



**CC CFR47 PART 22 SUBPART H
FCC CFR47 PART 24 SUBPART E
CERTIFICATION TEST REPORT**

FOR

**GT-S5310E~802.11 bgn 1x1+ BT4.0 +basic rates + HS + GSM 850/1900MHz +
WCDMA 1900MHz Bar phone**

MODEL NUMBER: GT-S5310E

FCC ID: A3LGTS5310E

REPORT NUMBER: 13I15088 – 2, Revision C

ISSUE DATE: MAY 30, 2013

Prepared for

**SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
	5/15/2013	Initial Copy	P. Kim
A	5/23/13	Updated label in Table 7.	P. Kim
B	5/28/13	Updated with correct Antenna gain information from Samsung	P. Kim
C	5/30/13	Updated linear maximum output power value	P. Kim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

EUT DESCRIPTION: GT-S5310E~802.11 bgn 1x1+ BT4.0 +basic rates + HS + GSM
850/1900MHz + WCDMA 1900MHz Bar phone

MODEL: GT-S5310E

SERIAL NUMBER: FK-122A

DATE TESTED: MAY 7 ~ 14, 2013

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

UL CCS 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS 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.

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WISE LAB TECHNICIAN
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 2, FCC CFR 47 Part 22, and FCC CFR Part 24.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

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:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a bar phone that supports 802.11 bgn 1x1+ BT4.0 +basic rates + HS + GSM 850/1900MHz + WCDMA 1900MHz

5.2. MAXIMUM OUTPUT POWER

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

Frequency range (MHz)	Modulation	Conducted		ERP	
		dBm	mW	dBm	mW
824.2 - 848.8	GPRS	32.25	1678.0	27.17	521.2
1850.2 - 1909.8	GPRS	29.93	871.0	23.53	225.4

Part 22/24					
Frequency range (MHz)	Modulation	Conducted		ERP/EIRP	
		dBm	mW	dBm	mW
1852.4 - 1907.6	REL 99	25.70	371.5	22.53	179.1

Part 22/24					
Frequency range (MHz)	Modulation	Conducted		ERP/EIRP	
		dBm	mW	dBm	mW
1852.4 - 1907.6	HSDPA	26.74	472.1	23.46	221.8

5.3. SOFTWARE AND FIRMWARE

The EUT is linked with Agilent 8960 Communication Test Set.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an integral antenna with a maximum peak gain as follow:

Frequency (MHz)	Gain (dBi)
GSM 850MHz	-5.38
GSM 1900MHz	-7.02
WCDMA 1900MHz	-5.57

5.5. WORST-CASE CONFIGURATION AND MODE

Based on the investigation results, the highest peak power and enhanced data rate is the worst-case scenario for all measurements.

Worst-case modes: GPRS, UMTS WCDMA and UMTS HSDPA Sub-test 4

Since the EUT is a portable device, to determine the worst/highest emissions, the X, Y, and Z orientations of the EUT with respect to the turntable and the worst among them with headset and an AC adapter were investigated. After the investigations, X-Orientation without AC adapter and headset was the worst case for GPRS bands, and Y-Orientation for WCDMA bands.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Samsung	ETA0U10EBE	DK2C313TS	NA
Headset	Samsung	NA	NA	NA

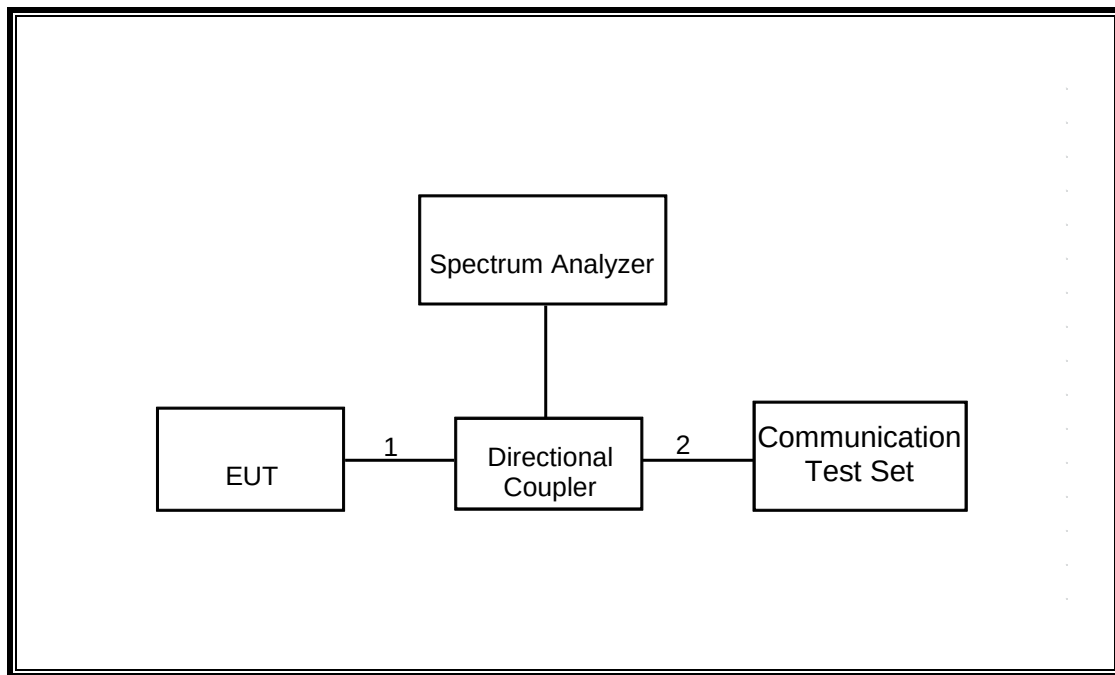
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	DC	Un-shielded	1m	NA
2	Jack	1	Earphone	Un-shielded	1.2m	NA

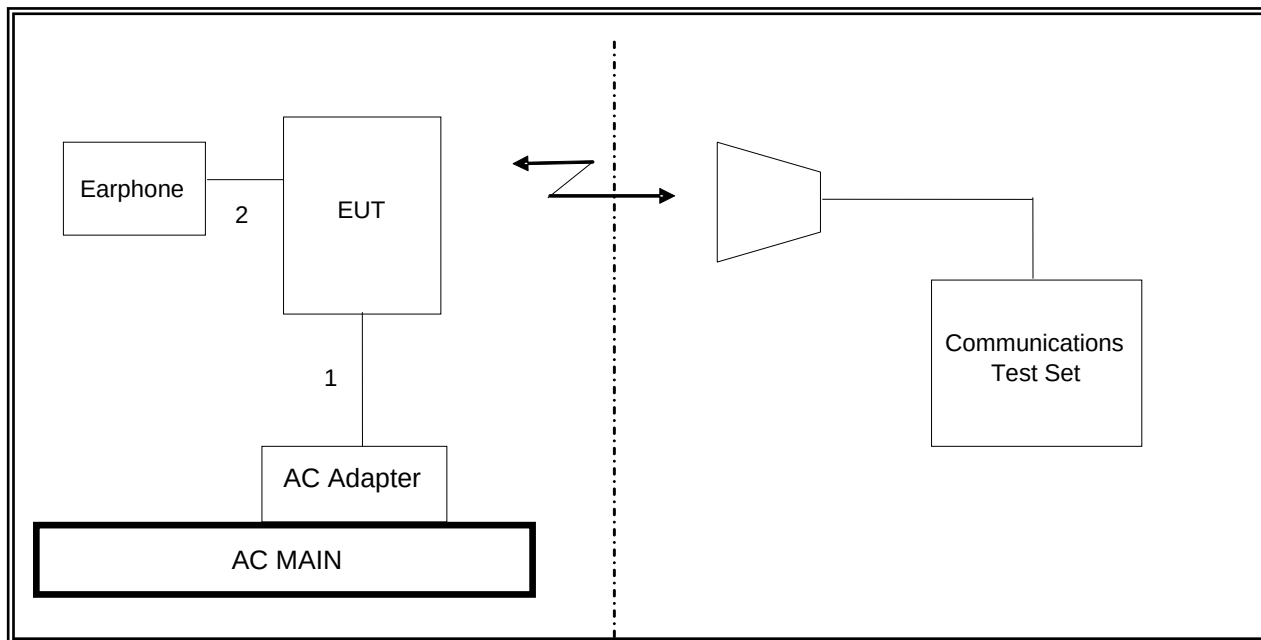
TEST SETUP

The EUT is a stand-alone device. A link is established between the EUT and the communications test set.

SETUP DIAGRAM FOR RF CONDUCTED TESTS



SETUP DIAGRAM FOR RF RADIATED TESTS



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
Antenna, Horn, 18 GHz	EMCO	3115	C00872	10/25/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	12/11/13
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	04/10/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/22/13
Communication Test Set	Agilent / HP	E5515C	C01086	06/20/13
Communication Test Set	Anritsu	MT8820C	1100481	07/13/13
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02689	CNR
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02687	CNR
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01016	08/14/13
Vector signal generator, 6 GHz	Agilent / HP	E4438C	None	07/06/13

7. RF POWER OUTPUT VERIFICATION

7.1. GSM

TEST PROCEDURE

The transmitter output was connected to the input terminal of Directional Coupler via calibrated coaxial cable. The output coupling terminal of the Directional Coupler was directly connected to a spectrum analyzer while the output through terminal connected to the communication test set via calibrated coaxial cable.

The output power was measured with the spectrum analyzer at the low, middle and high channel in each band.

- Set the spectrum analyzer span wide enough or greater than the modulated signal BW.
- Set a spectrum analyzer at peak detection mode with VBW $\geq$ RBW. $\geq$ 26dB BW, typically 3MHz.
- Set a marker to point the corresponding peak value.

PROCEDURE USED TO ESTABLISH TEST SIGNAL

GPRS/EGPRS

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

> 27 dBm for EGPRS 850/900

> 30 dBm for GPRS1800/1900

> 26 dBm for EGPRS1800/1900

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 > CS1 (GPRS) and MCS5 (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

RESULTS

GSM

	Ch.	f (MHz)	1 time slots	
			Peak	Avg
GSM	128	824.2	32.248	32.15
	190	836.6	32.25	32.17
	251	848.8	32.158	32.12

	Ch.	f (MHz)	1 time slots	
			Peak	Avg
GSM	512	1850.2	29.911	29.57
	661	1880.0	29.781	29.52
	810	1909.8	29.616	29.43

GPRS

	Ch.	f (MHz)	1 time slots		2 time slots		3 time slots		4 time slots	
			Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg
GPRS	128	824.2	32.246	32.14	29.805	29.71	27.813	27.74	25.863	25.76
	190	836.6	32.256	32.17	29.807	29.72	27.817	27.75	25.847	25.79
	251	848.8	32.177	32.11	29.682	29.62	27.669	27.62	25.721	25.69

	Ch.	f (MHz)	1 time slots		2 time slots		3 time slots		4 time slots	
			Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg
GPRS	512	1850.2	29.929	29.57	27.625	27.26	25.593	25.21	23.529	23.15
	661	1880.0	29.757	29.52	27.38	27.15	25.376	25.08	23.311	23.01
	810	1909.8	29.623	29.44	27.401	27.23	25.372	25.18	23.316	23.13

7.2. UMTS MODE

TEST PROCEDURE

The transmitter output was connected to the input terminal of Directional Coupler via calibrated coaxial cable. The output coupling terminal of the Directional Coupler was directly connected to a spectrum analyzer while the output through terminal connected to the communication test set via calibrated coaxial cable.

The output power was measured with the spectrum analyzer at the low, middle and high channel in each band.

- Set the spectrum analyzer span wide enough or greater than the modulated signal BW.
- Set a spectrum analyzer at peak detection mode with VBW $\geq$ RBW. $\geq$ 26dB BW, typically 5MHz.
- Set a marker to point the corresponding peak value.

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
	β_c	Not Applicable
	β_d	Not Applicable
	β_{ec}	Not Applicable
	β_c/β_d	8/15
	β_{hs}	Not Applicable
	β_{ed}	Not Applicable

RESULTS

UMTS REL99

Band	UL Ch	DL Ch	Frequency	Peak Conducted output power (dBm)	Avg Conducted output power (dBm)
UMTS 1900	9262	9662	1852.4	25.700	22.57
	9400	9800	1880.0	25.189	21.91
	9538	9938	1907.6	25.184	22.06

7.3. HSDPA REL 5

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121.

Summary of 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			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	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 = β_{hs}/β_c	30/15			

Result

Band	UL Ch	DL Ch	Frequency	Peak Conducted output power (dBm)	Avg Conducted output power (dBm)
UMTS 1900	9262	9662	1852.4	25.700	22.57
	9400	9800	1880.0	25.189	21.91
	9538	9938	1907.6	25.184	22.06

Note 1: Maximum output power levels that are possible for all subtests reported.

7.4. HSPA REL 6 (HSDPA & HSUPA)

TEST PROCEDURE

The following summary of these settings are illustrated below:

	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				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	6/15	15/9	2/15	-
	β_{hs}	22/15	12/15	30/15	4/15	5/15
HSDPA Specific Settings	β_{ed}	1309/225	94/75	47/15	56/75	47/15
	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				
HSUPA Specific Settings	$A_{hs} = \beta_{hs}/\beta_c$	30/15				
	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	12
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	67
	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	

RESULTS

Band	Subtest	UL Ch	DL Ch	Frequency	Peak Conducted output power (dBm)	Avg Conducted output power (dBm)
UMTS1900 (Band II)	1	9262	9662	1852.4	25.70	21.04
		9400	9800	1880.0	25.36	20.54
		9538	9938	1907.6	25.36	20.58
	2	9262	9662	1852.4	26.50	20.46
		9400	9800	1880.0	26.23	19.67
		9538	9938	1907.6	26.34	19.88
	3	9262	9662	1852.4	26.43	21.32
		9400	9800	1880.0	26.40	20.63
		9538	9938	1907.6	26.29	20.56
	4	9262	9662	1852.4	26.19	20.60
		9400	9800	1880.0	25.59	19.78
		9538	9938	1907.6	25.92	20.07
	5	9262	9662	1852.4	25.93	21.37
		9400	9800	1880.0	25.34	20.60
		9538	9938	1907.6	25.47	20.86

Note 1: Maximum output power levels that are possible for all subtests reported.

8. CONDUCTED TEST RESULTS

8.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

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

MODES TESTED

- GPRS
- UMTS REL 99, and HSDPA

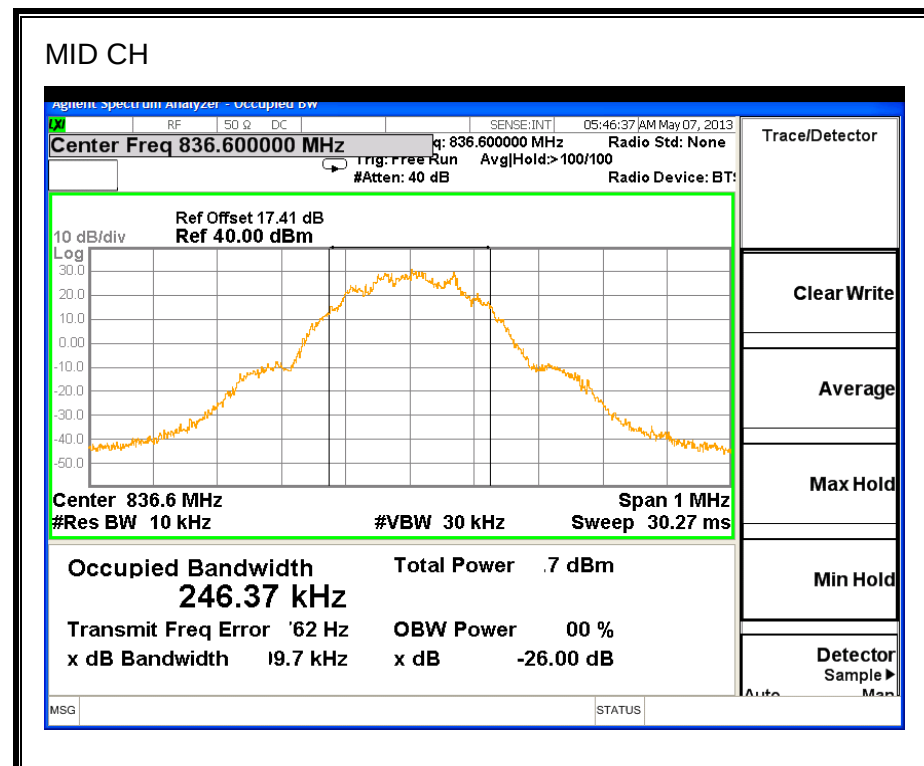
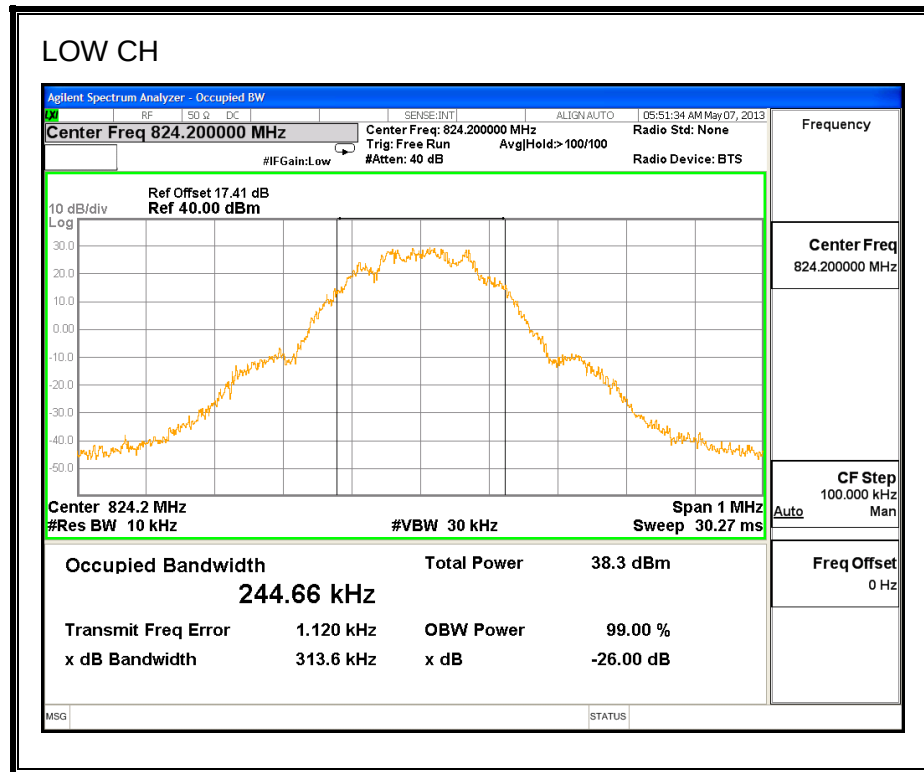
RESULTS

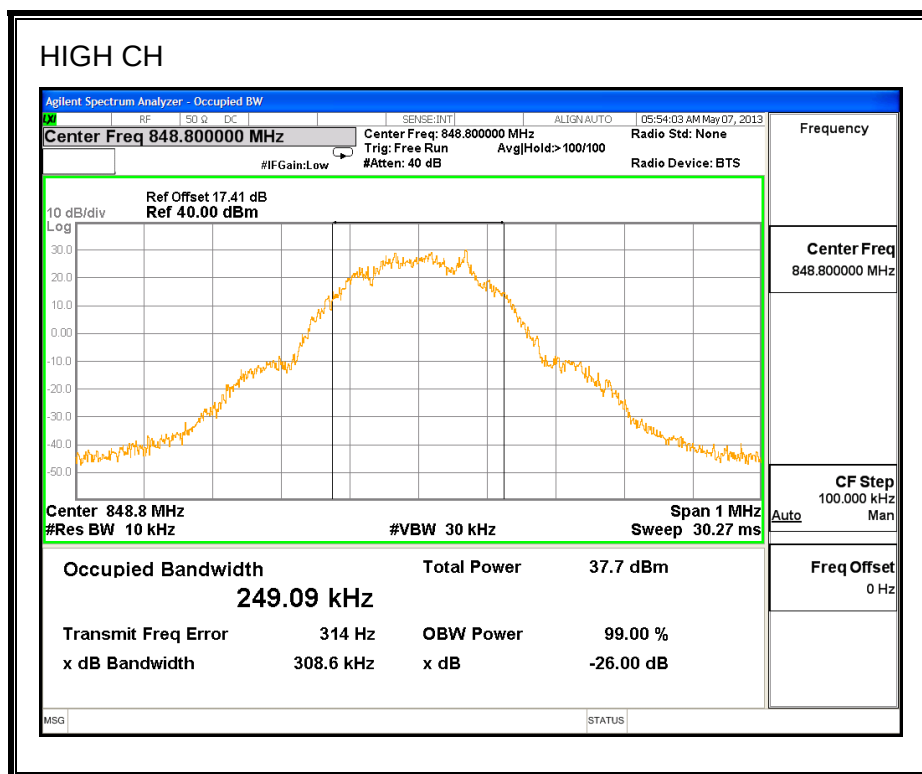
Band	Mode	Channel	f (MHz)	99% BW (kHz)	-26dB BW (kHz)
Cellular	GPRS	128	824.20	244.66	313.6
		190	836.60	246.37	309.7
		251	848.80	249.09	308.6
PCS		512	1850.2	249.90	312.4
		661	1880.0	247.05	310.0
		810	1909.8	246.02	310.2

Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
REL 99	PCS	9662	1852.4	4.1531	4.651
		9880	1880.0	4.1416	4.702
		9938	1907.6	4.1787	4.662
HSDPA	PCS	9662	1852.4	4.1837	4.674
		9880	1880.0	4.1815	4.672
		9938	1907.6	4.1856	4.666

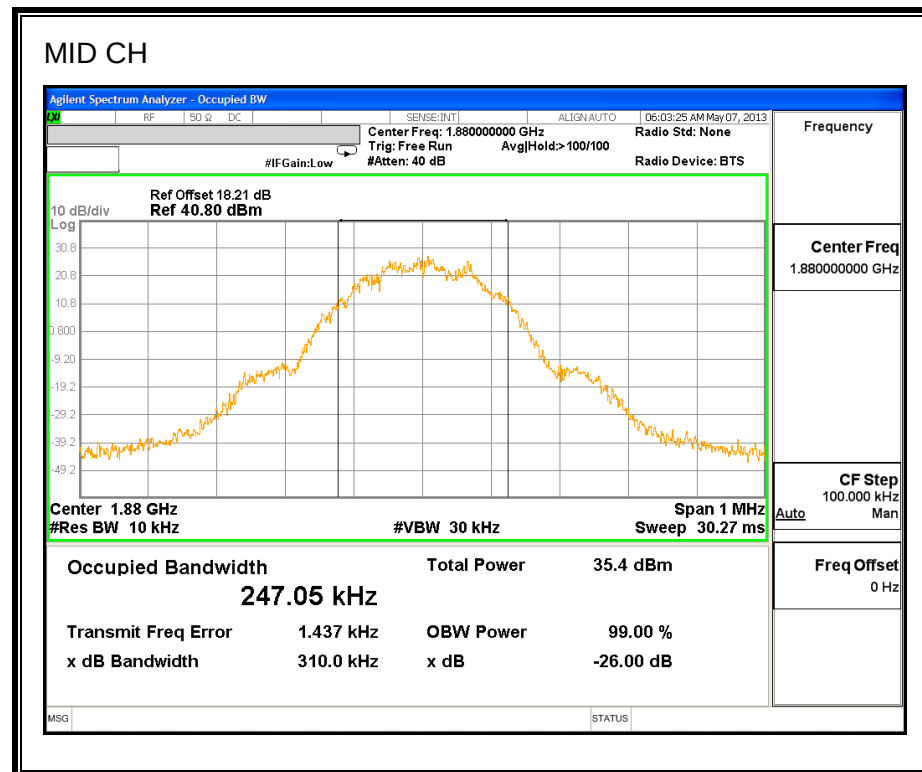
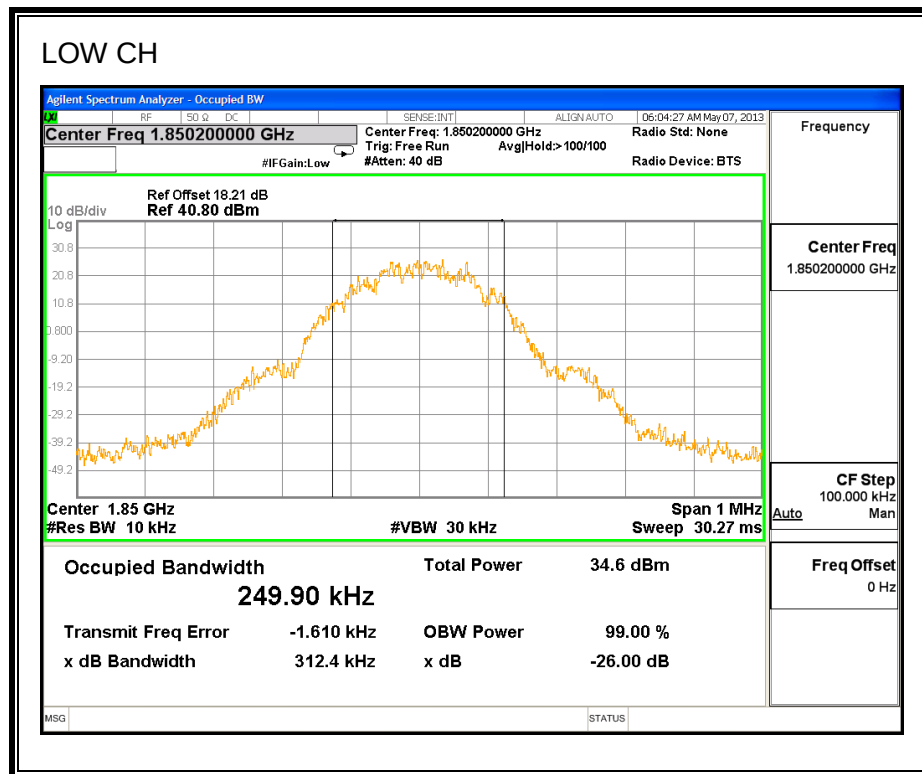
8.1.1. GPRS MODE

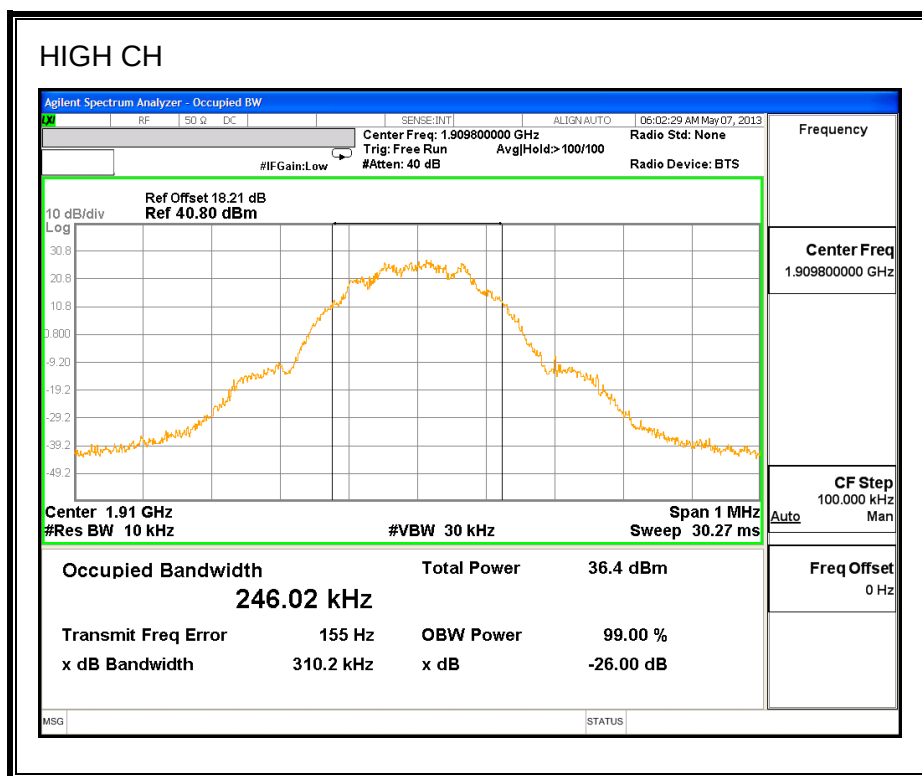
CELL BAND





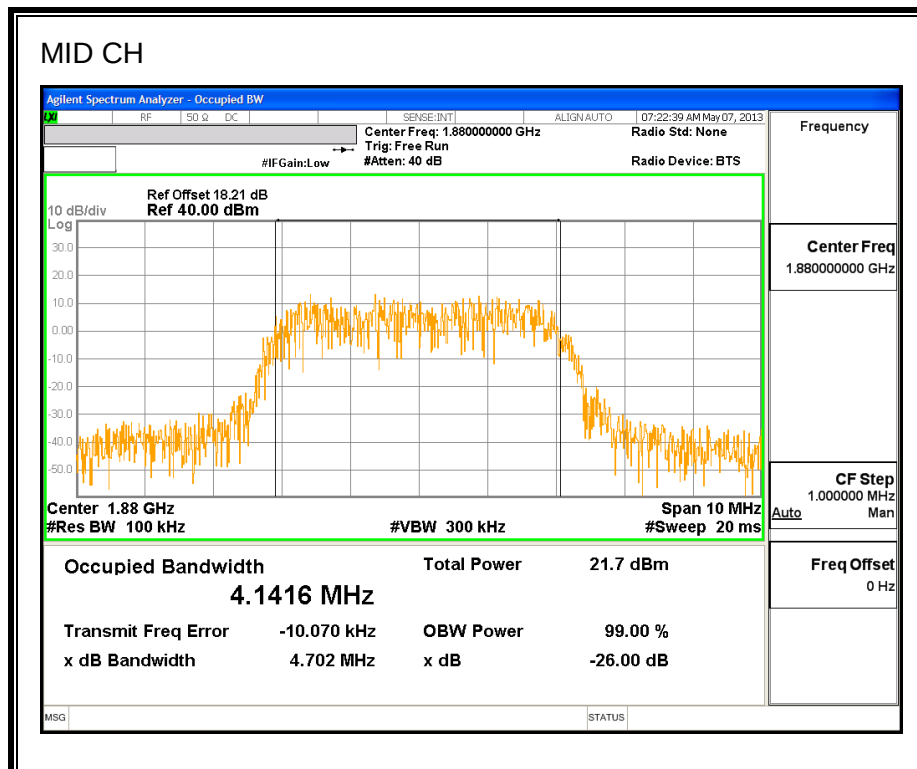
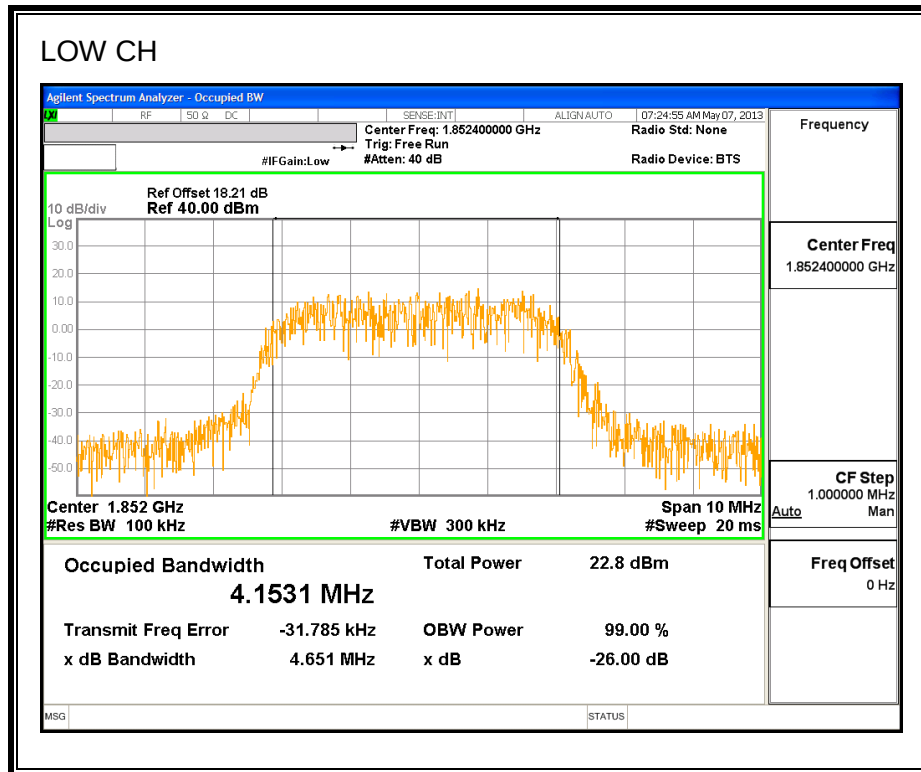
PCS Band

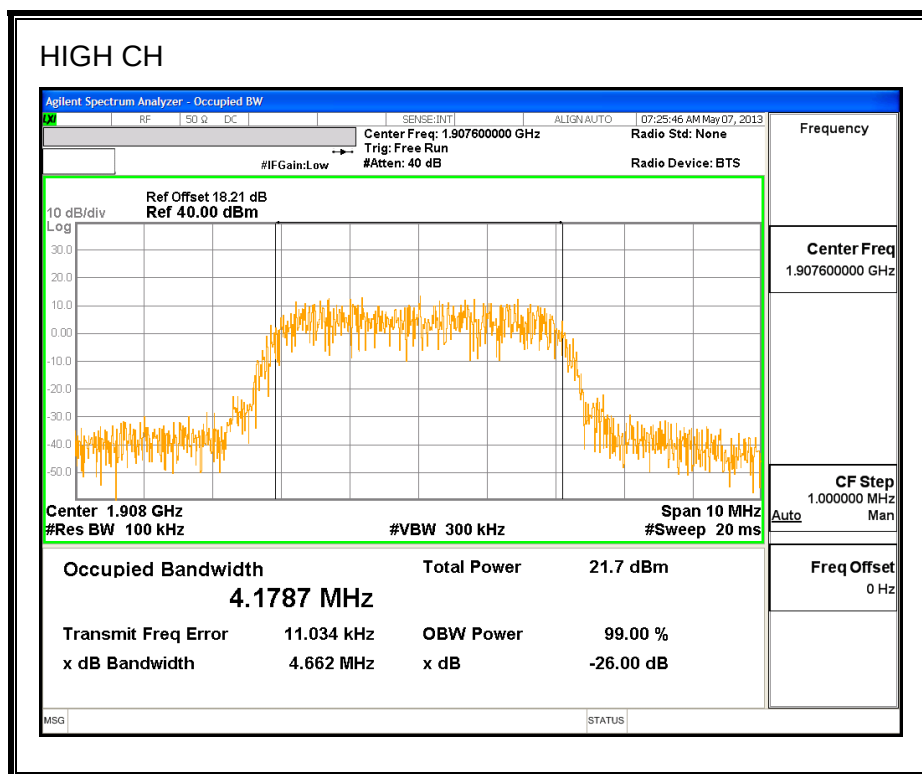


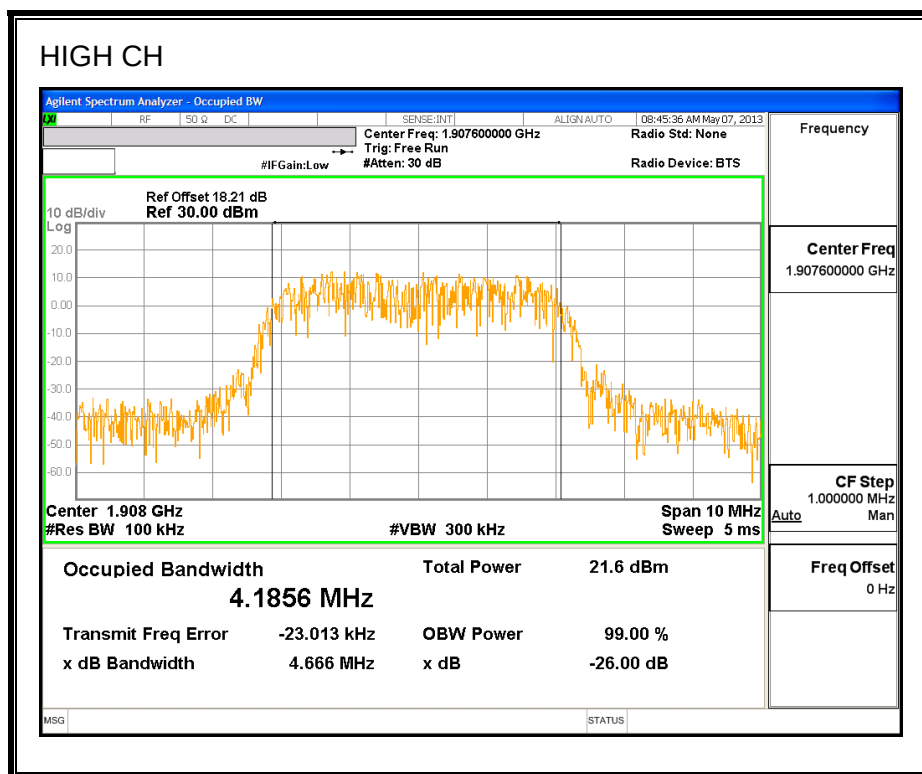


8.1.2. UMTS REL 99 MODE

PCS BAND







8.2. BAND EDGE

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

The transmitter output was connected to a Agilent 8960 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.

For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency (824, 848, 1850, 1910MHz)
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

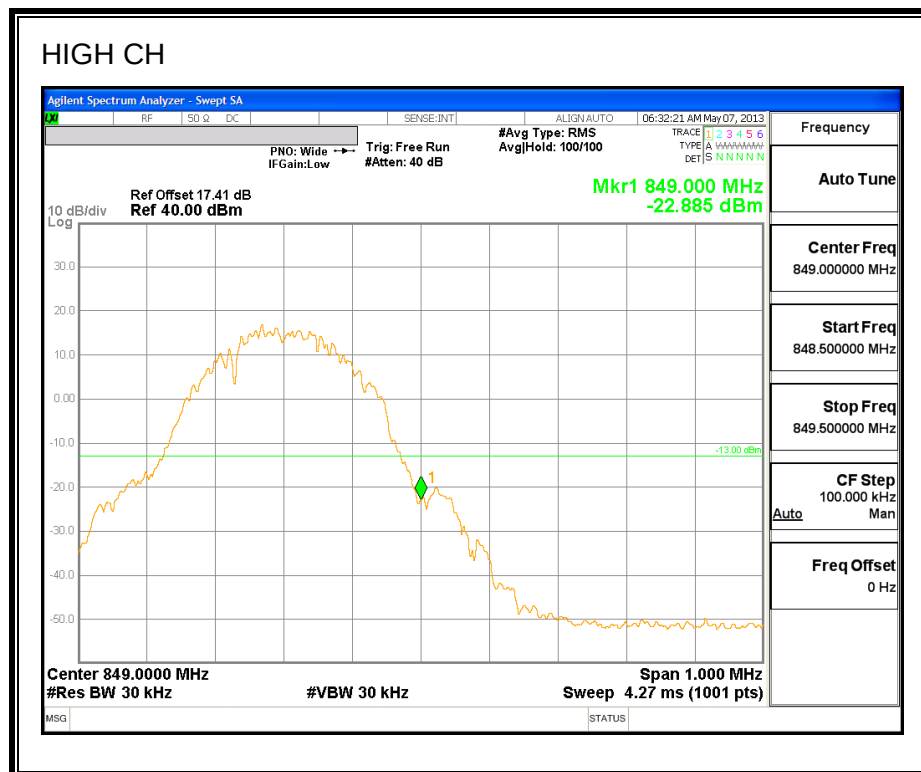
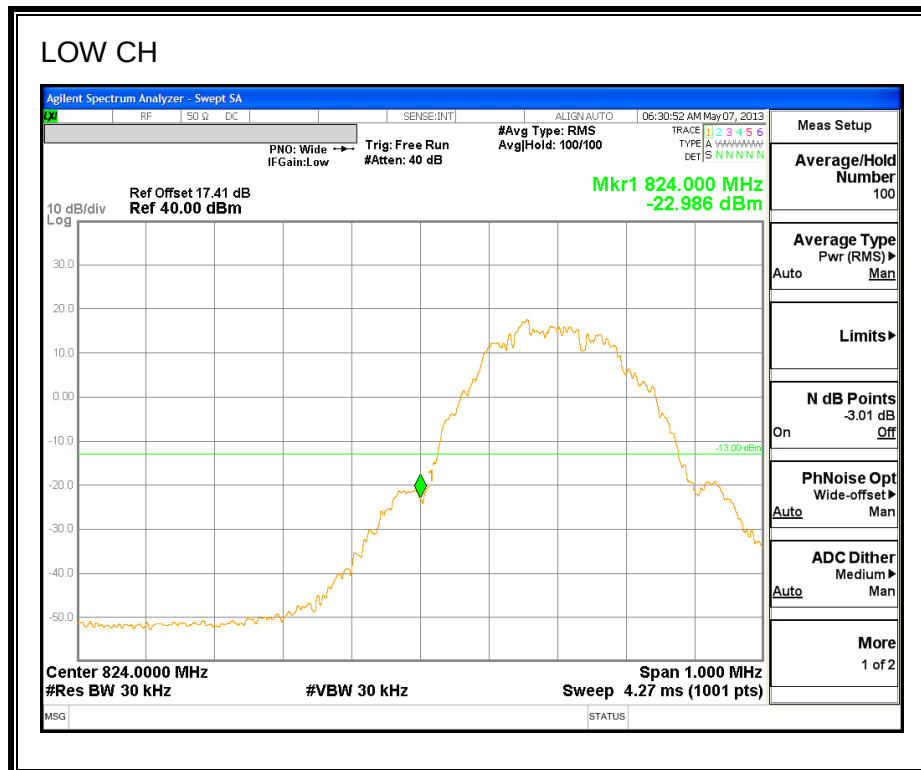
MODES TESTED

- GPRS
- UMTS REL 99, and HSUDPA

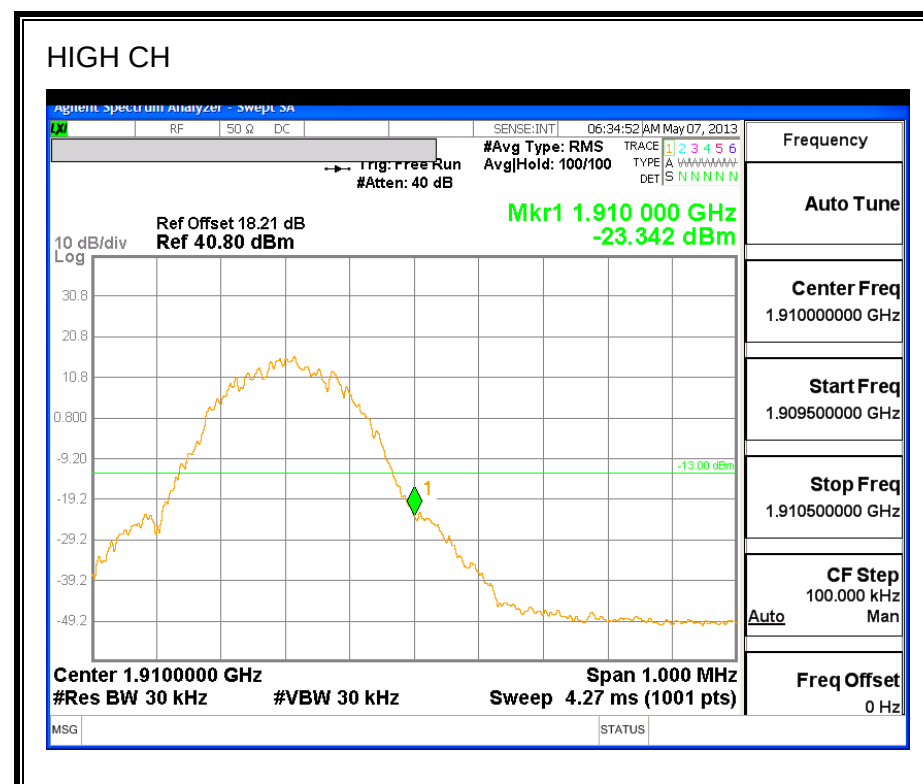
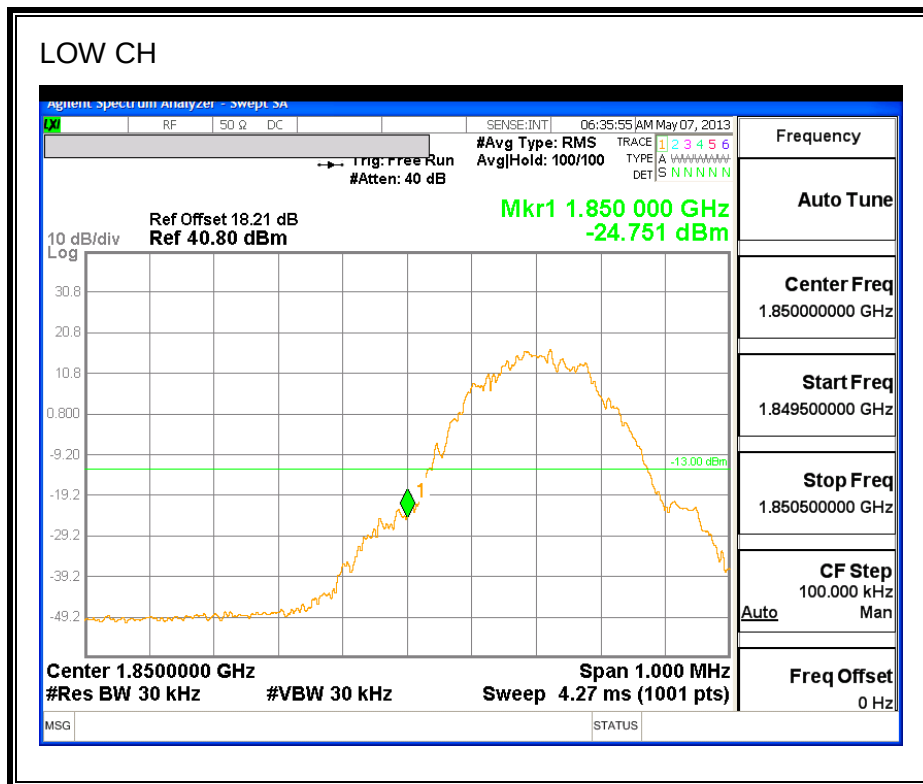
RESULTS

8.2.1. GPRS MODE

CELL BAND

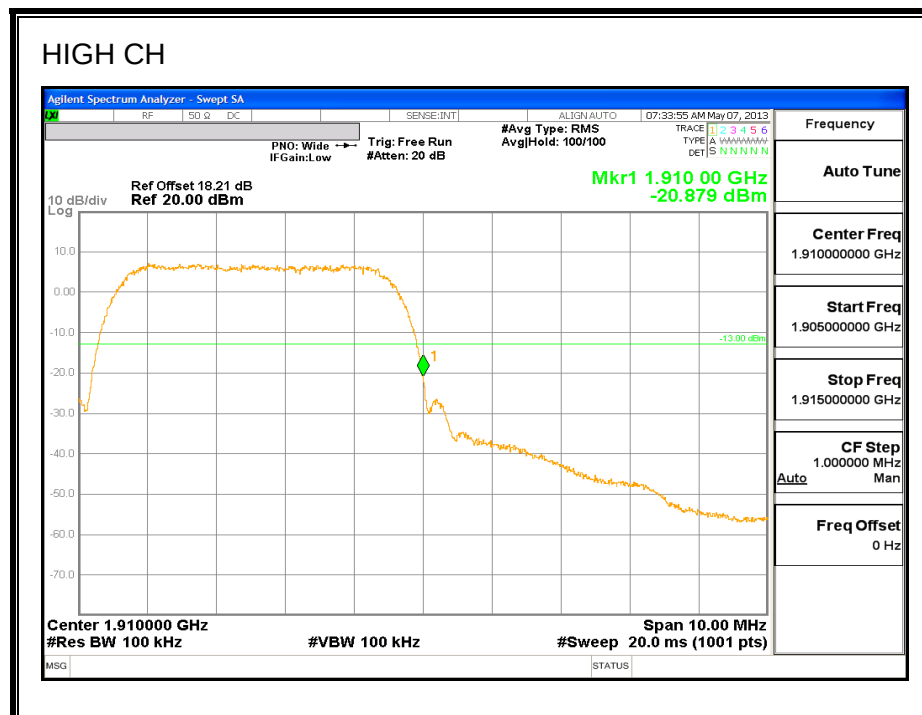
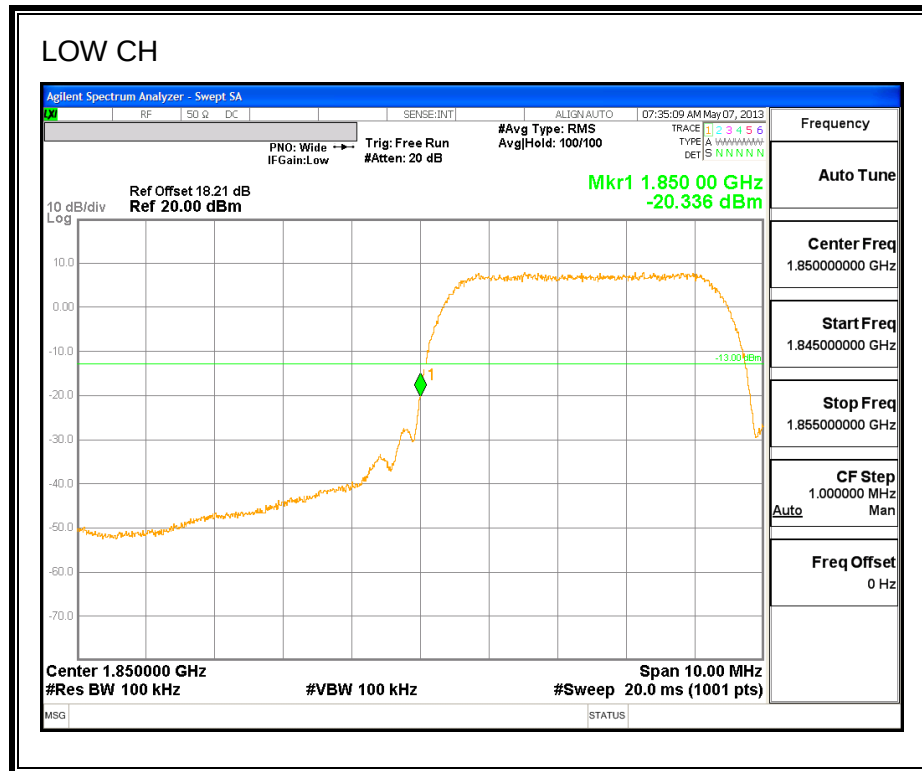


PCS BAND



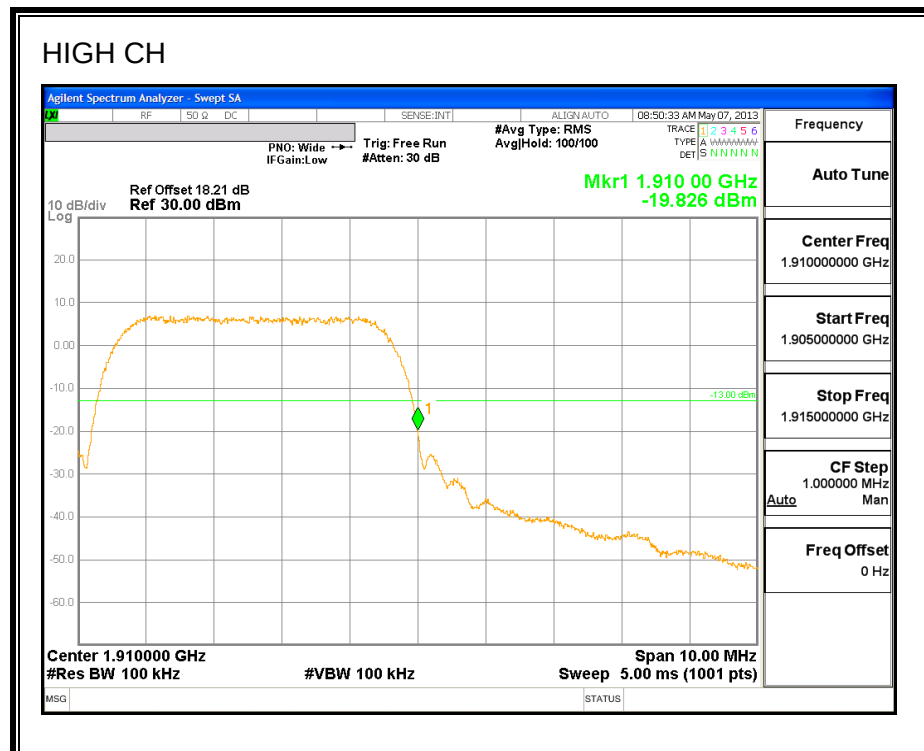
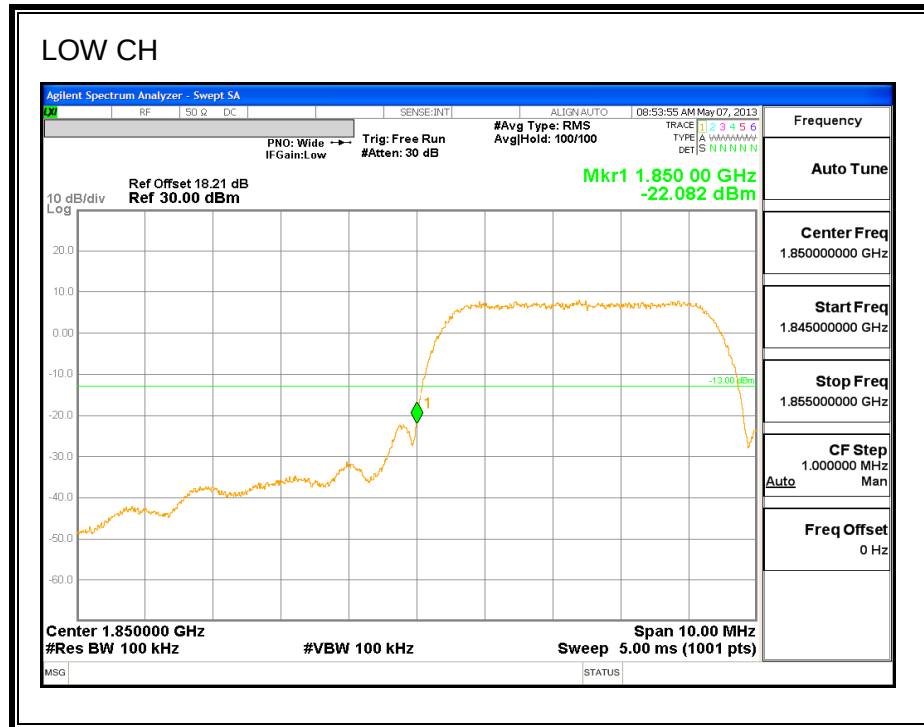
8.2.2. UMTS REL 99 MODE

PCS BAND



8.2.3. UMTS HSDPA MODE

PCS BAND



8.3. 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

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.

For each out of band emissions measurement:

- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

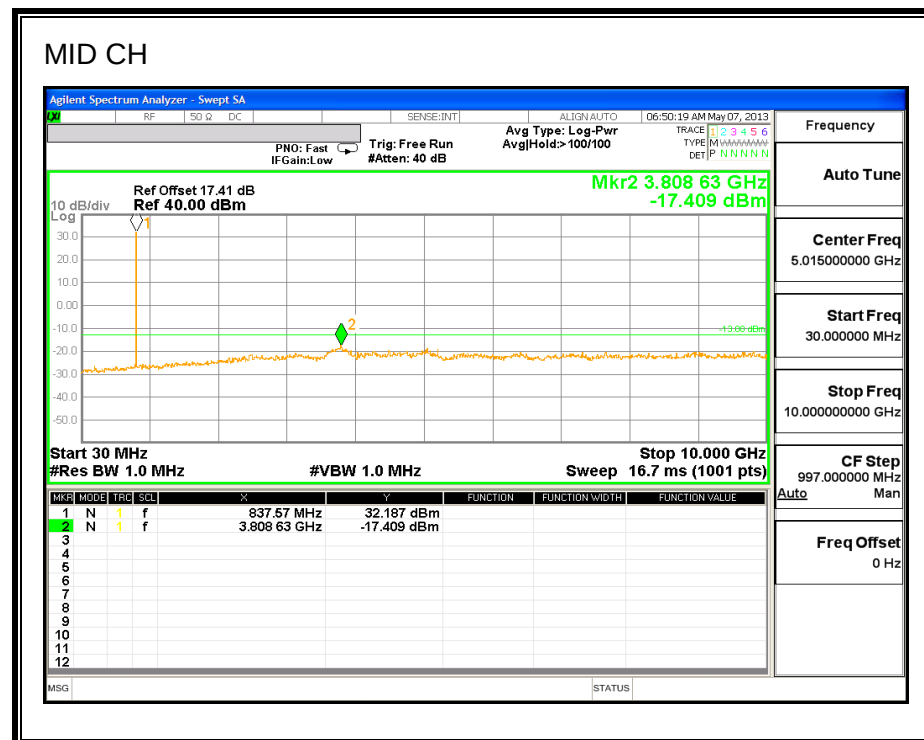
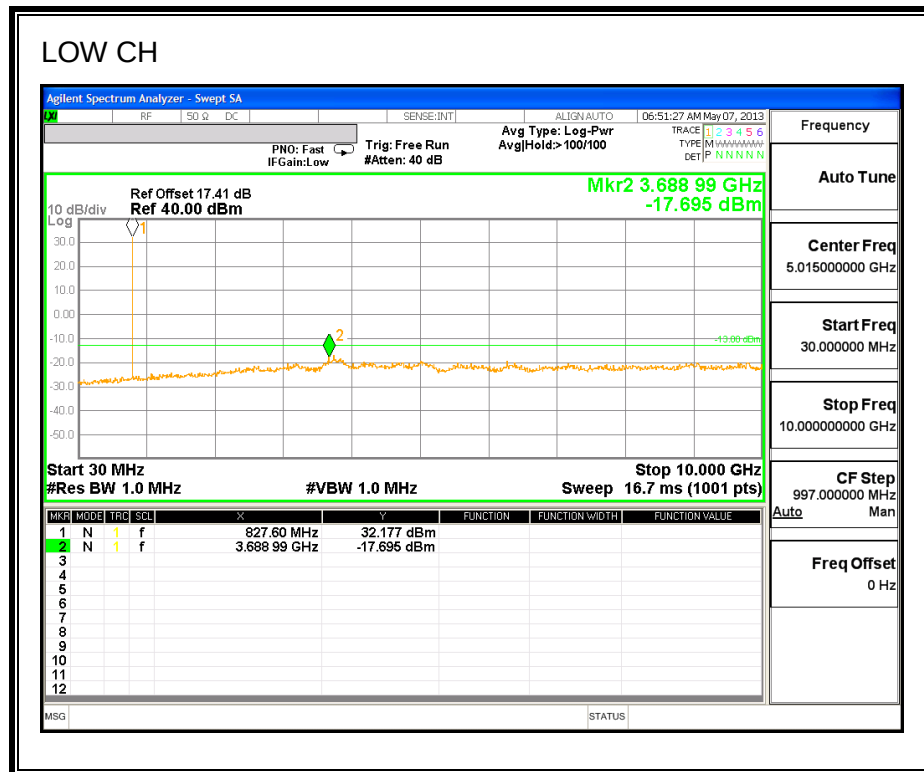
MODES TESTED

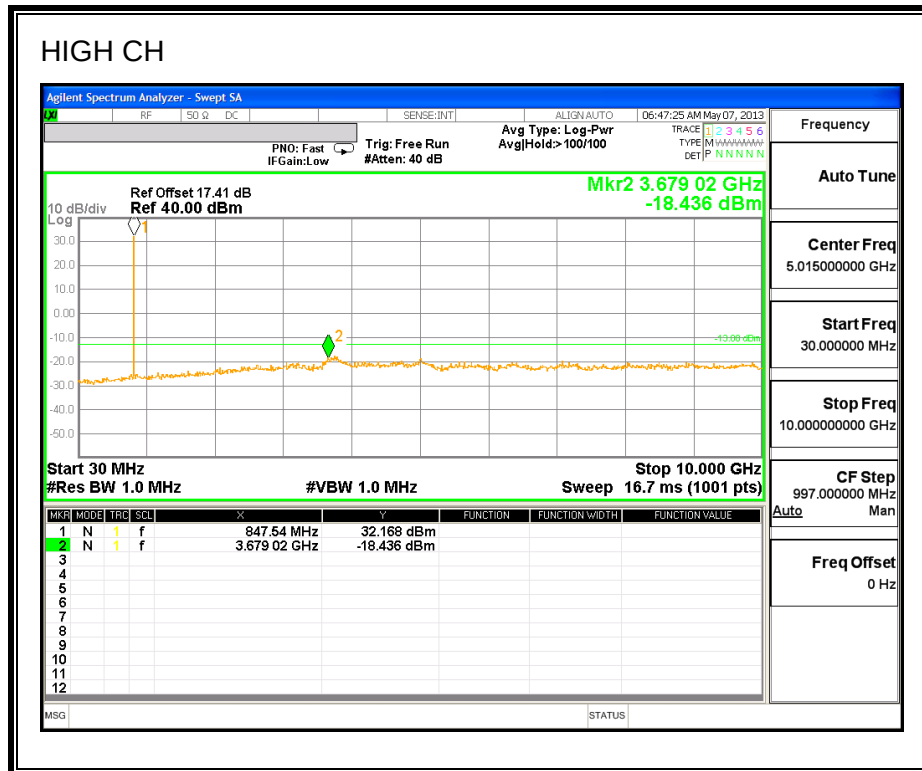
- GPRS
- UMTS REL 99, and HSDPA

RESULTS

8.3.1. GPRS MODE

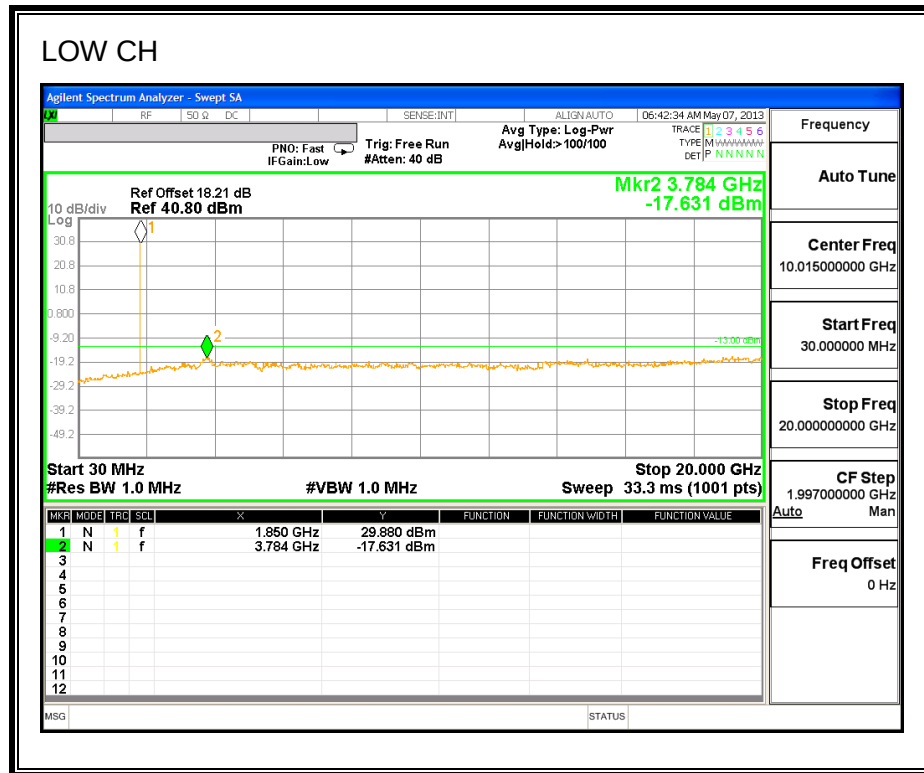
CELL BAND



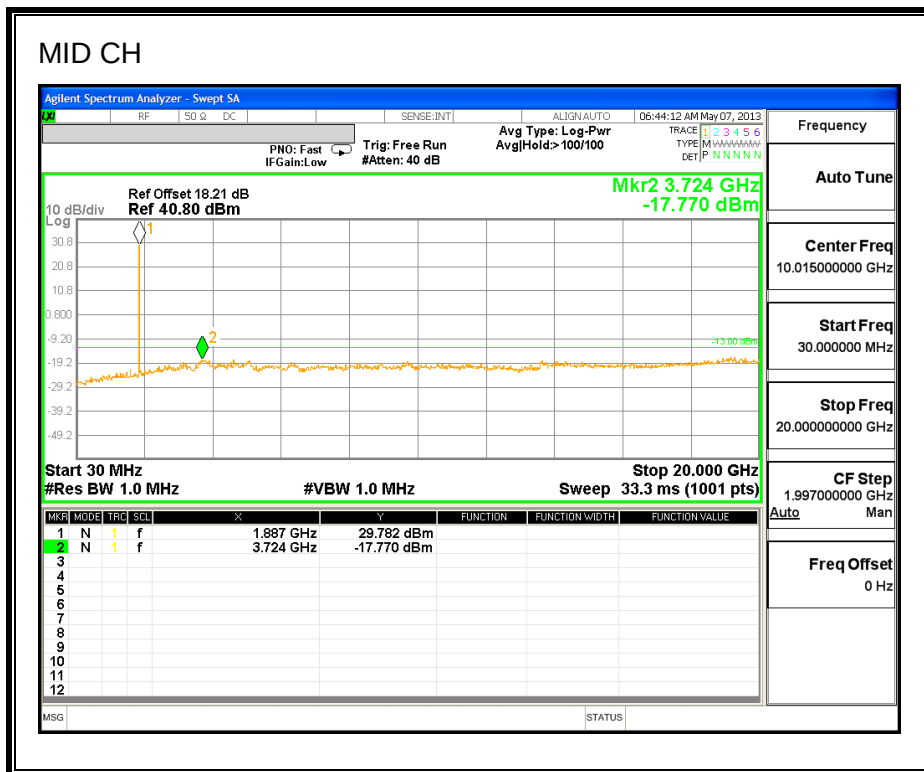


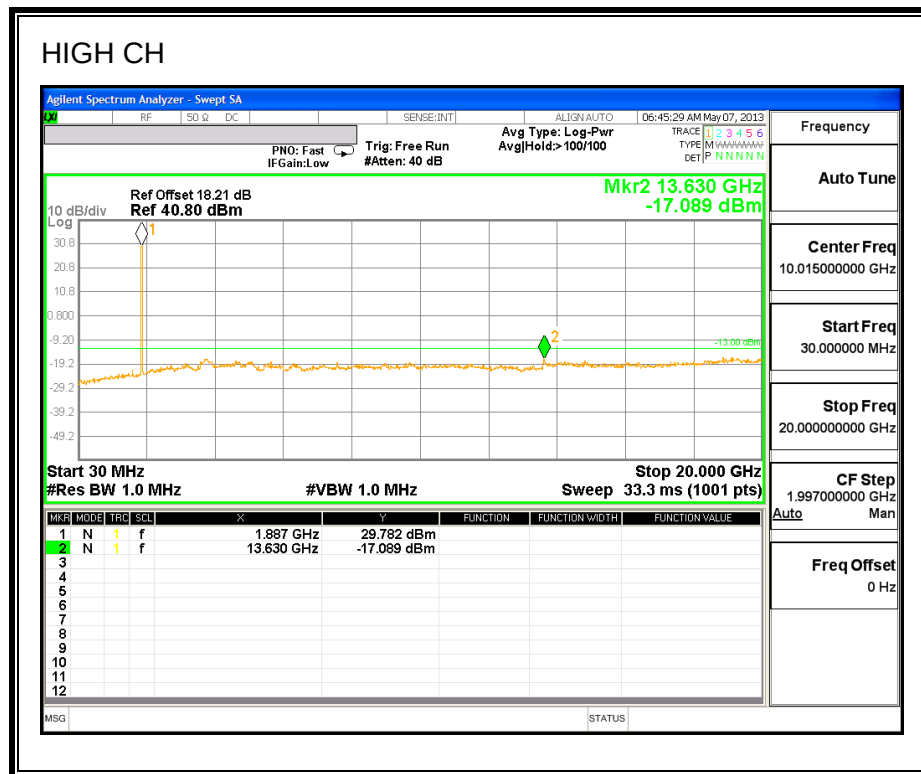
PCS BAND

LOW CH



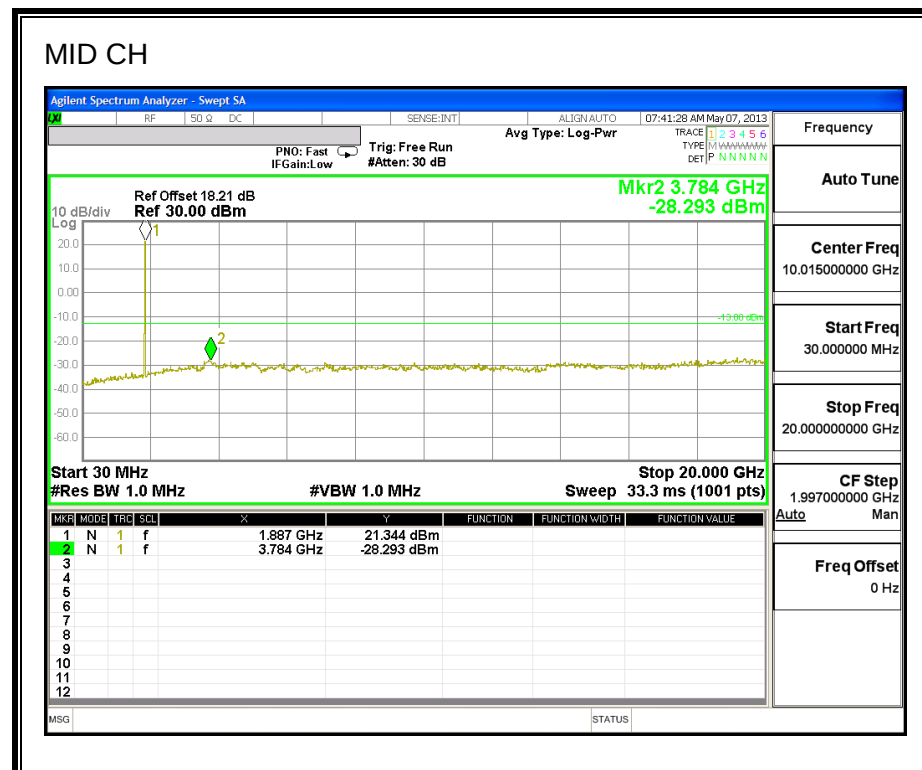
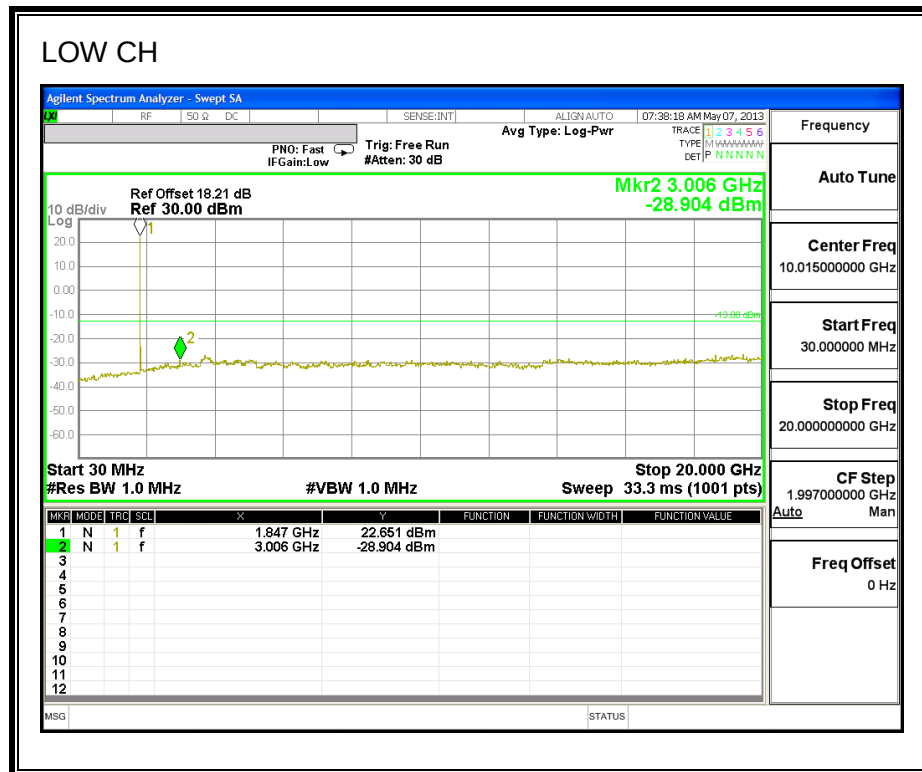
MID CH

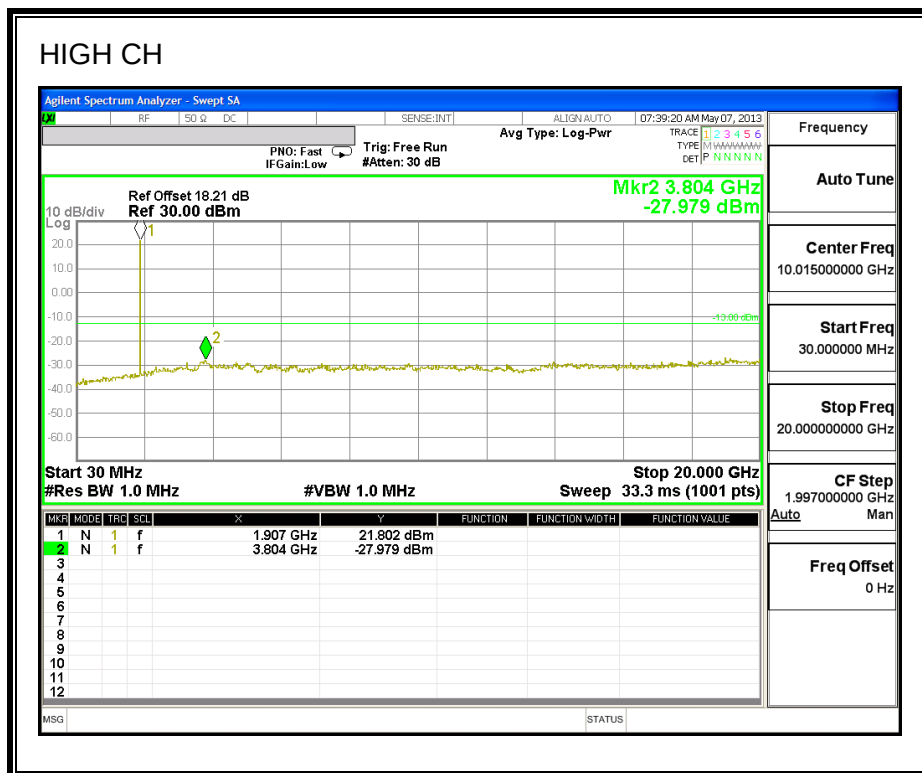




8.3.2. UMTS REL 99 MODE

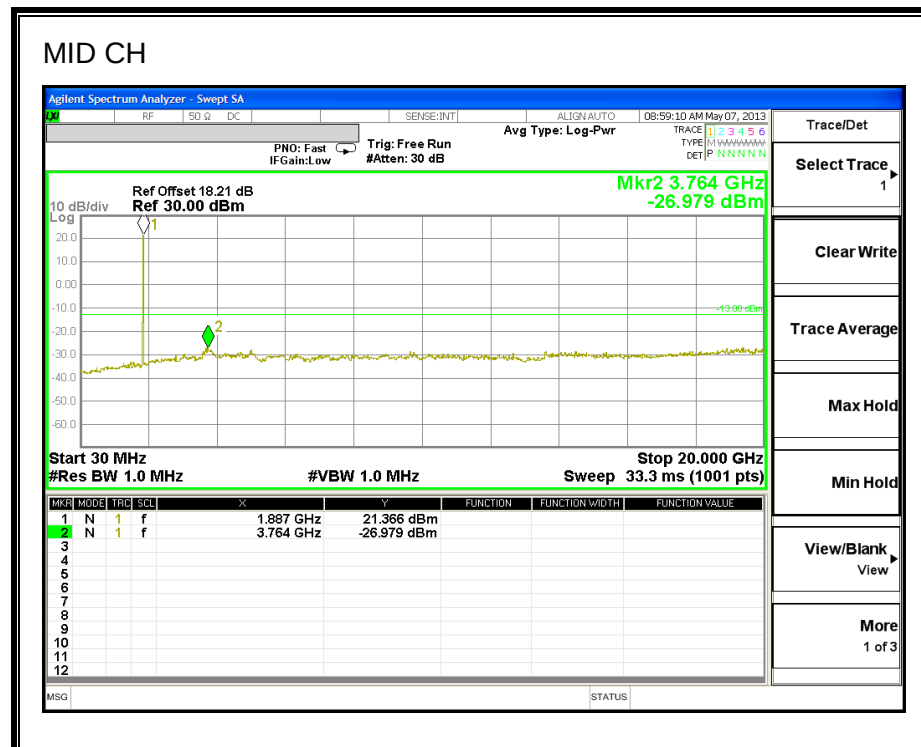
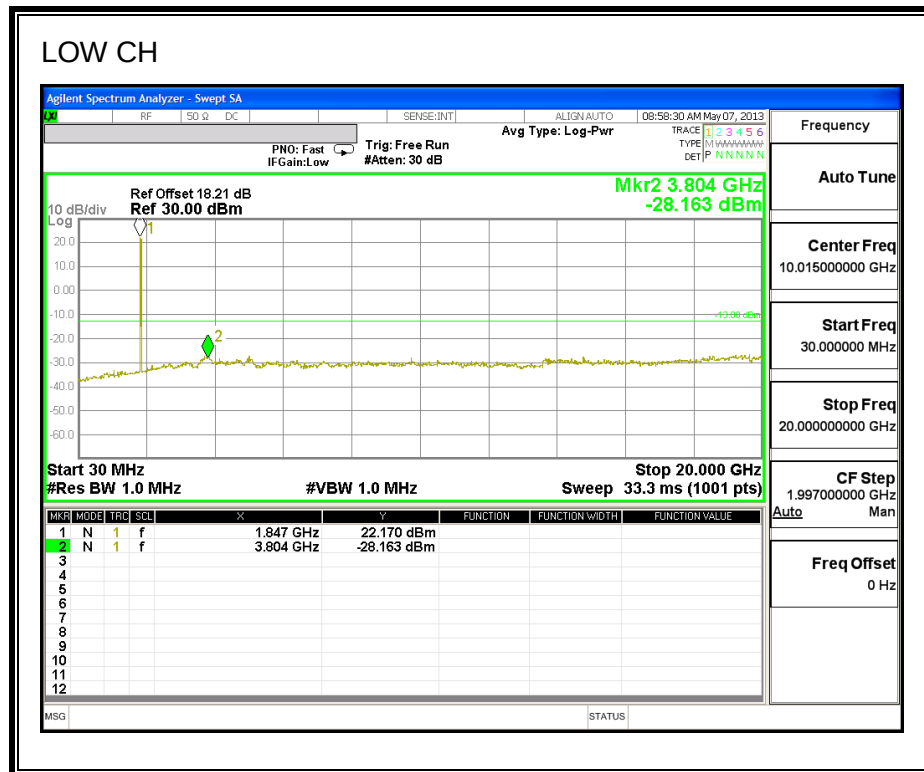
PCS BAND

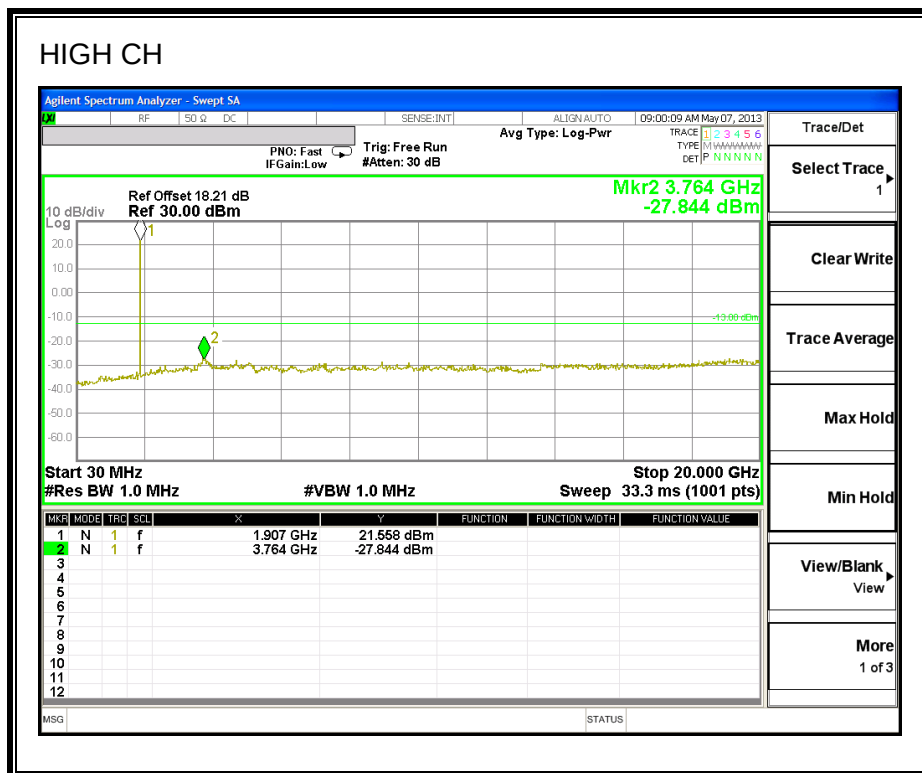




8.3.3. UMTS HSDPA MODE

PCS BAND





9. FREQUENCY STABILITY

RULE PART(S)

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

LIMITS

§22.355 & RSS-132 4.3 - 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

Use Agilent 8960 and CMW 500 with Frequency Error measurement capability.

- Temp. = -30° to $+50^{\circ}\text{C}$
- Voltage = Normal, 3.8Vdc, Low, 3.5Vdc and High, 4.26Vdc.

Frequency Stability vs Temperature:

The EUT is placed inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until $+50^{\circ}\text{C}$ is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

MODES TESTED

- GPRS
- WCDMA, HSDPA

RESULTS

See the following pages.

CELL, GPRS MODULATION – MID
CHANNEL

Reference Frequency: Cellular Mid Channel 836.604274MHz @ 20°C Limit: to stay +/- 2.5 ppm = 2091.511 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	836.604548	-0.328	2.5
3.80	40	836.604146	0.153	2.5
3.80	30	836.604748	-0.567	2.5
3.80	20	836.604274	0	2.5
3.80	10	836.603982	0.349	2.5
3.80	0	836.604771	-0.594	2.5
3.80	-10	836.604434	-0.191	2.5
3.80	-20	836.604622	-0.416	2.5
3.80	-30	836.604200	0.088	2.5

Reference Frequency: Cellular Mid Channel 836.604274MHz @ 20°C Limit: to stay +/- 2.5 ppm = 2091.511 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	20	836.604274	0	2.5
4.26	20	836.604351	-0.092	2.5
3.50	20	836.604611	-0.403	2.5
End Volt(3.2)	20	836.603798	0.569	2.5

PCS, GPRS MODULATION – MID
CHANNEL

Reference Frequency: PCS Mid Channel 1879.999374MHz @ 20°C Limit: within the authorized block or +/- 2.5 ppm = 4699.998 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	1879.998886	0.260	2.5
3.80	40	1879.999733	-0.191	2.5
3.80	30	1879.999195	0.095	2.5
3.80	20	1879.999374	0	2.5
3.80	10	1879.998992	0.203	2.5
3.80	0	1879.998566	0.430	2.5
3.80	-10	1879.999055	0.170	2.5
3.80	-20	1879.999498	-0.066	2.5
3.80	-30	1879.998948	0.227	2.5

Reference Frequency: PCS Mid Channel 1879.999374MHz @ 20°C Limit: within the authorized block or +/- 2.5 ppm = 4699.998 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	20	1879.999374	0.00000	2.5
4.26	20	1879.999078	0.15745	2.5
3.50	20	1879.998573	0.42606	2.5
End Volt(3.2)	20	1879.996568	1.49255	2.5

PCS WCDMA – MID
CHANNEL

Reference Frequency: PCS Mid Channel 1880.021268MHz @ 20°C				
Limit: within the authorized block or +/- 2.5 ppm = 4700.053 Hz				
Power Supply (Vdc)	Environment Temperature (*C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	1880.024500	-1.719	2.5
3.80	40	1880.022515	-0.663	2.5
3.80	30	1880.021186	0.044	2.5
3.80	20	1880.021268	0	2.5
3.80	10	1880.022281	-0.539	2.5
3.80	0	1880.022464	-0.636	2.5
3.80	-10	1880.023041	-0.943	2.5
3.80	-20	1880.021541	-0.145	2.5
3.80	-30	1880.022257	-0.526	2.5

Reference Frequency: PCS Mid Channel 1880.021268MHz @ 20°C				
Limit: within the authorized block or +/- 2.5 ppm = 4700.053 Hz				
Power Supply (Vdc)	Environment Temperature (*C)	Frequency Deviation Measured with Time Elapse		
			Delta (ppm)	Limit (ppm)
3.80	20	1880.021268	0.00000	2.5
4.26	20	1800.021444	42552.61648	2.5
3.50	20	1800.022222	42552.20266	2.5
End Volt(3.2)	20	1800.021323	42552.68085	2.5

10. RADIATED TEST RESULTS

10.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232

LIMITS

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

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

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.2.17

The ERP/EIRP power was measured with the spectrum analyzer which attached with receiver antenna via calibrated cable. The measurements have been taken at the low, middle and high channel in each band.

- Set the spectrum analyzer span wide enough or greater than the modulated signal BW.
- Set a spectrum analyzer at peak detection mode with VBW $\geq$ RBW $\geq$ 26dB BW, typically 3MHz for GSM and 5MHz for WCDMA modes respectively.
- Set a marker to point the corresponding peak value.

MODES TESTED

- GPRS
- UMTS REL 99, and HSDPA

RESULTS

Mode	Channel	f (MHz)	ERP /EIRP	
			dBm	mW
GPRS	128	824.20	26.42	438.53
	190	836.60	26.43	439.54
	251	848.80	27.17	521.19
GPRS	512	1850.20	23.53	225.42
	661	1880.00	23.21	209.41
	810	1909.80	23.46	221.82

Mode	Channel	f (MHz)	ERP / EIRP	
			dBm	mW
REL 99	9662	1852.40	22.53	179.06
	9800	1880.00	20.71	117.76
	9938	1907.60	21.76	149.97

Mode	Channel	f (MHz)	ERP / EIRP	
			dBm	mW
HSDPA	9662	1852.40	23.03	200.91
	9800	1880.00	22.51	178.24
	9938	1907.60	23.46	221.82

GPRS 850 (Cellular Band)

High Frequency Substitution Measurement Compliance Certification Services Chamber A								
Company:	Samsung							
Project #:	13I15088							
Date:	05/07/13							
Test Engineer:	K. Nguyen							
Configuration:	EUT only							
Mode:	Tx GPRS GSM850							
Test Equipment:								
Receiving: Sunol T243 and Chamber A N-type Cable (Setup this one for testing EUT)								
Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) 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	17.24	V	0.5	0.0	16.74	38.5	-21.7	
824.20	26.92	H	0.5	0.0	26.42	38.5	-12.0	
Mid Ch								
836.60	20.15	V	0.5	0.0	19.65	38.5	-18.8	
836.60	26.93	H	0.5	0.0	26.43	38.5	-12.0	
High Ch								
848.80	20.01	V	0.5	0.0	19.51	38.5	-18.9	
848.80	27.67	H	0.5	0.0	27.17	38.5	-11.3	
Rev. 3.17.11								

GPRS 1900 (PCS Band)

High Frequency Fundamental Measurement Compliance Certification Services Chamber A								
Company:		Samsung						
Project #:		13I15088						
Date:		05/07/13						
Test Engineer:		K. Nguyen						
Configuration:		EUT only						
Mode:		Tx GPRS GSM1900						
<u>Test Equipment:</u>								
Receiving: Horn T73, and Chamber B SMA Cables								
Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse								
f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.850	16.0	V	0.85	8.38	23.53	33.0	-9.5	
1.850	13.0	H	0.85	8.59	20.74	33.0	-12.3	
Mid Ch								
1.880	15.8	H	0.85	8.26	23.21	33.0	-9.8	
1.880	13.4	H	0.85	8.55	21.10	33.0	-11.9	
High Ch								
1.910	16.1	V	0.85	8.21	23.46	33.0	-9.5	
1.910	13.6	H	0.85	8.54	21.29	33.0	-11.7	
Rev. 3.17.11								

UMTS 1900 REL 99 (PCS Band)

High Frequency Fundamental Measurement Compliance Certification Services Chamber 3m								
Company: Samsung Project #: 13I15088 Date: 05/13/13 Test Engineer: Roy Zheng Configuration: EUT w/adapter Mode: UMTS REL 99 1900MHz								
Test Equipment:								
Receiving: Horn T60, and Chamber 3m SMA Cables								
Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse								
f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.852	15.0	V	0.85	8.38	22.53	33.0	-10.5	
1.852	11.2	H	0.85	8.59	18.94	33.0	-14.1	
Mid Ch								
1.880	13.3	V	0.85	8.26	20.71	33.0	-12.3	
1.880	7.9	H	0.85	8.55	15.60	33.0	-17.4	
High Ch								
1.908	14.4	V	0.85	8.21	21.76	33.0	-11.2	
1.908	10.6	H	0.85	8.54	18.29	33.0	-14.7	
Rev. 3.17.11								

UMTS 1900 HSDPA (PCS Band)

High Frequency Fundamental Measurement Compliance Certification Services Chamber 3m								
Company: Samsung Project #: 13I15088 Date: 05/13/13 Test Engineer: Roy Zheng Configuration: EUT w/adaptor Mode: UMTS HSDPA 1900MHz								
Test Equipment: Receiving: Horn T60, and Chamber 3m SMA Cables Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse								
f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.852	15.5	V	0.85	8.38	23.03	33.0	-10.0	
1.852	11.7	H	0.85	8.59	19.44	33.0	-13.6	
Mid Ch								
1.880	15.1	V	0.85	8.26	22.51	33.0	-10.5	
1.880	10.9	H	0.85	8.55	18.60	33.0	-14.4	
High Ch								
1.908	16.1	V	0.85	8.21	23.46	33.0	-9.5	
1.908	11.4	H	0.85	8.54	19.09	33.0	-13.9	
Rev. 3.17.11								

10.2. 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.

MODES TESTED

- GPRS
- UMTS REL 99, and HSDPA

RESULTS

GPRS (Cellular Band)

Compliance Certification Services Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		13I15088							
Date:		05/13/13							
Test Engineer:		Steven Tran							
Configuration:		X position, EUT w/ headphones+charger							
Mode:		Tx, 850MHz GPRS MODE							
Chamber		Pre-amplifier		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)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (824.2MHz)									
1.648	-16.4	V	3.0	37.4	1.0	-52.8	-13.0	-39.8	
2.473	-21.8	V	3.0	36.4	1.0	-57.2	-13.0	-44.2	
1.648	-13.1	H	3.0	37.4	1.0	-49.4	-13.0	-36.4	
2.473	-23.2	H	3.0	36.4	1.0	-58.6	-13.0	-45.6	
Mid Ch, (836.6MHz)									
1.673	-20.7	V	3.0	37.3	1.0	-57.0	-13.0	-44.0	
2.510	-22.8	V	3.0	36.4	1.0	-58.1	-13.0	-45.1	
1.673	-14.8	H	3.0	37.3	1.0	-51.1	-13.0	-38.1	
2.510	-24.4	H	3.0	36.4	1.0	-59.8	-13.0	-46.8	
High Ch, (848.8MHz)									
1.698	-20.2	V	3.0	37.3	1.0	-56.5	-13.0	-43.5	
2.546	-20.7	V	3.0	36.3	1.0	-56.0	-13.0	-43.0	
1.698	-15.2	H	3.0	37.3	1.0	-51.5	-13.0	-38.5	
2.546	-22.2	H	3.0	36.3	1.0	-57.6	-13.0	-44.6	
Rev. 03.03.09									
Note: No other emissions were detected above the system noise floor.									

GPRS (PCS Band)

Compliance Certification Services Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		13I15088							
Date:		05/13/13							
Test Engineer:		Steven Tran							
Configuration:		X position, EUT with headphones/charger							
Mode:		Tx, 1900MHz GPRS MODE							
Chamber		Pre-amplifier		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, 1850.2MHz									
3.700	-16.4	V	3.0	35.4	1.0	-50.8	-13.0	-37.8	
5.551	-12.0	V	3.0	34.7	1.0	-45.7	-13.0	-32.7	
11.101	-10.7	V	3.0	34.8	1.0	-44.5	-13.0	-31.5	
3.700	-14.4	H	3.0	35.4	1.0	-48.8	-13.0	-35.8	
5.551	-13.5	H	3.0	34.7	1.0	-47.2	-13.0	-34.2	
11.101	-13.8	H	3.0	34.8	1.0	-47.6	-13.0	-34.6	
Mid Ch, 1880MHz									
3.760	-16.9	V	3.0	35.3	1.0	-51.2	-13.0	-38.2	
5.640	-13.5	V	3.0	34.7	1.0	-47.3	-13.0	-34.3	
7.520	-15.1	V	3.0	34.9	1.0	-49.0	-13.0	-36.0	
3.760	-12.2	H	3.0	35.3	1.0	-46.5	-13.0	-33.5	
5.640	-13.5	H	3.0	34.7	1.0	-47.3	-13.0	-34.3	
7.520	-14.8	H	3.0	34.9	1.0	-48.8	-13.0	-35.8	
High Ch, 1909.8MHz									
3.820	-19.1	V	3.0	35.3	1.0	-53.4	-13.0	-40.4	
5.729	-13.2	V	3.0	34.7	1.0	-46.9	-13.0	-33.9	
7.639	-14.6	V	3.0	35.0	1.0	-48.5	-13.0	-35.5	
9.549	-13.5	V	3.0	35.3	1.0	-47.8	-13.0	-34.8	
3.820	-13.8	H	3.0	35.3	1.0	-48.0	-13.0	-35.0	
5.729	-13.2	H	3.0	34.7	1.0	-46.9	-13.0	-33.9	
7.639	-13.1	H	3.0	35.0	1.0	-47.1	-13.0	-34.1	
9.549	-14.2	H	3.0	35.3	1.0	-48.5	-13.0	-35.5	
Rev. 03.03.09									
Note: No other emissions were detected above the system noise floor.									

WCDMA REL 99 (PCS Band)

Compliance Certification Services Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		13I15088							
Date:		05/13/13							
Test Engineer:		Steven Tran							
Configuration:		Z position, EUT w/ charger+headphones							
Mode:		Tx, 1900MHz WCDMA Rel 99 MODE							
Chamber		Pre-amplifier		Filter		Limit			
5m Chamber B		T145 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	-22.1	V	3.0	35.4	1.0	-56.5	-13.0	-43.5	
3.705	-18.7	H	3.0	35.4	1.0	-53.0	-13.0	-40.0	
Mid Ch, 1880.0MHz									
3.760	-21.2	V	3.0	35.3	1.0	-55.6	-13.0	-42.6	
3.760	-17.6	H	3.0	35.3	1.0	-51.9	-13.0	-38.9	
High Ch, 1907.6MHz									
3.815	-20.9	V	3.0	35.3	1.0	-55.2	-13.0	-42.2	
3.815	-17.4	H	3.0	35.3	1.0	-51.7	-13.0	-38.7	
Rev. 03.03.09									
Note: No other emissions were detected above the system noise floor.									

WCDMA HSDPA (PCS Band)

Compliance Certification Services Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		13I15088							
Date:		05/14/13							
Test Engineer:		Steven Tran							
Configuration:		Z config, eut, headphones, charger							
Mode:		Tx, 1900MHz WCDMA HSDPA MODE							
Chamber		Pre-amplifier		Filter		Limit			
5m Chamber B		T145 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	-21.4	V	3.0	35.4	1.0	-55.8	-13.0	-42.8	
3.705	-17.8	H	3.0	35.4	1.0	-52.2	-13.0	-39.2	
Mid Ch, 1880.0MHz									
3.760	-21.1	V	3.0	35.3	1.0	-55.4	-13.0	-42.4	
3.760	-16.9	H	3.0	35.3	1.0	-51.2	-13.0	-38.2	
High Ch, 1907.6MHz									
3.815	-20.9	V	3.0	35.3	1.0	-55.2	-13.0	-42.2	
3.815	-20.7	H	3.0	35.3	1.0	-55.0	-13.0	-42.0	
Rev. 03.03.09									
Note: No other emissions were detected above the system noise floor.									