



FCC PART 27



TEST AND MEASUREMENT REPORT

For

ADC Telecommunications Inc.

P.O. Box 1101, Minneapolis, MN 55440-1101, USA

FCC ID: NOO-F0687-012

Report Type: Original Report	Product Type: Remote Access Unit for InterReach Fusion System
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TABLE OF CONTENTS

1	GENERAL DESCRIPTION	5
1.1	PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	5
1.2	MECHANICAL DESCRIPTION	5
1.3	OBJECTIVE.....	5
1.4	RELATED SUBMITTAL(S)/GRANT(S).....	5
1.5	TEST METHODOLOGY	5
1.6	MEASUREMENT UNCERTAINTY.....	6
1.7	TEST FACILITY.....	6
2	EUT TEST CONFIGURATION.....	7
2.1	JUSTIFICATION.....	7
2.2	EUT EXERCISE SOFTWARE.....	7
2.3	EQUIPMENT MODIFICATIONS	7
2.4	SPECIAL EQUIPMENT	7
2.5	LOCAL SUPPORT EQUIPMENT.....	7
2.6	EUT INTERNAL CONFIGURATION DETAILS.....	7
2.7	EXTERNAL I/O CABLING LIST AND DETAILS	7
2.8	TEST SETUP BLOCK DIAGRAM.....	8
3	SUMMARY OF TEST RESULTS.....	9
4	FCC §2.1046 & §27.50 – RF OUTPUT POWER.....	10
4.1	APPLICABLE STANDARD	10
4.2	TEST PROCEDURE	10
4.3	TEST EQUIPMENT LIST AND DETAILS	10
4.4	TEST ENVIRONMENTAL CONDITIONS.....	10
4.5	TEST RESULTS	10
5	FCC §2.1049 & §27.53 – OCCUPIED BANDWIDTH.....	13
5.1	APPLICABLE STANDARD	13
5.2	TEST PROCEDURE	13
5.3	TEST EQUIPMENT LIST AND DETAILS	13
5.4	TEST ENVIRONMENTAL CONDITIONS.....	13
5.5	TEST RESULTS	14
6	FCC §2.1053 & §27.53 - SPURIOUS RADIATED EMISSIONS.....	30
6.1	APPLICABLE STANDARD.....	30
6.2	TEST PROCEDURE	30
6.3	TEST EQUIPMENT LIST AND DETAILS	30
6.4	TEST ENVIRONMENTAL CONDITIONS.....	31
6.5	TEST RESULTS	31
7	FCC §2.1051 & §27.53 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS.....	32
7.1	APPLICABLE STANDARD	32
7.2	TEST PROCEDURE	32
7.3	TEST EQUIPMENT LIST AND DETAILS	32
7.4	TEST ENVIRONMENTAL CONDITIONS.....	32
7.5	TEST RESULTS	32
8	FCC §27.53 – BAND EDGE.....	37
8.1	APPLICABLE STANDARD.....	37
8.2	TEST PROCEDURE	37

8.3	TEST EQUIPMENT LIST AND DETAILS	37
8.4	TEST ENVIRONMENTAL CONDITIONS	37
8.5	TEST RESULTS	37
9	FCC §2.1055 & §27.54 – FREQUENCY STABILITY.....	51
9.1	APPLICABLE STANDARD	51
9.2	TEST PROCEDURE	51
9.3	TEST EQUIPMENT LIST AND DETAILS	51
9.4	TEST ENVIRONMENTAL CONDITIONS	51
9.5	TEST RESULTS	52
10	FCC §1.1307(B)(1) & §2.1091 – RF EXPOSURE INFORMATION.....	53
10.1	APPLICABLE STANDARD	53
10.2	MPE PREDICTION	53
11	EXHIBIT A - FCC ID LABELING REQUIREMENTS	54
11.1	FCC ID LABEL REQUIREMENTS.....	54
11.2	FCC ID LABEL CONTENTS	54
11.3	FCC LABEL LOCATION ON EUT	54
12	EXHIBIT B - TEST SETUP PHOTOGRAPHS.....	55
12.1	RADIATED EMISSIONS - FRONT VIEW (BELOW 1 GHZ).....	55
12.2	RADIATED EMISSIONS - REAR VIEW (BELOW 1 GHZ).....	55
12.3	RADIATED EMISSIONS - FRONT VIEW (ABOVE 1 GHZ).....	56
12.4	RADIATED EMISSIONS - REAR VIEW (ABOVE 1 GHZ).....	56
13	EXHIBIT C – EUT PHOTOGRAPHS.....	57
13.1	EUT - TOP VIEW.....	57
13.2	EUT - BOTTOM VIEW	57
13.3	EUT - FRONT VIEW	58
13.4	EUT - REAR VIEW	58
13.5	EUT – PCB BOARD COMPONENT VIEW	59
13.6	EUT – PCB BOARD SOLDER VIEW	59

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1205314-27	Original Report	2012-06-19

1 General Description

1.1 Product Description for Equipment under Test (EUT)

The ADC Telecommunications Inc. product, FCC ID: NOO-F0687-012, Model FSN-W2-7070-1 or the "EUT" as referred to in this report, is a RAU for Indoor Booster. It is Indoor Wireless Repeater System. The system consists three modular components, the Main Hub (model number: FSN-W2-MH-3), Expansion Hub (model: FSN-W1-EH-2) and RAU - EUT (model: FSN-W2-7070-1). For RAU the downlink frequency band is 728-746 MHz.

1.2 Mechanical Description

The EUT dimension is approximately 28.1cm (L) x 28.6cm (W) x 5.4cm (H) and weighs approximately 2.1 kg.

The test data gathered are from production sample. Serial number: MR221U6J, provided by ADC Telecommunications Inc.

1.3 Objective

This type approval report is prepared on behalf of ADC Telecommunications Inc. in accordance with Part 2, Part 27 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for RF output power, modulation characteristic, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation, frequency stability, band edge, and conducted and radiated margin.

1.4 Related Submittal(s)/Grant(s)

NA

1.5 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following part:

Part 27 - Miscellaneous Wireless Communications Services

Applicable Standards: TIA/EIA 603-C

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2003, The Treatment of Uncertainty in EMC Measurements, the values ranging from ± 2.0 dB for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at <http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionId=8430d44f1f47cf2996124343c704b367816b>

2 EUT Test Configuration

2.1 Justification

The EUT was configured for testing according to TIA/EIA-603-C.

The final qualification test was performed with the EUT operating at normal mode.

2.2 EUT Exercise Software

N/A.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Special Equipment

No special equipment used during testing.

2.5 Local Support Equipment

Manufacturers	Descriptions	Models	Serial Number
ADC Telecommunications Inc.	Main Hub	FSN-W2-MH-3	-
ADC Telecommunications Inc.	Expansion Hub	FSN-W1-EH-2	-

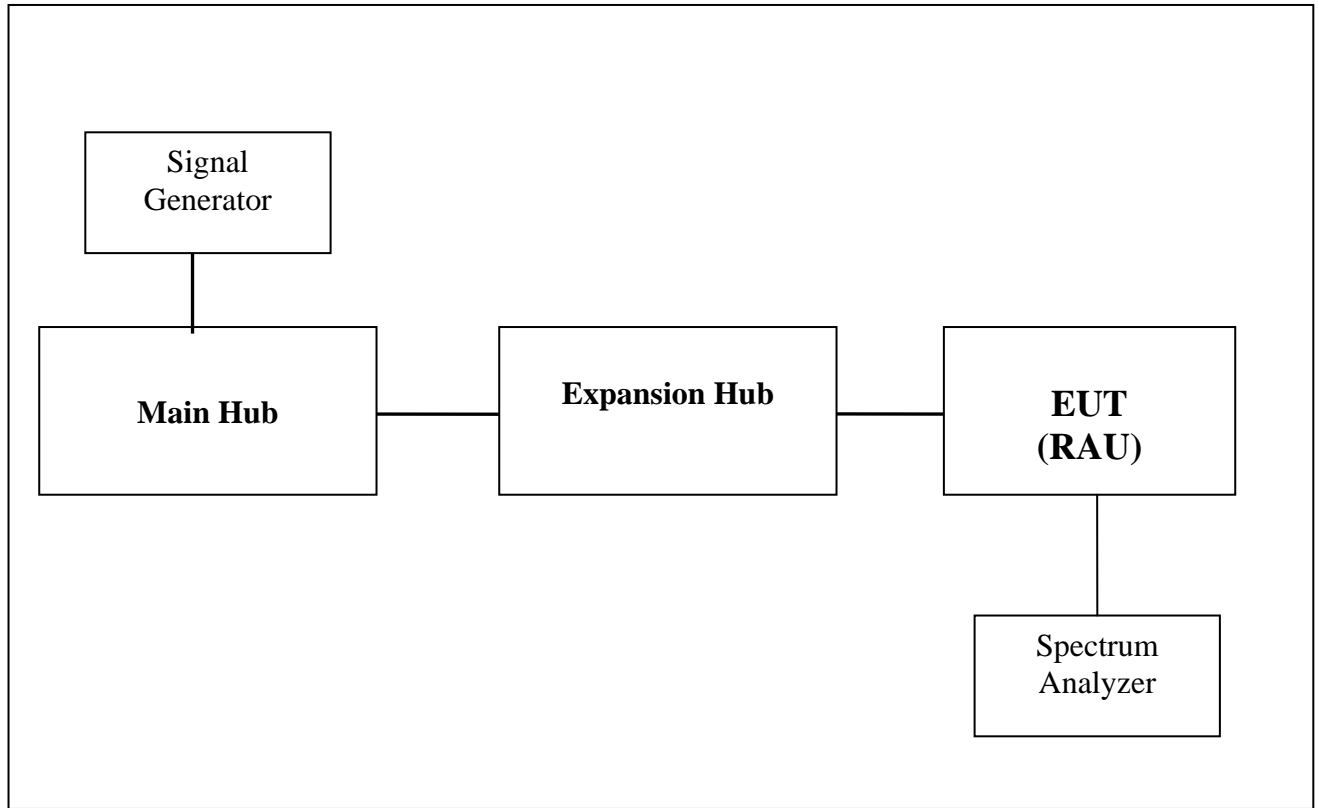
2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
ADC Telecommunications Inc.	PCB Board	MR221U6J	-

2.7 External I/O Cabling List and Details

Cable Descriptions	Length (m)	From	To
Shielded Detachable K/B Cable	150	Expansion Hub	RAU (EUT)
Fiber Cable	2.0	Main Hub	Expansion Hub

2.8 Test Setup Block Diagram



3 Summary of Test Results

FCC Rules	Description of Tests	Results
§2.1046 §27.50	RF Output Power	Compliant
§2.1047	Modulation Characteristics	N/A
§2.1049 §27.53 (c)	Occupied Bandwidth / Out of Band Emissions	Compliant
§2.1053 §27.53 (c)	Field Strength of Spurious Radiation	Compliant
§2.1051 §27.53 (c)	Spurious Emissions at Antenna Terminals	Compliant
§27.53 (c)	Band Edge	Compliant
§2.1055 §27.54	Frequency Stability	Compliant
§2.1091	RF Exposure Information	Compliant

4 FCC §2.1046 & §27.50 – RF Output Power

4.1 Applicable Standard

According to FCC §27.50, the maximum effective radiated power (ERP) of fixed and base station must not exceed 1000 Watts.

4.2 Test Procedure

Conducted:

The RF output of the transmitter was connected to the signal generator and the spectrum analyzer through sufficient attenuation.

4.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09 ¹
Agilent	Signal Generator	E4438C	MY45091309	2012-05-03

Note 1: Based on a two year calibration cycle.

Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

4.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	57 %
ATM Pressure:	101.4kPa

The testing was performed by Ning Ma from 2012-06-01 at RF Site.

4.5 Test Results

Maximum Output Power – Modulated Signal

For Port: 700ABC-1

WCDMA/HSPA

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
WCDMA/HSPA	Downlink	Low	730.4	5	19.45
		Middle	737	5	20.85
		High	743.6	5	19.35

LTE

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
LTE Downlink	QPSK (1.4 MHz)	729	5	19.18
	QPSK (1.4 MHz)	737	5	20.37
	QPSK (1.4 MHz)	745	5	19.01
	16QAM (1.4 MHz)	729	5	19.09
	16QAM (1.4 MHz)	737	5	20.27
	16QAM (1.4 MHz)	745	5	18.98
	64QAM (1.4 MHz)	729	5	19.01
	64QAM (1.4 MHz)	737	5	20.18
	64QAM (1.4 MHz)	745	5	18.98
	QPSK (3 MHz)	730	5	19.40
	QPSK (3 MHz)	737	5	20.54
	QPSK (3 MHz)	744	5	19.06
	16QAM (3 MHz)	730	5	19.43
	16QAM (3 MHz)	737	5	20.56
	16QAM (3 MHz)	744	5	19.07
	64QAM (3 MHz)	730	5	19.40
	64QAM (3 MHz)	737	5	20.53
	64QAM (3 MHz)	744	5	19.04
	QPSK (5 MHz)	731	5	19.49
	QPSK (5 MHz)	737	5	20.54
	QPSK (5 MHz)	743	5	19.56
	16QAM (5 MHz)	731	5	19.48
	16QAM (5 MHz)	737	5	20.52
	16QAM (5 MHz)	743	5	19.55
	64QAM (5 MHz)	731	5	19.49
	64QAM (5 MHz)	737	5	20.54
	64QAM (5 MHz)	743	5	19.57
	QPSK (10 MHz)	733	5	19.89
	QPSK (10 MHz)	741	5	20.19
	16QAM (10 MHz)	733	5	19.89
	16QAM (10 MHz)	741	5	20.19
	64QAM (10 MHz)	733	5	19.89
64QAM (10 MHz)	741	5	20.19	

For Port: 700ABC-2**WCDMA/HSPA**

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
WCDMA/HSPA	Downlink	Low	730.4	6	20.6
		Middle	737	6	21.14
		High	743.6	6	20.37

LTE

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
LTE Downlink	QPSK (1.4 MHz)	729	7	21.53
	QPSK (1.4 MHz)	737	7	21.99
	QPSK (1.4 MHz)	745	7	20.79
	16QAM (1.4 MHz)	729	7	21.51
	16QAM (1.4 MHz)	737	7	22.00
	16QAM (1.4 MHz)	745	7	20.71
	64QAM (1.4 MHz)	729	7	21.47
	64QAM (1.4 MHz)	737	7	21.95
	64QAM (1.4 MHz)	745	7	20.71
	QPSK (3 MHz)	730	7	21.47
	QPSK (3 MHz)	737	7	22.00
	QPSK (3 MHz)	744	7	21.12
	16QAM (3 MHz)	730	7	21.49
	16QAM (3 MHz)	737	7	22.01
	16QAM (3 MHz)	744	7	21.00
	64QAM (3 MHz)	730	7	21.48
	64QAM (3 MHz)	737	7	22.03
	64QAM (3 MHz)	744	7	21.12
	QPSK (5 MHz)	731	7	21.46
	QPSK (5 MHz)	737	7	21.99
	QPSK (5 MHz)	743	7	21.43
	16QAM (5 MHz)	731	7	21.43
	16QAM (5 MHz)	737	7	21.97
	16QAM (5 MHz)	743	7	21.37
	64QAM (5 MHz)	731	7	21.48
	64QAM (5 MHz)	737	7	21.94
	64QAM (5 MHz)	743	7	21.40
	QPSK (10 MHz)	733	7	21.73
	QPSK (10 MHz)	741	7	21.73
	16QAM (10 MHz)	733	7	27.68
	16QAM (10 MHz)	741	7	21.67
	64QAM (10 MHz)	733	7	21.69
64QAM (10 MHz)	741	7	21.72	

5 FCC §2.1049 & §27.53 – Occupied Bandwidth

5.1 Applicable Standard

Requirements: FCC §2.1049 and §27.53.

5.2 Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 30 kHz (Cellular/PCS) and the 26 dB & 99% bandwidth was recorded.

5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09 ¹
Agilent	Signal Generator	E4438C	MY45091309	2012-05-03

Note 1: Based on a two year calibration cycle.

Statement of Traceability: BACL Corp. attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

5.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	57 %
ATM Pressure:	101.4kPa

The testing was performed by Wei Sun from 2012-06-04 at RF Site.

5.5 Test Results

For Port: 700ABC-1

WCDMA/HSPA

Mode		Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
WCDMA/HSPA	Downlink	737	4.1488	4.1692

LTE

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
LTE Downlink	QPSK (1.4 MHz)	737	1.0962	1.0936
	16QAM (1.4 MHz)	737	1.0936	1.0987
	64QAM (1.4 MHz)	737	1.0930	1.0971
	QPSK (3 MHz)	737	2.6923	2.6953
	16QAM (3 MHz)	737	2.6965	2.6918
	64QAM (3 MHz)	737	2.6956	2.6953
	QPSK (5 MHz)	737	4.4725	4.4765
	16QAM (5 MHz)	737	4.4854	4.4831
	64QAM (5 MHz)	737	4.4848	4.4833
	QPSK (10 MHz)	737	8.9492	8.9391
	16QAM (10 MHz)	737	8.9476	8.9262
	64QAM (10 MHz)	737	8.9572	8.9477

For Port: 700ABC-2**WCDMA/HSPA**

Mode		Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
WCDMA/HSPA	Downlink	737	4.1488	4.1389

LTE

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
LTE Downlink	QPSK (1.4 MHz)	737	1.0962	1.0959
	16QAM (1.4 MHz)	737	1.0936	1.1009
	64QAM (1.4 MHz)	737	1.0930	1.0969
	QPSK (3 MHz)	737	2.6923	2.6930
	16QAM (3 MHz)	737	2.6965	2.7056
	64QAM (3 MHz)	737	2.6956	2.6982
	QPSK (5 MHz)	737	4.4725	4.4892
	16QAM (5 MHz)	737	4.4854	4.5210
	64QAM (5 MHz)	737	4.4848	4.4836
	QPSK (10 MHz)	737	8.9492	8.9470
	16QAM (10 MHz)	737	8.9476	8.9377
	64QAM (10 MHz)	737	8.9572	8.9345

Please refer to the following plots.

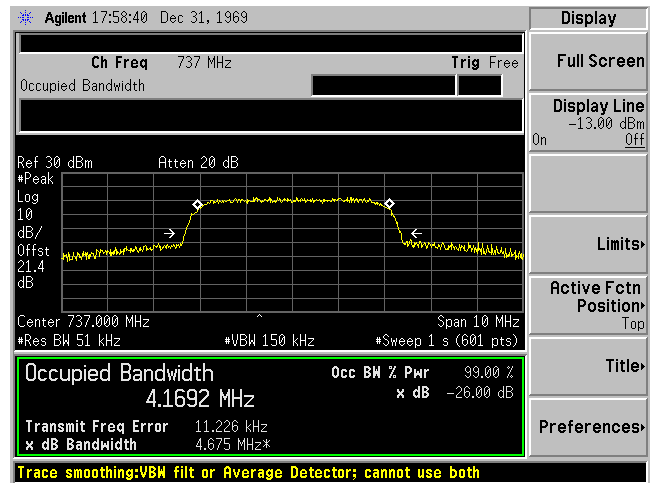
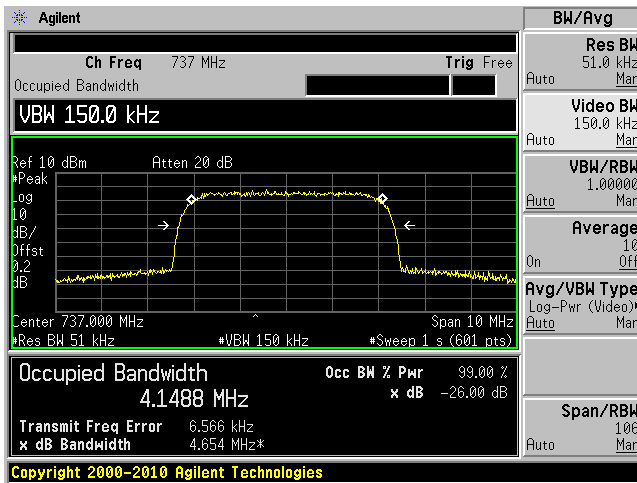
For Port: 700 ABC-1

WCDMA/HSPA

WCDMA/HSPA (Middle Channel)

Input

Output

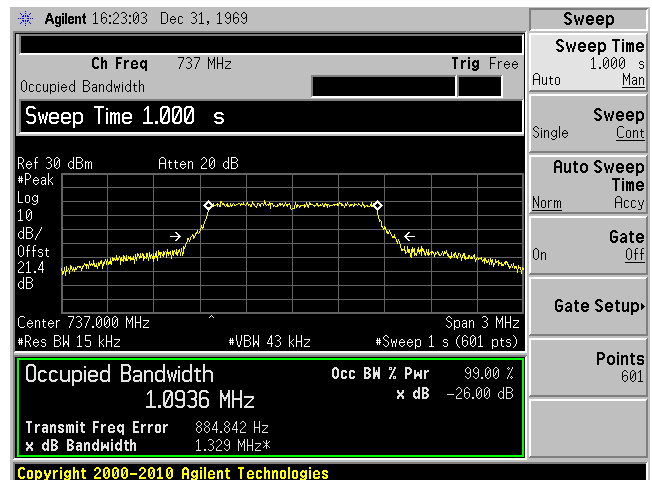
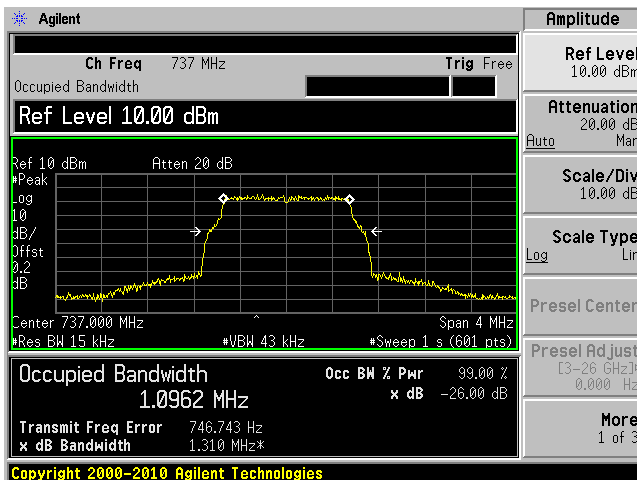


LTE; DL: 728-7746 MHz

QPSK (1.4 MHz), (Middle Channel)

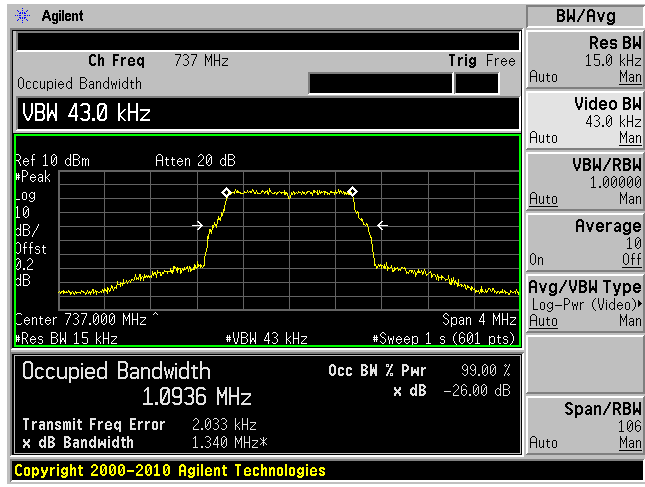
Input

Output

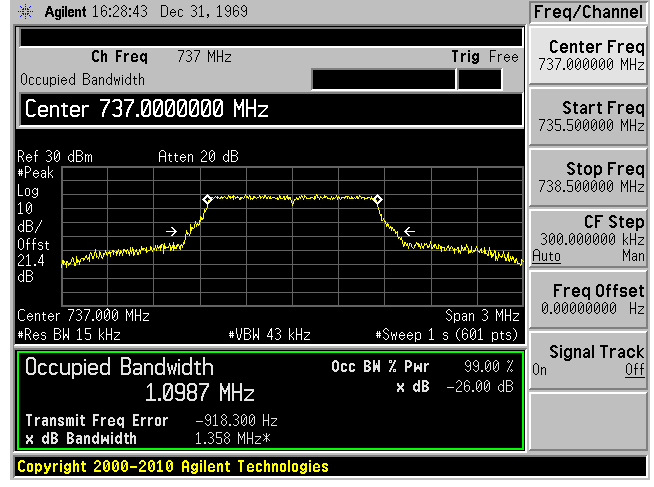


16QAM (1.4 MHz), (Middle Channel)

Input

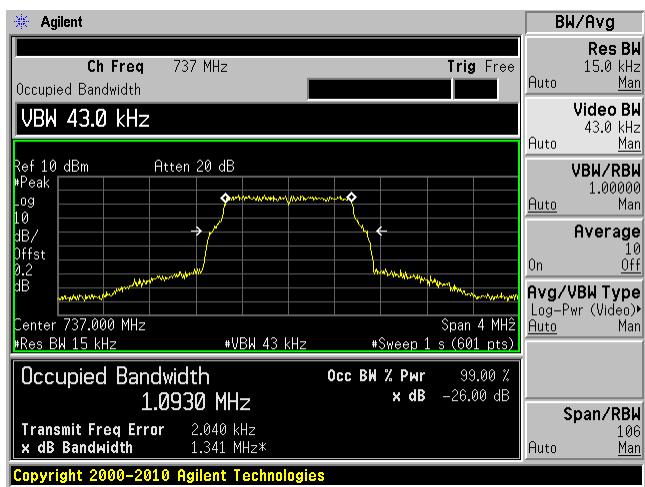


Output

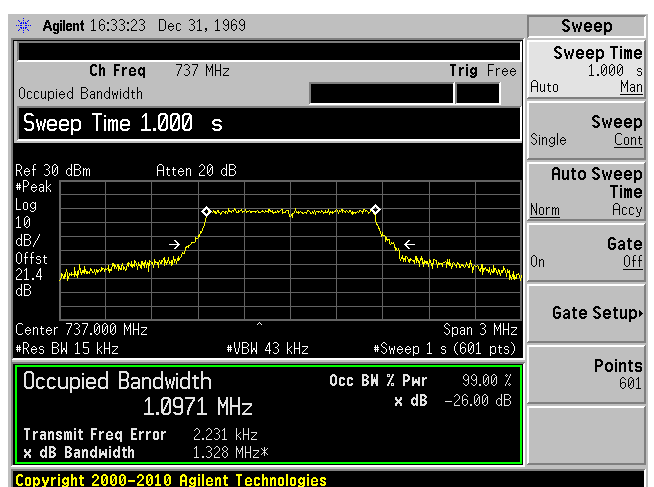


64QAM (1.4 MHz), (Middle Channel)

Input

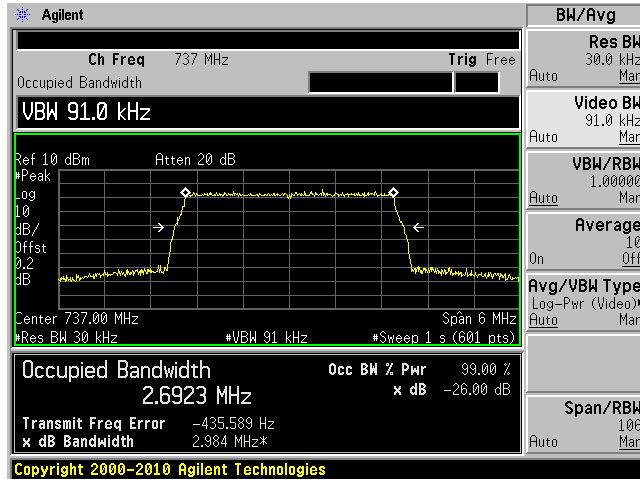


Output

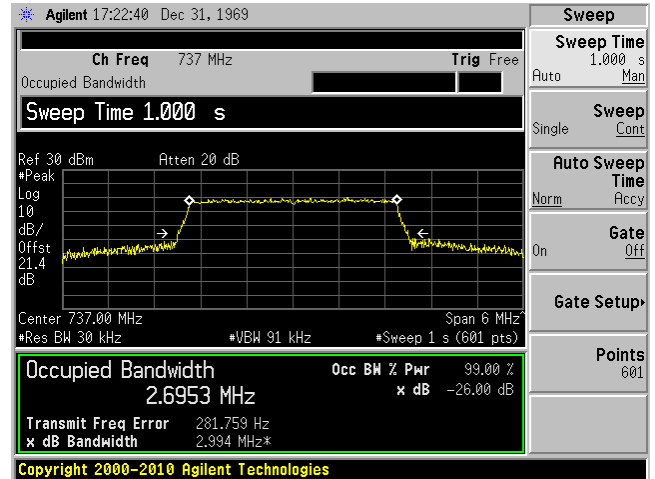


QPSK (3 MHz), (Middle Channel)

Input

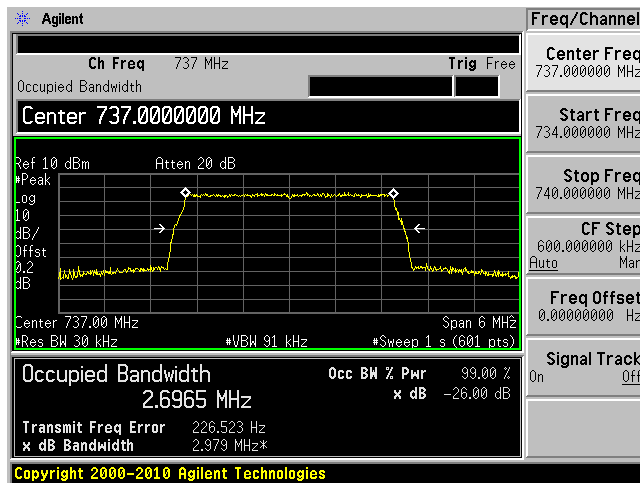


Output

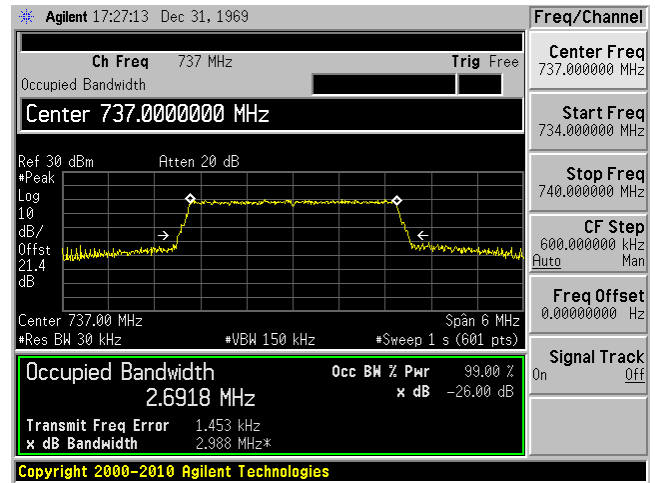


16QAM (3 MHz), (Middle Channel)

Input

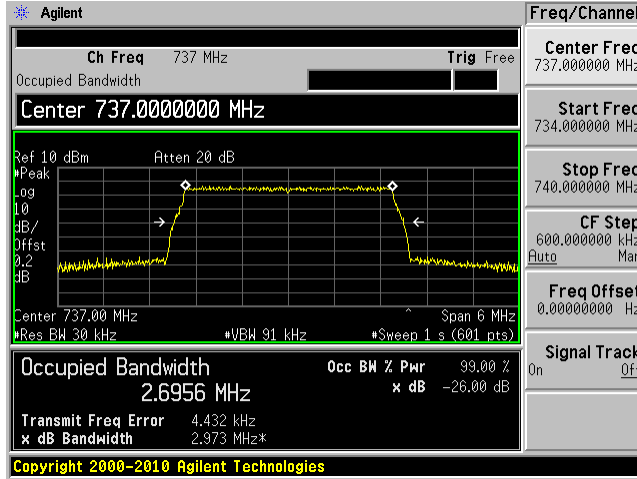


Output

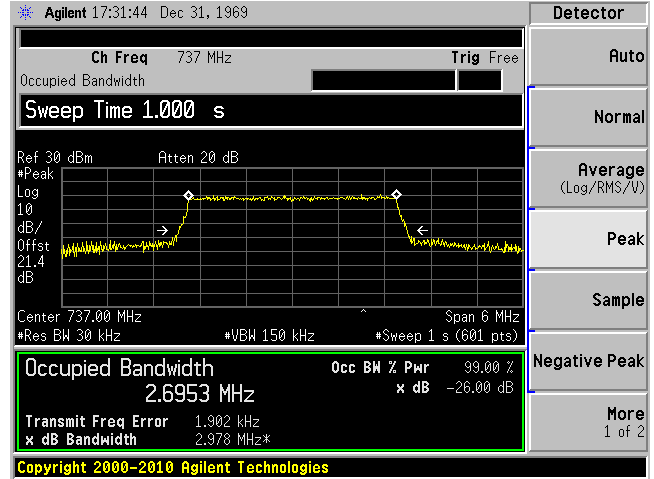


64QAM (3 MHz), (Middle Channel)

Input

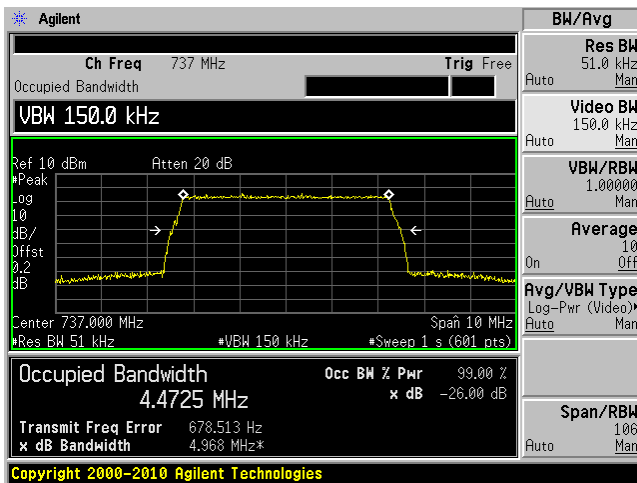


Output

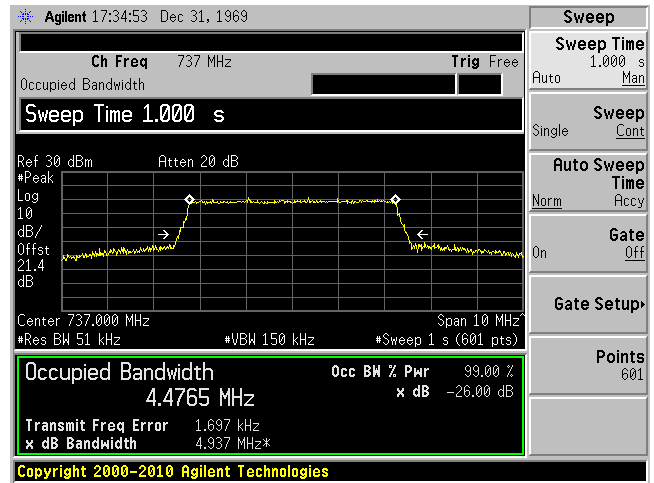


QPSK (5 MHz), (Middle Channel)

Input

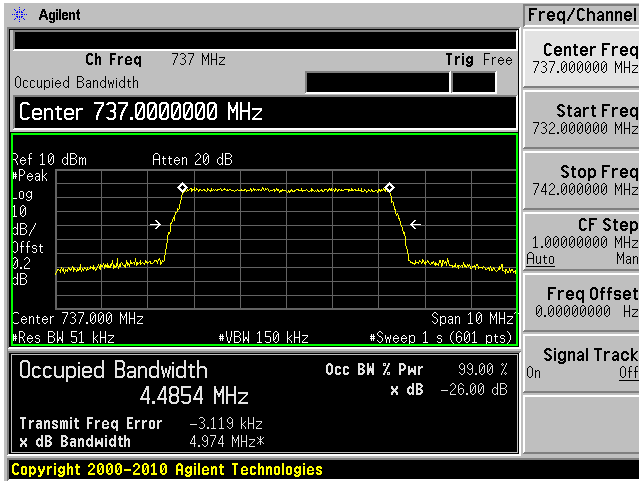


Output

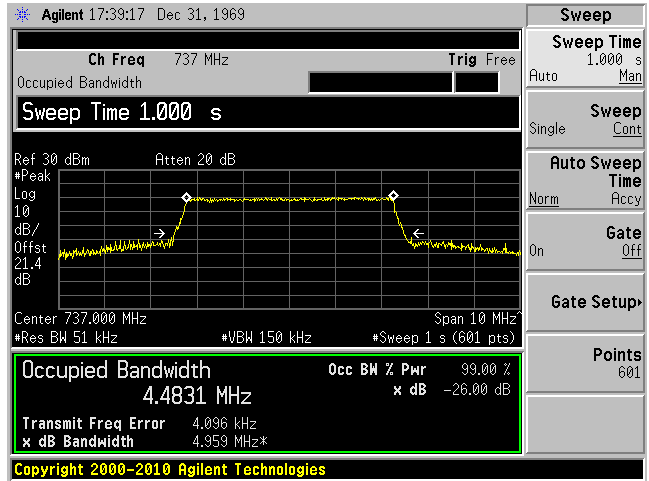


16QAM (5 MHz), (Middle Channel)

Input

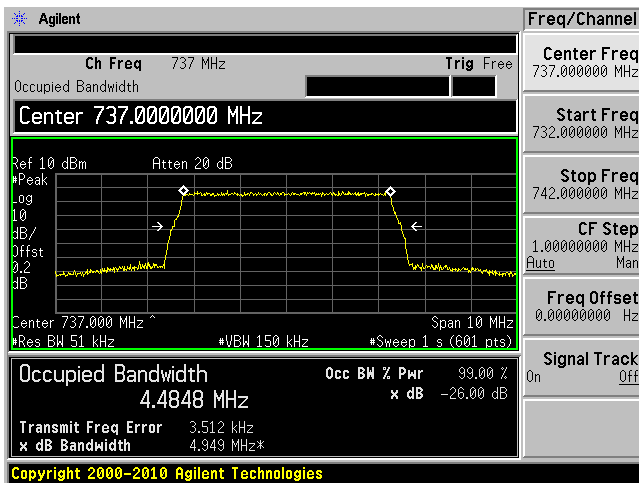


Output

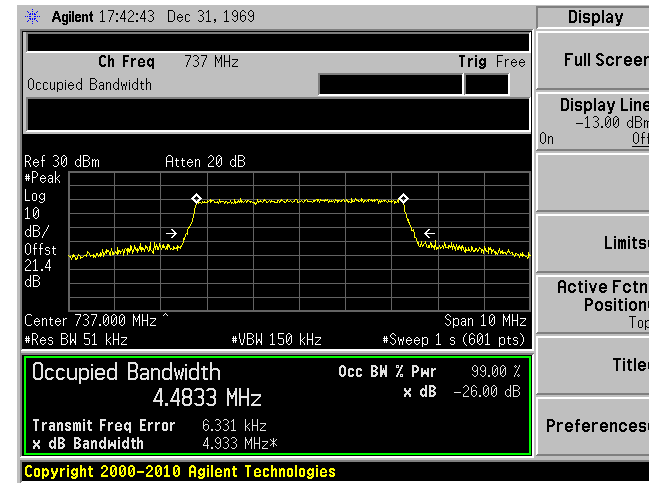


64QAM (5 MHz), (Middle Channel)

Input

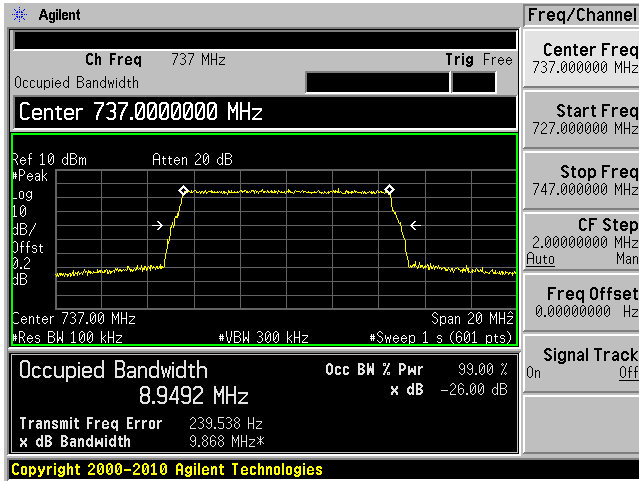


Output

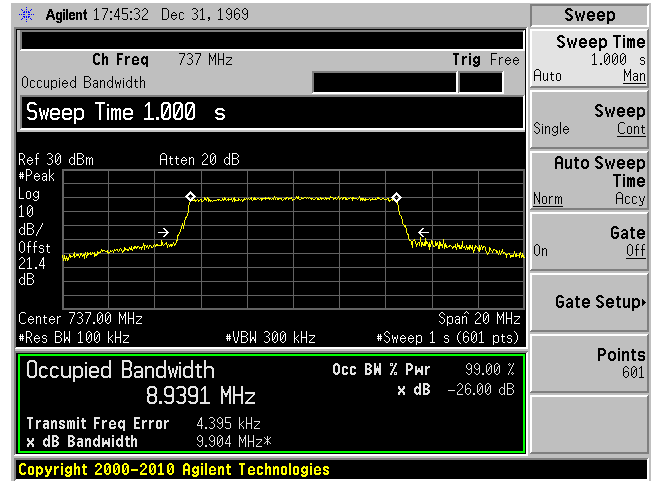


QPSK (10 MHz), (Low Channel)

Input

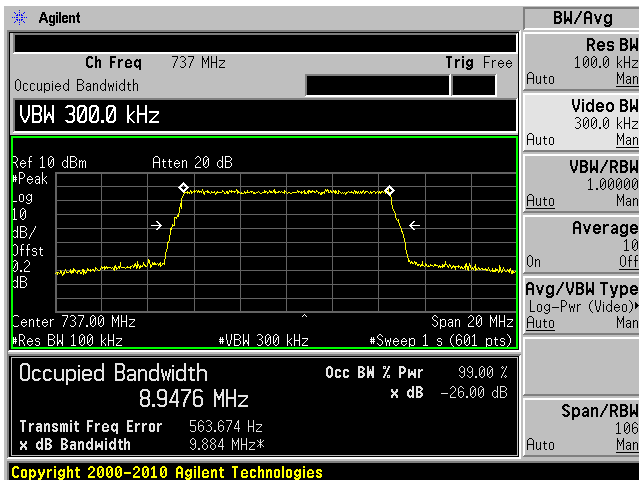


Output

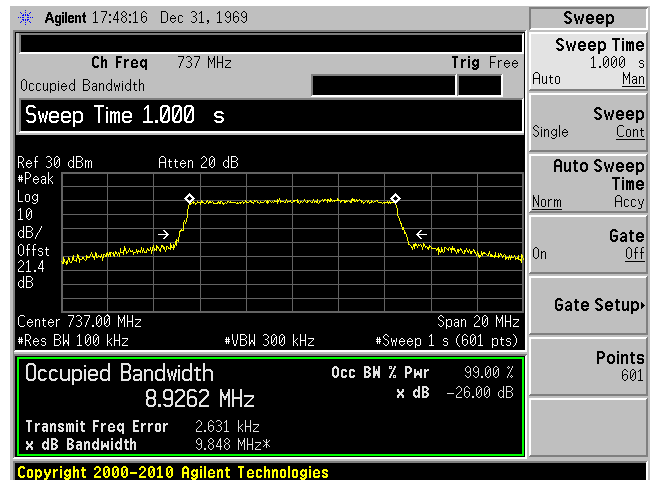


16QAM (10 MHz), (Low Channel)

Input

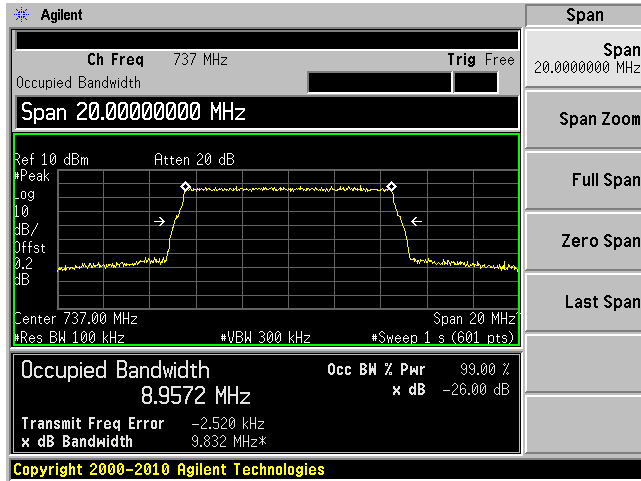


Output

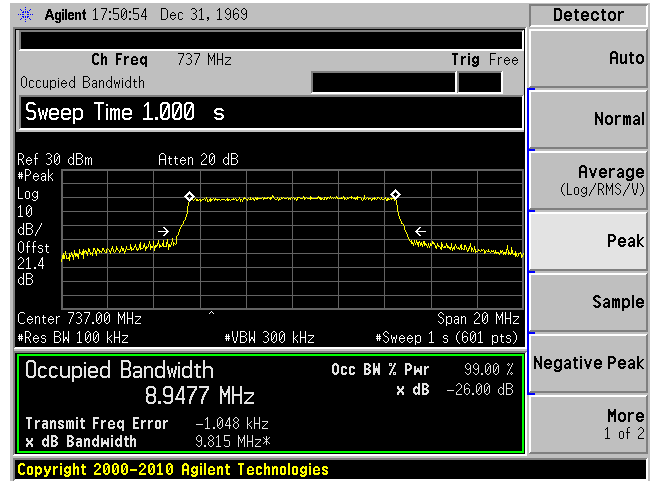


64QAM (10 MHz), (Low Channel)

Input



Output



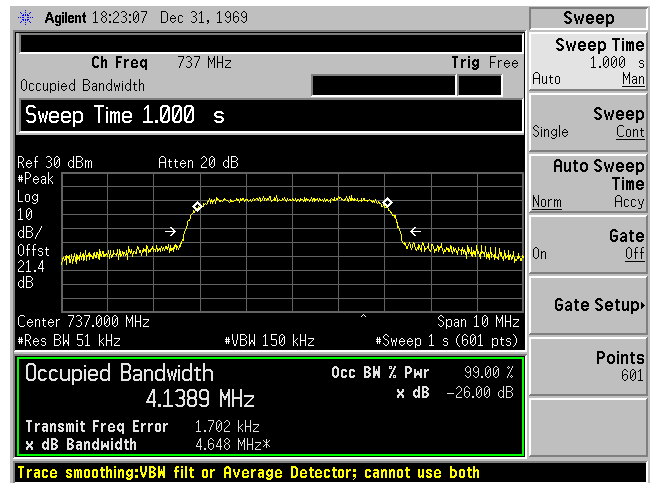
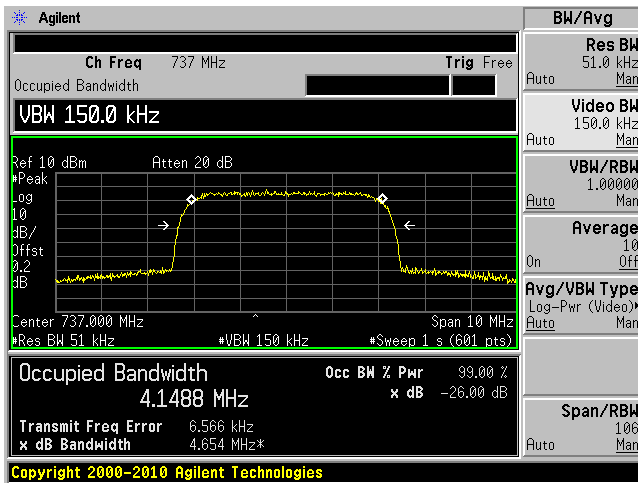
For Port: 700 ABC-2

WCDMA/HSPA

WCDMA/HSPA (Middle Channel)

Input

Output

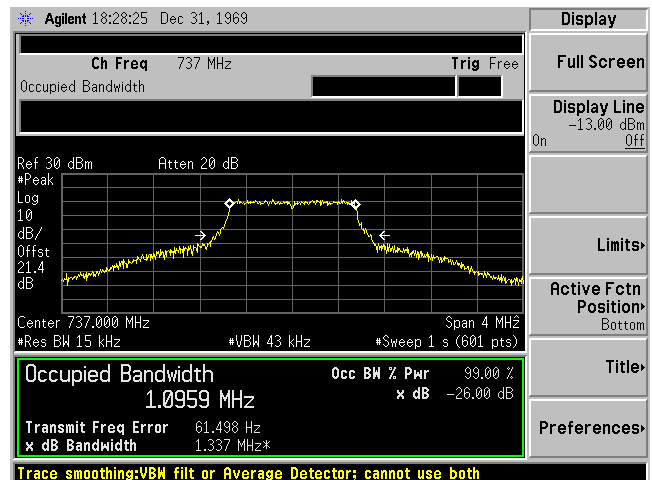
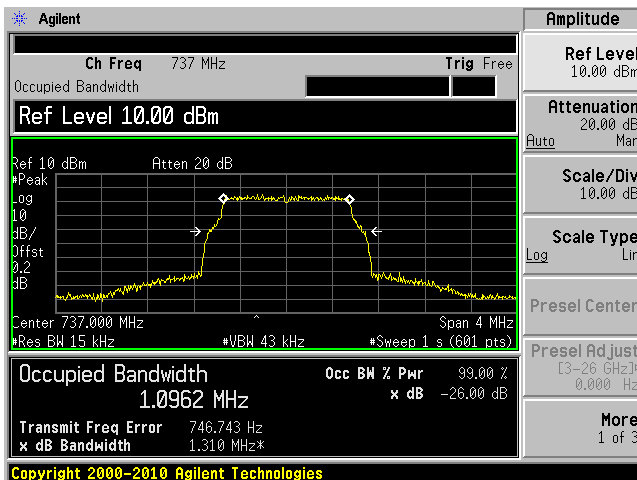


LTE; DL: 728-7746 MHz

QPSK (1.4 MHz), (Middle Channel)

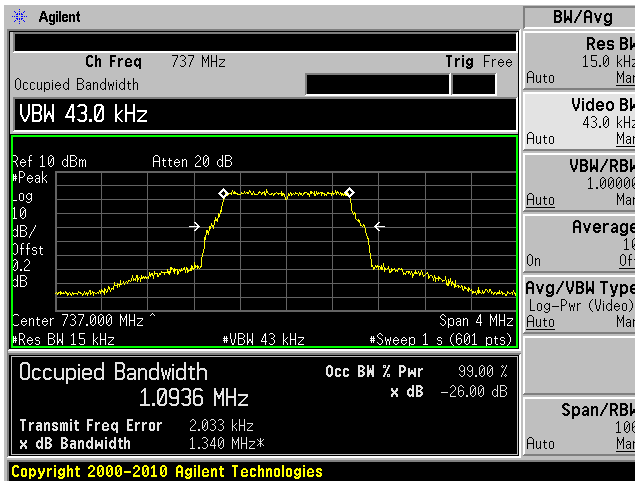
Input

Output

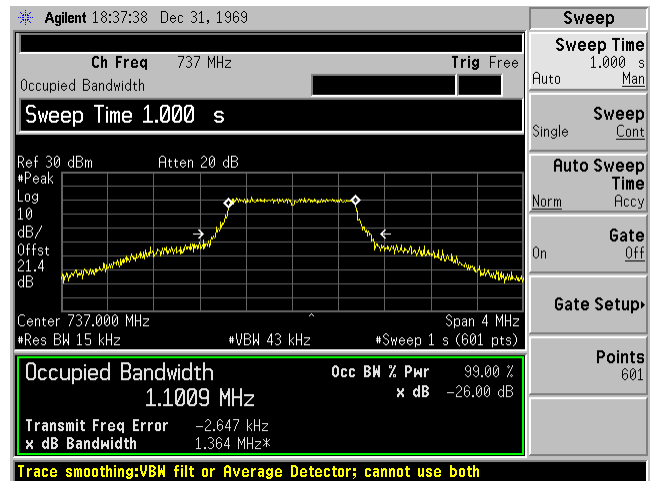


16QAM (1.4 MHz), (Middle Channel)

Input

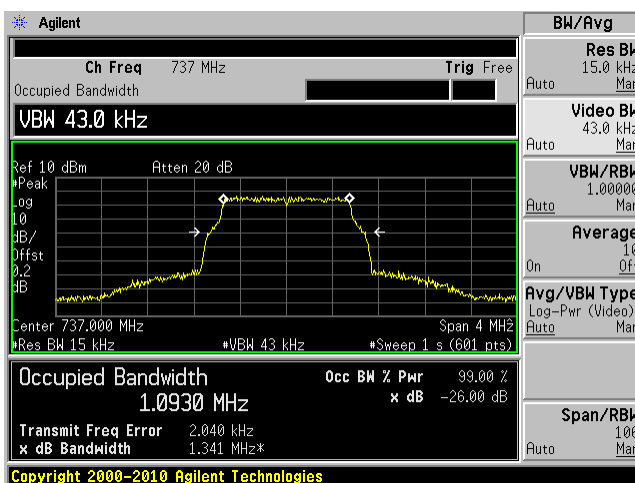


Output

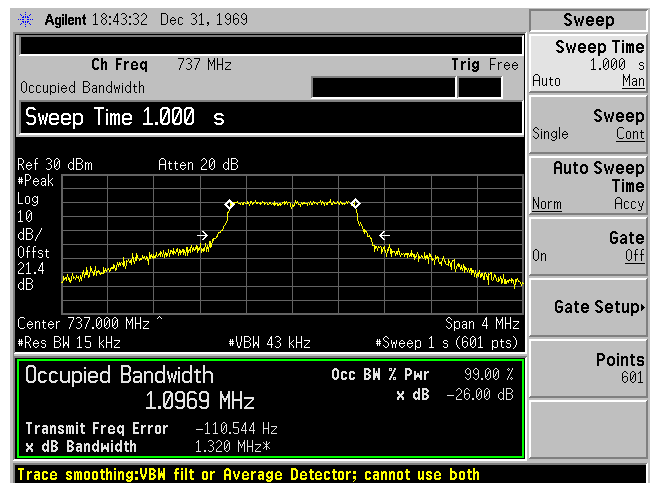


64QAM (1.4 MHz), (Middle Channel)

Input

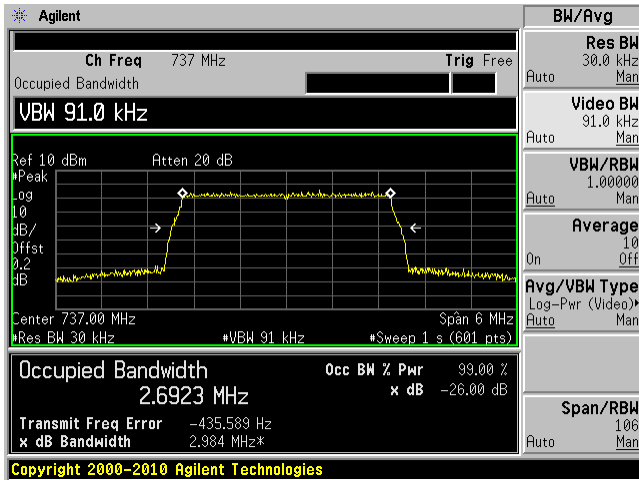


Output

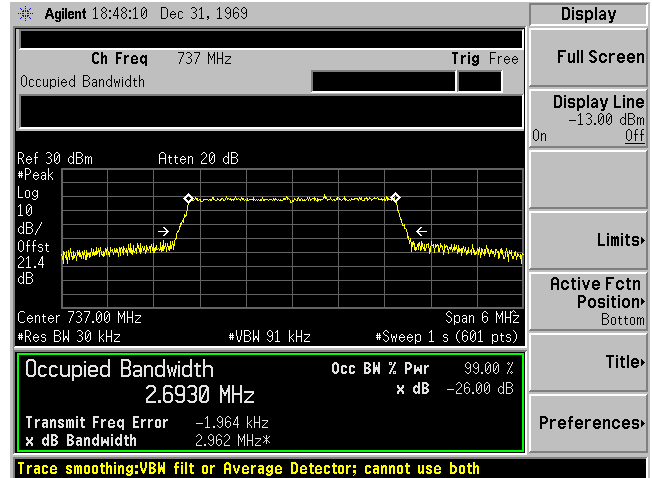


QPSK (3 MHz), (Middle Channel)

Input

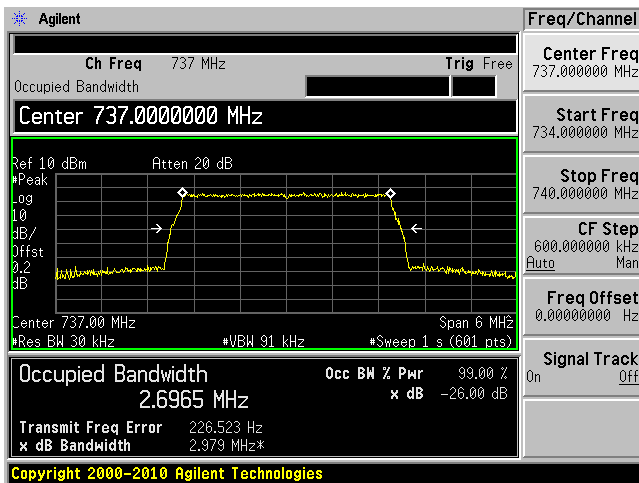


Output

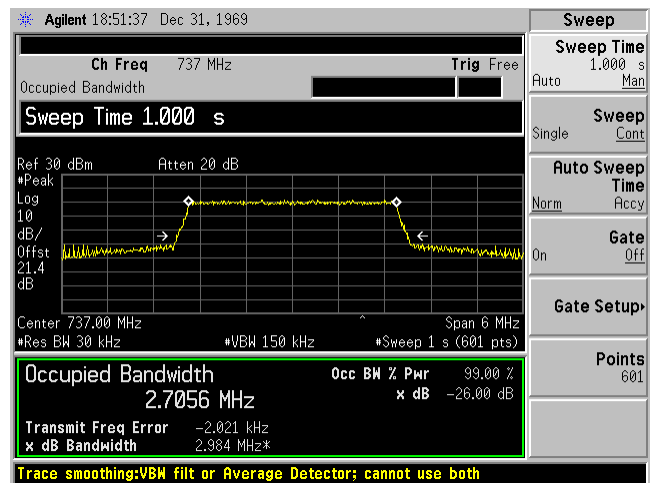


16QAM (3 MHz), (Middle Channel)

Input

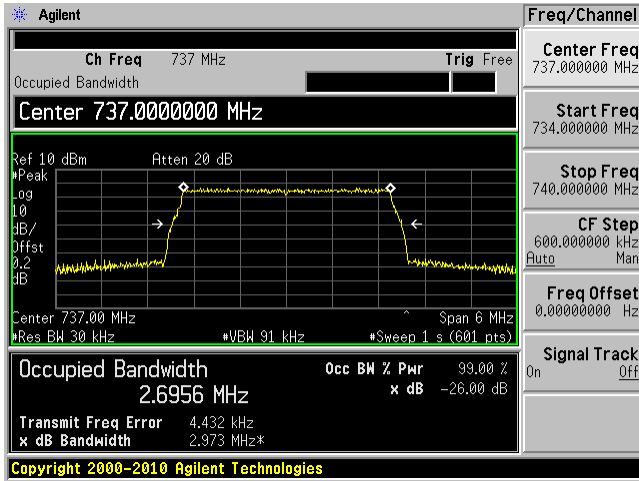


Output

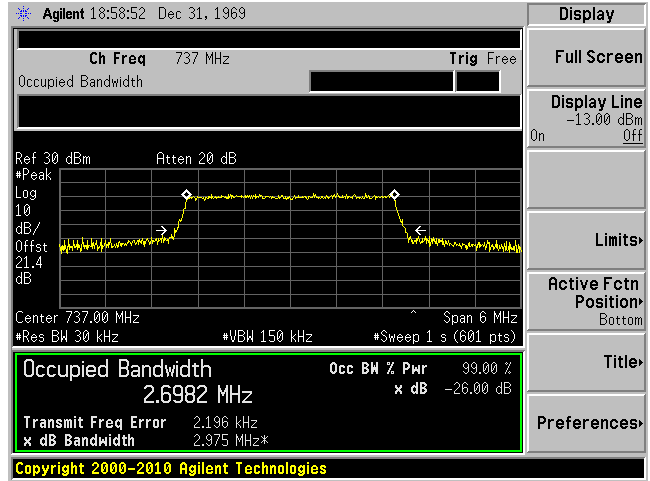


64QAM (3 MHz), (Middle Channel)

Input

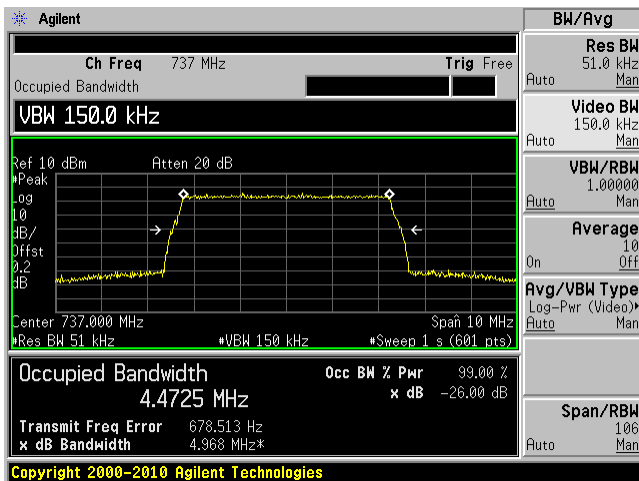


Output

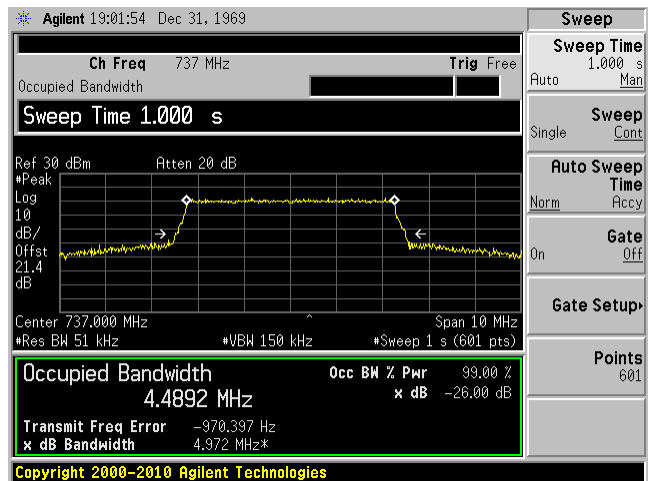


QPSK (5 MHz), (Middle Channel)

Input

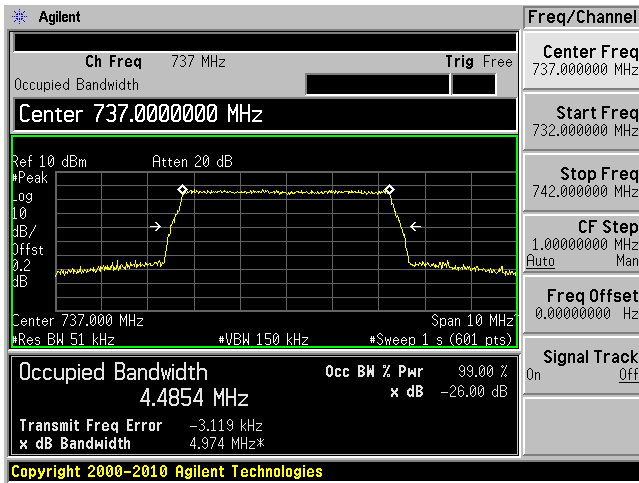


Output

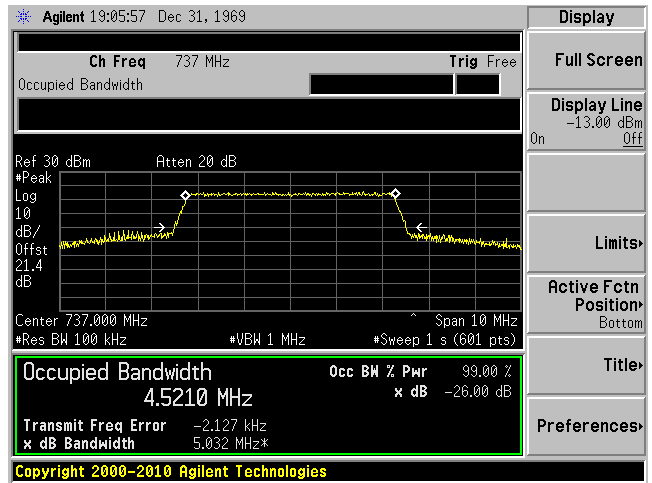


16QAM (5 MHz), (Middle Channel)

Input

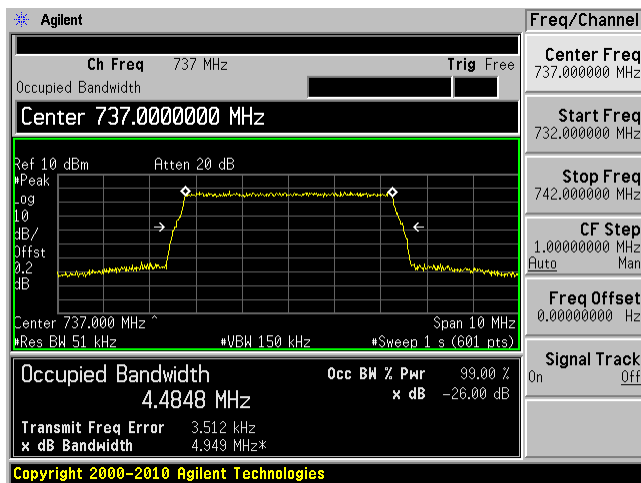


Output

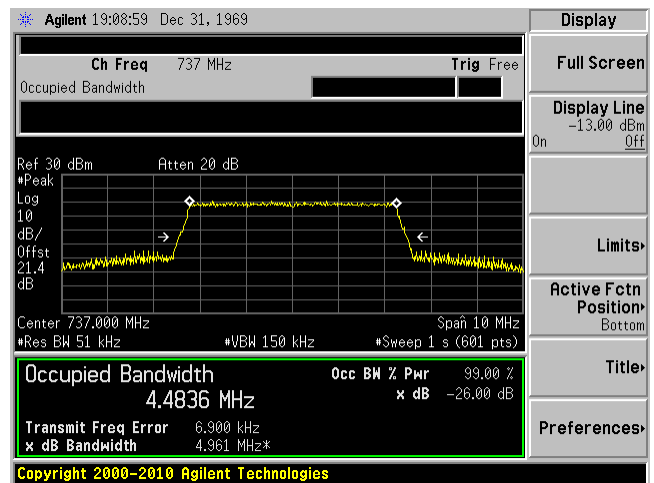


64QAM (5 MHz), (Middle Channel)

Input

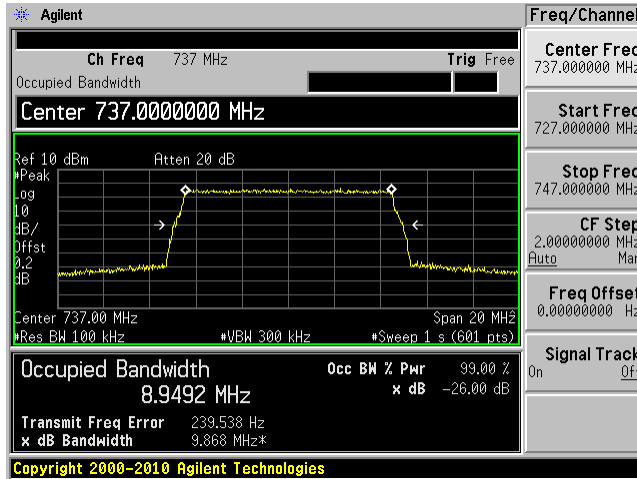


Output

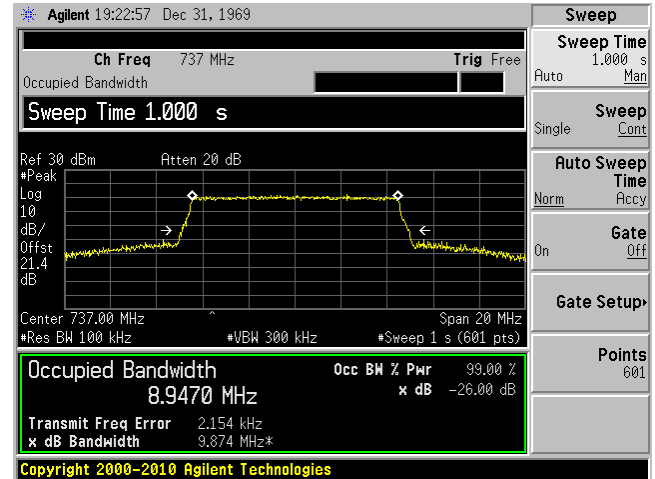


QPSK (10 MHz), (Low Channel)

Input

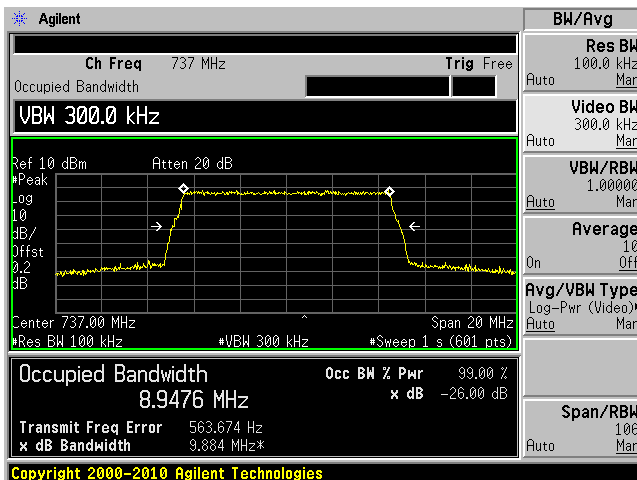


Output

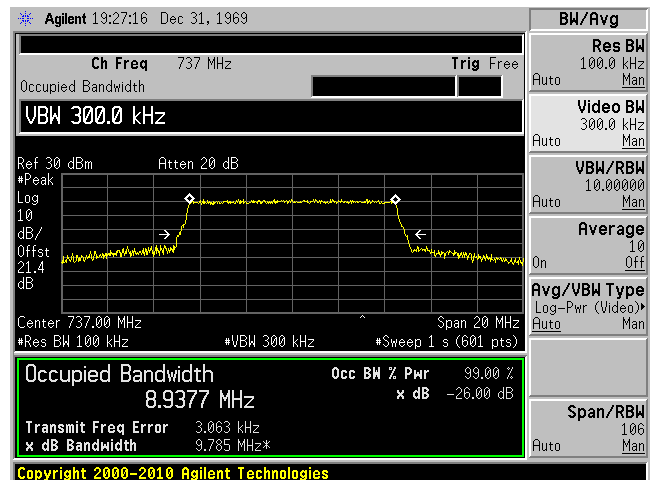


16QAM (10 MHz), (Low Channel)

Input



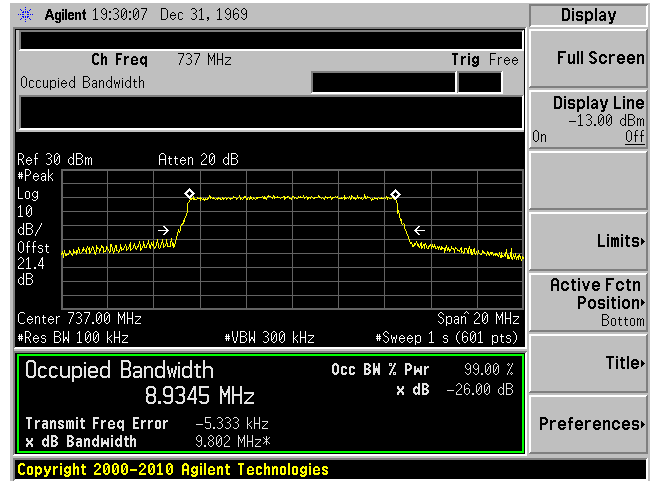
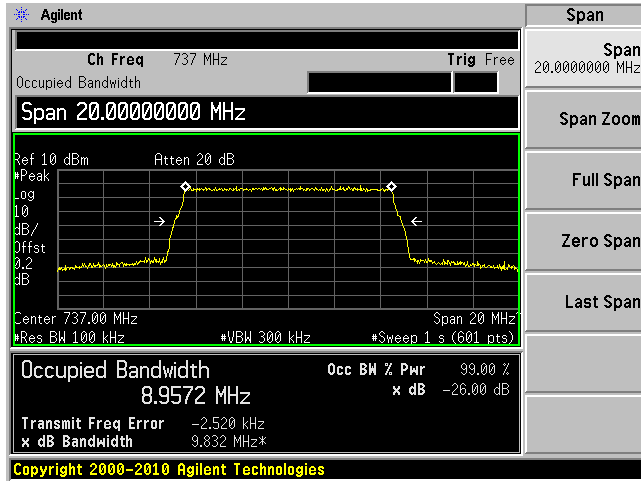
Output



64QAM (10 MHz), (Low Channel)

Input

Output



6 FCC §2.1053 & §27.53 - Spurious Radiated Emissions

6.1 Applicable Standard

Requirements: FCC §2.1053 and §27.53.

6.2 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 log (TX Power in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log10 (power out in Watts)

6.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09 ¹
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2011-08-10
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2011-06-09
Eaton	Horn antenna	96001	Mar-07	2011-10-03
A.H. Systems	Horn antenna	SAS-200/571	261	2012-01-18
Mini-Circuits	Pre-amplifier	ZVA-183-S	667400960	2012-05-08
HP	Signal Generator	8648C	3426A00417	2011-08-18

Note 1: Based on a two year calibration cycle.

Statement of Traceability: BACL Corp. attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

6.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	42 %
ATM Pressure:	101.79kPa

The testing was performed by Wei Sun on 2012-06-06 in 5 meters Chamber 3.

6.5 Test Results

Lower ABC Band:

Downlink (Input frequency = 737 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
514.9	57.82	323	155	V	514.9	-40.81	0	0.72	-41.53	-13	-28.53
514.9	62.5	211	163	H	514.9	-39.04	0	0.72	-39.76	-13	-26.76
609.9	40.62	118	155	V	609.9	-61.4	0	0.39	-61.79	-13	-48.79
609.9	42.4	135	182	H	609.9	-65.27	0	0.39	-65.66	-13	-52.66
514.9	57.82	323	155	V	514.9	-40.81	0	0.72	-41.53	-13	-28.53

7 FCC §2.1051 & §27.53 - Spurious Emissions at Antenna Terminals

7.1 Applicable Standard

Requirements: FCC §2.1051 and §27.53.

The spectrum shall be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

7.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

7.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09 ¹
HP	Signal Generator	E4438C	MY45091309	2012-05-03

Note 1: Based on a two year calibration cycle.

Statement of Traceability: BACL Corp. attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

7.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	57 %
ATM Pressure:	101.4kPa

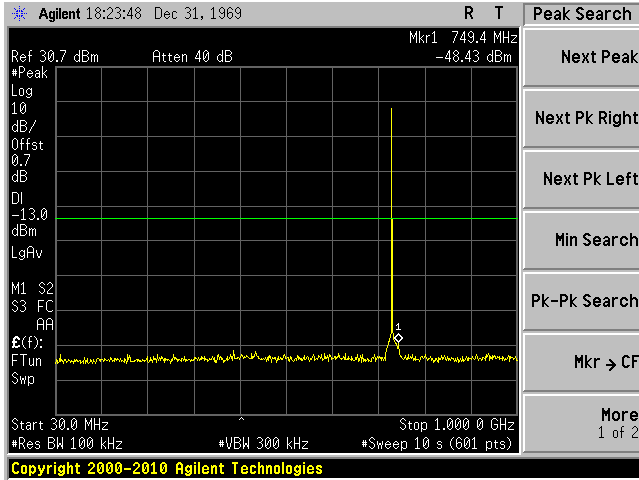
The testing was performed by Wei Sun on 2012-06-05 at RF Site.

7.5 Test Results

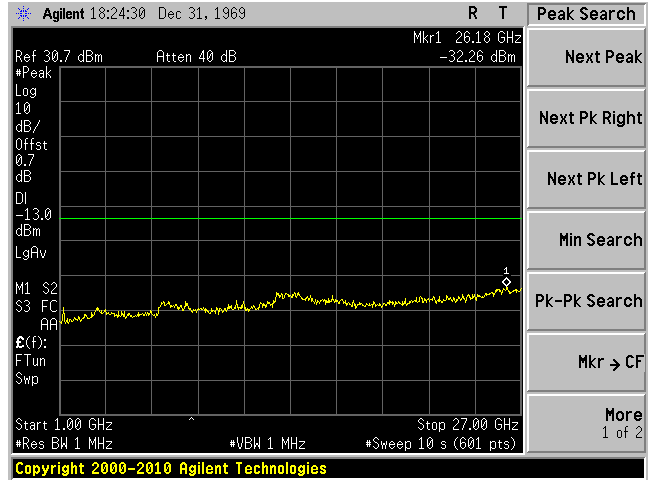
Please refer to the following plots.

For Port: 700 MHz ABC-1

Plot 1: 30 MHz to 1 GHz

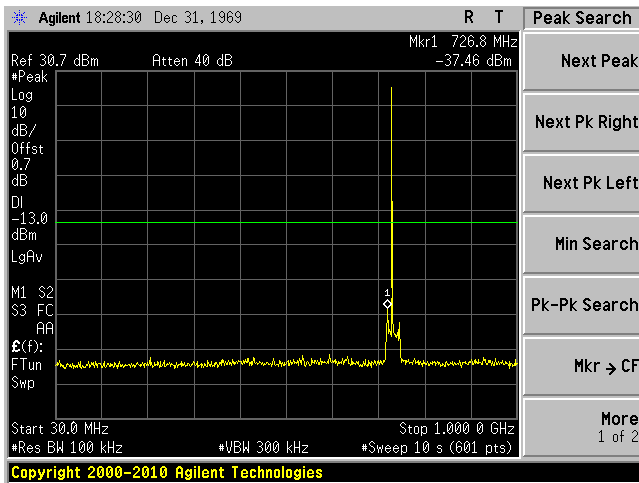


Plot 2: Above 1 GHz

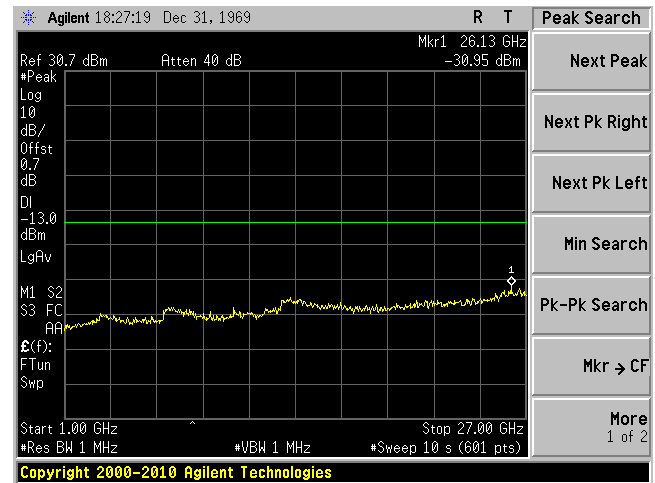


For Port: 700 MHz ABC-2

Plot 1: 30 MHz to 1 GHz



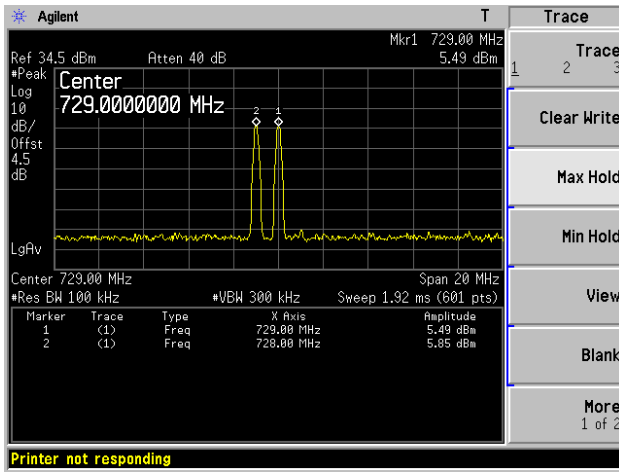
Plot 2: Above 1 GHz



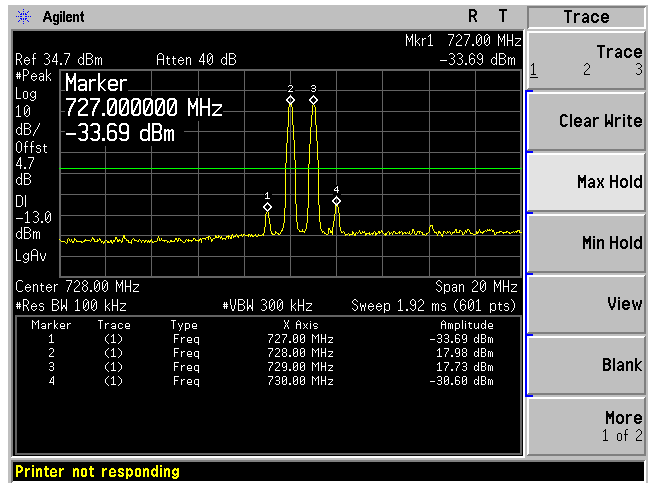
Inter-modulation

For Port: 700ABC-1

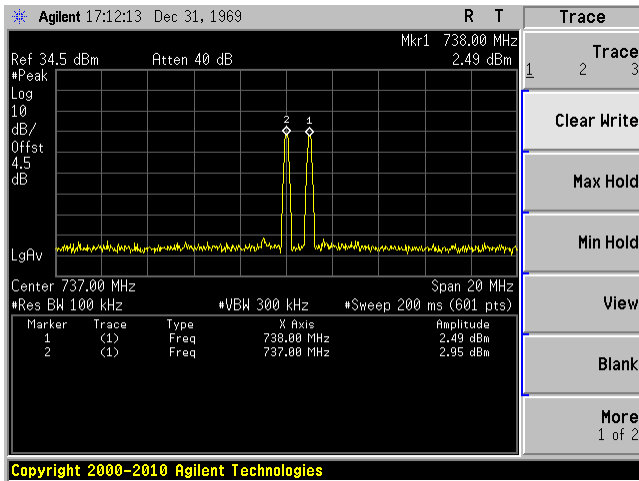
Low Channel, Input



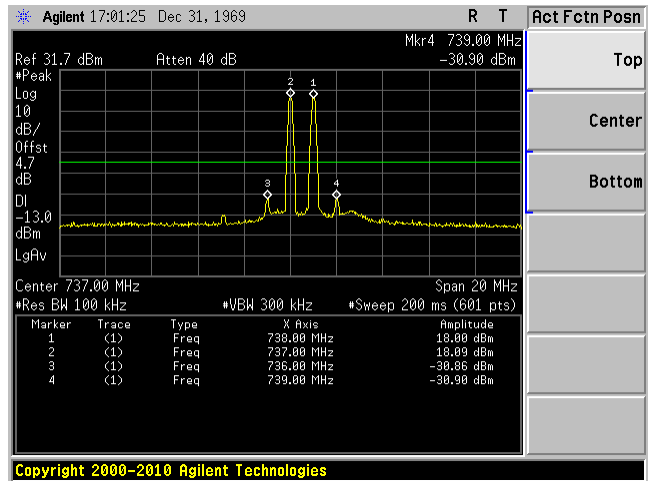
Low Channel, Output



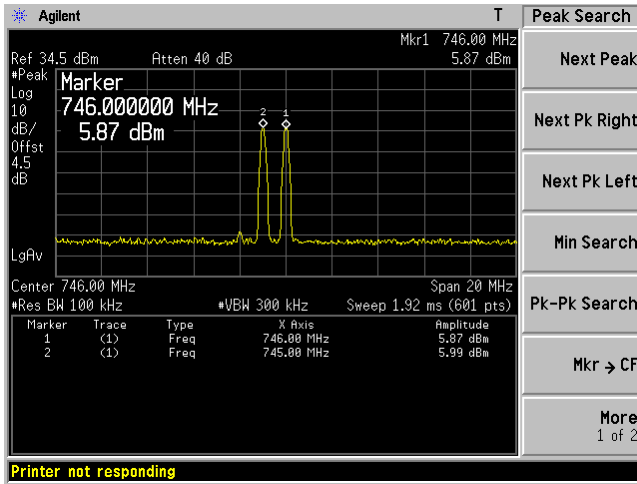
Middle Channel, Input



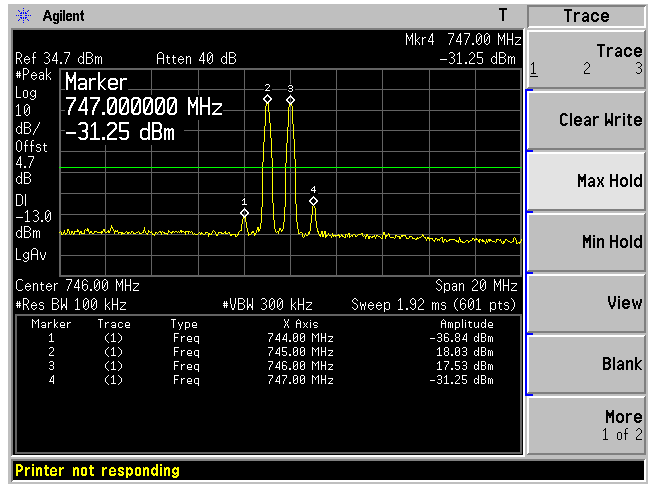
Middle Channel, Output



High Channel, Input

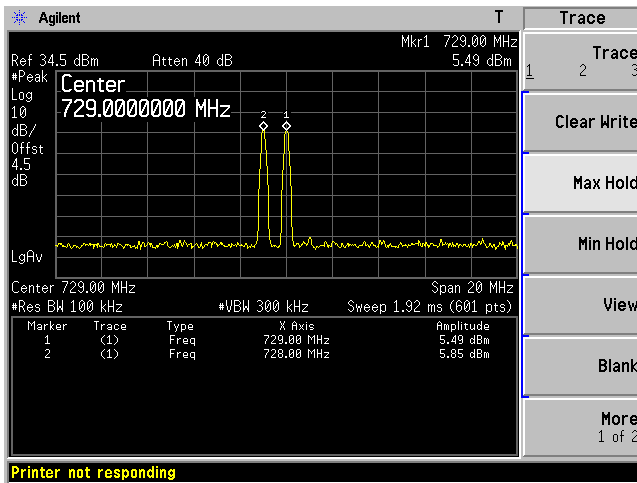


High Channel, Output

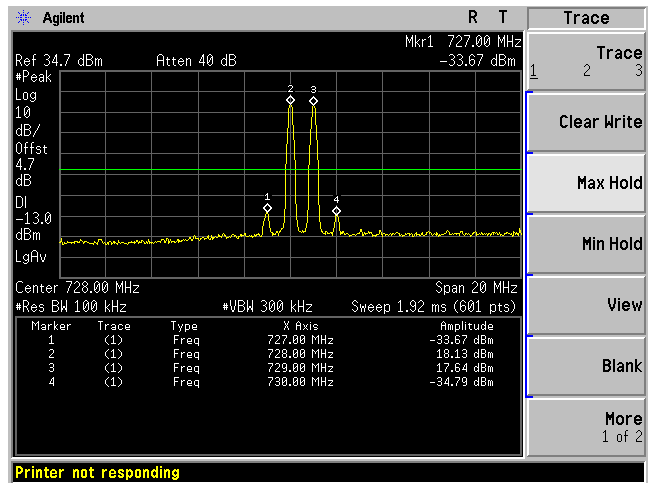


For Port: 700 ABC-2

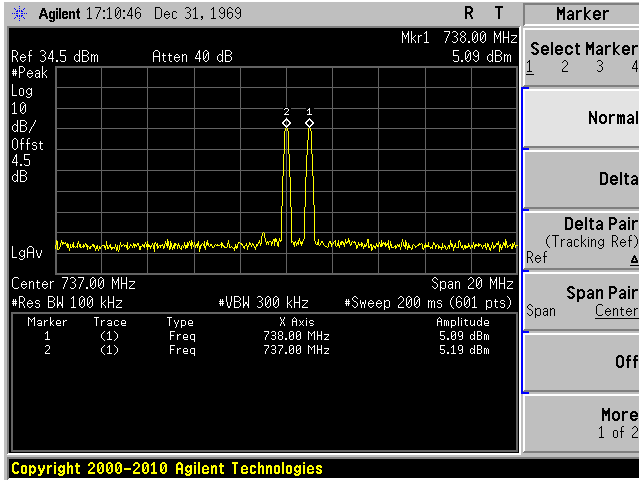
Low Channel, Input



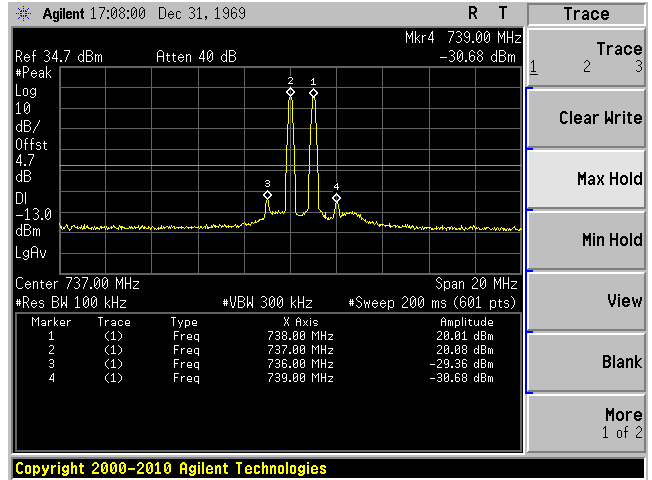
Low Channel, Output



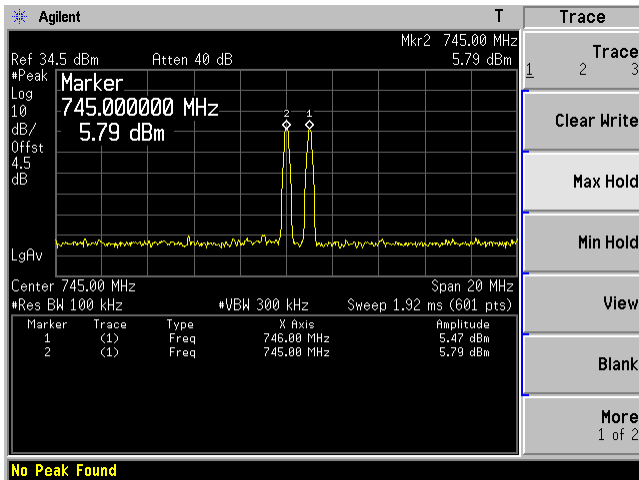
Middle Channel, Input



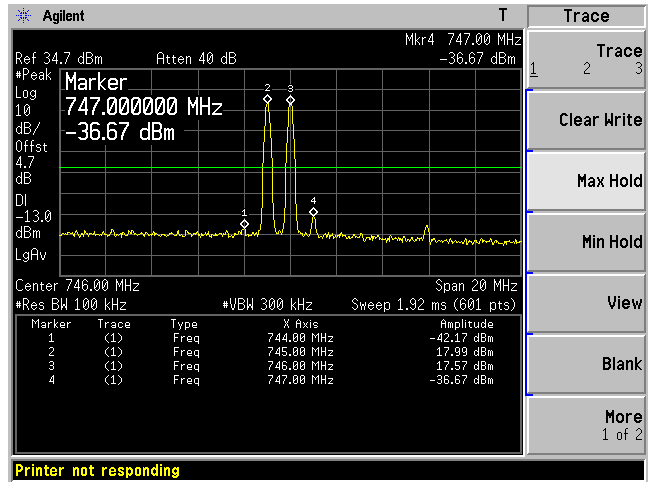
Middle Channel, Output



High Channel, Input



High Channel, Output



8 FCC §27.53 – Band Edge

8.1 Applicable Standard

According to FCC §27.53, 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.

8.2 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.

8.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09 ¹
HP	Signal Generator	E4438C	MY45091309	2012-05-03

Note 1: Based on a two year calibration cycle.

Statement of Traceability: BACL Corp. attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

8.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	57 %
ATM Pressure:	101.4kPa

The testing was performed by Ning Ma from 2012-06-01 at RF Site.

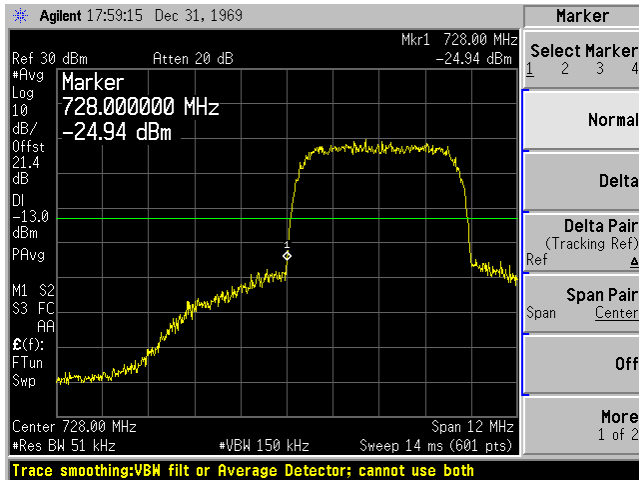
8.5 Test Results

Please refer to the following plots.

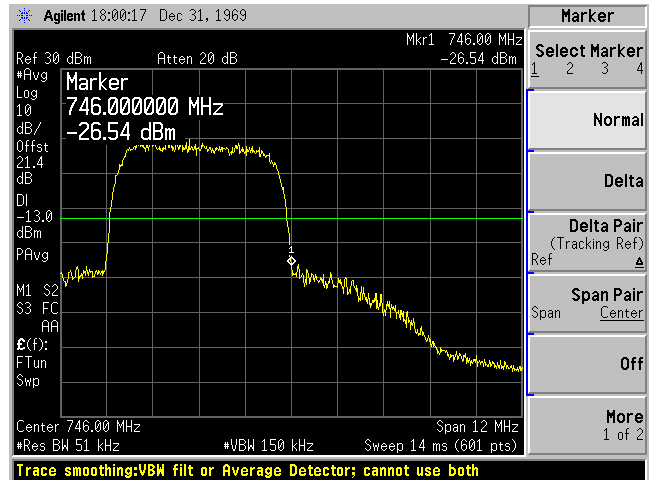
For Port: 700 MHz ABC-1

WCDMA/HSPA

WCDMA/HSPA - Low Channel

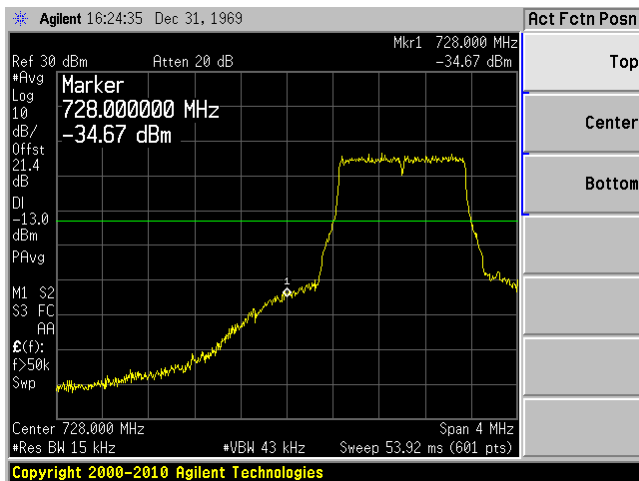


WCDMA/HSPA- High Channel

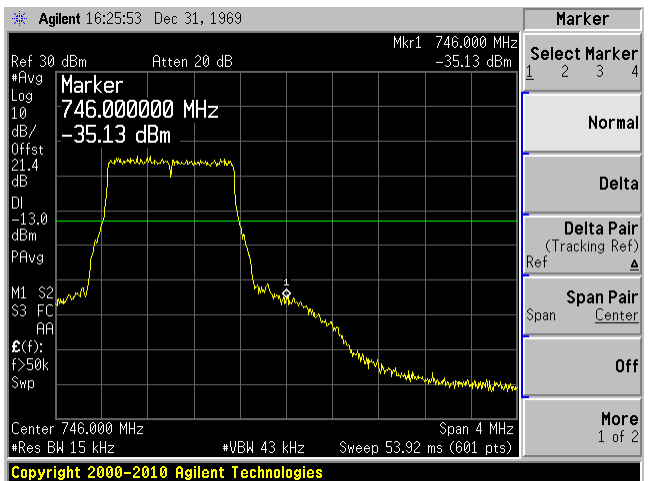


LTE

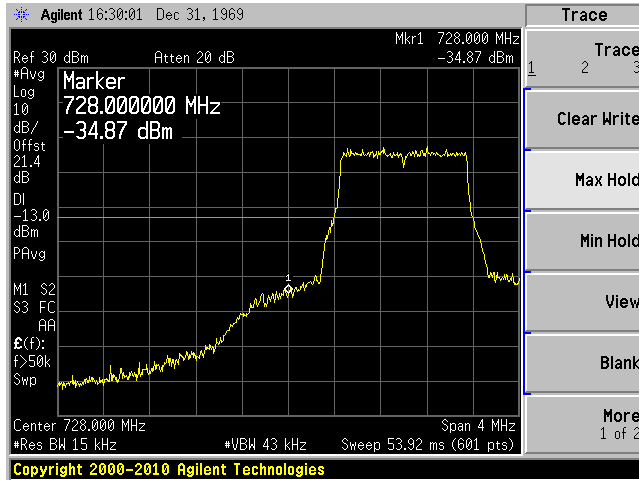
QPSK (1.4 MHz) - Low Channel



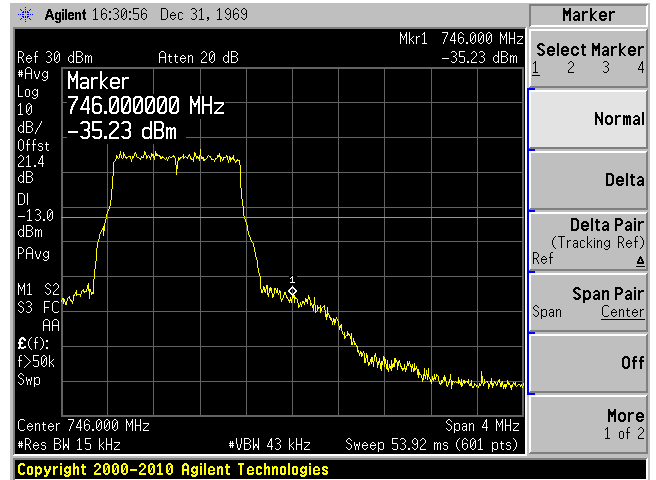
QPSK (1.4 MHz) - High Channel



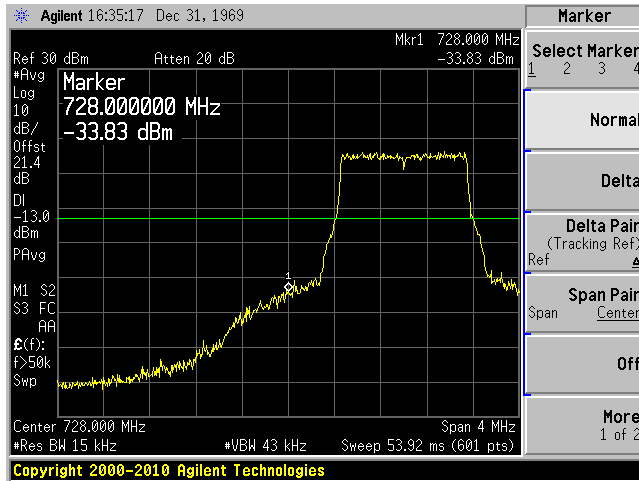
16QAM (1.4 MHz) - Low Channel



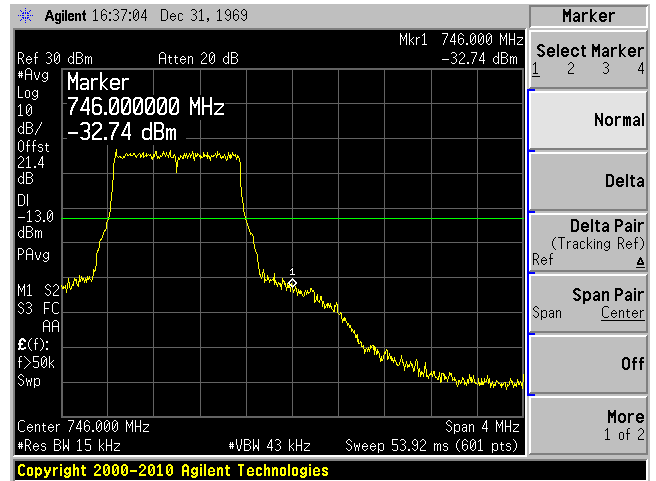
16QAM (1.4 MHz) - High Channel



64QAM (1.4 MHz) - Low Channel

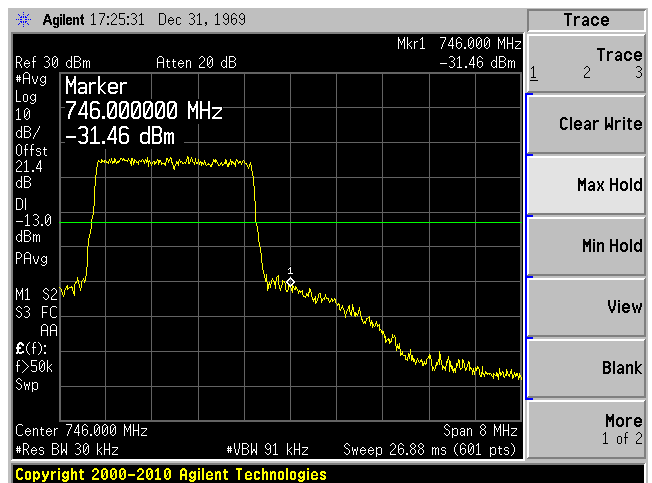
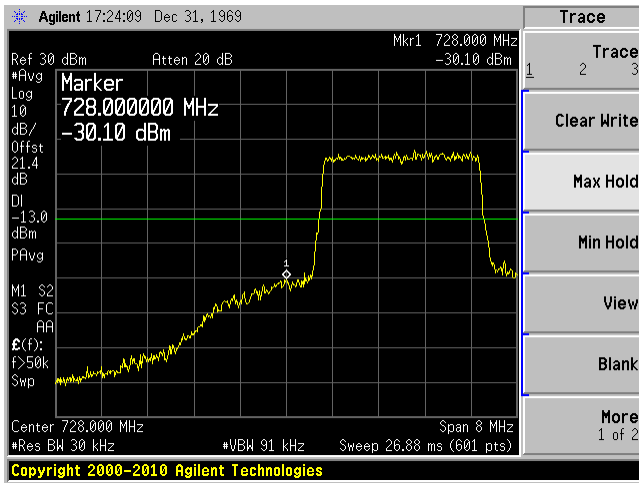


64QAM (1.4 MHz) - High Channel



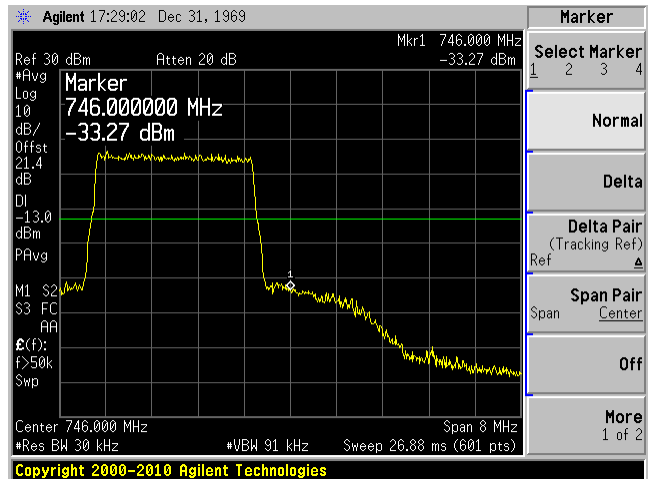
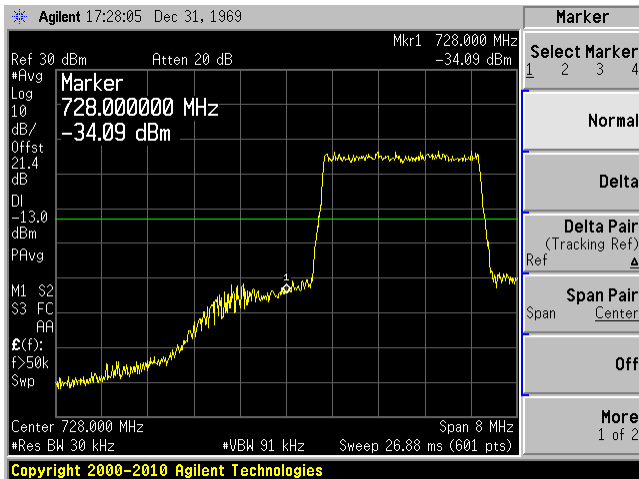
QPSK (3 MHz) - Low Channel

QPSK (3 MHz) - High Channel



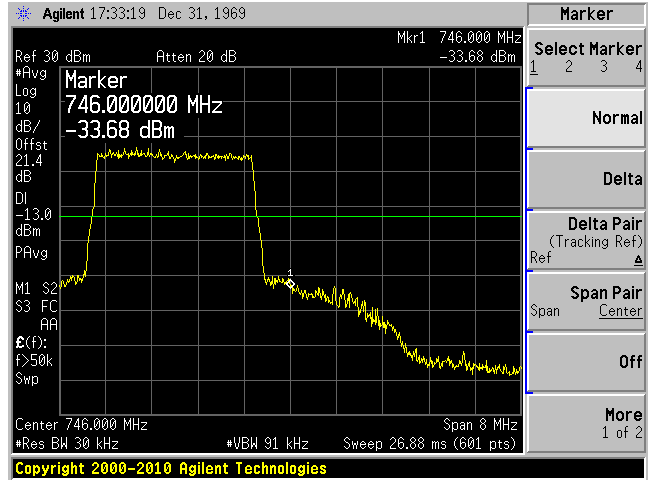
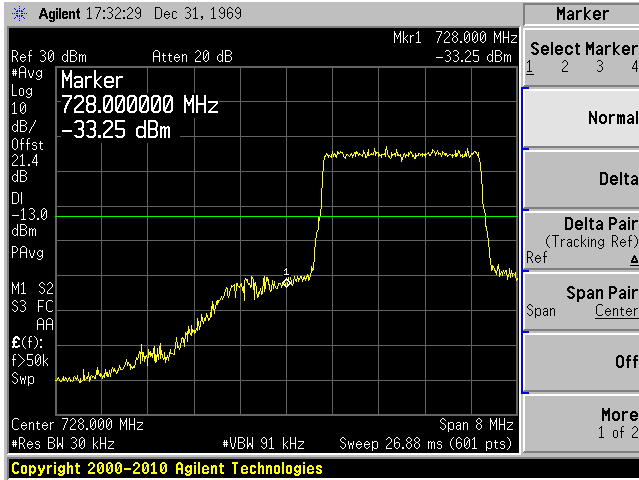
16QAM (3 MHz) - Low Channel

16QAM (3 MHz) - High Channel



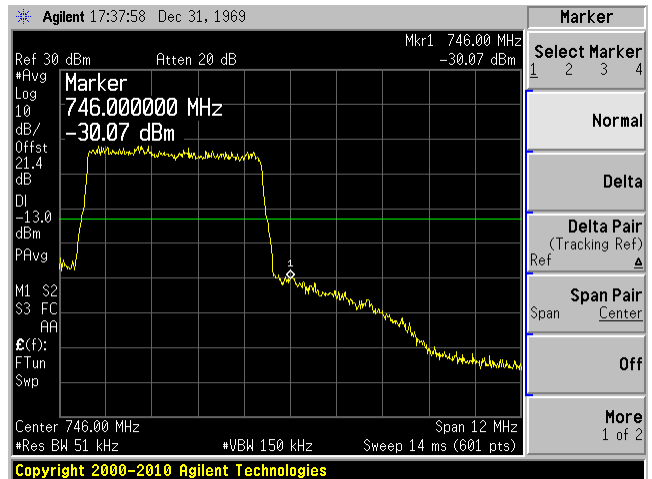
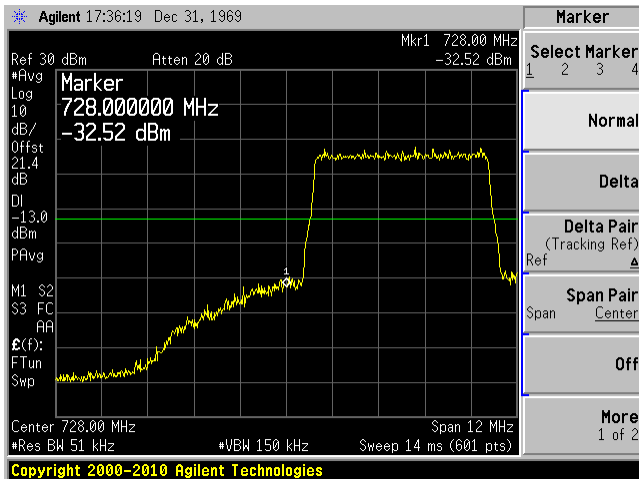
64QAM (3 MHz) - Low Channel

64QAM (3 MHz) - High Channel



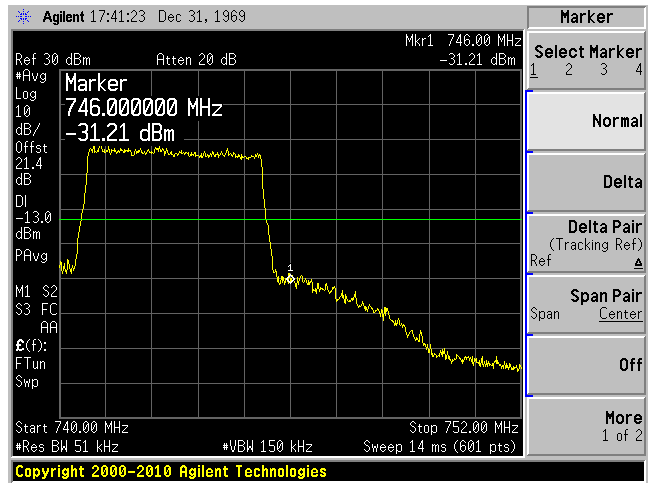
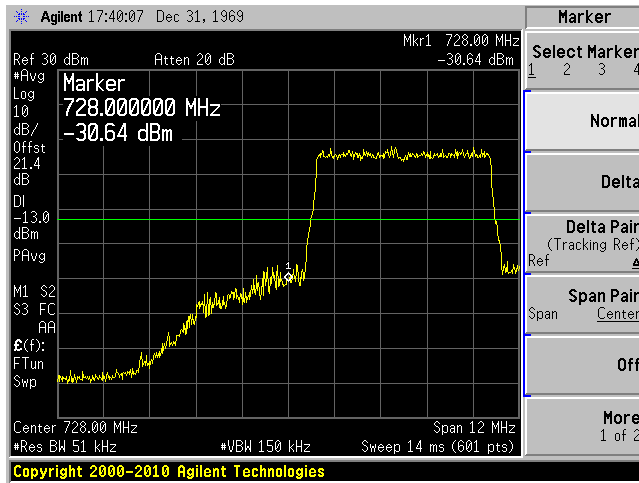
QPSK (5 MHz) - Low Channel

QPSK (5 MHz) - High Channel



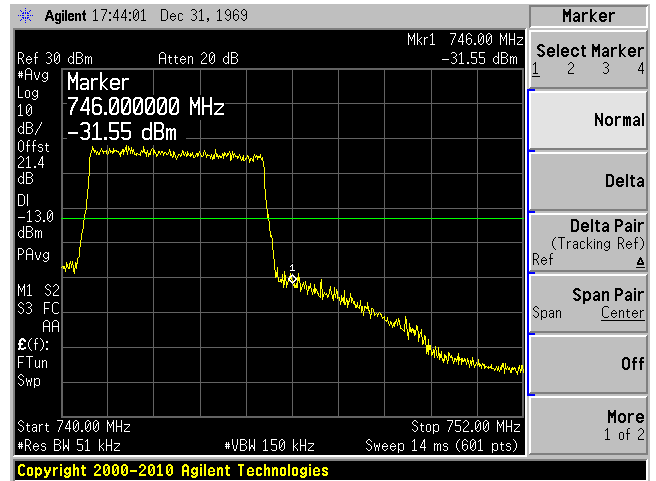
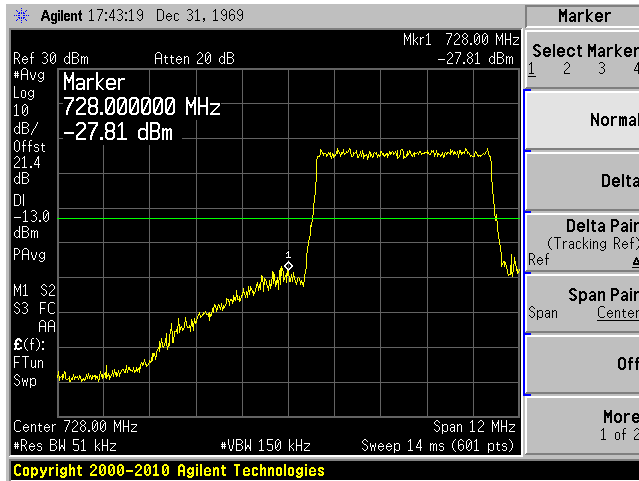
16QAM (5 MHz) - Low Channel

16QAM (5 MHz) - High Channel



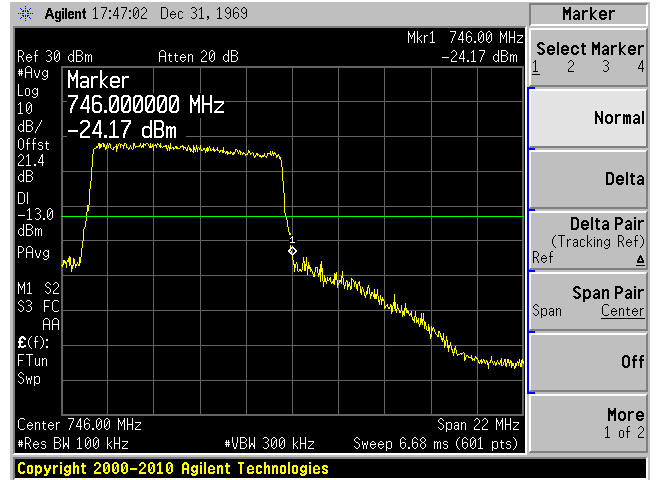
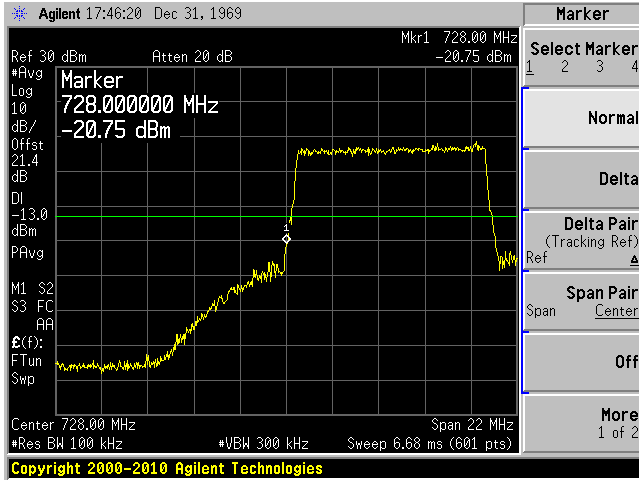
64QAM (5 MHz) - Low Channel

64QAM (5 MHz) - High Channel



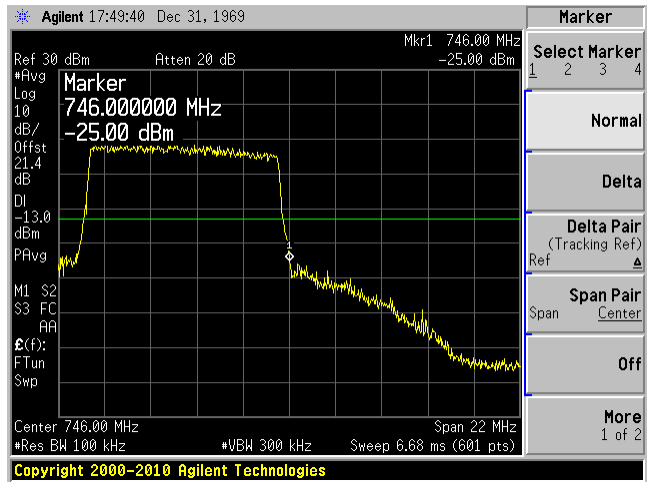
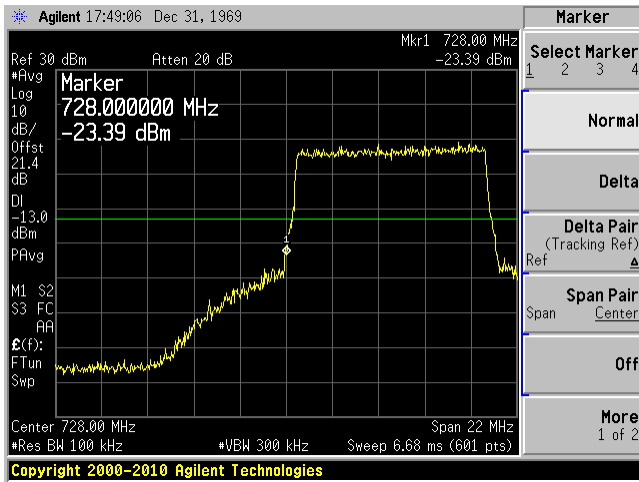
QPSK (10 MHz) - Low Channel

QPSK (10 MHz) - High Channel



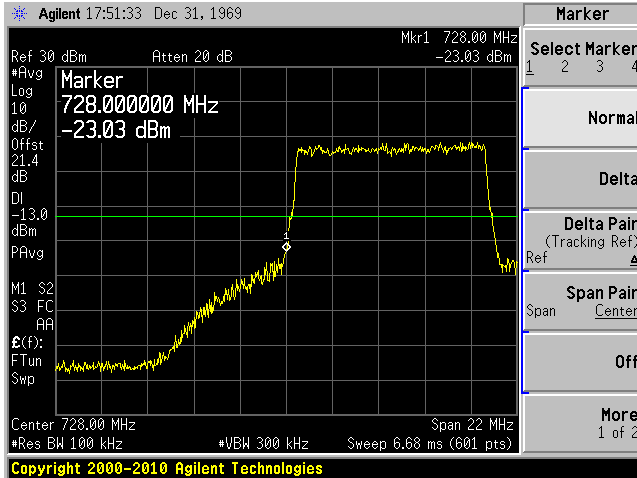
16QAM (10 MHz) - Low Channel

16QAM (10 MHz) - High Channel



64QAM (10 MHz) - Low Channel

64QAM (10 MHz) - High Channel

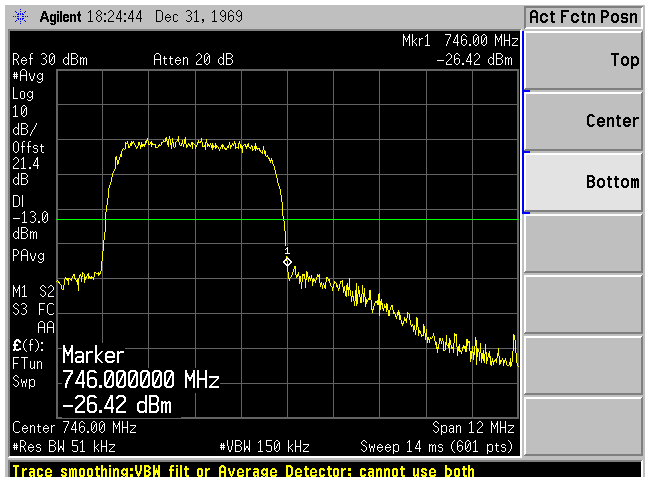
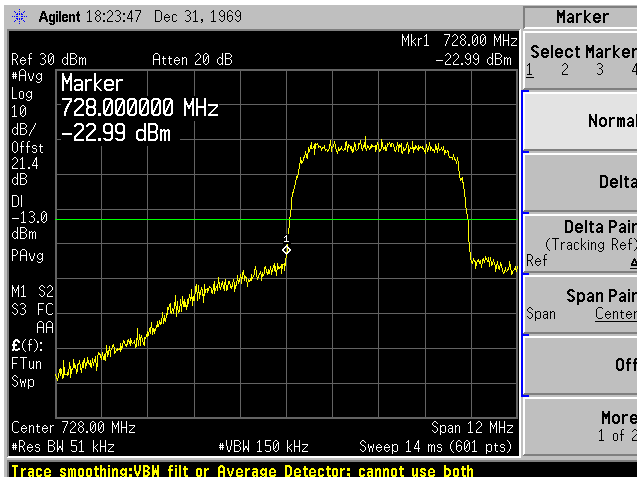


For Port: 700 MHz ABC-2

WCDMA/HSPA

WCDMA/HSPA - Low Channel

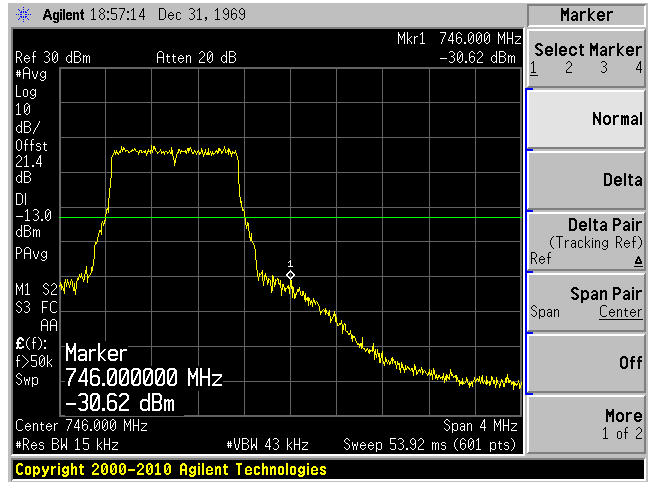
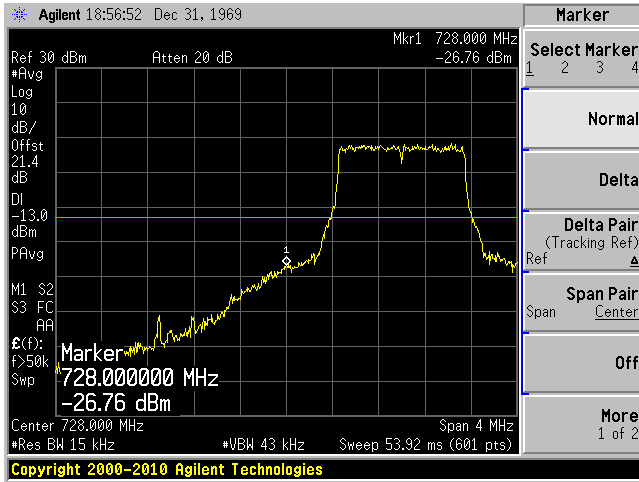
WCDMA/HSPA - High Channel



LTE

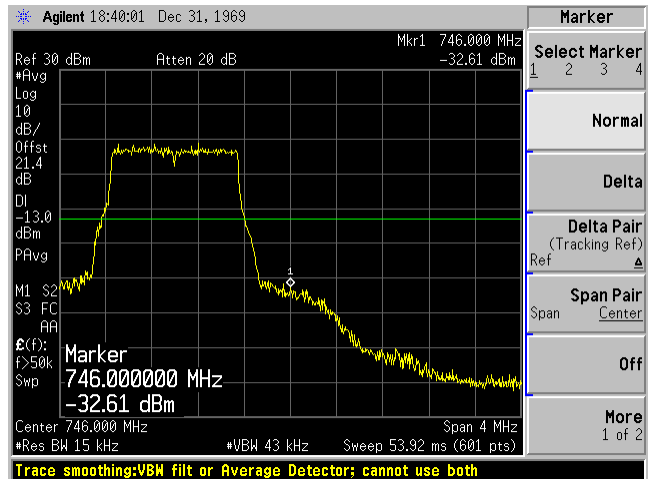
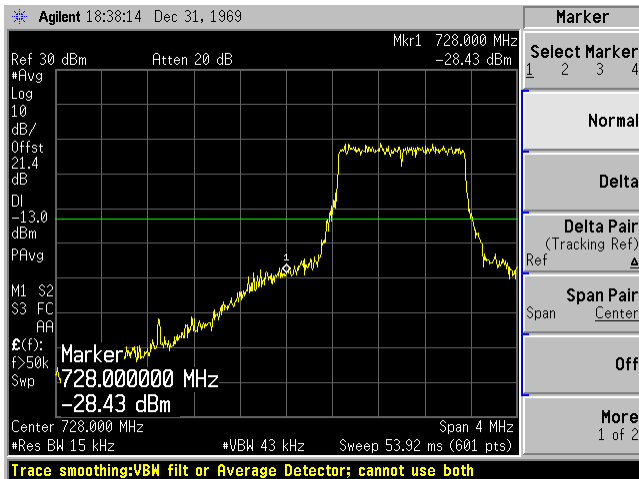
QPSK (1.4 MHz) - Low Channel

QPSK (1.4 MHz) - High Channel



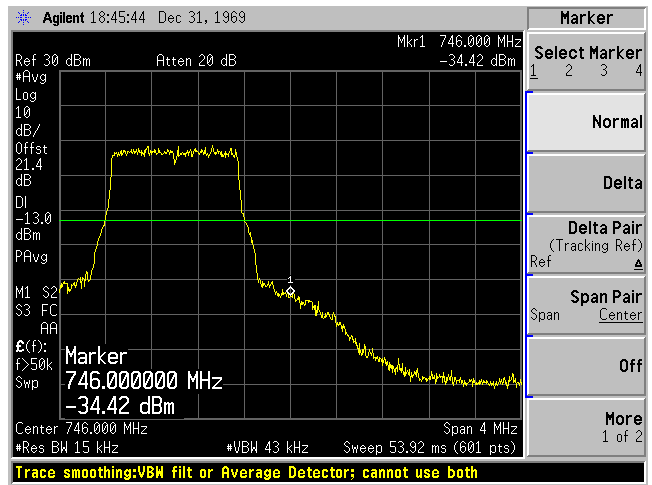
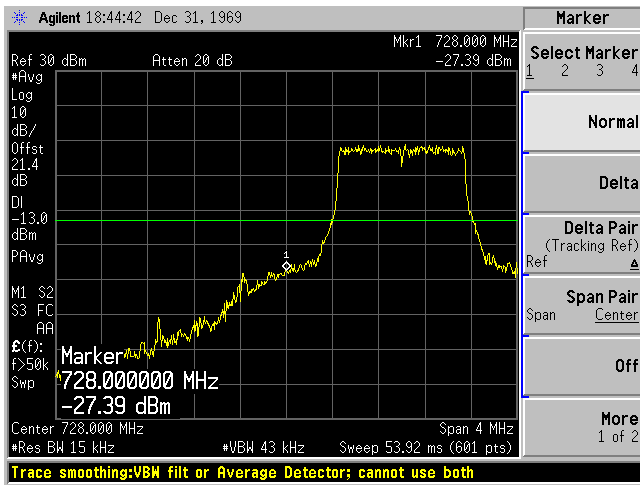
16QAM (1.4 MHz) - Low Channel

16QAM (1.4 MHz) - High Channel



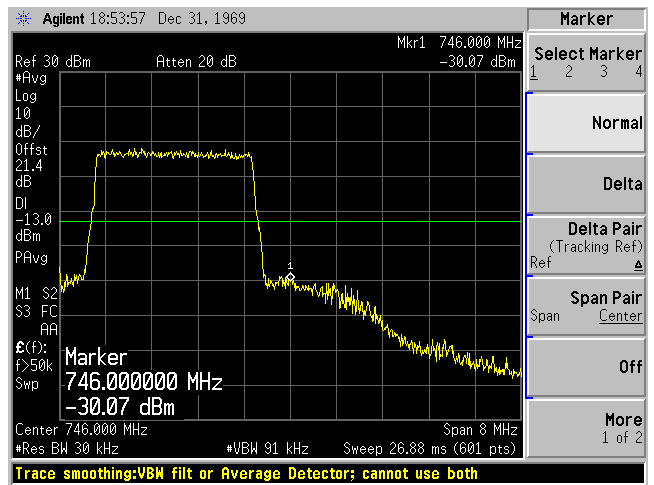
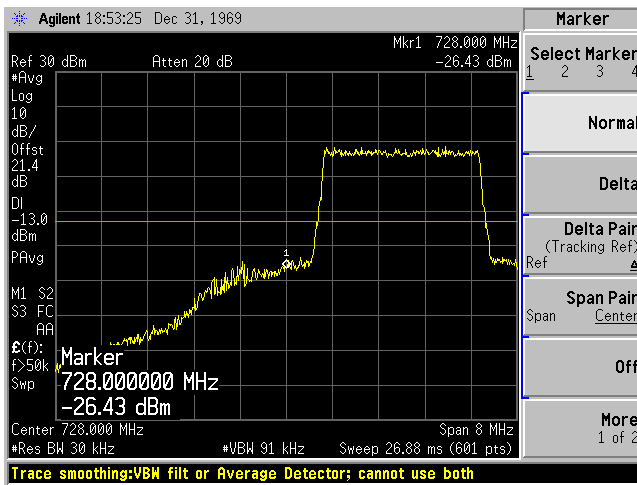
64QAM (1.4 MHz) - Low Channel

64QAM (1.4 MHz) - High Channel

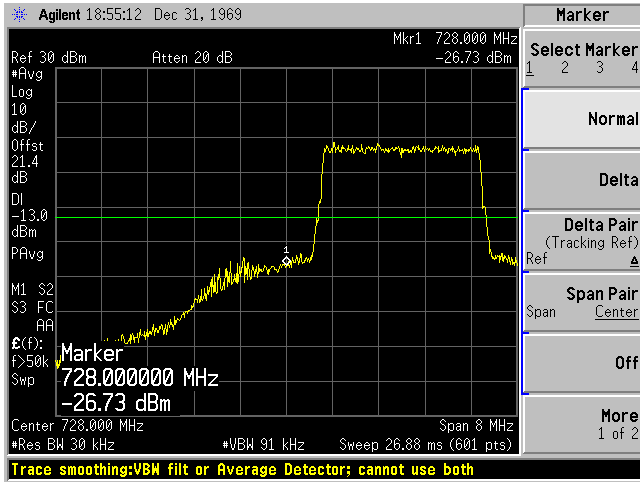


QPSK (3 MHz) - Low Channel

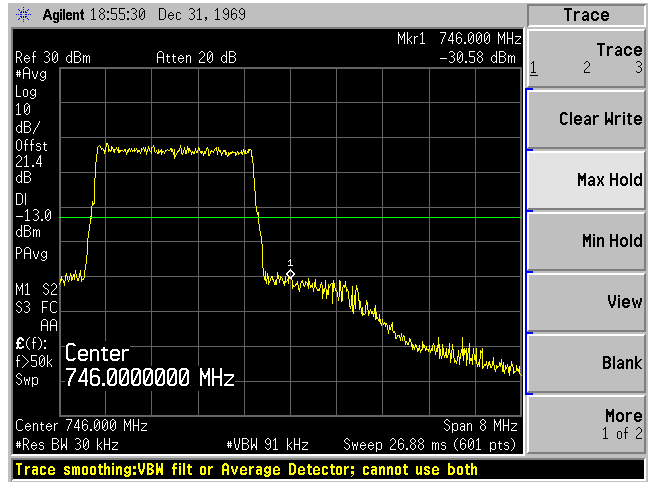
QPSK (3 MHz) - High Channel



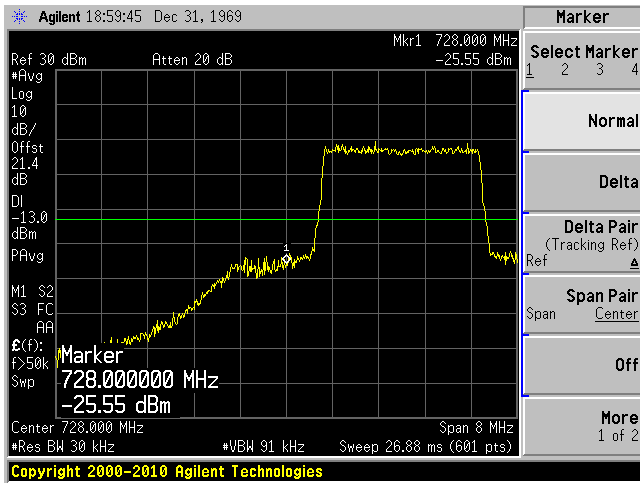
16QAM (3 MHz) - Low Channel



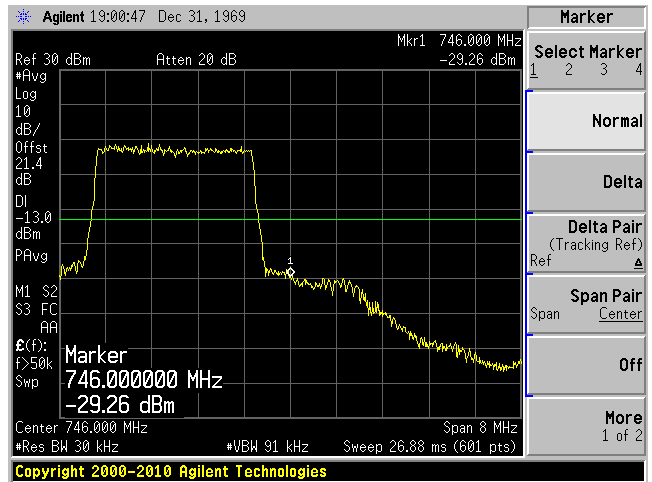
16QAM (3 MHz) - High Channel



64QAM (3 MHz) - Low Channel

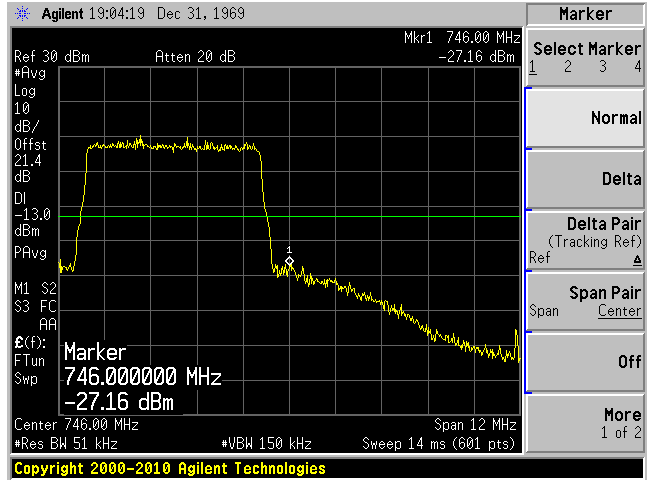
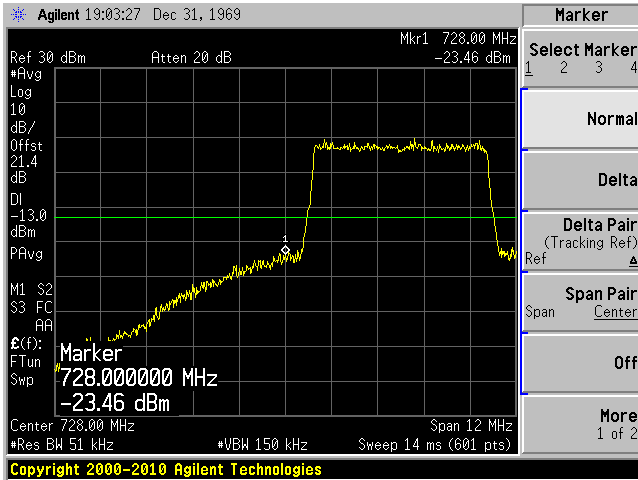


64QAM (3 MHz) - High Channel



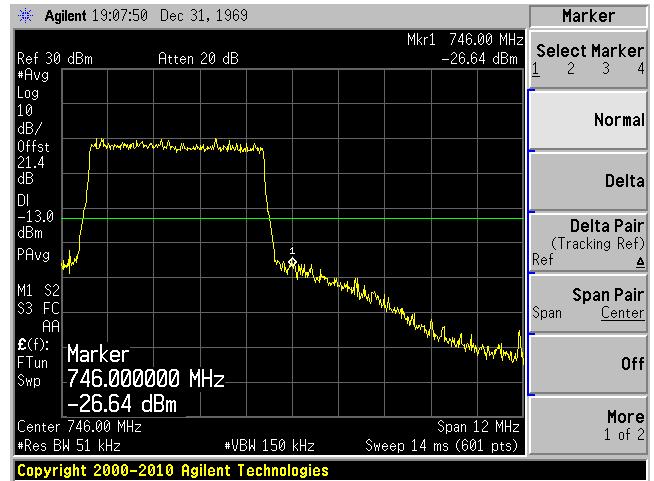
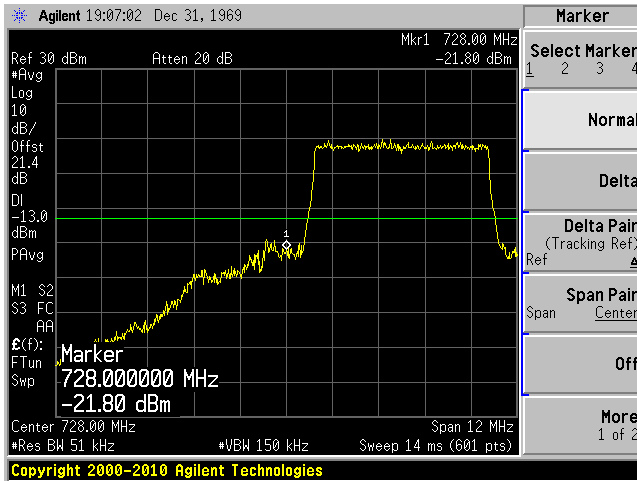
QPSK (5 MHz) - Low Channel

QPSK (5 MHz) - High Channel



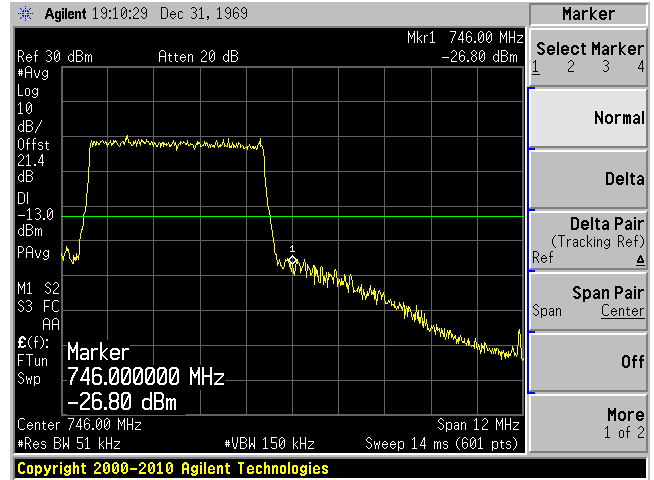
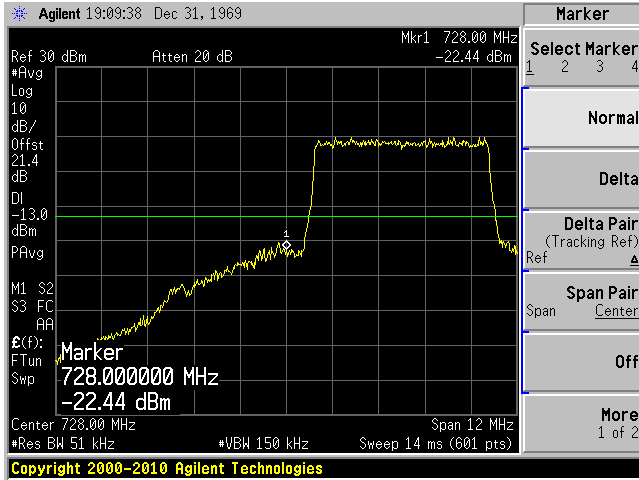
16QAM (5 MHz) - Low Channel

16QAM (5 MHz) - High Channel



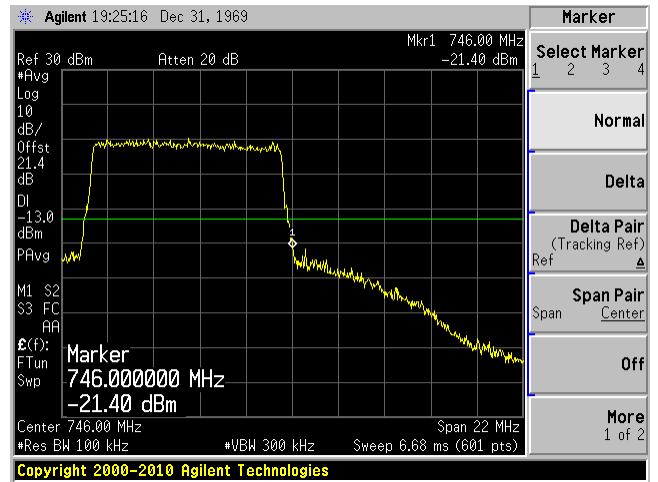
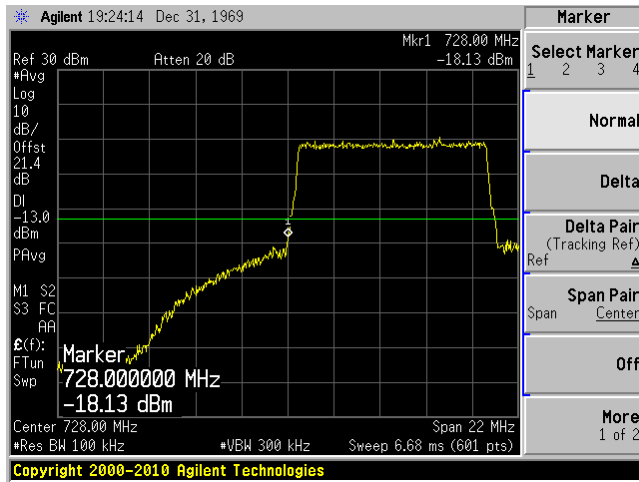
64QAM (5 MHz) - Low Channel

64QAM (5 MHz) - High Channel



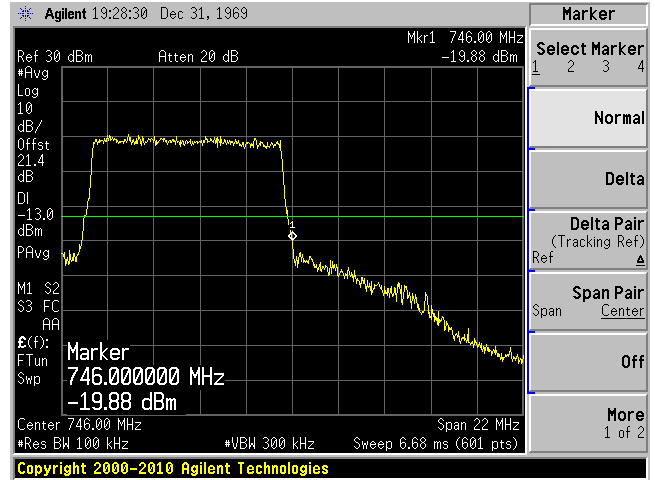
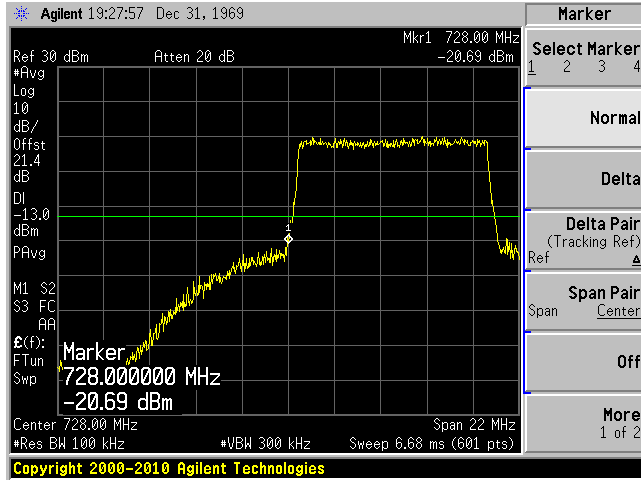
QPSK (10 MHz) - Low Channel

QPSK (10 MHz) - High Channel



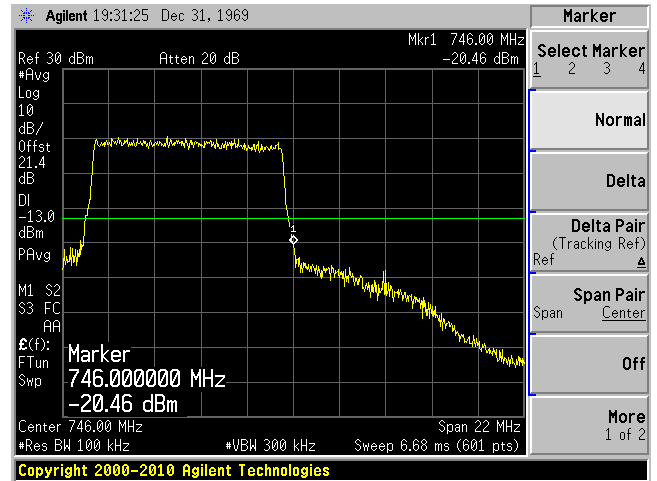
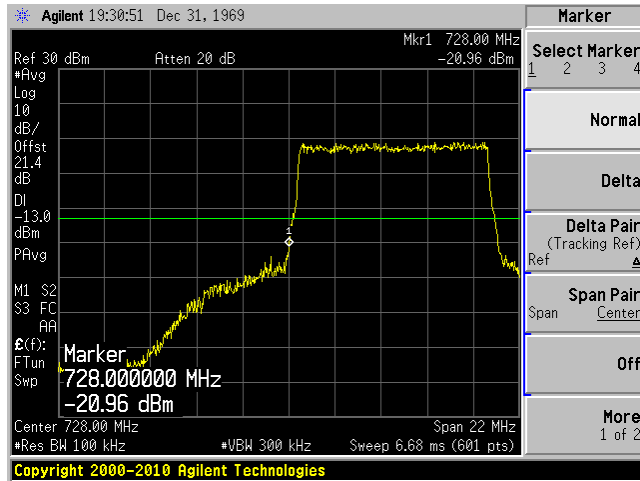
16QAM (10 MHz) - Low Channel

16QAM (10 MHz) - High Channel



64QAM (10 MHz) - Low Channel

64QAM (10 MHz) - High Channel



9 FCC §2.1055 & §27.54 – Frequency Stability

9.1 Applicable Standard

According to FCC §2.1055 the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

9.2 Test Procedure

The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from battery end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification — the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ± 0.00025 % (± 2.5 ppm) of the center frequency.

CW was tested as worst case.

9.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09 ¹
HP	Signal Generator	E4438C	MY45091309	2012-05-03

Note 1: Based on a two year calibration cycle.

Statement of Traceability: BA CL Corp. attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

9.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	57 %
ATM Pressure:	101.4kPa

The testing was performed by Wei Sun on 2012-06-10 at RF Site.

9.5 Test Results

For Port: 700ABC-1

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
Frequency vs. Temperature					
120	50	737	736.999967	-0.45	± 2.5
120	45	737	736.999967	-0.45	± 2.5
120	35	737	736.999967	-0.45	± 2.5
120	25	737	736.999967	0.45	± 2.5
120	15	737	736.999967	-0.45	± 2.5
120	5	737	736.999967	-0.45	± 2.5
120	-5	737	736.999967	-0.45	± 2.5
120	-15	737	736.999967	-0.45	± 2.5
120	-25	737	736.999967	-0.45	± 2.5
Frequency vs. Voltage					
108	25	737	736.999967	-0.45	± 2.5
132	25	737	736.999967	-0.45	± 2.5

For Port: 700ABC-2

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
Frequency vs. Temperature					
120	50	737	736.999967	-0.45	± 2.5
120	45	737	736.999967	-0.45	± 2.5
120	35	737	736.999967	-0.45	± 2.5
120	25	737	736.999967	-0.45	± 2.5
120	15	737	736.999967	-0.45	± 2.5
120	5	737	736.999967	-0.45	± 2.5
120	-5	737	736.999967	-0.45	± 2.5
120	-15	737	736.999967	-0.45	± 2.5
120	-25	737	736.999967	-0.45	± 2.5
Frequency vs. Voltage					
108	25	737	736.999967	-0.45	± 2.5
132	25	737	736.999967	-0.45	± 2.5

Note: the lowest temperature for EUT to function is -25 °C.

10 FCC §1.1307(b)(1) & §2.1091 – RF Exposure Information

10.1 Applicable Standard

According to FCC §1.1310 and §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
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

Note: f = frequency in MHz

* = Plane-wave equivalent power density

10.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

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

Where: 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

Lower LTE Band - Downlink

Maximum peak output power at antenna input terminal (dBm): 22.03

Maximum peak output power at antenna input terminal (mW): 159.59

Prediction distance (cm): 30

Prediction frequency (MHz): 737

Antenna Gain, typical (dBi): 15

Cable Loss (dB) 8.0

Maximum Antenna Net Gain (numeric): 5.01

Power density at predication frequency and distance (mW/cm²): 0.1592

MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.4913

The highest power density level at 20 cm is below the MPE uncontrolled exposure limit.