



HCT CO., LTD.

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CERTIFICATE OF COMPLIANCE

FCC PART 27 Certification

Applicant Name:

SAMSUNG Electronics Co., Ltd.
416, Maetan-3dong, Yeongtong-gu, Suwon-si,
Gyeonggi-do, Korea

Date of Testing: March 25, 2009

Test Site/Location:

HCT, San 136-1 Ami-ri, Bubal-eup, Icheon-si,
Kyungki-do, Korea

Test Report No.: HCT-RF09-0316

FCC ID : **A3LSPI-2213282600**

APPLICANT : **SAMSUNG Electronics Co., Ltd.**

EUT Type : Mobile WiMAX Outdoor RAS
Manufacturer : SAMSUNG Electronics Co., Ltd.
Model name : SPI-2213282600
Frequency of Operation : 2590 MHz ~ 2690 MHz
FCC Rule Part(s) : FCC Part 27.
Test Procedure(s) : ANSI C63.4-2003, EIA/TIA 603C
Application Type : Original Equipment
Data of issue : March 25, 2009

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 FCC Part 27 of the FCC Rules under normal use and maintenance.

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

Approved by
: Sang Jun Lee
Manager of RF Part

HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 1 of 89

C O N T E N T S

1. GENERAL INFORMATION.....	4
1.1. CLIENT INFORMATION	4
1.2. PRODUCT INFORMATION	4
1.3. OPERATING DESCRIPTION OF EUT	5
2. TEST SUMMARY	6
2.1. STANDARDS	6
2.2. MODE OF OPERATION DURING THE TEST	6
3. STANDARDS ENVIRONMENTAL TEST CONDITIONS	7
4. TEST EQUIPMENT	8
5. CONDUCTED OUTPUT POWER.....	9
5.1. Applicable Standard	9
5.2. Test Equipment List and Details	9
5.3. Test Procedure.....	9
5.3.1. Environmental Conditions:	9
5.4. Test Result	10
5.4.1. Test Data at Output Port 0	10
5.4.2. Test Data at Output Port 1	10
5.4.3. Plot Data for Output 0 (Conducted Output Power)	11
5.4.4. Plot Data for Output 1 (Conducted Output Power)	16
5.4.5. Plot Data for Output 0(CCDF).....	21
5.4.6. Plot Data for Output 1(CCDF).....	26
6. OCCUPIED BANDWIDTH	31
6.1. Applicable Standard	31
6.2. Test Equipment List and Details	31
6.3. Test Procedure.....	31
6.3.1. Environmental Conditions:	31
6.4. Test Result	31
6.4.1. Test Data at Output Port 0	32
6.4.2. Test Data at Output Port 1	32
6.4.3. Test Plot at Output Port 0	33
6.4.4. Test Plot at Output Port 1	38
7. BAND EDGES	43

HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 2 of 89

7.1. Applicable Standard	43
7.2. Test Equipment List and Details	43
7.3. Test Procedure.....	43
7.3.1. Environmental Conditions.....	43
7.4. Test Result	43
7.4.1. Test data at Output 0	44
7.4.2. Test data at Output 1	44
7.4.3. Plot Data at Output 0	45
7.4.4. Plot Data at Output 1	48
7.4.5. Plot Data at Combined Output	51
8. SPURIOUS EMISSION AT ANTENNA TERMINAL	54
8.1. Applicable Standard Requirements:	54
8.2. Test Equipment List and Details	54
8.3. Test Procedure.....	54
8.3.1 Environmental Conditions:	54
8.4. Test Result	54
8.4.1. Plot Data at Output 0	55
8.4.2. Plot Data at Output 1	64
8.4.4 Plot Data at Combined Output	73
8.4.5 Plot Data at Combined Output	74
9. RADIATED SPURIOUS EMISSION	82
9.1 Applicable Standard:	82
9.2 Test Equipment List and Details	82
9.3 Test Procedure.....	82
9.3.1 Radiated Spurious Emissions Test Setup	83
9.3.2 Environmental Conditions:	83
9.4 Test Result	83
10. FREQUENCY STABILITY	84
10.1 Applicable Standard	84
10.2 Test Equipment List and Details	84
10.3 Test Procedure.....	84
10.3.1. Environmental conditions	84
10.4. Test Result	84
10.4.1. Frequency Stability over Temperature and Voltage variation	85
11. RF Exposure Statement.....	88

HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 3 of 89

1. GENERAL INFORMATION

1.1. CLIENT INFORMATION

Company	Samsung Electronics Co., Ltd.
Contact Point	416, Maetan-3dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
Contact person	Name: JOON-HO LEE / Senior Research Engineer E-mail : joonho@samsung.com Tel: +82-31-279-3552 Fax: +82-31-279-7576

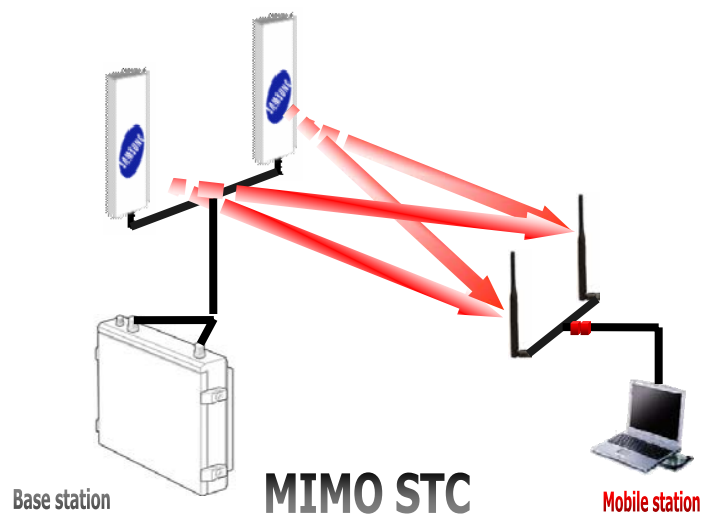
1.2. PRODUCT INFORMATION

EUT TYPE	Mobile WiMAX Outdoor RAS
EMISSION DESIGNATOR	9M13G7W
OPERATING FREQUENCY	2590 MHz ~ 2690 MHz
TX OUTPUT POWER	4 W (36 dBm)
CHANNEL BANDWIDTH	10 MHz
MODULATION TYPE	OFDMA (QPSK, 16QAM, 64QAM)
NUMBER OF CARRIERS/SECTORS	2 Carriers / 3 Sectors
CHANNEL CARD CAPACITY	1 Carrier / 1 Sector
SYSTEM INPUT VOLTAGE	DC -48V

1.3. OPERATING DESCRIPTION OF EUT

The outdoor SPI-2211 provides the MIMO function and using Matrix A (STC).

Explanation of STC is below.



Matrix A(Space-Time Coding)

Transmission ratio of the Matrix A or Space-Time Coding(STC) is 1 and equal to that of Single Input Single Output(SISO). However The Matrix A or the STC reduces the error of the signal received from the MS by raising the stability of the signal received from the MS by means of the Tx diversity. This technology is, also, effective in Signal to Noise Ratio(SNR) and provides excellent performance even when the MS moves in high speed.

HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 5 of 89

2. TEST SUMMARY

2.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance With **FCC Part 27**

SECTION	TEST ITEMS	RESULTS
2.1046, 27.50(h)	Conducted Output Power	Compliant
2.1049, 27.53(l)	Occupied Bandwidth	Compliant
2.1051, 27.53(l)	Spurious Emissions at Antenna Terminals	Compliant
2.1051, 27.53(l)	Band edge	Compliant
2.1053, 27.53(l)	Spurious Radiated Emissions.	Compliant
2.1055(a)(1), 27.54	Frequency Stability over Temperature variation	Compliant
2.1055(d), 27.54	Frequency stability over Voltage variation	Compliant

2.2. MODE OF OPERATION DURING THE TEST

The EUT was operated in a manner representative of the typical usage of the equipment.

During all testing, system components were manipulated within the confines of typical usage to maximize each emission. All Modulation (QPSK, 16QAM, and 64QAM) modes and different data rates were tested, and the worst data was recorded in this test report.

The device does not supply antenna(s) with the system, so the dummy loads were connected to the RF output ports for radiated spurious emission testing.

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 EQUIPMENT

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Schwarzbeck	BBHA 9120D /Double Ridged Horn Antenna	296	03/30/2009
Schwarzbeck	BBHA 9120D /Double Ridged Horn Antenna	147	03/26/2010
Schwarzbeck	VULB 9160/ TRILOG Antenna	9160-3150	12/18/2010
Schwarzbeck	VULB 9160/ TRILOG Antenna	3125	05/16/2009
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-60-0010 1800-35-20P	1200937	05/20/2009
Agilent	E7405A/EMI Receiver	US40240209	12/10/2009
Wainwright Instrument	WHF3.3/18G-10EF / High Pass Filter	1	06/28/2009
WEINSCHTEL	67-30-33/Attenuator	BU5347	01/13/2010
WEINSCHTEL	67-30-33/Attenuator	BR0530	02/03/2010
WEINSCHTEL	AF117A-69-43/ STEP ATTENUATOR	20623	02/06/2010
WEINSCHTEL	AF117A-69-43/ STEP ATTENUATOR	21207	01/13/2010
Agilent	N9020A / MXA Signal Analyzer	US46220219	02/19/2010

5. CONDUCTED OUTPUT POWER

5.1. Applicable Standard

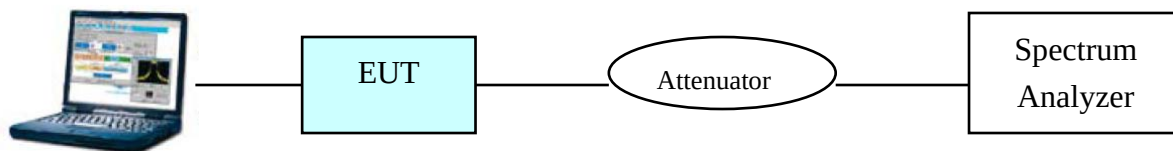
According to FCC §2.1046&27.5(h)

5.2. Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Due Date
Agilent	Signal Analyzer	N9020A	US46220219	02/19/2010

5.3. Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.



According to FCC §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). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

- 1) The radio frequency load attached to the EUT antenna terminal was 50 Ohm. The loss of the cables in the test system is calibrated to correct the reading.
- 2) The spectrum analyzer was set to RMS Detector function and Maximum hold mode.
- 3) The resolution bandwidth of the spectrum analyzer was comparable to the emission bandwidth.
- 4) PAR is measured by using CCDF function of Spectrum Analyzer. Info BW is equal to EUT's emission bandwidth.

5.3.1. Environmental Conditions:

Temperature:	25 °C
Relative Humidity:	57 %

HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 9 of 89

5.4. Test Result

: PASS

5.4.1. Test Data at Output Port 0

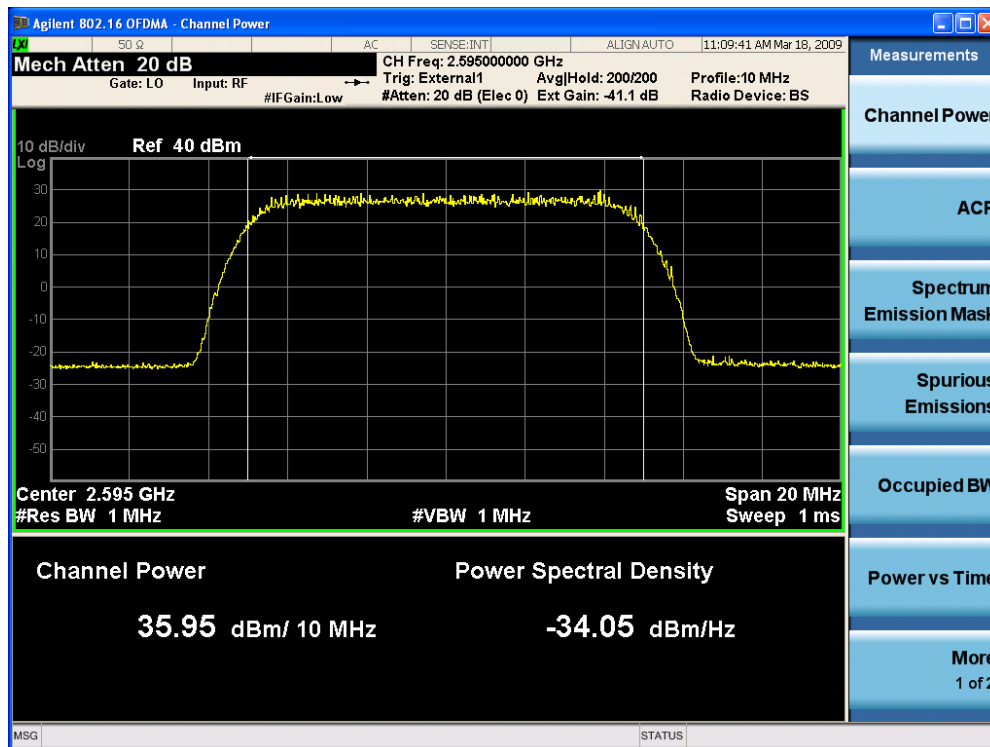
Modulation	Channel	Frequency	Measured Output Power		CCDF (dB)
			dBm	W	
QPSK	Low	2595.00	35.95	3.9355	11.29
	Middle	2645.00	36.19	4.1591	10.90
	High	2685.00	36.21	4.1783	10.78
16QAM	Low	2595.00	36.02	3.9994	11.51
	Middle	2645.00	36.22	4.1879	10.87
	High	2685.00	36.19	4.1591	11.00
64QAM	Low	2600.00	35.96	3.9445	11.22
	Middle	2645.00	36.21	4.1783	11.05
	High	2685.00	36.13	4.1020	10.54

5.4.2. Test Data at Output Port 1

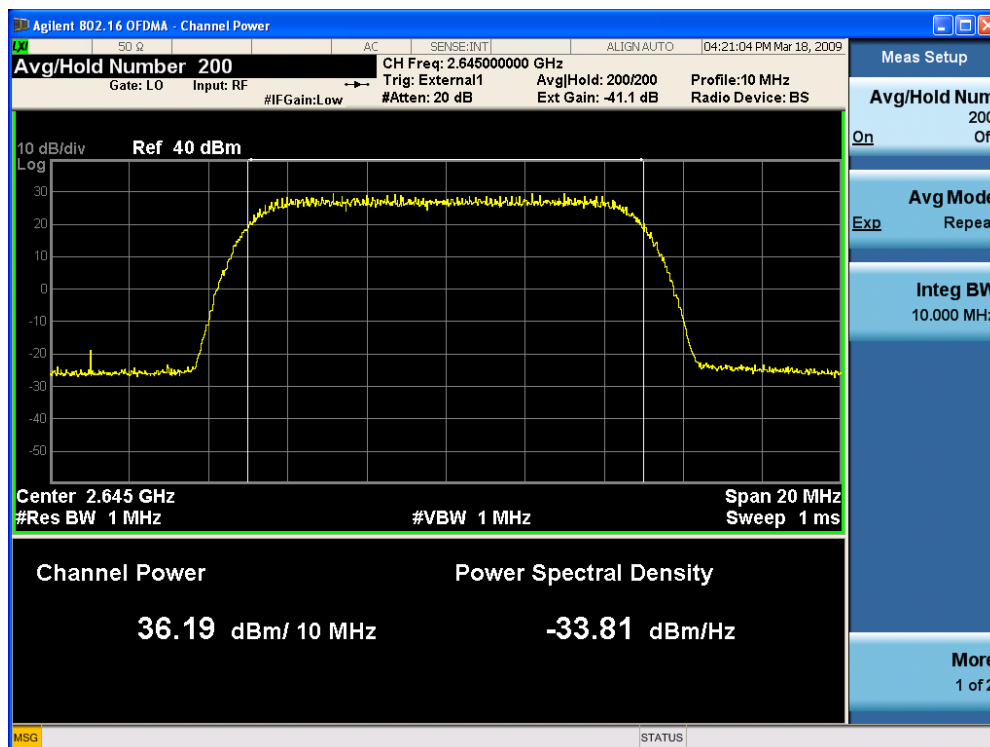
Modulation	Channel	Frequency	Measured Output Power		CCDF (dB)
			dBm	W	
QPSK	Low	2595.00	35.79	3.7931	12.36
	Middle	2645.00	36.15	4.1209	11.62
	High	2685.00	36.06	4.0364	11.45
16QAM	Low	2595.00	35.72	3.7325	12.20
	Middle	2645.00	36.10	4.0738	11.82
	High	2685.00	36.00	3.9810	11.64
64QAM	Low	2595.00	35.80	3.8018	12.13
	Middle	2645.00	36.12	4.0926	12.00
	High	2685.00	35.99	3.9719	11.43

5.4.3. Plot Data for Output 0 (Conducted Output Power)

(QPSK Low Channel)

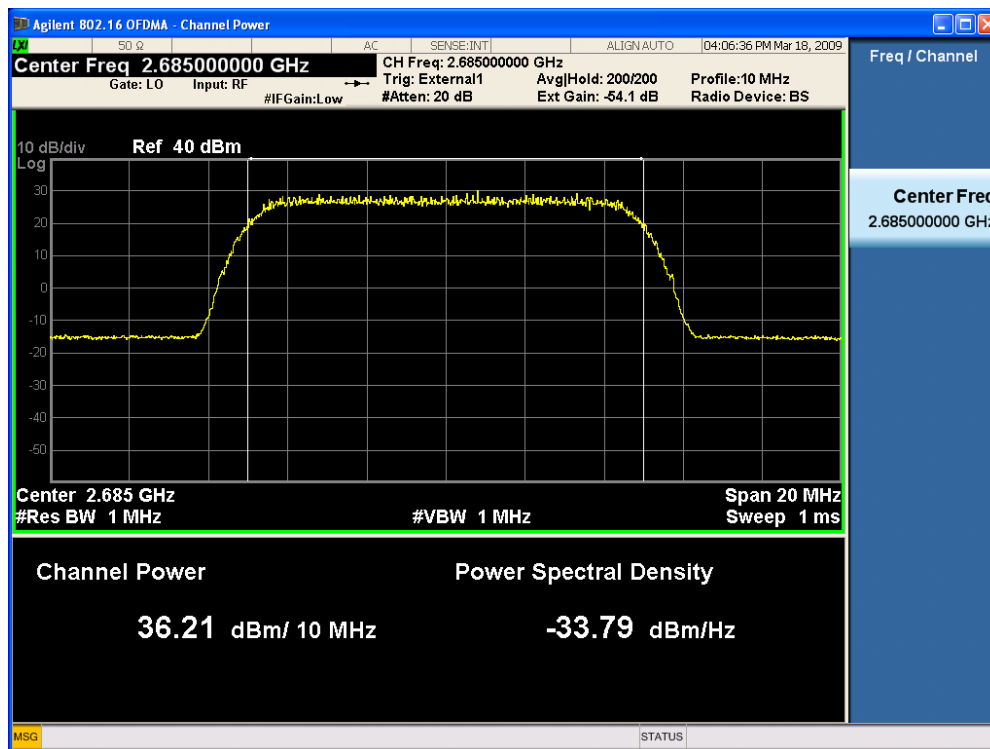


(QPSK Middle Channel)

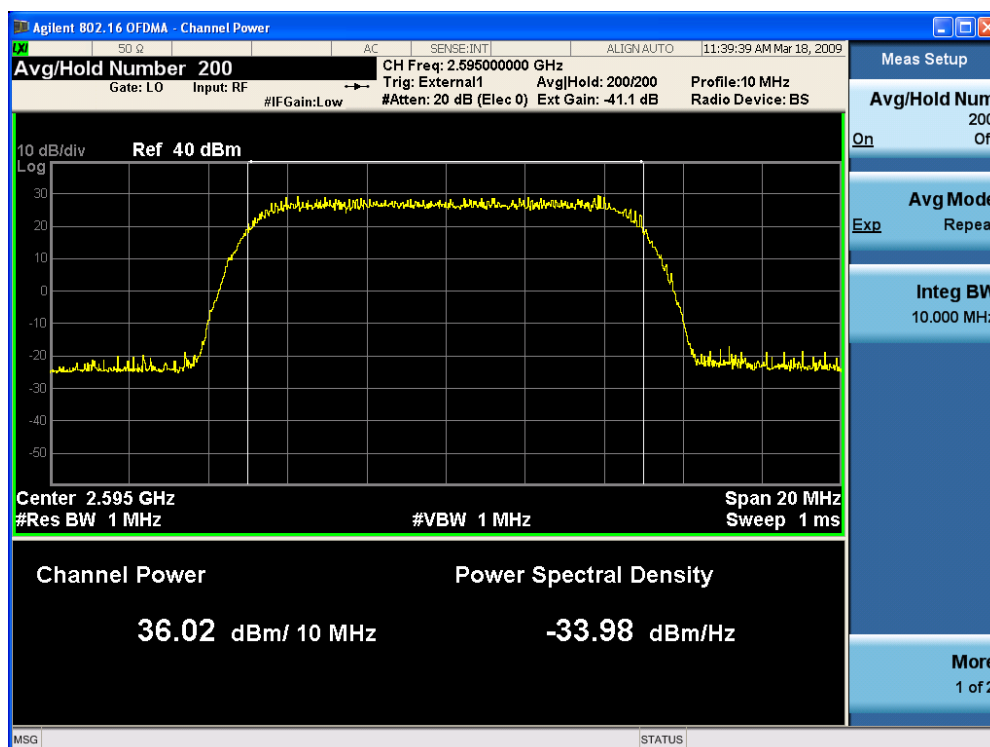


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 11 of 89

(QPSK High Channel)

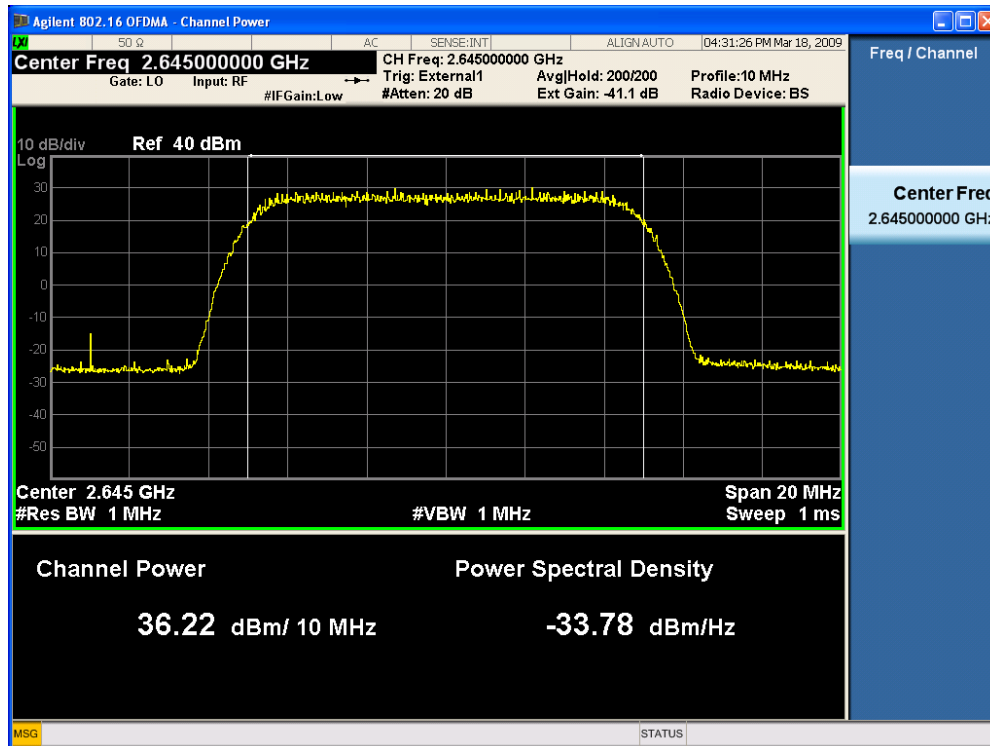


(16QAM Low Channel)

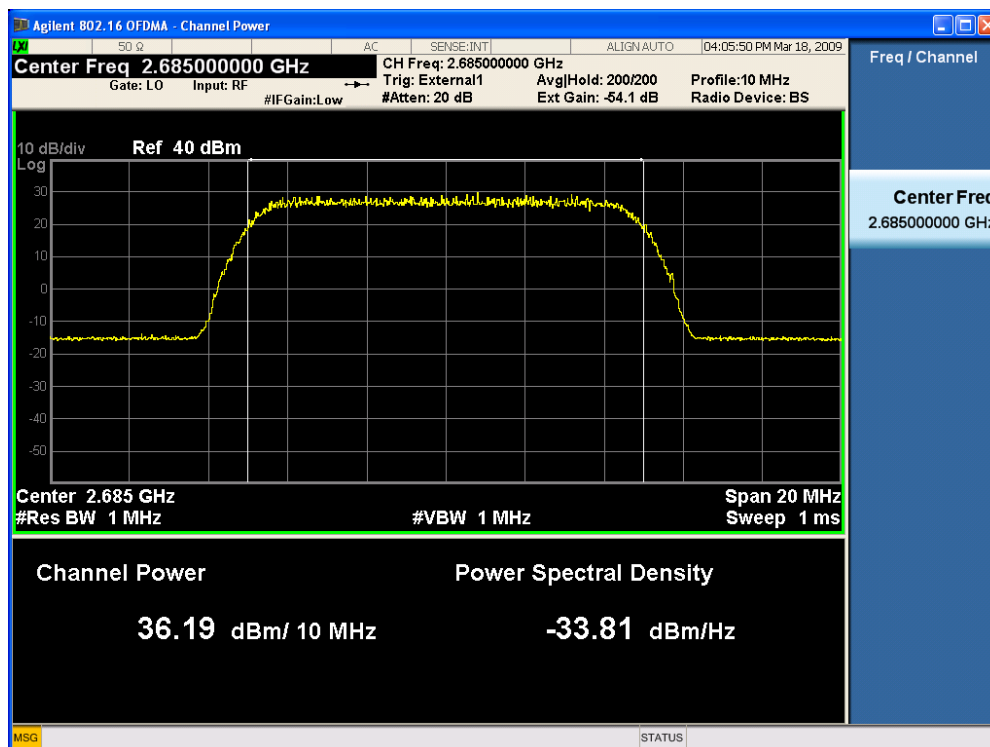


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 12 of 89

(16QAM Middle Channel)

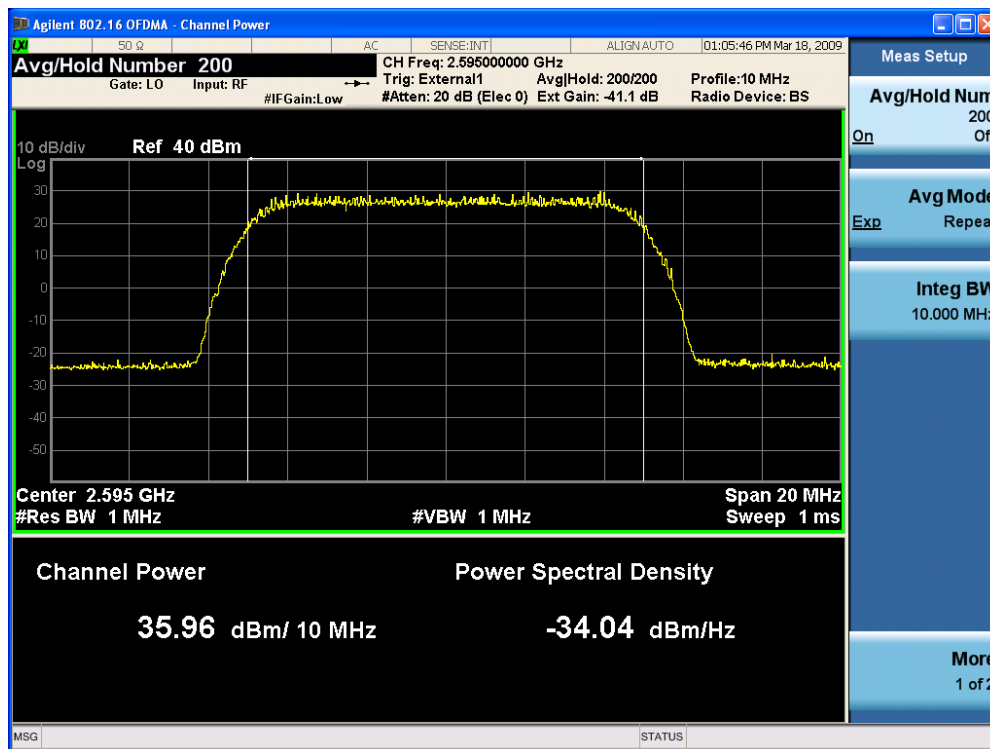


(16QAM High Channel)

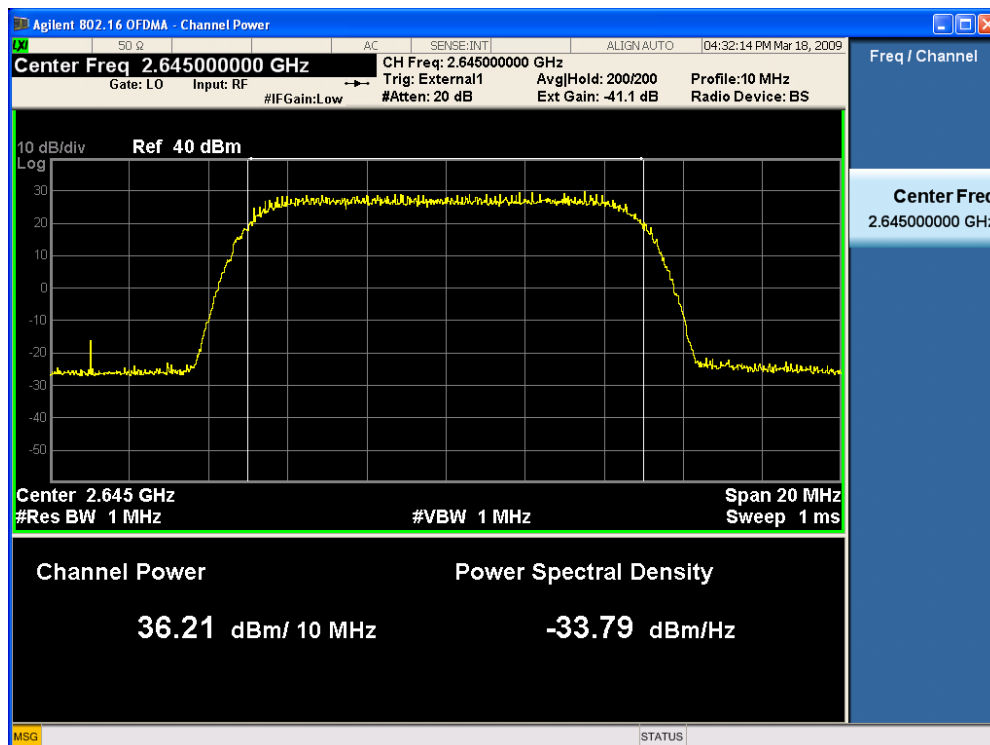


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 13 of 89

(64QAM Low Channel)

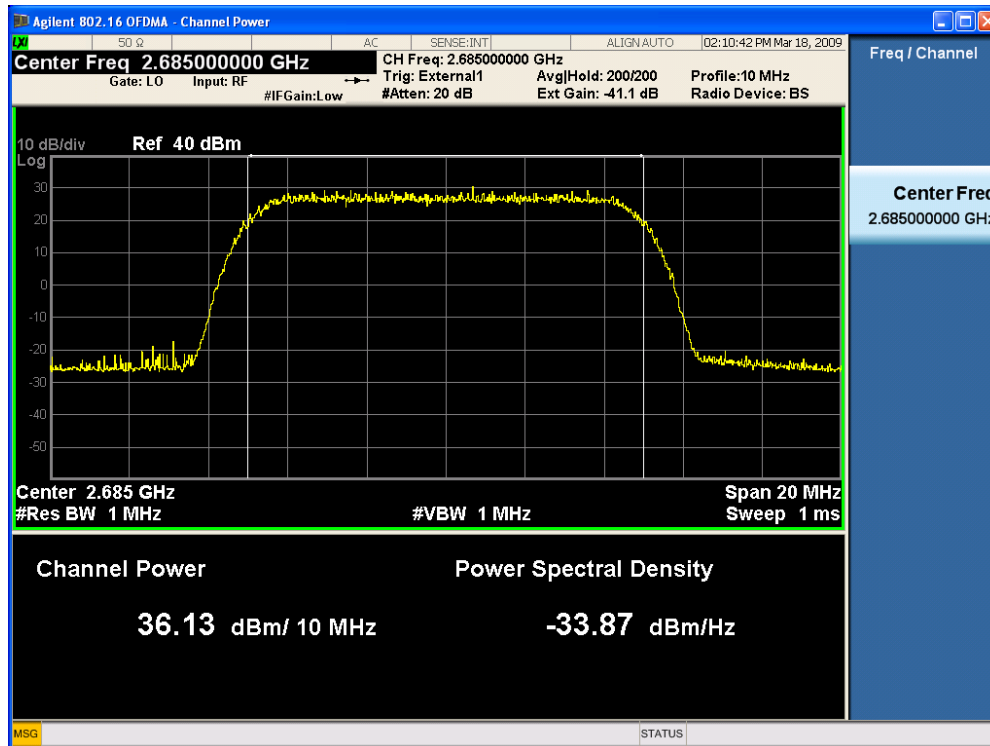


(64QAM Middle Channel)



HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 14 of 89

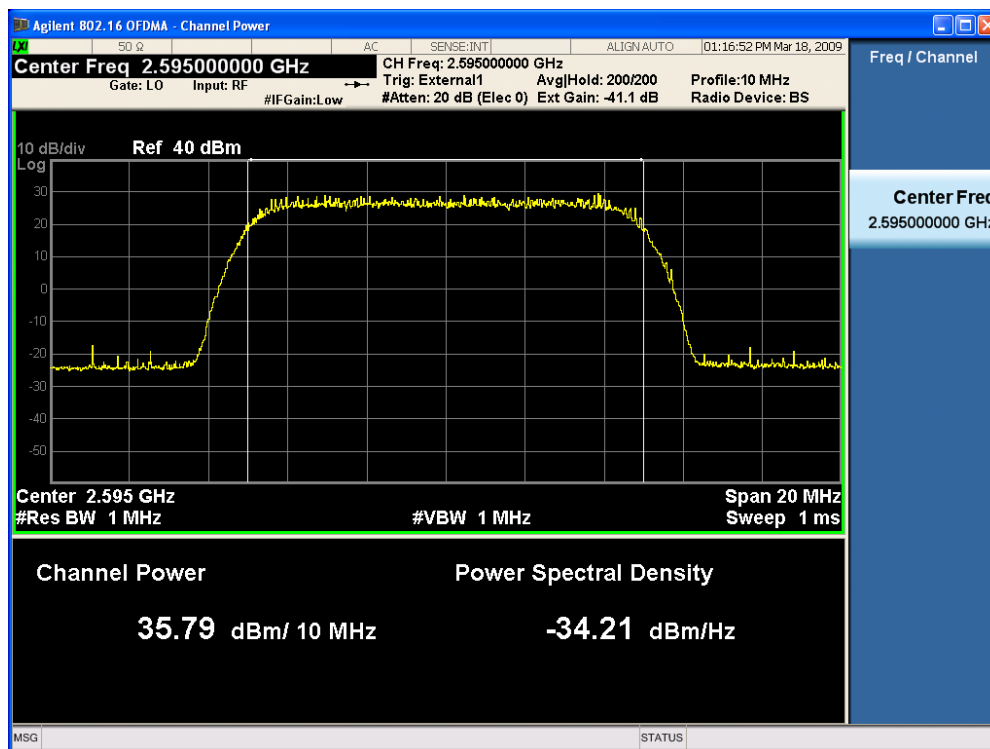
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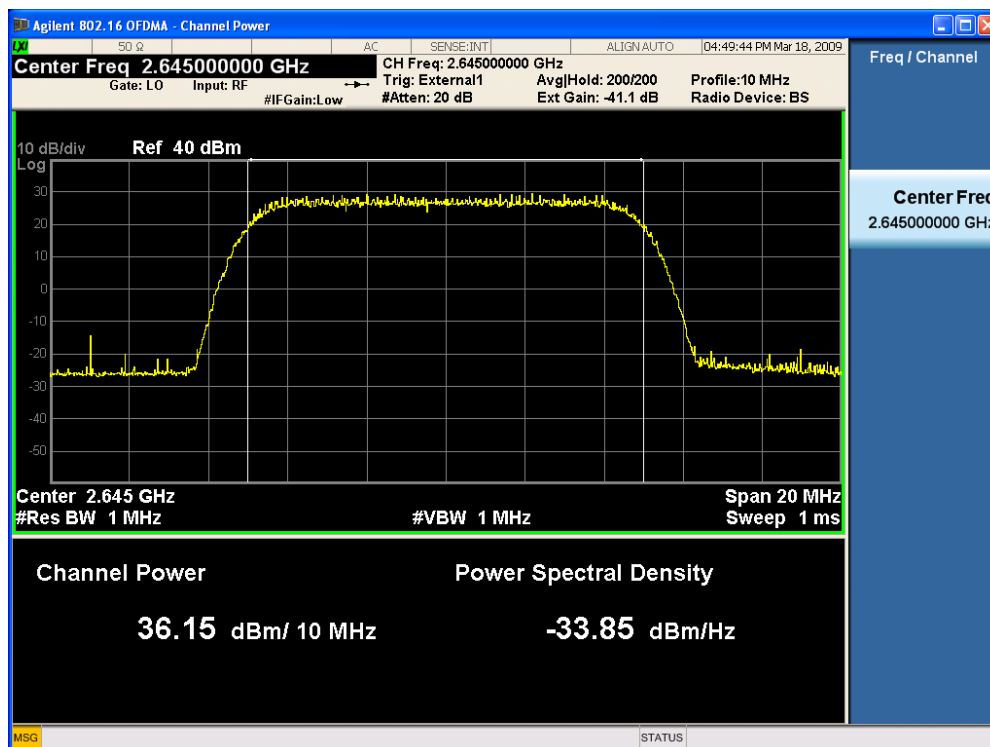
HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 15 of 89

5.4.4. Plot Data for Output 1 (Conducted Output Power)

(QPSK Low Channel)

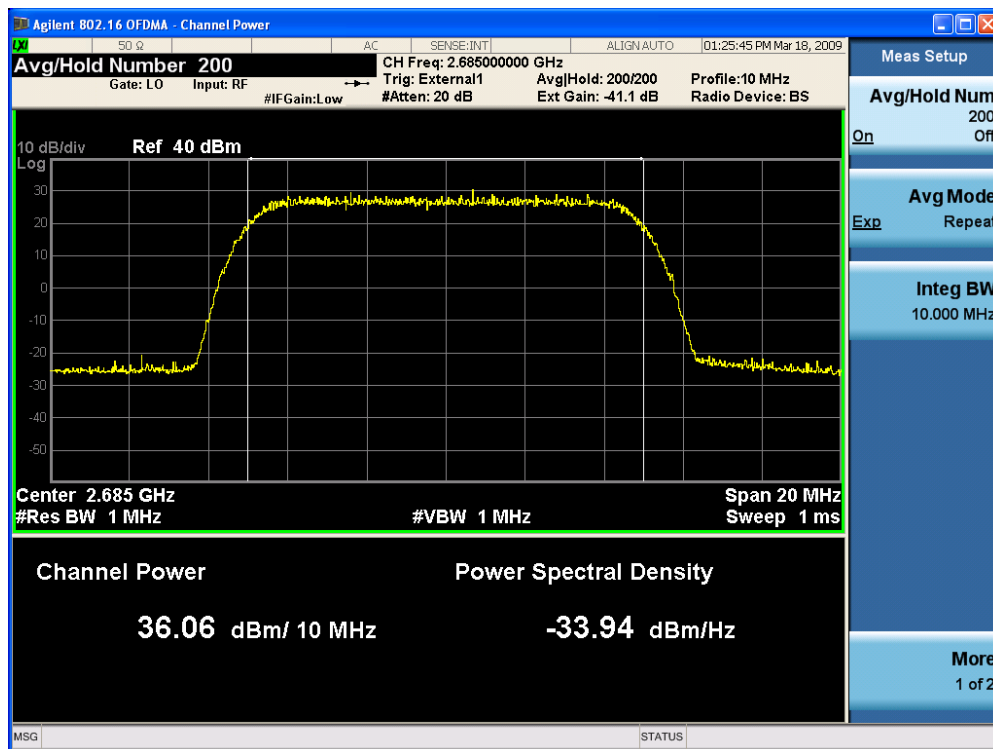


(QPSK Middle Channel)

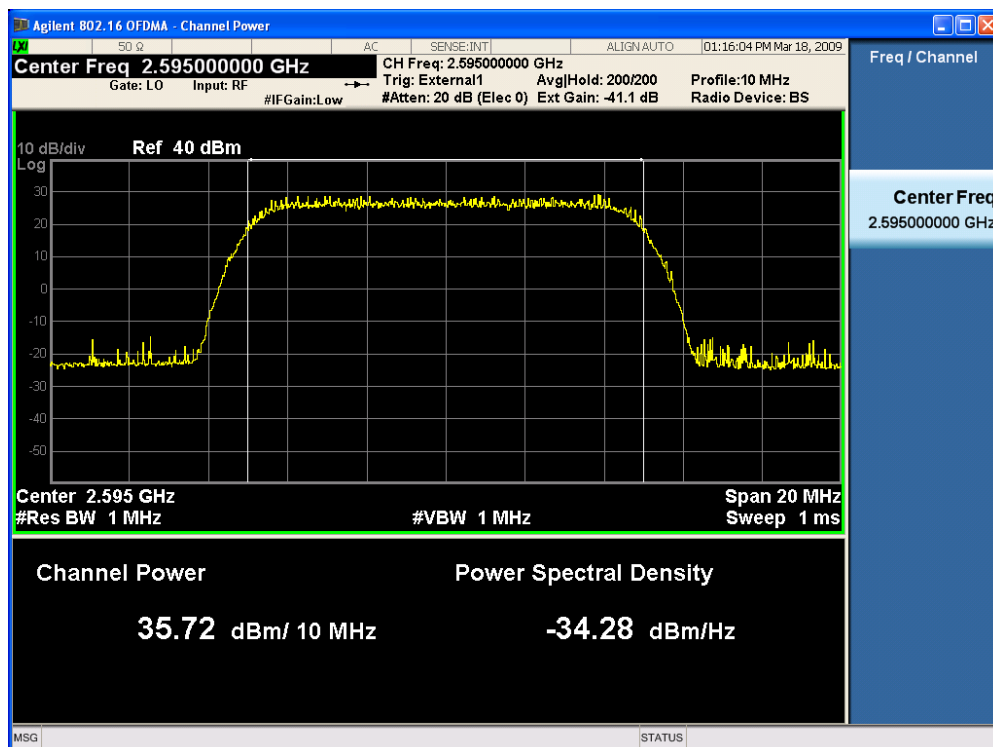


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 16 of 89

(QPSK High Channel)

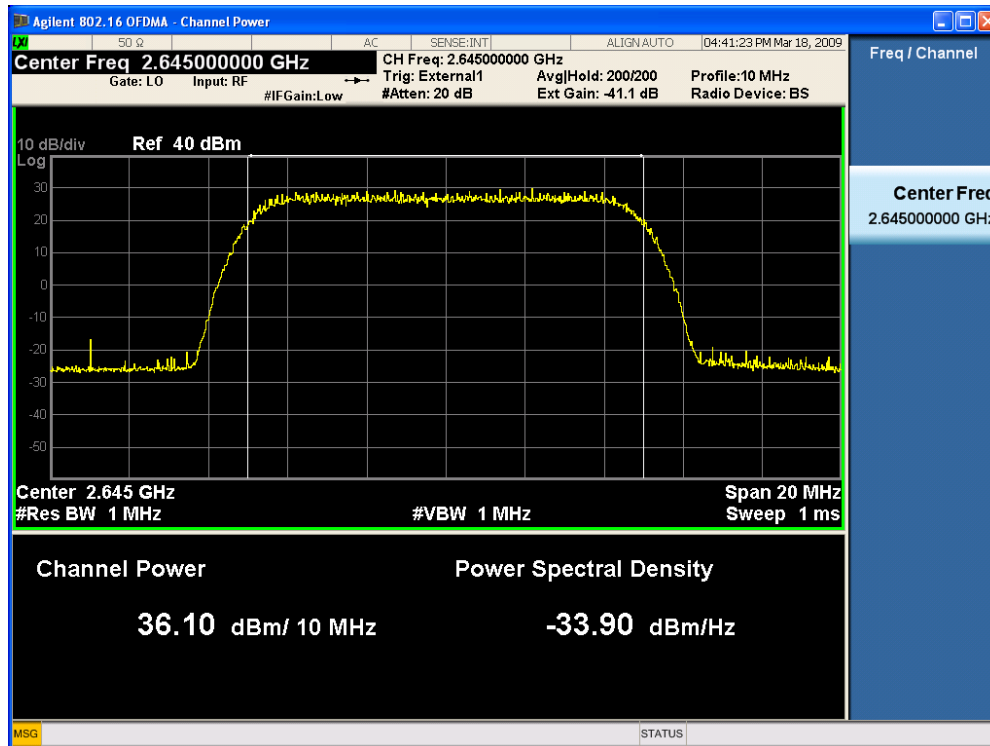


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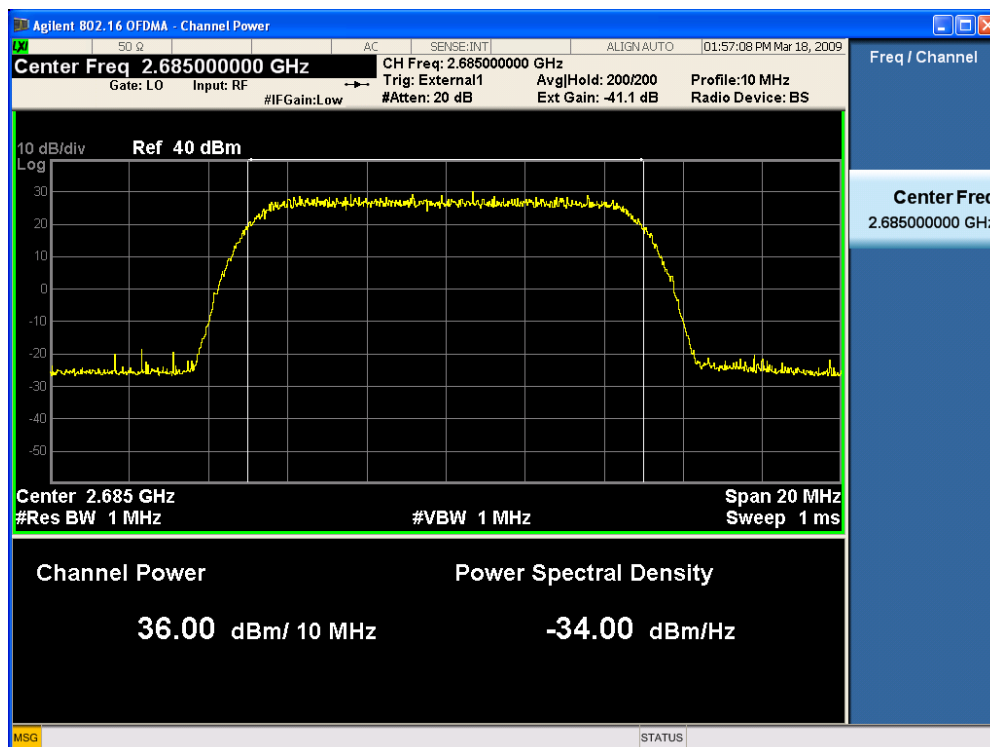


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 17 of 89

(16QAM Middle Channel)

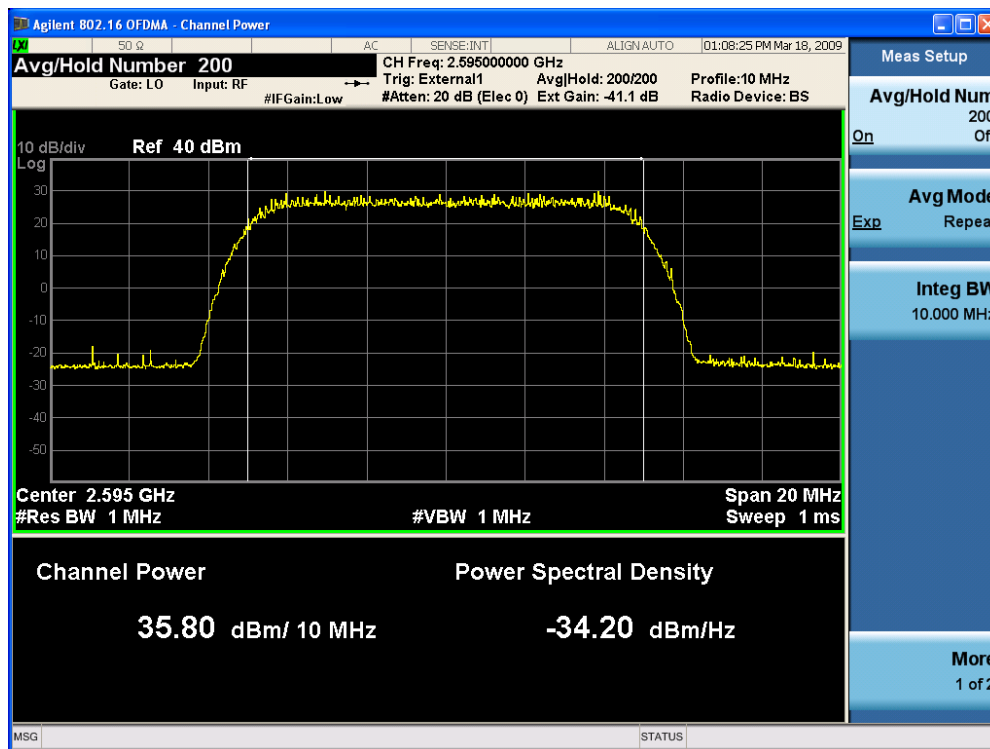


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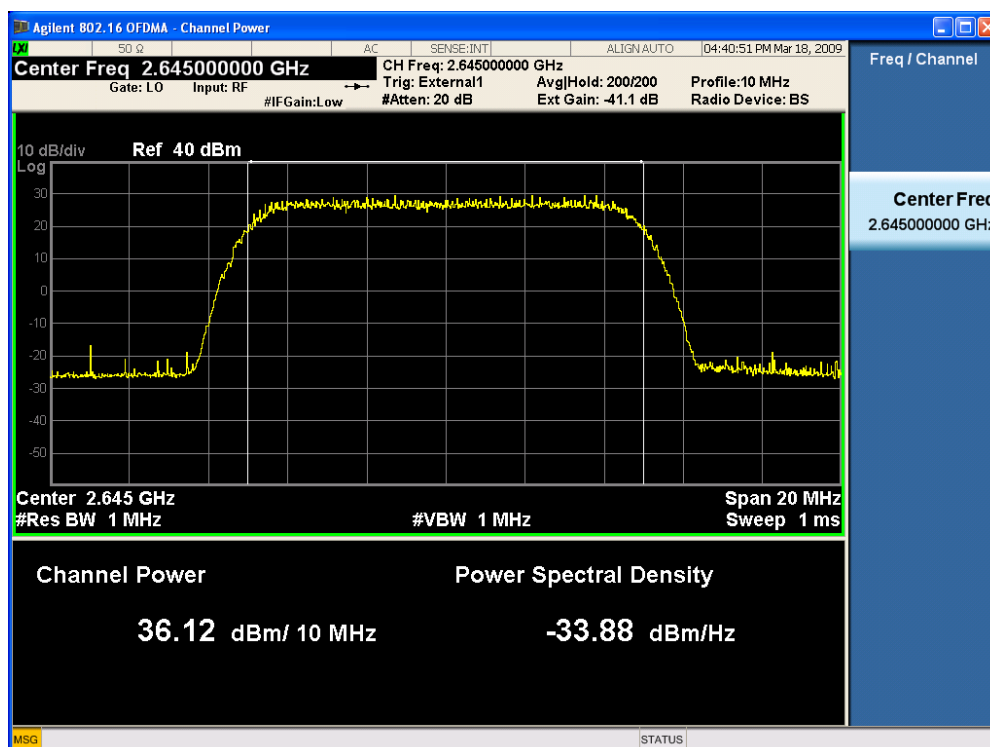


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 18 of 89

(64QAM Low Channel)

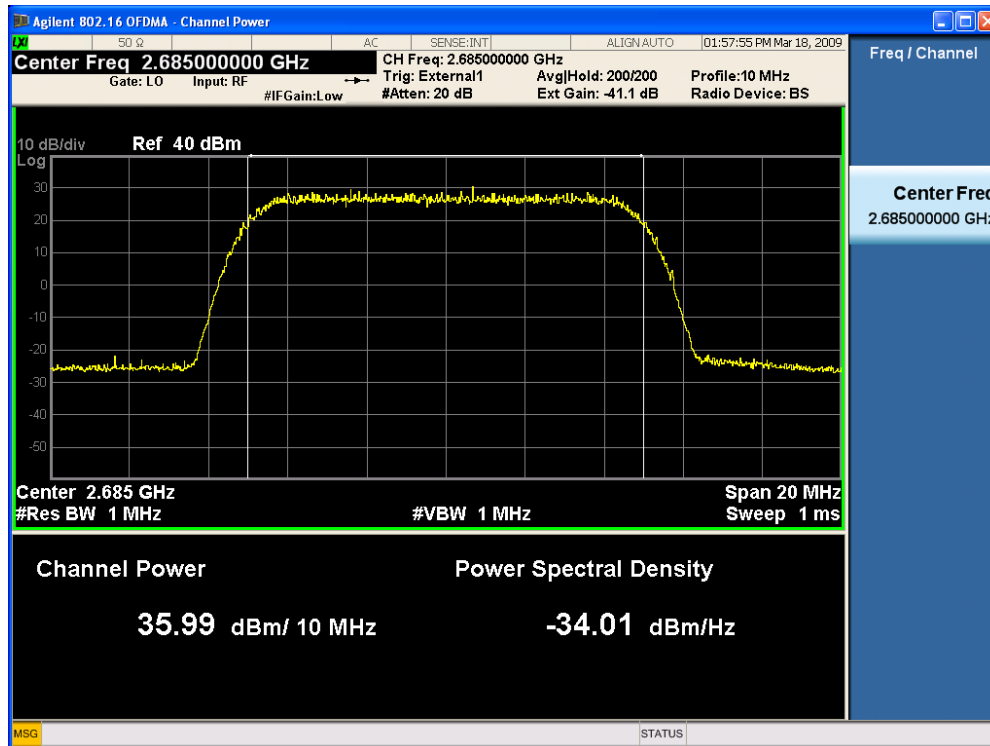


(64QAM Middle Channel)



HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 19 of 89

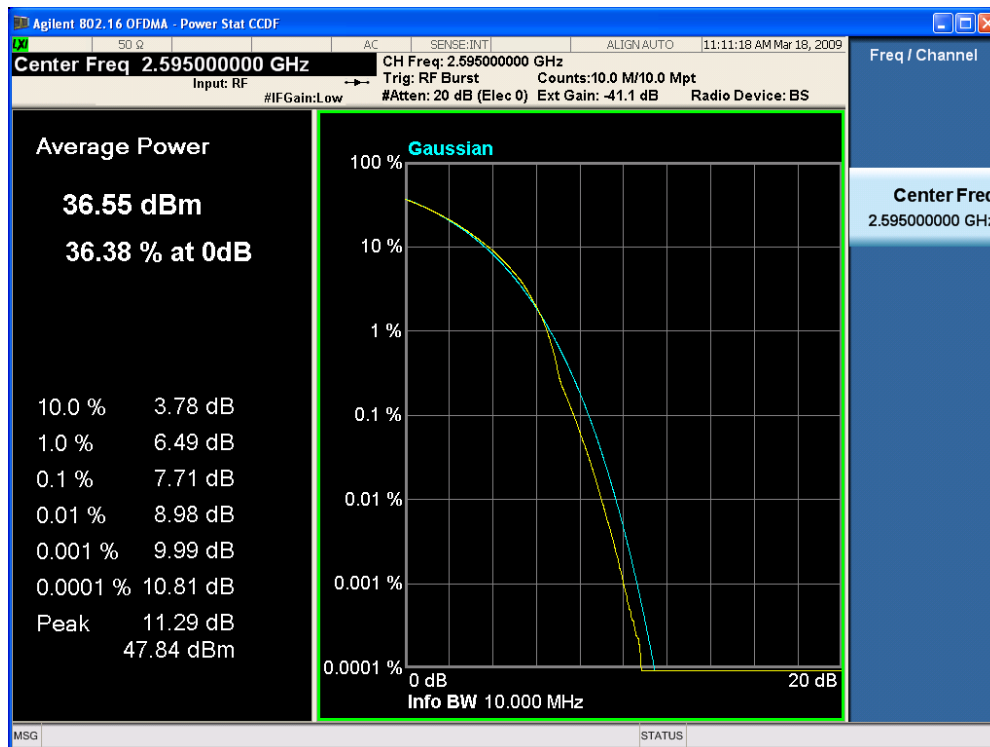
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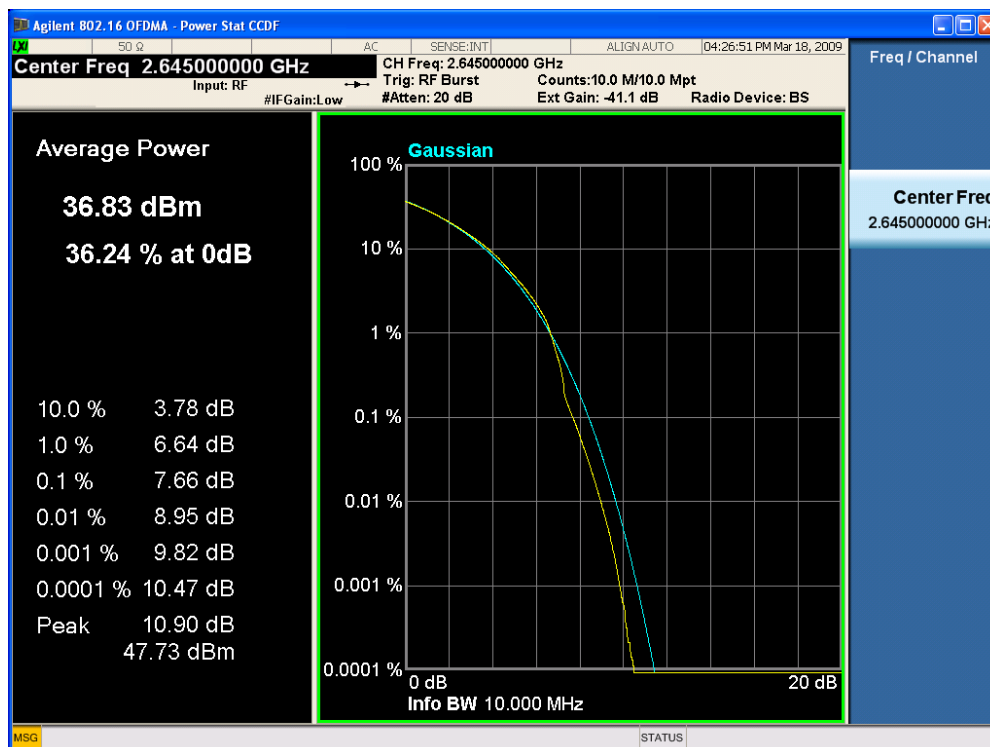
HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 20 of 89

5.4.5. Plot Data for Output 0(CCDF)

(QPSK Low Channel)

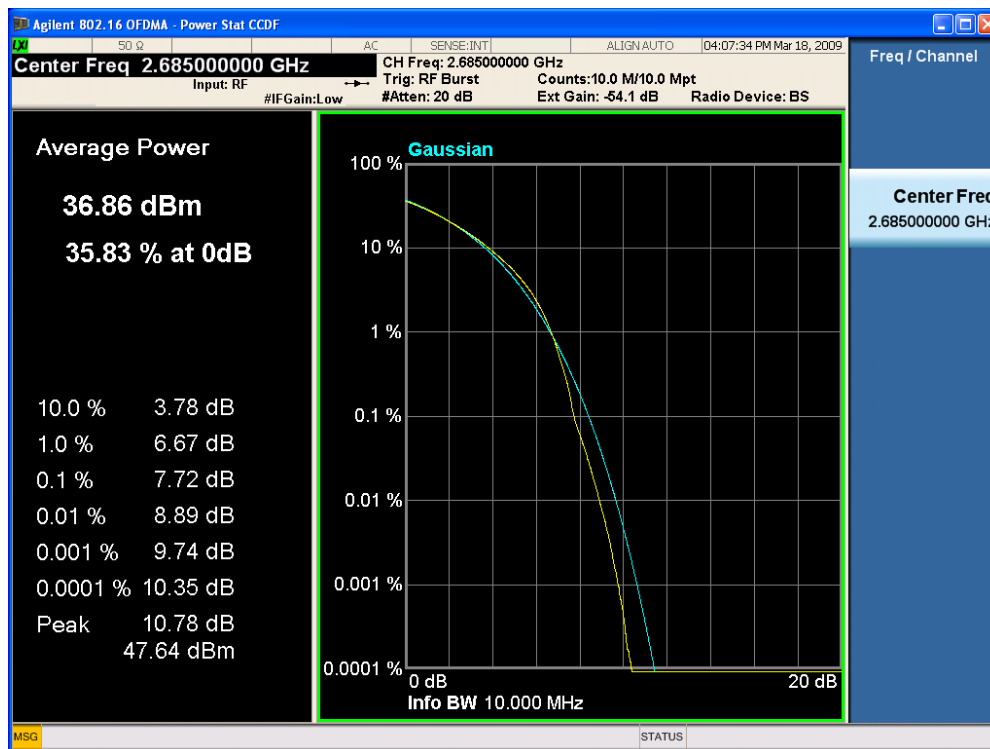


(QPSK Middle Channel)

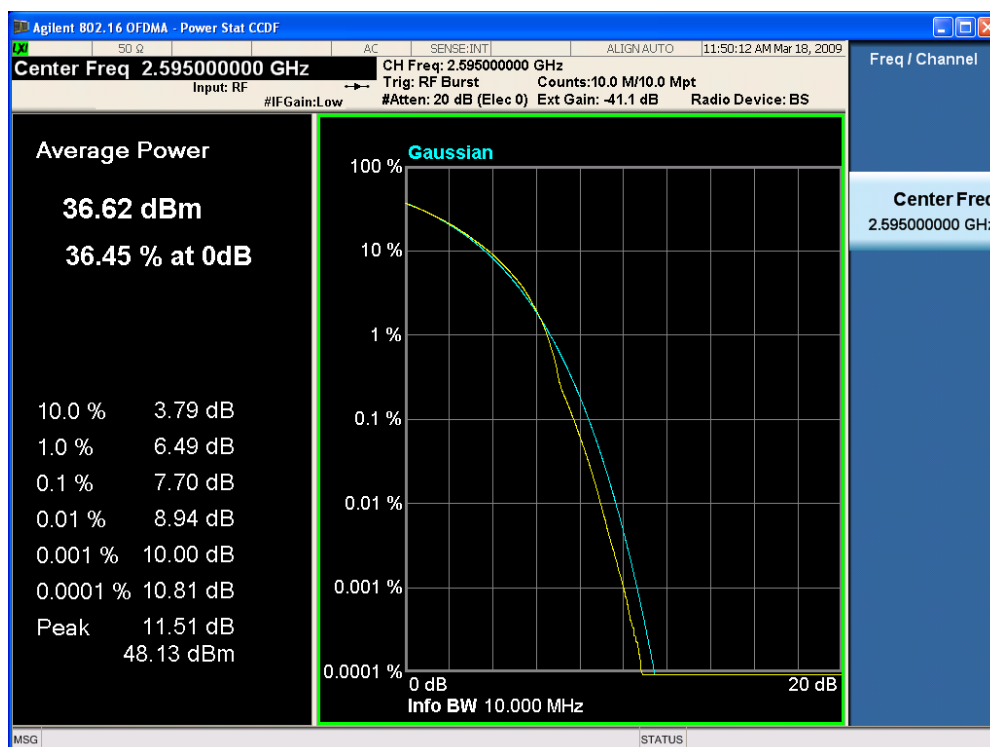


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 21 of 89

(QPSK High Channel)

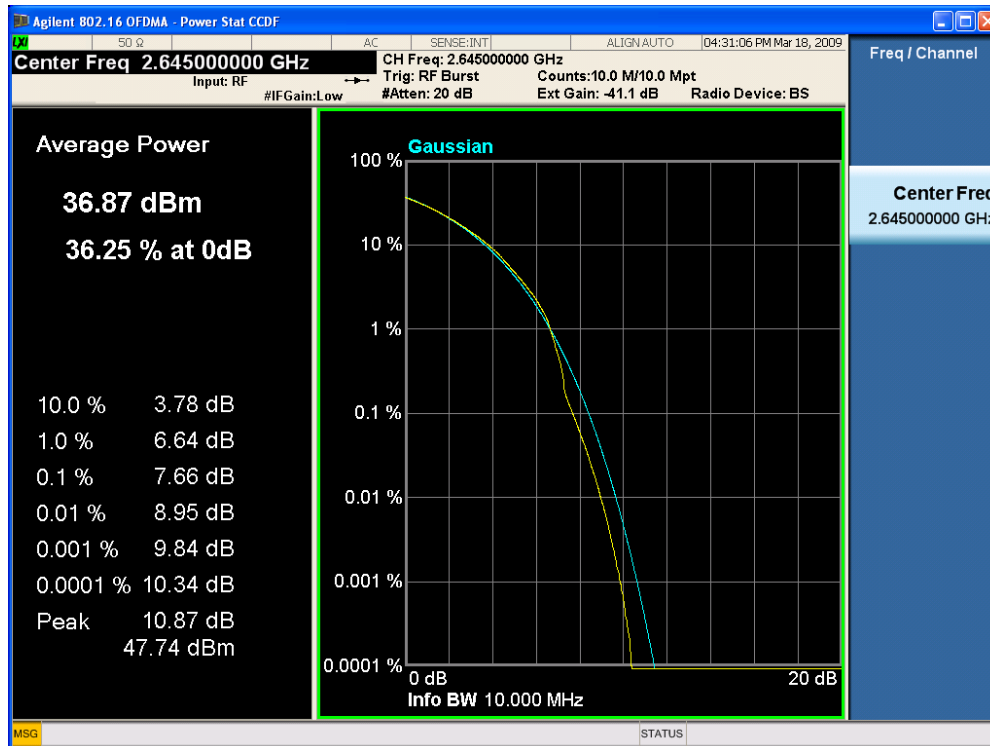


(16QAM Low Channel)

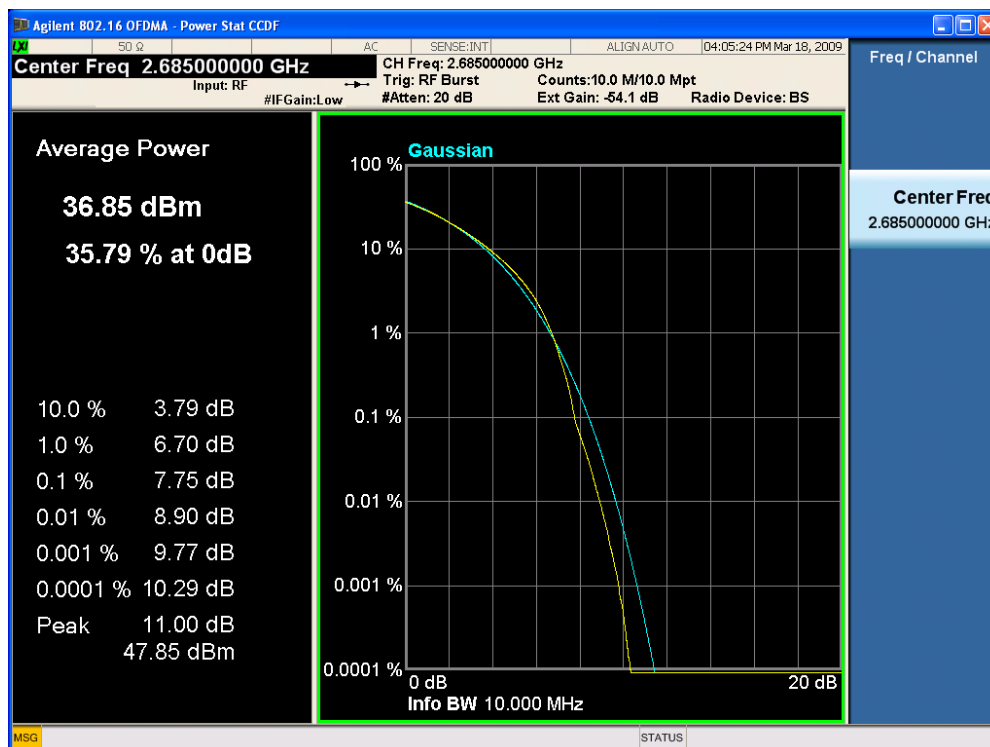


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 22 of 89

(16QAM Middle Channel)

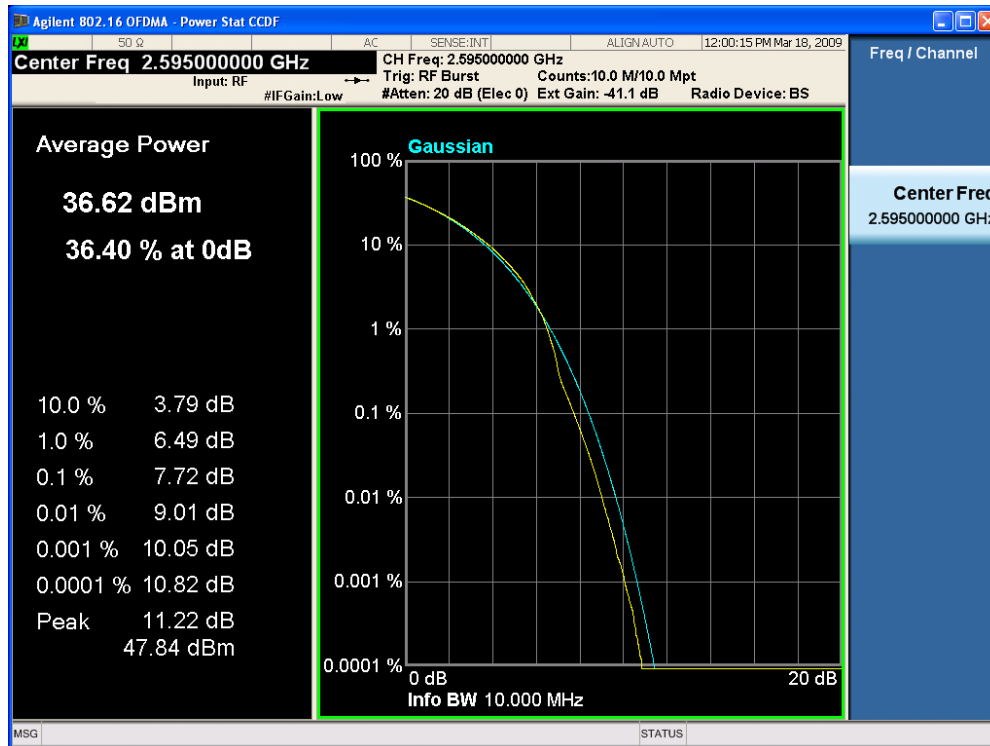


(16QAM High Channel)

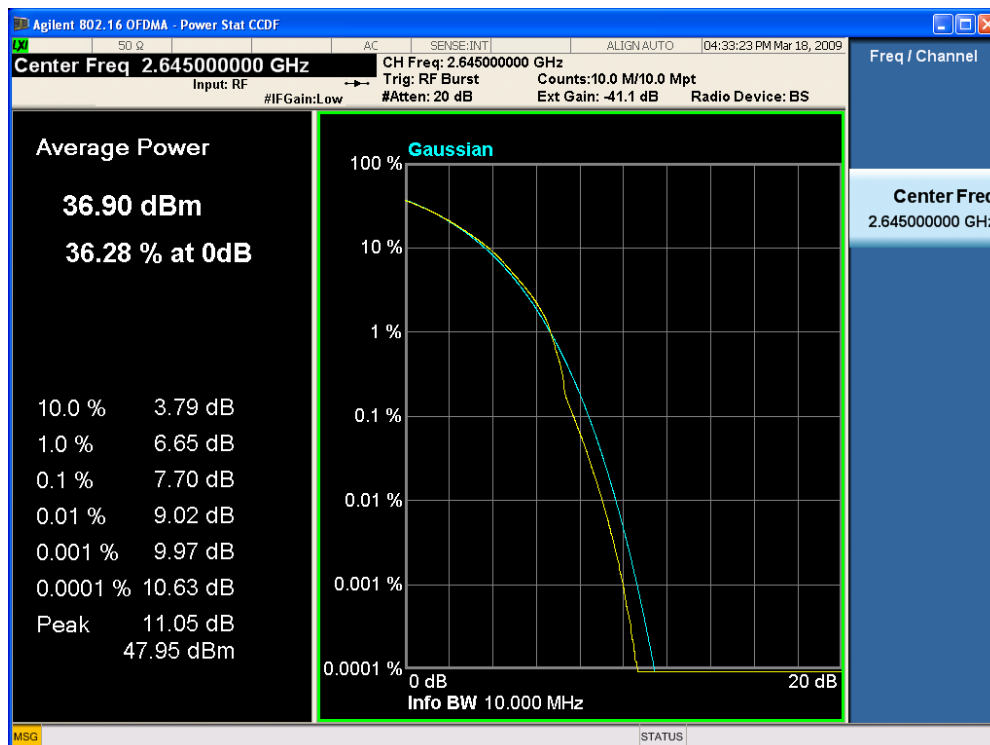


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 23 of 89

(64QAM Low Channel)

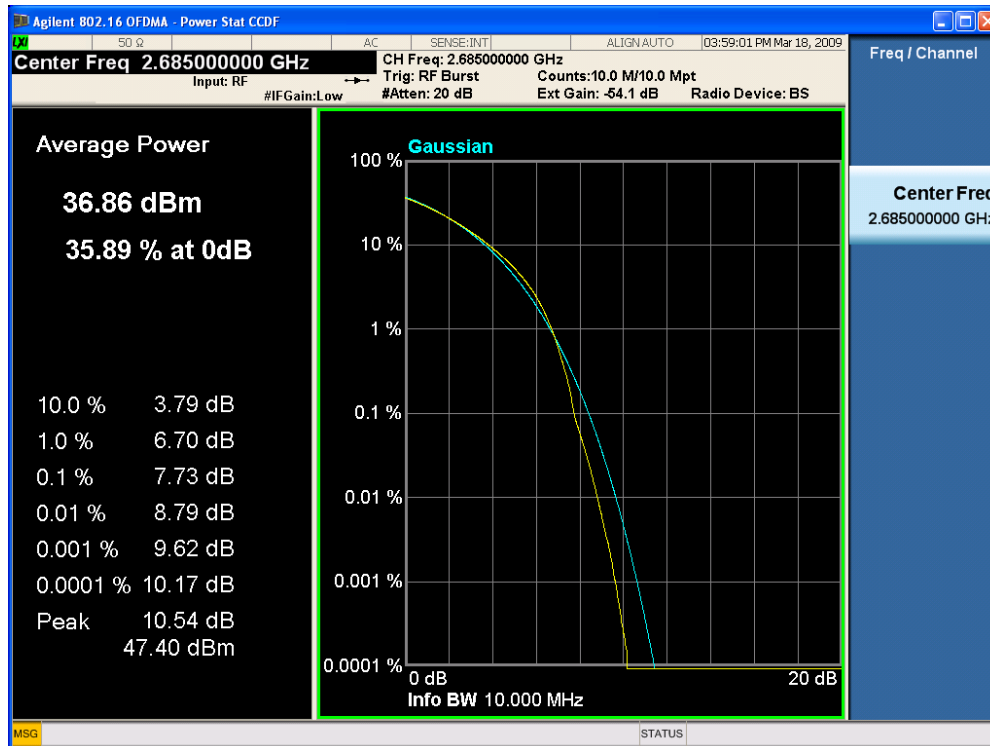


(16QAM Middle Channel)



HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 24 of 89

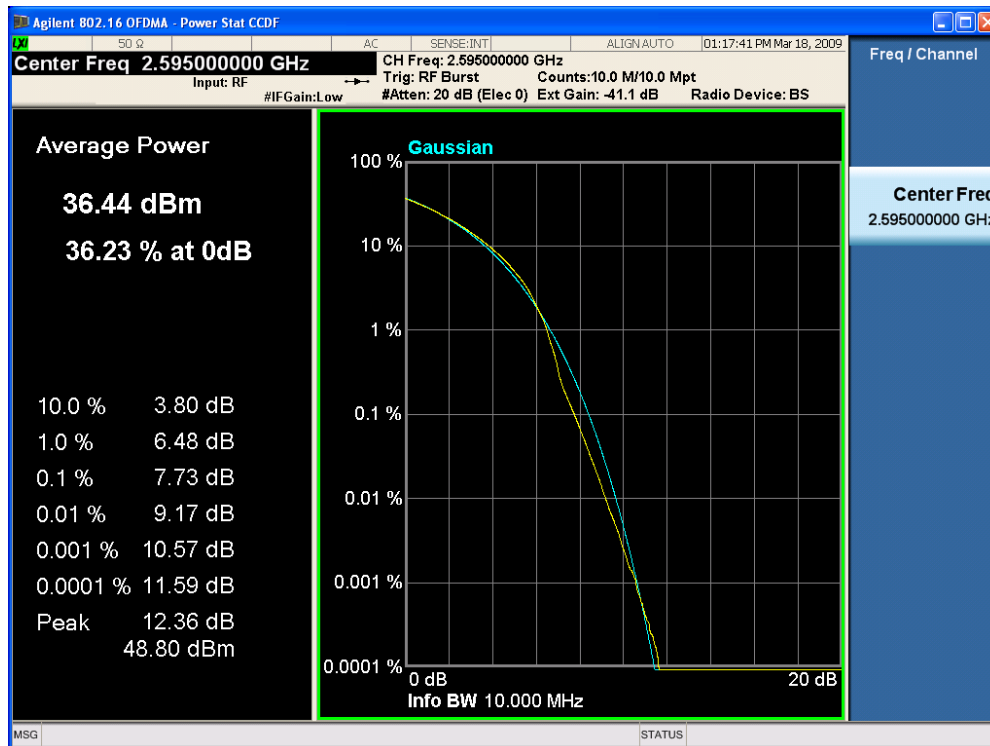
(64QAM High Channel)



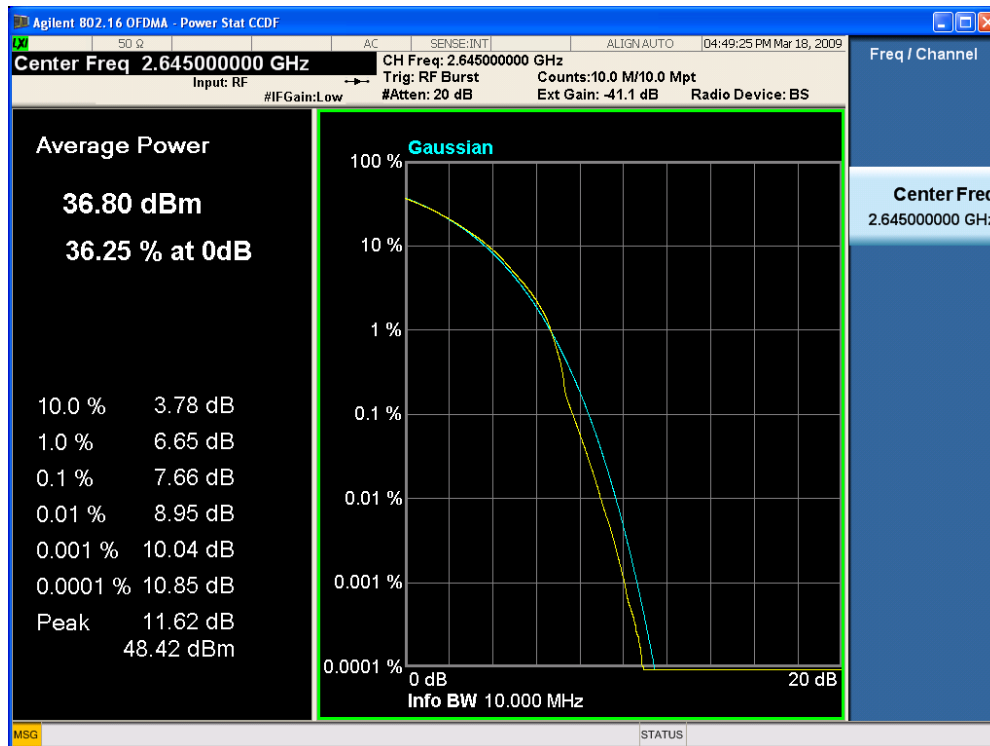
HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 25 of 89

5.4.6. Plot Data for Output 1(CCDF)

(QPSK Low Channel)

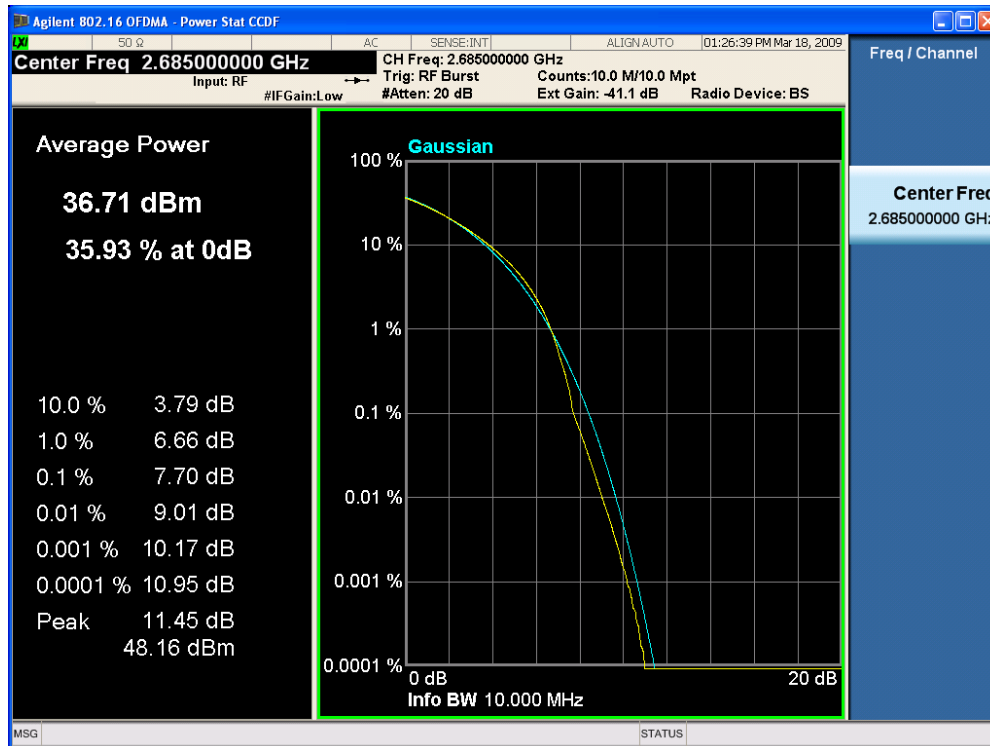


(QPSK Middle Channel)

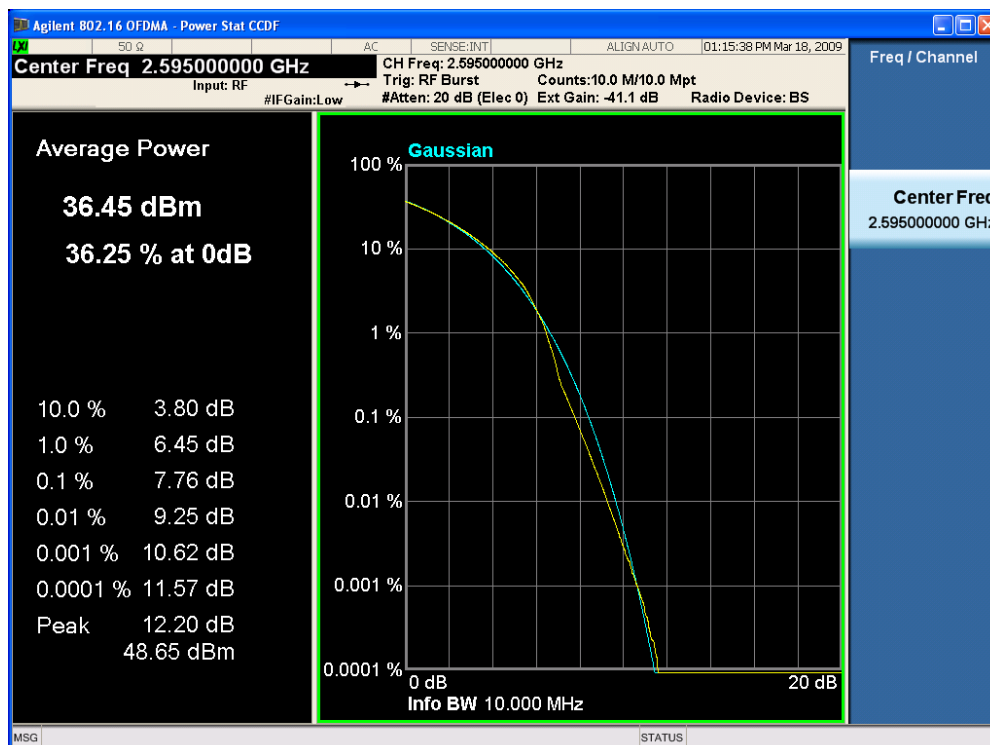


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 26 of 89

(QPSK High Channel)

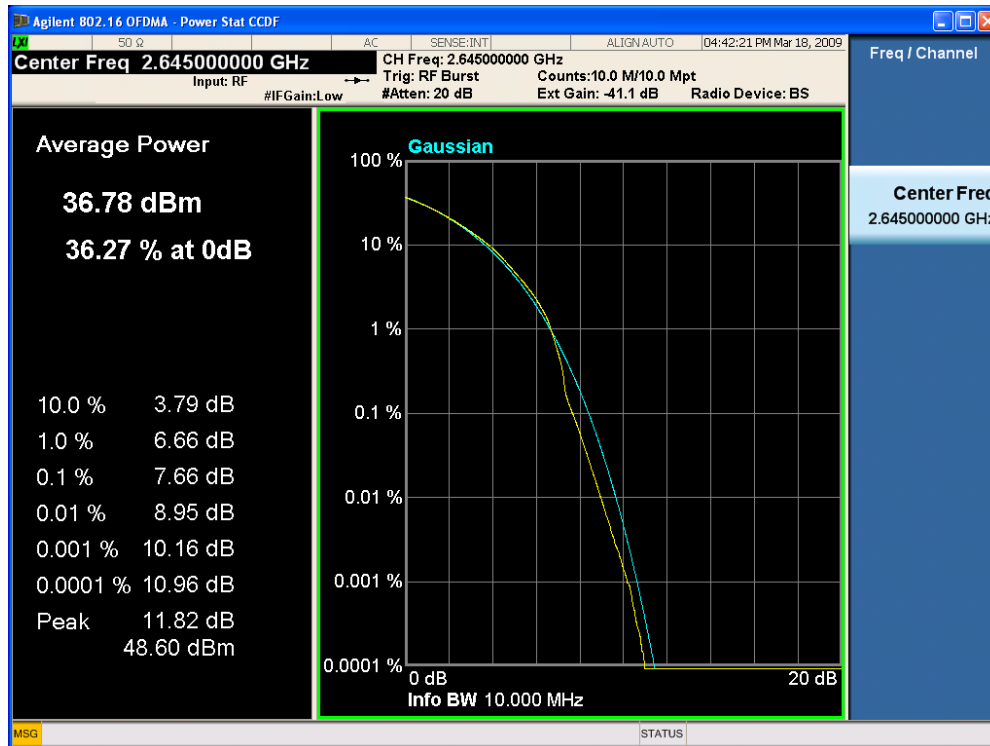


(16QAM Low Channel)

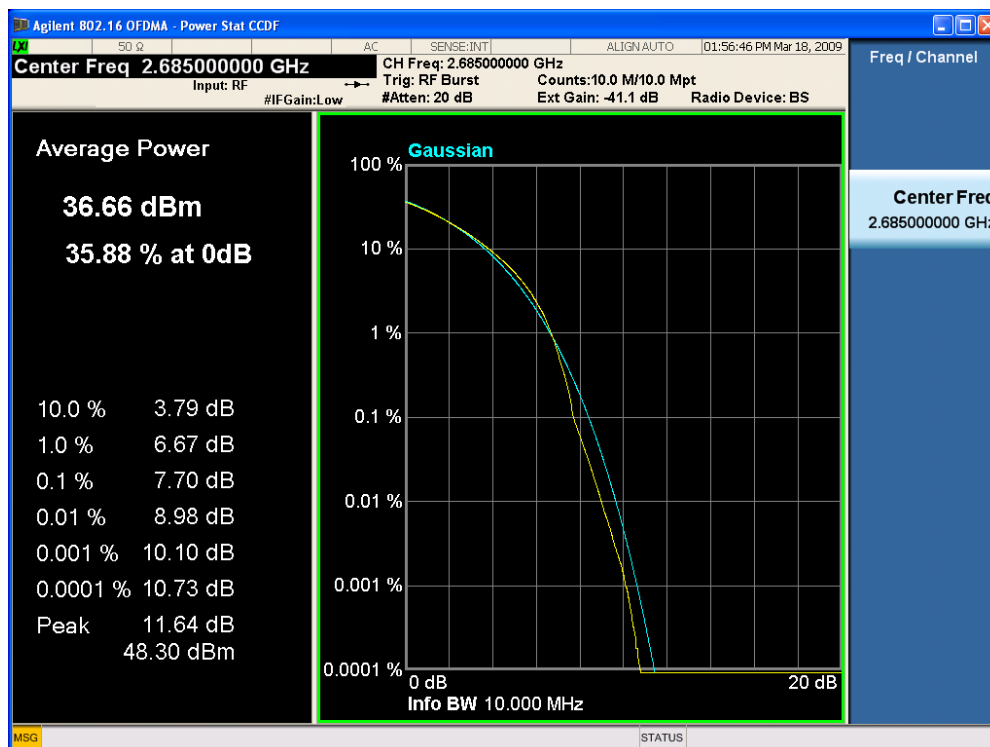


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 27 of 89

(16QAM Middle Channel)

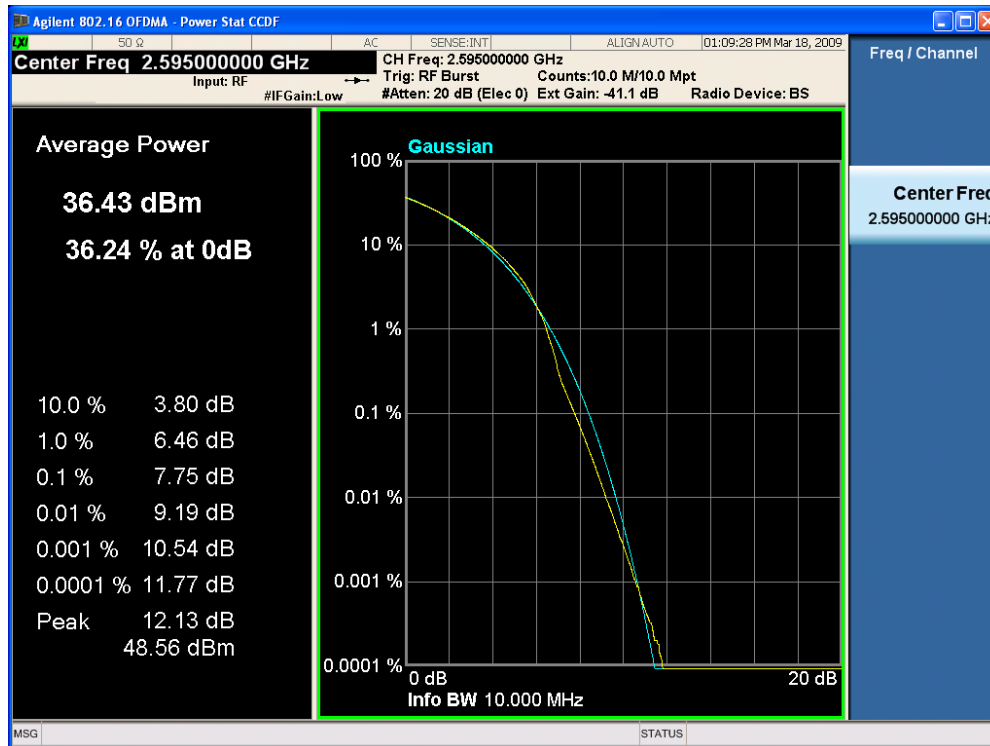


(16QAM High Channel)

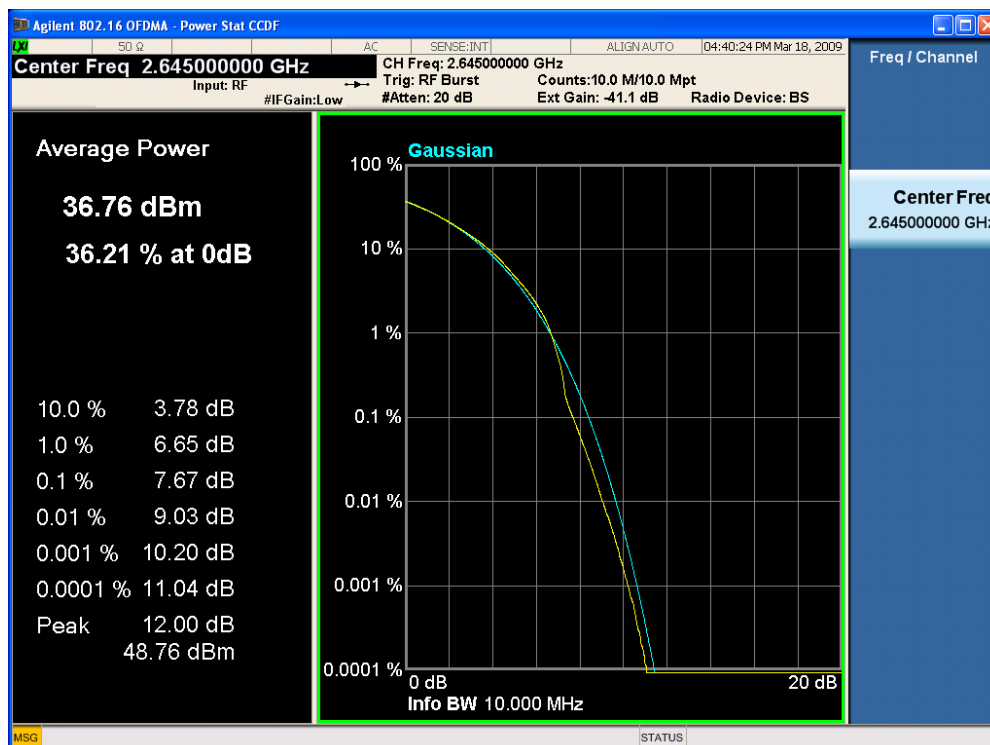


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 28 of 89

(64QAM Low Channel)

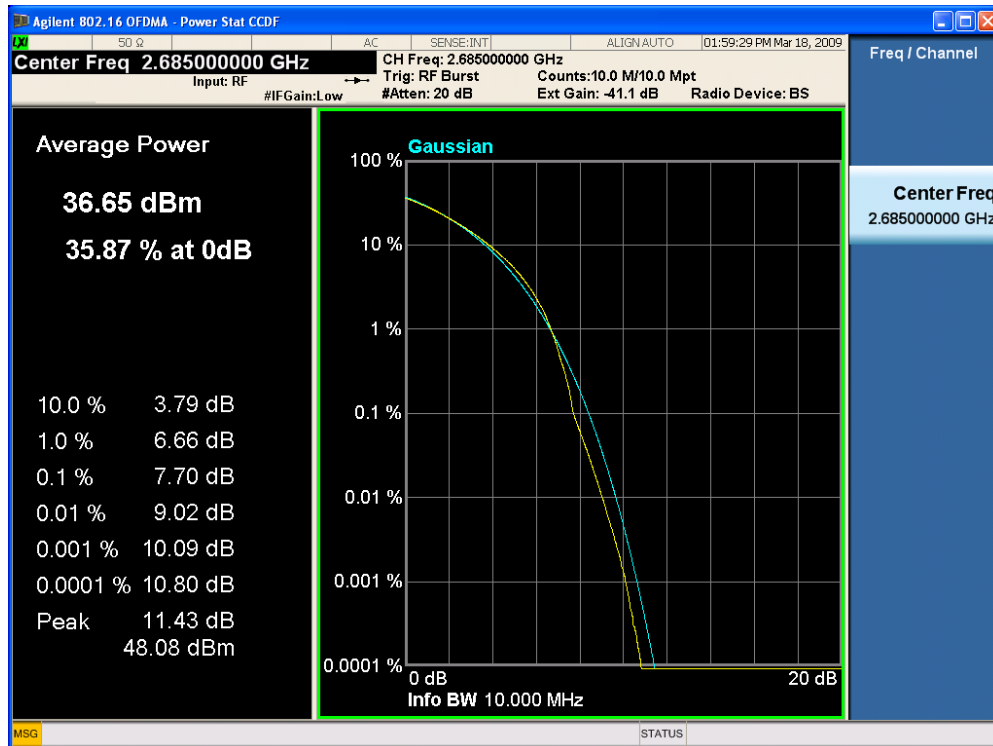


(64QAM Middle Channel)



HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 29 of 89

(64QAM High Channel)



HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 30 of 89

6. OCCUPIED BANDWIDTH

6.1. Applicable Standard

Requirements: CFR 47, Section 2.1049

6.2. Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Due Date
Agilent	Signal Analyzer	N9020A	US46220219	02/19/2010

6.3. Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

6.3.1. Environmental Conditions:

Temperature:	25 °C
Relative Humidity:	58 %

6.4. Test Result

: PASS

6.4.1. Test Data at Output Port 0

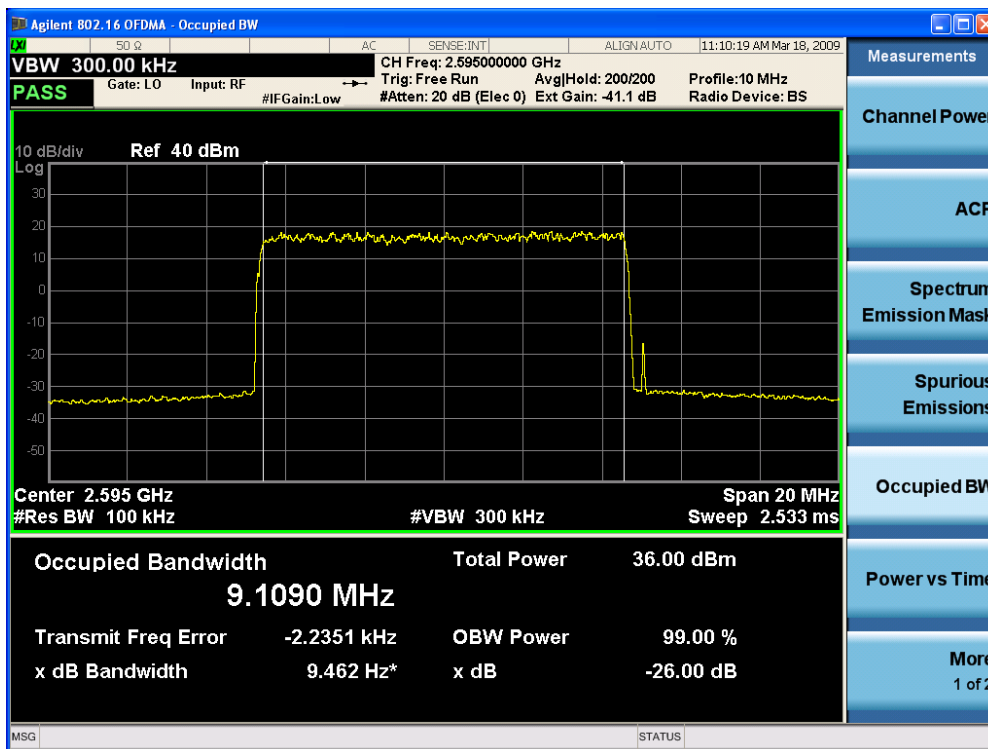
Modulation	Channel	Frequency	Measured Bandwidth
			99 %
QPSK	Low	2595.00	9.11
	Middle	2645.00	9.11
	High	2685.00	9.12
16QAM	Low	2595.00	9.11
	Middle	2645.00	9.11
	High	2685.00	9.13
64QAM	Low	2595.00	9.11
	Middle	2645.00	9.12
	High	2685.00	9.13

6.4.2. Test Data at Output Port 1

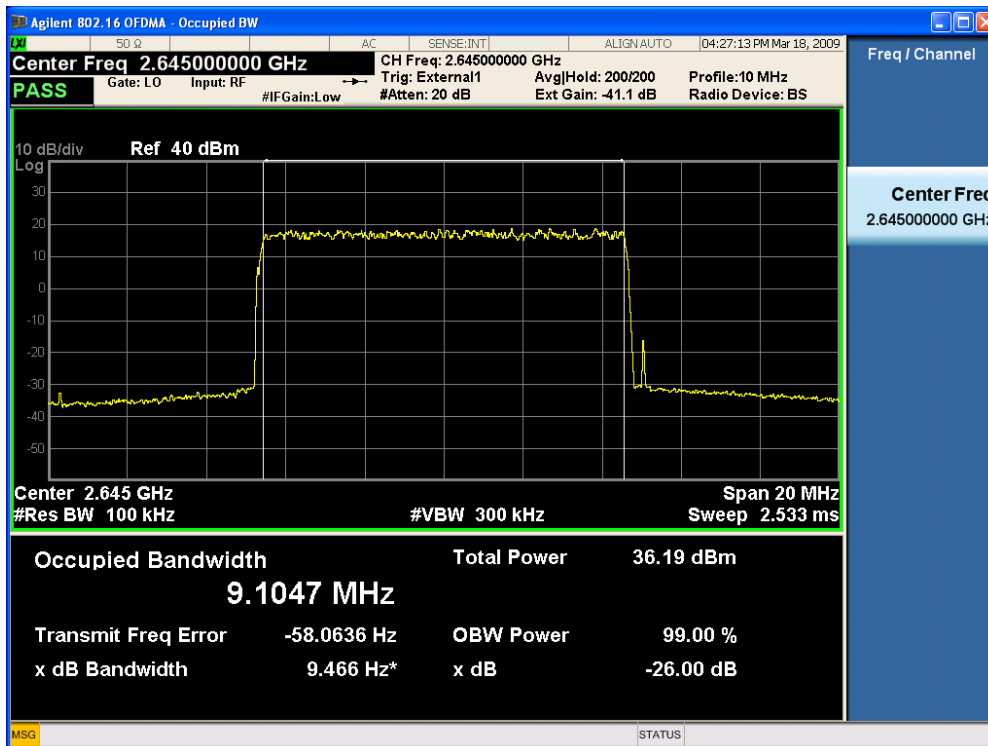
Modulation	Channel	Frequency	Measured Bandwidth
			99 %
QPSK	Low	2595.00	9.11
	Middle	2645.00	9.11
	High	2685.00	9.12
16QAM	Low	2595.00	9.11
	Middle	2645.00	9.11
	High	2685.00	9.13
64QAM	Low	2595.00	9.11
	Middle	2645.00	9.12
	High	2685.00	9.13

6.4.3. Test Plot at Output Port 0

(QPSK Low Channel)

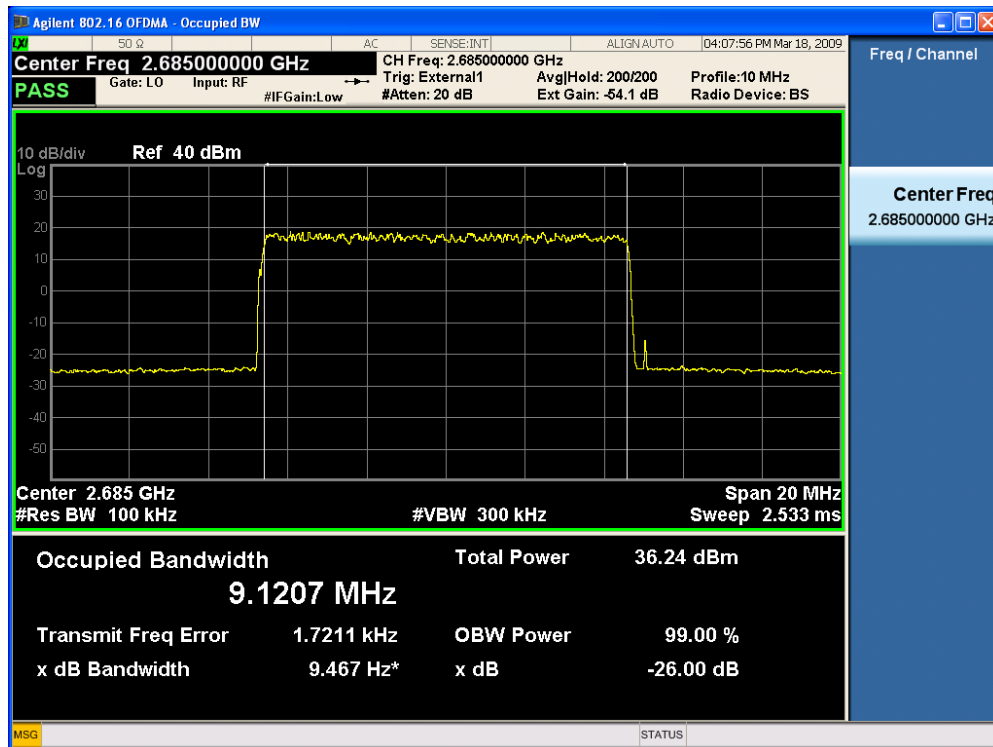


(QPSK Middle Channel)

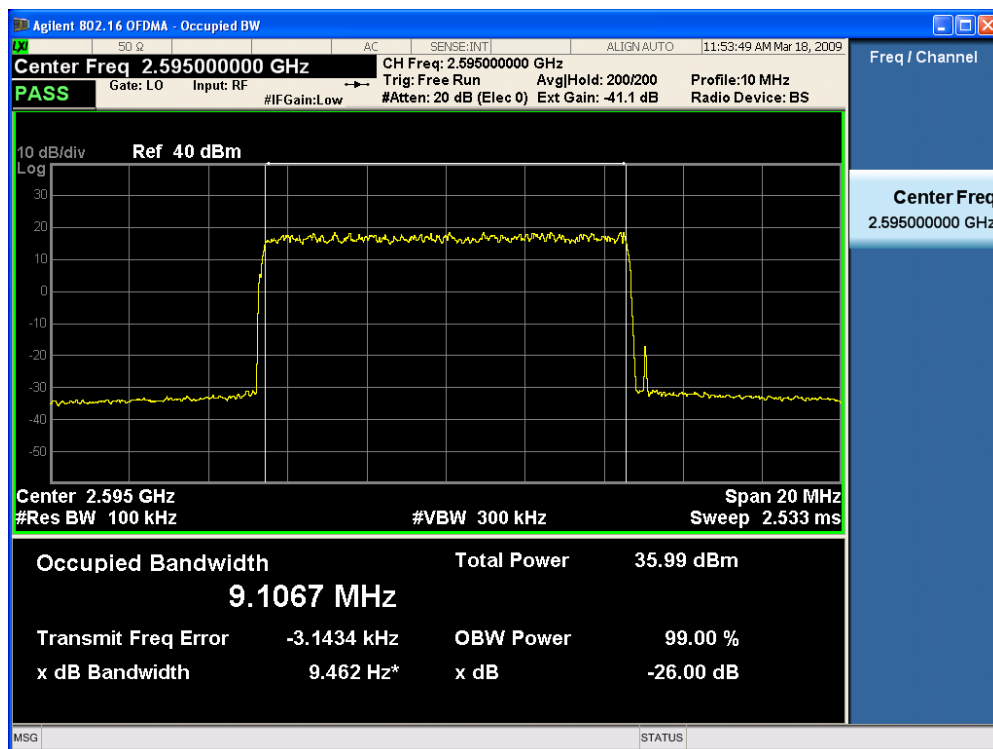


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 33 of 89

(QPSK High Channel)

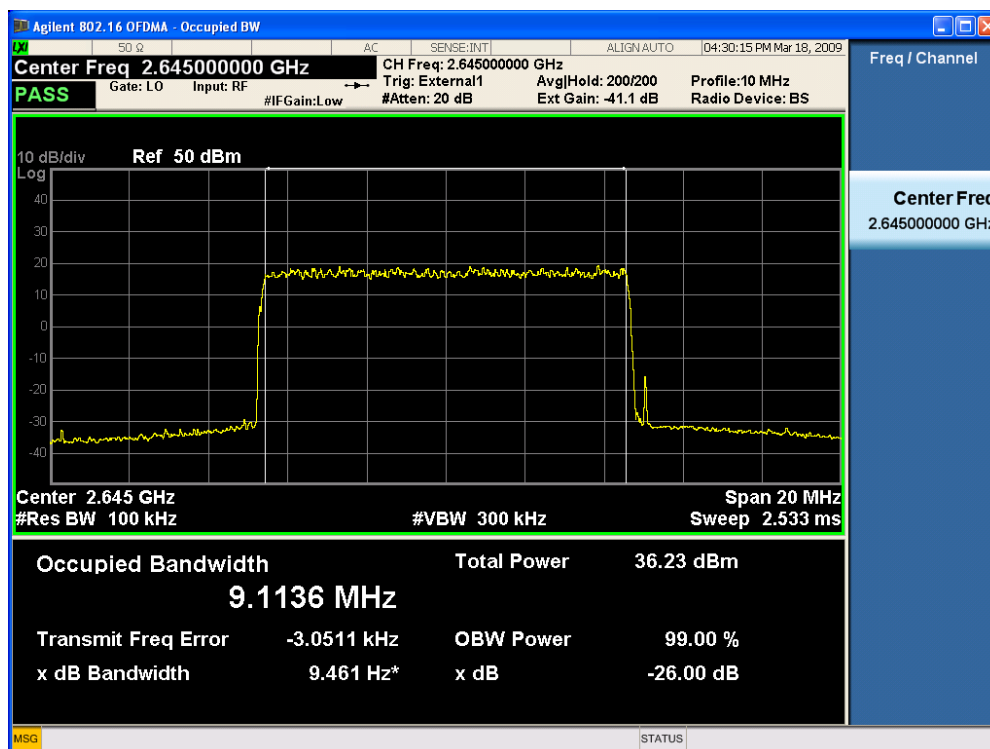


(16QAM Low Channel)

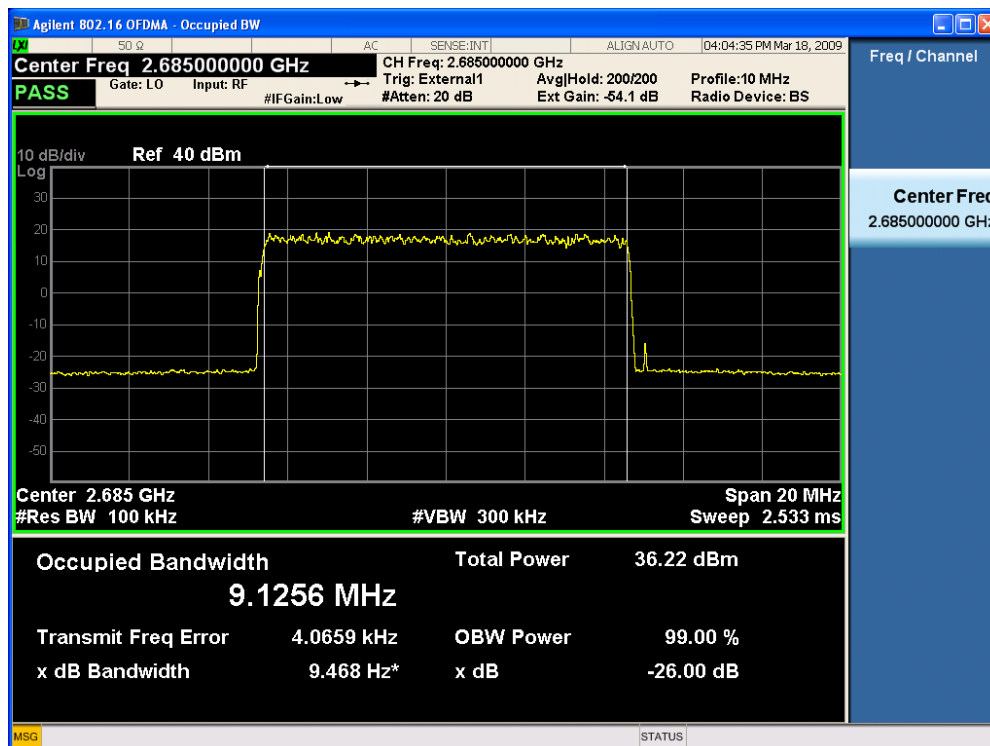


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 34 of 89

(16QAM Middle Channel)

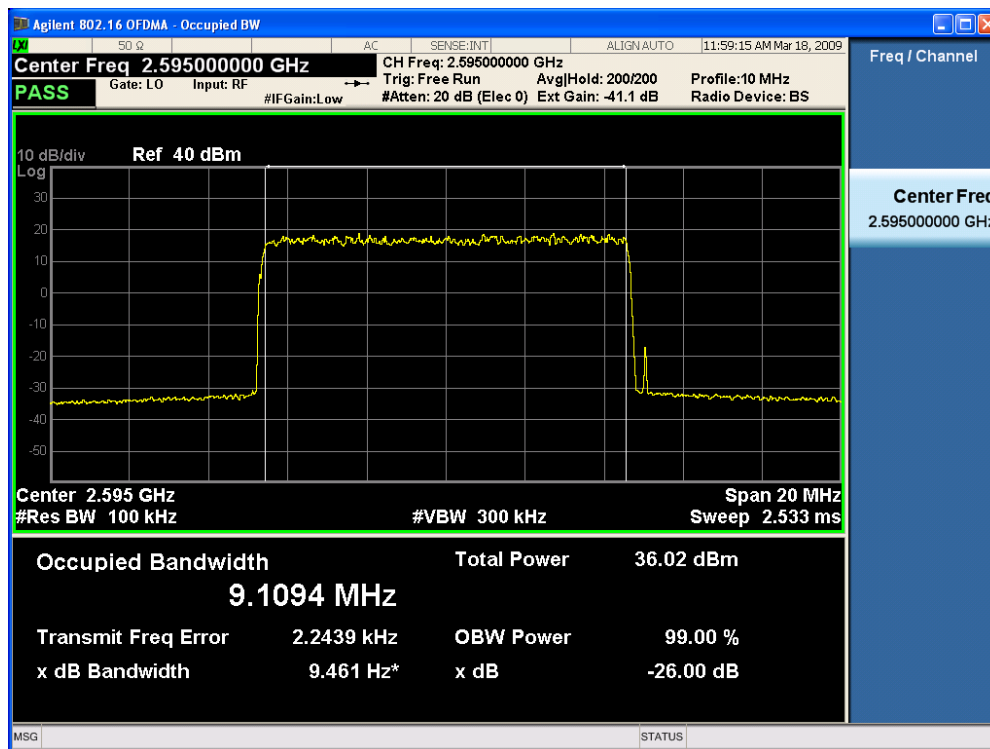


(16QAM High Channel)

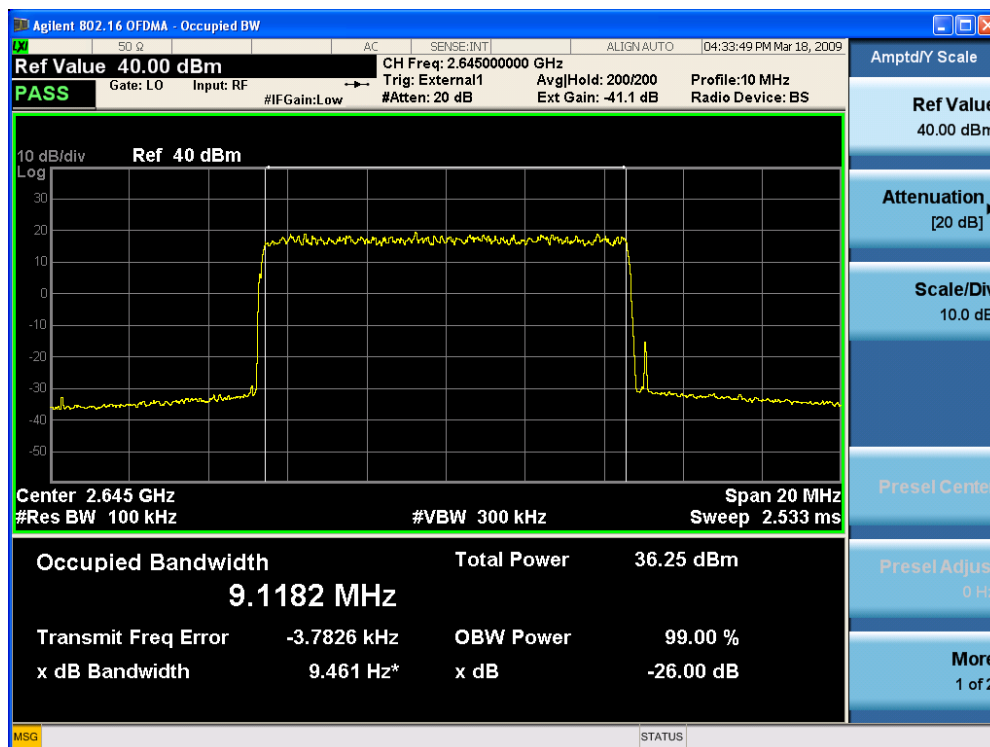


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 35 of 89

(64QAM Low Channel)

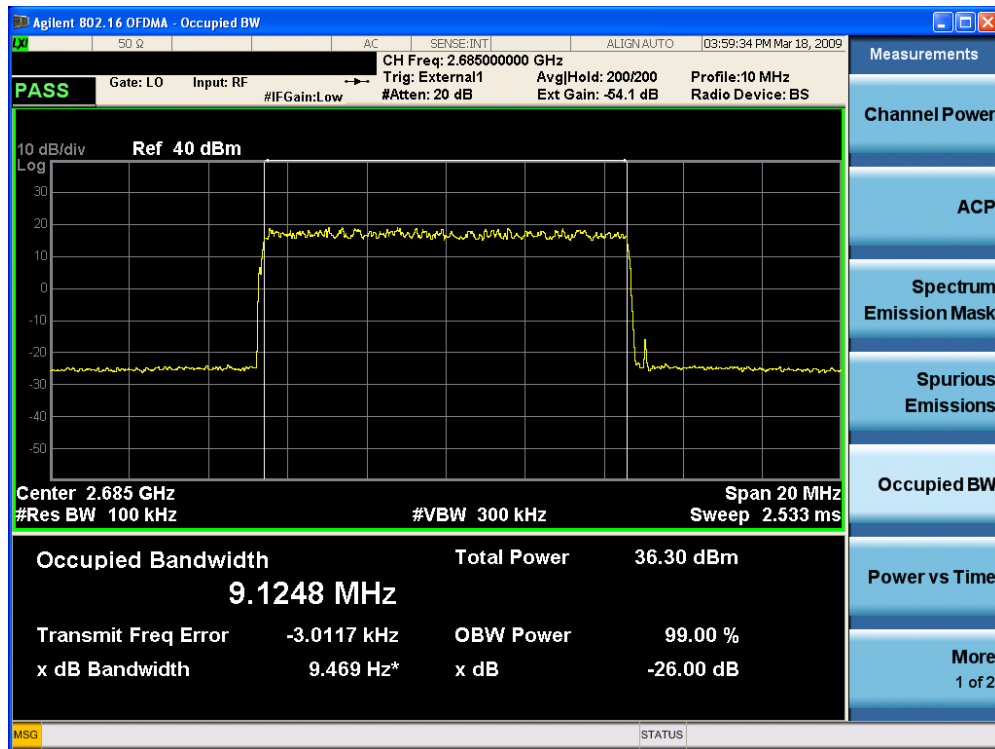


(64QAM Middle Channel)



HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 36 of 89

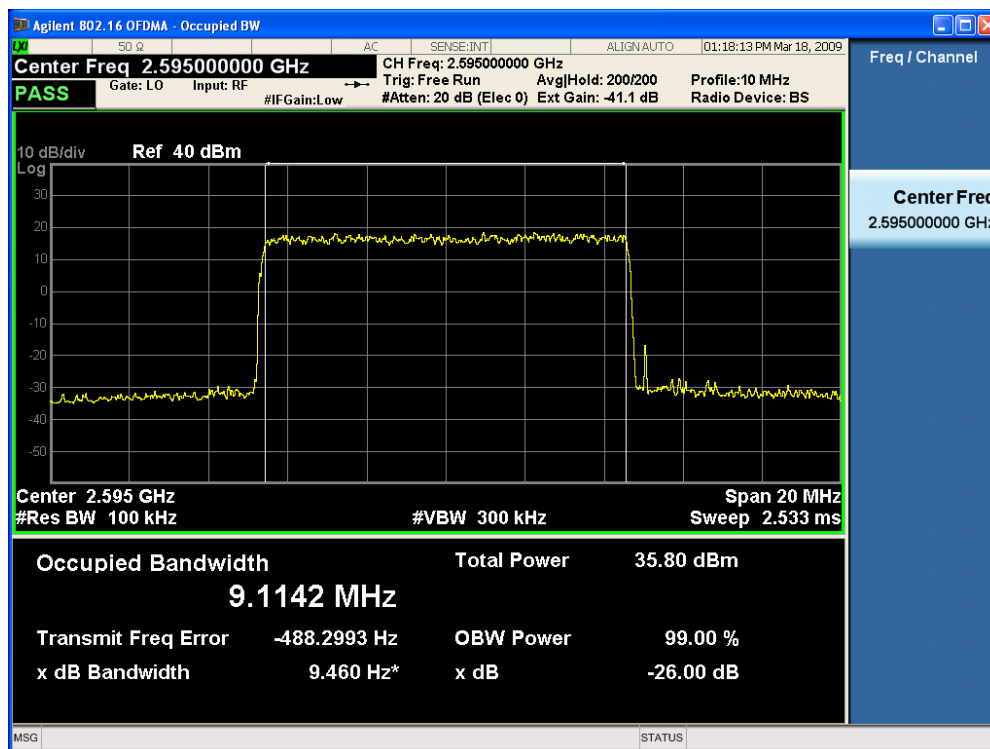
(64QAM High Channel)



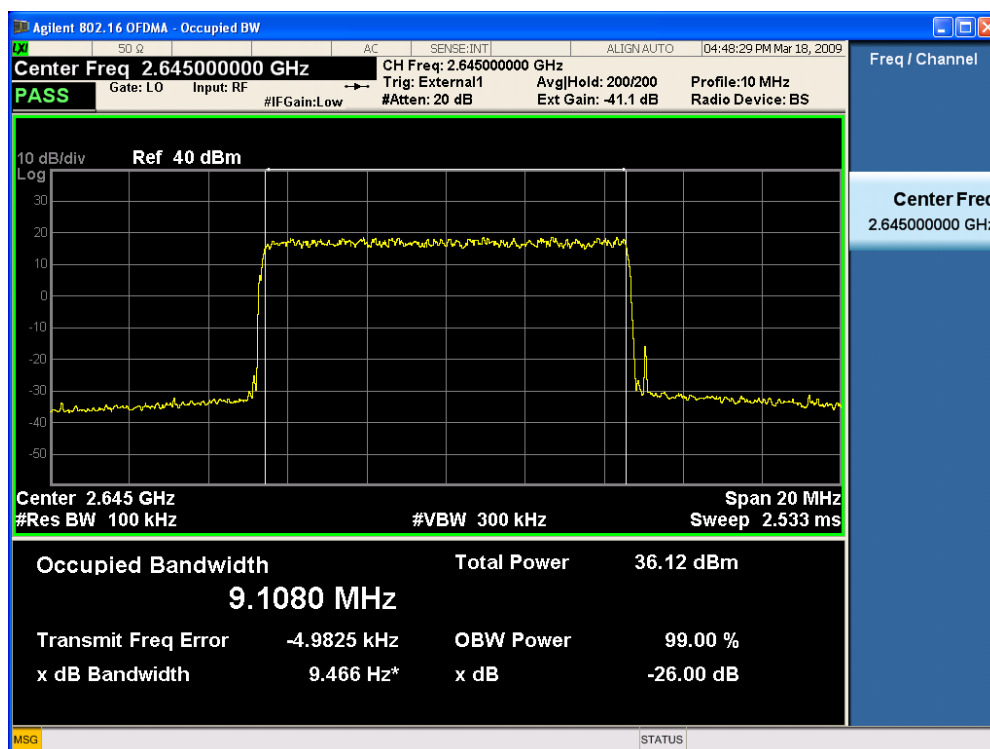
HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 37 of 89

6.4.4. Test Plot at Output Port 1

(QPSK Low Channel)

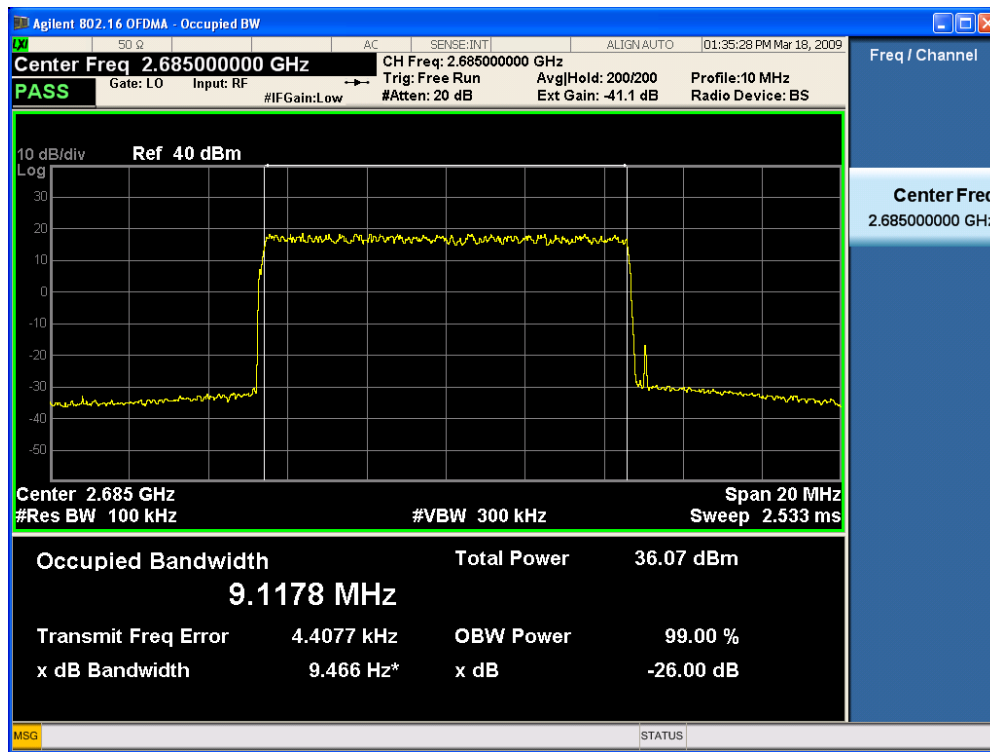


(QPSK Middle Channel)

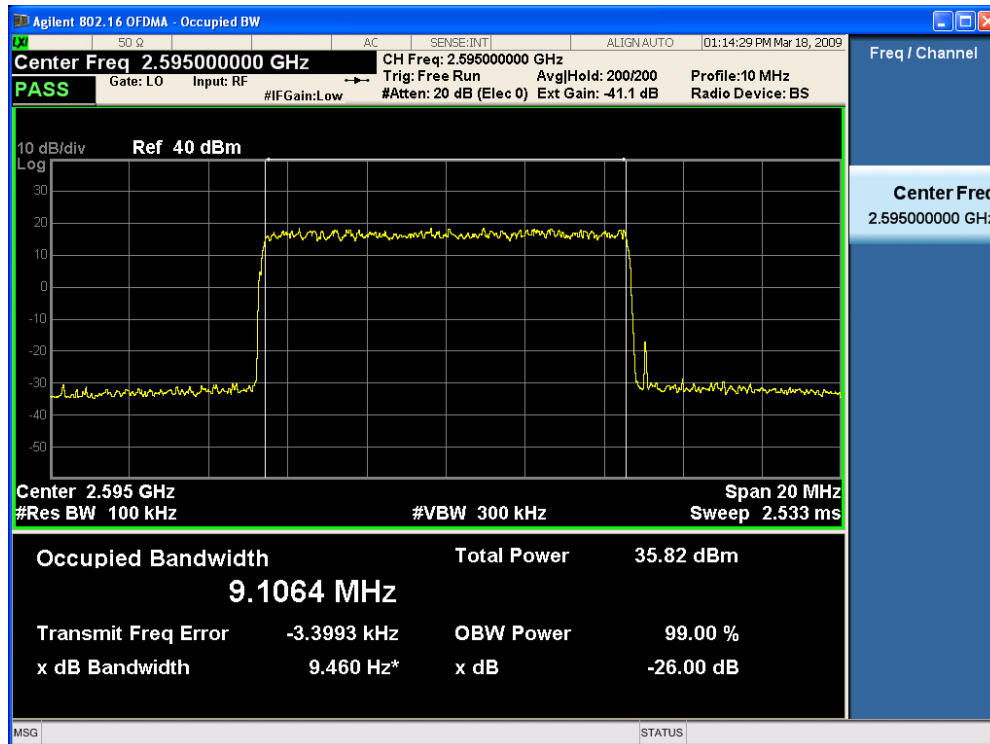


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 38 of 89

(QPSK High Channel)

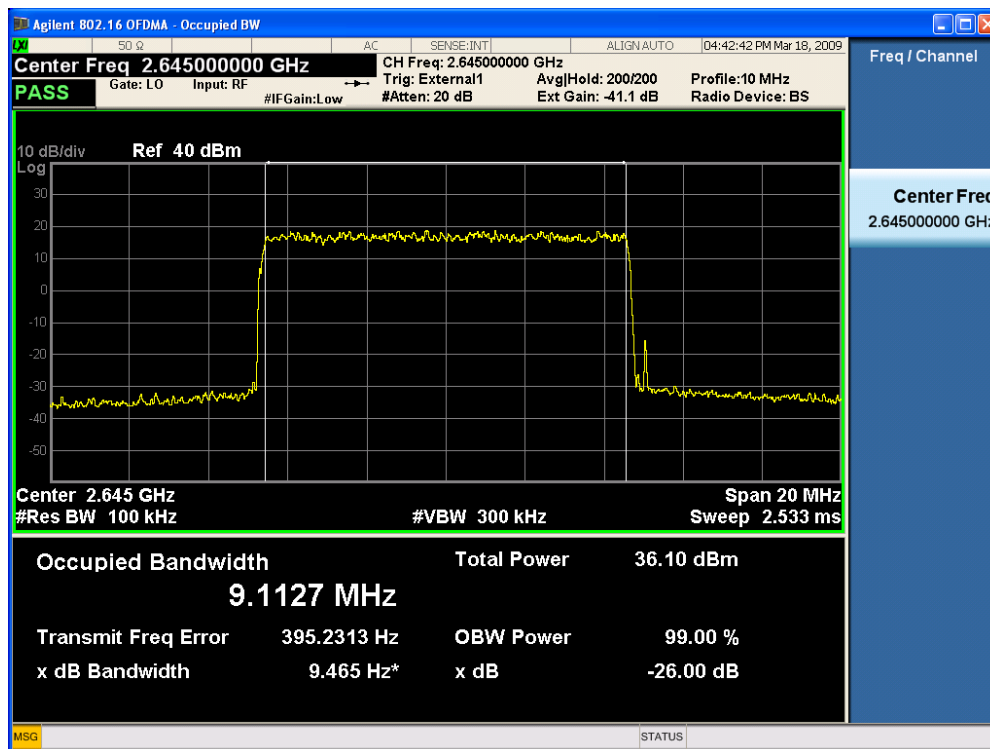


(16QAM Low Channel)

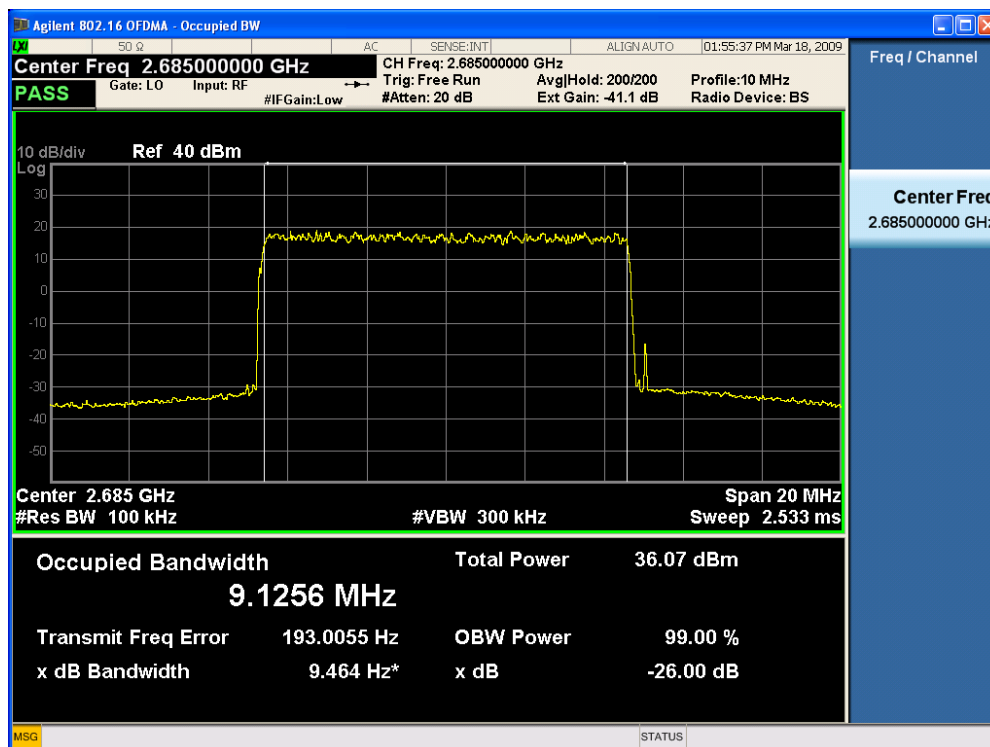


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 39 of 89

(16QAM Middle Channel)

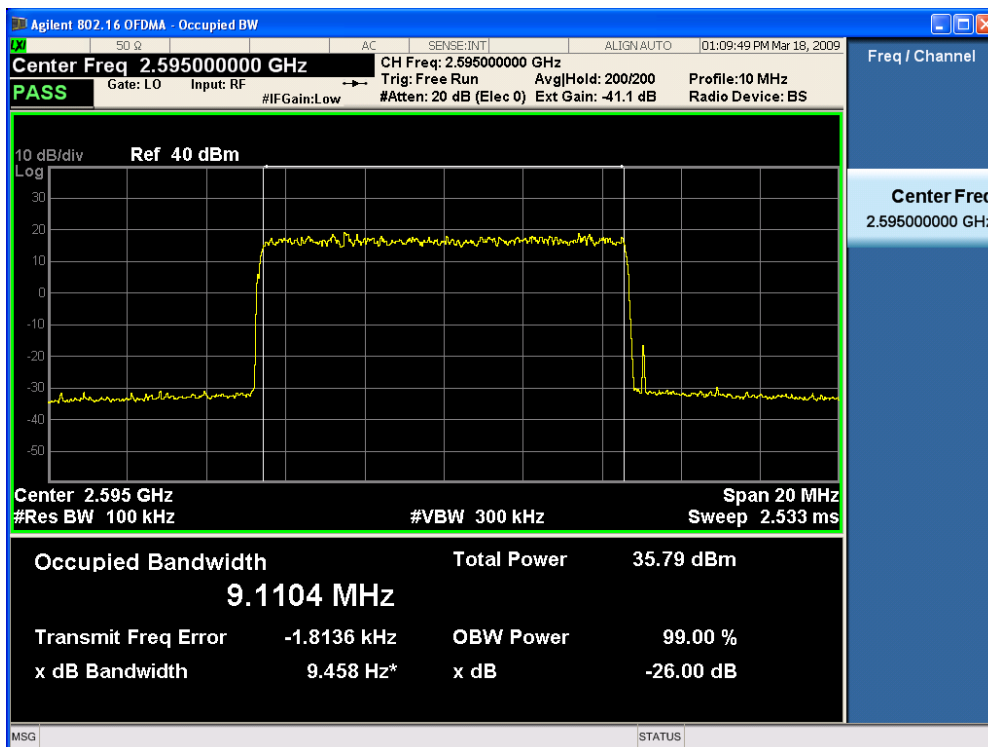


(16QAM High Channel)

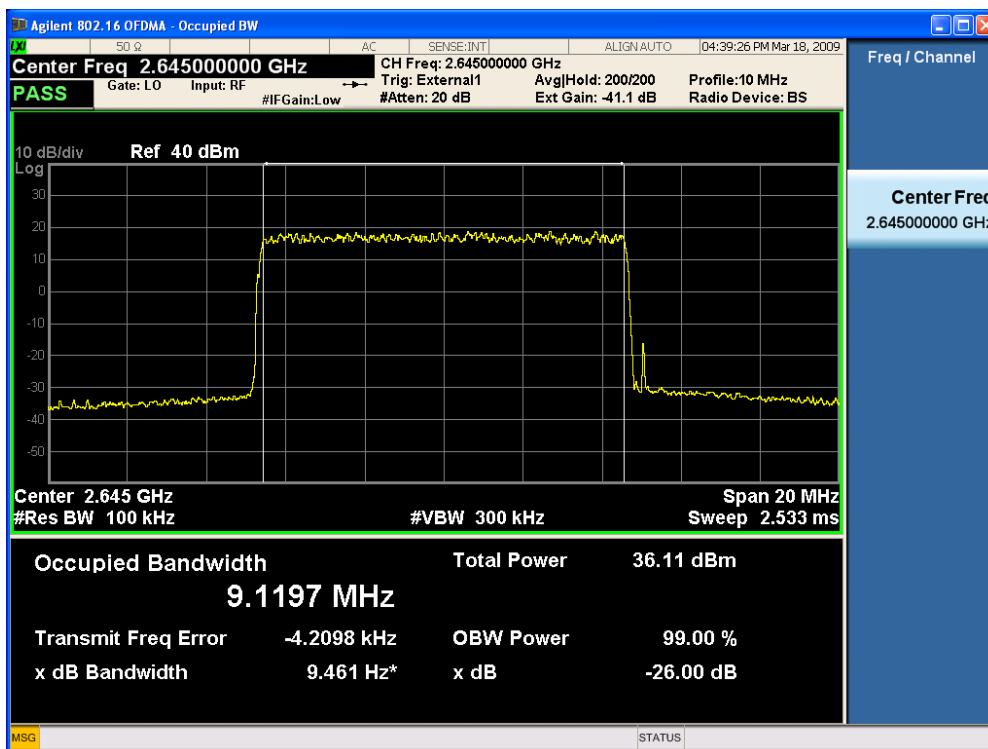


HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 40 of 89

(64QAM Low Channel)

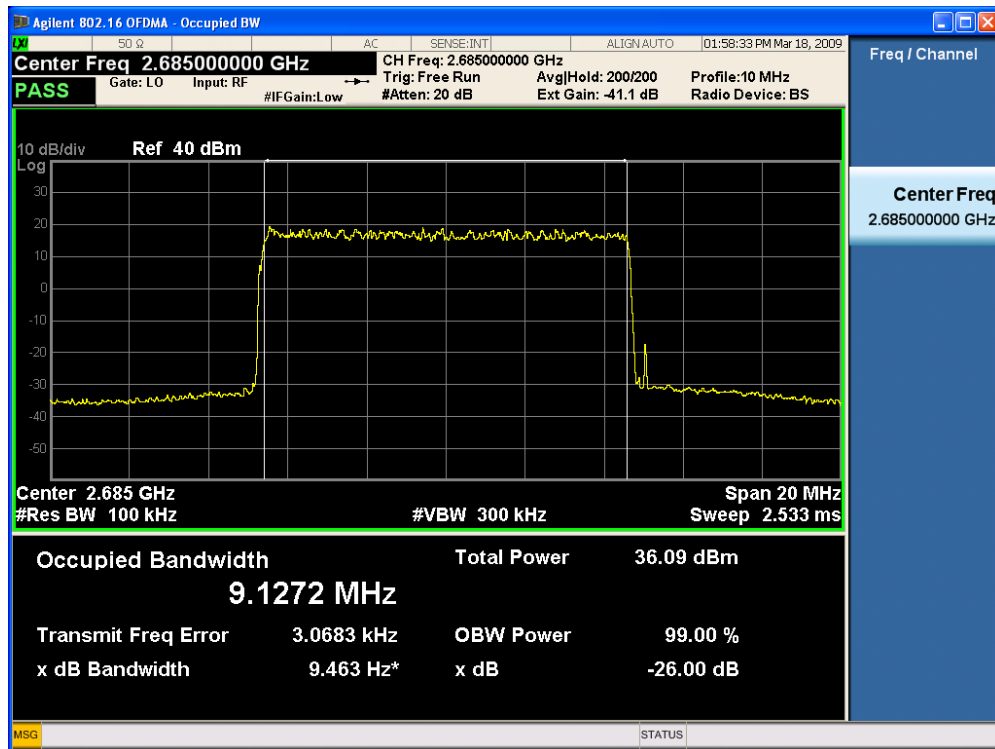


(64QAM Middle Channel)



HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 41 of 89

(64QAM High Channel)



HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 42 of 89

7. BAND EDGES

7.1. Applicable Standard

According to §22.917, 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.

7.2. Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Due Date
Agilent	Signal Analyzer	N9020A	US46220219	02/19/2010

7.3. Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency.

The EUT provides the MIMO function which is able to transmit on the same channel with same data simultaneously therefore a combiner is used to sum the individual transmitter output power.

The test data is shown as a combined output in the report.

7.3.1. Environmental Conditions

Temperature:	24 °C
Relative Humidity:	56 %

7.4. Test Result

: PASS

HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 43 of 89

7.4.1. Test data at Output 0

Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2595.00	-36.62	-13.0
	High	2685.00	-30.26	
16QAM	Low	2595.00	-37.68	
	High	2685.00	-28.28	
64QAM	Low	2595.00	-38.70	
	High	2685.00	-28.93	

7.4.2. Test data at Output 1

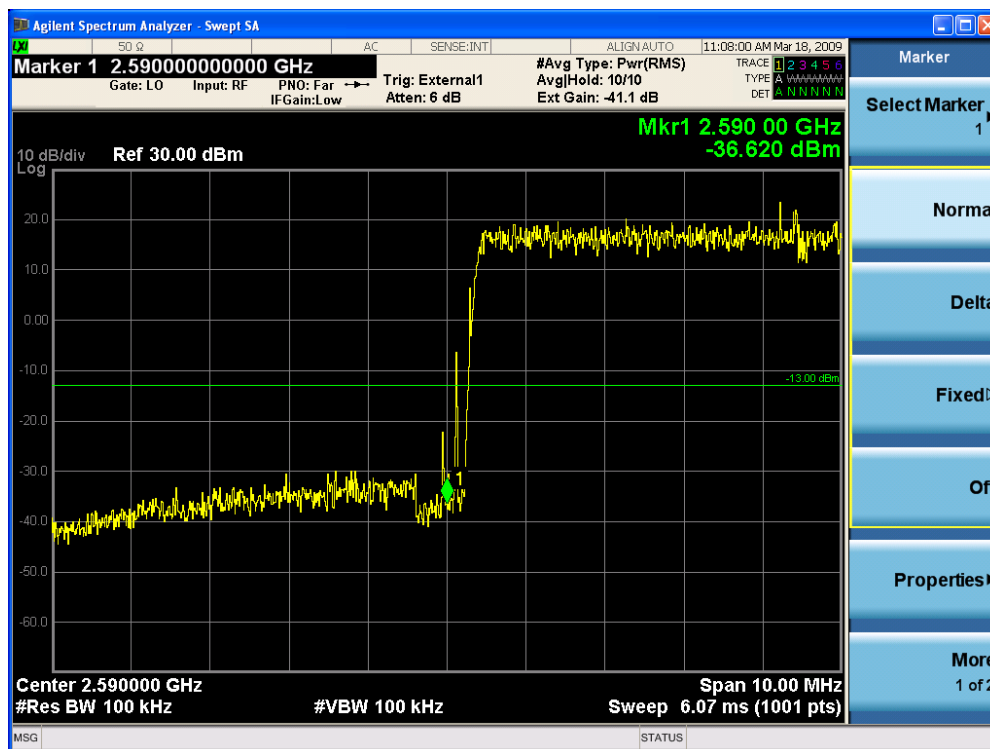
Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2595.00	-32.49	-13.0
	High	2685.00	-17.15	
16QAM	Low	2595.00	-36.93	
	High	2685.00	-17.68	
64QAM	Low	2595.00	-37.45	
	High	2685.00	-17.62	

Combined Test data at Output

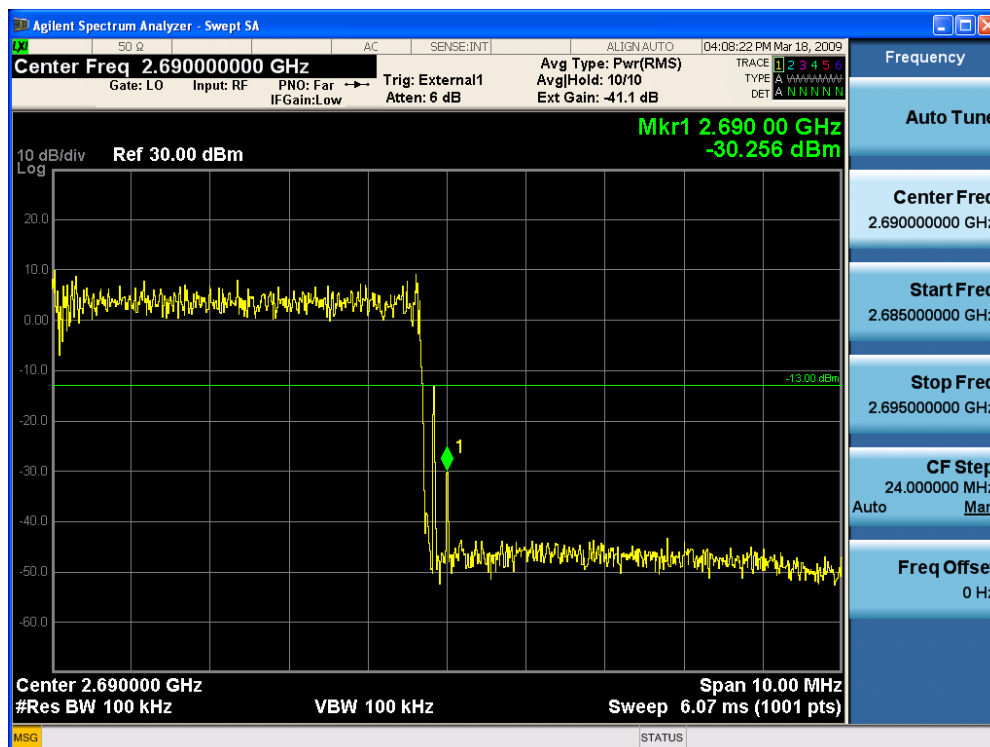
Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2595.00	-16.46	-13.0
	High	2685.00	-16.90	
16QAM	Low	2595.00	-15.88	
	High	2685.00	-17.87	
64QAM	Low	2595.00	-15.63	
	High	2685.00	-17.66	

7.4.3. Plot Data at Output 0

(QPSK Low Channel)



(QPSK High Channel)



HCT PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0316	Test Dates: March 25, 2009	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2213282600	Page 45 of 89