



## HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

INT'L STANDARD CERTIFICATION TEAM  
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNGKI-DO, 467-701, KOREA  
TEL : +82 31 639 8518 FAX : +82 31 639 8525

### CERTIFICATE OF COMPLIANCE (ERM EVALUATION)

Manufacture: GSTeletech Co., Ltd.

1385-14, Juan-Dong, Nam-Ku, Incheon, 402-200 Korea

Date of Issue : May 09, 2007

Test Report No.: HCT-R07-020

Test Site: HYUNDAI CALIBRATION & CERTIFICATION  
TECHNOLOGIES CO., LTD.

FCC ID

**U88GSTR-TRIT-SPR**

APPLICANT

**GSTeletech Co., Ltd.**

EUT Type:

TRI Band In-Building RF Repeater

MODEL :

GSTR-TRIT-SPR (WITH MODEM AND CCD)

GSTR-TRIC-SPR (WITH CCD ONLY)

GSTR-TRIM-SPR (WITH MODEM ONLY)

Frequency Ranges:

Uplink : 1851.25 – 1913.75 MHz (CDMA)

806 – 824 MHz (iDEN800), 896 – 901 MHz (iDEN900),

Downlink : 1931.25 – 1993.75 MHz (CDMA)

851 – 869 MHz (iDEN800), 935 – 940 MHz (iDEN900)

RF Output Power:

Downlink : 24.0 dBm (CDMA), 22.0 dBm (iDEN800 / iDEN900)

Uplink : 24.0 dBm (CDMA), 22.0 dBm (iDEN800 / iDEN900)

FCC Rules Part(s):

CFR 47, Part 24 Subpart E, Part 90

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 24 Subpart E of the FCC Rules under normal use and maintenance.

Youn Seok Jung

Report prepared by  
: Youn Seok Jung  
Test engineer of RF Part

Sang Jun Lee

Approved by  
: Sang Jun Lee  
Manager of RF Part



HCT CO., LTD.



## CONTENTS

1. CLIENT INFORMATION .....	2
2. TEST SPECIFICATIONS .....	3
2.1 Standards .....	3
3. STANDARDS ENVIRONMENTAL TEST CONDITIONS .....	4
4. TEST SUMMARY .....	5
5. TEST EQUIPMENT .....	6
6. RF OUTPUT POWER .....	7
7. OCCUPIED BANDWIDTH .....	10
8. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL .....	30
9. FIELD STRENGTH OF SPURIOUS RADIATION .....	52
10. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS .....	54

## 1. CLIENT INFORMATION

The EUT has been tested by request of

Company	<b>GSTeletech Co., Ltd</b>
Contact Point	1385-14, Juan-Dong, Nam-Ku, Incheon,,402-200 Korea

- **EUT Type:** TRI Band In-Building RF Repeater
- **FCC ID:** U88GSTR-TRIT-SPR
- **Frequency Ranges:** **Uplink** : 1851.25 – 1913.75 MHz (CDMA)  
806 – 824 MHz (iDEN800)  
896 – 901 MHz (iDEN900)  
**Downlink** : 1931.25 – 1993.75 MHz (CDMA)  
852 – 869 MHz (iDEN800)  
935 – 940 MHz (iDEN900)
- **RF Output Power:** **Downlink** : 24.0 dBm (CDMA)  
22.0 dBm (iDEN800 / iDEN900)  
**Uplink** : 24.0 dBm (CDMA)  
22.0 dBm (iDEN800 / iDEN900)
- **FCC Rules Part(s):** CFR Title 47 Part 24 Subpart E, Part90
- **Emission Designators:** F9W(CDMA), GXW(iDEN)

## 2. TEST SPECIFICATIONS

### 2.1 Standards

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance With  
**Part 24 Subpart E, Part 90**

Reference	Description	Results
Part 15 Subpart B §15.107(a)	Conducted Emissions	Compliant
Part 15 Subpart B §15.109(a)	Radiated Emissions	Compliant
§2.1046; §24.232; §90.205	RF Power Output	Compliant
§2.1047	Modulation Characteristics	N/A
§2.1049	Occupied Bandwidth	Compliant
§2.1051; §24.238; §90.210	Spurious Emissions at Antenna Terminals	Compliant
§2.1053; §24.238; §90.210	Radiated Spurious Emissions	Compliant
§2.1055; §24.135; §90.213	Frequency Stability	Compliant

### 3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature :	+ 15 °C to + 35 °C
Relative humidity:	30 % to 60 %
Air pressure	860 mbar to 1060 mbar

## 4. TEST SUMMARY

**The results in this report apply only to sample tested**

<u>Test Case</u>	<u>Applied standard</u>	<u>Result</u>
Conducted Emissions	Part 15 Subpart B §15.107(a)	Compliant
Radiated Emissions	Part 15 Subpart B §15.109(a)	Compliant
RF Power Output	§2.1046; §24.232; §90.205	Compliant
Occupied Bandwidth	§2.1049	Compliant
Spurious Emissions at Antenna Terminals	§2.1051; §24.238; §90.210	Compliant
Radiated Spurious Emissions	§2.1053; §24.238; §90.210	Compliant
Frequency Stability	§2.1055; §24.135; §90.213	Compliant

## 5. TEST EQUIPMENT

Manufacturer	Model / Equipment	Cal Interval	Calibration Due	Serial No.
Agilent	E4438C /Signal Generator	Annual	01/22/2008	MY42082646
Agilent	E4416A /Power Meter	Annual	01/22/2008	GB41291412
WEINSCHEL	67-30-33/ATTENUATOR	Annual	05/02/2008	BR0530
Korea Eng	KR-1005L/ Temperature and Humidity Chamber	Annual	03/30/2008	KRAC05063-3CH
Agilent	E7405A /EMC Analyzer	Annual	12/29/2007	US40240290
Schwarzbeck	VULB 9160/ TRILOG Antenna	Annual	01/24/2008	9160-3150
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
MITEQ	AMF-60-0010 1800-35-20P	Annual	01/24/2008	1200937
MITEQ	AMF-6D-01180-35-20P	Annual	02/24/2008	990893
Schwarzbeck	BBHA 9120D/ Horn Antenna	Annual	03/30/2008	147
Schwarzbeck	BBHA 9120D/ Horn Antenna	Annual	03/30/2008	296
Schwarzbeck	BBHA9170/SHF-EHF Horn Antenna	Annual	03/20/2008	BBHA9170342
Rohde & Schwarz	HFH2-Z2/Loop Antenna	Annual	01/10/2008	881056/070
ADVANTEST	R3671/Spectrum Analyzer	Annual	06/15/2007	150900068
ADVANTEST	R3273/Spectrum Analyzer	Annual	05/02/2008	J004821

## 6. RF OUTPUT POWER

### 6.1 Test Procedure

#### 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.

**§ 24.232 Power and antenna height limits.**

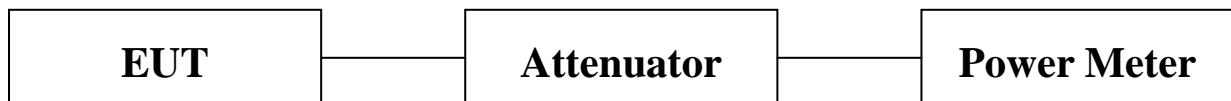
**§ 24.232 (b):** Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

**§ 90.205** Power and antenna height limits. Refer to § 90.635

**§ 90.635(b):** The Effective radiated power (ERP) of base transmitters and cellular CDMA Inbuilding RF Repeaters must not exceed 500 watts.

#### 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.



**Block Diagram 1. RF Power Output Test Setup**

**Test Results:**

The EUT complies with the requirements of this section. The EUT conducted power does not exceed limit at the carrier frequency.

**6.3.1 Test Results**

**(Downlink)**

<b>CDMA DownLink</b>		
<b>Carrier Channel</b>	<b>Frequency (MHz)</b>	<b>Measured Average Output Power dBm (mW)</b>
Low	193125	23.51 (224.3)
Mid	1962.50	23.96 (248.8)
High	1993.75	23.91 (246.0)
<b>iDEN800 DownLink</b>		
<b>Carrier Channel</b>	<b>Frequency (MHz)</b>	<b>Measured Average Output Power dBm (mW)</b>
Low	851.0125	21.80 (151.3)
Mid	858.6125	21.90 (154.8)
High	868.9875	20.43 (110.4)
<b>iDEN900 DownLink</b>		
<b>Carrier Channel</b>	<b>Frequency (MHz)</b>	<b>Measured Average Output Power dBm (mW)</b>
Low	935.0125	21.46 (139.9)
Mid	937.5000	21.40 (138.0)
High	939.9875	21.37 (137.0)

### 6.3.2 Test Results

#### (Uplink)

CDMA UpLink		
Carrier Channel	Frequency (MHz)	Measured Average Output Power dBm (mW)
Low	1851.25	23.88 (244.3)
Mid	1882.50	23.69 (233.8)
High	1913.75	23.37 (217.2)
iDEN800 UpLink		
Carrier Channel	Frequency (MHz)	Measured Average Output Power dBm (mW)
Low	806.0125	21.46 (139.9)
Mid	813.6125	21.91 (155.2)
High	823.9875	20.31 (107.3)
iDEN900 UpLink		
Carrier Channel	Frequency (MHz)	Measured Average Output Power dBm (mW)
Low	896.0125	21.98 (157.7)
Mid	898.5000	21.73 (148.9)
High	900.9875	21.59 (144.2)

## 7. OCCUPIED BANDWIDTH

### 7.1 Test Procedure

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

**NOTE:** The EUT is a band selective repeater. The test was performed using all selective bands and there was not much difference between them. The test result is reported using the widest bands.

**(Downlink)**

<b>CDMA DownLink</b>		
<b>Carrier Channel</b>	<b>Frequency (MHz)</b>	<b>26dB Bandwidth(MHz)</b>
Low	1931.25	1.395
Mid	1962.50	1.410
High	1993.75	1.398

<b>iDEN800 DownLink</b>		
<b>Carrier Channel</b>	<b>Frequency (MHz)</b>	<b>26dB Bandwidth(KHz)</b>
Low	851.0125	19.35
Mid	858.6125	19.25
High	868.9875	19.60

<b>iDEN900 DownLink</b>		
<b>Carrier Channel</b>	<b>Frequency (MHz)</b>	<b>26dB Bandwidth(KHz)</b>
Low	935.0125	19.35
Mid	937.5000	19.35
High	939.9875	19.35

**(Uplink)**

<b>CDMA UpLink</b>		
<b>Carrier Channel</b>	<b>Frequency (MHz)</b>	<b>26dB Bandwidth(MHz)</b>
Low	1851.25	1.392
Mid	1882.50	1.398
High	1913.75	1.395

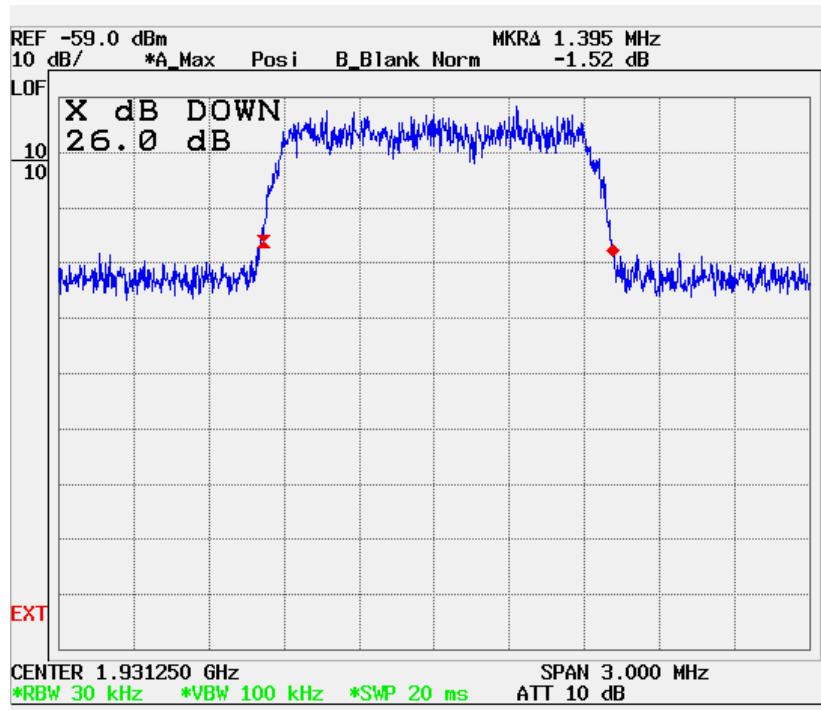
  

<b>iDEN800 UpLink</b>		
<b>Carrier Channel</b>	<b>Frequency (MHz)</b>	<b>26dB Bandwidth(KHz)</b>
Low	806.0125	19.35
Mid	813.6125	19.30
High	823.9875	19.60

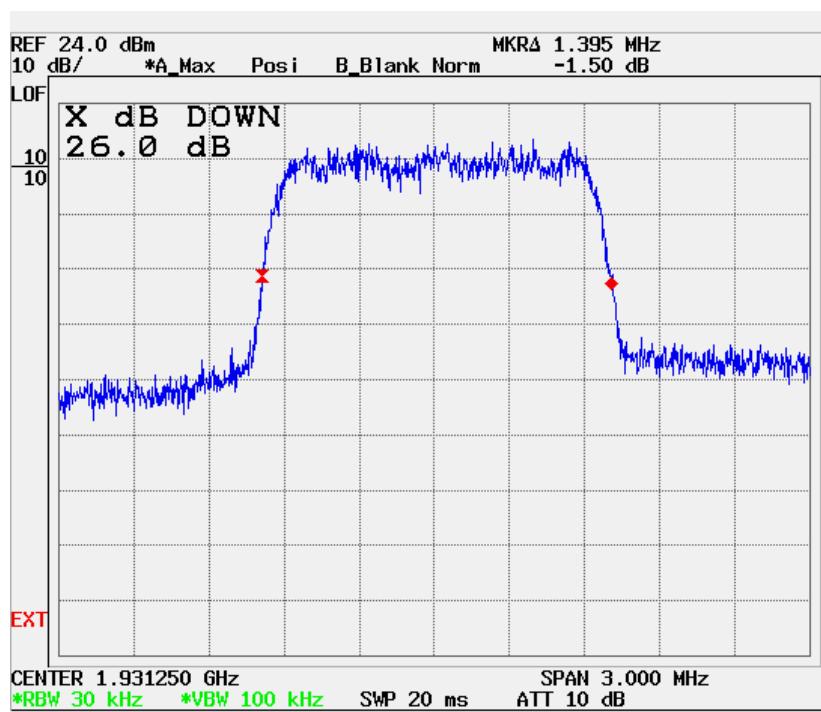
  

<b>iDEN900 UpLink</b>		
<b>Carrier Channel</b>	<b>Frequency (MHz)</b>	<b>26dB Bandwidth(KHz)</b>
Low	896.0125	19.35
Mid	898.5000	19.40
High	900.9875	19.50

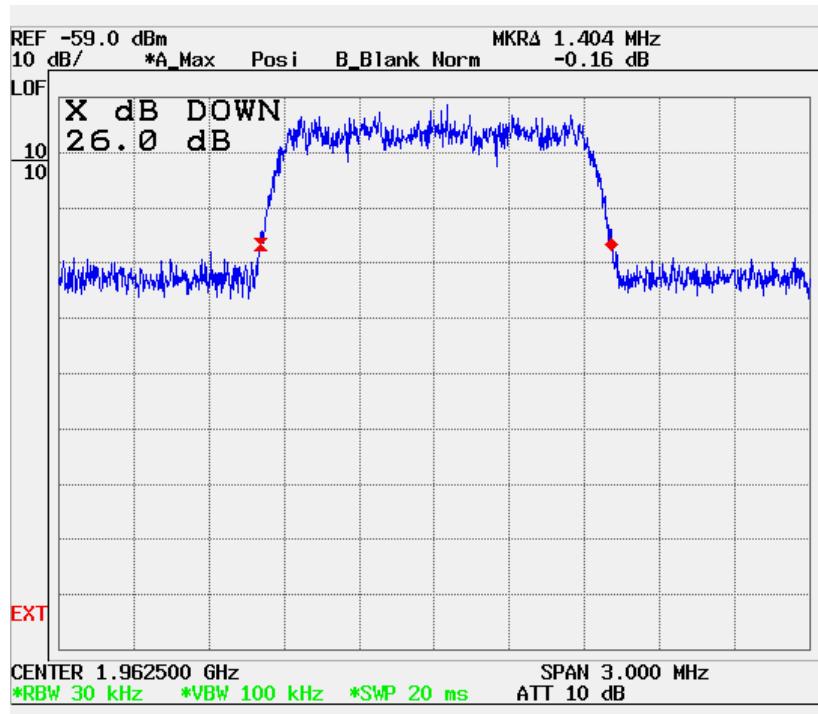
### Plots of Occupied Bandwidth



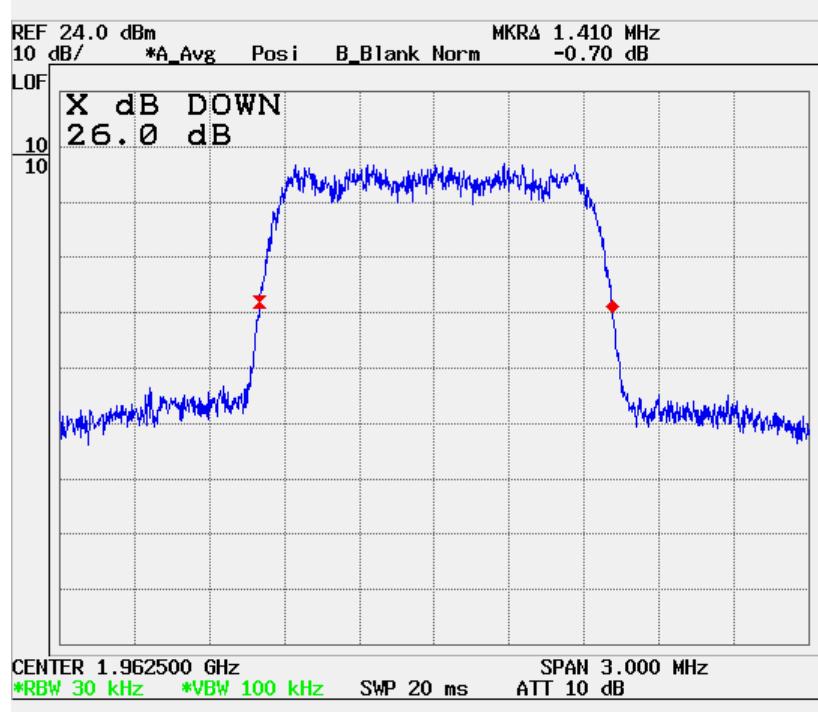
CDMA Downlink Low CH Input



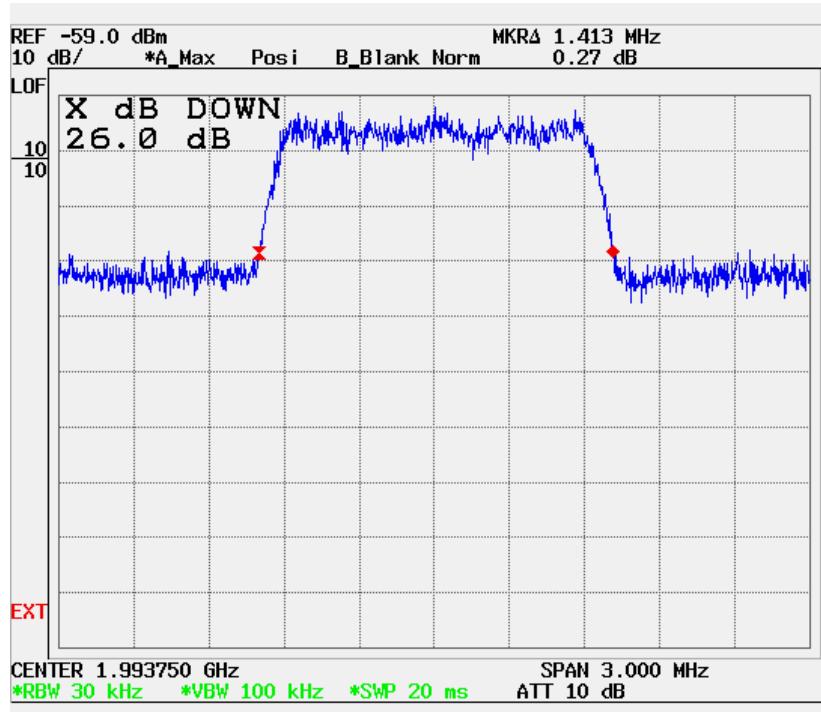
CDMA Downlink Low CH Output



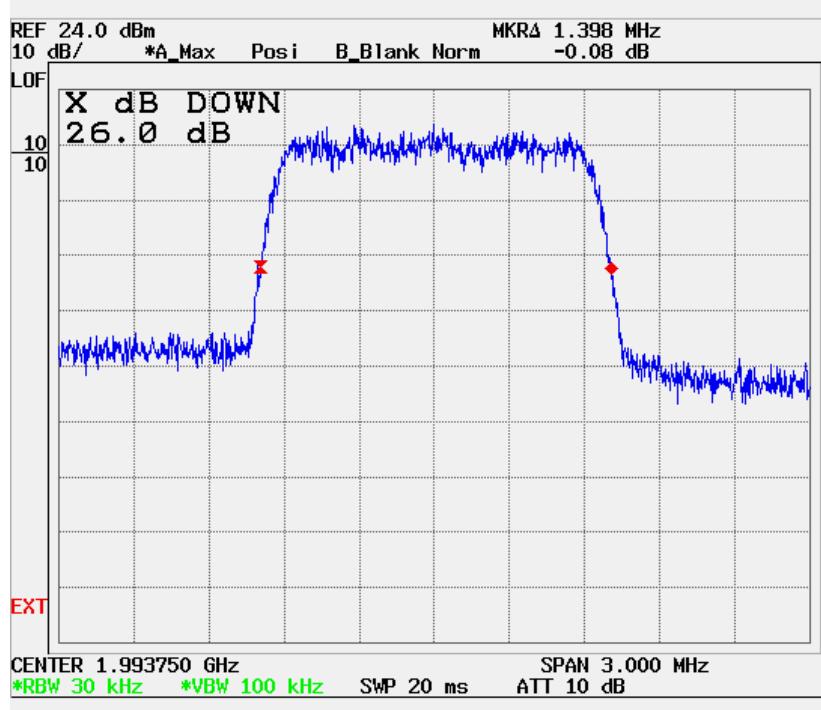
CDMA Downlink Mid CH Input



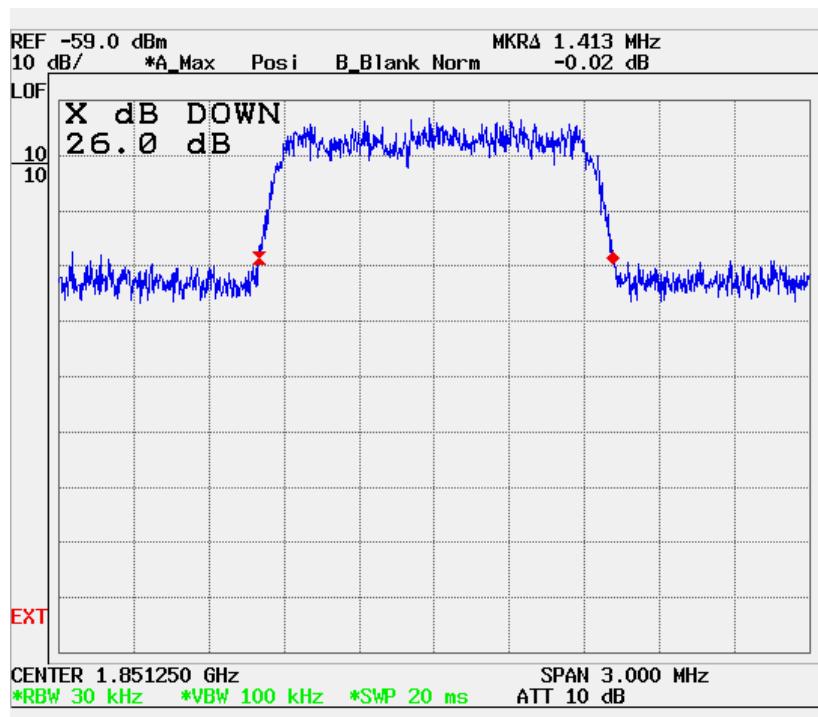
CDMA Downlink Mid CH Output



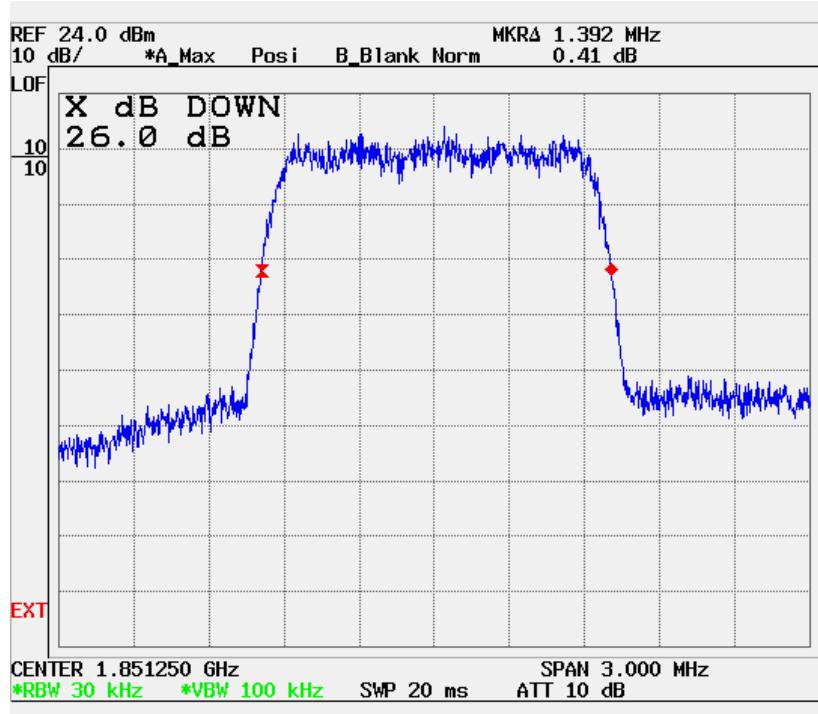
CDMA Downlink High CH Input



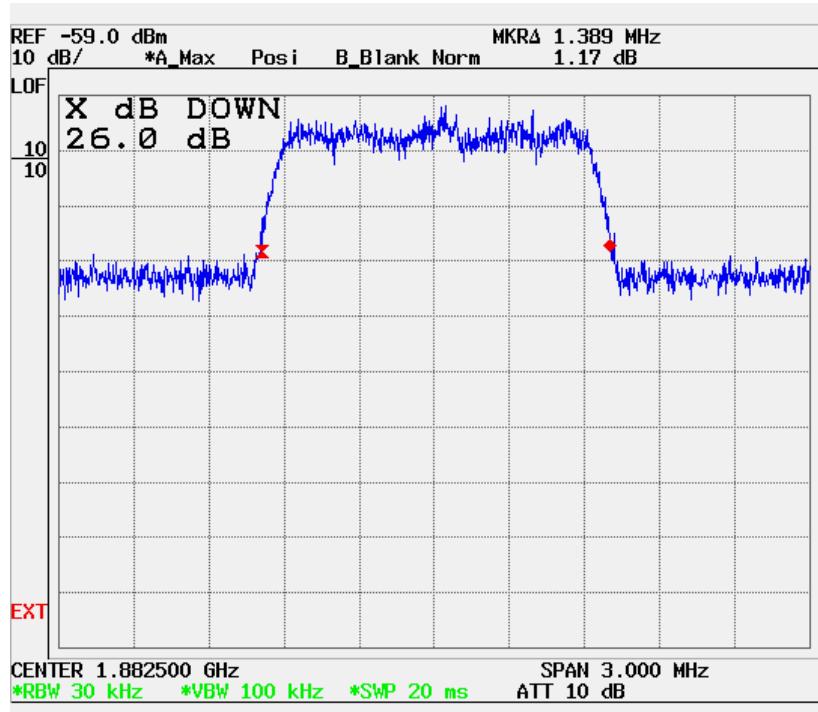
CDMA Downlink High CH Output



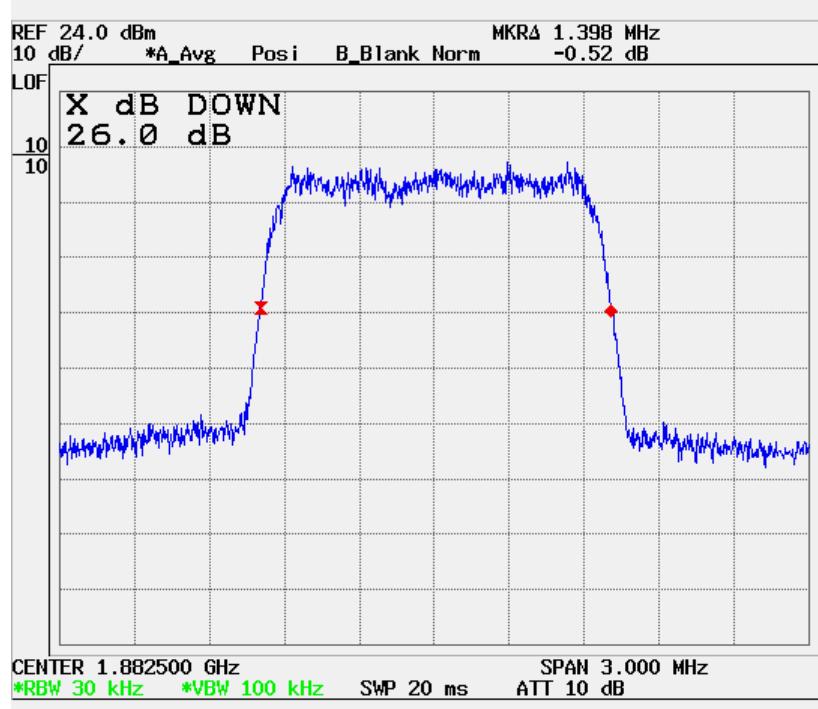
CDMA Uplink Low CH Input



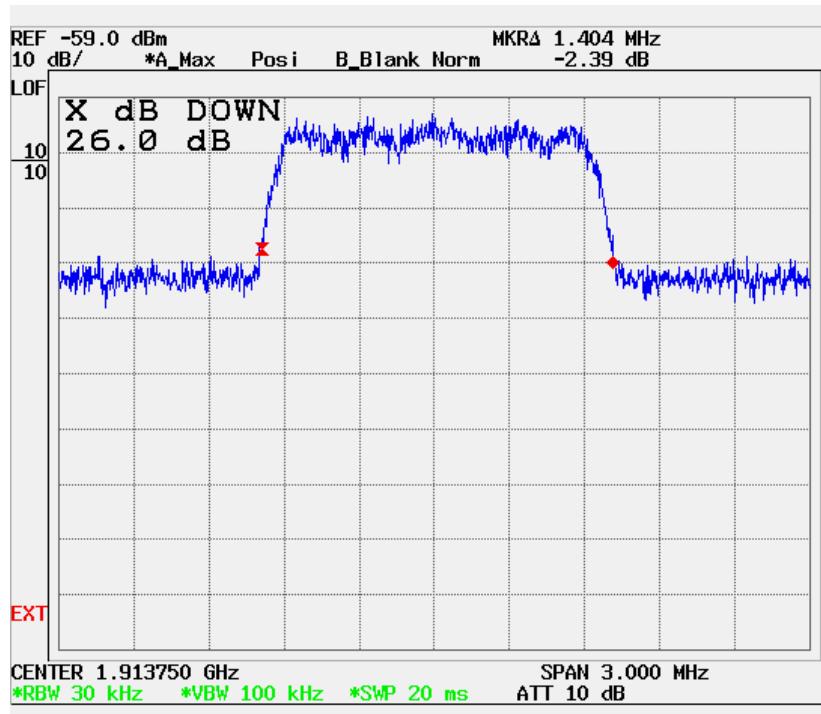
CDMA Uplink Low CH Output



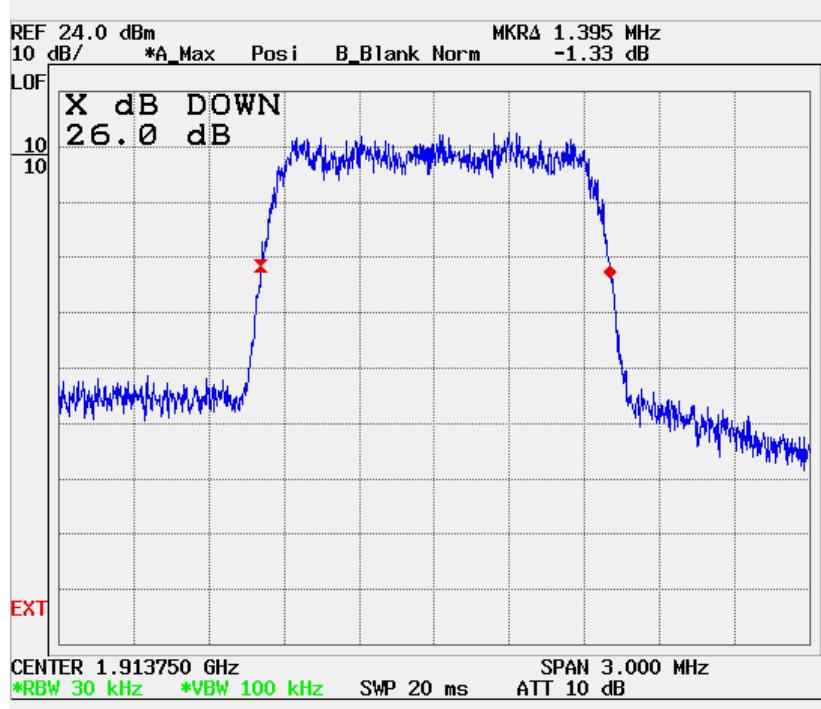
CDMA Uplink Mid CH Input



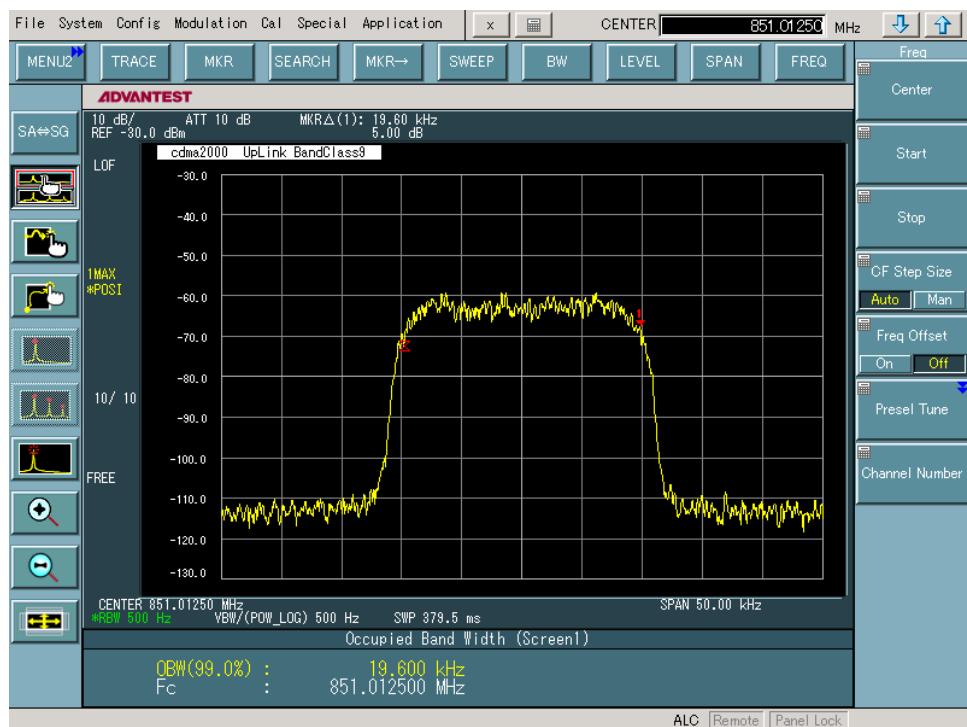
CDMA Uplink Mid CH Output



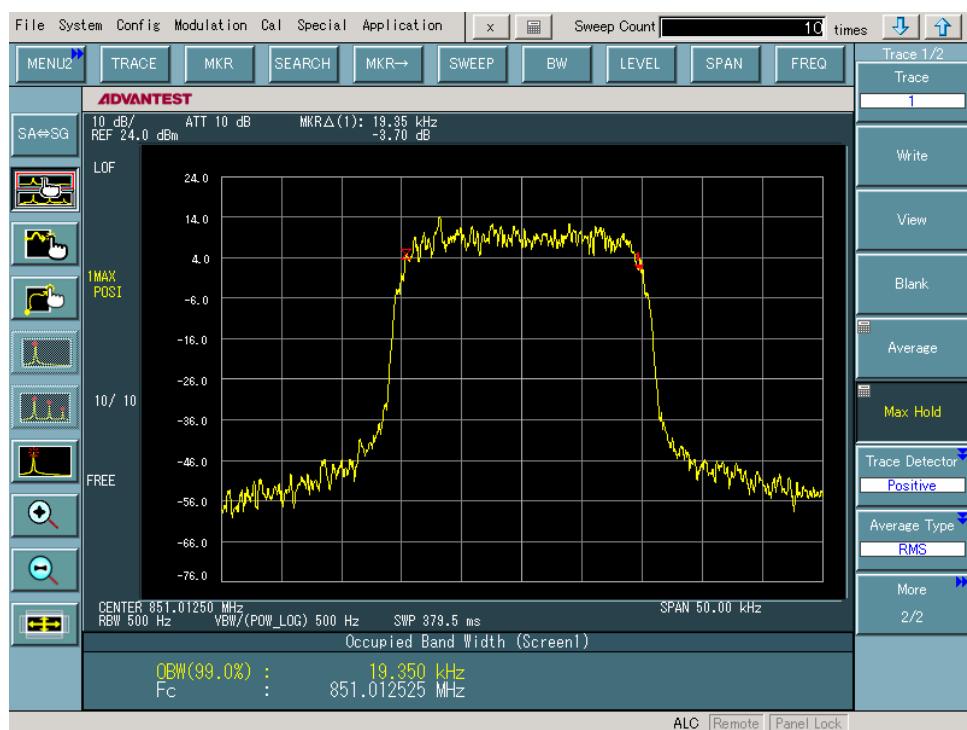
CDMA Uplink High CH Input



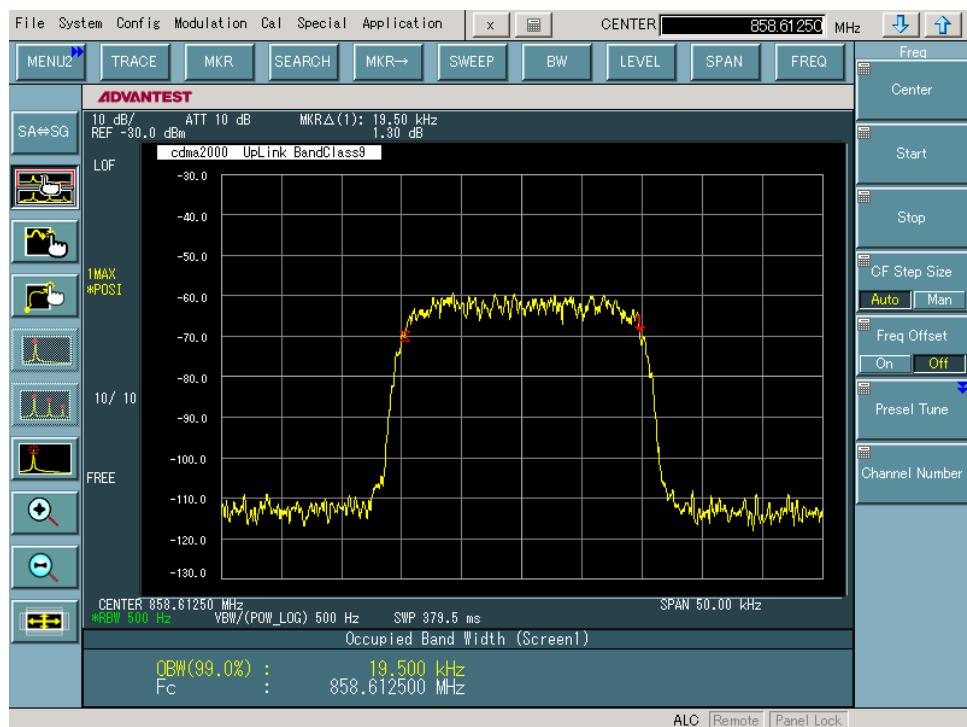
CDMA Uplink High CH Output



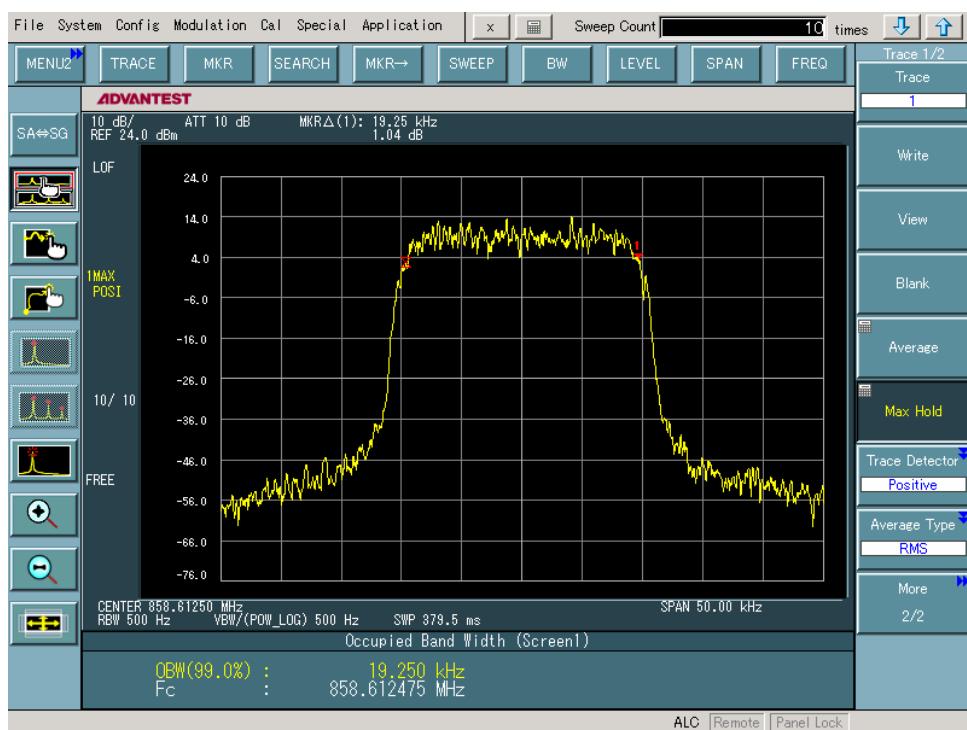
**iDEN800 Downlink Low CH Input**



**iDEN800 Downlink Low CH Output**



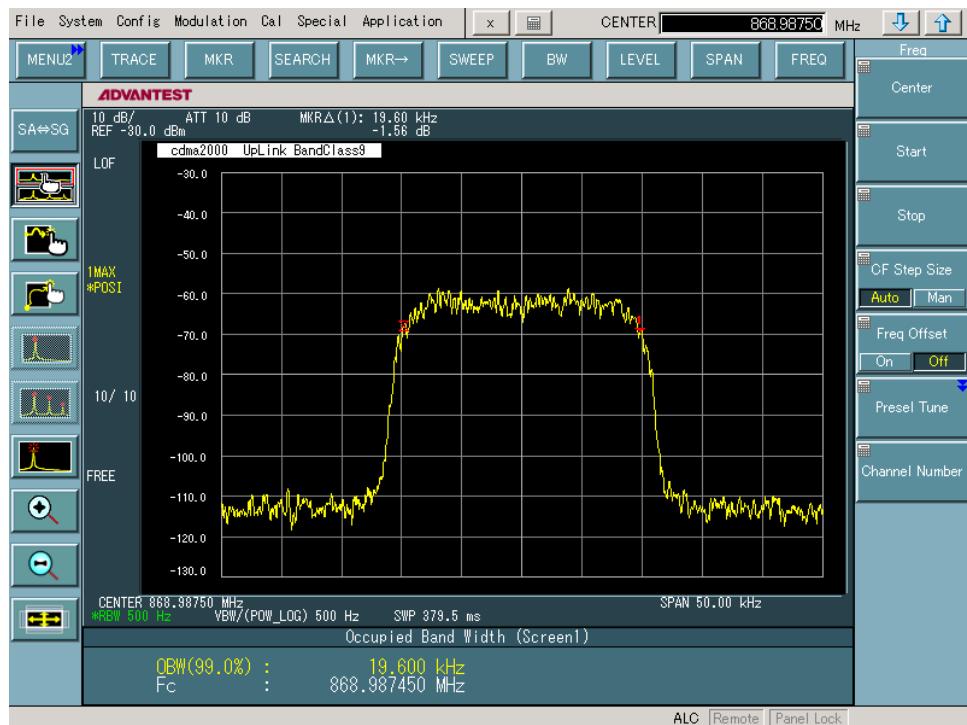
### iDEN800 Downlink Mid CH Input



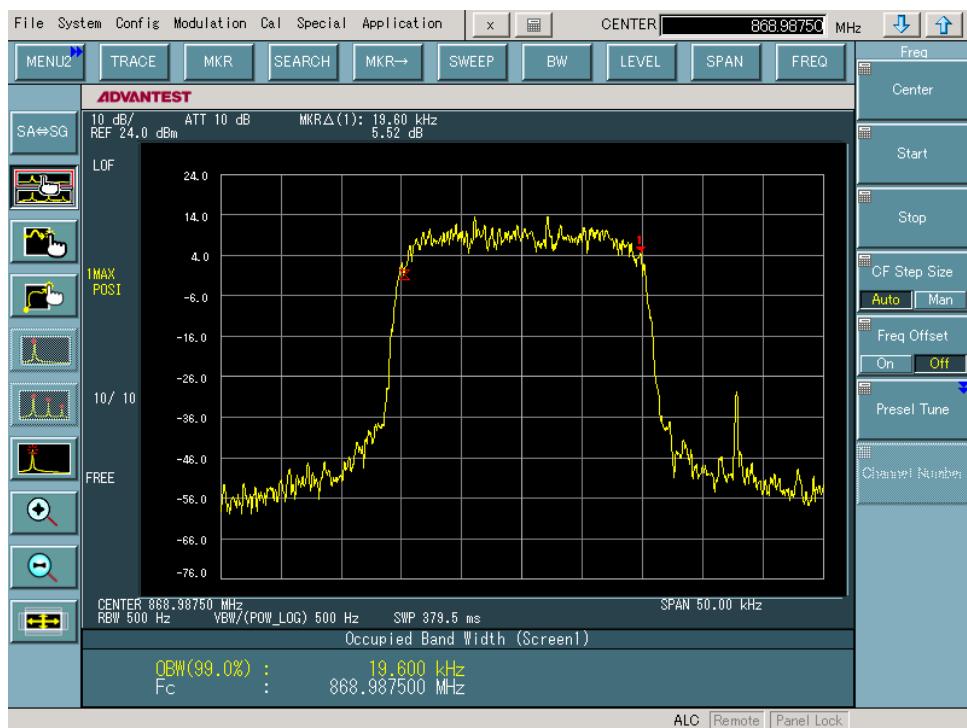
### iDEN800 Downlink Mid CH Output

**HCT Co., Ltd.**

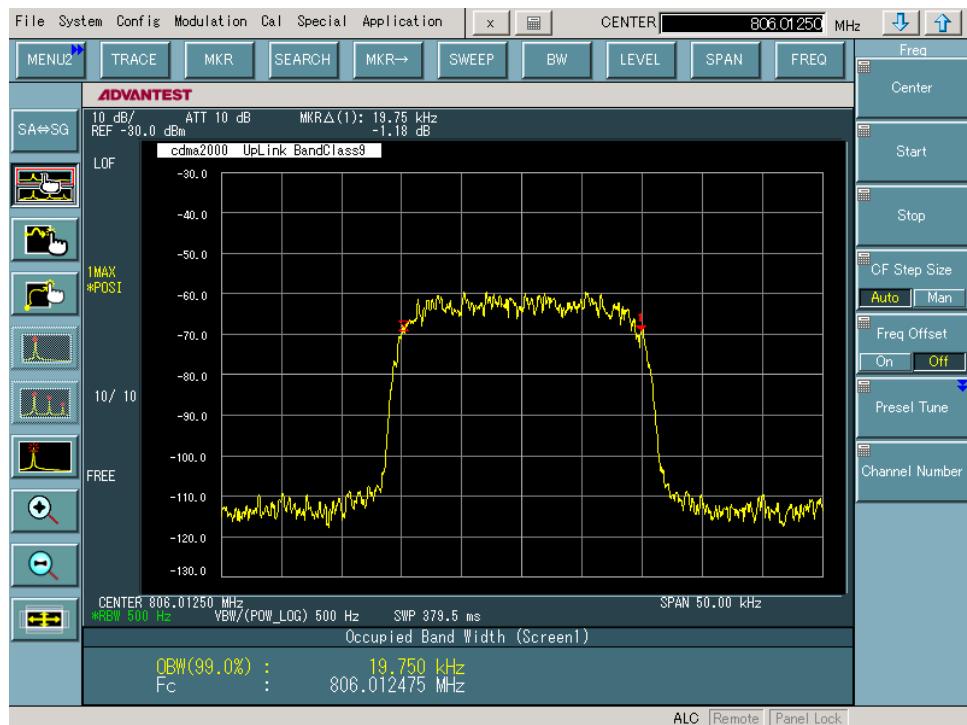
San 136-1, Ami-ri , Bubal-eup, Icheon-si, Kyounki-do, 467-701,Korea  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 [www.hct.co.kr](http://www.hct.co.kr)



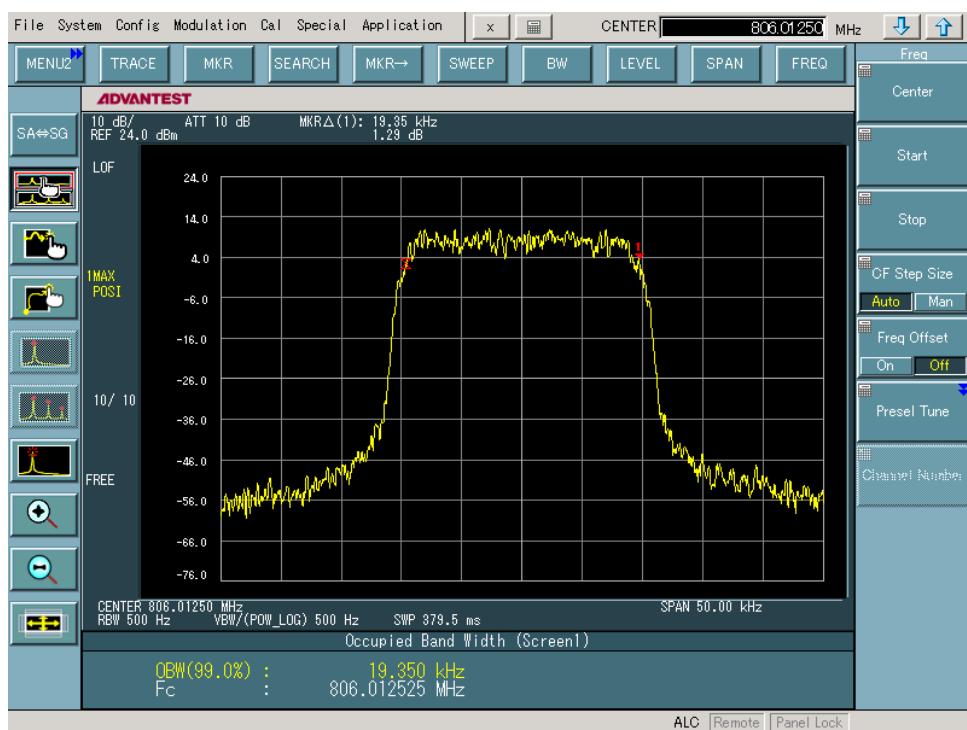
**iDEN800 Downlink High CH Input**



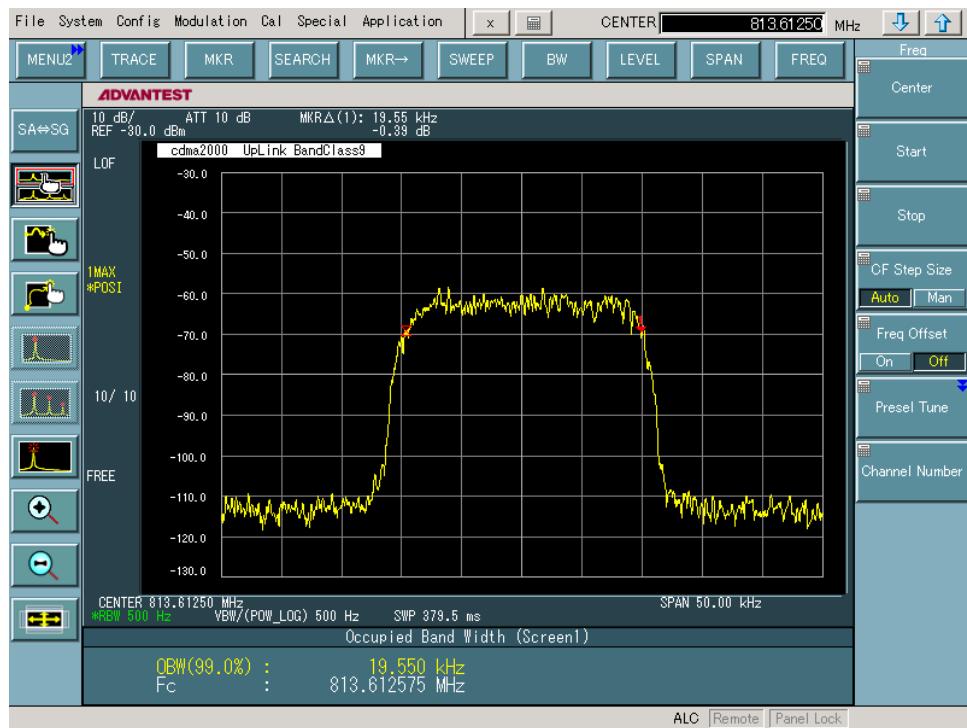
**iDEN800 Downlink High CH Output**



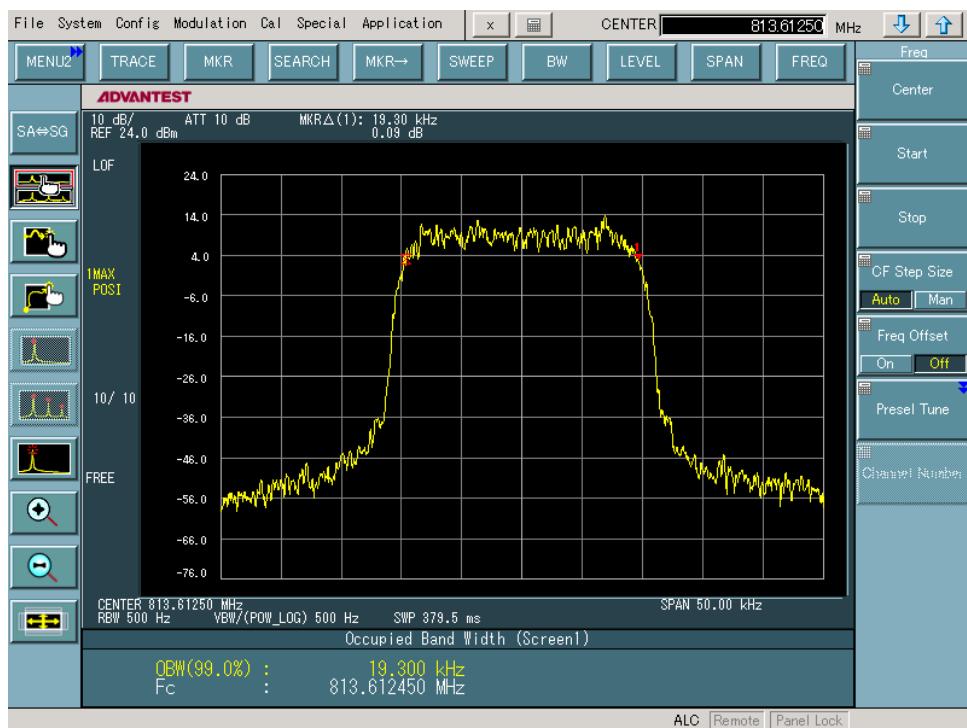
**iDEN800 Uplink Low CH Input**



**iDEN800 Uplink Low CH Output**



### iDEN800 Uplink Mid CH Input

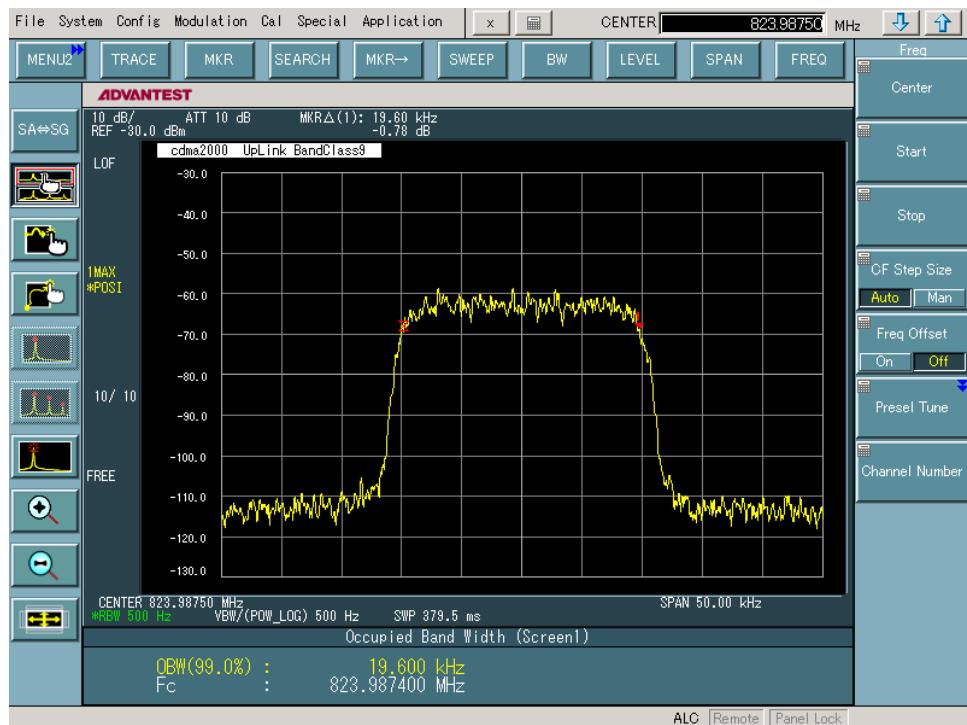


### iDEN800 Uplink Mid CH Output

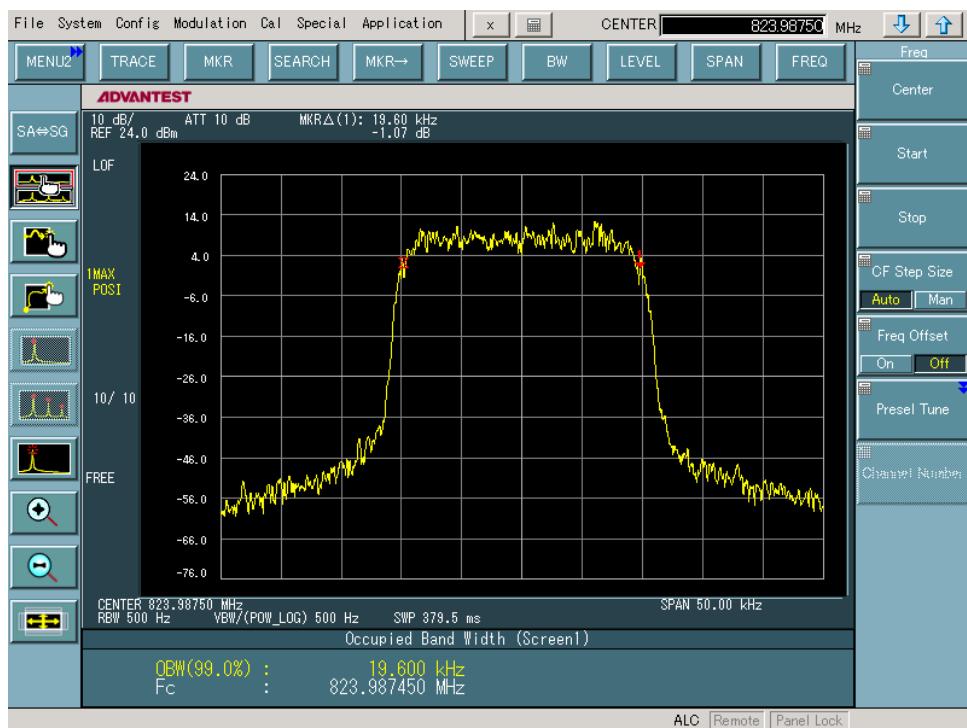
**HCT Co., Ltd.**

San 136-1, Ami-ri , Bubal-eup, Icheon-si, Kyounki-do, 467-701,Korea  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 [www.hct.co.kr](http://www.hct.co.kr)

- 22 /58-



### iDEN800 Uplink High CH Input

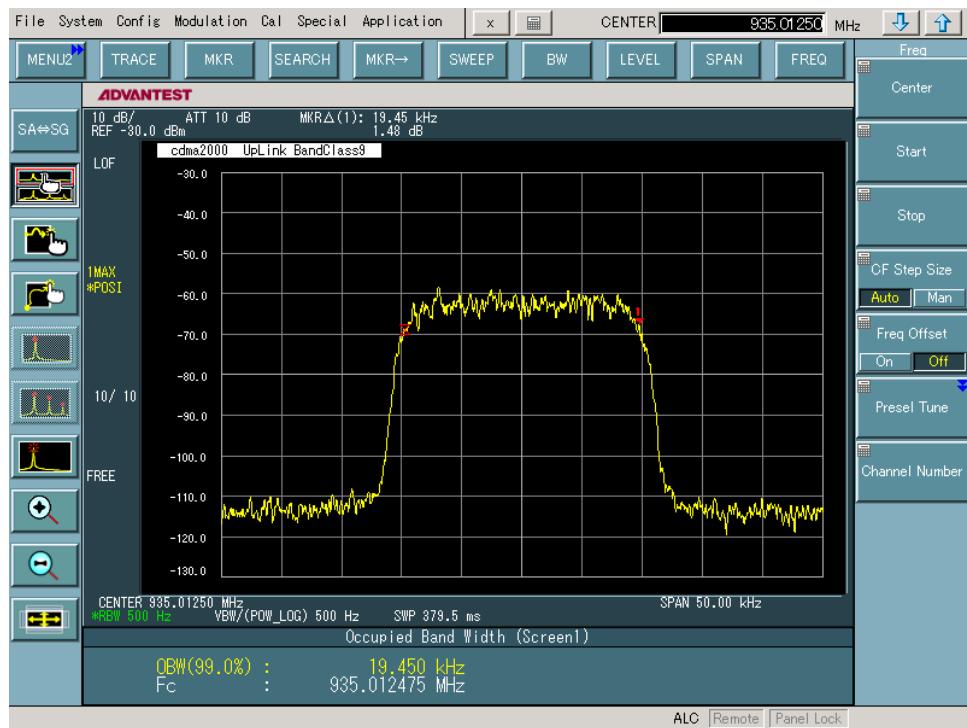


### iDEN800 Uplink High CH Output

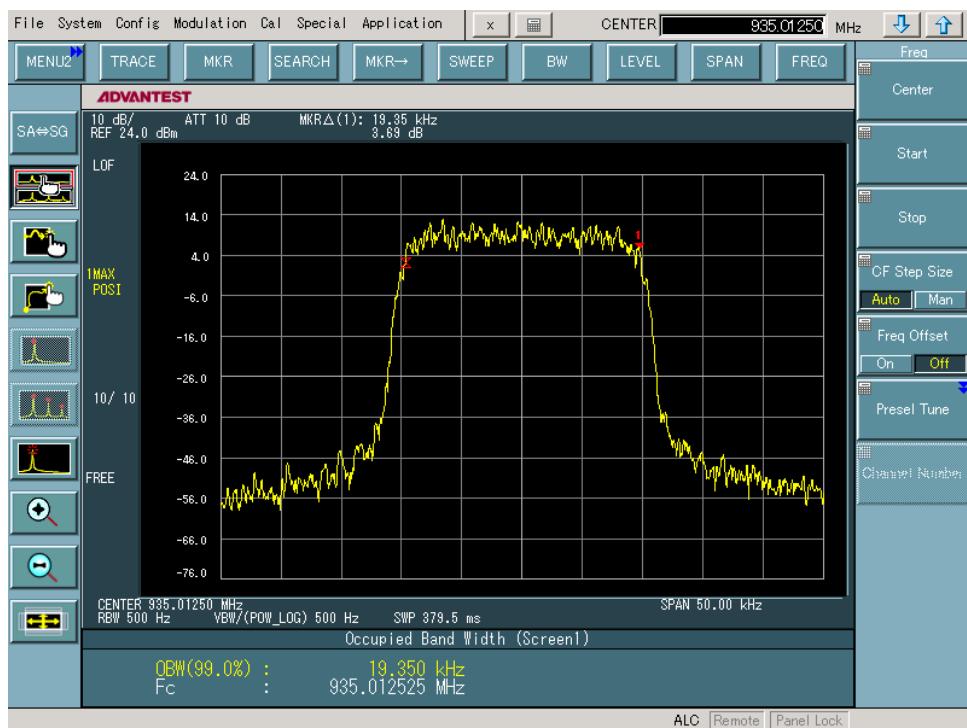
**HCT Co., Ltd.**

San 136-1, Ami-ri , Bubal-eup, Icheon-si, Kyounki-do, 467-701,Korea  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 [www.hct.co.kr](http://www.hct.co.kr)

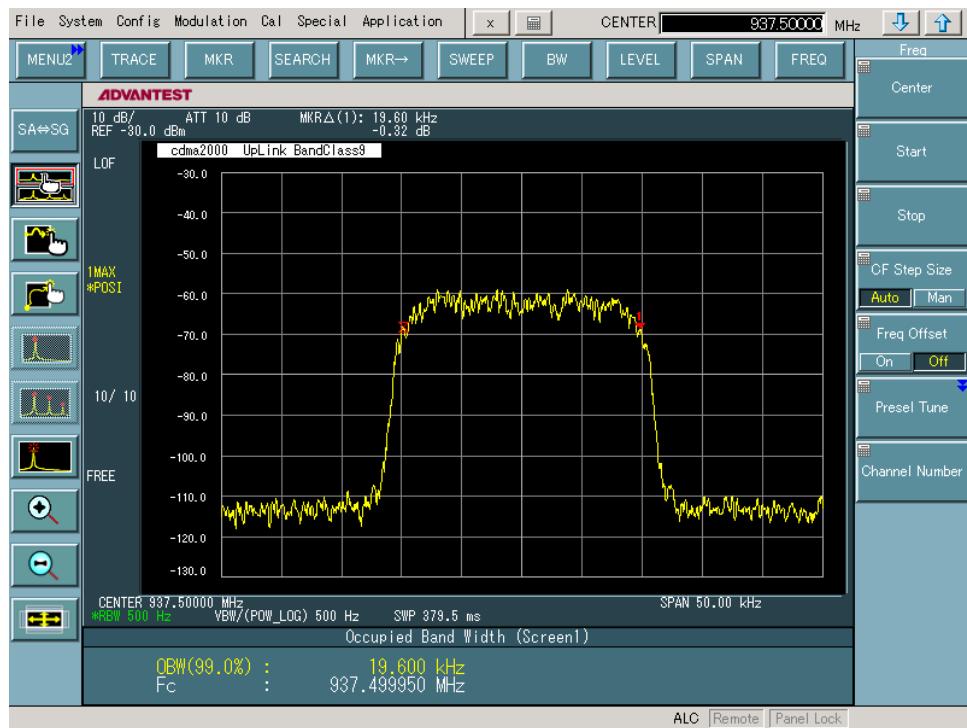
- 23 /58-



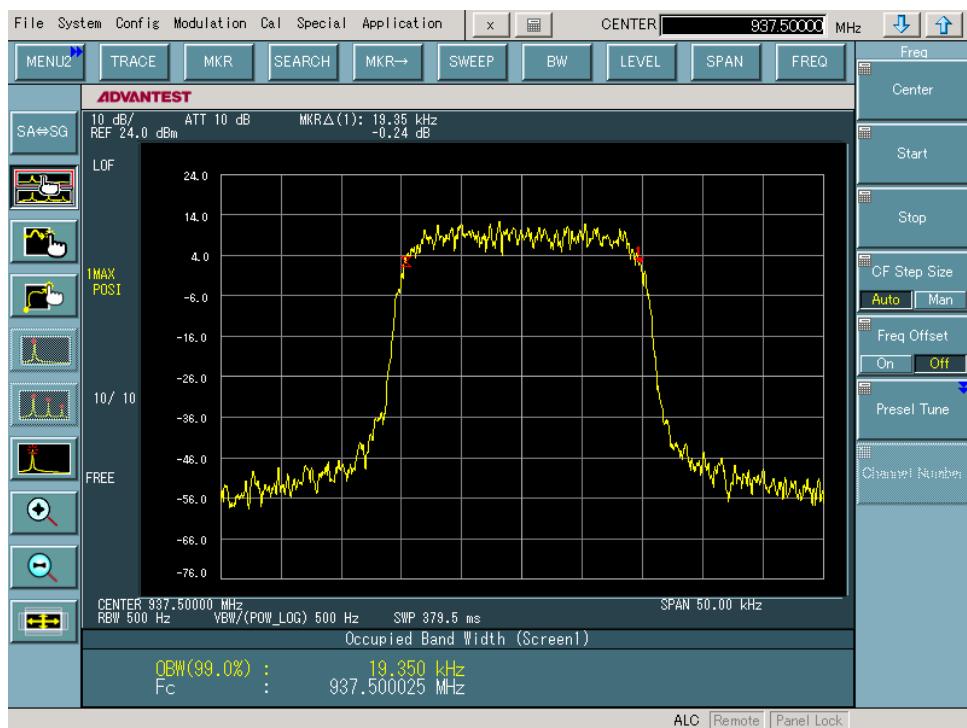
**iDEN900 Downlink Low CH Input**



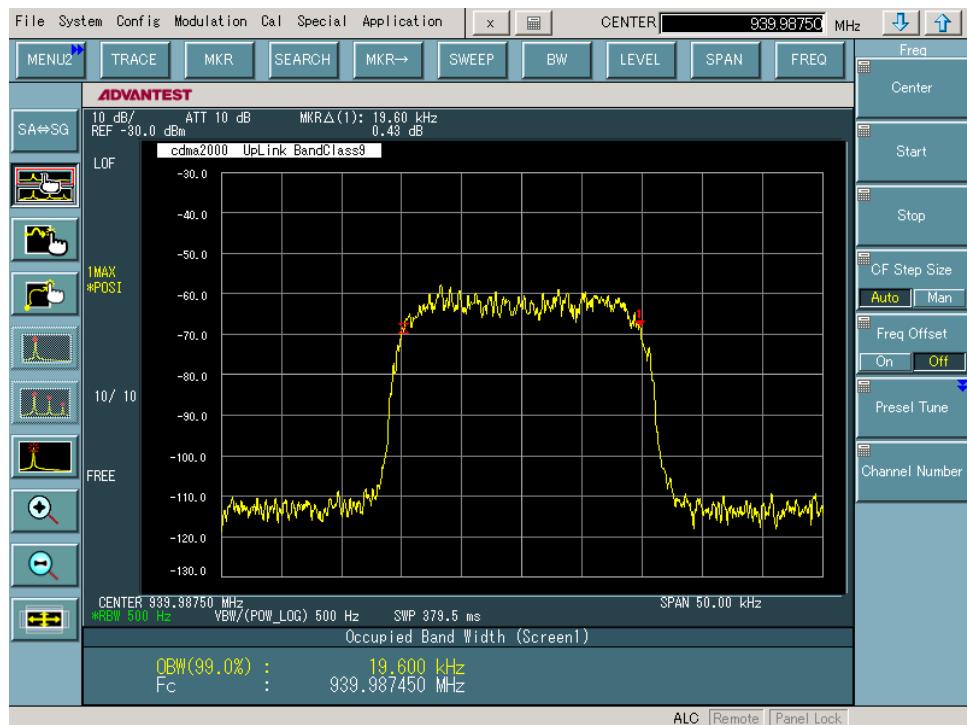
**iDEN900 Downlink Low CH Output**



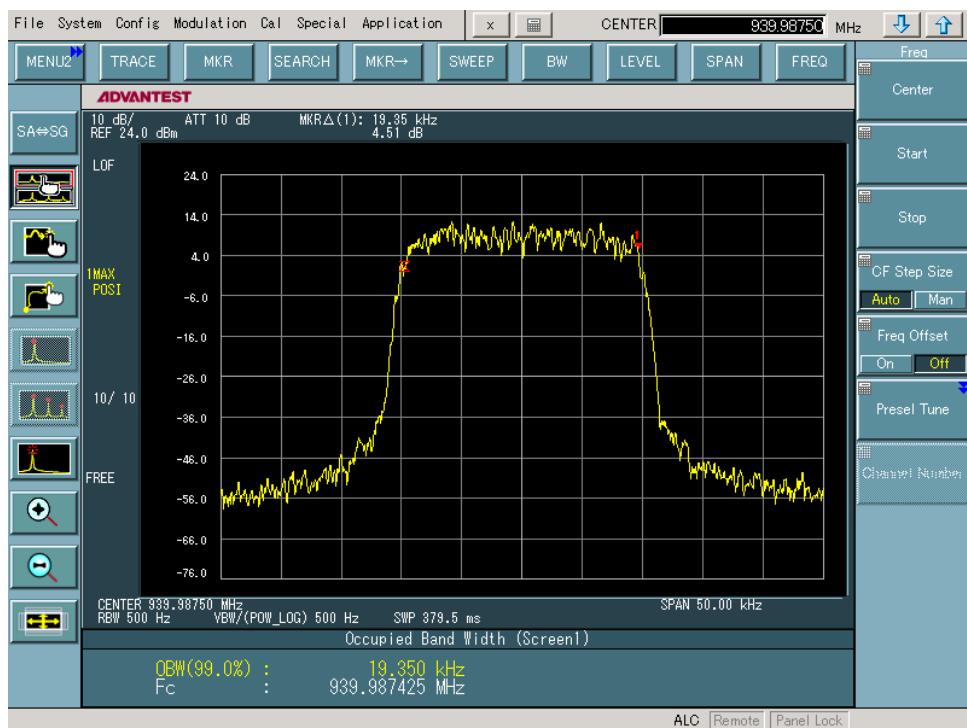
**iDEN900 Downlink Mid CH Input**



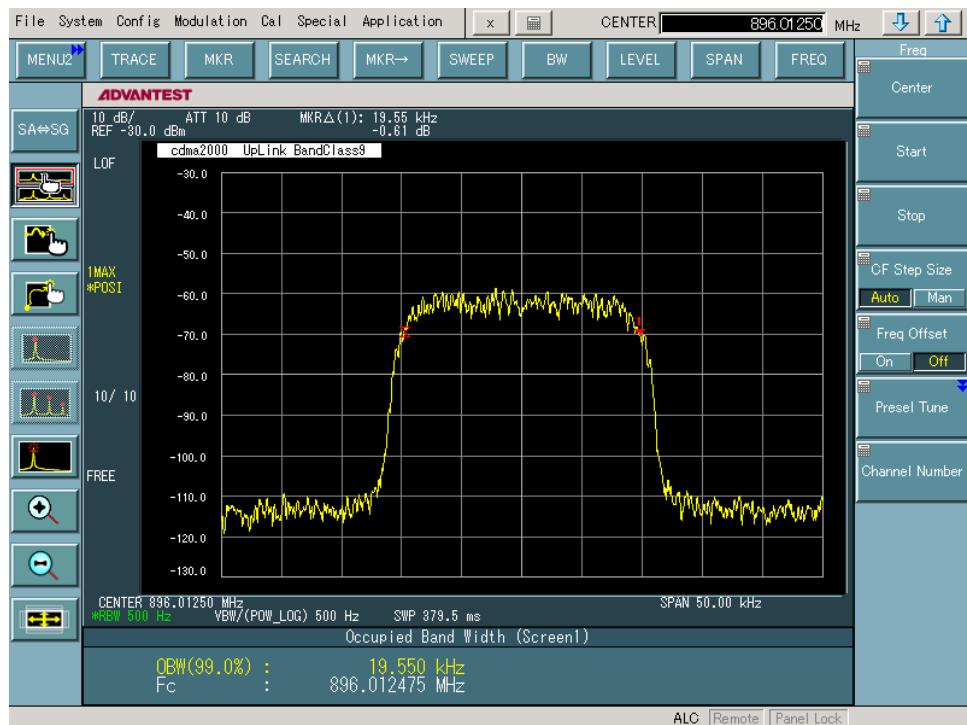
**iDEN900 Downlink Mid CH Output**



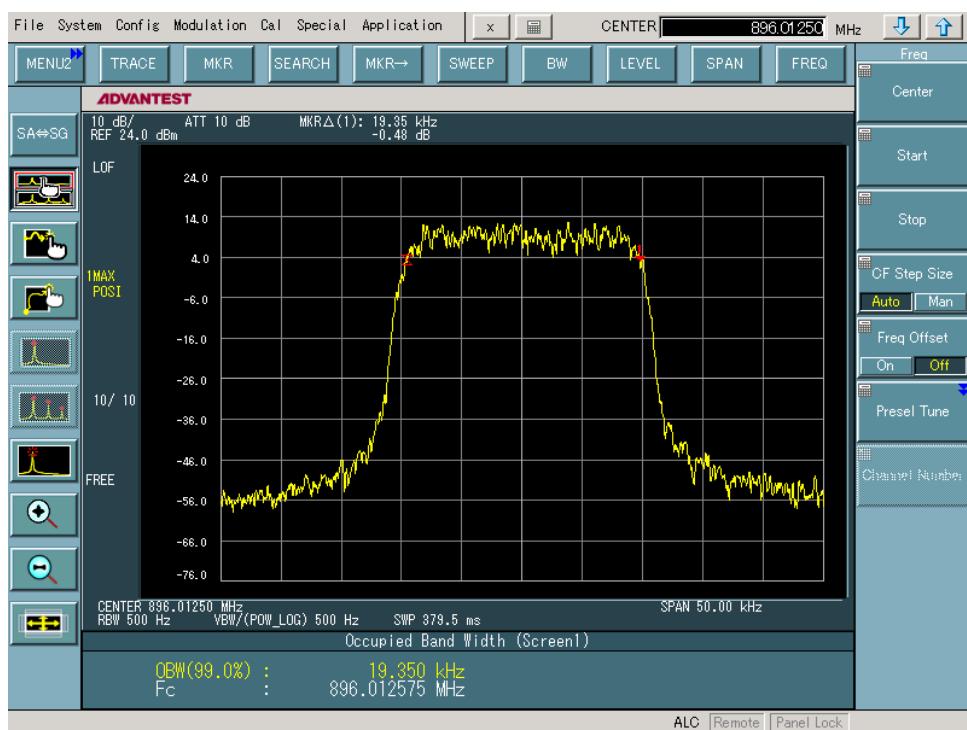
**iDEN900 Downlink High CH Input**



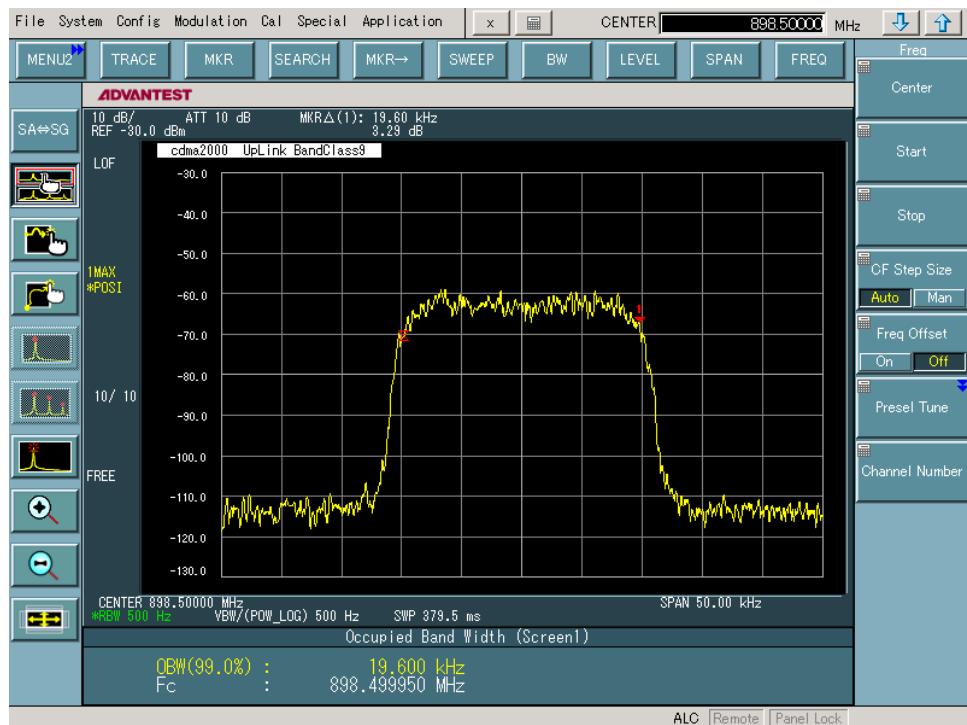
**iDEN900 Downlink High CH Output**



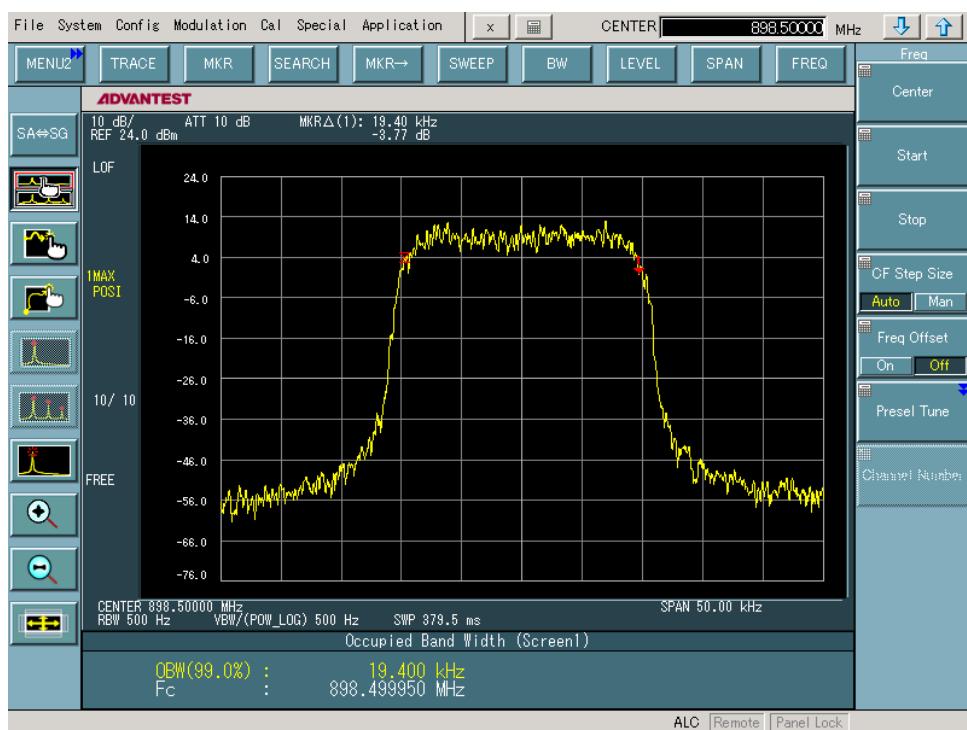
**iDEN900 Uplink Low CH Input**



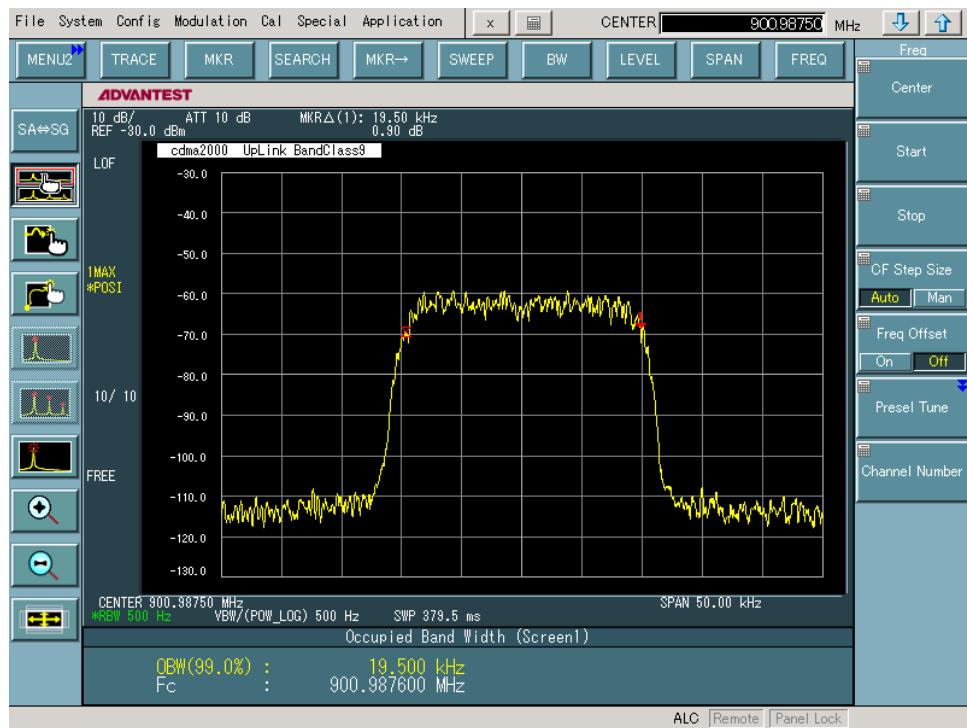
**iDEN900 Uplink Low CH Output**



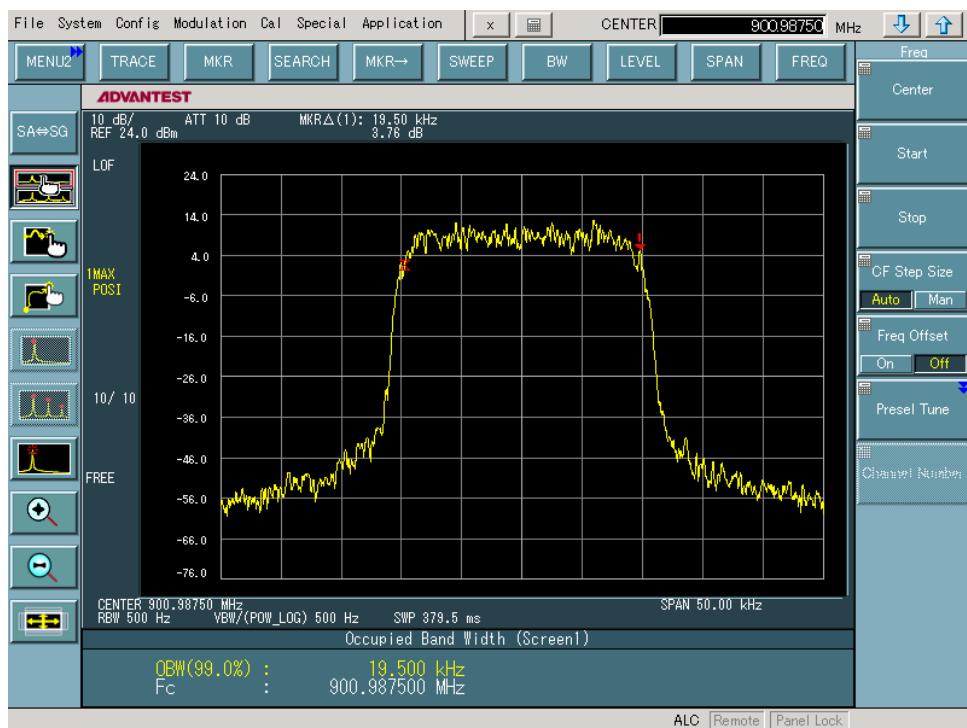
**iDEN900 Uplink Mid CH Input**



**iDEN900 Uplink Mid CH Output**



**iDEN900 Uplink High CH Input**



**iDEN900 Uplink High CH Output**

## 8. 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.

### § 24.238 Emission limitations for Broadband PCS equipment:

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

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

### § 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.

---

### HCT Co., Ltd.

San 136-1, Ami-ri , Bubal-eup, Icheon-si, Kyounki-do, 467-701,Korea  
TEL : +82 31 639 8518    FAX : +82 31 639 8525    [www.hct.co.kr](http://www.hct.co.kr)

- (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.

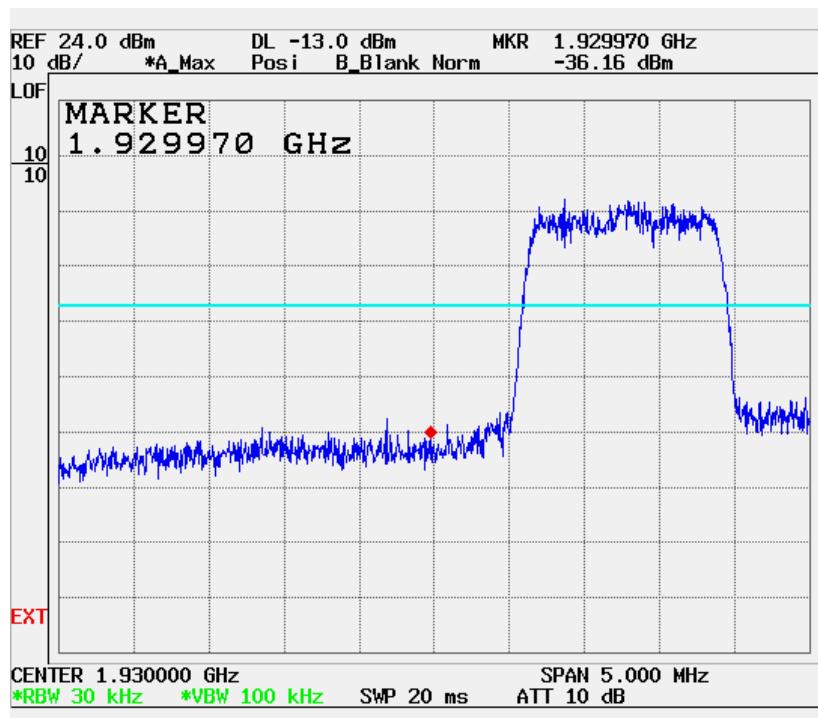
**§ 90.210 Emission limits:** The rules in this section govern the spectral characteristics of emissions in the Radiotelephone Service. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  or 80 dB whichever is the lesser attenuation.

**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 OEM A spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured. The spectrum analyzer was set to 1MHz RBW and 3MHz VBW. The spectrum was investigated from 30MHz to the 10<sup>th</sup> harmonic of the carrier. The inter-modulation requirements were performed in a similar manner as described above. The spectrum analyzer was set to 100KHz RBW and 300KHz VBW. Two modulated carriers were injected into the EUT. One carrier was set at the band edge of either the Uplink or Downlink band and the other at carrier set at 6MHz deviation from the first carrier. The in band spurious emissions were investigated.

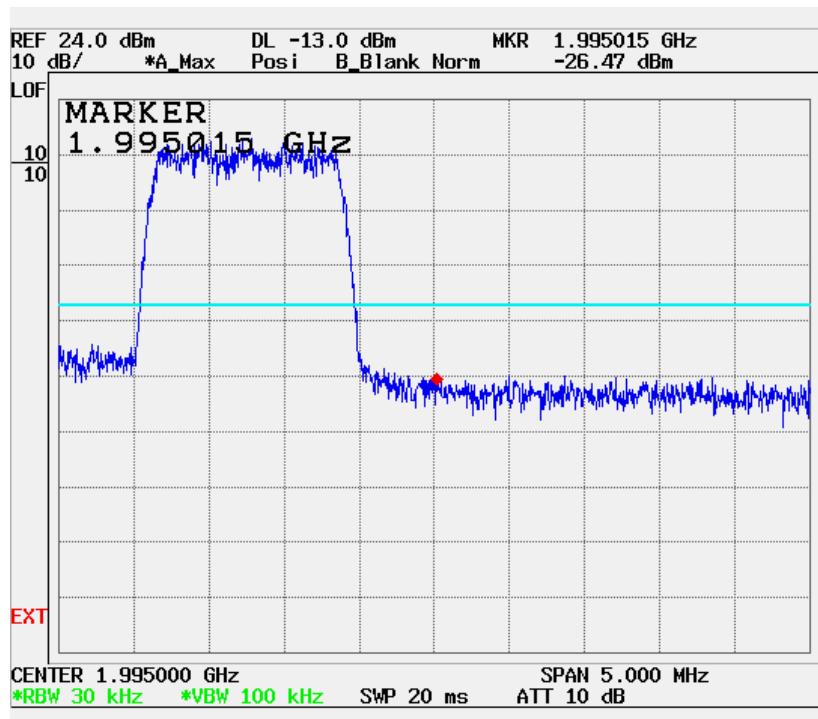
**Test Results:** The EUT complies with the requirements of this section. There were no detectable spurious emissions for this EUT.

**NOTE:** The EUT is a band selective repeater. The test was performed using all selective bands and there was not much difference between them. The test result is reported using the widest bands.

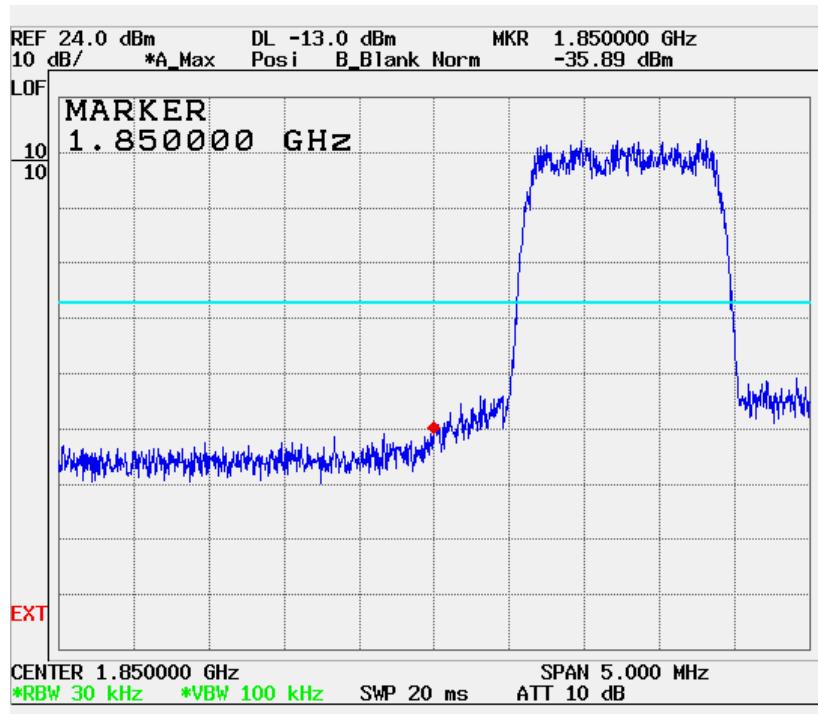
## Plots of BAND EDGE



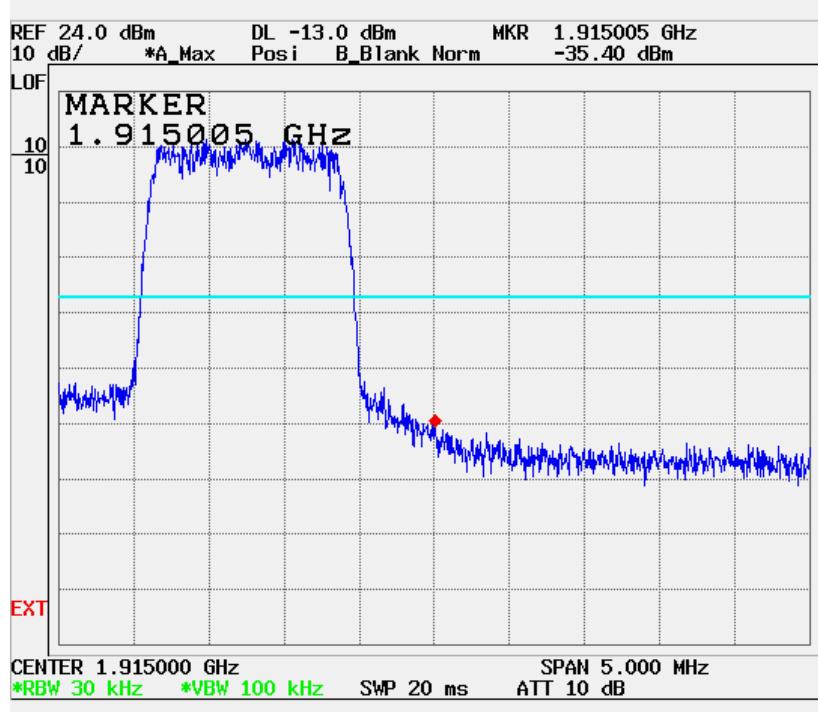
(CDMA Downlink Low CH)



(CDMA Downlink High CH)

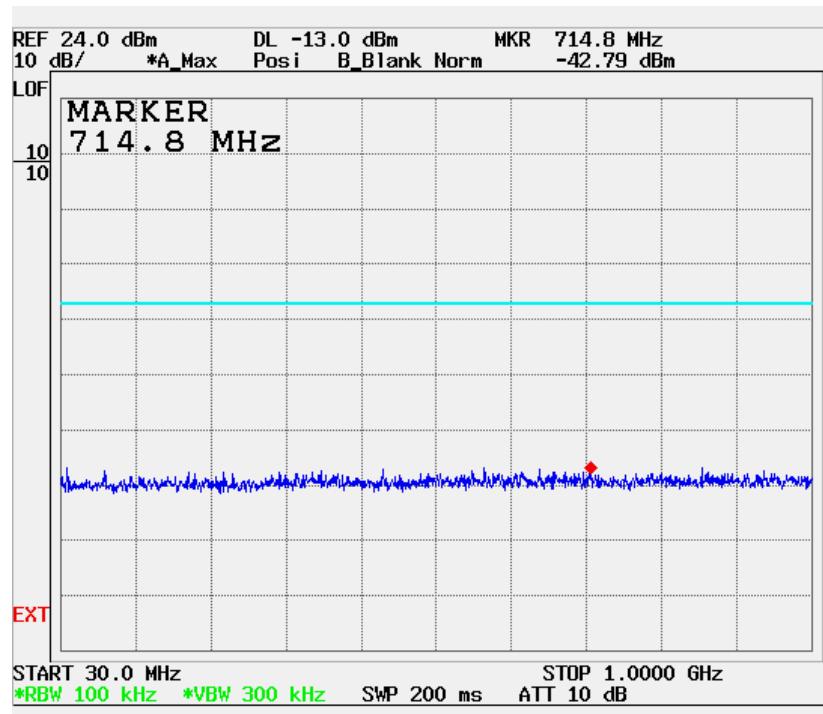


(CDMA Uplink Low CH)

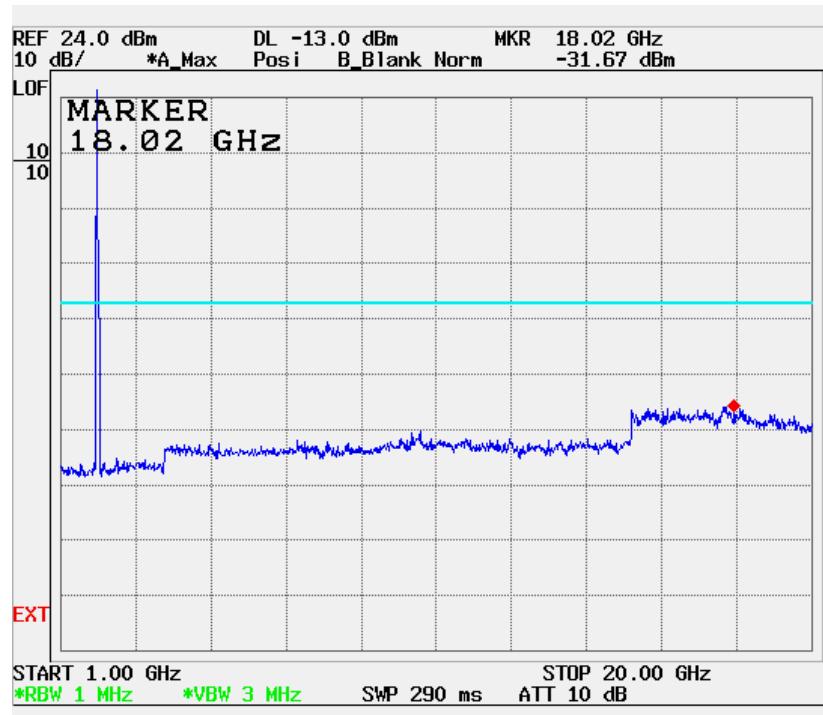


(CDMA Uplink High CH)

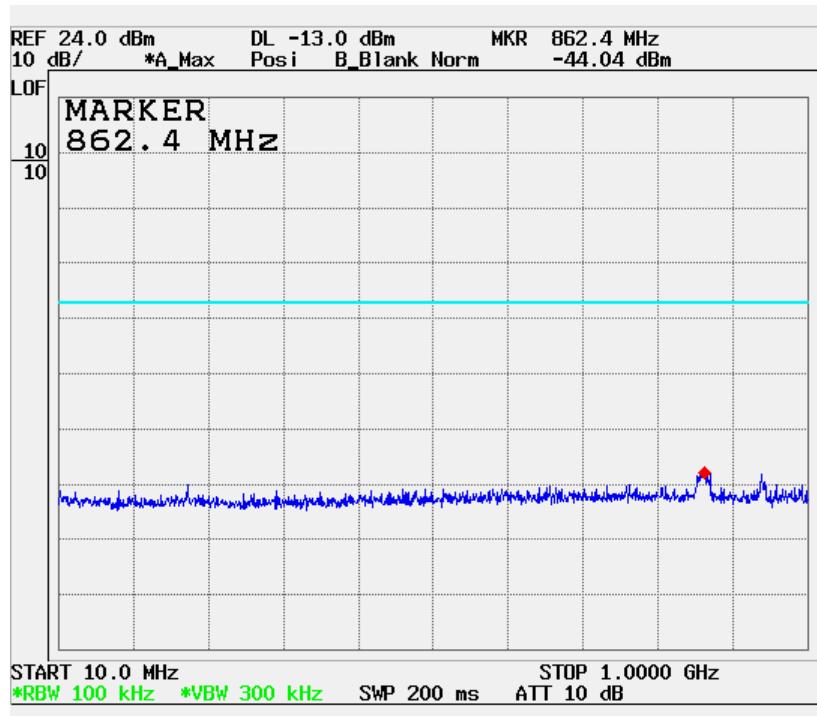
## Plots of Spurious Emission



Conducted Spurious Emissions Downlink Low CH (30 MHz – 1 GHz)



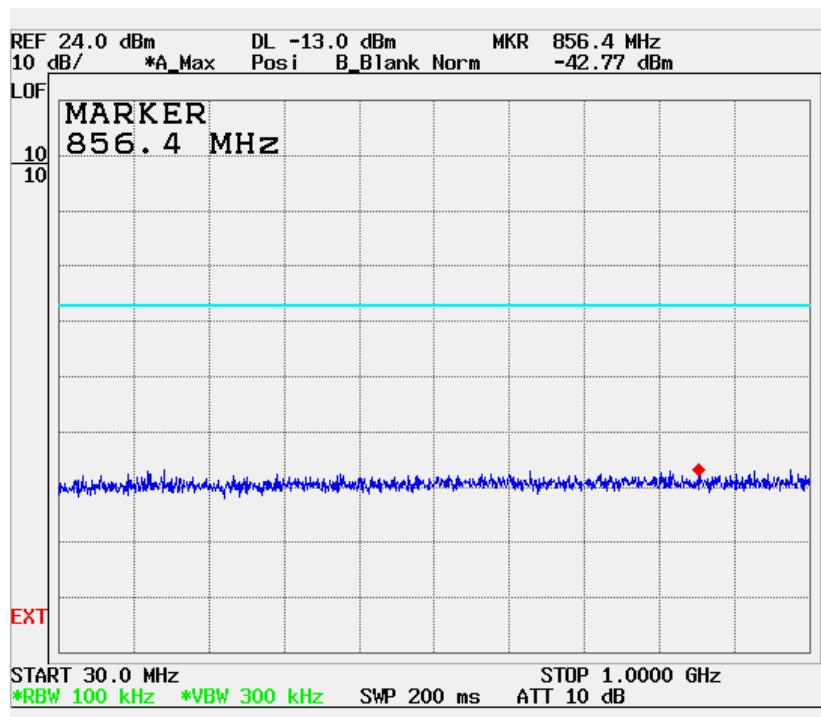
Conducted Spurious Emissions Downlink Low CH (1 GHz – 20 GHz)



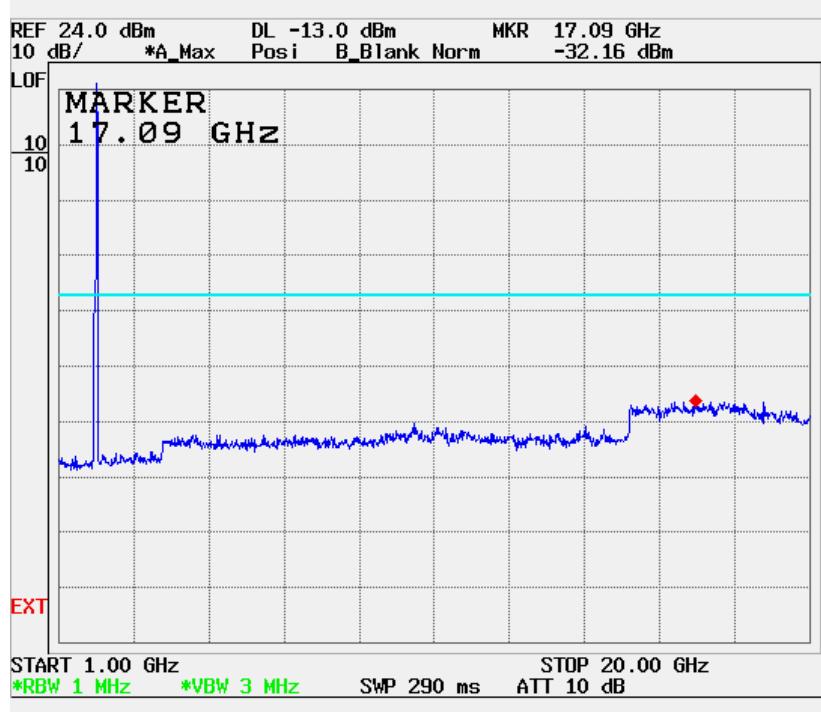
Conducted Spurious Emissions Downlink Mid CH (10 MHz – 1 GHz)



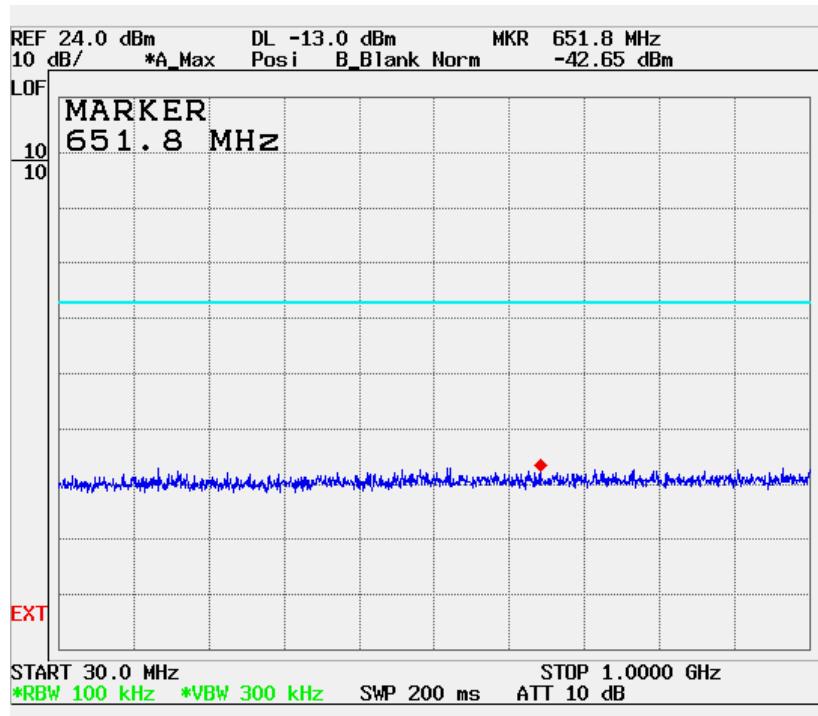
Conducted Spurious Emissions Downlink Mid CH (1 GHz – 20 GHz)



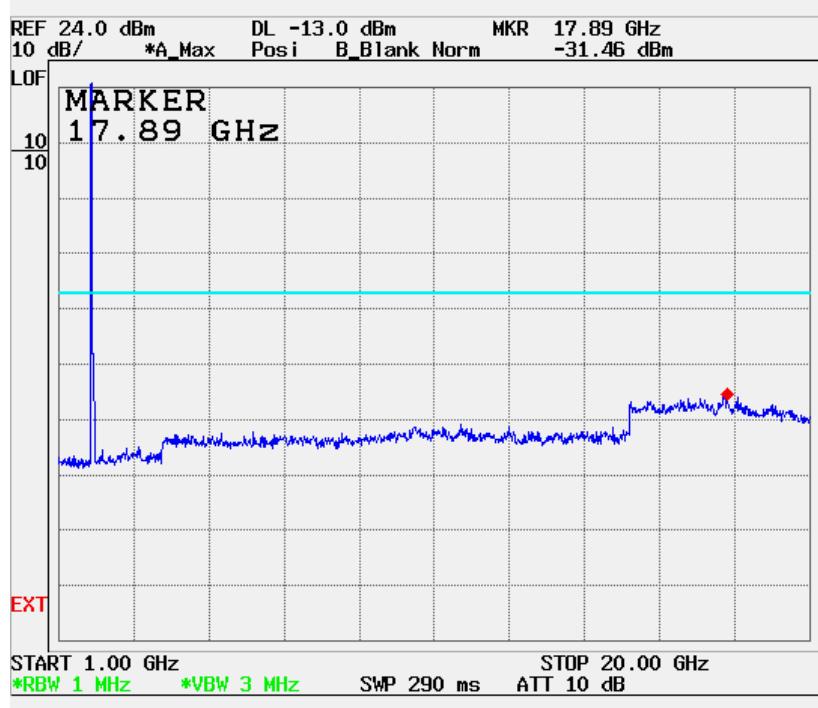
Conducted Spurious Emissions Downlink High CH (30 MHz – 1 GHz)



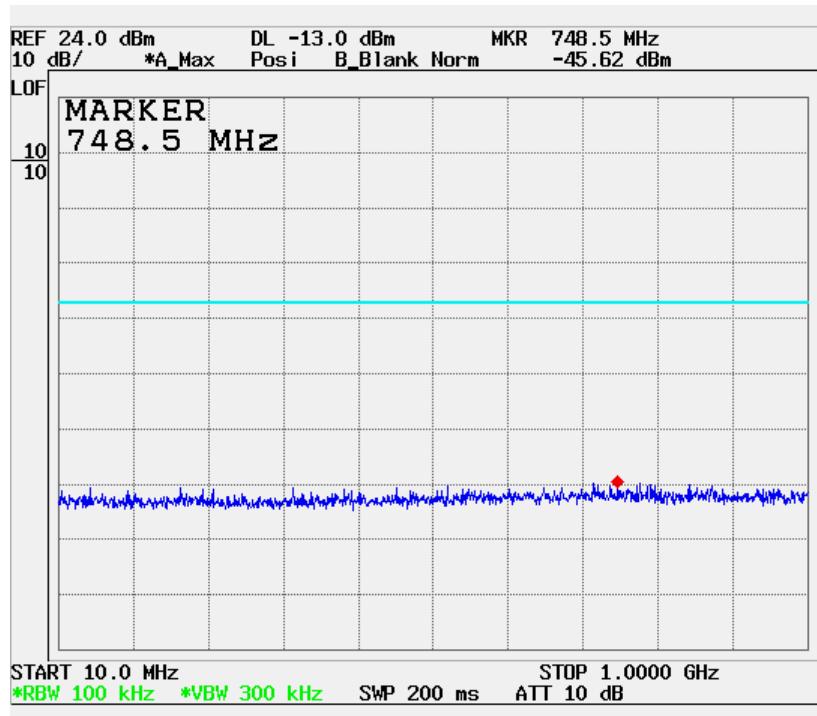
Conducted Spurious Emissions Downlink High CH (1 GHz – 20 GHz)



Conducted Spurious Emissions Uplink Low CH (30 MHz – 1 GHz)



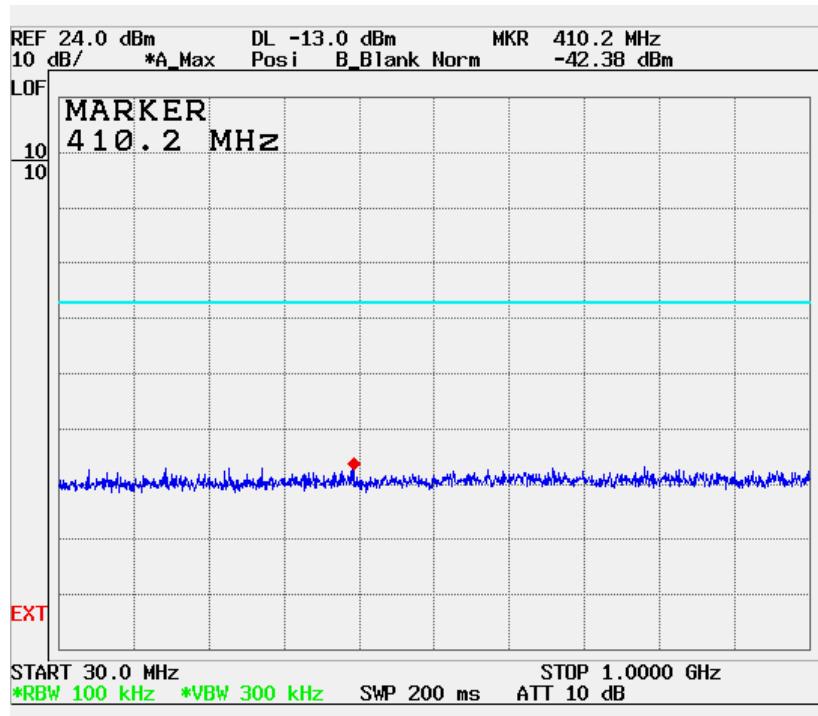
Conducted Spurious Emissions Uplink Low CH (1 GHz – 20 GHz)



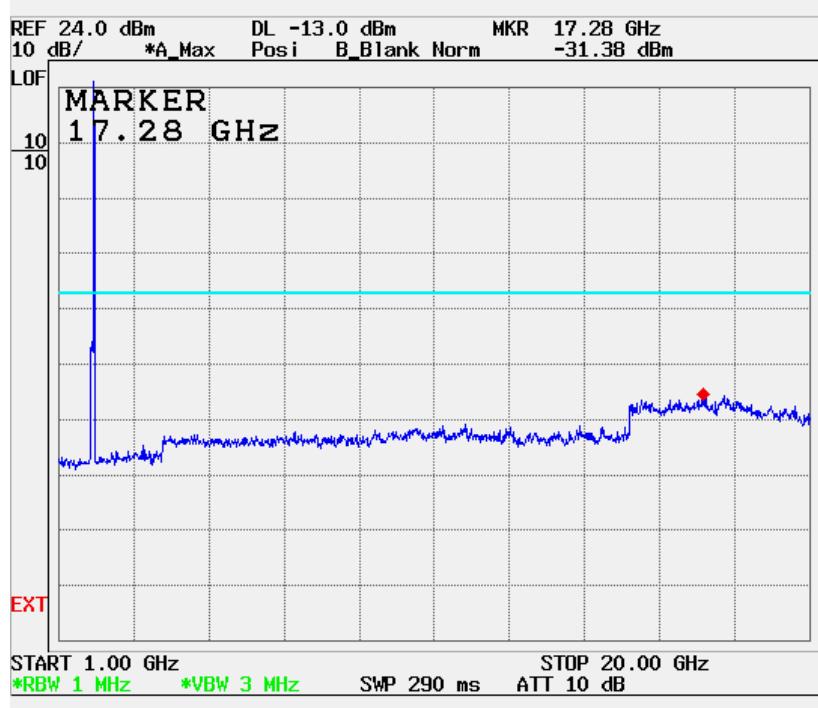
Conducted Spurious Emissions Uplink Mid CH (10 MHz – 1 GHz)



Conducted Spurious Emissions Uplink Mid CH (1 GHz – 20 GHz)

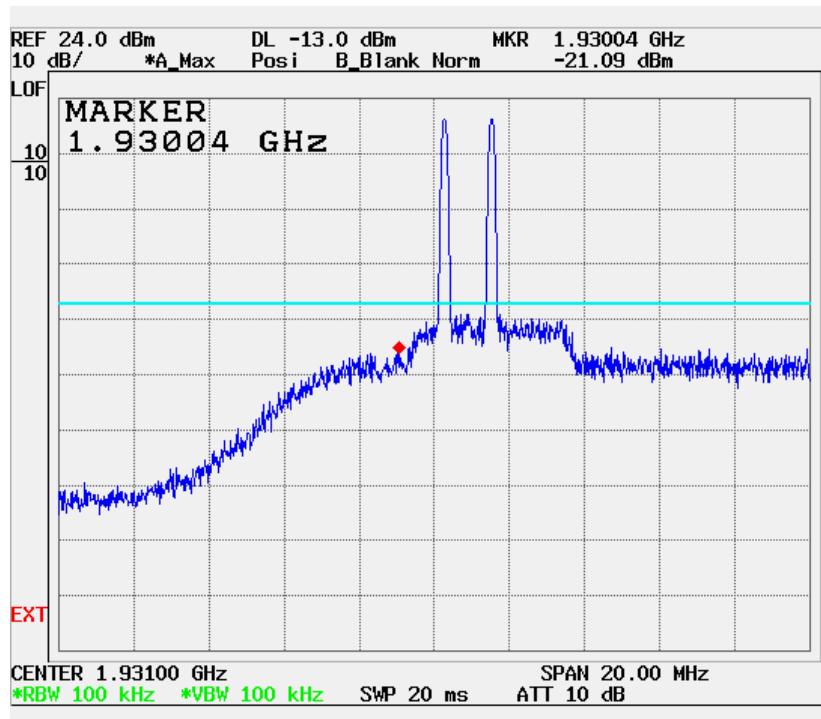


Conducted Spurious Emissions Uplink High CH (30 MHz – 1 GHz)

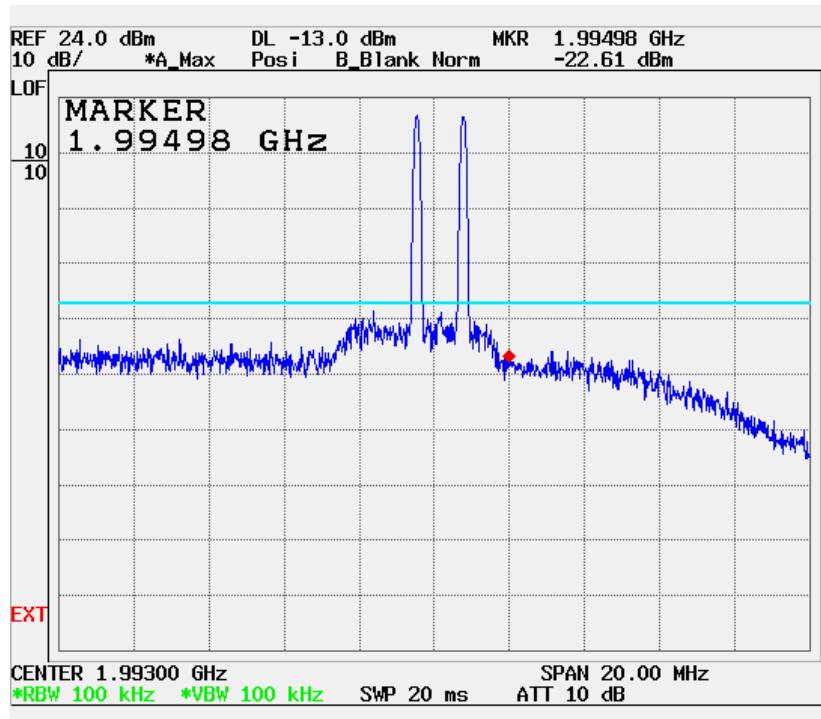


Conducted Spurious Emissions Uplink High CH (1 GHz – 20 GHz)

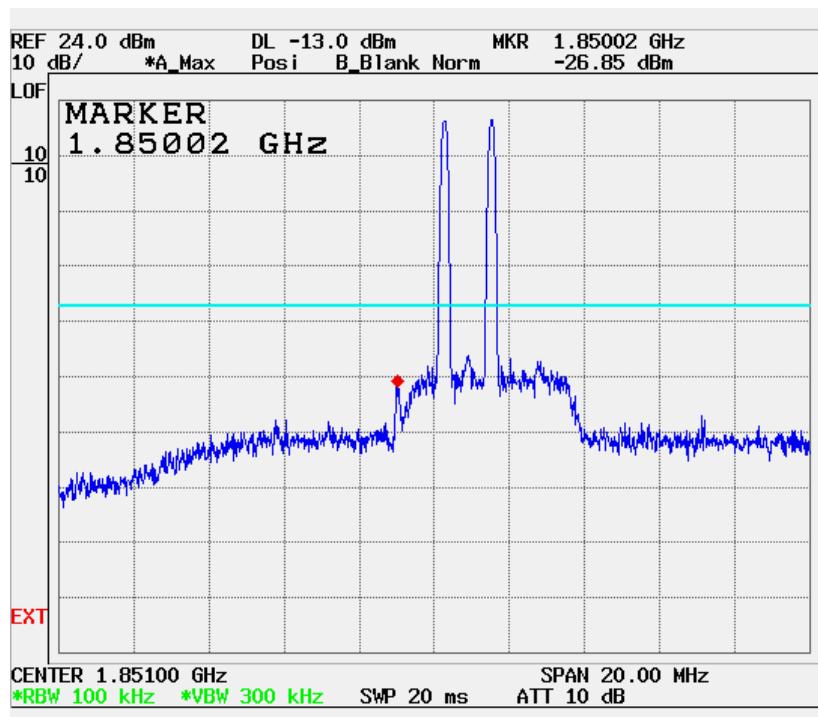
### Plots of Two Tone Intermodulation, CDMA



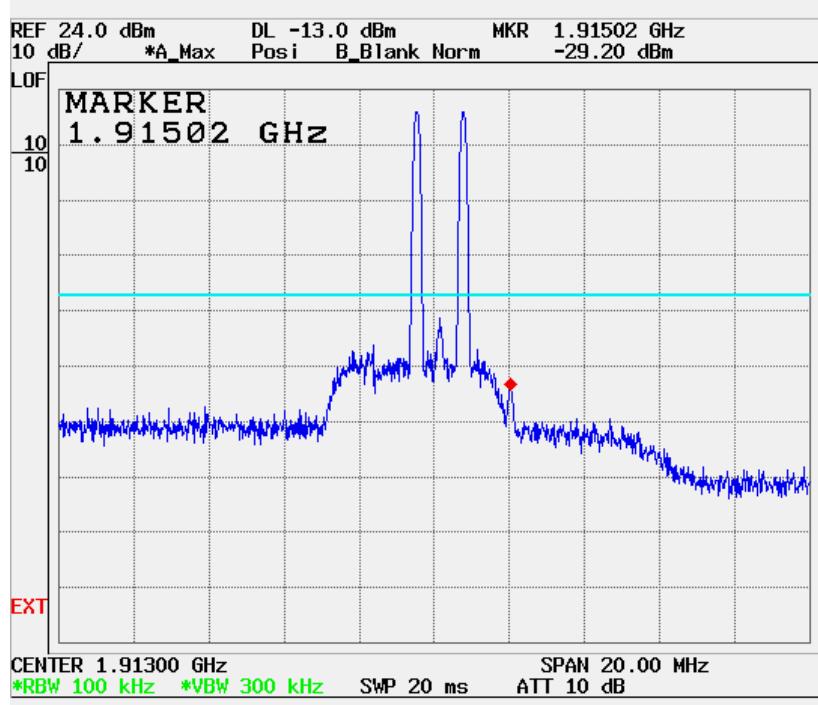
Two Tone Downlink Low End Intermodulation



Two Tone Downlink Hi End Intermodulation

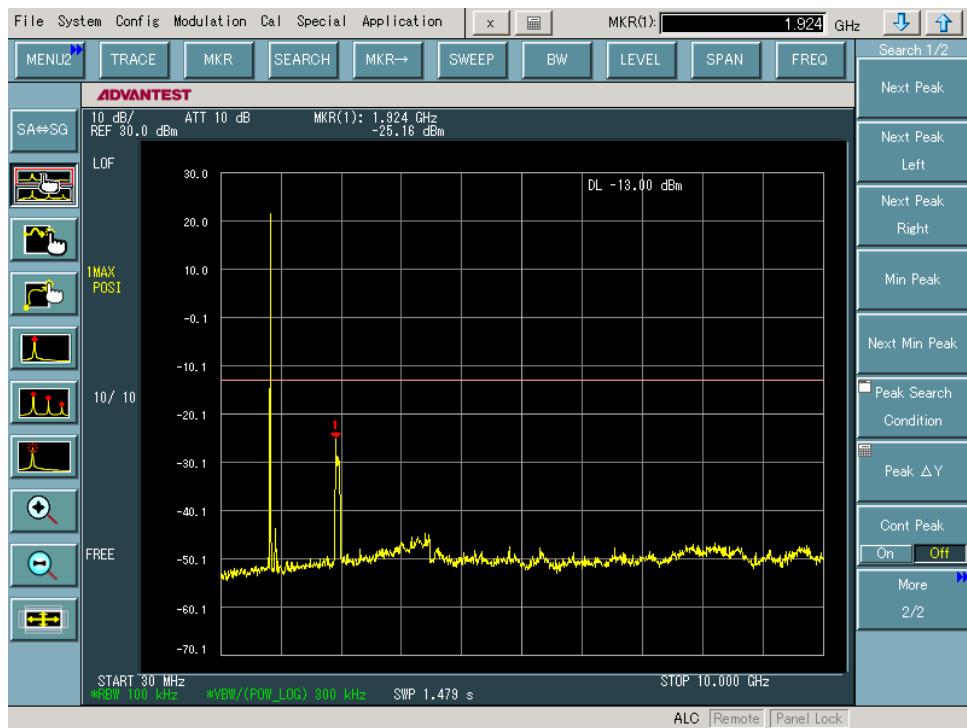


Two Tone Uplink Low End Intermodulation

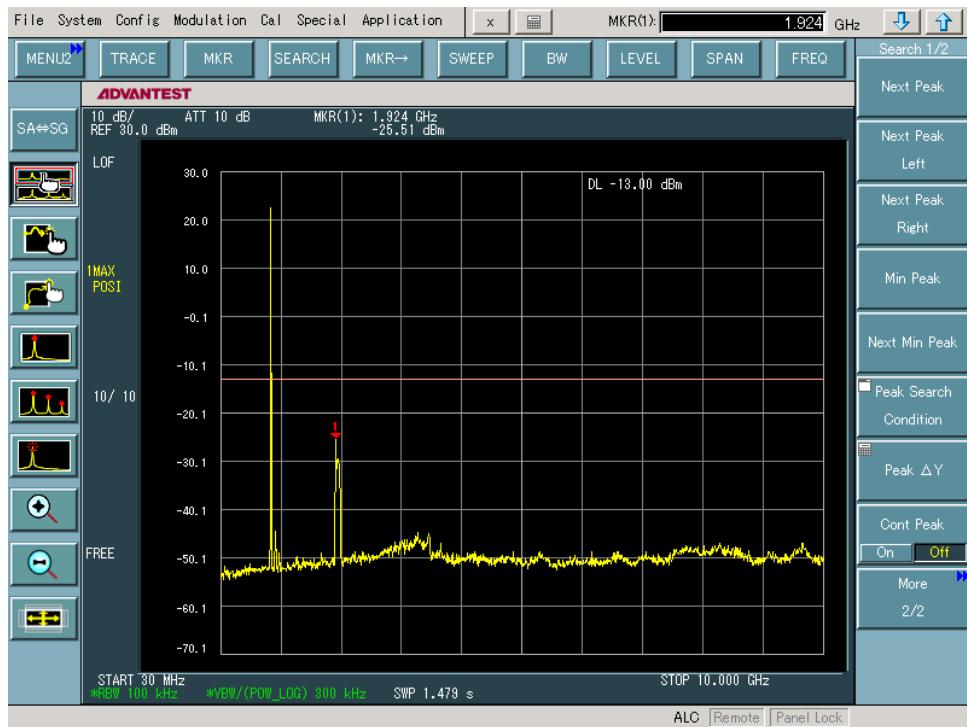


Two Tone Uplink Hi End Intermodulation

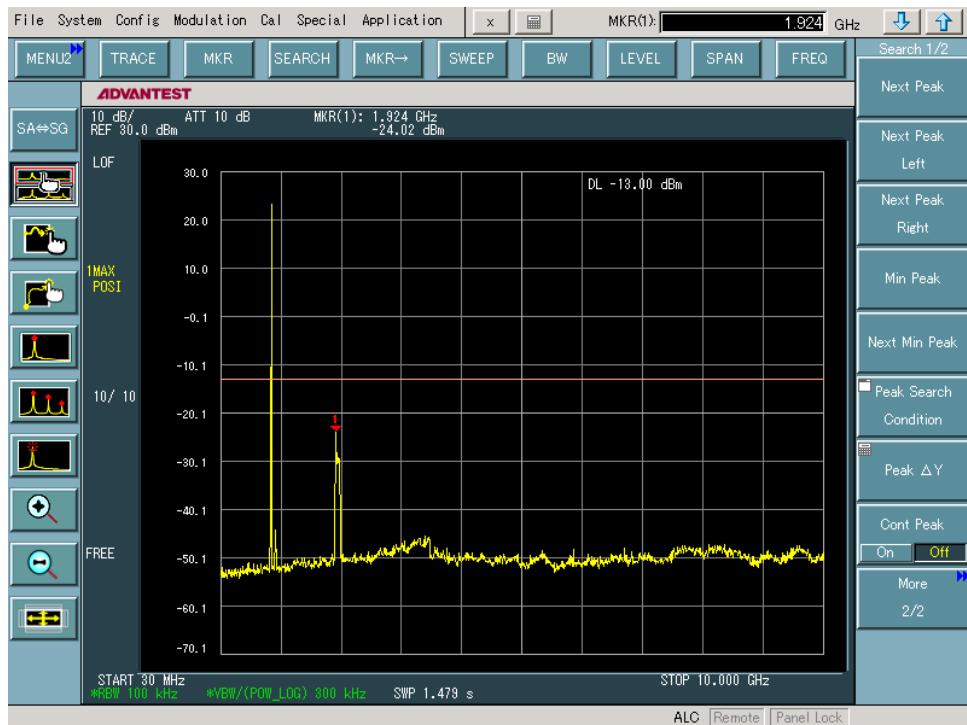
## Plots of Spurious Emission, iDEN800



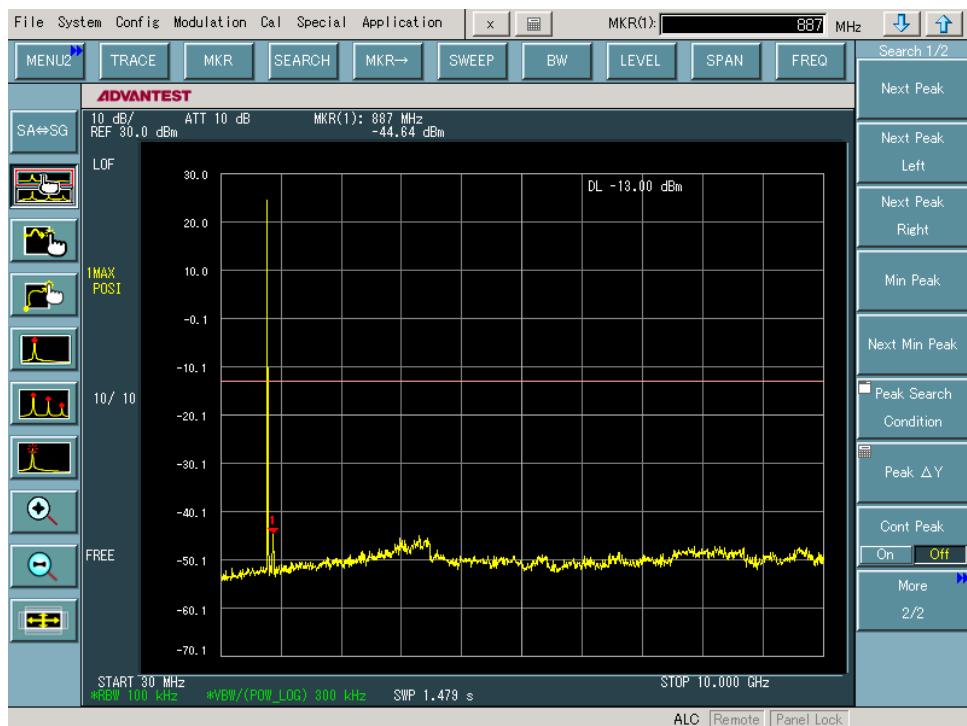
Conducted Spurious Emissions Downlink Low CH (30 MHz – 10 GHz)



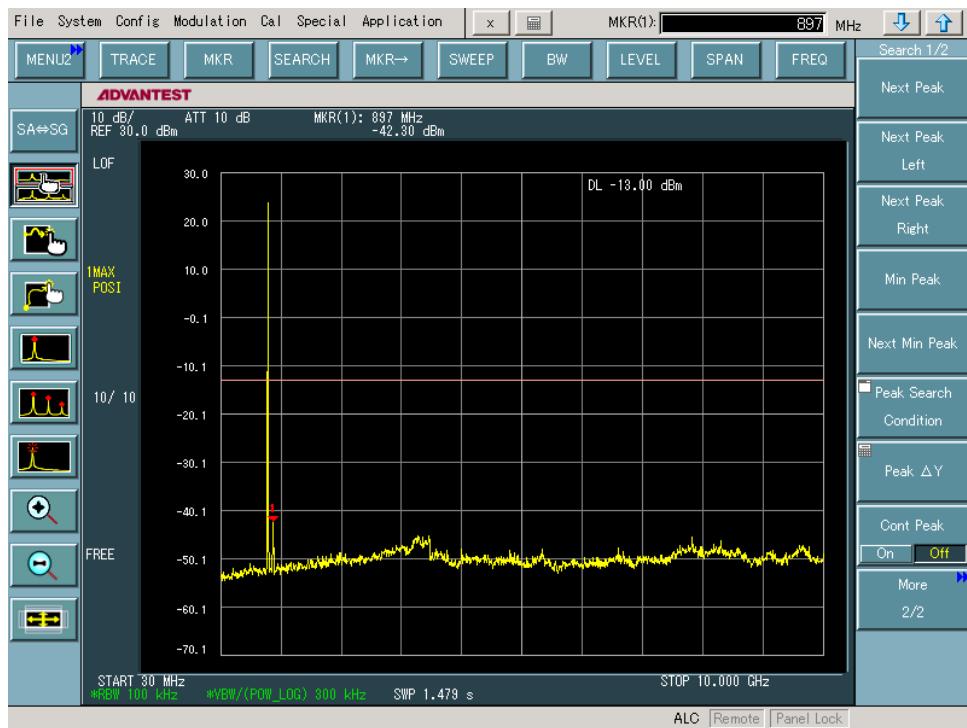
Conducted Spurious Emissions Downlink Mid CH (30 MHz – 10 GHz)



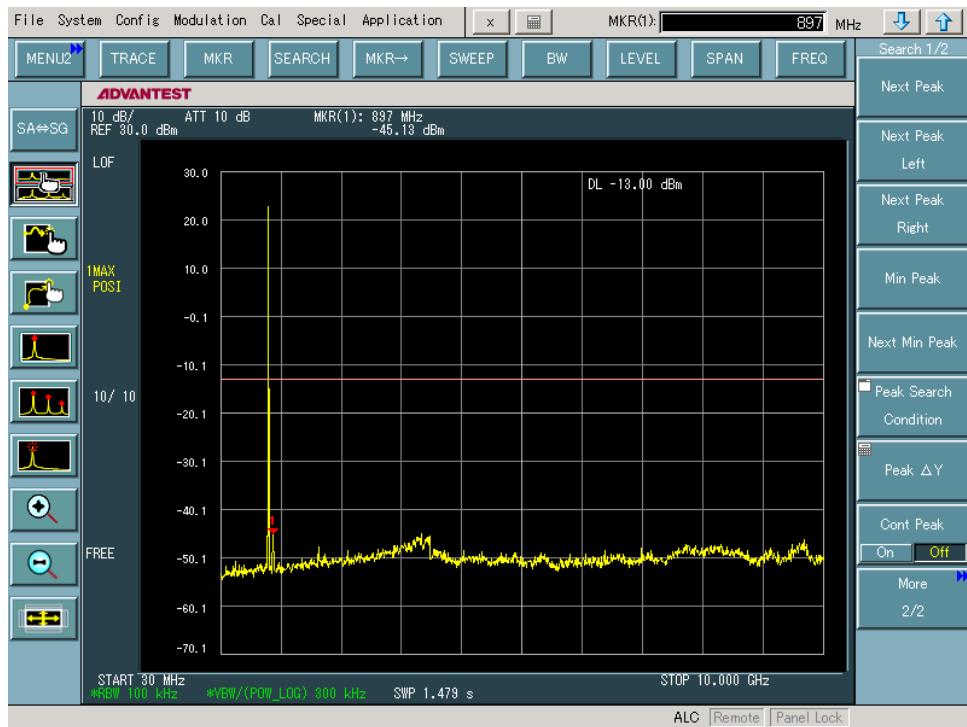
### Conducted Spurious Emissions Downlink High CH (30 MHz – 10 GHz)



### Conducted Spurious Emissions Uplink Low CH (30 MHz – 10 GHz)

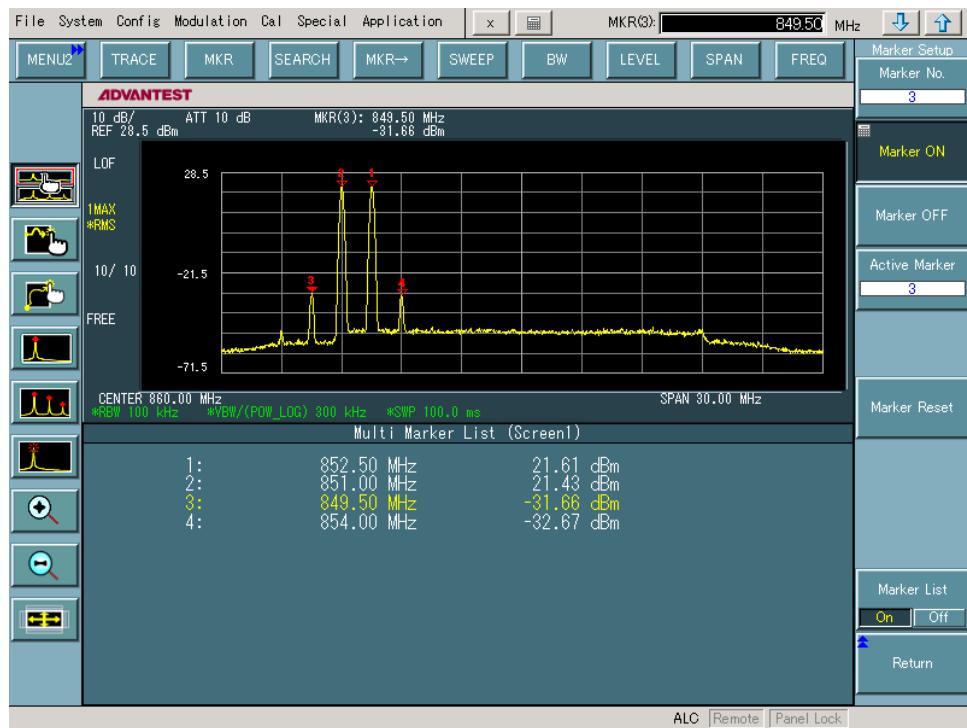


### Conducted Spurious Emissions Uplink Mid CH (30 MHz – 10 GHz)

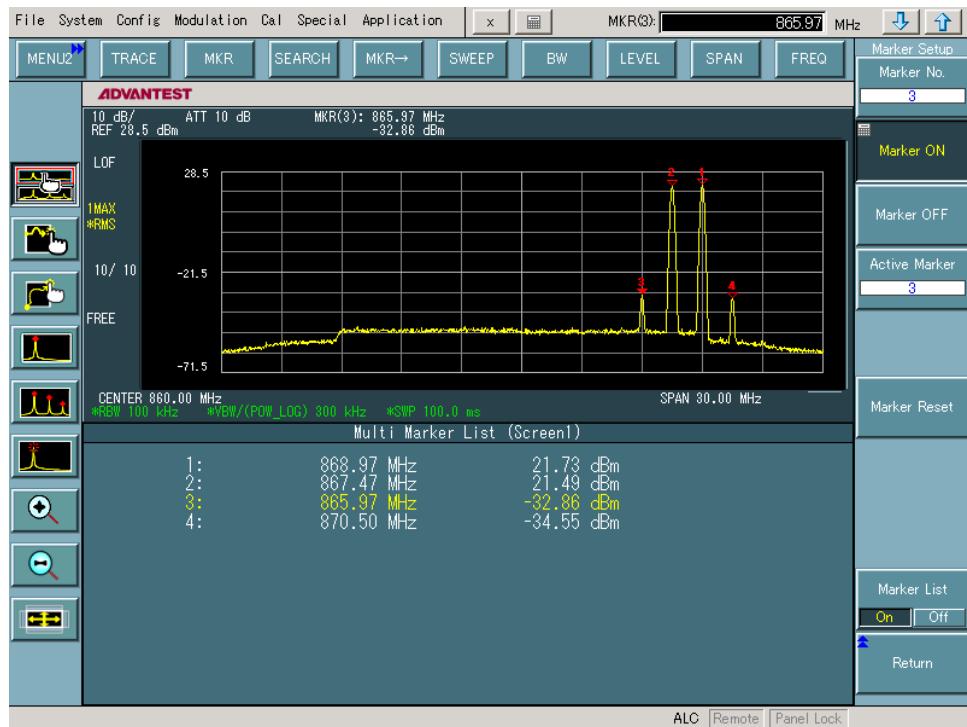


### Conducted Spurious Emissions Uplink High CH (30 MHz – 10 GHz)

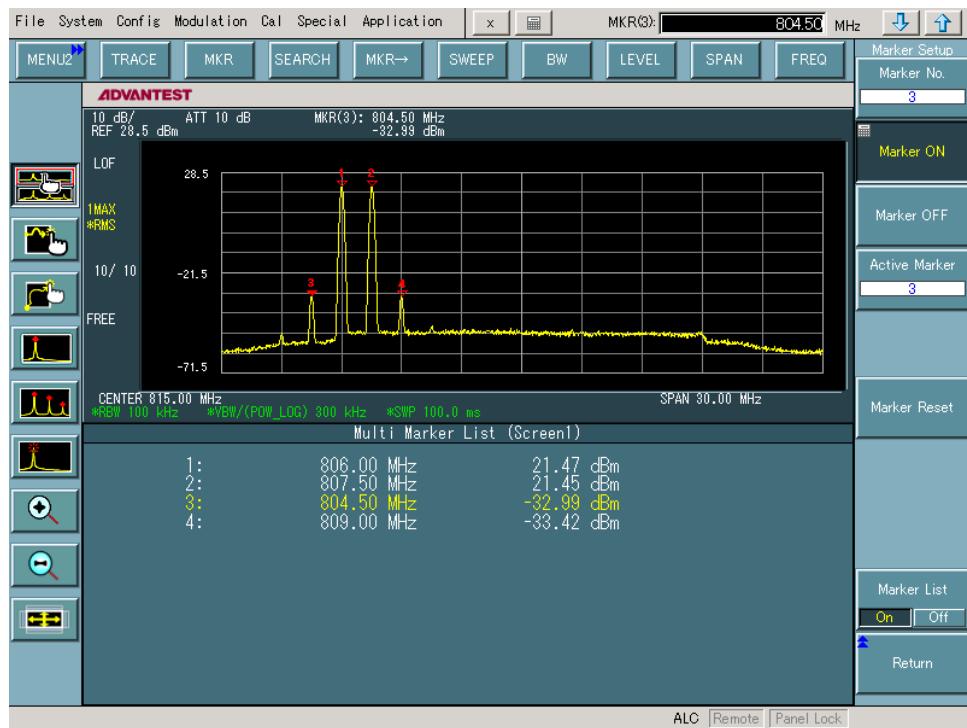
## Plots of Two Tone Intermodulation, iDEN 800



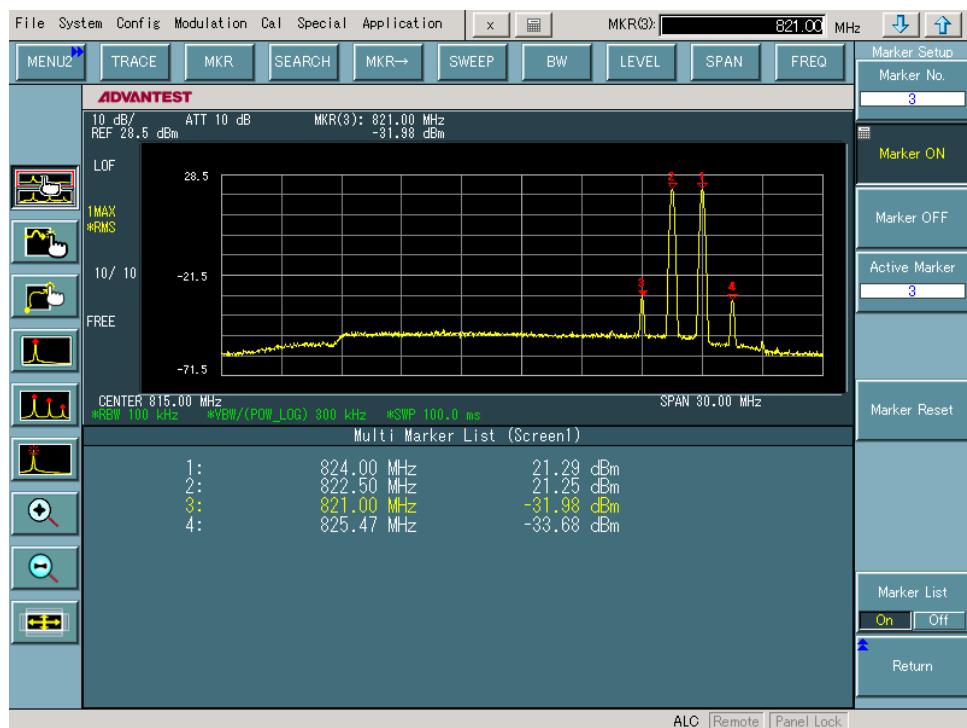
### Two Tone Downlink Low End Intermodulation



### Two Tone Downlink Hi End Intermodulation

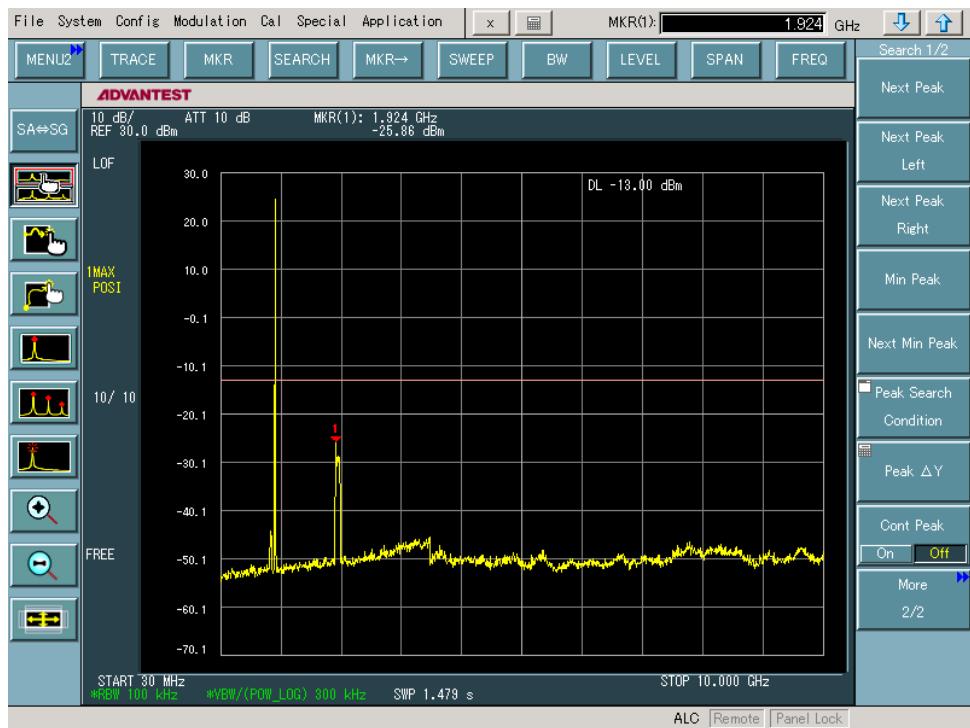


### Two Tone Uplink Low End Intermodulation

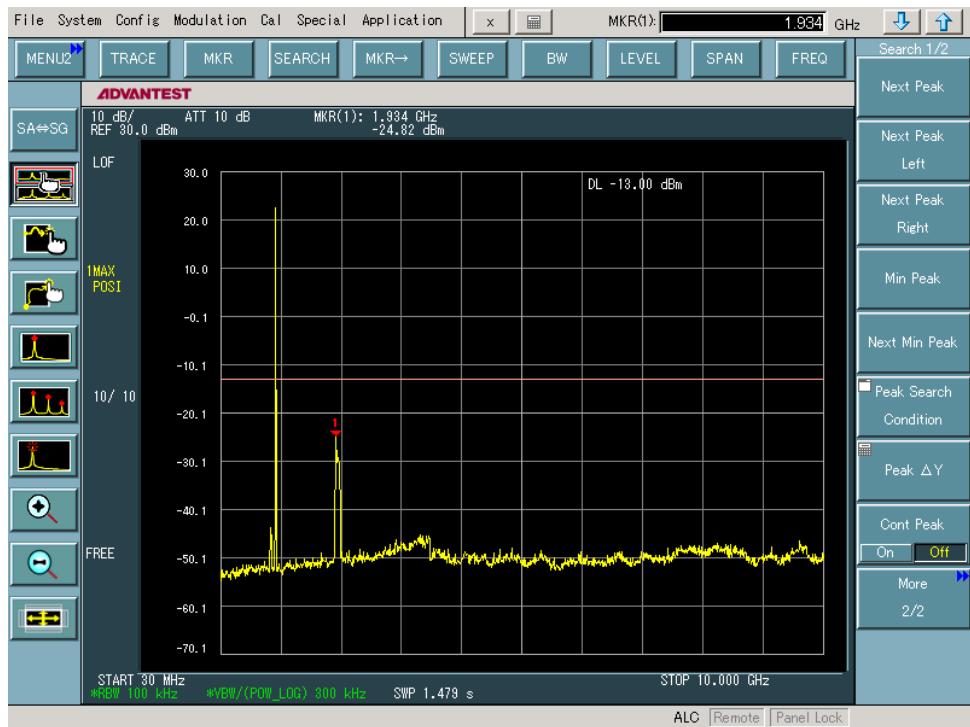


### Two Tone Uplink Hi End Intermodulation

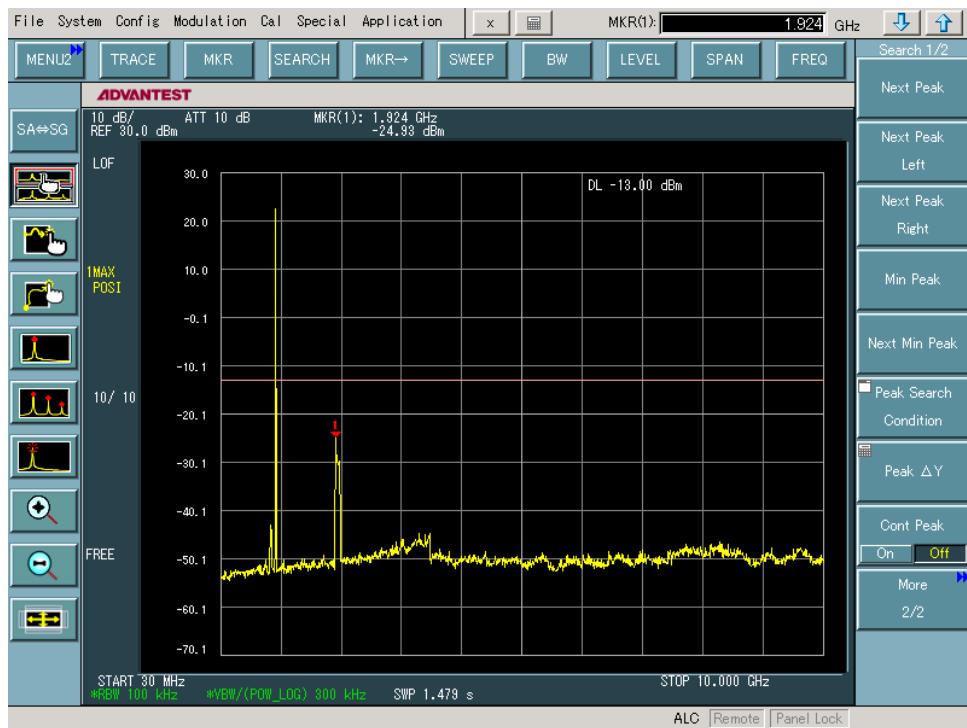
## Plots of Spurious Emission, iDEN900



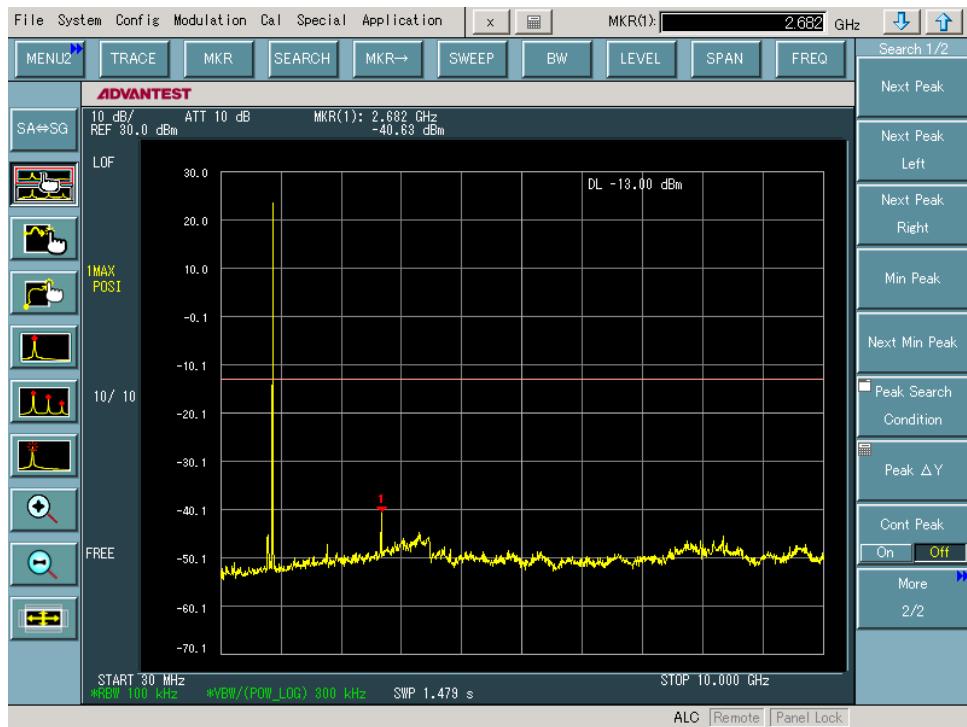
Conducted Spurious Emissions Downlink Low CH (30 MHz – 10 GHz)



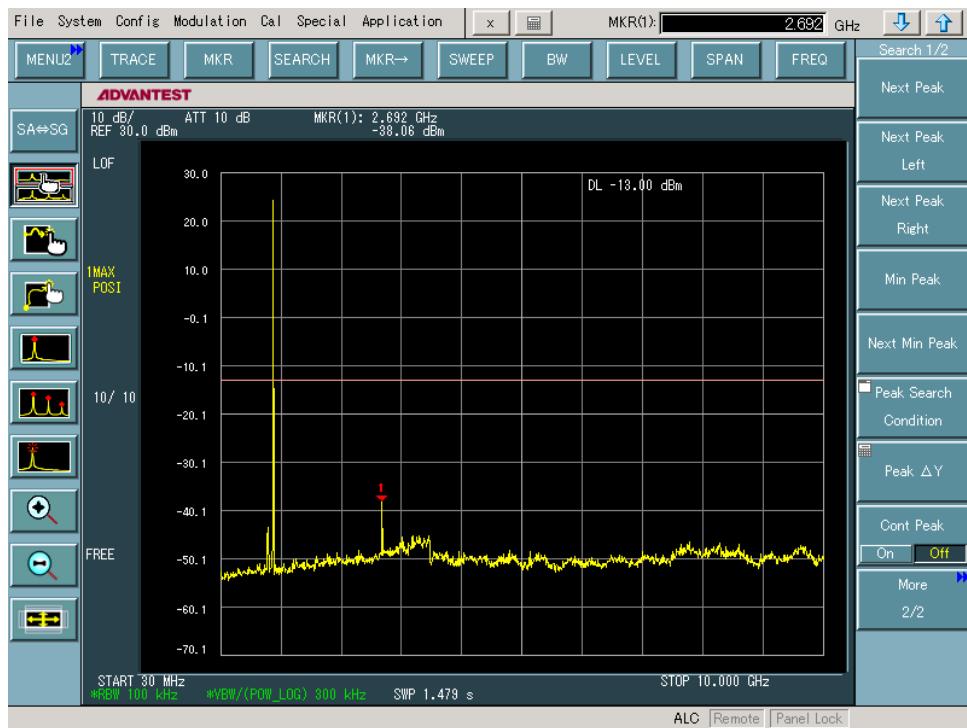
Conducted Spurious Emissions Downlink Mid CH (30 MHz – 10 GHz)



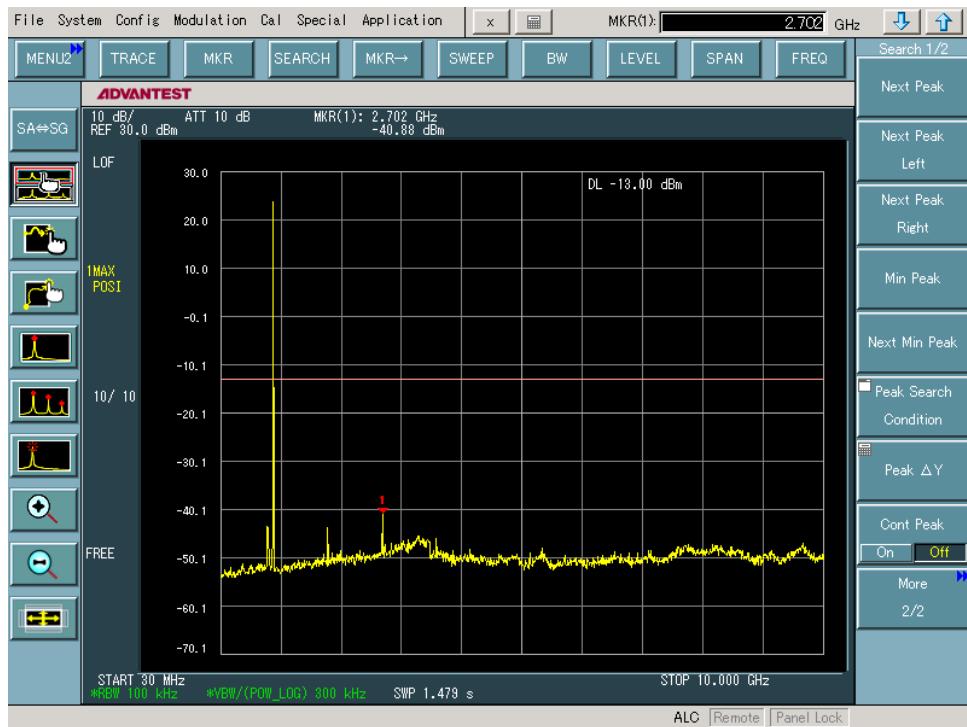
### Conducted Spurious Emissions Downlink High CH (30 MHz – 10 GHz)



### Conducted Spurious Emissions Uplink Low CH (30 MHz – 10 GHz)



### Conducted Spurious Emissions Uplink Mid CH (30 MHz – 10 GHz)

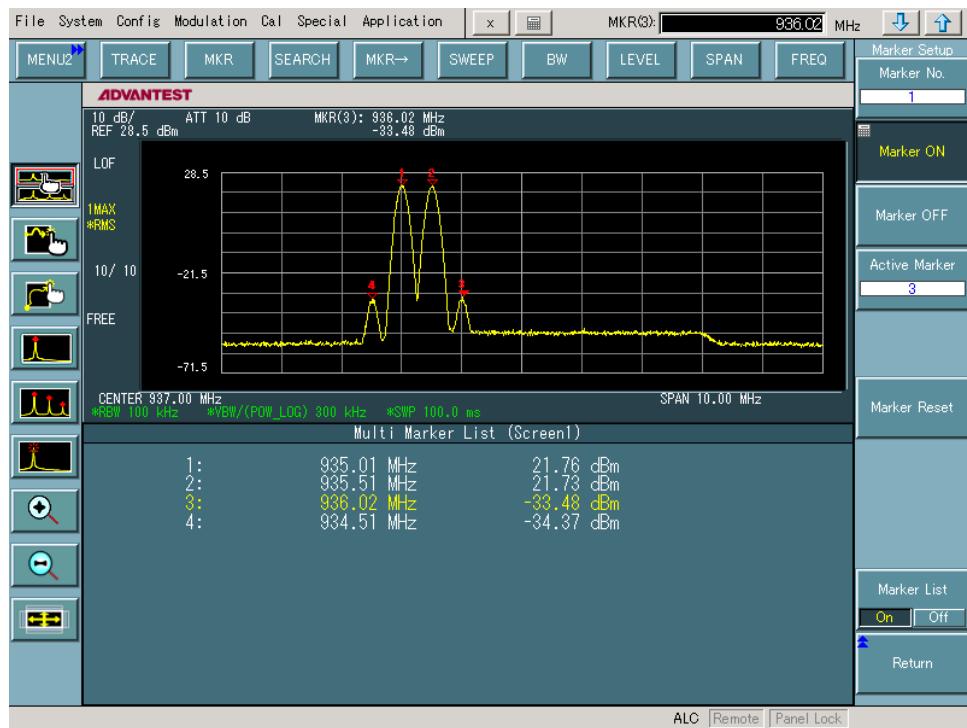


### Conducted Spurious Emissions Uplink High CH (30 MHz – 10 GHz)

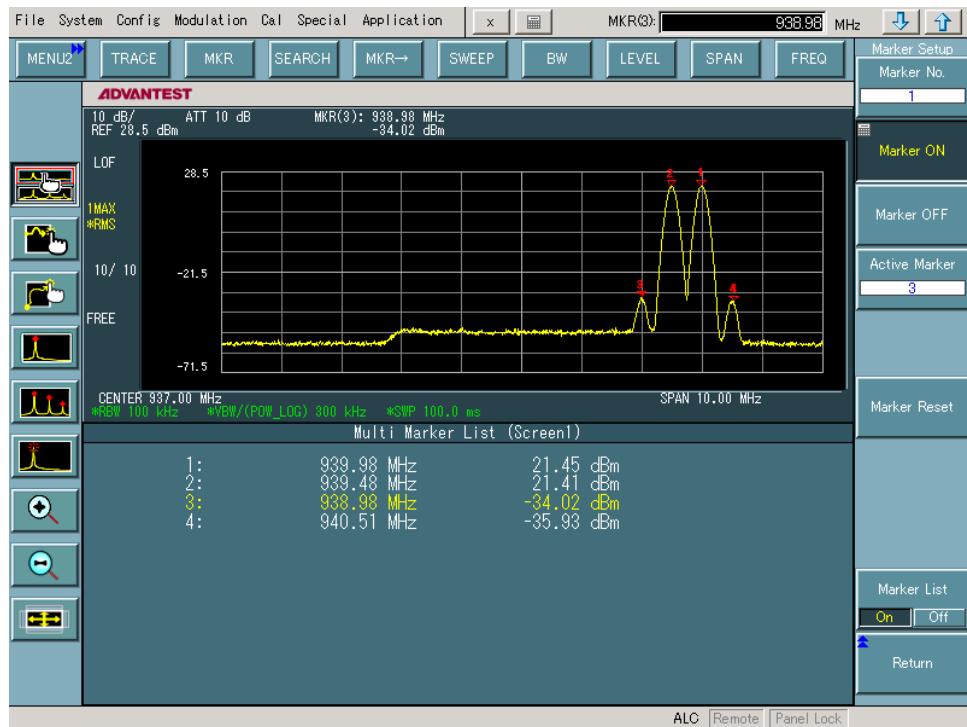
**HCT Co., Ltd.**

San 136-1, Ami-ri , Bubal-eup, Icheon-si, Kyounki-do, 467-701,Korea  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 [www.hct.co.kr](http://www.hct.co.kr)

## Plots of Two Tone Intermodulation, iDEN 900



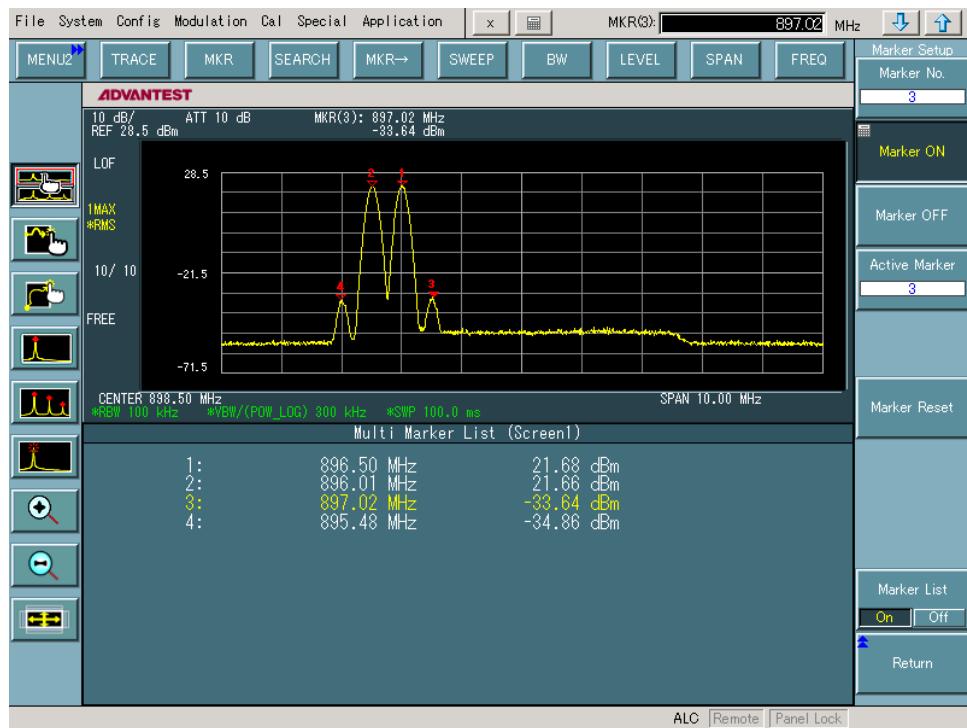
## Two Tone Downlink Low End Intermodulation



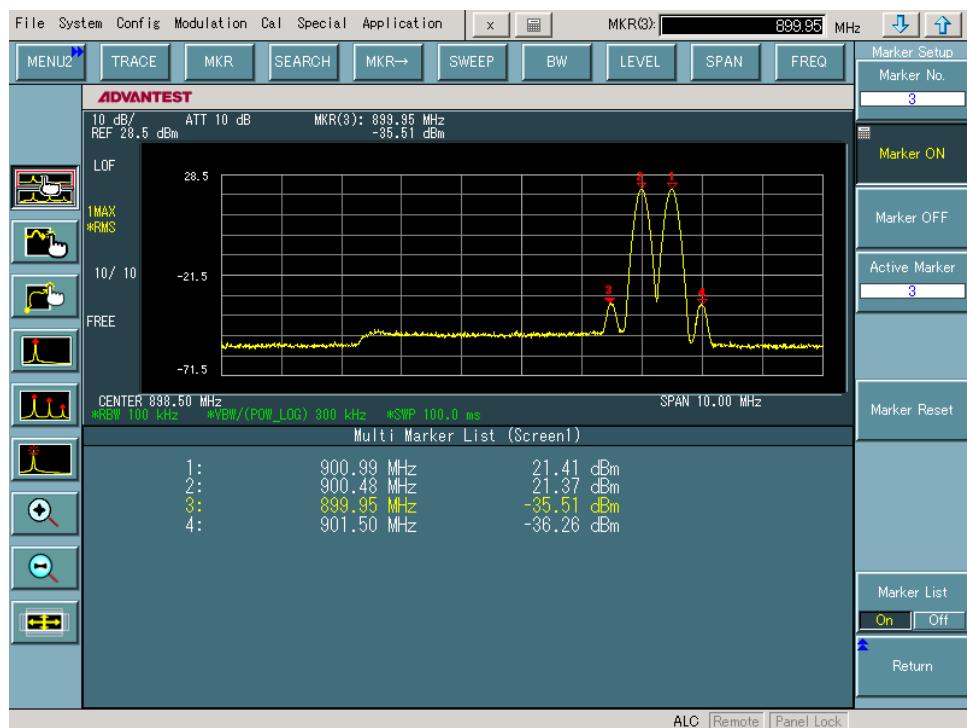
## Two Tone Downlink Hi End Intermodulation

**HCT Co., Ltd.**

San 136-1, Ami-ri , Bubal-eup, Icheon-si, Kyounki-do, 467-701,Korea  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 [www.hct.co.kr](http://www.hct.co.kr)



### Two Tone Uplink Low End Intermodulation



### Two Tone Uplink Hi End Intermodulation

## 9. 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.

**§ 24.238 Emission limitations for Broadband PCS equipment:** The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

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

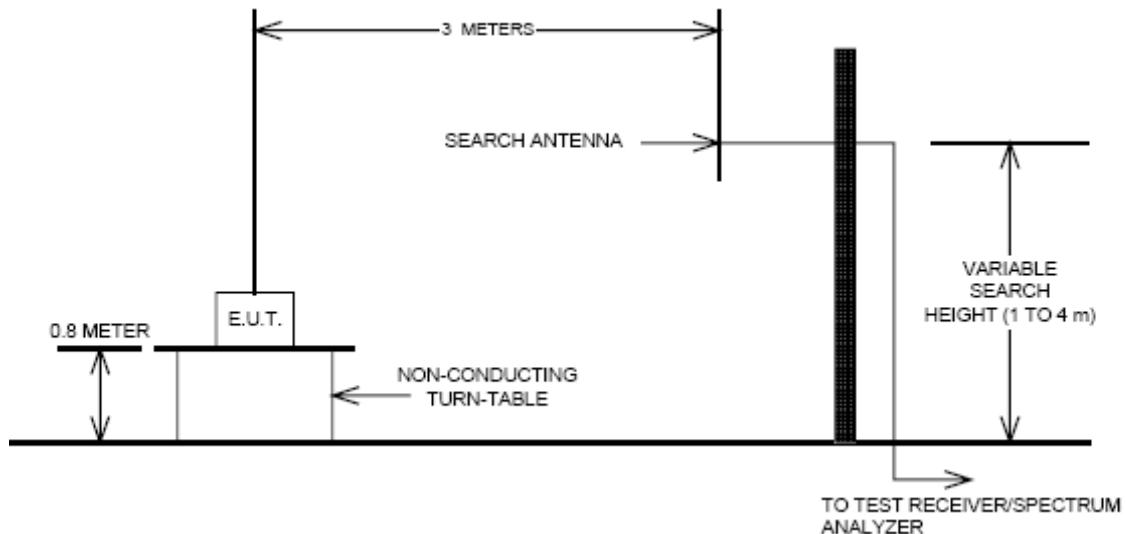
**Test Procedures:** As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 10 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 1-4m 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.

**Test Results:** There were no emissions detected above the noise floor which was at least 20 dB below the limit.

**NOTE:** The EUT is a band selective repeater. The test was performed using all selective bands and there was not much difference between them. The test result is reported using the widest bands.

## Radiated Spurious Emissions Test Setup



## 10. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS

### Test Requirement(s):

§2.1055(a)(1) §90.213

### 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.

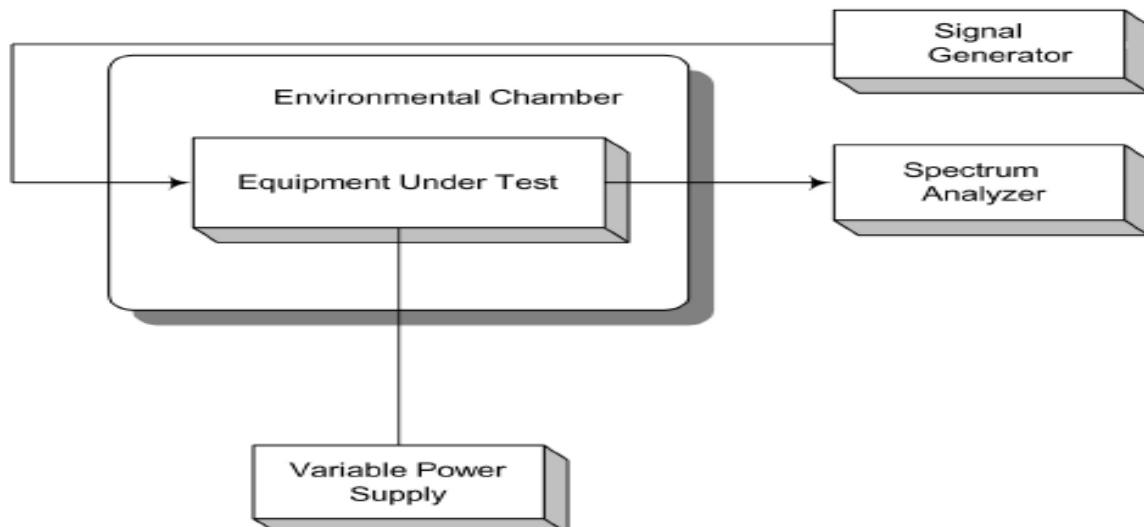
Voltage supplied to EUT is 120 Vac reference temperature was done at 20°C. The voltage was varied by  $\pm 15\%$  of nominal

### Test Results:

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

**NOTE:** The EUT is a band selective repeater. The test was performed using all selective bands and there was not much difference between them. The test result is reported using the widest bands.

### Test Setup:



## Frequency Stability and Voltage Test Results

**Reference:** 120 Vac at 20°C **Freq.** = 1882.500045 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift ppm
50	1882.500059	0.000014
40	1882.500051	0.000006
30	1882.500042	0.000003
20	Reference	
10	1882.500037	- 0.000008
0	1882.500020	- 0.000025
-10	1882.500016	- 0.000029
-20	1882.500003	- 0.000042
-30	1882.499997	- 0.000048

**Reference:** 120 Vac at 20°C **Freq.** = 1882.500045 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	1882.500012	0.000035
138	1882.500049	0.000004

**Uplink Mid CH CDMA**

**Reference:** 120 Vac at 20°C **Freq.** = 1962.499983 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift Ppm
50	1962.499977	- 0.000006
40	1962.499965	- 0.000018
30	1962.499960	- 0.000023
20	Reference	
10	1962.499987	0.000004
0	1962.499991	0.000008
-10	1962.499998	0.000015
-20	1962.500007	0.000024
-30	1962.500011	0.000028

**Reference:** 120 Vac at 20°C **Freq.** = 1962.499983 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	1962.499977	- 0.000006
138	1962.499997	- 0.000014

**Downlink Mid CH CDMA**

**HCT Co., Ltd.**

San 136-1, Ami-ri , Bubal-eup, Icheon-si, Kyounki-do, 467-701,Korea  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 [www.hct.co.kr](http://www.hct.co.kr)

- 55 /58-

**Reference:** 120 Vac at 20°C **Freq.** = 813.612463 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift ppm
50	813.612479	0.000016
40	813.612470	0.000007
30	813.612468	0.000005
20	Reference	
10	813.612460	- 0.000003
0	813.612457	- 0.000006
-10	813.612451	- 0.000012
-20	813.612448	- 0.000015
-30	813.612443	- 0.000020

**Reference:** 120 Vac at 20°C **Freq.** = 813.612463 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	813.612458	- 0.000005
138	813.612470	- 0.000007

**Uplink Mid CH, iDEN 800**

**Reference:** 120 Vac at 20°C **Freq.** = 858.612488 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift ppm
50	858.612495	0.000007
40	858.612490	0.000002
30	858.612487	- 0.000001
20	Reference	
10	858.612478	- 0.000010
0	858.612467	- 0.000021
-10	858.612462	- 0.000026
-20	858.612460	- 0.000028
-30	858.612453	- 0.000035

**Reference:** 120 Vac at 20°C **Freq.** = 858.612488 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	858.612475	- 0.000013
138	858.612497	0.000009

**Downlink Mid CH, iDEN 800**

**HCT Co., Ltd.**

San 136-1, Ami-ri , Bubal-eup, Icheon-si, Kyounki-do, 467-701,Korea  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 [www.hct.co.kr](http://www.hct.co.kr)

**Reference:** 120 Vac at 20°C **Freq.** = 898.500006 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift Ppm
50	898.499988	0.000018
40	898.499984	0.000022
30	898.499991	0.000015
20	Reference	
10	898.499999	0.000007
0	898.499997	0.000009
-10	898.499982	0.000024
-20	898.499977	0.000029
-30	898.499979	0.000027

**Reference:** 120Vac at 20°C **Freq.** = 898.500006 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	898.499985	0.021
138	898.499995	0.011

**Uplink Mid CH, iDEN 900**

**Reference:** 120 Vac at 20°C **Freq.** = 937.499987 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift Ppm
50	937.499981	0.000006
40	937.499995	-0.000008
30	937.499983	0.000004
20	Reference	
10	937.500003	-0.000016
0	937.499997	-0.000010
-10	937.499983	0.000004
-20	937.499989	-0.000002
-30	937.499992	-0.000005

**Reference:** 120Vac at 20°C **Freq.** = 937.499987 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	937.499982	0.000005
138	937.499997	-0.000010

**Downlink Mid CH, iDEN 900**

**HCT Co., Ltd.**

San 136-1, Ami-ri , Bubal-eup, Icheon-si, Kyounki-do, 467-701,Korea  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 [www.hct.co.kr](http://www.hct.co.kr)

- 57 /58-