



HCT CO., LTD.

CERTIFICATION DIVISION

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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 Issue: January 26, 2011

Test Site/Location:

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

Test Report No.: HCTR1101FR20

FCC ID : A3LSLS-2A30002100

APPLICANT : SAMSUNG Electronics Co., Ltd.

EUT Type : LTE Evolved UTRAN Node-B Outdoor System

Manufacturer : SAMSUNG Electronics Co., Ltd.

Model name : SLS-2A30002100

Frequency of Operation : 2135 MHz ~ 2140 MHz

Tx Output Power : 120 W (50.79 dBm) / Carrier / Sector

FCC Rule Part(s) : FCC Part 27.(c)

Test Procedure(s) : ANSI/TIA-603C-2004

Application Type : Original Equipment

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
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Test engineer of RF Team



Approved by
: Sang Jun Lee
Manager of RF Team

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Revision

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1101FR20	January 26, 2011	First Approval Report

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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: Tae-Han Kim / Principal Research Engineer E-mail : taehan2@samsung.com Tel: +82-31-279-3522 Fax: +82-31-279-7676

1.2. PRODUCT INFORMATION

EUT TYPE	LTE Evolved UTRAN Node-B Outdoor System
EMISSION DESIGNATOR	4M49G7D (QPSK), 4M49W7D (16QAM/64QAM)
OPERATING FREQUENCY	2 135 MHz ~ 2 140 MHz
TX OUTPUT POWER	60 W (47.78 dBm) / Carrier / Path 120 W (50.79 dBm) / Carrier / Sector
CHANNEL BANDWIDTH	5 MHz
MODULATION TYPE	OFDMA (QPSK, 16QAM, 64QAM)
NUMBER OF CARRIERS/SECTORS	1 Carrier / 3 Sectors
CHANNEL CARD CAPACITY	1 Carrier / 1 Sector
SYSTEM INPUT VOLTAGE	AC 220 V

1.3. INTRODUCTION OF EUT

3GPP Long Term Evolution (LTE) network is composed of E-UTRAN NodeB (eNB), LTE System Manager (LSM) and Evolved Packet Core (EPC). LTE network is the subnet of Packet Data Network (PDN) and enables User Equipments (UE) to interwork with IP network.

The eNB is located between the UE and EPC. It processes packet calls by connecting to the UE wirelessly according to the LTE Air standard. The eNB performs functionalities such as transmission and receipt of wireless signals, modulation and demodulation of packet traffic signals, packet scheduling for efficient utilization of wireless resources, Hybrid Automatic Repeat Request (HARQ)/ARQ processing, Packet Data Convergence Protocol (PDCP) for packet header compression, and wireless resources control. Moreover, it performs handover interoperating with the EPC.

- OFDMA Downlink Transmission
- SC-FDMA Uplink Transmission
- Downlink MIMO
- Uplink MIMO
- Power Control

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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(m)	Occupied Bandwidth	Compliant
2.1051, 27.53(m)	Spurious Emissions at Antenna Terminals	Compliant
2.1051, 27.53(m)	Channel Edge	Compliant
2.1053, 27.53(m)	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 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.

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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	09/23/2011
Schwarzbeck	BBHA 9120D / Double Ridged Horn Antenna	147	04/13/2011
Schwarzbeck	VULB 9168 / TRILOG Antenna	9168-255	05/28/2011
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	AFS44-00102650-42-10P44-PS	1532439	04/05/2011
EMCO	6502/Loop Antenna	9009-2536	01/13/2012
R&S	ESI40 / EMI TEST Receiver	831564/003	10/30/2011
Wainwright Instrument	WHF6.0/26.5G-6SS / High Pass Filter	1	05/12/2011
WEINSCHTEL	67-30-33 / Attenuator	BU5347	11/29/2011
WEINSCHTEL	67-30-33 / Attenuator	BR0530	11/29/2011
WEINSCHTEL	AF9003-69-31 / STEP ATTENUATOR	11787	11/12/2011
WEINSCHTEL	AF9003-69-31 / STEP ATTENUATOR	639	11/12/2011
Agilent	N9020A / MXA Signal Analyzer	US46220219	03/03/2011
Agilent	11636B / Power Divider	11377	12/29/2011

5. CONDUCTED OUTPUT POWER

5.1. Applicable Standard

According to FCC §2.1046 & 27.5(h)

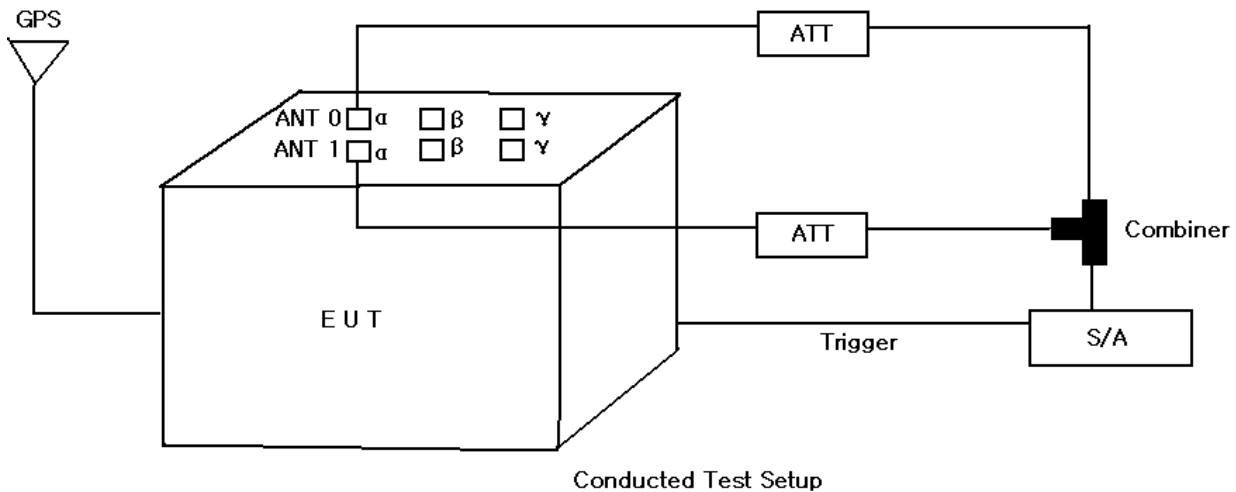
1) *Main, booster and base stations.* (i) The maximum EIRP of a main, booster or base station shall not exceed $33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

5.2. Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Agilent	87302C / Power Divider	3239A01051	03/19/2011
WEINSCHTEL	67-30-33 / Attenuator	BU5347	12/29/2011
WEINSCHTEL	67-30-33 / Attenuator	BR0530	12/29/2011
WEINSCHTEL	AF9003-69-31 / STEP ATTENUATOR	11787	11/12/2011
WEINSCHTEL	AF9003-69-31 / STEP ATTENUATOR	639	11/12/2011
Agilent	N9020A / MXA Signal Analyzer	US46220219	03/03/2011

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 the test system is calibrated to correct the reading.
- 2) The spectrum analyzer was set to RMS Detector function and Average mode.
- 3) The resolution bandwidth of the spectrum analyzer was comparable to the emission bandwidth.

5.3.1. Environmental Conditions:

Temperature:	22 °C
Relative Humidity:	25 %

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5.4. Test Result(α)

: PASS

5.4.1. Test Data at Output Port 0

Modulation	Frequency	Measured Output Power	
		dBm	W
QPSK	2 137.5	47.75	59.5662
16QAM		48.32	67.9204
QPSK		48.00	63.0957

5.4.2. Test Data at Output Port 1

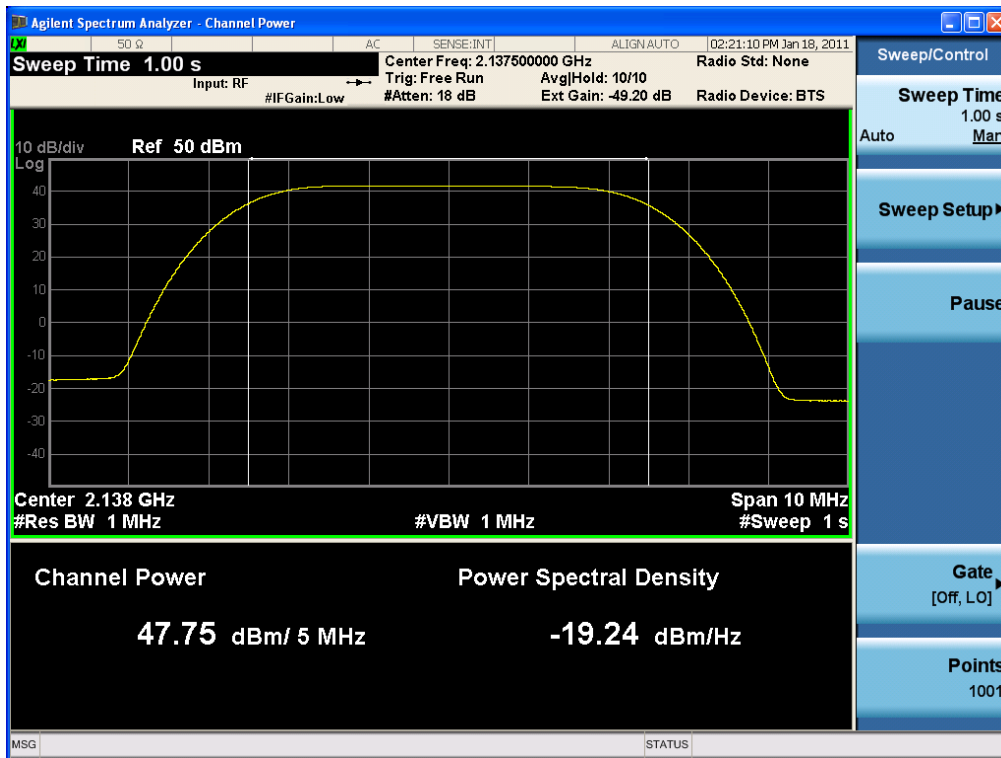
Modulation	Frequency	Measured Output Power	
		dBm	W
QPSK	2 137.5	47.76	59.7035
16QAM		47.77	59.8412
QPSK		47.79	60.1174

5.4.3. Test Data at Output Port MIMO

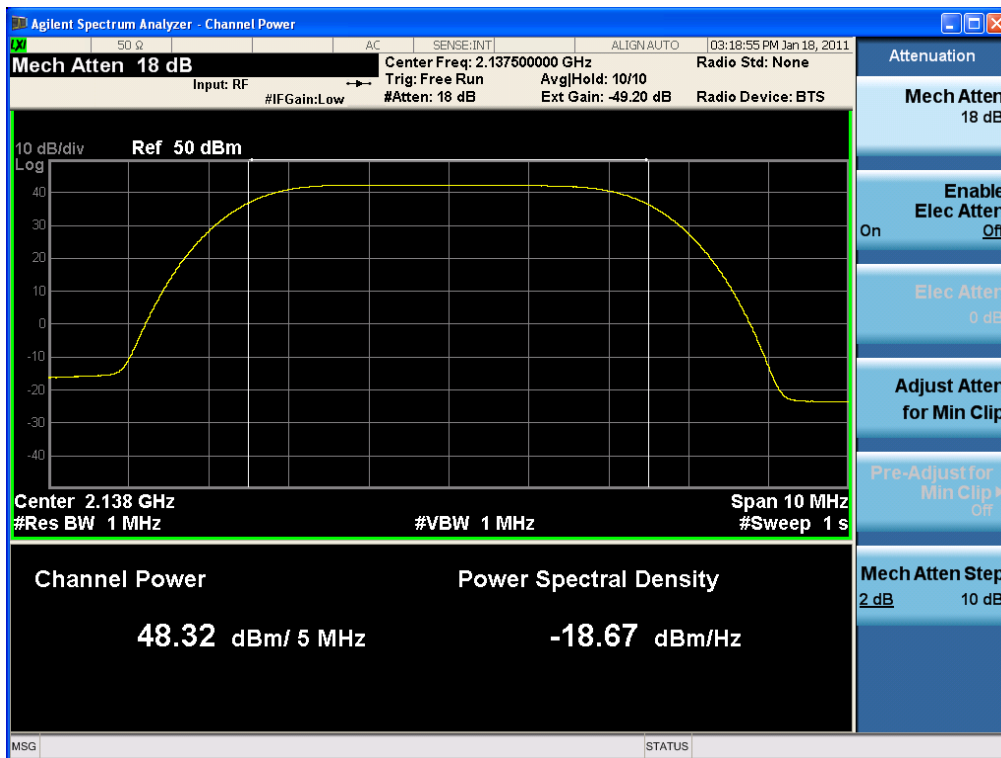
Modulation	Frequency	Measured Output Power	
		dBm	W
QPSK	2 137.5	50.18	104.2317
16QAM		50.24	105.6818
QPSK		50.27	106.4143

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

(QPSK Channel)



(16QAM Channel)



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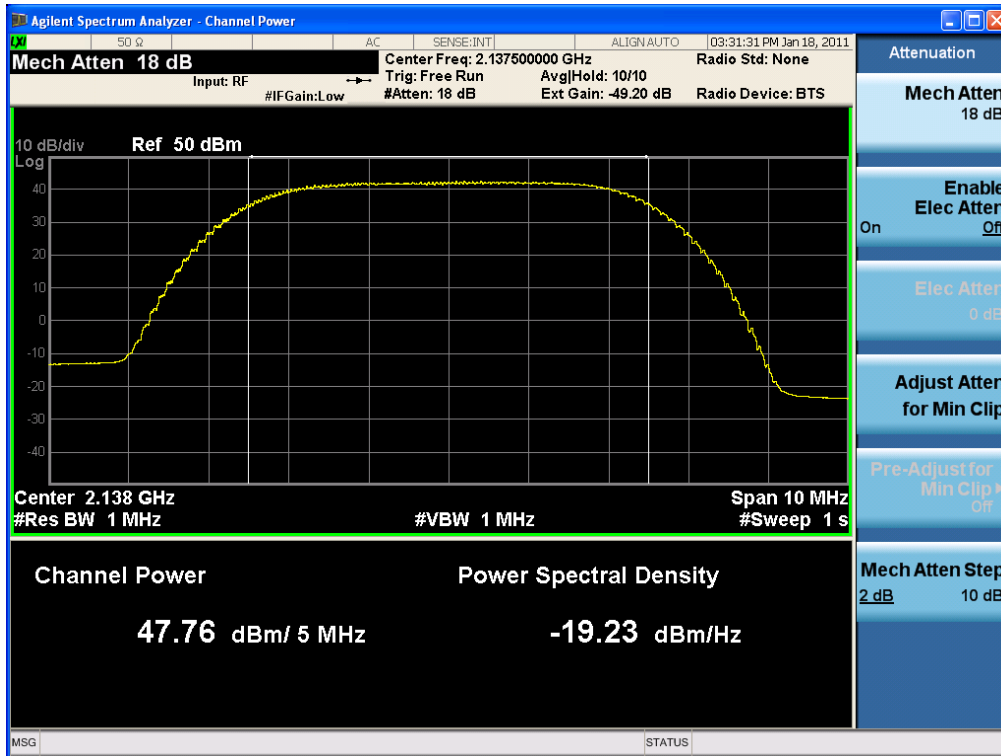
(64QAM Channel)



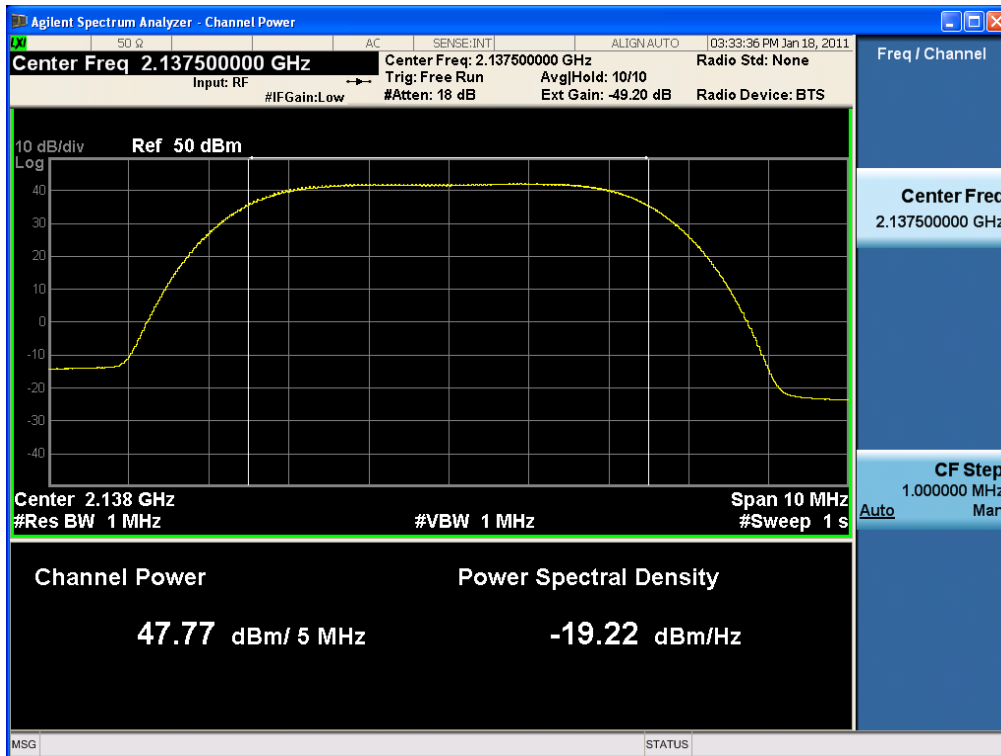
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5.4.5. Plot Data for Output 1 (Conducted Output Power)

(QPSK Channel)

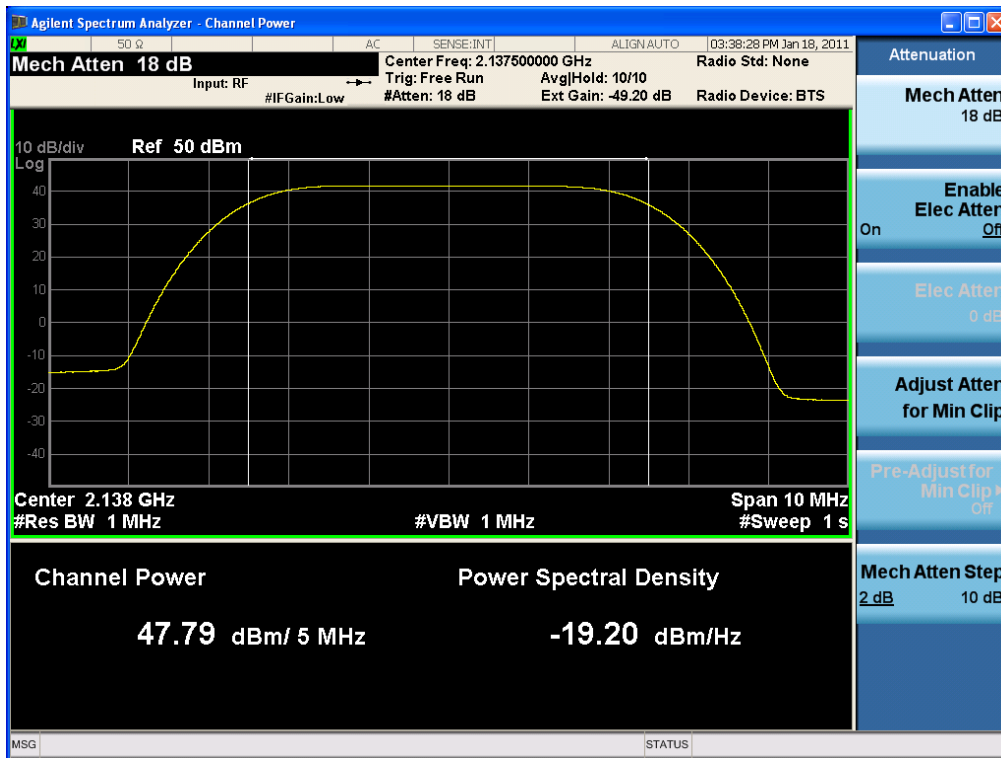


(16QAM Channel)



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(64QAM Channel)



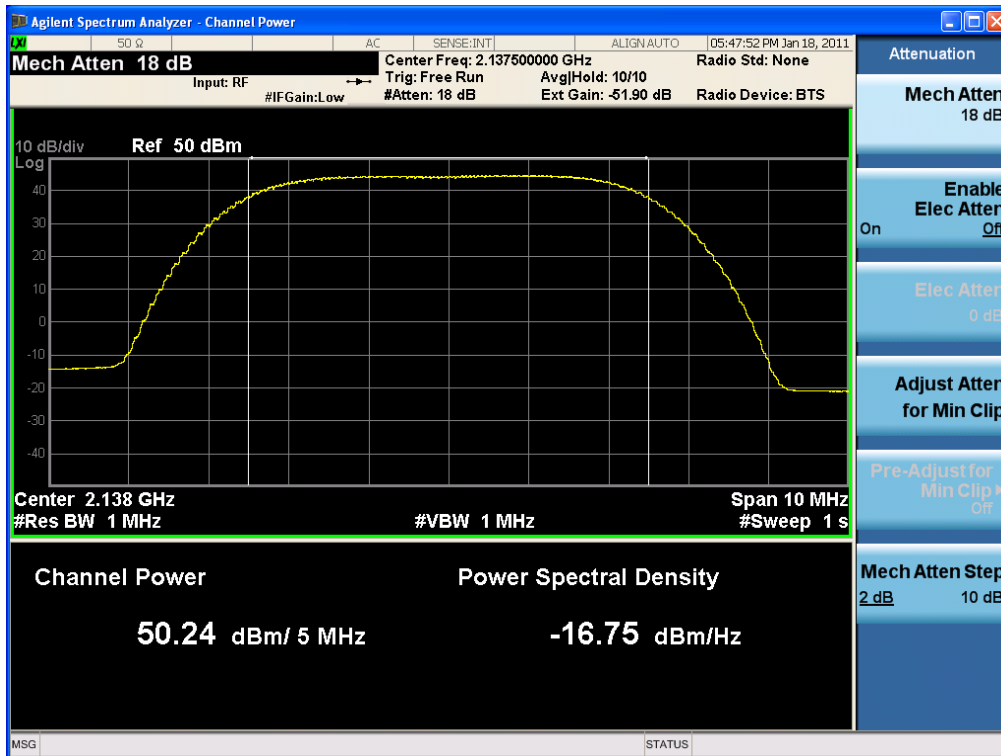
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5.4.6. Plot Data for Output MIMO (Conducted Output Power)

(QPSK Channel)

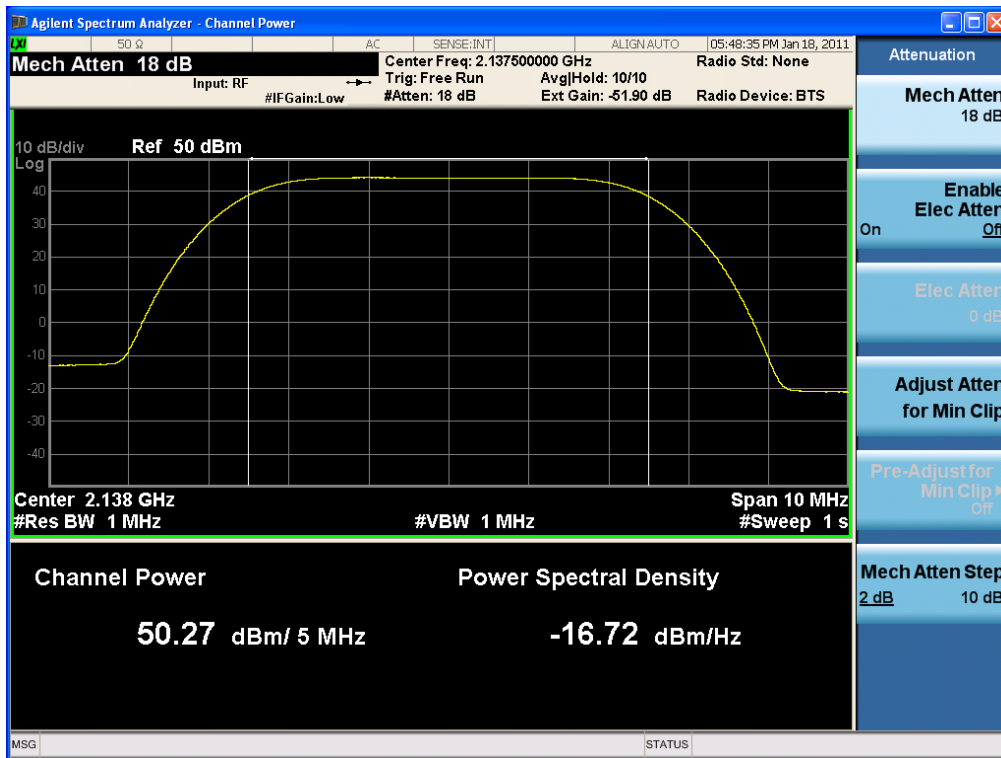


(16QAM Channel)



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(64QAM Channel)



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5.5. Test Result(β)

: PASS

5.5.1. Test Data at Output Port 0

Modulation	Frequency	Measured Output Power	
		dBm	W
QPSK	2 137.5	47.97	62.6614
16QAM		47.92	61.9441
QPSK		47.93	62.0869

5.5.2. Test Data at Output Port 1

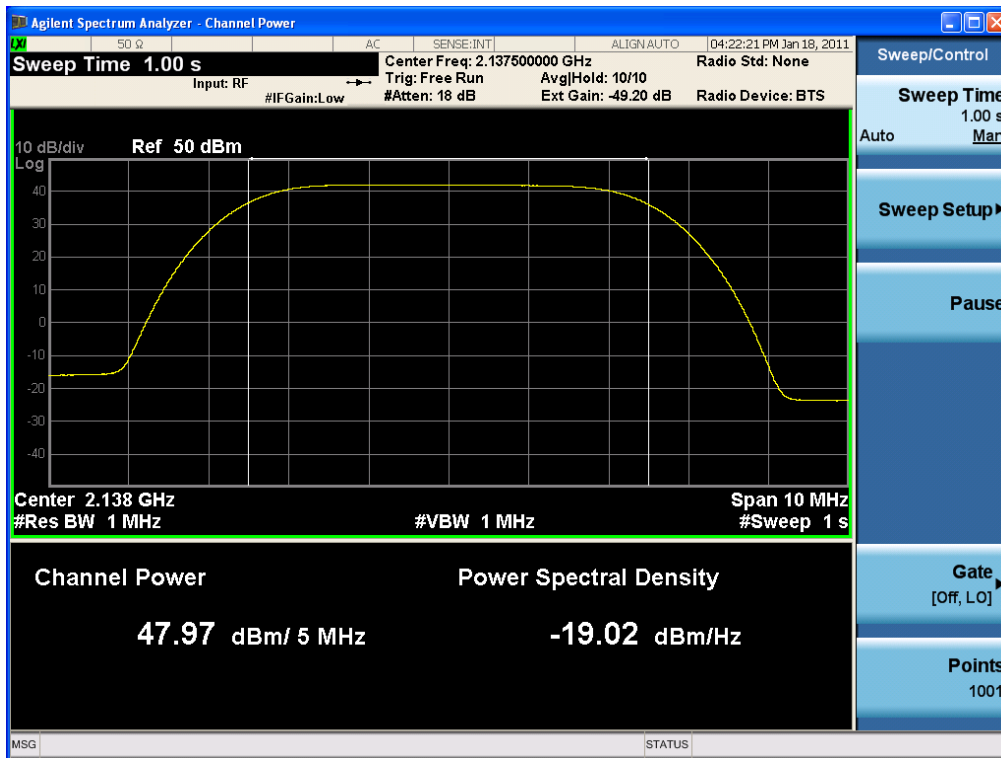
Modulation	Frequency	Measured Output Power	
		dBm	W
QPSK	2 137.5	48.07	64.1210
16QAM		48.13	65.0130
QPSK		48.17	65.6145

5.4.3. Test Data at Output Port MIMO

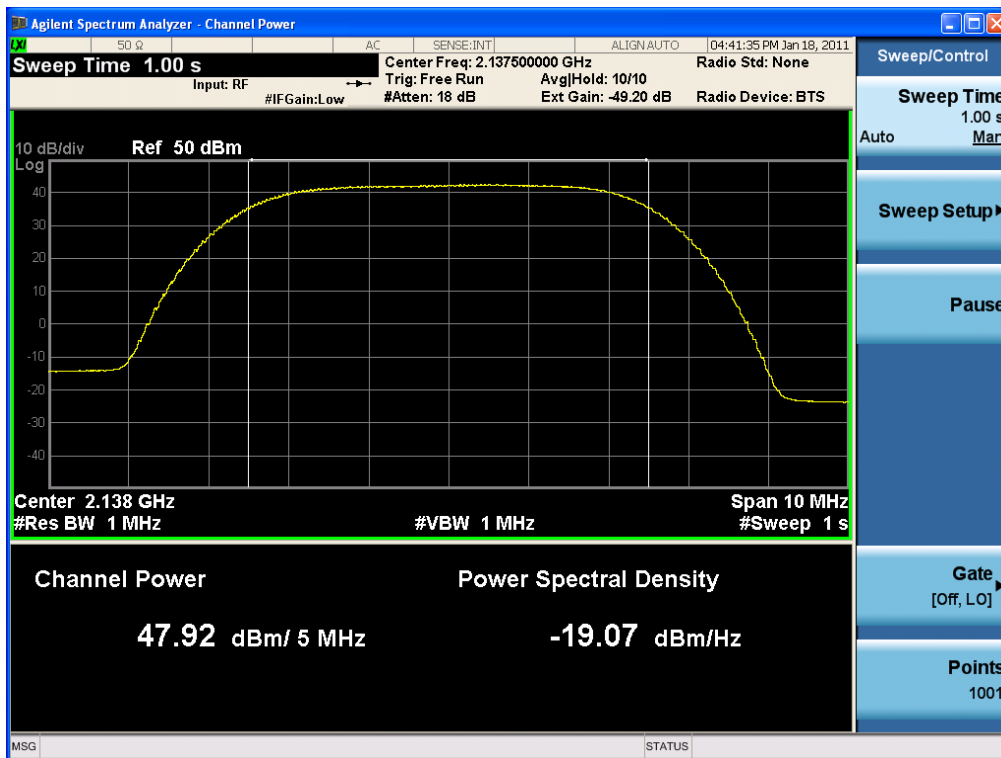
Modulation	Frequency	Measured Output Power	
		dBm	W
QPSK	2 137.5	50.82	120.7814
16QAM		50.83	121.0598
QPSK		50.87	122.1800

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

(QPSK Channel)

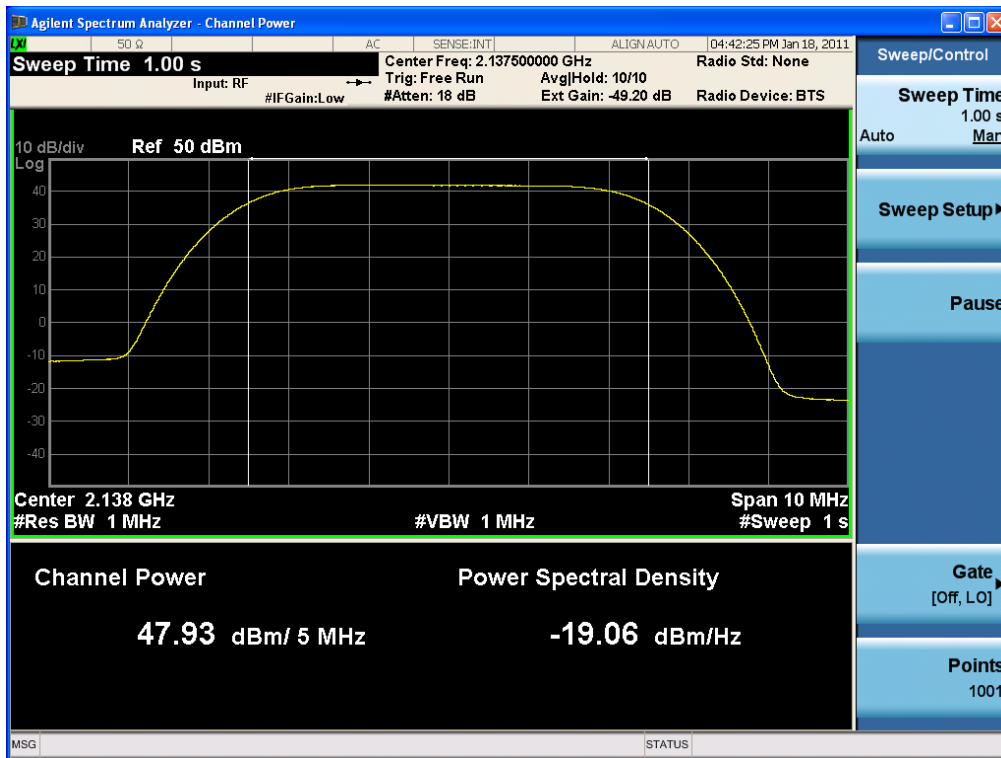


(16QAM Channel)



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(64QAM Channel)



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

(QPSK Channel)

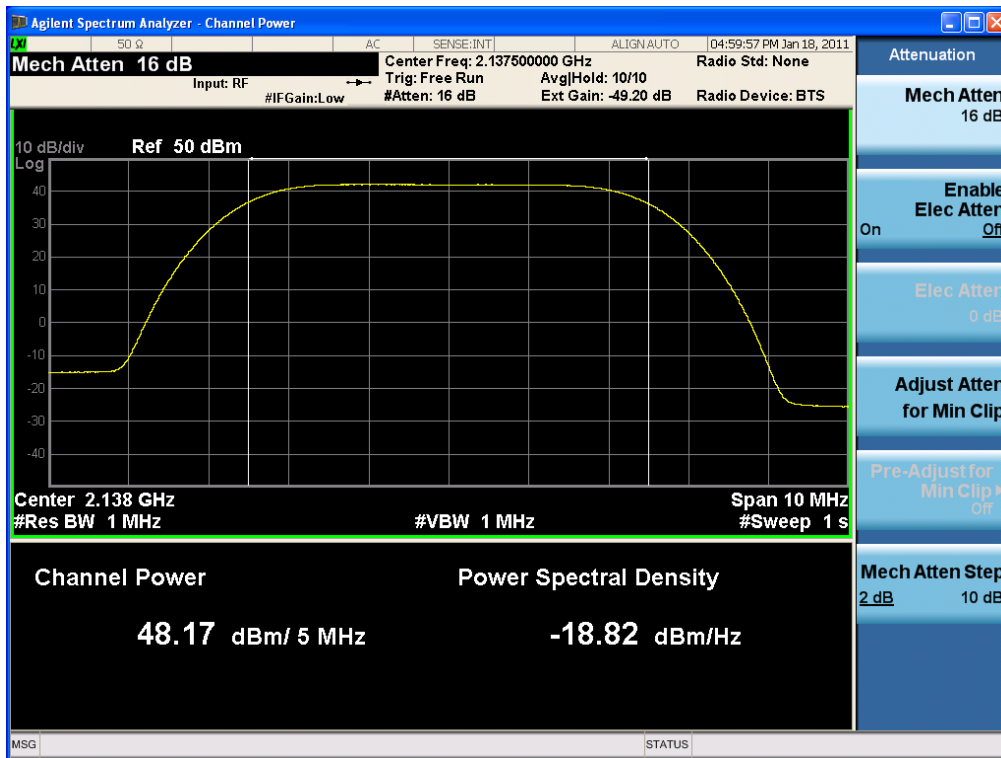


(16QAM Channel)



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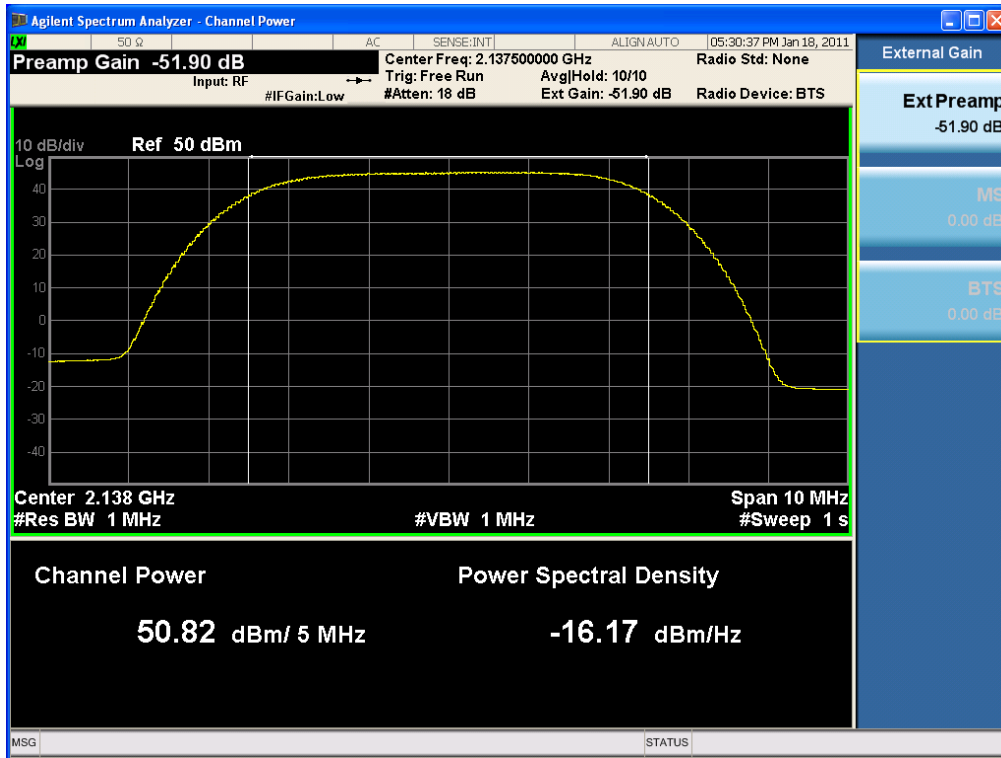
(64QAM Channel)



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5.5.6. Plot Data for Output MIMO (Conducted Output Power)

(QPSK Channel)

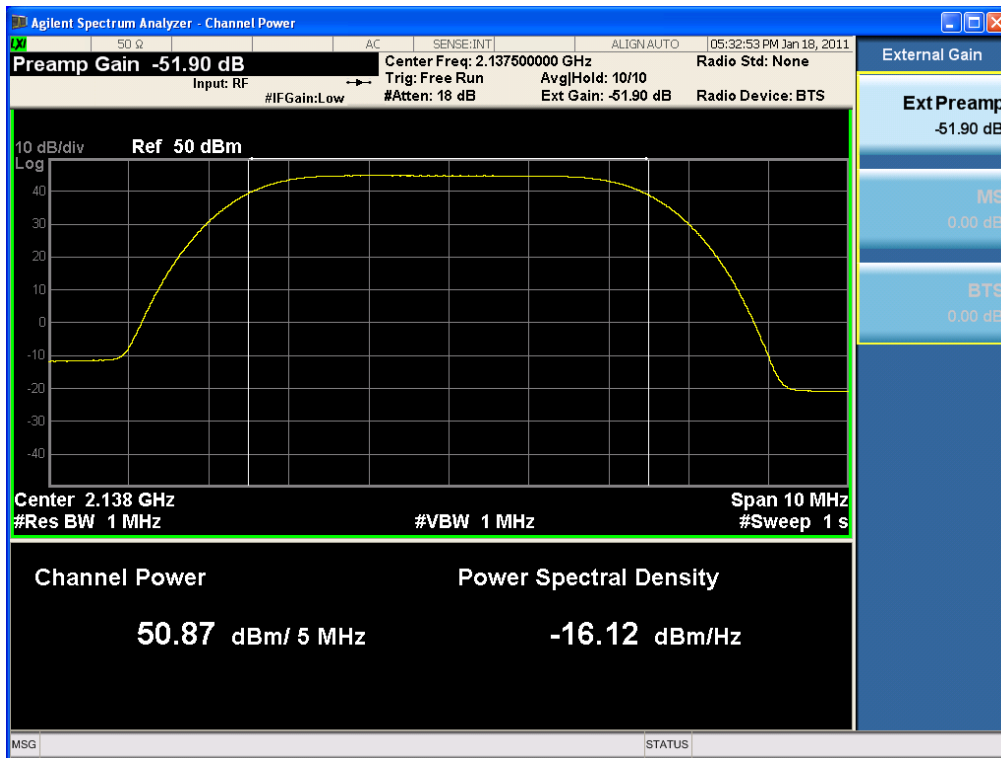


(16QAM Channel)



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6. OCCUPIED BANDWIDTH

6.1. Applicable Standard

Requirements: CFR 47, Section 27.53(m)(6) 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. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

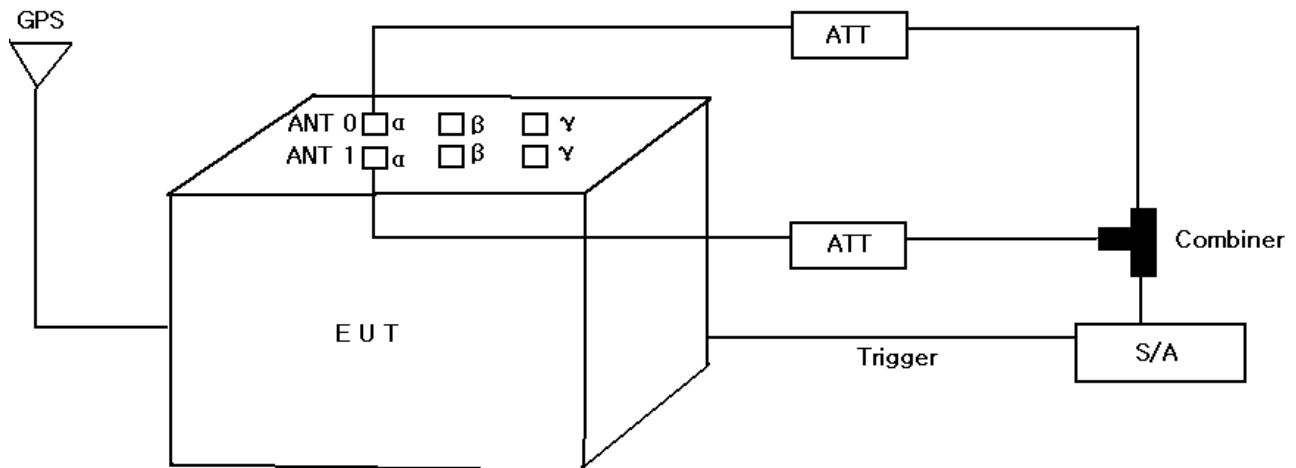
6.2. Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Agilent	87302C / Power Divider	3239A01051	03/19/2011
WEINSCHEL	67-30-33 / Attenuator	BU5347	12/29/2011
WEINSCHEL	67-30-33 / Attenuator	BR0530	12/29/2011
WEINSCHEL	AF9003-69-31 / STEP ATTENUATOR	11787	11/12/2011
WEINSCHEL	AF9003-69-31 / STEP ATTENUATOR	639	11/12/2011
Agilent	N9020A / MXA Signal Analyzer	US46220219	03/03/2011

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6.3. Test Procedure

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



[Conducted Test Setup]

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function via its antenna port. Measurements were performed to determine the occupied bandwidth in accordance with FCC Part 2.1049. The occupied bandwidth was measured from the fundamental emission at the bottom, middle and top channels. The occupied bandwidth was measured using the built in occupied bandwidth function of the spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser automatically configures the measurement bandwidths to make an accurate measurement based on the channel bandwidth and channel spacing of the EUT.

6.3.1. Environmental Conditions:

Temperature:	23 °C
Relative Humidity:	18 %

6.4. Test Result(α)

: PASS

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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6.4.1. Test Data at Output Port 0

Modulation	Frequency	Measured Bandwidth	
		99 %	26 dB
QPSK	2 137.5	4.4601	4.762
16QAM		4.4941	4.784
64QAM		4.4953	4.790

6.4.2. Test Data at Output Port 1

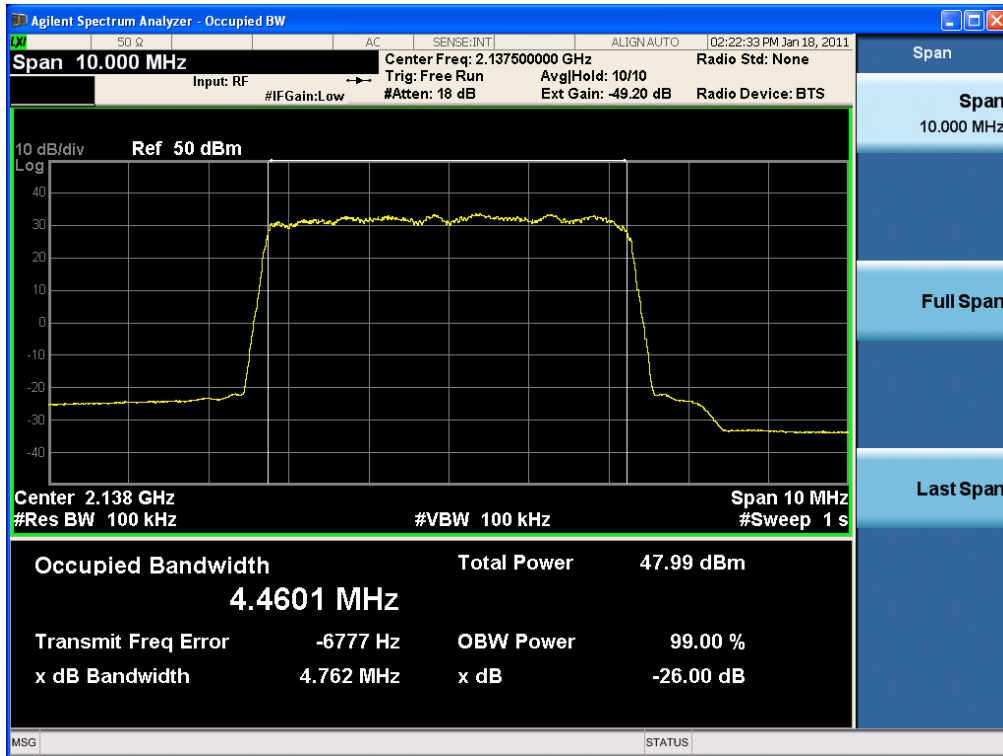
Modulation	Frequency	Measured Bandwidth	
		99 %	26 dB
QPSK	2 137.5	4.4704	4.763
16QAM		4.4779	4.769
64QAM		4.4963	4.788

6.4.3. Test Data at Output Port MIMO

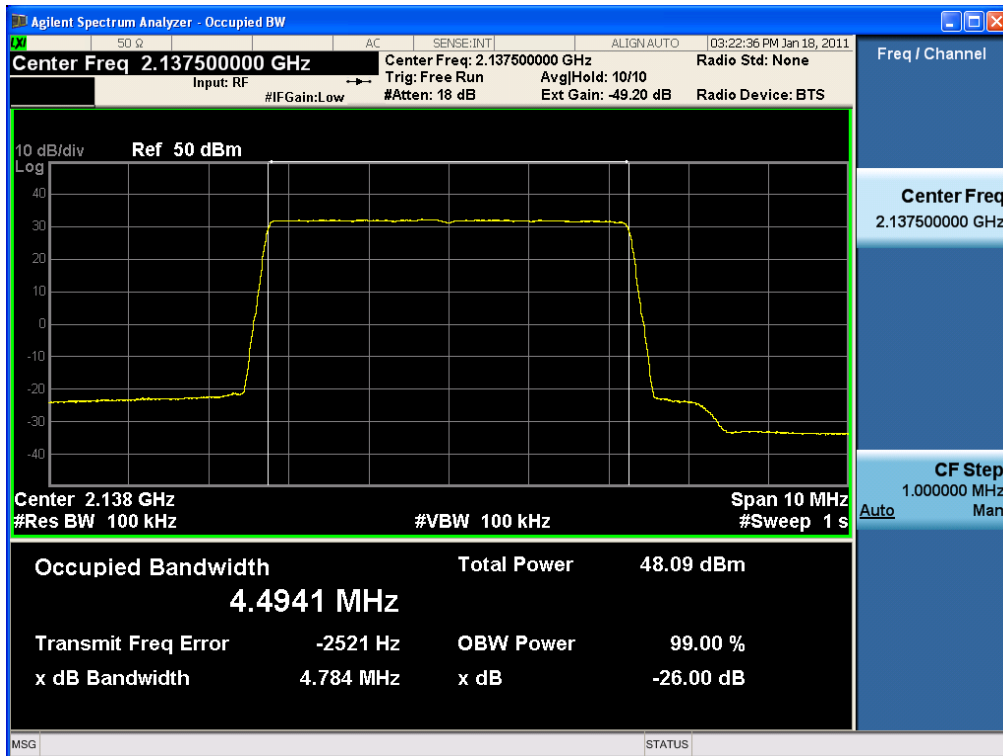
Modulation	Frequency	Measured Bandwidth	
		99 %	26 dB
QPSK	2 137.5	4.4683	4.756
16QAM		4.4793	4.769
64QAM		4.4977	4.795

6.4.4. Test Plot at Output Port 0

(QPSK Channel)

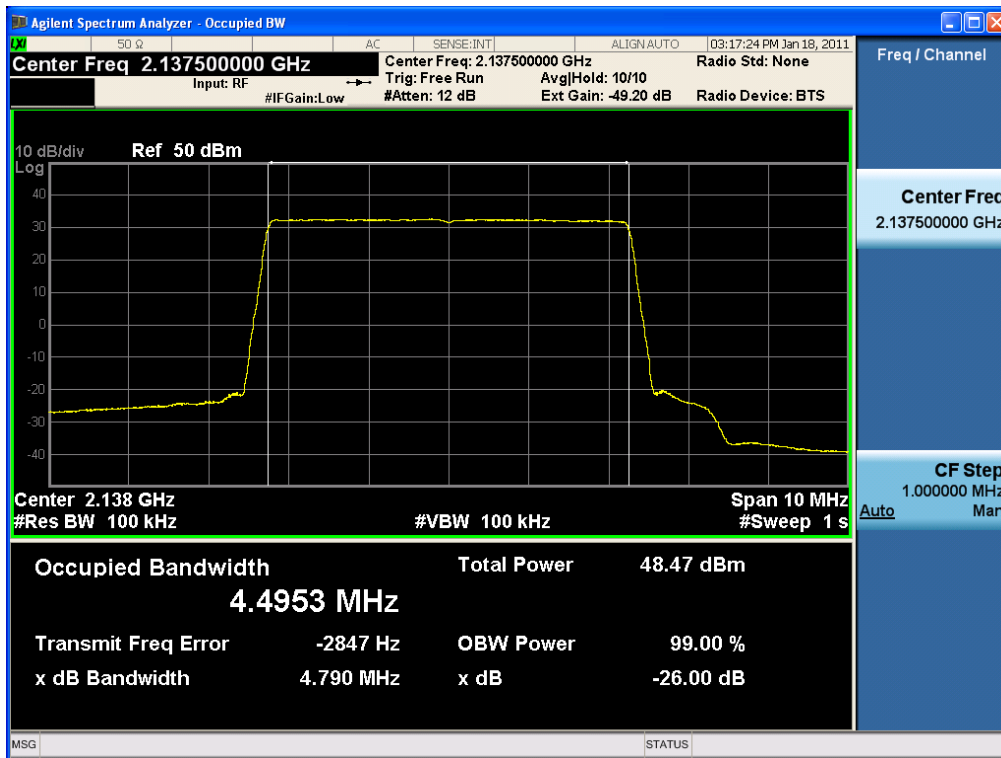


(16QAM Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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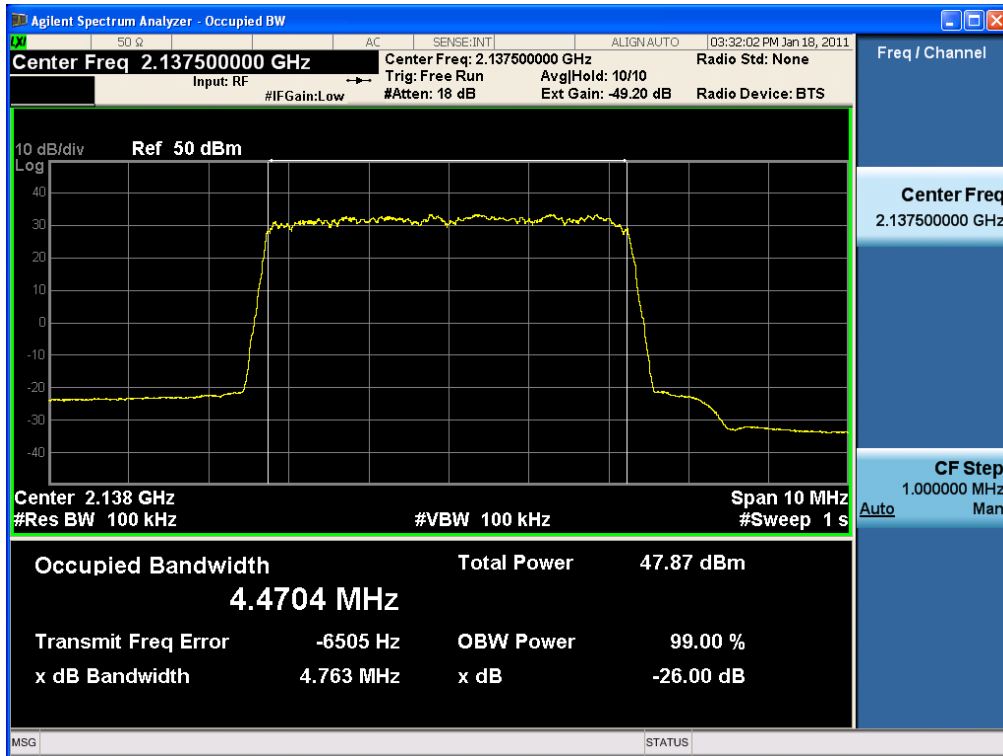
(64QAM Channel)



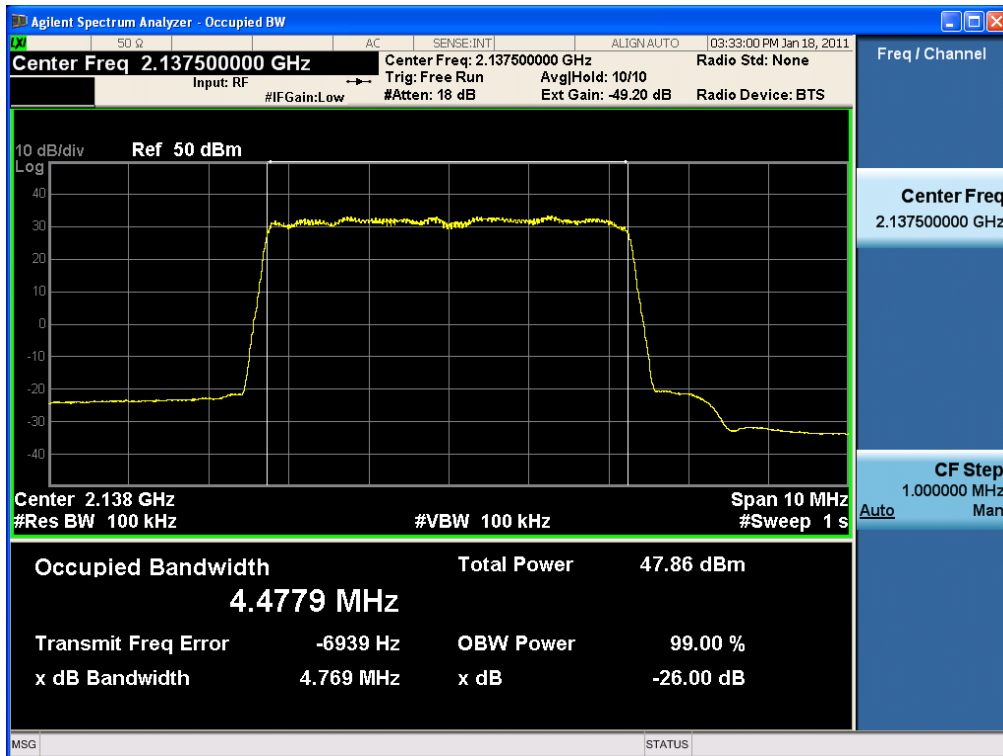
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1101FR20	Issue Dates: January 26, 2011	EUT Type: LTE Evolved UTRAN Node-B Outdoor System	FCC ID: A3LSLS-2A30002100	Page 31 of 85

6.4.5. Test Plot at Output Port 1

(QPSK Channel)

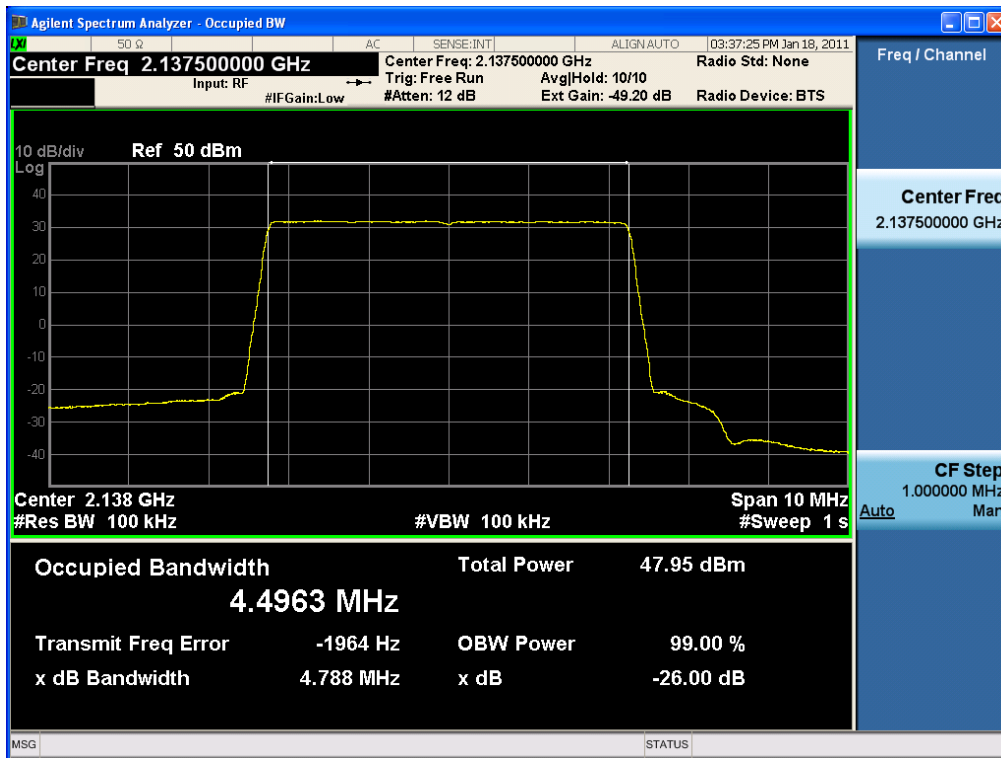


(16QAM Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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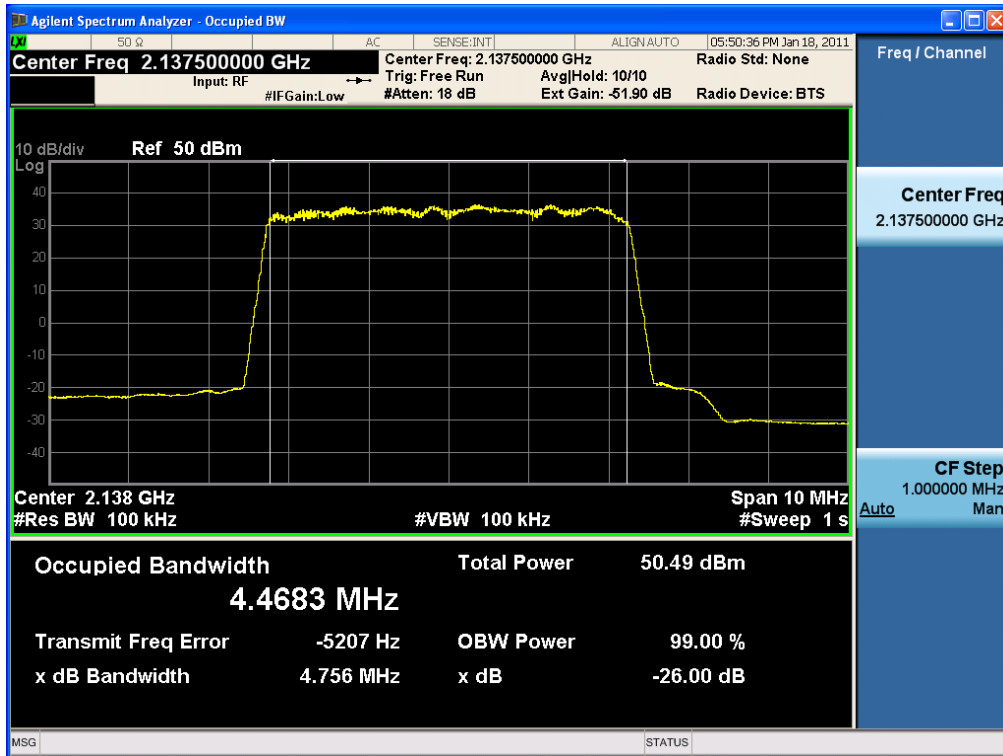
(64QAM Channel)



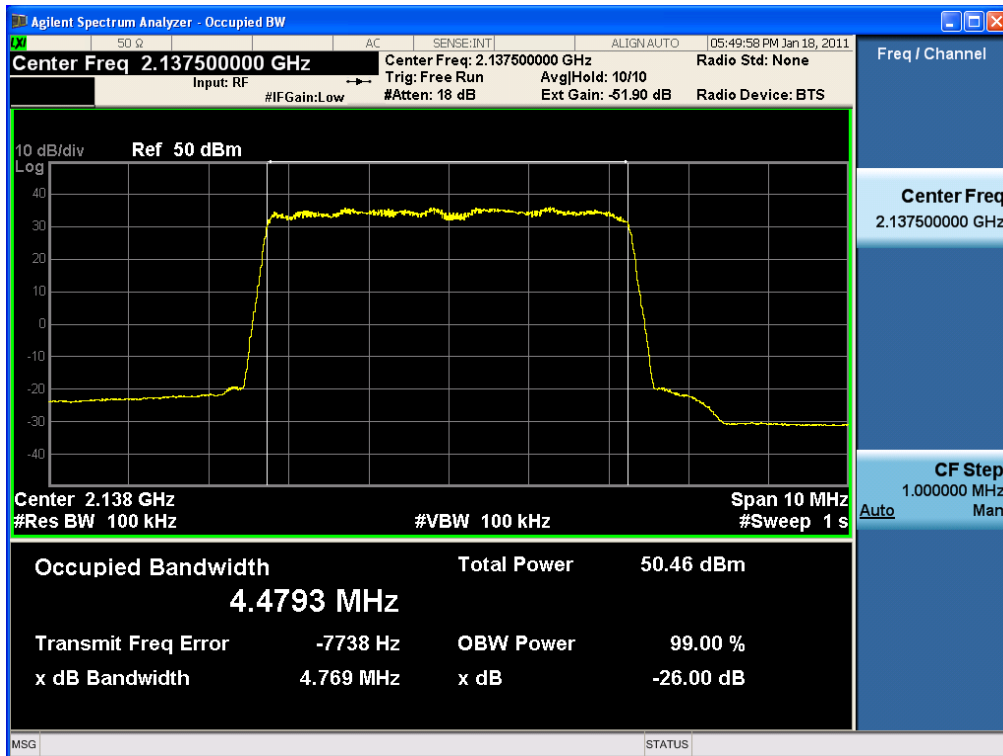
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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6.4.6. Test Plot at Output Port MIMO

(QPSK Channel)

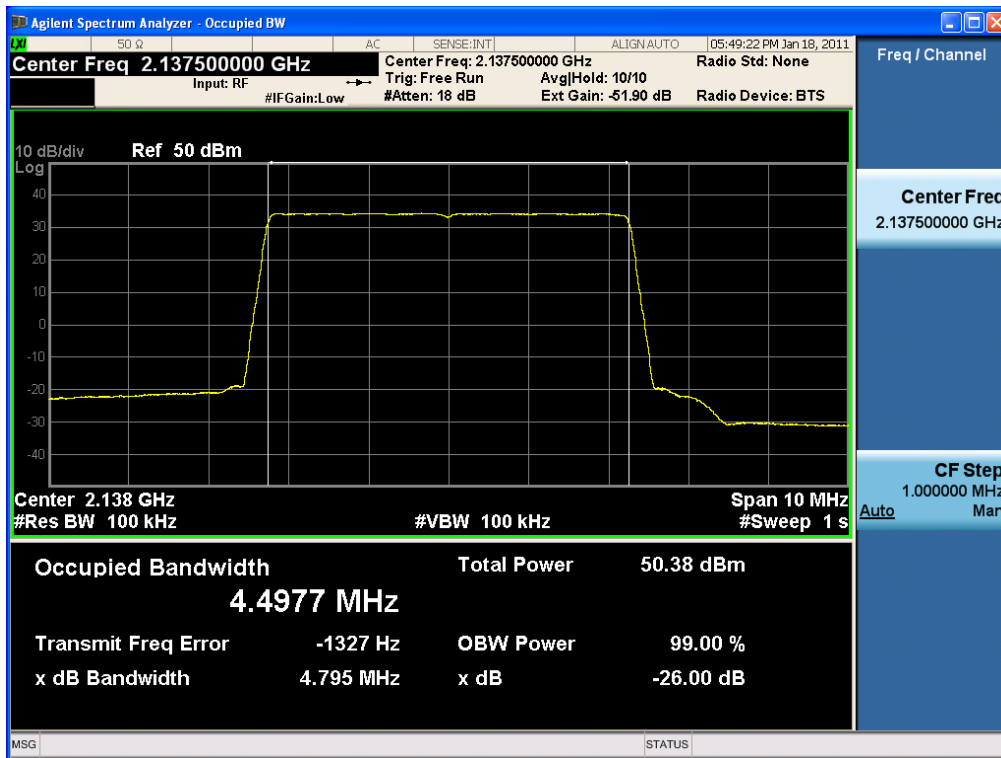


(16QAM Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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(64QAM Channel)



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6.5. Test Result(β)

: PASS

6.5.1. Test Data at Output Port 0

Modulation	Frequency	Measured Bandwidth	
		99 %	26 dB
QPSK	2 137.5	4.4657	4.752
16QAM		4.4750	4.766
64QAM		4.4975	4.796

6.5.2. Test Data at Output Port 1

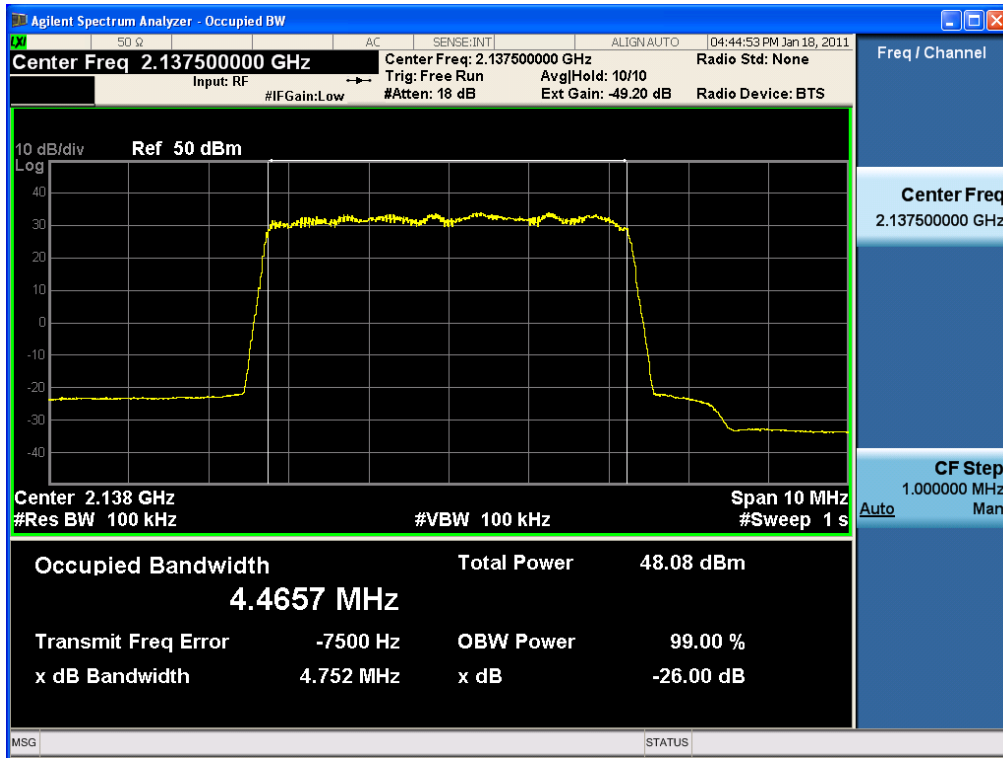
Modulation	Frequency	Measured Bandwidth	
		99 %	
QPSK	2 137.5	4.4622	4.763
16QAM		4.4784	4.763
64QAM		4.4969	4.797

6.5.3. Test Data at Output Port MIMO

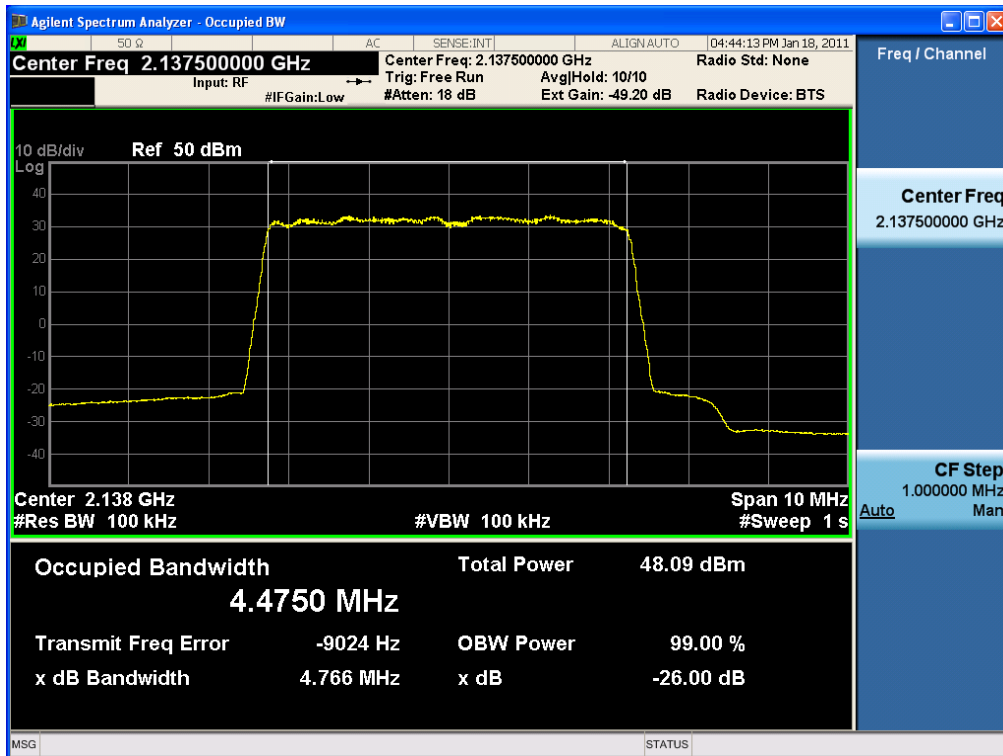
Modulation	Frequency	Measured Bandwidth	
		99 %	
QPSK	2 137.5	4.4969	4.795
16QAM		4.4767	4.770
64QAM		4.4966	4.799

6.5.4. Test Plot at Output Port 0

(QPSK Channel)

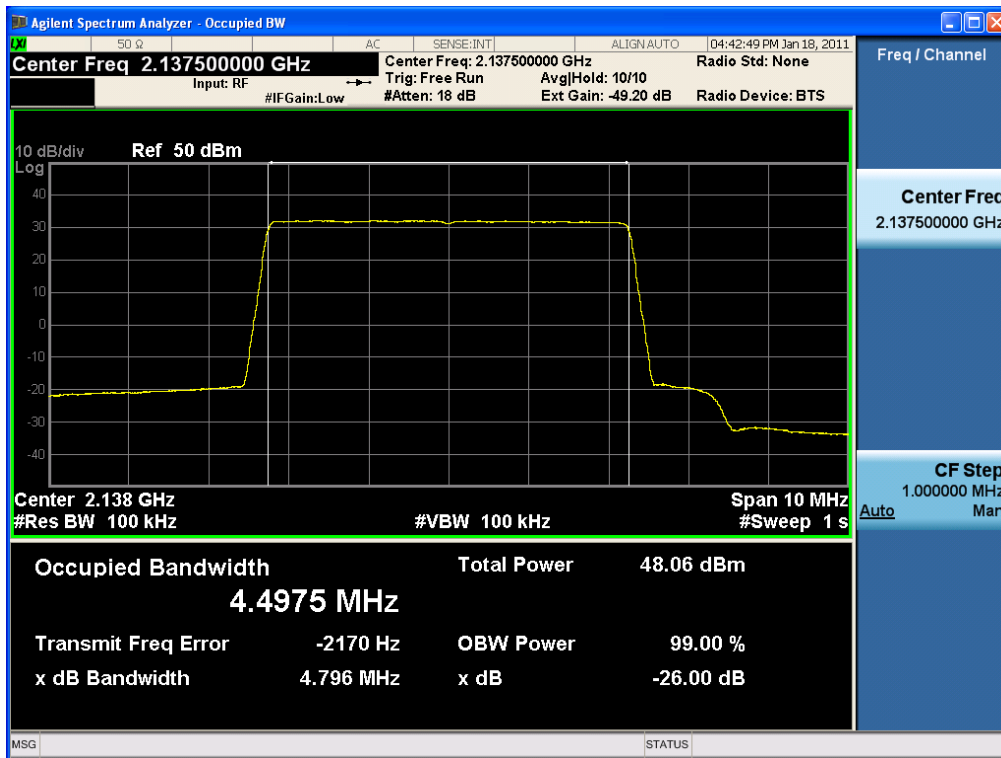


(16QAM Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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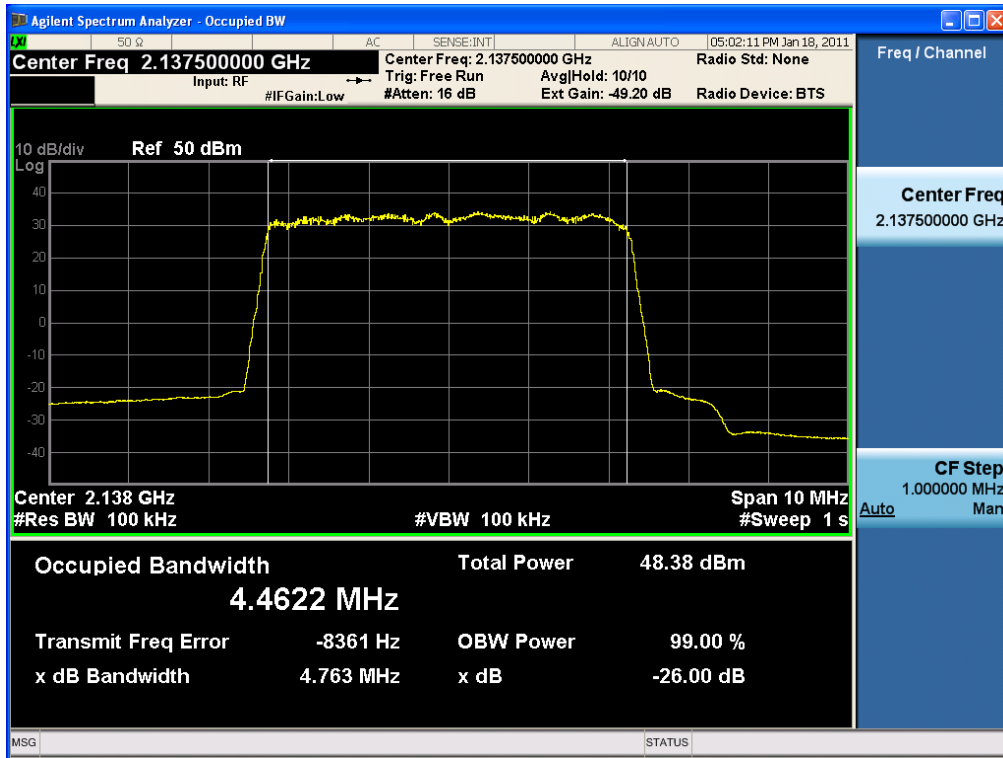
(64QAM Channel)



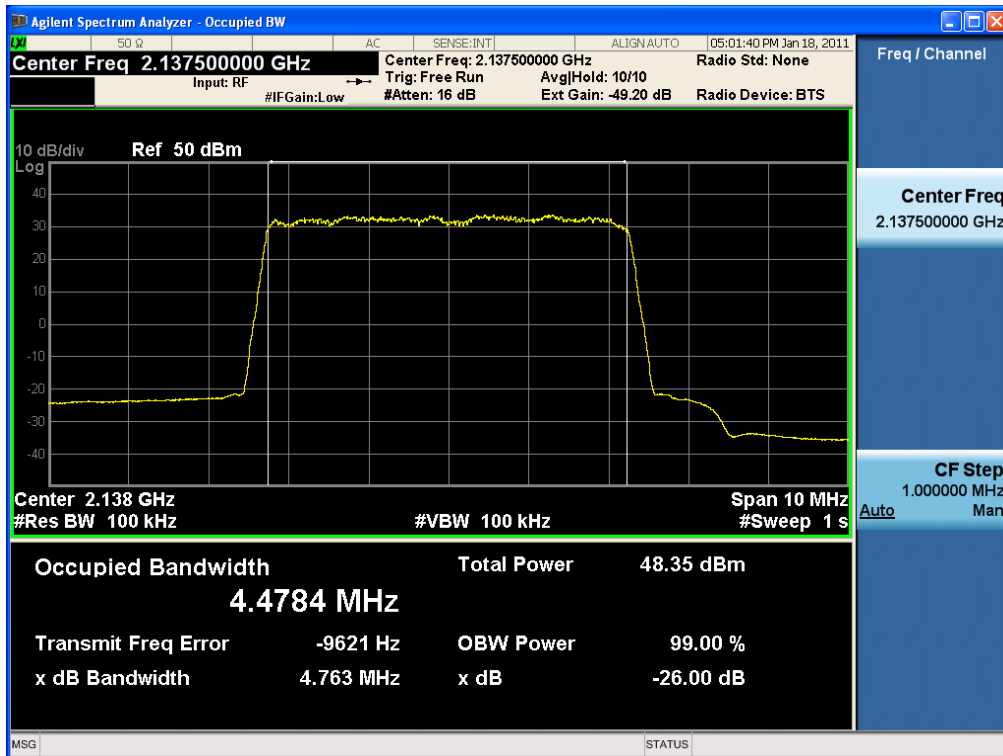
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1101FR20	Issue Dates: January 26, 2011	EUT Type: LTE Evolved UTRAN Node-B Outdoor System	FCC ID: A3LSLS-2A30002100	Page 38 of 85

6.5.5. Test Plot at Output Port 1

(QPSK Channel)

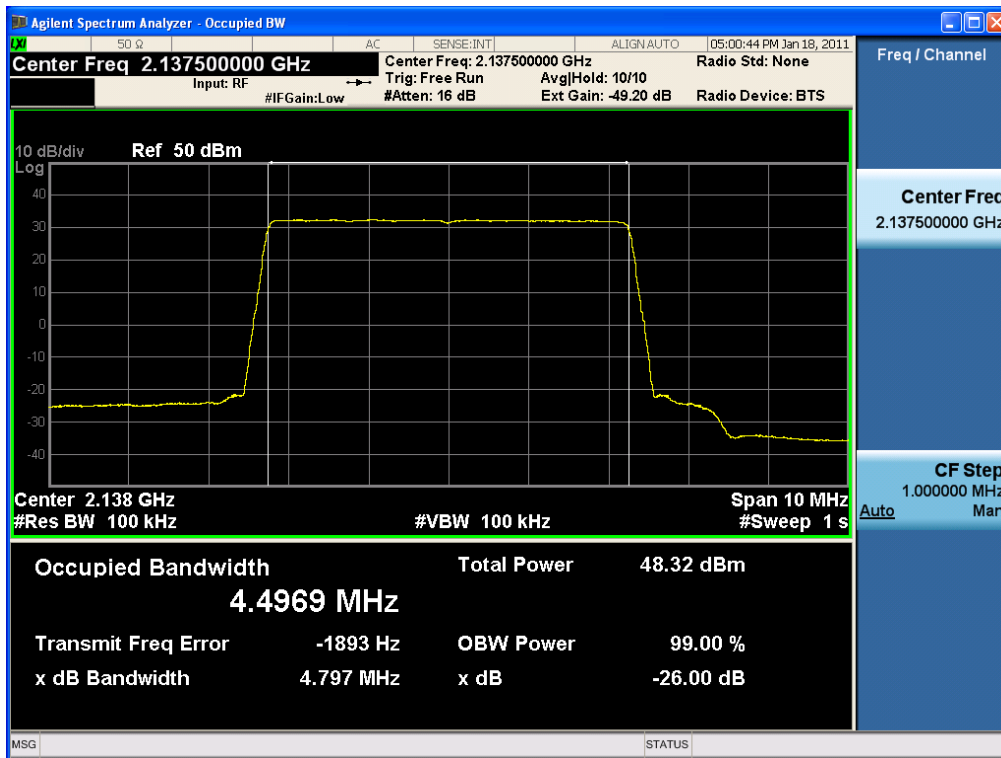


(16QAM Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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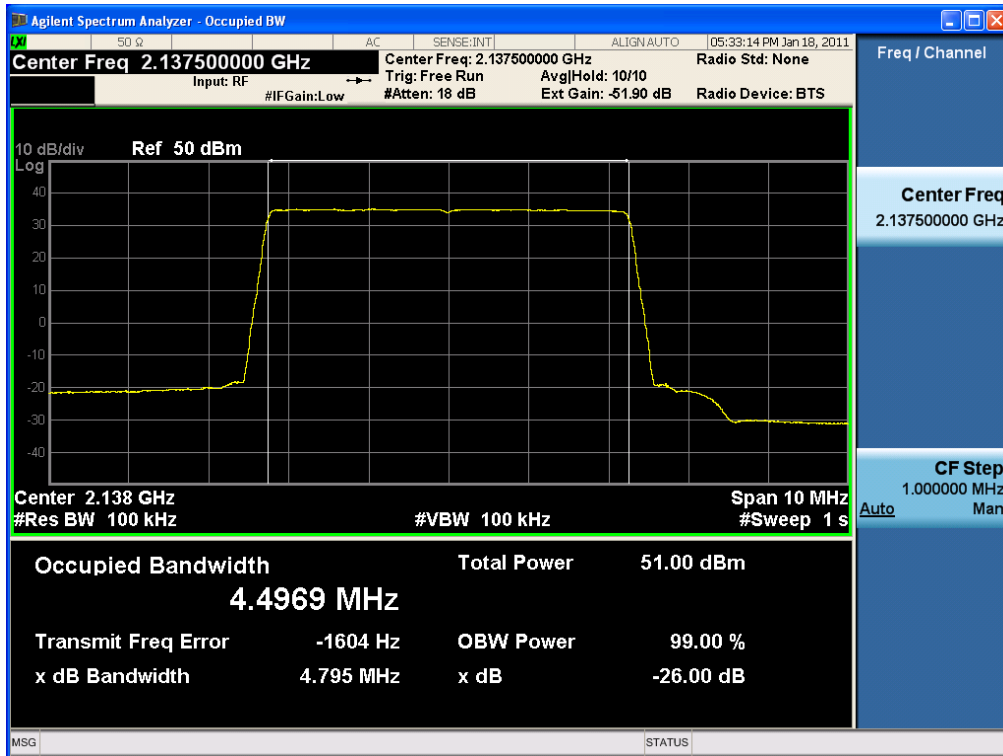
(64QAM Channel)



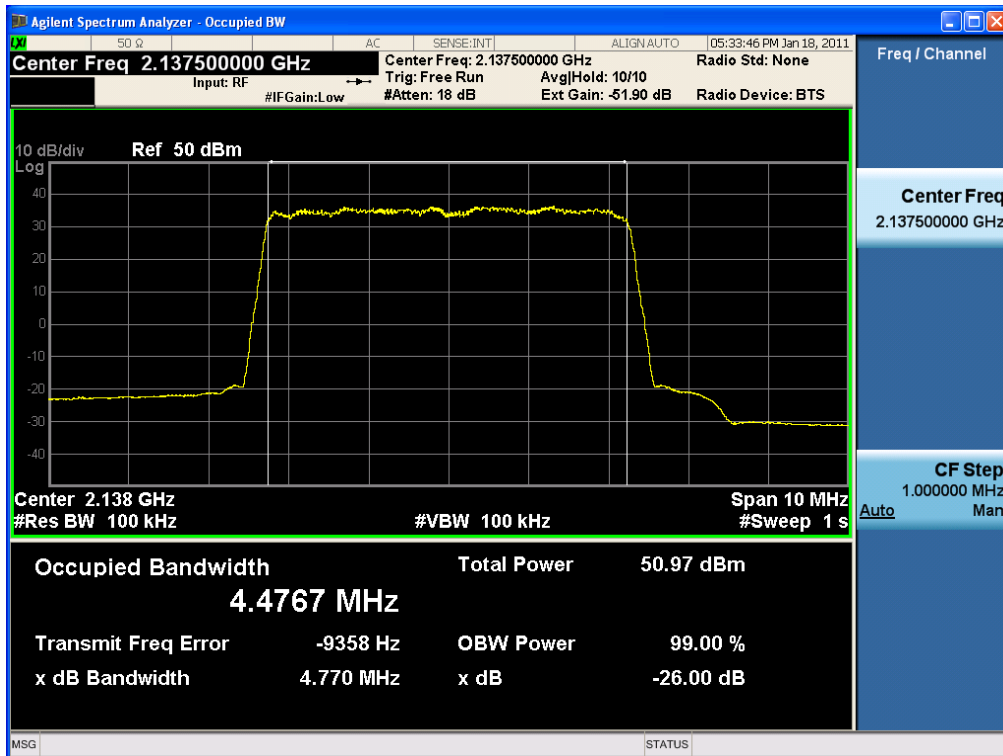
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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6.5.6. Test Plot at Output Port MIMO

(QPSK Channel)

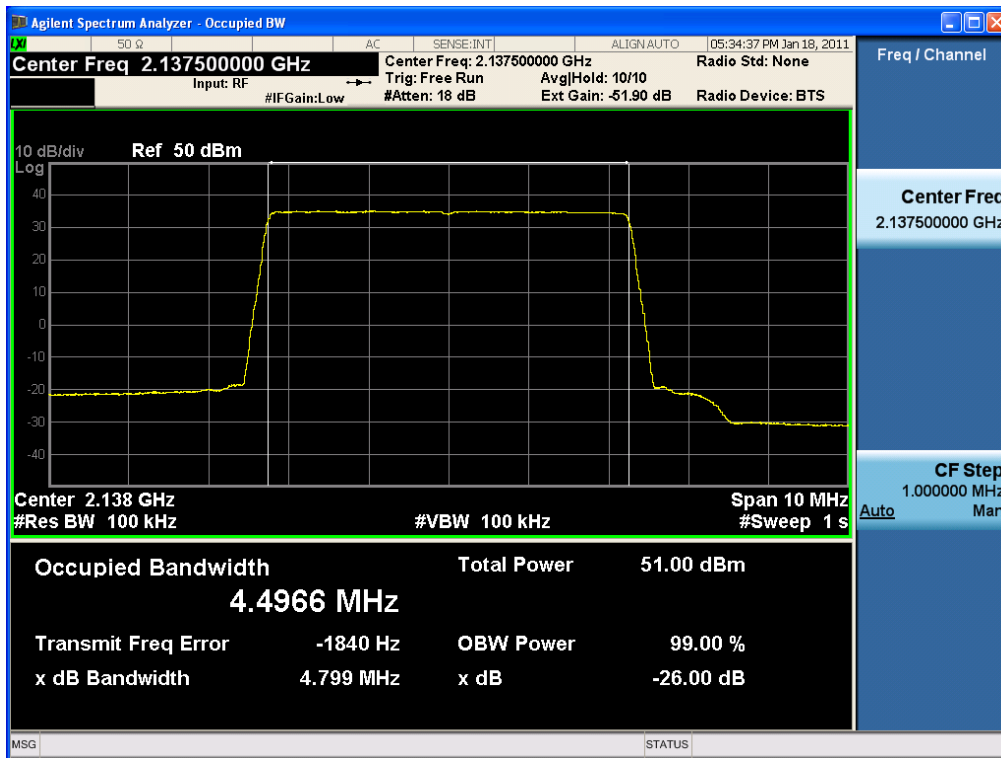


(16QAM Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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(64QAM Channel)



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7. CHANNEL EDGES

7.1. Applicable Standard

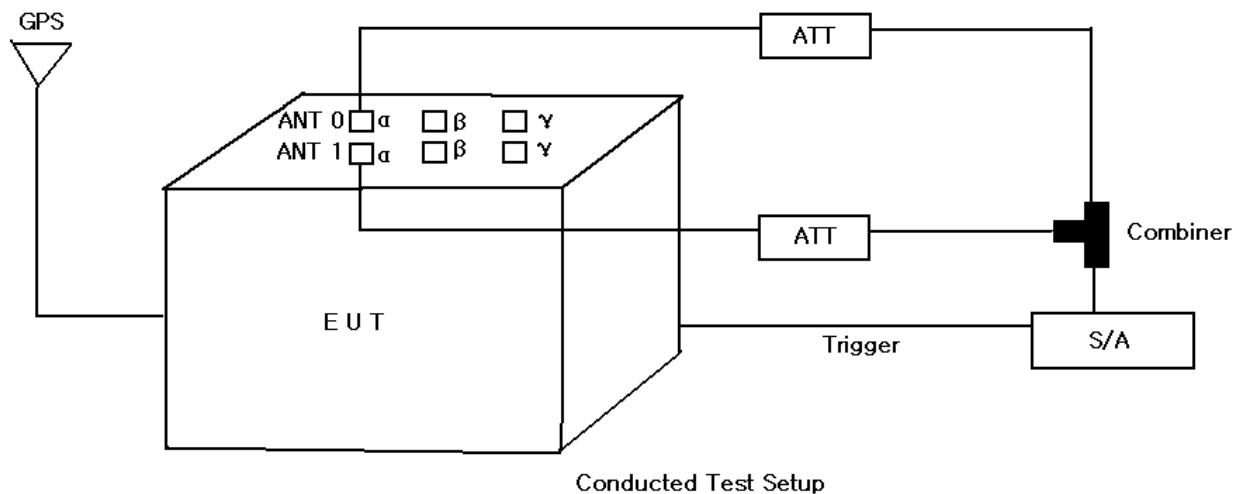
According to §27.53(l)(2), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (p) by a factor of at least $43 + 10 \log (p)$ dB.

7.2. Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Agilent	87302C / Power Divider	3239A01051	03/19/2011
WEINSCHTEL	67-30-33 / Attenuator	BU5347	12/29/2011
WEINSCHTEL	67-30-33 / Attenuator	BR0530	12/29/2011
WEINSCHTEL	AF9003-69-31 / STEP ATTENUATOR	11787	11/12/2011
WEINSCHTEL	AF9003-69-31 / STEP ATTENUATOR	639	11/12/2011
Agilent	N9020A / MXA Signal Analyzer	US46220219	03/03/2011

7.3. Test Procedure

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



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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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:	26 °C
Relative Humidity:	35 %

7.4. Test Result(α)

: PASS

7.4.1. Test data at Output 0

Modulation	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	2 137.5	-22.193	- 13.0
16QAM		-21.187	
64QAM		-21.953	

7.4.2. Test data at Output 1

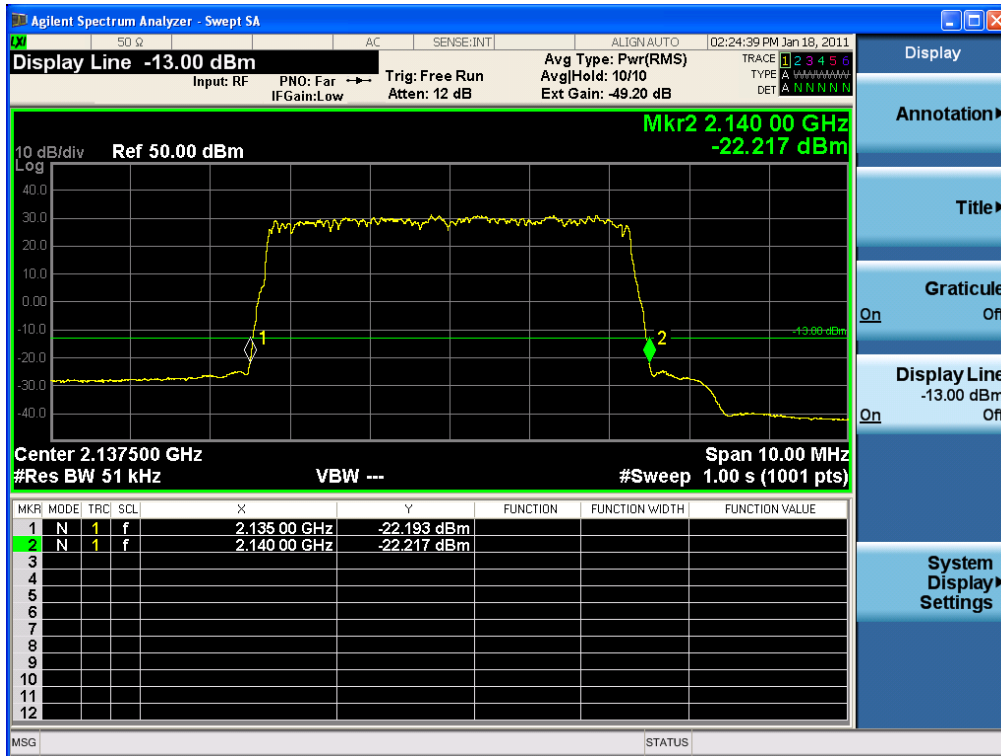
Modulation	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	2 137.5	-20.442	- 13.0
16QAM		-19.965	
64QAM		-20.180	

7.4.3. Test data at Output MIMO

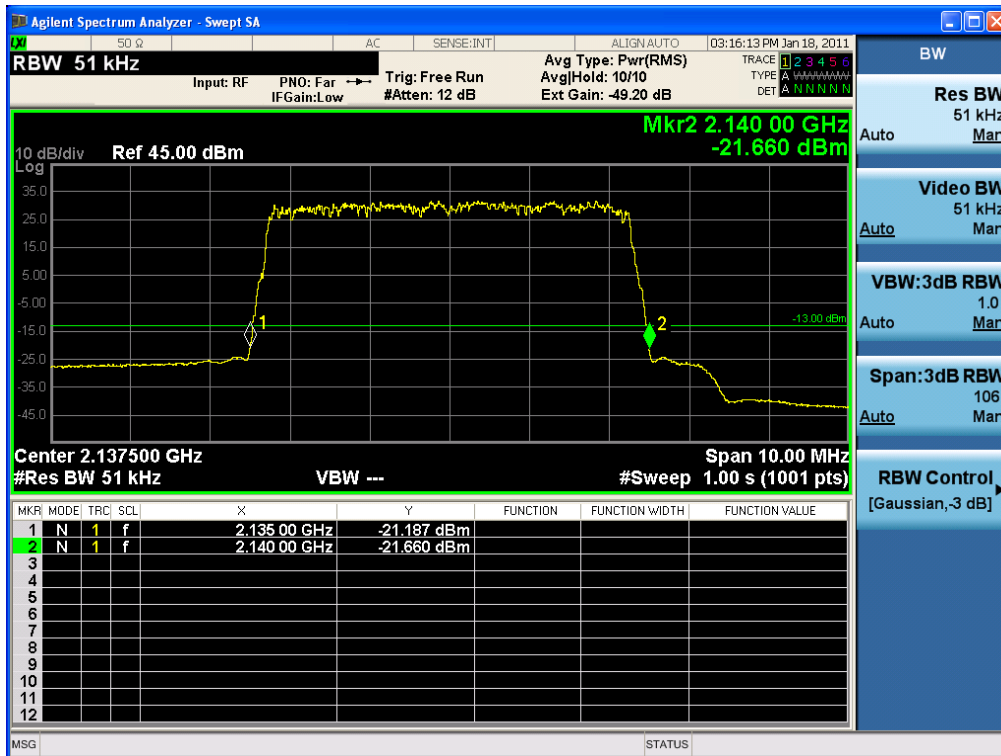
Modulation	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	2 137.5	-17.866	- 13.0
16QAM		-18.070	
64QAM		-19.253	

7.4.4. Plot Data at Output 0

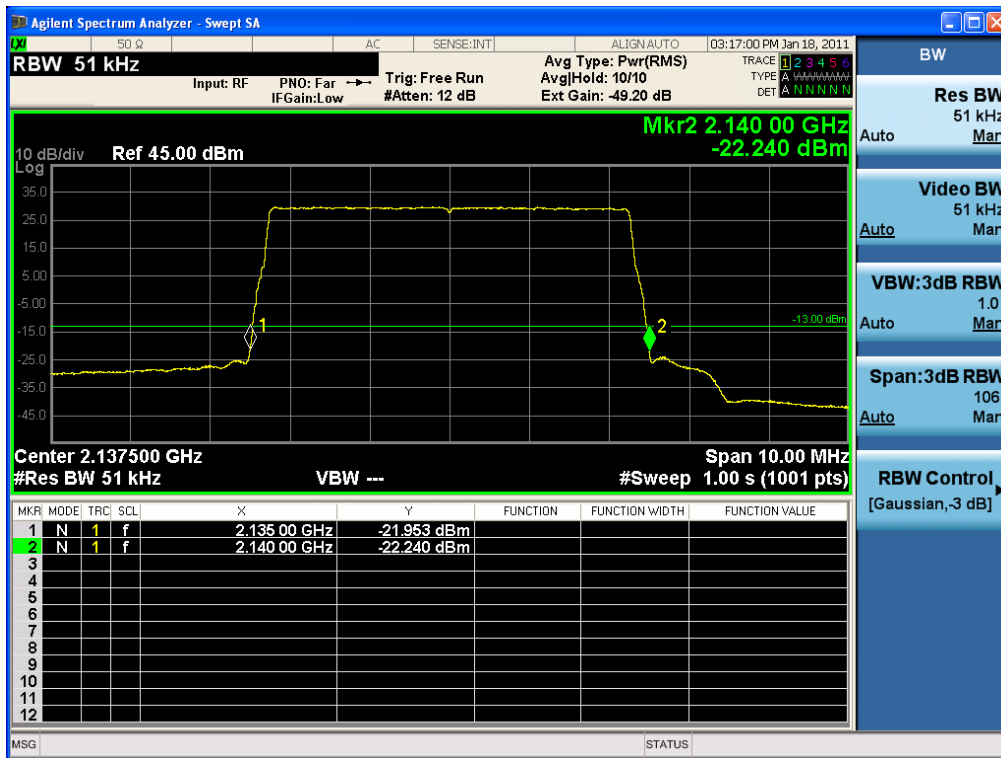
(QPSK Channel)



(16QAM Channel)



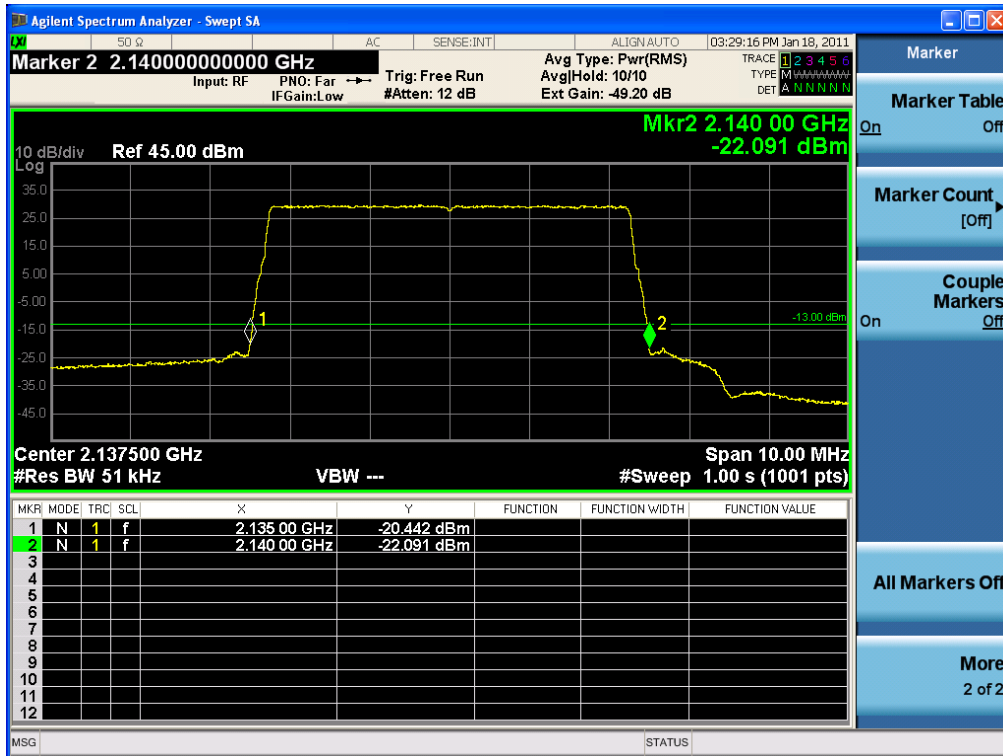
(64QAM Channel)



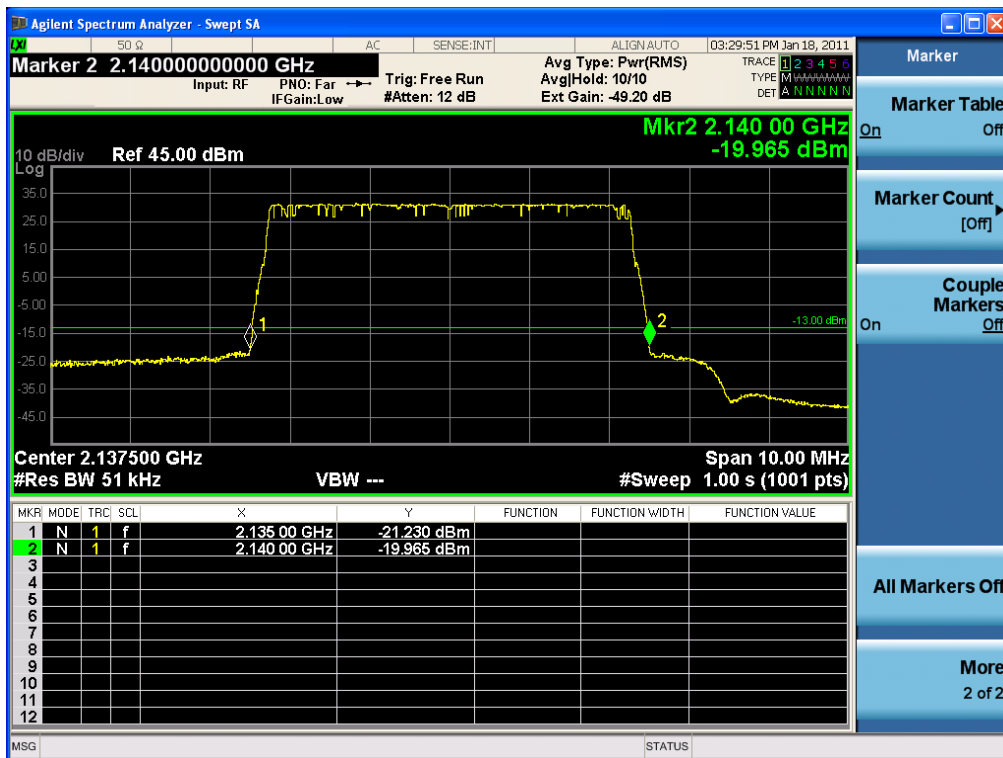
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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7.4.5. Plot Data at Output 1

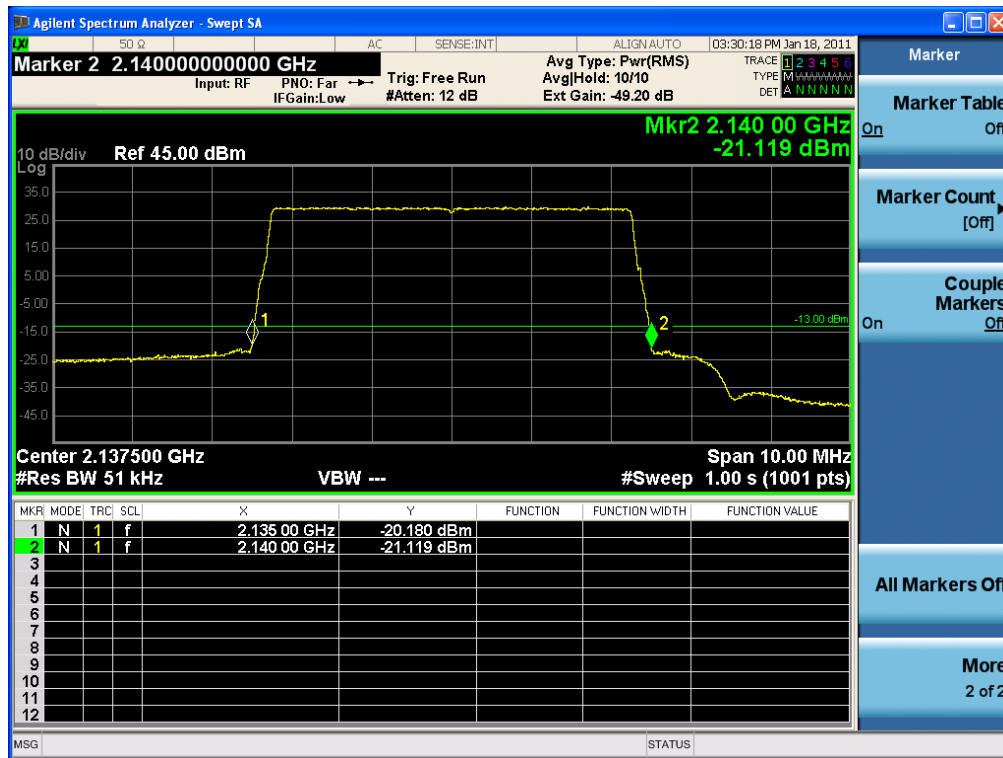
(QPSK Channel)



(16QAM Channel)



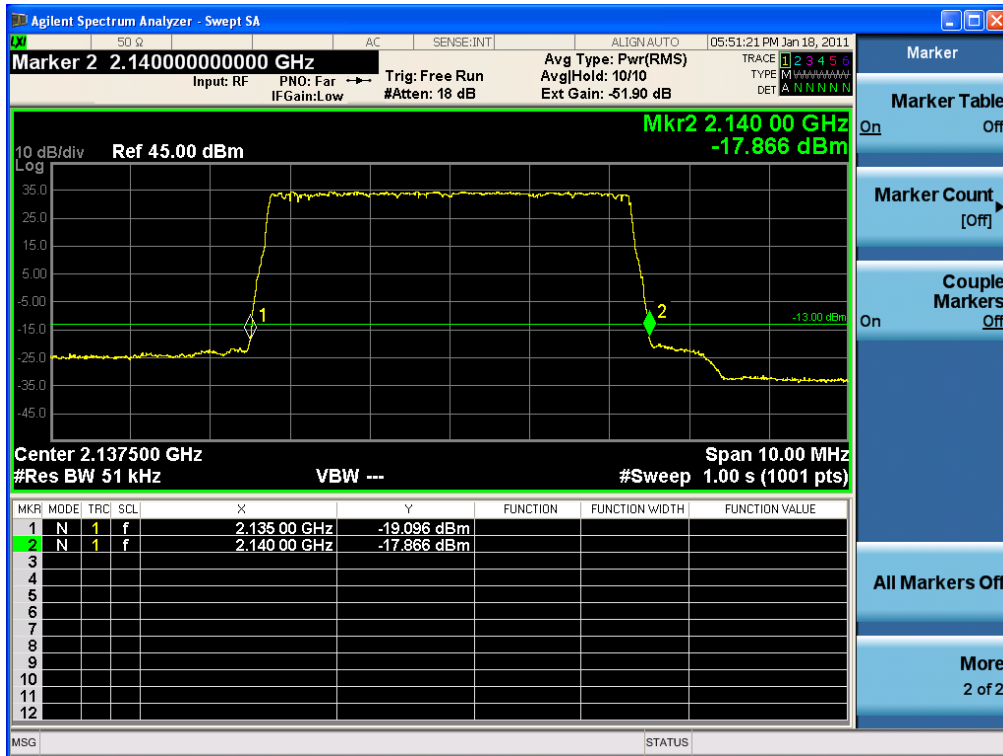
(64QAM Channel)



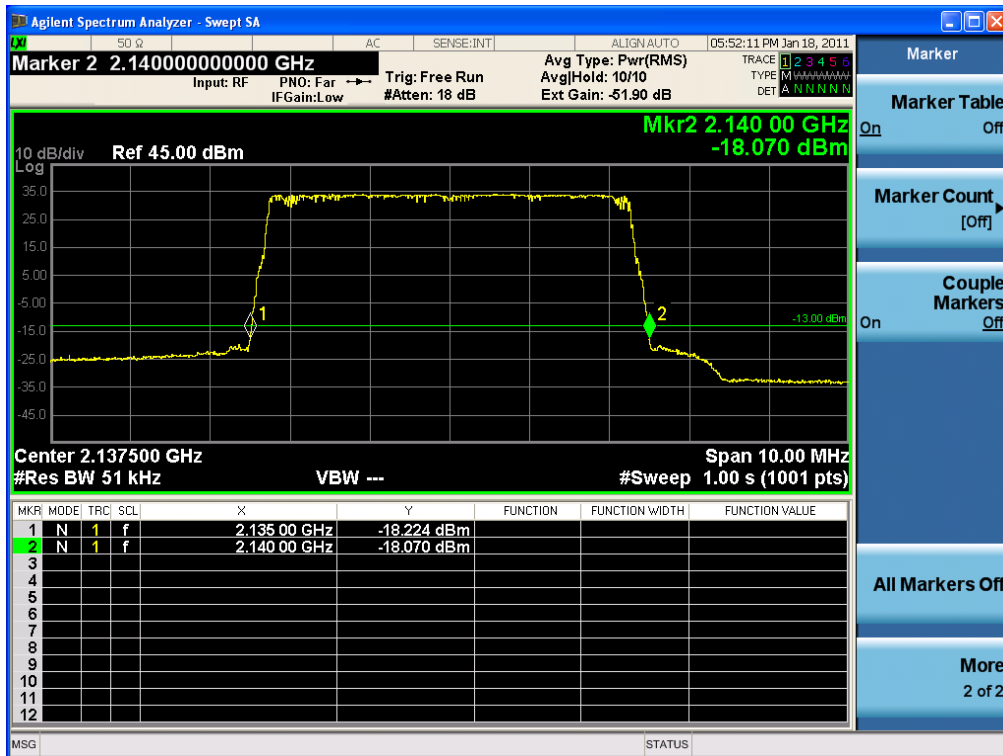
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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7.4.6. Plot Data at Output MIMO

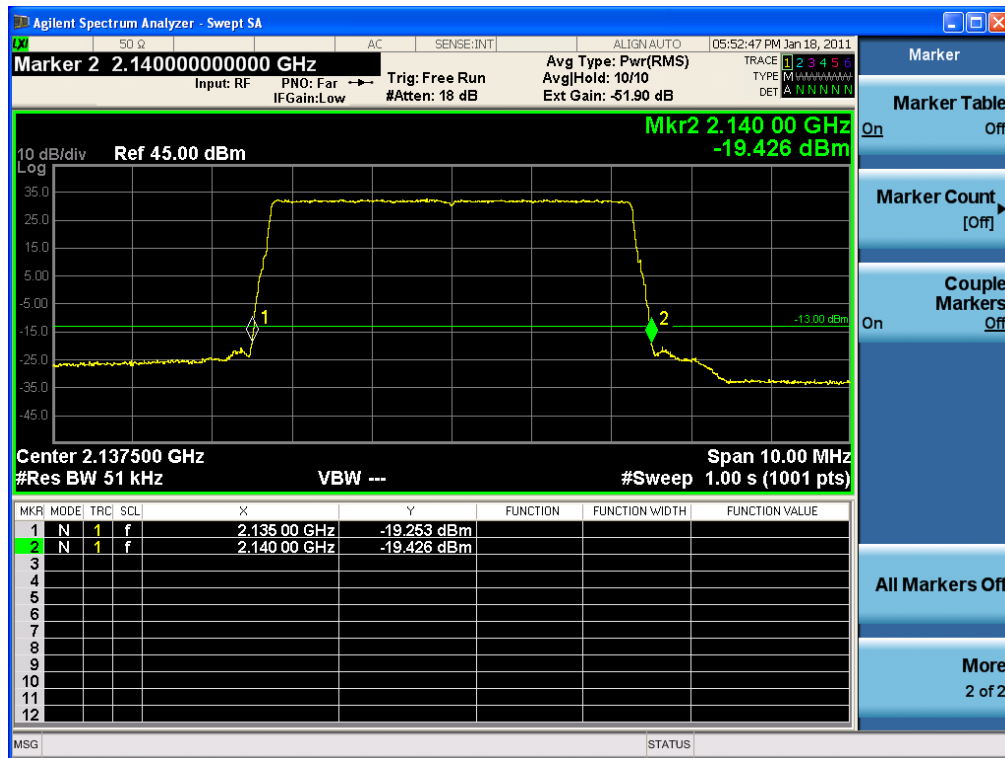
(QPSK Channel)



(16QAM Channel)



(64QAM Channel)



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7.5. Test Result(β)

: PASS

7.5.1. Test data at Output 0

Modulation	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	2 137.5	-20.512	- 13.0
16QAM		-21.652	
64QAM		-21.594	

7.5.2. Test data at Output 1

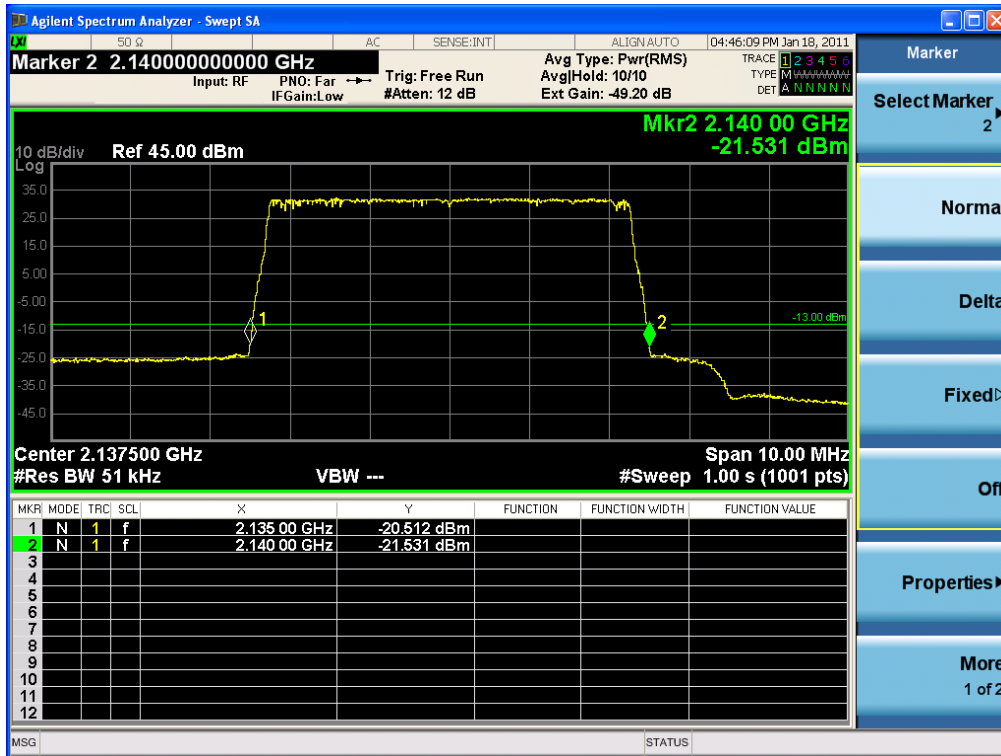
Modulation	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	2 137.5	-20.503	- 13.0
16QAM		-20.240	
64QAM		-20.920	

7.5.3. Test data at Output MIMO

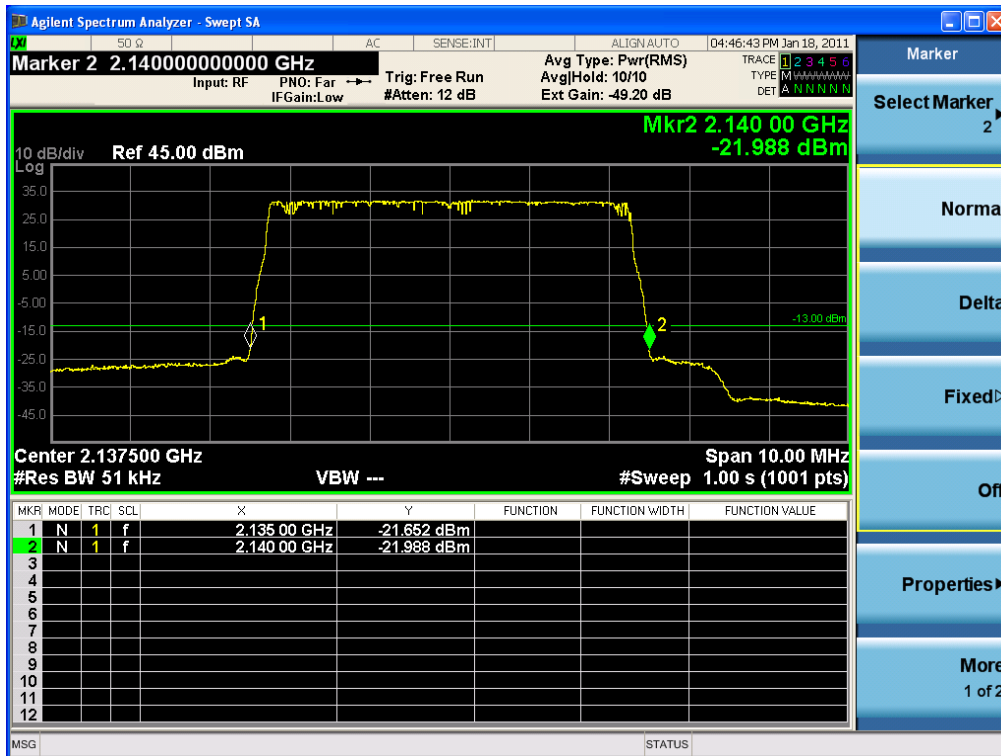
Modulation	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	2 137.5	-18.370	- 13.0
16QAM		-18.541	
64QAM		-17.427	

7.5.4. Plot Data at Output 0

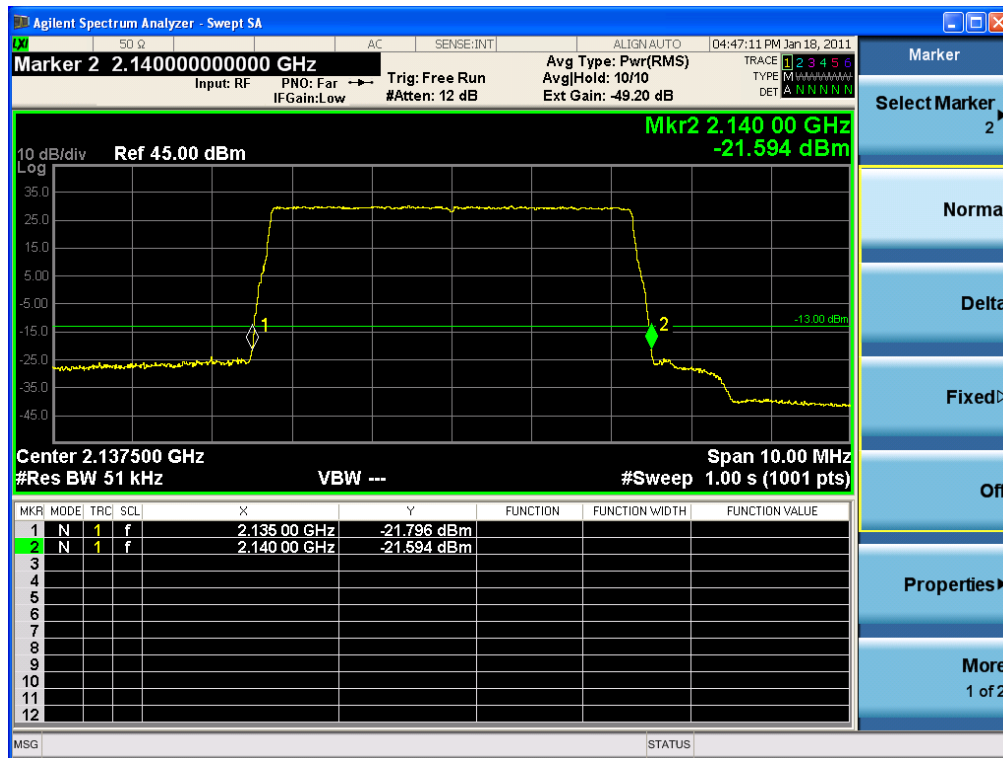
(QPSK Channel)



(16QAM Channel)



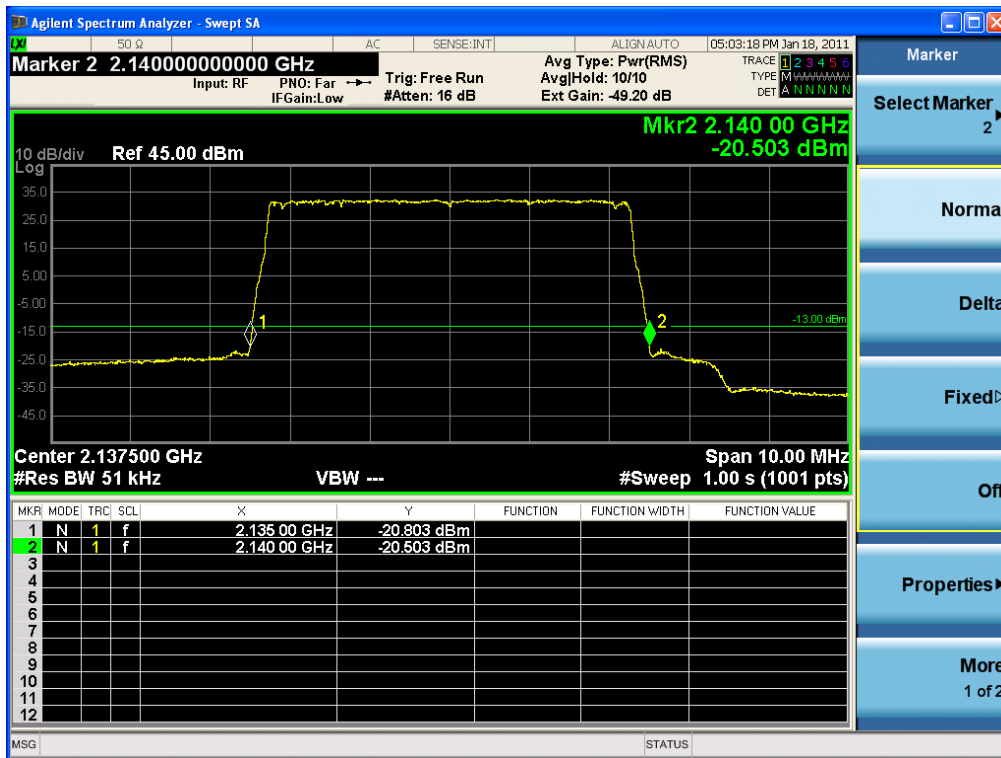
(64QAM Channel)



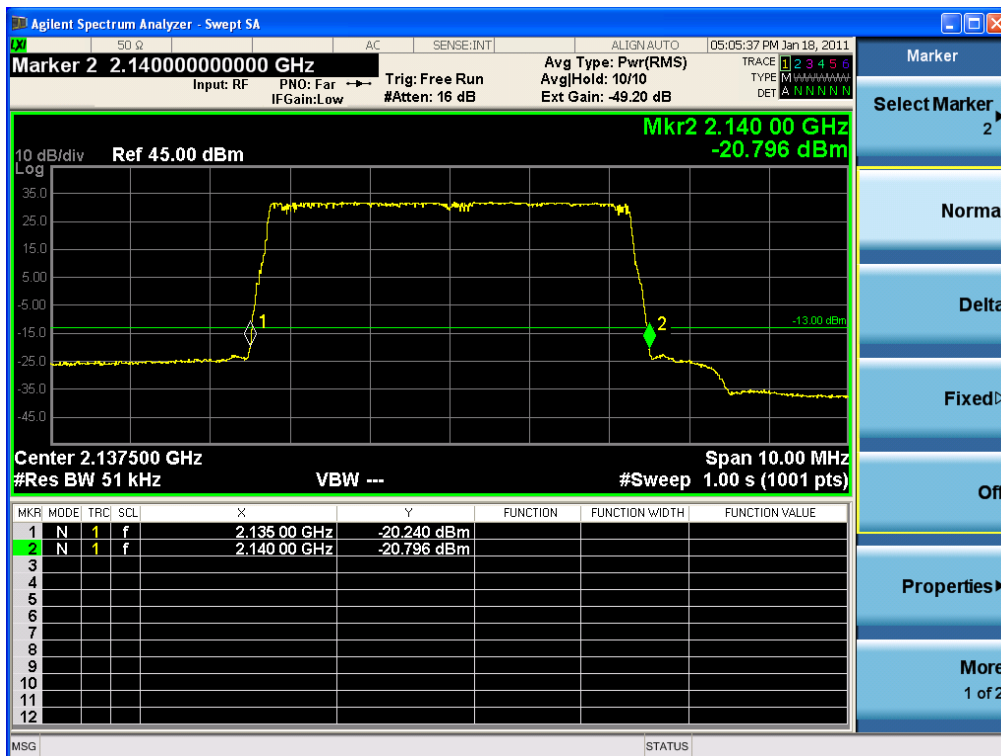
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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7.5.5. Plot Data at Output 1

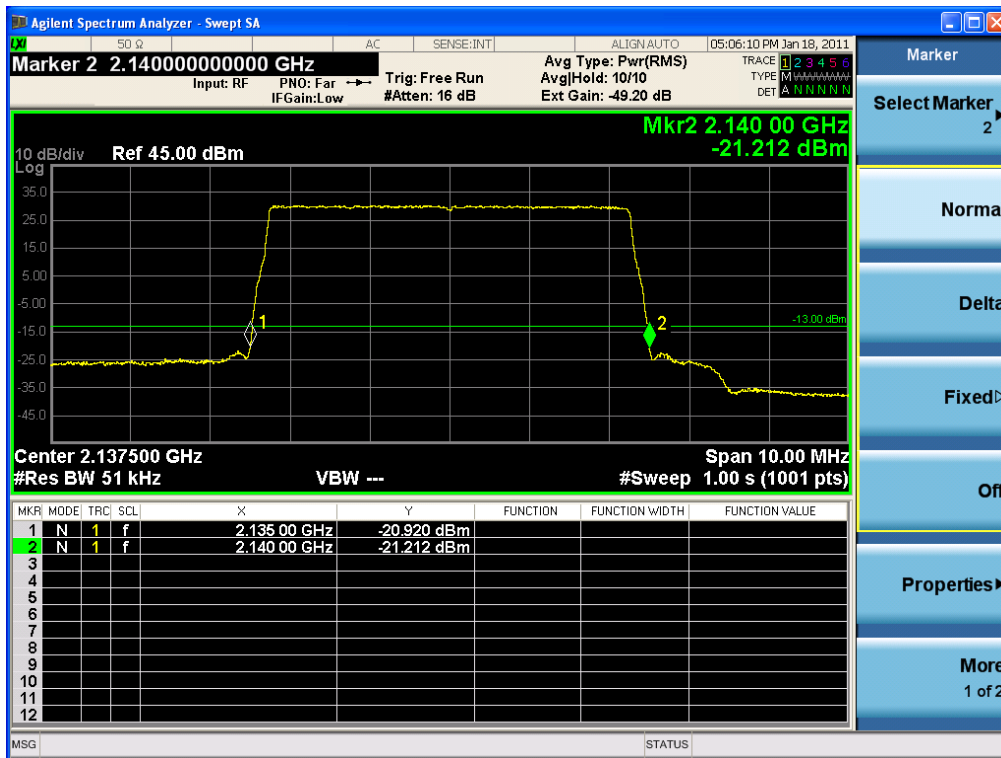
(QPSK Channel)



(16QAM Channel)



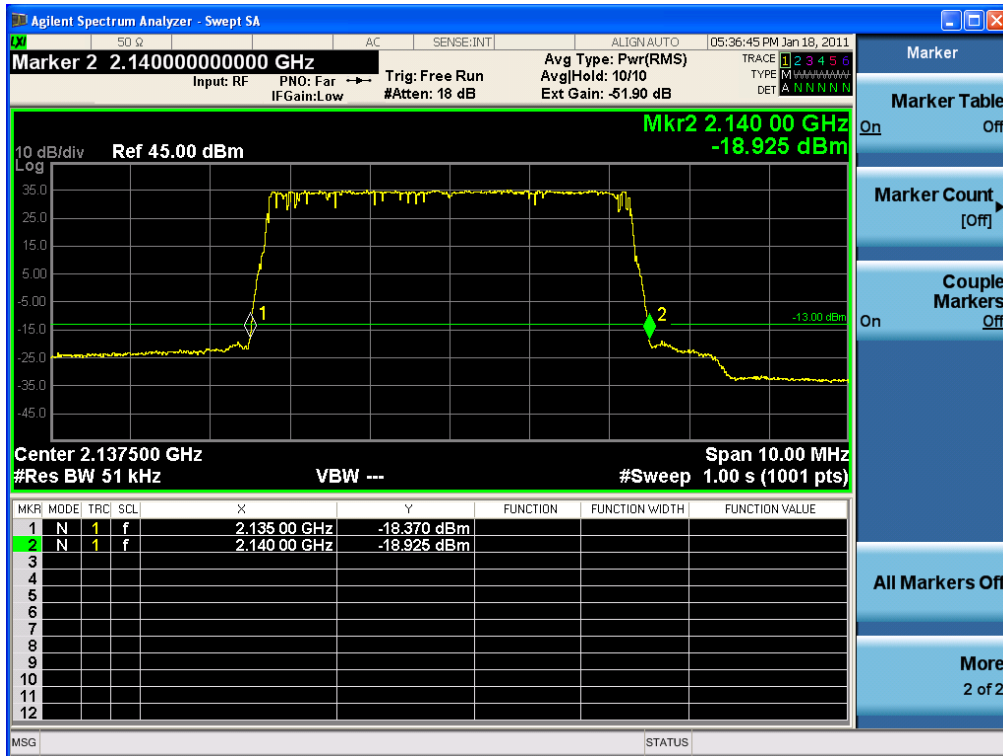
(64QAM Channel)



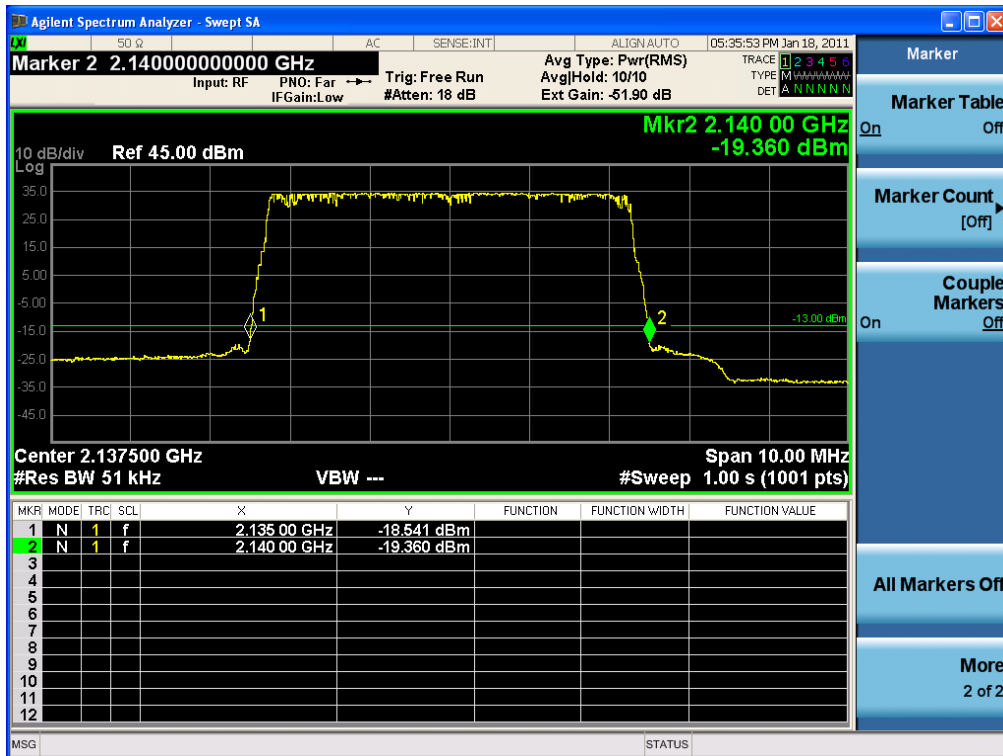
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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7.5.6. Plot Data at Output MIMO

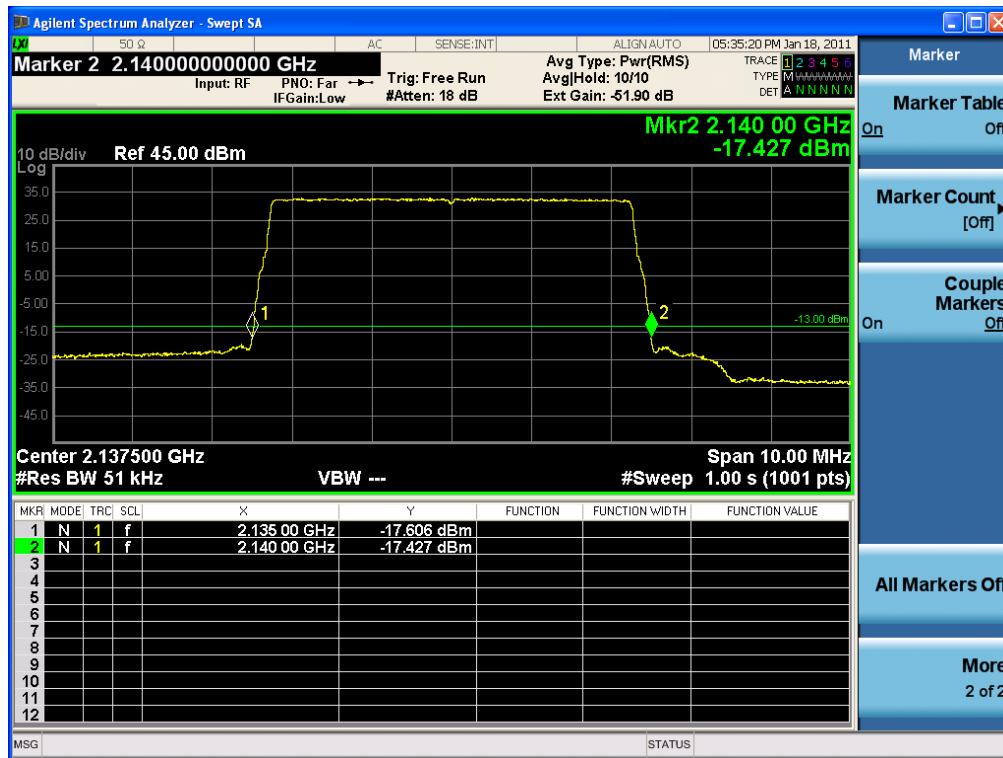
(QPSK Channel)



(16QAM Channel)



(64QAM Channel)



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8. SPURIOUS EMISSION AT ANTENNA TERMINAL

8.1. Applicable Standard

: CFR 47§2.1051, §27.53

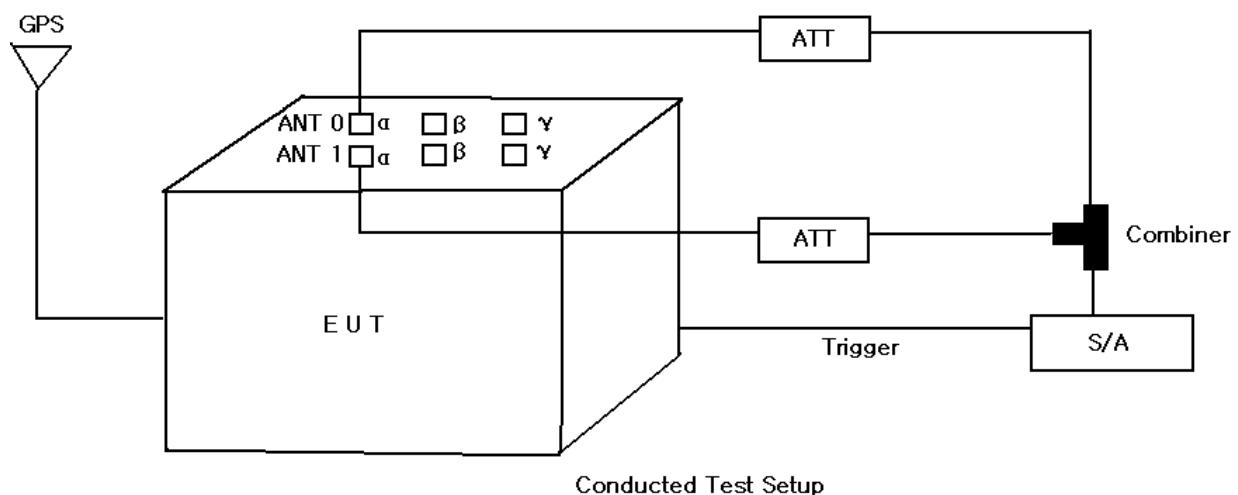
The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in §2.1051

8.2. Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Agilent	87302C / Power Divider	3239A01051	03/19/2011
WEINSCHEL	67-30-33 / Attenuator	BU5347	12/29/2011
WEINSCHEL	67-30-33 / Attenuator	BR0530	12/29/2011
WEINSCHEL	AF9003-69-31 / STEP ATTENUATOR	11787	11/12/2011
WEINSCHEL	AF9003-69-31 / STEP ATTENUATOR	639	11/12/2011
Agilent	N9020A / MXA Signal Analyzer	US46220219	03/03/2011

8.3. Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.



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The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

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.

8.3.1 Environmental Conditions:

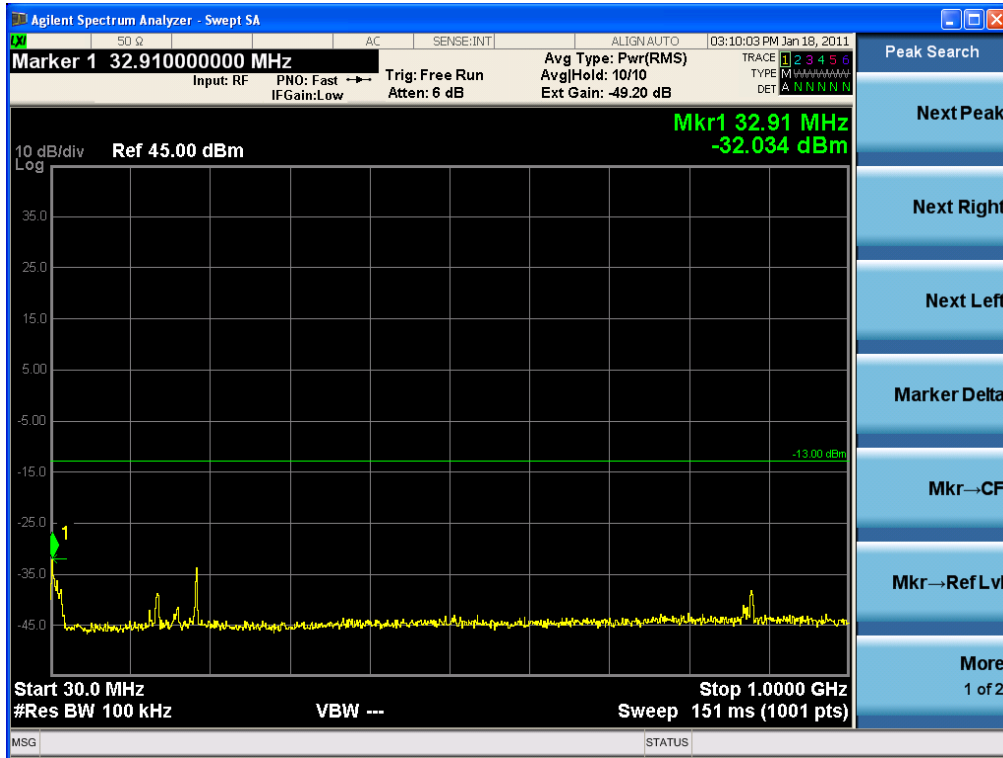
Temperature:	23 °C
Relative Humidity:	22 %

8.4. Test Result(α)

: Pass

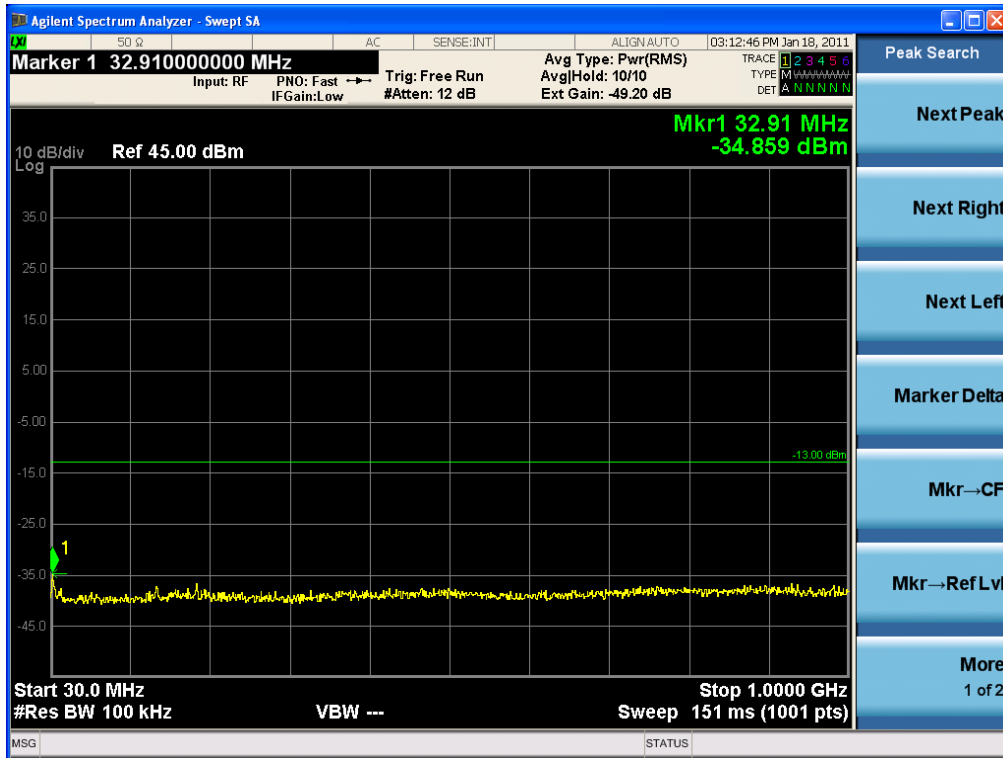
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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8.4.1. Plot Data at Output 0 (QPSK Channel)



(30 MHz ~ 1 GHz)

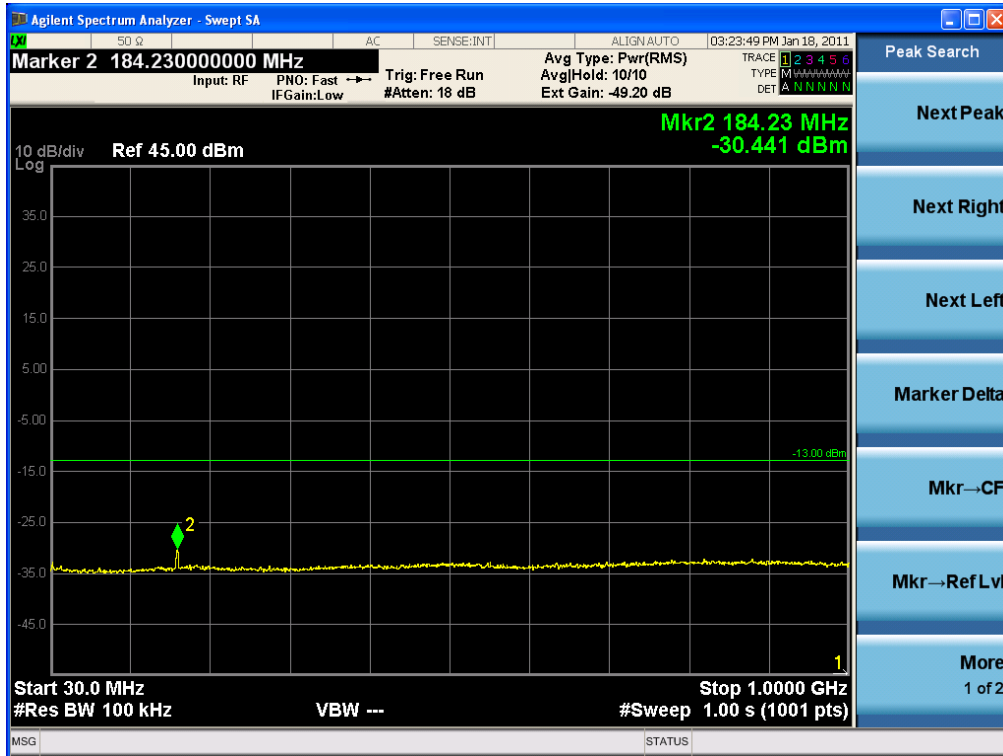
(16QAM Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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(64QAM Channel)



(30 MHz ~ 1 GHz)

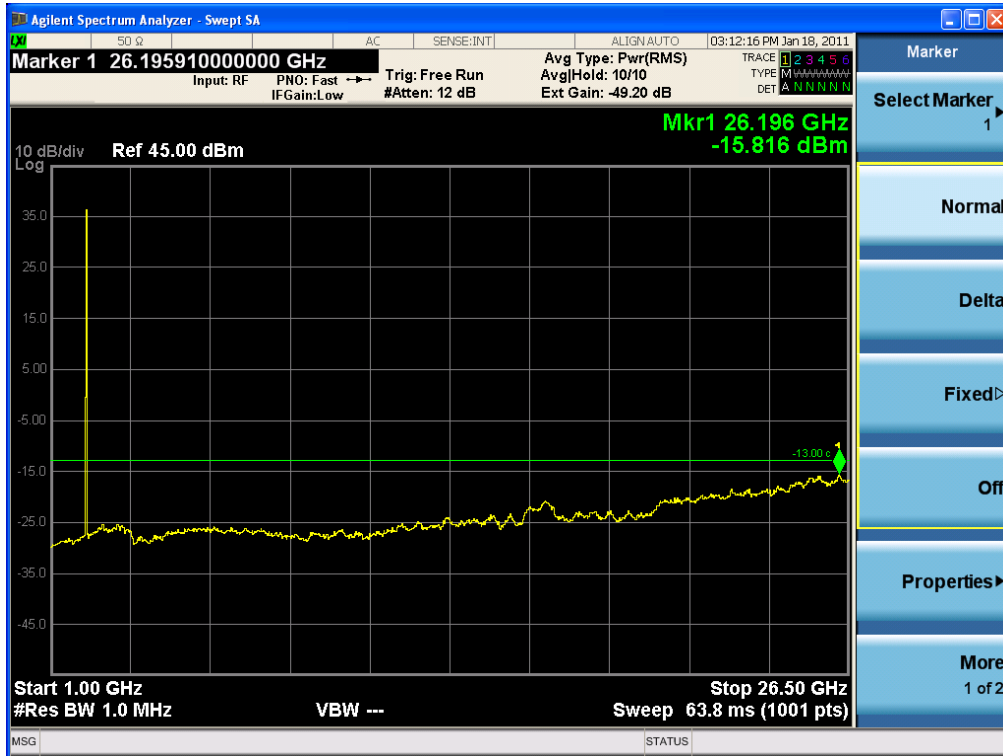
(QPSK Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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(16QAM Channel)



(1 GHz ~ 26.5 GHz)

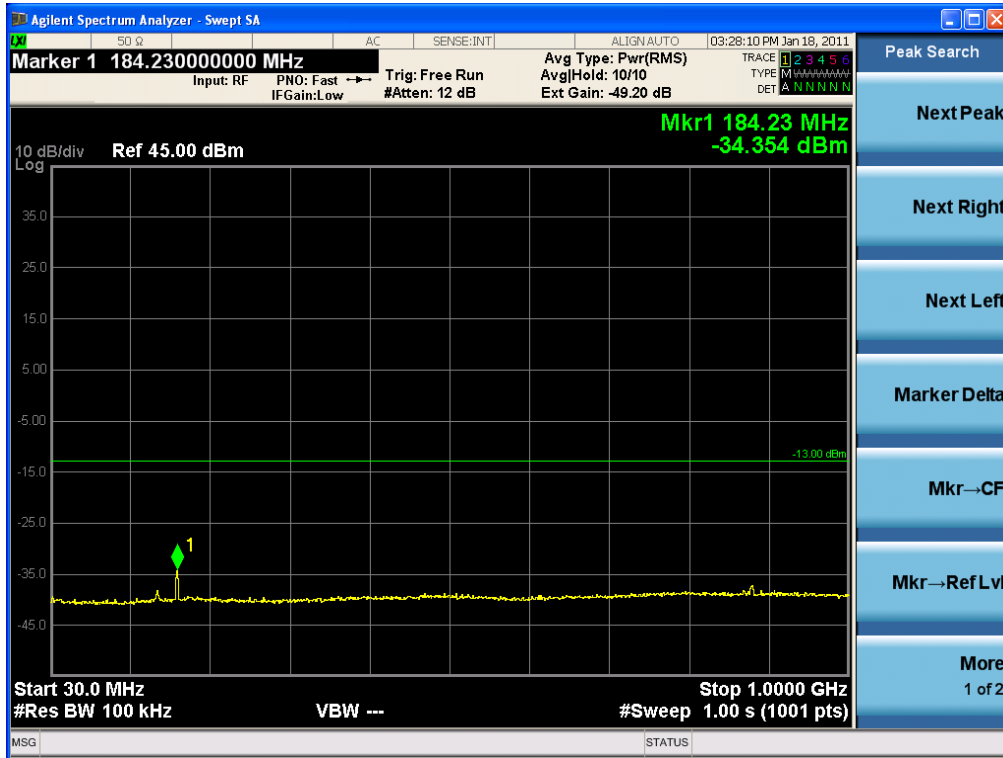
(64QAM Channel)



(1 GHz ~ 26.5 GHz)

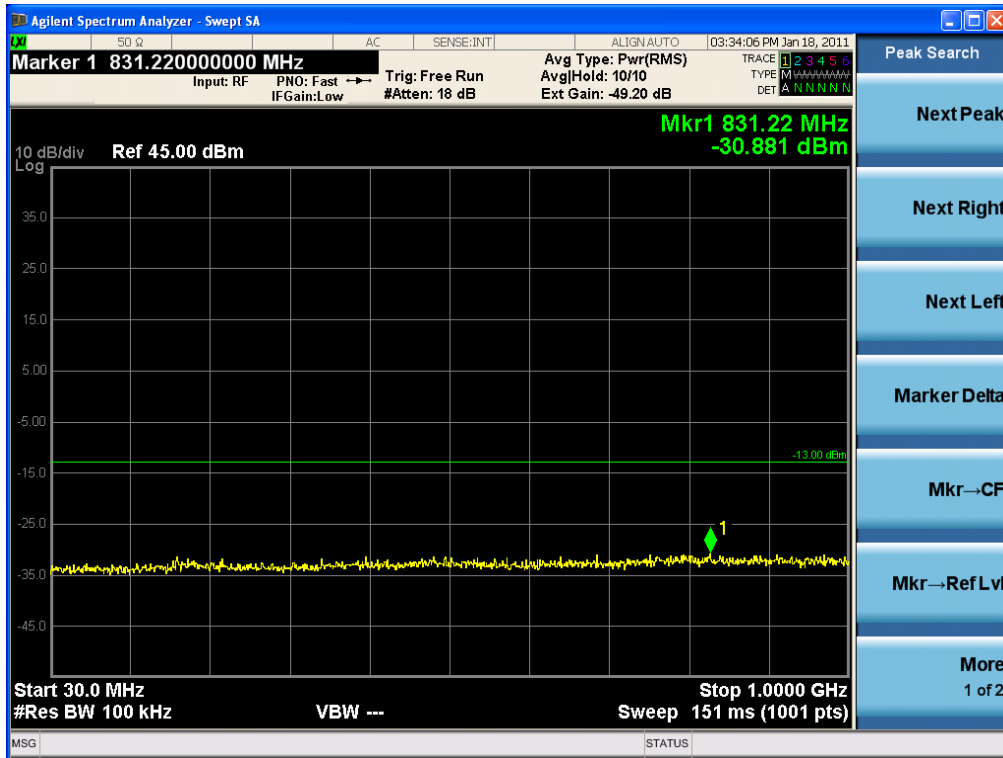
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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8.4.2. Plot Data at Output 1
(QPSK Channel)



(30 MHz ~ 1 GHz)

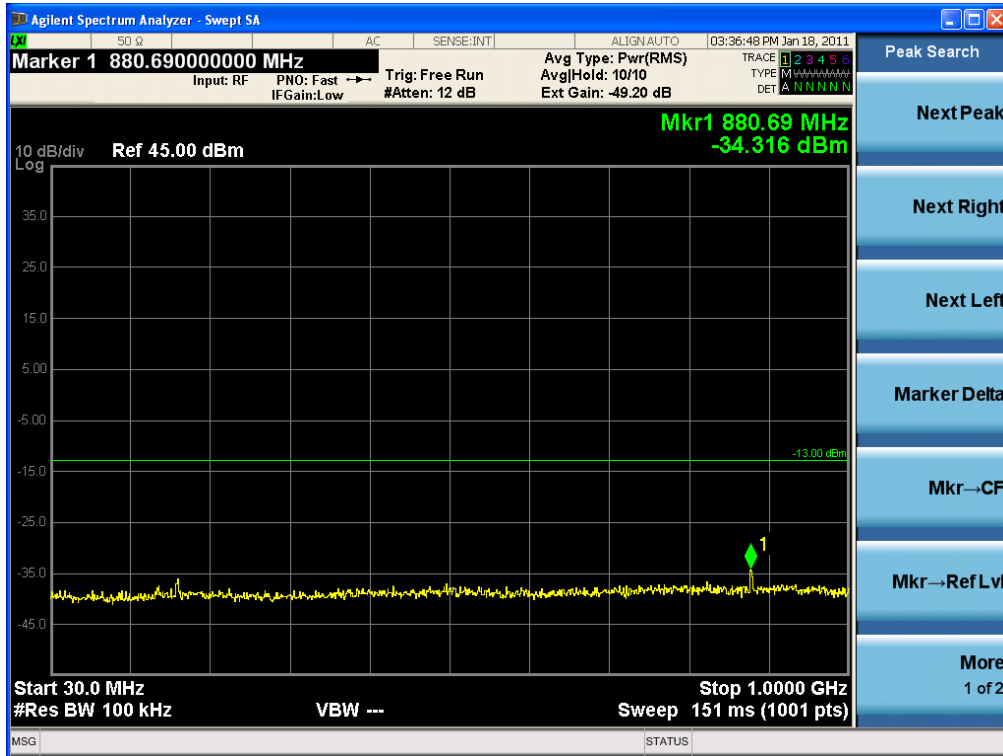
(16QAM Channel)



(30 MHz ~ 1 GHz)

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(64QAM Channel)



(30 MHz ~ 1 GHz)

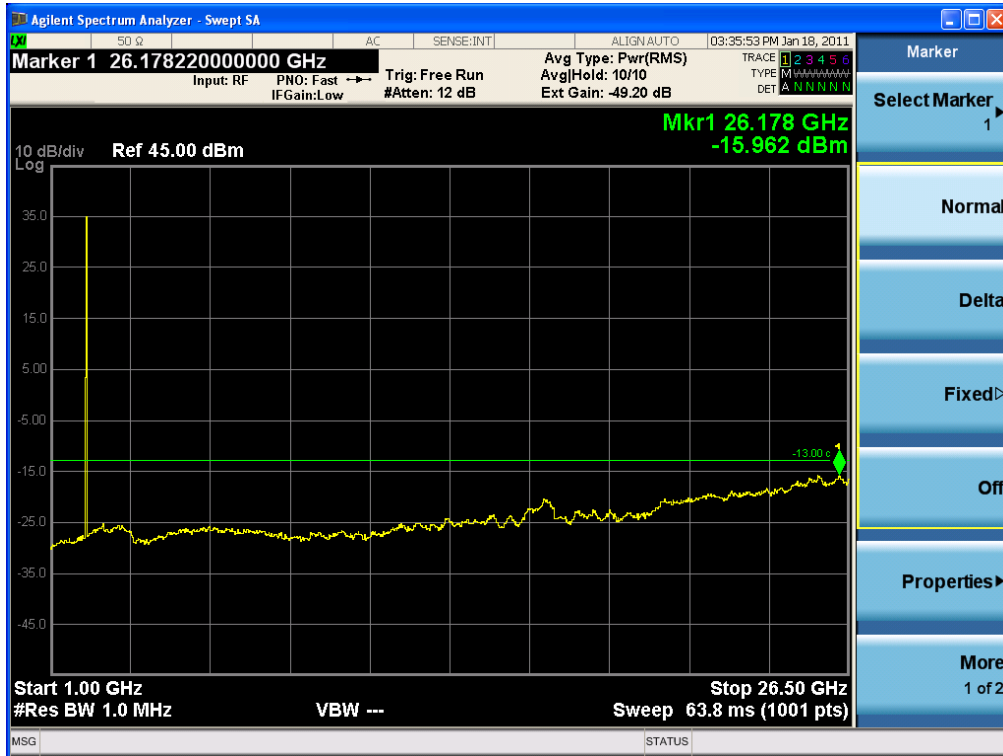
(QPSK Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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(16QAM Channel)



(1 GHz ~ 26.5 GHz)

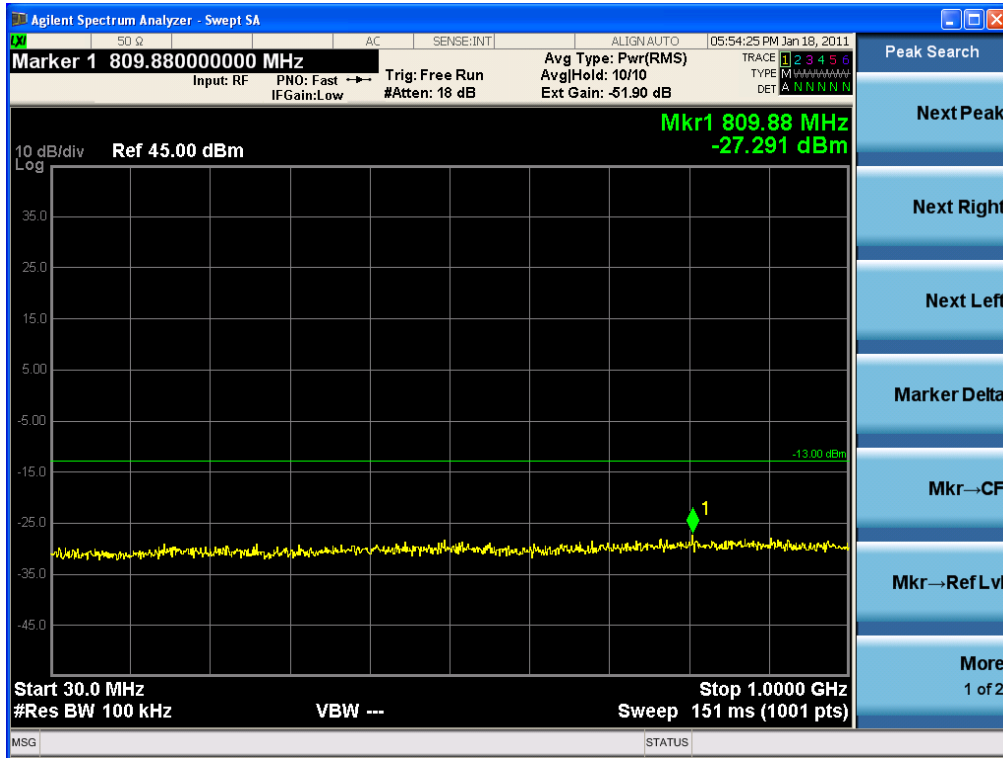
(64QAM Channel)



(1 GHz ~ 26.5 GHz)

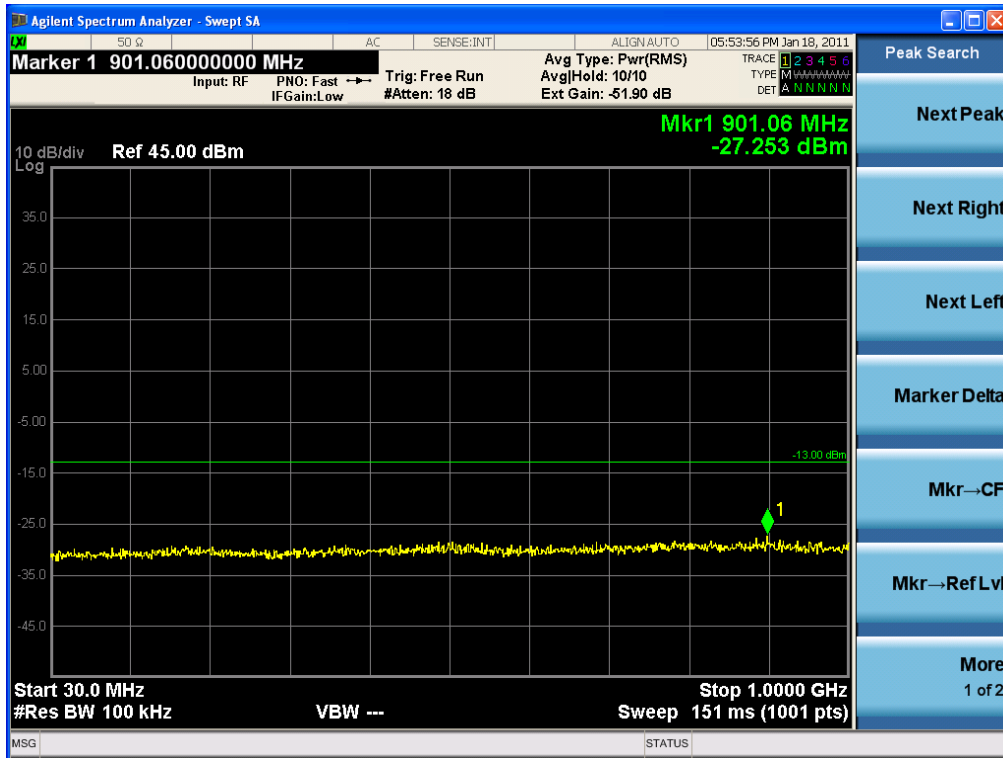
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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8.4.3. Plot Data at Output MIMO (QPSK Channel)



(30 MHz ~ 1 GHz)

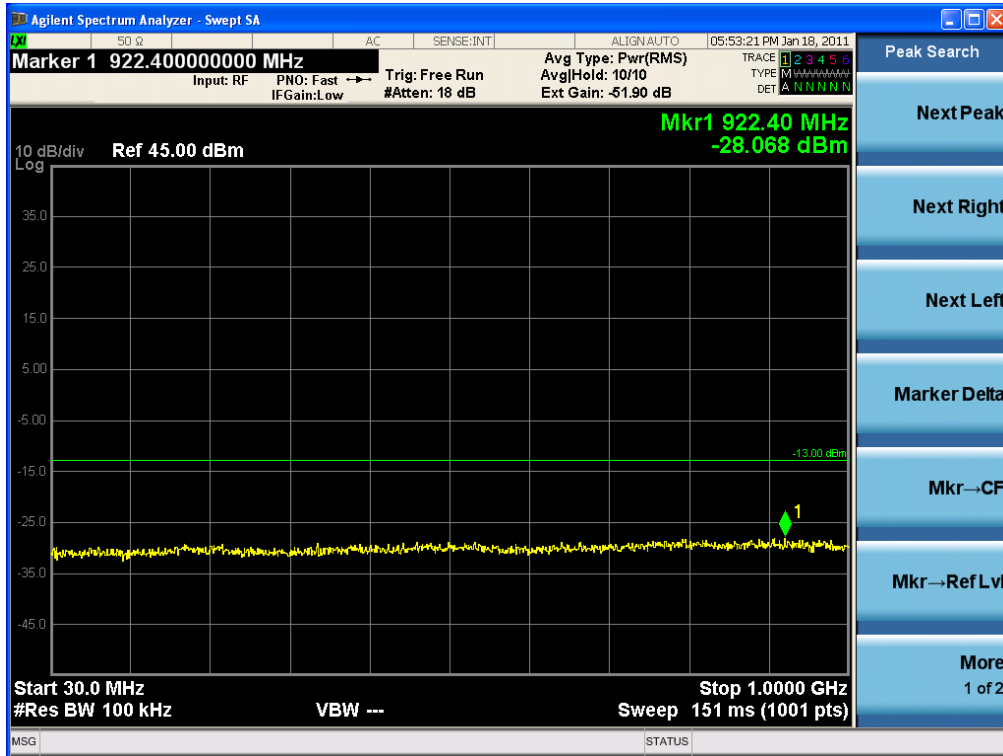
(16QAM Channel)



(30 MHz ~ 1 GHz)

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(64QAM Channel)



(30 MHz ~ 1 GHz)

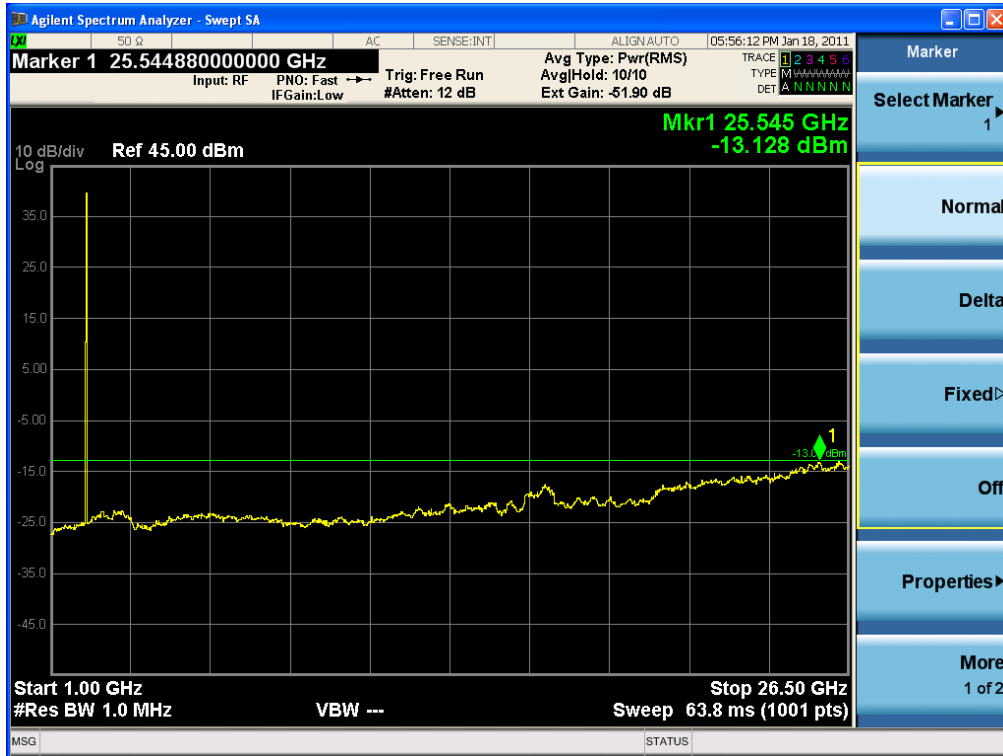
(QPSK Channel)



(1 GHz ~ 26.5 GHz)

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(16QAM Channel)



(1 GHz ~ 26.5 GHz)

(64QAM Channel)



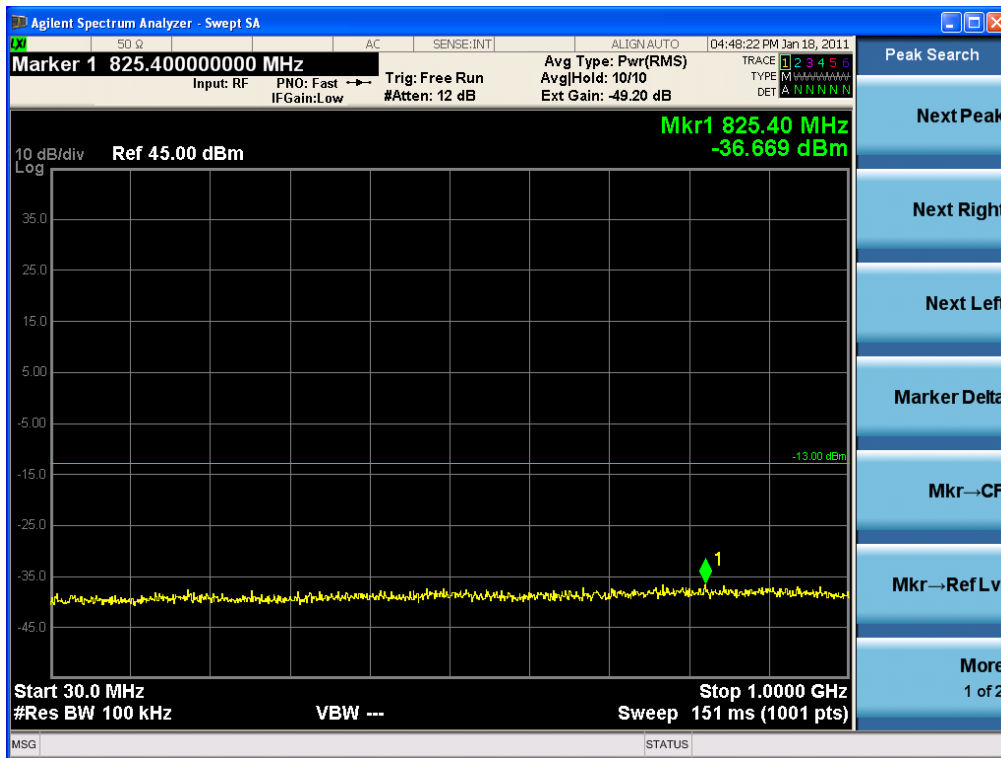
(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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8.5. Test Result(β)

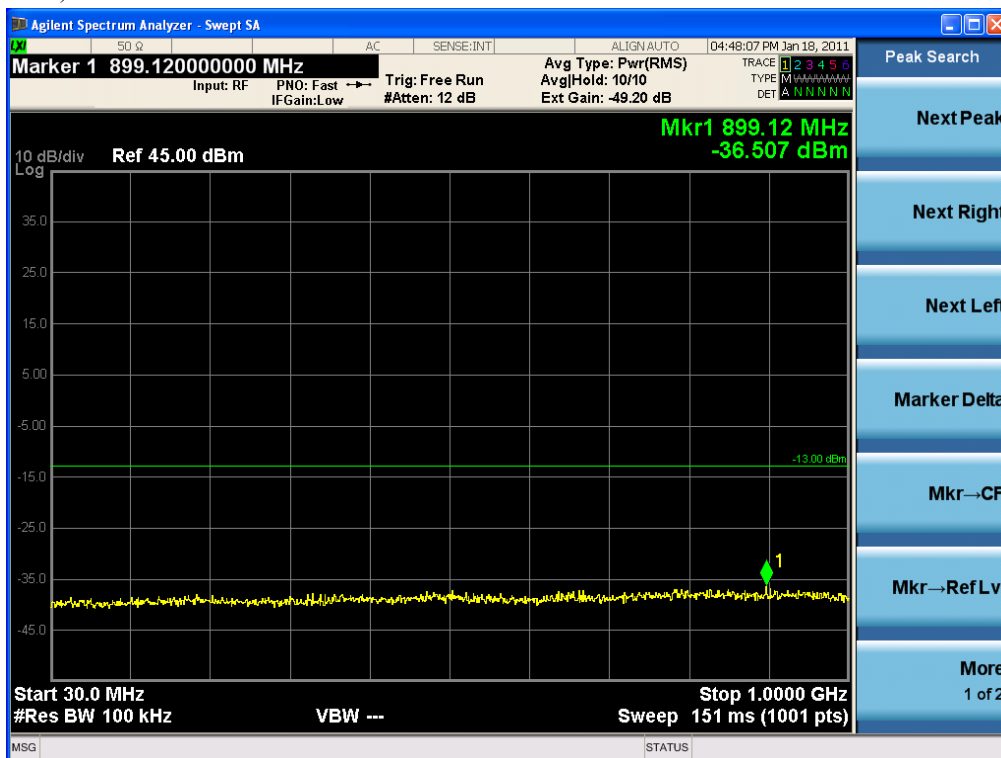
: Pass

8.5.1. Plot Data at Output 0 (QPSK Channel)



(30 MHz ~ 1 GHz)

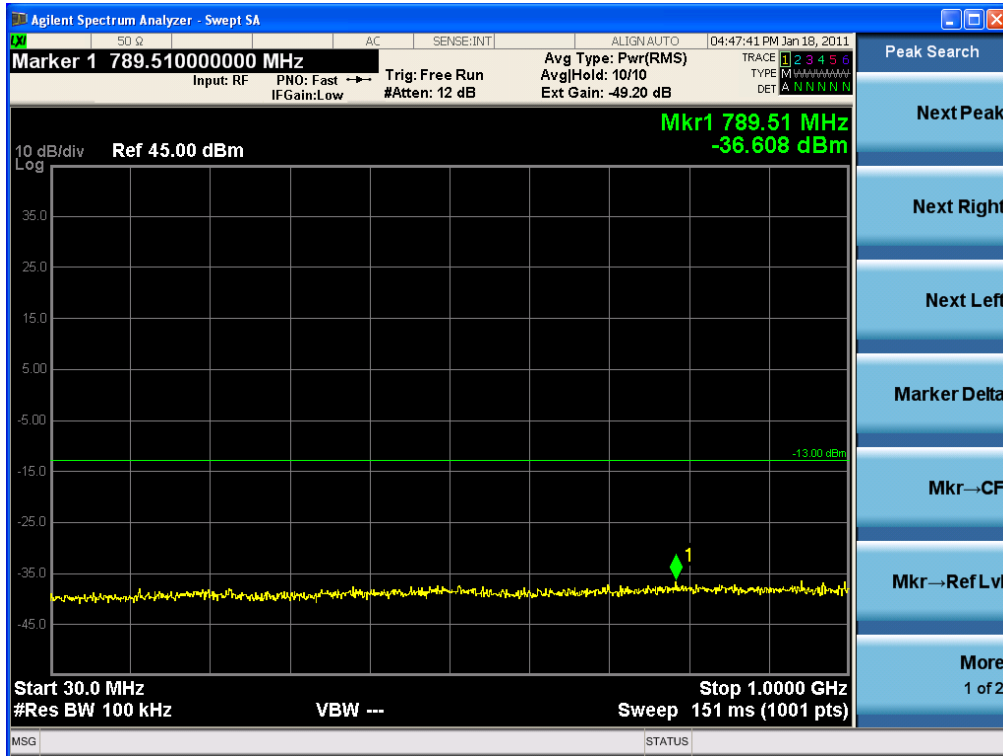
(16QAM Channel)



(30 MHz ~ 1 GHz)

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(64QAM Channel)



(30 MHz ~ 1 GHz)

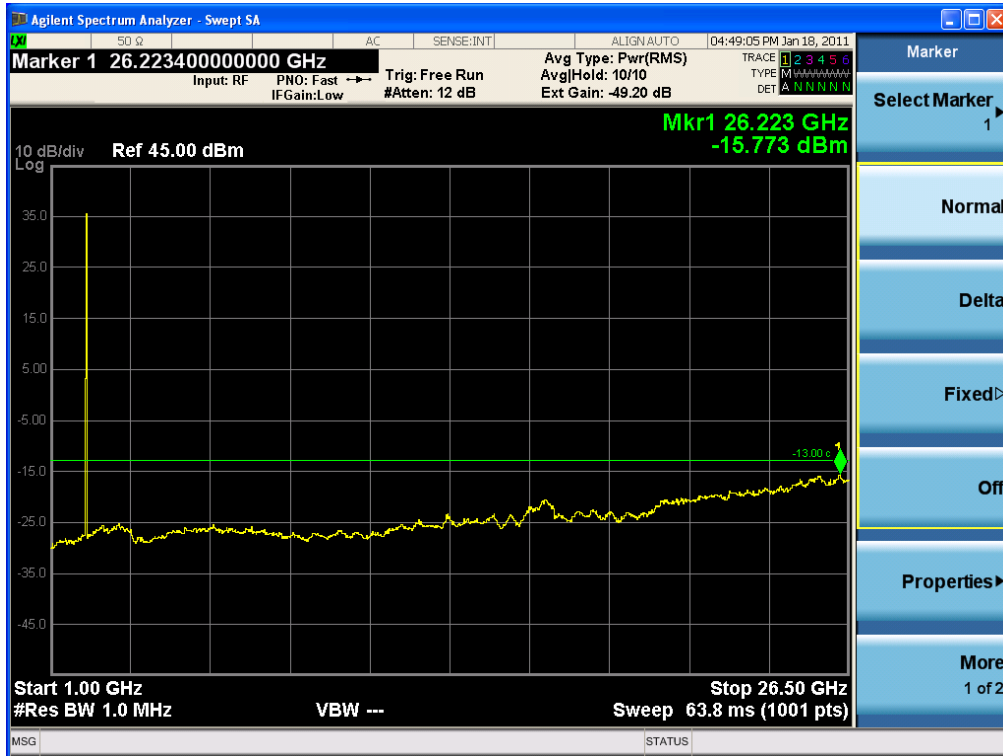
(QPSK Channel)



(1 GHz ~ 26.5 GHz)

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(16QAM Channel)



(1 GHz ~ 26.5 GHz)

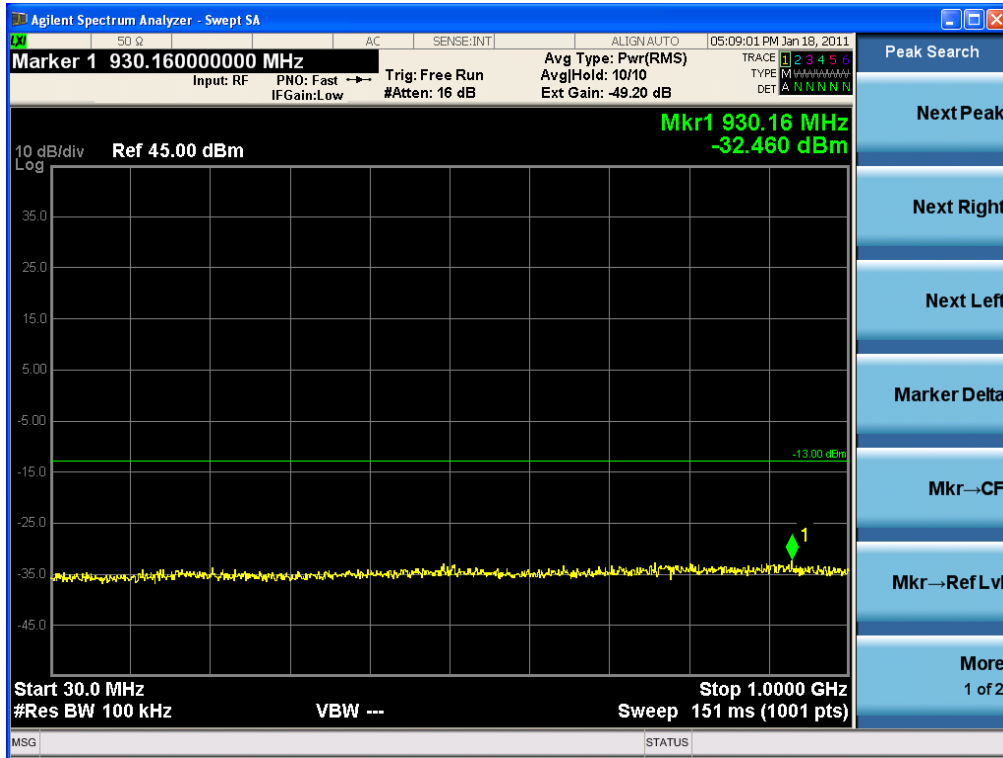
(64QAM Channel)



(1 GHz ~ 26.5 GHz)

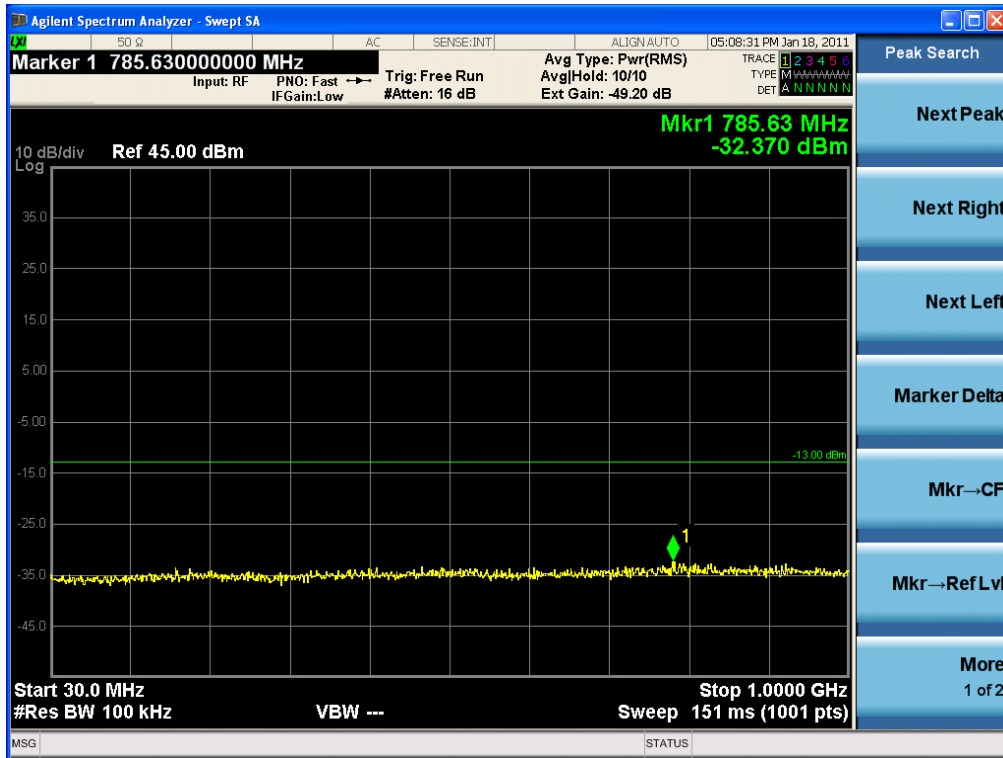
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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8.5.2. Plot Data at Output 1 (QPSK Channel)



(30 MHz ~ 1 GHz)

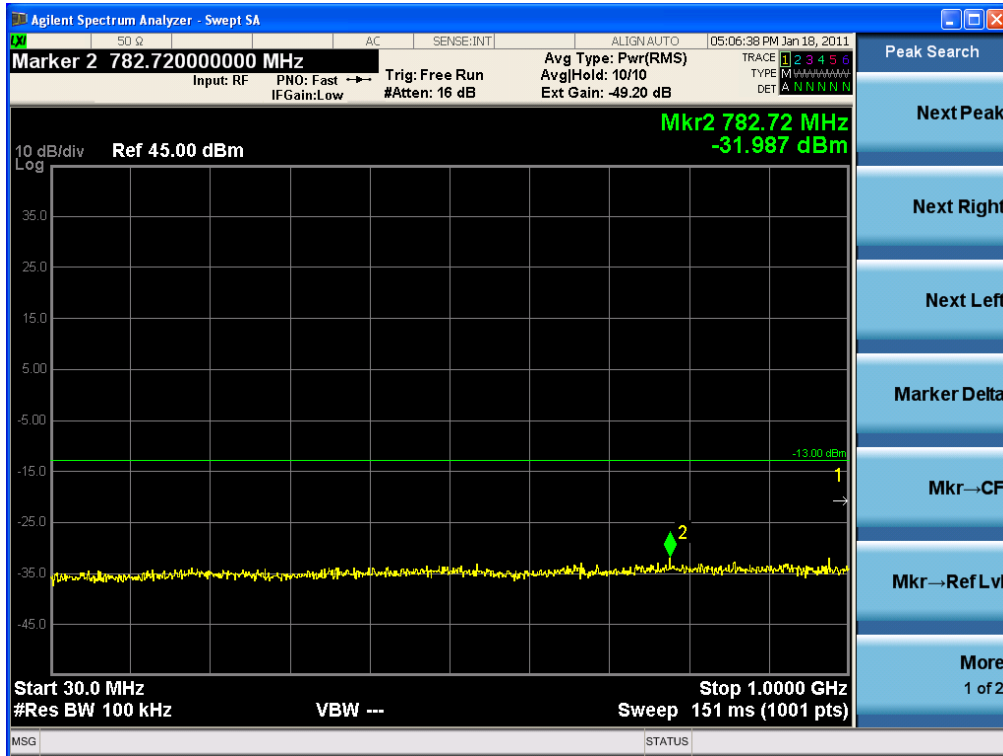
(16QAM Channel)



(30 MHz ~ 1 GHz)

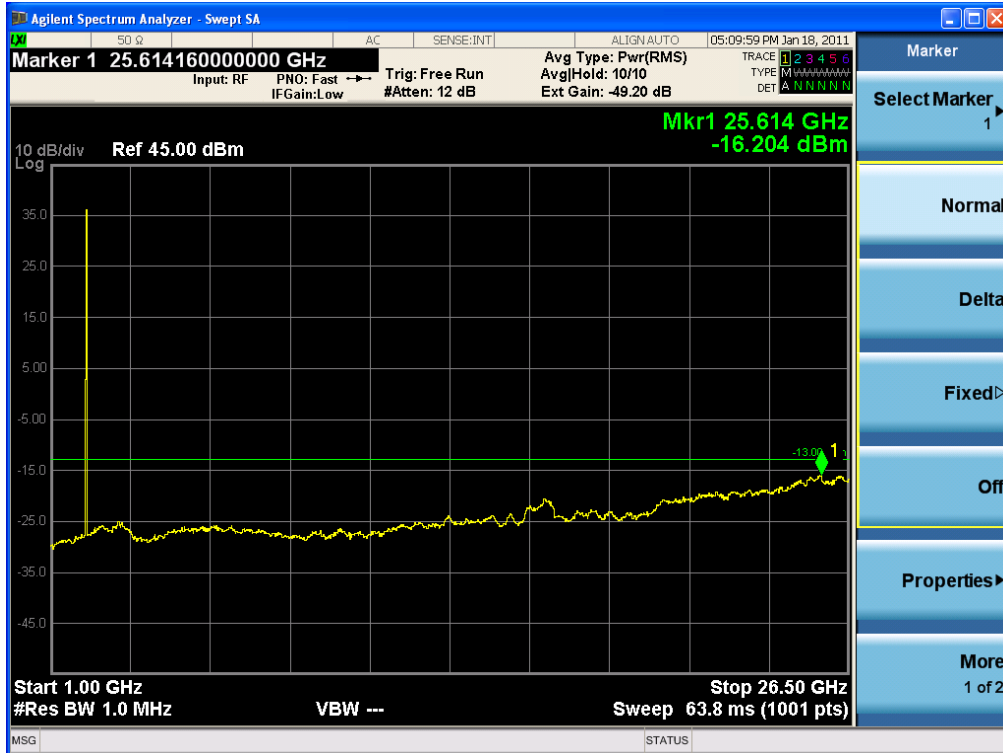
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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(64QAM Channel)



(30 MHz ~ 1 GHz)

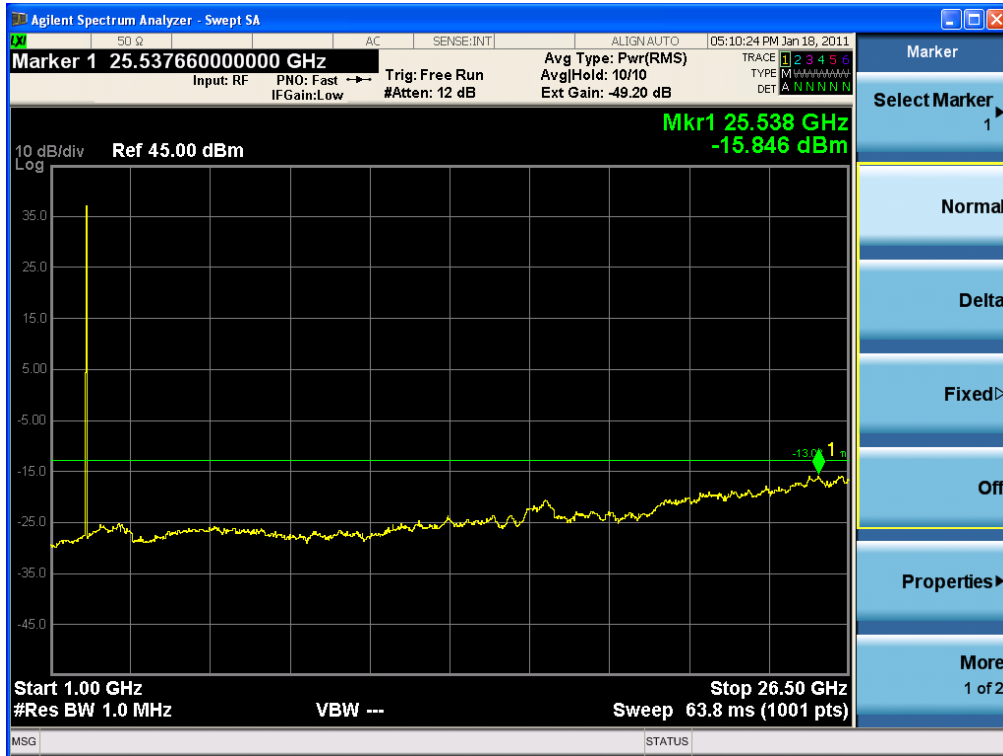
(QPSK Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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(16QAM Channel)



(1 GHz ~ 26.5 GHz)

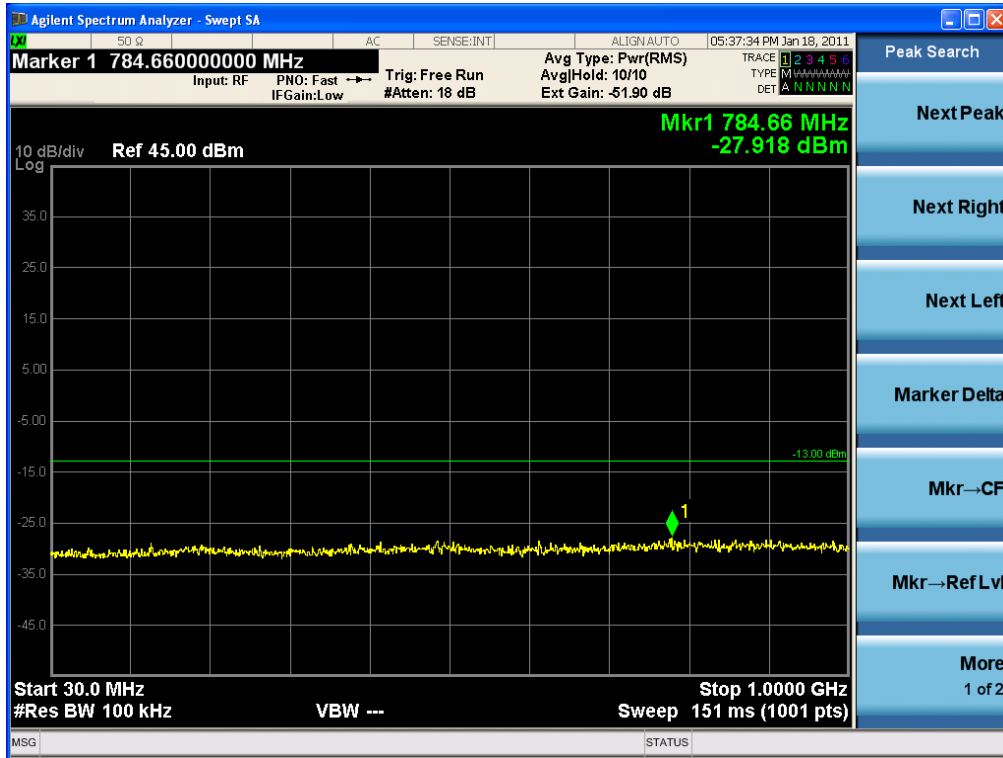
(64QAM Channel)



(1 GHz ~ 26.5 GHz)

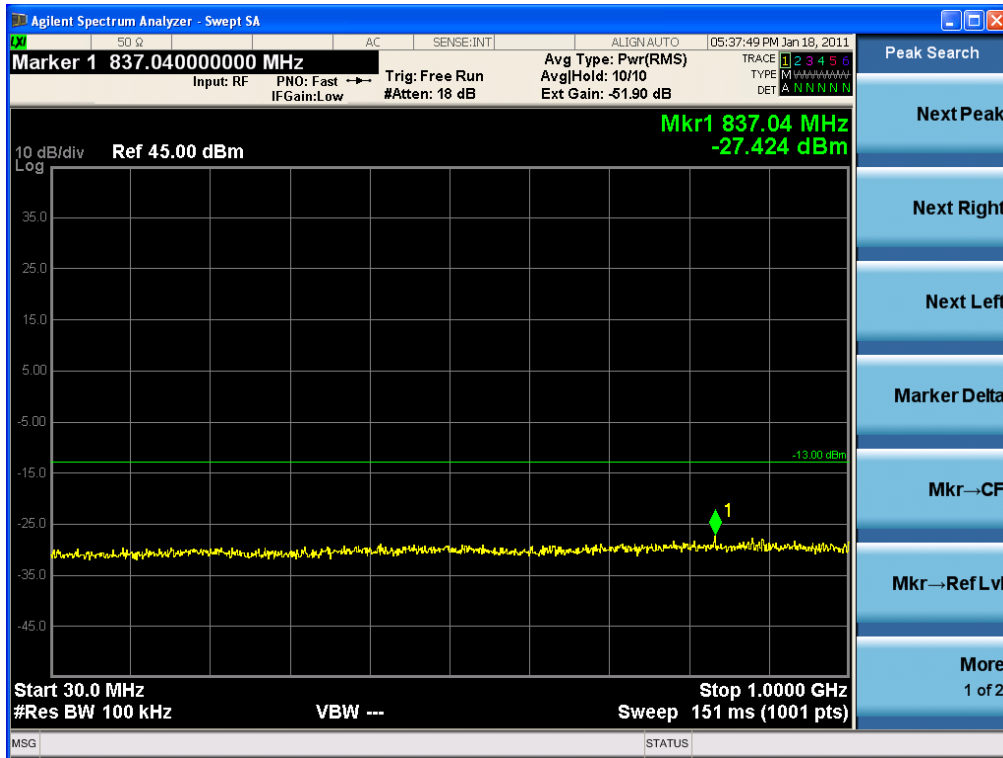
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
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8.5.3. Plot Data at Output MIMO (QPSK Channel)



(30 MHz ~ 1 GHz)

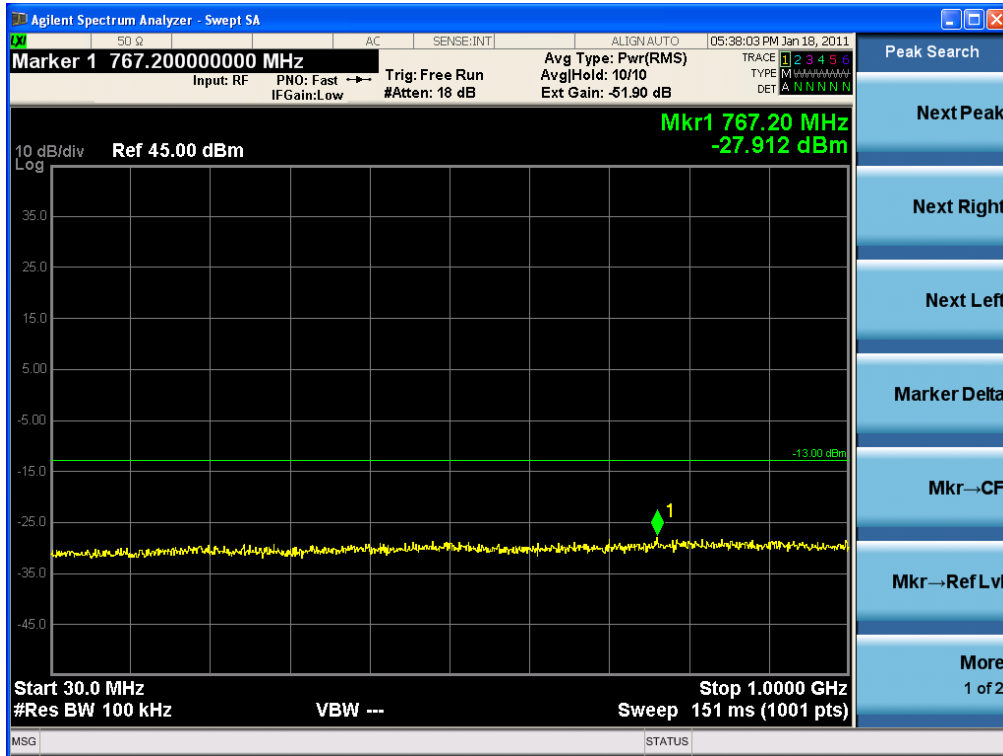
(16QAM Channel)



(30 MHz ~ 1 GHz)

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(64QAM Channel)



(30 MHz ~ 1 GHz)

(QPSK Channel)



(1 GHz ~ 26.5 GHz)

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(16QAM Channel)



(1 GHz ~ 26.5 GHz)

(64QAM Channel)



(1 GHz ~ 26.5 GHz)

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9. RADIATED SPURIOUS EMISSION

9.1 Applicable Standard

Requirements: CFR 47, §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 halfwave dipole antennas.

9.2 Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Schwarzbeck	BBHA 9120D / Double Ridged Horn Antenna	296	09/23/2011
Schwarzbeck	BBHA 9120D / Double Ridged Horn Antenna	147	04/13/2011
Schwarzbeck	VULB 9160 / TRILOG Antenna	9160-3150	09/13/2012
Schwarzbeck	VULB 9160 / TRILOG Antenna	3125	05/06/2011
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	04/05/2011
Schwarzbeck	BBHA9170 / SHF-EHF Horn Antenna	BBHA9170342	03/20/2011
R&S	ESI40 / EMI TEST Receiver	831564/003	10/30/2011

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9.3 Test Procedure

Radiated emission measurements were performed at an semi-anechoic chamber.

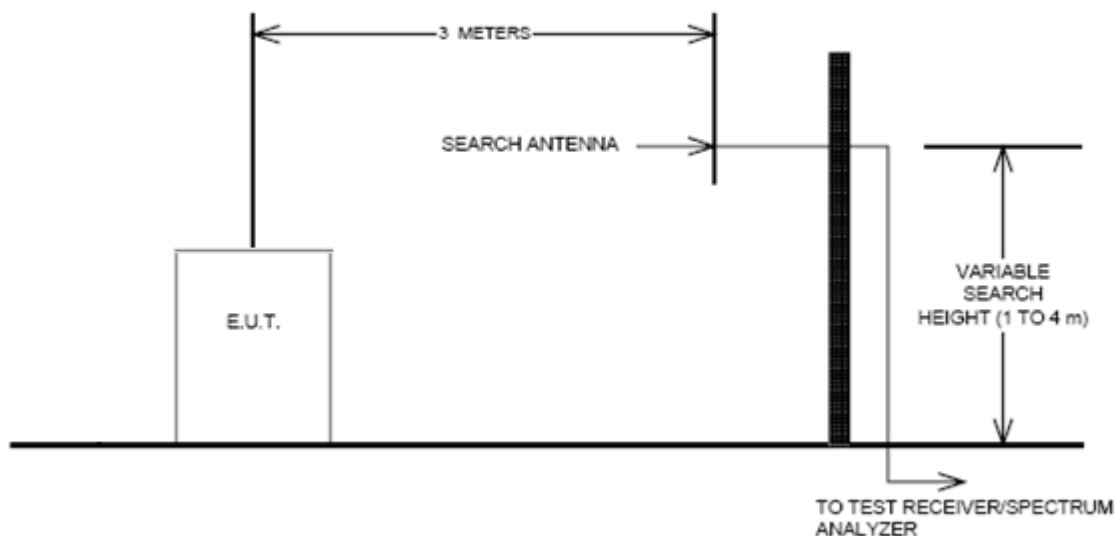
The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360° and the receiving antenna scanned 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.

This test was performed in accordance with ANSI / TIA / EIA 603C Clause 2.2.12

9.3.1 Radiated Spurious Emissions Test Setup



9.3.2 Environmental Conditions:

Temperature:	23 °C
Relative Humidity:	42 %

9.4 Test Result

: PASS

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Frequency	Freq.(MHz)	<u>Substitute Level</u> [dBm]	Ant. Gain (dBd)	C.L	Pol.	ERP (dBm)	Margin (dB)
2137.5	4275	-44.86	10.33	4.36	V	-38.89	-25.89
	6412	-39.77	9.91	4.57	V	-34.43	-21.43
	8550	-38.15	9.37	6.84	V	-35.62	-22.62

10. FREQUENCY STABILITY

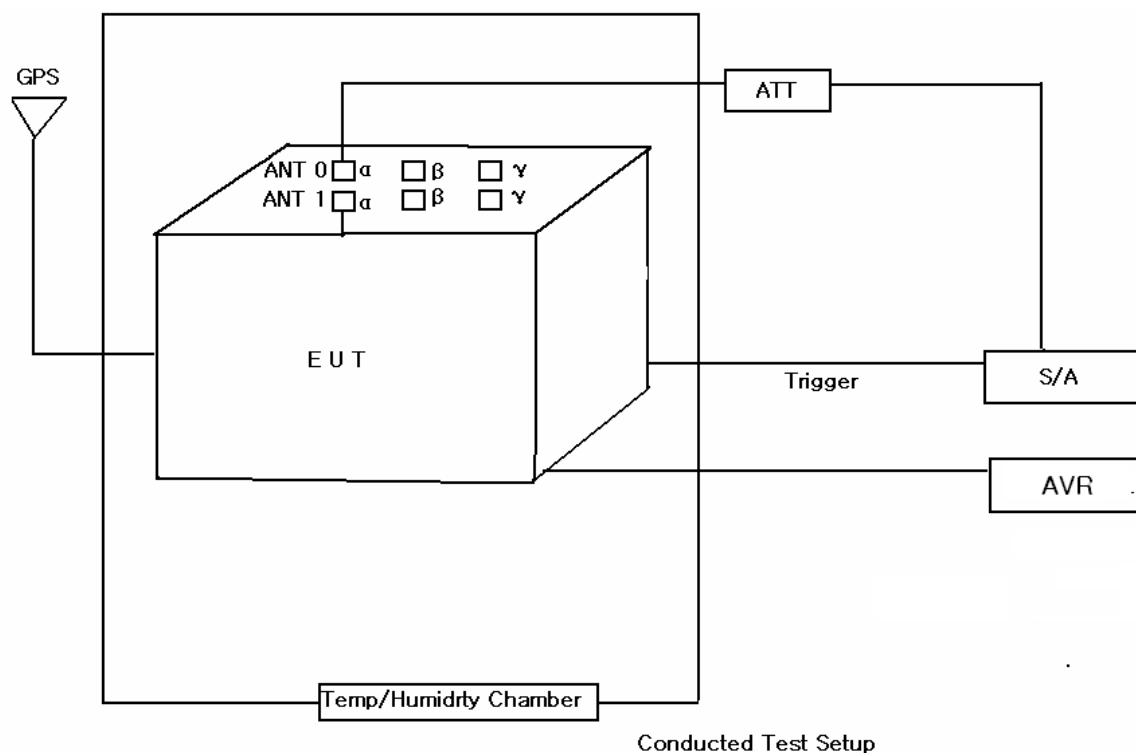
10.1 Applicable Standard

Requirements: FCC § 2.1055 (a), Part 27.54 following: The frequency stability shall be sufficient to ensure that the fundamental emissions stay

10.2 Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
WEINSCHTEL	67-30-33 / Attenuator	BR0530	01/14/2011
WEINSCHTEL	AF9003-69-31 / STEP ATTENUATOR	11787	11/12/2011
Agilent	N9020A / MXA Signal Analyzer	US46220219	03/03/2011
Nang-Yeul	NY-THR18750 / Temp Chamber	NY-200912201A	12/28/2010

10.3 Test Procedure



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Frequency Stability over Temperature variation:

The equipment under test was connected to an external AC source and the RF output was connected to a Spectrum Analyzer via feed-through attenuators. The EUT was placed inside the temperature chamber. RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 30 minutes, the frequency output was recorded from the Modulation Analyzing Function via MXA Signal Analyzer.

Frequency stability over Voltage variation:

An external variable AC Source. The voltage was set to 85% and 115% of the nominal value. The output frequency was recorded for each voltage.

10.3.1. Environmental conditions

Temperature:	24 ° C
Relative Humidity:	21 %

10.4. Test Result

: Pass

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10.4.1. Frequency Stability over Temperature and Voltage variation

Modulation: 64QAM

Reference: 220 Vac at 20 °C Freq. = 2 137.5 MHz

Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	2137 500 114	114	0	0.0000
	-30	2137 500 122	122	8	0.0037
	-20	2137 500 107	107	-7	-0.0033
	-10	2137 500 113	113	-1	-0.0005
	0	2137 500 118	118	4	0.0019
	+10	2137 500 125	125	11	0.0051
	+30	2137 500 119	119	5	0.0023
	+40	2137 500 132	132	18	0.0084
	+50	2137 500 108	108	-6	-0.0028
115%	+20	2137 500 104	104	-10	-0.0047
85%	+20	2137 500 112	112	-2	-0.0009

11. RF EXPOSURE STATEMENT

1. LIMITS

According to §1.1310 and §2.1091 RF exposure is calculated.

(B) Limits for General Population/Uncontrolled Exposures

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
0.3 - 1.34.....	614	1.63	*(100)	30
1.34 - 30.....	824/f	2.19/f	*(180/ f ²)	30
30 - 300.....	27.5	0.073	0.2	30
300 - 1500.....			f/1500	30
1500 - 100.000.....			1.0	30

F = frequency in MHz

* = Plane-wave equivalent power density

2. MAXIMUM PERMISSIBLE EXPOSURE Prediction

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

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Max Peak output Power at antenna input terminal	50.87000	dBm
Max Peak output Power at antenna input terminal	122.17996	W
Prediction distance	1100.00	cm
Prediction frequency	2137.50000	MHz
Antenna Gain(typical)	20.50000	dBi
Antenna Gain(numeric)	112.20185	–
Power density at prediction frequency (S)	0.90158	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm ²

3. RESULTS

The power density level at 1100 cm is 0.90158 mW/cm², which is below the uncontrolled exposure limit of 1.0 mW/cm² 2137.5 MHz.