0	-48.3	
Mid Ch, 836.6MHz									
1.673	-31.2	V	3.0	37.3	1.0	-67.6	-13.0	-54.6	
2.510	-25.8	V	3.0	36.4	1.0	-61.2	-13.0	-48.2	
3.346	-25.7	V	3.0	35.8	1.0	-60.4	-13.0	-47.4	
1.673	-31.0	H	3.0	37.3	1.0	-67.3	-13.0	-54.3	
2.510	-26.9	H	3.0	36.4	1.0	-62.2	-13.0	-49.2	
3.346	-25.7	H	3.0	35.8	1.0	-60.4	-13.0	-47.4	
High Ch, 846.6MHz									
1.693	-31.3	V	3.0	37.3	1.0	-67.6	-13.0	-54.6	
2.540	-25.4	V	3.0	36.3	1.0	-60.8	-13.0	-47.8	
3.386	-25.2	V	3.0	35.7	1.0	-59.9	-13.0	-46.9	
1.693	-31.2	H	3.0	37.3	1.0	-67.5	-13.0	-54.5	
2.540	-27.3	H	3.0	36.3	1.0	-62.6	-13.0	-49.6	
3.386	-25.3	H	3.0	35.7	1.0	-60.0	-13.0	-47.0	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: GPRS 1900

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	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	-16.9	V	3.0	35.4	1.0	-51.3	-13.0	-38.3	
5.551	-14.3	V	3.0	34.7	1.0	-48.0	-13.0	-35.0	
7.401	-2.4	V	3.0	34.9	1.0	-36.3	-13.0	-23.3	
3.700	-18.5	H	3.0	35.4	1.0	-52.9	-13.0	-39.9	
5.551	-15.0	H	3.0	34.7	1.0	-48.7	-13.0	-35.7	
7.401	-8.4	H	3.0	34.9	1.0	-42.3	-13.0	-29.3	
Mid Ch, 1880.0MHz									
3.760	-16.8	V	3.0	35.3	1.0	-51.2	-13.0	-38.2	
5.640	-13.7	V	3.0	34.7	1.0	-47.4	-13.0	-34.4	
7.520	-1.4	V	3.0	34.9	1.0	-35.3	-13.0	-22.3	
3.760	-16.0	H	3.0	35.3	1.0	-50.4	-13.0	-37.4	
5.640	-13.2	H	3.0	34.7	1.0	-46.9	-13.0	-33.9	
7.520	-7.0	H	3.0	34.9	1.0	-40.9	-13.0	-27.9	
High Ch, 1909.8MHz									
3.820	-15.6	V	3.0	35.3	1.0	-49.9	-13.0	-36.9	
5.729	-10.8	V	3.0	34.7	1.0	-44.5	-13.0	-31.5	
7.639	-8.4	V	3.0	35.0	1.0	-42.4	-13.0	-29.4	
3.820	-16.2	H	3.0	35.3	1.0	-50.5	-13.0	-37.5	
5.729	-13.1	H	3.0	34.7	1.0	-46.9	-13.0	-33.9	
7.639	-8.0	H	3.0	35.0	1.0	-42.0	-13.0	-29.0	

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 #: 14I18889
Date: 09/24/14
Test Engineer: Jude Semana
Configuration: X-Pos EUT w/ AC Charger + HS
Mode: GPRS 1900

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	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	-24.3	V	3.0	35.4	1.0	-58.7	-13.0	-45.7	
5.551	-21.2	V	3.0	34.7	1.0	-54.9	-13.0	-41.9	
7.401	-18.3	V	3.0	34.9	1.0	-52.2	-13.0	-39.2	
3.700	-25.3	H	3.0	35.4	1.0	-59.7	-13.0	-46.7	
5.551	-20.8	H	3.0	34.7	1.0	-54.5	-13.0	-41.5	
7.401	-16.5	H	3.0	34.9	1.0	-50.4	-13.0	-37.4	
Mid Ch, 1880.0MHz									
3.760	-25.0	V	3.0	35.3	1.0	-59.3	-13.0	-46.3	
5.640	-21.9	V	3.0	34.7	1.0	-55.6	-13.0	-42.6	
7.520	-20.9	V	3.0	34.9	1.0	-54.8	-13.0	-41.8	
3.760	-24.7	H	3.0	35.3	1.0	-59.0	-13.0	-46.0	
5.640	-21.3	H	3.0	34.7	1.0	-55.0	-13.0	-42.0	
7.520	-19.5	H	3.0	34.9	1.0	-53.4	-13.0	-40.4	
High Ch, 1909.8MHz									
3.820	-22.7	V	3.0	35.3	1.0	-57.0	-13.0	-44.0	
5.729	-21.8	V	3.0	34.7	1.0	-55.5	-13.0	-42.5	
7.639	-21.0	V	3.0	35.0	1.0	-55.0	-13.0	-42.0	
3.820	-23.3	H	3.0	35.3	1.0	-57.6	-13.0	-44.6	
5.729	-21.2	H	3.0	34.7	1.0	-55.0	-13.0	-42.0	
7.639	-20.0	H	3.0	35.0	1.0	-53.9	-13.0	-40.9	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: EGPRS850 Harm

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	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	1.648	-26.7	V	3.0	37.4	1.0	-63.1	-13.0	-50.1	
	2.473	-13.6	V	3.0	36.4	1.0	-49.0	-13.0	-36.0	
850	3.297	-20.8	V	3.0	35.8	1.0	-55.6	-13.0	-42.6	
	1.648	-21.0	H	3.0	37.4	1.0	-57.4	-13.0	-44.4	
EGPRS	2.473	-14.6	H	3.0	36.4	1.0	-50.0	-13.0	-37.0	
	3.297	-20.9	H	3.0	35.8	1.0	-55.7	-13.0	-42.7	
	Mid Ch, 836.6MHz									
	1.673	-27.2	V	3.0	37.3	1.0	-63.6	-13.0	-50.6	
	2.510	-22.3	V	3.0	36.4	1.0	-57.6	-13.0	-44.6	
	3.346	-21.1	V	3.0	35.8	1.0	-55.9	-13.0	-42.9	
	1.673	-26.5	H	3.0	37.3	1.0	-62.9	-13.0	-49.9	
	2.510	-22.6	H	3.0	36.4	1.0	-57.9	-13.0	-44.9	
	3.346	-19.7	H	3.0	35.8	1.0	-54.5	-13.0	-41.5	
	High Ch, 848.8MHz									
	1.698	-26.0	V	3.0	37.3	1.0	-62.3	-13.0	-49.3	
	2.547	-19.6	V	3.0	36.3	1.0	-55.0	-13.0	-42.0	
	3.395	-18.6	V	3.0	35.7	1.0	-53.3	-13.0	-40.3	
	1.698	-25.8	H	3.0	37.3	1.0	-62.1	-13.0	-49.1	
	2.547	-23.0	H	3.0	36.3	1.0	-58.3	-13.0	-45.3	
	3.395	-19.7	H	3.0	35.7	1.0	-54.4	-13.0	-41.4	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: EGPRS850 Harm

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	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	1.648	-26.7	V	3.0	37.4	1.0	-63.1	-13.0	-50.1	
	2.473	-13.6	V	3.0	36.4	1.0	-49.0	-13.0	-36.0	
850	3.297	-20.8	V	3.0	35.8	1.0	-55.6	-13.0	-42.6	
	1.648	-21.0	H	3.0	37.4	1.0	-57.4	-13.0	-44.4	
EGPRS	2.473	-14.6	H	3.0	36.4	1.0	-50.0	-13.0	-37.0	
	3.297	-20.9	H	3.0	35.8	1.0	-55.7	-13.0	-42.7	
	Mid Ch, 836.6MHz									
	1.673	-27.2	V	3.0	37.3	1.0	-63.6	-13.0	-50.6	
	2.510	-22.3	V	3.0	36.4	1.0	-57.6	-13.0	-44.6	
	3.346	-21.1	V	3.0	35.8	1.0	-55.9	-13.0	-42.9	
	1.673	-26.5	H	3.0	37.3	1.0	-62.9	-13.0	-49.9	
	2.510	-22.6	H	3.0	36.4	1.0	-57.9	-13.0	-44.9	
	3.346	-19.7	H	3.0	35.8	1.0	-54.5	-13.0	-41.5	
	High Ch, 848.8MHz									
	1.698	-26.0	V	3.0	37.3	1.0	-62.3	-13.0	-49.3	
	2.547	-19.6	V	3.0	36.3	1.0	-55.0	-13.0	-42.0	
	3.395	-18.6	V	3.0	35.7	1.0	-53.3	-13.0	-40.3	
	1.698	-25.8	H	3.0	37.3	1.0	-62.1	-13.0	-49.1	
	2.547	-23.0	H	3.0	36.3	1.0	-58.3	-13.0	-45.3	
	3.395	-19.7	H	3.0	35.7	1.0	-54.4	-13.0	-41.4	

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 #: 14I18889
Date: 09/24/14
Test Engineer: Jude Semana
Configuration: EUT w/ AC Adaptor + HS, X-pos
Mode: GPRS850 Harm

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 22

Band: GSM 850 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	-26.0	V	3.0	37.4	1.0	-62.4	-13.0	-49.4	
2.473	-11.9	V	3.0	36.4	1.0	-47.3	-13.0	-34.3	
3.297	-20.4	V	3.0	35.8	1.0	-55.2	-13.0	-42.2	
1.648	-16.8	H	3.0	37.4	1.0	-53.1	-13.0	-40.1	
2.473	-10.6	H	3.0	36.4	1.0	-46.0	-13.0	-33.0	
3.297	-21.0	H	3.0	35.8	1.0	-55.8	-13.0	-42.8	
Mid Ch, 836.6MHz									
1.673	-28.4	V	3.0	37.3	1.0	-64.7	-13.0	-51.7	
2.510	-22.8	V	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3.346	-21.0	V	3.0	35.8	1.0	-55.8	-13.0	-42.8	
1.673	-21.1	H	3.0	37.3	1.0	-57.4	-13.0	-44.4	
2.510	-18.9	H	3.0	36.4	1.0	-54.3	-13.0	-41.3	
3.346	-21.2	H	3.0	35.8	1.0	-55.9	-13.0	-42.9	
High Ch, 848.8MHz									
1.698	-27.4	V	3.0	37.3	1.0	-63.7	-13.0	-50.7	
2.547	-23.6	V	3.0	36.3	1.0	-58.9	-13.0	-45.9	
3.395	-21.5	V	3.0	35.7	1.0	-56.2	-13.0	-43.2	
1.698	-26.8	H	3.0	37.3	1.0	-63.1	-13.0	-50.1	
2.547	-25.5	H	3.0	36.3	1.0	-60.8	-13.0	-47.8	
3.395	-20.6	H	3.0	35.7	1.0	-55.3	-13.0	-42.3	

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 #: 14I18889
Date: 09/24/14
Test Engineer: Jude Semana
Configuration: EUT w/ AC Adaptor + HS, X-pos
Mode: GPRS850 Harm

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	T34 8449B	Filter 1	Part 22

Band: GSM 850 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	-26.0	V	3.0	37.4	1.0	-62.4	-13.0	-49.4	
2.473	-11.9	V	3.0	36.4	1.0	-47.3	-13.0	-34.3	
3.297	-20.4	V	3.0	35.8	1.0	-55.2	-13.0	-42.2	
1.648	-16.8	H	3.0	37.4	1.0	-53.1	-13.0	-40.1	
2.473	-10.6	H	3.0	36.4	1.0	-46.0	-13.0	-33.0	
3.297	-21.0	H	3.0	35.8	1.0	-55.8	-13.0	-42.8	
Mid Ch, 836.6MHz									
1.673	-28.4	V	3.0	37.3	1.0	-64.7	-13.0	-51.7	
2.510	-22.8	V	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3.346	-21.0	V	3.0	35.8	1.0	-55.8	-13.0	-42.8	
1.673	-21.1	H	3.0	37.3	1.0	-57.4	-13.0	-44.4	
2.510	-18.9	H	3.0	36.4	1.0	-54.3	-13.0	-41.3	
3.346	-21.2	H	3.0	35.8	1.0	-55.9	-13.0	-42.9	
High Ch, 848.8MHz									
1.698	-27.4	V	3.0	37.3	1.0	-63.7	-13.0	-50.7	
2.547	-23.6	V	3.0	36.3	1.0	-58.9	-13.0	-45.9	
3.395	-21.5	V	3.0	35.7	1.0	-56.2	-13.0	-43.2	
1.698	-26.8	H	3.0	37.3	1.0	-63.1	-13.0	-50.1	
2.547	-25.5	H	3.0	36.3	1.0	-60.8	-13.0	-47.8	
3.395	-20.6	H	3.0	35.7	1.0	-55.3	-13.0	-42.3	

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 #: 14I18889
Date: 09/25/14
Test Engineer: R. Alegre
Configuration: EUT w/ AC Adaptor + HS
Mode: EGPRS850 Harm

Chamber	Pre-amplifer	Filter	Limit
3m Chamber	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	1.648	-26.7	V	3.0	37.4	1.0	-63.1	-13.0	-50.1	
	2.473	-13.6	V	3.0	36.4	1.0	-49.0	-13.0	-36.0	
850	3.297	-20.8	V	3.0	35.8	1.0	-55.6	-13.0	-42.6	
	1.648	-21.0	H	3.0	37.4	1.0	-57.4	-13.0	-44.4	
EGPRS	2.473	-14.6	H	3.0	36.4	1.0	-50.0	-13.0	-37.0	
	3.297	-20.9	H	3.0	35.8	1.0	-55.7	-13.0	-42.7	
	Mid Ch, 836.6MHz									
	1.673	-27.2	V	3.0	37.3	1.0	-63.6	-13.0	-50.6	
	2.510	-22.3	V	3.0	36.4	1.0	-57.6	-13.0	-44.6	
	3.346	-21.1	V	3.0	35.8	1.0	-55.9	-13.0	-42.9	
	1.673	-26.5	H	3.0	37.3	1.0	-62.9	-13.0	-49.9	
	2.510	-22.6	H	3.0	36.4	1.0	-57.9	-13.0	-44.9	
	3.346	-19.7	H	3.0	35.8	1.0	-54.5	-13.0	-41.5	
	High Ch, 848.8MHz									
	1.698	-26.0	V	3.0	37.3	1.0	-62.3	-13.0	-49.3	
	2.547	-19.6	V	3.0	36.3	1.0	-55.0	-13.0	-42.0	
	3.395	-18.6	V	3.0	35.7	1.0	-53.3	-13.0	-40.3	
	1.698	-25.8	H	3.0	37.3	1.0	-62.1	-13.0	-49.1	
	2.547	-23.0	H	3.0	36.3	1.0	-58.3	-13.0	-45.3	
	3.395	-19.7	H	3.0	35.7	1.0	-54.4	-13.0	-41.4	

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.