



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: July 04, 2011

Test Site/Location:

HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, Korea

Test Report No.: HCTR1107FR01

FCC ID : **A3LSLS-2C40680700**

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

EUT Type : Remote Radio Head
Manufacturer : SAMSUNG Electronics Co., Ltd.
Model name : SLS-2C40680700
Frequency of Operation : 728 MHz ~ 746 MHz
Tx Output Power : 40 W (2 Tx Path) / 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
: Chang Seok Choi
Test engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

FCC PT.27 TEST REPORT		FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 1 of 89

Revision

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1107FR01	July 04, 2011	First Approval Report

C O N T E N T S

1. GENERAL INFORMATION.....	5
1.1. CLIENT INFORMATION	5
1.2. PRODUCT INFORMATION	5
1.3. INTRODUCTION OF EUT.....	6
2. TEST SUMMARY	8
2.1. STANDARDS	8
2.2. MODE OF OPERATION DURING THE TEST	8
3. STANDARDS ENVIRONMENTAL TEST CONDITIONS	9
4. TEST EQUIPMENT	10
5. CONDUCTED OUTPUT POWER.....	11
5.1. Applicable Standard	11
5.2. Test Procedure.....	11
5.3. Environmental Conditions:	11
5.4. Test Result	11
6. OCCUPIED BANDWIDTH	23
6.1. Applicable Standard	23
6.2. Test Procedure.....	23
6.3. Environmental Conditions:	23
6.4. Test Result	23
7. CHANNEL EDGES.....	35
7.1. Applicable Standard	35
7.2. Test Procedure.....	35
7.3. Environmental Conditions.....	35
7.4. Test Result	35
8. SPURIOUS EMISSION AT ANTENNA TERMINAL	43
8.1. Applicable Standard.....	43
8.2. Test Procedure.....	43
8.3 Environmental Conditions:	43
8.4. Test Result	43
9. RADIATED SPURIOUS EMISSION	63
9.1 Applicable Standard.....	63
9.2 Test Procedure	63

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 3 of 68

9.3.Environmental Conditions:	64
9.4 Test Result	64
10. FREQUECNY STABILITY	65
10.1 Applicable Standard	65
10.2 Test Procedure.....	65
10.3. Environmental conditions	65
10.4. Test Result	65
11. RF EXPOSURE STATEMENT	67

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 4 of 68

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	Remote Radio Head
EMISSION DESIGNATOR	4M78G7D (QPSK), 4M81W7D (16QAM/64QAM)
OPERATING FREQUENCY	728 MHz ~ 746 MHz
TX OUTPUT POWER	40 W (2 Tx Path) / Sector
CHANNEL BANDWIDTH	5 MHz
MODULATION TYPE	OFDMA (QPSK, 16QAM, 64QAM)
CHANNEL CARD CAPACITY	1/2 Carrier/3Sector
SYSTEM INPUT VOLTAGE	AC 220 V

1.3. INTRODUCTION OF EUT

The Samsung LTE system is a wireless network system supporting 3GPP Long Term Evolution (3GPP LTE; hereafter, LTE) based services. It improved the disadvantages of low transmission speed and the high cost of the data services provided by the existing 3GPP mobile communication system. The Samsung LTE system is a next generation wireless network system that can provide high-speed data services at a low cost regardless of time and location.

The Samsung LTE system supports the downlink Orthogonal Frequency Division Multiple Access (OFDMA) transmission technology and the uplink Single Carrier (SC) FDMA transmission technology in Frequency Division Duplex (FDD) mode, and supports a scalable bandwidth for supporting various spectrum allocations to provide high-speed data services. In addition, system performance and capacity have increased as a result of high-performance hardware; the Samsung LTE system can easily accommodate a variety of functions and services.

The Samsung LTE system consists of the evolved UTRAN Node B (eNB), Evolved Packet Core (EPC), and LTE System Manager (LSM). The eNB is a system between the UE and EPC, and processes packet calls by connecting to the User Equipment (UE) wirelessly in accordance with the LTE Air standards. The EPC is between the eNB and the Packet Data Network (PDN), and performs various control functions. The EPC consists of the Mobility Management Entity (MME), the Serving Gateway (S-GW), and PDN Gateway (P-GW). The LSM also provides an interface with an operator, functions to manage software, configurations, performance, and failures as well as an ability to act as a Self-Organizing Network (SON) server.

evolved UTRAN Node-B (eNB)

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.

It also performs handovers interoperating with the EPC.

Evolved Packet Core (EPC)

The EPC is a system between the eNB and PDN, consisting of the MME, S-GW and P-GW.

The MME processes control messages through the eNB and the NAS signaling protocol, and processes the control functions for the control plane, such as mobility management, tracking area list management, and bearer and session management for UEs.

The S-GW carries out the anchor function in the user plane between the 2G/3G access system and the LTE system, and manages the packet transport layer for downlink/uplink data.

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 6 of 68

The P-GW allocates an IP address to the UE. For mobility between the LTE system and the non-3GPP access system, the P-GW carries out the anchor function and manages the charging and transmission rate according to the service level.

LTE System Manager (LSM)

The LSM provides an interface to perform operations and maintenance on the eNB by the operator, functions to manage software, configurations, performance, and failures as well as an ability to act as a Self-Organizing Network (SON) server.

EPC System Manager (ESM)

The ESM provides the user interface for the operator to run and maintain the MME, S-GW, and P-GW as system management activities.

Master SON Server (MSS)

The MSS interoperates with the local SON server as its higher node, performing the optimized interoperation for the multi-LSM. The MSS can work with OSS (Operating Support System) of the service provider who can decide whether to link them.

Home Subscriber Server (HSS)

The HSS is a database management system that stores and manages the parameters and location information for all registered mobile subscribers. The HSS manages key data such as the mobile subscriber's access capability, basic services and supplementary services, and provides a routing function to the subscribed receivers.

Policy and Charging Rule Function (PCRF)

The PCRF creates policy rules to dynamically apply the QoS (Quality of Service) and accounting policies differentiated by service flow, or creates the policy rules that can be applied commonly to multiple service flows. The IP edge includes the PCEF (Policy and Charging Enforcement Function), which allows implementation of policy rules sent from the PCRF per service flow.

Online Charging System (OCS)

The OCS sends/receives charging information required for a subscriber's online charging during calls.

Offline Charging System (OFCS)

The OFCS stores offline charging data and provides subscriber charging information.

FCC PT.27 TEST REPORT		FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 7 of 68	

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(c)	Conducted Output Power	Compliant
2.1049, 27.53(g)	Occupied Bandwidth	Compliant
2.1051, 27.53(g)	Spurious Emissions at Antenna Terminals	Compliant
2.1051, 27.53(g)	Channel Edge	Compliant
2.1053, 27.53(g)	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

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.

The conducted emission level is measured at each antenna port and then summed mathmatically to determine the total emission level from the device

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 8 of 68

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	04/13/2012
Schwarzbeck	VULB 9168 / TRILOG Antenna	9168-200	02/19/2013
HD	MA240 / Antenna Position Tower	556	N/A
EMCO	1050 / Turn Table	114	N/A
HD GmbH	HD 100 / Controller	13	N/A
HD GmbH	KMS 560 / SlideBar	12	N/A
MITEQ	AMF-6D-001180-35-20P/AMP	990893	05/02/2012
EMCO	6502/Loop Antenna	9009-2536	01/13/2012
Agilent	N9020A /Signal Analyzer	MY51110020	04/16/2012
Agilent	6674A / DC Power Supply	3501A00901	05/02/2012
WEINSCHL	67-30-33 / Attenuator	BU5347	12/29/2011
WEINSCHL	67-30-33 / Attenuator	BR0530	12/29/2011
WEINSCHL	AF9003-69-31 / Attenuator	11787	11/12/2011
WEINSCHL	AF9003-69-31 / Attenuator	639	11/12/2011

5. CONDUCTED OUTPUT POWER

5.1. Applicable Standard

According to FCC §2.1046 & 27.50(c)

(3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;

5.2. 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. Environmental Conditions:

Temperature:	22 °C
Relative Humidity:	52 %

5.4. Test Result

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 11 of 68

5.4.1. Test Data at Output Port 0

Frequency [MHz]	Measured Value					
	QPSK		16QAM		64QAM	
	dBm	W	dBm	W	dBm	W
731.5	43.10	20.41738	43.09	20.37042	42.96	19.76970
737.0	43.16	20.70141	43.17	20.74914	43.13	20.55891
742.5	43.00	19.95262	42.98	19.86095	43.00	19.95262

5.4.2. Test Data at Output Port 1

Frequency [MHz]	Measured Value					
	QPSK		16QAM		64QAM	
	dBm	W	dBm	W	dBm	W
731.5	42.95	19.72423	42.95	19.72423	42.90	19.49845
737.0	43.01	19.99862	43.01	19.99862	42.97	19.81527
742.5	43.04	20.13724	43.02	20.04472	42.89	19.45360

5.4.3. Measure and sum data

Frequency [MHz]	Sum Value		
	QPSK	16QAM	64QAM
731.5	40.14161	40.09465	39.26815
737.0	40.70003	40.74776	40.37418
742.5	40.08986	39.90567	39.40622

5.4.4. Plot Data for Output 0 (Conducted Output Power)
(QPSK Low Channel)



(QPSK Mid Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 13 of 68

(QPSK High Channel)



(16QAM Low Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 14 of 68

(16QAM Mid Channel)



(16QAM High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 15 of 68

(64QAM Low Channel)

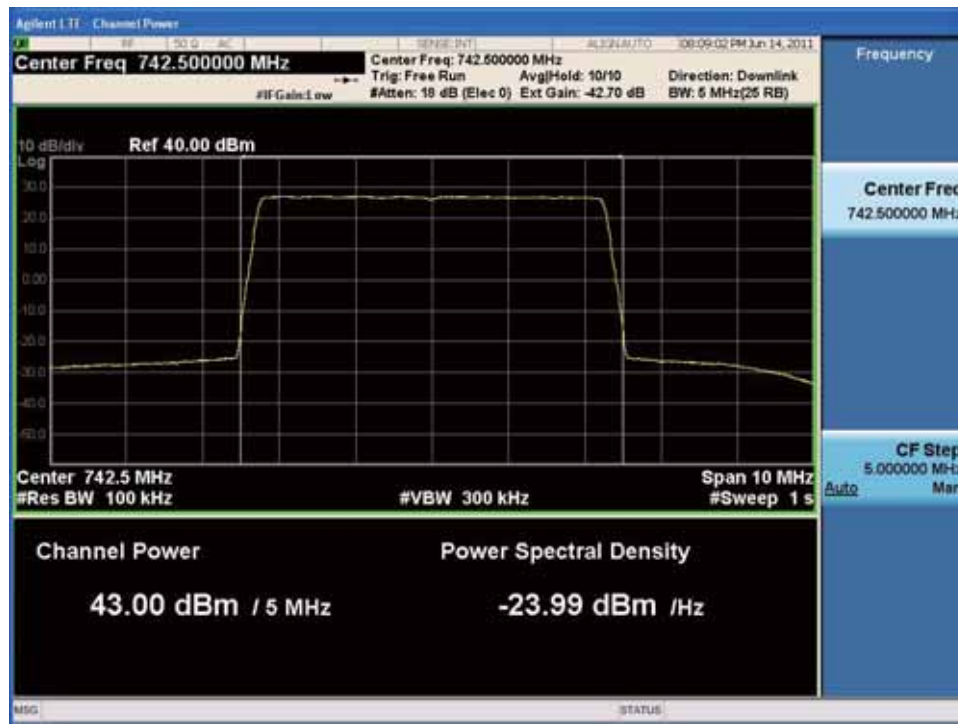


(64QAM Mid Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 16 of 68

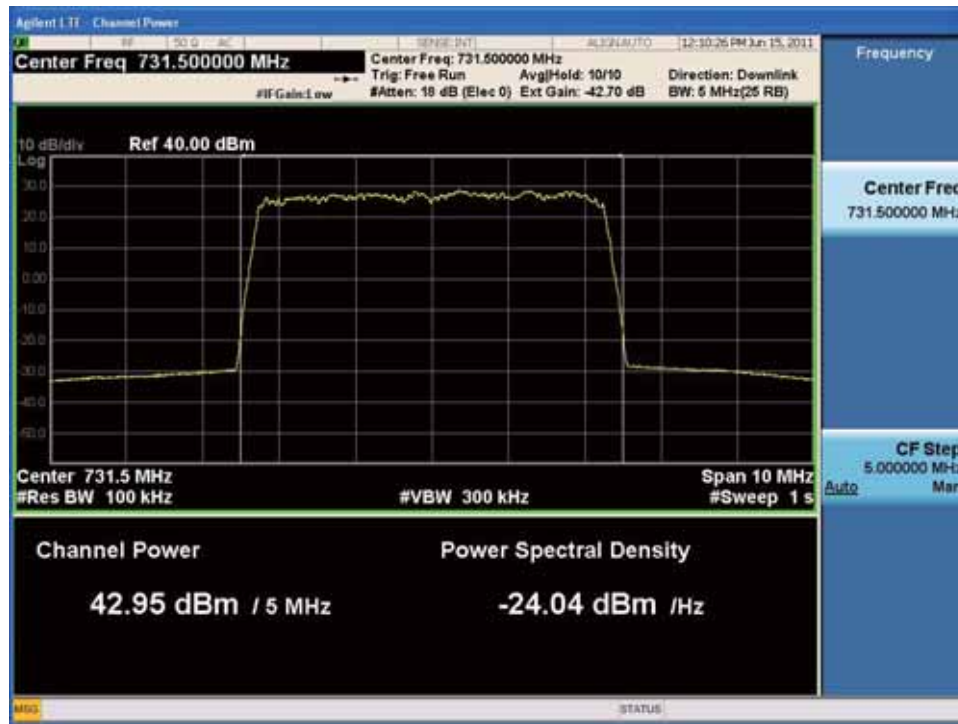
(64QAM High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 17 of 68

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

(QPSK Low Channel)



(QPSK Mid Channel)



(QPSK High Channel)



(16QAM Low Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 19 of 68

(16QAM Mid Channel)

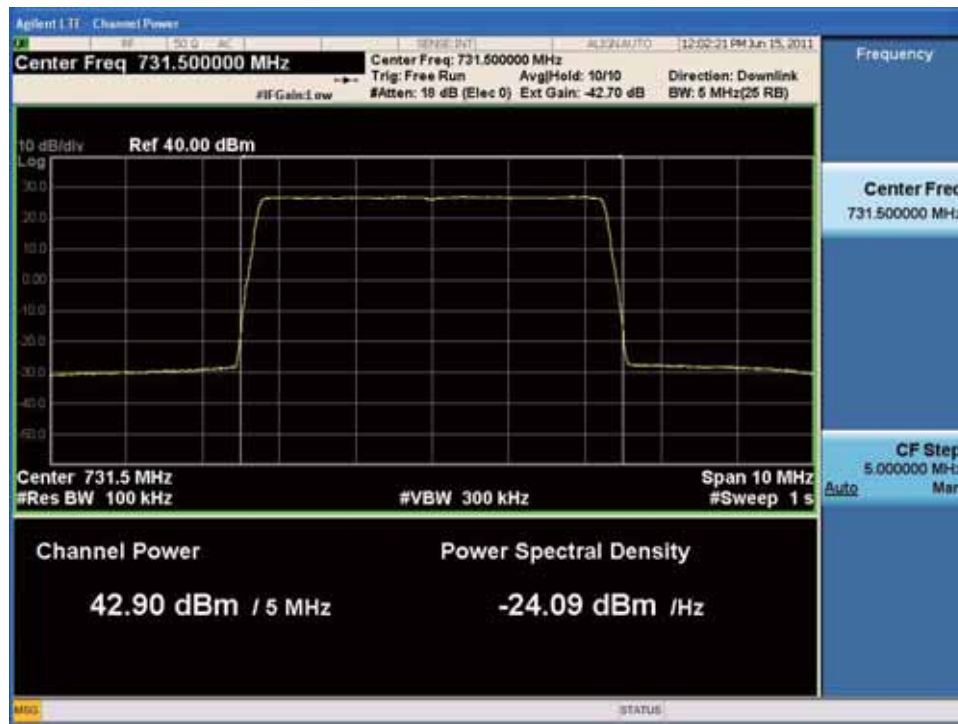


(16QAM High Channel)

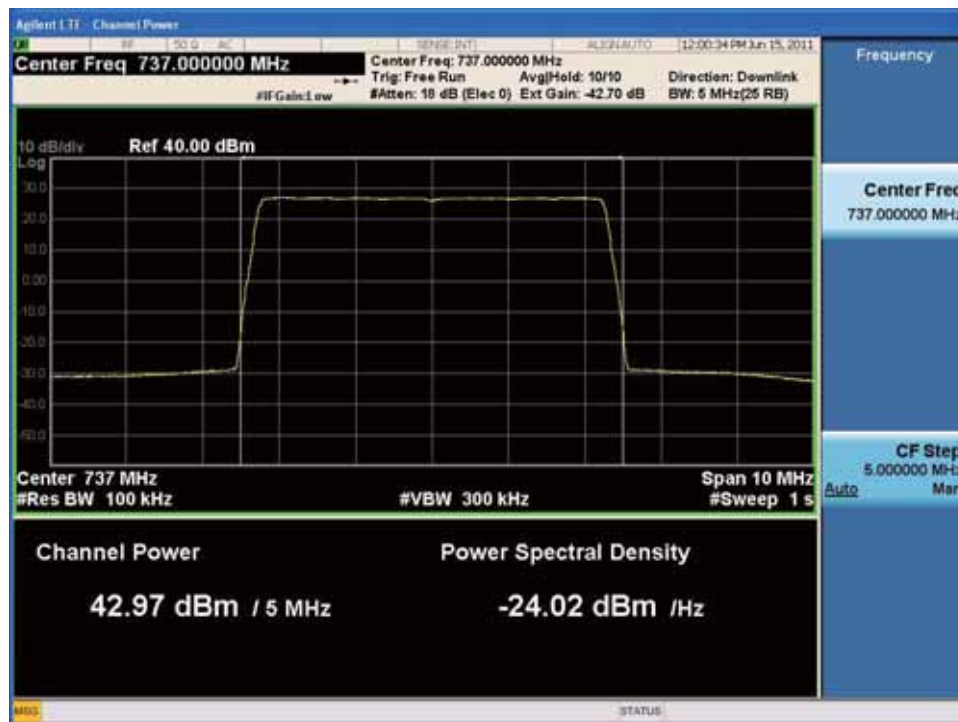


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 20 of 68

(64QAM Low Channel)

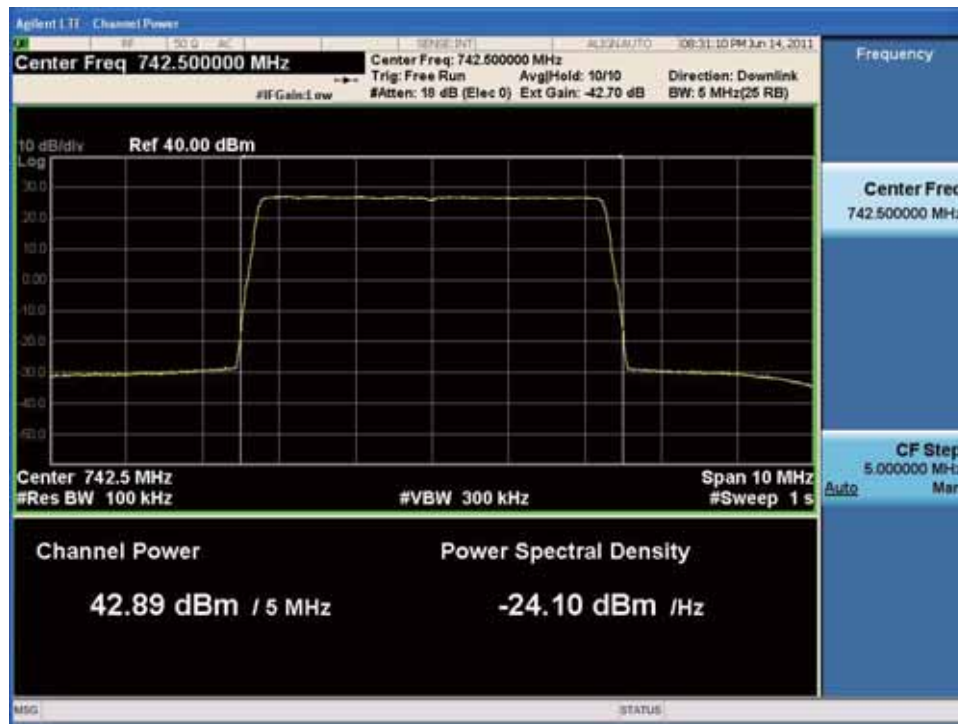


(64QAM Mid Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 21 of 68

(64QAM High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 22 of 68

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 Procedure

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

Temperature:	23 °C
Relative Humidity:	58 %

6.4. Test Result

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 23 of 68

6.4.1. Test Data at Output Port 0

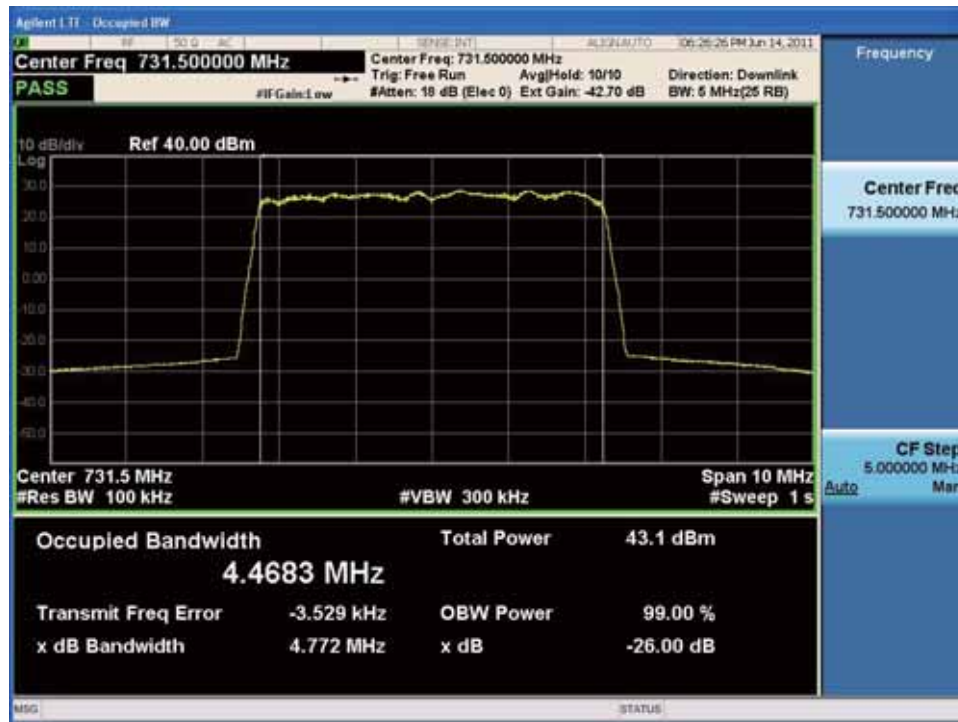
Frequency [MHz]	Measured Value [MHz]					
	QPSK		16QAM		64QAM	
	99 %	26 dB	99 %	26 dB	99 %	26 dB
731.5	4.772	4.4683	4.784	4.4819	4.810	4.5000
737.0	4.757	4.4654	4.776	4.4800	4.776	4.4606
742.5	4.772	4.4736	4.784	4.4813	4.810	4.4978

6.4.2. Test Data at Output Port 1

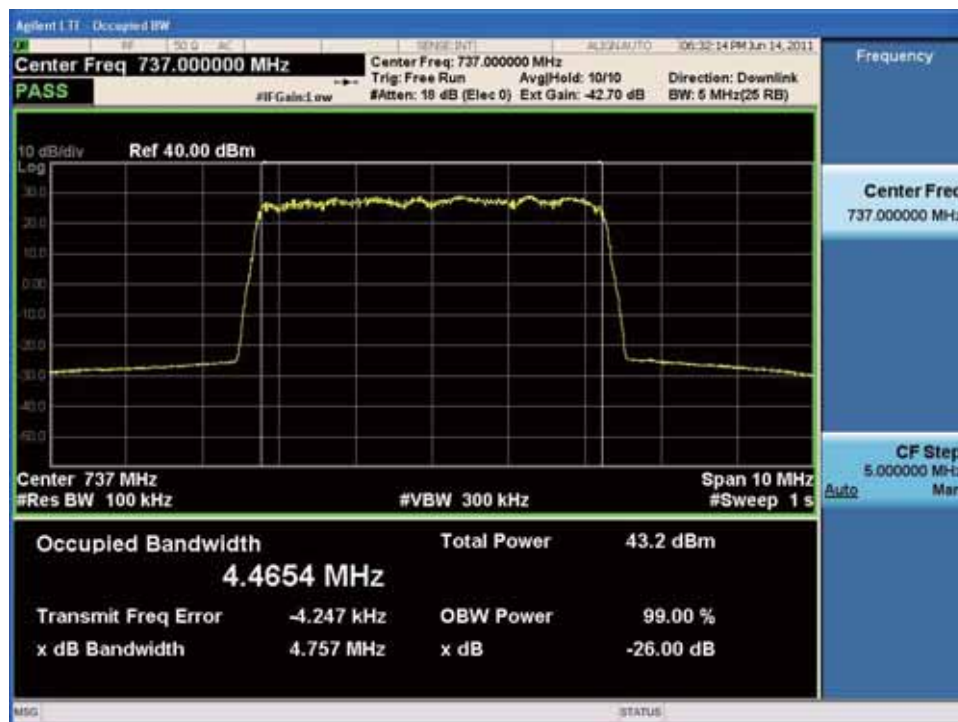
Frequency [MHz]	Measured Value [MHz]					
	QPSK		16QAM		64QAM	
	99 %	26 dB	99 %	26 dB	99 %	26 dB
731.5	4.767	4.4636	4.784	4.4807	4.816	4.4986
737.0	4.780	4.4605	4.790	4.4820	4.815	4.5007
742.5	4.775	4.4644	4.788	4.4841	4.810	4.4986

6.4.4. Test Plot at Output Port 0

(QPSK Low Channel)

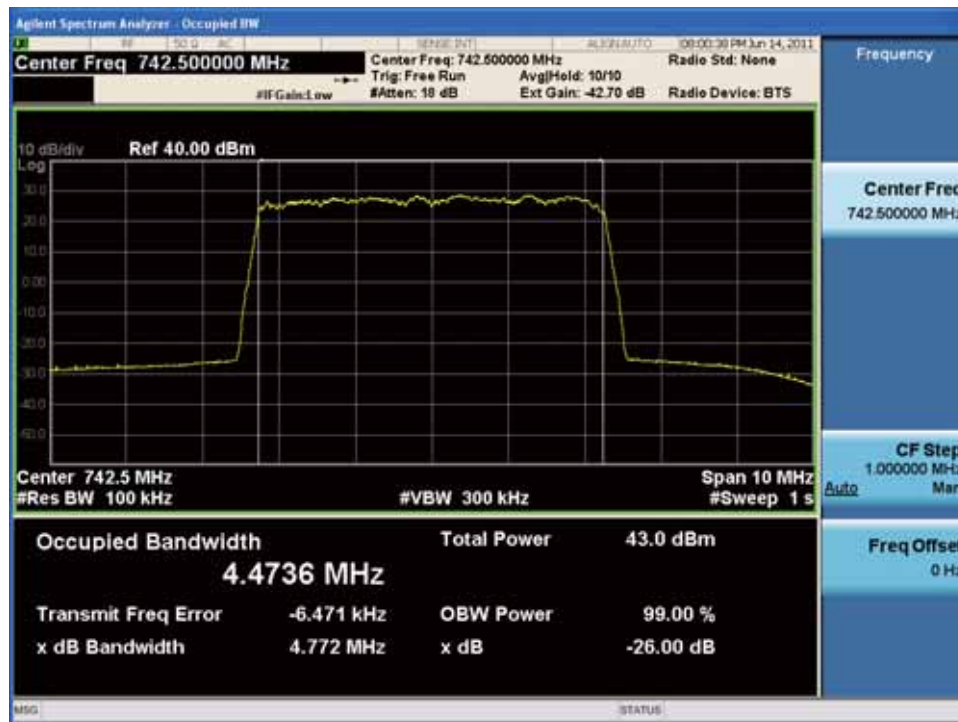


(QPSK Mid Channel)

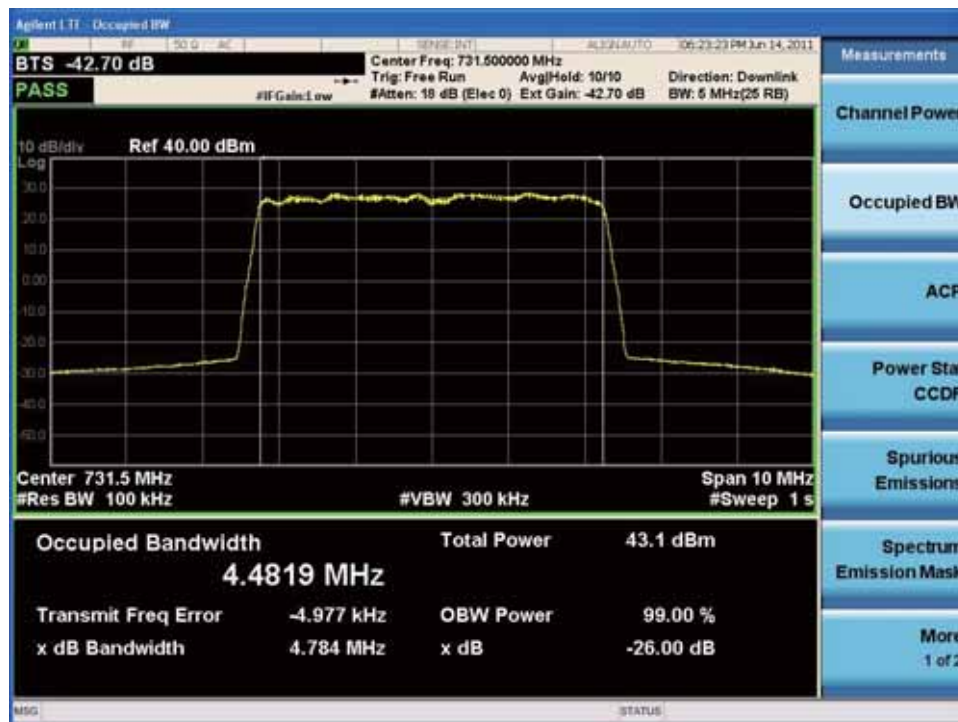


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 25 of 68

(QPSK High Channel)

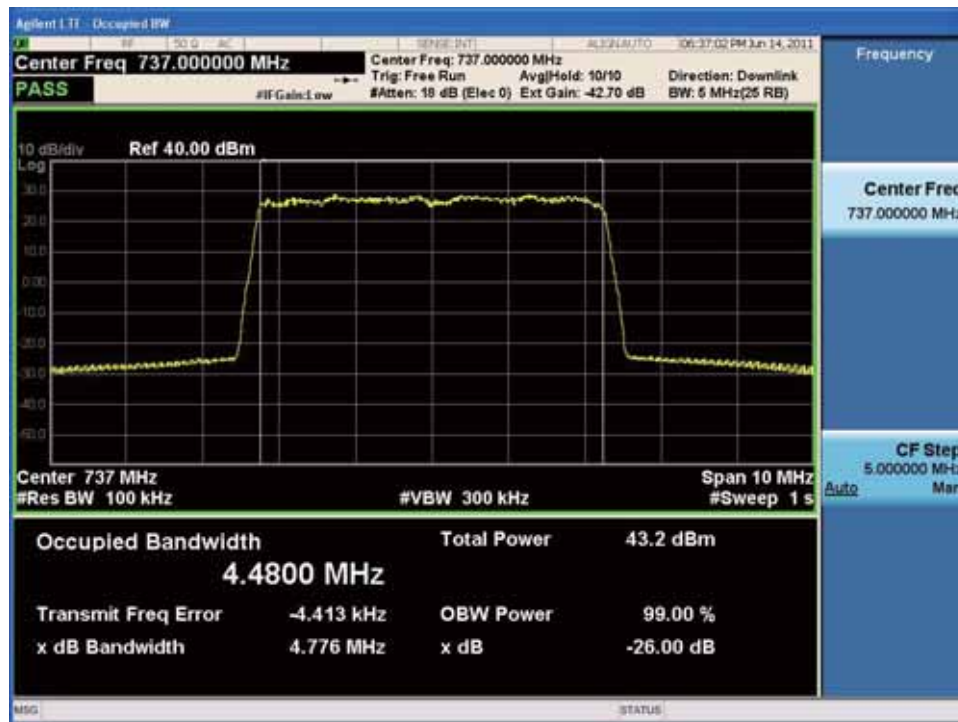


(16QAM Low Channel)

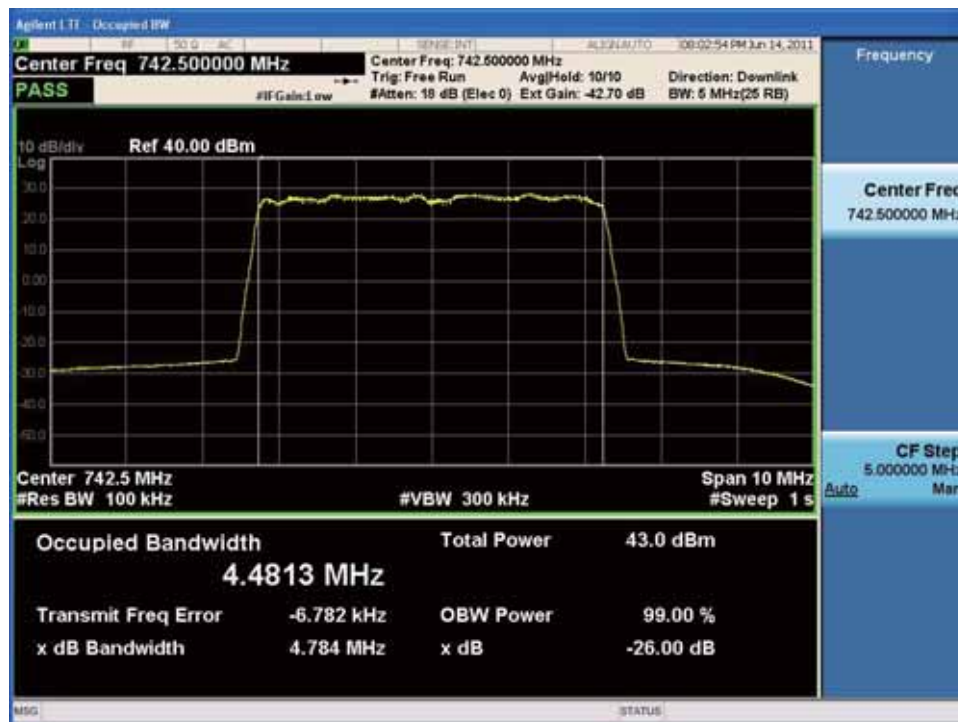


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 26 of 68

(16QAM Mid Channel)

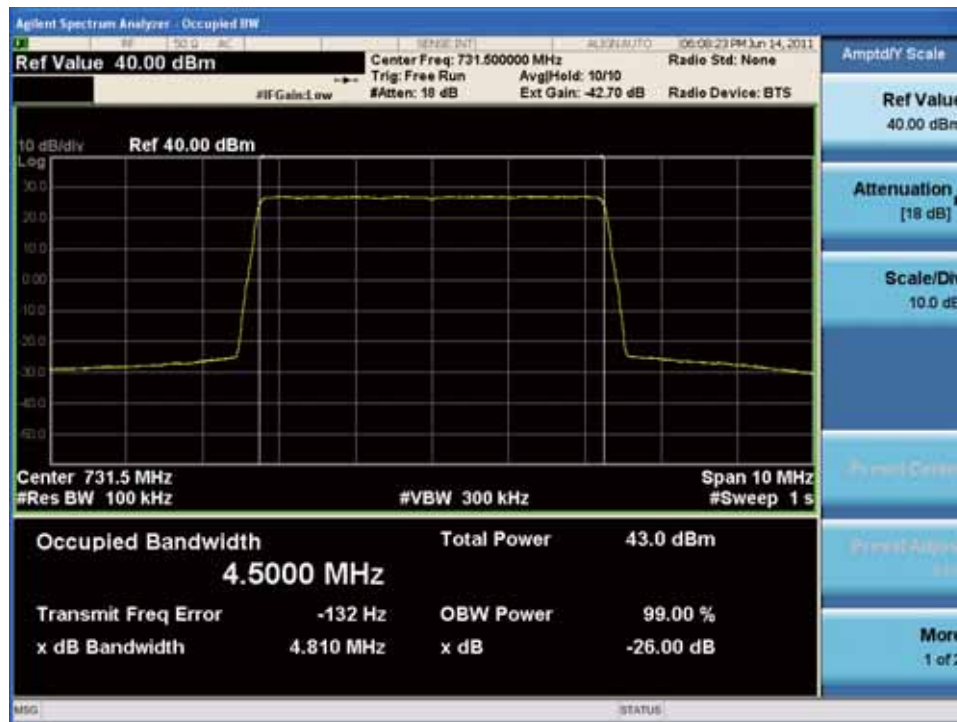


(16QAM High Channel)

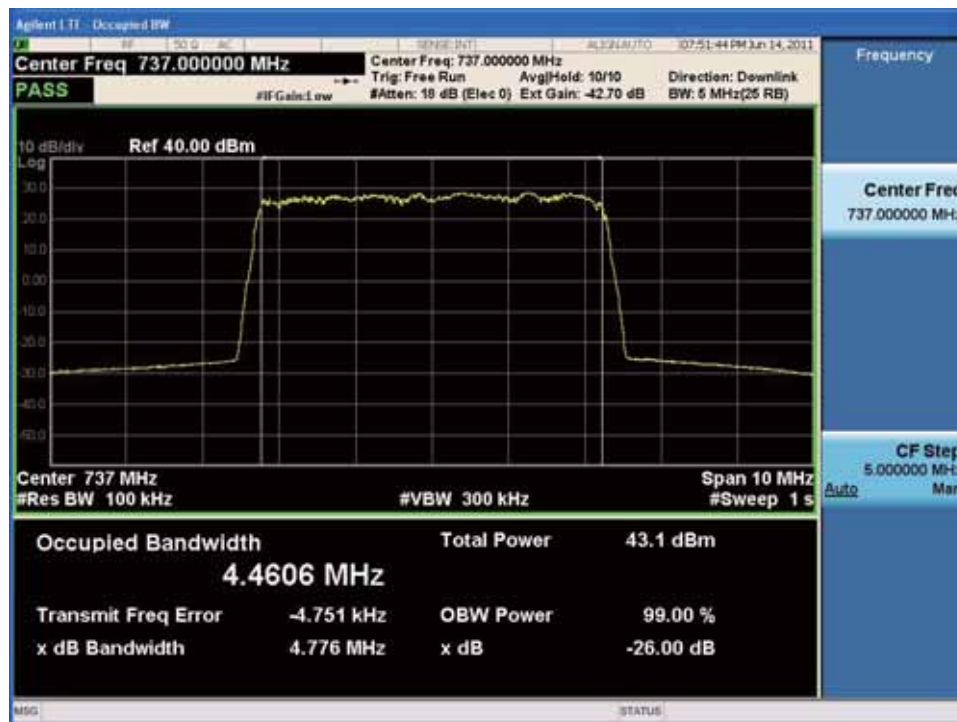


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 27 of 68

(64QAM Low Channel)

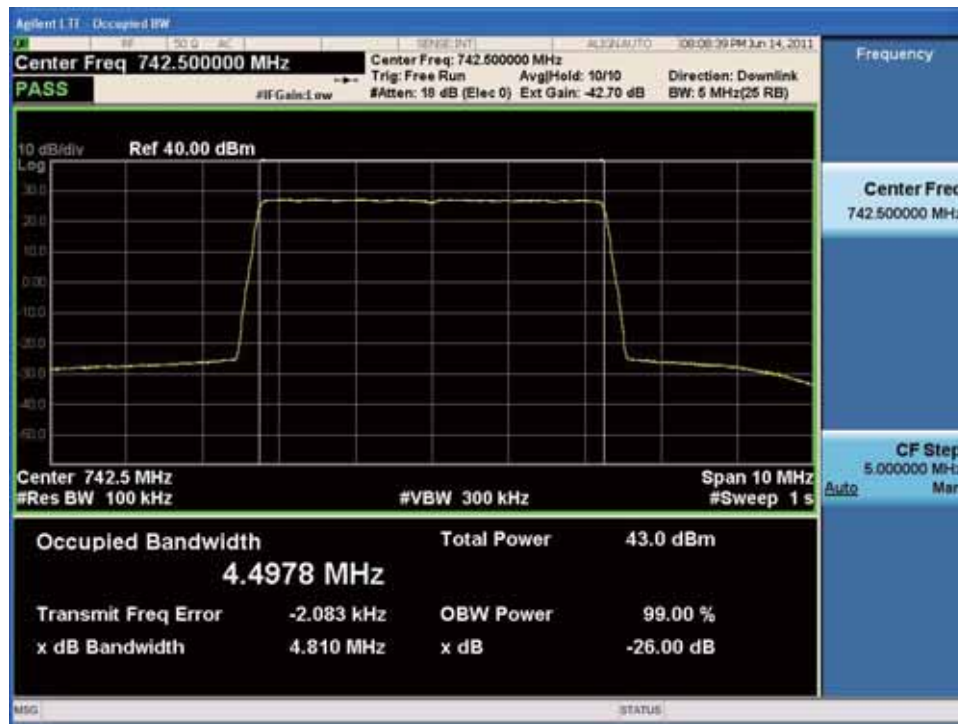


(64QAM Mid Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 28 of 68

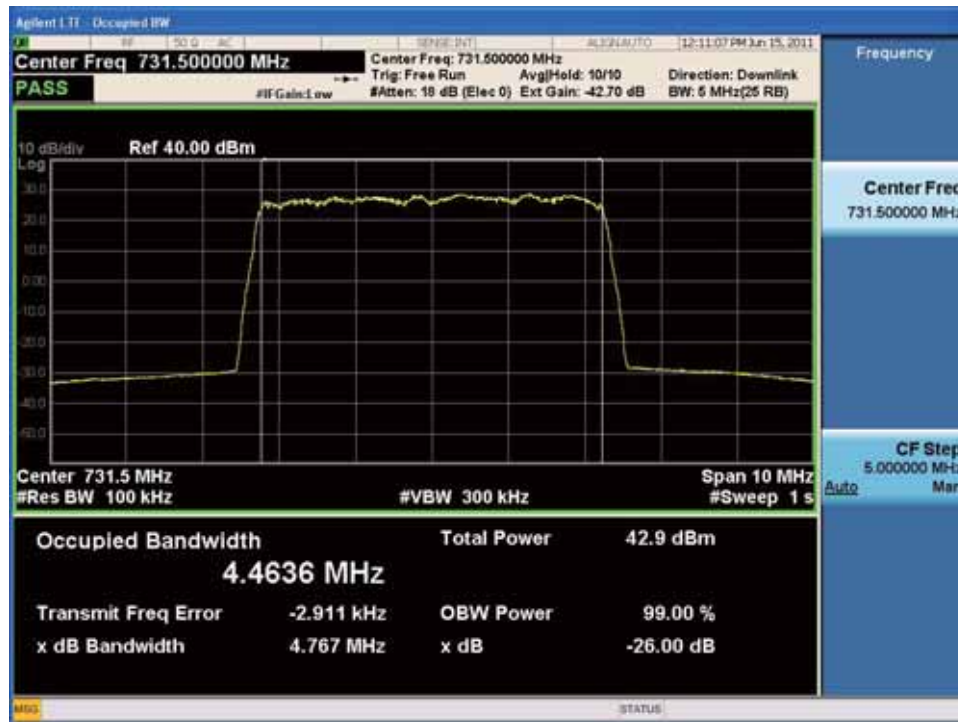
(64QAM High Channel)



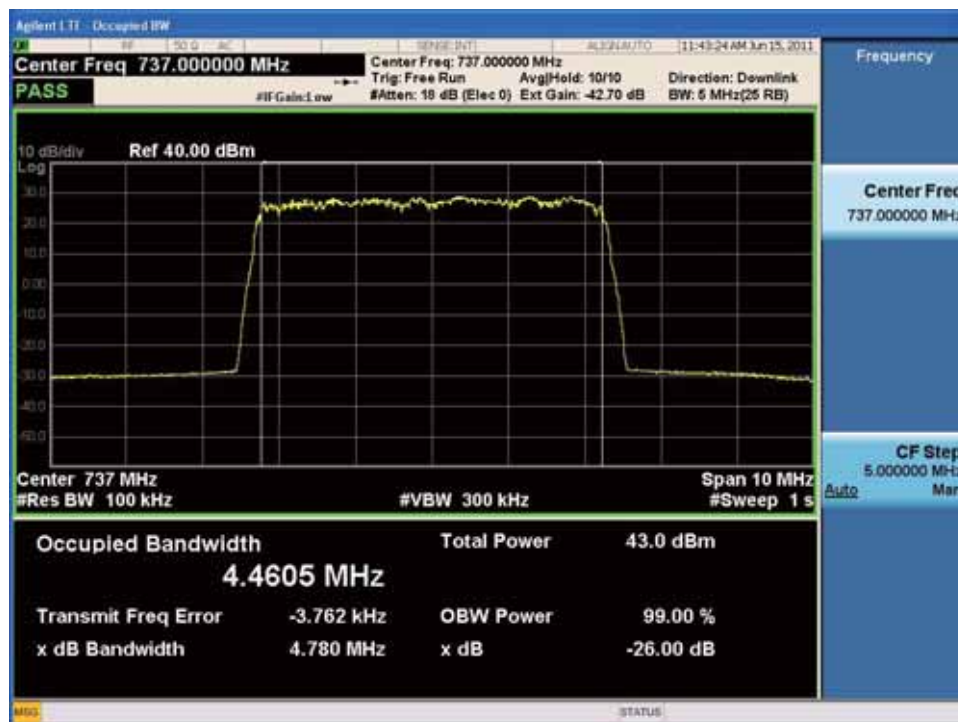
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 29 of 68

6.4.5. Test Plot at Output Port 1

(QPSK Low Channel)

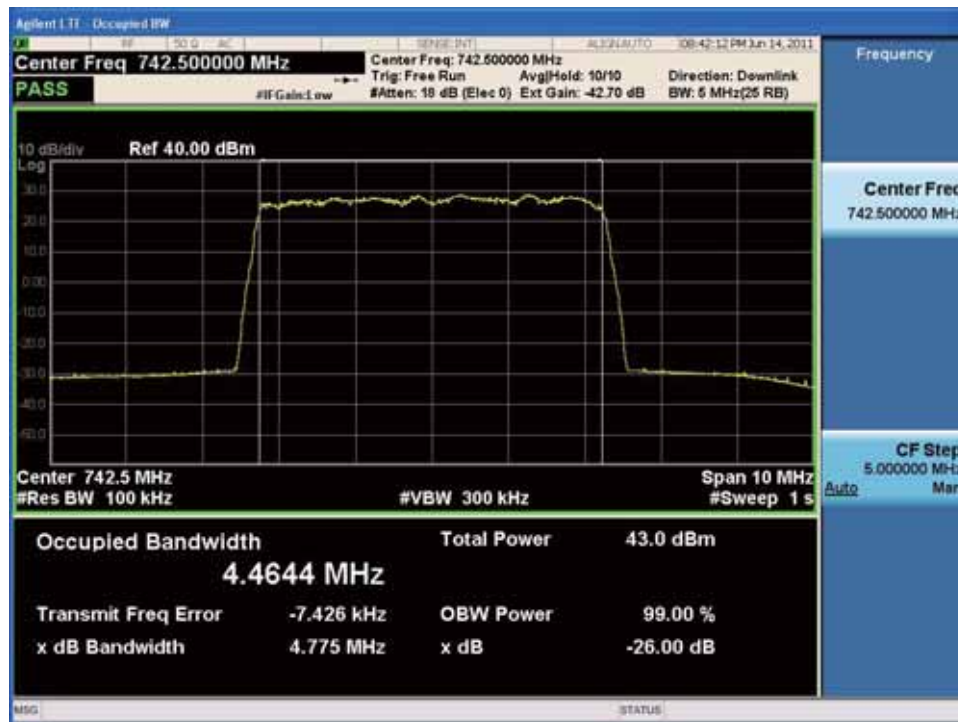


(QPSK Mid Channel)

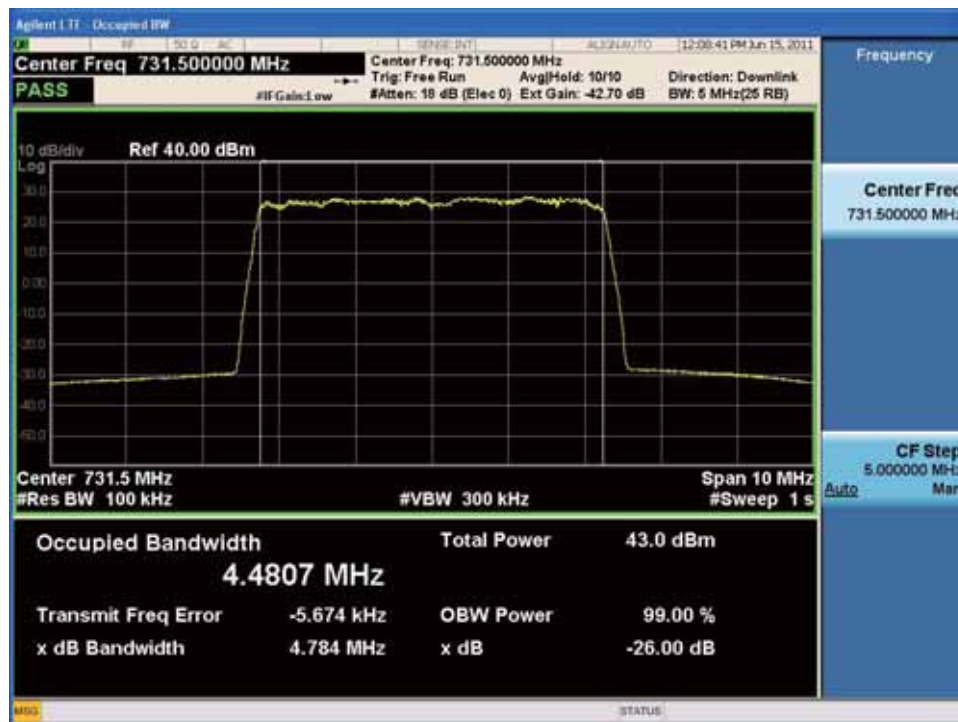


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 30 of 68

(QPSK High Channel)

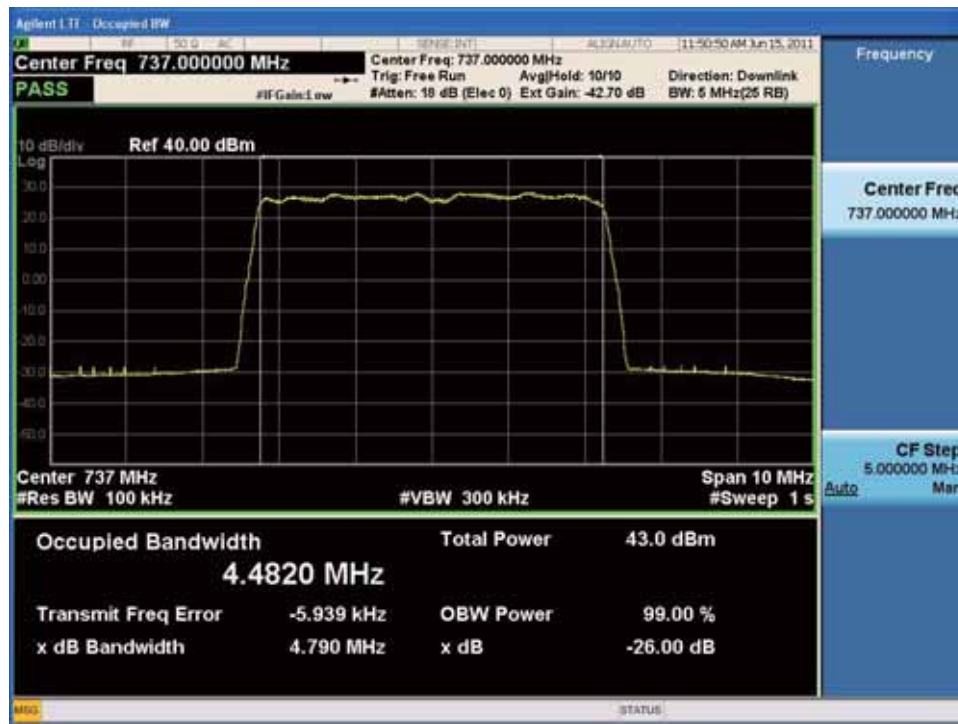


(16QAM Low Channel)

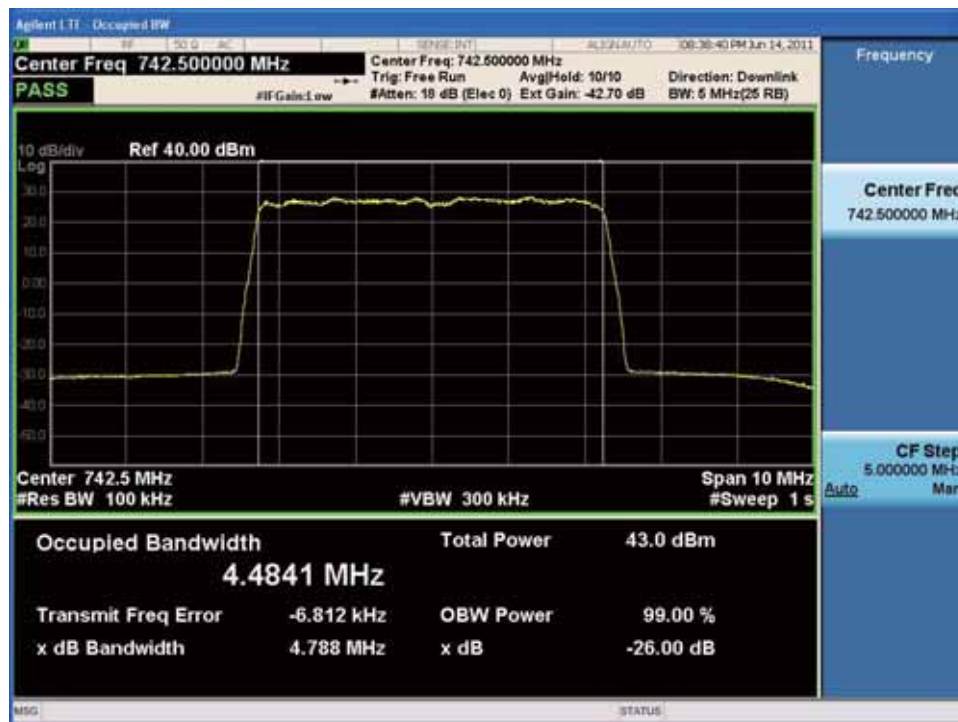


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 31 of 68

(16QAM Mid Channel)

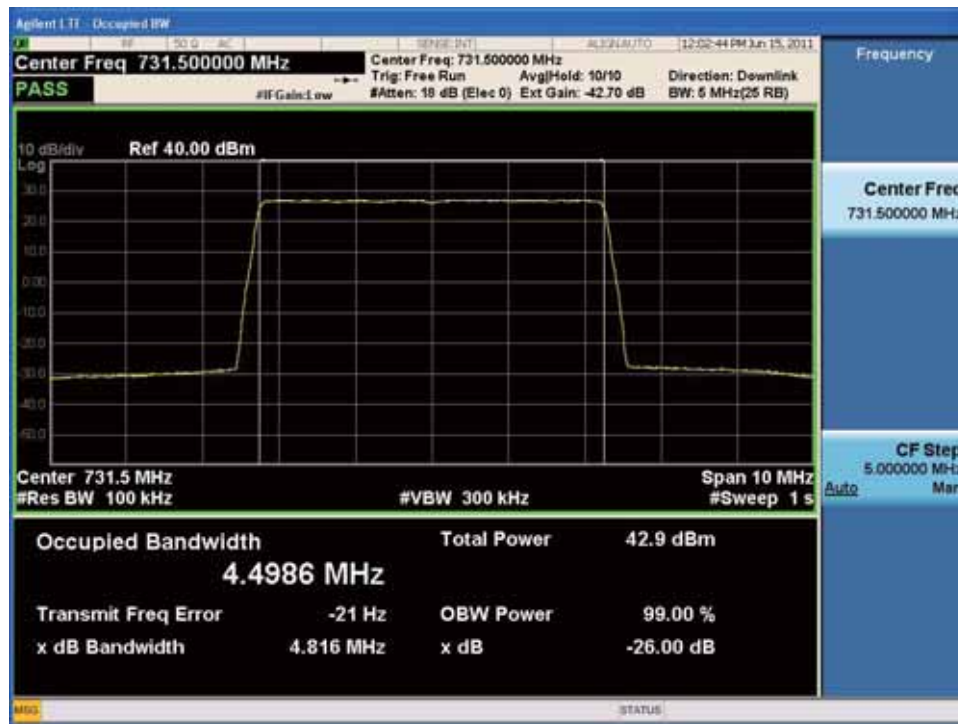


(16QAM High Channel)

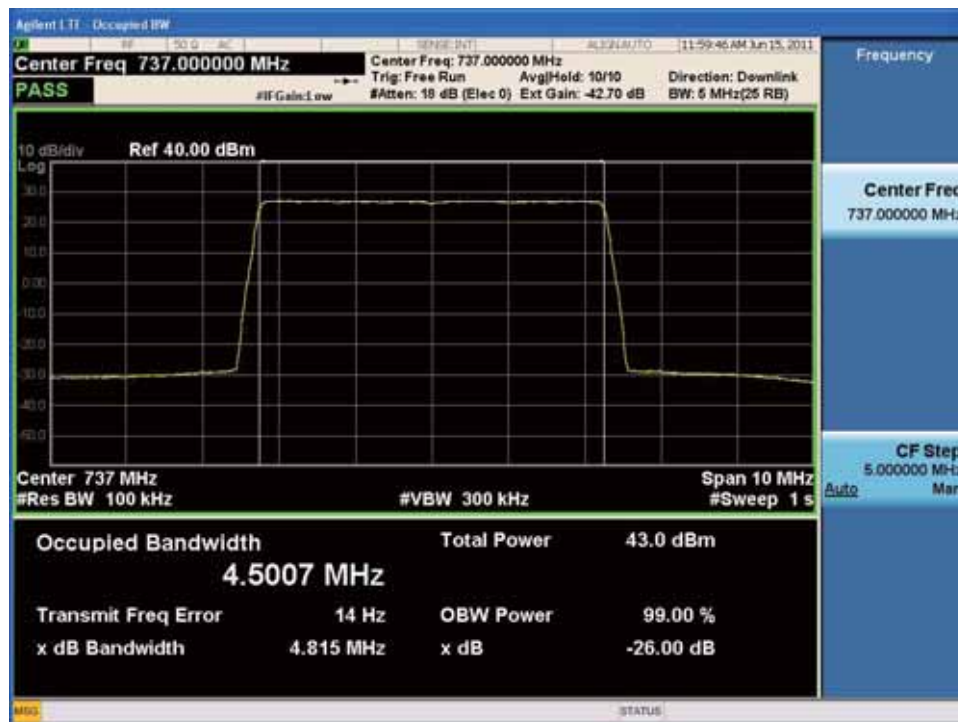


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 32 of 68

(64QAM Low Channel)

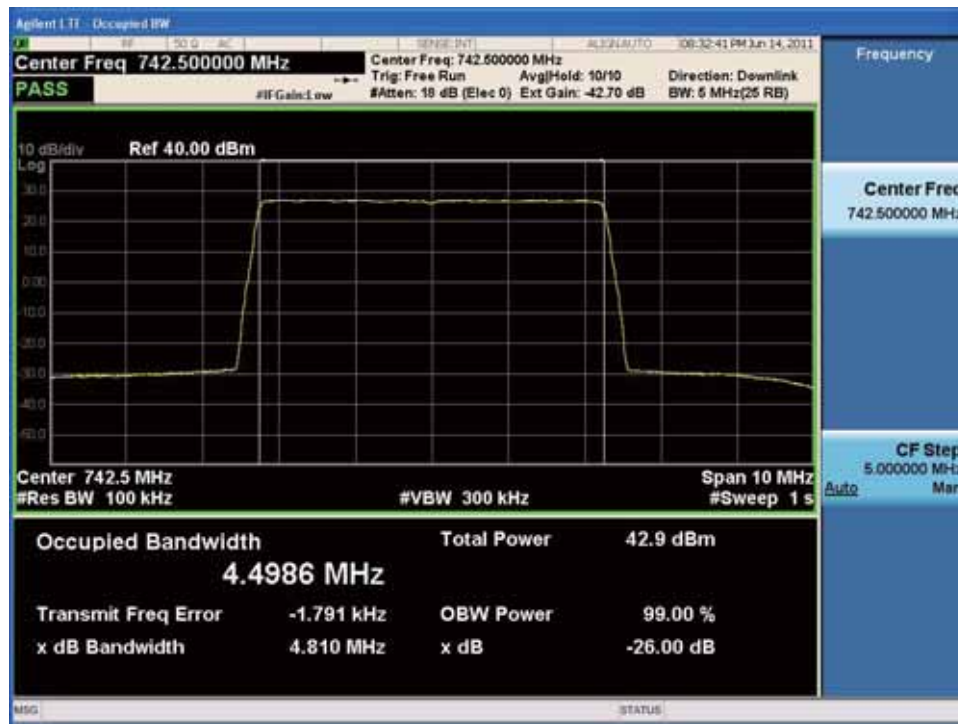


(64QAM Mid Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 33 of 68

(64QAM High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 34 of 68

7. CHANNEL EDGES

7.1. Applicable Standard

According to §27.53(g), 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 Procedure

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

7.3. Environmental Conditions

Temperature:	26 °C
Relative Humidity:	53 %

\

7.4. Test Result

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 35 of 68

7.4.1. Test data at Output 0

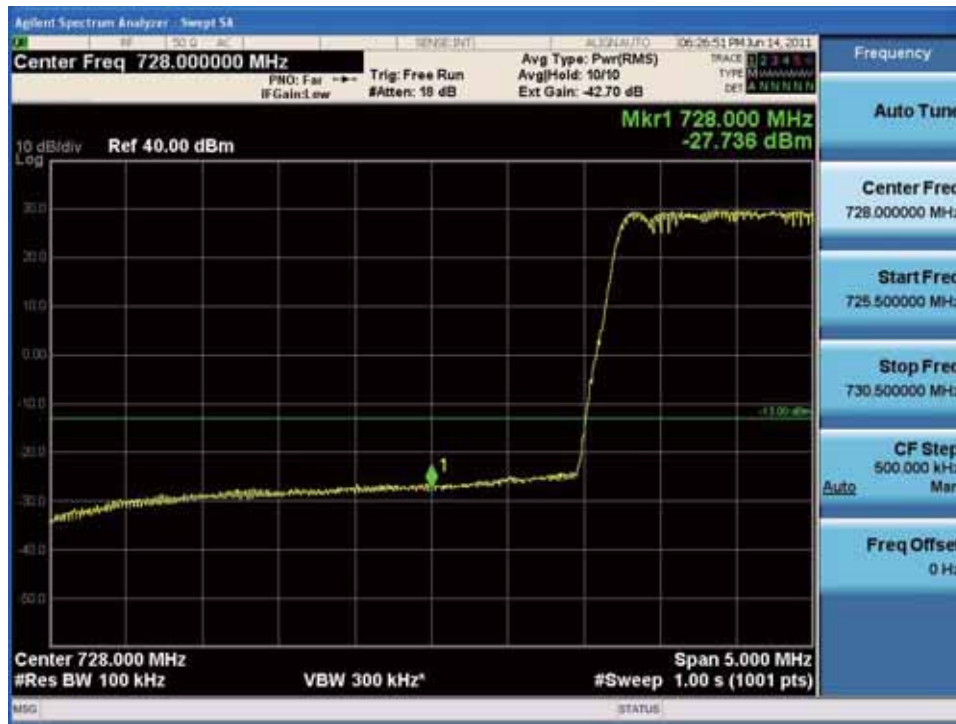
Frequency [MHz]	Measured Value [dBm]			Limit [dBm]
	QPSK	16QAM	64QAM	
731.5	-27.736	-27.096	-27.493	- 13
737.0	-	-	-	
742.5	-26.148	-25.901	-26.158	

7.4.2. Test data at Output 1

Frequency [MHz]	Measured Value [dBm]			Limit [dBm]
	QPSK	16QAM	64QAM	
731.5	-31.290	-30.926	-30.666	- 13
737.0	-	-	-	
742.5	-29.510	-26.033	-28.789	

7.4.3. Plot Data at Output 0

(QPSK Low Channel)

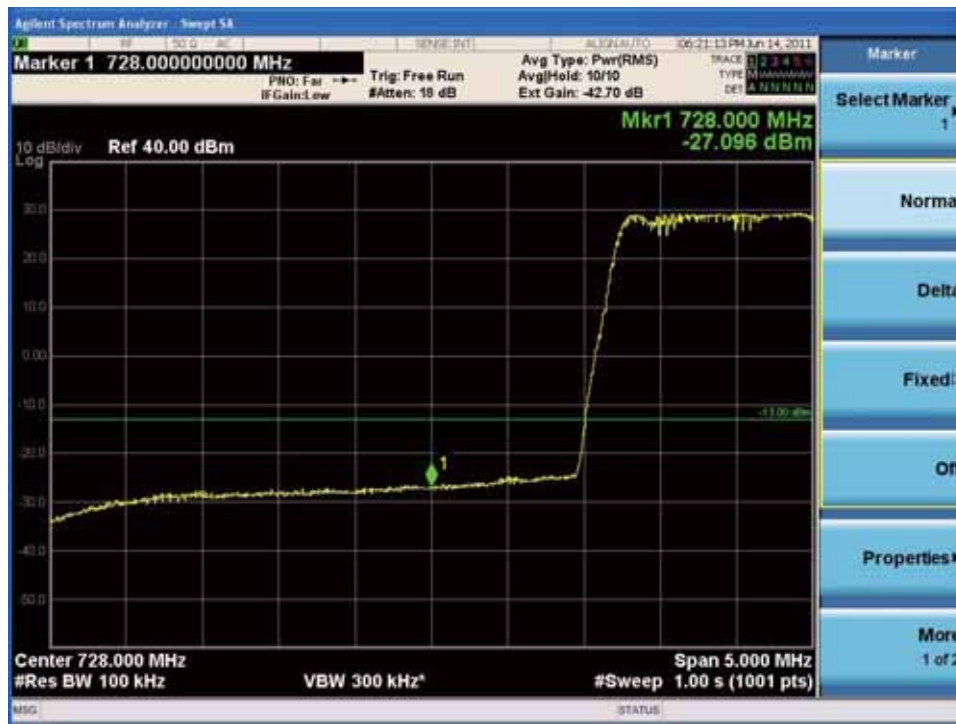


(QPSK High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 37 of 68

(16QAM Low Channel)

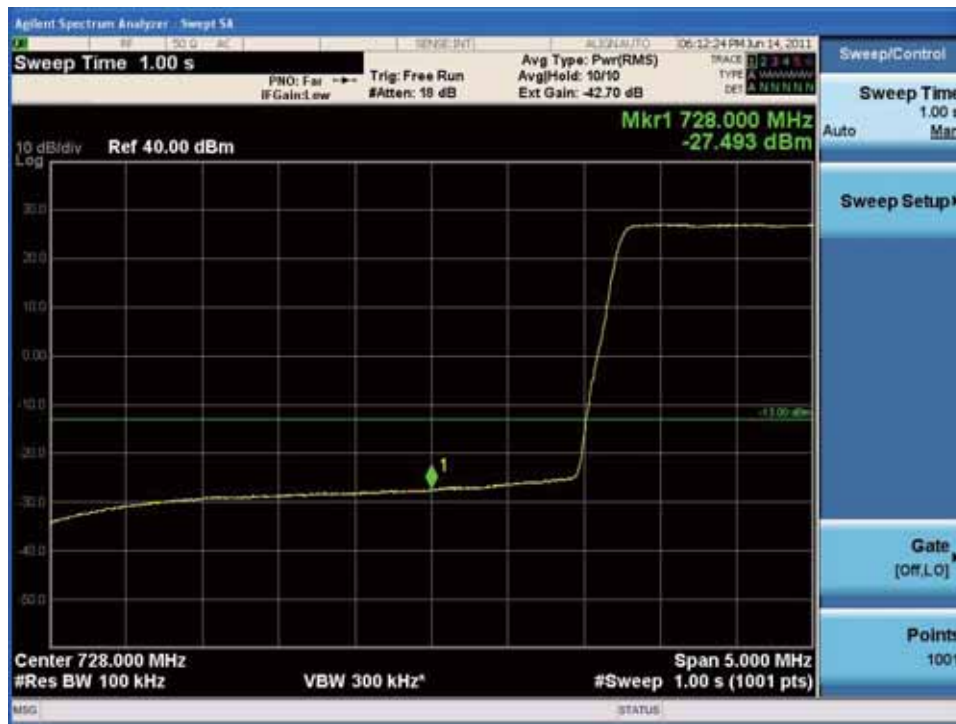


(16QAM High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 38 of 68

(64QAM Low Channel)



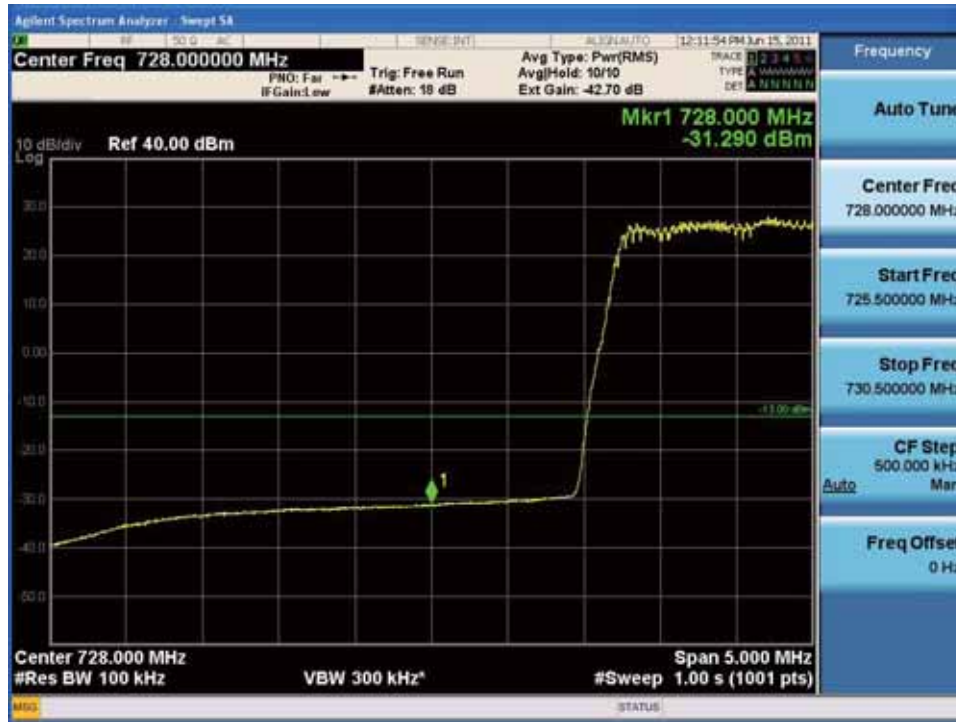
(64QAM High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 39 of 68

7.4.4. Plot Data at Output 1

(QPSK Low Channel)

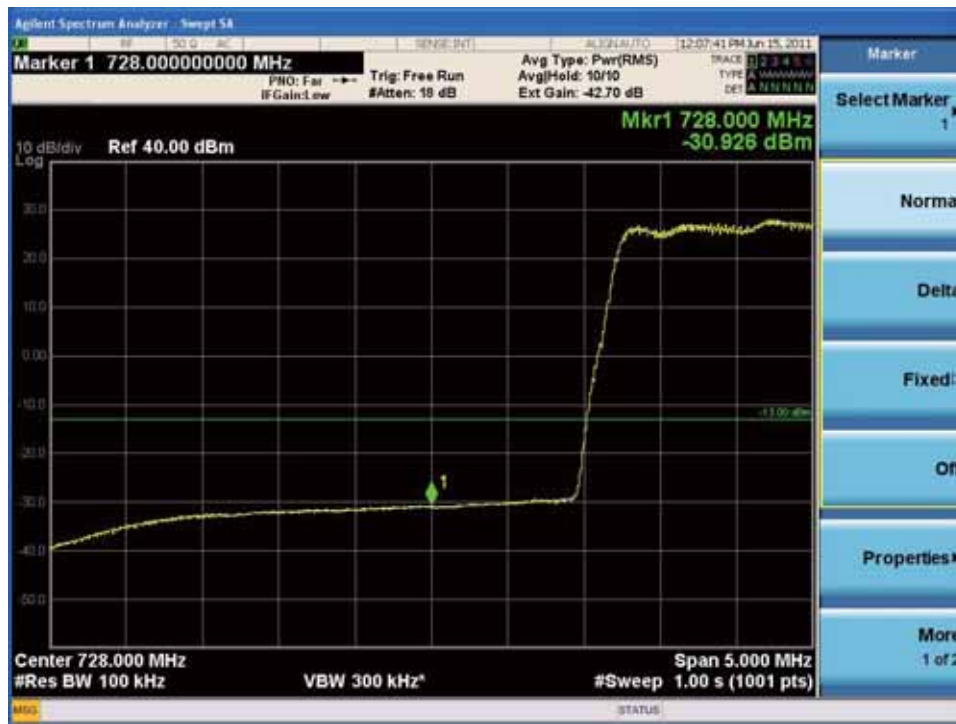


(QPSK High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 40 of 68

(16QAM Low Channel)



(16QAM High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 41 of 68

(64QAM Low Channel)



(64QAM High Channel)



FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 42 of 68

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 Procedure

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

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 measure-and-add $10 \log(N)$ dB the individual transmitter output power.

[$10 \log(2)$ dB = 3 dB]

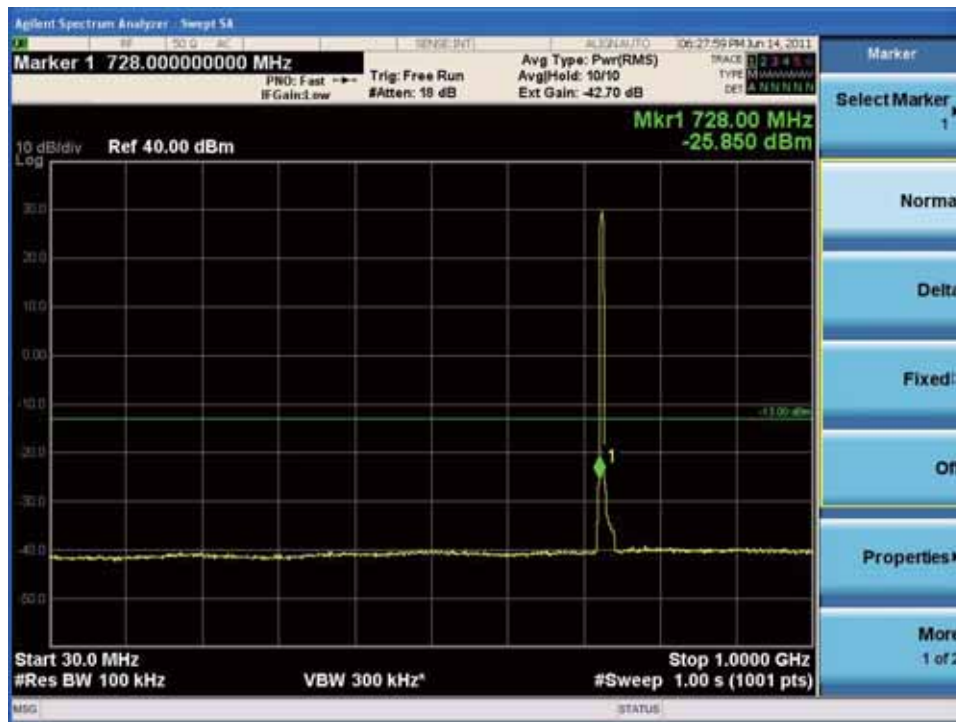
8.3 Environmental Conditions:

Temperature:	23 °C
Relative Humidity:	52 %

8.4. Test Result

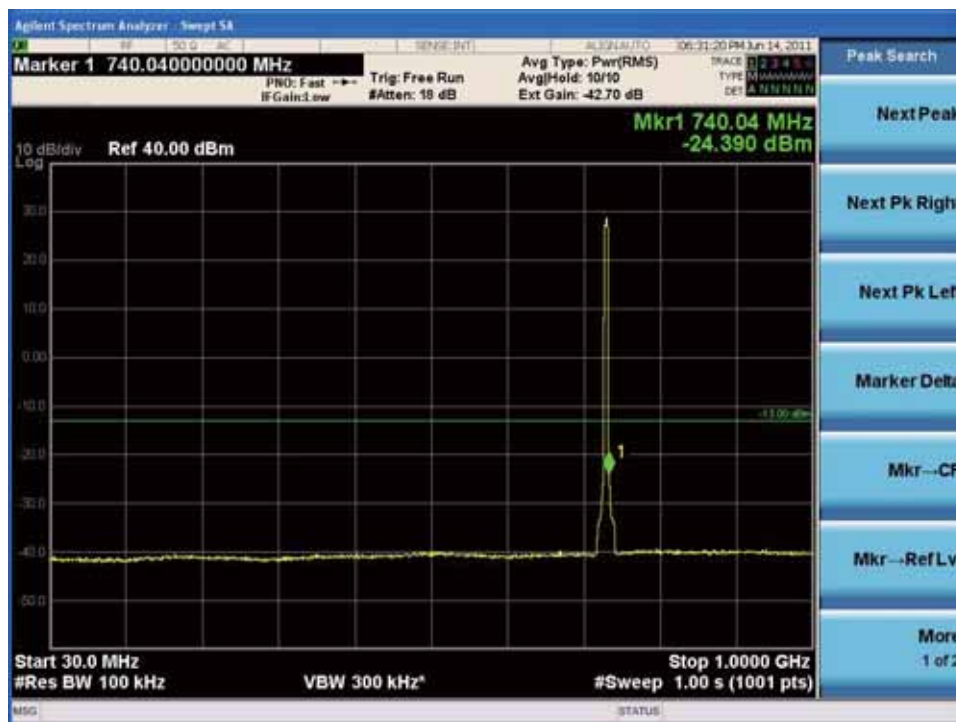
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 43 of 68

8.4.1. Plot Data at Output 0
(QPSK Low Channel)



(30 MHz ~ 1 GHz)

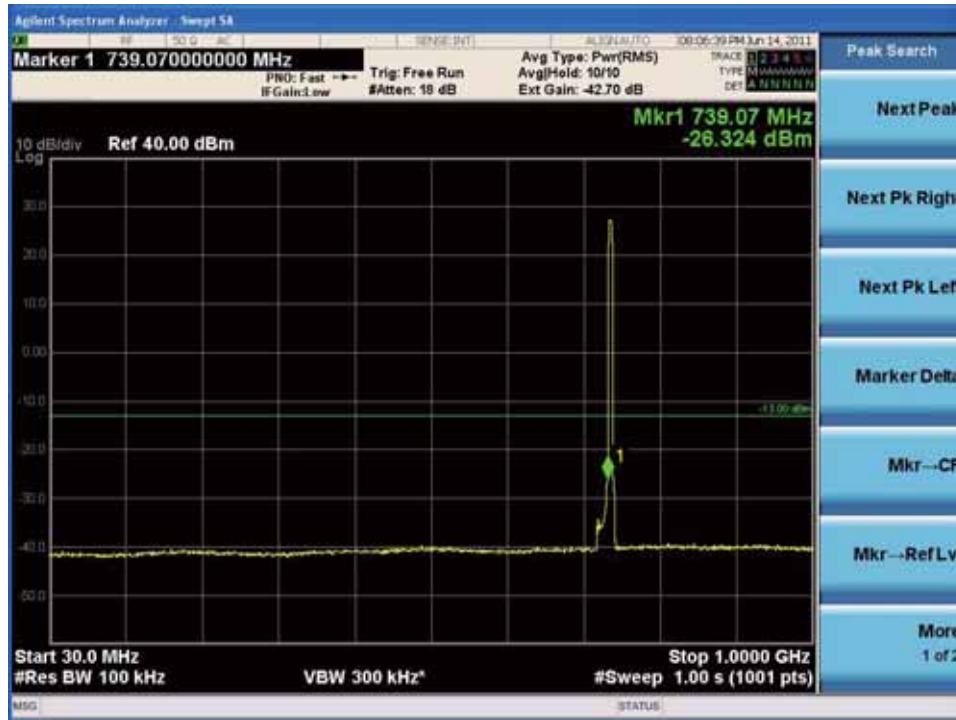
(QPSK Mid Channel)



(30 MHz ~ 1 GHz)

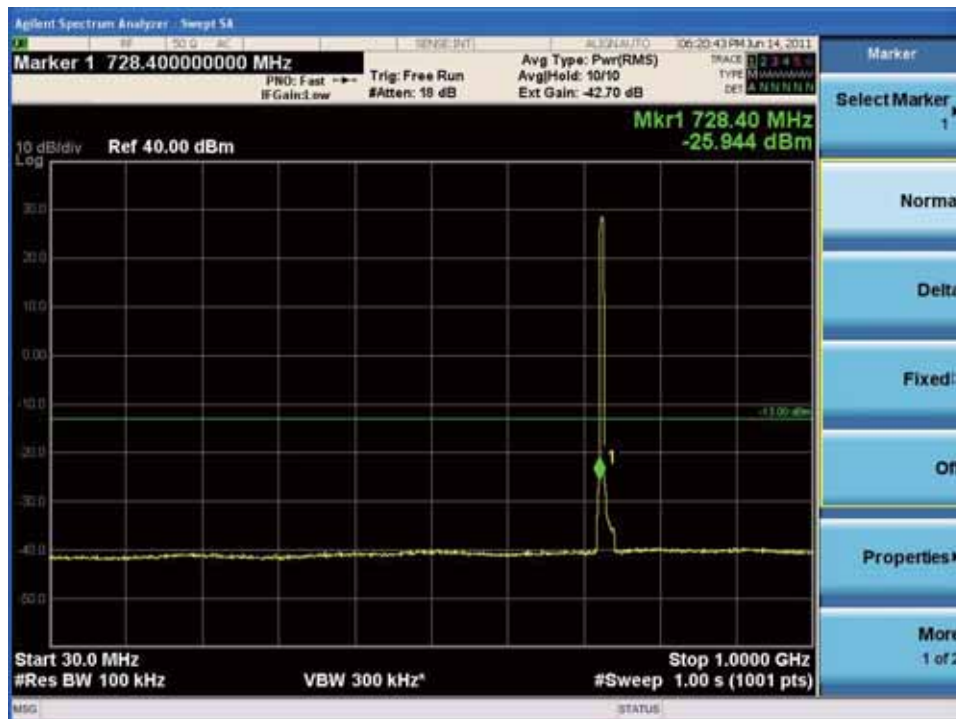
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 44 of 68

(QPSK High Channel)



(30 MHz ~ 1 GHz)

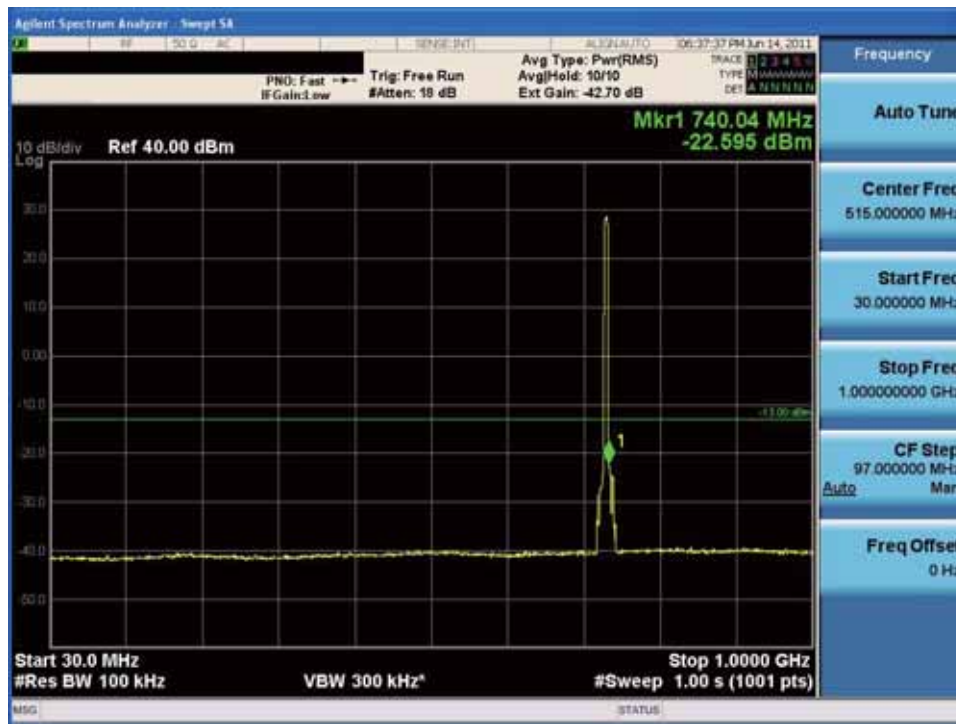
(16QAM Low Channel)



(30 MHz ~ 1 GHz)

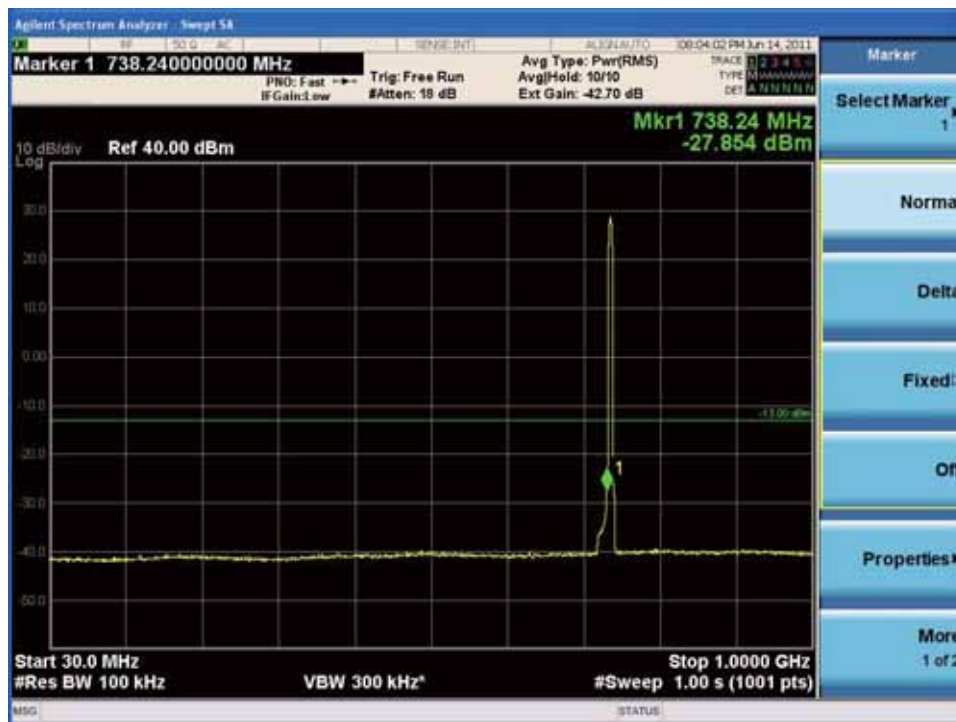
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 45 of 68

(16QAM Mid Channel)



(30 MHz ~ 1 GHz)

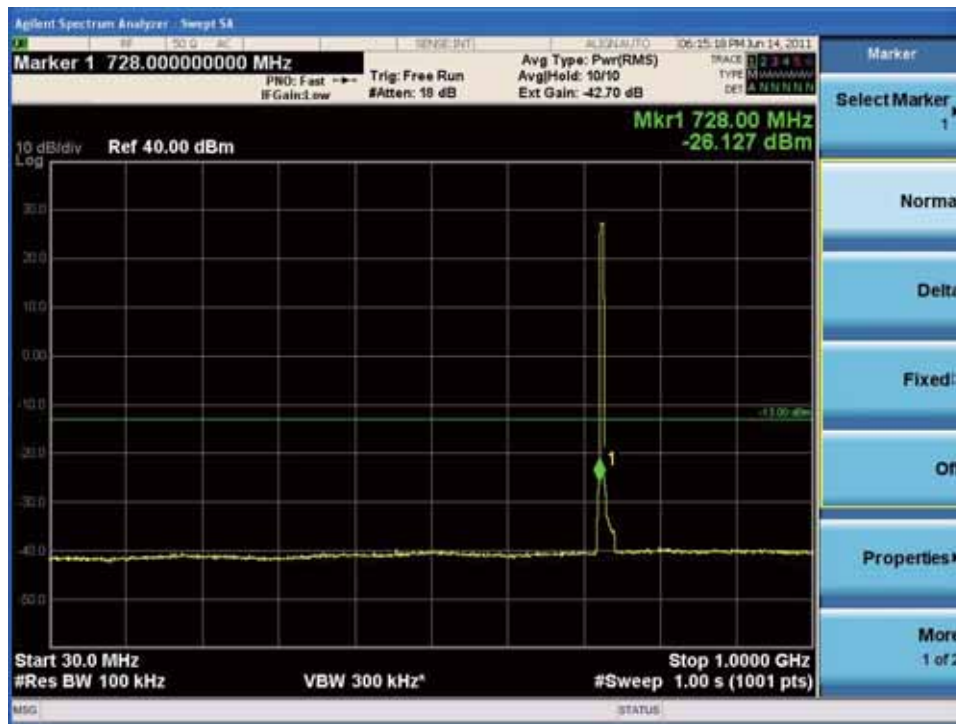
(16QAM High Channel)



(30 MHz ~ 1 GHz)

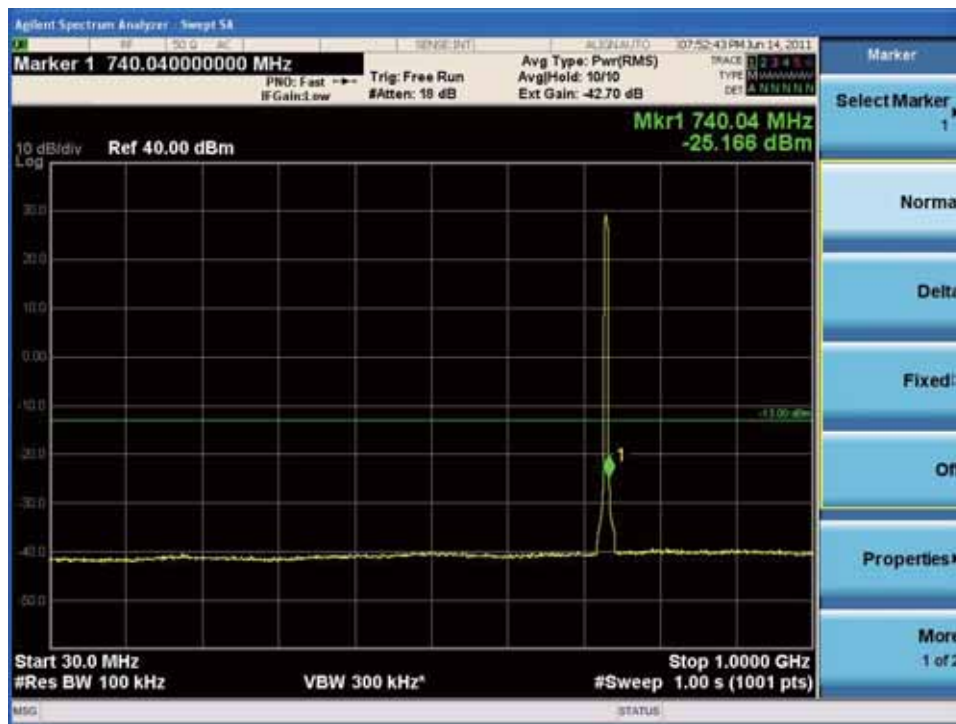
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 46 of 68

(64QAM Low Channel)



(30 MHz ~ 1 GHz)

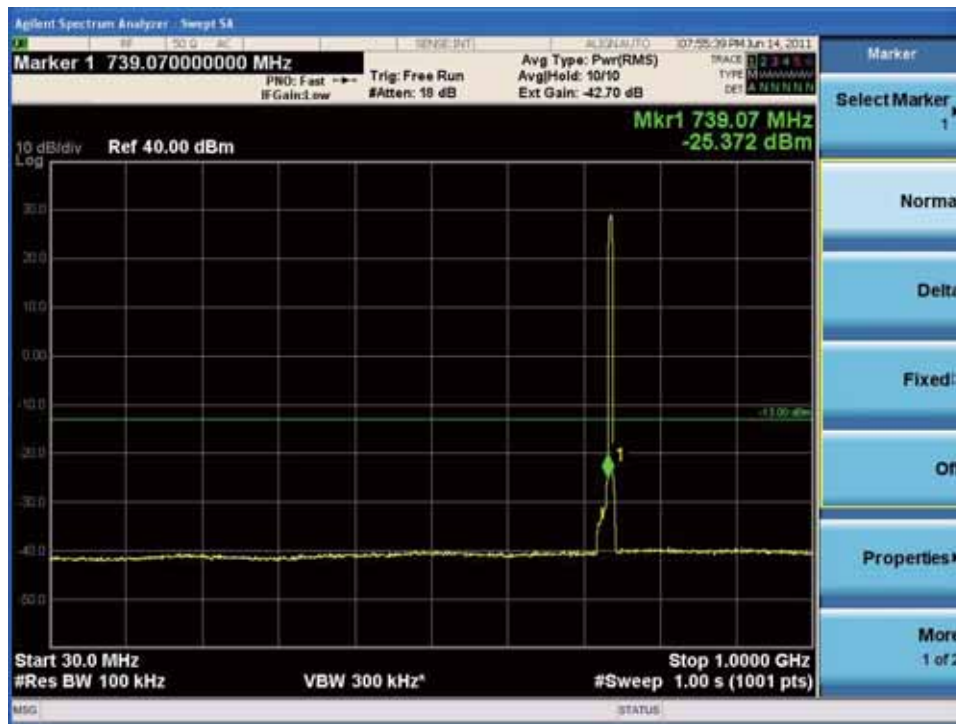
(64QAM Mid Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 47 of 68

(64QAM High Channel)



(30 MHz ~ 1 GHz)

(QPSK Low Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 48 of 68

(QPSK Mid Channel)



(1 GHz ~ 26.5 GHz)

(QPSK High Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 49 of 68

(16QAM Low Channel)



(1 GHz ~ 26.5 GHz)

(16QAM Mid Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 50 of 68

(16QAM High Channel)



(1 GHz ~ 26.5 GHz)

(64QAM Low Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 51 of 68

(64QAM Mid Channel)



(1 GHz ~ 26.5 GHz)

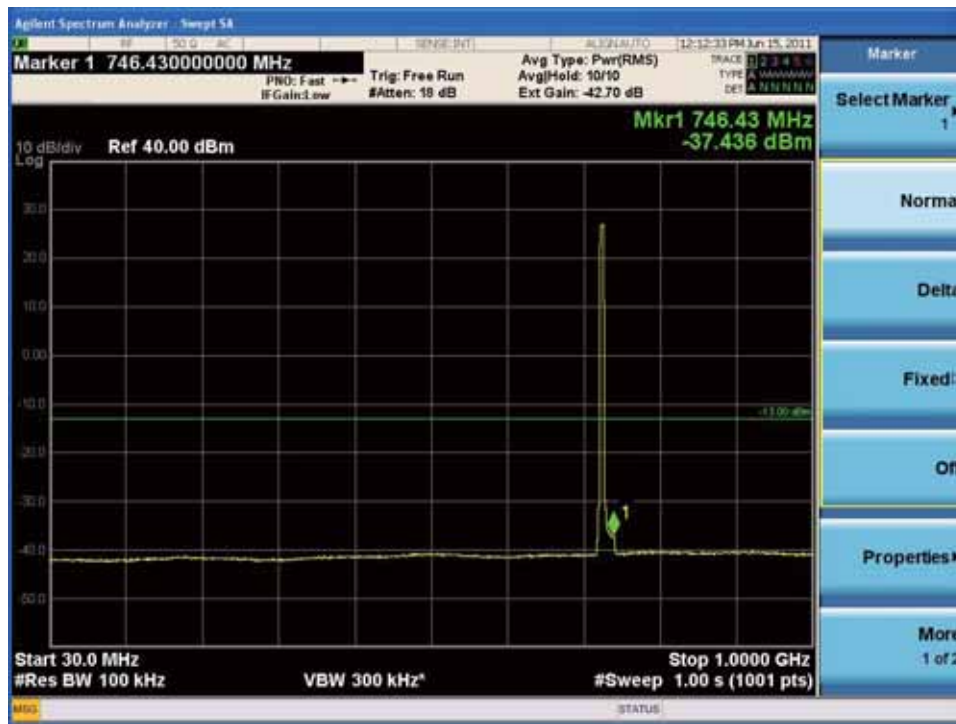
(64QAM High Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 52 of 68

8.4.2. Plot Data at Output 1
(QPSK Low Channel)



(30 MHz ~ 1 GHz)

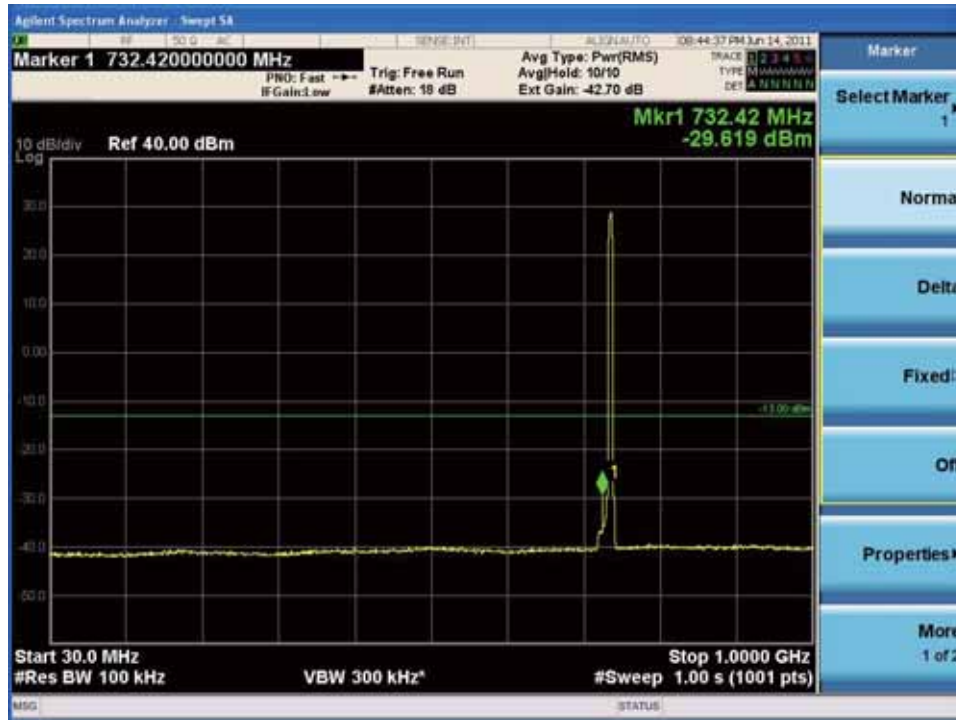
(QPSK Mid Channel)



(30 MHz ~ 1 GHz)

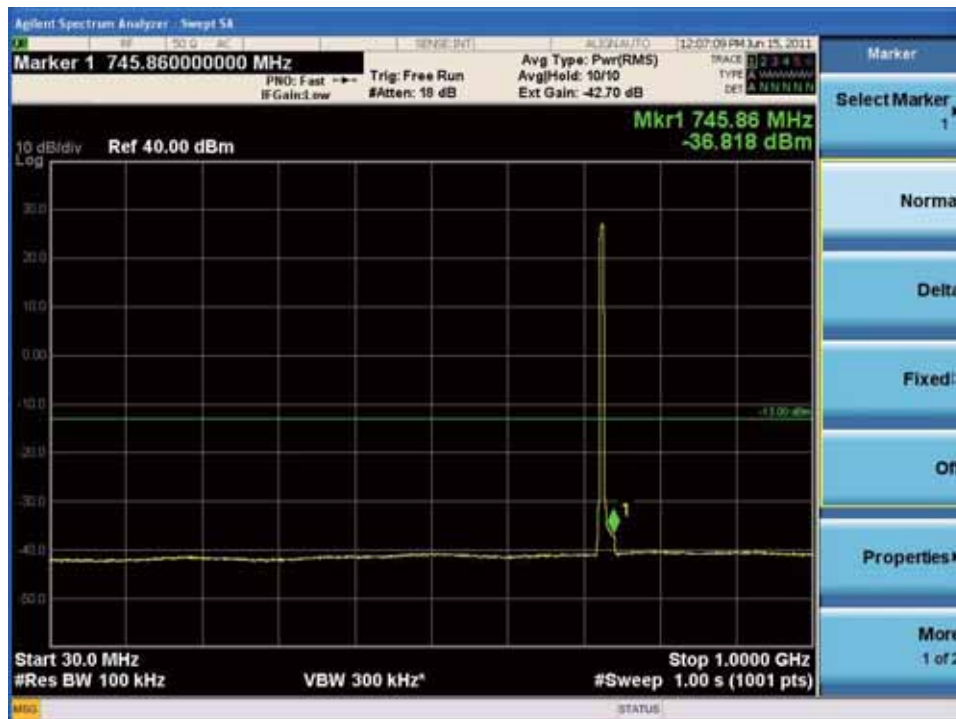
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 53 of 68

(QPSK High Channel)



(30 MHz ~ 1 GHz)

(16QAM Low Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 54 of 68

(16QAM Mid Channel)



(30 MHz ~ 1 GHz)

(16QAM High Channel)



(30 MHz ~ 1 GHz)

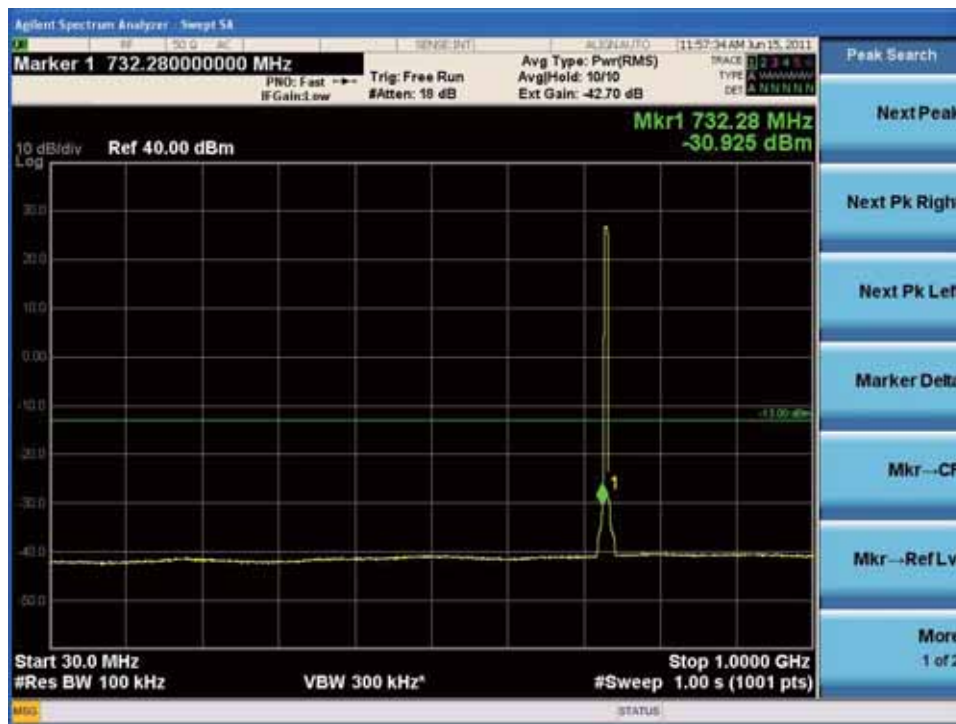
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 55 of 68

(64QAM Low Channel)



(30 MHz ~ 1 GHz)

(64QAM Mid Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 56 of 68

(64QAM High Channel)



(30 MHz ~ 1 GHz)

(QPSK Low Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 57 of 68

(QPSK Mid Channel)



(1 GHz ~ 26.5 GHz)

(QPSK High Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 58 of 68

(16QAM Low Channel)



(1 GHz ~ 26.5 GHz)

(16QAM Mid Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 59 of 68

(16QAM High Channel)



(1 GHz ~ 26.5 GHz)

(64QAM Low Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 60 of 68

(64QAM Mid Channel)



(1 GHz ~ 26.5 GHz)

(64QAM High Channel)



(1 GHz ~ 26.5 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 61 of 68

(Measure and add $10\log(N)$ data)

Modulation	Channel	Frequency	Measured data (dBm)		$10*\log(N)$ N=2	Measure and sum (dBm)	
			30 MHz ~ 1 GHz	1 GHz ~ 26.5 GHz		30 MHz ~ 1 GHz	1 GHz ~ 26.5 GHz
QPSK	Low	731.5	-25.850	-18.932	3.010	-19.830	-12.912
	Middle	737.0	-24.390	-18.943		-18.370	-12.923
	High	742.5	-26.324	-18.917		-20.304	-12.897
16QAM	Low	731.5	-25.944	-19.008		-19.924	-12.988
	Middle	737.0	-22.595	-18.890		-16.575	-12.870
	High	742.5	-27.854	-18.838		-21.834	-12.818
64QAM	Low	731.5	-26.127	-18.930		-20.107	-12.910
	Middle	737.0	-25.166	-18.998		-19.146	-12.978
	High	742.5	-25.372	-18.968		-19.352	-12.948

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 Procedure

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

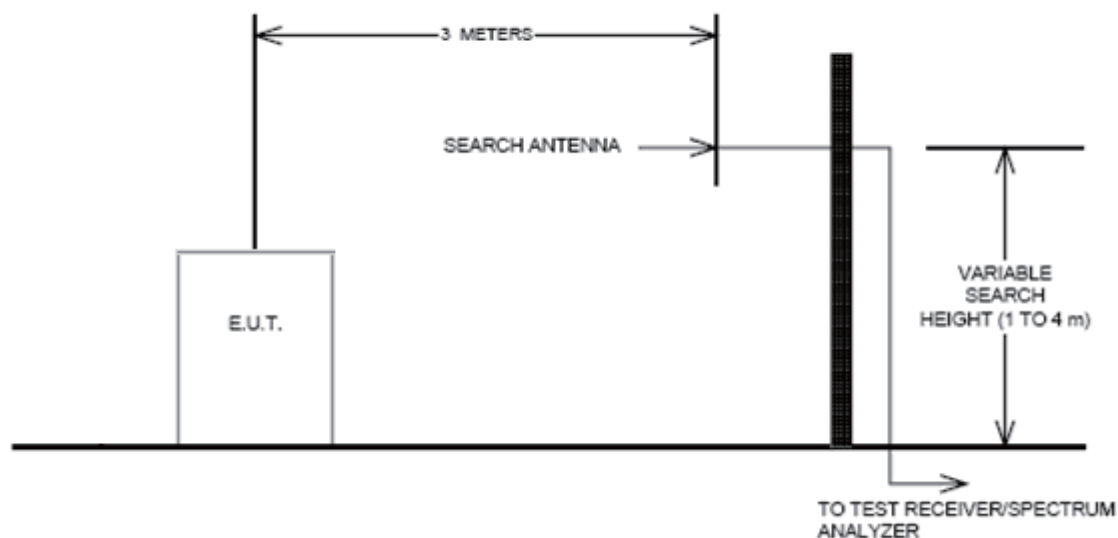
The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360⁰ and the receiving antenna scanned 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

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 63 of 68



9.3.Environmental Conditions:

Temperature:	23 °C
Relative Humidity:	52 %

9.4 Test Result

Frequency	Freq.(MHz)	Substitute Level [dBm]	Ant. Gain (dBd)	C.L	Pol.	ERP (dBm)	Margin (dB)
737.0	1474.0	-48.70	6.05	4.65	V	-47.30	-34.30
	2211.0	-48.30	8.03	5.99	V	-46.26	-33.26
	2948.0	-47.90	8.88	7.08	V	-46.10	-33.10

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT				www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 64 of 68	

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 Procedure

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. Environmental conditions

Temperature:	24 ° C
Relative Humidity:	51 %

10.4. Test Result

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 65 of 68

Modulation: 64QAM
Reference: - 48 Vdc at 20 °C Freq. = 737.0 MHz

Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	736 999 983	-17	0	0.0000
	-30	736 999 982	-18	-1	-0.0015
	-20	736 999 983	-17	0	0.0000
	-10	736 999 981	-19	-2	-0.0027
	0	736 999 986	-14	3	0.0041
	+10	736 999 983	-17	0	0.0000
	+30	736 999 982	-18	-1	-0.0014
	+40	736 999 981	-19	-2	-0.0027
	+50	736 999 983	-17	0	0.0000
115%	+20	736 999 983	-17	0	0.0000
85%	+20	736 999 982	-18	-1	-0.0014

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

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1107FR01	Issue Dates: July 04, 2011	EUT Type: Remote Radio Head	FCC ID: A3LSLS-2C40680700	Page 67 of 68

3. RESULTS

Max Peak output Power at antenna input terminal	46.160	dBm
Max Peak output Power at antenna input terminal	41304.750	mW
Prediction distance	900.000	cm
Prediction frequency	731.5000	MHz
Antenna Gain(typical)	19.800	dBi
Antenna Gain(numeric)	95.499	—
Power density at prediction frequency(S)	0.388	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.488	mW/cm ²

The power density level at 900 cm is 0.388 mW/cm², which is below the uncontrolled exposure limit of 0.488 mW/cm² at 731.5 MHz.