

**HCT CO., LTD.**

## CERTIFICATION DIVISION

105-1, JANGAM-RI, MAJANG-MYEON, ICHEON-SI, GYEONGGI-DO, KOREA  
TEL : +82 31 645 6300 FAX : +82 31 645 6401 [www.hct.co.kr](http://www.hct.co.kr)**CERTIFICATE OF COMPLIANCE**

## FCC PART 27 Certification

<b>Applicant Name:</b> GS Instruments Co.,Ltd.	<b>Date of Issue:</b> November 12, 2012 <b>Test Site/Location:</b> HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Gyeonggi-Do, Korea <b>Test Report No.:</b> HCTR1210FR16-1 <b>HCT FRN:</b> 0005866421 <b>IC Recognition No.:</b> 5944A-3
<b>Address:</b> 1385-14, Juan-Dong, Nam-Ku, Incheon, 402-200, Korea	

<b>FCC ID</b>	:	<b>U88-SMT-P33</b>
<b>IC</b>	:	<b>8137A-SMT-P33</b>
<b>APPLICANT</b>	:	<b>GS Instruments Co.,Ltd.</b>

<b>EUT Type:</b>	<b>CDMA In-Building RF Repeater</b>
<b>Model:</b>	<b>SMT-P33</b>
<b>Frequency Ranges:</b>	<b>DL : 1930 MHz ~ 1995 MHz</b> <b>UL : 1850 MHz ~ 1915 MHz</b>
<b>Conducted Output Power:</b>	<b>DL : 2.04 W , UL : 2.04 W</b>
<b>FCC Rules Part(s):</b>	<b>CFR 47, Part 24</b>
<b>IC Rules Part(s):</b>	<b>RSS-131, RSS-GEN</b>

**Engineering Statement:**

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

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

Approved by  
: Sang Jun Lee  
Manager of RF Team

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# Revision

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1210FR16	October 11, 2012	First Approval Report
HCTR1210FR16-1	November 12, 2012	Some comments for KDB935210 were added.

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## 1. CLIENT INFORMATION

The EUT has been tested by request of

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

■ FCC ID: **U88-SMT-P33**

■ APPLICANT: **GS Instruments Co.,Ltd.**

■ EUT Type: **CDMA In-Building RF Repeater**

■ Model: **SMT-P33**

■ Frequency Ranges: **DL : 1930 MHz ~ 1995 MHz  
UL : 1850 MHz ~ 1915 MHz**

■ Conducted Output Power: **DL : 30.11 dBm  
UL : 30.10 dBm**

■ Antenna Gain(s): **DL : 3 dBi , UL : 9 dBi**

■ FCC Rules Part(s): **CFR Title 47 Part 24**

■ IC Rules Part(s): **RSS-131, RSS-GEN**

■ Place of Tests: **105-1, Jangam-ri , Majang-Myeon, Icheon-si, Gyeonggi-Do,  
467-811, KOREA. (IC Recognition No. : 5944A-3)**

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## 2. TEST SPECIFICATIONS

Description	Reference (FCC)	Reference (IC)	Results
RF Power Output	§2.1046; §24.232	RSS-131, Section 6.2	Compliant
Occupied Bandwidth Passband Gain	§2.1049	RSS-131, Section 6.1 RSS-GEN, Section 4.6.1	Compliant
Spurious Emissions at Antenna Terminals	§2.1053, §24.238	RSS-131, Section 6.3 RSS-131, Section 6.4	Compliant
Radiated Spurious Emissions	§2.1053, §24.238	-	Compliant
Frequency Stability	§2.1055, §24.235	RSS-131, Section 6.5	Compliant

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

## 3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

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

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## 4. TEST EQUIPMENT

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

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## 5. RF OUTPUT POWER

### Test Requirements:

### 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.** (a)(1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see Tables 1 and 2 of this section.

(4) The service area boundary limit and microwave protection criteria specified in §§ 24.236 and 24.237 apply

### Test Requirements: RSS-131 6.2

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

#### **Additional Power Back-off Condition for Multiple Carrier Operations:**

An example of a single carrier operation is a band translator that incorporates an (IF) filter of a

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

An example of a multiple carrier operation is the use of an enhancer to amplify off-air signals that contain the wanted carrier and two (or more) adjacent band carriers. If the enhancer passband is wide enough to pass more than the wanted channel bandwidth, the enhancer output stage will be loaded by the multiple carriers.

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

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

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

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

### Test Procedures:

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

### Test Procedures: RSS-131 4.3

#### 4.3.1 Multi-channel Enhancer

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

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

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

Set the two generator frequencies  $f_1$  and  $f_2$  such that they and their third-order intermodulation product frequencies,  $f_3 = 2f_1-f_2$  and  $f_4 = 2f_2 - f_1$ , are all within the passband of the DUT.

Raise the input level to the DUT while observing the output tone levels,  $P_{o1}$  and  $P_{o2}$ , and the intermodulation product levels,  $P_{o3}$  and  $P_{o4}$ .

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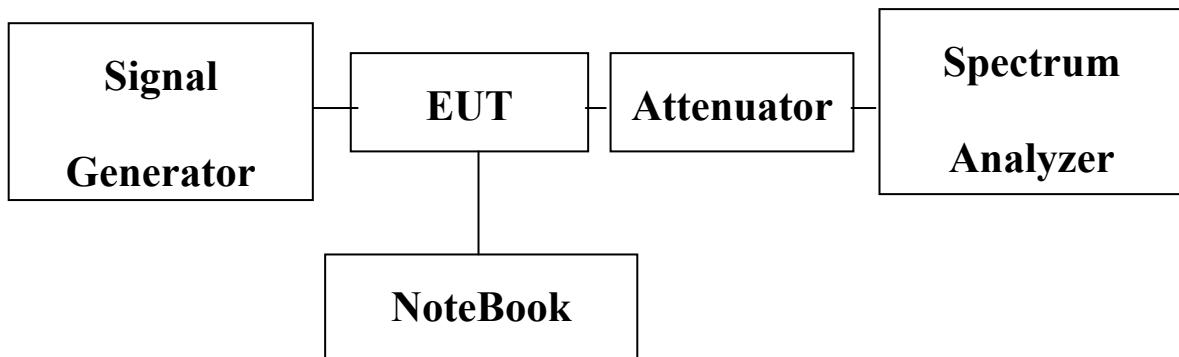
**For enhancers rated 500 watts or less:** Raise the input level to the DUT until the greater level of the intermodulation products at the enhancer output terminals, Po3 or Po4, equals -43 dBW.

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

Record all signal levels and their frequencies. Calculate the mean output power (Pmean) under this testing condition using  $P_{mean} = Po1 + 3 \text{ dB}$ .

#### 4.3.2 Single Channel Enhancer

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



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

#### Test Results:

※ According to KDB935210, both cases (Maximum input rating and Maximum gain setting) were looked at and the test result (Output Power and Spectral Shape) were almost same in uplink and downlink.

If we input a higher value than regulated value, the EUT is shut down to prevent itself.

The Test report was recorded the result of maximum gain setting mode only because it was a little worst case for EUT.

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### Sample Calculation

Output Power = Reading Value + ATT loss + Cable loss

1. Spectrum reading values are not plot data. The power results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss (35.15 dB at downlink, and 35.07 dB at uplink)
3. Actual value of loss for the attenuator and cable combination is 35.15 dB at 1960 MHz, 35.12 dB at 1930 MHz, 35.18 dB at 1990 MHz, 35.07 dB at 1880 MHz, 35.06 dB at 1850 MHz, and 35.10 dB at 1910 MHz

Input Signal	Modulation	Level (dBm)
CDMA	QPSK	-56.6
LTE	64QAM	-56.6

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**[Downlink]**

	Channel	Frequency (MHz)	Output Power (dBm)
CDMA	Low	1931.25	33.04
	Middle	1962.50	33.05
	High	1988.75	33.07
LTE 5 MHz	Low	1932.50	33.07
	Middle	1960.00	33.03
	High	1987.50	33.02
LTE 10 MHz	Low	1935.00	33.05
	Middle	1960.00	33.09
	High	1985.00	33.11

**[Uplink]**

	Channel	Frequency (MHz)	Output Power (dBm)
CDMA	Low	1851.25	33.03
	Middle	1882.50	33.03
	High	1908.75	33.09
LTE 5 MHz	Low	1852.50	33.08
	Middle	1880.00	33.03
	High	1907.50	33.04
LTE 10 MHz	Low	1855.00	33.03
	Middle	1880.00	33.03
	High	1905.00	33.10

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## Plots of RF Output Power

### [CDMA Downlink Low]

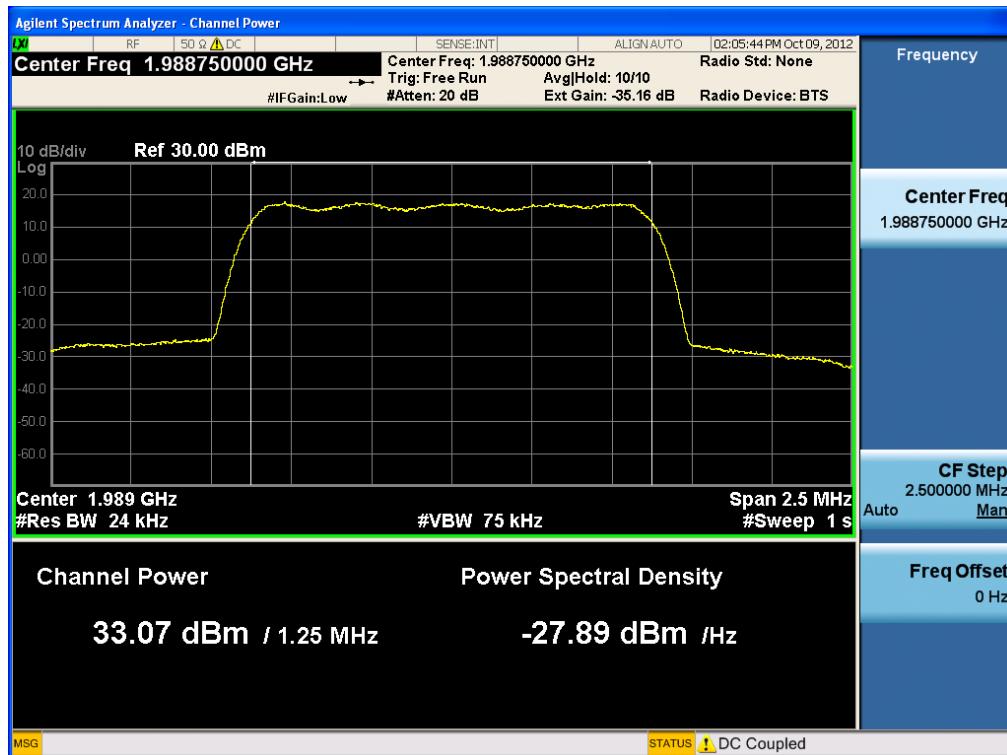


### [CDMA Downlink Middle]

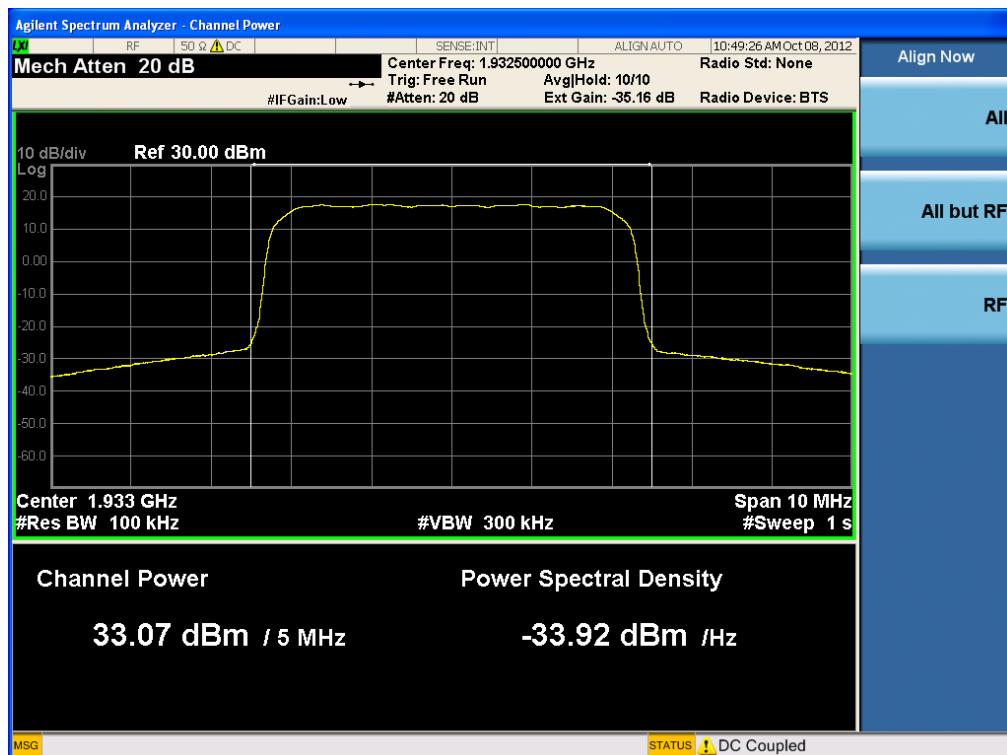


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### [CDMA Downlink High]



### [LTE Downlink Low 5 MHz]

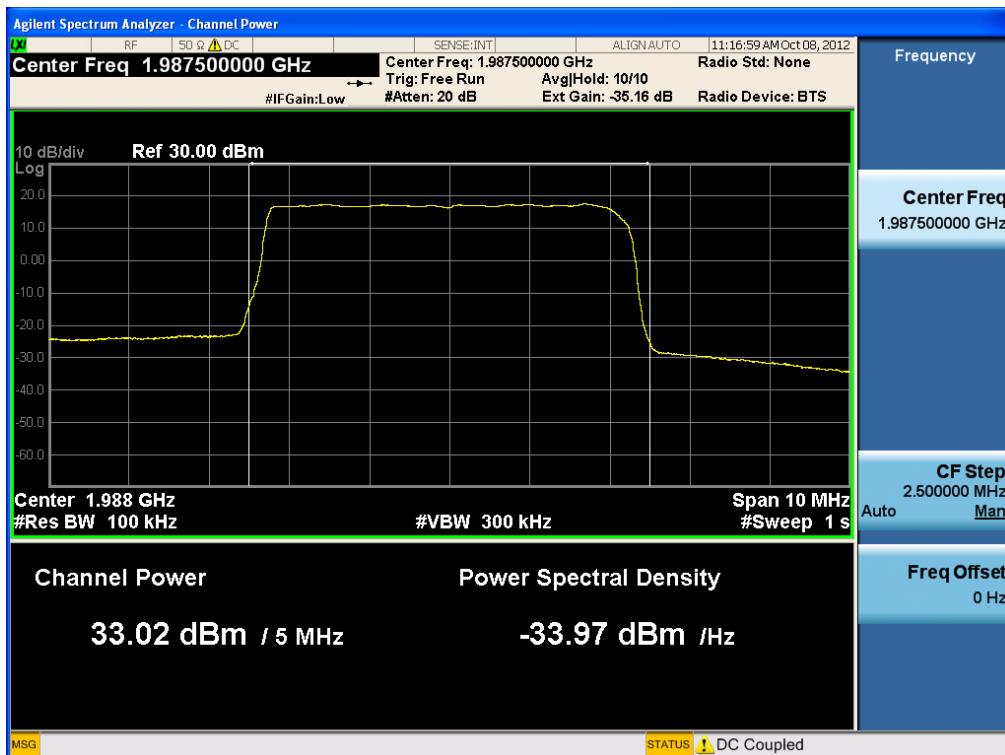


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### [LTE Downlink Middle 5 MHz]



### [LTE Downlink High 5 MHz]



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### [LTE Downlink Low 10 MHz]



### [LTE Downlink Middle 10 MHz]



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### [LTE Downlink High 10 MHz]

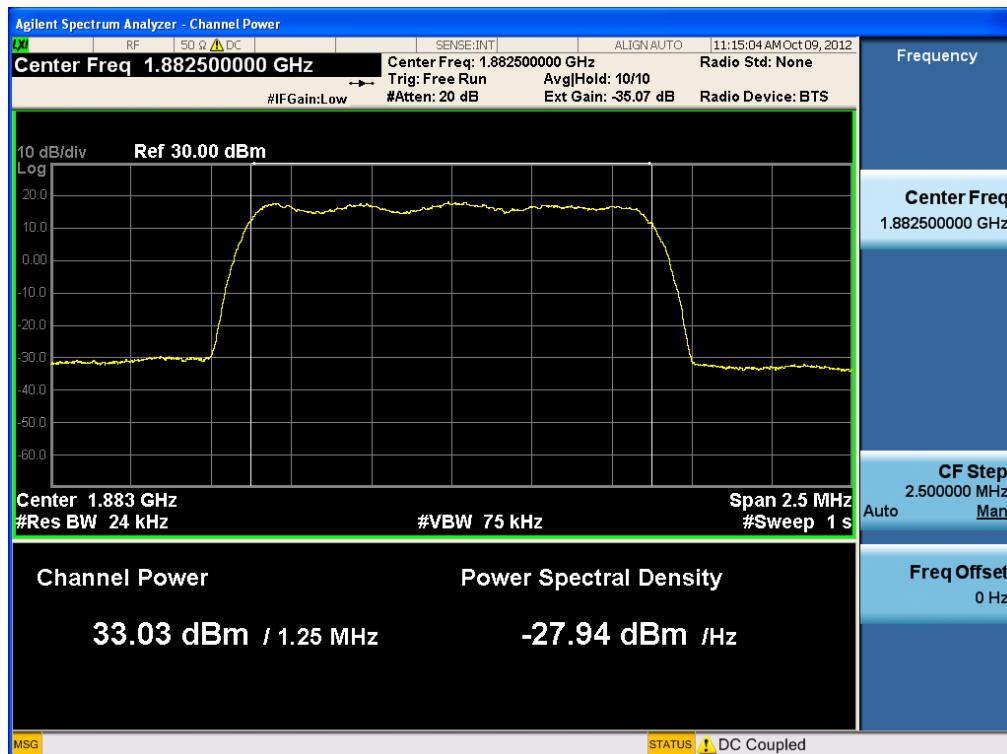


### [LTE Uplink Low]



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### [LTE Uplink Middle]

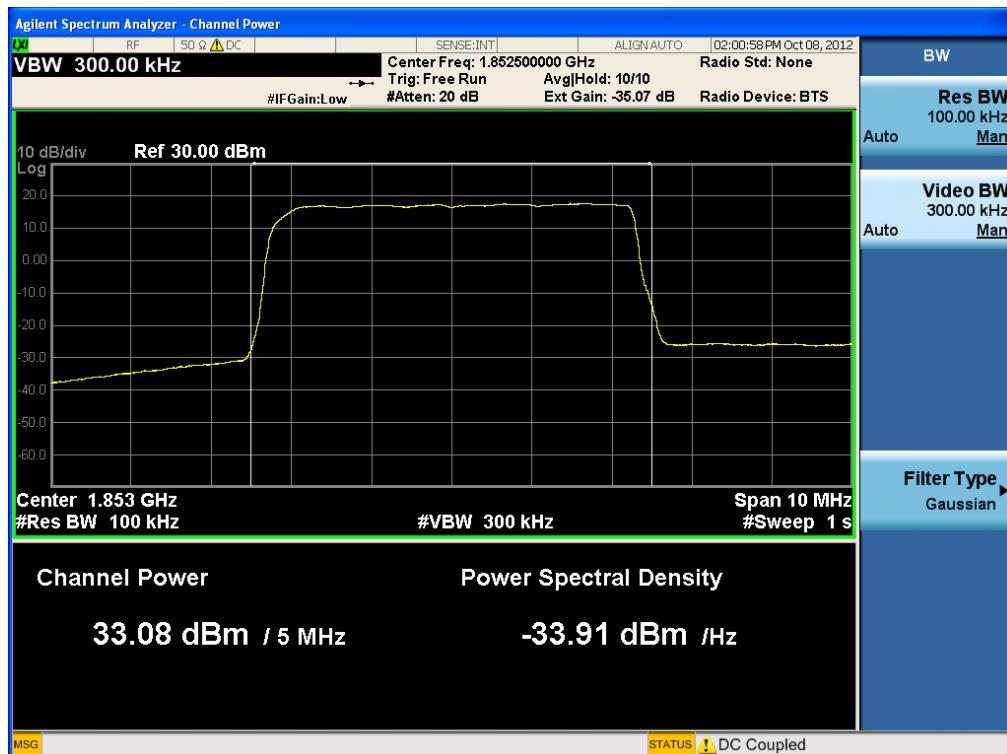


### [LTE Uplink High]



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### [CDMA Uplink Low 5 MHz]

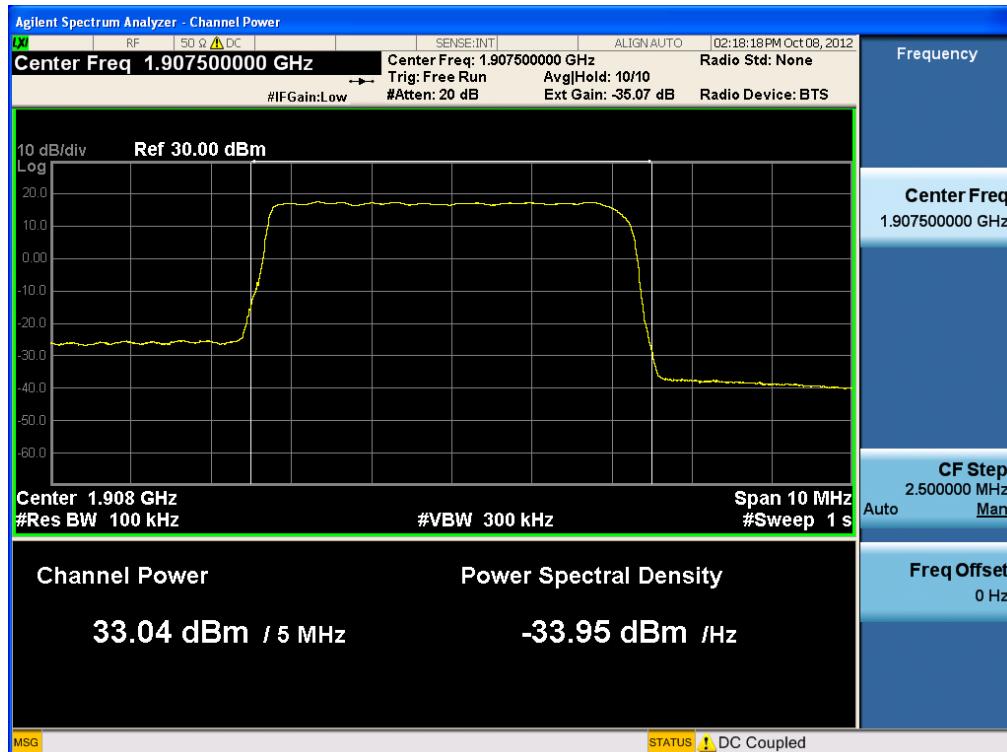


### [CDMA Uplink Middle 5 MHz]

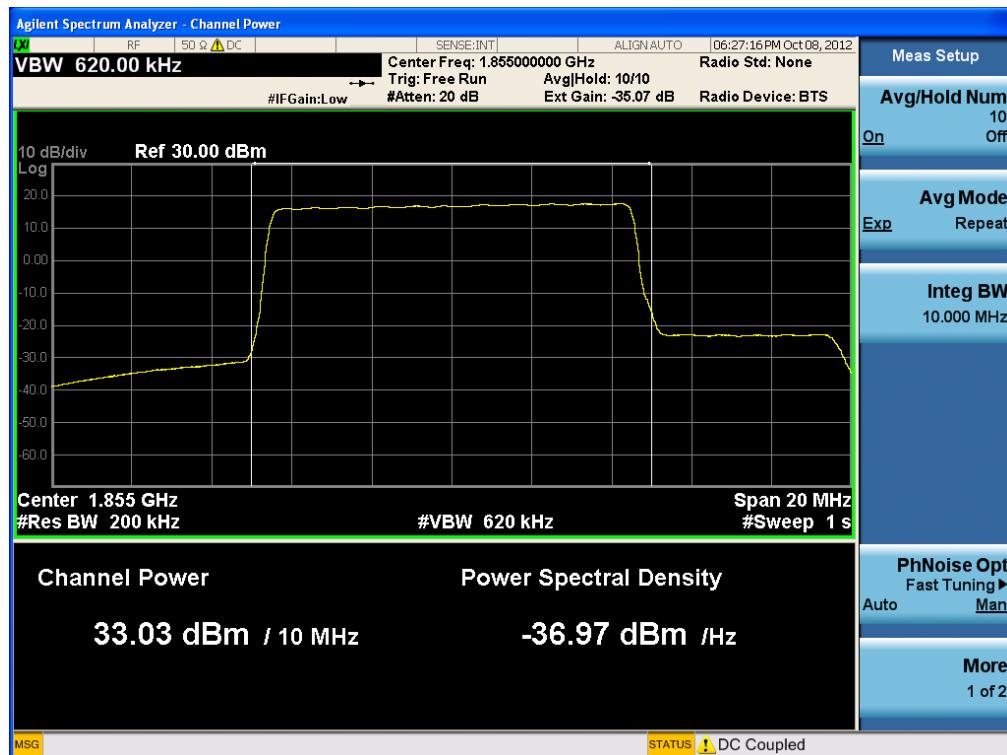


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### [CDMA Uplink High 5 MHz]



### [CDMA Uplink Low 10 MHz]



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### [CDMA Uplink Middle 10 MHz]



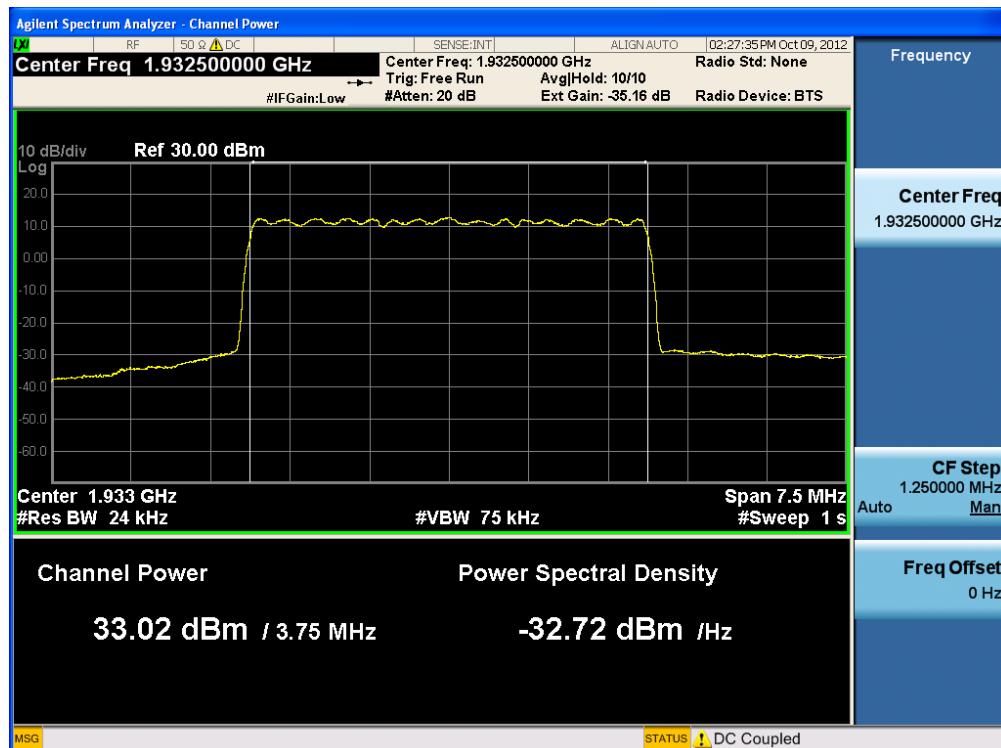
### [CDMA Uplink High 10 MHz]



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\* RSS-131 6.2 Power Back-off : 33.02 – 28.32 = 4.7 dB

[Downlink 3 carriers]



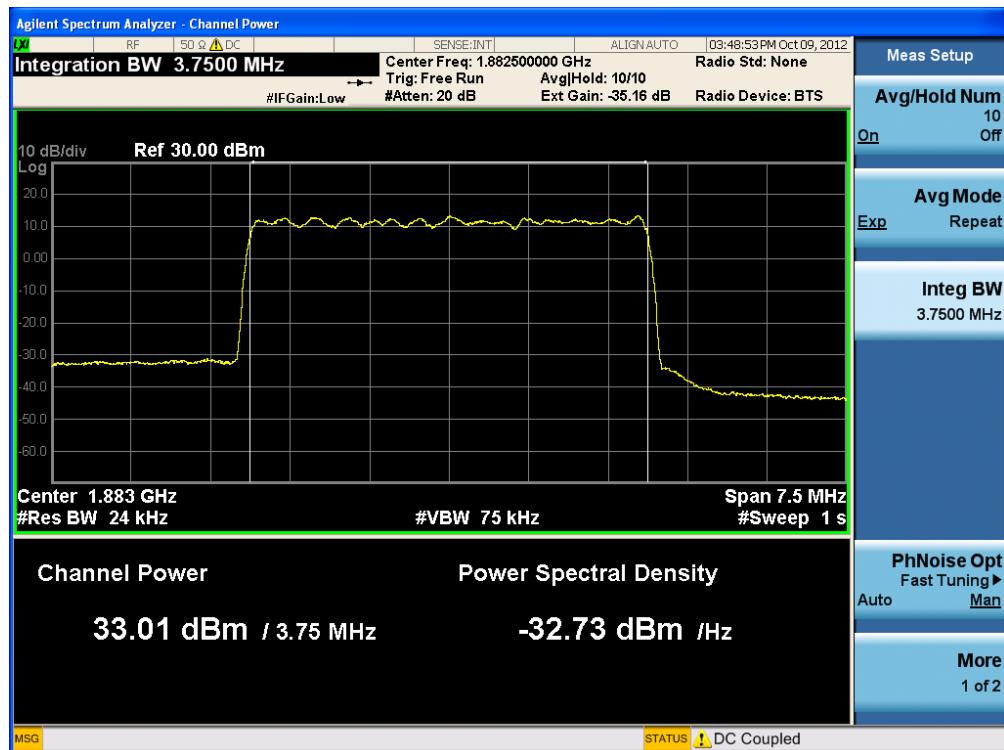
[Downlink 1 carrier]



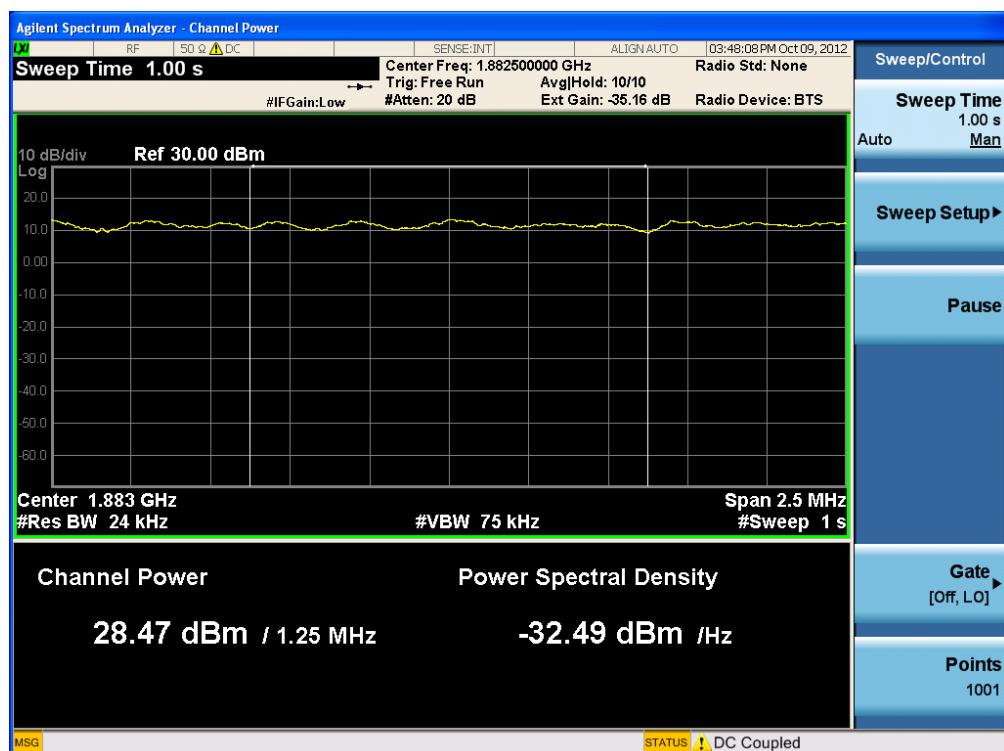
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\* RSS-131 6.2 Power Back-off :  $33.01 - 28.47 = 4.54$  dB

[Uplink 3 carriers]



[Uplink 1 carrier]



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## 6. OCCUPIED BANDWIDTH

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

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

### Test Requirements: RSS-131 6.1

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

### Test Procedures: RSS-131 6.1

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

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

### Test Procedures: RSS-131 4.2

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

With the aid of a signal generator and spectrum analyser, measure the 20 dB bandwidth of the amplifier (i.e. at the point where the gain has fallen by 20 dB). Measure the gain-versus-frequency response of the amplifier from the midband frequency  $f_0$  of the passband up to at least  $f_0 + 250\%$  of the 20 dB bandwidth.

### Test Results:

The EUT complies with the requirements of this section.

Input Signal	Modulation	Level (dBm)
CDMA	QPSK	-56.6
LTE	64QAM	-56.6

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**[Downlink]**

	Channel	Frequency MHz	OBW (Output) MHz	OBW (Input) MHz
CDMA	Low	1931.25	1.2580	1.2663
	Middle	1962.50	1.2621	1.2660
	High	1988.75	1.2586	1.2656
LTE 5 MHz	Low	1932.50	4.4311	4.5016
	Middle	1960.00	4.4988	4.5018
	High	1987.50	4.4355	4.5017
LTE 10 MHz	Low	1935.00	8.9728	8.9959
	Middle	1960.00	8.9646	8.9954
	High	1985.00	8.9632	8.9947

**[Uplink]**

	Channel	Frequency MHz	OBW (Output) MHz	OBW (Input) MHz
CDMA	Low	1851.25	1.2600	1.2661
	Middle	1882.50	1.2623	1.2646
	High	1908.75	1.2585	1.2654
LTE 5 MHz	Low	1852.50	4.4321	4.5028
	Middle	1880.00	4.5024	4.5028
	High	1907.50	4.4318	4.5028
LTE 10 MHz	Low	1855.00	8.9544	8.9948
	Middle	1880.00	8.9610	8.9947
	High	1905.00	8.9555	8.9951

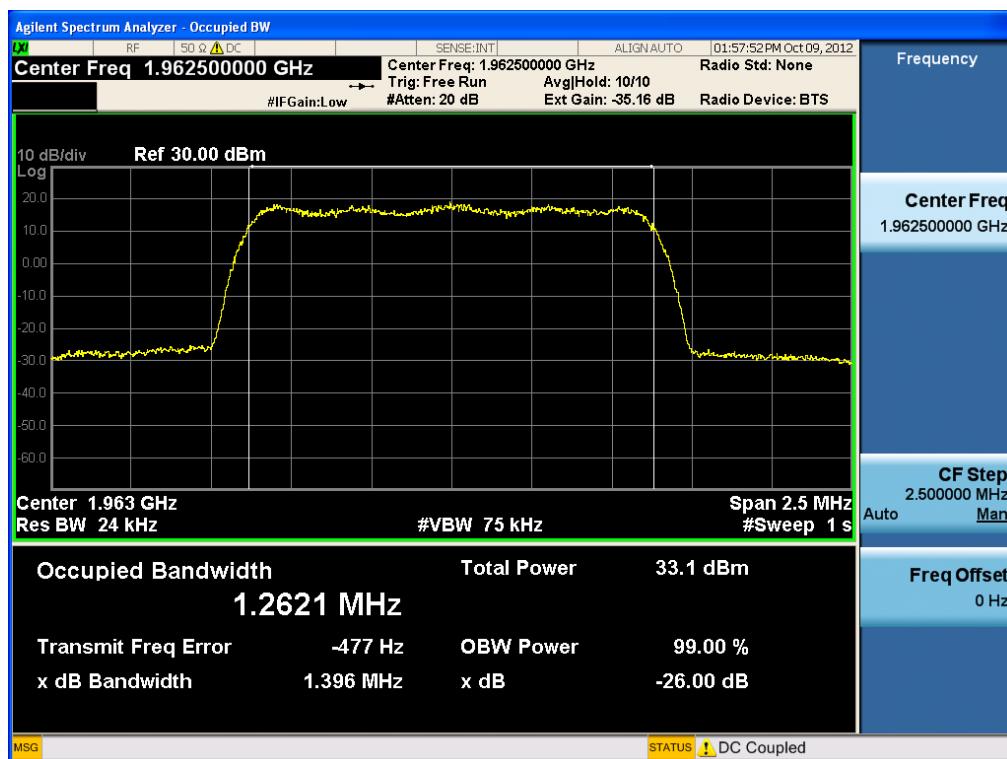
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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## Plots of Occupied Bandwidth

### [Output CDMA Downlink Low]



### [Output CDMA Downlink Middle]

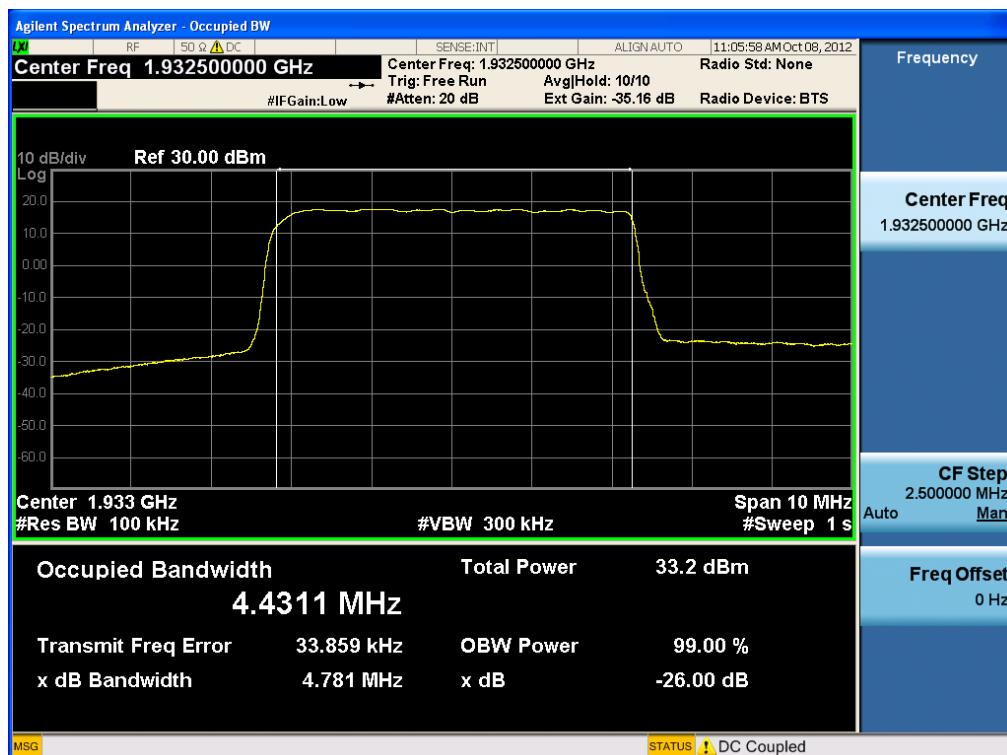


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.	Date of Issue:	EUT Type:	FCC ID:	IC:
HCTR1210FR16-1	November 12, 2012	CDMA In-Building RF Repeater	U88-SMT-P33	8137A-SMT-P33

### [Output CDMA Downlink High]



### [Output LTE Downlink Low 5 MHz]



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### [Output LTE Downlink Middle 5 MHz]



### [Output LTE Downlink High 5 MHz]

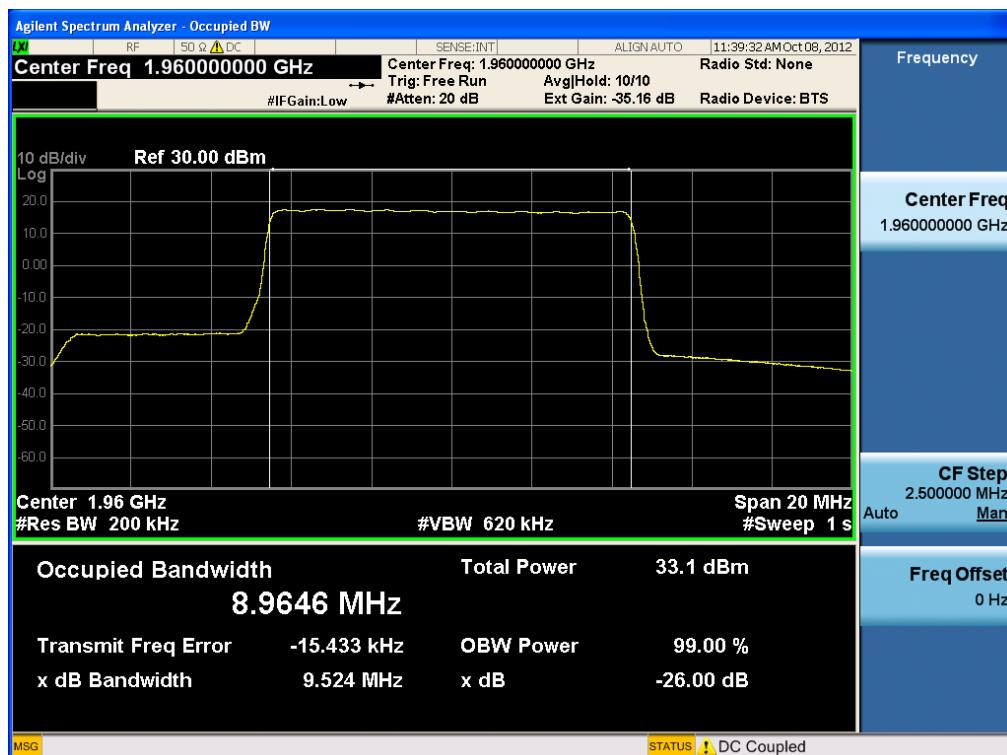


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1210FR16-1	Date of Issue: November 12, 2012	EUT Type: CDMA In-Building RF Repeater	FCC ID: U88-SMT-P33	IC: 8137A-SMT-P33

### [Output LTE Downlink Low 10 MHz]



### [Output LTE Downlink Middle 10 MHz]

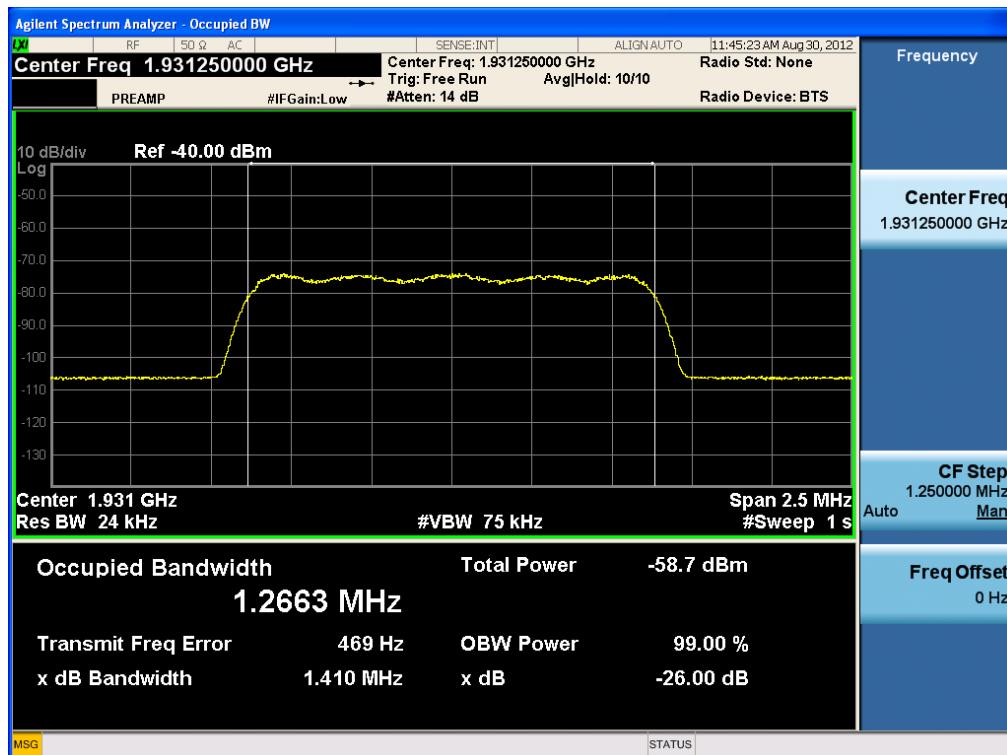


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.	Date of Issue:	EUT Type:	FCC ID:	IC:
HCTR1210FR16-1	November 12, 2012	CDMA In-Building RF Repeater	U88-SMT-P33	8137A-SMT-P33

### [Output LTE Downlink High 10 MHz]

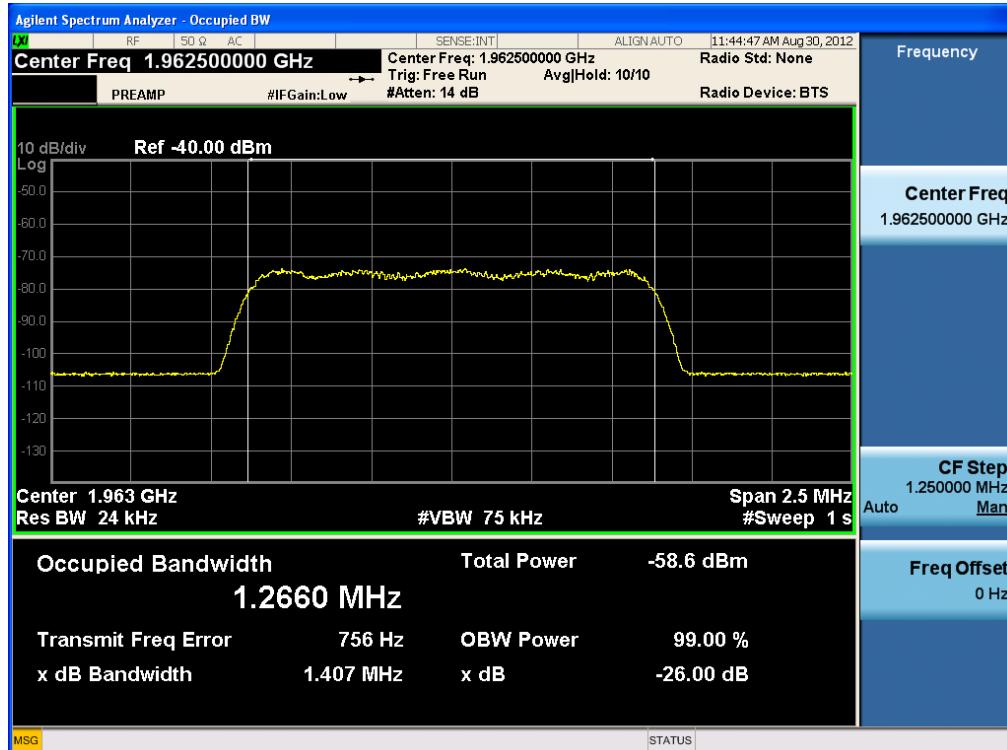


### [Input CDMA Downlink Low]



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### [Input CDMA Downlink Middle]



### [Input CDMA Downlink High]

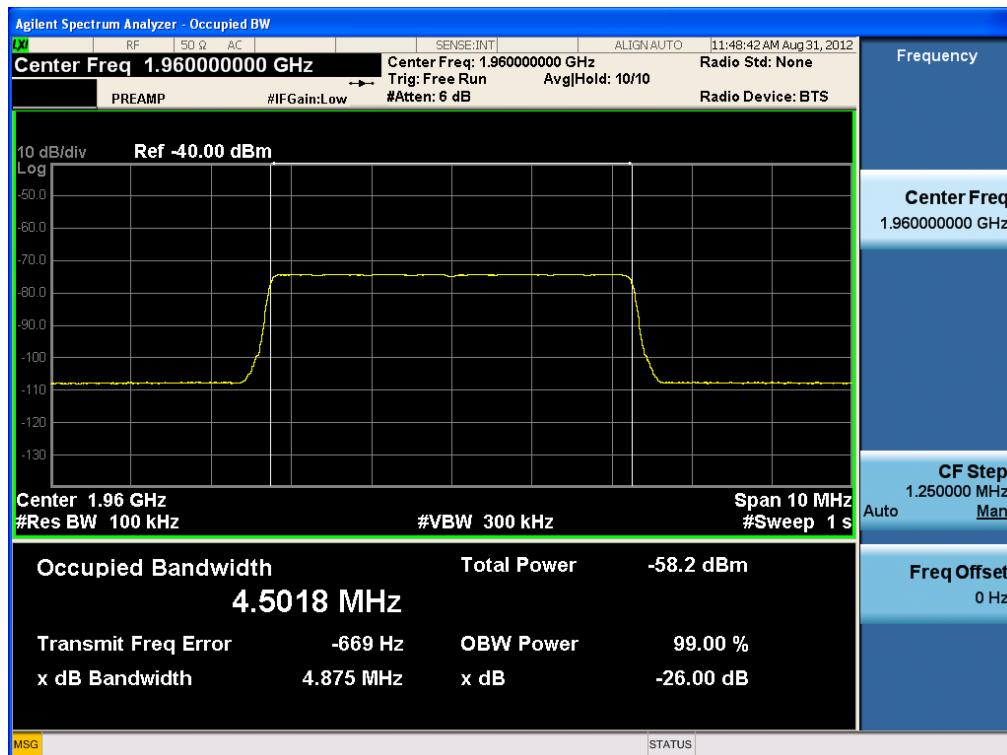


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1210FR16-1	Date of Issue: November 12, 2012	EUT Type: CDMA In-Building RF Repeater	FCC ID: U88-SMT-P33	IC: 8137A-SMT-P33

### [Input LTE Downlink Low 5 MHz]

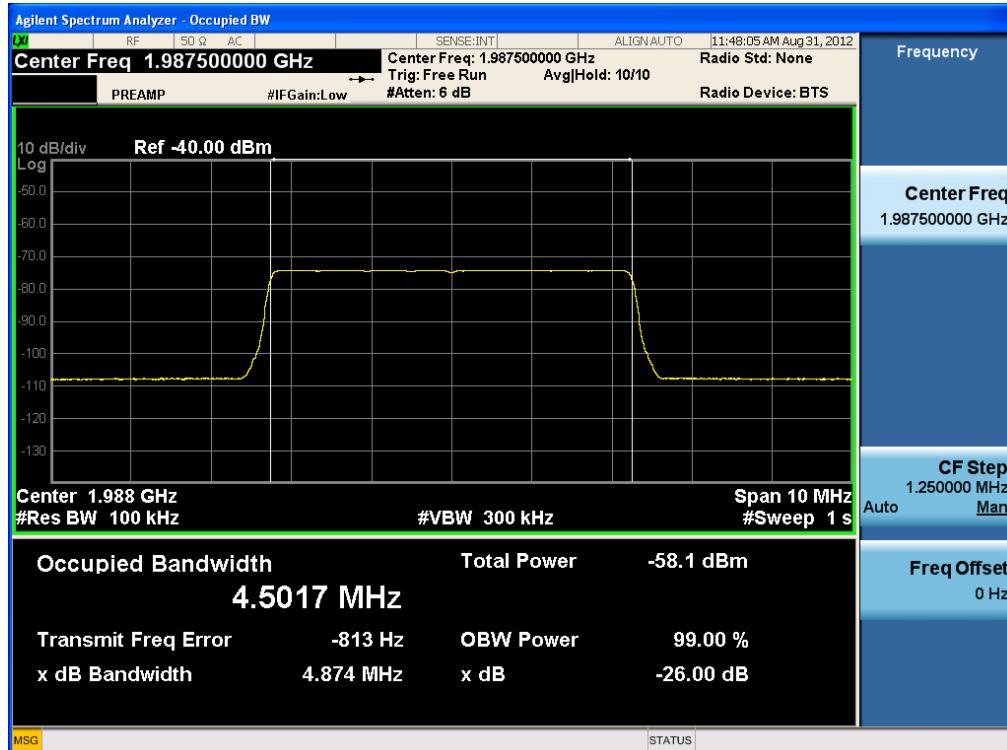


### [Input LTE Downlink Middle 5 MHz]



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### [Input LTE Downlink High 5 MHz]



### [Input LTE Downlink Low 10 MHz]

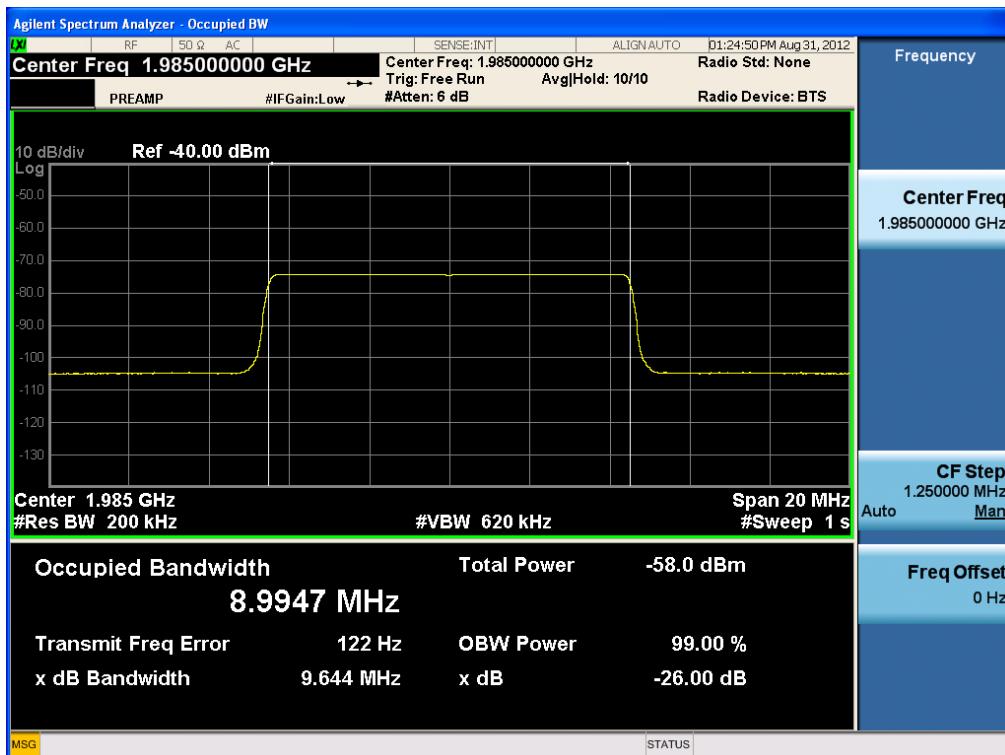


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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### [Input LTE Downlink Middle 10 MHz]

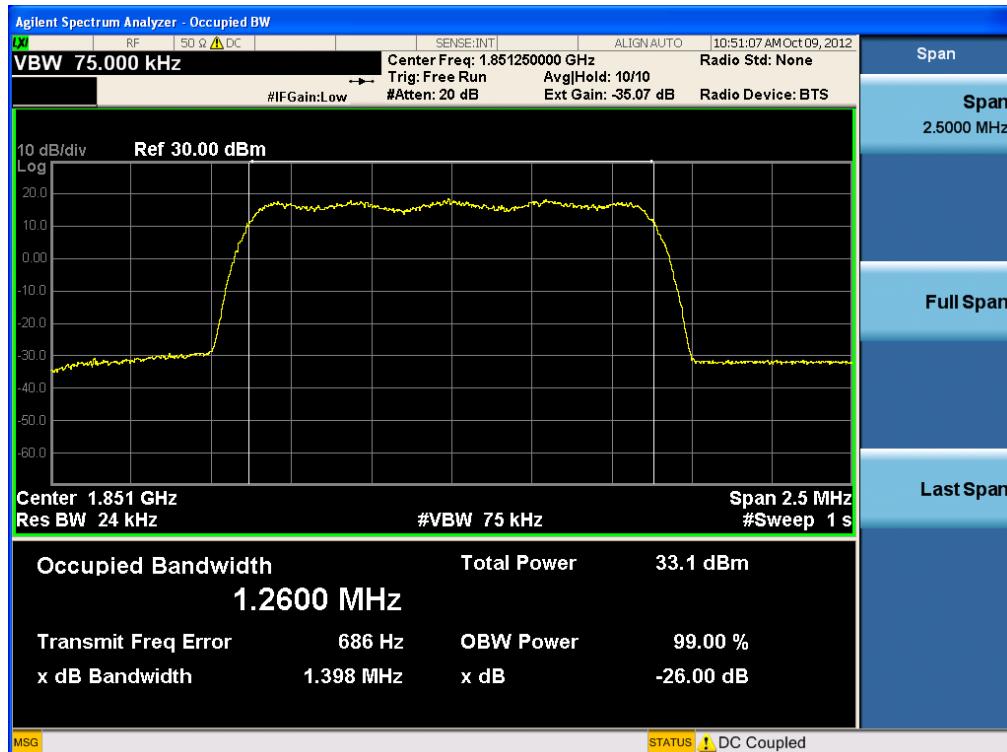


### [Input LTE Downlink High 10 MHz]

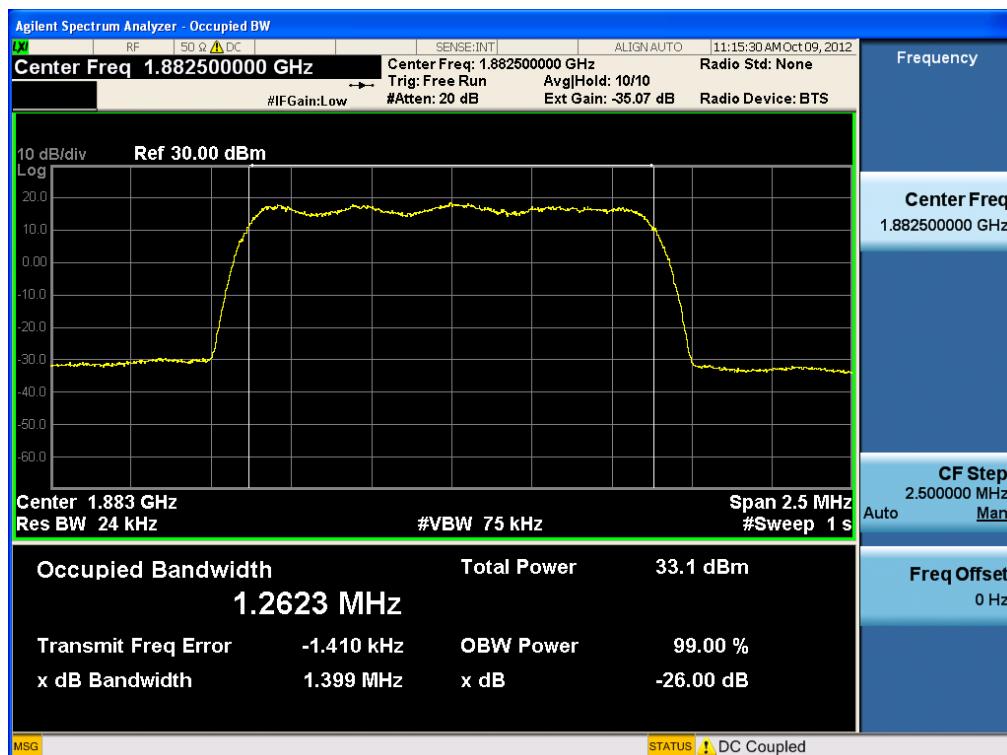


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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### [Output CDMA Uplink Low]



### [Output CDMA Uplink Middle]

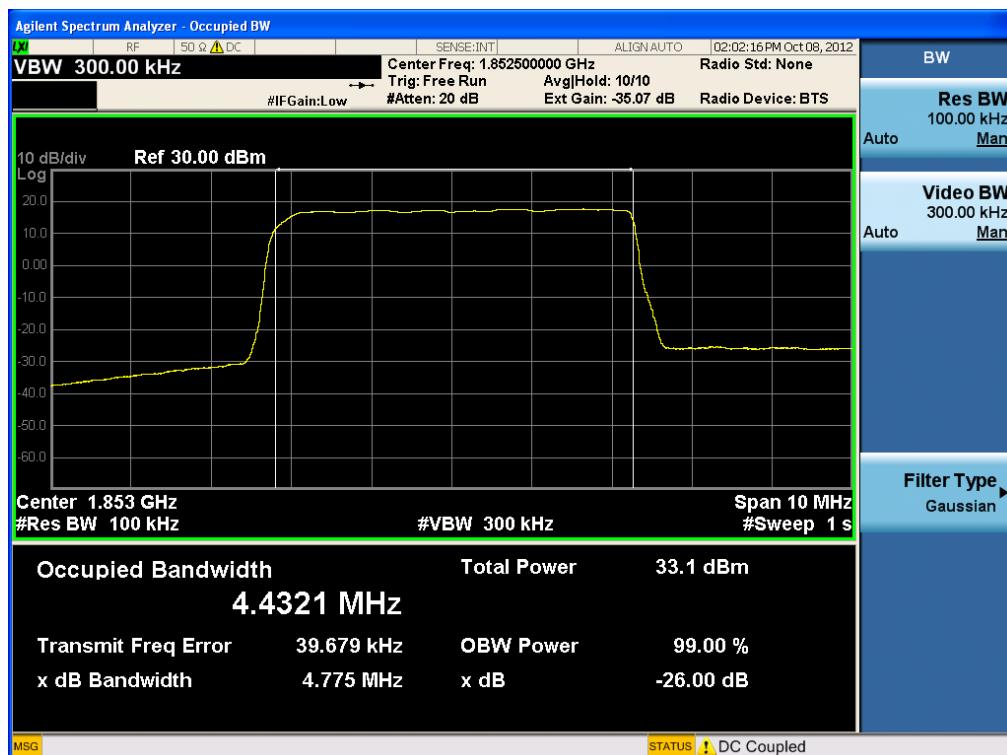


FCC PT.27 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.	Date of Issue:	EUT Type:	FCC ID:	IC:	
HCTR1210FR16-1	November 12, 2012	CDMA In-Building RF Repeater	U88-SMT-P33	8137A-SMT-P33	

### [Output CDMA Uplink High]



### [Output LTE Uplink Low 5 MHz]

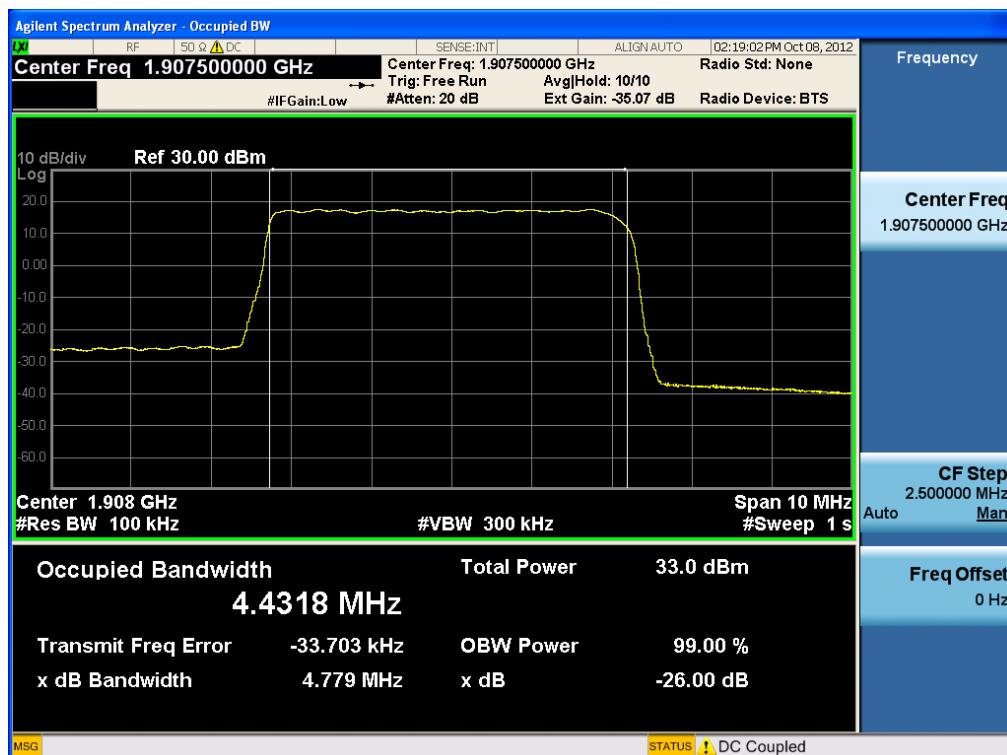


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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### [Output LTE Uplink Middle 5 MHz]

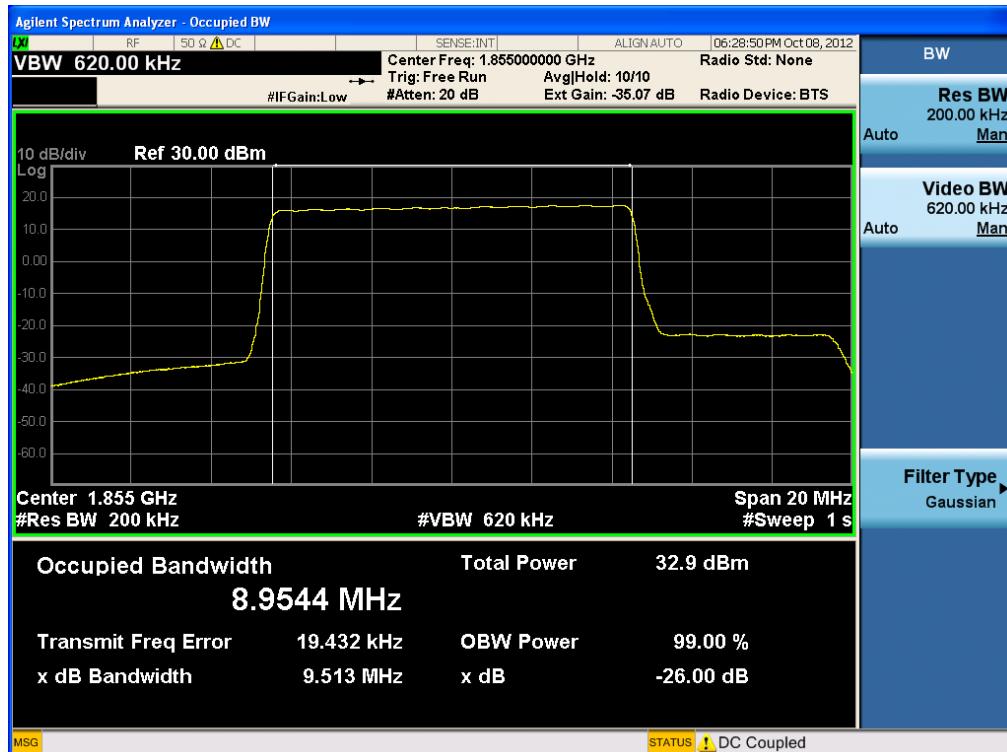


### [Output LTE Uplink High 5 MHz]

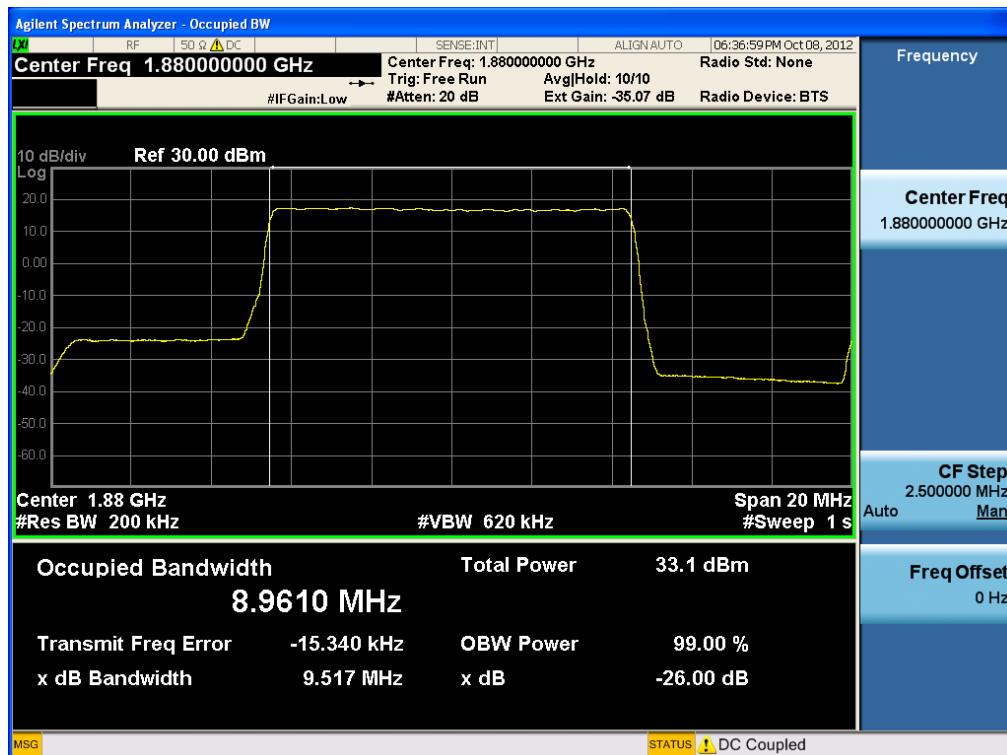


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.	Date of Issue:	EUT Type:	FCC ID:	IC:
HCTR1210FR16-1	November 12, 2012	CDMA In-Building RF Repeater	U88-SMT-P33	8137A-SMT-P33

### [Output LTE Uplink Low 10 MHz]

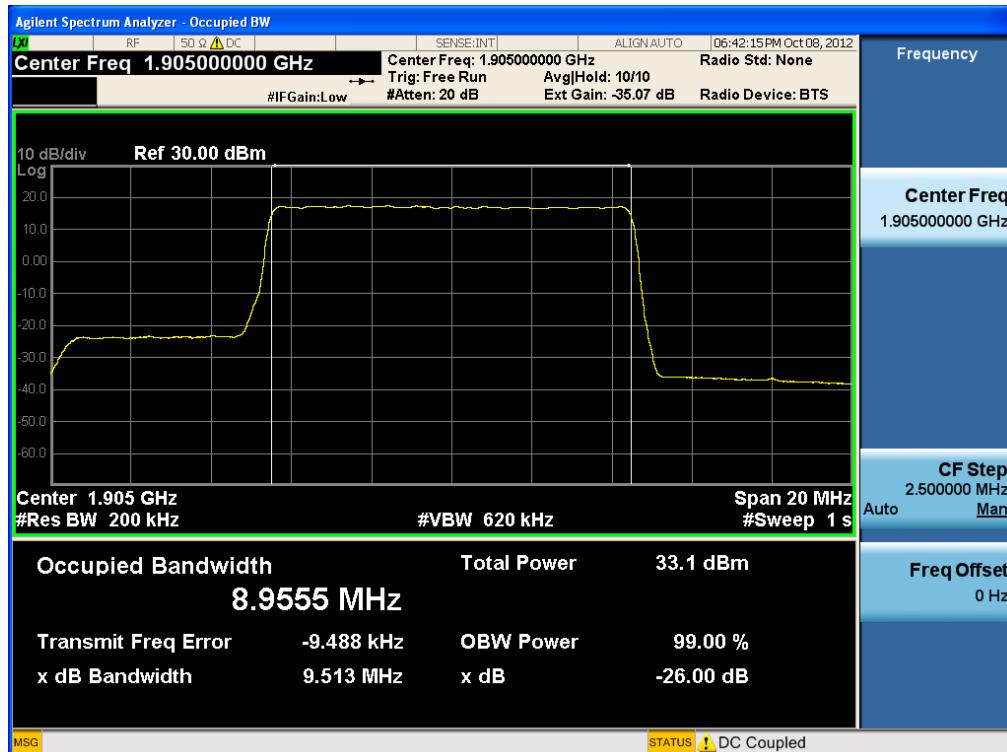


### [Output LTE Uplink Middle 10 MHz]

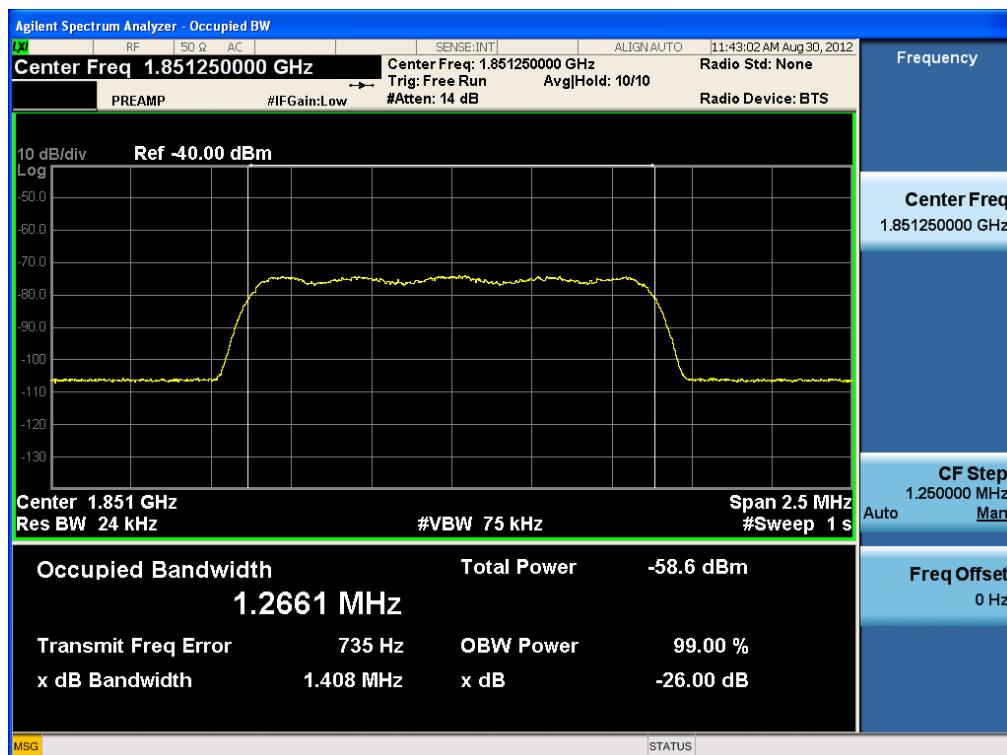


FCC PT.27 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1210FR16-1	Date of Issue: November 12, 2012	EUT Type: CDMA In-Building RF Repeater	FCC ID: U88-SMT-P33	IC: 8137A-SMT-P33	

### [Output LTE Uplink High 10 MHz]

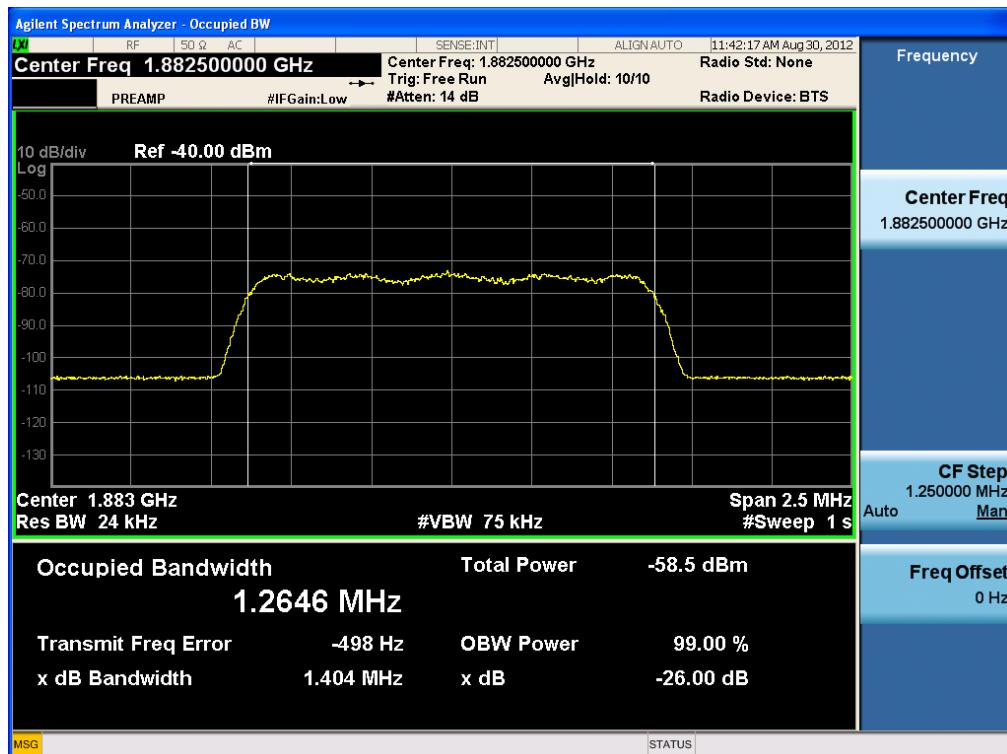


### [Input CDMA Uplink Low]

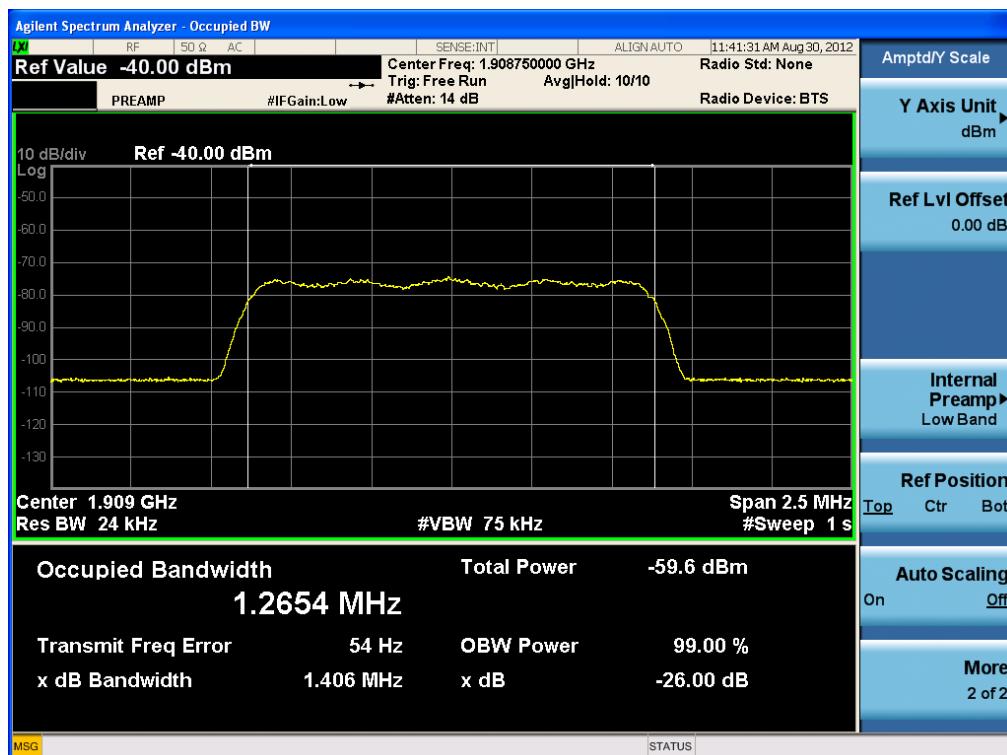


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.	Date of Issue:	EUT Type:	FCC ID:	IC:
HCTR1210FR16-1	November 12, 2012	CDMA In-Building RF Repeater	U88-SMT-P33	8137A-SMT-P33

### [Input CDMA Uplink Middle]

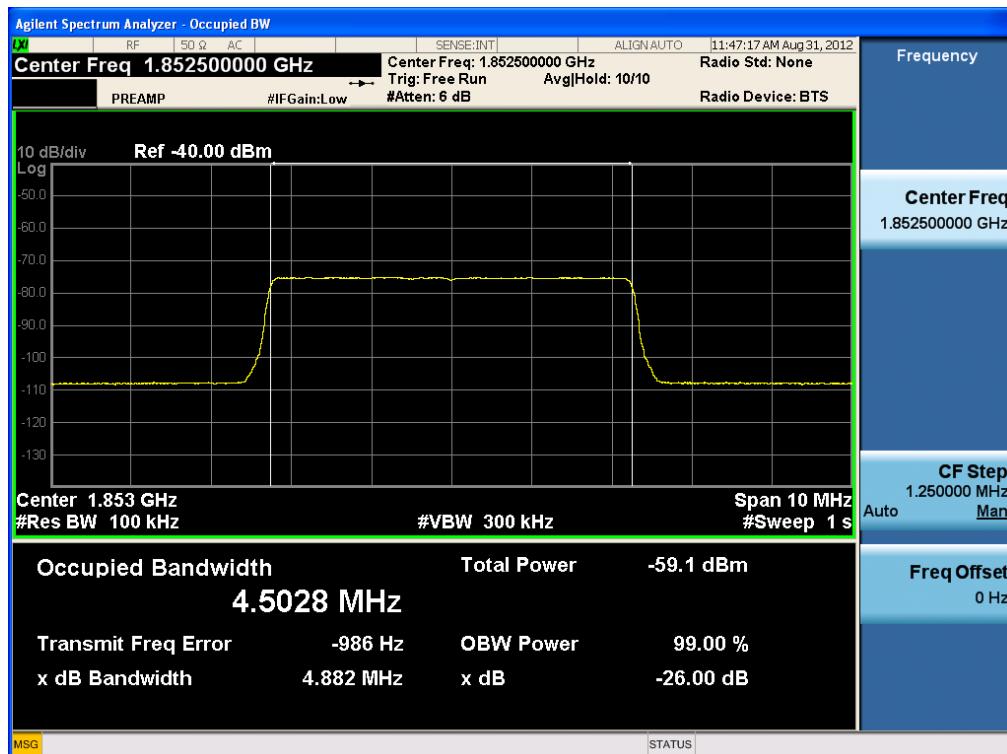


### [Input CDMA Uplink High]



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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### [Input LTE Uplink Low 5 MHz]



### [Input LTE Uplink Middle 5 MHz]

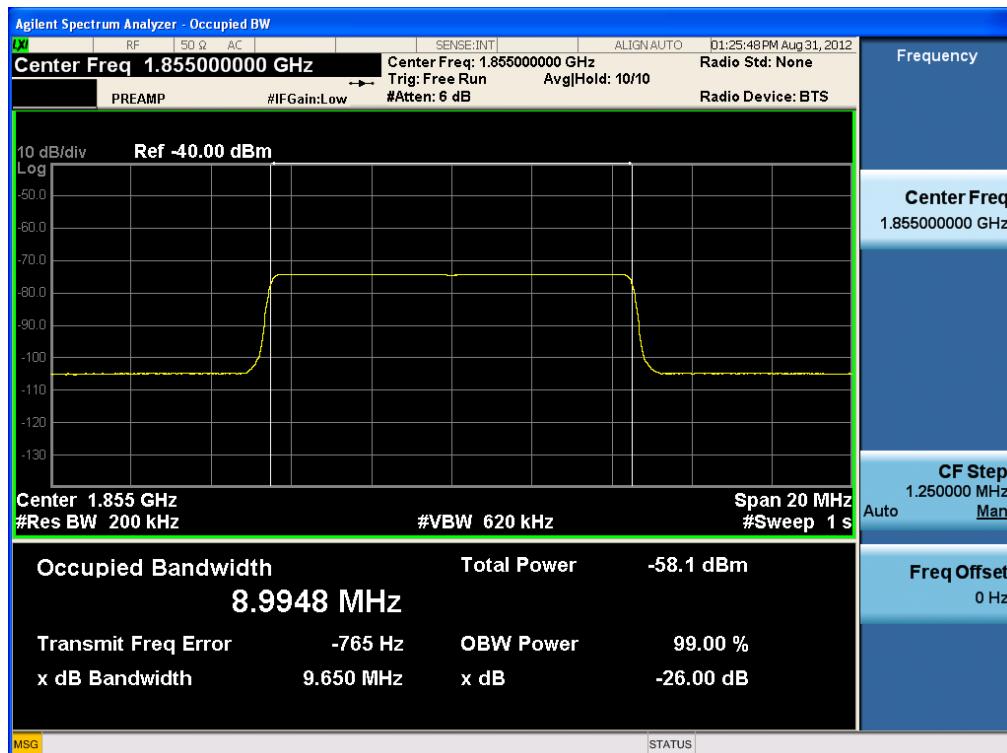


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.	Date of Issue:	EUT Type:	FCC ID:	IC:
HCTR1210FR16-1	November 12, 2012	CDMA In-Building RF Repeater	U88-SMT-P33	8137A-SMT-P33

### [Input LTE Uplink High 5 MHz]



### [Input LTE Uplink Low 10 MHz]

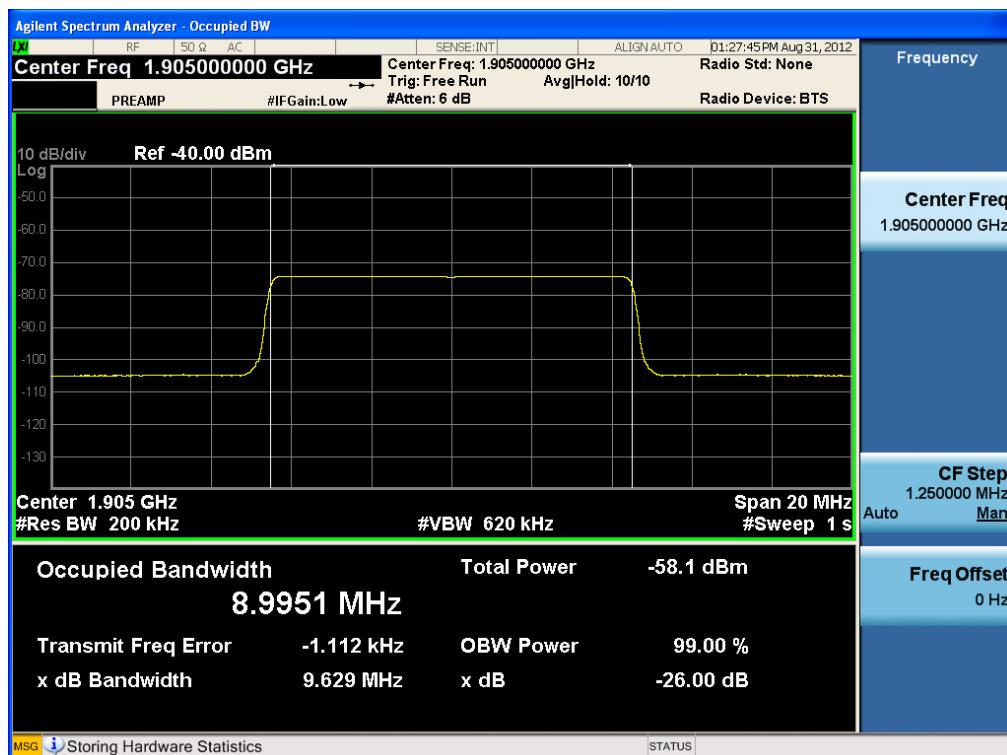


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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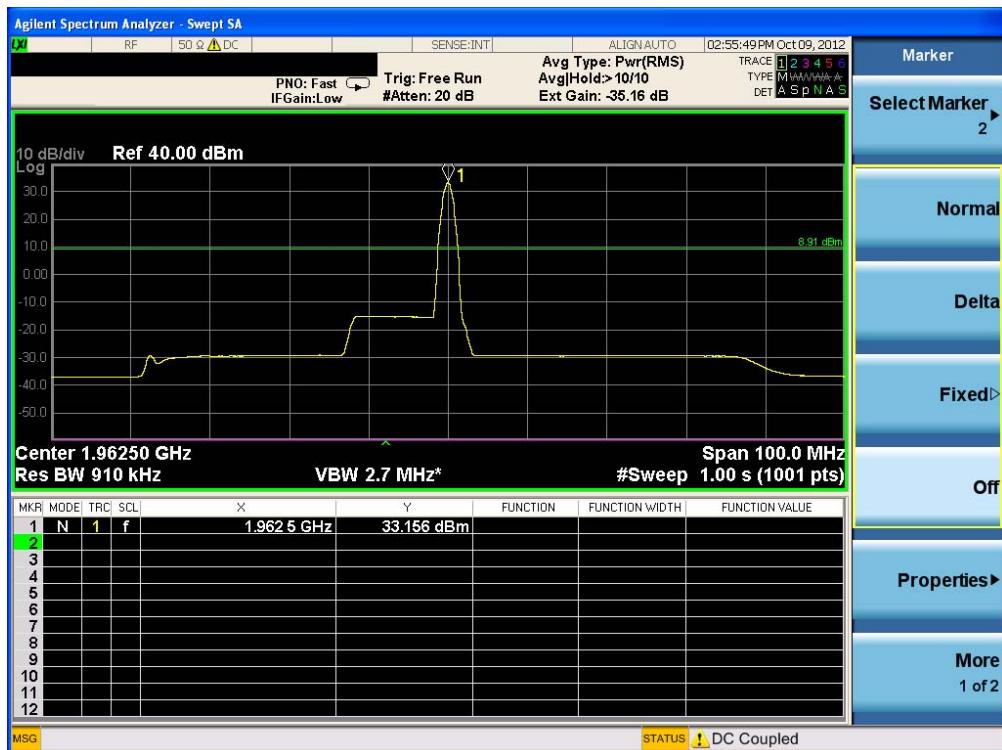
### [Input LTE Uplink Middle 10 MHz]



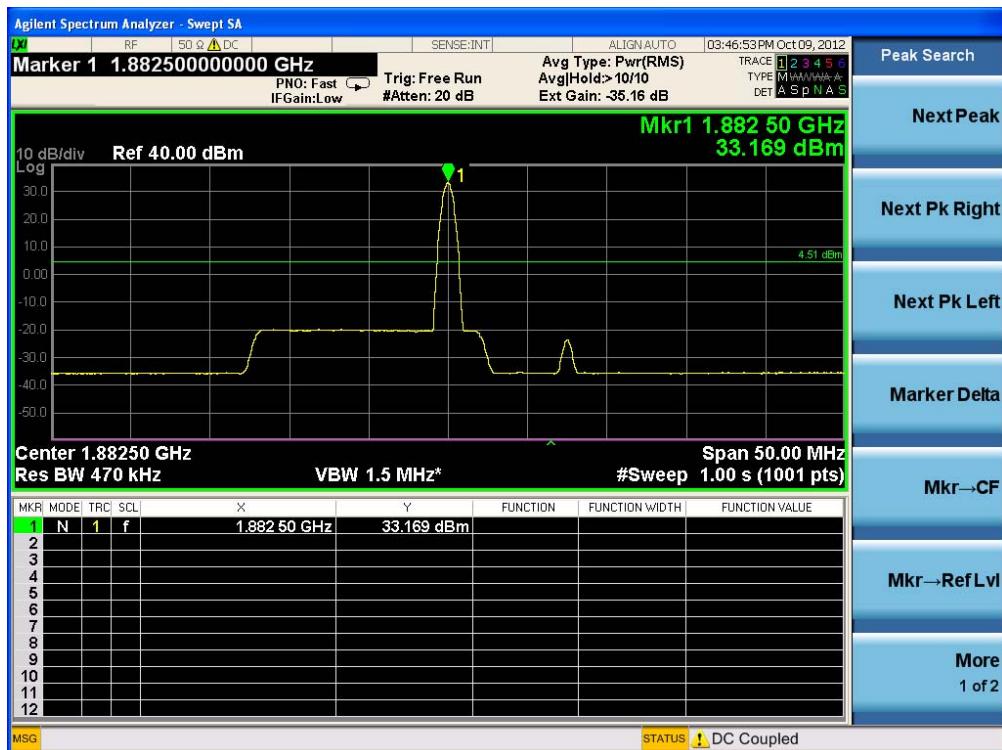
### [Input LTE Uplink High 10 MHz]



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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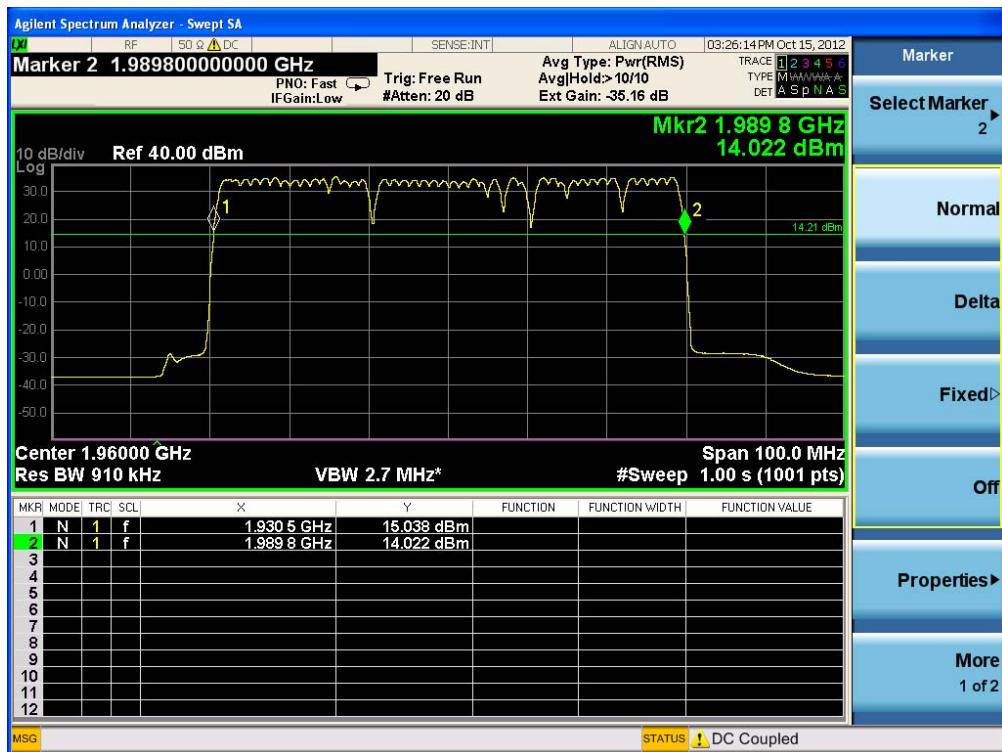


- Downlink Passband Gain :  $33.156 - (-56.6) = 89.756$  dB < nominal gain 90 dB

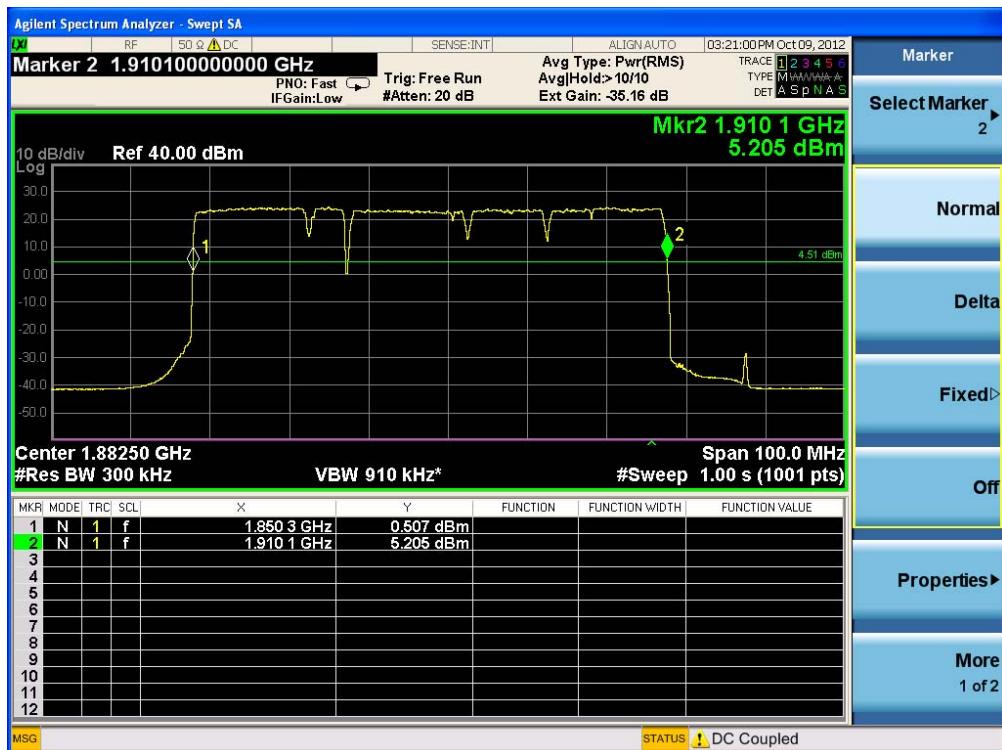


- Uplink Passband Gain :  $33.169 - (-56.6) = 89.769$  dB < nominal gain 90 dB

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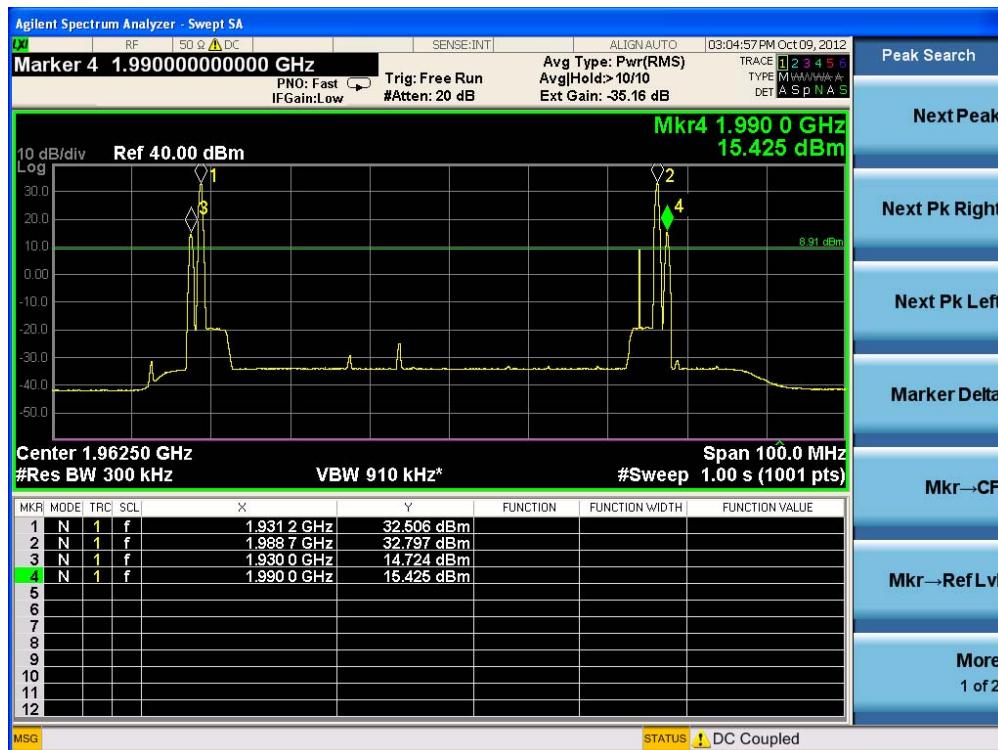


- 20 dB Bandwidth :  $1930.5 - 1989.8 = 59.3$  MHz < Nominal Bandwidth 60 MHz

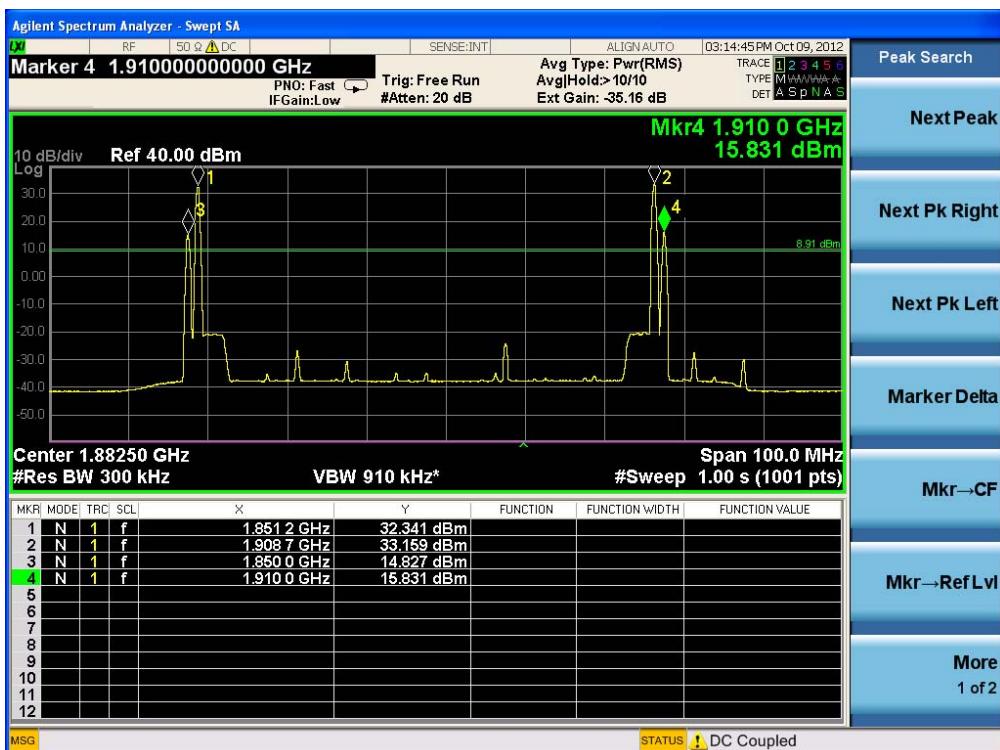


- 20 dB Bandwidth :  $1850.3 - 1910.1 = 59.8$  MHz < Nominal Bandwidth 60 MHz

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- Out of 20 dB Bandwidth Gain is less than 20 dB Bandwidth Gain by 17.372 dB



- Out of 20 dB Bandwidth Gain is less than 20 dB Bandwidth Gain by 17.328 dB

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## 7. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

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

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

### § 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.

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

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

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

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

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

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

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

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

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

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

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

**Sample Calculation**

Output Power = Reading Value + ATT loss + Cable loss

1. Spectrum reading values are not plot data. The power results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss (35.15 dB at downlink, and 35.07 dB at uplink)
3. Actual value of loss for the attenuator and cable combination is 35.15 dB at 1960 MHz , 35.12 dB at 1930 MHz, 35.18 dB at 1990 MHz, 35.07 dB at 1880 MHz, 35.06 dB at 1850 MHz, and 35.10 dB at 1910 MHz

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

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## Plots of Spurious Emission Conducted Spurious Emissions (30 MHz – 1 GHz)

### [CDMA Downlink Low]



### [CDMA Downlink Middle]



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### [CDMA Downlink High]



### [LTE Downlink Low 5 MHz]



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### [LTE Downlink Middle 5 MHz]



### [LTE Downlink High 5 MHz]



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### [LTE Downlink Low 10 MHz]



### [LTE Downlink Middle 10 MHz]



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### [LTE Downlink High 10 MHz]



### [CDMA Uplink Low]



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