Excellence in Compliance Testing

Certification Test Report

FCC ID: VEYXMODR2

FCC Rule Part: 15.247

ACS Report Number: 13-2112.W03.1A

Manufacturer: xG Technology, Inc
Model: xMod

Test Begin Date: **August 8, 2013**
Test End Date: **August 26, 2013**

Report Issue Date: September 3, 2013

ACCREDITED TESTING

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ACLASS, ANSI, or any agency of the Federal Government.

Project Manager:

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This report contains 100 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations.

1.2 Product Description

The xG Technology Model xMod consists of the 900 MHz xMax transceiver which encloses an xMaxW Wi-Fi module (FCC ID: VEYXMODR1W1). The device is a self contained 802.11b/g access point and xMax modem and functions as a wired/wireless bridge that allows Ethernet or Wi-Fi enabled devices to connect to an xMax network or vice-versa.

Technical Information:
Band of Operation: 904.2 MHz - 925.8 MHz
Number of Channels: 16
Modulation Format: BPSK, QPSK, 16-QAM, 64-QAM
Antenna Type/Gain: Planar Inverted-F Antenna Array (4 Rx, 2 Tx), 0 dBi
Operating Voltage: 120 V / 60Hz

Manufacturer Information:
xG Technology, Inc
7771 West Oakland Park Blvd, Suite 231
Sunrise, FL 33351

Co-Location
The 900 MHz xMax transceiver is co-located with the xMaxW WLAN transceiver module which is described in the table below.

Table 1.2-1: xMaxW Module Information

Model	FCC ID	Manufacturer	Mode of Operation	Frequency Range (MHz)
xMaxW	VEYXMODR1W1	xG Technology	IEEE 802.11 b/g	2412 - 2462

Test Sample Serial Number(s): ACS#1

Test Sample Condition: The unit was in good operating condition with no physical damages.

1.3 Test Methodology and Considerations

The xMod was evaluated for all available modulations formats while powered through the AC Mains.

The radiated spurious emissions evaluation in the restricted bands below 1000 MHz was performed with the antennas connected to the RF ports. Above 1 GHz, the measurements were collected for the EUT cabinet with the TX ports terminated with a 50 Ohm load. The measurements were collected up to the 10^{th} harmonic. Both TX RF ports were transmitting simultaneously at the maximum allowable duty cycle which was measured to be 47%. Additional measurements were performed using the RF conducted methods for the spurious emissions falling within the restricted bands above 1 GHz.

The RF conducted measurements were performed directly at each of the TX antenna ports through suitable attenuation. The maximum RF output power and PSD were calculated using the methodologies described in KDB Publication No. 662911 D01 Multiple Transmitter Output v02.

The unit was also evaluated for inter-modulation products when transmitting simultaneously with the co-located xMaxW 2.4 GHz WLAN transceiver. All inter-modulation products created by the co-transmission of both radios were compliant with the limits of 15.209.

The power line conducted emissions were performed for the unit in continuous transmit mode for each modulation format. The worst case results are reported in this document.

The unit was also evaluated for unintentional emissions. The results are documented separately in a DoC test report.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 475089
Industry Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

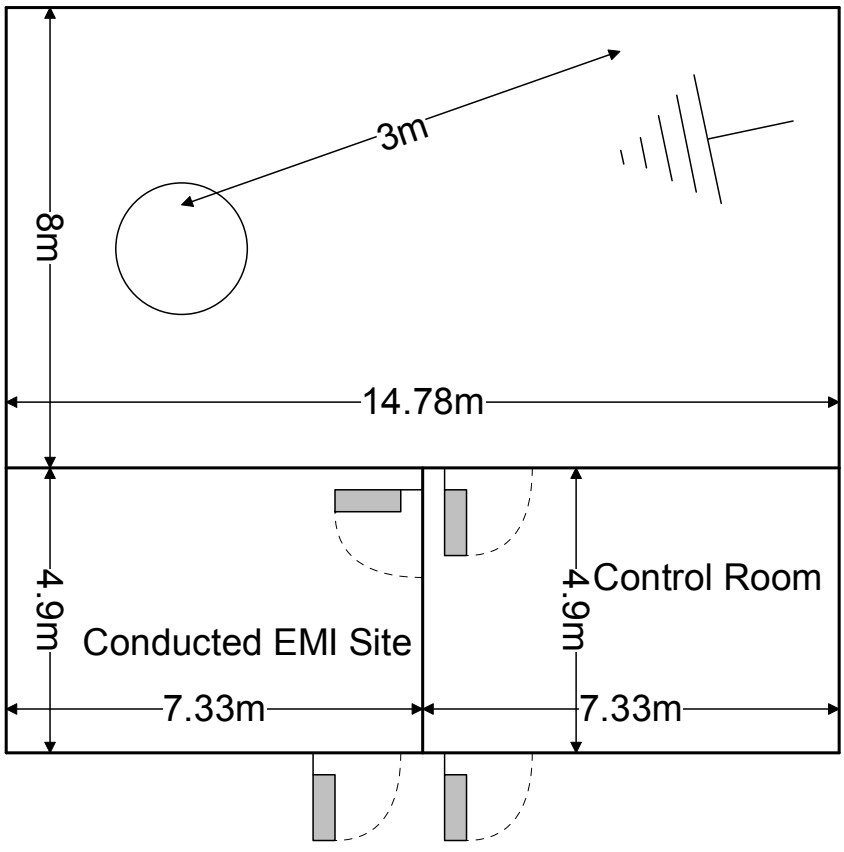

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

A diagram of the room is shown below in figure 2.3.2-1:

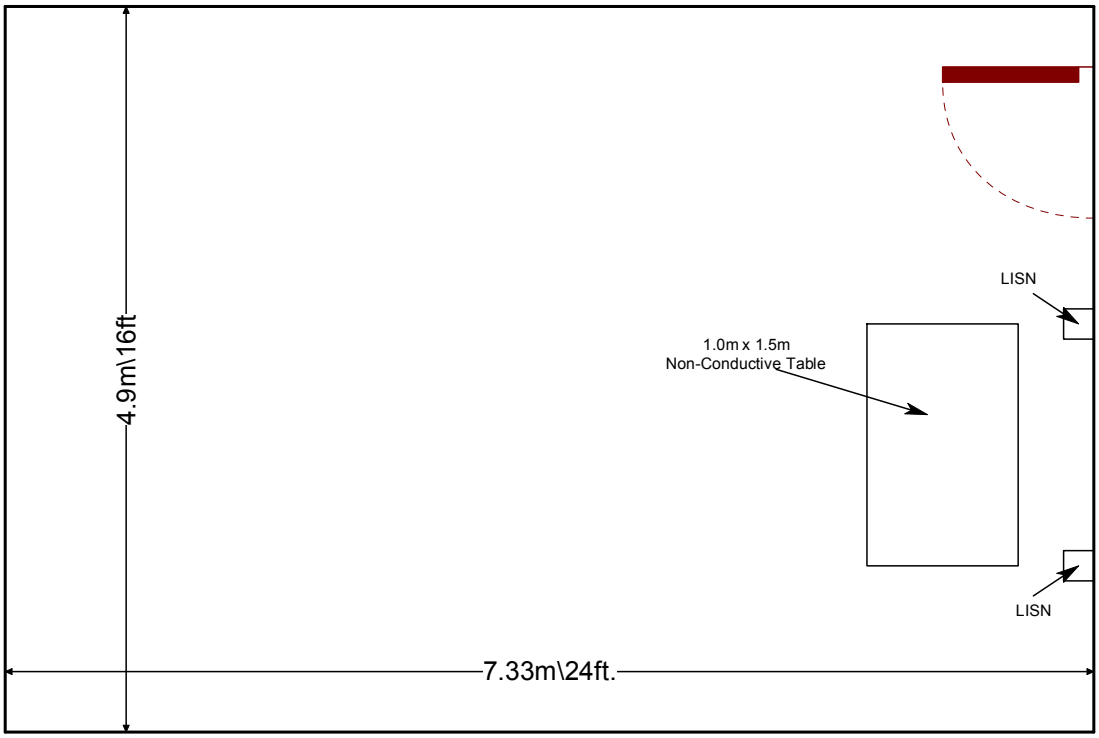

Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices.
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2013
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2013
- KDB Publication No. 558074 D01 Meas Guidance v03r01 – Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247, April 9, 2013.
- KDB Publication No. 662911 D01 Multiple Transmitter Output v02 – Emissions Testing of Transmitters with Multiple Outputs in the Same Band (*e.g.,* MIMO, Smart Antenna, etc), May 28, 2013.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/8/2013	1/8/2015
524	Chase	CBL6111	Antennas	1138	1/7/2013	1/7/2015
2006	EMCO	3115	Antennas	2573	4/24/2013	4/24/2015
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2012	12/31/2013
2022	EMCO	LISN3825/2R	LISN	1095	8/19/2011	8/19/2013
2022	EMCO	LISN3825/2R	LISN	1095	8/5/2013	9/30/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/1/2013	1/1/2014
2044	QMI	N/A	Cables	2044	12/31/2012	12/31/2013
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	12/31/2012	12/31/2013
2064	CIR Q-TEL	FHT/22-10K-13/50-3A/3A	Filter	9	12/31/2012	12/31/2013
2071	Trilithic, Inc.	4HC1400-1-KK	Filter	9643263	12/31/2012	12/31/2013
2075	Hewlett Packard	8495B	Attenuators	2626A11012	12/31/2012	12/31/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	12/29/2012	12/29/2013
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/31/2013	5/31/2014
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/20/2012	12/20/2013
267	Agilent	N1911A	Meters	MY45100129	7/30/2013	7/30/2015
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR

Notes:

NCR=No Calibration Required

The information for Asset 2022 is provided to cover the entire evaluation cycle.

5 SUPPORT EQUIPMENT

Table 5-1: EUT and Accessory Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	XG Technology	xMod	ACS#1
2	15 VDC Power Supply	Mean Well	GS60A15	EB34614917
3	Laptop	Dell	Latitude D620	CN-0TD761-12961-68G-3106
4	Jump Drive	N/A	N/A	N/A
5	Mouse	Dell	M-UAR DEL7	LZ9440C43W5

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Ethernet Cable	10m / 1.8m	No	EUT to Laptop
B	Power supply cable	1m	No	EUT to Power Supply
C	Power Cable	1.8m	No	Power Supply to AC Mains
D	USB	1.8 m	No	Mouse to Laptop
E	Serial	1.84 m	No	Unterminated

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

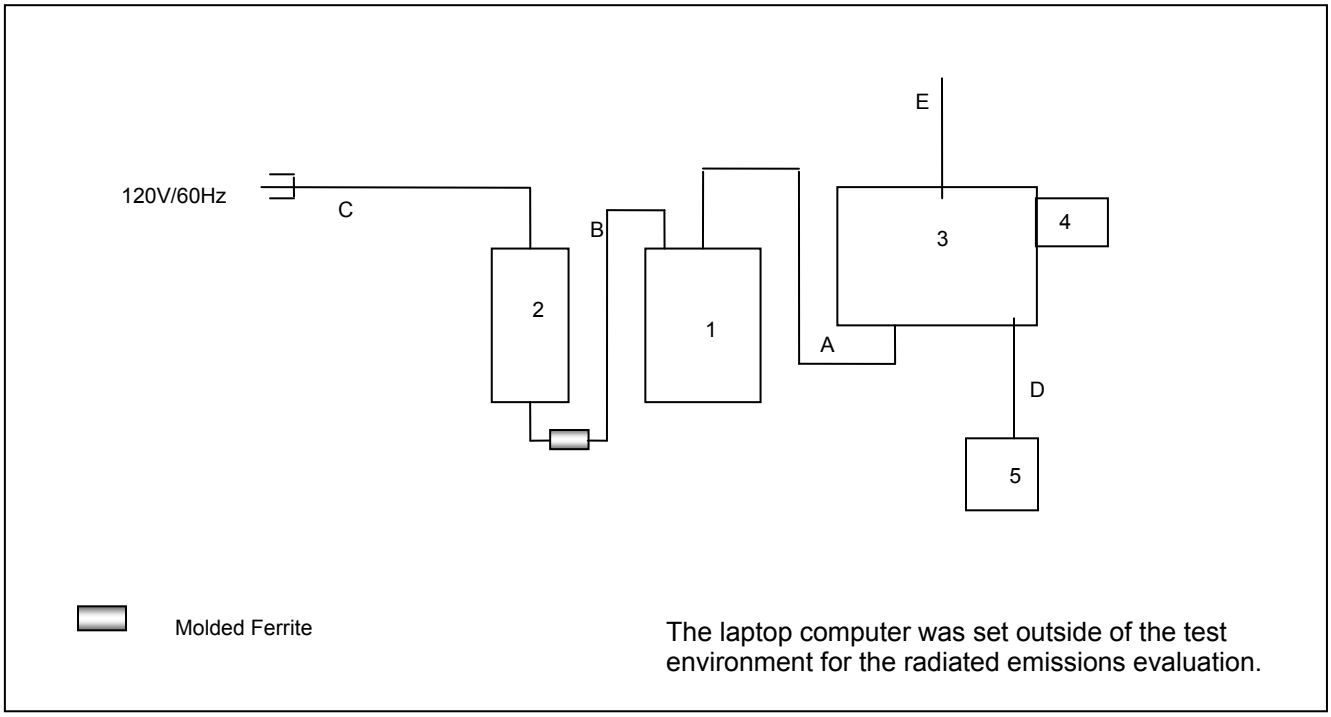

Figure 6-1: EUT Test Setup

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The EUT uses a 4 x 2 Planar Inverted-F antenna array, where two antennas receive only while the other two transmit and receive. The xMod uses MCX connectors at the antenna ports, thus meeting the requirements of FCC Section 15.203.

The directional gain is calculated per FCC KDB Publication No. 662911 D01 Multiple Transmitter Output v01r02.

Directional Gain = GANT + Array Gain
Array Gain = 10*log(NANT/NSS) dB

Where,
GANT = Antenna Gain
NANT = number of transmit antennas and
NSS = number of spatial streams. (Assume NSS = 1 unless you have specific information to the contrary.)

Directional Gain = 0 + 10*log(2/1) = 3.01 dBi

7.2 6 dB Bandwidth - FCC: Section 15.247(a)(2) / Occupied Bandwidth (OBW)

7.2.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC KDB Publication No. 558074 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)” DTS 6-dB Signal Bandwidth Option 1. The RBW of the spectrum analyzer was set to 100 kHz and VBW 300 kHz. Span was set large enough to capture the entire emissions and >> RBW.

The occupied bandwidth (OBW) as defined in the FCC KDB Publication No. 558074 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)” was measured in accordance with ANSI C63.10. The Span of the Spectrum Analyzer was configured between two to five times the OBW. The RBW of the SA was set to 1% to 5% of the OBW. The reference level was set to the highest amplitude signal observed. The occupied OBW was measured 20 dB down from the reference level.

7.2.2 Measurement Results

Results are shown below.

Table 7.2.2-1: 6dB / OBW (BPSK, Antenna Path 1)

Frequency [MHz]	6dB Bandwidth [kHz]	Bandwidth (OBW) (kHz)
904.2	1367	1508.3
915.72	1368	1508.3
925.8	1365	1501.7

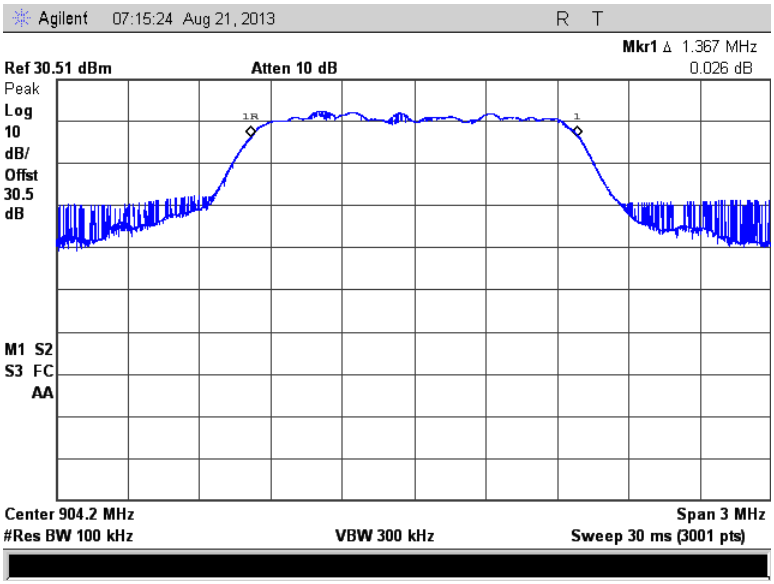

Figure 7.2.2-1: 6dB BW - Low Channel (BPSK, Antenna Path 1)

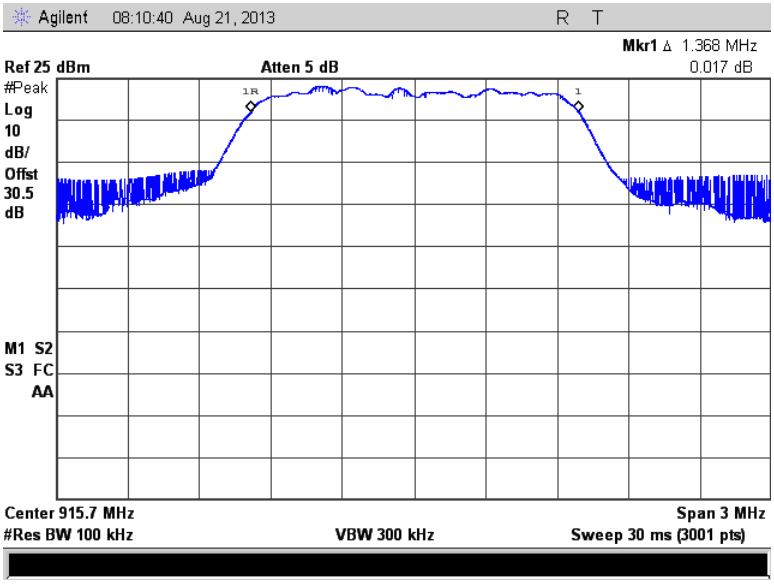

Figure 7.2.2-2: 6dB BW - Middle Channel (BPSK, Antenna Path 1)

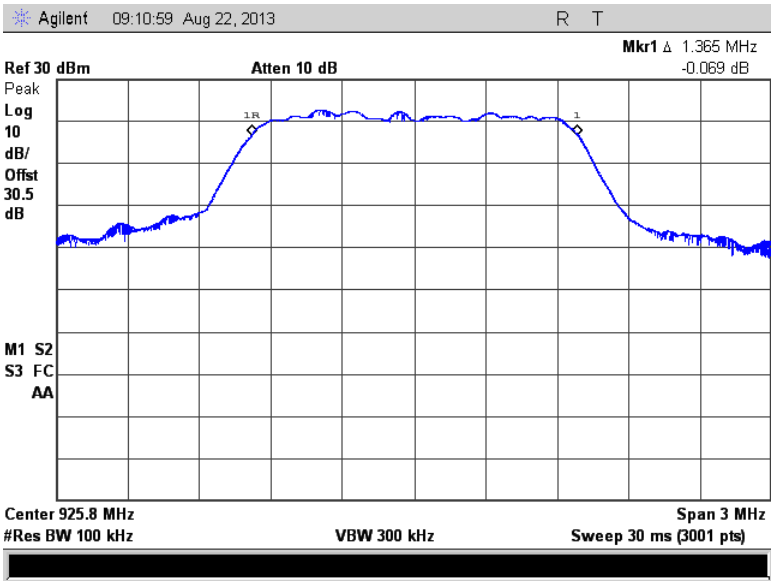

Figure 7.2.2-3: 6dB BW - High Channel (BPSK, Antenna Path 1)

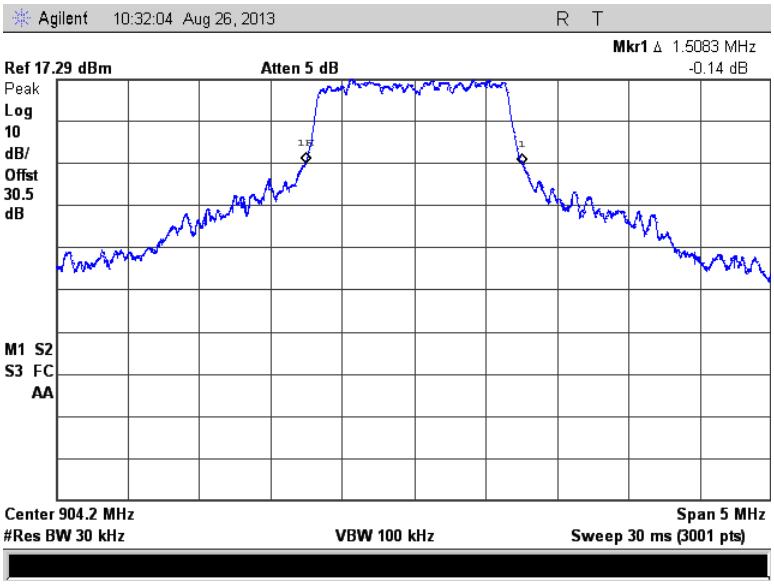

Figure 7.2.2-4: 20 dB OBW - Low Channel (BPSK, Antenna Path 1)

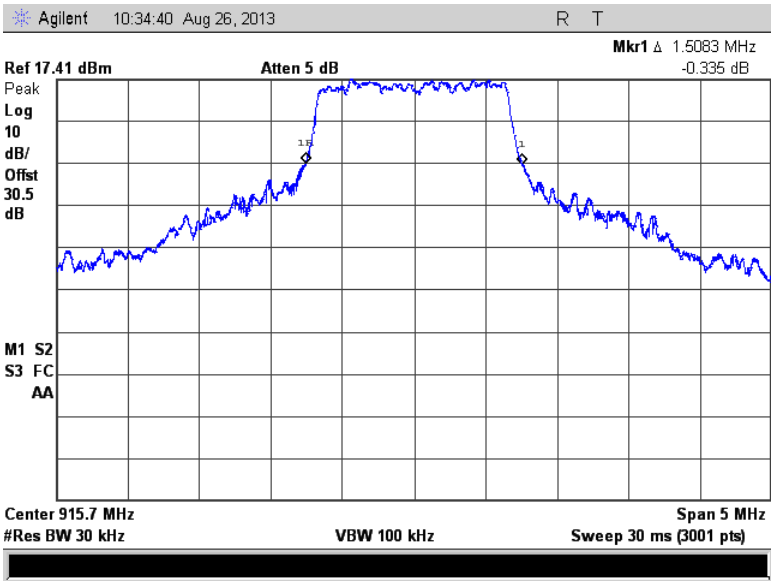

Figure 7.2.2-5: 20 dB OBW - Middle Channel (BPSK, Antenna Path 1)

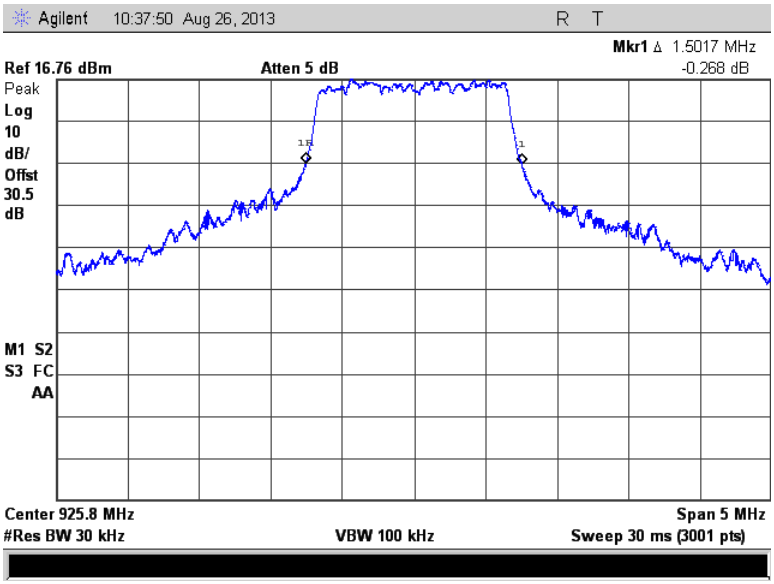

Figure 7.2.2-6: 20 dB OBW - High Channel (BPSK, Antenna Path 1)

Table 7.2.2-2: 6dB / OBW (BPSK, Antenna Path 2)

Frequency [MHz]	6dB Bandwidth [kHz]	OBW (kHz)
904.2	1364	1545
915.72	1363	1583.3
925.8	1363	1635

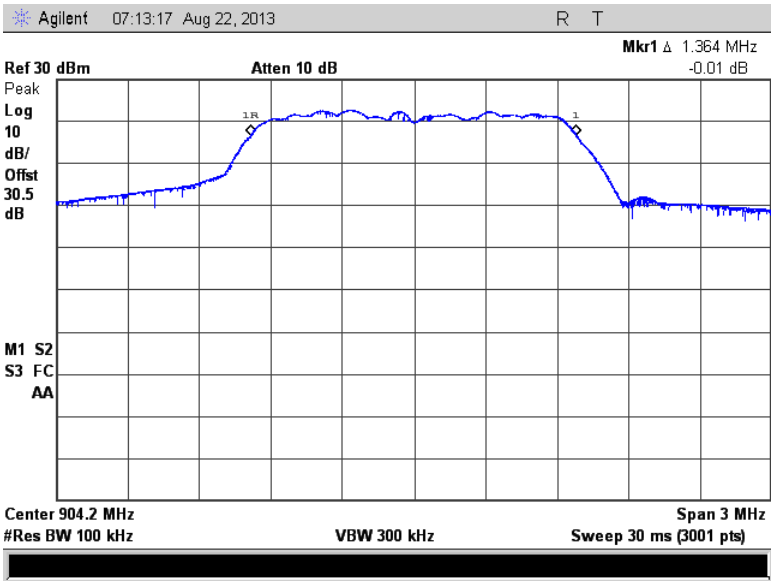

Figure 7.2.2-7: 6dB BW - Low Channel (BPSK, Antenna Path 2)

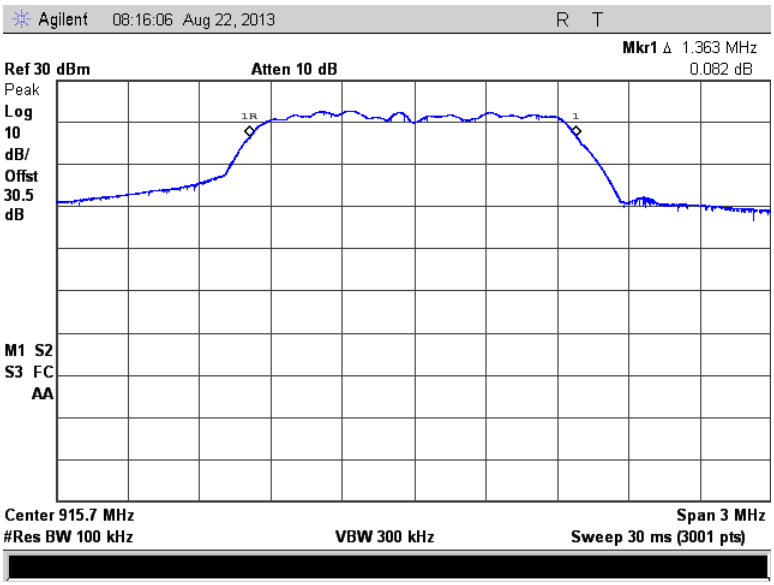

Figure 7.2.2-8: 6dB BW - Middle Channel (BPSK, Antenna Path 2)

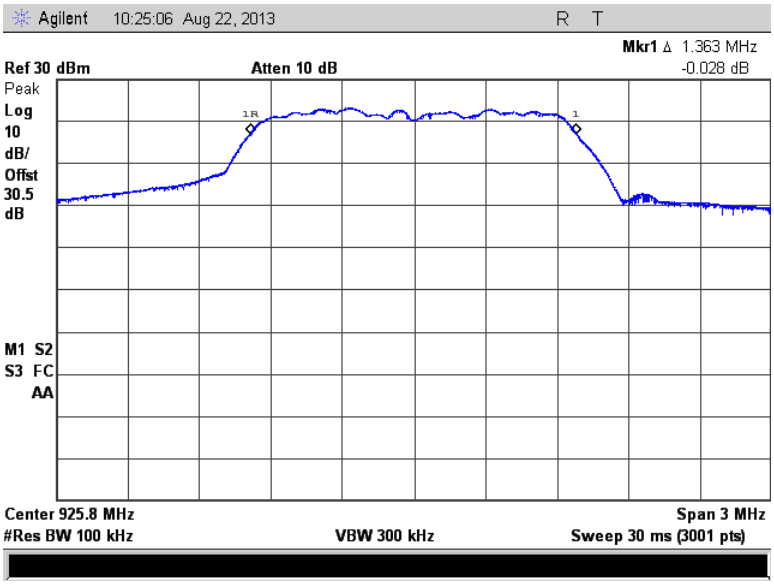

Figure 7.2.2-9: 6dB BW - High Channel (BPSK, Antenna Path 2)

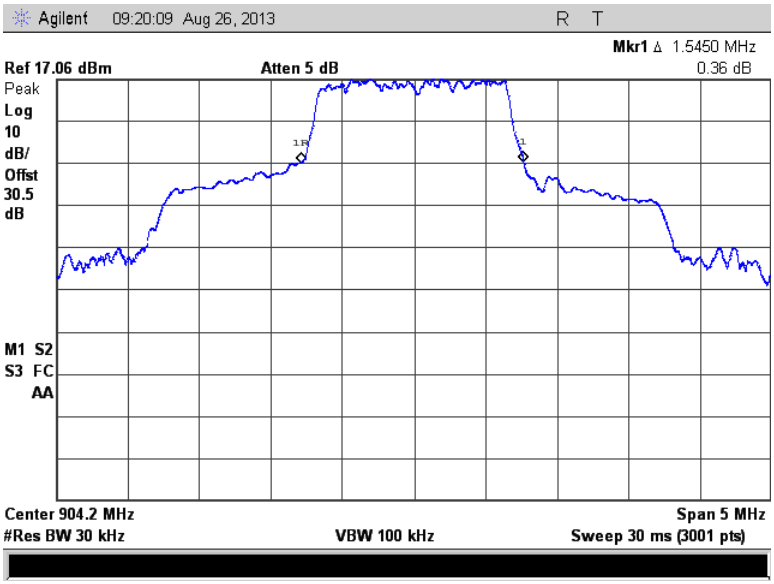

Figure 7.2.2-10: 20 dB OBW - Low Channel (BPSK, Antenna Path 2)

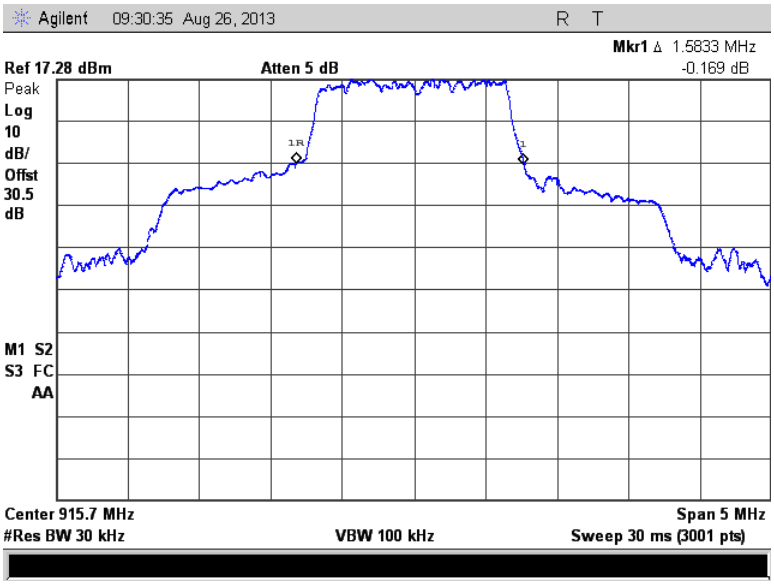

Figure 7.2.2-11: 20 dB OBW - Middle Channel (BPSK, Antenna Path 2)

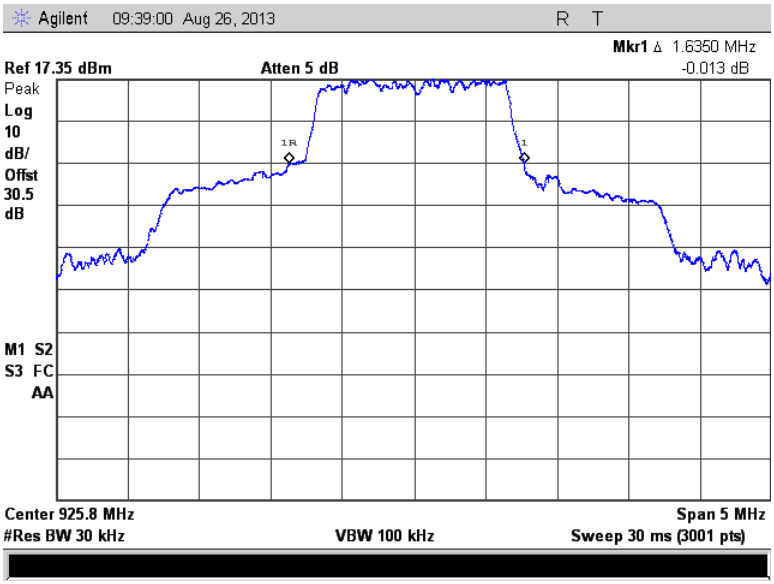

Figure 7.2.2-12: 20 dB OBW - High Channel (BPSK, Antenna Path 2)

Table 7.2.2-3: 6dB / OBW (QPSK, Antenna Path 1)

Frequency [MHz]	6dB Bandwidth [kHz]	OBW (kHz)
904.2	1352	1516.7
915.72	1350	1491.7
925.8	1352	1493.4

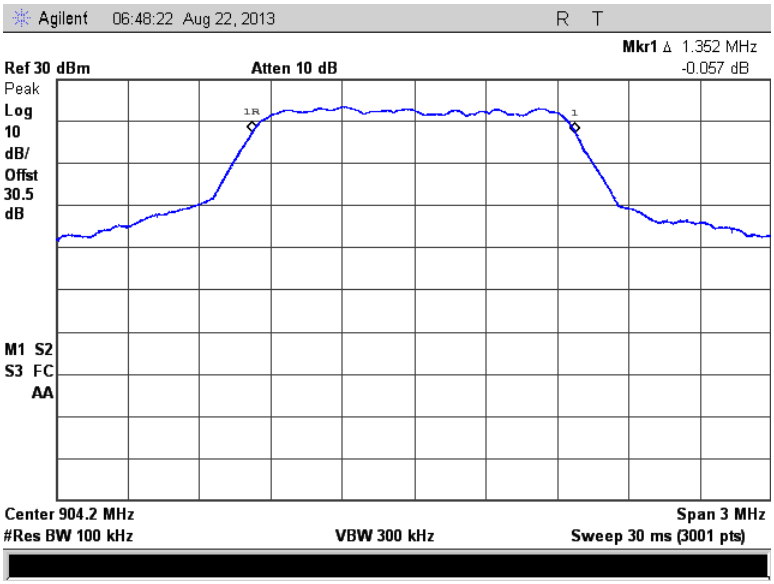

Figure 7.2.2-13: 6dB BW - Low Channel (QPSK, Antenna Path 1)

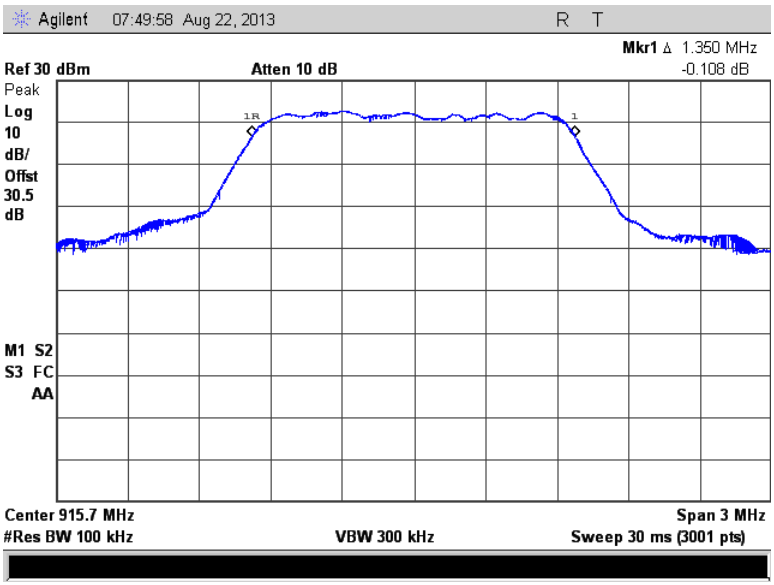

Figure 7.2.2-14: 6dB BW - Middle Channel (QPSK, Antenna Path 1)

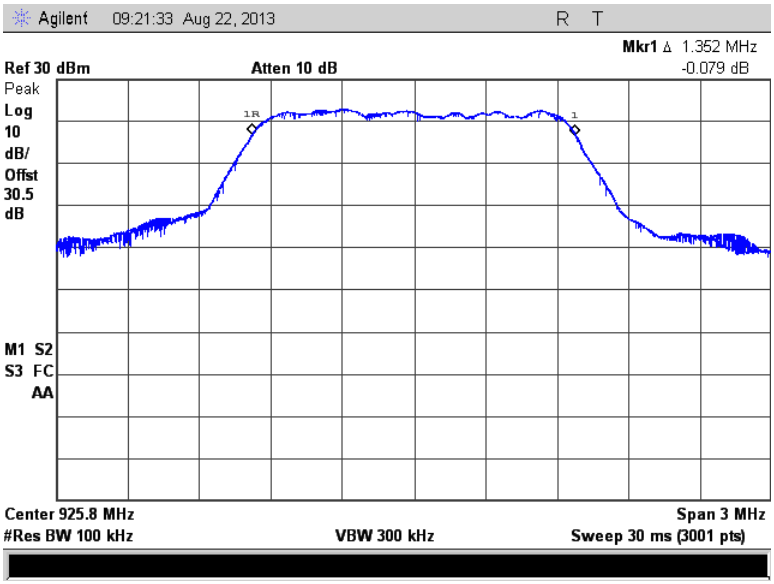

Figure 7.2.2-15: 6dB BW - High Channel (QPSK, Antenna Path 1)

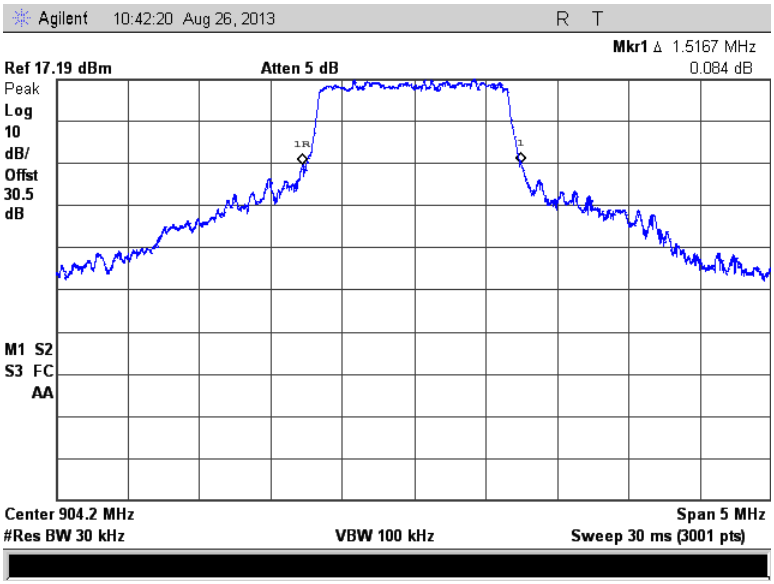

Figure 7.2.2-16: 20 dB OBW - Low Channel (QPSK, Antenna Path 1)

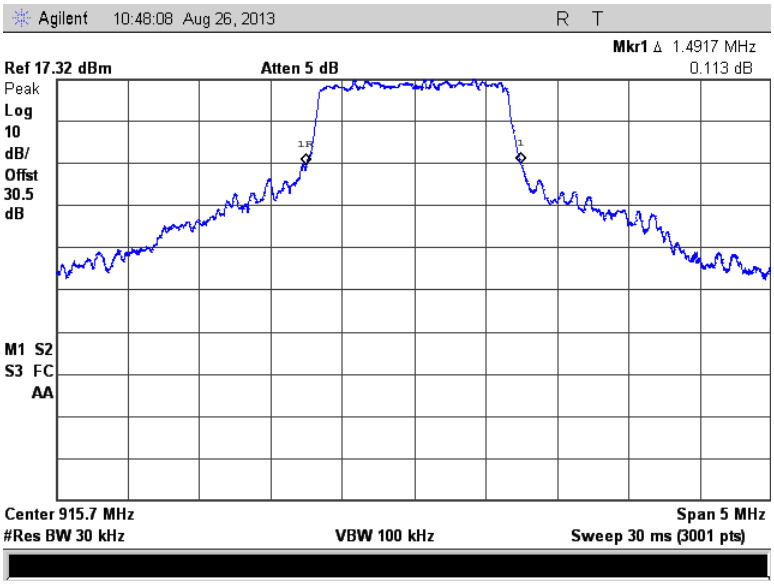

Figure 7.2.2-17: 20 dB OBW - Middle Channel (QPSK, Antenna Path 1)

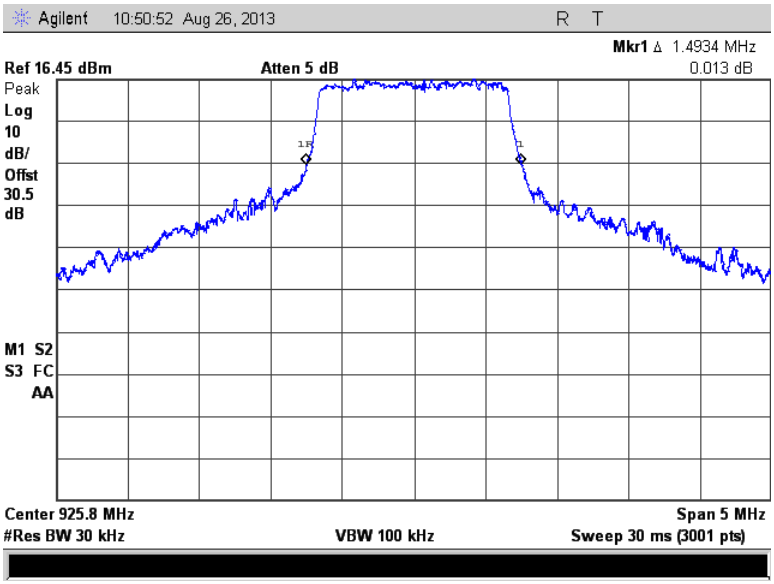

Figure 7.2.2-18: 20 dB OBW - High Channel (QPSK, Antenna Path 1)

Table 7.2.2-4: 6dB / OBW (QPSK, Antenna Path 2)

Frequency [MHz]	6dB Bandwidth [kHz]	OBW (kHz)
904.2	1352	1626.6
915.72	1352	1626.7
925.8	1351	1636.7

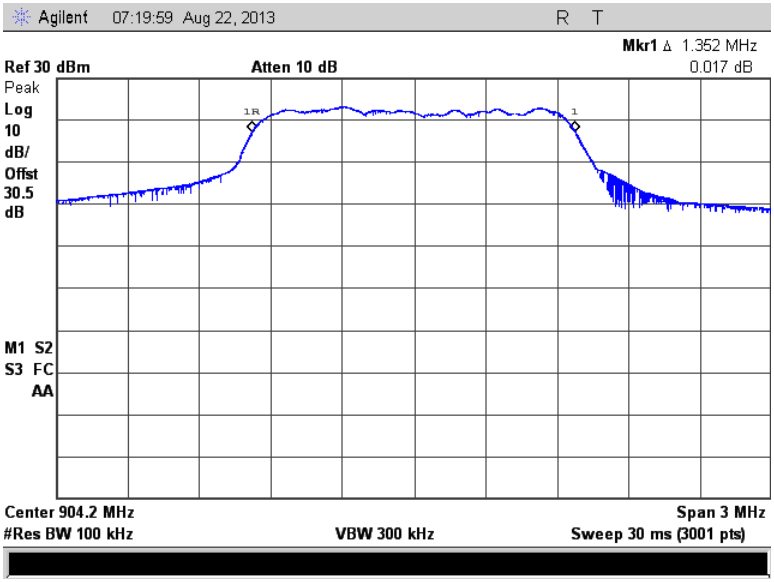

Figure 7.2.2-19: 6dB BW - Low Channel (QPSK, Antenna Path 2)

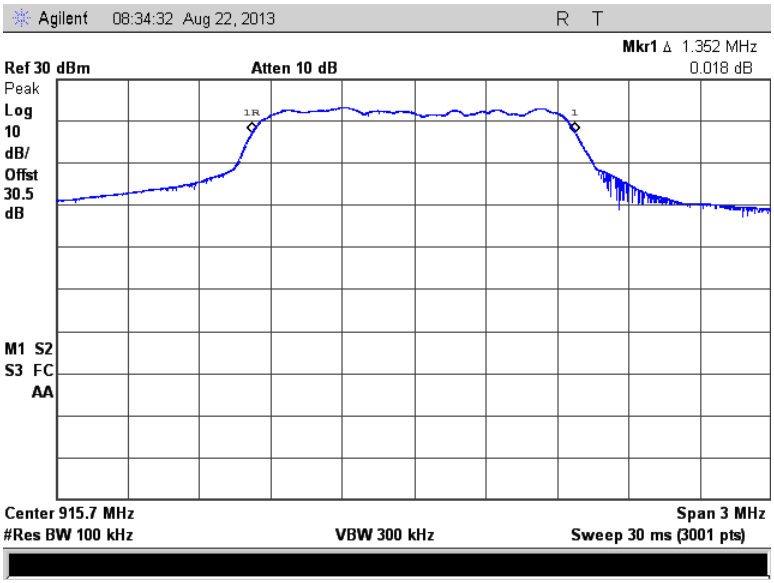

Figure 7.2.2-20: 6dB BW - Middle Channel (QPSK, Antenna Path 2)

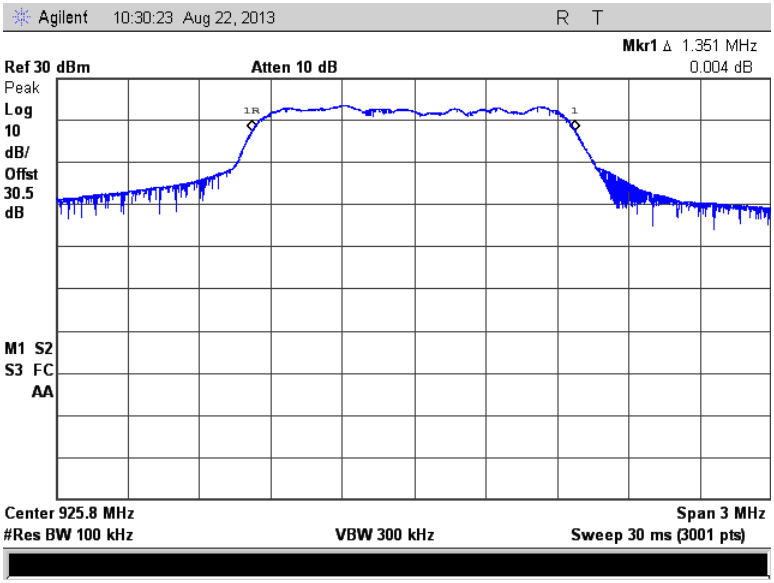

Figure 7.2.2-21: 6dB BW - High Channel (QPSK, Antenna Path 2)

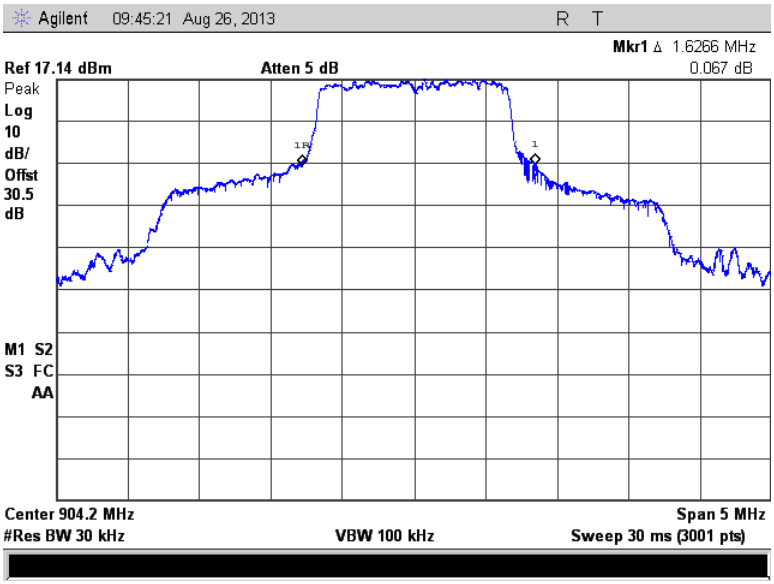

Figure 7.2.2-22: 20 dB OBW - Low Channel (QPSK, Antenna Path 2)

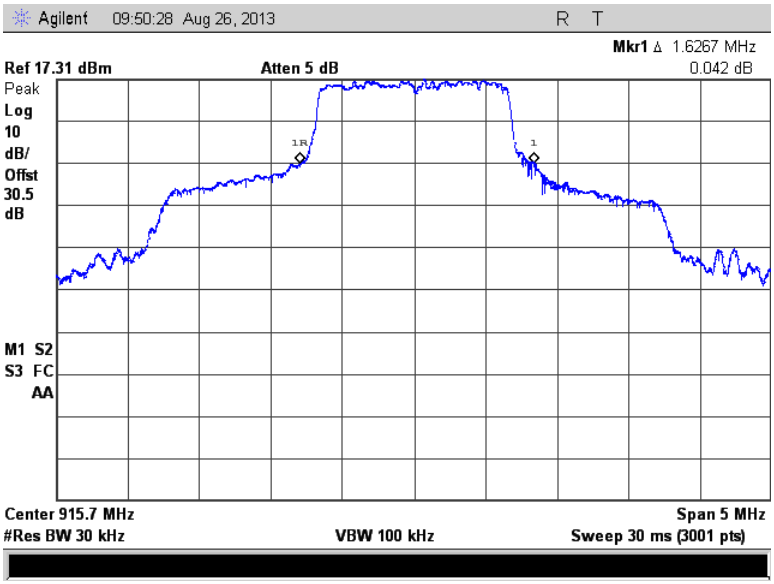

Figure 7.2.2-23: 20 dB OBW - Middle Channel (QPSK, Antenna Path 2)

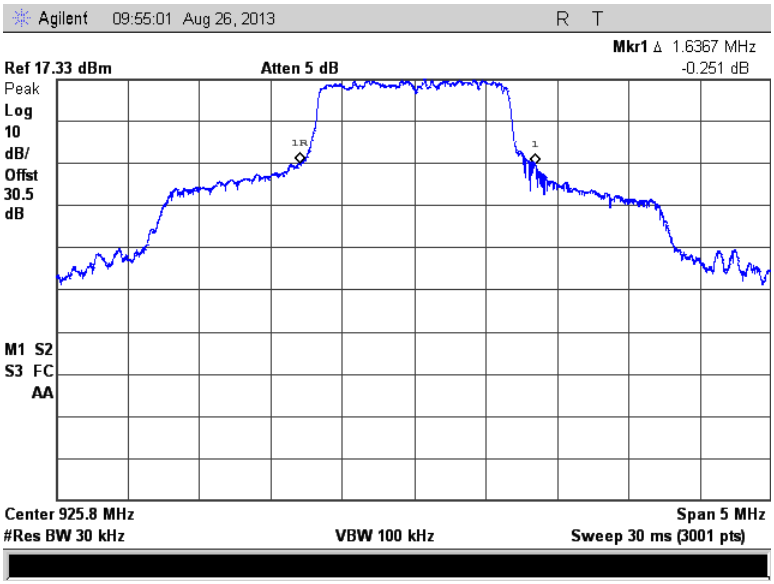

Figure 7.2.2-24: 20 dB OBW - High Channel (QPSK, Antenna Path 2)

Table 7.2.2-5: 6dB / OBW (16-QAM, Antenna Path 1)

Frequency [MHz]	6dB Bandwidth [kHz]	OBW (kHz)
904.2	1375	1505
915.72	1374	1498.3
925.8	1371	1478.3

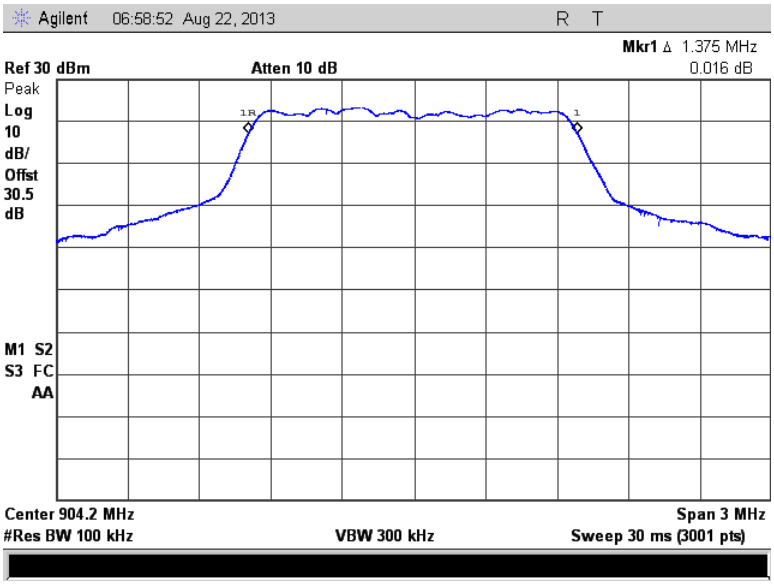

Figure 7.2.2-25: 6dB BW - Low Channel (16-QAM, Antenna Path 1)

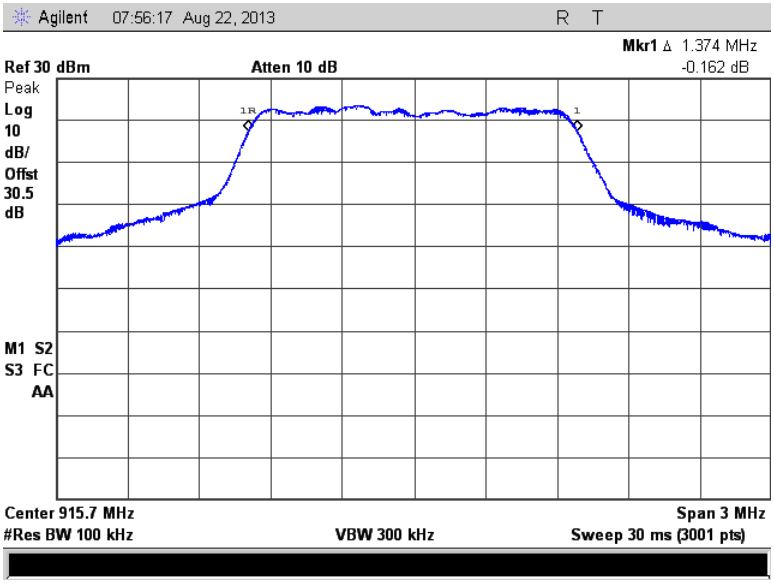

Figure 7.2.2-26: 6dB BW - Middle Channel (16-QAM, Antenna Path 1)

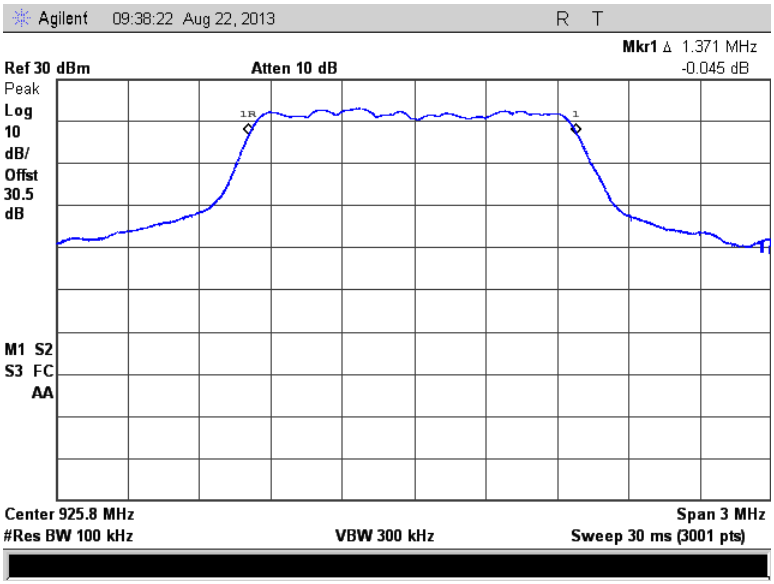

Figure 7.2.2-27: 6dB BW - High Channel (16-QAM, Antenna Path 1)

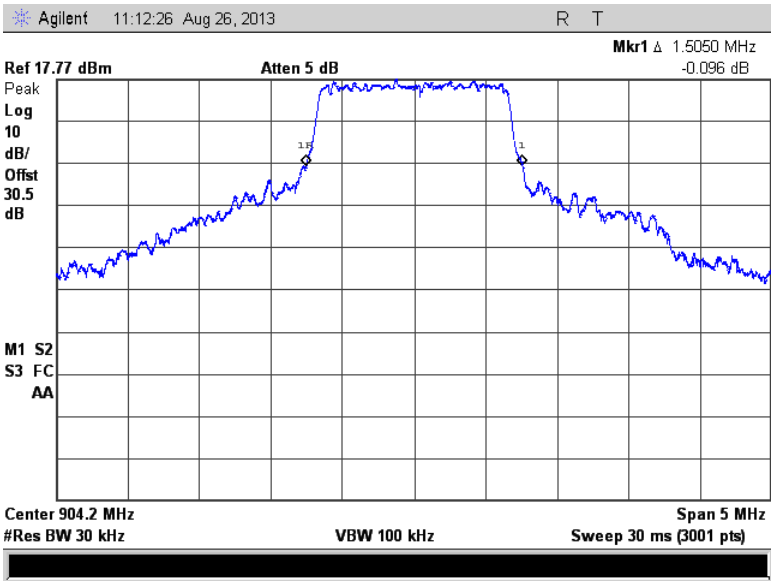

Figure 7.2.2-28: 20 dB OBW - Low Channel (16-QAM, Antenna Path 1)

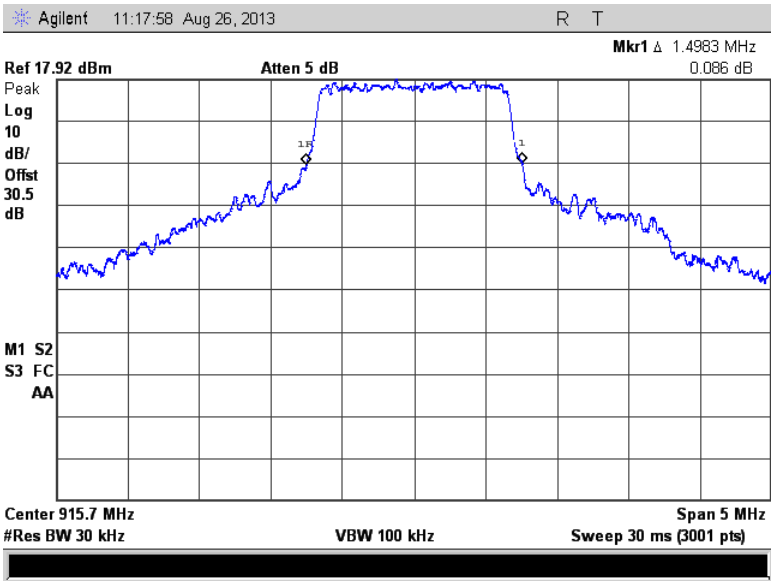

Figure 7.2.2-29: 20 dB OBW - Middle Channel (16-QAM, Antenna Path 1)

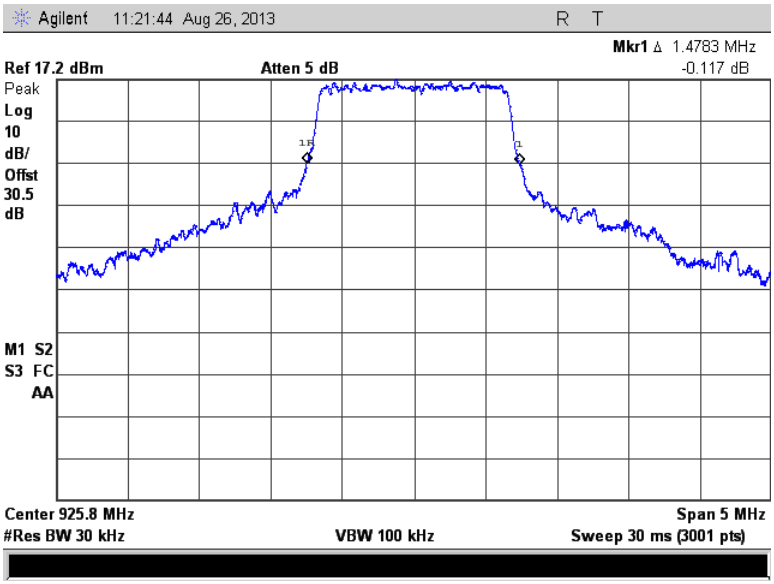

Figure 7.2.2-30: 20 dB OBW - High Channel (16-QAM, Antenna Path 1)

Table 7.2.2-6: 6dB / OBW (16-QAM, Antenna Path 2)

Frequency [MHz]	6dB Bandwidth [kHz]	OBW (kHz)
904.2	1371	1495
915.72	1371	1500
925.8	1371	1498.3

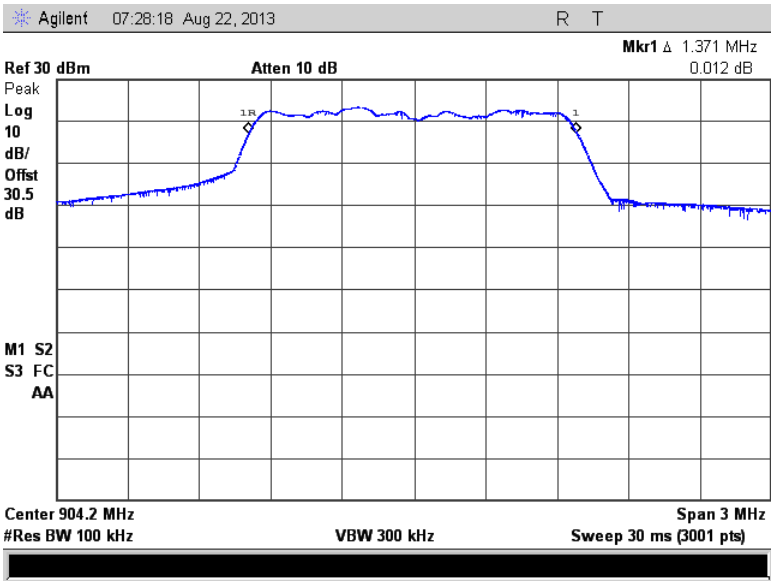

Figure 7.2.2-31: 6dB BW - Low Channel (16-QAM, Antenna Path 2)

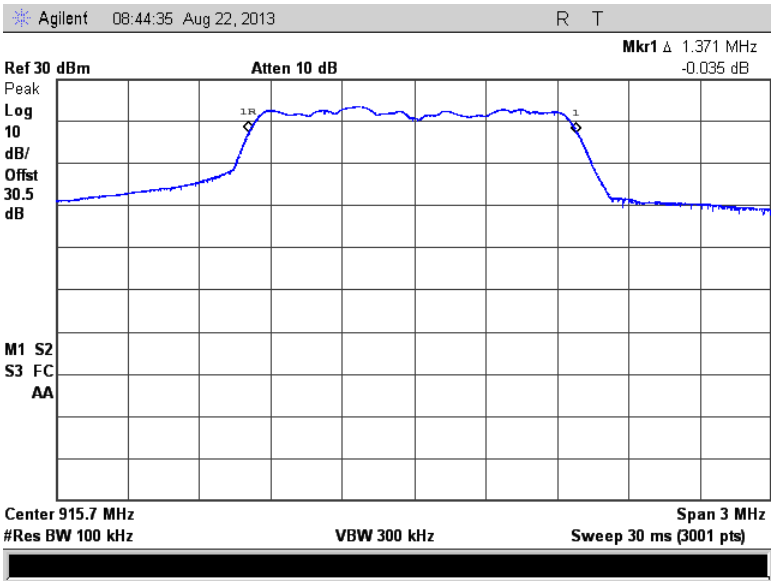

Figure 7.2.2-32: 6dB BW - Middle Channel (16-QAM, Antenna Path 2)

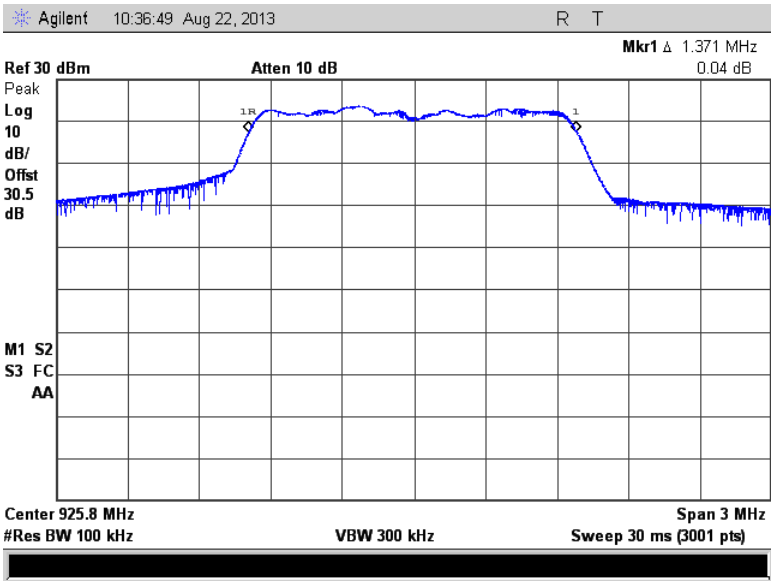

Figure 7.2.2-33: 6dB BW - High Channel (16-QAM, Antenna Path 2)

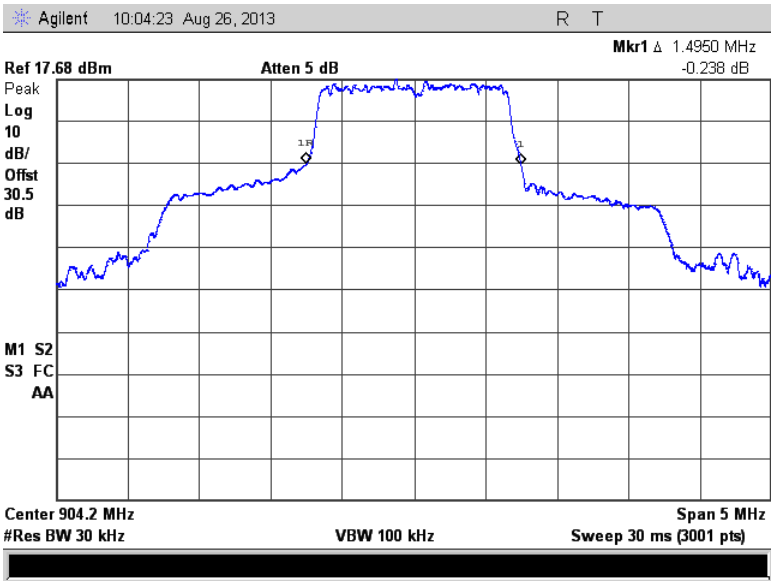

Figure 7.2.2-34: 20 dB OBW - Low Channel (16-QAM, Antenna Path 2)

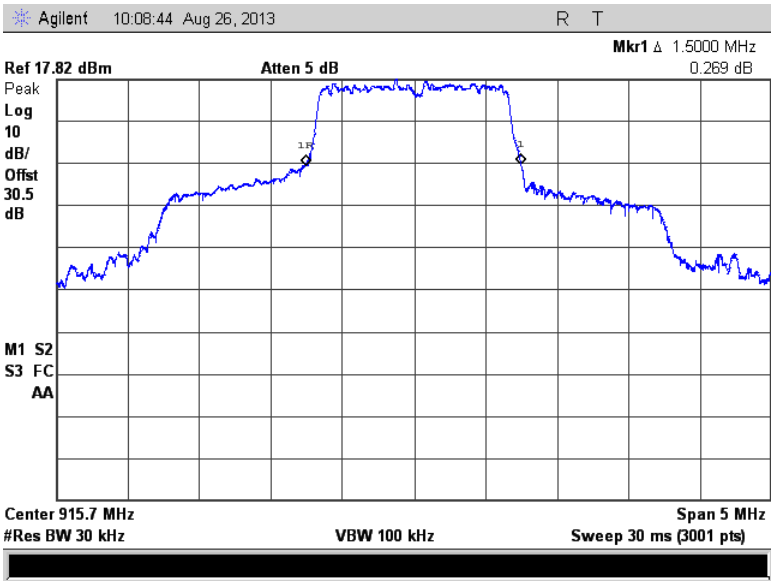

Figure 7.2.2-35: 20 dB OBW - Middle Channel (16-QAM, Antenna Path 2)

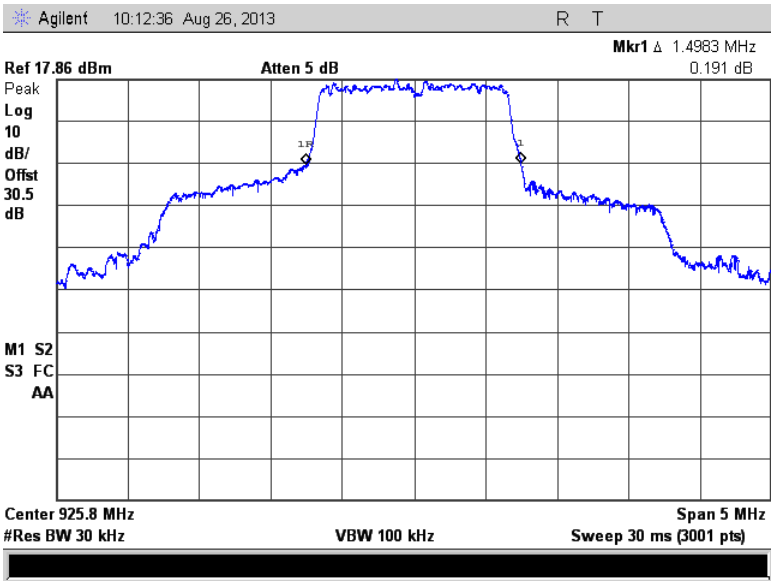

Figure 7.2.2-36: 20 dB OBW - High Channel (16-QAM, Antenna Path 2)

Table 7.2.2-7: 6dB / OBW (64-QAM, Antenna Path 1)

Frequency [MHz]	6dB Bandwidth [kHz]	OBW (kHz)
904.2	1383	1466.6
915.72	1385	1470
925.8	1383	1473.3

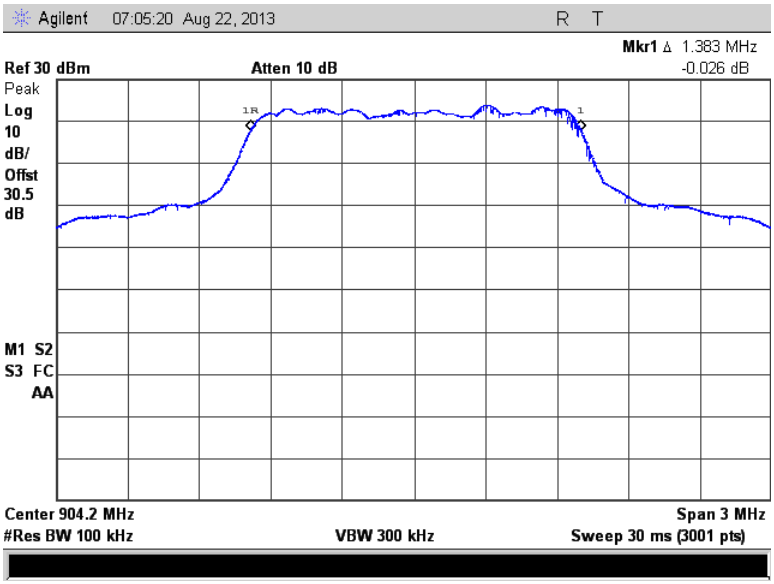

Figure 7.2.2-37: 6dB BW - Low Channel (64-QAM, Antenna Path 1)

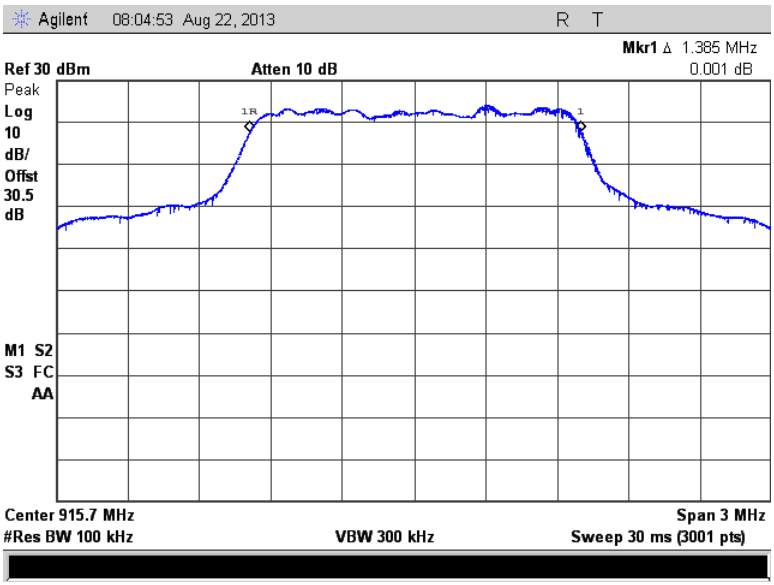

Figure 7.2.2-38: 6dB BW - Middle Channel (64-QAM, Antenna Path 1)

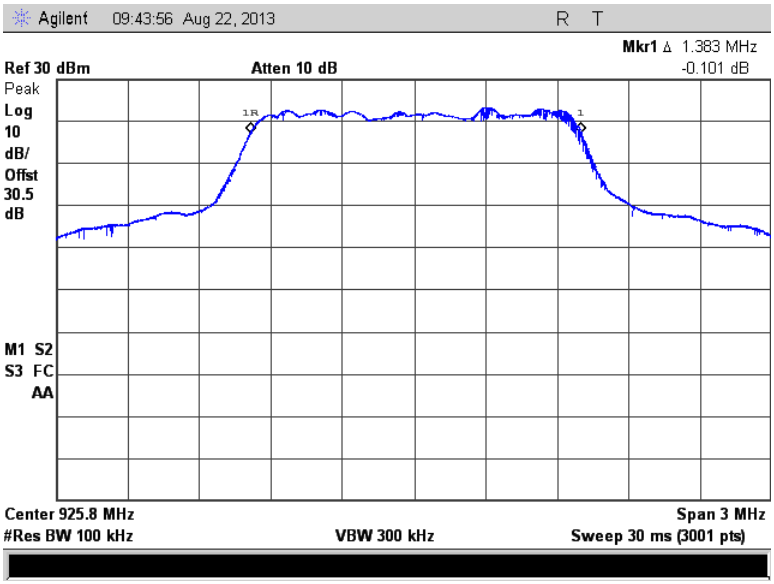

Figure 7.2.2-39: 6dB BW - High Channel (64-QAM, Antenna Path 1)

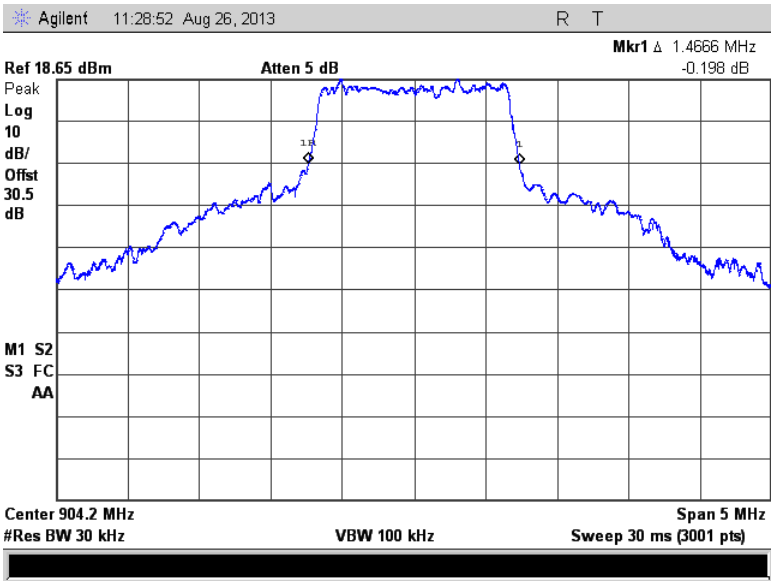

Figure 7.2.2-40: 20 dB OBW - Low Channel (64-QAM, Antenna Path 1)

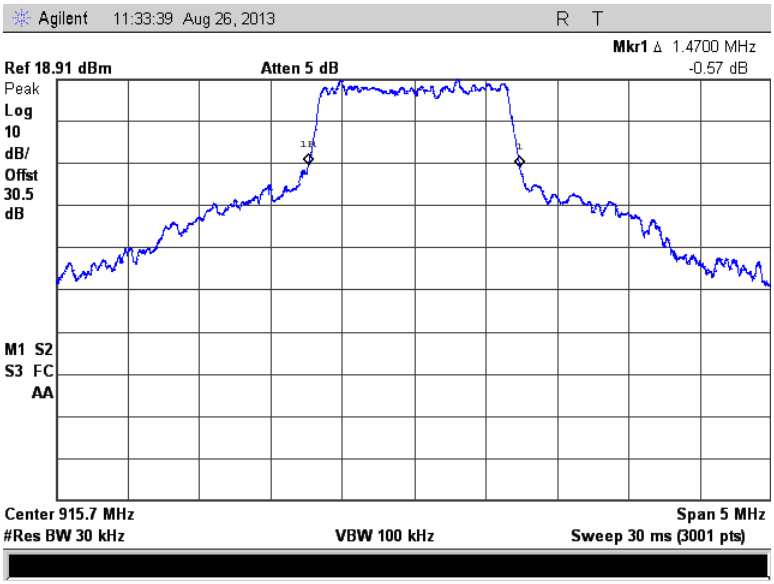

Figure 7.2.2-41: 20 dB OBW - Middle Channel (64-QAM, Antenna Path 1)

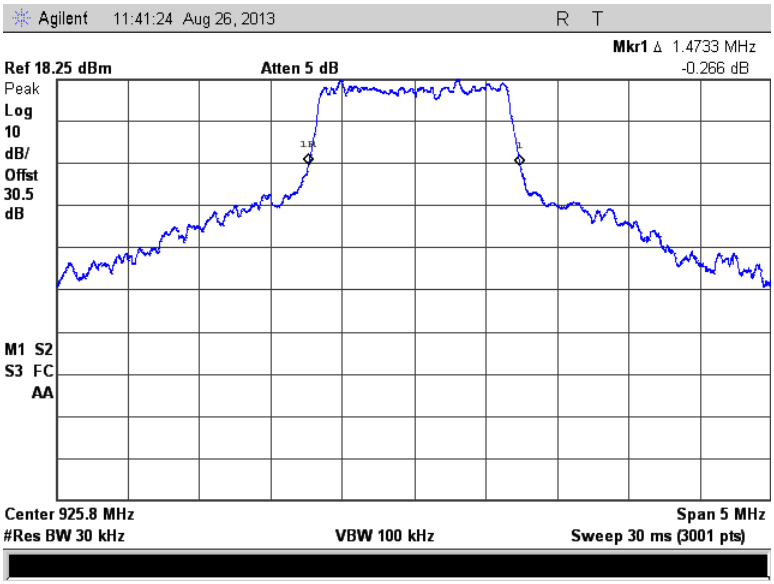

Figure 7.2.2-42: 20 dB OBW - High Channel (64-QAM, Antenna Path 1)

Table 7.2.2-8: 6dB / OBW (64-QAM, Antenna Path 2)

Frequency [MHz]	6dB Bandwidth [kHz]	OBW (kHz)
904.2	1382	1471.7
915.72	1383	1471.6
925.8	1384	1476.7

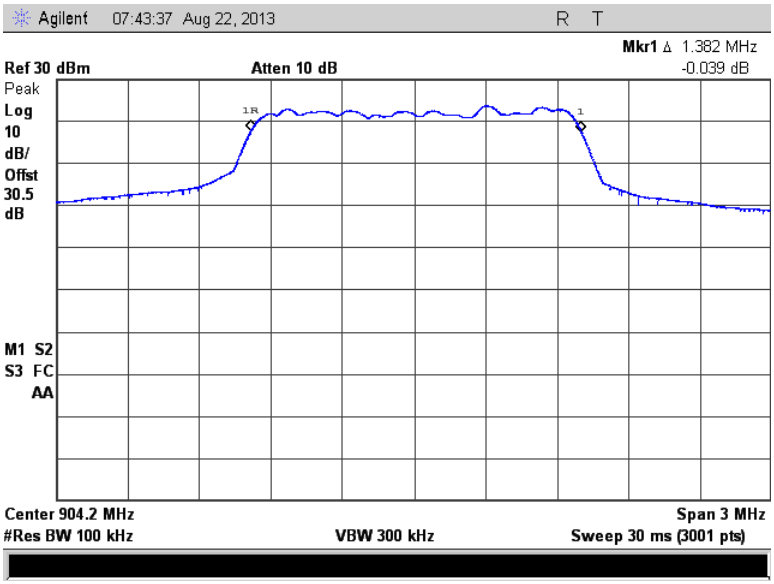

Figure 7.2.2-43: 6dB BW - Low Channel (64-QAM, Antenna Path 2)

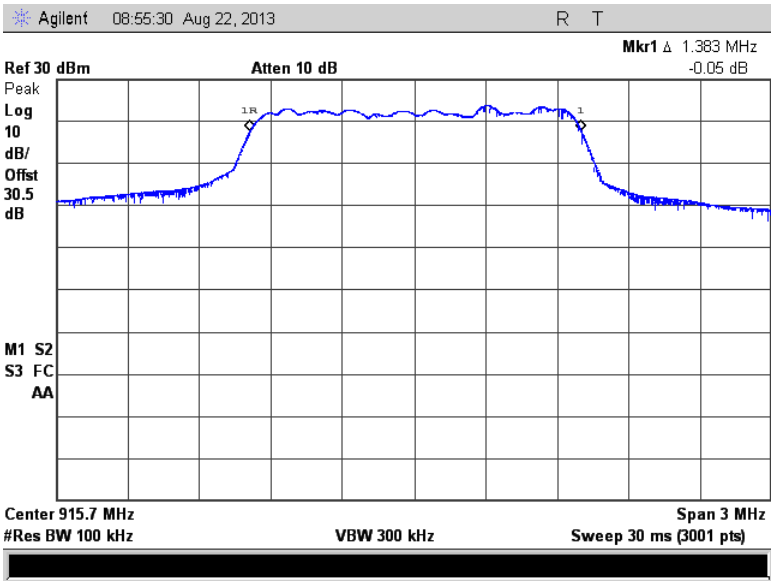

Figure 7.2.2-44: 6dB BW - Middle Channel (64-QAM, Antenna Path 2)

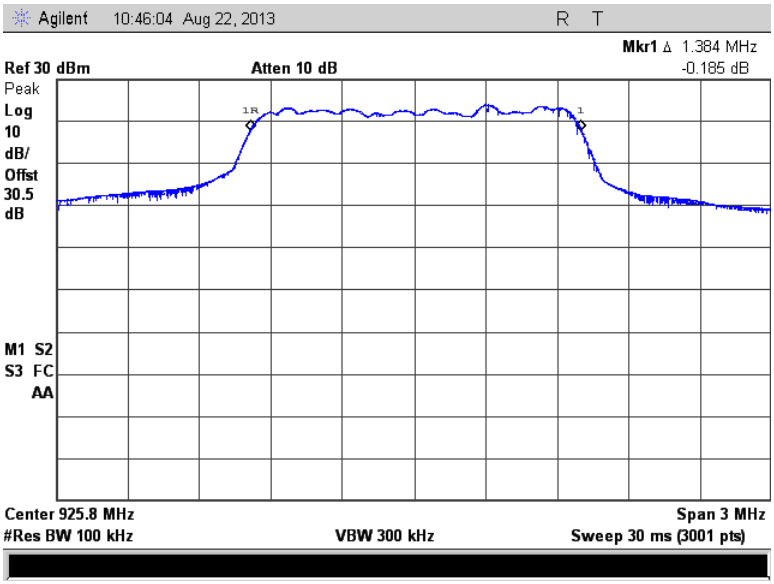

Figure 7.2.2-45: 6dB BW - High Channel (64-QAM, Antenna Path 2)

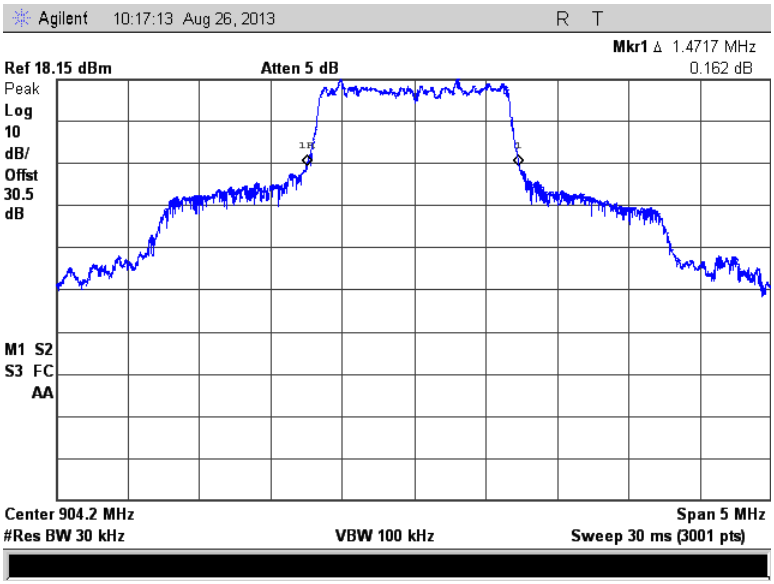

Figure 7.2.2-46: 20 dB OBW - Low Channel (64-QAM, Antenna Path 2)

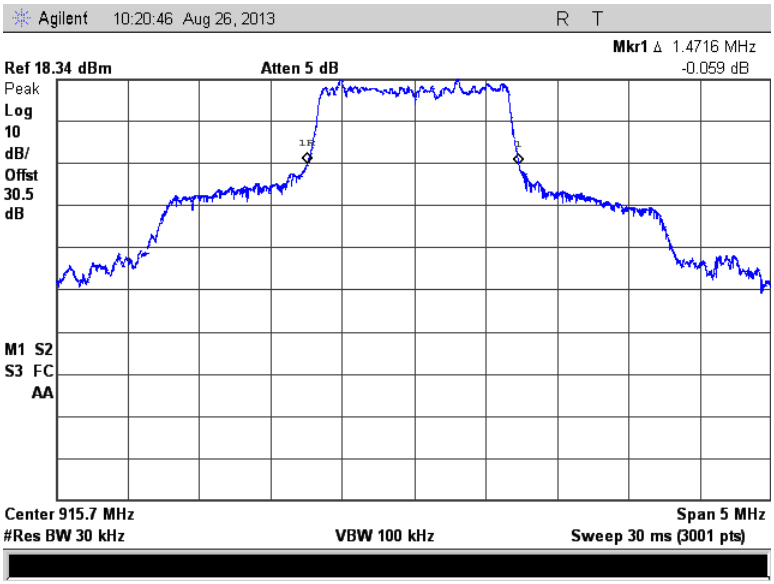

Figure 7.2.2-47: 20 dB OBW - Middle Channel (64-QAM, Antenna Path 2)

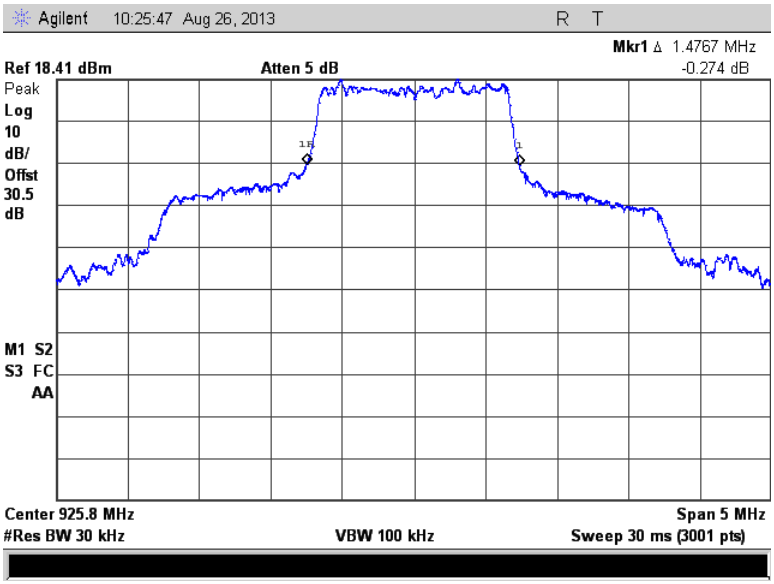

Figure 7.2.2-48: 20 dB OBW - High Channel (64-QAM, Antenna Path 2)

7.3 Peak Output Power - FCC Section 15.247(b)(3)

7.3.1 Measurement Procedure (Conducted Method)

The unit was configured to transmit at the maximum duty cycle. The Peak Output Power was measured in accordance with the FCC KDB Publication No. 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)" Section 9.2.3.1 Method AVGPM (Measurement using an RF average power meter). The RF output of the equipment under test was directly connected to the input of the power meter through suitable attenuation. The duty cycle correction was calculated as 10*log(1/0.47) = 3.28 dB. See section 7.6 for additional details.

The total output power was calculated in accordance with FCC KDB Publication No. 662911 "Emissions Testing of Transmitters with Multiple Outputs in the Same Band" in order to account for the two TX antenna paths by summing the output power across all transmitter outputs.

7.3.2 Measurement Results

Results are shown below.

Table 7.3.2-1: RF Output Power (BPSK)

Frequency [MHz]	TX Path 1 Level [dBm]	TX Path 2 Level [dBm]	Duty Cycle Correction [dB]	Total Output Power [dBm]
904.20	21.31	21.07	3.28	27.48
915.72	21.40	21.20	3.28	27.59
925.80	20.87	21.36	3.28	27.41

Table 7.3.2-2: RF Output Power (QPSK)

Frequency [MHz]	TX Path 1 Level [dBm]	TX Path 2 Level [dBm]	Duty Cycle Correction [dB]	Total Output Power [dBm]
904.20	21.29	21.00	3.28	27.44
915.72	21.53	21.20	3.28	27.66
925.80	20.85	21.37	3.28	27.41

Table 7.3.2-3: RF Output Power (16-QAM)

Frequency [MHz]	TX Path 1 Level [dBm]	TX Path 2 Level [dBm]	Duty Cycle Correction [dB]	Total Output Power [dBm]
904.20	21.32	21.00	3.28	27.45
915.72	21.58	21.25	3.28	27.71
925.80	20.90	21.32	3.28	27.40

Table 7.3.2-4: RF Output Power (64-QAM)

Frequency [MHz]	TX Path 1 Level [dBm]	TX Path 2 Level [dBm]	Duty Cycle Correction [dB]	Total Output Power [dBm]
904.20	21.30	20.92	3.28	27.40
915.72	21.53	21.18	3.28	27.65
925.80	20.83	21.30	3.28	27.36

7.4 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d)

7.4.1 Band-Edge Compliance of RF Conducted Emissions

7.4.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer via suitable attenuation. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement the spectrum analyzer's RBW was set to 100 kHz, and the VBW was set to 300 kHz. The reference level was determined by measuring the Peak PSD level in any 100 kHz bandwidth within the DTS channel bandwidth. Considering that the RF output power showed compliance based on average power measurements, the band edge emissions were compared with a limit of -30 dBc relative to the reference level.

7.4.1.2 Measurement Results

Results are shown below.

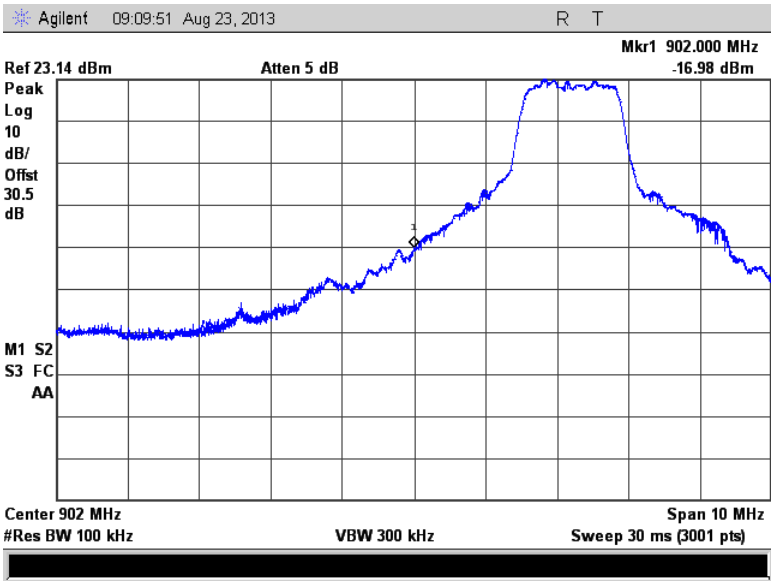

Figure 7.4.1.2-1: Lower Band-edge (BPSK, Antenna Path 1)

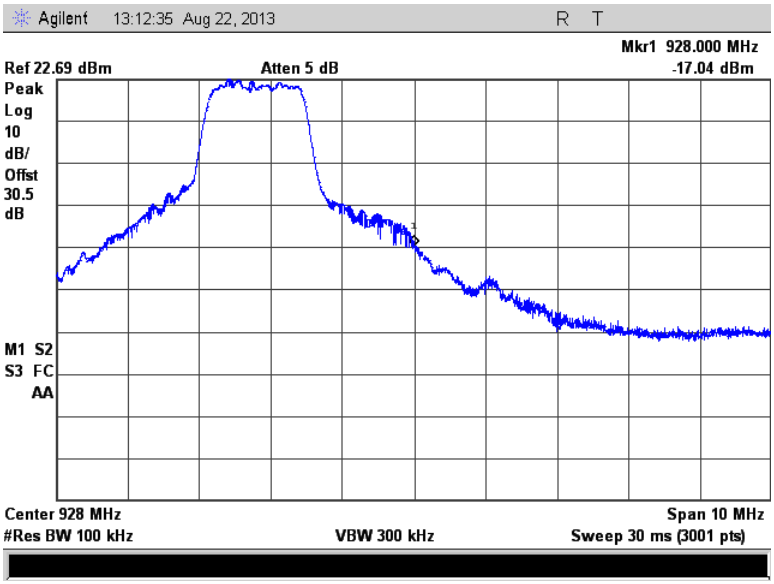

Figure 7.4.1.2-2: Upper Band-edge (BPSK, Antenna Path 1)

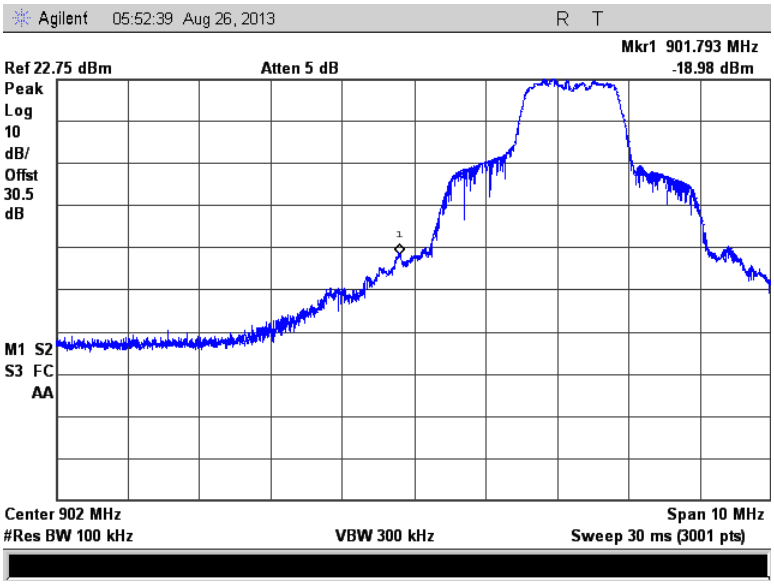

Figure 7.4.1.2-3: Lower Band-edge (BPSK, Antenna Path 2)

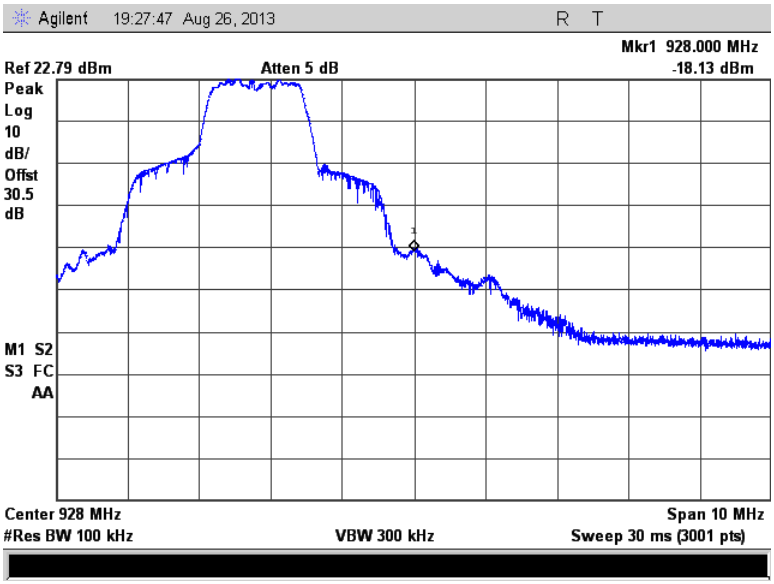

Figure 7.4.1.2-4: Upper Band-edge (BPSK, Antenna Path 2)

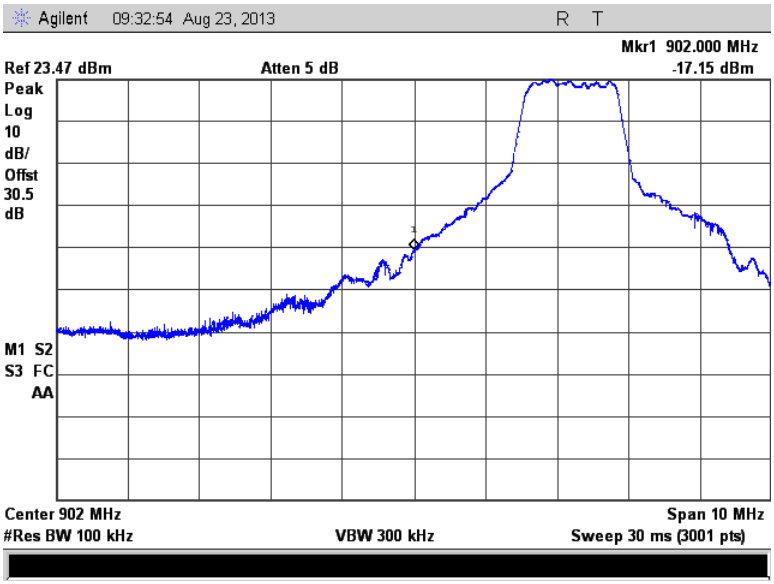

Figure 7.4.1.2-5: Lower Band-edge (QPSK, Antenna Path 1)

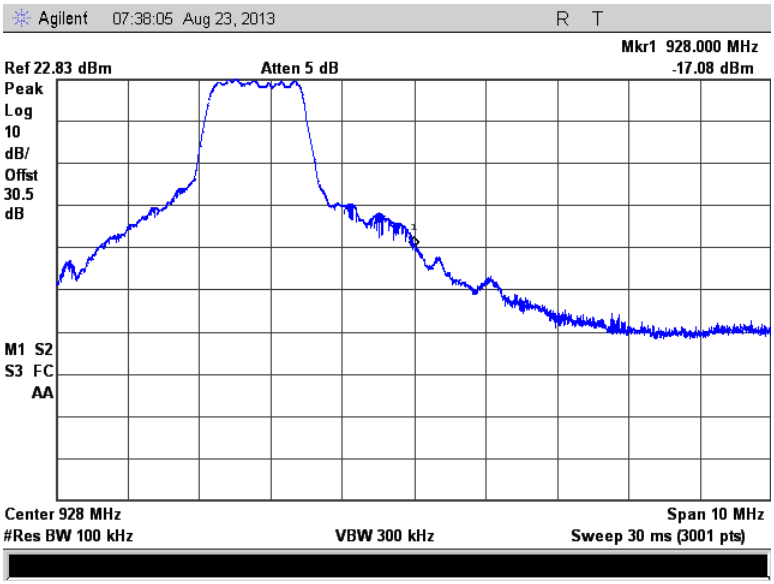

Figure 7.4.1.2-6: Upper Band-edge (QPSK, Antenna Path 1)

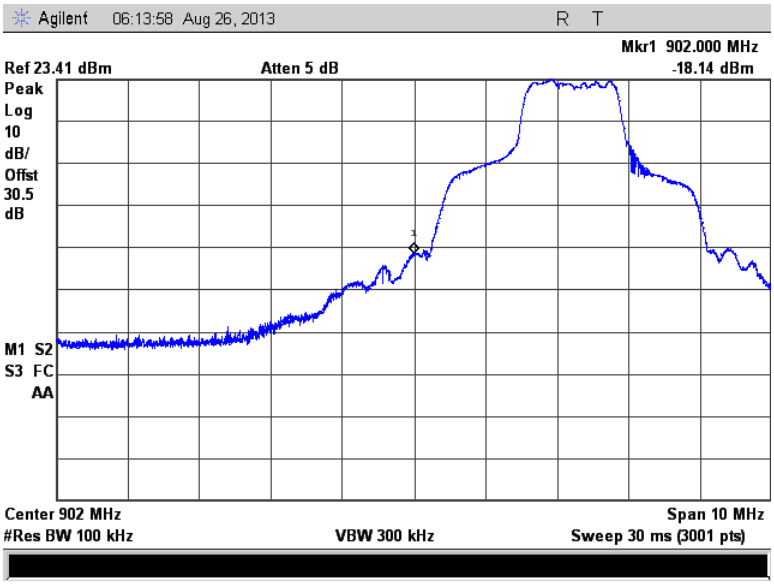

Figure 7.4.1.2-7: Lower Band-edge (QPSK, Antenna Path 2)

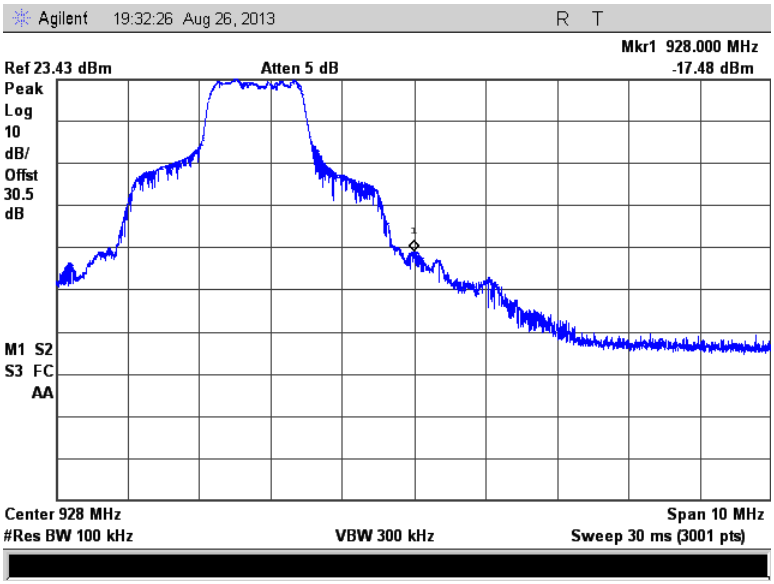

Figure 7.4.1.2-8: Upper Band-edge (QPSK, Antenna Path 2)

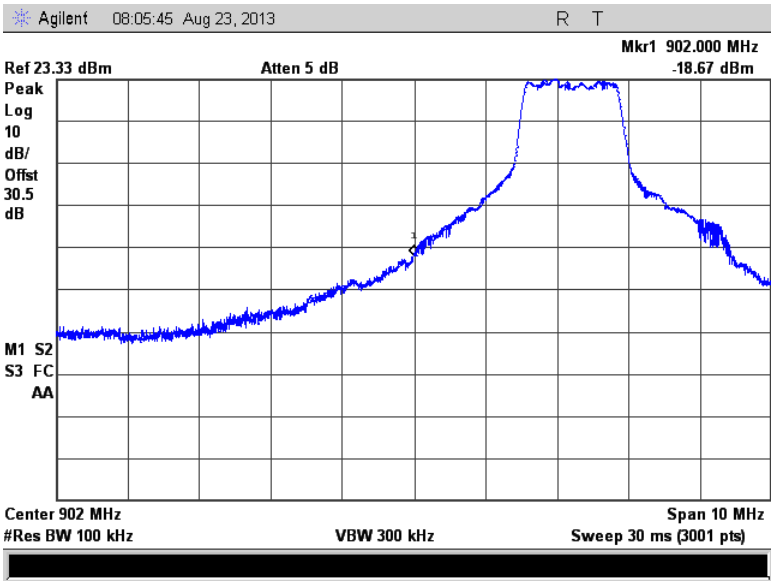

Figure 7.4.1.2-9: Lower Band-edge (16-QAM, Antenna Path 1)

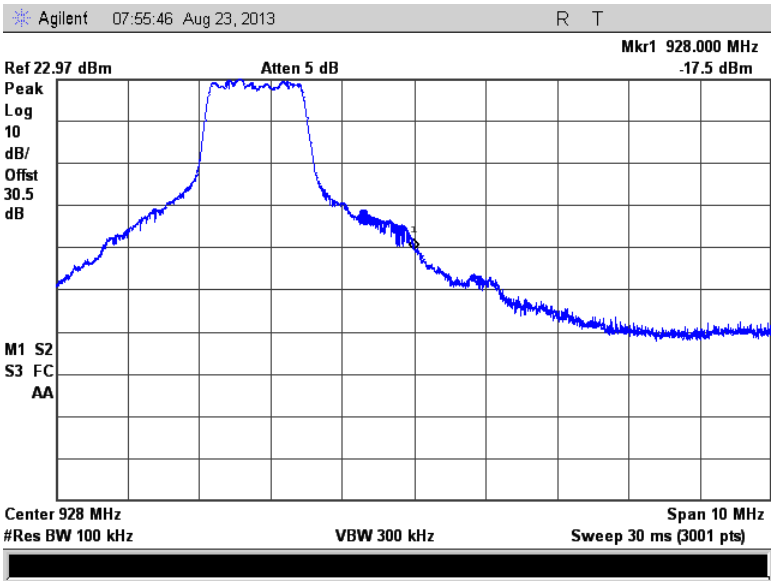

Figure 7.4.1.2-10: Upper Band-edge (16-QAM, Antenna Path 1)

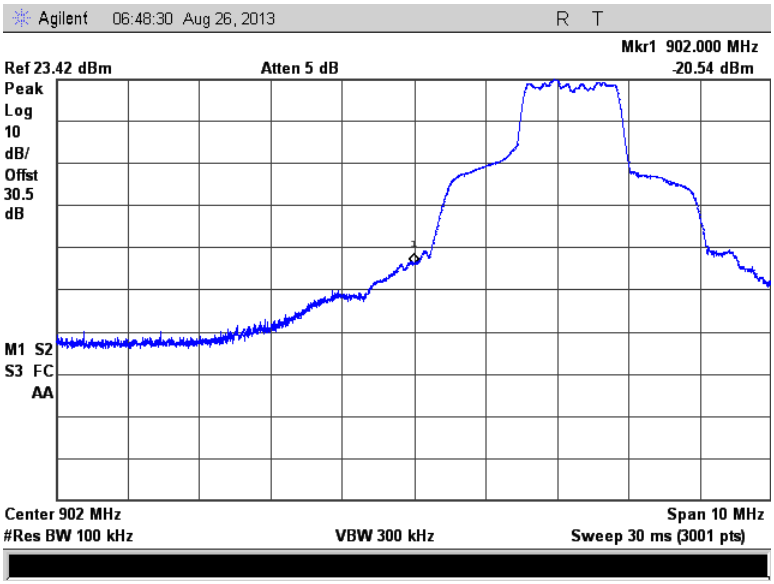

Figure 7.4.1.2-11: Lower Band-edge (16-QAM, Antenna Path 2)

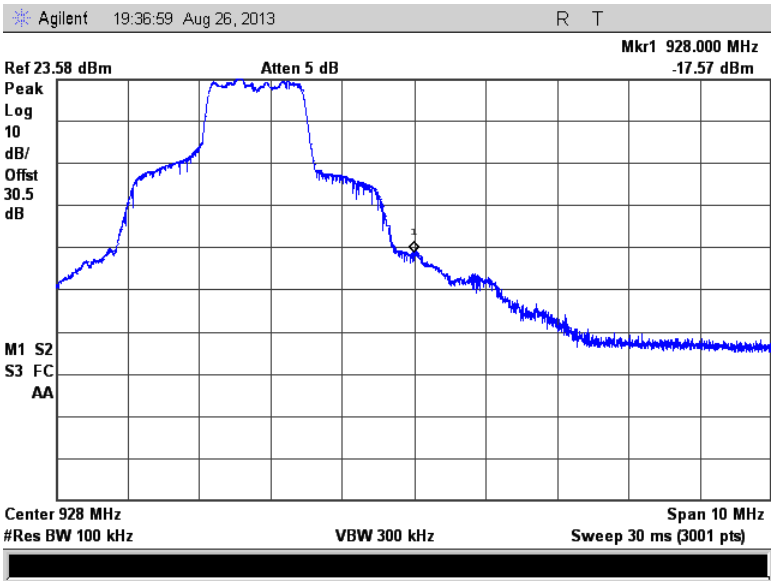

Figure 7.4.1.2-12: Upper Band-edge (16-QAM, Antenna Path 2)

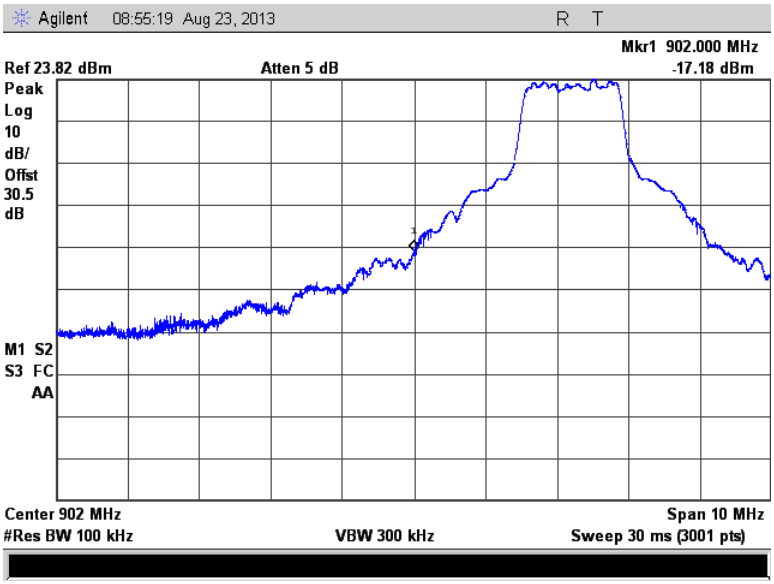

Figure 7.4.1.2-13: Lower Band-edge (64-QAM, Antenna Path 1)

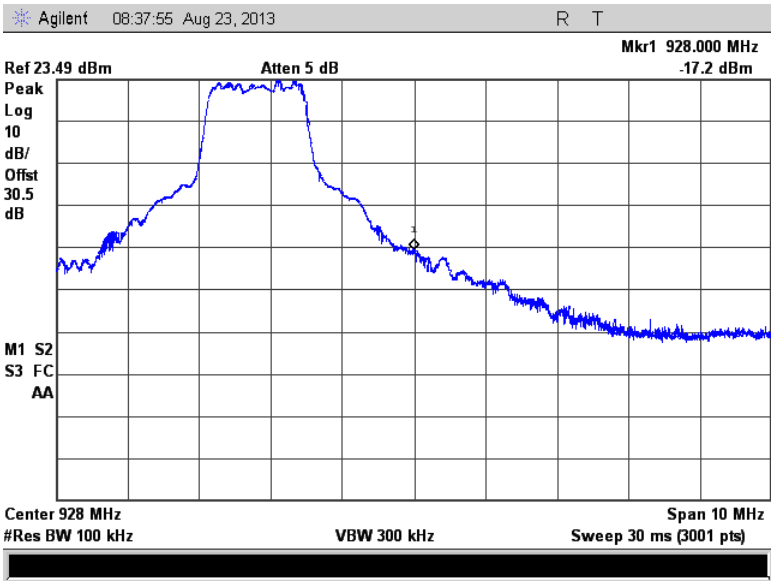

Figure 7.4.1.2-14: Upper Band-edge (64-QAM, Antenna Path 1)

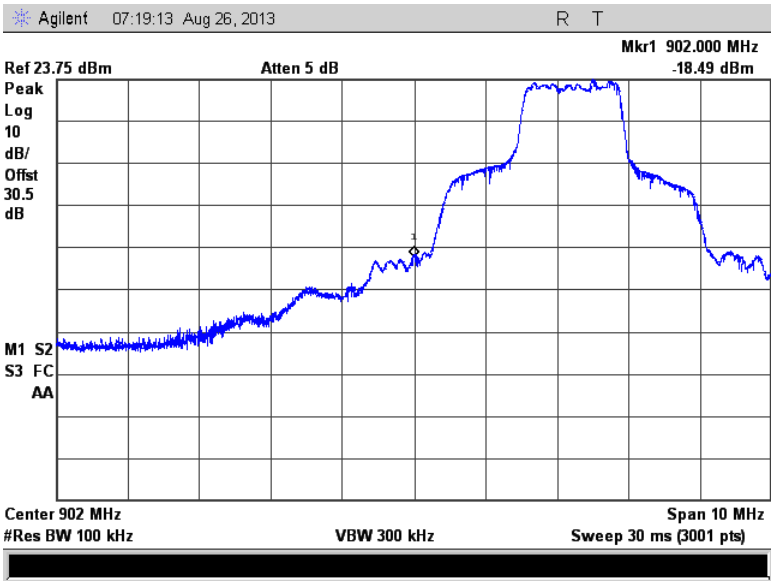

Figure 7.4.1.2-15: Lower Band-edge (64-QAM, Antenna Path 2)

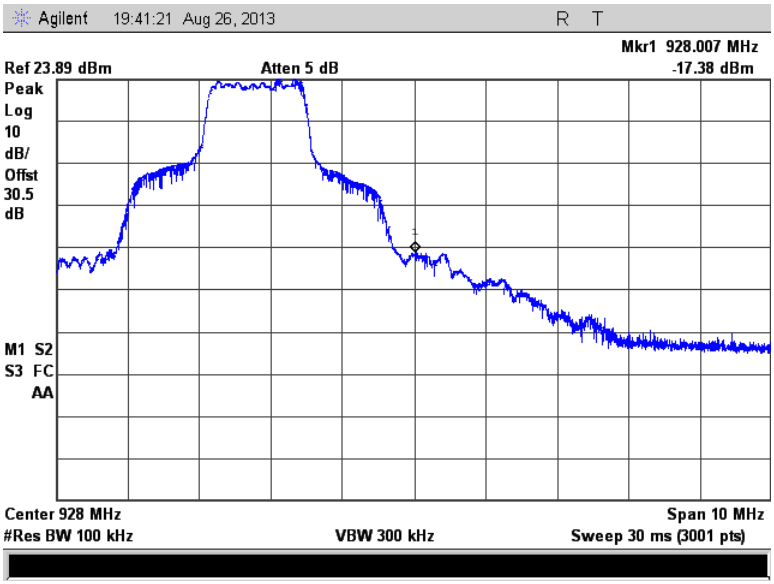

Figure 7.4.1.2-16: Upper Band-edge (64-QAM, Antenna Path 2)

7.4.2 RF Conducted Spurious Emissions

7.4.2.1 Measurement Procedure

The RF Conducted Spurious Emissions were measured in accordance with the FCC KDB Publication No. 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)". The RF output port of the equipment under test was directly connected to the input of the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 10 GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100 kHz and the VBW was set to 300 kHz. The peak Max Hold function of the analyzer was utilized. The reference level was determined by measuring the PSD level in any 100 kHz bandwidth within the DTS channel bandwidth. Considering that the RF output power showed compliance based on average power measurements, the spurious emissions were compared with a limit of -30 dBc relative to the reference level.

7.4.2.2 Measurement Results

Results are shown below.

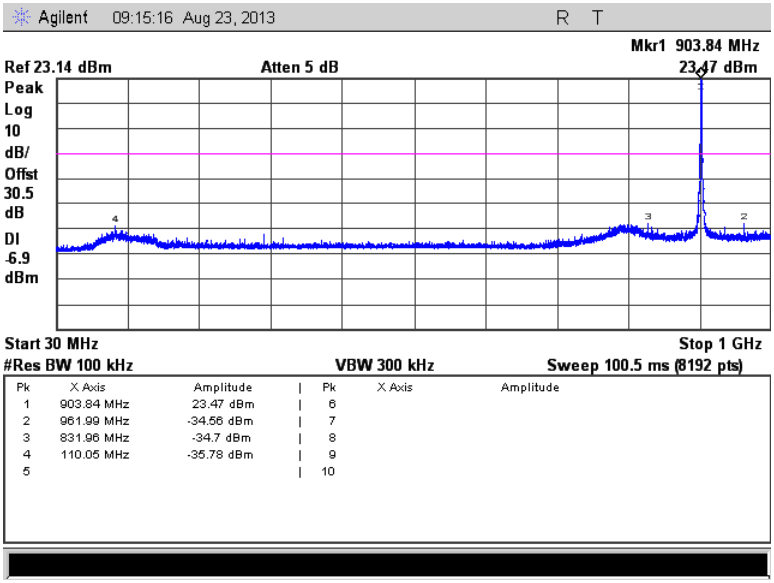

Figure 7.4.2.2-1: 30 MHz – 1 GHz – Low Channel (BPSK, Antenna Path 1)

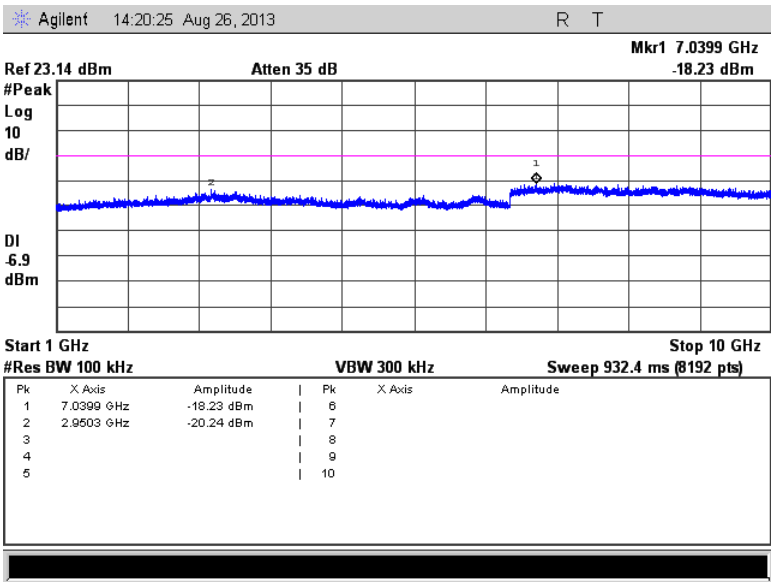

Figure 7.4.2.2-2: 1 GHz – 10 GHz – Low Channel (BPSK, Antenna Path 1)

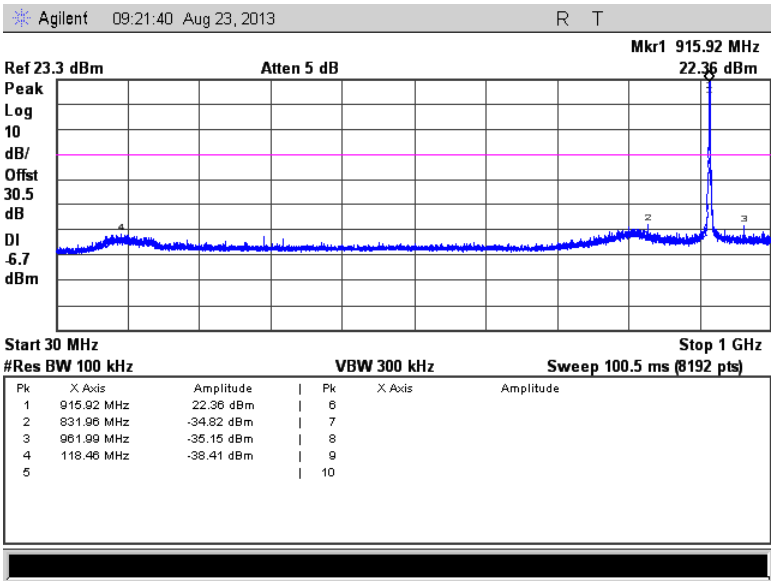

Figure 7.4.2.2-3: 30 MHz – 1 GHz – Middle Channel (BPSK, Antenna Path 1)

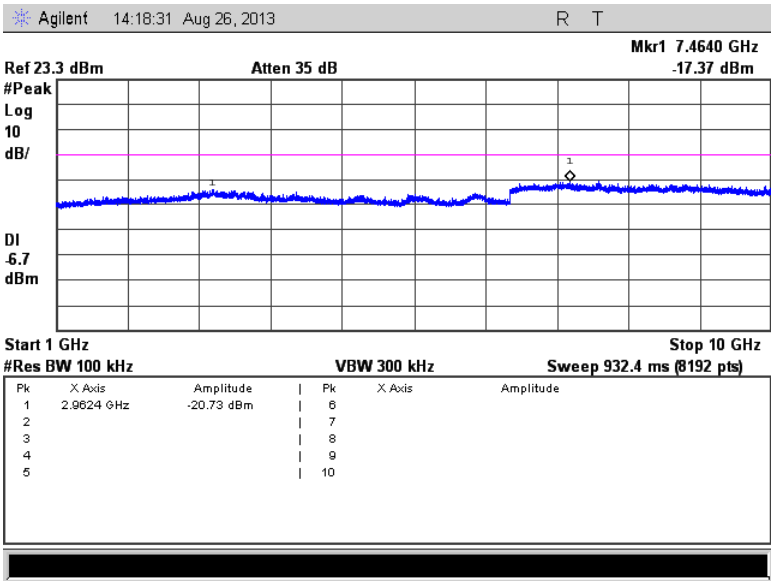

Figure 7.4.2.2-4: 1 GHz – 10 GHz – Middle Channel (BPSK, Antenna Path 1)

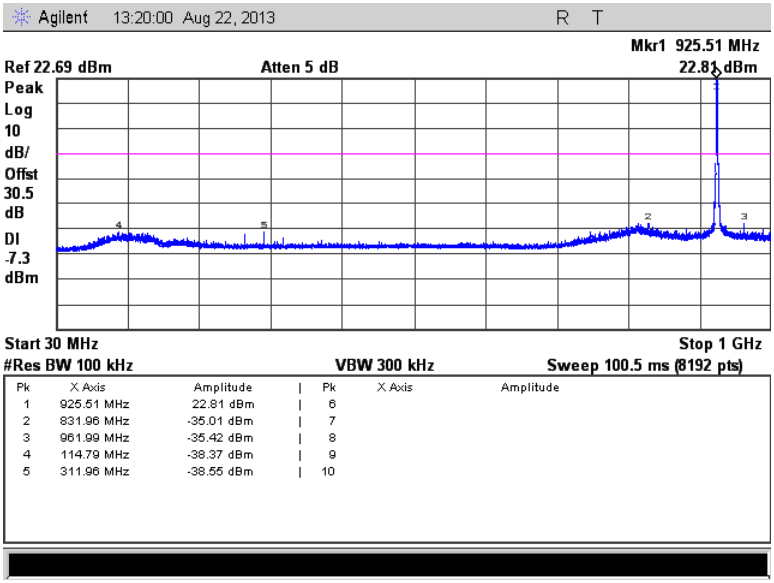

Figure 7.4.2.2-5: 30 MHz – 1 GHz – High Channel (BPSK, Antenna Path 1)

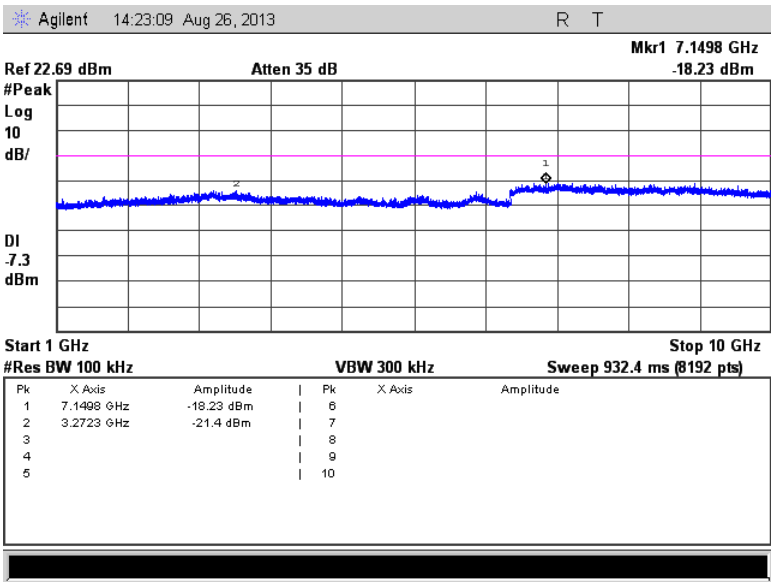

Figure 7.4.2.2-6: 1 GHz – 10 GHz – High Channel (BPSK, Antenna Path 1)

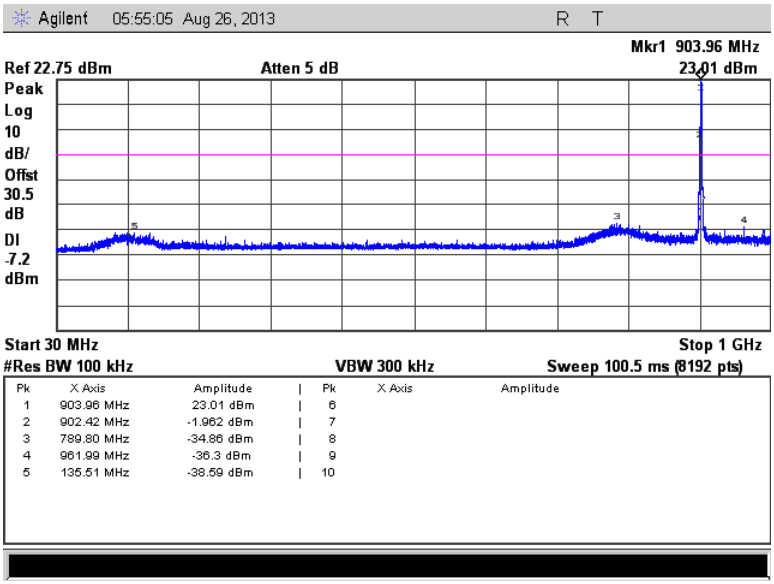

Figure 7.4.2.2-7: 30 MHz – 1 GHz – Low Channel (BPSK, Antenna Path 2)

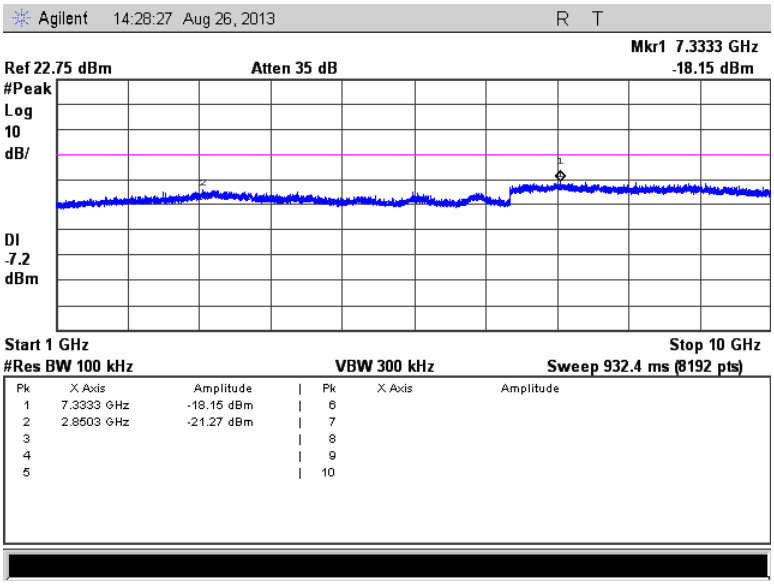

Figure 7.4.2.2-8: 1 GHz – 10 GHz – Low Channel (BPSK, Antenna Path 2)

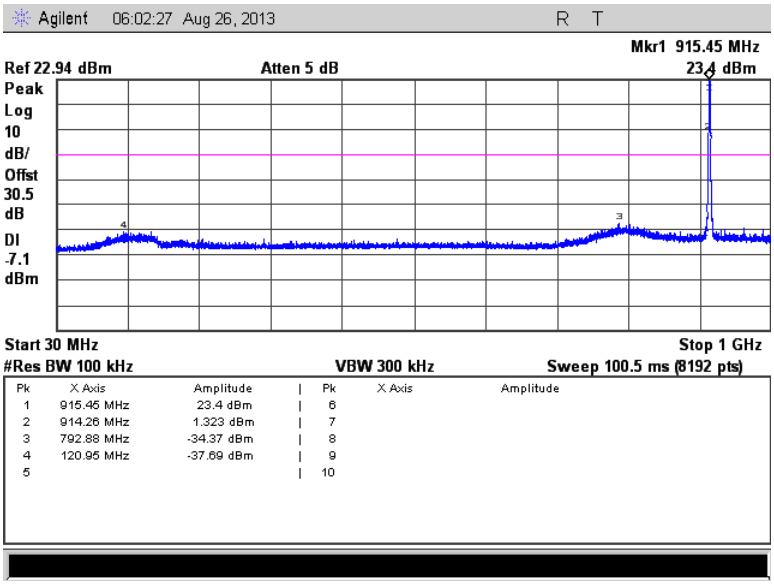

Figure 7.4.2.2-9: 30 MHz – 1 GHz – Middle Channel (BPSK, Antenna Path 2)

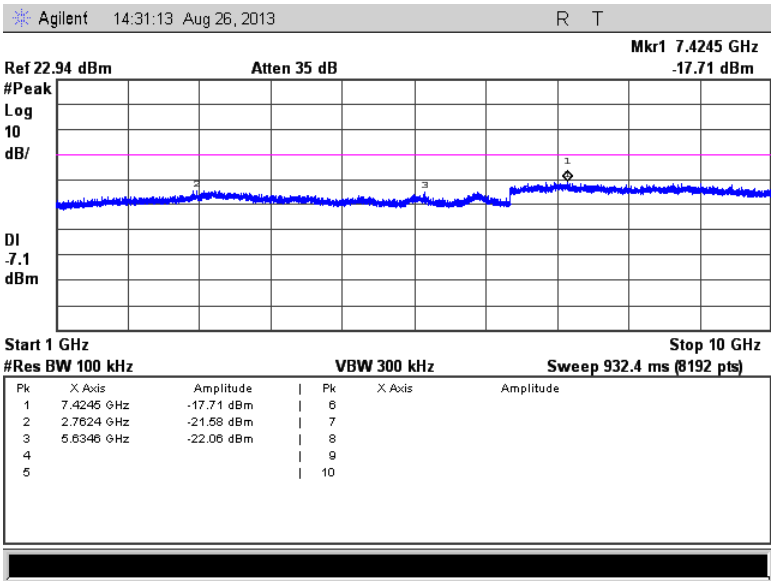

Figure 7.4.2.2-10: 1 GHz – 10 GHz – Middle Channel (BPSK, Antenna Path 2)

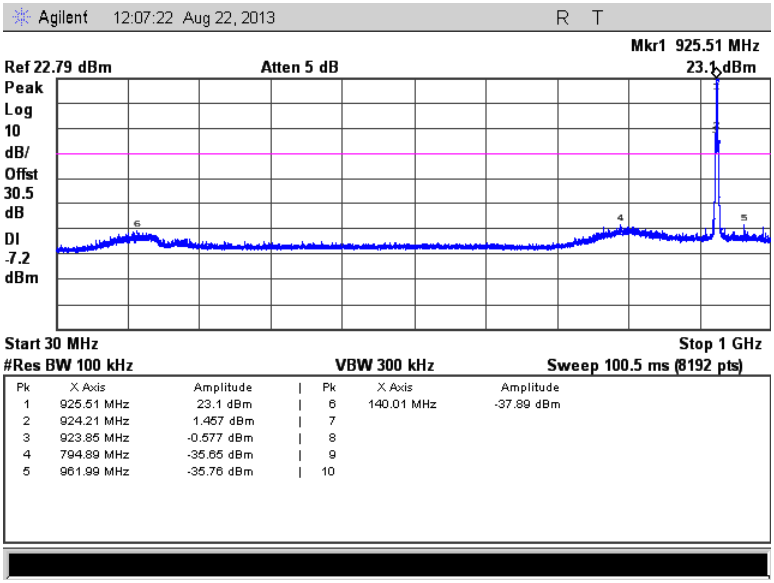

Figure 7.4.2.2-11: 30 MHz – 1 GHz – High Channel (BPSK, Antenna Path 2)

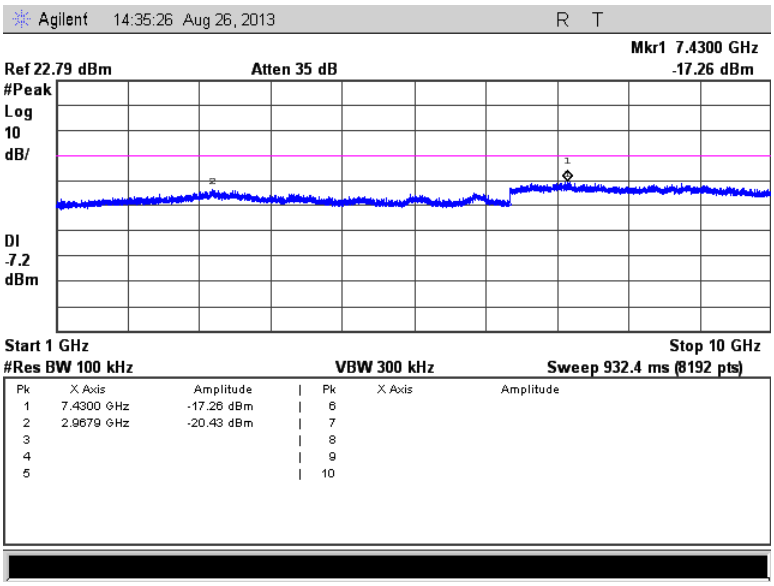

Figure 7.4.2.2-12: 1 GHz – 10 GHz – High Channel (BPSK, Antenna Path 2)

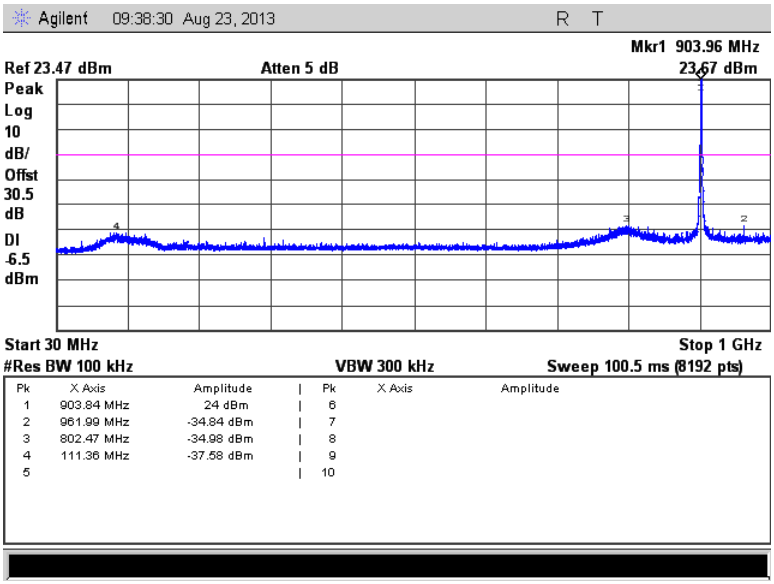

Figure 7.4.2.2-13: 30 MHz – 1 GHz – Low Channel (QPSK, Antenna Path 1)

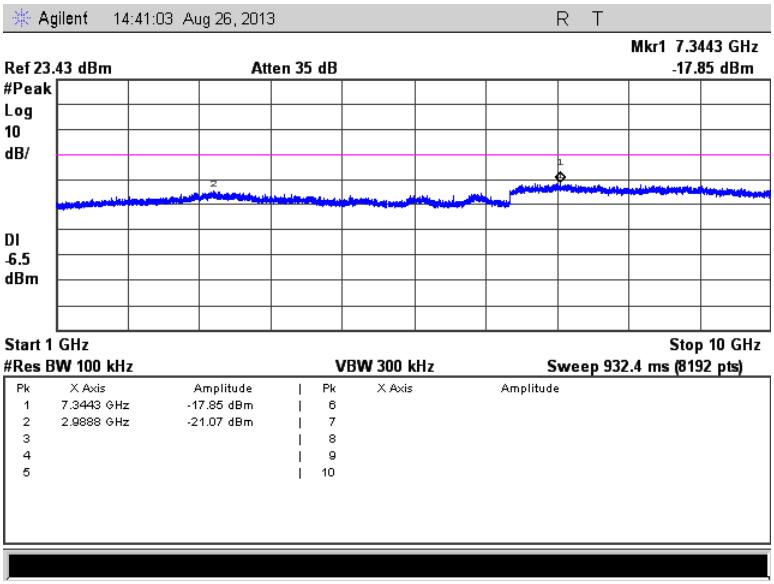

Figure 7.4.2.2-14: 1 GHz – 10 GHz – Low Channel (QPSK, Antenna Path 1)

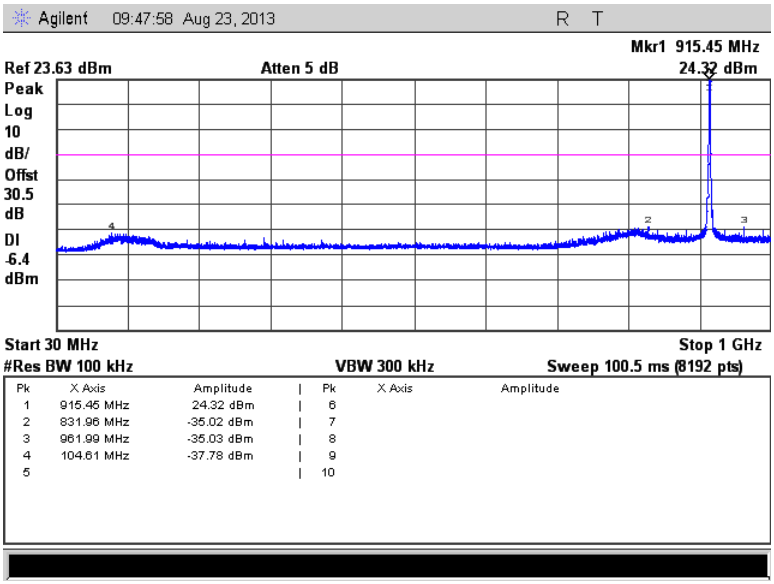

Figure 7.4.2.2-15: 30 MHz – 1 GHz – Middle Channel (QPSK, Antenna Path 1)

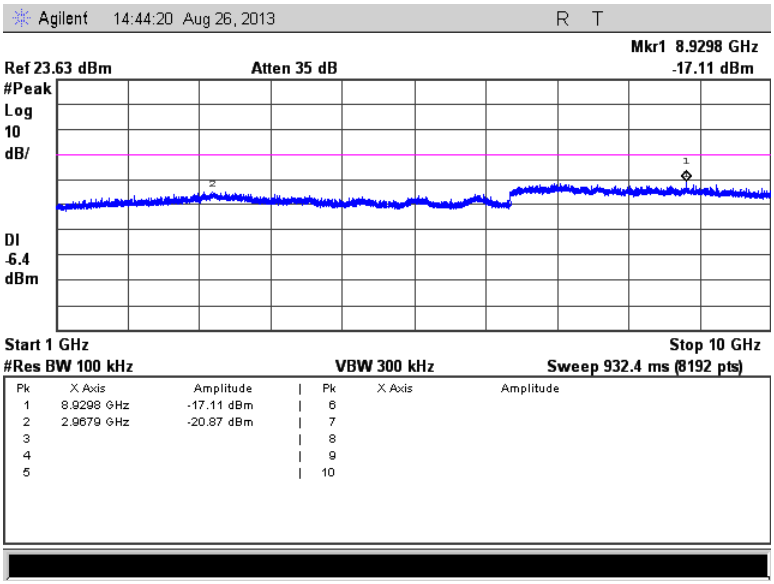

Figure 7.4.2.2-16: 1 GHz – 10 GHz – Middle Channel (QPSK, Antenna Path 1)

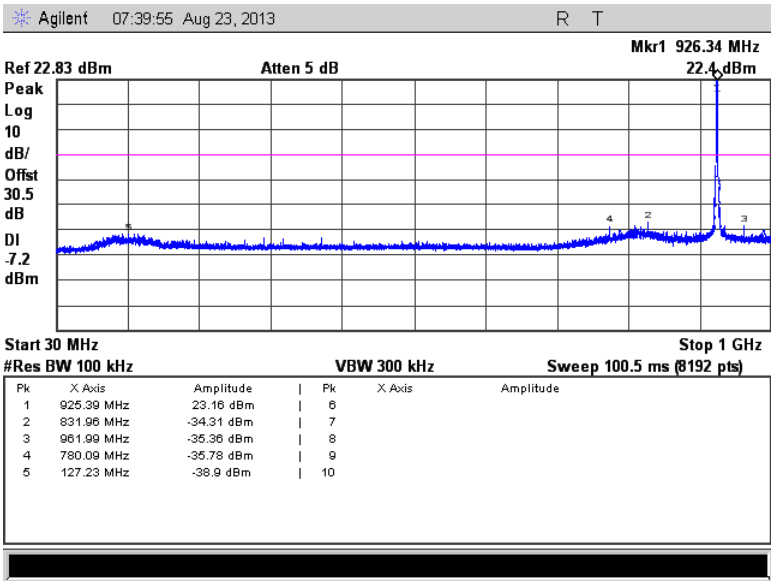

Figure 7.4.2.2-17: 30 MHz – 1 GHz – High Channel (QPSK, Antenna Path 1)

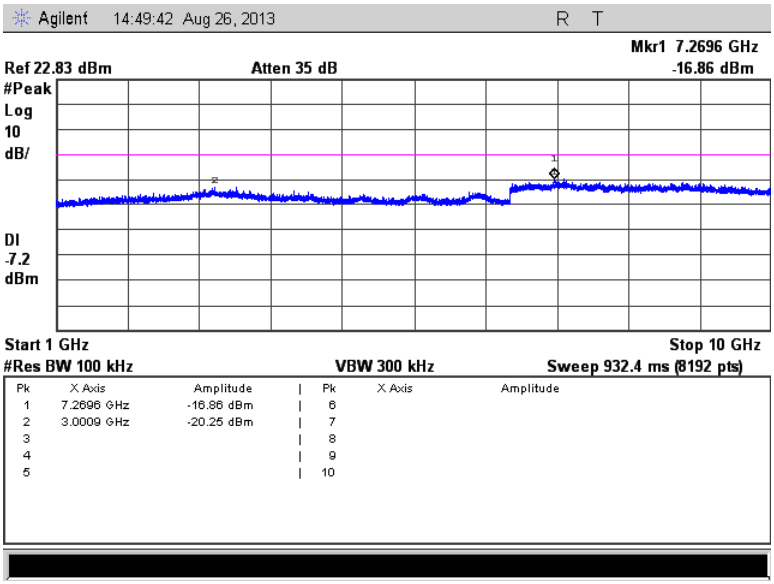

Figure 7.4.2.2-18: 1 GHz – 10 GHz – High Channel (QPSK, Antenna Path 1)

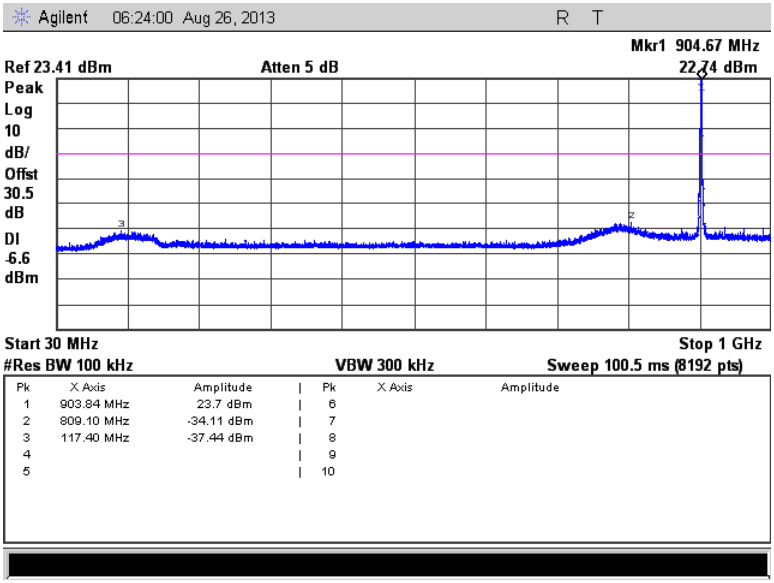

Figure 7.4.2.2-19: 30 MHz – 1 GHz – Low Channel (QPSK, Antenna Path 2)

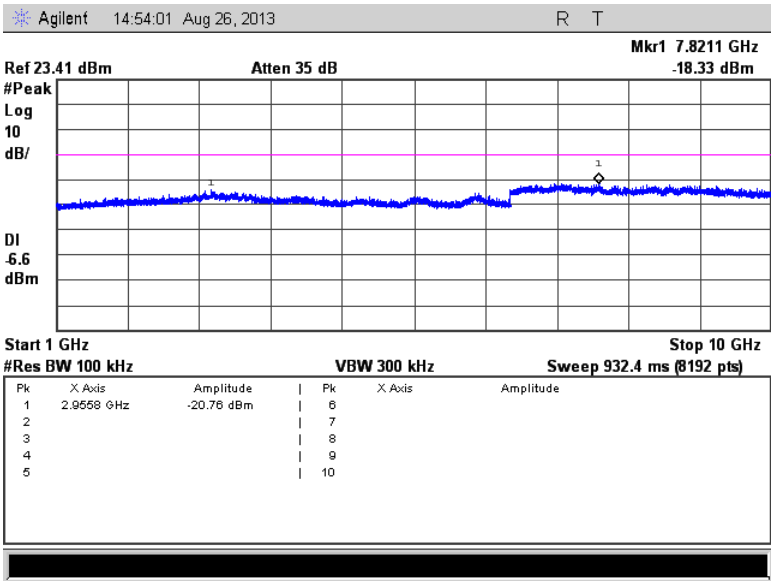

Figure 7.4.2.2-20: 1 GHz – 10 GHz – Low Channel (QPSK, Antenna Path 2)

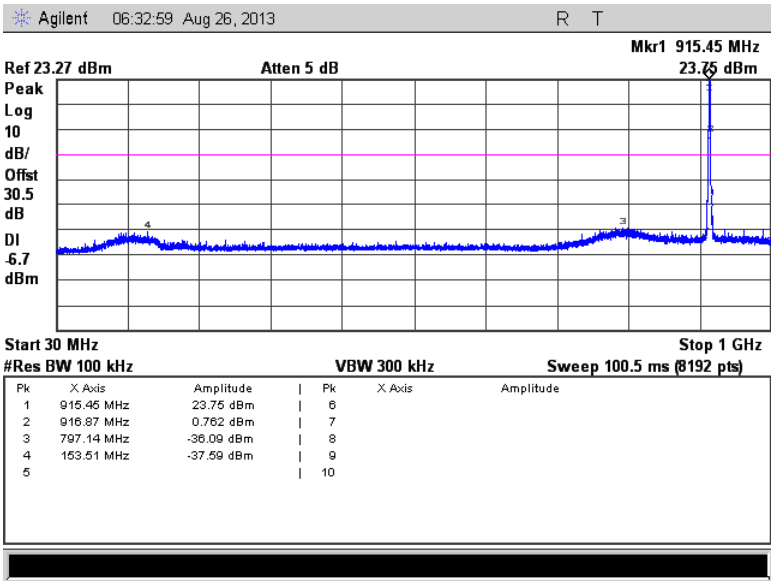

Figure 7.4.2.2-21: 30 MHz – 1 GHz – Middle Channel (QPSK, Antenna Path 2)

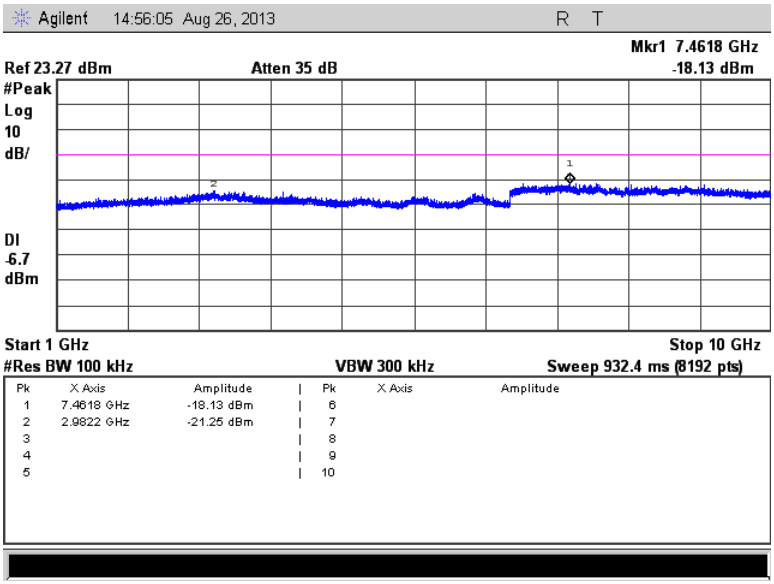

Figure 7.4.2.2-22: 1 GHz – 10 GHz – Middle Channel (QPSK, Antenna Path 2)

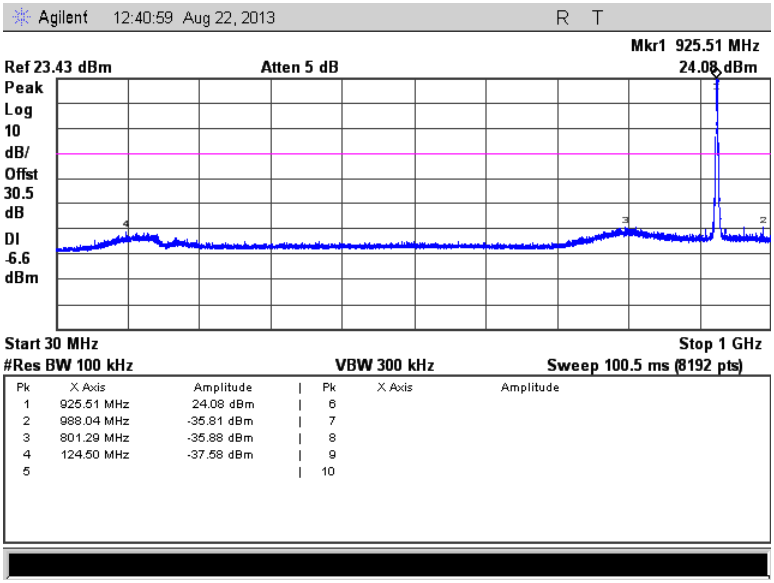

Figure 7.4.2.2-23: 30 MHz – 1 GHz – High Channel (QPSK, Antenna Path 2)

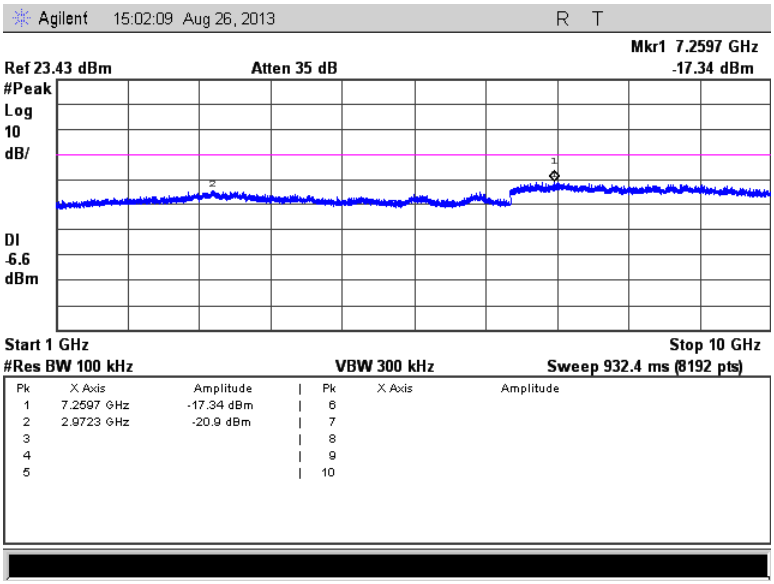

Figure 7.4.2.2-24: 1 GHz – 10 GHz – High Channel (QPSK, Antenna Path 2)

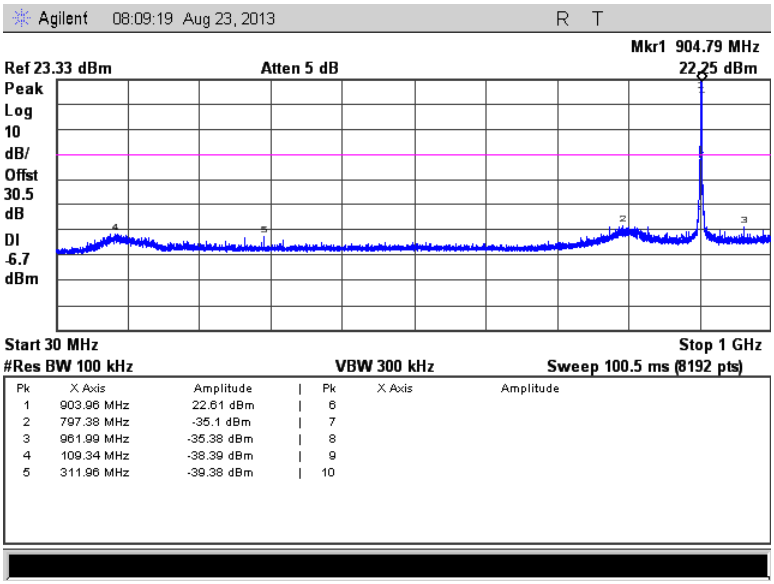

Figure 7.4.2.2-25: 30 MHz – 1 GHz – Low Channel (16-QAM, Antenna Path 1)

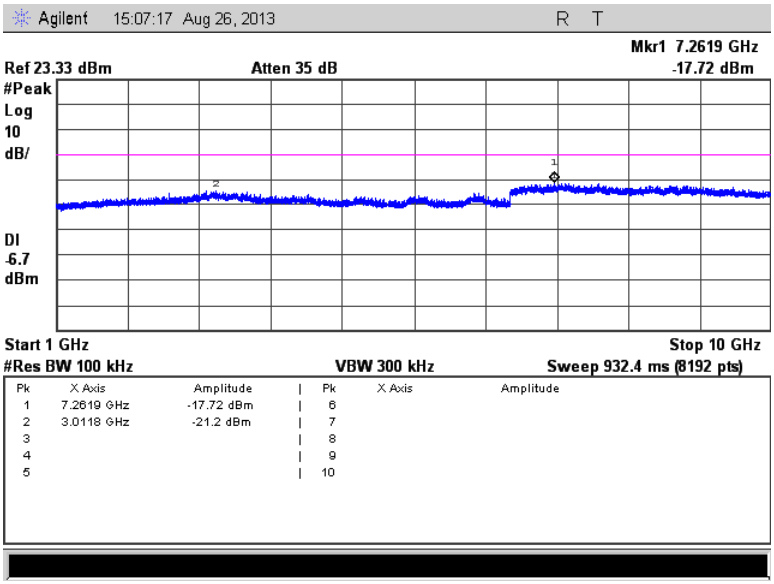

Figure 7.4.2.2-26: 1 GHz – 10 GHz – Low Channel (16-QAM, Antenna Path 1)

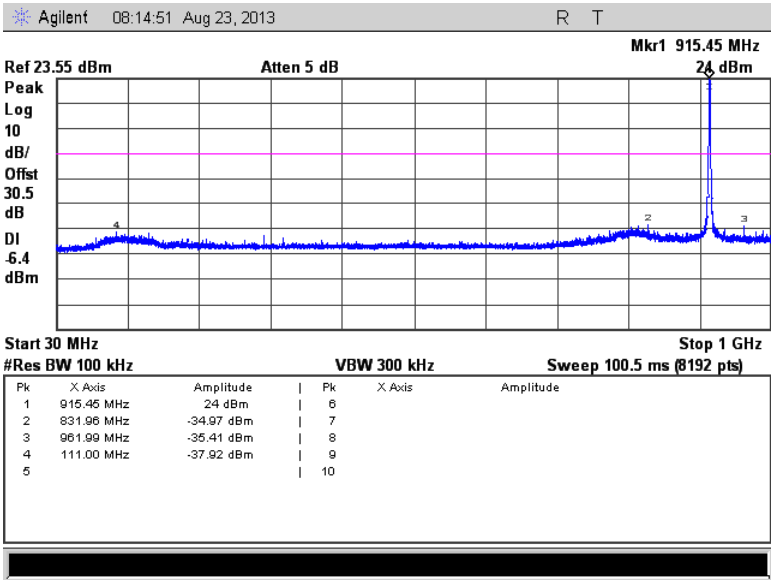

Figure 7.4.2.2-27: 30 MHz – 1 GHz – Middle Channel (16-QAM, Antenna Path 1)

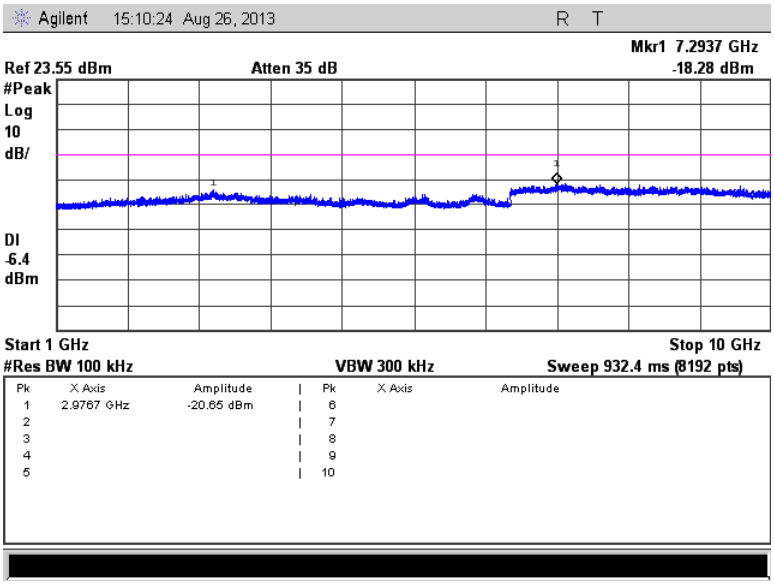

Figure 7.4.2.2-28: 1 GHz – 10 GHz – Middle Channel (16-QAM, Antenna Path 1)

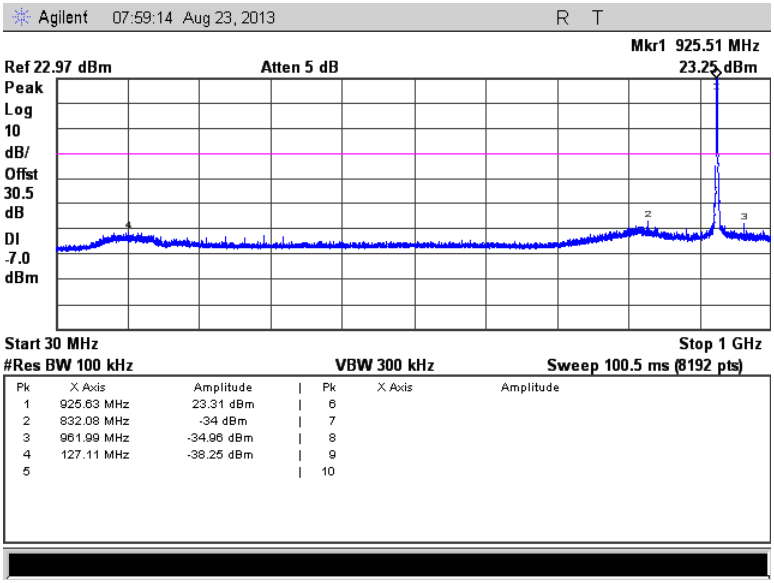

Figure 7.4.2.2-29: 30 MHz – 1 GHz – High Channel (16-QAM, Antenna Path 1)

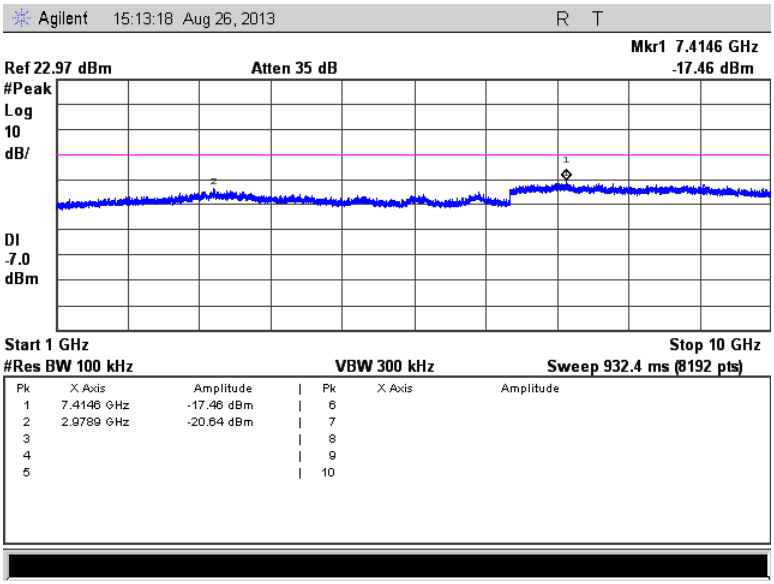

Figure 7.4.2.2-30: 1 GHz – 10 GHz – High Channel (16-QAM, Antenna Path 1)

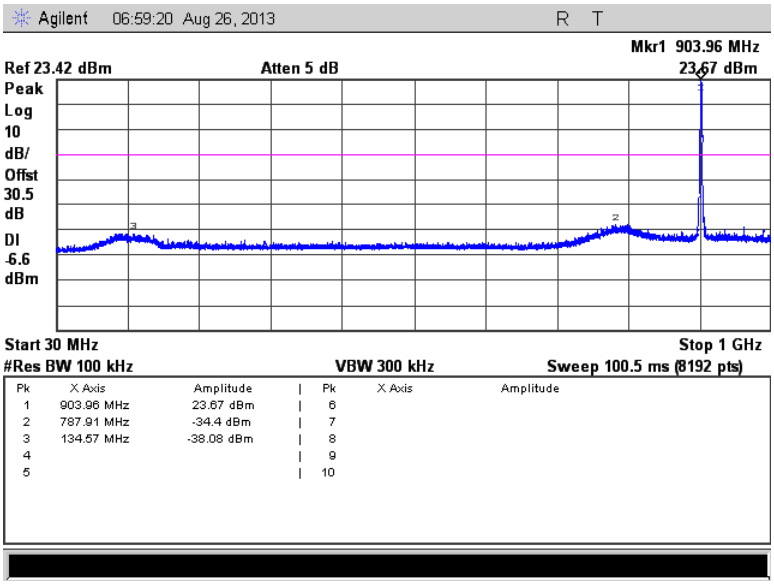

Figure 7.4.2.2-31: 30 MHz – 1 GHz – Low Channel (16-QAM, Antenna Path 2)

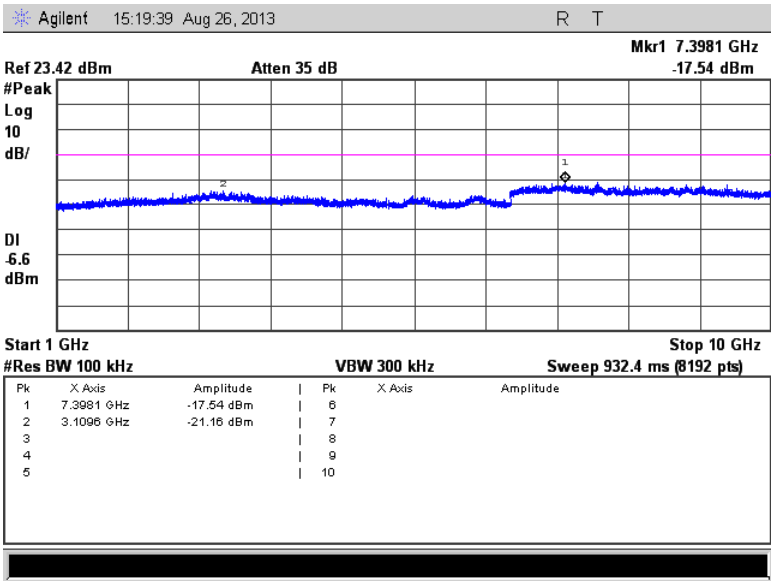

Figure 7.4.2.2-32: 1 GHz – 10 GHz – Low Channel (16-QAM, Antenna Path 2)

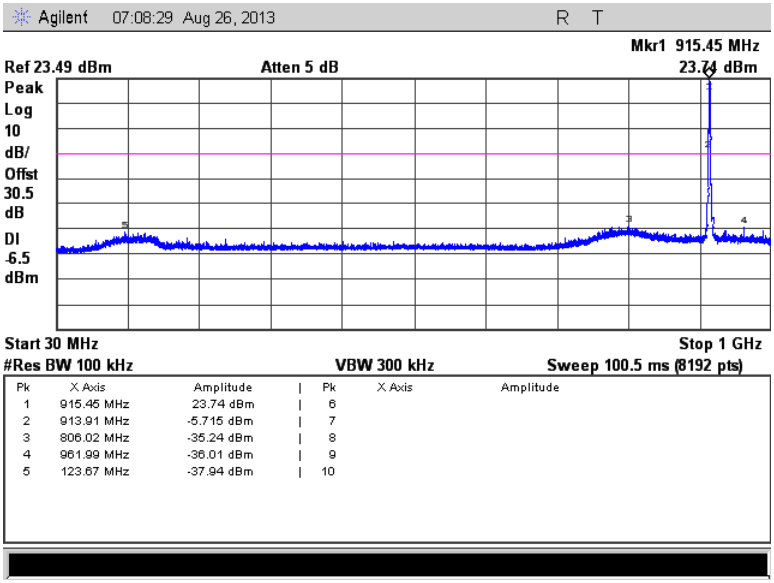

Figure 7.4.2.2-33: 30 MHz – 1 GHz – Middle Channel (16-QAM, Antenna Path 2)

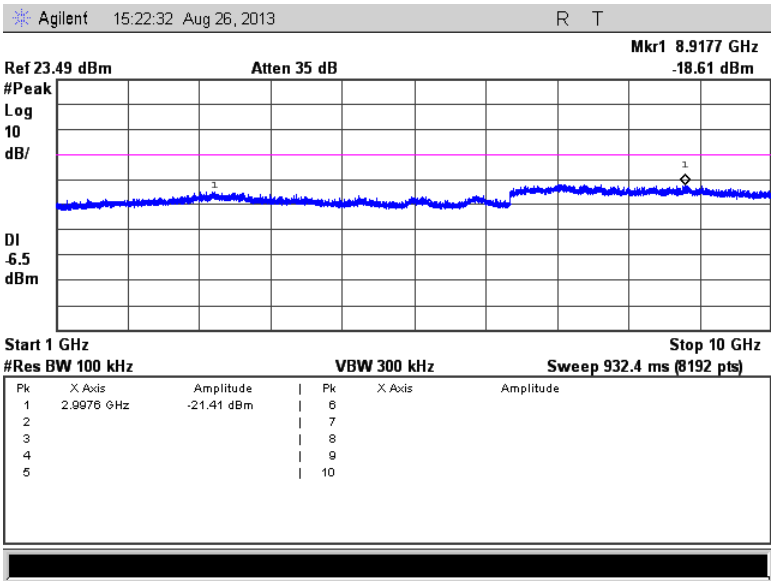

Figure 7.4.2.2-34: 1 GHz – 10 GHz – Middle Channel (16-QAM, Antenna Path 2)

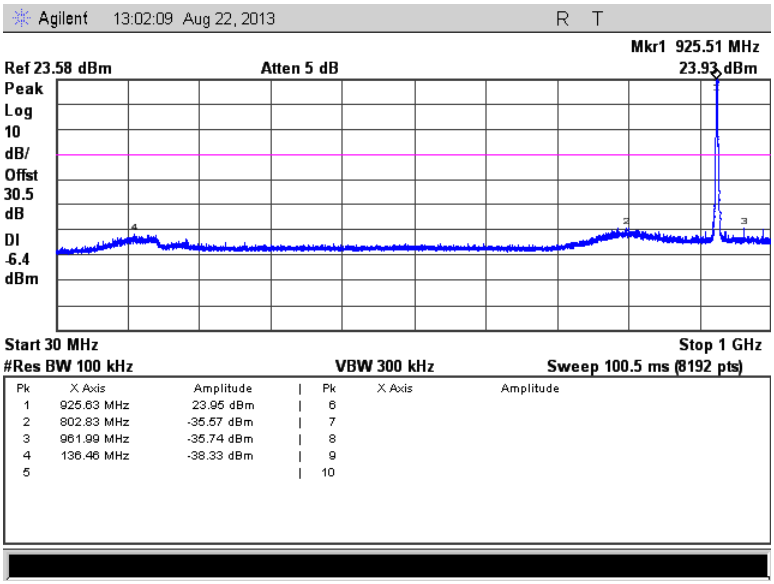

Figure 7.4.2.2-35: 30 MHz – 1 GHz – High Channel (16-QAM, Antenna Path 2)

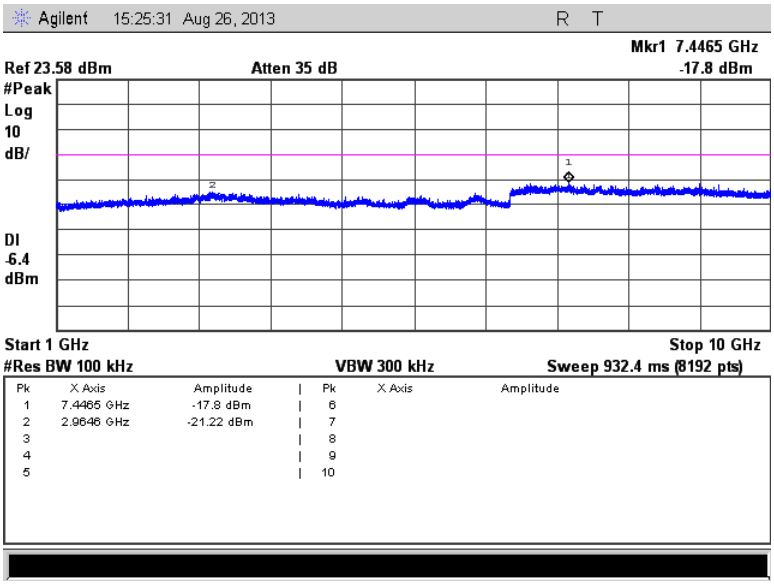

Figure 7.4.2.2-36: 1 GHz – 10 GHz – High Channel (16-QAM, Antenna Path 2)

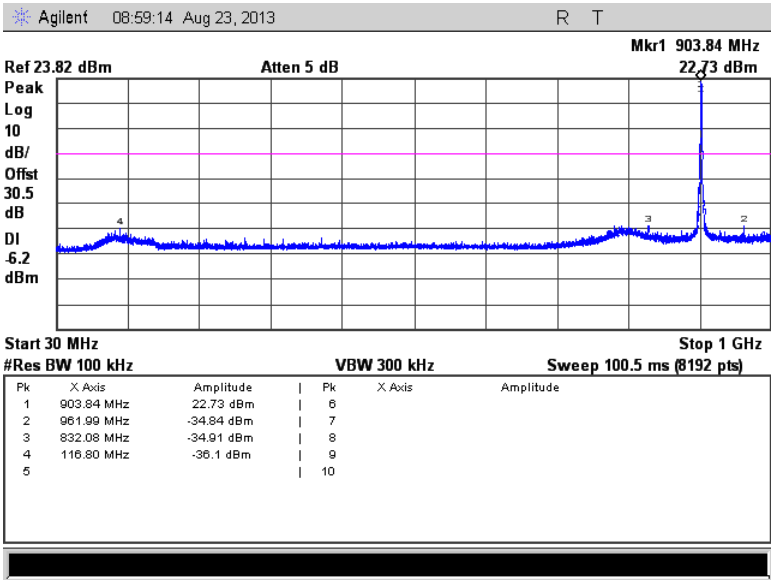

Figure 7.4.2.2-37: 30 MHz – 1 GHz – Low Channel (64-QAM, Antenna Path 1)

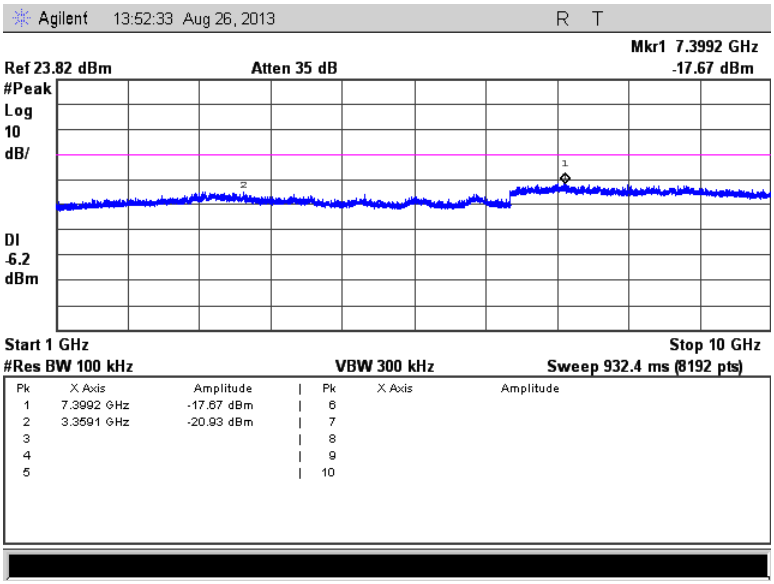

Figure 7.4.2.2-38: 1 GHz – 10 GHz – Low Channel (64-QAM, Antenna Path 1)

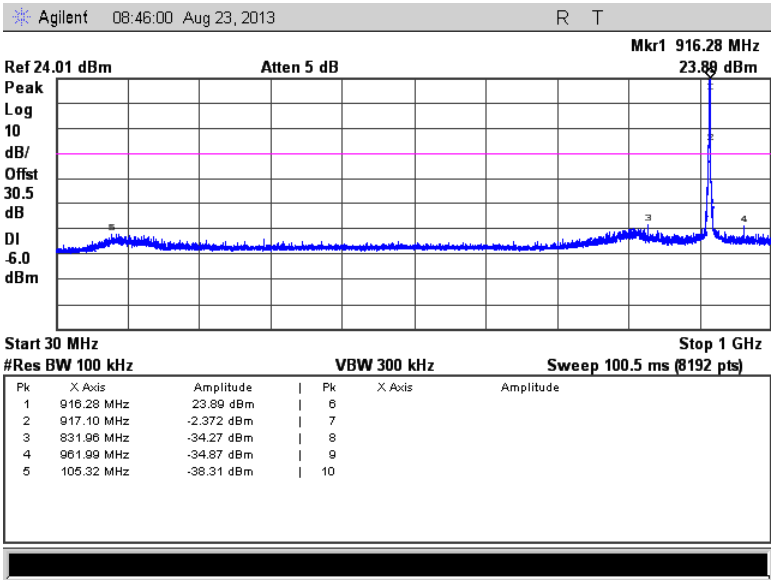

Figure 7.4.2.2-39: 30 MHz – 1 GHz – Middle Channel (64-QAM, Antenna Path 1)

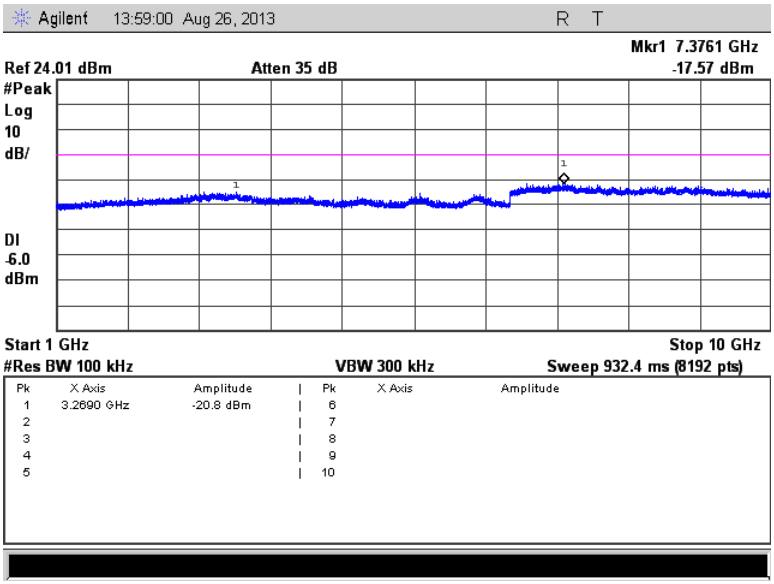

Figure 7.4.2.2-40: 1 GHz – 10 GHz – Middle Channel (64-QAM, Antenna Path 1)

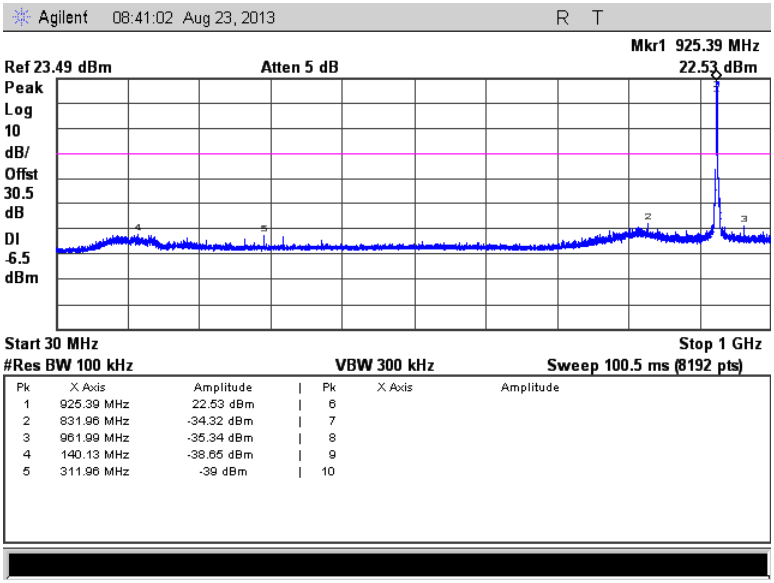

Figure 7.4.2.2-41: 30 MHz – 1 GHz – High Channel (64-QAM, Antenna Path 1)

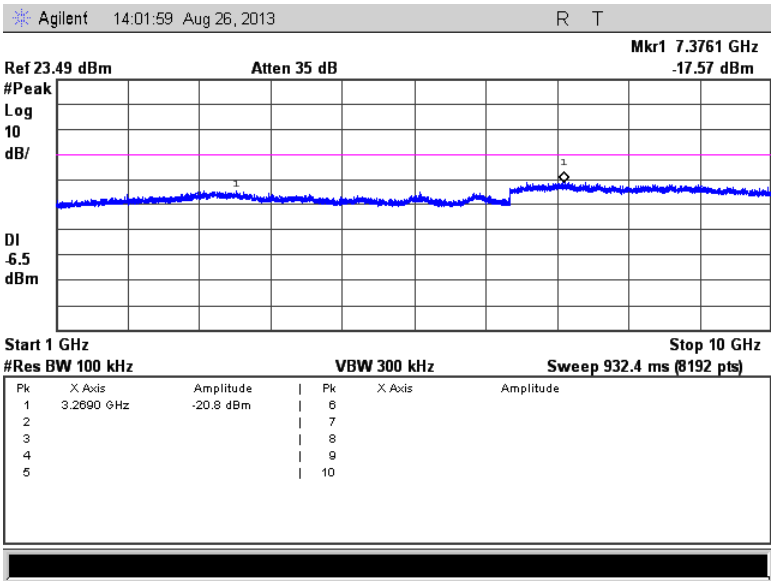

Figure 7.4.2.2-42: 1 GHz – 10 GHz – High Channel (64-QAM, Antenna Path 1)

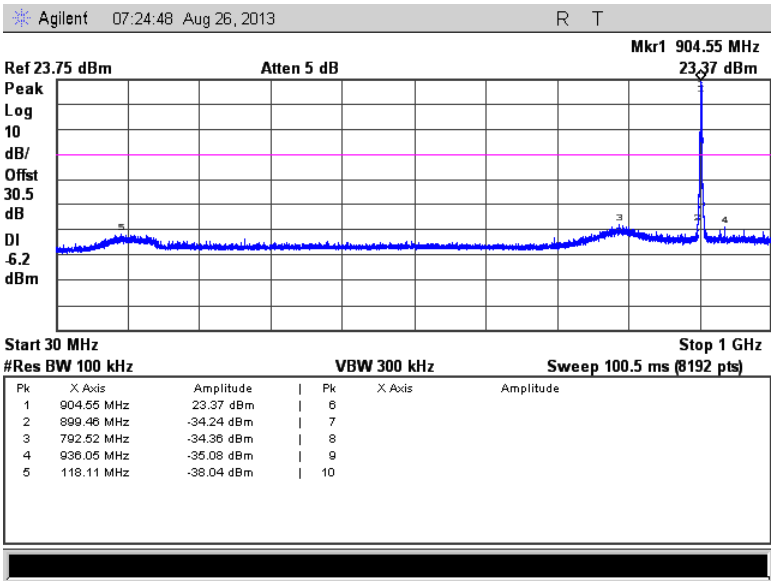

Figure 7.4.2.2-43: 30 MHz – 1 GHz – Low Channel (64-QAM, Antenna Path 2)

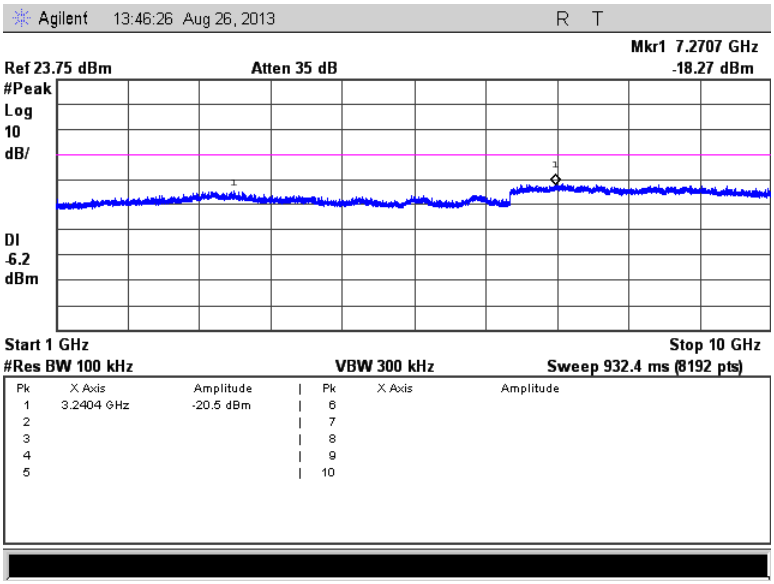

Figure 7.4.2.2-44: 1 GHz – 10 GHz – Low Channel (64-QAM, Antenna Path 2)

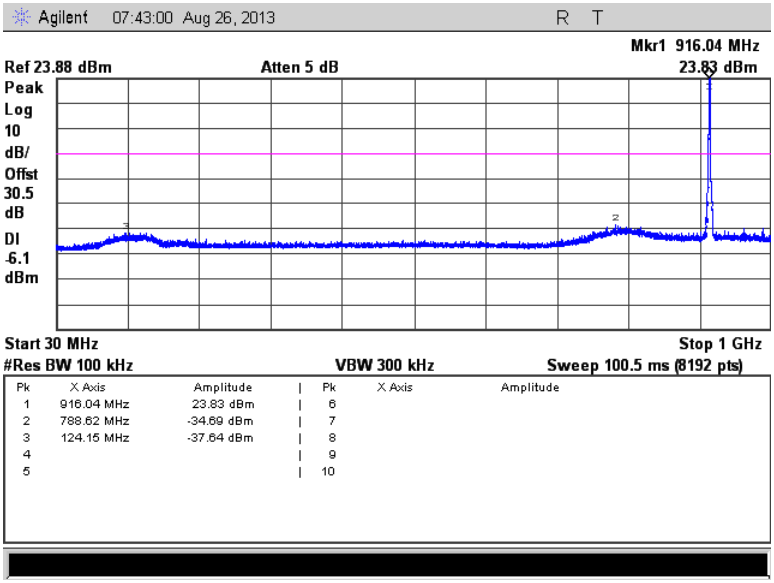

Figure 7.4.2.2-45: 30 MHz – 1 GHz – Middle Channel (64-QAM, Antenna Path 2)

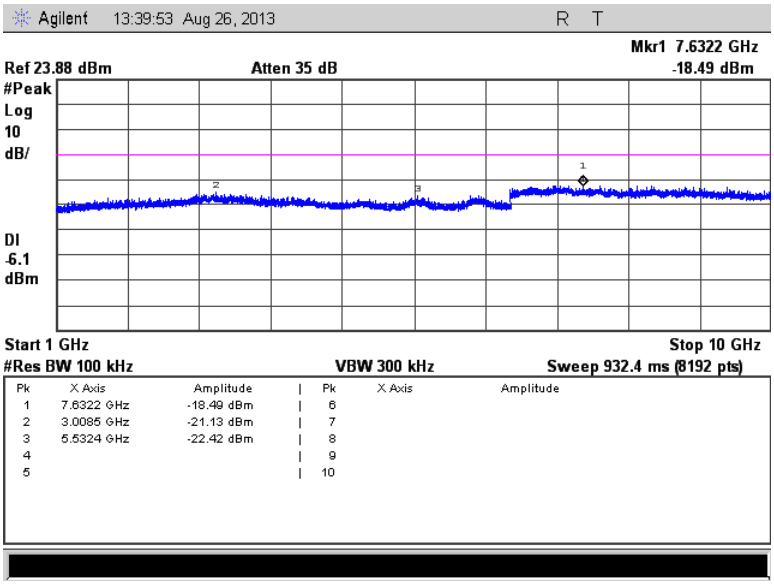

Figure 7.4.2.2-46: 1 GHz – 10 GHz – Middle Channel (64-QAM, Antenna Path 2)

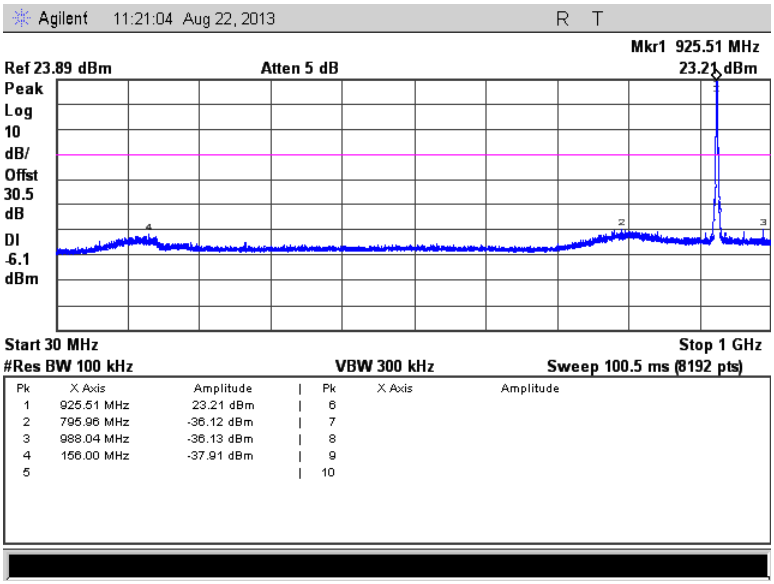

Figure 7.4.2.2-47: 30 MHz – 1 GHz – High Channel (64-QAM, Antenna Path 2)

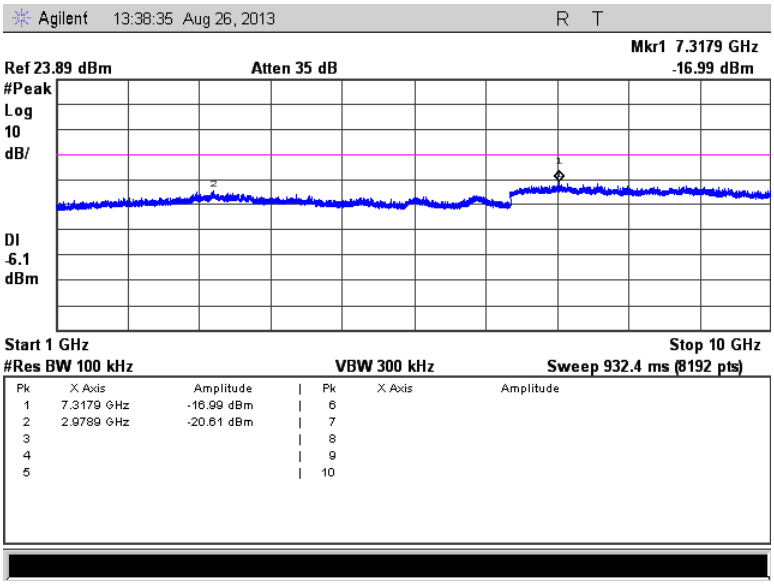

Figure 7.4.2.2-48: 1 GHz – 10 GHz – High Channel (64-QAM, Antenna Path 2)

7.4.3 Spurious Emissions - FCC Section 15.205

7.4.3.1 Conducted Spurious Emissions - FCC Section 15.205

7.4.3.1.1 Measurement Procedure

The conducted spurious emissions tests were made over the frequency range of 1GHz to 10 GHz, 10 times the highest fundamental frequency. Peak and average measurements were made with RBW of 1 MHz and VBW of 3MHz. The average measurements were performed per Section 12.2.5.2 of the FCC KDB Publication No. 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)". The measurements were performed at each antenna ports and the total EIRP was calculated per the FCC KDB Publication No. 662911 "Emissions Testing of Transmitters with Multiple Outputs in the Same Band" in order to account for the two TX antenna paths. The results were converted from EIRP to E-Field per the FCC KDB Publication No. 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)".

Frequencies below 1000 MHz were measured via the radiated method, with the antennas connected to the RF ports. No significant emissions from the transmitter could be observed in the restricted bands.

7.4.3.1.2 Measurement Results

Emissions found in the restricted bands of the frequency range of evaluation are reported below.

Table 7.4.3.1.2-1: RF Conducted Spurious Emissions Tabulated Data (BPSK)

Frequency (MHz)	Measured Power (dBm)				Total Corrected EIRP (dBm)		Corrected Levels (dBuV/m)		Limits (dBuV/m)		Margin (dBuV/m)	
	RF Port 1		RF Port 2									
	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg
TX = 904.2 MHz												
2712.6	-47.17	-55.73	-41.30	-54.12	-34.01	-45.55	61.25	49.71	74.00	54.00	12.75	4.29
TX = 915.72 MHz												
2747.16	-43.16	-55.60	-43.73	-54.35	-34.14	-45.63	61.12	49.63	74.00	54.00	12.88	4.37
TX = 925.8 MHz												
2777.4	-44.56	-55.54	-45.29	-54.95	-35.61	-45.94	59.65	49.32	74.00	54.00	14.35	4.68

Notes:

- **All emissions above 2777.4 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The total EIRP is calculated using the summation of the power output at each antenna port, the directional antenna gain of [0 + 10log (2)] and the duty cycle factor of 10log(1/0.47).**

Table 7.4.3.1.2-2: RF Conducted Spurious Emissions Tabulated Data (QPSK)

Frequency (MHz)	Measured Power (dBm)				Total Corrected EIRP (dBm)		Corrected Levels (dBuV/m)		Limits (dBuV/m)		Margin (dBuV/m)	
	RF Port 1		RF Port 2									
	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg
TX = 904.2 MHz												
2712.6	-45.10	-55.74	-40.64	-54.28	-33.02	-45.65	62.24	49.61	74.00	54.00	11.76	4.39
TX = 915.72 MHz												
2747.16	-44.20	-55.32	-42.50	-54.45	-33.97	-45.56	61.29	49.69	74.00	54.00	12.71	4.31
TX = 925.8 MHz												
2777.4	-45.11	-55.41	-42.98	-55.10	-34.62	-45.95	60.64	49.30	74.00	54.00	13.36	4.70

Notes:

- **All emissions above 2777.4 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The total EIRP is calculated using the summation of the power output at each antenna port, the directional antenna gain of [0 + 10log (2)] and the duty cycle factor of 10log(1/0.47).**

Table 7.4.3.1.2-3: RF Conducted Spurious Emissions Tabulated Data (16-QAM)

Frequency (MHz)	Measured Power (dBm)				Total Corrected EIRP (dBm)		Corrected Levels (dBuV/m)		Limits (dBuV/m)		Margin (dBuV/m)	
	RF Port 1		RF Port 2									
	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg
TX = 904.2 MHz												
2712.6	-45.20	-55.88	-46.33	-54.84	-36.43	-46.03	58.83	49.23	74.00	54.00	15.17	4.77
TX = 915.72 MHz												
2747.16	-45.53	-55.61	-33.59	-54.37	-27.03	-45.65	68.23	49.61	74.00	54.00	5.77	4.39
TX = 925.8 MHz												
2777.4	-45.09	-55.95	-34.24	-55.02	-27.61	-46.16	67.65	49.10	74.00	54.00	6.35	4.90

Notes:

- **All emissions above 2777.4 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The total EIRP is calculated using the summation of the power output at each antenna port, the directional antenna gain of [0 + 10log (2)] and the duty cycle factor of 10log(1/0.47).**

Table 7.4.3.1.2-4: RF Conducted Spurious Emissions Tabulated Data (64-QAM)

Frequency (MHz)	Measured Power (dBm)				Total Corrected EIRP (dBm)		Corrected Levels (dBuV/m)		Limits (dBuV/m)		Margin (dBuV/m)	
	RF Port 1		RF Port 2									
	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg	Peak	QPk/Avg
TX = 904.2 MHz												
2712.6	-45.10	-55.81	-40.84	-54.08	-33.17	-45.56	62.09	49.70	74.00	54.00	11.91	4.30
TX = 915.72 MHz												
2747.16	-44.93	-55.70	-42.75	-54.47	-34.41	-45.74	60.85	49.52	74.00	54.00	13.15	4.48
TX = 925.8 MHz												
2777.4	-44.53	-55.63	-42.13	-54.28	-33.87	-45.60	61.39	49.65	74.00	54.00	12.61	4.35

Notes:

- **All emissions above 2777.4 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The total EIRP is calculated using the summation of the power output at each antenna port, the directional antenna gain of [0 + 10log (2)] and the duty cycle factor of 10log(1/0.47).**

7.4.3.2 Radiated Spurious Emissions - FCC Section 15.205

7.4.3.2.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 10 GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak measurements were made with RBW of 1 MHz and VBW of 3MHz. Average measurements were performed in the linear scale, using RBW = 1 MHz and VBW = 30 Hz.

Since the unit was operating at the maximum duty cycle of 47% for all available modulations, the emissions presenting the same pulsing characteristics as the fundamental, were further corrected using a duty cycle correction factor consisting of 20*log(47/100) dB ≈ -6.56 dB.

The evaluation above 1000 MHz was performed on the EUT cabinet with a termination at the TX antenna ports. Measurements below 1000 MHz were performed with the antennas connected to the RF ports. No significant emissions from the transmitter could be observed in the restricted bands below 1000 MHz.

7.4.3.2.2 Measurement Results

Radiated spurious and band-edge emissions found in the band of 30MHz to 10 GHz are reported below.

Table 7.4.3.2.2-1: Radiated Spurious Emissions Tabulated Data (BPSK)

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel (904.2 MHz)										
2712.6	49.33	35.70	H	-7.02	42.31	22.13	74.0	54.0	31.7	31.9
2712.6	54.78	39.46	V	-7.02	47.76	25.89	74.0	54.0	26.2	28.1
3616.8	48.34	37.79	H	-3.79	44.55	27.44	74.0	54.0	29.4	26.6
3616.8	47.68	37.33	V	-3.79	43.89	26.98	74.0	54.0	30.1	27.0
Middle Channel (915.72 MHz)										
2747.16	49.36	35.54	H	-6.86	42.50	22.12	74.0	54.0	31.5	31.9
2747.16	53.53	38.53	V	-6.86	46.67	25.11	74.0	54.0	27.3	28.9
3662.88	47.74	35.95	H	-3.61	44.13	25.78	74.0	54.0	29.9	28.2
3662.88	48.21	36.45	V	-3.61	44.60	26.28	74.0	54.0	29.4	27.7
7325.76	47.34	35.73	H	3.86	51.20	33.04	74.0	54.0	22.8	21.0
7325.76	50.56	42.03	V	3.86	54.42	39.34	74.0	54.0	19.6	14.7
High Channel (925.8 MHz)										
2777.4	51.22	37.23	H	-6.72	44.50	23.95	74.0	54.0	29.5	30.1
2777.4	54.80	40.64	V	-6.72	48.08	27.36	74.0	54.0	25.9	26.6
7406.4	49.95	42.44	V	4.12	54.07	40.00	74.0	54.0	19.9	14.0

Notes:

- **All emissions above 7406.4 MHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The harmonics in the restricted bands showed pulsing characteristics similar to the fundamental. A duty cycle corresponding to 20*log(47/100) dB ≈ -6.56 dB was applied to the average values for the corrected levels.**

Table 7.4.3.2.2-2: Radiated Spurious Emissions Tabulated Data (QPSK)

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel (904.2 MHz)										
2712.6	49.45	37.37	H	-7.02	42.43	23.80	74.0	54.0	31.6	30.2
2712.6	55.33	41.93	V	-7.02	48.31	28.36	74.0	54.0	25.7	25.6
Middle Channel (915.72 MHz)										
2747.16	50.80	36.60	H	-6.86	43.94	23.18	74.0	54.0	30.1	30.8
2747.16	55.52	40.34	V	-6.86	48.66	26.92	74.0	54.0	25.3	27.1
3662.88	46.42	33.72	V	-3.61	42.81	23.55	74.0	54.0	31.2	30.5
7325.76	46.29	34.50	H	3.86	50.15	31.81	74.0	54.0	23.8	22.2
7325.76	48.77	37.56	V	3.86	52.63	34.87	74.0	54.0	21.4	19.1
High Channel (925.8 MHz)										
2777.4	50.60	36.34	H	-6.72	43.88	23.06	74.0	54.0	30.1	30.9
2777.4	52.73	36.89	V	-6.72	46.01	23.61	74.0	54.0	28.0	30.4
3703.2	46.64	33.54	V	-3.46	43.18	23.52	74.0	54.0	30.8	30.5
7406.4	47.17	35.89	H	4.12	51.29	33.45	74.0	54.0	22.7	20.6
7406.4	49.67	42.00	V	4.12	53.79	39.56	74.0	54.0	20.2	14.4

Notes:

- **All emissions above 7406.4 MHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The harmonics in the restricted bands showed pulsing characteristics similar to the fundamental. A duty cycle corresponding to 20*log(47/100) dB ≈ -6.56 dB was applied to the average values for the corrected levels.**

Table 7.4.3.2.2-3: Radiated Spurious Emissions Tabulated Data (16-QAM)

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel (904.2 MHz)										
2712.6	52.38	37.40	V	-7.02	45.36	23.83	74.0	54.0	28.6	30.2
Middle Channel (915.72 MHz)										
2747.16	50.10	36.15	H	-6.86	43.24	22.73	74.0	54.0	30.8	31.3
2747.16	55.15	39.51	V	-6.86	48.29	26.09	74.0	54.0	25.7	27.9
7325.76	46.97	34.90	H	3.86	50.83	32.21	74.0	54.0	23.2	21.8
7325.76	48.87	38.39	V	3.86	52.73	35.70	74.0	54.0	21.3	18.3
High Channel (925.8 MHz)										
2777.4	51.00	35.53	H	-6.72	44.28	22.25	74.0	54.0	29.7	31.7
2777.4	53.25	37.73	V	-6.72	46.53	24.45	74.0	54.0	27.5	29.5
7406.4	47.58	36.55	H	4.12	51.70	34.11	74.0	54.0	22.3	19.9
7406.4	49.45	41.39	V	4.12	53.57	38.95	74.0	54.0	20.4	15.1

Notes:

- **All emissions above 7406.4 MHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The harmonics in the restricted bands showed pulsing characteristics similar to the fundamental. A duty cycle corresponding to 20*log(47/100) dB ≈ -6.56 dB was applied to the average values for the corrected levels.**

Table 7.4.3.2.2-4: Radiated Spurious Emissions Tabulated Data (64-QAM)

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel (904.2 MHz)										
2712.6	49.05	35.47	H	-7.02	42.03	21.90	74.0	54.0	32.0	32.1
2712.6	53.77	38.33	V	-7.02	46.75	24.76	74.0	54.0	27.2	29.2
Middle Channel (915.72 MHz)										
2747.16	49.10	35.65	H	-6.86	42.24	22.23	74.0	54.0	31.8	31.8
2747.16	53.23	38.05	V	-6.86	46.37	24.63	74.0	54.0	27.6	29.4
7325.76	46.80	34.86	H	3.86	50.66	32.17	74.0	54.0	23.3	21.8
7325.76	47.89	38.22	V	3.86	51.75	35.53	74.0	54.0	22.2	18.5
High Channel (925.8 MHz)										
2777.4	49.03	35.13	H	-6.72	42.31	21.85	74.0	54.0	31.7	32.1
2777.4	53.28	38.09	V	-6.72	46.56	24.81	74.0	54.0	27.4	29.2
7406.4	48.46	37.11	H	4.12	52.58	34.67	74.0	54.0	21.4	19.3
7406.4	49.23	41.27	V	4.12	53.35	38.83	74.0	54.0	20.7	15.2

Notes:

- **All emissions above 7406.4 MHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The harmonics in the restricted bands showed pulsing characteristics similar to the fundamental. A duty cycle corresponding to 20*log(47/100) dB ≈ -6.56 dB was applied to the average values for the corrected levels.**

Table 7.4.3.2.2-5: Radiated Spurious Emissions Tabulated Data (Other than harmonics)

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
1170	61.38	58.06	V	-15.80	45.58	42.26	74.0	54.0	28.4	11.7
1377.995	57.14	52.73	V	-14.32	42.82	38.41	74.0	54.0	31.2	15.6
1404.4	58.29	53.40	V	-14.13	44.16	39.27	74.0	54.0	29.8	14.7
1456	56.00	48.91	V	-13.77	42.23	35.14	74.0	54.0	31.8	18.9
1482	59.41	55.16	V	-13.58	45.83	41.58	74.0	54.0	28.2	12.4

Notes:

- **The table above reports spurious emissions other than harmonics falling within the restricted bands. These emissions were observed to be independent of the modulations and channel of operation of the transmitter.**
- **The emissions listed above do not show the same modulation characteristics as the transmitter. Therefore, no duty cycle correction factors were applied to the measurements.**

7.4.3.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Duty Cycle Correction Factor = 20*log(47/100) ≈ -6.56 dB

Example Calculation: Peak
Corrected Level: 49.33 -7.02 = 42.31 dBµV/m
Margin: 74 dBµV/m – 42.31 dBµV/m = 31.7dB

Example Calculation: Average
Corrected Level: 35.7 - 7.02 - 6.56 = 22.12 dBµV/m
Margin: 54 dBµV/m – 22.12 dBµV/m = 31.9 dB

7.5 Power Spectral Density - FCC Section 15.247(e)

7.5.1 PSD Measurement Procedure (Conducted Method)

The power spectral density was measured in accordance with the FCC KDB Publication No. 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)" Measurement Section 10.5 Method AVGPSD-2. The RF output port of the EUT was directly connected to the input of the spectrum analyzer. Offset values were input for cable and external attenuation. The spectrum analyzer RBW was set to 3 kHz and VBW 10 kHz. Span was adjusted to at least 1.5 times the OBW bandwidth and the sweep time was set to auto. The PSD was measured with trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction.

The output PSD was corrected in accordance with FCC KDB Publication No. 662911 "Emissions Testing of Transmitters with Multiple Outputs in the Same Band" in order to account for the multiple outputs by applying the correction factor of 10*log(N) dB to the measured level, where N corresponds to the number of transmitter outputs.

7.5.2 Measurement Results

Results are shown below.

Table 7.5.2-1: Power Spectral Density (BPSK, Antenna Path 1)

Frequency (MHz)	PSD/3kHz (dBm)	Duty Cycle	10*log(2) (dB)	Total PSD/3kHz (dBm)	Limit (dBm)	Margin (dB)
904.2	0.247	47%	3.01	6.54	8	1.46
915.72	0.122	47%	3.01	6.41	8	1.59
925.8	-0.097	47%	3.01	6.19	8	1.81

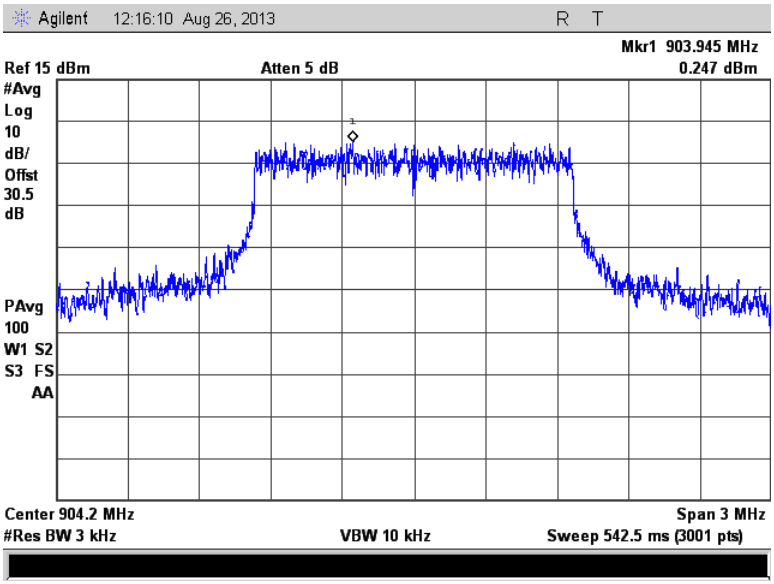

Figure 7.5.2-1: Power Spectral Density - Low Channel (BPSK, Antenna Path 1)

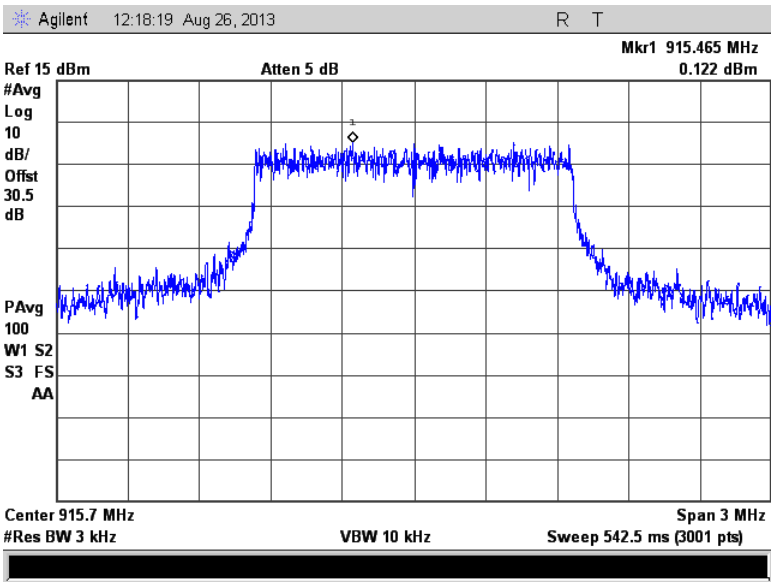

Figure 7.5.2-2: Power Spectral Density - Middle Channel (BPSK, Antenna Path 1)

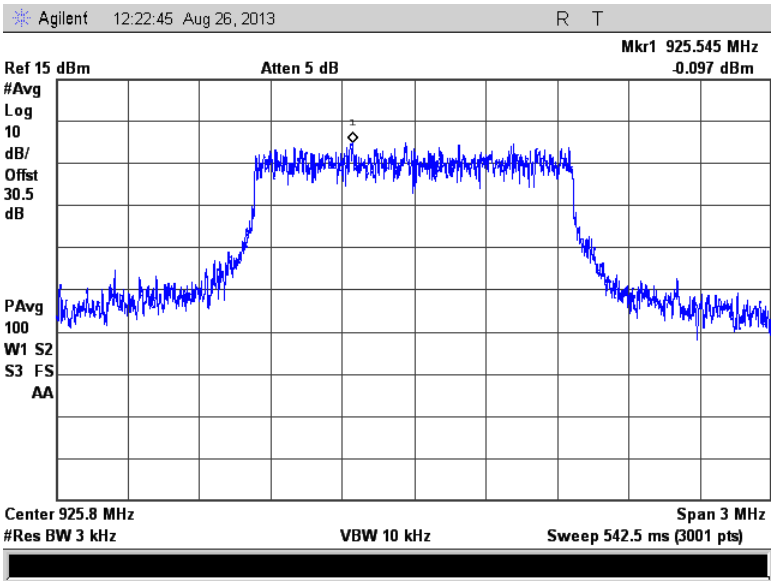

Figure 7.5.2-3: Power Spectral Density – High Channel (BPSK, Antenna Path 1)

Table 7.5.2-2: Power Spectral Density (BPSK, Antenna Path 2)

Frequency (MHz)	PSD/3kHz (dBm)	Duty Cycle	10*log(2) (dB)	Total PSD/3kHz (dBm)	Limit (dBm)	Margin (dB)
904.2	-0.447	47%	3.01	5.84	8	2.16
915.72	0.188	47%	3.01	6.48	8	1.52
925.8	1.046	47%	3.01	7.34	8	0.66

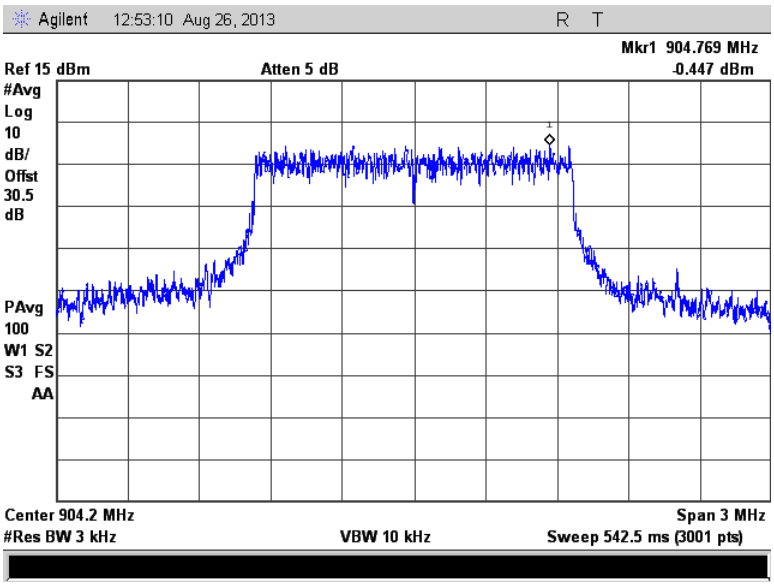

Figure 7.5.2-4: Power Spectral Density - Low Channel (BPSK, Antenna Path 2)

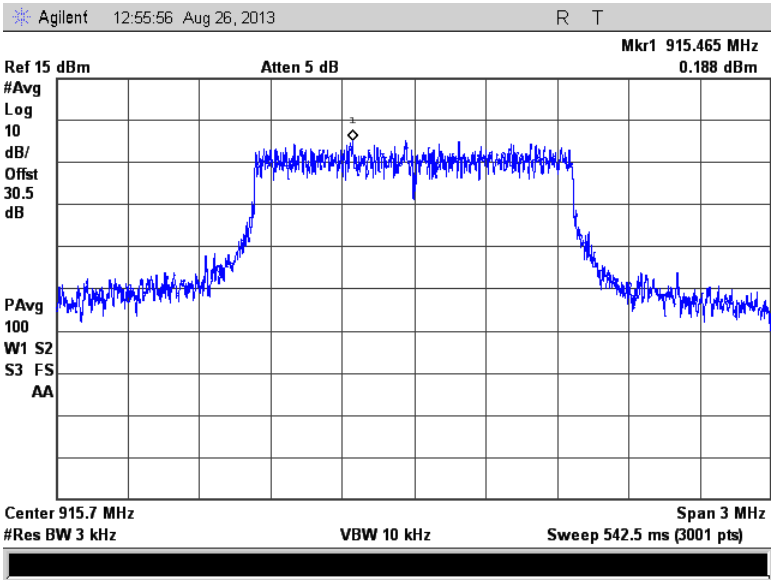

Figure 7.5.2-5: Power Spectral Density - Middle Channel (BPSK, Antenna Path 2)

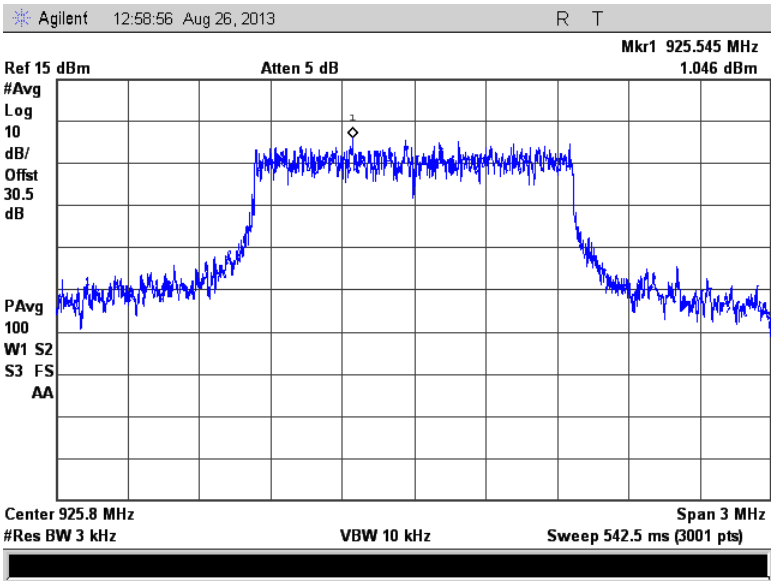

Figure 7.5.2-6: Power Spectral Density – High Channel (BPSK, Antenna Path 2)

Table 7.5.2-3: Power Spectral Density (QPSK, Antenna Path 1)

Frequency (MHz)	PSD/3kHz (dBm)	Duty Cycle	10*log(2) (dB)	Total PSD/3kHz (dBm)	Limit (dBm)	Margin (dB)
904.2	0.159	47%	3.01	6.45	8	1.55
915.72	0.645	47%	3.01	6.93	8	1.07
925.8	-0.44	47%	3.01	5.85	8	2.15

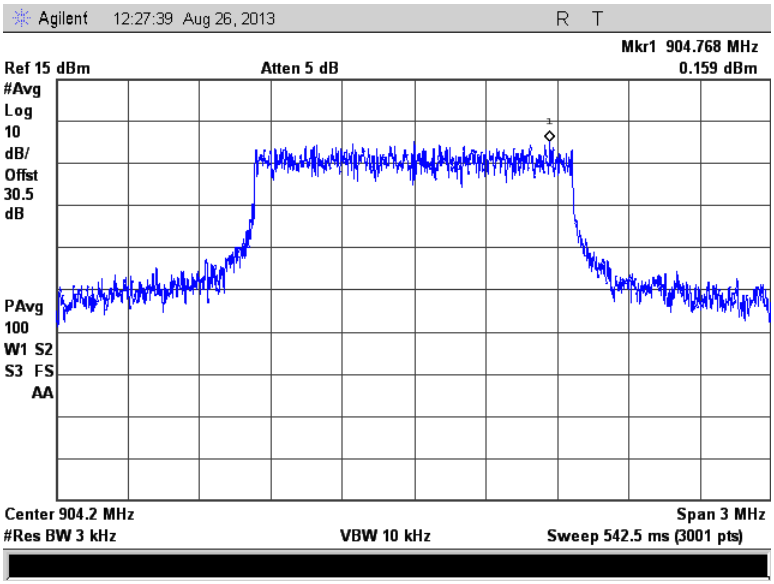

Figure 7.5.2-7: Power Spectral Density - Low Channel (QPSK, Antenna Path 1)

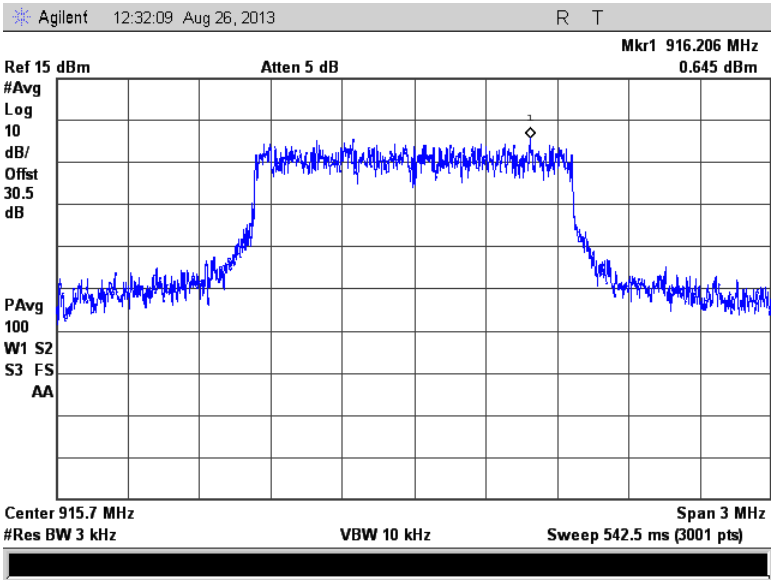

Figure 7.5.2-8: Power Spectral Density - Middle Channel (QPSK, Antenna Path 1)

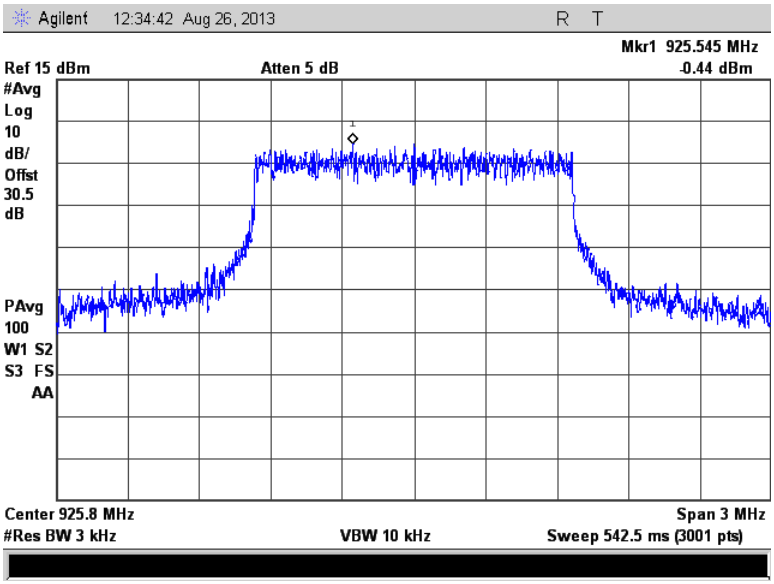

Figure 7.5.2-9: Power Spectral Density – High Channel (QPSK, Antenna Path 1)

Table 7.5.2-4: Power Spectral Density (QPSK, Antenna Path 2)

Frequency (MHz)	PSD/3kHz (dBm)	Duty Cycle	10*log(2) (dB)	Total PSD/3kHz (dBm)	Limit (dBm)	Margin (dB)
904.2	-0.25	47%	3.01	6.04	8	1.96
915.72	0.442	47%	3.01	6.73	8	1.27
925.8	0.554	47%	3.01	6.84	8	1.16

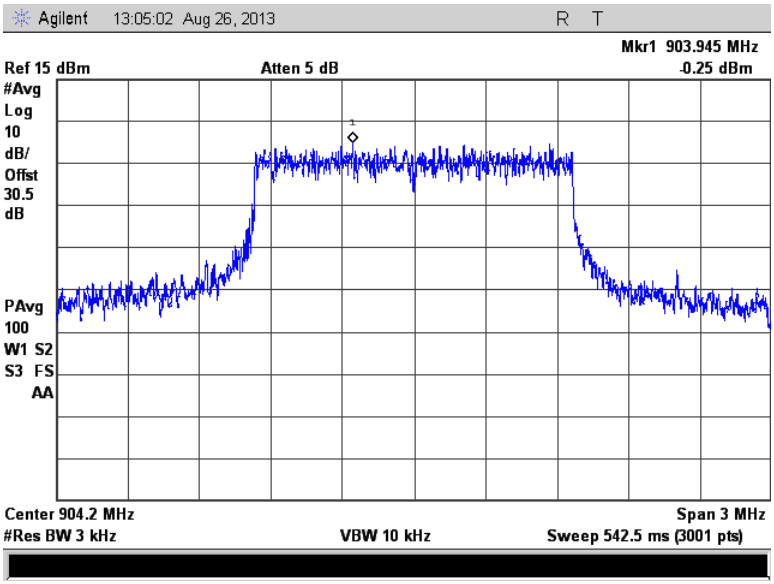

Figure 7.5.2-10: Power Spectral Density - Low Channel (QPSK, Antenna Path 2)

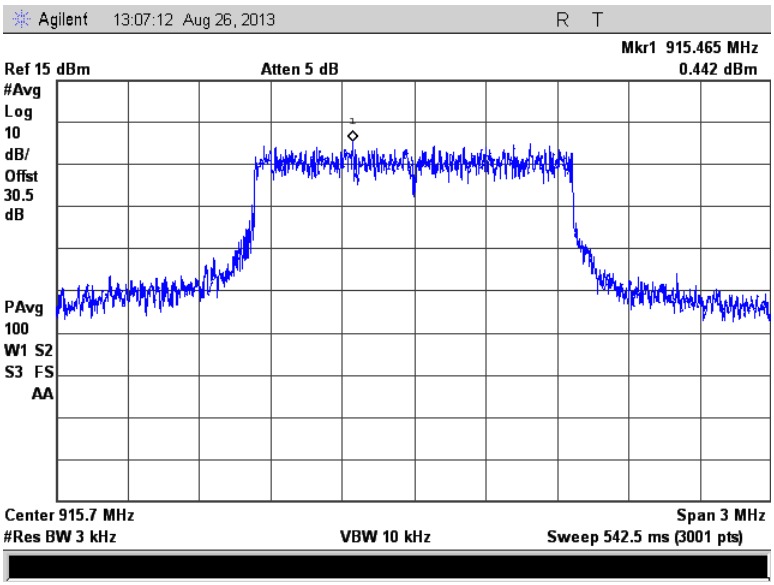

Figure 7.5.2-11: Power Spectral Density - Middle Channel (QPSK, Antenna Path 2)

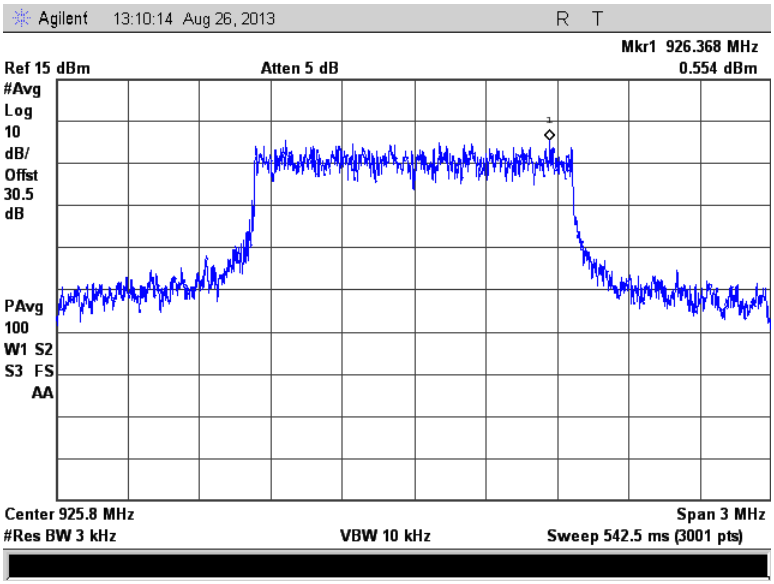

Figure 7.5.2-12: Power Spectral Density – High Channel (QPSK, Antenna Path 2)

Table 7.5.2-5: Power Spectral Density (16-QAM, Antenna Path 1)

Frequency (MHz)	PSD/3kHz (dBm)	Duty Cycle	10*log(2) (dB)	Total PSD/3kHz (dBm)	Limit (dBm)	Margin (dB)
904.2	0.257	47%	3.01	6.55	8	1.45
915.72	0.182	47%	3.01	6.47	8	1.53
925.8	-0.13	47%	3.01	6.16	8	1.84

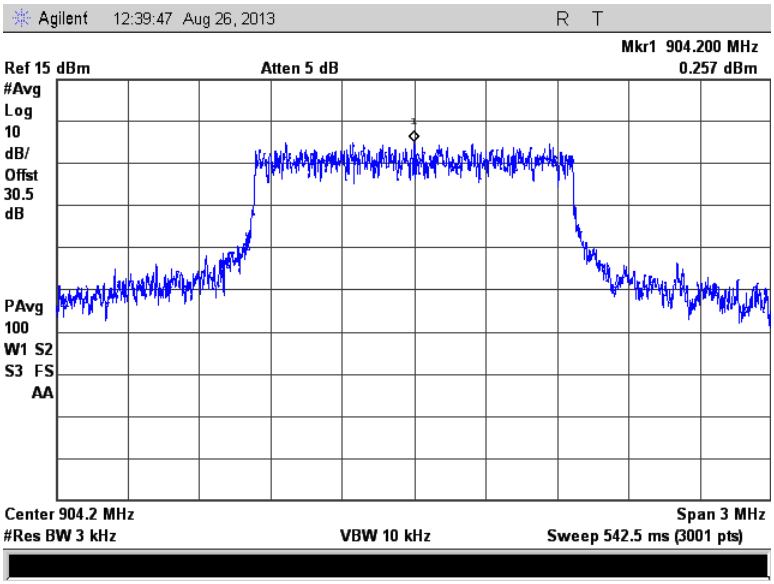

Figure 7.5.2-13: Power Spectral Density - Low Channel (16-QAM, Antenna Path 1)

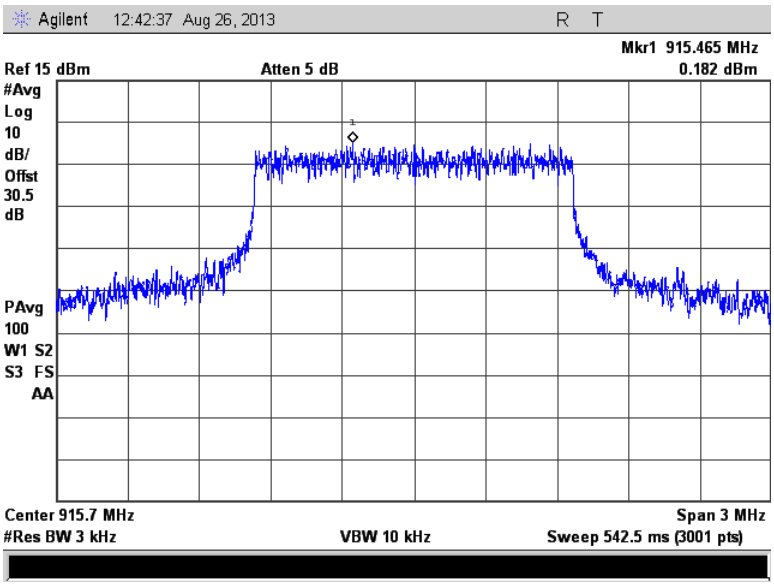

Figure 7.5.2-14: Power Spectral Density - Middle Channel (16-QAM, Antenna Path 1)

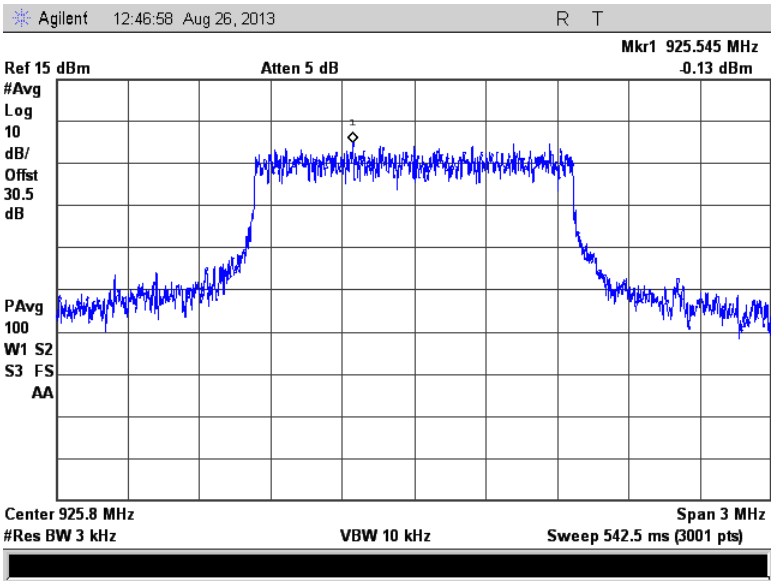

Figure 7.5.2-15: Power Spectral Density – High Channel (16-QAM, Antenna Path 1)

Table 7.5.2-6: Power Spectral Density (16-QAM, Antenna Path 2)

Frequency (MHz)	PSD/3kHz (dBm)	Duty Cycle	10*log(2) (dB)	Total PSD/3kHz (dBm)	Limit (dBm)	Margin (dB)
904.2	-0.031	47%	3.01	6.26	8	1.74
915.72	0.576	47%	3.01	6.87	8	1.13
925.8	0.099	47%	3.01	6.39	8	1.61

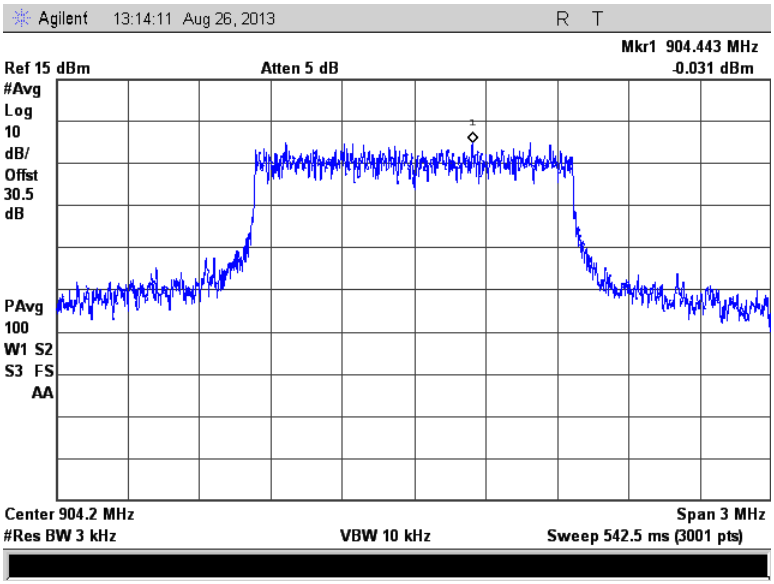

Figure 7.5.2-16: Power Spectral Density - Low Channel (16-QAM, Antenna Path 2)

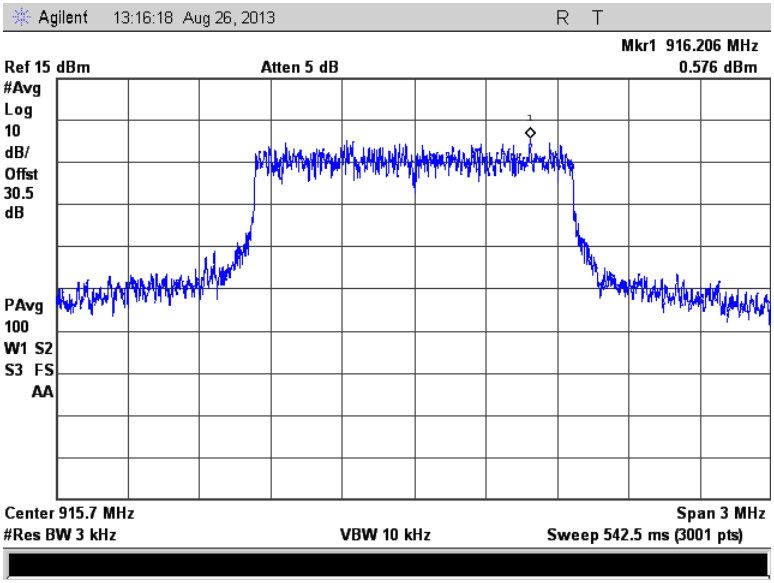

Figure 7.5.2-17: Power Spectral Density - Middle Channel (16-QAM, Antenna Path 2)

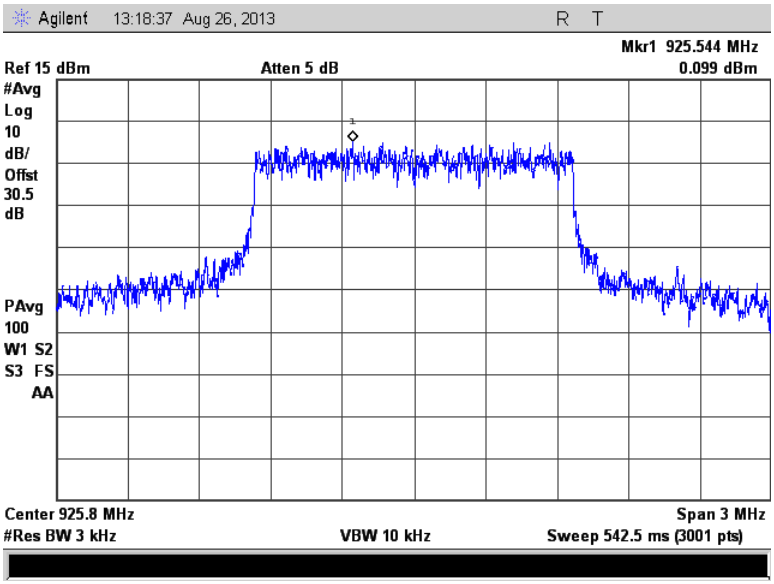

Figure 7.5.2-18: Power Spectral Density – High Channel (16-QAM, Antenna Path 2)

Table 7.5.2-7: Power Spectral Density (64-QAM, Antenna Path 1)

Frequency (MHz)	PSD/3kHz (dBm)	Duty Cycle	10*log(2) (dB)	Total PSD/3kHz (dBm)	Limit (dBm)	Margin (dB)
904.2	0.177	47%	3.01	6.47	8	1.53
915.72	0.159	47%	3.01	6.45	8	1.55
925.8	-0.645	47%	3.01	5.64	8	2.36

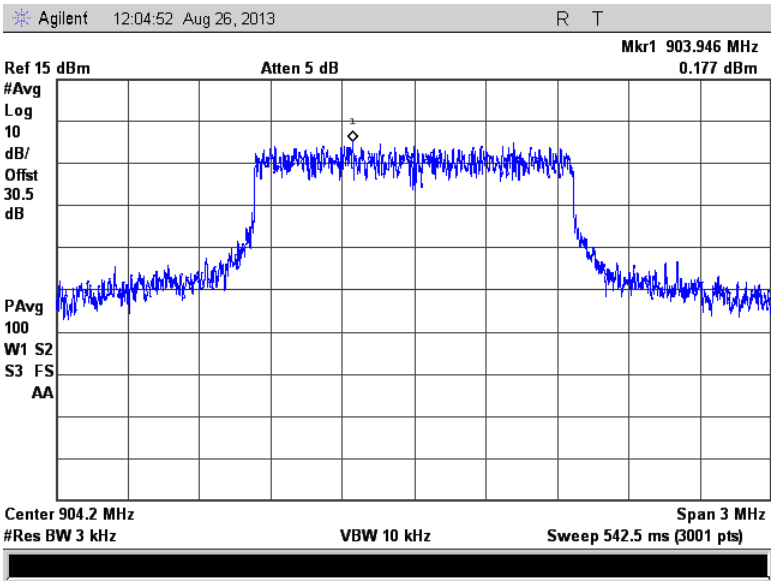

Figure 7.5.2-19: Power Spectral Density - Low Channel (64-QAM, Antenna Path 1)

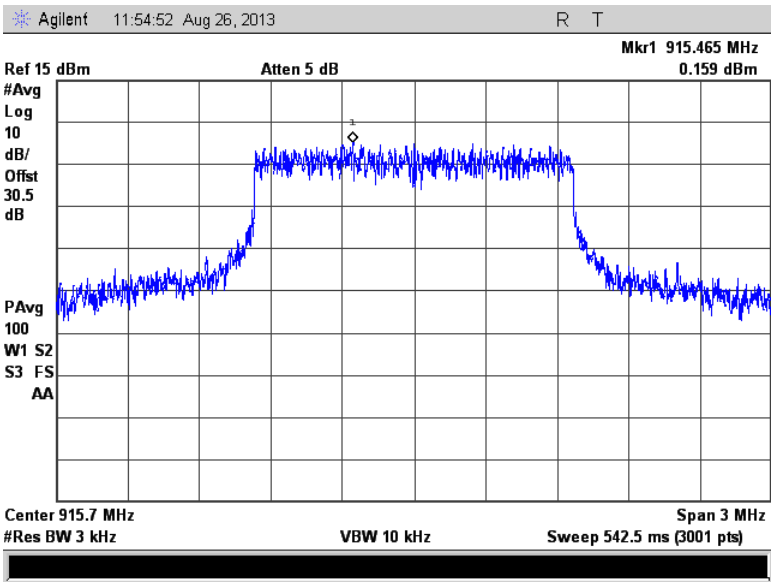

Figure 7.5.2-20: Power Spectral Density - Middle Channel (64-QAM, Antenna Path 1)

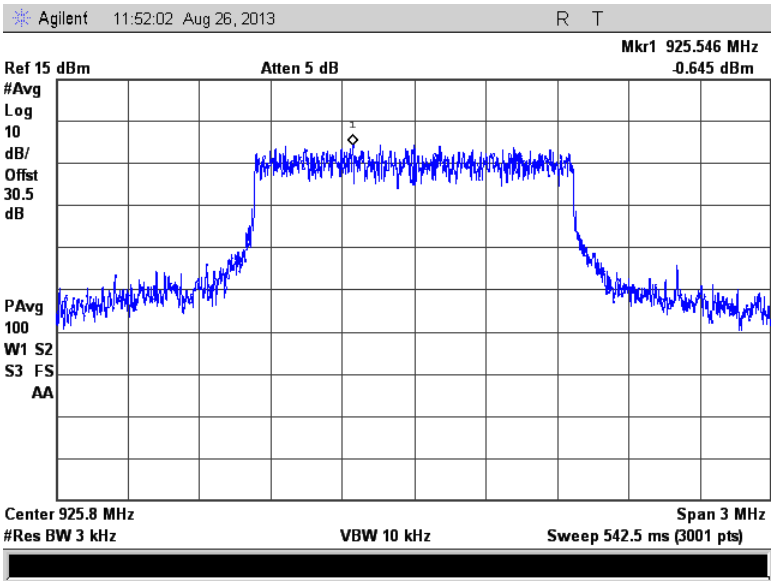

Figure 7.5.2-21: Power Spectral Density – High Channel (64-QAM, Antenna Path 1)

Table 7.5.2-8: Power Spectral Density (64-QAM, Antenna Path 2)

Frequency (MHz)	PSD/3kHz (dBm)	Duty Cycle	10*log(2) (dB)	Total PSD/3kHz (dBm)	Limit (dBm)	Margin (dB)
904.2	0.099	47%	3.01	6.39	8	1.61
915.72	-0.286	47%	3.01	6	8	2
925.8	0.524	47%	3.01	6.81	8	1.19

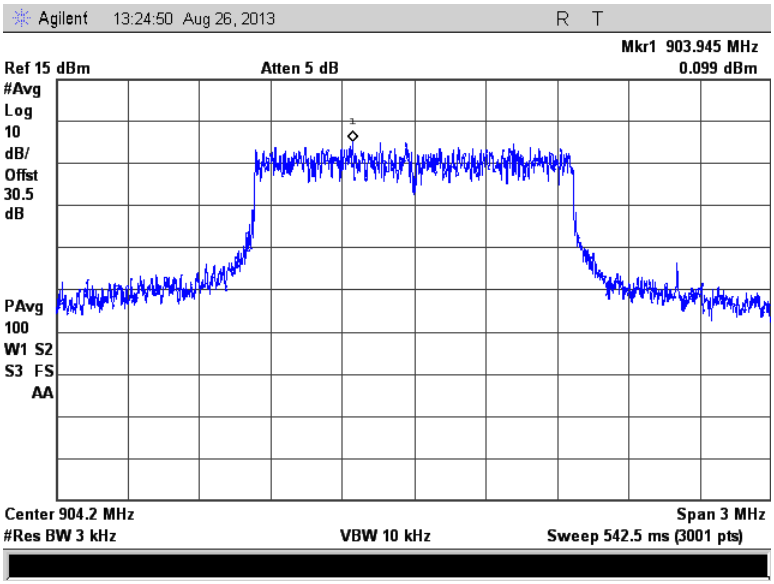

Figure 7.5.2-22: Power Spectral Density - Low Channel (64-QAM, Antenna Path 2)

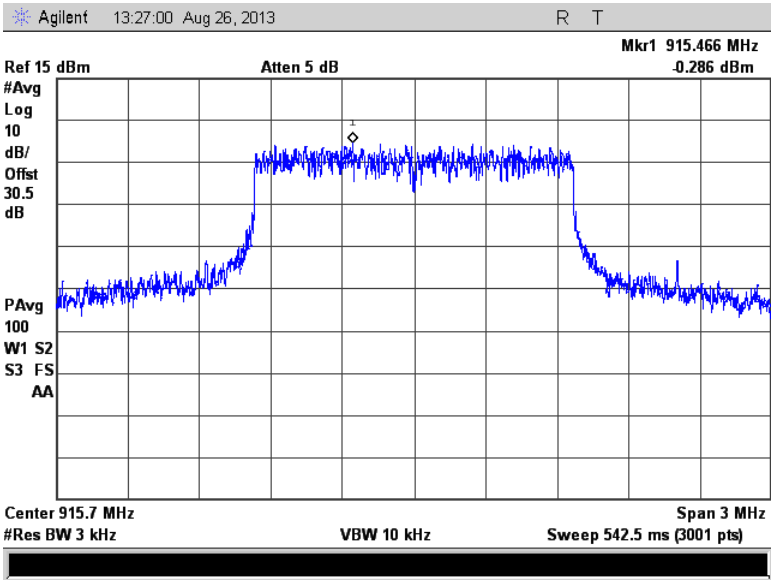

Figure 7.5.2-23: Power Spectral Density - Middle Channel (64-QAM, Antenna Path 2)

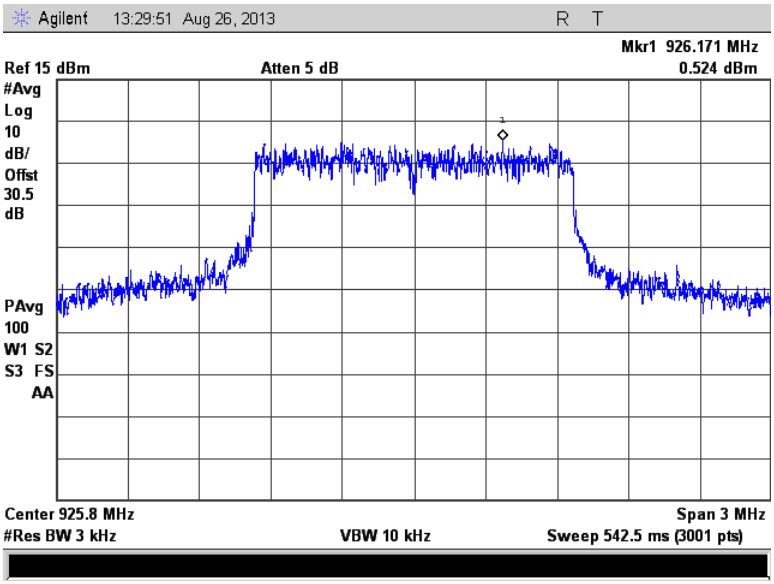

Figure 7.5.2-24: Power Spectral Density – High Channel (64-QAM, Antenna Path 2)

7.6 Duty Cycle

7.6.1 Measurement Procedure

The duty cycle was measured in accordance with the FCC KDB Publication No. 558074 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)” Section 6.0 b). The unit was connected directly to the input of the spectrum analyzer via suitable attenuation. The RBW and VBW were set to 3 MHz and the number of sweep points across the minimum transmission duration (T) exceeded 100.

7.6.2 Measurement Procedure

The results area provided below:

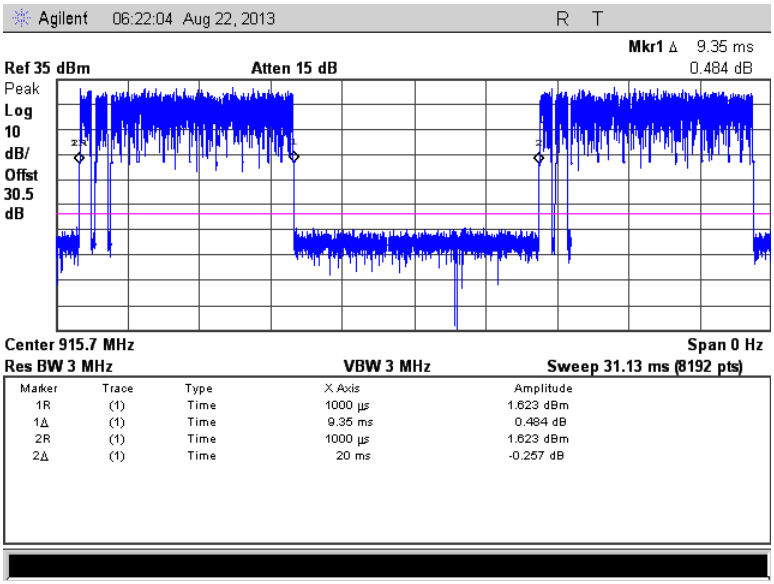

Figure 7.6.2-1: Duty Cycle

Note: The duty cycle is calculated to be (9.35 / 20) ≈ 0.47

7.7 Power Line Conducted Emissions – FCC: Section 15.207

7.7.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.7.2 Measurement Results

Results are shown below.

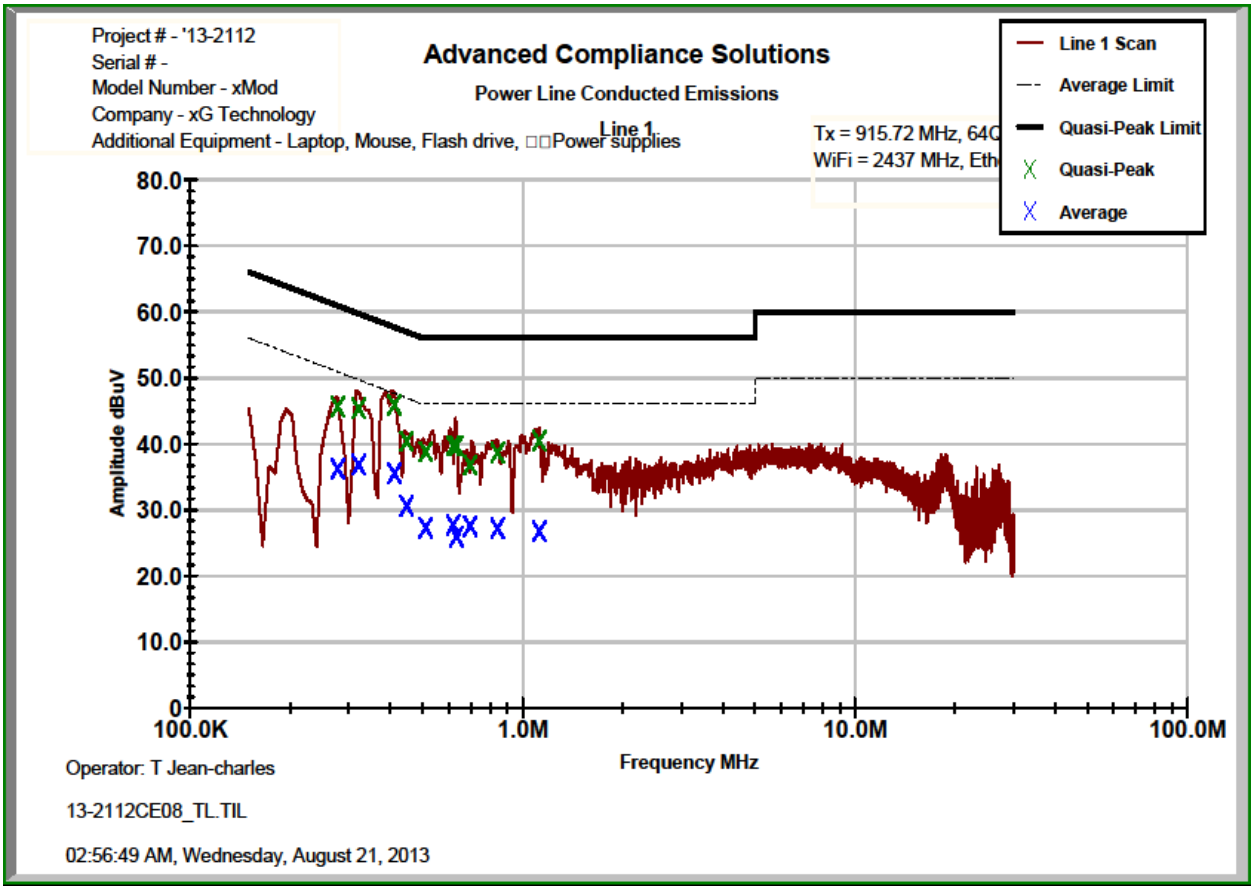

Figure 7.7.2-1: Conducted Emissions Results – Line 1

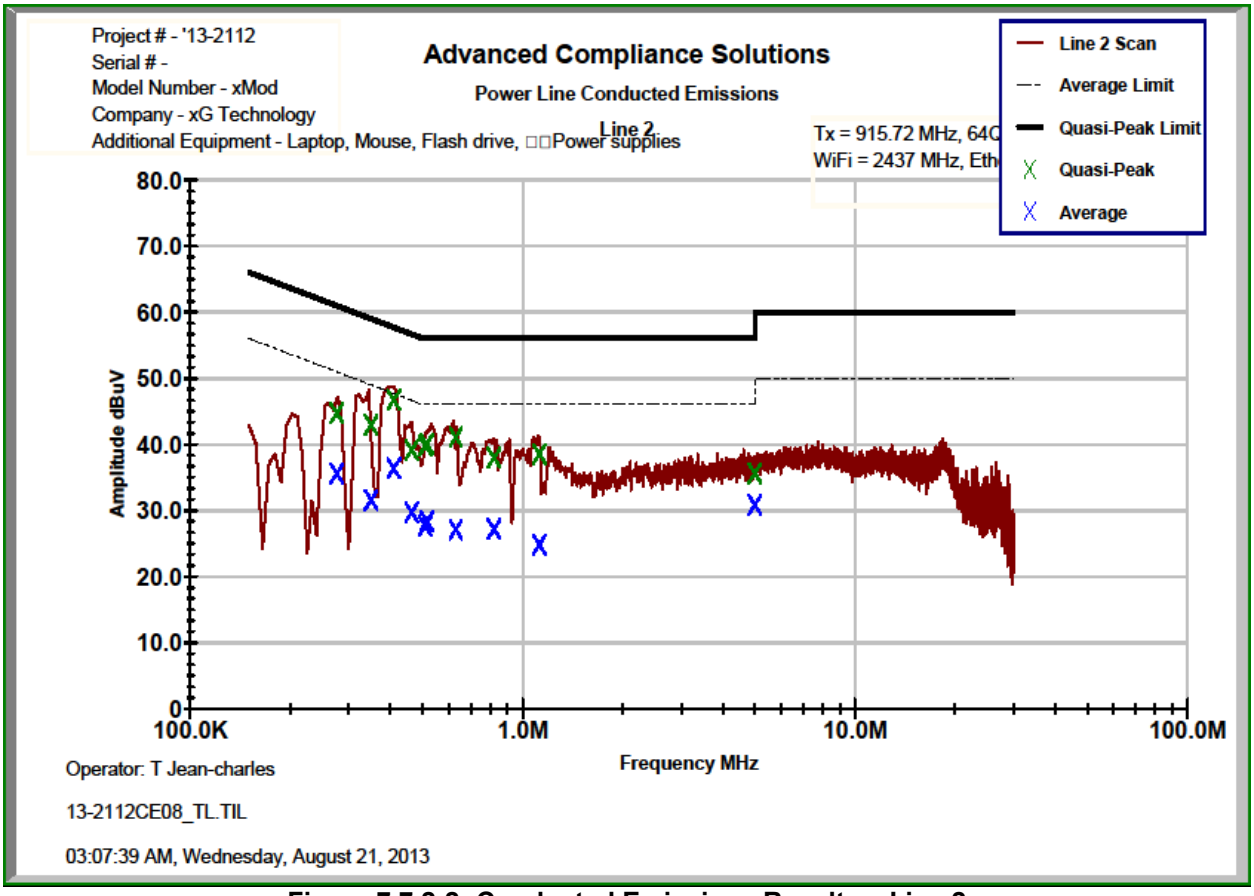

Figure 7.7.2-2: Conducted Emissions Results – Line 2

Table 7.7.2-1: Conducted EMI Results

☒ Line 1 ☒ Line 2 ☐ Line 3
☐ Line 4
☒ To Ground ☐ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

Plot Number: 13-2112CE08
Power Supply Description: 15 VDC

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
Line 1									
0.277413	44.818	35.421	0.85	45.67	36.27	60.89	50.89	15.2	14.6
0.320725	44.646	36.092	0.73	45.38	36.82	59.69	49.69	14.3	12.9
0.411175	45.304	34.965	0.57	45.87	35.54	57.62	47.62	11.7	12.1
0.447438	39.838	30.028	0.56	40.40	30.59	56.92	46.92	16.5	16.3
0.51025	38.271	26.778	0.50	38.77	27.28	56.00	46.00	17.2	18.7
0.616813	39.21	27.211	0.47	39.68	27.68	56.00	46.00	16.3	18.3
0.6305	39.189	25.504	0.47	39.66	25.97	56.00	46.00	16.3	20.0
0.694774	36.296	27.069	0.46	36.76	27.53	56.00	46.00	19.2	18.5
0.8392	38.204	26.746	0.44	38.65	27.19	56.00	46.00	17.4	18.8
1.12032	39.991	26.331	0.42	40.41	26.75	56.00	46.00	15.6	19.3
Line 2									
0.275663	43.868	34.764	0.87	44.74	35.64	60.95	50.95	16.2	15.3
0.349525	42.236	30.888	0.73	42.96	31.62	58.97	48.97	16.0	17.4
0.408763	46.085	35.732	0.61	46.69	36.34	57.67	47.67	11.0	11.3
0.462925	38.569	29.154	0.59	39.16	29.75	56.64	46.64	17.5	16.9
0.50885	39.257	27.099	0.54	39.79	27.64	56.00	46.00	16.2	18.4
0.514138	39.461	27.851	0.54	40.00	28.39	56.00	46.00	16.0	17.6
0.628888	40.55	26.603	0.49	41.04	27.10	56.00	46.00	15.0	18.9
0.819212	37.491	26.689	0.47	37.96	27.16	56.00	46.00	18.0	18.8
1.12156	38.121	24.397	0.41	38.53	24.81	56.00	46.00	17.5	21.2
4.98545	34.938	30.187	0.59	35.53	30.78	56.00	46.00	20.5	15.2

* Note: Results are reported for the EUT configuration leading to the worst case emissions.

8 CONCLUSION

In the opinion of ACS, Inc. the xMod, manufactured by xG Technology, Inc meets the requirements of FCC Part 15 subpart C.

END REPORT