



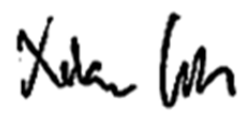
# FCC PART 15, SUBPART C TEST REPORT

For

**Roku Inc.**

150 Winchester Circle,  
Los Gatos, CA 95032, USA

**FCC ID: TC2-R1023**

|                                                                                                                                            |                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Original Report                                                                                                     | <b>Model:</b><br>9030X                                                               |
| <b>Prepared By:</b> Vincent Licata<br>Test Engineer                                                                                        |  |
| <b>Report Number:</b> R1808081-247 DSS                                                                                                     |                                                                                      |
| <b>Report Date:</b> 2018-09-17                                                                                                             |                                                                                      |
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**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by A2LA\*, NIST, or any agency of the Federal Government.

\* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “\*” (Rev. 0)

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**DOCUMENT REVISION HISTORY**

| Revision Number | Report Number    | Description of Revision | Date of Revision |
|-----------------|------------------|-------------------------|------------------|
| 0               | R1808081-247 DSS | Original Report         | 2018-09-17       |

## 1 General Description

### 1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Roku Inc.*, and their product model: 9030X, FCC ID: TC2-R1023 or the “EUT” as referred to in this report.

### 1.2 Objective

This report is prepared on behalf of *Roku Inc.*, in accordance with Part 2, Subpart J, and Part 15 and C of the Federal Communication Commission’s rules.

The objective is to determine compliance with FCC Part 15.247 for Output Power, Antenna Requirements, RF Exposure, 20 dB Bandwidth, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions, Number of Hopping Channels, Dwell Time, and Hopping Channel Separation.

### 1.3 Related Submittal(s)/Grant(s)

FCC 15.407 Report: R1808081-407

FCC 15.247 Report: R1808081-247 DTS

### 1.4 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

### 1.5 Measurement Uncertainty

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

| Parameter                         | Measurement uncertainty |
|-----------------------------------|-------------------------|
| Occupied Channel Bandwidth        | ±5 %                    |
| RF output power, conducted        | ±0.57 dB                |
| Power Spectral Density, conducted | ±1.48dB                 |
| Unwanted Emissions, conducted     | ±1.57dB                 |
| All emissions, radiated           | ±4.0 dB                 |
| AC power line Conducted Emission  | ±2.0 dB                 |
| Temperature                       | ±2 ° C                  |
| Humidity                          | ±5 %                    |
| DC and low frequency voltages     | ±1.0 %                  |
| Time                              | ±2 %                    |
| Duty Cycle                        | ±3 %                    |

## 1.6 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

## 1.7 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

**A- An independent, 3<sup>rd</sup>-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3279.02),** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (\*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

**B- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.03)** to certify

- For the USA (Federal Communications Commission):

- 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
- 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
- 3- All Telephone Terminal Equipment within FCC Scope C.

- For the Canada (Industry Canada):

- 1 All Scope 1-Licence-Exempt Radio Frequency Devices;
- 2 All Scope 2-Licensed Personal Mobile Radio Services;
- 3 All Scope 3-Licensed General Mobile and Fixed Radio Services;
- 4 All Scope 4-Licensed Maritime and Aviation Radio Services;
- 5 All Scope 5-Licensed Fixed Microwave Radio Services
- 6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.

- For Singapore (Info-Communications Development Authority (IDA)):

- 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2

2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
  - 1 All Radio Equipment, per KHCA 10XX-series Specifications;
  - 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  - 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  - 1 MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
  - 2 Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

**C- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.01) to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:**

- 1 Electronics and Office Equipment:
  - for Telephony (ver. 3.0)
  - for Audio/Video (ver. 3.0)
  - for Battery Charging Systems (ver. 1.1)
  - for Set-top Boxes and Cable Boxes (ver. 4.1)
  - for Televisions (ver. 6.1)
  - for Computers (ver. 6.0)
  - for Displays (ver. 6.0)
  - for Imaging Equipment (ver. 2.0)
  - for Computer Servers (ver. 2.0)
- 2 Commercial Food Service Equipment
  - for Commercial Dishwashers (ver. 2.0)
  - for Commercial Ice Machines (ver. 2.0)
  - for Commercial Ovens (ver. 2.1)
  - for Commercial Refrigerators and Freezers
- 3 Lighting Products
  - For Decorative Light Strings (ver. 1.5)
  - For Luminaires (including sub-components) and Lamps (ver. 1.2)
  - For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
  - For Integral LED Lamps (ver. 1.4)
- 4 Heating, Ventilation, and AC Products
  - for Residential Ceiling Fans (ver. 3.0)
  - for Residential Ventilating Fans (ver. 3.2)
- 5 Other
  - For Water Coolers (ver. 3.0)

**D- A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:**

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;

- Canada: (Industry Canada - ISED) Foreign Certification Body – FCB – APEC Tel MRA -Phase I and Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - o BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - o NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - o EMC Directive 2004/108/EC US-EU EMC and Telecom MRA CAB
  - o Radio and Teleterminal Equipment (Rand TTE) Directive 1995/5/EC  
US -EU EMC and Telecom MRA CAB (NB)
  - o Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - o Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA)  
APEC Tel MRA -Phase I and Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Development Authority - IDA) APEC Tel MRA -Phase I and Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - o ENERGY STAR Recognized Test Laboratory – US EPA
  - o Telecommunications Certification Body (TCB) – US FCC;
  - o Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

## 2 System Test Configuration

### 2.1 Justification

The EUT was configured for testing in accordance to ANSI C63.10-2013.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring peak power across all data rates bandwidths, and modulations.

### 2.2 EUT Exercise Software

The test firmware used was Tera Term and commands provided by *Roku Inc.*, the software is compliant with the standard requirements being tested against.

| Modulation     | Frequency (MHz) | Power Setting |
|----------------|-----------------|---------------|
| GFSK           | 2402            | 23            |
|                | 2441            | 23            |
|                | 2480            | 23            |
| $\pi/4$ -DQPSK | 2402            | 23            |
|                | 2441            | 23            |
|                | 2480            | 23            |
| 8DPSK          | 2402            | 23            |
|                | 2441            | 23            |
|                | 2480            | 23            |

### 2.3 Duty Cycle Correction Factor

According to ANSI C63.10-2013 section 7.5:

Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 s (100 ms). In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined during a 0.1 s interval. The following procedure is an example of how the average value may be determined. The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation as shown in following equation:

$$\delta(\text{dB}) = 20\log(\Delta)$$

where

$\delta$  is the duty cycle correction factor (dB)

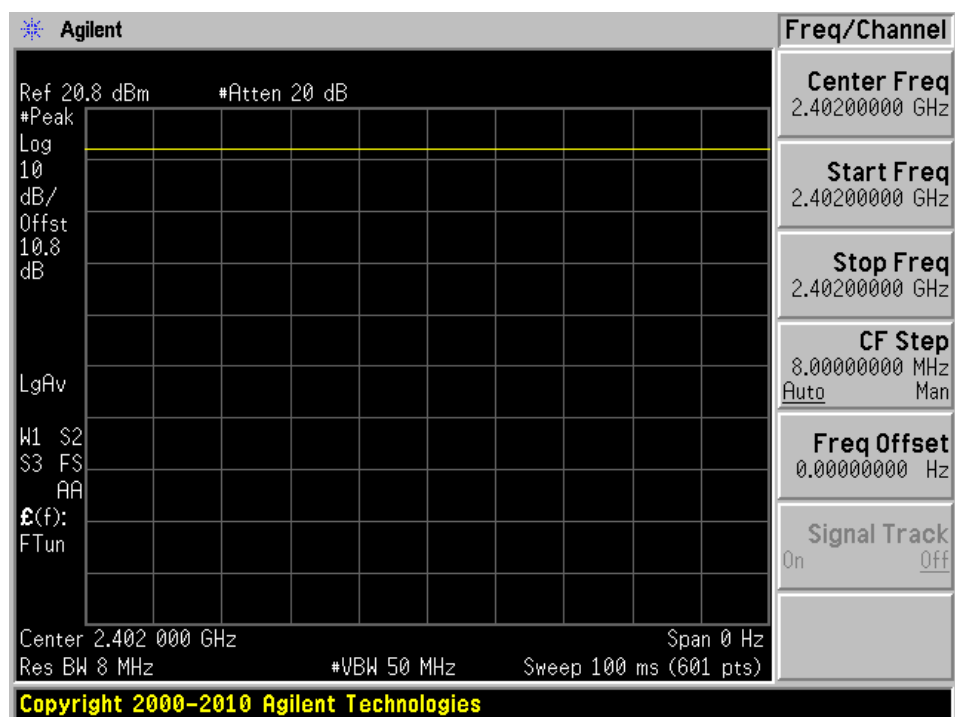
$\Delta$  is the duty cycle (dimensionless)

| Radio Mode     | On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) |
|----------------|--------------|-------------|----------------|-----------------------------------|
| GFSK           | 100          | 100         | 100            | 0                                 |
| $\pi/4$ -DQPSK | 100          | 100         | 100            | 0                                 |
| 8DPSK          | 100          | 100         | 100            | 0                                 |

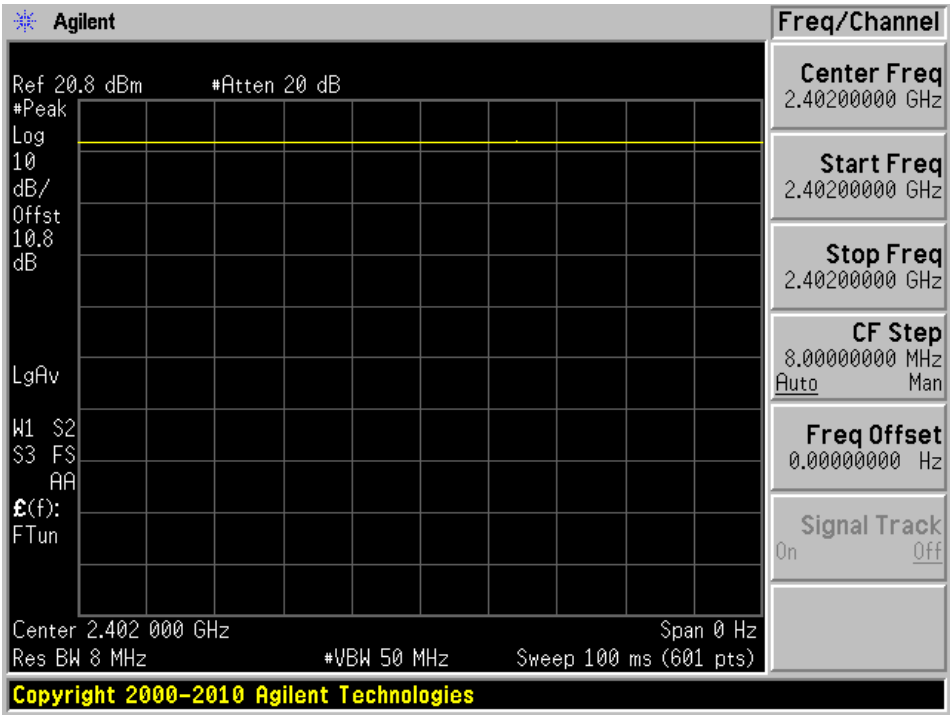
Duty Cycle = On Time (ms) / Period (ms)

Please refer to the following plots.

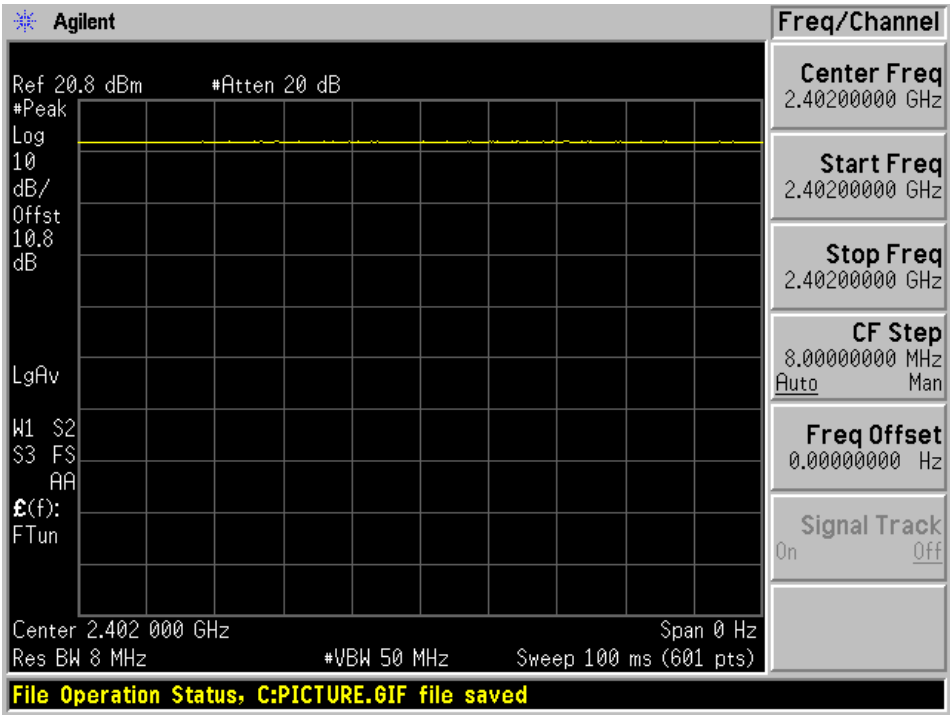
### GFSK Mode



$\pi/4$ -DQPSK



8DPSK



## 2.4 Equipment Modifications

N/A

## 2.5 Local Support Equipment

| Manufacturer | Description | Model          | Serial Number |
|--------------|-------------|----------------|---------------|
| Dell         | Laptop      | Latitude E6410 | 3CKRAQ1       |

## 2.6 Support Equipment

| Manufacturer | Description | Model   |
|--------------|-------------|---------|
| Roku         | Debug Board | Unknown |

## 2.7 Interface Ports and Cabling

| Cable Description        | Length (m) | To     | From |
|--------------------------|------------|--------|------|
| USB 2.0 A-Male to B-Male | 2 m        | Laptop | EUT  |
| RF Cable                 | < 1 m      | EUT    | PSA  |

### 3 Summary of Test Results

Results reported relate only to the product tested.

| FCC Rules                             | Description of Test                      | Results   |
|---------------------------------------|------------------------------------------|-----------|
| §15.203                               | Antenna Requirement                      | Compliant |
| §15.207                               | AC Line Conducted Emissions              | Compliant |
| §2.1091, §15.247(i)                   | RF Exposure                              | Compliant |
| §2.1051, §15.247 (d)                  | Spurious Emissions at Antenna Port       | Compliant |
| §2.1053, §15.205, §15.209, §15.247(d) | Radiated Spurious Emissions              | Compliant |
| §15.247(a)(1)                         | 20 dB and 99% Emission Bandwidth         | Compliant |
| §15.247(b)(1)                         | Maximum Peak Output Power                | Compliant |
| §15.247(d)                            | 100 kHz Bandwidth of Frequency Band Edge | Compliant |
| §15.247(a)(1)(iii)                    | Number of Hopping Channels               | Compliant |
| §15.247(a)(1)                         | Hopping Channel Separation               | Compliant |
| §15.247(a)(1)(iii)                    | Dwell Time                               | Compliant |

## 4 FCC §15.203 - Antenna Requirements

### 4.1 Applicable Standards

According to FCC §15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 4.2 Antenna Description

The antennas used by the EUT are permanent attached antennas.

| Antenna usage       | Frequency Range (MHz) | Maximum Antenna Gain (dBi) |
|---------------------|-----------------------|----------------------------|
| Wi-Fi and Bluetooth | 2400-2483.5           | 1.0                        |
| Wi-Fi               | 5000-6000             | 1.0                        |

## 5 FCC §2.1091 & §15.247(i) - RF Exposure

### 5.1 Applicable Standards

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

#### Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz)                               | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minutes) |
|-----------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                          |
| 0.3-1.34                                            | 614                           | 1.63                          | * (100)                             | 30                       |
| 1.34-30                                             | 824/f                         | 2.19/f                        | * (180/f <sup>2</sup> )             | 30                       |
| 30-300                                              | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300-1500                                            | /                             | /                             | f/1500                              | 30                       |
| 1500-100,000                                        | /                             | /                             | 1.0                                 | 30                       |

f = frequency in MHz

\* = Plane-wave equivalent power density

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF field.

### 5.2 MPE Prediction

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

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

Where: S = power density

P = power input to antenna

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

R = distance to the center of radiation of the antenna

## 5.3 MPE Results

### 2.4 GHz Wi-Fi

|                                                                                             |                 |
|---------------------------------------------------------------------------------------------|-----------------|
| <u>Maximum output power at antenna input terminal (dBm):</u>                                | <u>23.06</u>    |
| <u>Maximum output power at antenna input terminal (mW):</u>                                 | <u>202.3019</u> |
| <u>Prediction distance (cm):</u>                                                            | <u>20</u>       |
| <u>Prediction frequency (MHz):</u>                                                          | <u>2412</u>     |
| <u>Maximum Antenna Gain, typical (dBi):</u>                                                 | <u>1.0</u>      |
| <u>Maximum Antenna Gain (numeric):</u>                                                      | <u>1.258925</u> |
| <u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>                | <u>0.050668</u> |
| <u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u> | <u>1.0</u>      |

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.050668 mW/cm<sup>2</sup>. Limit is 1.0 mW/cm<sup>2</sup>.

### 2.4 GHz Classic Bluetooth

|                                                                                             |                 |
|---------------------------------------------------------------------------------------------|-----------------|
| <u>Maximum peak output power at antenna input terminal (dBm):</u>                           | <u>12.87</u>    |
| <u>Maximum peak output power at antenna input terminal (mW):</u>                            | <u>19.36422</u> |
| <u>Prediction distance (cm):</u>                                                            | <u>20</u>       |
| <u>Prediction frequency (MHz):</u>                                                          | <u>2441</u>     |
| <u>Maximum Antenna Gain, typical (dBi):</u>                                                 | <u>1.0</u>      |
| <u>Maximum Antenna Gain (numeric):</u>                                                      | <u>1.258925</u> |
| <u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>                | <u>0.004850</u> |
| <u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u> | <u>1.0</u>      |

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.004850 mW/cm<sup>2</sup>. Limit is 1.0 mW/cm<sup>2</sup>.

### 5 GHz Wi-Fi

|                                                                                             |                  |
|---------------------------------------------------------------------------------------------|------------------|
| <u>Maximum output power at antenna input terminal (dBm):</u>                                | <u>19.04</u>     |
| <u>Maximum output power at antenna input terminal (mW):</u>                                 | <u>80.16781</u>  |
| <u>Prediction distance (cm):</u>                                                            | <u>20</u>        |
| <u>Prediction frequency (MHz):</u>                                                          | <u>5825</u>      |
| <u>Maximum Antenna Gain, typical (dBi):</u>                                                 | <u>1.0</u>       |
| <u>Maximum Antenna Gain (numeric):</u>                                                      | <u>1.258925</u>  |
| <u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>                | <u>0.0200785</u> |
| <u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u> | <u>1.0</u>       |

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0200785 mW/cm<sup>2</sup>. Limit is 1.0 mW/cm<sup>2</sup>.

**Worst case colocation 2.4 GHz/5GHz Wi-Fi and 2.4 GHz Classic Bluetooth.**

| Frequency Band            | Max Conducted Power(dBm) | Evaluated Distance (cm) | Worst-Case MPE (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) | Worst-Case MPE Ratios | Sum of MPE Ratios | Limit |
|---------------------------|--------------------------|-------------------------|--------------------------------------|---------------------------------|-----------------------|-------------------|-------|
| <b>Worst Case</b>         |                          |                         |                                      |                                 |                       |                   |       |
| 2.4 GHz WiFi              | 23.06                    | 20                      | 0.050668                             | 1.0                             | 5.0668%               | 5.5518%           | 100%  |
| 2.4 GHz Classic Bluetooth | 12.87                    | 20                      | 0.004850                             | 1.0                             | 0.485%                |                   |       |
| 5 GHz WiFi                | 19.04                    | 20                      | 0.0200785                            | 1.0                             | 2.00785%              | 2.49285%          | 100%  |
| 2.4 GHz Classic Bluetooth | 12.87                    | 20                      | 0.0048500                            | 1.0                             | 0.485%                |                   |       |

## 6 FCC §15.207 - AC Line Conducted Emissions

### 6.1 Applicable Standards

As per FCC §15.207 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

| Frequency of Emission<br>(MHz) | Conducted Limit (dBuV)    |                           |
|--------------------------------|---------------------------|---------------------------|
|                                | Quasi-Peak                | Average                   |
| 0.15-0.5                       | 66 to 56 <sup>Note1</sup> | 56 to 46 <sup>Note2</sup> |
| 0.5-5                          | 56                        | 46                        |
| 5-30                           | 60                        | 50                        |

*Note1: Decreases with the logarithm of the frequency.*

*Note2: A linear average detector is required*

### 6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used were FCC §15.207 limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

### 6.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data were recorded in the peak, quasi-peak, and average detection mode. Quasi-Peak readings are distinguished with a "QP." Average readings are distinguished with an "Ave".

#### 6.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = A_i + CL + \text{Atten}$$

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

#### 6.5 Test Equipment List and Details

| Manufacturer              | Description                     | Model No.                   | Serial No. | Calibration Date | Calibration Interval |
|---------------------------|---------------------------------|-----------------------------|------------|------------------|----------------------|
| Rohde & Schwarz           | Receiver, EMI Test              | ESCI 1166.5950.03           | 100338     | 2018-07-05       | 2 years              |
| Rohde & Schwarz           | Impulse Limiter                 | ESH3-Z2                     | 101964     | 2018-07-27       | 1 year               |
| Solar Electronics Company | High Pass Filter                | Type 7930-100               | 7930150203 | 2018-02-28       | 1 year               |
| Suirong                   | 30 ft conductive emission cable | LMR 400                     | -          | N/R              | N/A                  |
| FCC                       | LISN                            | FCC-LISN-50-25-2-10-CISPR16 | 160129     | 2018-04-04       | 1 year               |
| Vasona                    | Test software                   | V6.0 build 11               | 10400213   | N/R              | N/R                  |
| Rohde & Schwarz           | Receiver, EMI Test              | ESCI 1166.5950.03           | 100338     | 2018-07-05       | 2 years              |

**Statement of Traceability:** *BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) “A2LA Policy on Metrological Traceability”.*

#### 6.6 Test Environmental Conditions

|                    |            |
|--------------------|------------|
| Temperature:       | 23° C      |
| Relative Humidity: | 42 %       |
| ATM Pressure:      | 101.31 kPa |

*The testing was performed by Vincent Licata on 2018-08-16 in 5 meter chamber 3.*

## 6.7 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC 15C standard's conducted emissions limits, with the margin reading of:

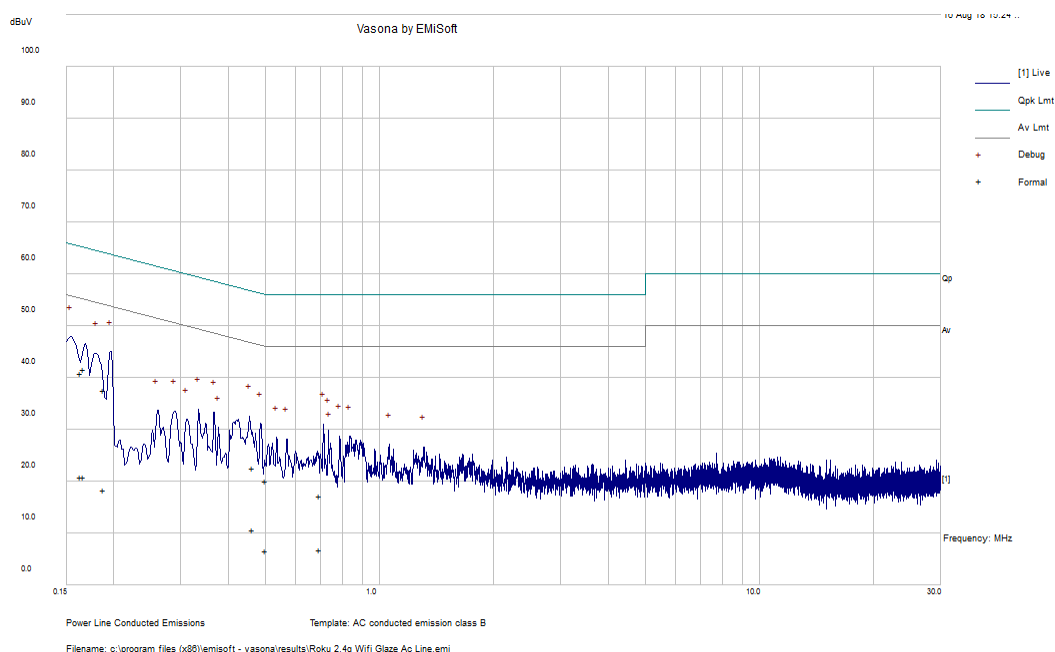
Colocation 2.4 GHz Wi-Fi and 2.4 GHz Classic Bluetooth

| Connection: AC/DC adapter connected to 120 V/60 Hz, AC |                    |                                  |                |
|--------------------------------------------------------|--------------------|----------------------------------|----------------|
| Margin<br>(dB)                                         | Frequency<br>(MHz) | Conductor Mode<br>(Line/Neutral) | Range<br>(MHz) |
| -21.14                                                 | 0.152987           | Neutral                          | 0.15-30        |

## 6.8 Conducted Emissions Test Plots and Data

Worst Case Colocation, 2.4 GHz Wi-Fi b mode (2412 MHz) and 2.4 GHz Classic Bluetooth 8DPSK (2441 MHz)

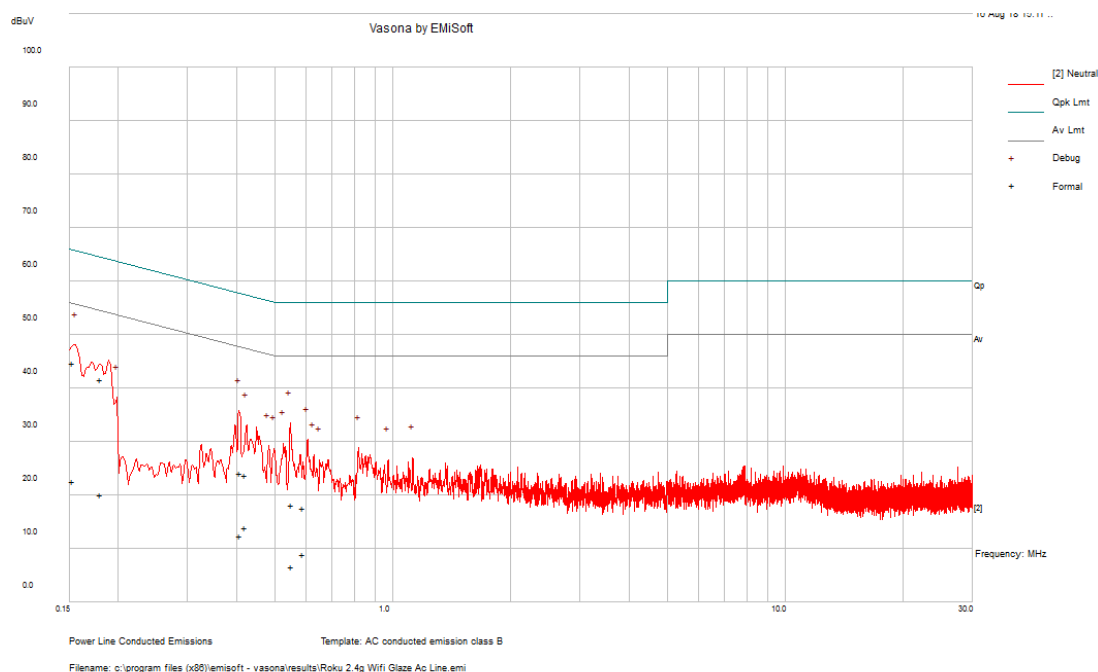
120 V, 60 Hz – Line



| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.166529        | 41.71                      | Line                     | 65.13        | -23.42      | QP                 |
| 0.188664        | 37.54                      | Line                     | 64.1         | -26.55      | QP                 |
| 0.163648        | 40.91                      | Line                     | 65.28        | -24.37      | QP                 |
| 0.464924        | 22.67                      | Line                     | 56.6         | -33.93      | QP                 |
| 0.697332        | 17.29                      | Line                     | 56           | -38.71      | QP                 |
| 0.503376        | 20.11                      | Line                     | 56           | -35.89      | QP                 |

| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.166529        | 20.92                      | Line                     | 55.13        | -34.21      | Ave.               |
| 0.188664        | 18.41                      | Line                     | 54.1         | -35.68      | Ave.               |
| 0.163648        | 20.98                      | Line                     | 55.28        | -34.29      | Ave.               |
| 0.464924        | 10.78                      | Line                     | 46.6         | -35.83      | Ave.               |
| 0.697332        | 6.9                        | Line                     | 46           | -39.1       | Ave.               |
| 0.503376        | 6.62                       | Line                     | 46           | -39.38      | Ave.               |

## 120 V, 60 Hz – Neutral

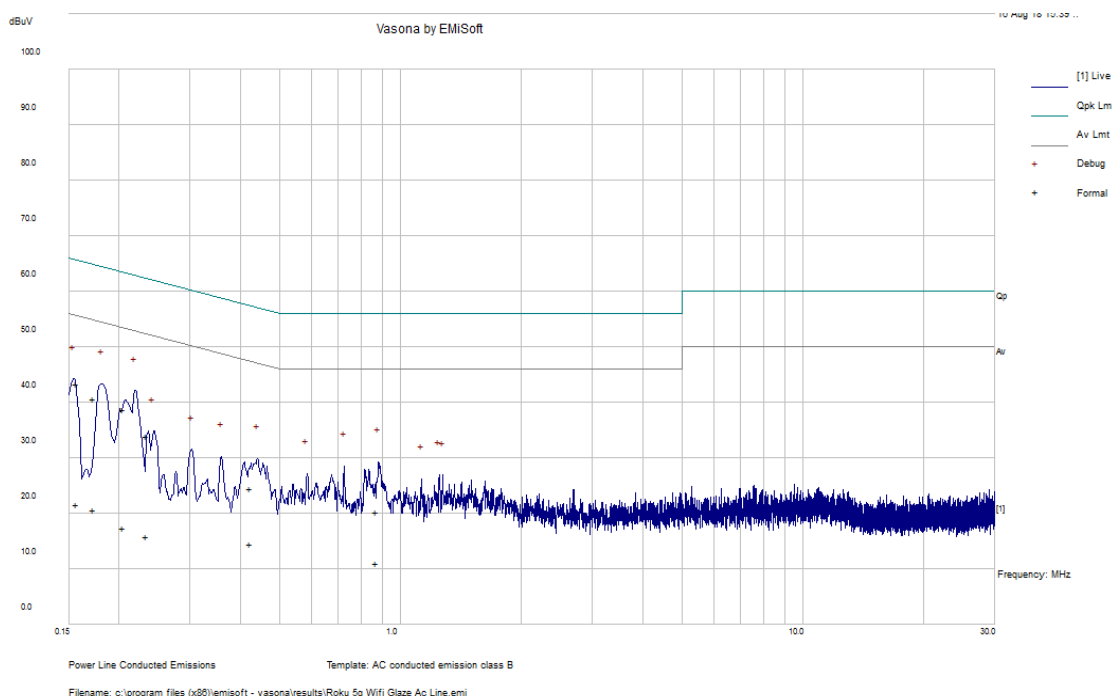


| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.152987        | 44.7                       | Neutral                  | 65.84        | -21.14      | QP                 |
| 0.40795         | 24.2                       | Neutral                  | 57.69        | -33.49      | QP                 |
| 0.552014        | 18.2                       | Neutral                  | 56           | -37.8       | QP                 |
| 0.422087        | 23.77                      | Neutral                  | 57.41        | -33.64      | QP                 |
| 0.180593        | 41.64                      | Neutral                  | 64.46        | -22.82      | QP                 |
| 0.591532        | 17.65                      | Neutral                  | 56           | -38.35      | QP                 |

| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.152987        | 22.68                      | Neutral                  | 55.84        | -33.16      | Ave.               |
| 0.40795         | 12.53                      | Neutral                  | 47.69        | -35.16      | Ave.               |
| 0.552014        | 6.77                       | Neutral                  | 46           | -39.23      | Ave.               |
| 0.422087        | 13.93                      | Neutral                  | 47.41        | -33.48      | Ave.               |
| 0.180593        | 20.2                       | Neutral                  | 54.46        | -34.26      | Ave.               |
| 0.591532        | 8.91                       | Neutral                  | 46           | -37.09      | Ave.               |

Worst Case Colocation, 5 GHz Wi-Fi a mode (5745 MHz) and 2.4 GHz Classic Bluetooth 8DPSK (2441 MHz)

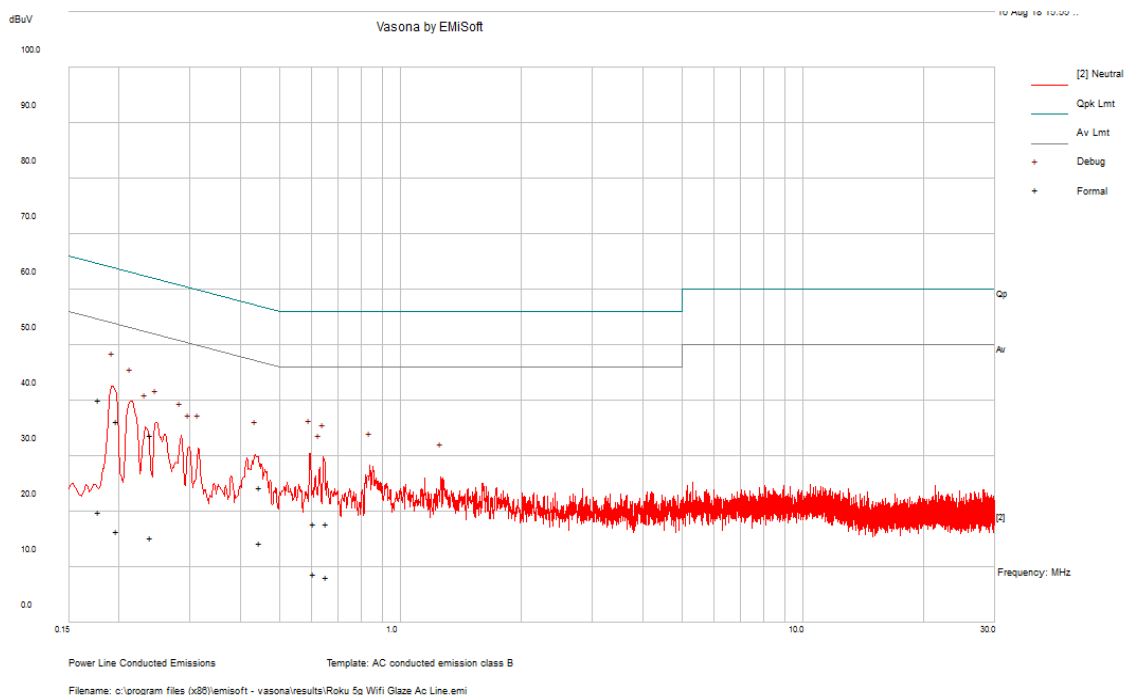
### 120 V, 60 Hz – Line



| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB)   | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|---------------|--------------------|
| 0.204156        | 38.77                      | Line                     | 63.44        | -24.67        | QP                 |
| 0.172498        | 40.61                      | Line                     | 64.84        | -24.23        | QP                 |
| <b>0.156647</b> | <b>43.48</b>               | <b>Line</b>              | <b>65.64</b> | <b>-22.15</b> | <b>QP</b>          |
| 0.869306        | 20.38                      | Line                     | 56           | -35.62        | QP                 |
| 0.423306        | 24.47                      | Line                     | 57.38        | -32.91        | QP                 |
| 0.234527        | 34.03                      | Line                     | 62.29        | -28.26        | QP                 |

| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.204156        | 17.38                      | Line                     | 53.44        | -36.06      | Ave.               |
| 0.172498        | 20.65                      | Line                     | 54.84        | -34.19      | Ave.               |
| 0.156647        | 21.73                      | Line                     | 55.64        | -33.91      | Ave.               |
| 0.869306        | 11.17                      | Line                     | 46           | -34.83      | Ave.               |
| 0.423306        | 14.53                      | Line                     | 47.38        | -32.85      | Ave.               |
| 0.234527        | 15.9                       | Line                     | 52.29        | -36.39      | Ave.               |

## 120 V, 60 Hz – Neutral



| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.177751        | 40.11                      | Neutral                  | 64.59        | -24.48      | QP                 |
| 0.197731        | 36.26                      | Neutral                  | 63.71        | -27.45      | QP                 |
| 0.607633        | 17.81                      | Neutral                  | 56           | -38.19      | QP                 |
| 0.23968         | 33.72                      | Neutral                  | 62.11        | -28.39      | QP                 |
| 0.656226        | 17.83                      | Neutral                  | 56           | -38.17      | QP                 |
| 0.448328        | 24.28                      | Neutral                  | 56.91        | -32.63      | QP                 |

| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.177751        | 19.96                      | Neutral                  | 54.59        | -34.63      | Ave.               |
| 0.197731        | 16.41                      | Neutral                  | 53.71        | -37.3       | Ave.               |
| 0.607633        | 8.74                       | Neutral                  | 46           | -37.26      | Ave.               |
| 0.23968         | 15.28                      | Neutral                  | 52.11        | -36.83      | Ave.               |
| 0.656226        | 8.18                       | Neutral                  | 46           | -37.82      | Ave.               |
| 0.448328        | 14.42                      | Neutral                  | 46.91        | -32.49      | Ave.               |

## 7 FCC §15.209 & §15.247(d) - Spurious Radiated Emissions

### 7.1 Applicable Standards

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) and RSS-Gen except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz           |
|---------------------|-----------------------|-----------------|---------------|
| 0.090 – 0.110       | 16.42 – 16.423        | 960 – 1240      | 4.5 – 5.15    |
| 0.495 – 0.505       | 16.69475 – 16.69525   | 1300 – 1427     | 5.35 – 5.46   |
| 2.1735 – 2.1905     | 25.5 – 25.67          | 1435 – 1626.5   | 7.25 – 7.75   |
| 4.125 – 4.128       | 37.5 – 38.25          | 1645.5 – 1646.5 | 8.025 – 8.5   |
| 4.17725 – 4.17775   | 73 – 74.6             | 1660 – 1710     | 9.0 – 9.2     |
| 4.20725 – 4.20775   | 74.8 – 75.2           | 1718.8 – 1722.2 | 9.3 – 9.5     |
| 6.215 – 6.218       | 108 – 121.94          | 2200 – 2300     | 10.6 – 12.7   |
| 6.26775 – 6.26825   | 123 – 138             | 2310 – 2390     | 13.25 – 13.4  |
| 6.31175 – 6.31225   | 149.9 – 150.05        | 2483.5 – 2500   | 14.47 – 14.5  |
| 8.291 – 8.294       | 156.52475 – 156.52525 | 2690 – 2900     | 15.35 – 16.2  |
| 8.362 – 8.366       | 156.7 – 156.9         | 3260 – 3267     | 17.7 – 21.4   |
| 8.37625 – 8.38675   | 162.0125 – 167.17     | 3.332 – 3.339   | 22.01 – 23.12 |
| 8.41425 – 8.41475   | 167.72 – 173.2        | 3.3458 – 3.358  | 23.6 – 24.0   |
| 12.29 – 12.293      | 240 – 285             | 3.600 – 4.400   | 31.2 – 31.8   |
| 12.51975 – 12.52025 | 322 – 335.4           |                 | 36.43 – 36.5  |
| 12.57675 – 12.57725 | 399.9 – 410           |                 | Above 38.6    |
| 13.36 – 13.41       | 608 – 614             |                 |               |

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (micro volts/meter) | Measurement Distance (meters) |
|-----------------|------------------------------------|-------------------------------|
| 0.009 - 0.490   | 2400/F(kHz)                        | 300                           |
| 0.490 - 1.705   | 24000/F(kHz)                       | 30                            |
| 1.705 - 30.0    | 30                                 | 30                            |
| 30 - 88         | 100**                              | 3                             |
| 88 - 216        | 150**                              | 3                             |
| 216 - 960       | 200**                              | 3                             |
| Above 960       | 500                                | 3                             |

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

## 7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

## 7.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT was set 3 meter away from the testing antenna, which was varied from 1-4 meter, and the EUT was placed on a turntable, which was 0.8 meter and 1.5 meter above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

- (1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
- (2) Average: RBW = 1MHz / VBW = 10Hz or 1/T / Sweep = Auto

## 7.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + AF + CL + Atten - Ga$$

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

## 7.5 Test Equipment List and Details

| Manufacturer      | Description                       | Model No.            | Serial No.               | Calibration Date       | Calibration Interval |
|-------------------|-----------------------------------|----------------------|--------------------------|------------------------|----------------------|
| Rohde and Schwarz | Receiver, EMI Test                | ESCI<br>1166.5950K03 | 100337                   | 2017-07-15             | 2 years              |
| Agilent           | Analyzer, Spectrum                | E4446A               | MY48250238               | 2018-05-08             | 1 year               |
| Sunol Sciences    | System Controller                 | SC99V                | 011003-1                 | N/R                    | N/A                  |
| Sunol Sciences    | Antenna, Biconi-Log               | JB1                  | A013105-3                | 2018-02-26             | 2 years              |
| Wisewave          | Antenna, Horn                     | ARH-4223-02          | 10555-02                 | 2017-12-15             | 2 years              |
| Agilent           | Amplifier, Pre                    | 8447D                | 2944A10187               | 2018-04-02             | 1 year               |
| IW                | AOBOR Hi frequency<br>Co AX Cable | DC 1531              | KPS-<br>1501A3960K<br>PS | 2018-01-11             | 1 year               |
| -                 | SMA cable                         | -                    | C00011                   | Each time <sup>1</sup> | N/A                  |
| -                 | N-Type Cable                      | -                    | C00012                   | Each time <sup>1</sup> | N/A                  |
| -                 | N-Type Cable                      | -                    | C00014                   | Each time <sup>1</sup> | N/A                  |
| HP                | Pre-Amplifier                     | 8449B                | 3147A00400               | 2018-02-02             | 1 year               |
| Sunol Sciences    | Antenna, Horn                     | DRH-118              | A052704                  | 2017-03-27             | 2 years              |
| Vasona            | Test software                     | V6.0 build 11        | 10400213                 | N/R                    | N/R                  |

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

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

## 7.6 Test Environmental Conditions

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 20-22 °C  |
| <b>Relative Humidity:</b> | 42-50 %   |
| <b>ATM Pressure:</b>      | 102.7 kPa |

*The testing was performed by Vincent Licata from 2018-08-13 to 2018-08-16 in 5m chamber 3.*

## 7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with FCC Title 47, Part 15C standard's radiated emissions limits, and had the worst margin of:

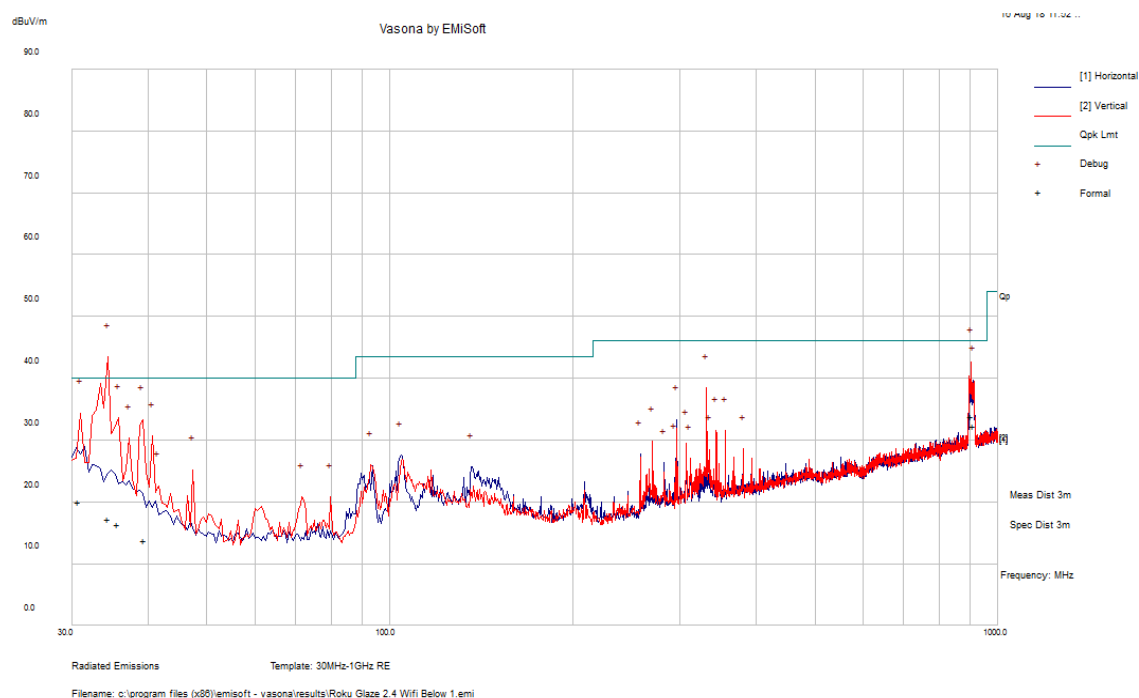
| <b>Mode: Transmitting</b> |                            |                                               |                      |
|---------------------------|----------------------------|-----------------------------------------------|----------------------|
| <b>Margin<br/>(dB)</b>    | <b>Frequency<br/>(MHz)</b> | <b>Polarization<br/>(Horizontal/Vertical)</b> | <b>Mode, Channel</b> |
| -5.06                     | 7440                       | Horizontal                                    | GFSK, High           |

Please refer to the following table and plots for specific test result details.

## 7.8 Radiated Emissions Test Results

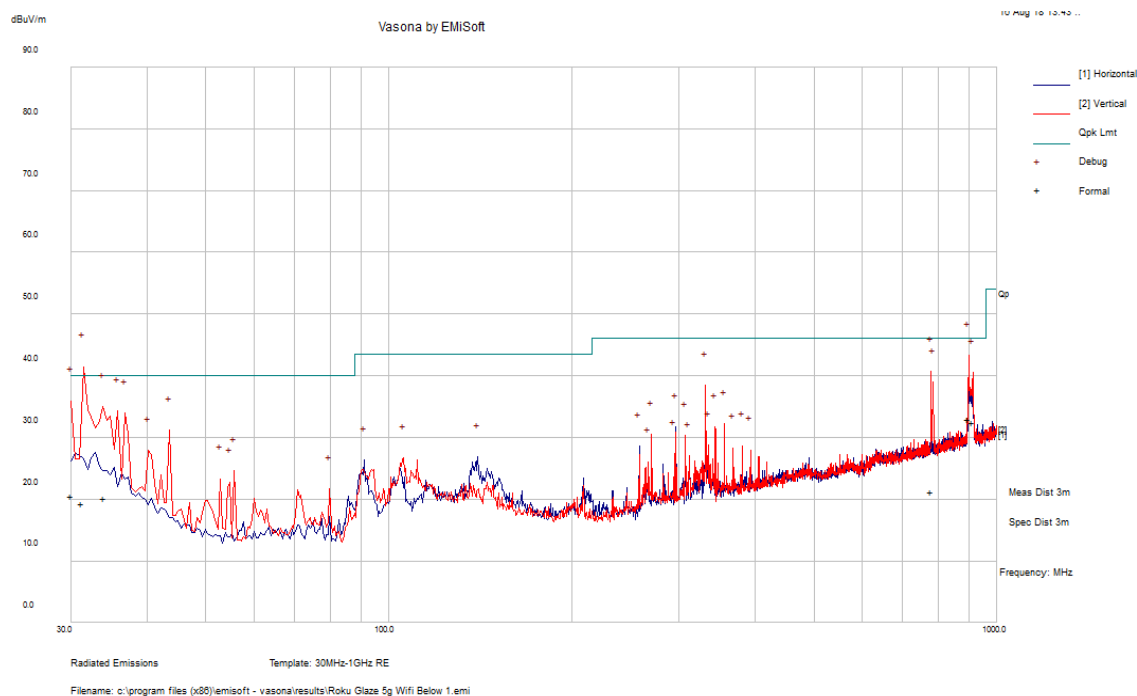
### 1) 30 MHz – 1 GHz Worst Case on Middle Channel, Measured at 3 meters

Colocation, 2.4 GHz Wi-Fi b mode (2412 MHz) and 2.4 GHz Classic Bluetooth 8DPSK (2441 MHz)



| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (degrees) | Limit (dBμV/m) | Margin (dB) | Comment |
|-----------------|------------------------------|---------------------|------------------------|-----------------------------|----------------|-------------|---------|
| 34.4095         | 17.2                         | 107                 | V                      | 341                         | 40             | -22.8       | QP      |
| 903.6605        | 33.81                        | 99                  | V                      | 351                         | 46             | -12.19      | QP      |
| 30.75675        | 19.96                        | 151                 | V                      | 182                         | 40             | -20.04      | QP      |
| 911.5313        | 32.25                        | 110                 | H                      | 324                         | 46             | -13.75      | QP      |
| 35.71           | 16.4                         | 300                 | V                      | 360                         | 40             | -23.6       | QP      |
| 39.3835         | 13.87                        | 144                 | V                      | 261                         | 40             | -26.13      | QP      |

**Worst Case Colocation, 5 GHz Wi-Fi a mode (5745 MHz) and 2.4 GHz Classic Bluetooth 8DPSK (2441 MHz)**



| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (degrees) | Limit (dBμV/m) | Margin (dB) | Comment |
|-----------------|------------------------------|---------------------|------------------------|-----------------------------|----------------|-------------|---------|
| 31.22575        | 19.32                        | 162                 | V                      | 173                         | 40             | -20.68      | QP      |
| 898.5675        | 33.09                        | 161                 | V                      | 0                           | 46             | -12.91      | QP      |
| 30              | 20.5                         | 181                 | V                      | 15                          | 40             | -19.5       | QP      |
| 34.0435         | 20.28                        | 127                 | V                      | 127                         | 40             | -19.72      | QP      |
| 779.4028        | 21.16                        | 280                 | V                      | 131                         | 46             | -24.84      | QP      |
| 913.3198        | 32.56                        | 105                 | V                      | 45                          | 46             | -13.44      | QP      |

## 2) 1-25 GHz Measured at 3 meters

GFSK mode

| Frequency<br>(MHz)      | S.A.<br>Reading<br>(dBμV) | Turntable<br>Azimuth<br>(degrees) | Test Antenna   |                   |                  | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>(dB) | Cord.<br>Reading<br>(dBμV/m) | FCC               |                | Comments |
|-------------------------|---------------------------|-----------------------------------|----------------|-------------------|------------------|-----------------------|----------------------|------------------------------|-------------------|----------------|----------|
|                         |                           |                                   | Height<br>(cm) | Polarity<br>(H/V) | Factor<br>(dB/m) |                       |                      |                              | Limit<br>(dBμV/m) | Margin<br>(dB) |          |
| Low Channel 2402 MHz    |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2402                    | 72.02                     | 132                               | 139            | H                 | 28.93            | 5.76                  | 0                    | 106.71                       | -                 | -              | PK       |
| 2402                    | 71.63                     | 132                               | 139            | H                 | 28.93            | 5.76                  | 0                    | 106.32                       | -                 | -              | AV       |
| 2402                    | 71.32                     | 291                               | 245            | V                 | 28.93            | 5.76                  | 0                    | 106.01                       | -                 | -              | PK       |
| 2402                    | 70.87                     | 291                               | 245            | V                 | 28.93            | 5.76                  | 0                    | 105.56                       | -                 | -              | AV       |
| 2390                    | 48.28                     | 132                               | 139            | H                 | 28.93            | 6.489                 | 32.207               | 51.50                        | 74.00             | -22.51         | PK       |
| 2390                    | 37.53                     | 132                               | 139            | H                 | 28.93            | 6.489                 | 32.207               | 40.75                        | 54.00             | -13.26         | AV       |
| 2390                    | 48.09                     | 291                               | 245            | V                 | 28.93            | 6.489                 | 32.207               | 51.31                        | 74.00             | -22.70         | PK       |
| 2390                    | 37.32                     | 291                               | 245            | V                 | 28.93            | 6.489                 | 32.207               | 40.54                        | 54.00             | -13.47         | AV       |
| 4804                    | 46.08                     | 0                                 | 100            | H                 | 32.56            | 9.36                  | 32.993               | 55.01                        | 74.00             | -18.99         | PK       |
| 4804                    | 33.83                     | 0                                 | 100            | H                 | 32.56            | 9.36                  | 32.993               | 42.76                        | 54.00             | -11.24         | AV       |
| 7206                    | 44.51                     | 0                                 | 100            | H                 | 36.88            | 12.01                 | 33.248               | 60.15                        | 74.00             | -13.85         | PK       |
| 7206                    | 32.36                     | 0                                 | 100            | H                 | 36.88            | 12.01                 | 33.248               | 48.00                        | 54.00             | -6.00          | AV       |
| Middle Channel 2441 MHz |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2441                    | 71.92                     | 311                               | 138            | H                 | 28.93            | 5.76                  | 0                    | 106.61                       | -                 | -              | PK       |
| 2441                    | 71.44                     | 311                               | 138            | H                 | 28.93            | 5.76                  | 0                    | 106.13                       | -                 | -              | AV       |
| 2441                    | 71.26                     | 282                               | 300            | V                 | 28.93            | 5.76                  | 0                    | 105.95                       | -                 | -              | PK       |
| 2441                    | 70.96                     | 282                               | 300            | V                 | 28.93            | 5.76                  | 0                    | 105.65                       | -                 | -              | AV       |
| 4882                    | 45.91                     | 0                                 | 100            | H                 | 32.53            | 9.46                  | 32.993               | 54.90                        | 74.00             | -19.10         | PK       |
| 4882                    | 34.32                     | 0                                 | 100            | H                 | 32.53            | 9.46                  | 32.993               | 43.31                        | 54.00             | -10.69         | AV       |
| 7323                    | 44.43                     | 0                                 | 100            | H                 | 36.99            | 11.97                 | 33.248               | 60.14                        | 74.00             | -13.86         | PK       |
| 7323                    | 32.68                     | 0                                 | 100            | H                 | 36.99            | 11.97                 | 33.248               | 48.39                        | 54.00             | -5.61          | AV       |
| High Channel 2480 MHz   |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2480                    | 71.20                     | 143                               | 192            | H                 | 29.19            | 5.86                  | 0                    | 106.25                       | -                 | -              | PK       |
| 2480                    | 70.90                     | 143                               | 192            | H                 | 29.19            | 5.86                  | 0                    | 105.95                       | -                 | -              | AV       |
| 2480                    | 70.09                     | 276                               | 300            | V                 | 29.19            | 5.86                  | 0                    | 105.14                       | -                 | -              | PK       |
| 2480                    | 69.80                     | 276                               | 300            | V                 | 29.19            | 5.86                  | 0                    | 104.85                       | -                 | -              | AV       |
| 2483.5                  | 51.66                     | 143                               | 192            | H                 | 29.18            | 6.61                  | 32.207               | 55.24                        | 74.00             | -18.76         | PK       |
| 2483.5                  | 42.61                     | 143                               | 192            | H                 | 29.18            | 6.61                  | 32.207               | 46.19                        | 54.00             | -7.81          | AV       |
| 2483.5                  | 50.87                     | 276                               | 300            | V                 | 29.18            | 6.61                  | 32.207               | 54.45                        | 74.00             | -19.55         | PK       |
| 2483.5                  | 41.98                     | 276                               | 300            | V                 | 29.18            | 6.61                  | 32.207               | 45.56                        | 54.00             | -8.44          | AV       |
| 4960                    | 45.82                     | 0                                 | 100            | H                 | 32.70            | 9.42                  | 32.993               | 54.94                        | 74.00             | -19.06         | PK       |
| 4960                    | 33.88                     | 0                                 | 100            | H                 | 32.70            | 9.42                  | 32.993               | 43.00                        | 54.00             | -11.00         | AV       |
| 7440                    | 44.36                     | 0                                 | 100            | H                 | 37.10            | 12.01                 | 33.248               | 60.22                        | 74.00             | -13.78         | PK       |
| 7440                    | 33.08                     | 0                                 | 100            | H                 | 37.10            | 12.01                 | 33.248               | 48.94                        | 54.00             | -5.06          | AV       |

$\pi/4$ -DQPSK mode

| Frequency<br>(MHz)      | S.A.<br>Reading<br>(dBμV) | Turntable<br>Azimuth<br>(degrees) | Test Antenna   |                   |                  | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>(dB) | Cord.<br>Reading<br>(dBμV/m) | FCC               |                | Comments |
|-------------------------|---------------------------|-----------------------------------|----------------|-------------------|------------------|-----------------------|----------------------|------------------------------|-------------------|----------------|----------|
|                         |                           |                                   | Height<br>(cm) | Polarity<br>(H/V) | Factor<br>(dB/m) |                       |                      |                              | Limit<br>(dBμV/m) | Margin<br>(dB) |          |
| Low Channel 2402 MHz    |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2402                    | 72.59                     | 130                               | 138            | H                 | 28.93            | 5.76                  | 0                    | 107.28                       | -                 | -              | PK       |
| 2402                    | 70.38                     | 130                               | 138            | H                 | 28.93            | 5.76                  | 0                    | 105.07                       | -                 | -              | AV       |
| 2402                    | 71.82                     | 271                               | 273            | V                 | 28.93            | 5.76                  | 0                    | 106.51                       | -                 | -              | PK       |
| 2402                    | 69.79                     | 271                               | 273            | V                 | 28.93            | 5.76                  | 0                    | 104.48                       | -                 | -              | AV       |
| 2390                    | 53.55                     | 130                               | 138            | H                 | 28.93            | 6.489                 | 32.207               | 56.77                        | 74.00             | -17.24         | PK       |
| 2390                    | 37.92                     | 130                               | 138            | H                 | 28.93            | 6.489                 | 32.207               | 41.14                        | 54.00             | -12.87         | AV       |
| 2390                    | 48.02                     | 271                               | 273            | V                 | 28.93            | 6.489                 | 32.207               | 51.24                        | 74.00             | -22.77         | PK       |
| 2390                    | 36.78                     | 271                               | 273            | V                 | 28.93            | 6.489                 | 32.207               | 40.00                        | 54.00             | -14.01         | AV       |
| 4804                    | 46.60                     | 0                                 | 100            | H                 | 32.56            | 9.36                  | 32.993               | 55.53                        | 74.00             | -18.47         | PK       |
| 4804                    | 34.41                     | 0                                 | 100            | H                 | 32.56            | 9.36                  | 32.993               | 43.34                        | 54.00             | -10.66         | AV       |
| 7206                    | 45.60                     | 0                                 | 100            | H                 | 36.88            | 12.01                 | 33.248               | 61.24                        | 74.00             | -12.76         | PK       |
| 7206                    | 33.21                     | 0                                 | 100            | H                 | 36.88            | 12.01                 | 33.248               | 48.85                        | 54.00             | -5.15          | AV       |
| Middle Channel 2441 MHz |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2441                    | 71.45                     | 145                               | 190            | H                 | 28.93            | 5.76                  | 0                    | 106.14                       | -                 | -              | PK       |
| 2441                    | 69.44                     | 145                               | 190            | H                 | 28.93            | 5.76                  | 0                    | 104.13                       | -                 | -              | AV       |
| 2441                    | 70.56                     | 283                               | 263            | V                 | 28.93            | 5.76                  | 0                    | 105.25                       | -                 | -              | PK       |
| 2441                    | 68.26                     | 283                               | 263            | V                 | 28.93            | 5.76                  | 0                    | 102.95                       | -                 | -              | AV       |
| 4882                    | 45.87                     | 0                                 | 100            | H                 | 32.53            | 9.46                  | 32.993               | 54.86                        | 74.00             | -19.14         | PK       |
| 4882                    | 33.73                     | 0                                 | 100            | H                 | 32.53            | 9.46                  | 32.993               | 42.72                        | 54.00             | -11.28         | AV       |
| 7323                    | 44.28                     | 0                                 | 100            | H                 | 36.99            | 11.97                 | 33.248               | 59.99                        | 74.00             | -14.01         | PK       |
| 7323                    | 32.69                     | 0                                 | 100            | H                 | 36.99            | 11.97                 | 33.248               | 48.40                        | 54.00             | -5.60          | AV       |
| High Channel 2480 MHz   |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2480                    | 70.40                     | 144                               | 148            | H                 | 29.19            | 5.86                  | 0                    | 105.45                       | -                 | -              | PK       |
| 2480                    | 68.26                     | 144                               | 148            | H                 | 29.19            | 5.86                  | 0                    | 103.31                       | -                 | -              | AV       |
| 2480                    | 69.71                     | 278                               | 282            | V                 | 29.19            | 5.86                  | 0                    | 104.76                       | -                 | -              | PK       |
| 2480                    | 67.48                     | 278                               | 282            | V                 | 29.19            | 5.86                  | 0                    | 102.53                       | -                 | -              | AV       |
| 2483.5                  | 53.73                     | 144                               | 148            | H                 | 29.18            | 6.61                  | 32.207               | 57.31                        | 74.00             | -16.69         | PK       |
| 2483.5                  | 42.70                     | 144                               | 148            | H                 | 29.18            | 6.61                  | 32.207               | 46.28                        | 54.00             | -7.72          | AV       |
| 2483.5                  | 53.29                     | 278                               | 282            | V                 | 29.18            | 6.61                  | 32.207               | 56.87                        | 74.00             | -17.13         | PK       |
| 2483.5                  | 42.08                     | 278                               | 282            | V                 | 29.18            | 6.61                  | 32.207               | 45.66                        | 54.00             | -8.34          | AV       |
| 4960                    | 45.80                     | 0                                 | 100            | H                 | 32.70            | 9.42                  | 32.993               | 54.92                        | 74.00             | -19.08         | PK       |
| 4960                    | 33.88                     | 0                                 | 100            | H                 | 32.70            | 9.42                  | 32.993               | 43.00                        | 54.00             | -11.00         | AV       |
| 7440                    | 44.62                     | 0                                 | 100            | H                 | 37.10            | 12.01                 | 33.248               | 60.48                        | 74.00             | -13.52         | PK       |
| 7440                    | 33.07                     | 0                                 | 100            | H                 | 37.10            | 12.01                 | 33.248               | 48.93                        | 54.00             | -5.07          | AV       |

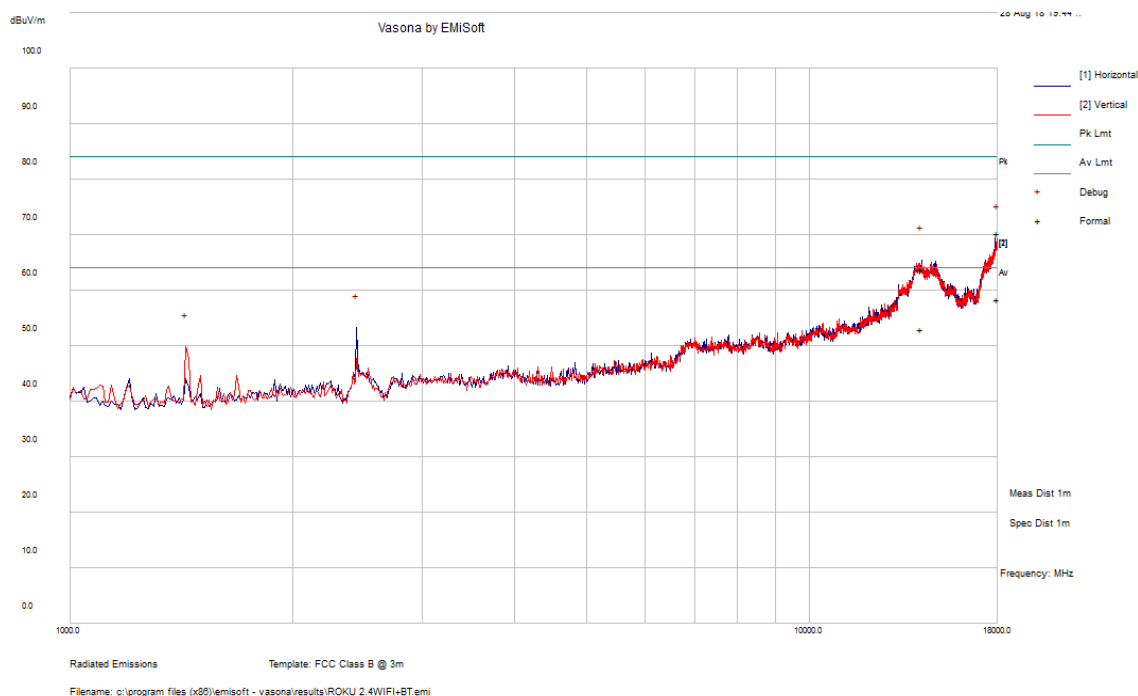
## 8DPSK mode

| Frequency<br>(MHz)      | S.A.<br>Reading<br>(dBμV) | Turntable<br>Azimuth<br>(degrees) | Test Antenna   |                   |                  | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>(dB) | Cord.<br>Reading<br>(dBμV/m) | FCC               |                | Comments |
|-------------------------|---------------------------|-----------------------------------|----------------|-------------------|------------------|-----------------------|----------------------|------------------------------|-------------------|----------------|----------|
|                         |                           |                                   | Height<br>(cm) | Polarity<br>(H/V) | Factor<br>(dB/m) |                       |                      |                              | Limit<br>(dBμV/m) | Margin<br>(dB) |          |
| Low Channel 2402 MHz    |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2402                    | 72.26                     | 130                               | 139            | H                 | 28.93            | 5.76                  | 0                    | 106.95                       | -                 | -              | PK       |
| 2402                    | 70.24                     | 130                               | 139            | H                 | 28.93            | 5.76                  | 0                    | 104.93                       | -                 | -              | AV       |
| 2402                    | 71.83                     | 270                               | 270            | V                 | 28.93            | 5.76                  | 0                    | 106.52                       | -                 | -              | PK       |
| 2402                    | 69.75                     | 270                               | 270            | V                 | 28.93            | 5.76                  | 0                    | 104.44                       | -                 | -              | AV       |
| 2390                    | 57.50                     | 130                               | 139            | H                 | 28.93            | 6.489                 | 32.207               | 60.72                        | 74.00             | -13.29         | PK       |
| 2390                    | 36.95                     | 130                               | 139            | H                 | 28.93            | 6.489                 | 32.207               | 40.17                        | 54.00             | -13.84         | AV       |
| 2390                    | 56.30                     | 270                               | 270            | V                 | 28.93            | 6.489                 | 32.207               | 59.52                        | 74.00             | -14.49         | PK       |
| 2390                    | 36.78                     | 270                               | 270            | V                 | 28.93            | 6.489                 | 32.207               | 40.00                        | 54.00             | -14.01         | AV       |
| 4804                    | 45.80                     | 0                                 | 100            | H                 | 32.56            | 9.36                  | 32.993               | 54.73                        | 74.00             | -19.27         | PK       |
| 4804                    | 34.49                     | 0                                 | 100            | H                 | 32.56            | 9.36                  | 32.993               | 43.42                        | 54.00             | -10.58         | AV       |
| 7206                    | 45.07                     | 0                                 | 100            | H                 | 36.88            | 12.01                 | 33.248               | 60.71                        | 74.00             | -13.29         | PK       |
| 7206                    | 33.12                     |                                   | 100            | H                 | 36.88            | 12.01                 | 33.248               | 48.76                        | 54.00             | -5.24          | AV       |
| Middle Channel 2441 MHz |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2441                    | 71.58                     | 144                               | 193            | H                 | 28.93            | 5.76                  | 0                    | 106.27                       | -                 | -              | PK       |
| 2441                    | 69.53                     | 144                               | 193            | H                 | 28.93            | 5.76                  | 0                    | 104.22                       | -                 | -              | AV       |
| 2441                    | 70.61                     | 263                               | 290            | V                 | 28.93            | 5.76                  | 0                    | 105.30                       | -                 | -              | PK       |
| 2441                    | 68.53                     | 263                               | 290            | V                 | 28.93            | 5.76                  | 0                    | 103.22                       | -                 | -              | AV       |
| 4882                    | 45.52                     | 0                                 | 100            | H                 | 32.53            | 9.46                  | 32.993               | 54.51                        | 74.00             | -19.49         | PK       |
| 4882                    | 33.81                     | 0                                 | 100            | H                 | 32.53            | 9.46                  | 32.993               | 42.80                        | 54.00             | -11.20         | AV       |
| 7323                    | 44.42                     | 0                                 | 100            | H                 | 36.99            | 11.97                 | 33.248               | 60.13                        | 74.00             | -13.87         | PK       |
| 7323                    | 32.84                     | 0                                 | 100            | H                 | 36.99            | 11.97                 | 33.248               | 48.55                        | 54.00             | -5.45          | AV       |
| High Channel 2480 MHz   |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2480                    | 70.44                     | 144                               | 148            | H                 | 29.19            | 5.86                  | 0                    | 105.49                       | -                 | -              | PK       |
| 2480                    | 68.27                     | 144                               | 148            | H                 | 29.19            | 5.86                  | 0                    | 103.32                       | -                 | -              | AV       |
| 2480                    | 68.93                     | 267                               | 281            | V                 | 29.19            | 5.86                  | 0                    | 103.98                       | -                 | -              | PK       |
| 2480                    | 66.74                     | 267                               | 281            | V                 | 29.19            | 5.86                  | 0                    | 101.79                       | -                 | -              | AV       |
| 2483.5                  | 54.93                     | 144                               | 148            | H                 | 29.18            | 6.61                  | 32.207               | 58.51                        | 74.00             | -15.49         | PK       |
| 2483.5                  | 43.31                     | 144                               | 148            | H                 | 29.18            | 6.61                  | 32.207               | 46.89                        | 54.00             | -7.11          | AV       |
| 2483.5                  | 52.05                     | 267                               | 281            | V                 | 29.18            | 6.61                  | 32.207               | 55.63                        | 74.00             | -18.37         | PK       |
| 2483.5                  | 41.36                     | 267                               | 281            | V                 | 29.18            | 6.61                  | 32.207               | 44.94                        | 54.00             | -9.06          | AV       |
| 4960                    | 44.38                     | 0                                 | 100            | H                 | 32.70            | 9.42                  | 32.993               | 53.50                        | 74.00             | -20.50         | PK       |
| 4960                    | 32.72                     | 0                                 | 100            | H                 | 32.70            | 9.42                  | 32.993               | 41.84                        | 54.00             | -12.16         | AV       |
| 7440                    | 44.75                     | 0                                 | 100            | H                 | 37.10            | 12.01                 | 33.248               | 60.61                        | 74.00             | -13.39         | PK       |
| 7440                    | 33.05                     | 0                                 | 100            | H                 | 37.10            | 12.01                 | 33.248               | 48.91                        | 54.00             | -5.09          | AV       |

The worst case middle channel plot has been listed below.

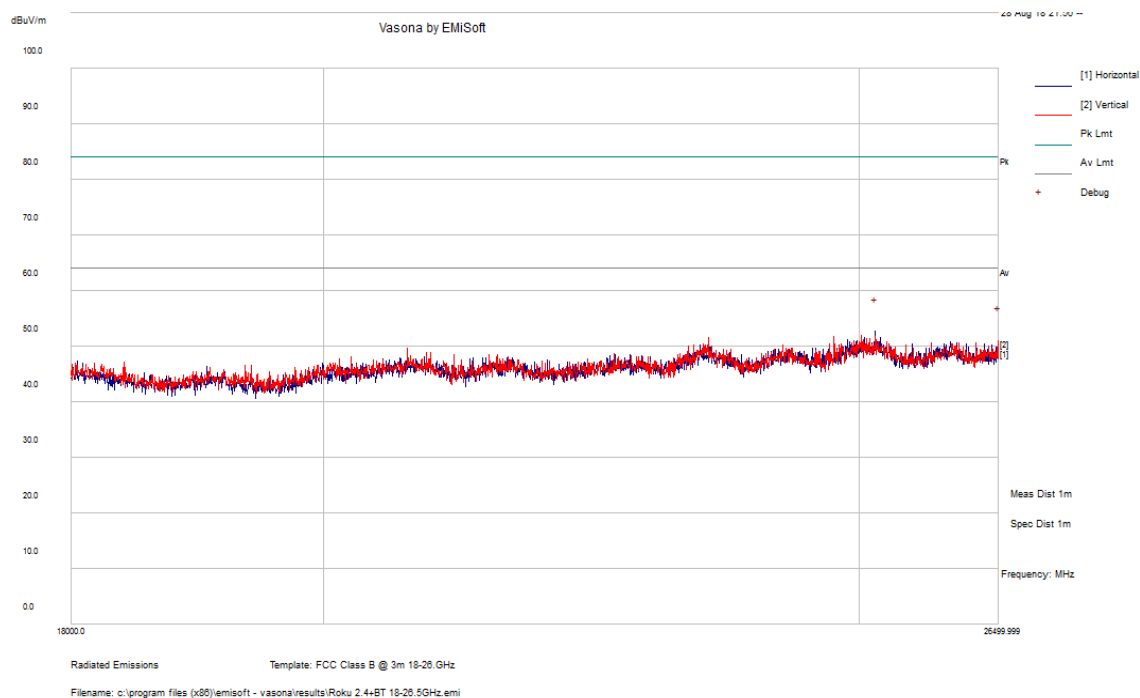
### 1-18 GHz

*Colocation, 2.4 GHz Wi-Fi b mode (2412 MHz) and 2.4 GHz Classic Bluetooth 8DPSK (2441 MHz)*



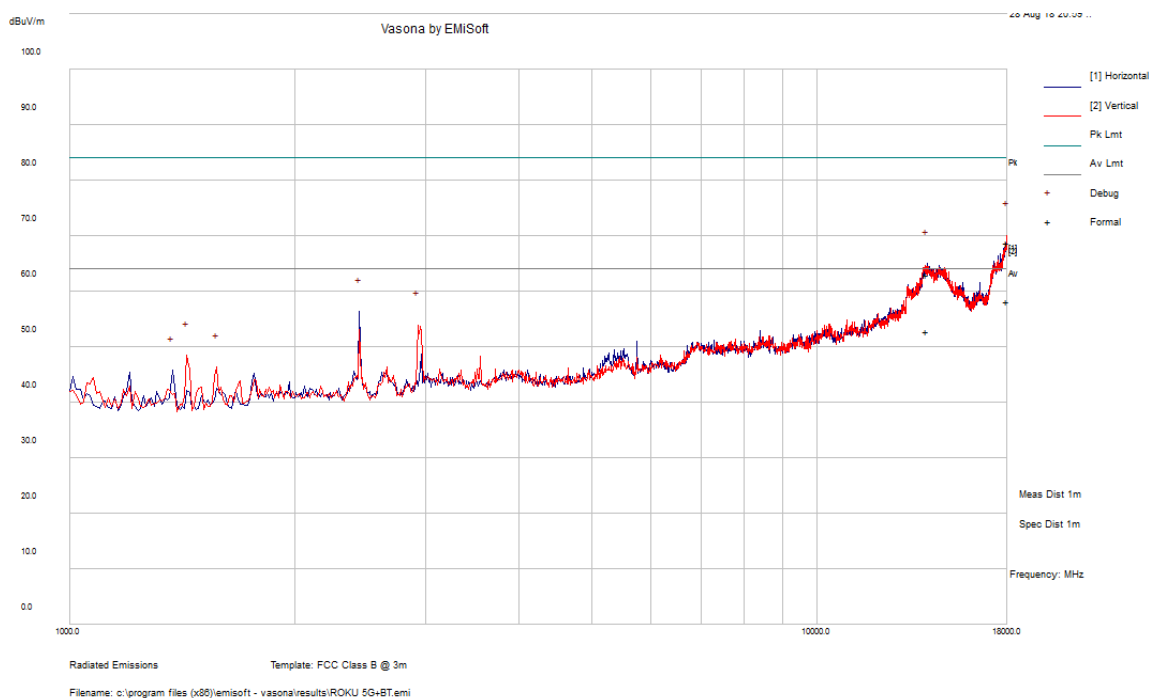
### 18-26.5 GHz

*Colocation, 2.4 GHz Wi-Fi b mode (2412 MHz) and 2.4 GHz Classic Bluetooth 8DPSK (2441 MHz)*

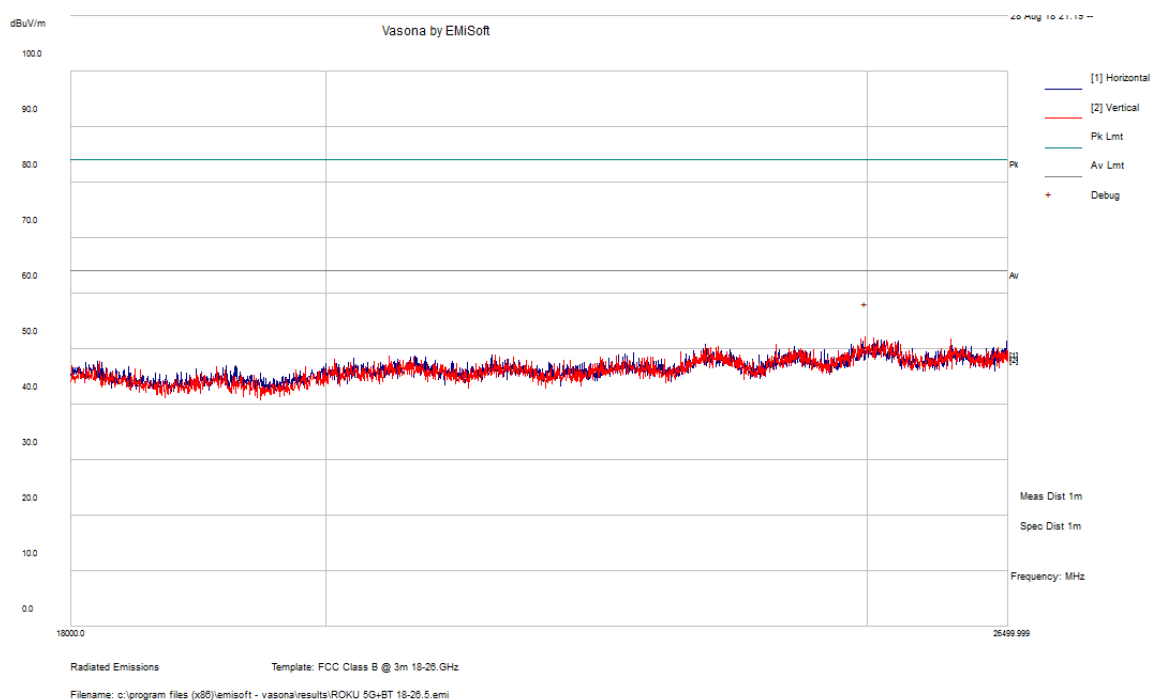


**1-18 GHz**

*Worst Case Colocation, 5 GHz Wi-Fi a mode (5745 MHz) and 2.4 GHz Classic Bluetooth 8DPSK(2441 MHz)*

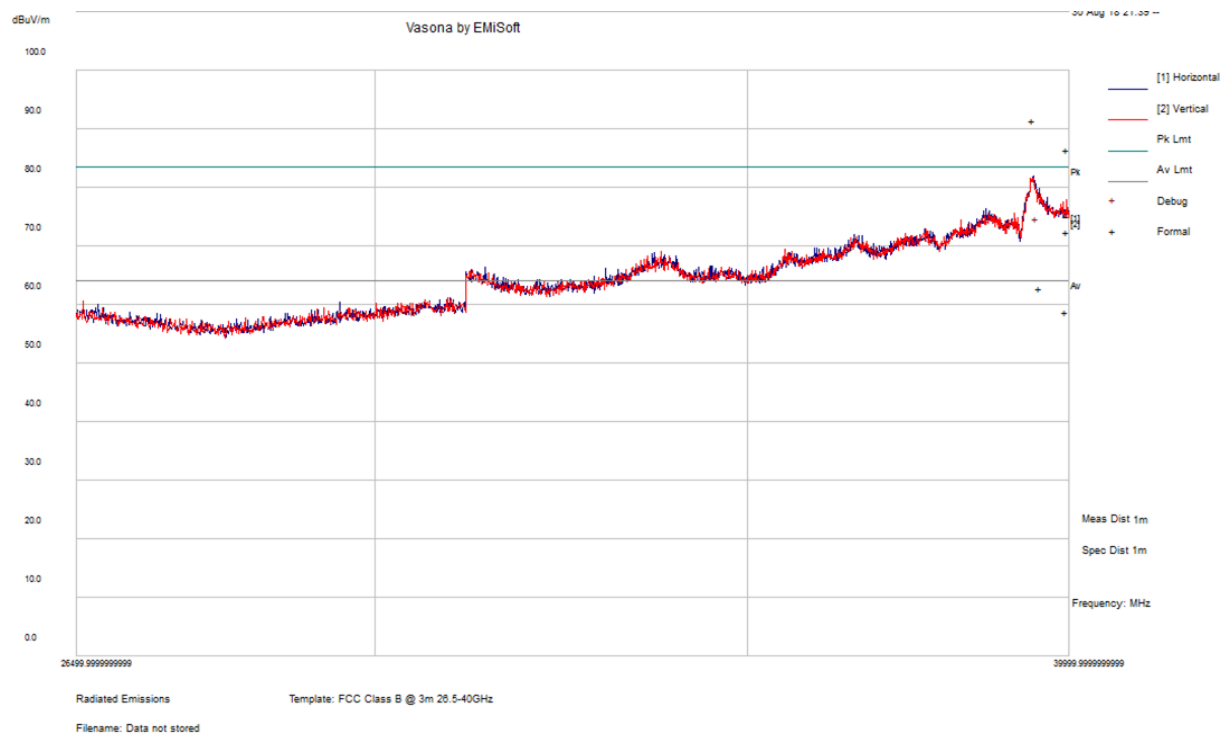
**18-26.5 GHz**

*Worst Case Colocation, 5 GHz Wi-Fi a mode (5745 MHz) and 2.4 GHz Classic Bluetooth 8DPSK (2441 MHz)*



26.5-40 GHz

Worst Case Colocation, 5 GHz Wi-Fi a mode (5745 MHz) and 2.4 GHz Classic Bluetooth 8DPSK (2441 MHz)



## 8 FCC §15.247(a) (1) - Emission Bandwidth

### 8.1 Applicable Standards

According to FCC §15.247(a) (1): the maximum 20 dB bandwidth of the hopping channel shall be presented.

### 8.2 Measurement Procedure

Span = approximately 2 to 5 times the 99% occupied bandwidth, centered on a hopping channel

RBW = 1% to 5 % of the 99% occupied bandwidth

VBW = 3RBW

Sweep = auto

Detector function = peak

Trace = max hold

### 8.3 Test Equipment List and Details

| Manufacturer | Description        | Model No. | Serial No. | Calibration Date       | Calibration Interval |
|--------------|--------------------|-----------|------------|------------------------|----------------------|
| Agilent      | Analyzer, Spectrum | E4446A    | MY48250238 | 2018-05-08             | 1 year               |
| -            | 10 dB Attenuator   | -         | -          | Each time <sup>1</sup> | N/A                  |
| -            | RF cable           | -         | -          | Each time <sup>1</sup> | N/A                  |

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

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

### 8.4 Test Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 42 %      |
| ATM Pressure:      | 102.7 KPa |

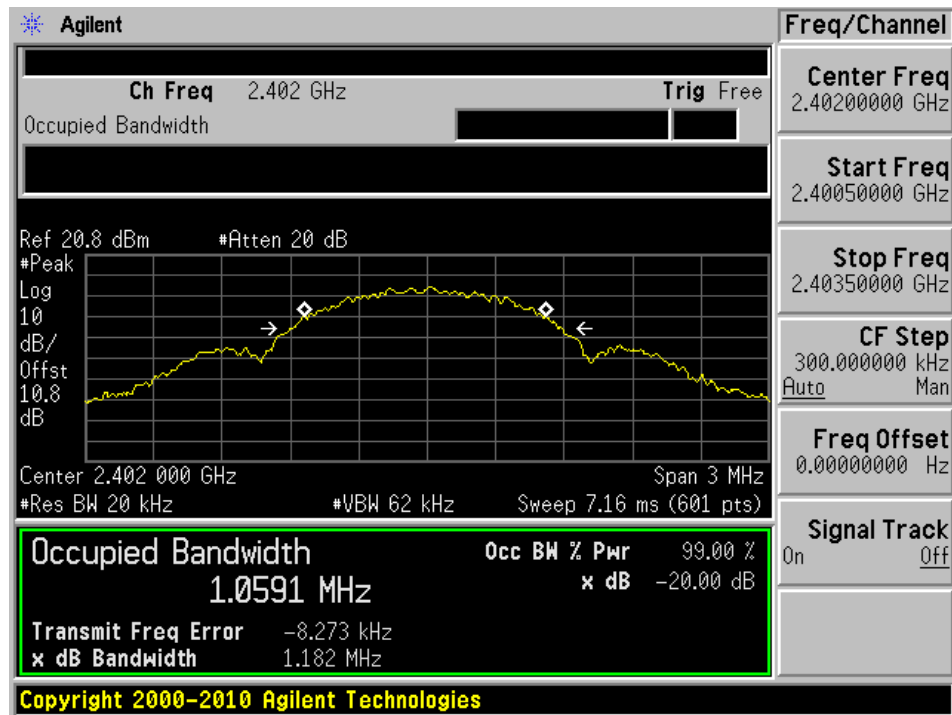
The testing was performed by Vincent Licata from 2018-08-14 to 2018-08-15 in RF site.

## 8.5 Test Results

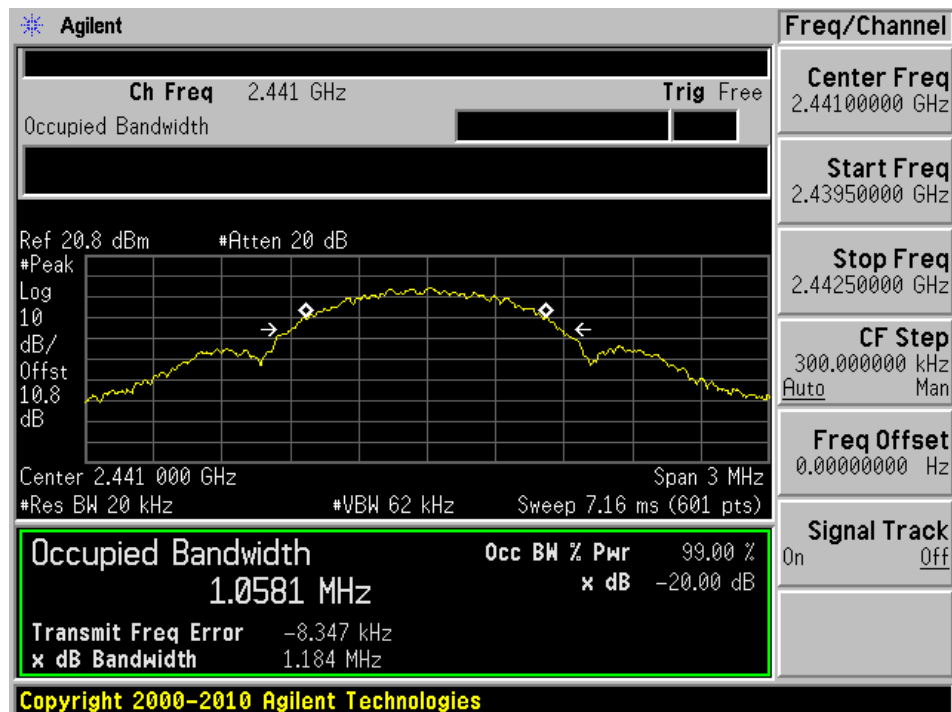
| Channel        | Frequency (MHz) | 99% OBW (MHz) | 20 dB OBW (MHz) |
|----------------|-----------------|---------------|-----------------|
| GFSK           |                 |               |                 |
| Low            | 2402            | 1.5091        | 1.182           |
| Middle         | 2441            | 1.0581        | 1.184           |
| High           | 2480            | 1.0630        | 1.198           |
| $\pi/4$ -DQPSK |                 |               |                 |
| Low            | 2402            | 1.0573        | 1.183           |
| Middle         | 2441            | 1.0597        | 1.189           |
| High           | 2480            | 1.0603        | 1.197           |
| 8DPSK          |                 |               |                 |
| Low            | 2402            | 1.0595        | 1.187           |
| Middle         | 2441            | 1.0597        | 1.184           |
| High           | 2480            | 1.0577        | 1.191           |

Please refer to the following plots for detailed test results.

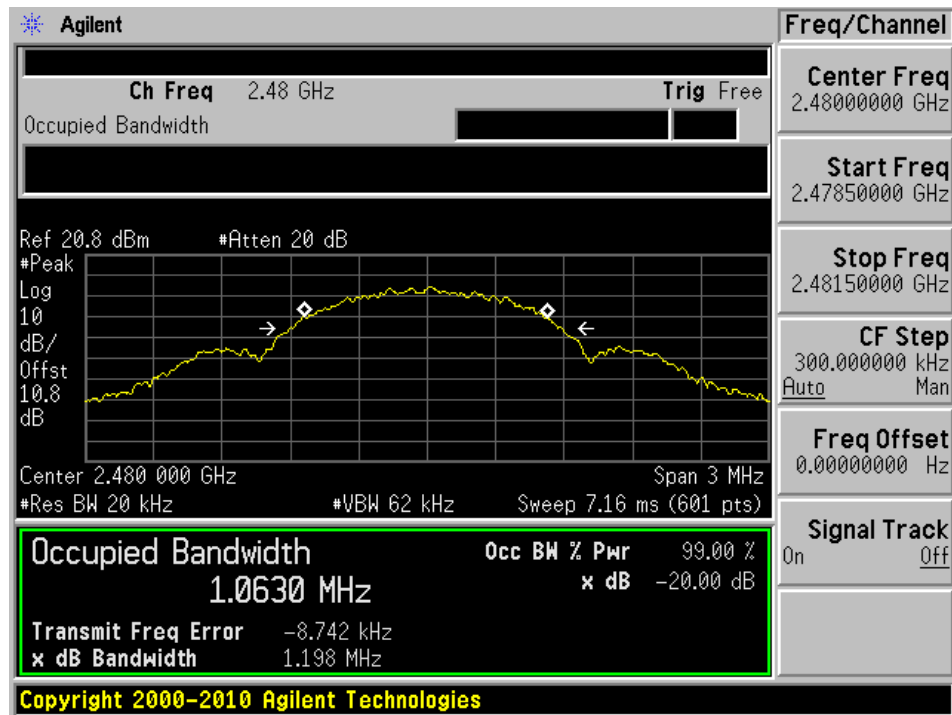
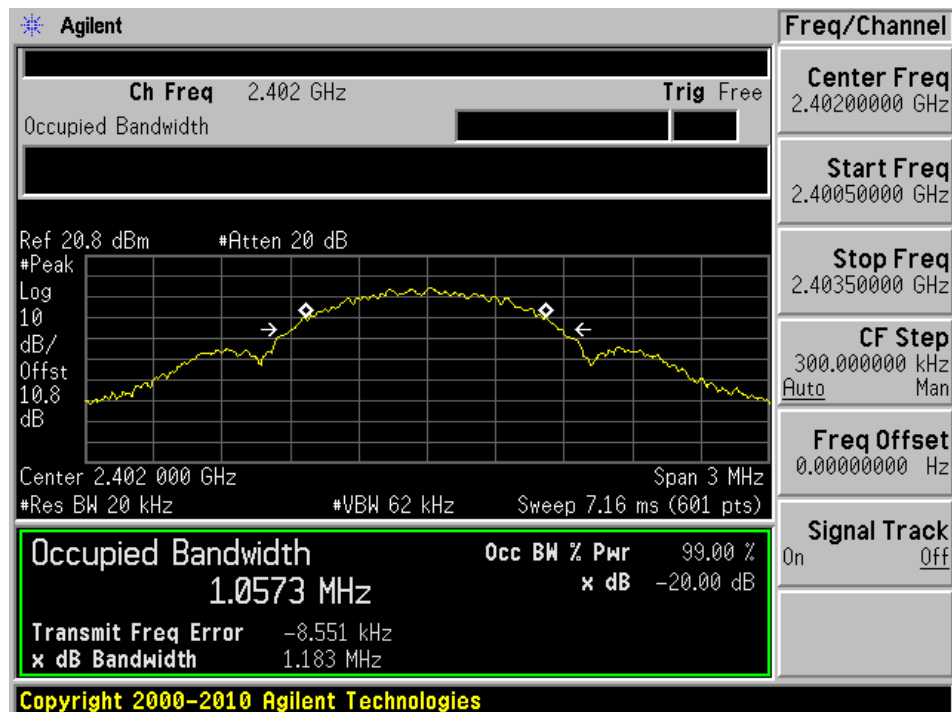
## GFSK Mode 2402 MHz Low Channel OBW

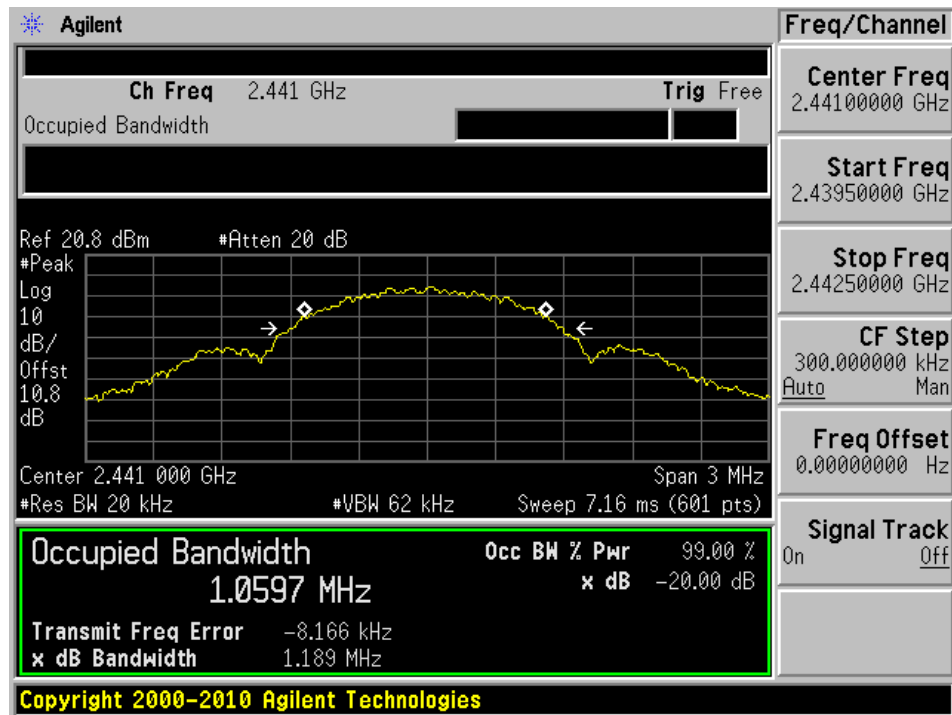
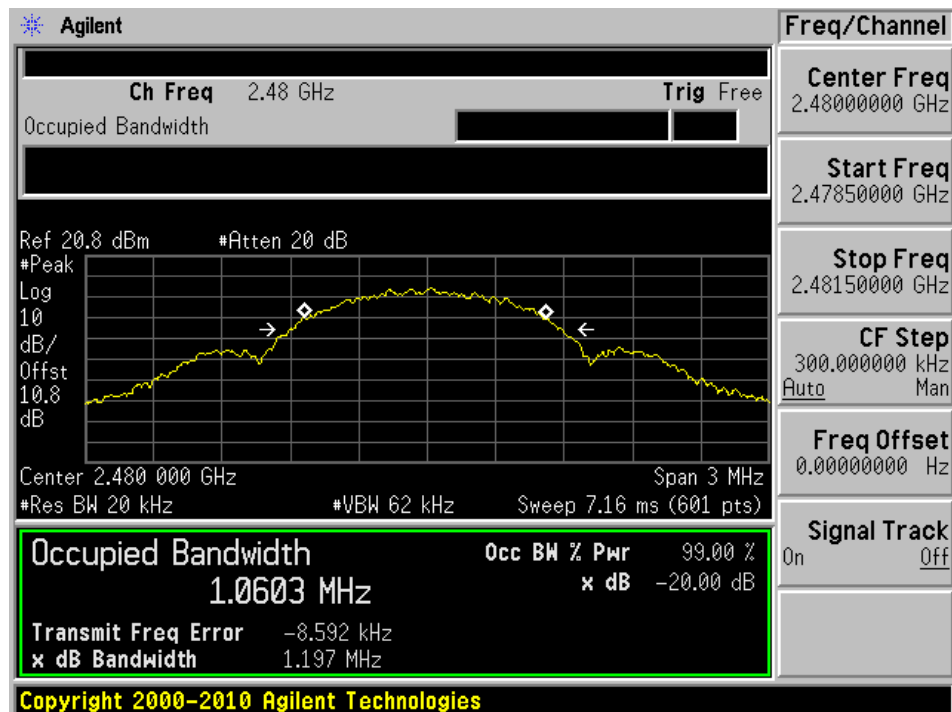


## GFSK Mode 2441 MHz Mid Channel OBW

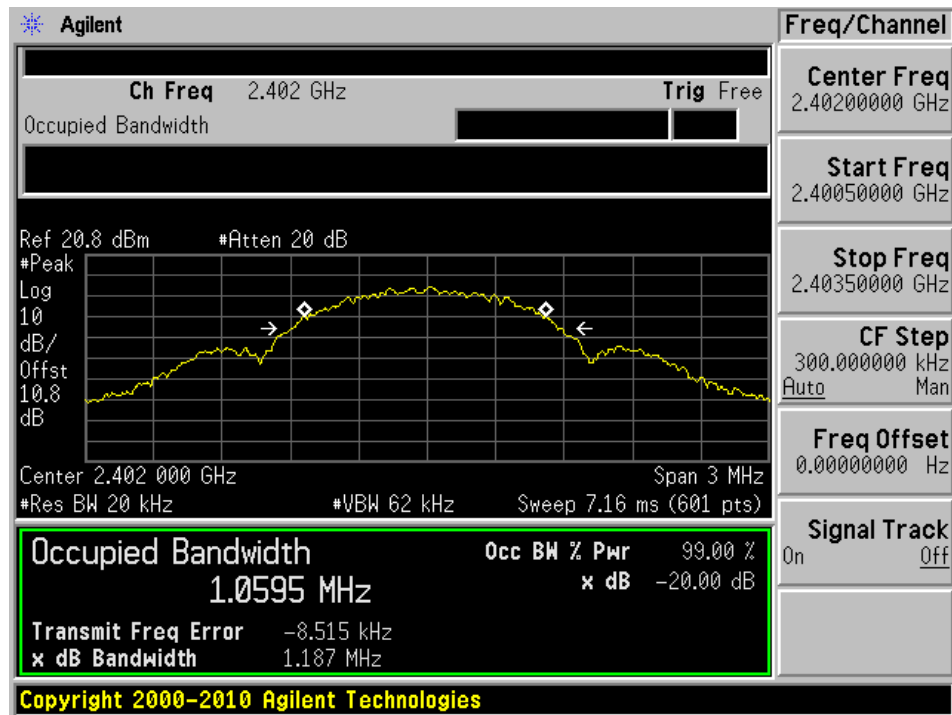


## GFSK Mode 2480 MHz High Channel OBW

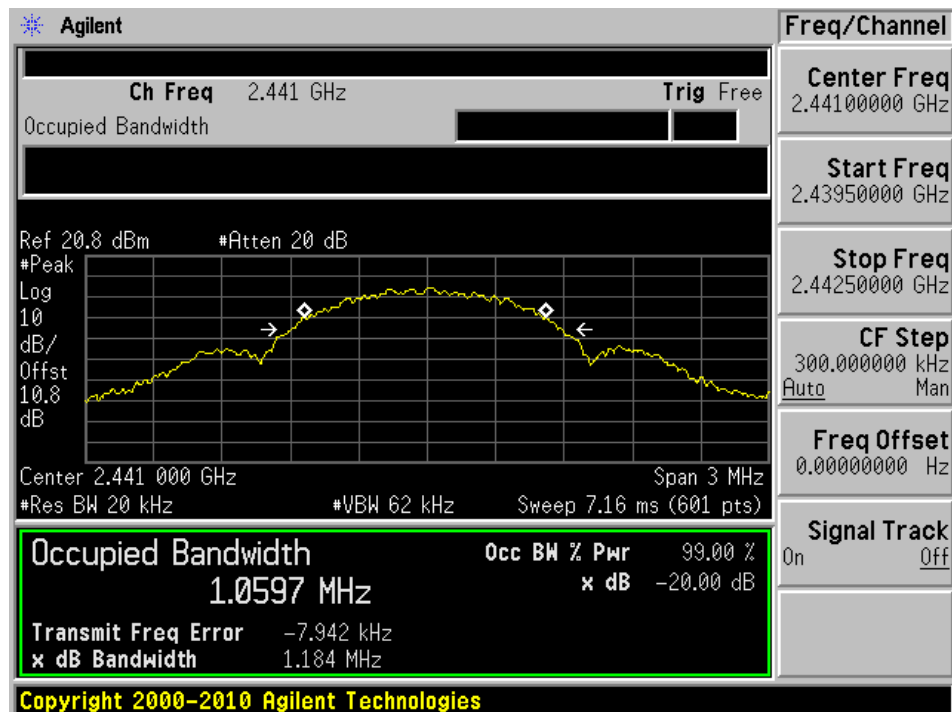
 $\pi/4$ -DQPSK Mode 2402 MHz Low Channel OBW

$\pi/4$ -DQPSK Mode 2441 MHz Mid Channel OBW $\pi/4$ -DQPSK Mode 2480 MHz High Channel OBW

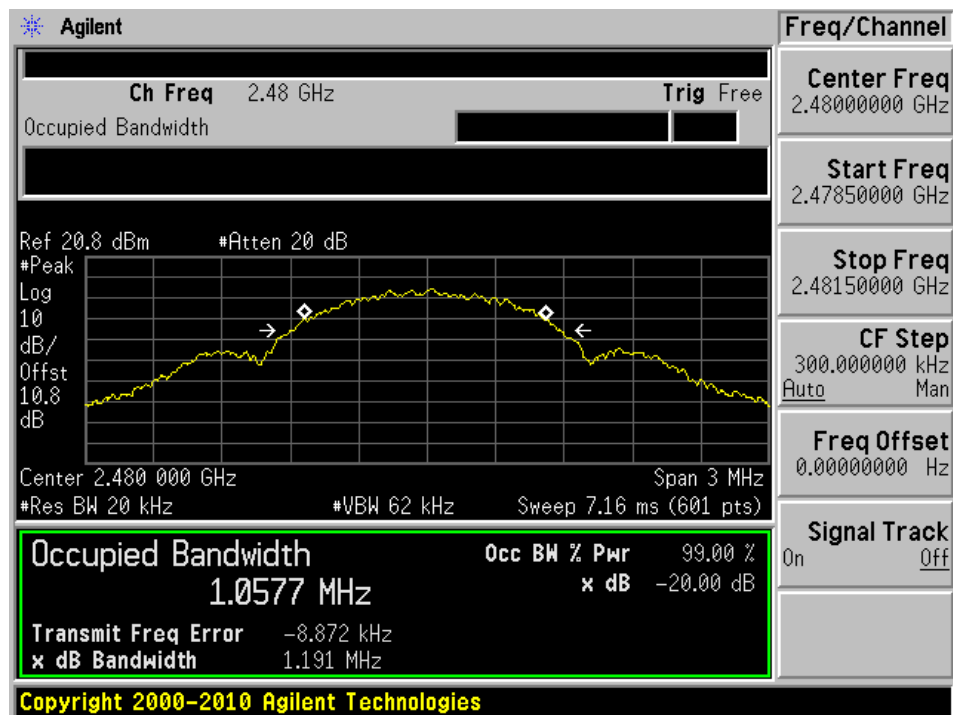
## 8DPSK Mode 2402 MHz Low Channel OBW



## 8DPSK Mode 2441 MHz Mid Channel OBW



## 8DPSK Mode 2480 MHz High Channel OBW



## 9 FCC §15.247(b) (1) - Output Power

### 9.1 Applicable Standards

According to FCC §15.247(b) (1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 9.2 Measurement Procedure

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

### 9.3 Test Equipment List and Details

| Manufacturer | Description        | Model No. | Serial No. | Calibration Date       | Calibration Interval |
|--------------|--------------------|-----------|------------|------------------------|----------------------|
| Agilent      | Analyzer, Spectrum | E4446A    | MY48250238 | 2018-05-08             | 1 year               |
| -            | 10 dB Attenuator   | -         | -          | Each time <sup>1</sup> | N/A                  |
| -            | RF cable           | -         | -          | Each time <sup>1</sup> | N/A                  |

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

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

### 9.4 Test Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 42 %      |
| ATM Pressure:      | 102.7 KPa |

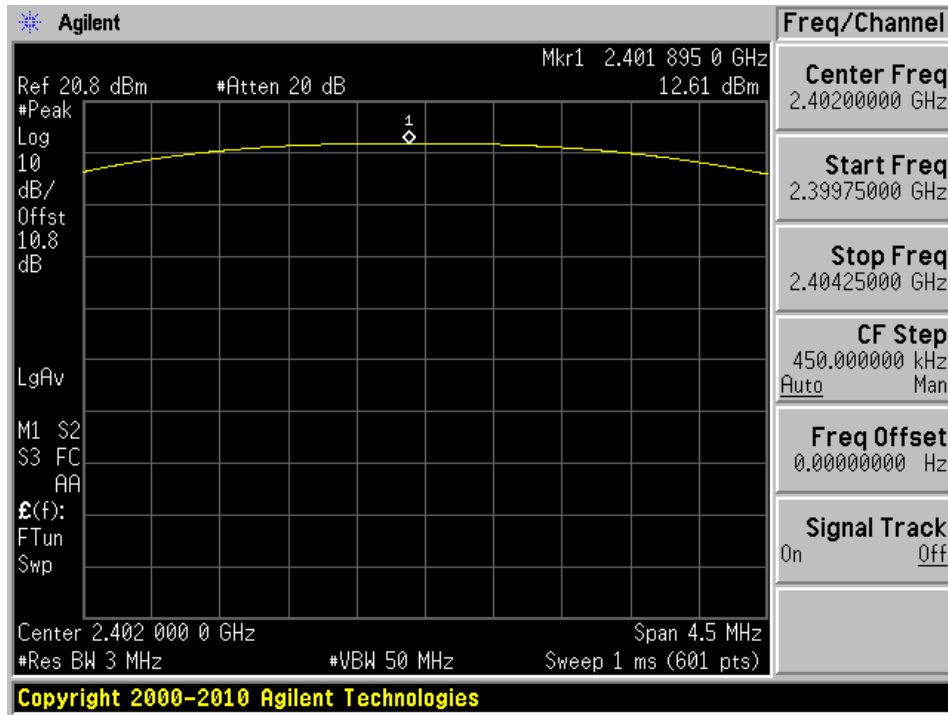
The testing was performed by Vincent Licata from 2018-08-14 to 2018-08-15 in RF site.

## 9.5 Test Results

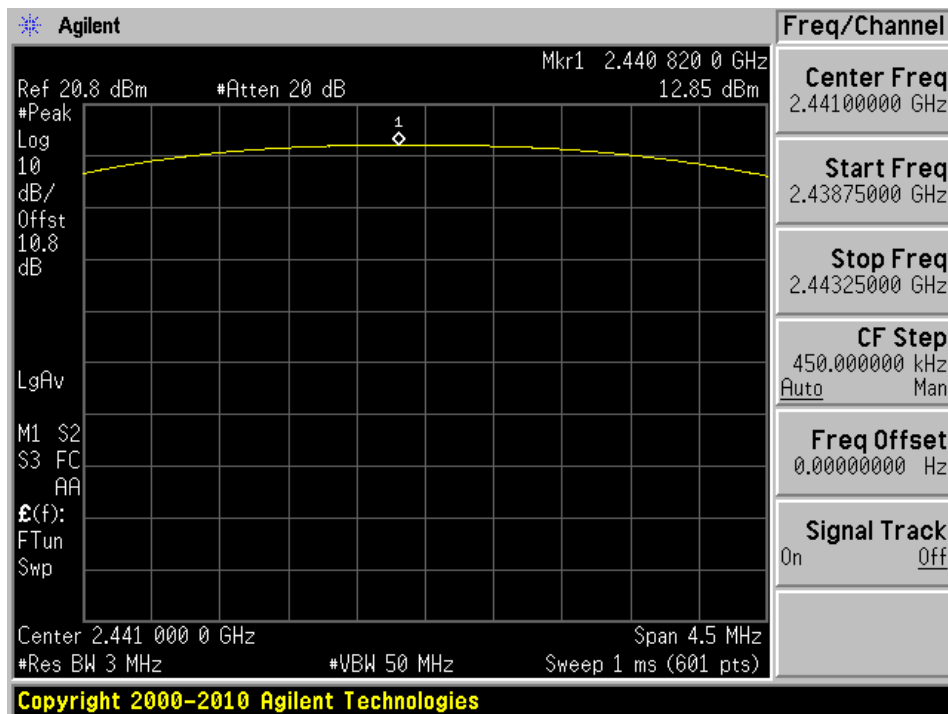
| Channel        | Frequency (MHz) | Conducted Output Power (dBm) | Limit (dBm) |
|----------------|-----------------|------------------------------|-------------|
| GFSK           |                 |                              |             |
| Low            | 2402            | 12.61                        | 21          |
| Middle         | 2441            | 12.85                        | 21          |
| High           | 2480            | 12.42                        | 21          |
| $\pi/4$ -DQPSK |                 |                              |             |
| Low            | 2402            | 12.65                        | 21          |
| Middle         | 2441            | 12.85                        | 21          |
| High           | 2480            | 12.41                        | 21          |
| 8DPSK          |                 |                              |             |
| Low            | 2402            | 12.59                        | 21          |
| Middle         | 2441            | 12.87                        | 21          |
| High           | 2480            | 12.40                        | 21          |

Please refer to the following plots for detailed test results.

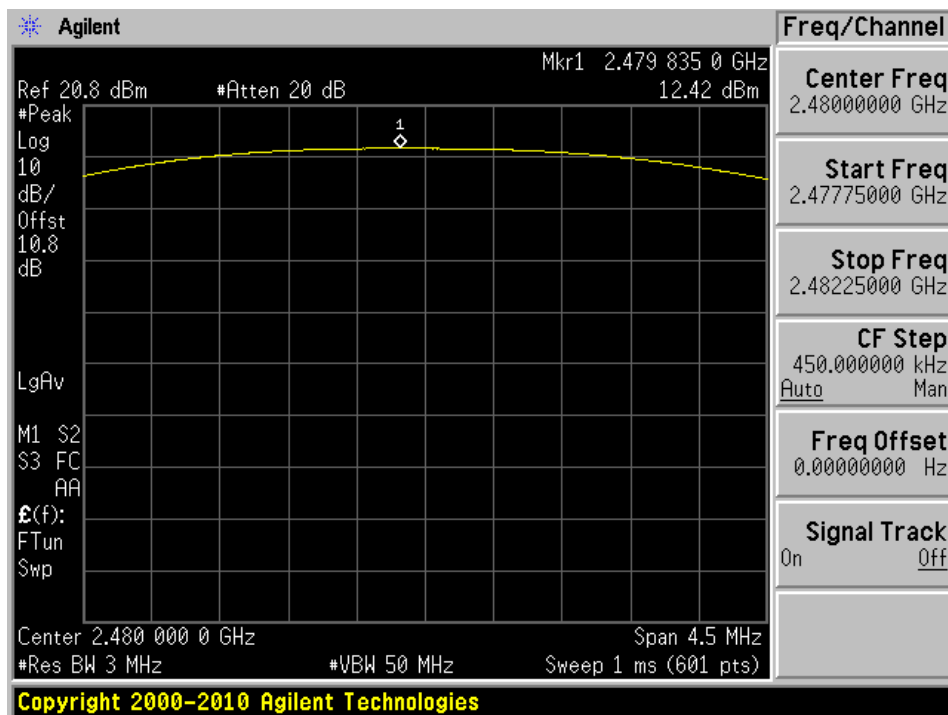
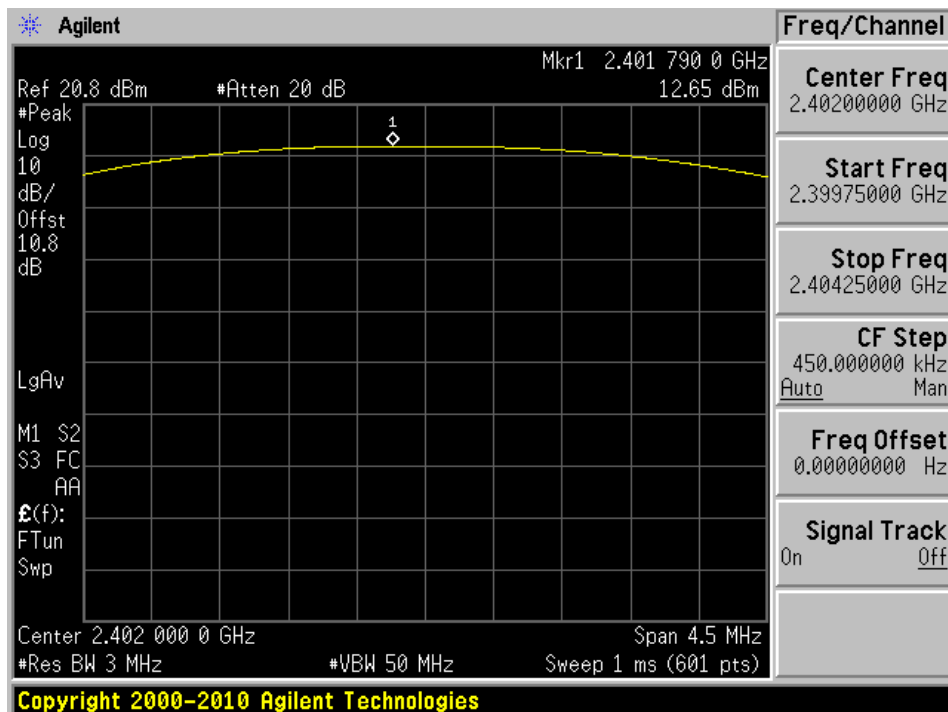
## GFSK Mode 2402 MHz Low Channel Power

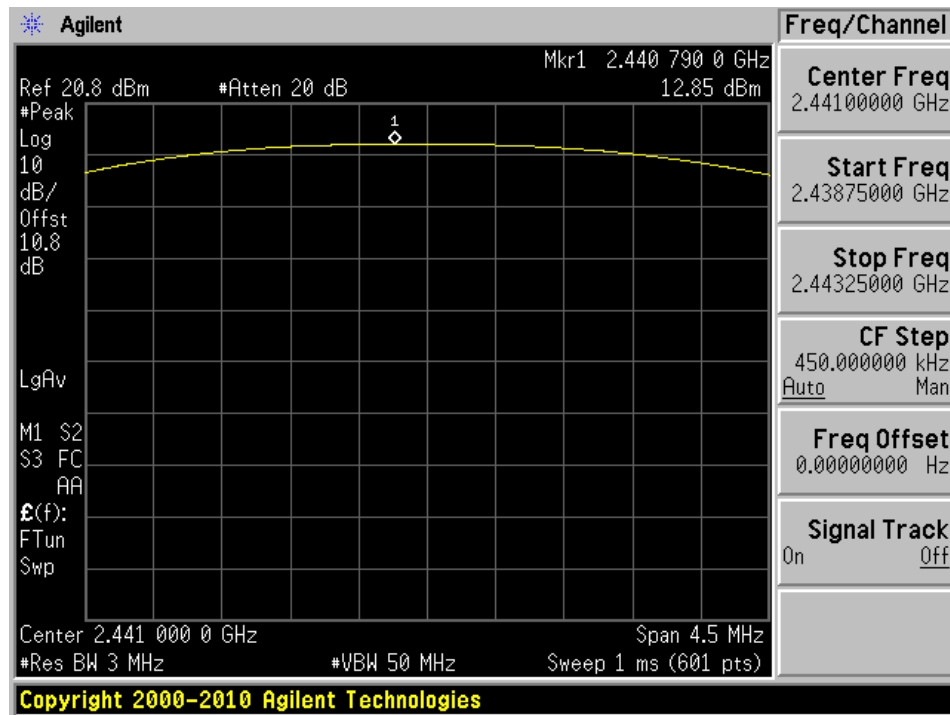
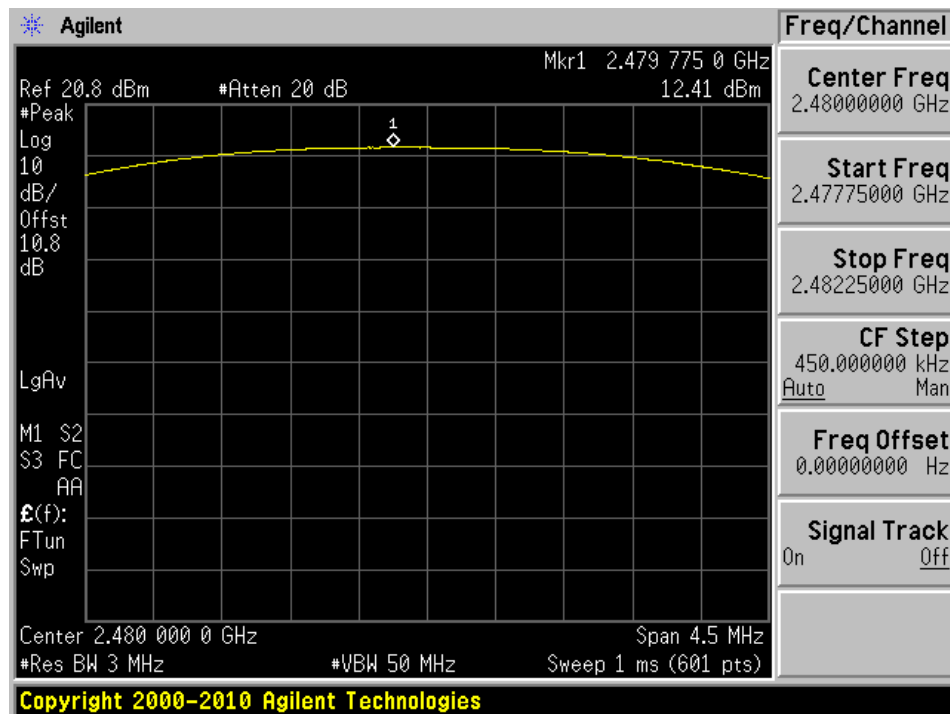


## GFSK Mode 2441 MHz Mid Channel Power

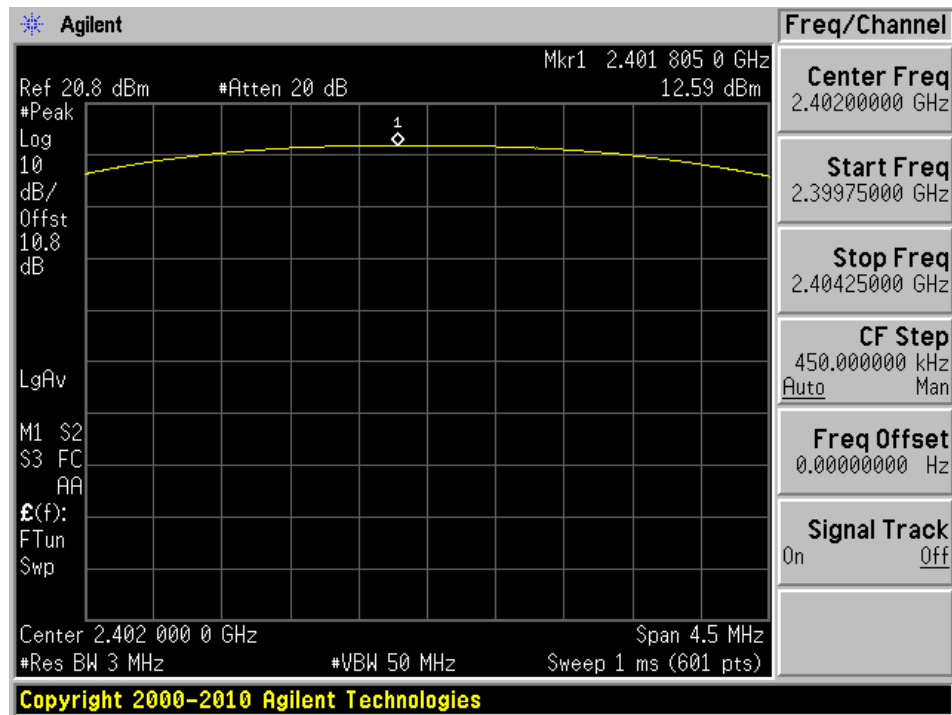


## GFSK Mode 2480 MHz High Channel Power

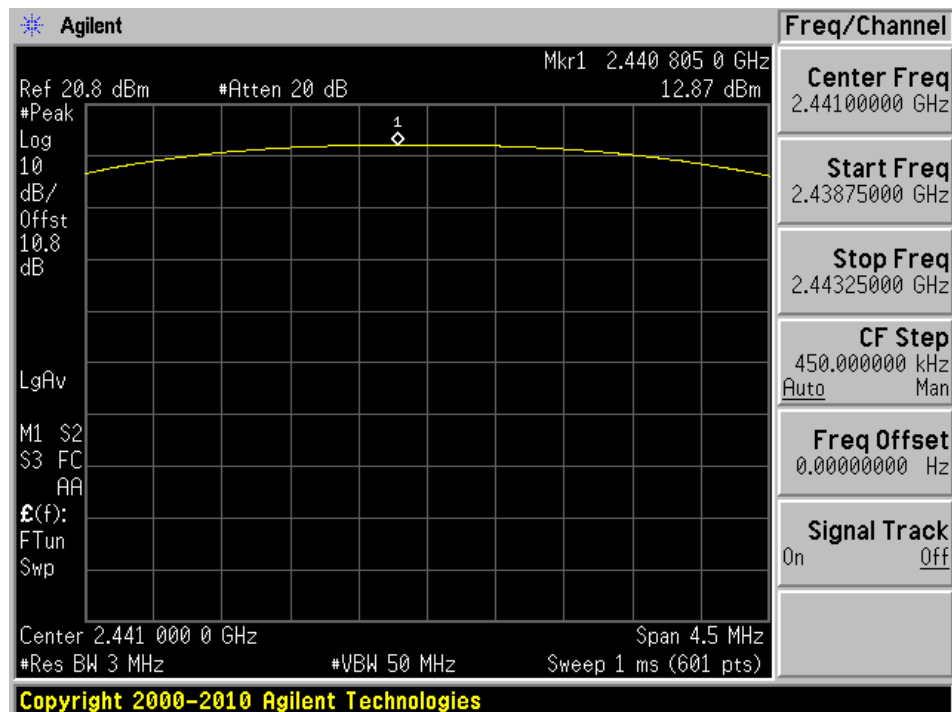
 $\pi/4$ -DQPSK Mode 2402 MHz Low Channel Power

$\pi/4$ -DQPSK Mode 2441 MHz Mid Channel Power $\pi/4$ -DQPSK Mode 2480 MHz High Channel Power

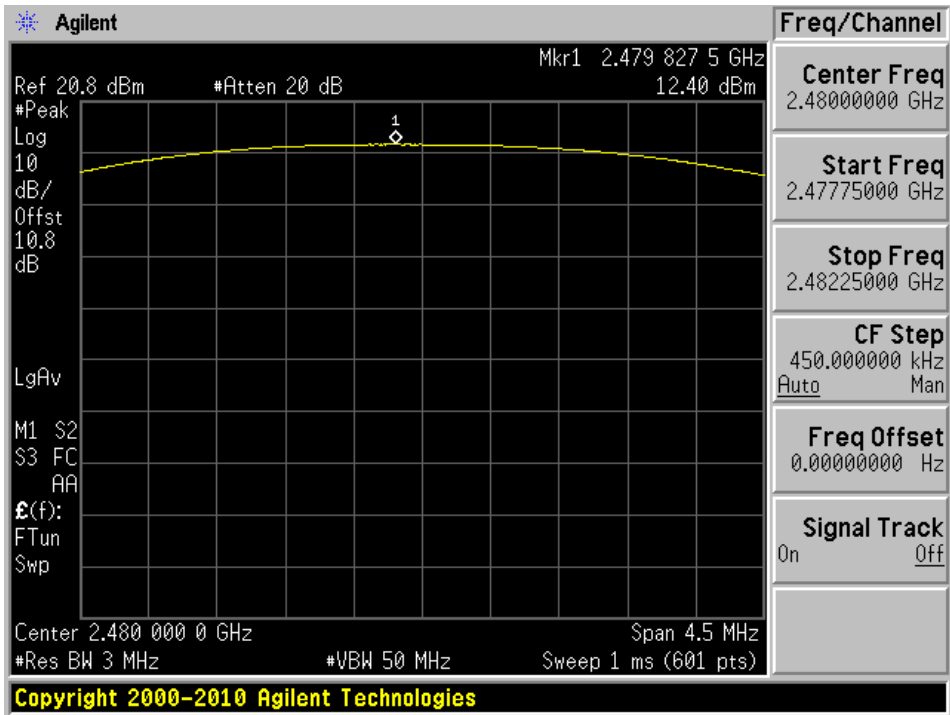
## 8DPSK Mode 2402 MHz Low Channel Power



## 8DPSK Mode 2441 MHz Mid Channel Power



8DPSK Mode 2480 MHz High Channel Power



## 10 FCC §15.247(d) - 100 kHz Bandwidth of Band Edges

### 10.1 Applicable Standards

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

### 10.2 Measurement Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation

RBW = 100 kHz

VBW = 300 kHz

Sweep = coupled

Detector function = peak

Trace = max hold

### 10.3 Test Equipment List and Details

| Manufacturer | Description        | Model No. | Serial No. | Calibration Date       | Calibration Interval |
|--------------|--------------------|-----------|------------|------------------------|----------------------|
| Agilent      | Analyzer, Spectrum | E4446A    | MY48250238 | 2018-05-08             | 1 year               |
| -            | 10 dB Attenuator   | -         | -          | Each time <sup>1</sup> | N/A                  |
| -            | RF cable           | -         | -          | Each time <sup>1</sup> | N/A                  |

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

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

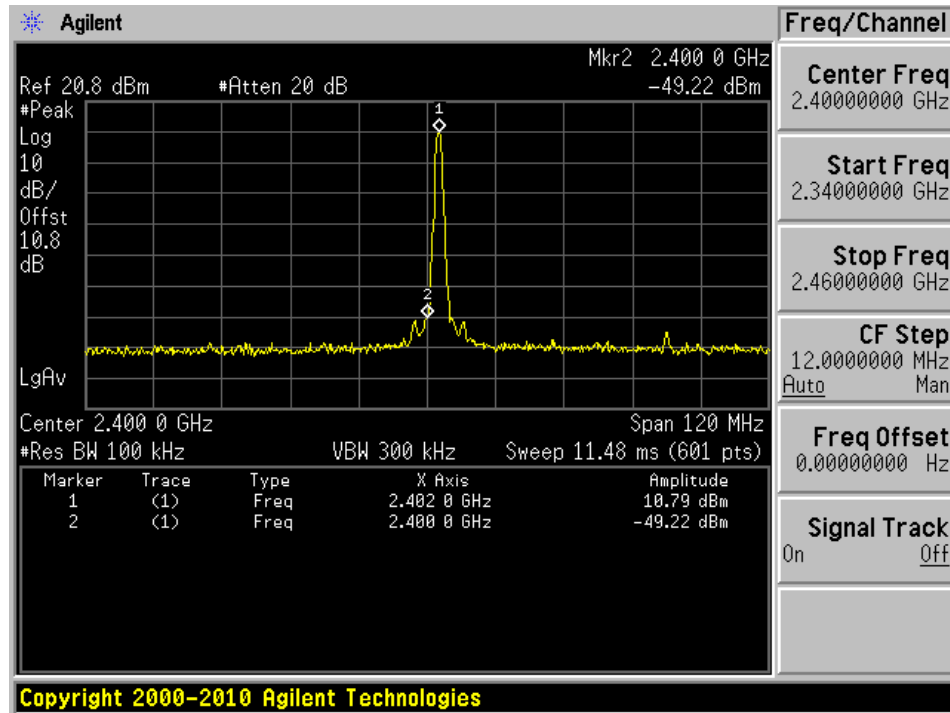
### 10.4 Test Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 42 %      |
| ATM Pressure:      | 102.7 KPa |

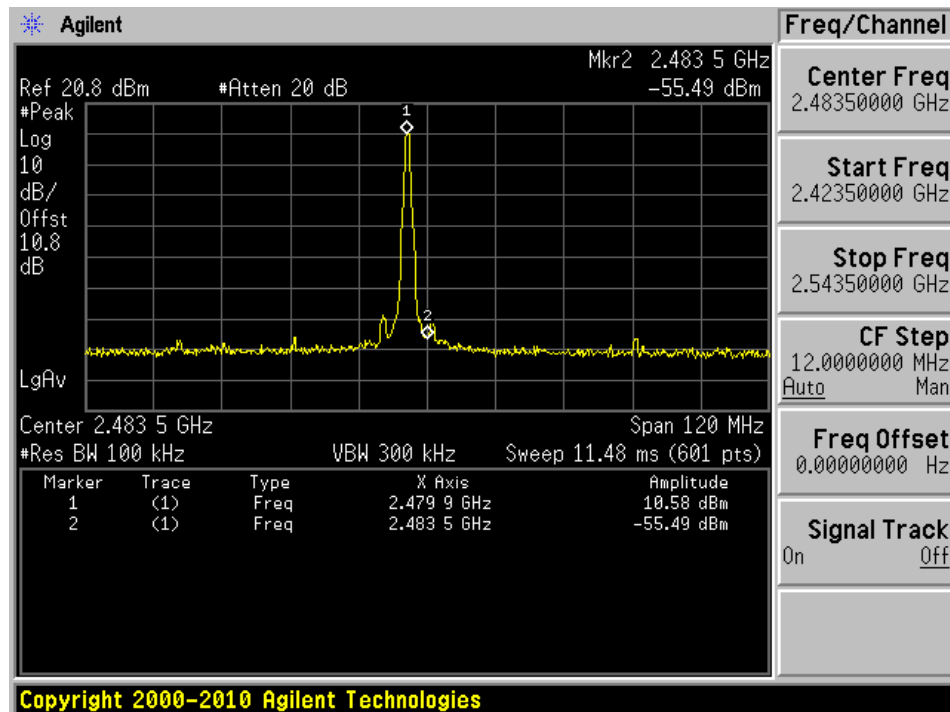
The testing was performed by Vincent Licata from 2018-08-14 to 2018-08-15 in RF site.

## 10.5 Test Results

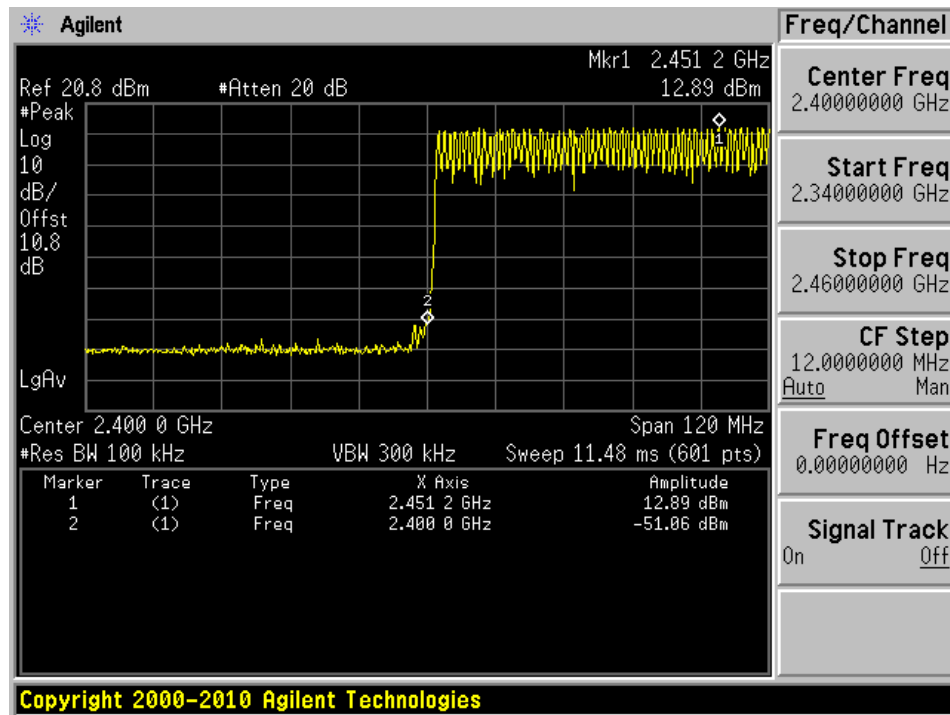
### GFSK Mode 2402 MHz Low Channel Band Edge Fixed



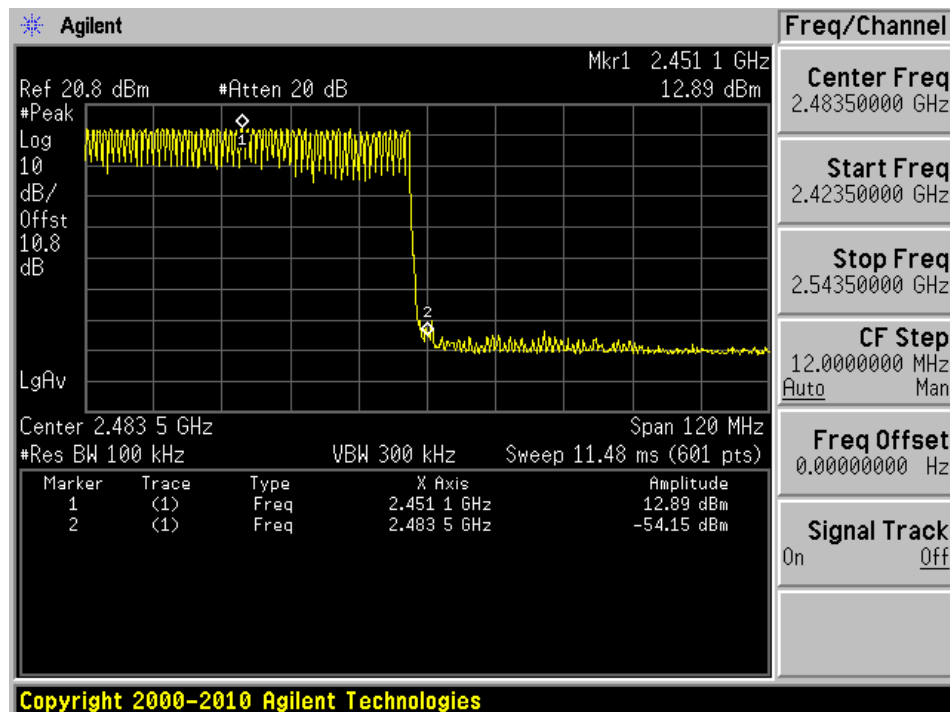
### GFSK Mode 2480 MHz High Channel Band Edge Fixed

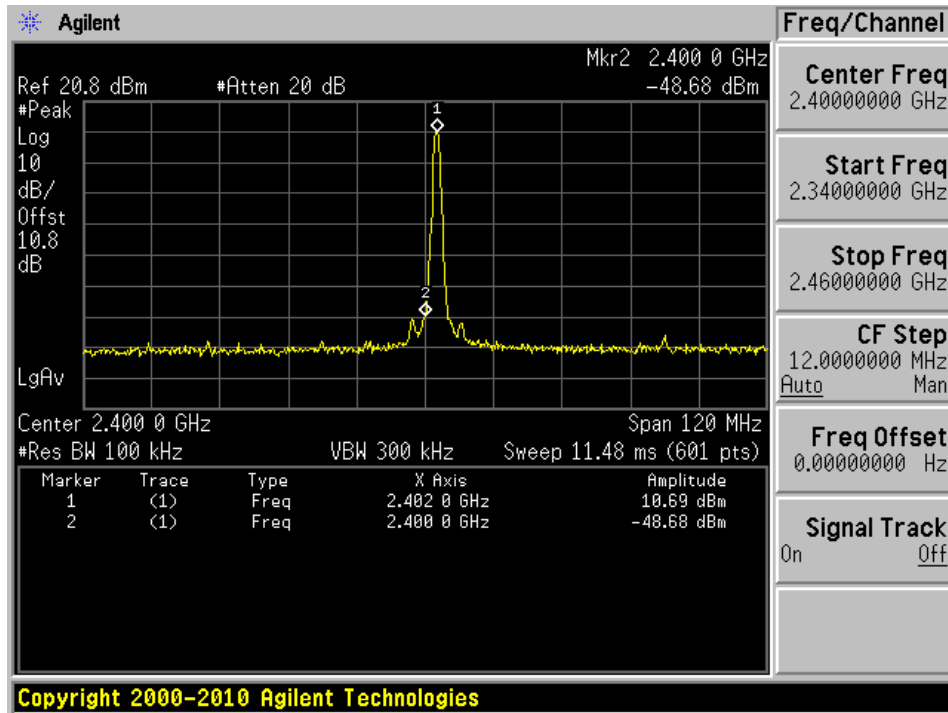
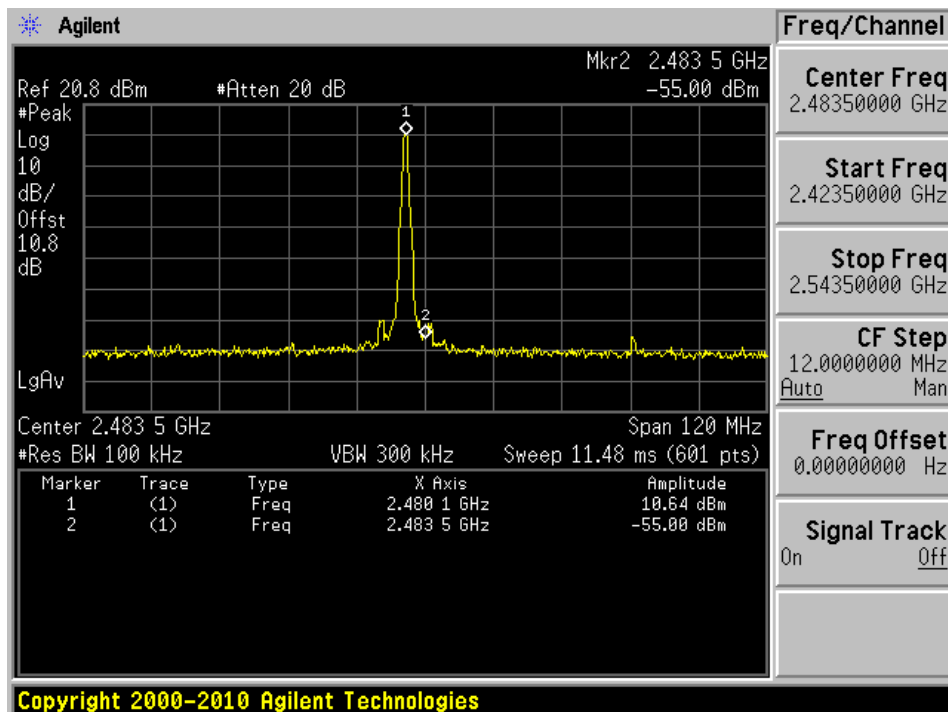


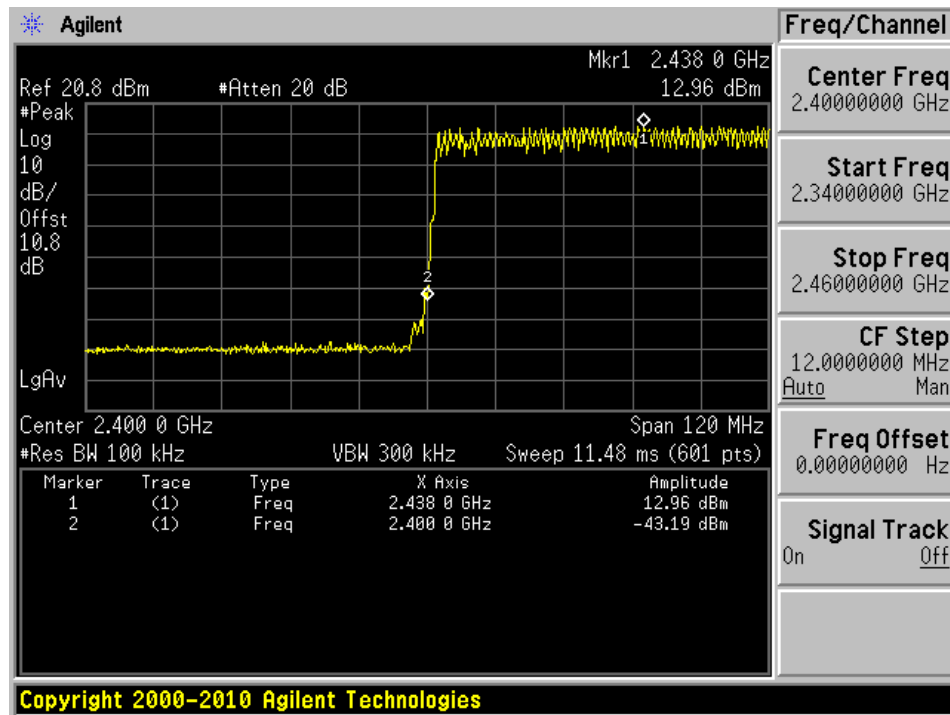
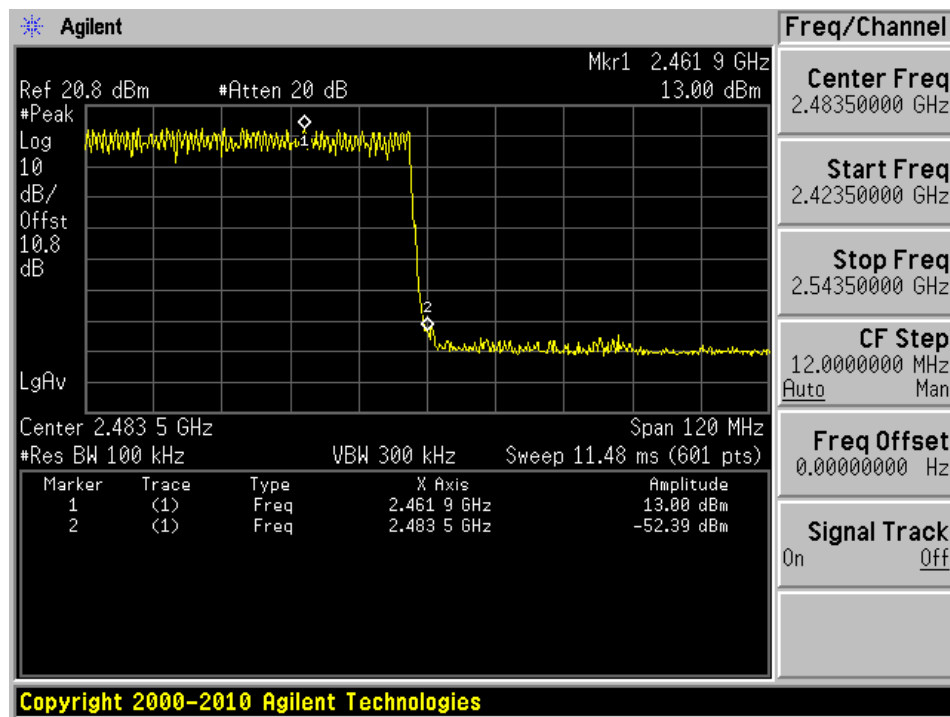
## GFSK Mode 2402 MHz Low Channel Band Edge Hopping



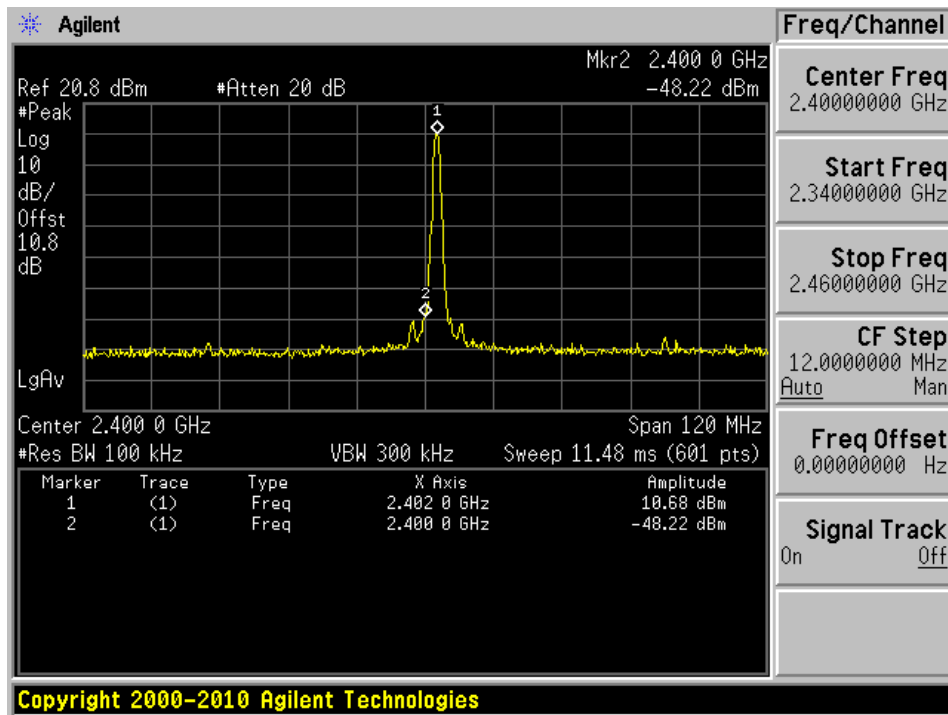
## GFSK Mode 2480 MHz High Channel Band Edge Hopping



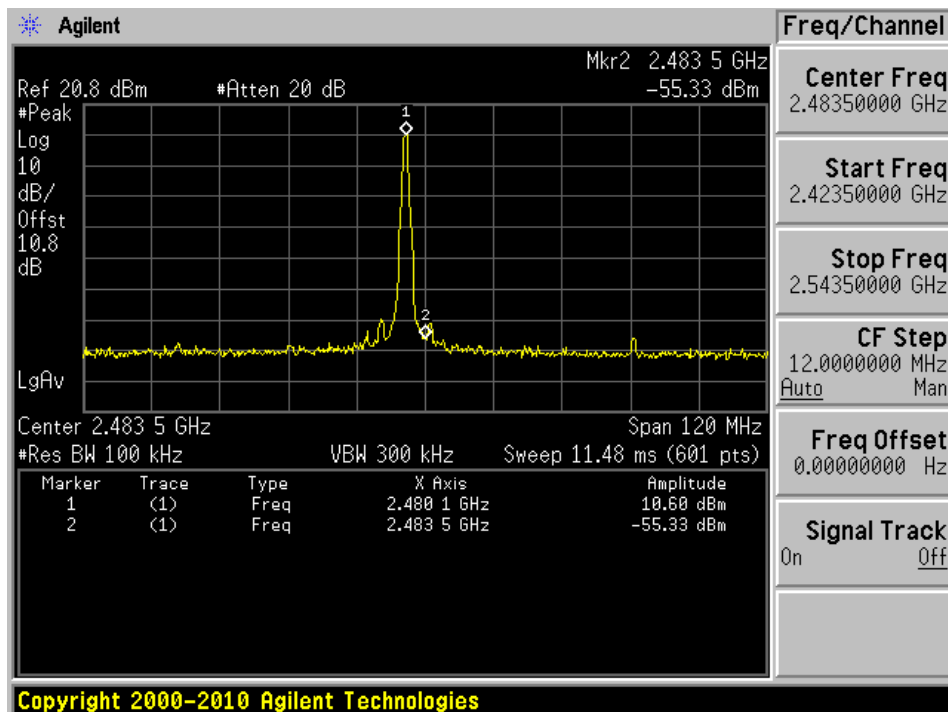
$\pi/4$ -DQPSK Mode 2402 MHz Low Channel Band Edge Fixed $\pi/4$ -DQPSK Mode 2480 MHz High Channel Band Edge Fixed

$\pi/4$ -DQPSK Mode 2402 MHz Low Channel Band Edge Hopping $\pi/4$ -DQPSK Mode 2480 MHz High Channel Band Edge Hopping

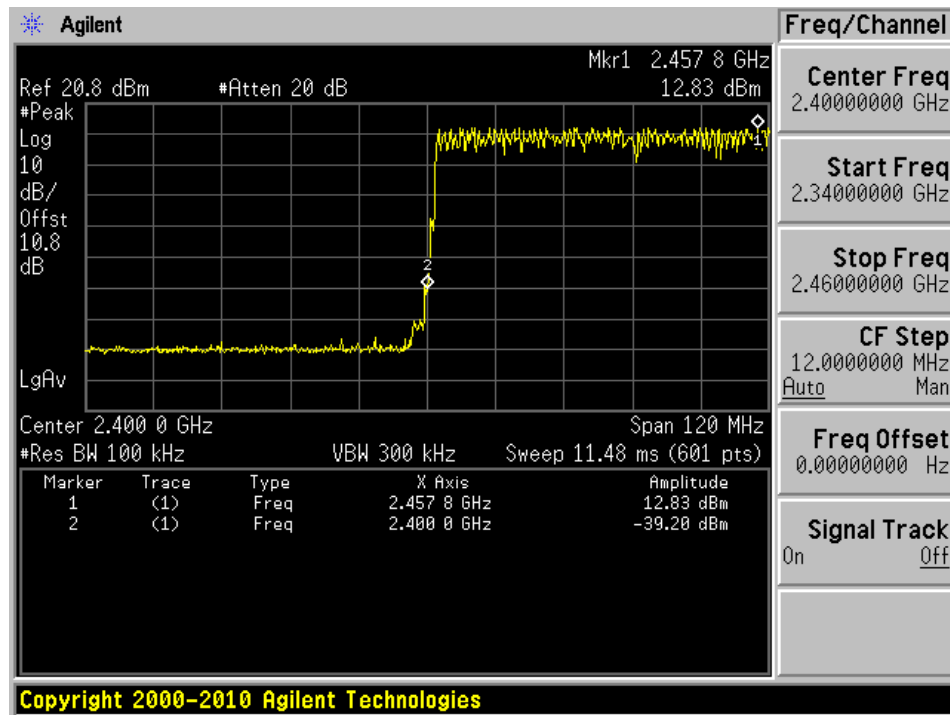
## 8DPSK Mode 2402 MHz Low Channel Band Edge Fixed



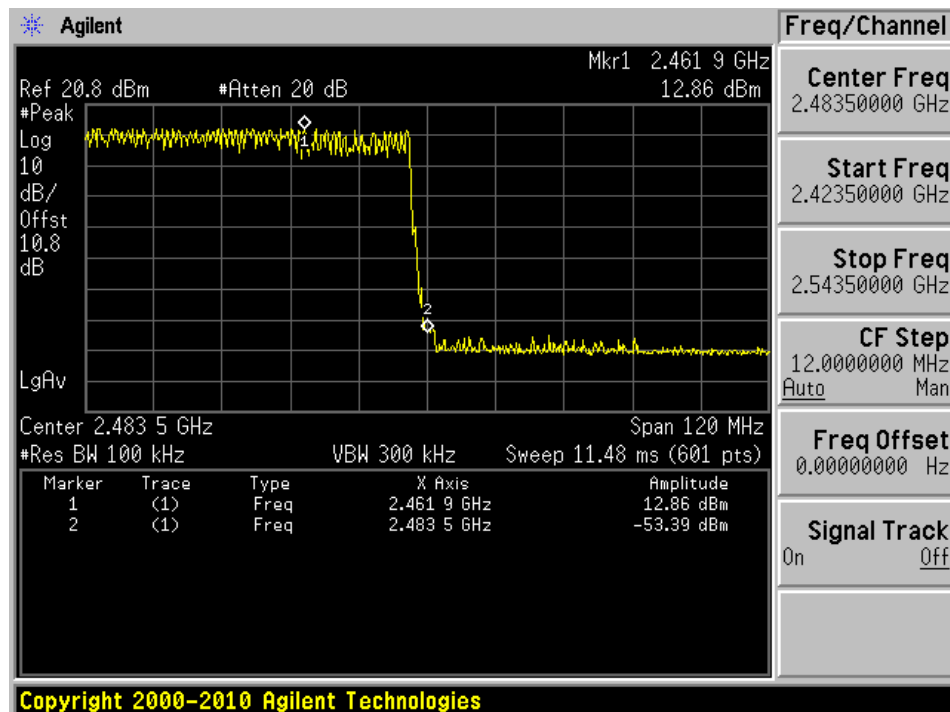
## 8DPSK Mode 2480 MHz High Channel Band Edge Fixed



## 8DPSK Mode 2402 MHz Low Channel Band Edge Hopping



## 8DPSK Mode 2480 MHz High Channel Band Edge Hopping



## 11 FCC §15.247(a) (1) (iii) - Dwell Time

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### 11.1 Applicable Standards

According to FCC §15.247(a) (1) (iii), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 11.2 Measurement Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW  $\leq$  channel spacing and where possible RBW should be set  $\gg 1/T$ , where  $T$  is the expected dwell time per channel

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

$$\begin{aligned} &(\text{Number of hops in the period specified in the requirements}) = \\ &(\text{number of hops on spectrum analyzer}) \times (\text{period specified in the requirements} / \text{analyzer sweep time}) \end{aligned}$$

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

### 11.3 Test Equipment List and Details

| Manufacturer | Description        | Model No. | Serial No. | Calibration Date       | Calibration Interval |
|--------------|--------------------|-----------|------------|------------------------|----------------------|
| Agilent      | Analyzer, Spectrum | E4446A    | MY48250238 | 2018-05-08             | 1 year               |
| -            | RF cable           | -         | -          | Each time <sup>1</sup> | N/A                  |
| -            | 10 dB Attenuator   | -         | -          | Each time <sup>1</sup> | N/A                  |

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

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

### 11.4 Test Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 42 %      |
| ATM Pressure:      | 102.7 KPa |

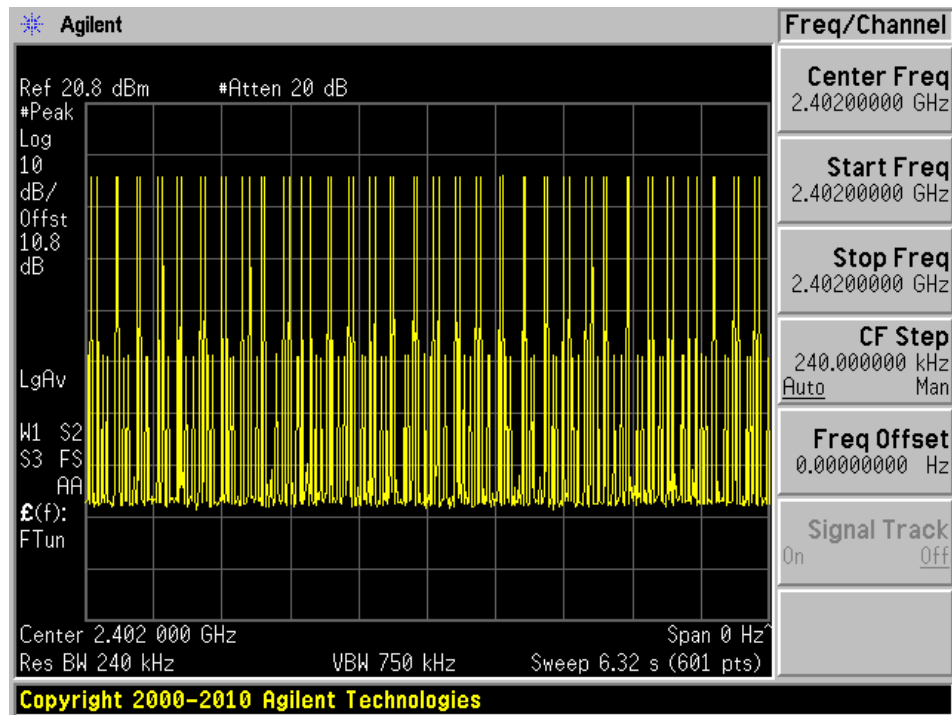
*The testing was performed by Vincent Licata from 2018-08-14 to 2018-08-15 in RF site.*

## 11.5 Test Results

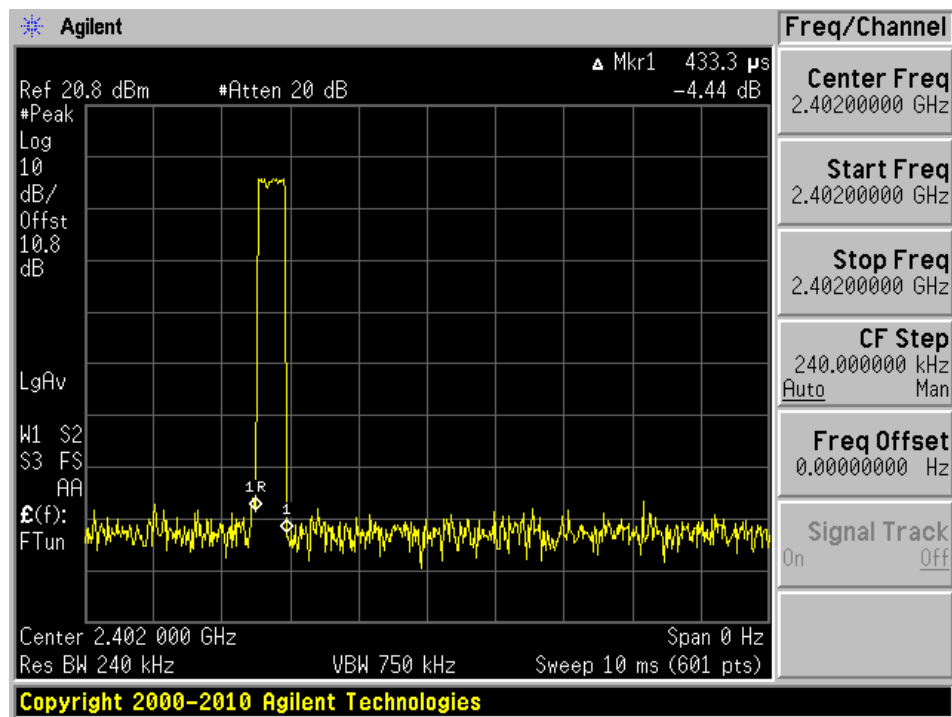
| Channel            | Pulse Width (ms) | Number of Hops in the Period Specified in the Requirements | Average Time of Occupancy (s) | Limit (sec) | Results   |
|--------------------|------------------|------------------------------------------------------------|-------------------------------|-------------|-----------|
| GFSK,DH1           |                  |                                                            |                               |             |           |
| Low                | 0.4333           | 320                                                        | 0.139                         | 0.4         | compliant |
| Middle             | 0.4333           | 310                                                        | 0.134                         | 0.4         | compliant |
| High               | 0.4333           | 320                                                        | 0.139                         | 0.4         | compliant |
| GFSK,DH3           |                  |                                                            |                               |             |           |
| Low                | 1.617            | 160                                                        | 0.259                         | 0.4         | compliant |
| Middle             | 1.617            | 165                                                        | 0.267                         | 0.4         | compliant |
| High               | 1.617            | 160                                                        | 0.259                         | 0.4         | compliant |
| GFSK,DH5           |                  |                                                            |                               |             |           |
| Low                | 2.867            | 135                                                        | 0.387                         | 0.4         | compliant |
| Middle             | 2.867            | 120                                                        | 0.344                         | 0.4         | compliant |
| High               | 2.867            | 120                                                        | 0.344                         | 0.4         | compliant |
| $\pi/4$ -DQPSK,DH1 |                  |                                                            |                               |             |           |
| Low                | 0.4333           | 320                                                        | 0.139                         | 0.4         | compliant |
| Middle             | 0.4333           | 300                                                        | 0.130                         | 0.4         | compliant |
| High               | 0.4333           | 320                                                        | 0.139                         | 0.4         | compliant |
| $\pi/4$ -DQPSK,DH3 |                  |                                                            |                               |             |           |
| Low                | 1.617            | 170                                                        | 0.275                         | 0.4         | compliant |
| Middle             | 1.617            | 170                                                        | 0.275                         | 0.4         | compliant |
| High               | 1.617            | 170                                                        | 0.275                         | 0.4         | compliant |
| $\pi/4$ -DQPSK,DH5 |                  |                                                            |                               |             |           |
| Low                | 2.867            | 135                                                        | 0.387                         | 0.4         | compliant |
| Middle             | 2.867            | 125                                                        | 0.358                         | 0.4         | compliant |
| High               | 2.867            | 135                                                        | 0.387                         | 0.4         | compliant |
| 8DPSK,DH1          |                  |                                                            |                               |             |           |
| Low                | 0.4333           | 320                                                        | 0.139                         | 0.4         | compliant |
| Middle             | 0.4333           | 320                                                        | 0.139                         | 0.4         | compliant |
| High               | 0.4333           | 320                                                        | 0.139                         | 0.4         | compliant |
| 8DPSK,DH3          |                  |                                                            |                               |             |           |
| Low                | 1.617            | 160                                                        | 0.259                         | 0.4         | compliant |
| Middle             | 1.617            | 160                                                        | 0.259                         | 0.4         | compliant |
| High               | 1.617            | 165                                                        | 0.267                         | 0.4         | compliant |
| 8DPSK,DH5          |                  |                                                            |                               |             |           |
| Low                | 2.867            | 130                                                        | 0.373                         | 0.4         | compliant |
| Middle             | 2.867            | 130                                                        | 0.373                         | 0.4         | compliant |
| High               | 2.867            | 130                                                        | 0.373                         | 0.4         | compliant |

Please refer to the following plots for detailed test results.

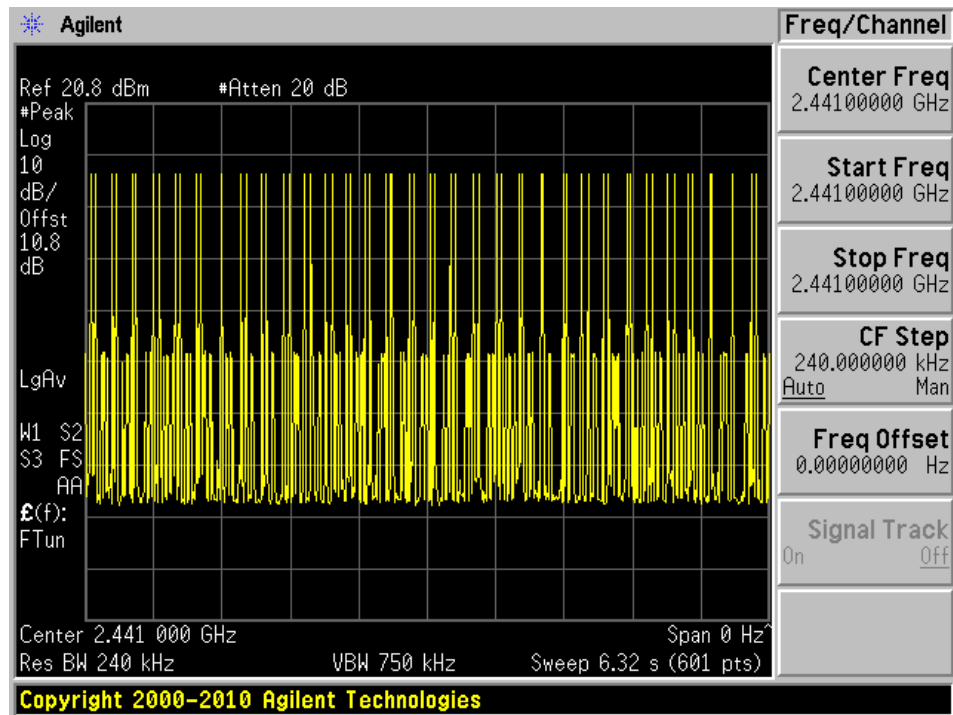
### DH1 Mode 2402 MHz Low Channel # of Pulses



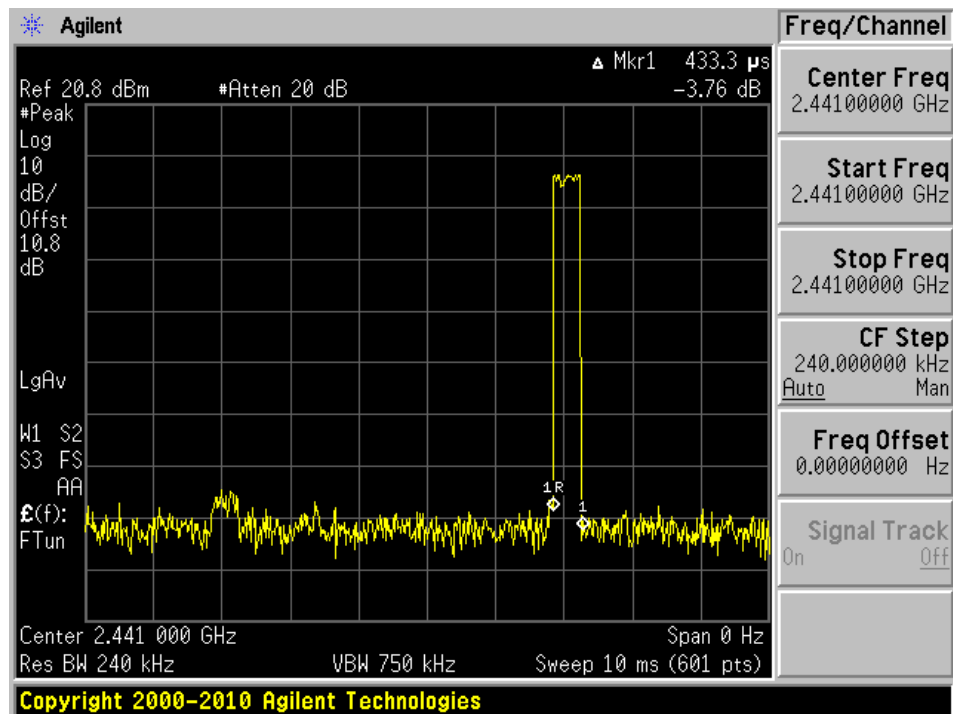
### DH1 Mode 2402 MHz Low Channel Pulse Width



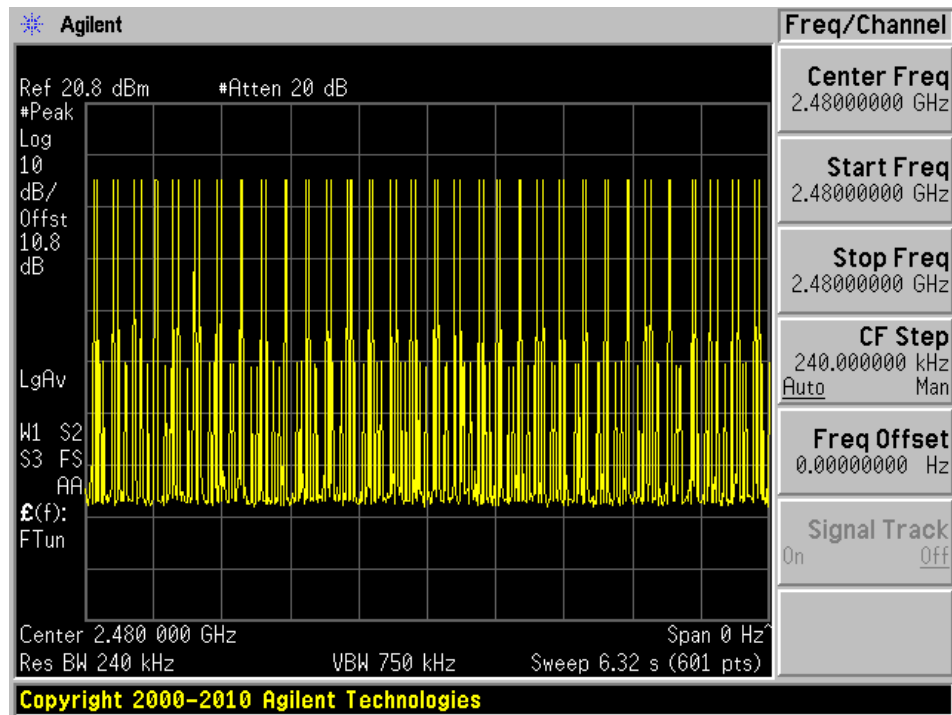
## DH1 Mode 2441 MHz Mid Channel # of Pulses



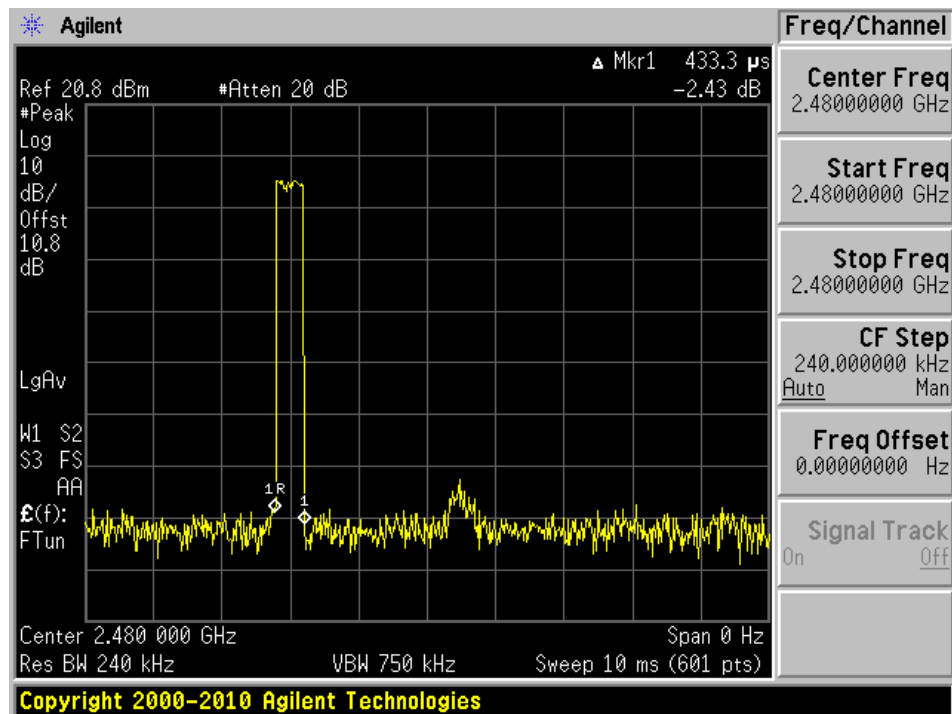
## DH1 Mode 2441 MHz Mid Channel Pulse Width



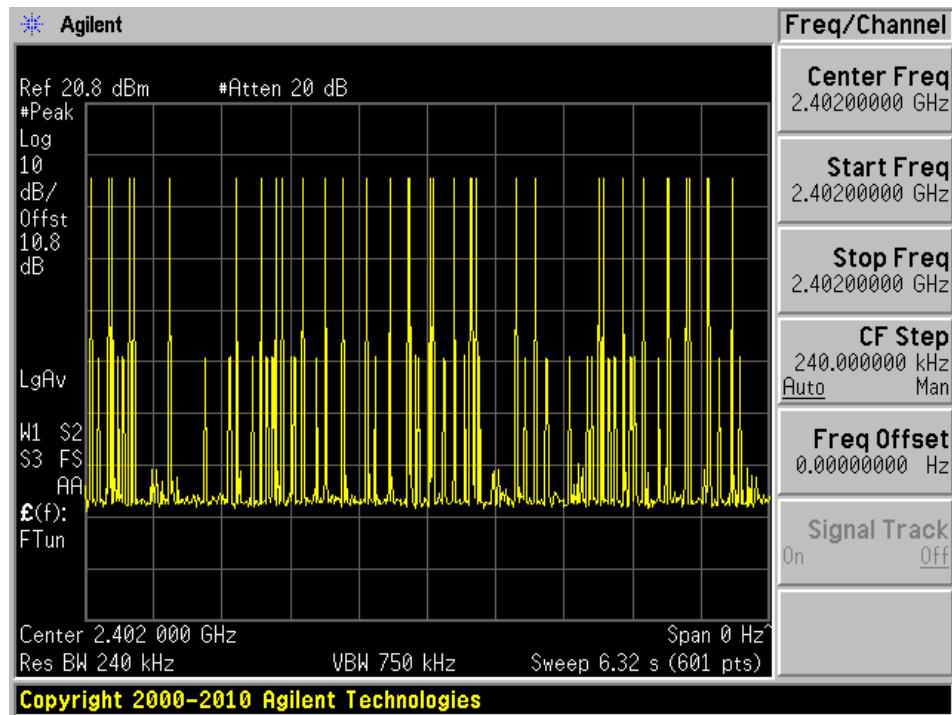
## DH1 Mode 2480 MHz High Channel # of Pulses



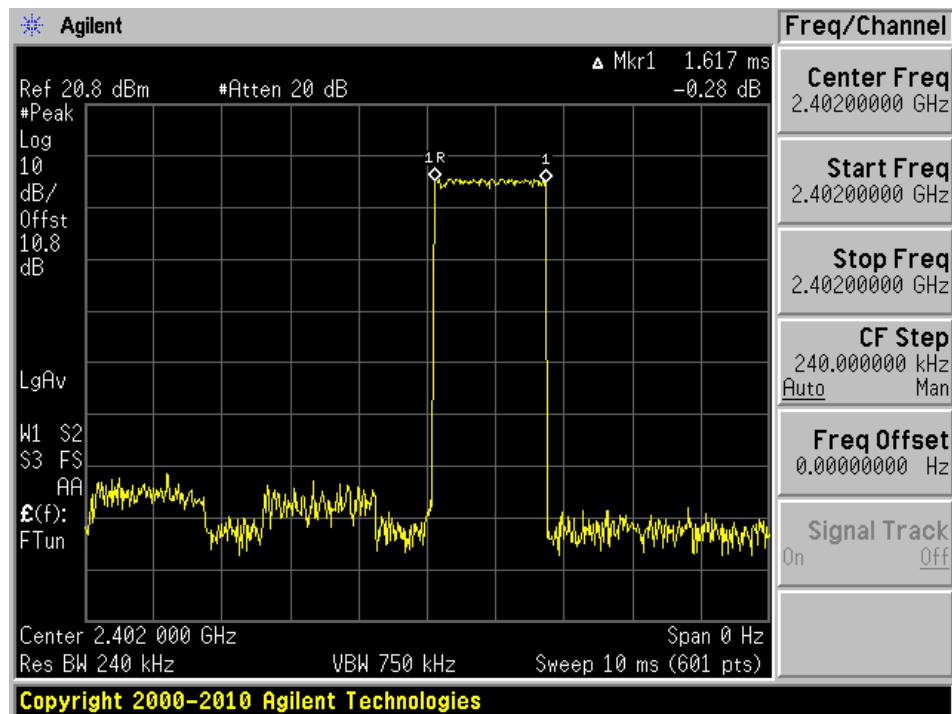
## DH1 Mode 2480 MHz High Channel Pulse Width



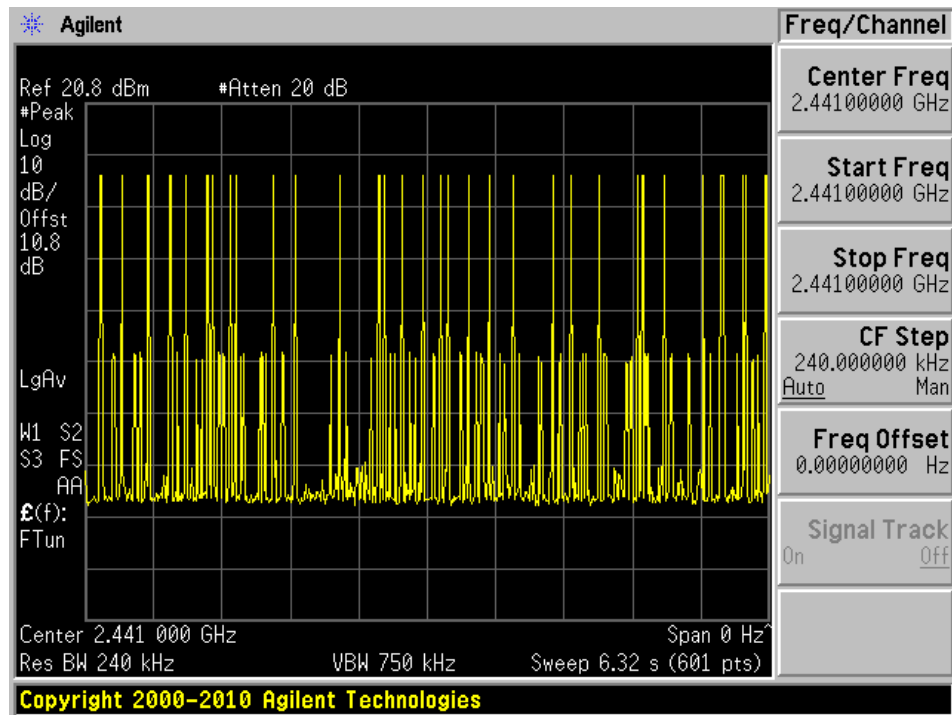
## DH3 Mode 2402 MHz Low Channel # of Pulses



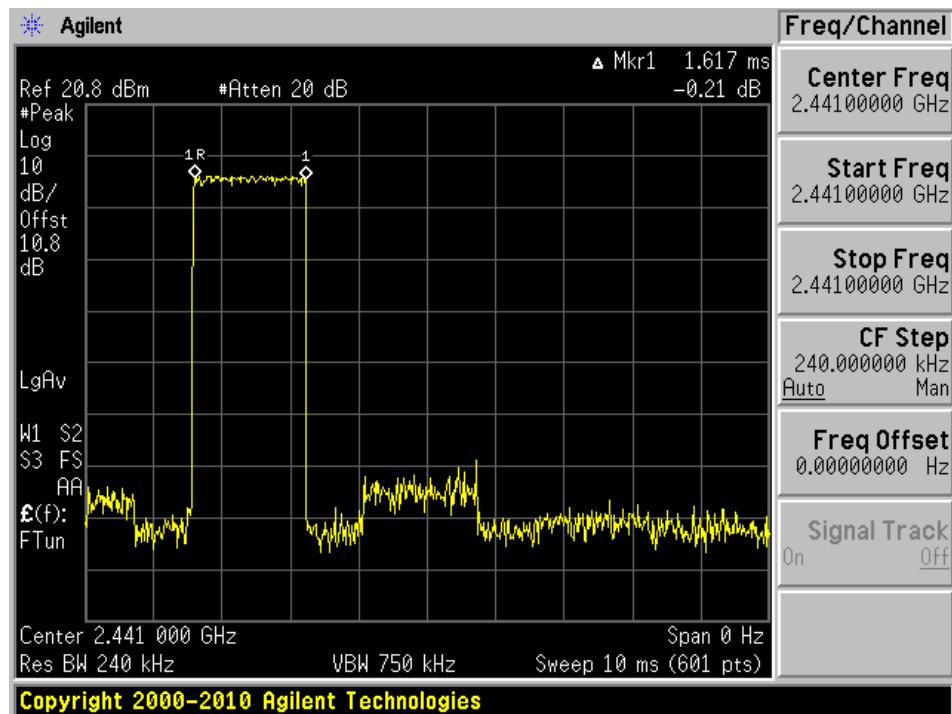
## DH3 Mode 2402 MHz Low Channel Pulse Width



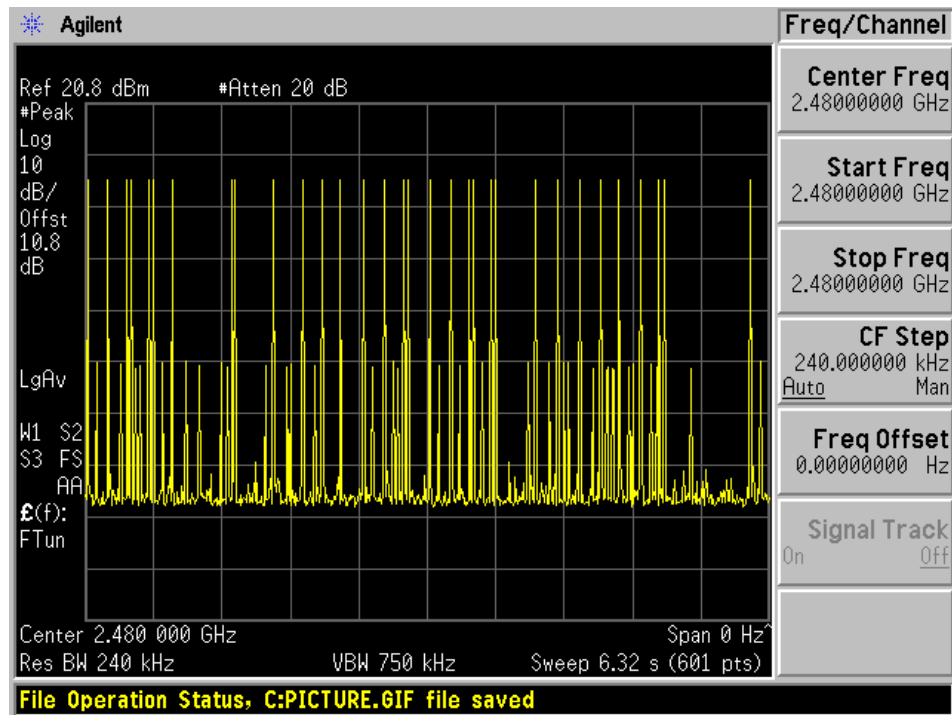
## DH3 Mode 2441 MHz Mid Channel # of Pulses



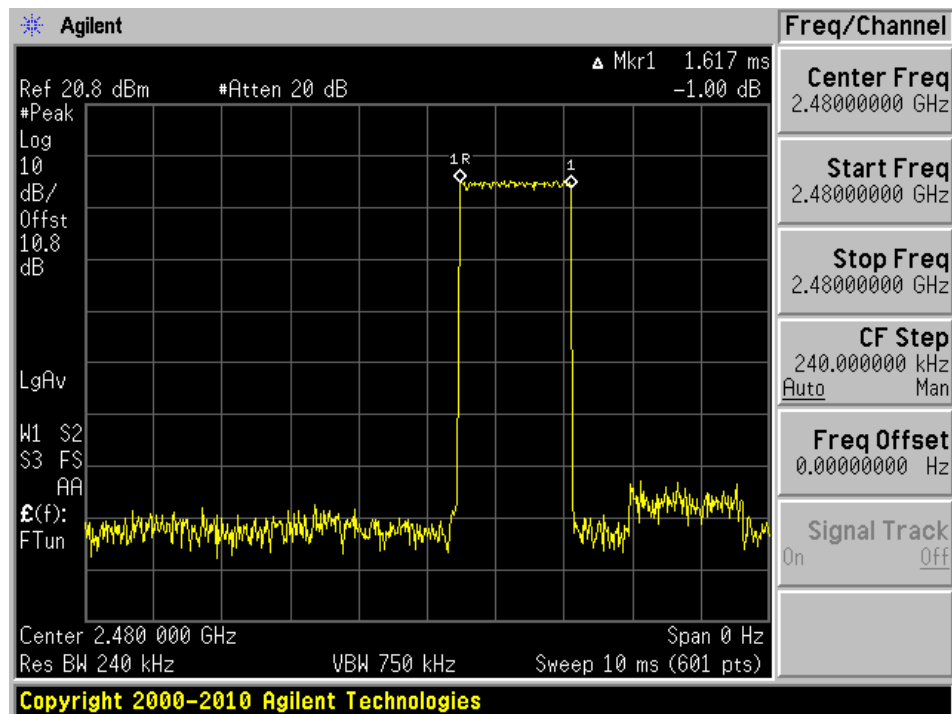
## DH3 Mode 2441 MHz Mid Channel Pulse Width



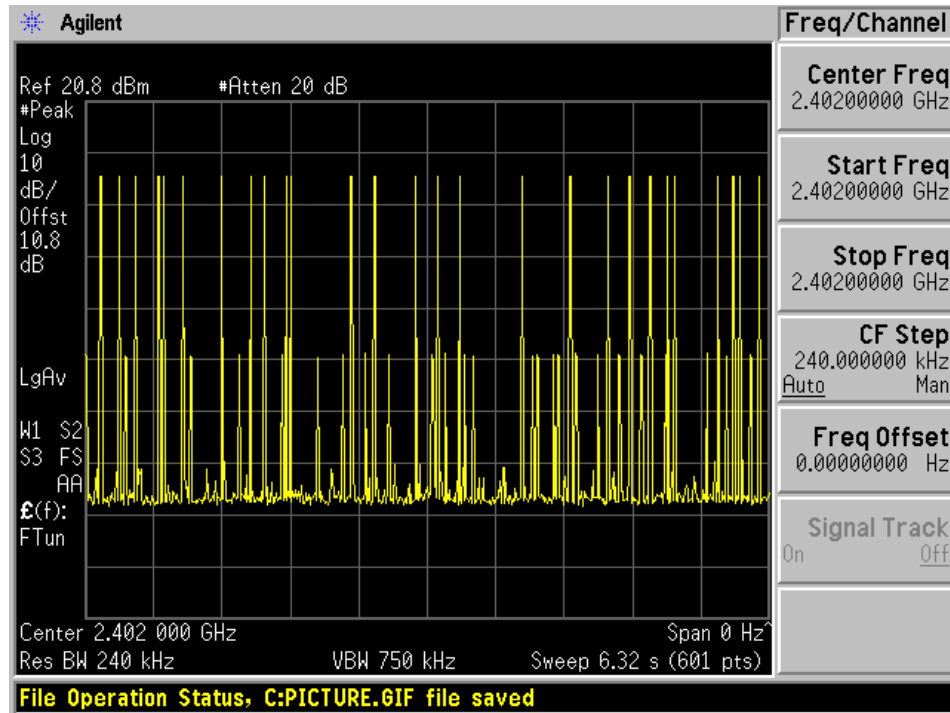
## DH3 Mode 2480 MHz High Channel # of Pulses



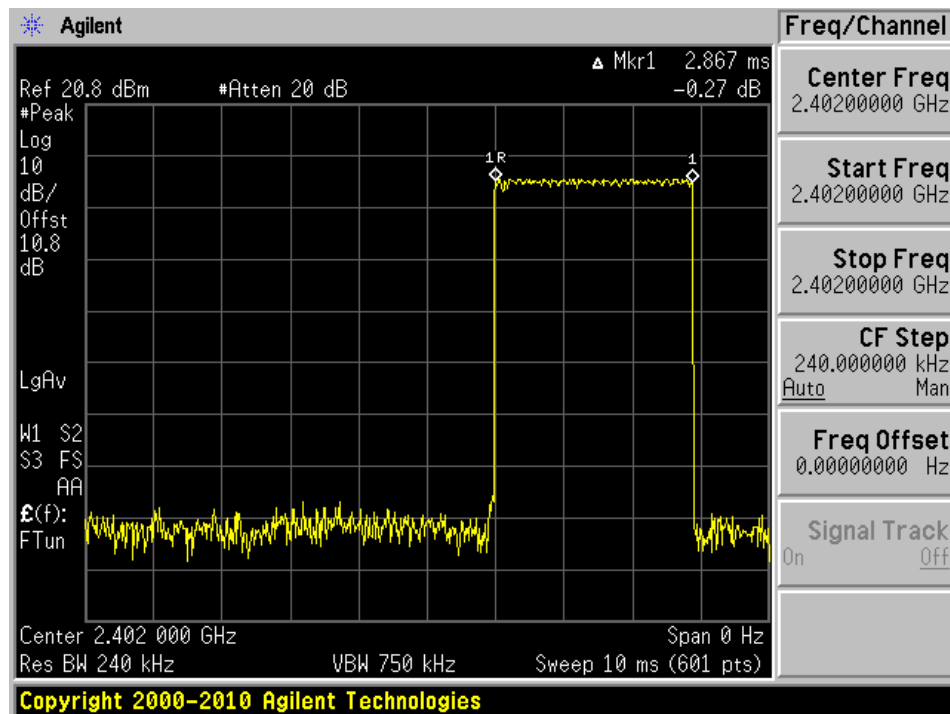
## DH3 Mode 2480 MHz High Channel Pulse Width



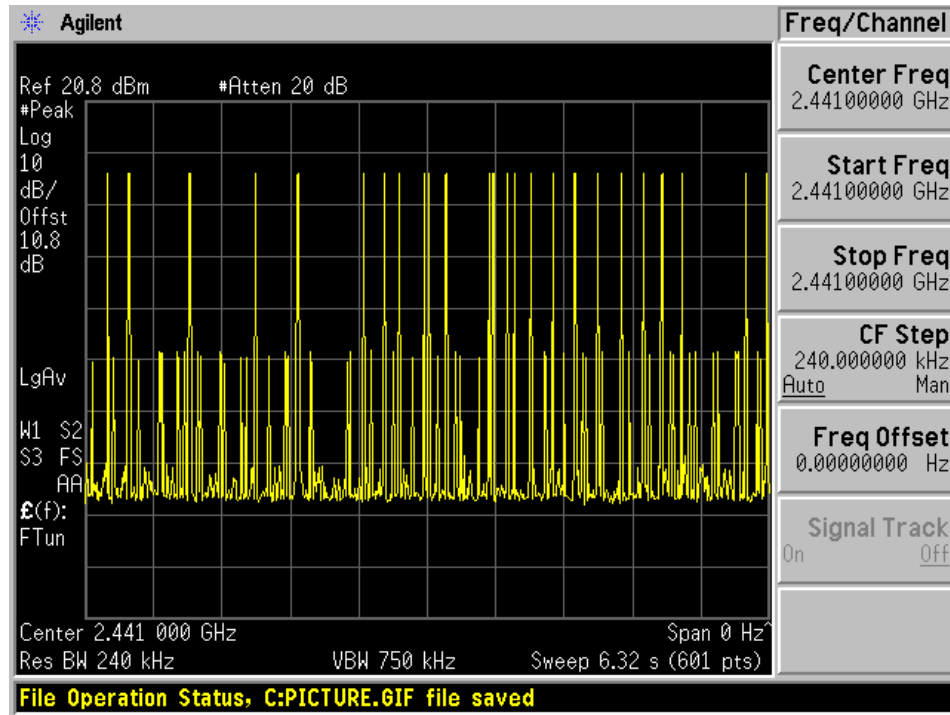
## DH5 Mode 2402 MHz Low Channel # of Pulses



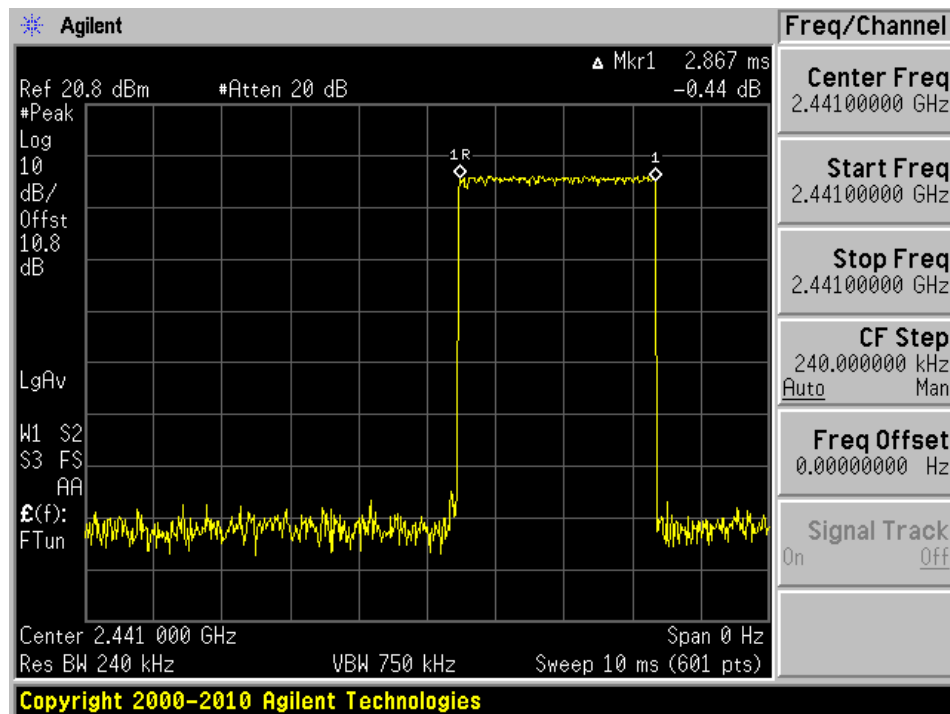
## DH5 Mode 2402 MHz Low Channel Pulse Width



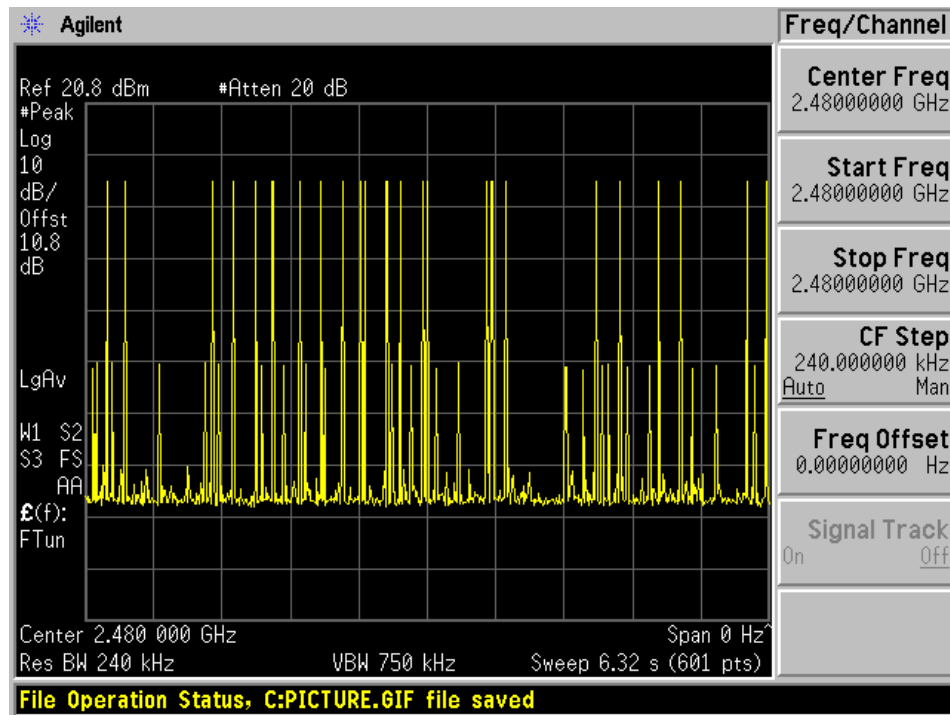
## DH5 Mode 2441 MHz Mid Channel # of Pulses



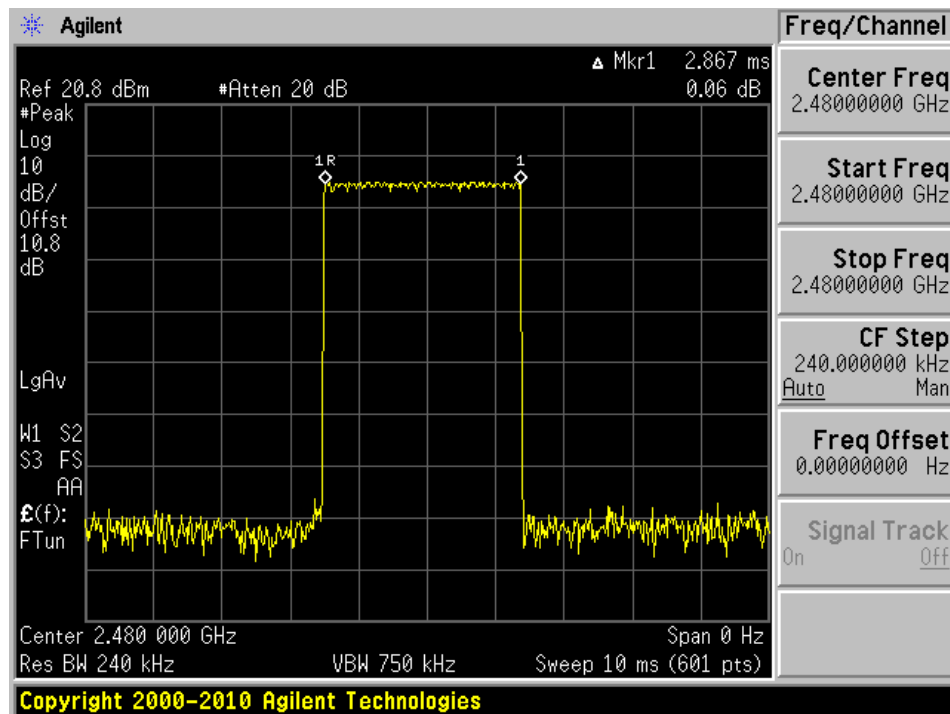
## DH5 Mode 2441 MHz Mid Channel Pulse Width



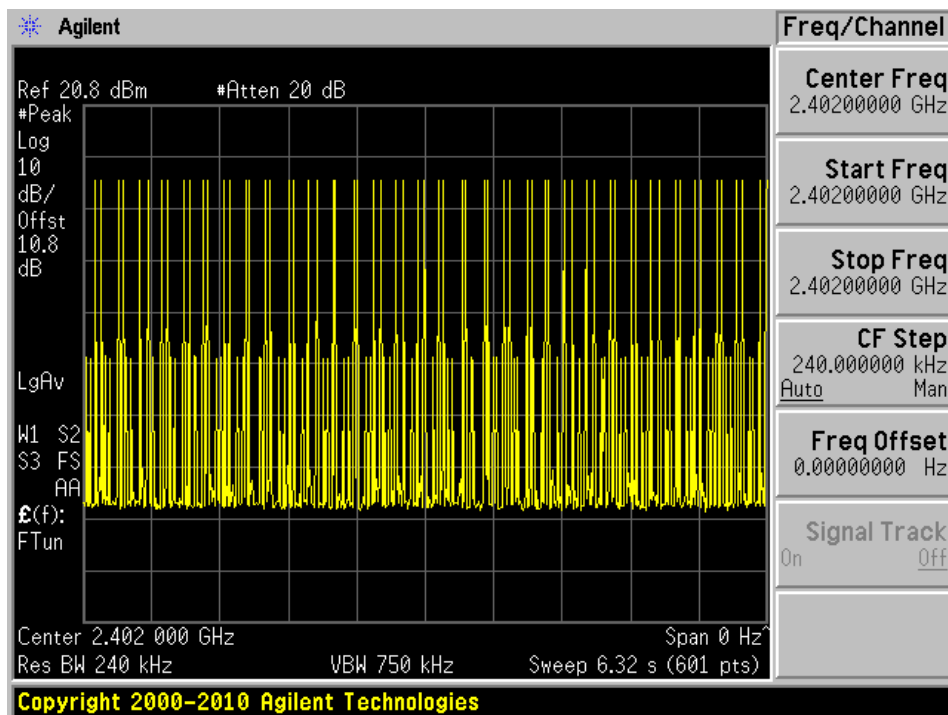
## DH5 Mode 2480 MHz High Channel # of Pulses



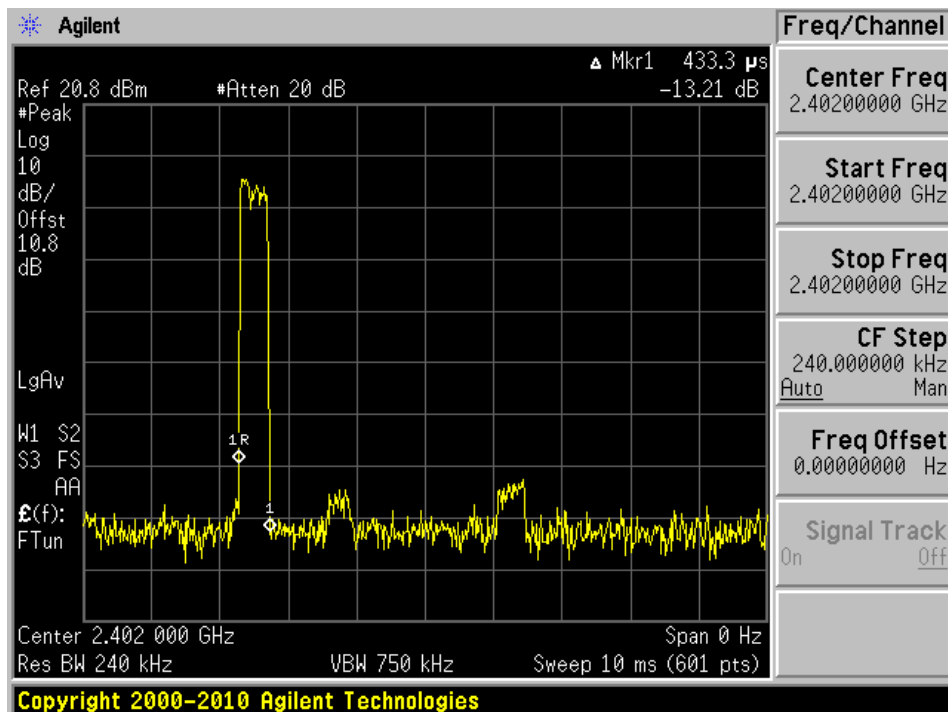
## DH5 Mode 2480 MHz High Channel Pulse Width



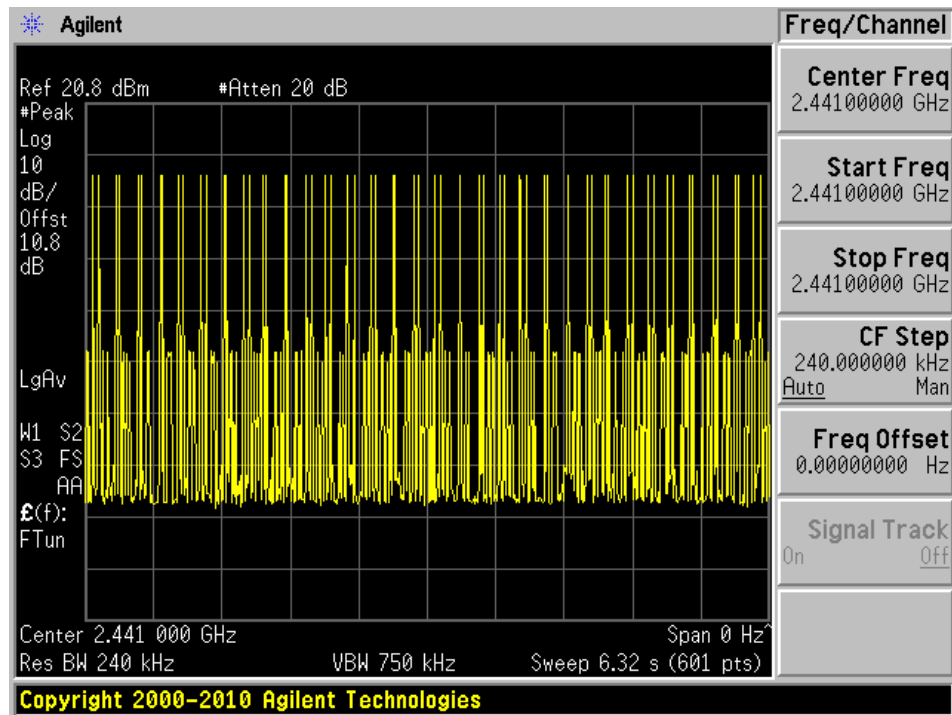
## 2DH1 Mode 2402 MHz Low Channel # of Pulses



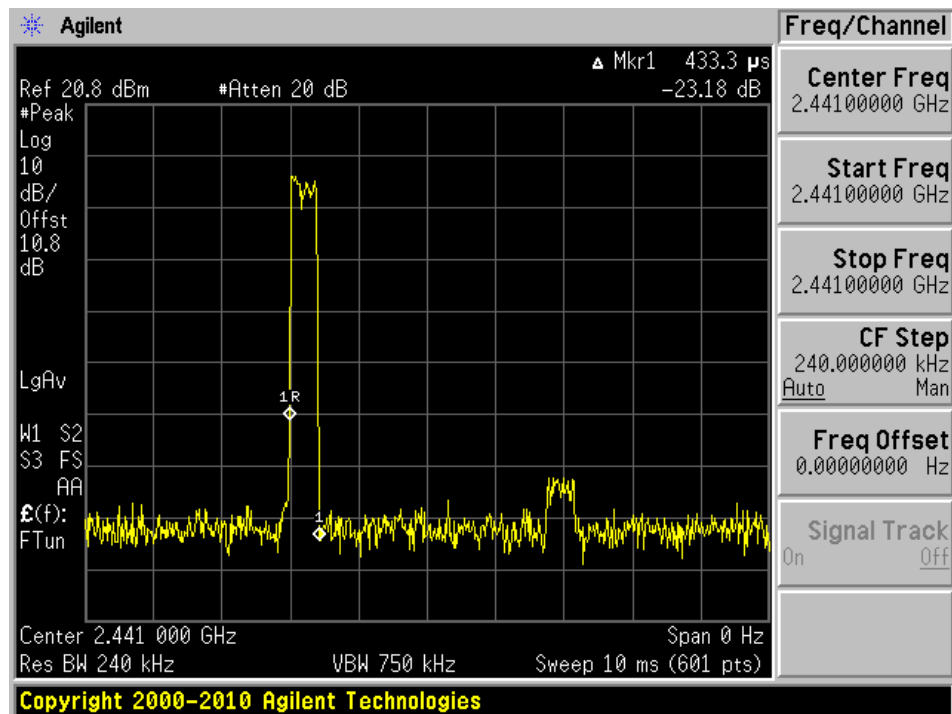
## 2DH1 Mode 2402 MHz Low Channel Pulse Width



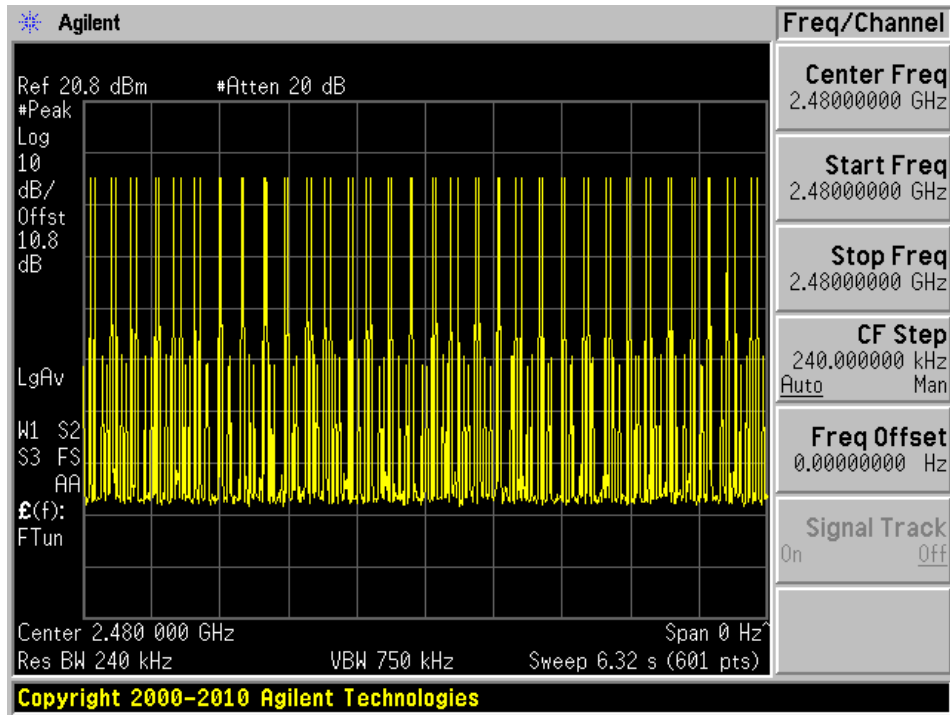
## 2DH1 Mode 2441 MHz Mid Channel # of Pulses



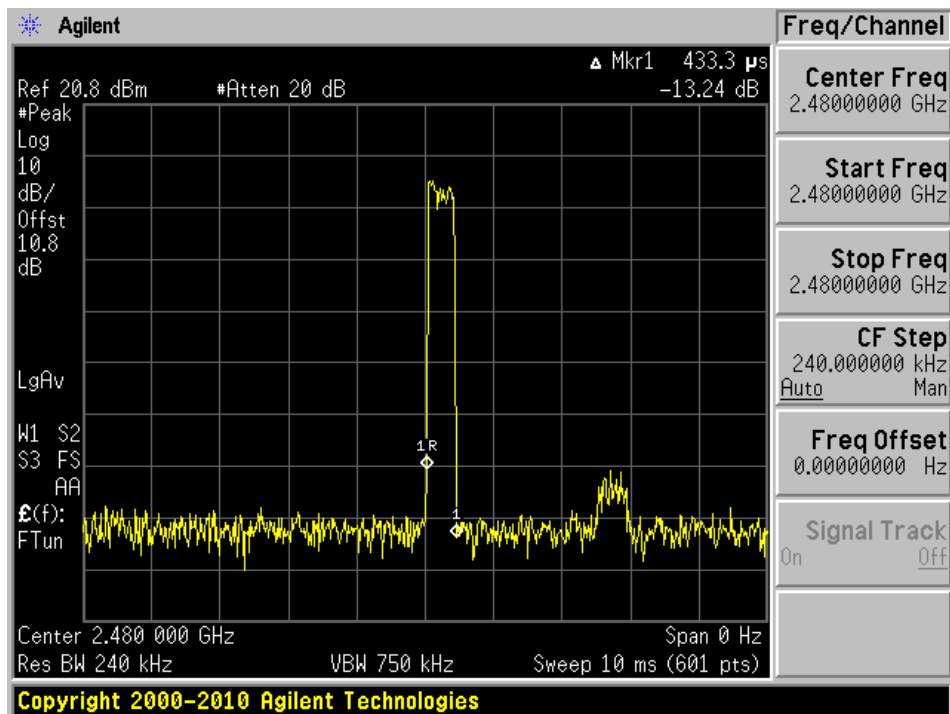
## 2DH1 Mode 2441 MHz Mid Channel Pulse Width



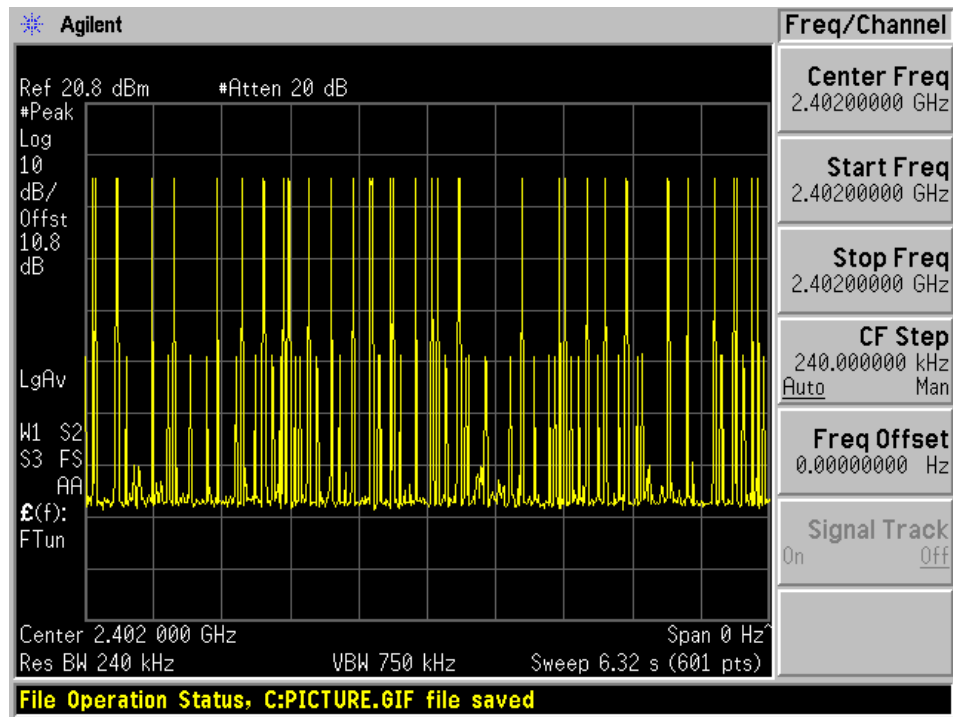
## 2DH1 Mode 2480 MHz High Channel # of Pulses



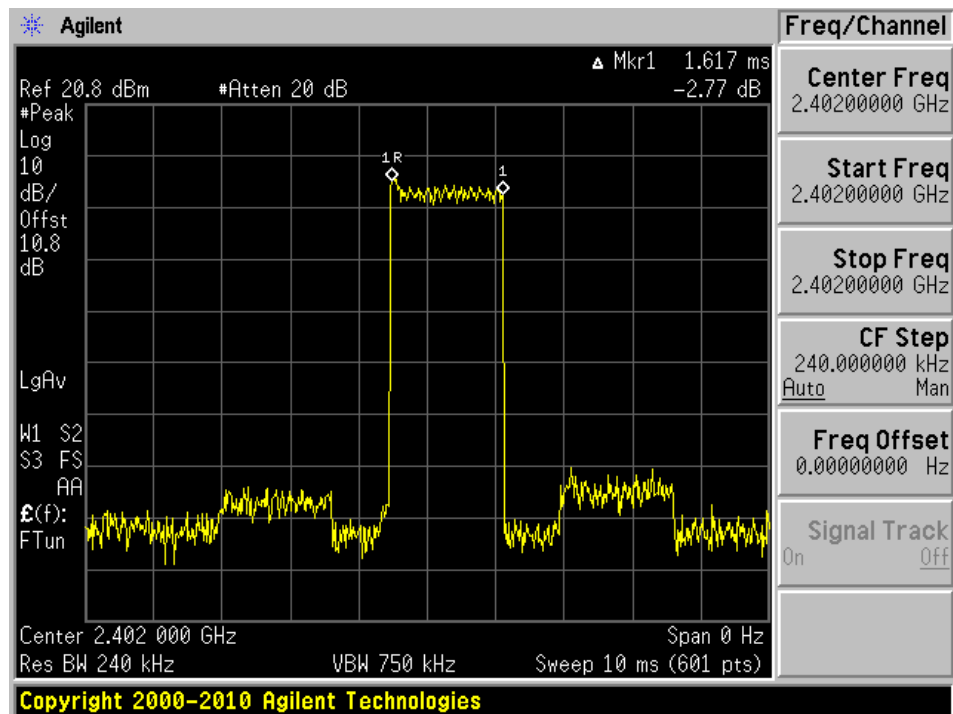
## 2DH1 Mode 2480 MHz High Channel Pulse Width



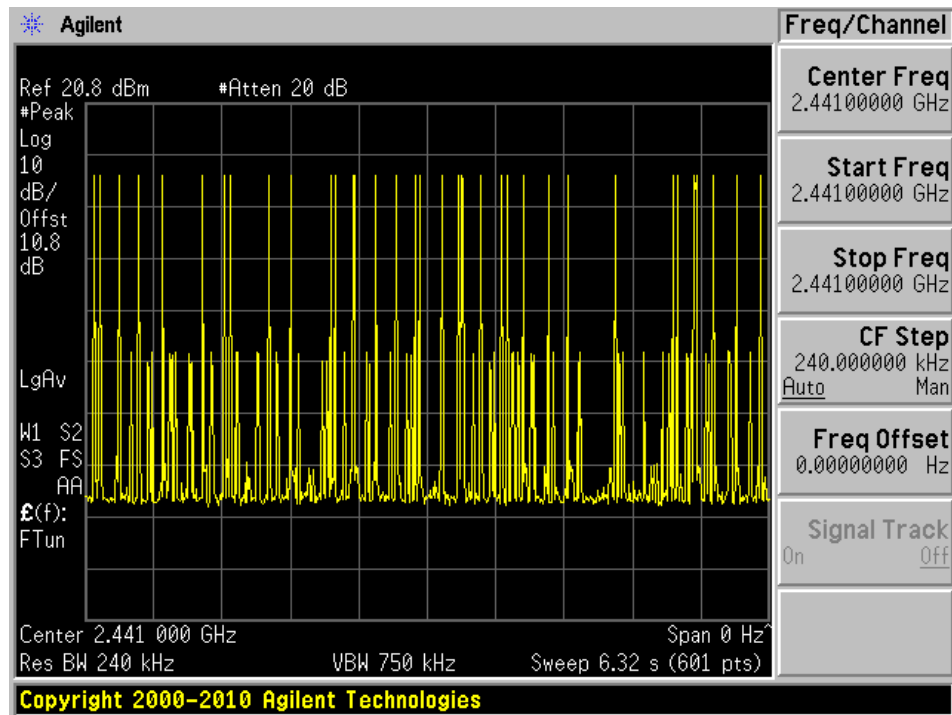
## 2DH3 Mode 2402 MHz Low Channel # of Pulses



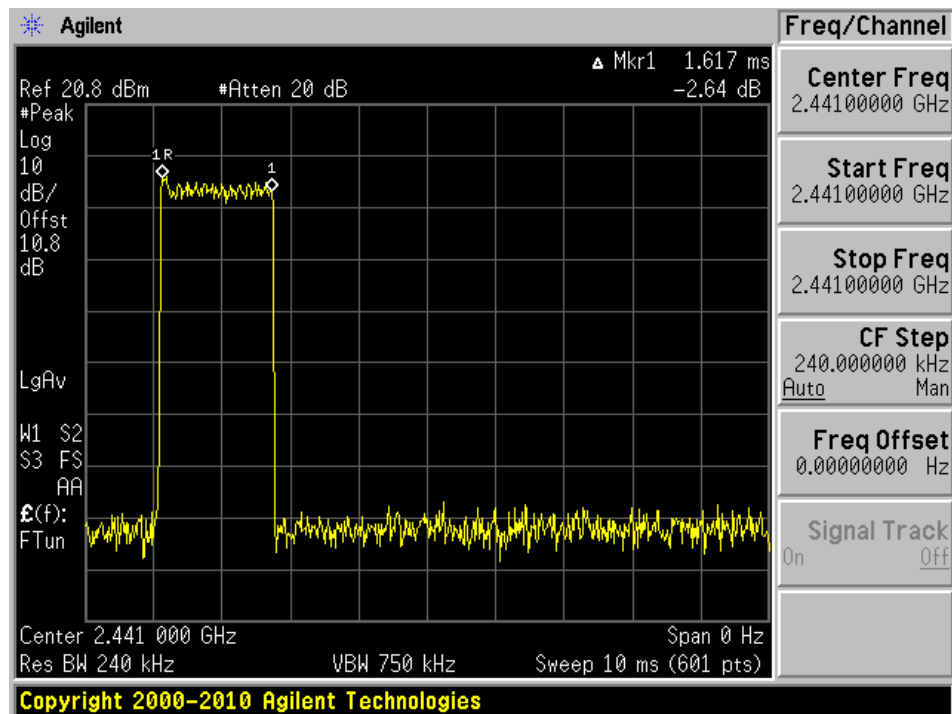
## 2DH3 Mode 2402 MHz Low Channel Pulse Width



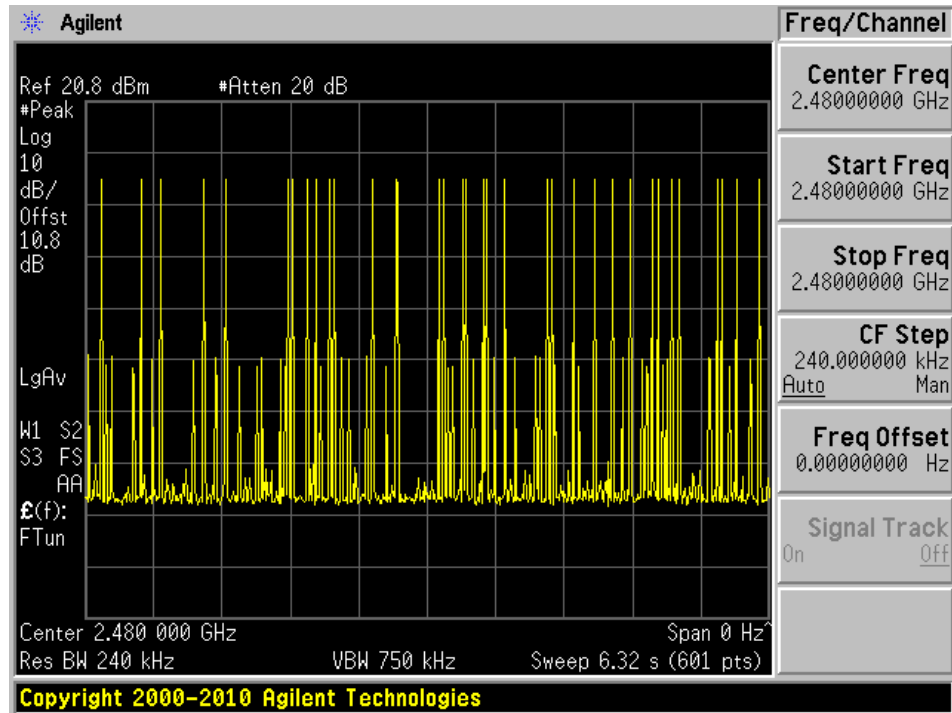
## 2DH3 Mode 2441 MHz Mid Channel # of Pulses



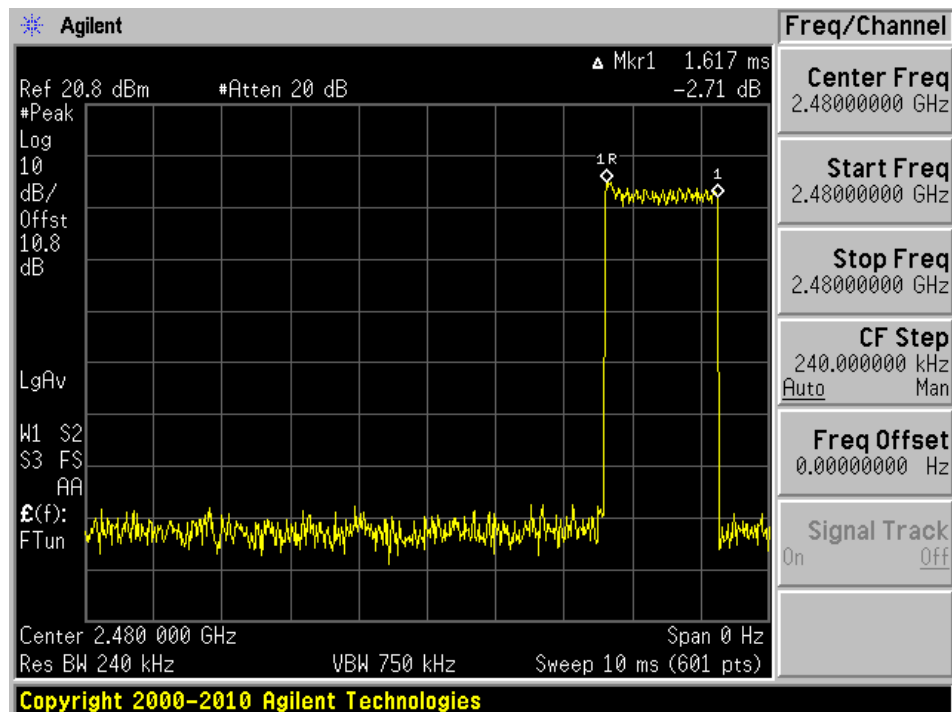
## 2DH3 Mode 2441 MHz Mid Channel Pulse Width



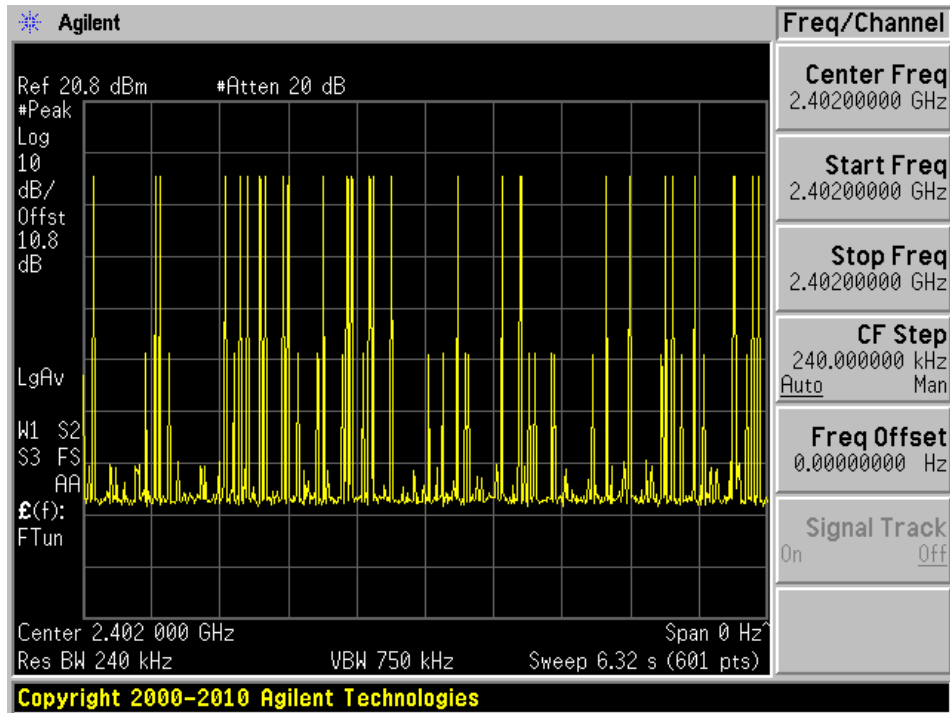
## 2DH3 Mode 2480 MHz High Channel # of Pulses



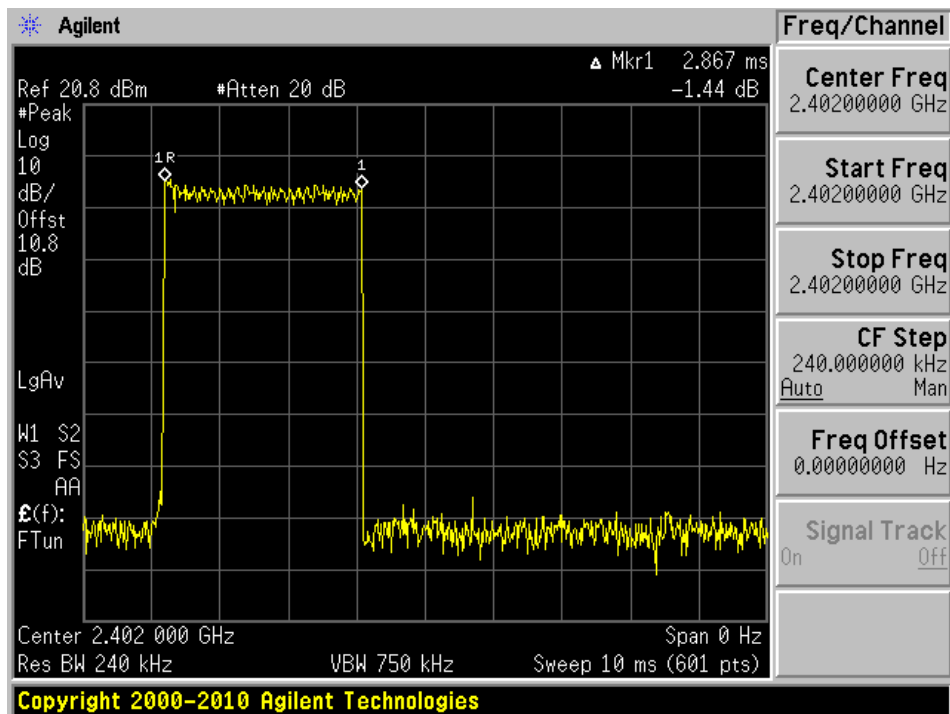
## 2DH3 Mode 2480 MHz High Channel Pulse Width



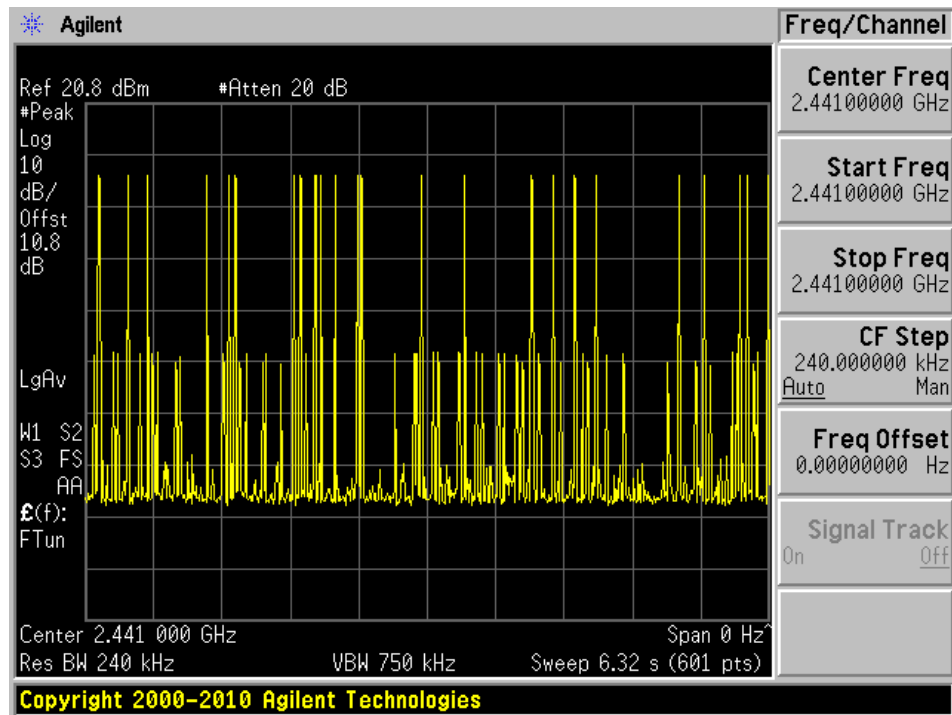
## 2DH5 Mode 2402 MHz Low Channel # of Pulses



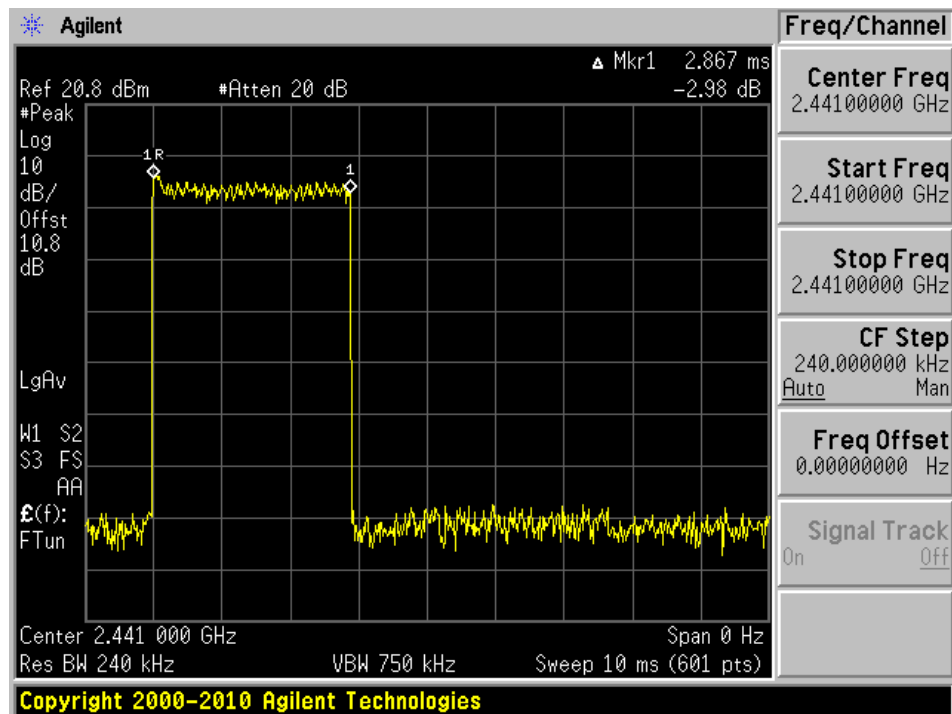
## 2DH5 Mode 2402 MHz Low Channel Pulse Width



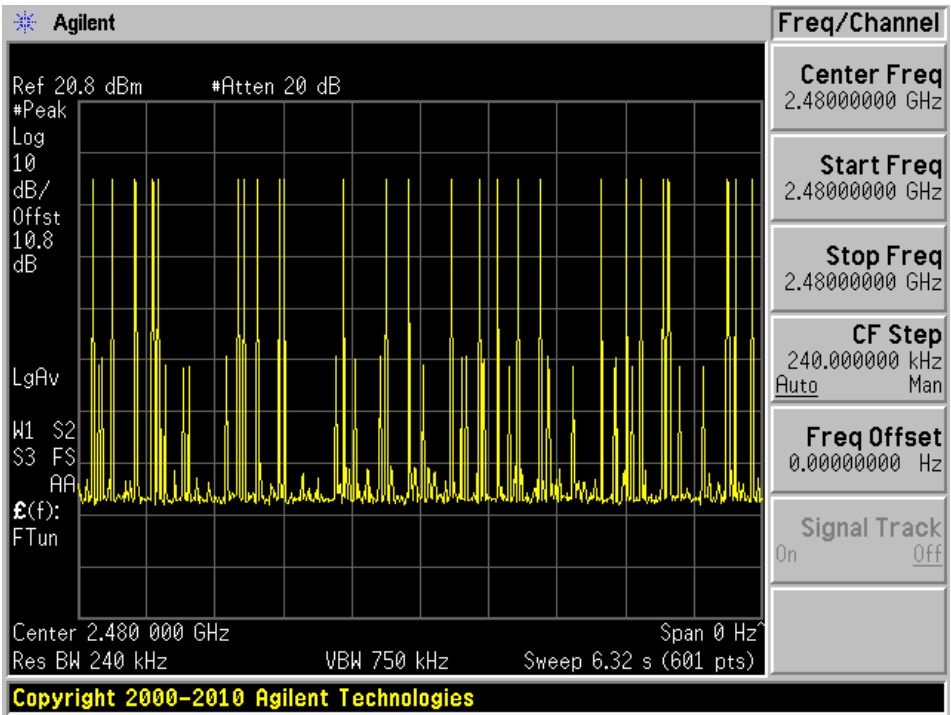
## 2DH5 Mode 2441 MHz Mid Channel # of Pulses



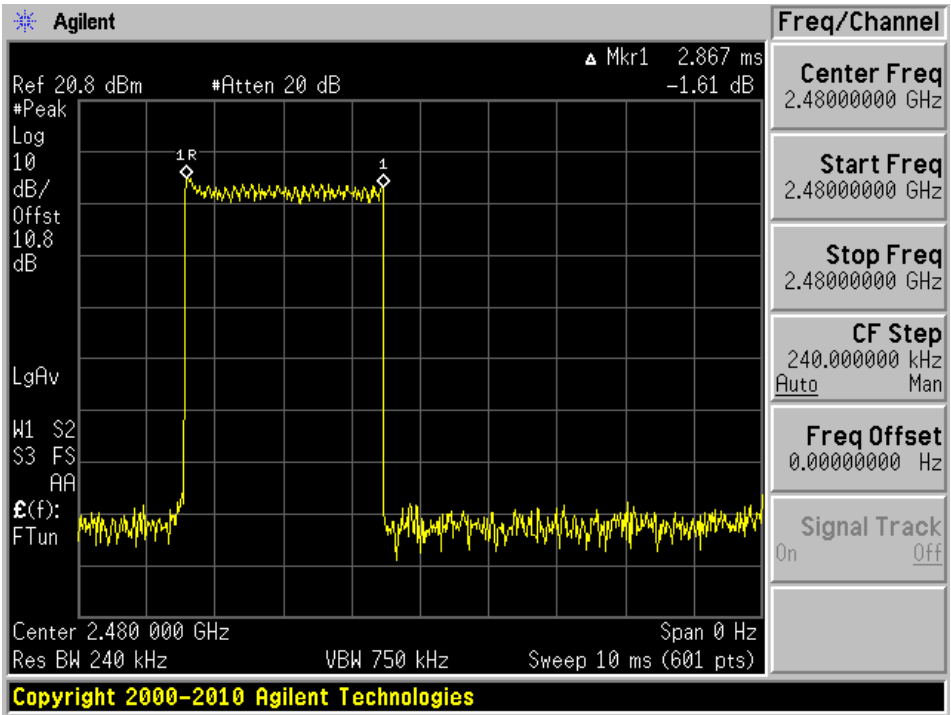
## 2DH5 Mode 2441 MHz Mid Channel Pulse Width



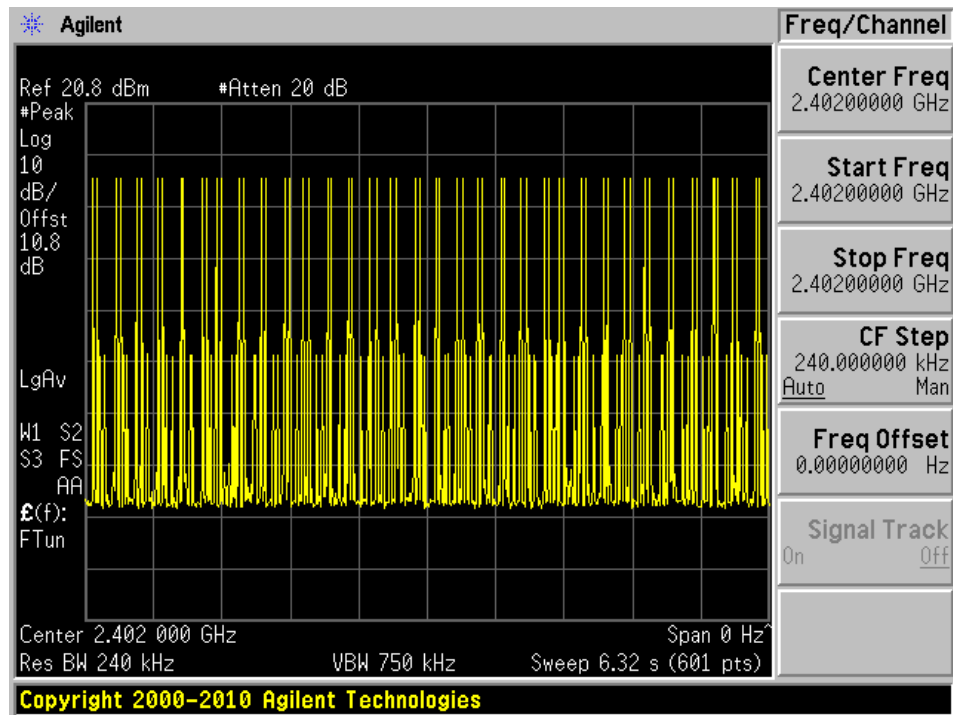
2DH5 Mode 2480 MHz High Channel # of Pulses



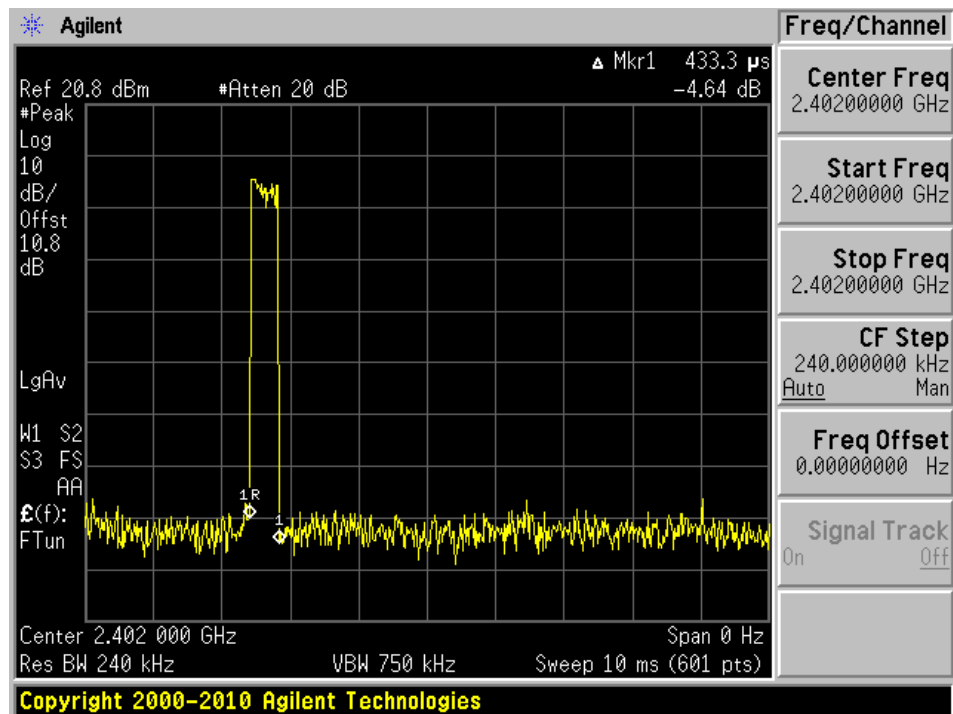
2DH5 Mode 2480 MHz High Channel Pulse Width



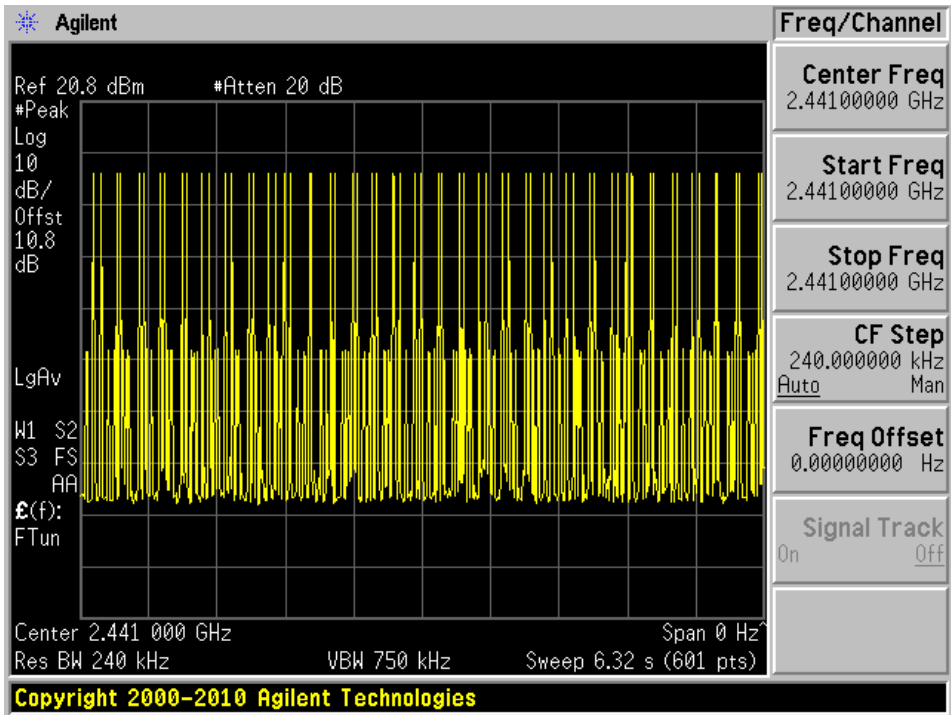
## 3DH1 Mode 2402 MHz Low Channel # of Pulses



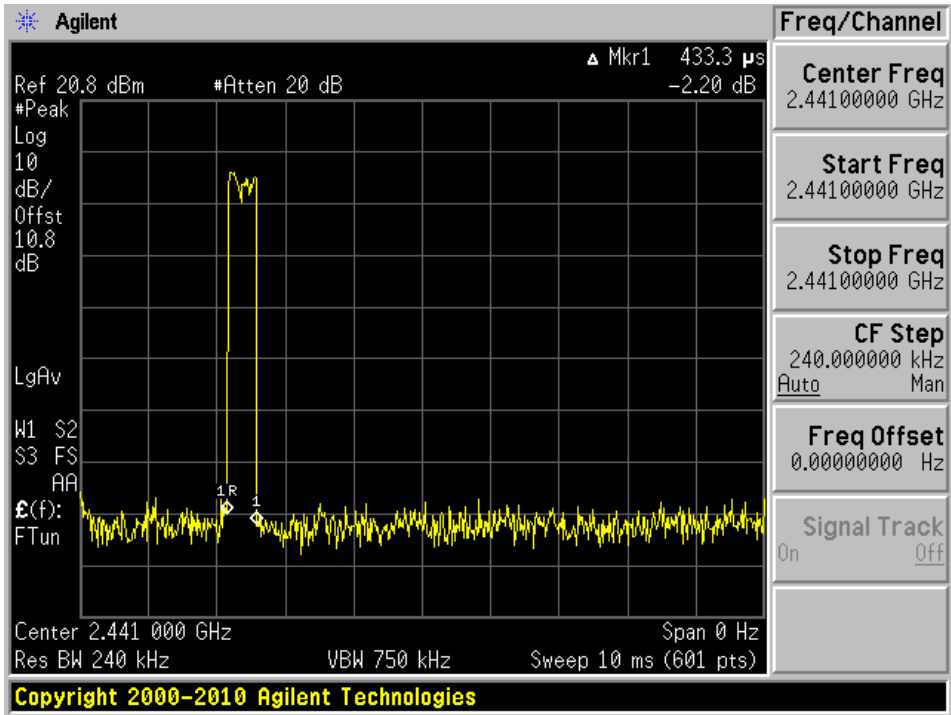
## 3DH1 Mode 2402 MHz Low Channel Pulse Width



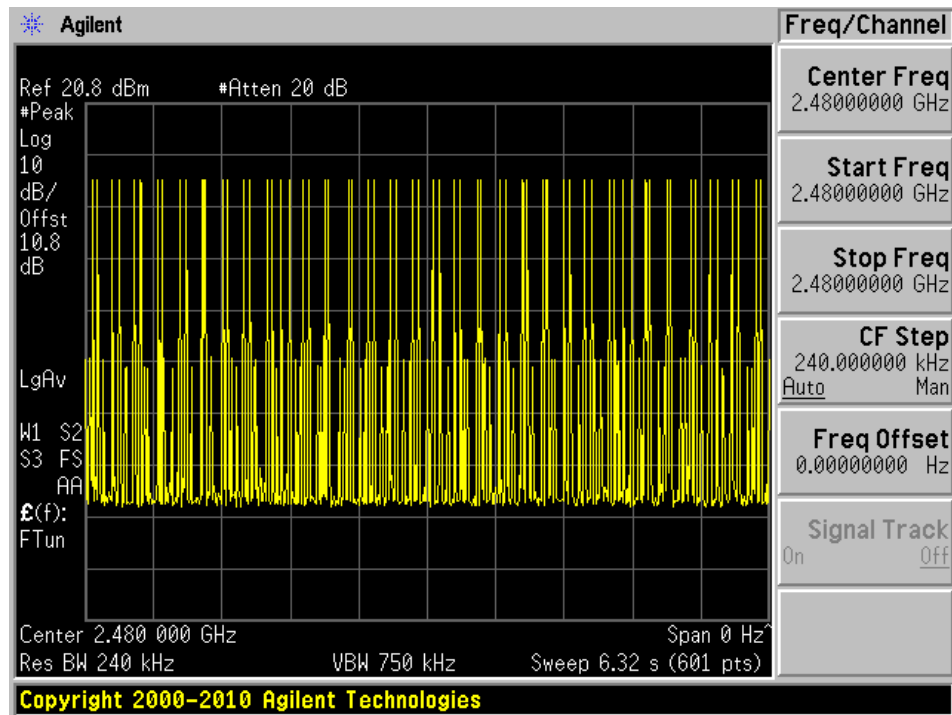
3DH1 Mode 2441 MHz Mid Channel # of Pulses



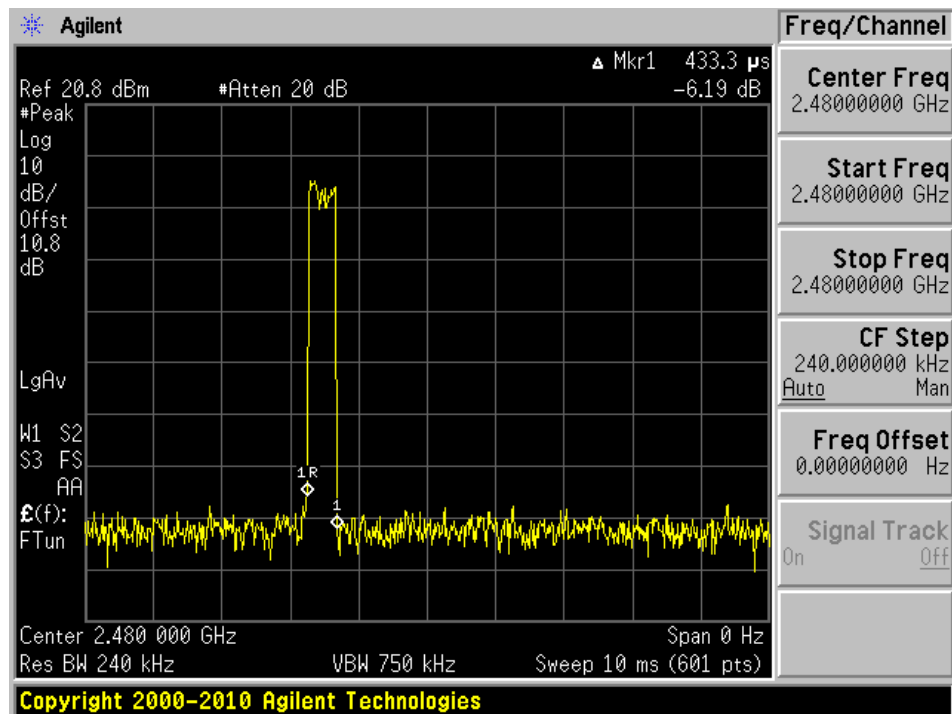
3DH1 Mode 2441 MHz Mid Channel Pulse Width



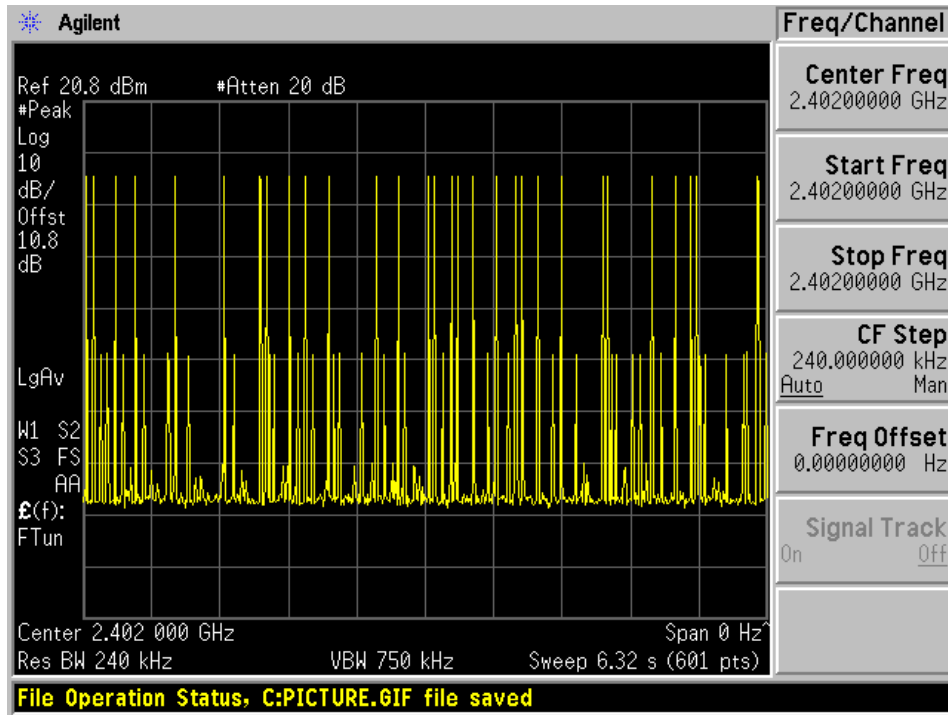
## 3DH1 Mode 2480 MHz High Channel # of Pulses



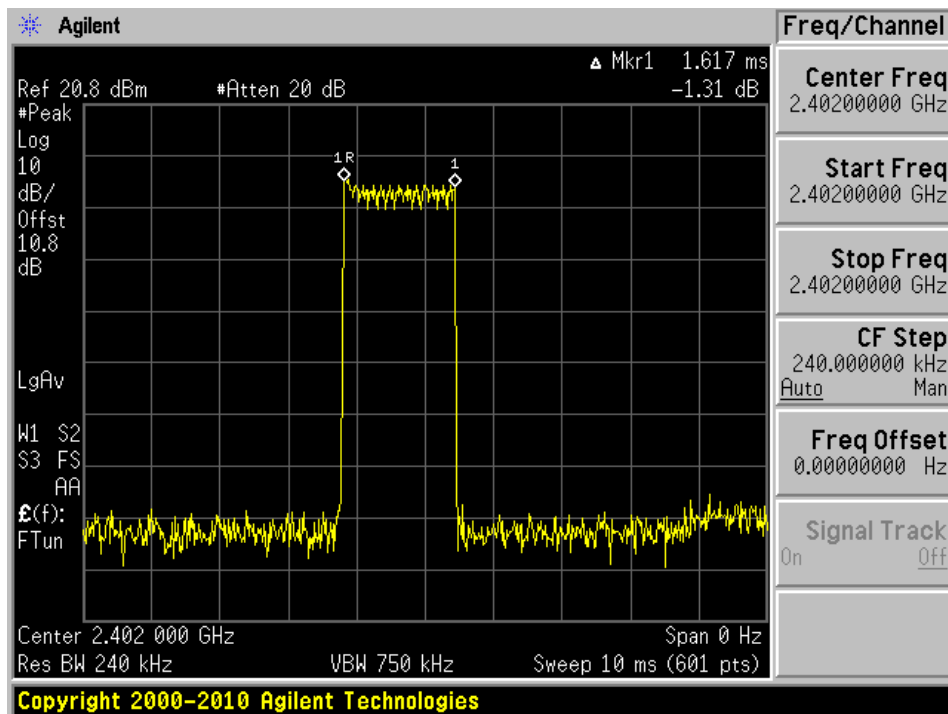
## 3DH1 Mode 2480 MHz High Channel Pulse Width



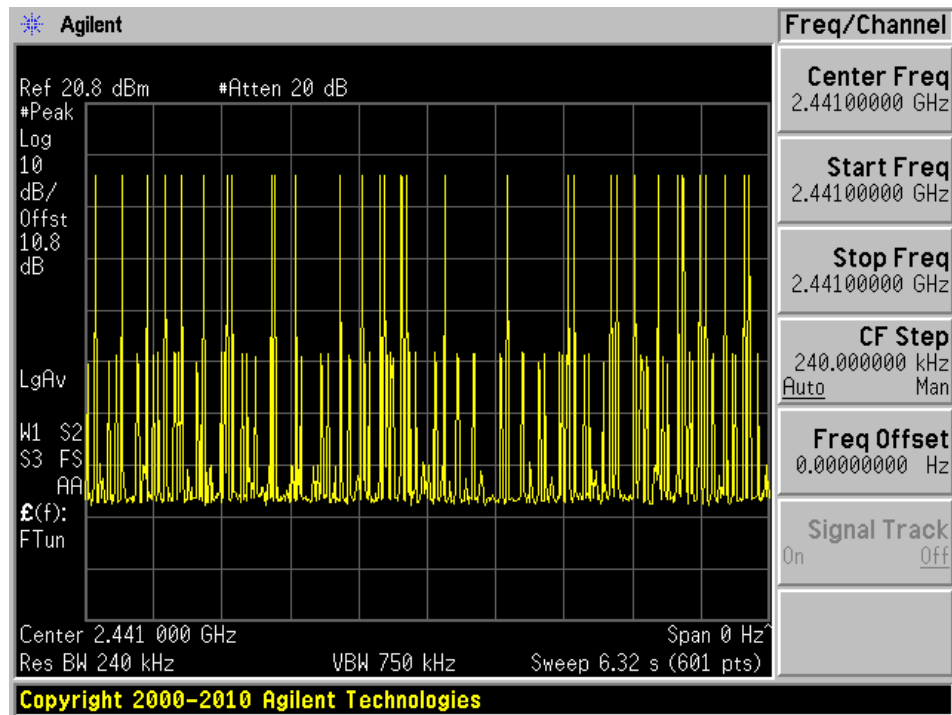
## 3DH3 Mode 2402 MHz Low Channel # of Pulses



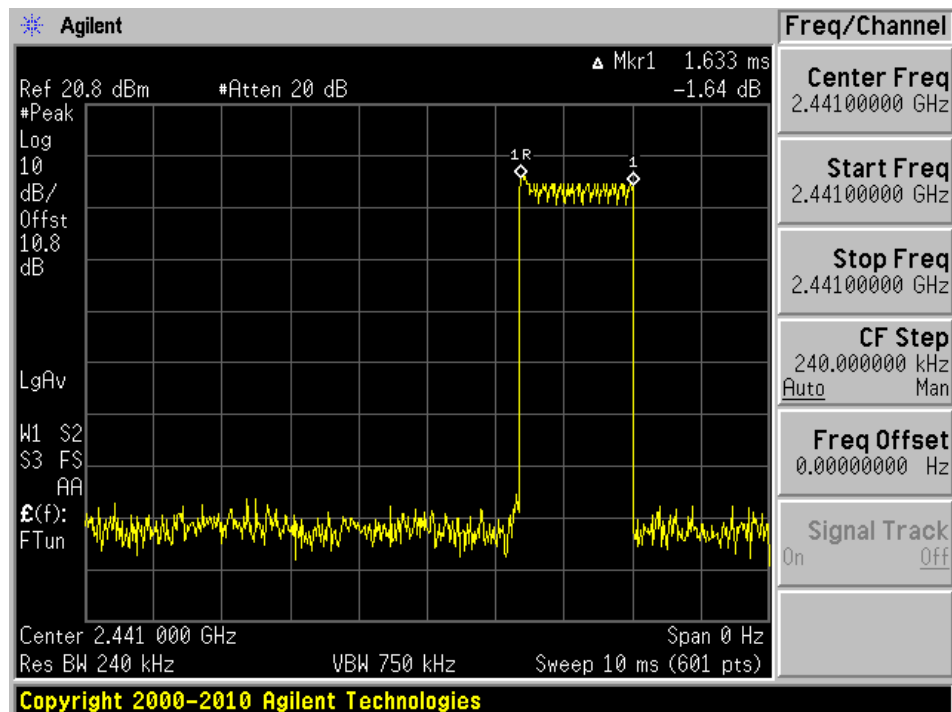
## 3DH3 Mode 2402 MHz Low Channel Pulse Width



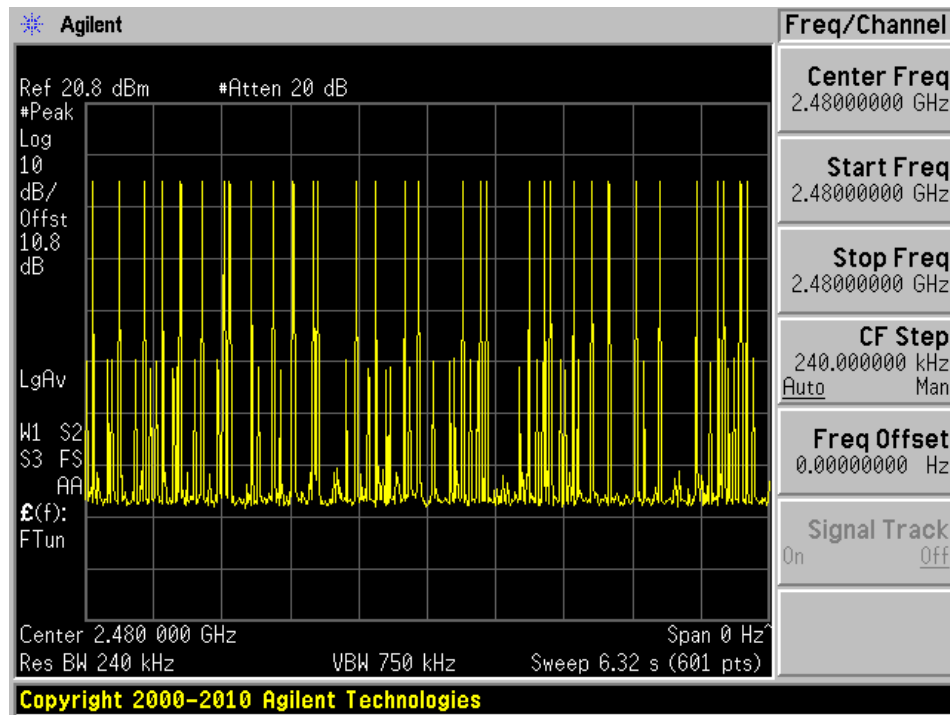
## 3DH3 Mode 2441 MHz Mid Channel # of Pulses



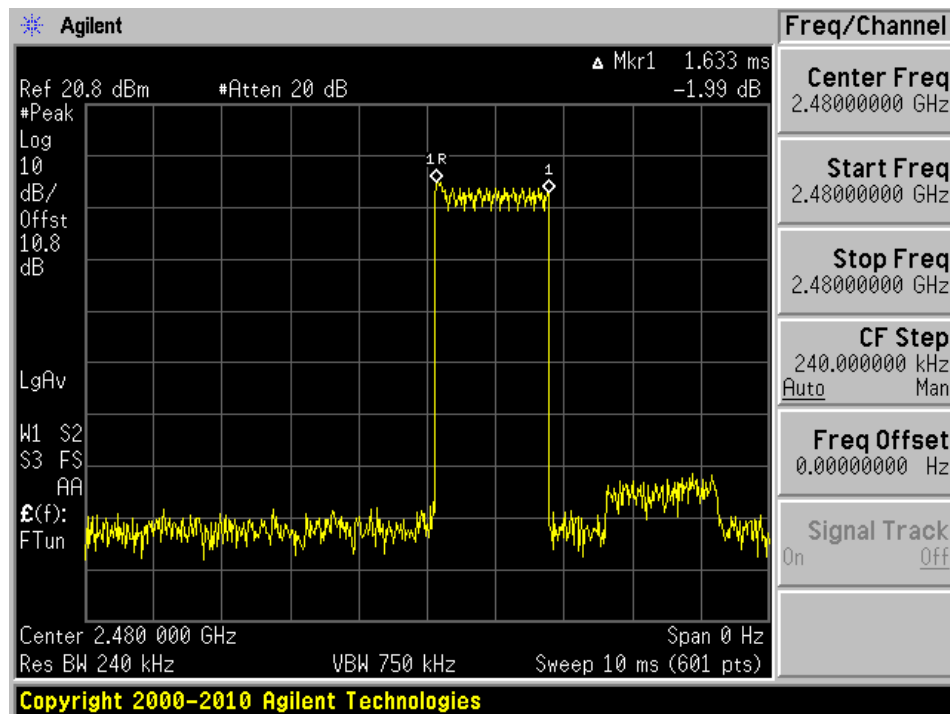
## 3DH3 Mode 2441 MHz Mid Channel Pulse Width



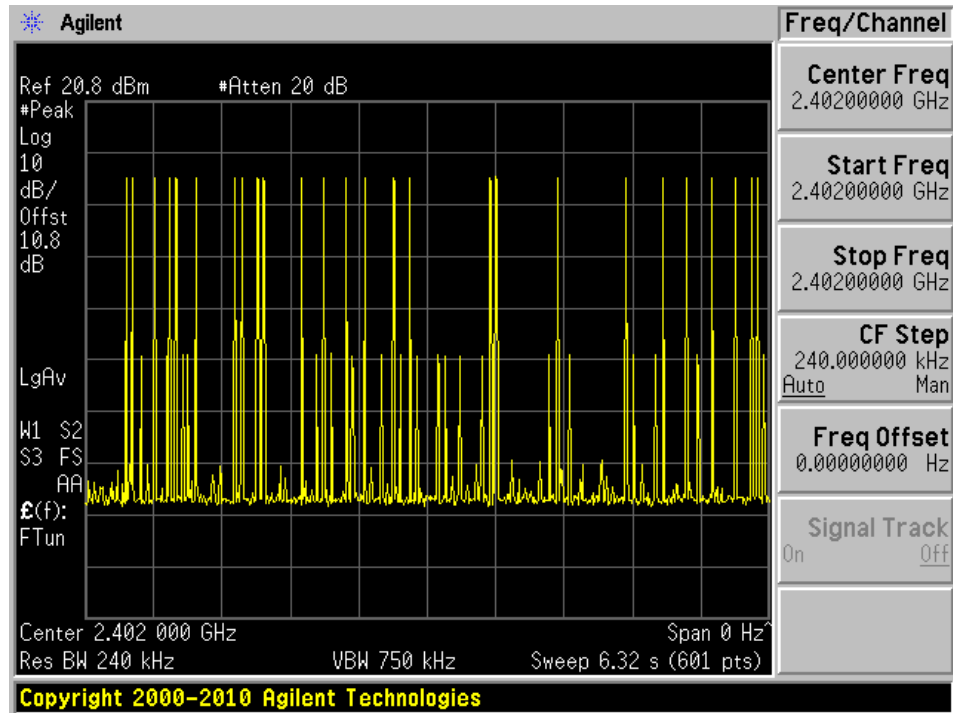
## 3DH3 Mode 2480 MHz High Channel # of Pulses



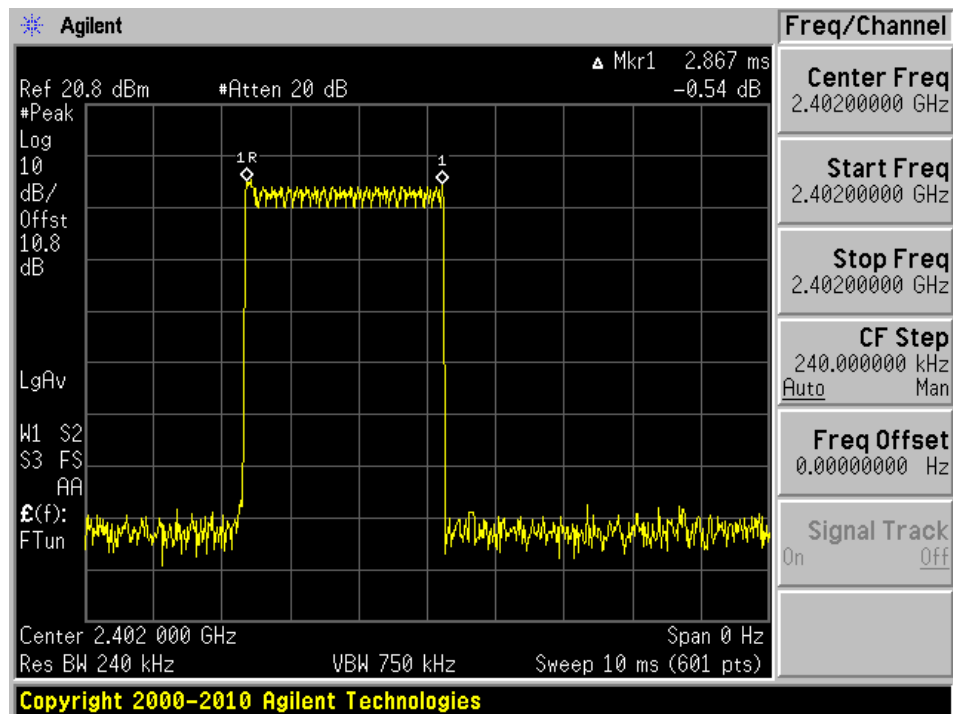
## 3DH3 Mode 2480 MHz High Channel Pulse Width



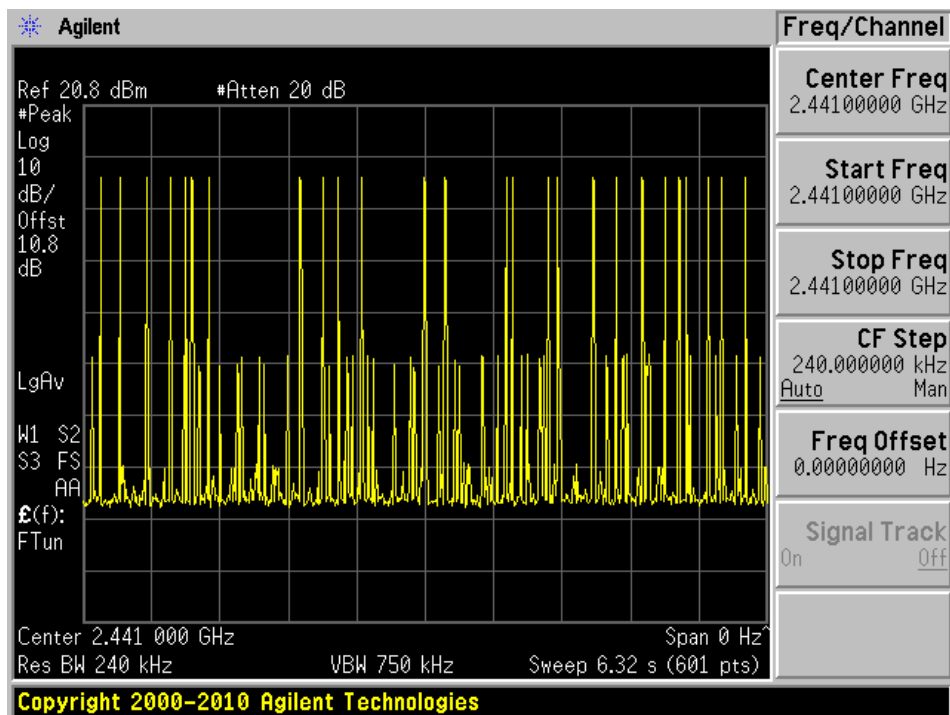
## 3DH5 Mode 2402 MHz Low Channel # of Pulses



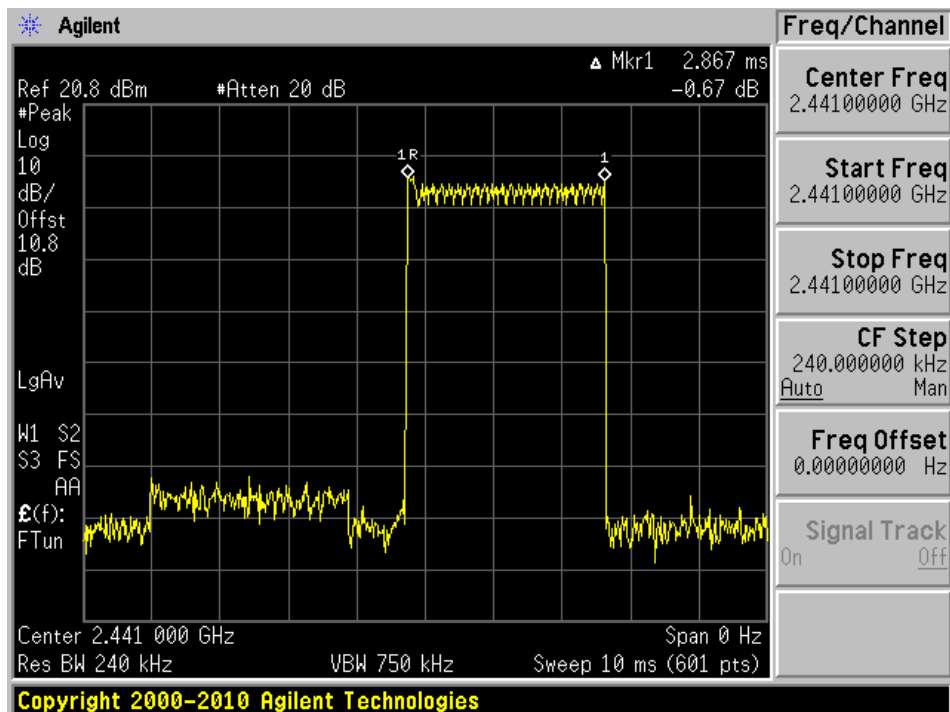
## 3DH5 Mode 2402 MHz Low Channel Pulse Width



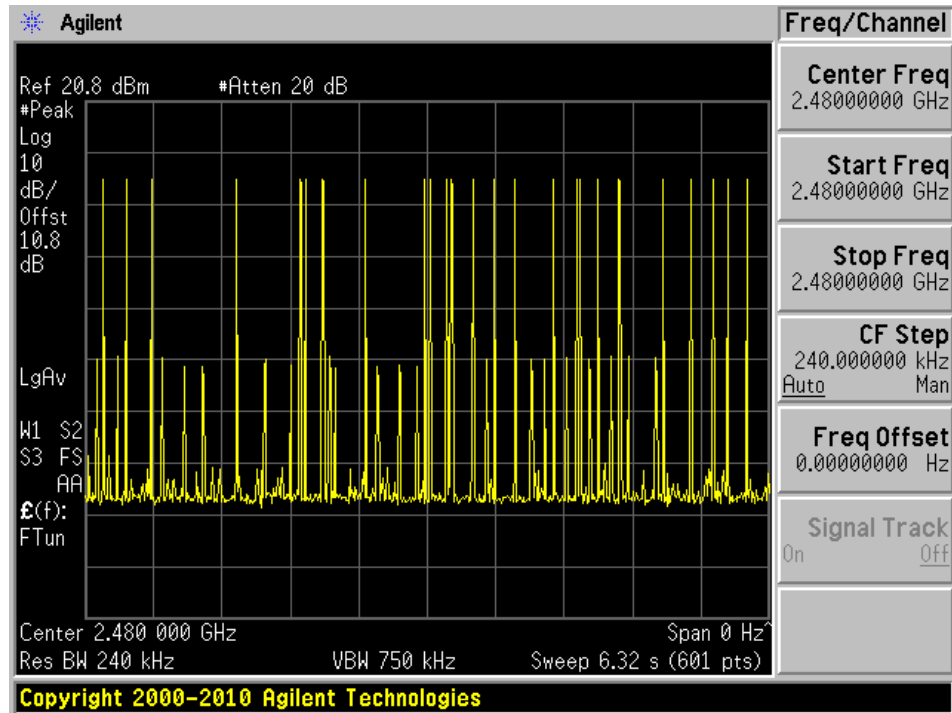
## 3DH5 Mode 2441 MHz Mid Channel # of Pulses



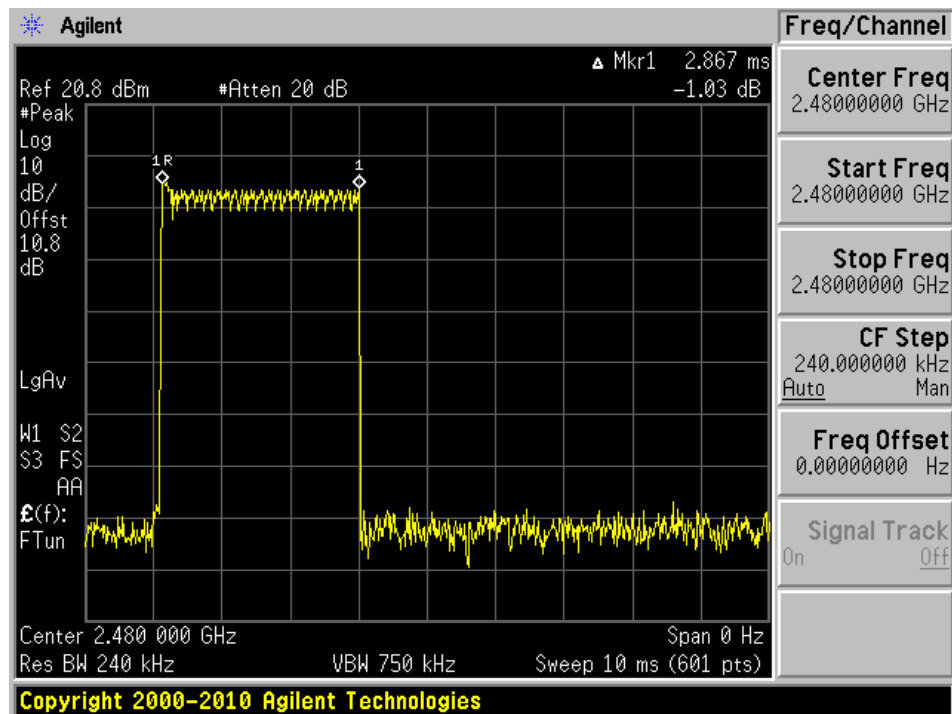
## 3DH5 Mode 2441 MHz Mid Channel Pulse Width



## 3DH5 Mode 2480 MHz High Channel # of Pulses



## 3DH5 Mode 2480 MHz High Channel Pulse Width



## 12 FCC §15.247(a)(1)(iii) - Number of Hopping Channels

### 12.1 Applicable Standards

According to FCC §15.247(a) (1) (iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 12.2 Test Procedure

Span = the frequency band of operation

RBW < 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

### 12.3 Test Equipment List and Details

| Manufacturer | Description        | Model No. | Serial No. | Calibration Date       | Calibration Interval |
|--------------|--------------------|-----------|------------|------------------------|----------------------|
| Agilent      | Analyzer, Spectrum | E4446A    | MY48250238 | 2018-05-08             | 1 year               |
| -            | RF cable           | -         | -          | Each time <sup>1</sup> | N/A                  |
| -            | 10 dB Attenuator   | -         | -          | Each time <sup>1</sup> | N/A                  |

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

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

### 12.4 Test Environmental Conditions

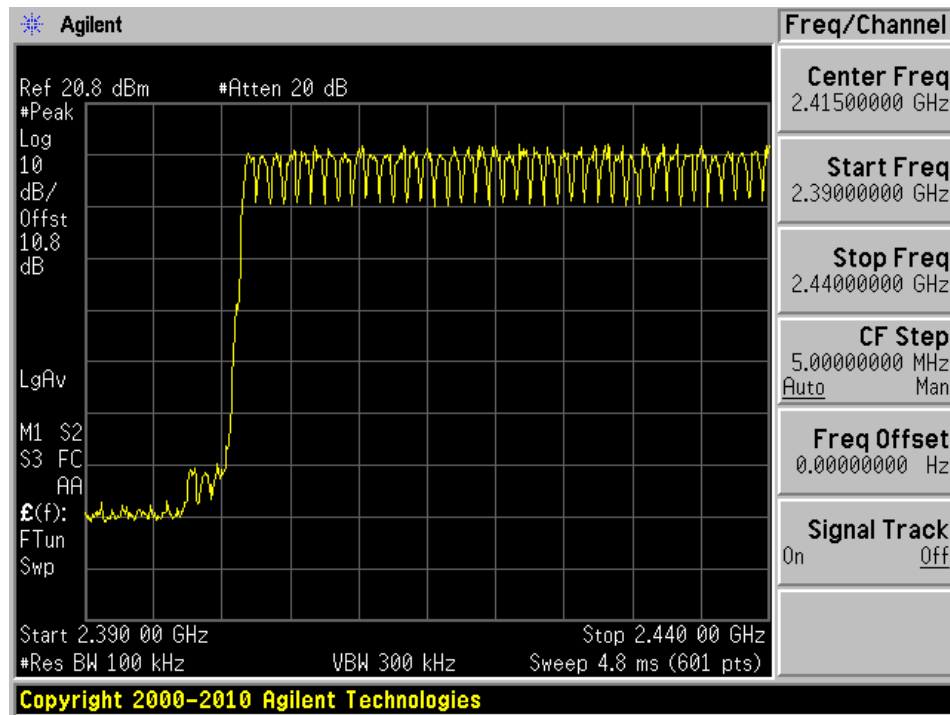
|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 42 %      |
| ATM Pressure:      | 102.7 KPa |

The testing was performed by Vincent Licata from 2018-08-14 to 2018-08-15 in RF site.

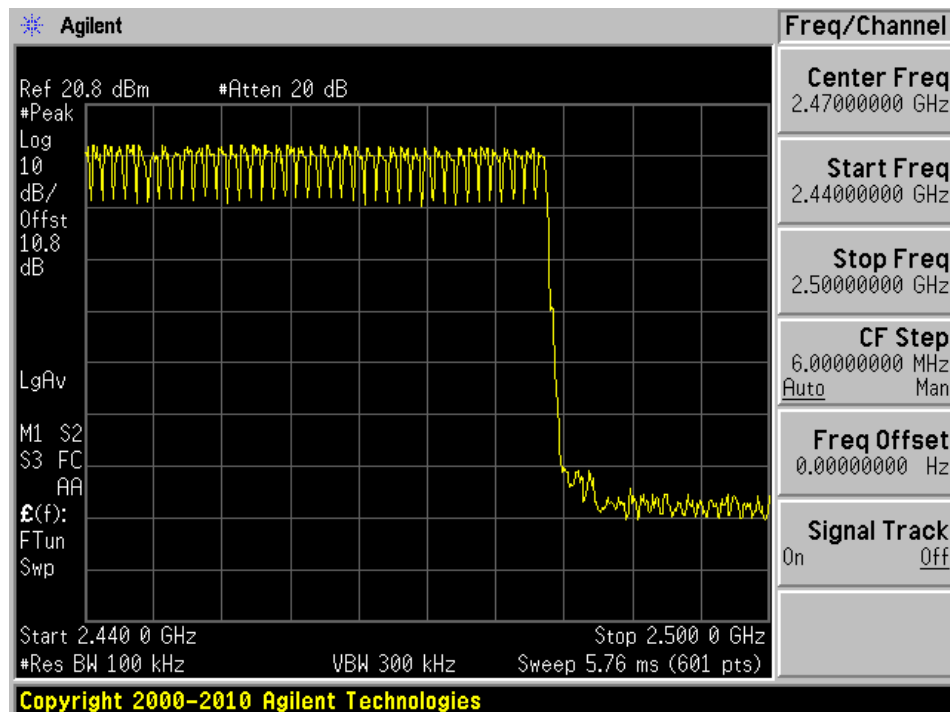
### 12.5 Test Results

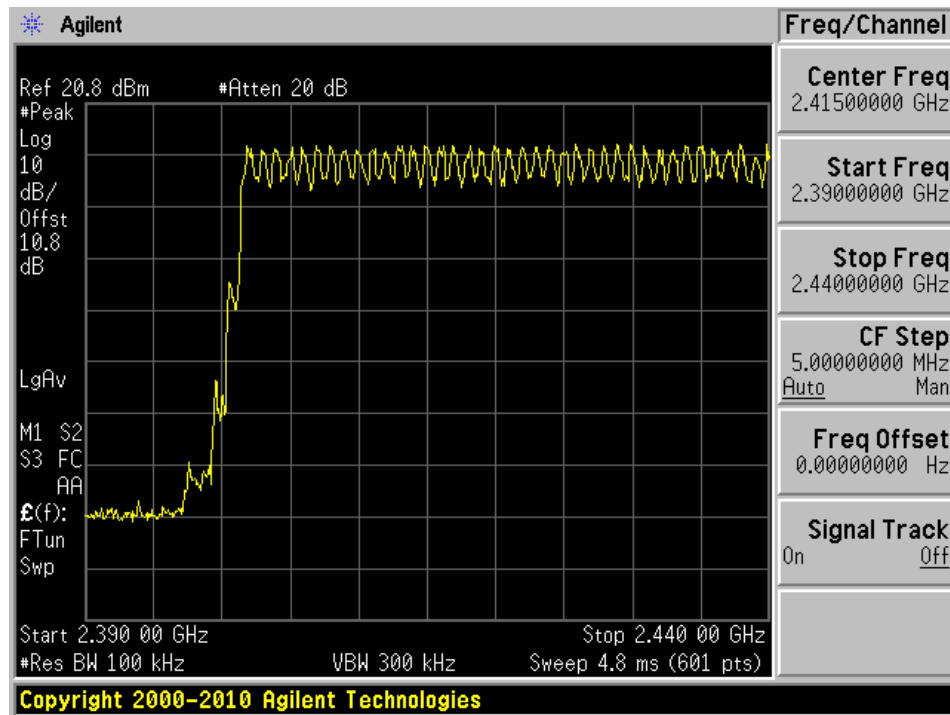
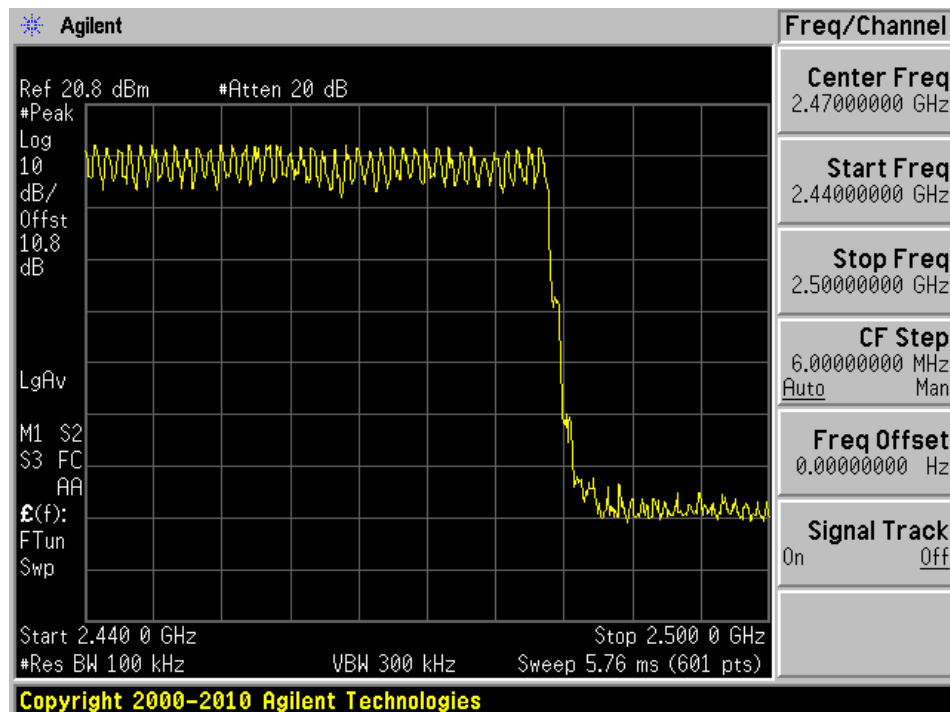
Total 79 channels; please refer to the plots hereinafter.

## GFSK Mode Number of Hopping Channels\_1

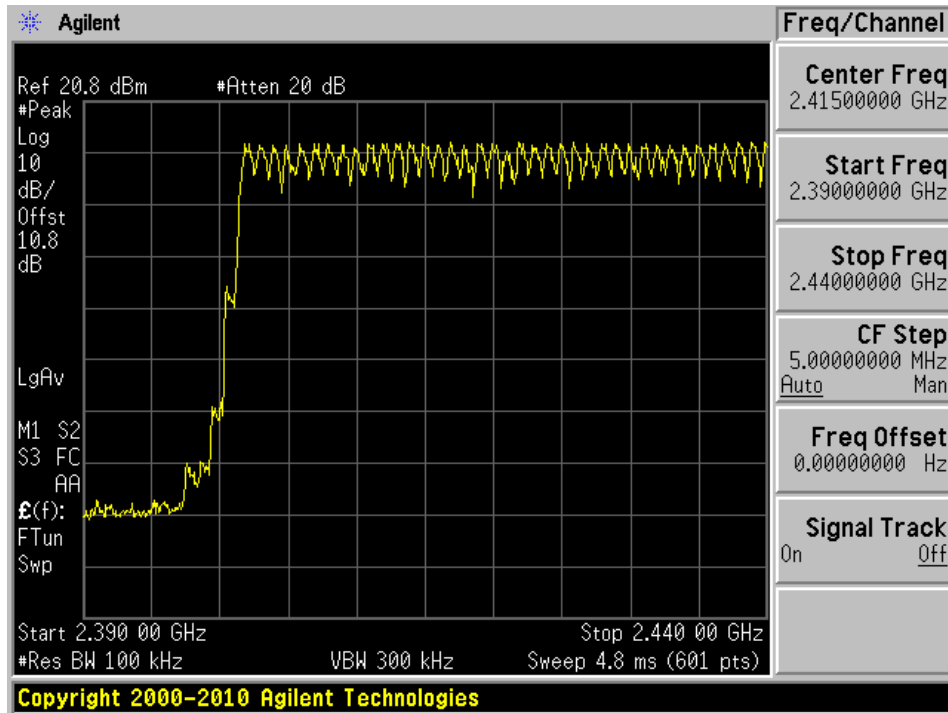


## GFSK Mode Number of Hopping Channels\_2

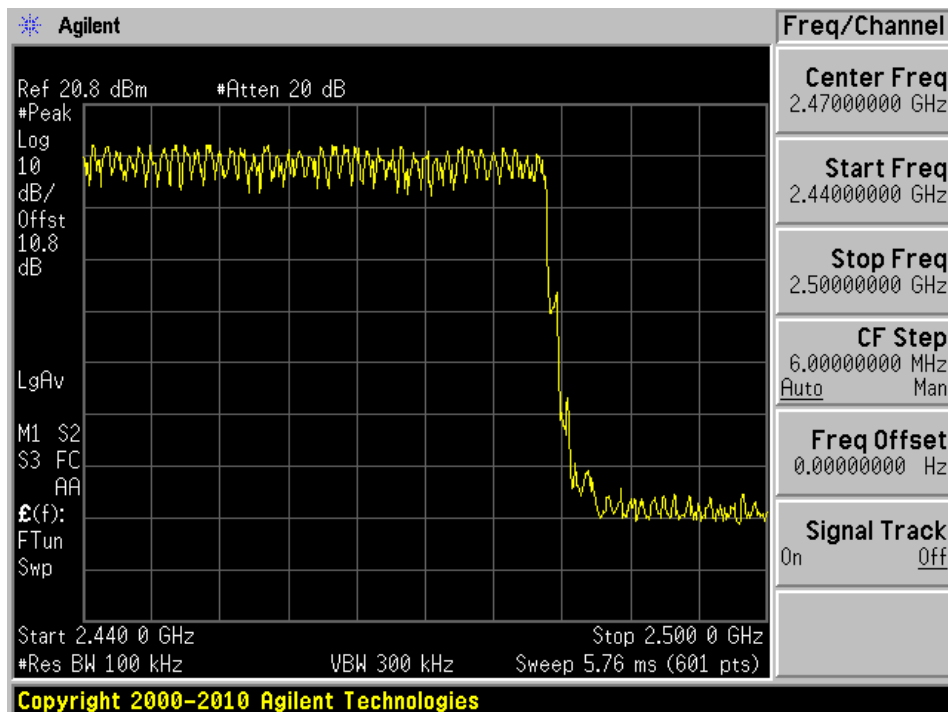


$\pi/4$ -DQPSK Mode Number of Hopping Channels\_1 $\pi/4$ -DQPSK Mode Number of Hopping Channels\_2

## 8DPSK Mode Number of Hopping Channels\_1



## 8DPSK Mode Number of Hopping Channels\_2



## 13 FCC §15.247(a) (1) - Hopping Channel Separation

### 13.1 Applicable Standards

According to FCC §15.247(a) (1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

### 13.2 Test Procedure

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW)  $\approx$  30% of the channel spacing, adjust as necessary to best identify the center of each individual channel

Video (or Average) Bandwidth (VBW)  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

### 13.3 Test Equipment List and Details

| Manufacturer | Description        | Model No. | Serial No. | Calibration Date       | Calibration Interval |
|--------------|--------------------|-----------|------------|------------------------|----------------------|
| Agilent      | Analyzer, Spectrum | E4446A    | MY48250238 | 2018-05-08             | 1 year               |
| -            | RF cable           | -         | -          | Each time <sup>1</sup> | N/A                  |
| -            | 10 dB Attenuator   | -         | -          | Each time <sup>1</sup> | N/A                  |

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

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

### 13.4 Test Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 42 %      |
| ATM Pressure:      | 102.7 KPa |

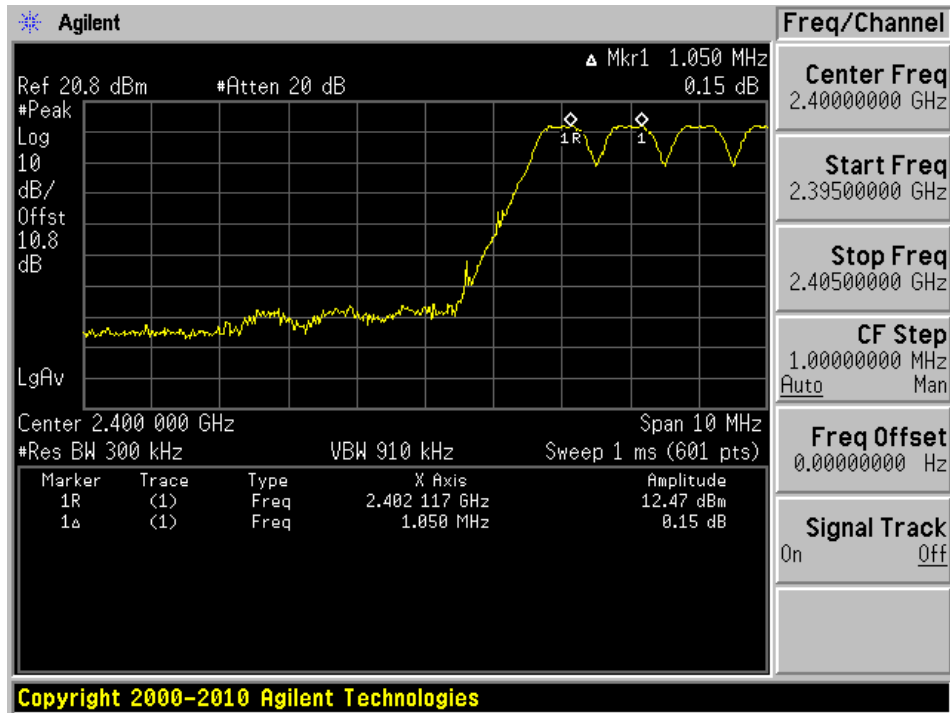
The testing was performed by Vincent Licata from 2018-08-14 to 2018-08-15 in RF site.

### 13.5 Test Results

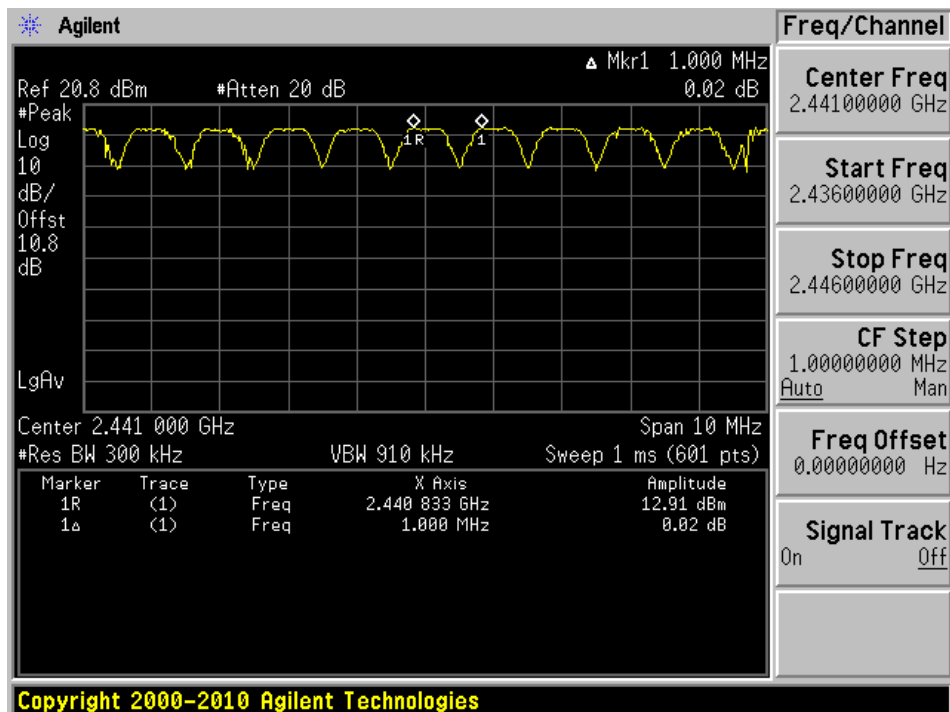
| Channel        | Frequency (MHz) | Channel Separation (kHz) | 2/3 20 dB OBW (kHz) |
|----------------|-----------------|--------------------------|---------------------|
| GFSK           |                 |                          |                     |
| Low            | 2402            | 1050                     | 788                 |
| Middle         | 2445            | 1000                     | 789                 |
| High           | 2480            | 983                      | 799                 |
| $\pi/4$ -DQPSK |                 |                          |                     |
| Low            | 2402            | 1000                     | 789                 |
| Middle         | 2445            | 1050                     | 792                 |
| High           | 2480            | 983                      | 798                 |
| 8DPSK          |                 |                          |                     |
| Low            | 2402            | 1000                     | 791                 |
| Middle         | 2445            | 1000                     | 789                 |
| High           | 2480            | 1017                     | 794                 |

Please refer to following plots.

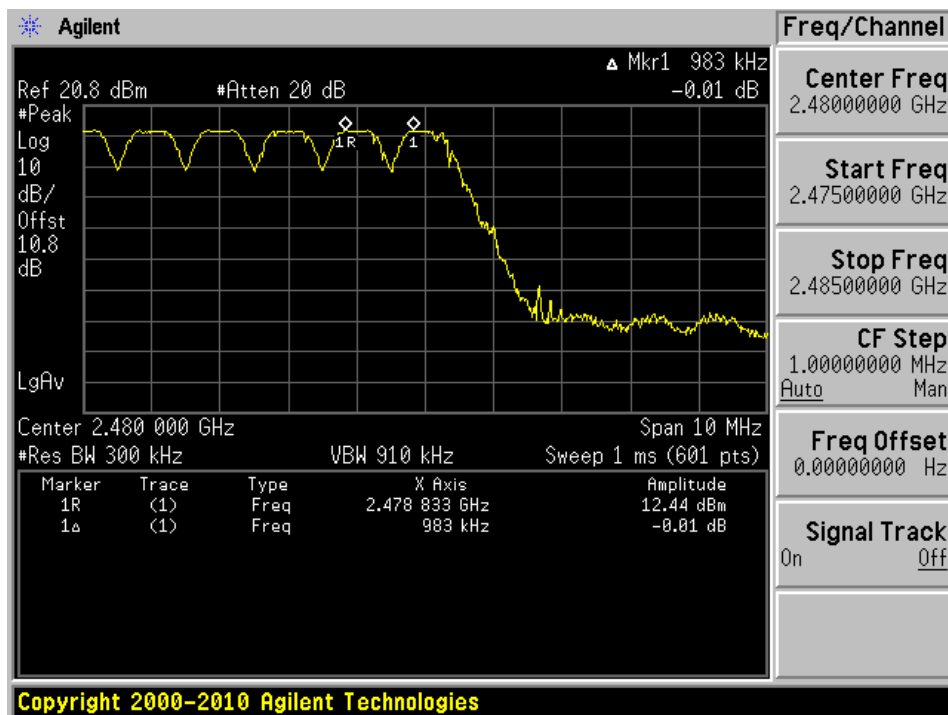
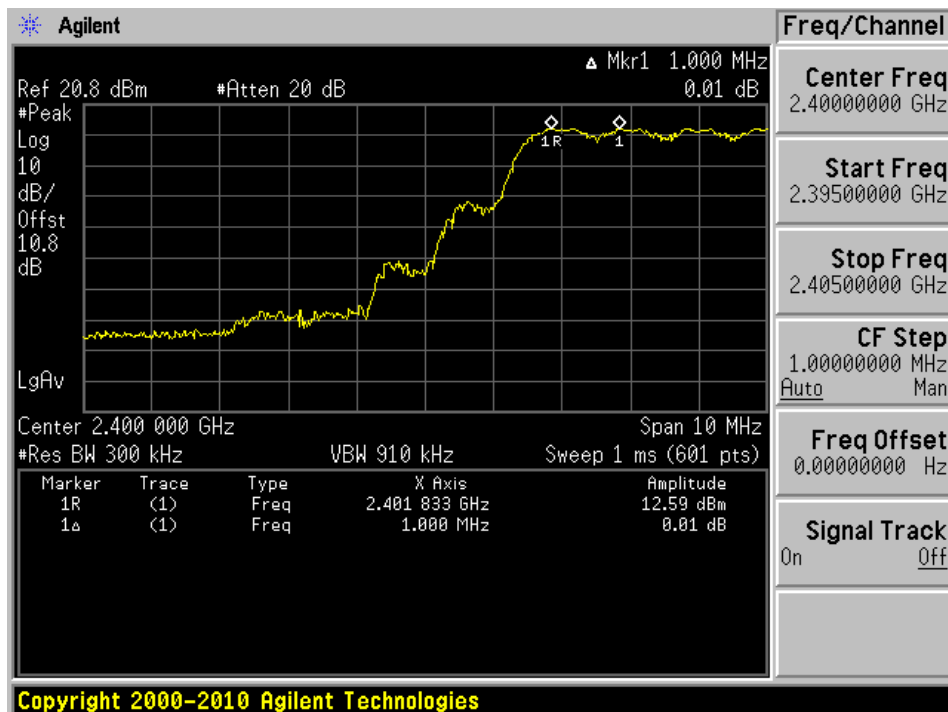
## GFSK Mode 2402 MHz Low Channel Hopping Channel Separation

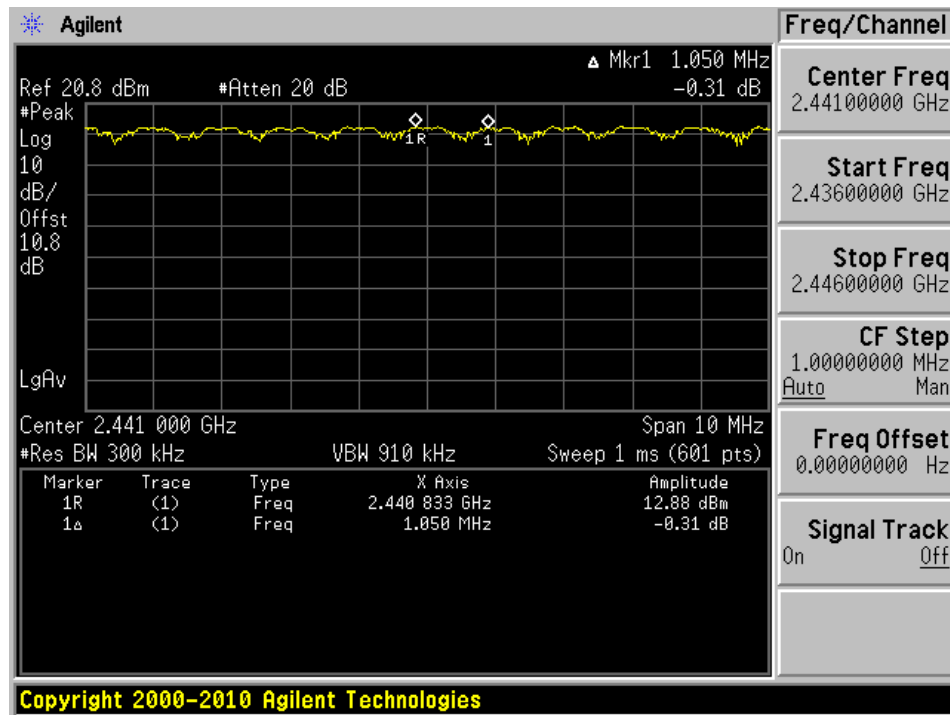
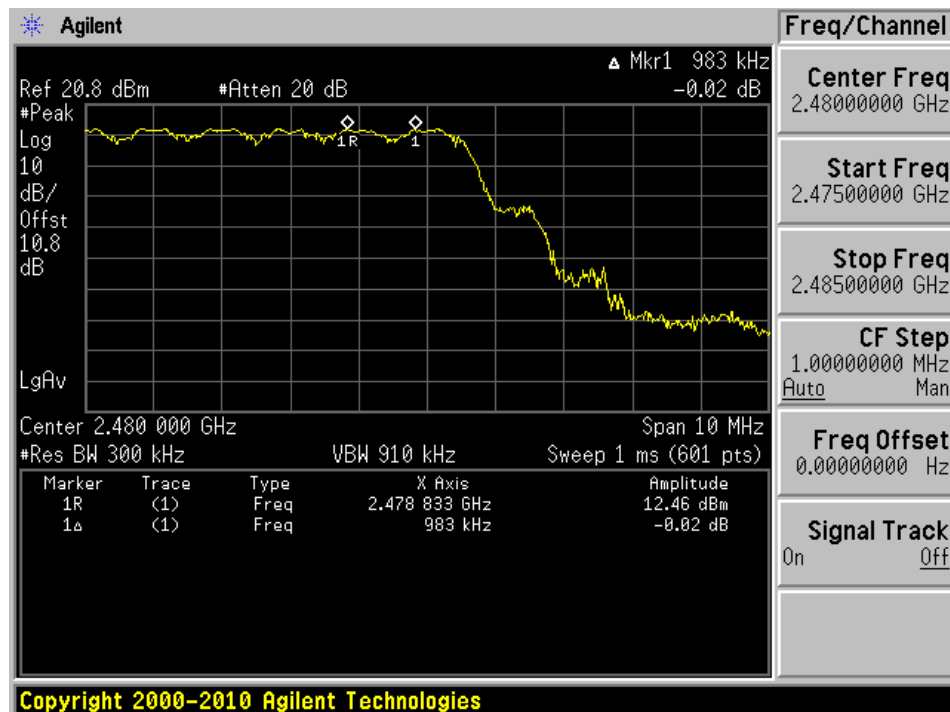


## GFSK Mode 2441 MHz Mid Channel Hopping Channel Separation

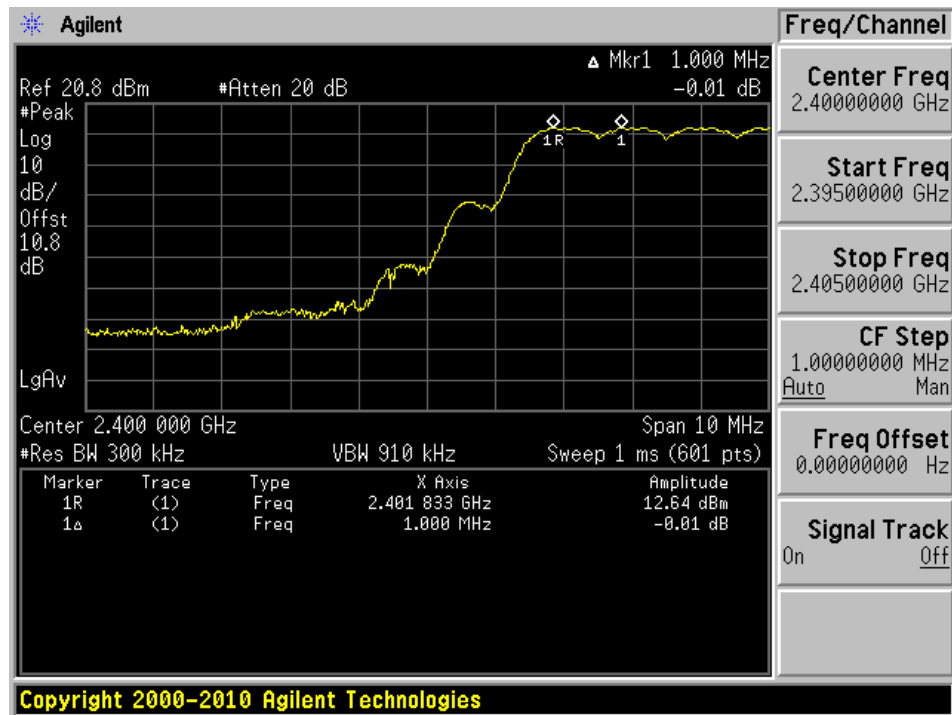


## GFSK Mode 2480 MHz High Channel Hopping Channel Separation

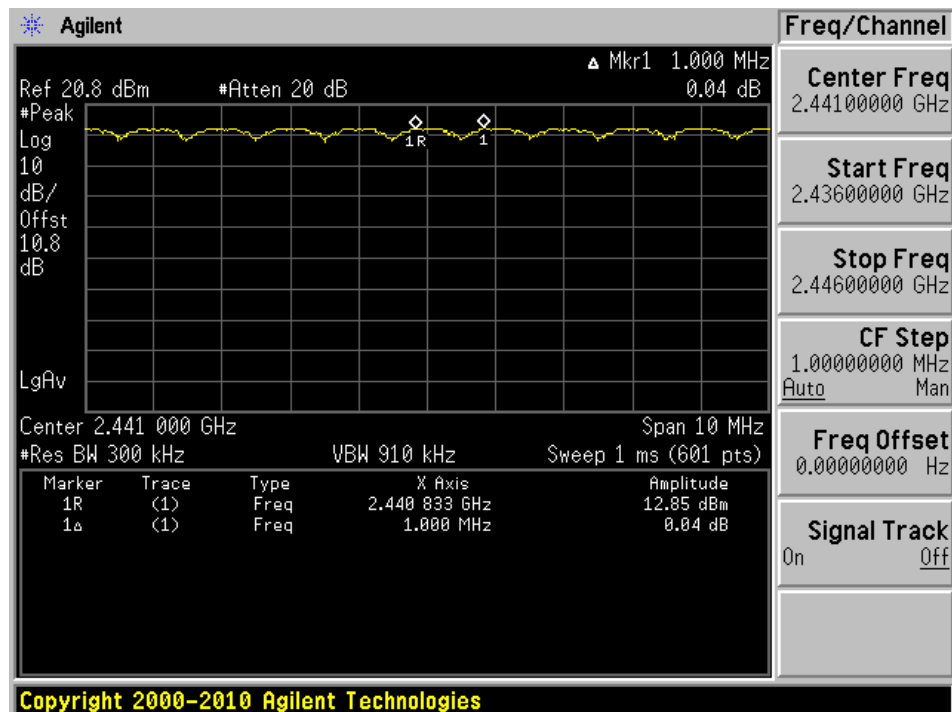
 $\pi/4$ -DQPSK Mode 2402 MHz Low Channel Hopping Channel Separation

$\pi/4$ -DQPSK Mode 2441 MHz Mid Channel Hopping Channel Separation $\pi/4$ -DQPSK Mode 2480 MHz High Channel Hopping Channel Separation

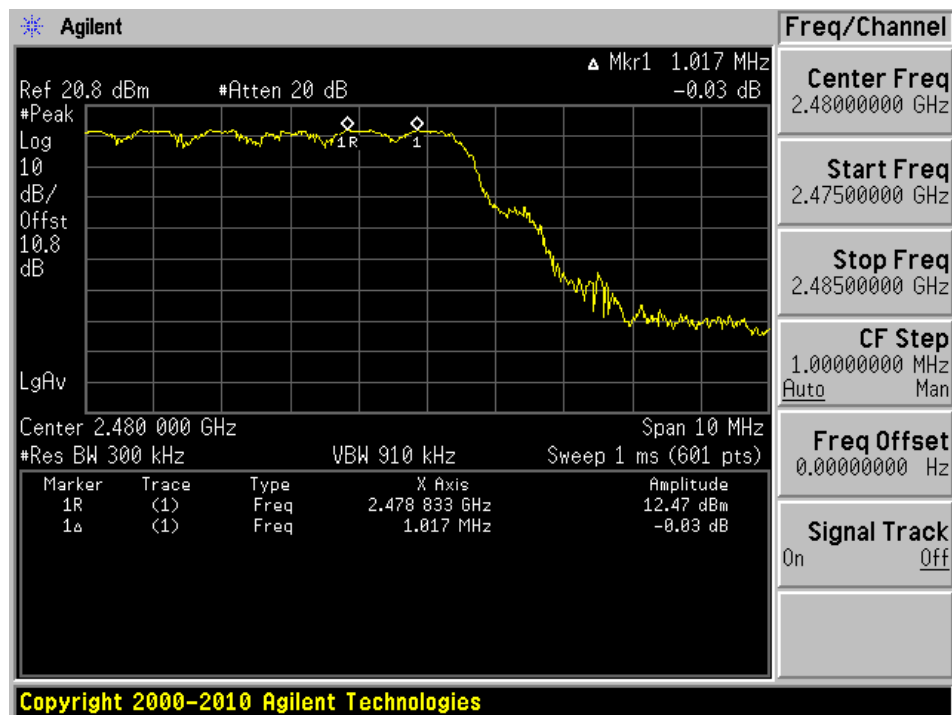
## 8DPSK Mode 2402 MHz Low Channel Hopping Channel Separation



## 8DPSK Mode 2441 MHz Mid Channel Hopping Channel Separation



## 8DPSK Mode 2480 MHz High Channel Hopping Channel Separation



## 14 FCC §15.247(d) - Spurious Emissions at Antenna Terminals

### 14.1 Applicable Standards

For FCC §15.247(d) in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### 14.2 Test Procedure

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

### 14.3 Test Equipment List and Details

| Manufacturer | Description        | Model No. | Serial No. | Calibration Date       | Calibration Interval |
|--------------|--------------------|-----------|------------|------------------------|----------------------|
| Agilent      | Analyzer, Spectrum | E4446A    | MY48250238 | 2018-05-08             | 1 year               |
| -            | RF cable           | -         | -          | Each time <sup>1</sup> | N/A                  |
| -            | 10 dB Attenuator   | -         | -          | Each time <sup>1</sup> | N/A                  |

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

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

### 14.4 Test Environmental Conditions

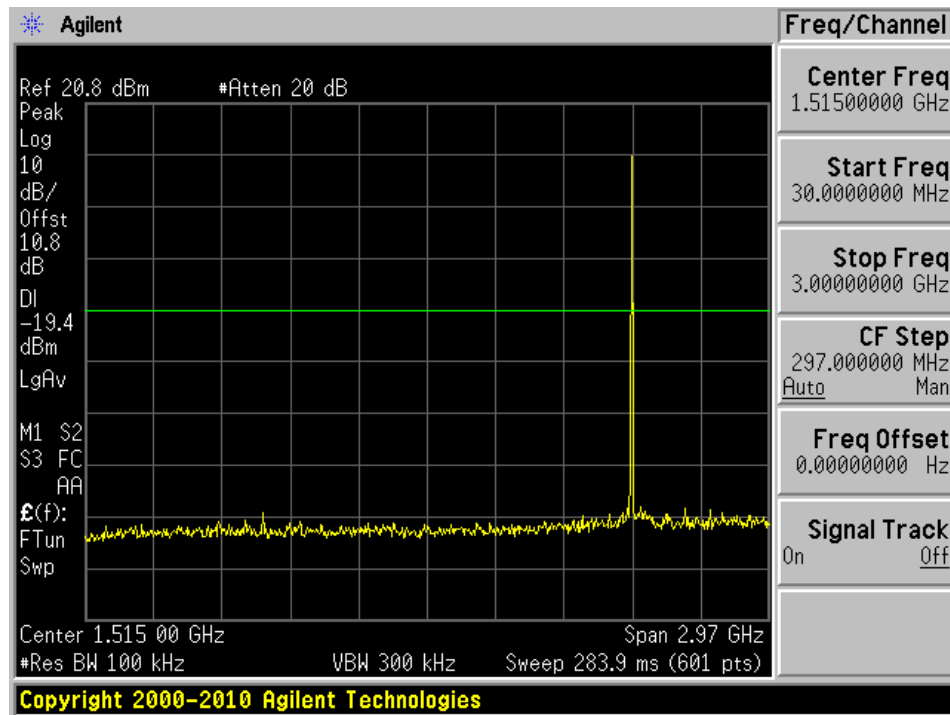
|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 42 %      |
| ATM Pressure:      | 102.7 KPa |

The testing was performed by Vincent Licata from 2018-08-14 to 2018-08-15 in RF site.

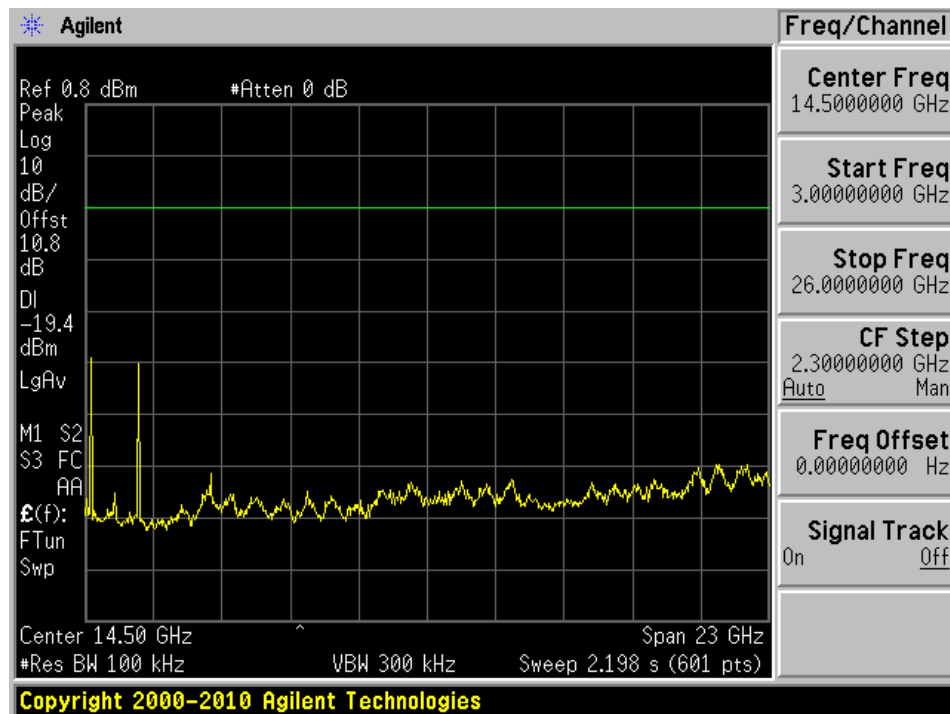
### 14.5 Test Results

Please refer to following plots.

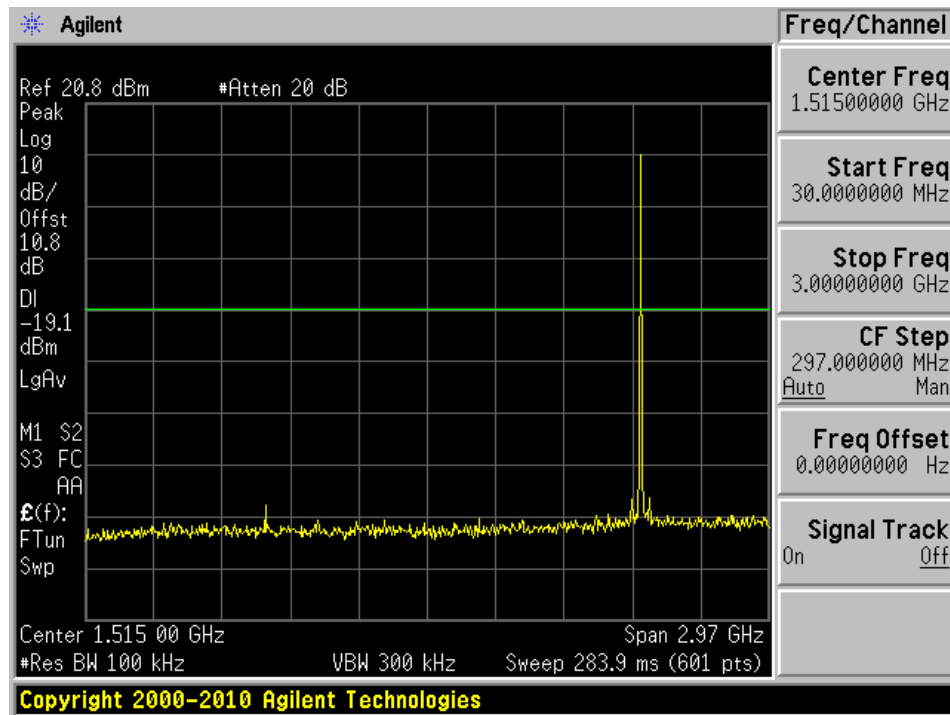
## GFSK Mode 2402 MHz Low Channel Spurious Emission\_1



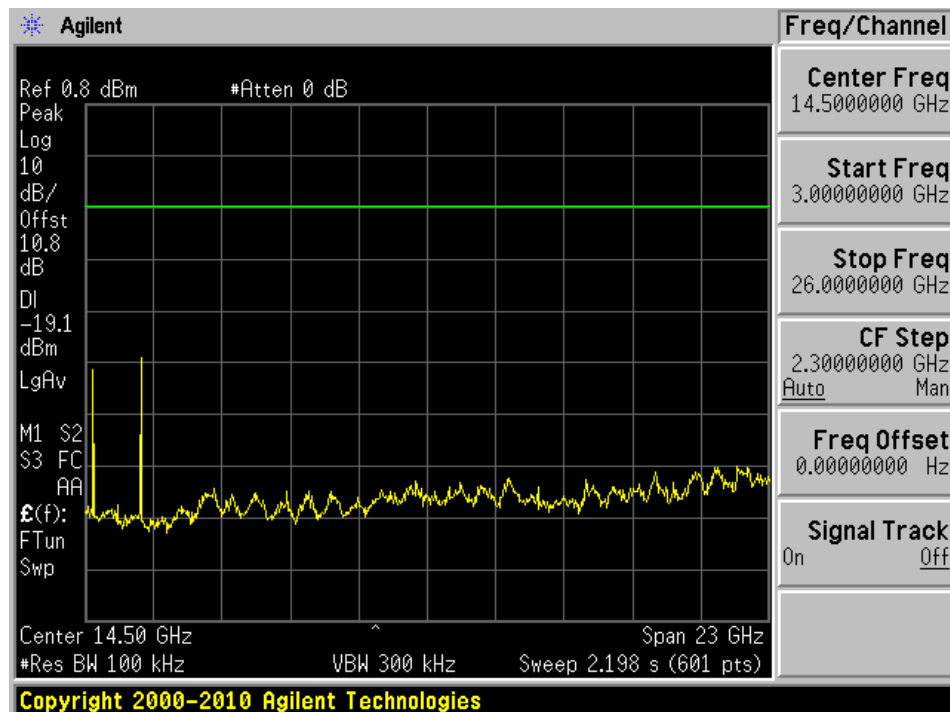
## GFSK Mode 2402 MHz Low Channel Spurious Emission\_2



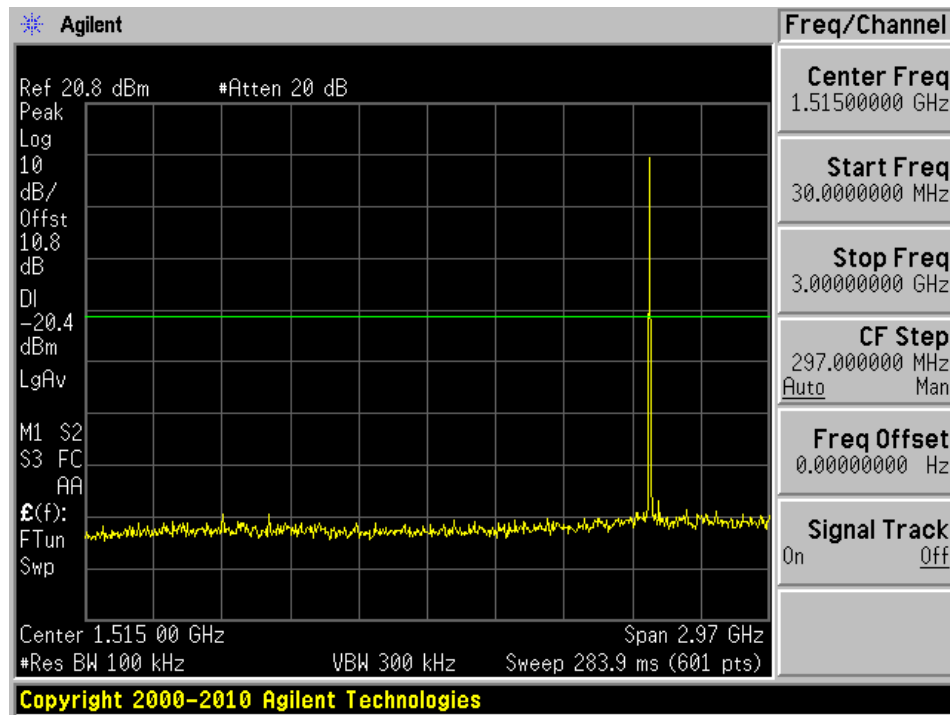
## GFSK Mode 2441 MHz Mid Channel Spurious Emission\_1



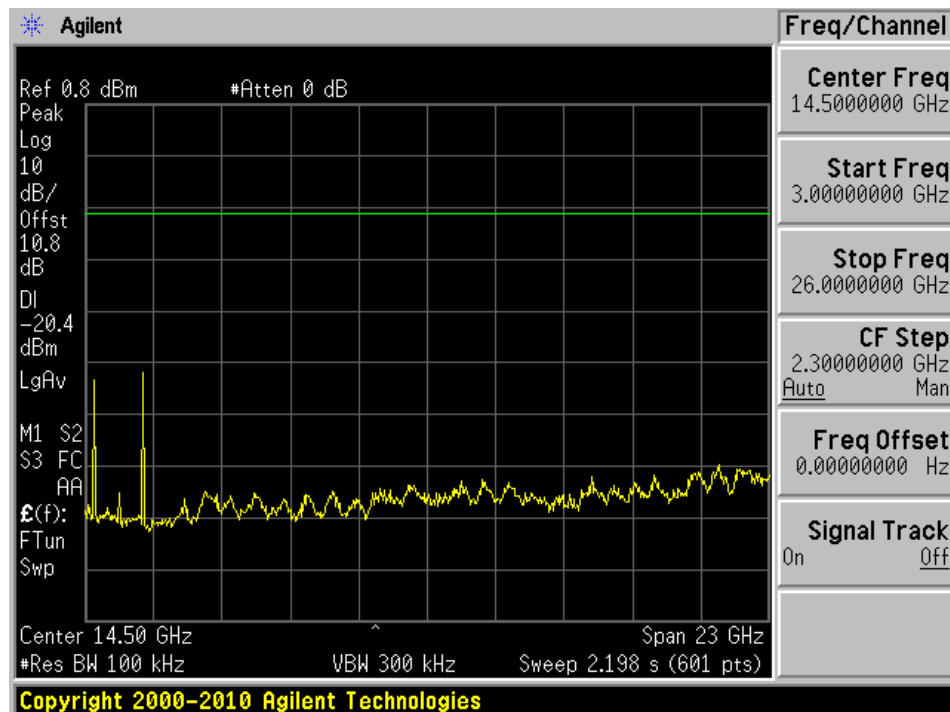
## GFSK Mode 2441 MHz Mid Channel Spurious Emission\_2

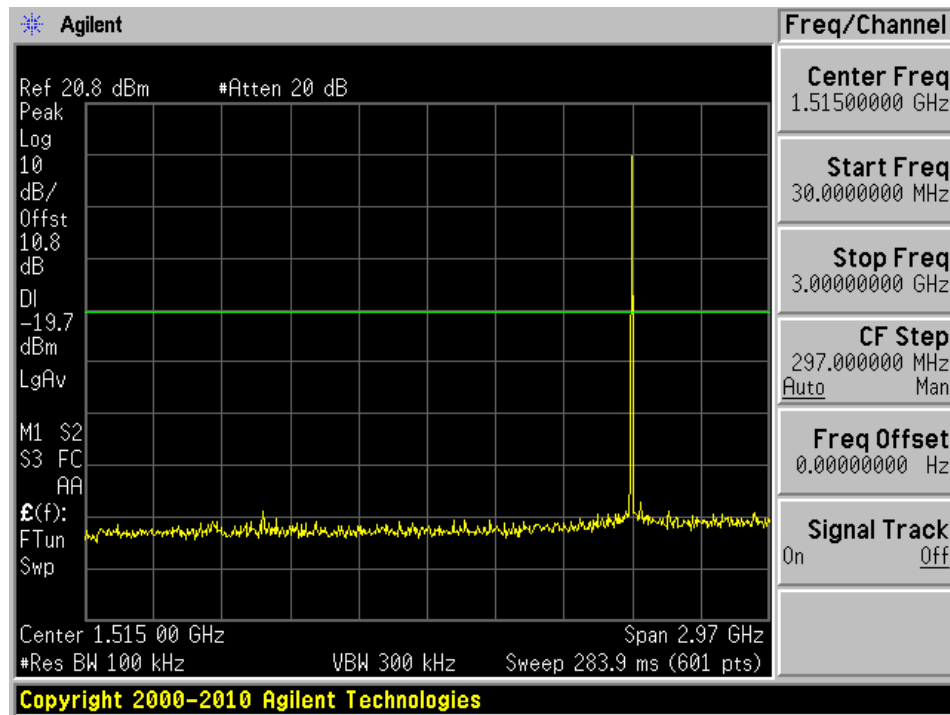
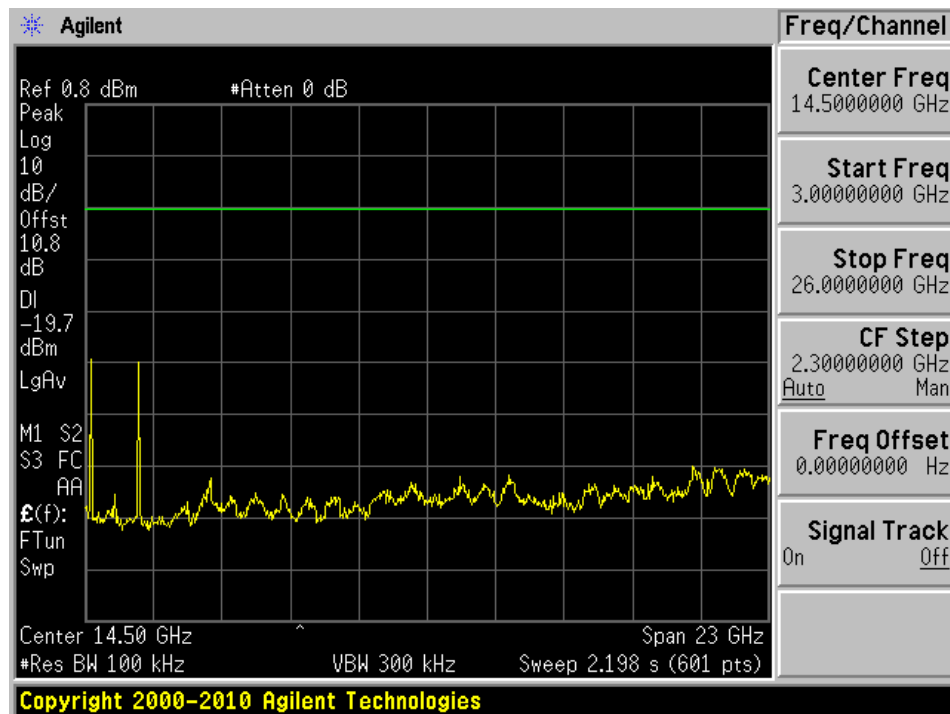


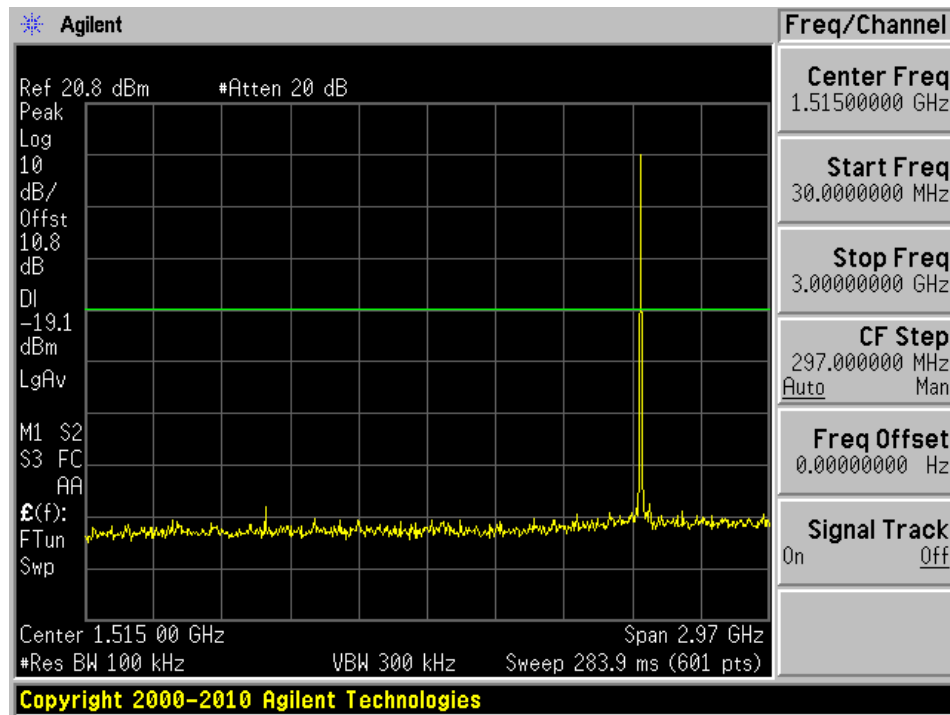
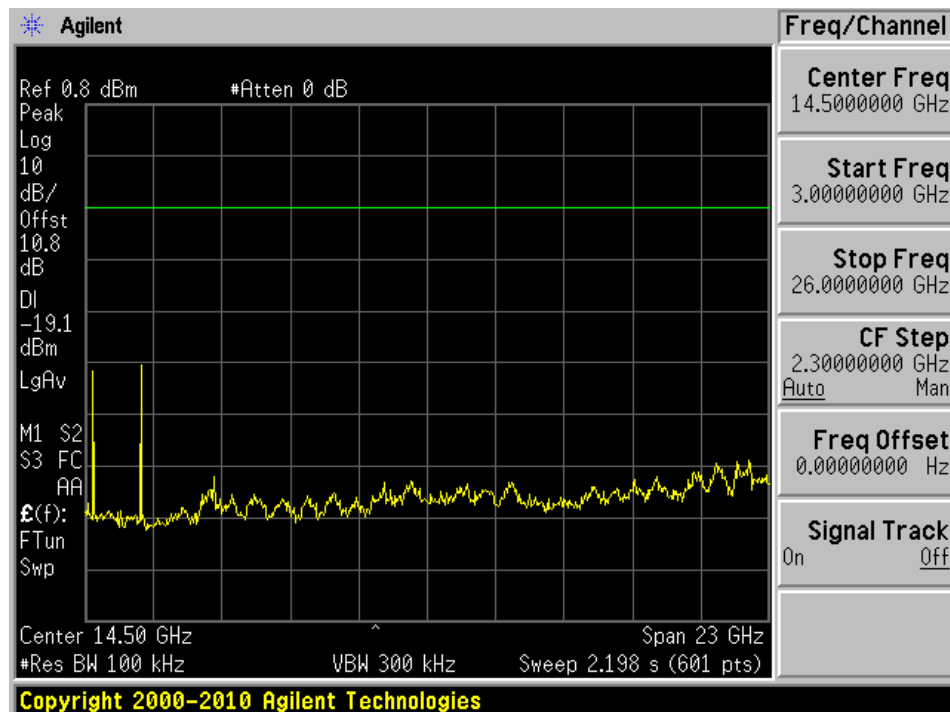
## GFSK Mode 2480 MHz High Channel Spurious Emission\_1

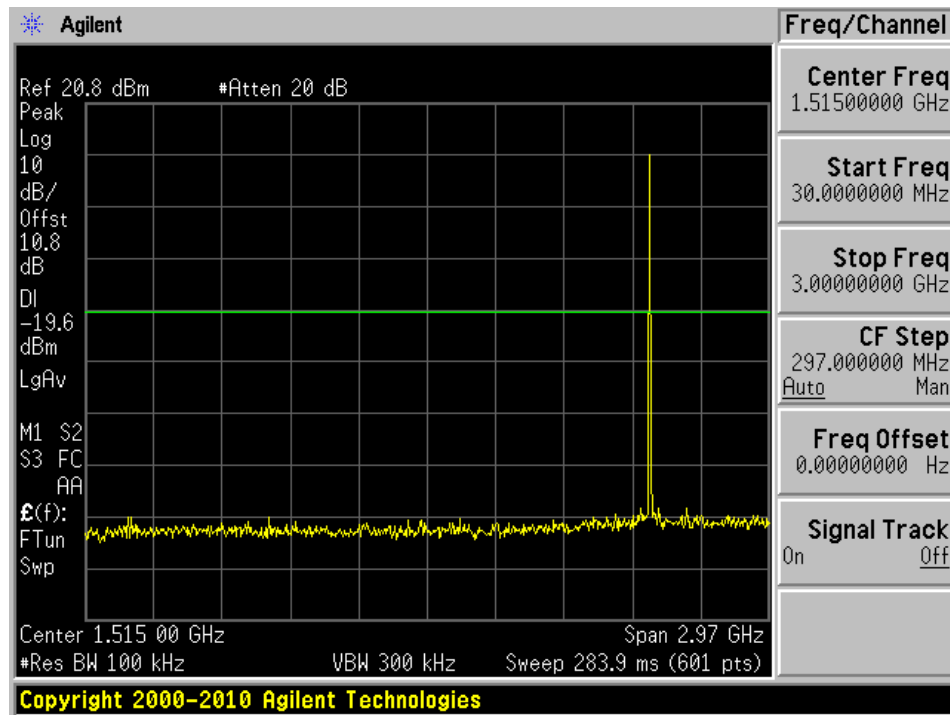
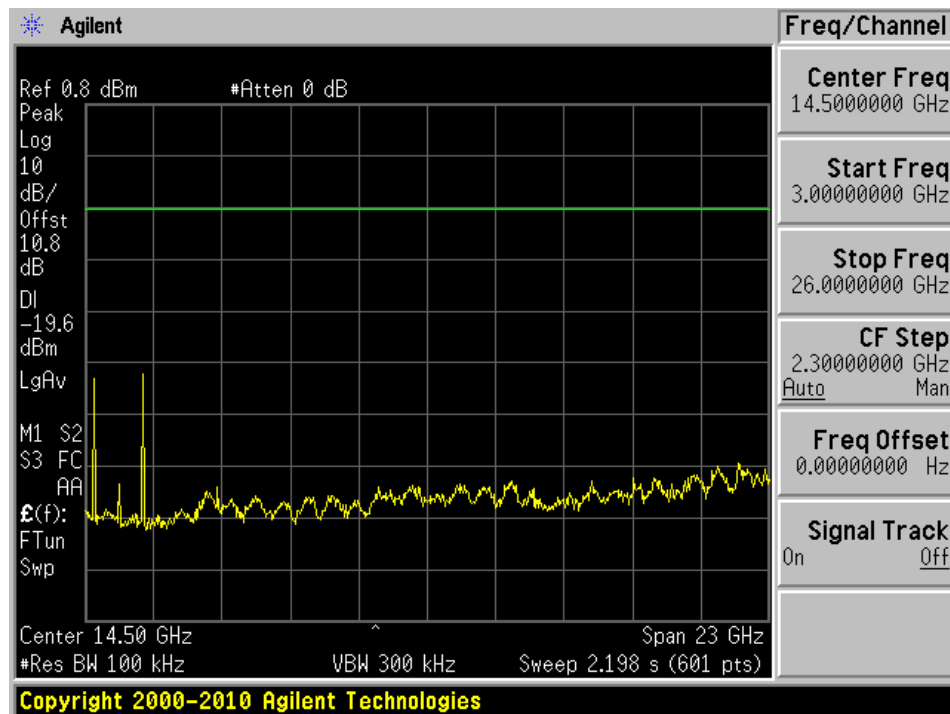


## GFSK Mode 2480 MHz High Channel Spurious Emission\_2

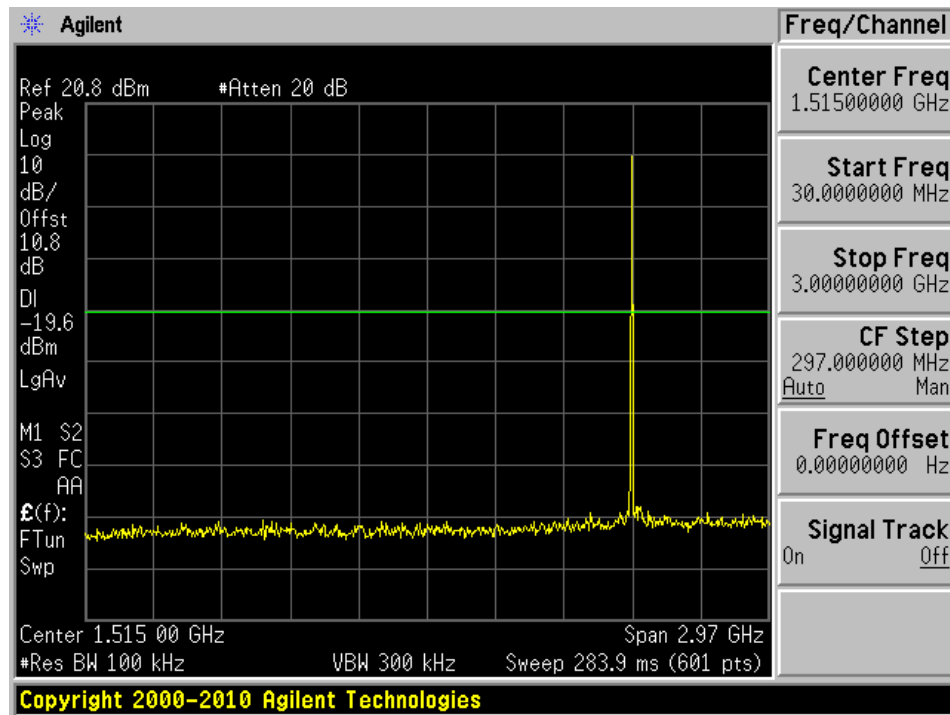


$\pi/4$ -DQPSK Mode 2402 MHz Low Channel Spurious Emission\_1 $\pi/4$ -DQPSK Mode 2402 MHz Low Channel Spurious Emission\_2

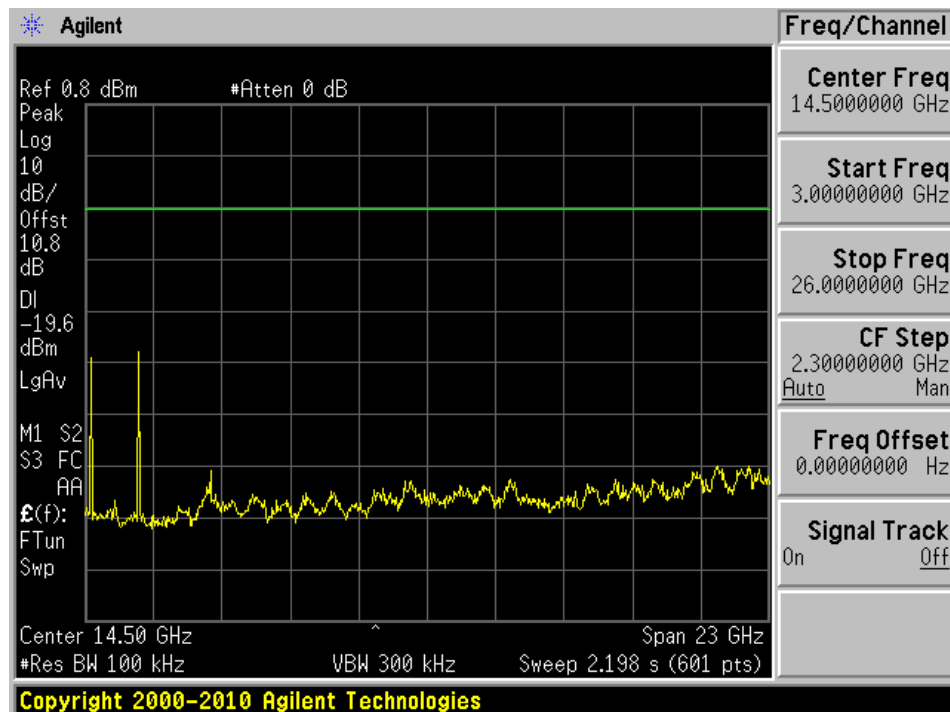
$\pi/4$ -DQPSK Mode 2441 MHz Mid Channel Spurious Emission\_1 $\pi/4$ -DQPSK Mode 2441 MHz Mid Channel Spurious Emission\_2

$\pi/4$ -DQPSK Mode 2480 MHz High Channel Spurious Emission\_1 $\pi/4$ -DQPSK Mode 2480 MHz High Channel Spurious Emission\_2

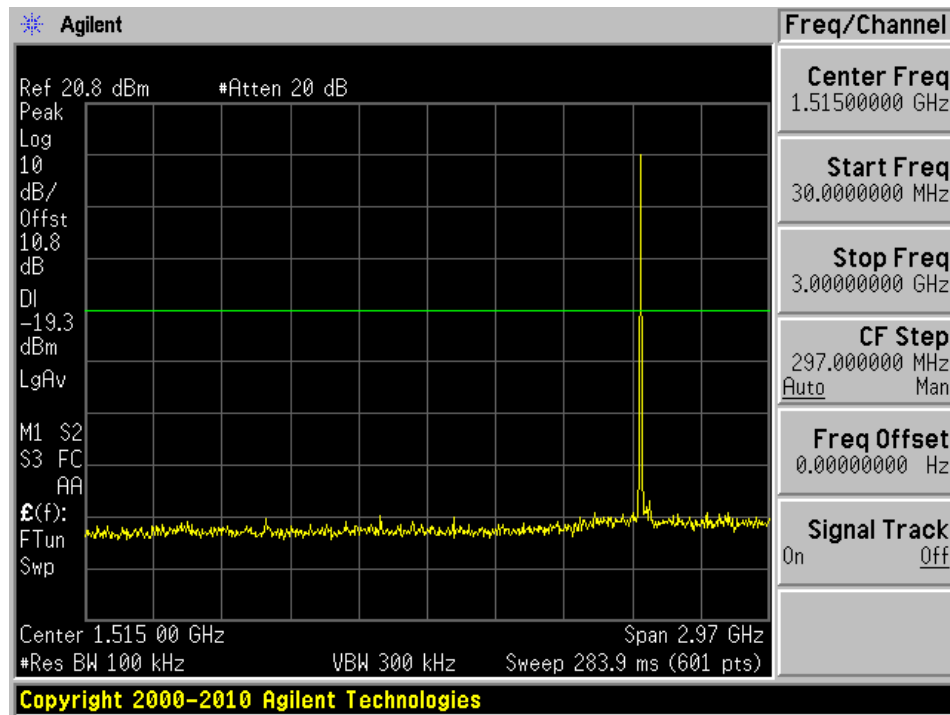
## 8DPSK Mode 2402 MHz Low Channel Spurious Emission\_1



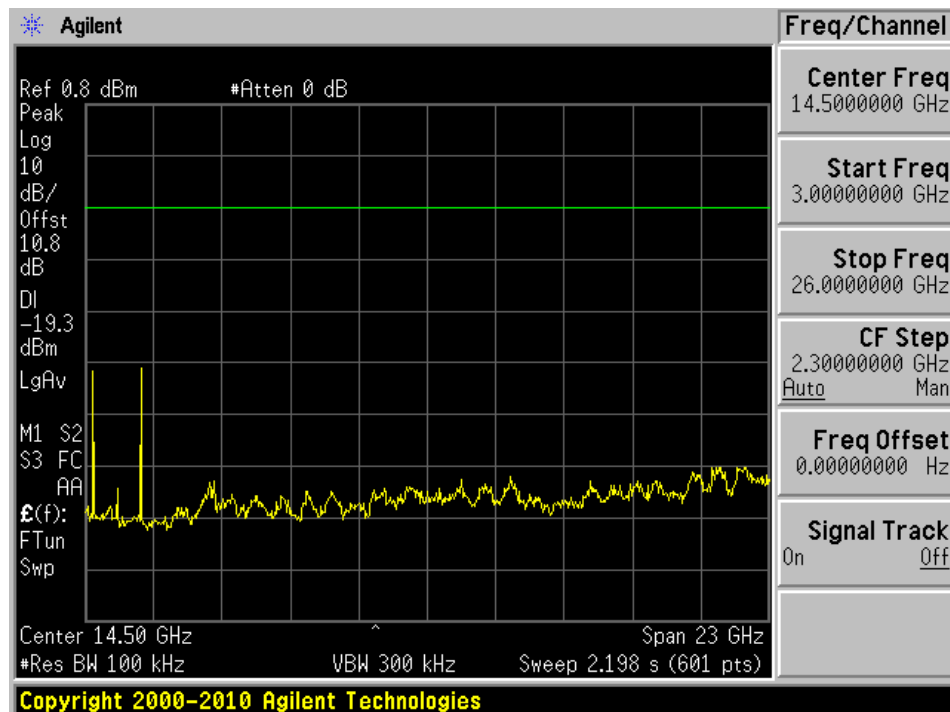
## 8DPSK Mode 2402 MHz Low Channel Spurious Emission\_2



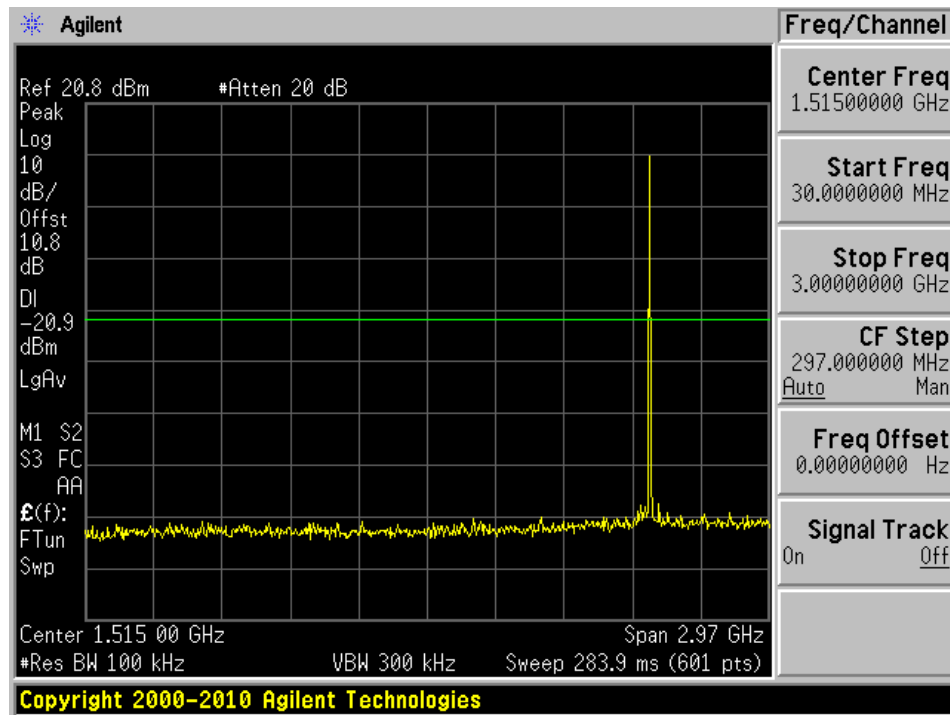
## 8DPSK Mode 2441 MHz Mid Channel Spurious Emission\_1



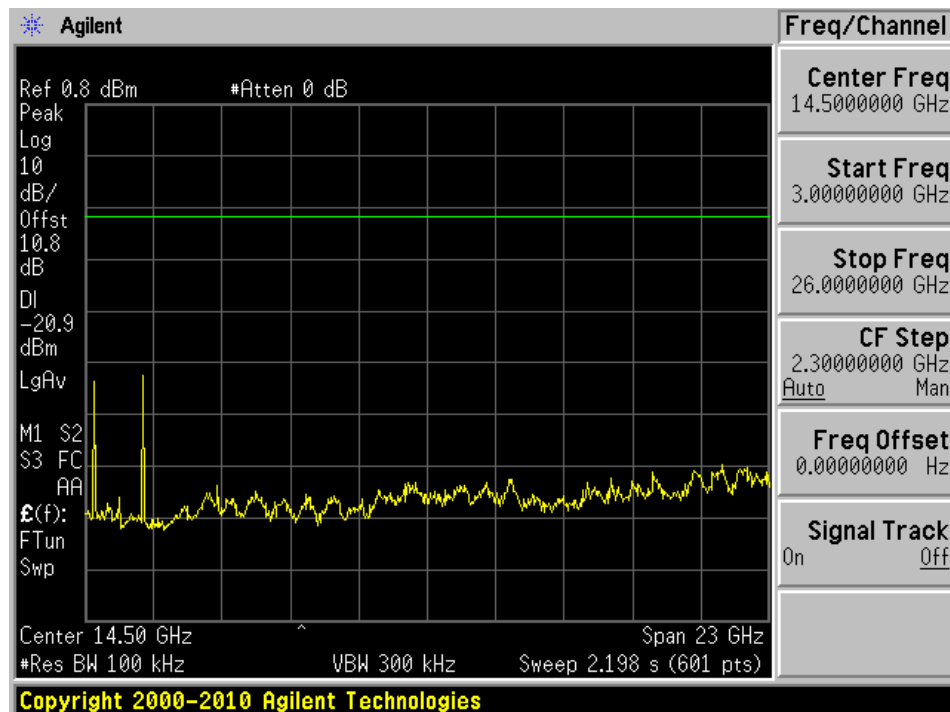
## 8DPSK Mode 2441 MHz Mid Channel Spurious Emission\_2



## 8DPSK Mode 2480 MHz High Channel Spurious Emission\_1



## 8DPSK Mode 2480 MHz High Channel Spurious Emission\_2



A2LA has accredited

Sunnyvale, CA

## Electrical Testing

*[Signature]*

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

FCC Part 15C Test Report