



# FCC

## RF Test Report - EDR

**Product Name: HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone  
with Bluetooth**

**Model Number: HUAWEI Discovery, D51, D51-3**

**Report No: SYBH(Z-RF)026092011-2005  
FCC ID: QISD51-3**

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# 1 Summary

The table below summarizes the measurements and results for the EUT. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

FCC Measurement Specification	Description	Result
15.247 (a) (1)	Bandwidth measurement	PASS
15.247 (a) (1)	Carrier frequency separation measurement	PASS
15.247 (a) (1) III	Number of hopping channel	PASS
15.247 (a) (1) III	Time of occupancy	PASS
15.247 (b) (1)	Peak output power	PASS
15.247 (d)	Band edge compliance measurement	PASS
15.247 (d)	Conducted RF spurious	PASS
15.247 (d) / 15.205 & 15.209	Radiated spurious emission & Radiated restricted band measurement	PASS
15.207	Conducted emission test for power port	PASS



## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth HUAWEI Discovery, D51, D51-3 is subscriber equipment in the WCDMA/GSM system. The HSDPA/UMTS frequency band is Band I, band IV. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSDPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video, MMS service, and GPS, AGPS etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and USIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to exchange data with other Bluetooth devices.

Note: D51-3 Phone the same to D51-5 in BT mode and antenna,  
 So HUAWEI Discovery, D51, D51-3 test data refer to SYBH(Z-RF) 012082011 of HUAWEI D51-5 test report.

#### 2.1.2 Support function and Service

The EUT support the Bluetooth's function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
Data and Voice	Modulation: $\pi/4$ -DQPSK	TM1	/
Data and Voice	Modulation: 8DPSK	TM2	/

### 2.2 Modification Information

For original equipment, following table is not application.

Table 3 Modification Information

Model Number	Board/Module	Original Version	New Version	Modify Information
Not applicable!				
Not applicable!				
Not applicable!				



### **3 Test Site Description**

The test site of:

***Huawei Technologies Co. Ltd.  
P.O. Box 518129  
Huawei base, bantian,  
Longgang District, Shenzhen, China***

#### **3.1 Testing Period**

The test have been performed during the period of

**Aug.02, 2011 –Aug.03, 2011**

#### **3.2 General Set up Description**

The Bluetooth hopping frequency system of Mobile Phone can Support 2.4GHz Band. For compliance with FCC regulation 47CFR part15 subpart C, we set the mobile phone as following test mode to do all compliance tests.

**Bluetooth MODE:**

**TM1:**  $\pi/4$ -DQPSK Modulation

**TM2:** 8DPSK Modulation



## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 4 Frequency Range

Uplink band:	2400 to 2483.5 MHz	
Downlink band:	2400 to 2483.5 MHz	
Hop frequency support:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

#### 4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

Channel spacing:	1 MHz
Channel separation:	1 MHz

#### 4.1.3 Antenna Information

Table 6 Antenna Information

Type:	Integrated / Internal
Maximum Gain(dBi):	1.8(from 2400MHz to 2500MHz)



#### 4.1.4 Environmental Requirements

Table 7 Environmental Requirements

Minimum temperature:	- 10 °C
Maximum temperature:	+ 55 °C
Relative Humidity:	5%-95%

#### 4.1.5 Power Source

Table 8 Power Source

AC voltage nominal:	~120V
AC voltage range	~100V-240V
AC current maximal:	0.2A

#### 4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

#### 4.1.7 Applied DC Voltages and Currents

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8).

The voltage and current in the final RF stage is:

Table 9 Applied RF module DC Voltages and Currents

Voltage:	 +3.7V
Current:	100mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)



## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 10 Board Information

HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth		
HUAWEI D51-5		
Main board		
Hardware Version	Software Version	Serial Number
Ver.A	D51C17B103	L2P2B11162200170

### 4.2.2 Adapter Technical Data

AC/DCAdapter Model	HS-050040U6
Manufacturer	Huawei Technologies Co., Ltd.
Input Voltage	~100-240V 50/60Hz 0.2A
Output Voltage	5V  400mA
Rated Power	2W

### 4.2.3 Battery Technical Data

Name	Manufacture	Description
Rechargeable Li-ion	Huawei Technologies Co., Ltd.	Battery Model: HB5A2 Rated capacity: 1000mAh Nominal Voltage:  +3.7V Charging Voltage:  +4.2V

### 4.2.4 FCC Identification

Grantee Code: QIS  
Product Code: D51-3  
FCC Identification: QISD51-3



## 5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2011
Universal Radio Communication Tester	R&S	CMU200	105822	Oct.24,2011
Wireless Communication Test set	Agilent	N4010A	MY49081592	Dec.14,2011
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.04,2011
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2011
Temperature Chamber	WEISS	WKL64	24600294	Jan.25,2012
Signal generator	Agilent	E8257D	MY49281095	Jul.09,2012
Vector Signal Generator	R&S	SMU200A	104162	Sep.07,2011
Test receiver	R&S	ESU26	36090302083	Jun.24,2012
EMI Test receiver	R&S	FSQ43	100048	Jun.23,2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Dec.13,2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Dec.13,2011
Horn Antenna	R & S	HF906	359287/005	May.07, 2012
Horn Antenna	R & S	HF906	359287/006	Apr.27, 2012
Horn Antenna	R & S	HF906	100684	Jun.28,2012
Broadband Antenna	SCHAFFNER	CBL 6112B	2536	Sep.21, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	Jun.20, 2012
Broadband Antenna	SCHAFFNER	VULB 9163	9163-357	Sep.28,2011
Horn Antenna	ETS-LINDGREN	3160	60008	Sep.20,2011
Horn Antenna	ETS-LINDGREN	3160	91989	Sep.28,2011



## 6 Transmitter Measurements

### 6.1 Bandwidth measurement

#### 6.1.1 Test Conditions

Table 12 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55%
Test Configurations:	TM1/TM2 at channel No.0, 40, 78

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 15.247 (a) (1) and DA 00-705

##### 6.1.2.2 Supporting Standards

Table 13 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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##### 6.1.2.3 Limits

Not Applicable.

#### 6.1.3 Test Method and Setup

- (a) Connect test port of mobile phone to universal communication tester.
- (b) Set the mobile phone to transmit maximum output power at 2.4GHz and switch off frequency hopping function, then set the measured frequency number and test the bandwidth with universal communication tester.

## Test setup

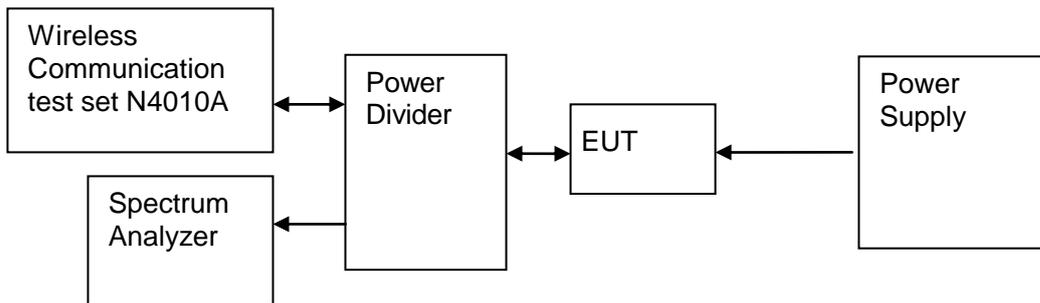


Figure 1. Test Set-up

### 6.1.4 Measurement Results

Table 14 Measurement Results TM1(Modulation:  $\pi/4$ -DQPSK)

Channel Position	Channel Number	Frequency [GHz]	Bandwidth Type	Measured Bandwidth [MHz]	Result
Bottom	0	2.402	20dB	1.265	Pass
			99%	1.185	Pass
Middle	40	2.442	20dB	1.279	Pass
			99%	1.186	Pass
Top	78	2.480	20dB	1.274	Pass
			99%	1.198	Pass

Table 15 Measurement Results TM2(Modulation: 8DPSK)

Channel Position	Channel Number	Frequency [GHz]	Bandwidth Type	Measured Bandwidth [MHz]	Result
Bottom	0	2.402	20dB	1.277	Pass
			99%	1.192	Pass
Middle	40	2.442	20dB	1.275	Pass
			99%	1.187	Pass
Top	78	2.480	20dB	1.277	Pass
			99%	1.190	Pass

### 6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix A.

## 6.2 Carrier frequency separation measurement

### 6.2.1 Test Conditions

Table 16 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55%
Test Configurations:	TM1/TM2 at channel No.39, 40, 41

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 15.247 (a) (1) and DA 00-705

#### 6.2.2.2 Supporting Standards

Table 17 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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#### 6.2.2.3 Limits

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.

Table 18 Limits TM1 (Modulation:  $\pi/4$ -DQPSK)

Regulation:	$\geq 0.025$ or $2/3$ of the 20 dB bandwidth
Limit:	$\geq 2/3 \times 1.279\text{M} = 0.853$ MHz

Table 19 Limits TM2 (Modulation: 8DPSK)

Regulation:	$\geq 0.025$ or $2/3$ of the 20 dB bandwidth
Limit:	$\geq 2/3 \times 1.275\text{M} = 0.850$ MHz

### 6.2.3 Test Method and Setup

- (a) Connect test port of mobile phone to spectrum analyzer and universal communication tester.
- (b) Set the mobile phone to transmit maximum output power at 2.4GHz and switch off frequency hopping function, then set the measured frequency number to two adjacent channels separately and test the carrier frequency separation with spectrum analyzer.

## Test setup

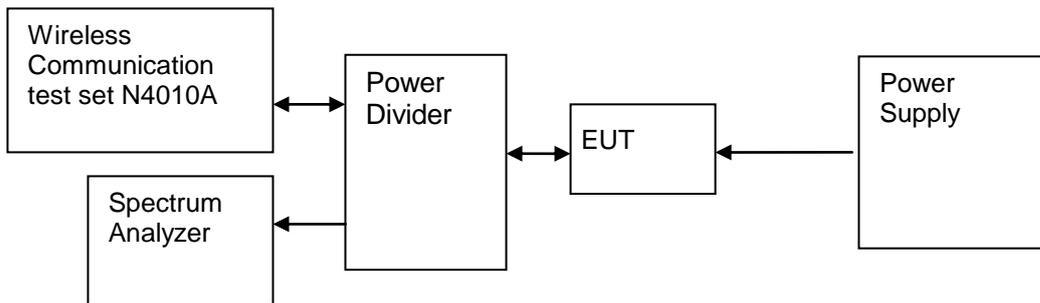


Figure 2. Test Set-up

### 6.2.4 Measurement Results

Table 20 Measurement Results TM1 (Modulation:  $\pi/4$ -DQPSK)

Channel No.	Frequency [GHz]	Channel No.	Frequency [GHz]	Measured frequency separation [MHz]	Limit [MHz]	Result
40	2.442	39	2.441	0.9	$\geq 0.853$	Pass
40	2.442	41	2.443	1.15	$\geq 0.853$	Pass

Table 21 Measurement Results TM2 (Modulation: 8DPSK)

Channel No.	Frequency [GHz]	Channel No.	Frequency [GHz]	Measured frequency separation [MHz]	Limit [MHz]	Result
40	2.442	39	2.441	0.95	$\geq 0.850$	Pass
40	2.442	41	2.443	1.05	$\geq 0.850$	Pass

### 6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix B.

## 6.3 Number of hopping channel

### 6.3.1 Test Conditions

Table 22 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55%
Test Configurations:	TM1/TM2 at hopping frequency state

### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 15.247 (a) (1) iii and DA 00-705

#### 6.3.2.2 Supporting Standards

Table 23 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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#### 6.3.2.3 Limits

Number of hopping channel should be compliance with the requirements in part15.247 (a) (1) iii.

Table 24 Limits

Limits	≥ 15 hopping frequency channel
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### 6.3.3 Test Method and Setup

- (a) Connect test port of mobile phone to spectrum analyzer and universal communication tester.
- (b) Set the mobile phone to transmit maximum output power at 2.4GHz and switch on frequency hopping function, then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer.
- (c) Count the quantity of peaks to get the number of hopping channels.

### Test setup

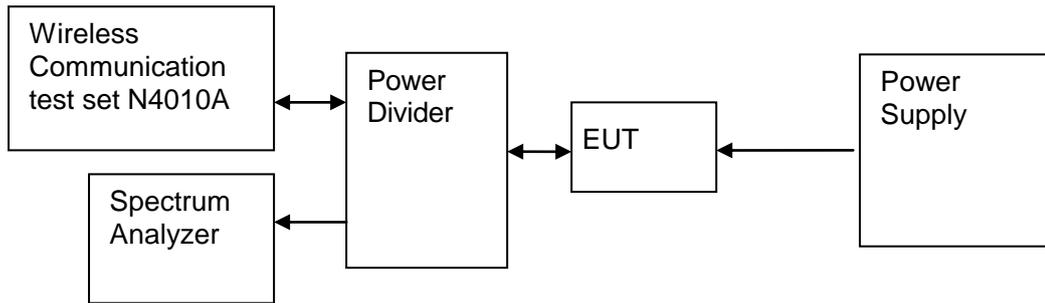


Figure 3. Test Set-up

### 6.3.4 Measurement Results

Table 25 Measurement Results TM1 (Modulation:  $\pi/4$ -DQPSK)

Measured frequency range [MHz]	Channel No. range	Measured Channel No.	Limit	Result
2400 to 2483.5	0-78	79	$\geq 15$	Pass

Table 26 Measurement Results TM2 (Modulation: 8-DPSK)

Measured frequency range [MHz]	Channel No. range	Measured Channel No.	Limit	Result
2400 to 2483.5	0-78	79	$\geq 15$	Pass

### 6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix C.

## 6.4 Time of occupancy

### 6.4.1 Test Conditions

Table 27 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2 at hopping frequency state

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

CFR 47 (FCC) part 15.247 (a) (1) iii and DA 00-705

#### 6.4.2.2 Supporting Standards

Table 28 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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#### 6.4.2.3 Limits

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.

Table 29 Limits

Limits for time of occupancy	$\leq 0.4s$
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### 6.4.3 Test Method and Setup

- Connect test port of mobile phone to spectrum analyzer and universal communication tester.
- Set the mobile phone to transmit maximum output power at 2.4GHz and switch on frequency hopping function.
- Set the span of spectrum analyzer to 0 Hz, and set the resolution bandwidth to 1 MHz and the video bandwidth to 1 MHz, then get the time domain measured diagram and set sweep time to 2 times of one burst occupancy time, and measure the time of occupancy of one burst.
- Set the resolution bandwidth to 1 MHz and the video bandwidth to 3 MHz, and set the sweep time to a period (0.4 seconds multiplied by the number of hopping channels employed), and count the number of the bursts.
- Calculate the time of occupancy in a period with time occupancy of a burst and quantity of bursts.

## Test setup

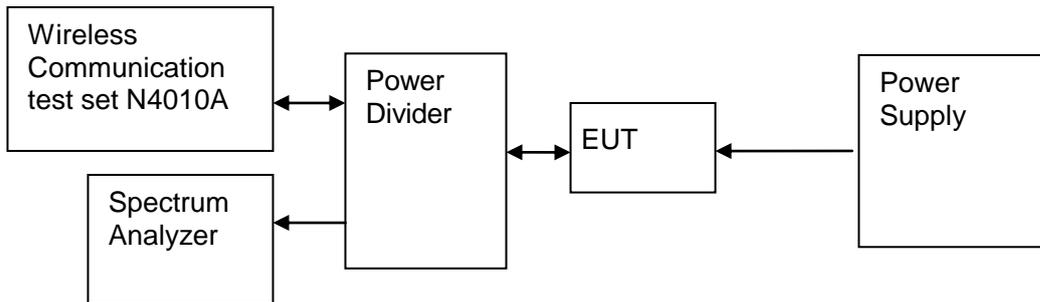


Figure 4. Test Set-up

### 6.4.4 Measurement Results

Table 30 Measurement Results TM1(Modulation:  $\pi/4$ -DQPSK)

Time of Single Slot [ms]	Numbers of slots in a period	Time of occupied in a period [s]	Limit [s]	Result
2.9	106.7	0.30943	$\leq 0.4$	Pass

Table 31 Measurement Results TM2(Modulation: 8DPSK)

Time of Single Slot [ms]	Numbers of slots in a period	Time of occupied in a period [s]	Limit [s]	Result
3.0	106.7	0.32010	$\leq 0.4$	Pass

Note: The result is measured at 2-DH5\3-DH5 mode in  $\pi/4$ -DQPSK\8DPSK modulation, which has longest time in one transmission burst.

### 6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix D.

## 6.5 Peak output power

### 6.5.1 Test Conditions

Table 32 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55%
Test Configurations:	TM1/TM2 at channel No.0, 40, 78

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 15.247 (b) (1) and DA 00-705

#### 6.5.2.2 Supporting Standards

Table 33 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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#### 6.5.2.3 Limits

Compliance with part 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 watt.

Table 34 Limits

2.4GHz and 5.8GHz hopping frequency system	1 Watt (=30 dBm)
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### 6.5.3 Test Method and Setup

- Connect test port of mobile phone to universal communication tester.
- Set the mobile phone to transmit maximum output power at 2.4GHz and switch off frequency hopping function.
- Then set the mobile phone to transmit at high, middle and low frequency and measure the conducted output power separately.

## Test setup

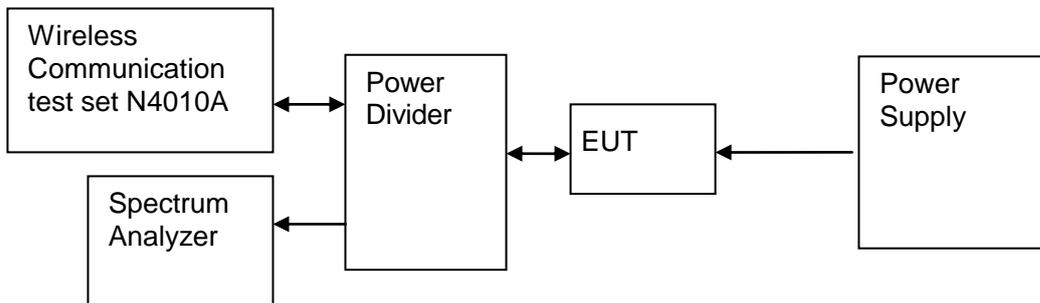


Figure 5. Test Set-up

## 6.5.4 Measurement Results

Table 35 Measurement Results TM1(Modulation:  $\pi/4$ -DQPSK)

Channel	Channel No.	Center Freq.[MHz]	Meas. Level (Cond.) [dBm]	Limit [dBm]	Result
Bottom	0	2402	5.21	< 30	Pass
Middle	40	2442	5.34	< 30	Pass
Top	78	2480	4.44	< 30	Pass

Table 36 Measurement Results TM2(Modulation: 8DPSK)

Channel	Channel No.	Center Freq.[MHz]	Meas. Level (Cond.) [dBm]	Limit [dBm]	Result
Bottom	0	2402	5.19	< 30	Pass
Middle	40	2442	5.41	< 30	Pass
Top	78	2480	4.43	< 30	Pass

## 6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix E.

## 6.6 Band edge spurious emission

### 6.6.1 Test Conditions

Table 37 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2 at channel No. 0, 78 and frequency hopping state

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 15.247 (d) and DA 00-705

#### 6.6.2.2 Supporting Standards

Table 38 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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#### 6.6.2.3 Limits

Compliance with part 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 Section 15.209(a) is not required.

Table 39 Limits

Band edge spurious:	20 dBc/100kHz
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### 6.6.3 Test Method and Setup

- Connect test port of mobile phone to spectrum analyzer and universal communication tester
- Set the mobile phone to transmit maximum output power at 2.4GHz and switch off frequency hopping function.
- Then set the mobile phone to transmit at high, low frequency and measure the conducted band edge spurious separately.
- Switch on the frequency hopping function, and repeat above measurement.

## Test setup

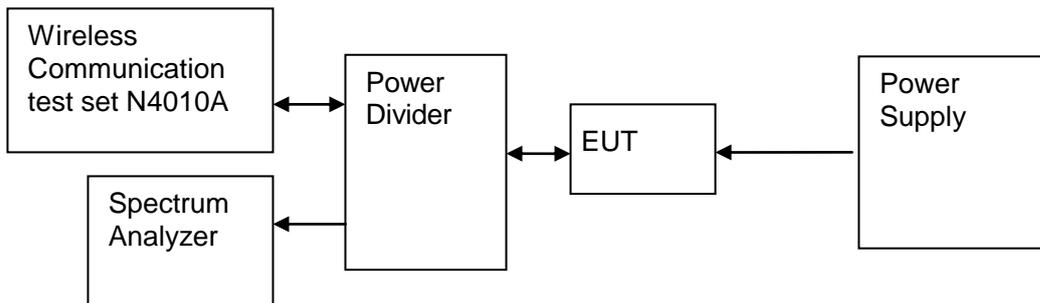


Figure 6. Test Set-up

### 6.6.4 Measurement Results

Table 40 Measurement Results for Band Edge immediately outside the 2.4GHz Band  
 TM1(Modulation:  $\pi/4$ -DQPSK)

	Chan- nel No.	Carrier Freque- ncy [MHz]	Carrier Power [dBm]	Frequen- cy Hopping	Max. Spurious Level [dBm]	Limit [dBm]	Result
Low Edge	0	2402	4.02	Off	-53.71	-18.96	Pass
	-	-	4.14	On	-54.13	-19.00	Pass
High Edge	78	2480	7.28	Off	-54.81	-20.02	Pass
	-	-	6.27	On	-54.37	-19.79	Pass

Table 41 Measurement Results for Band Edge immediately outside the 2.4GHz Band  
 TM2(Modulation: 8DPSK)

	Chan- nel No.	Carrier Freque- ncy [MHz]	Carrier Power [dBm]	Frequency Hopping	Max. Spurious Level [dBm]	Limit [dBm]	Result
Low Edge	0	2402	4.06	Off	-53.75	-18.66	Pass
	-	-	3.98	On	-55.29	-19.13	Pass
High Edge	78	2480	7.22	Off	-54.20	-18.97	Pass
	-	-	7.03	On	-54.64	-21.51	Pass

### 6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix F.

## 6.7 Conducted RF spurious

### 6.7.1 Test Conditions

Table 42 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55%
Test Configurations:	TM1/TM2 at channel No.0, 40, 78

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 15.247 (d) and DA 00-705

#### 6.7.2.2 Supporting Standards

Table 43 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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#### 6.7.2.3 Limits

Compliance with part 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 Section 15.209(a) is not required.

Table 44 Limits

Band edge spurious:	20 dBc/100kHz
---------------------	---------------

### 6.7.3 Test Method and Setup

- (a) Connect test port of mobile phone to spectrum analyzer and universal communication tester
- (b) Set the mobile phone to transmit maximum output power at 2.4GHz and switch off frequency hopping function.
- (c) Then set the mobile phone to transmit at high, middle and low frequency and measure the conducted band edge spurious separately.
- (d) Switch on the frequency hopping function, and repeat above measurement.

## Test setup

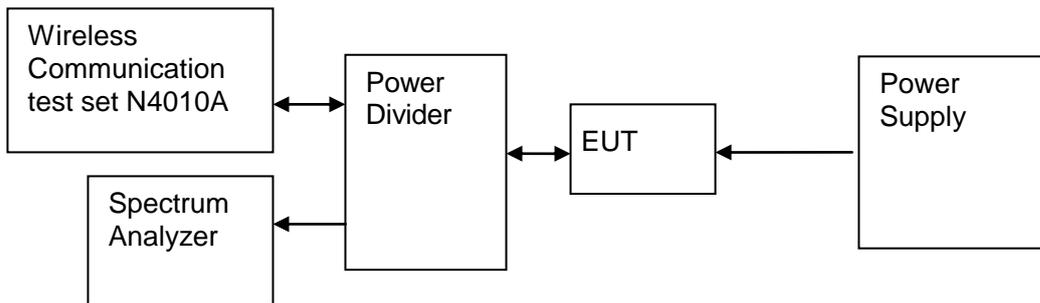


Figure 7. Test Set-up

## 6.7.4 Measurement Results

Table 45 Measurement Results TM1 (Modulation:  $\pi/4$ -DQPSK)

Test Frequency Range	Channel No.	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max. Spurious Level [dBm]	Limit [dBm]	Result
9kHz-25GHz	0	2402	-2.21	Off	-41.31	-22.21	Pass
9kHz-25GHz	40	2442	-0.72	Off	-45.24	-20.72	Pass
9kHz-25GHz	78	2480	-2.22	Off	-46.66	-22.22	Pass

Table 46 Measurement Results TM2 (Modulation: 8DPSK)

Test Frequency Range	Channel No.	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max. Spurious Level [dBm]	Limit [dBm]	Result
9kHz-25GHz	0	2402	-3.42	Off	-41.05	-23.42	Pass
9kHz-25GHz	40	2442	1.84	Off	-44.80	-18.16	Pass
9kHz-25GHz	78	2480	-2.48	Off	-46.88	-22.48	Pass

## 6.7.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix G.

## 6.8 Radiated spurious emission & spurious in restricted band

### 6.8.1 Test Conditions

Table 47 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Enclosure
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1/TM2 at channel No.0, 40, 78

### 6.8.2 Test Specifications and Limits

#### 6.8.2.1 Specification

CFR 47 (FCC) part 15.247 (d), 15.205 & 15.209 and DA 00-705

#### 6.8.2.2 Supporting Standards

Table 48 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

#### 6.8.2.3 Limits

According to part 15.247 (d) / 15.205 & 15.209, all spurious emission in the frequency range from 30MHz to 10<sup>th</sup> harmonics of carrier frequency should be meet the requirement of following table.

Table 49 Limits

Frequency (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (meters)	Detector
30 - 88	100	40	3	QP
88 - 216	150	43.5	3	QP
216 - 960	200	46	3	QP
960 -1000	500	54	3	QP
Above 1000	500	54	3	AV
Above 1000	500	74	3	PK

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a) (see above table).

### 6.8.3 Test Method and Setup

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The

set-up and test methods were according to ANSI C63.4. The Radiated Disturbance measurements were made using a Rohde and Schwarz Test Receiver and control software.

A preliminary scan and a final scan of the emissions were made by using test script of software; the emissions were measured using a Quasi-Peak Detector below 1GHz, Peak Detector and AV detector above 1GHz. The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1m to 4m, the azimuth range of turntable was 0° to 360°, The receive antenna has two polarizations V and H.

The EUT was communicated with the BTS simulator through Air interface. The EUT transmits maximum output power at 2.4GHz and switch off frequency hopping function.

Measurement bandwidth: 30 MHz - 1000 MHz: 120 kHz

Measurement bandwidth: 1000 MHz - 10<sup>th</sup> Carrier Frequency: 1 MHz

### Test set up

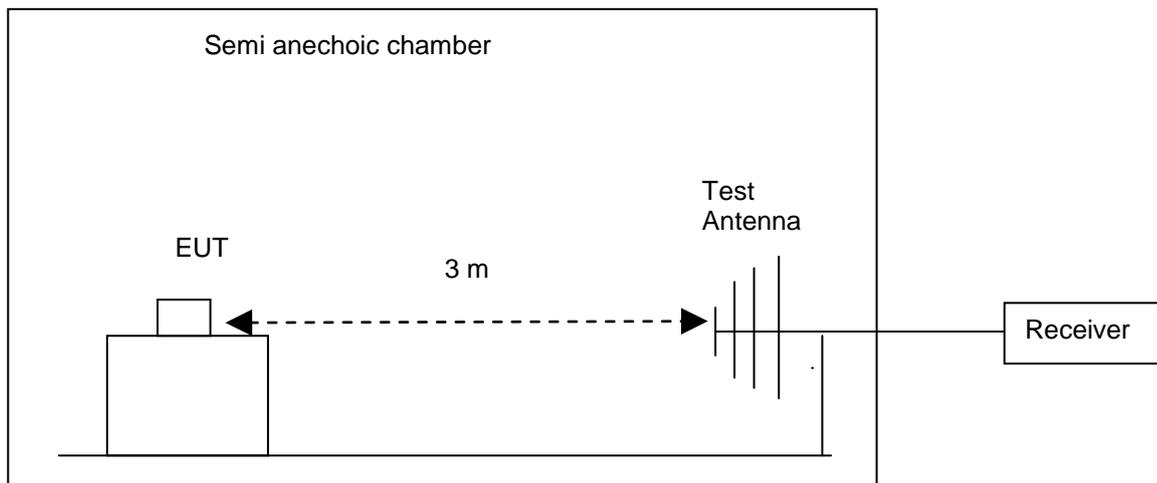


Figure 8. Test Set up

### 6.8.4 Measurement Results

Note 1: The following measurement results exceed the limit line is the carrier frequency.

Note 2: This test was carried out in all the test modes, here only the worst test result was shown.

Test Frequency Range	Channel No.	Carrier Frequency [MHz]	Measured	Result
30MHz-26.5GHz	0	2402	Refer to Appendix H	Pass
30MHz-26.5GHz	40	2442	Refer to Appendix H	Pass
30MHz-26.5GHz	78	2480	Refer to Appendix H	Pass

### 6.8.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix H.

## 6.9 Conducted Emission at Power Port

### 6.9.1 Test Conditions

Table 50 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Power port
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	TM1/TM2 at channel No. 40

### 6.9.2 Test Specifications and Limits

#### 6.9.2.1 Specification

CFR 47 (FCC) part 15.207 and DA 00-705

#### 6.9.2.2 Supporting Standards

Table 51 Supporting Standards:

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
------------------	--

#### 6.9.2.3 Limits

Compliance with part15.207, conducted emission must meet the requirement of following table.

Table 52 Limits

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

Note: \* Decreases with the logarithm of the frequency.

### 6.9.3 Test Method and Setup

The Table-top EUT was placed upon a non-metallic table 0.8 m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4: 2009.

Conducted Disturbance at AC Port measurements were undertaken on the L and N Lines. The emissions were measured using a Quasi-Peak Detector and Average Detector.

The EUT was communicated with the BTS simulator through Air interface, the BTS simulator controls the Mobile Phone to transmitter the maximum power which defined in specification of product. The EUT operated on the typical channel.

Measurement bandwidth (RBW) for 150kHz to 30 MHz: 9 kHz;

### Test Set-up

The Mobile Phone was setup in the screened chamber and operated under nominal conditions.

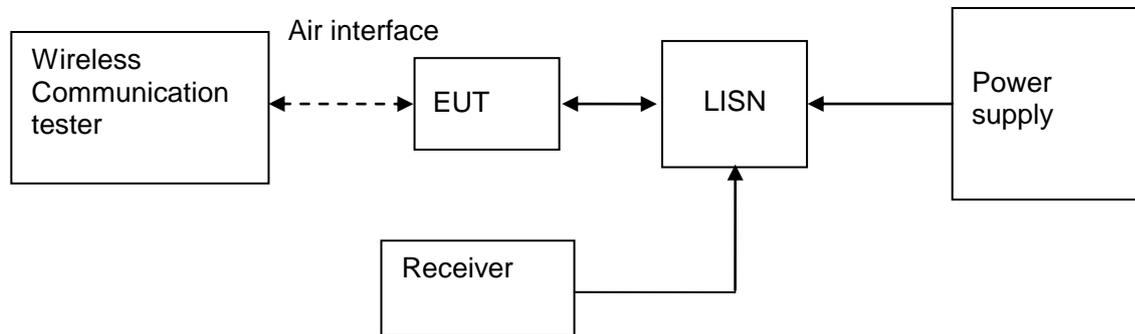


Figure 9. Test Set-up

### 6.9.4 Measurement Results

Table 53 MEASUREMENT RESULT:QP DECTER

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Line	PE
0.194000	37.60	10.1	64	26.4	N	FLO
0.386000	38.00	10.0	58	20.0	N	FLO
2.066000	29.90	10.1	56	26.1	N	FLO
3.690000	29.80	10.2	56	26.2	N	FLO
9.210000	26.30	10.3	60	33.7	N	FLO
22.892000	25.00	10.4	60	35.0	N	FLO

Table 54 MEASUREMENT RESULT:AV DECTER

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Line	PE
0.338000	33.20	10.0	49	15.8	N	FLO
0.434000	37.00	10.1	47	10.0	N	FLO
1.292000	28.90	10.1	46	17.1	N	FLO
2.848000	26.80	10.2	46	19.2	N	FLO
5.340000	21.70	10.2	50	28.3	N	FLO
25.102000	20.20	10.4	50	29.8	N	FLO

### 6.9.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix I.



## 7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 55 System Measurement Uncertainty

Items		Extended Uncertainty
20dB bandwidth measurement	Magnitude (%)	U=0.2%; k=2
Carrier frequency separation measurement	Magnitude (%)	U=0.2%; k=2
Time of occupancy	Magnitude (%)	U=0.2%; k=2
Peak output power	Power(dBm)	U=0.39dB; k=2
Band edge compliance measurement	Disturbance Power(dBm)	U= 2.0dB; k=2
Conducted RF spurious	Disturbance Power(dBm)	U= 2.0dB; k=2
Radiated spurious emission & Radiated restricted band measurement	Field strength (dB $\mu$ V/m)	U=2.2dB; k=2 U=5dB; k=2
Conducted emission test for power port	Disturbance Voltage(dB $\mu$ V)	U=4dB; k=2



## 8 Appendices List

Appendix A	Measurement Results Bandwidth measurement
Appendix B	Measurement Results Carrier frequency separation measurement
Appendix C	Measurement Results Number of hopping channel
Appendix D	Measurement Results Time of occupancy
Appendix E	Measurement Results Peak output power
Appendix F	Measurement Results Band edge compliance measurement
Appendix G	Measurement Results Conducted RF spurious
Appendix H	Measurement Results Radiated spurious emission & spurious in restricted band
Appendix I	Measurement Results Conducted emission test for power port
Appendix J	Photos of Test Setup

----- End of Report -----



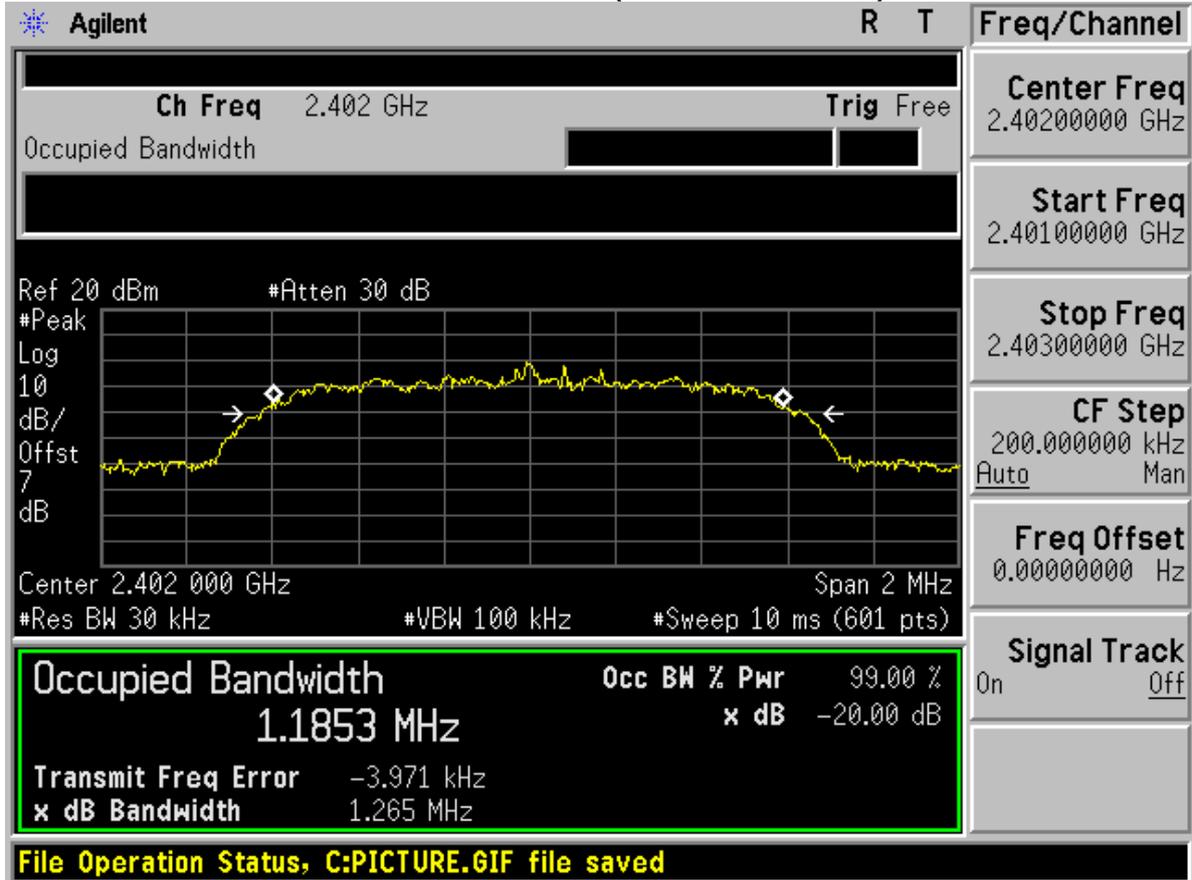
# **Appendix A**

## Bandwidth measurement

According to FCC Part 15.247 (a) (1)



## Modulation: $\pi/4$ -DQPSK Channel 0 (2402MHz)





# Channel 40 (2442MHz)

Agilent
R T

**Ch Freq** 2.442 GHz

Occupied Bandwidth

**Trig** Free

Ref 20 dBm #Atten 30 dB

Center 2.442 000 GHz Span 2 MHz

#Res BW 30 kHz #VBW 100 kHz #Sweep 10 ms (601 pts)

**Center Freq**  
2.44200000 GHz

**Start Freq**  
2.44100000 GHz

**Stop Freq**  
2.44300000 GHz

**CF Step**  
200.000000 kHz  
Auto Man

**Freq Offset**  
0.00000000 Hz

**Signal Track**  
On Off

<b>Occupied Bandwidth</b>	<b>Occ BW % Pwr</b> 99.00 %
1.1855 MHz	x dB -20.00 dB
<b>Transmit Freq Error</b>	-8.690 kHz
<b>x dB Bandwidth</b>	1.279 MHz

**File Operation Status, C:PICTURE.GIF file saved**

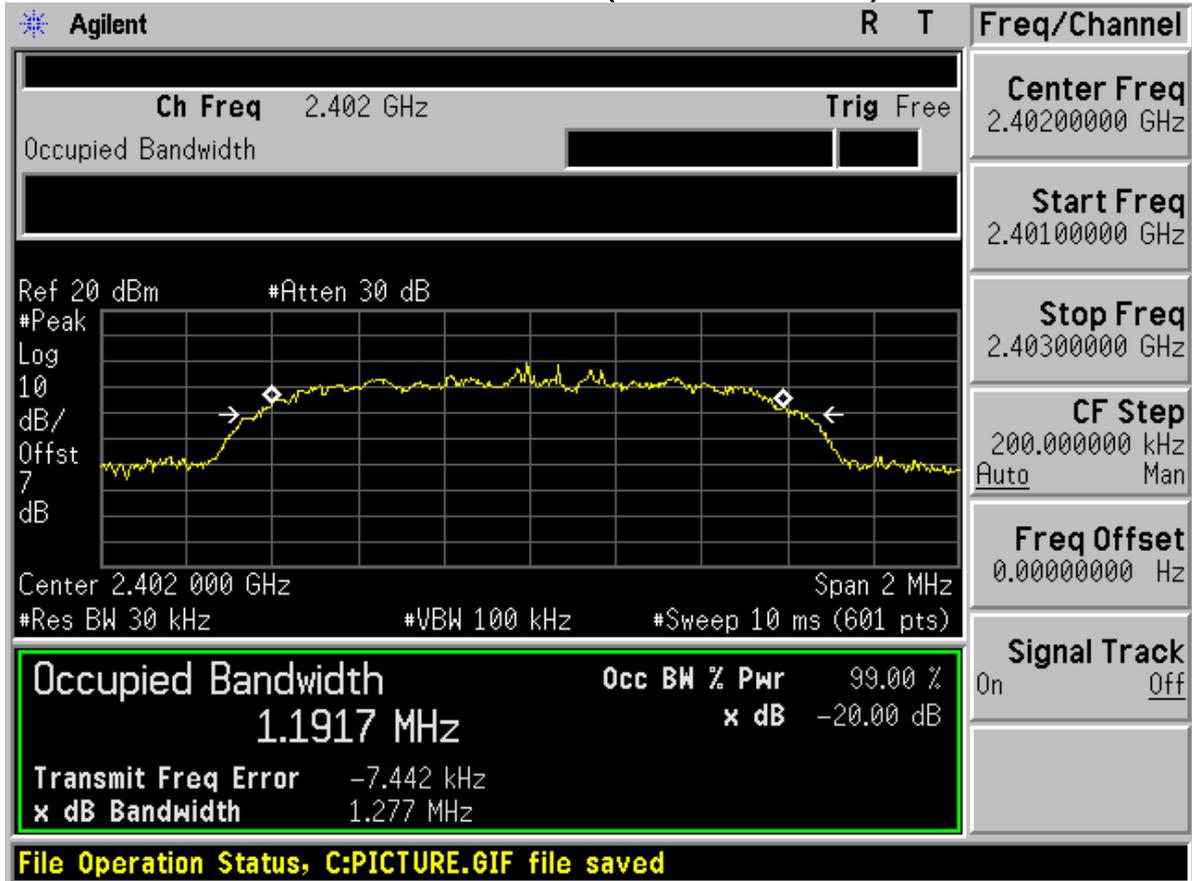


## Channel 78 (2480MHz)



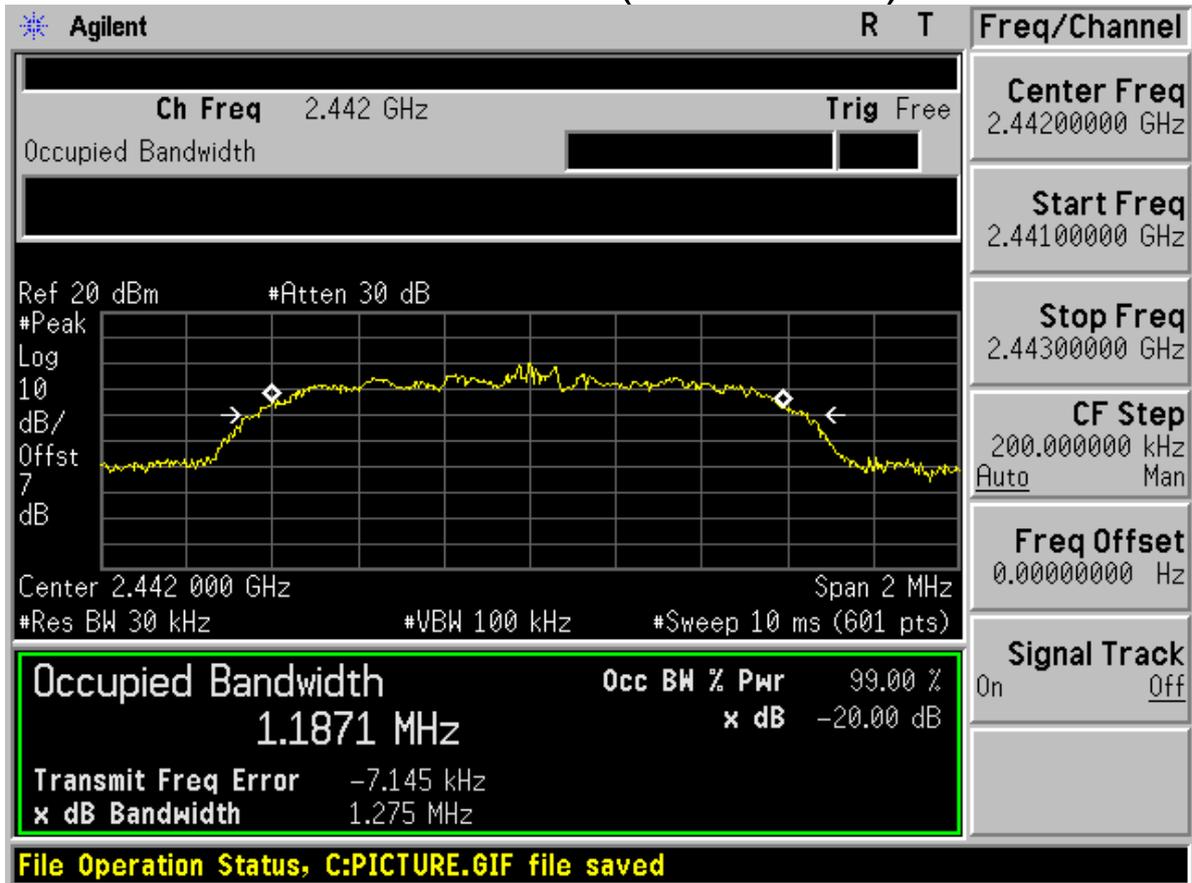


## Modulation: 8DPSK Channel 0 (2402MHz)



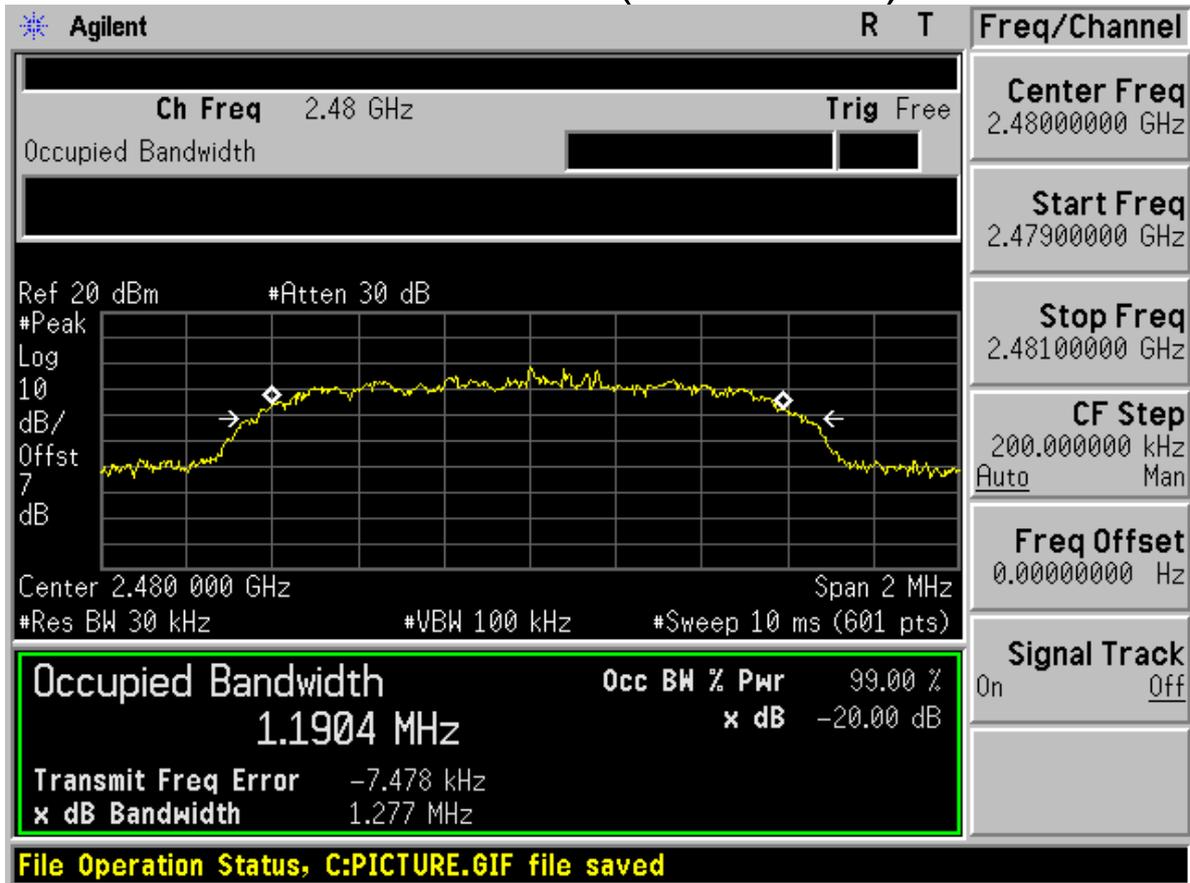


## Channel 40 (2442MHz)





## Channel 78 (2480MHz)





## **Appendix B**

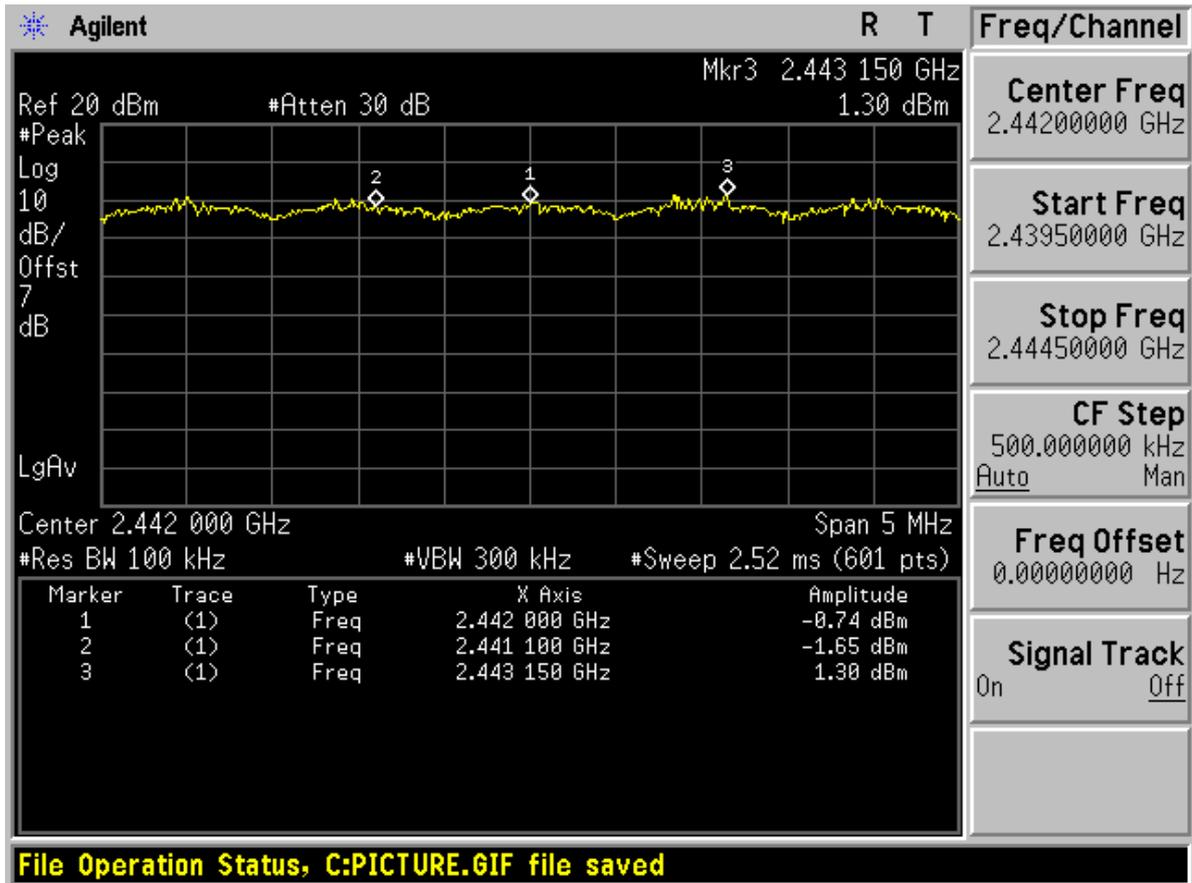
# Carrier frequency separation measurement

According to FCC Part 15.247 (a) (1)



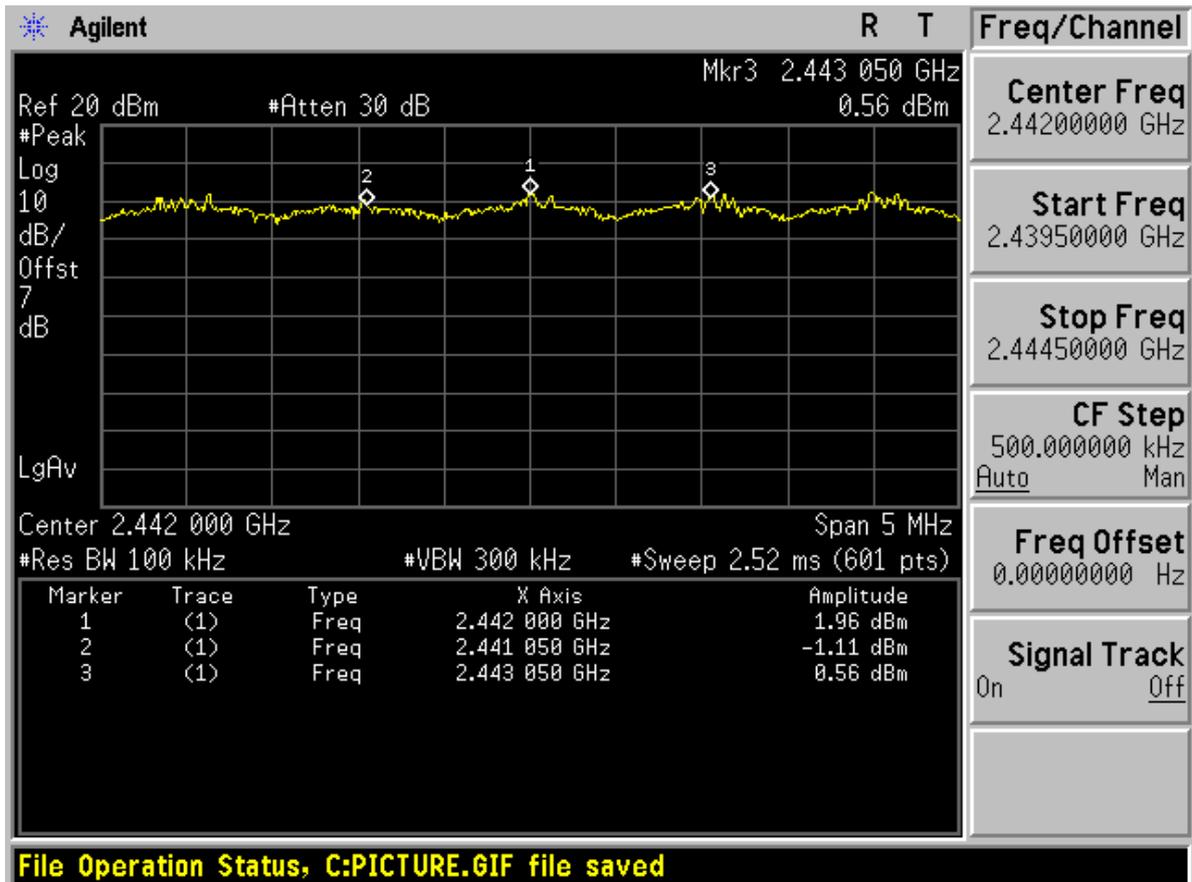
## Modulation: $\pi/4$ -DQPSK

### Centred at Channel 40





## Modulation: 8DPSK Centred at Channel 40





## **Appendix C**

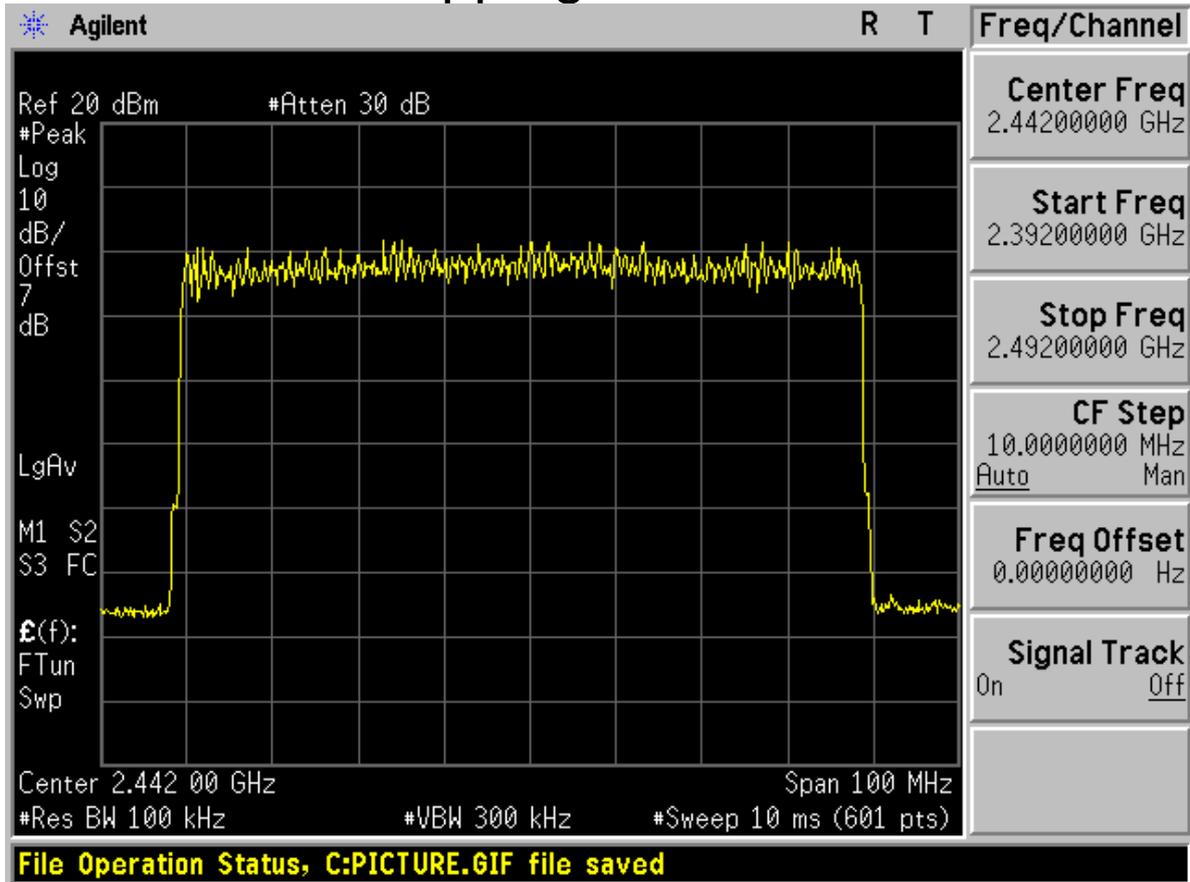
# Number of hopping channel

According to FCC Part 15.247 (a) (1) iii



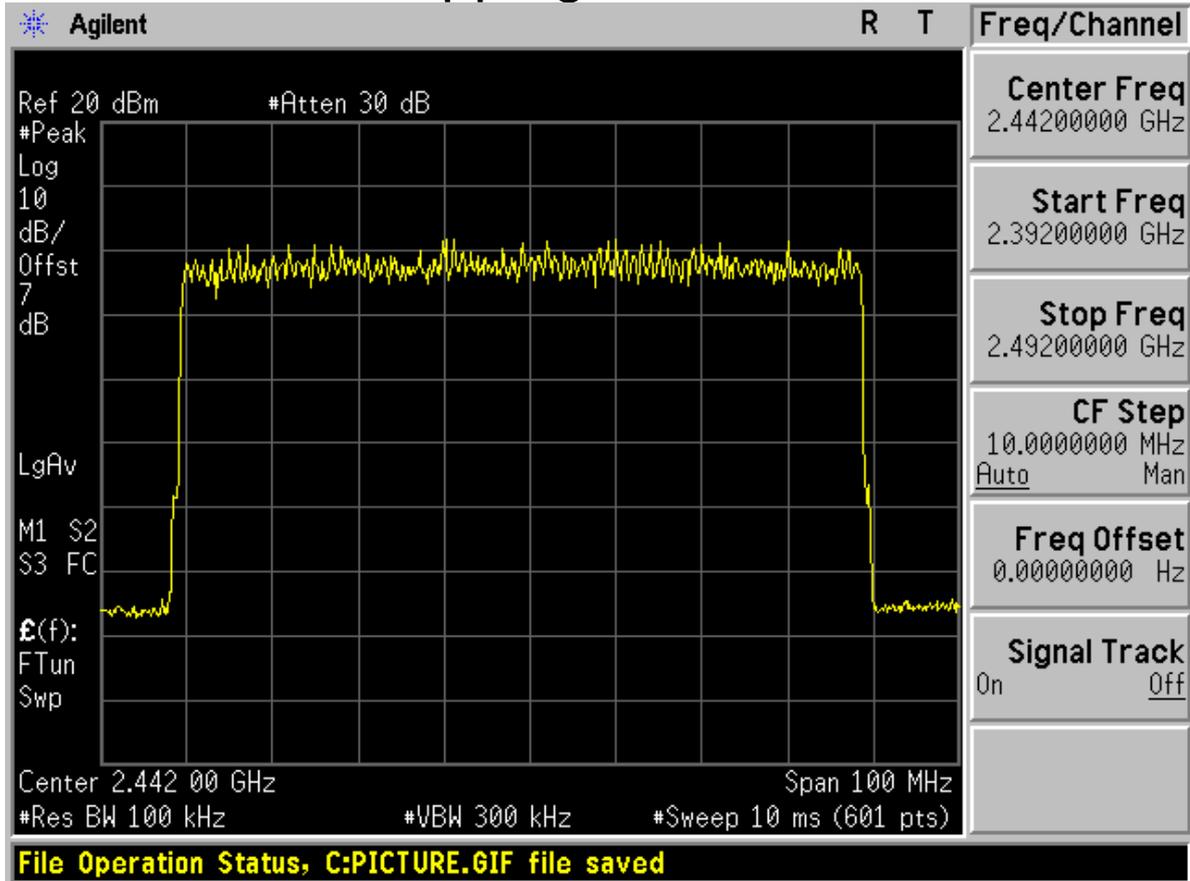
Modulation:  $\pi/4$ -DQPSK

Total hopping channels = 79





## Modulation: 8DPSK Total hopping channels = 79





# Appendix D

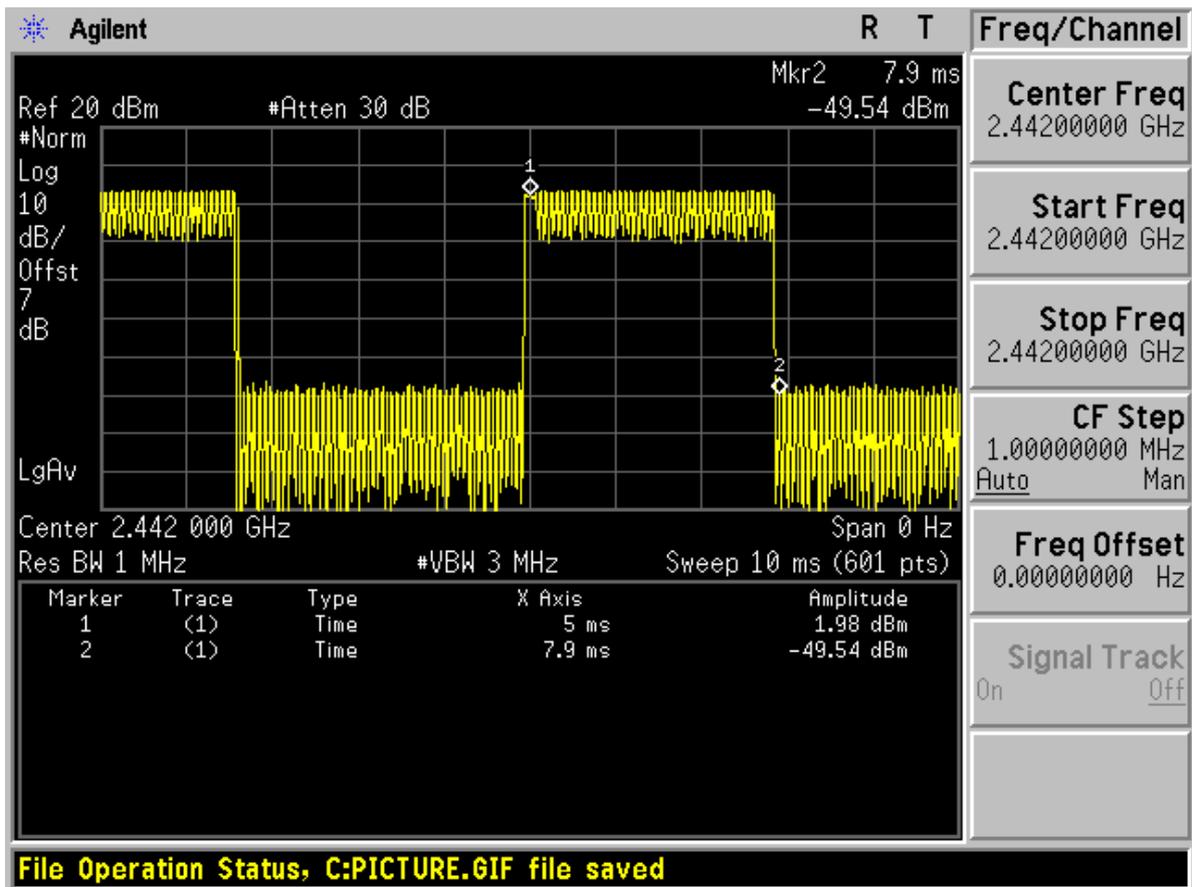
## Time of occupancy

According to FCC Part 15.247 (a) (1) iii



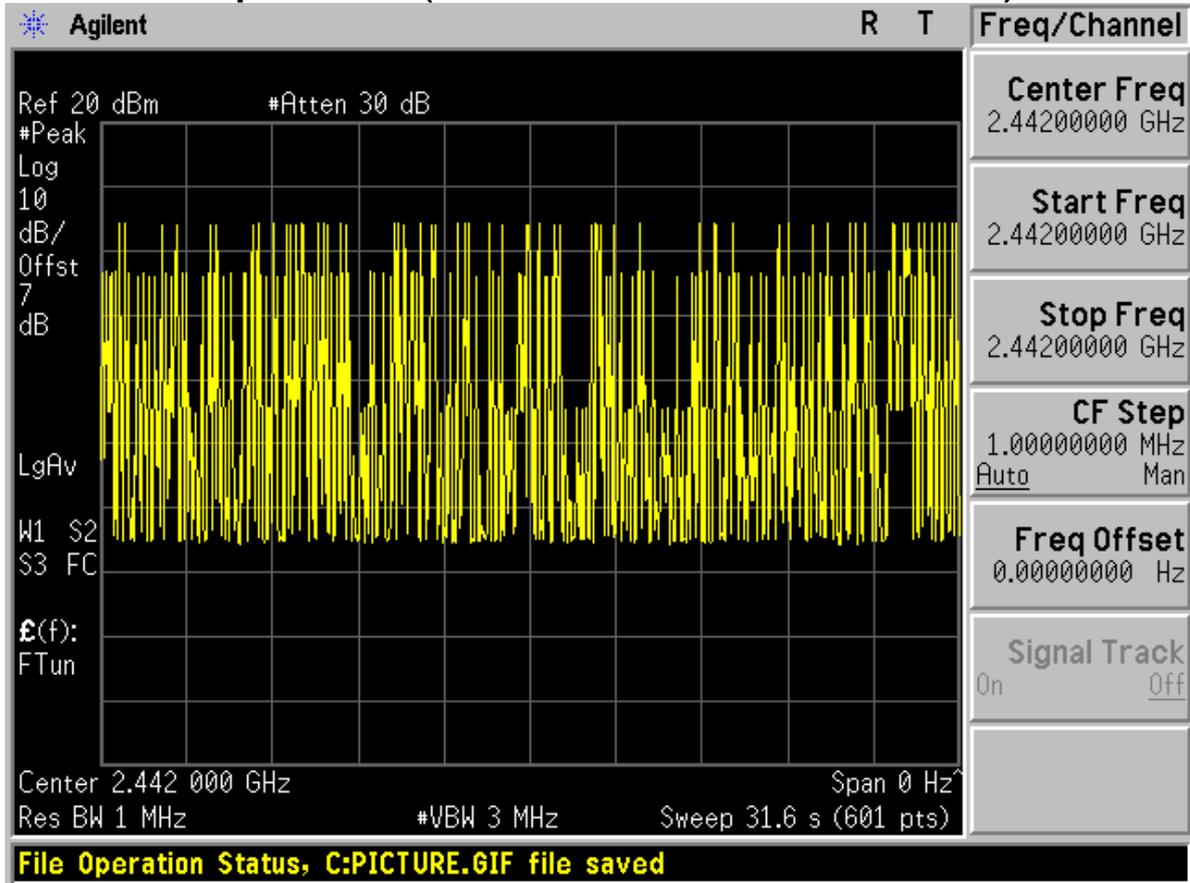
# Modulation: $\pi/4$ -DQPSK

## A burst (One time slot)





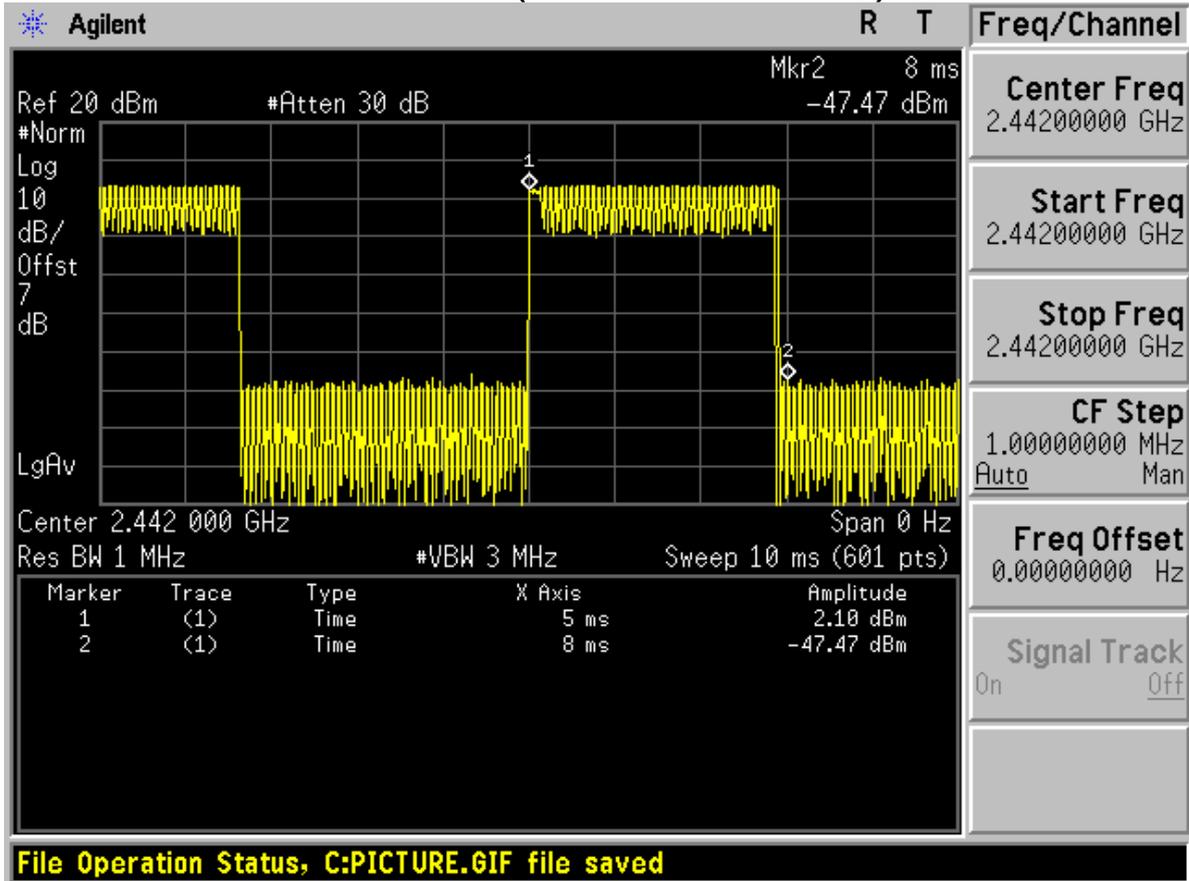
## A period (Less than 106.7 burst)





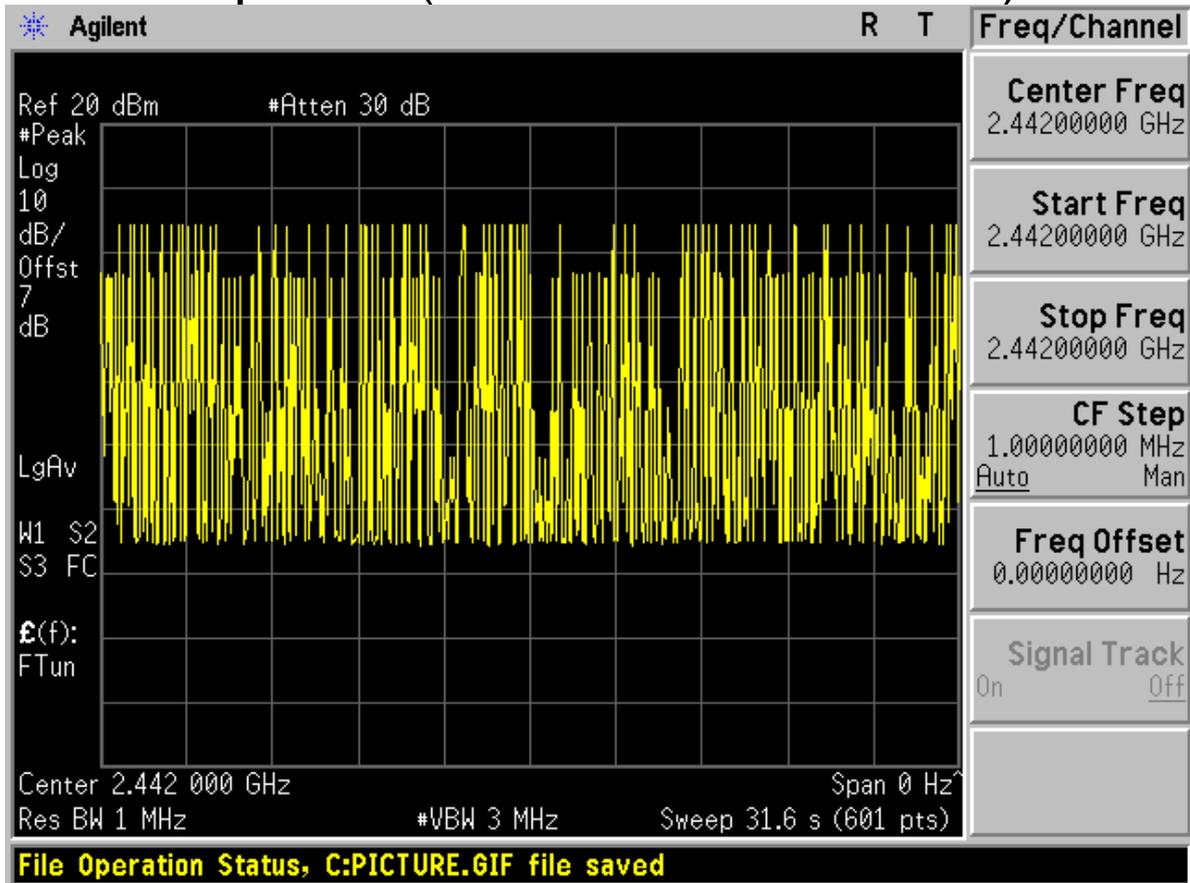
## Modulation: 8DPSK

### A burst (One time slot)





## A period (Less than 106.7 burst)





# Appendix E

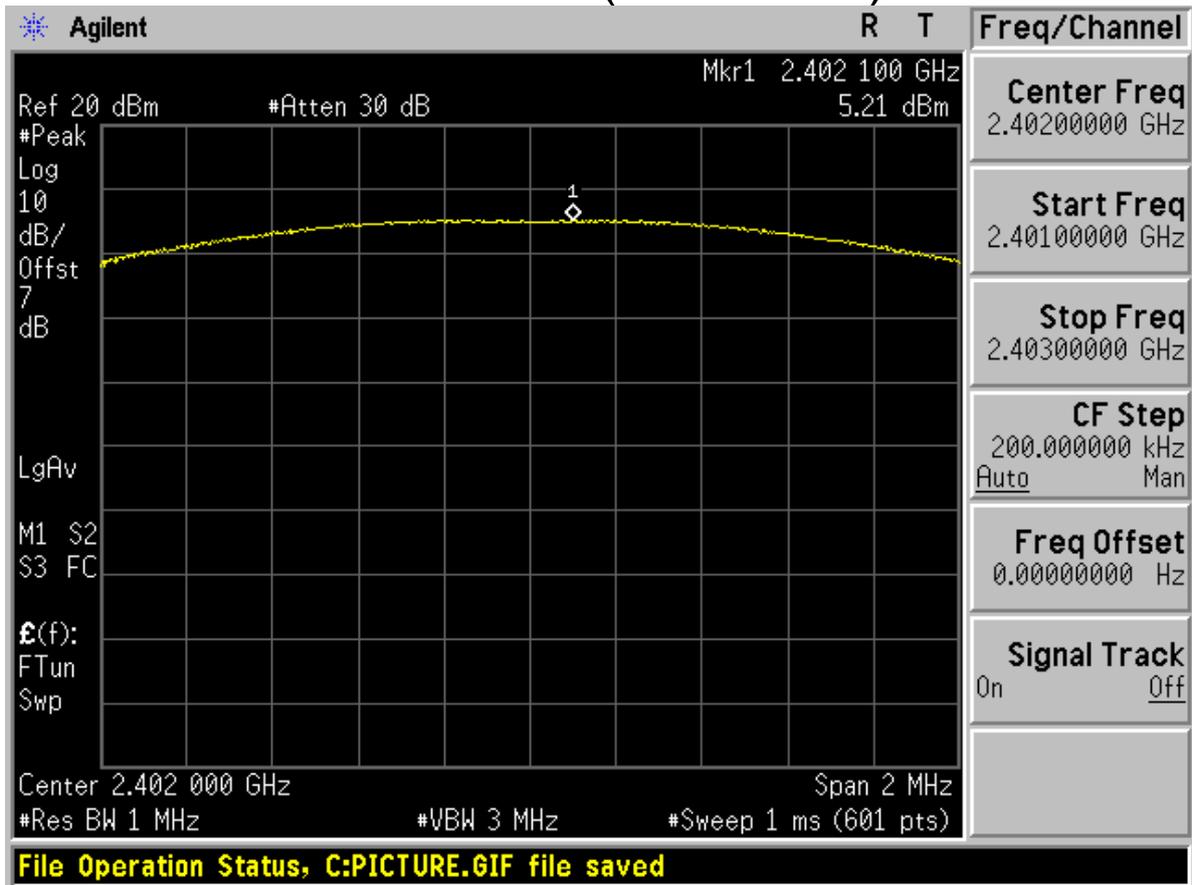
## Peak output power

According to FCC Part 15.247 (b) (1)



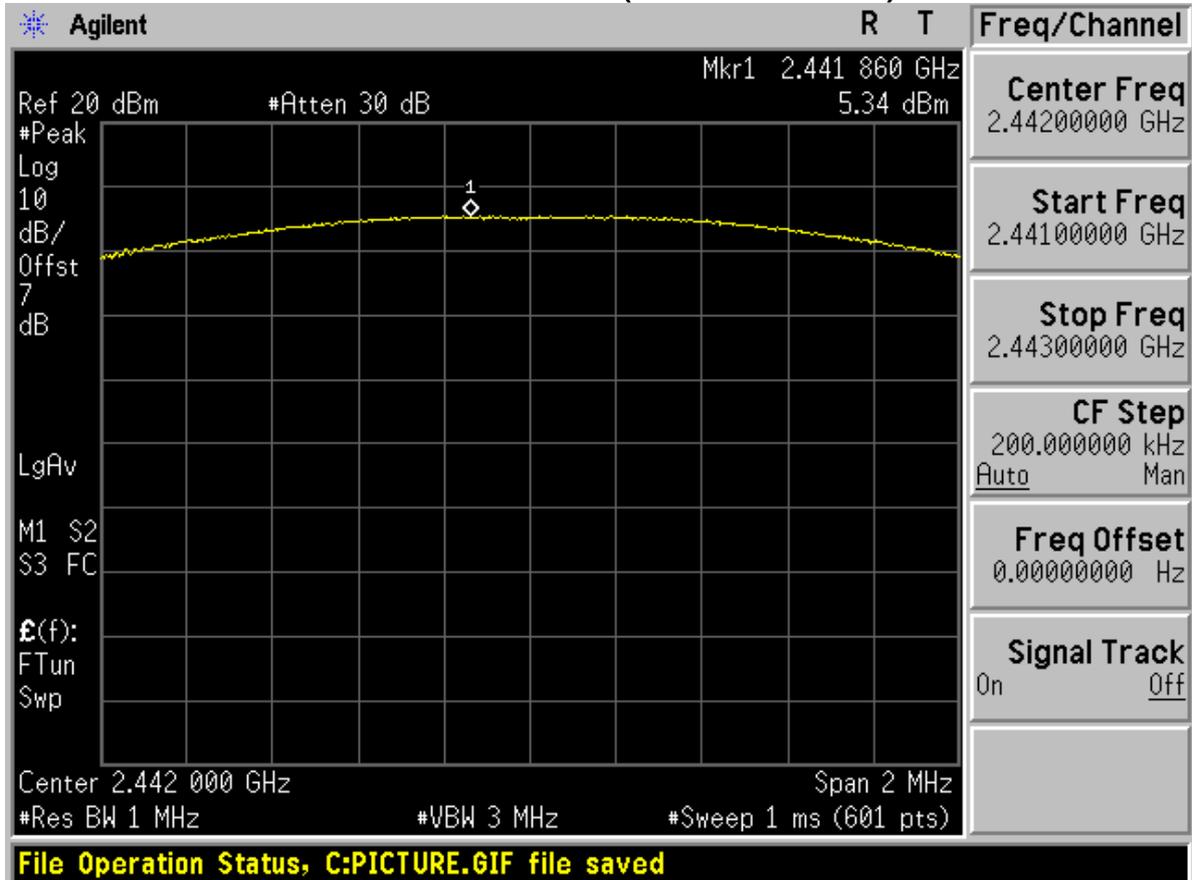
Modulation:  $\pi/4$ -DQPSK

Channel 0 (2402MHz)



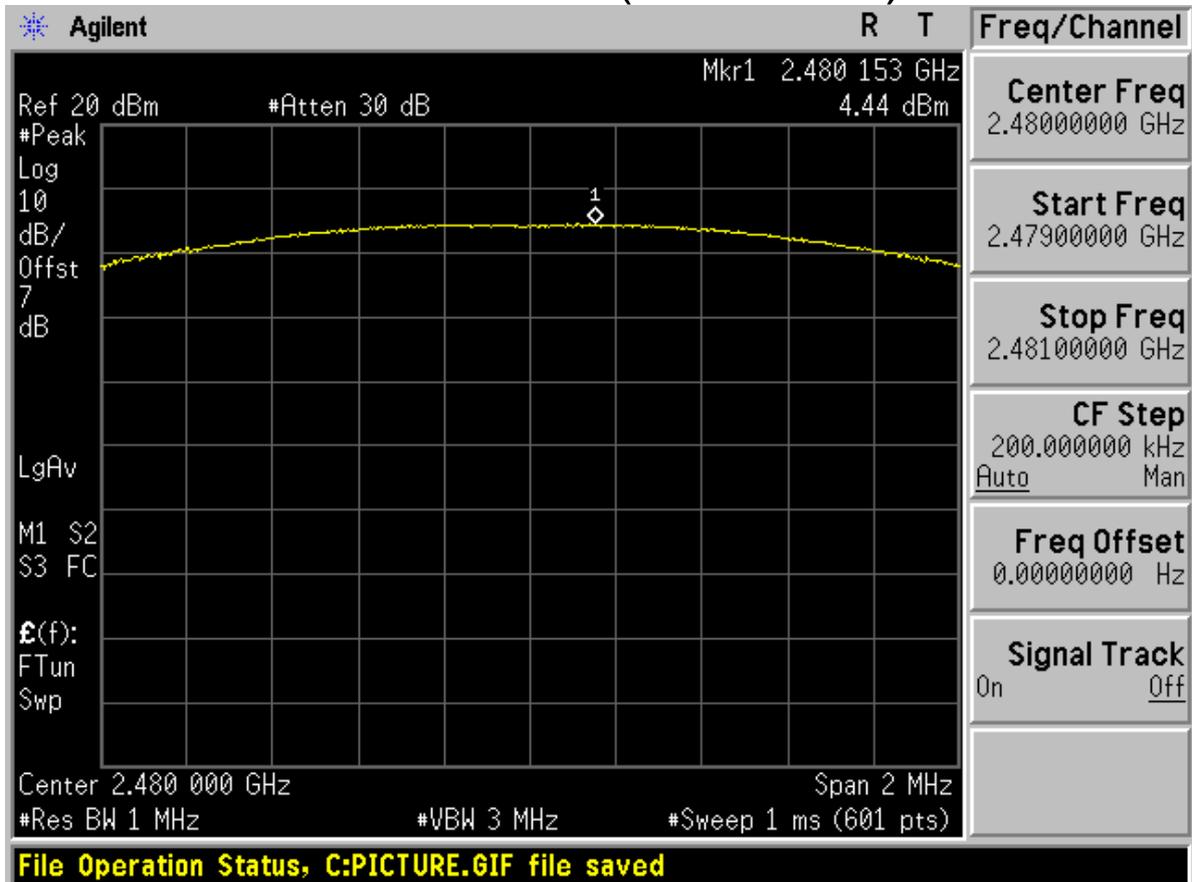


# Channel 40 (2442MHz)



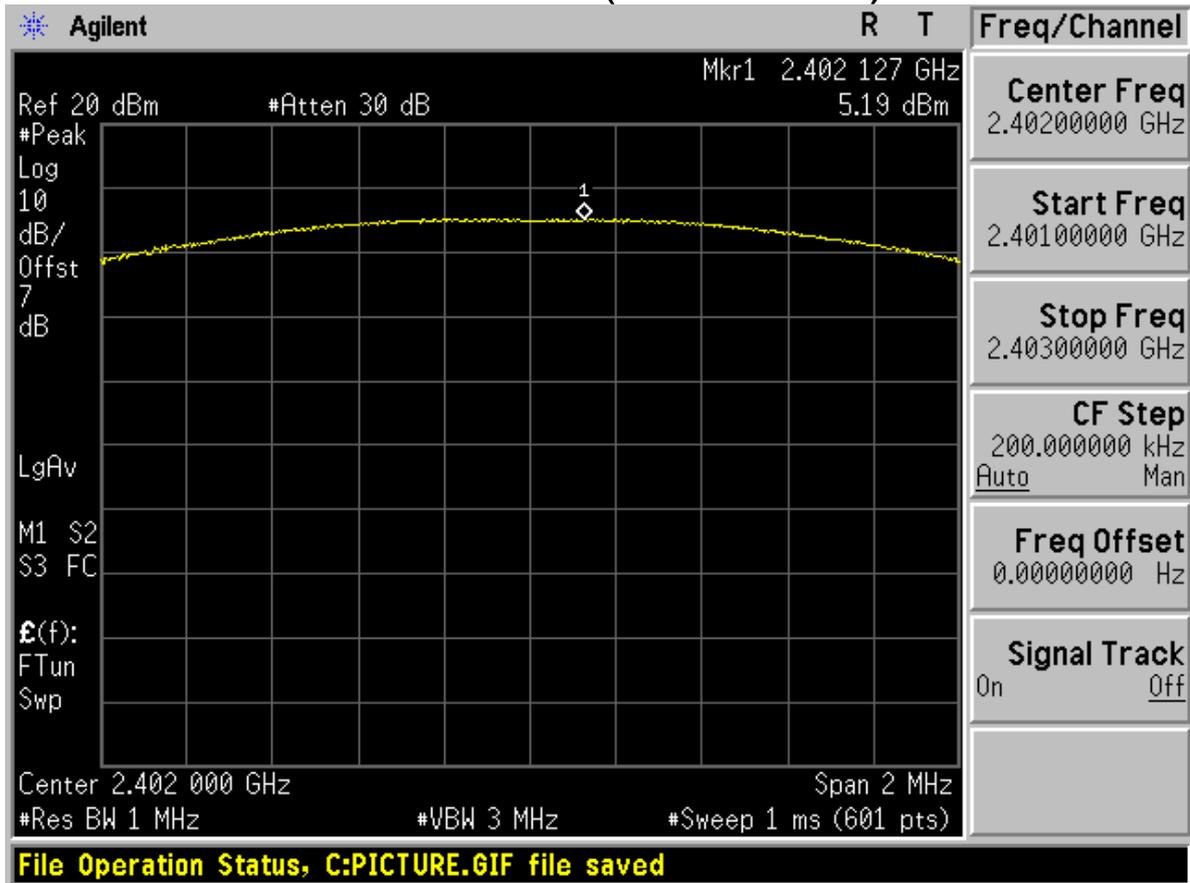


# Channel 78 (2480MHz)



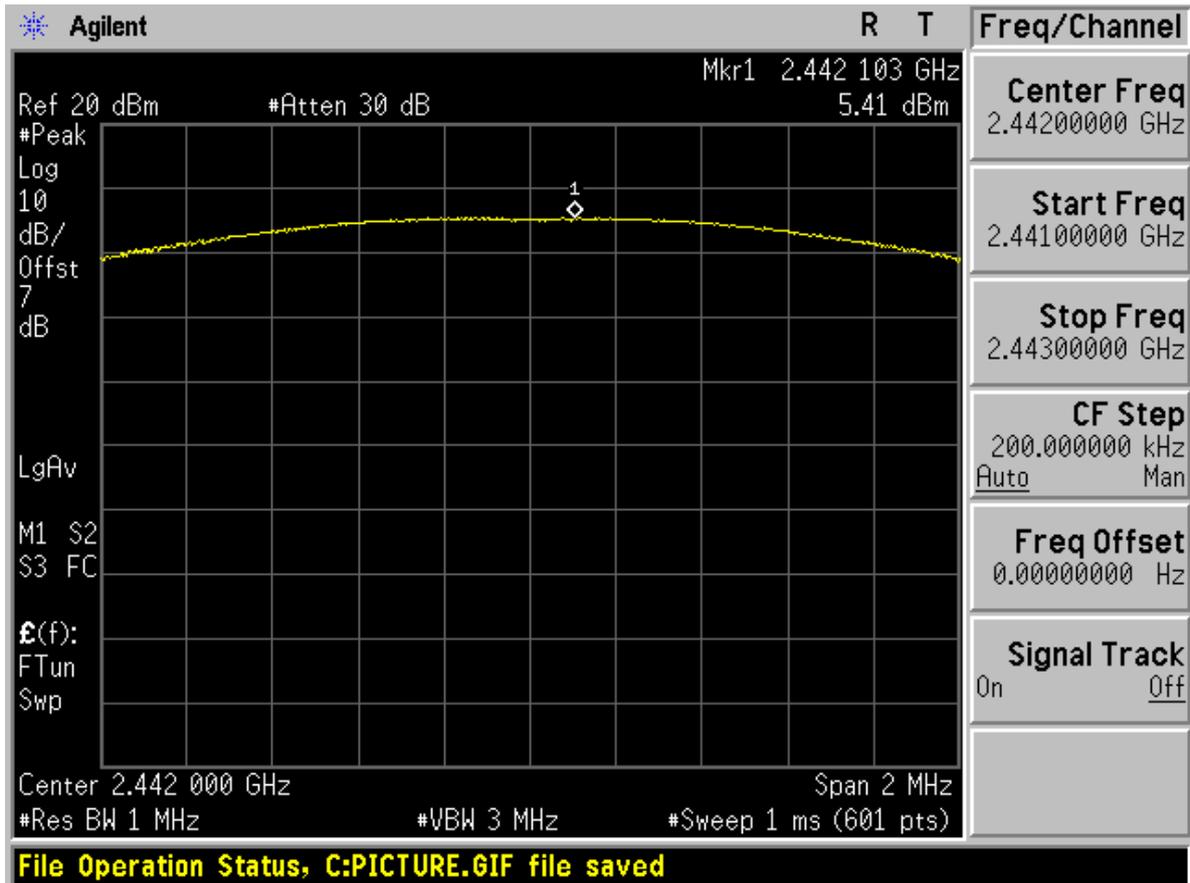


## Modulation: 8DPSK Channel 0 (2402MHz)



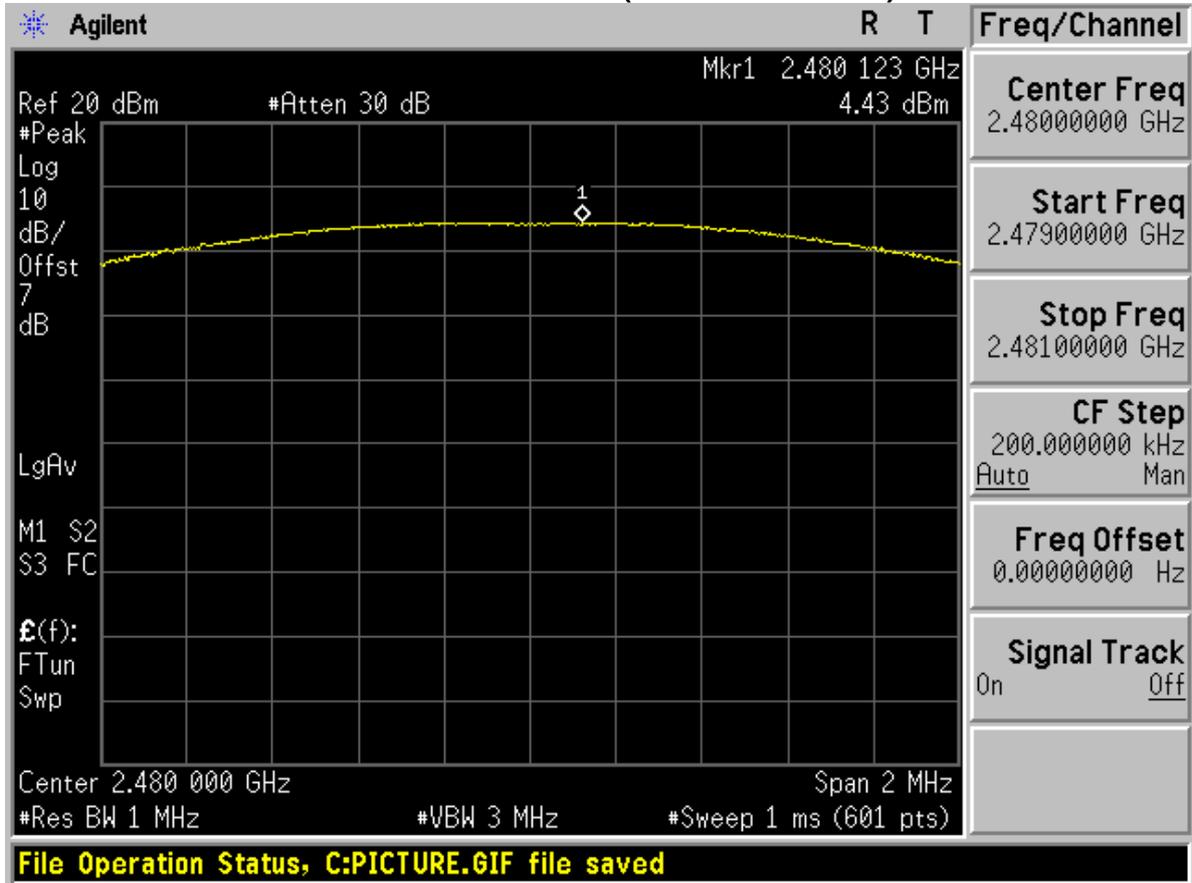


## Channel 40 (2442MHz)





# Channel 78 (2480MHz)





# Appendix F

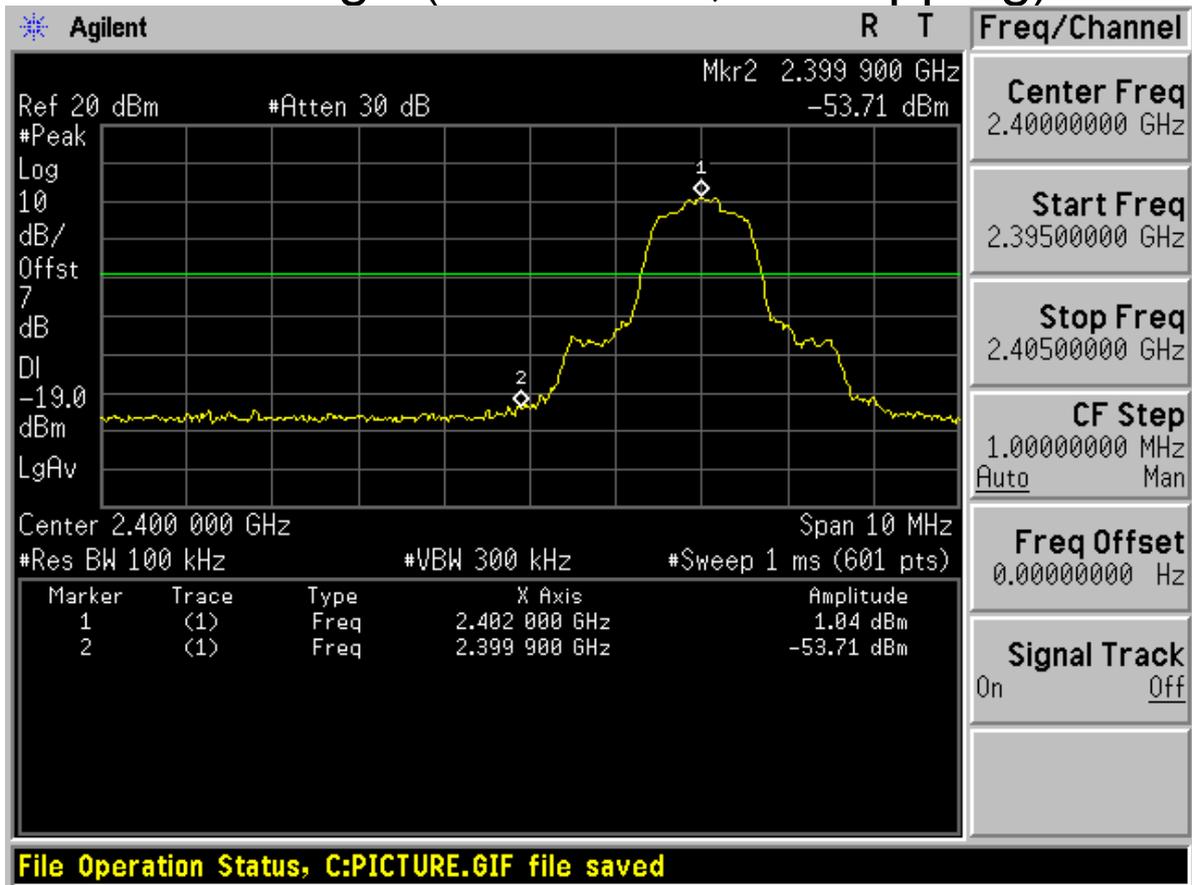
## Band edge spurious emission

According to FCC Part 15.247 (d)



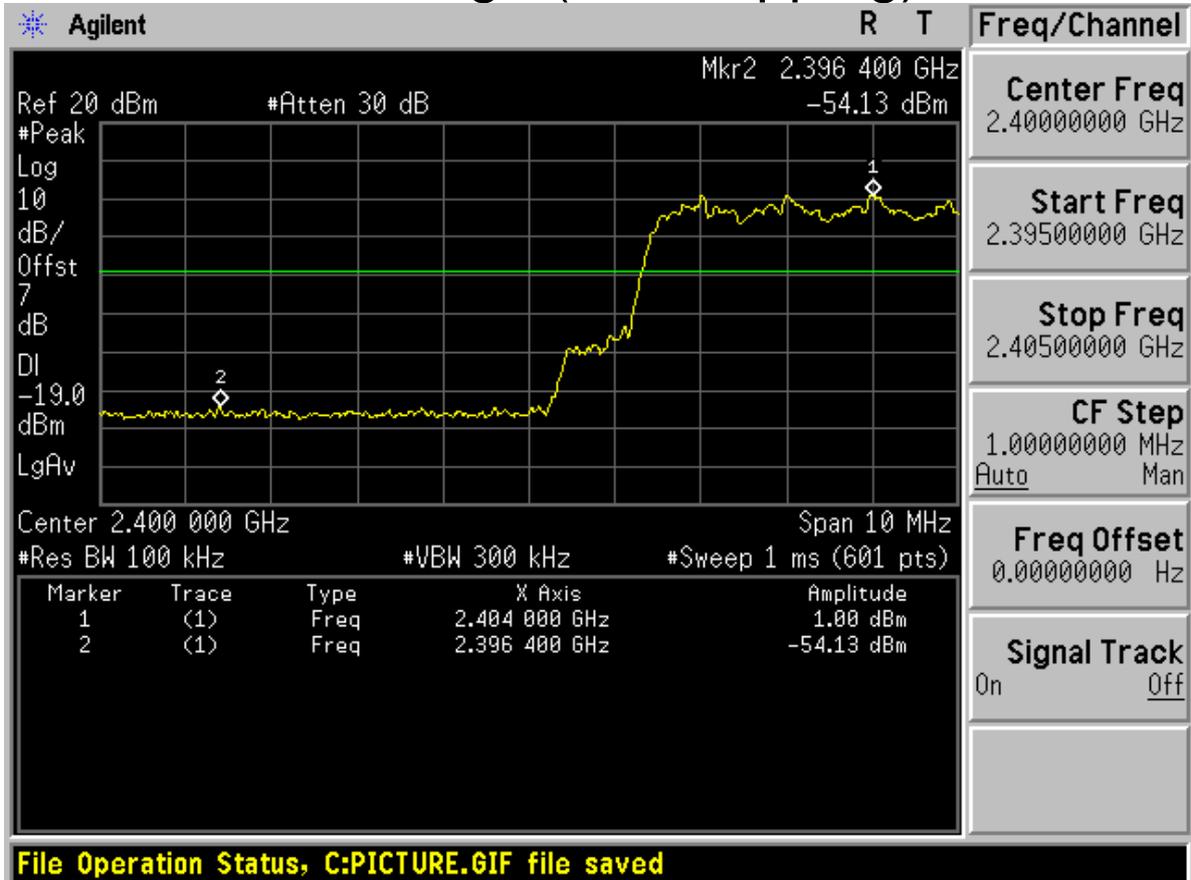
## Modulation: $\pi/4$ -DQPSK

### Low edge (Channel 0, no hopping)



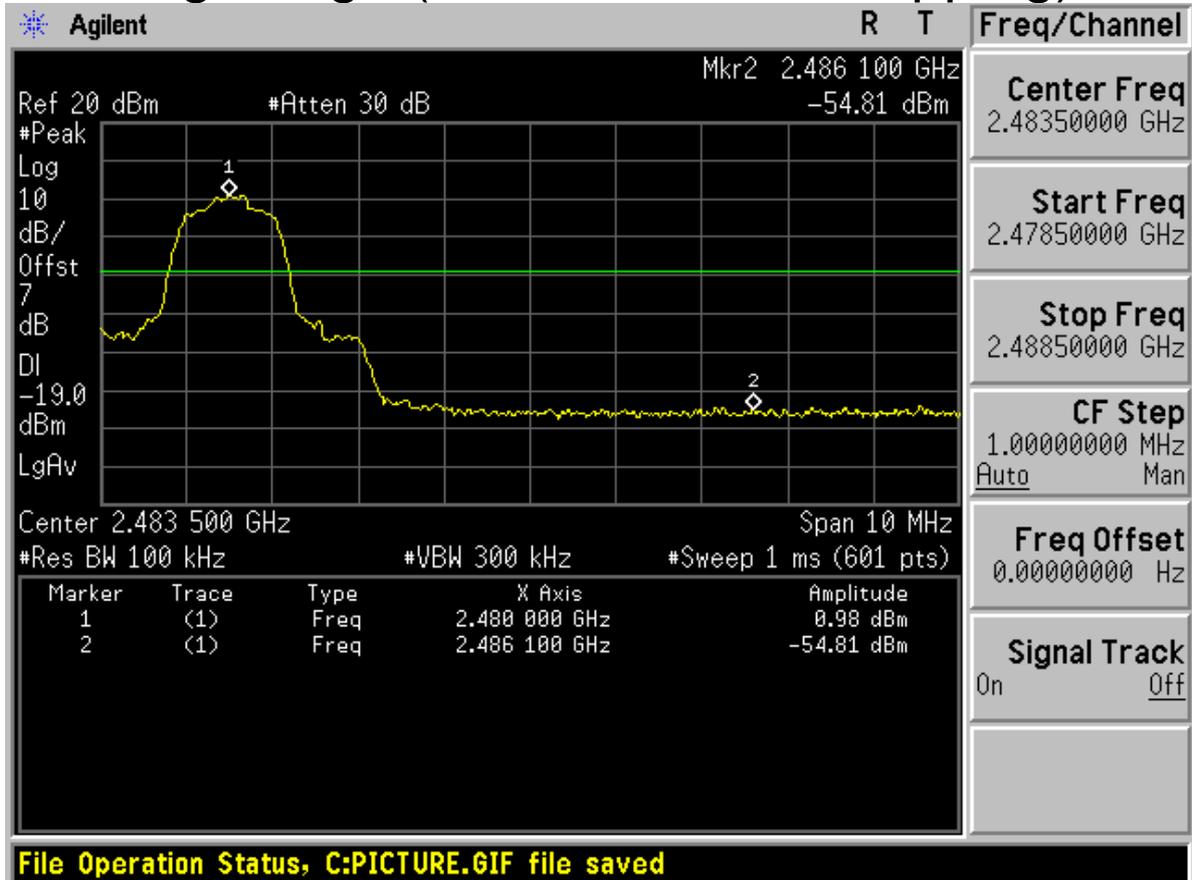


# Low edge (with hopping)



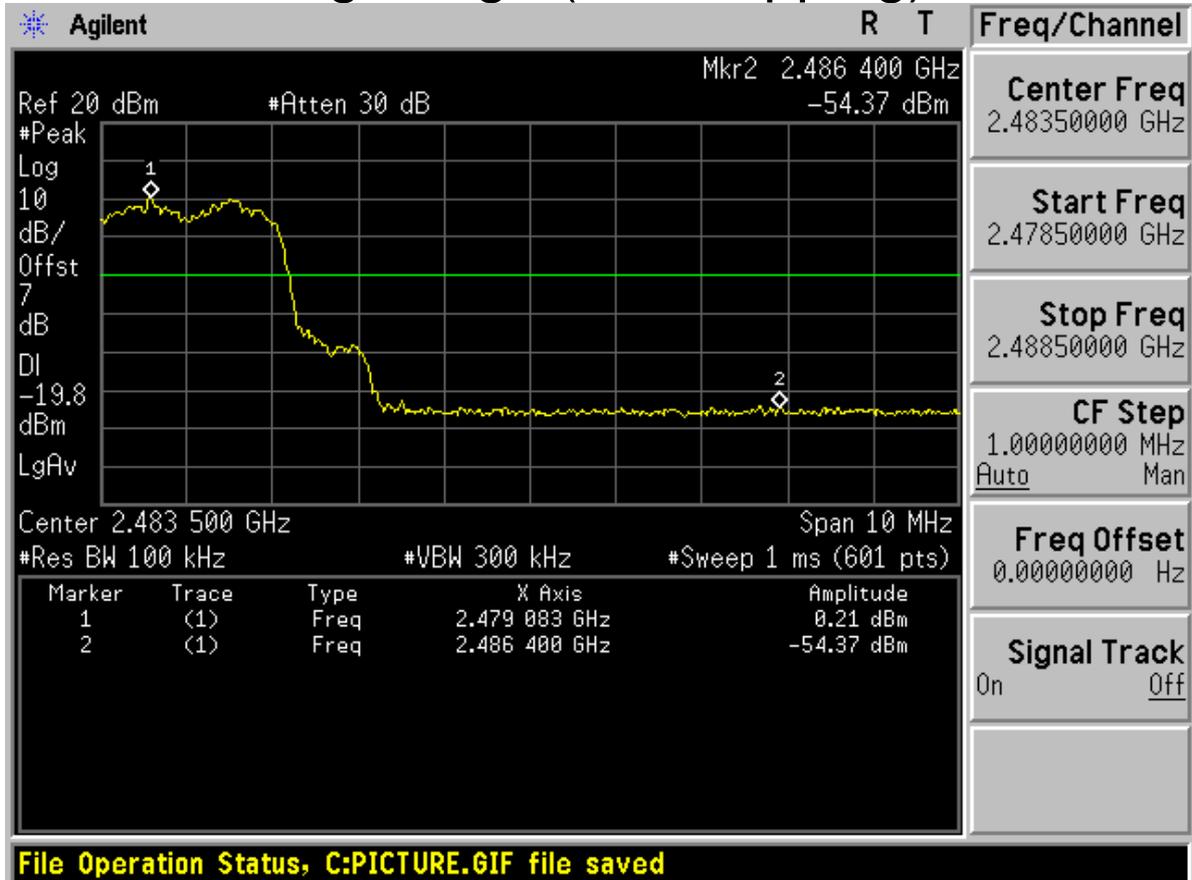


# High edge (Channel 78, no hopping)



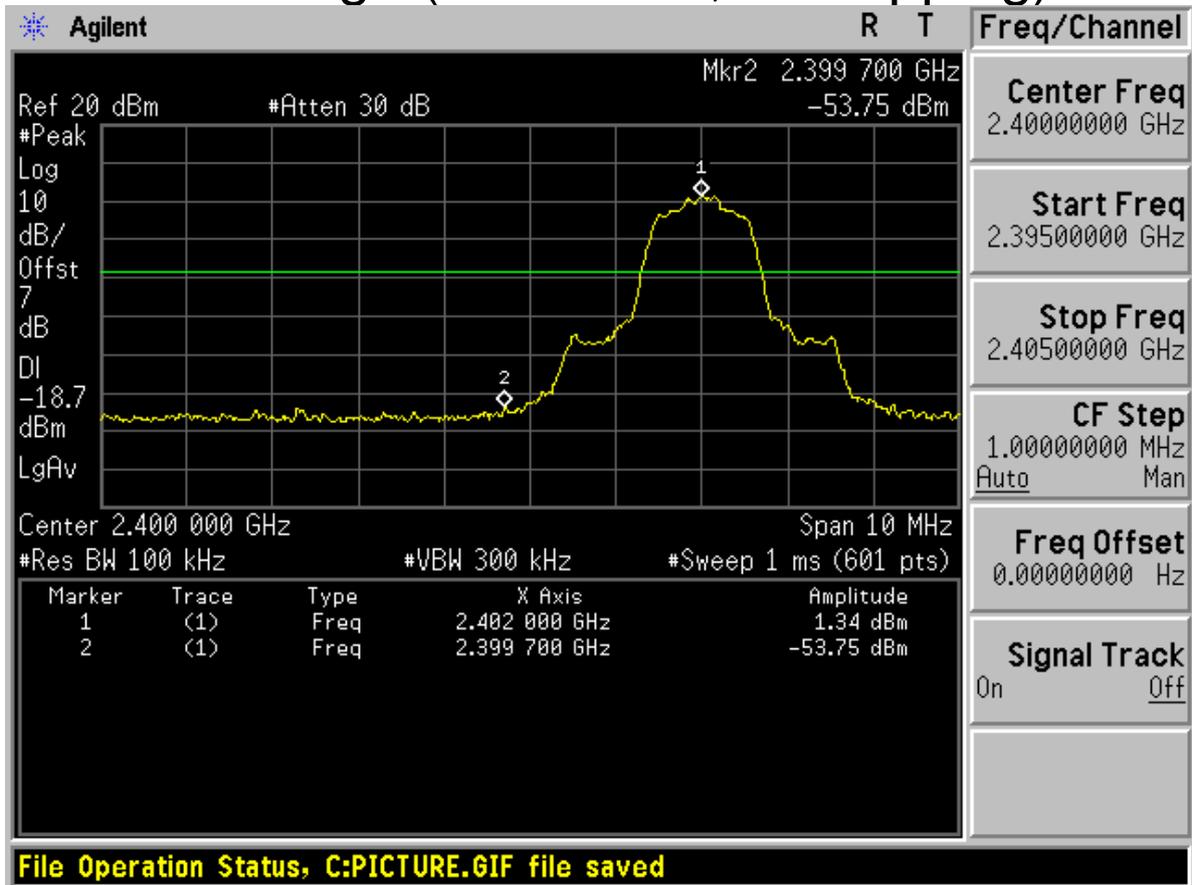


# High edge (with hopping)



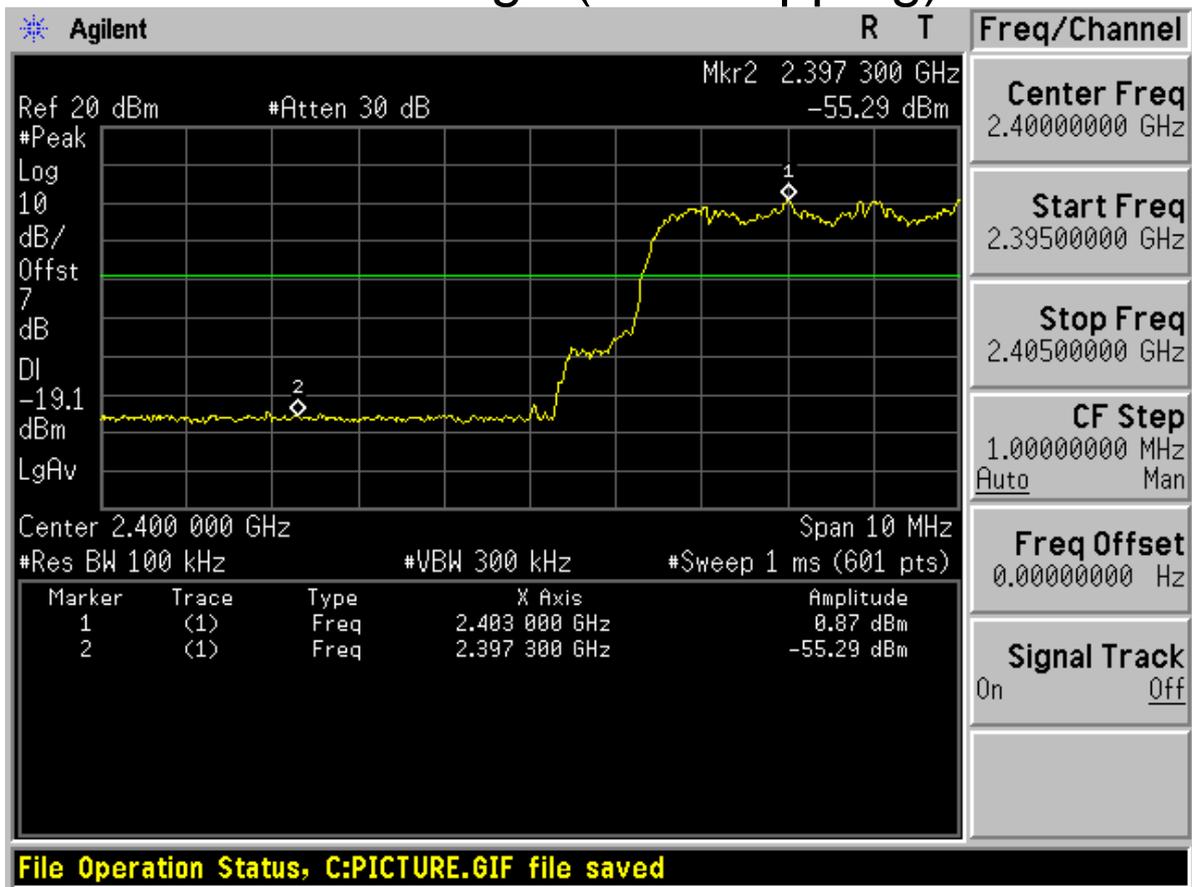


## Modulation: 8DPSK Low edge (Channel 0, no hopping)



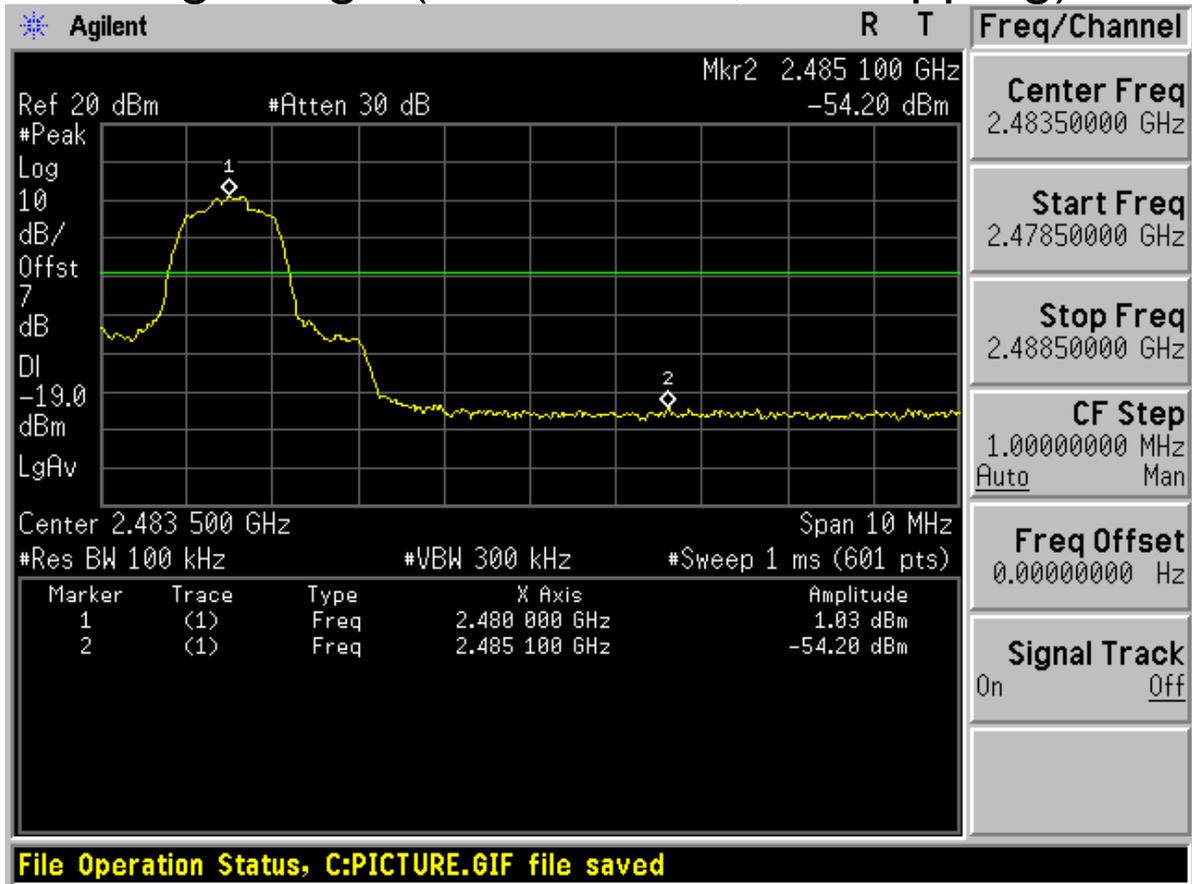


## Low edge (with hopping)



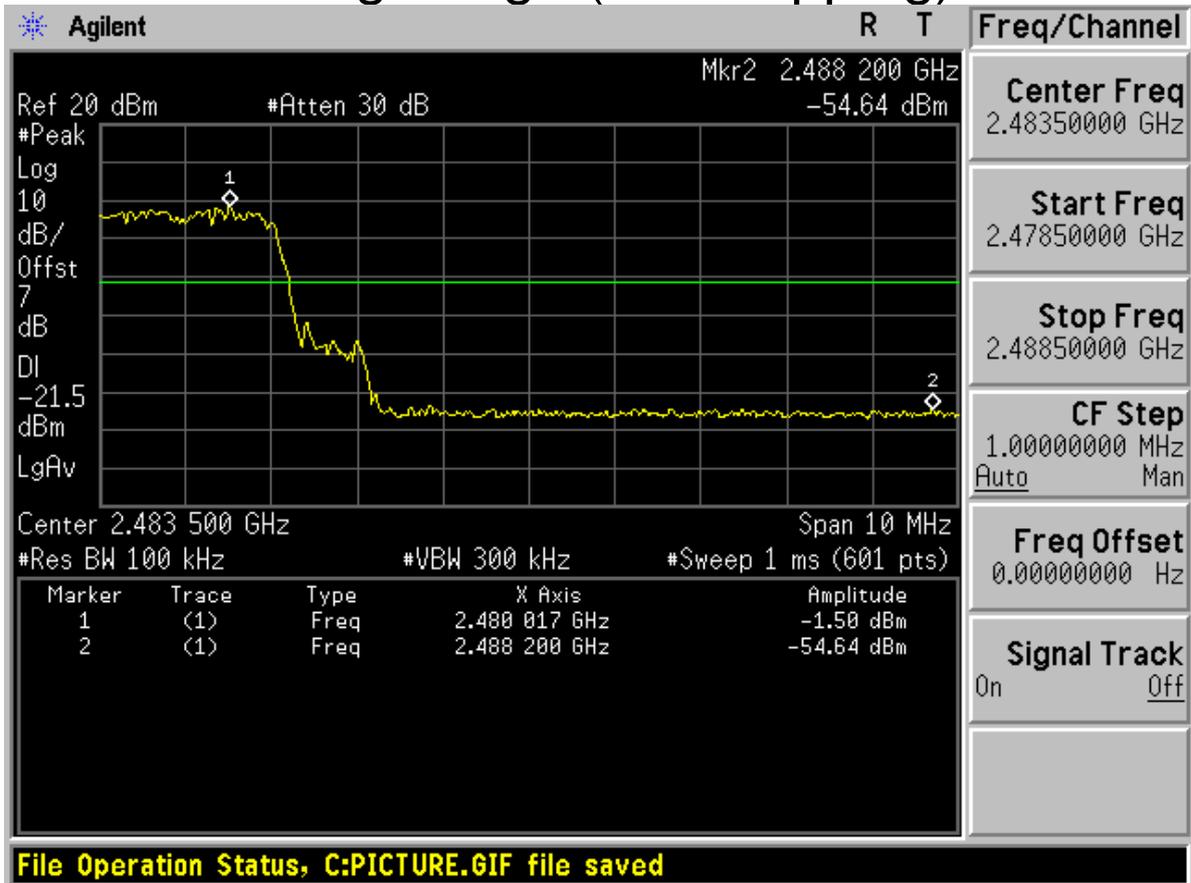


## High edge (Channel 78, no hopping)





## High edge (with hopping)





# **Appendix G**

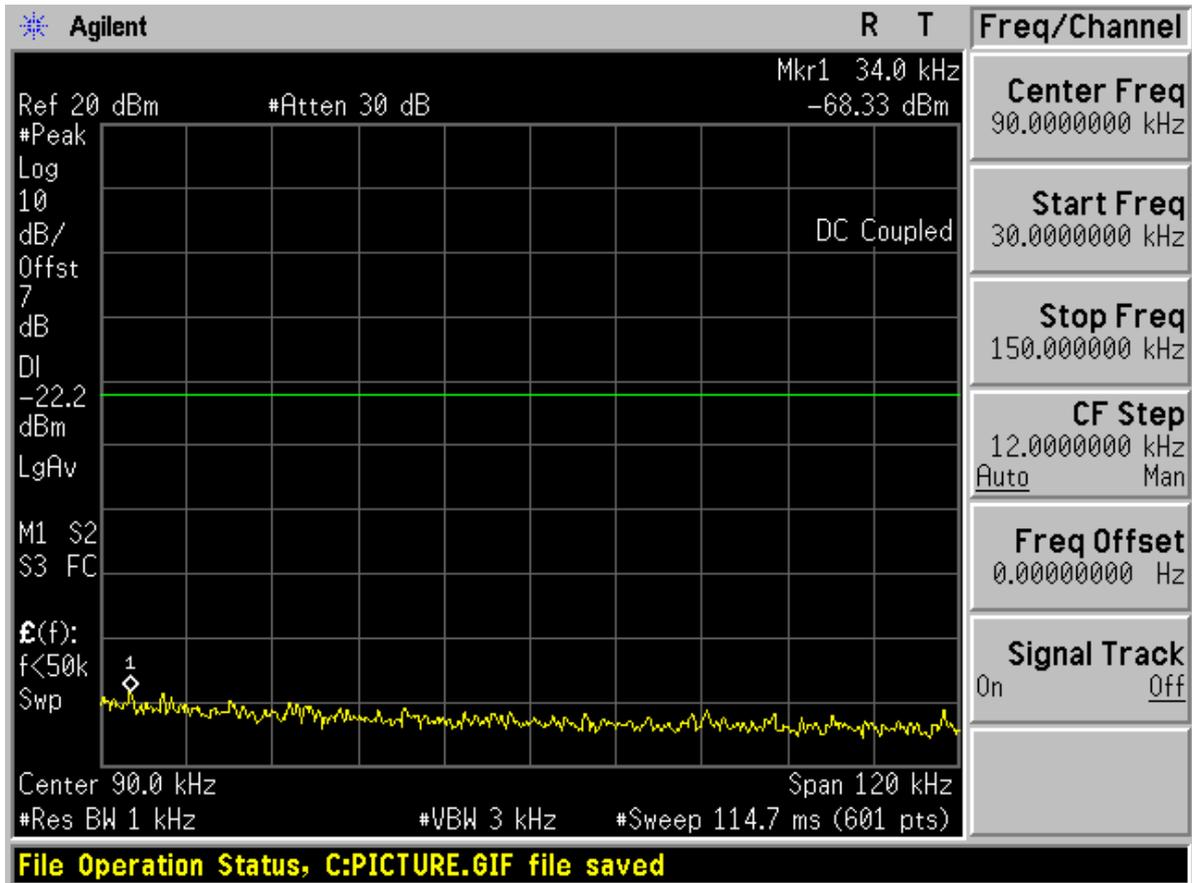
## Conducted RF spurious

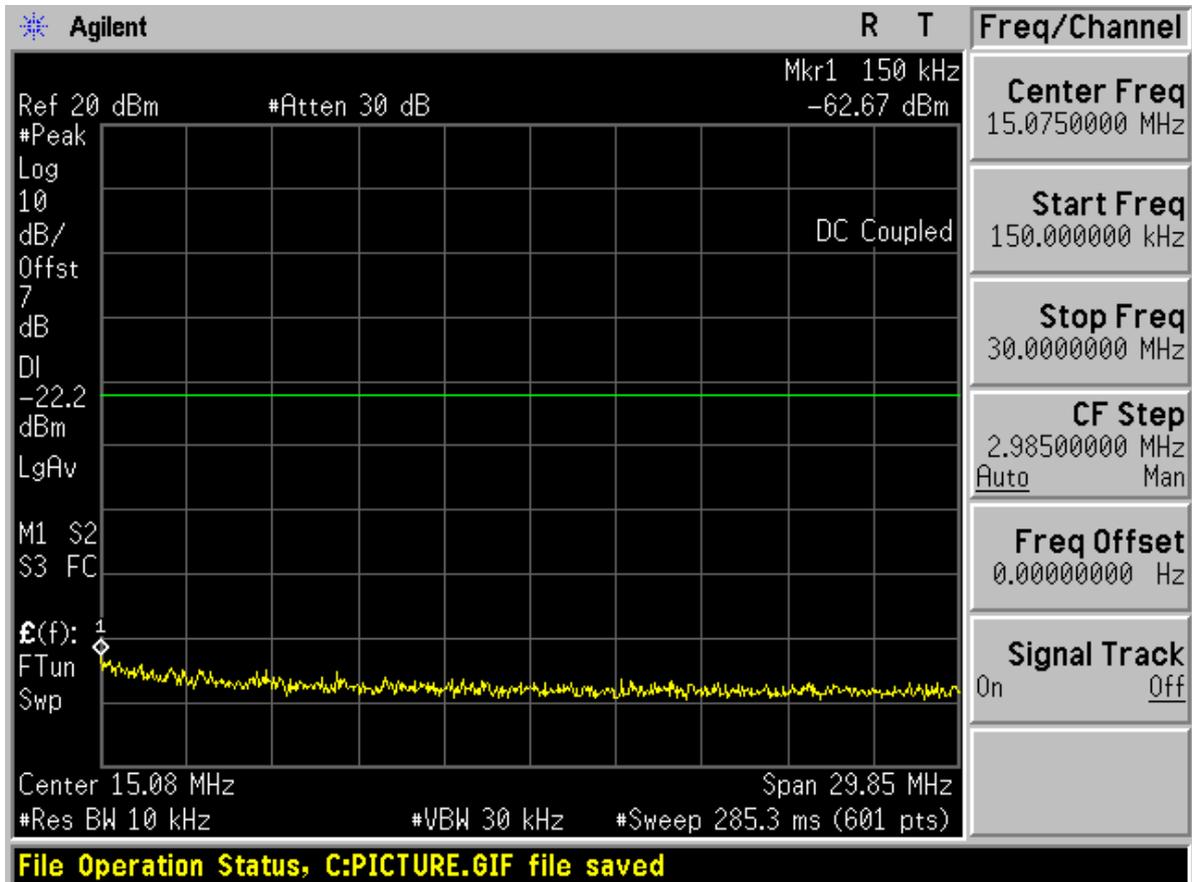
According to FCC Part 15.247 (d)

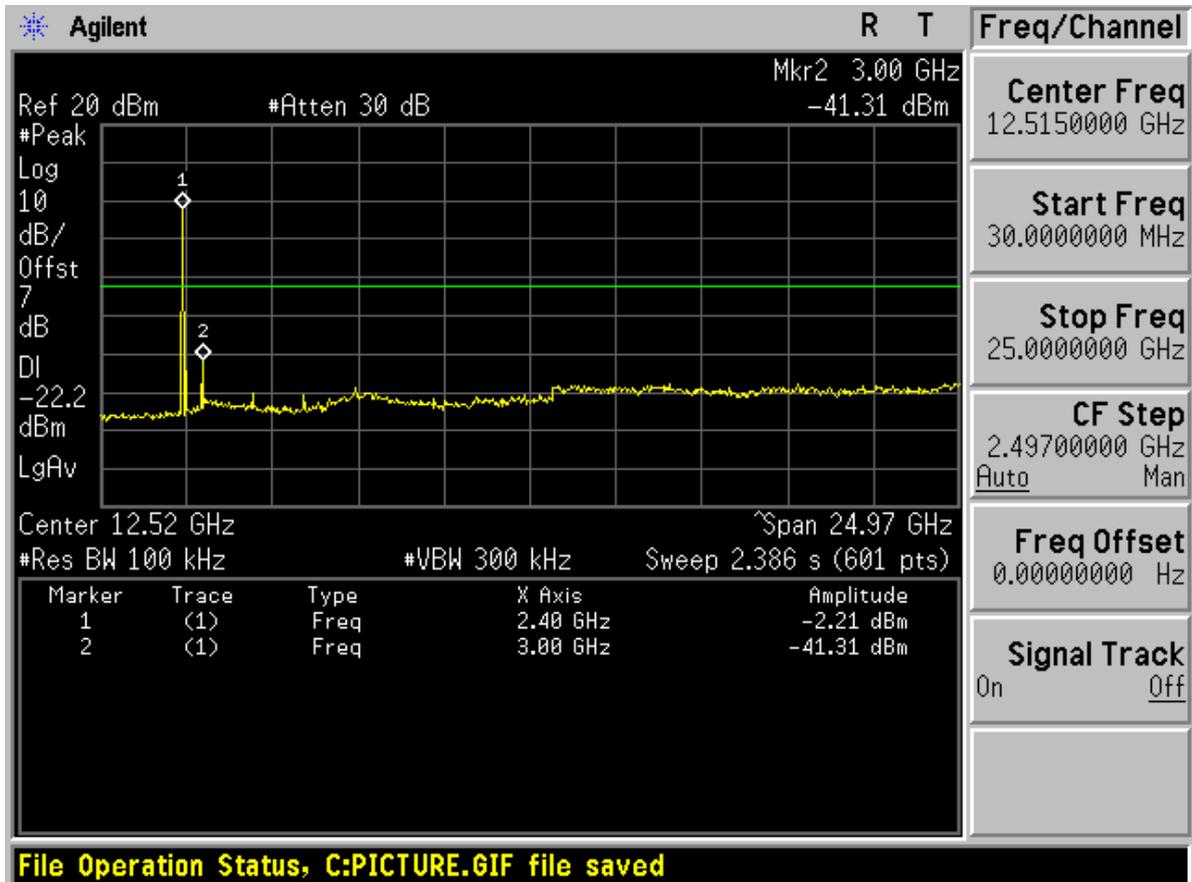


## Modulation: $\pi/4$ -DQPSK

### Channel 0

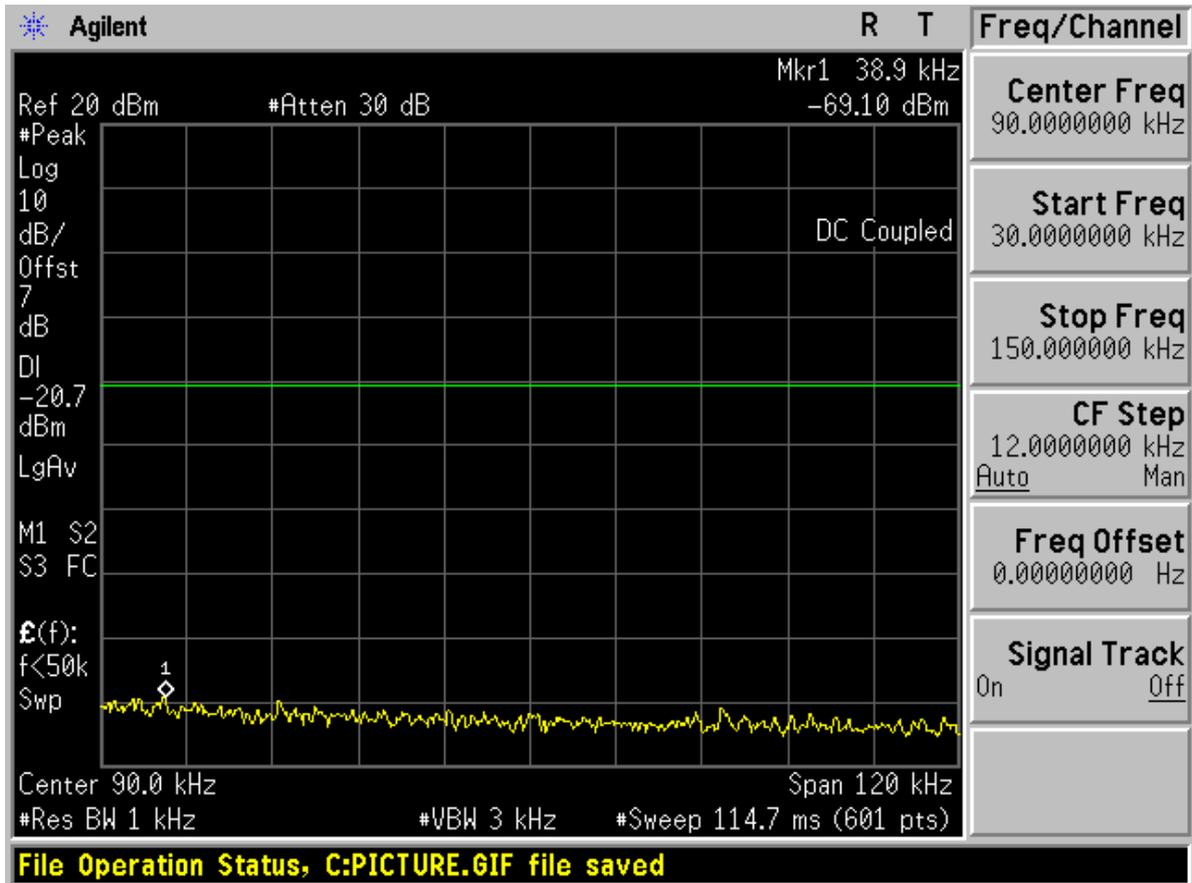


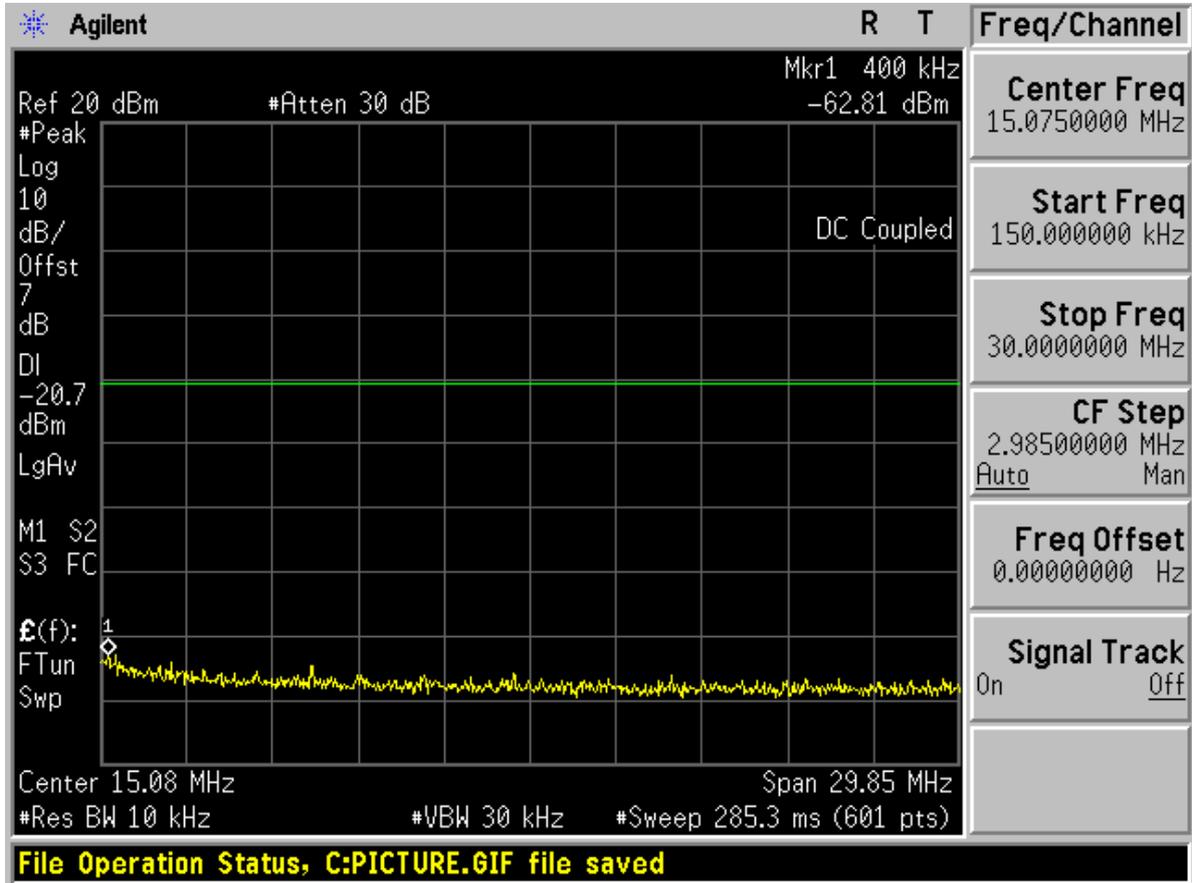


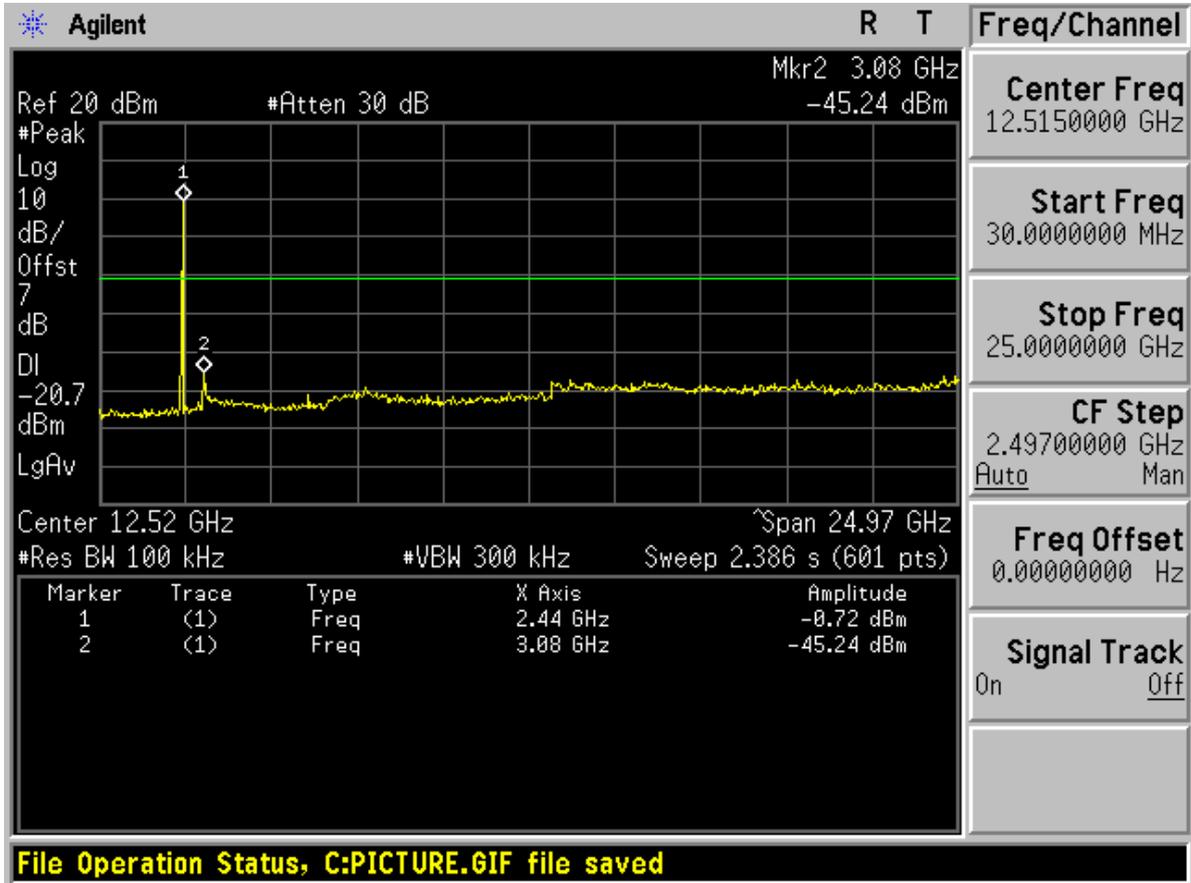




## Channel 40

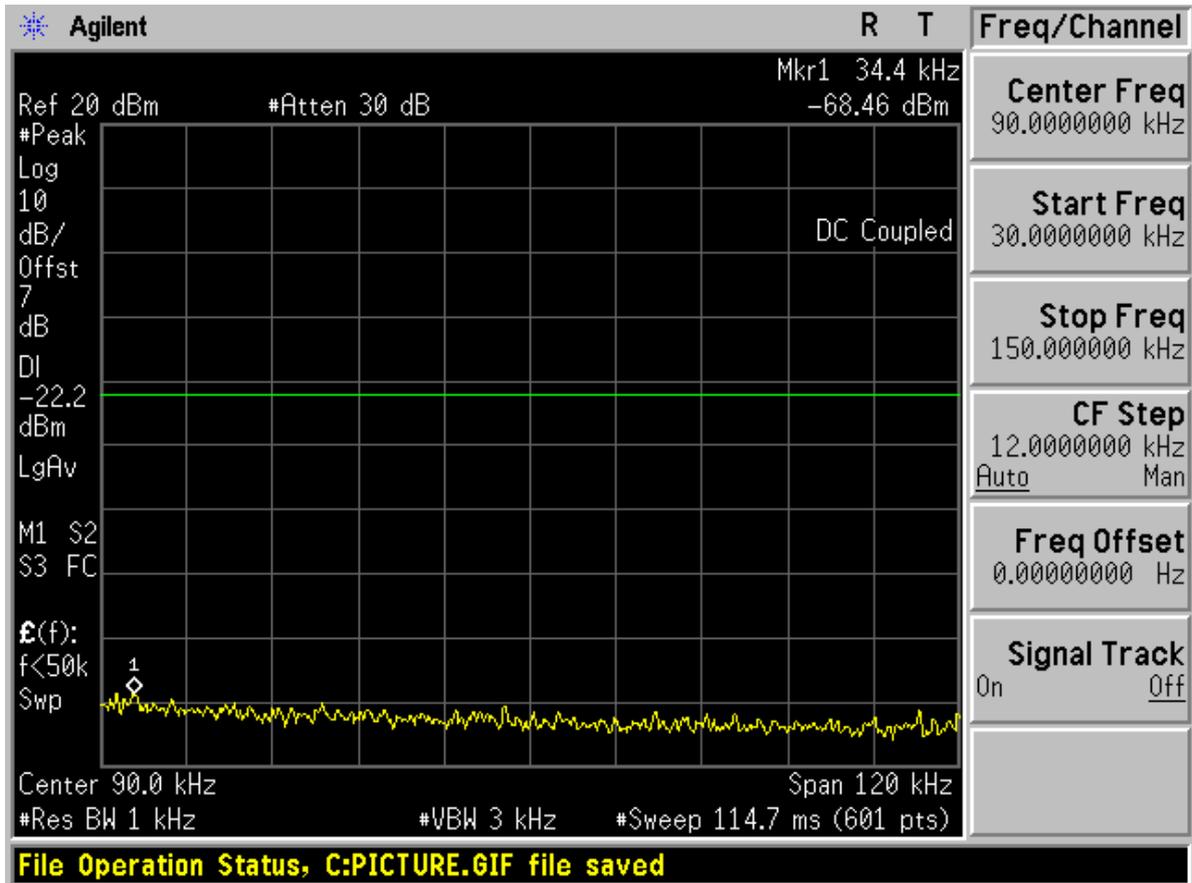


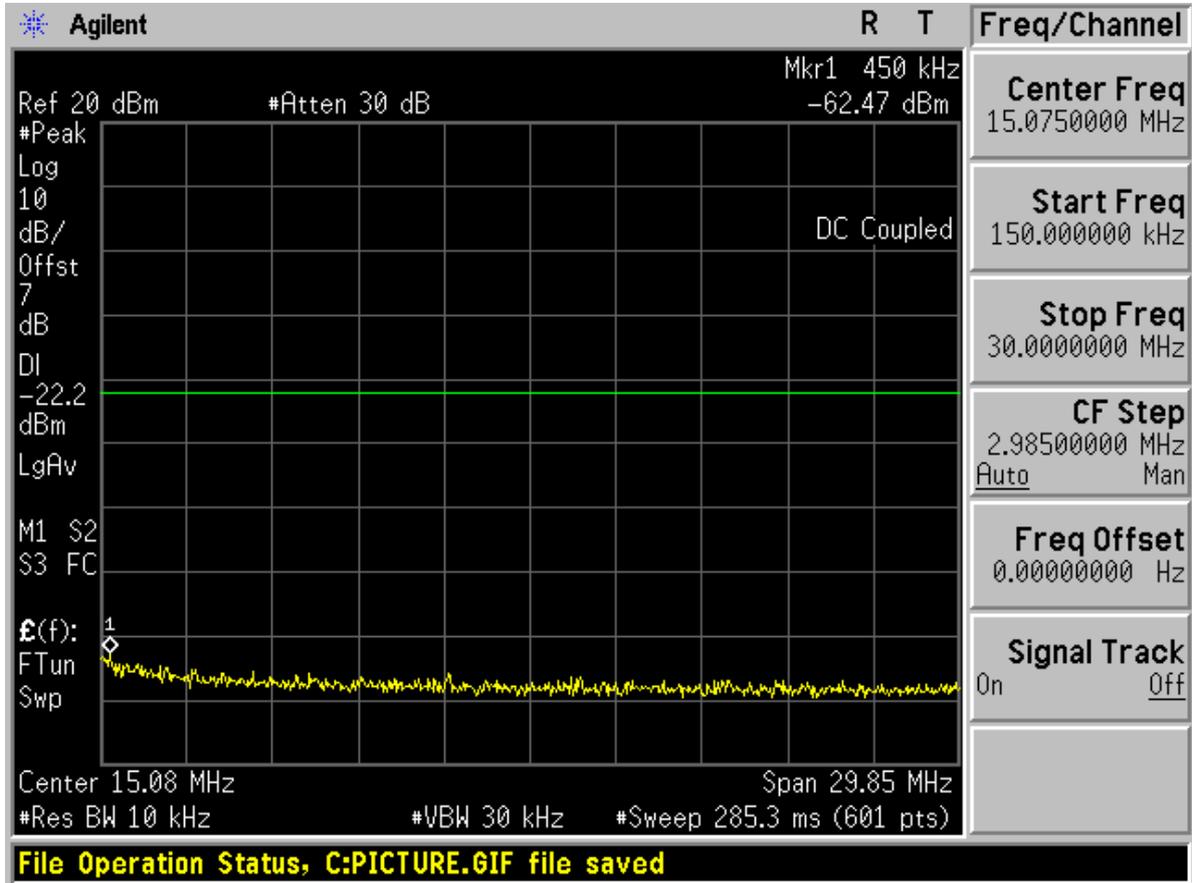


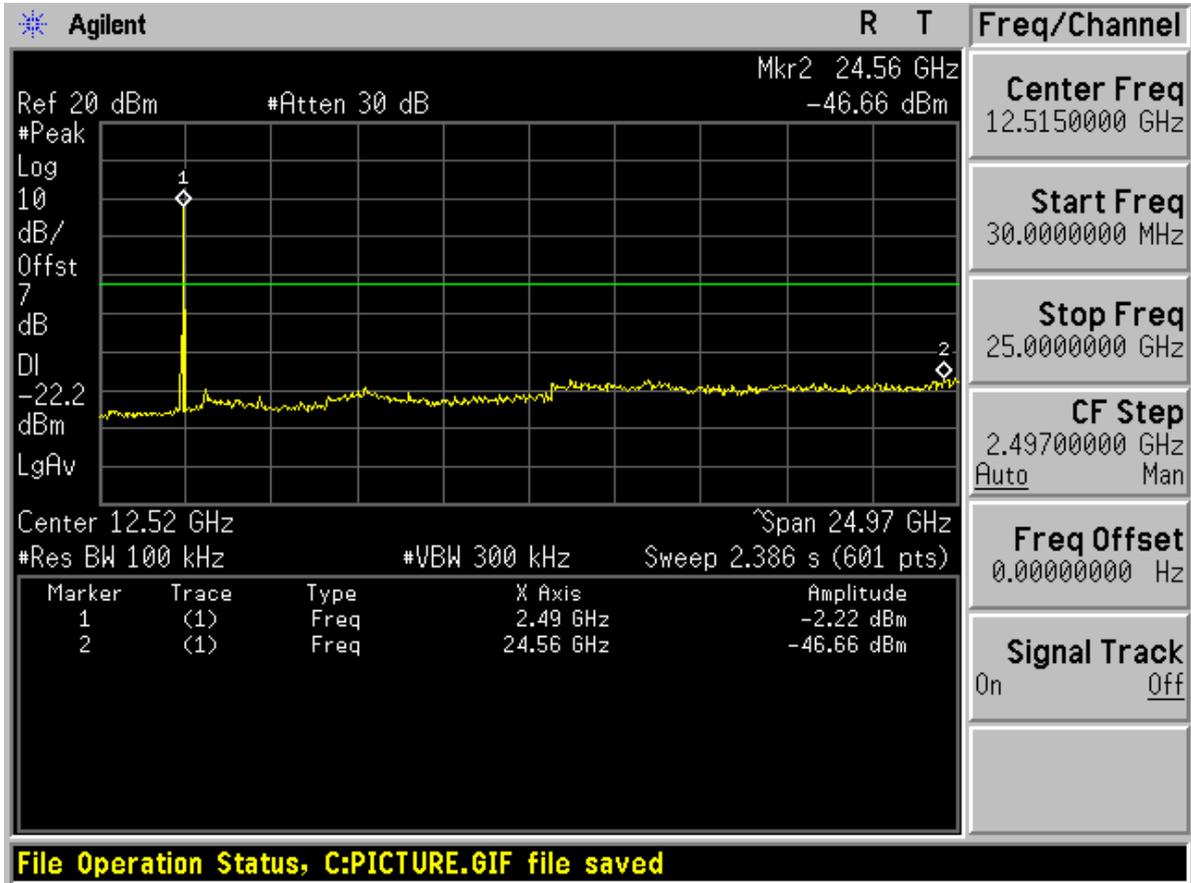




# Channel 78

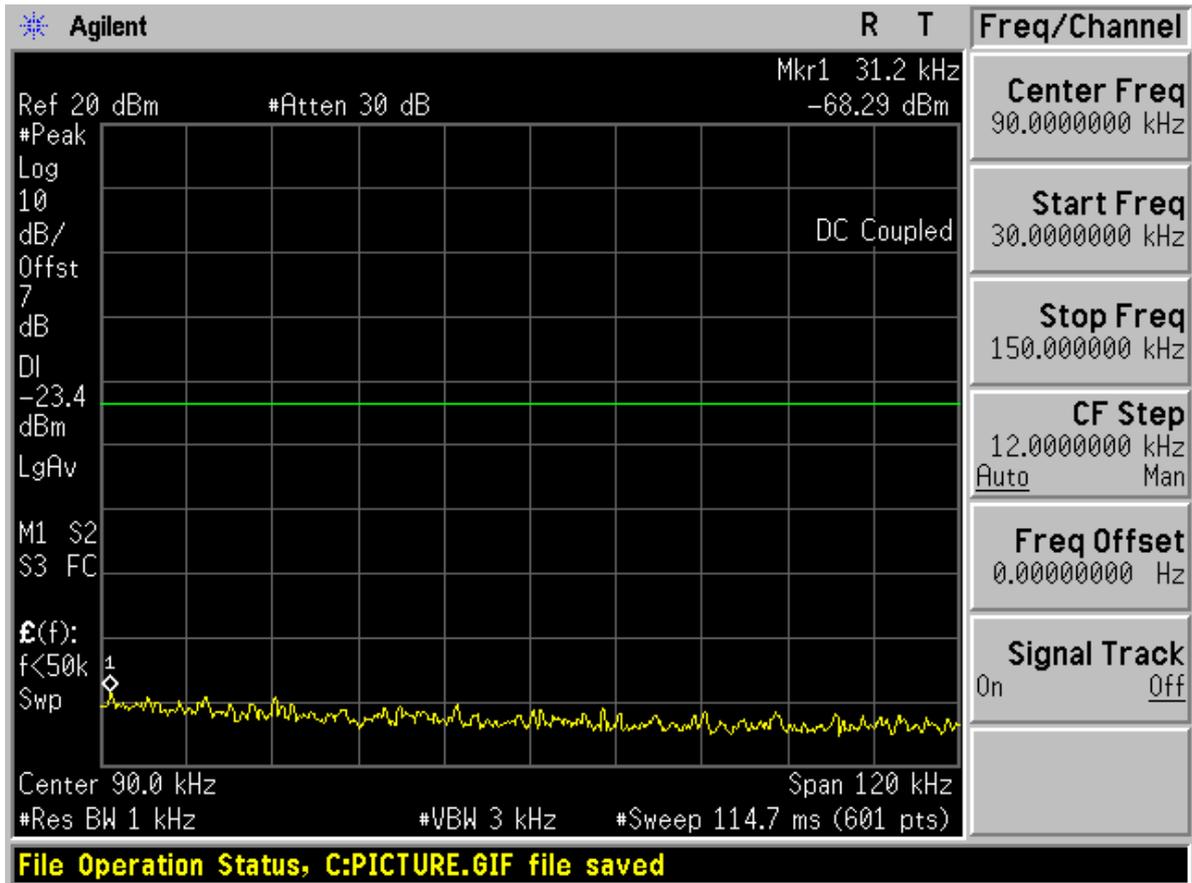


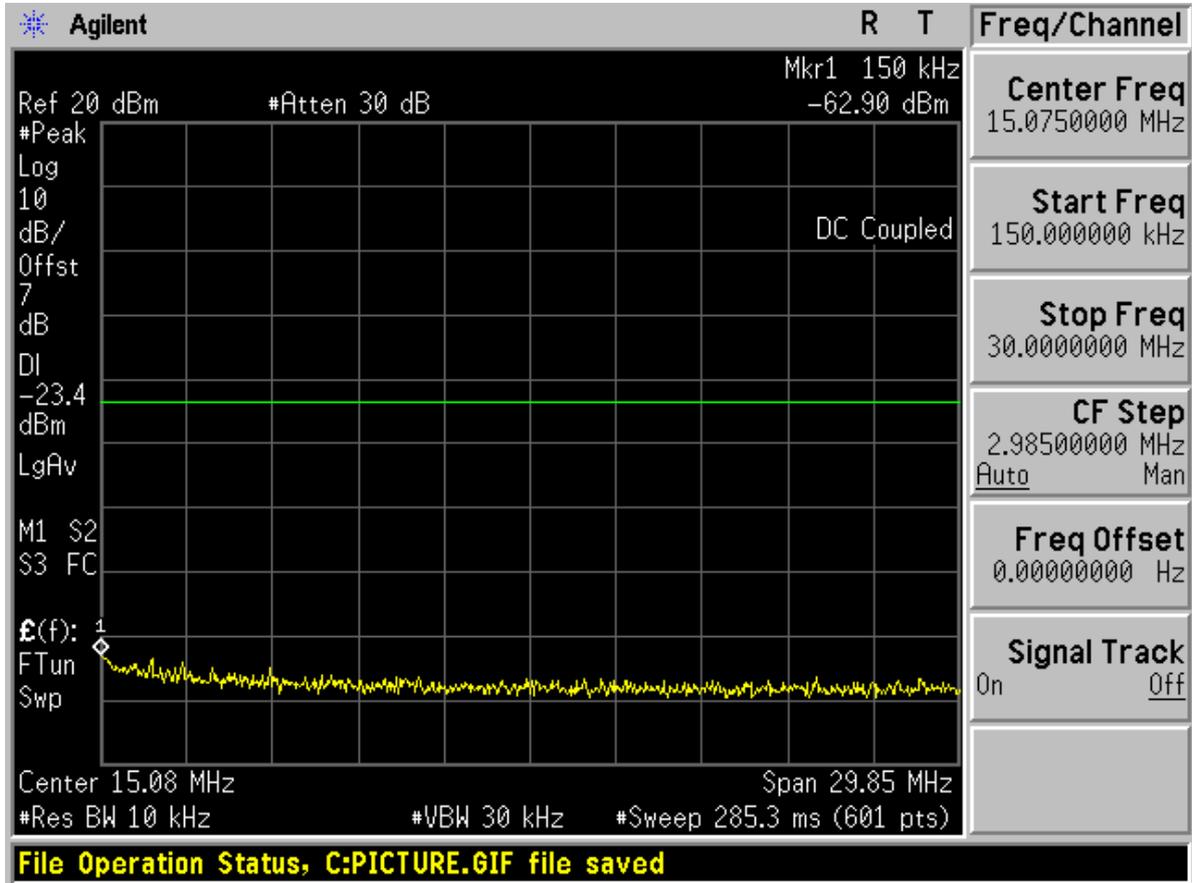


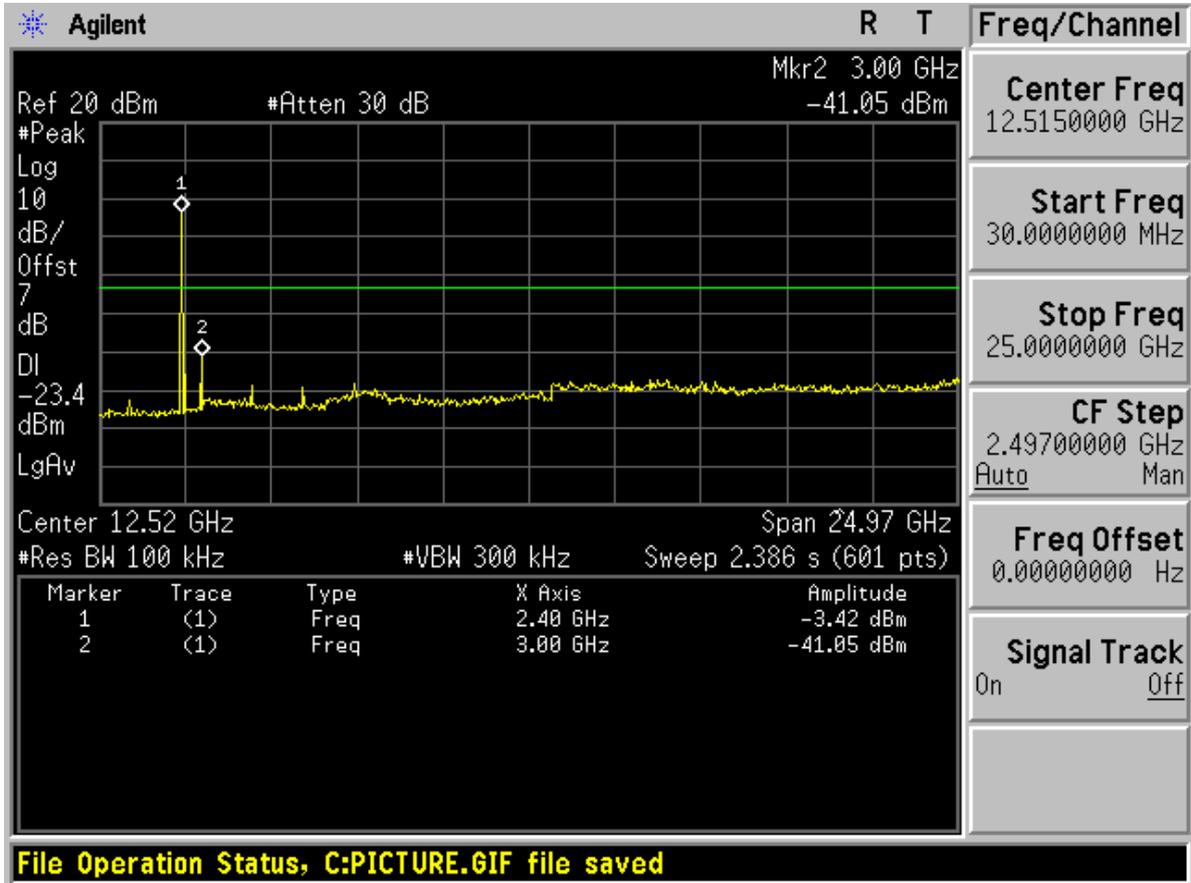




## Modulation: 8DPSK Channel 0

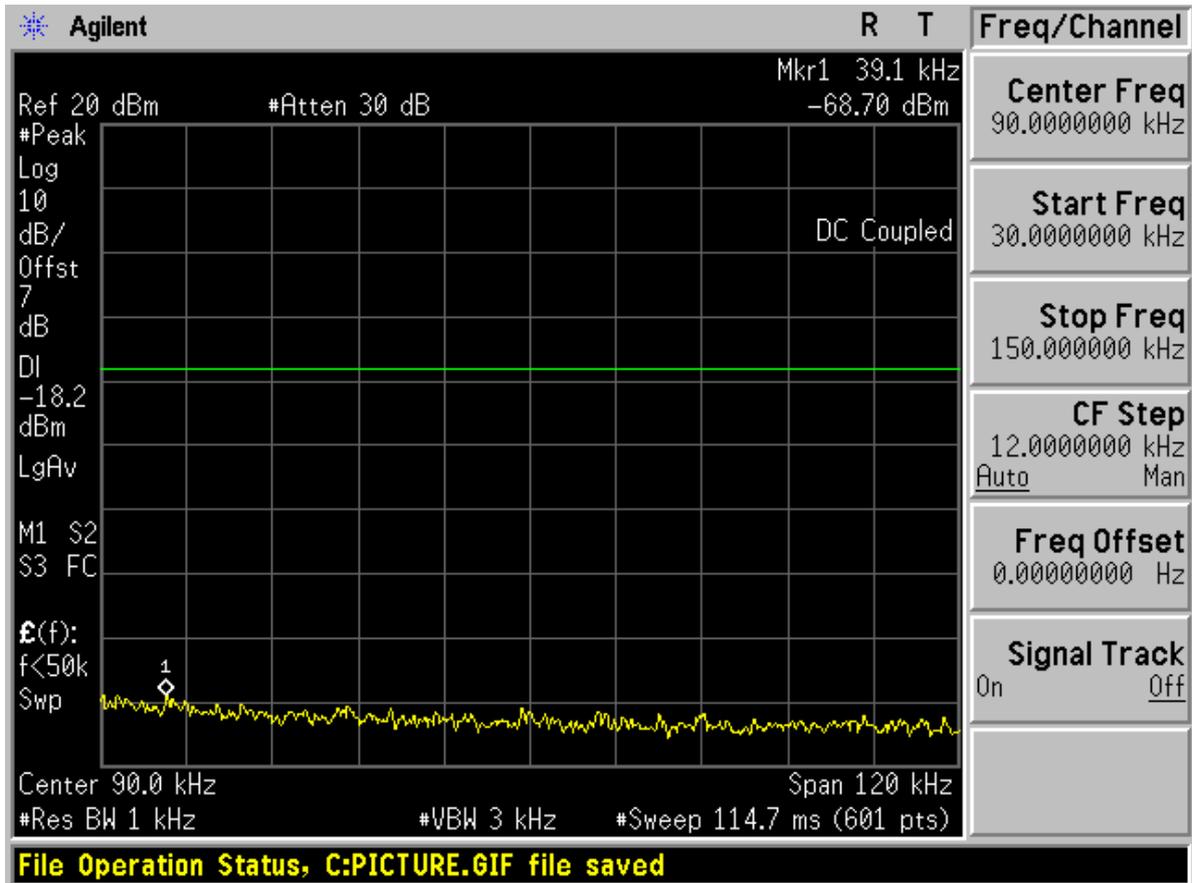


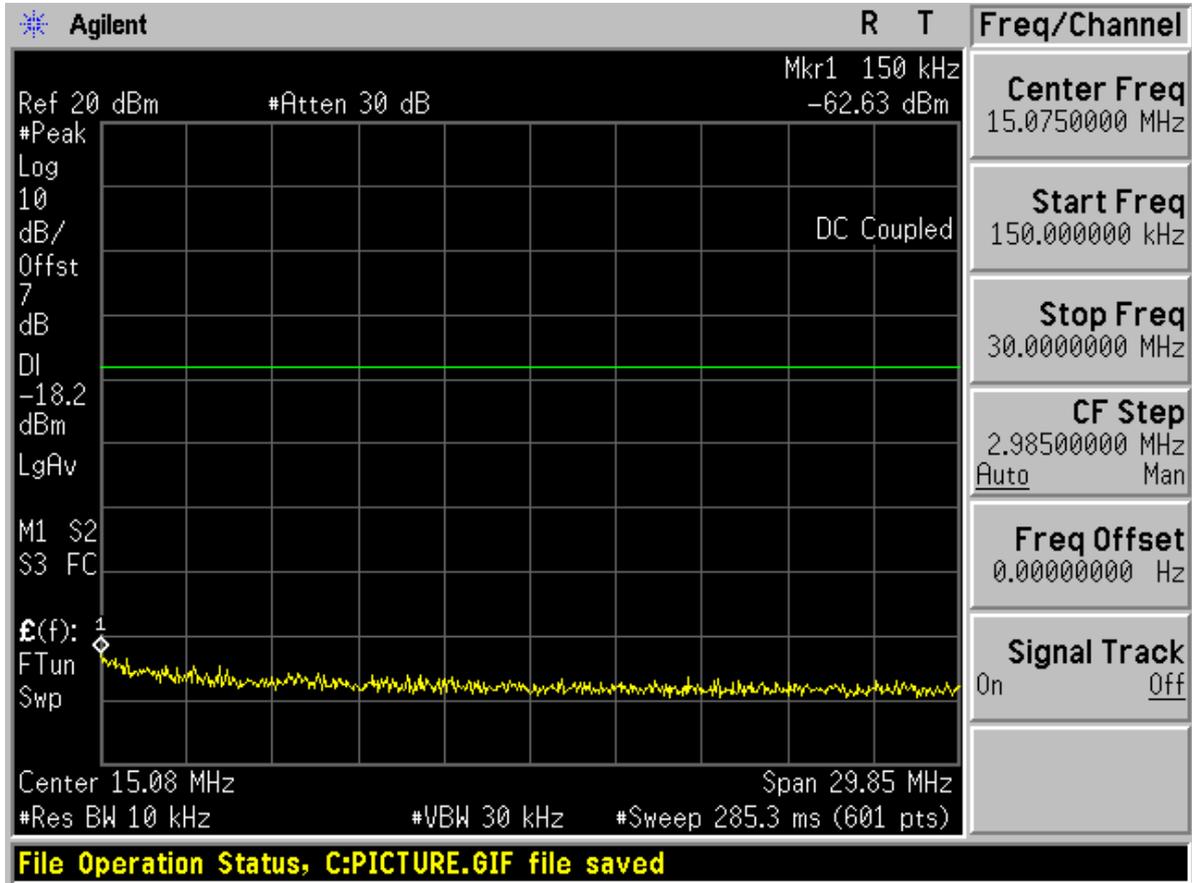


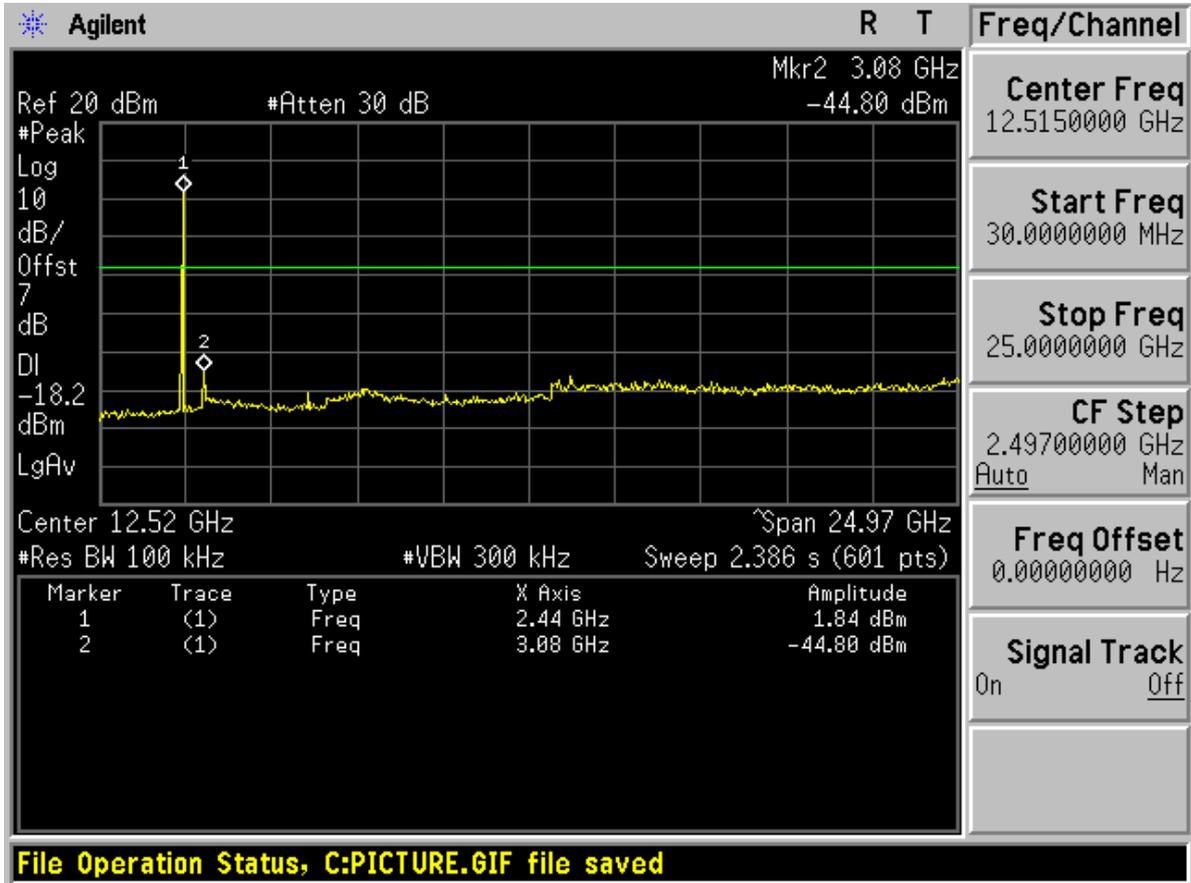




# Channel 40

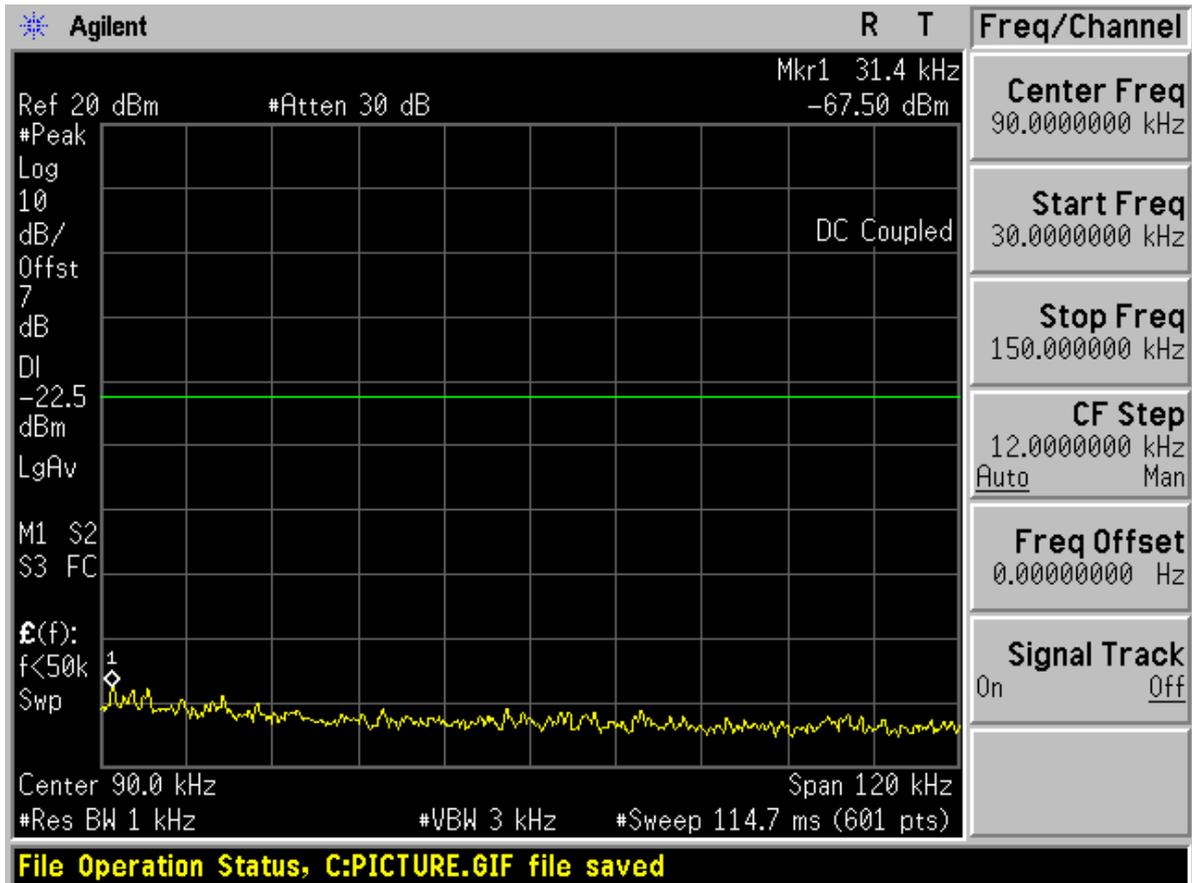


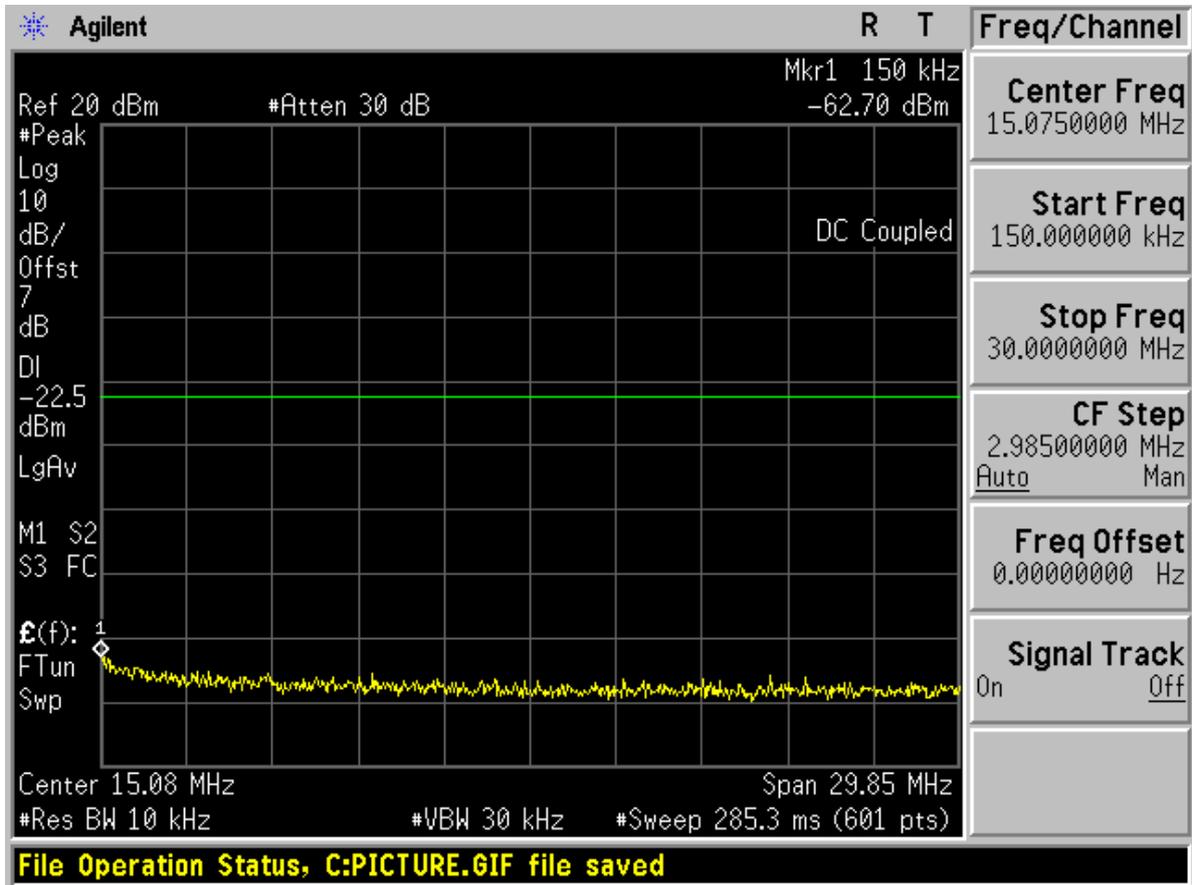


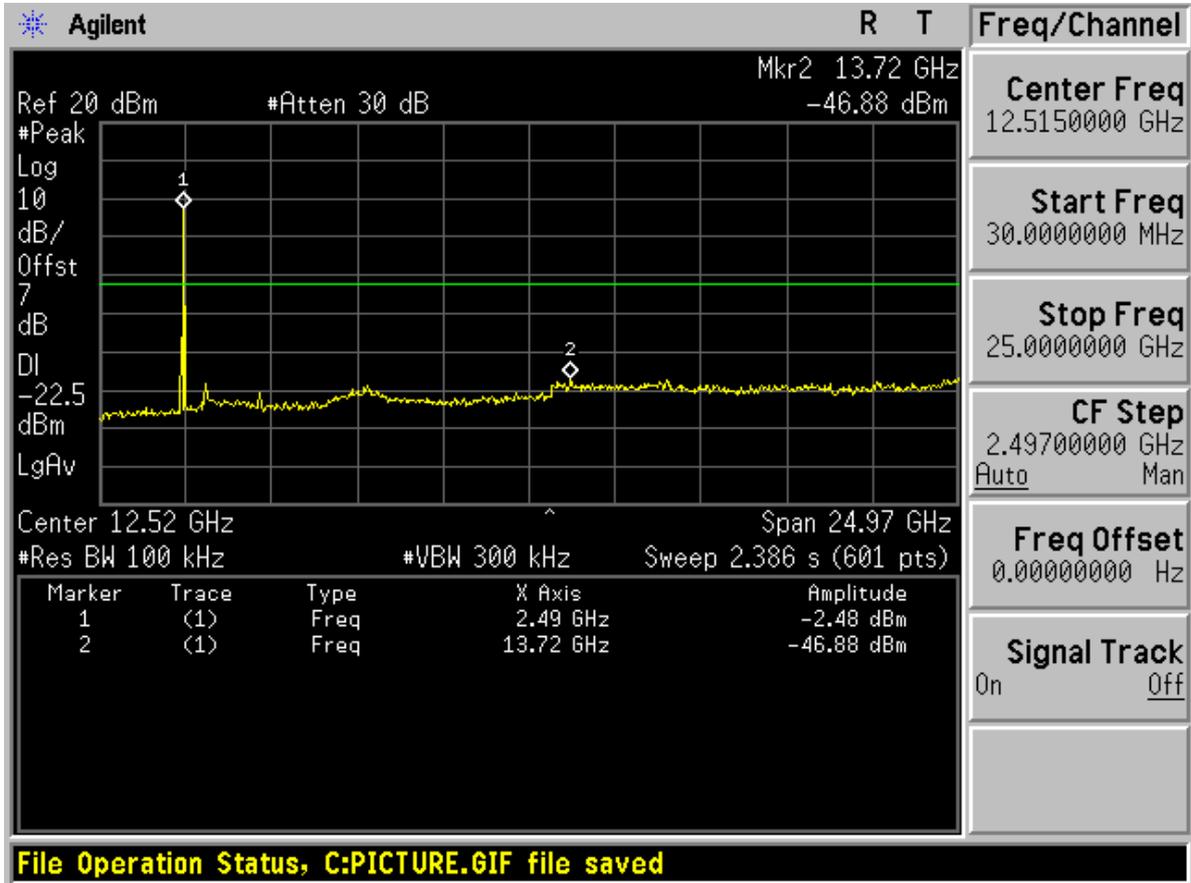




# Channel 78









# Appendix H

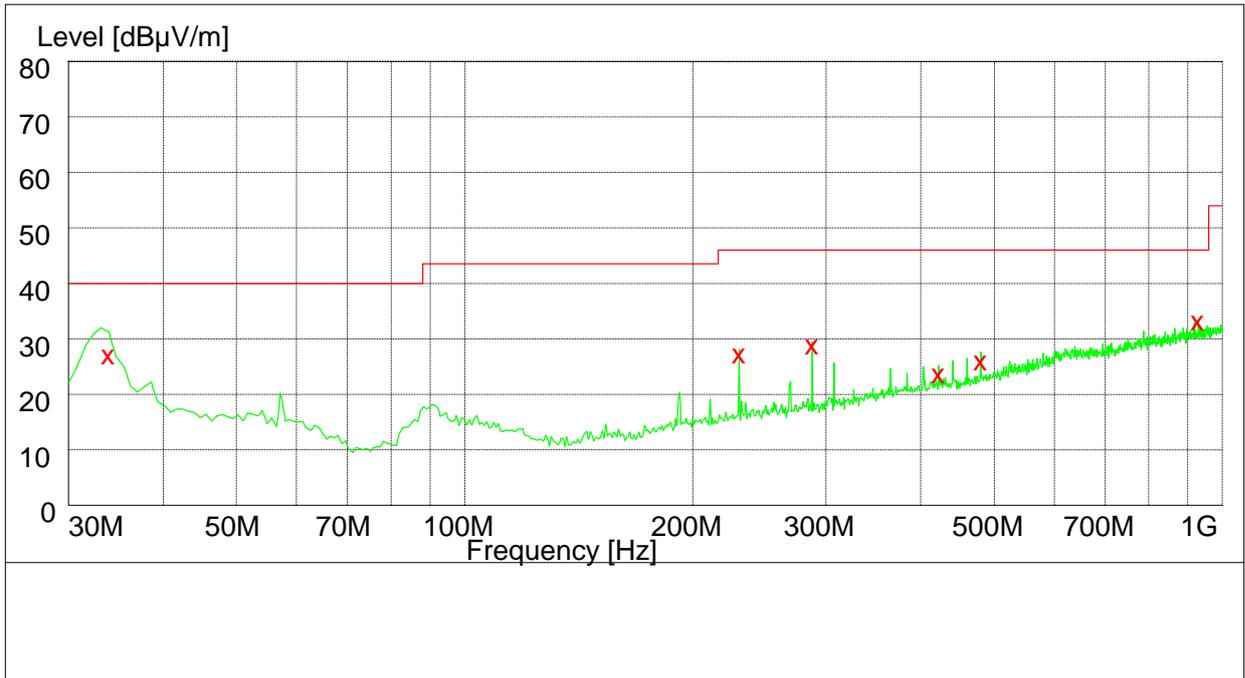
## Radiated spurious emission

According to FCC Part 15.247 (d) & 15.205 & 15.209



This test was carried out in all the test modes, Here only the worst test result was shown.

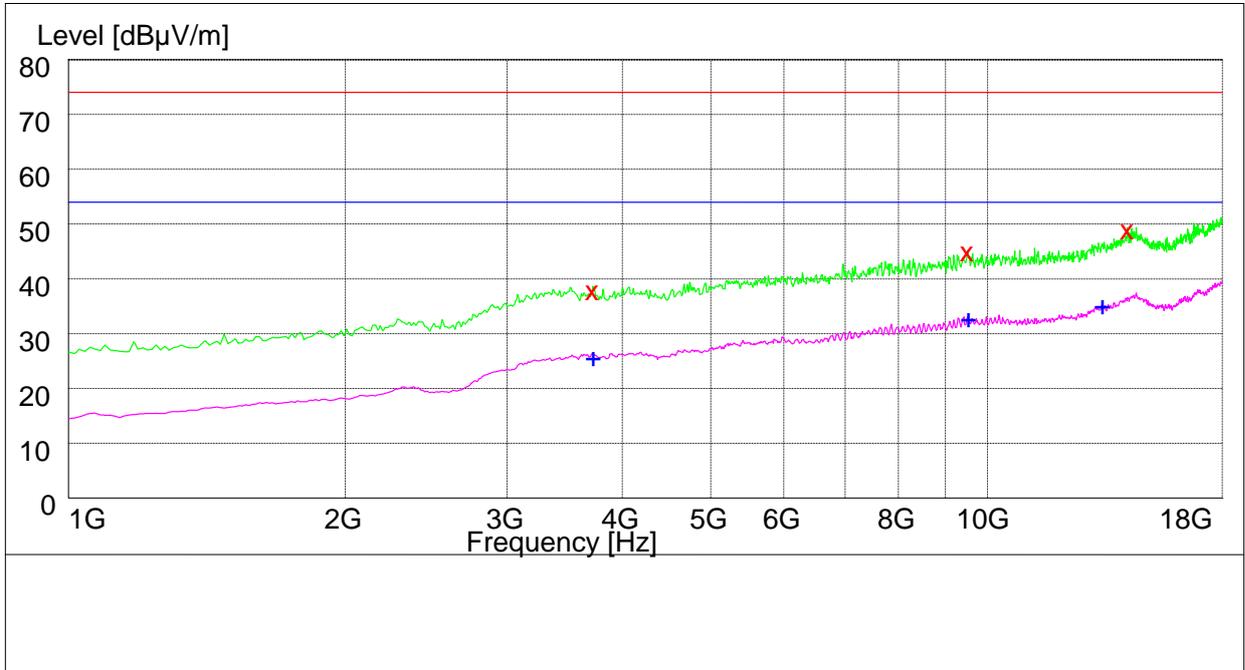
## Channel 0 30MHz to 1GHz



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Plarization
33.900000	27.40	11.7	40.0	12.6	103.0	104.00	VERTICAL
230.208000	27.80	13.5	46.0	18.2	142.0	76.00	VERTICAL
287.632000	29.20	15.2	46.0	16.8	112.0	342.00	HORIZONTAL
422.656000	25.00	18.8	46.0	21.0	171.0	249.00	VERTICAL
480.080000	27.40	19.6	46.0	18.6	126.0	218.00	HORIZONTAL
929.384000	33.10	26.4	46.0	12.9	156.0	115.00	VERTICAL



# 1GHz to 18GHz



Note: Signal suppressed with a 2.4 GHz band rejection filter

### MEASUREMENT RESULT: PK Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
3718.000000	38.50	-5.2	74.0	35.5	105.0	37.00	VERTICAL
9513.600000	45.10	6.2	74.0	28.9	190.0	99.00	HORIZONTAL
14192.000000	49.20	13.7	74.0	24.8	155.0	146.00	HORIZONTAL

### MEASUREMENT RESULT: AVDetector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
3721.000000	25.70	-5.2	54.0	28.3	101.0	130.00	VERTICAL
9527.200000	33.00	6.4	54.0	21.0	172.0	268.00	HORIZONTAL
13321.600000	35.50	11.3	54.0	18.5	101.0	0.00	VERTICAL



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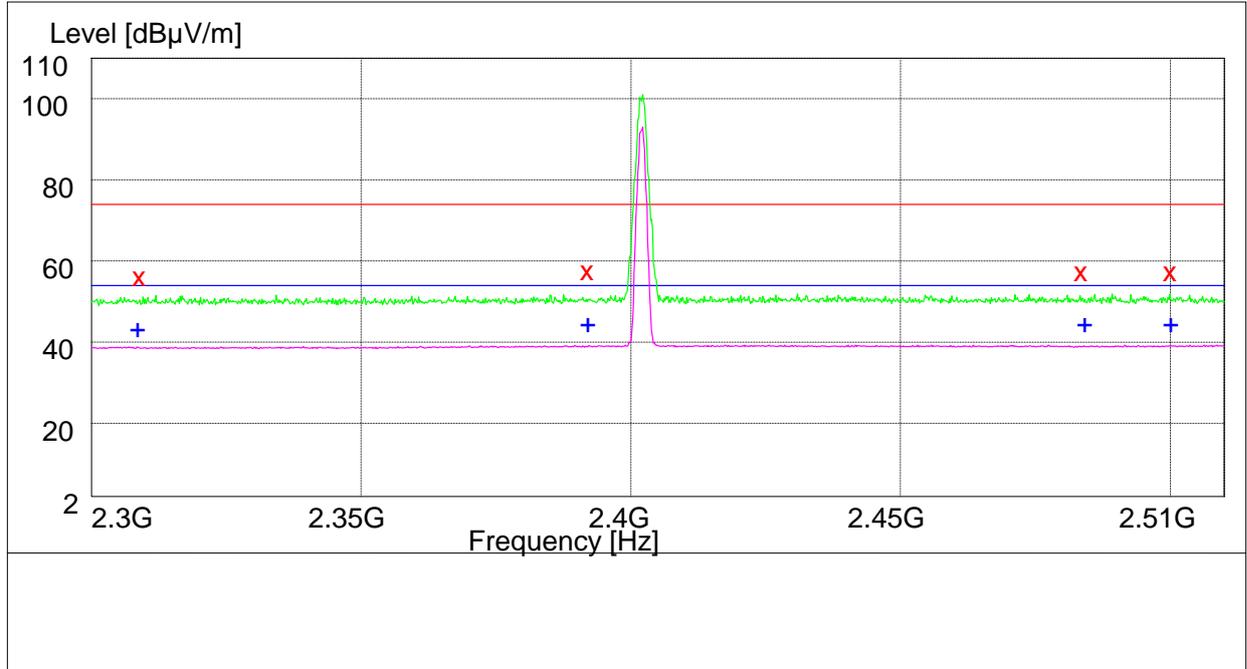
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# 18GHz to 26GHz

Note: No peak found in pre- test.



## 2.30GHz to 2.51GHz



Note: The peak exceeds the limit line is carrier frequency.

MEASUREMENT RESULT: PK Detector

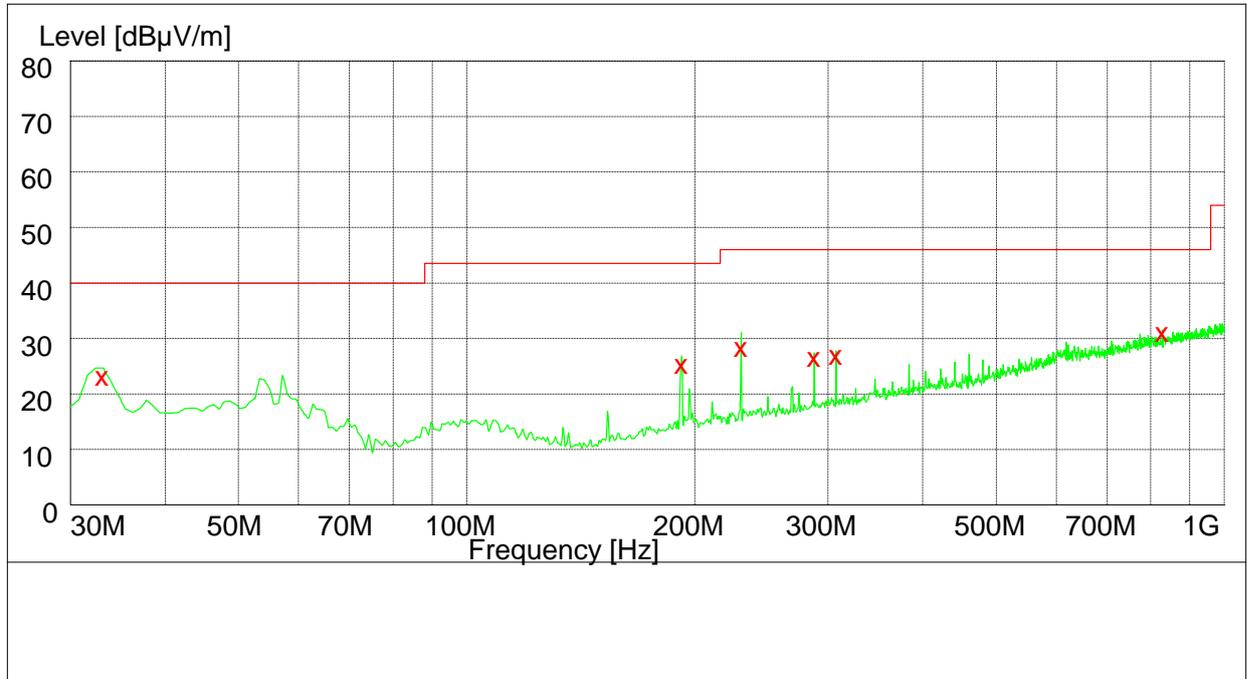
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2310.000000	58.00	33.3	74.0	16.0	190.0	183.00	HORIZONTAL
2390.000000	59.50	33.5	74.0	14.5	173.0	263.00	HORIZONTAL
2483.500000	59.20	33.8	74.0	14.8	100.0	86.00	HORIZONTAL
2500.000000	59.30	33.8	74.0	14.7	112.0	117.00	HORIZONTAL

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2310.000000	45.40	33.3	54.0	8.6	145.0	315.00	VERTICAL
2390.000000	46.40	33.5	54.0	7.6	120.0	241.00	VERTICAL
2483.500000	46.40	33.8	54.0	7.6	170.0	359.00	VERTICAL
2500.000000	46.50	33.8	54.0	7.5	100.0	166.00	HORIZONTAL



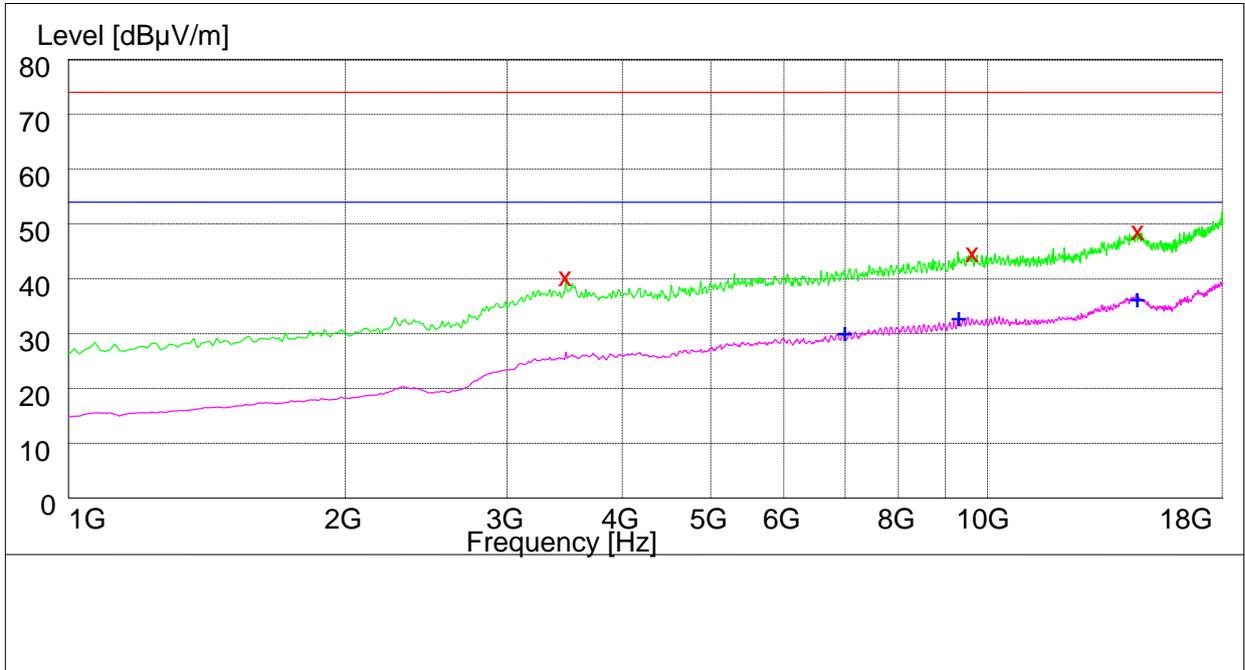
## Channel 40 30MHz to 1GHz



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
33.104000	24.50	11.7	40.0	15.5	100.0	61.00	VERTICAL
192.184000	26.60	11.9	43.5	16.4	112.0	125.00	HORIZONTAL
230.400000	29.80	13.5	46.0	16.2	103.0	19.00	VERTICAL
287.632000	27.30	15.2	46.0	18.7	134.0	267.00	HORIZONTAL
307.032000	27.60	15.7	46.0	18.4	162.0	183.00	HORIZONTAL
828.504000	31.30	25.2	46.0	14.7	132.0	356.00	VERTICAL



# 1GHz to 18GHz



Note: Signal suppressed with a 2.4 GHz band rejection filter

MEASUREMENT RESULT: PK Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
3475.200000	40.00	-5.5	74.0	30.0	145.0	92.00	HORIZONTAL
9636.000000	45.00	6.3	74.0	29.0	200.0	211.00	VERTICAL
14577.000000	49.00	14.2	74.0	25.0	118.0	333.00	VERTICAL

MEASUREMENT RESULT: AVDetector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
6984.000000	30.50	1.2	54.0	23.5	166.0	89.00	HORIZONTAL
9296.000000	32.80	5.9	54.0	21.2	122.0	295.00	VERTICAL
14520.500000	36.60	14.9	54.0	17.4	197.0	19.00	HORIZONTAL



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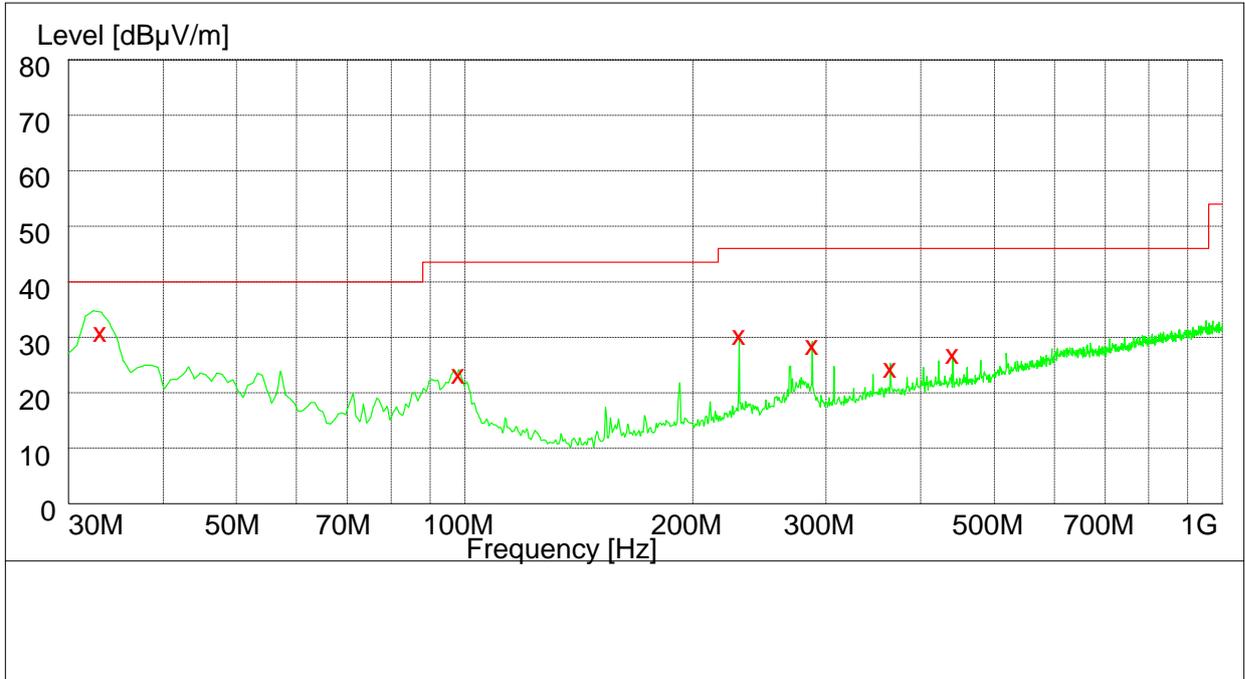
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# 18GHz to 26GHz

Note: No peak found in pre- test.



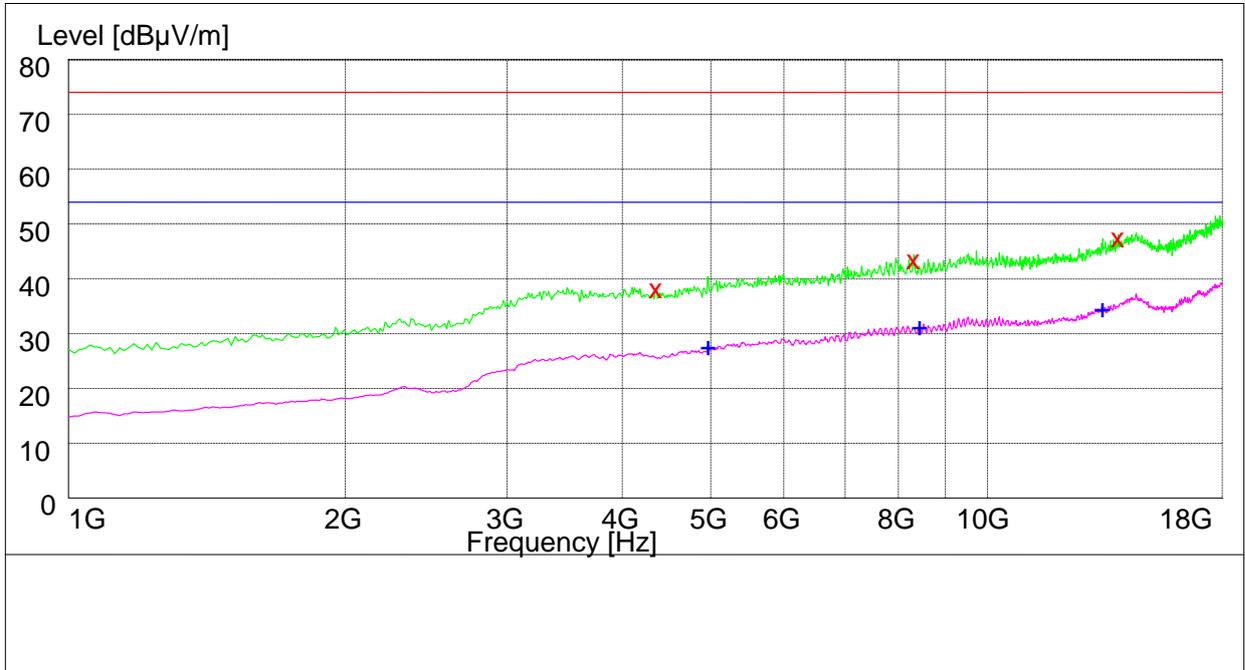
## Channel 78 30MHz to 1GHz



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
33.060000	30.70	11.7	40.0	9.3	103.0	0.00	VERTICAL
98.288000	24.00	13.0	40.0	16.0	122.0	95.00	HORIZONTAL
230.208000	30.00	13.5	46.0	16.0	113.0	151.00	VERTICAL
287.632000	29.10	15.2	46.0	16.9	142.0	200.00	HORIZONTAL
364.456000	25.10	17.4	46.0	20.9	160.0	103.00	HORIZONTAL
441.280000	26.40	18.9	46.0	19.6	176.0	326.00	VERTICAL



# 1GHz to 18GHz



Note: Signal suppressed with a 2.4 GHz band rejection filter

### MEASUREMENT RESULT: PK Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
4359.200000	38.10	-5.0	74.0	35.9	135.0	184.00	HORIZONTAL
8316.800000	44.20	3.4	74.0	29.8	192.0	359.00	VERTICAL
13864.500000	47.10	12.6	74.0	26.9	165.0	121.00	HORIZONTAL

### MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
4957.600000	27.60	-3.3	54.0	26.4	104.0	104.00	HORIZONTAL
8425.600000	31.20	4.0	54.0	22.8	154.0	220.00	VERTICAL
13322.500000	34.20	11.6	54.0	19.8	100.0	8.00	VERTICAL



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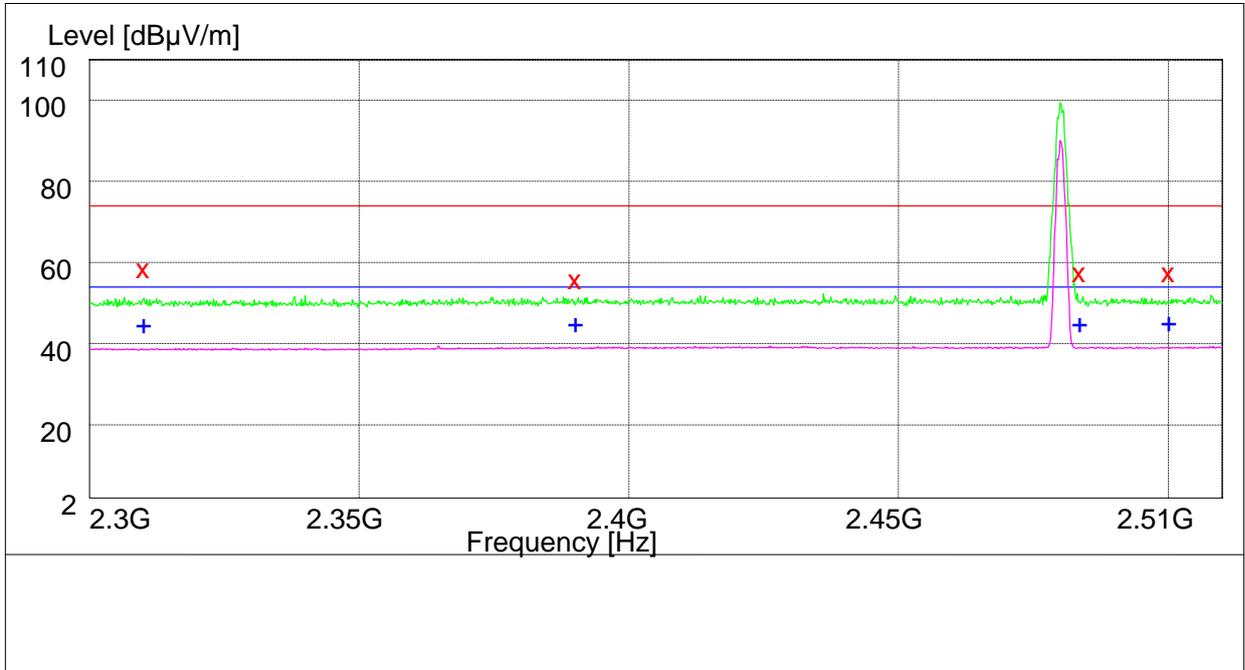
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# 18GHz to 26GHz

Note: No peak found in pre- test.



## 2.30GHz to 2.51GHz



Note: The peak exceeds the limit line is carrier frequency.

### MEASUREMENT RESULT: PK Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2310.000000	60.20	33.3	74.0	13.8	135.0	161.00	HORIZONTAL
2390.000000	57.70	33.5	74.0	16.3	114.0	299.00	HORIZONTAL
2483.500000	59.50	33.8	74.0	14.5	100.0	144.00	VERTICAL
2500.000000	59.30	33.8	74.0	14.7	172.0	327.00	HORIZONTAL

### MEASUREMENT RESULT: AVDetector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2310.000000	46.60	33.3	54.0	7.4	104.0	312.00	HORIZONTAL
2390.000000	46.80	33.5	54.0	7.2	131.0	87.00	VERTICAL
2483.500000	46.90	33.8	54.0	7.1	166.0	181.00	VERTICAL
2500.000000	47.10	33.8	54.0	6.9	158.0	254.00	HORIZONTAL



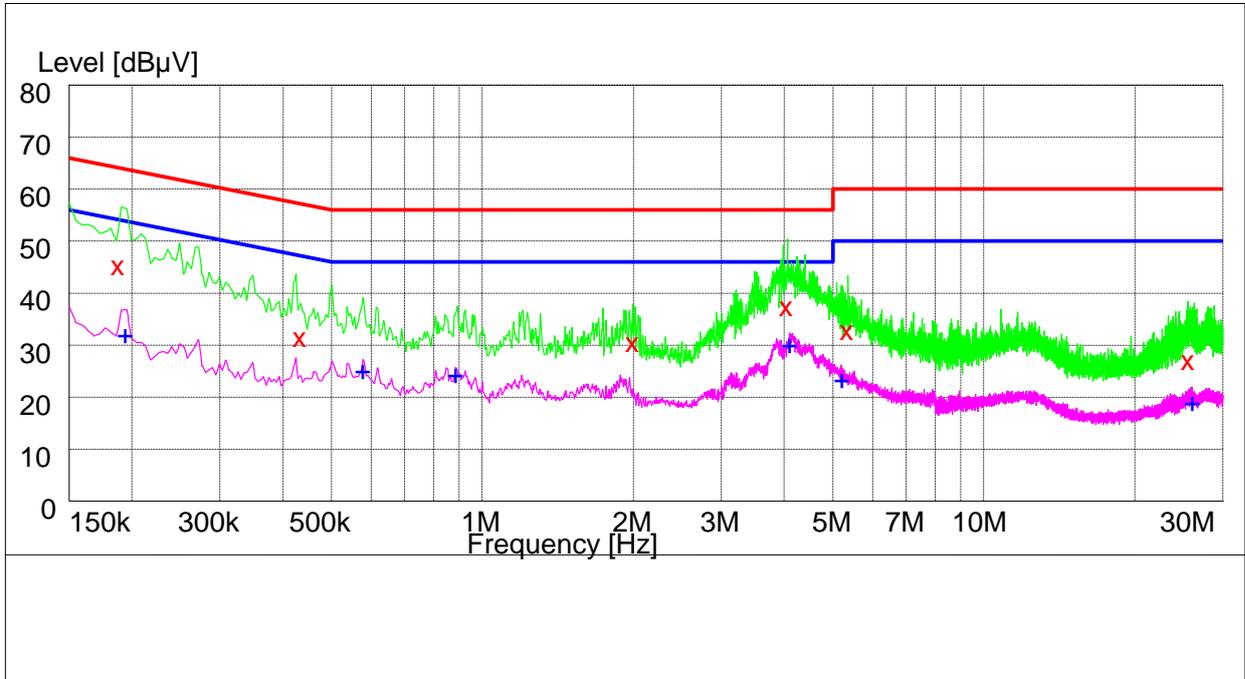
# Appendix I

## Conducted Emission at Power Port

According to FCC Part 15.207



# Channel 40



## MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.188000	46.80	10.1	64	17.2	N	FLO
0.434000	31.00	10.1	57	26.0	N	FLO
1.994000	30.90	10.1	56	25.1	N	FLO
4.046000	39.00	10.2	56	17.0	N	FLO
5.350000	31.60	10.2	60	28.4	N	FLO
25.594000	28.60	10.4	60	31.4	N	FLO

## MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.194000	32.10	10.1	54	21.9	N	FLO
0.576000	26.60	10.1	46	19.4	N	FLO
0.884000	25.80	10.1	46	20.2	N	FLO
4.098000	30.20	10.2	46	15.8	N	FLO
5.206000	24.90	10.2	50	25.1	N	FLO
26.034000	20.60	10.4	50	29.4	N	FLO