Report No.: SZ13040100W01

FCC TEST REPORT

Issued to

RM Acquisition LLC

For

Truck Information Terminal

Model Name:	HD100
Brand Name:	RAND MCNALLY
Trade Name:	RAND MCNALLY
FCC ID:	A4C-01002A
Standard:	47 CFR Part 2
	47 CFR Part 22 Subpart H
	47 CFR Part 24 Subpart E
Test date:	2013-5-13 to 2013-7-18
Issue date:	2013-7-19

By

Shenzhen Morlab Communications Technology Co., Ltd.

Tested by	*Approved by*	*Review by*
Peng Huarui	Zeng Dexin	Nie Quan
(Test Engineer)	(Department Manager)	(Project Manager)
Date 2013.7.19	*Date* 2013.7.19	*Date* 2013.7.19

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Change History		
Issue	Date	Reason for change
1.0	Jul 19, 2013	First edition

1. GENERAL INFORMATION

1.1 EUT Description

EUT Type	:	Truck Information Terminal
Model Name	:	HD100
Serial No.	:	(n.a, marked #1 by test site)
Hardware Version	:	V4.0
Software Version	:	V4.0
Applicant	:	RM Acquisition LLC 9855 Woods Drive, Skokie, Illinos 60077
Manufacturer	:	SHENZHEN LONGHORN AUTOMATIC ELECTRONICS EQUIPMENT CO., LTD. LONGHORN HI-TECH ESTATE,GONGYEYUAN RD., DALANG STREET,BAOAN, SHENZHEN, CHINA
Frequency Range	:	CDMA 800MHz: Tx: 824.7-848.31 MHz; Rx: 869.7-893.31MHz CDMA 1900MHz: Tx: 1851.25 MHz-1908.75 MHz; Rx: 1931.25 MHz-1988.75 MHz
Modulation Type	:	CDMA 1X
Emission Designators	:	1M28F9W
Modulation Type	:	Chip Antenna

Note 1: The EUT is a HD100 Truck Information Terminal operating in Cellular and PCS bands.

Note 2: The normal configuration for the EUT is the Mobile Phone (MS) associated with ancillary equipments e.g. the Battery and/or the AC Adapter (Charger).

Note 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2 Test Standards and Results

The objective of the report is to perform testing according to:

No.	Identity	Document Title
1	47 CFR Part 2 (10-1-09 Edition)	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22 (10-1-09 Edition)	Public Mobile Services
3	47 CFR Part 24 (10-1-09 Edition)	Personal Communications Services

Test detailed items/section required by FCC rules and results are as below:

No.	Section in CFR	Description	Test Band	Result
1	2.1046 22.913(a) 24.232	Conducted RF Output Power	CDMA 800/1900MHz	PASS
2.	24.232(d),	Peak to average radio	CDMA 800/1900MHz	PASS
3	2.1049	Occupied Bandwidth	CDMA 800/1900MHz	PASS
4	2.1055 22.355 24.235	Frequency Stability	CDMA 800/1900MHz	PASS
5	2.1051 2.1057 22.917 24.238	Conducted Out of Band Emissions	CDMA 800/1900MHz	PASS
6	2.1051 2.1057 22.917 24.238	Band Edge	CDMA 800/1900MHz	PASS
7	22.913 24.232	Transmitter Radiated Power (EIPR/ERP)	CDMA 800/1900MHz	PASS
8	2.1053 2.1057 22.917 24.238	Radiated Out of Band Emissions	CDMA 800/1900MHz	PASS

NOTE： Measurement method according to ANSI/TIA-603-D 2010.

1.3 Facilities and Accreditations

1.3.1 Facilities

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at 3/F, Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22; the FCC registration number is 741109.

1.3.2 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (℃):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR PART 2, PART 22H & 24E REQUIREMENTS

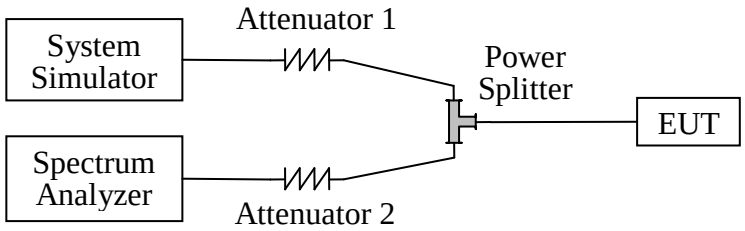
2.1 Conducted RF Output Power

2.1.1 Requirement

According to FCC section 2.1046(a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified

2.1.2 Test Description

1. Test Setup:



The EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. A call is established between the EUT and the SS.

2. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date
System Simulator	Agilent	E5515C	GB43130131	2013.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05
Power Splitter	Weinschel	1506A	NW521	(n.a.)
Attenuator 1	Resnet	20dB	(n.a.)	(n.a.)
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)

2.1.3 Test Result

Here the lowest, middle and highest channels are selected to perform testing to verify the conducted

RF output power of the EUT. For the CDMA 800MHz operates at maximum output Power, the rated conducted RF output power is 38.5dBm, and For the CDMA 1900MHz operates at maximum output Power, the rated conducted RF output power is 33dBm.

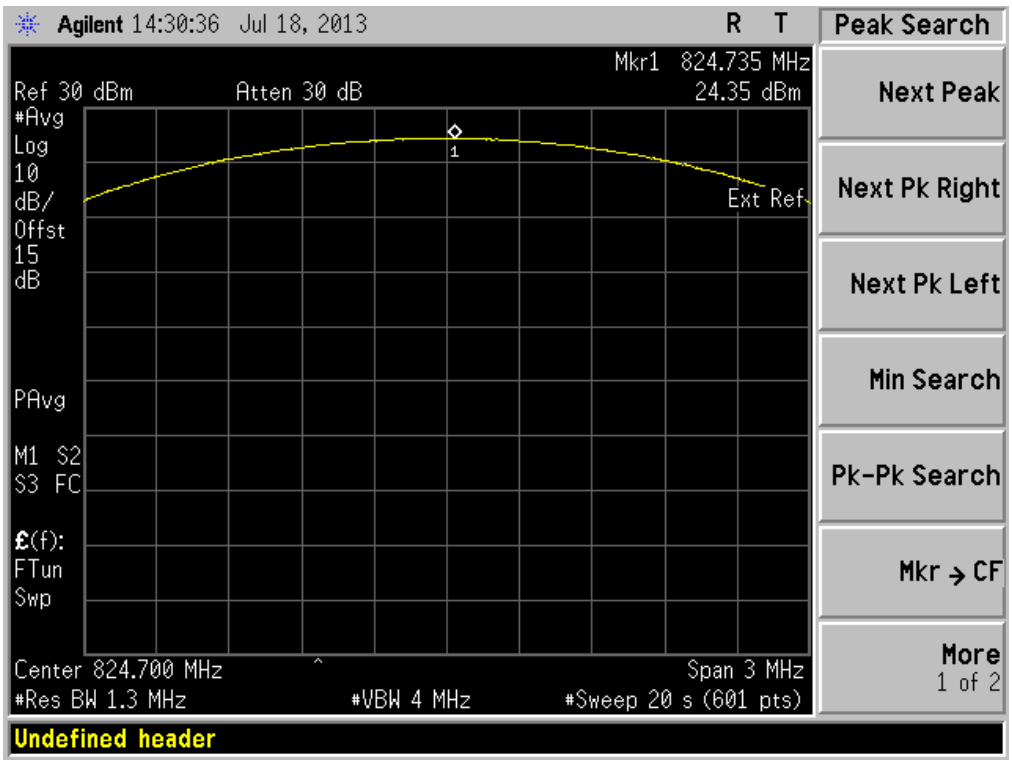
1. Test Verdict:

No.	Channel Number	Frequency (MHz)	Measured Power(AVG)		Rated Power	
			dBm	W	dBm	W
CDMA 800MHz	1013	824.7	24.35	0.27227	38.5	7
	384	836.52	23.66	0.23227		
	777	848.31	23.90	0.24547		
CDMA 1900MHz	25	1851.2	23.46	0.22182	33	2
	600	1880.0	23.52	0.22491		
	1175	1909.8	23.65	0.23174		

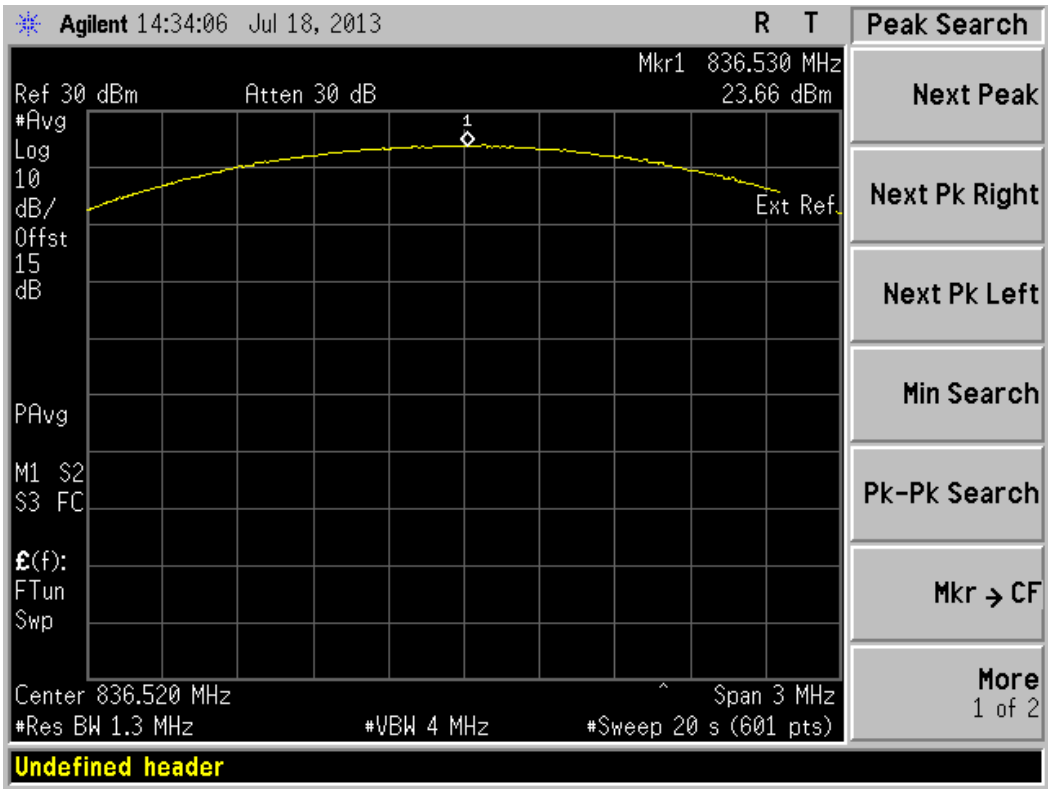
Test Verdict:

No.	Channel Number	Frequency (MHz)	Measured Power(Peak)		Rated Power	
			dBm	W	dBm	W
CDMA 800MHz	1013	824.7	28.45	0.69984	38.5	7
	384	836.52	27.81	0.60395		
	777	848.31	28.11	0.64714		
CDMA 1900MHz	25	1851.2	26.84	0.48306	33	2
	600	1880.0	27.06	0.50816		
	1175	1909.8	27.47	0.55847		

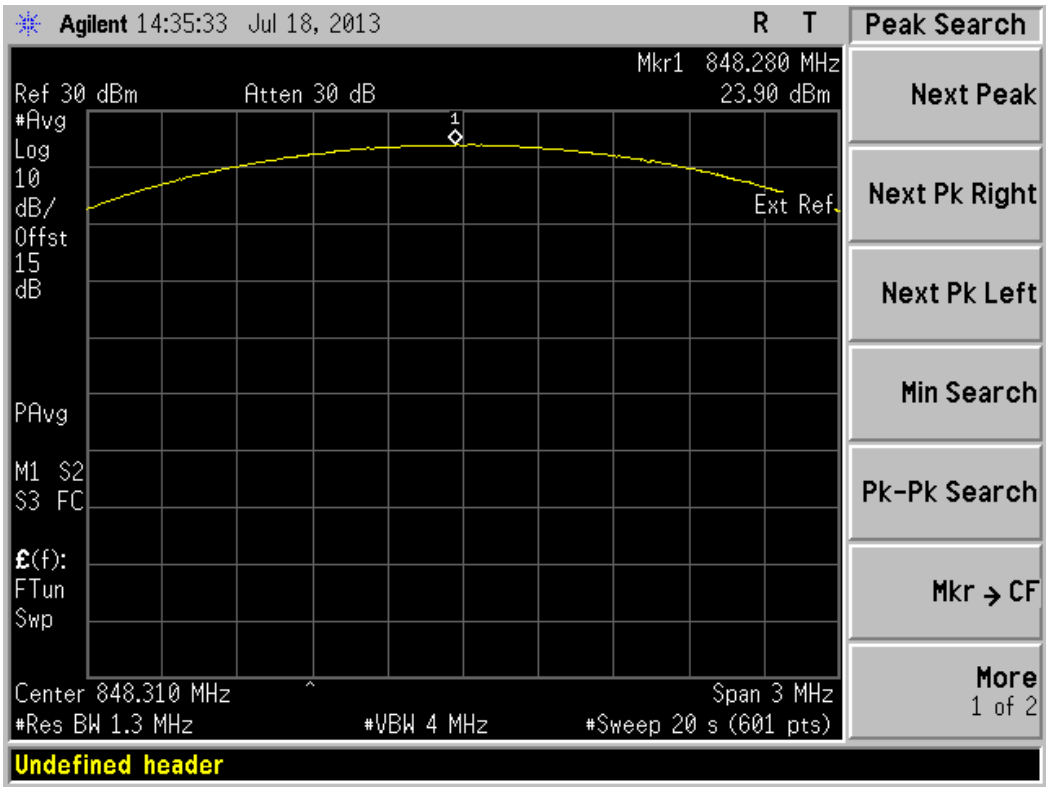
2. Test Plots:



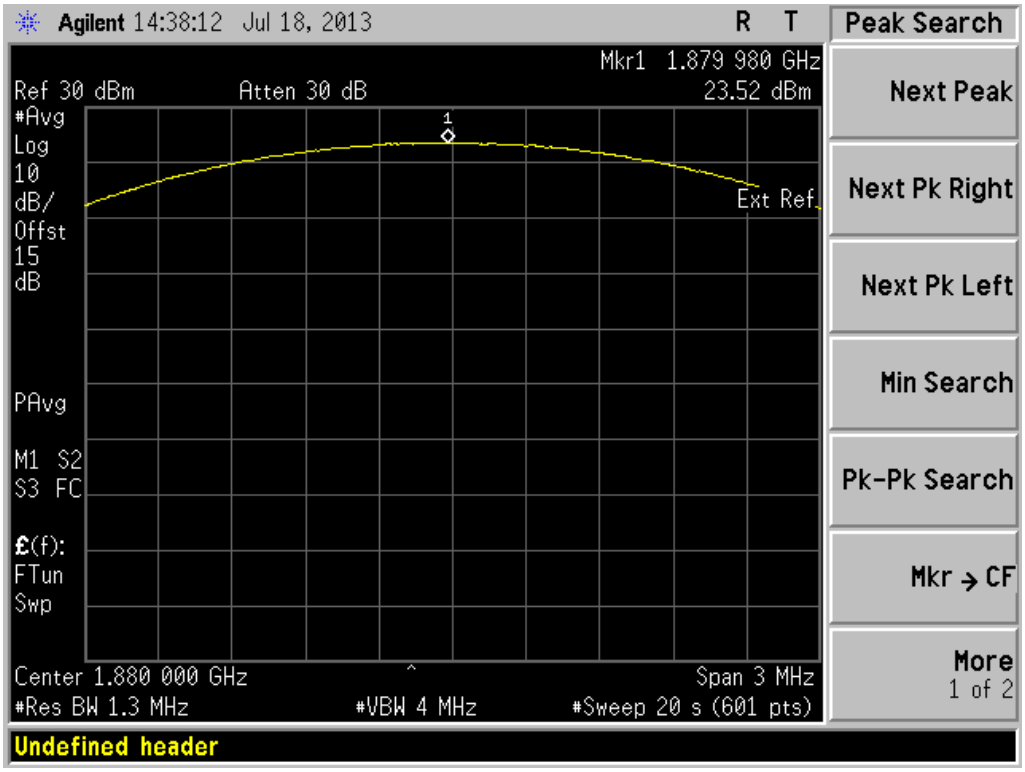
(Plot A: CDMA 800MHz Channel = 1013 AVG)



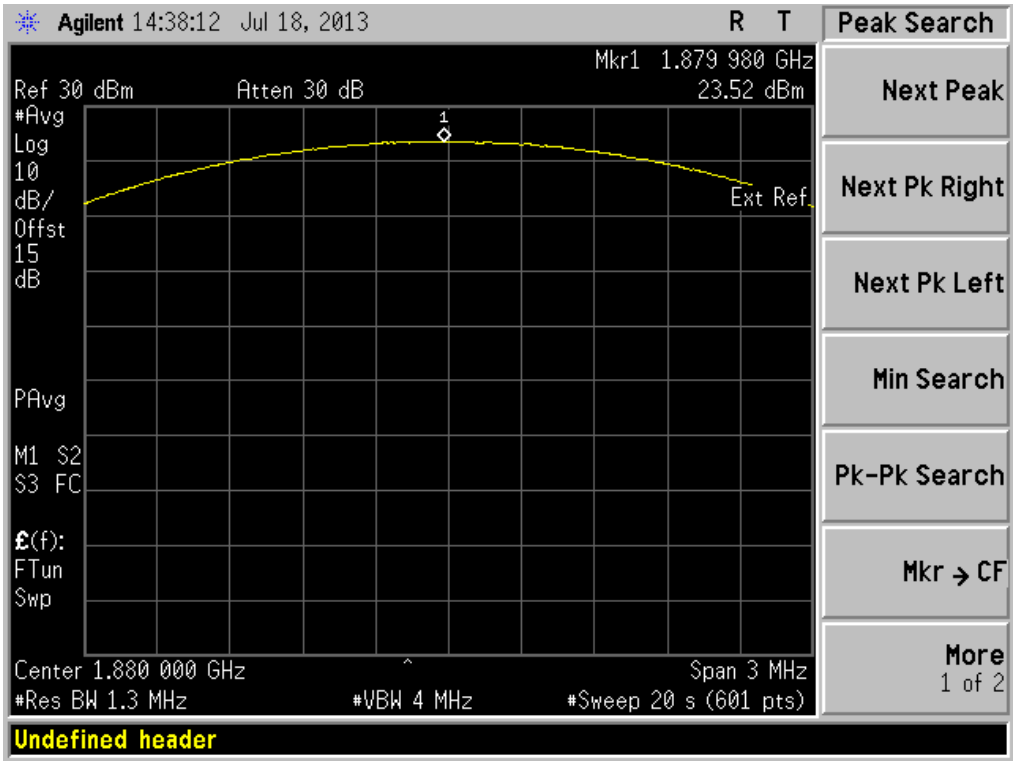
(Plot B: CDMA 800MHz Channel = 384 AVG)



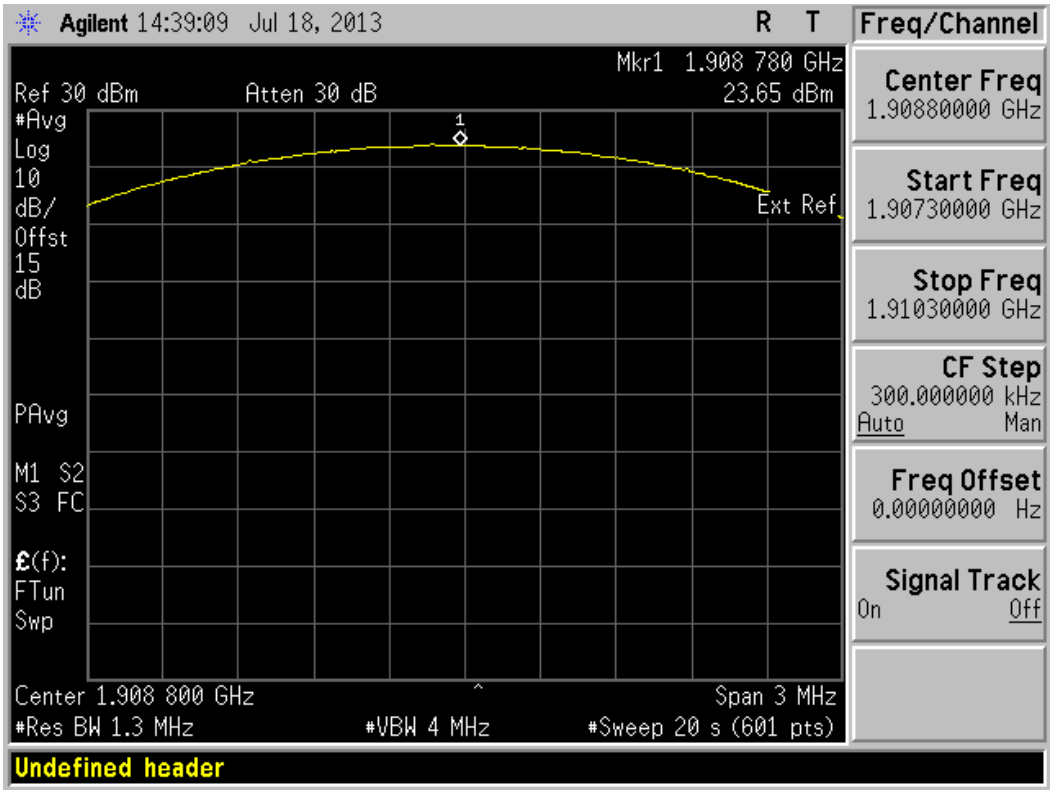
(Plot C: CDMA 800MHz Channel = 777 AVG)



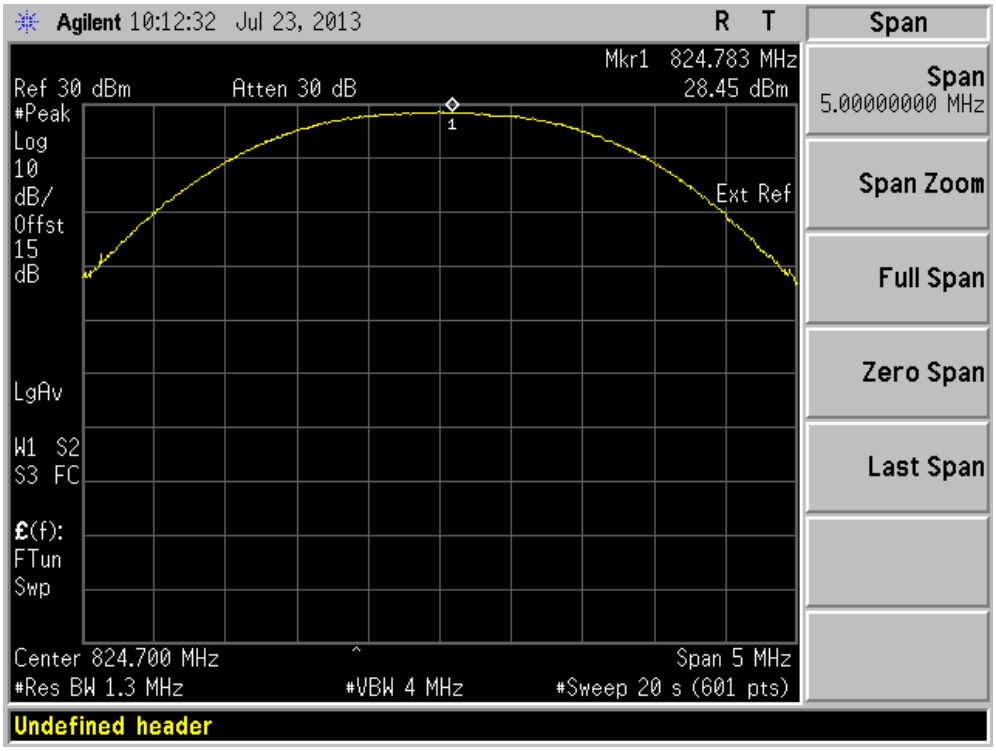
(Plot D: CDMA 1900MHz Channel = 25 AVG)



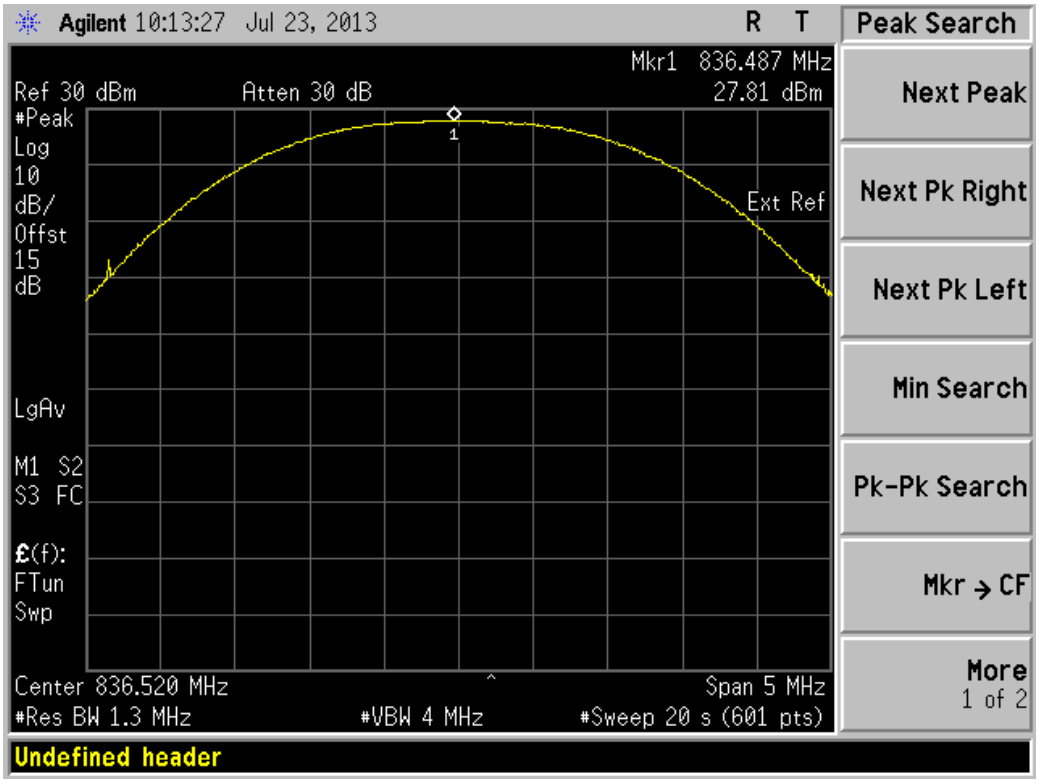
(Plot E: CDMA 1900MHz Channel = 600 AVG)



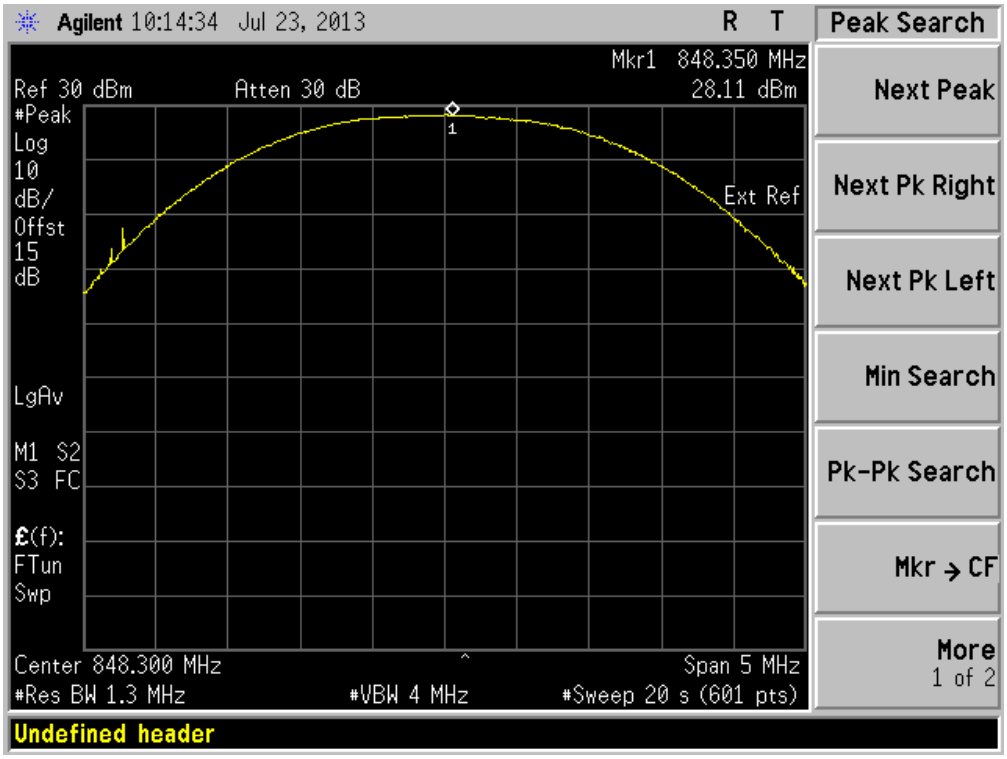
(Plot F: CDMA 1900MHz Channel = 1175 AVG)



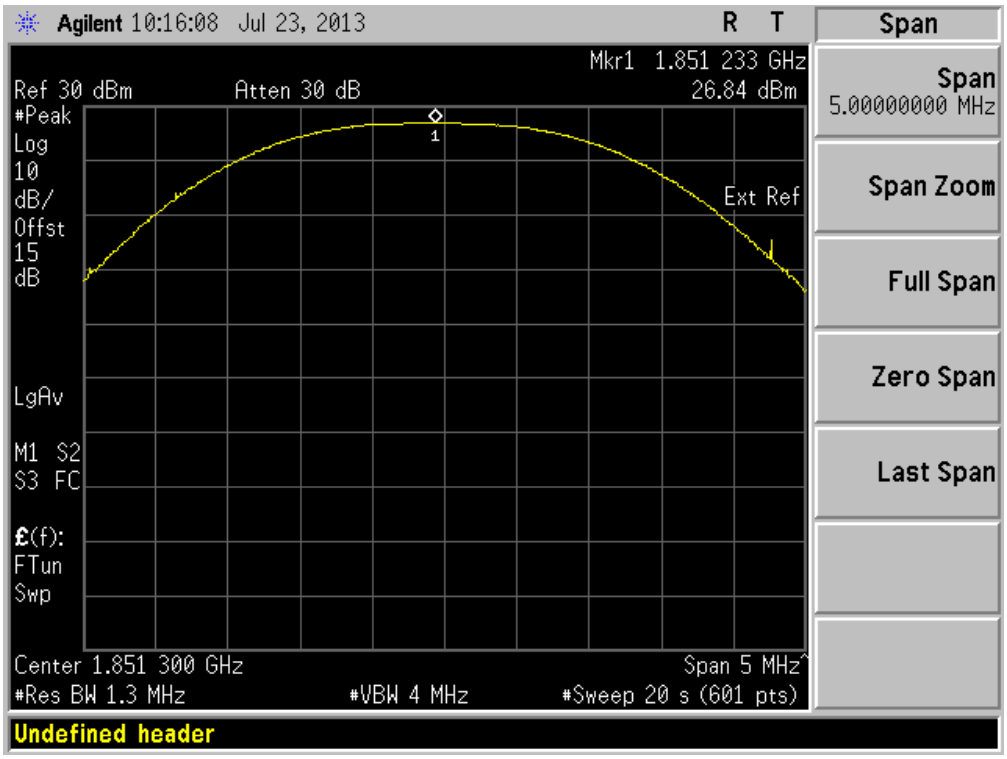
(Plot G: CDMA 800MHz Channel = 1013 Peak)



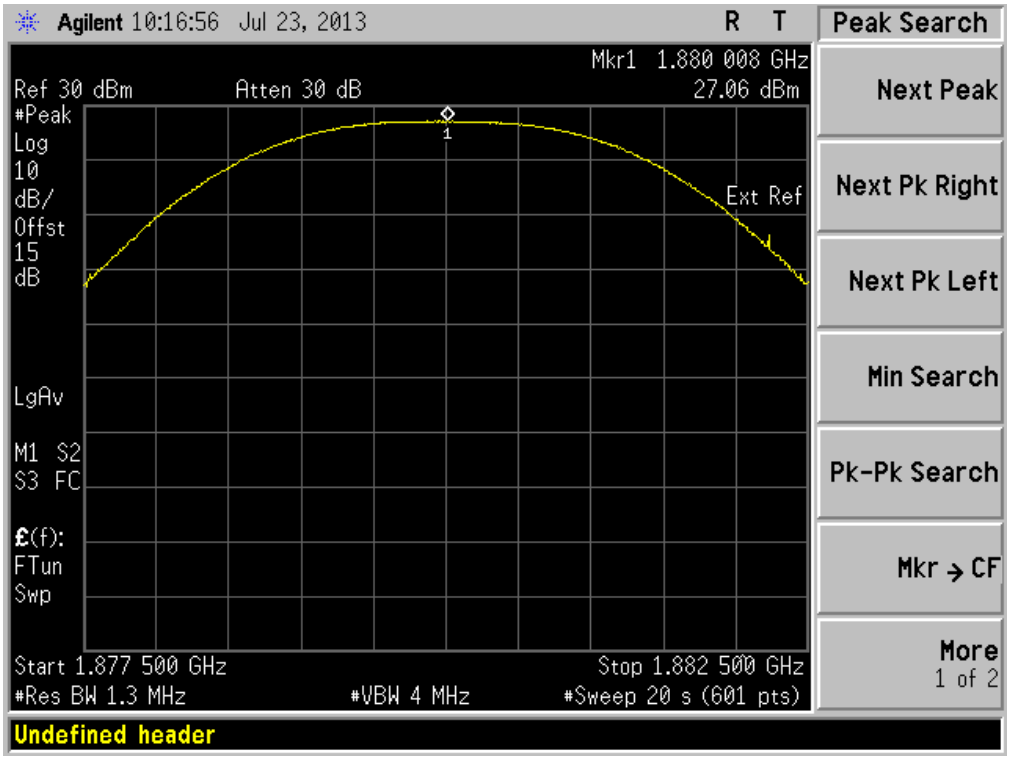
(Plot H: CDMA 800MHz Channel = 384 Peak)



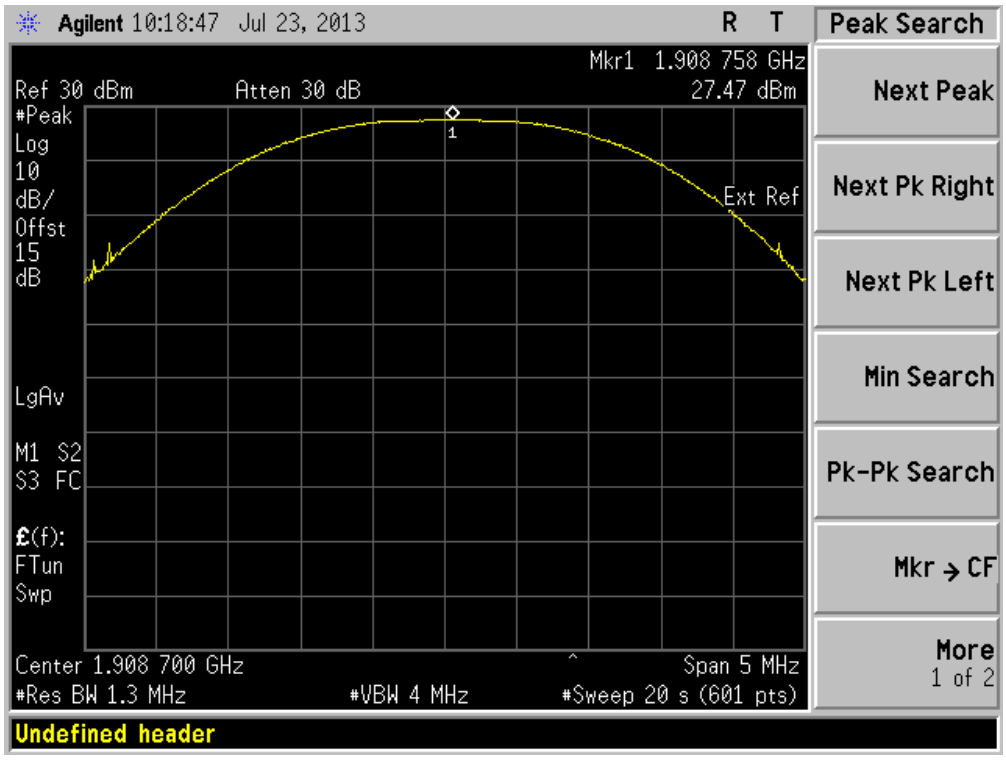
(Plot I: CDMA 800MHz Channel = 777 Peak)



(Plot J: CDMA 1900MHz Channel = 25 Peak)



(Plot K: CDMA 1900MHz Channel = 600 Peak)



(Plot M: CDMA 1900MHz Channel = 1175 Peak)

2.2 Peak to Average Radio

2.2.1 Definition

According to FCC section 2.1049 and FCC 24.232(d), the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

2.2.2 Test Description

See section 2.1.2 of this report.

2.2.3 Test Verdict

Here the lowest, middle and highest channels are selected to perform testing to verify the peak-to-average ratio.

Test procedures:

A .For GSM/EGPRS operating mode:

a. Set RBW=1MHz, VBW=1MHz, peak detector in spectrum analyzer.

b. Set EUT in maximum output power, and triggered the bust signal.

c. Measured respectively the peak level and mean level, and the deviation was recorded as Peak to Average radio.

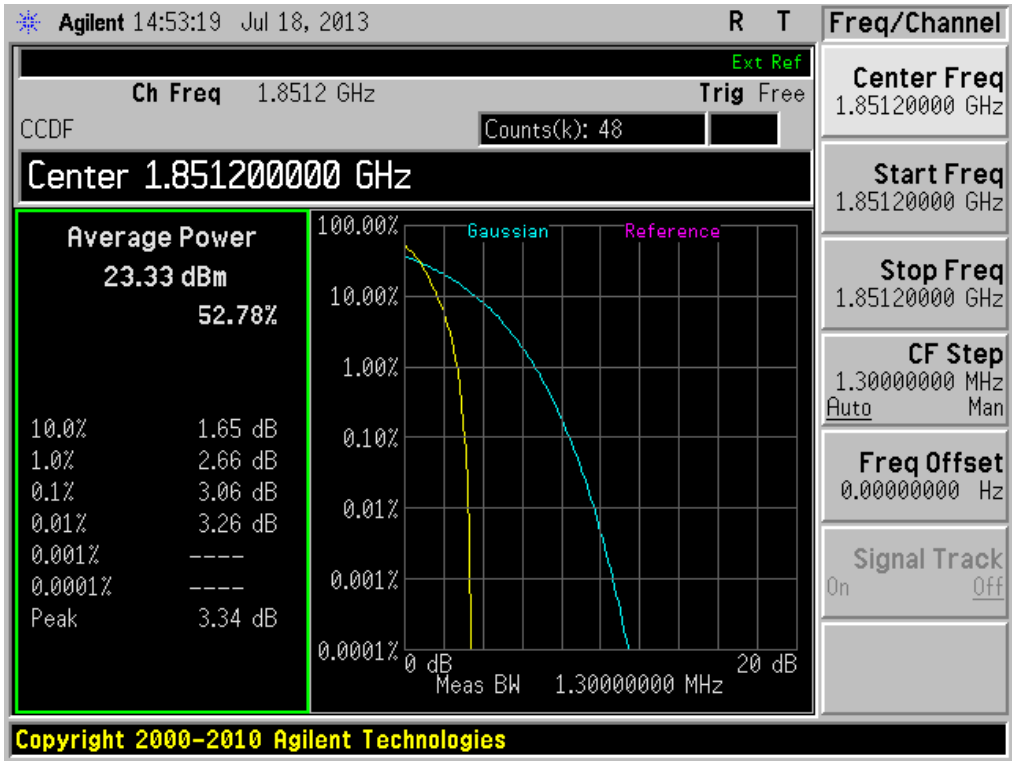
B. For UMTS operating mode:

a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.

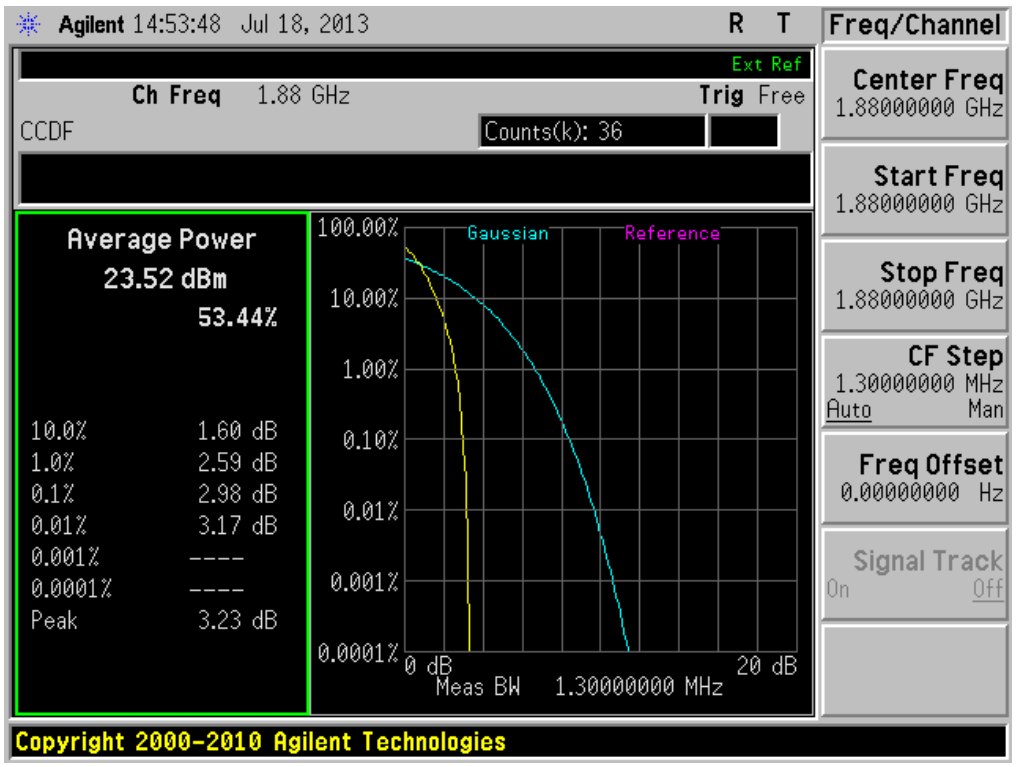
b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1%.

1. Test Verdict:

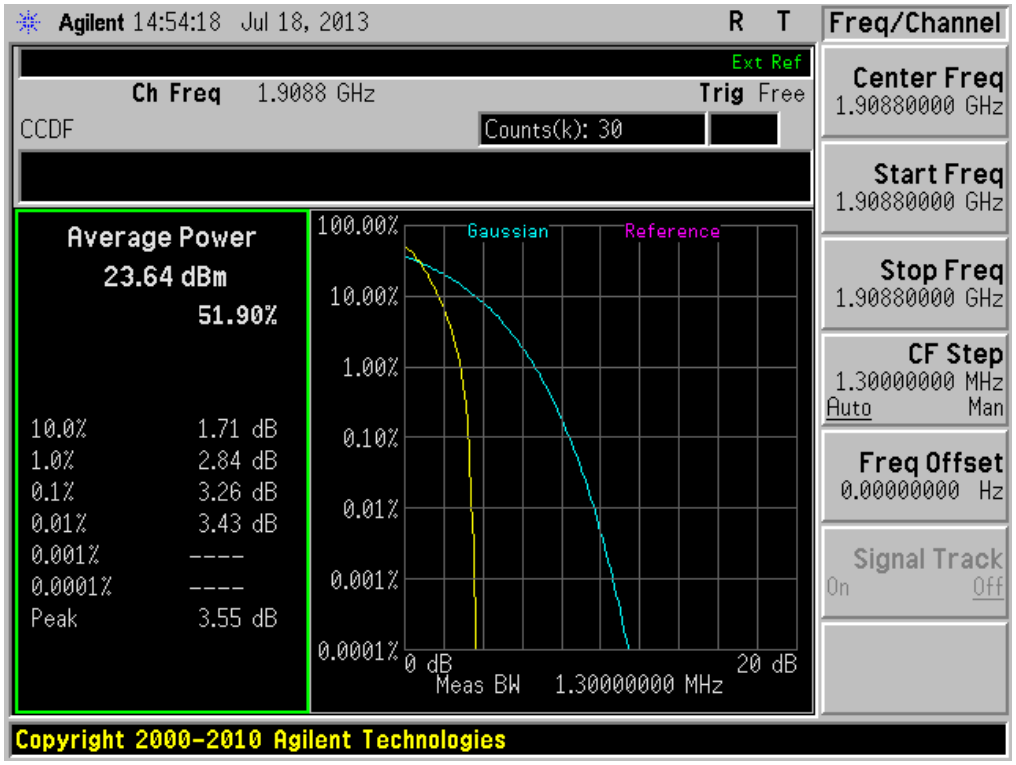
Band	Channel	Frequency (MHz)	Peak to Average radio		Limit	Verdict
			dBm	Refer to Plot	dBm	
CDMA 1900MHz	25	1851.2	3.06	Plot A1 to A3	13	PASS
	600	1880.0	2.98			PASS
	1175	1909.8	3.26			PASS



(Plot A1: CDMA 1900MHz Channel = 1312)



(Plot A2: CDMA 1900MHz Channel = 600)



(Plot A3: CDMA 1900MHz Channel = 1175)

2.3 99% Occupied Bandwidth

2.3.1 Definition

According to FCC section 2.1049, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Occupied bandwidth is also known as the 99% emission bandwidth.

2.3.2 Test Description

See section 2.1.2 of this report.

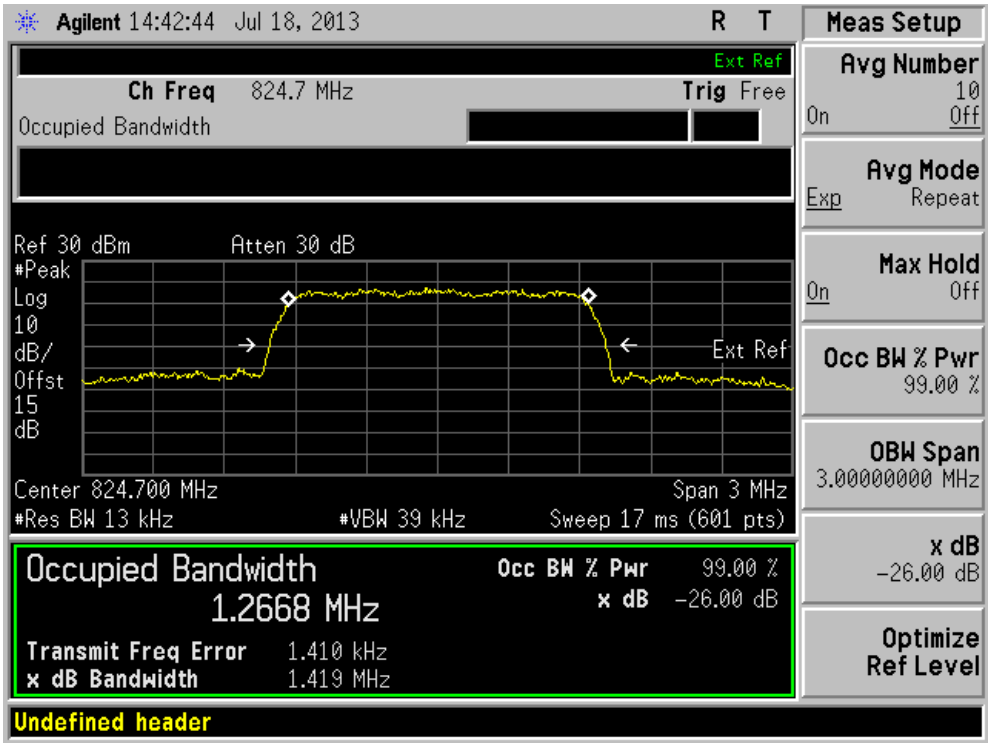
2.3.3 Test Verdict

Here the lowest, middle and highest channels are tested to record the 99% occupied bandwidth.

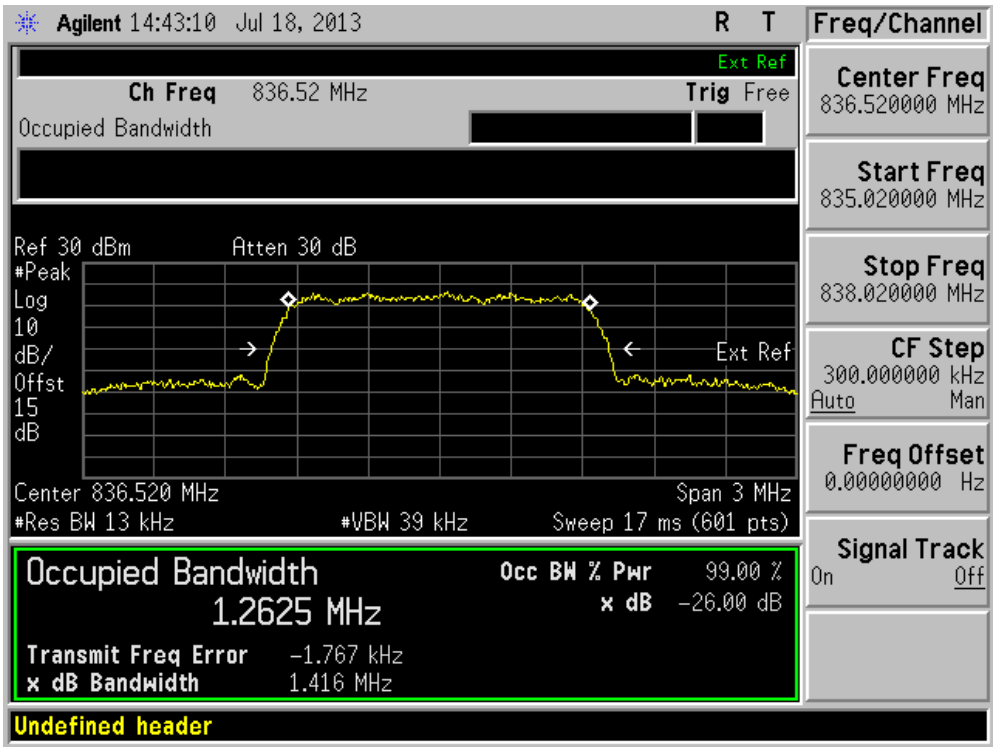
2. Test Verdict:

Band	Channel	Frequency (MHz)	Measured 99% Occupied Bandwidth (MHz)	Refer to Plot
CDMA 800MHz	1013	824.7	1.2668	Plot A
	384	836.52	1.2625	Plot B
	777	848.31	1.2666	Plot C
CDMA 1900MHz	25	1851.2	1.2695	Plot D
	600	1880.0	1.2713	Plot E
	1175	1909.8	1.2759	Plot F

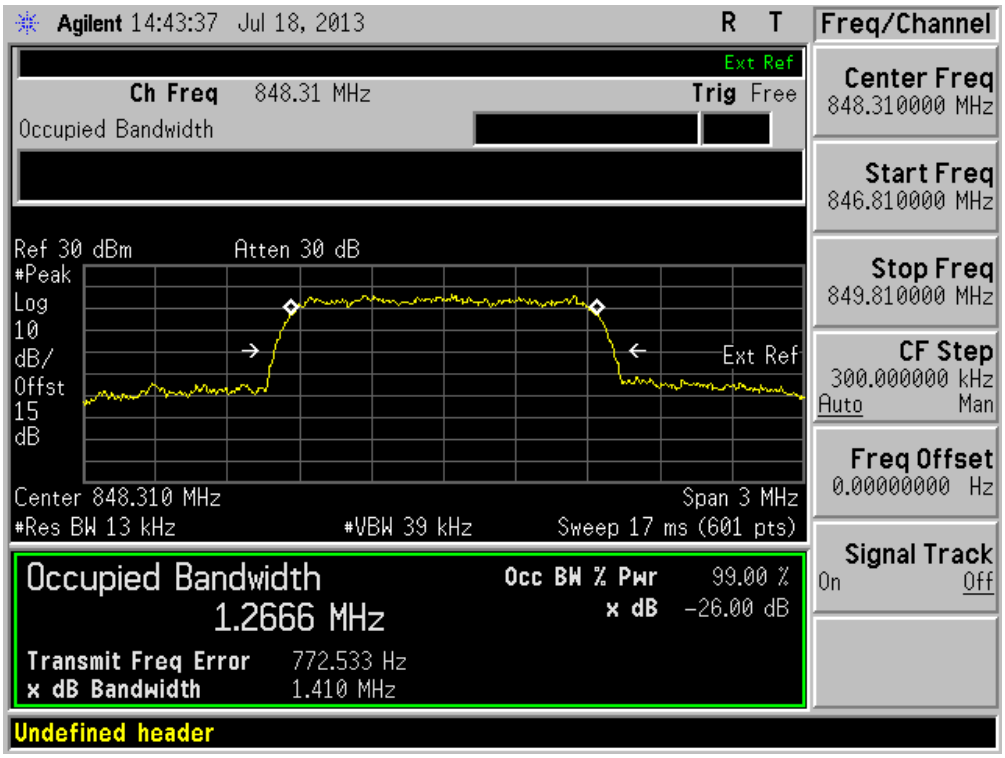
3. Test Plots:



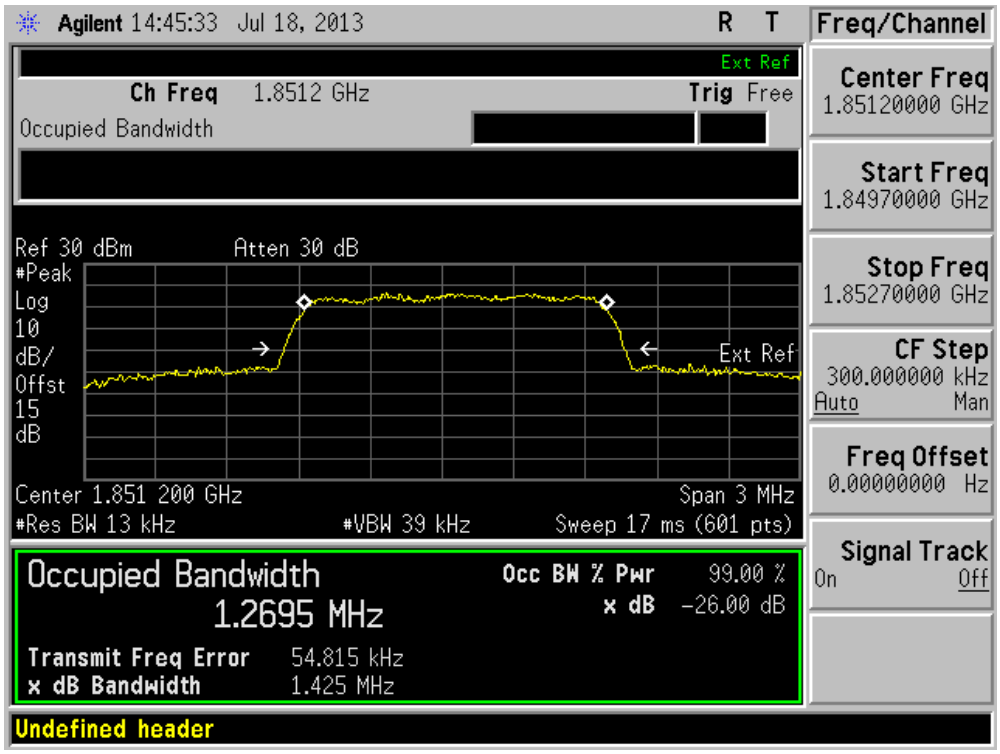
(Plot A: CDMA 800MHz Channel = 1013)



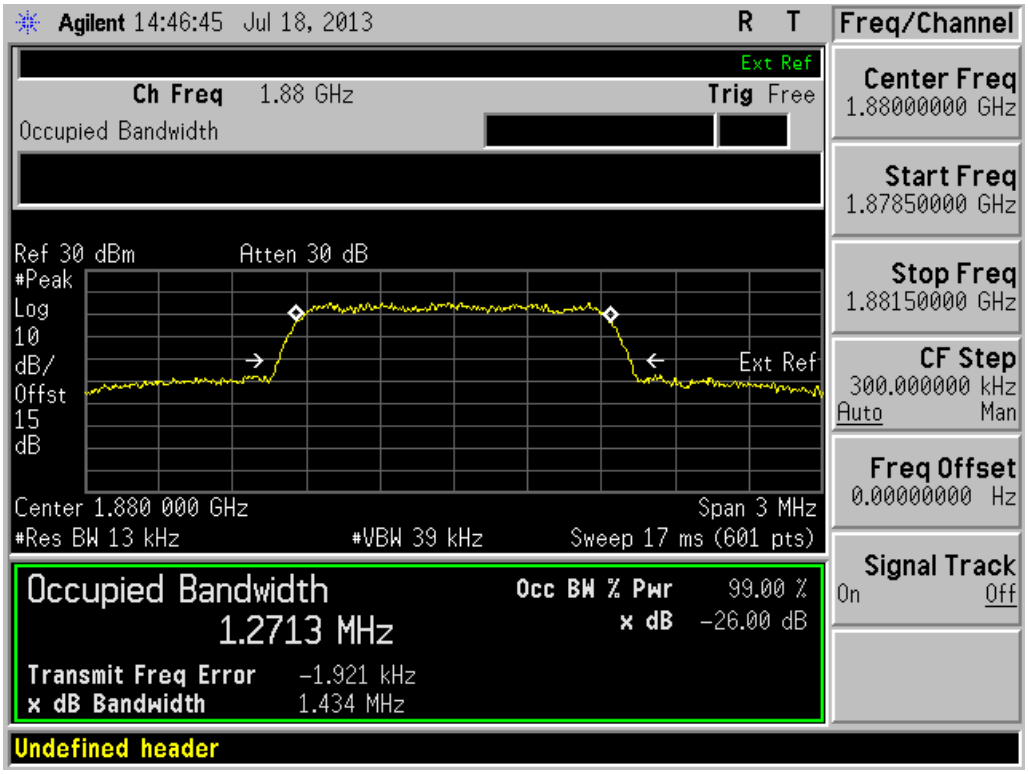
(Plot B: CDMA 800MHz Channel = 384)



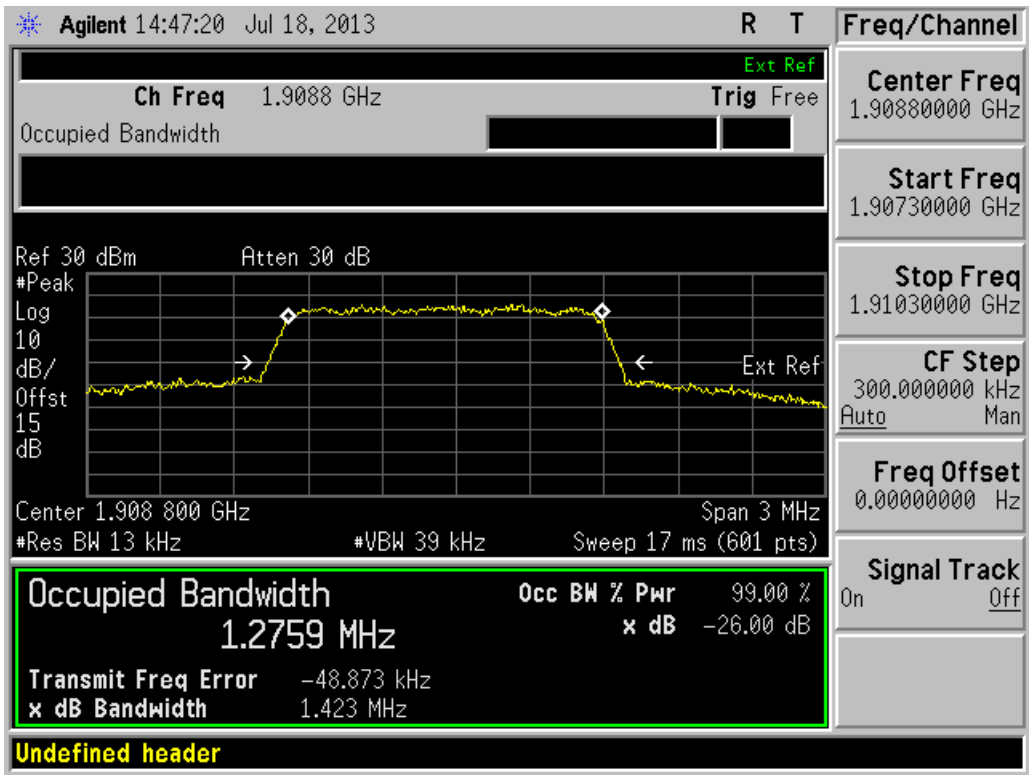
(Plot C: CDMA 800MHz Channel = 777)



(Plot D: CDMA 1900MHz Channel = 25)



(Plot E: CDMA 1900MHz Channel = 600)



(Plot F: CDMA 1900MHz Channel = 1175)

2.4 Frequency Stability

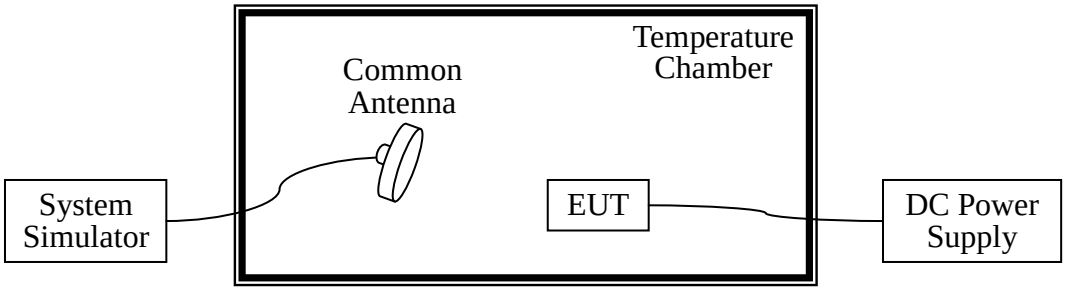
2.4.1 Requirement

According to FCC section 22.355 and FCC section 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

(a) The temperature is varied from -30 ℃ to +50 ℃ at intervals of not more than 10 ℃.
(b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

2.4.2 Test Description

1. Test Setup:



The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power. A call is established between the EUT and the SS via a Common Antenna.

2. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date
System Simulator	Agilent	E5515C	GB43130131	2013.05
DC Power Supply	Good Will	GPS-3030DD	EF920938	2013.05
Temperature Chamber	YinHe Experimental Equip.	HL4003T	(n.a.)	2013.05

2.4.3 Test Verdict

The nominal, highest and lowest extreme voltages are separately 12VDC, 13.2VDC and 10.8VDC, which are specified by the applicant; the normal temperature here used is 25 ℃. The frequency deviation limit of CDMA 800MHz band is ±2.5ppm, CDMA 1900MHz is ±1ppm.

Band	Test Conditions		Frequency Deviation						Verdict
	Power (VDC)	Temperature (℃)	Channel = 1013 (824.7MHz)		Channel = 384 (836.52MHz)		Channel = 777 (848.31MHz)		
			Hz	Limits	Hz	Limits	Hz	Limits	
CDMA 800MHz	12.0	-30	7.06	±2061.75	26.75	±2091.30	-16.29	±2120.775	PASS
		-20	-21.13		-11.01		29.37		
		-10	17.01		11.54		-11.06		
		0	3.20		-4.85		35.04		
		+10	-5.17		13.32		-22.26		
		+20	14.51		5.09		35.09		
		+30	20.79		23.04		26.75		
		+40	-18.75		-10.26		-11.08		
		+50	17.43		21.09		21.44		
	13.2	+25	13.27		-17.85		-7.85		
	10.8	+25	14.34		15.32		25.32		

Band	Test Conditions		Frequency Deviation						Verdict
	Power (VDC)	Temperature (℃)	Channel = 25 (1851.2MHz)		Channel = 600 (1880.0MHz)		Channel = 1175 (1908.8MHz)		
			Hz	Limits	Hz	Limits	Hz	Limits	
CDMA 1900MHz	12.0	-30	-16.11	±1851.2	15.06	±1880.0	-9.54	±1908.8	PASS
		-20	9.35		-25.16		18.17		
		-10	-25.42		24.03		-24.09		
		0	-2.21		-23.21		23.41		
		+10	-19.01		9.85		-16.07		
		+20	26.52		27.01		29.16		
		+30	-18.49		26.09		-17.54		
		+40	17.92		-8.15		11.74		
		+50	-10.25		27.23		28.05		
	13.2	+25	26.98		24.37		-20.13		
	10.8	+25	7.39		24.26		33.70		

2.5 Conducted Out of Band Emissions

2.5.1 Requirement

According to FCC section 21051, 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. This calculated to be -13dBm.

2.5.2 Test Description

See section 2.1.2 of this report.

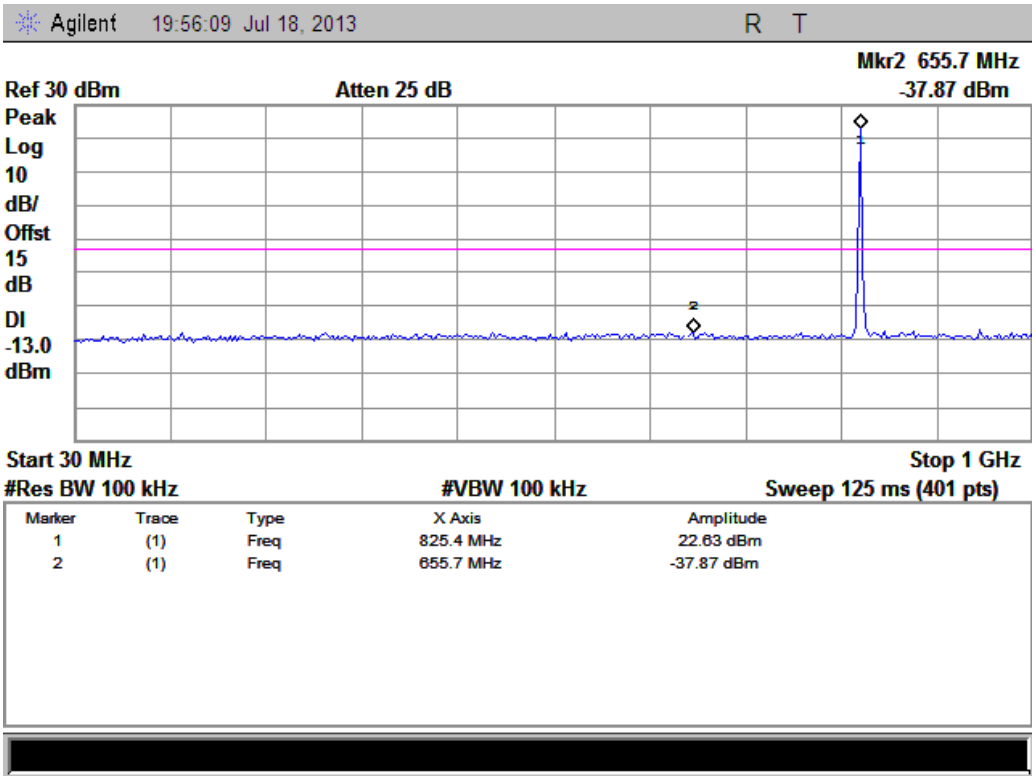
2.5.3 Test Result

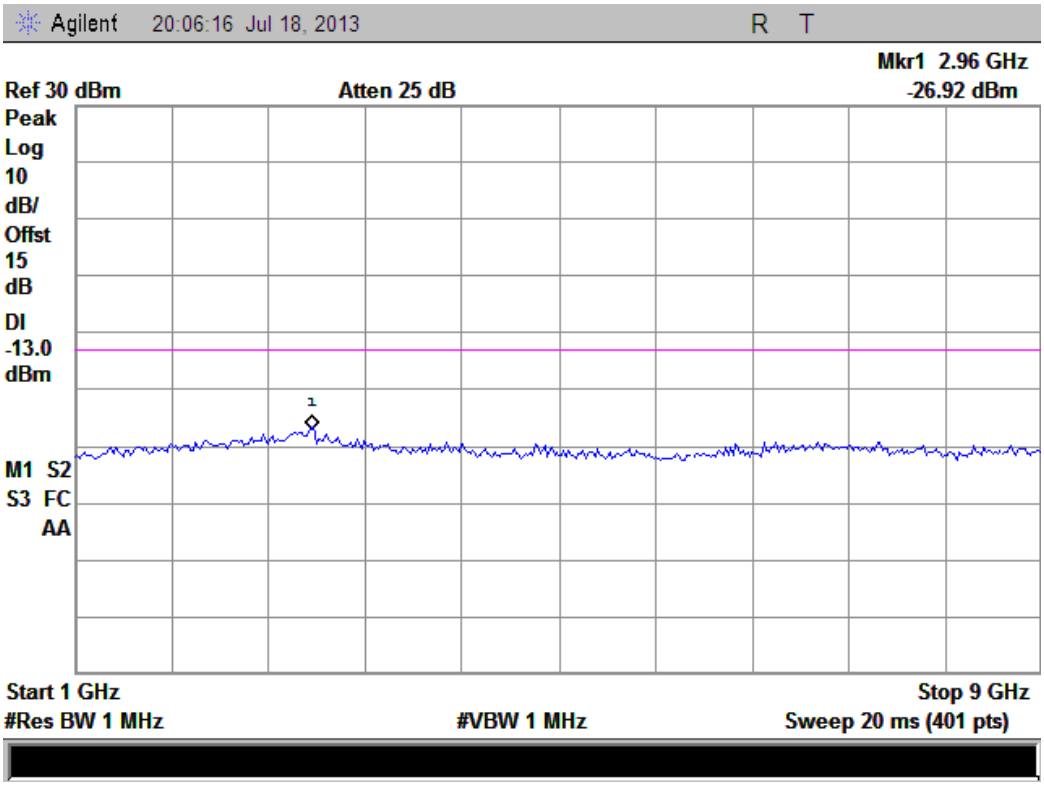
The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the out of band emissions.

1. Test Verdict:

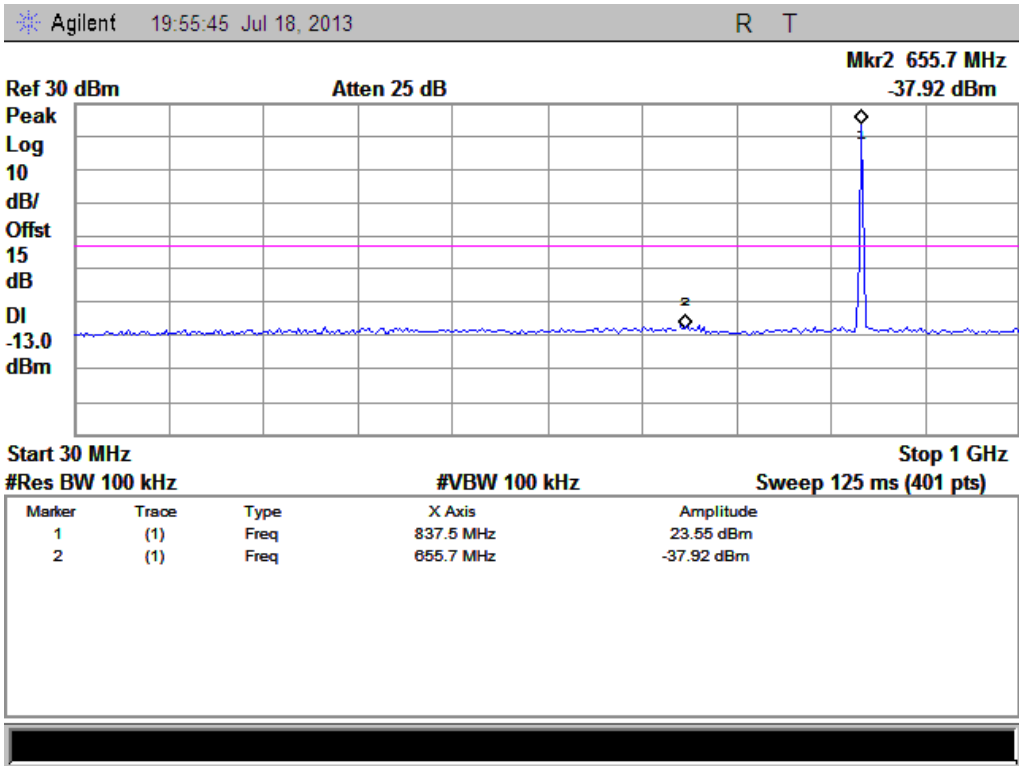
No.	Channel	Frequency(MHz)	Measured Max Spurious Emission(dBm)	Limit(dBm)	
CDMA 800MHz	1013	824.7	-26.92	-13	Plot A
	384	836.52	-25.72	-13	Plot B
	777	848.31	-37.83	-13	Plot C
CDMA 1900MHz	25	1851.2	-24.62	-13	Plot D
	600	1880.0	-25.43	-13	Plot E
	1175	1909.8	-24.27	-13	Plot F

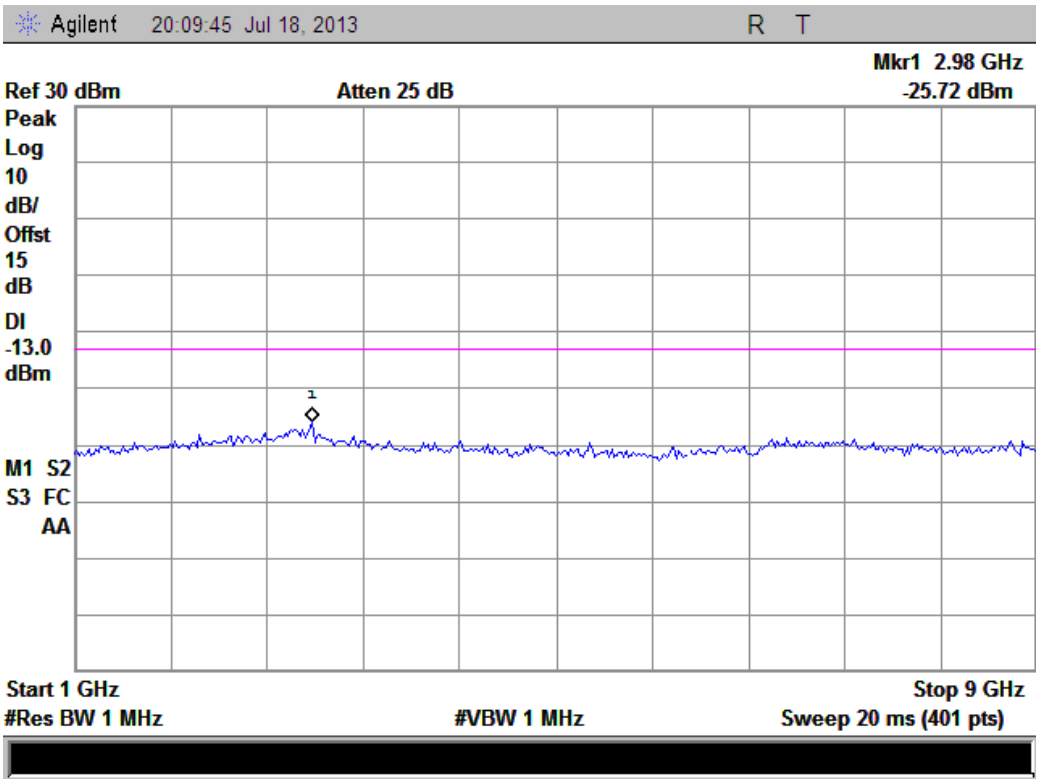
2. Test Plots:



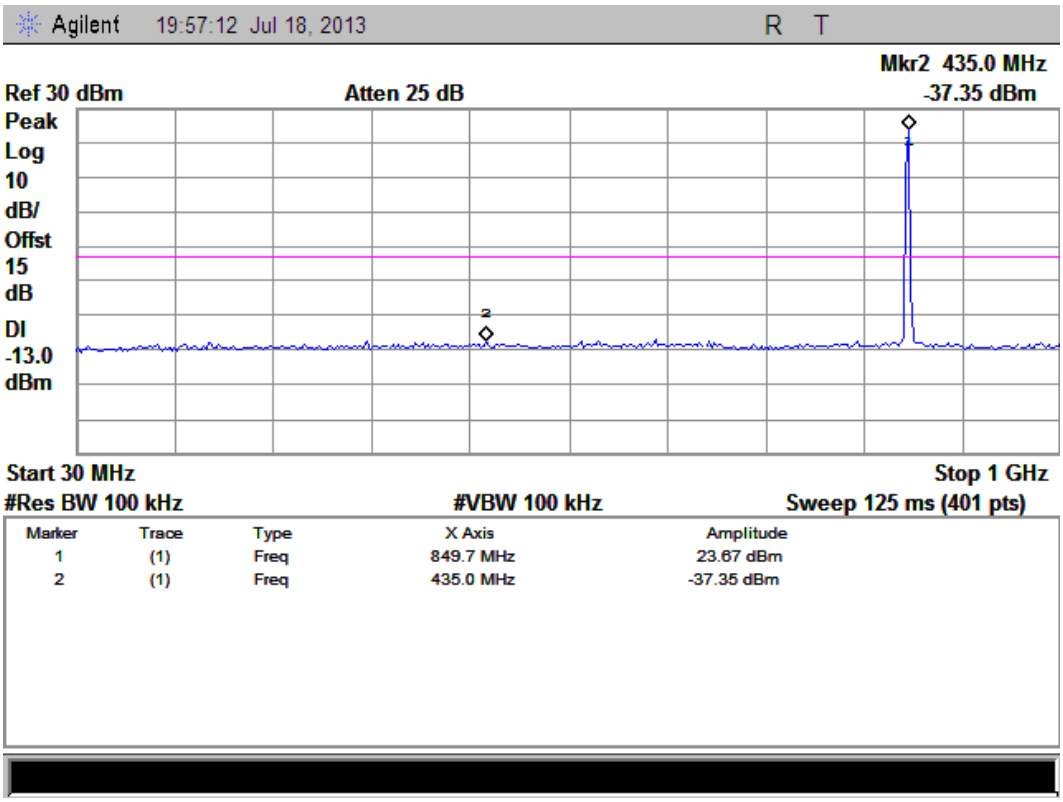


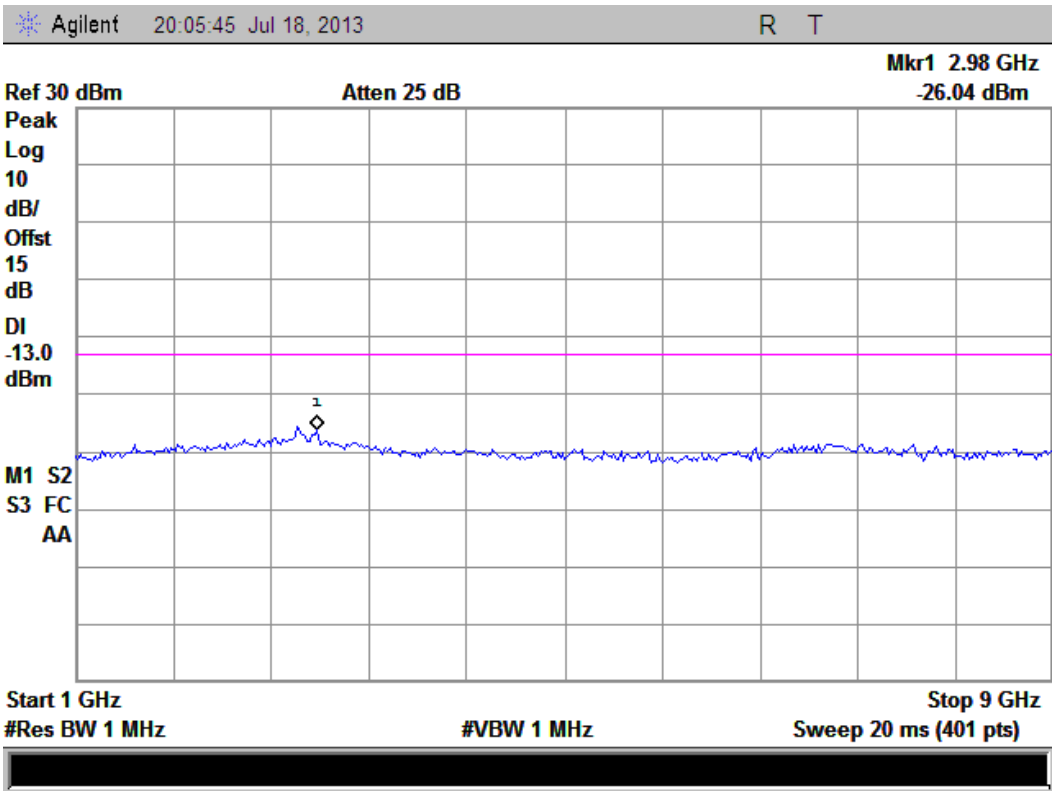
(Plot A: CDMA 800MHz Channel = 1013, 30M to 9GHz)



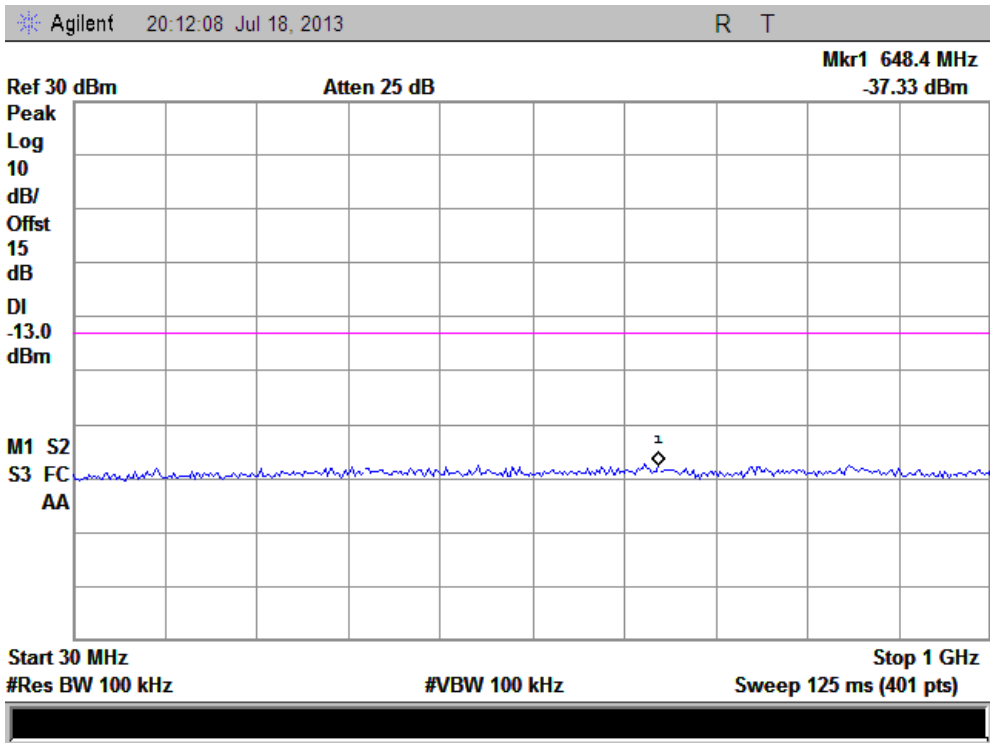


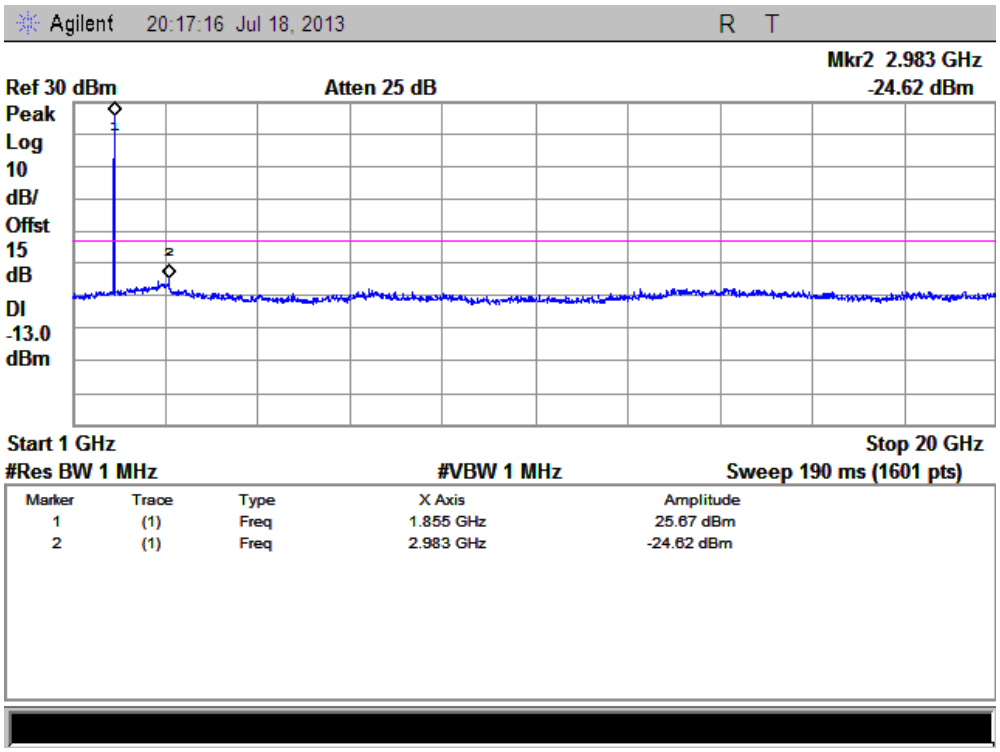
(Plot B: CDMA 800MHz Channel = 384, 30M to 9GHz)



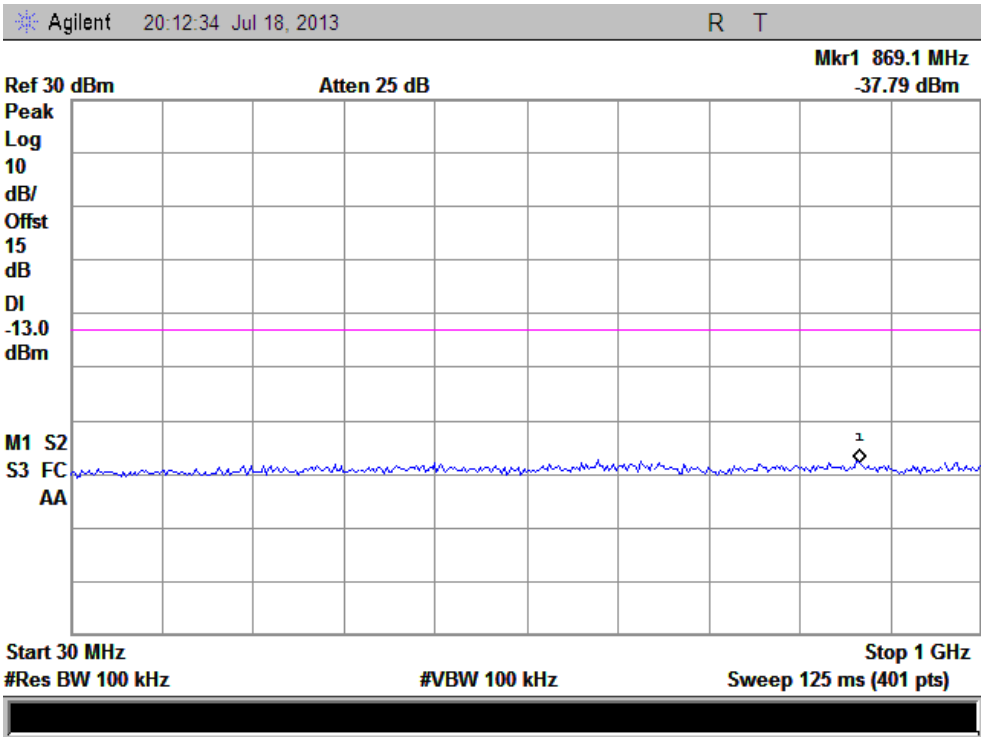


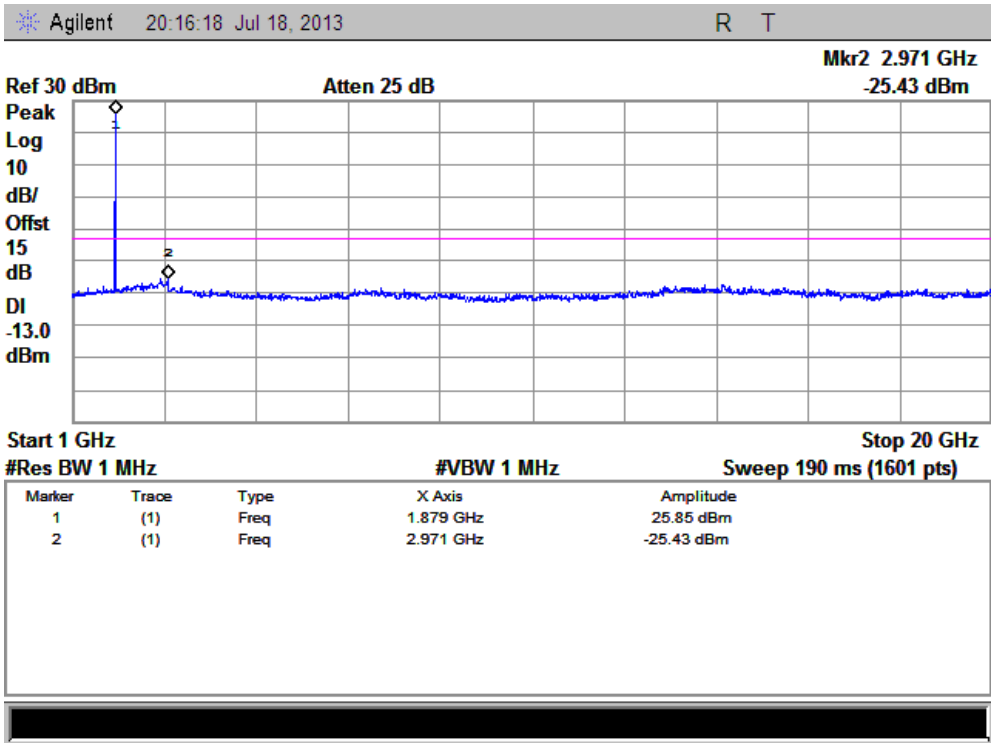
(Plot C: CDMA 800MHz Channel = 777, 30M to 9GHz)



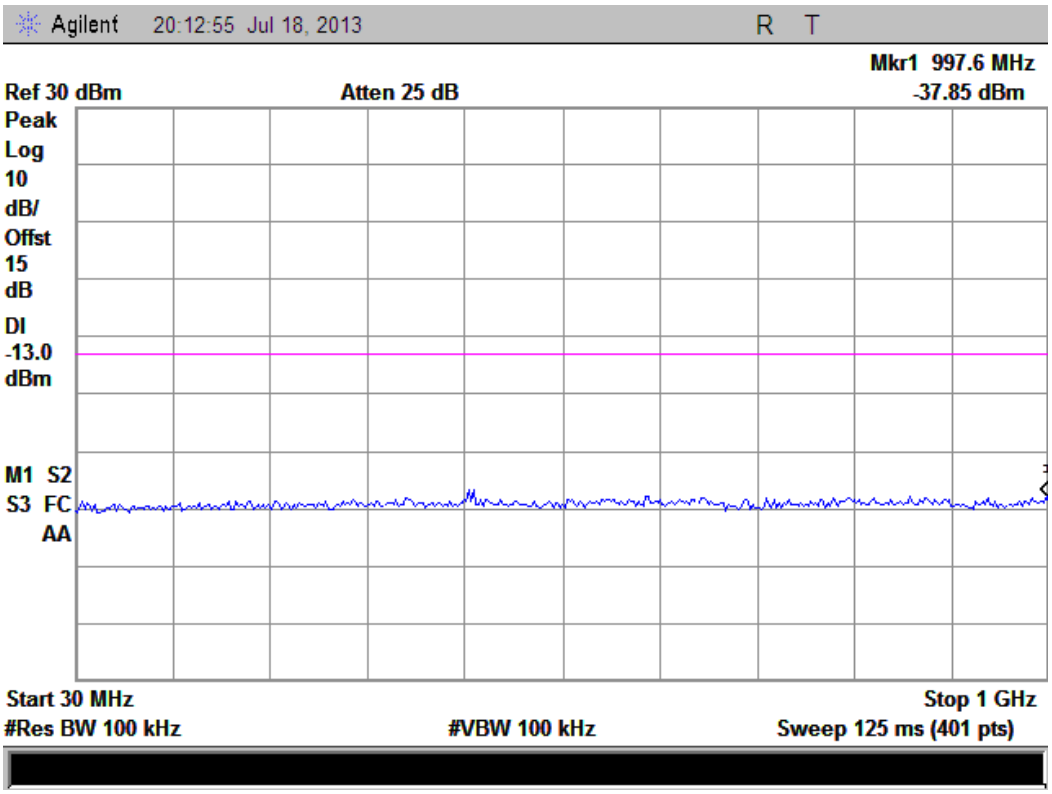


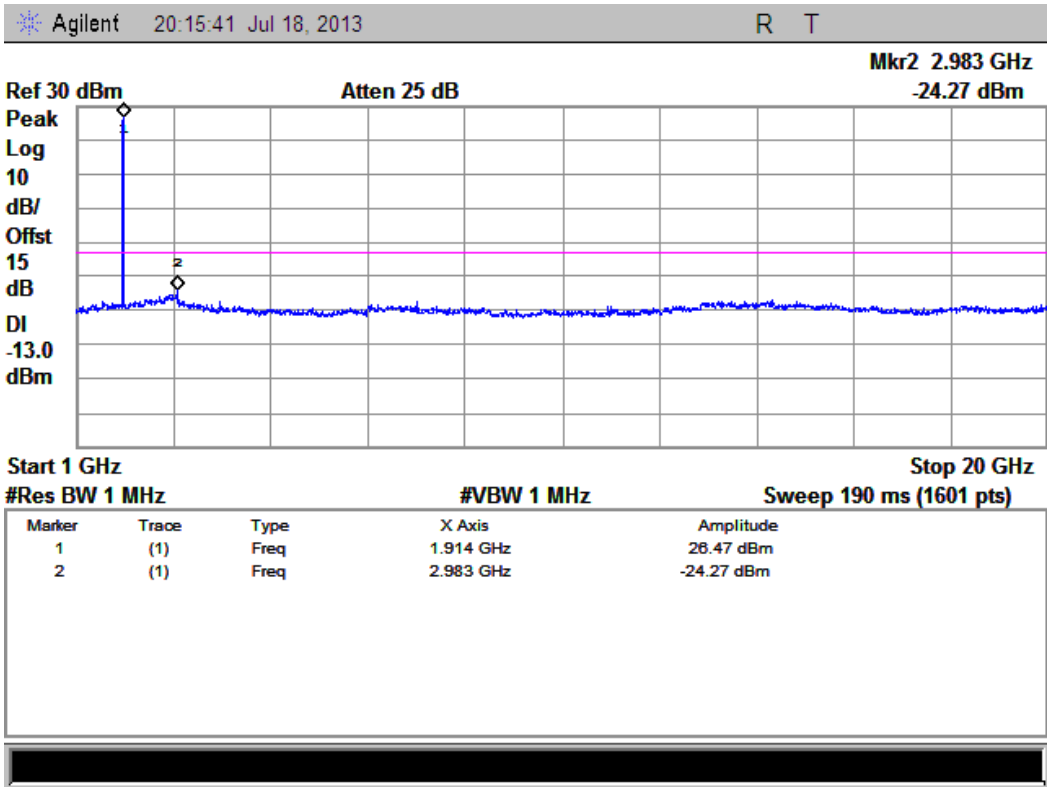
(Plot D: CDMA 1900MHz Channel = 25, 30M to 20GHz)





(Plot E: CDMA 1900MHz Channel = 600, 30M to 20GHz)





(Plot F: CDMA 1900MHz Channel = 1175, 30M to 20GHz)

2.6 Band Edge

2.6.1 Requirement

According to FCC section 2.1051, in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth (26dB emission bandwidth) of the fundamental emission of the transmitter may be employed.

2.6.2 Test Description

See section 2.1.2 of this report.

2.6.3 Test Result

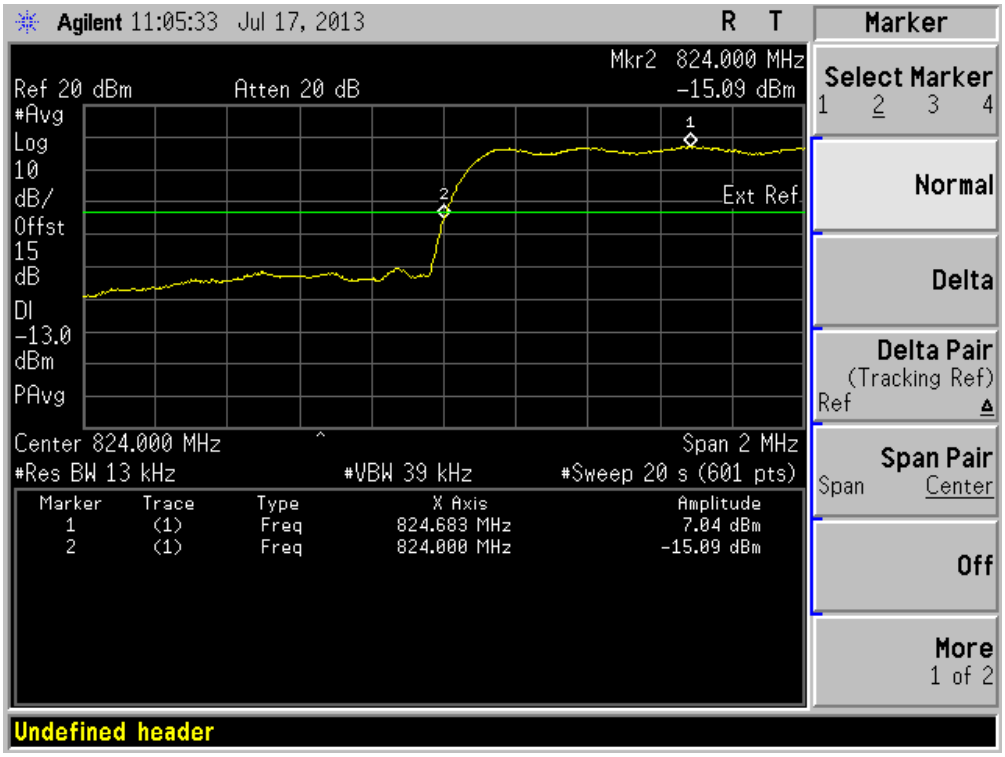
The lowest and highest channels are tested to verify the band edge emissions.

1. Test Verdict:

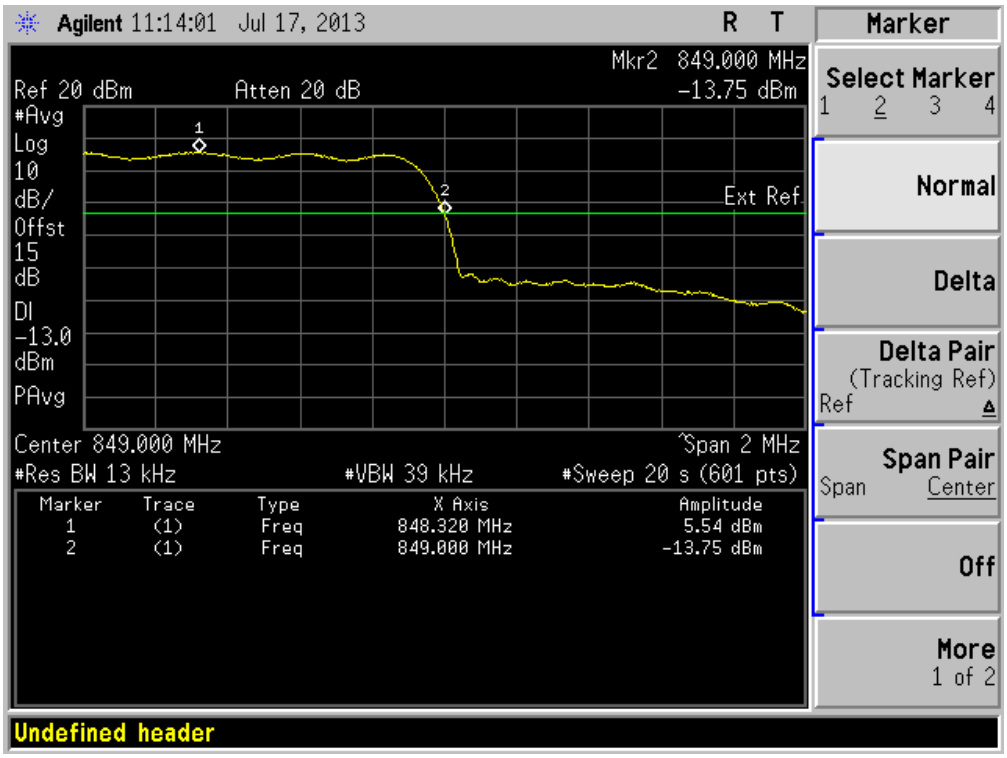
Band	Channel	Frequency (MHz)	Measured Max. Band Edge Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
CDMA 800MHz	1013	824.7	-15.09	Plat A	-13	Pass
	777	848.31	-13.75	Plot B		Pass
CDMA 1900MHz	25	1851.2	-32.27	Plat C	-13	Pass
	1175	1908.8	-32.27	Plot D		Pass

.

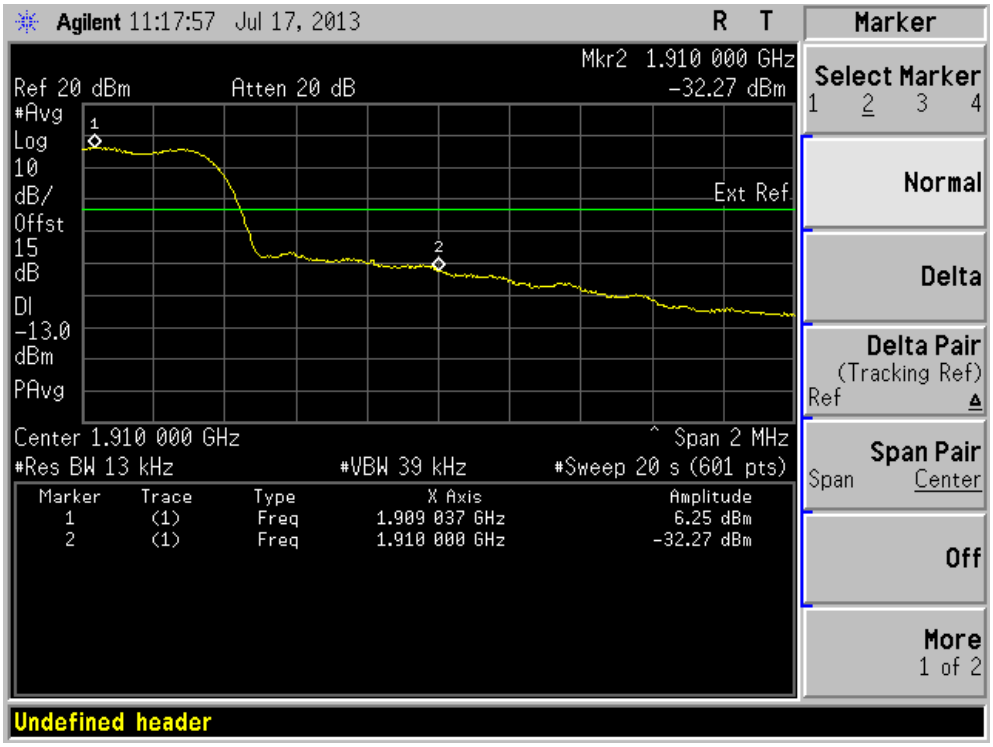
2. Test Plots:



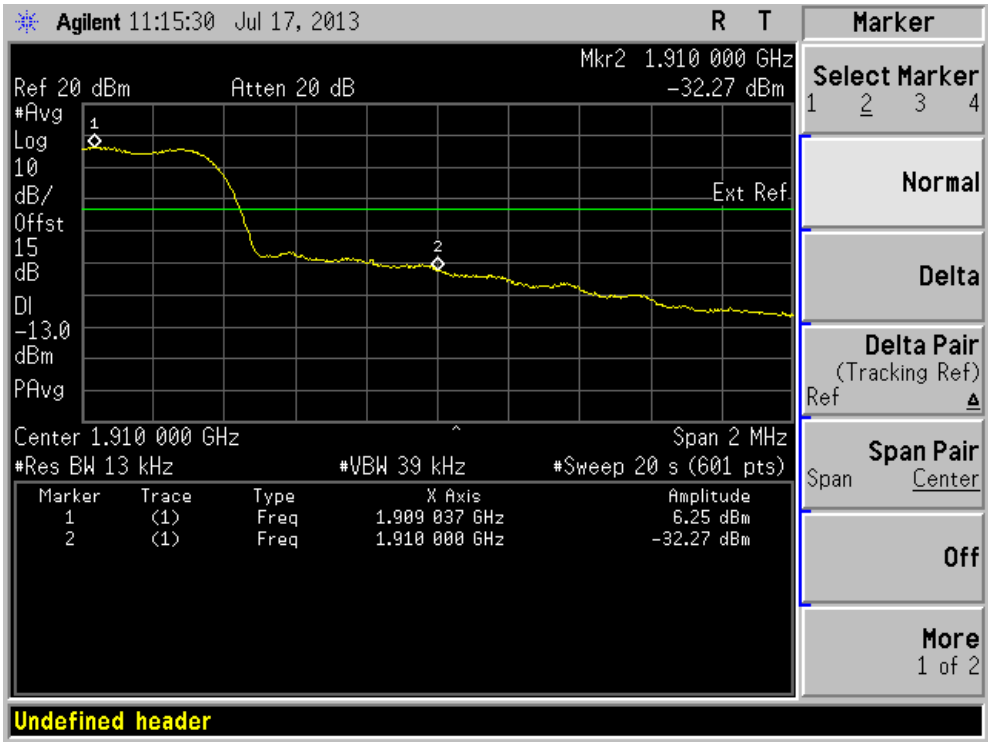
(Plot A: CDMA 800MHz Channel = 1013)



(Plot C: CDMA 800MHz Channel = 777)



(Plot D: CDMA 1900MHz Channel = 25)



(Plot F: CDMA 1900MHz Channel = 1175)

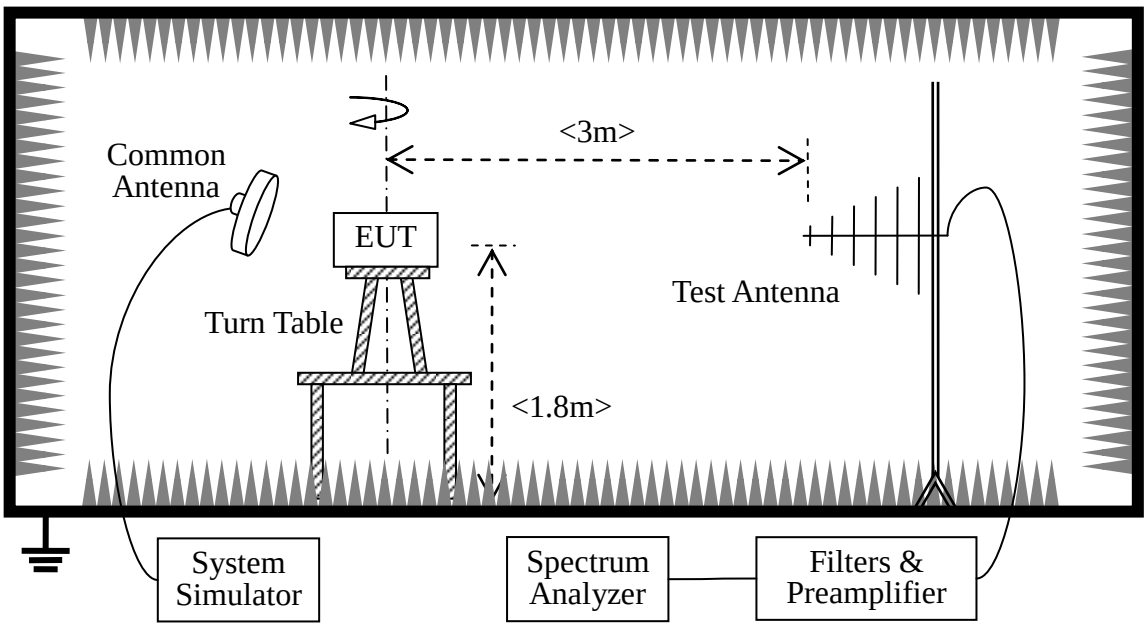
2.7 Transmitter Radiated Power (EIRP/ERP)

2.7.1 Requirement

According to FCC section 22.913, the Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7Watts, and FCC section 24.232, the broadband PCS mobile station is limited to 2Watts e.i.r.p. peak power.

2.7.2 Test Description

1. Test Setup:



1. The resolution bandwidth of the Spectrum Analyzer is set to be comparable to the emission bandwidth of the transmitter, e.g. for GSM modulated signal (here used): RBW=VBW=1MHz, for CDMA modulated signal: RBW=VBW=3MHz.
2. The low, middle and the high channels are selected to perform tests respectively.
3. Employ the bi-log Test Antenna as the test system receiving antenna; set the polarization of the Test Antenna to be the same as that of the EUT transmitting antenna.

Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; actuate the Turn Table to turn from 0 degrees to 360 degrees to find the maximum reading via the Spectrum Analyzer, mark the peak; finally record the peak and the plot.

-Maximum RF output power: CDMA800 27.01dBm, CDMA 1900 25.64dBm

- Step size (dB): 3dB

- Minimum RF power: CDMA800 -0.1dBm, CDMA 1900 -0.3dBm

2. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date
System Simulator	Agilent	E5515C	GB43130131	2013.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2013.05
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2013.05
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2013.05

2.7.3 Test Result

The Turn Table is actuated to turn from 0 ° to 360 °, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested.

The substitution corrections are obtained as described below:

$A_{SUBST} = P_{SUBST\_TX} - P_{SUBST\_RX} - L_{SUBST\_CABLES} + G_{SUBST\_TX\_ANT}$

$A_{TOT} = L_{CABLES} + A_{SUBST}$

Where A_{SUBST} is the final substitution correction including receive antenna gain.

P_{SUBST_TX} is signal generator level,

P_{SUBST_RX} is receiver level,

L_{SUBST_CABLES} is cable losses including TX cable,

$G_{SUBST\_TX\_ANT}$ is substitution antenna gain.

A_{TOT} is total correction factor including cable loss and substitution correction

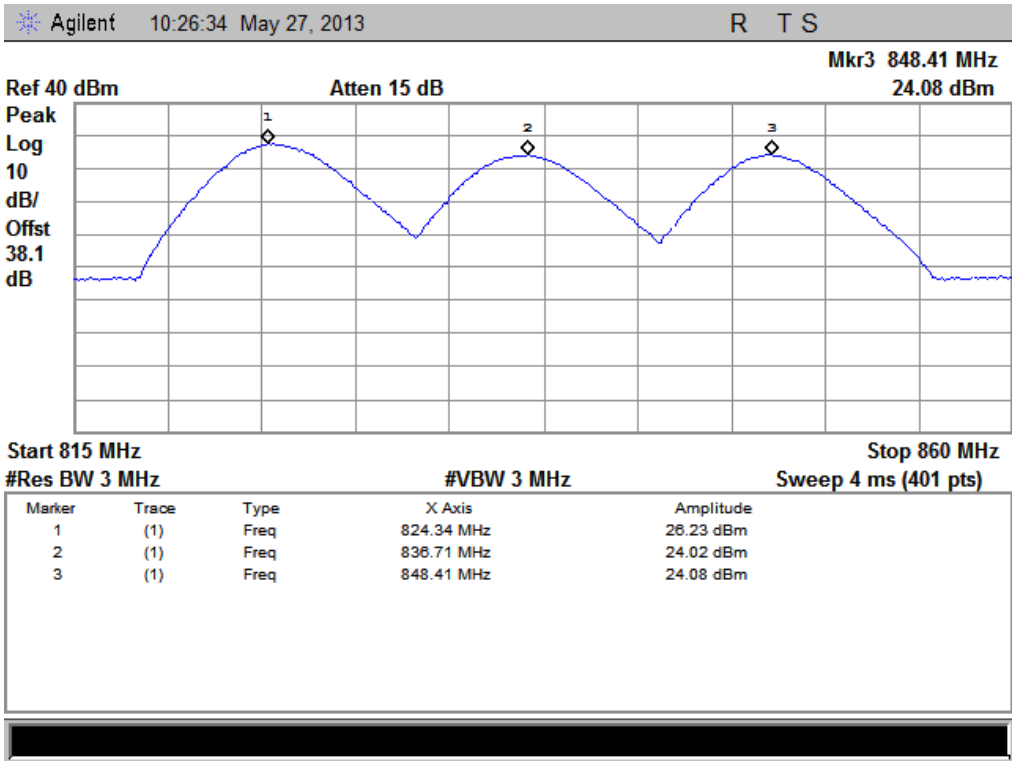
During the test, the data of A_{TOT} was added in the Test Spectrum Analyze, so Spectrum Analyze reading is the final values which contain the data of A_{TOT}.

1. Test Verdict:

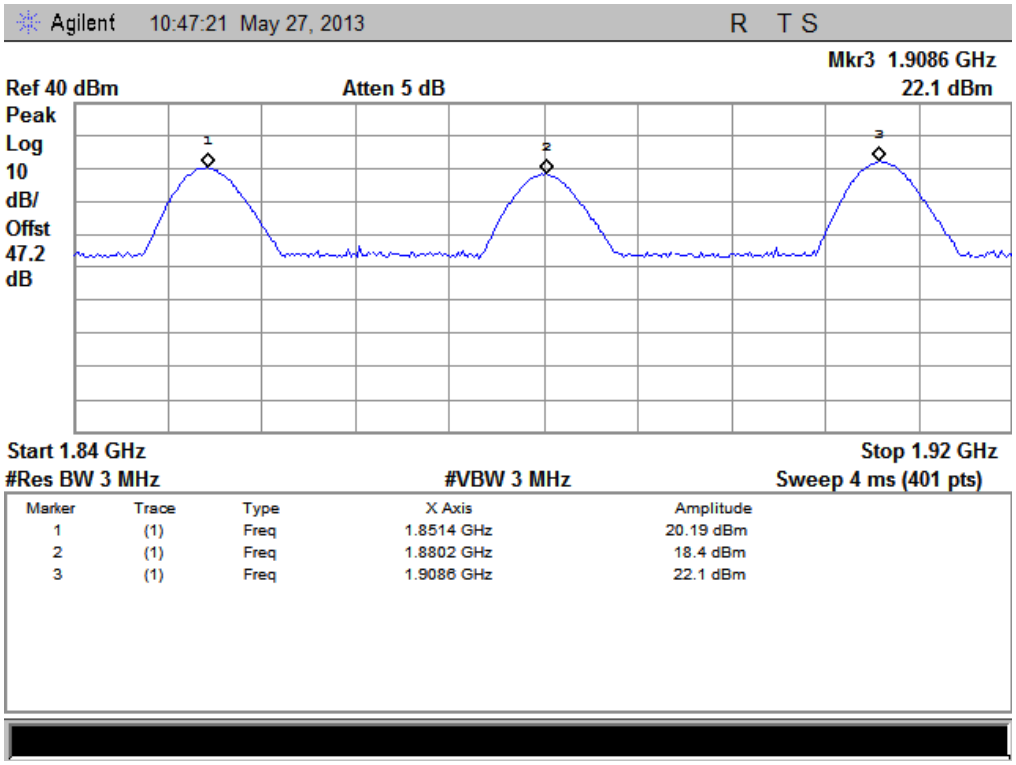
No.	Channel	Frequency (MHz)	Measured ERP		Limit	
			dBm	W	dBm	W
CDMA 800MHz	1013	824.7	26.33	0.429536	38.5	7
	384	836.52	24.02	0.252348		
	777	848.31	24.08	0.255859		

No.	Channel	Frequency (MHz)	Measured EIRP		Limit	
			dBm	W	dBm	W
CDMA 1900MHz	25	1851.2	20.19	0.104472	33	2
	600	1880.0	18.40	0.069183		
	1175	1909.8	22.10	0.162181		

2. Test Plots:



(Plot A: CDMA 800MHz Channel = 1013,384, 777)



(Plot B: CDMA 1900MHz Channel = 25, 600, 1175)

2.8 Radiated Out of Band Emissions

2.8.1 Requirement

According to FCC section 2.1053, 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. This calculated to be -13dBm.

2.8.2 Test Description

See section 2.7.2 of this report.

Note: when doing measurements above 1GHz, the EUT has been within the 3dB cone width of the horn antenna during horizontal antenna.

2.8.3 Test Result

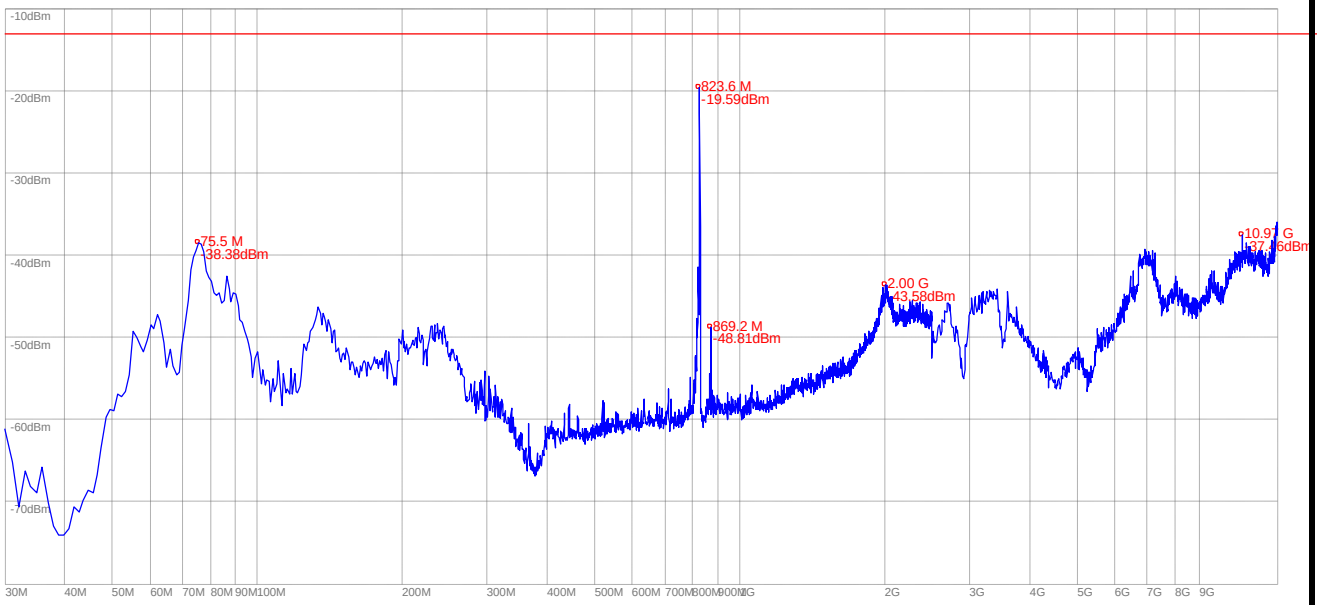
The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0 ° to 360 °, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested to verify the out of band emissions.

1. Test Verdict:

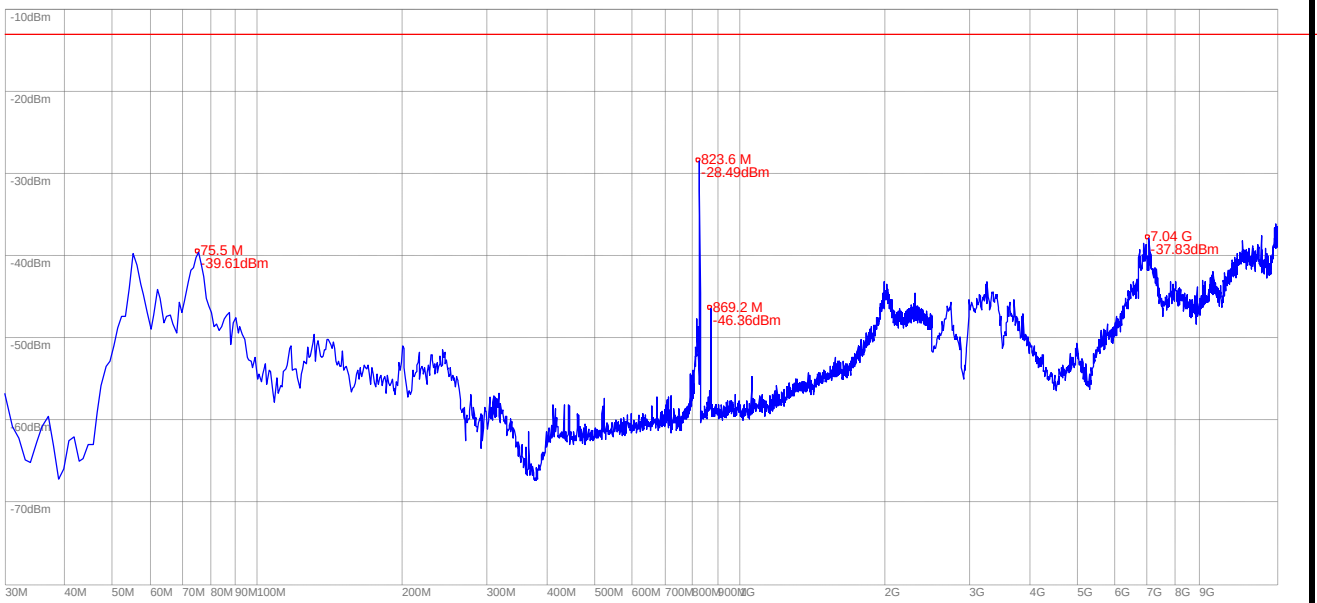
Band	Channel	Frequency (MHz)	Measured Max. Spurious Emission (dBm)		Refer to Plot	Limit (dBm)	Verdict
			Test Antenna Horizontal	Test Antenna Vertical			
CDMA 800MHz	1013	824.7	< -25	< -25	Plot A.1/A.2	-13	PASS
	384	836.52	< -25	< -25	Plot B.1/B.2		PASS
	777	848.31	< -25	< -25	Plot C.1/C.2		PASS
CDMA 1900MHz	25	1851.2	< -25	< -25	Plot D.1/D.2	-13	PASS
	600	1880.0	< -25	< -25	Plot E.1/E.2		PASS
	1175	1909.8	< -25	< -25	Plot F.1/F.2		PASS

2. Test Plots for the Whole Measurement Frequency Range:

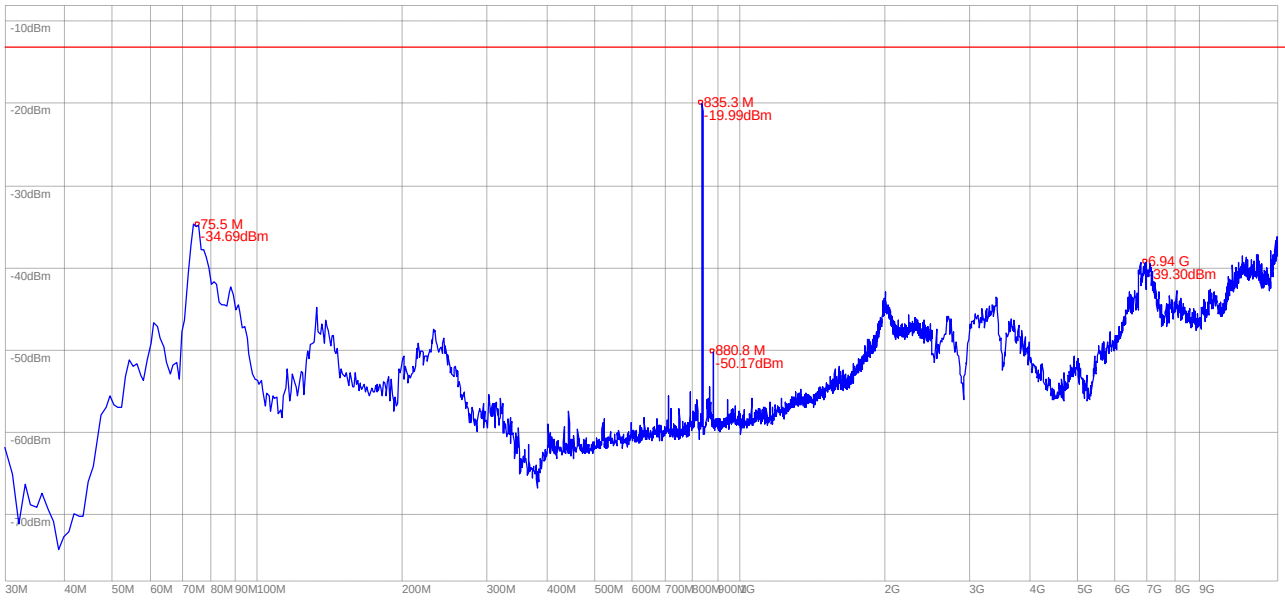
Note: the power of the EUT transmitting frequency should be ignored.



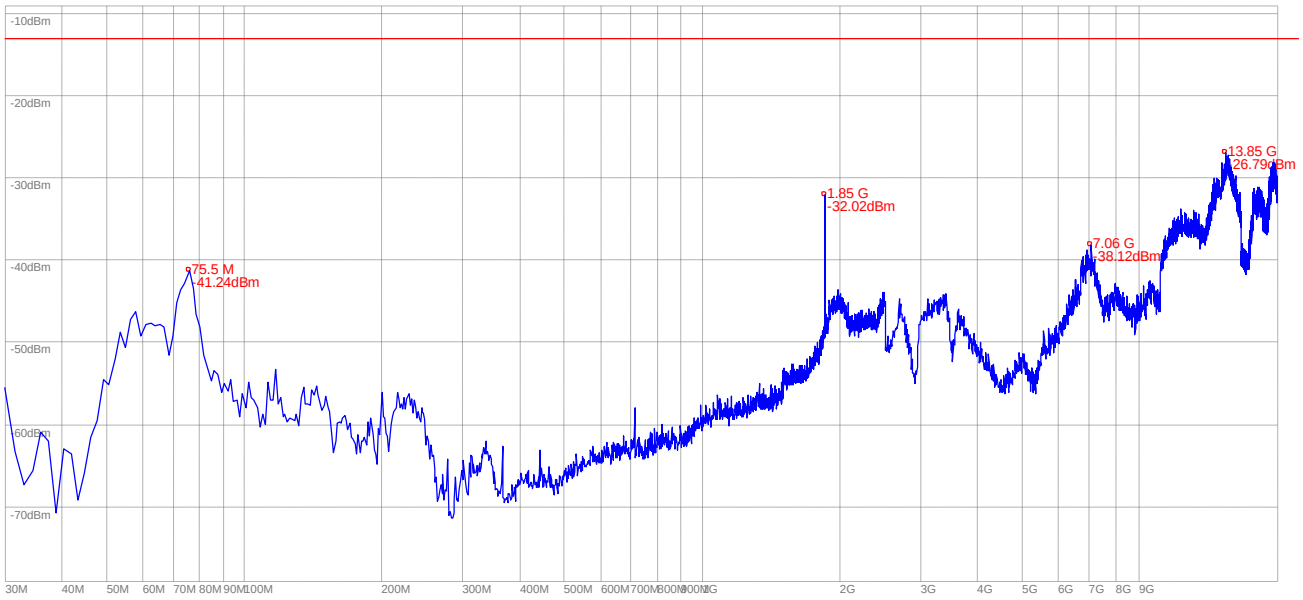
(Plot A.1: CDMA 800MHz Channel = 1013, Test Antenna Horizontal)



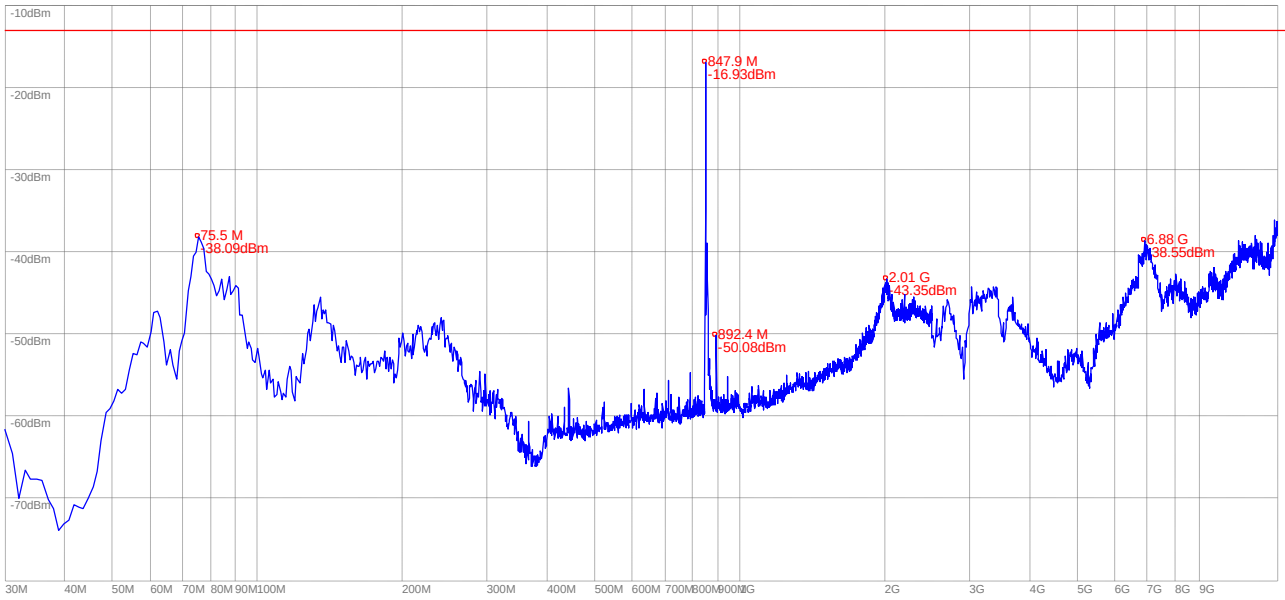
(Plot A.2: CDMA 800MHz Channel = 1013, Test Antenna Vertical)



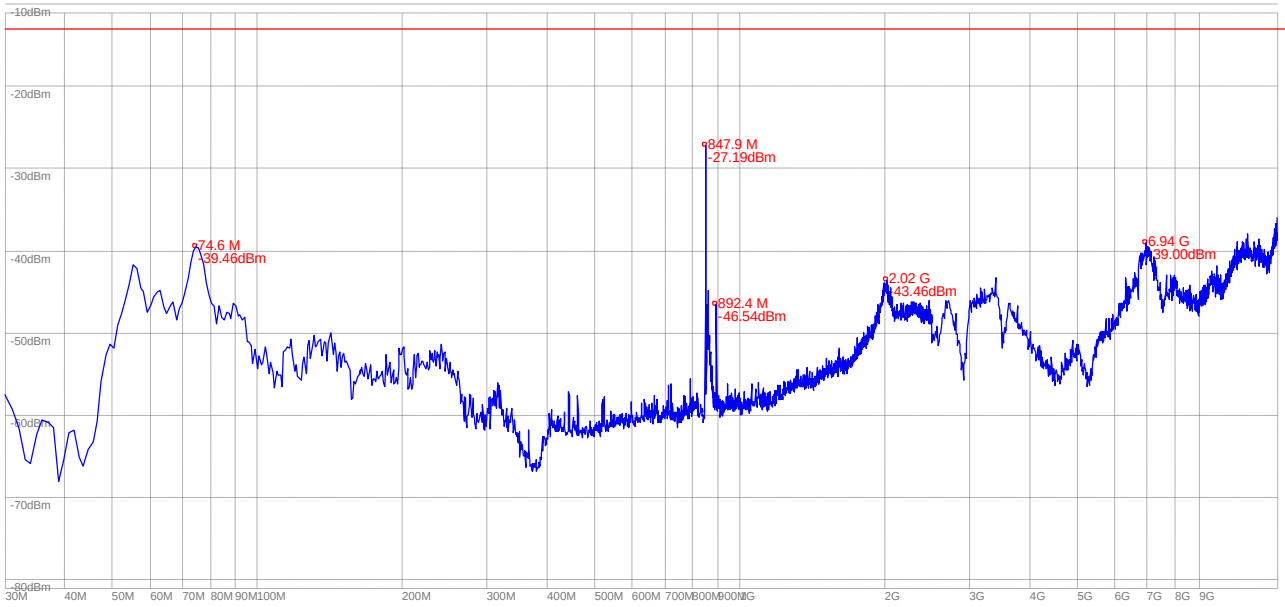
(Plot B.1: CDMA 800MHz Channel = 384, Test Antenna Horizontal)



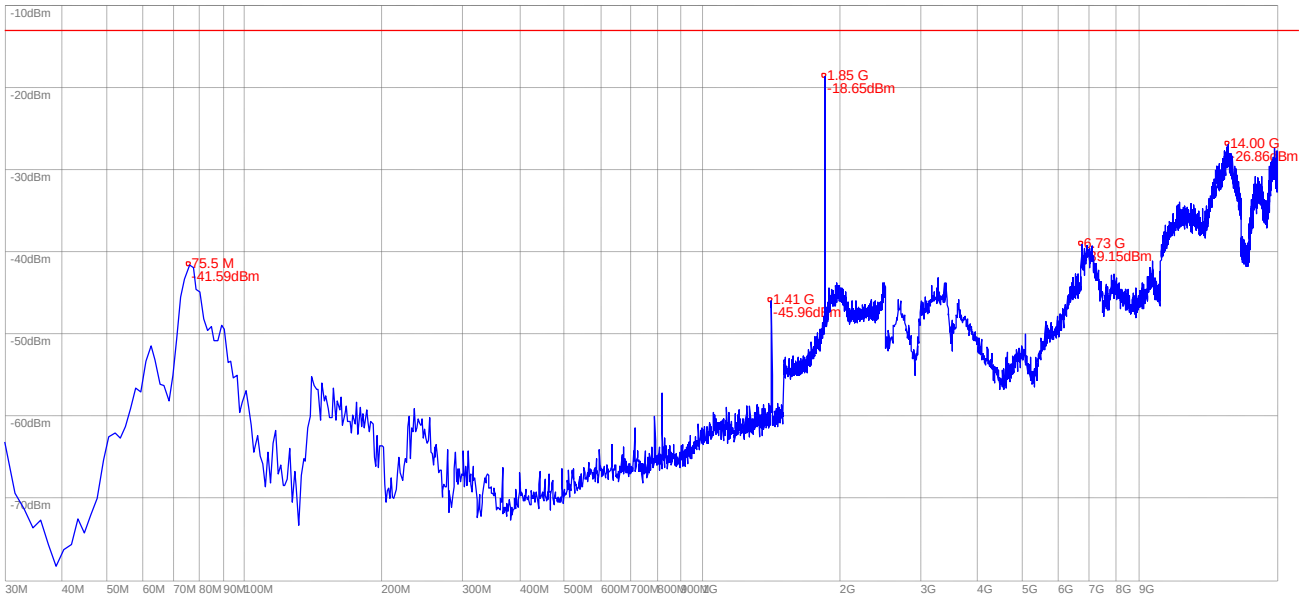
(Plot B.2: CDMA 800MHz Channel = 384, Test Antenna Vertical)



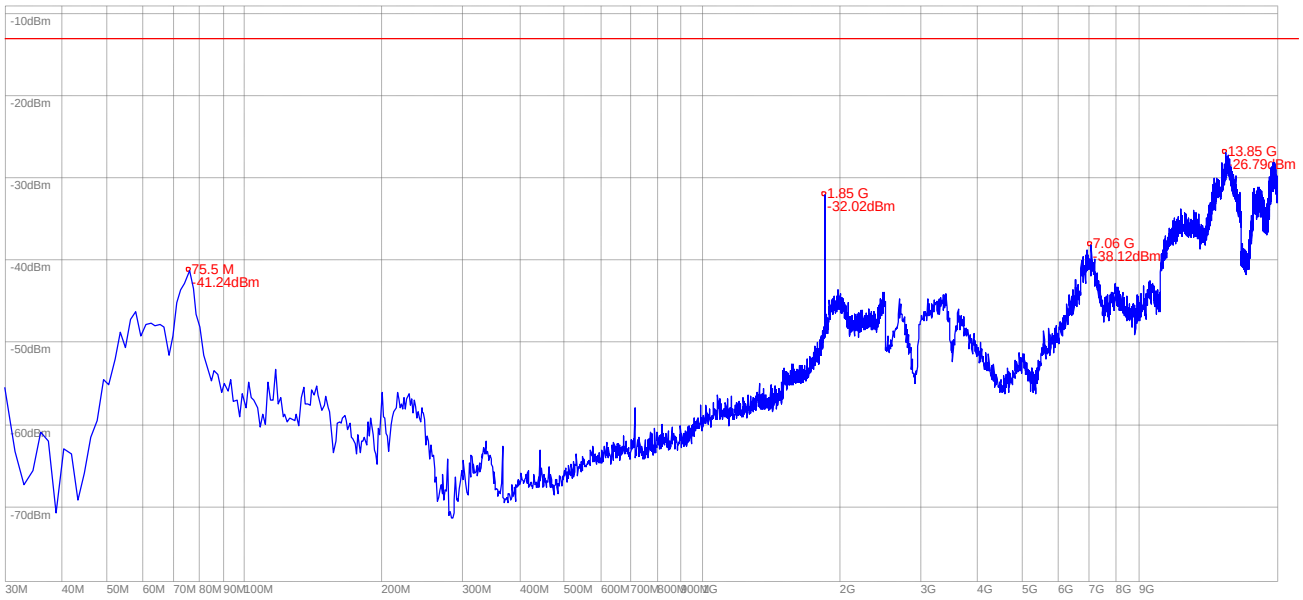
(Plot C.1: CDMA 800MHz Channel = 777, Test Antenna Horizontal)



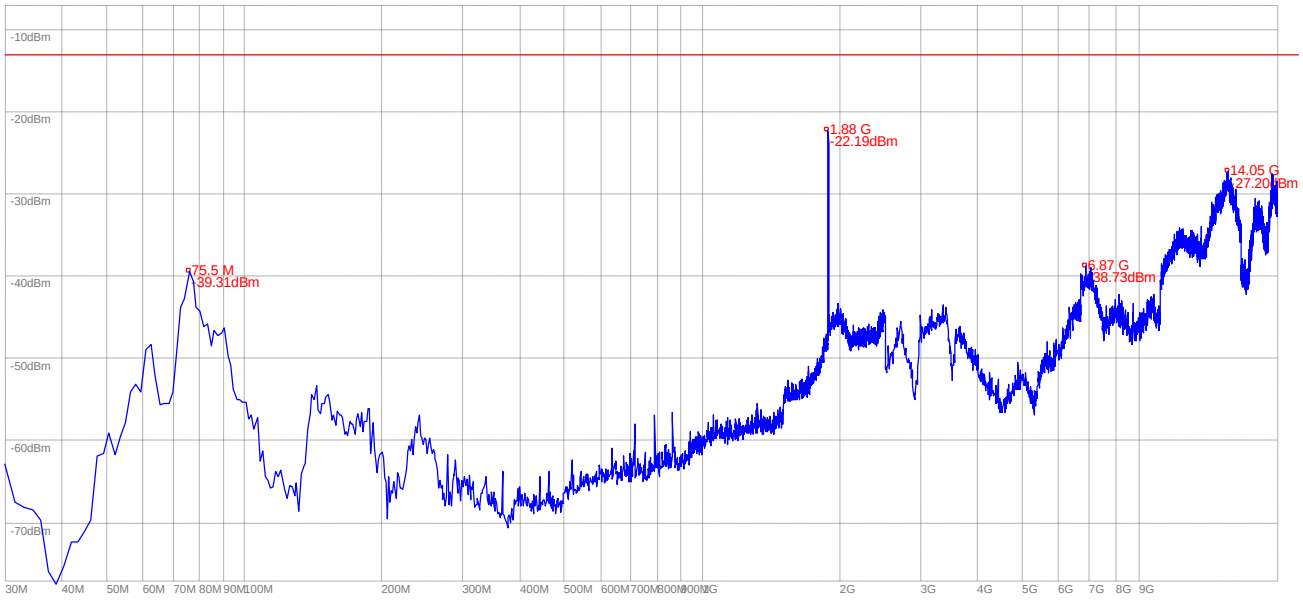
(Plot C.2: CDMA 800MHz Channel = 777, Test Antenna Vertical)



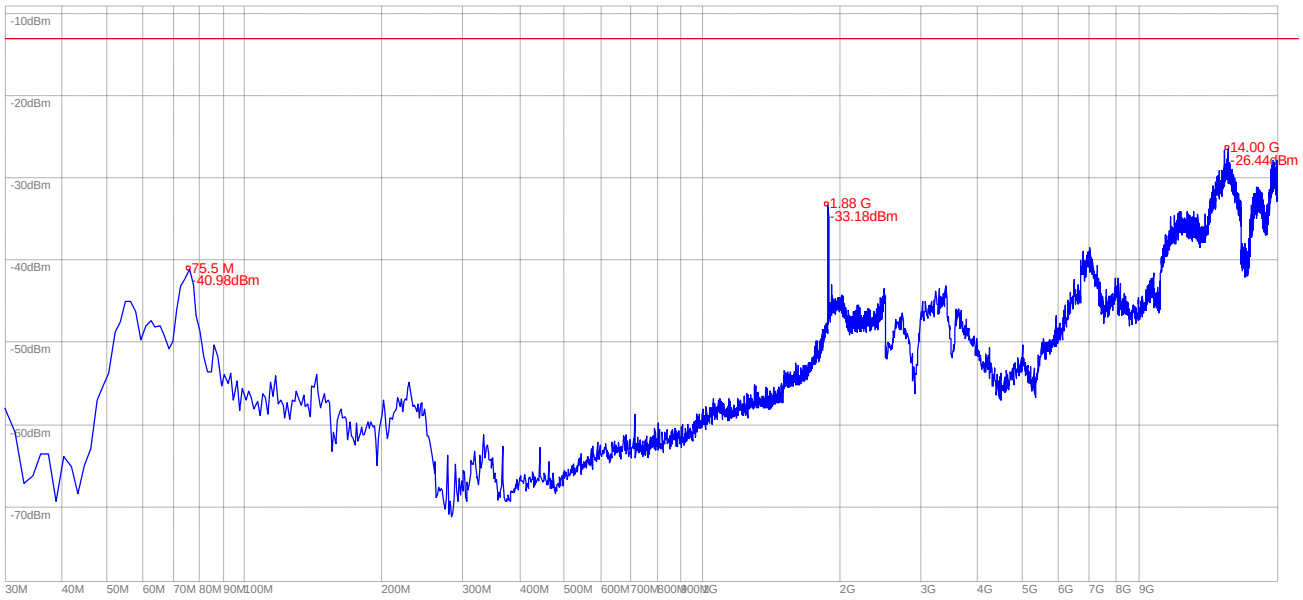
(Plot D.1: CDMA 1900MHz Channel = 25, Test Antenna Horizontal)



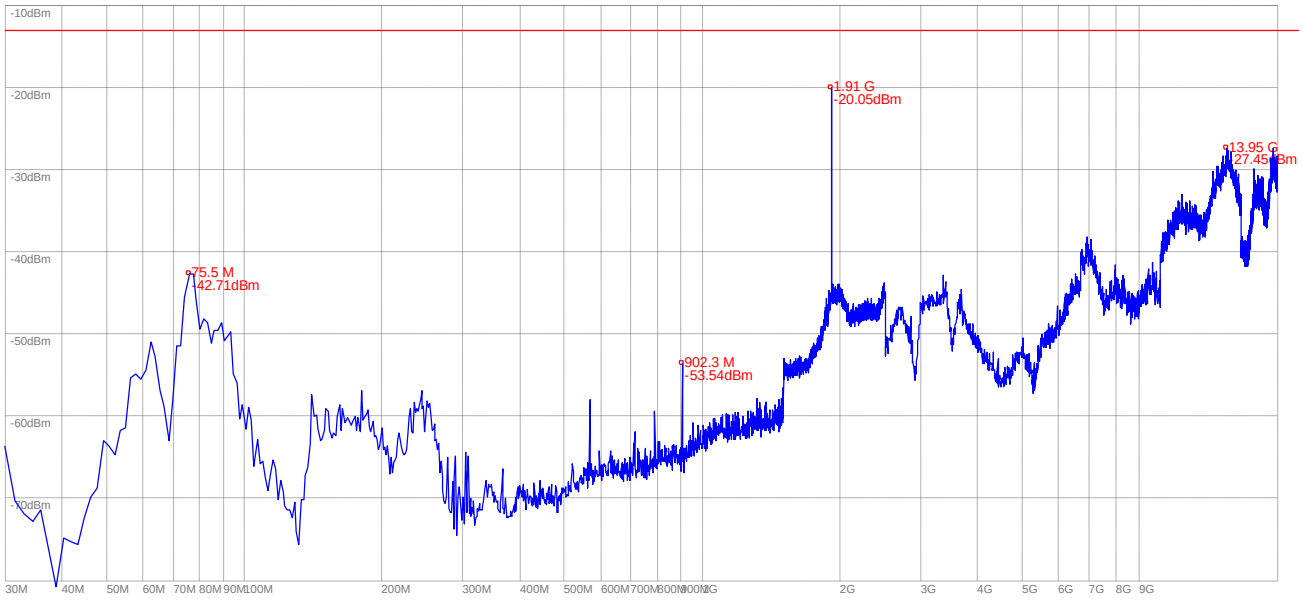
(Plot D.2: CDMA 1900MHz Channel = 25, Test Antenna Vertical)



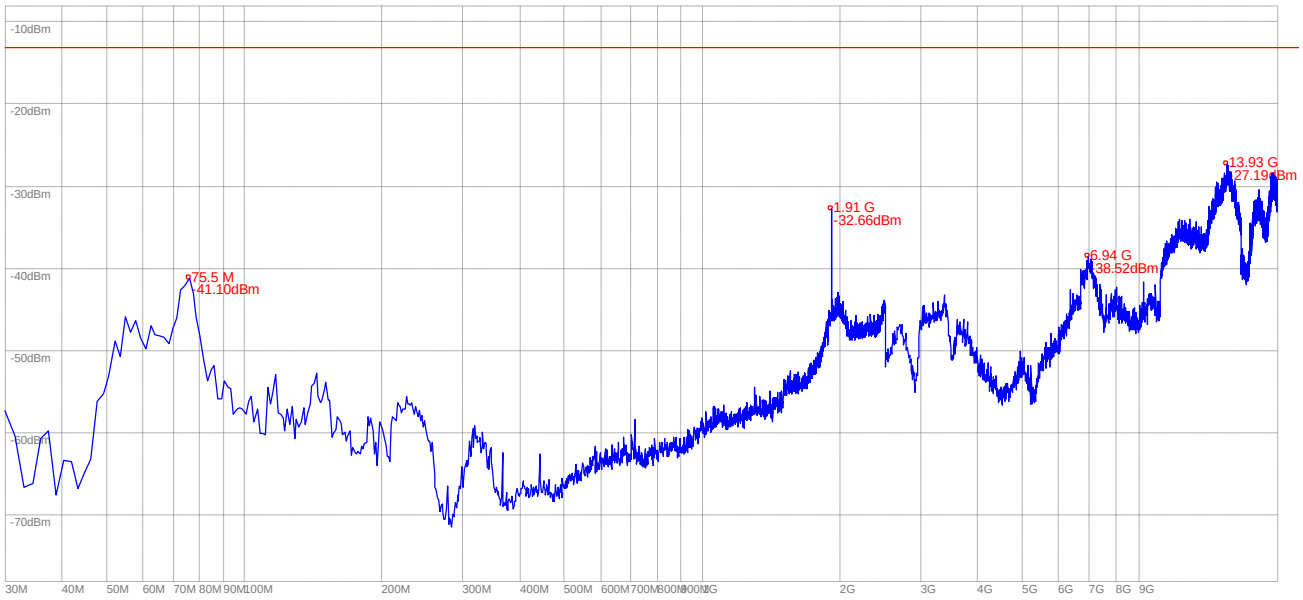
(Plot E.1: CDMA 1900MHz Channel = 600, Test Antenna Horizontal)



(Plot E.2: CDMA 1900MHz Channel = 600, Test Antenna Vertical)



(Plot F.1: CDMA 1900MHz Channel = 1175, Test Antenna Horizontal)



(Plot F.2: CDMA 1900MHz Channel = 1175, Test Antenna Vertical)

** END OF REPORT **