



**FCC CFR47 PART 22H, 24E
CERTIFICATION TEST REPORT**

FOR

**GT-S7273T-802.11 bgn 1x1+ BT4.0 +basic rates +EDR+GSM/WCDMA850/1900MHz
Bar phone**

MODEL NUMBER: GT-S7273T

FCC ID: A3LGTS7273T

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Prepared for

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/10/13	Initial Issue	P. Kim
A	06/14/13	Updated reports	P. Kim
B	6/20/13	Updated antenna gain information per customer request.	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-S7273T~802.11 bgn 1x1+ BT4.0 +basic rates
+EDR+GSM/WCDMA850/1900MHz Bar phone

MODEL: GT-S7273T

SERIAL NUMBER: (CONDUCTED) 4D05C26B05D13000
(RADIATED) 4D05E6BE77523000

DATE TESTED: MAY 15 TO MAY19, 2013

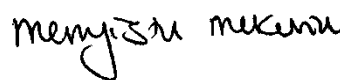
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 22H, 24E	Pass

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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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, 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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

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 GSM/WCDMA Phone with Bluetooth and WLAN 2.4GHz smart phone.

5.2. MAXIMUM OUTPUT POWER

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

Maximum output power has been verified to be for REL99 and worst case mode, therefore, all of the testing has been performed for REL99 only.

Part 22 Cellular Band					
Frequency range (MHz)	Modulation	Conducted		ERP	
		dBm	mW	dBm	mW
824.2 - 848.8	GPRS	32.80	1905.5	22.40	173.8

Part 24 PCS Band					
Frequency range (MHz)	Modulation	Conducted		EIRP	
		dBm	mW	dBm	mW
1850.2 - 1909.8	GPRS	29.80	955.0	30.11	1025.7

Part 22/24 Band					
Frequency range (MHz)	Modulation	Conducted		ERP/EIRP	
		dBm	mW	dBm	mW
826.4 - 846	REL 99	24.92	310.5	18.80	75.9
1852.4 - 1907.6		24.57	286.4	24.41	276.1

5.3. SOFTWARE AND FIRMWARE

The EUT is linked with Agilent 8960 and CMW500 Communication Test Sets.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

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

BAND	Gain (dBi)
GSM850/WCDMA B5(824-894MHz)	-1.43
PCS/WCDMA B2 (1850-1990MHz)	--2.2

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case is EUT on the highest power. Based on Peak Power measurement investigations, the following modes should be considered as worst-case scenario for all other measurements.

Worst-case modes:

- GSM: GPRS
- UMTS: WCDMA (REL-99)

For the fundamental investigation, since the EUT is a portable device that has three orientations; an X, Y and Z orientations and the worst among X, Y, and Z with AC/DC adapter and headset have been investigated. After the investigation the worst case was found to be X-Position with an AC Adapter for Cell bands and Z-position with an AC Adapter and headset for PCS bands respectively

5.6. DESCRIPTION OF TEST SETUP

RADIATED TESTS SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	
AC Adapter	Samsung Electronics	ETA0U10BBB	DW2D203DS/7-E	DoC
Headset	Samsung Electronics	N/A	N/A	DoC

I/O CABLES (RF Conducted Test)

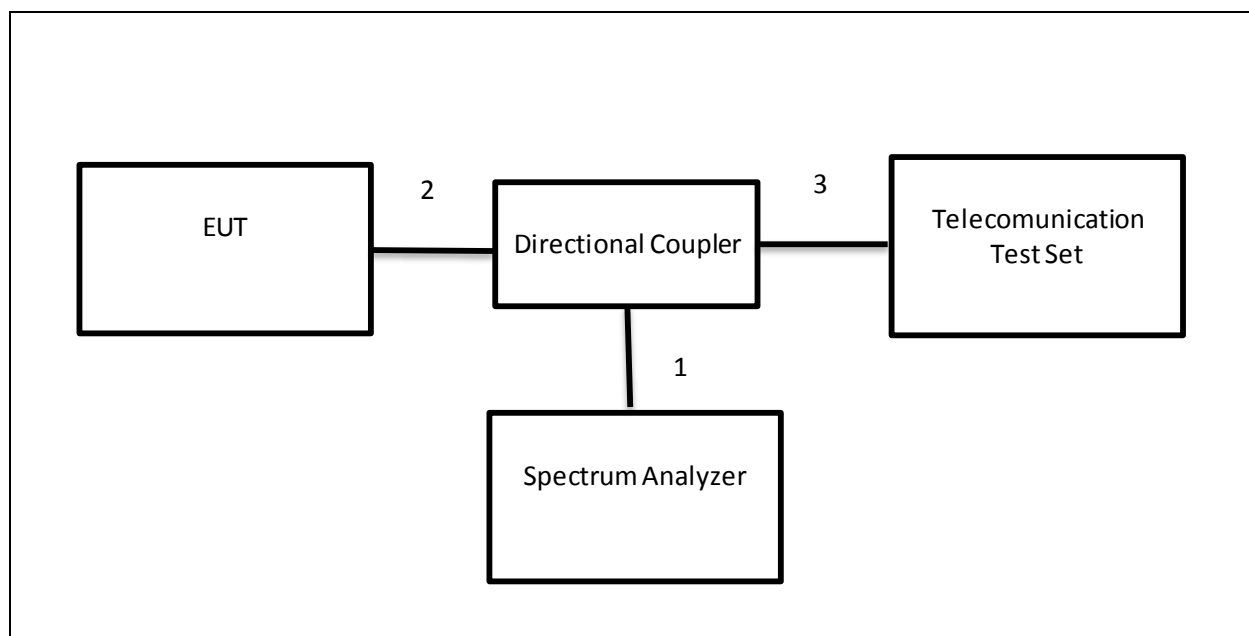
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	RF In/Out	1	Spectrum Analyzer	UN-SHELDED	None	N/A
2	RF out	1	Directional Coupler	UN-SHELDED	0.1m	N/A
3	RF In/Out	1	Communication Call box	UN-SHELDED	0.5m	N/A

I/O CABLES (RF Radiated Test)

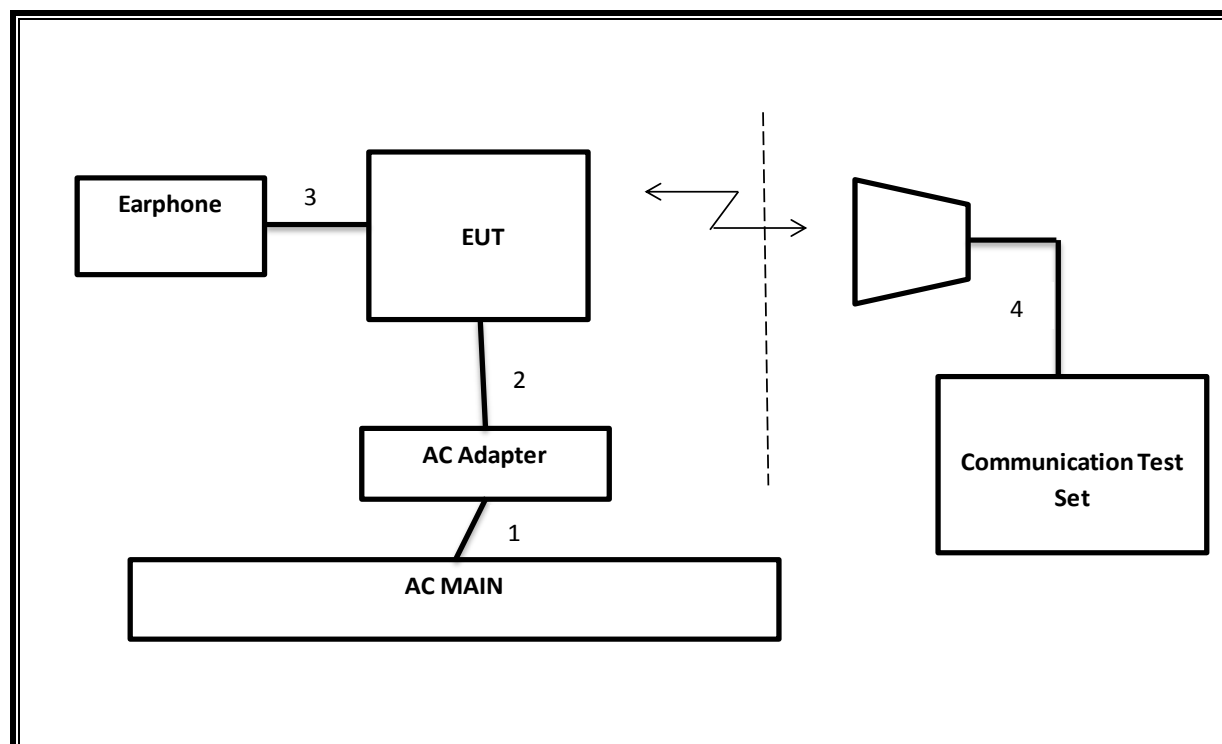
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	115VAC	UN-SHELDED	1.0m	N/A
2	DC	1	DC	UN-SHELDED	1.0m	Volume control on
3	Audio	1	Earphone	UN-SHELDED	1.0m	NA
4	RF In/Out	1	Horn	UN-SHELDED	5m	NA

TEST SETUP

CONDUCTED SETUP



RADIATED SETUP



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, 26.5 GHz	Agilent / HP	E4440A	C01179	02/26/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/13
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/13
Antenna, Horn, 18 GHz	EMCO	3115	C00945	12/11/13
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	03/28/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/22/13
Communication Test Set	Agilent / HP	E5515C	C01086	11/10/13
Communication Test Set	R & S	CMW500	None	06/28/13
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	01/09/14
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02689`	CNR
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02687	CNR
Directional Coupler, 4.2 GHz, 40 dB	A-R	DC7144A	C00983	CNR
Vector Signal Generator	Agilent / HP	E4438C	None	07/06/13
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121C DB4	C00993	02/01/14

7. RF POWER OUTPUT VERIFICATION

7.1. GSM MODES

7.1.1. GSM/GPRS/EGPRS

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.

TEST PROCEDURE

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

CELL BAND

Mode	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	32.77	32.26	29.24	29.24	28.2	28.2	26.18	26.18
	190	836.6	32.77	32.3	29.29	29.29	28.26	28.26	26.25	26.25
	251	848.8	32.71	32.25	29.25	29.25	28.23	28.23	26.24	26.24

PCS BAND

Mode	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	29.71	29.17	26.65	26.11	25.64	25.10	23.55	23.00
	661	1880.0	29.80	29.20	26.79	26.16	25.80	25.18	23.77	23.14
	810	1909.8	29.86	29.27	26.88	26.28	25.91	25.31	23.91	23.31

7.2. UMTS MODES

7.2.1. UMTS-REL 99

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

Band	UL Ch	DL Ch	Frequency	Peak Conducted Output Power (dBm)	Average Conducted Output Power (dBm)
UMTS 850	4132	4357	826.4	24.92	22.29
	4180	4405	836.0	24.42	22.02
	4230	4455	846.0	24.70	22.26

Band	UL Ch	DL Ch	Frequency	Peak Conducted Output Power (dBm)	Average Conducted Output Power (dBm)
UMTS 1900	9262	9662	1852.4	24.43	22.13
	9400	9800	1880.0	24.52	22.3
	9538	9938	1907.6	24.57	22.45

7.2.2. UMTS-HSDPA

TEST PROCEDURE

The following summary of these 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			
	HSUPA Test	Not Applicable			
	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
	β_{ec}	-	-	-	-
	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	β_{ed}	Not Applicable			
	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			
	$A_{hs} = \beta_{hs}/\beta_c$	30/15			

RESULTS

Band	Subtest	UL Ch	DL Ch	Frequency	Average power (dBm)	Peak Power dBm
UMTS850 (Band V)	1	4132	4357	826.4	22.14	26.22
		4180	4405	836.0	21.92	25.98
		4230	4455	846.0	22.12	26.13
	2	4132	4357	826.4	22.16	26.03
		4180	4405	836.0	22.28	26.16
		4230	4455	846.0	22.41	26.05
	3	4132	4357	826.4	21.93	26.61
		4180	4405	836.0	21.73	26.52
		4230	4455	846.0	21.97	27.05
	4	4132	4357	826.4	22.05	26.87
		4180	4405	836.0	22.10	26.51
		4230	4455	846.0	22.11	26.41
UMTS1900 (Band II)	1	9262	9662	1852.4	21.68	27.17
		9400	9800	1880.0	21.37	26.85
		9538	9938	1907.6	21.71	27.27
	2	9262	9662	1852.4	21.78	26.62
		9400	9800	1880.0	21.79	26.80
		9538	9938	1907.6	21.84	26.80
	3	9262	9662	1852.4	21.69	26.63
		9400	9800	1880.0	21.44	26.83
		9538	9938	1907.6	21.78	26.95
	4	9262	9662	1852.4	21.85	26.93
		9400	9800	1880.0	21.87	26.75
		9538	9938	1907.6	21.90	26.63

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

7.2.3. UMTS-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 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				
	$A_{hs} = \beta_{hs}/\beta_c$	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	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	Average power (dBm)	Peak power (dBm)
UMTS850 (Band V)	1	4132	4357	826.4	20.63	26.28
		4180	4405	836.0	20.42	26.31
		4230	4455	846.0	20.7	25.73
	2	4132	4357	826.4	20.87	25.90
		4180	4405	836.0	20.9	26.06
		4230	4455	846.0	20.99	25.93
	3	4132	4357	826.4	21.22	26.81
		4180	4405	836.0	21.03	26.67
		4230	4455	846.0	21.23	26.71
	4	4132	4357	826.4	21.37	26.46
		4180	4405	836.0	21.42	26.65
		4230	4455	846.0	21.46	26.54
	5	4132	4357	826.4	21.19	26.78
		4180	4405	836.0	21.02	26.55
		4230	4455	846.0	21.17	26.22
UMTS1900 (Band II)	1	9262	9662	1852.4	21.33	26.54
		9400	9800	1880.0	21.45	26.51
		9538	9938	1907.6	21.47	26.38
	2	9262	9662	1852.4	22.16	26.80
		9400	9800	1880.0	21.98	26.59
		9538	9938	1907.6	22.13	26.96
	3	9262	9662	1852.4	22.26	26.52
		9400	9800	1880.0	22.38	26.67
		9538	9938	1907.6	22.41	26.52
	4	9262	9662	1852.4	21.55	27.51
		9400	9800	1880.0	21.27	27.32
		9538	9938	1907.6	21.57	27.69
	5	9262	9662	1852.4	21.62	27.16
		9400	9800	1880.0	21.66	27.20
		9538	9938	1907.6	21.64	27.16

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

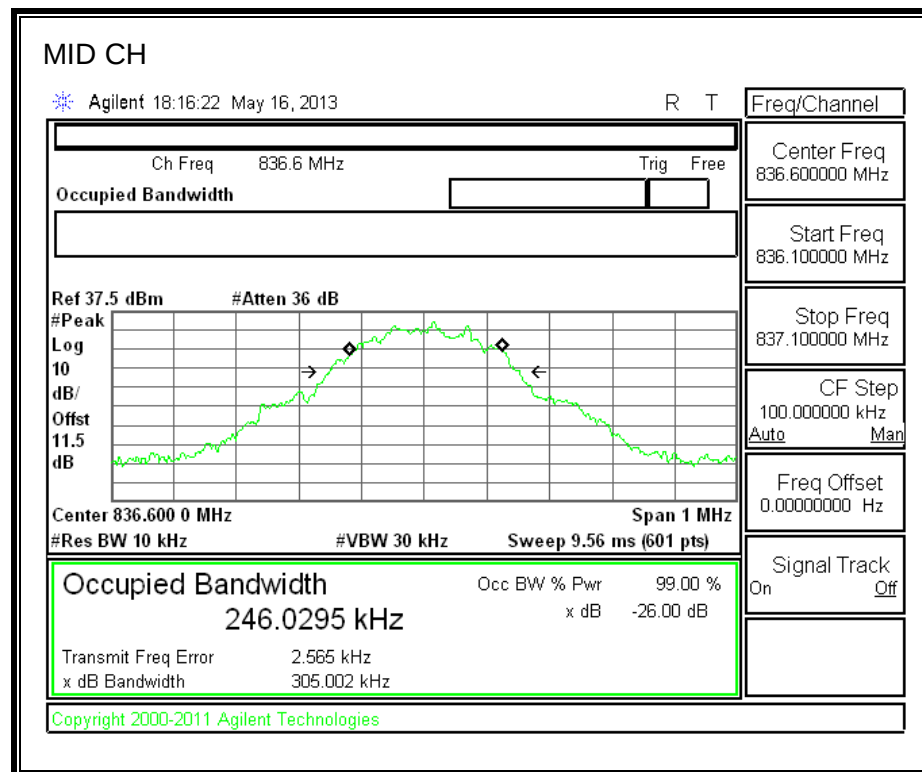
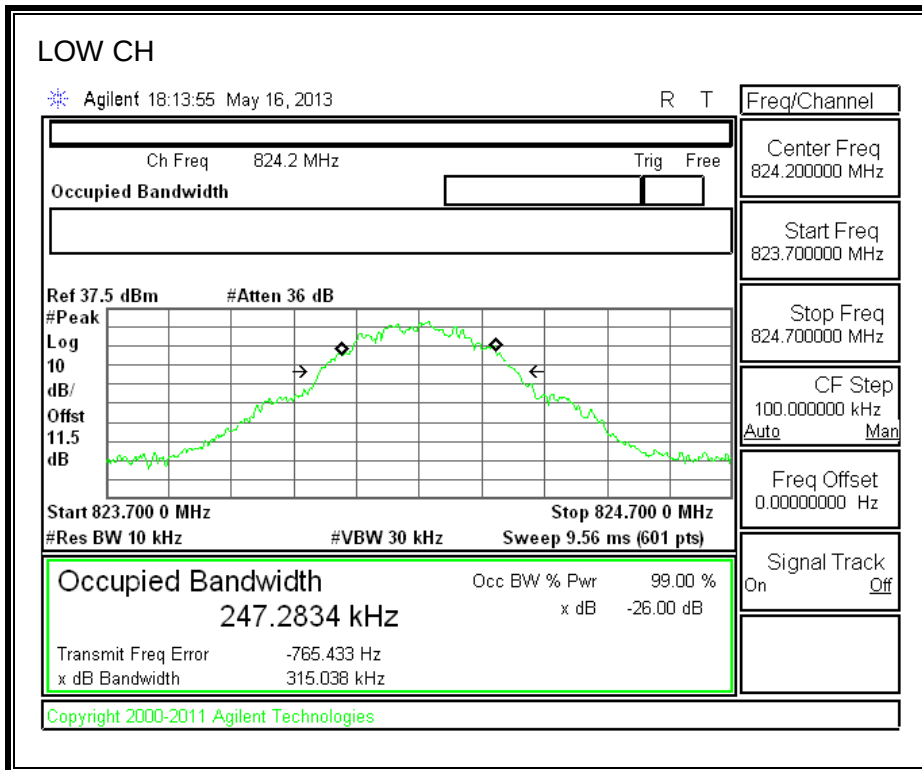
Band	Mode	Channel	f (MHz)	99% BW (kHz)	-26dB BW (kHz)
Cellular	GPRS	128	824.20	247.28	315.04
		190	836.60	246.03	305.00
		251	848.80	243.04	305.00
PCS		512	1850.2	234.23	302.01
		661	1880.0	248.20	303.52
		810	1909.8	242.85	303.71

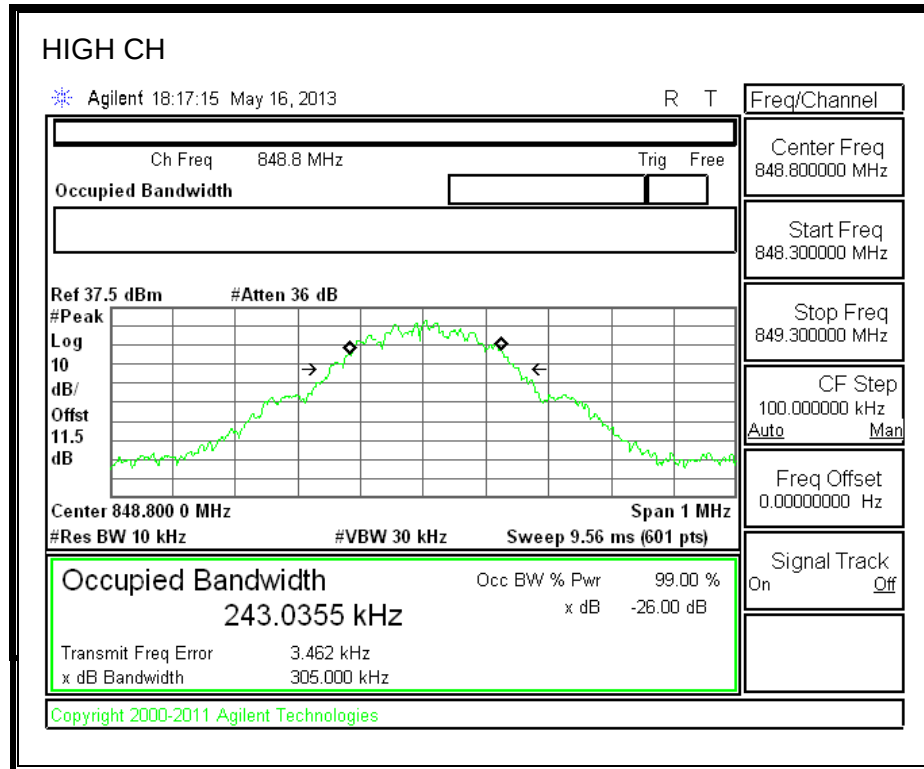
Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
REL 99	GSM	4357	826.40	4.126	4.735
		4405	836.00	4.143	4.752
		4455	846.00	4.138	4.681

Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
REL 99	PCS	9662	1852.4	4.170	4.737
		9880	1880.0	4.147	4.726
		9938	1907.6	4.170	4.771

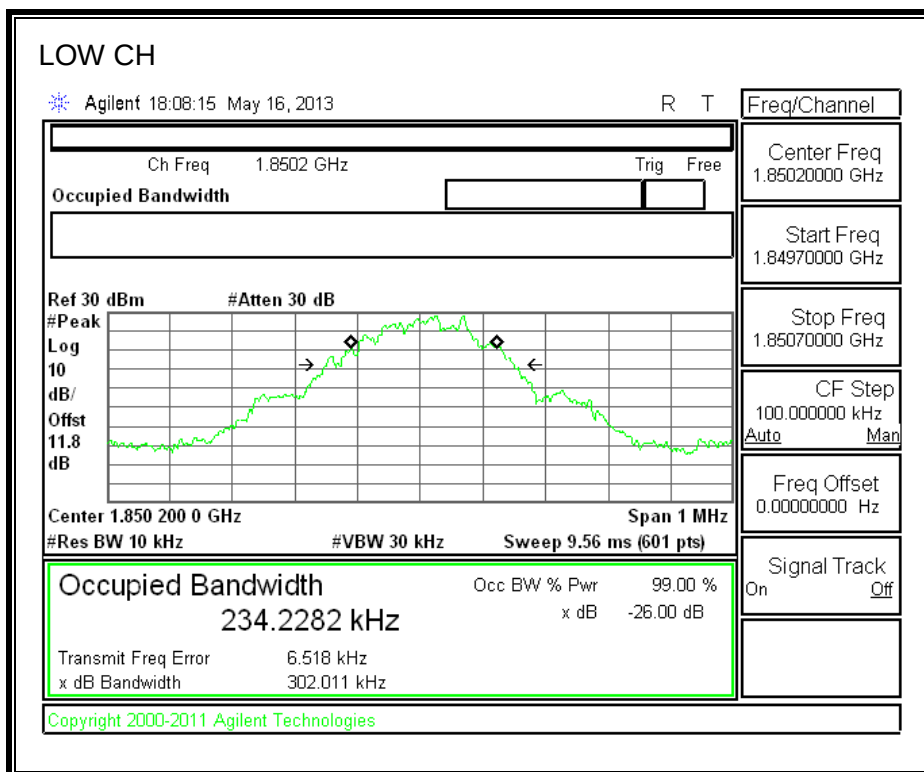
8.1.1. GSM-GPRS

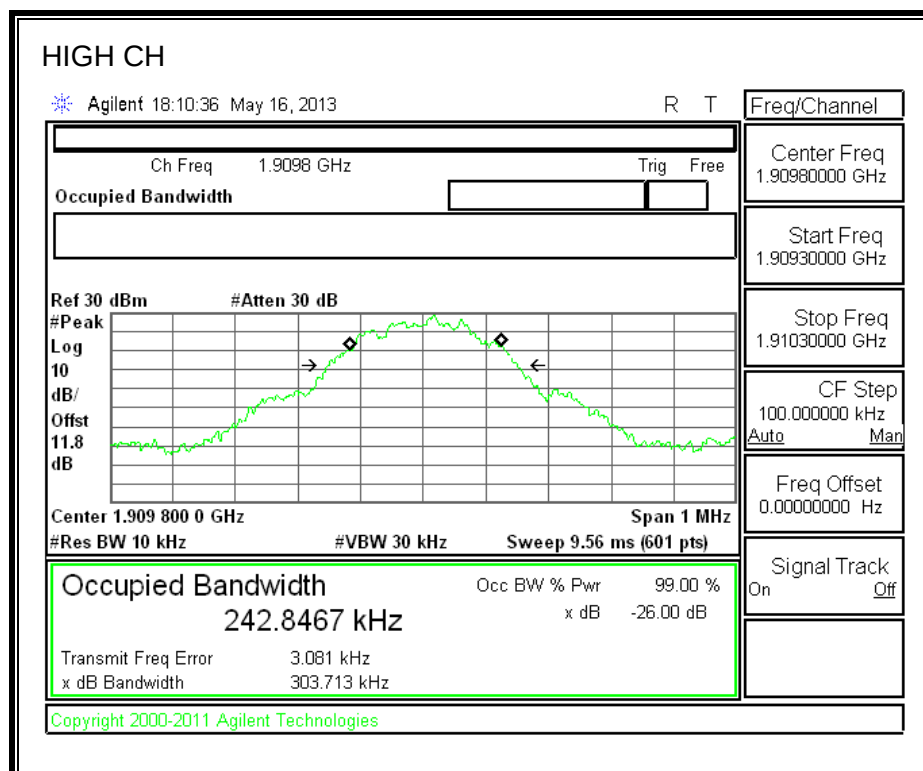
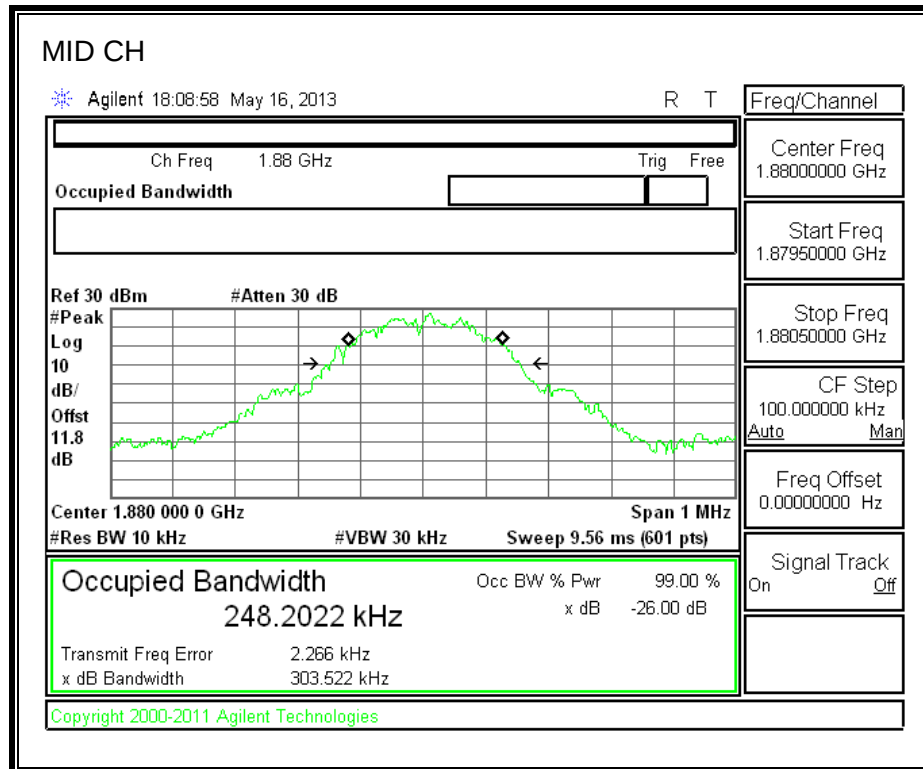
CELL BAND





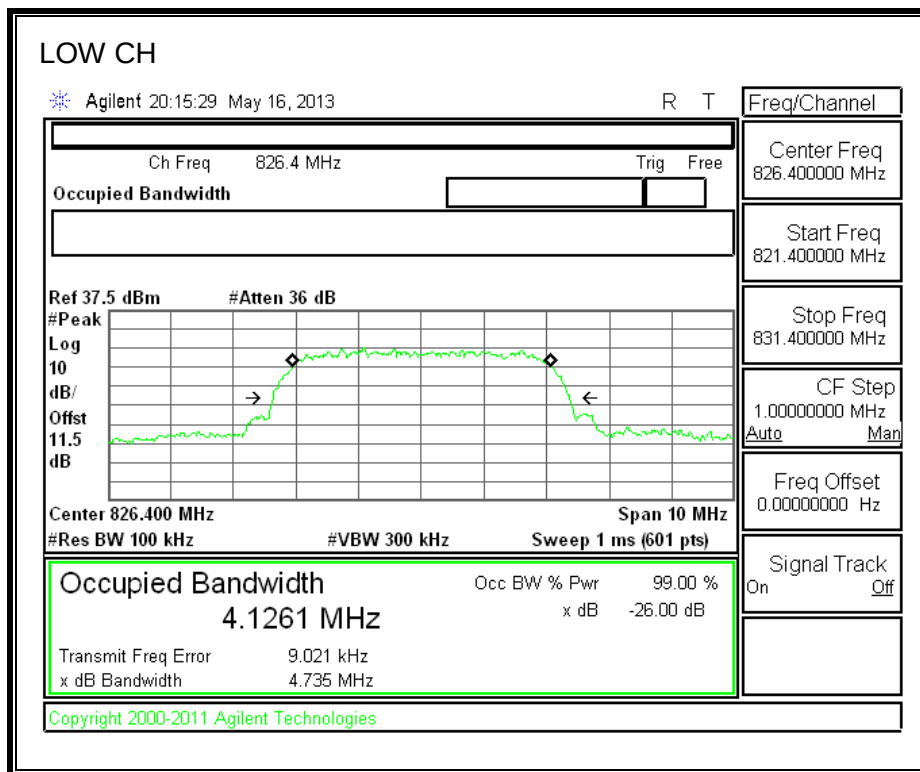
PCS BAND



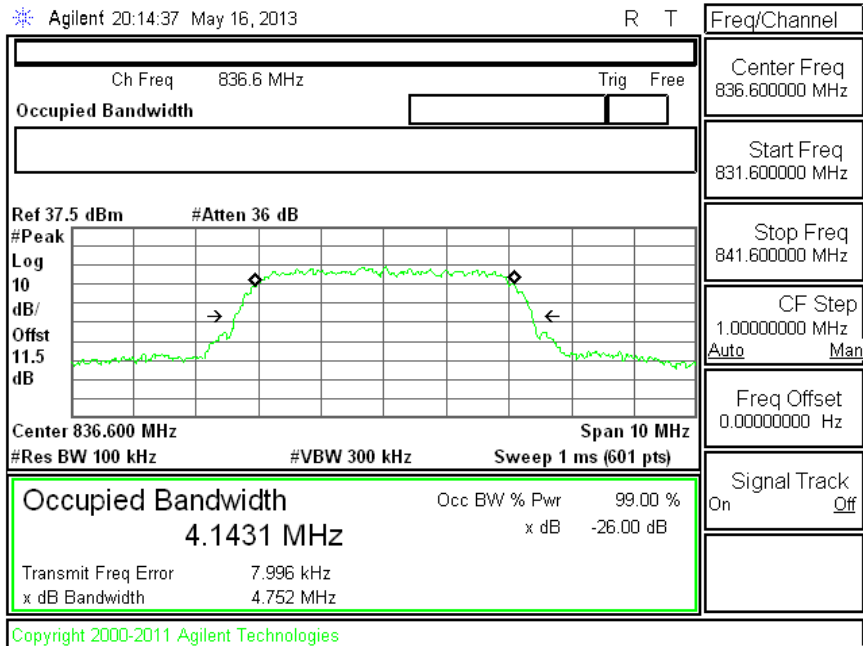


8.1.2. UMTS-REL 99

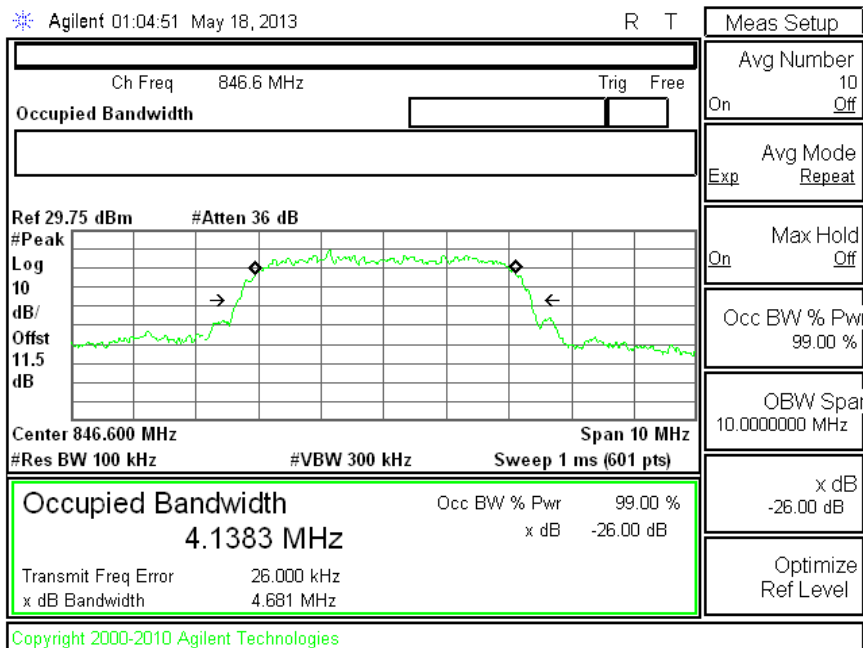
CELL BAND

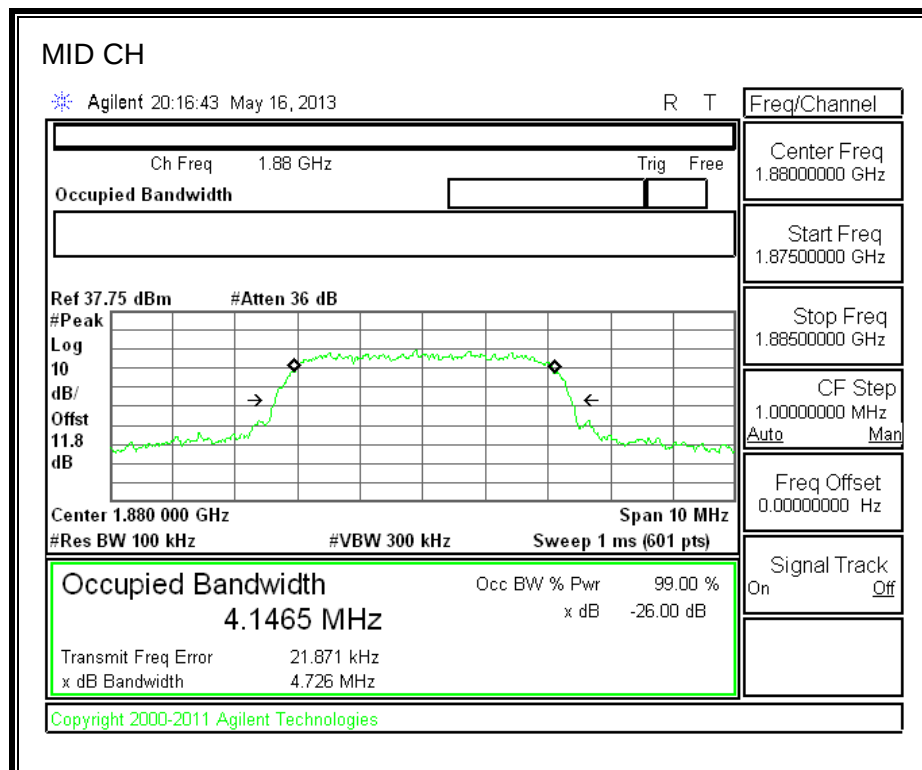
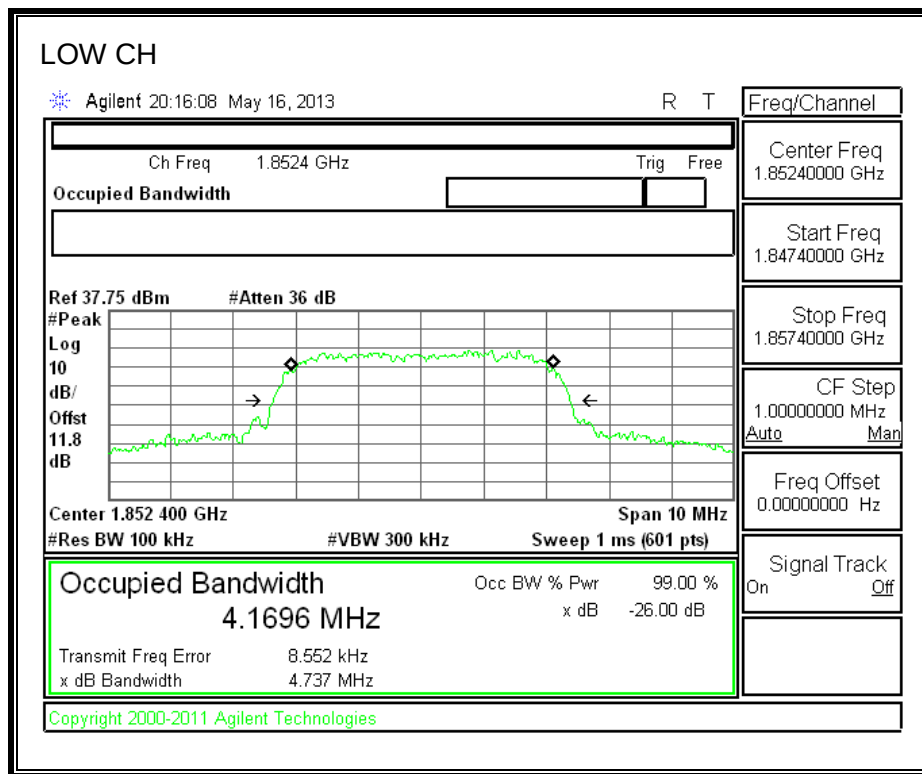


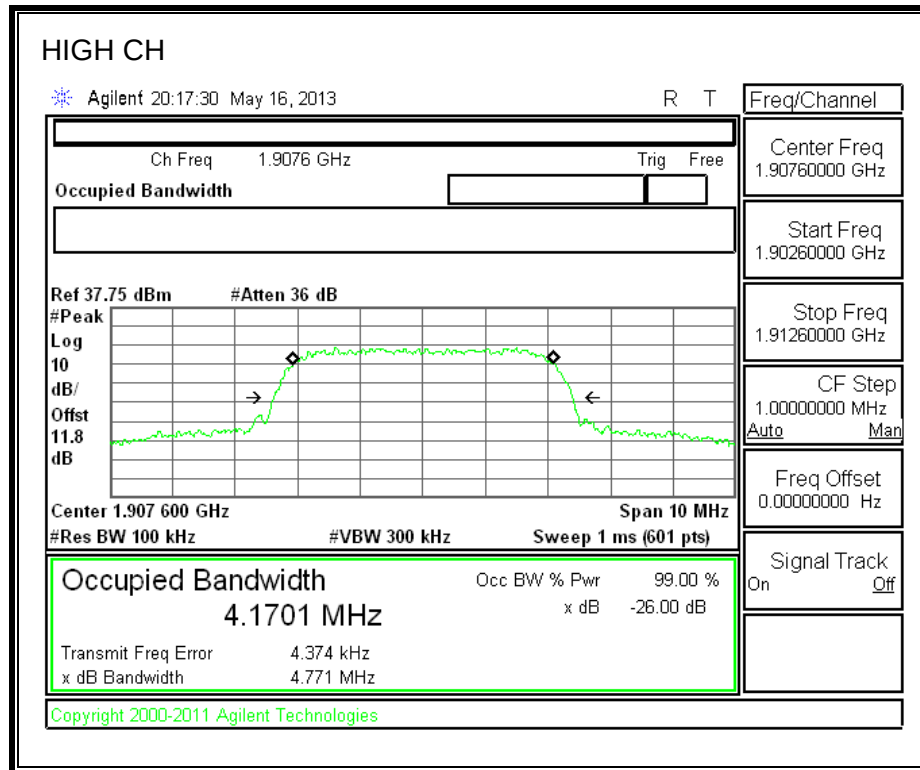
MID CH



HIGH CH







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, 849, 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.

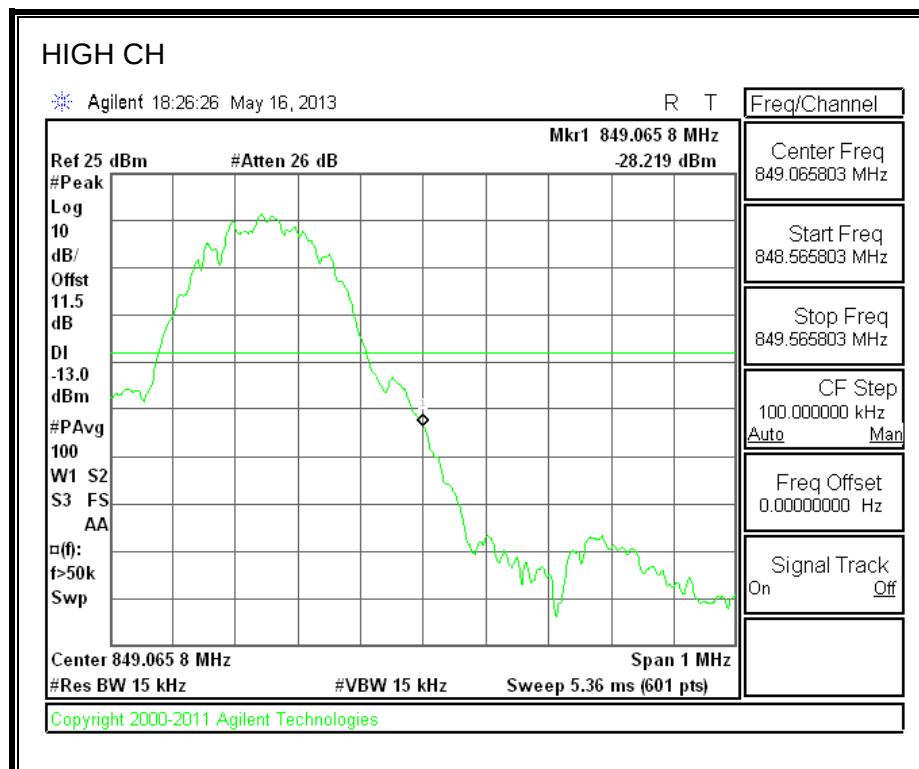
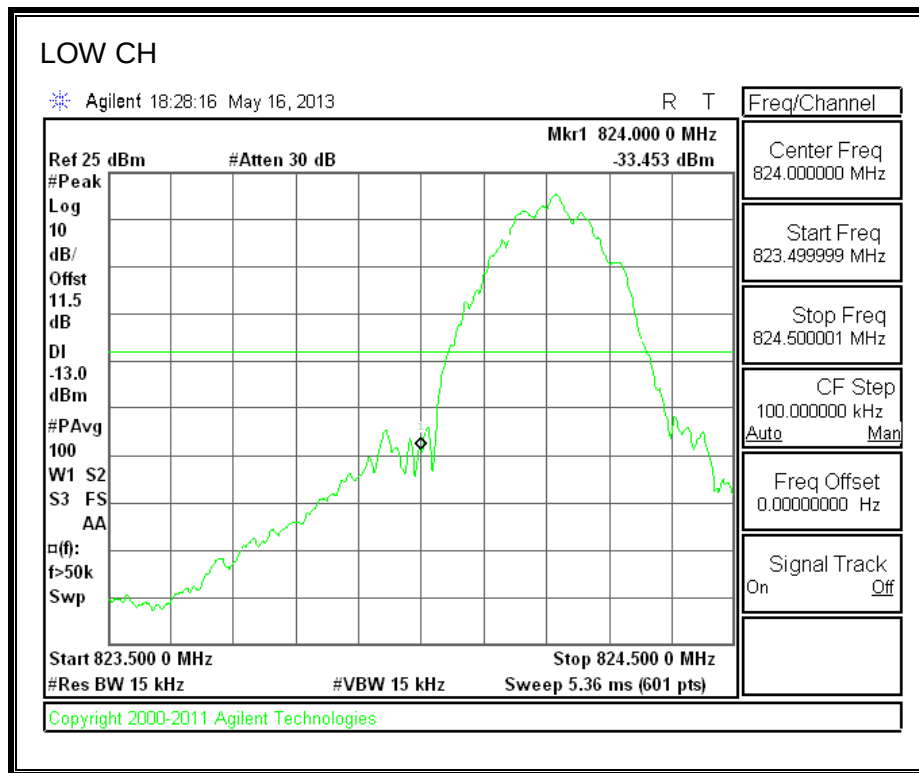
MODES TESTED

- GSM: GPRS
- UMTS: WCDMA and HSDPA

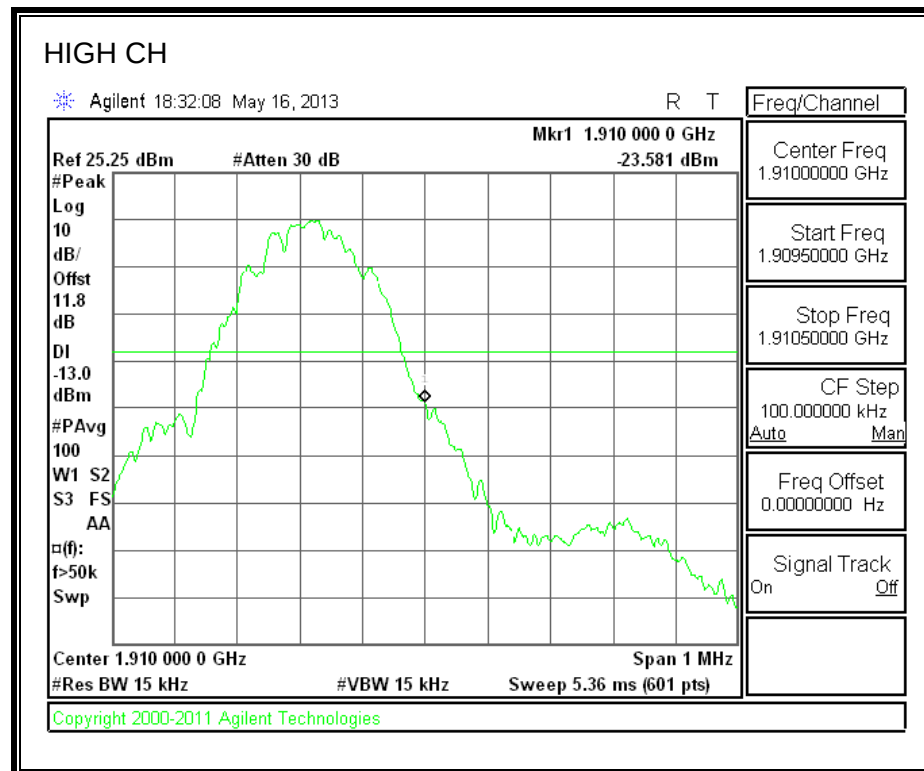
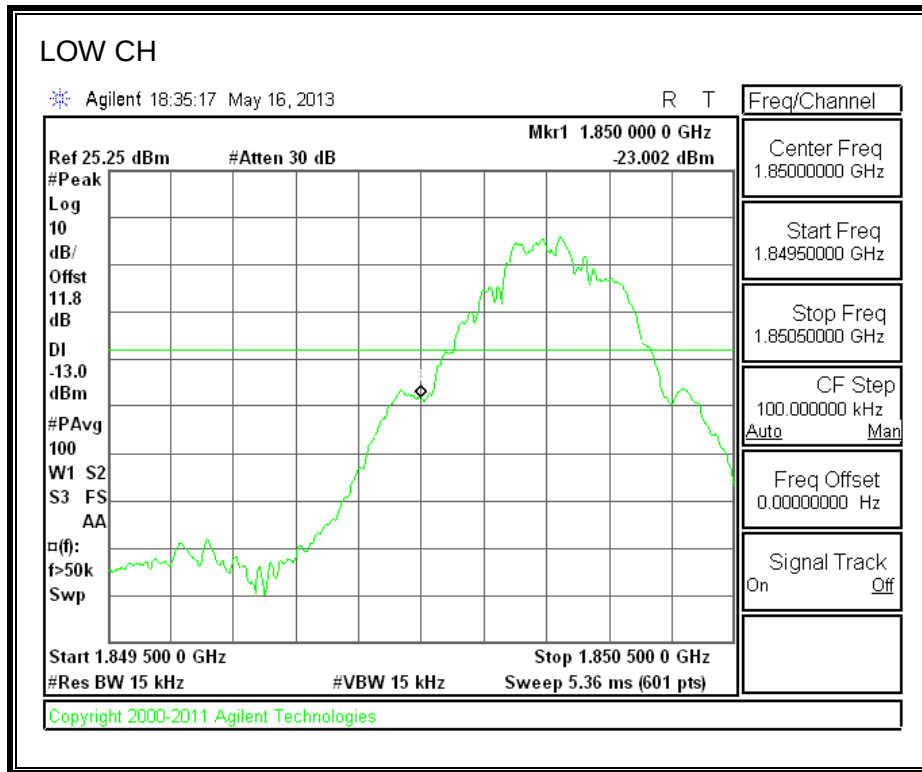
RESULTS

8.2.1. GSM-GPRS

CELL BAND

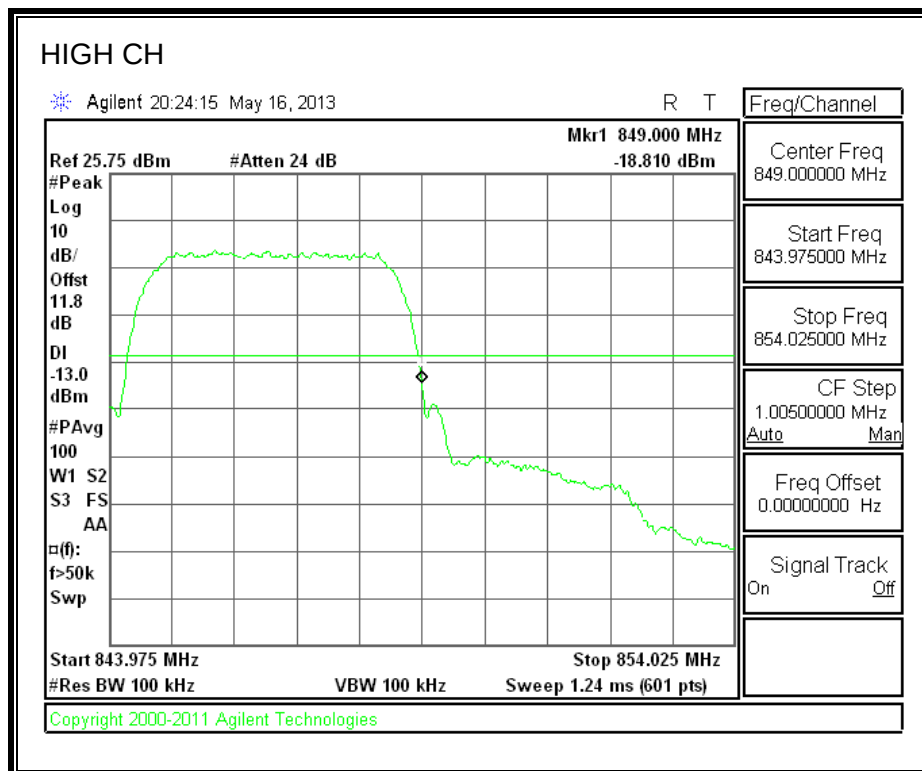
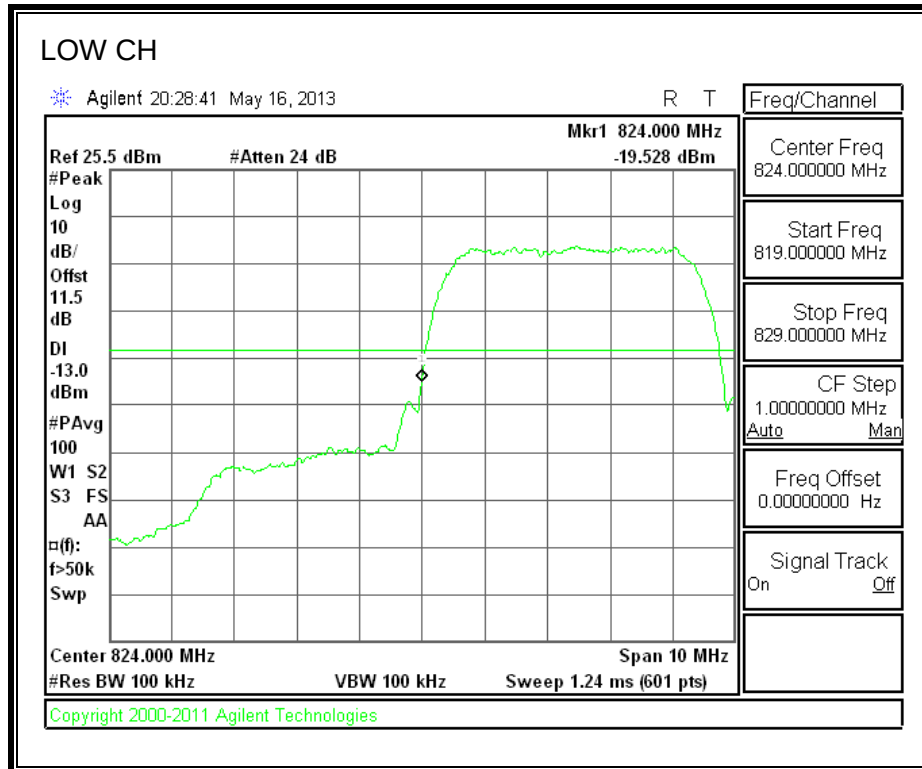


PCS BAND

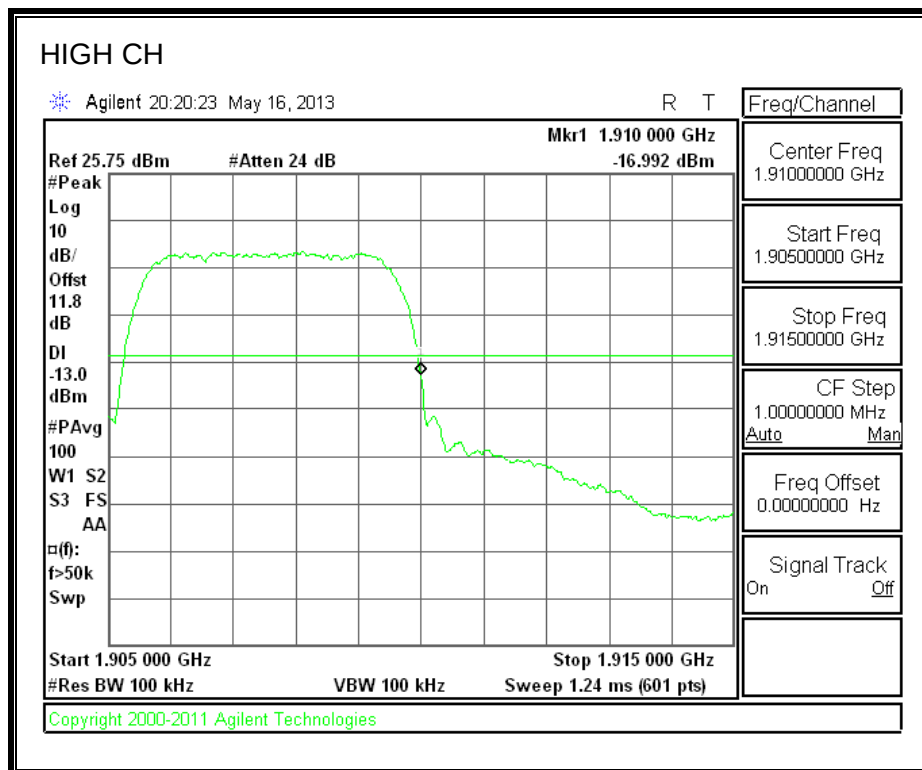
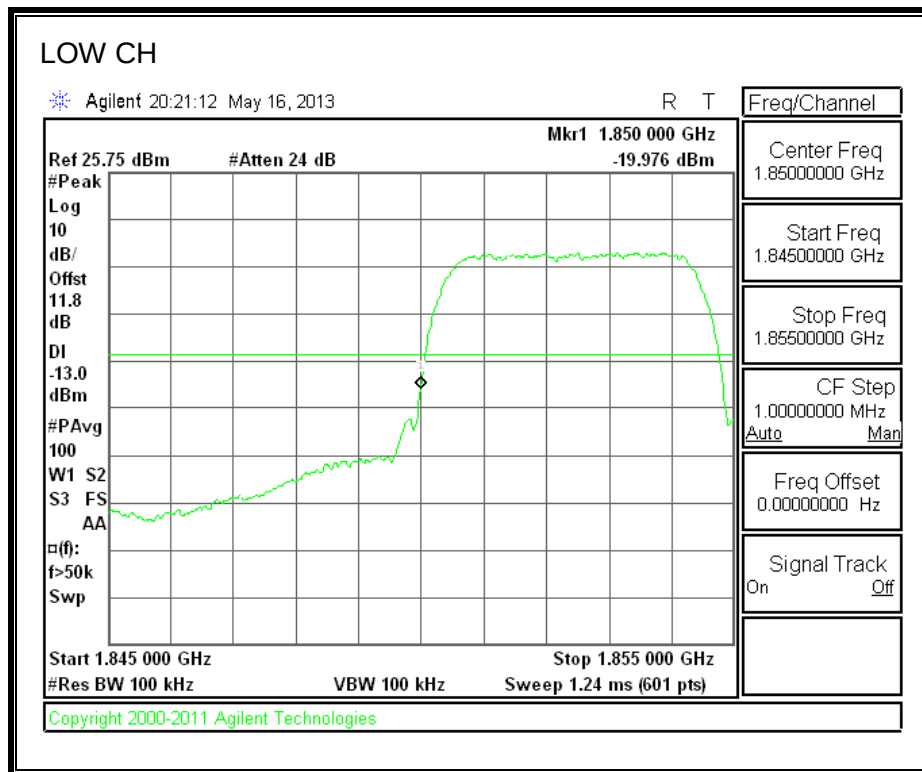


8.2.2. UMTS-REL 99

CELL BAND



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.

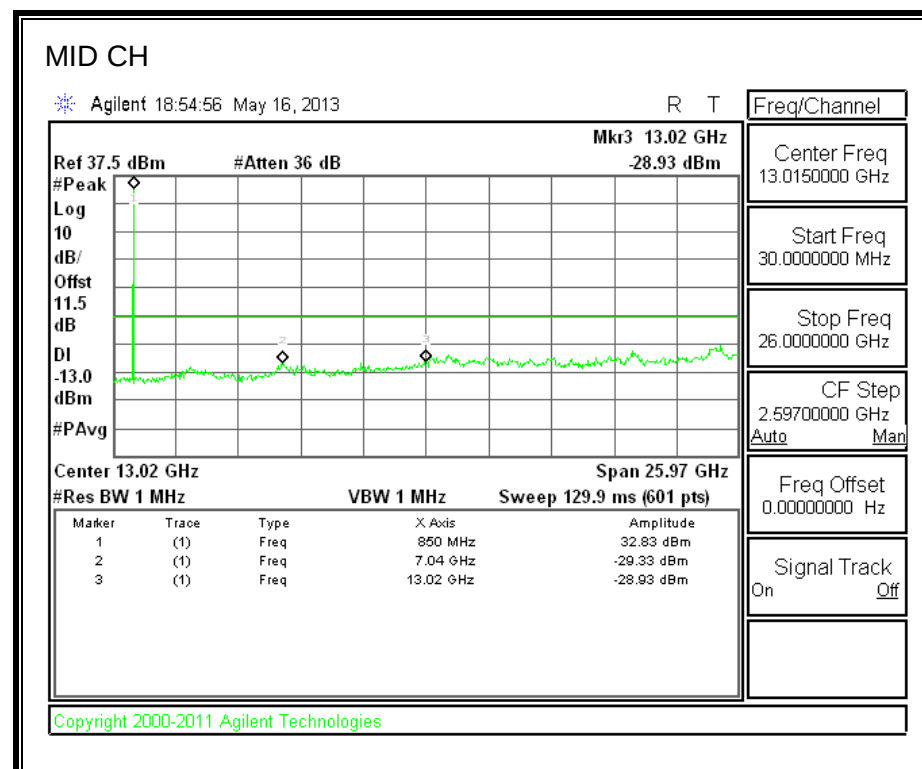
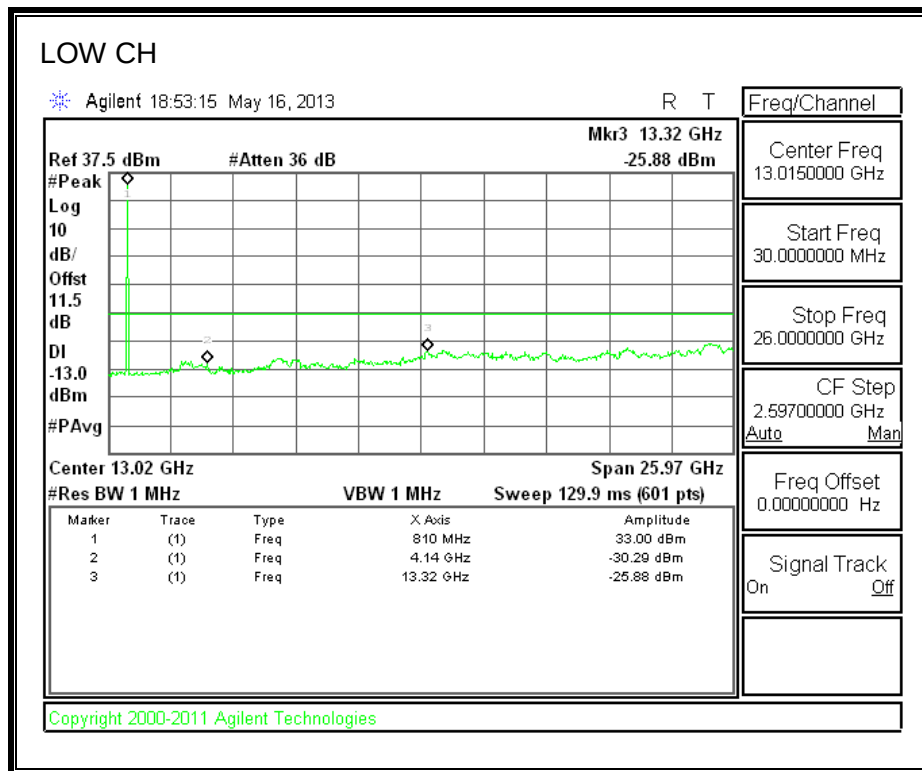
MODES TESTED

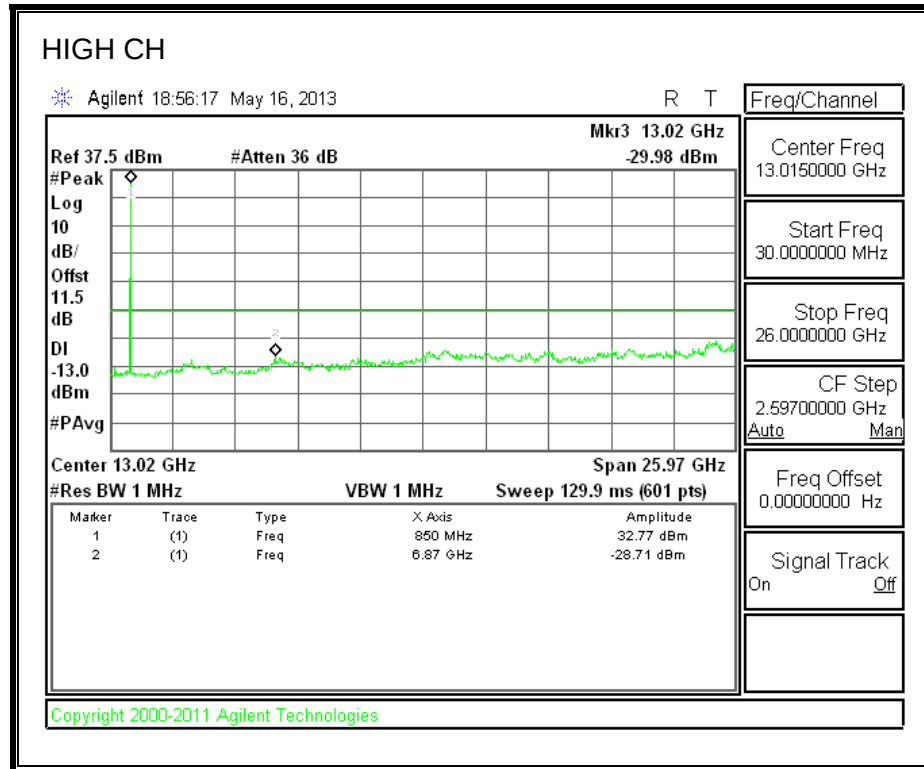
- GSM: GPRS
- UMTS: WCDMA and HSDPA

RESULTS

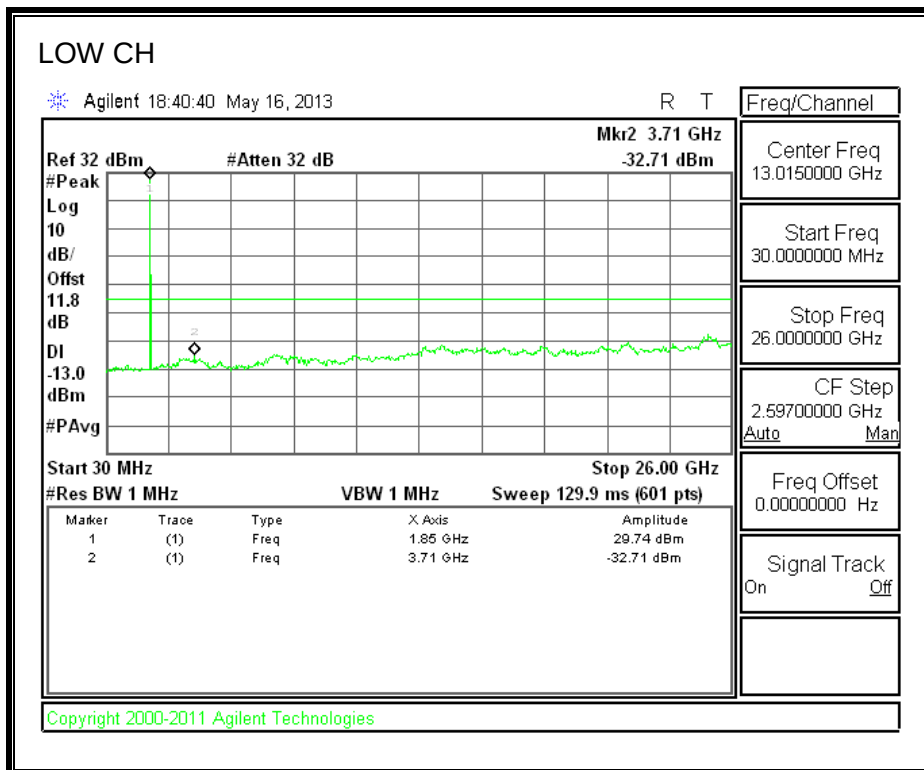
8.3.1. GSM-GPRS

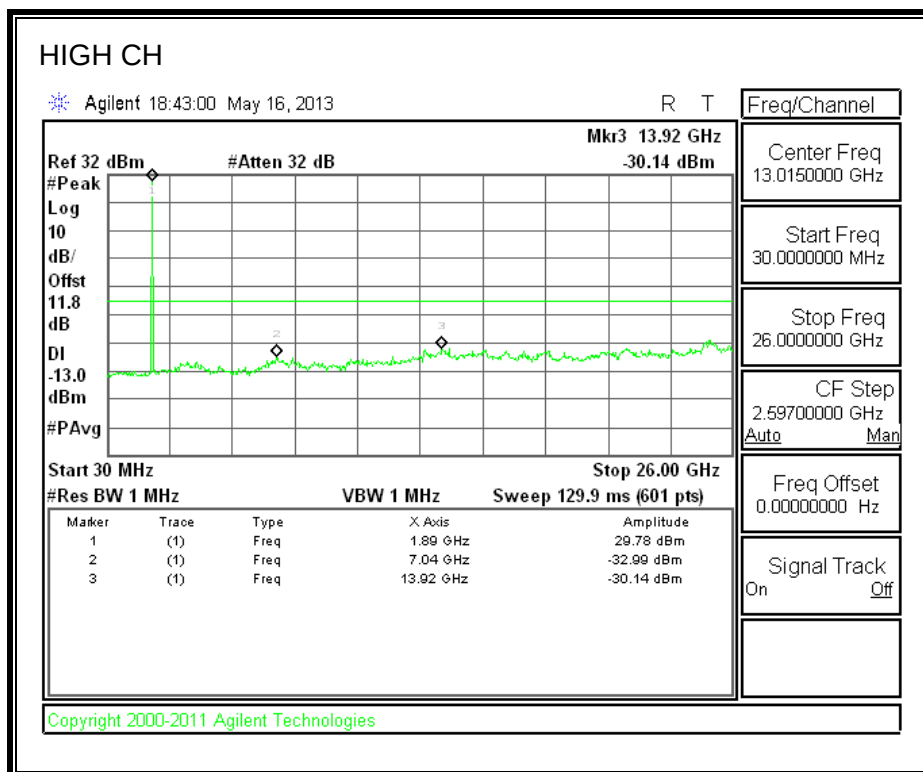
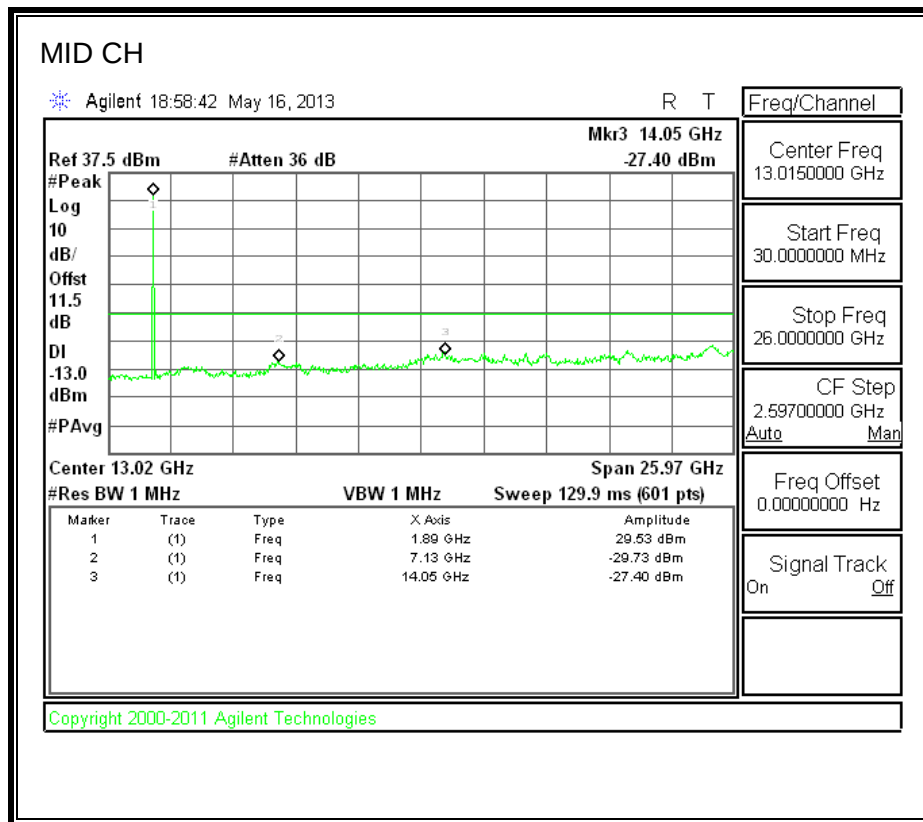
CELL BAND





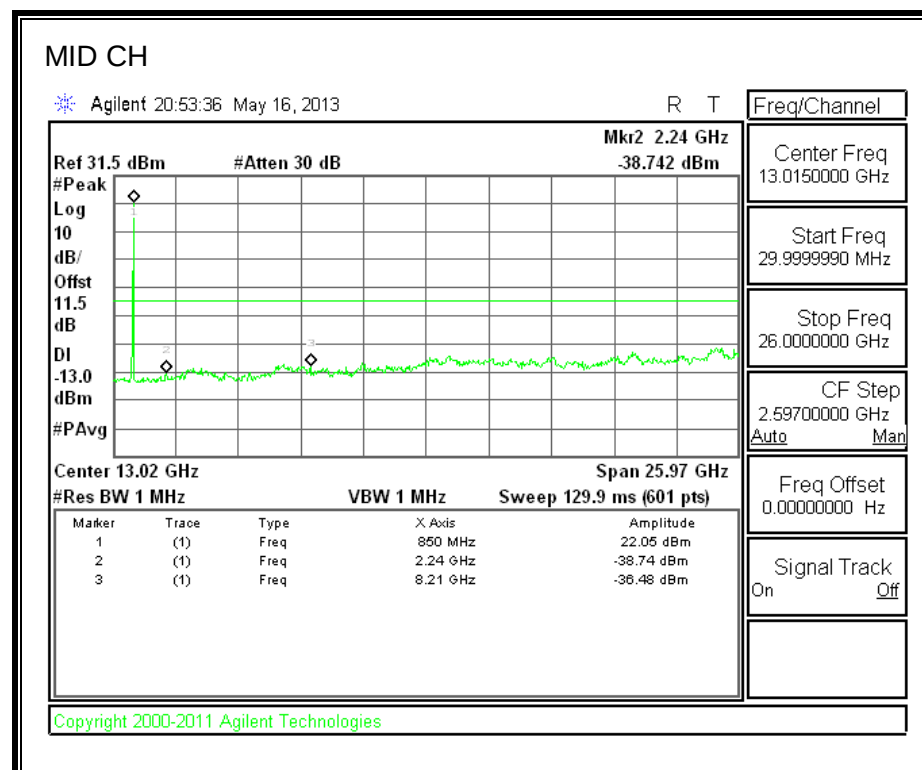
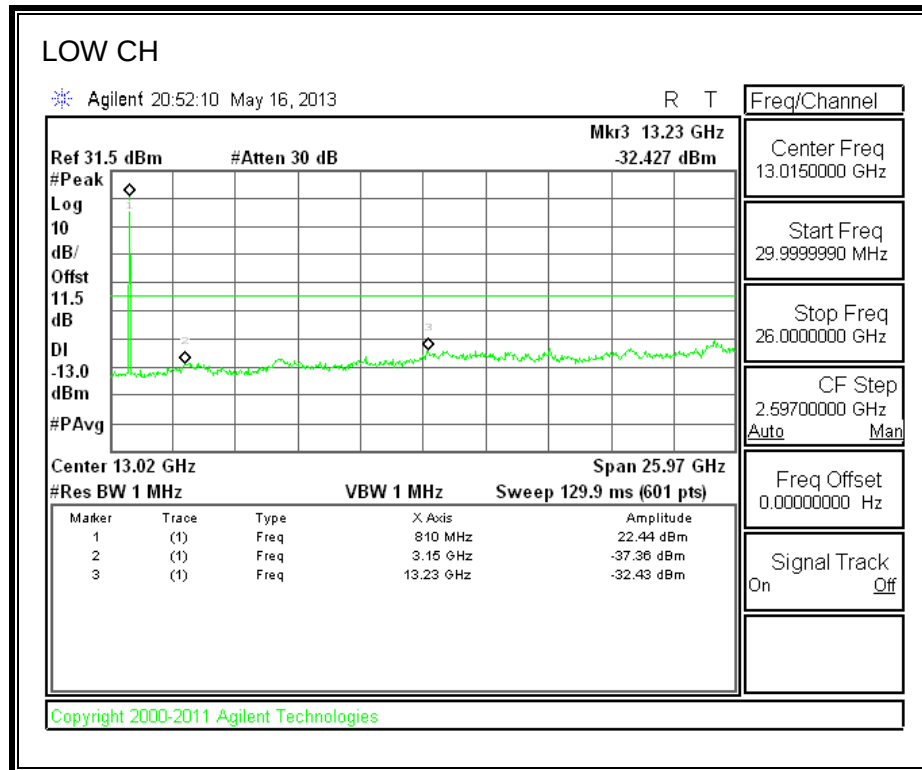
PCS BAND

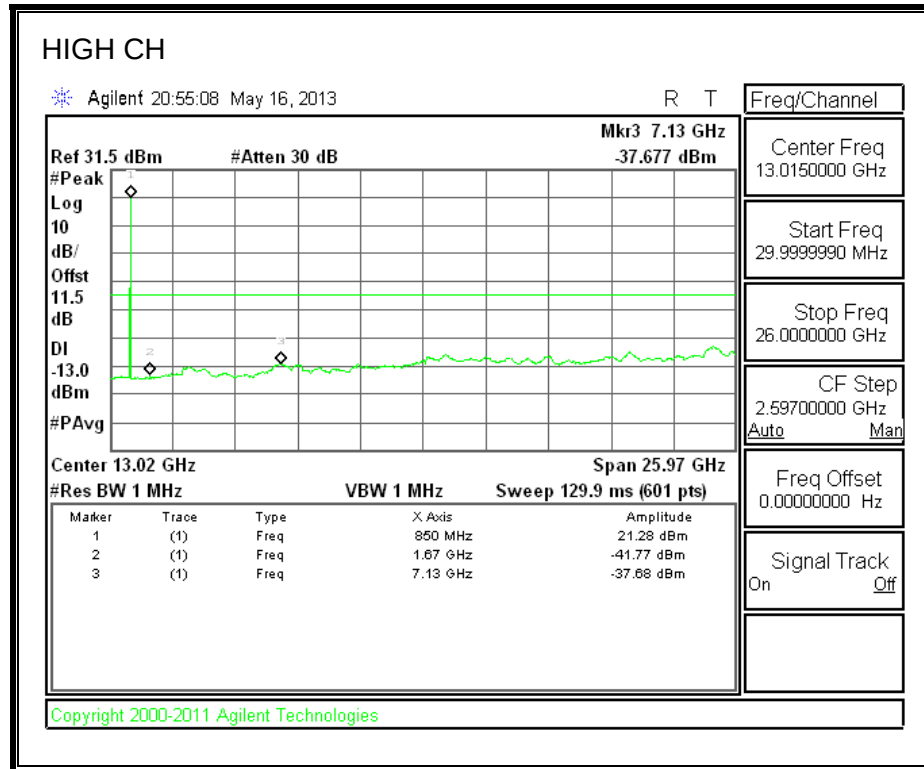




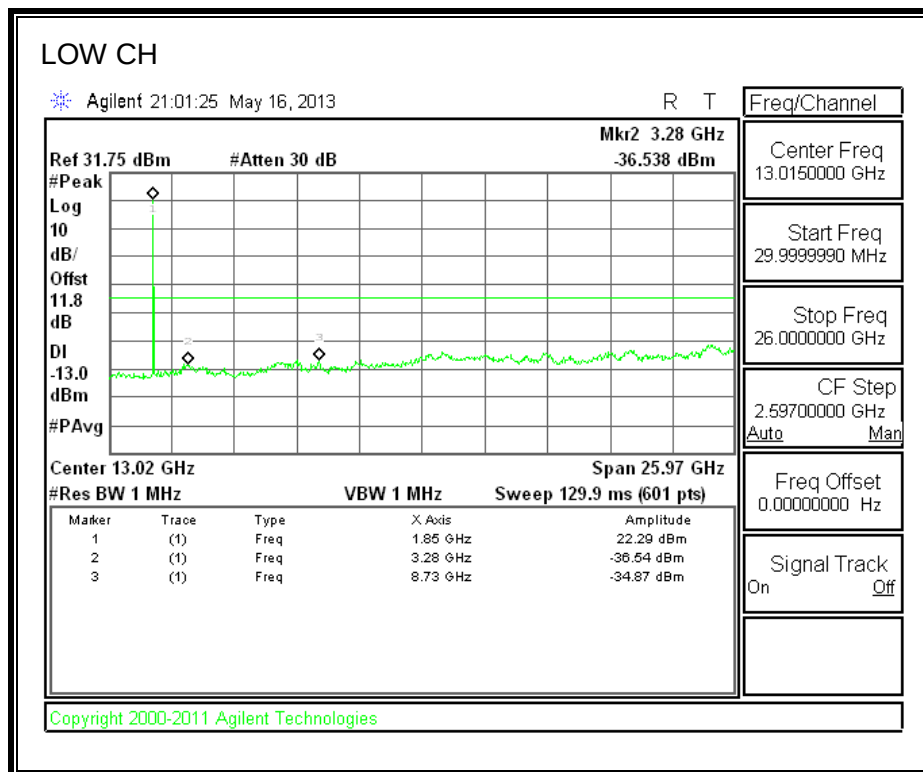
8.3.2. UMTS-REL 99

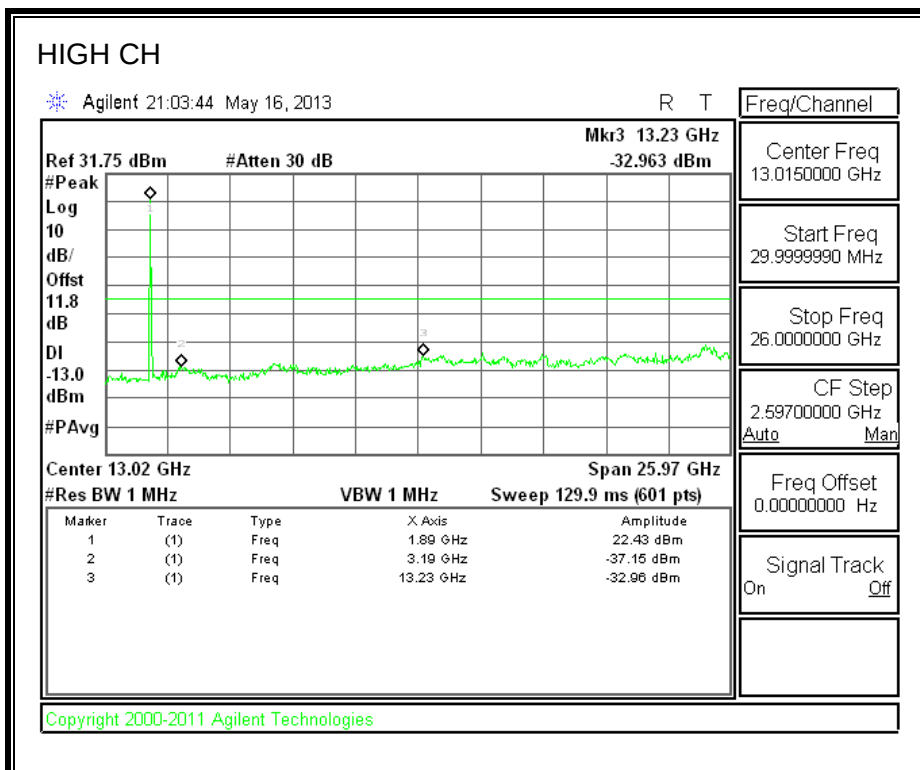
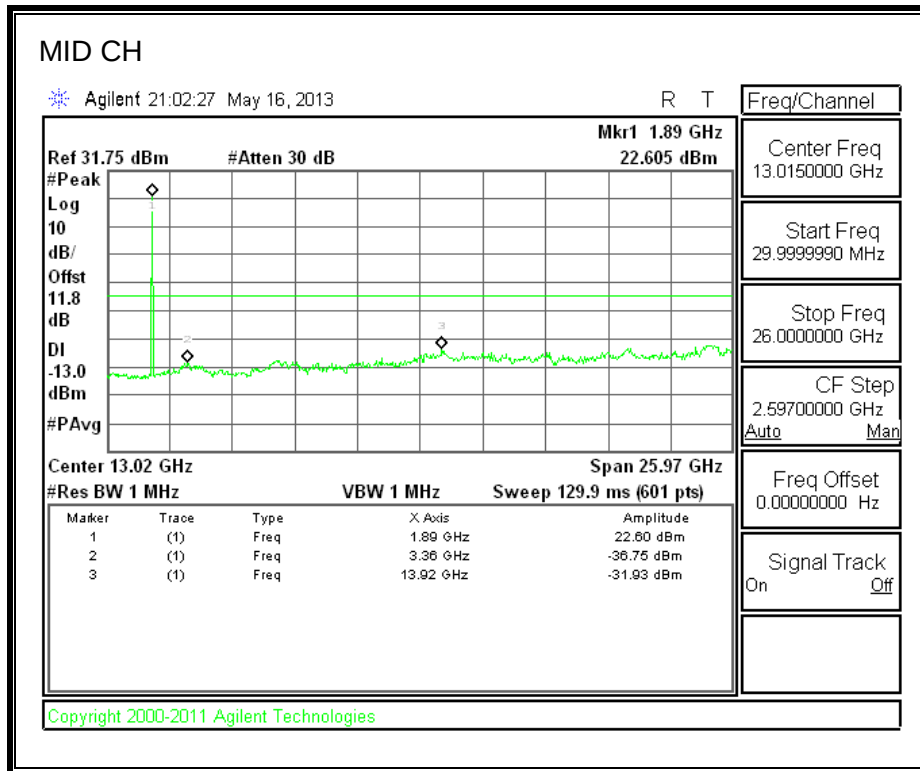
CELL BAND





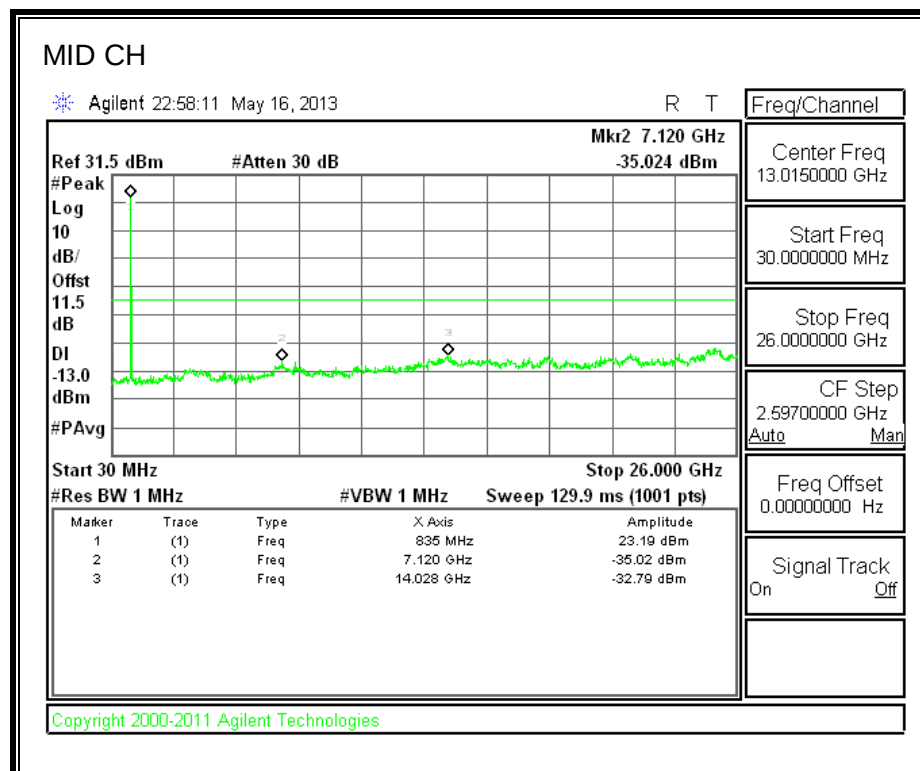
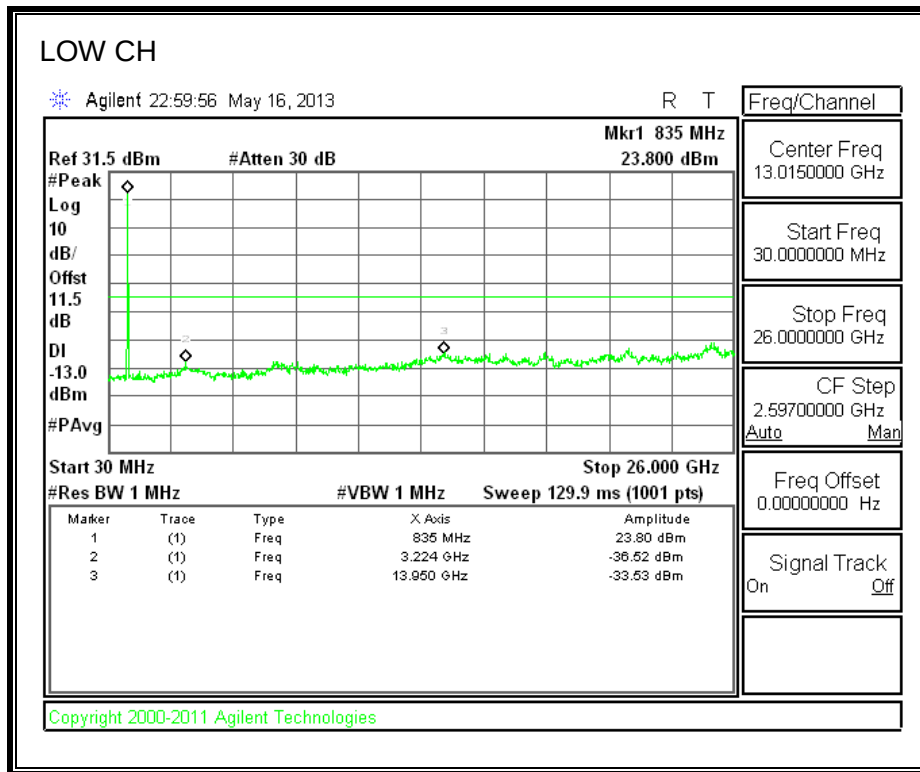
PCS BAND

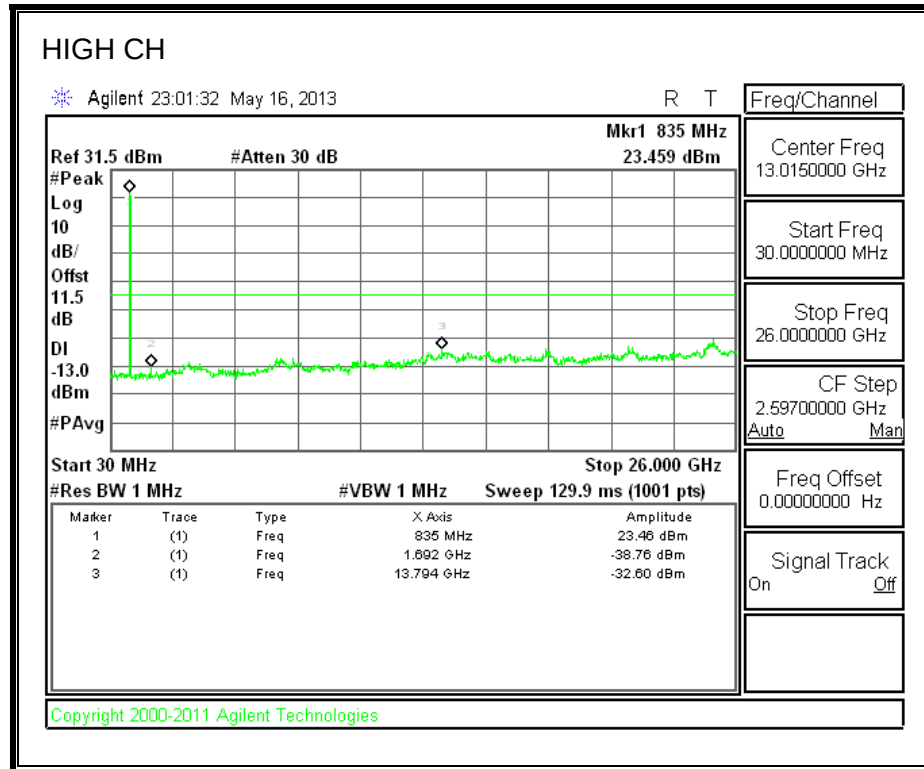




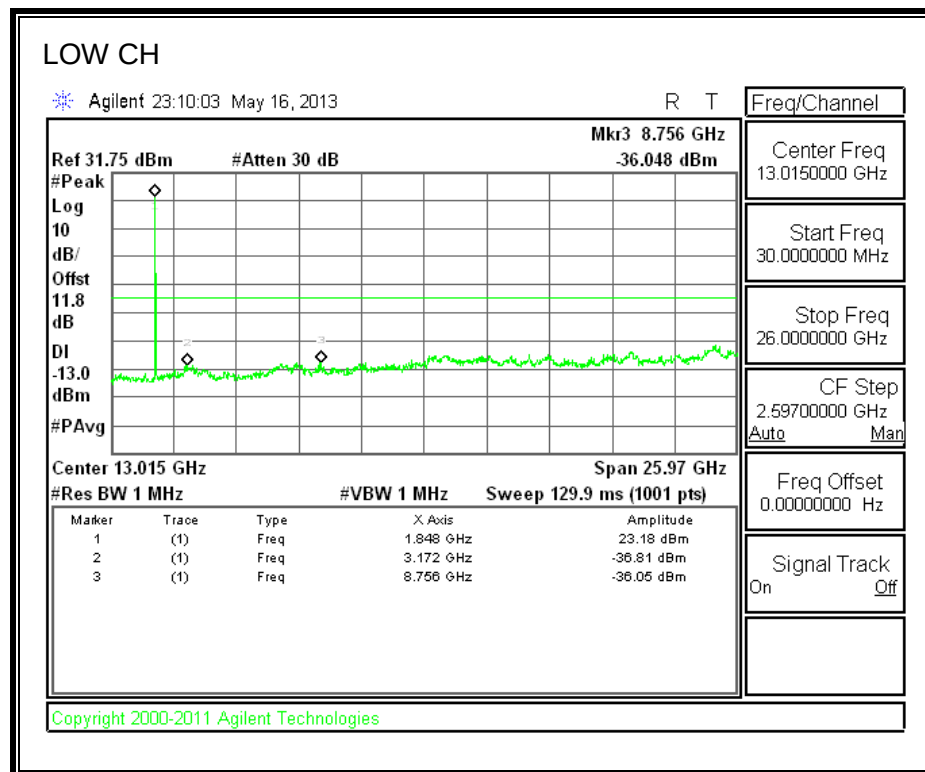
8.3.3. UMTS-HSDPA

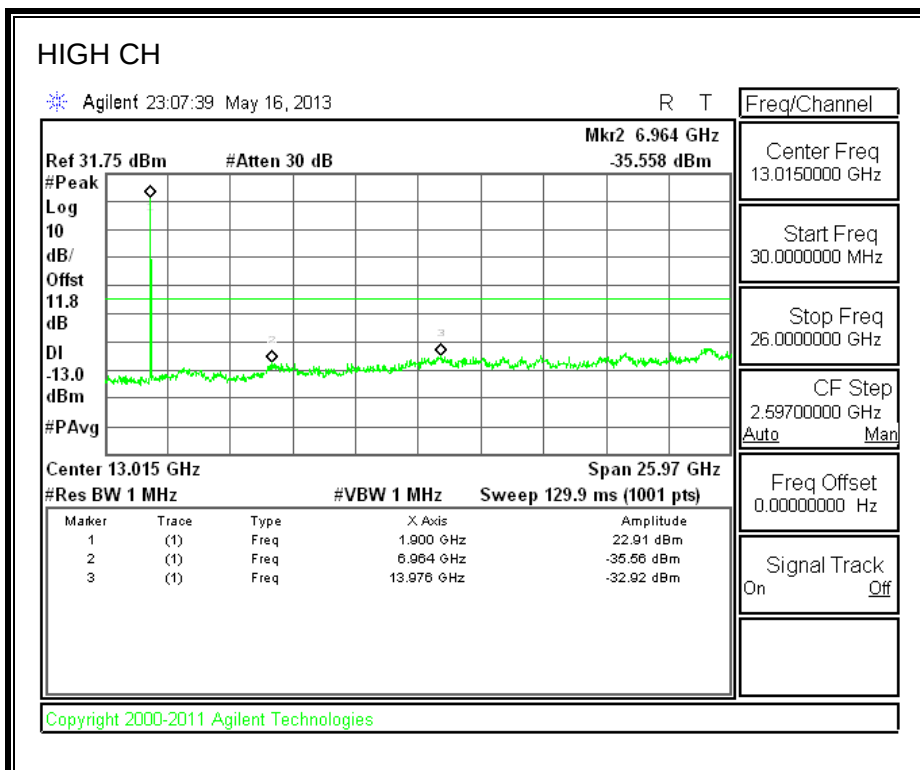
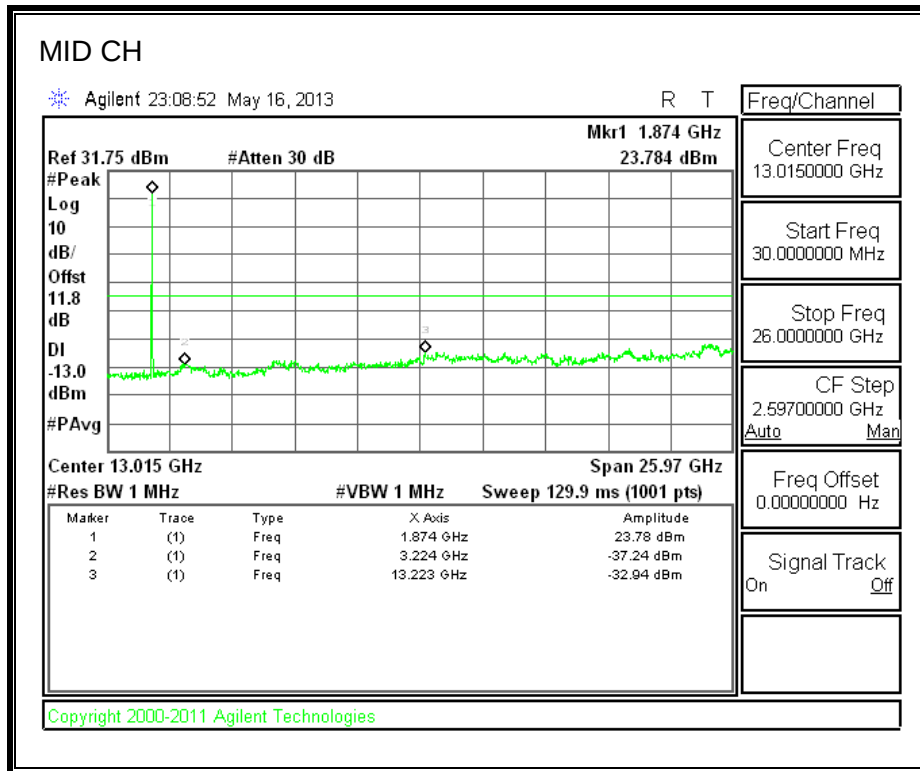
CELL BAND





PCS BAND





9. 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 & §27.54 - 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, 3.7Vdc, 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

- GSM: GPRS
- UMTS: WCDMA and HSDPA

RESULTS

See the following pages.

CELL, GPRS MODULATION – MID CHANNEL

Reference Frequency: Cellular Mid Channel 836.600027MHz @ 20°C Limit: to stay +/- 2.5 ppm = 2091.500 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.70	50	836.600001	0.007	2.5
3.70	40	836.600011	-0.005	2.5
3.70	30	836.600003	-0.027	2.5
3.70	20	836.600007	0	2.5
3.70	10	836.600011	-0.005	2.5
3.70	0	836.599991	0.019	2.5
3.70	-10	836.600013	-0.007	2.5
3.70	-20	836.600004	0.004	2.5
3.70	-30	836.600004	0.004	2.5

Reference Frequency: Cellular Mid Channel 836.600027MHz @ 20°C Limit: to stay +/- 2.5 ppm = 2091.500 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.70	20	836.600007	0	2.5
4.20	20	836.600001	0.007	2.5
3.30	20	836.600013	-0.007	2.5
End Volt(3.2)	20		1000000.000	2.5

PCS, GPRS MODULATION – MID CHANNEL

Reference Frequency: PCS Mid Channel 1880.000036MHz @ 20°C Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.70	50	1880.000015	0.003	2.5
3.70	40	1880.000012	0.005	2.5
3.70	30	1880.000003	-0.005	2.5
3.70	20	1880.000021	0	2.5
3.70	10	1880.000017	0.002	2.5
3.70	0	1880.000021	0.000	2.5
3.70	-10	1880.000024	-0.002	2.5
3.70	-20	1880.000028	-0.004	2.5
3.70	-30	1880.000022	-0.001	2.5

Reference Frequency: PCS Mid Channel 1880.000036MHz @ 20°C Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.70	20	1880.000021	0.00000	2.5
4.20	20	1880.000013	0.00426	2.5
3.30	20	1880.000008	0.00691	2.5
End Volt(3.2)	20		1000000.00000	2.5

CELL WCDMA – MID CHANNEL

Reference Frequency: Cellular Mid Channel 835.999992MHz @ 20°C Limit: to stay +/- 2.5 ppm = 2091.500 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.70	50	836.599996	0.001	2.5
3.70	40	836.599996	0.001	2.5
3.70	30	836.599996	0.001	2.5
3.70	20	836.599997	0	2.5
3.70	10	836.599997	0.000	2.5
3.70	0	836.599996	0.001	2.5
3.70	-10	836.599996	0.001	2.5
3.70	-20	836.599997	0.000	2.5
3.70	-30	836.599996	0.001	2.5

Reference Frequency: Cellular Mid Channel 836.000004MHz @ 20°C Limit: to stay +/- 2.5 ppm = 2091.500 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.70	20	836.599996	0	2.5
4.20	20	836.599997	-0.001	2.5
3.30	20	836.599998	-0.002	2.5
End Volt(3.2)	20		1000000.000	2.5

PCS, WCDMA – MIDCHANNEL

Reference Frequency: PCS Mid Channel 1879.999985MHz @ 20°C Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.70	50	1879.999996	0.001	2.5
3.70	40	1879.999997	0.000	2.5
3.70	30	1879.999996	0.001	2.5
3.70	20	1879.999997	0	2.5
3.70	10	1879.999997	0.000	2.5
3.70	0	1879.999996	0.001	2.5
3.70	-10	1879.999996	0.001	2.5
3.70	-20	1879.999997	0.000	2.5
3.70	-30	1879.999996	0.001	2.5

Reference Frequency: PCS Mid Channel 1880.000036MHz @ 20°C Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.70	20	1879.999997	0.00000	2.5
4.20	20	1879.999997	0.00000	2.5
3.30	20	1879.999996	0.00053	2.5
End Volt(3.2)	20		1000000.00000	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 603C Clause 2.2.17

MODES TESTED

- GSM: GPRS
- UMTS: WCDMA and HSDPA

RESULTS

Mode	Channel	f (MHz)	ERP	
			dBm	mW
GPRS	128	824.20	21.10	128.82
	190	836.60	21.30	134.90
	251	848.80	22.40	173.78

Mode	Channel	f (MHz)	EIRP	
			dBm	mW
GPRS	512	1850.20	29.61	914.11
	661	1880.00	29.71	935.41
	810	1909.80	30.11	1025.65

Mode	Channel	f (MHz)	ERP	
			dBm	mW
UMTS850, REL 99	4357	826.40	16.00	39.81
	4405	836.00	15.60	36.31
	4455	846.00	18.80	75.86

*Verified the ERP to be the highest in REL99 vs. HSDPA/HSUPA.

Mode	Channel	f (MHz)	EIRP	
			dBm	mW
UMTS1900, REL 99	9662	1852.40	23.41	219.28
	9800	1880.00	24.41	276.06
	9938	1907.60	24.21	263.63

*Verified EIRP to be highest in REL 99 vs. HSDPA/HSUPA.

10.1.1. GSM-GPRS
CELL BAND (ERP)

High Frequency Substitution Measurement Compliance Certification Services Chamber B								
Company: Samsung Project #: 13I15168 Date: 05/17/13 Test Engineer: Roy Zheng Configuration: EUT with AC and HS Mode: GSM, 850 GPRS								
Test Equipment:								
Receiving: Sunol T243, and Chamber B N-type Cable (Setup this one for testing EUT)								
Substitution: Dipole S/N: 00022117, 4ft 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	21.70	V	0.6	0.0	21.10	38.5	-17.3	
824.20	21.00	H	0.6	0.0	20.40	38.5	-18.0	
Mid Ch								
836.60	21.90	V	0.6	0.0	21.30	38.5	-17.1	
836.60	21.60	H	0.6	0.0	21.00	38.5	-17.4	
High Ch								
848.80	23.00	V	0.6	0.0	22.40	38.5	-16.0	
848.80	21.50	H	0.6	0.0	20.90	38.5	-17.5	
Rev. 3.17.11								

PCS BAND (EIRP)

**High Frequency Fundamental Measurement
Compliance Certification Services 5M Chamber B**

Company: Samsung
Project #: 13I15168
Date: 05/17/13
Test Engineer: Roy Zheng
Configuration: EUT with AC and HS
Mode: GSM 1900 GPRS

Test Equipment:

Receiving: Horn T59, and Chamber B SMA Cables
Substitution: Horn T60 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	22.0	V	0.85	8.46	29.61	33.0	-3.4	
1.850	17.3	H	0.85	8.52	24.97	33.0	-8.0	
Mid Ch								
1.880	22.1	V	0.85	8.46	29.71	33.0	-3.3	
1.880	17.9	H	0.85	8.52	25.57	33.0	-7.4	
High Ch								
1.910	22.5	V	0.85	8.46	30.11	33.0	-2.9	
1.910	19.3	H	0.85	8.52	26.97	33.0	-6.0	

Rev. 3.17.11

10.1.2. UMTS-REL 99
CELL BAND (ERP)

High Frequency Substitution Measurement Compliance Certification Services Chamber B								
Company: Samsung								
Project #: 13I15168								
Date: 05/17/13								
Test Engineer: Roy Zheng								
Configuration: EUT with AC and HS								
Mode: UMTS,850 REL 99								
Test Equipment:								
Receiving: Sunol T243, and Chamber B N-type Cable (Setup this one for testing EUT)								
Substitution: Dipole S/N: 00022117, 4ft 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								
826.40	15.90	V	0.6	0.0	15.30	38.5	-23.1	
826.40	16.60	H	0.6	0.0	16.00	38.5	-22.4	
Mid Ch								
836.60	16.20	V	0.6	0.0	15.60	38.5	-22.8	
836.60	14.90	H	0.6	0.0	14.30	38.5	-24.1	
High Ch								
846.60	18.10	V	0.6	0.0	17.50	38.5	-20.9	
846.60	19.40	H	0.6	0.0	18.80	38.5	-19.6	
Rev. 3.17.11								

PCS BAND (EIRP)

High Frequency Fundamental Measurement Compliance Certification Services Chamber 5m								
Company: Samsung Project #: 13I15168 Date: 05/17/13 Test Engineer: Roy Zheng Configuration: EUT with AC and HS Mode: UMTS REL 99 1900MHz								
Test Equipment: Receiving: Horn T59, and Chamber 5m SMA Cables Substitution: Horn T60 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	15.8	V	0.85	8.46	23.41	33.0	-9.6	
1.852	11.4	H	0.85	8.52	19.07	33.0	-13.9	
Mid Ch								
1.880	16.8	V	0.85	8.46	24.41	33.0	-8.6	
1.880	12.5	H	0.85	8.52	20.17	33.0	-12.8	
High Ch								
1.908	16.6	V	0.85	8.46	24.21	33.0	-8.8	
1.908	12.1	H	0.85	8.52	19.77	33.0	-13.2	
Rev. 3.17.11								

10.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238

LIMIT

§22.917 (e) and §24.238 (a): Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

TEST PROCEDURE

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

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

MODES TESTED

- GSM: GPRS (Determined to be the worst case)
- UMTS: WCDMA (Determined to be the worst case)

RESULTS

10.2.1. GSM-GPRS

CELL BAND

Compliance Certification Services									
Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		13I15168							
Date:		05/17/13							
Test Engineer:		Steven Tran							
Configuration:		Z 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	-5.6	V	3.0	37.4	1.0	-42.0	-13.0	-29.0	
2.473	-12.4	V	3.0	36.4	1.0	-47.8	-13.0	-34.8	
3.297	-17.4	V	3.0	35.8	1.0	-52.2	-13.0	-39.2	
1.648	-9.3	H	3.0	37.4	1.0	-45.7	-13.0	-32.7	
2.473	-16.8	H	3.0	36.4	1.0	-52.2	-13.0	-39.2	
3.297	-12.8	H	3.0	35.8	1.0	-47.6	-13.0	-34.6	
Mid Ch, (836.6MHz)									
1.673	-20.0	V	3.0	37.3	1.0	-56.3	-13.0	-43.3	
2.510	-6.7	V	3.0	36.4	1.0	-42.0	-13.0	-29.0	
3.346	-12.1	V	3.0	35.8	1.0	-46.9	-13.0	-33.9	
4.183	-17.9	V	3.0	35.0	1.0	-52.0	-13.0	-39.0	
1.673		H	3.0	37.3	1.0	-36.3	-13.0	-23.3	
2.510	-11.0	H	3.0	36.4	1.0	-46.4	-13.0	-33.4	
3.346	-14.0	H	3.0	35.8	1.0	-48.7	-13.0	-35.7	
4.183	-12.4	H	3.0	35.0	1.0	-46.4	-13.0	-33.4	
High Ch, (848.8MHz)									
1.698	-18.1	V	3.0	37.3	1.0	-54.4	-13.0	-41.4	
2.546	-10.0	V	3.0	36.3	1.0	-45.4	-13.0	-32.4	
3.395	-14.0	V	3.0	35.7	1.0	-48.7	-13.0	-35.7	
4.244	-19.0	V	3.0	35.0	1.0	-53.0	-13.0	-40.0	
1.698	-19.4	H	3.0	37.3	1.0	-55.7	-13.0	-42.7	
2.546	-16.0	H	3.0	36.3	1.0	-51.3	-13.0	-38.3	
3.395	-16.4	H	3.0	35.7	1.0	-51.1	-13.0	-38.1	
4.24	-14.1	H	3.0	35.0	1.0	-48.1		-48.1	
Rev. 03.03.09									
Note: No other emissions were detected above the system noise floor.									

PCS BAND

Compliance Certification Services Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		13I15168							
Date:		05/17/13							
Test Engineer:		Steven Tran							
Configuration:		z 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	-18.3	V	3.0	35.4	1.0	-52.7	-13.0	-39.7	
5.551	-14.0	V	3.0	34.7	1.0	-47.7	-13.0	-34.7	
7.401	-14.5	V	3.0	34.9	1.0	-48.4	-13.0	-35.4	
3.700	-17.5	H	3.0	35.4	1.0	-51.9	-13.0	-38.9	
5.551	-14.7	H	3.0	34.7	1.0	-48.4	-13.0	-35.4	
7.401	-13.7	H	3.0	34.9	1.0	-47.6	-13.0	-34.6	
Mid Ch, 1880MHz									
3.760	-19.1	V	3.0	35.3	1.0	-53.4	-13.0	-40.4	
5.640	-9.5	V	3.0	34.7	1.0	-43.3	-13.0	-30.3	
7.520	-13.3	V	3.0	34.9	1.0	-47.2	-13.0	-34.2	
3.760	-19.0	H	3.0	35.3	1.0	-53.3	-13.0	-40.3	
5.640	-8.8	H	3.0	34.7	1.0	-42.6	-13.0	-29.6	
7.520	-9.8	H	3.0	34.9	1.0	-43.7	-13.0	-30.7	
High Ch, 1909.8MHz									
3.820	-13.4	V	3.0	35.3	1.0	-47.7	-13.0	-34.7	
5.729	-8.0	V	3.0	34.7	1.0	-41.7	-13.0	-28.7	
7.639	-9.8	V	3.0	35.0	1.0	-43.8	-13.0	-30.8	
3.820	-19.0	H	3.0	35.3	1.0	-53.3	-13.0	-40.3	
5.729	-6.2	H	3.0	34.7	1.0	-39.9	-13.0	-26.9	
7.639	-9.4	H	3.0	35.0	1.0	-43.4	-13.0	-30.4	
Rev. 03.03.09									
Note: No other emissions were detected above the system noise floor.									

10.2.2. UMTS-REL 99

CELL BAND

UL Verification Services									
Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		13U15168							
Date:		05/07/13							
Test Engineer:		Steven Tran							
Configuration:		EUT w/ headphones+charger, X position							
Mode:		TX, UMTS 850MHz, Rel 99							
Chamber		Pre-amplifier		Filter		Limit			
5m Chamber B		T145 8449B		Filter 1		FCC 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 Channel (826.4MHz)									
1.653	-7.6	V	3.0	35.5	1.0	-42.1	-13.0	-29.1	
1.653	-14.3	H	3.0	35.5	1.0	-48.8	-13.0	-35.8	
Mid Channel (836.6MHz)									
1.673	-12.2	V	3.0	35.5	1.0	-46.8	-13.0	-33.8	
1.673	-18.5	H	3.0	35.5	1.0	-53.0	-13.0	-40.0	
High Channel (846.8MHz)									
1.694	-7.9	V	3.0	35.5	1.0	-42.5	-13.0	-29.5	
1.694	-13.6	H	3.0	35.5	1.0	-48.1	-13.0	-35.1	
Rev. 03.03.09									
Note: No other emissions were detected above the system noise floor.									

PCS BAND

UL Verification Services Above 1GHz High Frequency Substitution Measurement									
Company: Samsung									
Project #: 13I15168									
Date: 05/17/13									
Test Engineer: Steven Tran									
Configuration: z position, EUT w/ charger+headphones									
Mode: Tx, 1900MHz WCDMA Rel 99 MODE									
Chamber 5m Chamber B ▼		Pre-amplifier T145 8449B ▼		Filter Filter 1 ▼		Limit 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	-22.2	V	3.0	35.4	1.0	-56.6	-13.0	-43.6	
3.705	-19.9	H	3.0	35.4	1.0	-54.2	-13.0	-41.2	
Mid Ch, 1880.0MHz									
3.760	-19.8	V	3.0	35.3	1.0	-54.2	-13.0	-41.2	
3.760	-19.4	H	3.0	35.3	1.0	-53.7	-13.0	-40.7	
High Ch, 1907.6MHz									
3.815	-19.3	V	3.0	35.3	1.0	-53.6	-13.0	-40.6	
3.815	-17.0	H	3.0	35.3	1.0	-51.3	-13.0	-38.3	
Rev. 03.03.09 Note: No other emissions were detected above the system noise floor.									