STC Test Report

Date : 2012-10-22
No. : MH187332

Applicant (CEM001): Celltronik Microwave HK Limited
Room 109, 1/F, Well Fung Industrial Centre, 68 Ta Chuen Ping Street, Kwai Chung, N.T., HK.

Manufacturer: Celltronik Microwave HK Limited

Description of Sample(s):

Product Name:	CDMA Repeater
Brand Name:	Celltronik
Model Number:	CA262DML
FCC ID:	QKICA262DML

Date Sample(s) Received: 2012-09-11

Date Tested: 2012-09-18 – 2012-10-17

Investigation Requested: Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 22H and TIA-603-D for FCC Certification.

Conclusion(s): The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 22H. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

Remark(s): For additional models details, see page 3.

Dr. LEE Kam Chuen
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.

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1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
10 Dai Wang Street, Taipo Industrial Estate
New Territories, Hong Kong

1.2 Equipment Under Test [EUT]
Description of Sample(s)

Product Name:	CDMA Repeater
Manufacturer:	Celltronik Microwave HK Limited
Brand Name:	Celltronik
Model Number:	CA262DML
Input Voltage:	120Va.c

1.3 Description of EUT Operation

Product Description:	The CA262DML repeater is designed for CDMA850 networks. The pair of the operation bands of the EUT is 870 – 882.5MHz for Downlink and 825 – 837.5MHz for Uplink, which are separated into 2 bands. There are 4 pairs (one input and one output as a pair) of connectors exist in the EUT, each pair of connectors is only available for one frequency band only (Uplink and Downlink are of two frequency bands). Remote configuration is possible through CC813 controller with Amplifier to Amplifier link (ATA) or via PC by Com port
Type of Modulation:	CDMA
Emission Designator:	1M25F9W (CDMA)
Frequency Band:	Cellular Band Band I: CDMA Port Downlink: 870MHz to 877.5MHz Uplink: 825MHz to 832.5MHz Band II: U850 Port Downlink: 877.5MHz to 882.5MHz Uplink: 832.5MHz to 837.5MHz Remark: for band 1 and band 2, they couldn't be overlapped.
Nominal Power Output:	Downlink: 43dBm Uplink: 33dBm

1.4 Date of Order

2012-09-11

1.5 Submitted Sample(s):

1 Sample

1.6 Test Duration

2012-09-17 to 2012-10-17

1.7 Country of Origin

Hong Kong

2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 22H: 2010 Regulations and TIA-603-D for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION
Results Summary

Test Condition	Test Requirement	Test Method	Class / Severity	Test Result	
				Pass	Fail
RF Output Power	FCC 47CFR 22.913	FCC Part 2.1046 2-11-04/EAB/RF	N/A	☒	☐
Conducted Spurious Emission	FCC 47CFR 22.917	FCC Part 2.1051 2-11-04/EAB/RF	N/A	☒	☐
Band-edge & Intermodulation	FCC 47CFR 22.917	FCC Part 2.1051 2-11-04/EAB/RF	N/A	☒	☐
Radiated Spurious Emissions	FCC 47CFR 22.917	FCC Part 2.1053 2-11-04/EAB/RF	N/A	☒	☐
Occupied Bandwidth	2-11-04/EAB/RF	FCC Part 2.1049 2-11-04/EAB/RF	N/A	☒	☐
Out of Band Rejection	2-11-04/EAB/RF	2-11-04/EAB/RF	N/A	☒	☐
Frequency Stability	FCC 47CFR 22.355	FCC Part 2.1055	N/A	☒	☐

Note: N/A – Not Applicable

3.0 Test Results

3.1 E.U.T. Operation

Test Requirement:	The RF output power of the EUT was measured at the antenna port, by adjusting the input power of signal generator to drive the EUT to get to maximum output power point and keep the EUT at maximum gain setting for all tests. The device should be tested on both uplink and downlink. For detail test modulation and frequency, please refer to 3.2
Input Voltage:	120Va.c.
Temperature:	22°C ~ 26°C
Humidity:	46% ~ 56% RH
Atmospheric Pressure:	990 ~ 1005mbar

REMARK:
GERNERAL DEFINITIONS FOR CERTIFICATION PURPOSES:
The following three general definitions follow from those stated in the Part 22, 24 and 90 rule sections as listed above. Two of the definitions replace previous EAB internal definitions given for booster, repeater and extender. The general term “extender” is the same as booster, but booster should be used rather than extender. The general term “translator” is the same as repeater, but repeater should be used rather than translator.

External radio frequency power amplifier (ERFPA) – any device which, (1) when used in conjunction with a radio transmitter signal source, is capable of amplification of the signal, and (2) is not an integral part of a radio transmitter as manufactured. The EAS equipment class AMP is used only for an ERFPA device inserted between a transmitter (TNB/PCB) and an antenna (has only one antenna port)

Booster is a device that automatically reradiates signals from base transmitters without channel translation, for the purpose of improving the reliability of existing service by increasing the signal strength in dead spots. An “in-building radiation system” is a signal booster. These devices are not intended to extend the size of coverage from the originating base station. A booster can be either single or multiple channels.

Repeater is a device that retransmits the signals of other stations. Repeaters are different from boosters in that they can include frequency translation and can extend coverage beyond the design of the original base station. A repeater is typically single channel but can also be multiple channels.
ERFPA(AMP) and booster/repeaters (TNB/PCB) can generally be authorized for all rules parts except 15 and 18.
Tests should be done with each typical signal. e.g., for F3E emissions use 2500Hz with 2.5 or 5kHz deviation. Use of CW signal for some tests in acceptable in lieu of actual emission, in some cases when CW signal gives worst case.

The EUT is a Repeater and belongs to TNB class.

3.2 Test Procedure & Measurement Data

Test Modulation and Frequency

Cellular Band 1: CDMA Port

Modulation	Lowest Frequency (MHz)	Middle Frequency (MHz)	Highest Frequency (MHz)
Downlink: 870MHz to 877.5MHz			
CDMA	871.5	873.5	876.0
Uplink: 825MHz to 832.5MHz			
CDMA	826.5	828.5	831.0

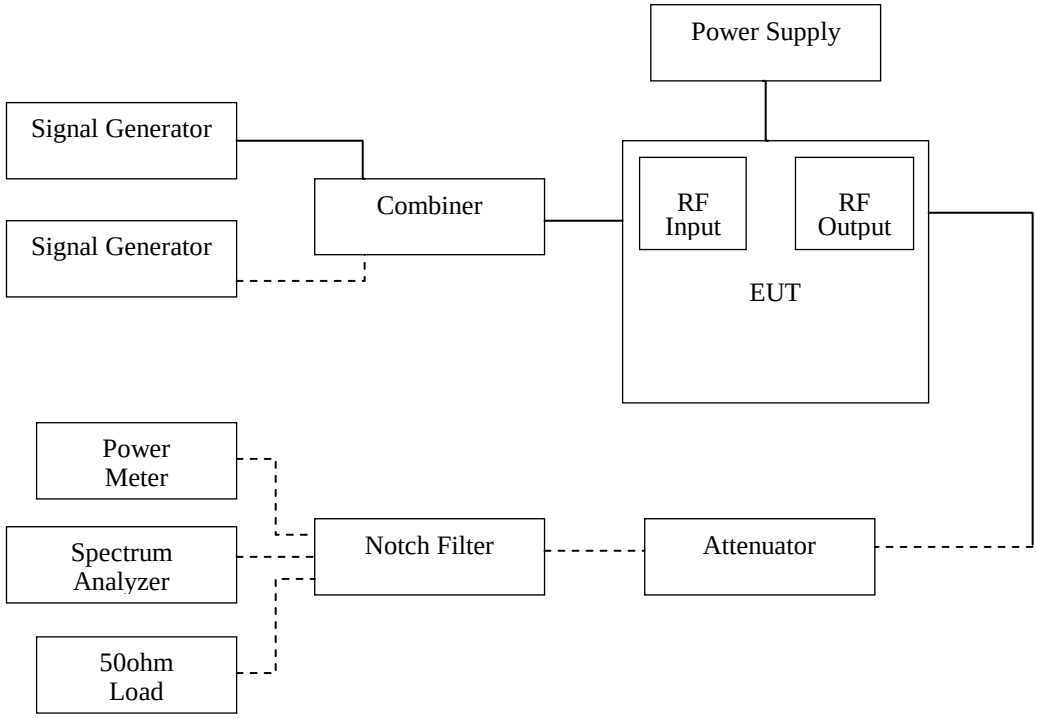
Cellular Band 2: U850 Port

Modulation	Lowest Frequency (MHz)	Middle Frequency (MHz)	Highest Frequency (MHz)
Downlink: 877.5MHz to 882.5MHz			
CDMA	879.0	880.0	881.0
Uplink: 832.5MHz to 837.5MHz			
CDMA	834.0	835.0	836.0

Remark:

1) For band 1 and band 2, we adjusted the working band in the lowest band; the middle band; the highest band and test the respective frequency as above table.

General Test Setup:



According to the tune up procedure, test the EUT DT port (Downlink) and MT port (Uplink) to achieve the maximum output power.

3.3 RF Output Power

Test Requirement:	FCC 47CFR 22.913(a) 22.913(a): Maximum ERP in general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500Watts.
Test Method:	FCC Part 2.1046
Test Date:	2012-09-17
Mode of Operation:	Status: Drive the EUT to maximum output power Conditions: Normal conditions Application: Cellular Band RF output ports

Test Configuration:

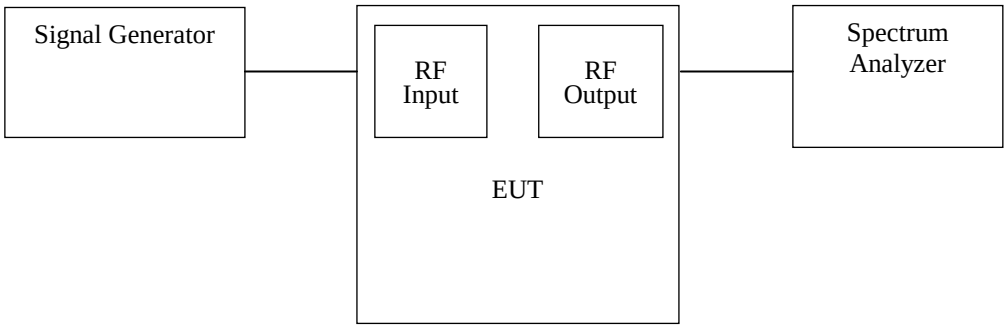


Figure 1 RF Output Power Test Configuration

Test Procedure: RF output power test procedure:

1.

a) Connect the equipment as illustrated, when the output power is over the max value of the spectrum analyzer; add the attenuator to avoid destroying the facility.
b) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency, key the transmitter, and set the level of the carrier to the full scale reference line.
c) Do not apply any tone to modulate the EUT.
d1) Adjust the spectrum analyzer for the following settings:
1) Resolution Bandwidth >> the carrier bandwidth,
2) Video Bandwidth refer to standard requirement.
d2) Use spectrum analyzer channel power measurement function;
e) Record the frequencies and levels of carrier power;
f) Calculate the signal path loss and final power value.

Or

2.

a) Connect the equipment as illustrated;
b) Read the value from the power meter;
c) Calculate the signal path loss and final power value.

Remark: Output power –

- Power on Form 731 should be clearly understood as either composite of multi-channels or per carrier. If power is composite include in comments field: “Power output listed is composite for multi-channel operation.”
- Check that the input drive level is at maximum input rating and maximum gain settings for all tests. Check both uplink and downlink input levels. See manual or brochures / technical description for maximum rating. May need to check FCC identifier of transmitter used for tests.

3.3.1 Measurement Record:

Test for all configuration

Band 1: CDMA Port

Per channel power, input =-7dBm for downlink and -17dBm for uplink.			
Modulation	**Lowest Frequency**	**Middle Frequency**	**Highest Frequency**
Downlink: Working Band (870MHz ~ 877.5MHz), Measure Maximum Output Power			
CDMA	43.1dBm (20.4W)	43.5dBm (22.4W)	43.0dBm (20.0W)
Uplink: Working Band (825MHz ~ 832.5MHz), Measure Maximum Output Power			
CDMA	32.3dBm (1.698W)	33.1dBm (2.042W)	32.1dBm (1.622W)

Band 2: U850 Port

Per channel power, input =-7dBm for downlink and -17dBm for uplink.			
Modulation	**Lowest Frequency**	**Middle Frequency**	**Highest Frequency**
Downlink: Working Band (877.5MHz ~ 882.5MHz), Measure Maximum Output Power			
CDMA	42.4dBm (17.8W)	43.3dBm (21.4W)	42.5dBm (18.2W)
Uplink: Working Band (832.5MHz ~ 837.5MHz), Measure Maximum Output Power			
CDMA	32.1dBm (0.3W)	33.3dBm (0.281W)	31.9dBm (0.288W)

Remark: test in single channel status, output power is tested in full amplifying status.
Kept the EUT working in maximum gain, adjusted the input power until to get the EUT to maximum output power (ALC point).

Note: Conducted output power tested. ERP was not tested because the amplifier does not come with an antenna.

3.4 Conducted Spurious Emissions

Test Requirement:	FCC 47CFR 22.917 (a) 22.917(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, which are 1.) 56dB attenuation for Downlink 2.) 46dB attenuation for Uplink
Test Method:	FCC Part 2.1051
Test Date:	2012-09-17 – 2012-09-28
Mode of Operation:	Status: Drive the EUT to maximum output power Conditions: Normal conditions Application: Cellular Band RF output ports

Test Configuration:

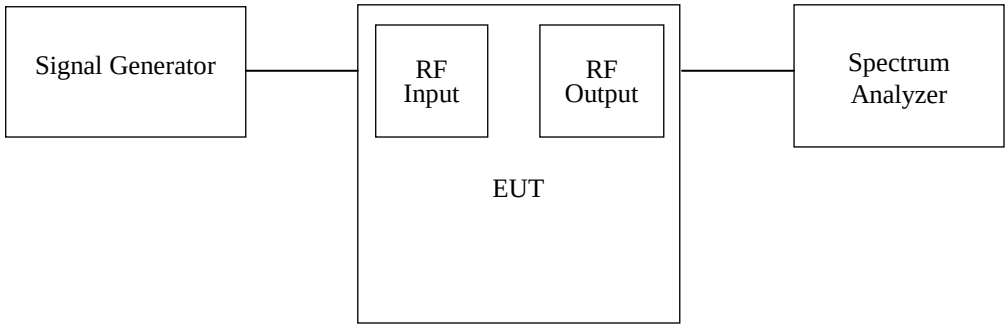
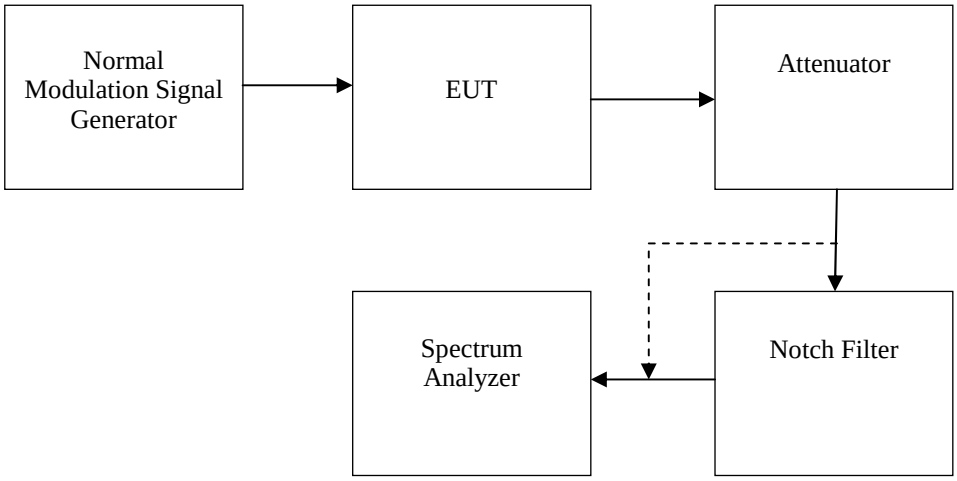


Figure 2 Conducted Spurious Emission Test Configuration



Test Procedure: Conducted Emission test procedure:

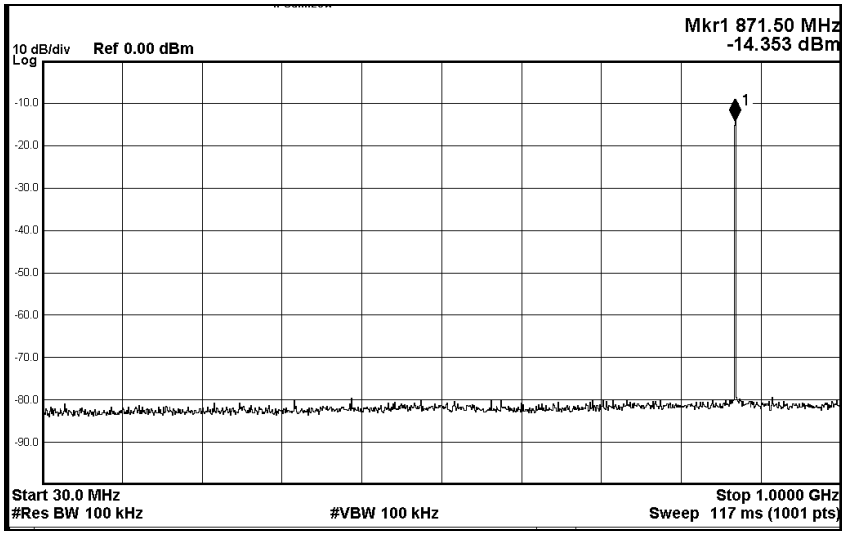
a) Connect the equipment as illustrated, with the notch filter by-passed, when the output power is over the max value of the spectrum analyzer, add the attenuator to avoid destroying the facility.
b) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency, key the transmitter, and set the level of the carrier to the full scale reference line.
c) Do not apply any tone to modulate the EUT.
d) Adjust the spectrum analyzer for the following settings:
   1) Resolution Bandwidth, (base the standard, apply the different set), here is 100kHz for frequency band less than 1GHz, 1MHz for frequency over 1GHz;
   2) Video Bandwidth refer to standard requirement.
e) Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from:
   1) 30MHz to 1000MHz;
   2) the highest radio frequency shall higher than 10 times of carrier frequency;
f) Record the frequencies and levels of spurious emissions from step e)

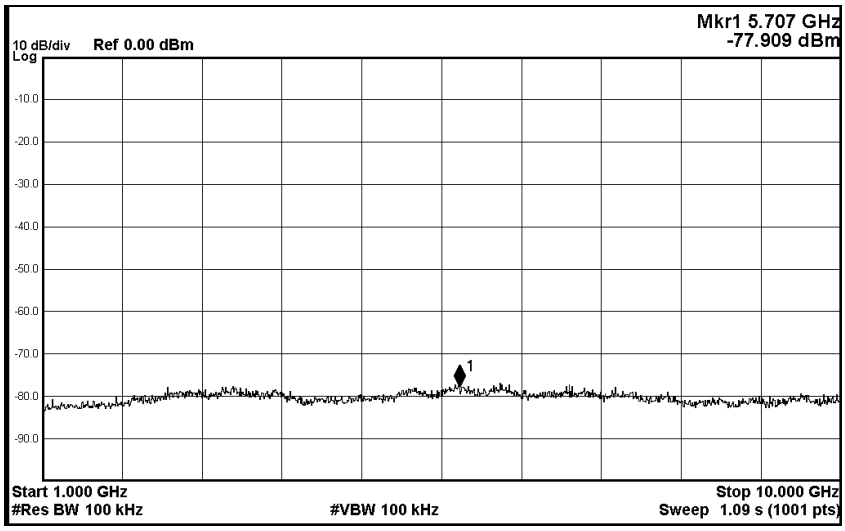
Remark: The notch filter maybe used for avoid the EUT fundamental carrier output power making the spectrum overload and the harmonic spurious brought by it.
When the EUT fundamental carrier is not enough to make the status, the notch filter could be not used.

3.4.1 Measurement Record:

Pretest 43dBm / 40dBm / 37dBm for Downlink and 33dBm / 30dBm / 27dBm / 24dBm for Uplink output systems and found the worst case are in 43dBm for Downlink system and 33dBm for Uplink system and reported.

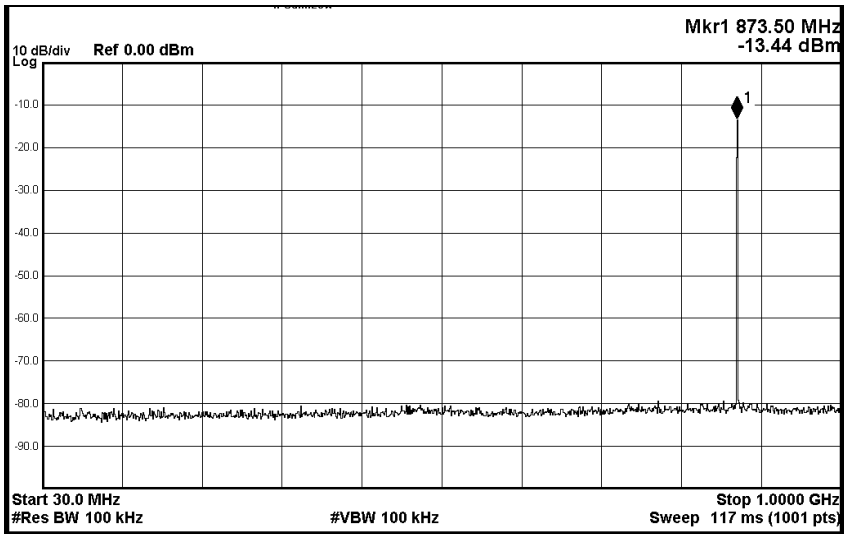
Test in Band 1:
Test for Downlink:
Cellular Band 1– CDMA downlink (lowest frequency)

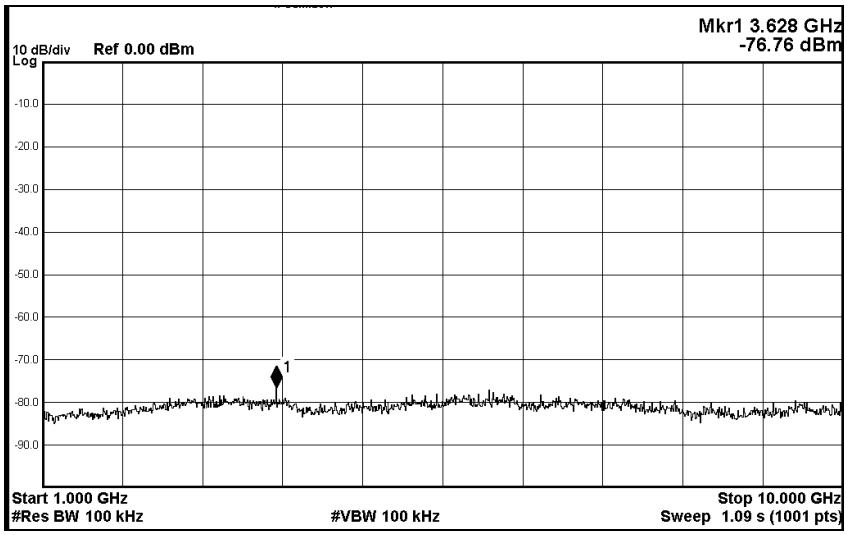




Remarks: 56dB attenuator was used for Band 1 Downlink during Conducted Spurious Emission Test

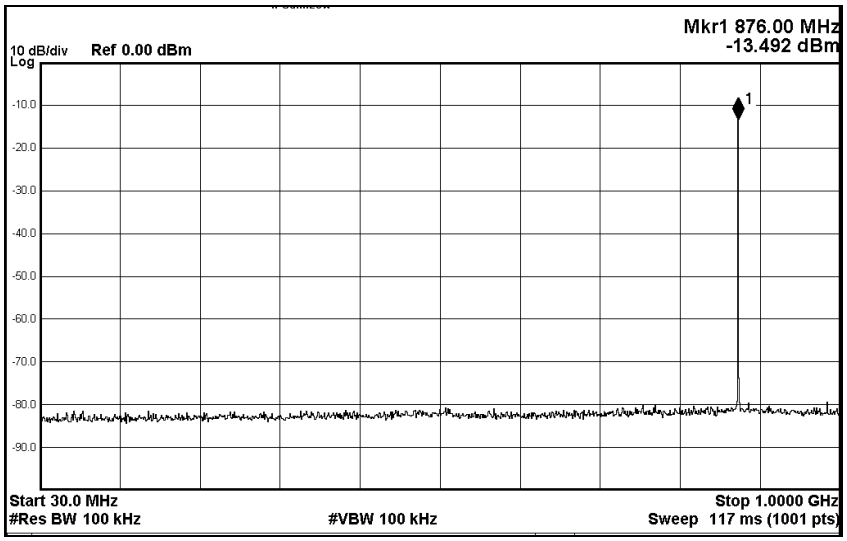
Cellular Band 1– CDMA downlink (middle frequency)

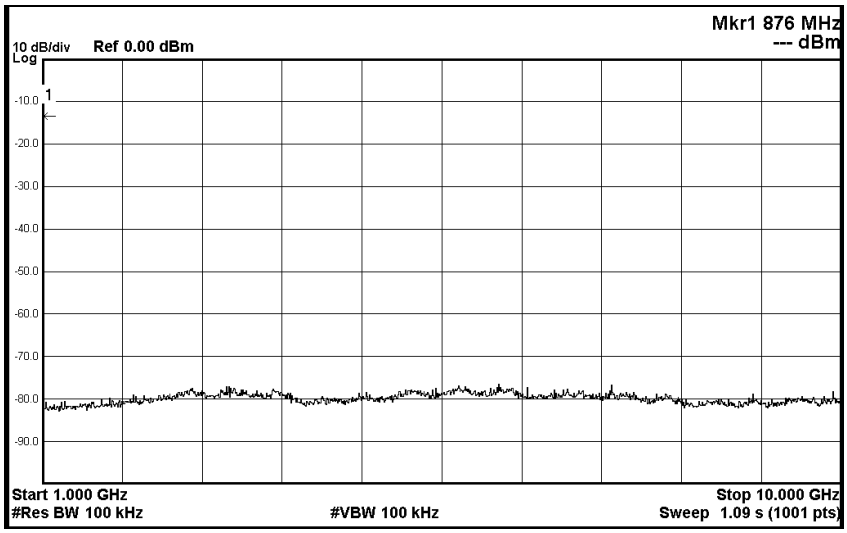




Remarks: 56dB attenuator was used for Band 1 Downlink during Conducted Spurious Emission Test

Cellular Band 1– CDMA downlink (highest frequency)

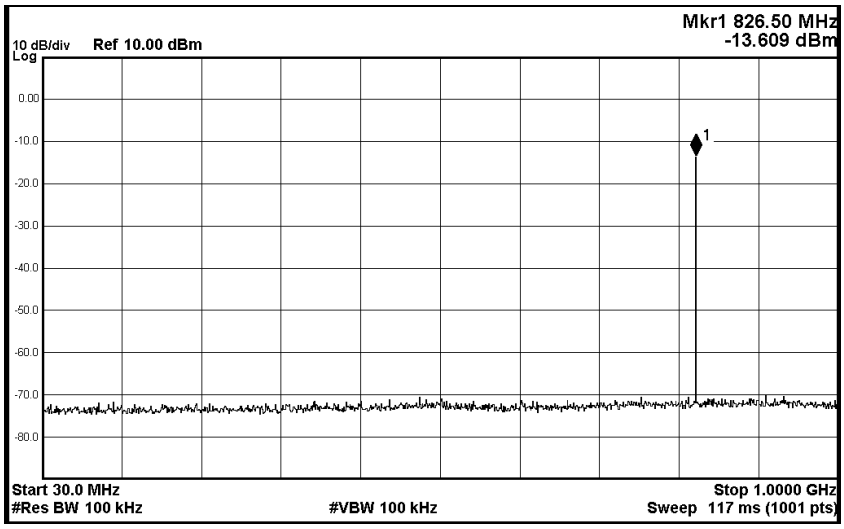


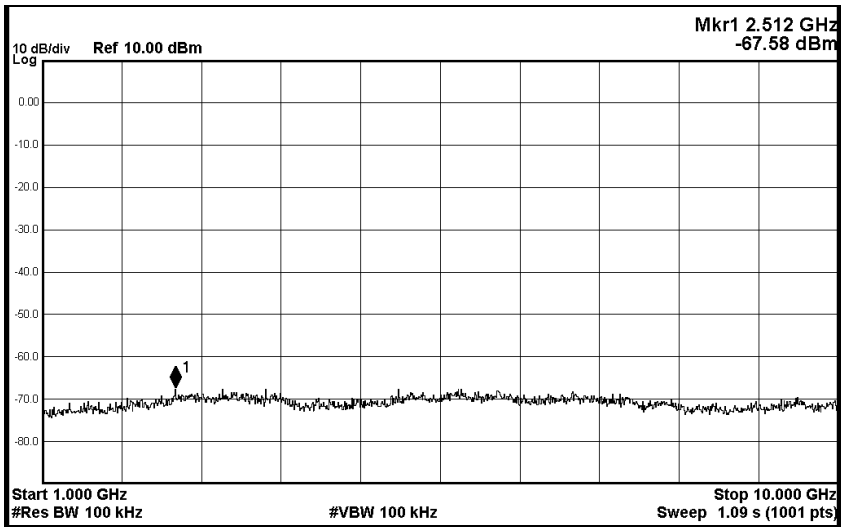


Remarks: 56dB attenuator was used for Band 1 Downlink during Conducted Spurious Emission Test

Test for Uplink:

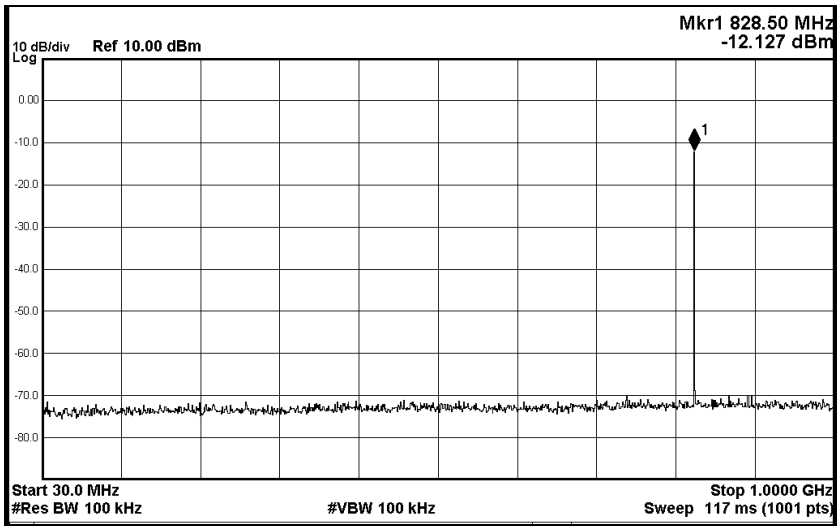
Cellular Band 1– CDMA Uplink (lowest frequency)

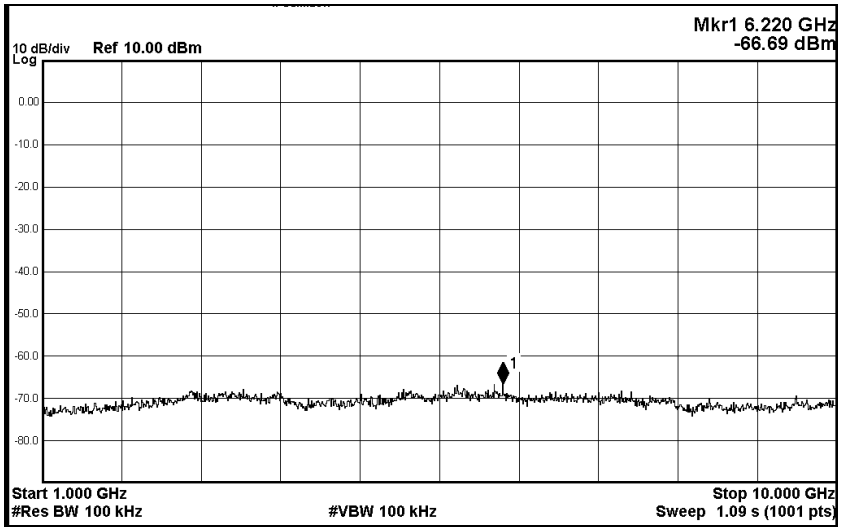




Remarks: 46dB attenuator was used for Band 1 Uplink during Conducted Spurious Emission Test

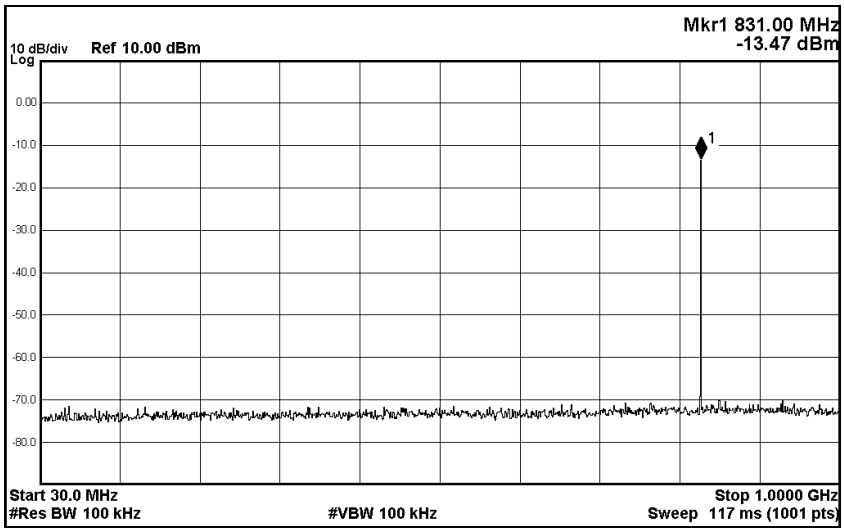
Cellular Band 1– CDMA Uplink (middle frequency)

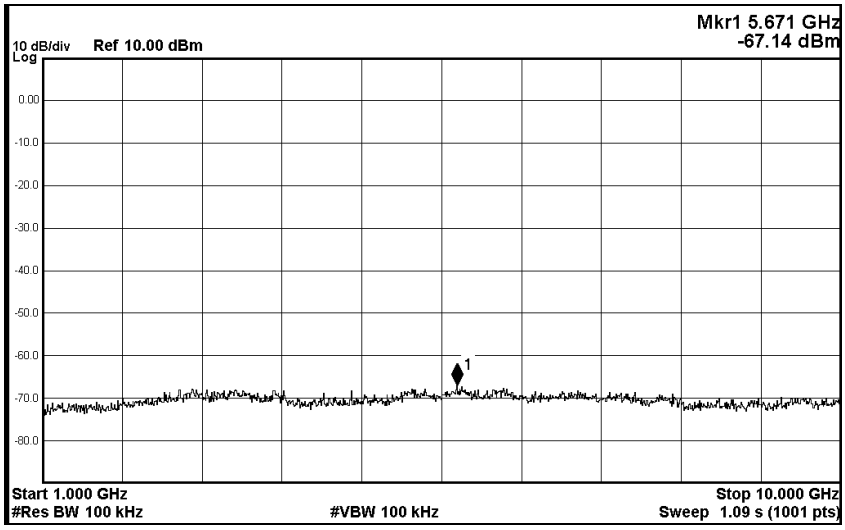




Remarks: 46dB attenuator was used for Band 1 Uplink during Conducted Spurious Emission Test

Cellular Band 1– CDMA Uplink (highest frequency)



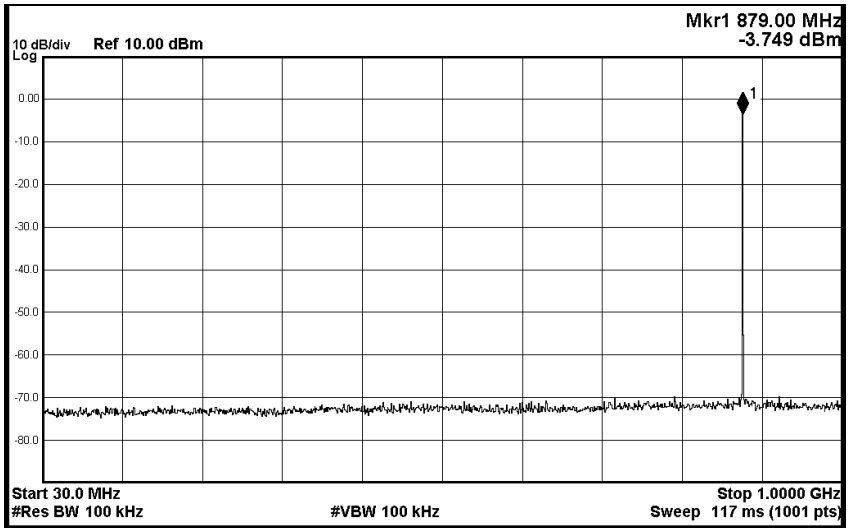


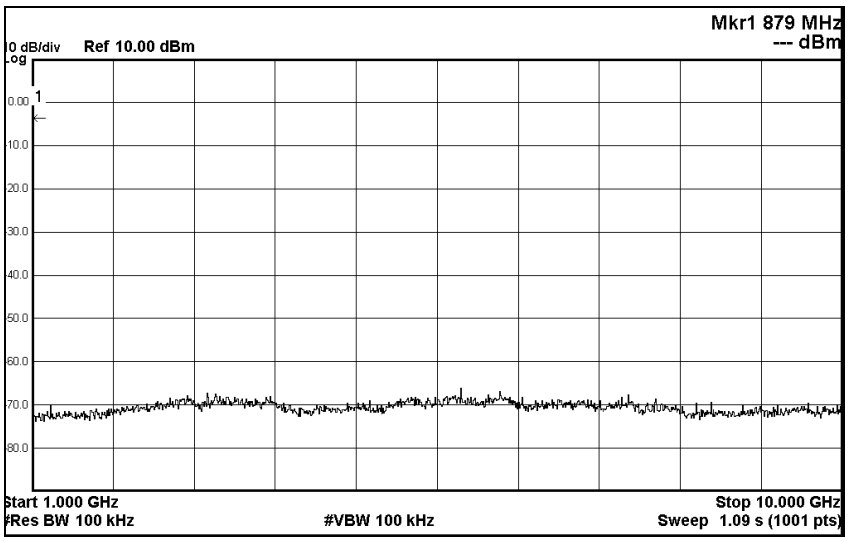
Remarks: 46dB attenuator was used for Band 1 Uplink during Conducted Spurious Emission Test

Test in Band 2:

Test for Downlink:

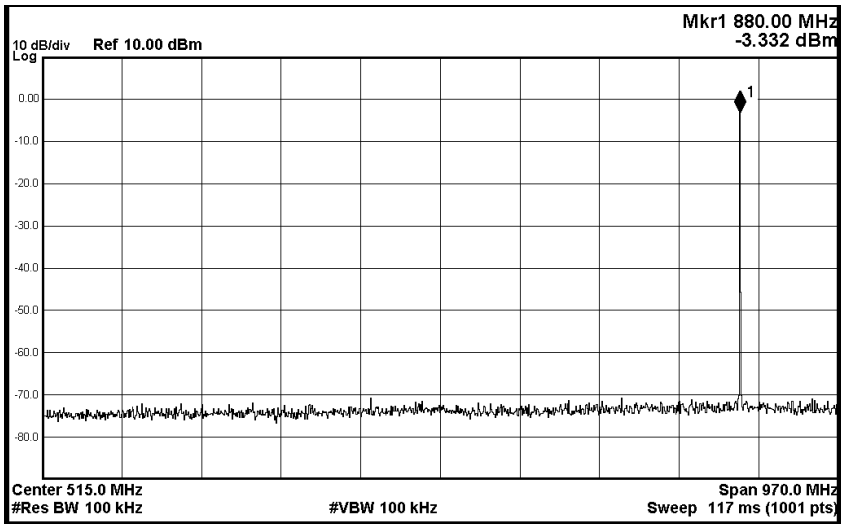
Cellular Band 2– CDMA downlink (lowest frequency)

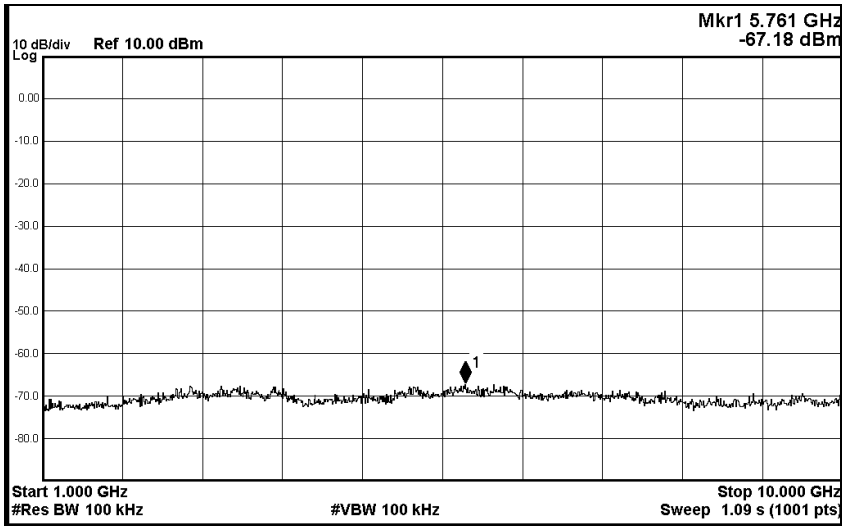




Remarks: 46dB attenuator was used for Band 2 Downlink during Conducted Spurious Emission Test

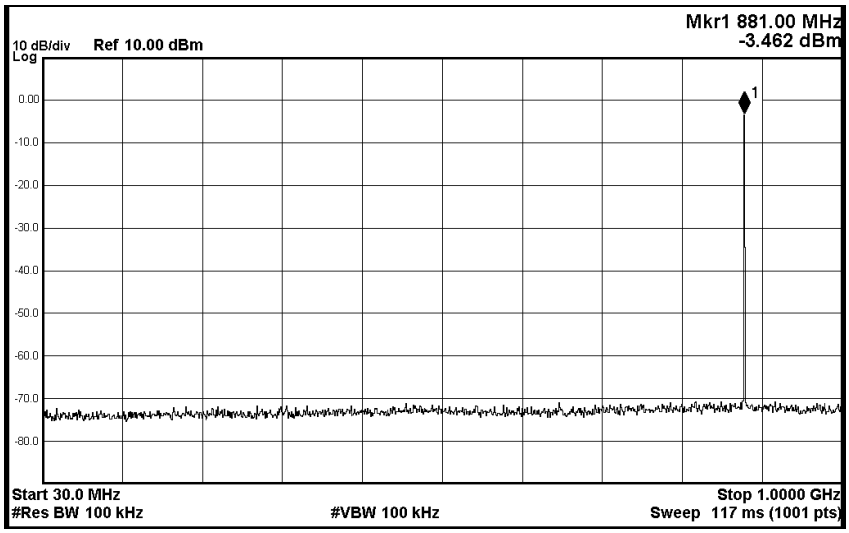
Cellular Band 2– CDMA downlink (middle frequency)

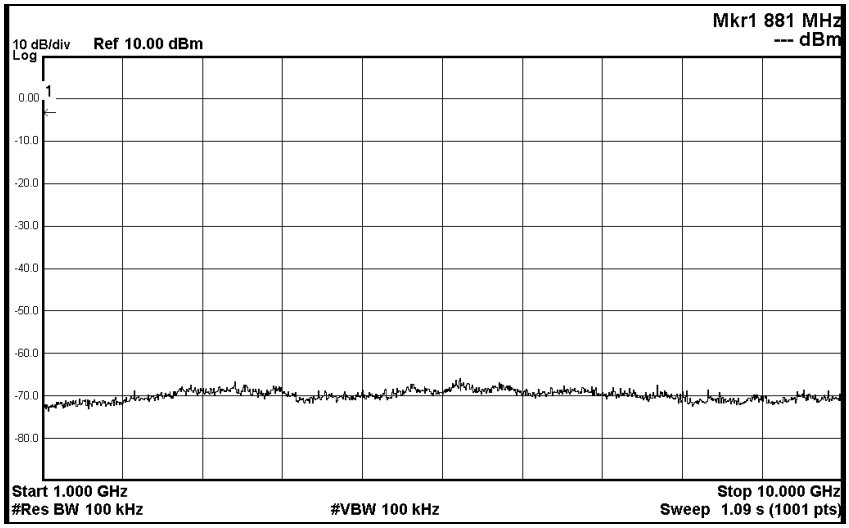




Remarks: 46dB attenuator was used for Band 2 Downlink during Conducted Spurious Emission Test

Cellular Band 2– CDMA downlink (highest frequency)

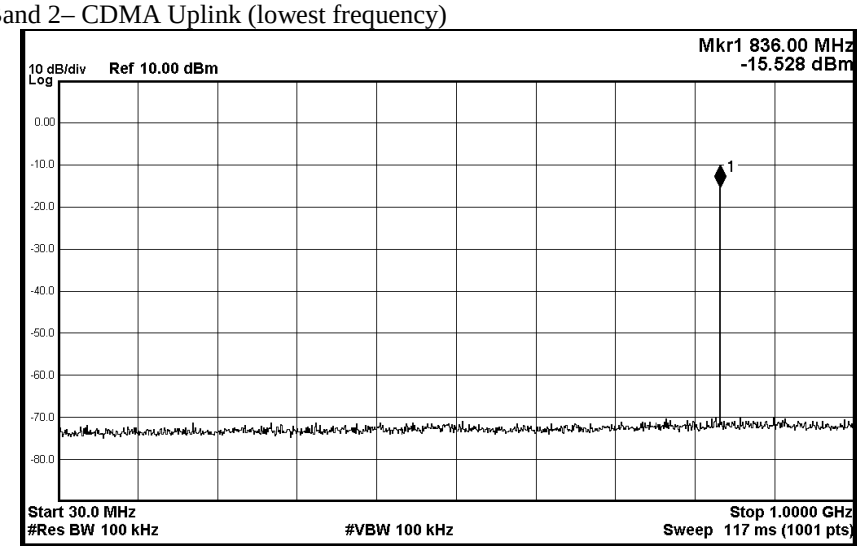


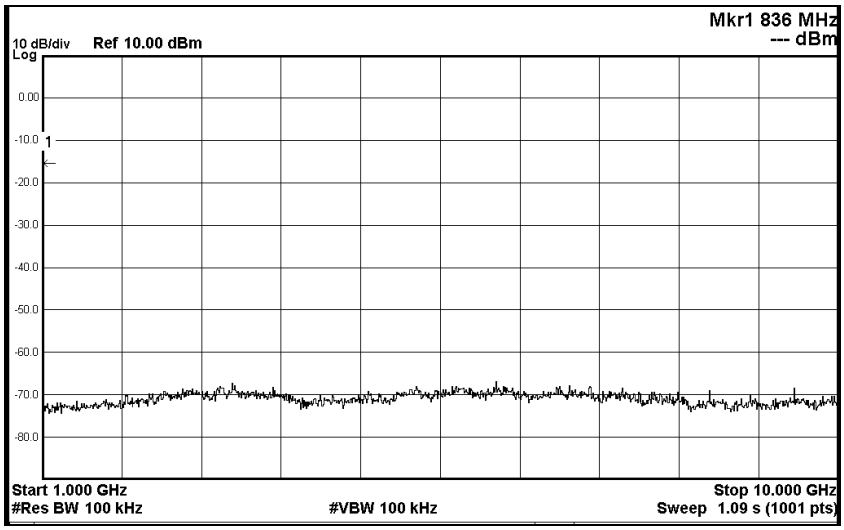


Remarks: 46dB attenuator was used for Band 2 Downlink during Conducted Spurious Emission Test

Test for Uplink:

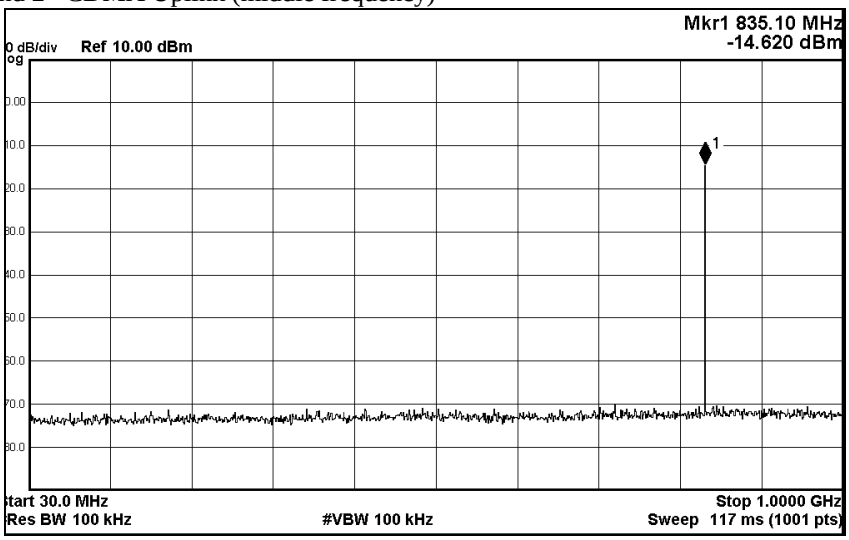
Cellular Band 2– CDMA Uplink (lowest frequency)

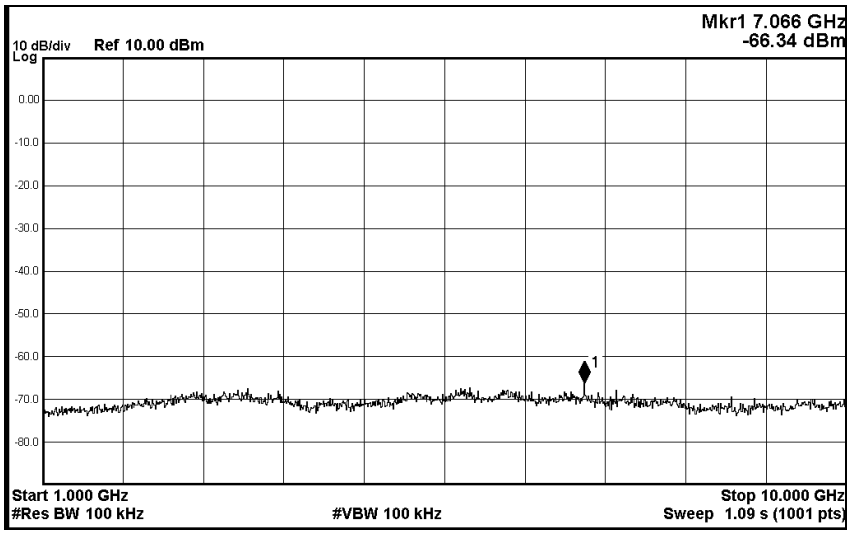




Remarks: 46dB attenuator was used for Band 2 Uplink during Conducted Spurious Emission Test

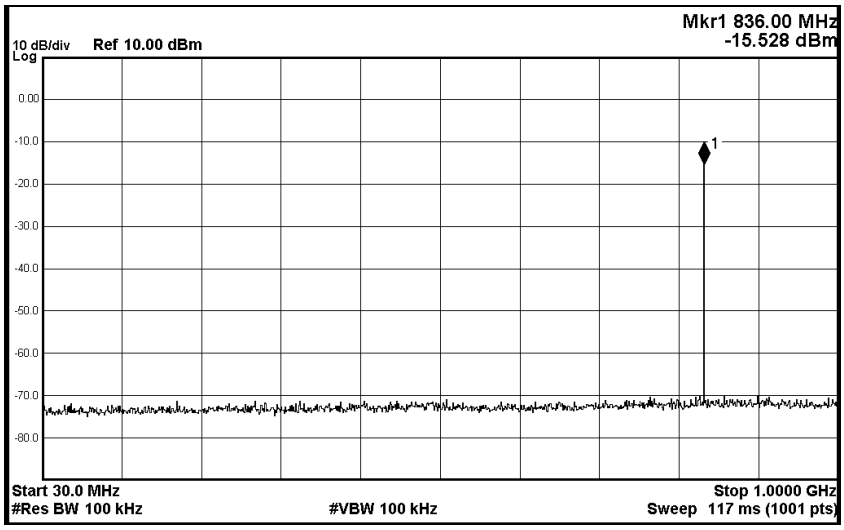
Cellular Band 2– CDMA Uplink (middle frequency)

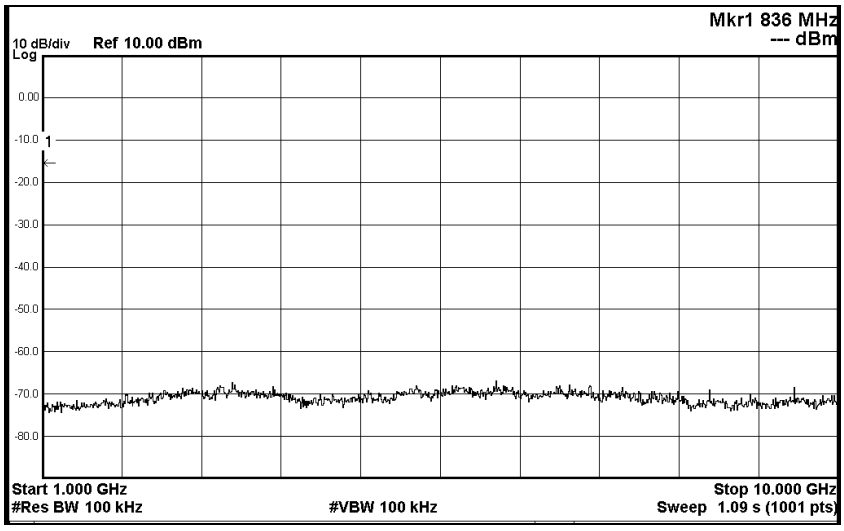




Remarks: 46dB attenuator was used for Band 2 Uplink during Conducted Spurious Emission Test

Cellular Band 2– CDMA Uplink (highest frequency)





Remarks: 46dB attenuator was used for Band 2 Uplink during Conducted Spurious Emission Test

3.5 Band Edge & Intermodulation

Test Requirement:	FCC 47CFR 22.917 (b) 22.917(b): Measurement procedure. Compliance with these rules in based on the use of measurement instrumentation employing a resolution bandwidth of 100kHz or greater. In the 1MHz 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. 100kHz 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 26dB below the transmitter power.
Test Method:	FCC Part 2.1051 & 2-11-04/EAB/RF
Test Date:	2012-09-28
Mode of Operation:	Status: Drive the EUT to maximum output power Conditions: Normal conditions Application: Cellular Band RF output ports

Test Configuration:

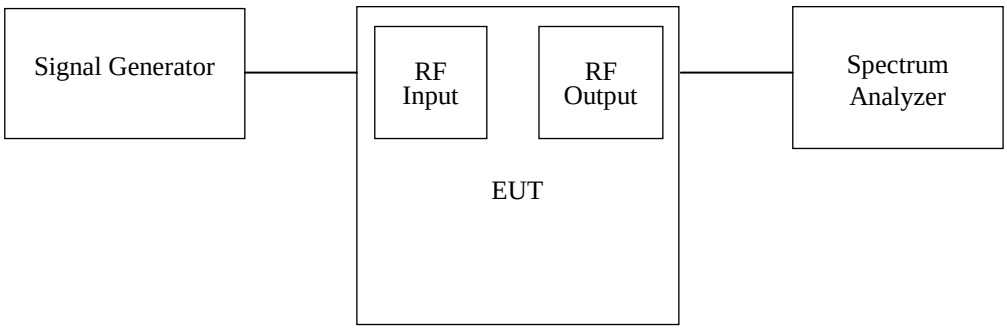
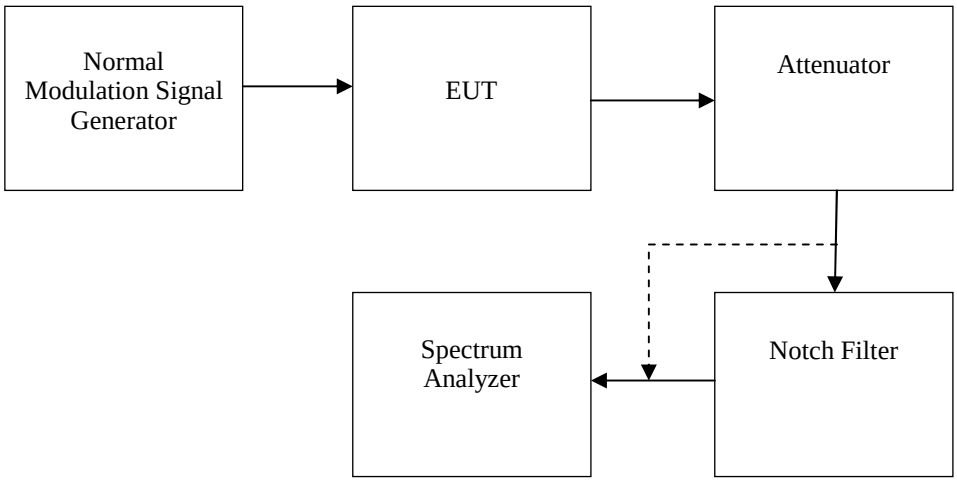


Figure 3 Band edge and Intermodulation Test Configuration



Test Procedure: Conducted Emission test procedure:

a) Connect the equipment as illustrated, with the notch filter by-passed, when the output power is over the max value of the spectrum analyzer, add the attenuator to avoid destroying the facility.
b) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency, key the transmitter, and set the level of the carrier to the full scale reference line.
c) Do not apply any tone to modulate the EUT.
d) Adjust the spectrum analyzer for the following settings:
   1) Resolution Bandwidth, (base the standard, apply the different set), here is 100kHz for frequency band less than 1GHz, 1MHz for frequency over 1GHz;
   2) Video Bandwidth refer to standard requirement.
e) Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from:
   1) 30MHz to 1000MHz;
   2) the highest radio frequency shall higher than 10 times of carrier frequency;
f) Record the frequencies and levels of spurious emissions from step e)

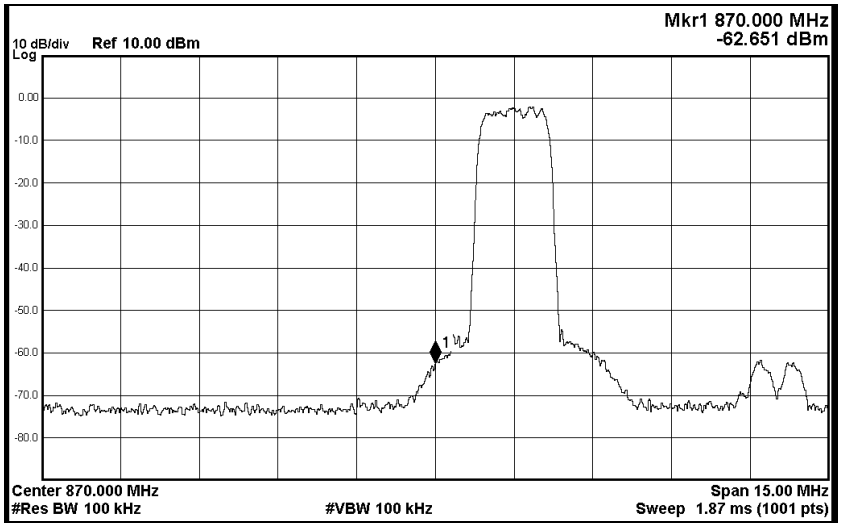
Remark: The notch filter maybe used for avoid the EUT fundamental carrier output power making the spectrum overload and the harmonic spurious brought by it.
When the EUT fundamental carrier is not enough to make the status, the notch filter could be not used.

Intermodulation Test Procedure:	1) Connect the equipment as illustrated; 2) Test the background noise level with all the test facilities; 3) Keep one transmitting path, all other connectors shall be connected by normal power or RF leads; 4) Select the attenuator to avoid the test receiver or spectrum analyzer being destroyed; 5) Keep the EUT continuously transmitting in max power; 6) Keep two signals are same in modulation type and level; 7) Measure the 3 order inter-modulated product by the EUT (the sum of the two unwanted signal should be rated power); 8) Correct for all losses in the RF path; 9) Read the conducted spurious emissions of the EUT antenna port.
Remark:	• CW signal rather than typical signal is acceptable (for FM). • At maximum drive level, for each modulation: one test with three tones, or two tests (high-, low-band edge) with two tones • Limit usually is -13dBm conducted. • Not needed for single channel systems. • Combination of modulation types not needed.

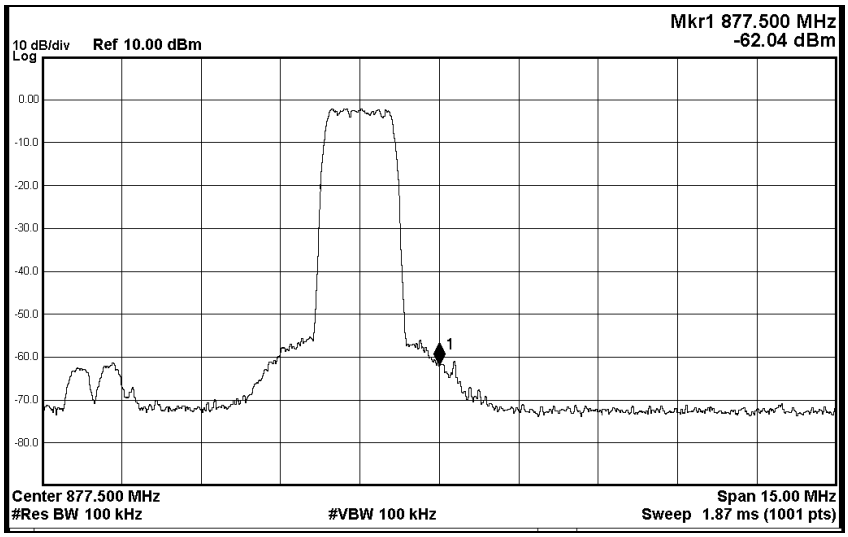
3.5.1 Measurement Record:

Pretest 43dBm / 40dBm / 37dBm for Downlink and 33dBm / 30dBm / 27dBm / 24dBm for Uplink output systems and found the worst case are in 43dBm for Downlink system and 33dBm for Uplink system and reported.

Test in Band 1:
Test for Downlink:
Cellular Band 1– CDMA one signal input downlink (lower edge)

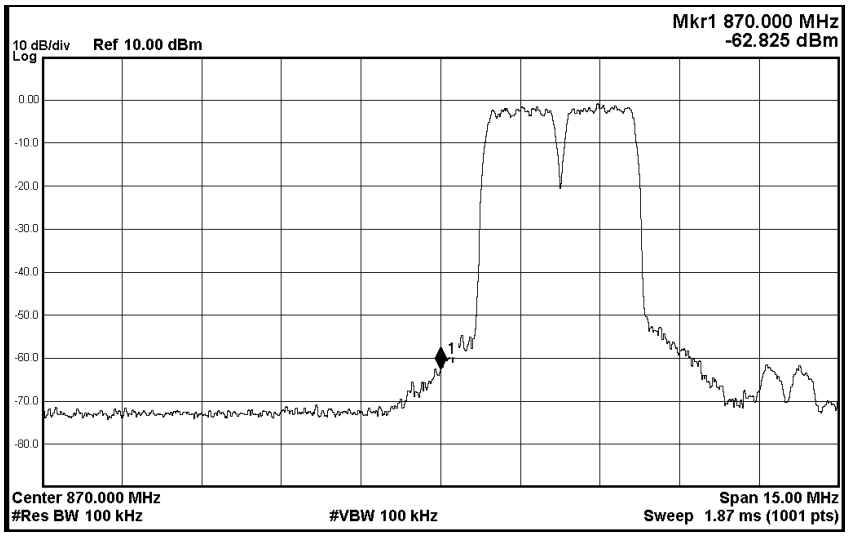


Cellular Band 1– CDMA one signal input downlink (upper edge)

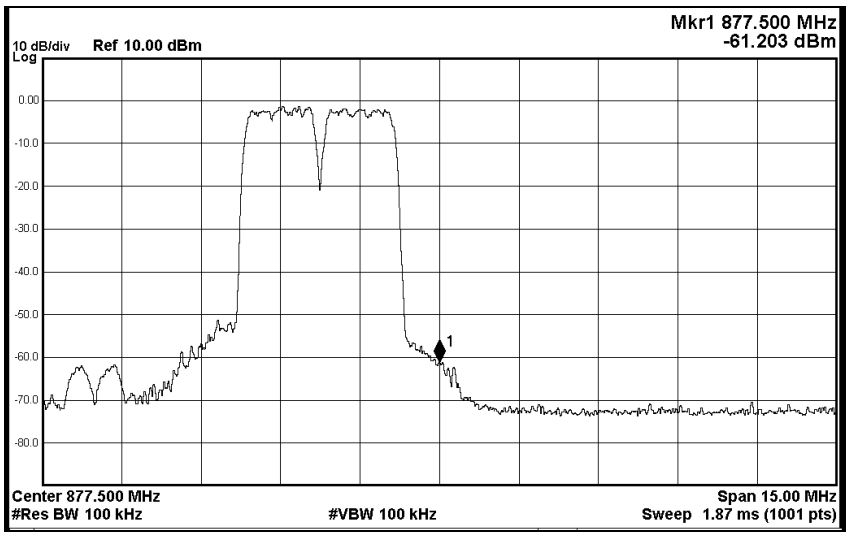


Remarks: 46dB attenuator was used for Band 1 Downlink during Band Edge Measurement

Cellular Band 1– CDMA two signal input downlink (lower edge)



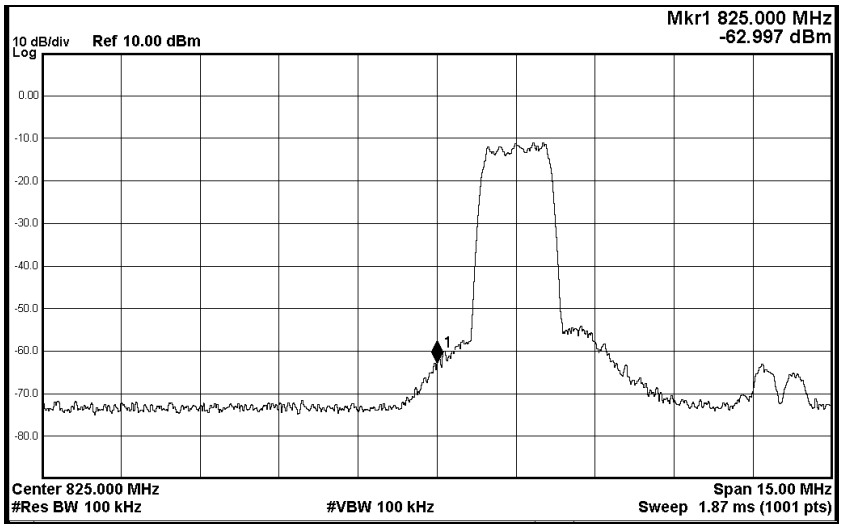
Cellular Band 1– CDMA two signal input downlink (upper edge)



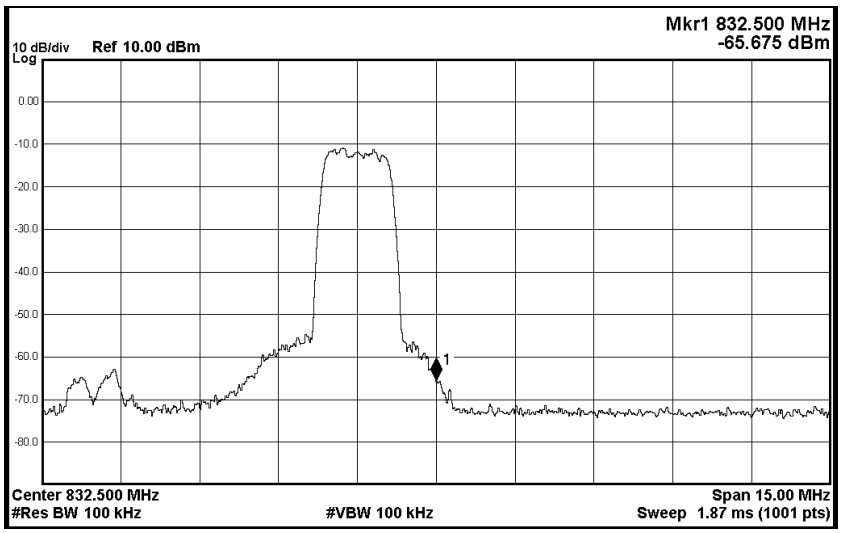
Remarks: 46dB attenuator was used for Band 1 Downlink during Band Edge Measurement

Test for Uplink:

Cellular Band 1– CDMA one signal input uplink (lower edge)

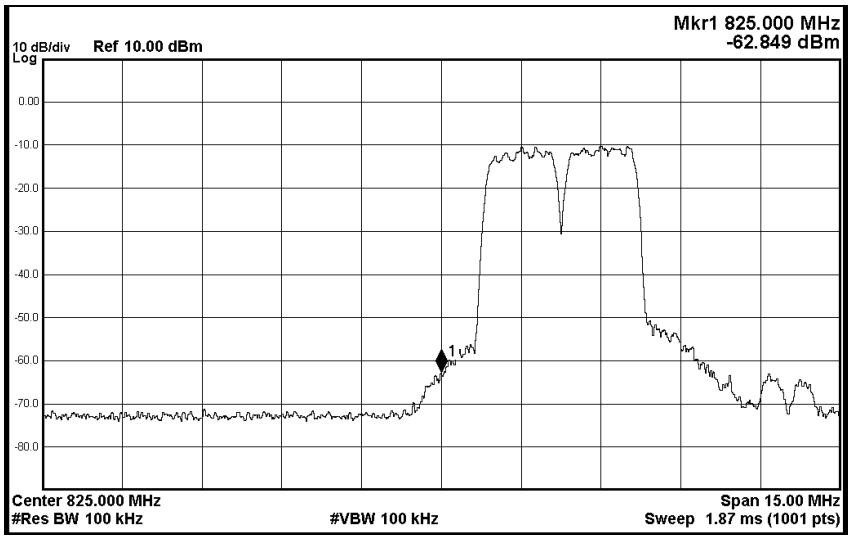


Cellular Band 1– CDMA one signal input uplink (upper edge)

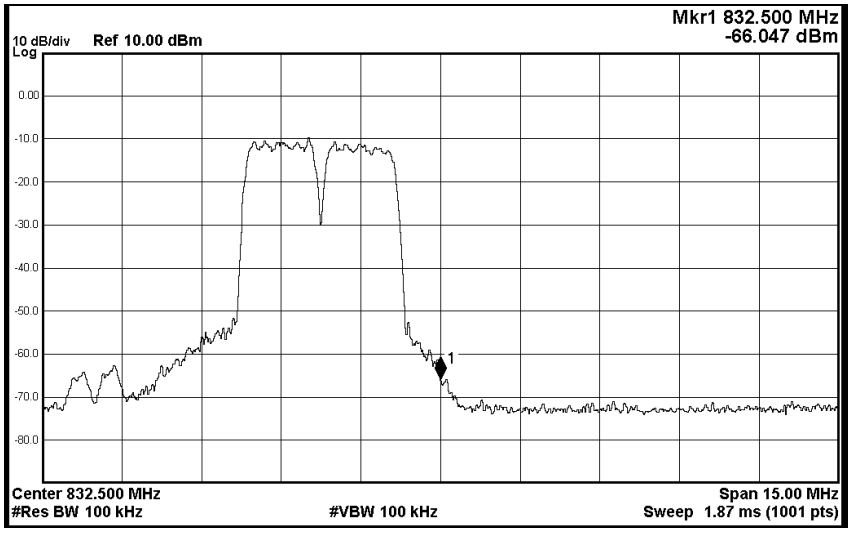


Remarks: 46dB attenuator was used for Band 1 Uplink during Band Edge Measurement

Cellular Band 1– CDMA two signal input uplink (lower edge)



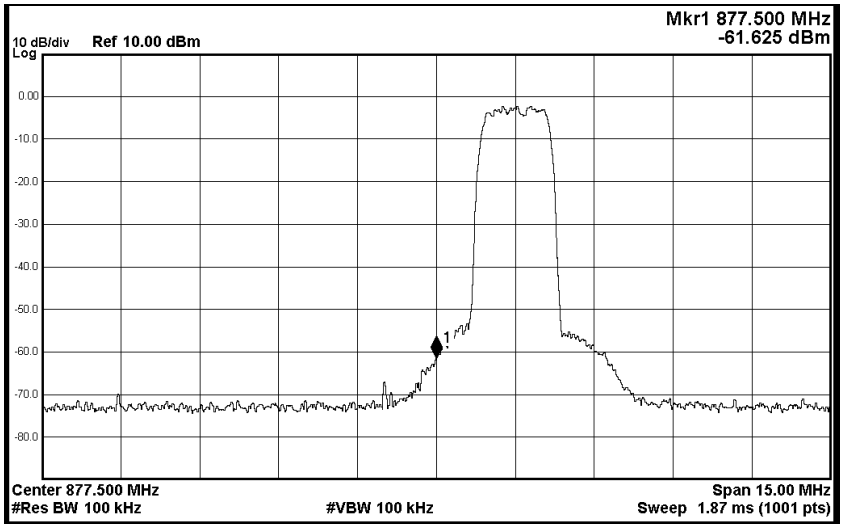
Cellular Band 1– CDMA two signal input uplink (upper edge)



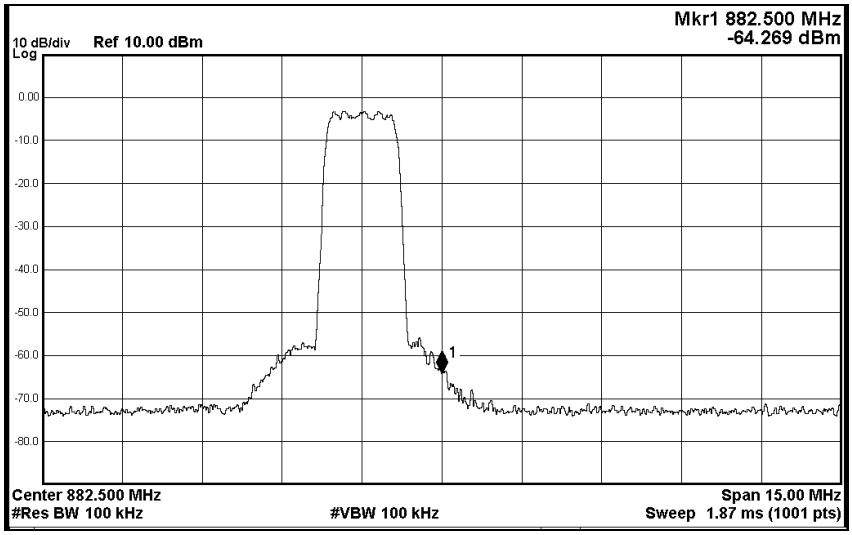
Remarks: 46dB attenuator was used for Band 1 Uplink during Band Edge Measurement

Test in Band 2:
Test for Downlink:

Cellular Band 2 – CDMA one signal input downlink (lower edge)

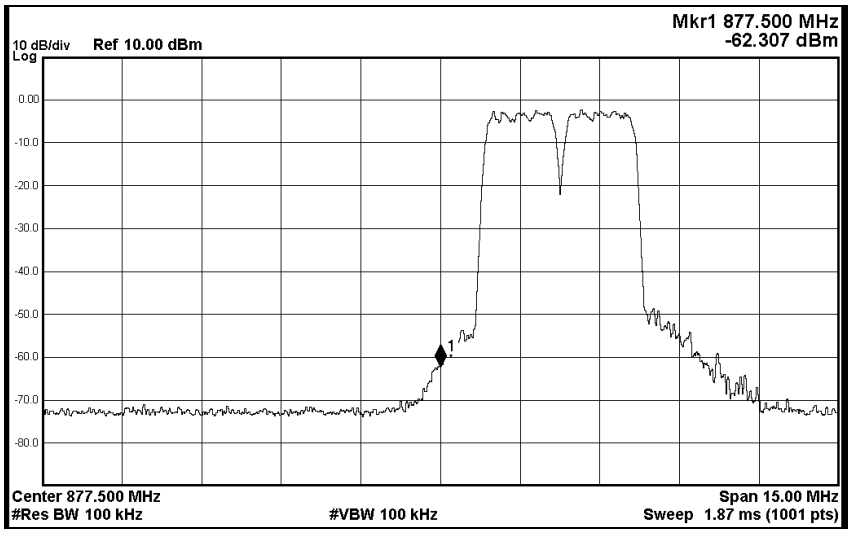


Cellular Band 2– CDMA one signal input downlink (upper edge)

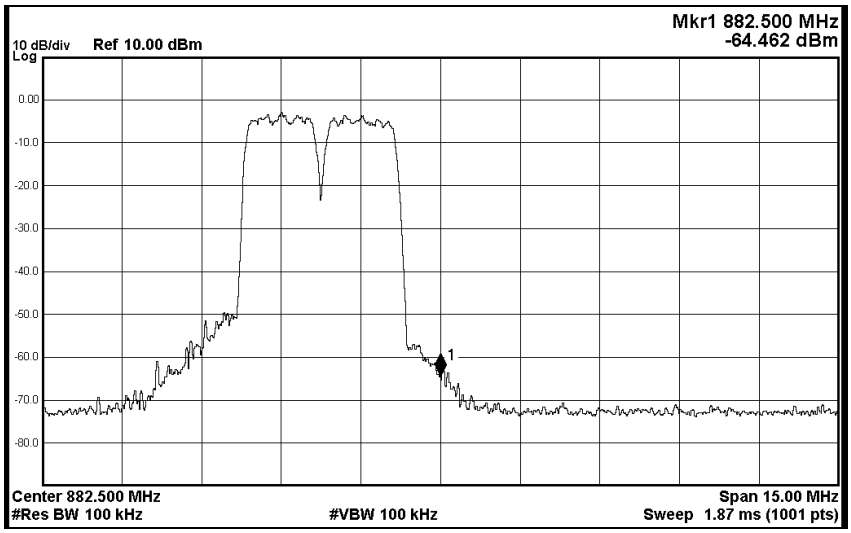


Remarks: 46dB attenuator was used for Band 2 Downlink during Band Edge Measurement

Cellular Band 2– CDMA two signal input downlink (lower edge)



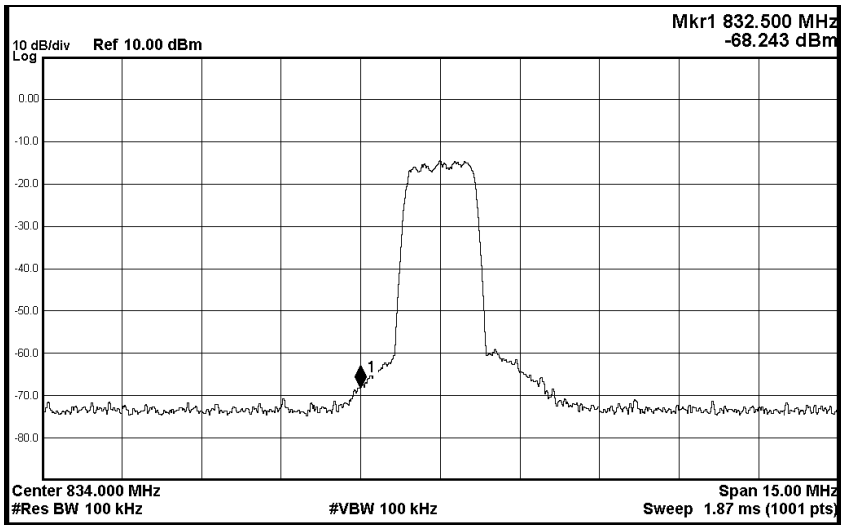
Cellular Band 2– CDMA two signal input downlink (upper edge)



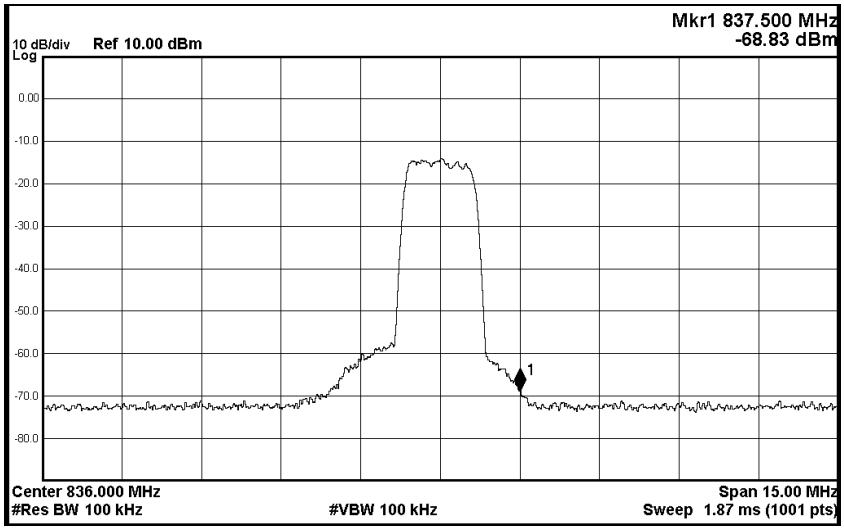
Remarks: 46dB attenuator was used for Band 2 Downlink during Band Edge Measurement

Test for Uplink:

Cellular Band 2– CDMA one signal input uplink (lower edge)

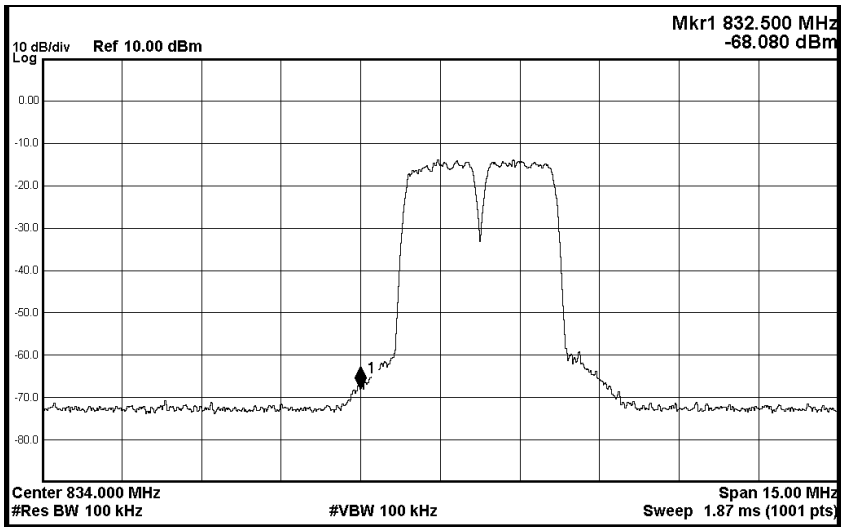


Cellular Band 2– CDMA one signal input uplink (upper edge)

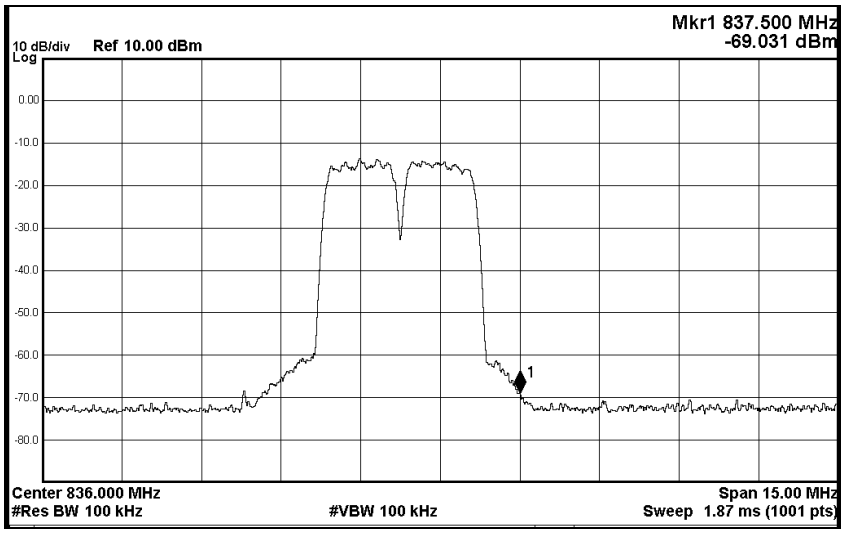


Remarks: 46dB attenuator was used for Band 2 Uplink during Band Edge Measurement

Cellular Band 2– CDMA two signal input uplink (lower edge)



Cellular Band 2– CDMA two signal input uplink (upper edge)



Remark: 46dB attenuator was used for Band 2 Uplink during Band Edge Measurement

For the test in two signal input or intermodulation, test input signal f1 and f2 will consider as follows conditions:

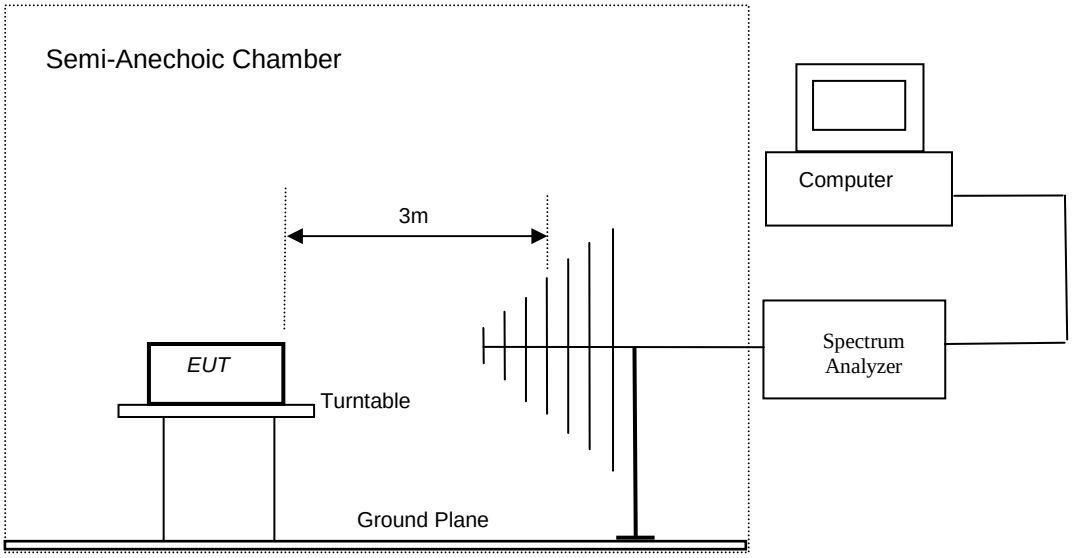
1) EUT frequency band span and the amount of channels;
2) f1 is the frequency lower, f2 is the frequency higher, △f is the channel spacing;
3) in lower edge test, f1 is the lower edge frequency + 1 channel frequency, and f2 is +2 channel frequency;
4) in higher edge test, f1 is the higher edge frequency – 2 channel frequency, and f2 is -1 channel frequency;
5) according to the amplifier characteristic, the 3rd product will appear when two signals input;
6) base the 3rd product frequency F1=2f1-f2 and F2=2f2-f1, when the f1 and f2 frequency select above,
   a) in lower edge test, F1=2f1-(f1+△f)=f1-△f=lower edge frequency;
   b) in higher edge test, F2=2f2-(f2-△f)=f2+△f=higher edge frequency.

3.6 Radiated Spurious Emissions

Test Requirement:	FCC 47CFR 22.917 (a) 22.917(a):
Test Method:	FCC Part 2.1053
Test Date:	2012-10-03 – 2012-10-08
Mode of Operation:	Status: Drive the EUT to maximum output power Conditions: Normal conditions Application: Enclosure

Test Configuration:

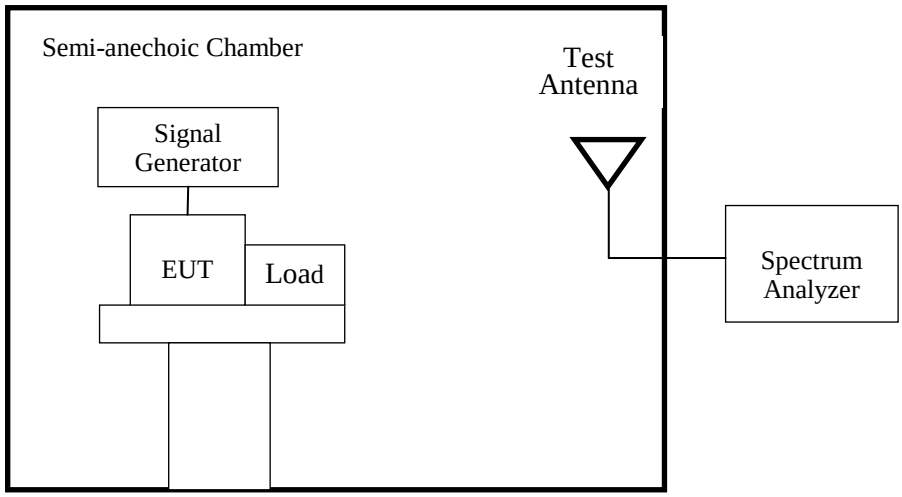
30MHz to 40GHz emissions:



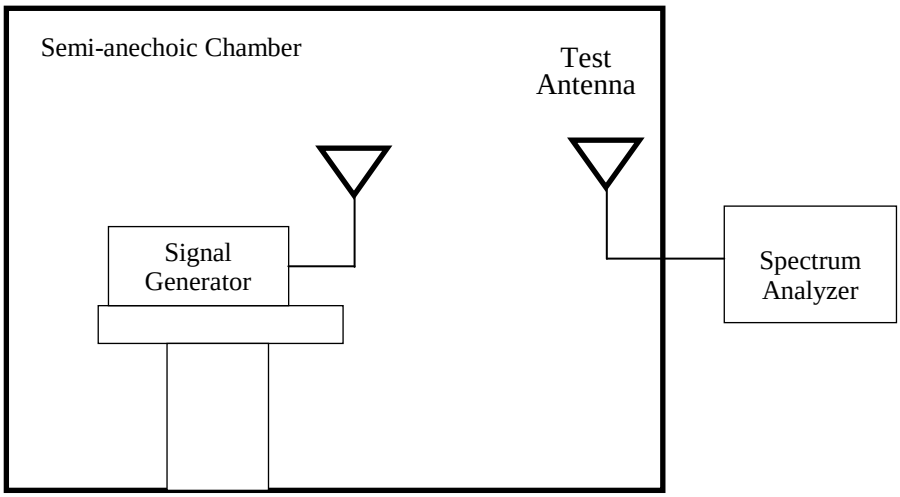
Test Procedure:

1. Test the background noise level with all the test facilities;
2. Keep one transmitting path, all other connectors shall be connected by normal power or RF leads;
3. A suitable RF notch filter maybe used to avoid the test receiver or spectrum analyzer produce unwanted spurious emissions;
4. Keep the EUT continuously transmitting in max power;
5. Read the radiated emissions of the EUT enclosure.

Radiated Emissions Test Procedure:



a) Connect the equipment as illustrated.
b) Adjust the spectrum analyzer for the following settings:
1) Resolution Bandwidth = 100kHz for spurious emissions below 1GHz, and 1MHz for spurious emissions above 1GHz.
2) Video Bandwidth = 300kHz for spurious emissions below 1GHz, and 3MHz for spurious emissions above 1GHz
3) Sweep Speed slow enough to maintain measurement calibration.
4) Detector Mode = Positive Peak.
c) Place the transmitter to be tested on the turntable in the standard test site, the transmitter is transmitting into a non-radiating load that is placed on the turntable. The RF cable to this load should be minimum length.
d) Measurements shall be made from 30MHz to 10 items of fundamental carrier, except for the region close to the carrier equal to ± the carrier bandwidth.
e) Key the transmitter without modulation or normal modulation base the standard.
f) For each spurious frequency, raise and lower the test antenna from 1m to 4m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
g) Repeat step f) for each spurious frequency with the test antenna polarized vertically.



h) Reconnect the equipment as illustrated.
i) Keep the spectrum analyzer adjusted as in step b).
j) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3m above the ground.
k) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antenna at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
l) Repeat step k) with both antennas vertically polarized for each spurious frequency.
m) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in step k) and l) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

Pd (dBm) = *Pg* (dBm) – *cable loss* (dB) + *antenna gain* (dB)

Where:
Pd is the dipole equivalent power and
Pg is the generator output power into the substitution antenna.
NOTE: It is permissible to use other antennas provided they can be referenced to a dipole.
NOTE: Effective radiated power (e.r.p.) refers to the radiation of a half wave tuned dipole instead of an isotropic antenna. There is a constant difference of 2.15dB between e.i.r.p.
e.r.p(dBm) = e.i.r.p. (dBm)-2.15

3.6.1 Measurement Record:

Pretest 43dBm / 40dBm / 37dBm for Downlink and 33dBm / 30dBm / 27dBm / 24dBm for Uplink output systems and found the worst case are in 43dBm for Downlink system and 33dBm for Uplink system and reported.

Test Band 1:

No emissions were detected within 20dB below the limit for the Downlink direction.
No emissions were detected within 20dB below the limit for the Uplink direction.

Test Band 2:

No emissions were detected within 20dB below the limit for the Downlink direction.
No emissions were detected within 20dB below the limit for the Uplink direction.

Remark:
The cabinet radiation was measured with the equipment transmitting a CW signal into a non-radiating 50Ohm load at maximum output power on a signal frequency.
Measured were performed in the lowest, middle and highest frequency for both the Downlink and Uplink.
The spectrum was searched from 30MHz to 10GHz (10^{th} Harmonic).

3.7 Occupied Bandwidth

Test Requirement:	2-11-04/EAB/RF
Test Method:	FCC Part 2.1049, 2-11-04/EAB/RF The spectral shape of the output should look similar to input for all modulations.
Test Date:	2012-09-28
Mode of Operation:	Status: Drive the EUT to maximum output power Conditions: Normal conditions Application: Cellular Band RF output ports

Test Configuration:

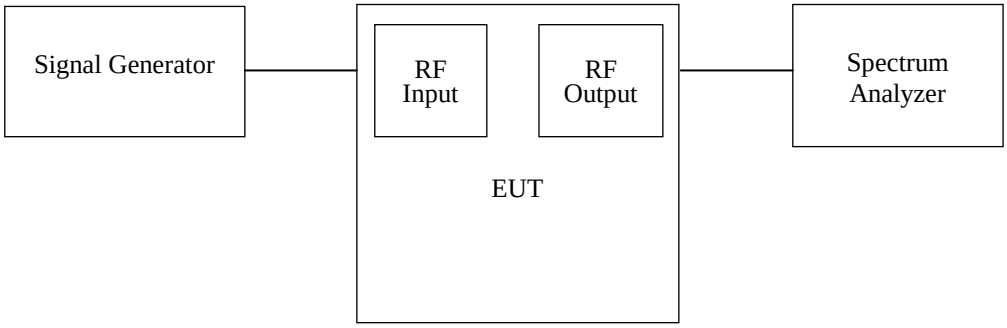


Figure 2 Conducted Spurious Emission Test Configuration

Test Procedure:

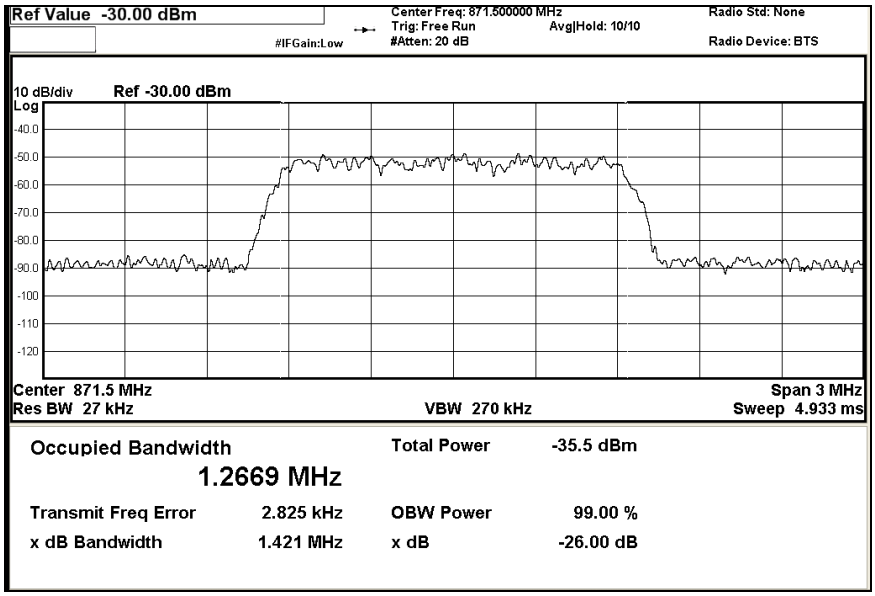
a) Set the spectrum analyzer RBW 300Hz or >1% & <2% emission bandwidth of carrier.
b) Capture the trace of input signal;
c) Connect the equipment as illustrated;
d) Capture the trace of output signal;

Remark: Attenuator may be used to limit the RF input of the Spectrum Analyzer for protection.

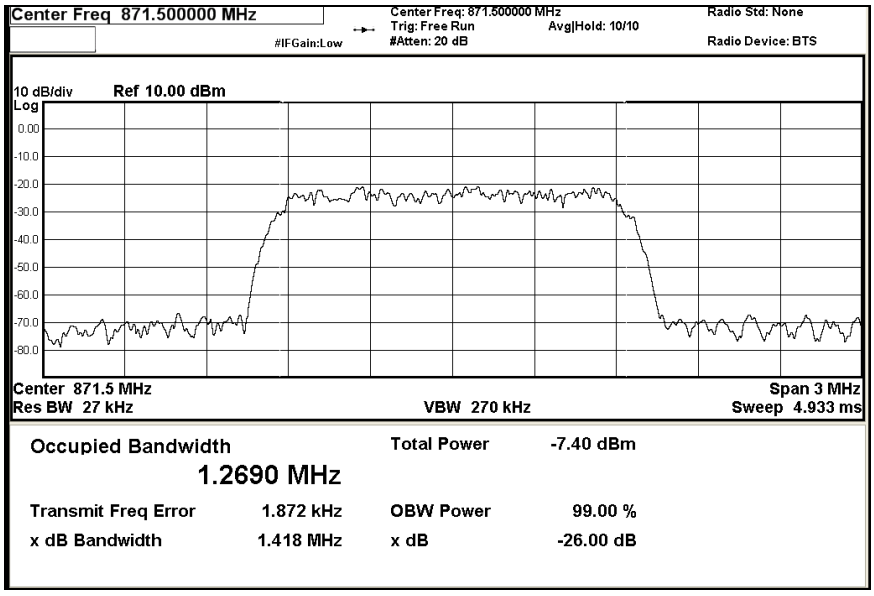
Test for all configuration

Test in Band 1:
Test for Downlink:

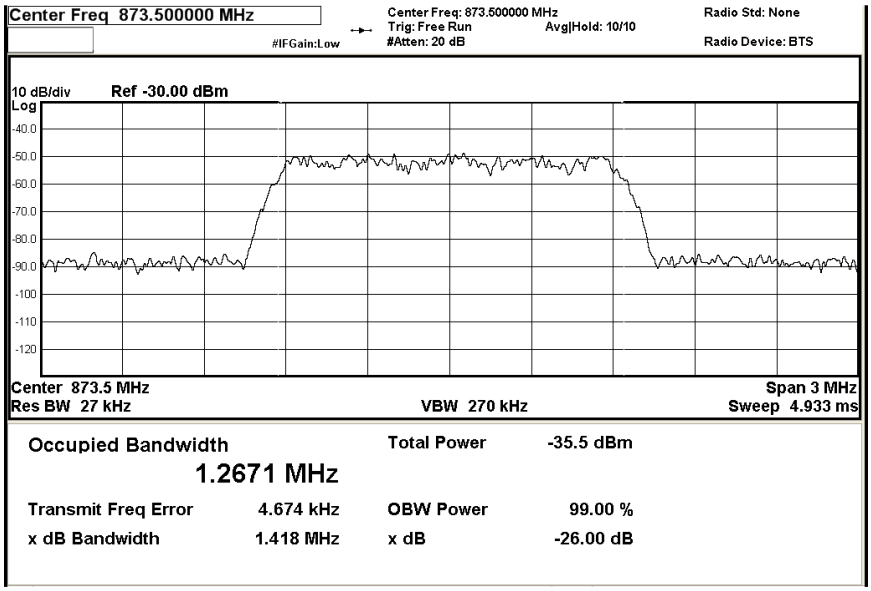
Cellular Band 1– CDMA downlink (lowest frequency) – Input



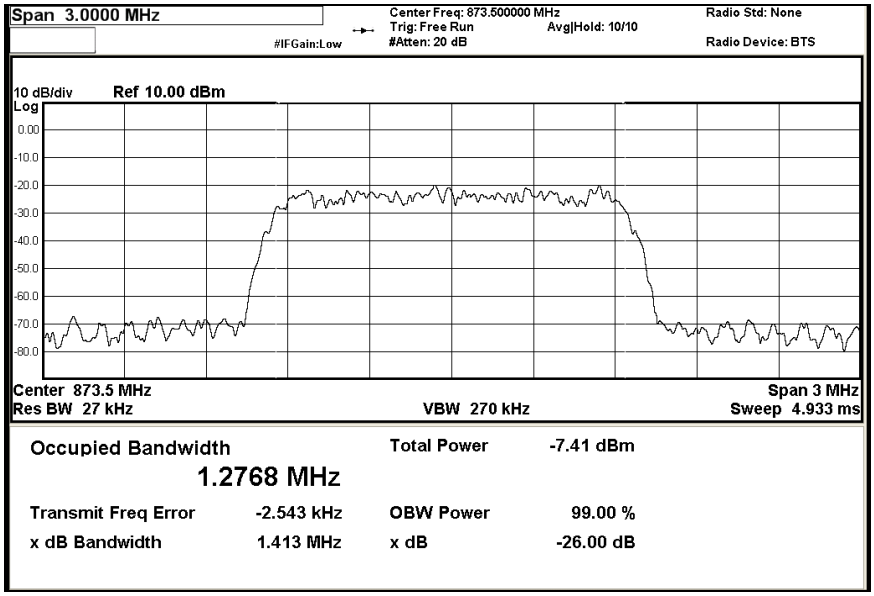
Cellular Band 1– CDMA downlink (lowest frequency) – Output



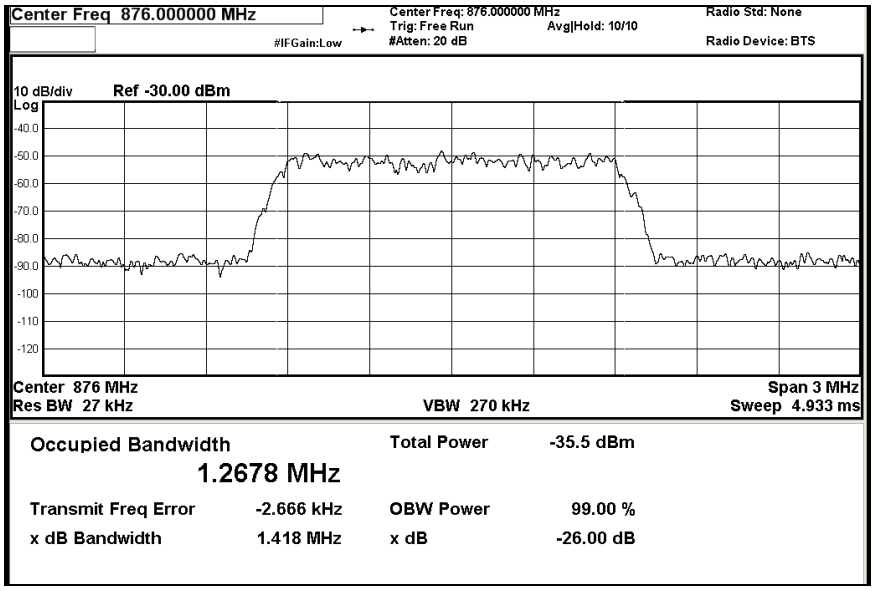
Cellular Band 1– CDMA downlink (middle frequency) – Input



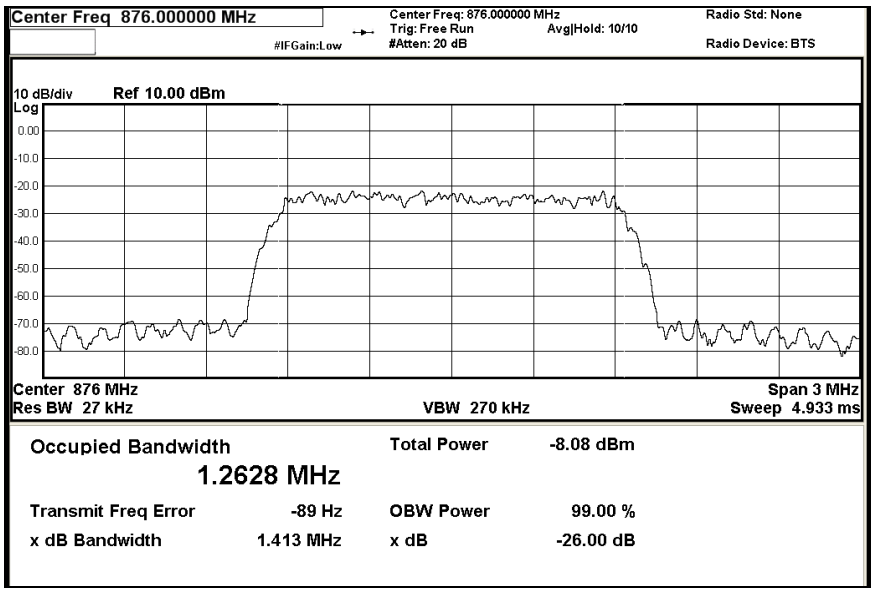
Cellular Band 1– CDMA downlink (middle frequency) – Output



Cellular Band 1– CDMA downlink (highest frequency) – Input

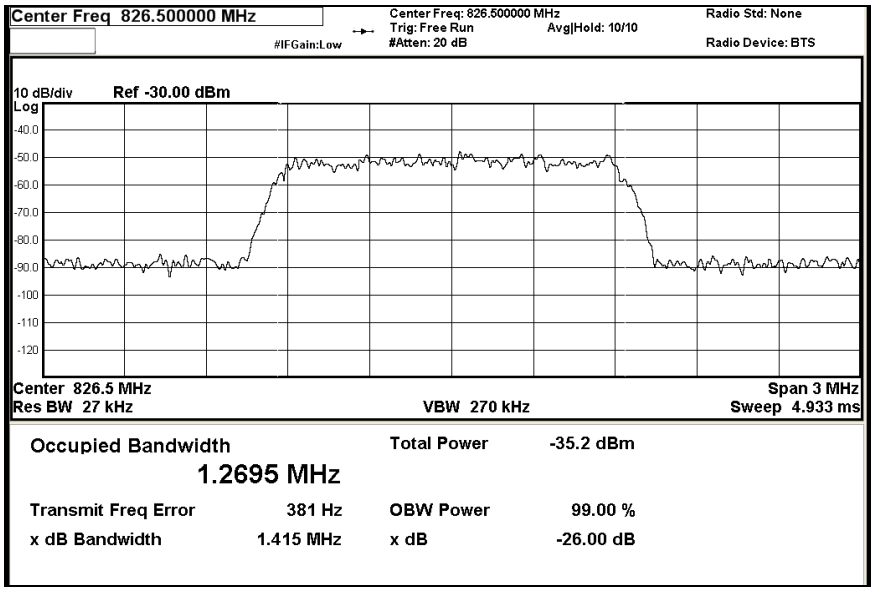


Cellular Band 1– CDMA downlink (highest frequency) – Output

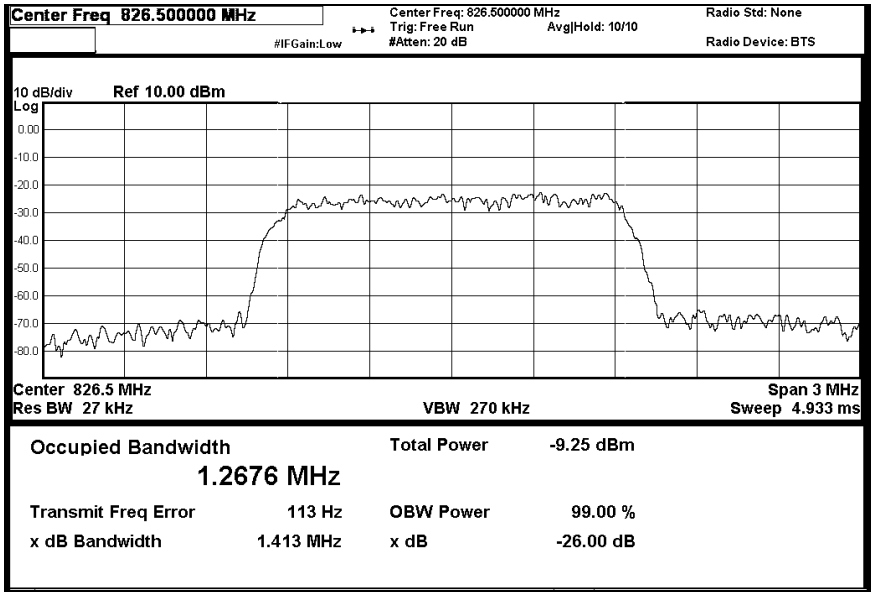


Test for Uplink:

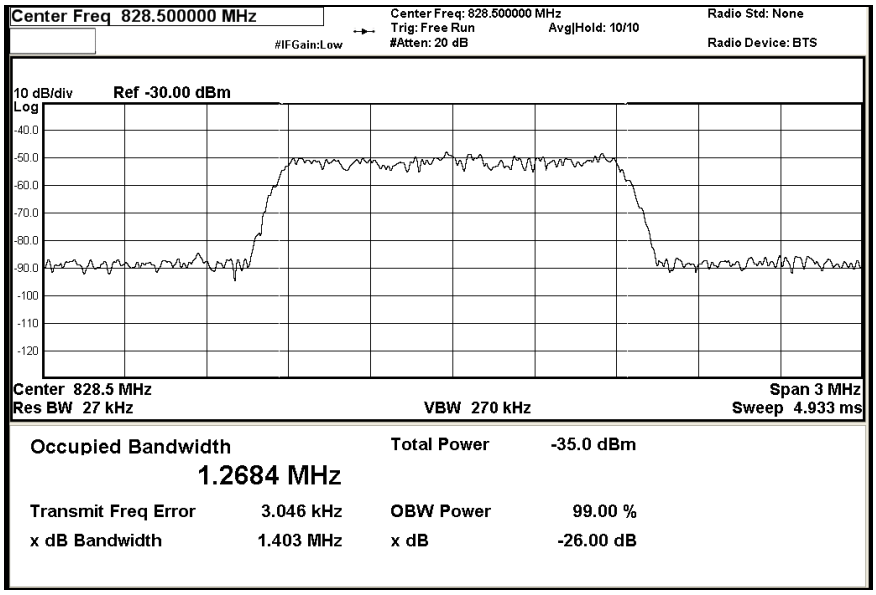
Cellular Band 1– CDMA uplink (lowest frequency) – Input



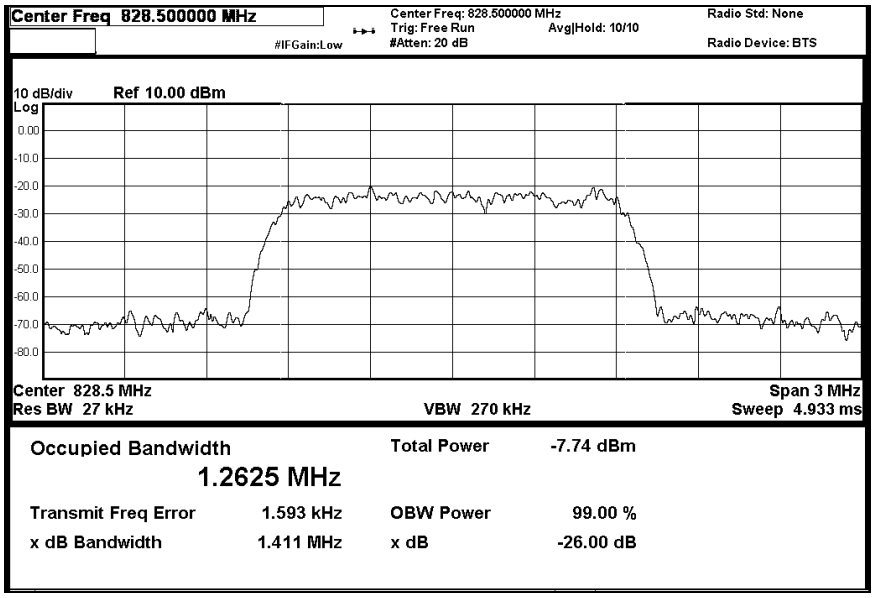
Cellular Band 1– CDMA uplink (lowest frequency) – Output



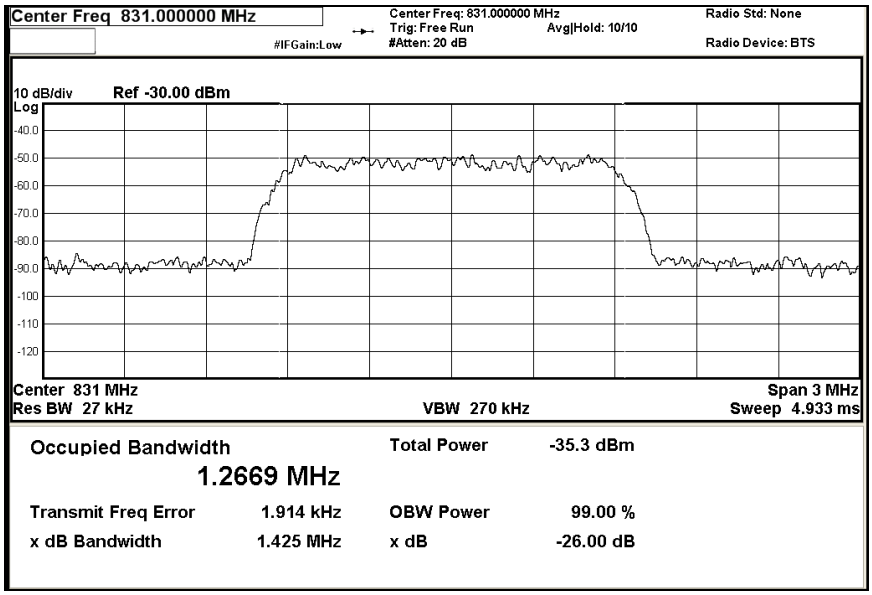
Cellular Band 1– CDMA uplink (middle frequency) – Input



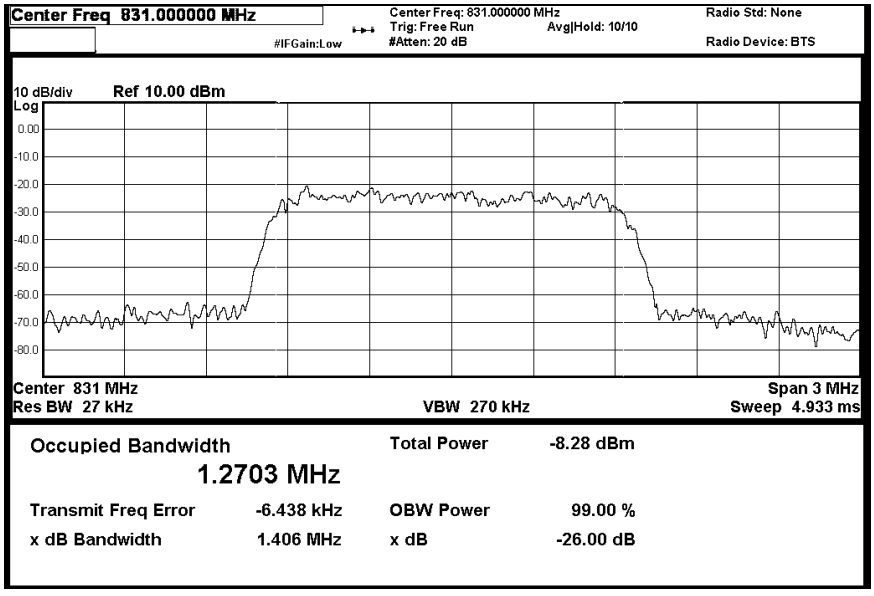
Cellular Band 1– CDMA uplink (middle frequency) – Output



Cellular Band 1– CDMA uplink (highest frequency) – Input



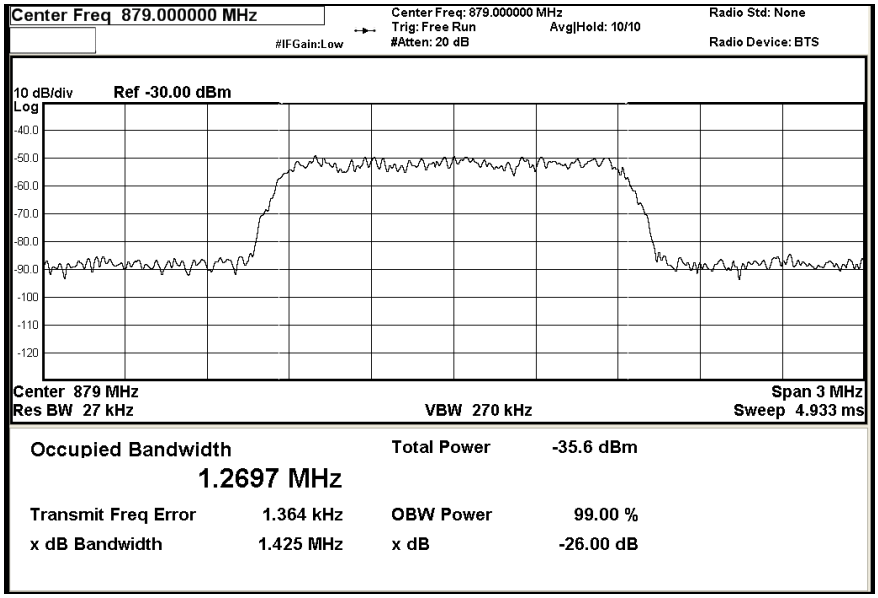
Cellular Band 1– CDMA uplink (highest frequency) – Output



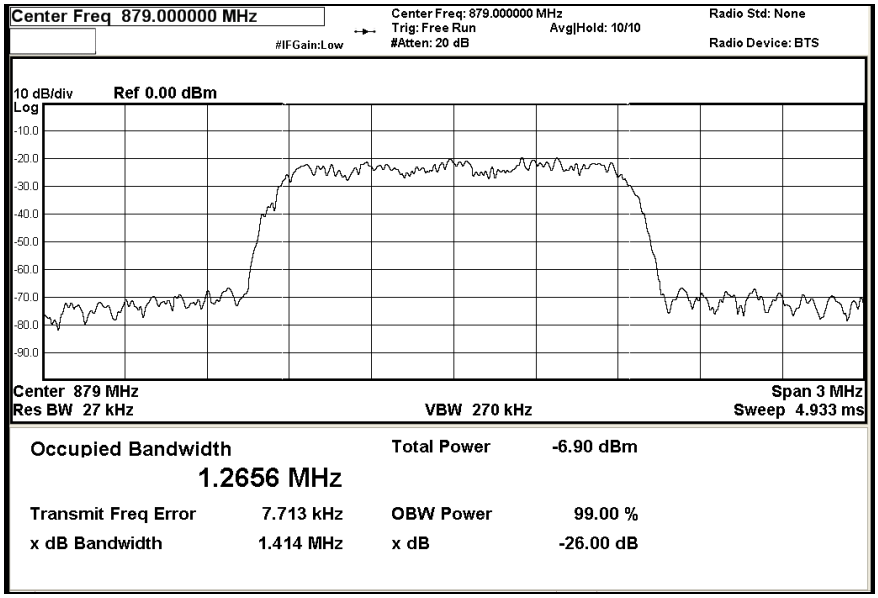
Test in Band 2:

Test for Downlink:

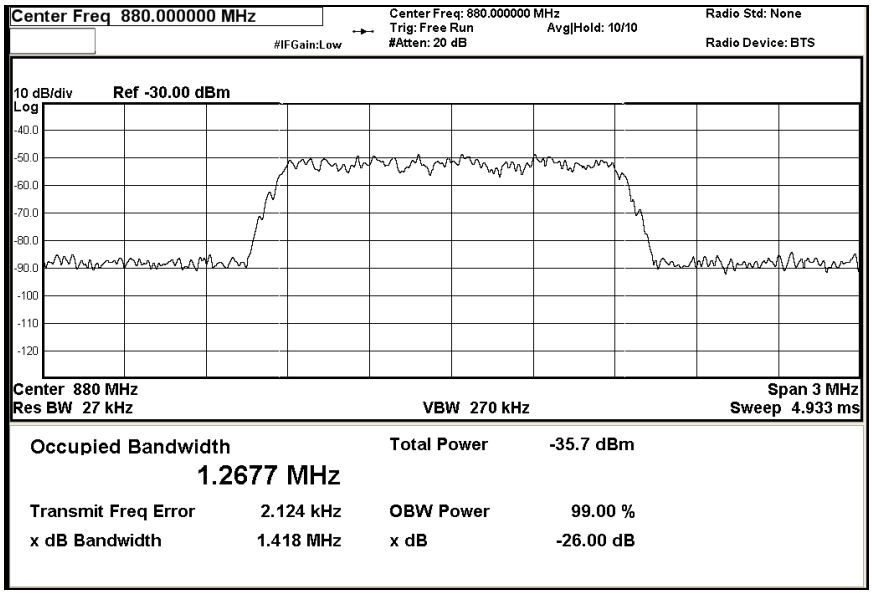
Cellular Band 2– CDMA downlink (lowest frequency) – Input



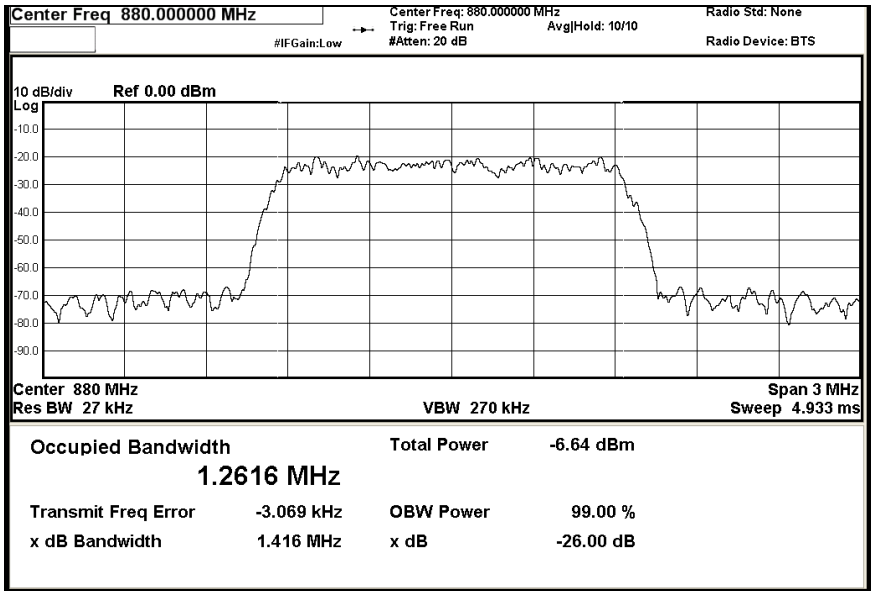
Cellular Band 2– CDMA downlink (lowest frequency) – Output



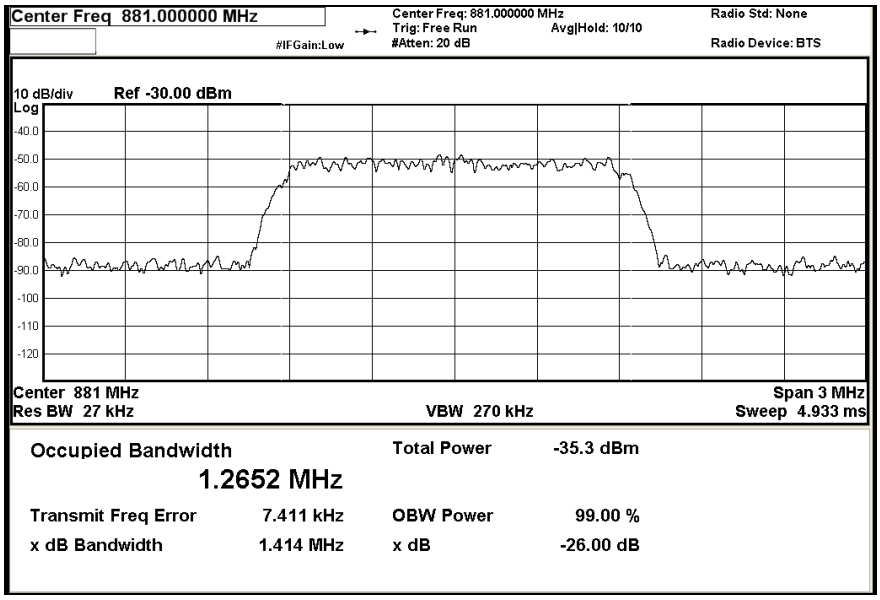
Cellular Band 2– CDMA downlink (middle frequency) – Input



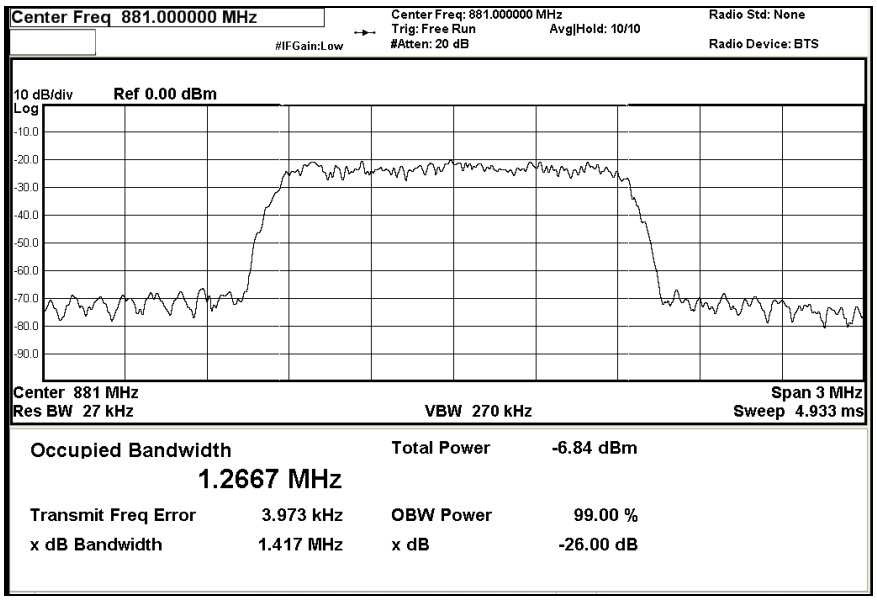
Cellular Band 2– CDMA downlink (middle frequency) – Output



Cellular Band 2– CDMA downlink (highest frequency) – Input

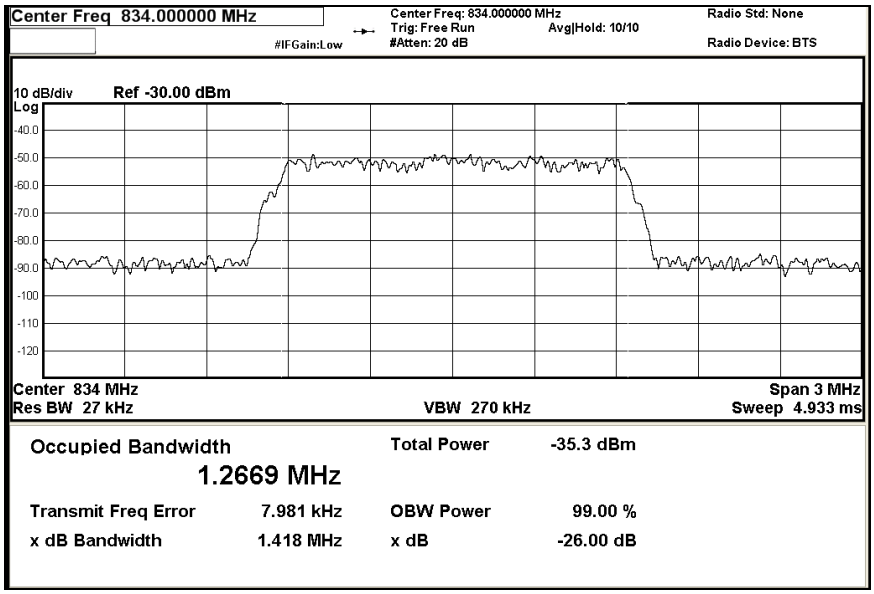


Cellular Band 2– CDMA downlink (highest frequency) – Output

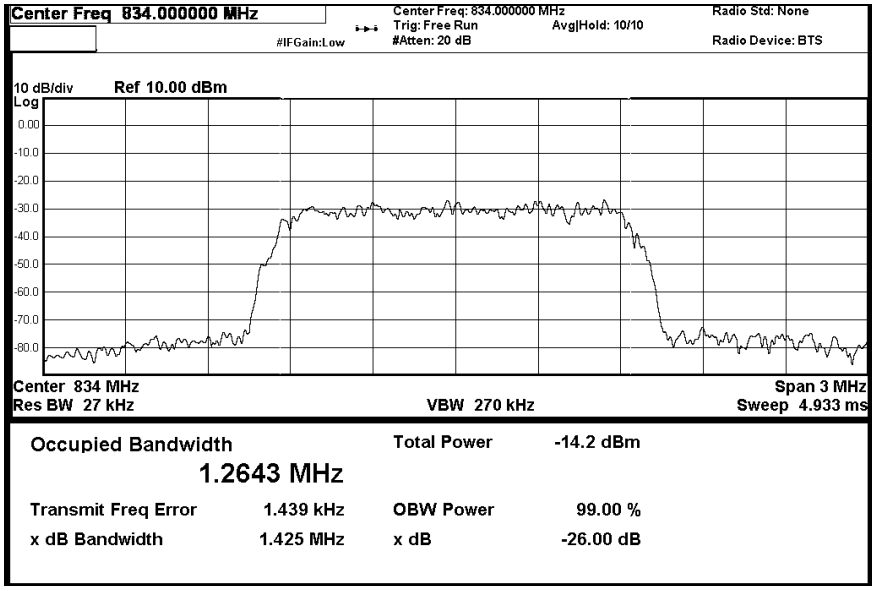


Test for Uplink:

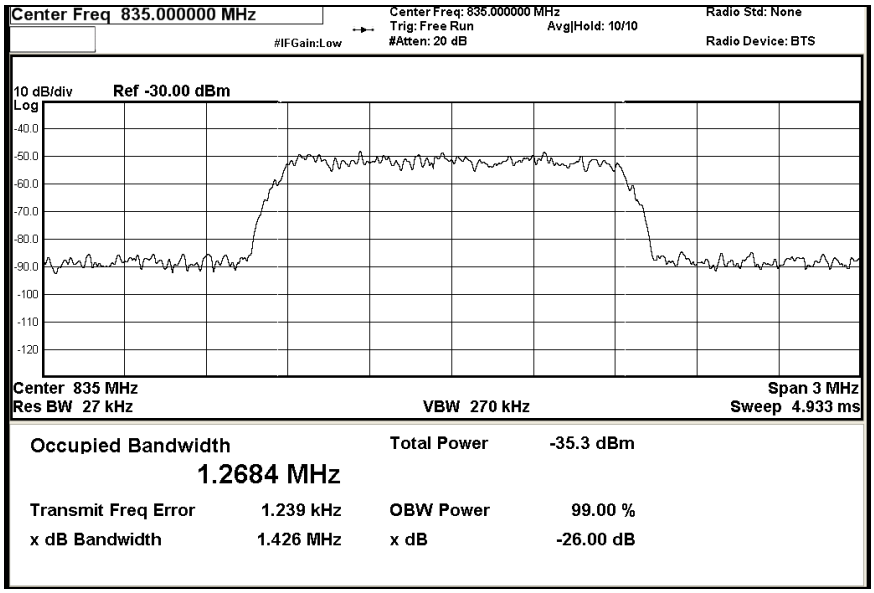
Cellular Band 2– CDMA uplink (lowest frequency) – Input



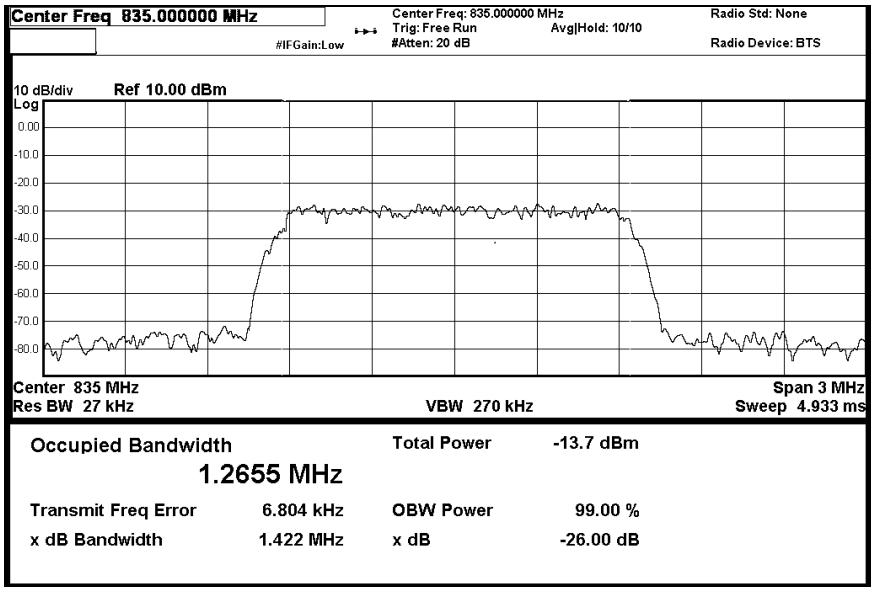
Cellular Band 2– CDMA uplink (lowest frequency) – Output



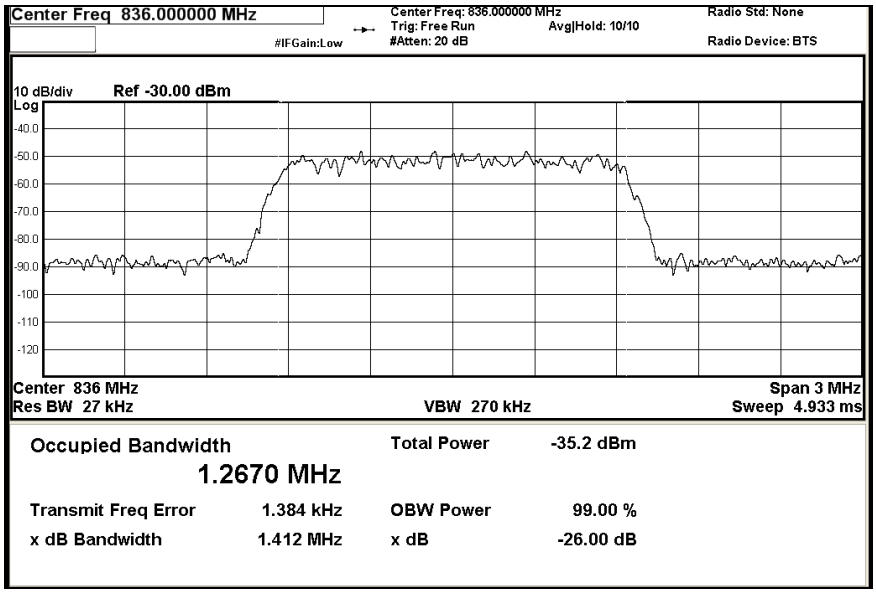
Cellular Band 2– CDMA uplink (middle frequency) – Input



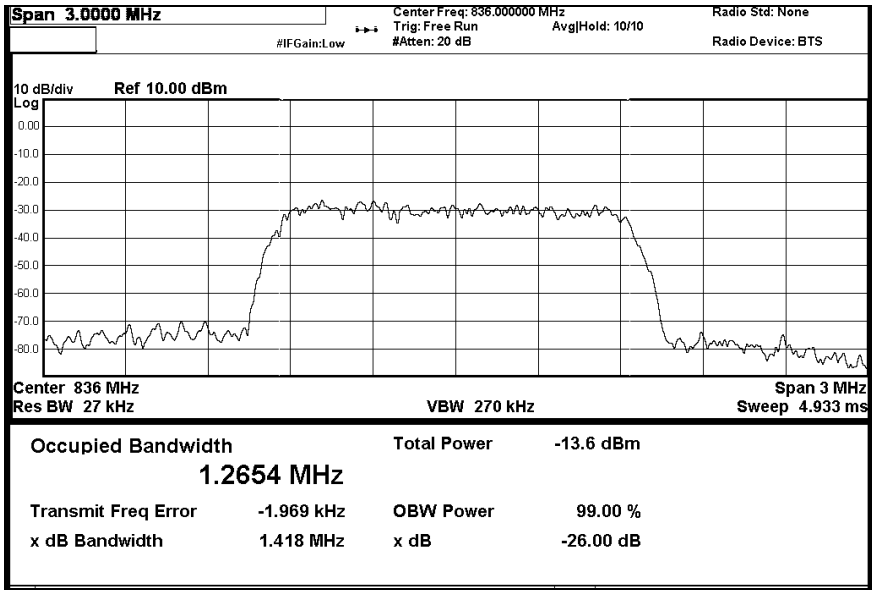
Cellular Band 2– CDMA uplink (middle frequency) – Output



Cellular Band 2– CDMA uplink (highest frequency) – Input



Cellular Band 2– CDMA uplink (highest frequency) – Output



3.8 Out of Band Rejection

Test Requirement:	2-11-04/EAB/RF Test for rejection of out band signals. Filter frequency response plots are acceptable.
Test Method:	2-11-04/EAB/RF
Test Date:	2012-09-28 – 2012-10-03
Mode of Operation:	Status: Drive the EUT to maximum output power Conditions: Normal conditions Application: Cellular Band RF output ports

Test Configuration:

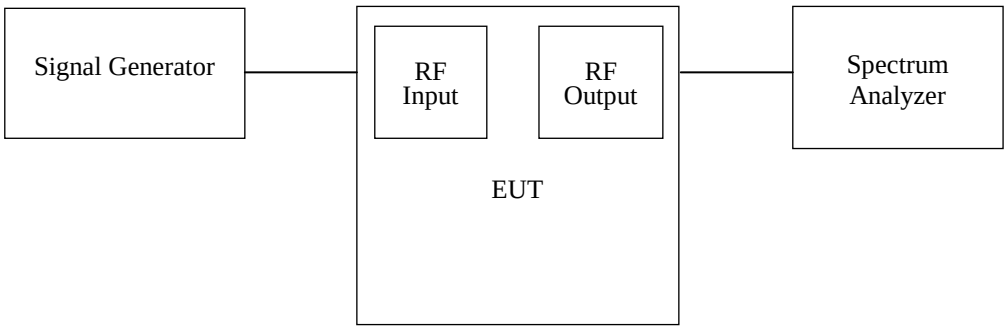


Figure 4 Out of Band Rejection Test Configuration

Test Procedure:

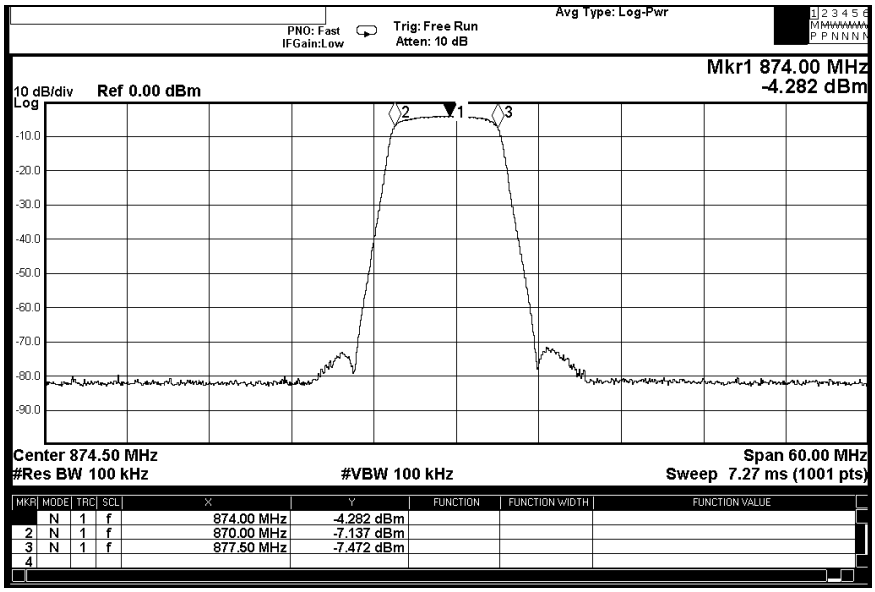
1. Connect the equipment as illustrated;
2. Test the background noise level with all the test facilities;
3. Keep one transmitting path, all other connectors shall be connected by normal power or RF leads;
4. Select the attenuator to avoid the test receiver or spectrum analyzer being destroyed;
5. Keep the EUT continuously transmitting in max power;
6. Signal generator sweep from the frequency more lower than the product frequency to the frequency more higher than it, find the product band filter characteristic;
   - CW signal rather than typical signal is acceptable (for FM).
   - Multiple band filter will need test each other.

Remark: Attenuator may be used to limit the RF input of the Spectrum Analyzer for protection.

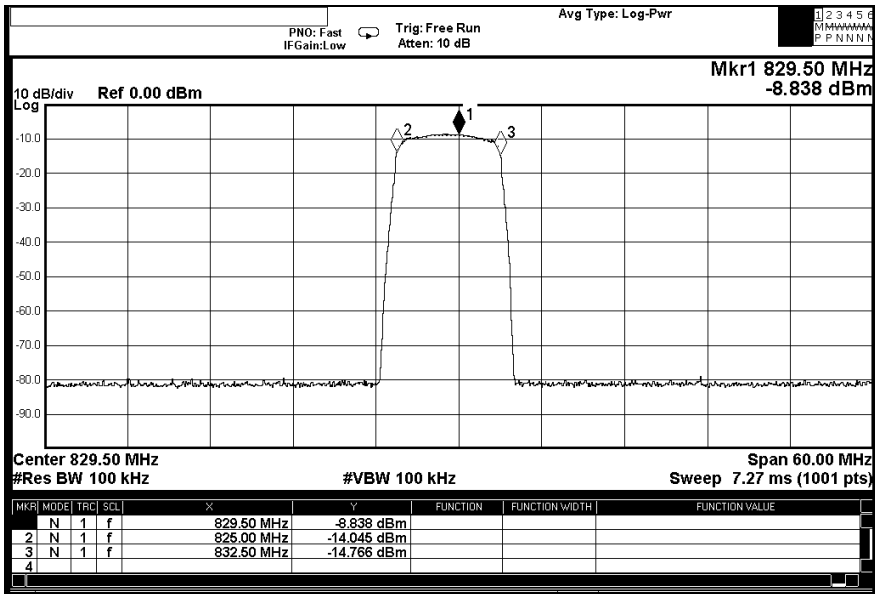
3.8.1 Measurement Record:

Pretest 43dBm / 40dBm / 37dBm for Downlink and 33dBm / 30dBm / 27dBm / 24dBm for Uplink output systems and found the worst case are in 43dBm for Downlink system and 33dBm for Uplink system and reported.

Band 1
Test for Downlink:

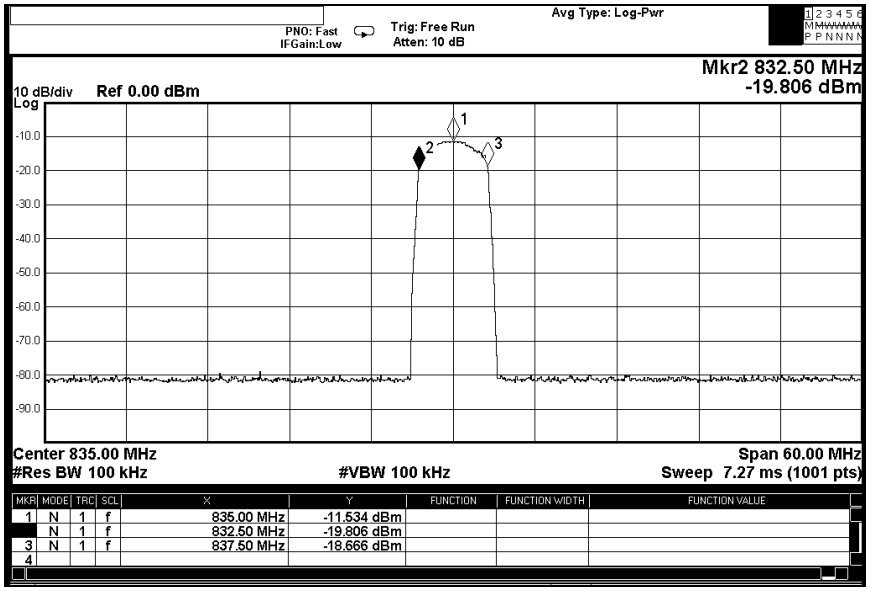


Test for Uplink:

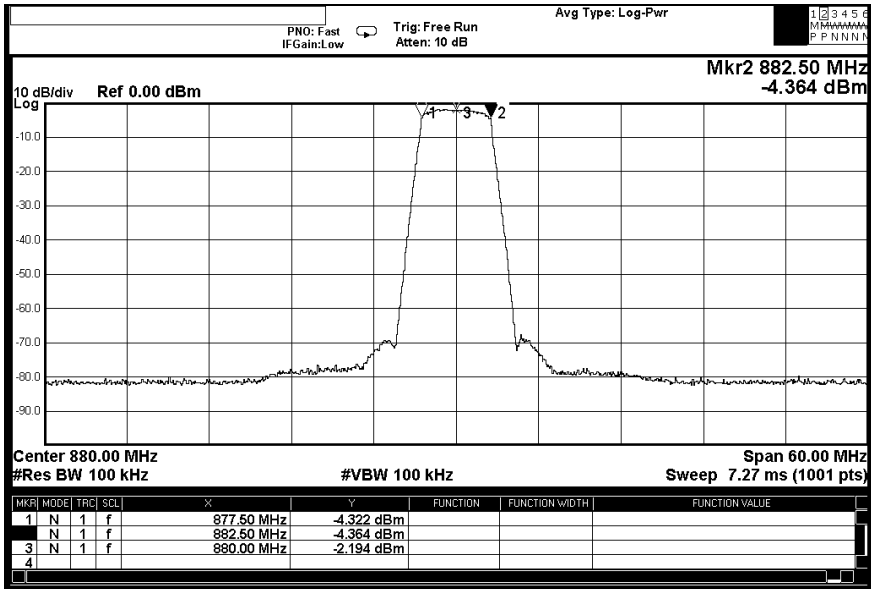


Band 2

Test for Downlink:



Test for Uplink:



3.9 Frequency Stability

Test Requirement:	FCC 47CFR 22.355
Test Method:	FCC Part 2.1055
Test Date:	2012-10-12 – 2012-10-15
Mode of Operation:	Status: Drive the EUT to maximum output power Conditions: Temperature conditions, voltage conditions Application: Cellular Band RF output ports
Test Procedure:	1. Temperature conditions: a) The RF output port of the EUT was connected to Frequency Meter; b) Set the working frequency in the middle channel; c) record the 20°C and normal voltage frequency value as reference point; d) vary the temperature from -30°C to 50°C with step 10°C e) when reach a temperature point, keep the temperature balance at least 1 hour to make the product working in this status; f) read the frequency at the relative temperature. 2. Voltage conditions: a) record the 20°C and normal voltage frequency value as reference point; b) vary the voltage from -15% normal voltage to +15% voltage; c) read the frequency at the relative voltage.

3.9.1 Measurement Record:

Pretest 43dBm / 40dBm / 37dBm for Downlink and 33dBm / 30dBm / 27dBm / 24dBm for Uplink output systems and found the worst case are in 43dBm for Downlink system and 33dBm for Uplink system and reported.

Frequency Stability versus temperature:

Test in Band 1:

Test for Downlink:
(Middle channel 873.5MHz)

Temperature (°C)	Frequency (MHz)	Tolerance (ppm)
50	873.500019	0.003
40	873.500019	0.003
30	873.500018	0.002
20	873.500016	Reference
10	873.500014	0.002
0	873.500021	0.006
-10	873.500023	0.008
-20	873.500021	0.008
-30	873.500029	0.015

Test for Uplink:
(Middle channel 828.5MHz)

Temperature (°C)	Frequency (MHz)	Tolerance (ppm)
50	828.500034	0.016
40	828.500031	0.012
30	828.500029	0.010
20	828.500021	Reference
10	828.500024	0.004
0	828.500026	0.006
-10	828.500019	0.002
-20	828.500023	0.002
-30	828.500019	0.002

Frequency Stability versus temperature:

Test in Band 2:

Test for Downlink:
(Middle channel 880.0MHz)

Temperature (°C)	Frequency (MHz)	Tolerance (ppm)
50	880.000023	0.007
40	880.000021	0.005
30	880.000020	0.003
20	880.000017	Reference
10	880.000015	0.002
0	880.000025	0.009
-10	880.000023	0.007
-20	880.000025	0.009
-30	880.000019	0.002

Test for Uplink:
(Middle channel 835.0MHz)

Temperature (°C)	Frequency (MHz)	Tolerance (ppm)
50	835.000029	0.005
40	835.000027	0.002
30	835.000025	0
20	835.000025	Reference
10	835.000021	0.005
0	835.000016	0.011
-10	835.000019	0.007
-20	835.000021	0.005
-30	835.00009	0.007

Frequency Stability versus voltage:

Test in Band 1:

Test for Downlink:
(Middle channel 873.5MHz)

Voltage (V AC)	Frequency (MHz)	Tolerance (ppm)
102 (120*0.85)	873.500021	0.006
120	873.500016	Reference
138 (120*1.15)	873.500023	0.008

Test for Uplink:
(Middle channel 828.5MHz)

Voltage (V AC)	Frequency (MHz)	Tolerance (ppm)
102 (120*0.85)	828.500023	0.002
120	828.500021	Reference
138 (120*1.15)	828.500021	0

Test in Band 2:

Test for Downlink:
(Middle channel 880.0MHz)

Voltage (V AC)	Frequency (MHz)	Tolerance (ppm)
102 (120*0.85)	880.000015	0.002
120	881.500017	Reference
138 (120*1.15)	881.500017	0

Test for Uplink:
(Middle channel 836.5MHz)

Voltage (V AC)	Frequency (MHz)	Tolerance (ppm)
102 (120*0.85)	835.500025	0
120	835.500025	Reference
138 (120*1.15)	835.000023	0.002

Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM276	Broadband Horn Antenna	A-INFOMW	JXTXLB-10180-SF	J2031090903007	2010/08/21	2013/08/21
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-Linggren	FACT-3	--	2011/10/25	2012/10/25
EM219	BICONILOG ANTENNA	EMCO	3142C	00029071	2011/03/01	2013/03/01
EM229	EMI Test Receiver	R&S	ESIB40	100248	2012/05/03	2013/05/03
EM293	MXA Signal Analyzer	Agilent Technologies	MY50510152	N/A	2011/11/10	2012/11/10

Conducted Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM218	ANECHOIC CHAMBER	ETS-Linggren	FACT-3	--	2011/10/25	2012/10/25
EM229	EMI Test Receiver	R&S	ESIB40	100248	2012/05/03	2013/05/03
EM293	MXA Signal Analyzer	Agilent Technologies	MY50510152	N/A	2011/11/10	2012/11/10
--	8960 Series 10 Wireless Communication Test System	Agilent Technologies	E5515C	GB43460707	2011/12/26	2012/12/26

Remarks:-

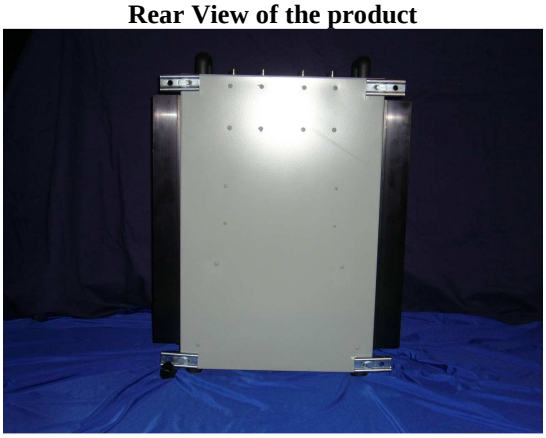
CM Corrective Maintenance
N/A Not Applicable or Not Available
TBD To Be Determined

Appendix B

Photographs of EUT

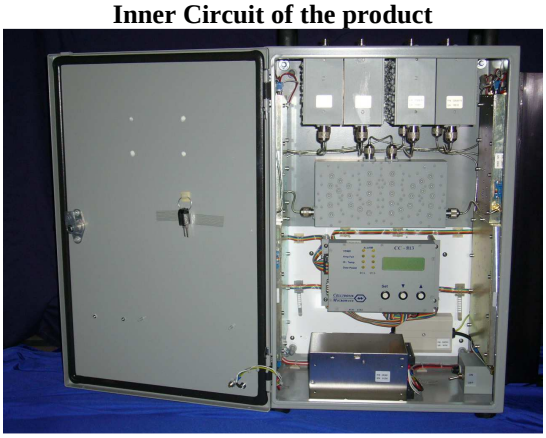
Front View of the product

Rear View of the product



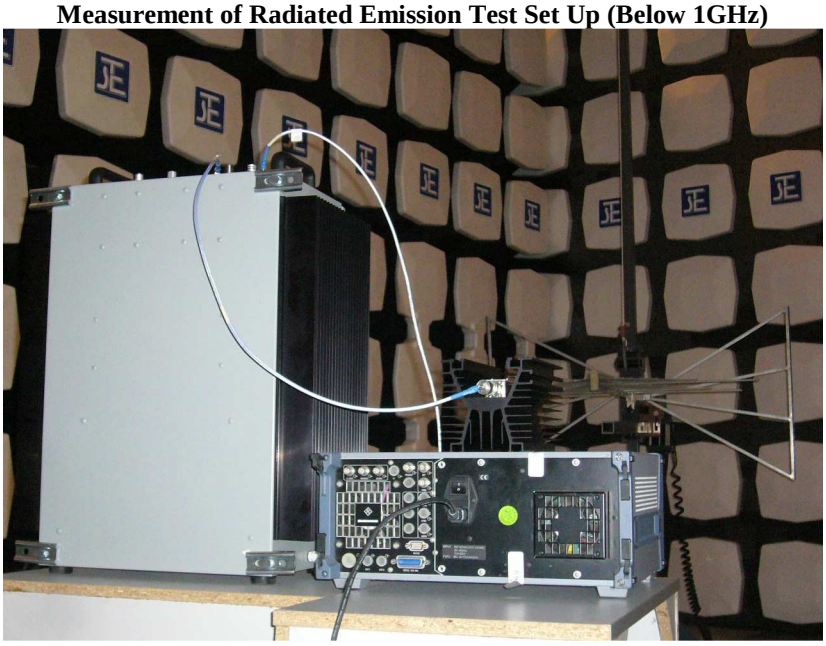
Top View of the product

Inner Circuit of the product

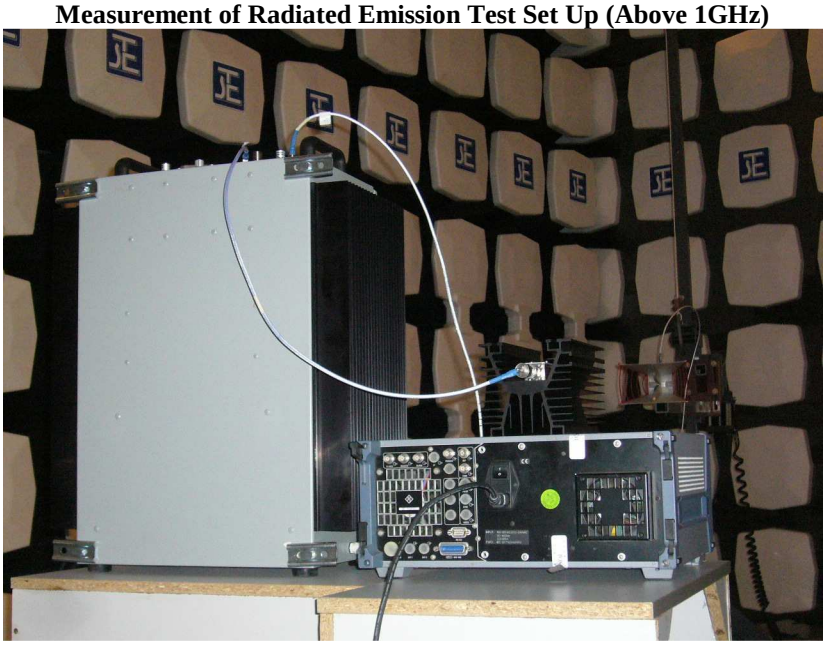


Photographs of EUT

Measurement of Radiated Emission Test Set Up (Below 1GHz)

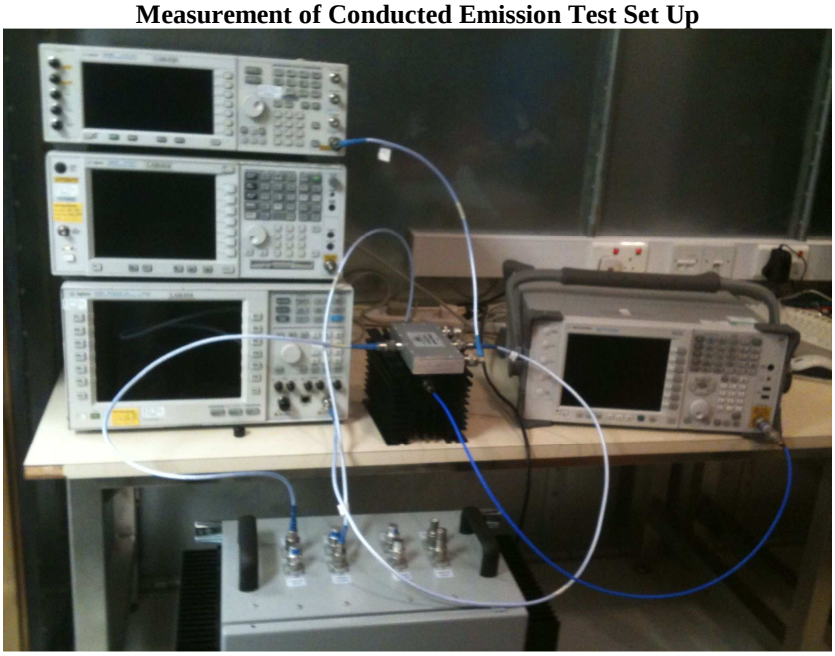


Measurement of Radiated Emission Test Set Up (Above 1GHz)



Photographs of EUT

Measurement of Conducted Emission Test Set Up



Measurement in Extreme Condition Test Set Up

******* End of Test Report *******