HCT CO., LTD.

CERTIFICATION DIVISION
105-1, JANGAM-RI, MAJANG-MYEON, ICHEON-SI, GYEONGGI-DO, KOREA
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CERTIFICATE OF COMPLIANCE

FCC PART 22 Certification

Applicant Name: **GS Instruments Co.,Ltd.** **Address: 1385-14, Juan-Dong, Nam-Ku, Incheon, 402-200, Korea**	**Date of Issue: November 12, 2012** **Test Site/Location:** HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Gyeonggi-Do, Korea **Test Report No.:** HCTR1210FR14-1 **HCT FRN:** 0005866421 **IC Recognition No.:** 5944A-3

FCC ID	**:**	**U88-SMT-C33**
IC	**:**	**8137A-SMT-C33**
APPLICANT	**:**	**GS Instruments Co.,Ltd.**

EUT Type:	**CDMA In-Building RF Repeater**
Model:	**SMT-C33**
Frequency Ranges:	**DL : 869 MHz ~ 894 MHz** **UL : 824 MHz ~ 849 MHz**
Conducted Output Power:	**DL : 2.07 W ,UL : 2.04 W**
FCC Rules Part(s):	**CFR 47, Part 22**
IC Rules Part(s):	**RSS-131, RSS-GEN**

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 22 of the FCC Rules under normal use and maintenance.

Report prepared by
:Chang Seok Choi
Test engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

Revision

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1210FR14	October 11, 2012	First Approval Report
HCTR1210FR14-1	November 12, 2012	Some comments for KDB935210 were added.

CONTENTS

1. CLIENT INFORMATION

The EUT has been tested by request of

Company	GS Instrumnets Co.,Ltd. 1385-14, Juan-Dong, Nam-Ku, Incheon, 402-200, Korea
Contact Point	Attention: Young Il Kim Tel. : +82-32-870-5545

■ **FCC ID:**	**U88-SMT-C33**
■ **APPLICANT:**	**GS Instruments Co.,Ltd.**
■ **EUT Type:**	**CDMA In-Building RF Repeater**
■ **Model:**	**SMT-C33**
■**Frequency Ranges:**	**DL : 869 MHz ~ 894 MHz** **UL : 824 MHz ~ 849 MHz**
■ **Conducted Output Power:**	**DL : 30.17 dBm** **UL : 30.10 dBm**
■ **Antenna Gain(s):**	**DL : 2 dBi , UL : 9 dBi**
■ **FCC Rules Part(s):**	**CFR Title 47 Part 22**
■ **IC Rules Part(s):**	**RSS-131, RSS-GEN**
■ **Place of Tests:**	**105-1, Jangam-ri , Majang-Myeon, Icheon-si, Gyeongggi-Do, 467-811, KOREA. (IC Recognition No. : 5944A-3)**

2. TEST SPECIFICATIONS

Description	Reference (FCC)	Reference (IC)	Results
RF Power Output	§2.1046; §22.913	RSS-131, Section 6.2	Compliant
Occupied Bandwidth Passband Gain	§2.1049	RSS-131, Section 6.1 RSS-GEN, Section 4.6.1	Compliant
Spurious Emissions at Antenna Terminals	§2.1053, §22.917	RSS-131, Section 6.3 RSS-131, Section 6.4	Compliant
Frequency Stability	§2.1055	RSS-131, Section 6.5	Compliant

※ We refered to KDB935210 to test the EUT.

※ According to KDB935210, for spurious emissions and bandwidth both maximum input at the highest gain setting (-57dBm input, 90dB gain) and maximum input level (-27dBm) is checked and the worst case (-57dBm/90dB gain) of the two is contained in the test report

3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature :	**+ 15 ℃ to + 35 ℃**
Relative humidity:	**30 % to 60 %**
Air pressure	**860 mbar to 1 060 mbar**

4. TEST EQUIPMENT

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Schwarzbeck	BBHA 9120D / Double Ridged Horn Antenna	147	05/15/2014
Schwarzbeck	BBHA 9120D / Double Ridged Horn Antenna	937	10/17/2013
Schwarzbeck	VULB 9168 / TRILOG Antenna	9168-200	02/19/2013
HD	MA240 / Antenna Position Tower	556	N/A
EMCO	1050 / Turn Table	114	N/A
HD GmbH	HD 100 / Controller	13	N/A
HD GmbH	KMS 560 / SlideBar	12	N/A
MITEQ	AMF-6B-180265-35-10P / POWER AMP	667624	04/16/2013
Agilent	N9020A /Signal Analyzer	US46220219	05/02/2013
Agilent	6674A / DC Power Supply	3501A00901	05/02/2013
WEINSCHEL	67-30-33 / Attenuator	BU5347	11/07/2012
WEINSCHEL	AF9003-69-31 / Attenuator	5701	11/07/2012
Nang-Yeoul	NY-THR18750 / Temperature Chamber	NY-2009012201A	11/08/2012

5. RF OUTPUT POWER

Test Requirements:

§ 2.1046 Measurements required: RF power output:

§ 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 in § 2.1033(c)(8).The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

§ 2.1046 (b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

§ 2.1046 (c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

§ 22.913 Effective radiated power limits. The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(a) Maximum ERP. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. However, for those systems operating in areas more than 72 km (45 miles) from international borders that:

Test Requirements: RSS-131 6.2

The manufacturer's output power rating Prated MUST NOT be greater than Pmean for all types of enhancers.

Additional Power Back-off Condition for Multiple Carrier Operations:

An example of a single carrier operation is a band translator that incorporates an (IF) filter of a passband equal to one channel bandwidth. Another example of a single carrier operation is the use of an enhancer, before the connection to the antenna, to boost a low power transmitter (single carrier) to a higher power.

An example of a multiple carrier operation is the use of an enhancer to amplify off-air signals that contain the wanted carrier and two (or more) adjacent band carriers. If the enhancer

passband is wide enough to pass more than the wanted channel bandwidth, the enhancer output stage will be loaded by the multiple carriers.

Examination: with 3 carrier signals (of assumed equal level), the peak voltage will be 3 times the single carrier voltage. The corresponding Peak Envelope Power (PEP) will be 3**2** times greater than a single carrier or 9/4 = 2.25 times greater than 2 tones PEP. Therefore the permissible wanted signal operating point has to be backed off by 3.5 dB (i.e. **Ppermissible = Prated - 3.5 dB**).

Note 1: All enhancers will be classified in the Radio Equipment List (REL) for a single carrier operation.

Note 2: For a multiple carrier operation, the rating must be reduced by 3.5 dB or more.

Note 3: If there are more than 3 carriers present at the amplifier input point, greater power back-off may be required. This can be examined on a case-by-case basis.

Test Procedures:

As required by 47 CFR 2.1046, RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer or power meter. This test was performed in all applicable modulations.

Test Procedures: RSS-131 4.3

4.3.1 Multi-channel Enhancer

The following subscript "o" denotes a parameter at the enhancer output point.

Connect two signal generators to the input of the Device Under Test (DUT), via a proper impedance matching network (and preferably via a variable attenuator) so that the two input signals are equal sinusoids (and can be raised equally).

Connect a dummy load of suitable load rating to the enhancer output point. Connect also a spectrum analyser to this output point via a coupling network and attenuator, so that only a portion of the output signal is coupled to the spectrum analyser. The coupling attenuation shall be stated in the test report.

Set the two generator frequencies f1 and f2 such that they and their third-order intermodulation product frequencies, f3= 2f1-f2 and f4 = 2f2 - f1, are all within the passband of the DUT.

Raise the input level to the DUT while observing the output tone levels, Po1 and Po2, and the intermodulation product levels, Po3 and Po4.

For enhancers rated 500 watts or less: Raise the input level to the DUT until the greater level of the intermodulation products at the enhancer output terminals, Po3 or Po4, equals -43 dBW.

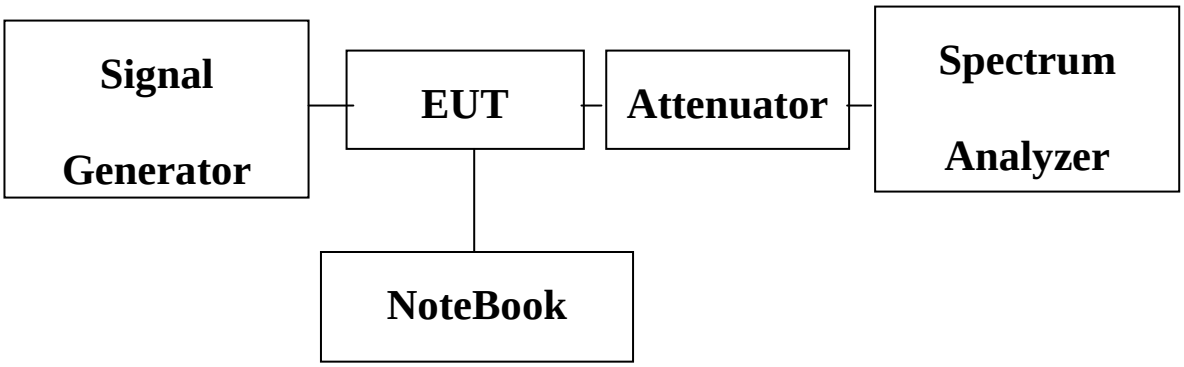
For enhancers rated over 500 watts: Raise the input level to the DUT until the greater level of the intermodulation products at the enhancer output terminals, Po3 or Po4, is 67 dB below the level of either output tone level, Po1 or Po2.

Record all signal levels and their frequencies. Calculate the mean output power (Pmean) under

this testing condition using Pmean = Po1 + 3 dB.

4.3.2 Single Channel Enhancer

A suitably modulated signal, representative of the technology for which certification is sought, is applied to the input of the amplifier. The input power level is increased until the manufacturer's rated input power level is achieved or until a 2 dB increase in input level results in a 1 dB increase in output level (i.e. compression begins). Record the output power in the 99% emission bandwidth using any suitable means.



Block Diagram 1. RF Power Output Test Setup

Test Results:

※ According to KDB935210, both cases (Maximum input rating and Maximum gain setting) were looked at and the test result (Output Power and Spectral Shape) were almost same in uplink and downlink.
If we input a higher value than regulated value, the EUT is shut down to prevent itself.
The Test report was recorded the result of maximum gain setting mode only because it was a little worst case for EUT.

Sample Calculation

Output Power = Reading Value + ATT loss + Cable loss

1. Spectrum reading values are not plot data. The power results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss (33.53 dB at downlink/uplink)
3. Actual value of loss for the attenuator and cable combination is 33.53 dB at 850 MHz , 33.61 dB at 894 MHz, and 33.45 dB at 824 MHz.

Input Signal	Modulation	Level (dBm)
CDMA	QPSK	-56.4

[Downlink]

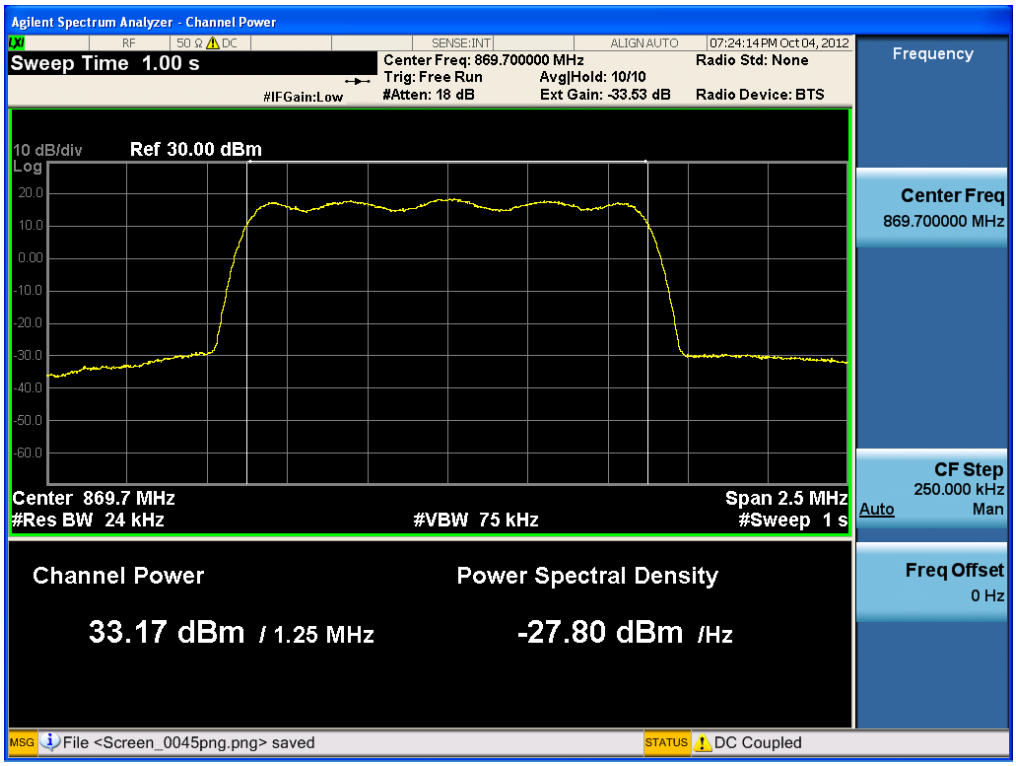
	Channel	Frequency (MHz)	Output Power (dBm)
CDMA	Low	869.70	33.17
	Middle	881.52	33.09
	High	893.31	33.06

[Uplink]

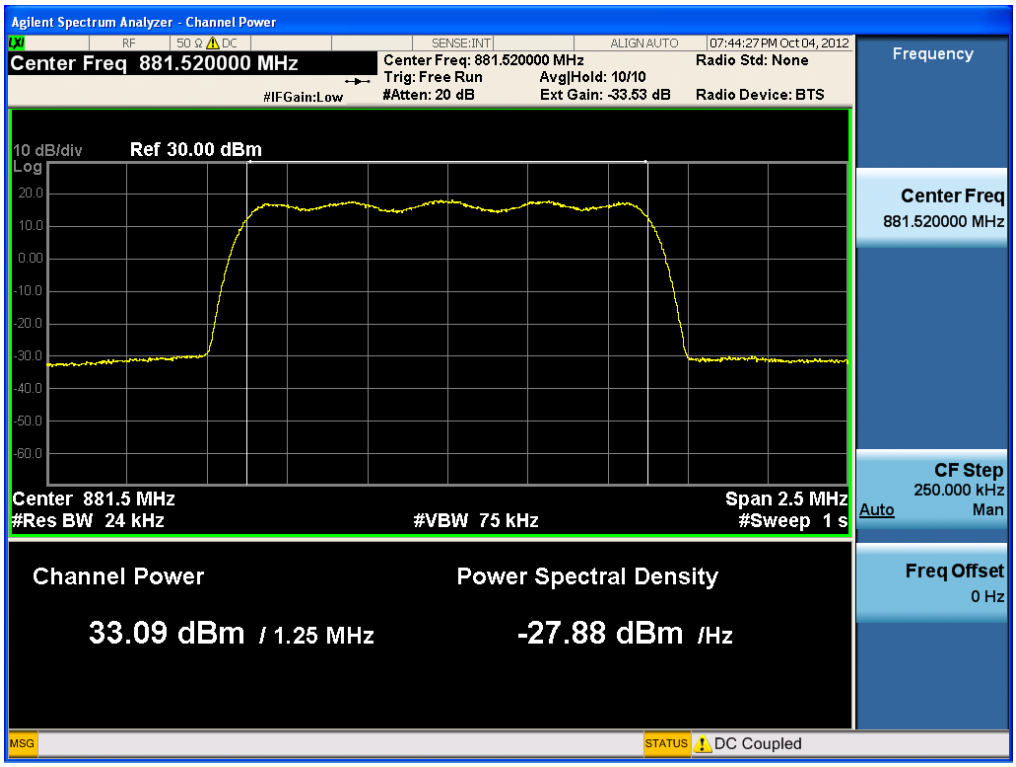
	Channel	Frequency (MHz)	Output Power (dBm)
CDMA	Low	824.70	33.07
	Middle	836.52	33.09
	High	848.31	33.10

Plots of RF Output Power

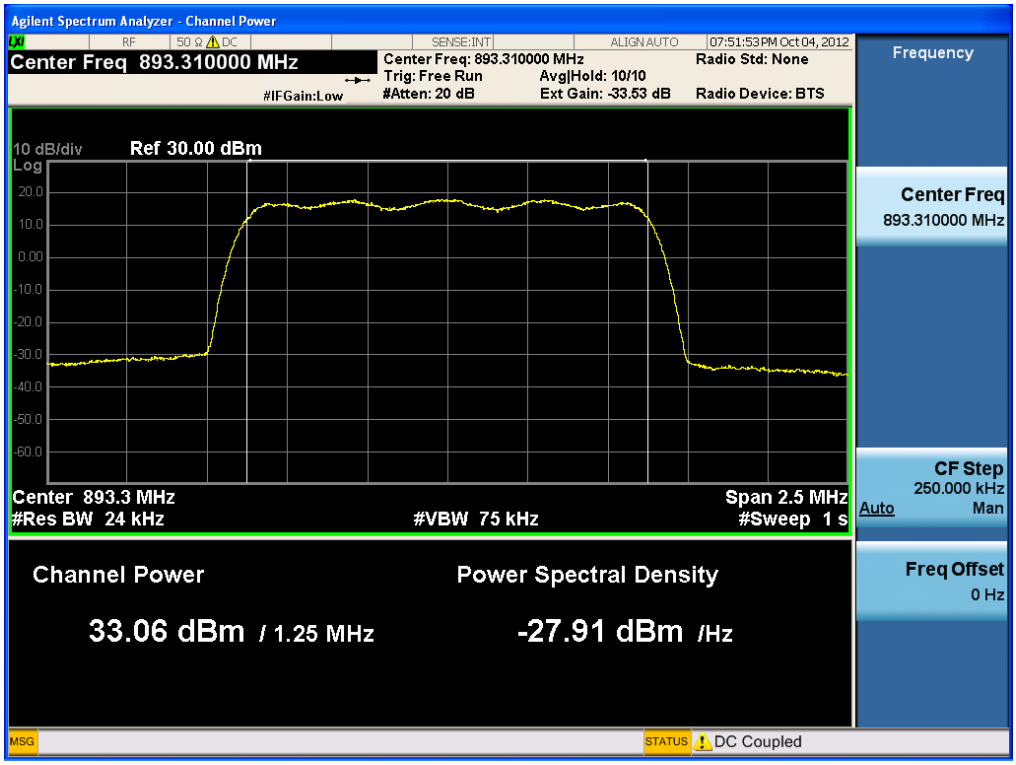
[CDMA Downlink Low]



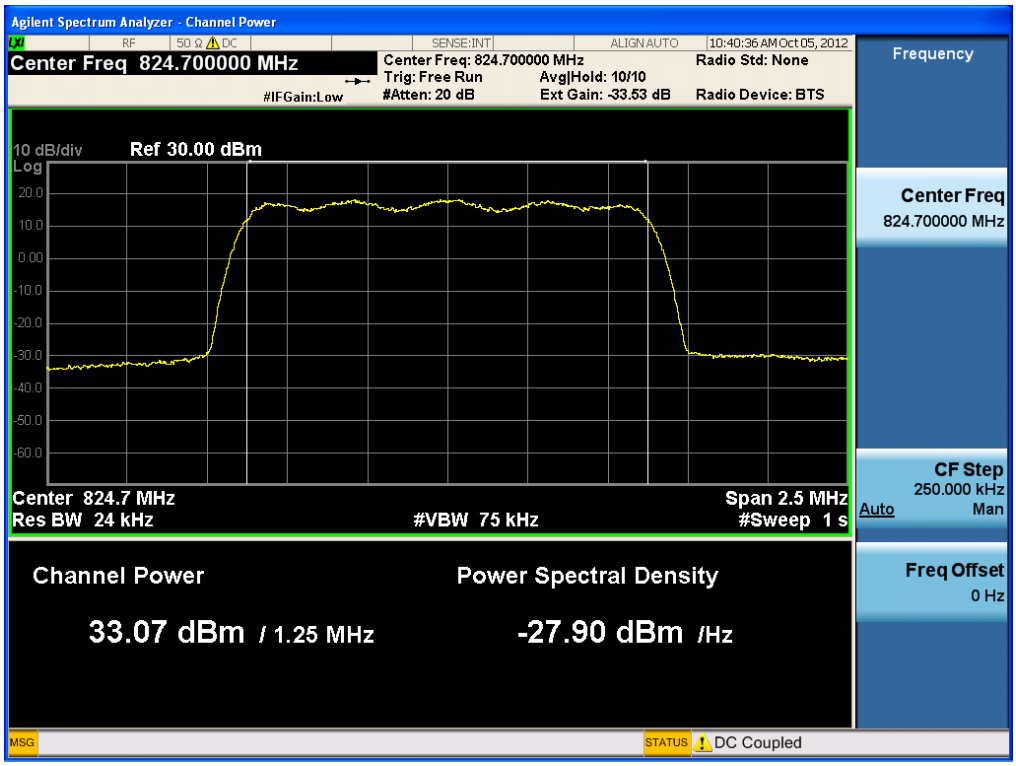
[CDMA Downlink Middle]



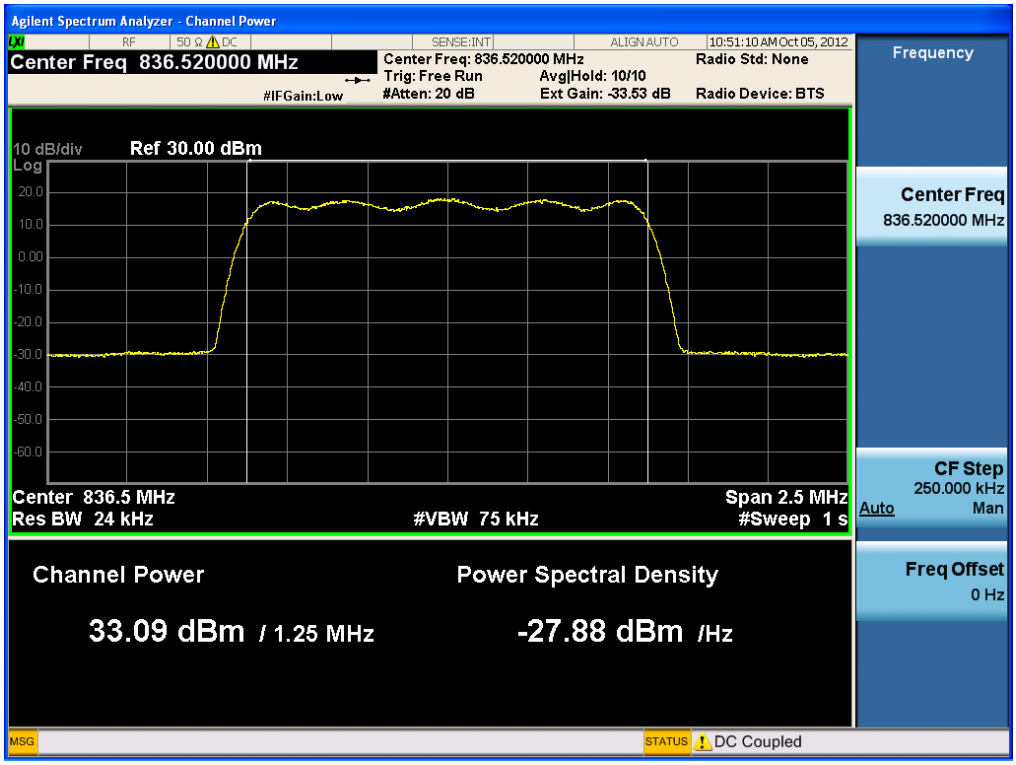
[CDMA Downlink High]



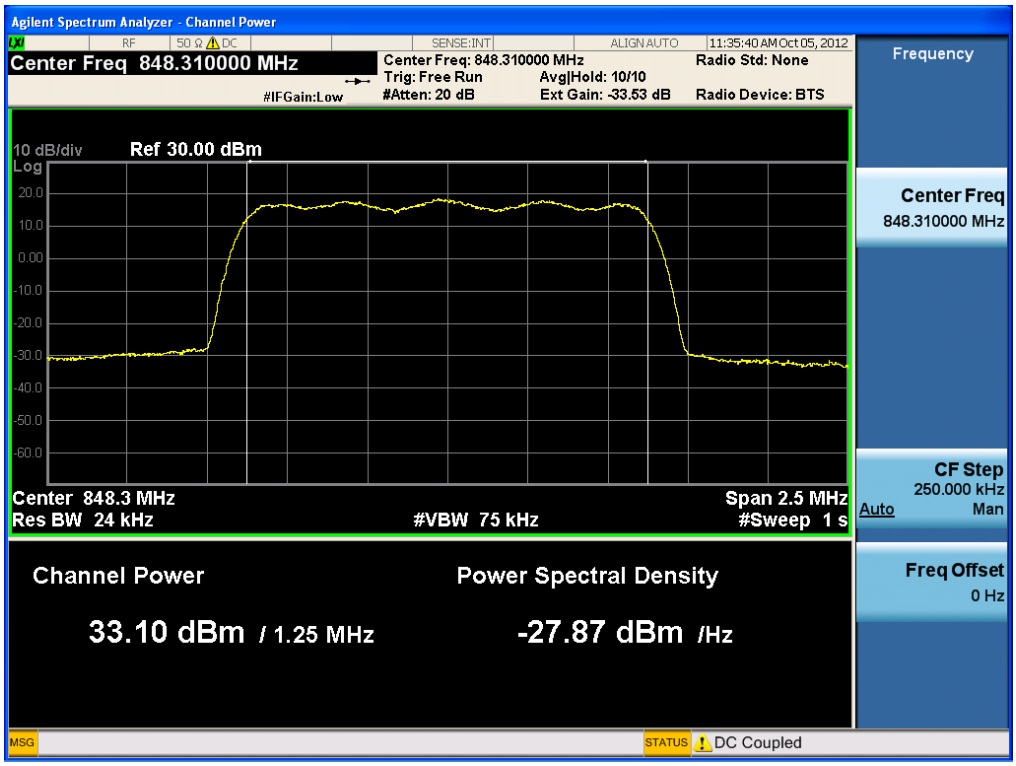
[CDMA Uplink Low]



[CDMA Uplink Middle]

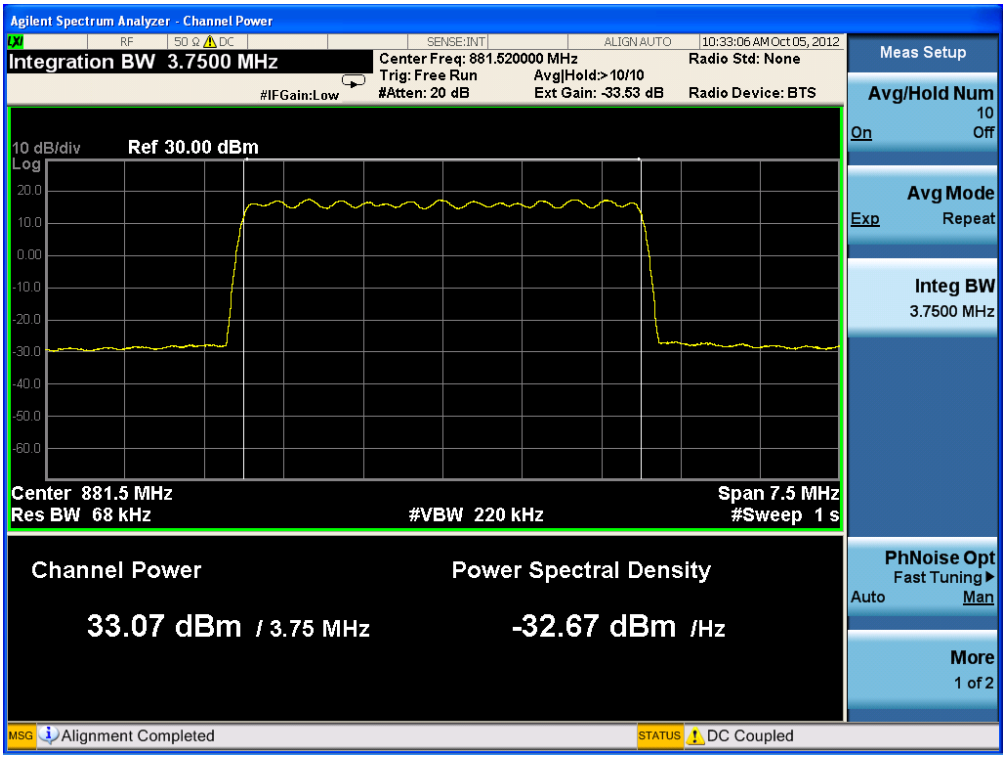


[CDMA Uplink High]

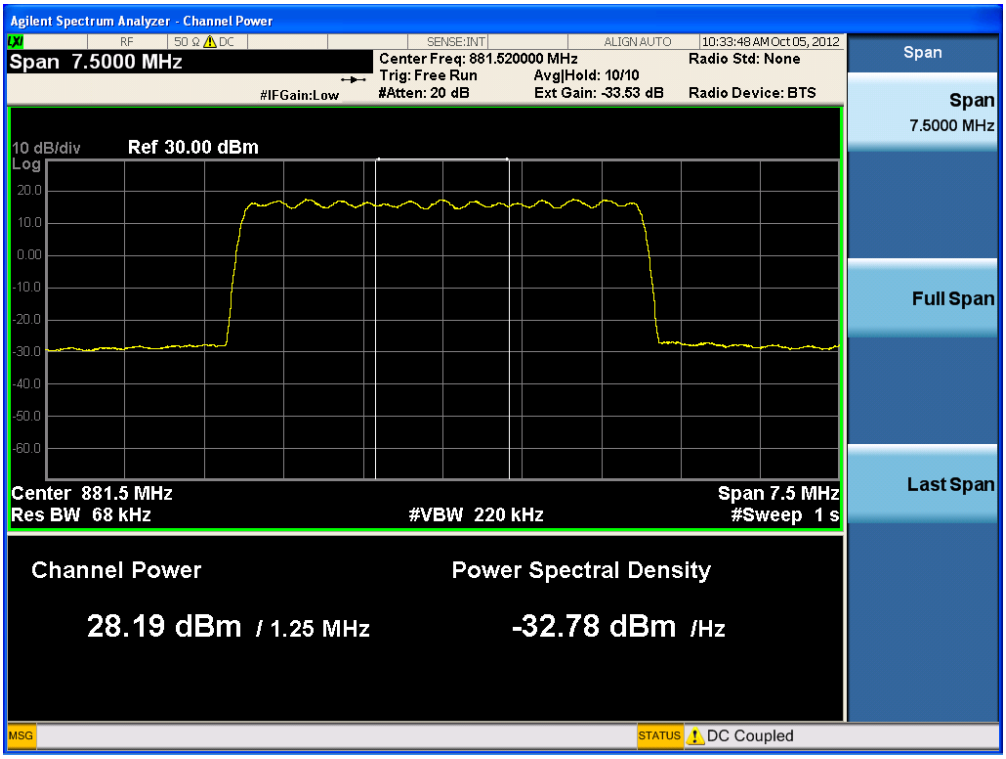


*** RSS-131 6.2 Power Back-off : 33.07 – 28.19 = 4.88 dB**

[Downlink 3 carriers]

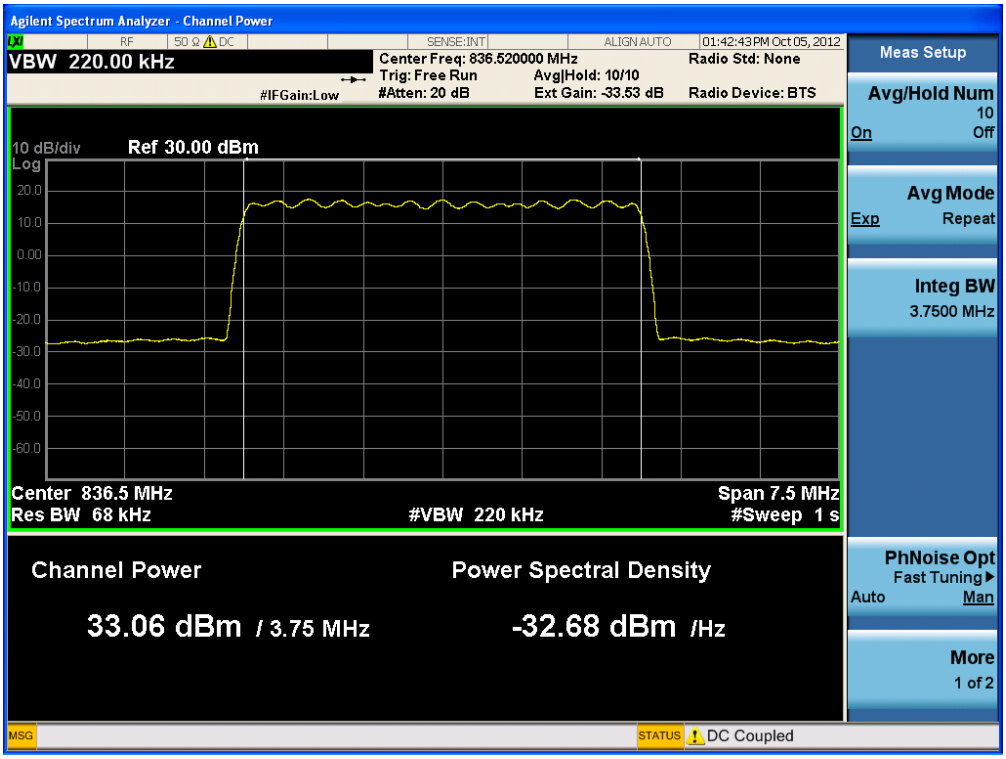


[Downlink 1 carrier]

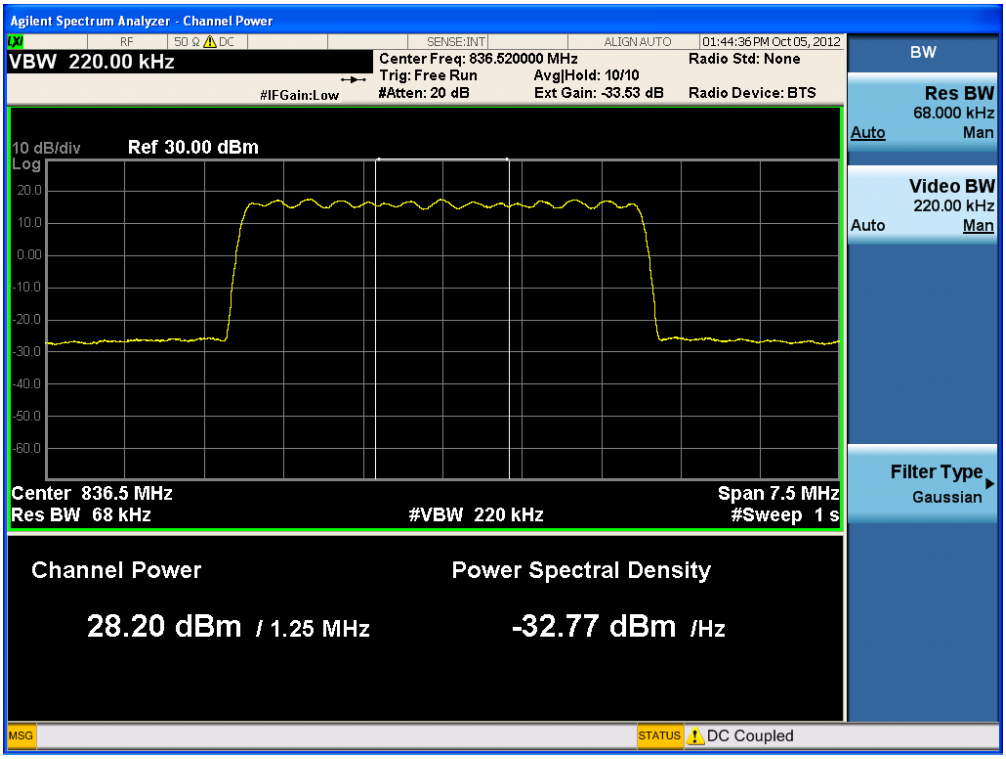


*** RSS-131 6.2 Power Back-off : 33.06 – 28.20 = 4.86 dB**

[Uplink 3 carriers]



[Uplink 1 carrier]



6. OCCUPIED BANDWIDTH

Test Requirement(s): § 2.1049 Measurements required: Occupied bandwidth:

The occupied bandwidth, that 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 shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

Test Requirements: RSS-131 6.1

The passband gain shall not exceed the nominal gain by more than 1.0 dB. The 20 dB bandwidth shall not exceed the nominal bandwidth that is stated by the manufacturer. Outside of the 20 dB bandwidth, the gain shall not exceed the gain at the 20 dB point.

Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made with a Spectrum Analyzer connected to the RF ports for both Uplink and Downlink

The modulation characteristics of signal generator's carrier was measured first at a maximum RF level prescribed by the OEM. The signal generator was then connected to either the Uplink or Downlink input at the appropriate RF level. The resulting modulated signal through the EUT was measured and compared against the original signal.

Test Procedures: RSS-131 4.2

Adjust the internal gain control of the equipment under test to the nominal gain for which equipment certification is sought.

With the aid of a signal generator and spectrum analyser, measure the 20 dB bandwidth of the amplifier (i.e. at the point where the gain has fallen by 20 dB). Measure the gain-versus-frequency response of the amplifier from the midband frequency f0 of the passband up to at least f0 + 250% of the 20 dB bandwidth.

Test Results: The EUT complies with the requirements of this section.

Input Signal	Modulation	Level (dBm)
CDMA	QPSK	-56.4

[Downlink]

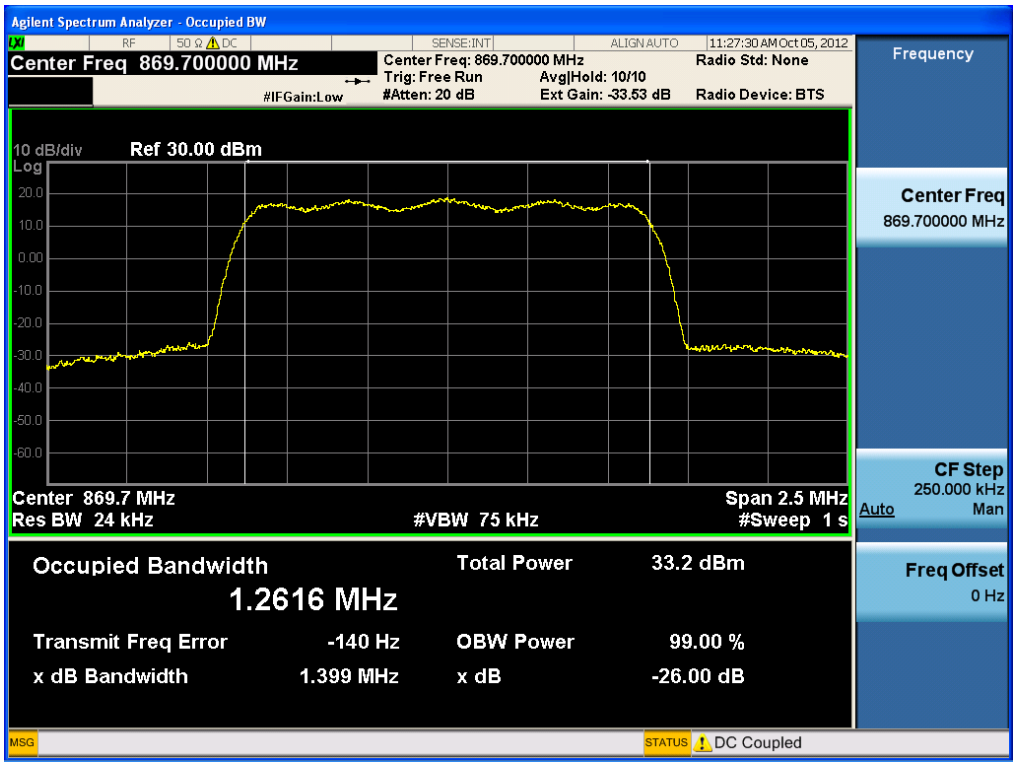
	Channel	Frequency MHz	OBW (Output) MHz	OBW (Input) MHz
CDMA	Low	869.70	1.2616	1.2626
	Middle	881.52	1.2678	1.2629
	High	893.31	1.2636	1.2633

[Uplink]

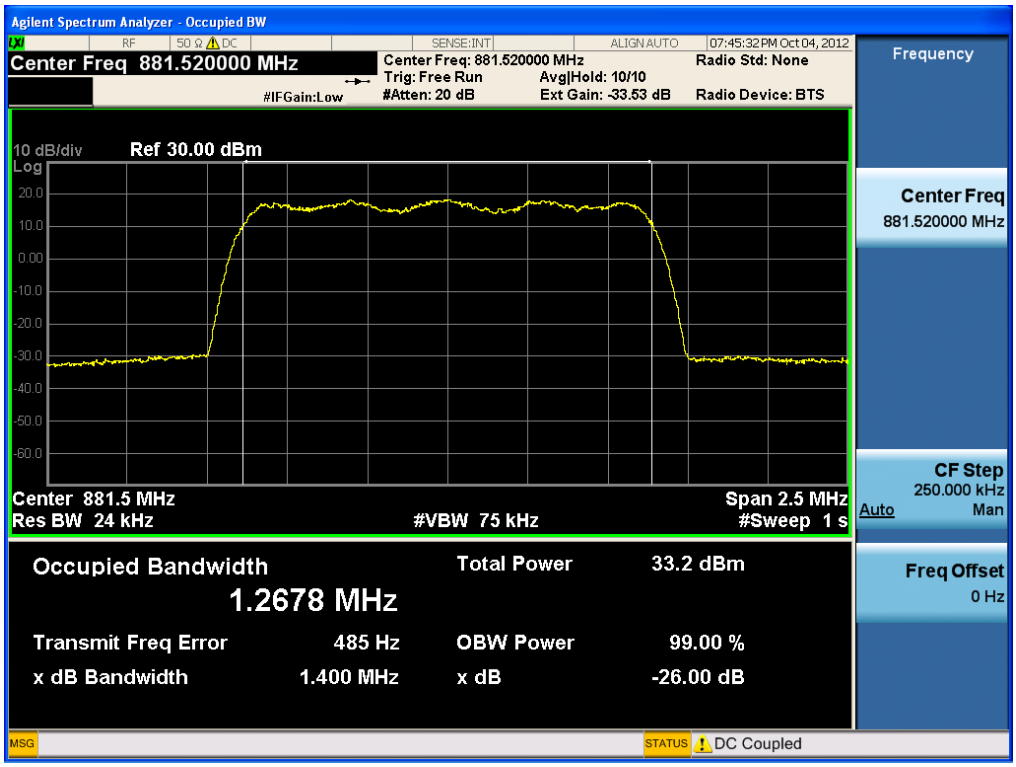
	Channel	Frequency MHz	OBW (Output) MHz	OBW (Input) MHz
CDMA	Low	824.70	1.2632	1.2629
	Middle	836.52	1.2675	1.2627
	High	848.31	1.2629	1.2632

Plots of Occupied Bandwidth

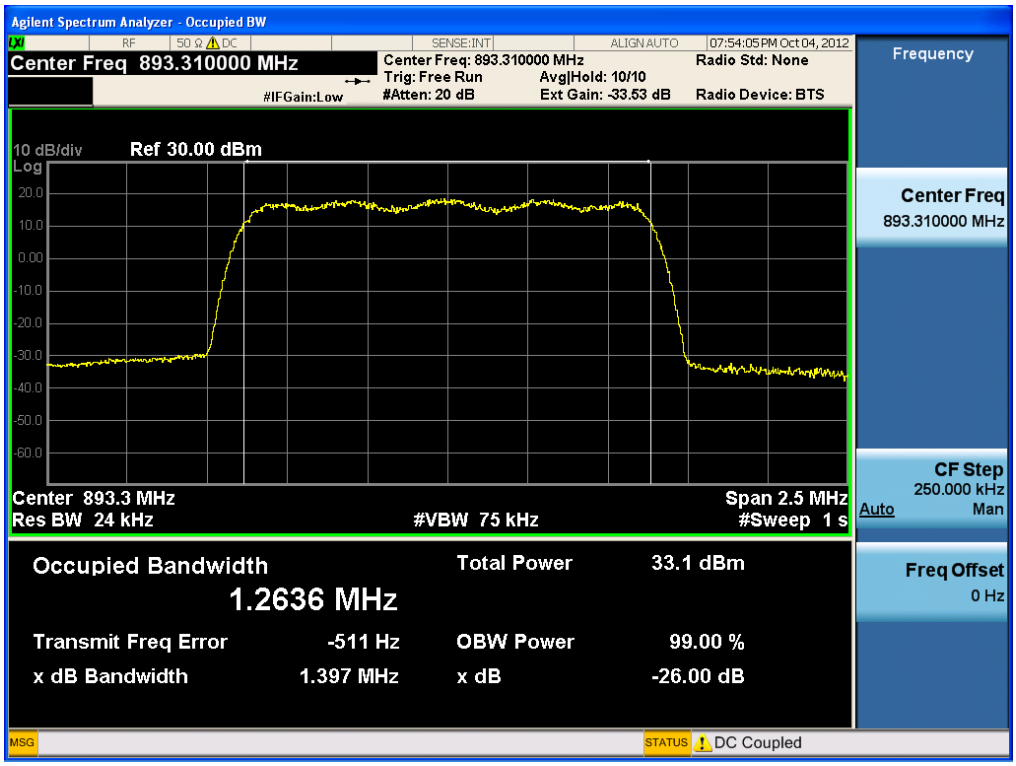
[Output CDMA Downlink Low]



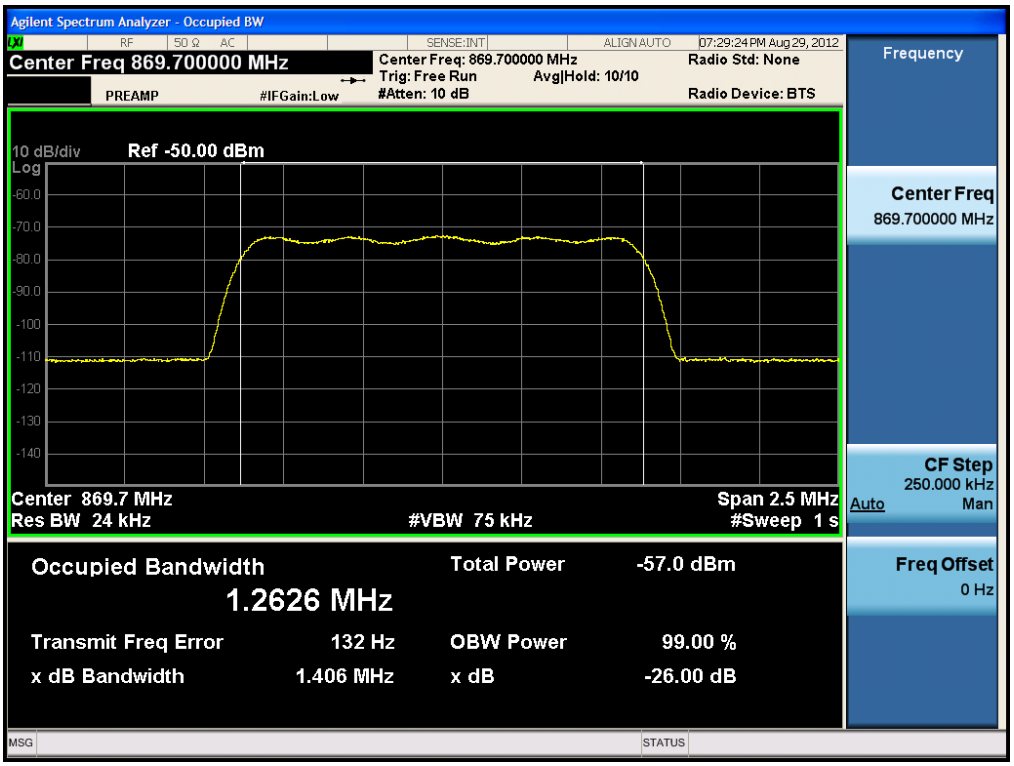
[Output CDMA Downlink Middle]



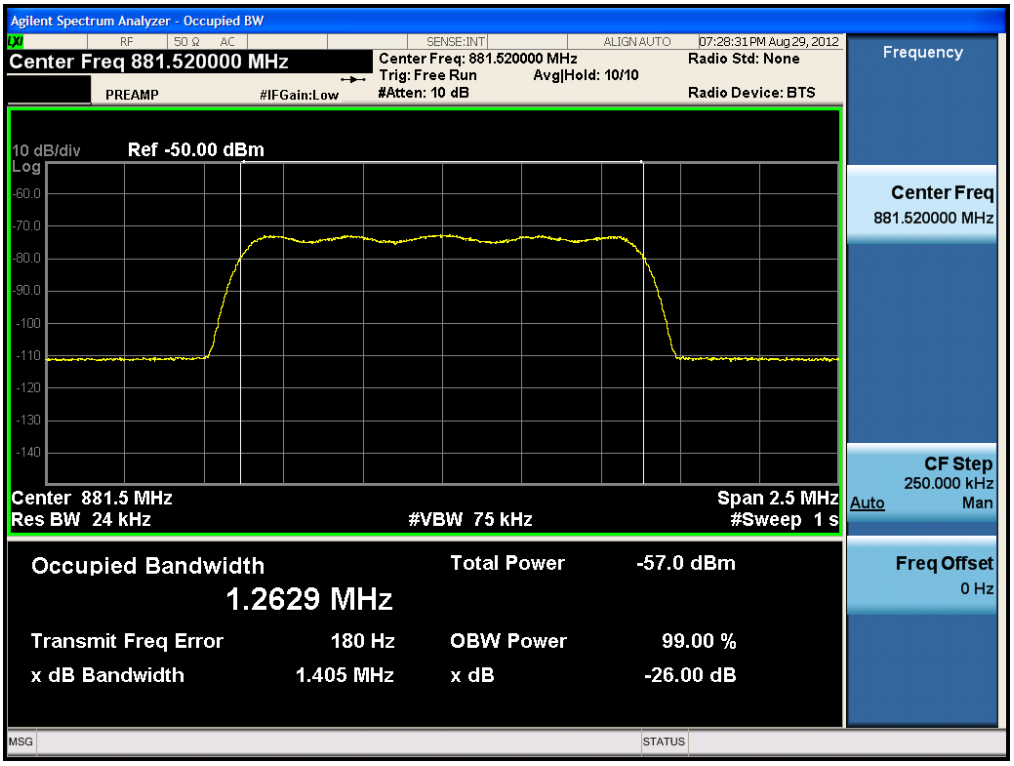
[Output CDMA Downlink High]



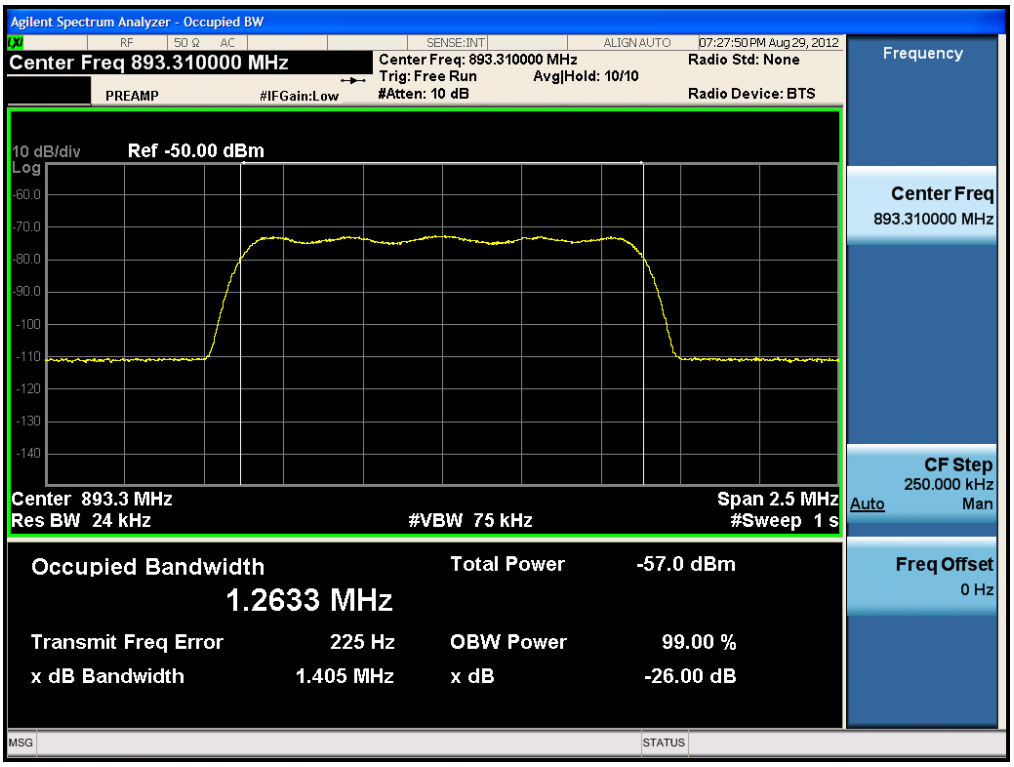
[Input CDMA Downlink Low]



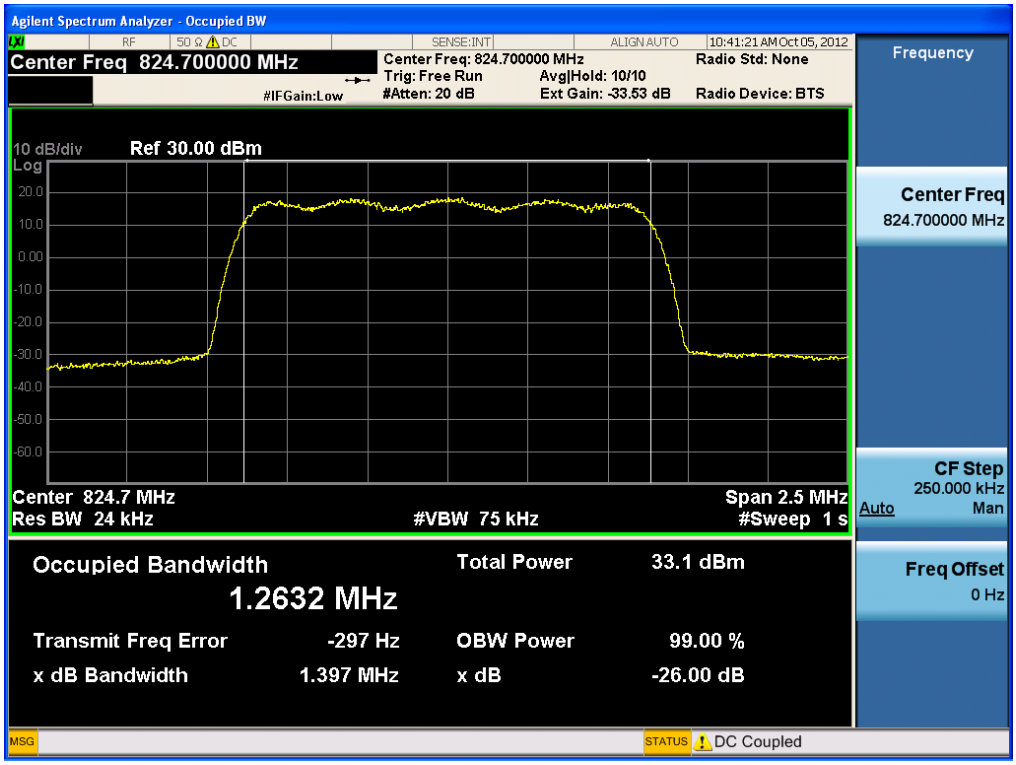
[Input CDMA Downlink Middle]



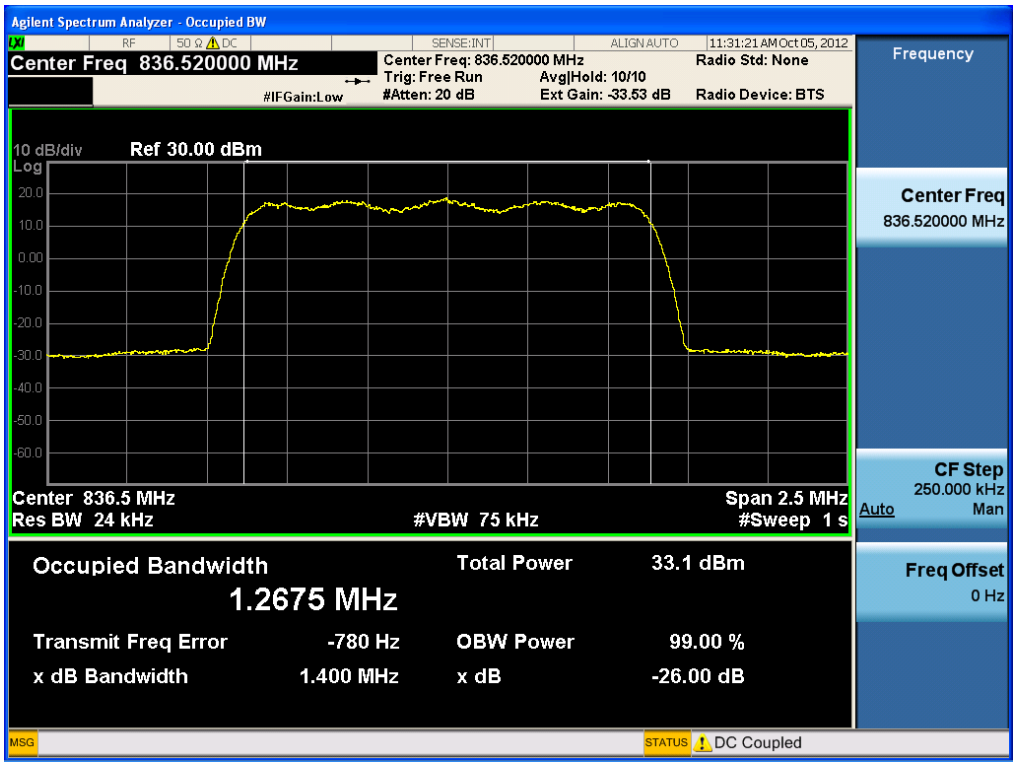
[Input CDMA Downlink High]



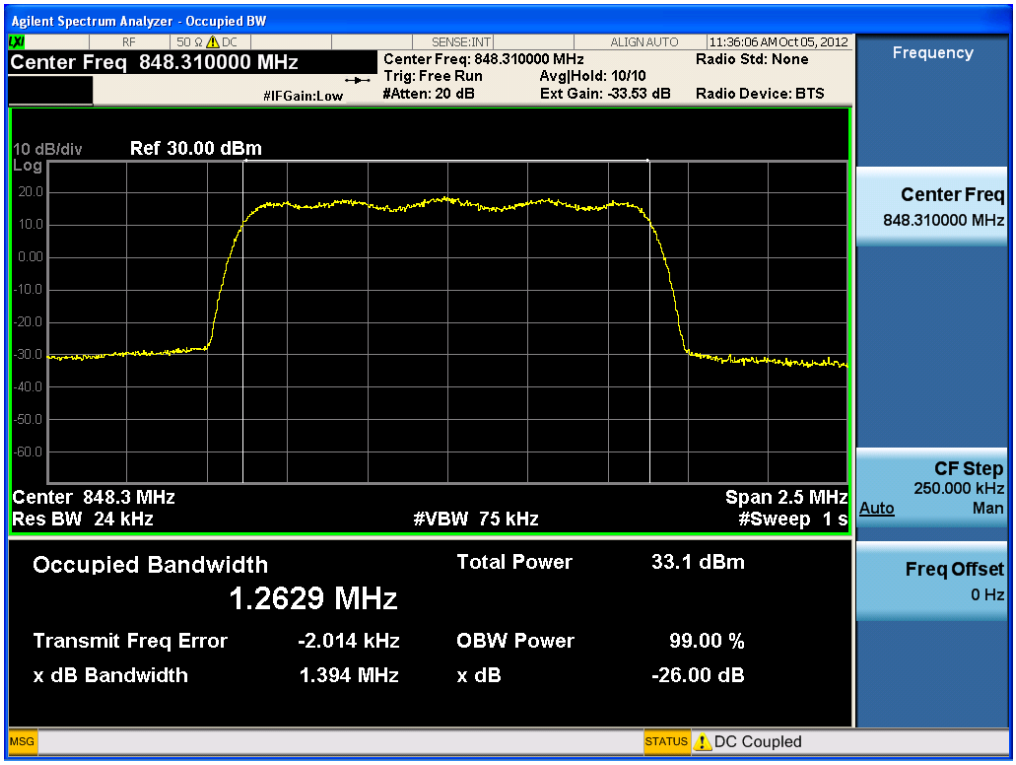
[Output CDMA Uplink Low]



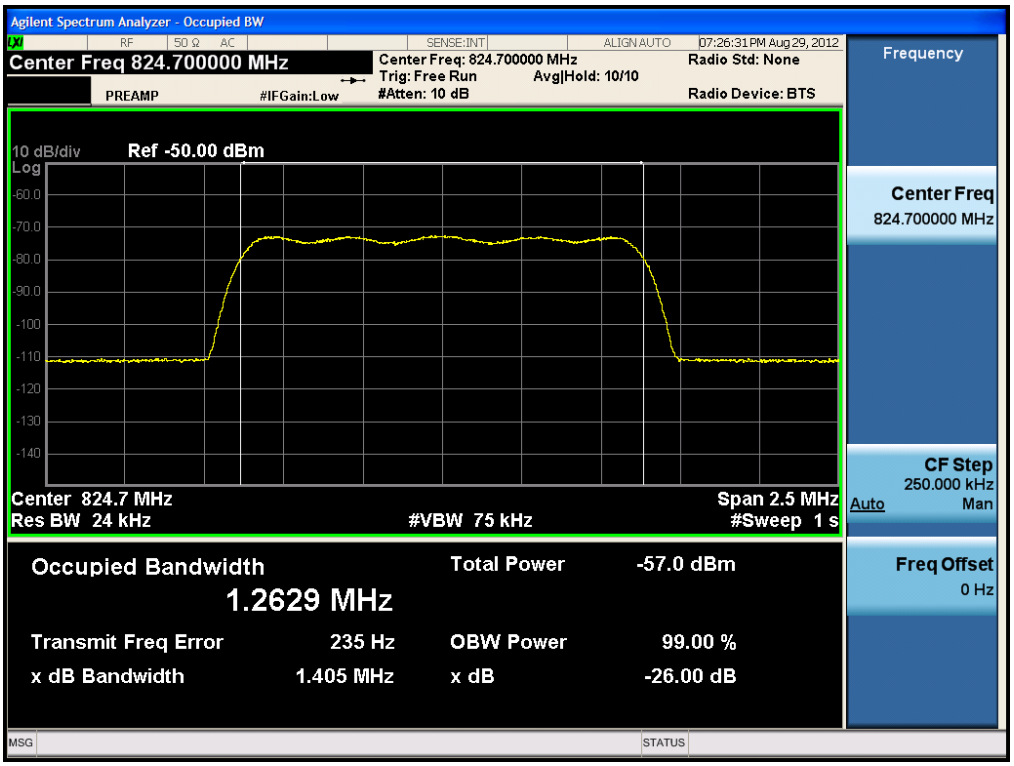
[Output CDMA Uplink Middle]



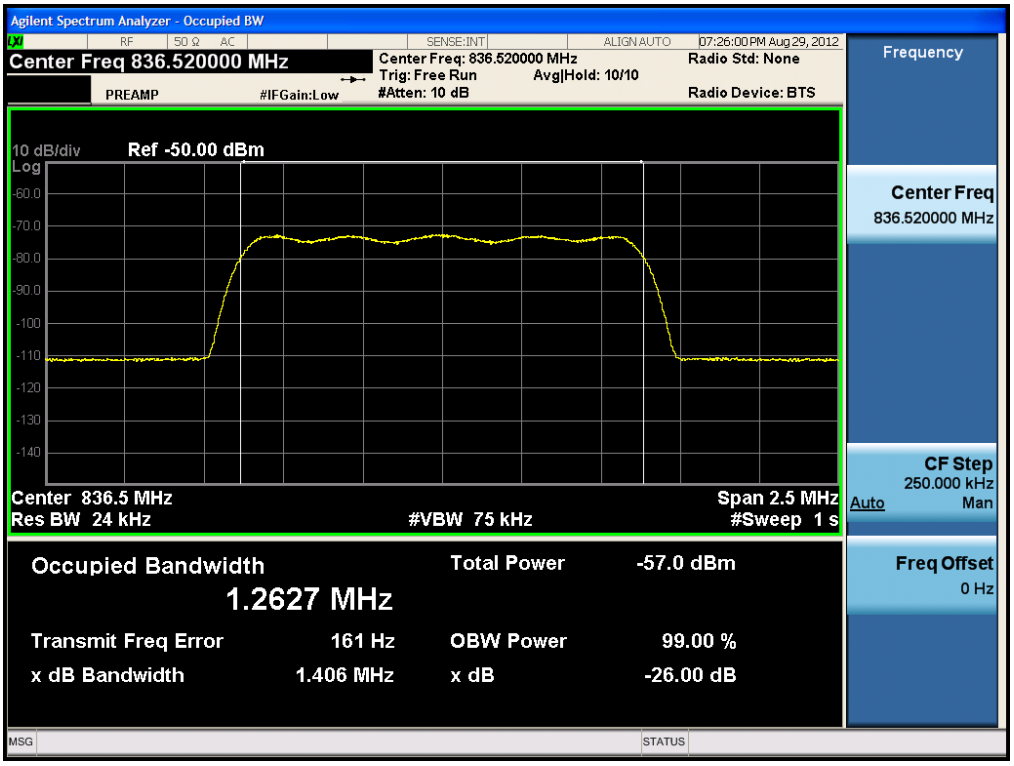
[Output CDMA Uplink High]



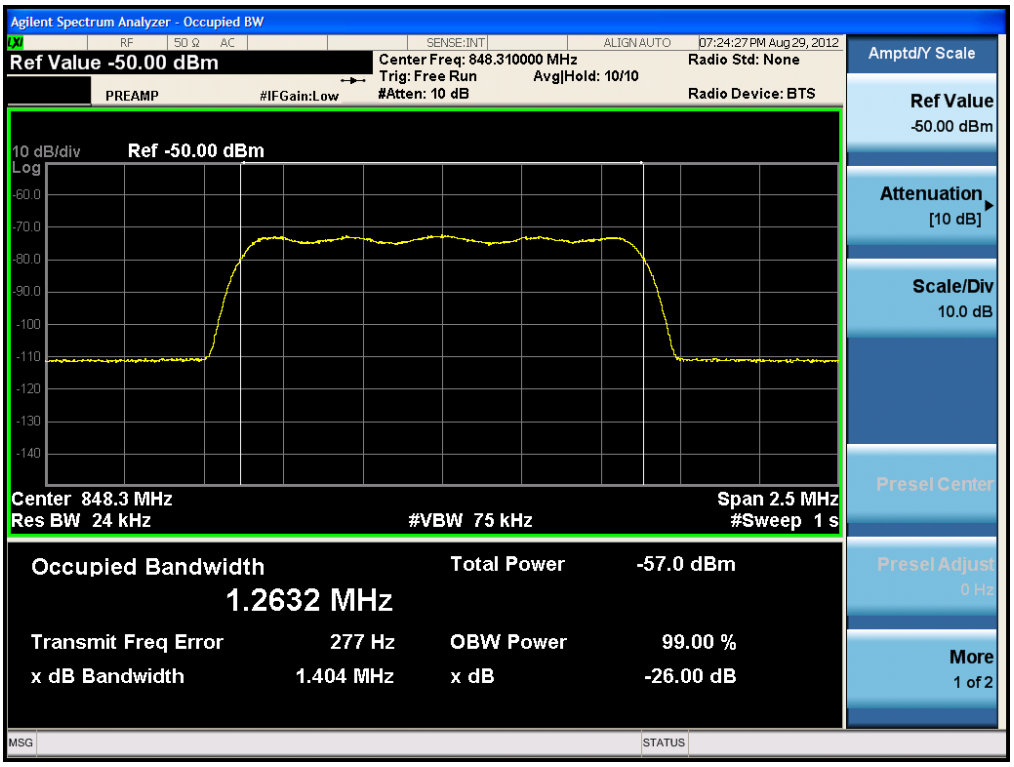
[Input CDMA Uplink Low]

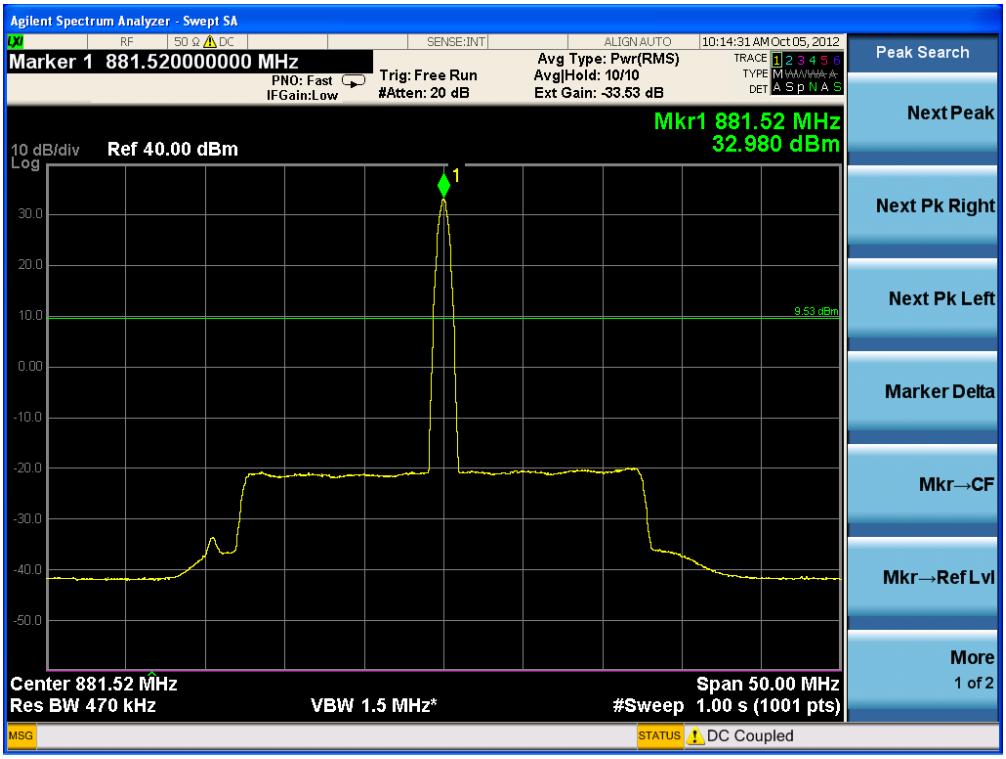


[Input CDMA Uplink Middle]

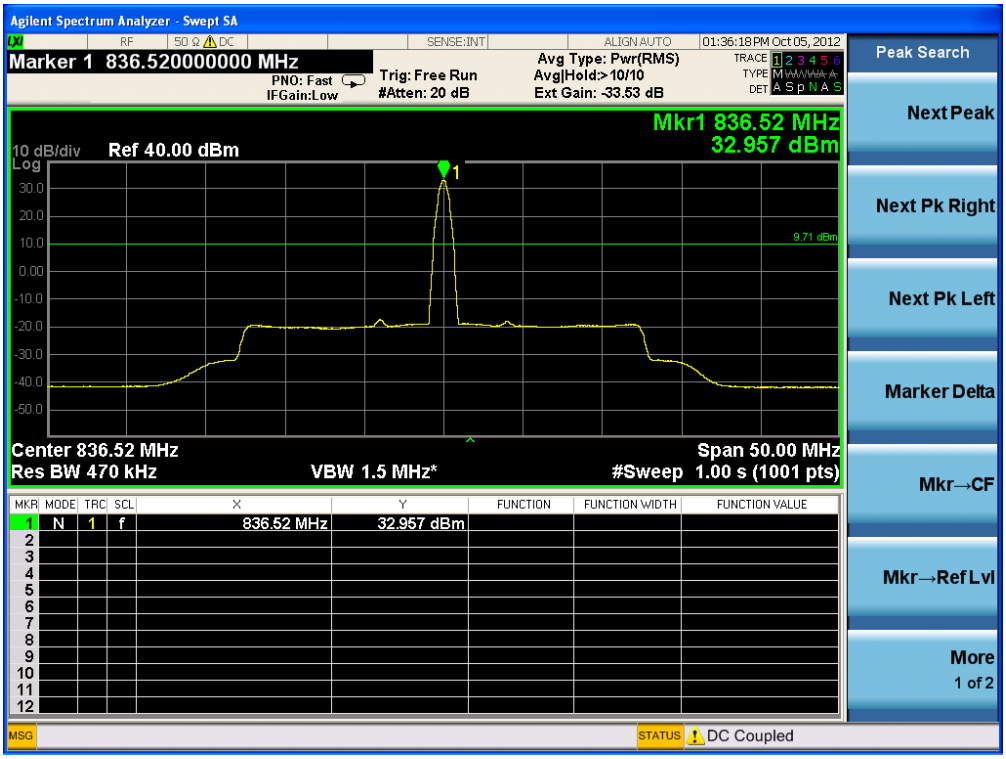


[Input CDMA Uplink High]

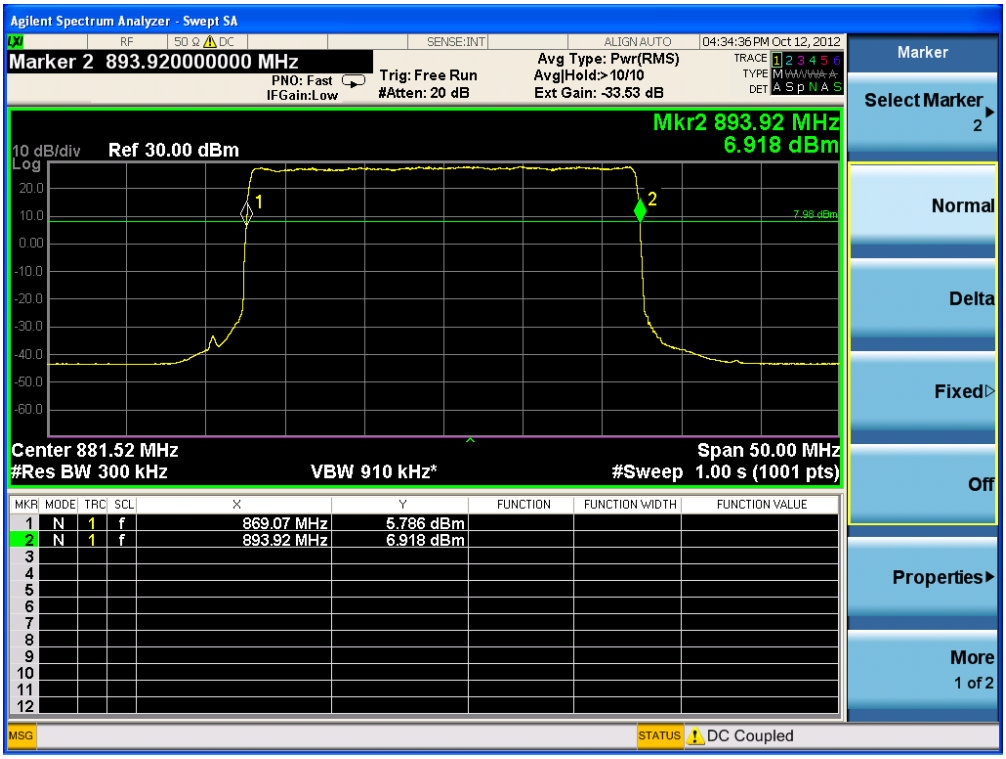




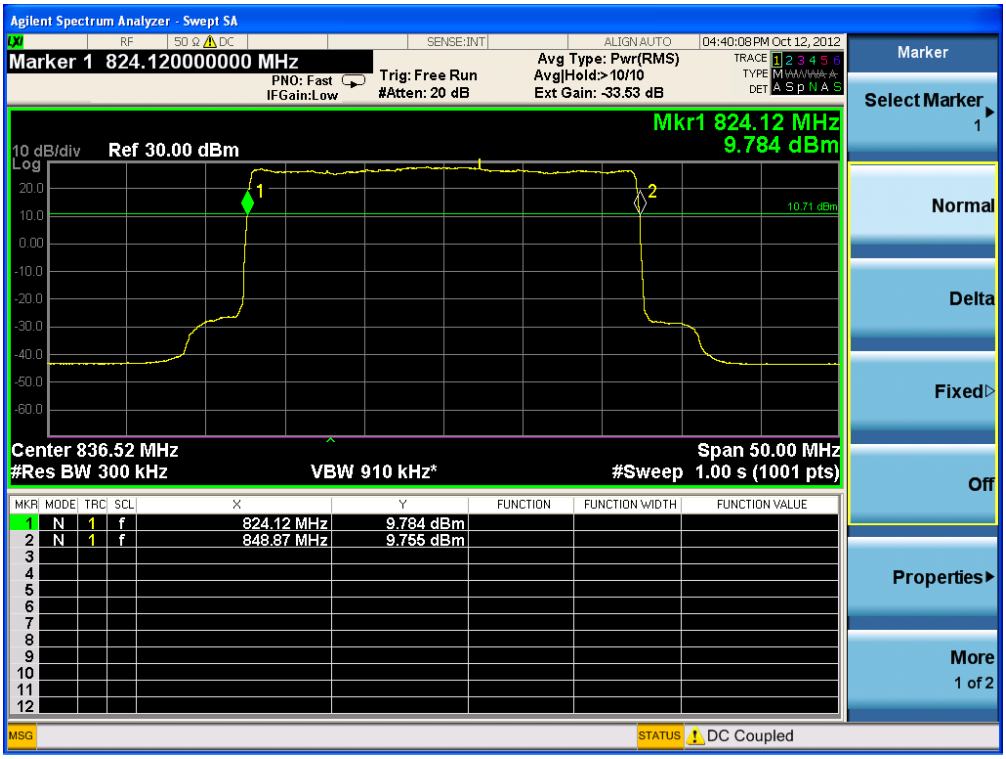
- **Downlink Passband Gain : 32.98- (-56.4) = 89.38 dB < nominal gain 90 dB**



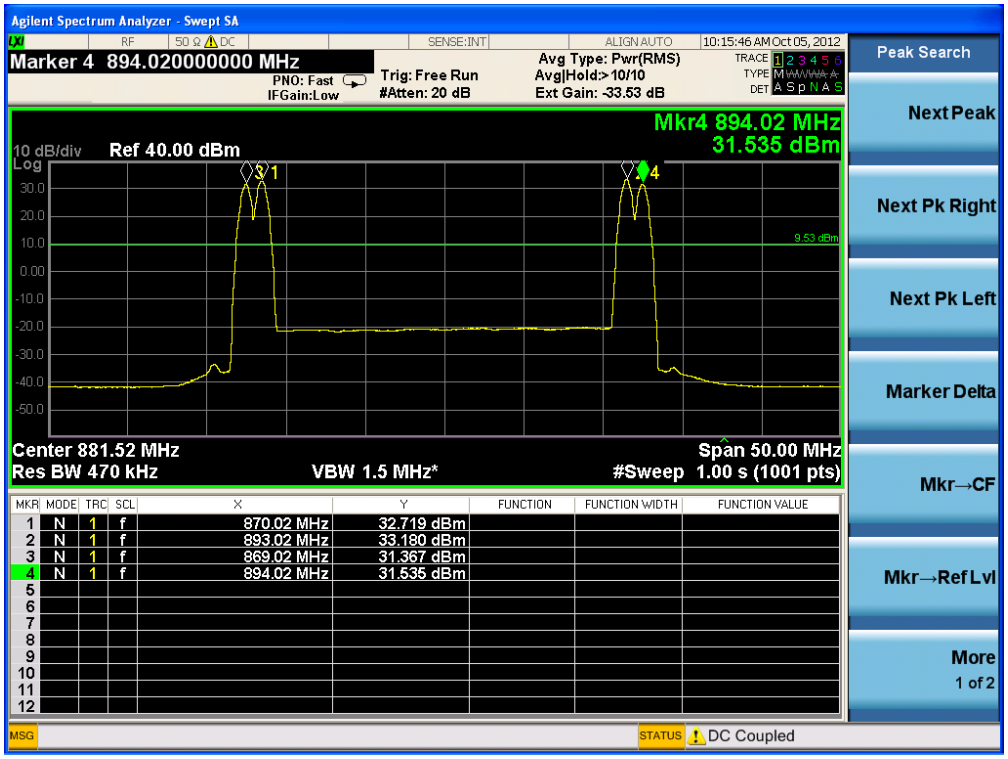
- **Uplink Passband Gain : 32.957- (-56.4) = 89.357 dB < nominal gain 90 dB**



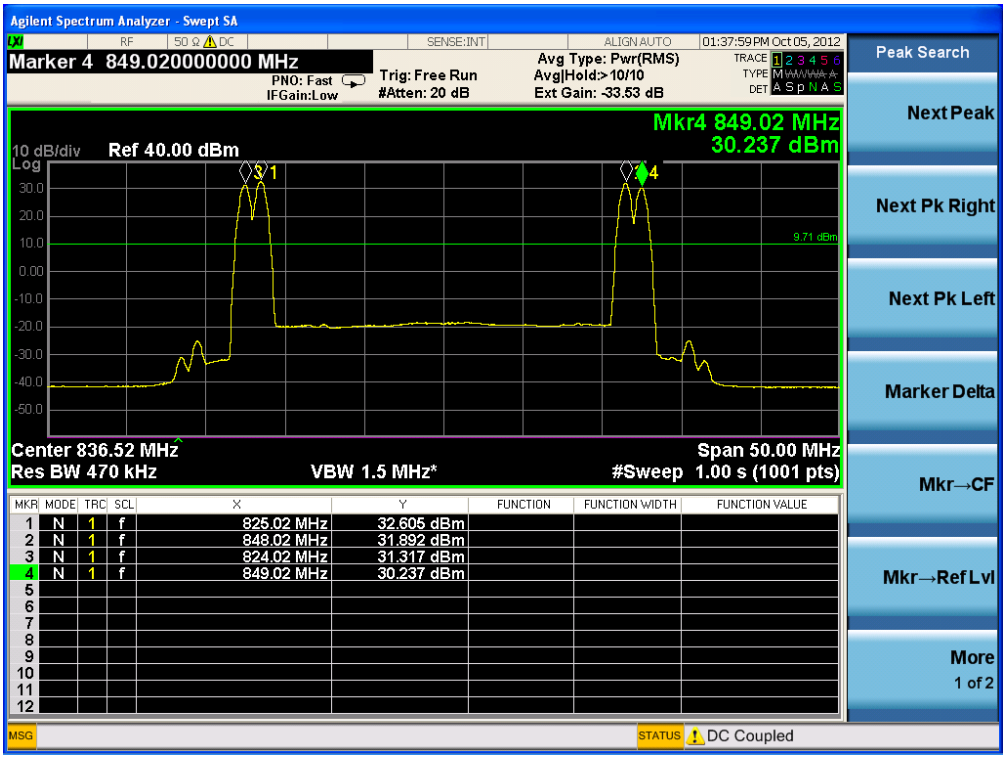
- **20 dB Bandwidth : 893.92 – 869.07 = 24.85 MHz < Nominal Bandwidth 25 MHz**



- **20 dB Bandwidth : 848.87 – 824.12 = 24.75 MHz < Nominal Bandwidth 25 MHz**



- **Out of 20 dB Bandwidth Gain is less than 20 dB Bandwidth Gain by 1.352 dB**



- **Out of 20 dB Bandwidth Gain is less than 20 dB Bandwidth Gain by 1.655 dB**

7. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

Test Requirement(s): § 2.1051 Measurements required: Spurious emissions at antenna terminals:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(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.

(b) Measurement procedure. 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.

(c) Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) Interference caused by out of band emissions. If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

Test Requirement(s): RSS-GEN 4.9 Transmitter Unwanted Emissions , RSS-131 4.4 Spurious Emisson

The measurement method shall be described in the test report. The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.

The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

Unless otherwise specified, compliance with the emission limits shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth for emissions below 1000 MHz and, an average detector with a minimum resolution bandwidth of 1 MHz for emissions above 1 GHz.

Test Procedures: A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level as determined by the spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured.

The spectrum was investigated from 30 MHz to the 26.5 GHz of the carrier.

Test Results: The EUT complies with the requirements of this section. There were no detectable Spurious emissions for this EUT.

Sample Calculation

Output Power = Reading Value + ATT loss + Cable loss

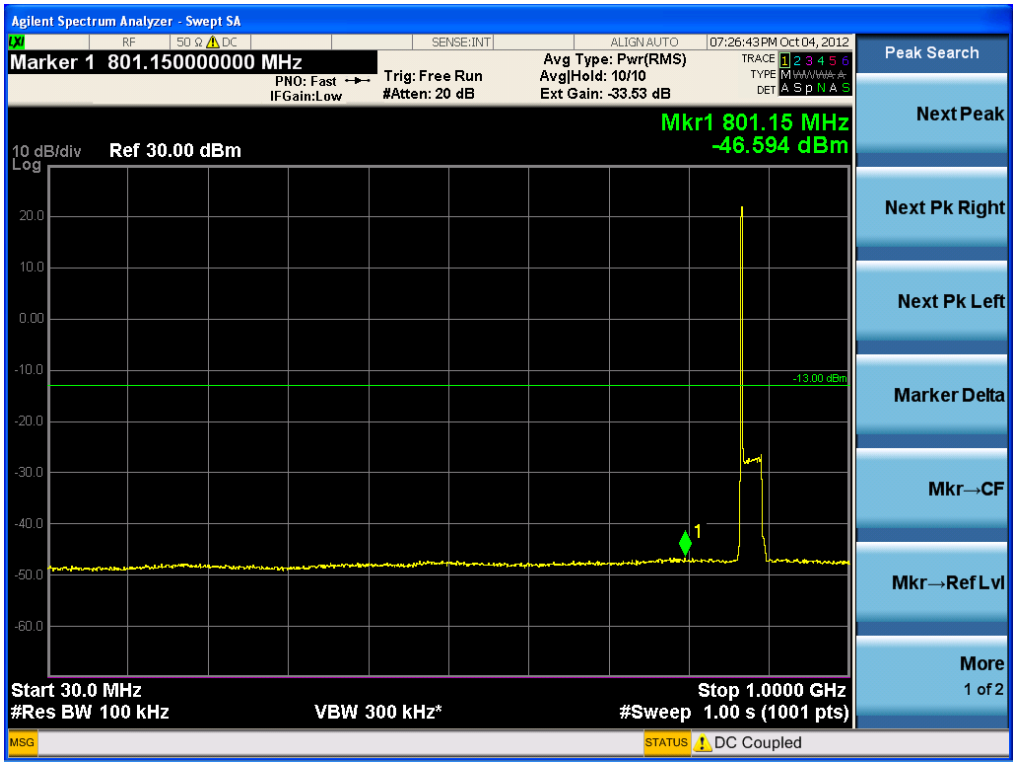
1. Spectrum reading values are not plot data. The power results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss (33.53 dB at downlink/uplink)
3. Actual value of loss for the attenuator and cable combination is 33.53 dB at 850 MHz , 33.61 dB at 894 MHz, and 33.45 dB at 824 MHz.

※ The Test Report's Intermodulation test result was executed at Maximum gain setting mode because it is a little worst case for the EUT.

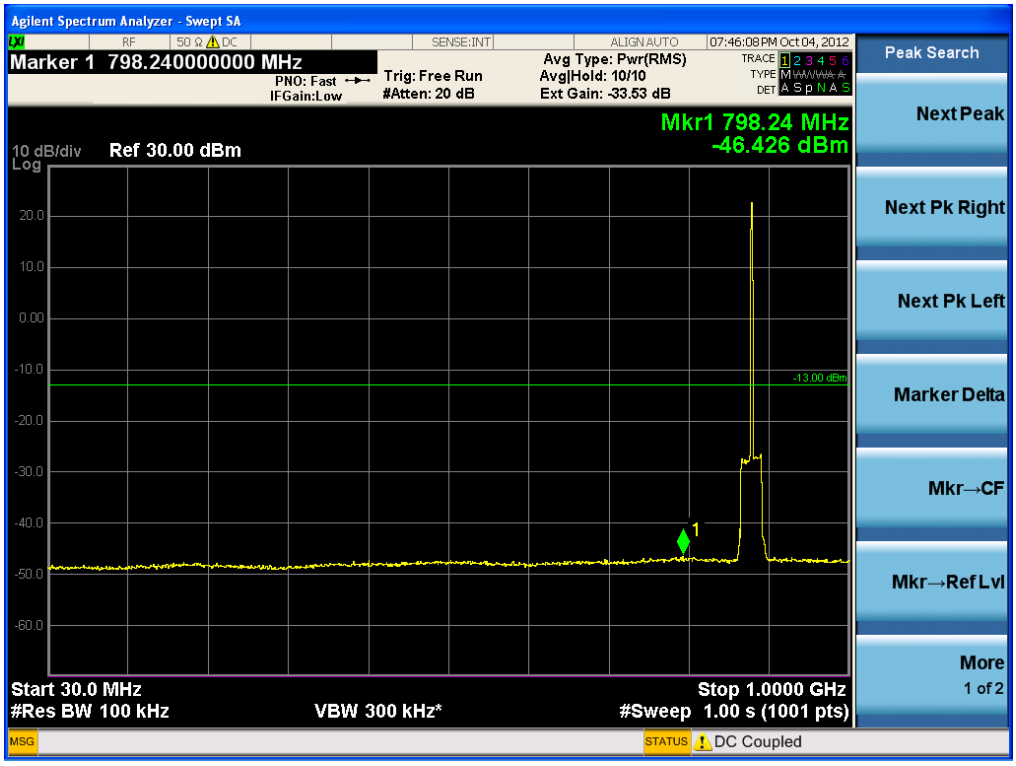
Plots of Spurious Emission

Conducted Spurious Emissions (30 MHz – 1 GHz)

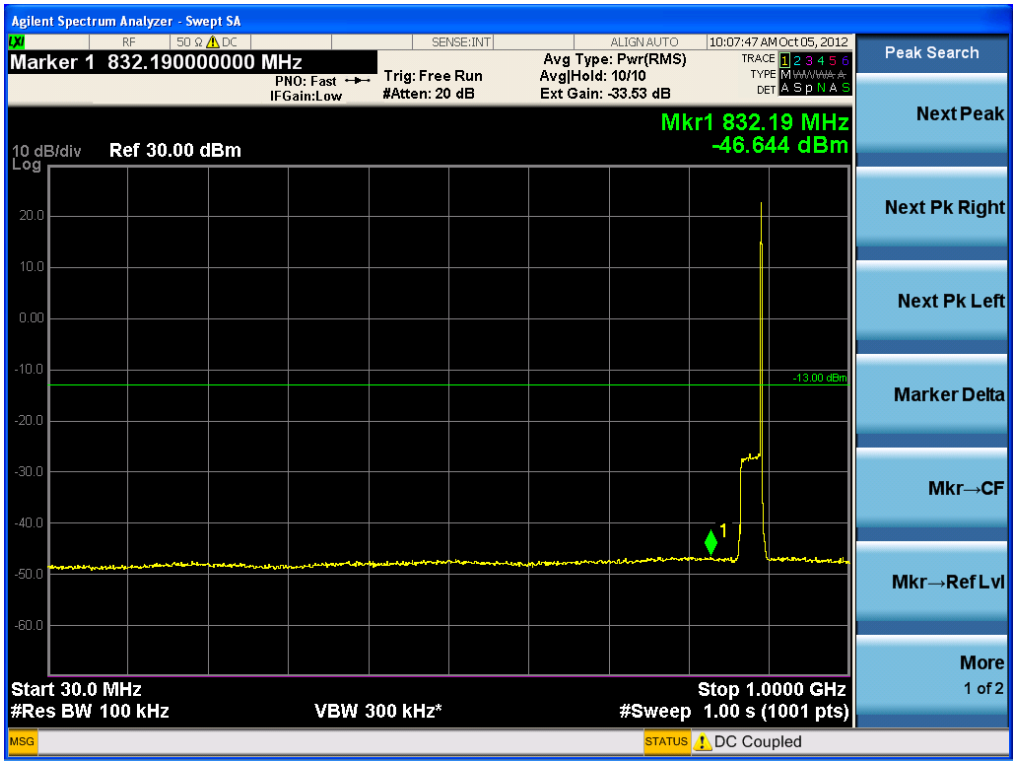
[CDMA Downlink Low]



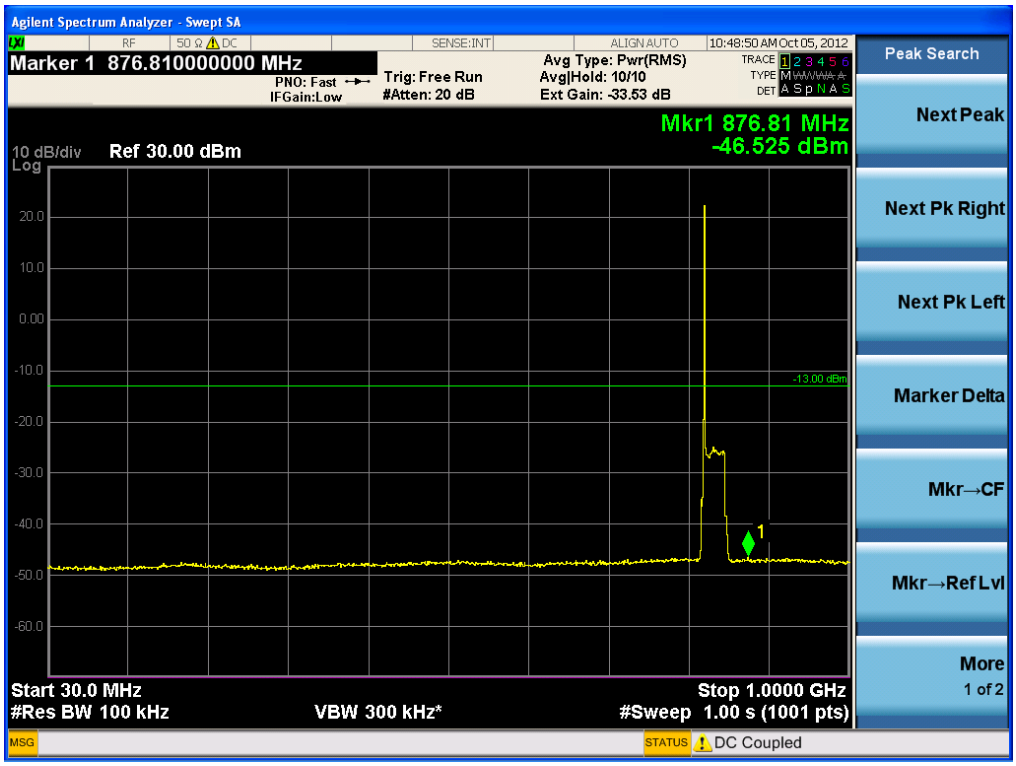
[CDMA Downlink Middle]



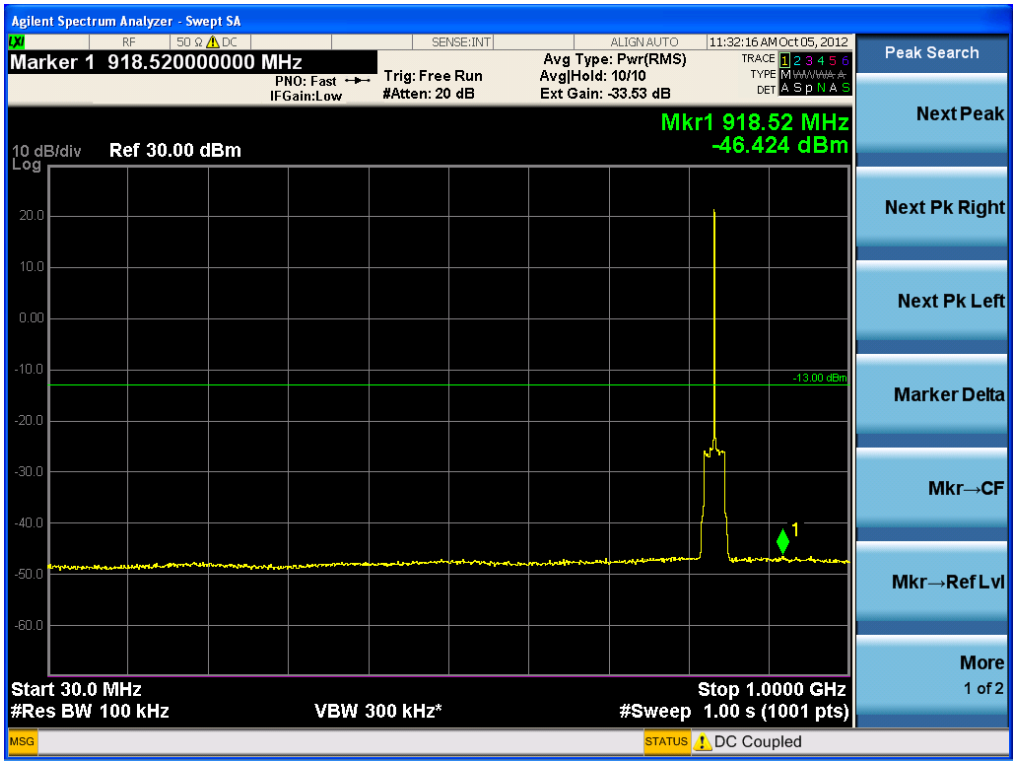
[CDMA Downlink High]



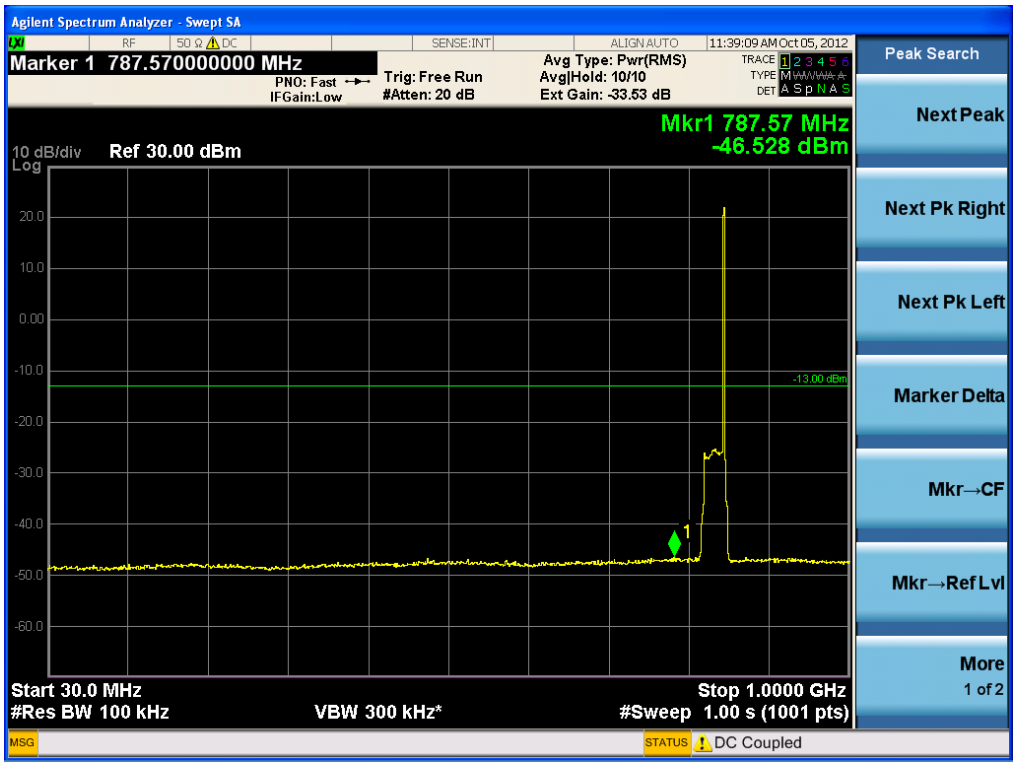
[CDMA Uplink Low]



[CDMA Uplink Middle]

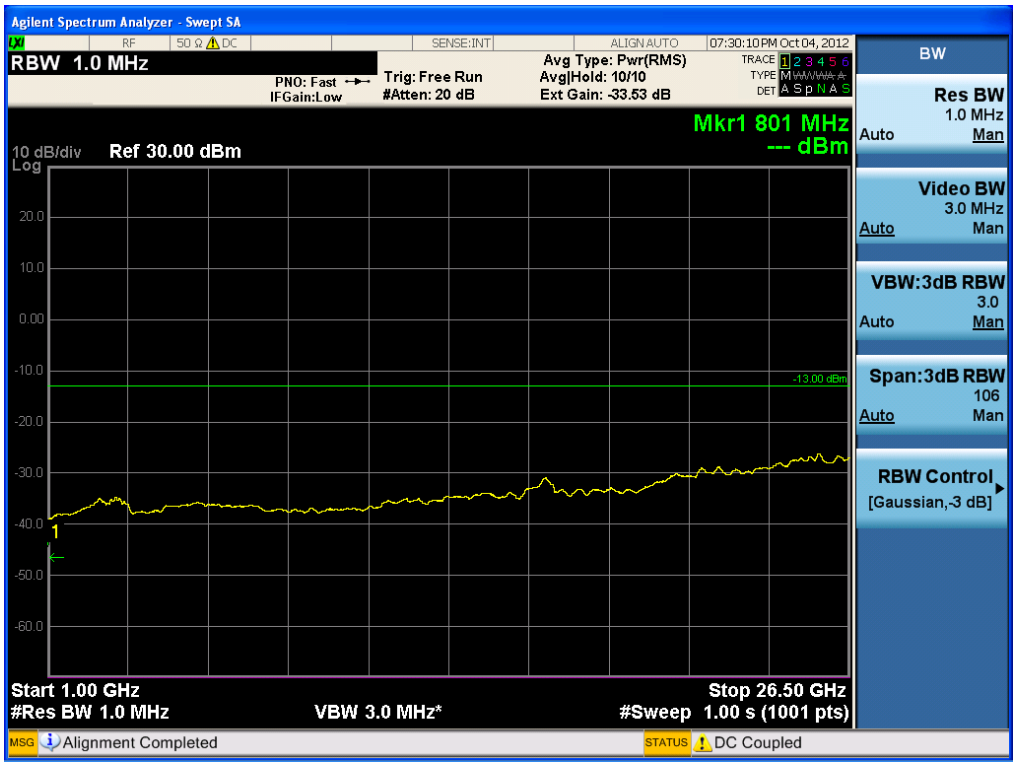


[CDMA Uplink High]



Conducted Spurious Emissions (1 GHz –26.5 GHz)

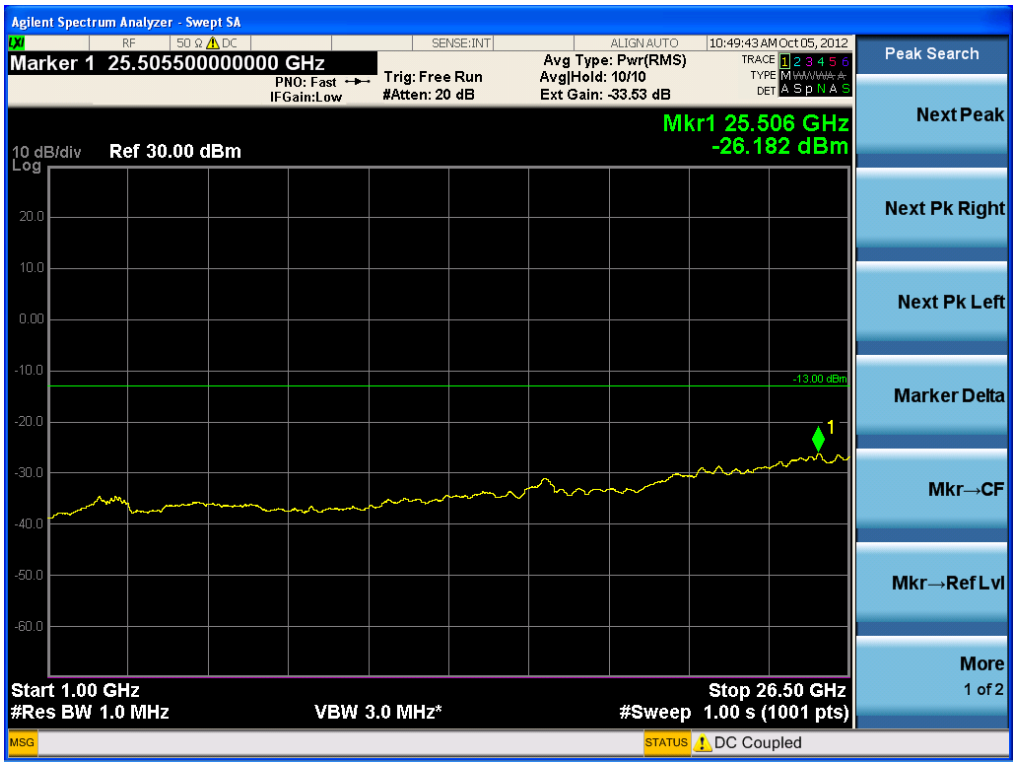
[CDMA Downlink Low]



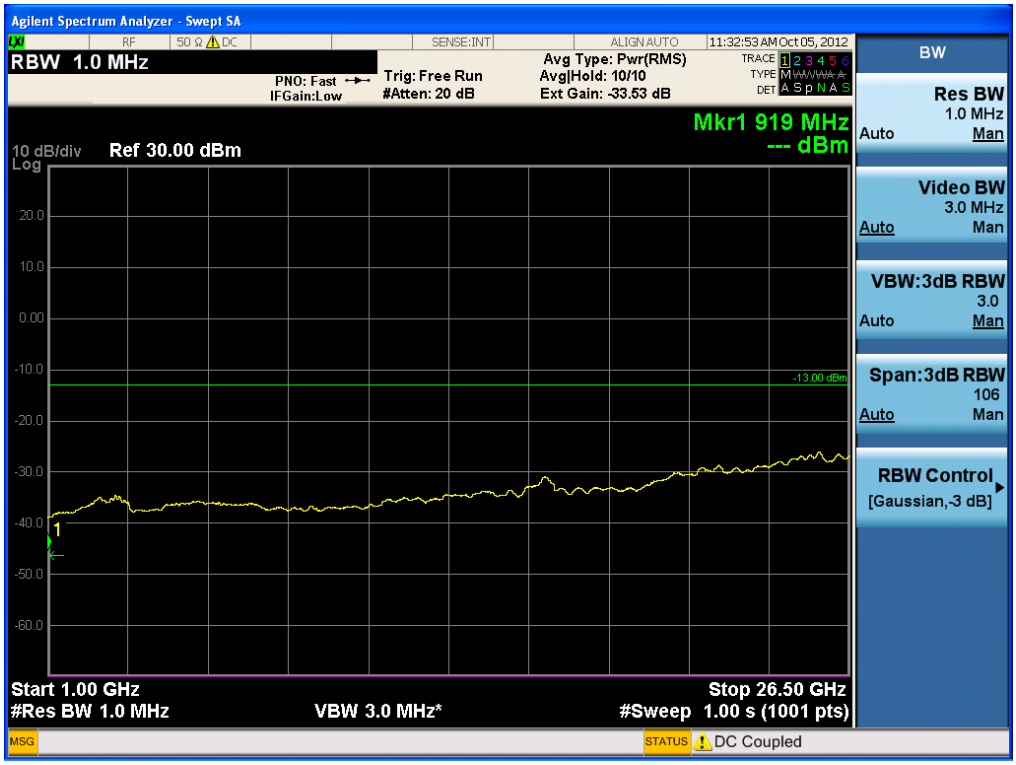
[CDMA Downlink Middle]

[CDMA Downlink High]

[CDMA Uplink Low]



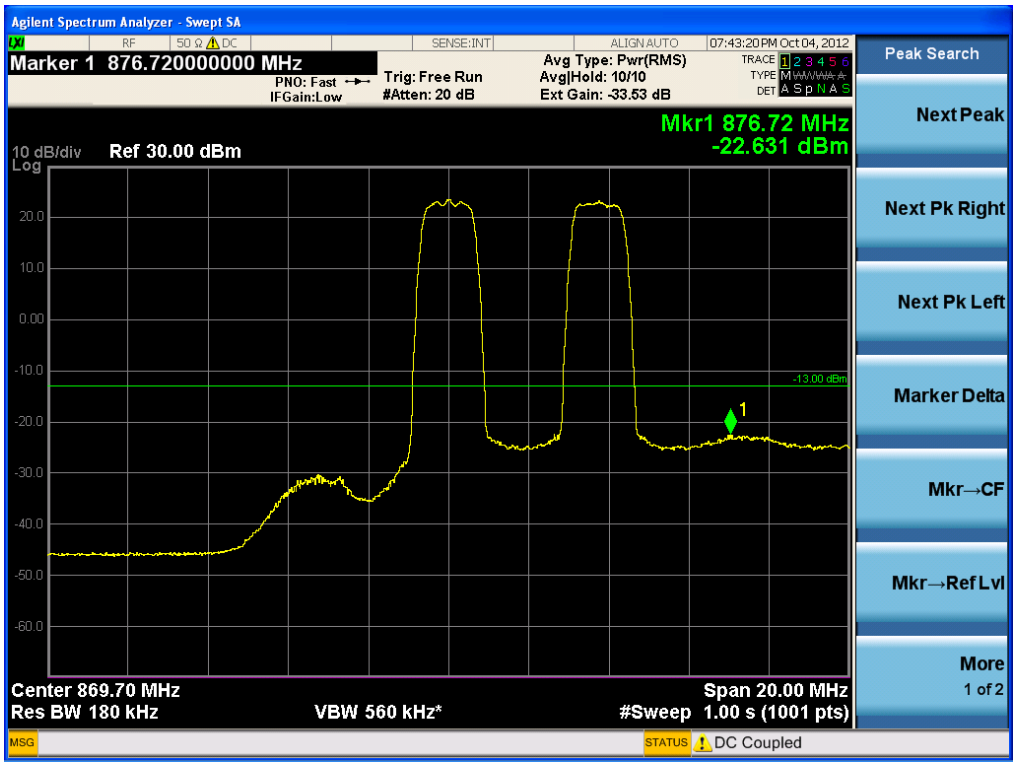
[CDMA Uplink Middle]



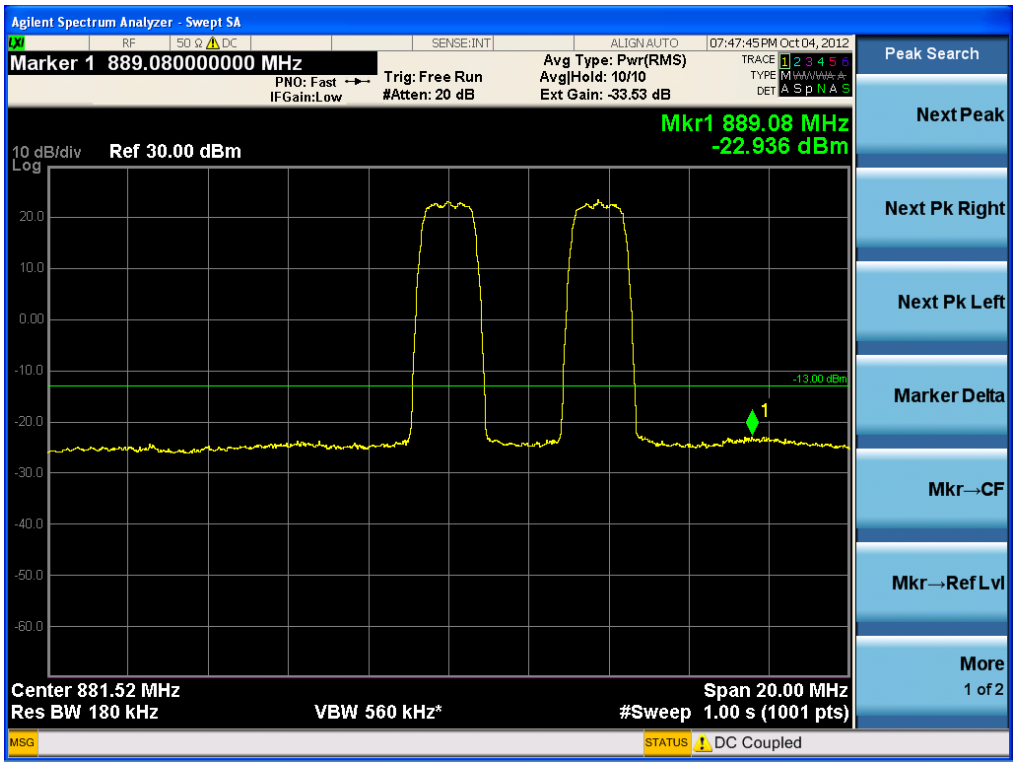
[CDMA Uplink High]

Intermodulation Spurious Emissions

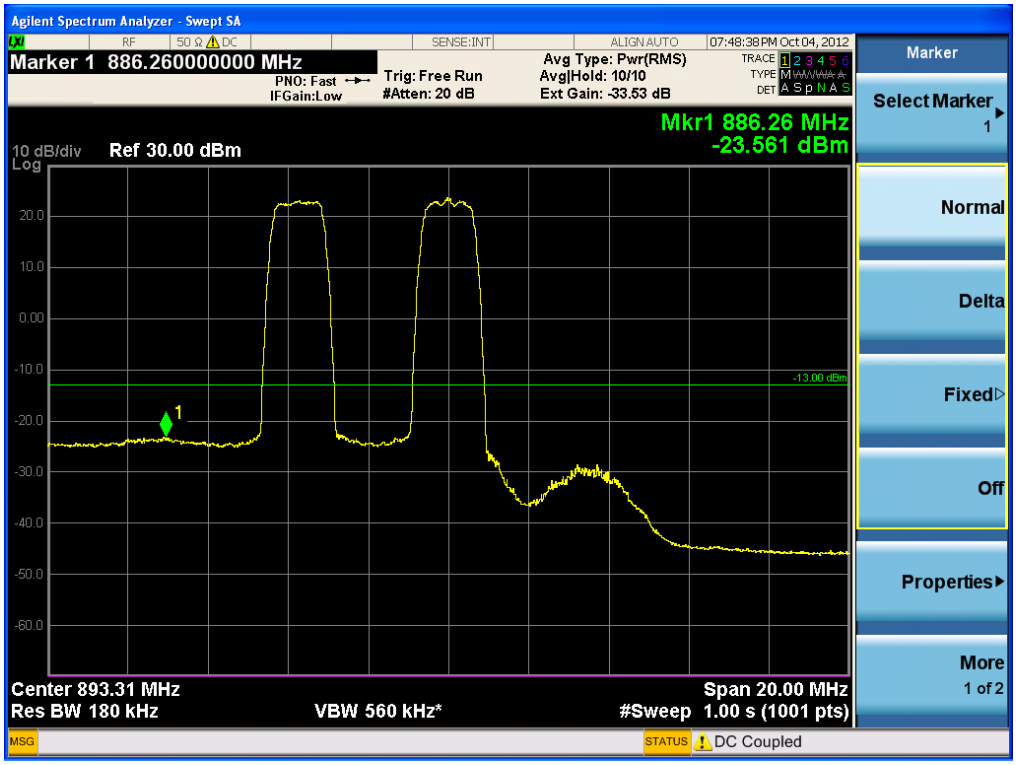
[CDMA Downlink Low]



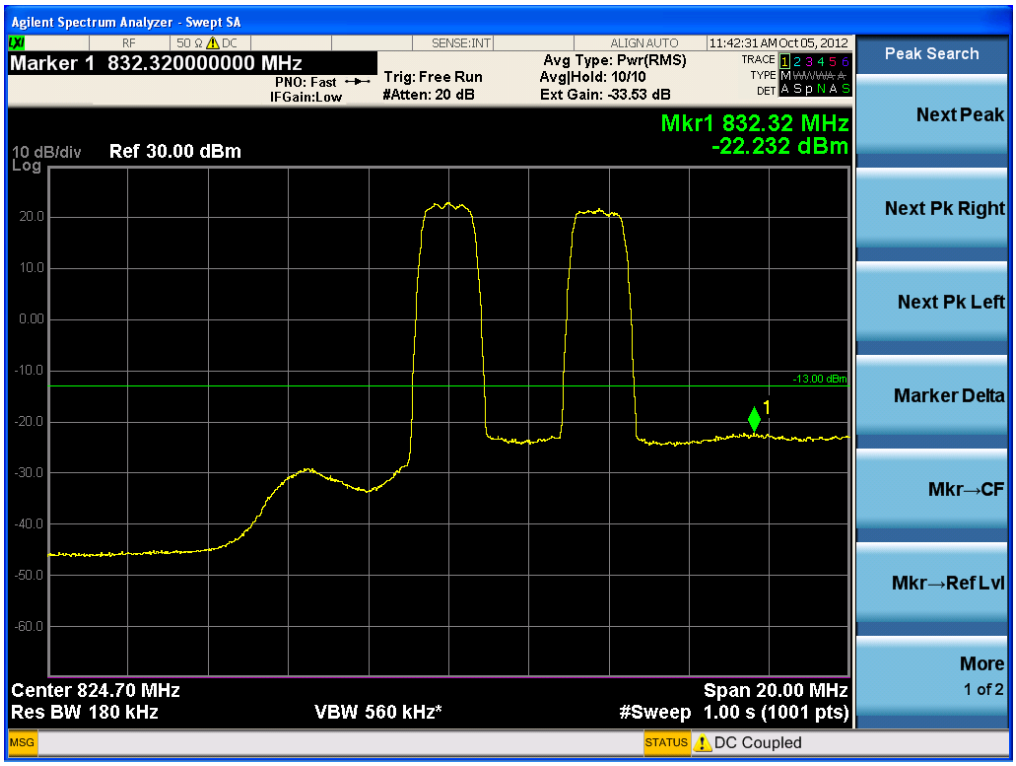
[CDMA Downlink Middle]



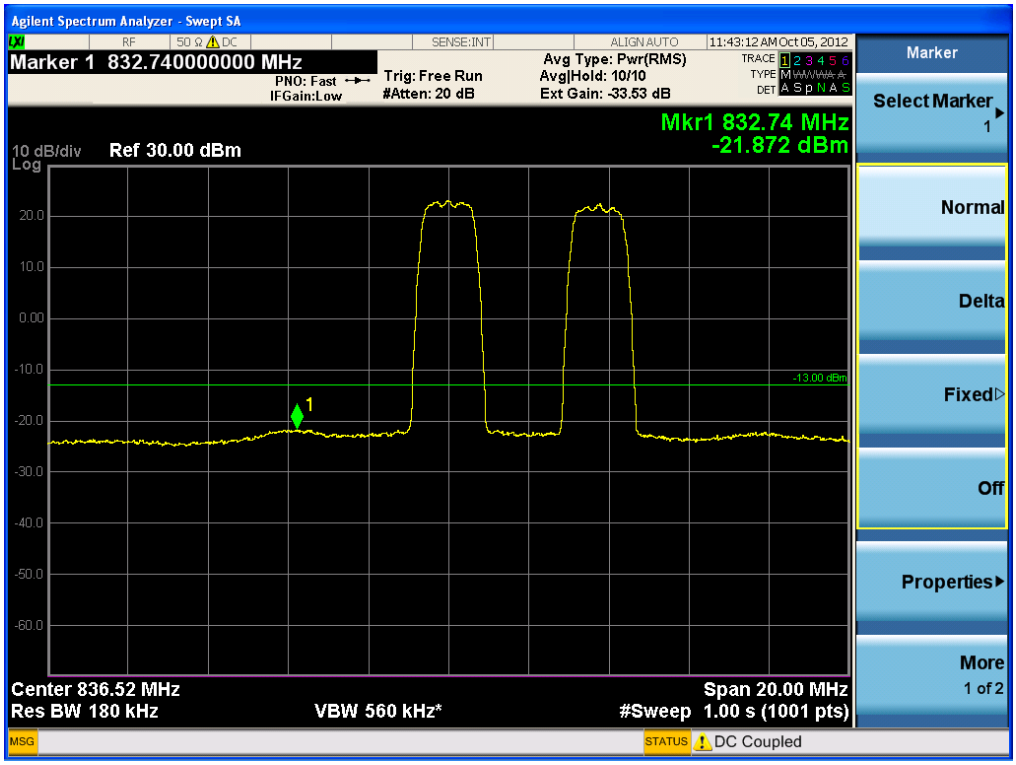
[CDMA Downlink High]



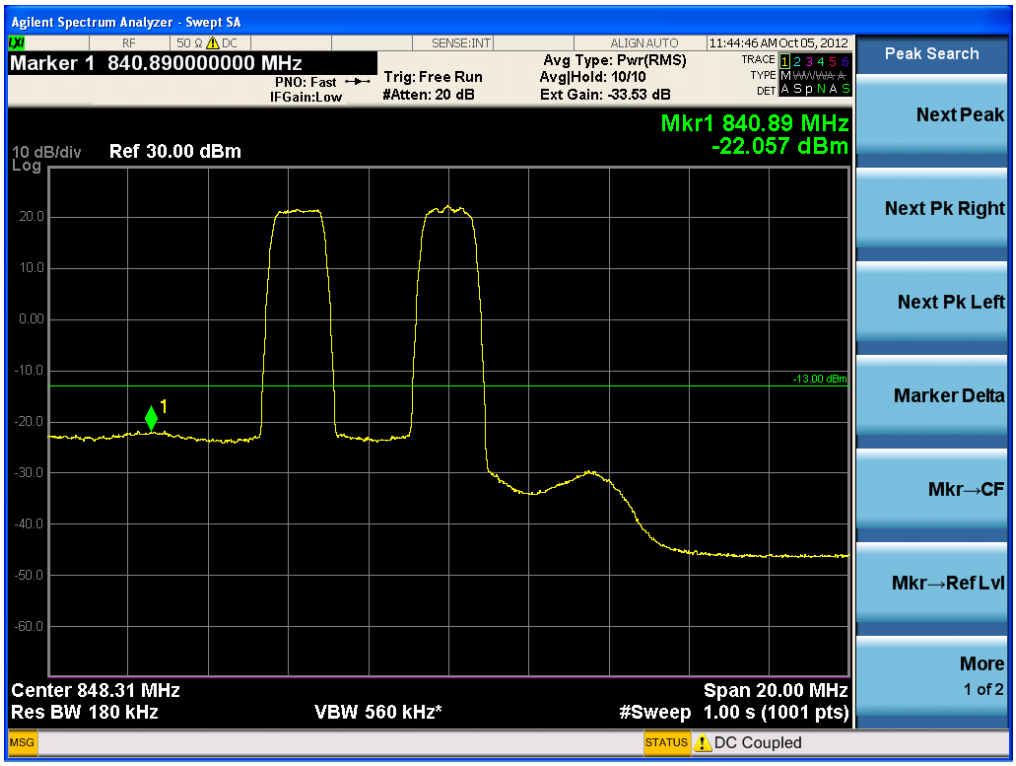
[CDMA Uplink Low]



[CDMA Uplink Middle]

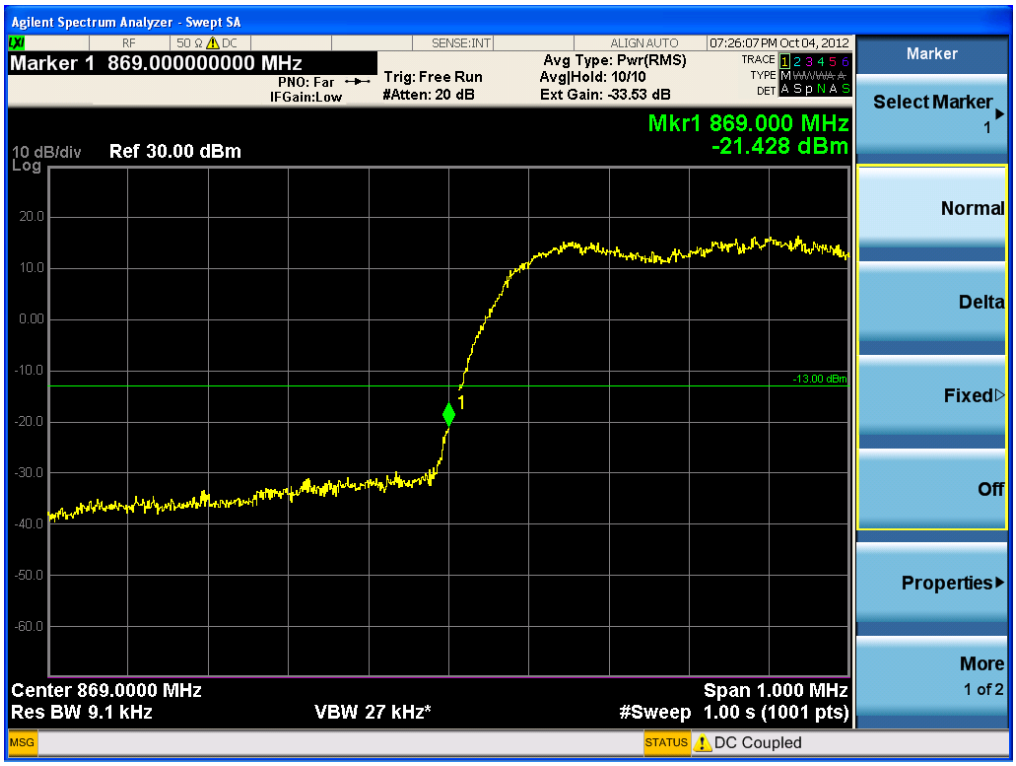


[CDMA Uplink High]

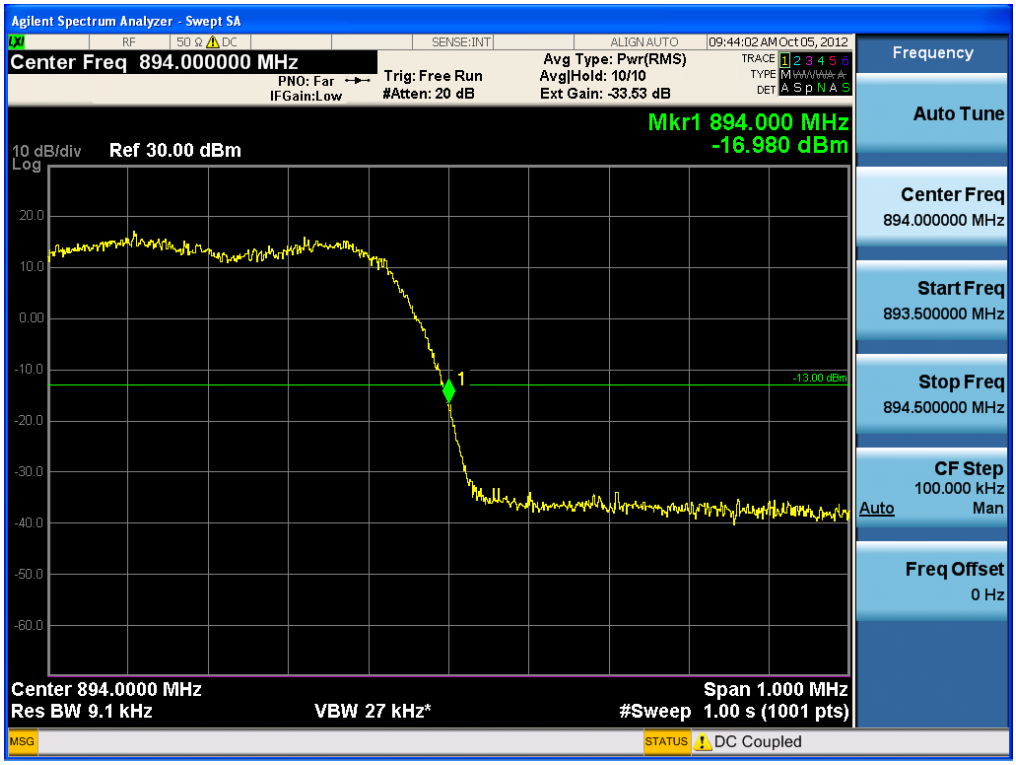


Band Edge

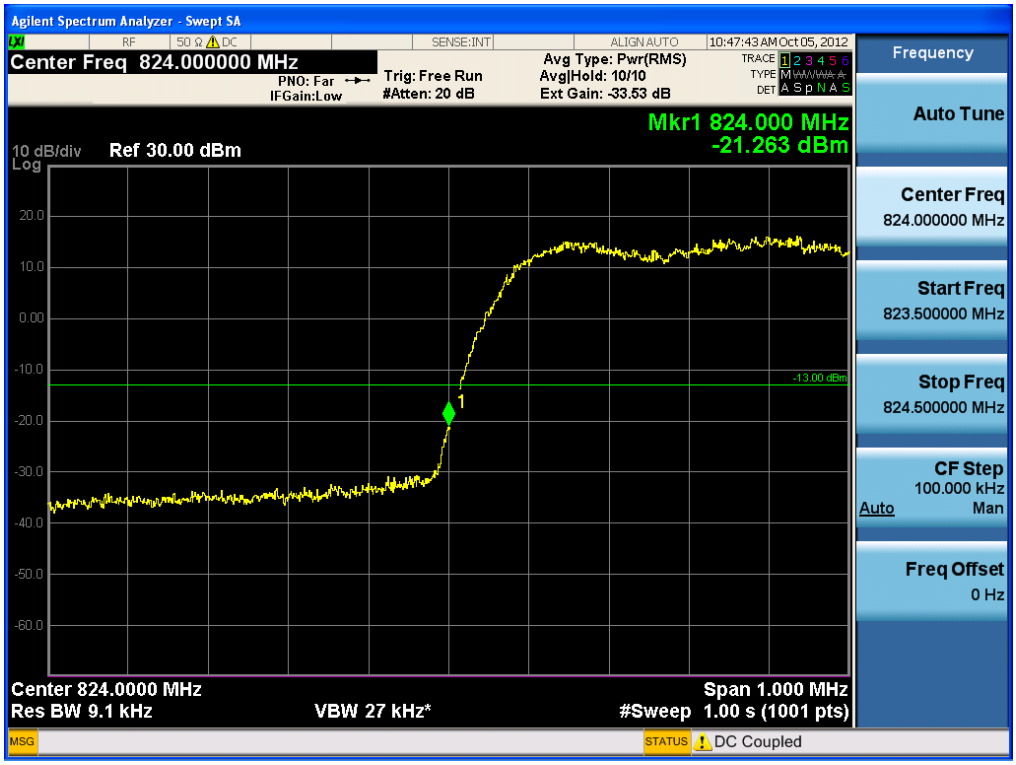
[CDMA Downlink Low]



[CDMA Downlink High]



[CDMA Uplink Low]



[CDMA Uplink High]

8. FIELD STRENGTH OF SPURIOUS RADIATION

Test Requirement(s): § 2.1053 Measurements required: Field strength of spurious radiation.

§ 2.1053 (a) Measurements shall be made to detect spurious emissions that may be Radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

§ 2.1053 (b): The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to The transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber.

The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was

rotated about 360 and the receiving antenna scanned from 1-3m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried. out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10th or 40GHz, whichever was the lesser, were investigated.

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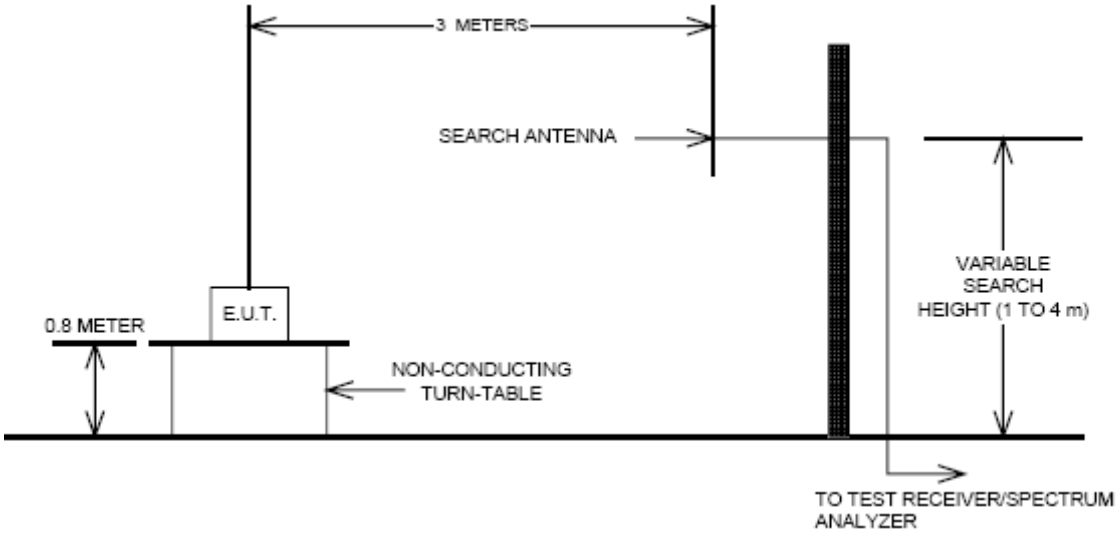
Radiated Spurious Emissions Test Setup



Sample Calculation

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	C.L	SigGen Level [dBm]	Pol.	EIRP (dBm)	Margin (dB)
1660	−80.37	9.6	4.99	−50.38	H	−45.77	32.77

EIRP = Substitude LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

-45.77 = -50.38 + 9.6 - 4.99

1) The EUT mounted on a table on 0.8 meter above test site ground level.

2) During the test, the turn table is rotated and the antenna height is also varied from 1 to 4 meters until the maximum signal is found.

3) Record the field strength meter's level.

4) Replace the EUT with antenna that is connected to a calibrated signal generator.

5) Increase the signal generator output till the field strength meter's level is equal to the item (3).

6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power (**EIRP**).

Test Result:

[Downlink]

Test Frequency	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	C.L	SigGen Level [dBm]	Pol.	EIRP (dBm)	Margin (dB)
869.7	1640	-80.39	9.52	4.95	-50.5	H	-45.89	32.89
	3320	-75.46	11.88	7.41	-39.8	H	-35.34	22.34
881.52	1090	-80.73	5.94	3.9	-51.8	H	-49.8	36.8
	2624	-77.85	10.68	6.64	-43.3	H	-39.29	26.29
893.31	1435	-80.43	7.54	4.58	-50.5	H	-47.54	34.54
	3362	-77.75	11.99	7.44	-42.06	H	-37.51	24.51

[Uplink]

Test Frequency	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	C.L	SigGen Level [dBm]	Pol.	EIRP (dBm)	Margin (dB)
824.7	1660	-80.37	9.6	4.99	-50.38	H	-45.77	32.77
	2579	-77.68	10.64	6.57	-43.32	H	-39.25	26.25
836.52	1673	-79.5	9.48	4.93	-49.6	H	-45.06	32.06
	2509.6	-77.43	10.56	6.48	-43.3	H	-39.23	26.23
848.31	1696.6	-80.64	9.52	4.95	-50.7	H	-46.15	33.15
	2544.9	-76.92	10.6	6.53	-42.7	H	-38.61	25.61

9. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS

Test Requirement(s): §2.1055(a)(1) , §22.355

Test Procedures:

As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Spectrum Analyzer.

The EUT was placed in the Environmental Chamber.

A CW signal was injected into the EUT at the appropriate RF level. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations.

The frequency drift was investigated for every 10 °C increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30 to 50 °C.

Voltage supplied to EUT is 110 Vac reference temperature was done at 20°C.

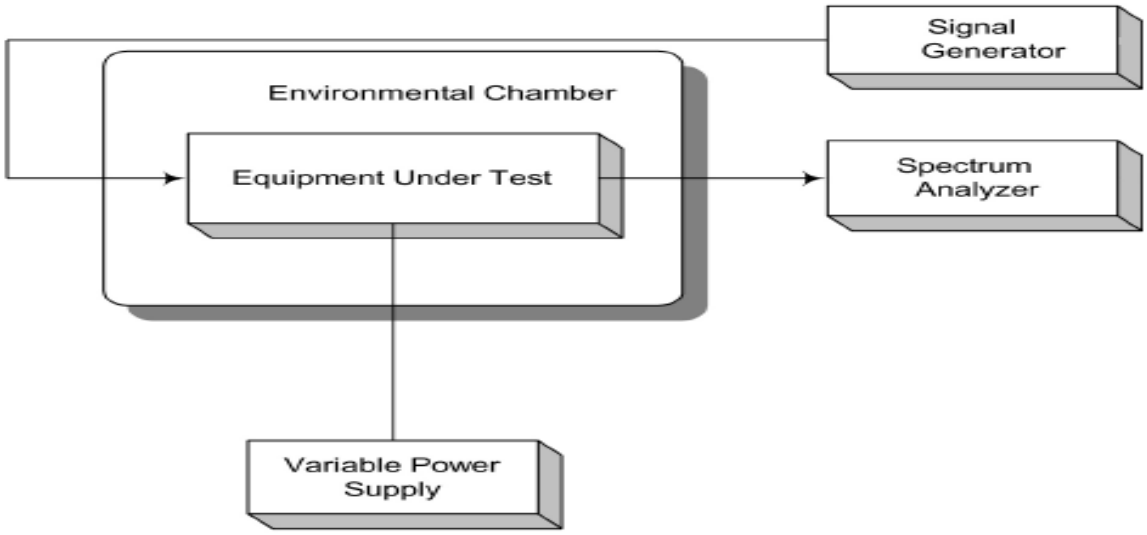
The voltage was varied by ± 15 % of nominal

§ 22.355 Frequency tolerance. Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C‑ 1 of this section.

Table C‑ 1– Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed (ppm)	Mobile ≤3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

Test Setup:



Test Results:

The E.U.T was found in compliance for Frequency Stability and Voltage Test

Frequency Stability and Voltage Test Results

Reference: 110 Vac at 20°C **Freq.** = 881.52 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	881 519 992	-7.9	0.0	0.0000
	-30	881 519 992	-7.9	0.0	0.0000
	-20	881 519 992	-8.3	-0.4	-0.0005
	-10	881 519 992	-8.2	-0.3	-0.0003
	0	881 519 992	-8.4	-0.5	-0.0006
	+10	881 519 992	-8.3	-0.4	-0.0005
	+30	881 519 992	-8.5	-0.6	-0.0007
	+40	881 519 992	-8.2	-0.3	-0.0003
	+50	881 519 992	-8.4	-0.5	-0.0006
115%	+20	881 519 992	-8.3	-0.4	-0.0005
85%	+20	881 519 992	-8.2	-0.3	-0.0003

[Downlink]

Reference: 110 Vac at 20°C **Freq.** = 836.52 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	836 519 992	-8.5	0.0	0.0000
	-30	836 519 992	-8.4	0.1	0.0001
	-20	836 519 992	-8.5	0.0	0.0000
	-10	836 519 992	-8.2	0.3	0.0004
	0	836 519 992	-8.3	0.2	0.0002
	+10	836 519 992	-8.4	0.1	0.0001
	+30	836 519 991	-8.6	-0.1	-0.0001
	+40	836 519 992	-8.4	0.1	0.0001
	+50	836 519 992	-8.5	0.0	0.0000
115%	+20	836 519 992	-8.1	0.4	0.0005
85%	+20	836 519 992	-8.3	0.2	0.0002

[Uplink]

10. RF EXPOSURE STATEMENT

1. LIMITS

According to §1.1310 and §2.1091 RF exposure is calculated.

(B) Limits for General Population/Uncontrolled Exposures

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
0.3 - 1.34	614	1.63	*(100)	30
1.34 - 30	824/f	2.19/f	*(180/ f^2)	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	.....	.....	f/1500	30
1500 - 100.000	.....	.....	1.0	30

F = frequency in MHz

* = Plane-wave equivalent power density

2. MAXIMUM PERMISSIBLE EXPOSURE Prediction

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

2-1 Limit (Down Link)

Max Peak output Power at antenna input terminal	33.170	dBm
Max Peak output Power at antenna input terminal	2.075	W
Prediction distance	50.000	cm
Prediction frequency	869.7000	MHz
Antenna Gain(typical)	2.000	dBi
Antenna Gain(numeric)	1.585	-
Power density at prediction frequency(S)	0.105	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	0.580	mW/cm^2

2-2 Limit (Up Link)

Max Peak output Power at antenna input terminal	33.100	dBm
Max Peak output Power at antenna input terminal	2.042	W
Prediction distance	50.000	cm
Prediction frequency	848.3100	MHz
Antenna Gain(typical)	9.000	dBi
Antenna Gain(numeric)	7.943	-
Power density at prediction frequency(S)	0.516	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	0.566	mW/cm^2

3. RESULTS

The power density level at 50 cm is 0.105 mW/cm², which is below the uncontrolled exposure limit of 0.580 mW/cm² at Down Link

The power density level at 50 cm is 0.516 mW/cm², which is below the uncontrolled exposure limit of 0.566 mW/cm² at Up Link

Warning: In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, it must also have a minimum distance of 50 cm from the body during normal operation.