FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

Tablet with Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC

MODEL NUMBER: SM-T360

FCC ID: A3LSMT360

REPORT NUMBER: 14U18495-E1

ISSUE DATE: AUGUST 20, 2014

Prepared for

SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

Prepared by

UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	8/20/14	Initial Issue	P. Zhang

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5

2. TEST METHODOLOGY 6

3. FACILITIES AND ACCREDITATION 6

4. CALIBRATION AND UNCERTAINTY 6

4.1. MEASURING INSTRUMENT CALIBRATION 6

4.2. SAMPLE CALCULATION 6

4.3. MEASUREMENT UNCERTAINTY 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. MAXIMUM OUTPUT POWER 7

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 7

5.4. WORST-CASE CONFIGURATION AND MODE 8

5.5. DESCRIPTION OF TEST SETUP 9

6. TEST AND MEASUREMENT EQUIPMENT 11

7. SUMMARY TABLE 12

8. ANTENNA PORT TEST RESULTS 13

8.1. 20 dB AND 99% BANDWIDTH 13

8.1.1. BASIC DATA RATE GFSK MODULATION 13

8.1.2. ENHANCED DATA RATE 8PSK MODULATION 13

20 dB AND 99% BANDWIDTH PLOTS 14

8.2. HOPPING FREQUENCY SEPARATION 26

8.3. NUMBER OF HOPPING CHANNELS 28

8.4. AVERAGE TIME OF OCCUPANCY 33

8.5. OUTPUT POWER 40

8.5.1. BASIC DATA RATE GFSK MODULATION 40

8.5.2. ENHANCED DATA RATE 8PSK MODULATION 40

8.5.3. OUTPUT POWER PLOTS 41

8.6. AVERAGE POWER 47

8.6.1. BASIC DATA RATE GFSK MODULATION 47

8.6.2. DATA RATE PI/4-DQPSK MODULATION 47

8.6.3. ENHANCED DATA RATE 8PSK MODULATION 48

8.7. CONDUCTED SPURIOUS EMISSIONS 49

8.7.1. BASIC DATA RATE GFSK MODULATION 50

ENHANCED DATA RATE 8PSK MODULATION 58

9. RADIATED TEST RESULTS 66

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.1. LIMITS AND PROCEDURE 66

9.2. TRANSMITTER ABOVE 1 GHz 67

9.2.1. BASIC DATA RATE GFSK MODULATION 67

9.2.2. ENHANCED DATA RATE 8PSK MODULATION 80

9.3. WORST-CASE BELOW 1 GHz 93

10. AC POWER LINE CONDUCTED EMISSIONS 96

11. SETUP PHOTOS 99

END OF REPORT 104

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: Tablet with Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC

MODEL: SM-T360

SERIAL NUMBER: 1934661 (Radiated) and 1934663(Conducted)

DATE TESTED: AUGUST 8-19, 2014

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Verification Services Inc. By:

PENG ZHANG
CONSUMER TECHNOLOGY DIVISION
PROJECT LEADER
UL Verification Services Inc.

Tested By:

CHARLES VERGONIO
CONSUMER TECHNOLOGY DIVISION
LAB ENGINEER
UL Verification Services Inc.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☐ Chamber A	☐ Chamber D
☐ Chamber B	☐ Chamber E
☒ Chamber C	☐ Chamber F
	☒ Chamber G

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 26000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Tablet with Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	7.46	5.57
2402 - 2480	Enhanced 8PSK	8.71	7.43

Note: GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode to showing compliance. For average power data please refer to section 8.6.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -0.73 dBi.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Both standalone and with back cover configuration investigated through preliminary scanning and final measurement based on worst case configuration with EUT standalone with.

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	SAMSUNG	EP-TA10EWE	N/A	N/A
Earphone	SAMSUNG	N/A	N/A	N/A
Back cover with touch pen	SAMSUNG	N/A	N/A	N/A

I/O CABLES

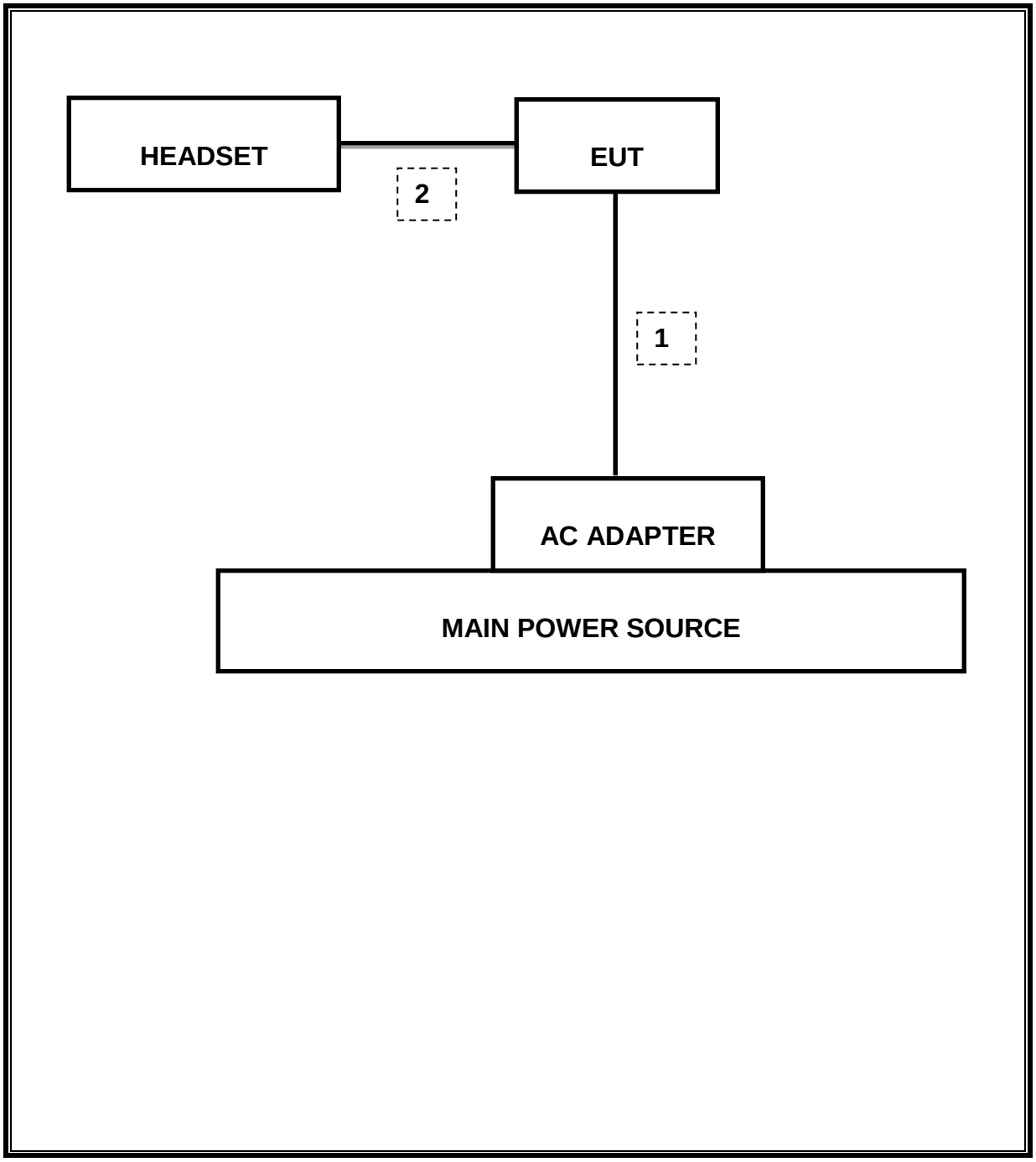
I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests.
EUT was set in the Hidden menu mode to enable BT communications.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

SETUP DIAGRAM FOR TESTS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/15
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/14
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/15
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
CBT Bluetooth Tester	R & S	CBT	None	07/12/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/15
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

7. SUMMARY TABLE

The model FCC ID: A3LSMT360 shares the same enclosure and circuit board as mode FCC ID: A3LSMT365. The WLAN/Bluetooth circuitry and layout, including antenna, are almost identical between the two units. The WLAN/Bluetooth antenna and surrounding circuitry is the same between these two units.

After confirming through preliminary radiated emissions that the performance of the A3LSMT365 BT remains representative of this model (FCC ID: A3LSMT360) test data for FCC ID: A3LSMT365 is being submitted for this application.

Only different between these two models is A3LSMT360 don't have WWAN radio module which is loaded on A3LSMT365.

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	RSS-GEN 4.6	Occupied Band width (99%)	N/A	Conducted	Pass	1.197MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-43.4dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	8.71dBm
15.247 (a)(1)	RSS-210 A8.1(b)	Hopping frequency separation	> 25KHz		Pass	1MHz
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Number of Hopping channels	More than 15 non-overlapping channels		Pass	79
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Avg Time of Occupancy	< 0.4sec		Pass	0.29sec
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	50dBuV
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	41.12dBuV/m

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8. ANTENNA PORT TEST RESULTS

8.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

8.1.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.927	0.895
Middle	2441	0.928	0.845
High	2480	0.926	0.891
Worst		0.928	0.895

8.1.2. ENHANCED DATA RATE 8PSK MODULATION

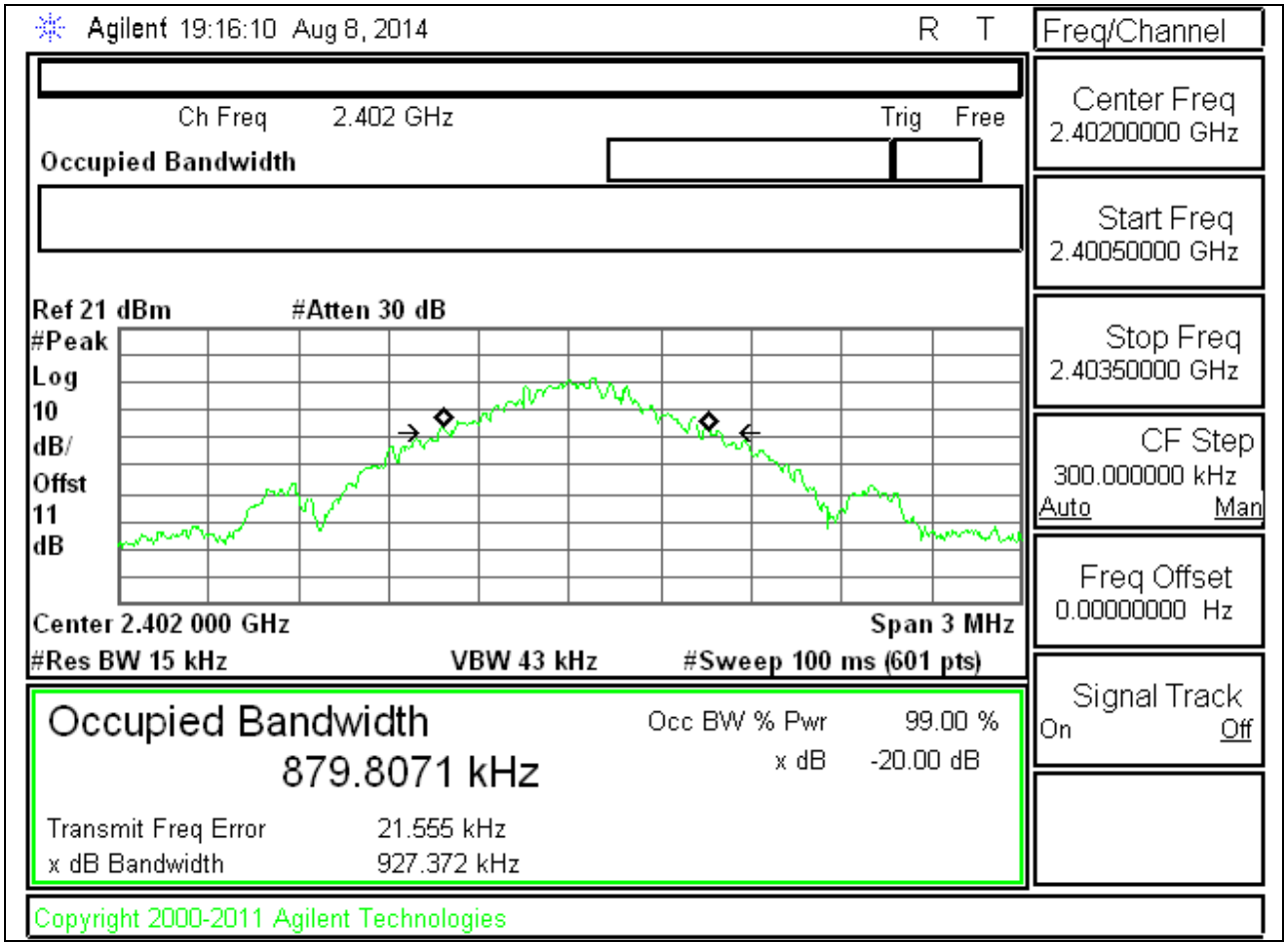
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.266	1.197
Middle	2441	1.266	1.171
High	2480	1.265	1.166
Worst		1.266	1.197

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

20 dB AND 99% BANDWIDTH PLOTS

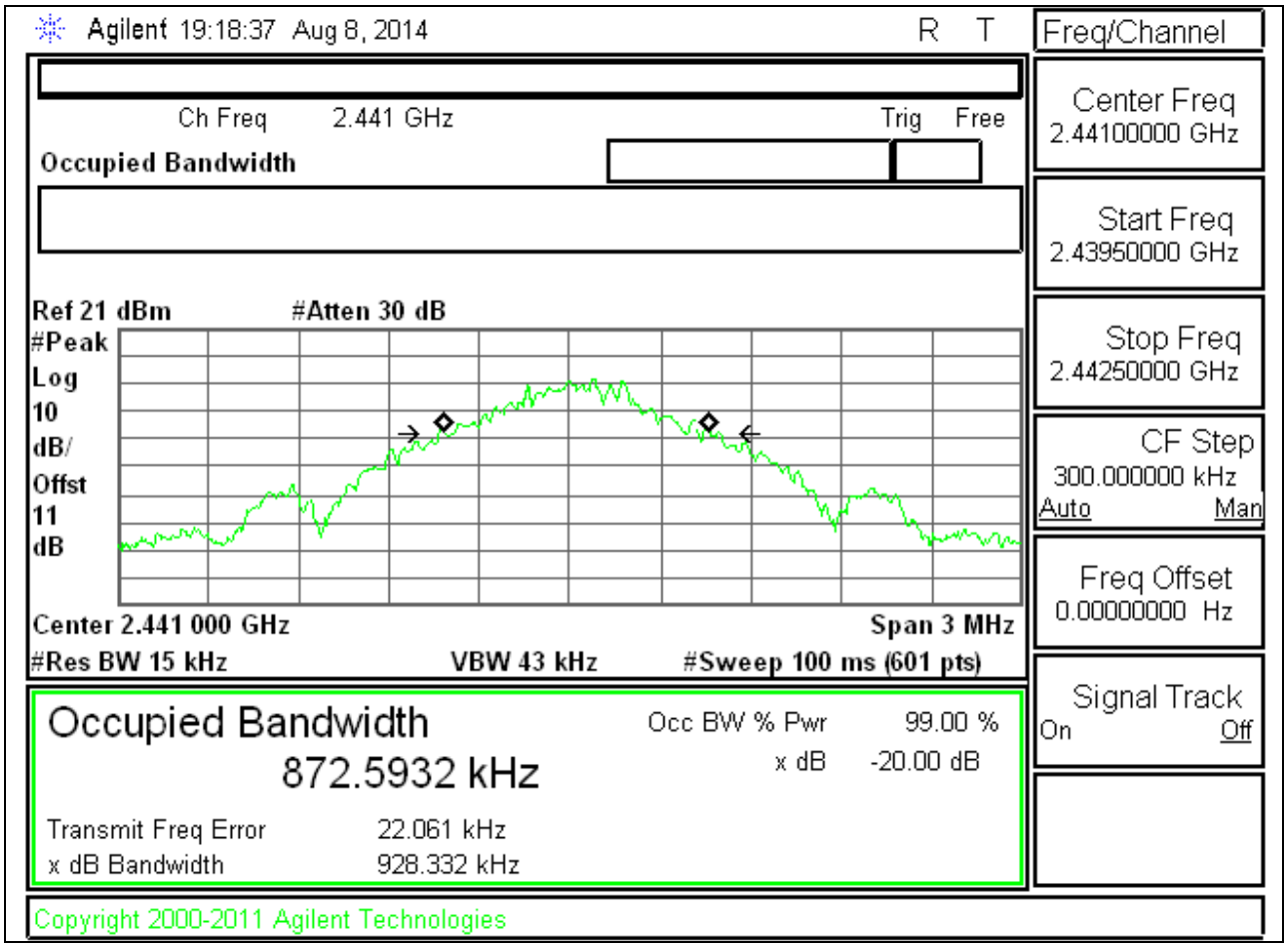
GFSK 20 dB BANDWIDTH

LOW CHANNEL



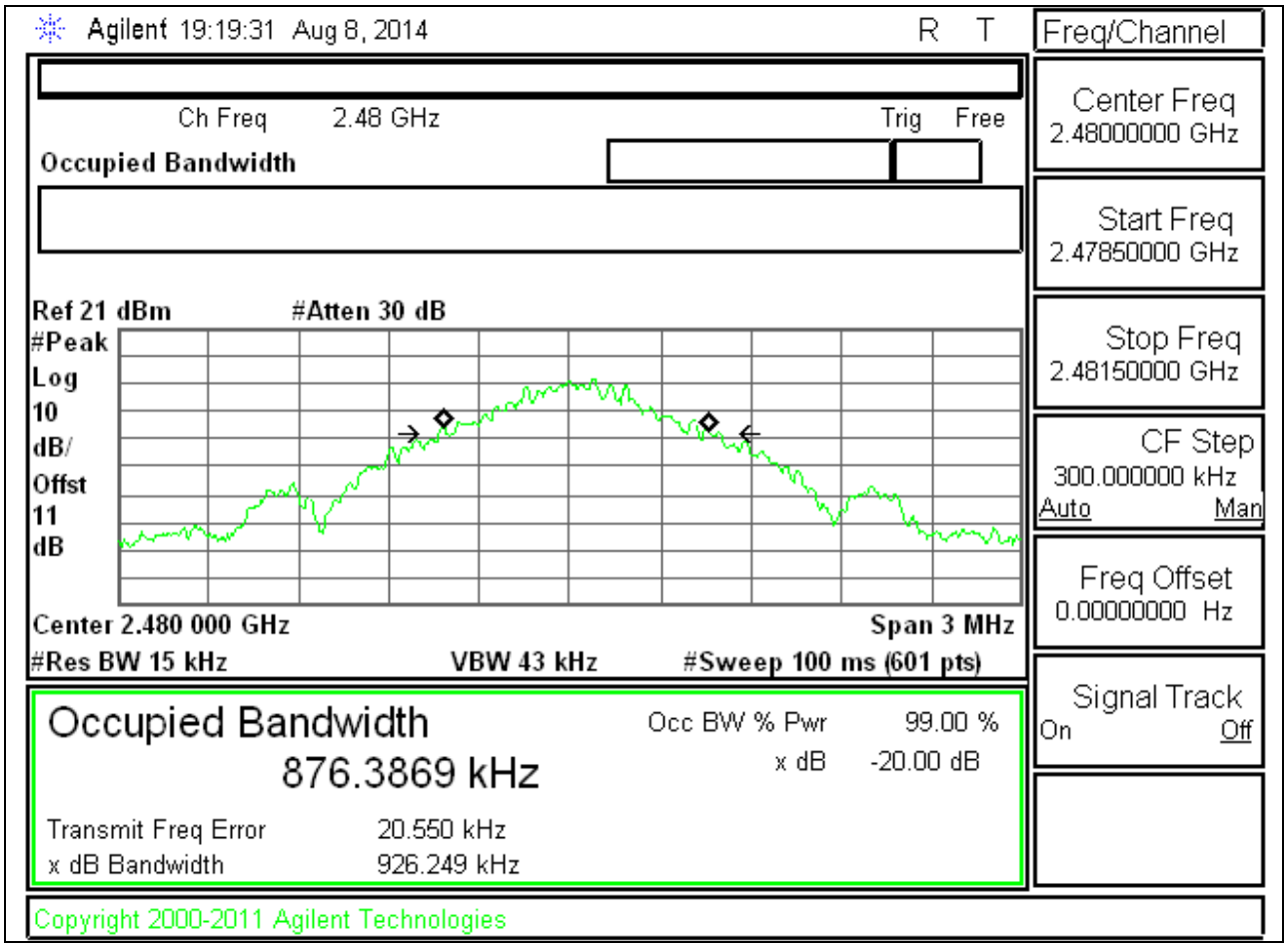
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

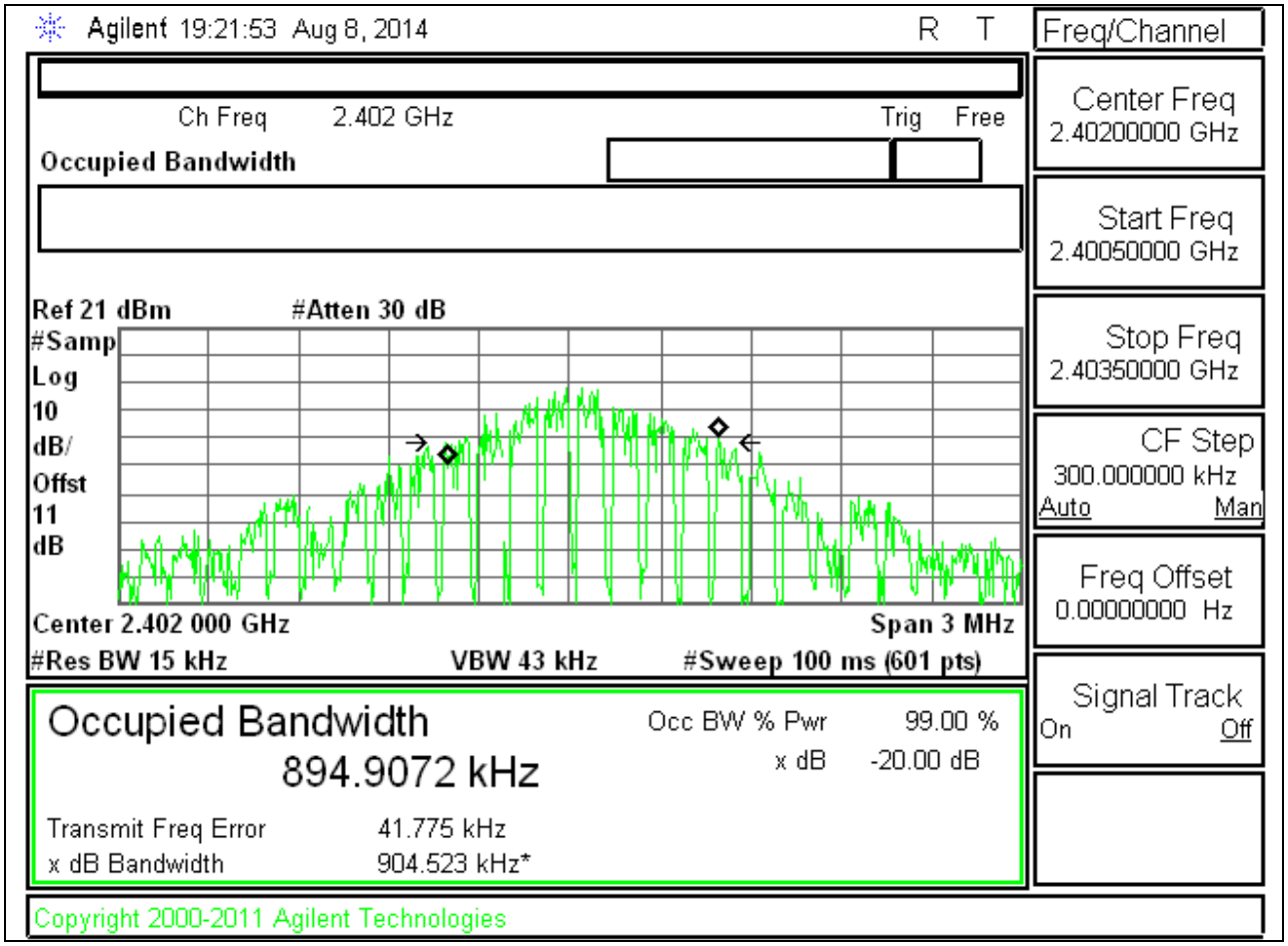
HIGH CHANNEL



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

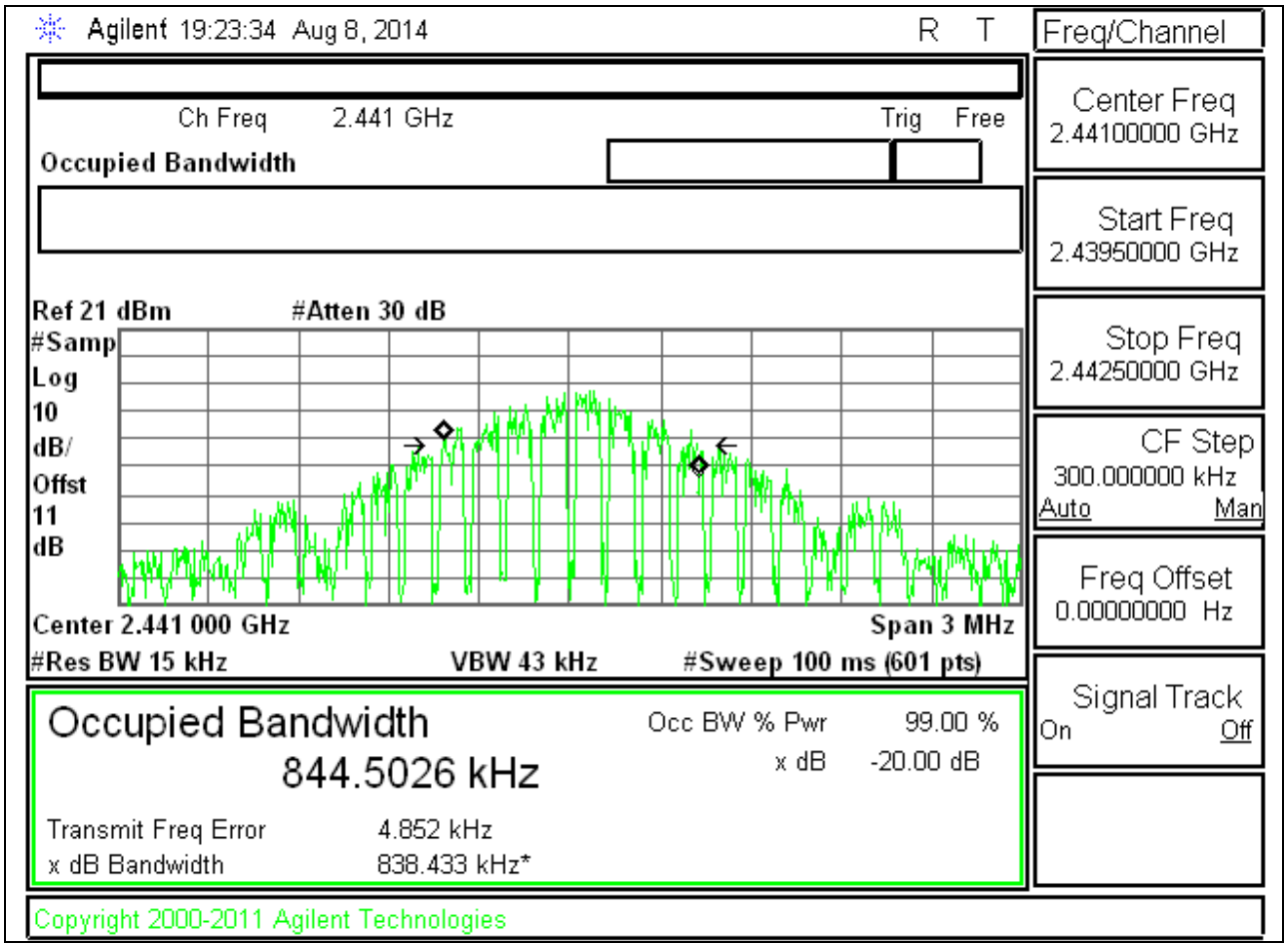
GFSK 99% BANDWIDTH

LOW CHANNEL



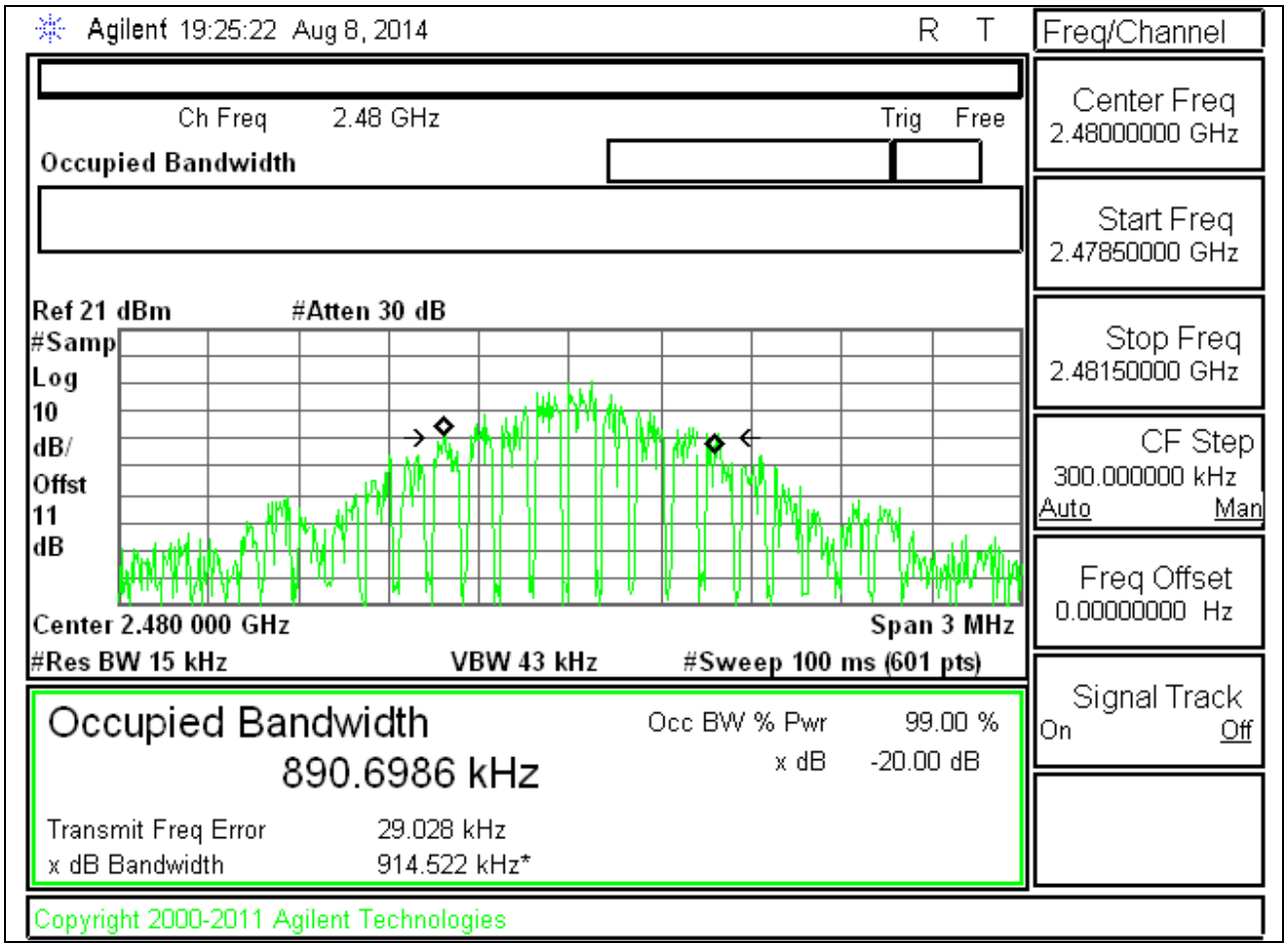
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

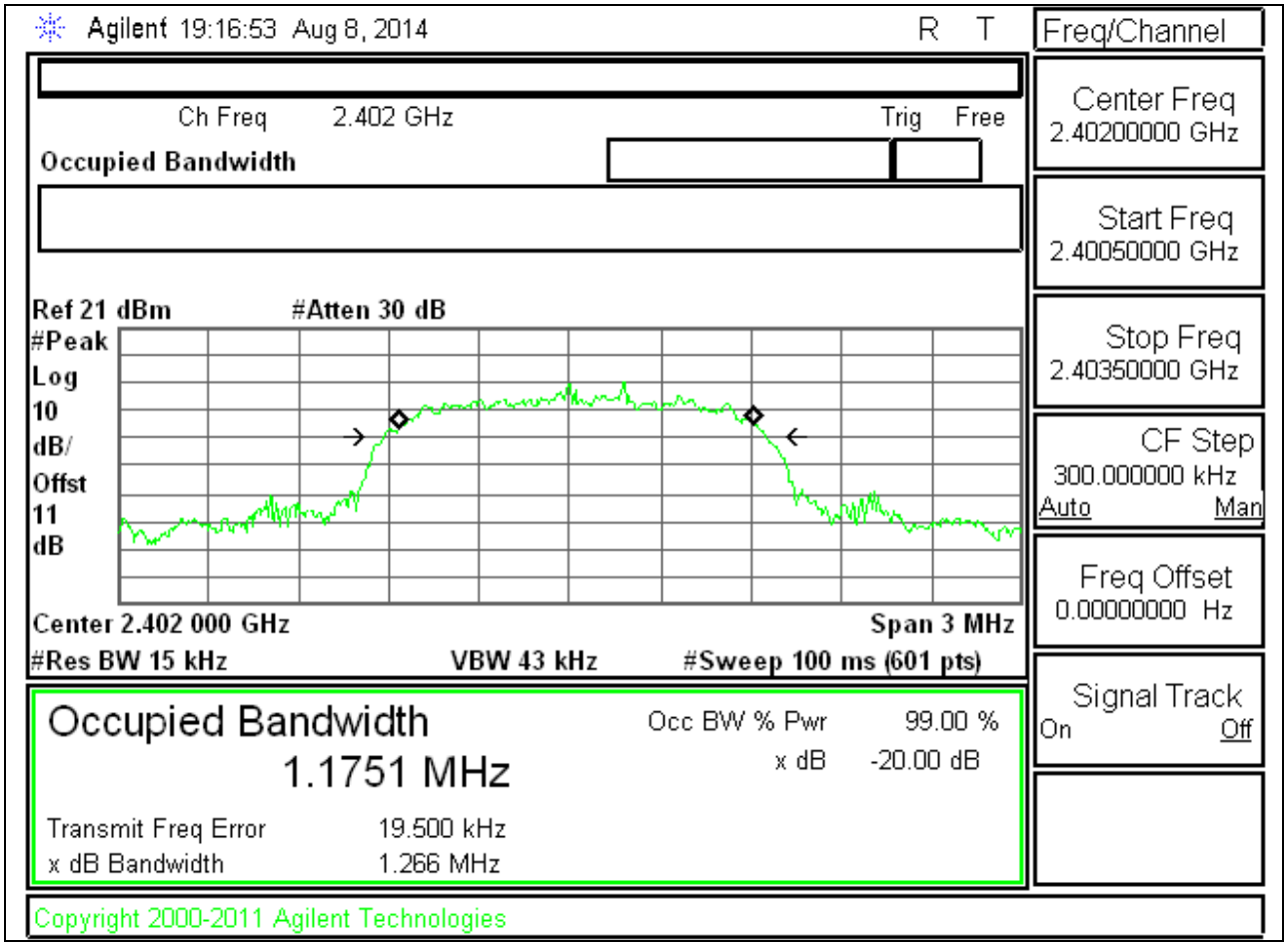
HIGH CHANNEL



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

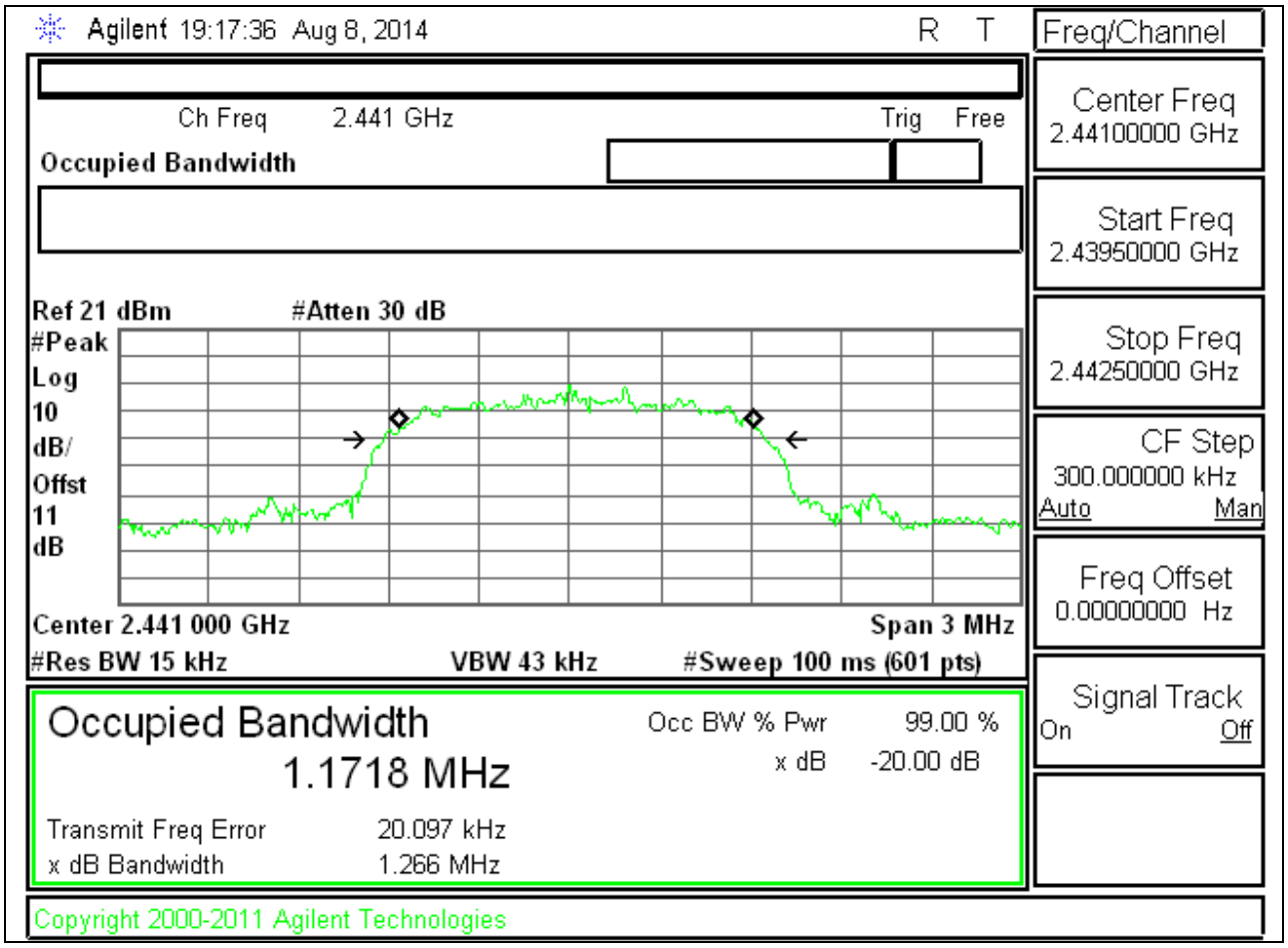
8PSK 20 dB BANDWIDTH

LOW CHANNEL



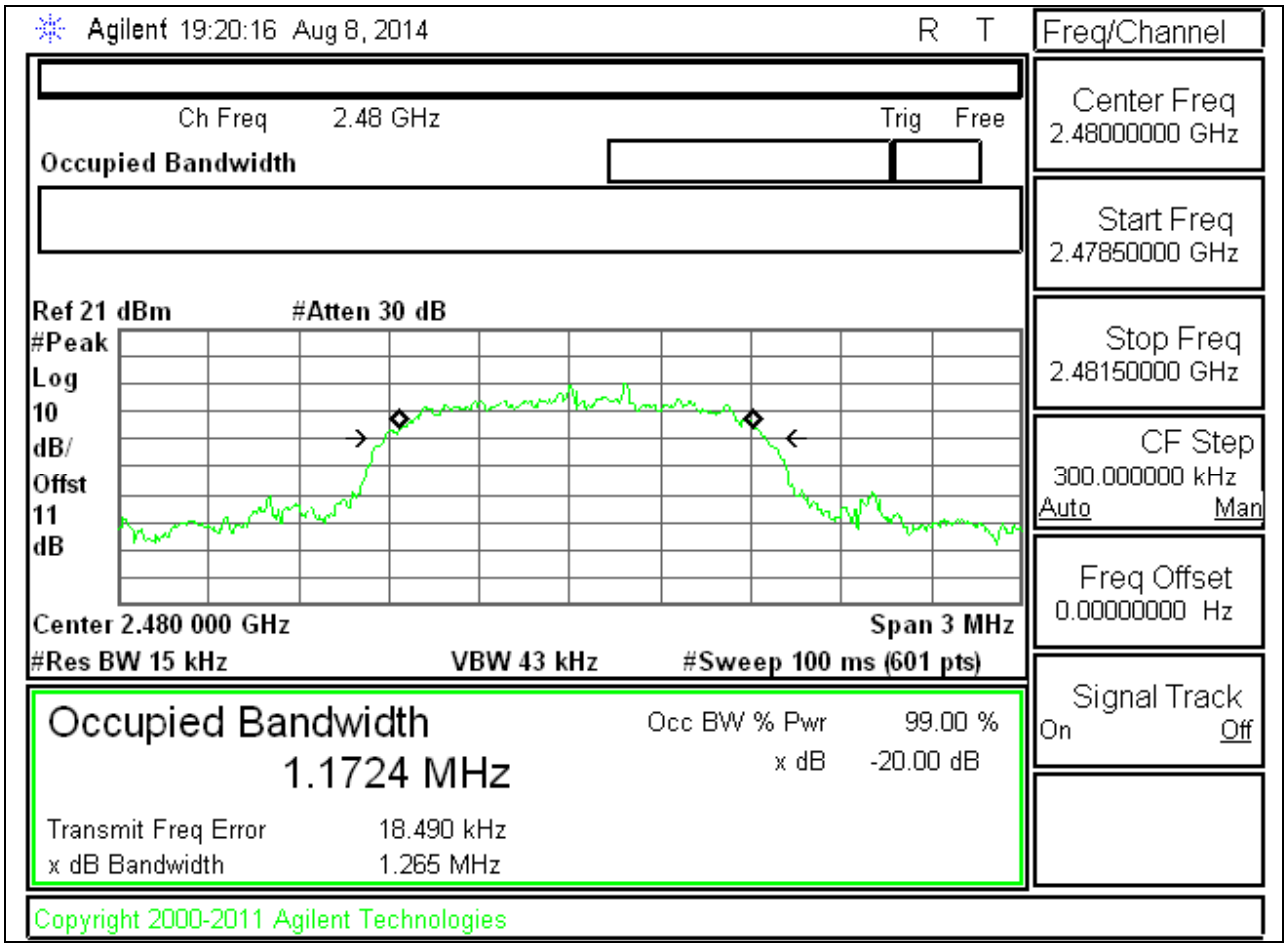
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

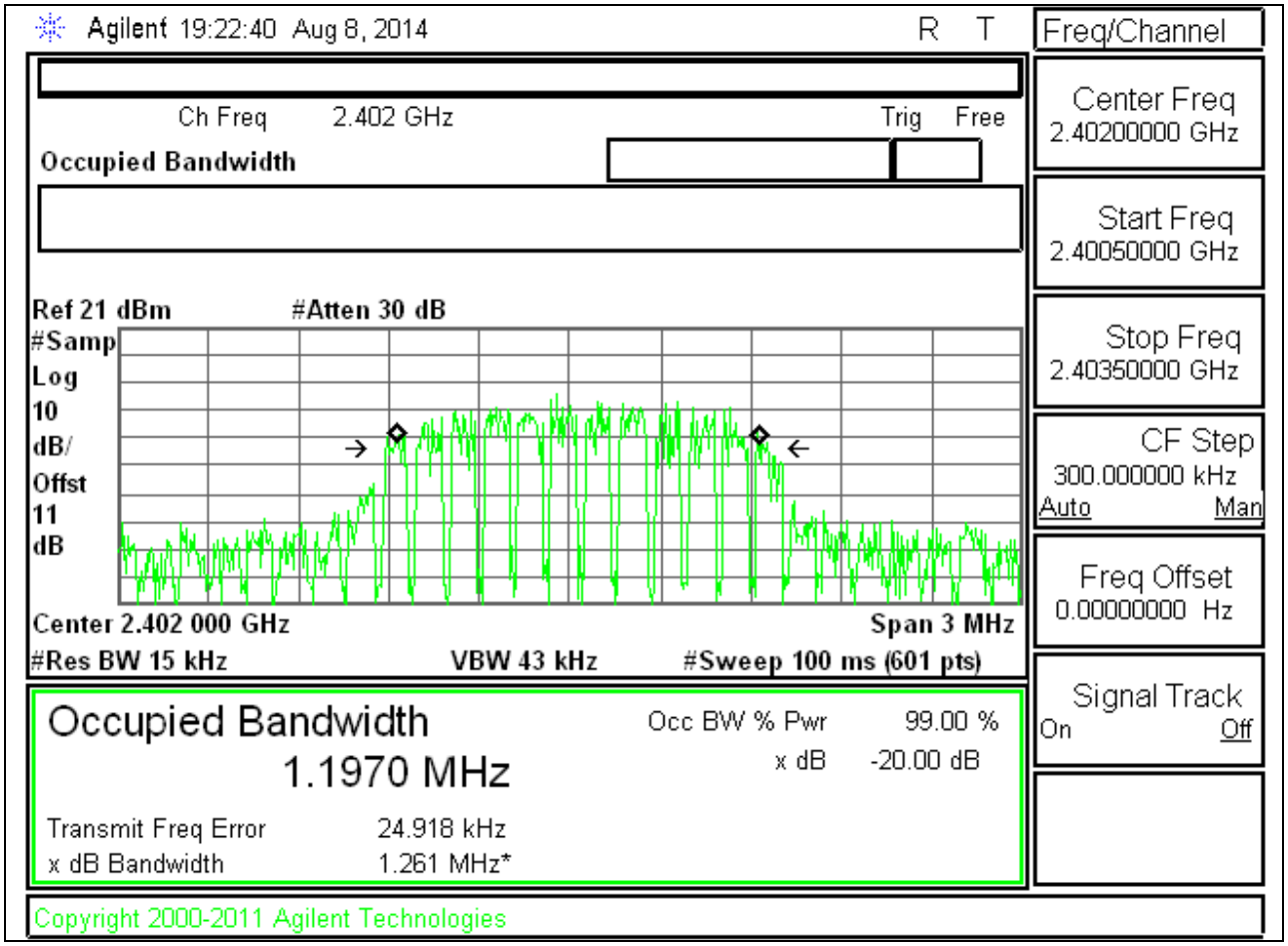
HIGH CHANNEL



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

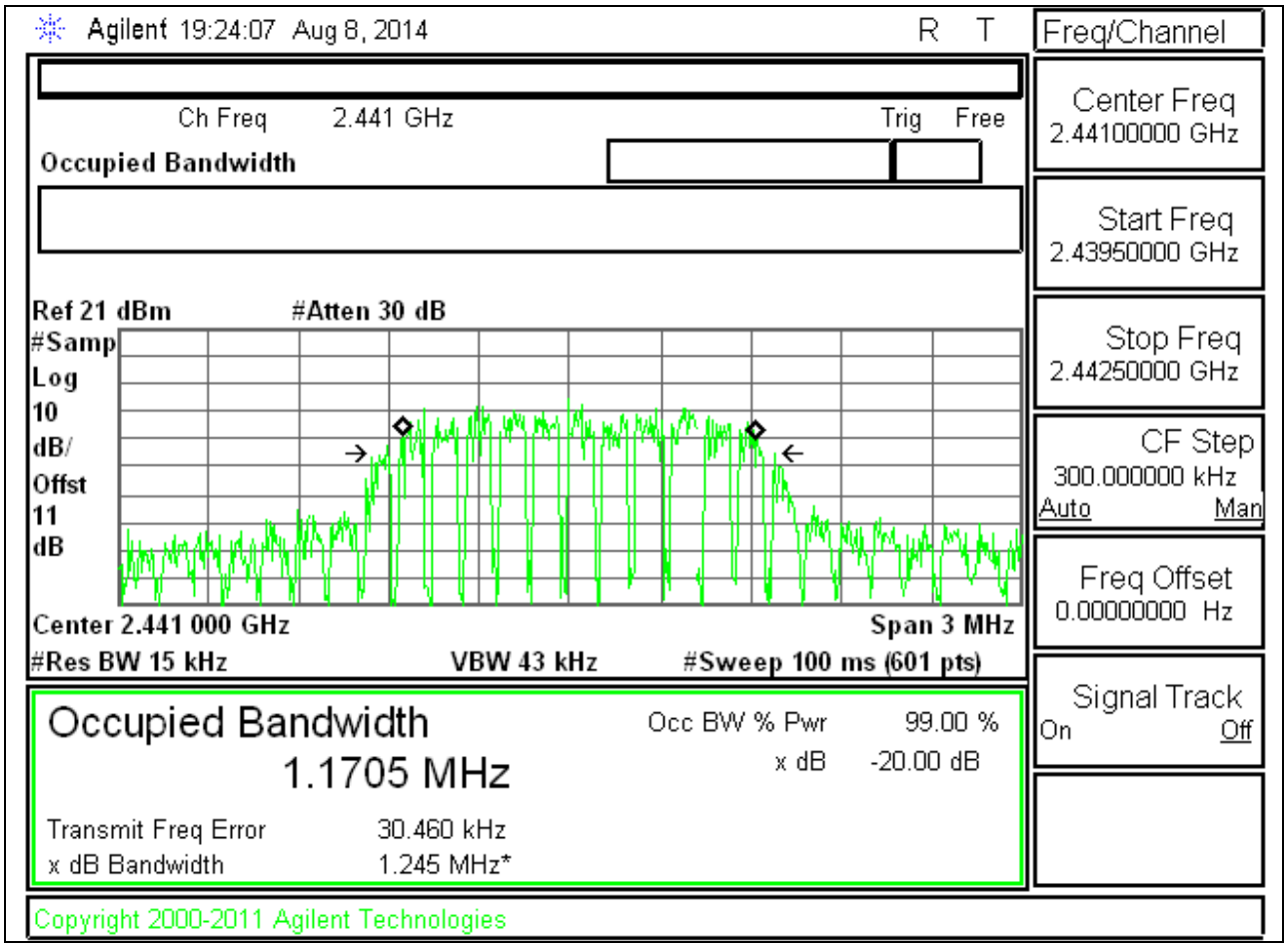
8PSK 99% BANDWIDTH

LOW CHANNEL



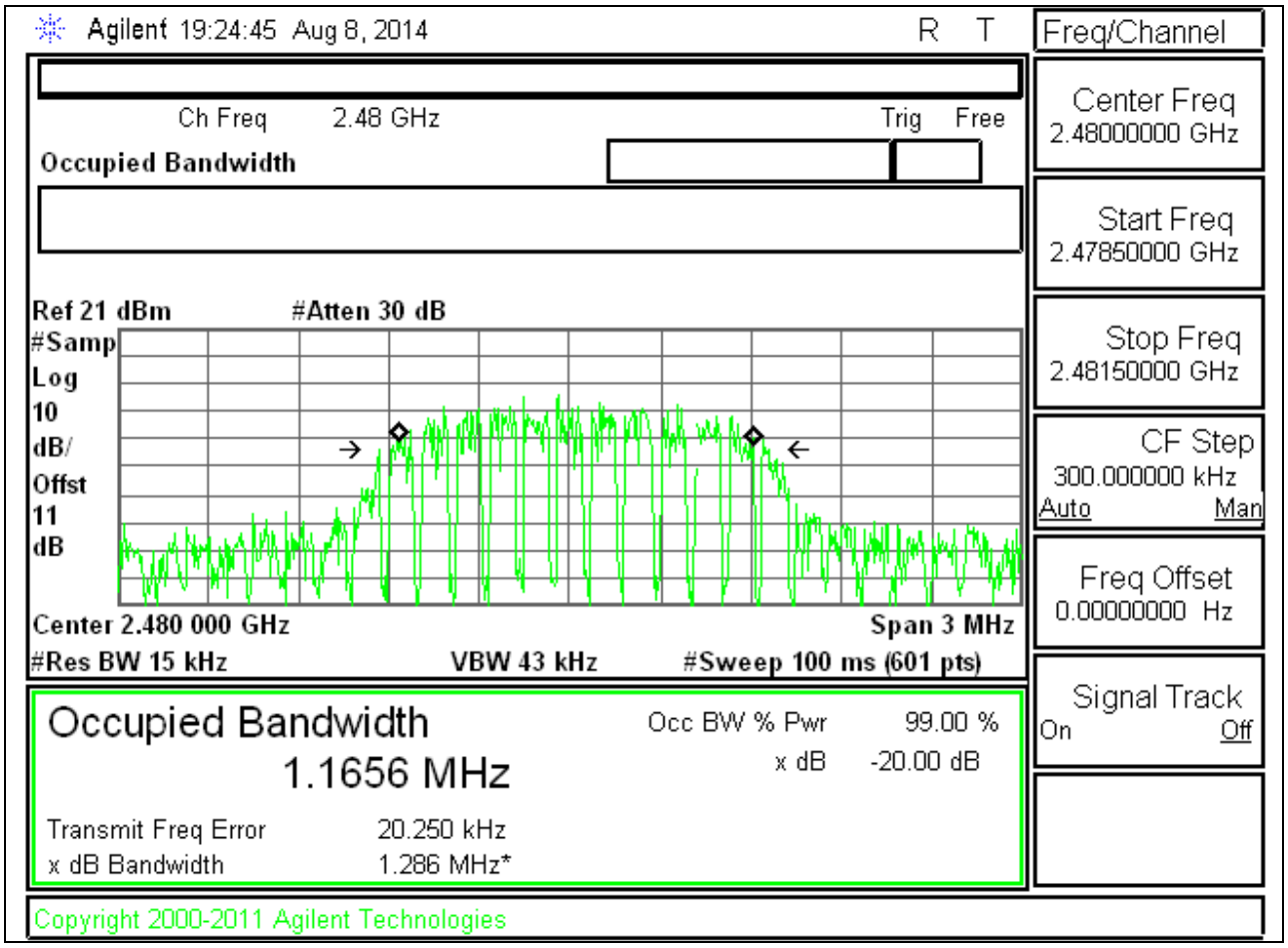
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

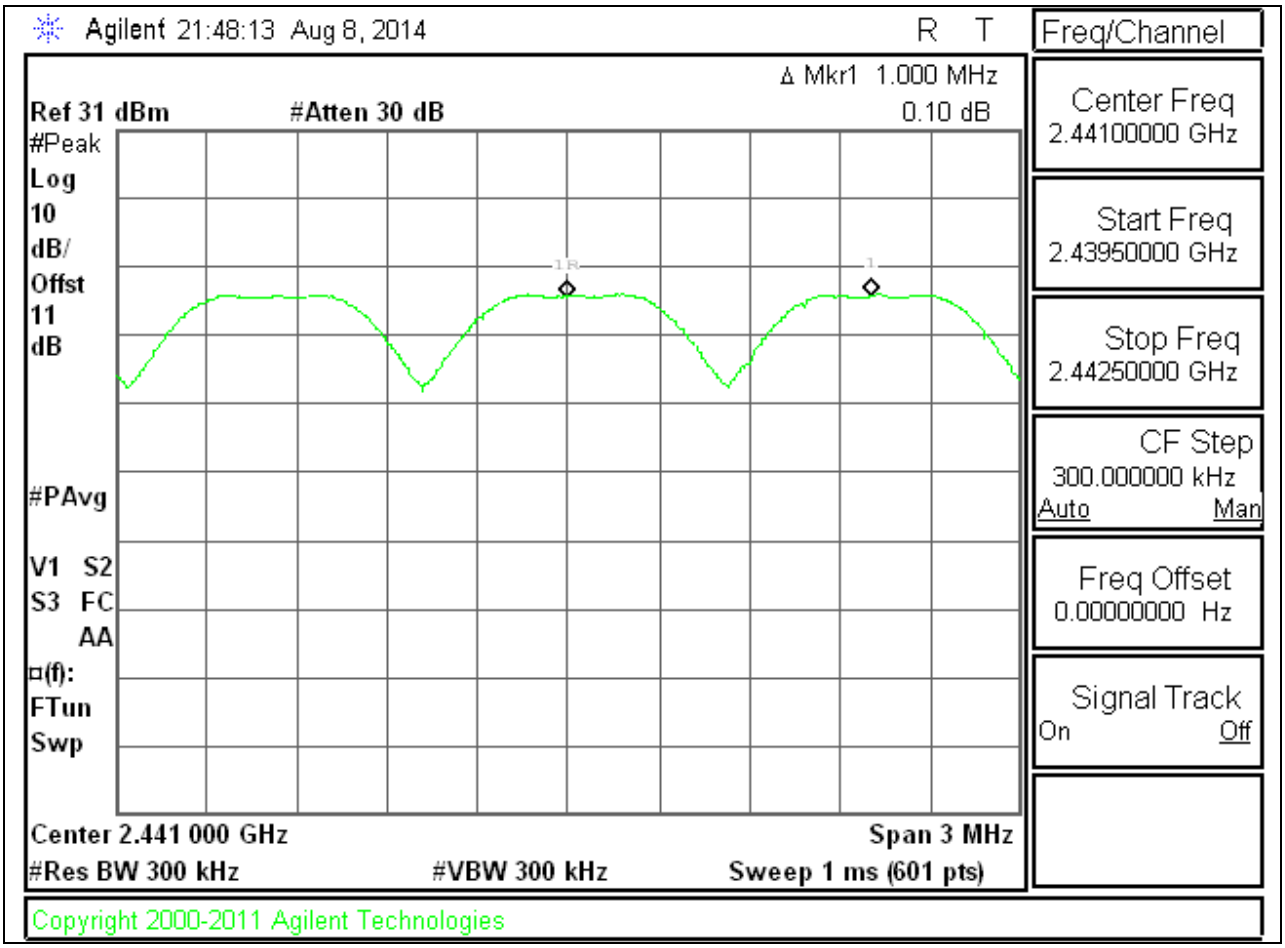
TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HOPPING FREQUENCY SEPARATION PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

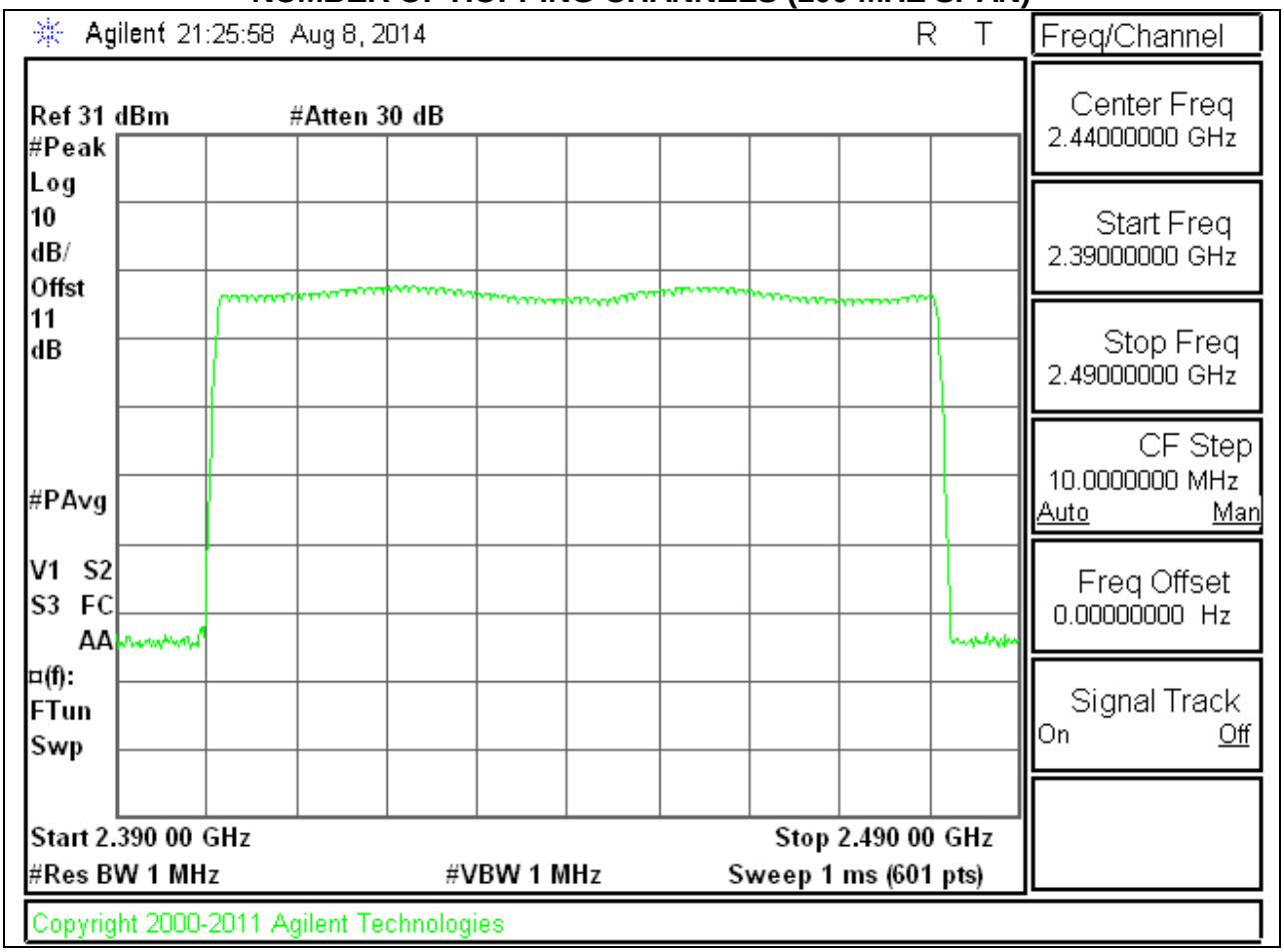
RESULTS

Normal Mode: 79 Channels observed.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

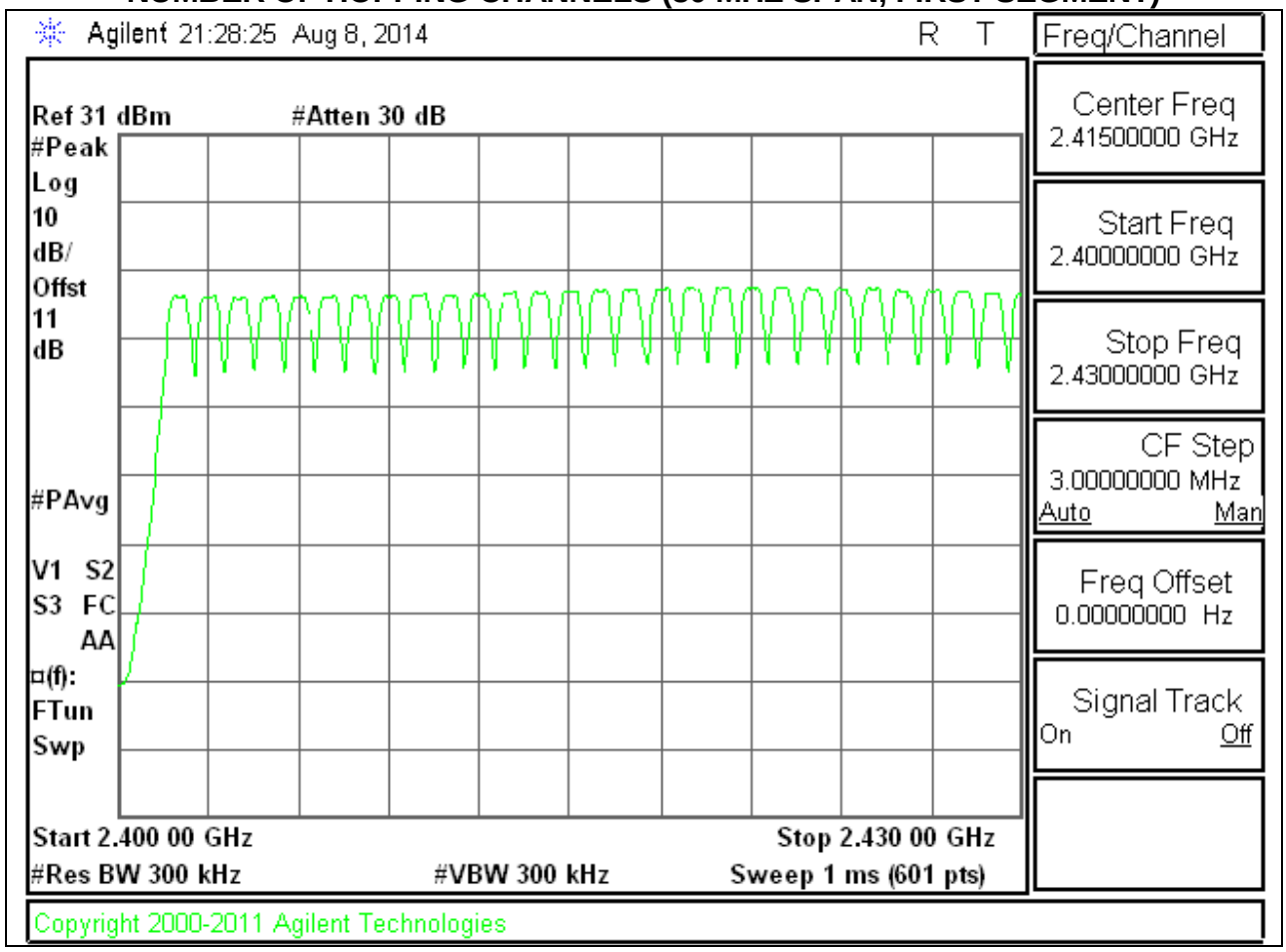
NUMBER OF HOPPING CHANNELS PLOTS

NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



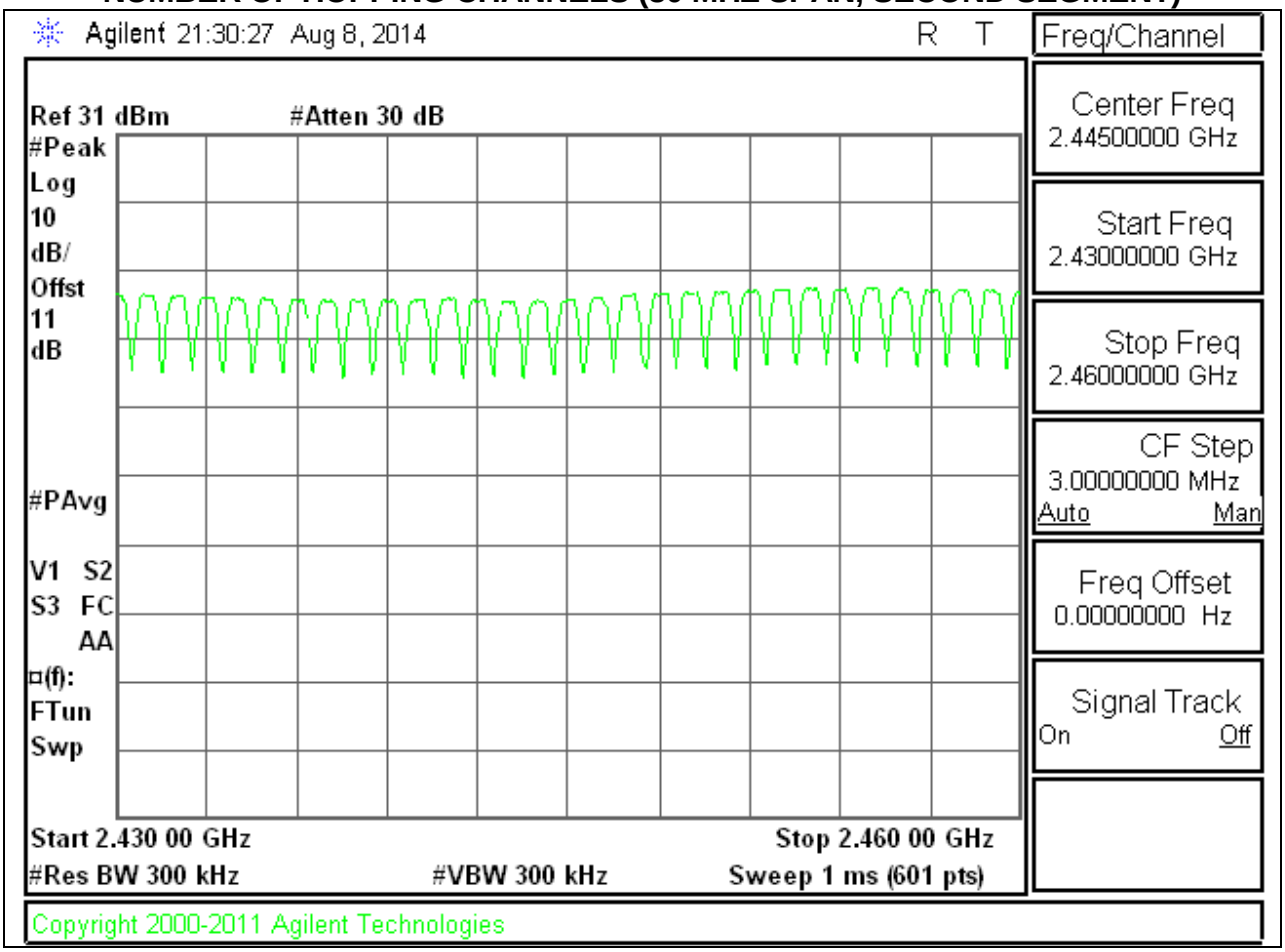
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



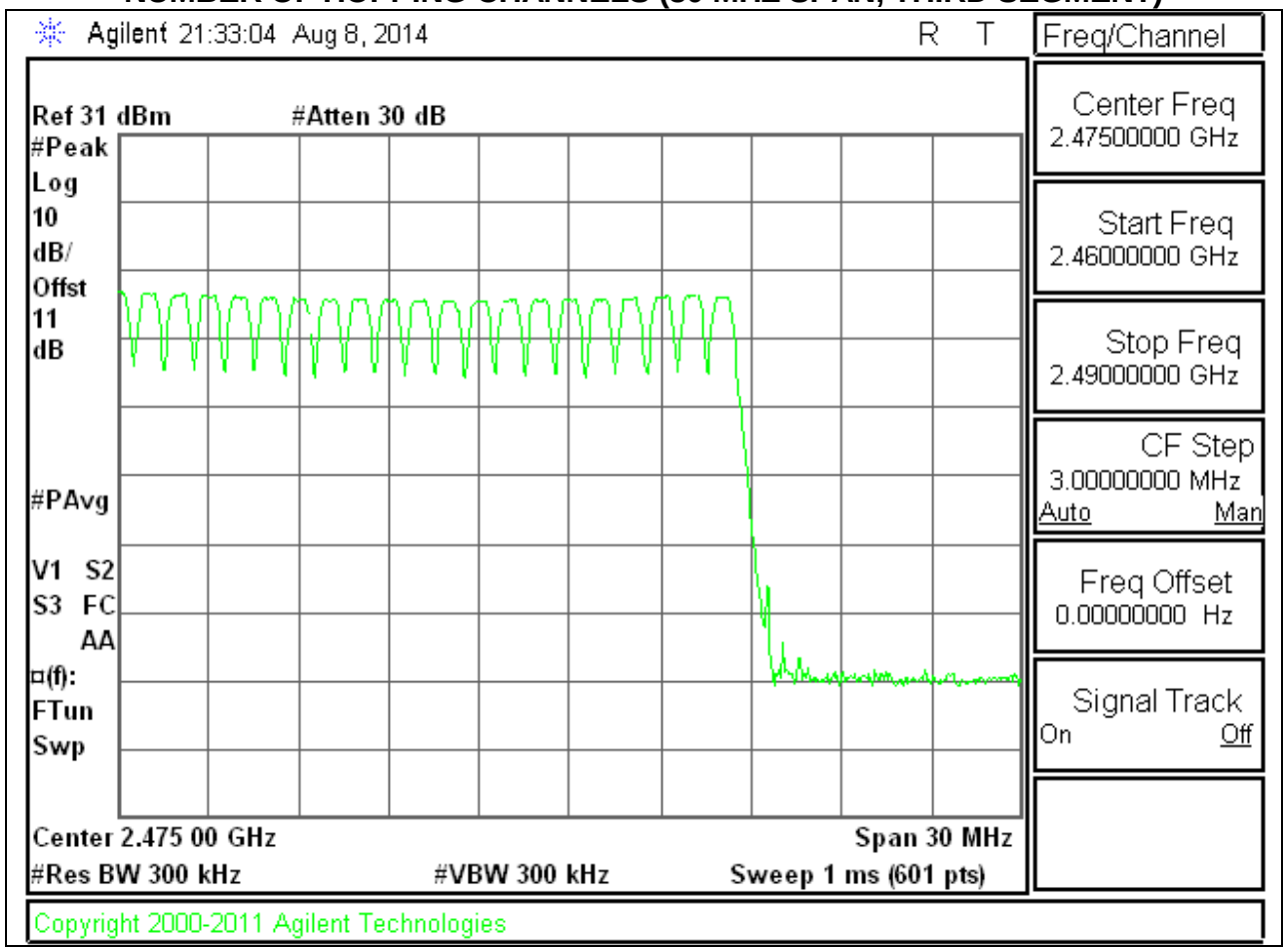
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

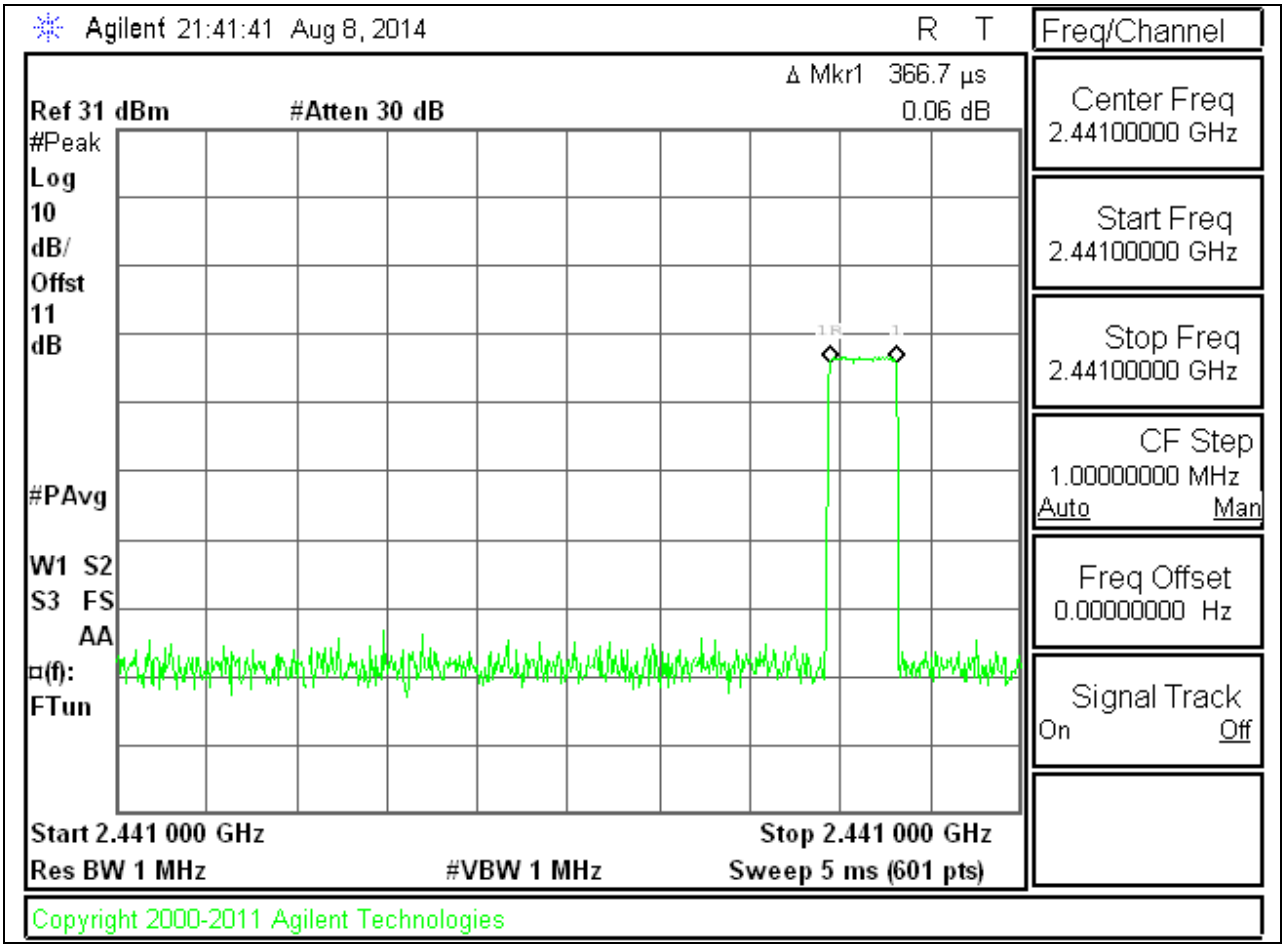
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.3667	31	0.113677	0.4	-0.28632
DH3	1.633	18	0.29394	0.4	-0.10606
DH5	2.883	7	0.20181	0.4	-0.19819
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.3667	7.75	0.02841925	0.4	-0.37158
DH3	1.633	4.5	0.073485	0.4	-0.32652
DH5	2.883	1.75	0.0504525	0.4	-0.34955

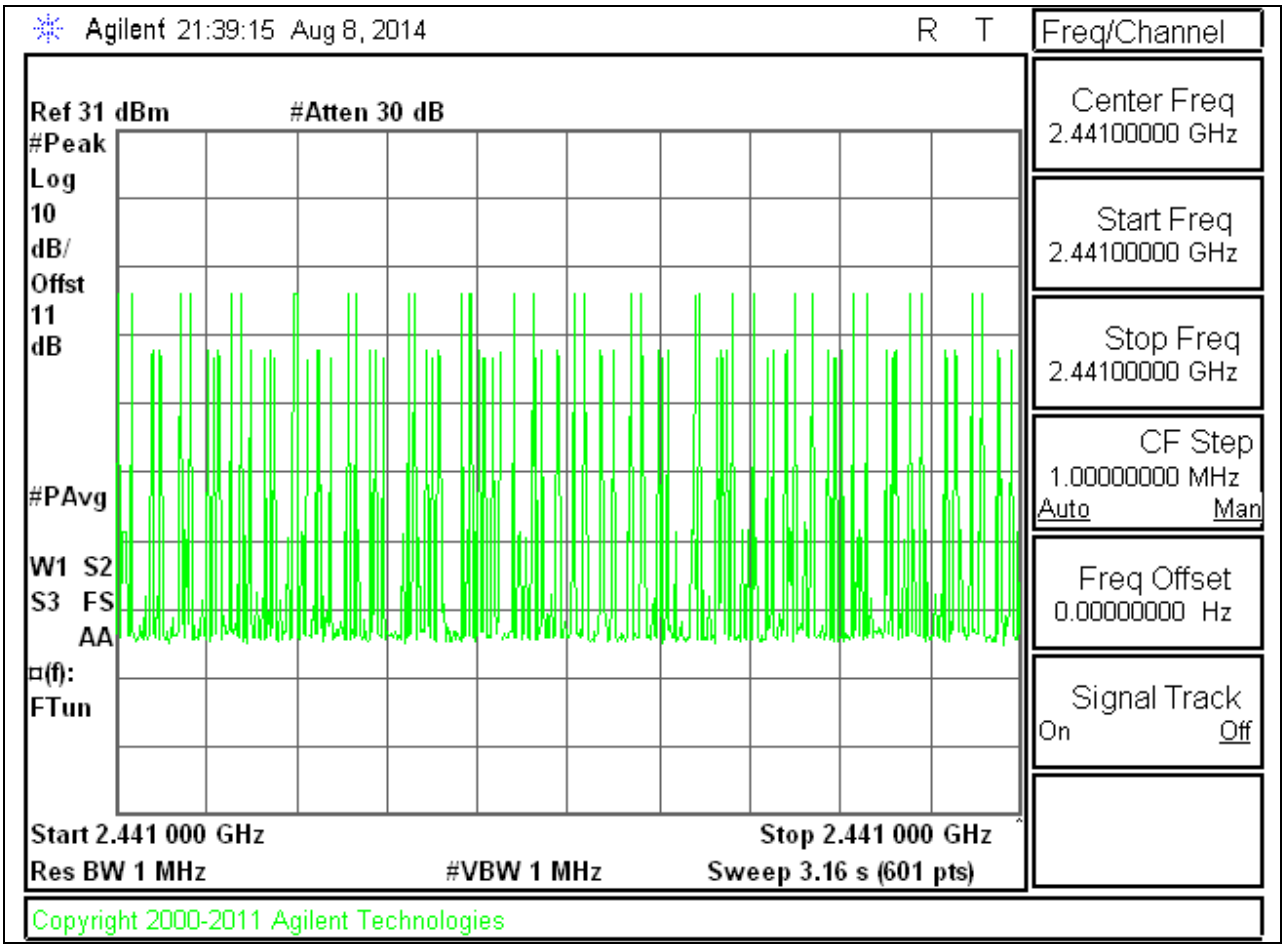
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

PULSE WIDTH - DH1



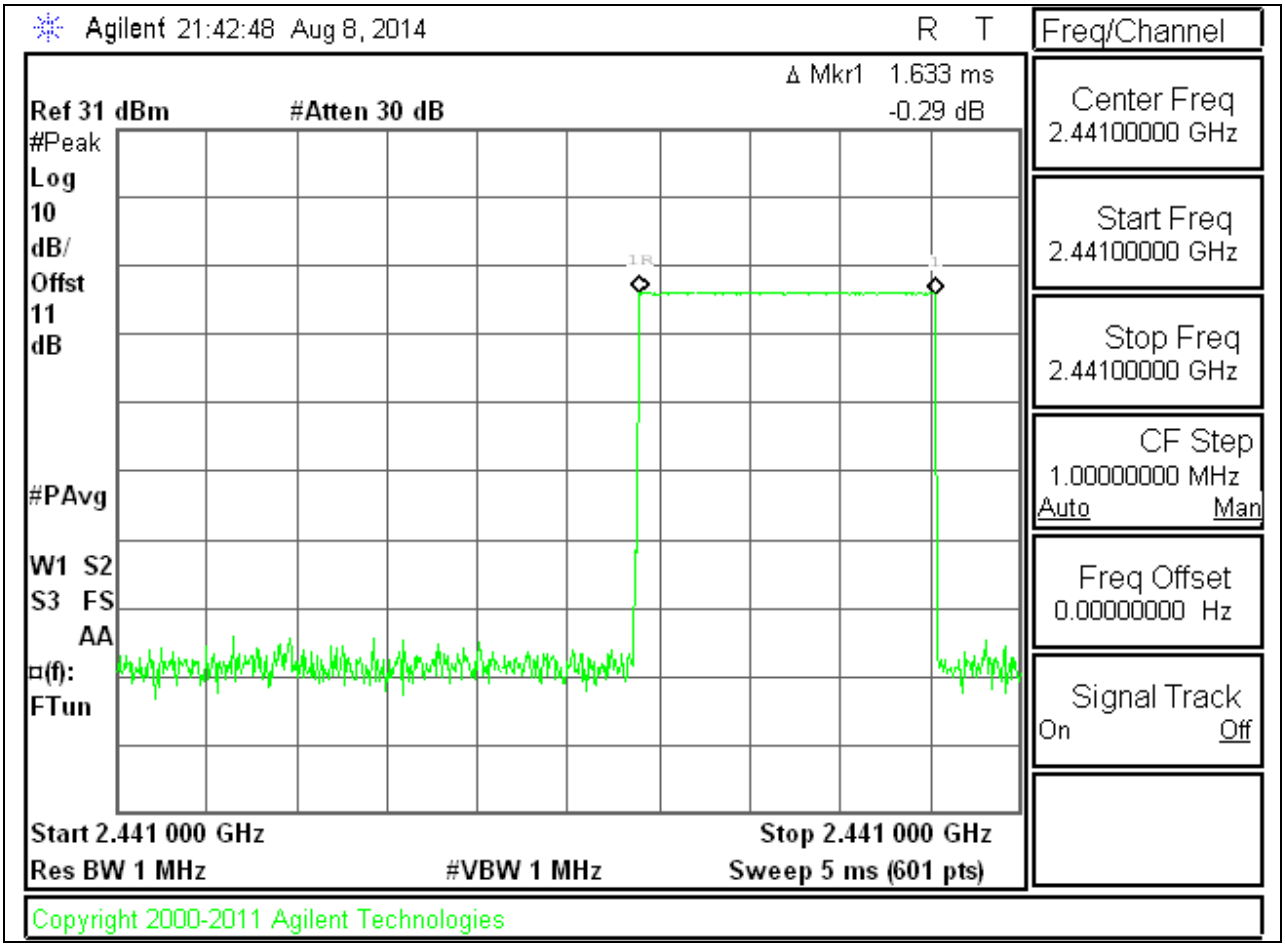
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



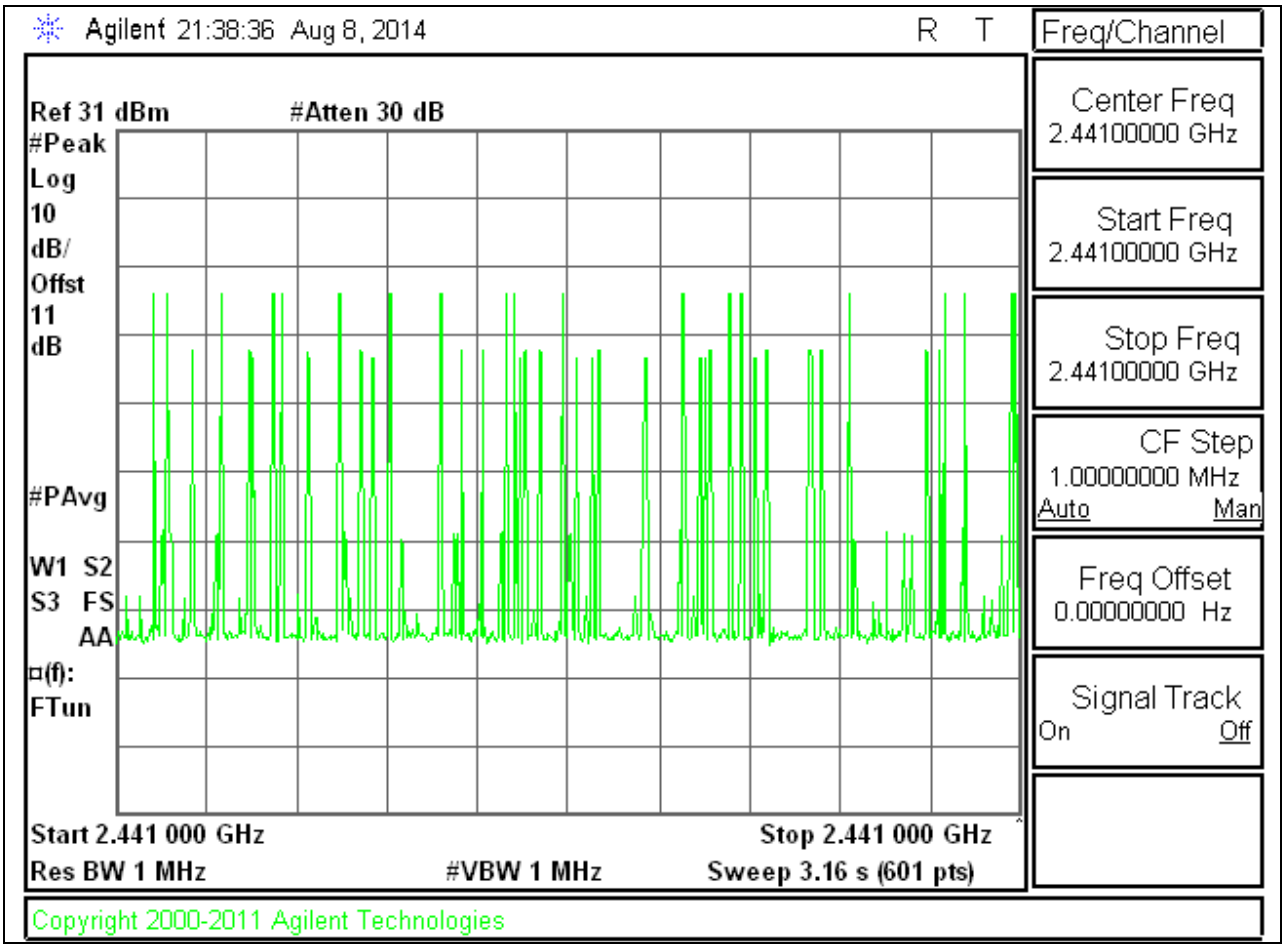
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

PULSE WIDTH - DH3



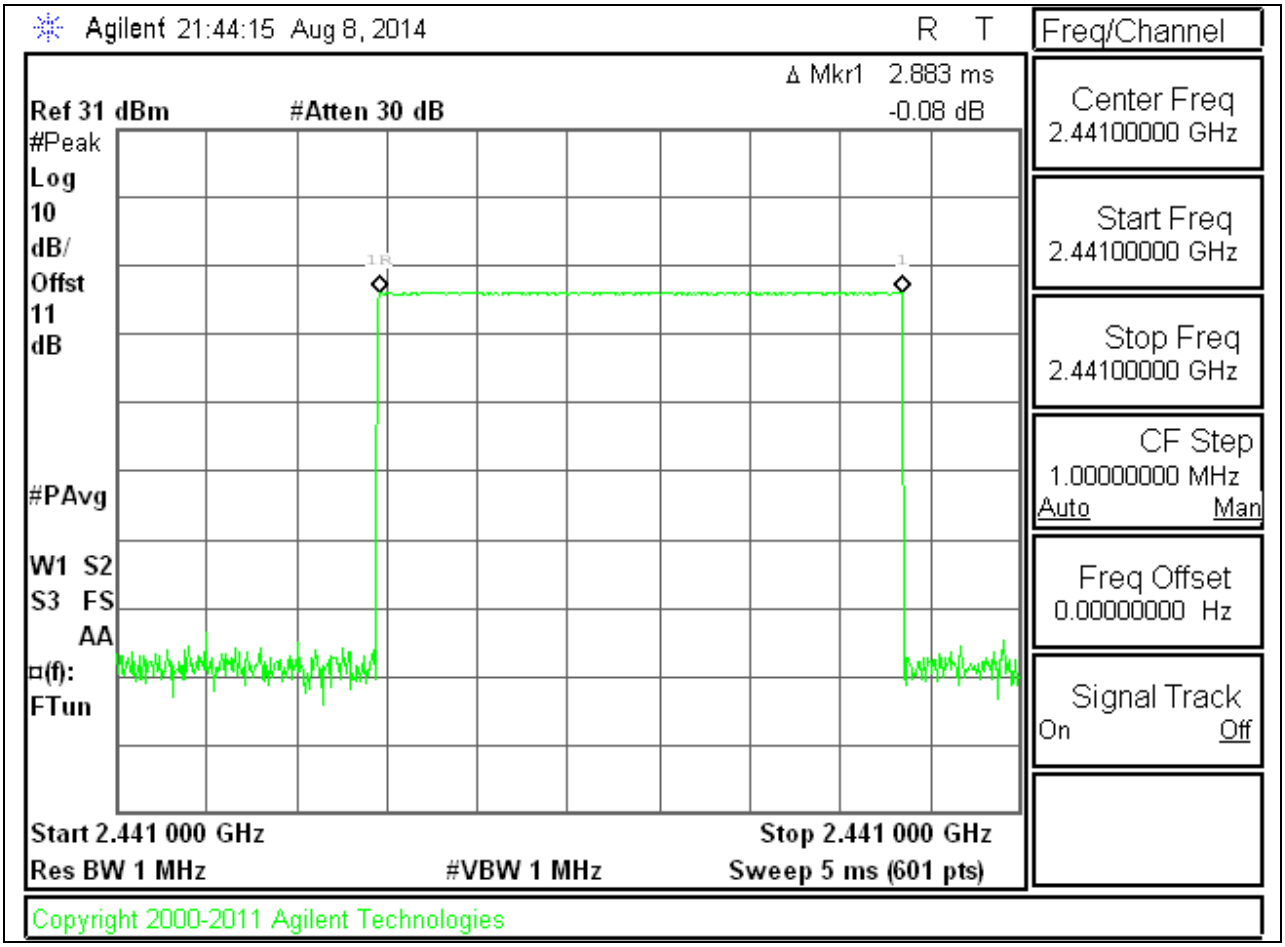
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



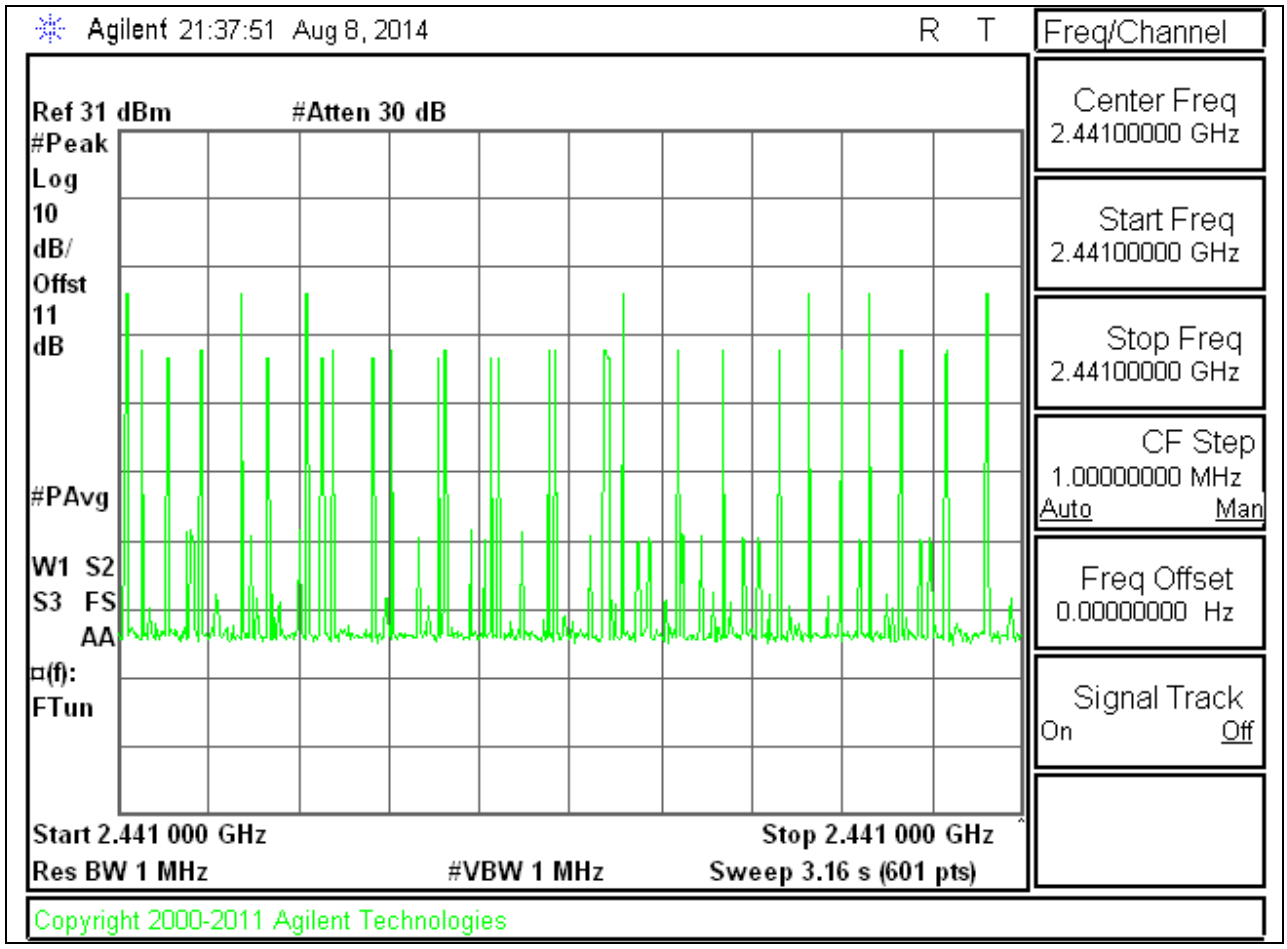
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

PULSE WIDTH - DH5



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

8.5.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.46	21	-13.54
Middle	2441	7.13	21	-13.87
High	2480	7.38	21	-13.62
Worst		7.46		-13.54

8.5.2. ENHANCED DATA RATE 8PSK MODULATION

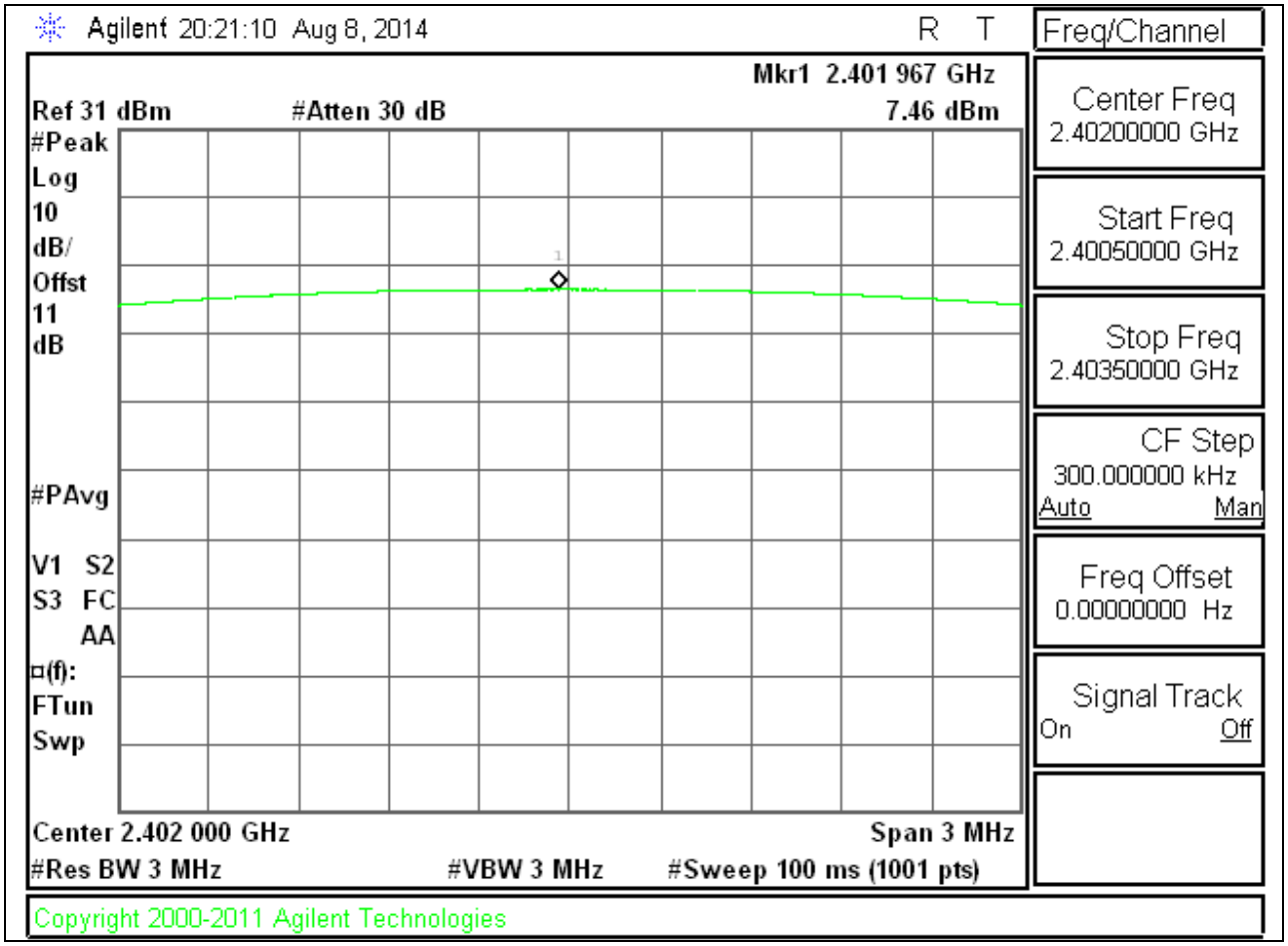
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.71	21	-12.29
Middle	2441	8.32	21	-12.68
High	2480	8.62	21	-12.38
Worst		8.71		-12.29

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.5.3. OUTPUT POWER PLOTS

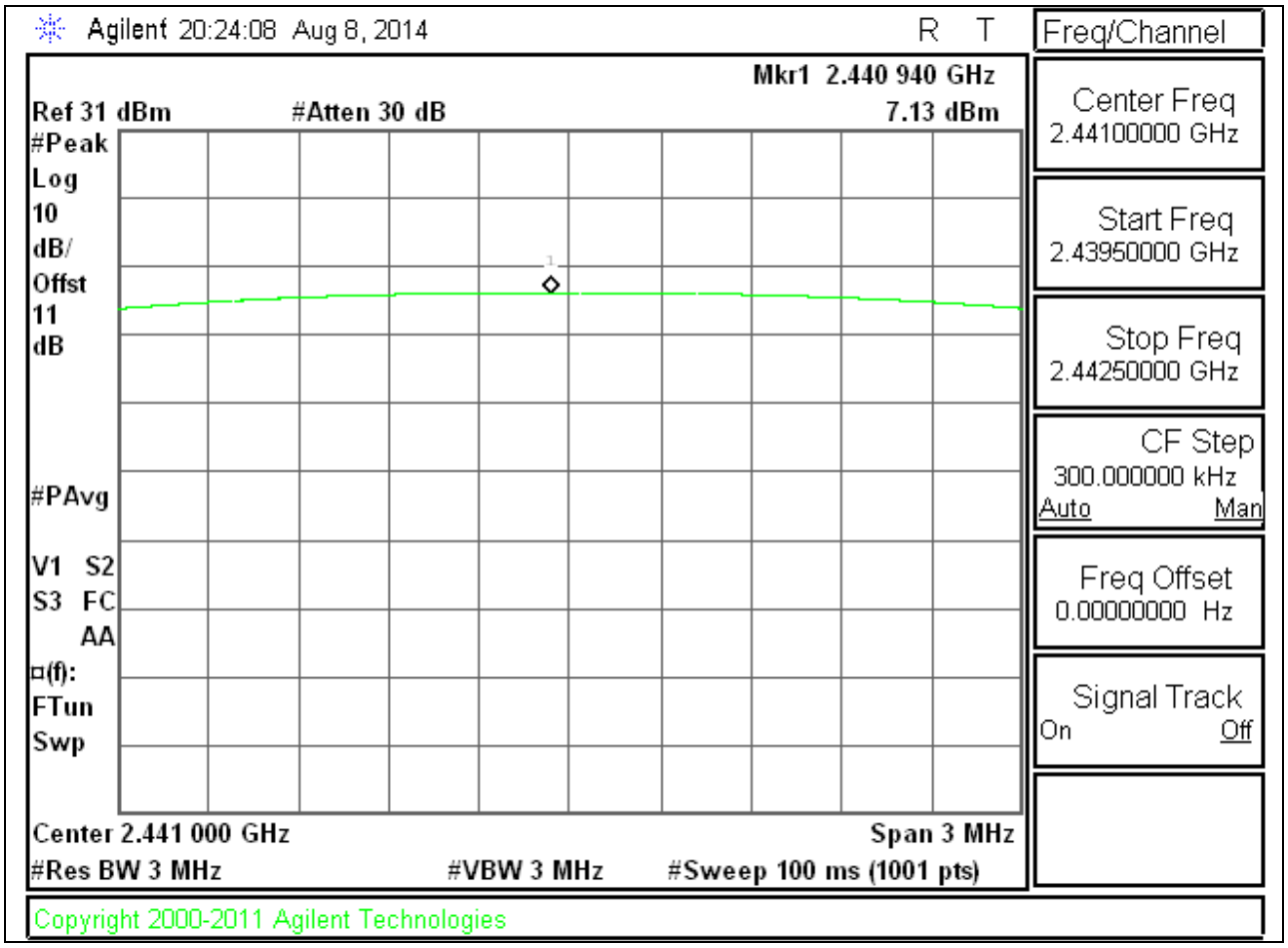
GFSK OUTPUT POWER

LOW CHANNEL



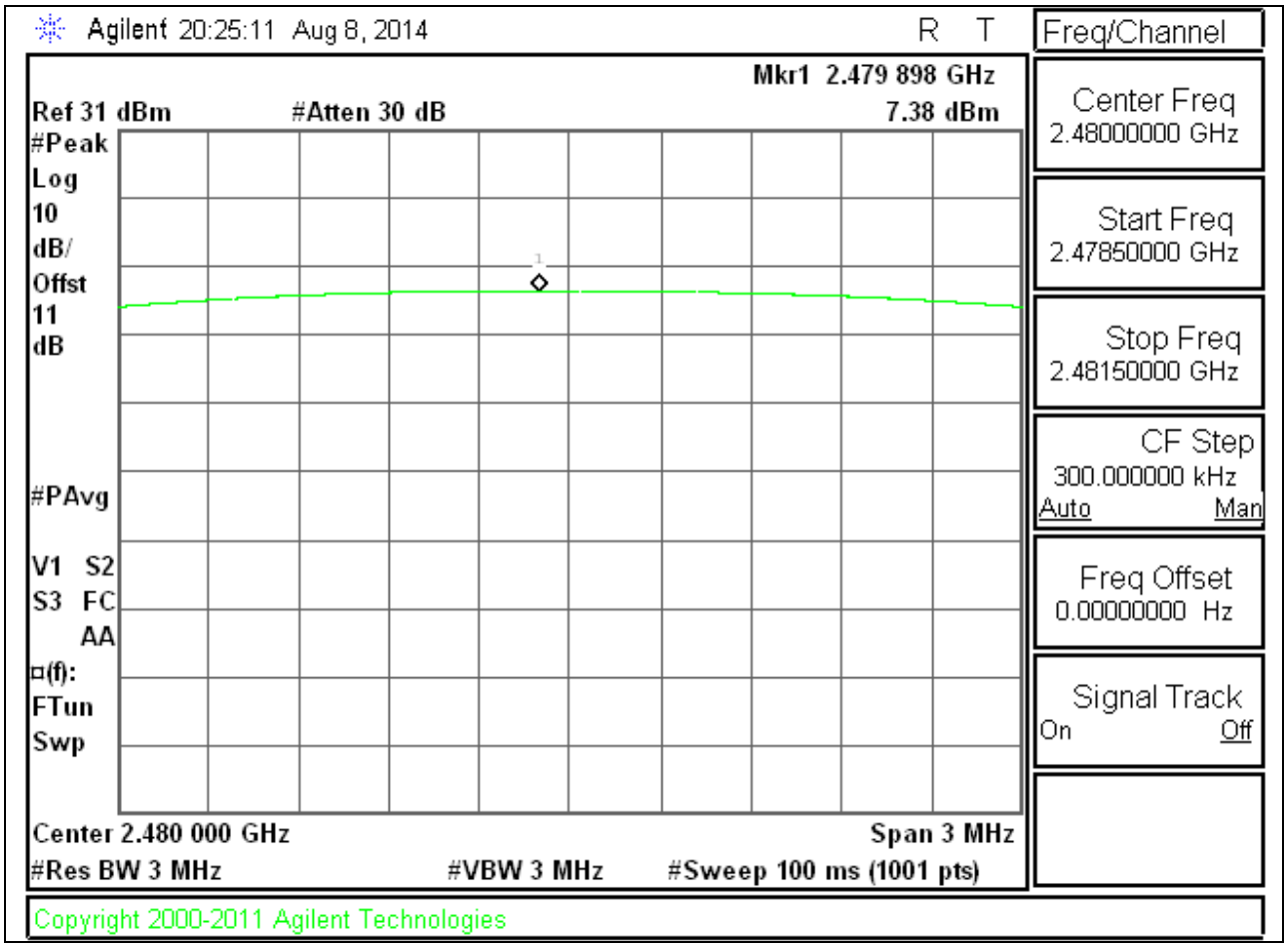
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

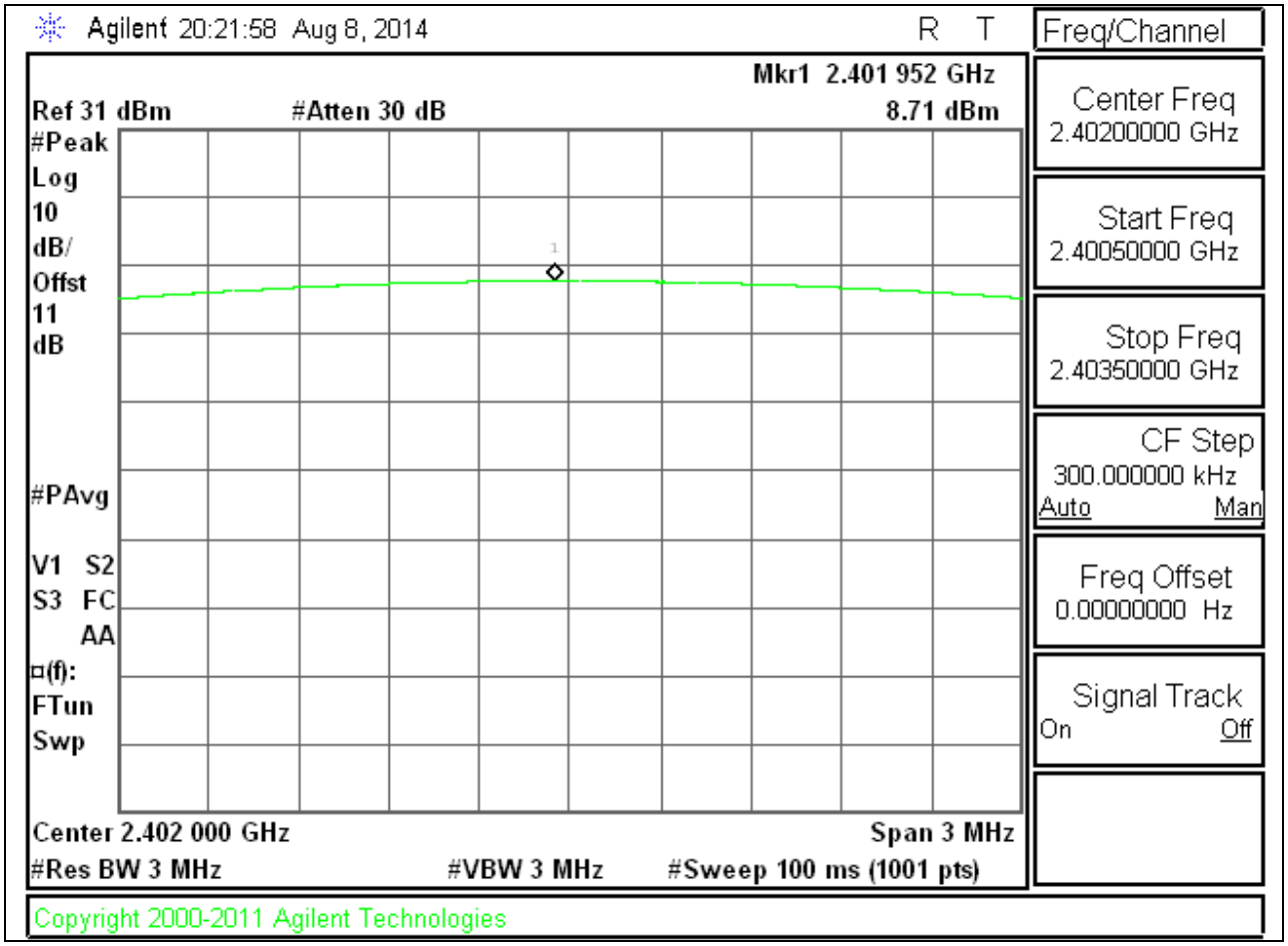
HIGH CHANNEL



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

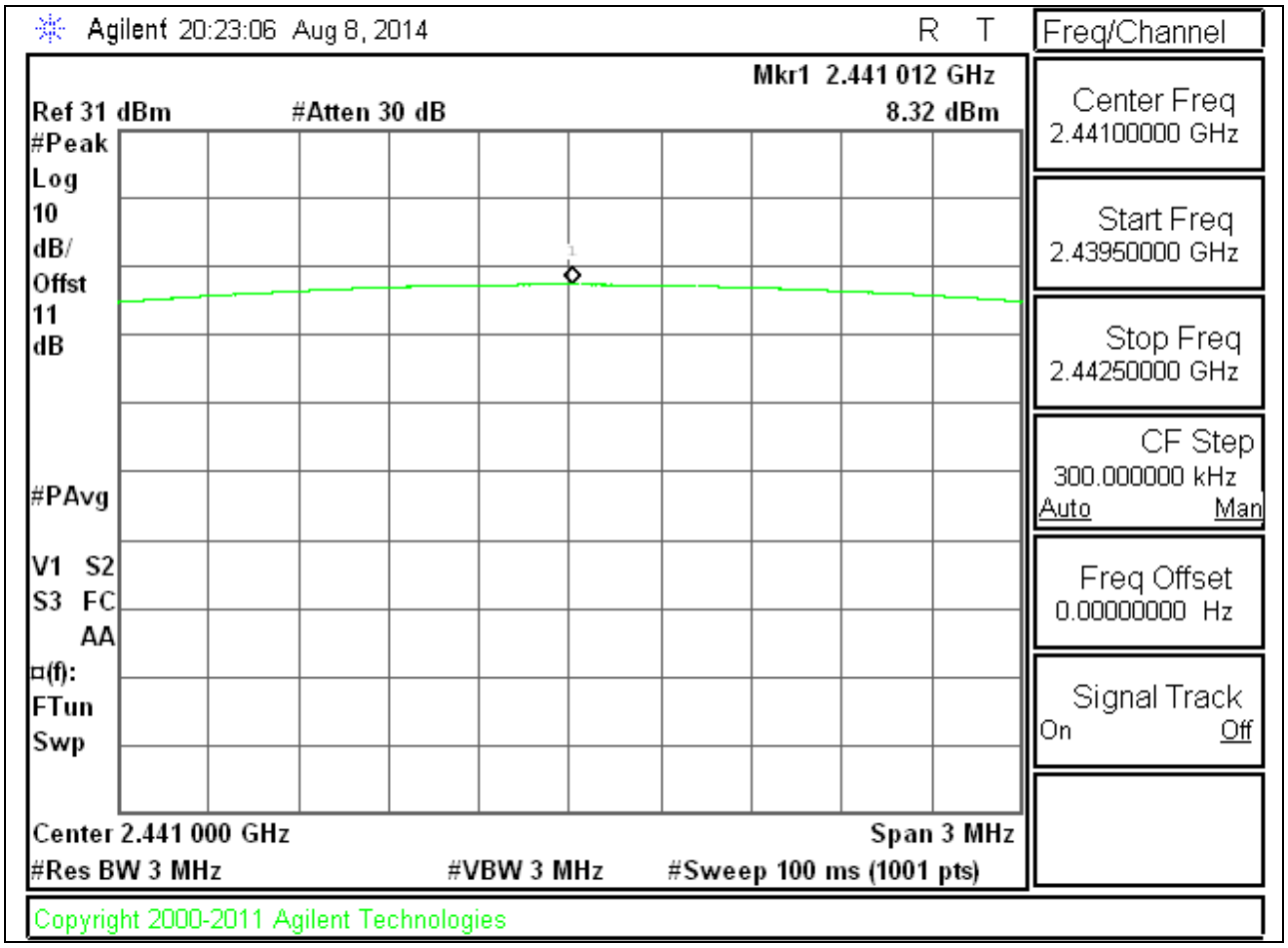
8PSK OUTPUT POWER

LOW CHANNEL



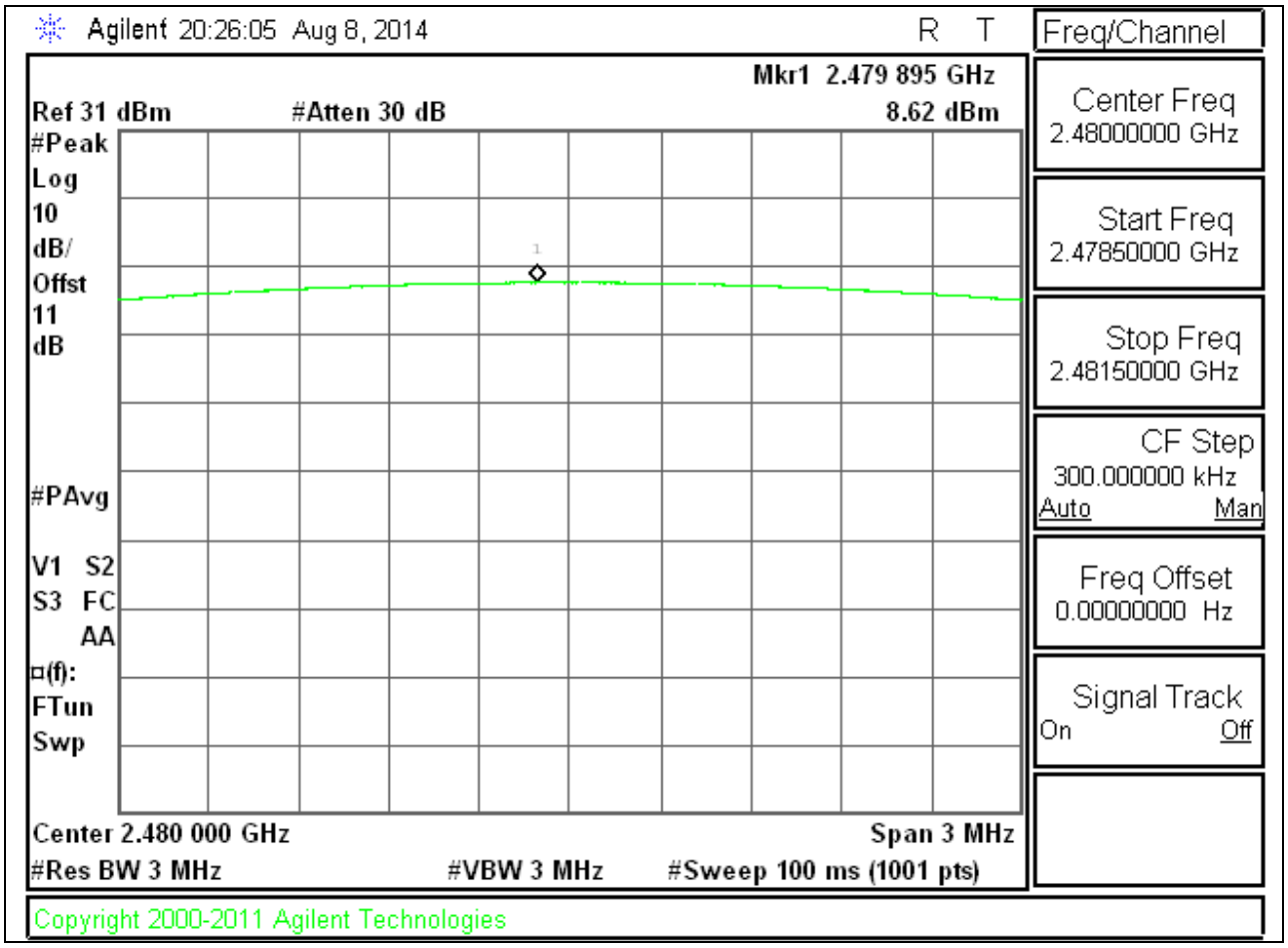
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

8.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	6.6
Middle	2441	6.7
High	2480	6.5
Worst		6.7

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.1
Middle	2441	5.1
High	2480	5.2
Worst		5.20

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.2
Middle	2441	5.1
High	2480	5.2
Worst		5.2

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

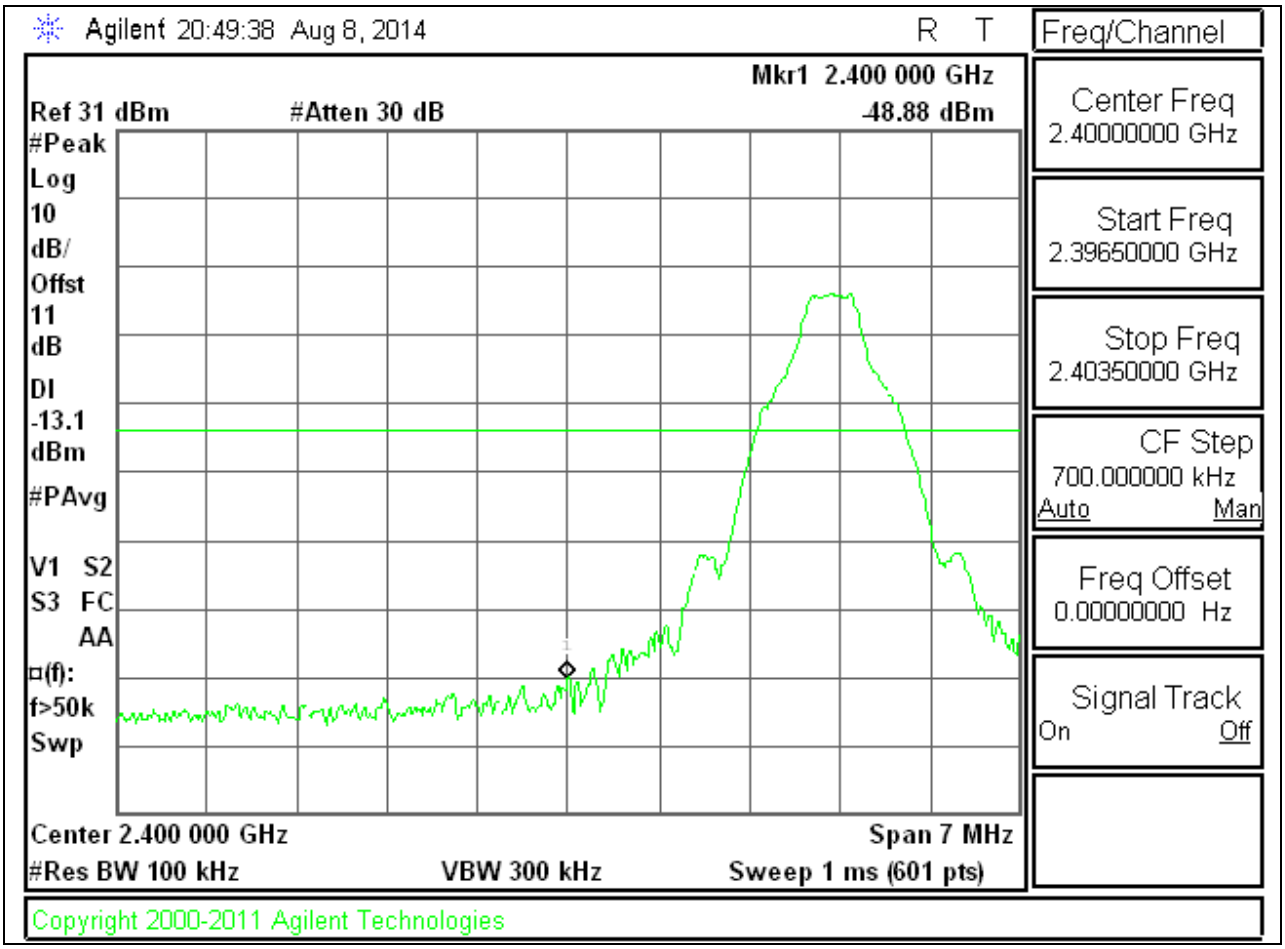
RESULTS

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8.7.1. BASIC DATA RATE GFSK MODULATION

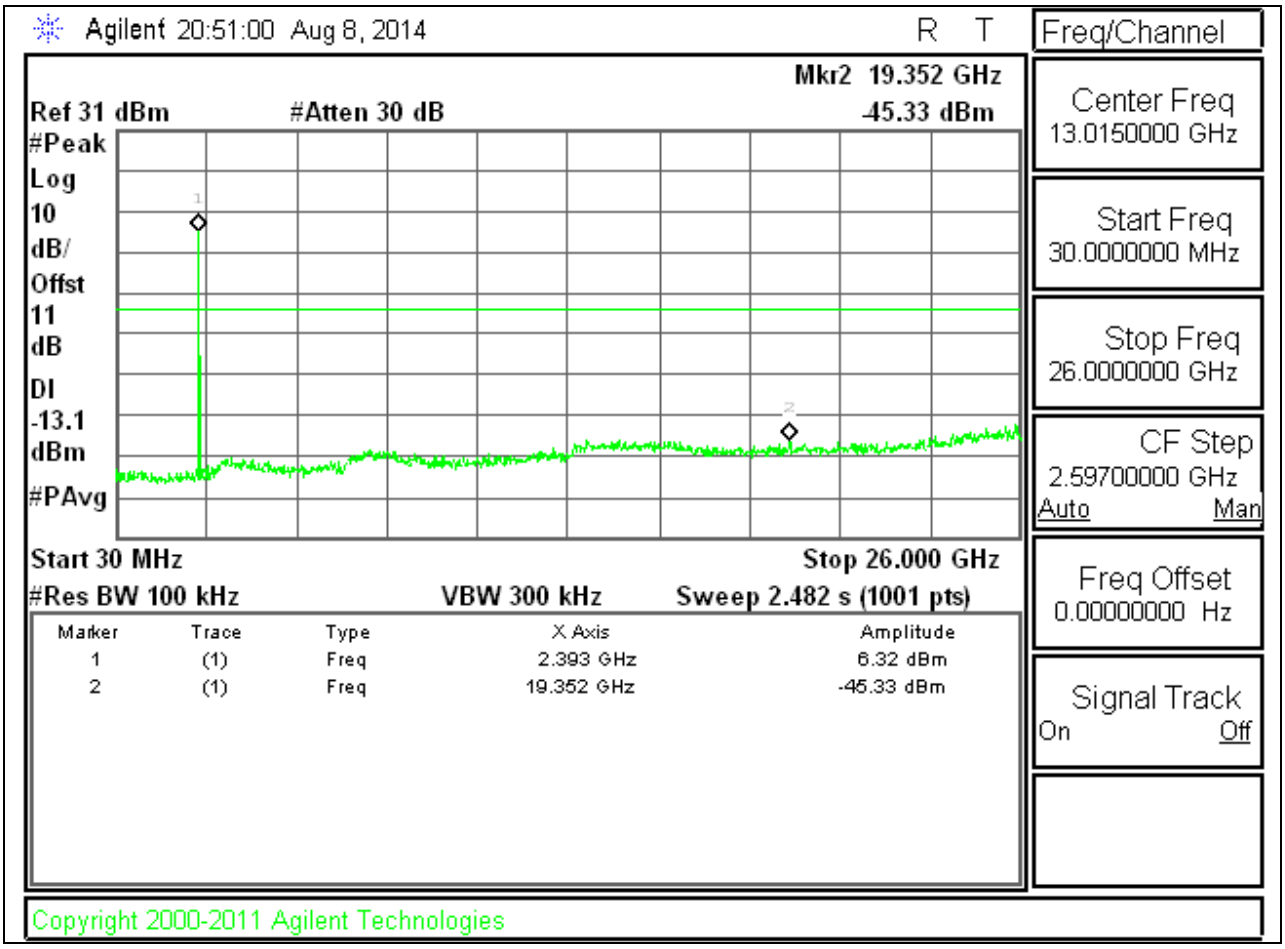
SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

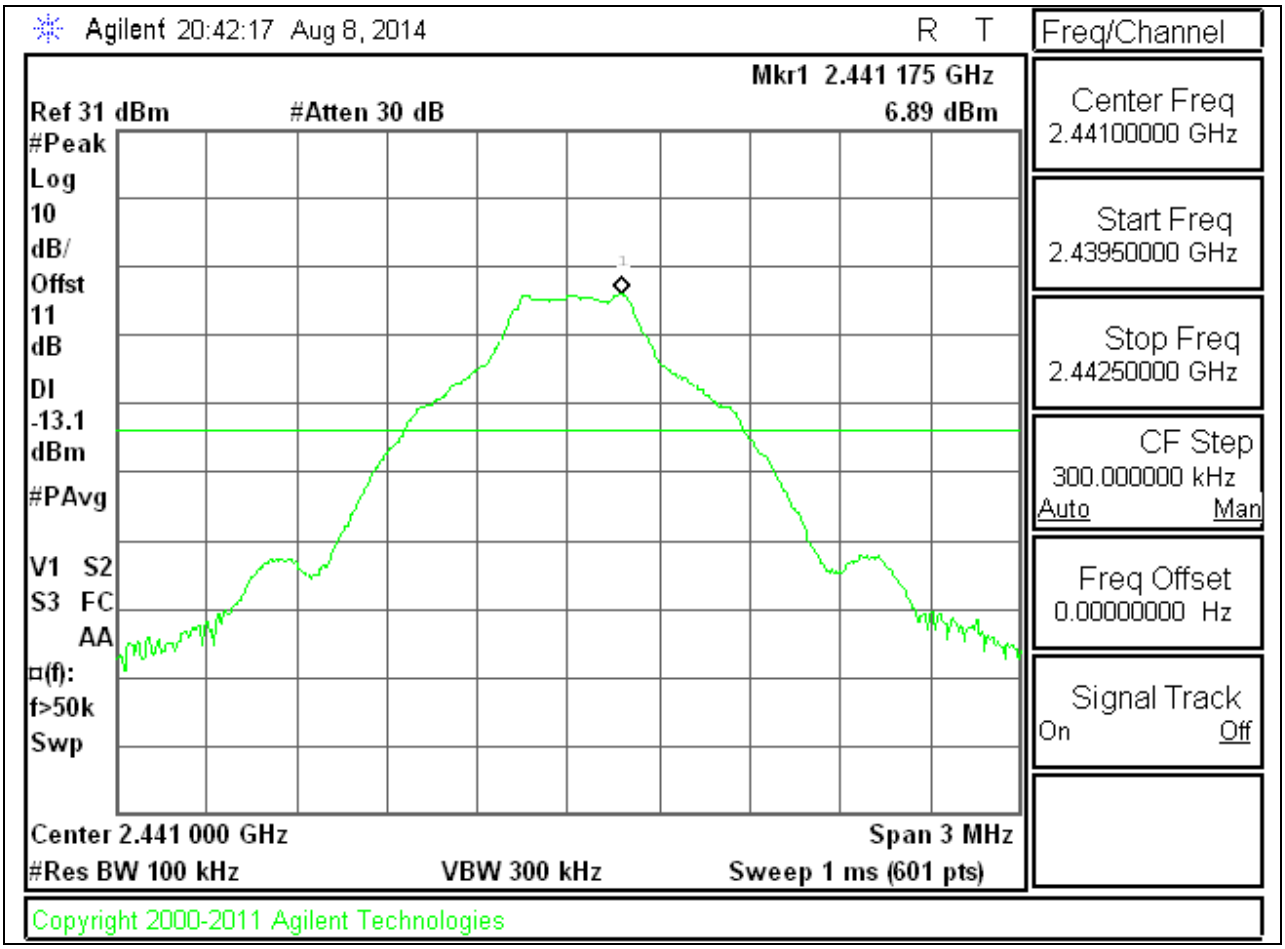
LOW CHANNEL SPURIOUS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

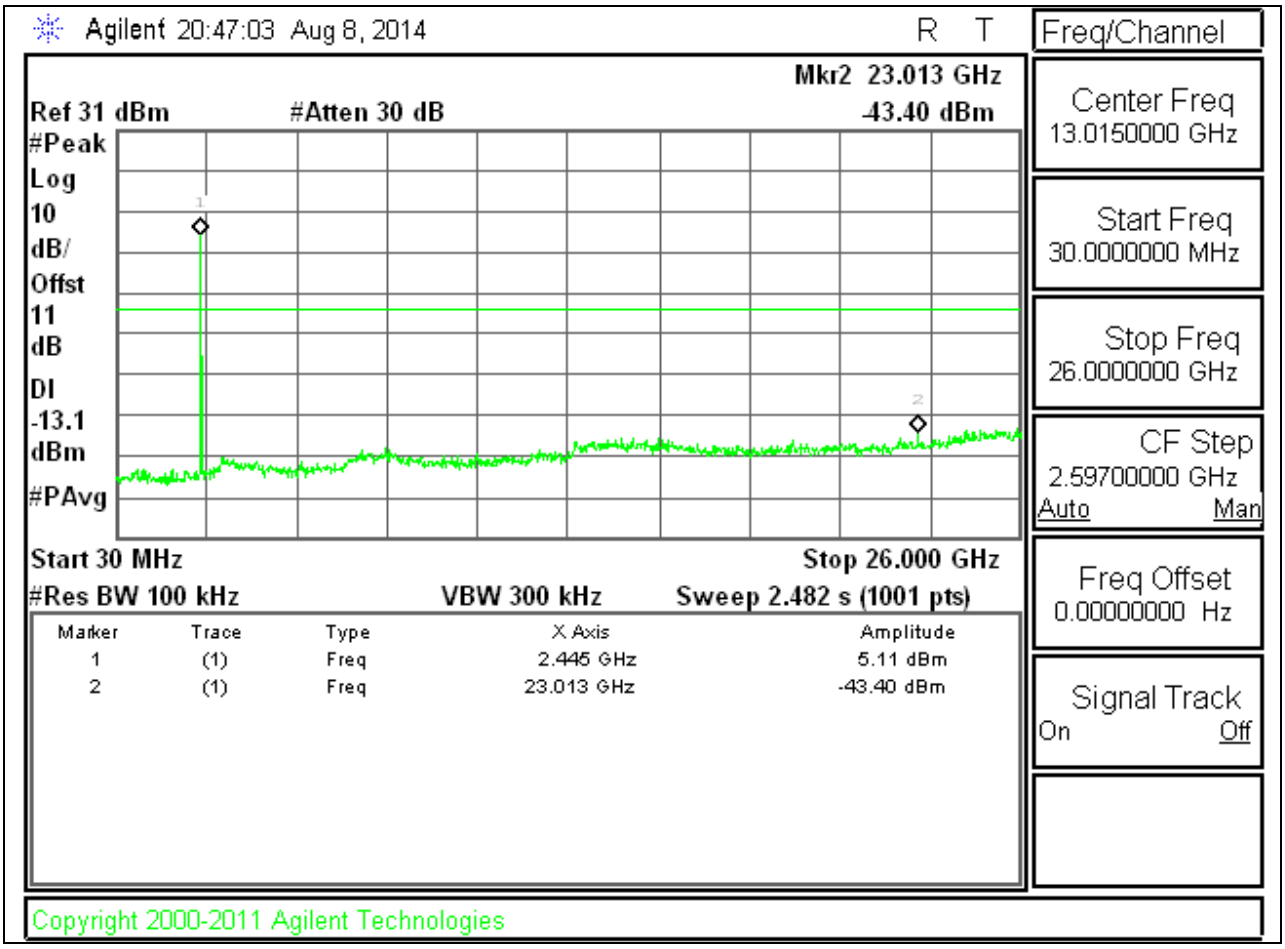
SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL BANDEDGE



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

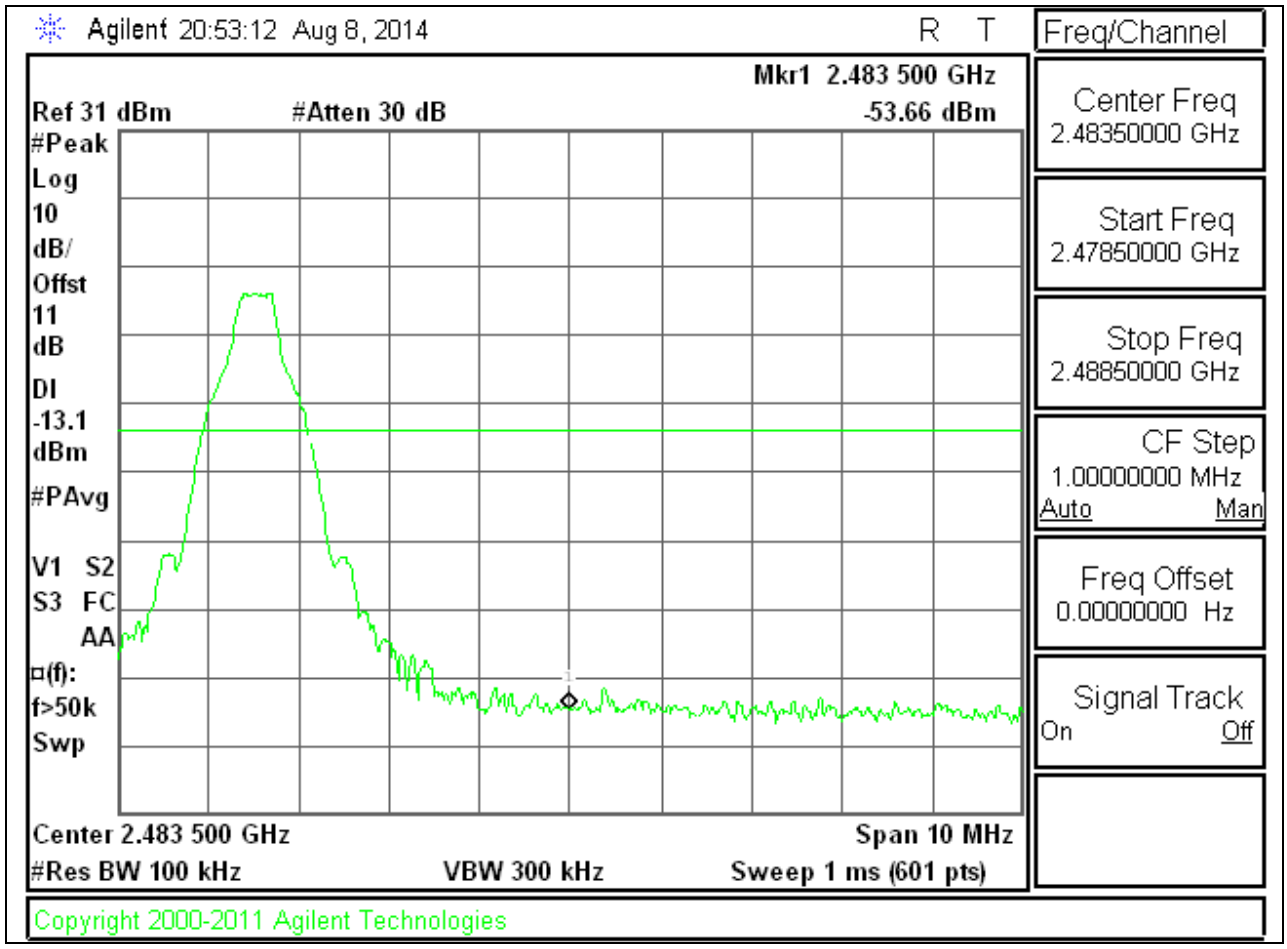
MID CHANNEL SPURIOUS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

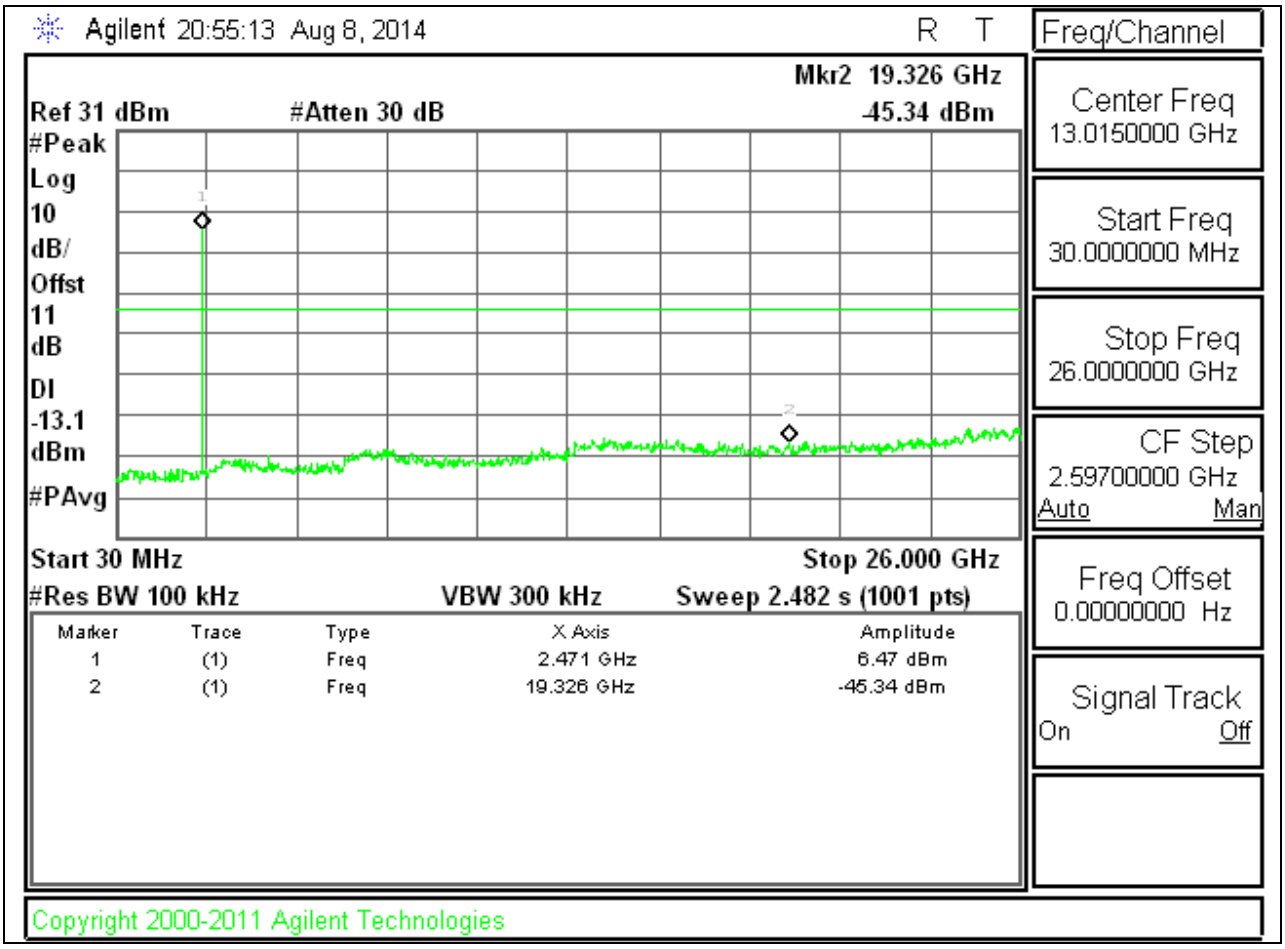
SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

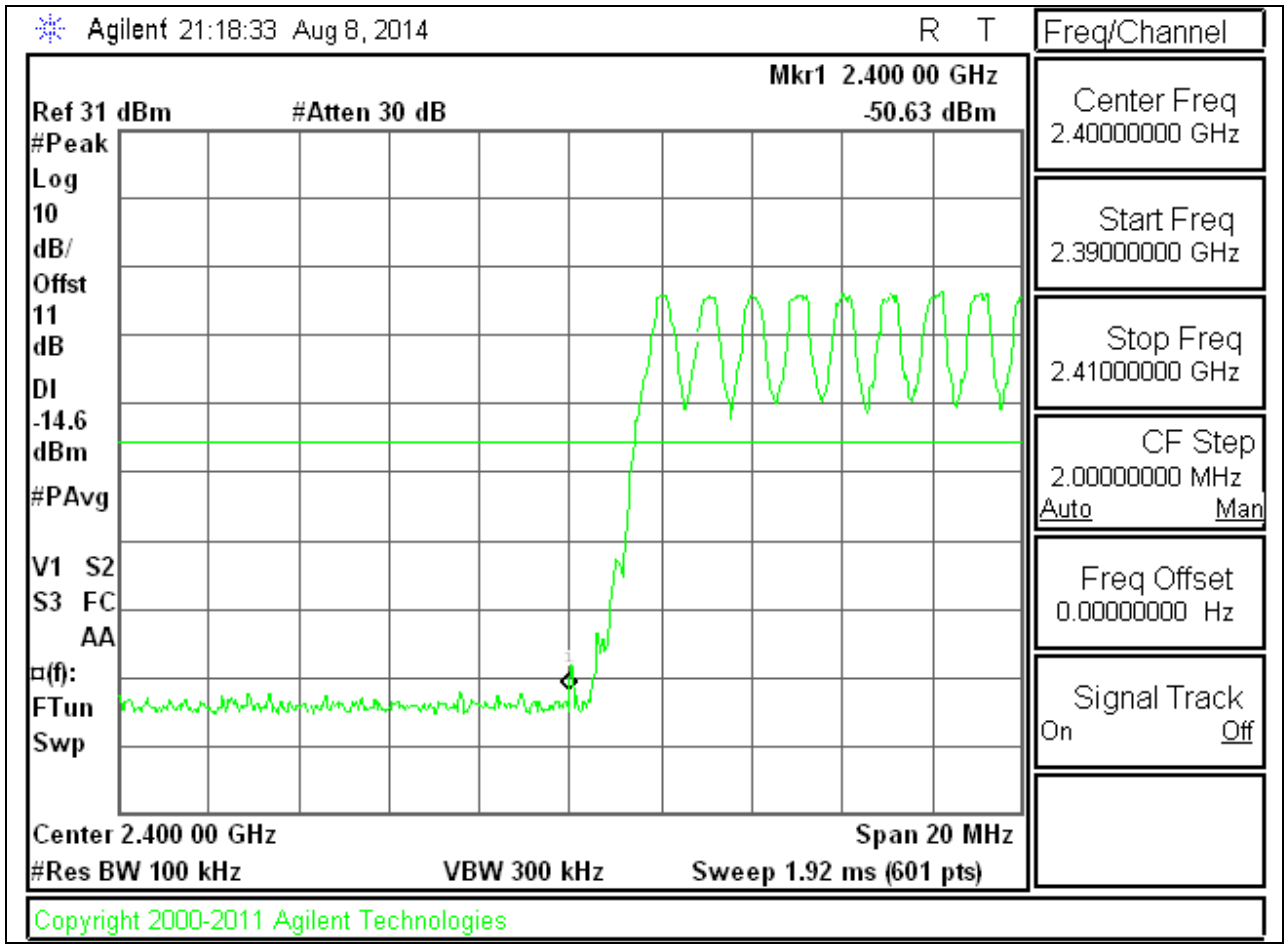
HIGH CHANNEL SPURIOUS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

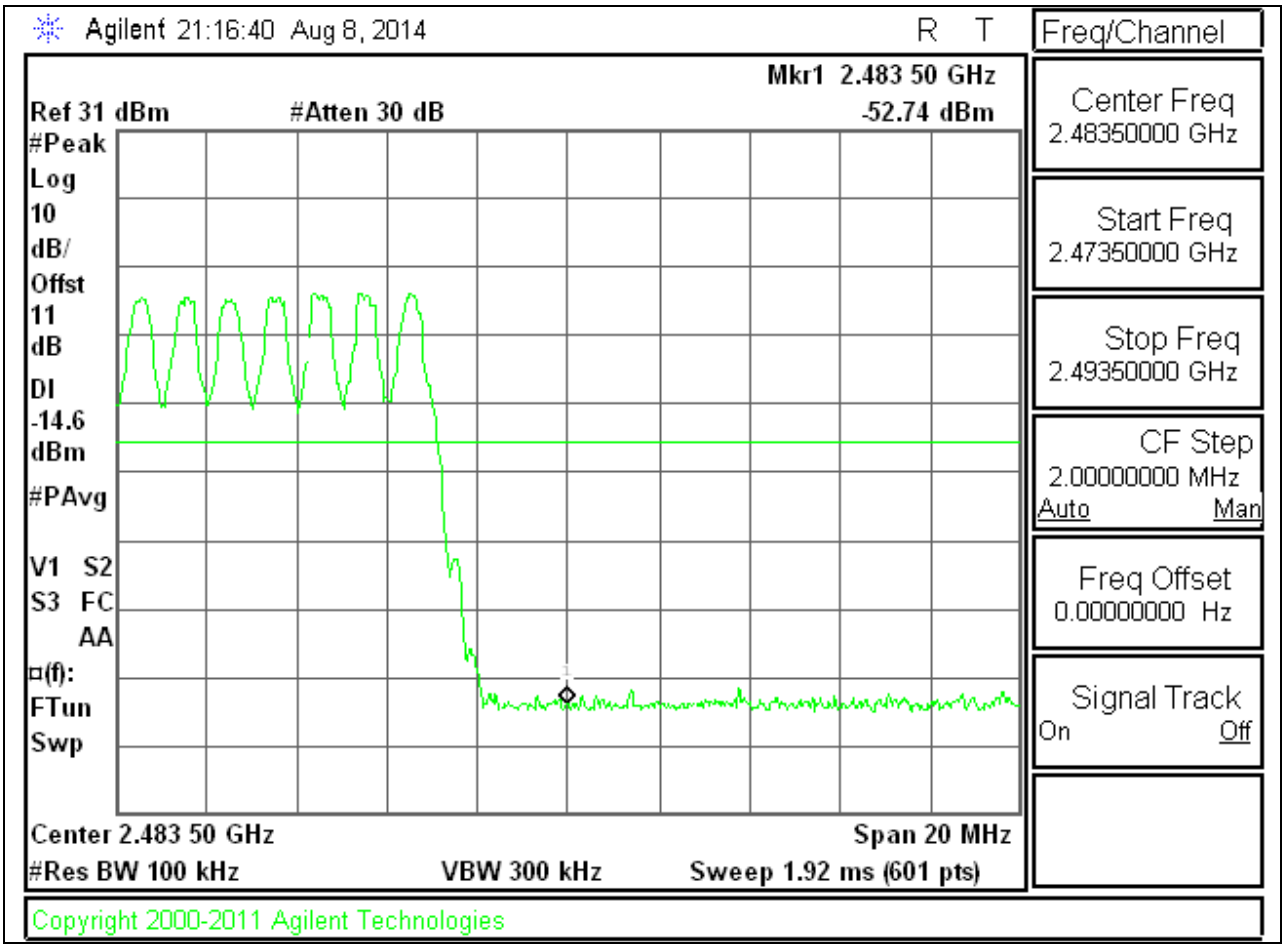
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH BANDEDGE WITH HOPPING ON

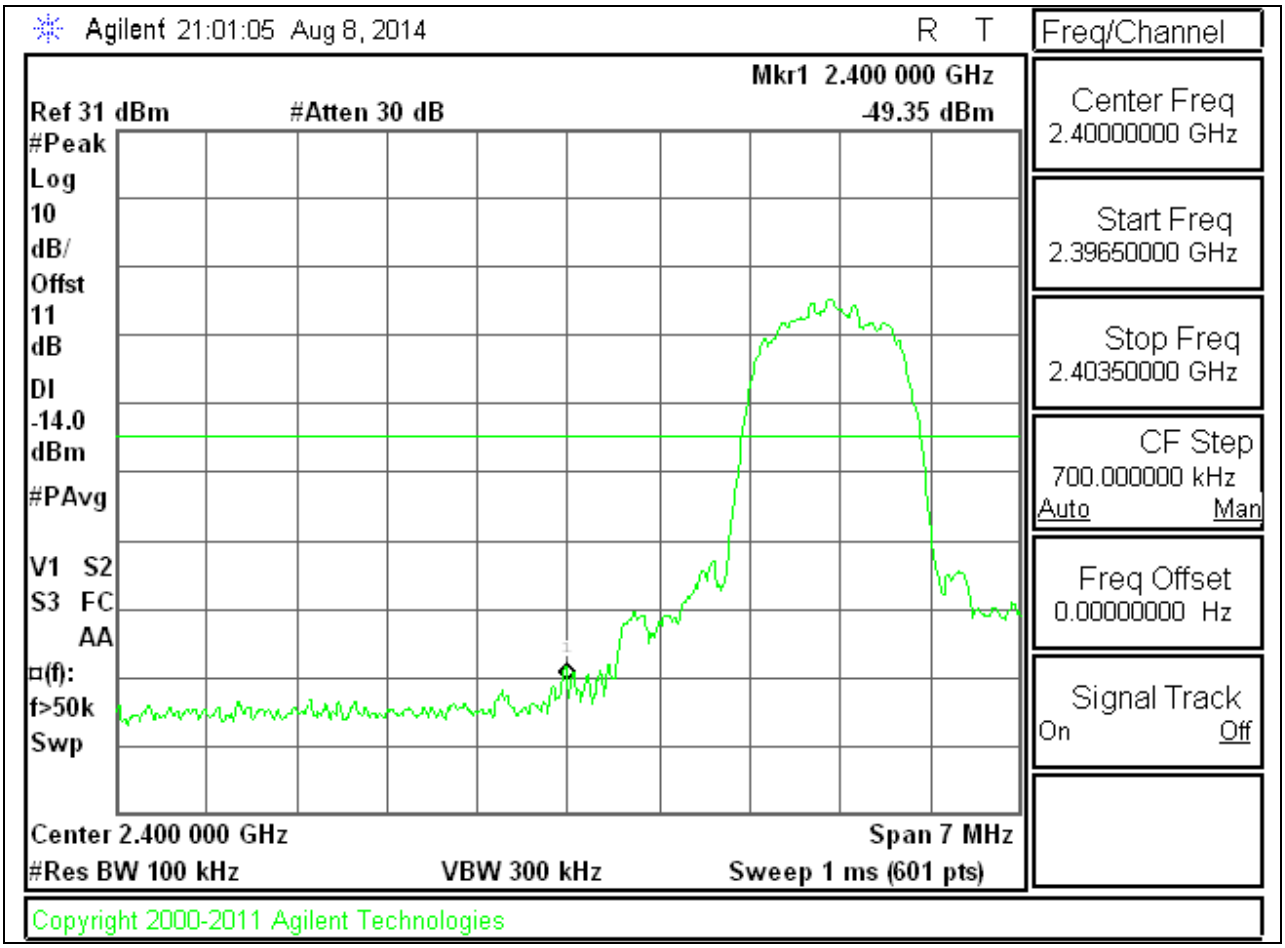


This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

ENHANCED DATA RATE 8PSK MODULATION

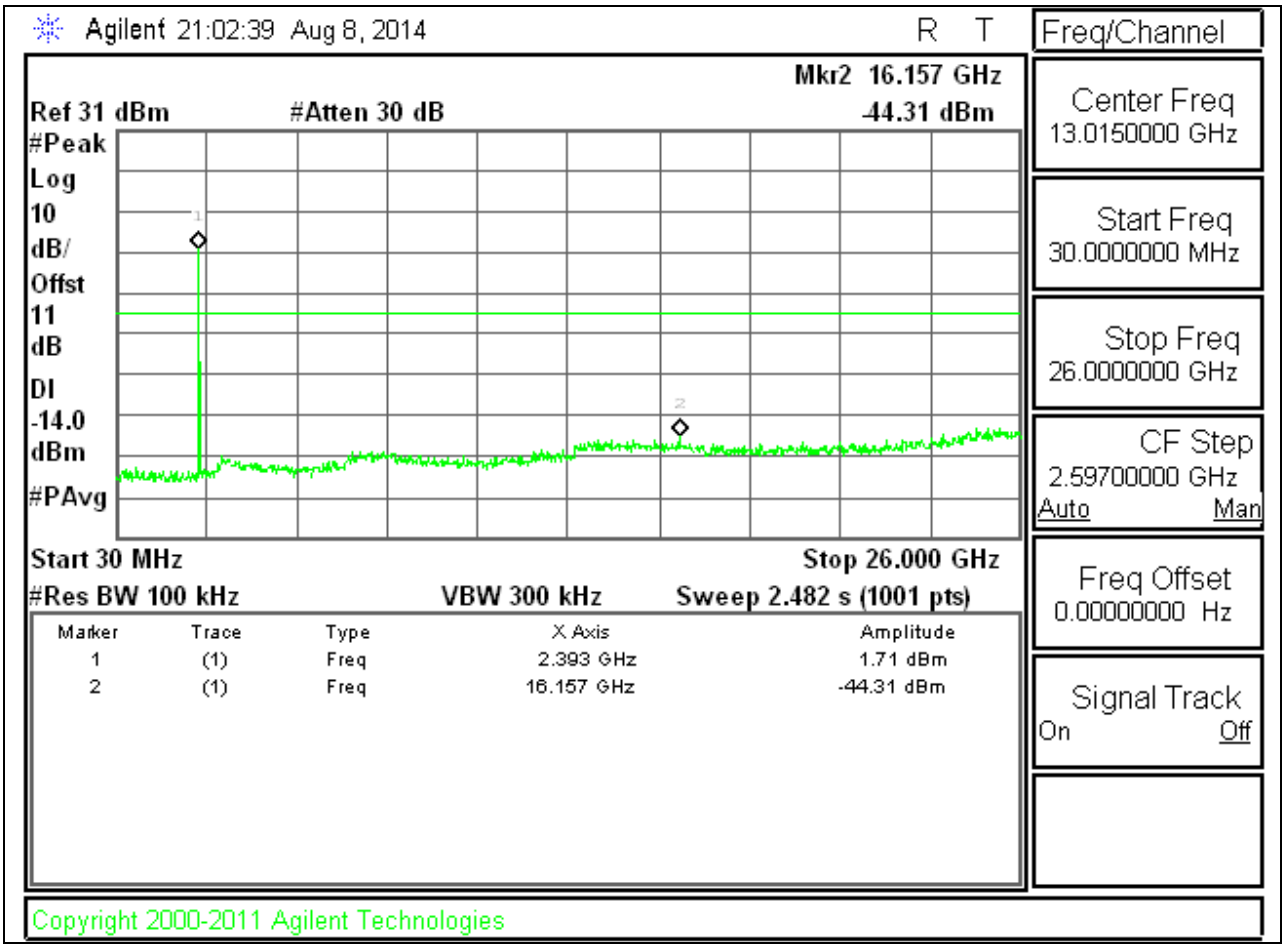
SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

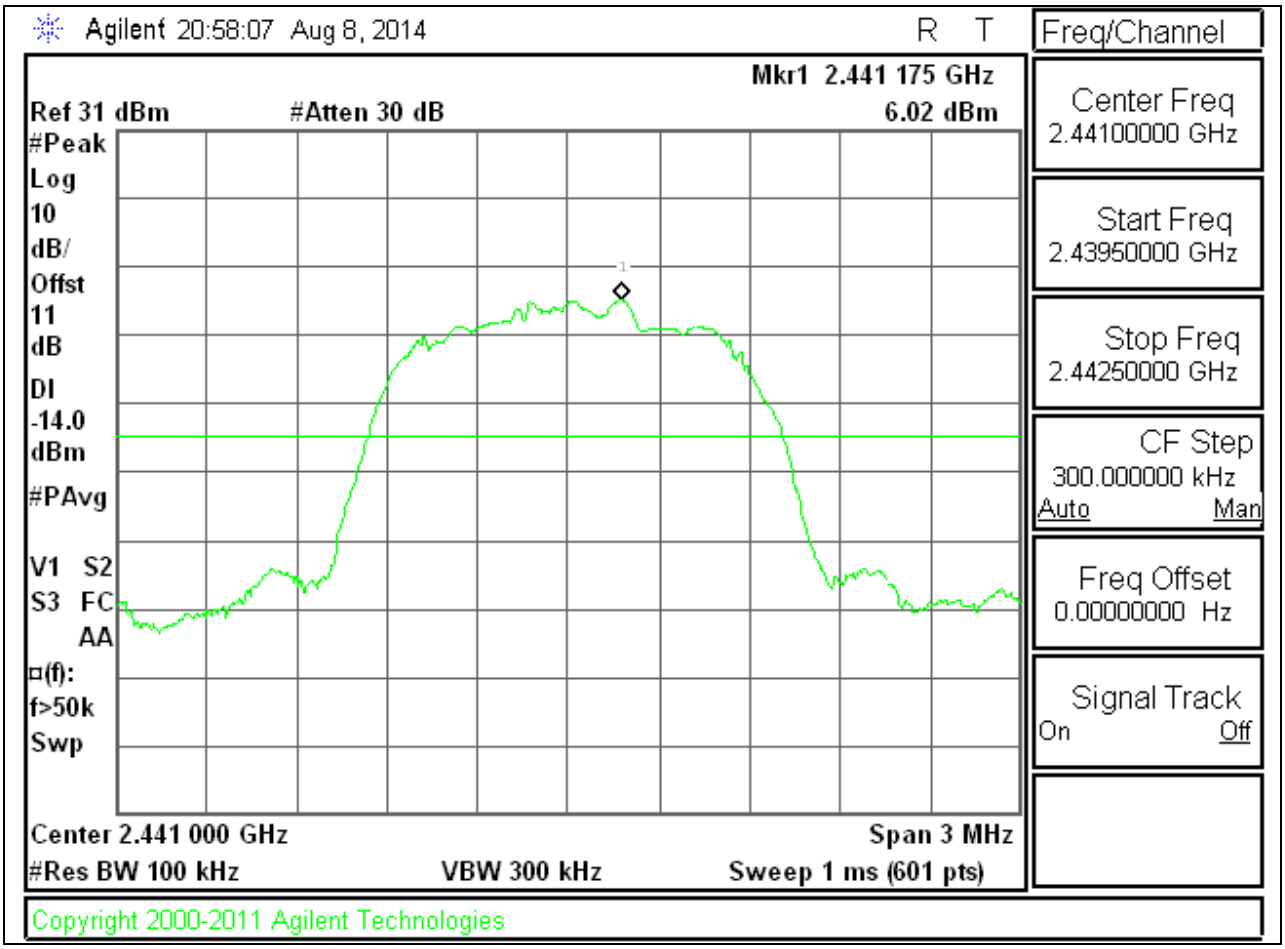
LOW CHANNEL SPURIOUS



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

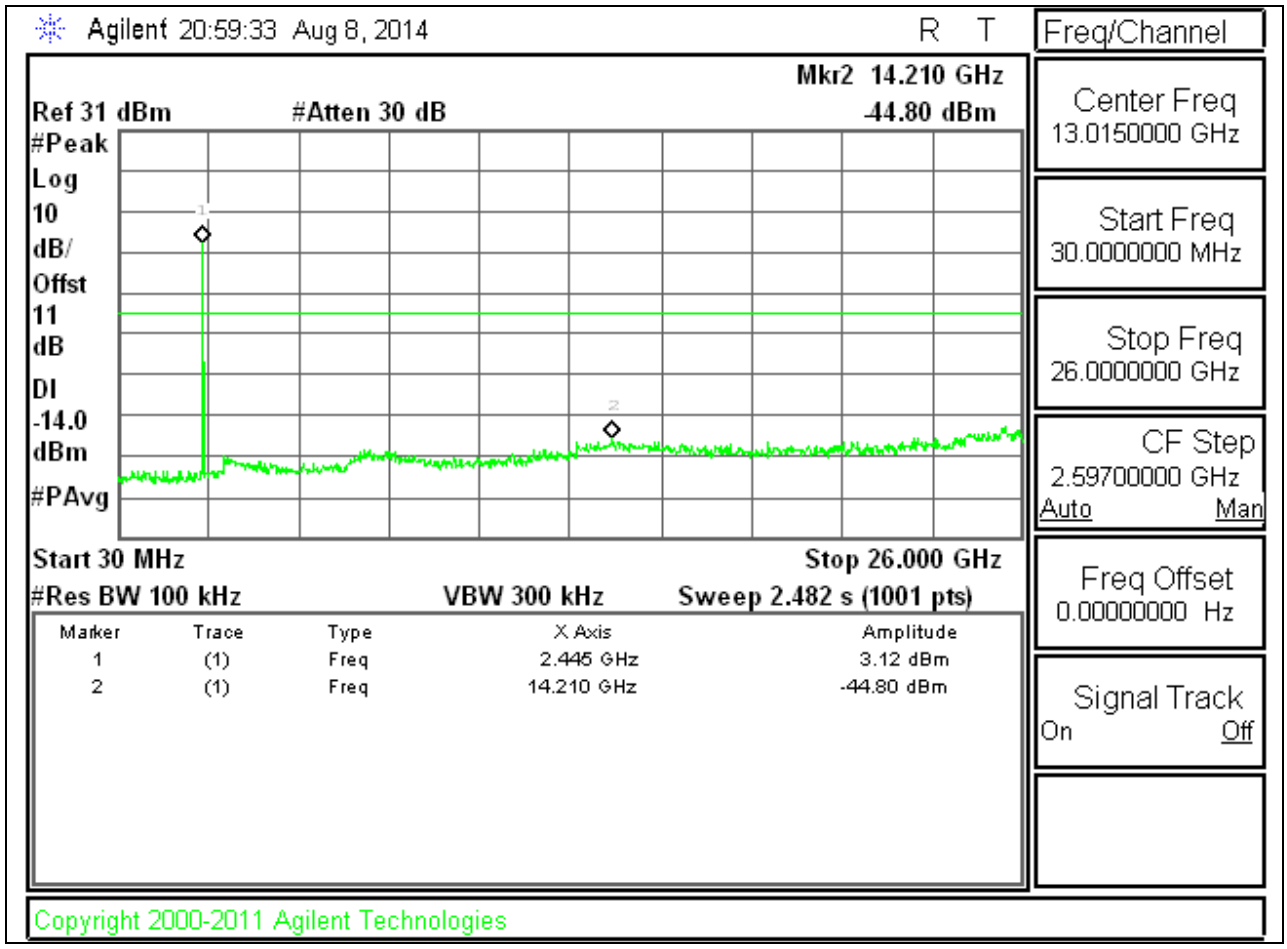
SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL BANDEDGE



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

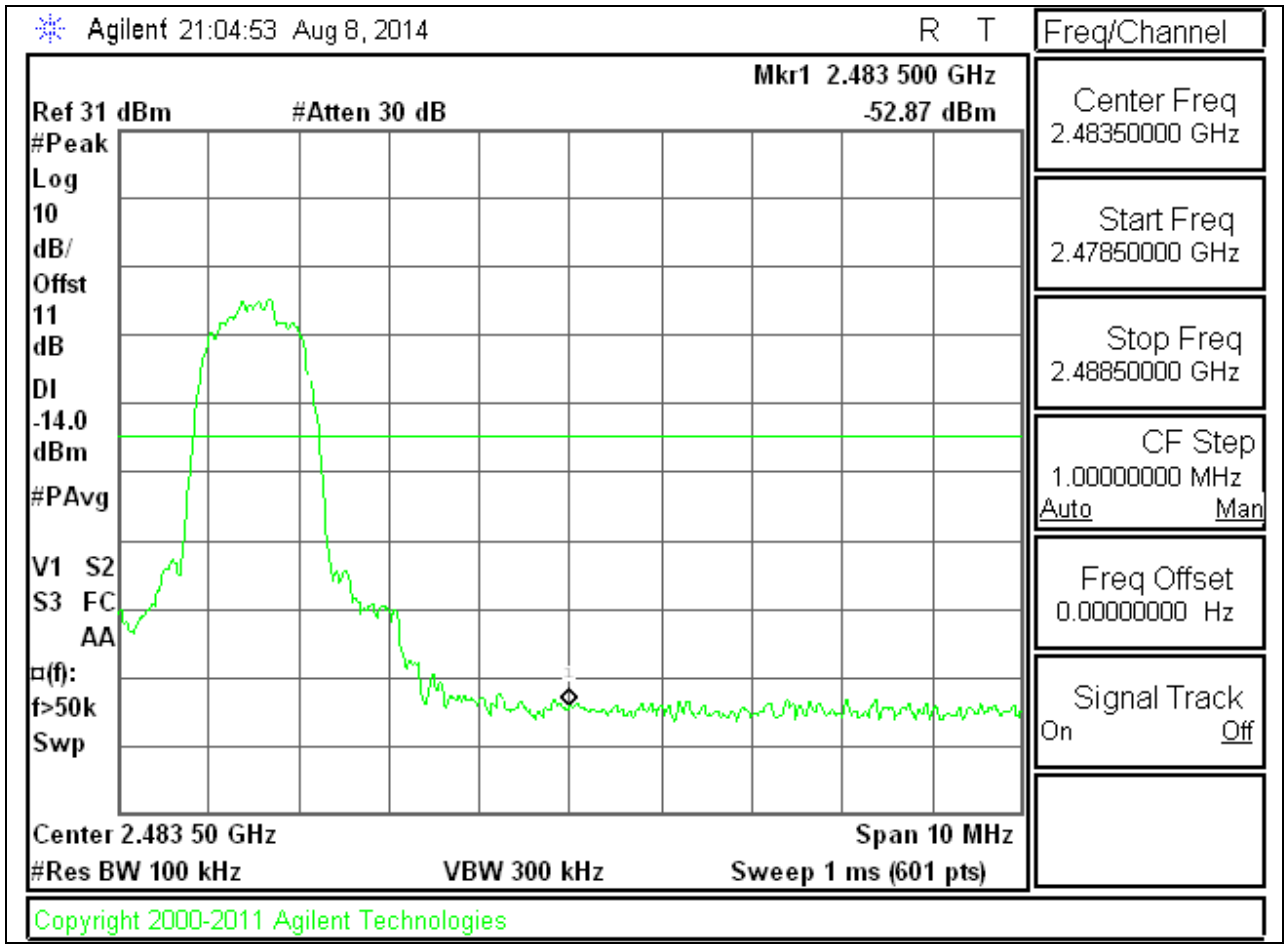
MID CHANNEL SPURIOUS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

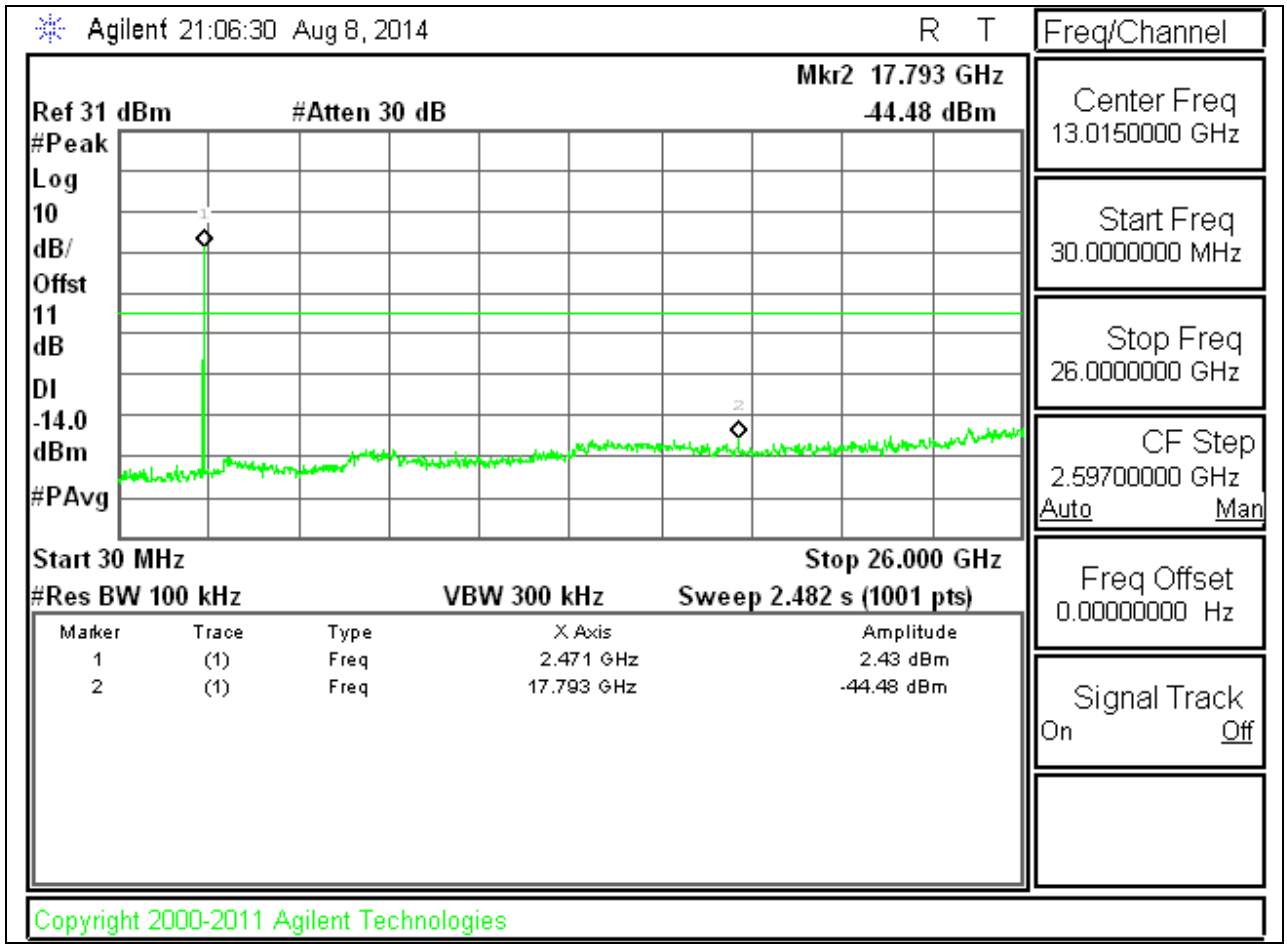
SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

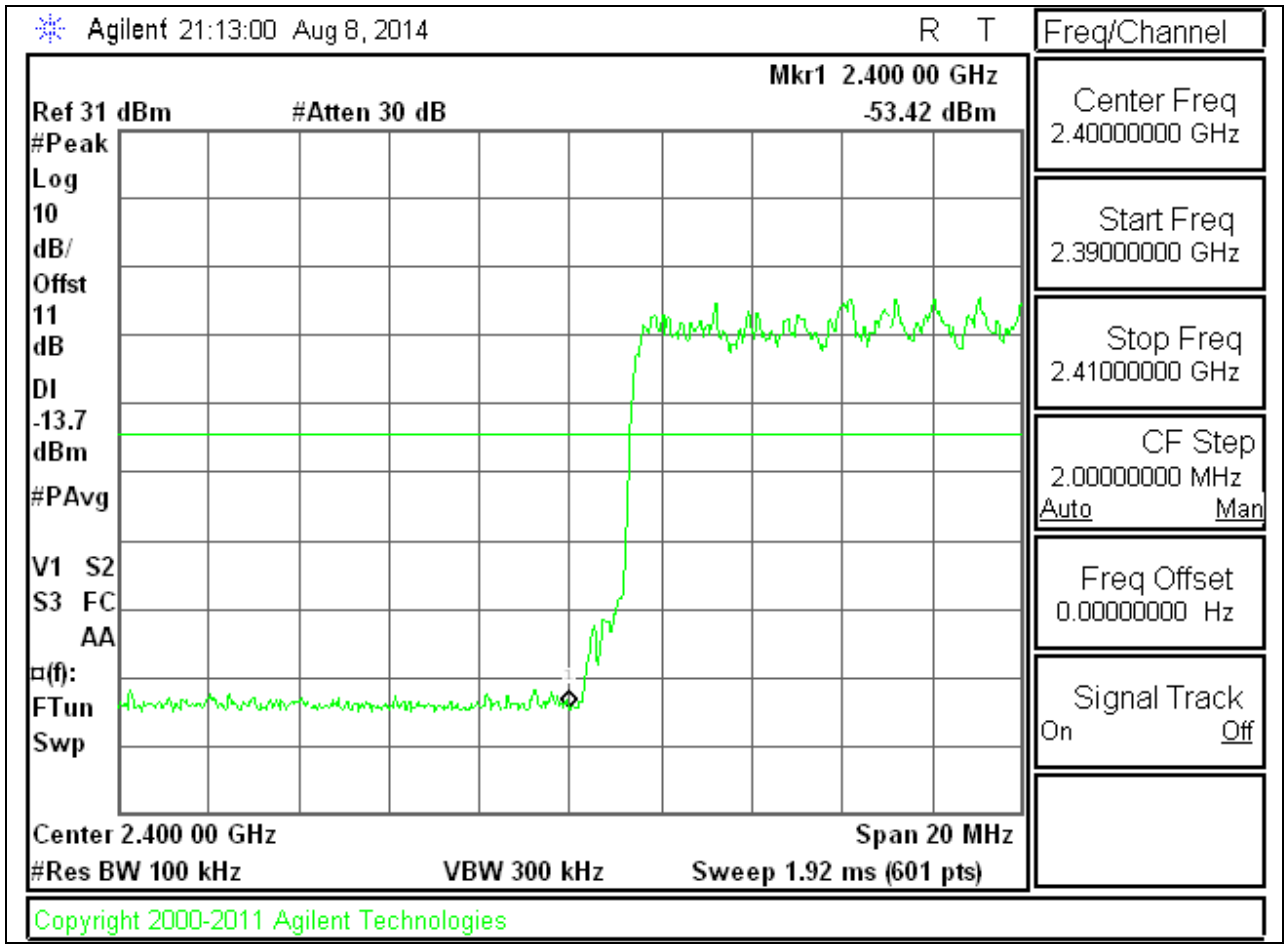
HIGH CHANNEL SPURIOUS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

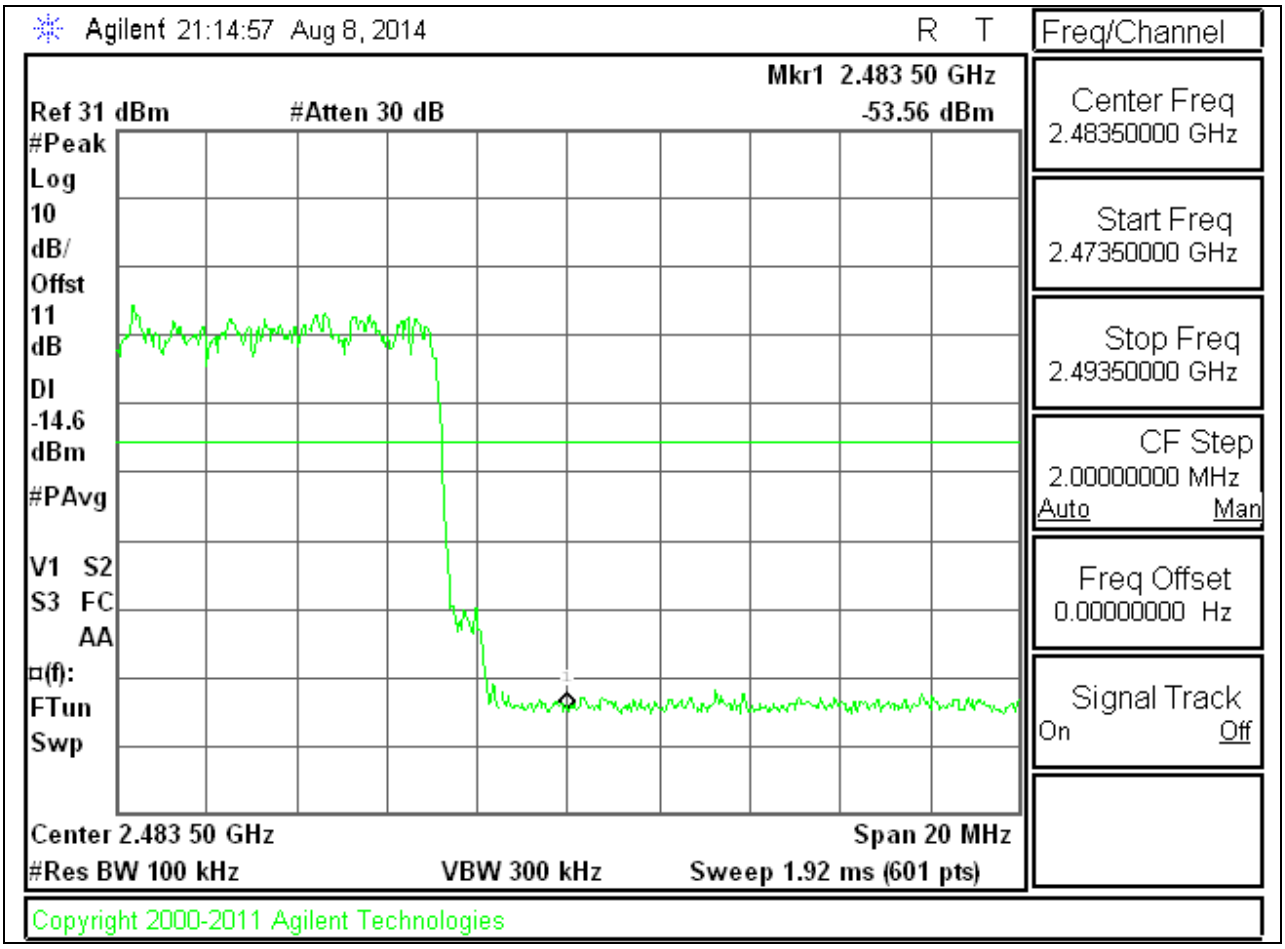
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH BANDEDGE WITH HOPPING ON



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 1/T (on time) for average measurement. GFSK = 1/T = 1 / 0.0028S = 360Hz.

The spectrum from 1GHzHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

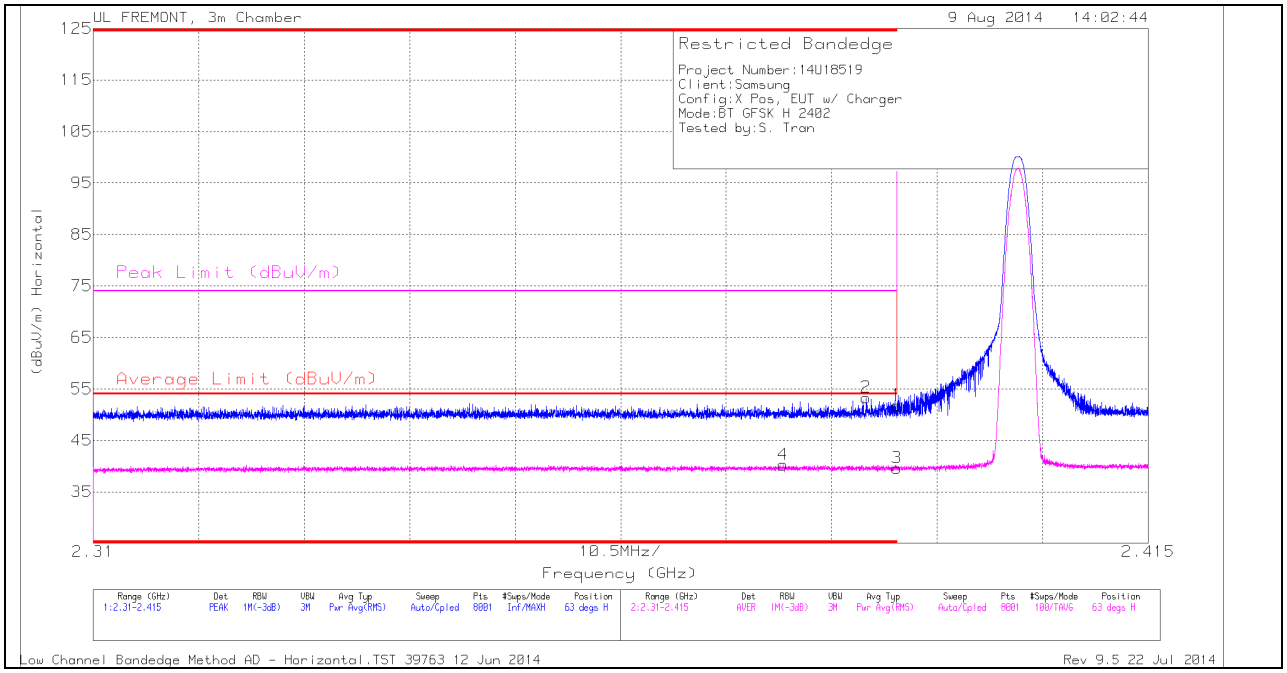
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

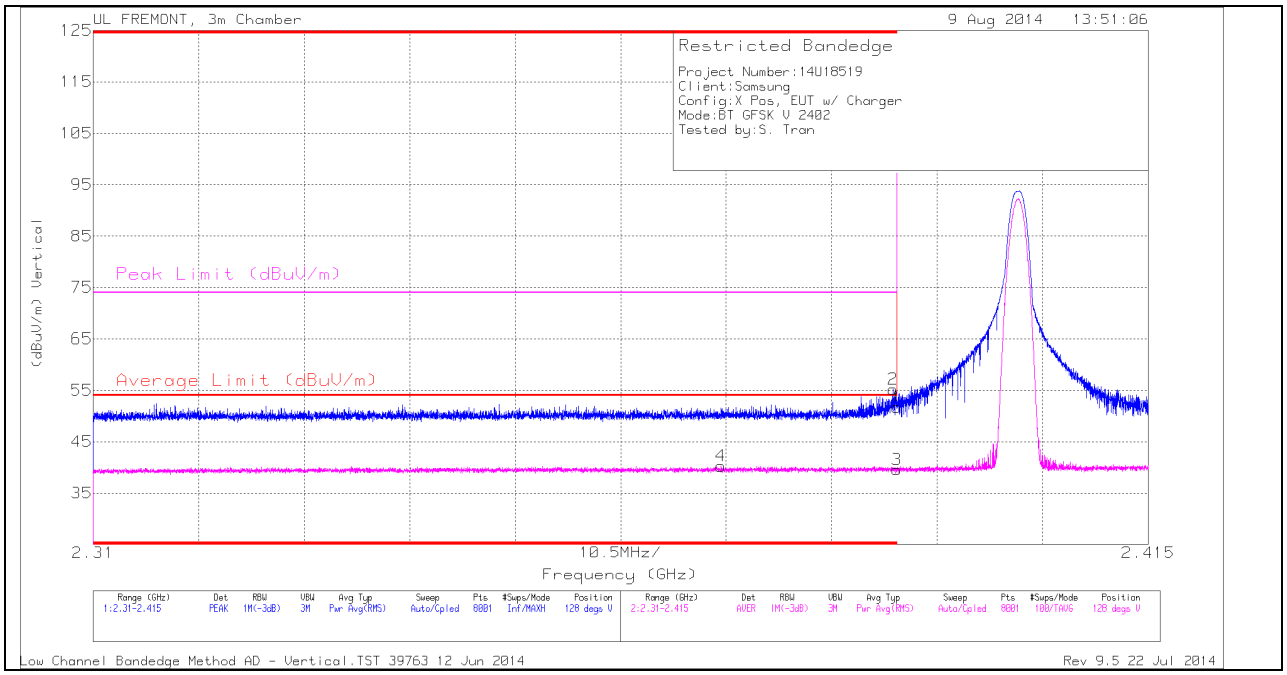
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 2.379	31.27	VB1T	32.1	-23.1	40.27	54	-13.73	-	-	63	304	H
2	* 2.387	44.32	PK	32.1	-23.1	53.32	-	-	74	-20.68	63	304	H
1	* 2.39	42.82	PK	32.1	-23.1	51.82	-	-	74	-22.18	63	304	H
3	* 2.39	30.64	VB1T	32.1	-23.1	39.64	54	-14.36	-	-	63	304	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 2.372	31.36	VB1T	32	-23.1	40.26	54	-13.74	-	-	128	199	V
1	* 2.39	42.75	PK	32.1	-23.1	51.75	-	-	74	-22.25	128	199	V
2	* 2.39	46.21	PK	32.1	-23.1	55.21	-	-	74	-18.79	128	199	V
3	* 2.39	30.56	VB1T	32.1	-23.1	39.56	54	-14.44	-	-	128	199	V

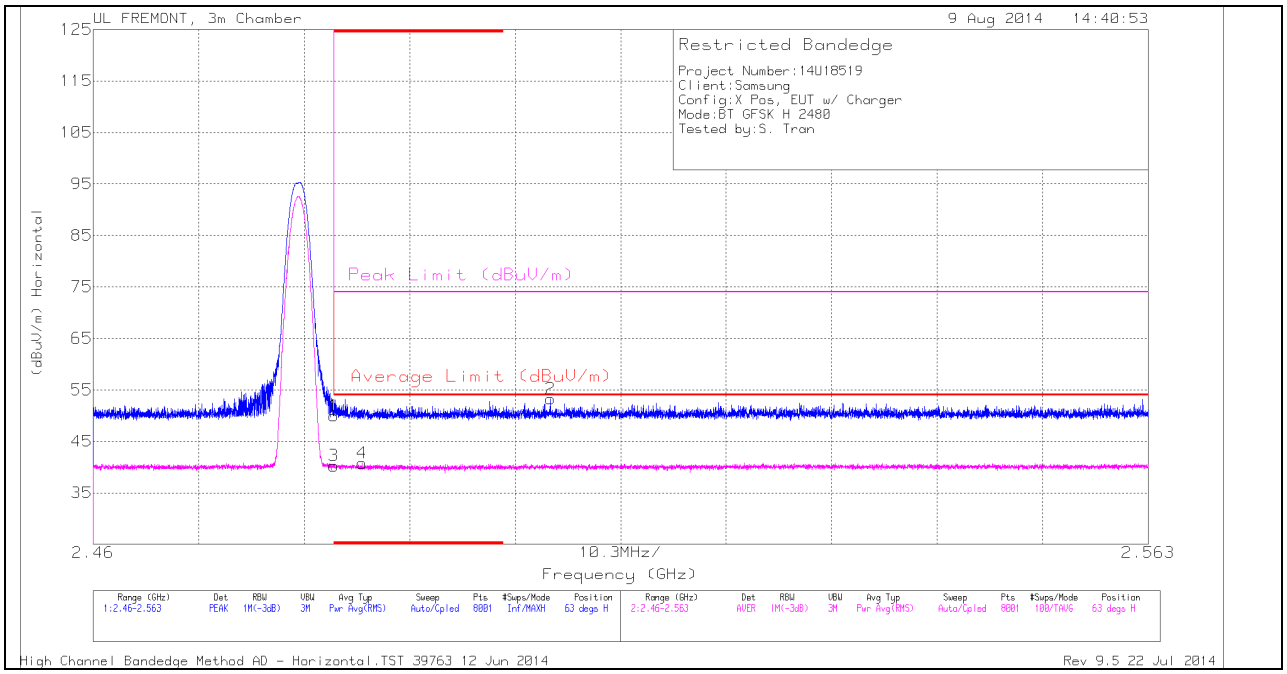
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

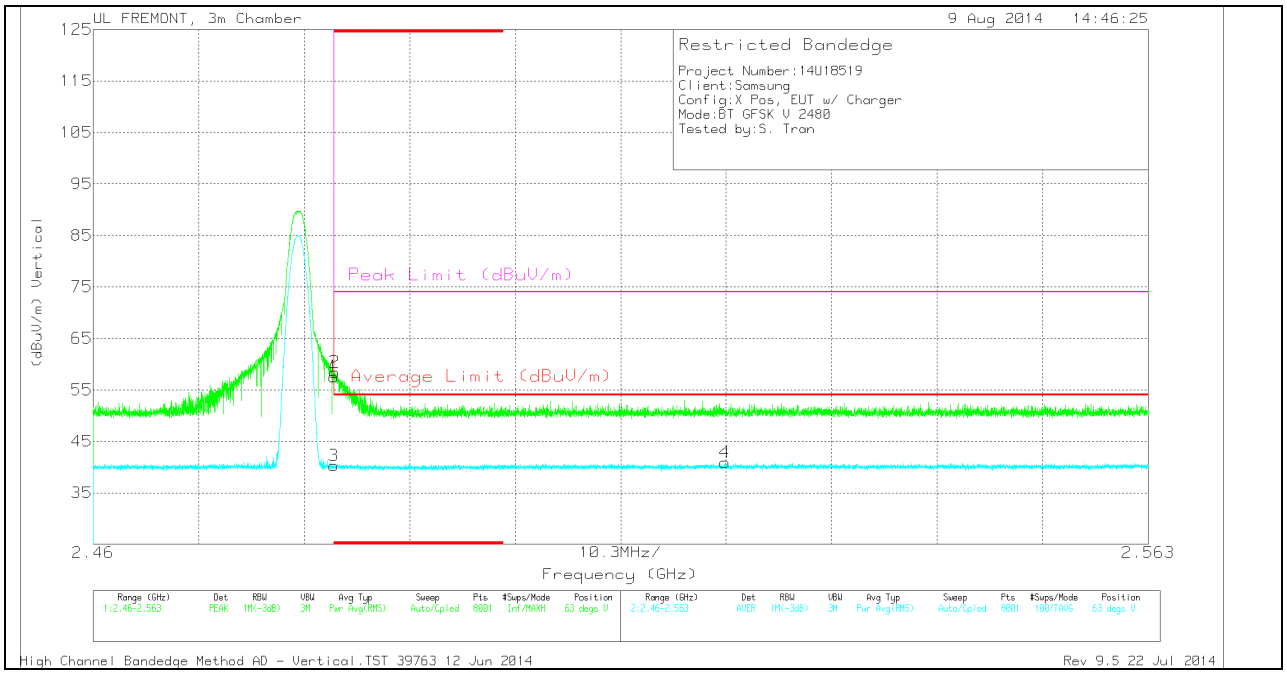
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.47	PK	32.3	-22.8	49.97	-	-	74	-24.03	63	304	H
3	* 2.484	30.76	VB1T	32.3	-22.8	40.26	54	-13.74	-	-	63	304	H
4	* 2.486	31.25	VB1T	32.3	-22.8	40.75	54	-13.25	-	-	63	304	H
2	2.505	43.73	PK	32.3	-22.8	53.23	-	-	74	-20.77	63	304	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	48.09	PK	32.3	-22.8	57.59	-	-	74	-16.41	63	304	V
2	* 2.484	48.91	PK	32.3	-22.8	58.41	-	-	74	-15.59	63	304	V
3	* 2.484	30.81	VB1T	32.3	-22.8	40.31	54	-13.69	-	-	63	304	V
4	2.522	31.31	VB1T	32.4	-22.8	40.91	54	-13.09	-	-	63	304	V

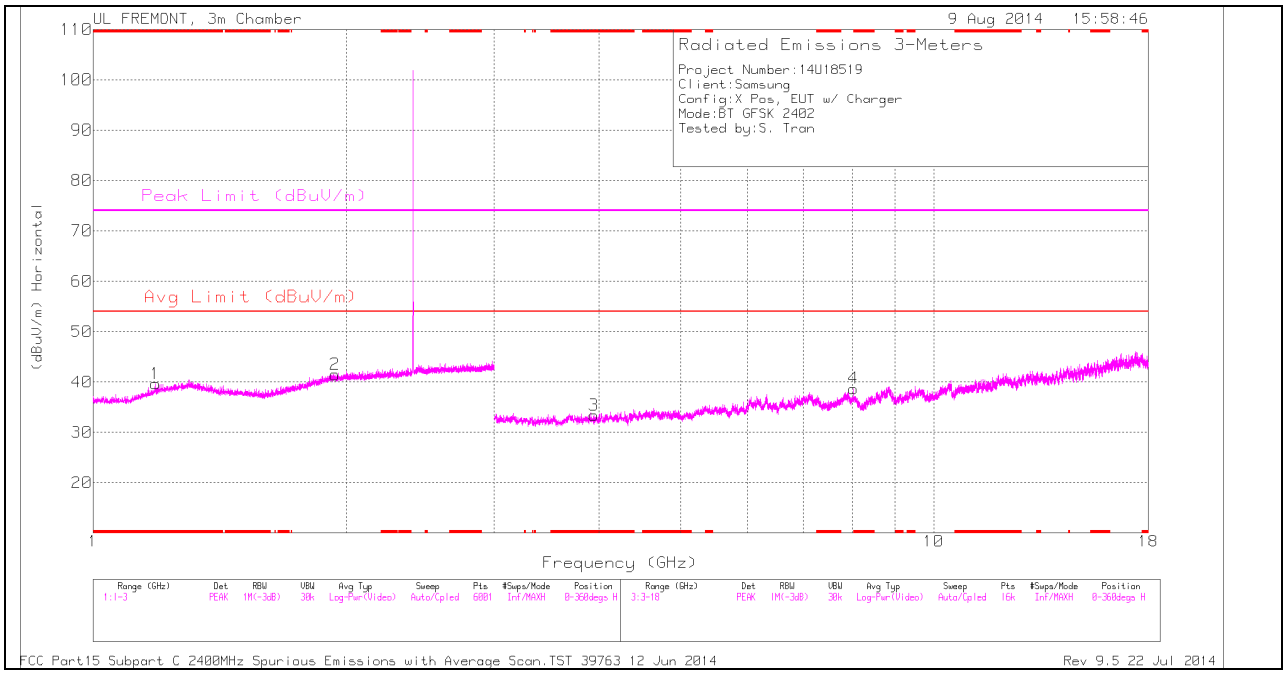
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HARMONICS AND SPURIOUS EMISSIONS

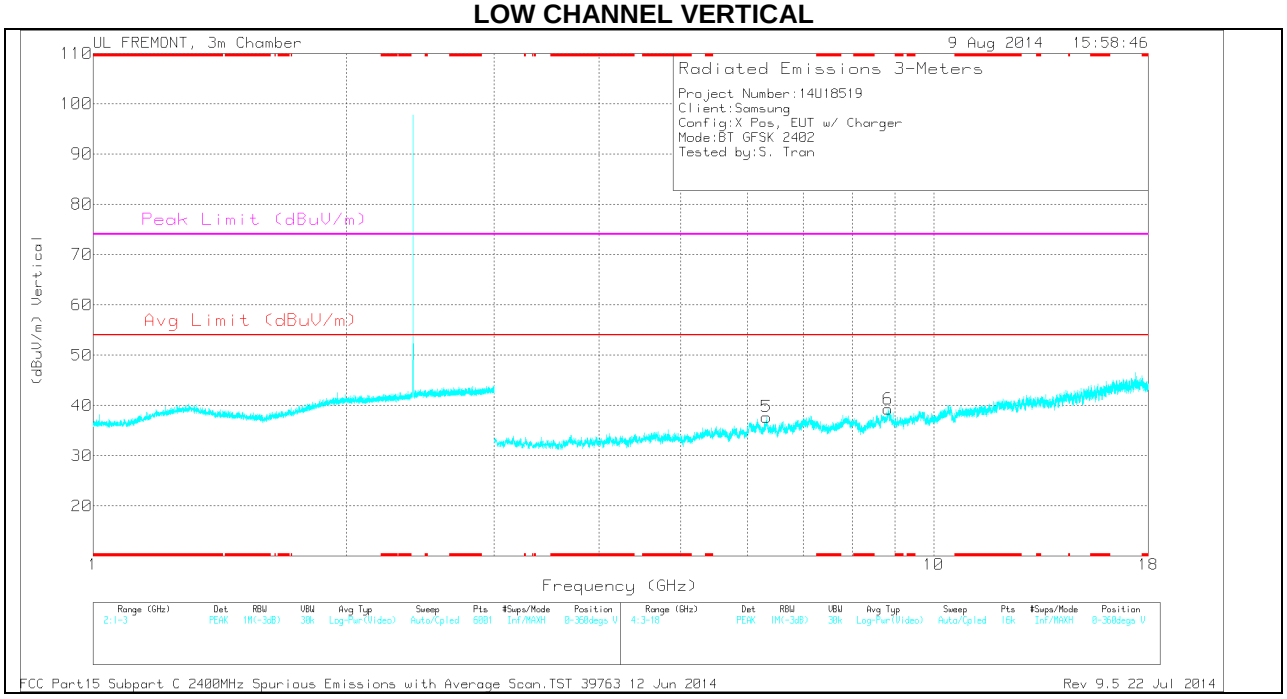
LOW CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.187	34.46	PK	29	-23.8	39.66	-	-	74	-34.34	0-360	200	H
3	* 3.946	31.19	PK	33.3	-31.1	33.39	-	-	74	-40.61	0-360	200	H
4	* 8.028	31.12	PK	35.7	-28.1	38.72	-	-	74	-35.28	0-360	200	H
2	1.941	33.27	PK	31.4	-23.2	41.47	-	-	-	-	0-360	100	H
5	6.325	31.51	PK	35.4	-29.2	37.71	-	-	-	-	0-360	100	V
6	8.822	29.86	PK	36	-26.6	39.26	-	-	-	-	0-360	200	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.948	40.41	PK3	33.3	-31.1	42.61	-	-	74	-31.39	0	200	H
* 3.948	27.72	VB1T	33.3	-31.1	29.92	54	-24.08	-	-	0	200	H

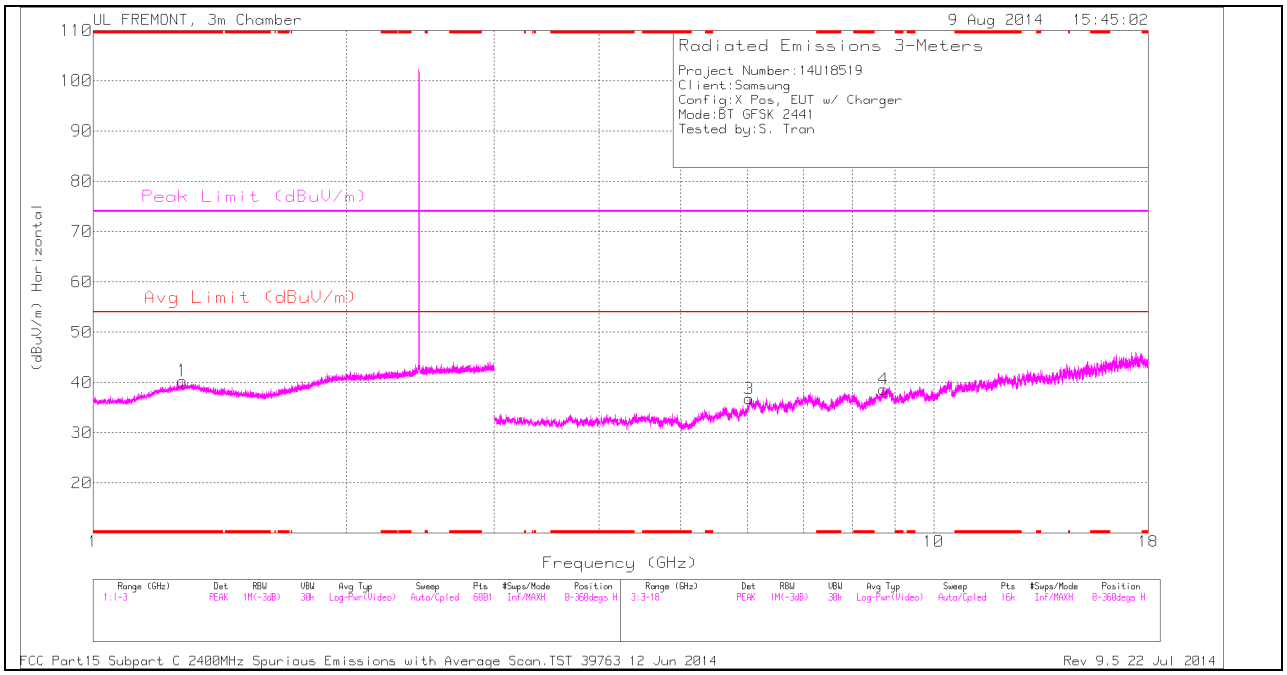
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

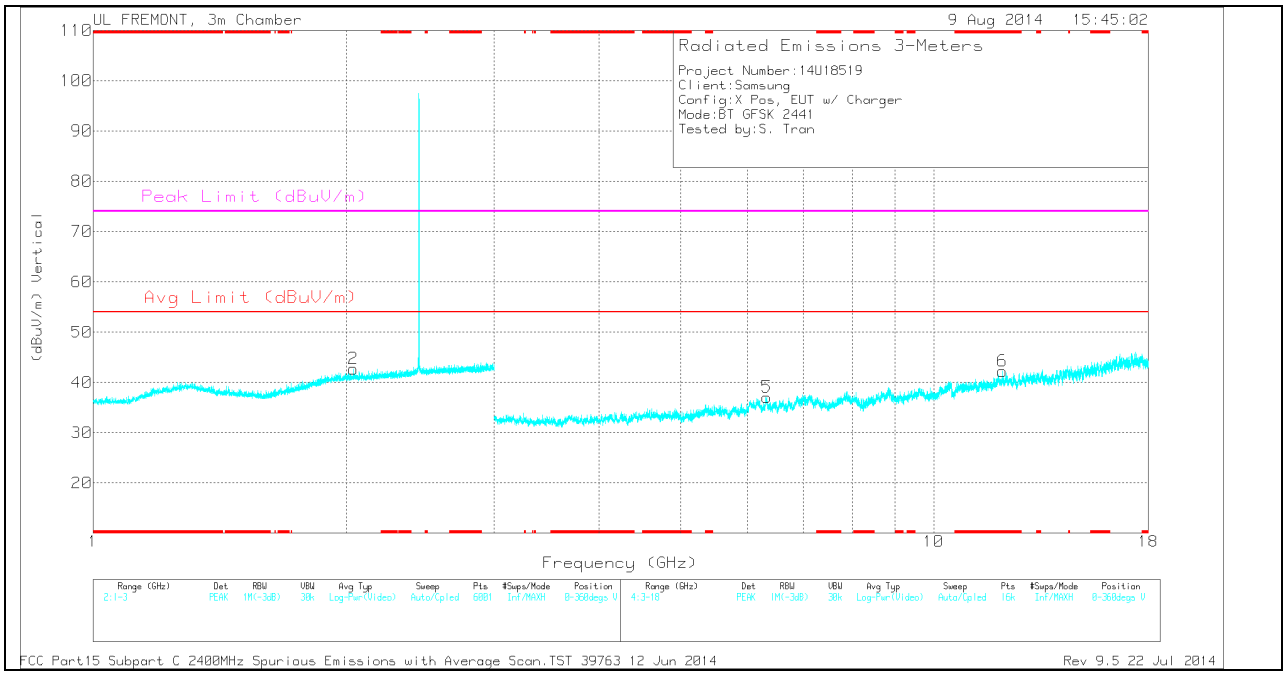
MID CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.278	34.11	PK	30	-23.8	40.31	-	-	74	-33.69	0-360	200	H
6	* 12.075	29.43	PK	39.1	-26.3	42.23	-	-	74	-31.77	0-360	100	V
2	2.039	34.32	PK	31.6	-23.2	42.72	-	-	-	-	0-360	100	V
3	6.034	30.99	PK	35.3	-29.5	36.79	-	-	-	-	0-360	200	H
5	6.33	30.68	PK	35.4	-29	37.08	-	-	-	-	0-360	100	V
4	8.725	30.36	PK	35.9	-27.6	38.66	-	-	-	-	0-360	200	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 12.076	37.78	PK3	39.1	-26.3	50.58	-	-	74	-23.42	3	100	V
* 12.077	25.07	VB1T	39.1	-26.3	37.87	54	-16.13	-	-	3	100	V

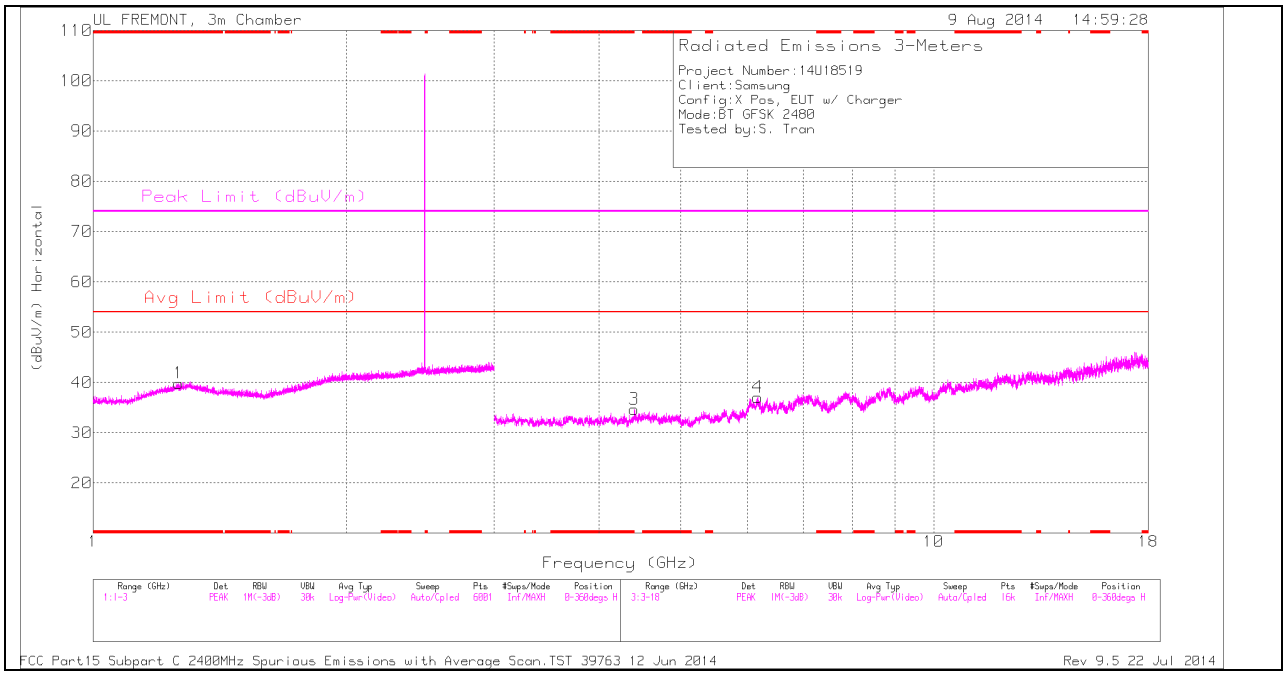
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

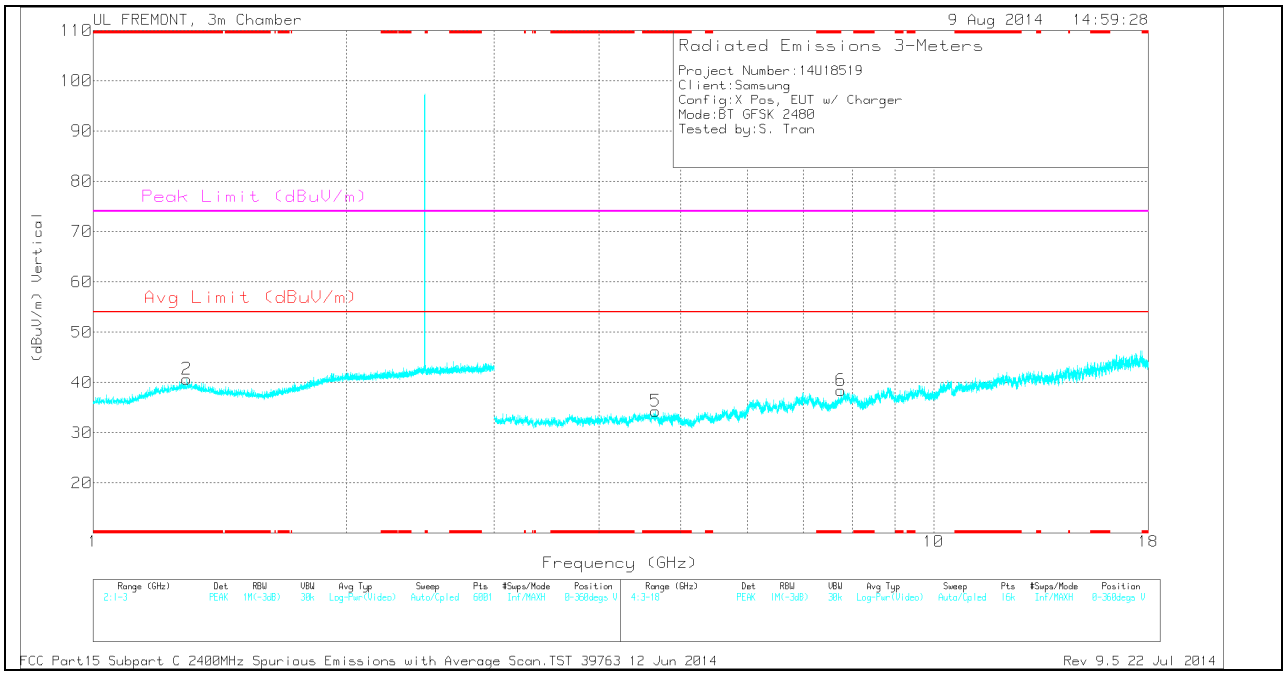
HIGH CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.265	33.74	PK	29.9	-23.8	39.84	-	-	74	-34.16	0-360	200	H
2	* 1.293	34.28	PK	30.2	-23.8	40.68	-	-	74	-33.32	0-360	100	V
5	* 4.671	30.92	PK	34.1	-30.7	34.32	-	-	74	-39.68	0-360	200	V
3	4.403	31.1	PK	33.7	-30.1	34.7	-	-	-	-	0-360	200	H
4	6.175	31.78	PK	35.3	-30	37.08	-	-	-	-	0-360	100	H
6	7.756	31.84	PK	35.8	-29.2	38.44	-	-	-	-	0-360	200	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.67	39.85	PK3	34.1	-30.7	43.25	-	-	74	-30.75	0	200	V
* 4.672	27.47	VB1T	34.1	-30.7	30.87	54	-23.13	-	-	0	200	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

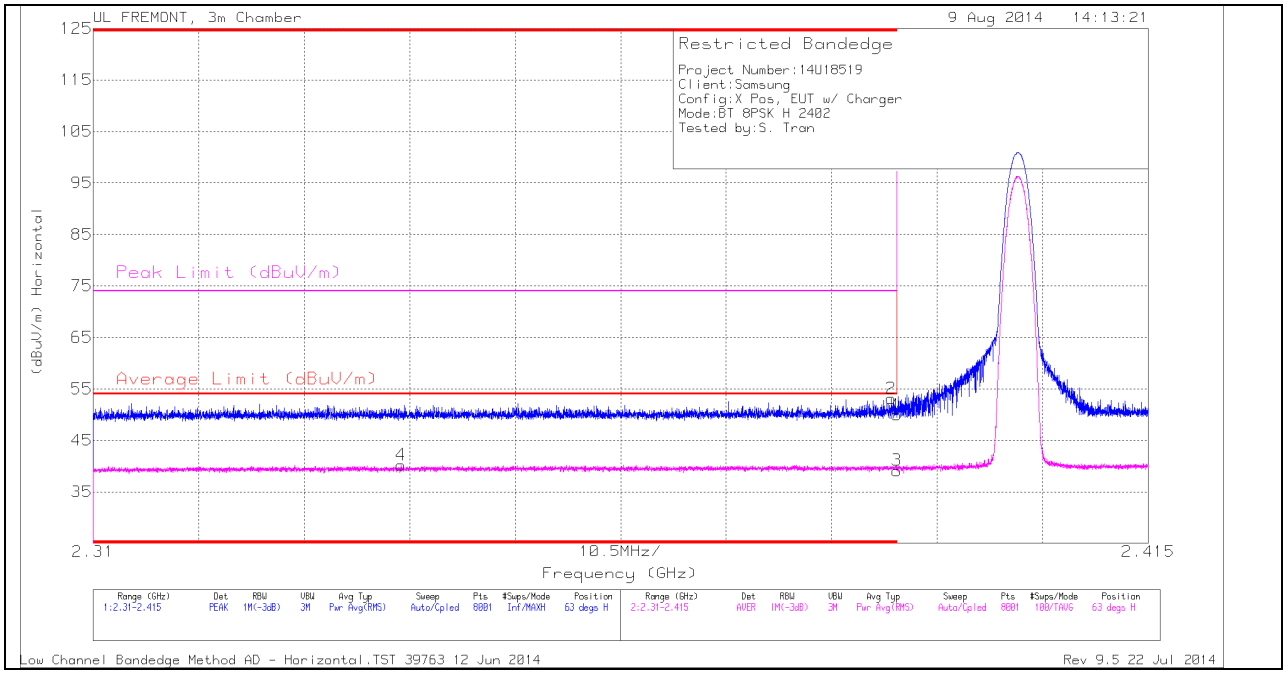
PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.2.2. ENHANCED DATA RATE 8PSK MODULATION RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

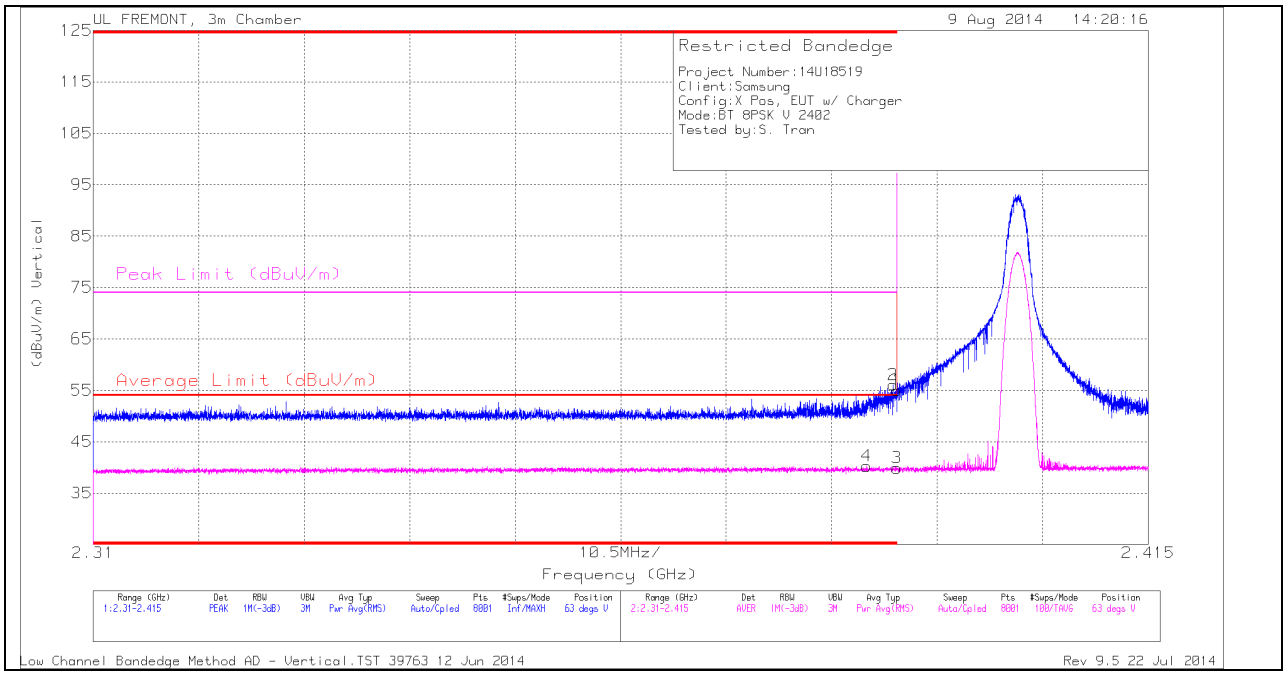
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 2.341	31.3	VB1T	32	-23.1	40.2	54	-13.8	-	-	63	304	H
2	* 2.389	44.11	PK	32.1	-23.1	53.11	-	-	74	-20.89	63	304	H
1	* 2.39	40.94	PK	32.1	-23.1	49.94	-	-	74	-24.06	63	304	H
3	* 2.39	30.14	VB1T	32.1	-23.1	39.14	54	-14.86	-	-	63	304	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 2.387	31.27	VB1T	32.1	-23.1	40.27	54	-13.73	-	-	63	304	V
1	* 2.39	46.02	PK	32.1	-23.1	55.02	-	-	74	-18.98	63	304	V
2	* 2.39	47.04	PK	32.1	-23.1	56.04	-	-	74	-17.96	63	304	V
3	* 2.39	30.89	VB1T	32.1	-23.1	39.89	54	-14.11	-	-	63	304	V

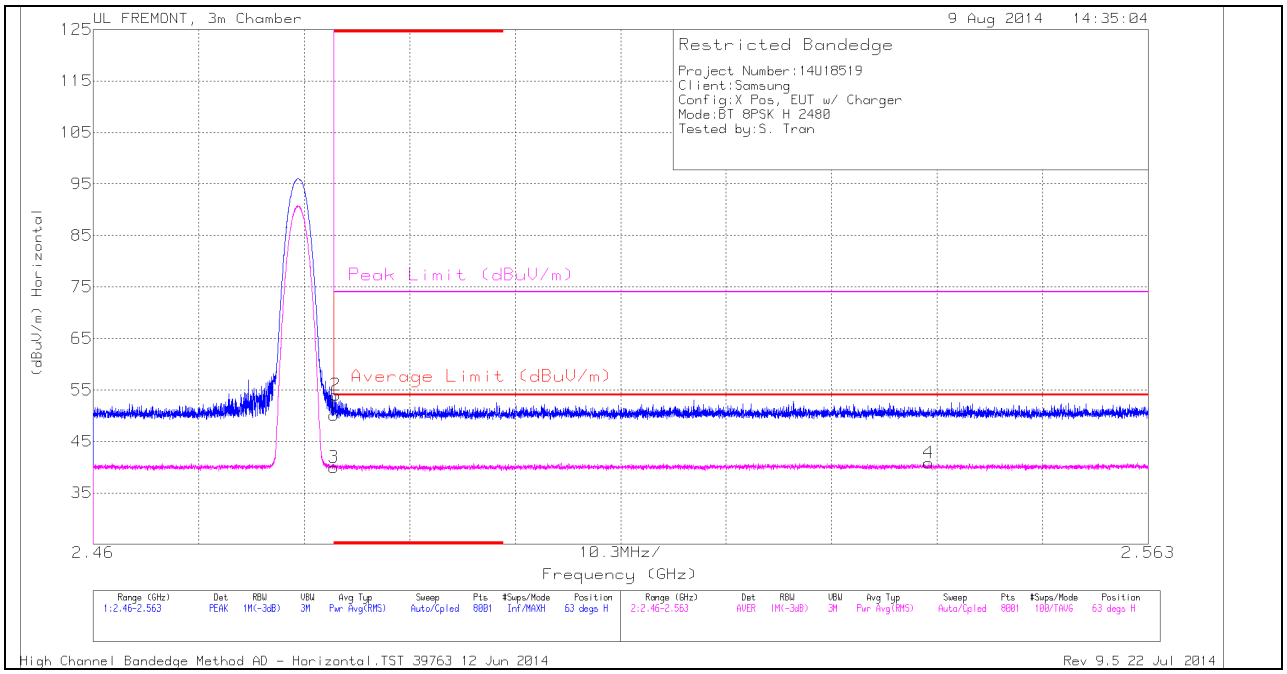
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

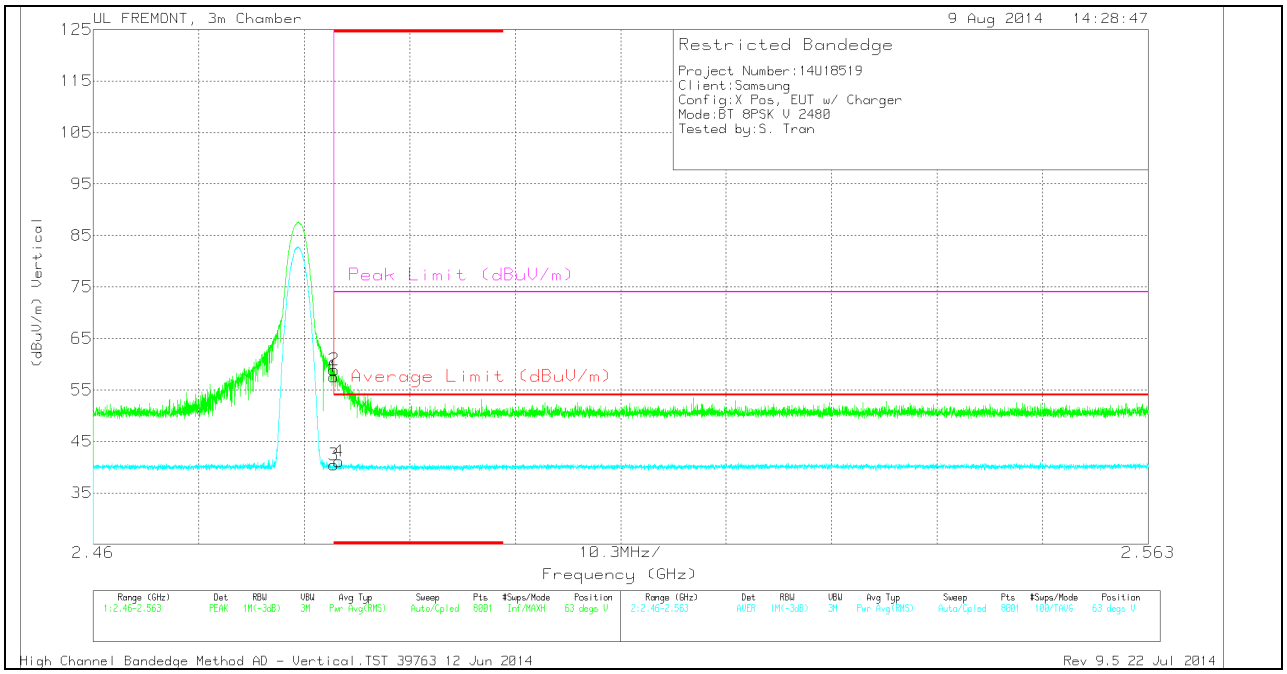
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.59	PK	32.3	-22.8	50.09	-	-	74	-23.91	63	304	H
2	* 2.484	44.52	PK	32.3	-22.8	54.02	-	-	74	-19.98	63	304	H
3	* 2.484	30.49	VB1T	32.3	-22.8	39.99	54	-14.01	-	-	63	304	H
4	2.542	31.04	VB1T	32.4	-22.6	40.84	54	-13.16	-	-	63	304	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	48.01	PK	32.3	-22.8	57.51	-	-	74	-16.49	63	304	V
2	* 2.484	49.41	PK	32.3	-22.8	58.91	-	-	74	-15.09	63	304	V
3	* 2.484	30.95	VB1T	32.3	-22.8	40.45	54	-13.55	-	-	63	304	V
4	* 2.484	31.62	VB1T	32.3	-22.8	41.12	54	-12.88	-	-	63	304	V

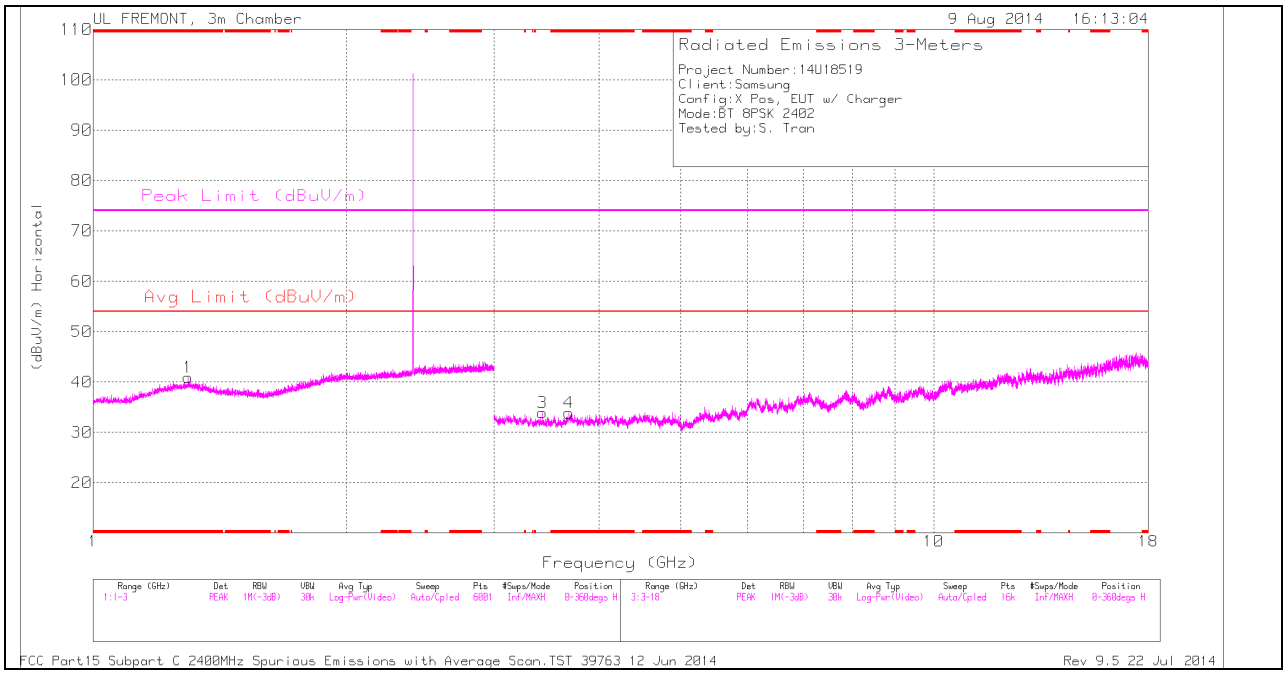
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HARMONICS AND SPURIOUS EMISSIONS

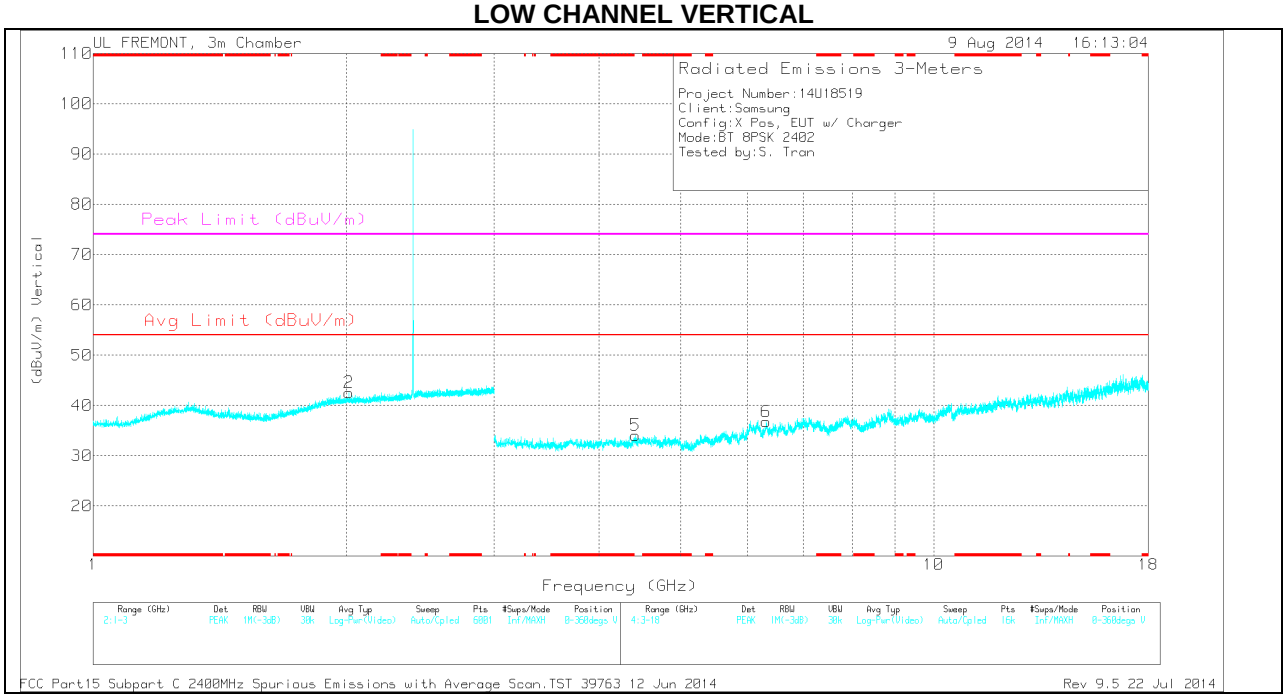
LOW CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.297	34.47	PK	30.2	-23.8	40.87	-	-	74	-33.13	0-360	100	H
4	* 3.682	31.37	PK	33.2	-30.7	33.87	-	-	74	-40.13	0-360	100	H
2	2.014	34.14	PK	31.6	-23.2	42.54	-	-	-	-	0-360	200	V
3	3.424	32.58	PK	32.9	-31.6	33.88	-	-	-	-	0-360	100	H
5	4.42	30.95	PK	33.7	-30.6	34.05	-	-	-	-	0-360	200	V
6	6.323	30.67	PK	35.4	-29.3	36.77	-	-	-	-	0-360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.681	40.22	PK3	33.2	-30.7	42.72	-	-	74	-31.28	0	100	H
* 3.683	27.79	VB1T	33.2	-30.7	30.29	54	-23.71	-	-	0	100	H

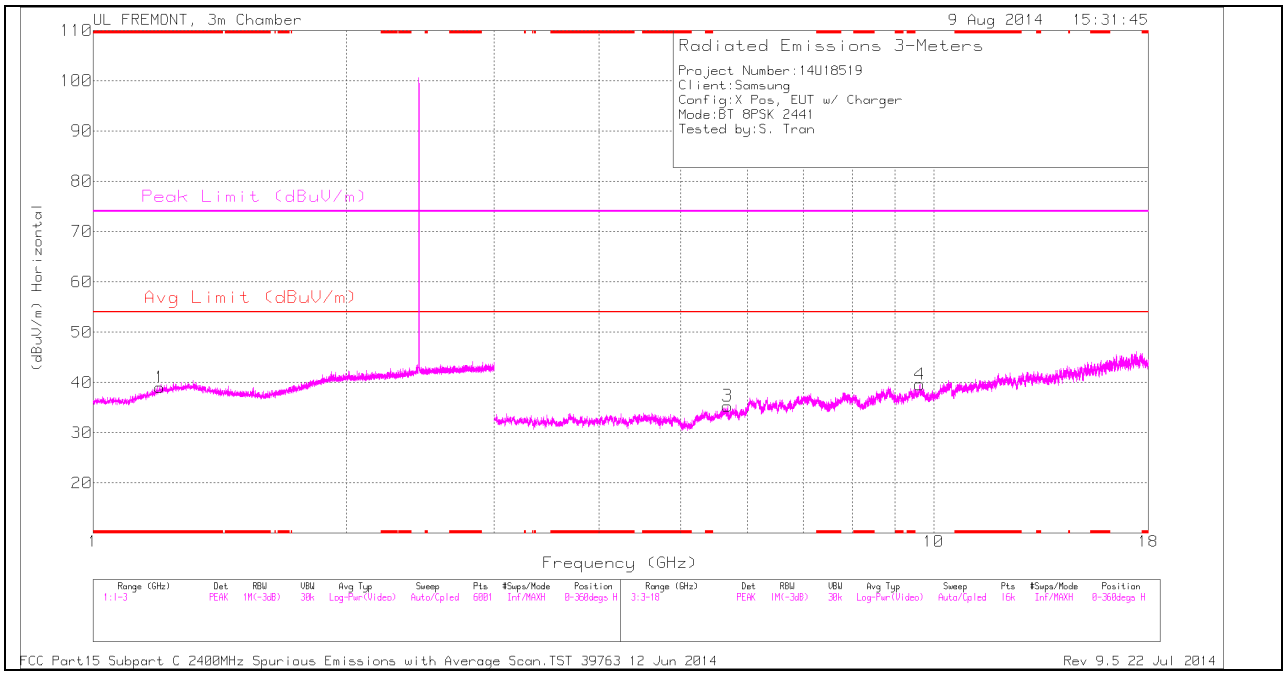
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

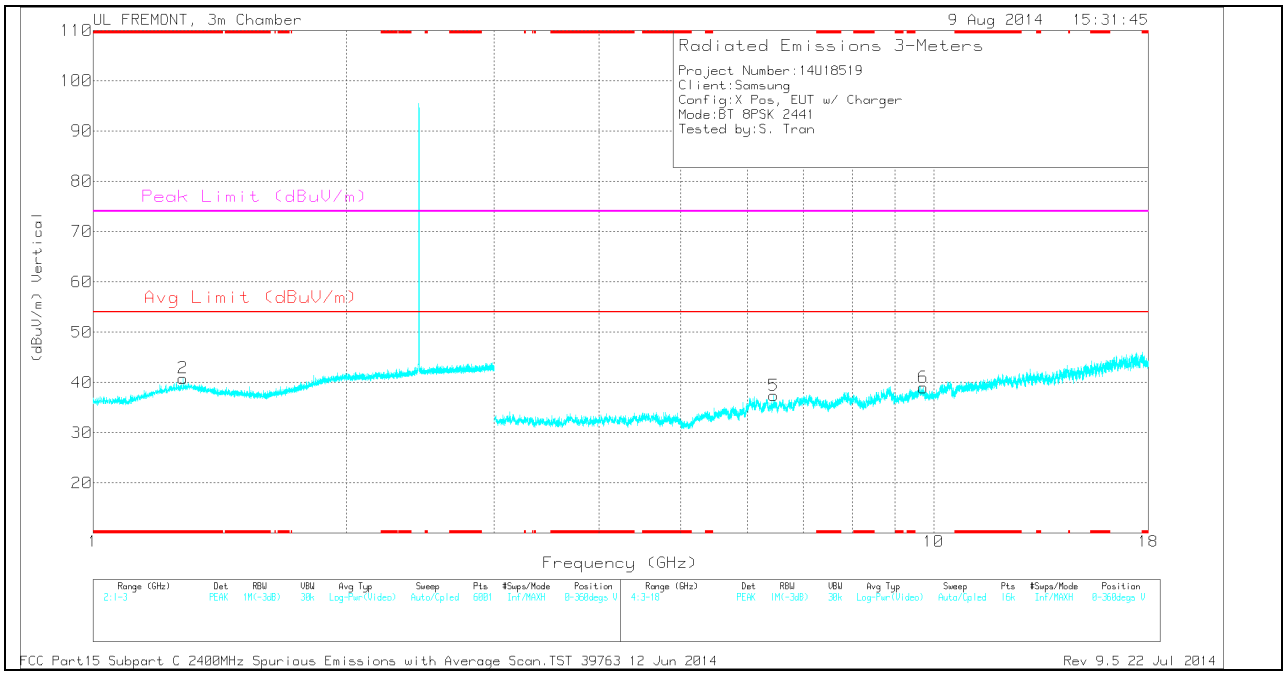
MID CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.2	33.61	PK	29.2	-23.8	39.01	-	-	74	-34.99	0-360	200	H
2	* 1.279	34.64	PK	30	-23.8	40.84	-	-	74	-33.16	0-360	100	V
3	5.685	30.93	PK	34.8	-30.4	35.33	-	-	-	-	0-360	100	H
5	6.448	32.1	PK	35.5	-30.2	37.4	-	-	-	-	0-360	200	V
4	9.627	28.2	PK	36.7	-25.3	39.6	-	-	-	-	0-360	200	H
6	9.721	27.58	PK	36.9	-25.5	38.98	-	-	-	-	0-360	200	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.281	43.21	PK3	30	-23.8	49.41	-	-	74	-24.59	0	100	V
* 1.281	30.09	VB1T	30	-23.8	36.29	54	-17.71	-	-	0	100	V

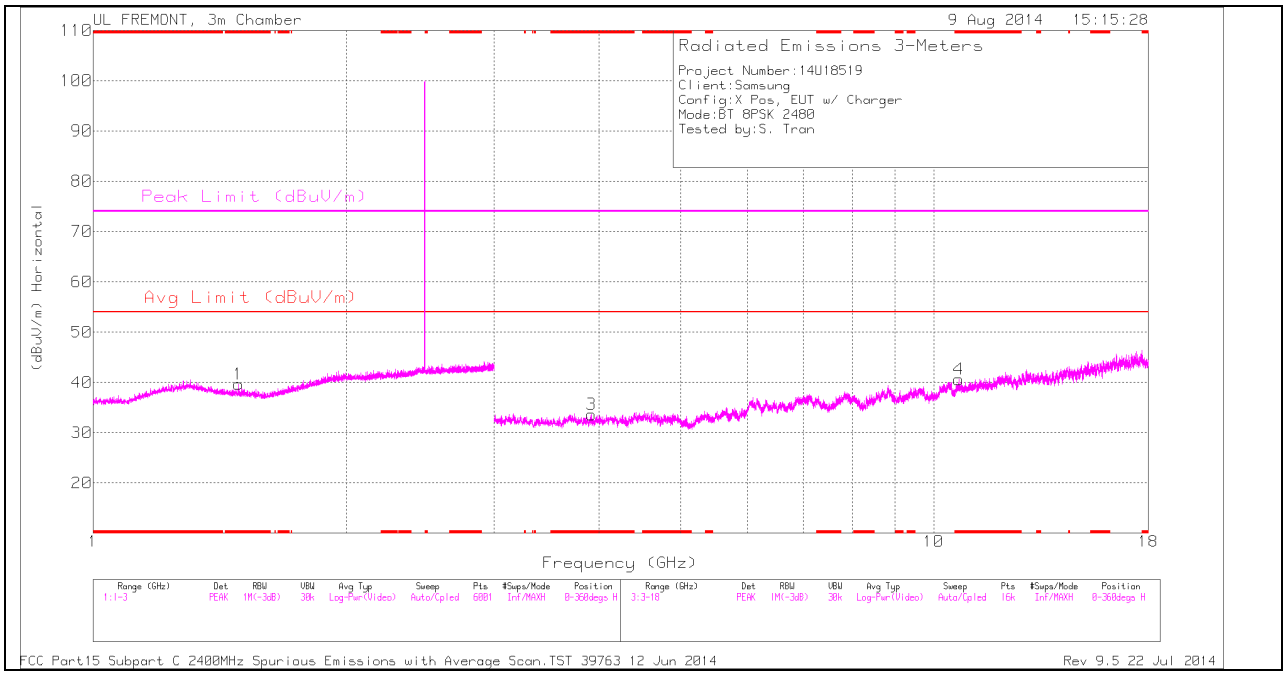
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

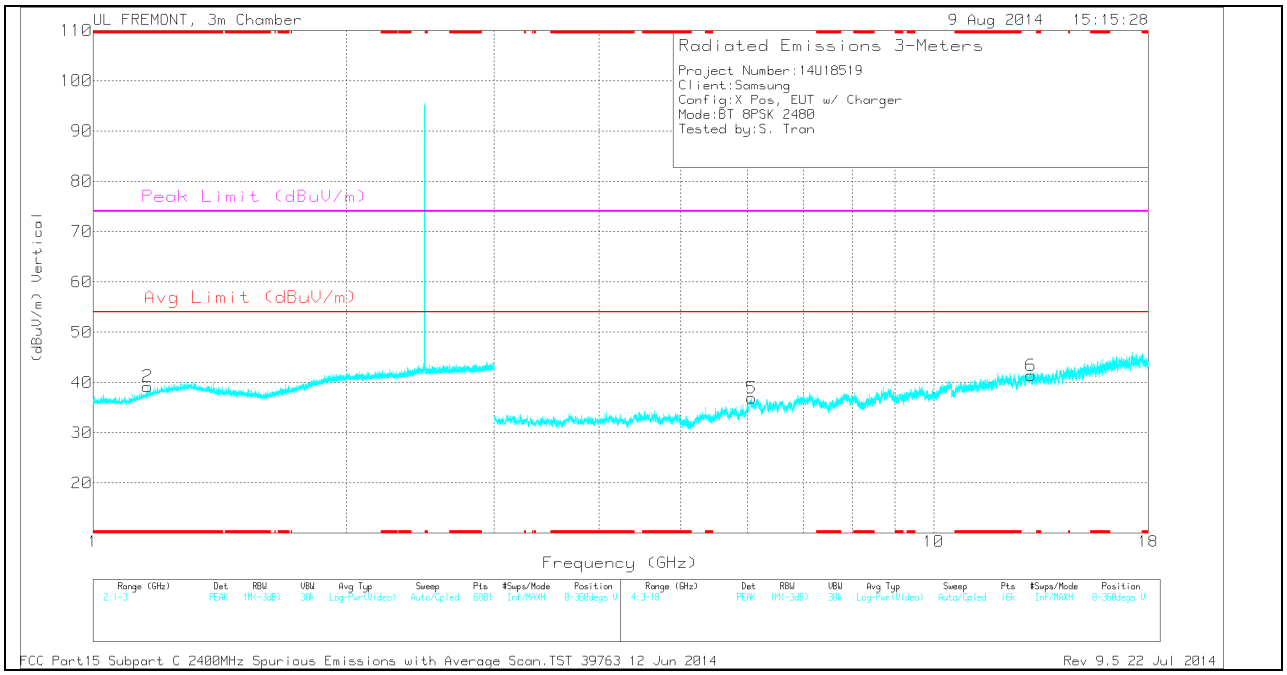
HIGH CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.49	34.63	PK	28.6	-23.6	39.63	-	-	74	-34.37	0-360	100	H
2	* 1.161	34.5	PK	28.5	-23.8	39.2	-	-	74	-34.8	0-360	100	V
3	* 3.916	31.51	PK	33.3	-31.2	33.61	-	-	74	-40.39	0-360	200	H
4	* 10.711	27.71	PK	37.9	-25	40.61	-	-	74	-33.39	0-360	100	H
5	6.078	30.58	PK	35.3	-29	36.88	-	-	-	-	0-360	100	V
6	13.056	29.61	PK	39.1	-27.3	41.41	-	-	-	-	0-360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 10.711	36.56	PK3	37.9	-25	49.46	-	-	74	-24.54	0	100	H
* 10.713	23.68	VB1T	37.9	-25	36.58	54	-17.42	-	-	0	100	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

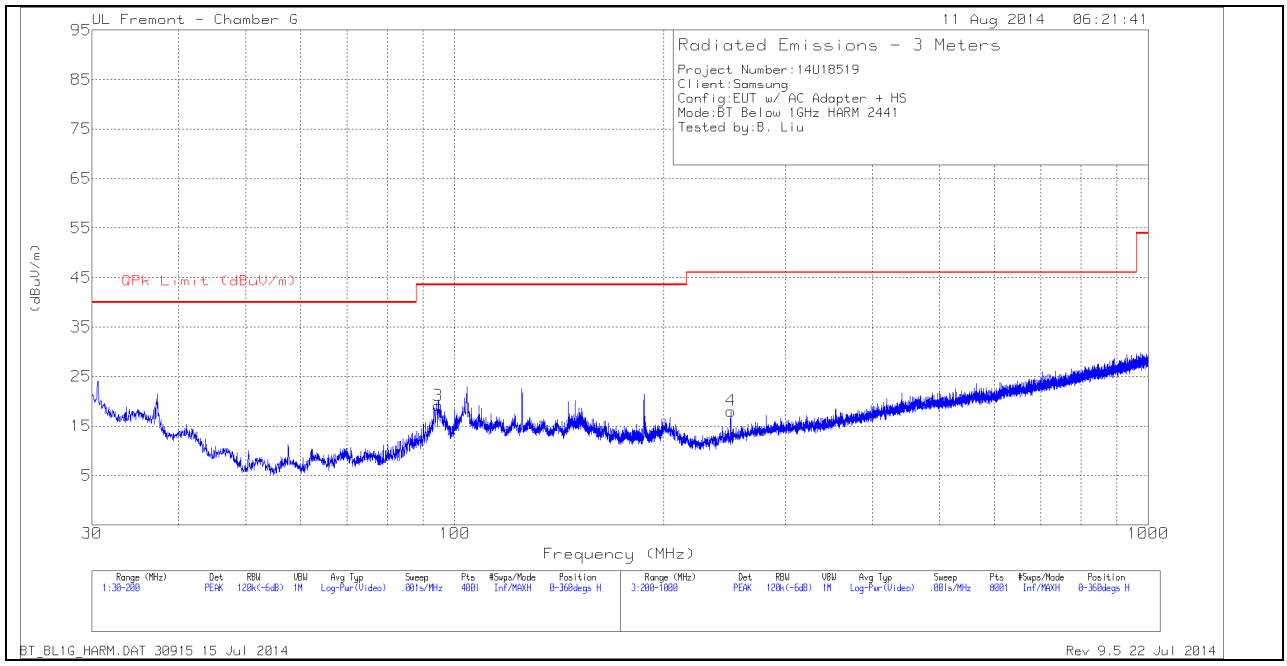
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.3. WORST-CASE BELOW 1 GHz

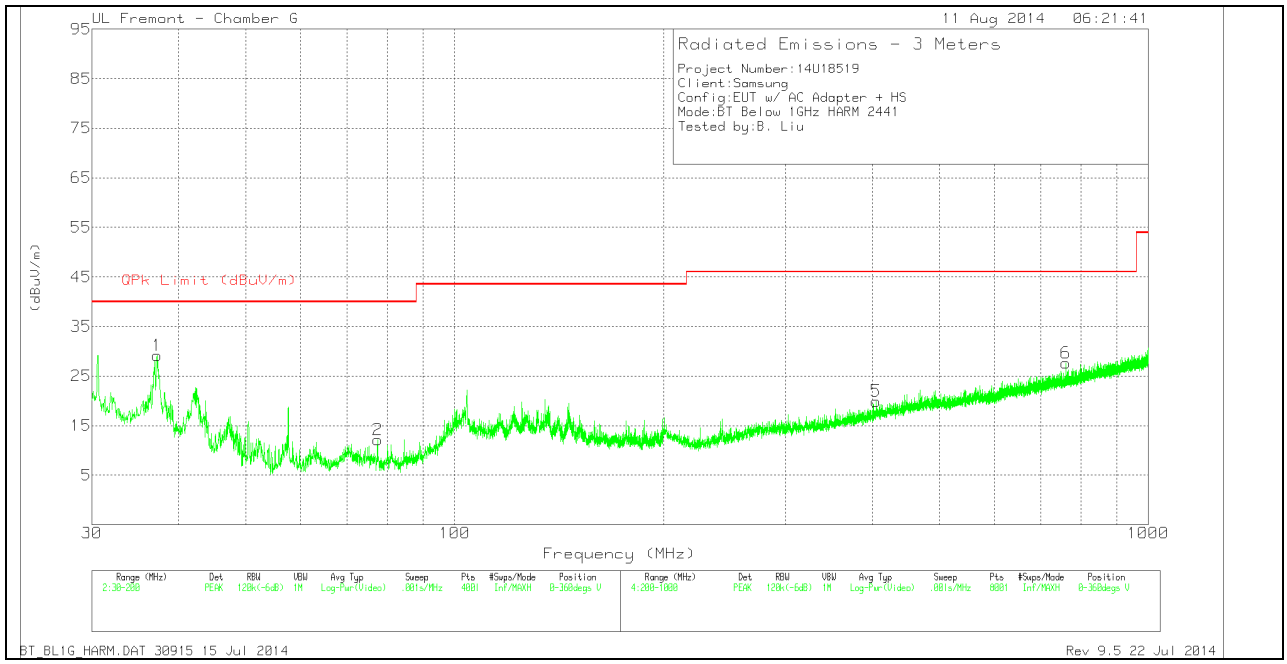
GFSK SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

BELOW 1 GHz TABLE

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 250	32.05	PK	14.9	-28.9	18.05	46.02	-27.97	0-360	100	H
5	* 405	29.25	PK	18.7	-28	19.95	46.02	-26.07	0-360	301	V
1	37.225	40.91	PK	19.1	-30.9	29.11	40	-10.89	0-360	100	V
2	77.43	31.85	PK	10.6	-30.3	12.15	40	-27.85	0-360	100	V
3	94.685	37.67	PK	11.6	-30.2	19.07	43.52	-24.45	0-360	201	H
6	761	30.41	PK	23.7	-26.5	27.61	46.02	-18.41	0-360	301	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

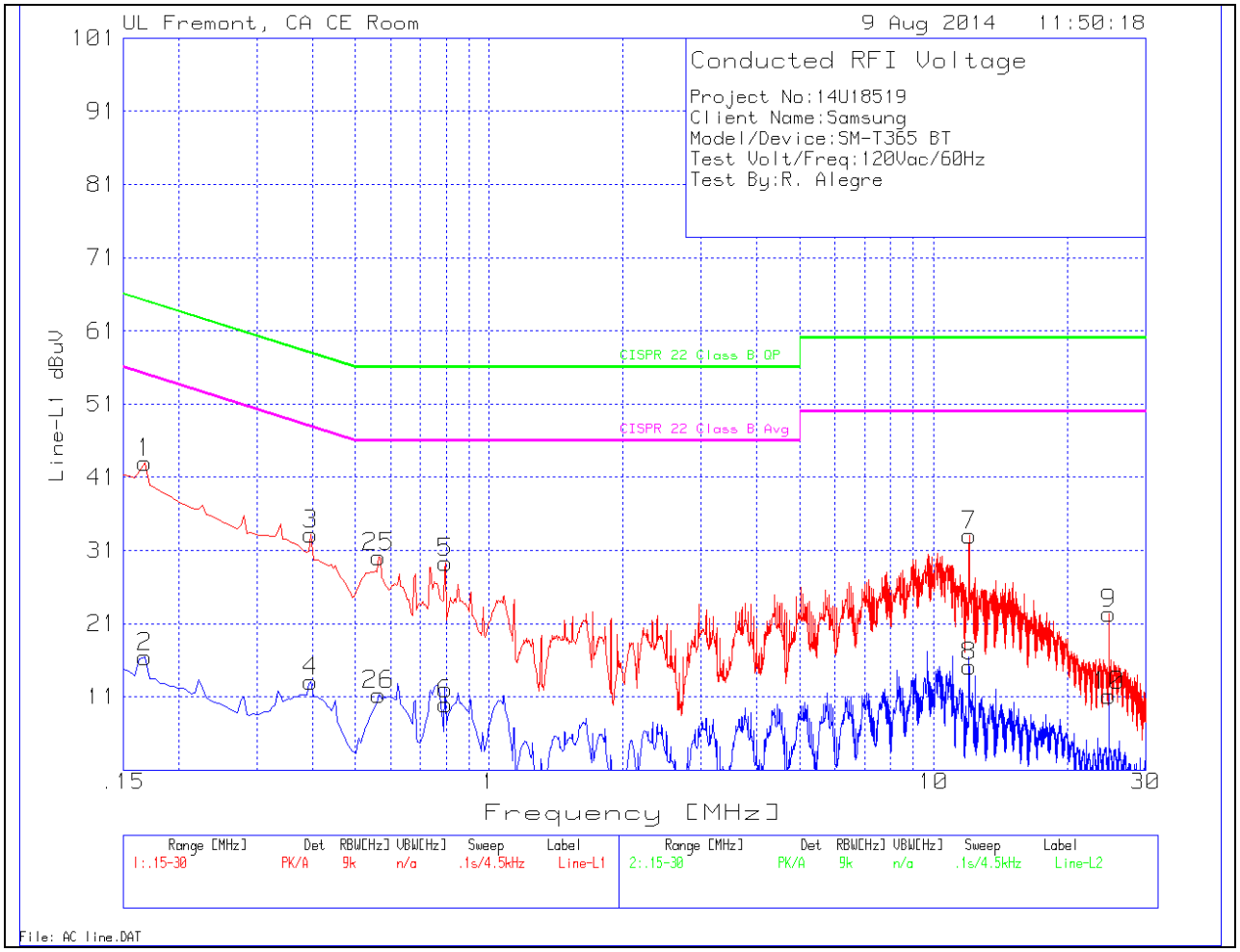
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.168	41.8	PK	1.2	0	43	65.1	-22.1	-	-
2	.168	15.2	Av	1.2	0	16.4	-	-	55.1	-38.7
3	.3975	32.8	PK	.4	0	33.2	57.9	-24.7	-	-
4	.3975	12.72	Av	.4	0	13.12	-	-	47.9	-34.78
25	.564	29.85	PK	.3	0	30.15	56	-25.85	-	-
26	.564	10.97	Av	.3	0	11.27	-	-	46	-34.73
5	.798	29.07	PK	.3	0	29.37	56	-26.63	-	-
6	.798	9.73	Av	.3	0	10.03	-	-	46	-35.97
7	12.0165	32.71	PK	.2	.2	33.11	60	-26.89	-	-
8	12.0165	14.76	Av	.2	.2	15.16	-	-	50	-34.84
9	24.783	21.8	PK	.3	.3	22.4	60	-37.6	-	-
10	24.783	10.52	Av	.3	.3	11.12	-	-	50	-38.88

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LINE 2 PLOT

LINE 2 RESULTS

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
11	.1635	48.7	PK	1.3	0	50	65.3	-15.3	-	-
12	.1635	19.08	Av	1.3	0	20.38	-	-	55.3	-34.92
13	.222	44.95	PK	.9	0	45.85	62.7	-16.85	-	-
14	.222	16	Av	.9	0	16.9	-	-	52.7	-35.8
15	.7935	28.66	PK	.3	0	28.96	56	-27.04	-	-
16	.7935	4.99	Av	.3	0	5.29	-	-	46	-40.71
17	1.0995	29.76	PK	.3	.1	30.16	56	-25.84	-	-
18	1.0995	11.31	Av	.3	.1	11.71	-	-	46	-34.29
19	9.249	27.09	PK	.2	.1	27.39	60	-32.61	-	-
20	9.249	4.7	Av	.2	.1	5	-	-	50	-45
21	9.8205	26.8	PK	.2	.2	27.2	60	-32.8	-	-
22	9.8205	6	Av	.2	.2	6.4	-	-	50	-43.6
23	15.162	25.7	PK	.3	.2	26.2	60	-33.8	-	-
24	15.162	5.8	Av	.3	.2	6.3	-	-	50	-43.7

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.