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## **8.8. LAT3, HIGH POWER BASIC DATA RATE GFSK MODULATION**

### **8.8.1. 20 dB AND 99% BANDWIDTH**

#### **LIMITS**

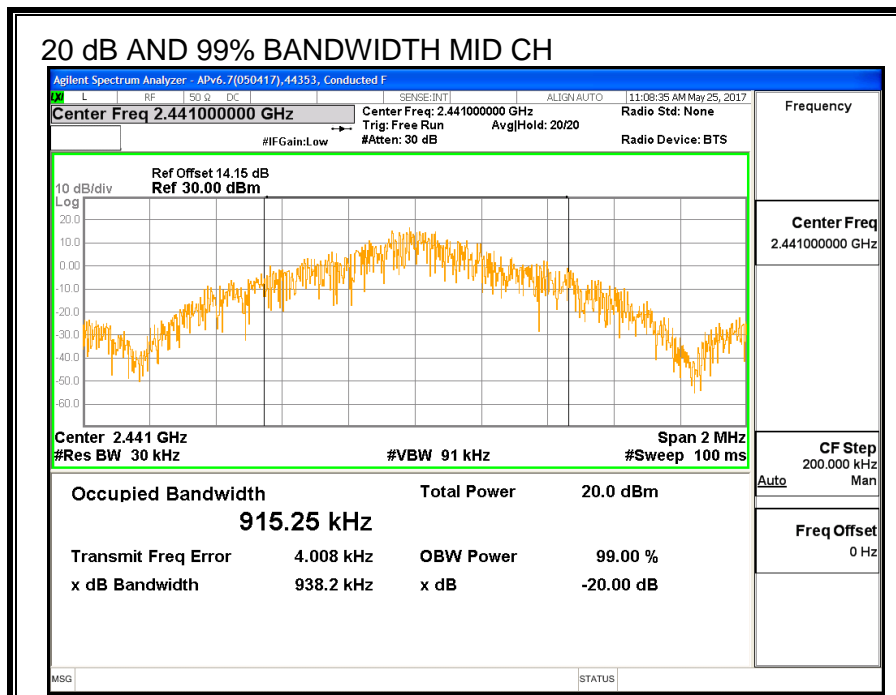
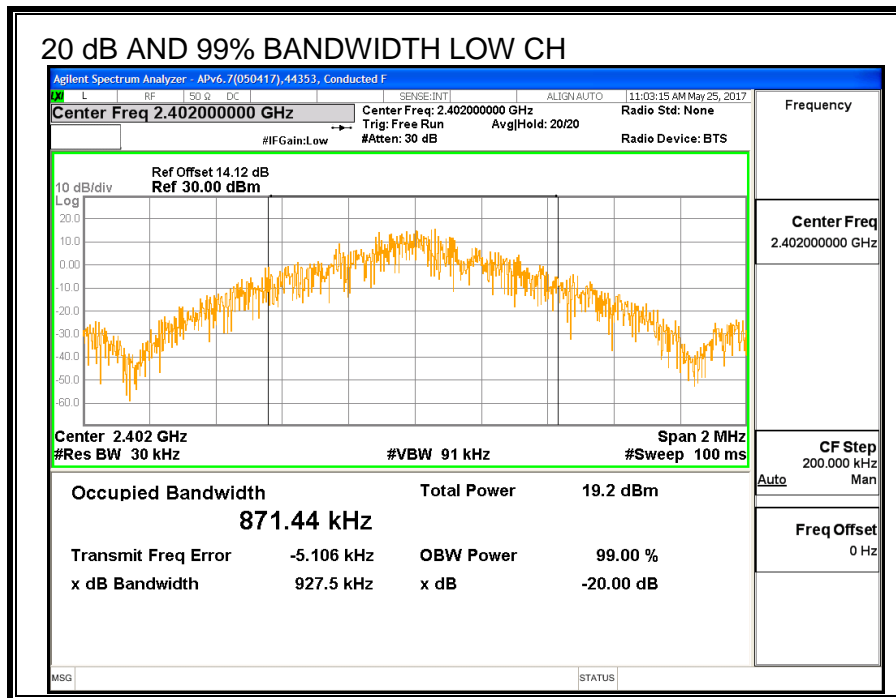
None; for reporting purposes only.

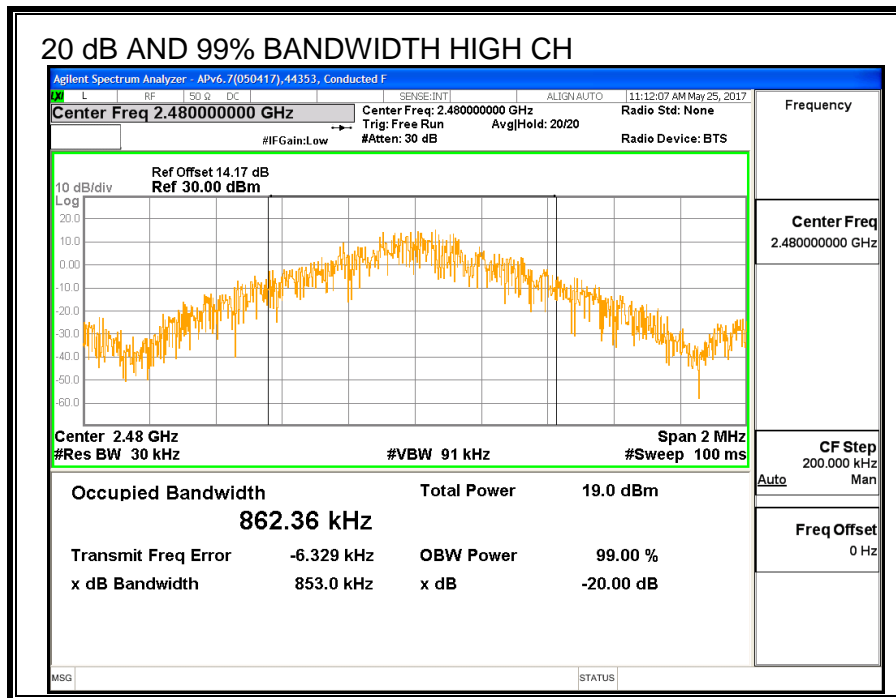
#### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

#### **RESULTS**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>20 dB Bandwidth (KHz)</b>	<b>99% Bandwidth (KHz)</b>
Low	2402	927.5	871.44
Middle	2441	938.2	915.25
High	2480	853.0	862.36





## 8.8.2. HOPPING FREQUENCY SEPARATION

### LIMITS

FCC §15.247 (a) (1)

IC RSS-247 (5.1) (b)

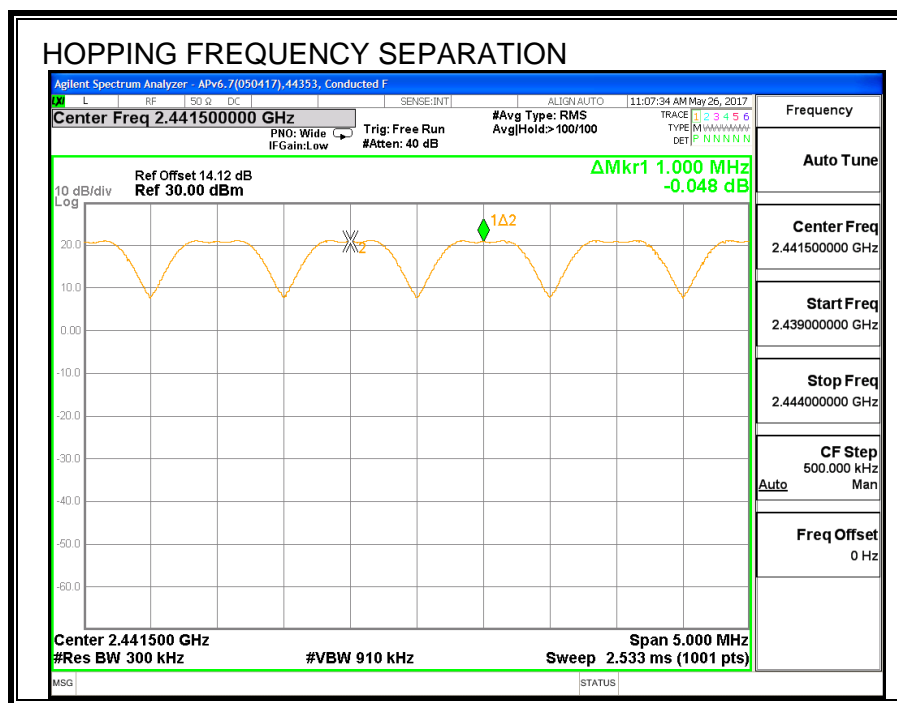
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 910 kHz. The sweep time is coupled.

### RESULTS



### 8.8.3. NUMBER OF HOPPING CHANNELS

#### LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

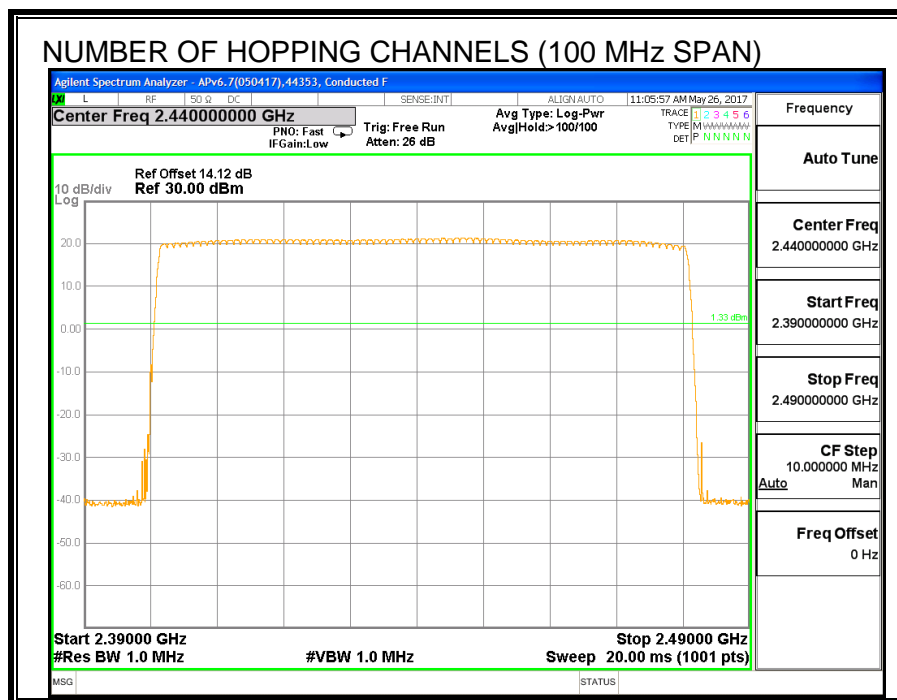
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

#### TEST PROCEDURE

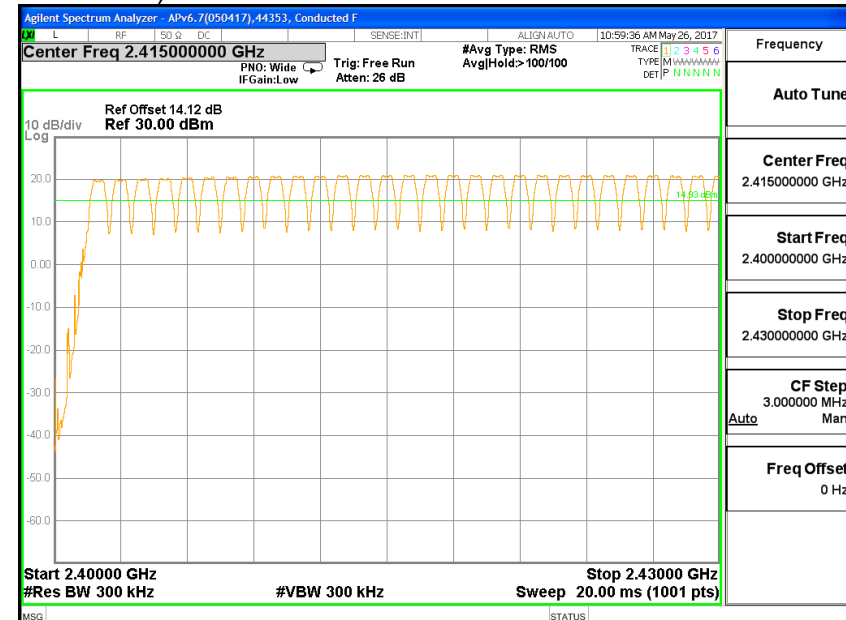
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

#### RESULTS

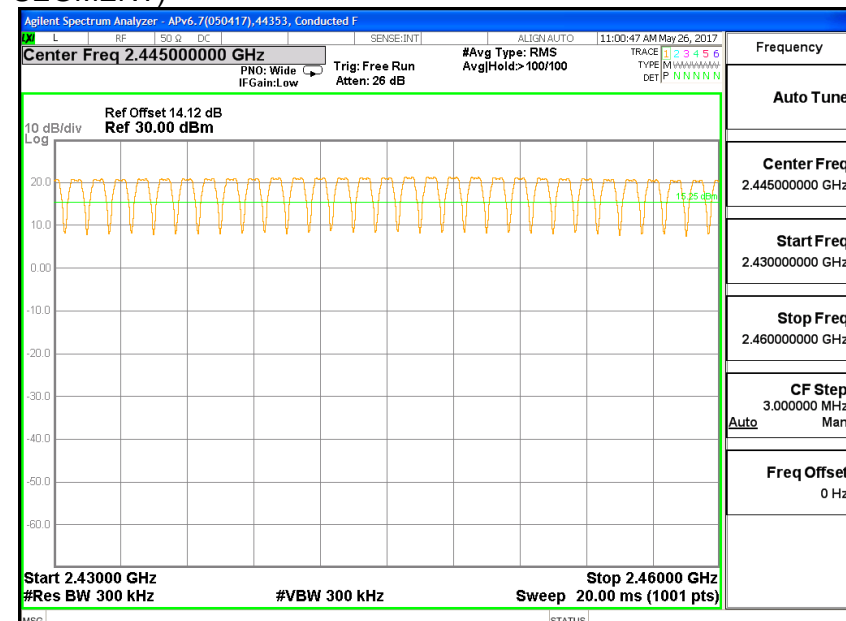
Normal Mode: 79 Channels observed.

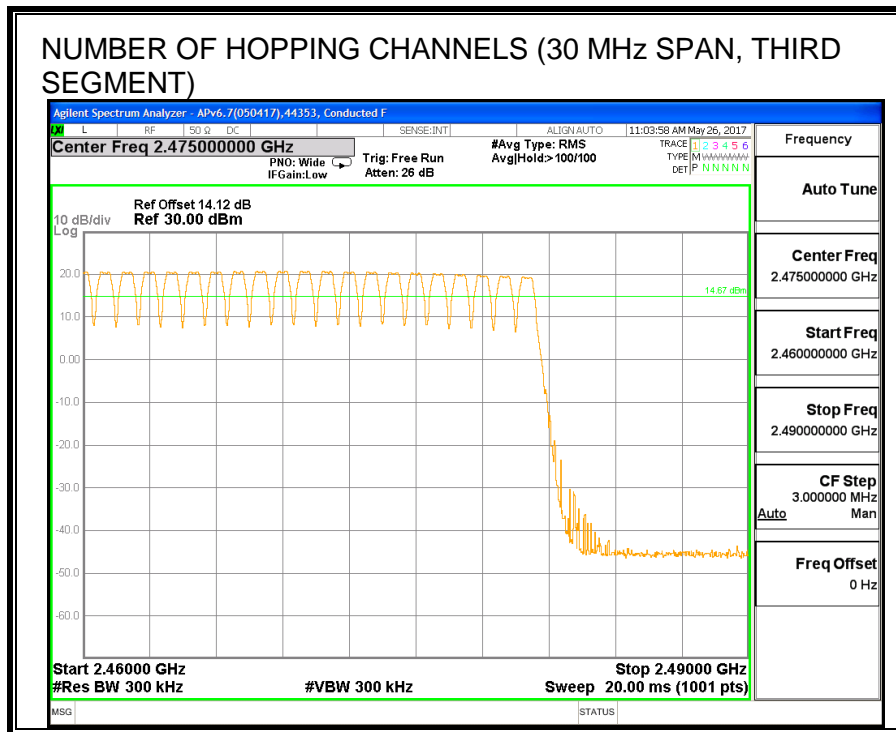


### NUMBER OF HOPPING CHANNELS (30 MHz SPAN, FIRST SEGMENT)



### NUMBER OF HOPPING CHANNELS (30 MHz SPAN, SECOND SEGMENT)





## 8.8.4. AVERAGE TIME OF OCCUPANCY

### LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

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

### TEST PROCEDURE

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

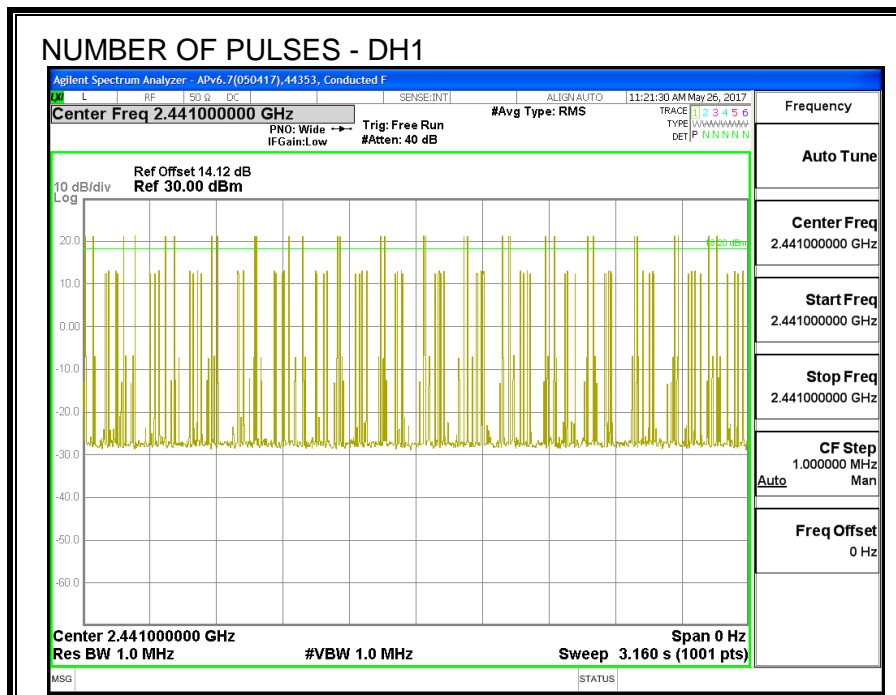
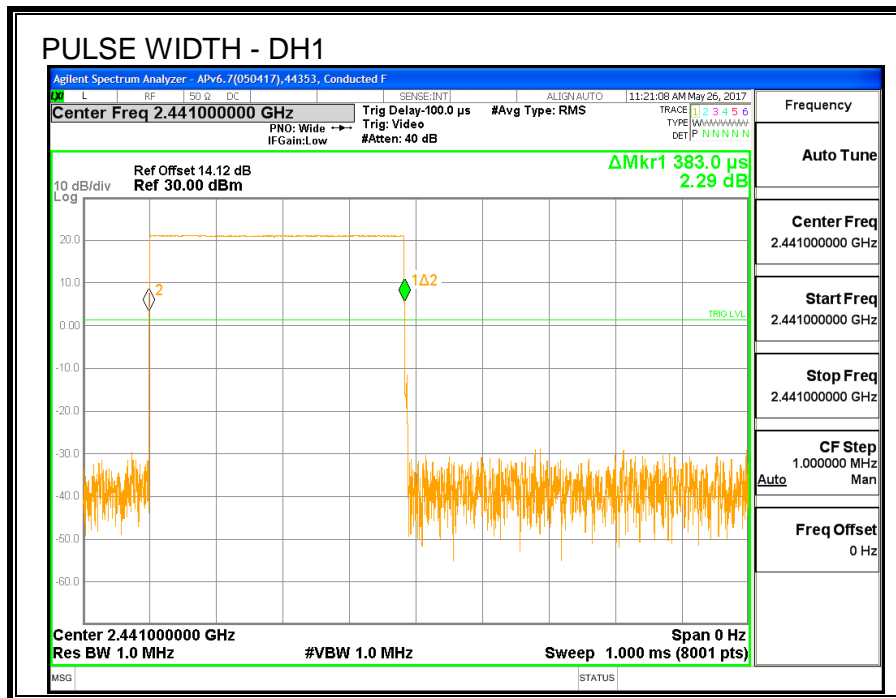
The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$ .

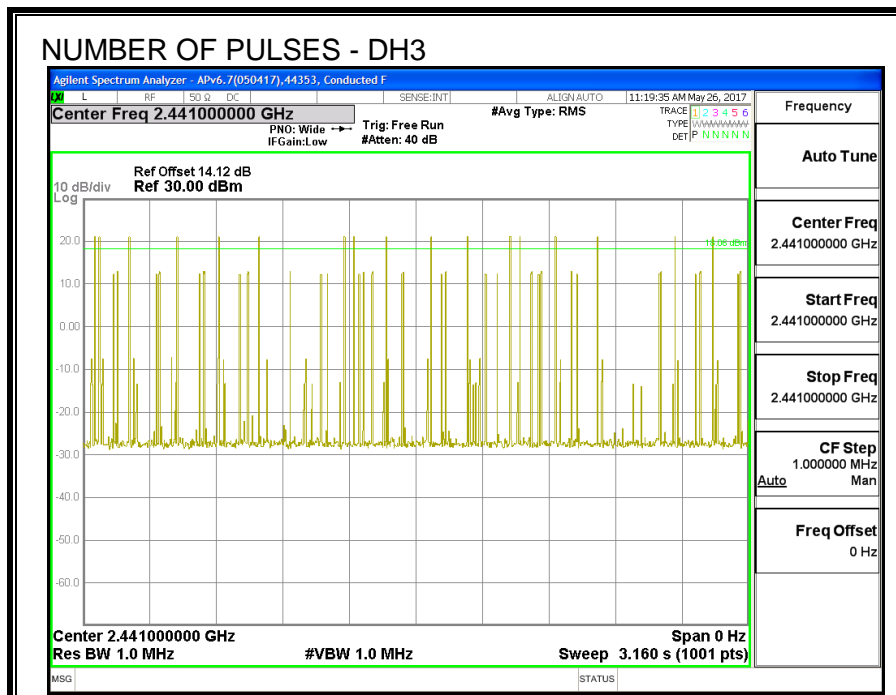
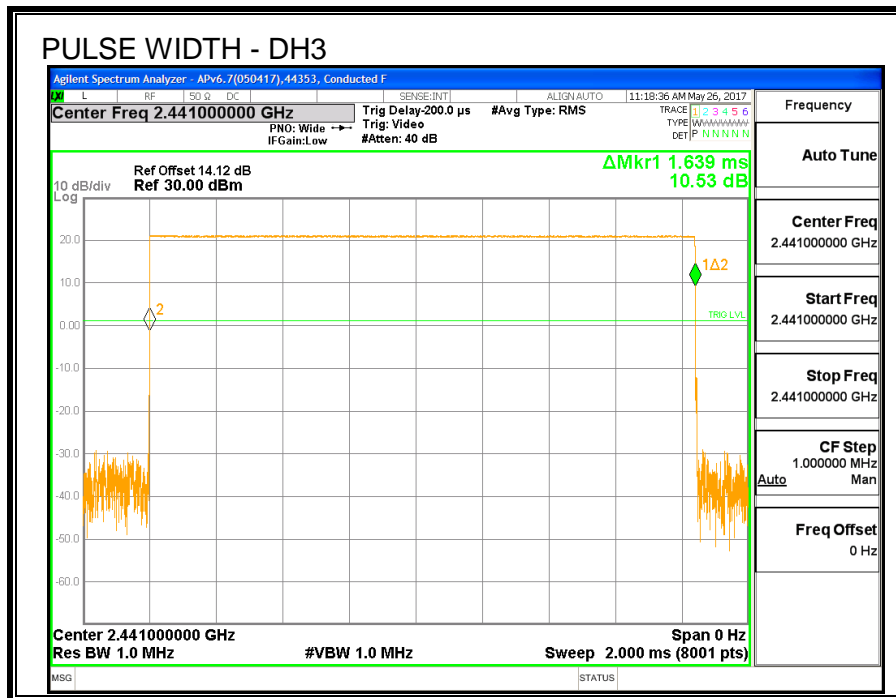
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$ .

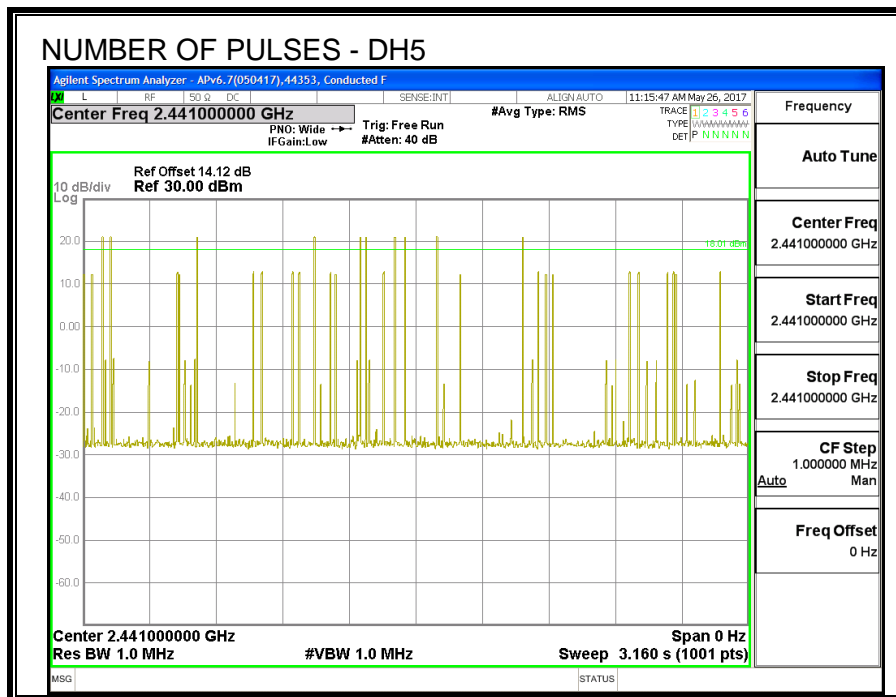
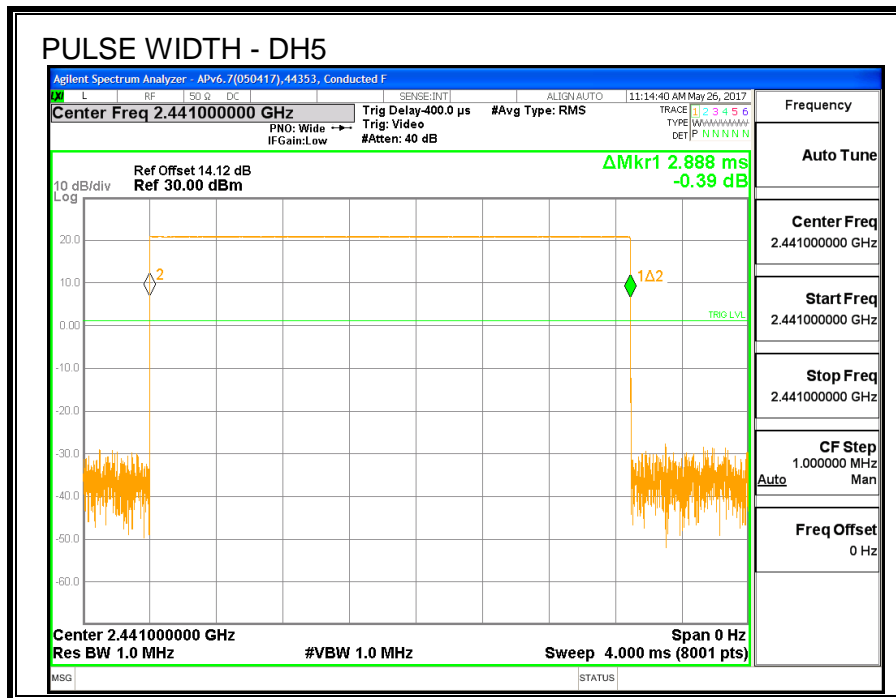
### RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.383	30	0.115	0.4	-0.285
DH3	1.639	17	0.279	0.4	-0.121
DH5	2.888	10	0.289	0.4	-0.111
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.383	7.5	0.029	0.4	-0.371
DH3	1.639	4.25	0.070	0.4	-0.330
DH5	2.888	2.5	0.072	0.4	-0.328









### 8.8.5. OUTPUT POWER

<b>ID:</b>	44353	<b>Date:</b>	8/25/2017
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#### LIMITS

§15.247 (b) (1)

RSS-247 (5.4) (b)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

#### TEST PROCEDURE

The transmitter output is connected to a wideband peak and average power meter.

#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	20.08	30	-9.92
Middle	2441	20.22	30	-9.78
High	2480	20.15	30	-9.85

### 8.8.6. AVERAGE POWER

<b>ID:</b>	44353	<b>Date:</b>	8/25/2017
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#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	19.79
Middle	2441	19.91
High	2480	19.86

### **8.8.7. CONDUCTED SPURIOUS EMISSIONS**

#### **LIMITS**

FCC §15.247 (d)

IC RSS-247 (5.5)

Limit = -20 dBc

#### **TEST PROCEDURE**

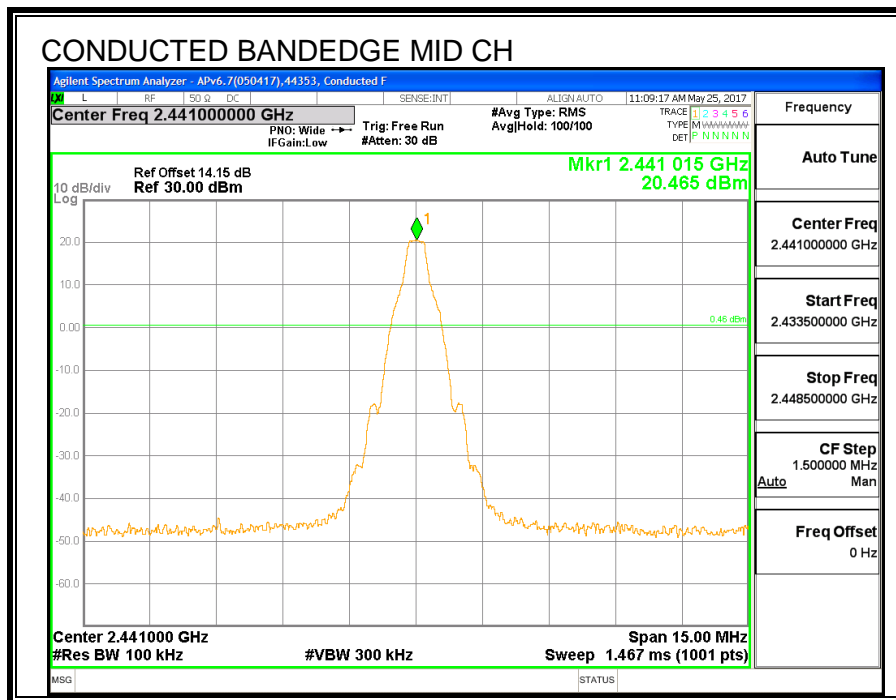
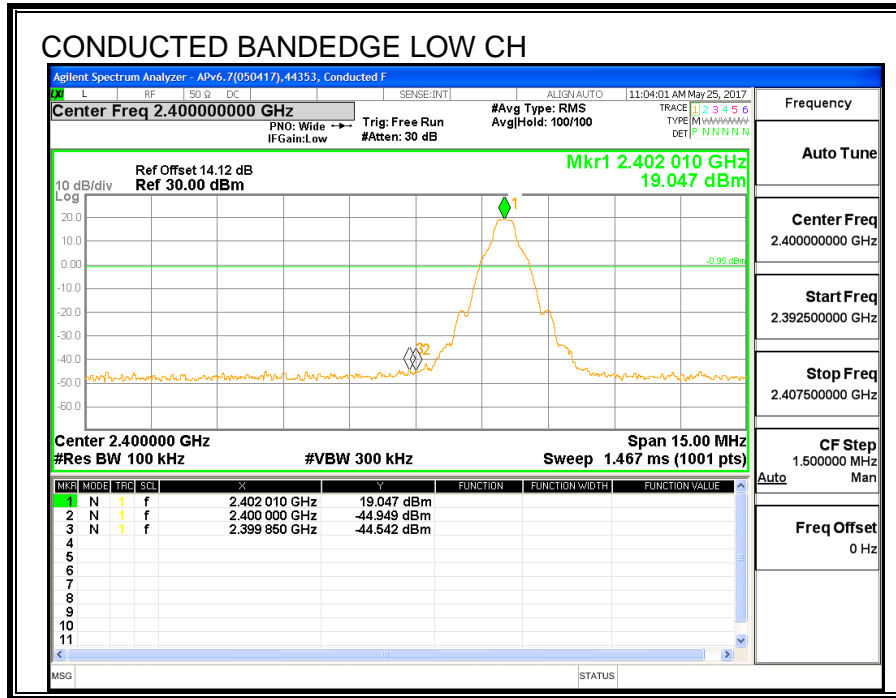
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

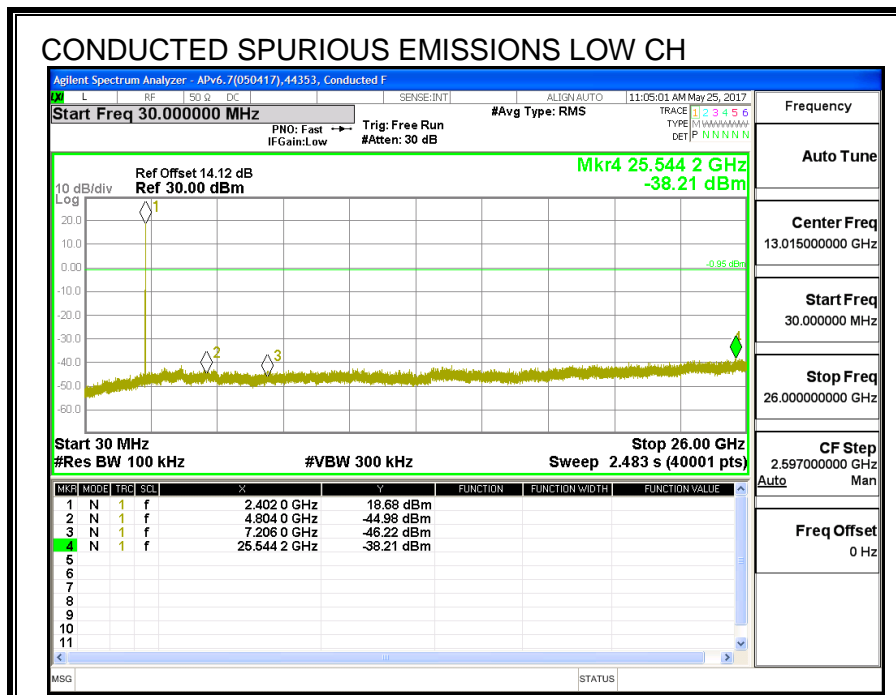
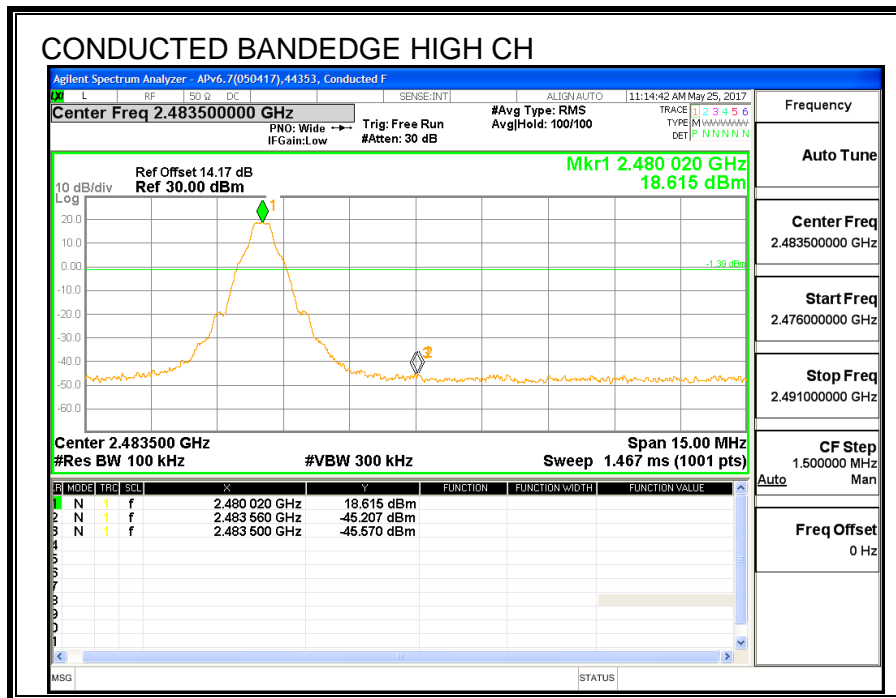
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

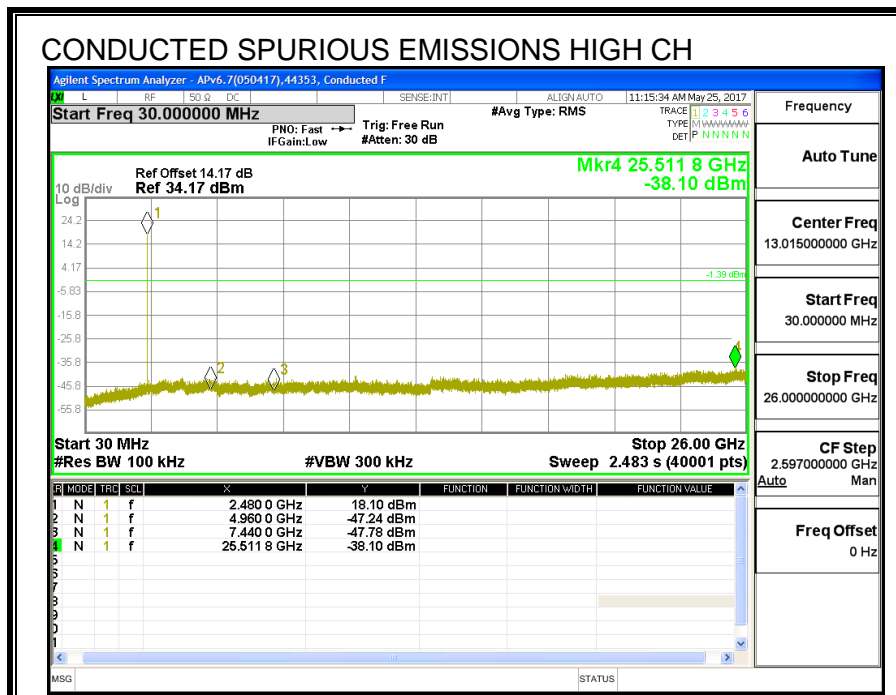
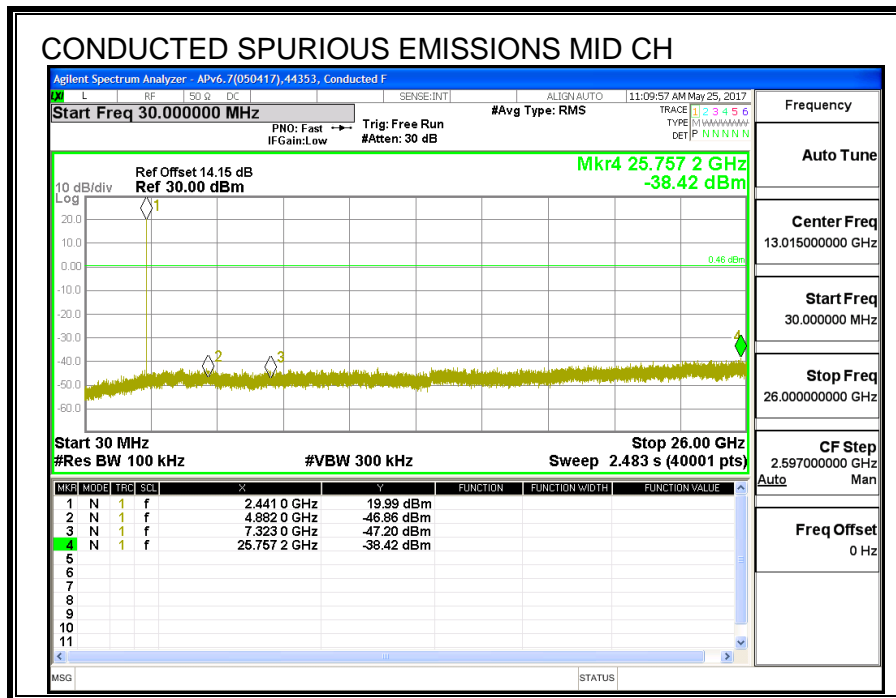
#### **RESULTS**

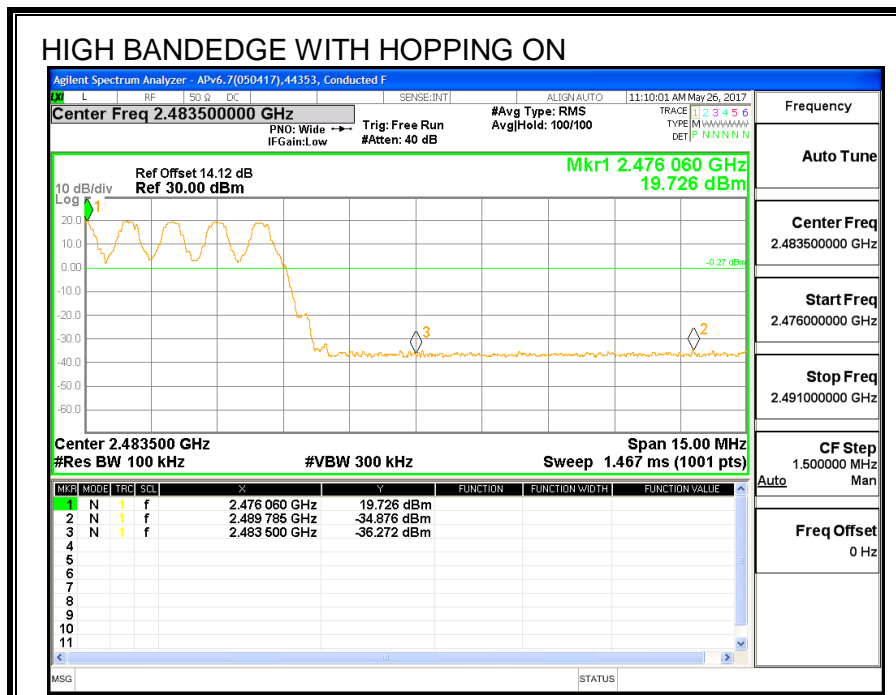
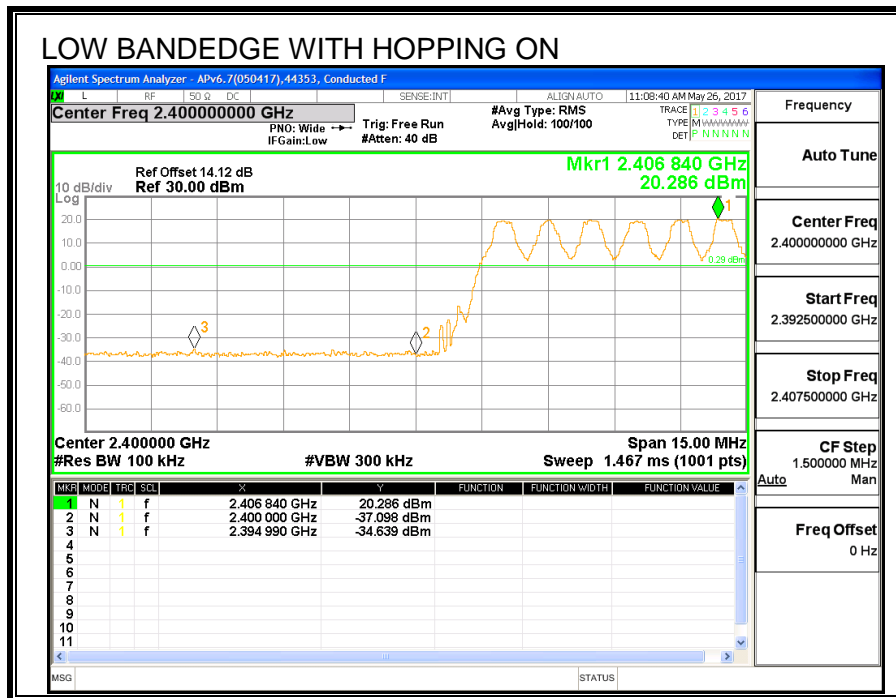
**CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS**











## **8.9. LAT3, HIGH POWER ENHANCED DATA RATE DQPSK MODULATION**

### **8.9.1. OUTPUT POWER**

<b>ID:</b>	30554	<b>Date:</b>	7/29/2017
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#### **LIMITS**

§15.247 (b) (1)

RSS-247 (5.4) (b)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

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

#### **TEST PROCEDURE**

The transmitter output is connected to a wideband peak and average power meter.

#### **RESULTS**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Output Power (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
Low	2402	20.11	21	-10.89
Middle	2441	20.23	21	-10.77
High	2480	20.17	21	-10.83

### 8.9.2. AVERAGE POWER

<b>ID:</b>	30554	<b>Date:</b>	7/29/2017
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#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	17.75
Middle	2441	17.86
High	2480	17.78

## **8.10. LAT3, HIGH POWER ENHANCED DATA RATE 8PSK MODULATION**

### **8.10.1. 20 dB AND 99% BANDWIDTH**

#### **LIMITS**

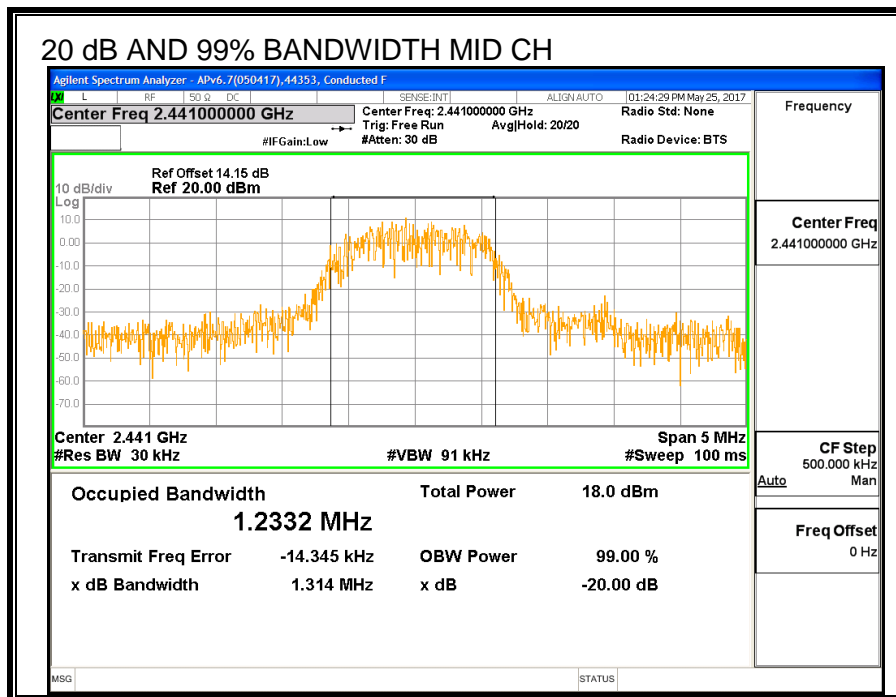
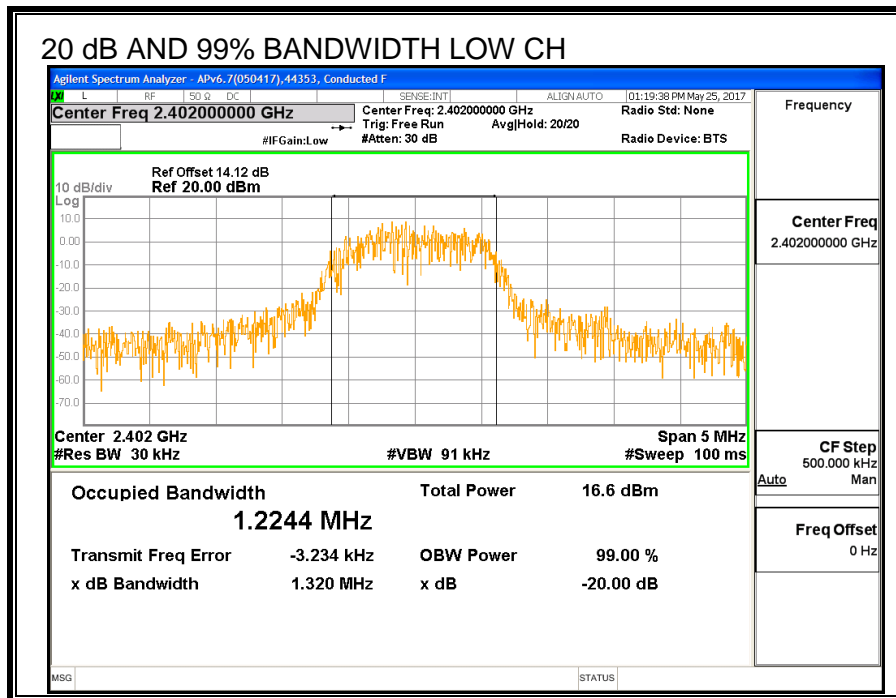
None; for reporting purposes only.

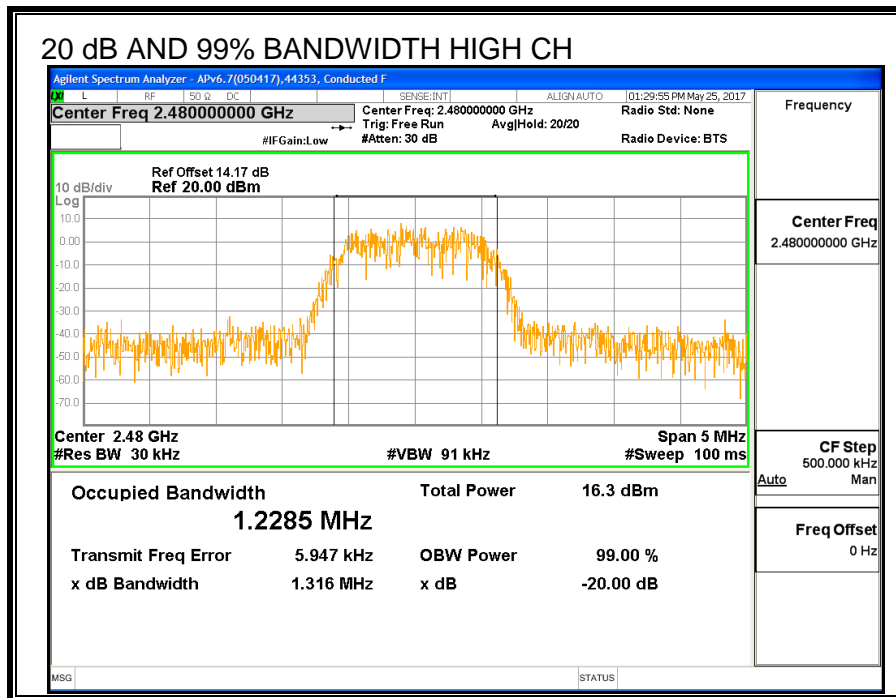
#### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

#### **RESULTS**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>20 dB Bandwidth (KHz)</b>	<b>99% Bandwidth (KHz)</b>
Low	2402	1320	1224.4
Middle	2441	1314	1233.2
High	2480	1316	1228.5





## 8.10.2. HOPPING FREQUENCY SEPARATION

### LIMITS

FCC §15.247 (a) (1)

IC RSS-247 (5.1) (b)

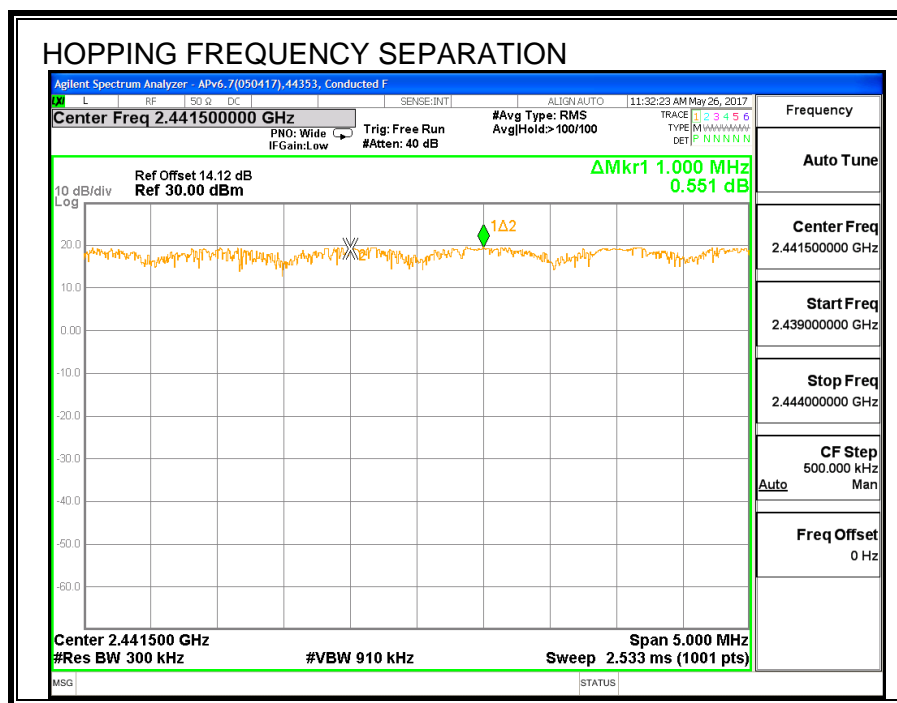
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 910 kHz. The sweep time is coupled.

### RESULTS





### 8.10.3. NUMBER OF HOPPING CHANNELS

#### LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

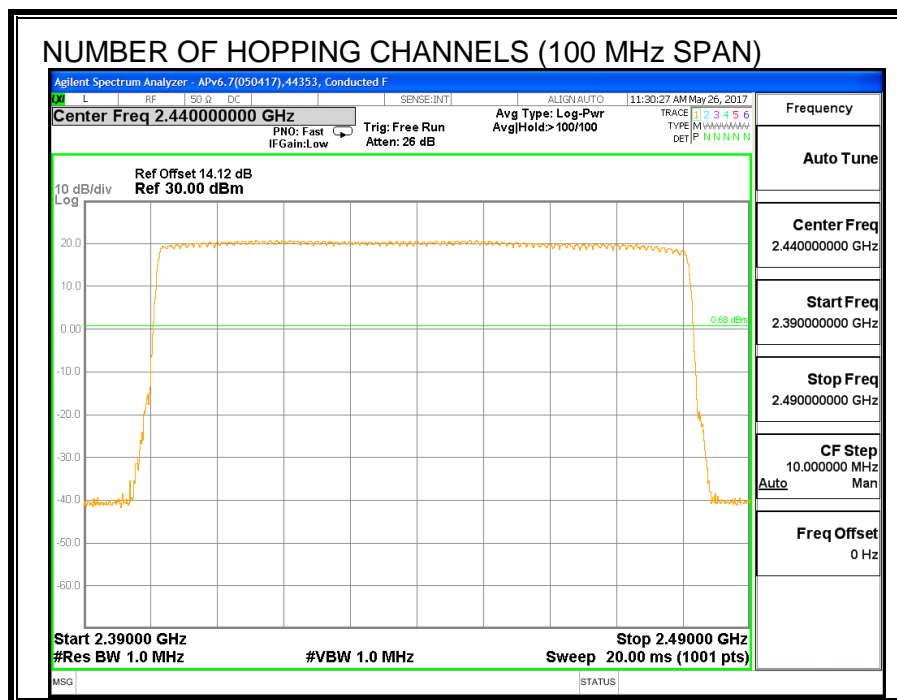
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

#### TEST PROCEDURE

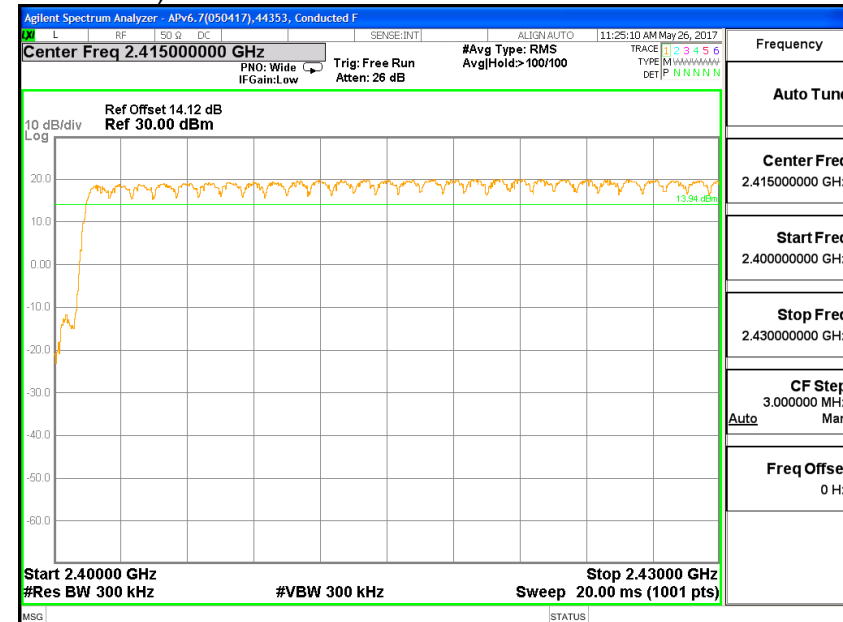
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

#### RESULTS

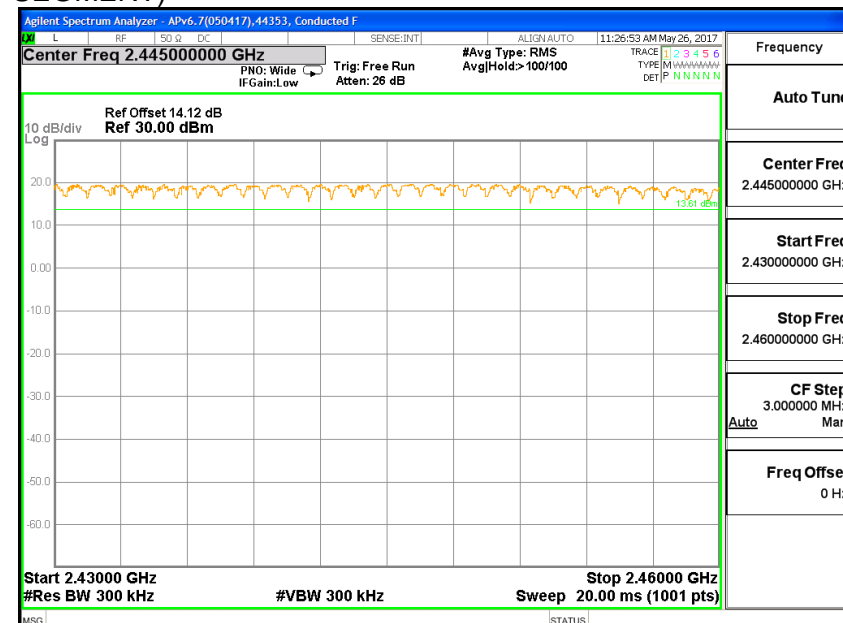
Normal Mode: 79 Channels observed.

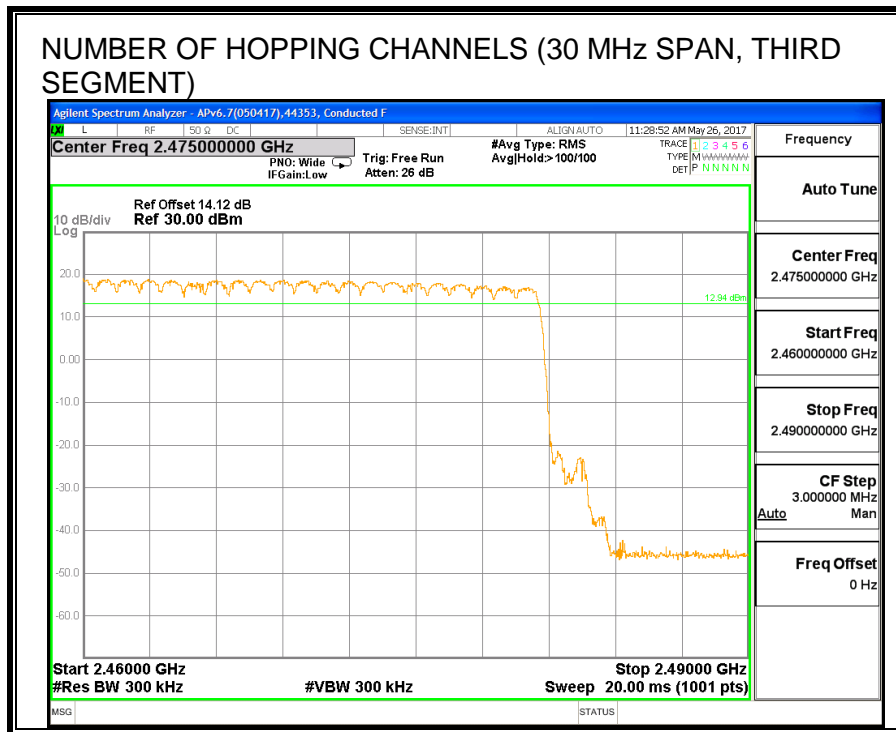


### NUMBER OF HOPPING CHANNELS (30 MHz SPAN, FIRST SEGMENT)



### NUMBER OF HOPPING CHANNELS (30 MHz SPAN, SECOND SEGMENT)





## 8.10.4. AVERAGE TIME OF OCCUPANCY

### LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

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

### TEST PROCEDURE

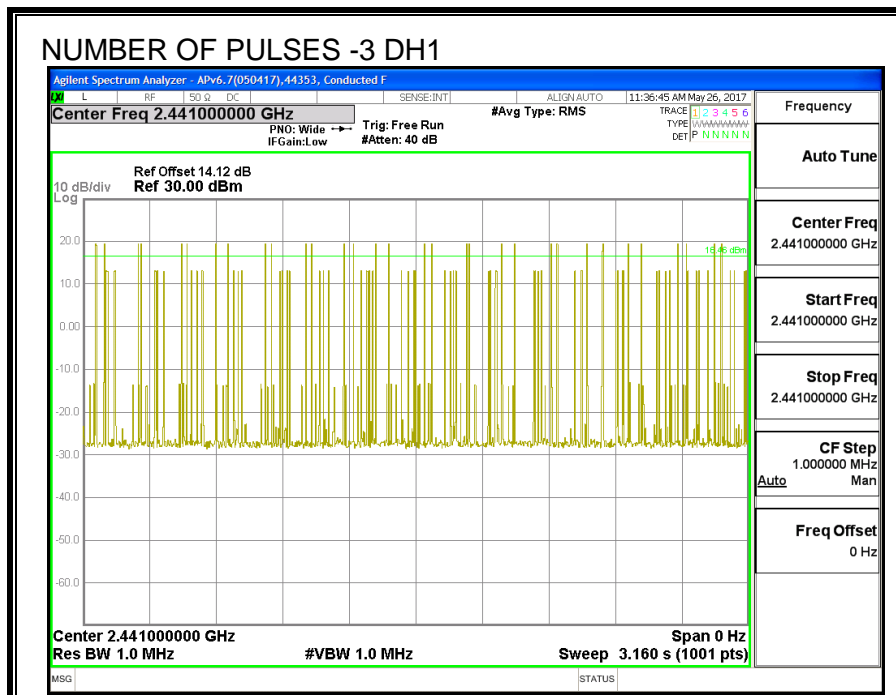
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

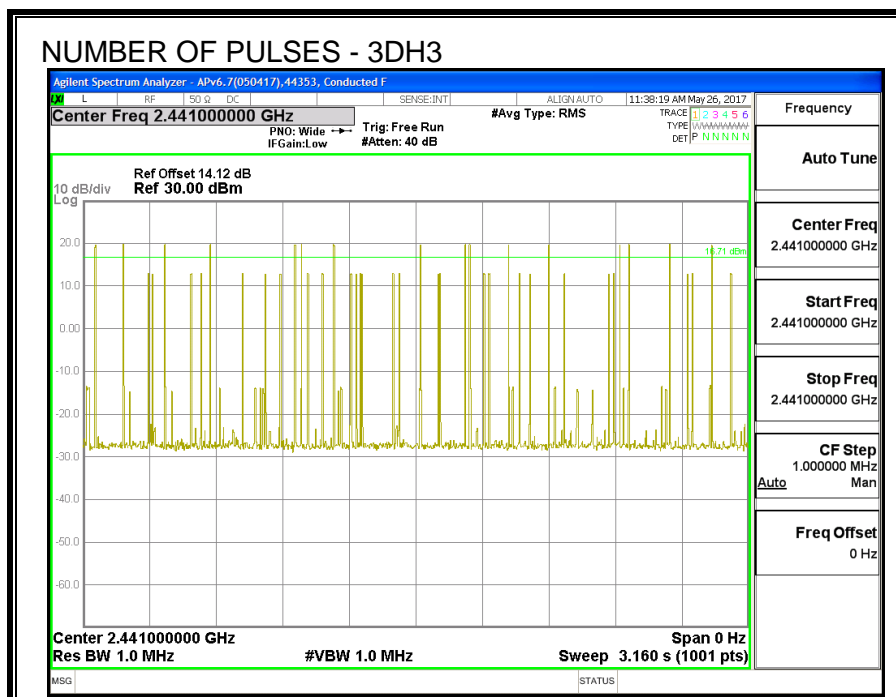
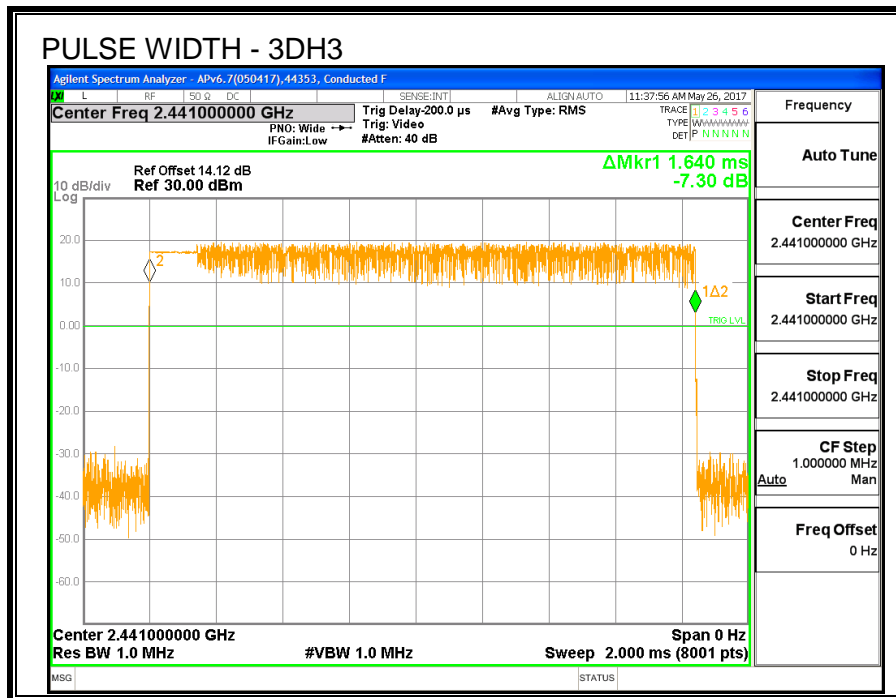
The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$ .

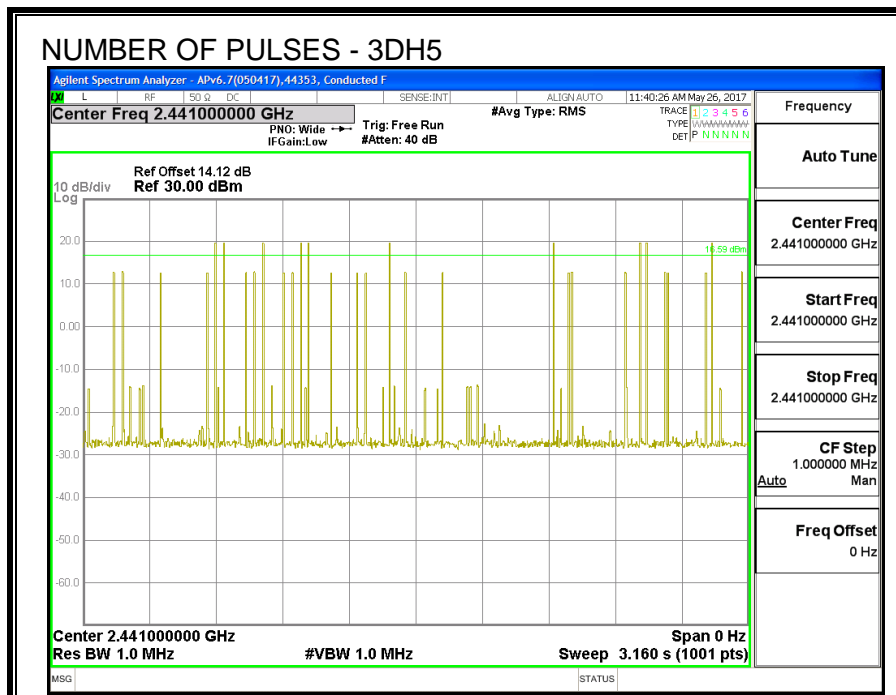
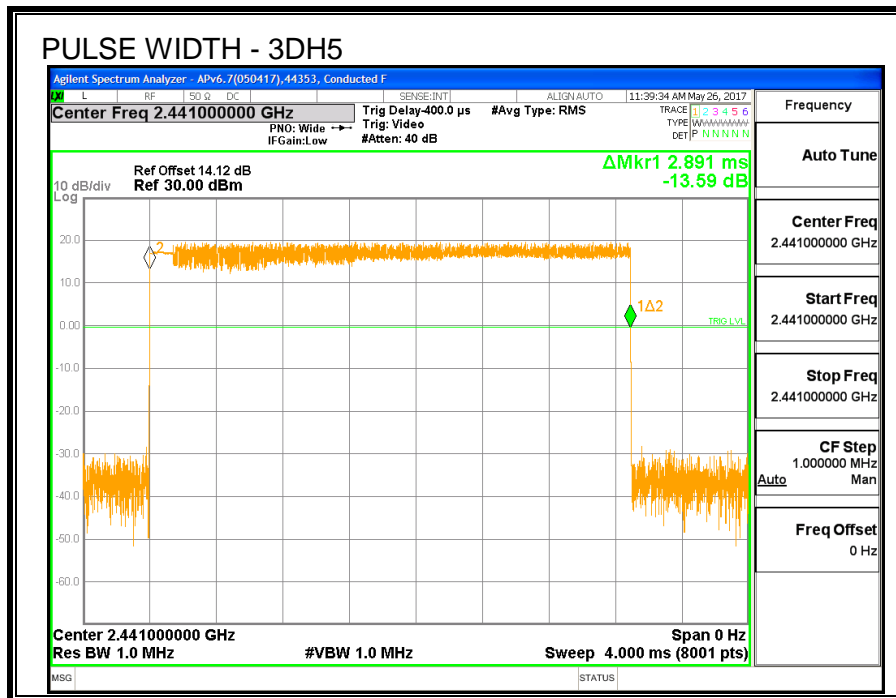
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$ .

### RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK (EDR) Mode					
3DH1	0.3888	32	0.124	0.4	-0.276
3DH3	1.64	16	0.262	0.4	-0.138
3DH5	2.891	10	0.289	0.4	-0.111







### 8.10.5. OUTPUT POWER

<b>ID:</b>	30554	<b>Date:</b>	7/29/2017
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#### LIMITS

§15.247 (b) (1)

RSS-247 (5.4) (b)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

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

#### TEST PROCEDURE

The transmitter output is connected to a wideband peak and average power meter.

#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	20.23	21	-0.77
Middle	2441	20.36	21	-0.64
High	2480	20.18	21	-0.82



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**8.10.6. AVERAGE POWER**

<b>ID:</b>	30554	<b>Date:</b>	7/29/2017
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**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

**RESULTS**

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	17.81
Middle	2441	17.95
High	2480	17.79

## **8.10.7. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-247 (5.5)

Limit = -20 dBc

### **TEST PROCEDURE**

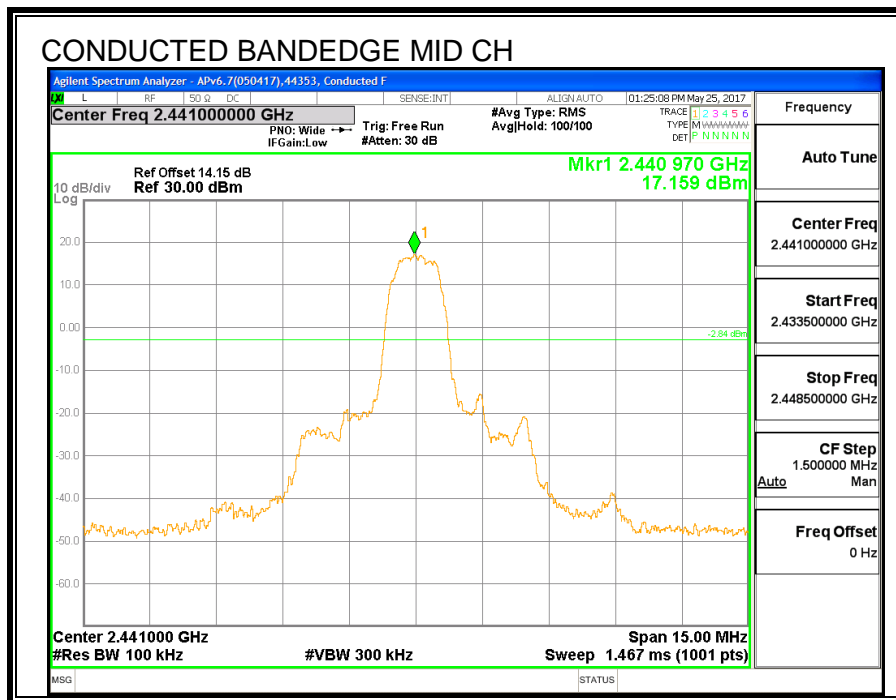
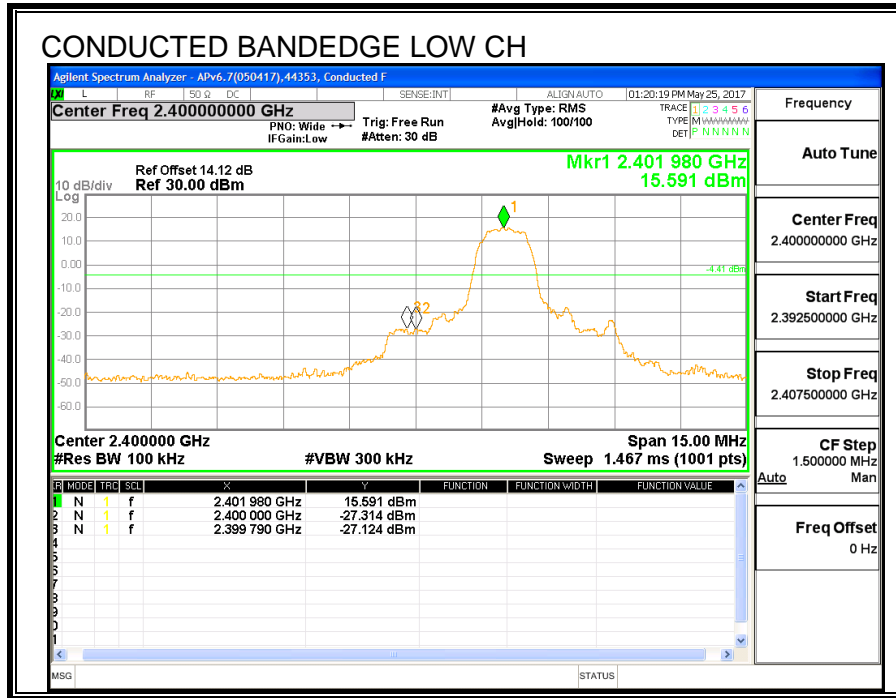
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

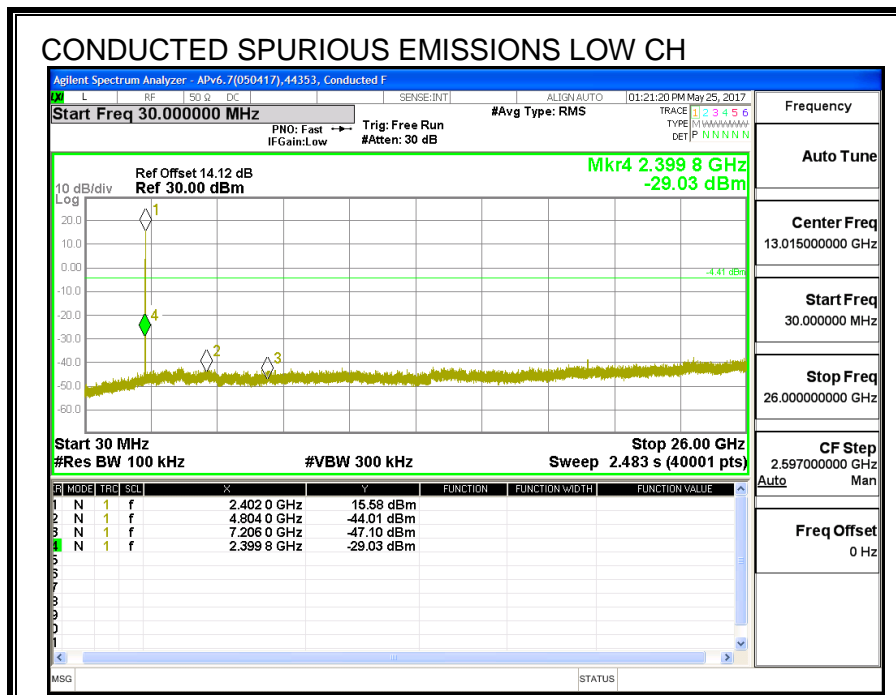
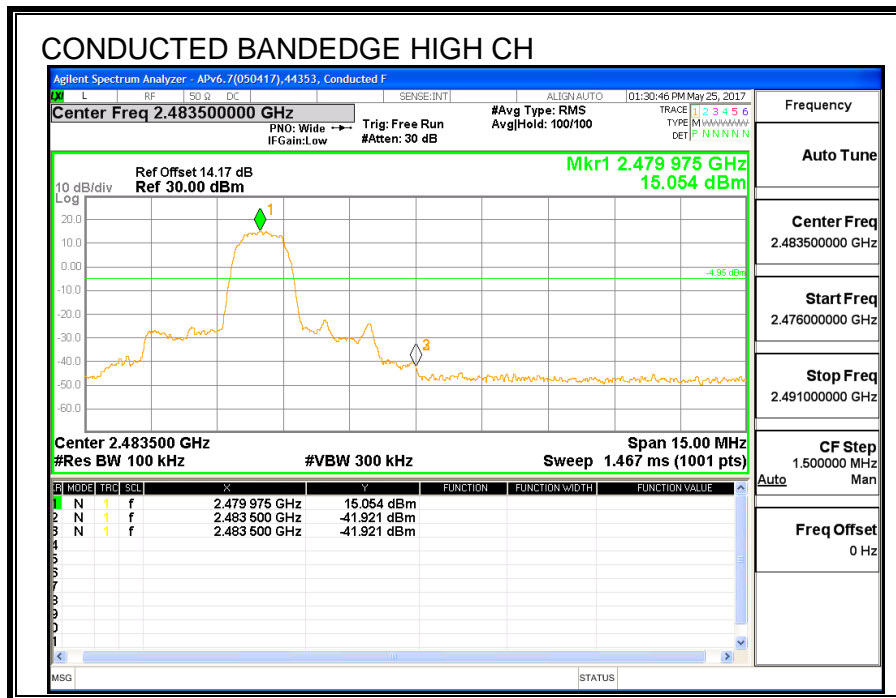
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

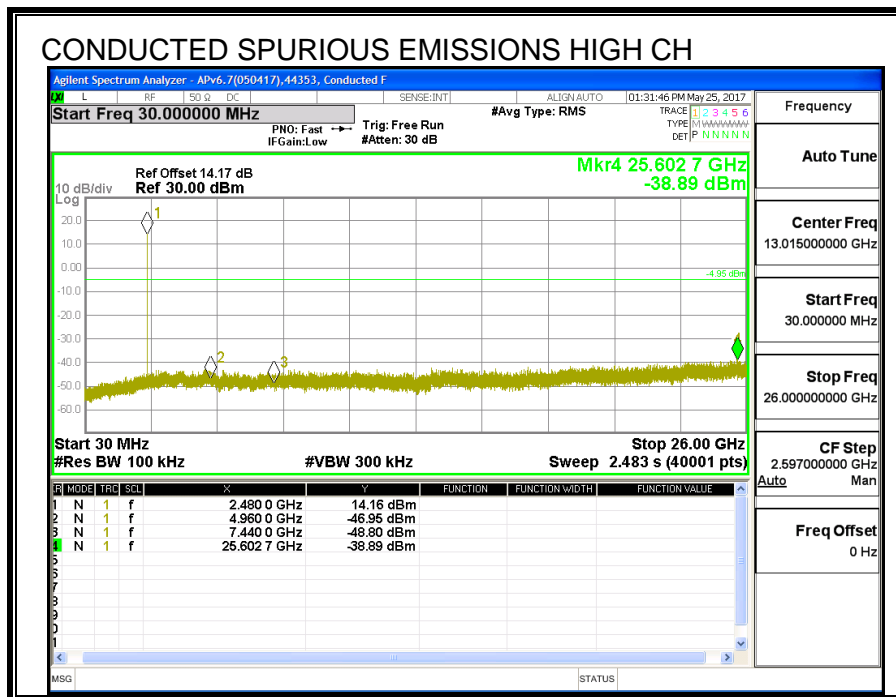
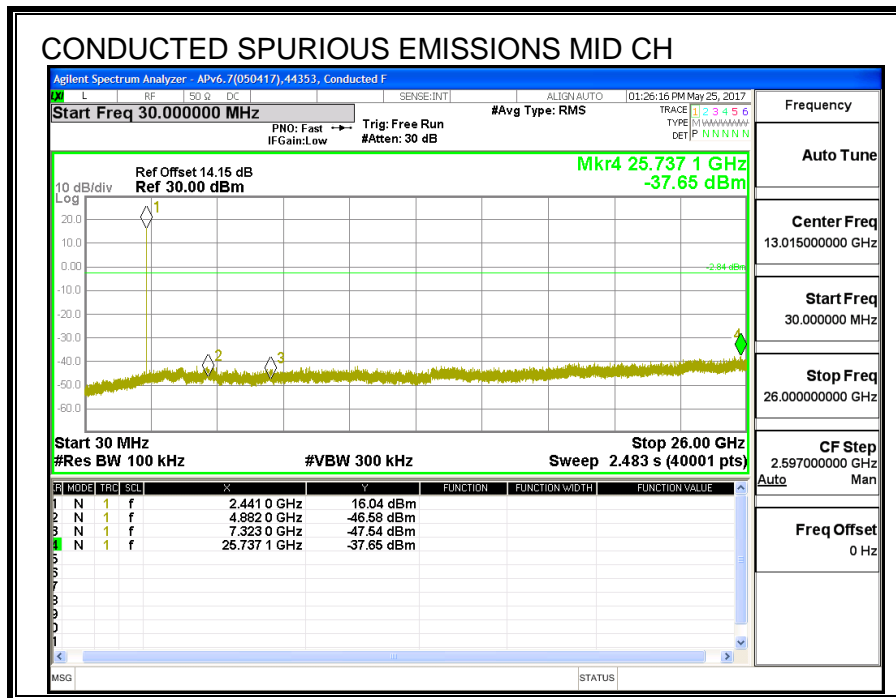
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

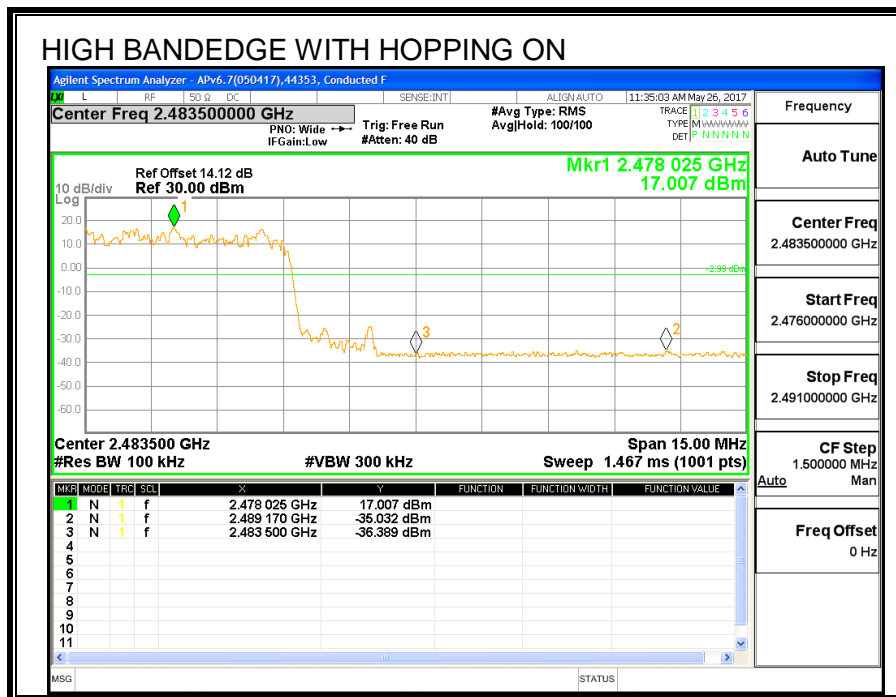
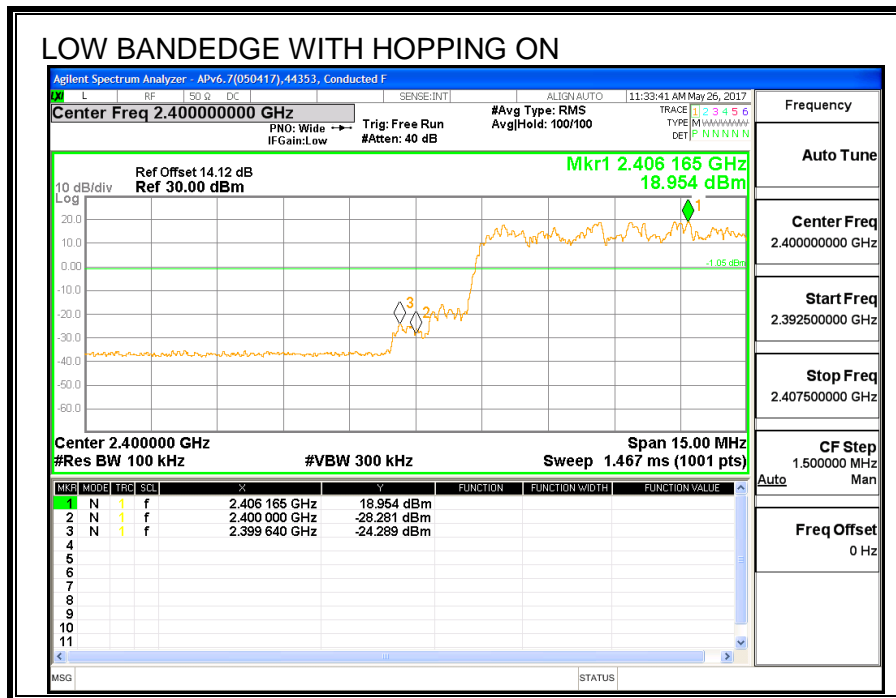
### **RESULTS**

**CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS**









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## **8.11. LAT3, LOW POWER BASIC DATA RATE GFSK MODULATION**

### **8.11.1. 20 dB AND 99% BANDWIDTH**

#### **LIMITS**

None; for reporting purposes only.

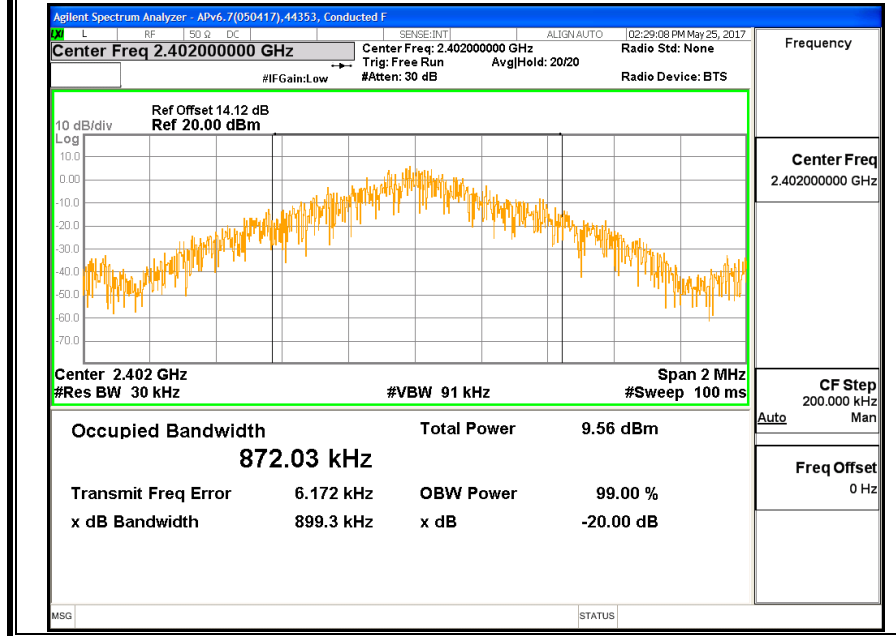
#### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

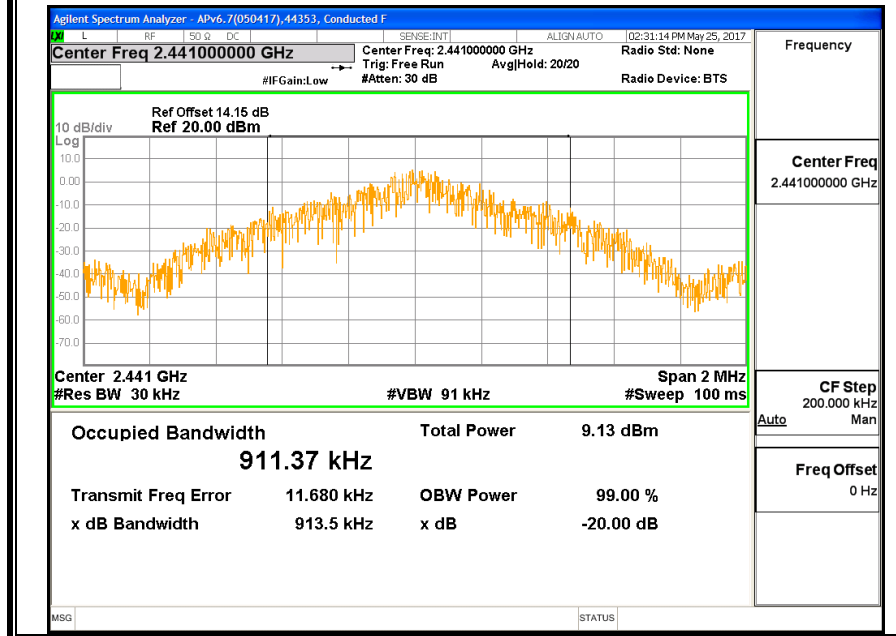
#### **RESULTS**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>20 dB Bandwidth (KHz)</b>	<b>99% Bandwidth (KHz)</b>
Low	2402	899.3	872.03
Middle	2441	913.5	911.37
High	2480	913.4	892.18

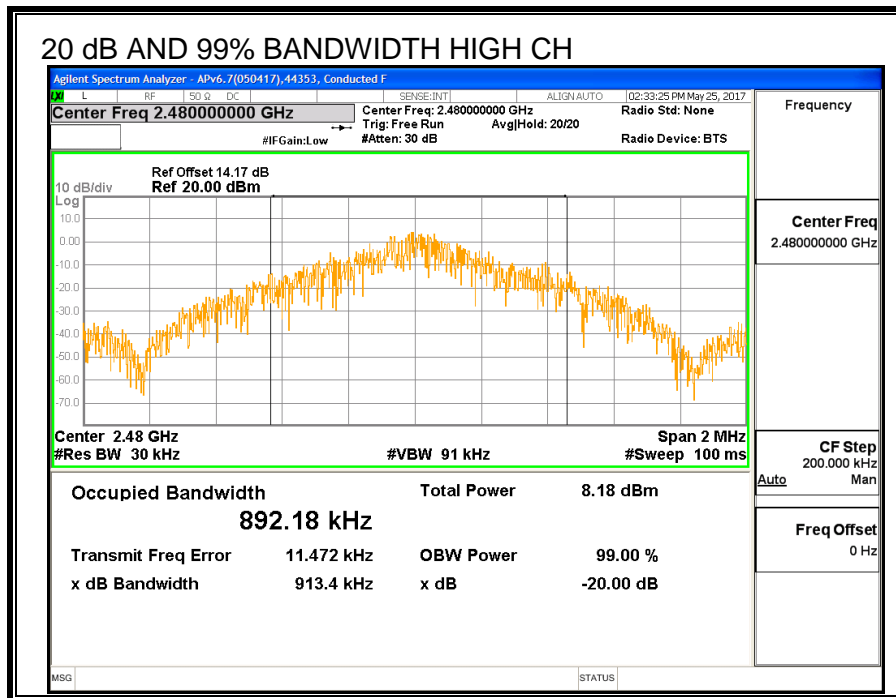
### 20 dB AND 99% BANDWIDTH LOW CH



### 20 dB AND 99% BANDWIDTH MID CH







## 8.11.2. HOPPING FREQUENCY SEPARATION

### LIMITS

FCC §15.247 (a) (1)

IC RSS-247 (5.1) (b)

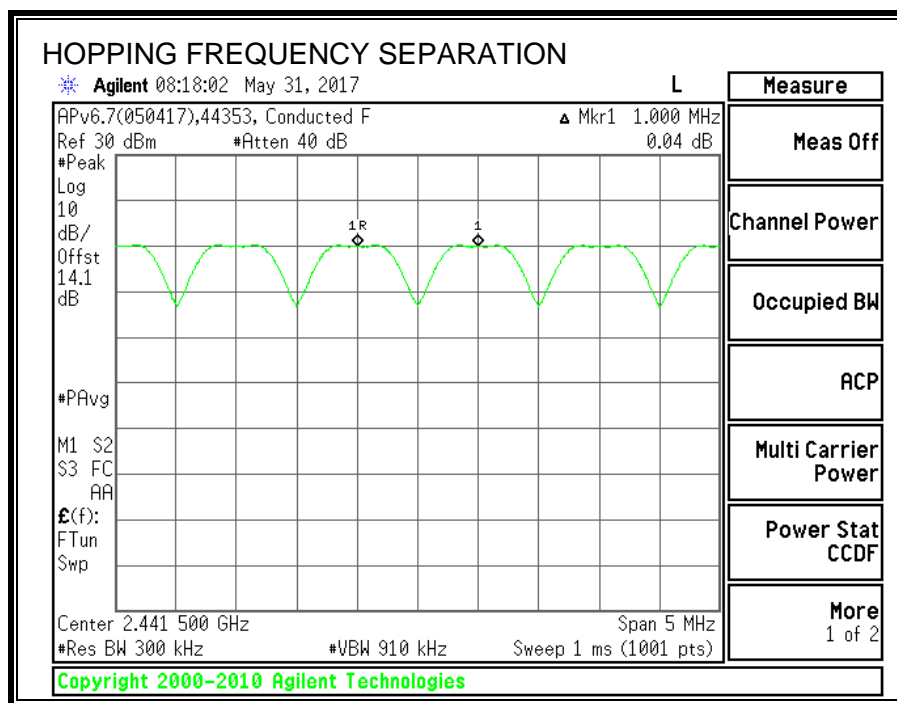
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 910 kHz. The sweep time is coupled.

### RESULTS



### 8.11.3. NUMBER OF HOPPING CHANNELS

#### LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

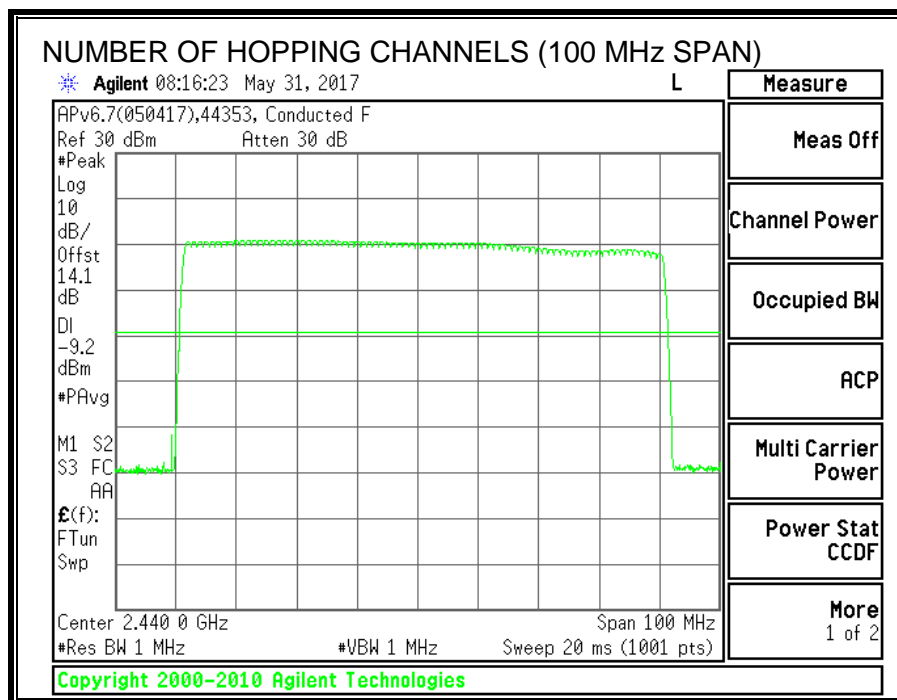
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

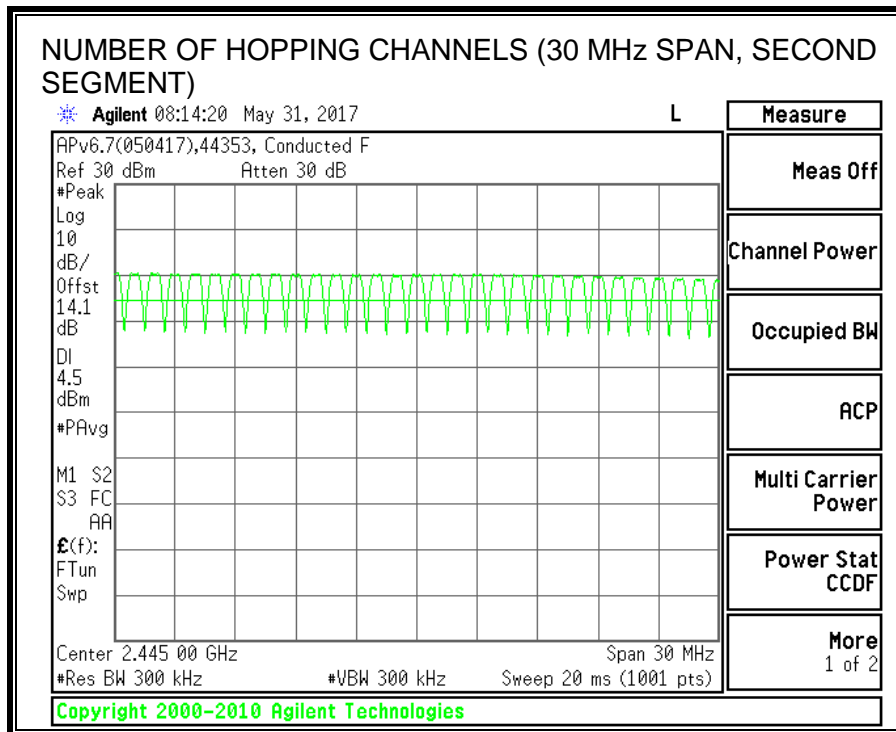
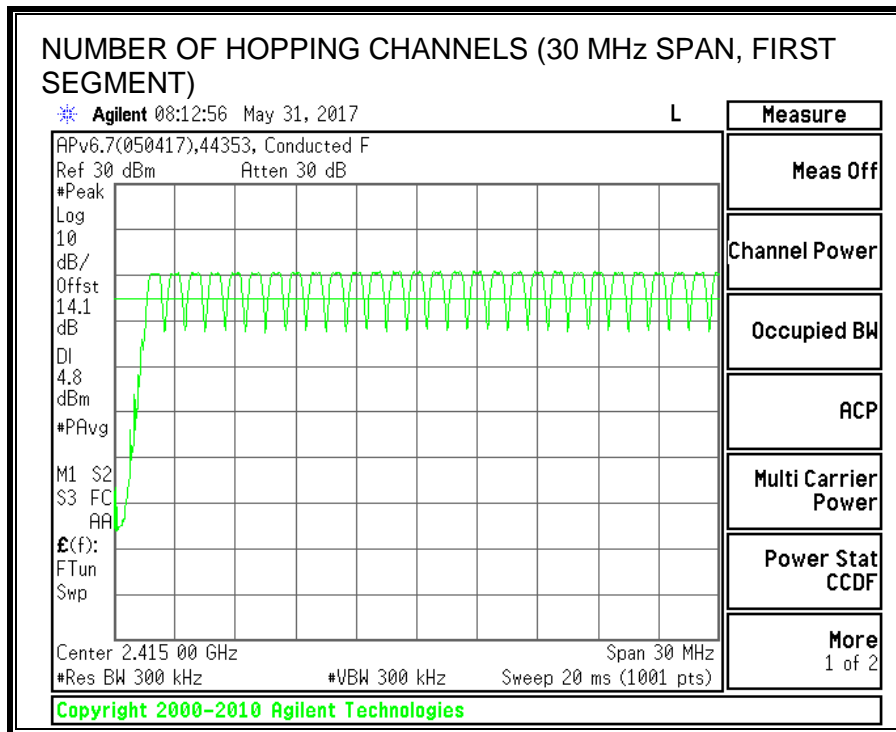
#### TEST PROCEDURE

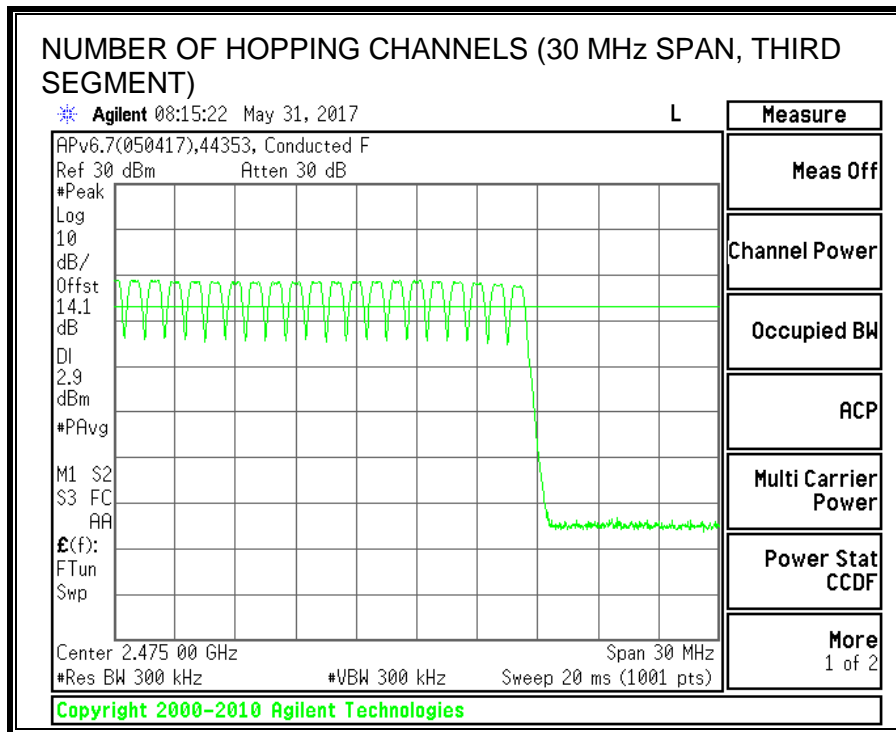
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

#### RESULTS

Normal Mode: 79 Channels observed.







## 8.11.4. AVERAGE TIME OF OCCUPANCY

### LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

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

### TEST PROCEDURE

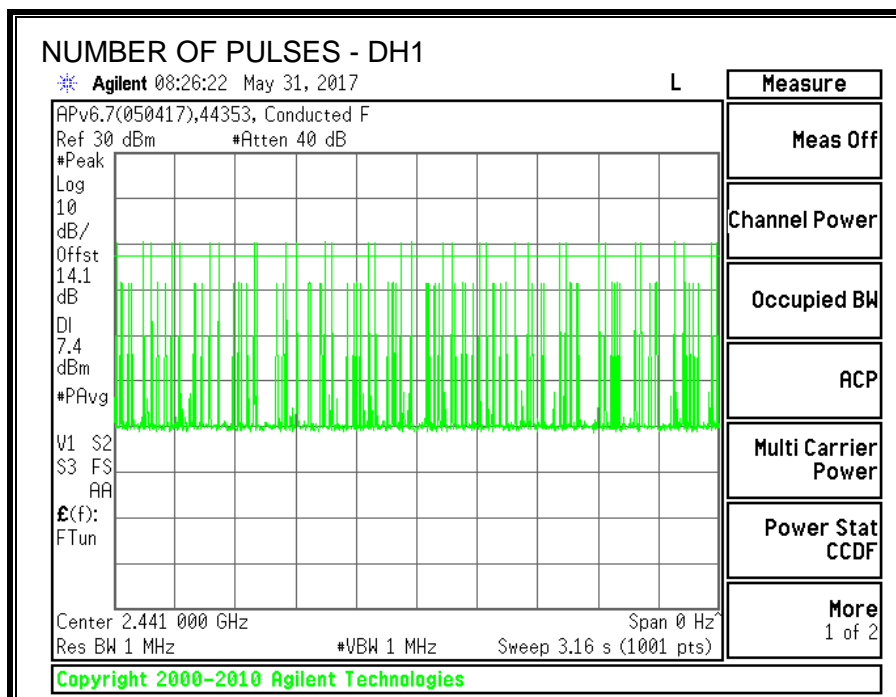
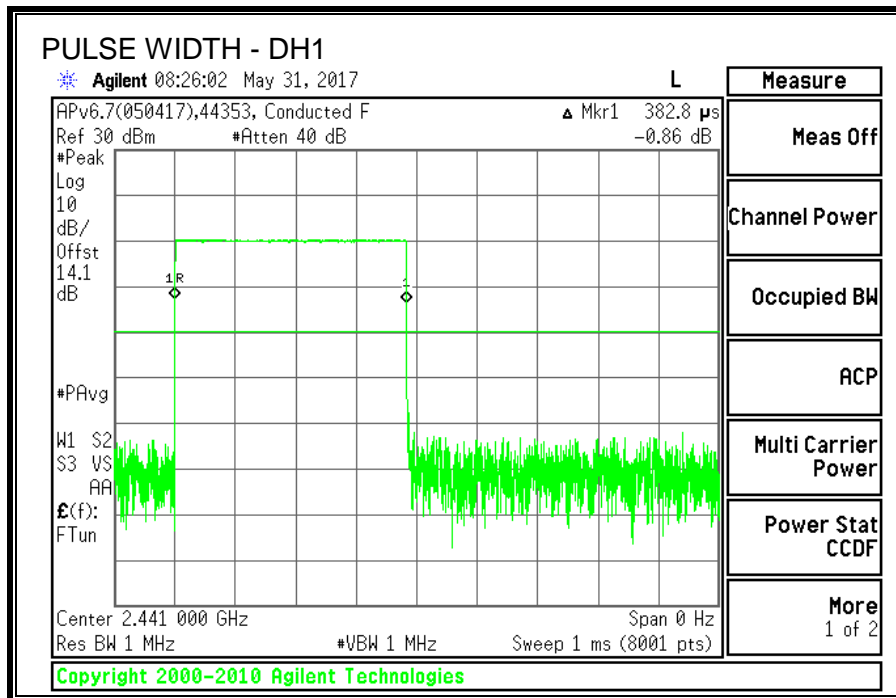
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

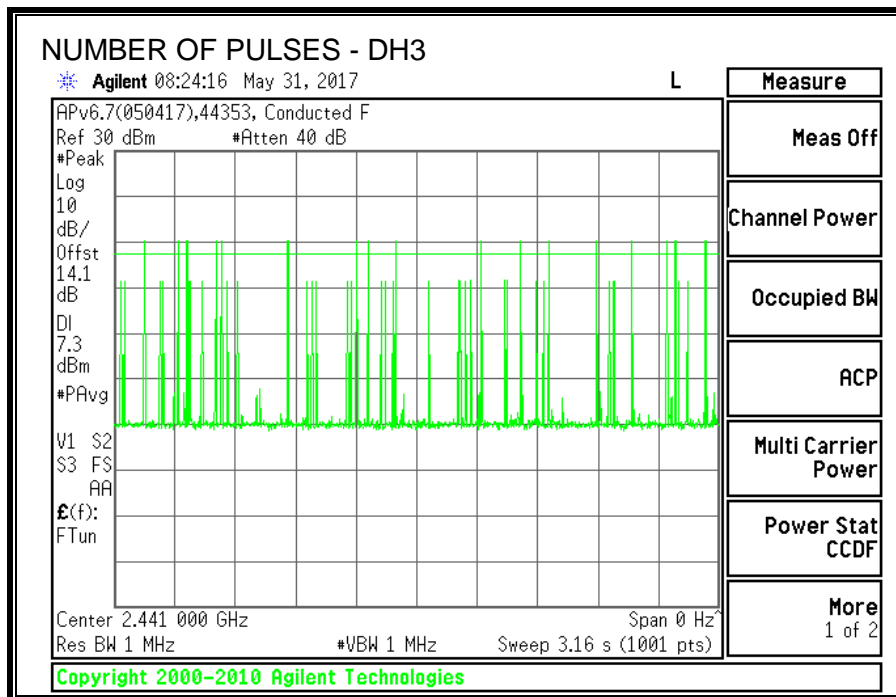
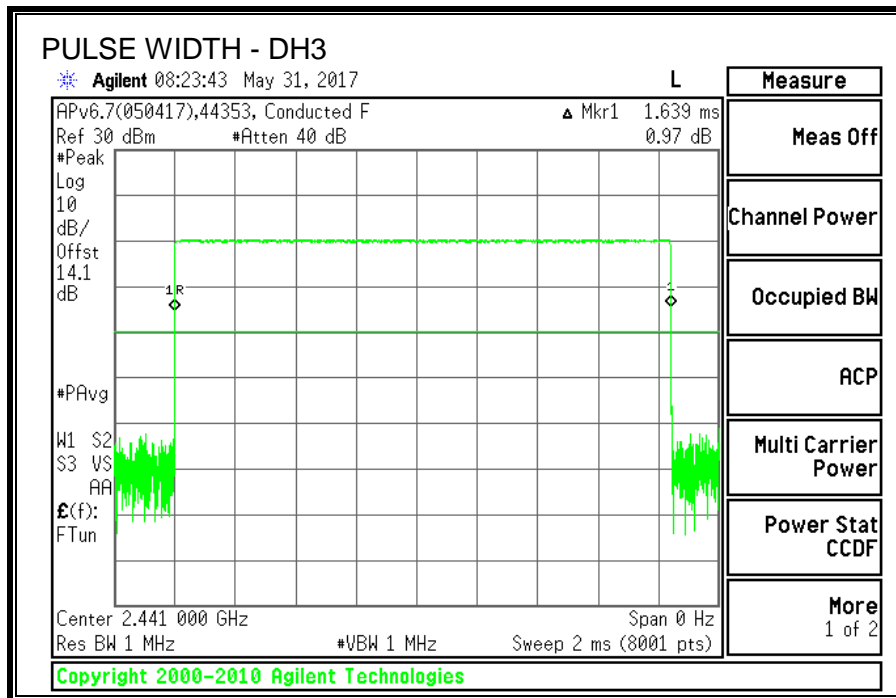
The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$ .

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

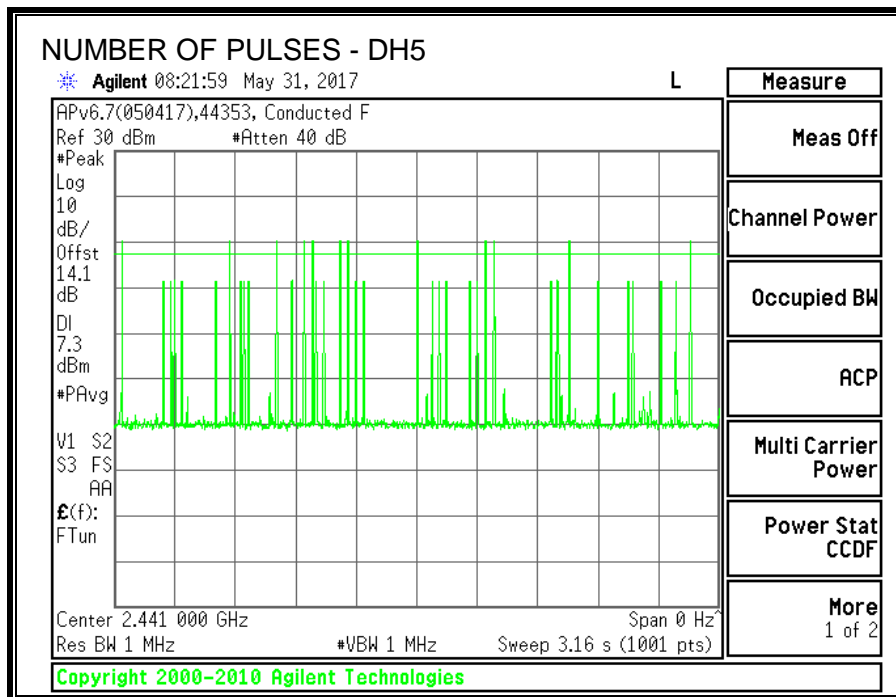
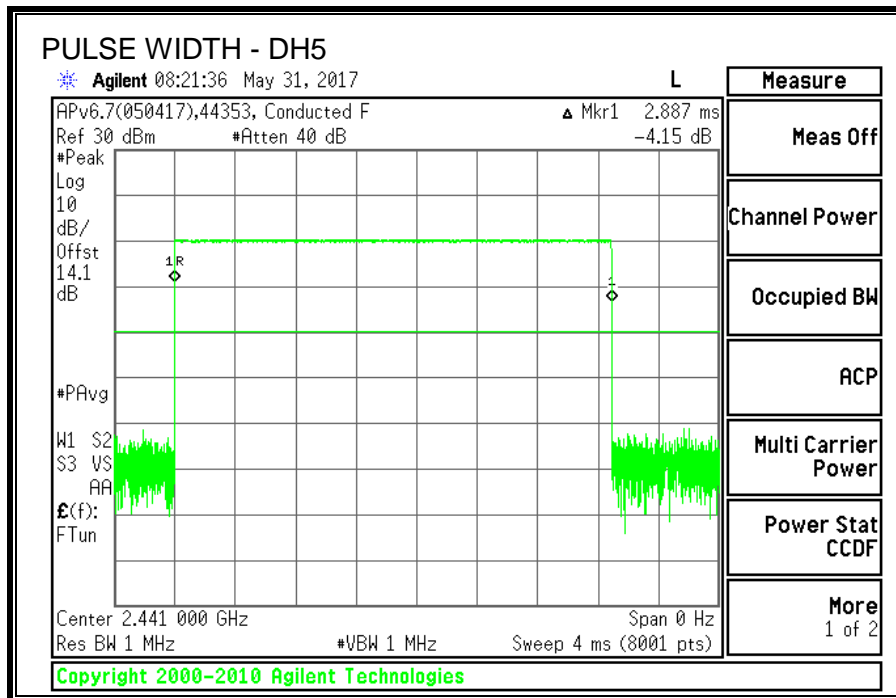
### RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.3828	33	0.126	0.4	-0.274
DH3	1.639	17	0.279	0.4	-0.121
DH5	2.887	12	0.346	0.4	-0.054
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.3828	8.25	0.032	0.4	-0.368
DH3	1.639	4.25	0.070	0.4	-0.330
DH5	2.887	3	0.087	0.4	-0.313









### 8.11.5. OUTPUT POWER

<b>ID:</b>	44353	<b>Date:</b>	8/25/2017
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#### LIMITS

§15.247 (b) (1)

RSS-247 (5.4) (b)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

#### TEST PROCEDURE

The transmitter output is connected to a wideband peak and average power meter.

#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.14	30	-19.86
Middle	2441	10.21	30	-19.79
High	2480	10.09	30	-19.91

---

**8.11.6. AVERAGE POWER**

<b>ID:</b>	44353	<b>Date:</b>	8/25/2017
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**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

**RESULTS**

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.83
Middle	2441	9.91
High	2480	9.78

## **8.11.7. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-247 (5.5)

Limit = -20 dBc

### **TEST PROCEDURE**

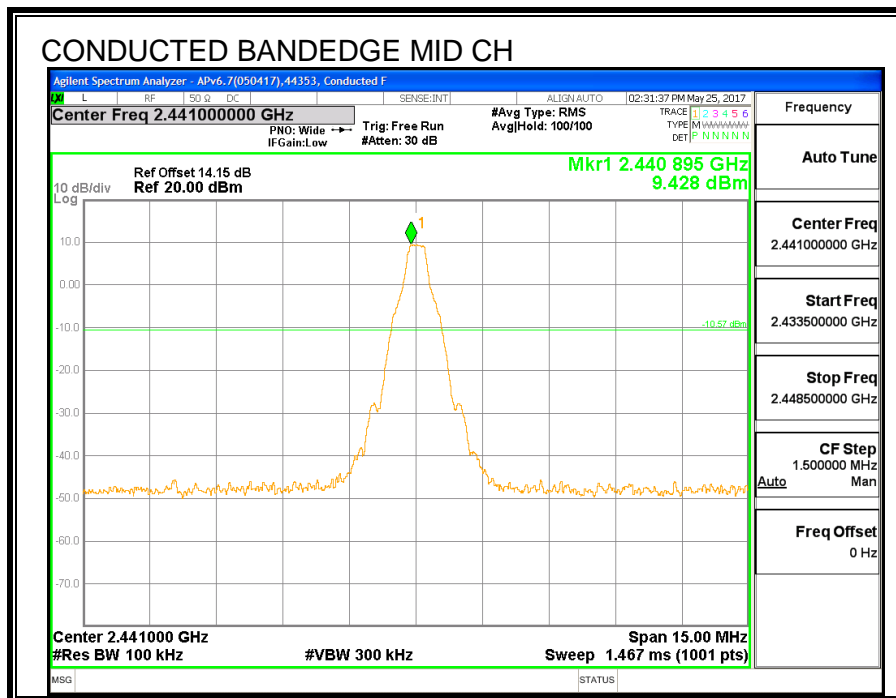
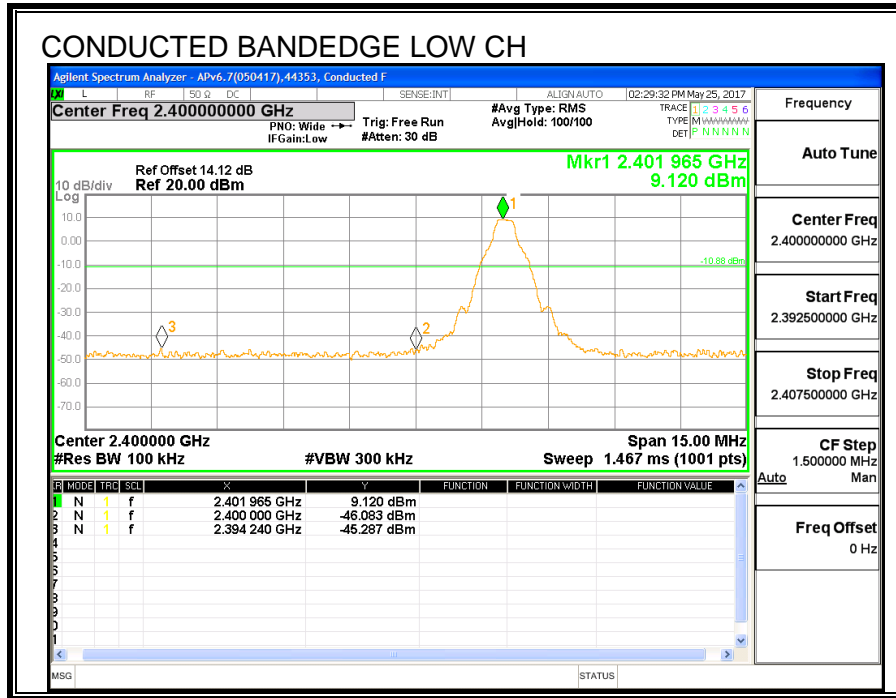
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

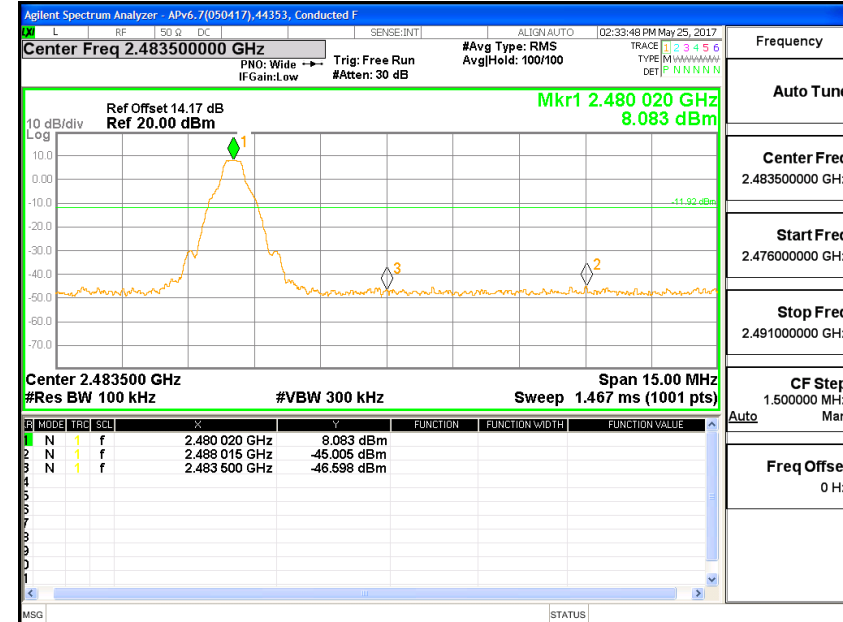
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

### **RESULTS**

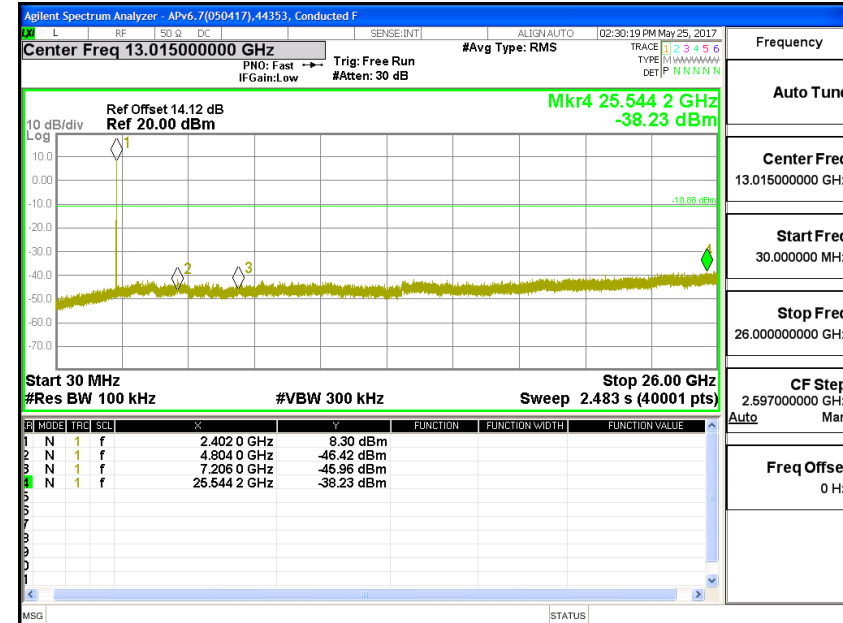
**CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS**



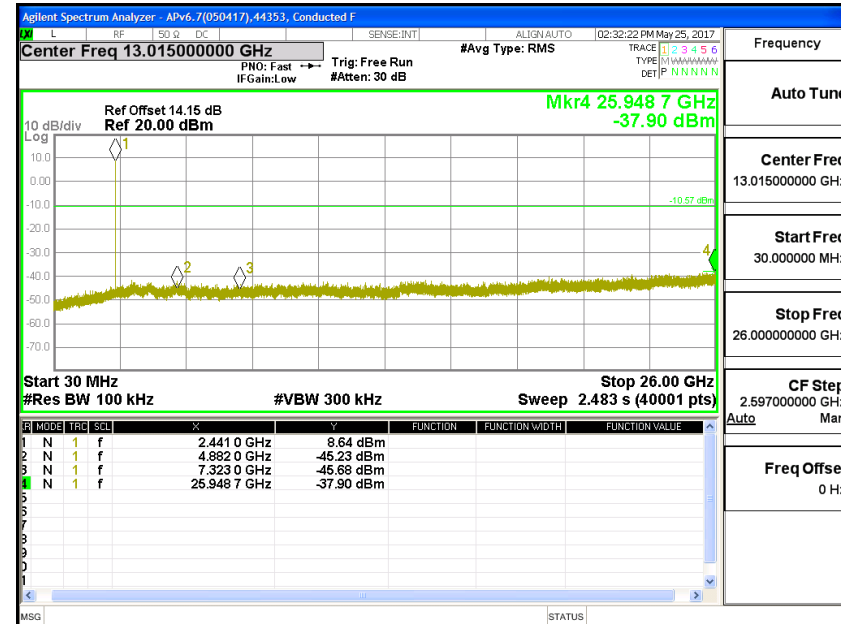
## CONDUCTED BANDEDGE HIGH CH



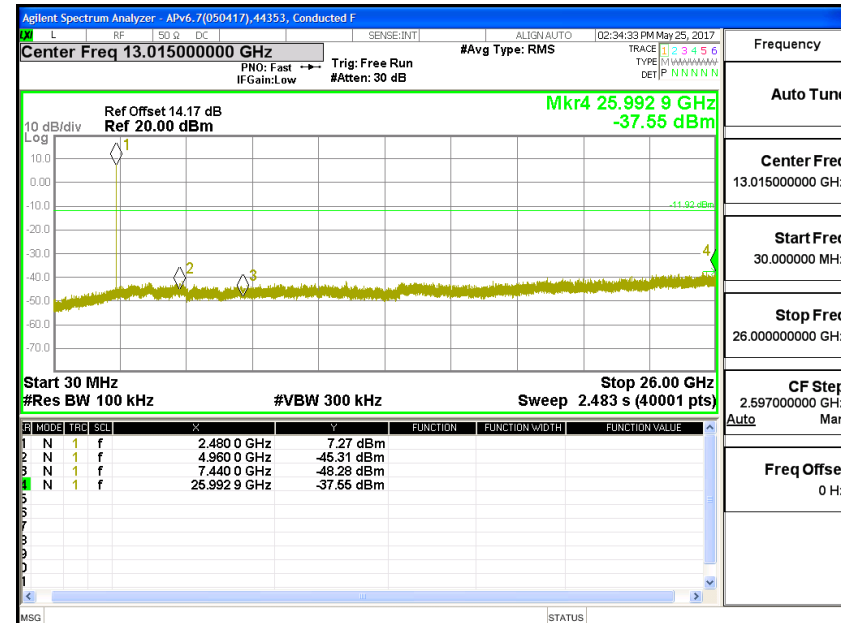
## CONDUCTED SPURIOUS EMISSIONS LOW CH



## CONDUCTED SPURIOUS EMISSIONS MID CH



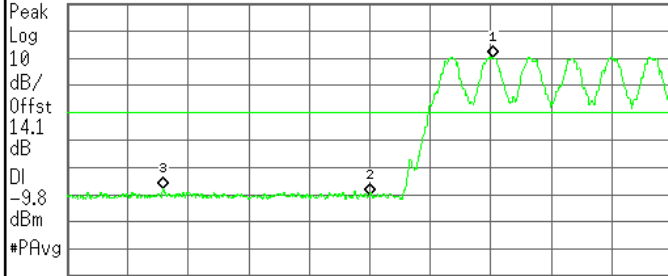
## CONDUCTED SPURIOUS EMISSIONS HIGH CH



### LOW BANDEDGE WITH HOPPING ON

Agilent 08:19:49 May 31, 2017

APv6.7(050417),44353, Conducted F Mkr1 2.403 045 GHz  
Ref 30 dBm #Atten 40 dB 10.20 dBm



Center 2.400 000 GHz Span 15 MHz  
#Res BW 100 kHz #VBW 300 kHz Sweep 1.467 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.403 045 GHz	10.20 dBm
2	(1)	Freq	2.400 000 GHz	-40.06 dBm
3	(1)	Freq	2.394 870 GHz	-37.76 dBm

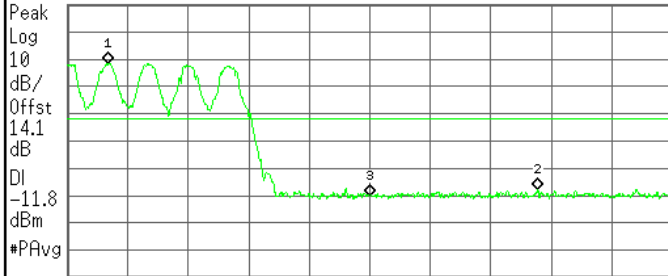
Measure
Meas Off
Channel Power
Occupied BW
ACP
Multi Carrier Power
Power Stat CCDF
More 1 of 2

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### HIGH BANDEDGE WITH HOPPING ON

Agilent 08:20:54 May 31, 2017

APv6.7(050417),44353, Conducted F Mkr1 2.477 005 GHz  
Ref 30 dBm #Atten 40 dB 8.21 dBm



Center 2.483 500 GHz Span 15 MHz  
#Res BW 100 kHz #VBW 300 kHz Sweep 1.467 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.477 005 GHz	8.21 dBm
2	(1)	Freq	2.487 655 GHz	-37.56 dBm
3	(1)	Freq	2.483 500 GHz	-40.36 dBm

Measure
Meas Off
Channel Power
Occupied BW
ACP
Multi Carrier Power
Power Stat CCDF
More 1 of 2

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## 8.12. LAT3, LOW POWER ENHANCED DATA RATE DQPSK MODULATION

### 8.12.1. OUTPUT POWER

<b>ID:</b>	30554	<b>Date:</b>	7/29/2017
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#### LIMITS

§15.247 (b) (1)

RSS-247 (5.4) (b)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

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

#### TEST PROCEDURE

The transmitter output is connected to a wideband peak and average power meter.

#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.61	21	-10.39
Middle	2441	10.80	21	-10.80
High	2480	10.72	21	-10.28

---

**8.12.2. AVERAGE POWER**

<b>ID:</b>	30554	<b>Date:</b>	7/29/2017
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**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

**RESULTS**

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.26
Middle	2441	8.39
High	2480	8.31

## **8.13. LAT3, LOW POWER ENHANCED DATA RATE 8PSK MODULATION**

### **8.13.1. 20 dB AND 99% BANDWIDTH**

#### **LIMITS**

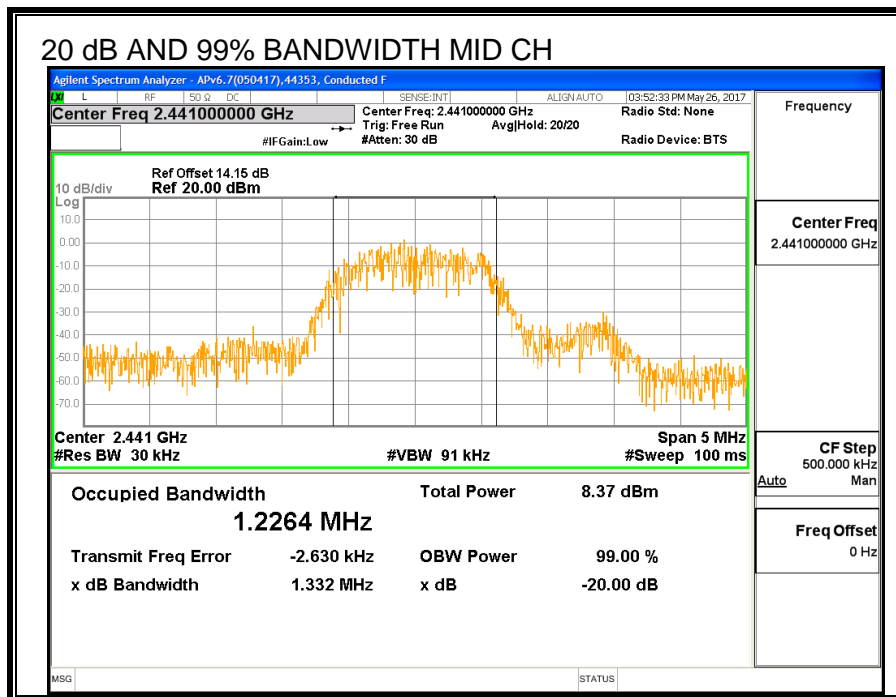
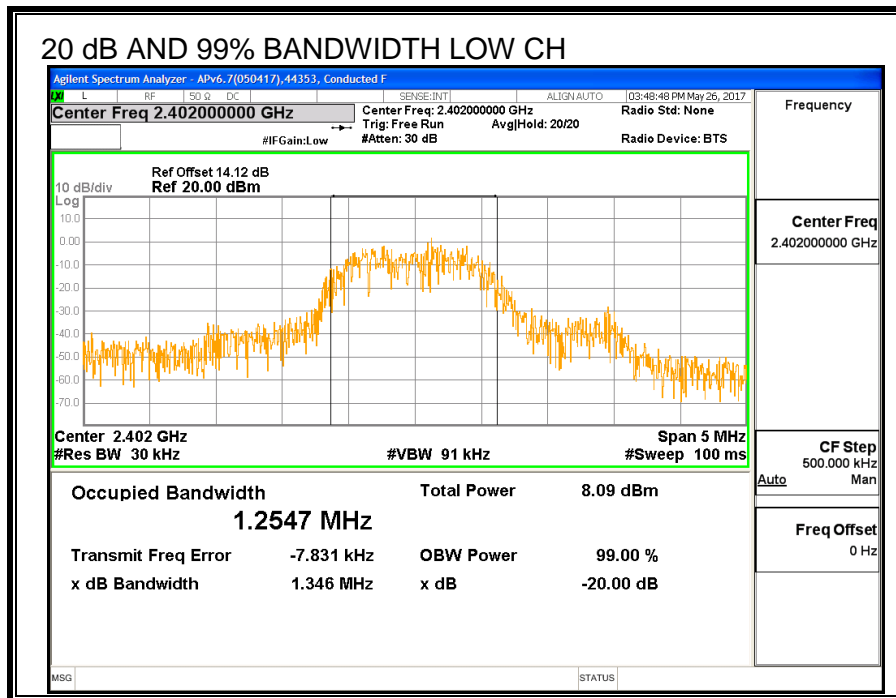
None; for reporting purposes only.

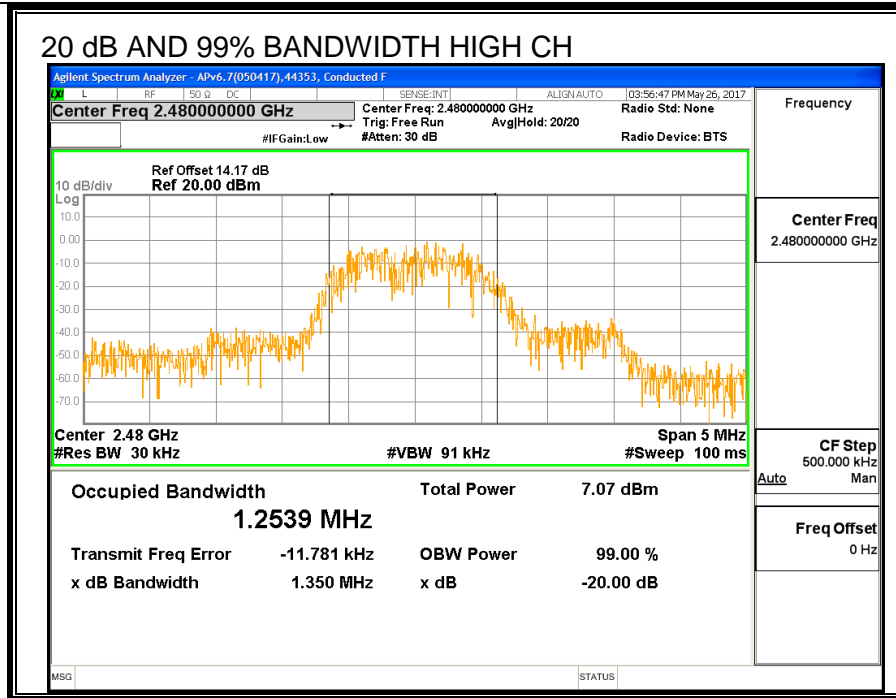
#### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

#### **RESULTS**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>20 dB Bandwidth (KHz)</b>	<b>99% Bandwidth (KHz)</b>
Low	2402	1346	1254.7
Middle	2441	1332	1226.4
High	2480	1350	1253.9





## 8.13.2. HOPPING FREQUENCY SEPARATION

### LIMITS

FCC §15.247 (a) (1)

IC RSS-247 (5.1) (b)

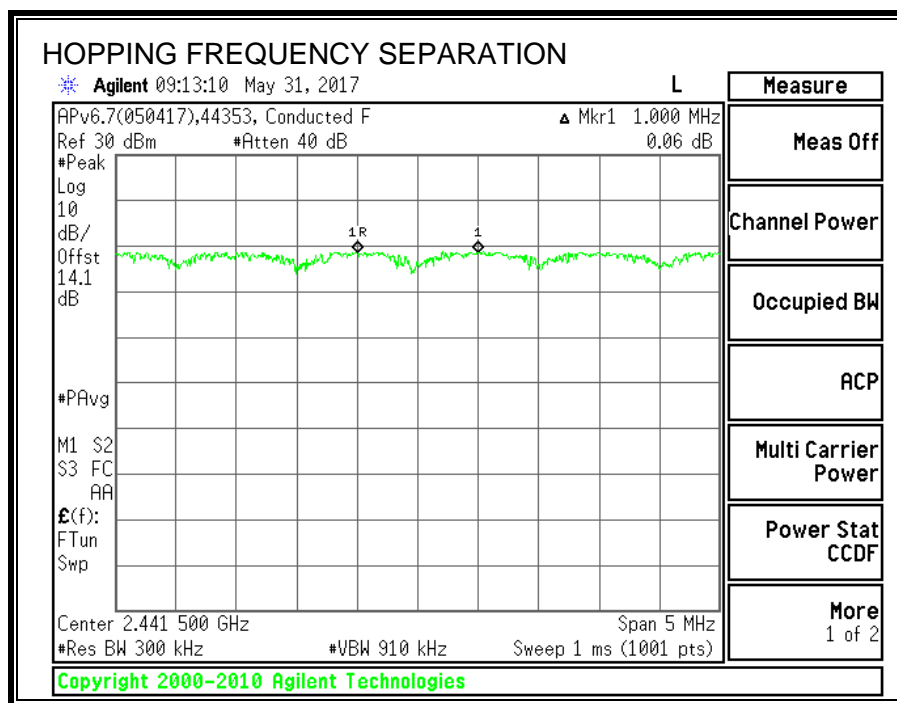
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 910 kHz. The sweep time is coupled.

### RESULTS



### 8.13.3. NUMBER OF HOPPING CHANNELS

#### LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

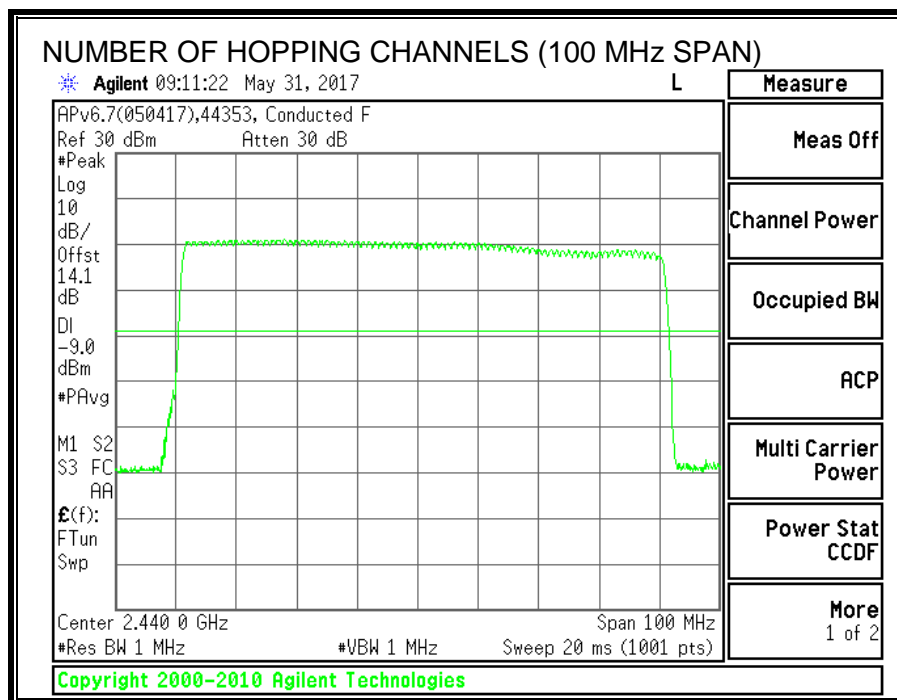
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

#### TEST PROCEDURE

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

#### RESULTS

Normal Mode: 79 Channels observed.



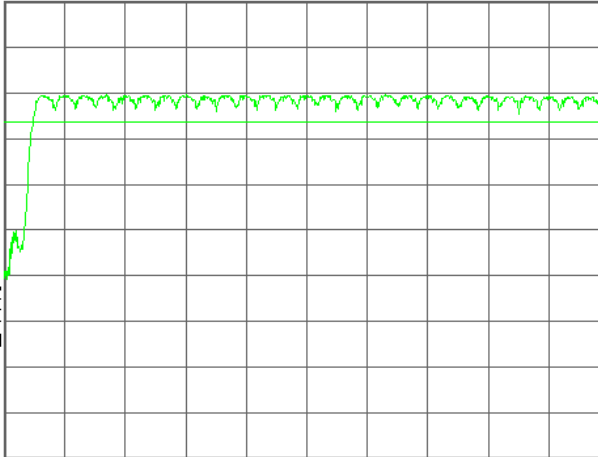
### NUMBER OF HOPPING CHANNELS (30 MHz SPAN, FIRST SEGMENT)

Agilent 09:03:35 May 31, 2017

L

APv6.7(050417),44353, Conducted F  
Ref 30 dBm Atten 30 dB

#Peak  
Log  
10  
dB/  
Offst  
14.1  
dB  
DI  
3.5  
dBm  
#PAvg  
M1 S2  
S3 FC  
AA  
E(f):  
FTun  
Swp



Center 2.415 00 GHz

Span 30 MHz

#Res BW 300 kHz

#VBW 300 kHz

Sweep 20 ms (1001 pts)

Copyright 2000-2010 Agilent Technologies

Measure

Meas Off

Channel Power

Occupied BW

ACP

Multi Carrier Power

Power Stat CCDF

More  
1 of 2

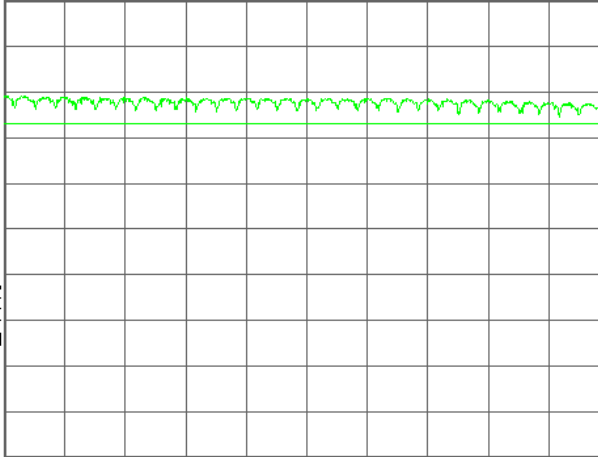
### NUMBER OF HOPPING CHANNELS (30 MHz SPAN, SECOND SEGMENT)

Agilent 09:05:50 May 31, 2017

L

APv6.7(050417),44353, Conducted F  
Ref 30 dBm Atten 30 dB

#Peak  
Log  
10  
dB/  
Offst  
14.1  
dB  
DI  
3.1  
dBm  
#PAvg  
M1 S2  
S3 FC  
AA  
E(f):  
FTun  
Swp



Center 2.445 00 GHz

Span 30 MHz

#Res BW 300 kHz

#VBW 300 kHz

Sweep 20 ms (1001 pts)

Copyright 2000-2010 Agilent Technologies

Measure

Meas Off

Channel Power

Occupied BW

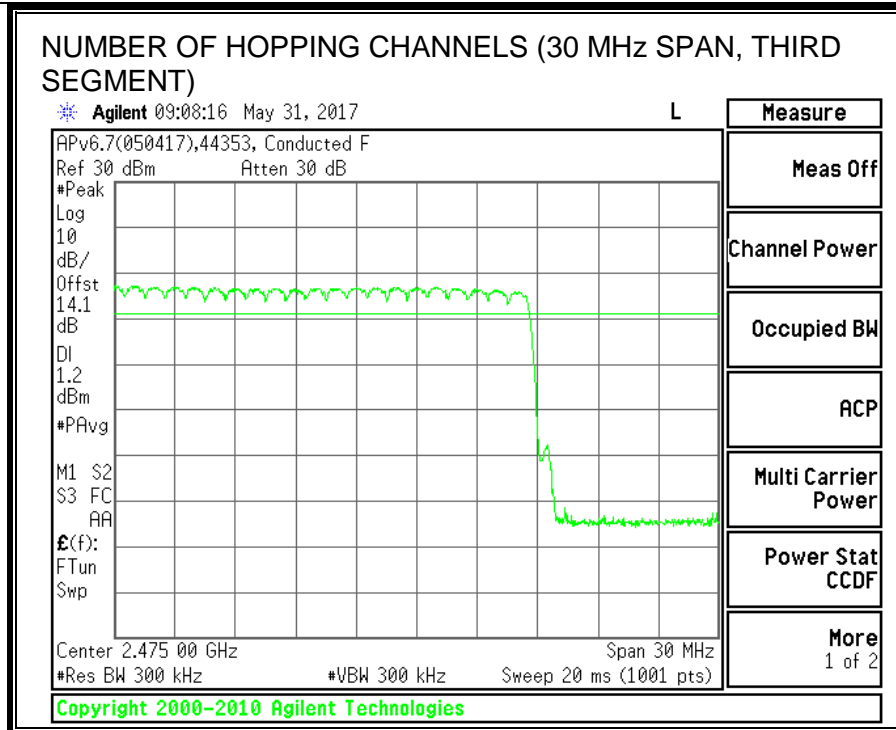
ACP

Multi Carrier Power

Power Stat CCDF

More  
1 of 2





### 8.13.4. AVERAGE TIME OF OCCUPANCY

#### LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

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

#### TEST PROCEDURE

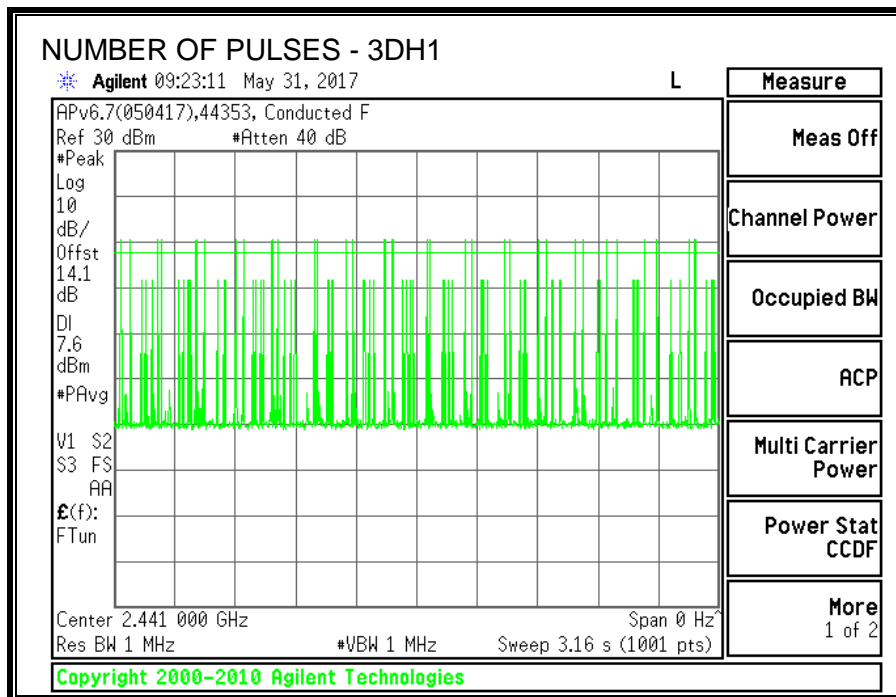
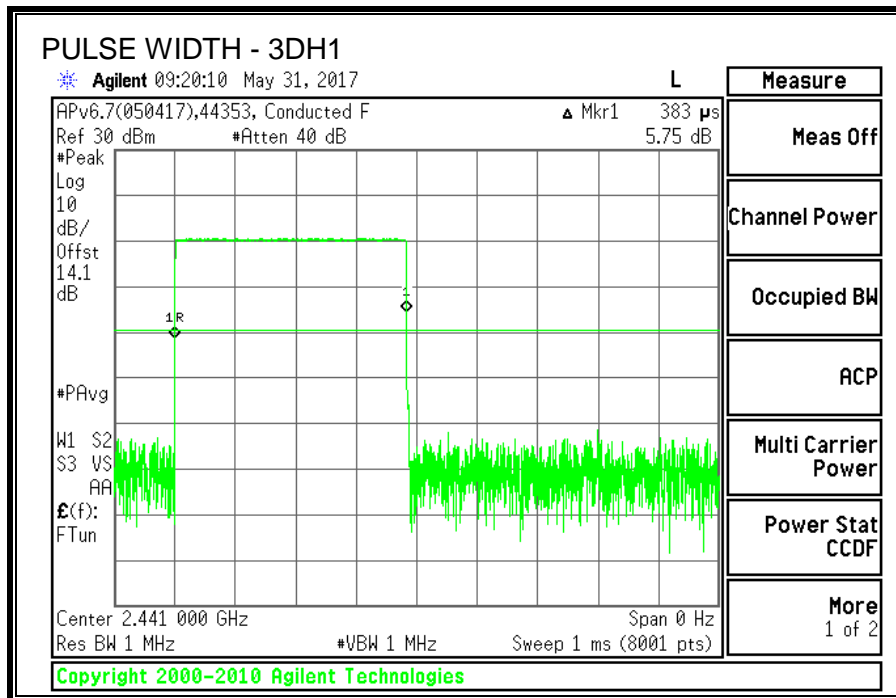
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

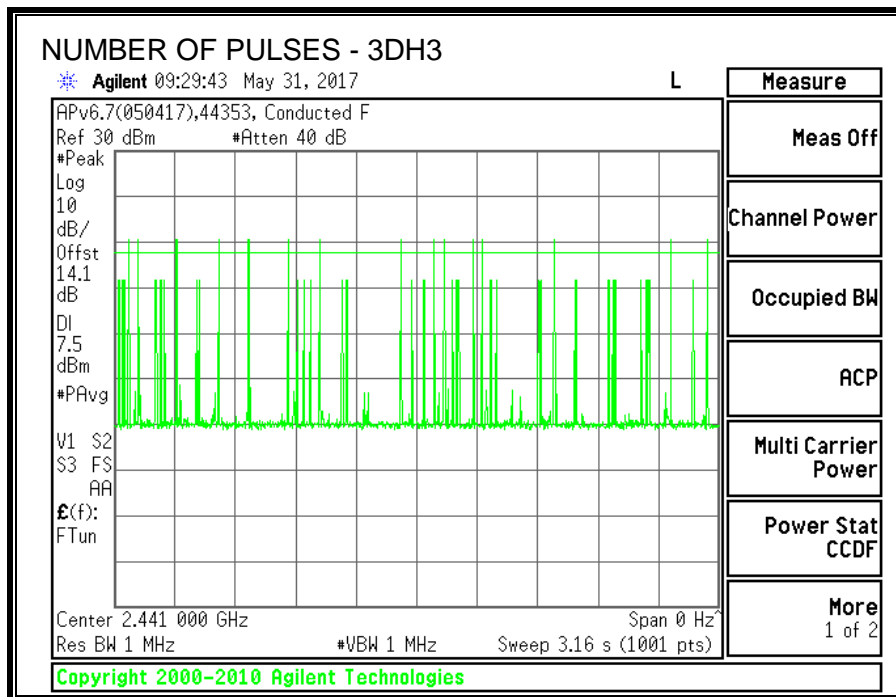
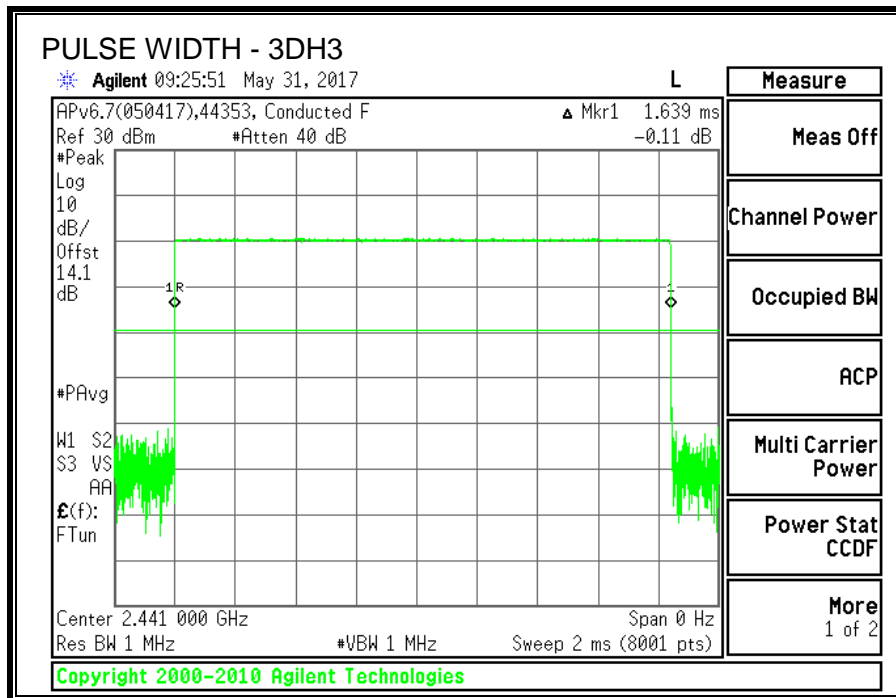
The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$ .

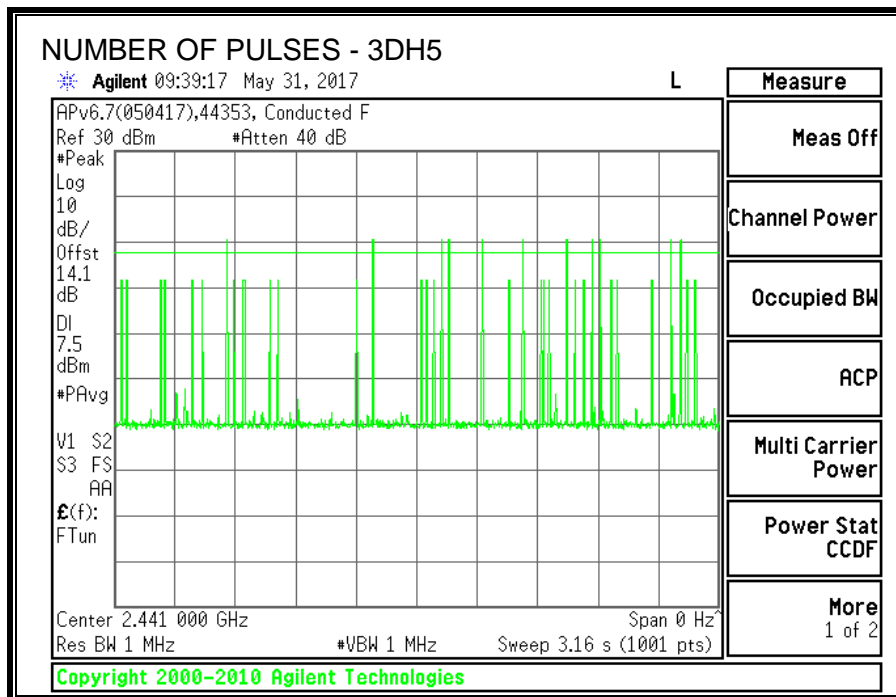
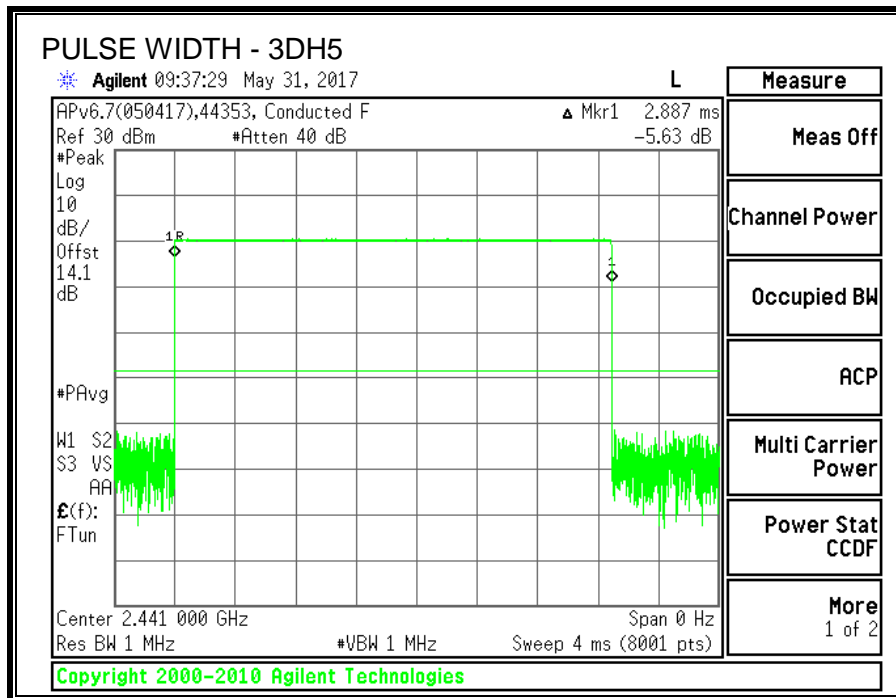
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$ .

#### RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK (EDR) Mode					
3DH1	0.383	32	0.123	0.4	-0.277
3DH3	1.639	15	0.246	0.4	-0.154
3DH5	2.887	10	0.289	0.4	-0.111







### 8.13.5. OUTPUT POWER

<b>ID:</b>	30554	<b>Date:</b>	7/29/2017
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#### LIMITS

§15.247 (b) (1)

RSS-247 (5.4) (b)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

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

#### TEST PROCEDURE

The transmitter output is connected to a wideband peak and average power meter.

#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.71	21	-10.29
Middle	2441	10.88	21	-10.12
High	2480	10.79	21	-10.21

---

**8.13.6. AVERAGE POWER**

<b>ID:</b>	30554	<b>Date:</b>	7/29/2017
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**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

**RESULTS**

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.32
Middle	2441	8.47
High	2480	8.40

### **8.13.7. CONDUCTED SPURIOUS EMISSIONS**

#### **LIMITS**

FCC §15.247 (d)

IC RSS-247 (5.5)

Limit = -20 dBc

#### **TEST PROCEDURE**

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

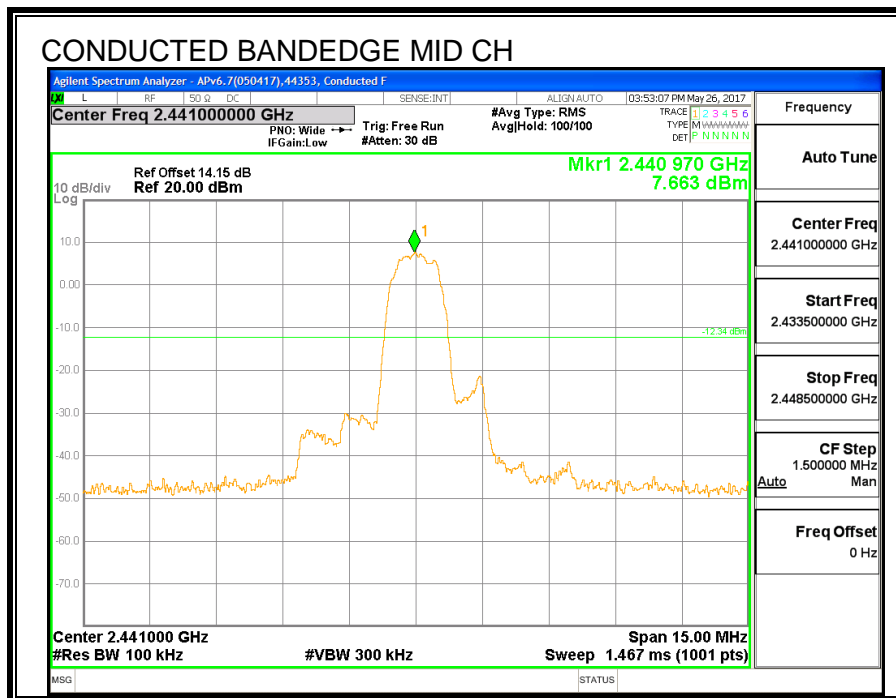
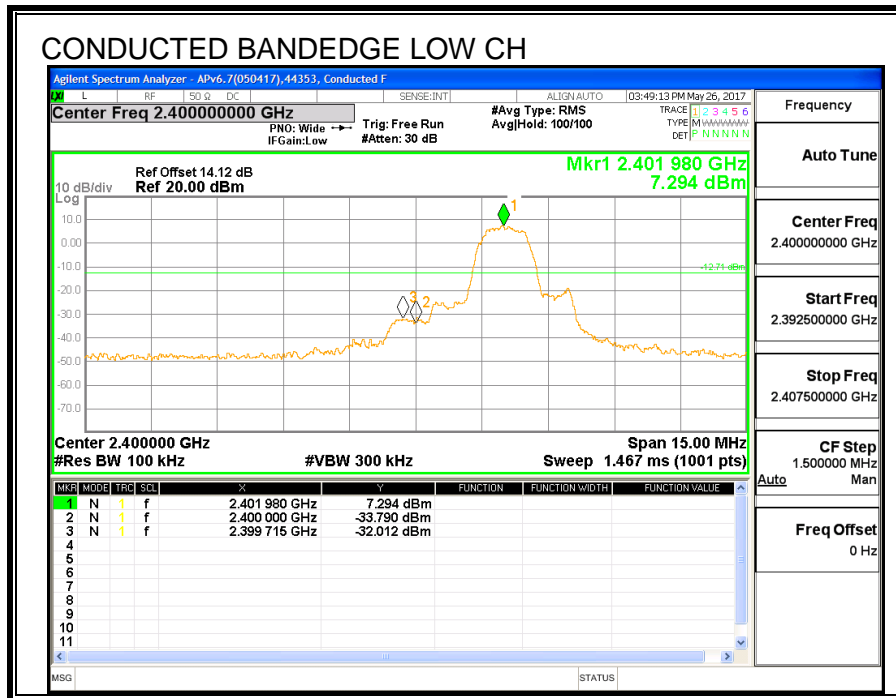
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

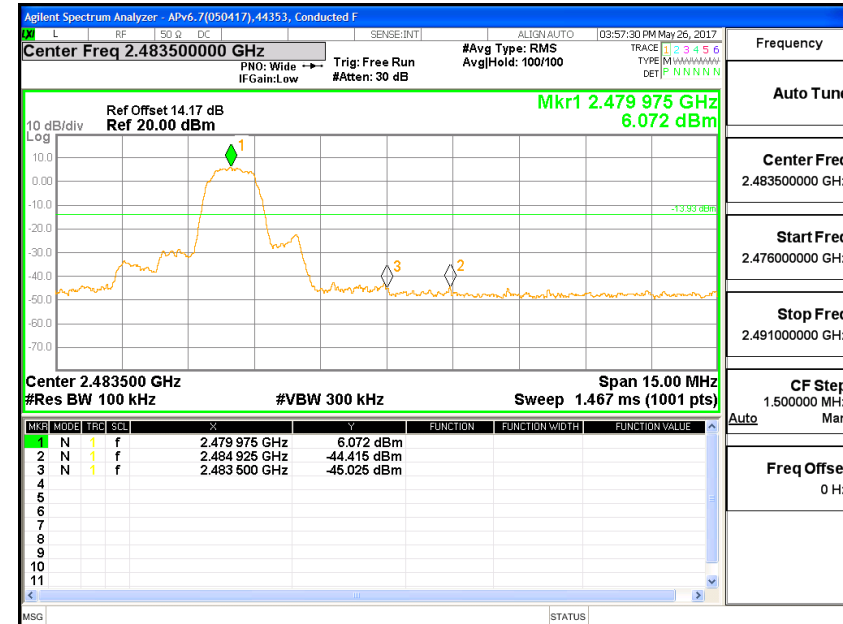
#### **RESULTS**



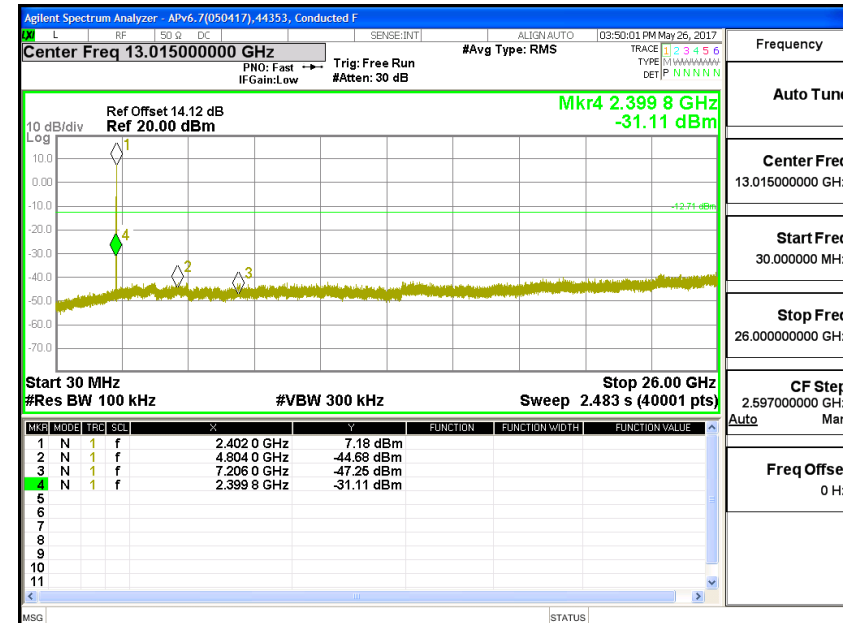
**CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS**



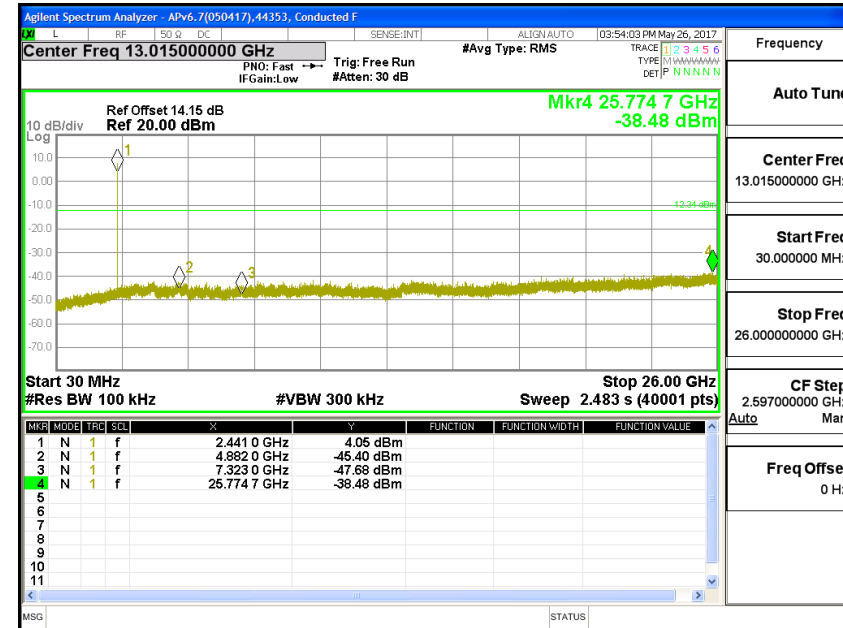
## CONDUCTED BANDEDGE HIGH CH



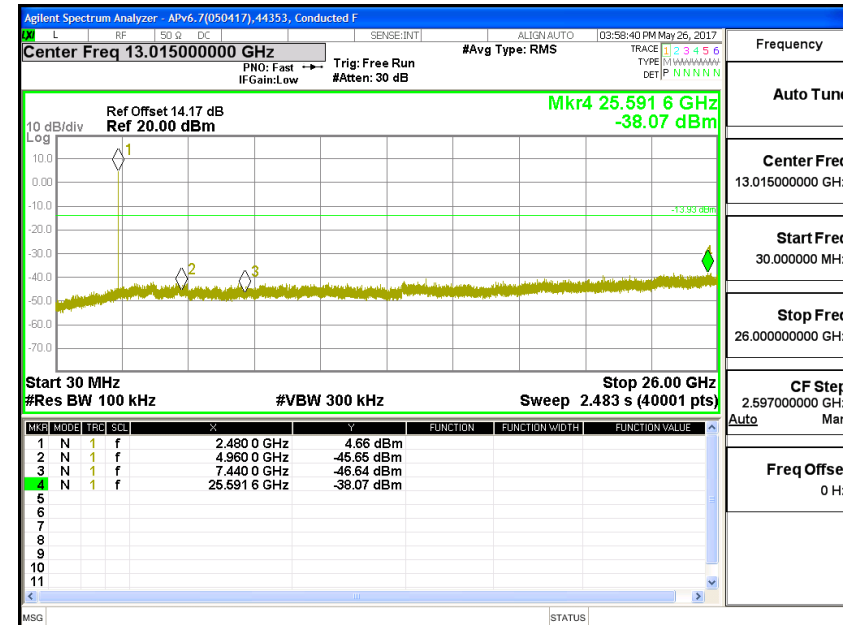
## CONDUCTED SPURIOUS EMISSIONS LOW CH



## CONDUCTED SPURIOUS EMISSIONS MID CH

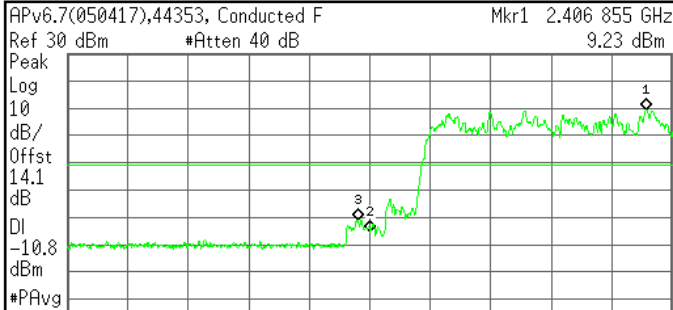


## CONDUCTED SPURIOUS EMISSIONS HIGH CH



### LOW BANDEDGE WITH HOPPING ON

Agilent 09:15:26 May 31, 2017



Center 2.400 000 GHz Span 15 MHz  
#Res BW 100 kHz #VBW 300 kHz Sweep 1.467 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.406 855 GHz	9.23 dBm
2	(1)	Freq	2.400 000 GHz	-35.30 dBm
3	(1)	Freq	2.399 700 GHz	-31.01 dBm

Measure

Meas Off

Channel Power

Occupied BW

ACP

Multi Carrier Power

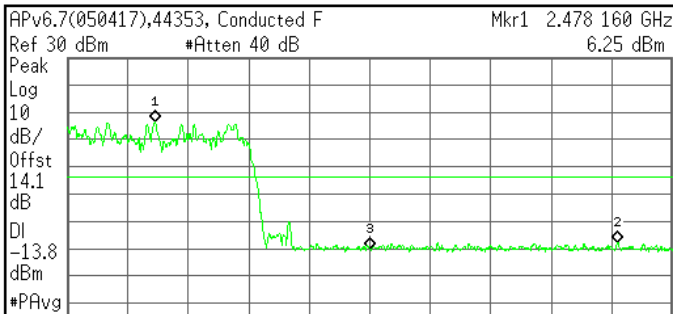
Power Stat CCDF

More  
1 of 2

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### HIGH BANDEDGE WITH HOPPING ON

Agilent 09:18:02 May 31, 2017



Center 2.483 500 GHz Span 15 MHz  
#Res BW 100 kHz #VBW 300 kHz Sweep 1.467 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.478 160 GHz	6.25 dBm
2	(1)	Freq	2.489 650 GHz	-37.84 dBm
3	(1)	Freq	2.483 500 GHz	-40.16 dBm

Measure

Meas Off

Channel Power

Occupied BW

ACP

Multi Carrier Power

Power Stat CCDF

More  
1 of 2

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