

HCT. CO., LTD.
CERTIFICATION DIVISION
105-1, JANGAM-RI, MAJANG-MYEON, ICHEON-SI, KYUNGGI-DO, KOREA
TEL : +82 31 645 6300 FAX : +82 31 645 6401

CERTIFICATE OF COMPLIANCE (ERM EVALUATION)

Manufacture: GS Instruments Co., Ltd.

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

Date of Issue: July 27, 2012

Test Report No.: HCTR1207FR20

Test Site: HCT CO., LTD.

FCC ID:

U88-MCPA-2002S-SPR

APPLICANT:

GS Instruments Co., Ltd.

EUT Type:

Multi-Carrier Power Amplifier

Model:

MCPA-192002S-SPR

Frequency Ranges:

1930 MHz ~ 1995 MHz

RF Output Power:

316 W (158 W + 158 W)

FCC Rules Part(s):

Title 47 of CFR, Part 24 Subpart E

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.

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

Approved by
: Sang Jun Lee
Manager of RF Team

FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 2 of 57	

CONTENTS

1. CLIENT INFORMATION	4
2. TEST SPECIFICATIONS	5
3. STANDARDS ENVIRONMENTAL TEST CONDITIONS	5
4. TEST EQUIPMENT	6
5. RF OUTPUT POWER.....	7
6. OCCUPIED BANDWIDTH	16
7. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL	30
8. RADIATED SPURIOUS EMISSIONS	52
9. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS.....	55
10. RF EXPOSURE STATEMENT	57

FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 3 of 57



1. CLIENT INFORMATION

The EUT has been tested by request of

Company	GS Instruments Co., Ltd
Contact Point	1385-14, Juan-Dong, Nam-Ku, Incheon, 402-200, Korea

- EUT Type: Multi-Carrier Power Amplifier
- Model: MCPA-192002S-SPR
- Frequency Ranges: 1930 MHz ~ 1995 MHz
- RF Output Power: 316 W (158 W + 158 W)
- FCC Rules Part(s): Title 47 of CFR, Part 24 Subpart E
- Emission Designators: F9W
- Modulation: QPSK, 16QAM
- Place of Tests: HCT Co., Ltd.

FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page	4 of 57



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.

Description	Reference (FCC)	Results
RF Power Output	§2.1046 §24.232	Compliant
Modulation Characteristics	§2.1047	N/A
Occupied Bandwidth	§2.1049	Compliant
Spurious Emissions at Antenna Terminals	§2.1051 §24.238	Compliant
Radiated Spurious Emissions	§2.1053 §24.238	Compliant
Frequency Stability	§2.1055 §24.235	Compliant

3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

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

FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page	5 of 57



4. TEST EQUIPMENT

Manufacturer	Model / Equipment	Cal Interval	Calibration Due	Serial No.
Agilent	E4438C /Signal Generator	Annual	12/30/2013	MY42082646
Agilent	E4416A /Power Meter	Annual	11/07/2012	GB41291412
Agilent	E9327A/ Power Sensor	Annual	05/02/2013	MY4442009
NangYeul	NY-THR18750/Temp. Chamber	Annual	11/08/2012	NY-200912201A
Agilent	N9020A /Signal Analyzer	Annual	05/02/2013	MY51110020
WEINSCHEL	67-30-33/Attenuator	Annual	11/07/2012	BR0530
WEINSCHEL	AF9003-69-31/Step Attenuator	Annual	11/07/2012	11787
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
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	05/15/2014	147
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	02/20/2014	296
Schwarzbeck	VULB 9168/TRILOG Antenna	Biennial	02/09/2013	9168-200
Schwarzbeck	VULB 9160/TRILOG Antenna	Biennial	07/15/2013	9160-3150

5. RF OUTPUT POWER

FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.		Date of Issue:	EUT Type:	FCC ID:	Page
HCTR1207FR20		July 27, 2012	Multi-Carrier Power Amplifier	U88-MCPA-2002S-SPR	6 of 57



5.1 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.

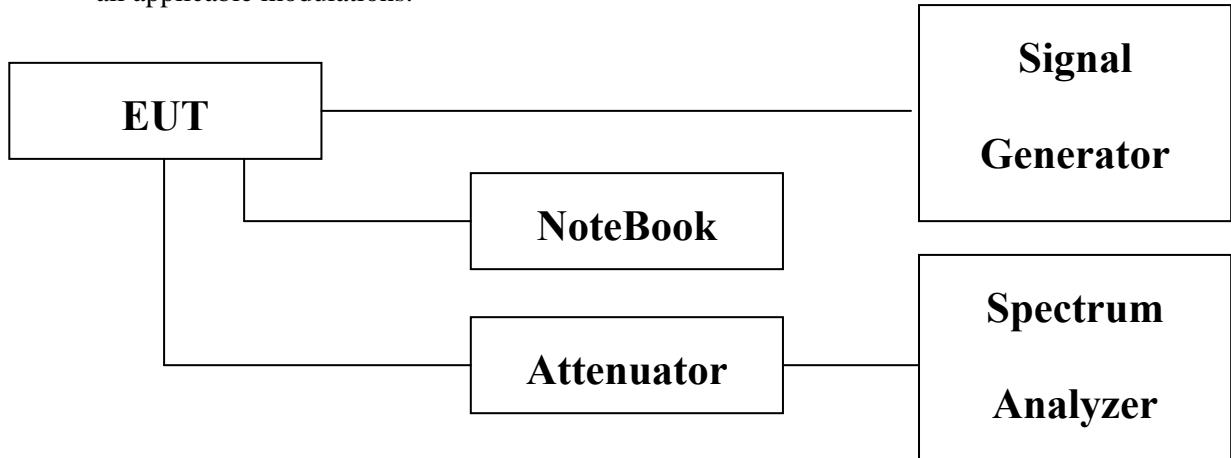
§ 24.232 Power and antenna height limits.

(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.

FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page	7 of 57

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****5.2 Test Results**

FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page	8 of 57

[MCA1]

CHANNEL	FREQUENCY (MHz)	MEASURED POWER dBm (W)	
		QPSK	16QAM
Low	1931.25	52.01(158.8547)	51.85(153.1088)
Mid	1962.5	51.98(157.7611)	52.04(159.9558)
High	1993.75	51.99(158.1248)	51.98(157.7611)

[MCA2]

CHANNEL	FREQUENCY (MHz)	MEASURED POWER dBm (W)	
		QPSK	16QAM
Low	1931.25	51.97(157.3983)	51.90(154.8817)
Mid	1962.5	51.93(155.9553)	52.02(159.2209)
High	1993.75	51.97(157.3983)	52.02(159.2209)

[MCA1 & MCA2]

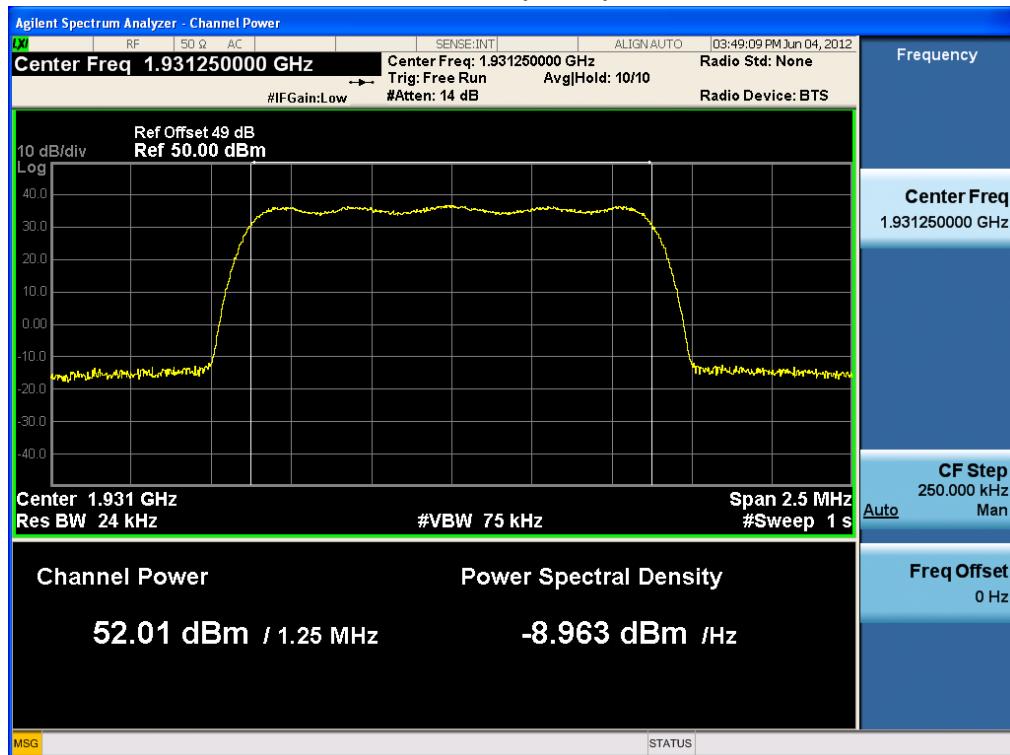
CHANNEL	FREQUENCY (MHz)	MEASURED POWER W	
		QPSK	16QAM
Low	1931.25	316.2530	307.9905
Mid	1962.5	313.7164	319.1767
High	1993.75	315.5231	316.9820

INPUT SIGNAL	REAL-TIME CDMA FORWARD
Source	Real-time CDMA Forward
Input Power Level (Signal Generator)	37.8 dBm
Amplitude offset (Spectrum Analyzer)	49.0 dB

FCC PT.24 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 9 of 57

Plots of RF Output Power [MCA1]

Low CH (QPSK)

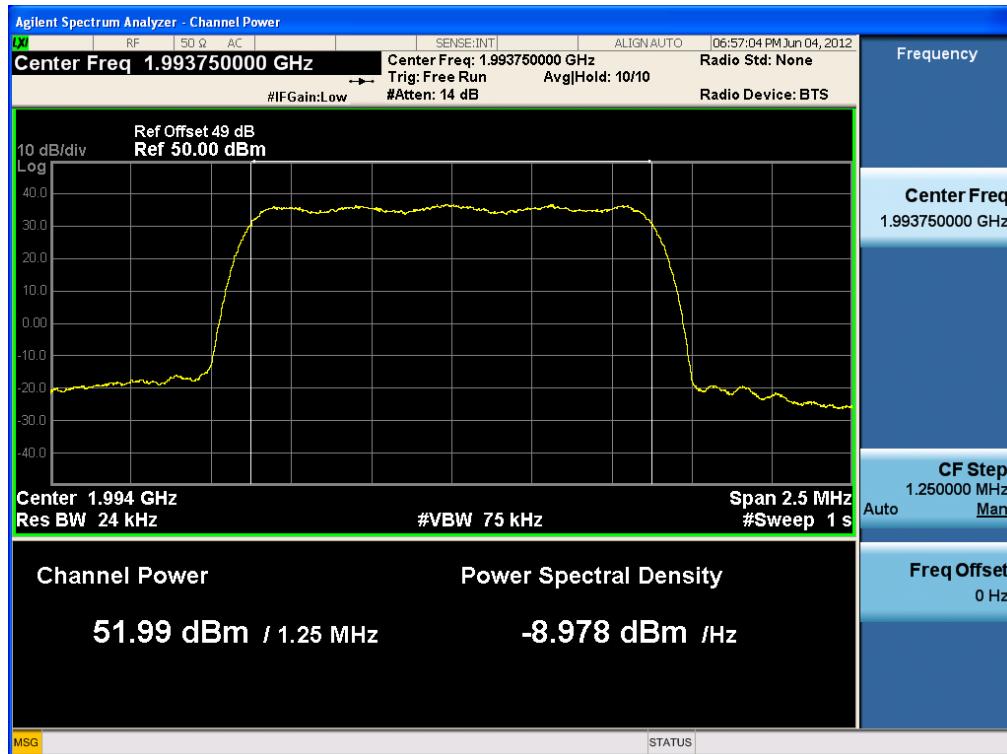


Middle CH (QPSK)

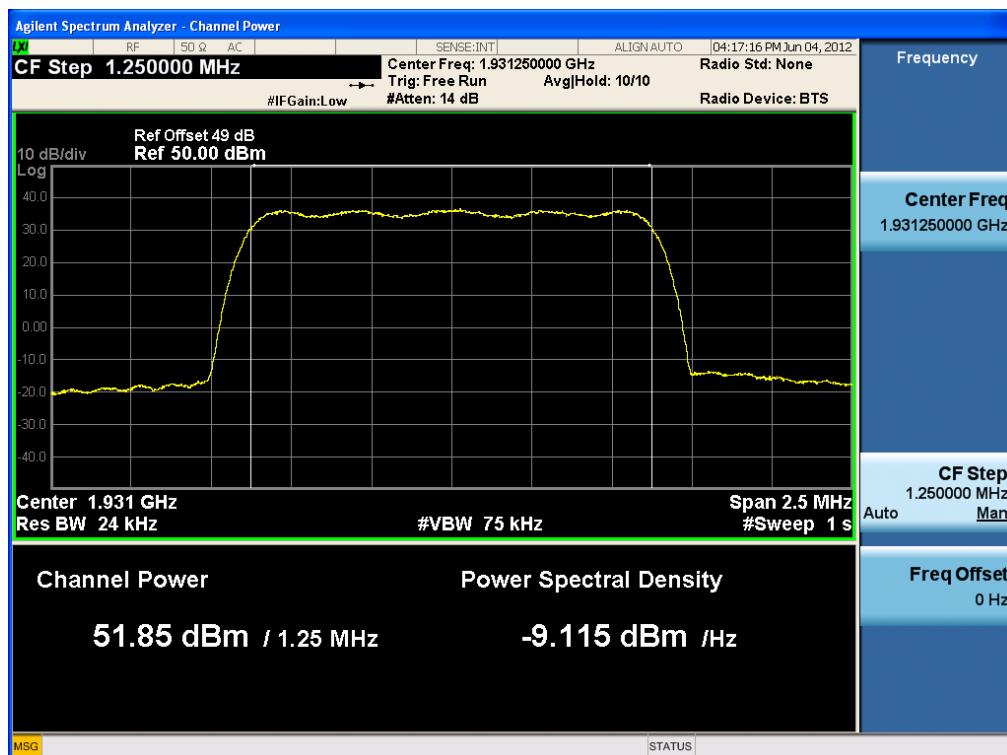


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 10 of 57	

High CH (QPSK)

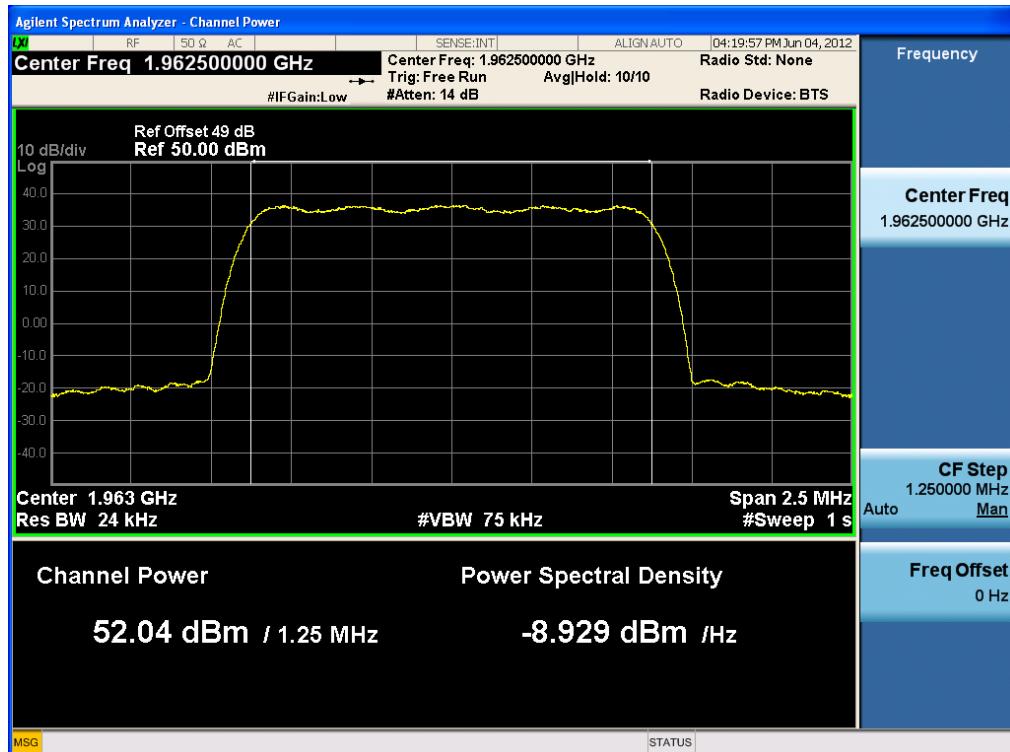


Low CH (16QAM)



FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1207ER20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 11 of 57

Middle CH (16QAM)



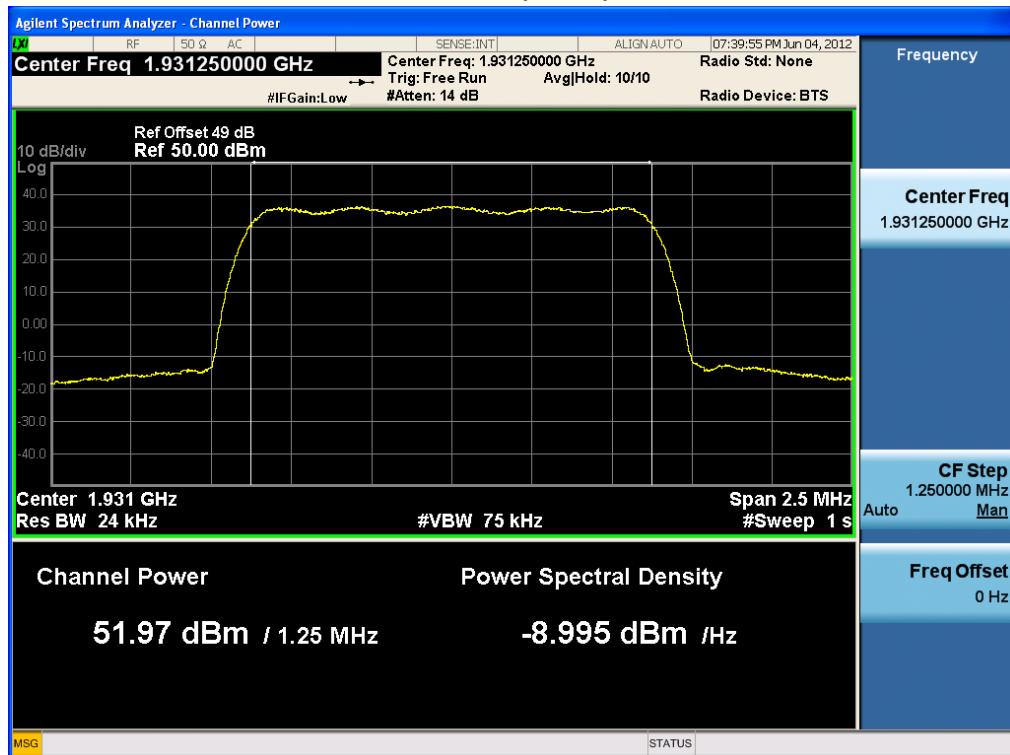
High CH (16QAM)



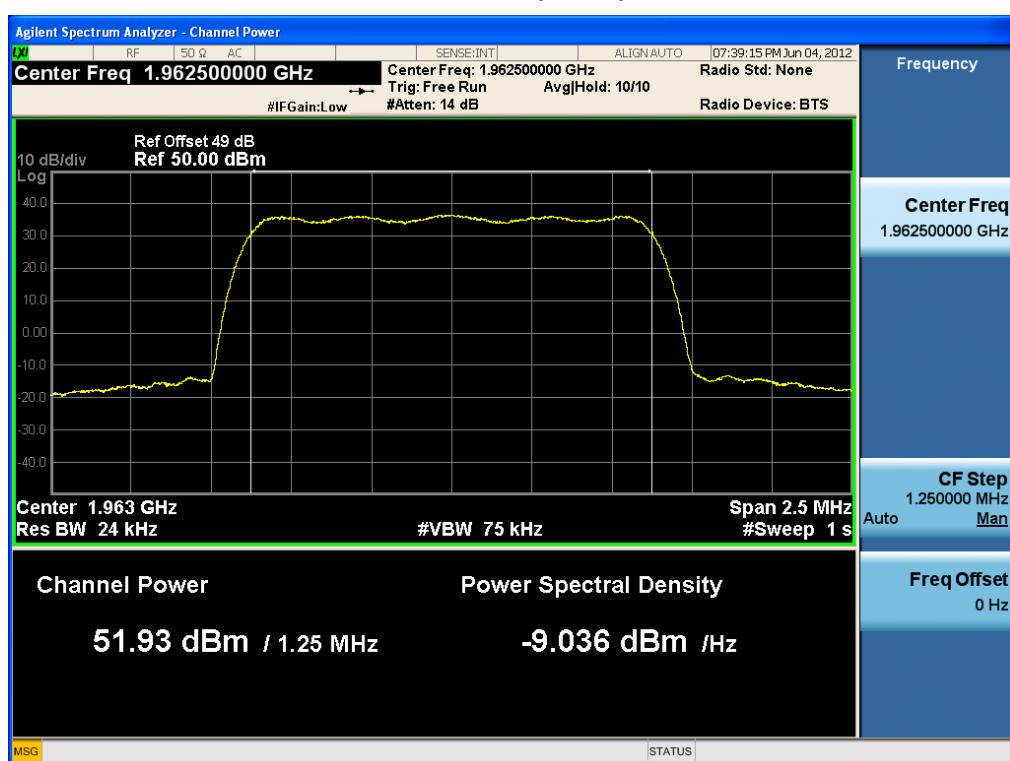
FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 12 of 57	

Plots of RF Output Power [MCA2]

Low CH (QPSK)

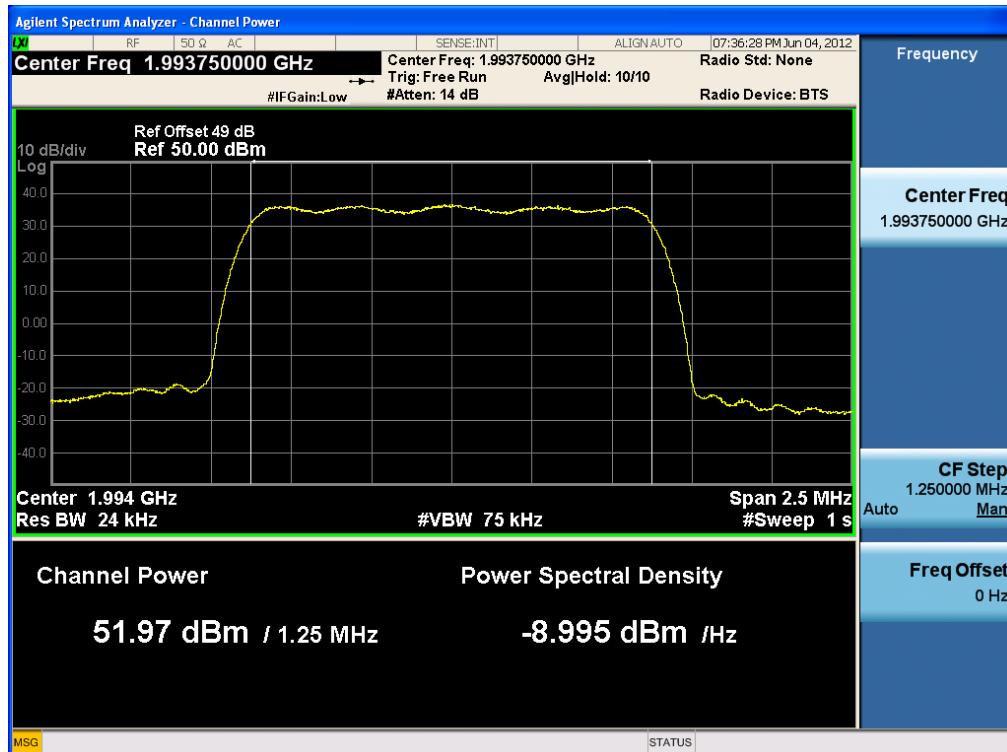


Middle CH (QPSK)

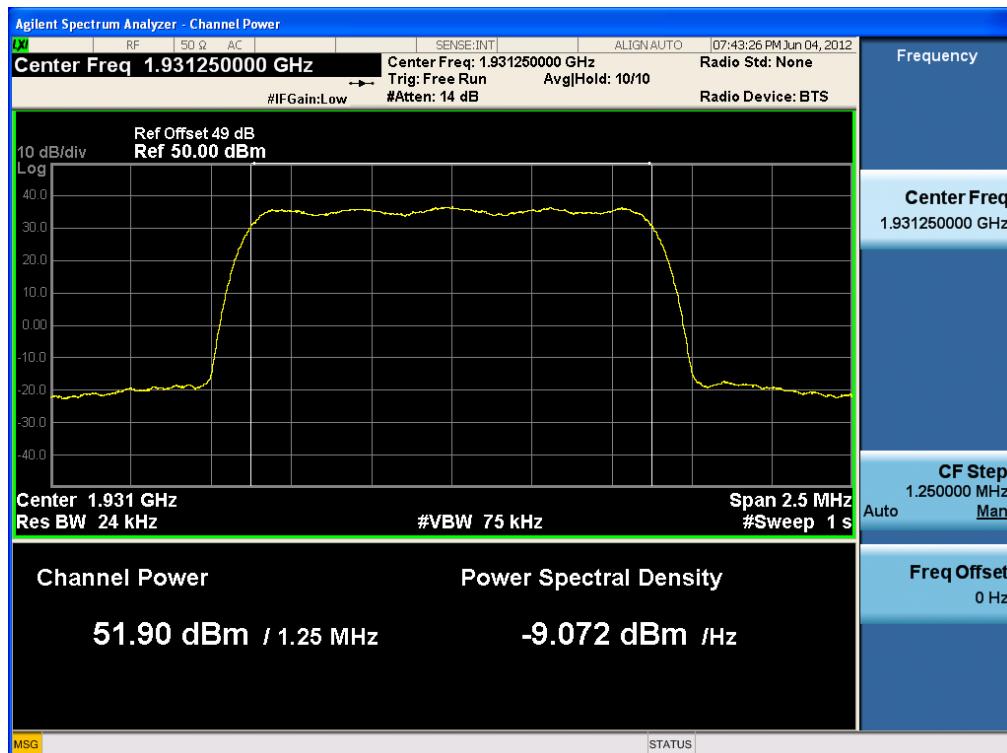


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 13 of 57	

High CH (QPSK)

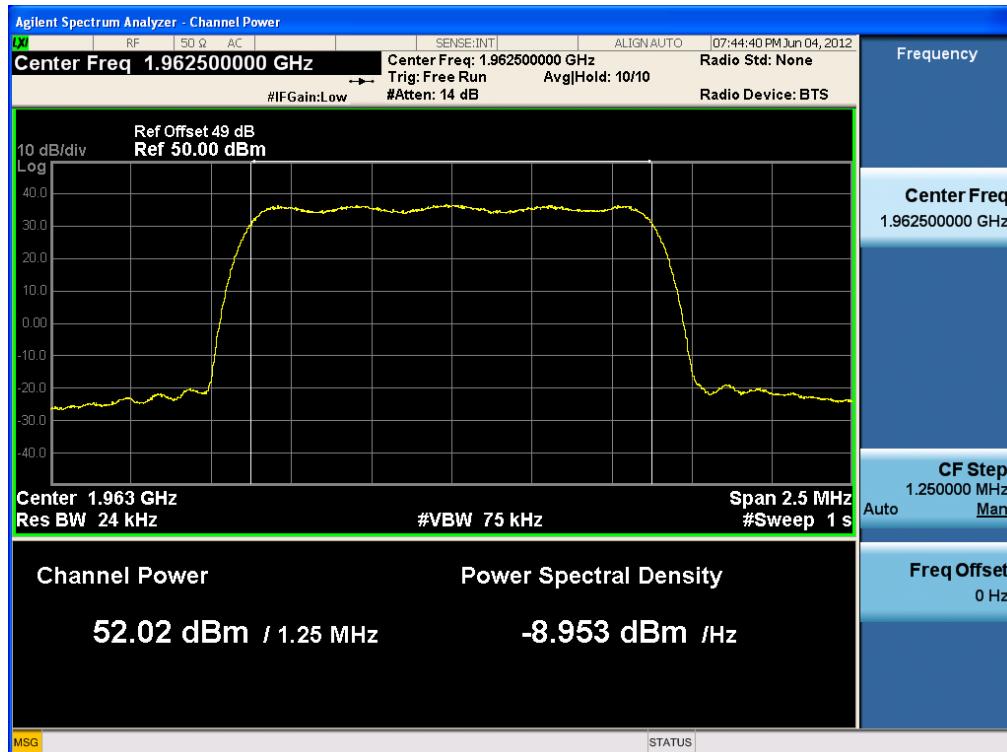


Low CH (16QAM)



FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 14 of 57	

Middle CH (16QAM)



High CH (16QAM)



FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 15 of 57	



6. OCCUPIED BANDWIDTH

6.1 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 Downlink

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

FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page	16 of 57

6.2 Test Results

[MCA1]

CHANNEL	FREQUENCY (MHz)	MEASURED DATA (MHz)			
		QPSK		16QAM	
		Input	Output	Input	Output
Low	1931.25	1.2709	1.2647	1.2707	1.2603
Mid	1962.5	1.2708	1.2643	1.2738	1.2667
High	1993.75	1.2703	1.2627	1.2711	1.2642

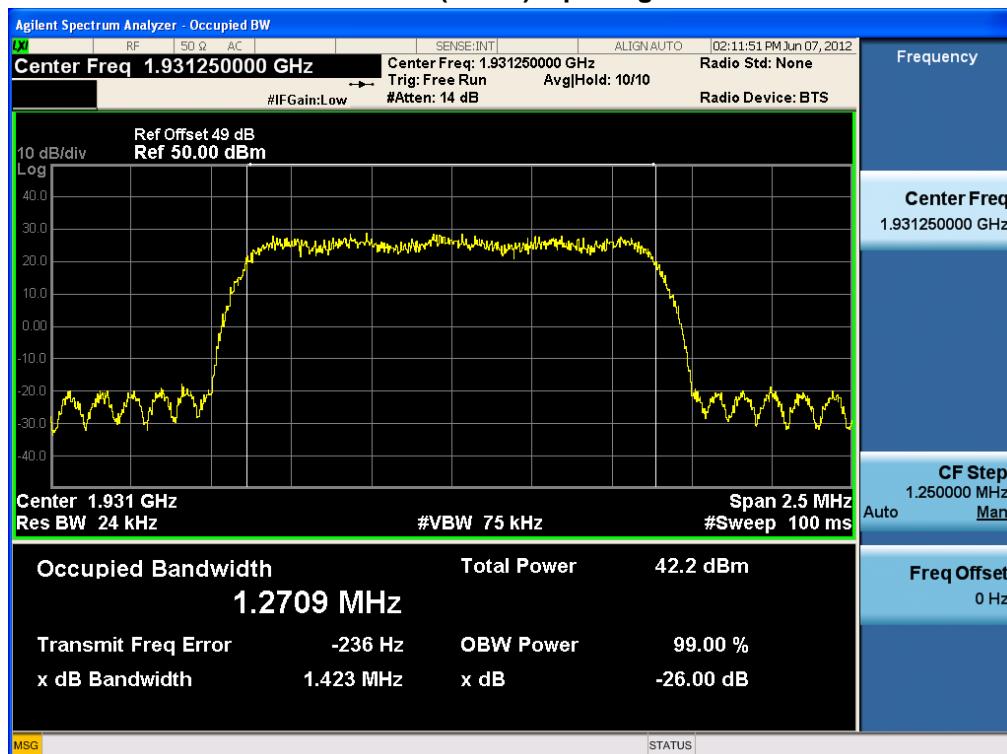
[MCA2]

CHANNEL	FREQUENCY (MHz)	MEASURED DATA (MHz)			
		QPSK		16QAM	
		Input	Output	Input	Output
Low	1931.25	1.2744	1.2634	1.2731	1.2565
Mid	1962.5	1.2736	1.2629	1.2711	1.2577
High	1993.75	1.2765	1.2603	1.2734	1.2607

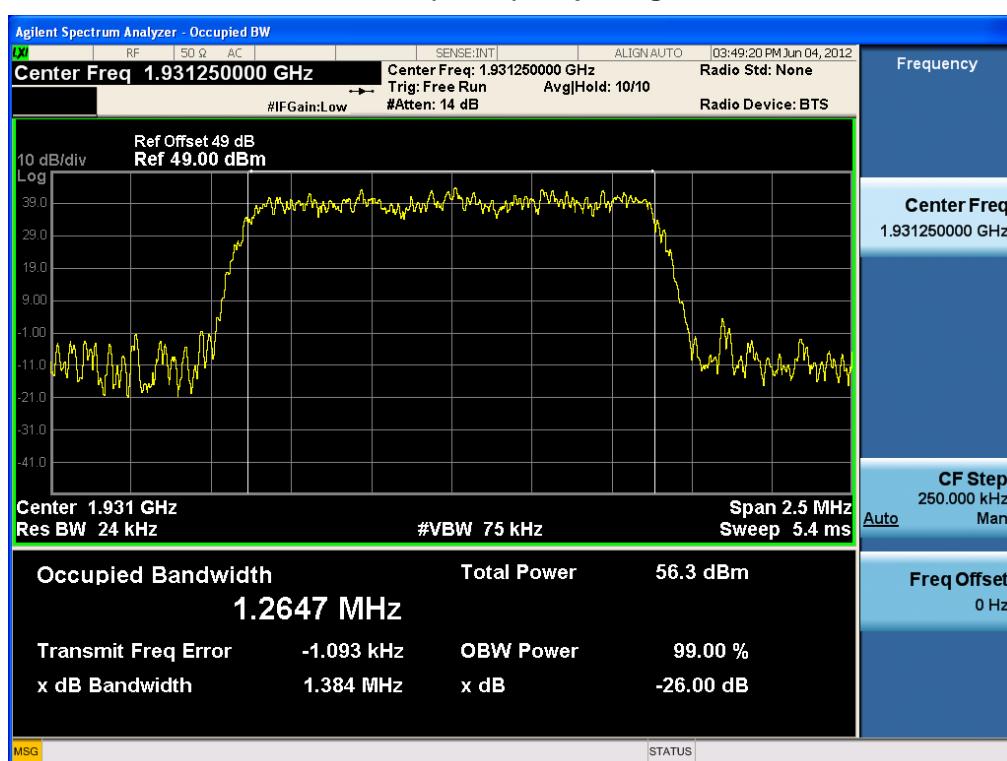
FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.	Date of Issue:	EUT Type:	FCC ID:	Page	
HCTR1207FR20	July 27, 2012	Multi-Carrier Power Amplifier	U88-MCPA-2002S-SPR	17 of 57	

Plots of Occupied Bandwidth [MCA1]

Low CH (QPSK) Input Signal

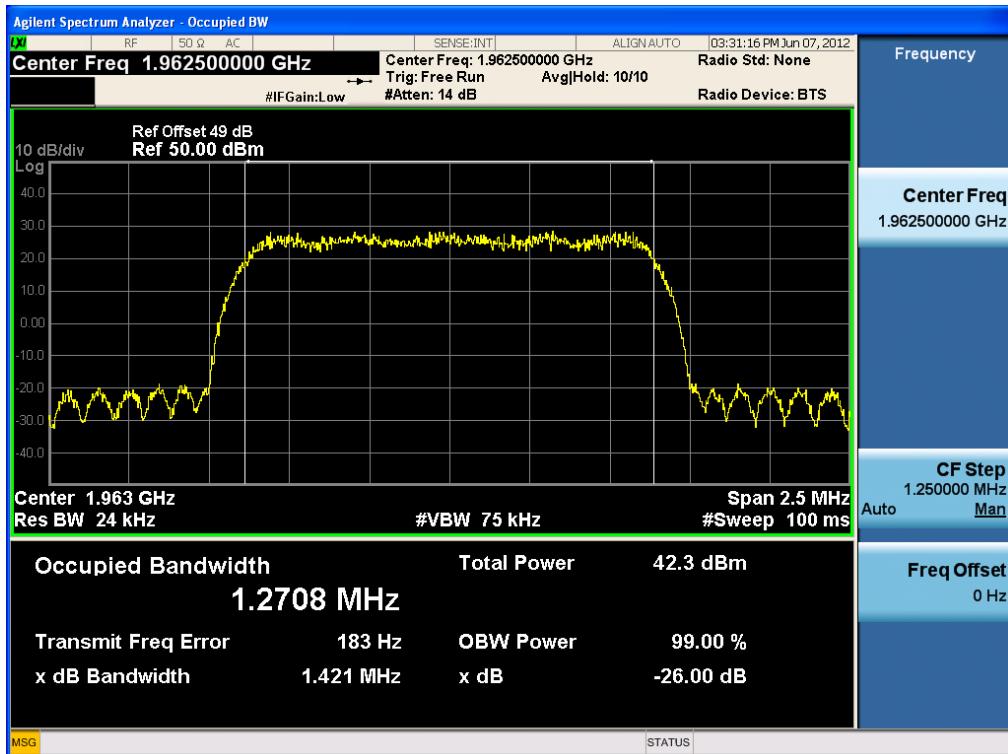


Low CH (QPSK) Output Signal

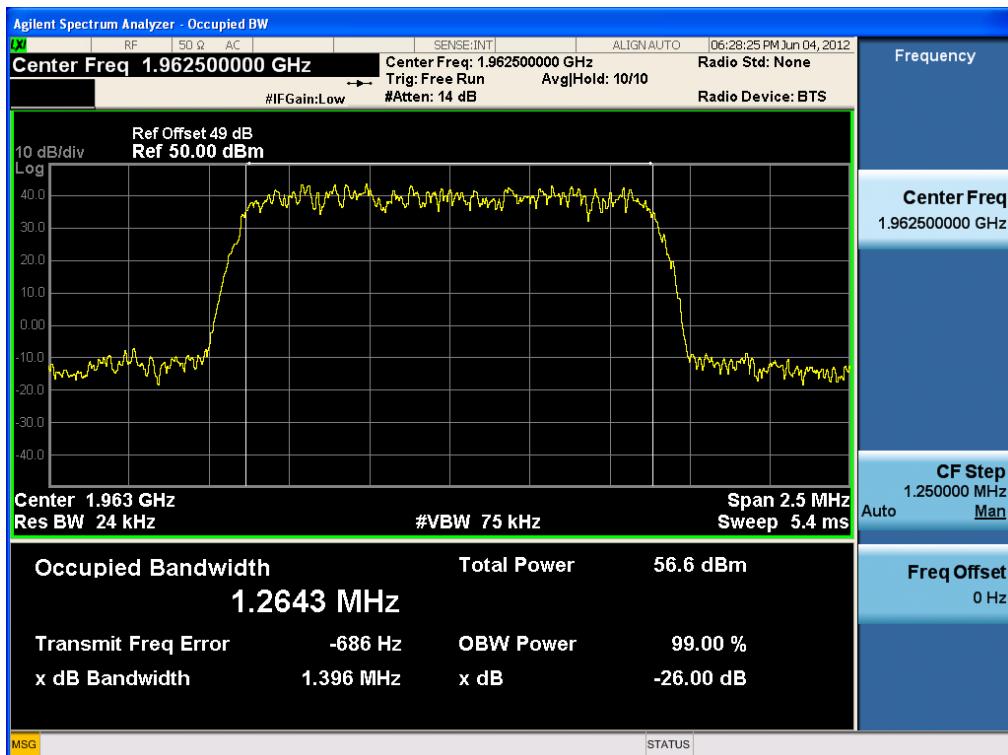


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 18 of 57	

Mid CH (QPSK) Input Signal

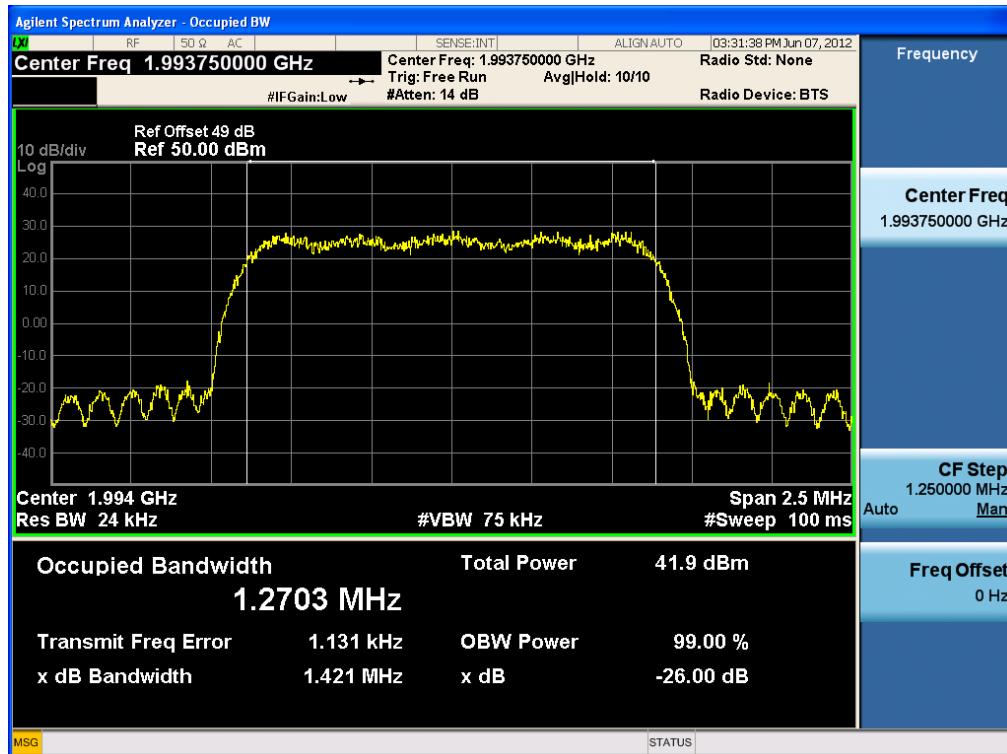


Mid CH (QPSK) Output Signal

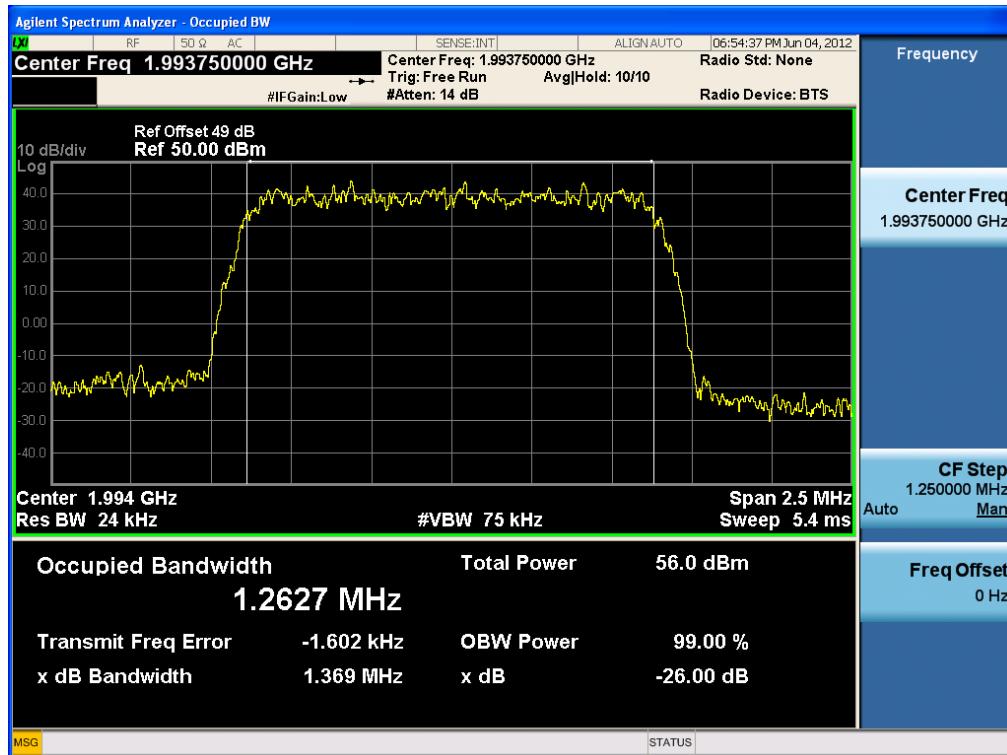


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.	Date of Issue:	EUT Type:	FCC ID:	Page	19 of 57
HCTR1207FR20	July 27, 2012	Multi-Carrier Power Amplifier	U88-MCPA-2002S-SPR		

High CH (QPSK) Input Signal

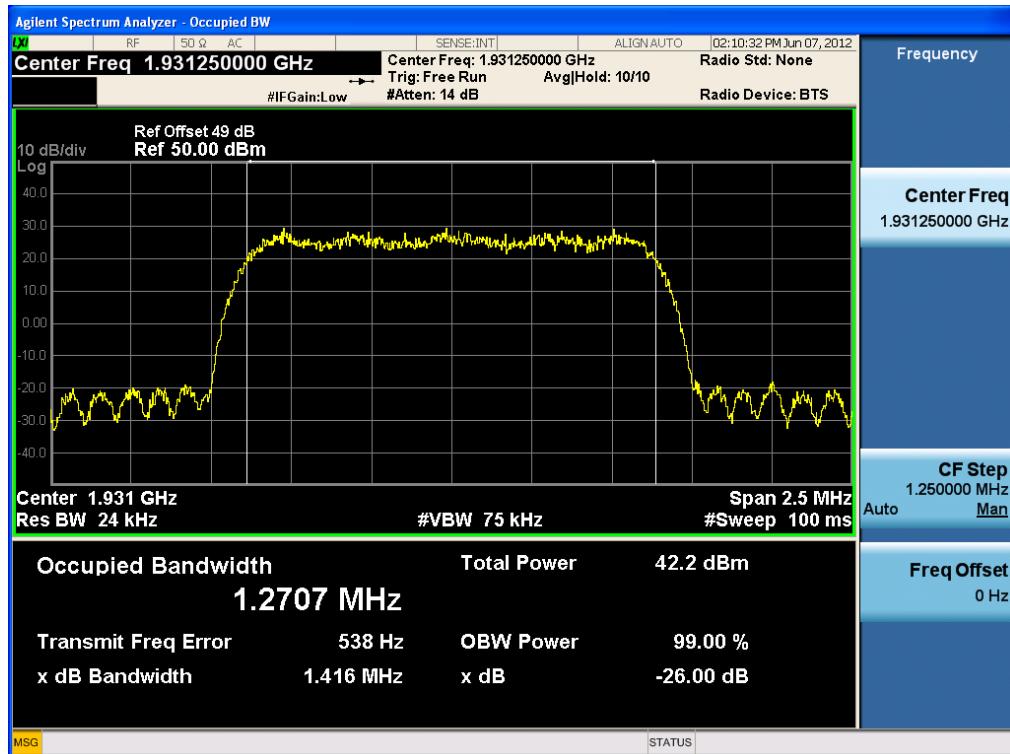


High CH (QPSK) Output Signal

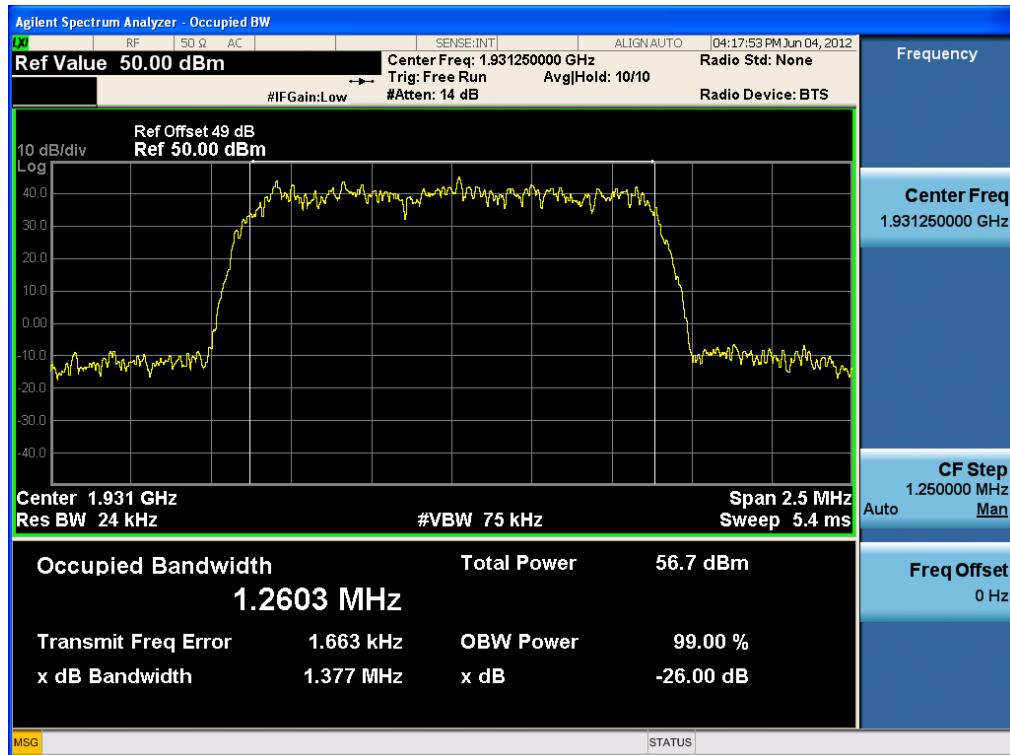


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 20 of 57	

Low CH (16QAM) Input Signal

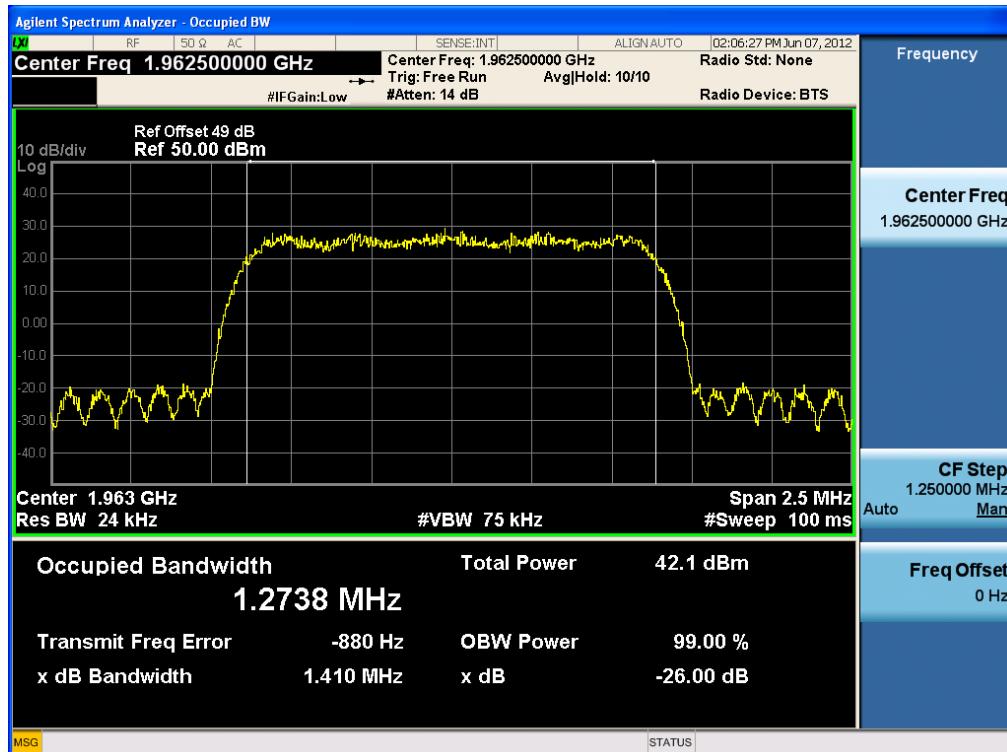


Low CH (16QAM) Output Signal

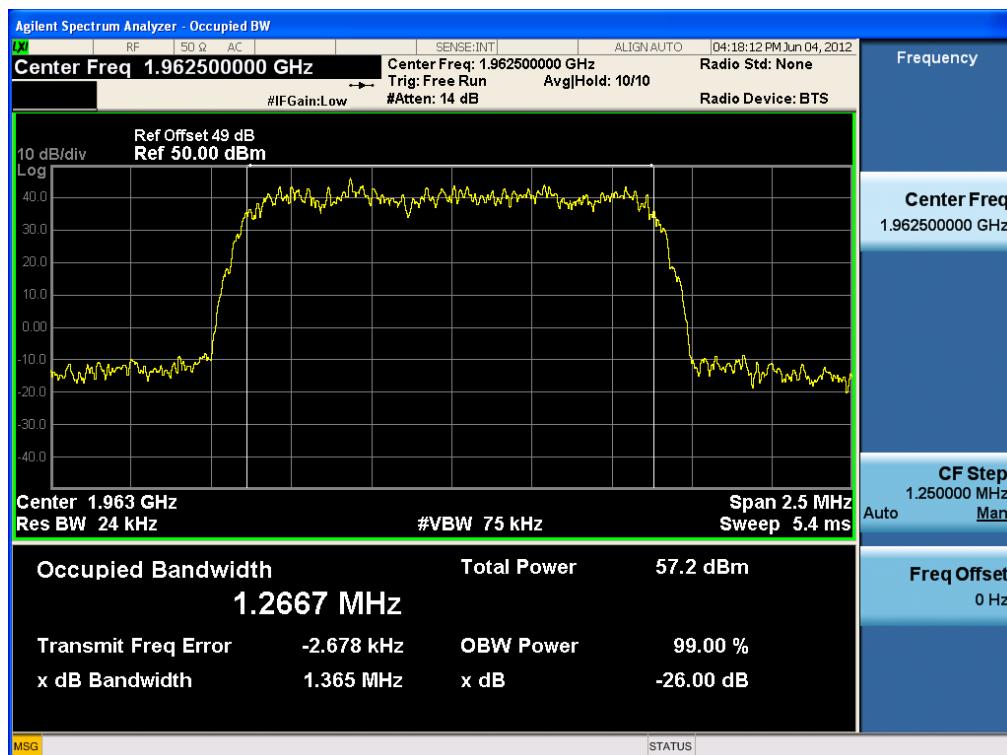


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier		FCC ID: U88-MCPA-2002S-SPR	Page 21 of 57

Mid CH (16QAM) Input Signal

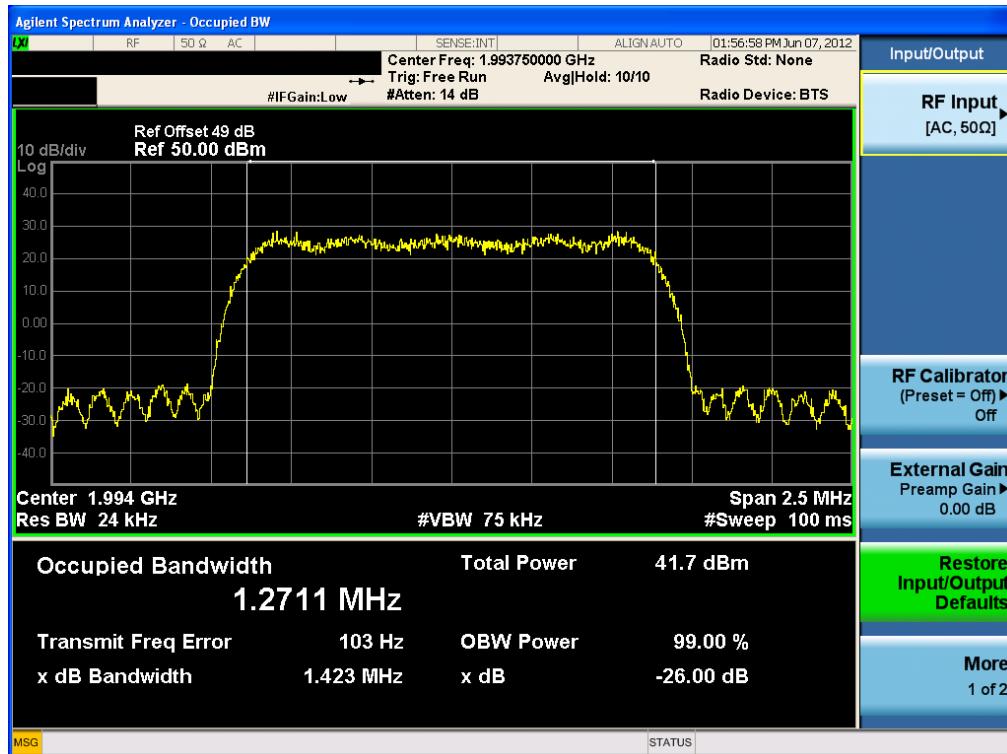


Mid CH (16QAM) Output Signal

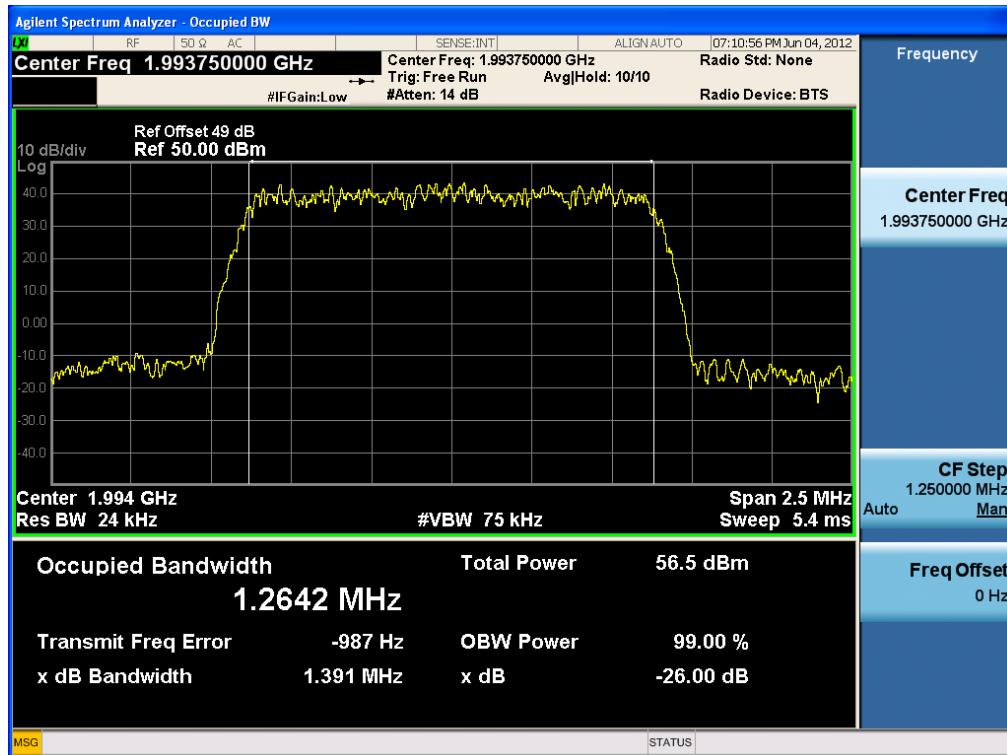


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier		FCC ID: U88-MCPA-2002S-SPR	Page 22 of 57

High CH (16QAM) Input Signal



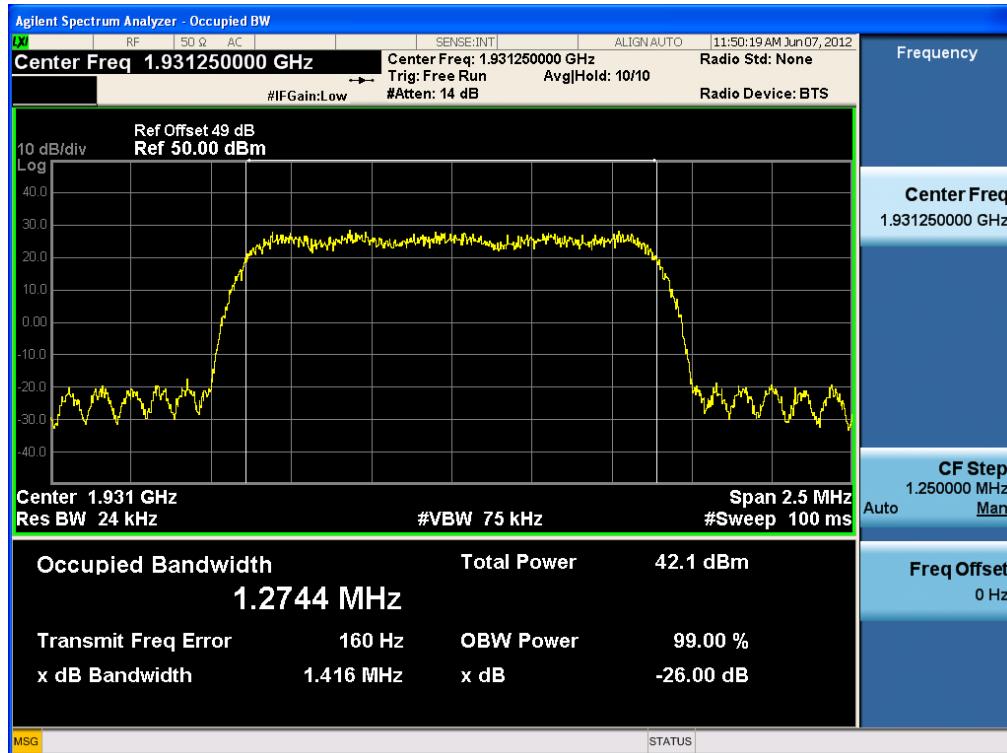
High CH (16QAM) Output Signal



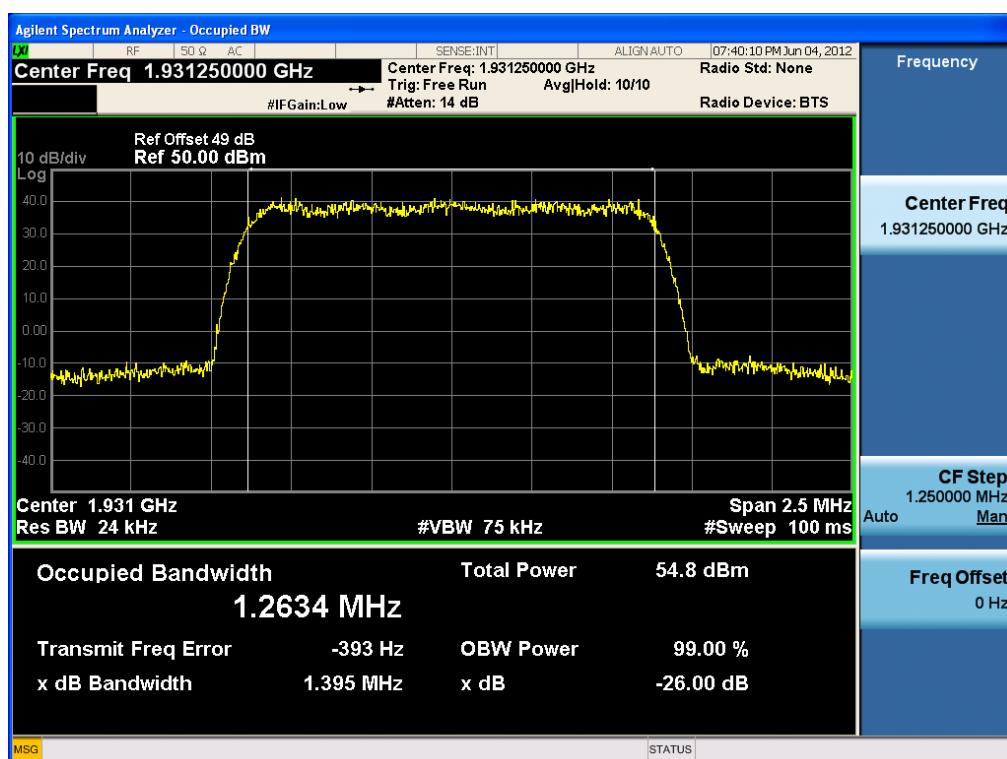
FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier	FCC ID: U88-MCPA-2002S-SPR	Page 23 of 57	

Plots of Occupied Bandwidth [MCA2]

Low CH (QPSK) Input Signal

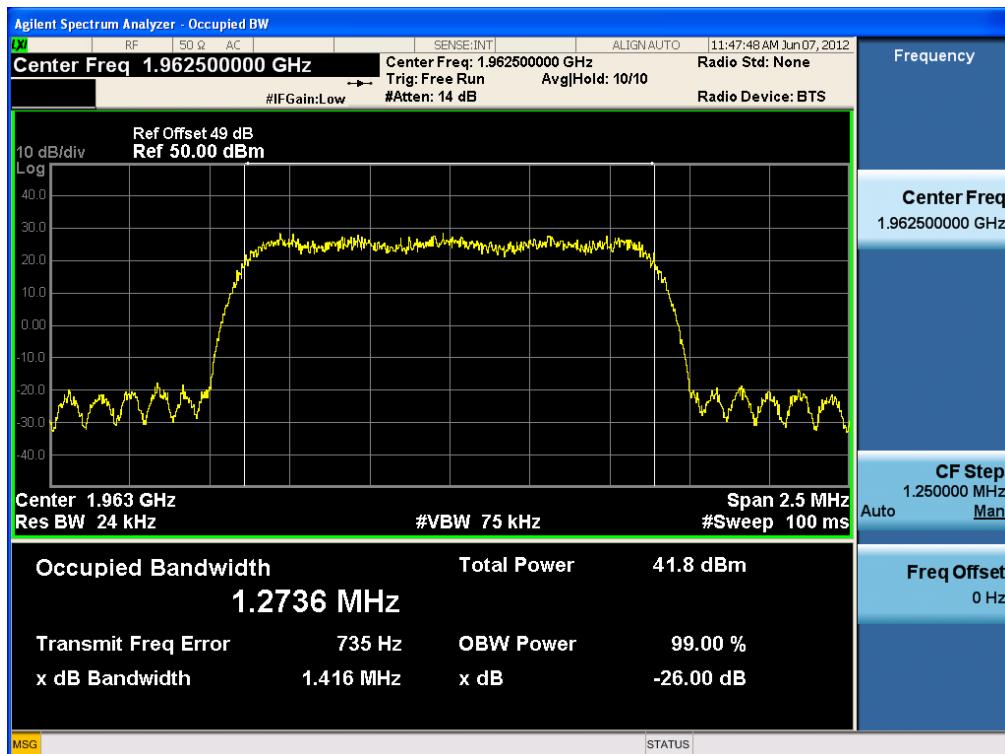


Low CH (QPSK) Output Signal

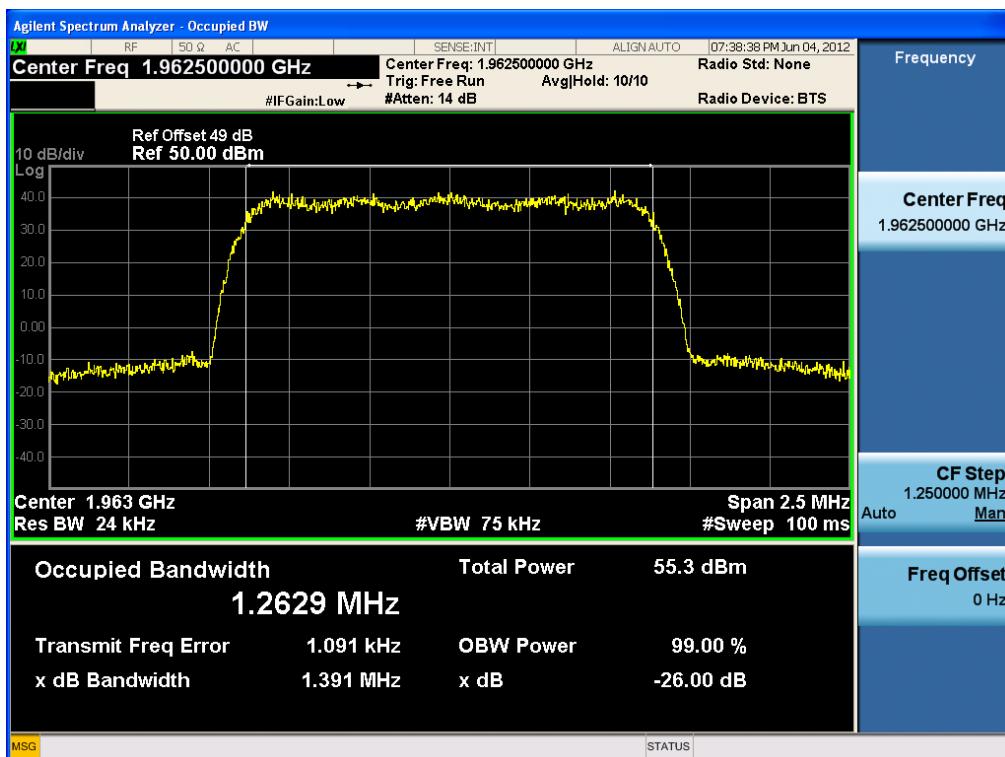


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier		FCC ID: U88-MCPA-2002S-SPR	Page 24 of 57

Mid CH (QPSK) Input Signal

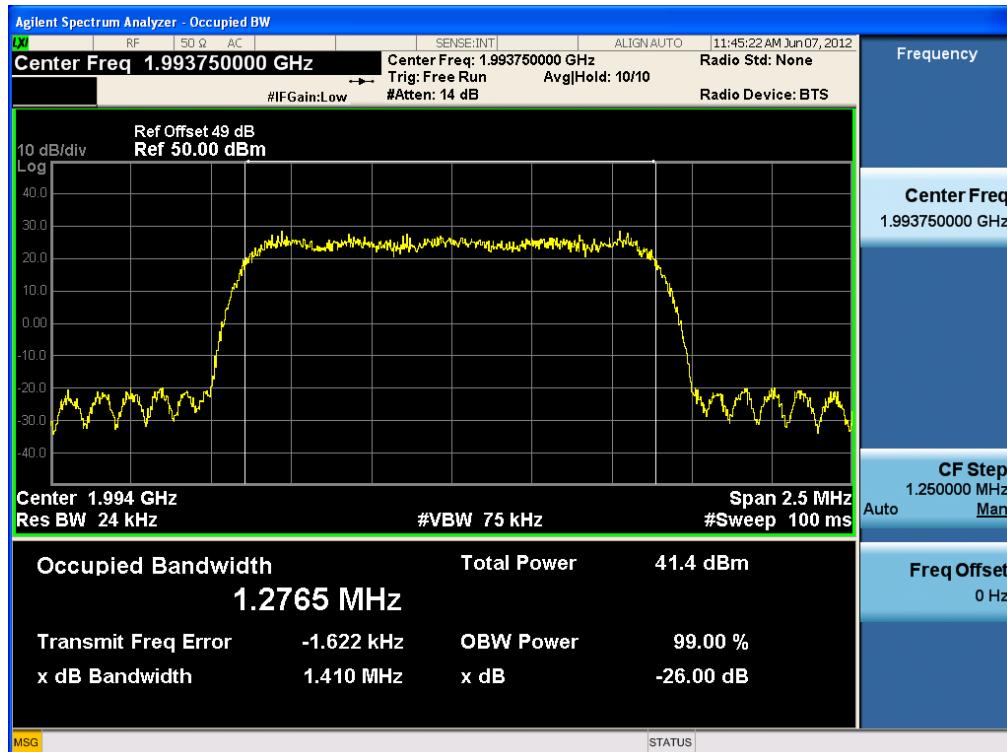


Mid CH (QPSK) Output Signal

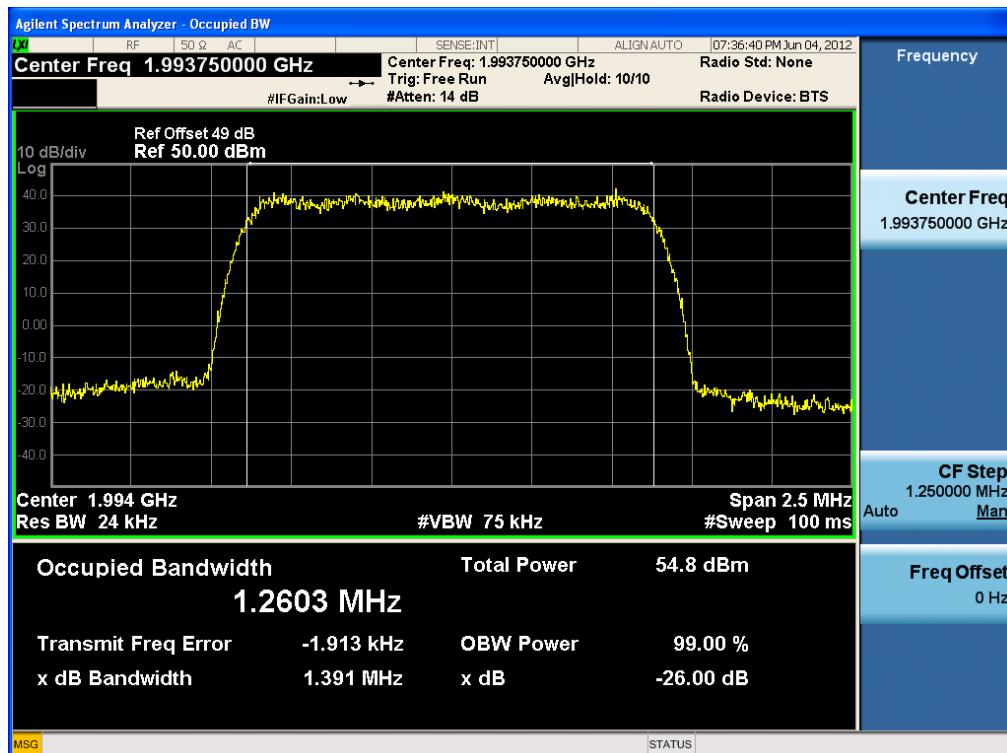


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier		FCC ID: U88-MCPA-2002S-SPR	Page 25 of 57

High CH (QPSK) Input Signal

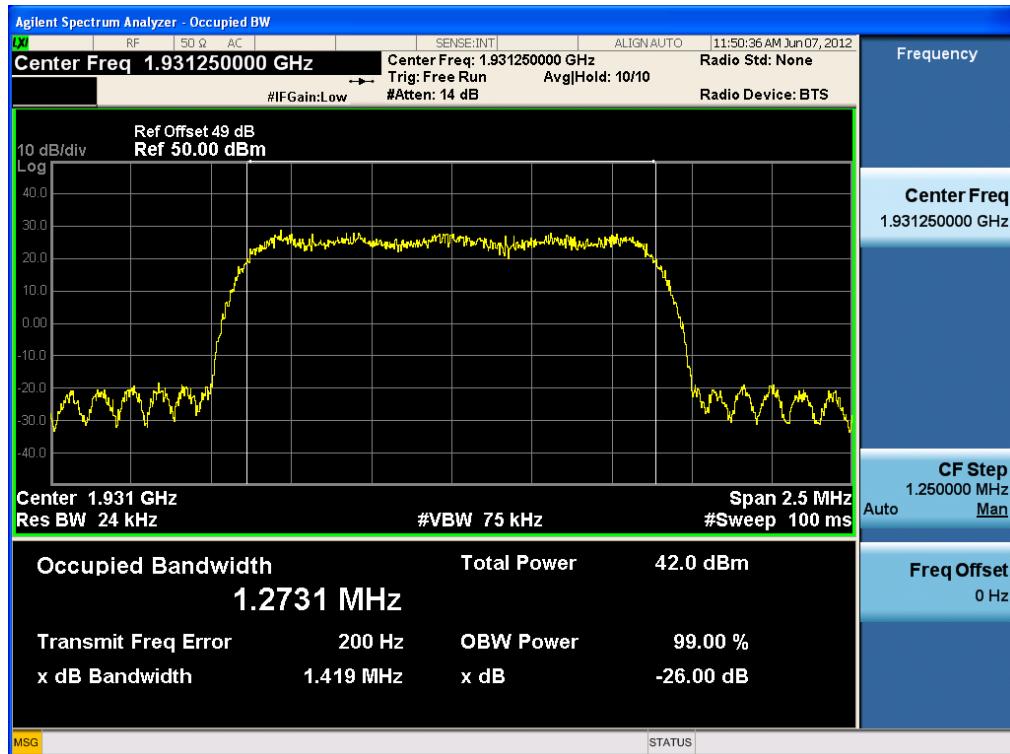


High CH (QPSK) Output Signal

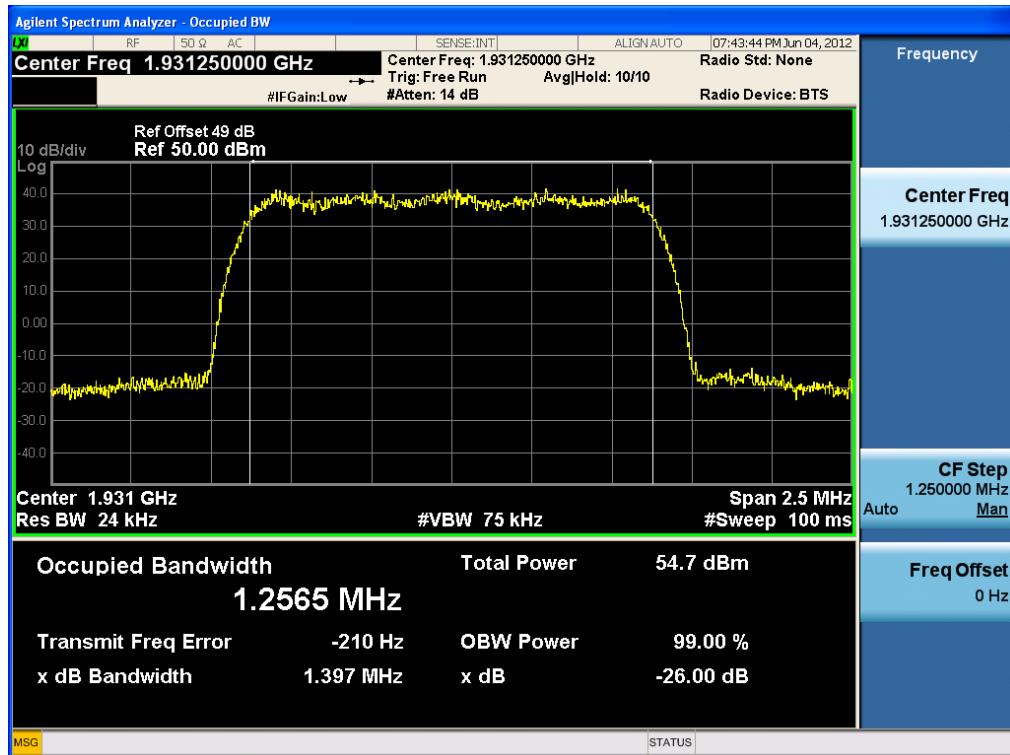


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier		FCC ID: U88-MCPA-2002S-SPR	Page 26 of 57

Low CH (16QAM) Input Signal

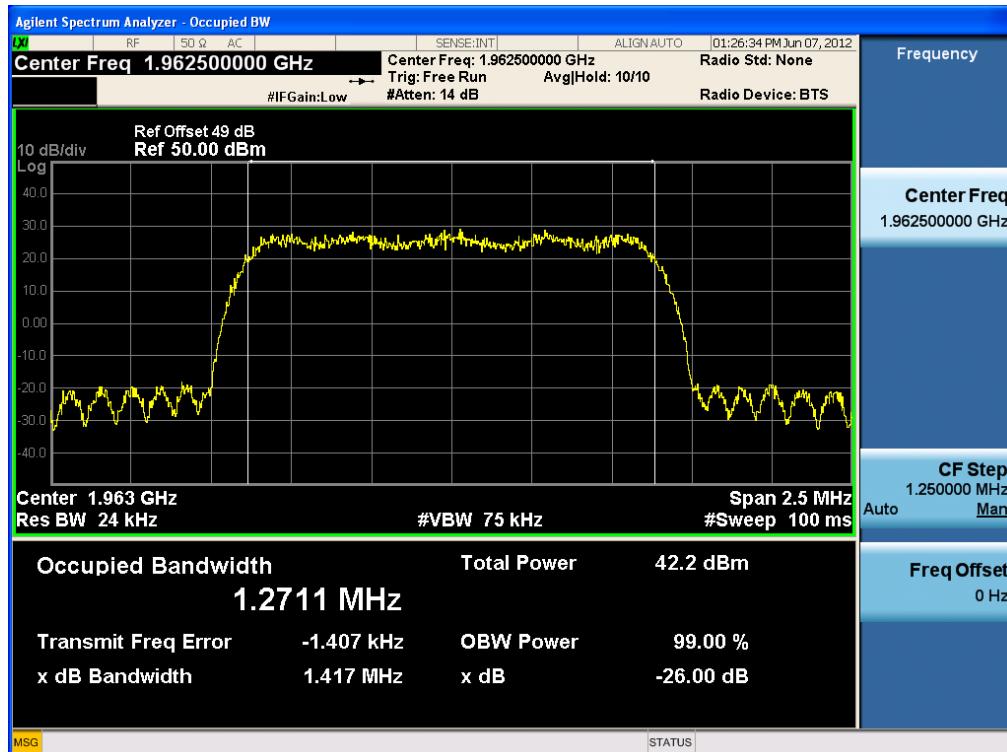


Low CH (16QAM) Output Signal

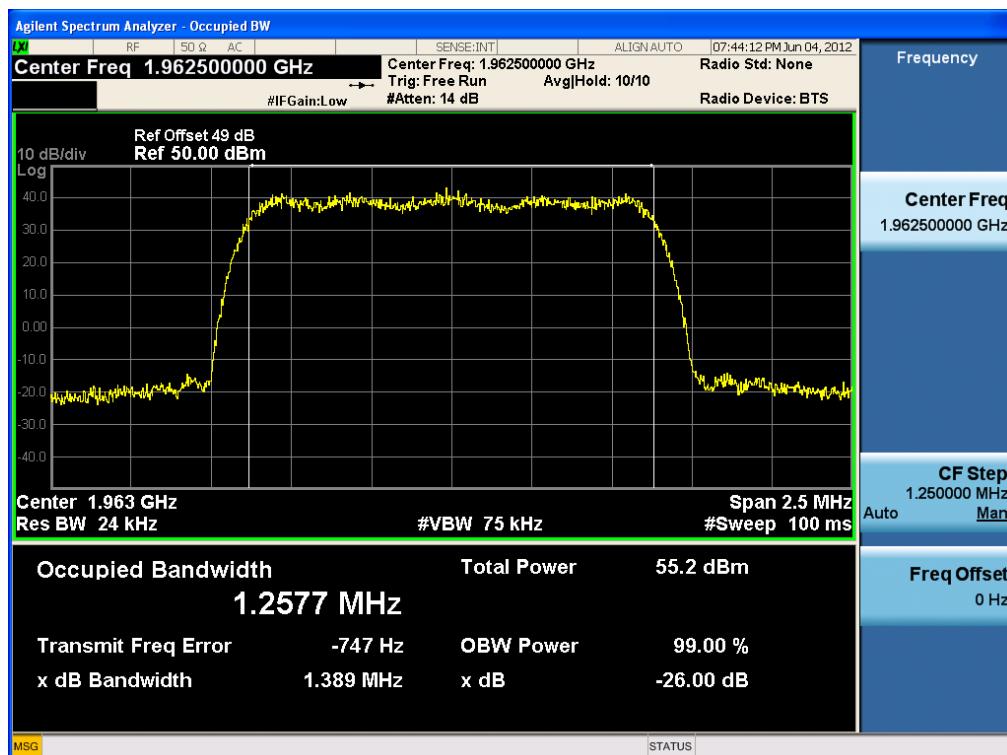


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No.	Date of Issue:	EUT Type:	FCC ID:	Page 27 of 57	
HCTR1207FR20	July 27, 2012	Multi-Carrier Power Amplifier	U88-MCPA-2002S-SPR		

Mid CH (16QAM) Input Signal

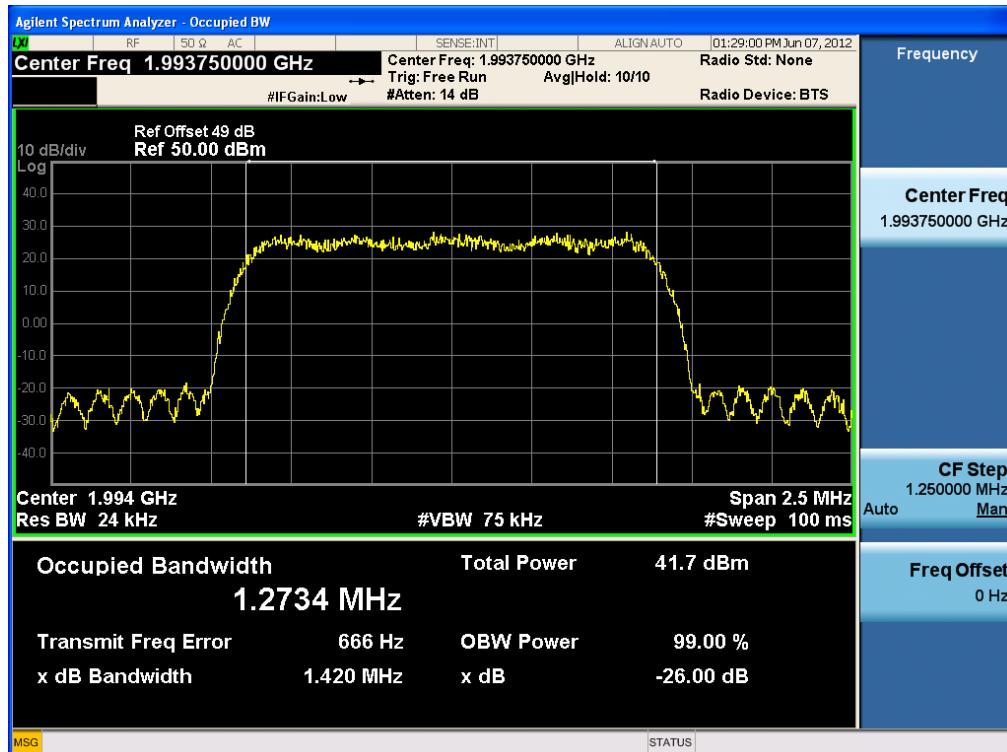


Mid CH (16QAM) Output Signal

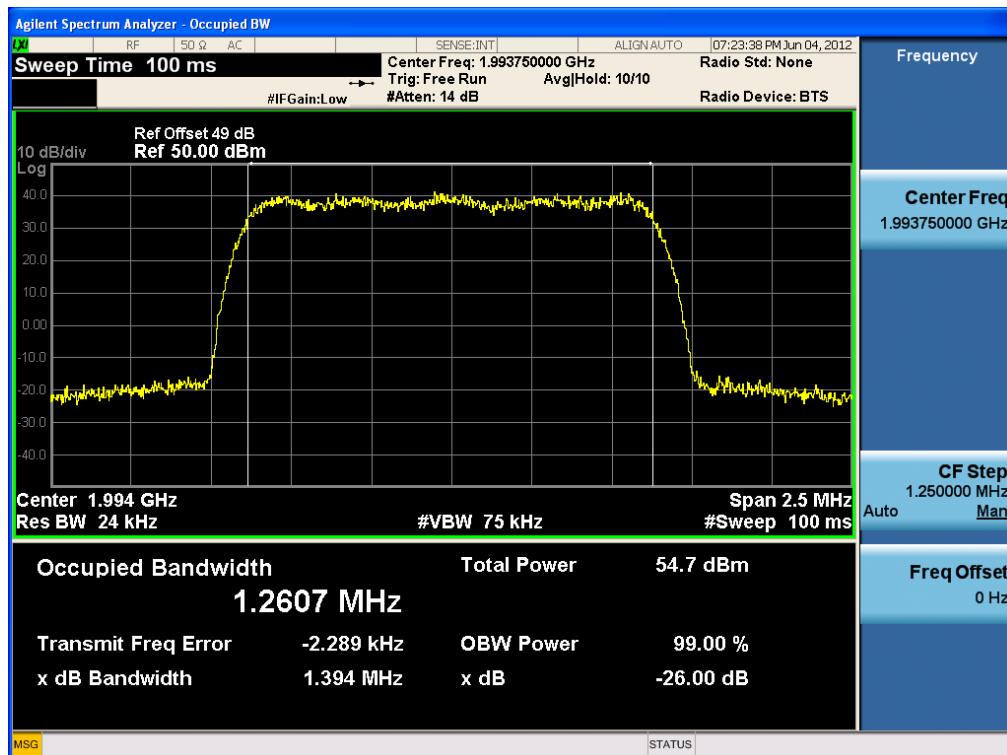


FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier		FCC ID: U88-MCPA-2002S-SPR	Page 28 of 57

High CH (16QAM) Input Signal



High CH (16QAM) Output Signal



FCC PT.24 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1207FR20	Date of Issue: July 27, 2012	EUT Type: Multi-Carrier Power Amplifier		FCC ID: U88-MCPA-2002S-SPR	Page 29 of 57