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

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Tablet with Bluetooth, DTS/UNII a/b/g/n, and ANT+

MODEL NUMBER: SM-T355

FCC ID: A3LSMT355

REPORT NUMBER: 15I19901-E1

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Prepared for

SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

Prepared by

UL VERIFICATION SERVICES
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
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 Tablet with Bluetooth, DTS/UNII a/b/g/n, and ANT+**
MODEL:	**SM-T355**
SERIAL NUMBER:	**2044004 (Radiated), 2044006 (Conducted)**
DATE TESTED:	**JANUARY 22 – FEBRURAY 6, 2015**

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

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

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

Approved & Released For
UL Verification Services Inc. By:

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

Tested By:

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

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2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

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

47173 Benicia Street	47266 Benicia Street
☐ Chamber A	☐ Chamber D
☒ Chamber B	☐ Chamber E
☒ Chamber C	☐ Chamber F

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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 26000 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 Tablet with Bluetooth, DTS/UNII a/b/g/n, and ANT+.

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	Conducted		Radiated	
			AVG(dBm)	AVG(mW)	AVG(dBm)	AVG(mW)
GSM850	824~849	GMSK	32.6	1819.7		
	824~849	GPRS	32.6	1819.7	31.83	1513.6
	824~849	EGPRS	27.0	501.2	26.90	489.8
GSM1900	1850~1910	GMSK	30.0	1000		
	1850~1910	GPRS	29.8	955	31.72	1485.9
	1850~1910	EGPRS	25.5	354.8	27.57	571.5
Band 5	824~849	REL99	22.5	177.8	21.84	152.8
	824~849	HSDPA	22.5	177.8	21.83	152.4
	824~849	HSUPA	21.9	154.9		
Band 2	1850~1910	REL99	22.9	195	24.40	275.4
	1850~1910	HSDPA	22.8	190.5	24.08	255.9
	1850~1910	HSUPA	22.1	162.2		

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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 22							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation	Conducted		Radiated	
				AVG(dBm)	AVG(mW)	AVG(dBm)	AVG(mW)
LTE5	824~849	10MHz	QPSK	22.5	177.8	22.22	166.7
	824~849	10MHz	16QAM	21.5	141.25	21.80	151.4

FCC Part 22							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation	Conducted		Radiated	
				AVG(dBm)	AVG(mW)	AVG(dBm)	AVG(mW)
LTE5	824~849	5MHz	QPSK	22.5	177.8	22.17	164.8
	824~849	5MHz	16QAM	21.5	141.25	21.5	141.3

FCC Part 22							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation	Conducted		Radiated	
				AVG(dBm)	AVG(mW)	AVG(dBm)	AVG(mW)
LTE5	824~849	3MHz	QPSK	22.5	177.8	22.24	167.5
	824~849	3MHz	16QAM	21.5	141.25	21.67	146.9

FCC Part 22							
Band	Frequency Range(MHz)	BandWidth (MHz)	Modulation	Conducted		Radiated	
				AVG(dBm)	AVG(mW)	AVG(dBm)	AVG(mW)
LTE5	824~849	1.4MHz	QPSK	22.5	177.8	22.21	166.3
	824~849	1.4MHz	16QAM	21.5	141.25	21.69	147.6

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5.4. DESCRIPTION OF AVAILABLE ANTENNAS

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

Frequency (MHz)	Peak Gain (dBi)
Band 5, 824~849MHz	0.12
Band 2, 1850~1910MHz	-1.06

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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	SM-T355	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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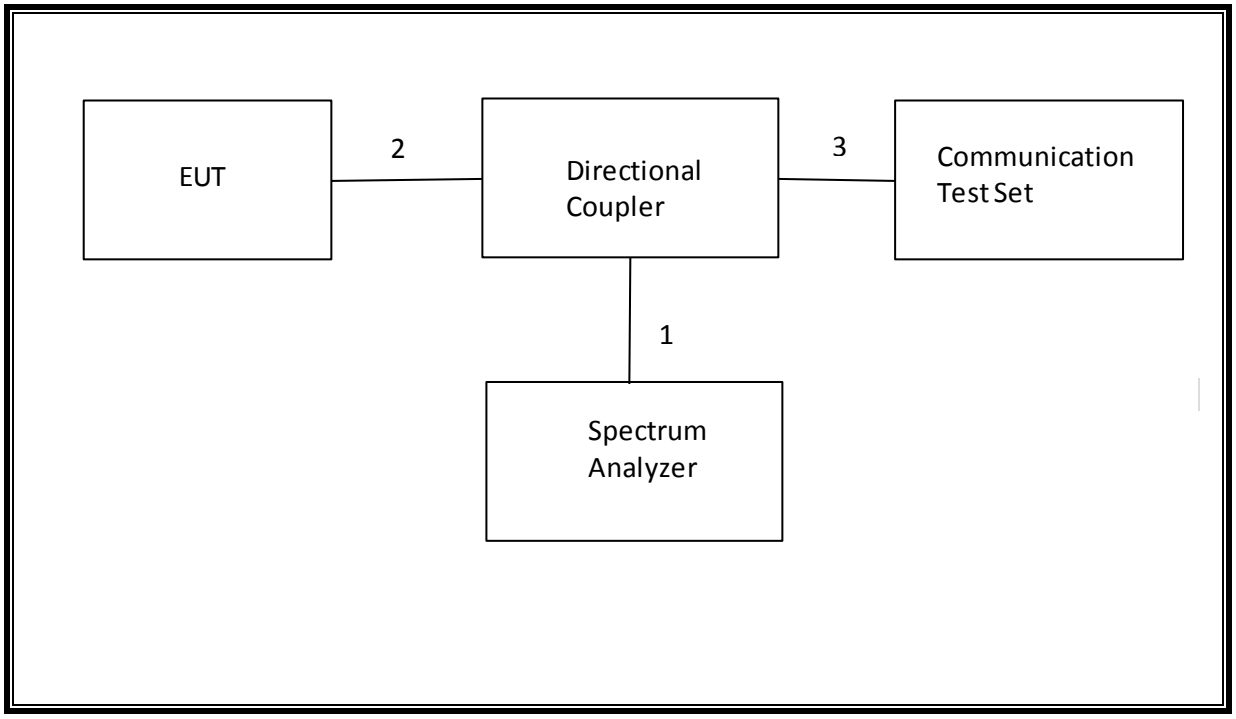
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



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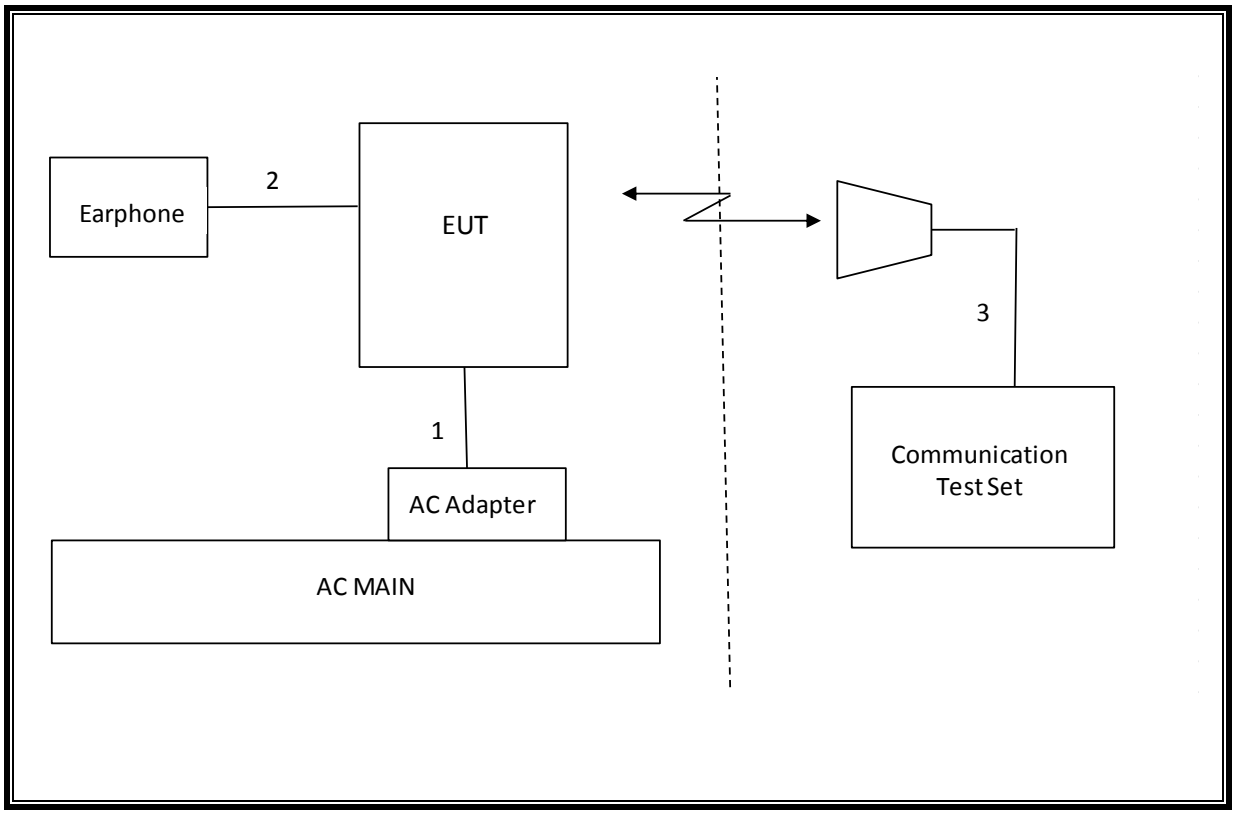
SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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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	02/26/15
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	08/14/15
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/15
Antenna, Horn, 18 GHz	EMCO	3115	C00784	10/25/15
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02687	CNR
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02688	CNR
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	01/09/16
Communications Test Set	R&S	CMW500	T159	07/02/15
DC power supply, 8 V @ 3 A or 15 V	Agilent / HP	E3610A	None	CNR
Vector signal generator, 6 GHz	Agilent / HP	E4438C	None	07/06/15
Antenna, Tuned Dipole 400~1000	ETS	3121C DB4	C00993	02/14/15
Directional Coupler	RF-Lambda	RFDC5M06G15	None	CNR
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	12/17/15
Multimeter	Fluke	26111	74320701	4/15/2015

Test Equipment 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	Worse Case
2.1049	N/A	Occupied Band width (99%)	N/A	Conducted	Pass	8.98MHz
22.917(a) 24.238(a)	RSS-132(4.5.1) RSS-133(6.5.1)	Band Edge / Conducted Spurious Emission	-13dBm		Pass	-19.55dBm
2.1046	N/A	Conducted output power	N/A		Pass	32.6dBm
22.355 24.235	RSS-132(4.3) RSS-133(6.3)	Frequency Stability	2.5PPM		Pass	0.041PPM
22.913(a)(2)	RSS-132(4.4)	Effective Radiated Power	38 dBm	Radiated	Pass	31.83dBm
24.232(c)	RSS-133(6.4)	Equivalent Isotropic Radiated Power	33dBm		Pass	31.72dBm
22.917(a) 24.238(a)	RSS-132(4.5.1) RSS-133(6.5.1)	Radiated Spurious Emission	-13dBm		Pass	-34.1dBm

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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

Band	Mode	Ch.	f(MHz)	1 time slot	2 time slot	3 time slot	4 time slot
				Peak (dBm)	Peak (dBm)	Peak (dBm)	Peak (dBm)
GSM850	GMSK	128	824.2	32.5			
		190	836.6	32.6			
		251	848.8	32.6			
	GPRS	128	824.2	32.5	30.8	29.2	27.0
		190	836.6	32.6	30.6	29.0	26.8
		251	848.8	32.6	30.6	29.1	27.1
	EGPRS	128	824.2	27.0	25.0	23.0	21.7
		190	836.6	27.0	25.0	23.0	21.7
		251	848.8	27.0	25.0	23.0	21.5
GSM1900	GMSK	512	1850.2	30.0			
		661	1880	29.6			
		810	1909.8	29.8			
	GPRS	512	1850.2	29.8	27.8	25.8	23.6
		661	1880	29.6	27.6	25.6	23.6
		810	1909.8	29.8	27.8	25.8	23.7
	EGPRS	512	1850.2	25.0	24.0	22.6	20.9
		661	1880	25.3	24.0	22.5	20.8
		810	1909.8	25.5	24.2	22.6	21.0

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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	Ch.	f(MHz)	Conducted Power (dBm) Avg (dBm)
Band 5	REL99	4132	826.4	22.5
		4183	836.6	22.5
		4233	846.6	22.4
Band 2	REL99	9262	1852.4	22.8
		9400	1880	22.8
		9538	1907.6	22.9

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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	Subset	Ch.	f(MHz)	Conducted Power (dBm) Avg (dBm)
Band 5	HSDPA	1	4132	826.4	22.5
			4183	836.6	22.5
			4233	846.6	22.5
		2	4132	826.4	22.3
			4183	836.6	22.4
			4233	846.6	22.3
		3	4132	826.4	21.1
			4183	836.6	21.1
			4233	846.6	21.0
		4	4132	826.4	21.1
			4183	836.6	21.1
			4233	846.6	21.0
Band 2	HSDPA	1	9262	1852.4	22.7
			9400	1880	22.8
			9538	1907.6	22.7
		2	9262	1852.4	21.3
			9400	1880	21.6
			9538	1907.6	21.4
		3	9262	1852.4	21.1
			9400	1880	21.2
			9538	1907.6	21.2
		4	9262	1852.4	21.2
			9400	1880	21.2
			9538	1907.6	21.3

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8.3.2. UMTS HSUPA

TEST PROCEDURE

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

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

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

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8.3.3. UMTS HSUPA OUTPUT POWER RESULT

Band	Mode	Subset	Ch.	f(MHz)	Conducted Power (dBm) Avg (dBm)
Band 5	HSUPA	1	4132	826.4	21.9
			4183	836.6	21.8
			4233	846.6	21.8
		2	4132	826.4	21.9
			4183	836.6	21.9
			4233	846.6	21.8
		3	4132	826.4	21.9
			4183	836.6	21.8
			4233	846.6	21.8
		4	4132	826.4	21.9
			4183	836.6	21.8
			4233	846.6	21.8
		5	4132	826.4	21.9
			4183	836.6	21.8
			4233	846.6	21.7
Band 2	HSUPA	1	9262	1852.4	21.5
			9400	1880	22.1
			9538	1907.6	21.4
		2	9262	1852.4	21.3
			9400	1880	21.2
			9538	1907.6	21.4
		3	9262	1852.4	21.3
			9400	1880	21.3
			9538	1907.6	21.2
		4	9262	1852.4	21.2
			9400	1880	21.5
			9538	1907.6	21.3
		5	9262	1852.4	21.3
			9400	1880	21.3
			9538	1907.6	21.2

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8.3.4. DC-HSDPA

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

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

Table E.5.0: Levels for HSDPA connection setup

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

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

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

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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.		

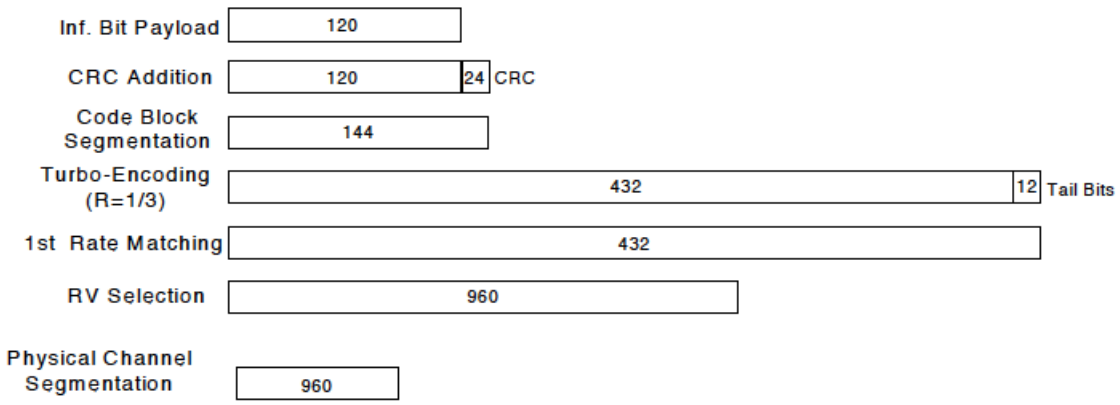

Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15

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	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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8.3.1. UMTS DC-HSDPA OUTPUT POWER RESULT

DC-HSPA

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)	Output Power Tolerance (dBm)		
						Maximum	Target	Minimum
W-CDMA Band V	Subtest 1	4132	826.4	0	22.0	23.0	22.5	21.0
		4183	836.6	0	21.8			
		4233	846.6	0	21.8			
	Subtest 2	4132	826.4	2	22.0	23.0	22.5	21.0
		4183	836.6	2	21.9			
		4233	846.6	2	21.8			
	Subtest 3	4132	826.4	1	22.0	23.0	22.5	21.0
		4183	836.6	1	21.8			
		4233	846.6	1	21.8			
	Subtest 4	4132	826.4	2	22.0	23.0	22.5	21.0
		4183	836.6	2	21.8			
		4233	846.6	2	21.8			

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)	Output Power Tolerance (dBm)		
						Maximum	Target	Minimum
W-CDMA Band II	Subtest 1	9262	1852.4	0	22.0	23.0	22.5	21.0
		9400	1880.0	0	22.1			
		9538	1907.6	0	22.0			
	Subtest 2	9262	1852.4	2	21.5	23.0	22.5	21.0
		9400	1880.0	2	21.5			
		9538	1907.6	2	21.5			
	Subtest 3	9262	1852.4	1	21.5	23.0	22.5	21.0
		9400	1880.0	1	21.5			
		9538	1907.6	1	21.5			
	Subtest 4	9262	1852.4	2	21.5	23.0	22.5	21.0
		9400	1880.0	2	21.5			
		9538	1907.6	2	21.3			

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8.4. LTE OUTPUT VERIFICATION

8.4.1. LTE OUTPUT RESULT

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20450	20525	20600
						829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	22.5	22.5	22.5
			1	25	0	22.4	22.5	22.5
			1	49	0	22.5	22.5	22.5
			25	0	1	21.5	21.5	21.5
			25	12	1	21.5	21.4	21.5
			25	25	1	21.5	21.4	21.4
			50	0	1	21.5	21.5	21.5
		16QAM	1	0	1	21.5	21.4	21.5
			1	25	1	21.5	21.5	21.5
			1	49	1	21.5	21.5	21.5
			25	0	2	20.5	20.5	20.5
			25	12	2	20.5	20.5	20.5
			25	25	2	20.5	20.4	20.5
			50	0	2	20.5	20.5	20.5

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20425	20525	20625
						826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	22.5	22.4	22.4
			1	12	0	22.5	22.4	22.5
			1	24	0	22.5	22.4	22.4
			12	0	1	21.5	21.4	21.5
			12	7	1	21.4	21.5	21.4
			12	13	1	21.5	21.4	21.5
			25	0	1	21.5	21.5	21.5
		16QAM	1	0	1	21.0	21.5	21.5

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			1	12	1	21.5	21.2	21.5
			1	24	1	21.5	21.5	21.5
			12	0	2	20.5	20.5	20.5
			12	7	2	20.5	20.5	20.5
			12	13	2	20.5	20.4	20.5
			25	0	2	20.5	20.5	20.4

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Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20415	20525	20635
						825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	22.4	22.5	22.4
			1	8	0	22.3	22.5	22.4
			1	14	0	22.3	22.5	22.3
			8	0	1	21.4	21.4	21.4
			8	4	1	21.4	21.4	21.4
			8	7	1	21.5	21.4	21.5
			15	0	1	21.5	21.4	21.4
		16QAM	1	0	1	21.5	21.5	21.0
			1	8	1	21.5	21.5	21.2
			1	14	1	21.5	21.5	21.2
			8	0	2	20.5	20.5	20.3
			8	4	2	20.5	20.5	20.3
			8	7	2	20.5	20.3	20.2
			15	0	2	20.5	20.5	20.3

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20407	20525	20643
						824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	22.4	22.4	22.5
			1	3	0	22.5	22.5	22.5
			1	5	0	22.5	22.5	22.5
			3	0	0	22.3	22.4	22.5
			3	1	0	22.5	22.5	22.5
			3	3	0	22.5	22.4	22.5
			6	0	1	21.5	21.5	21.5
		16QAM	1	0	1	21.5	21.5	20.7
			1	3	1	21.5	21.5	21.4
			1	5	1	21.5	21.5	21.3
			3	0	1	21.2	21.2	21.0

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			3	1	1	21.2	21.5	21.3
			3	3	1	21.2	21.2	21.1
			6	0	2	20.4	20.5	20.5

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9. PEAK TO AVERAGE RATIO

Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v02r02;

EUT connect to Peak and average power meter and measure the power delta for PAR.

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

PAR Measurement						
Cell Bandwidth	**Channel (Mhz)**	**Mode**	**Peak (dBm)**	**Average (dBm)**		**Delta**
WCDMA B5	836.6	REL99	25.27	22.26		3.01
		HSDPA	25.25	22.06		3.19

PAR Measurement						
Cell Bandwidth	**Channel (Mhz)**	**Mode**	**Peak (dBm)**	**Average (dBm)**		**Delta**
WCDMA B2	1880	REL99	25.94	22.08		3.86
		HSDPA	25.82	22.04		3.78

PAR Measurement						
Cell Bandwidth	**Channel (Mhz)**	**Mode**	**Peak (dBm)**	**Average (dBm)**		**Delta**
GSM850	836.6	GPRS	32.39	22.49		9.9
		EGPRS	32.4	22.51		9.89

PAR Measurement						
Cell Bandwidth	**Channel (Mhz)**	**Mode**	**Peak (dBm)**	**Average (dBm)**		**Delta**
GSM1900	1880	GPRS	29.14	18.37		10.77
		EGPRS	29.13	18.87		10.26

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PAR Measurement						
Cell Bandwidth	**Channel (Mhz)**	**Mode**	**Peak (dBm)**	**Average (dBm)**		**Delta**
LTE5 1.4M	836.5	QPSK	26.09	20.88		5.21
		16QAM	25.8	19.8		6
LTE5 3M	836.5	QPSK	26.17	20.97		5.2
		16QAM	26.06	19.9		6.16
LTE5 5M	836.5	QPSK	26.1	20.85		5.25
		16QAM	25.97	19.99		5.98
LTE5 10M	836.5	QPSK	26.25	20.68		5.57
		16QAM	26.27	19.61		6.66

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10. LIMITS AND CONDUCTED RESULTS

10.1. OCCUPIED BANDWIDTH

RULE PART(S)

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

LIMITS

For reporting purposes only

TEST PROCEDURE

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

(KDB 971168 D01 Power Meas License Digital Systems v02r02)

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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	246.9	321.3
		190	836.6	243.9	319.6
		251	848.8	242.1	325.2
	EGPRS	128	824.2	246.4	305.8
		190	836.6	248.3	313.2
		251	848.8	245.5	319.2
GSM1900	GMSK	512	1850.2		
		661	1880		
		810	1909.8		
	GPRS	512	1850.2	243.3	304.8
		661	1880	244	313.4
		810	1909.8	239.6	311.1
	EGPRS	512	1850.2	247.1	314.2
		661	1880	244	324.4
		810	1909.8	251.8	303.4

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Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
WCDMA Band 5	REL99	4132	826.4	4.165	4.652
		4183	836.6	4.163	4.642
		4233	846.6	4.178	4.642
	HSDPA	4132	826.4	4.169	4.653
		4183	836.6	4.17	4.643
		4233	846.6	4.152	4.627
	HSUPA	4132	826.4		
		4183	836.6		
		4233	846.6		
WCDMA Band 2	REL99	9262	1852.4	4.174	4.654
		9400	1880	4.173	4.656
		9538	1907.6	4.155	4.649
	HSDPA	9262	1852.4	4.17	4.655
		9400	1880	4.172	4.655
		9538	1907.6	4.157	4.654
	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
LTE5	10	QPSK	50/0	829	8.954	9.81
			50/0	836.5	8.959	9.784
			50/0	844	8.977	9.657
		16QAM	50/0	829	8.94	9.643
			50/0	836.5	8.976	9.759
			50/0	844	8.955	9.789

Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW
LTE5	5	QPSK	25/0	826.5	4.511	4.921
			25/0	836.5	4.514	4.993
			25/0	846.5	4.503	4.988
		16QAM	25/0	826.5	4.499	4.957
			25/0	836.5	4.501	4.965
			25/0	846.5	4.519	5.039

Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW
LTE5	3	QPSK	15/0	825.5	2.681	2.945
			15/0	836.5	2.689	2.948
			15/0	847.5	2.689	2.977
		16QAM	15/0	825.5	2.679	2.968
			15/0	836.5	2.692	2.958
			15/0	847.5	2.685	2.949

Band	BW(MHz)	Mode	RB/RB Size	f (MHz)	99% BW (MHz)	-26dB BW
LTE5	1.4	QPSK	6/0	824.7	1.083	1.267
			6/0	836.5	1.09	1.276
			6/0	848.3	1.085	1.267
		16QAM	6/0	824.7	1.085	1.271
			6/0	836.5	1.08	1.258
			6/0	848.3	1.087	1.268

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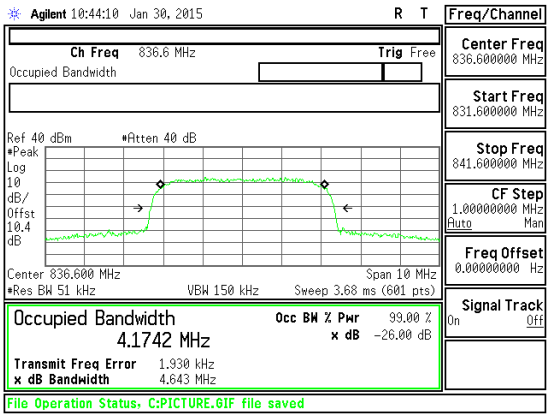
10.1.3. OCCUPIED BANDWIDTH PLOTS

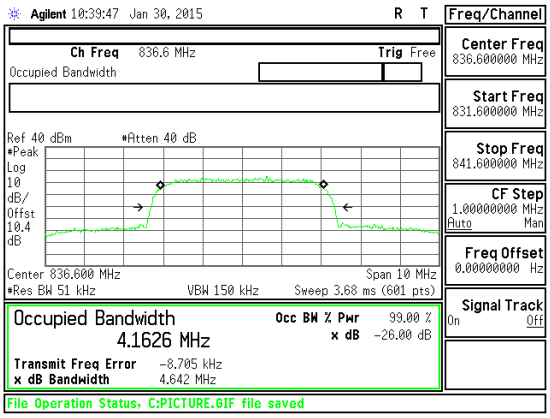
Band

Band 5

HSDPA



Band WCDMA B5 HSDPA OBW

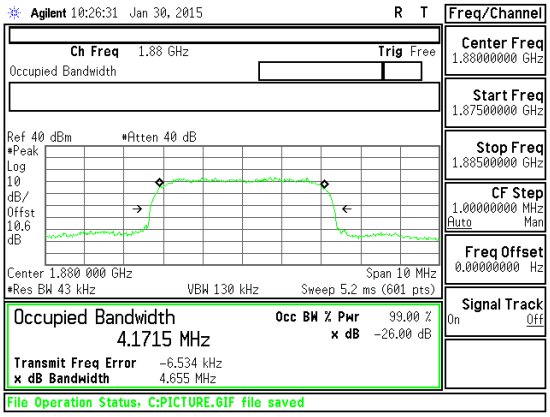


Band WCDMA B5 REL99 OBW

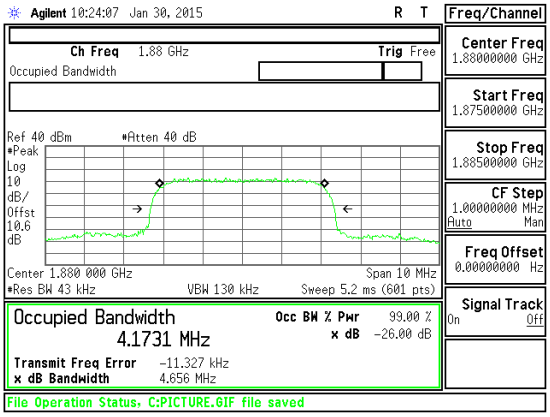
Band

Band 2

HSDPA



Band WCDMA B2 HSDPA OBW



Band WCDMA B2 REL99 OBW

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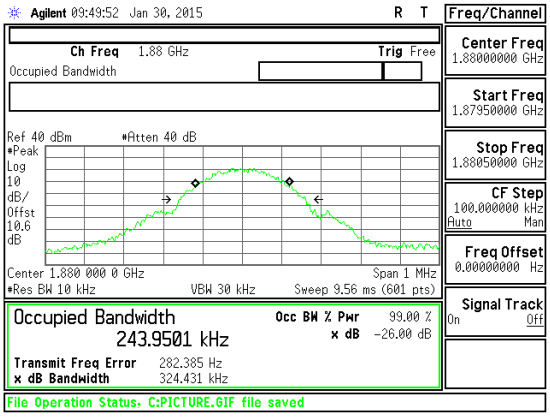
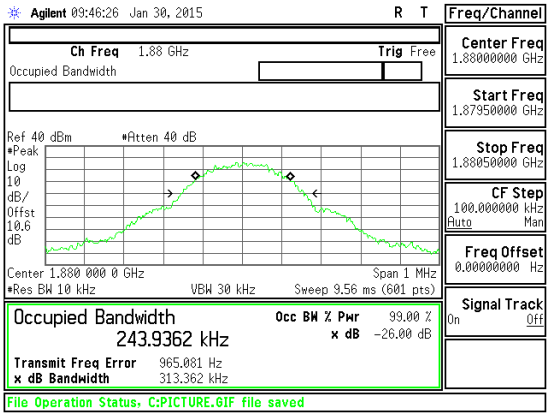
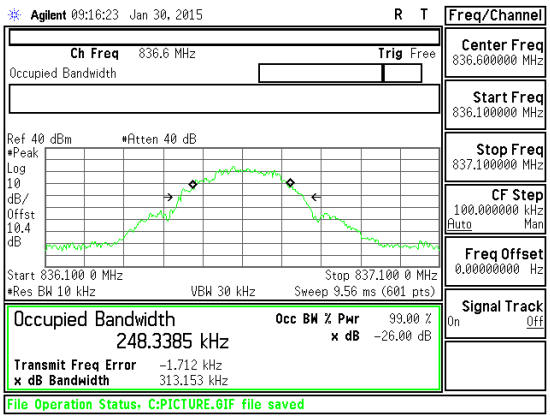
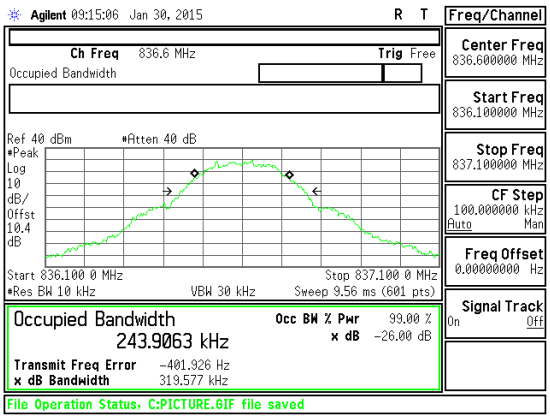
Band GSM1900	 Band GSM1900 EGPRS OBW Mid channel	 Band GSM1900 GPRS OBW Mid channel
Band GSM850	 Band GSM850 EGPRS OBW Mid channel	 Band GSM850 GPRS OBW Mid channel

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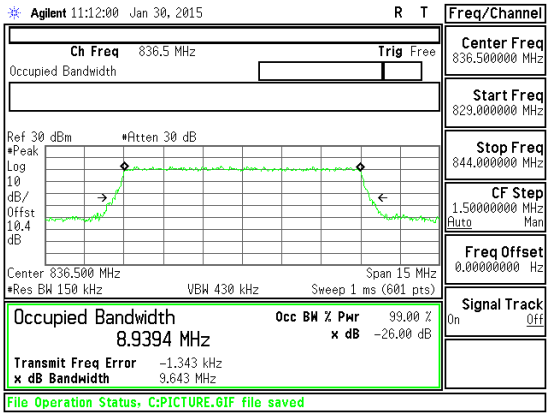
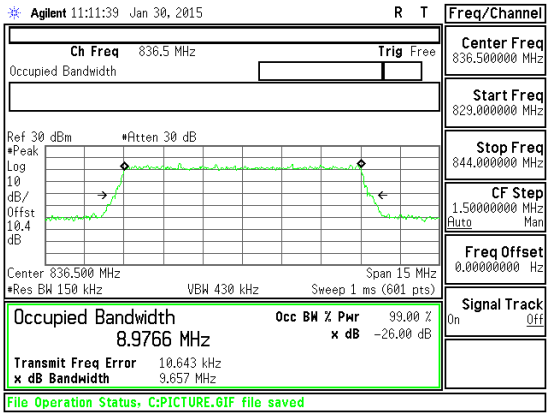
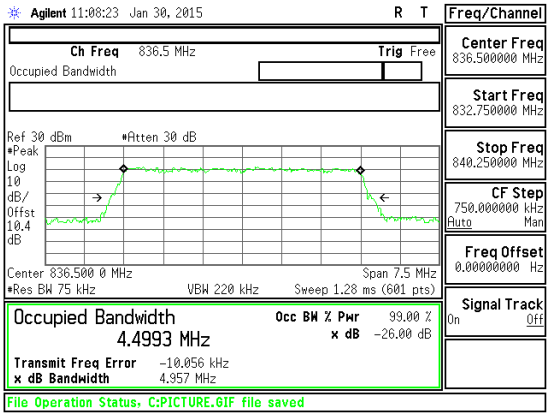
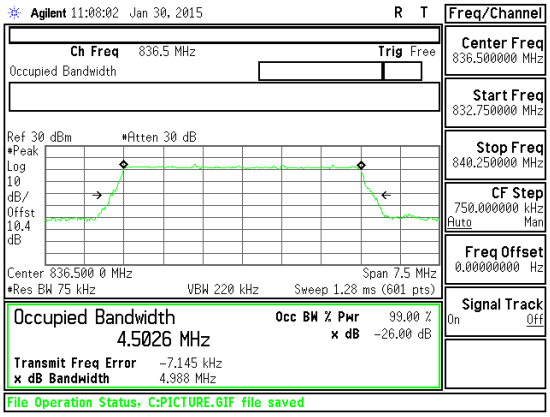
Band LTE5 10MHz	 Band LTE5 10MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE5 10MHz OBW QPSK Mid Channel FRB.gif
Band LTE5 5MHz	 Band LTE5 5MHz OBW 16QAM Mid Channel FRB.gif	 Band LTE5 5MHz OBW QPSK Mid Channel FRB.gif

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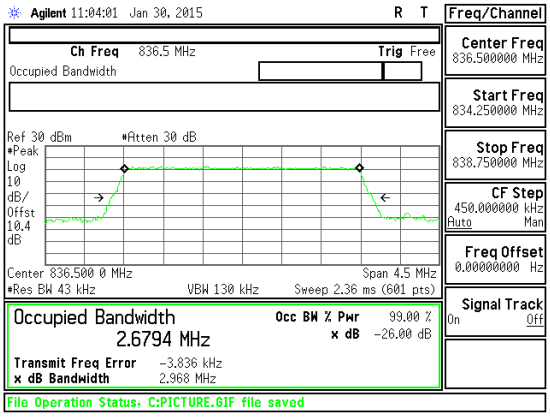
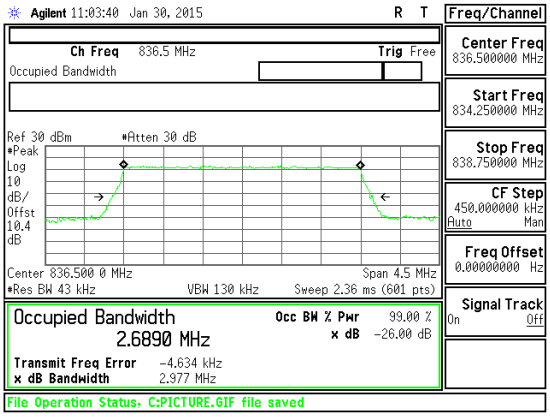
Band LTE5 3MHz

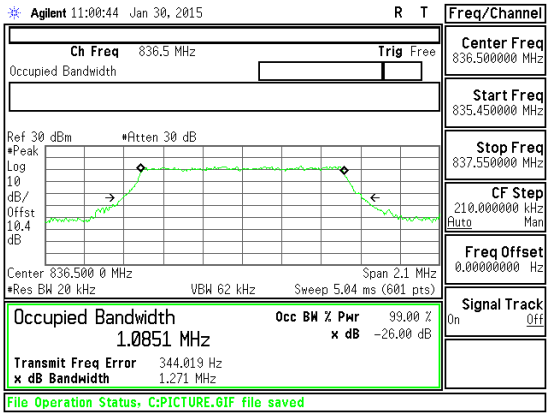


Band LTE5 3MHz OBW 16QAM Mid Channel FRB.gif

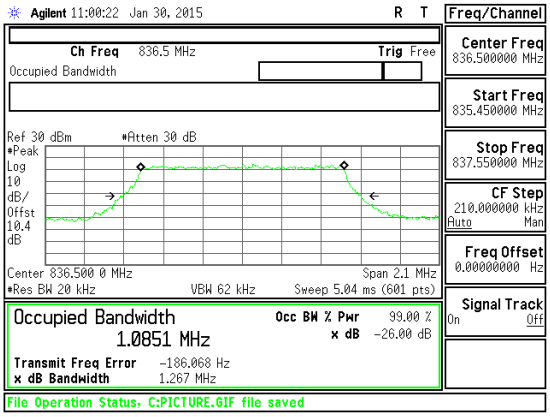


Band LTE5 3MHz OBW QPSK Mid Channel FRB.gif

Band LTE5 1.4MHz



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



Band LTE5 1.4MHz OBW QPSK Mid Channel FRB.gif

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10.2. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §22.359, §24.238

LIMITS

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

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.

RESULTS

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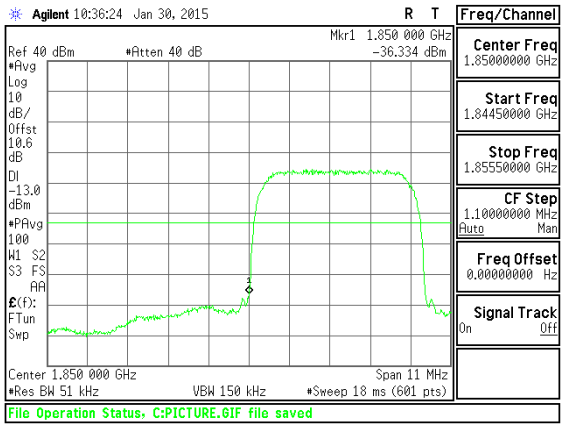
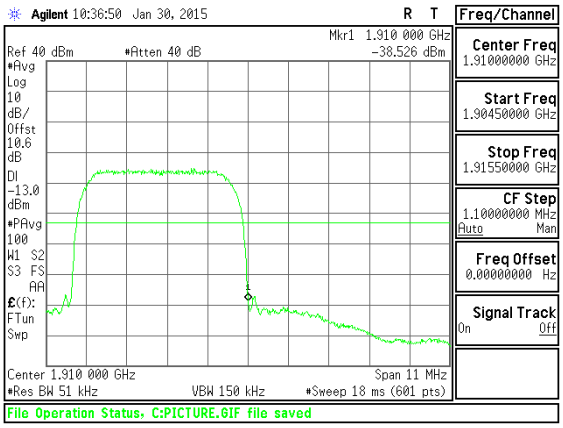
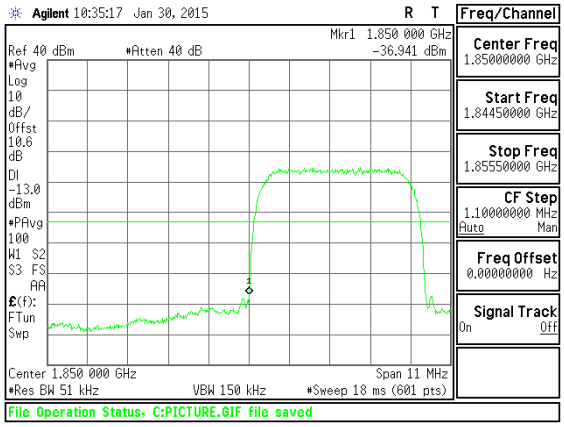
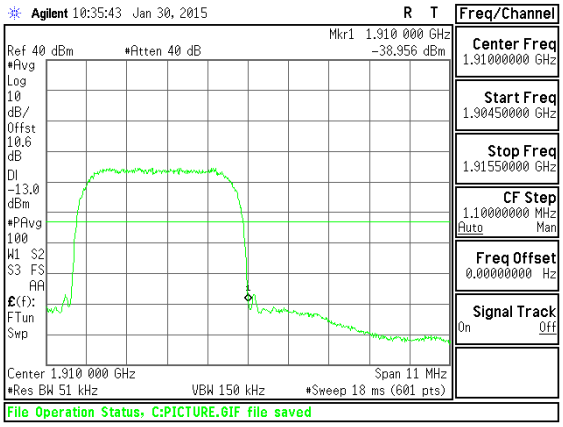
10.2.1. BAND EDGE PLOTS

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

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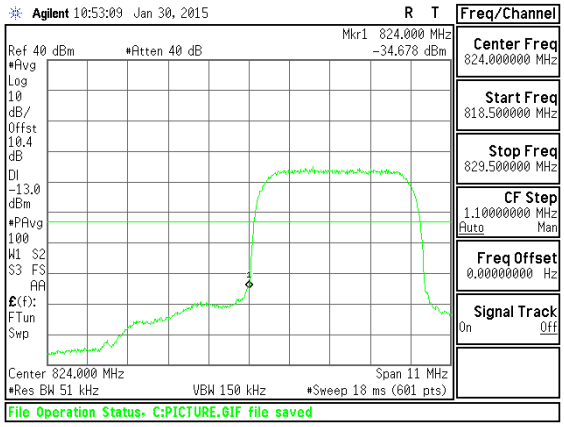
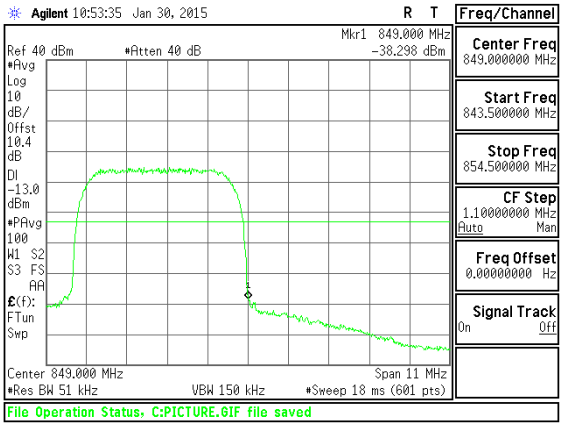
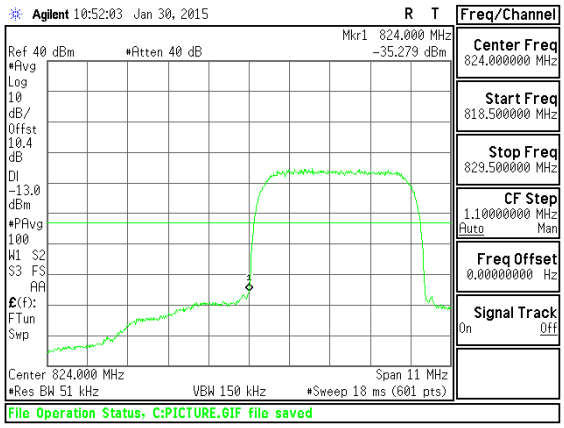
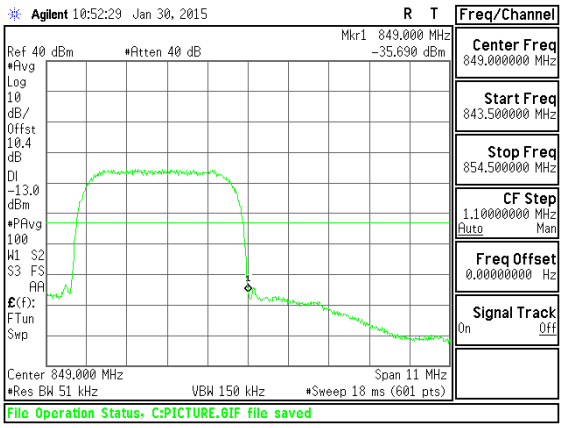
Band Band 5 HSDPA	 Band WCDMA B5 HSDPA CBE	 Band WCDMA B5 HSDPA CBE
Band Band 5 REL99	 Band WCDMA B5 REL99 CBE	 Band WCDMA B5 REL99 CBE

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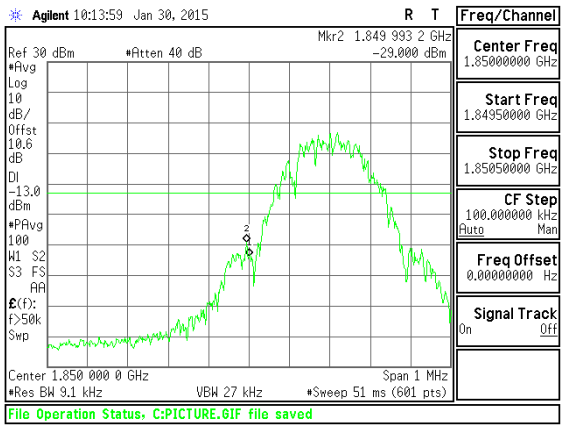
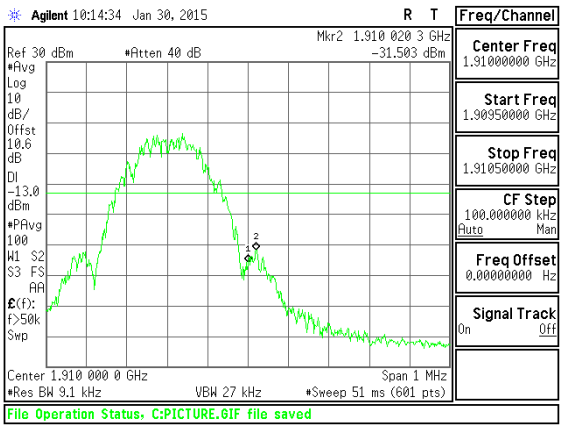
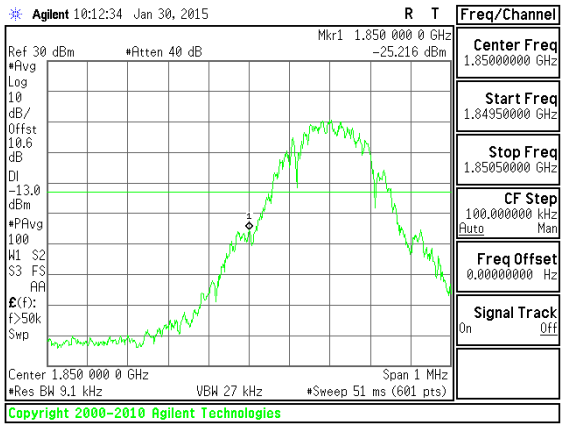
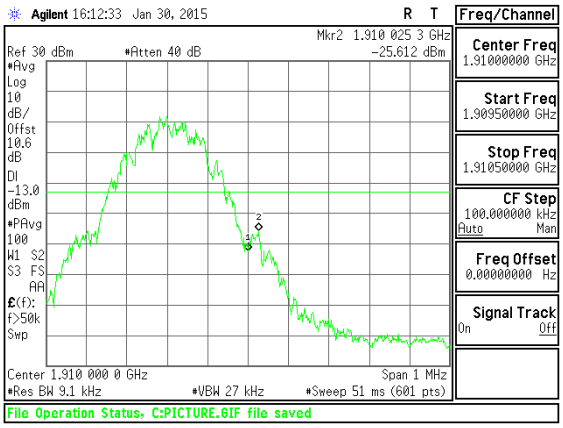
Band GSM1900 EGPRS	 Band GSM1900 EGPRS CBE Low channel	 Band GSM1900 EGPRS CBE High channel
Band GSM1900 GPRS	 Band GSM1900 GPRS CBE Low channel	 Band GSM1900 GPRS CBE High channel

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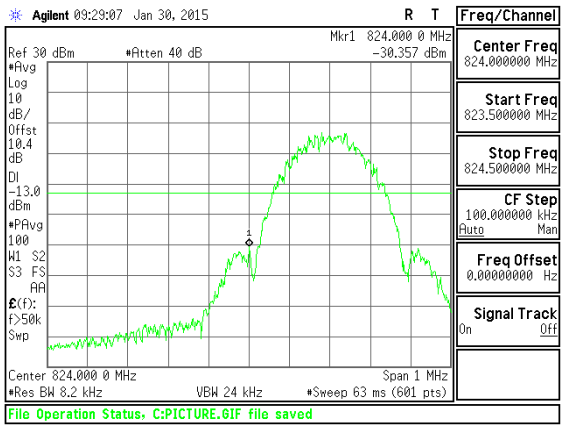
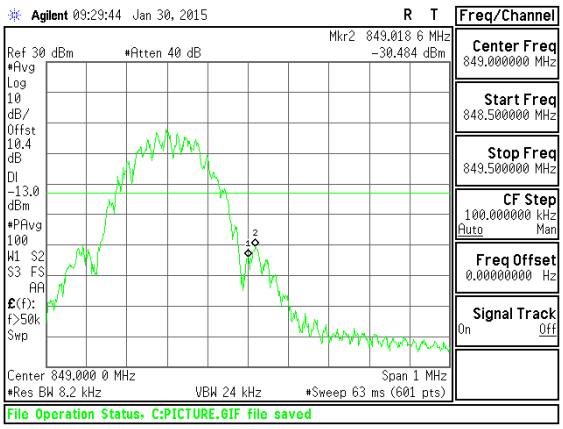
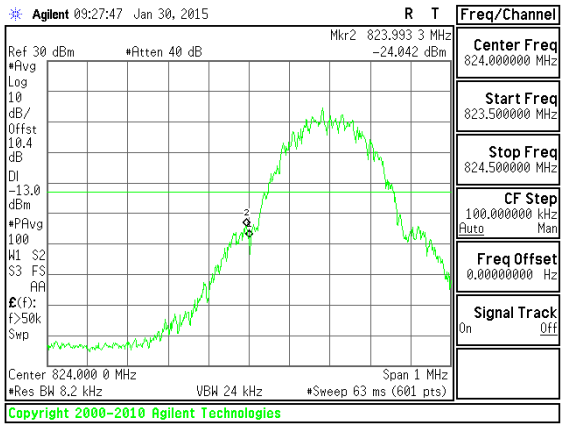
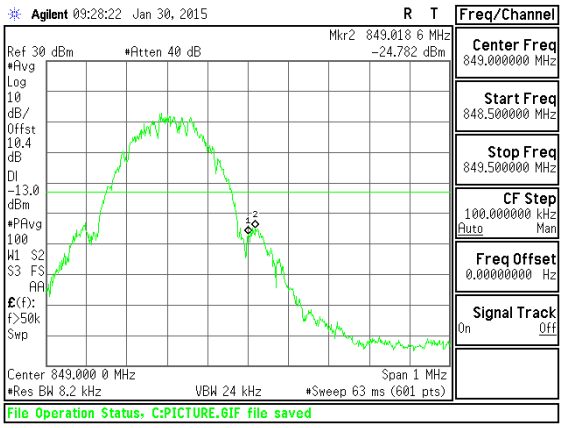
Band GSM850 EGPRS	 Band GSM850 EGPRS CBE Low channel	 Band GSM850 EGPRS CBE High channel
Band GSM850 GPRS	 Band GSM850 GPRS CBE Low channel	 Band GSM850 GPRS CBE High channel

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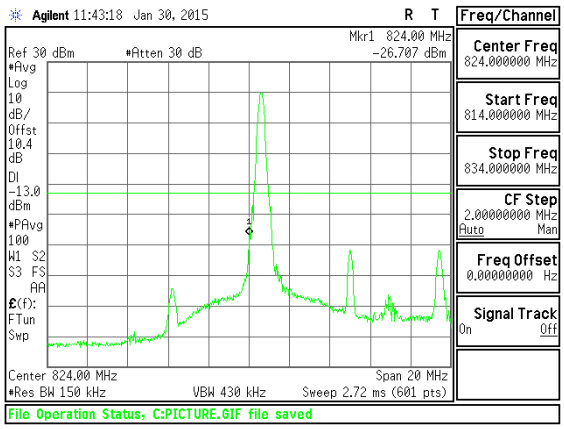
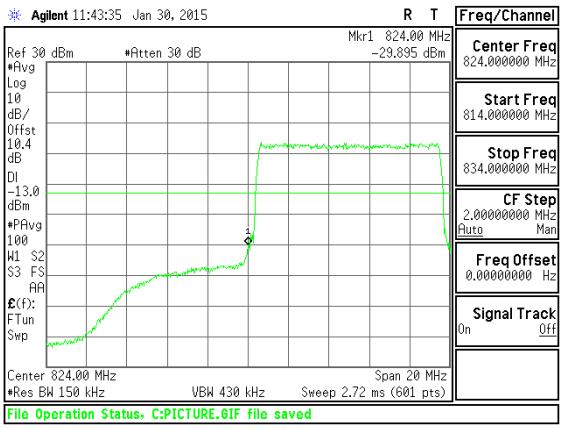
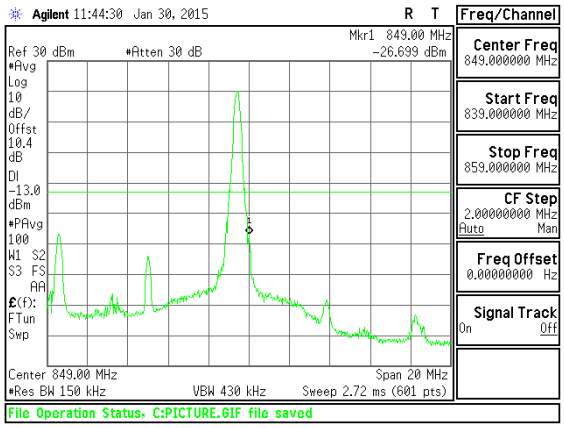
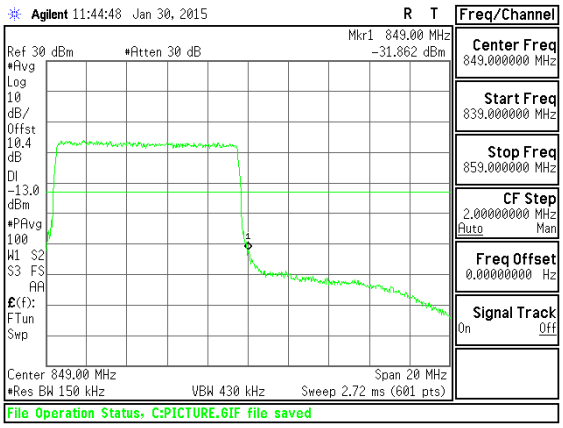
Band LTE5 10MHz 16QAM	 Band LTE5 10MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 10MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 10MHz 16QAM	 Band LTE5 10MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 10MHz CBE 16QAM High Channel FRB.gif

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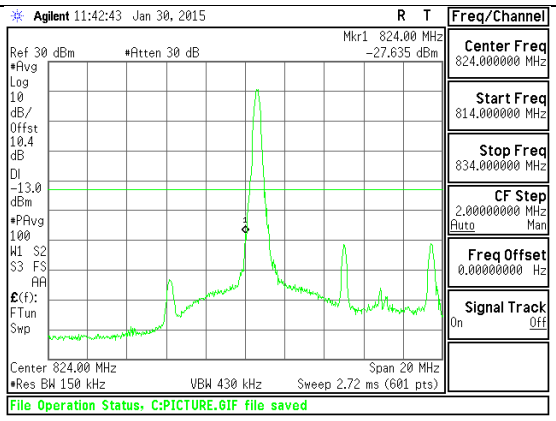
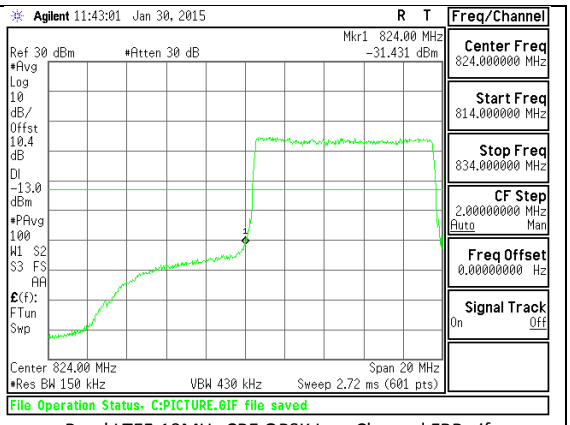
Band LTE5 10MHz QPSK

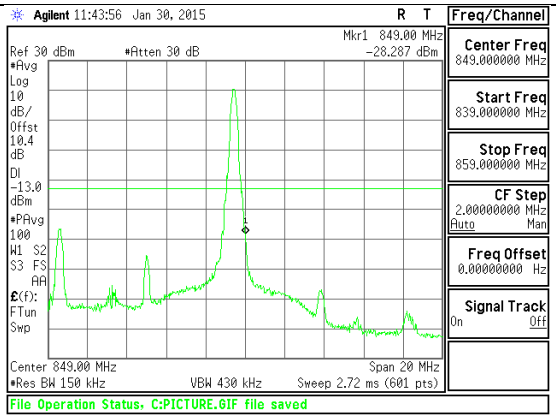


Band LTE5 10MHz CBE QPSK Low Channel 1RB.gif

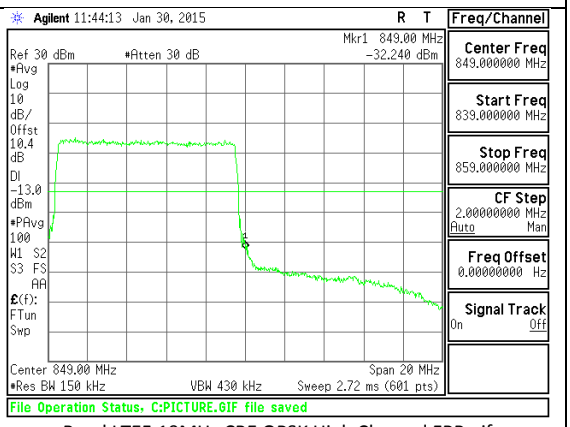


Band LTE5 10MHz CBE QPSK Low Channel FRB.gif

Band LTE5 10MHz QPSK



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



Band LTE5 10MHz CBE QPSK High Channel FRB.gif

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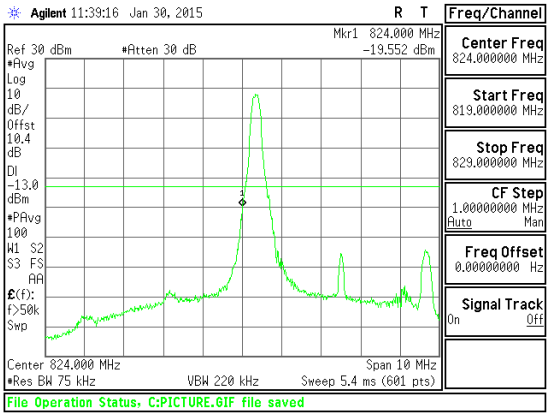
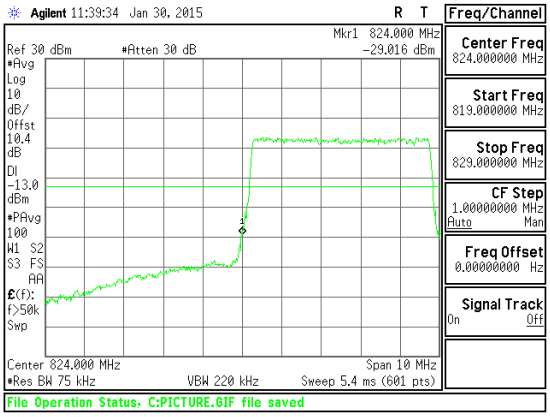
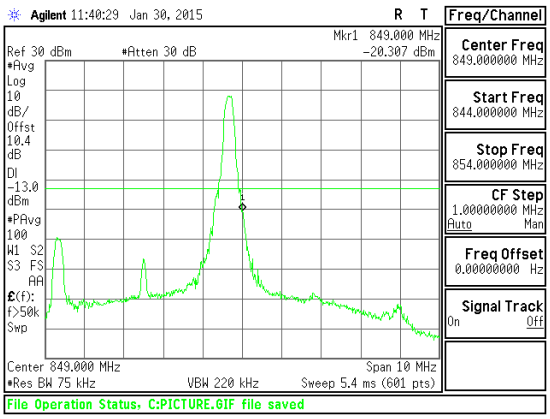
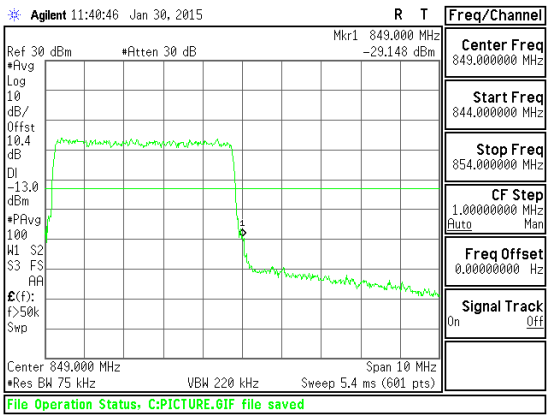
Band LTE5 5MHz 16QAM	 Band LTE5 5MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 5MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 5MHz 16QAM	 Band LTE5 5MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 5MHz CBE 16QAM High Channel FRB.gif

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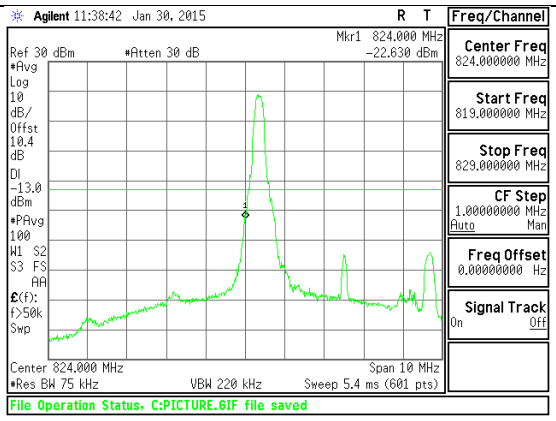
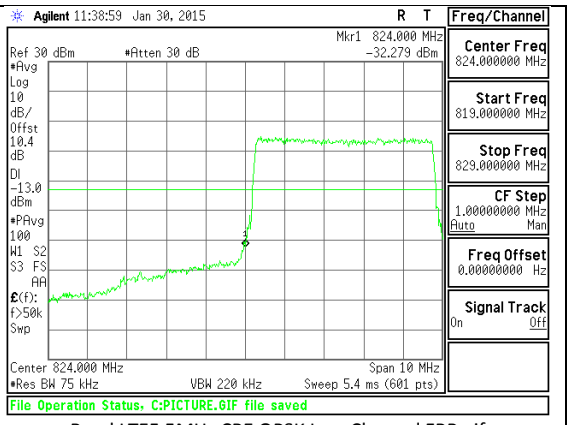
Band LTE5 5MHz QPSK

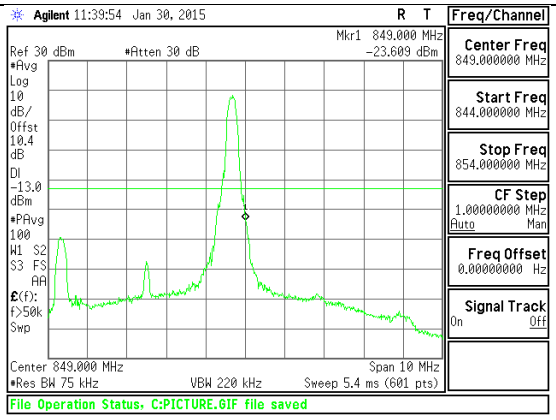


Band LTE5 5MHz CBE QPSK Low Channel 1RB.gif

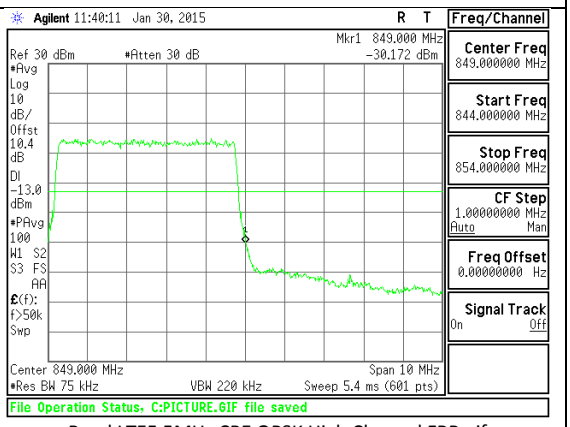


Band LTE5 5MHz CBE QPSK Low Channel FRB.gif

Band LTE5 5MHz QPSK



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



Band LTE5 5MHz CBE QPSK High Channel FRB.gif

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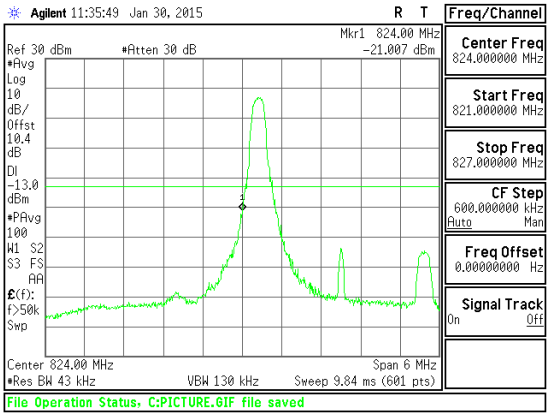
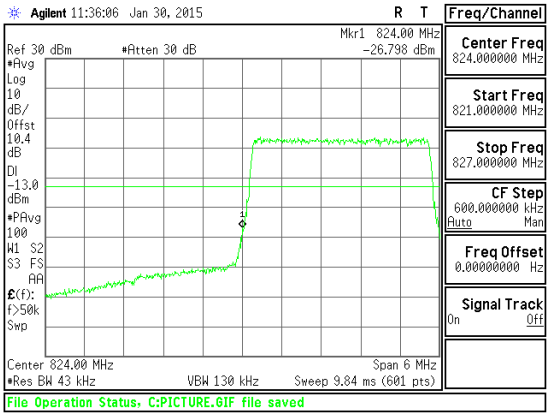
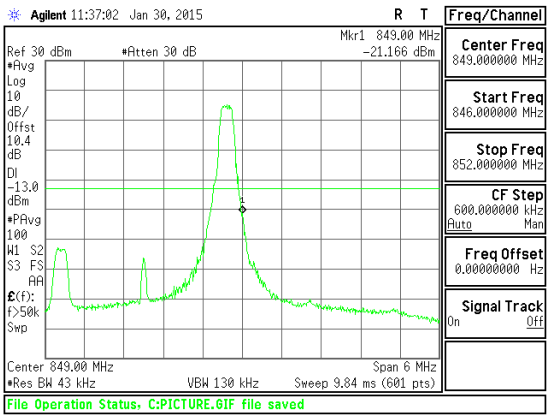
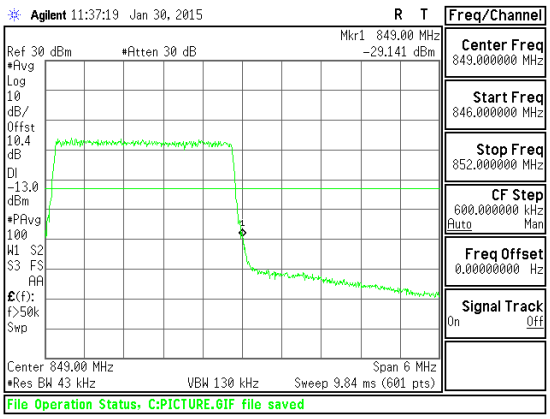
Band LTE5 3MHz 16QAM	 Band LTE5 3MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 3MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 3MHz 16QAM	 Band LTE5 3MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 3MHz CBE 16QAM High Channel FRB.gif

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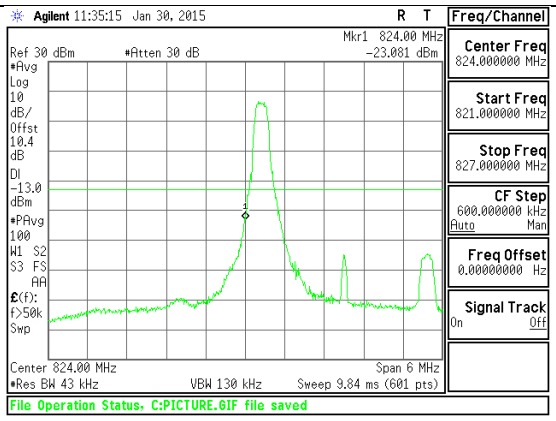
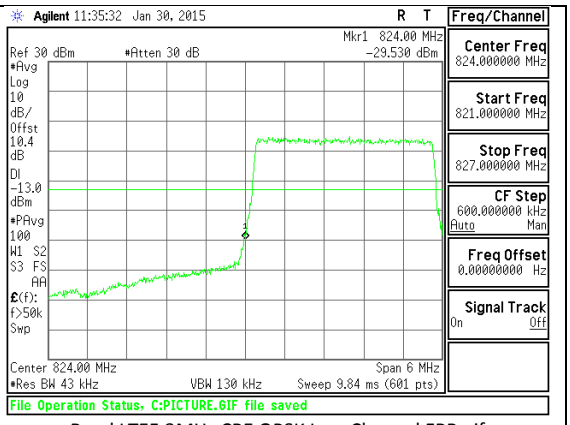
Band LTE5 3MHz QPSK

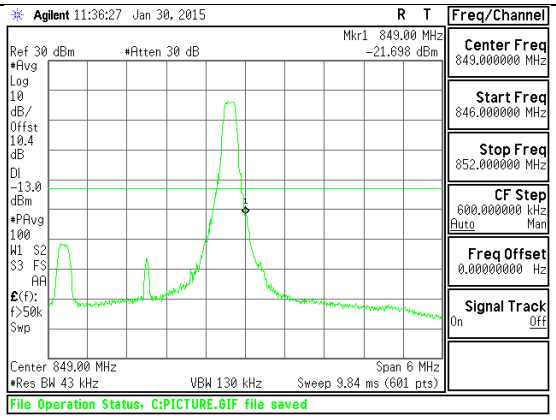


Band LTE5 3MHz CBE QPSK Low Channel 1RB.gif

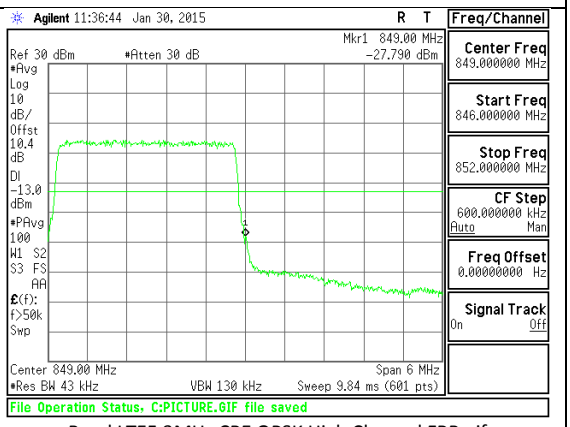


Band LTE5 3MHz CBE QPSK Low Channel FRB.gif

Band LTE5 3MHz QPSK



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



Band LTE5 3MHz CBE QPSK High Channel FRB.gif

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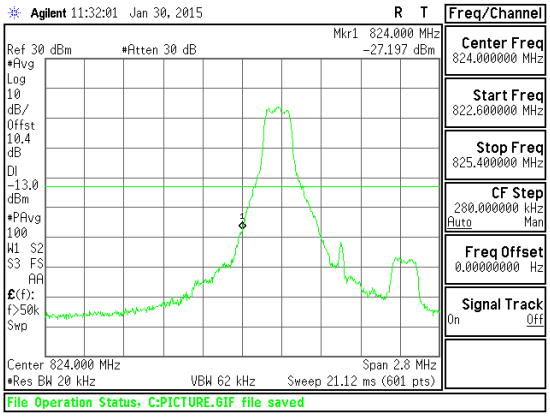
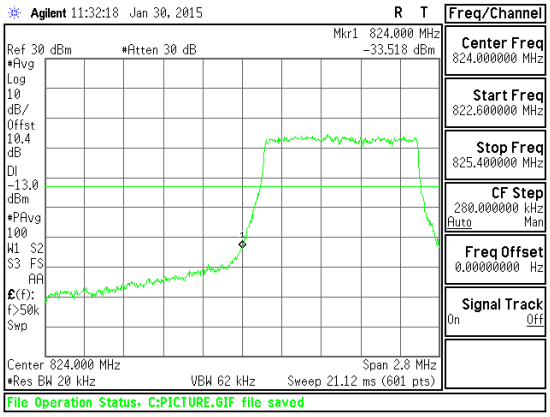
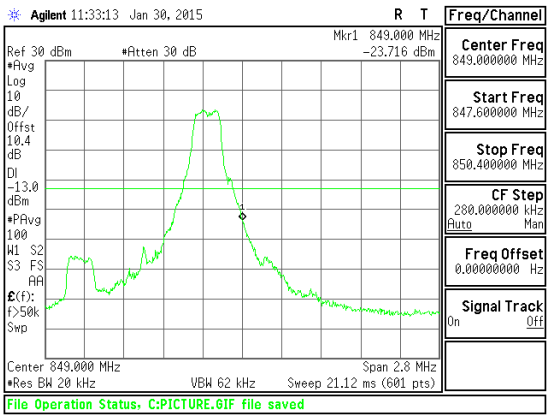
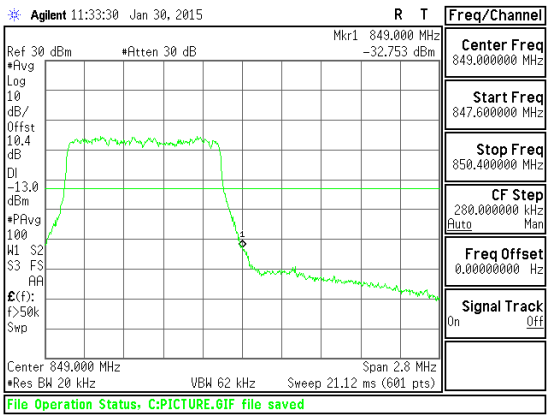
Band LTE5 1.4MHz 16QAM	 Band LTE5 1.4MHz CBE 16QAM Low Channel 1RB.gif	 Band LTE5 1.4MHz CBE 16QAM Low Channel FRB.gif
Band LTE5 1.4MHz 16QAM	 Band LTE5 1.4MHz CBE 16QAM High Channel 1RB.gif	 Band LTE5 1.4MHz CBE 16QAM High Channel FRB.gif

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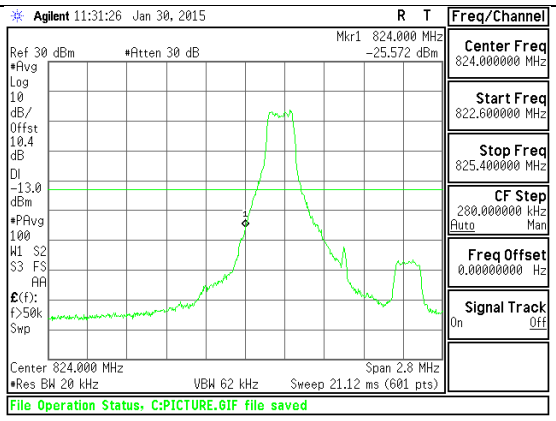
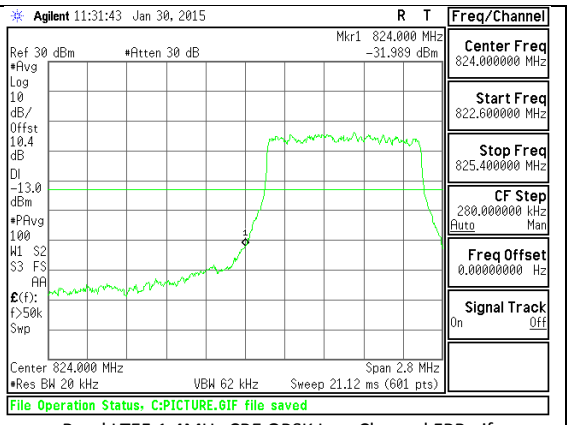
Band LTE5 1.4MHz QPSK

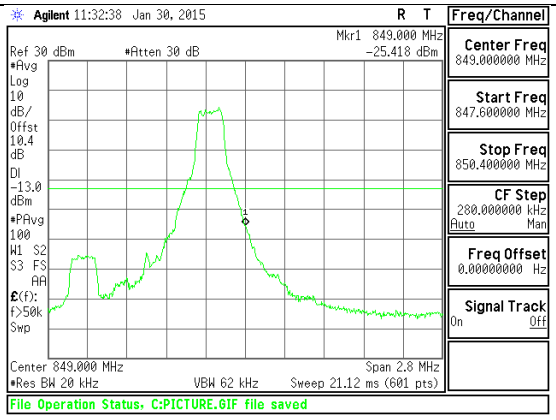


Band LTE5 1.4MHz CBE QPSK Low Channel 1RB.gif

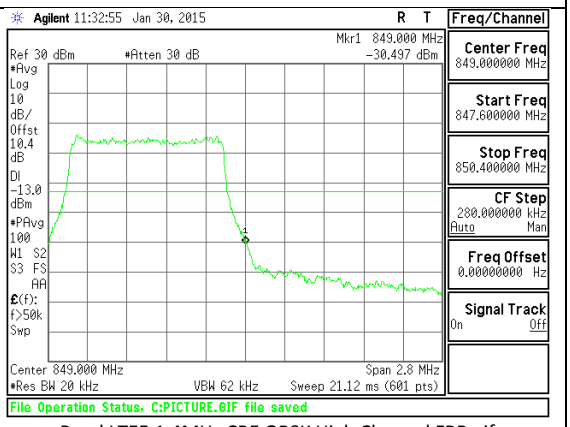


Band LTE5 1.4MHz CBE QPSK Low Channel FRB.gif

Band LTE5 1.4MHz QPSK



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



Band LTE5 1.4MHz CBE QPSK High Channel FRB.gif

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10.3. OUT OF BAND EMISSIONS

RULE PART(S)

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

LIMITS

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

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

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

RESULTS

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10.3.1. OUT OF BAND EMISSIONS RESULT

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE5	10	QPSK	829	-26.972	-13	-13.972
			836.5	-25.459	-13	-12.459
			844	-33.836	-13	-20.836
		16QAM	829	-26.363	-13	-13.363
			836.5	-26.894	-13	-13.894
			844	-33.192	-13	-20.192

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE5	5	QPSK	826.5	-33.34	-13	-20.34
			836.5	-33.916	-13	-20.916
			846.5	-32.913	-13	-19.913
		16QAM	826.5	-33.486	-13	-20.486
			836.5	-33.844	-13	-20.844
			846.5	-33.817	-13	-20.817

Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE5	3	QPSK	825.5	-32.134	-13	-19.134
			836.5	-33.668	-13	-20.668
			847.5	-34.127	-13	-21.127
		16QAM	825.5	-33.692	-13	-20.692
			836.5	-33.719	-13	-20.719
			847.5	-33.504	-13	-20.504

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Band	BW (MHz)	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
LTE5	1.4	QPSK	824.7	-33.157	-13	-20.157
			836.5	-34.07	-13	-21.07
			848.3	-33.436	-13	-20.436
		16QAM	824.7	-34.014	-13	-21.014
			836.5	-33.574	-13	-20.574
			848.3	-33.346	-13	-20.346

Band	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
GSM850	GPRS	824.2	-25.559	-13	-12.559
		836.6	-26.173	-13	-13.173
		848.8	-25.787	-13	-12.787
	EGPRS	824.2	-25.47	-13	-12.47
		836.6	-25.873	-13	-12.873
		848.8	-25.377	-13	-12.377
GSM1900	GPRS	1850.2	-25.692	-13	-12.692
		1880	-25.725	-13	-12.725
		1909.8	-25.63	-13	-12.63
	EGPRS	1850.2	-25.919	-13	-12.919
		1880	-25.782	-13	-12.782
		1909.8	-25.542	-13	-12.542

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Band	Mode	f (MHz)	Spur (dBm)	Spec (dBm)	Delta (dB)
Band 5	REL99	826.4	-25.944	-13	-12.944
		836.6	-26.124	-13	-13.124
		846.6	-25.771	-13	-12.771
	HSDPA	826.4	-25.868	-13	-12.868
		836.6	-26.443	-13	-13.443
		846.6	-25.704	-13	-12.704
Band 2	REL99	1852.4	-25.688	-13	-12.688
		1880	-25.821	-13	-12.821
		1907.6	-24.425	-13	-11.425
	HSDPA	1852.4	-25.359	-13	-12.359
		1880	-25.649	-13	-12.649
		1907.6	-25.727	-13	-12.727

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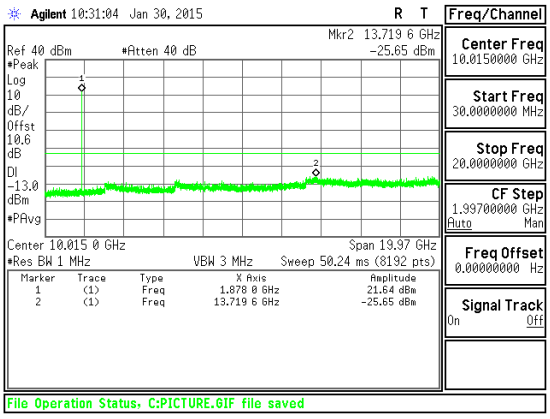
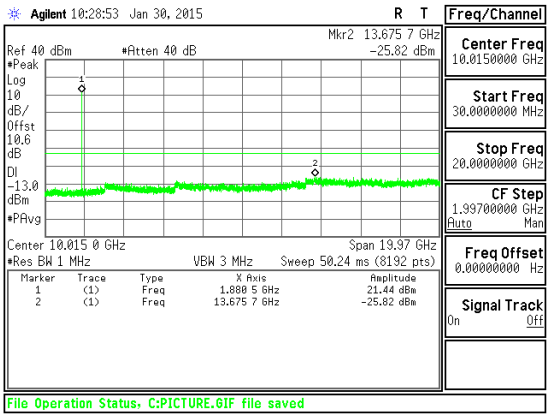
10.3.2. OUT OF BAND EMISSIONS PLOTS

Band

Band 2



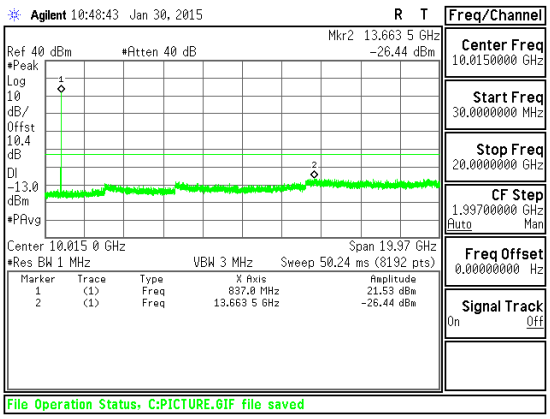
Band WCDMA B2 HSDPA CSE



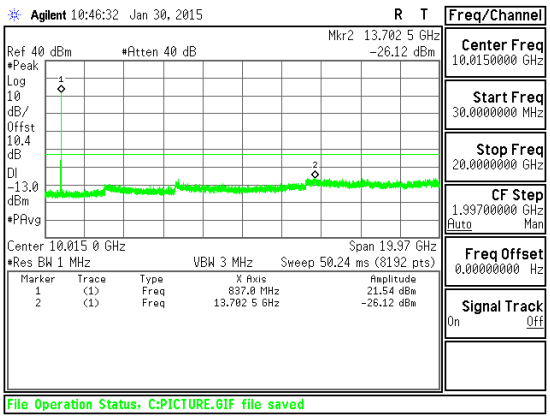
Band WCDMA B2 REL99 CSE

Band

Band 5



Band WCDMA B5 HSDPA CSE



Band WCDMA B5 REL99 CSE

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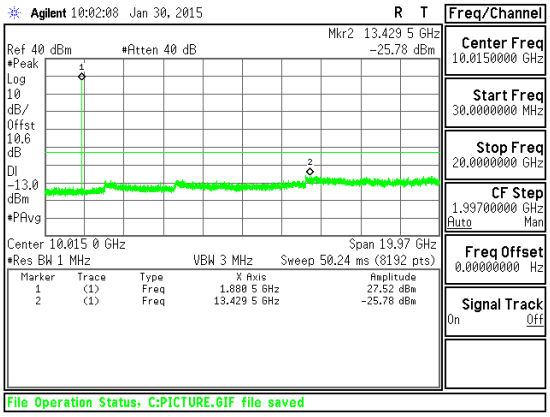
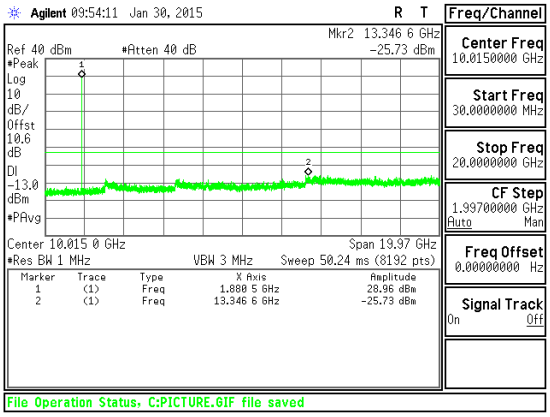
Band GSM1900	 Band GSM1900 EGPRS CSE Mid channel	 Band GSM1900 GPRS CSE Mid channel

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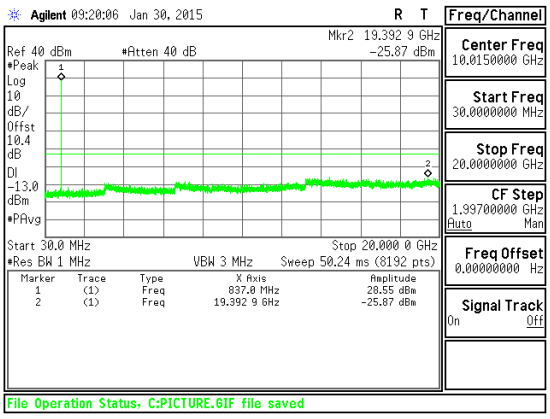
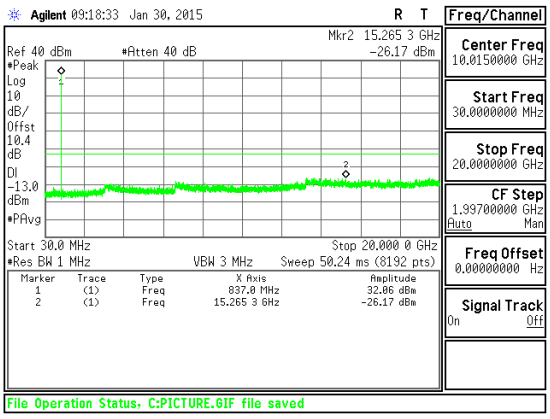
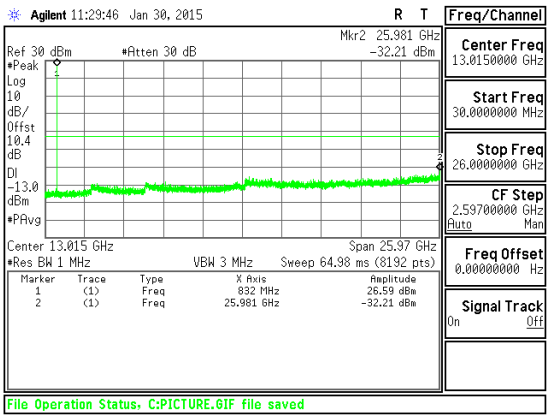
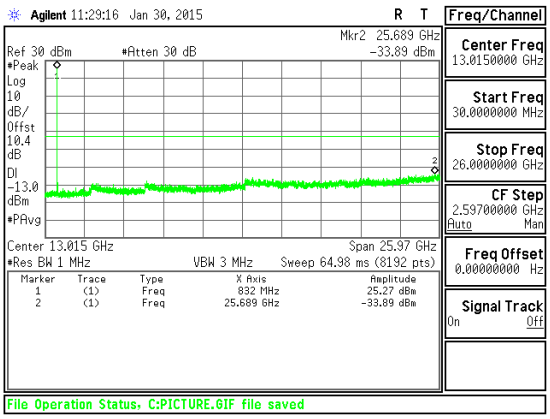
Band GSM850	 Band GSM850 EGPRS CSE Mid channel	 Band GSM850 GPRS CSE Mid channel
Band LTE5 10MHz	 Band LTE5 10MHz CSE 16QAM Mid channel	 Band LTE5 10MHz CSE QPSK Mid channel

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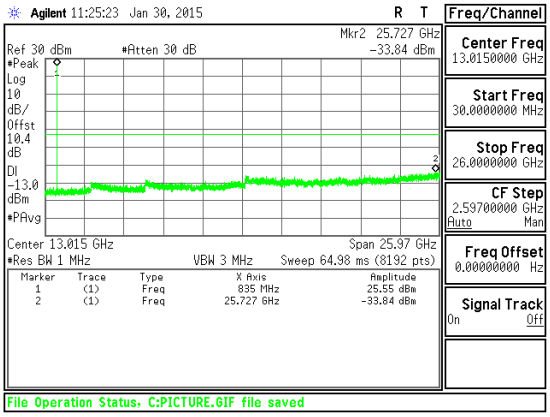
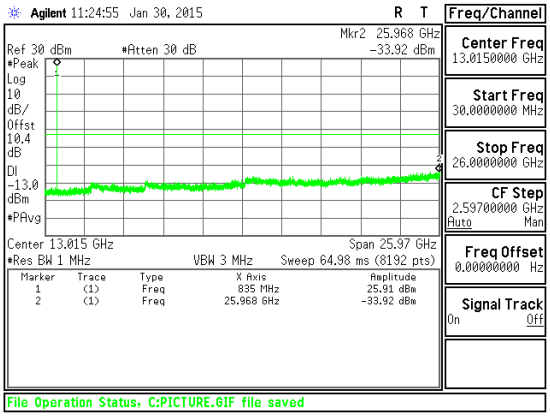
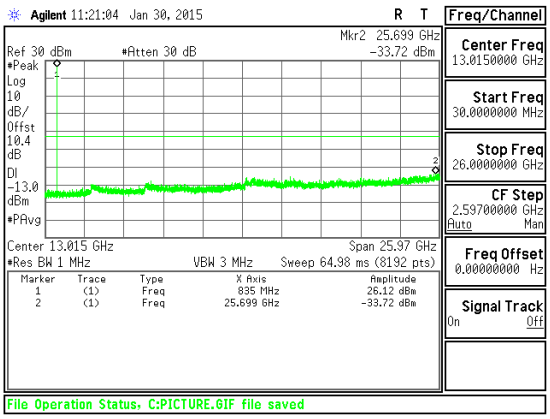
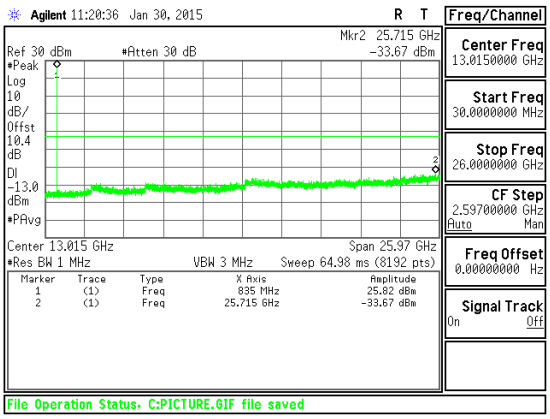
Band LTE5 5MHz	 Band LTE5 5MHz CSE 16QAM Mid channel	 Band LTE5 5MHz CSE QPSK Mid channel
Band LTE5 3MHz	 Band LTE5 3MHz CSE 16QAM Mid channel	 Band LTE5 3MHz CSE QPSK Mid channel

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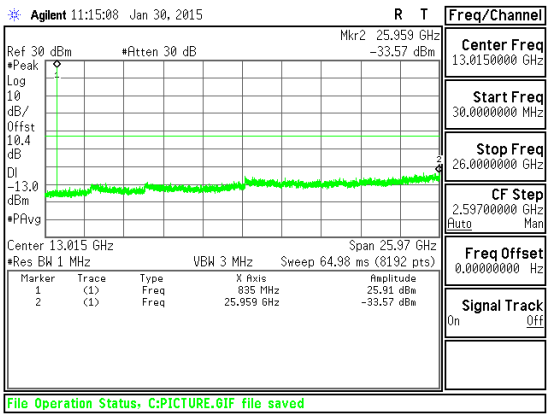
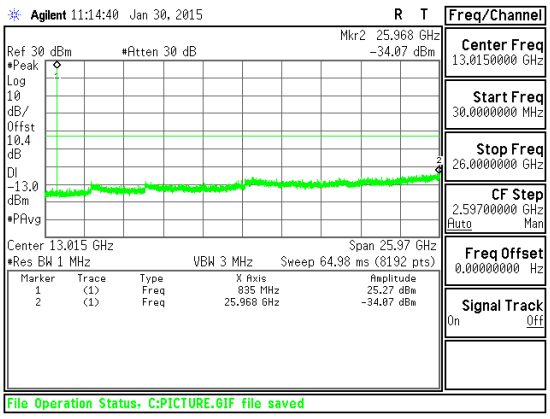
Band LTE5 1.4MHz	 Band LTE5 1.4MHz CSE 16QAM Mid channel	 Band LTE5 1.4MHz CSE QPSK Mid channel

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10.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235

LIMITS

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

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

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

RESULTS

See the following pages.

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GPRS 1900, Channel 661 - 1880MHz

Reference Frequency: PCS Mid Channel 1880 MHz @ 20°C Limit: to stay +- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse (MHz)	Delta (ppm)	Limit (ppm)
3.80	50	1880.000027	0.001	2.5
3.80	40	1880.000027	0.001	2.5
3.80	30	1880.000025	0.002	2.5
3.80	***20***	**1880.000028**	**0**	***2.5***
3.80	10	1880.000025	0.002	2.5
3.80	0	1880.000012	0.008	2.5
3.80	-10	1880.000011	0.009	2.5
3.80	-20	1880.000015	0.007	2.5
3.80	-30	1880.000011	0.009	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***	***1880.000028***	***0***	***2.5***
4.37	20	1880	*0.015*	2.5
3.3(End of volt)	20	1880	*0.015*	2.5

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GPRS 850 CELL BAND, – CHANNEL 190, Frequency 836.6MHz

Reference Frequency: PCS Mid Channel		836.6	MHz @ 20°C	
Limit: to stay +- 2.5 ppm =		2091.500	Hz	
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse (MHz)	Delta (ppm)	Limit (ppm)
3.80	50	836.600036	-0.002	2.5
3.80	40	836.600028	0.007	2.5
3.80	30	836.600033	0.002	2.5
3.80	***20***	**836.600034**	**0**	***2.5***
3.80	10	836.600027	0.009	2.5
3.80	0	836.600037	-0.003	2.5
3.80	-10	836.600032	0.003	2.5
3.80	-20	836.600036	-0.002	2.5
3.80	-30	836.600033	0.001	2.5

Reference Frequency: PCS Mid Channel		836.6	MHz @ 20°C	
Limit: to stay +- 2.5 ppm =		2091.500	Hz	
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse (MHz)	Delta (ppm)	Limit (ppm)
3.80	***20***	***836.600034***	***0***	***2.5***
4.37	20	836.6	*0.041*	2.5
3.3(End of volt)	20	836.6	*0.041*	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.

LIMITS

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

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

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

TEST PROCEDURE

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

For peak power measurement with a PSA:

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

For average power measurement with a PSA:

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

TEST RESULTS

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11.1.1. ERP/EIRP Results

Band	Mode	Channel	f(MHz)	EIRP	
				dBm	mW
Band 2	REL99	9262	1852.4	24.4	275.4
		9400	1880	23.74	236.6
		9538	1907.6	23.78	238.8
	HSDPA	9262	1852.4	24.08	255.9
		9400	1880	23.73	236.0
		9538	1907.6	23.69	233.9

Band	Mode	Channel	f(MHz)	ERP	
				dBm	mW
Band 5	REL99	4132	826.4	21.69	147.6
		4183	836.6	21.84	152.8
		4233	846.6	21.52	141.9
	HSDPA	4132	826.4	21.67	146.9
		4183	836.6	21.83	152.4
		4233	846.6	21.48	140.6

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Band	Mode	Channel	f(MHz)	EIRP	
				dBm	mW
GSM1900	GPRS	512	1850.2	31.72	1485.9
		661	1880	31.64	1458.8
		810	1909.8	31.11	1291.2
	EGPRS	512	1850.2	26.98	498.9
		661	1880	27.21	526.0
		810	1909.8	27.57	571.5

Band	Mode	Channel	f(MHz)	ERP	
				dBm	mW
GSM850	GPRS	128	824.2	31.77	1503.1
		190	836.6	31.83	1524.1
		251	848.8	31.02	1264.7
	EGPRS	128	824.2	26.89	488.7
		190	836.6	26.90	489.8
		251	848.8	26.63	460.3

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11.1.2. LTE ERP/EIRP Results

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP	
					dBm	mW
LTE5	10	QPSK	1/0	829	22.05	160.3
			1/0	836.5	22.22	166.7
			1/0	844	22.07	161.1
		16QAM	1/0	829	21.67	146.9
			1/0	836.5	21.72	148.6
			1/0	844	21.80	151.4

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP	
					dBm	mW
LTE5	5	QPSK	1/0	826.5	22.08	161.4
			1/0	836.5	22.17	164.8
			1/0	846.5	21.79	151
		16QAM	1/0	826.5	21.50	141.3
			1/0	836.5	21.36	136.8
			1/0	846.5	20.63	115.6

Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP	
					dBm	mW
LTE5	3	QPSK	1/0	825.5	22.22	166.7
			1/0	836.5	22.24	167.5
			1/0	847.5	21.61	144.9
		16QAM	1/0	825.5	21.65	146.2
			1/0	836.5	21.67	146.9
			1/0	847.5	21.02	126.5

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Band	BW (MHz)	Mode	RB/RB Size	f (MHz)	ERP	
					dBm	mW
LTE5	1.4	QPSK	1/0	824.7	22.21	166.3
			1/0	836.5	22.19	165.6
			1/0	848.3	21.71	148.3
		16QAM	1/0	824.7	21.50	141.3
			1/0	836.5	21.69	147.6
			1/0	848.3	20.93	123.9

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11.1.3. ERP/EIRP DATA

Band

LTE5

10MHz

16QAM

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: LTE5 10MHz 16QAM

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								
829.00	16.05	V	0.9	0.0	15.15	38.5	-23.3	
829.00	22.57	H	0.9	0.0	21.67	38.5	-16.8	
Mid Ch								
836.50	16.41	V	0.9	0.0	15.51	38.5	-22.9	
836.50	22.62	H	0.9	0.0	21.72	38.5	-16.7	
High Ch								
844.00	15.91	V	0.9	0.0	15.01	38.5	-23.4	
844.00	22.70	H	0.9	0.0	21.80	38.5	-16.6	

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

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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Band

LTE5

10MHz

QPSK

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: LTE5 10MHz QPSK

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								
829.00	16.37	V	0.9	0.0	15.47	38.5	-23.0	
829.00	22.95	H	0.9	0.0	22.05	38.5	-16.4	
Mid Ch								
836.50	16.59	V	0.9	0.0	15.69	38.5	-22.8	
836.50	23.12	H	0.9	0.0	22.22	38.5	-16.2	
High Ch								
844.00	16.24	V	0.9	0.0	15.34	38.5	-23.1	
844.00	22.97	H	0.9	0.0	22.07	38.5	-16.4	

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

LTE5

5MHz

16QAM

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: LTE5 5MHz 16QAM

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								
826.50	16.09	V	0.9	0.0	15.19	38.5	-23.3	
826.50	22.40	H	0.9	0.0	21.50	38.5	-16.9	
Mid Ch								
836.50	16.69	V	0.9	0.0	15.79	38.5	-22.7	
836.50	22.26	H	0.9	0.0	21.36	38.5	-17.1	
High Ch								
846.50	15.34	V	0.9	0.0	14.44	38.5	-24.0	
846.50	21.53	H	0.9	0.0	20.63	38.5	-17.8	

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

LTE5

5MHz

QPSK

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: LTE5 5MHz QPSK

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								
826.50	16.52	V	0.9	0.0	15.62	38.5	-22.8	
826.50	22.98	H	0.9	0.0	22.08	38.5	-16.4	
Mid Ch								
836.50	16.97	V	0.9	0.0	16.07	38.5	-22.4	
836.50	23.07	H	0.9	0.0	22.17	38.5	-16.3	
High Ch								
846.50	16.01	V	0.9	0.0	15.11	38.5	-23.3	
846.50	22.69	H	0.9	0.0	21.79	38.5	-16.7	

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

LTE5

3MHz

16QAM

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: LTE5 3MHz 16QAM

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								
825.50	16.08	V	0.9	0.0	15.18	38.5	-23.3	
825.50	22.55	H	0.9	0.0	21.65	38.5	-16.8	
Mid Ch								
836.50	16.78	V	0.9	0.0	15.88	38.5	-22.6	
836.50	22.57	H	0.9	0.0	21.67	38.5	-16.8	
High Ch								
847.50	15.92	V	0.9	0.0	15.02	38.5	-23.4	
847.50	21.92	H	0.9	0.0	21.02	38.5	-17.4	

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

LTE5

3MHz

QPSK

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: LTE5 3MHz QPSK

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								
825.50	16.61	V	0.9	0.0	15.71	38.5	-22.7	
825.50	23.12	H	0.9	0.0	22.22	38.5	-16.2	
Mid Ch								
836.50	16.67	V	0.9	0.0	15.77	38.5	-22.7	
836.50	23.14	H	0.9	0.0	22.24	38.5	-16.2	
High Ch								
847.50	15.88	V	0.9	0.0	14.98	38.5	-23.5	
847.50	22.51	H	0.9	0.0	21.61	38.5	-16.8	

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

LTE5

1.4MHz

16QAM

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: LTE5 1.4MHz 16QAM

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								
824.70	16.05	V	0.9	0.0	15.15	38.5	-23.3	
824.70	22.40	H	0.9	0.0	21.50	38.5	-16.9	
Mid Ch								
836.50	16.40	V	0.9	0.0	15.50	38.5	-22.9	
836.50	22.59	H	0.9	0.0	21.69	38.5	-16.8	
High Ch								
848.30	15.37	V	0.9	0.0	14.47	38.5	-24.0	
848.30	21.83	H	0.9	0.0	20.93	38.5	-17.5	

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

LTE5

1.4MHz

QPSK

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: LTE5 1.4MHz QPSK

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								
824.70	16.59	V	0.9	0.0	15.69	38.5	-22.8	
824.70	23.11	H	0.9	0.0	22.21	38.5	-16.2	
Mid Ch								
836.50	16.78	V	0.9	0.0	15.88	38.5	-22.6	
836.50	23.09	H	0.9	0.0	22.19	38.5	-16.3	
High Ch								
848.30	15.96	V	0.9	0.0	15.06	38.5	-23.4	
848.30	22.61	H	0.9	0.0	21.71	38.5	-16.7	

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

Band 2

HSDPA

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT Only
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	12.30	V	0.9	8.0	19.41	33.0	-13.6	
1852.40	16.97	H	0.9	8.0	24.08	33.0	-8.9	
Mid Ch								
1880.00	12.51	V	0.9	8.0	19.62	33.0	-13.4	
1880.00	16.62	H	0.9	8.0	23.73	33.0	-9.3	
High Ch								
1907.60	12.24	V	0.9	8.0	19.35	33.0	-13.7	
1907.60	16.58	H	0.9	8.0	23.69	33.0	-9.3	

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 #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT Only
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	12.83	V	0.9	8.0	19.94	33.0	-13.1	
1852.40	17.29	H	0.9	8.0	24.40	33.0	-8.6	
Mid Ch								
1880.00	12.98	V	0.9	8.0	20.09	33.0	-12.9	
1880.00	16.63	H	0.9	8.0	23.74	33.0	-9.3	
High Ch								
1907.60	12.75	V	0.9	8.0	19.86	33.0	-13.1	
1907.60	16.67	H	0.9	8.0	23.78	33.0	-9.2	

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 #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: WCDMA Band 5 HSDPA

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								
826.40	14.82	V	0.9	0.0	13.92	38.5	-24.5	
826.40	22.57	H	0.9	0.0	21.67	38.5	-16.8	
Mid Ch								
836.60	15.42	V	0.9	0.0	14.52	38.5	-23.9	
836.60	22.73	H	0.9	0.0	21.83	38.5	-16.6	
High Ch								
846.60	14.72	V	0.9	0.0	13.82	38.5	-24.6	
846.60	22.38	H	0.9	0.0	21.48	38.5	-17.0	

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 C

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
Mode: REL99 B5 FUND

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								
826.40	15.04	V	0.9	0.0	14.14	38.5	-24.3	
826.40	22.59	H	0.9	0.0	21.69	38.5	-16.8	
Mid Ch								
836.60	15.30	V	0.9	0.0	14.40	38.5	-24.0	
836.60	22.74	H	0.9	0.0	21.84	38.5	-16.6	
High Ch								
846.60	15.05	V	0.9	0.0	14.15	38.5	-24.3	
846.60	22.42	H	0.9	0.0	21.52	38.5	-16.9	

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

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Band

GSM1900

EGPRS

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT Only
Mode: EGPRS 1880

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	16.92	V	0.9	8.0	24.03	33.0	-9.0	
1850.20	19.87	H	0.9	8.0	26.98	33.0	-6.0	
Mid Ch								
1880.00	17.03	V	0.9	8.0	24.14	33.0	-8.9	
1880.00	20.10	H	0.9	8.0	27.21	33.0	-5.8	
High Ch								
1909.80	16.82	V	0.9	8.0	23.93	33.0	-9.1	
1909.80	20.46	H	0.9	8.0	27.57	33.0	-5.4	

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

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Band

GSM1900

GPRS

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT Only
Mode: GPRS 1880

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	20.85	V	0.9	8.0	27.96	33.0	-5.0	
1850.20	24.61	H	0.9	8.0	31.72	33.0	-1.3	
Mid Ch								
1880.00	20.62	V	0.9	8.0	27.73	33.0	-5.3	
1880.00	24.53	H	0.9	8.0	31.64	33.0	-1.4	
High Ch								
1909.80	20.94	V	0.9	8.0	28.05	33.0	-5.0	
1909.80	24.00	H	0.9	8.0	31.11	33.0	-1.9	

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

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Band

GSM850

EGPRS

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
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	20.10	V	0.9	0.0	19.20	38.5	-19.2	
824.20	27.79	H	0.9	0.0	26.89	38.5	-11.6	
Mid Ch								
836.60	20.53	V	0.9	0.0	19.63	38.5	-18.8	
836.60	27.80	H	0.9	0.0	26.90	38.5	-11.5	
High Ch								
848.80	20.42	V	0.9	0.0	19.52	38.5	-18.9	
848.80	27.53	H	0.9	0.0	26.63	38.5	-11.8	

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

GSM850

GPRS

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

Company: Samsung
Project #: 15I19901
Date: 01/30/15
Test Engineer: R.Alegre
Configuration: EUT X-position
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	24.85	V	0.9	0.0	23.95	38.5	-14.5	
824.20	32.67	H	0.9	0.0	31.77	38.5	-6.7	
Mid Ch								
836.60	25.26	V	0.9	0.0	24.36	38.5	-14.1	
836.60	32.73	H	0.9	0.0	31.83	38.5	-6.6	
High Ch								
848.80	25.01	V	0.9	0.0	24.11	38.5	-14.3	
848.80	31.92	H	0.9	0.0	31.02	38.5	-7.4	

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

LIMIT

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

TEST PROCEDURE

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

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

RESULTS

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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11.2.1. SPURIOUS RADIATION DATA

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: EGPRS850

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

Band: GSM850 EGPRS

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1.648	-6.3	V	3.0	37.4	1.0	-42.7	-13.0	-29.7	
2.473	-10.1	V	3.0	36.4	1.0	-45.5	-13.0	-32.5	
3.297	-21.3	V	3.0	35.8	1.0	-56.1	-13.0	-43.1	
1.648	-15.2	H	3.0	37.4	1.0	-51.6	-13.0	-38.6	
2.473	-15.2	H	3.0	36.4	1.0	-50.6	-13.0	-37.6	
3.297	-21.7	H	3.0	35.8	1.0	-56.5	-13.0	-43.5	
Mid Ch, 836.6MHz									
1.673	-6.1	V	3.0	37.3	1.0	-42.4	-13.0	-29.4	
2.510	-14.6	V	3.0	36.4	1.0	-49.9	-13.0	-36.9	
3.346	-21.0	V	3.0	35.8	1.0	-55.8	-13.0	-42.8	
1.673	-16.0	H	3.0	37.3	1.0	-52.3	-13.0	-39.3	
2.510	-22.8	H	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3.346	-21.1	H	3.0	35.8	1.0	-55.8	-13.0	-42.8	
High Ch, 848.8MHz									
1.697	-7.9	V	3.0	37.3	1.0	-44.2	-13.0	-31.2	
2.546	-18.5	V	3.0	36.3	1.0	-53.9	-13.0	-40.9	
3.395	-21.8	V	3.0	35.7	1.0	-56.5	-13.0	-43.5	
1.697	-15.2	H	3.0	37.3	1.0	-51.5	-13.0	-38.5	
2.546	-24.5	H	3.0	36.3	1.0	-59.8	-13.0	-46.8	
3.395	-21.8	H	3.0	35.7	1.0	-56.5	-13.0	-43.5	

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

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: GPRS850

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

Band

GSM850

GPRS

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.2MHz									
1.648	-6.0	V	3.0	37.4	1.0	-42.4	-13.0	-29.4	
2.473	-10.0	V	3.0	36.4	1.0	-45.4	-13.0	-32.4	
3.297	-20.9	V	3.0	35.8	1.0	-55.7	-13.0	-42.7	
1.648	-14.8	H	3.0	37.4	1.0	-51.2	-13.0	-38.2	
2.473	-14.6	H	3.0	36.4	1.0	-50.0	-13.0	-37.0	
3.297	-21.3	H	3.0	35.8	1.0	-56.1	-13.0	-43.1	
Mid Ch, 836.6MHz									
1.673	-5.8	V	3.0	37.3	1.0	-42.1	-13.0	-29.1	
2.510	-14.7	V	3.0	36.4	1.0	-50.0	-13.0	-37.0	
3.346	-20.8	V	3.0	35.8	1.0	-55.6	-13.0	-42.6	
1.673	-15.2	H	3.0	37.3	1.0	-51.5	-13.0	-38.5	
2.510	-22.2	H	3.0	36.4	1.0	-57.6	-13.0	-44.6	
3.346	-20.5	H	3.0	35.8	1.0	-55.2	-13.0	-42.2	
High Ch, 848.8MHz									
1.697	-6.8	V	3.0	37.3	1.0	-43.1	-13.0	-30.1	
2.546	-18.1	V	3.0	36.3	1.0	-53.4	-13.0	-40.4	
3.395	-20.8	V	3.0	35.7	1.0	-55.5	-13.0	-42.5	
1.697	-14.6	H	3.0	37.3	1.0	-50.9	-13.0	-37.9	
2.546	-24.0	H	3.0	36.3	1.0	-59.4	-13.0	-46.4	
3.395	-21.1	H	3.0	35.7	1.0	-55.8	-13.0	-42.8	

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

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: EGPRS 1900

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

Band	f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch, 1850.2MHz									
GSM1900	3.700	-12.2	V	3.0	35.4	1.0	-46.6	-13.0	-33.6	
	5.551	-12.5	V	3.0	34.7	1.0	-46.2	-13.0	-33.2	
	7.401	-9.0	V	3.0	34.9	1.0	-42.9	-13.0	-29.9	
	3.700	-12.5	H	3.0	35.4	1.0	-46.9	-13.0	-33.9	
	5.551	-14.7	H	3.0	34.7	1.0	-48.4	-13.0	-35.4	
	7.401	-7.6	H	3.0	34.9	1.0	-41.5	-13.0	-28.5	
	Mid Ch, 1880.0MHz									
	3.760	-15.2	V	3.0	35.3	1.0	-49.5	-13.0	-36.5	
	5.640	-14.6	V	3.0	34.7	1.0	-48.3	-13.0	-35.3	
	7.520	-4.5	V	3.0	34.9	1.0	-38.4	-13.0	-25.4	
	3.760	-14.3	H	3.0	35.3	1.0	-48.6	-13.0	-35.6	
	5.640	-12.4	H	3.0	34.7	1.0	-46.2	-13.0	-33.2	
	7.520	-6.4	H	3.0	34.9	1.0	-40.4	-13.0	-27.4	
	High Ch, 1909.8MHz									
	3.820	-15.9	V	3.0	35.3	1.0	-50.2	-13.0	-37.2	
	5.729	-14.8	V	3.0	34.7	1.0	-48.5	-13.0	-35.5	
	7.639	-4.8	V	3.0	35.0	1.0	-38.8	-13.0	-25.8	
	3.820	-14.7	H	3.0	35.3	1.0	-49.0	-13.0	-36.0	
	5.729	-13.6	H	3.0	34.7	1.0	-47.4	-13.0	-34.4	
	7.639	-1.3	H	3.0	35.0	1.0	-35.2	-13.0	-22.2	

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

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: GPRS 1900

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

Band

GSM1900

GPRS

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3.700	-12.0	V	3.0	35.4	1.0	-46.4	-13.0	-33.4	
5.551	-13.4	V	3.0	34.7	1.0	-47.1	-13.0	-34.1	
7.401	-10.1	V	3.0	34.9	1.0	-44.0	-13.0	-31.0	
3.700	-12.1	H	3.0	35.4	1.0	-46.5	-13.0	-33.5	
5.551	-14.3	H	3.0	34.7	1.0	-48.0	-13.0	-35.0	
7.401	-7.4	H	3.0	34.9	1.0	-41.3	-13.0	-28.3	
Mid Ch, 1880.0MHz									
3.760	-15.1	V	3.0	35.3	1.0	-49.5	-13.0	-36.5	
5.640	-14.7	V	3.0	34.7	1.0	-48.5	-13.0	-35.5	
7.520	-5.2	V	3.0	34.9	1.0	-39.2	-13.0	-26.2	
3.760	-13.9	H	3.0	35.3	1.0	-48.2	-13.0	-35.2	
5.640	-12.2	H	3.0	34.7	1.0	-45.9	-13.0	-32.9	
7.520	-6.5	H	3.0	34.9	1.0	-40.4	-13.0	-27.4	
High Ch, 1909.8MHz									
3.820	-15.8	V	3.0	35.3	1.0	-50.1	-13.0	-37.1	
5.729	-14.6	V	3.0	34.7	1.0	-48.3	-13.0	-35.3	
7.639	-4.7	V	3.0	35.0	1.0	-38.7	-13.0	-25.7	
3.820	-14.7	H	3.0	35.3	1.0	-49.0	-13.0	-36.0	
5.729	-13.5	H	3.0	34.7	1.0	-47.2	-13.0	-34.2	
7.639	-1.2	H	3.0	35.0	1.0	-35.1	-13.0	-22.1	

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

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: REL99_B5

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

WCDMA B5 REL99

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1.653	-25.9	V	3.0	37.4	1.0	-62.3	-13.0	-49.3	
2.479	-22.1	V	3.0	36.4	1.0	-57.5	-13.0	-44.5	
3.306	-20.7	V	3.0	35.8	1.0	-55.5	-13.0	-42.5	
1.653	-23.0	H	3.0	37.4	1.0	-59.3	-13.0	-46.3	
2.479	-21.3	H	3.0	36.4	1.0	-56.7	-13.0	-43.7	
3.306	-19.7	H	3.0	35.8	1.0	-54.5	-13.0	-41.5	
Mid Ch, 836.6MHz									
1.673	-25.1	V	3.0	37.3	1.0	-61.5	-13.0	-48.5	
2.510	-20.7	V	3.0	36.4	1.0	-56.0	-13.0	-43.0	
3.346	-20.1	V	3.0	35.8	1.0	-54.9	-13.0	-41.9	
1.673	-23.0	H	3.0	37.3	1.0	-59.4	-13.0	-46.4	
2.510	-22.8	H	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3.346	-20.3	H	3.0	35.8	1.0	-55.1	-13.0	-42.1	
High Ch, 846.6MHz									
1.693	-24.8	V	3.0	37.3	1.0	-61.1	-13.0	-48.1	
2.540	-22.5	V	3.0	36.3	1.0	-57.9	-13.0	-44.9	
3.386	-20.5	V	3.0	35.7	1.0	-55.2	-13.0	-42.2	
1.693	-22.8	H	3.0	37.3	1.0	-59.1	-13.0	-46.1	
2.540	-23.9	H	3.0	36.3	1.0	-59.3	-13.0	-46.3	
3.386	-20.1	H	3.0	35.7	1.0	-54.9	-13.0	-41.9	

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

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: HSDPA_B5

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

WCDMA B5 HSDPA

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.4MHz									
1.653	-26.0	V	3.0	37.4	1.0	-62.4	-13.0	-49.4	
2.479	-21.8	V	3.0	36.4	1.0	-57.2	-13.0	-44.2	
3.306	-20.6	V	3.0	35.8	1.0	-55.4	-13.0	-42.4	
1.653	-23.6	H	3.0	37.4	1.0	-60.0	-13.0	-47.0	
2.479	-22.4	H	3.0	36.4	1.0	-57.8	-13.0	-44.8	
3.306	-19.3	H	3.0	35.8	1.0	-54.1	-13.0	-41.1	
Mid Ch, 836.6MHz									
1.673	-26.2	V	3.0	37.3	1.0	-62.6	-13.0	-49.6	
2.510	-20.8	V	3.0	36.4	1.0	-56.2	-13.0	-43.2	
3.346	-21.0	V	3.0	35.8	1.0	-55.8	-13.0	-42.8	
1.673	-23.1	H	3.0	37.3	1.0	-59.4	-13.0	-46.4	
2.510	-22.8	H	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3.346	-20.1	H	3.0	35.8	1.0	-54.9	-13.0	-41.9	
High Ch, 846.6MHz									
1.693	-26.2	V	3.0	37.3	1.0	-62.5	-13.0	-49.5	
2.540	-22.4	V	3.0	36.3	1.0	-57.7	-13.0	-44.7	
3.386	-20.5	V	3.0	35.7	1.0	-55.3	-13.0	-42.3	
1.693	-22.8	H	3.0	37.3	1.0	-59.1	-13.0	-46.1	
2.540	-24.2	H	3.0	36.3	1.0	-59.6	-13.0	-46.6	
3.386	-20.0	H	3.0	35.7	1.0	-54.7	-13.0	-41.7	

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

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WCDMA B2

REL99

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: Rel99_B2

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

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3.705	-2.5	V	3.0	35.4	1.0	-36.9	-13.0	-23.9	
5.557	-10.8	V	3.0	34.7	1.0	-44.5	-13.0	-31.5	
7.410	-13.4	V	3.0	34.9	1.0	-47.4	-13.0	-34.4	
3.705	-3.0	H	3.0	35.4	1.0	-37.4	-13.0	-24.4	
5.557	-12.3	H	3.0	34.7	1.0	-46.0	-13.0	-33.0	
7.410	-12.1	H	3.0	34.9	1.0	-46.1	-13.0	-33.1	
Mid Ch, 1880MHz									
3.760	-2.6	V	3.0	35.3	1.0	-36.9	-13.0	-23.9	
5.640	-14.3	V	3.0	34.7	1.0	-48.0	-13.0	-35.0	
7.520	-12.5	V	3.0	34.9	1.0	-46.5	-13.0	-33.5	
3.760	-1.2	H	3.0	35.3	1.0	-35.5	-13.0	-22.5	
5.640	-13.3	H	3.0	34.7	1.0	-47.1	-13.0	-34.1	
7.520	-12.1	H	3.0	34.9	1.0	-46.0	-13.0	-33.0	
High Ch, 1907.6MHz									
3.815	0.0	V	3.0	35.3	1.0	-34.3	-13.0	-21.3	
5.723	-12.5	V	3.0	34.7	1.0	-46.3	-13.0	-33.3	
7.630	-12.1	V	3.0	34.9	1.0	-46.1	-13.0	-33.1	
3.815	0.2	H	3.0	35.3	1.0	-34.1	-13.0	-21.1	
5.723	-12.1	H	3.0	34.7	1.0	-45.8	-13.0	-32.8	
7.630	-10.4	H	3.0	34.9	1.0	-44.3	-13.0	-31.3	

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

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WCDMA
B2

HSDPA

UL Verification Services
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: HSDPA_B2

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

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.4MHz									
3.705	-5.4	V	3.0	35.4	1.0	-39.8	-13.0	-26.8	
5.557	-13.3	V	3.0	34.7	1.0	-47.0	-13.0	-34.0	
7.410	-12.2	V	3.0	34.9	1.0	-46.1	-13.0	-33.1	
3.705	-4.2	H	3.0	35.4	1.0	-38.6	-13.0	-25.6	
5.557	-14.0	H	3.0	34.7	1.0	-47.7	-13.0	-34.7	
7.410	-11.4	H	3.0	34.9	1.0	-45.3	-13.0	-32.3	
Mid Ch, 1880MHz									
3.760	-5.2	V	3.0	35.3	1.0	-39.5	-13.0	-26.5	
5.640	-13.7	V	3.0	34.7	1.0	-47.5	-13.0	-34.5	
7.520	-12.9	V	3.0	34.9	1.0	-46.9	-13.0	-33.9	
3.760	-4.9	H	3.0	35.3	1.0	-39.3	-13.0	-26.3	
5.640	-14.3	H	3.0	34.7	1.0	-48.0	-13.0	-35.0	
7.520	-11.6	H	3.0	34.9	1.0	-45.6	-13.0	-32.6	
High Ch, 1907.6MHz									
3.815	-5.3	V	3.0	35.3	1.0	-39.6	-13.0	-26.6	
5.723	-13.1	V	3.0	34.7	1.0	-46.8	-13.0	-33.8	
7.630	-10.7	V	3.0	34.9	1.0	-44.7	-13.0	-31.7	
3.815	-2.0	H	3.0	35.3	1.0	-36.3	-13.0	-23.3	
5.723	-13.7	H	3.0	34.7	1.0	-47.4	-13.0	-34.4	
7.630	-9.5	H	3.0	34.9	1.0	-43.4	-13.0	-30.4	

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

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

Company: Samsung
Project #: 15I19901
Date: 2/2/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger/ HS
Mode: LTE5 1.4MHz QPSK

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

LTE 5

1.4MHz

QPSK

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
1.649	-27.5	V	3.0	37.4	1.0	-63.9	-13.0	-50.9	
2.474	-23.2	V	3.0	36.4	1.0	-58.6	-13.0	-45.6	
3.299	-20.6	V	3.0	35.8	1.0	-55.4	-13.0	-42.4	
1.649	-28.0	H	3.0	37.4	1.0	-64.4	-13.0	-51.4	
2.474	-23.5	H	3.0	36.4	1.0	-58.9	-13.0	-45.9	
3.299	-21.6	H	3.0	35.8	1.0	-56.4	-13.0	-43.4	
Mid Ch, 836.5MHz									
1.673	-27.5	V	3.0	37.3	1.0	-63.9	-13.0	-50.9	
2.510	-22.8	V	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3.346	-21.8	V	3.0	35.8	1.0	-56.5	-13.0	-43.5	
1.673	-26.9	H	3.0	37.3	1.0	-63.3	-13.0	-50.3	
2.510	-24.9	H	3.0	36.4	1.0	-60.3	-13.0	-47.3	
3.346	-21.4	H	3.0	35.8	1.0	-56.1	-13.0	-43.1	
High Ch, 848.3MHz									
1.697	-26.9	V	3.0	37.3	1.0	-63.2	-13.0	-50.2	
2.545	-23.3	V	3.0	36.3	1.0	-58.6	-13.0	-45.6	
3.393	-21.5	V	3.0	35.7	1.0	-56.2	-13.0	-43.2	
1.697	-28.2	H	3.0	37.3	1.0	-64.5	-13.0	-51.5	
2.545	-24.4	H	3.0	36.3	1.0	-59.7	-13.0	-46.7	
3.393	-21.1	H	3.0	35.7	1.0	-55.8	-13.0	-42.8	

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

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

Company: Samsung
Project #: 15I19901
Date: 2/2/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger/ HS
Mode: LTE5 1.4MHz 16QAM

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

LTE 5

1.4MHz

16QAM

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7MHz									
1.649	-27.7	V	3.0	37.4	1.0	-64.1	-13.0	-51.1	
2.474	-23.5	V	3.0	36.4	1.0	-58.9	-13.0	-45.9	
3.299	-20.9	V	3.0	35.8	1.0	-55.7	-13.0	-42.7	
1.649	-27.7	H	3.0	37.4	1.0	-64.1	-13.0	-51.1	
2.474	-23.7	H	3.0	36.4	1.0	-59.1	-13.0	-46.1	
3.299	-21.7	H	3.0	35.8	1.0	-56.5	-13.0	-43.5	
Mid Ch, 836.5MHz									
1.673	-27.5	V	3.0	37.3	1.0	-63.8	-13.0	-50.8	
2.510	-22.8	V	3.0	36.4	1.0	-58.1	-13.0	-45.1	
3.346	-21.9	V	3.0	35.8	1.0	-56.6	-13.0	-43.6	
1.673	-26.8	H	3.0	37.3	1.0	-63.1	-13.0	-50.1	
2.510	-25.1	H	3.0	36.4	1.0	-60.5	-13.0	-47.5	
3.346	-21.1	H	3.0	35.8	1.0	-55.8	-13.0	-42.8	
High Ch, 848.3MHz									
1.697	-26.8	V	3.0	37.3	1.0	-63.1	-13.0	-50.1	
2.545	-23.0	V	3.0	36.3	1.0	-58.4	-13.0	-45.4	
3.393	-21.8	V	3.0	35.7	1.0	-56.5	-13.0	-43.5	
1.697	-28.9	H	3.0	37.3	1.0	-65.2	-13.0	-52.2	
2.545	-24.5	H	3.0	36.3	1.0	-59.8	-13.0	-46.8	
3.393	-21.3	H	3.0	35.7	1.0	-56.0	-13.0	-43.0	

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

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LTE 5

3MHz

QPSK

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: LTE5 3MHz QPSK

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

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 825.5MHz									
1.651	-23.2	V	3.0	37.4	1.0	-59.6	-13.0	-46.6	
2.477	-21.9	V	3.0	36.4	1.0	-57.3	-13.0	-44.3	
3.302	-20.6	V	3.0	35.8	1.0	-55.4	-13.0	-42.4	
1.651	-25.3	H	3.0	37.4	1.0	-61.7	-13.0	-48.7	
2.477	-24.5	H	3.0	36.4	1.0	-59.9	-13.0	-46.9	
3.302	-20.9	H	3.0	35.8	1.0	-55.7	-13.0	-42.7	
Mid Ch, 836.5MHz									
1.673	-19.9	V	3.0	37.3	1.0	-56.3	-13.0	-43.3	
2.510	-14.4	V	3.0	36.4	1.0	-49.8	-13.0	-36.8	
3.346	-20.3	V	3.0	35.8	1.0	-55.0	-13.0	-42.0	
1.673	-23.3	H	3.0	37.3	1.0	-59.6	-13.0	-46.6	
2.510	-23.5	H	3.0	36.4	1.0	-58.9	-13.0	-45.9	
3.346	-20.3	H	3.0	35.8	1.0	-55.0	-13.0	-42.0	
High Ch, 847.5MHz									
1.695	-27.0	V	3.0	37.3	1.0	-63.3	-13.0	-50.3	
2.543	-21.6	V	3.0	36.3	1.0	-57.0	-13.0	-44.0	
3.390	-20.1	V	3.0	35.7	1.0	-54.8	-13.0	-41.8	
1.695	-26.2	H	3.0	37.3	1.0	-62.5	-13.0	-49.5	
2.543	-23.7	H	3.0	36.3	1.0	-59.0	-13.0	-46.0	
3.390	-20.3	H	3.0	35.7	1.0	-55.0	-13.0	-42.0	

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

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LTE 5

3MHz

16QAM

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

Company: Samsung
Project #: 15I19901
Date: 1/31/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: LTE5 3MHz 16QAM

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

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 825.5MHz									
1.651	-23.9	V	3.0	37.4	1.0	-60.2	-13.0	-47.2	
2.477	-22.0	V	3.0	36.4	1.0	-57.4	-13.0	-44.4	
3.302	-20.3	V	3.0	35.8	1.0	-55.1	-13.0	-42.1	
1.651	-26.0	H	3.0	37.4	1.0	-62.4	-13.0	-49.4	
2.477	-24.4	H	3.0	36.4	1.0	-59.8	-13.0	-46.8	
3.302	-20.4	H	3.0	35.8	1.0	-55.2	-13.0	-42.2	
Mid Ch, 836.5MHz									
1.673	-20.3	V	3.0	37.3	1.0	-56.7	-13.0	-43.7	
2.510	-14.3	V	3.0	36.4	1.0	-49.6	-13.0	-36.6	
3.346	-20.4	V	3.0	35.8	1.0	-55.2	-13.0	-42.2	
1.673	-23.9	H	3.0	37.3	1.0	-60.2	-13.0	-47.2	
2.510	-24.0	H	3.0	36.4	1.0	-59.4	-13.0	-46.4	
3.346	-20.3	H	3.0	35.8	1.0	-55.1	-13.0	-42.1	
High Ch, 847.5MHz									
1.695	-27.0	V	3.0	37.3	1.0	-63.3	-13.0	-50.3	
2.543	-21.7	V	3.0	36.3	1.0	-57.1	-13.0	-44.1	
3.390	-20.5	V	3.0	35.7	1.0	-55.2	-13.0	-42.2	
1.695	-26.0	H	3.0	37.3	1.0	-62.3	-13.0	-49.3	
2.543	-23.8	H	3.0	36.3	1.0	-59.1	-13.0	-46.1	
3.390	-20.5	H	3.0	35.7	1.0	-55.2	-13.0	-42.2	

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

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
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UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Samsung
Project #: 15I19901
Date: 2/2/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: LTE5 5MHz QPSK

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

LTE 5

5MHz

QPSK

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5MHz									
1.653	-28.0	V	3.0	37.4	1.0	-64.4	-13.0	-51.4	
2.480	-21.9	V	3.0	36.4	1.0	-57.3	-13.0	-44.3	
3.306	-21.4	V	3.0	35.8	1.0	-56.2	-13.0	-43.2	
1.653	-27.7	H	3.0	37.4	1.0	-64.1	-13.0	-51.1	
2.480	-24.2	H	3.0	36.4	1.0	-59.6	-13.0	-46.6	
3.306	-21.9	H	3.0	35.8	1.0	-56.7	-13.0	-43.7	
Mid Ch, 836.5MHz									
1.673	-27.4	V	3.0	37.3	1.0	-63.7	-13.0	-50.7	
2.510	-22.2	V	3.0	36.4	1.0	-57.6	-13.0	-44.6	
3.346	-21.0	V	3.0	35.8	1.0	-55.7	-13.0	-42.7	
1.673	-27.8	H	3.0	37.3	1.0	-64.1	-13.0	-51.1	
2.510	-24.3	H	3.0	36.4	1.0	-59.7	-13.0	-46.7	
3.346	-21.7	H	3.0	35.8	1.0	-56.4	-13.0	-43.4	
High Ch, 846.5MHz									
1.693	-28.0	V	3.0	37.3	1.0	-64.3	-13.0	-51.3	
2.540	-22.4	V	3.0	36.3	1.0	-57.7	-13.0	-44.7	
3.386	-21.4	V	3.0	35.7	1.0	-56.1	-13.0	-43.1	
1.693	-27.8	H	3.0	37.3	1.0	-64.1	-13.0	-51.1	
2.540	-24.3	H	3.0	36.3	1.0	-59.7	-13.0	-46.7	
3.386	-21.5	H	3.0	35.7	1.0	-56.2	-13.0	-43.2	

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

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Company: Samsung
Project #: 15I19901
Date: 2/2/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: LTE5 5MHz 16QAM

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

LTE 5

5MHz

16QAM

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5MHz									
1.653	-27.6	V	3.0	37.4	1.0	-63.9	-13.0	-50.9	
2.480	-21.3	V	3.0	36.4	1.0	-56.7	-13.0	-43.7	
3.306	-22.0	V	3.0	35.8	1.0	-56.7	-13.0	-43.7	
1.653	-28.0	H	3.0	37.4	1.0	-64.4	-13.0	-51.4	
2.480	-24.5	H	3.0	36.4	1.0	-59.9	-13.0	-46.9	
3.306	-21.7	H	3.0	35.8	1.0	-56.5	-13.0	-43.5	
Mid Ch, 836.5MHz									
1.673	-28.1	V	3.0	37.3	1.0	-64.4	-13.0	-51.4	
2.510	-23.9	V	3.0	36.4	1.0	-59.2	-13.0	-46.2	
3.346	-20.9	V	3.0	35.8	1.0	-55.7	-13.0	-42.7	
1.673	-28.0	H	3.0	37.3	1.0	-64.3	-13.0	-51.3	
2.510	-25.1	H	3.0	36.4	1.0	-60.5	-13.0	-47.5	
3.346	-21.1	H	3.0	35.8	1.0	-55.8	-13.0	-42.8	
High Ch, 846.5MHz									
1.693	-28.4	V	3.0	37.3	1.0	-64.7	-13.0	-51.7	
2.540	-22.7	V	3.0	36.3	1.0	-58.0	-13.0	-45.0	
3.386	-21.5	V	3.0	35.7	1.0	-56.2	-13.0	-43.2	
1.693	-28.0	H	3.0	37.3	1.0	-64.3	-13.0	-51.3	
2.540	-24.8	H	3.0	36.3	1.0	-60.1	-13.0	-47.1	
3.386	-21.2	H	3.0	35.7	1.0	-55.9	-13.0	-42.9	

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

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

Company: Samsung
Project #: 15I19901
Date: 2/2/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: LTE5 10MHz QPSK

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

LTE 5

10MHz

QPSK

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 829MHz									
1.658	-27.4	V	3.0	37.4	1.0	-63.7	-13.0	-50.7	
2.487	-21.8	V	3.0	36.4	1.0	-57.1	-13.0	-44.1	
3.316	-21.5	V	3.0	35.8	1.0	-56.3	-13.0	-43.3	
1.658	-28.2	H	3.0	37.4	1.0	-64.5	-13.0	-51.5	
2.487	-24.2	H	3.0	36.4	1.0	-59.6	-13.0	-46.6	
3.316	-21.8	H	3.0	35.8	1.0	-56.6	-13.0	-43.6	
Mid Ch, 836.5MHz									
1.673	-28.5	V	3.0	37.3	1.0	-64.9	-13.0	-51.9	
2.510	-23.9	V	3.0	36.4	1.0	-59.3	-13.0	-46.3	
3.346	-20.8	V	3.0	35.8	1.0	-55.5	-13.0	-42.5	
1.673	-27.7	H	3.0	37.3	1.0	-64.0	-13.0	-51.0	
2.510	-25.8	H	3.0	36.4	1.0	-61.1	-13.0	-48.1	
3.346	-21.3	H	3.0	35.8	1.0	-56.0	-13.0	-43.0	
High Ch, 844MHz									
1.688	-28.1	V	3.0	37.3	1.0	-64.4	-13.0	-51.4	
2.532	-22.7	V	3.0	36.3	1.0	-58.0	-13.0	-45.0	
3.376	-21.8	V	3.0	35.7	1.0	-56.5	-13.0	-43.5	
1.688	-28.4	H	3.0	37.3	1.0	-64.7	-13.0	-51.7	
2.532	-25.0	H	3.0	36.3	1.0	-60.3	-13.0	-47.3	
3.376	-21.1	H	3.0	35.7	1.0	-55.8	-13.0	-42.8	

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

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Company: Samsung
Project #: 15I19901
Date: 2/2/2015
Test Engineer: R. Alegre
Configuration: EUT w/ AC Charger + HS
Mode: LTE5 10MHz 16QAM

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

LTE 5

10MHz

16QAM

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 829MHz									
1.658	-27.7	V	3.0	37.4	1.0	-64.0	-13.0	-51.0	
2.487	-21.8	V	3.0	36.4	1.0	-57.2	-13.0	-44.2	
3.316	-21.2	V	3.0	35.8	1.0	-56.0	-13.0	-43.0	
1.658	-28.2	H	3.0	37.4	1.0	-64.6	-13.0	-51.6	
2.487	-25.0	H	3.0	36.4	1.0	-60.4	-13.0	-47.4	
3.316	-22.2	H	3.0	35.8	1.0	-56.9	-13.0	-43.9	
Mid Ch, 836.5MHz									
1.673	-28.5	V	3.0	37.3	1.0	-64.8	-13.0	-51.8	
2.510	-23.6	V	3.0	36.4	1.0	-58.9	-13.0	-45.9	
3.346	-20.8	V	3.0	35.8	1.0	-55.6	-13.0	-42.6	
1.673	-28.6	H	3.0	37.3	1.0	-65.0	-13.0	-52.0	
2.510	-24.9	H	3.0	36.4	1.0	-60.3	-13.0	-47.3	
3.346	-20.7	H	3.0	35.8	1.0	-55.4	-13.0	-42.4	
High Ch, 844MHz									
1.688	-28.6	V	3.0	37.3	1.0	-64.9	-13.0	-51.9	
2.532	-22.7	V	3.0	36.3	1.0	-58.0	-13.0	-45.0	
3.376	-22.0	V	3.0	35.7	1.0	-56.7	-13.0	-43.7	
1.688	-28.4	H	3.0	37.3	1.0	-64.7	-13.0	-51.7	
2.532	-25.1	H	3.0	36.3	1.0	-60.4	-13.0	-47.4	
3.376	-21.5	H	3.0	35.7	1.0	-56.3	-13.0	-43.3	

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

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