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

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER: SM-G5500

FCC ID: A3LSMG5500

REPORT NUMBER: 15I21583-E1V2

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

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

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47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE Phone + Bluetooth and WLAN 2.4GHz b/g/n
MODEL:	SM-G5500
SERIAL NUMBER:	2204885 (Radiated), 2204883(Conducted)
DATE TESTED:	SEPTEMBER 10 – 18, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 22H, 24E and 27M	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:

CHARLES VERGONIO
CONSUMER TECHNOLOGY DIVISION
WiSE LAB ENGINEER
UL Verification Services Inc.

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2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

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

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

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4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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

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

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 27000 MHz	4.94 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

5.2. MAXIMUM OUTPUT POWER

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	mW	Avg	mW
GSM850	824~849	GMSK	32.9	1949.84		
	824~849	GPRS	32.9	1949.84	28.48	704.69
	824~849	EGPRS	27.3	537.03	23.35	216.27
GSM1900	1850~1910	GMSK	29.9	977.24		
	1850~1910	GPRS	29.9	977.24	30.27	1064.14
	1850~1910	EGPRS	26.4	436.52	27.19	523.60
Band 5	824~849	REL99	22.7	186.21	18.8	75.86
	824~849	HSDPA	22.5	177.83	18.16	65.46
	824~849	HSUPA	22.5	177.83		
Band 2	1850~1910	REL99	23.0	199.53	22.7	186.21
	1850~1910	HSDPA	23.0	199.53	22.48	177.01
	1850~1910	HSUPA	23.0	199.53		

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5.3. MAXIMUM OUTPUT POWER (LTE)

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

FCC Part 27							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation	Conducted		Radiated	
			Peak	Avg	mW	Avg	mW
LTE41	2555~2655	20MHz	QPSK	23.9	245.47	20.44	110.66
		20MHz	16QAM	22.7	186.21	19.48	88.72

FCC Part 27							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation	Conducted		Radiated	
			Peak	Avg	mW	Avg	mW
LTE41	2555~2655	15MHz	QPSK	23.9	245.47	20.92	123.59
		15MHz	16QAM	22.6	181.97	19.83	96.16

FCC Part 27							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation	Conducted		Radiated	
			Peak	Avg	mW	Avg	mW
LTE41	2555~2655	10MHz	QPSK	23.8	239.88	20.86	121.90
		10MHz	16QAM	22.7	186.21	19.98	99.54

FCC Part 27							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation	Conducted		Radiated	
			Peak	Avg	mW	Avg	mW
LTE41	2555~2655	5MHz	QPSK	23.9	245.47	20.63	115.61
		5MHz	16QAM	22.7	186.21	19.85	96.61

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5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna for the bands list below with a maximum peak gain as follow:

Frequency (MHz)	Peak Gain (dBi)
Band 5, 824~849MHz	-1.8dBi
Band 2, 1850~1910MHz	-4.62dBi
LTE41, 2555~2655MHz	-4.0dBi

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5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

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

I/O CABLES (CONDUCTED SETUP)

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

I/O CABLES (RADIATED SETUP)

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

TEST SETUP

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

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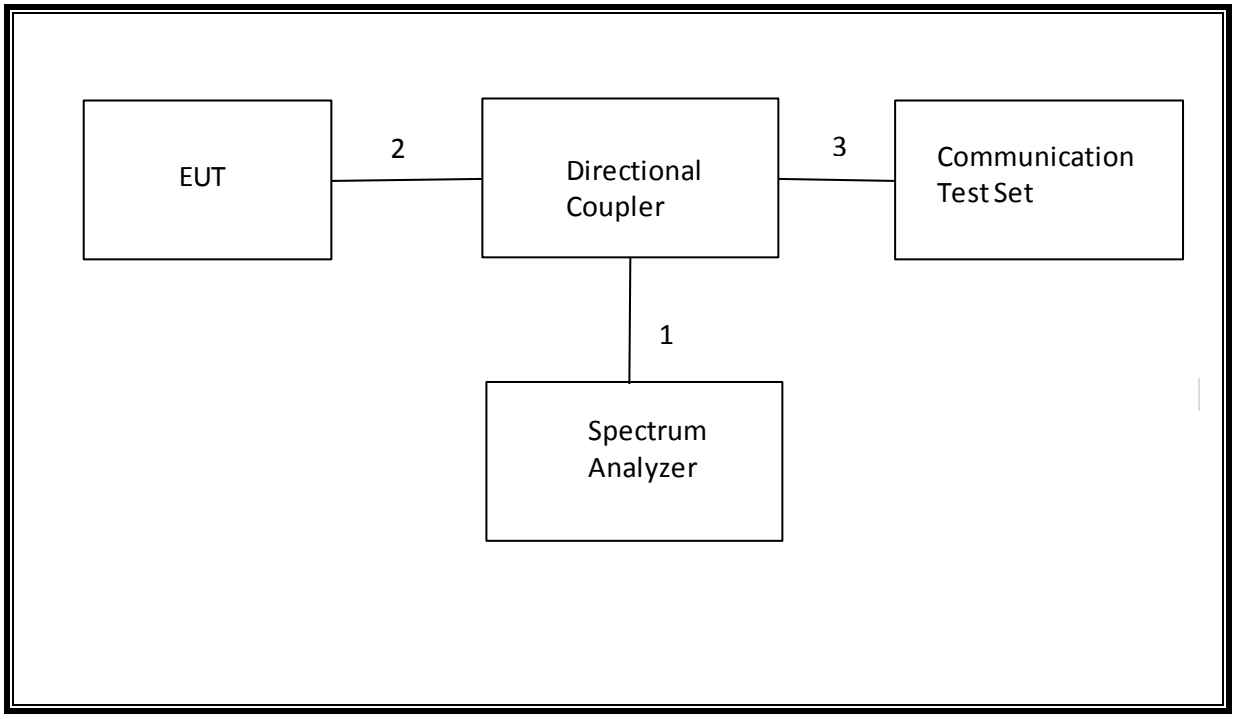
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



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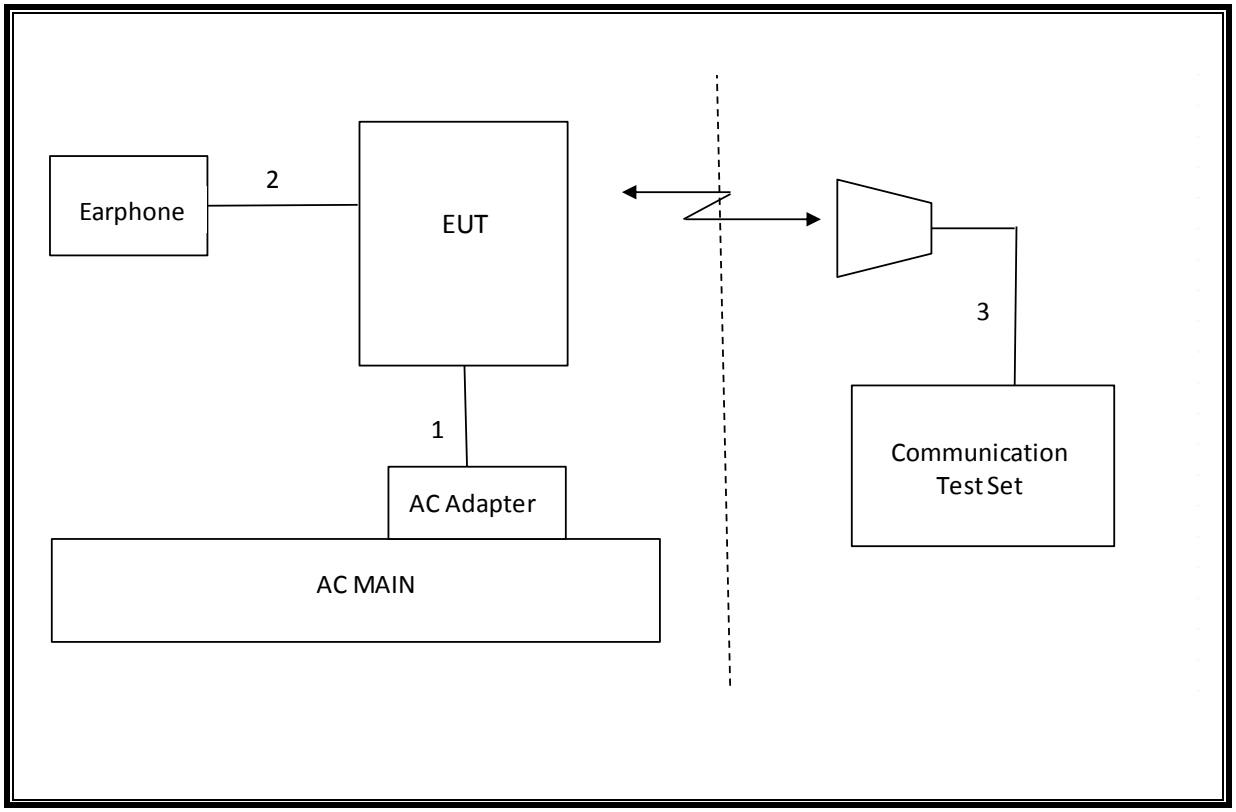
SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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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	05/01/16
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	04/22/16
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/15
Antenna, Horn, 18 GHz	EMCO	3115	C00784	10/25/15
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02687	CNR
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02688	CNR
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	05/11/16
Communications Test Set	R&S	CMW500	T159	07/02/16
DC power supply, 8 V @ 3 A or 15 V	Agilent / HP	E3610A	None	CNR
Vector signal generator, 6 GHz	Agilent / HP	E4438C	None	06/18/16
Antenna, Tuned Dipole 400~1000	ETS	3121C DB4	C00993	02/11/16
Directional Coupler	RF-Lambda	RFDC5M06G15	None	CNR
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	12/17/15
Multimeter	Fluke	26111	74320701	4/15/2016

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Version 9.5, 07/22/14
Conducted Software	UL	UL EMC	Version 9.5, 05/17/14
CLT Software	UL	UL RF	Version 1.0, 02/02/15
Antenna Port Software	UL	UL RF	Version 2.1.1.1, 1/20/15

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7. Summary Table

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	N/A	Occupied Band width (99%)	N/A	Conducted	Pass	17.916 MHz
22.917(a) 24.238(a) 27.53(g) 90.691	RSS-132(4.5.1) RSS-133(6.5.1) RSS-139(6.5.1)	Band Edge / Conducted Spurious Emission	-13dBm		Pass	-15.243 dBm
27.53(m)	RSS-199(4.5)		-25dBm		Pass	-34.01dBm
2.1046	N/A	Conducted output power	N/A		Pass	22.5 dBm
27.53(m)	RSS-199(4.5)	Emission Mask			Pass	
22.355 24.235 27.54 90.213	RSS-132(4.3) RSS-133(6.3) RSS-139(6.3) RSS-199(4.3)	Frequency Stability	2.5PPM		Pass	0.026 PPM
22.913(a)(2)	RSS-132(4.4)	Effective Radiated Power	38 dBm	Radiated	Pass	28.48 dBm
24.232(c) 27.50(h)(2)	RSS-133(6.4) RSS-199(4.4)	Equivalent Isotropic Radiated Power	33dBm		Pass	30.27 dBm
22.917(a) 24.238(a) 27.53(g)	RSS-132(4.5.1) RSS-133(6.5.1) RSS-139(6.5.1)	Radiated Spurious Emission	-13dBm		Pass	-45.6dBm
27.53(m)	RSS-199(4.5)		-25dBm		Pass	-34.2 dBm

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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

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8.1.1. GSM OUTPUT POWER RESULT

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)
GSM (Voice)	CS1	1	512	1850.2	29.8
			661	1880.0	29.6
			810	1909.8	29.9
GPRS (GMSK)	CS1	1	512	1850.2	29.9
			661	1880.0	29.6
			810	1909.8	29.9
		2	512	1850.2	27.0
			661	1880.0	26.7
			810	1909.8	27.0
		3	512	1850.2	26.1
			661	1880.0	25.7
			810	1909.8	26.2
		4	512	1850.2	24.8
			661	1880.0	24.4
			810	1909.8	24.8
EGPRS (8PSK)	MCS5	1	512	1850.2	26.3
			661	1880.0	25.7
			810	1909.8	26.4
		2	512	1850.2	23.2
			661	1880.0	22.8
			810	1909.8	23.5
		3	512	1850.2	22.4
			661	1880.0	22.0
			810	1909.8	22.4
		4	512	1850.2	21.1
			661	1880.0	20.7
			810	1909.8	21.0

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Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)
GSM (Voice)	CS1	1	128	824.4	32.8
			190	836.6	32.9
			251	848.8	32.7
GPRS (GMSK)	CS1	1	128	824.4	32.8
			190	836.6	32.9
			251	848.8	32.7
		2	128	824.4	30.0
			190	836.6	30.0
			251	848.8	30.0
		3	128	824.4	29.4
			190	836.6	29.5
			251	848.8	29.5
		4	128	824.4	28.6
			190	836.6	28.6
			251	848.8	28.7
EGPRS (8PSK)	MCS5	1	128	824.4	27.2
			190	836.6	27.3
			251	848.8	27.1
		2	128	824.4	24.5
			190	836.6	24.5
			251	848.8	24.5
		3	128	824.4	23.7
			190	836.6	23.7
			251	848.8	23.6
		4	128	824.4	22.8
			190	836.6	22.7
			251	848.8	22.7

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8.2. UMTS REL 99

TEST PROCEDURE

The following summary of these settings are illustrated below:

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

8.2.1. UMTS REL 99 OUTPUT POWER RESULT

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

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	0	22.7
		9400	1880.0	0	23.0
		9538	1907.6	0	23.0

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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			

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8.3.1. UMTS HSDPA OUTPUT POWER RESULT

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	22.5
		4183	836.6	0	22.5
		4233	846.6	0	22.5
	Subtest 2	4132	826.4	0	22.5
		4183	836.6	0	22.5
		4233	846.6	0	22.5
	Subtest 3	4132	826.4	0.5	22.0
		4183	836.6	0.5	22.0
		4233	846.6	0.5	22.0
	Subtest 4	4132	826.4	0.5	22.0
		4183	836.6	0.5	22.0
		4233	846.6	0.5	22.0

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band II	Subtest 1	9262	1852.4	0	22.6
		9400	1880.0	0	23.0
		9538	1907.6	0	23.0
	Subtest 2	9262	1852.4	0	22.6
		9400	1880.0	0	23.0
		9538	1907.6	0	23.0
	Subtest 3	9262	1852.4	0.5	22.1
		9400	1880.0	0.5	22.4
		9538	1907.6	0.5	22.5
	Subtest 4	9262	1852.4	0.5	22.1
		9400	1880.0	0.5	22.4
		9538	1907.6	0.5	22.5

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8.4. UMTS HSUPA

TEST PROCEDURE

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

	Mode	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	P-CPICH (dB)	-10				
	P-CCPCH (dB)	-12				
	SCH (dB)	-12				
	PICH(dB)	-15				
	DPCH (dB)	-9				
	HS-SCCH_1 (dB)	-8				
	HS-PDSCH (dB)	-3				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	Bc	11/15	6/15	15/15	2/15	15/15
	Bd	15/15	15/15	9/15	15/15	15/15
	Bec	209/225	12/15	30/15	2/15	5/15
	βc/βd	11/15	6/15	15/9	2/15	15/15
	Bhs	22/15	12/15	30/15	4/15	30/15
	βed (note1)	1309/225	94/75	47/15 47/15	56/75	134/15
	MPR	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	Ahs = βhs/βc	30/15				
HSUPA Specific Settings	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	Reference E-TFCIs	5	5	2	5	5
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_TFCIs	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27	

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

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8.4.1. UMTS HSUPA OUTPUT POWER RESULT

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	21.7
		4183	836.6	0	21.6
		4233	846.6	0	21.6
	Subtest 2	4132	826.4	2	21.3
		4183	836.6	2	21.2
		4233	846.6	2	21.2
	Subtest 3	4132	826.4	1	21.7
		4183	836.6	1	21.7
		4233	846.6	1	21.7
	Subtest 4	4132	826.4	2	21.3
		4183	836.6	2	21.2
		4233	846.6	2	21.2
	Subtest 5	4132	826.4	0	22.5
		4183	836.6	0	22.5
		4233	846.6	0	22.4

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band II	Subtest 1	9262	1852.4	0	21.7
		9400	1880.0	0	21.9
		9538	1907.6	0	22.0
	Subtest 2	9262	1852.4	2	19.5
		9400	1880.0	2	20.0
		9538	1907.6	2	20.0
	Subtest 3	9262	1852.4	1	20.0
		9400	1880.0	1	20.5
		9538	1907.6	1	20.0
	Subtest 4	9262	1852.4	2	19.5
		9400	1880.0	2	20.0
		9538	1907.6	2	20.0
	Subtest 5	9262	1852.4	0	22.6
		9400	1880.0	0	22.9
		9538	1907.6	0	23.0

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8.4.1. 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.

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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.		

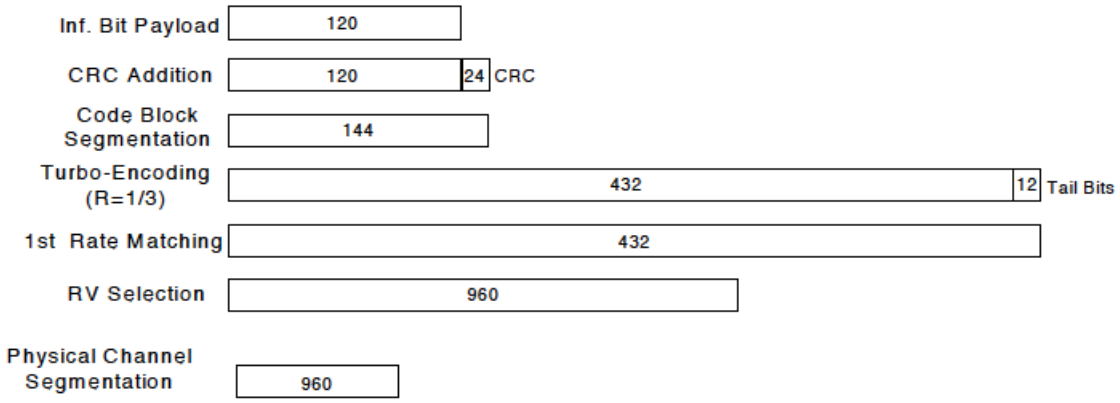

Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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			

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	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.

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8.4.1. UMTS DC-HSDPA OUTPUT POWER RESULT

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	22.5
		4183	836.6	0	22.5
		4233	846.6	0	22.5
	Subtest 2	4132	826.4	0	22.5
		4183	836.6	0	22.5
		4233	846.6	0	22.4
	Subtest 3	4132	826.4	0.5	22.0
		4183	836.6	0.5	22.0
		4233	846.6	0.5	22.0
	Subtest 4	4132	826.4	0.5	22.0
		4183	836.6	0.5	22.0
		4233	846.6	0.5	22.0

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band II	Subtest 1	9262	1852.4	0	22.6
		9400	1880.0	0	23.0
		9538	1907.6	0	23.0
	Subtest 2	9262	1852.4	0	22.6
		9400	1880.0	0	23.0
		9538	1907.6	0	23.0
	Subtest 3	9262	1852.4	0.5	22.1
		9400	1880.0	0.5	22.4
		9538	1907.6	0.5	22.5
	Subtest 4	9262	1852.4	0.5	22.1
		9400	1880.0	0.5	22.4
		9538	1907.6	0.5	22.5

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8.5. LTE OUTPUT VERIFICATION

8.5.1. LTE OUTPUT RESULT

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						40340	40640	40940
						2565 MHz	2595 MHz	2625 MHz
LTE Band 41	20	QPSK	1	0	0	23.60	23.90	23.50
			1	49	0	23.60	23.70	23.40
			1	99	0	23.40	23.60	23.30
			50	0	1	22.60	22.80	22.30
			50	24	1	22.40	22.70	22.30
			50	50	1	22.40	22.50	22.10
			100	0	1	22.40	22.70	22.10
		16QAM	1	0	1	22.50	22.70	22.10
			1	49	1	22.30	22.70	22.00
			1	99	1	22.20	22.40	21.90
			50	0	2	21.20	21.60	21.00
			50	24	2	21.10	21.50	21.00
			50	50	2	21.10	21.30	21.00
			100	0	2	21.10	21.50	21.00

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						40315	40640	40965
						2562.5 MHz	2595 MHz	2627.5 MHz
LTE Band 41	15	QPSK	1	0	0	23.80	23.90	23.50
			1	37	0	23.70	23.70	23.50
			1	74	0	23.50	23.50	23.30
			36	0	1	22.50	22.80	22.30
			36	20	1	22.50	22.60	22.40
			36	39	1	22.50	22.50	22.30
			75	0	1	22.40	22.60	22.30
		16QAM	1	0	1	22.60	22.30	22.30
			1	37	1	22.40	22.20	22.30
			1	74	1	22.45	22.10	22.50
			36	0	2	21.10	21.50	21.10
			36	20	2	21.20	21.50	21.20
			36	39	2	21.10	21.40	21.00
			75	0	2	21.00	21.50	21.10

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Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						40290	40640	40990
						2560 MHz	2595 MHz	2630 MHz
LTE Band 41	10	QPSK	1	0	0	23.80	23.80	23.50
			1	25	0	23.80	23.80	23.40
			1	49	0	23.70	23.60	23.40
			25	0	1	22.50	22.70	22.30
			25	12	1	22.60	22.60	22.40
			25	25	1	22.60	22.50	22.20
			50	0	1	22.50	22.60	22.20
		16QAM	1	0	1	22.70	22.00	22.20
			1	25	1	22.60	22.00	22.10
			1	49	1	22.50	22.00	22.00
			25	0	2	21.10	21.40	21.00
			25	12	2	21.20	21.30	21.10
			25	25	2	21.00	21.20	21.00
			50	0	2	21.10	21.30	21.10

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						40265	40640	41015
						2557.5 MHz	2595 MHz	2632.5 MHz
LTE Band 41	5	QPSK	1	0	0	23.80	23.80	23.30
			1	12	0	23.87	23.90	23.30
			1	24	0	23.80	23.80	23.20
			12	0	1	22.60	22.70	22.30
			12	7	1	22.70	22.70	22.20
			12	13	1	22.70	22.60	22.10
			25	0	1	22.60	22.70	22.20
		16QAM	1	0	1	22.70	22.60	22.20
			1	12	1	22.70	22.50	22.20
			1	24	1	22.70	22.60	22.20
			12	0	2	21.20	21.50	21.00
			12	7	2	21.30	21.30	20.90
			12	13	2	21.20	21.20	20.90
			25	0	2	21.30	21.40	21.00

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9. PEAK TO AVERAGE RATIO

Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

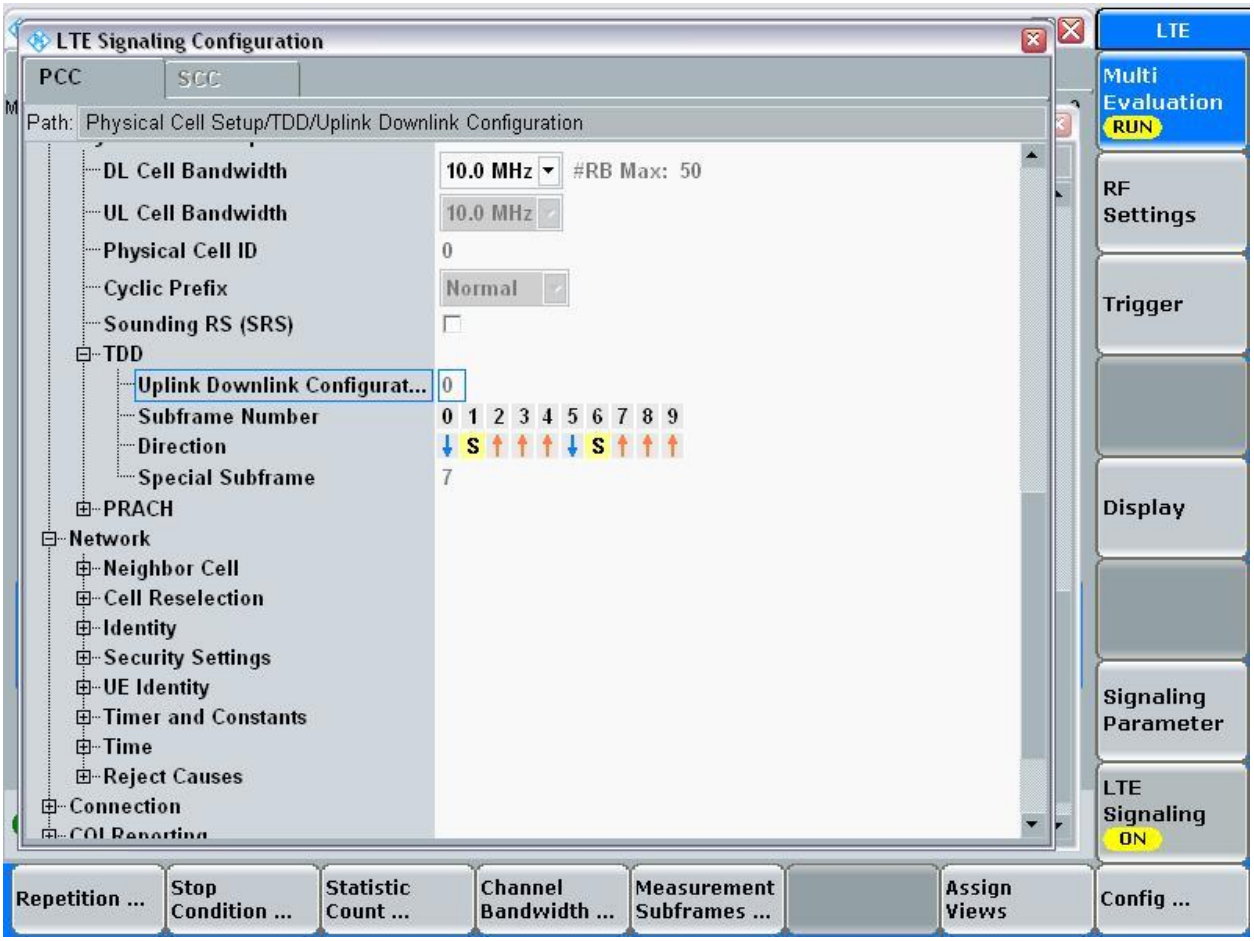
Test Spec

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

9.1. CONDUCTED PEAK TO AVERAGE RESULT

LTE Band 41

Sub frame setting:



So average reading need apply 2.22dB duty cycle factor (10log (6/10)).

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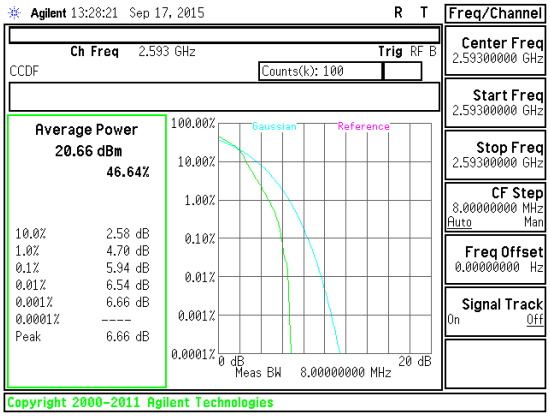
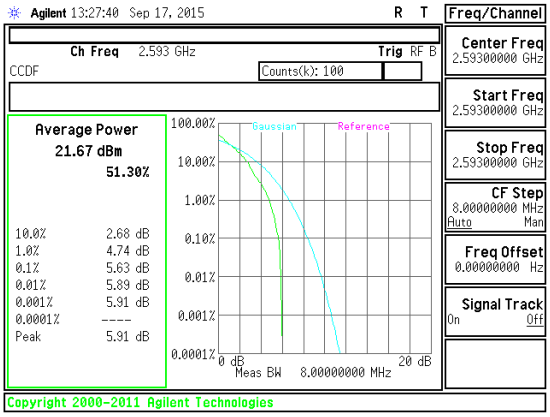
Band LTE41 20MHz	 Band LTE41 20MHz 16QAM Mid channel	 Band LTE41 20MHz QPSK Mid channel

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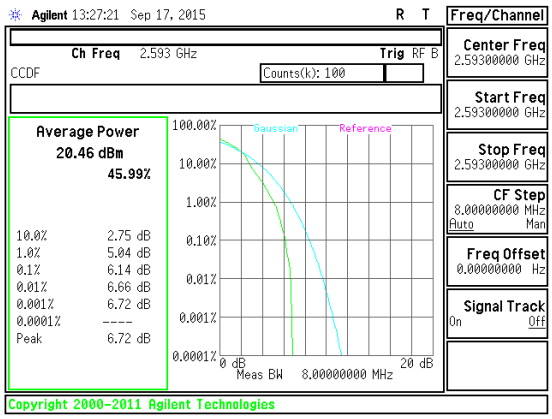
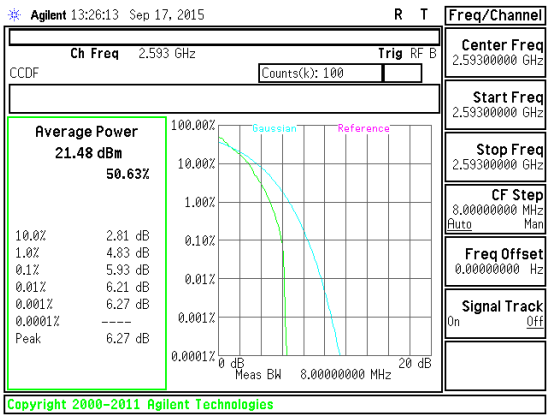
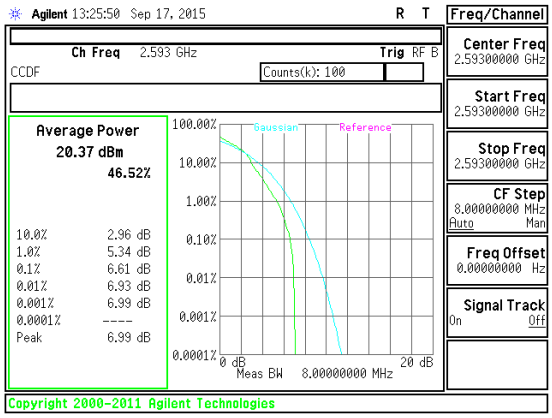
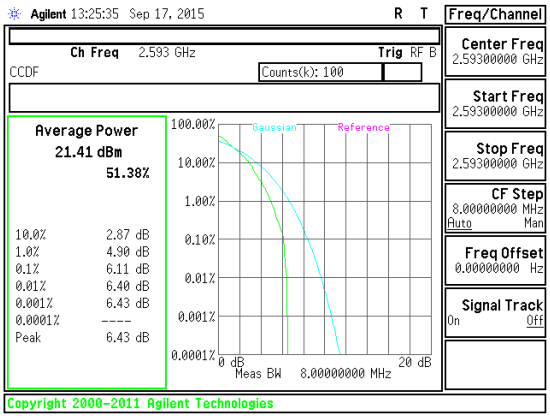
Band LTE41 15MHz	 Band LTE41 15MHz 16QAM Mid channel	 Band LTE41 15MHz QPSK Mid channel
Band LTE41 10MHz	 Band LTE41 10MHz 16QAM Mid channel	 Band LTE41 10MHz QPSK Mid channel

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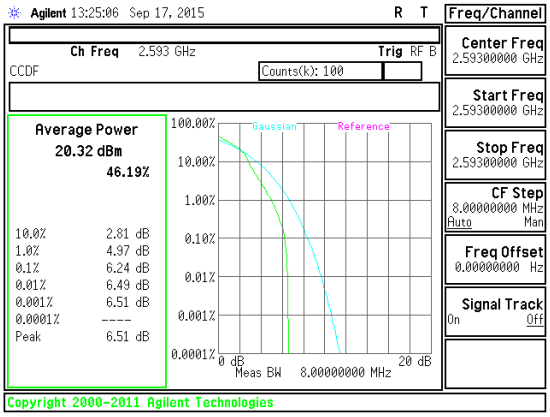
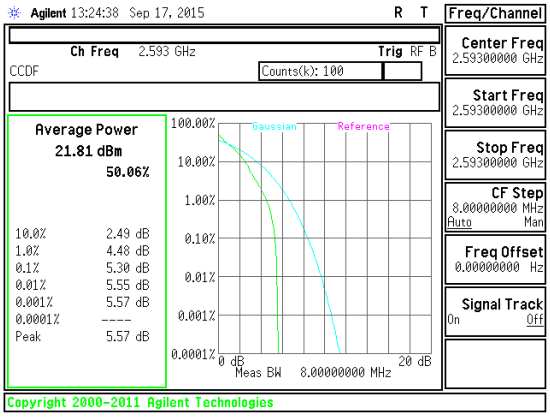
Band LTE41 5MHz	 Band LTE41 5MHz 16QAM Mid channel	 Band LTE41 5MHz QPSK Mid channel

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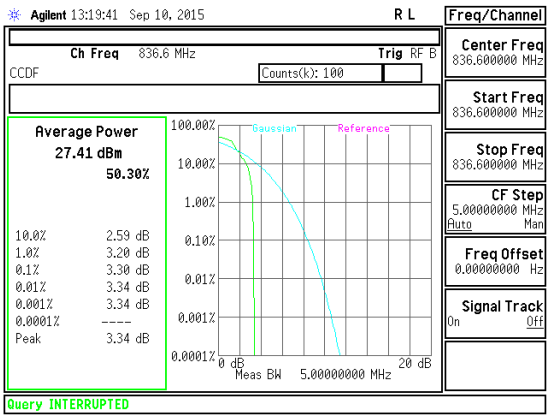
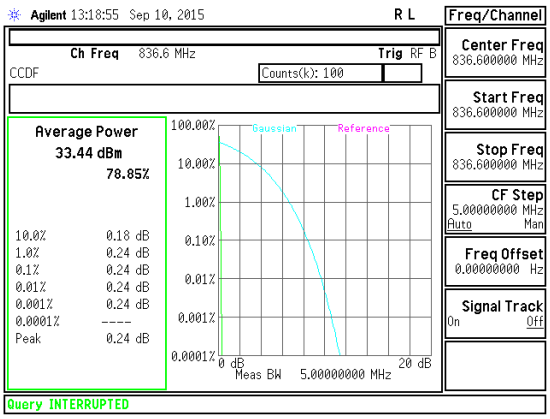
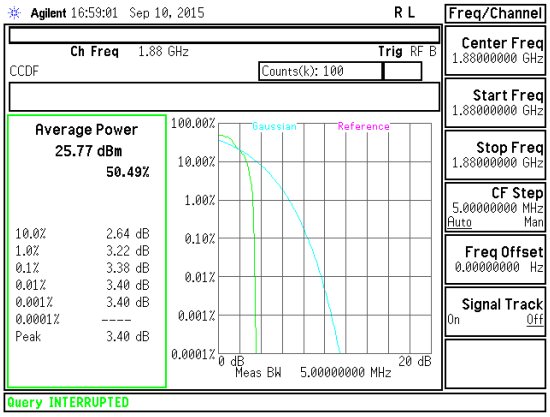
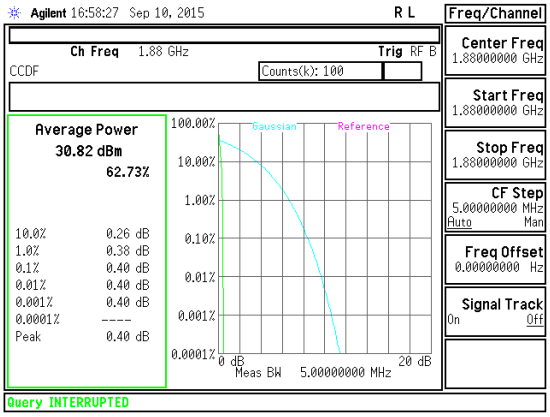
GSM

GSM 850	 EGPRS	 GPRS
GSM 1900	 EGPRS	 GPRS

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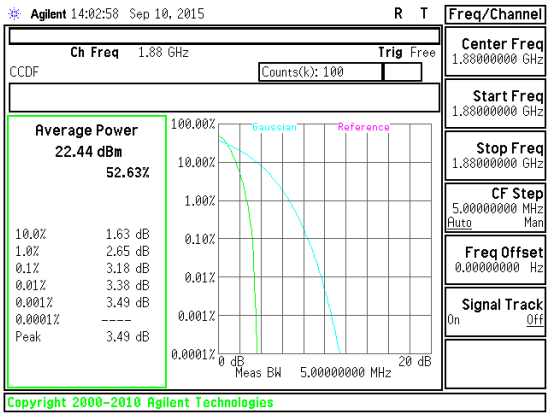
WCDMA

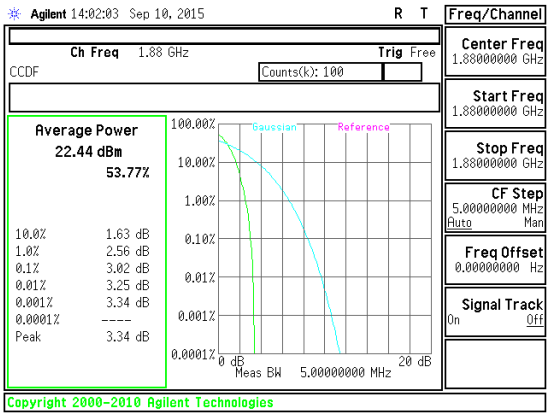
Band

Band 2

HSDPA



Band WCDMA B2 HSDPA

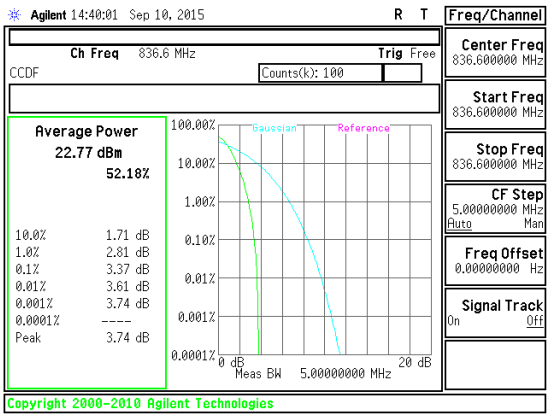


Band WCDMA B2 REL99

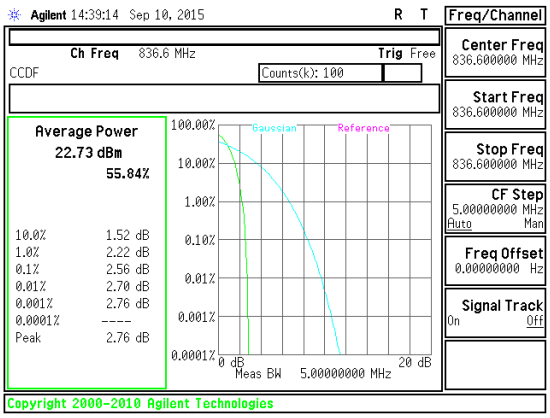
Band

Band 5

HSDPA



Band WCDMA B5 HSDPA



Band WCDMA B5 REL99

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10. LIMITS AND CONDUCTED RESULTS

10.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

(KDB 971168 D01 Power Meas License Digital Systems v02r02)

MODES TESTED

GSM 850, GSM 1900, WCDMA Band 2, WCDMA Band 5, LTE Band 41

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10.1.1. OCCUPIED BANDWIDTH RESULTS

Band	Mode	Channel	f (MHz)	99% BW (KHz)	-26dB BW (KHz)
GSM850	GMSK	128	824.2		
		190	836.6		
		251	848.8		
	GPRS	128	824.2	240.8	314.7
		190	836.6	240.3	316.7
		251	848.8	245.1	313.8
	EGPRS	128	824.2	243.8	300.3
		190	836.6	246.1	301.8
		251	848.8	248.3	306.8
GSM1900	GMSK	512	1850.2		
		661	1880		
		810	1909.8		
	GPRS	512	1850.2	243.9	312.1
		661	1880	239.5	310.7
		810	1909.8	246	311.5
	EGPRS	512	1850.2	248.2	314.5
		661	1880	243.9	303.5
		810	1909.8	241.9	308.2

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Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
Band 5	REL99	4132	826.4	4.13	4.761
		4183	836.6	4.149	4.747
		4233	846.6	4.133	4.756
	HSDPA	4132	826.4	4.124	4.718
		4183	836.6	4.161	4.781
		4233	846.6	4.17	4.783
	HSUPA	4132	826.4		
		4183	836.6		
		4233	846.6		
Band 2	REL99	9262	1852.4	4.137	4.71
		9400	1880	4.129	4.717
		9538	1907.6	4.146	4.723
	HSDPA	9262	1852.4	4.115	4.707
		9400	1880	4.135	4.701
		9538	1907.6	4.16	4.728
	HSUPA	9262	1852.4		
		9400	1880		
		9538	1907.6		

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10.1.2. LTE OCCUPIED BANDWIDTH RESULTS

Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE41	20	QPSK	100/0	2565	17.825	19.677
			100/0	2593	17.916	19.751
			100/0	2645	17.865	19.712
		16QAM	100/0	2565	17.832	19.493
			100/0	2593	17.871	19.708
			100/0	2645	17.842	19.647

Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE41	15	QPSK	75/0	2562.5	13.454	15.158
			75/0	2593	13.459	15.161
			75/0	2647.5	13.414	15.190
		16QAM	75/0	2562.5	13.406	15.301
			75/0	2593	13.439	15.141
			75/0	2647.5	13.456	15.358

Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE41	10	QPSK	50/0	2560	8.985	10.127
			50/0	2593	8.969	10.170
			50/0	2650	8.968	10.481
		16QAM	50/0	2560	8.967	10.243
			50/0	2593	8.980	10.252
			50/0	2650	8.964	10.308

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Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE41	5	QPSK	25/0	2557.5	4.509	5.307
			25/0	2593	4.526	5.447
			25/0	2652.5	4.525	5.270
		16QAM	25/0	2557.5	4.505	5.177
			25/0	2593	4.511	5.314
			25/0	2652.5	4.502	5.249

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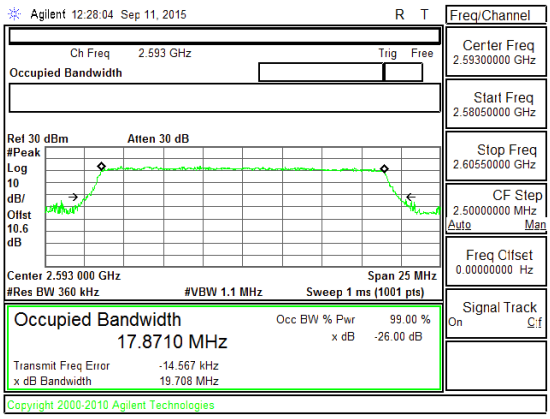
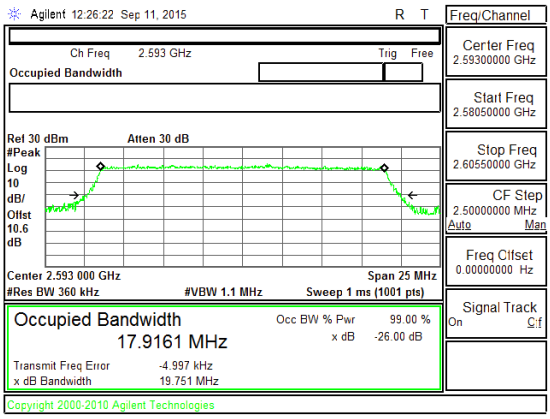
10.1.3. OCCUPIED BANDWIDTH PLOTS

Band LTE41 20MHz	 Band LTE41 20MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE41 20MHz OBW QPSK Mid Channel FRB.gif

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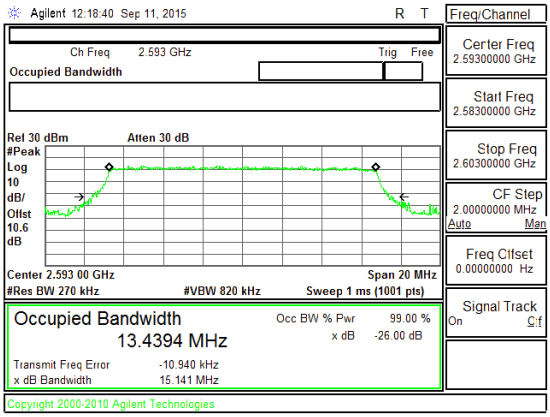
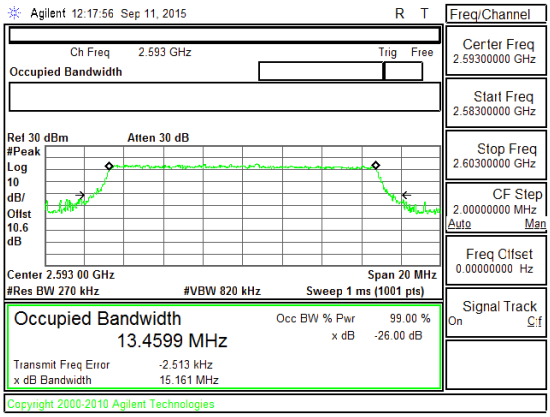
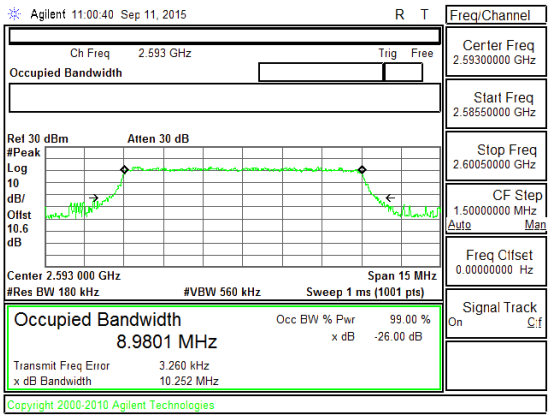
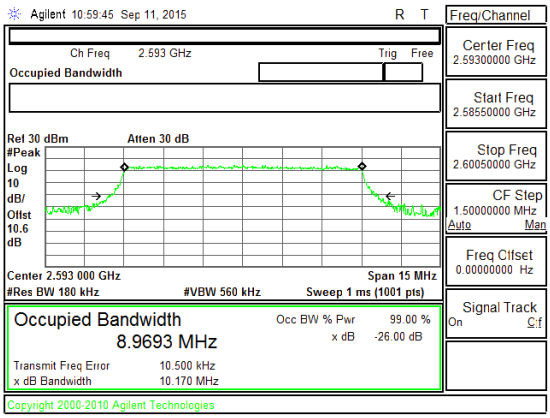
Band LTE41 15MHz	 Band LTE41 15MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE41 15MHz OBW QPSK Mid Channel FRB.gif
Band LTE41 10MHz	 Band LTE41 10MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE41 10MHz OBW QPSK Mid Channel FRB.gif

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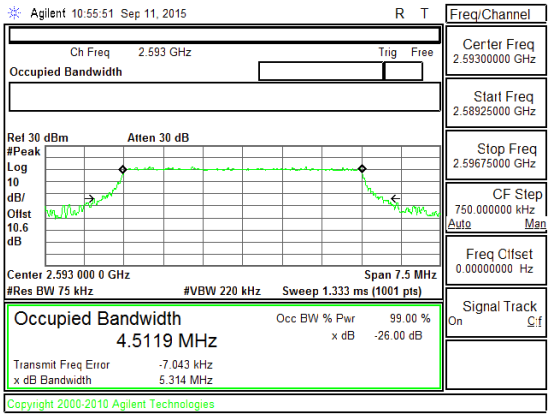
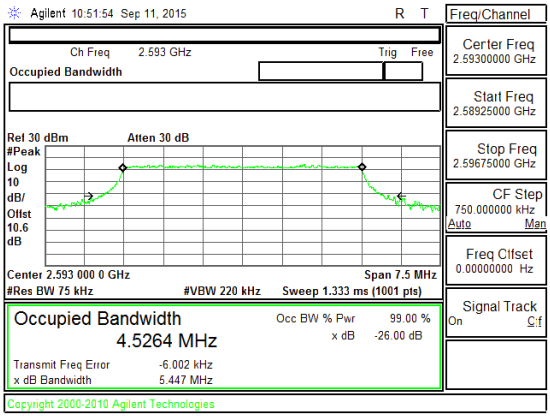
Band LTE41 5MHz

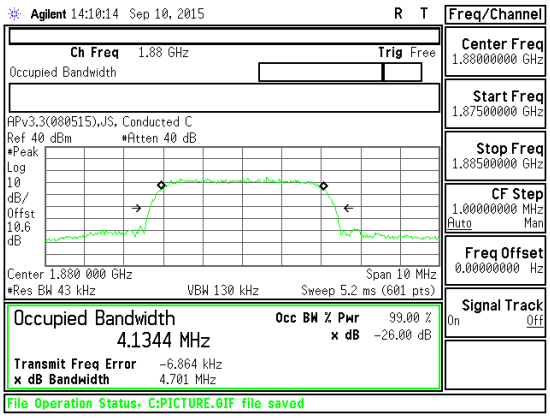


Band LTE41 5MHz OBW 16QAM Mid Channel FRB.gif

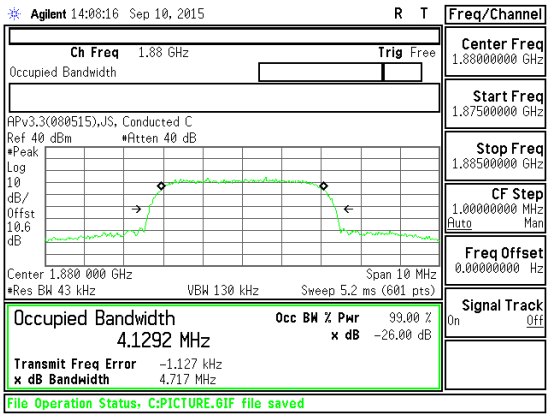


Band LTE41 5MHz OBW QPSK Mid Channel FRB.gif

Band Band 2



Band WCDMA B2 HSDPA OBW



Band WCDMA B2 REL99 OBW

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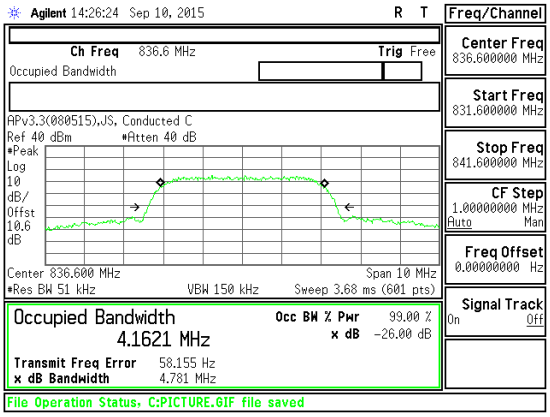
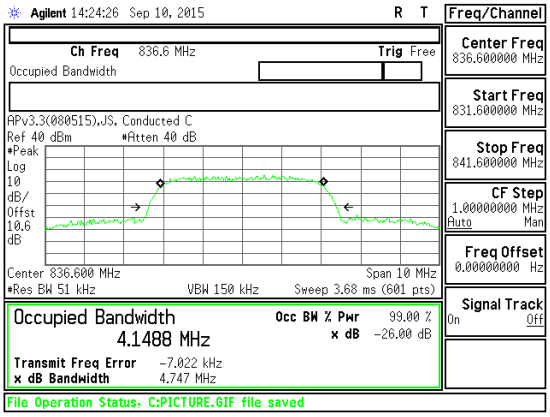
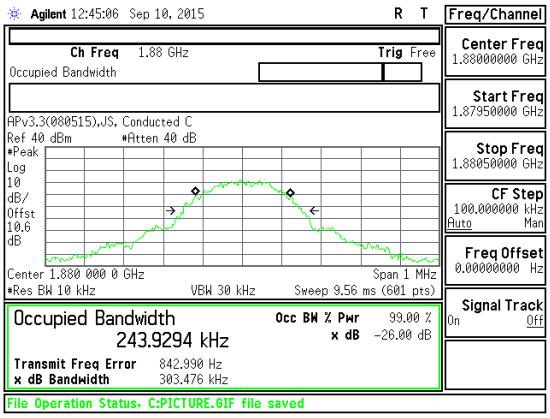
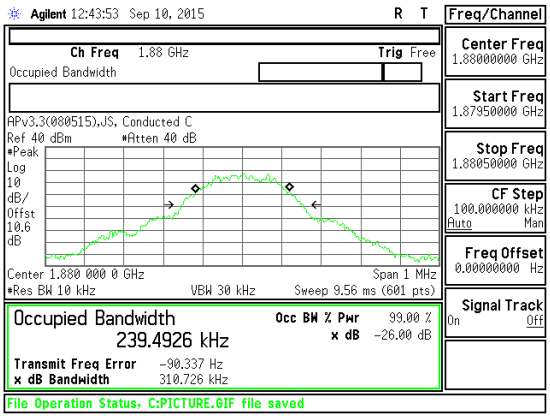
Band Band 5	 Band WCDMA B5 HSDPA OBW	 Band WCDMA B5 REL99 OBW
Band GSM 1900	 Band GSM1900 EGPRS OBW Mid channel	 Band GSM1900 GPRS OBW Mid channel

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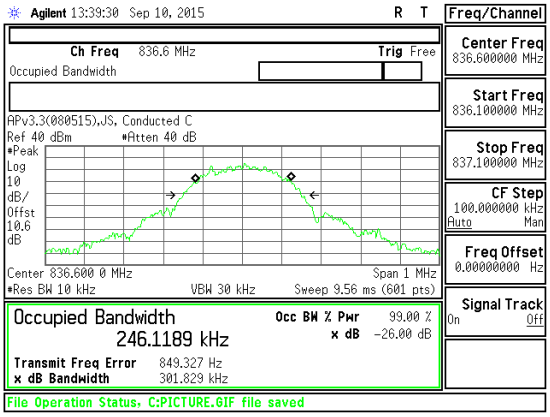
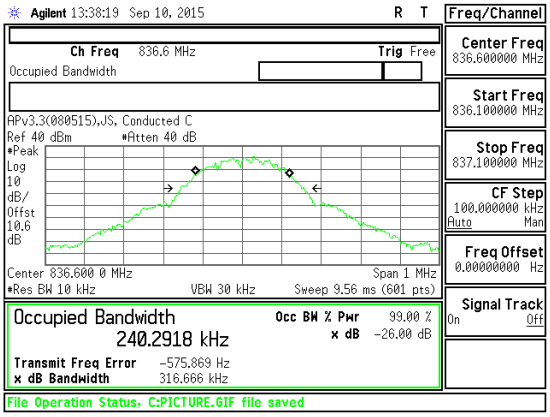
Band GSM 850	 Band GSM850 EGPRS OBW Mid channel	 Band GSM850 GPRS OBW Mid channel

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10.2. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §22.359, §24.238, §27. 53

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 27.53 m(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02
The transmitter output was connected to an Agilent 8960 or a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

MODES TESTED

GSM 850, GSM 1900, WCDMA Band 2, WCDMA Band 5, LTE Band 41

RESULTS

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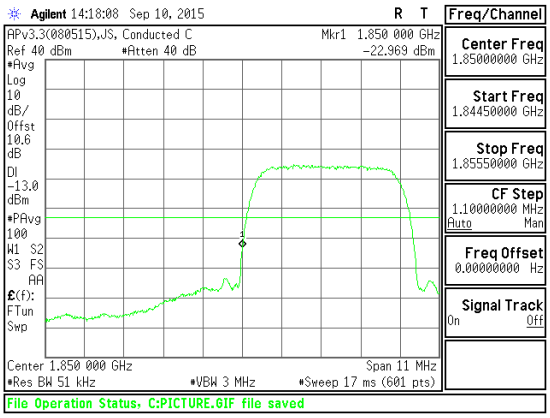
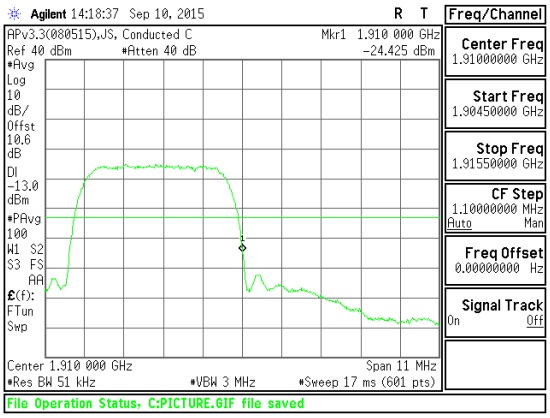
10.2.1. BAND EDGE PLOTS

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

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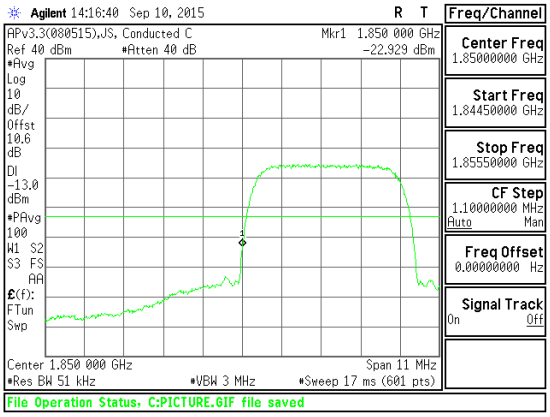
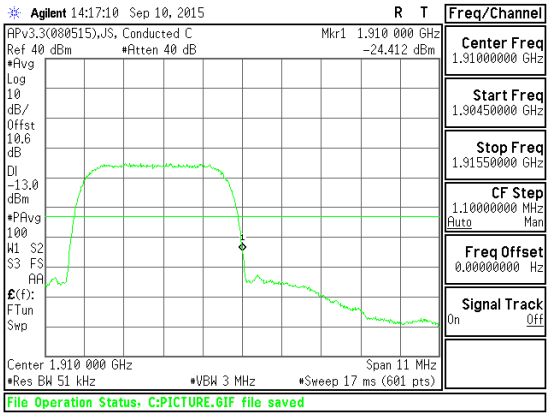
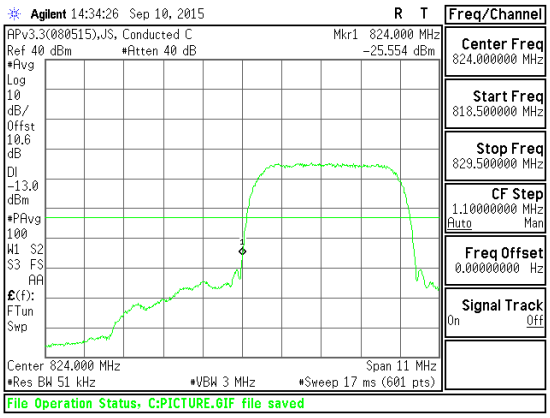
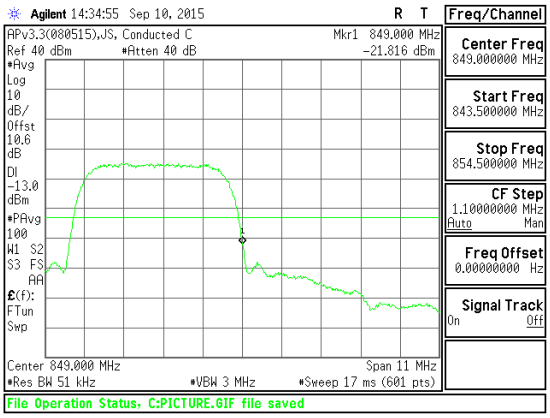
Band Band 2 REL99	 Band WCDMA B2 REL99 CBE	 Band WCDMA B2 REL99 CBE
Band Band 5 HSDPA	 Band WCDMA B5 HSDPA CBE	 Band WCDMA B5 HSDPA CBE

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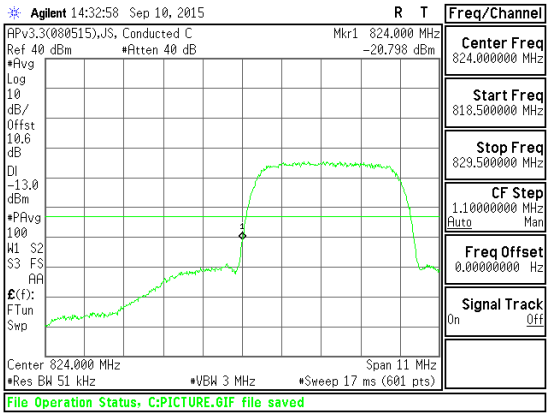
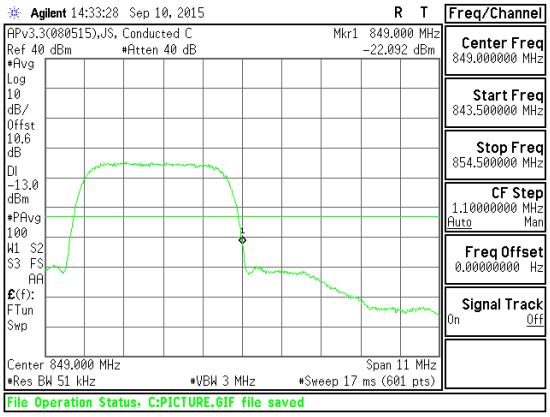
Band Band 5 REL99	 Band WCDMA B5 REL99 CBE	 Band WCDMA B5 REL99 CBE

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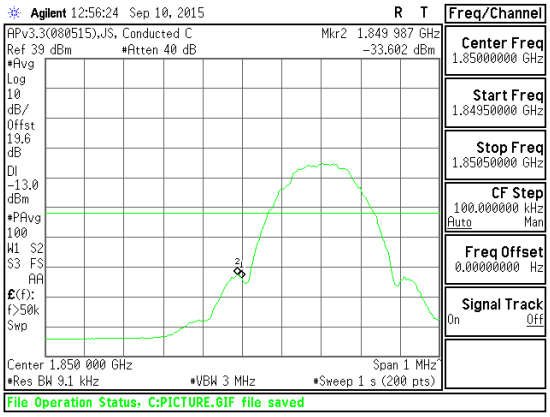
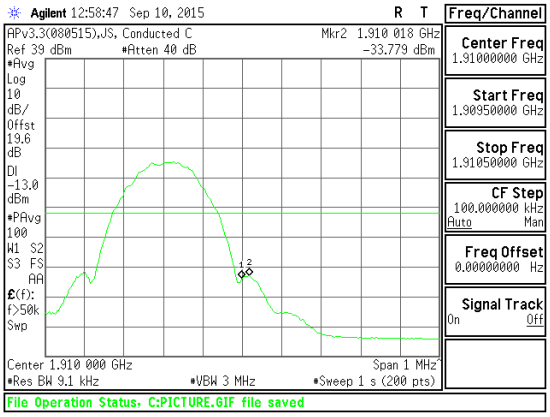
Band

GSM 1900

EGPRS



Band GSM1900 EGPRS CBE Low channel

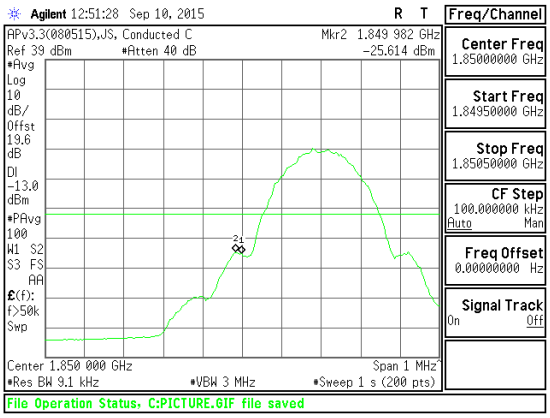


Band GSM1900 EGPRS CBE High channel

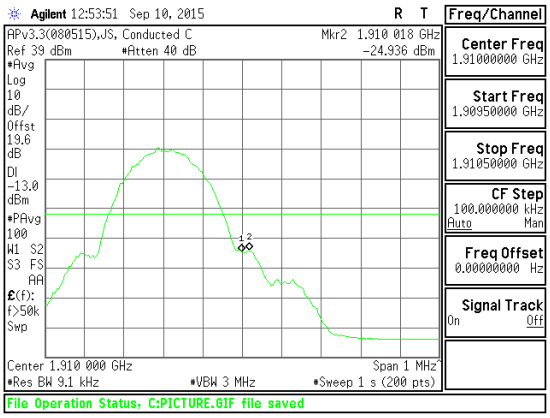
Band

GSM 1900

GPRS



Band GSM1900 GPRS CBE Low channel



Band GSM1900 GPRS CBE High channel

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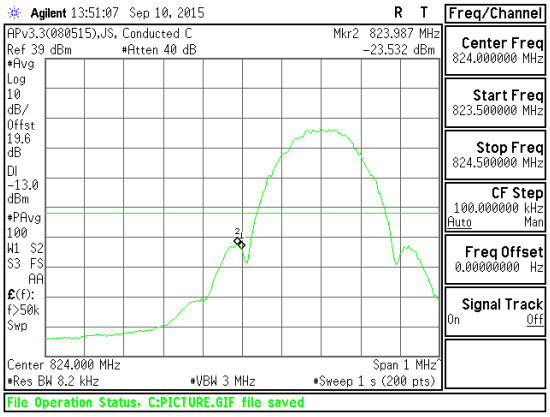
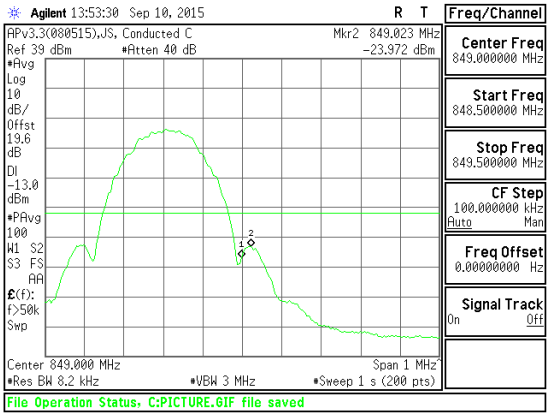
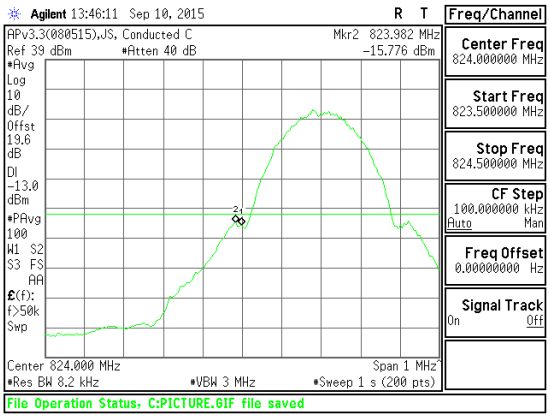
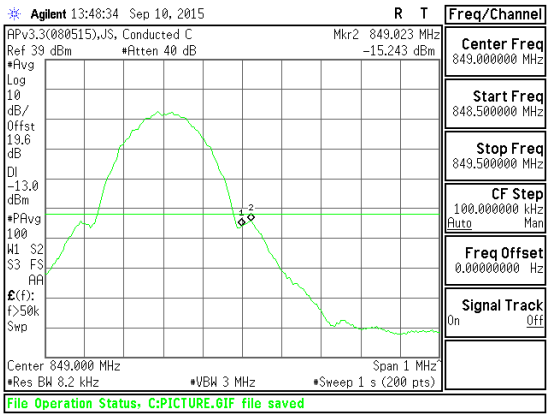
Band GSM 850 EGPRS	 Band GSM850 EGPRS CBE Low channel	 Band GSM850 EGPRS CBE High channel
Band GSM 850 GPRS	 Band GSM850 GPRS CBE Low channel	 Band GSM850 GPRS CBE High channel

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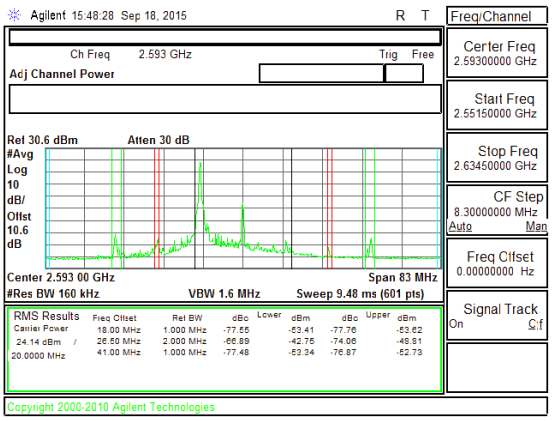
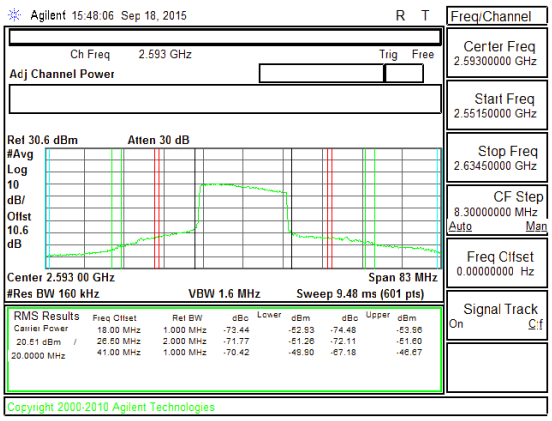
10.2.2. EMISSION MASK PLOTS

Note: Reading need apply 2.22dB duty cycle factor (10log (6/10)).

Below plots demonstrate compliance high band edge requirement.

Band LTE41 20MHz 16QAM	 Band LTE41 20MHz EM 16QAM Mid Channel 1RB.gif	 Band LTE41 20MHz EM 16QAM Mid Channel FRB.gif

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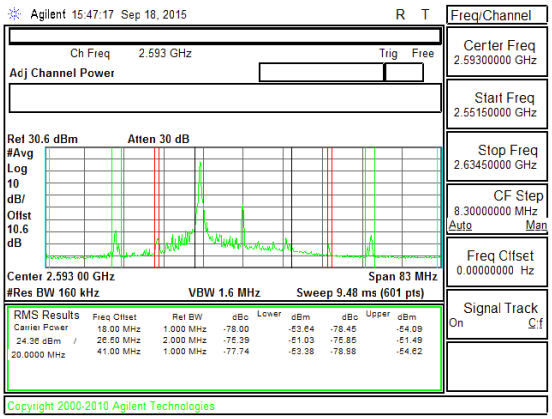
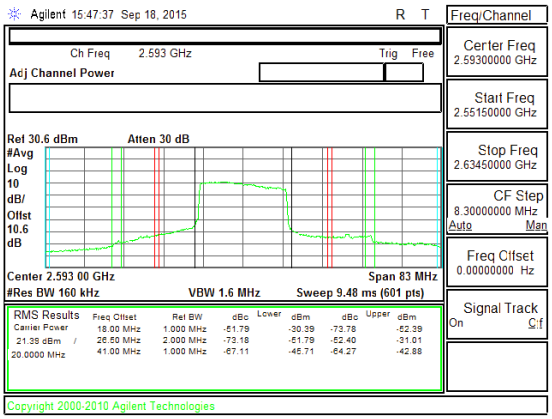
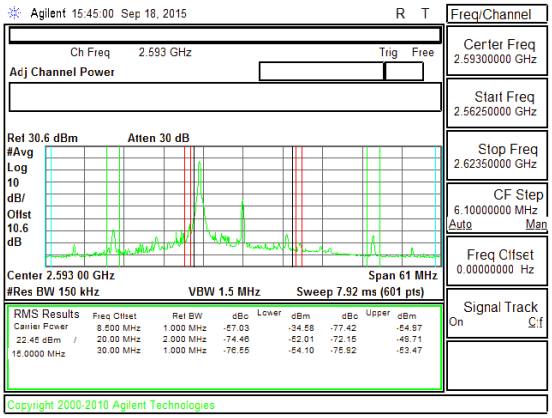
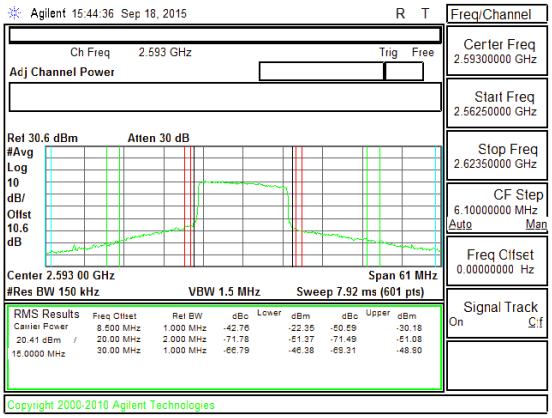
Band LTE41 20MHz QPSK	 Band LTE41 20MHz EM QPSK 1RB.gif	 Band LTE41 20MHz EM QPSK FRB.gif
Band LTE41 15MHz 16QAM	 Band LTE41 15MHz EM 16QAM Mid Channel 1RB.gif	 Band LTE41 15MHz EM 16QAM Mid Channel FRB.gif

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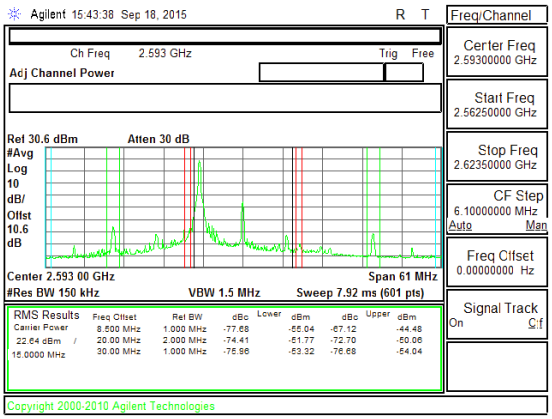
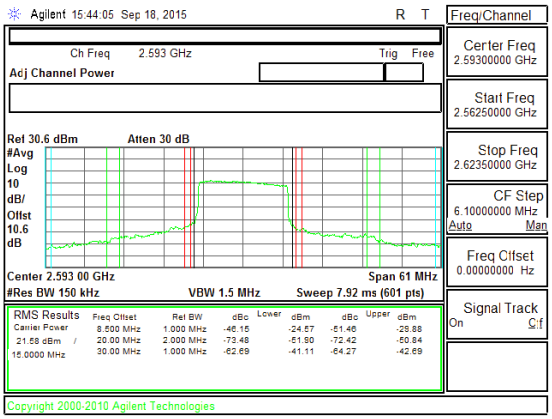
Band LTE41 15MHz QPSK	 Band LTE41 15MHz EM QPSK 1RB.gif	 Band LTE41 15MHz EM QPSK FRB.gif

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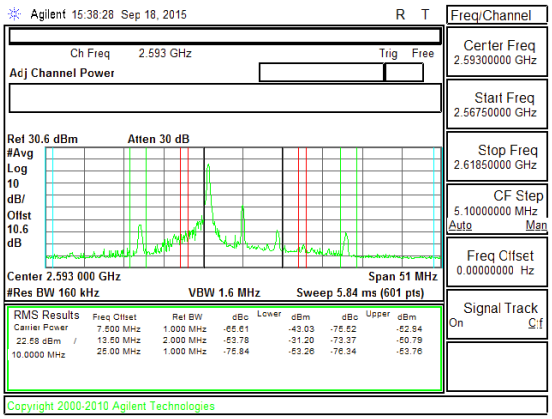
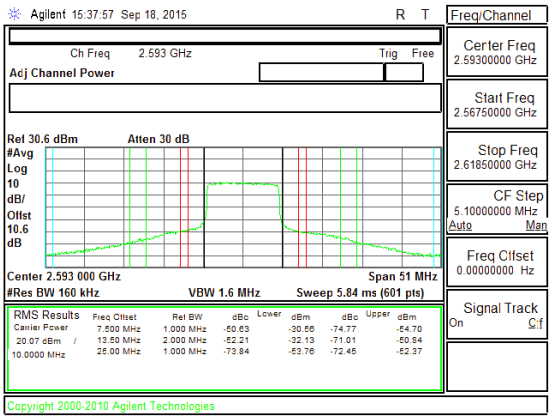
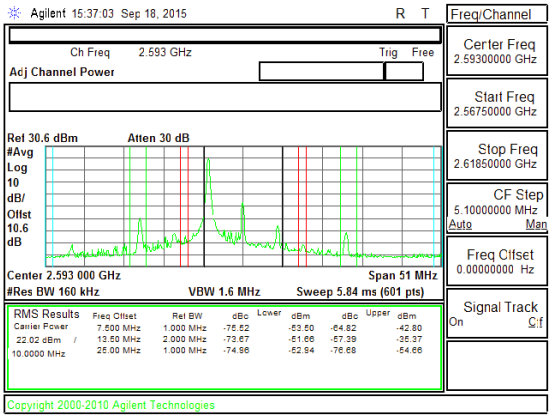
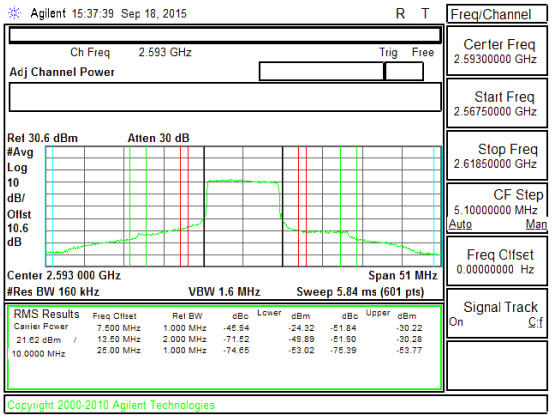
Band LTE41 10MHz 16QAM	 Band LTE41 10MHz EM 16QAM Mid Channel 1RB.gif	 Band LTE41 10MHz EM 16QAM Mid Channel FRB.gif
Band LTE41 10MHz QPSK	 Band LTE41 10MHz EM QPSK 1RB.gif	 Band LTE41 10MHz EM QPSK FRB.gif

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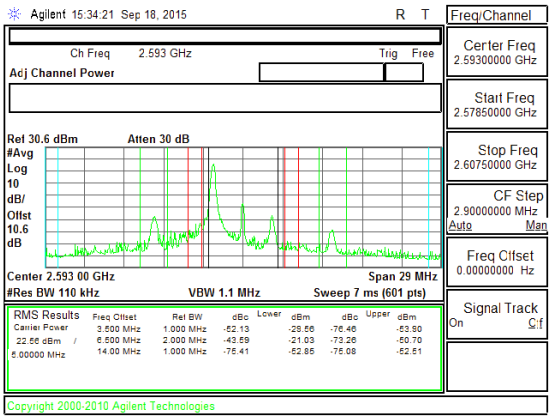
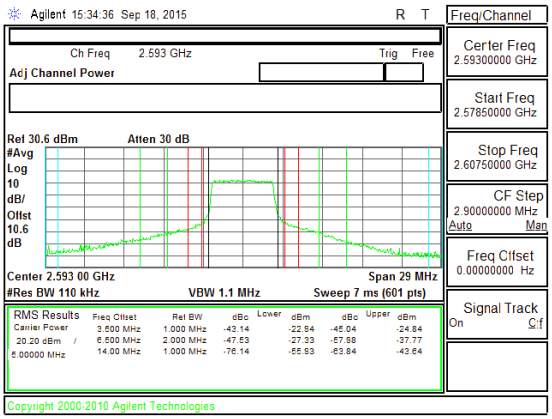
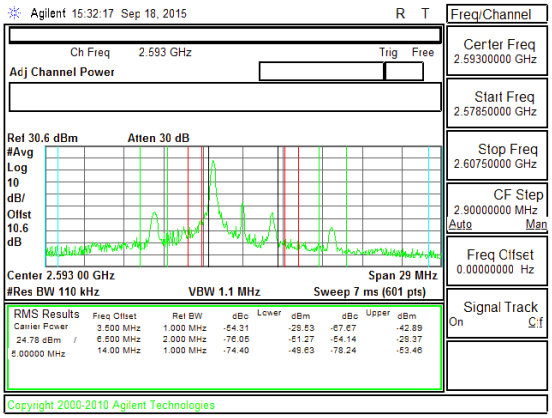
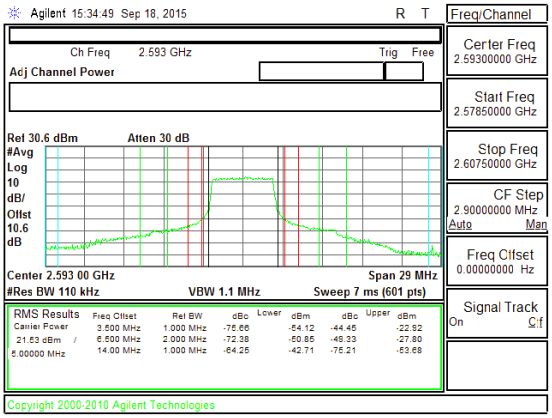
Band LTE41 5MHz 16QAM	 Band LTE41 5MHz EM 16QAM Mid Channel 1RB.gif	 Band LTE41 5MHz EM 16QAM Mid Channel FRB.gif
Band LTE41 5MHz QPSK	 Band LTE41 5MHz EM QPSK Mid Channel 1RB.gif	 Band LTE41 5MHz EM QPSK Mid Channel FRB.gif

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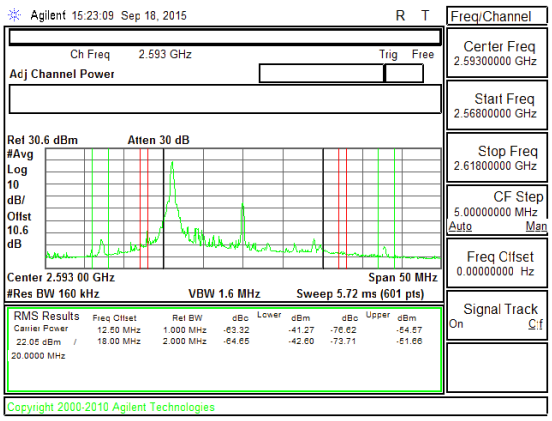
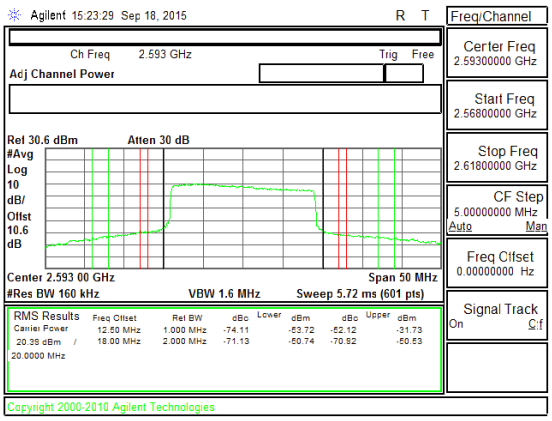
Below plots demonstrate compliance low band edge requirement.

Band LTE41 20MHz 16QAM	 Band LTE41 20MHz EM 16QAM Mid Channel 1RB.gif	 Band LTE41 20MHz EM 16QAM Mid Channel FRB.gif

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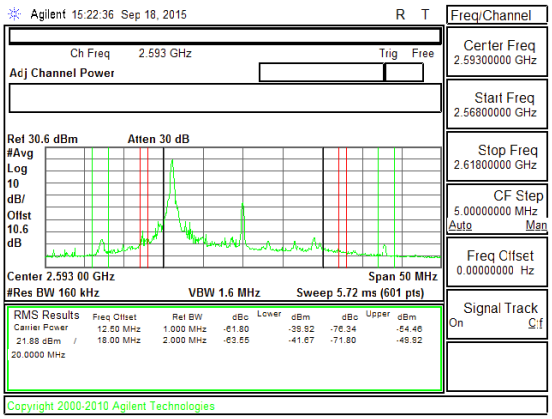
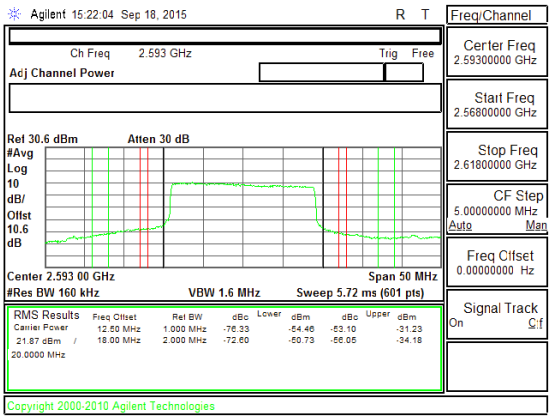
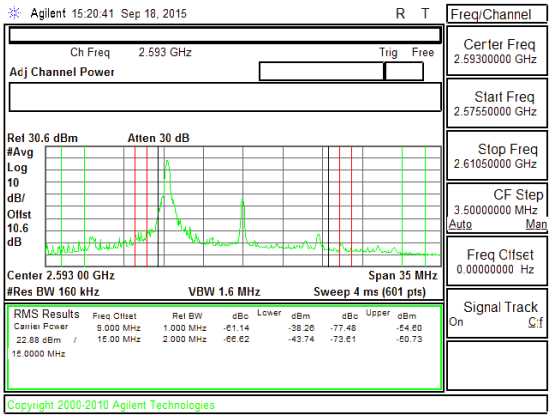
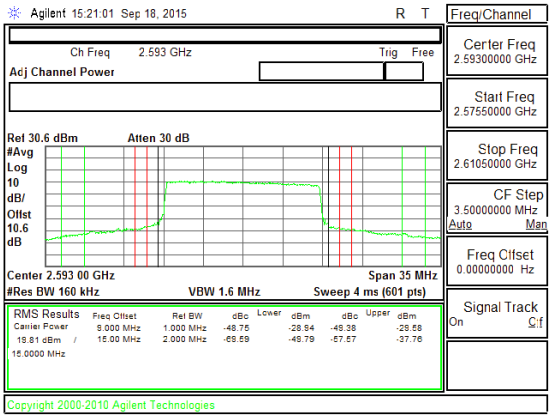
Band LTE41 20MHz QPSK	 Band LTE41 20MHz EM QPSK 1RB.gif	 Band LTE41 20MHz EM QPSK FRB.gif
Band LTE41 15MHz 16QAM	 Band LTE41 15MHz EM 16QAM Mid Channel 1RB.gif	 Band LTE41 15MHz EM 16QAM Mid Channel FRB.gif

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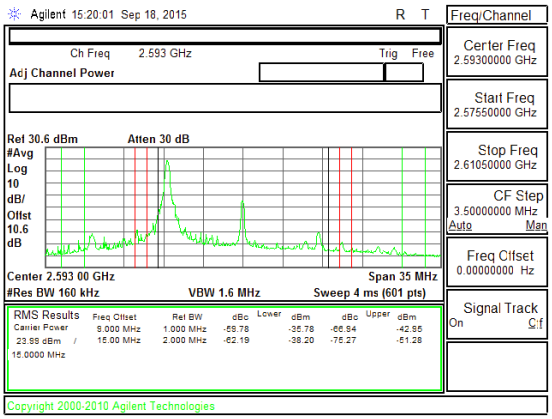
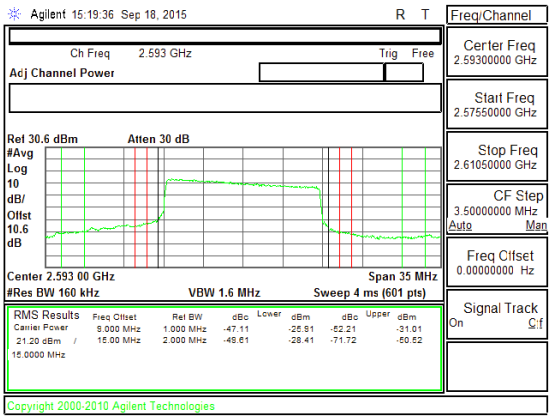
Band LTE41 15MHz QPSK	 Band LTE41 15MHz EM QPSK 1RB.gif	 Band LTE41 15MHz EM QPSK FRB.gif

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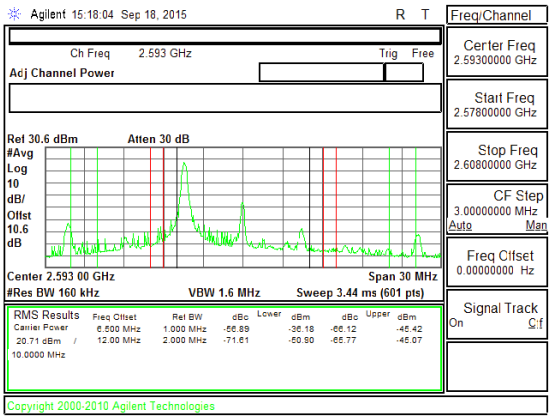
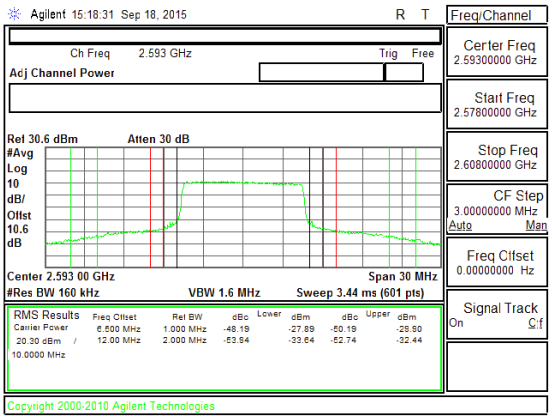
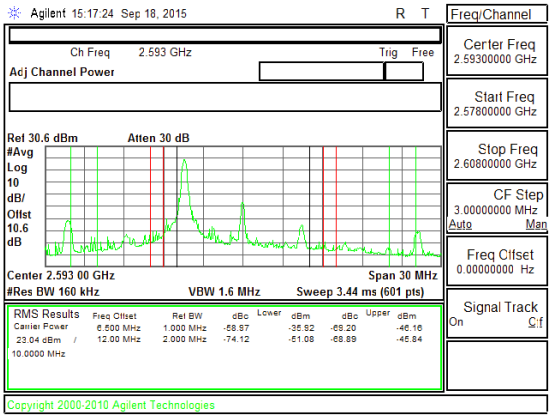
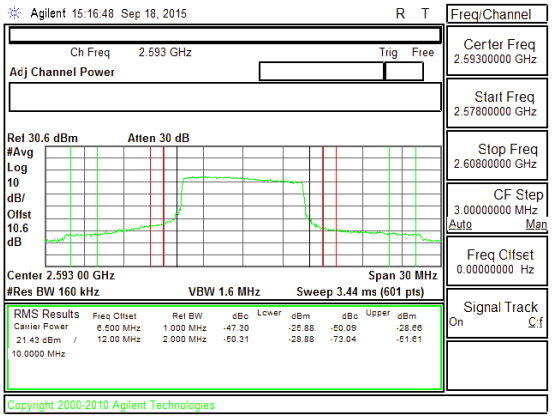
Band LTE41 10MHz 16QAM	 Band LTE41 10MHz EM 16QAM Mid Channel 1RB.gif	 Band LTE41 10MHz EM 16QAM Mid Channel FRB.gif
Band LTE41 10MHz QPSK	 Band LTE41 10MHz EM QPSK 1RB.gif	 Band LTE41 10MHz EM QPSK FRB.gif

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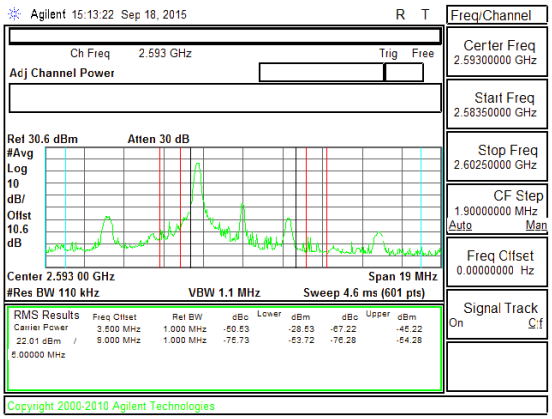
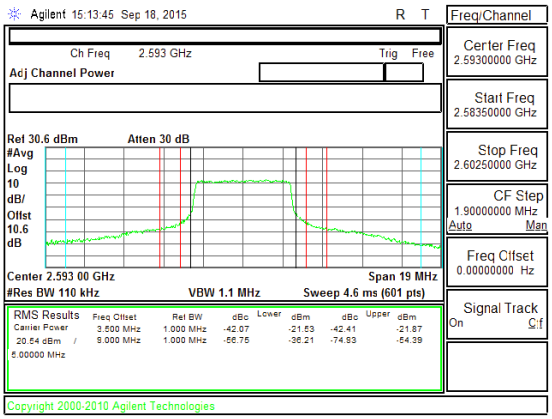
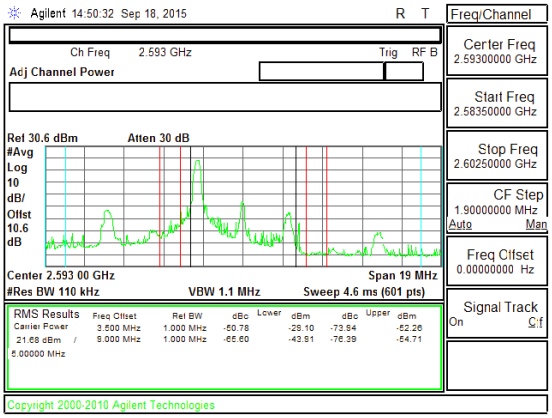
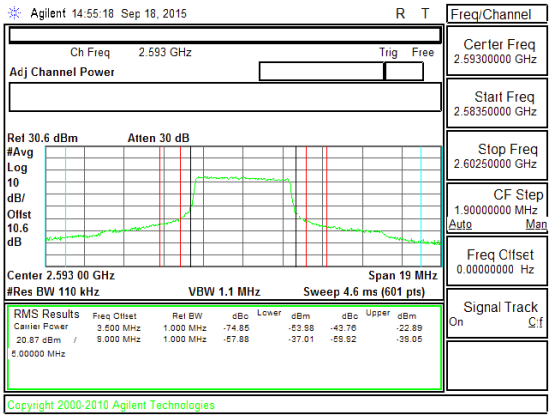
Band LTE41 5MHz 16QAM	 Band LTE41 5MHz EM 16QAM Mid Channel 1RB.gif	 Band LTE41 5MHz EM 16QAM Mid Channel FRB.gif
Band LTE41 5MHz QPSK	 Band LTE41 5MHz EM QPSK Mid Channel 1RB.gif	 Band LTE41 5MHz EM QPSK Mid Channel FRB.gif

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10.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238, §27.53

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 27.53 m(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

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

MODES TESTED

GSM 850, GSM 1900, WCDMA Band 2, WCDMA Band 5, LTE Band 41

RESULTS

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10.3.1. OUT OF BAND EMISSIONS RESULT

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE41	20	QPSK	2565	-35.03	-25	-10.03
			2593	-36.51	-25	-11.51
			2625	-34.75	-25	-9.75
		16QAM	2565	-35.81	-25	-10.81
			2593	-35.47	-25	-10.47
			2625	-35.28	-25	-10.28

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE41	15	QPSK	2562.5	-35.18	-25	-10.18
			2593	-35.07	-25	-10.07
			2627.5	-34.24	-25	-9.24
		16QAM	2562.5	-34.55	-25	-9.55
			2593	-34.49	-25	-9.49
			2627.5	-35.35	-25	-10.35

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE41	10	QPSK	2560	-35.33	-25	-10.33
			2593	-34.73	-25	-9.73
			2630	-36.96	-25	-11.96
		16QAM	2560	-36.33	-25	-11.33
			2593	-35.99	-25	-10.99
			2630	-38.50	-25	-13.5

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Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE41	5	QPSK	2557.5	-34.81	-25	-9.81
			2593	-34.01	-25	-9.01
			2632.5	-36.86	-25	-11.86
		16QAM	2557.5	-34.33	-25	-9.33
			2593	-34.79	-25	-9.79
			2632.5	-34.74	-25	-9.74

Band	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
GSM850	GMSK	824.2			
		836.6			
		848.8			
	GPRS	824.2	-25.19	-13	-12.19
		836.6	-24.75	-13	-11.75
		848.8	-25.25	-13	-12.25
	EGPRS	824.2	-25.94	-13	-12.94
		836.6	-25.86	-13	-12.86
		848.8	-25.38	-13	-12.38
GSM1900	GMSK	1850.2			
		1880			
		1909.8			
	GPRS	1850.2	-25.18	-13	-12.18
		1880	-25.82	-13	-12.82
		1909.8	-26.29	-13	-13.29
	EGPRS	1850.2	-25.33	-13	-12.33
		1880	-26.11	-13	-13.11
		1909.8	-26.25	-13	-13.25

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Band	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
Band 5	REL99	826.4	-25.77	-13	-12.77
		836.6	-24.97	-13	-11.97
		846.6	-26.12	-13	-13.12
	HSDPA	826.4	-26.36	-13	-13.36
		836.6	-25.87	-13	-12.87
		846.6	-26.11	-13	-13.11
Band 2	REL99	1852.4	-26.39	-13	-13.39
		1880	-25.54	-13	-12.54
		1907.6	-25.71	-13	-12.71
	HSDPA	1852.4	-25.83	-13	-12.83
		1880	-26.20	-13	-13.2
		1907.6	-26.05	-13	-13.05

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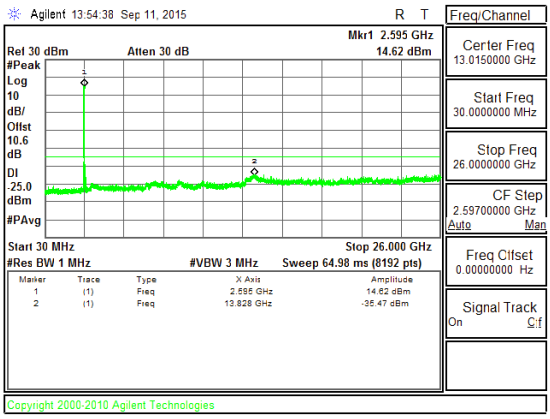
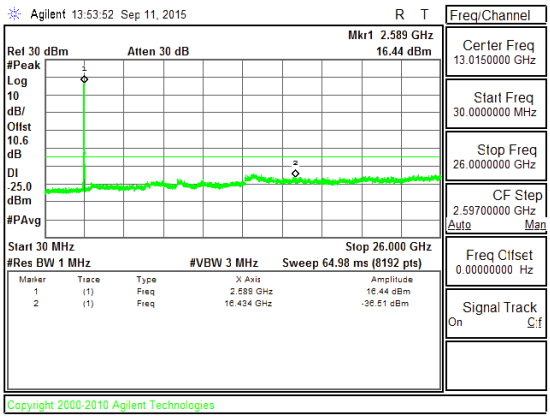
10.3.2. OUT OF BAND EMISSIONS PLOTS

Band LTE41 20MHz	 Band LTE41 20MHz CSE 16QAM Mid channel	 Band LTE41 20MHz CSE QPSK Mid channel

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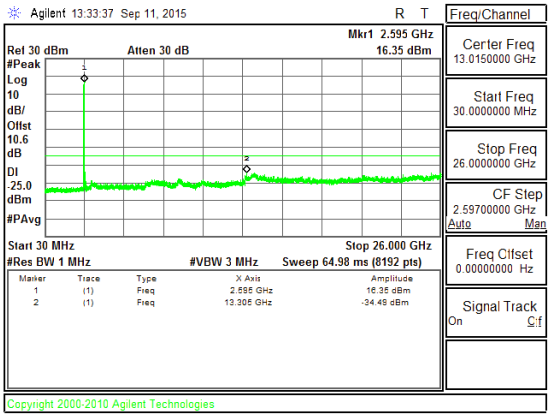
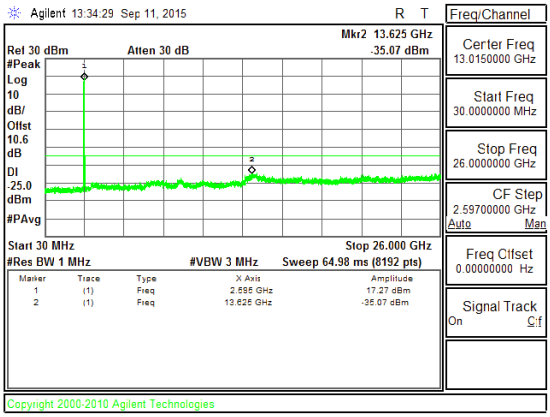
Band LTE41 15MHz

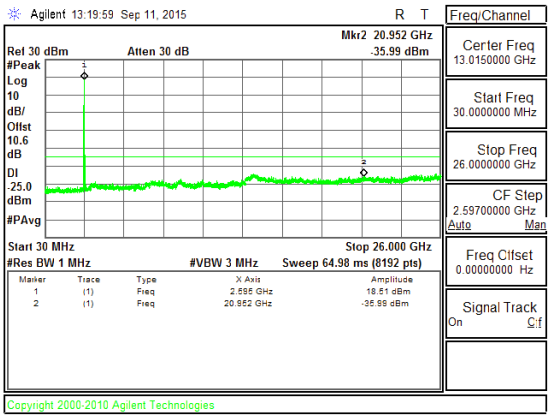


Band LTE41 15MHz CSE 16QAM Mid channel

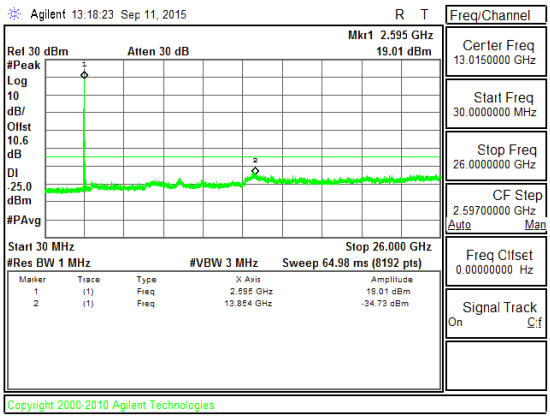


Band LTE41 15MHz CSE QPSK Mid channel

Band LTE41 10MHz



Band LTE41 10MHz CSE 16QAM Mid channel



Band LTE41 10MHz CSE QPSK Mid channel

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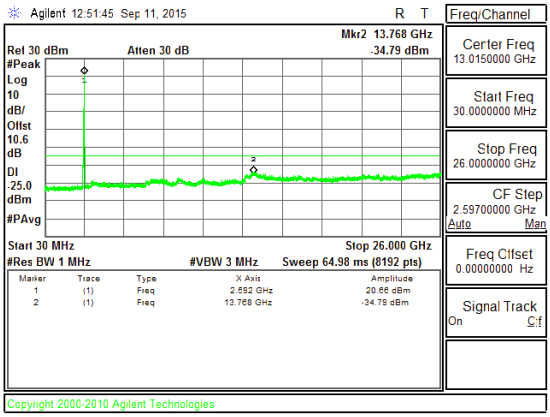
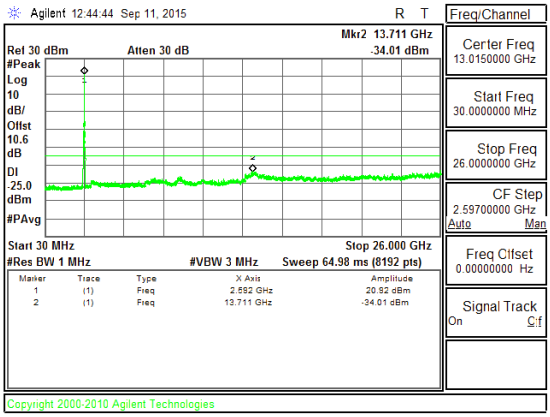
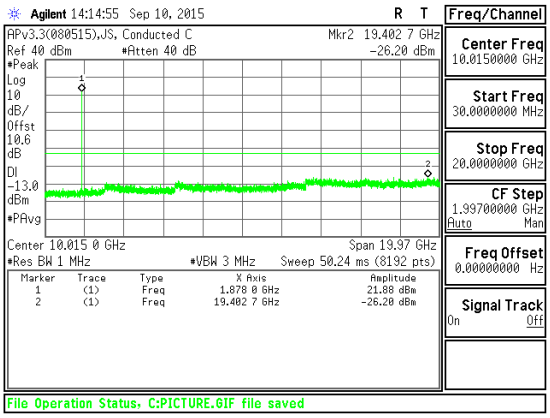
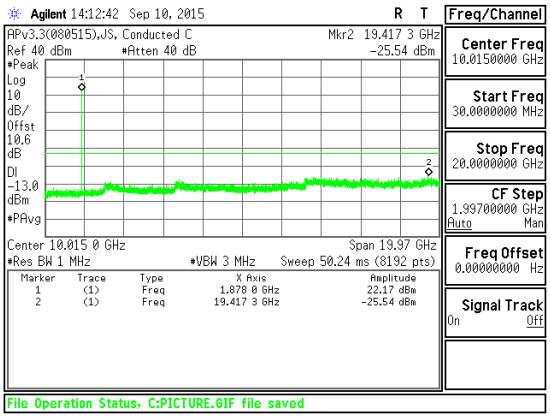
Band LTE41 5MHz	 Band LTE41 5MHz CSE 16QAM Mid channel	 Band LTE41 5MHz CSE QPSK Mid channel
Band Band 2	 Band WCDMA B2 HSDPA CSE	 Band WCDMA B2 REL99 CSE

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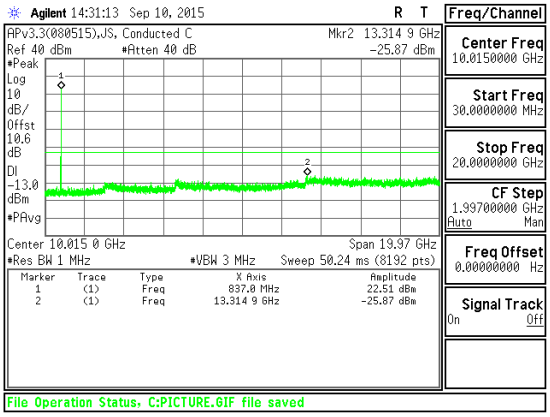
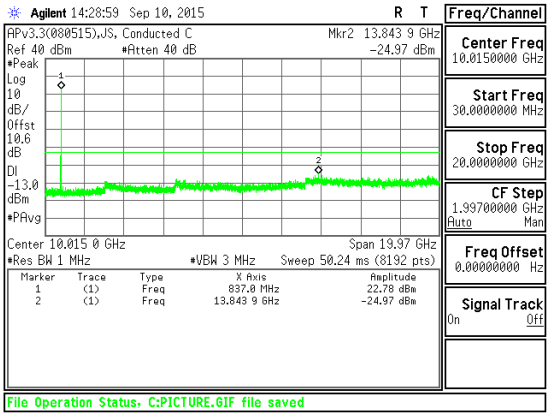
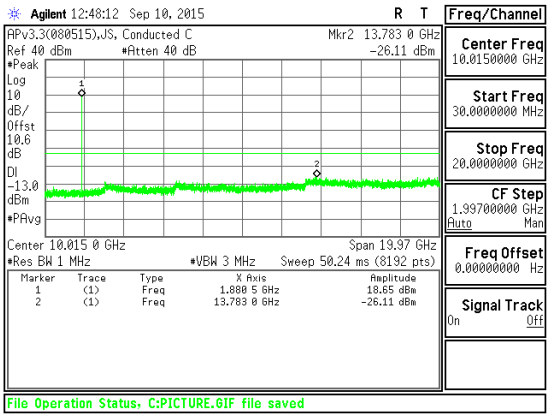
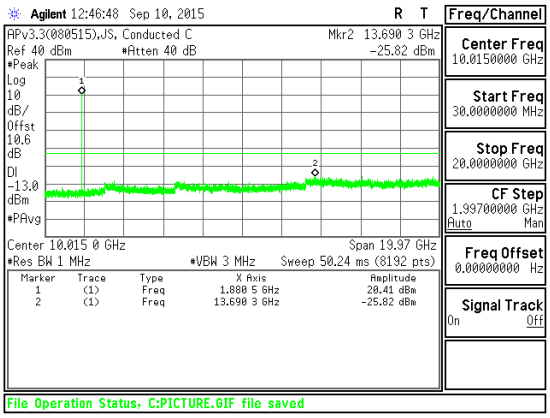
Band Band 5	 Band WCDMA B5 HSDPA CSE	 Band WCDMA B5 REL99 CSE
Band GSM 1900	 Band GSM1900 EGPRS CSE Mid channel	 Band GSM1900 GPRS CSE Mid channel

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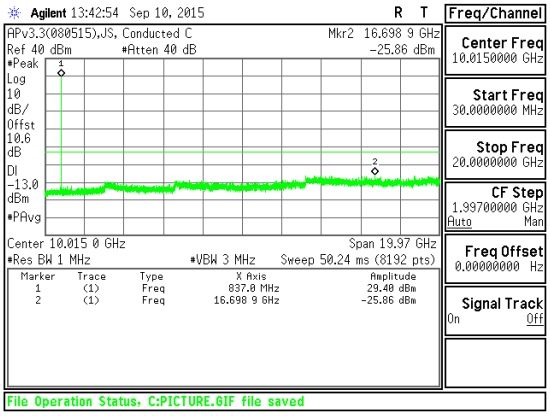
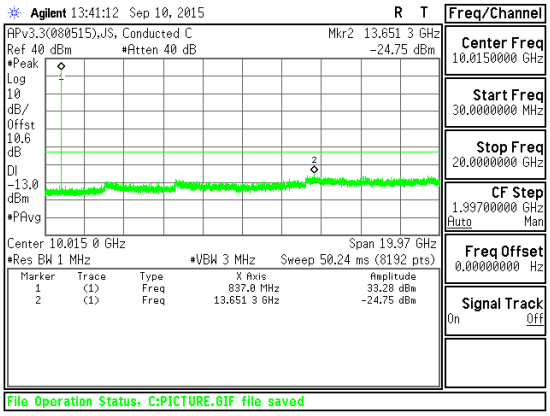
Band GSM 850	 Band GSM850 EGPRS CSE Mid channel	 Band GSM850 GPRS CSE Mid channel

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10.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, §27.54

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.

§27.54 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

MODES TESTED

GSM 850, GSM 1900, LTE Band 41

RESULTS

See the following pages.

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10.4.1. FREQUENCY STABILITY RESULTS

GPRS 850, Channel 190 Freq: 836.6MHz– MID CHANNEL

Reference Frequency: PCS Mid Channel 836.5 MHz @ 20°C Limit: to stay +- 2.5 ppm = 2091.250 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse (MHz)	Delta (ppm)	Limit (ppm)
3.80	50	836.499987	0.004	2.5
3.80	40	836.499994	-0.005	2.5
3.80	30	836.499987	0.004	2.5
3.80	***20***	**836.499990**	**0**	***2.5***
3.80	10	836.499997	-0.008	2.5
3.80	0	836.499977	0.015	2.5
3.80	-10	836.499990	0.000	2.5
3.80	-20	836.499985	0.007	2.5
3.80	-30	836.500002	-0.015	2.5

Reference Frequency: PCS Mid Channel 836.5 MHz @ 20°C Limit: to stay +- 2.5 ppm = 2091.250 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse (MHz)	Delta (ppm)	Limit (ppm)
3.80	***20***	***836.499990***	***0***	***2.5***
4.37	20	836.5000073	*-0.020*	2.5
3.23(End of volt)	20	836.500012	*-0.026*	2.5

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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	1879.999982	0.005	2.5
3.80	40	1879.999989	0.002	2.5
3.80	30	1879.999992	0.000	2.5
3.80	***20***	**1879.999992**	**0**	***2.5***
3.80	10	1879.999992	0.000	2.5
3.80	0	1879.999994	-0.001	2.5
3.80	-10	1879.999992	0.000	2.5
3.80	-20	1879.999997	-0.003	2.5
3.80	-30	1879.999995	-0.002	2.5

Reference Frequency: PCS Mid Channel		1880	MHz @ 20°C	
Limit: to stay +- 2.5 ppm =		4700.000	Hz	
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse (MHz)	Delta (ppm)	Limit (ppm)
3.80	***20***	***1879.999992***	***0***	***2.5***
4.37	20	1879.999993	*-0.001*	2.5
3.23(End of volt)	20	1879.999994	*-0.001*	2.5

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LTE41 Channel 40620 Freq: 2593 MHz– MID CHANNEL done

Reference Frequency: PCS Mid Channel 2535 MHz @ 20°C Limit: to stay +- 2.5 ppm = 6337.500 Hz				
Power Supply (Vdc)	**Environment Temperature (°C)**	**Frequency Deviation Measureed with Time Elapse**		
		(MHz)	**Delta (ppm)**	**Limit (ppm)**
3.80	50	2534.999985	0.002	2.5
3.80	40	2534.999992	-0.001	2.5
3.80	30	2534.999995	-0.002	2.5
3.80	***20***	**2534.999989**	**0**	***2.5***
3.80	10	2534.999988	0.000	2.5
3.80	0	2534.999995	-0.002	2.5
3.80	-10	2534.999988	0.000	2.5
3.80	-20	2534.999997	-0.003	2.5
3.80	-30	2534.999989	0.000	2.5

Reference Frequency: PCS Mid Channel 2535 MHz @ 20°C Limit: to stay +- 2.5 ppm = 6337.500 Hz				
Power Supply (Vdc)	**Environment Temperature (°C)**	**Frequency Deviation Measureed with Time Elapse**		
		(MHz)	**Delta (ppm)**	**Limit (ppm)**
3.80	***20***	***2534.999989***	***0***	***2.5***
4.37	20	2534.999986	*0.001*	2.5
3.23(End of volt)	20	2534.999993	*-0.001*	2.5

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11. RADIATED TEST RESULTS

11.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232, §27.

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.

27.50(h) - (2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.(LTE B41 & 7)

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 603D Clause 2.2.17; PSA setting reference to 971168 D01 v02r02

For peak power measurement with a PSA:

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

For average power measurement with a PSA:

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

MODES TESTED

GSM 850, GSM 1900, WCDMA Band 2, WCDMA Band 5, LTE Band 41

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TEST RESULTS

11.1.1. ERP/EIRP Results

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
Band 2	REL99	9262	1852.4	22.70	186.21
		9400	1880	21.92	155.60
		9538	1907.6	21.73	148.94
	HSDPA	9262	1852.4	22.48	177.01
		9400	1880	21.70	147.91
		9538	1907.6	21.34	136.14
	HSUPA	9262	1852.4		
		9400	1880		
		9538	1907.6		

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
Band 5	REL99	4132	826.4	18.23	66.53
		4183	836.6	18.80	75.86
		4233	846.6	18.37	68.71
	HSDPA	4132	826.4	18.16	65.46
		4183	836.6	17.85	60.95
		4233	846.6	17.80	60.26
	HSUPA	4132	826.4		
		4183	836.6		
		4233	846.6		

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Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
GSM1900	GMSK	512	1850.2		
		661	1880		
		810	1909.8		
	GPRS	512	1850.2	30.27	1064.14
		661	1880	29.32	855.07
		810	1909.8	29.30	851.14
	EGPRS	512	1850.2	27.19	523.60
		661	1880	26.37	433.51
		810	1909.8	26.31	427.56

Band	Mode	Channel	f(MHz)	ERP / EIRP	
				dBm	mW
GSM850	GMSK	128	824.2		
		190	836.6		
		251	848.8		
	GPRS	128	824.2	28.48	704.69
		190	836.6	28.14	651.63
		251	848.8	27.87	612.35
	EGPRS	128	824.2	23.35	216.27
		190	836.6	23.15	206.54
		251	848.8	22.80	190.55

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11.1.2. LTE ERP/EIRP Results

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP / EIRP	
					dBm	mW
LTE41	20	QPSK	1/0	2565	19.92	98.17
			1/0	2593	20.44	110.66
			1/0	2625	20.38	109.14
		16QAM	1/0	2565	19.12	81.66
			1/0	2593	19.48	88.72
			1/0	2625	19.48	88.72

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP / EIRP	
					dBm	mW
LTE41	15	QPSK	1/0	2562.5	19.90	97.72
			1/0	2593	20.92	123.59
			1/0	2627.5	20.33	107.89
		16QAM	1/0	2562.5	19.12	81.66
			1/0	2593	19.83	96.16
			1/0	2627.5	19.48	88.72

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP / EIRP	
					dBm	mW
LTE41	10	QPSK	1/0	2560	19.93	98.40
			1/0	2593	20.86	121.90
			1/0	2630	20.24	105.68
		16QAM	1/0	2560	19.10	81.28
			1/0	2593	19.98	99.54
			1/0	2630	19.37	86.50

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Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP / EIRP	
					dBm	mW
LTE41	5	QPSK	1/0	2557.5	19.88	97.27
			1/0	2593	20.63	115.61
			1/0	2632.5	20.05	101.16
		16QAM	1/0	2557.5	18.92	77.98
			1/0	2593	19.85	96.61
			1/0	2632.5	19.08	80.91

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11.1.3. ERP/EIRP DATA

LTE Band 41

Band

LTE41

20MHz

16QAM

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT only
Mode: LTE 41 20M 16QAM

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59 Substitution, 8ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
2565.00	6.73	V	0.9	9.5	15.38	33.0	-17.6	
2565.00	10.47	H	0.9	9.5	19.12	33.0	-13.9	
Mid Ch								
2593.00	6.75	V	0.9	9.5	15.40	33.0	-17.6	
2593.00	10.83	H	0.9	9.5	19.48	33.0	-13.5	
High Ch								
2625.00	7.08	V	0.9	9.5	15.73	33.0	-17.3	
2625.00	10.83	H	0.9	9.5	19.48	33.0	-13.5	

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

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Band

LTE41

20MHz

QPSK

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT only
Mode: LTE 41 20M QPSK

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59 Substitution, 8ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
2565.00	7.68	V	0.9	9.5	16.33	33.0	-16.7	
2565.00	11.27	H	0.9	9.5	19.92	33.0	-13.1	
Mid Ch								
2593.00	7.70	V	0.9	9.5	16.35	33.0	-16.7	
2593.00	11.79	H	0.9	9.5	20.44	33.0	-12.6	
High Ch								
2625.00	7.94	V	0.9	9.5	16.59	33.0	-16.4	
2625.00	11.73	H	0.9	9.5	20.38	33.0	-12.6	

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

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Band

LTE41

15MHz

16QAM

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT only
Mode: LTE 41 15M 16QAM

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59 Substitution, 8ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
2562.50	6.78	V	0.9	9.5	15.43	33.0	-17.6	
2562.50	10.47	H	0.9	9.5	19.12	33.0	-13.9	
Mid Ch								
2593.00	6.72	V	0.9	9.5	15.37	33.0	-17.6	
2593.00	11.18	H	0.9	9.5	19.83	33.0	-13.2	
High Ch								
2627.50	7.09	V	0.9	9.5	15.74	33.0	-17.3	
2627.50	10.83	H	0.9	9.5	19.48	33.0	-13.5	

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

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Band

LTE41

15MHz

QPSK

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT only
Mode: LTE 41 15M QPSK

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59 Substitution, 8ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
2562.50	7.72	V	0.9	9.5	16.37	33.0	-16.6	
2562.50	11.25	H	0.9	9.5	19.90	33.0	-13.1	
Mid Ch								
2593.00	7.67	V	0.9	9.5	16.32	33.0	-16.7	
2593.00	12.27	H	0.9	9.5	20.92	33.0	-12.1	
High Ch								
2627.50	7.96	V	0.9	9.5	16.61	33.0	-16.4	
2627.50	11.68	H	0.9	9.5	20.33	33.0	-12.7	

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

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Band

LTE41

10MHz

16QAM

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT only
Mode: LTE 41 10M 16QAM

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59 Substitution, 8ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
2560.00	6.87	V	0.9	9.5	15.47	33.0	-17.5	
2560.00	10.50	H	0.9	9.5	19.10	33.0	-13.9	
Mid Ch								
2593.00	6.68	V	0.9	9.5	15.28	33.0	-17.7	
2593.00	11.38	H	0.9	9.5	19.98	33.0	-13.0	
High Ch								
2630.00	6.99	V	0.9	9.5	15.59	33.0	-17.4	
2630.00	10.77	H	0.9	9.5	19.37	33.0	-13.6	

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

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Band

LTE41

10MHz

QPSK

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT only
Mode: LTE 41 10M QPSK

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59 Substitution, 8ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
2560.00	7.77	V	0.9	9.5	16.37	33.0	-16.6	
2560.00	11.33	H	0.9	9.5	19.93	33.0	-13.1	
Mid Ch								
2593.00	7.78	V	0.9	9.5	16.38	33.0	-16.6	
2593.00	12.26	H	0.9	9.5	20.86	33.0	-12.1	
High Ch								
2630.00	7.94	V	0.9	9.5	16.54	33.0	-16.5	
2630.00	11.64	H	0.9	9.5	20.24	33.0	-12.8	

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

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Band

LTE41

5MHz

16QAM

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT only
Mode: LTE 41 5M 16QAM

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59 Substitution, 8ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
2557.50	6.87	V	0.9	9.5	15.47	33.0	-17.5	
2557.50	10.32	H	0.9	9.5	18.92	33.0	-14.1	
Mid Ch								
2593.00	6.68	V	0.9	9.5	15.28	33.0	-17.7	
2593.00	11.25	H	0.9	9.5	19.85	33.0	-13.2	
High Ch								
2632.50	6.97	V	0.9	9.5	15.57	33.0	-17.4	
2632.50	10.48	H	0.9	9.5	19.08	33.0	-13.9	

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Note: For Band 4 EIRP limit is 30dBm

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Band

LTE41

5MHz

QPSK

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT only
Mode: LTE 41 5M QPSK

Test Equipment:
Receiving: Horn T119, and Chamber C SMA Cables
Substitution: Horn T59 Substitution, 8ft SMA Cable Warehouse

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
2557.50	7.64	V	0.9	9.5	16.24	33.0	-16.8	
2557.50	11.28	H	0.9	9.5	19.88	33.0	-13.1	
Mid Ch								
2593.00	7.54	V	0.9	9.5	16.14	33.0	-16.9	
2593.00	12.03	H	0.9	9.5	20.63	33.0	-12.4	
High Ch								
2632.50	7.80	V	0.9	9.5	16.40	33.0	-16.6	
2632.50	11.45	H	0.9	9.5	20.05	33.0	-13.0	

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Note: For Band 4 EIRP limit is 30dBm

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WCDMA

Band

Band 2

HSDPA

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

Company: Samsung
Project #: 15I21583
Date: 9/10/2015
Test Engineer: R.Alegre
Configuration: EUT Only (2204885)
Mode: HSDPA B2

Test Equipment:
Receiving: Horn T345, and Chamber B 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 Ch								
1852.40	9.50	V	0.9	7.9	16.45	33.0	-16.6	
1852.40	15.53	H	0.9	7.9	22.48	33.0	-10.5	
Mid Ch								
1880.00	9.57	V	0.9	7.9	16.52	33.0	-16.5	
1880.00	14.75	H	0.9	7.9	21.70	33.0	-11.3	
High Ch								
1907.60	9.56	V	0.9	7.9	16.51	33.0	-16.5	
1907.60	14.39	H	0.9	7.9	21.34	33.0	-11.7	

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

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Band

Band 2

REL99

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

Company: Samsung
Project #: 15I21583
Date: 9/10/2015
Test Engineer: R.Alegre
Configuration: EUT Only (2204885)
Mode: Rel99 B2

Test Equipment:
Receiving: Horn T345, and Chamber B 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 Ch								
1852.40	10.14	V	0.9	7.9	17.09	33.0	-15.9	
1852.40	15.75	H	0.9	7.9	22.70	33.0	-10.3	
Mid Ch								
1880.00	10.30	V	0.9	7.9	17.25	33.0	-15.8	
1880.00	14.97	H	0.9	7.9	21.92	33.0	-11.1	
High Ch								
1907.60	10.16	V	0.9	7.9	17.11	33.0	-15.9	
1907.60	14.78	H	0.9	7.9	21.73	33.0	-11.3	

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

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Band

Band 5

HSDPA

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

Company: Samsung
Project #: 15I21583
Date: 9/10/2015
Test Engineer: R.Alegre
Configuration: EUT Only (2204885)
Mode: WCDMA Band 5 HSDPA

Test Equipment:
Receiving: Sunol T185, and 5m Chamber C N-type Cable
Substitution: Dipole S/N: 00022117, 4ft SMA Cable (SN # 245200 001) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
826.40	19.06	V	0.9	0.0	18.16	38.5	-20.3	
826.40	5.48	H	0.9	0.0	4.58	38.5	-33.9	
Mid Ch								
836.60	18.75	V	0.9	0.0	17.85	38.5	-20.6	
836.60	5.70	H	0.9	0.0	4.80	38.5	-33.6	
High Ch								
846.60	18.70	V	0.9	0.0	17.80	38.5	-20.6	
846.60	5.82	H	0.9	0.0	4.92	38.5	-33.5	

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

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Band

Band 5

REL99

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

Company: Samsung
Project #: 15I21583
Date: 9/10/2015
Test Engineer: R.Alegre
Configuration: EUT Only (2204885)
Mode: WCDMA Band 5 Rel 99

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

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
826.40	19.13	V	0.9	0.0	18.23	38.5	-20.2	
826.40	7.80	H	0.9	0.0	6.90	38.5	-31.5	
Mid Ch								
836.60	19.70	V	0.9	0.0	18.80	38.5	-19.6	
836.60	8.40	H	0.9	0.0	7.50	38.5	-30.9	
High Ch								
846.60	19.27	V	0.9	0.0	18.37	38.5	-20.1	
846.60	8.46	H	0.9	0.0	7.56	38.5	-30.9	

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

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GSM

Band

GSM 1900

EGPRS

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

Company: Samsung
Project #: 15I21583
Date: 9/10/2015
Test Engineer: R.Alegre
Configuration: EUT Only (2204885)
Mode: EGPRS 1900

Test Equipment:
Receiving: Horn T345 and Chamber B 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 Ch								
1850.20	7.90	V	0.9	7.9	14.85	33.0	-18.2	
1850.20	20.24	H	0.9	7.9	27.19	33.0	-5.8	
Mid Ch								
1880.00	7.00	V	0.9	7.9	13.95	33.0	-19.1	
1880.00	19.42	H	0.9	7.9	26.37	33.0	-6.6	
High Ch								
1909.80	7.08	V	0.9	7.9	14.03	33.0	-19.0	
1909.80	19.36	H	0.9	7.9	26.31	33.0	-6.7	

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

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Band

GSM 1900

GPRS

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

Company: Samsung
Project #: 15I21583
Date: 9/10/2015
Test Engineer: R.Alegre
Configuration: EUT Only (2204885)
Mode: GPRS 1900

Test Equipment:
Receiving: Horn T345 and Chamber B 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 Ch								
1850.20	11.83	V	0.9	7.9	18.78	33.0	-14.2	
1850.20	23.32	H	0.9	7.9	30.27	33.0	-2.7	
Mid Ch								
1880.00	10.97	V	0.9	7.9	17.92	33.0	-15.1	
1880.00	22.37	H	0.9	7.9	29.32	33.0	-3.7	
High Ch								
1909.80	10.87	V	0.9	7.9	17.82	33.0	-15.2	
1909.80	22.35	H	0.9	7.9	29.30	33.0	-3.7	

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

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Band

GSM 850

EGPRS

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT Only (2204885)
Mode: EGPRS850

Test Equipment:
Receiving: Sunol T185, and 3m Chamber C N-type Cable
Substitution: Dipole T273, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
824.20	24.25	V	0.9	0.0	23.35	38.5	-15.1	
824.20	12.58	H	0.9	0.0	11.68	38.5	-26.8	
Mid Ch								
836.60	24.05	V	0.9	0.0	23.15	38.5	-15.3	
836.60	12.78	H	0.9	0.0	11.88	38.5	-26.6	
High Ch								
848.80	23.70	V	0.9	0.0	22.80	38.5	-15.6	
848.80	12.68	H	0.9	0.0	11.78	38.5	-26.7	

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

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Band

GSM 850

GPRS

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

Company: Samsung
Project #: 15I21583
Date: 09/11/15
Test Engineer: R.A
Configuration: EUT Only (2204885)
Mode: GPRS850

Test Equipment:
Receiving: Sunol T185, and 3m Chamber C N-type Cable
Substitution: Dipole T273, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
824.20	29.38	V	0.9	0.0	28.48	38.5	-10.0	
824.20	18.44	H	0.9	0.0	17.54	38.5	-20.9	
Mid Ch								
836.60	29.04	V	0.9	0.0	28.14	38.5	-10.3	
836.60	18.21	H	0.9	0.0	17.31	38.5	-21.1	
High Ch								
848.80	28.77	V	0.9	0.0	27.87	38.5	-10.6	
848.80	18.06	H	0.9	0.0	17.16	38.5	-21.3	

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

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11.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238, §27.53 and §90.691

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 27.53 m(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

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.

MODES TESTED

GSM 850, GSM 1900, WCDMA Band 2, WCDMA Band 5, LTE Band 41

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11.2.1. SPURIOUS RADIATION DATA

LTE Band 41

Band

LTE 41

20MHz

16QAM

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: LTE_16QAM Band 41 Harmonics, 20MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2565									
5130.00	-15.0	V	3.0	35.5	1.0	-49.4	-25.0	-24.4	
7695.00	-13.2	V	3.0	35.7	1.0	-48.0	-25.0	-23.0	
10260.00	-9.8	V	3.0	36.0	1.0	-44.8	-25.0	-19.8	
5130.00	-16.1	H	3.0	35.5	1.0	-50.5	-25.0	-25.5	
7695.00	-12.9	H	3.0	35.7	1.0	-47.6	-25.0	-22.6	
10260.00	-11.3	H	3.0	36.0	1.0	-46.3	-25.0	-21.3	
Mid Ch, 2593									
5186.00	-16.1	V	3.0	35.4	1.0	-50.5	-25.0	-25.5	
7779.00	-8.6	V	3.0	35.8	1.0	-43.4	-25.0	-18.4	
10372.00	-12.2	V	3.0	35.8	1.0	-47.0	-25.0	-22.0	
5186.00	-20.0	H	3.0	35.4	1.0	-54.4	-25.0	-29.4	
7779.00	-11.7	H	3.0	35.8	1.0	-46.4	-25.0	-21.4	
10372.00	-11.7	H	3.0	35.8	1.0	-46.5	-25.0	-21.5	
High Ch, 2625									
5250.00	-12.7	V	3.0	35.4	1.0	-47.1	-25.0	-22.1	
7875.00	-16.0	V	3.0	35.8	1.0	-50.8	-25.0	-25.8	
10500.00	-11.9	V	3.0	35.7	1.0	-46.6	-25.0	-21.6	
5250.00	-16.8	H	3.0	35.4	1.0	-51.2	-25.0	-26.2	
7875.00	-11.3	H	3.0	35.8	1.0	-46.1	-25.0	-21.1	
10500.00	-12.3	H	3.0	35.7	1.0	-47.0	-25.0	-22.0	

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Band

LTE41

20MHz

QPSK

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: LTE_QPSK Band 41 Harmonics, 20MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2565									
5130.00	-16.1	V	3.0	35.5	1.0	-49.4	-25.0	-24.4	
7695.00	-13.7	V	3.0	35.7	1.0	-48.0	-25.0	-23.0	
10260.00	-12.1	V	3.0	36.0	1.0	-44.8	-25.0	-19.8	
5130.00	-16.1	H	3.0	35.5	1.0	-50.5	-25.0	-25.5	
7695.00	-12.9	H	3.0	35.7	1.0	-47.6	-25.0	-22.6	
10260.00	-11.3	H	3.0	36.0	1.0	-46.3	-25.0	-21.3	
Mid Ch, 2593									
5186.00	-15.8	V	3.0	35.4	1.0	-50.2	-25.0	-25.2	
7779.00	-8.6	V	3.0	35.8	1.0	-43.4	-25.0	-18.4	
10372.00	-11.4	V	3.0	35.8	1.0	-46.2	-25.0	-21.2	
5186.00	-16.5	H	3.0	35.4	1.0	-50.9	-25.0	-25.9	
7779.00	-12.1	H	3.0	35.8	1.0	-46.9	-25.0	-21.9	
10372.00	-11.4	H	3.0	35.8	1.0	-46.2	-25.0	-21.2	
High Ch, 2625									
5250.00	-12.8	V	3.0	35.4	1.0	-47.3	-25.0	-22.3	
7875.00	-16.4	V	3.0	35.8	1.0	-51.2	-25.0	-26.2	
10500.00	-12.1	V	3.0	35.7	1.0	-46.7	-25.0	-21.7	
5250.00	-16.6	H	3.0	35.4	1.0	-51.1	-25.0	-26.1	
7875.00	-11.7	H	3.0	35.8	1.0	-46.5	-25.0	-21.5	
10500.00	-12.2	H	3.0	35.7	1.0	-46.9	-25.0	-21.9	

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: LTE_16QAM Band 41 Harmonics, 15MHz Bandwidth

Band

LTE41

15MHz

16QAM

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2562.5									
5125.00	-17.4	V	3.0	35.5	1.0	-51.9	-25.0	-26.9	
7687.50	-8.2	V	3.0	35.7	1.0	-43.0	-25.0	-18.0	
10250.00	-12.6	V	3.0	36.0	1.0	-47.6	-25.0	-22.6	
5125.00	-15.8	H	3.0	35.5	1.0	-50.3	-25.0	-25.3	
7687.50	-12.4	H	3.0	35.7	1.0	-47.1	-25.0	-22.1	
10250.00	-11.6	H	3.0	36.0	1.0	-46.7	-25.0	-21.7	
Mid Ch, 2593									
5186.00	-17.7	V	3.0	35.4	1.0	-52.2	-25.0	-27.2	
7779.00	-12.8	V	3.0	35.8	1.0	-47.5	-25.0	-22.5	
10372.00	-12.2	V	3.0	35.8	1.0	-47.0	-25.0	-22.0	
5186.00	-18.1	H	3.0	35.4	1.0	-52.6	-25.0	-27.6	
7779.00	-8.8	H	3.0	35.8	1.0	-43.6	-25.0	-18.6	
10372.00	-11.7	H	3.0	35.8	1.0	-46.5	-25.0	-21.5	
High Ch, 2627.5									
5255.00	-16.0	V	3.0	35.4	1.0	-50.5	-25.0	-25.5	
7882.50	-12.3	V	3.0	35.8	1.0	-47.1	-25.0	-22.1	
10510.00	-10.6	V	3.0	35.7	1.0	-45.3	-25.0	-20.3	
5255.00	-17.0	H	3.0	35.4	1.0	-51.4	-25.0	-26.4	
7882.50	-11.5	H	3.0	35.8	1.0	-46.3	-25.0	-21.3	
10510.00	-12.3	H	3.0	35.7	1.0	-47.0	-25.0	-22.0	

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Band

LTE41

15MHz

QPSK

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: LTE_QPSK Band 41 Harmonics, 15MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2562.5									
5125.00	-17.6	V	3.0	35.5	1.0	-52.0	-25.0	-27.0	
7687.50	-8.4	V	3.0	35.7	1.0	-43.1	-25.0	-18.1	
10250.00	-12.6	V	3.0	36.0	1.0	-47.7	-25.0	-22.7	
5125.00	-15.8	H	3.0	35.5	1.0	-50.3	-25.0	-25.3	
7687.50	-12.5	H	3.0	35.7	1.0	-47.2	-25.0	-22.2	
10250.00	-12.1	H	3.0	36.0	1.0	-47.1	-25.0	-22.1	
Mid Ch, 2593									
5186.00	-17.5	V	3.0	35.4	1.0	-51.9	-25.0	-26.9	
7779.00	-12.9	V	3.0	35.8	1.0	-47.6	-25.0	-22.6	
10372.00	-11.4	V	3.0	35.8	1.0	-46.3	-25.0	-21.3	
5186.00	-17.2	H	3.0	35.4	1.0	-51.6	-25.0	-26.6	
7779.00	-10.8	H	3.0	35.8	1.0	-45.6	-25.0	-20.6	
10372.00	-10.8	H	3.0	35.8	1.0	-45.7	-25.0	-20.7	
High Ch, 2627.5									
5255.00	-16.1	V	3.0	35.4	1.0	-50.5	-25.0	-25.5	
7882.50	-12.2	V	3.0	35.8	1.0	-47.0	-25.0	-22.0	
10510.00	-10.5	V	3.0	35.7	1.0	-45.1	-25.0	-20.1	
5255.00	-16.8	H	3.0	35.4	1.0	-51.3	-25.0	-26.3	
7882.50	-11.7	H	3.0	35.8	1.0	-46.5	-25.0	-21.5	
10510.00	-11.8	H	3.0	35.7	1.0	-46.5	-25.0	-21.5	

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: LTE_16QAM Band 41 Harmonics, 10MHz Bandwidth

Band

LTE41

10MHz

16QAM

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2560									
5120.00	-17.2	V	3.0	35.5	1.0	-51.7	-25.0	-26.7	
7680.00	-14.1	V	3.0	35.7	1.0	-48.8	-25.0	-23.8	
10240.00	-10.7	V	3.0	36.0	1.0	-45.8	-25.0	-20.8	
5120.00	-16.8	H	3.0	35.5	1.0	-51.3	-25.0	-26.3	
7680.00	-12.7	H	3.0	35.7	1.0	-47.5	-25.0	-22.5	
10240.00	-12.5	H	3.0	36.0	1.0	-47.6	-25.0	-22.6	
Mid Ch, 2593									
5186.00	-5.7	V	3.0	35.4	1.0	-40.1	-25.0	-15.1	
7779.00	-12.4	V	3.0	35.8	1.0	-47.2	-25.0	-22.2	
10372.00	-11.5	V	3.0	35.8	1.0	-46.4	-25.0	-21.4	
5186.00	-3.7	H	3.0	35.4	1.0	-38.1	-25.0	-13.1	
7779.00	-12.4	H	3.0	35.8	1.0	-47.2	-25.0	-22.2	
10372.00	-5.8	H	3.0	35.8	1.0	-40.7	-25.0	-15.7	
High Ch, 2630									
5260.00	0.2	V	3.0	35.4	1.0	-34.2	-25.0	-9.2	
7890.00	-9.4	V	3.0	35.8	1.0	-44.2	-25.0	-19.2	
10520.00	-5.2	V	3.0	35.7	1.0	-39.9	-25.0	-14.9	
5260.00	-2.9	H	3.0	35.4	1.0	-37.3	-25.0	-12.3	
7890.00	-10.3	H	3.0	35.8	1.0	-45.1	-25.0	-20.1	
10520.00	-12.1	H	3.0	35.7	1.0	-46.8	-25.0	-21.8	

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: LTE_QPSK Band 41 Harmonics, 10MHz Bandwidth

Band

LTE41

10MHz

QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2560									
5120.00	-16.9	V	3.0	35.5	1.0	-51.4	-25.0	-26.4	
7680.00	-13.7	V	3.0	35.7	1.0	-48.4	-25.0	-23.4	
10240.00	-10.0	V	3.0	36.0	1.0	-45.1	-25.0	-20.1	
5120.00	-18.0	H	3.0	35.5	1.0	-52.5	-25.0	-27.5	
7680.00	-13.1	H	3.0	35.7	1.0	-47.8	-25.0	-22.8	
10240.00	-12.2	H	3.0	36.0	1.0	-47.2	-25.0	-22.2	
Mid Ch, 2593									
5186.00	-6.7	V	3.0	35.4	1.0	-41.1	-25.0	-16.1	
7779.00	-11.7	V	3.0	35.8	1.0	-46.5	-25.0	-21.5	
10372.00	-12.9	V	3.0	35.8	1.0	-47.7	-25.0	-22.7	
5186.00	-4.0	H	3.0	35.4	1.0	-38.5	-25.0	-13.5	
7779.00	-12.7	H	3.0	35.8	1.0	-47.5	-25.0	-22.5	
10372.00	-4.8	H	3.0	35.8	1.0	-39.7	-25.0	-14.7	
High Ch, 2630									
5260.00	-0.8	V	3.0	35.4	1.0	-35.3	-25.0	-10.3	
7890.00	-8.9	V	3.0	35.8	1.0	-43.7	-25.0	-18.7	
10520.00	-4.2	V	3.0	35.7	1.0	-38.9	-25.0	-13.9	
5260.00	-2.6	H	3.0	35.4	1.0	-37.0	-25.0	-12.0	
7890.00	-12.0	H	3.0	35.8	1.0	-46.8	-25.0	-21.8	
10520.00	-13.5	H	3.0	35.7	1.0	-48.2	-25.0	-23.2	

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

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: LTE_16QAM Band 41 Harmonics, 5MHz Bandwidth

Band

LTE41

5MHz

16QAM

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2557.5									
5115.00	-18.4	V	3.0	35.5	1.0	-52.9	-25.0	-27.9	
7672.50	-13.9	V	3.0	35.7	1.0	-48.6	-25.0	-23.6	
10230.00	-12.9	V	3.0	36.0	1.0	-47.9	-25.0	-22.9	
5115.00	-14.7	H	3.0	35.5	1.0	-49.2	-25.0	-24.2	
7672.50	-8.9	H	3.0	35.7	1.0	-43.6	-25.0	-18.6	
10230.00	-11.7	H	3.0	36.0	1.0	-46.7	-25.0	-21.7	
Mid Ch, 2593									
5186.00	-17.6	V	3.0	35.4	1.0	-52.0	-25.0	-27.0	
7779.00	-13.5	V	3.0	35.8	1.0	-48.3	-25.0	-23.3	
10372.00	-11.6	V	3.0	35.8	1.0	-46.5	-25.0	-21.5	
5186.00	-17.3	H	3.0	35.4	1.0	-51.7	-25.0	-26.7	
7779.00	-7.0	H	3.0	35.8	1.0	-41.7	-25.0	-16.7	
10372.00	-11.7	H	3.0	35.8	1.0	-46.5	-25.0	-21.5	
High Ch, 2632.5									
5265.00	-8.7	V	3.0	35.4	1.0	-43.2	-25.0	-18.2	
7897.50	-13.3	V	3.0	35.8	1.0	-48.1	-25.0	-23.1	
10530.00	-11.1	V	3.0	35.7	1.0	-45.8	-25.0	-20.8	
5265.00	-14.1	H	3.0	35.4	1.0	-48.6	-25.0	-23.6	
7897.50	-12.3	H	3.0	35.8	1.0	-47.1	-25.0	-22.1	
10530.00	-11.1	H	3.0	35.7	1.0	-45.7	-25.0	-20.7	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: LTE_QPSK Band 41 Harmonics, 5MHz Bandwidth

Band LTE41 5MHz QPSK

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2557.5									
5115.00	-18.6	V	3.0	35.5	1.0	-53.0	-25.0	-28.0	
7672.50	-14.3	V	3.0	35.7	1.0	-49.0	-25.0	-24.0	
10230.00	-12.8	V	3.0	36.0	1.0	-47.9	-25.0	-22.9	
5115.00	-14.4	H	3.0	35.5	1.0	-48.8	-25.0	-23.8	
7672.50	-8.7	H	3.0	35.7	1.0	-43.4	-25.0	-18.4	
10230.00	-11.4	H	3.0	36.0	1.0	-46.4	-25.0	-21.4	
Mid Ch, 2593									
5186.00	-17.7	V	3.0	35.4	1.0	-52.1	-25.0	-27.1	
7779.00	-13.3	V	3.0	35.8	1.0	-48.1	-25.0	-23.1	
10372.00	-11.5	V	3.0	35.8	1.0	-46.4	-25.0	-21.4	
5186.00	-16.7	H	3.0	35.4	1.0	-51.2	-25.0	-26.2	
7779.00	-6.9	H	3.0	35.8	1.0	-41.6	-25.0	-16.6	
10372.00	-11.6	H	3.0	35.8	1.0	-46.4	-25.0	-21.4	
High Ch, 2632.5									
5265.00	-8.8	V	3.0	35.4	1.0	-43.2	-25.0	-18.2	
7897.50	-13.4	V	3.0	35.8	1.0	-48.2	-25.0	-23.2	
10530.00	-11.2	V	3.0	35.7	1.0	-45.9	-25.0	-20.9	
5265.00	-14.2	H	3.0	35.4	1.0	-48.6	-25.0	-23.6	
7897.50	-11.3	H	3.0	35.8	1.0	-46.1	-25.0	-21.1	
10530.00	-11.5	H	3.0	35.7	1.0	-46.2	-25.0	-21.2	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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WCDMA

Band

Band 2

HSDPA

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: HSDPA Band 2 Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4									
3704.80	-21.4	V	3.0	35.9	1.0	-56.3	-13.0	-43.3	
5557.20	-18.2	V	3.0	35.5	1.0	-52.7	-13.0	-39.7	
7409.60	-13.7	V	3.0	35.7	1.0	-48.4	-13.0	-35.4	
3704.80	-20.3	H	3.0	35.9	1.0	-55.2	-13.0	-42.2	
5557.20	-17.9	H	3.0	35.5	1.0	-52.4	-13.0	-39.4	
7409.60	-13.2	H	3.0	35.7	1.0	-47.9	-13.0	-34.9	
Mid Ch, 1880									
3760.00	-20.9	V	3.0	35.8	1.0	-55.7	-13.0	-42.7	
5640.00	-15.9	V	3.0	35.5	1.0	-50.4	-13.0	-37.4	
7520.00	-13.6	V	3.0	35.7	1.0	-48.4	-13.0	-35.4	
3760.00	-21.4	H	3.0	35.8	1.0	-56.2	-13.0	-43.2	
5640.00	-16.4	H	3.0	35.5	1.0	-50.9	-13.0	-37.9	
7520.00	-12.6	H	3.0	35.7	1.0	-47.4	-13.0	-34.4	
High Ch, 1907.6									
3815.20	-20.6	V	3.0	35.8	1.0	-55.4	-13.0	-42.4	
5722.80	-16.7	V	3.0	35.5	1.0	-51.2	-13.0	-38.2	
7630.40	-10.8	V	3.0	35.8	1.0	-45.5	-13.0	-32.5	
3815.20	-21.5	H	3.0	35.8	1.0	-56.2	-13.0	-43.2	
5722.80	-15.9	H	3.0	35.5	1.0	-50.4	-13.0	-37.4	
7630.40	-12.4	H	3.0	35.8	1.0	-47.1	-13.0	-34.1	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: Rel99 Band 2 Harmonics

Band

Band 2

REL99

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4									
3704.80	-21.5	V	3.0	35.9	1.0	-56.4	-13.0	-43.4	
5557.20	-18.4	V	3.0	35.5	1.0	-52.9	-13.0	-39.9	
7409.60	-14.0	V	3.0	35.7	1.0	-48.7	-13.0	-35.7	
3704.80	-20.6	H	3.0	35.9	1.0	-55.4	-13.0	-42.4	
5557.20	-18.3	H	3.0	35.5	1.0	-52.7	-13.0	-39.7	
7409.60	-13.4	H	3.0	35.7	1.0	-48.1	-13.0	-35.1	
Mid Ch, 1880									
3760.00	-21.0	V	3.0	35.8	1.0	-55.8	-13.0	-42.8	
5640.00	-15.9	V	3.0	35.5	1.0	-50.4	-13.0	-37.4	
7520.00	-14.3	V	3.0	35.7	1.0	-49.0	-13.0	-36.0	
3760.00	-21.5	H	3.0	35.8	1.0	-56.3	-13.0	-43.3	
5640.00	-16.9	H	3.0	35.5	1.0	-51.4	-13.0	-38.4	
7520.00	-12.9	H	3.0	35.7	1.0	-47.6	-13.0	-34.6	
High Ch, 1907.6									
3815.20	-20.7	V	3.0	35.8	1.0	-55.5	-13.0	-42.5	
5722.80	-16.8	V	3.0	35.5	1.0	-51.3	-13.0	-38.3	
7630.40	-10.8	V	3.0	35.8	1.0	-45.6	-13.0	-32.6	
3815.20	-21.6	H	3.0	35.8	1.0	-56.3	-13.0	-43.3	
5722.80	-16.1	H	3.0	35.5	1.0	-50.6	-13.0	-37.6	
7630.40	-12.6	H	3.0	35.8	1.0	-47.3	-13.0	-34.3	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: HSDPA Band 5 Harmonics

Band

Band 5

HSDPA

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4									
1652.80	-28.7	V	3.0	37.0	1.0	-64.7	-13.0	-51.7	
2479.20	-24.5	V	3.0	36.4	1.0	-59.9	-13.0	-46.9	
3305.60	-21.2	V	3.0	36.1	1.0	-56.3	-13.0	-43.3	
1652.80	-28.8	H	3.0	37.0	1.0	-64.9	-13.0	-51.9	
2479.20	-27.4	H	3.0	36.4	1.0	-62.8	-13.0	-49.8	
3305.60	-22.8	H	3.0	36.1	1.0	-57.9	-13.0	-44.9	
Mid Ch, 836.6									
1673.20	-27.8	V	3.0	37.0	1.0	-63.8	-13.0	-50.8	
2509.80	-23.4	V	3.0	36.4	1.0	-58.8	-13.0	-45.8	
3346.40	-23.6	V	3.0	36.1	1.0	-58.7	-13.0	-45.7	
1673.20	-28.8	H	3.0	37.0	1.0	-64.8	-13.0	-51.8	
2509.80	-25.9	H	3.0	36.4	1.0	-61.3	-13.0	-48.3	
3346.40	-22.0	H	3.0	36.1	1.0	-57.1	-13.0	-44.1	
High Ch, 846.6									
1693.20	-28.9	V	3.0	37.0	1.0	-64.9	-13.0	-51.9	
2539.80	-23.7	V	3.0	36.4	1.0	-59.1	-13.0	-46.1	
3386.40	-18.9	V	3.0	36.1	1.0	-54.0	-13.0	-41.0	
1693.20	-28.3	H	3.0	37.0	1.0	-64.2	-13.0	-51.2	
2539.80	-26.4	H	3.0	36.4	1.0	-61.8	-13.0	-48.8	
3386.40	-23.5	H	3.0	36.1	1.0	-58.6	-13.0	-45.6	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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Band

Band 5

REL99

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: Rel99 Band 5 Harmonics

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4									
1652.80	-27.4	V	3.0	37.0	1.0	-63.5	-13.0	-50.5	
2479.20	-24.6	V	3.0	36.4	1.0	-60.0	-13.0	-47.0	
3305.60	-21.1	V	3.0	36.1	1.0	-56.2	-13.0	-43.2	
1652.80	-28.4	H	3.0	37.0	1.0	-64.4	-13.0	-51.4	
2479.20	-26.3	H	3.0	36.4	1.0	-61.7	-13.0	-48.7	
3305.60	-23.8	H	3.0	36.1	1.0	-58.9	-13.0	-45.9	
Mid Ch, 836.6									
1673.20	-27.7	V	3.0	37.0	1.0	-63.7	-13.0	-50.7	
2509.80	-23.5	V	3.0	36.4	1.0	-58.9	-13.0	-45.9	
3346.40	-23.5	V	3.0	36.1	1.0	-58.7	-13.0	-45.7	
1673.20	-28.7	H	3.0	37.0	1.0	-64.7	-13.0	-51.7	
2509.80	-26.5	H	3.0	36.4	1.0	-61.9	-13.0	-48.9	
3346.40	-24.6	H	3.0	36.1	1.0	-59.7	-13.0	-46.7	
High Ch, 846.6									
1693.20	-28.9	V	3.0	37.0	1.0	-64.8	-13.0	-51.8	
2539.80	-23.9	V	3.0	36.4	1.0	-59.3	-13.0	-46.3	
3386.40	-17.4	V	3.0	36.1	1.0	-52.5	-13.0	-39.5	
1693.20	-28.0	H	3.0	37.0	1.0	-64.0	-13.0	-51.0	
2539.80	-26.3	H	3.0	36.4	1.0	-61.7	-13.0	-48.7	
3386.40	-19.5	H	3.0	36.1	1.0	-54.6	-13.0	-41.6	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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GSM

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: EGPRS 1900 MHz Harmonics

Band

GSM 1900

EGPRS

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2									
3700.40	-21.3	V	3.0	35.9	1.0	-56.1	-13.0	-43.1	
5550.60	-17.3	V	3.0	35.5	1.0	-51.8	-13.0	-38.8	
7400.80	-19.1	V	3.0	35.7	1.0	-53.8	-13.0	-40.8	
3700.40	-20.9	H	3.0	35.9	1.0	-55.7	-13.0	-42.7	
5550.60	-16.5	H	3.0	35.5	1.0	-51.0	-13.0	-38.0	
7400.80	-13.0	H	3.0	35.7	1.0	-47.7	-13.0	-34.7	
Mid Ch, 1880									
3760.00	-21.0	V	3.0	35.8	1.0	-55.8	-13.0	-42.8	
5640.00	-17.9	V	3.0	35.5	1.0	-52.4	-13.0	-39.4	
7520.00	-14.0	V	3.0	35.7	1.0	-48.8	-13.0	-35.8	
3760.00	-20.2	H	3.0	35.8	1.0	-55.0	-13.0	-42.0	
5640.00	-16.9	H	3.0	35.5	1.0	-51.4	-13.0	-38.4	
7520.00	-12.7	H	3.0	35.7	1.0	-47.5	-13.0	-34.5	
High Ch, 1909.8									
3819.60	-19.0	V	3.0	35.8	1.0	-53.8	-13.0	-40.8	
5729.40	-16.4	V	3.0	35.5	1.0	-50.9	-13.0	-37.9	
7639.20	-13.8	V	3.0	35.8	1.0	-48.5	-13.0	-35.5	
3819.60	-16.9	H	3.0	35.8	1.0	-51.6	-13.0	-38.6	
5729.40	-12.5	H	3.0	35.5	1.0	-47.0	-13.0	-34.0	
7639.20	-11.8	H	3.0	35.8	1.0	-46.6	-13.0	-33.6	

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: GPRS 1900 MHz Harmonics

Band

GSM 1900

GPRS

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2									
3700.40	-20.9	V	3.0	35.9	1.0	-55.8	-13.0	-42.8	
5550.60	-17.1	V	3.0	35.5	1.0	-51.6	-13.0	-38.6	
7400.80	-18.5	V	3.0	35.7	1.0	-53.3	-13.0	-40.3	
3700.40	-20.8	H	3.0	35.9	1.0	-55.7	-13.0	-42.7	
5550.60	-16.6	H	3.0	35.5	1.0	-51.1	-13.0	-38.1	
7400.80	-12.8	H	3.0	35.7	1.0	-47.6	-13.0	-34.6	
Mid Ch, 1880									
3760.00	-20.8	V	3.0	35.8	1.0	-55.7	-13.0	-42.7	
5640.00	-17.6	V	3.0	35.5	1.0	-52.1	-13.0	-39.1	
7520.00	-14.1	V	3.0	35.7	1.0	-48.9	-13.0	-35.9	
3760.00	-19.7	H	3.0	35.8	1.0	-54.5	-13.0	-41.5	
5640.00	-16.8	H	3.0	35.5	1.0	-51.3	-13.0	-38.3	
7520.00	-12.8	H	3.0	35.7	1.0	-47.6	-13.0	-34.6	
High Ch, 1909.8									
3819.60	-20.0	V	3.0	35.8	1.0	-54.8	-13.0	-41.8	
5729.40	-17.3	V	3.0	35.5	1.0	-51.8	-13.0	-38.8	
7639.20	-14.8	V	3.0	35.8	1.0	-49.5	-13.0	-36.5	
3819.60	-17.1	H	3.0	35.8	1.0	-51.9	-13.0	-38.9	
5729.40	-13.4	H	3.0	35.5	1.0	-47.9	-13.0	-34.9	
7639.20	-13.3	H	3.0	35.8	1.0	-48.1	-13.0	-35.1	

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: EGPRS 850 MHz Harmonics

Band

GSM 850

EGPRS

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2									
1648.40	-28.3	V	3.0	37.0	1.0	-64.4	-13.0	-51.4	
2472.60	-24.9	V	3.0	36.4	1.0	-60.3	-13.0	-47.3	
3296.80	-24.5	V	3.0	36.2	1.0	-59.6	-13.0	-46.6	
1648.40	-29.7	H	3.0	37.0	1.0	-65.7	-13.0	-52.7	
2472.60	-27.9	H	3.0	36.4	1.0	-63.3	-13.0	-50.3	
3296.80	-25.6	H	3.0	36.2	1.0	-60.7	-13.0	-47.7	
Mid Ch, 836.6									
1673.20	-28.1	V	3.0	37.0	1.0	-64.1	-13.0	-51.1	
2509.80	-24.5	V	3.0	36.4	1.0	-60.0	-13.0	-47.0	
3346.40	-23.8	V	3.0	36.1	1.0	-58.9	-13.0	-45.9	
1673.20	-27.3	H	3.0	37.0	1.0	-63.3	-13.0	-50.3	
2509.80	-26.7	H	3.0	36.4	1.0	-62.1	-13.0	-49.1	
3346.40	-23.7	H	3.0	36.1	1.0	-58.8	-13.0	-45.8	
High Ch, 848.8									
1697.60	-28.8	V	3.0	37.0	1.0	-64.7	-13.0	-51.7	
2546.40	-25.4	V	3.0	36.4	1.0	-60.9	-13.0	-47.9	
3395.20	-25.2	V	3.0	36.1	1.0	-60.2	-13.0	-47.2	
1697.60	-27.9	H	3.0	37.0	1.0	-63.8	-13.0	-50.8	
2546.40	-25.9	H	3.0	36.4	1.0	-61.3	-13.0	-48.3	
3395.20	-25.2	H	3.0	36.1	1.0	-60.3	-13.0	-47.3	

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

Company: LIONS
Project #: 15I21583
Date: 9/14/2015
Test Engineer: D. Mun
Configuration: EUT + Headphones + AC Adapter
Location: Chamber C
Mode: GPRS 850 MHz Harmonics

Band

GSM 850

GPRS

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2									
1648.40	-28.3	V	3.0	37.0	1.0	-64.4	-13.0	-51.4	
2472.60	-25.3	V	3.0	36.4	1.0	-60.7	-13.0	-47.7	
3296.80	-24.5	V	3.0	36.2	1.0	-59.6	-13.0	-46.6	
1648.40	-28.7	H	3.0	37.0	1.0	-64.7	-13.0	-51.7	
2472.60	-26.8	H	3.0	36.4	1.0	-62.2	-13.0	-49.2	
3296.80	-24.8	H	3.0	36.2	1.0	-59.9	-13.0	-46.9	
Mid Ch, 836.6									
1673.20	-28.9	V	3.0	37.0	1.0	-64.9	-13.0	-51.9	
2509.80	-25.2	V	3.0	36.4	1.0	-60.6	-13.0	-47.6	
3346.40	-24.6	V	3.0	36.1	1.0	-59.7	-13.0	-46.7	
1673.20	-28.9	H	3.0	37.0	1.0	-64.9	-13.0	-51.9	
2509.80	-26.2	H	3.0	36.4	1.0	-61.6	-13.0	-48.6	
3346.40	-22.0	H	3.0	36.1	1.0	-57.1	-13.0	-44.1	
High Ch, 848.8									
1697.60	-28.8	V	3.0	37.0	1.0	-64.8	-13.0	-51.8	
2546.40	-25.6	V	3.0	36.4	1.0	-61.0	-13.0	-48.0	
3395.20	-24.2	V	3.0	36.1	1.0	-59.3	-13.0	-46.3	
1697.60	-28.6	H	3.0	37.0	1.0	-64.6	-13.0	-51.6	
2546.40	-25.8	H	3.0	36.4	1.0	-61.2	-13.0	-48.2	
3395.20	-25.3	H	3.0	36.1	1.0	-60.3	-13.0	-47.3	

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