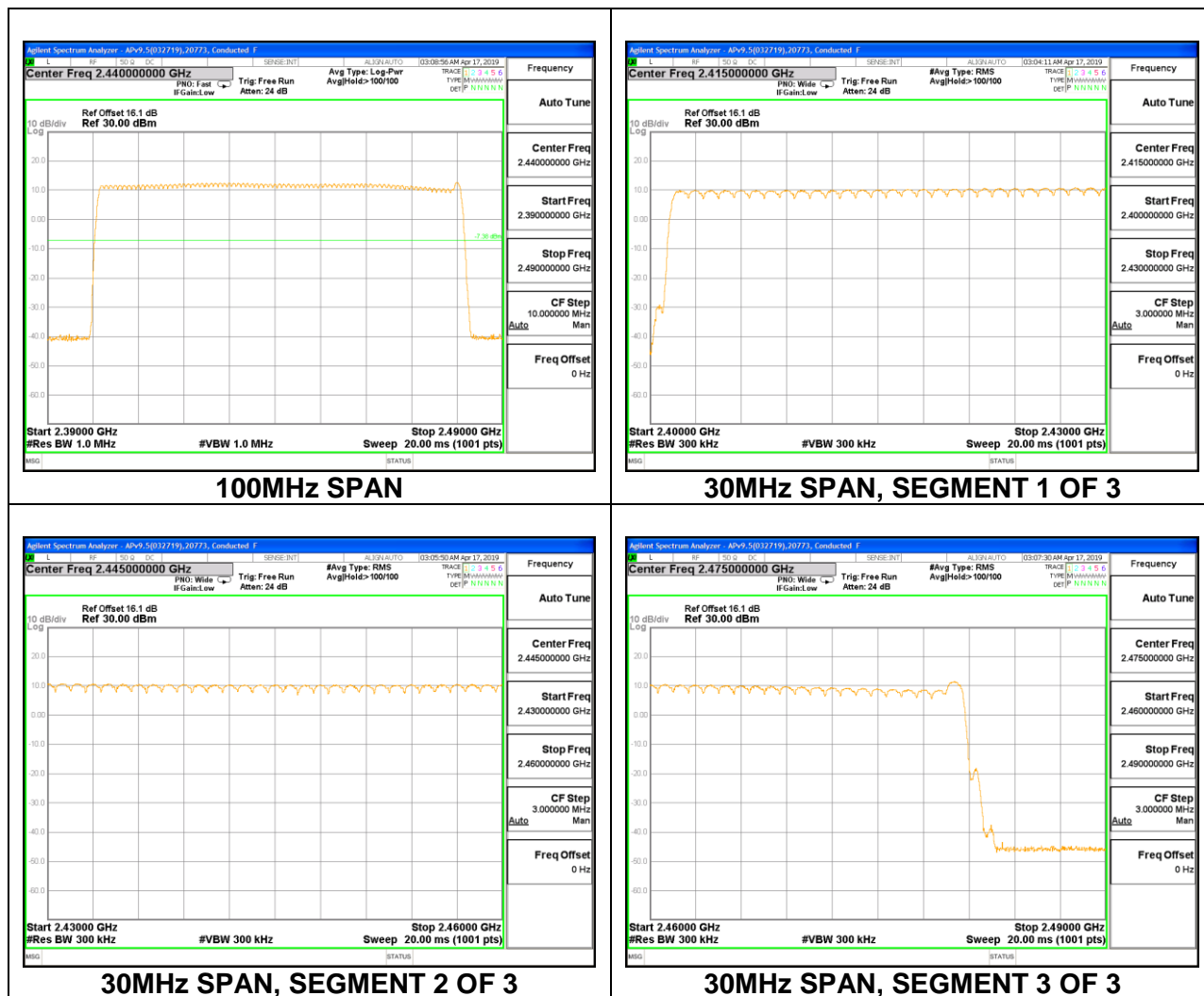


### Antenna 3



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## **8.7. BEAMFORMING NUMBER OF HOPPING CHANNELS**

### **LIMITS**

FCC §15.247 (a) (1) (iii)

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.

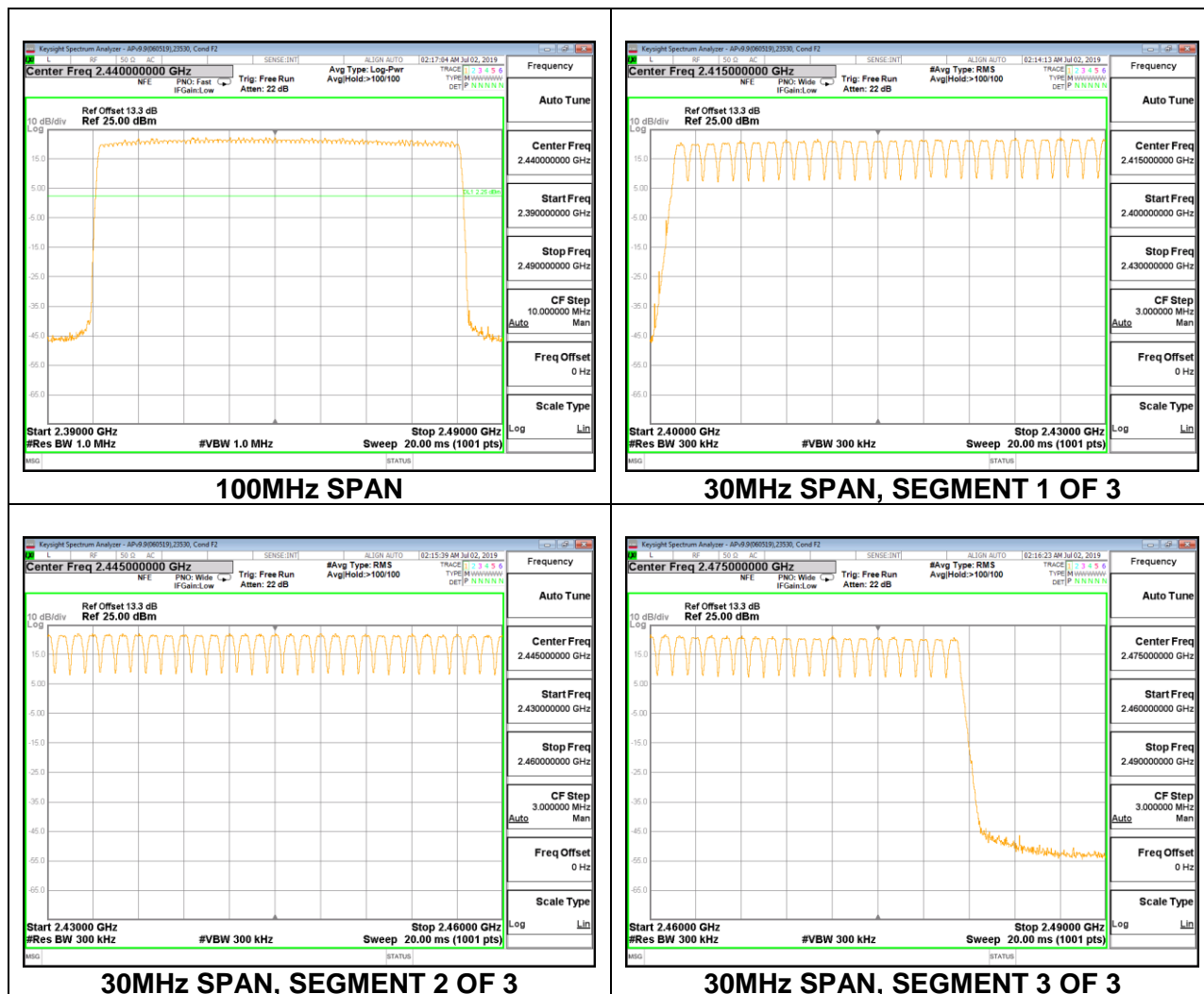
Note: Test procedure on beamforming mode is same as BT basic and EDR mode

### **RESULTS**

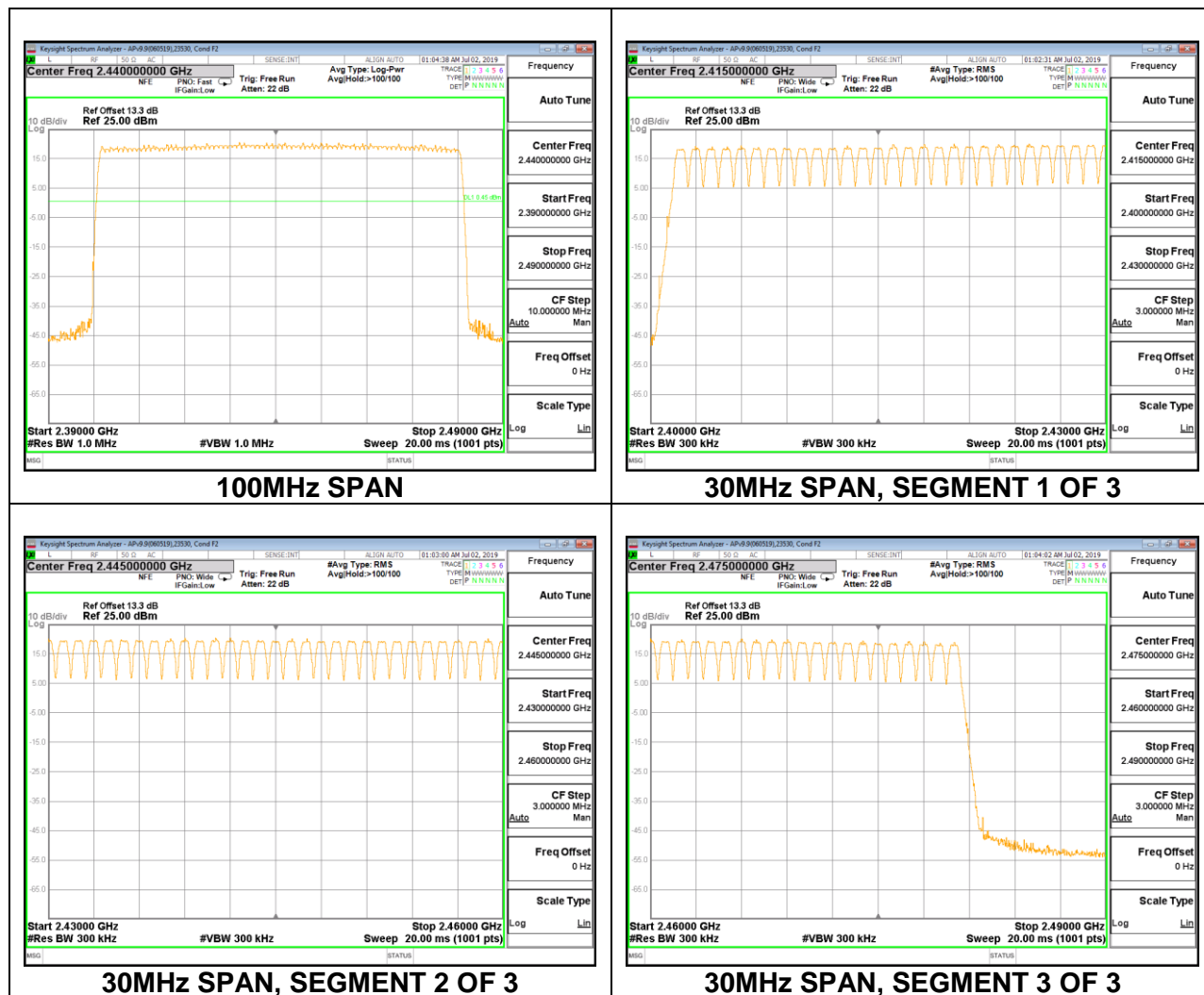
Normal Mode: 79 Channels Observed

## 8.7.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

### Antenna 4

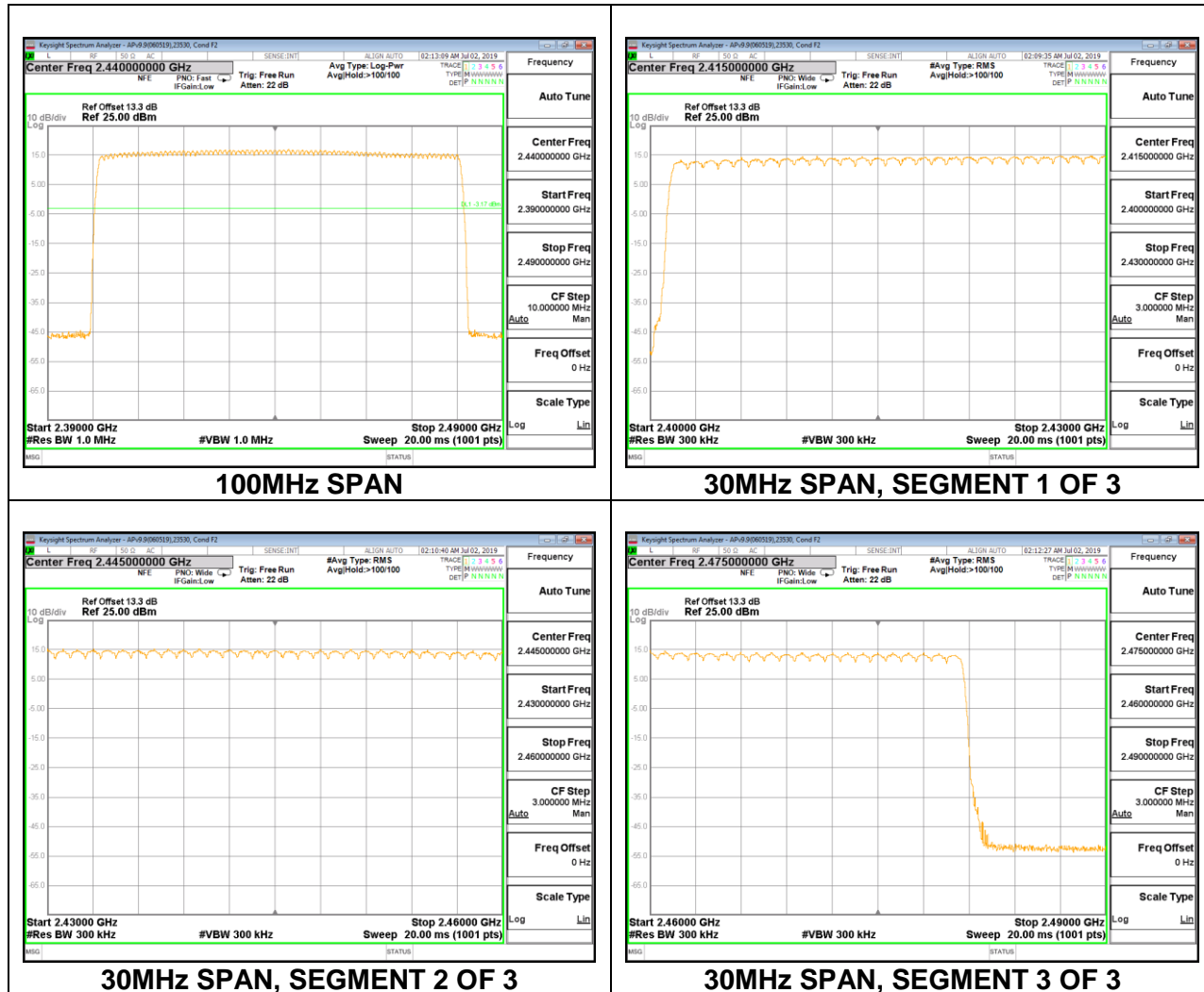


### Antenna 3

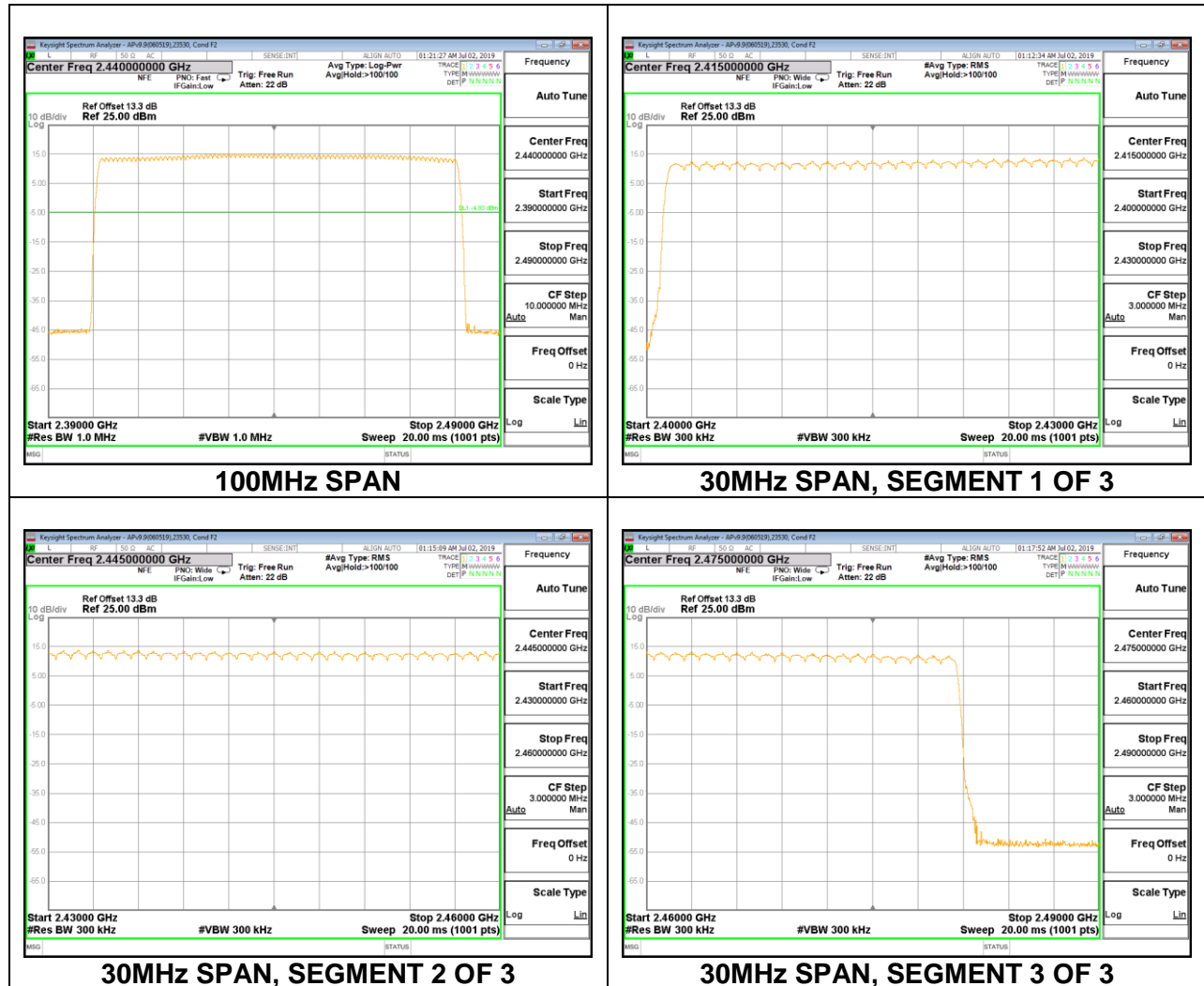


## 8.7.2. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

### Antenna 4

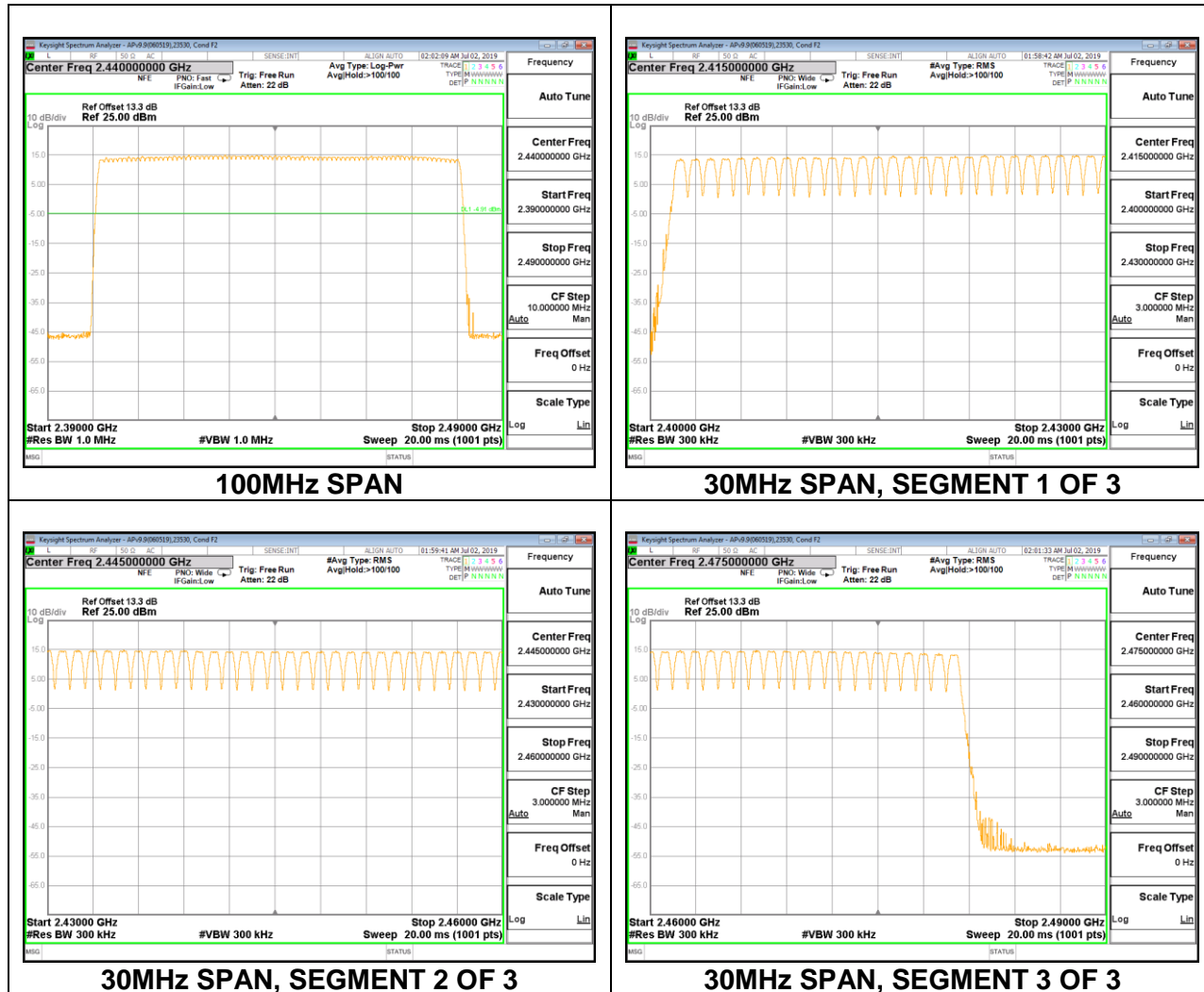


### Antenna 3

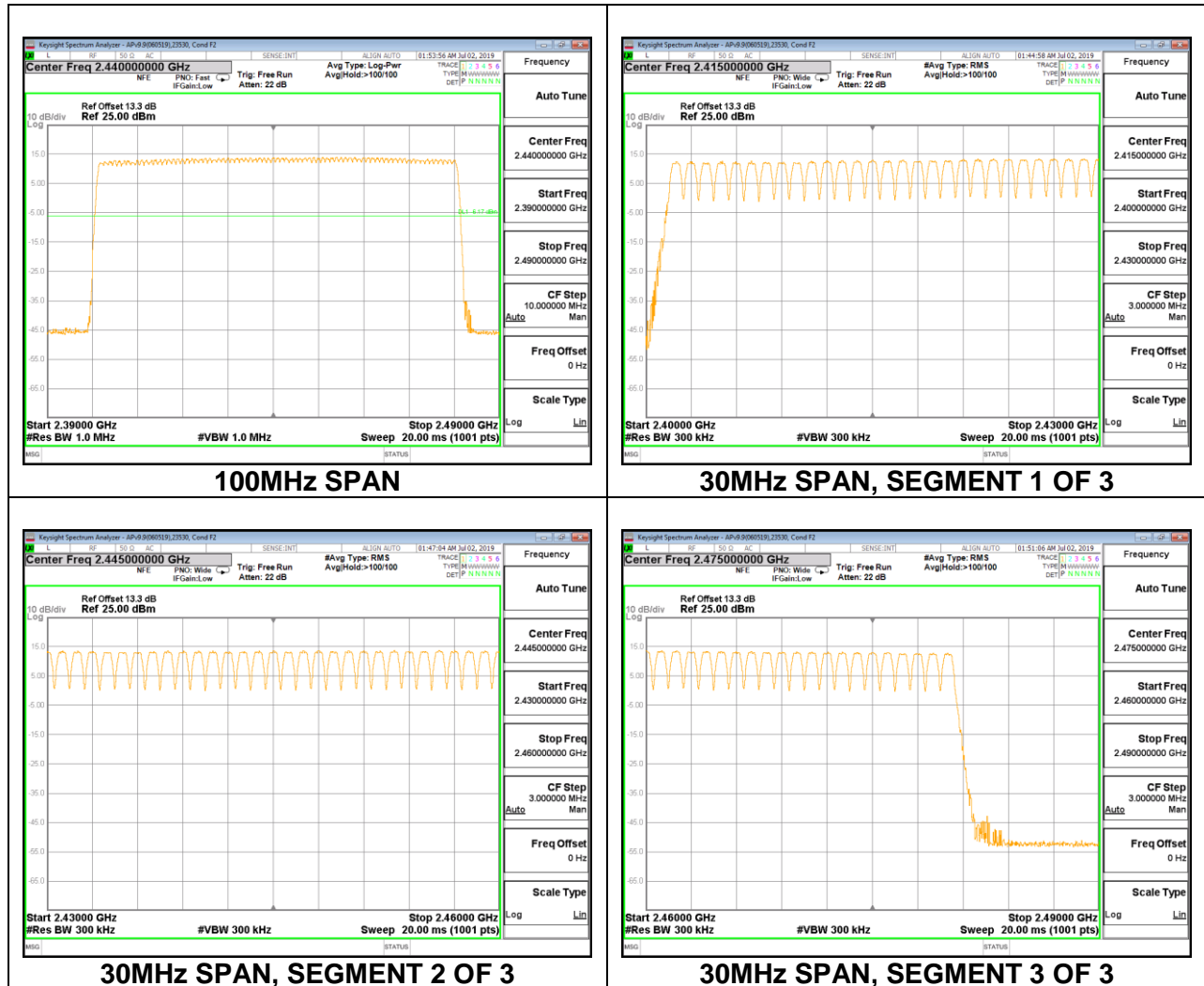


## 8.7.3. LOW POWER BASIC DATA RATE GFSK MODULATION

### Antenna 4



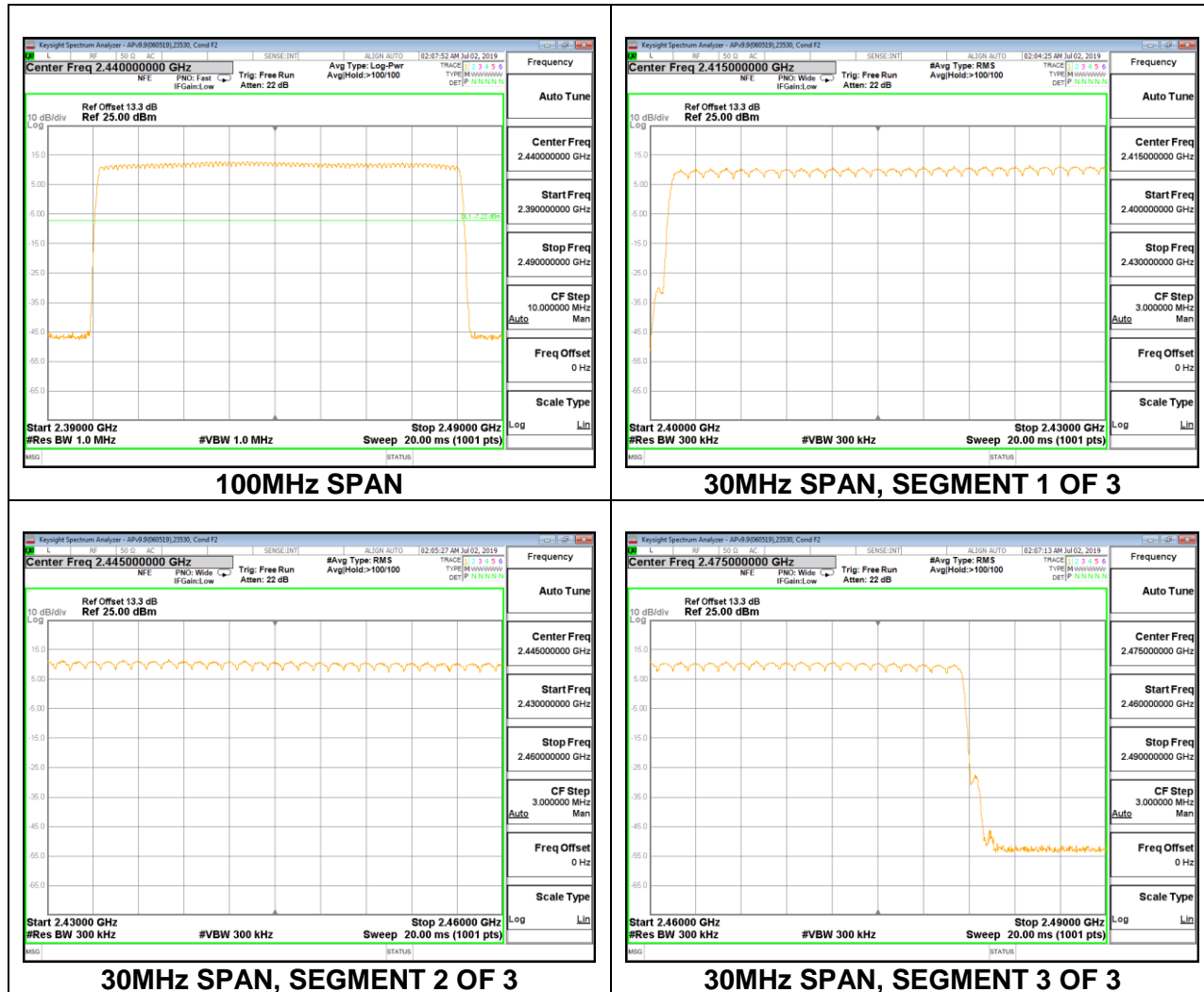
### Antenna 3



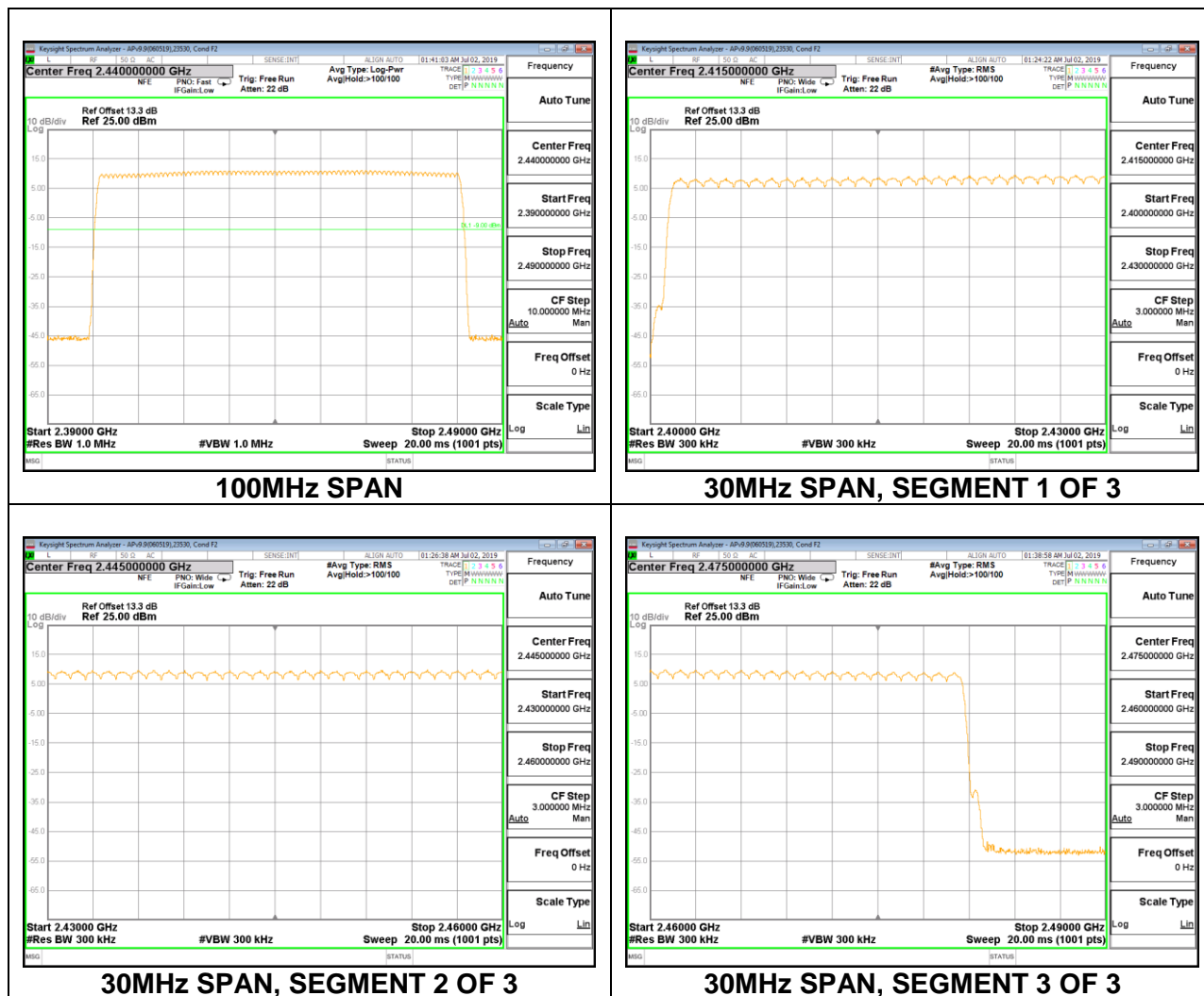


## 8.7.4. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

### Antenna 4



### Antenna 3



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## **8.8. AVERAGE TIME OF OCCUPANCY**

### **LIMITS**

FCC §15.247 (a) (1) (iii)

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 3.16 second period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$ .

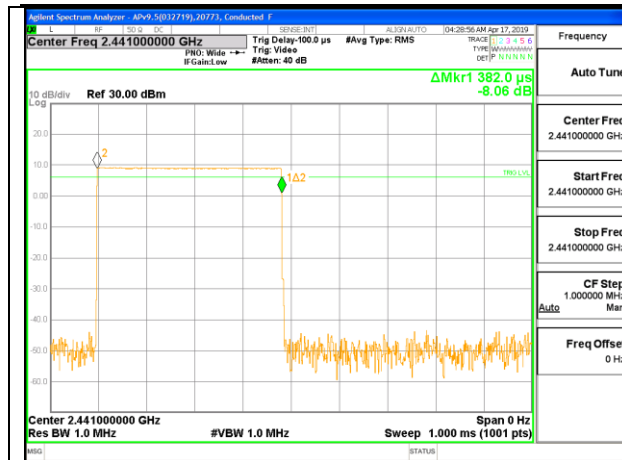
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$ .

### **RESULTS**

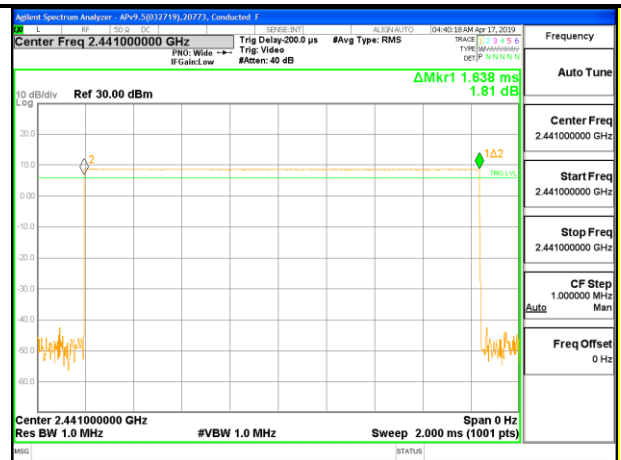
## 8.8.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

### Antenna 4

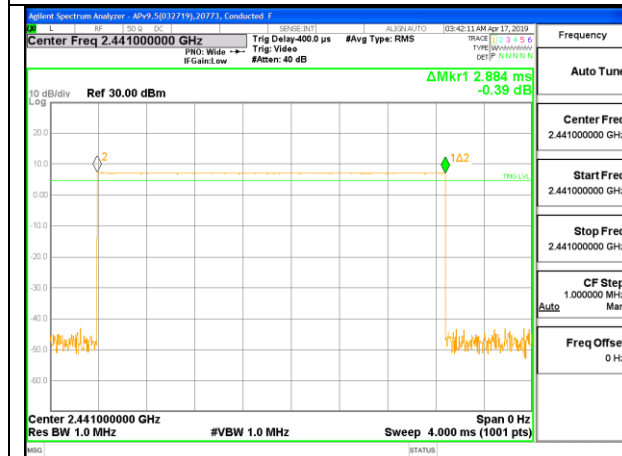
| DH Packet        | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
|------------------|--------------------|----------------------------------|---------------------------------|-------------|--------------|
| GFSK Normal Mode |                    |                                  |                                 |             |              |
| DH1              | 0.382              | 30                               | 0.1146                          | 0.4         | -0.2854      |
| DH3              | 1.638              | 17                               | 0.2785                          | 0.4         | -0.1215      |
| DH5              | 2.884              | 5                                | 0.1442                          | 0.4         | -0.2558      |
|                  |                    |                                  |                                 |             |              |
| DH Packet        | Pulse Width (sec)  | Number of Pulses in 0.8 seconds  | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
| GFSK AFH Mode    |                    |                                  |                                 |             |              |
| DH1              | 0.382              | 7.5                              | 0.02865                         | 0.4         | -0.3714      |
| DH3              | 1.638              | 4.25                             | 0.06962                         | 0.4         | -0.3304      |
| DH5              | 2.884              | 1.25                             | 0.03605                         | 0.4         | -0.3640      |



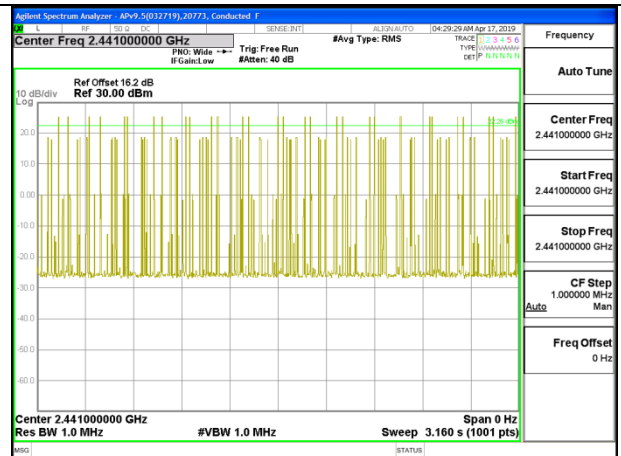
**PULSE WIDTH – DH1**



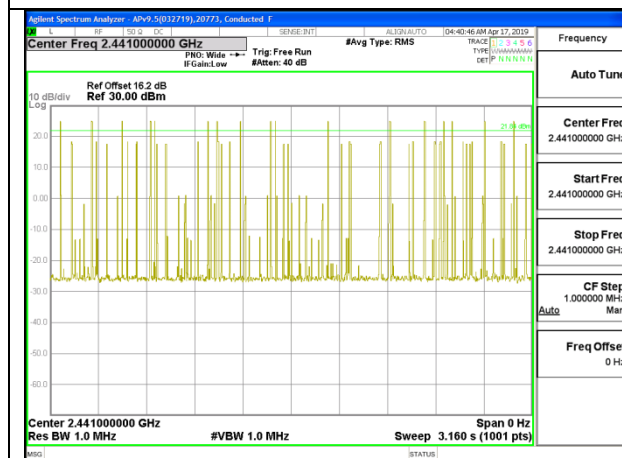
**PULSE WIDTH – DH3**



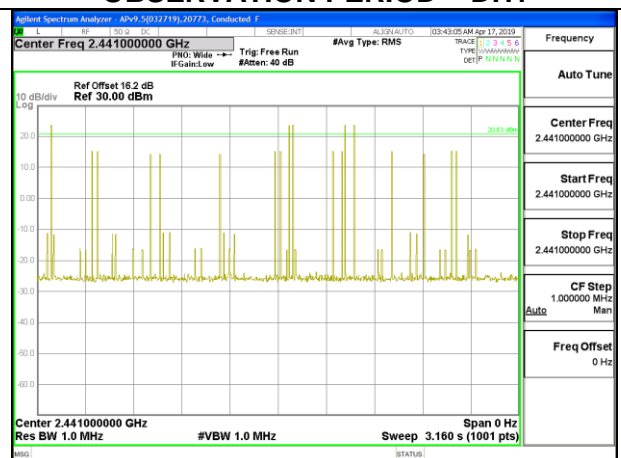
**PULSE WIDTH – DH5**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – DH1**



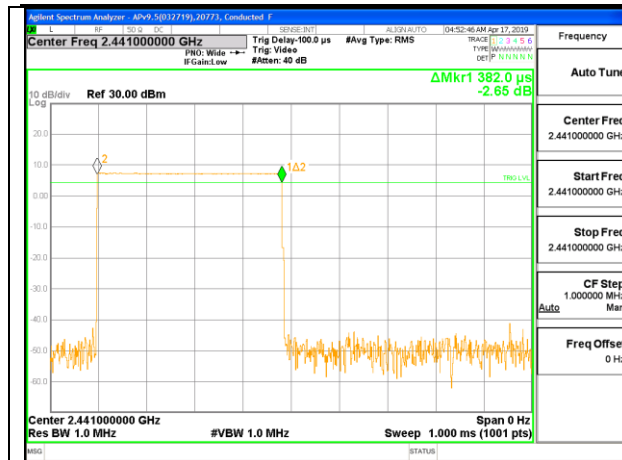
**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD –DH3**



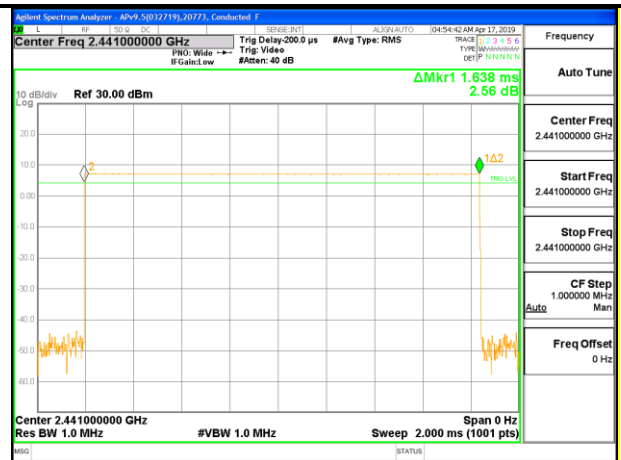
**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD –DH5**

**Antenna 3**

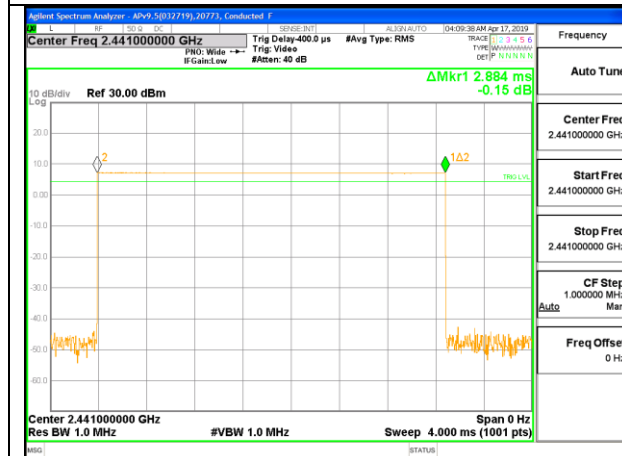
| DH Packet        | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
|------------------|--------------------|----------------------------------|---------------------------------|-------------|--------------|
| GFSK Normal Mode |                    |                                  |                                 |             |              |
| DH1              | 0.382              | 32                               | 0.1222                          | 0.4         | -0.2778      |
| DH3              | 1.638              | 13                               | 0.2129                          | 0.4         | -0.1871      |
| DH5              | 2.884              | 10                               | 0.2884                          | 0.4         | -0.1116      |
|                  |                    |                                  |                                 |             |              |
| DH Packet        | Pulse Width (sec)  | Number of Pulses in 0.8 seconds  | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
| GFSK AFH Mode    |                    |                                  |                                 |             |              |
| DH1              | 0.382              | 8                                | 0.03056                         | 0.4         | -0.3694      |
| DH3              | 1.638              | 3.25                             | 0.05324                         | 0.4         | -0.3468      |
| DH5              | 2.884              | 2.5                              | 0.07210                         | 0.4         | -0.3279      |



PULSE WIDTH – DH1



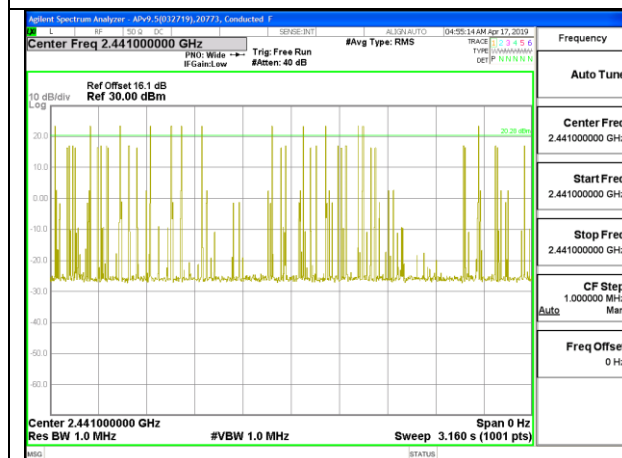
PULSE WIDTH – DH3



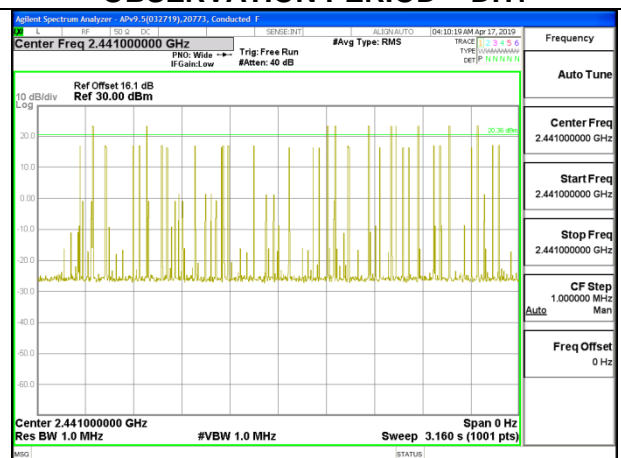
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – DH3



NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – DH5

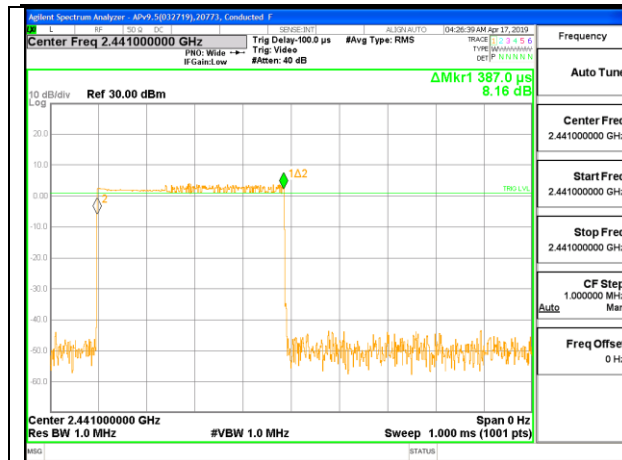
## 8.8.2. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

### Antenna 4

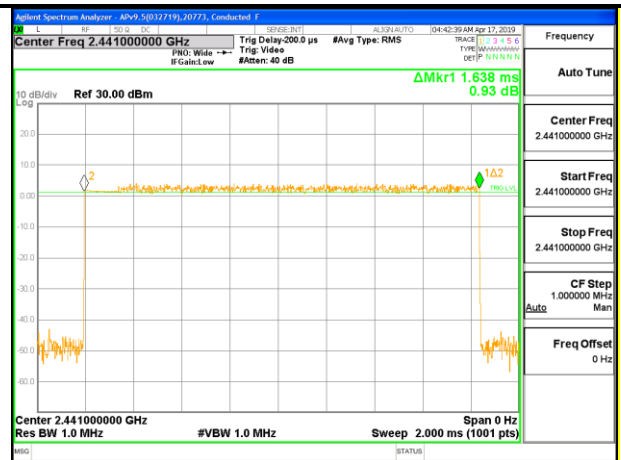
| DH Packet        | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
|------------------|--------------------|----------------------------------|---------------------------------|-------------|--------------|
| 8PSK Normal Mode |                    |                                  |                                 |             |              |
| 3DH1             | 0.387              | 32                               | 0.12384                         | 0.4         | -0.2762      |
| 3DH3             | 1.638              | 17                               | 0.27846                         | 0.4         | -0.1215      |
| 3DH5             | 2.892              | 8                                | 0.23136                         | 0.4         | -0.1686      |

Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.

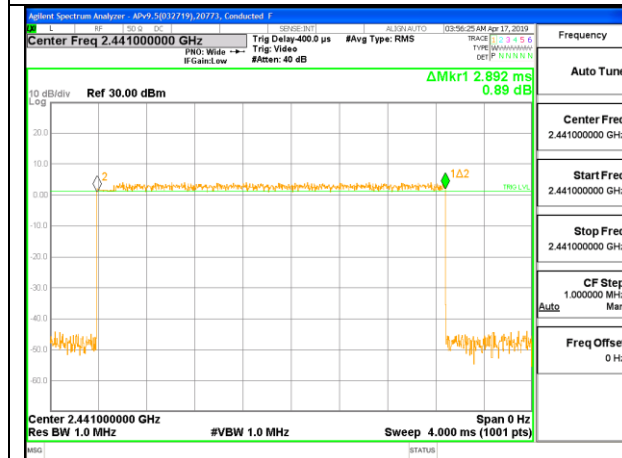




**PULSE WIDTH – 3DH1**



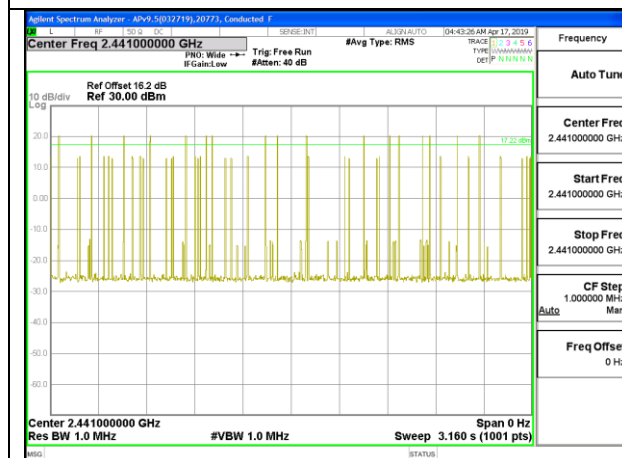
**PULSE WIDTH – 3DH3**



**PULSE WIDTH – 3DH5**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH1**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH3**

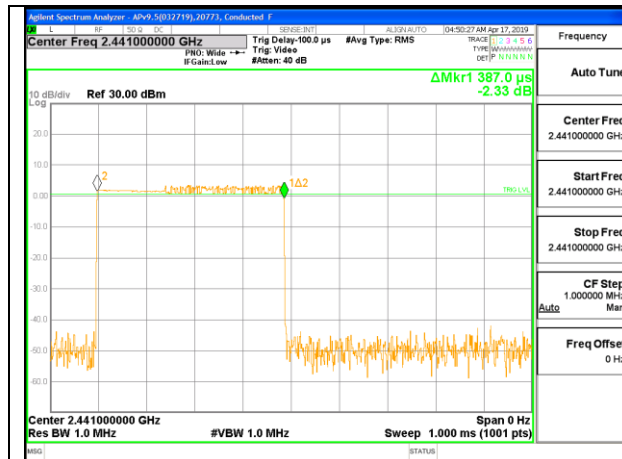


**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH5**

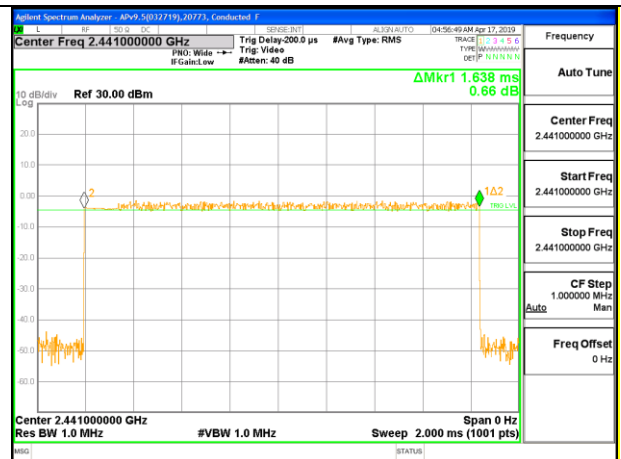
**Antenna 3**

| DH Packet        | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
|------------------|--------------------|----------------------------------|---------------------------------|-------------|--------------|
| 8PSK Normal Mode |                    |                                  |                                 |             |              |
| 3DH1             | 0.387              | 32                               | 0.12384                         | 0.4         | -0.2762      |
| 3DH3             | 1.638              | 16                               | 0.26208                         | 0.4         | -0.1379      |
| 3DH5             | 2.888              | 5                                | 0.1444                          | 0.4         | -0.2556      |

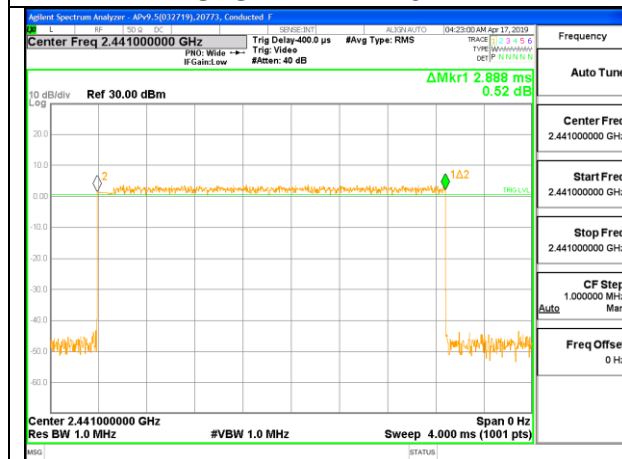
Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



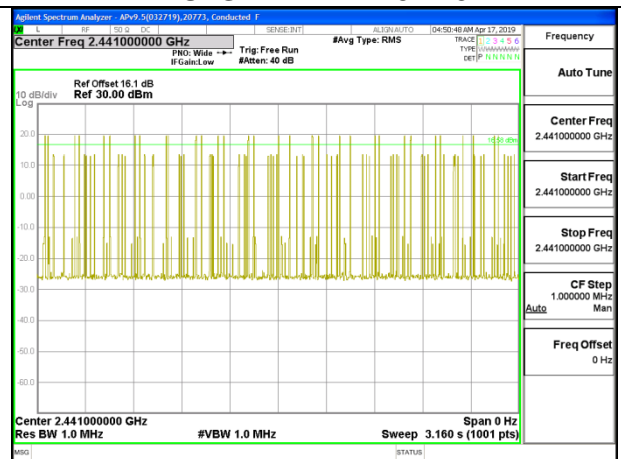
**PULSE WIDTH – 3DH1**



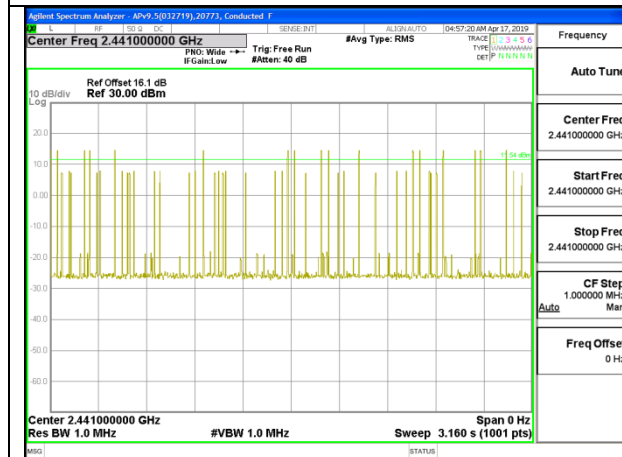
**PULSE WIDTH – 3DH3**



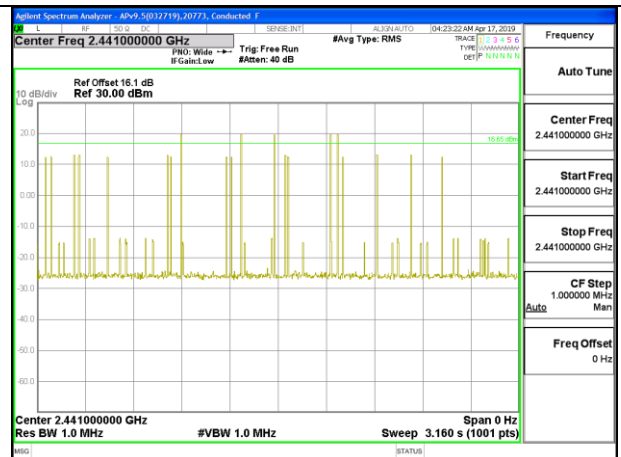
**PULSE WIDTH – 3DH5**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH1**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH3**

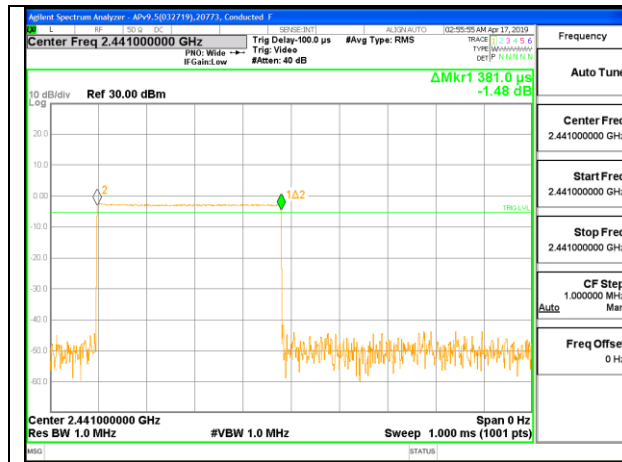


**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH5**

### 8.8.3. LOW POWER BASIC DATA RATE GFSK MODULATION

#### Antenna 4

| 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              | 0.381              | 32                               | 0.1219                          | 0.4         | -0.2781      |
| DH3              | 1.638              | 20                               | 0.3276                          | 0.4         | -0.0724      |
| DH5              | 2.884              | 11                               | 0.3172                          | 0.4         | -0.0828      |
|                  |                    |                                  |                                 |             |              |
| DH Packet        | Pulse Width (sec)  | Number of Pulses in 0.8 seconds  | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
| GFSK AFH Mode    |                    |                                  |                                 |             |              |
| DH1              | 0.381              | 8                                | 0.03048                         | 0.4         | -0.3695      |
| DH3              | 1.638              | 5                                | 0.08190                         | 0.4         | -0.3181      |
| DH5              | 2.884              | 2.75                             | 0.07931                         | 0.4         | -0.3207      |



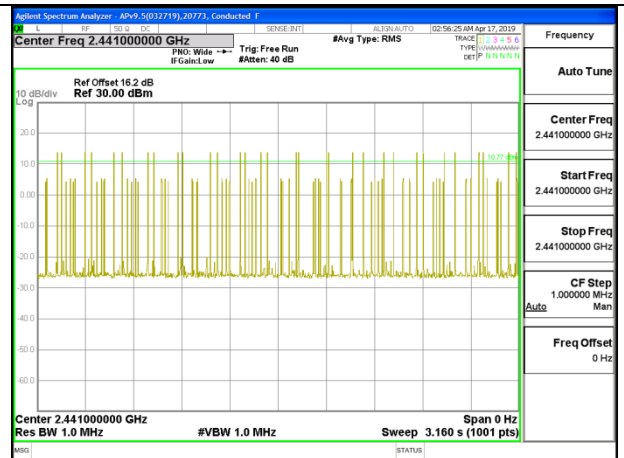
PULSE WIDTH – 3DH1



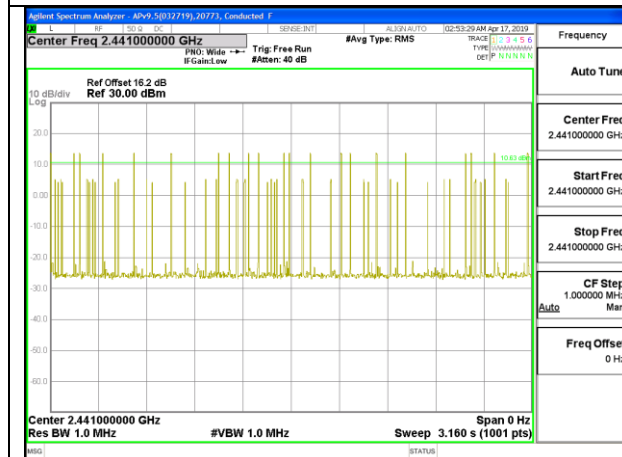
PULSE WIDTH – 3DH3



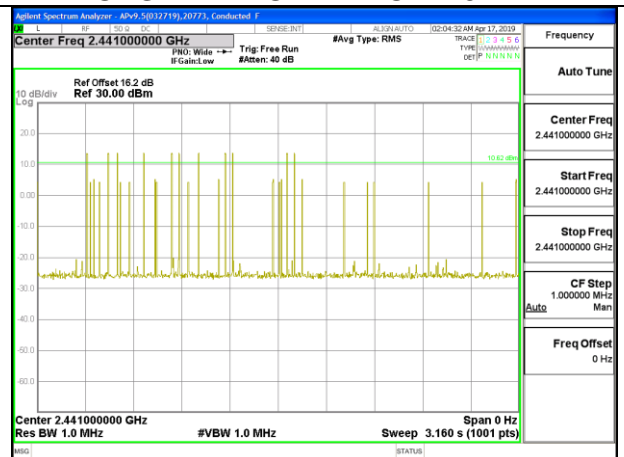
PULSE WIDTH – 3DH5



NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH1



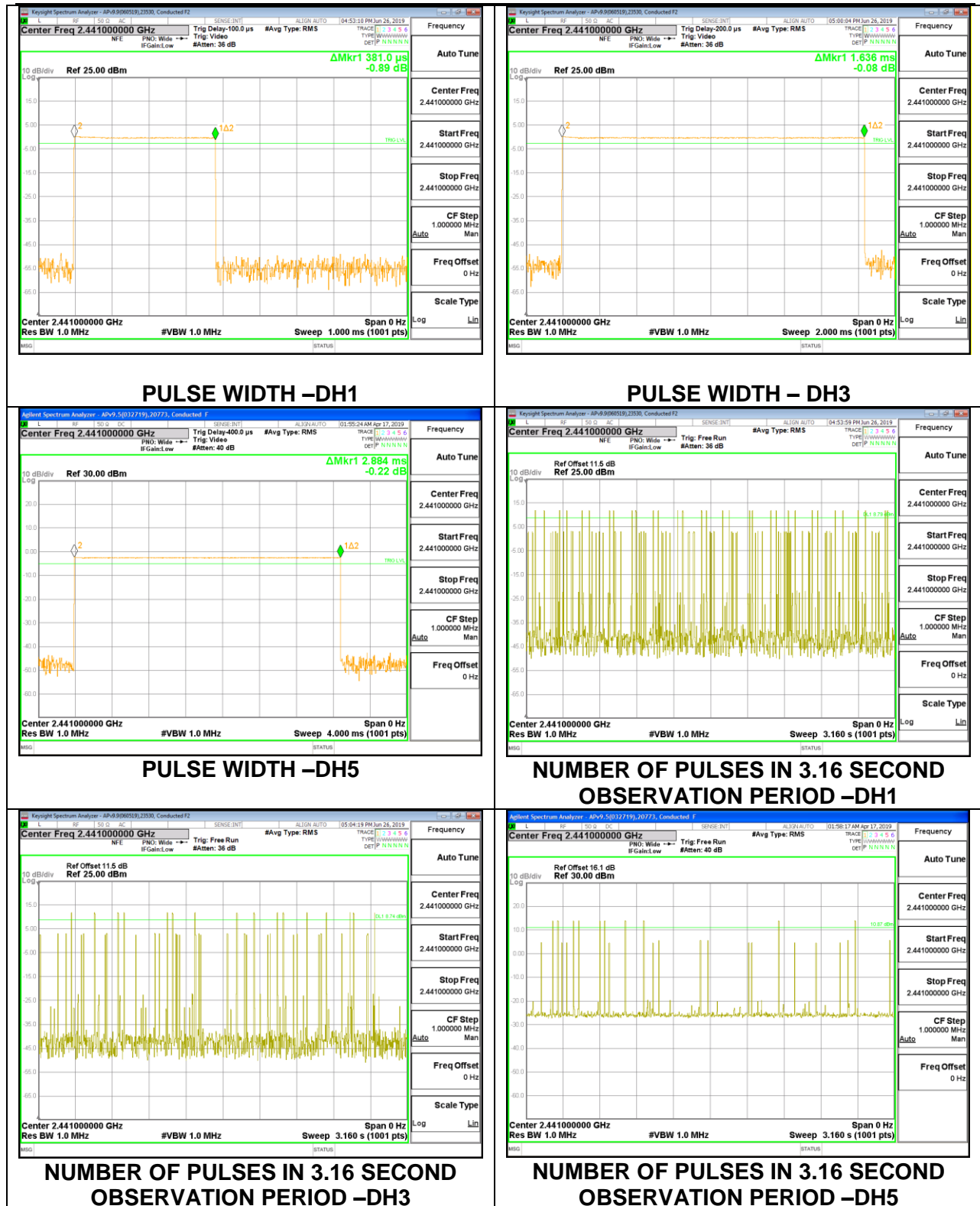
NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH3



NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH5

**Antenna 3**

| 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              | 0.381              | 32                               | 0.1219                          | 0.4         | -0.2781      |
| DH3              | 1.636              | 16                               | 0.2618                          | 0.4         | -0.1382      |
| DH5              | 2.884              | 10                               | 0.2884                          | 0.4         | -0.1116      |
|                  |                    |                                  |                                 |             |              |
| DH Packet        | Pulse Width (sec)  | Number of Pulses in 0.8 seconds  | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
| GFSK AFH Mode    |                    |                                  |                                 |             |              |
| DH1              | 0.381              | 8                                | 0.03048                         | 0.4         | -0.3695      |
| DH3              | 1.636              | 4                                | 0.06544                         | 0.4         | -0.3346      |
| DH5              | 2.884              | 2.5                              | 0.07210                         | 0.4         | -0.3279      |



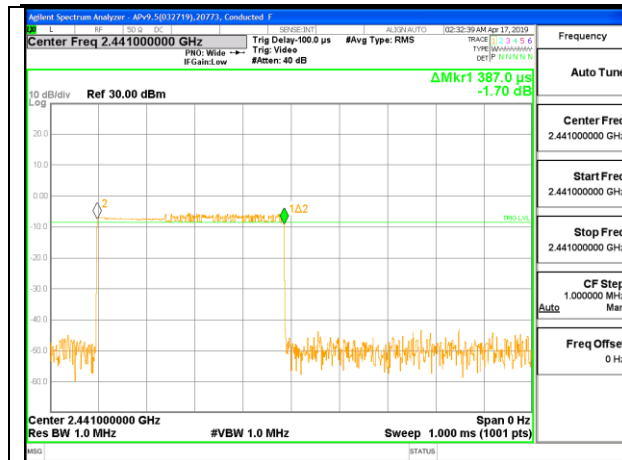
#### 8.8.4. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

##### Antenna 4

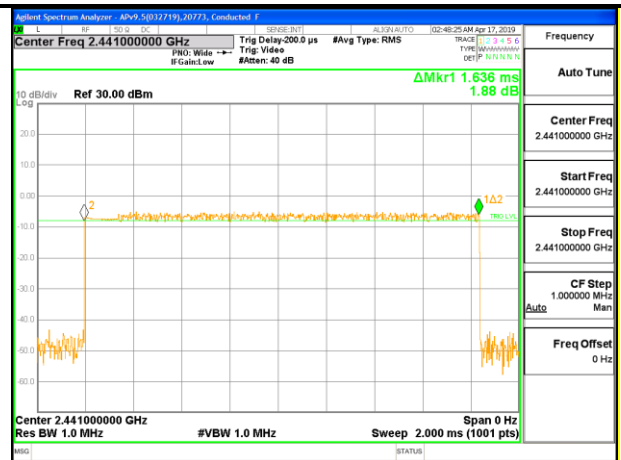
| DH Packet        | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
|------------------|--------------------|----------------------------------|---------------------------------|-------------|--------------|
| 8PSK Normal Mode |                    |                                  |                                 |             |              |
| 3DH1             | 0.387              | 32                               | 0.12384                         | 0.4         | -0.2762      |
| 3DH3             | 1.636              | 16                               | 0.26176                         | 0.4         | -0.1382      |
| 3DH5             | 2.888              | 4                                | 0.11552                         | 0.4         | -0.2845      |

Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.

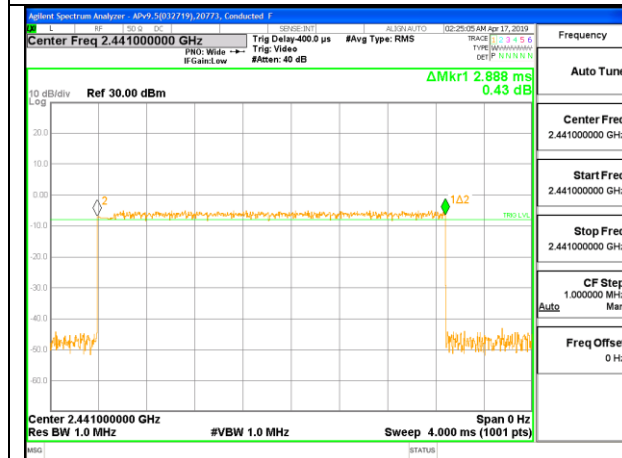




**PULSE WIDTH – 3DH1**



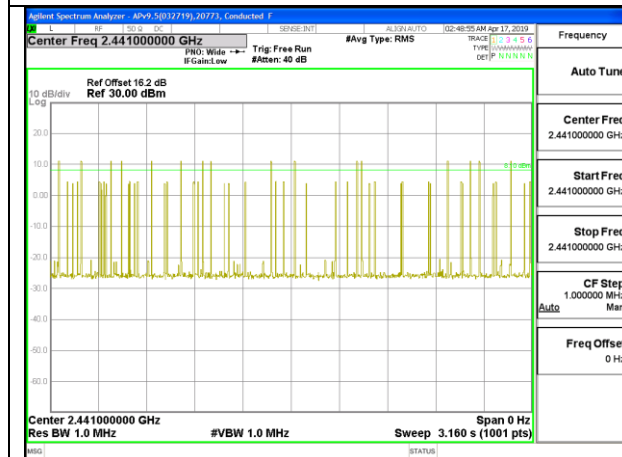
**PULSE WIDTH – 3DH3**



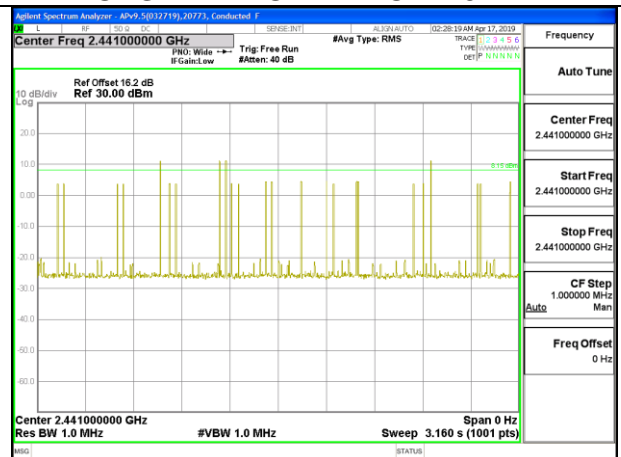
**PULSE WIDTH – 3DH5**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH1**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH3**

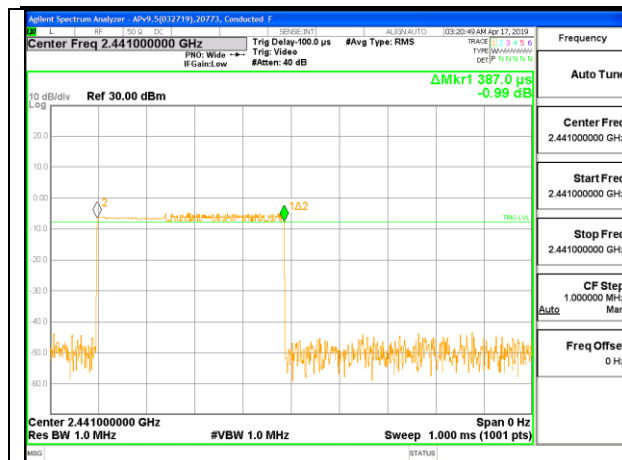


**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH5**

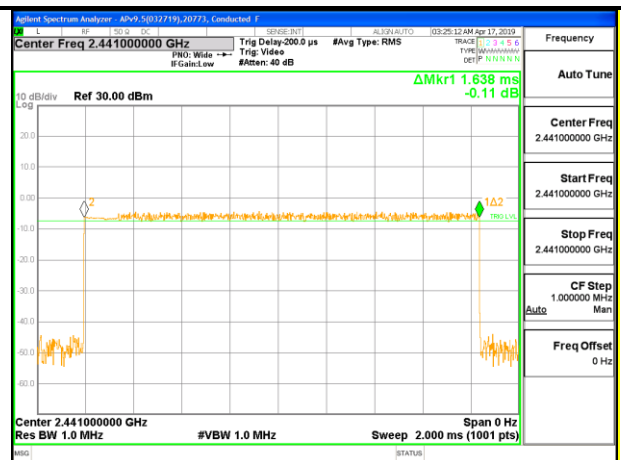
**Antenna 3**

| DH Packet        | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
|------------------|--------------------|----------------------------------|---------------------------------|-------------|--------------|
| 8PSK Normal Mode |                    |                                  |                                 |             |              |
| 3DH1             | 0.387              | 30                               | 0.1161                          | 0.4         | -0.2839      |
| 3DH3             | 1.638              | 14                               | 0.22932                         | 0.4         | -0.1707      |
| 3DH5             | 2.888              | 5                                | 0.1444                          | 0.4         | -0.2556      |

Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



**PULSE WIDTH – 3DH1**



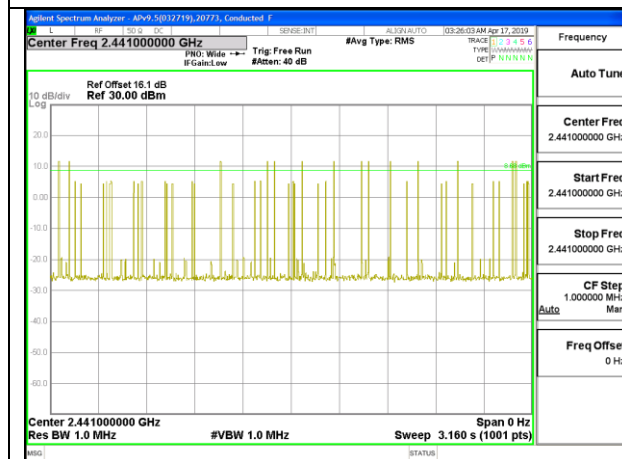
**PULSE WIDTH – 3DH3**



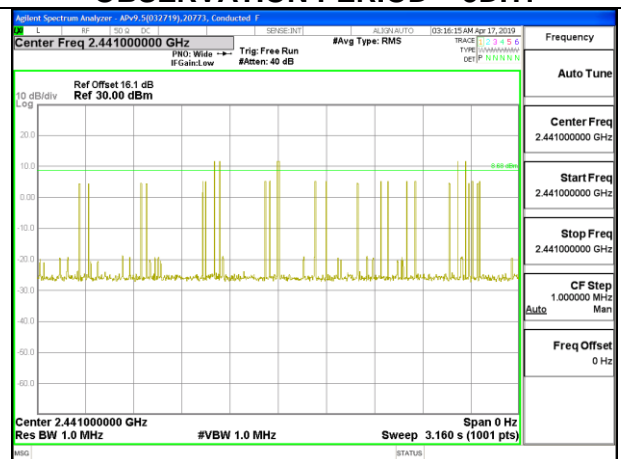
**PULSE WIDTH – 3DH5**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH1**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH3**



**NUMBER OF PULSES IN 3.16 SECOND  
OBSERVATION PERIOD – 3DH5**

## **8.9. BEAMFORMING AVERAGE TIME OF OCCUPANCY**

### **LIMITS**

FCC §15.247 (a) (1) (iii)

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 3.16 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  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$ .

Note: Test procedure on beamforming mode is same as BT basic and EDR mode

### **RESULTS**

## 8.9.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

### Antenna 4

| 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              | 0.381              | 32                               | 0.1219                          | 0.4         | -0.2781      |
| DH3              | 1.638              | 18                               | 0.2948                          | 0.4         | -0.1052      |
| DH5              | 2.892              | 6                                | 0.1735                          | 0.4         | -0.2265      |
|                  |                    |                                  |                                 |             |              |
| DH Packet        | Pulse Width (sec)  | Number of Pulses in 0.8 seconds  | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
| GFSK AFH Mode    |                    |                                  |                                 |             |              |
| DH1              | 0.381              | 8                                | 0.03048                         | 0.4         | -0.3695      |
| DH3              | 1.638              | 4.5                              | 0.07371                         | 0.4         | -0.3263      |
| DH5              | 2.892              | 1.5                              | 0.04338                         | 0.4         | -0.3566      |