

## Appendix C

### RF Test Data for 2.4G WIFI (Conducted Measurement)

Product Name: OVMS (Open Vehicle Monitoring System)

Trade Mark: Open Vehicles

Test Model: OVMS-31-5360A

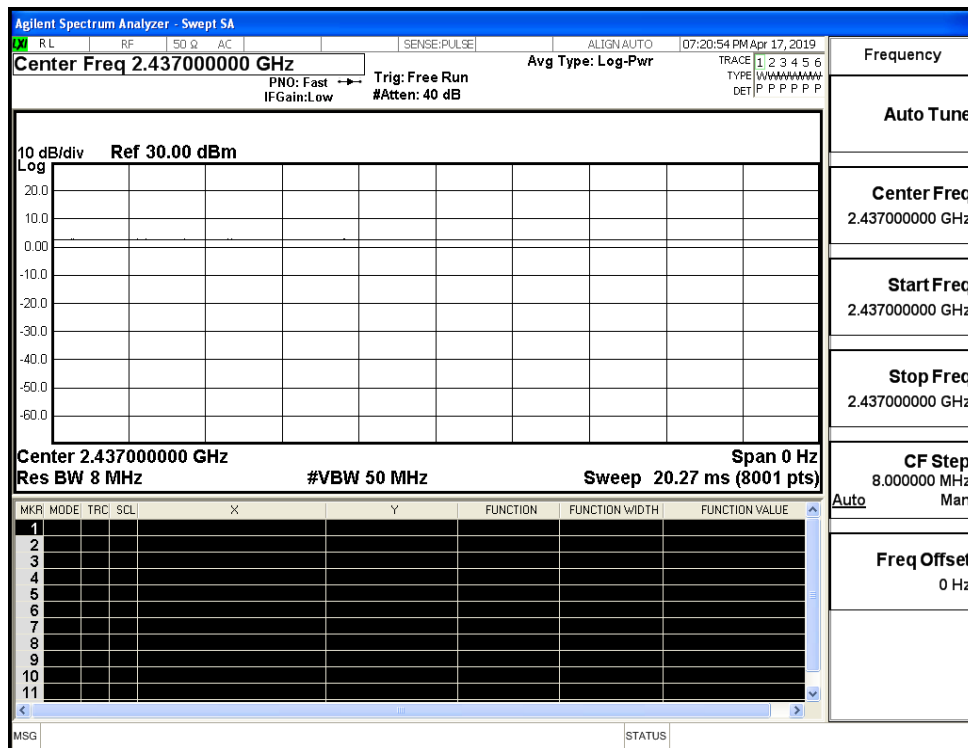
#### Environmental Conditions

|                    |             |
|--------------------|-------------|
| Temperature:       | 23.8 ° C    |
| Relative Humidity: | 53.4%       |
| ATM Pressure:      | 100.0 kPa   |
| Test Engineer:     | Wang Chuang |
| Supervised by:     | Tom Liu     |

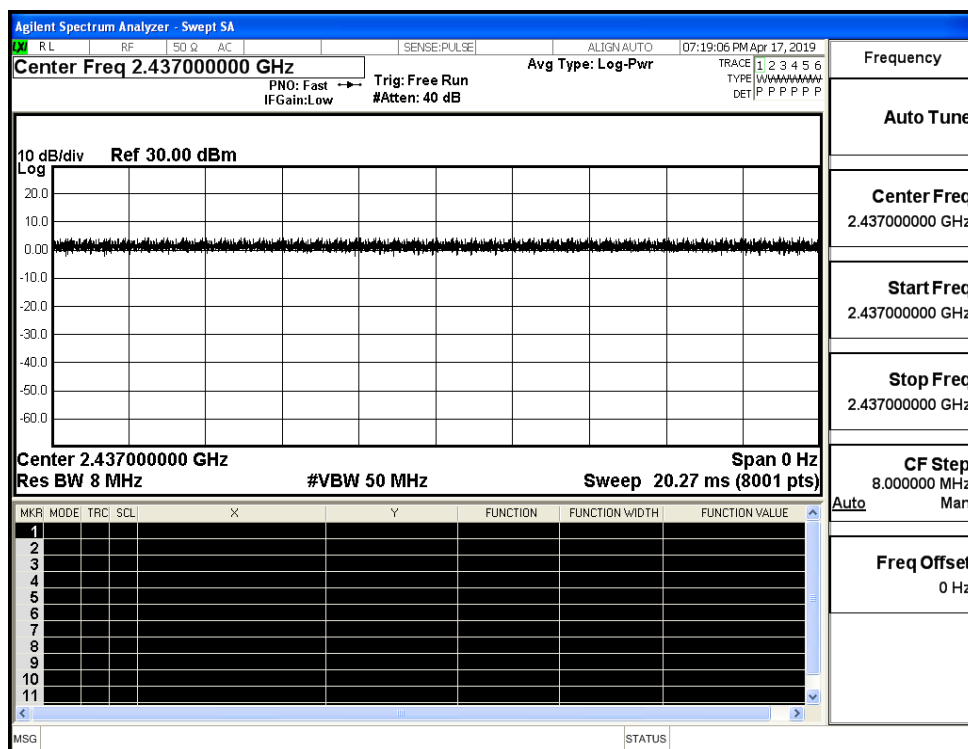
#### C.1 Duty Cycle

| Test Mode | Test Channel | Ant  | Duty Cycle[%] | Verdict |
|-----------|--------------|------|---------------|---------|
| 11B       | 2437         | Ant1 | 100           | PASS    |
| 11G       | 2437         | Ant1 | 100           | PASS    |
| 11N20SISO | 2437         | Ant1 | 100           | PASS    |
| 11N40SISO | 2437         | Ant1 | 100           | PASS    |

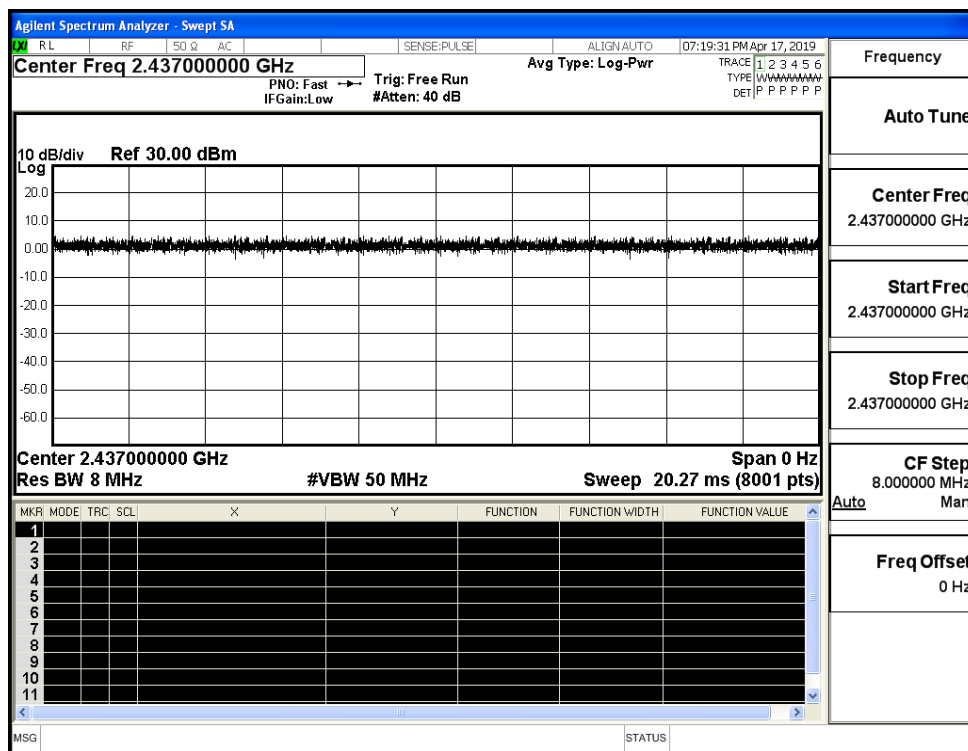
## Duty Cycle\_11B\_2437\_Ant1



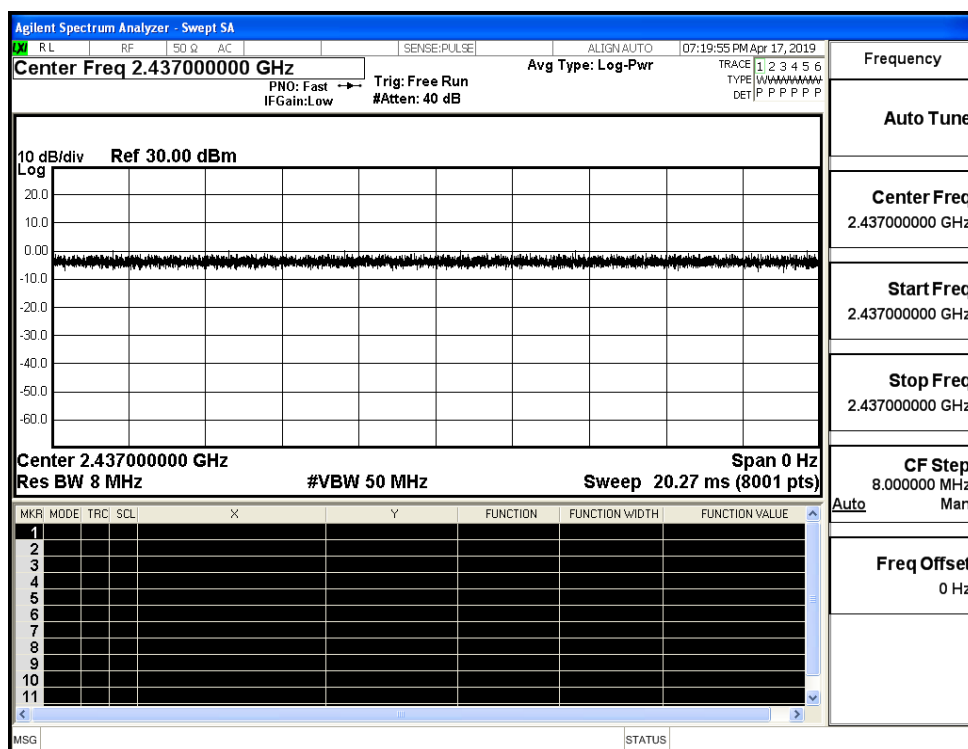
## Duty Cycle\_11G\_2437\_Ant1



## Duty Cycle\_11N20SISO\_2437\_Ant1



## Duty Cycle\_11N40SISO\_2437\_Ant1



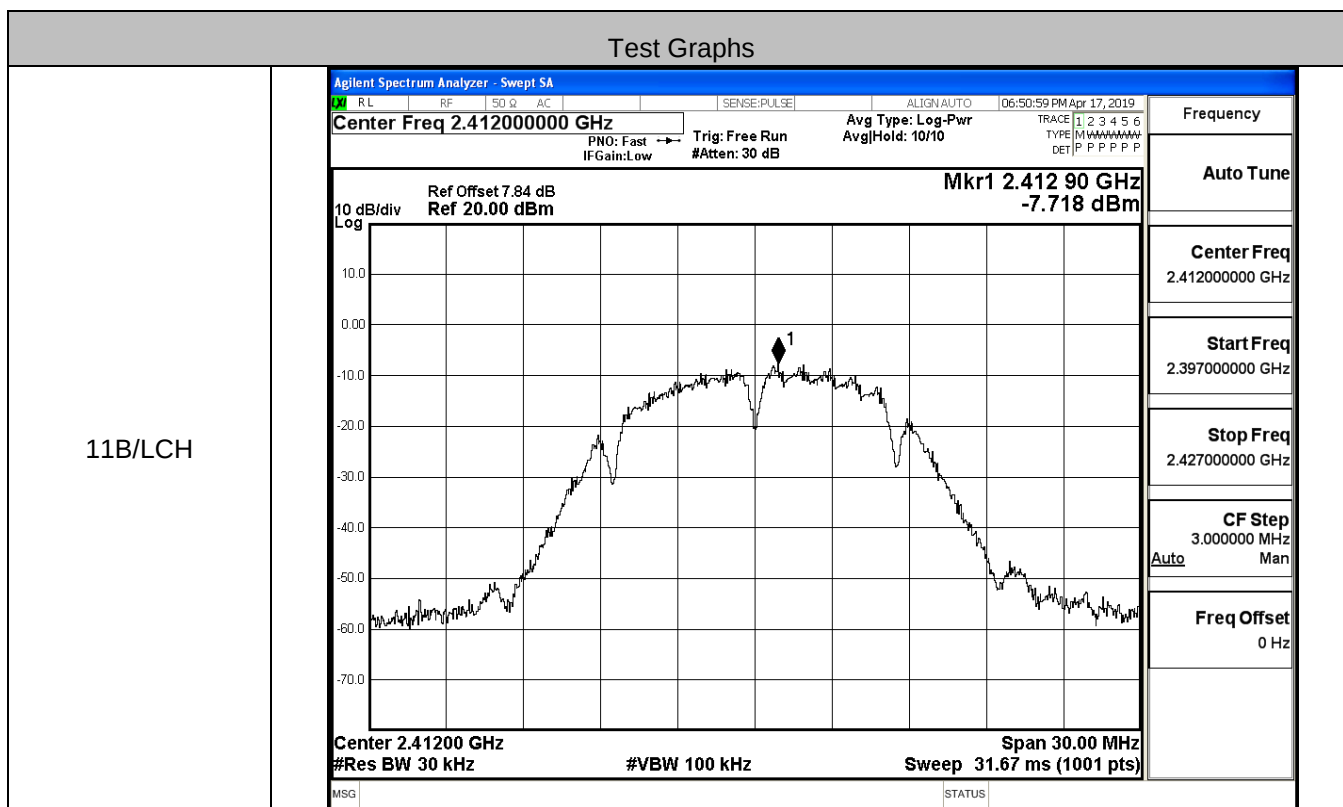
**C.2 Maximum Conducted Output Power**

| Mode      | Channel | Meas. Peak Level [dBm] | Meas. Average Level [dBm] | Limit [dBm] | Verdict |
|-----------|---------|------------------------|---------------------------|-------------|---------|
| 11B       | LCH     | 9.86                   | 7.69                      | 30          | PASS    |
|           | MCH     | 10.07                  | 7.87                      | 30          | PASS    |
|           | HCH     | 8.80                   | 6.65                      | 30          | PASS    |
| 11G       | LCH     | 11.14                  | 7.80                      | 30          | PASS    |
|           | MCH     | 13.06                  | 9.72                      | 30          | PASS    |
|           | HCH     | 12.11                  | 8.71                      | 30          | PASS    |
| 11N20SISO | LCH     | 10.89                  | 7.42                      | 30          | PASS    |
|           | MCH     | 13.01                  | 9.41                      | 30          | PASS    |
|           | HCH     | 11.90                  | 8.38                      | 30          | PASS    |
| 11N40SISO | LCH     | 13.16                  | 7.87                      | 30          | PASS    |
|           | MCH     | 12.48                  | 7.19                      | 30          | PASS    |
|           | HCH     | 12.51                  | 7.13                      | 30          | PASS    |

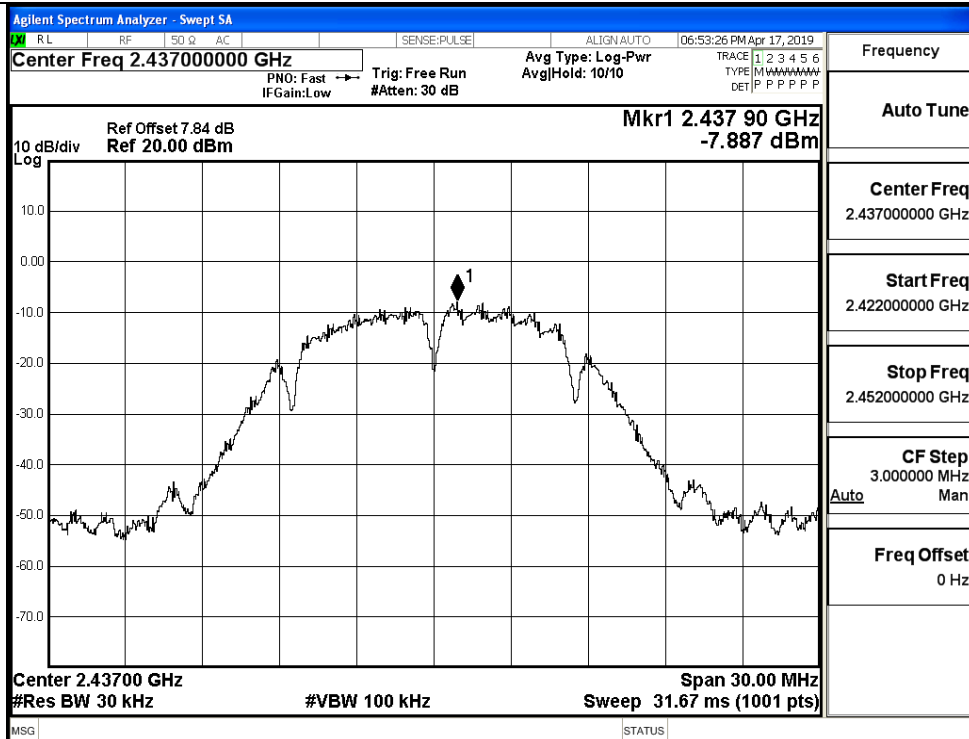
### C.3 Maximum Power Spectral Density

| Mode      | Channel | Meas.Level<br>[dBm/30KHz] | Convert<br>Factor | Result<br>[dBm/30KHz] | Limit<br>[dBm/30KHz] | Verdict |
|-----------|---------|---------------------------|-------------------|-----------------------|----------------------|---------|
| 11B       | LCH     | -7.718                    | -10               | -17.718               | 8                    | PASS    |
|           | MCH     | -7.887                    | -10               | -17.887               | 8                    | PASS    |
|           | HCH     | -9.116                    | -10               | -19.116               | 8                    | PASS    |
| 11G       | LCH     | -11.448                   | -10               | -21.448               | 8                    | PASS    |
|           | MCH     | -10.631                   | -10               | -20.631               | 8                    | PASS    |
|           | HCH     | -9.989                    | -10               | -19.989               | 8                    | PASS    |
| 11N20SISO | LCH     | -10.648                   | -10               | -20.648               | 8                    | PASS    |
|           | MCH     | -9.939                    | -10               | -19.939               | 8                    | PASS    |
|           | HCH     | -10.088                   | -10               | -20.088               | 8                    | PASS    |
| 11N40SISO | LCH     | -11.915                   | -10               | -21.915               | 8                    | PASS    |
|           | MCH     | -13.251                   | -10               | -23.251               | 8                    | PASS    |
|           | HCH     | -11.706                   | -10               | -21.706               | 8                    | PASS    |

\*\*\*Note: The Convert Factor =  $10 \cdot \log(3\text{KHz}/30\text{KHz}) = -10$



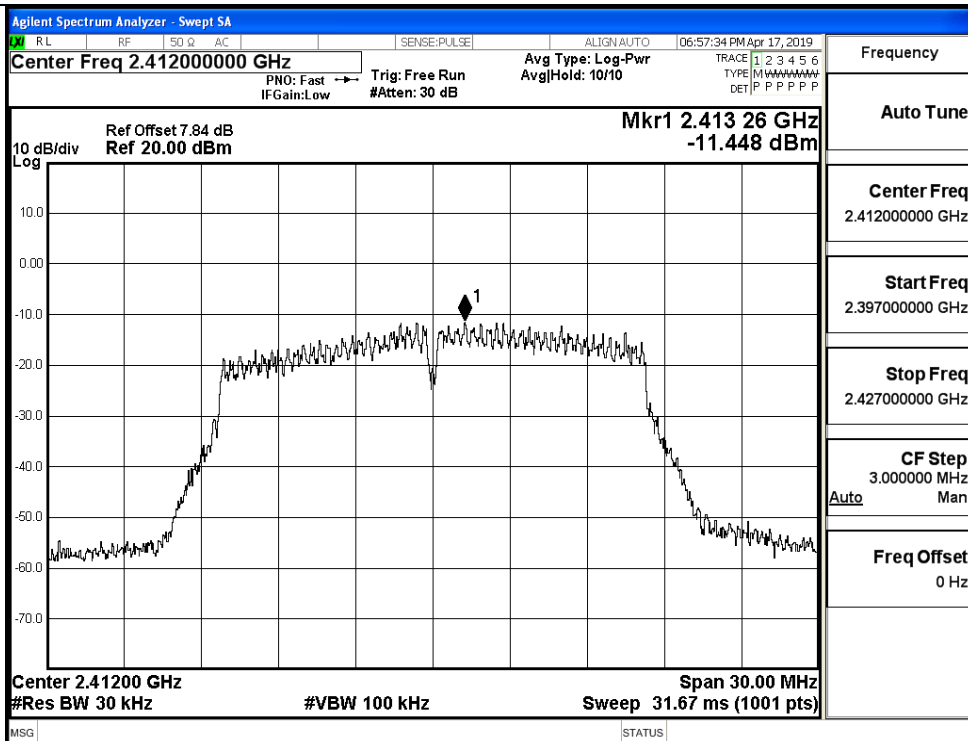
11B/MCH



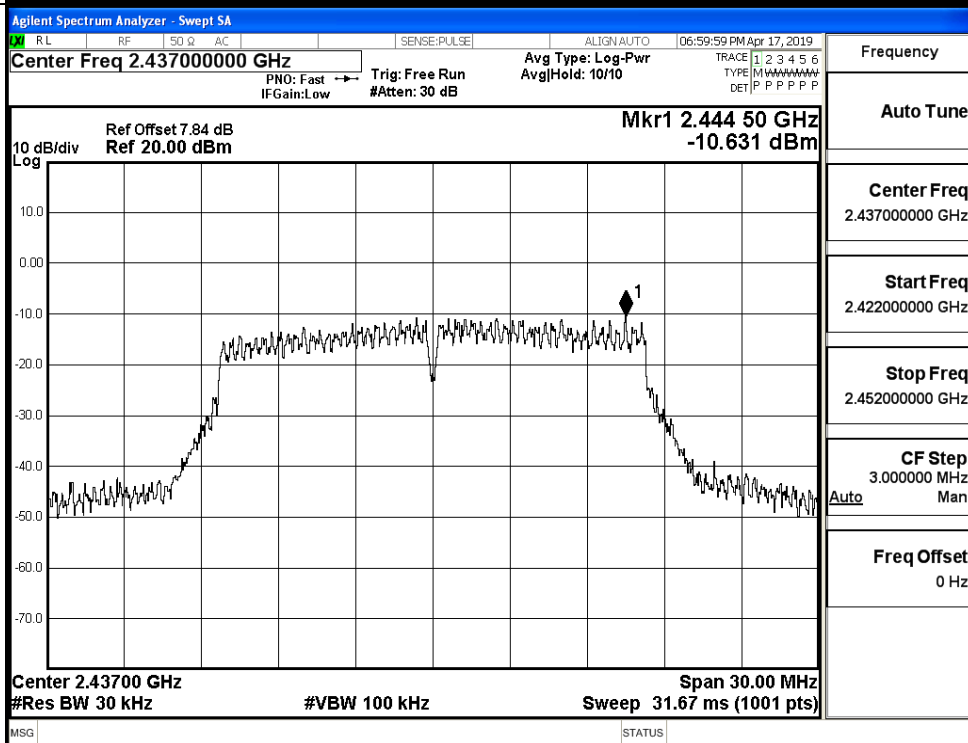
11B/HCH



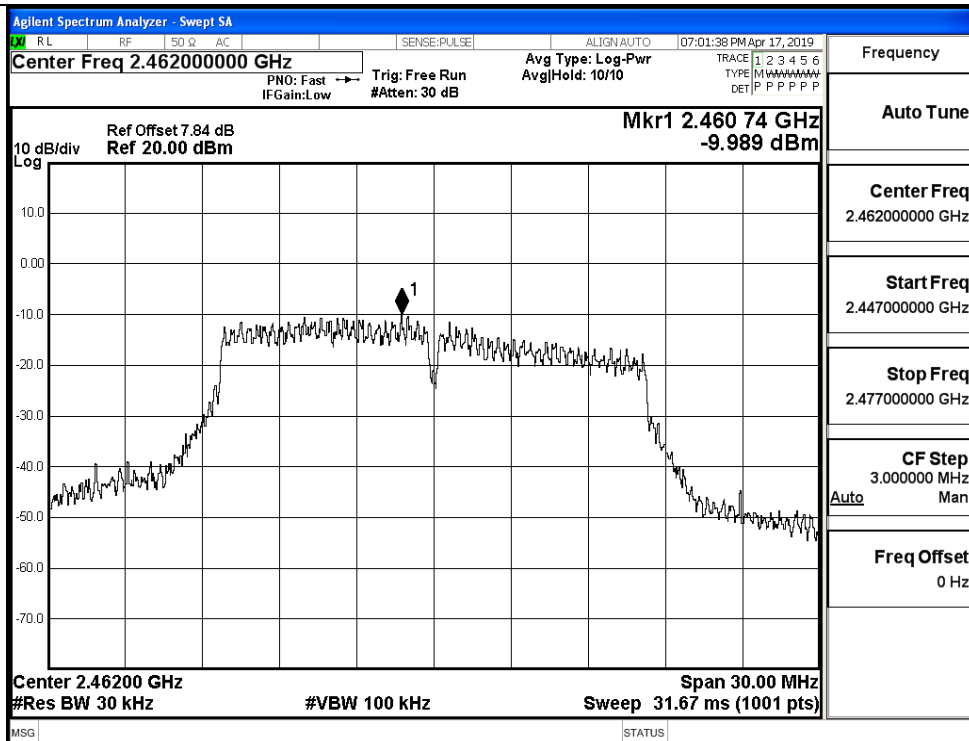
11G/LCH



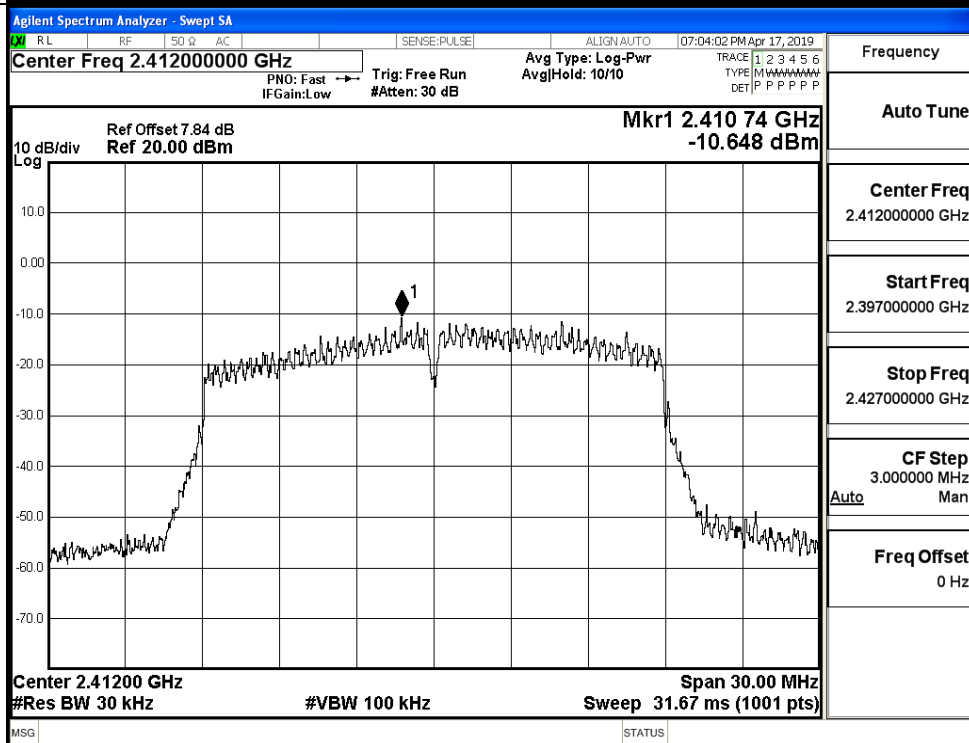
11G/MCH



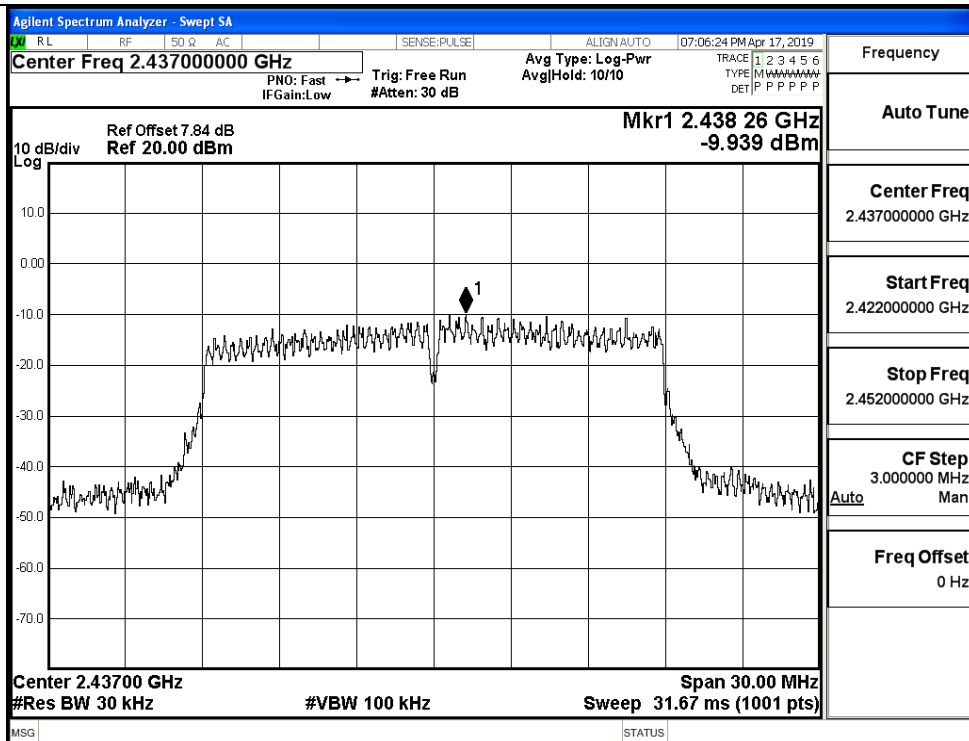
11G/HCH



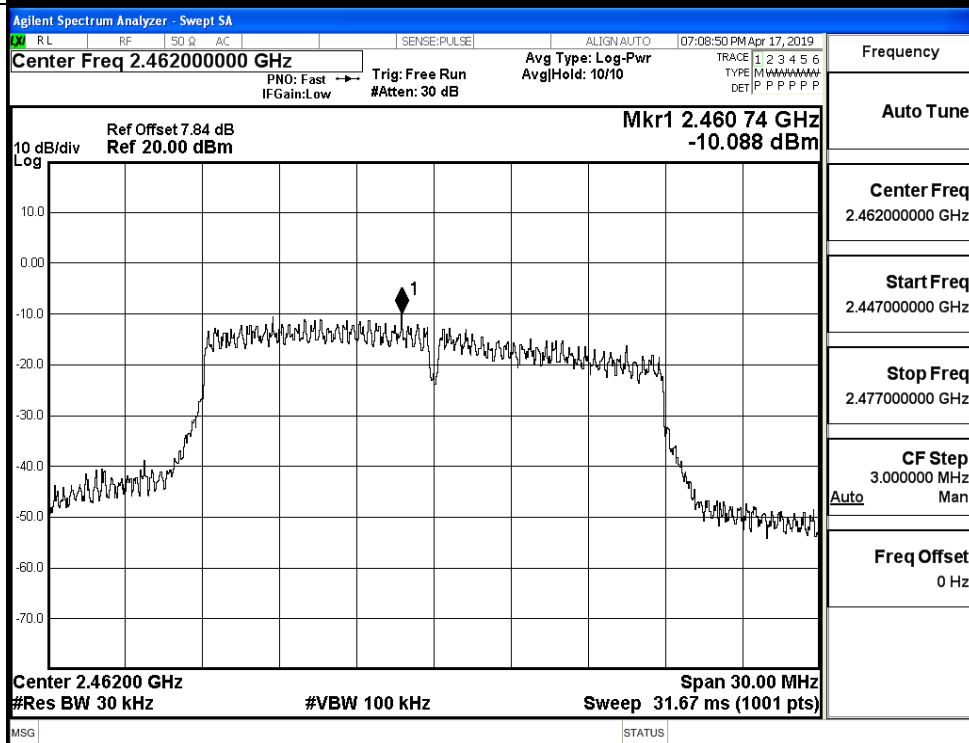
11N20SISO/LCH



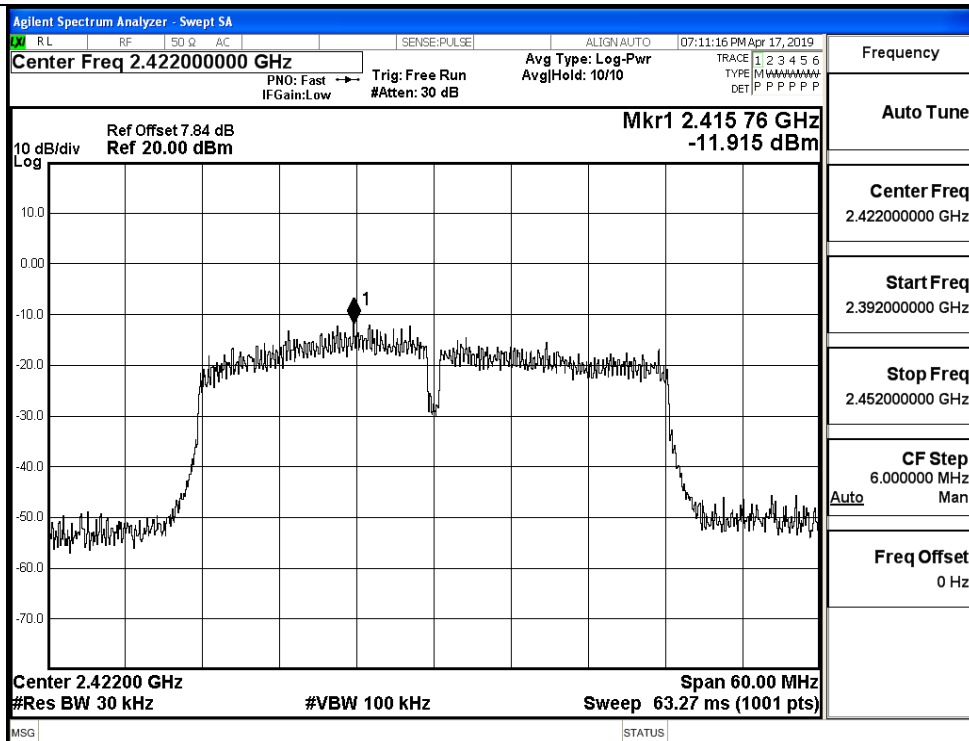
11N20SISO/MCH



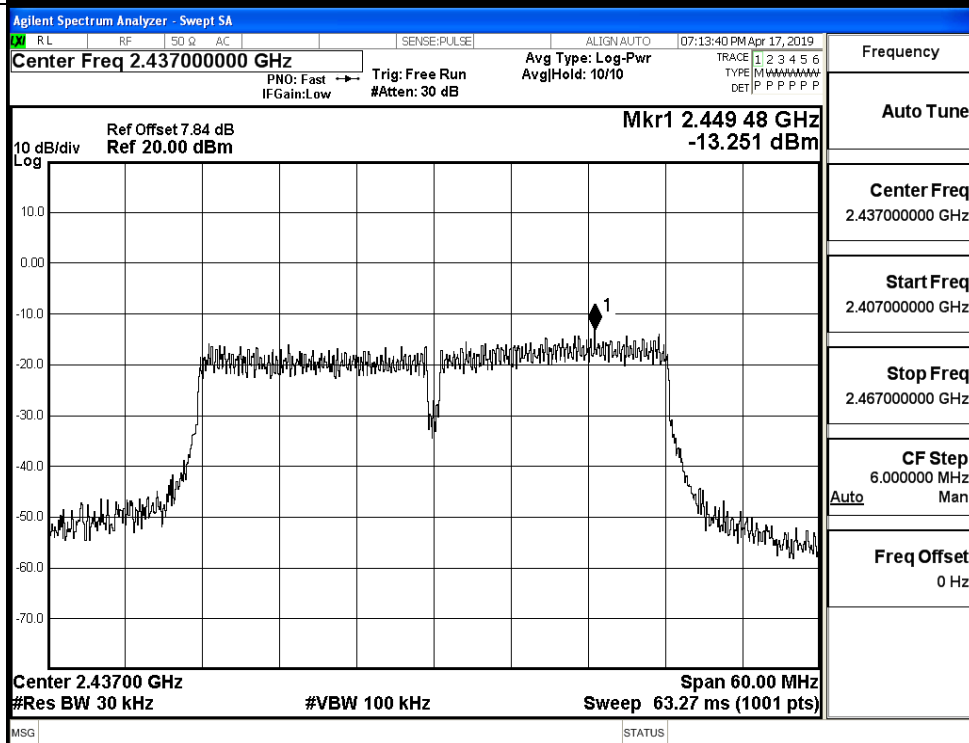
11N20SISO/HCH



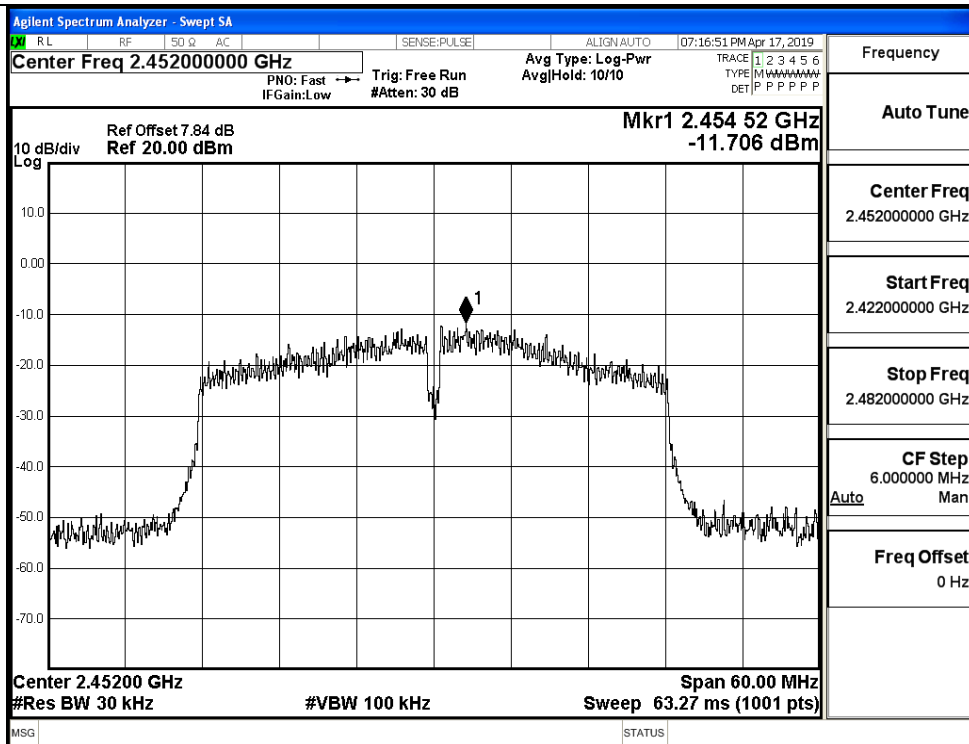
11N40SISO/LCH



11N40SISO/MCH



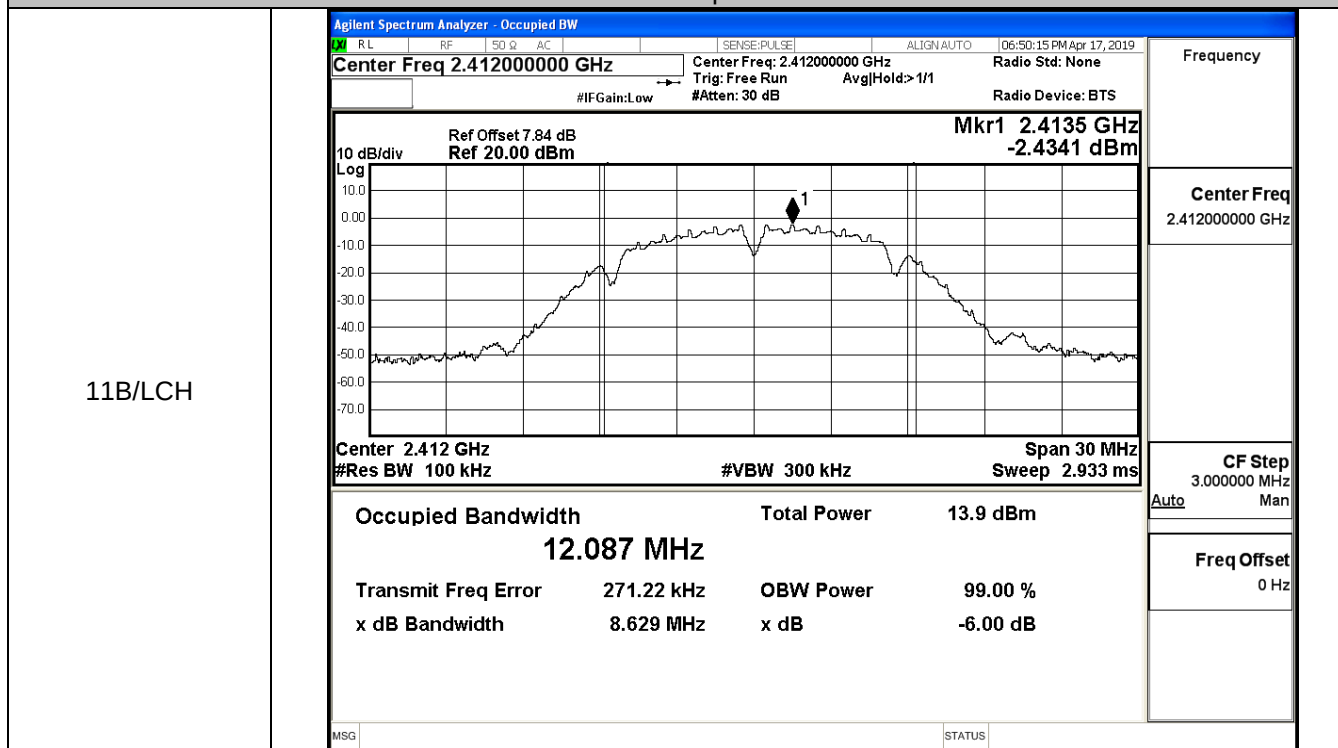
11N40SISO/HCH



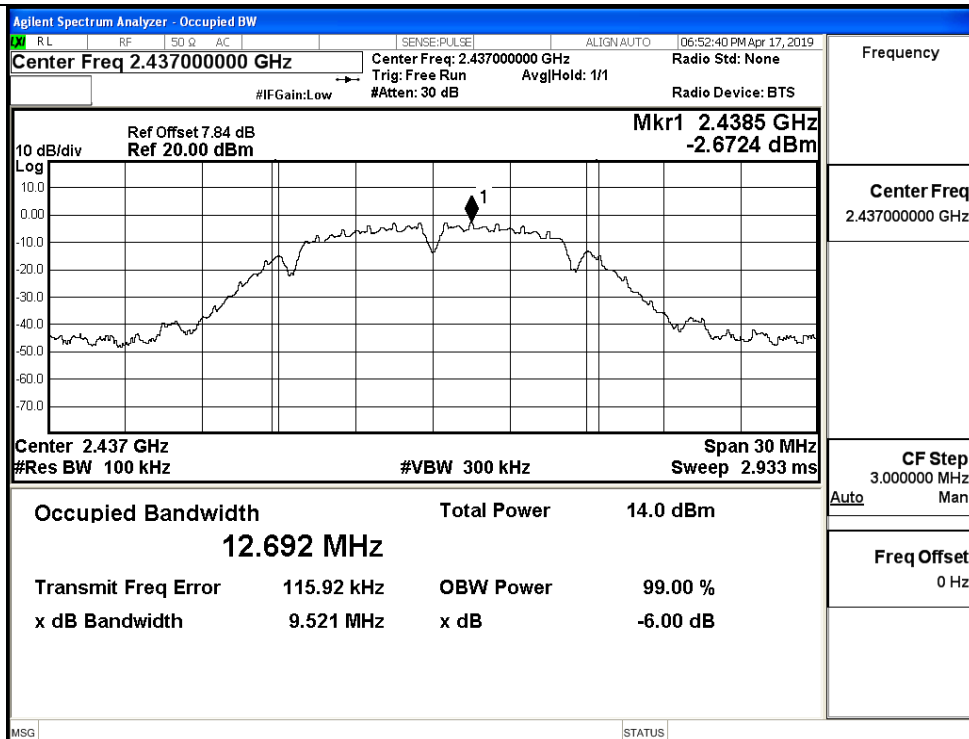
## C.4 6dB Bandwidth

| Mode      | Channel | 6dB Bandwidth [MHz] | Limit [MHz] | Verdict |
|-----------|---------|---------------------|-------------|---------|
| 11B       | LCH     | 8.629               | $\geq 0.5$  | PASS    |
|           | MCH     | 9.521               | $\geq 0.5$  | PASS    |
|           | HCH     | 8.631               | $\geq 0.5$  | PASS    |
| 11G       | LCH     | 13.86               | $\geq 0.5$  | PASS    |
|           | MCH     | 15.72               | $\geq 0.5$  | PASS    |
|           | HCH     | 14.48               | $\geq 0.5$  | PASS    |
| 11N20SISO | LCH     | 13.89               | $\geq 0.5$  | PASS    |
|           | MCH     | 16.34               | $\geq 0.5$  | PASS    |
|           | HCH     | 15.09               | $\geq 0.5$  | PASS    |
| 11N40SISO | LCH     | 35.11               | $\geq 0.5$  | PASS    |
|           | MCH     | 35.75               | $\geq 0.5$  | PASS    |
|           | HCH     | 25.03               | $\geq 0.5$  | PASS    |

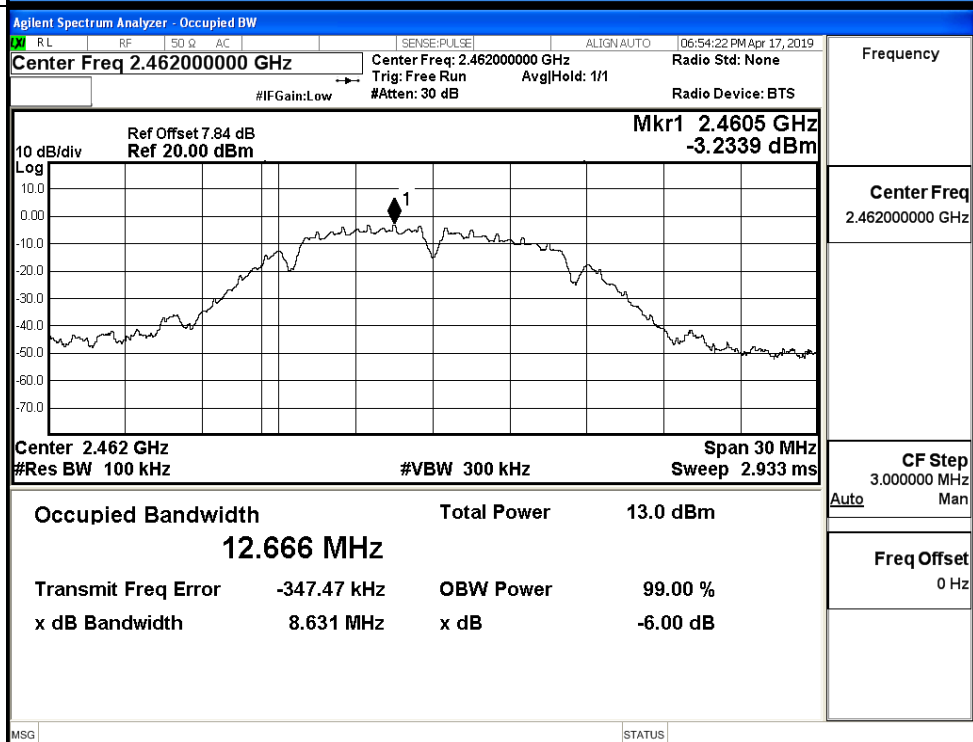
## Test Graphs



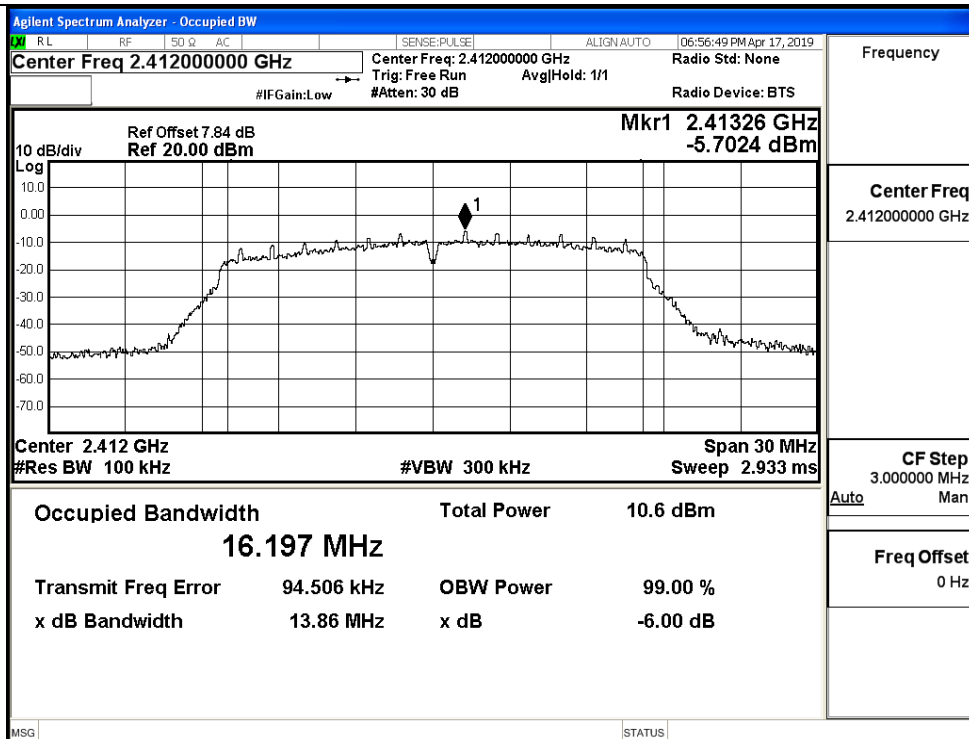
11B/MCH



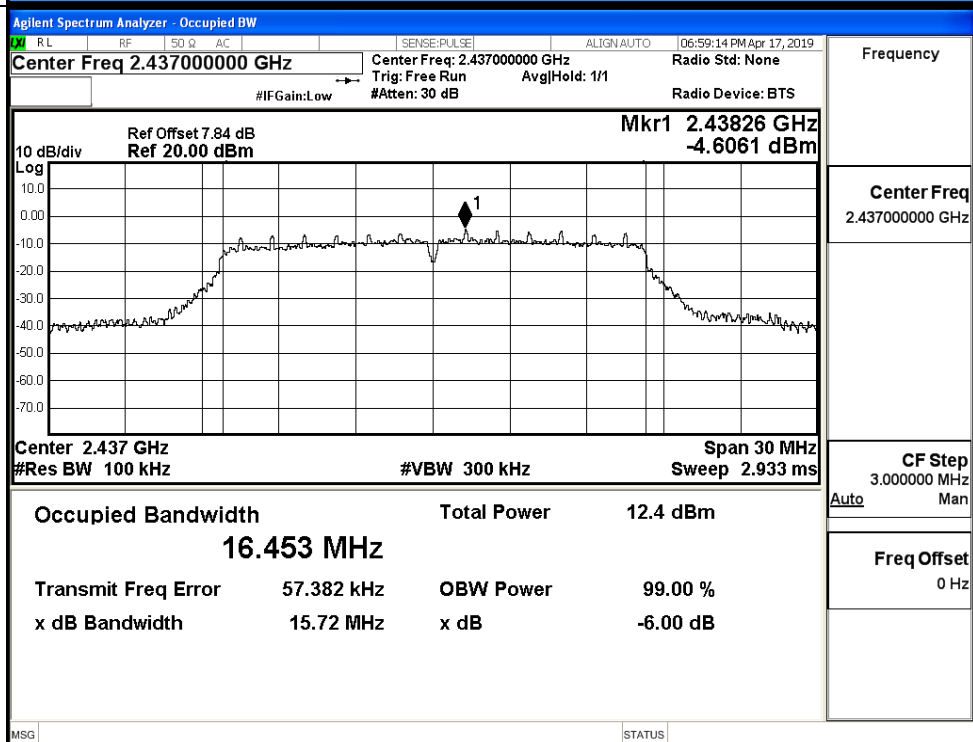
11B/HCH



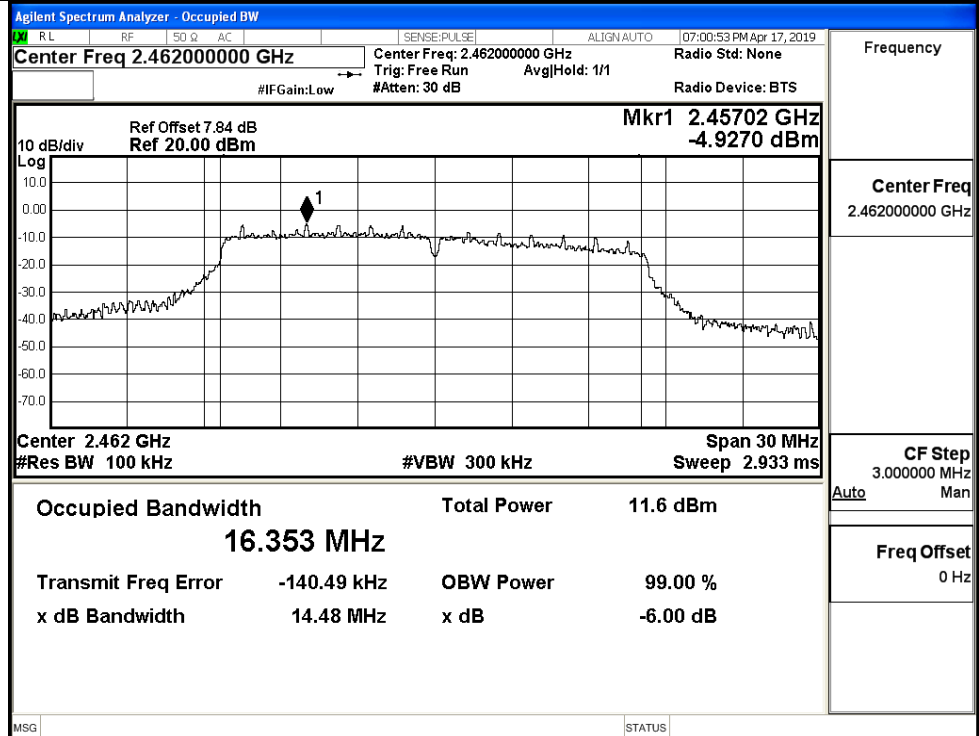
11G/LCH



11G/MCH



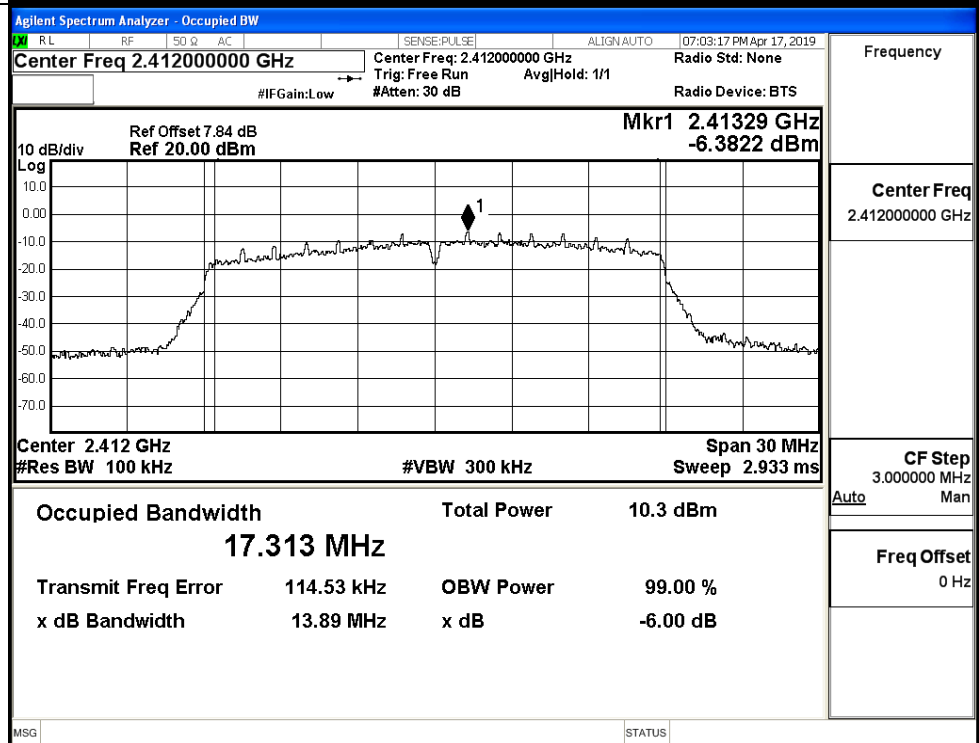
11G/HCH



Frequency

Center Freq  
2.46200000 GHzCF Step  
3.000000 MHz  
Auto ManFreq Offset  
0 Hz

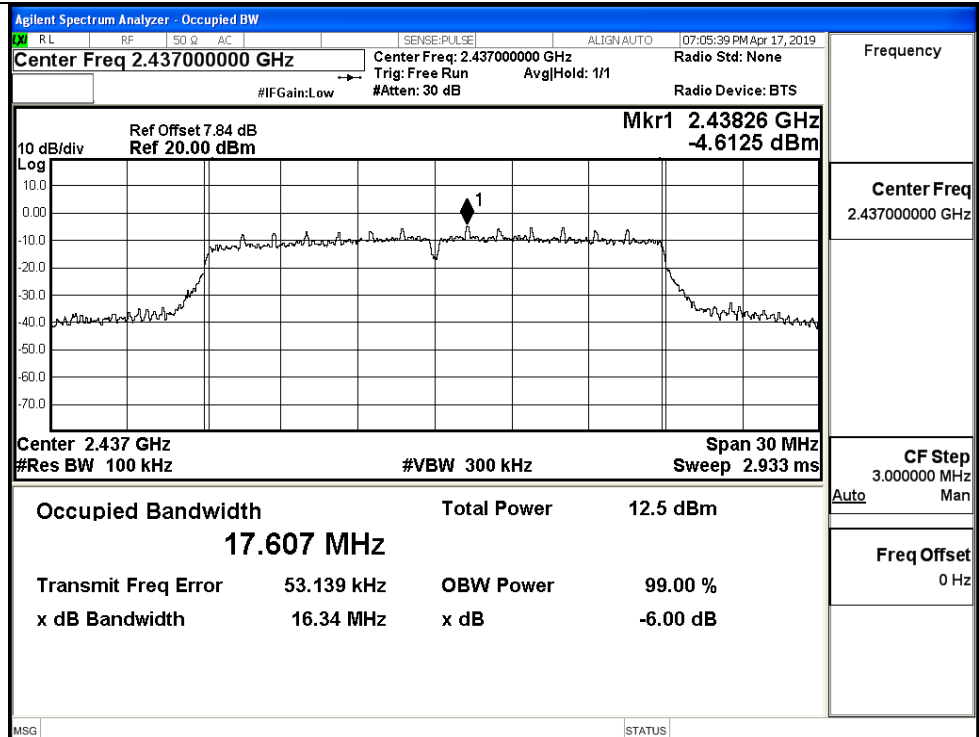
11N20SISO/LCH



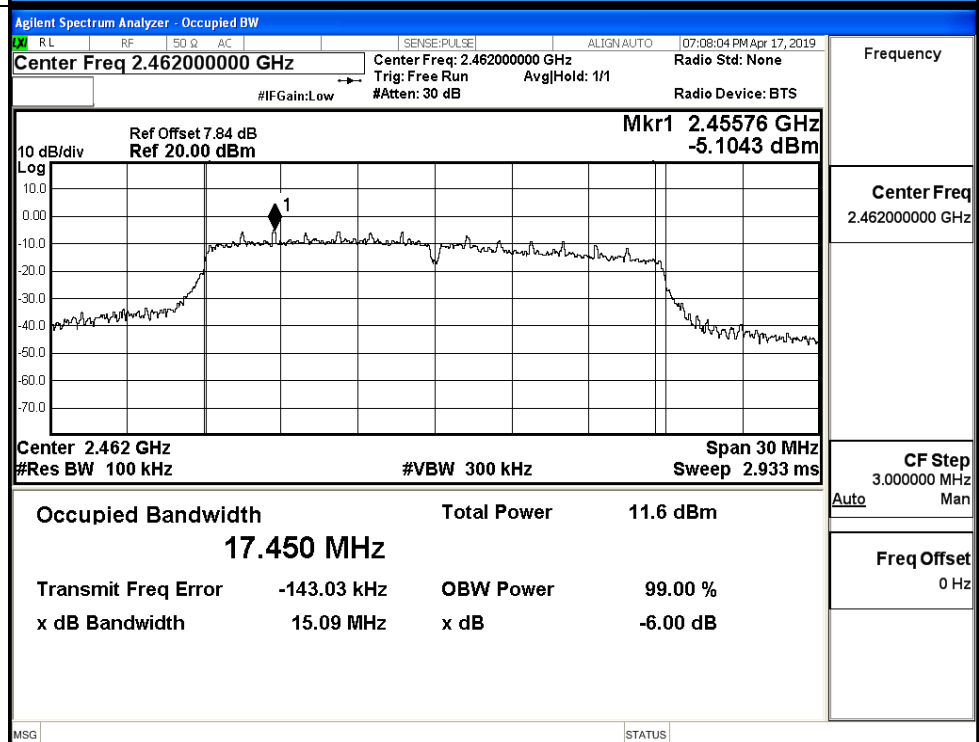
Frequency

Center Freq  
2.41200000 GHzCF Step  
3.000000 MHz  
Auto ManFreq Offset  
0 Hz

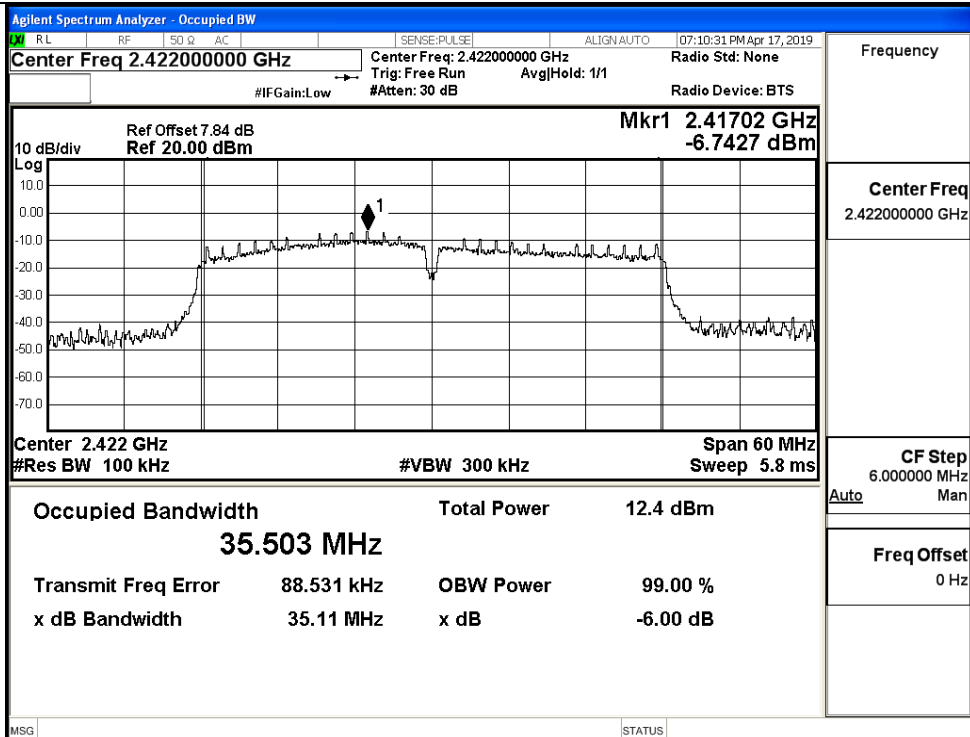
11N20SISO/MCH



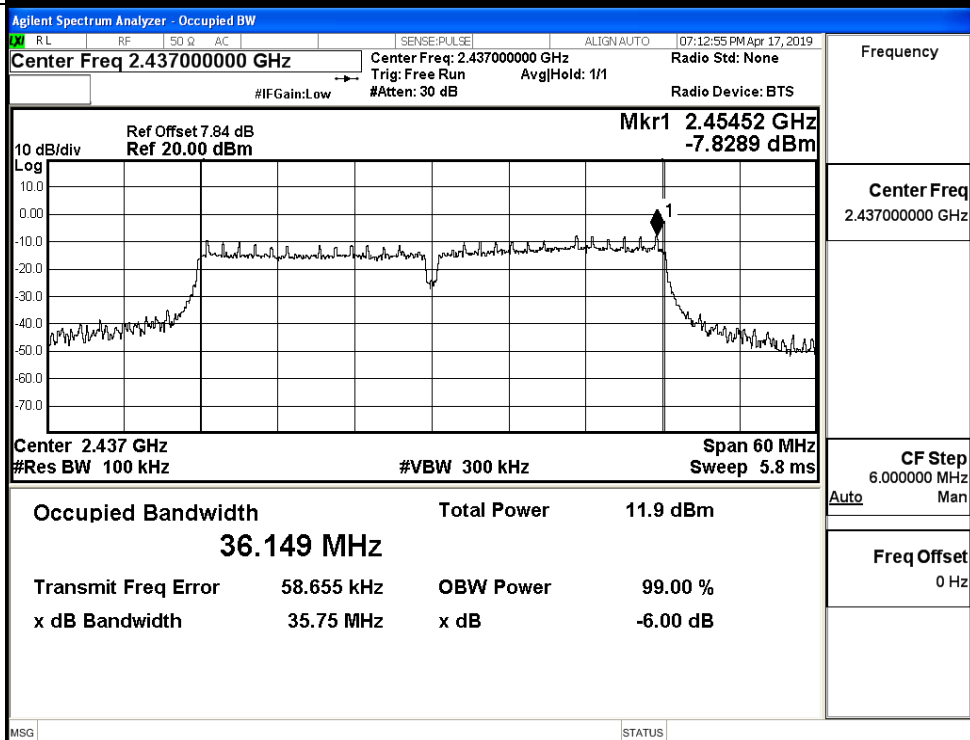
11N20SISO/HCH



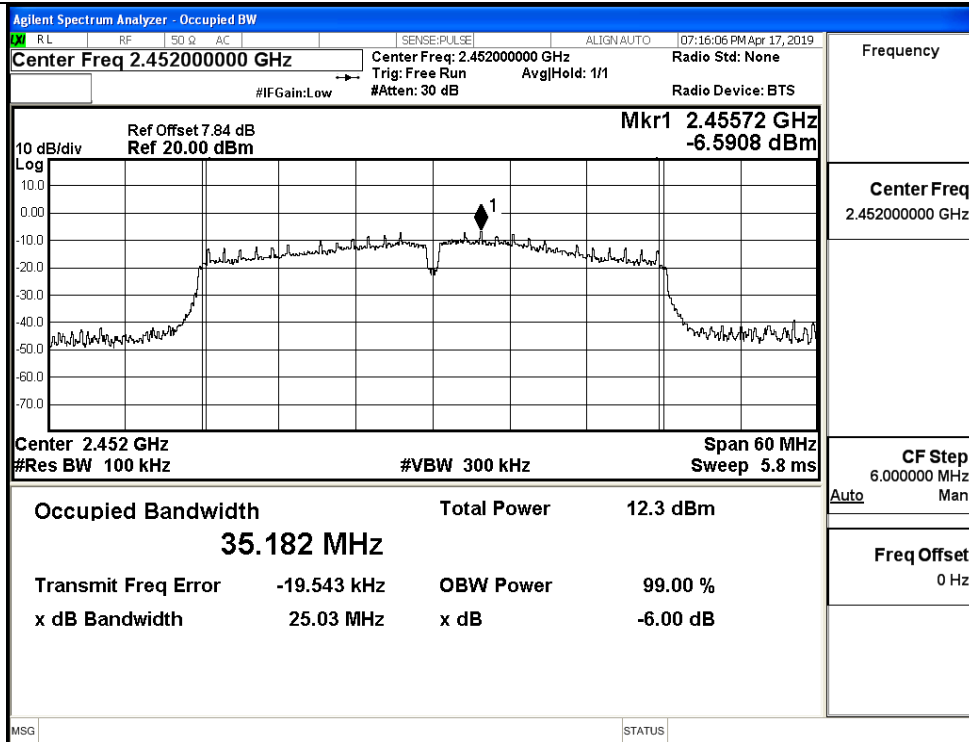
11N40SISO/LCH



11N40SISO/MCH



11N40SISO/HCH

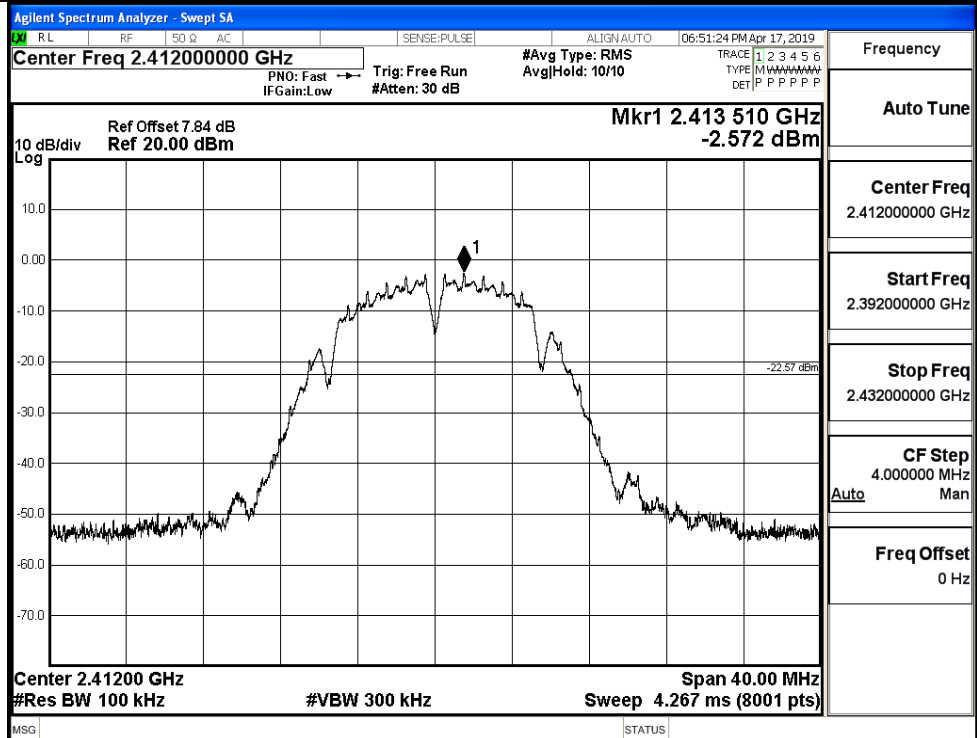


## C.5 RF Conducted Spurious Emissions

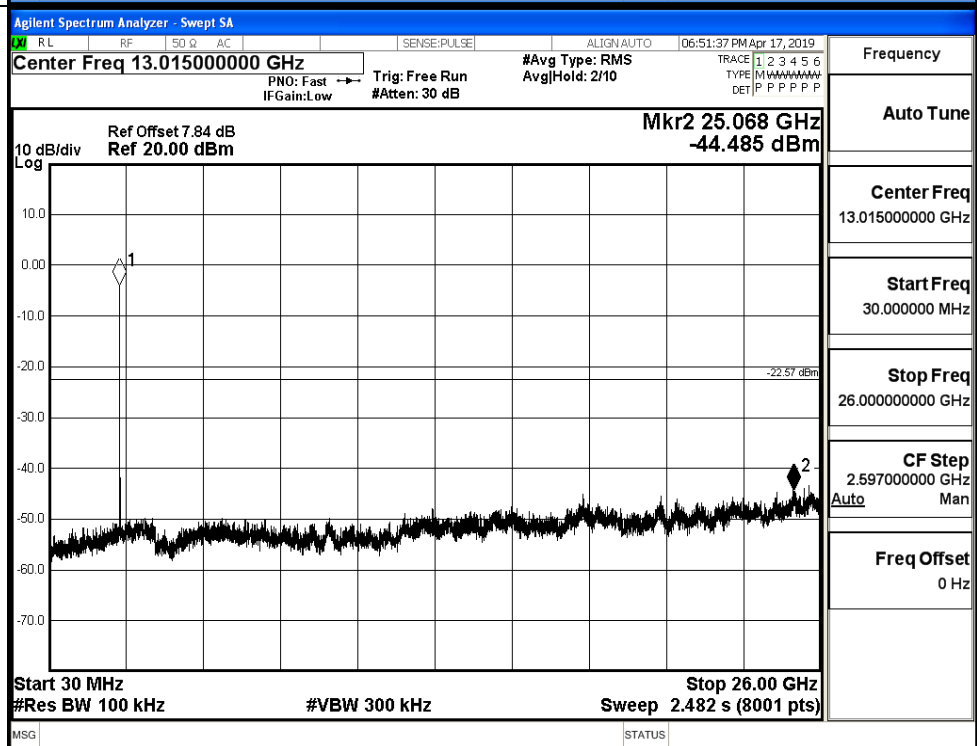
| Mode          | Channel | Pref [dBm] | Max. Level [dBm] | Limit [dBm] | Verdict |
|---------------|---------|------------|------------------|-------------|---------|
| 11B           | LCH     | -2.572     | -44.485          | -22.572     | PASS    |
|               | MCH     | -2.775     | -42.688          | -22.775     | PASS    |
|               | HCH     | -3.283     | -43.843          | -23.283     | PASS    |
| 11G           | LCH     | -5.763     | -43.397          | -25.763     | PASS    |
|               | MCH     | -5.603     | -43.568          | -25.603     | PASS    |
|               | HCH     | -5.066     | -43.583          | -25.066     | PASS    |
| 11N20<br>SISO | LCH     | -5.703     | -43.692          | -25.703     | PASS    |
|               | MCH     | -5.517     | -43.125          | -25.517     | PASS    |
|               | HCH     | -5.484     | -44.173          | -25.484     | PASS    |
| 11N40<br>SISO | LCH     | -6.827     | -43.943          | -26.827     | PASS    |
|               | MCH     | -7.763     | -42.720          | -27.763     | PASS    |
|               | HCH     | -6.316     | -44.009          | -26.316     | PASS    |

## 11B LCH Graphs

Pref/11B/LCH

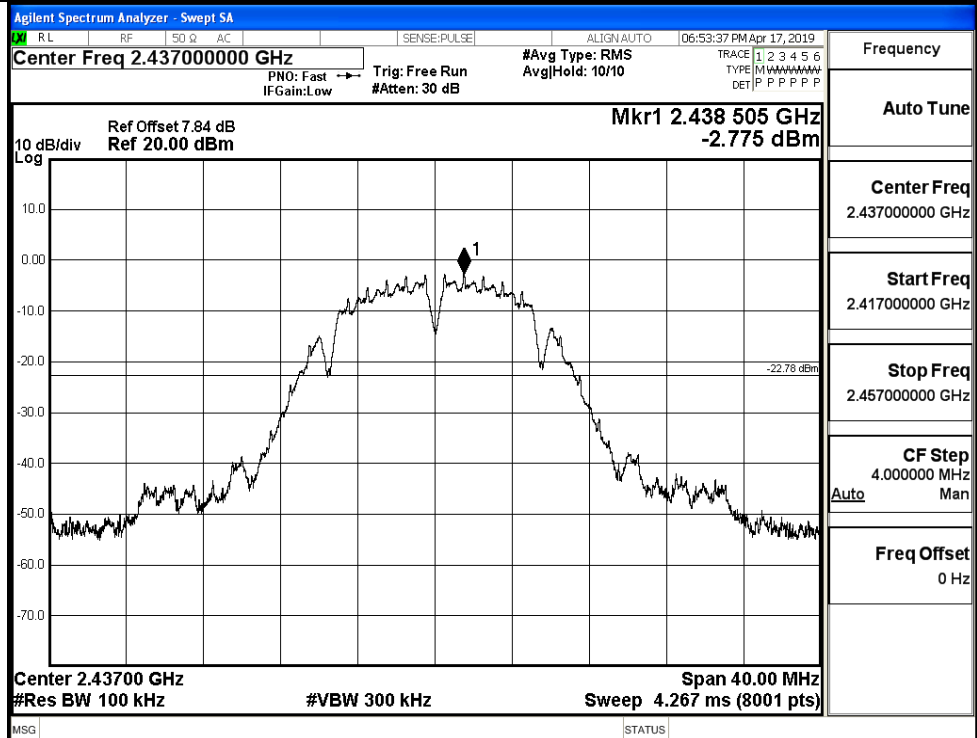


Puw/11B/LCH

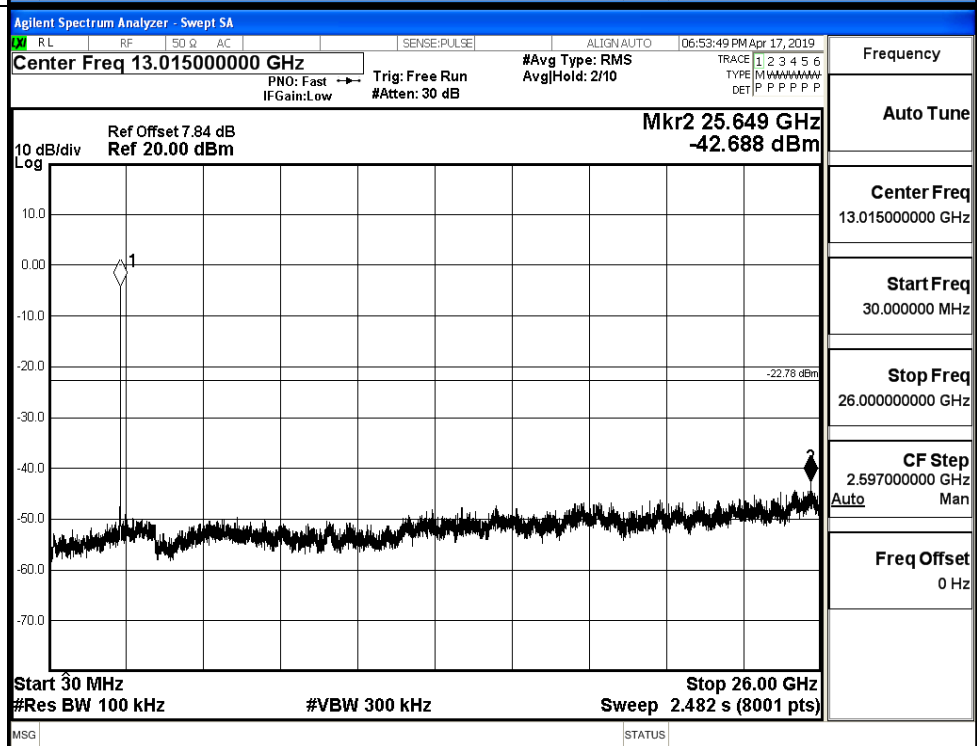


## 11B MCH Graphs

Pref/11B/MCH

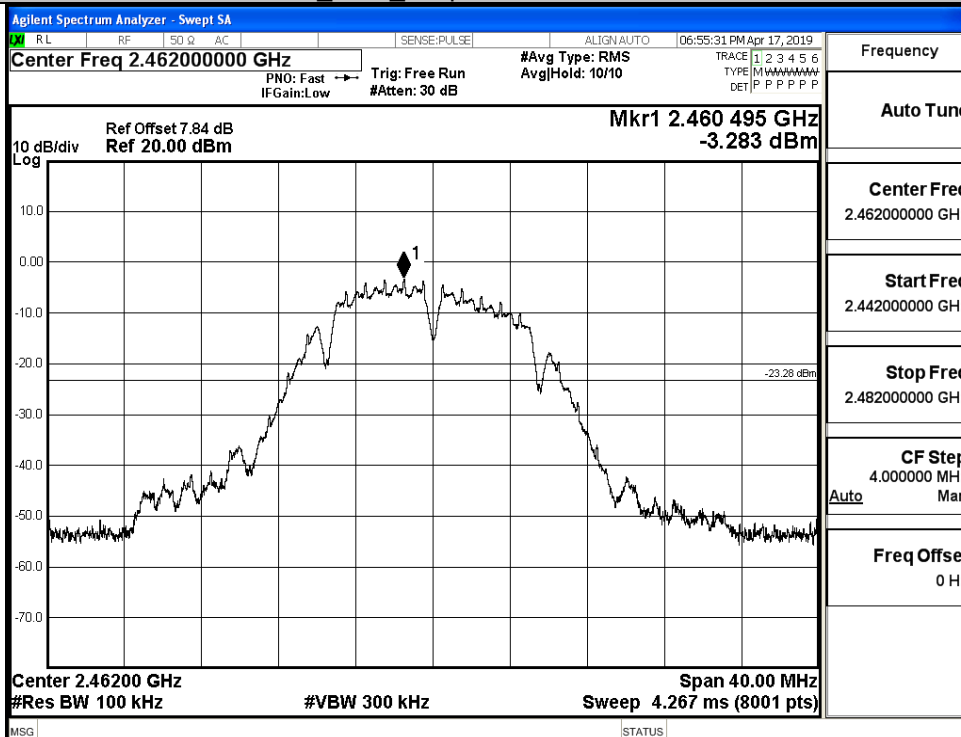


Puw/11B/MCH

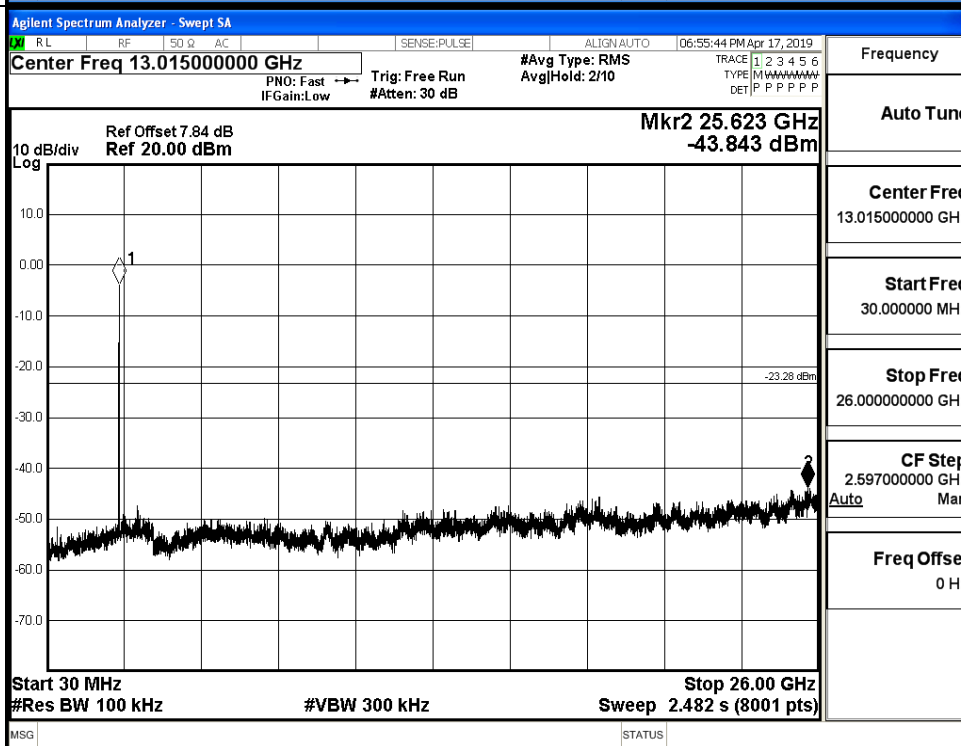


## 11B HCH Graphs

Pref/11B/HCH

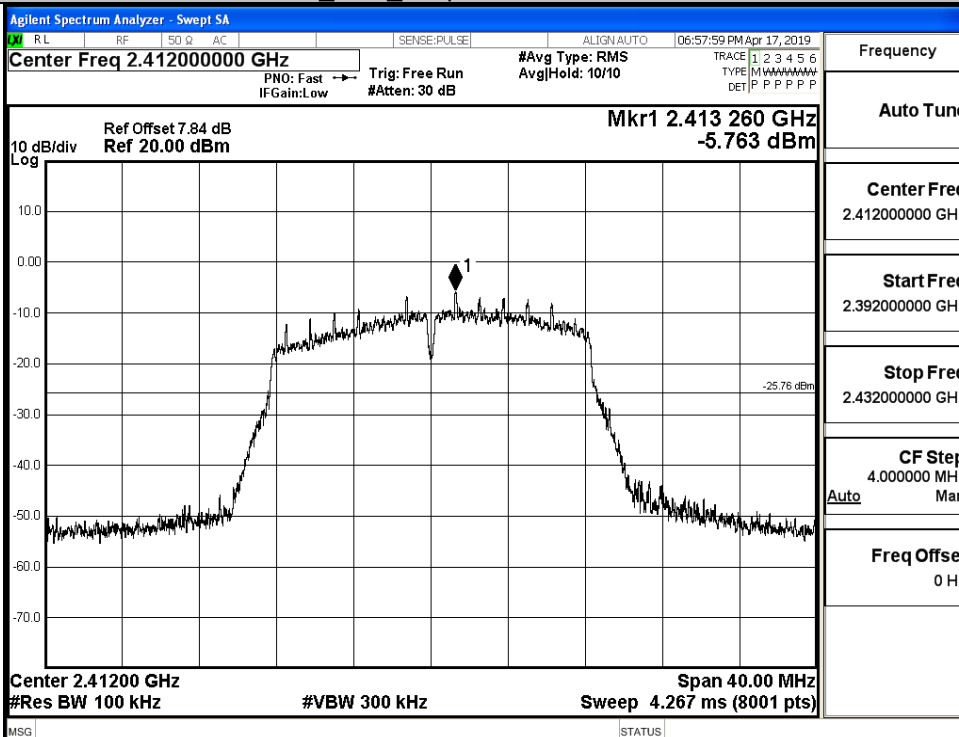


Puw/11B/HCH

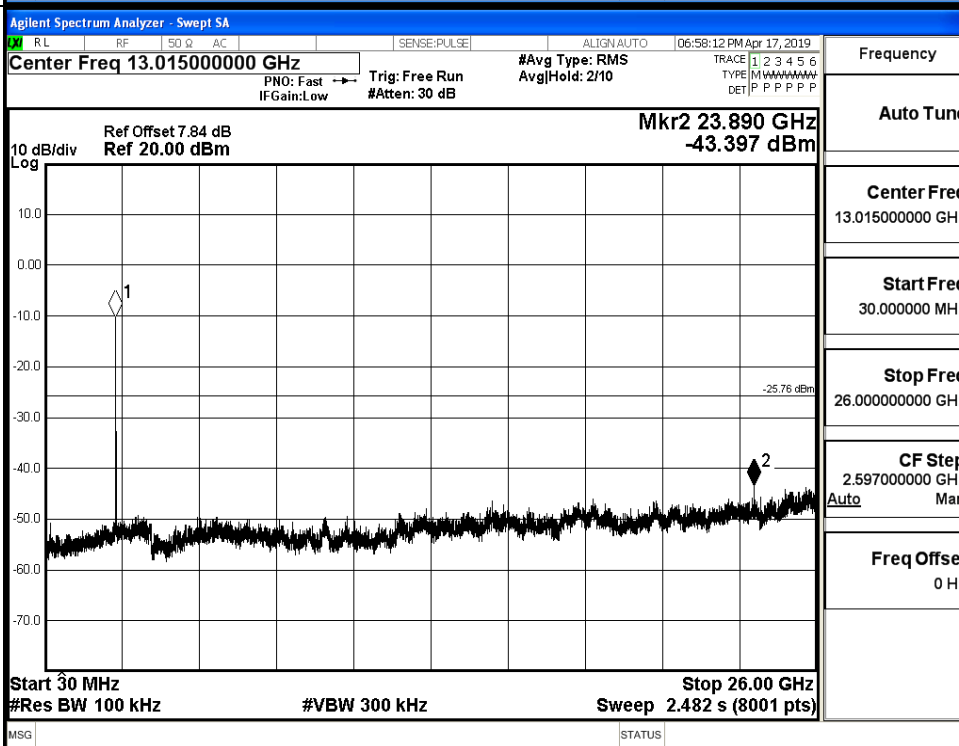


## 11G\_LCH\_Graphs

Pref/11G/LCH

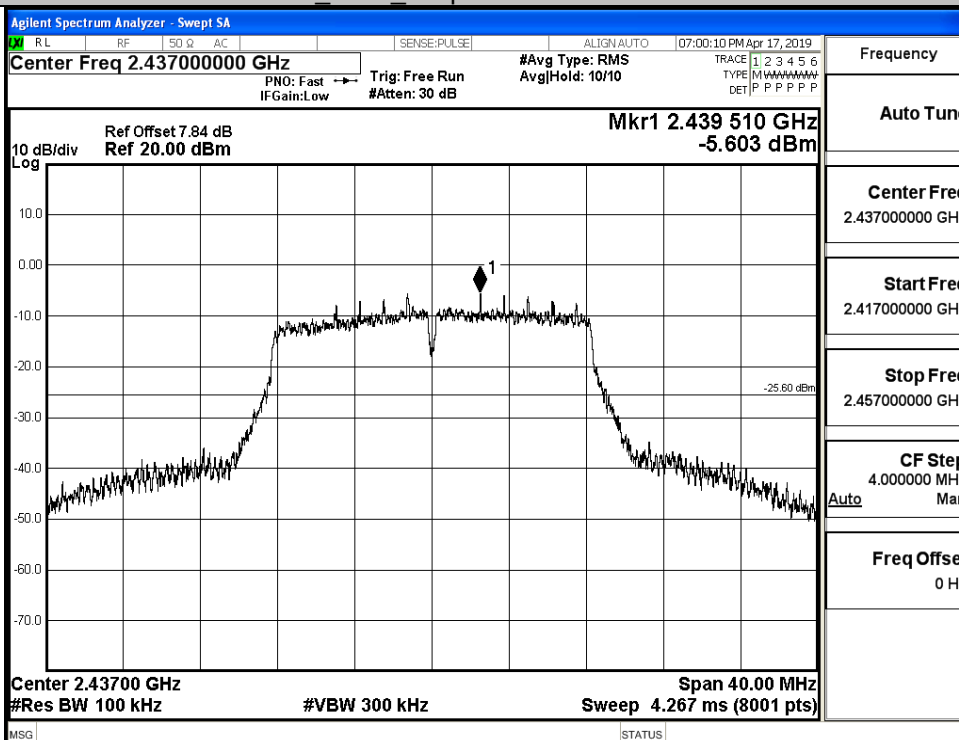


Puw/11G/LCH

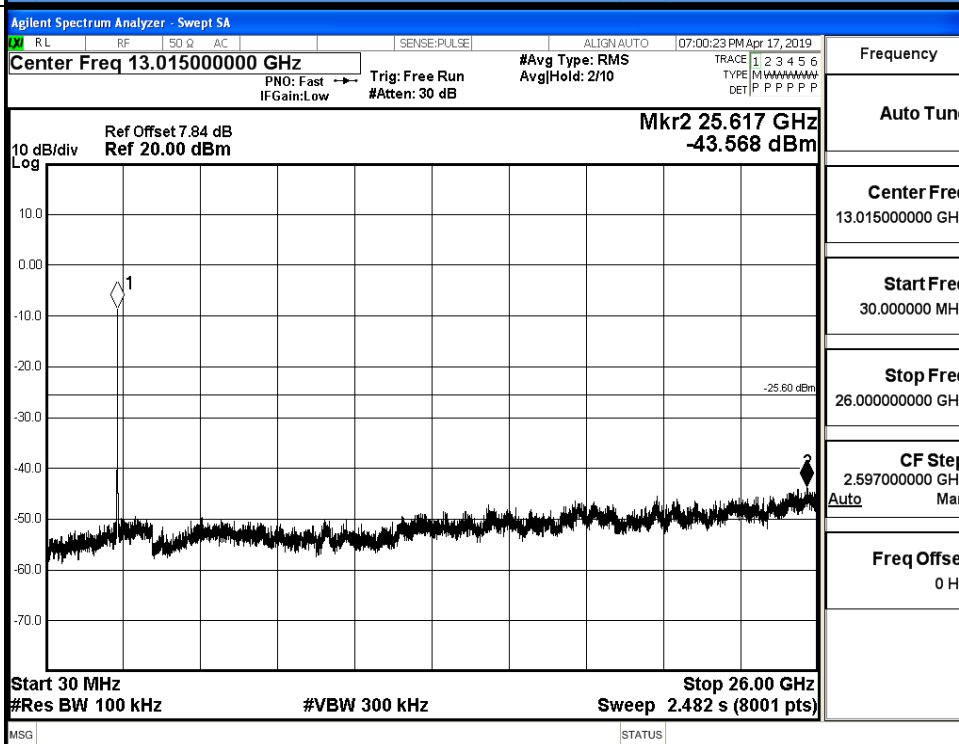


## 11G MCH Graphs

Pref/11G/MCH

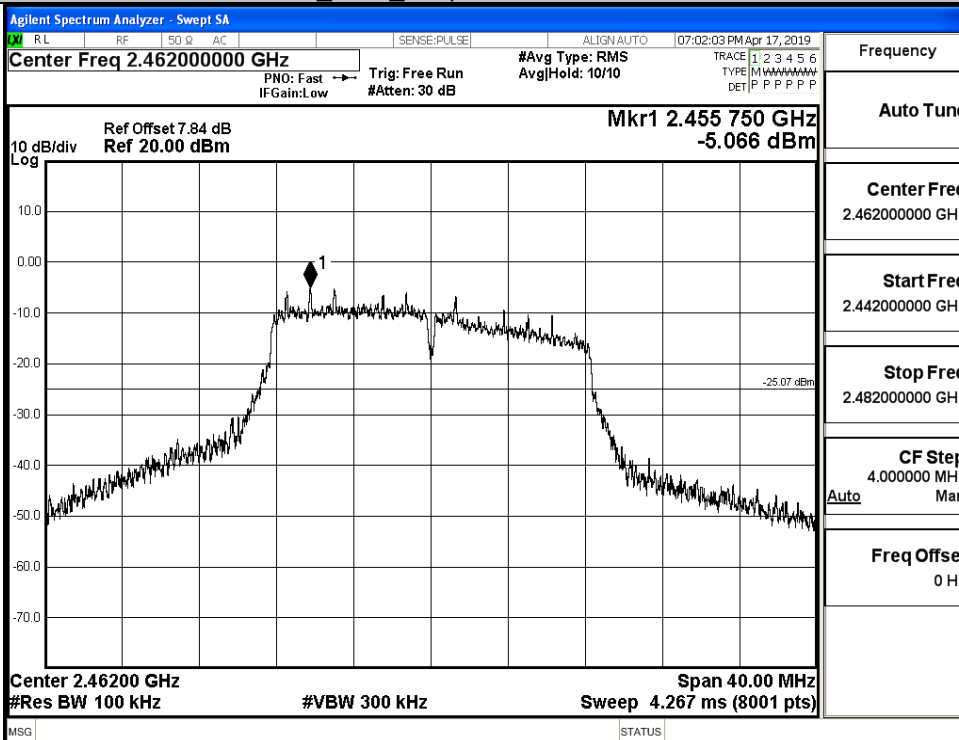


Puw/11G/MCH

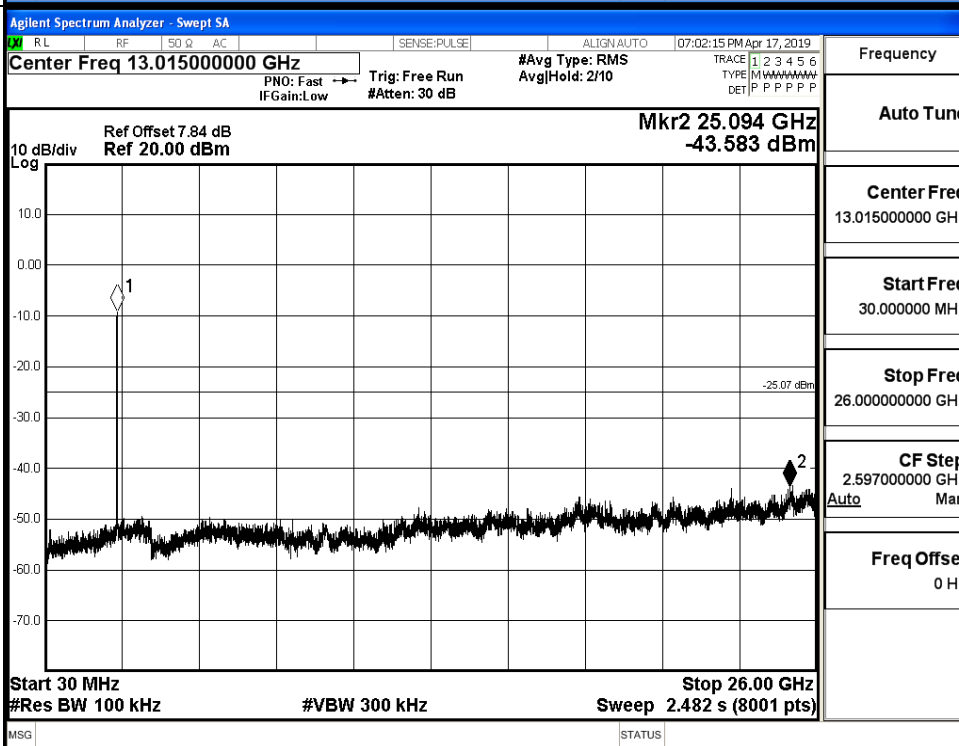


## 11G HCH Graphs

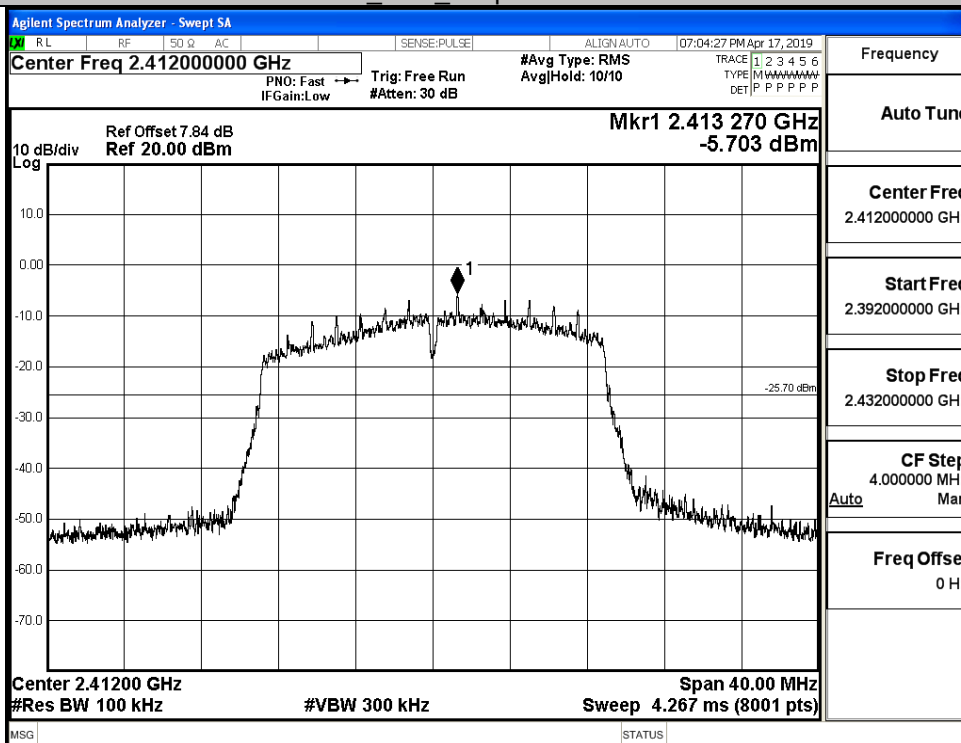
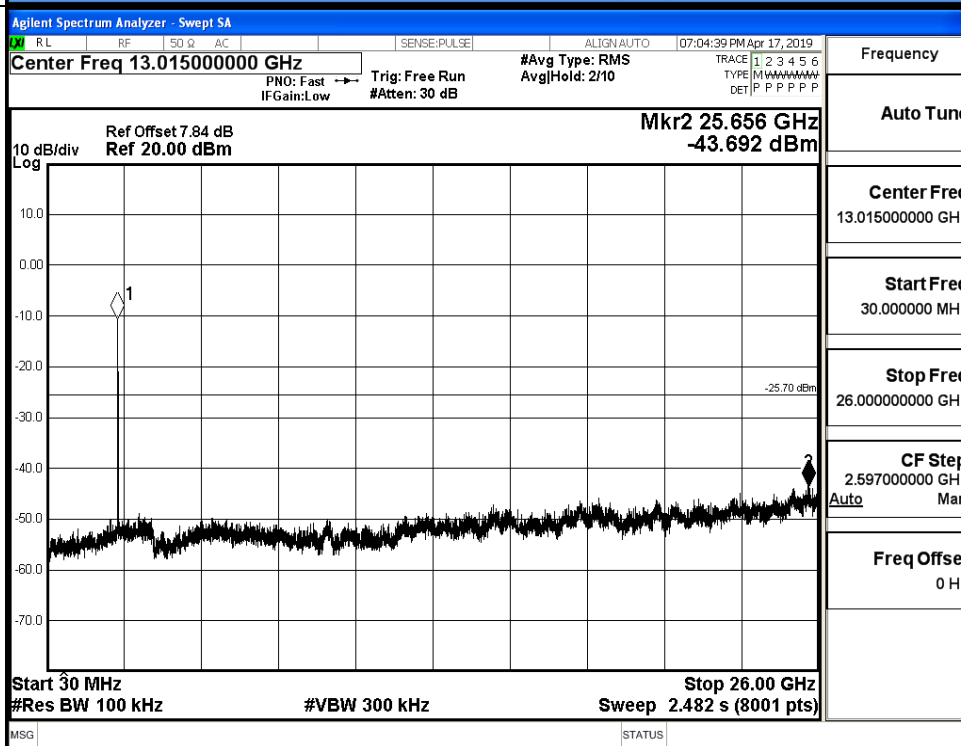
Pref/11G/HCH



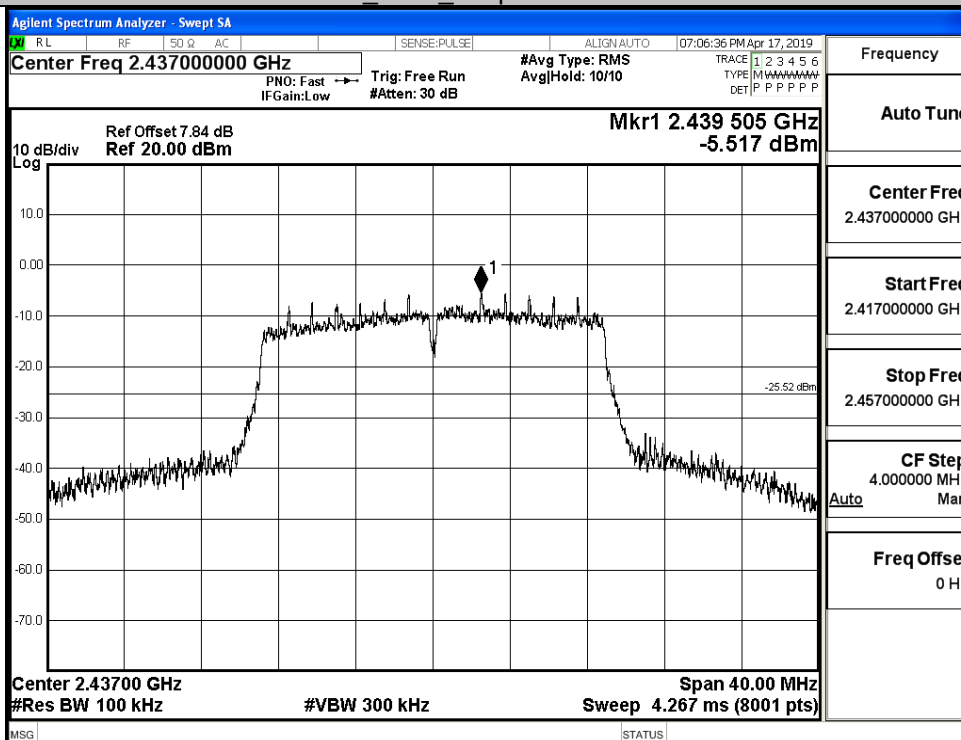
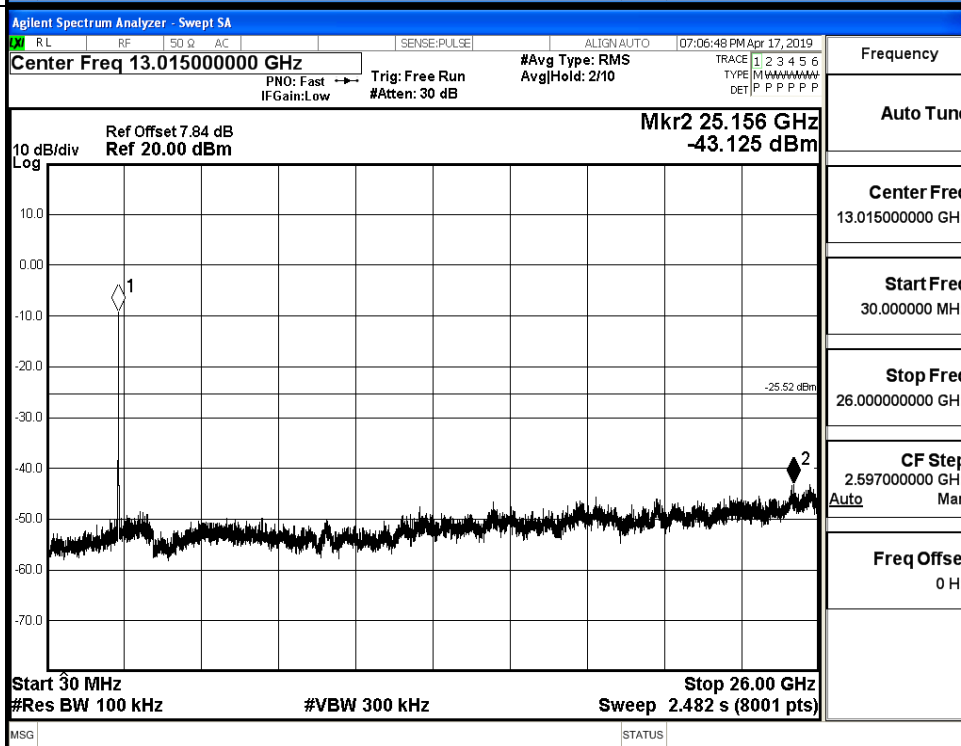
Puw/11G/HCH



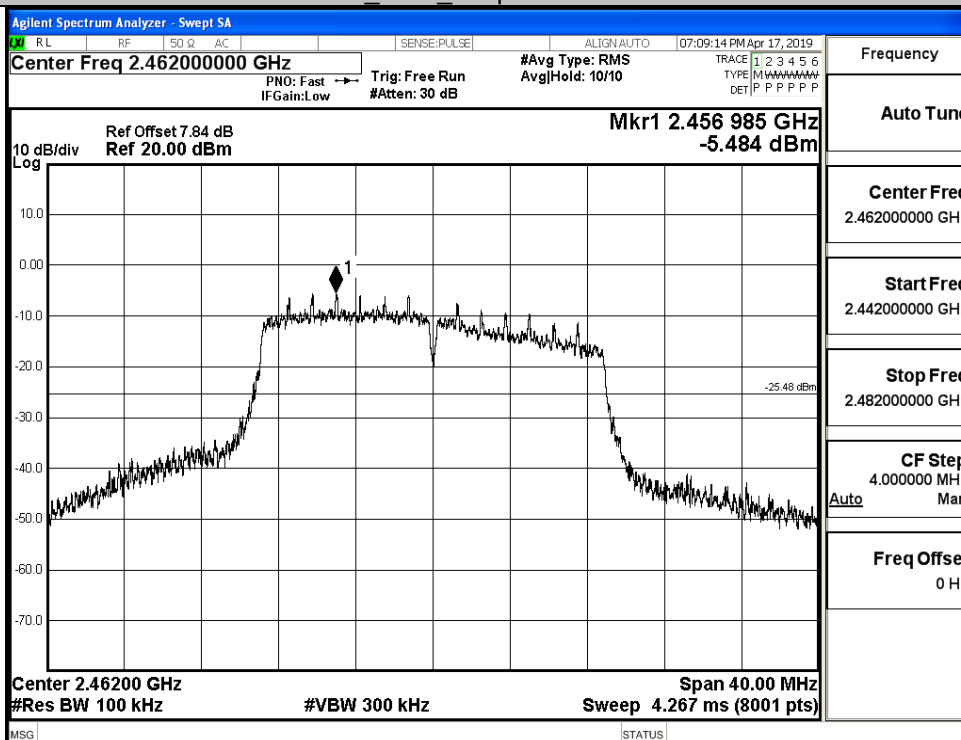
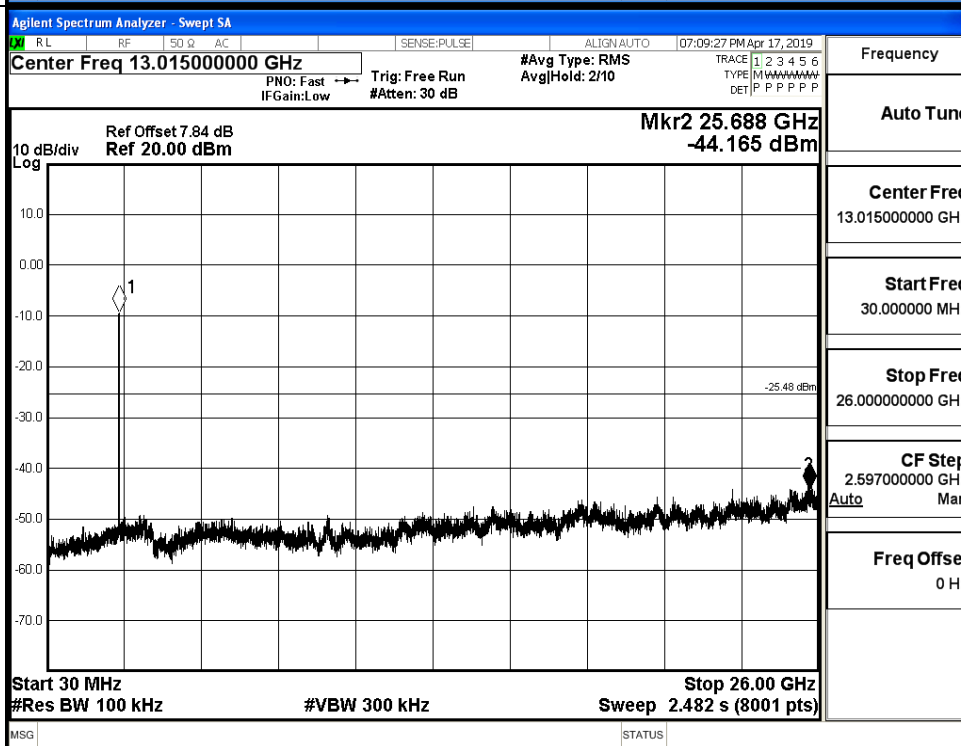
## 11N20SISO LCH Graphs

Pref/11N20SIS  
O/LCHPuw/11N20  
SISO/LCH

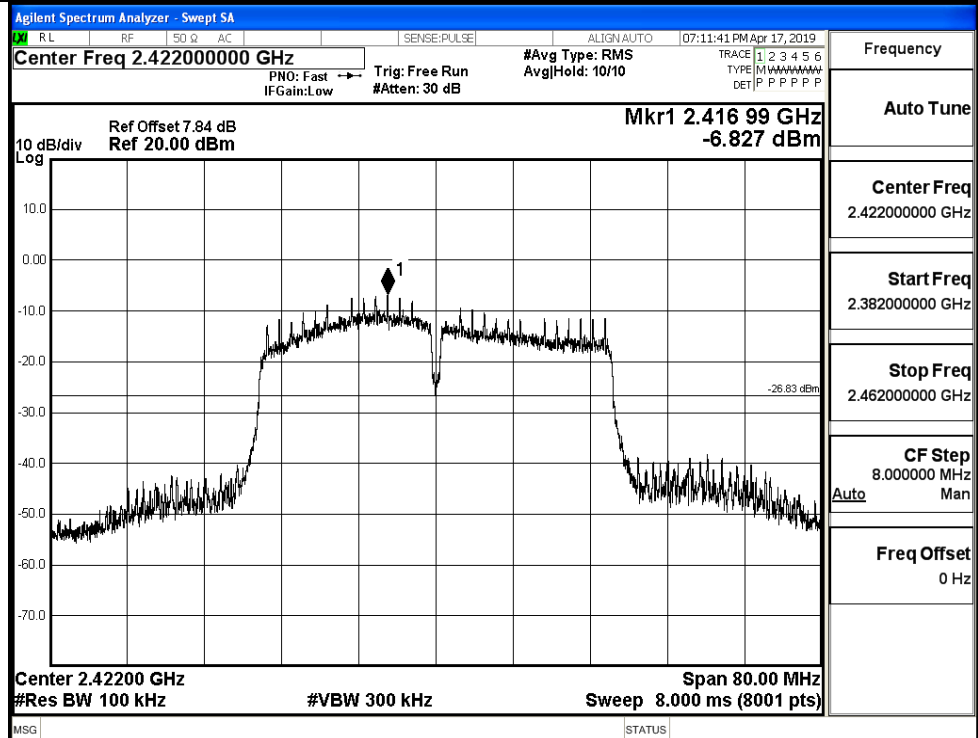
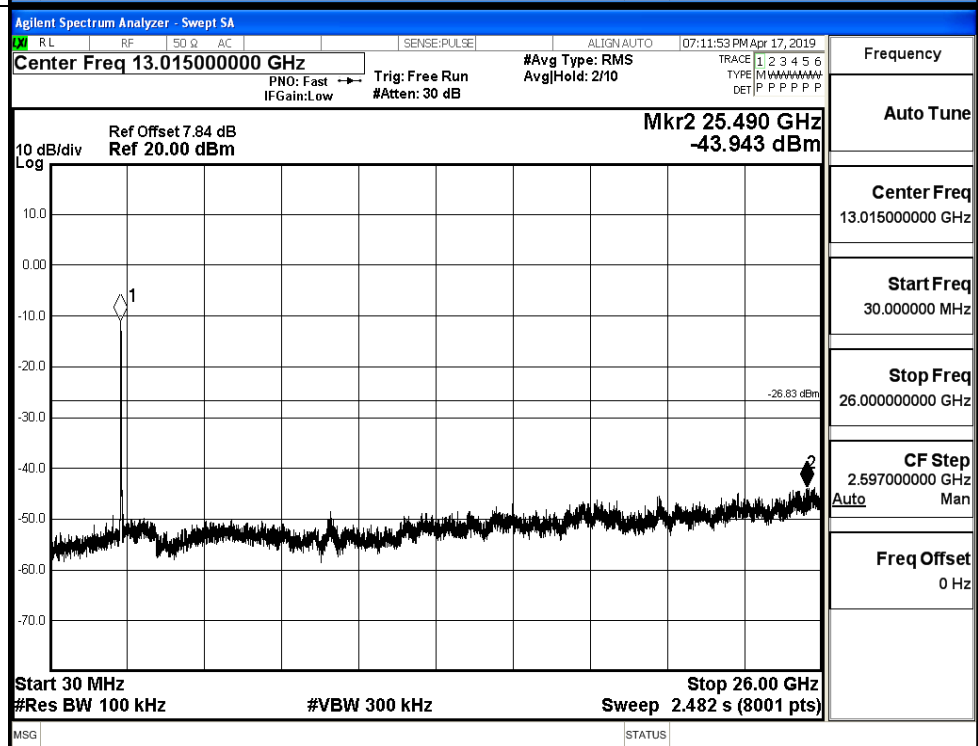
## 11N20SISO\_MCH\_Graphs

Pref/11N20  
SISO/MCHPuw/11N20  
SISO/MCH

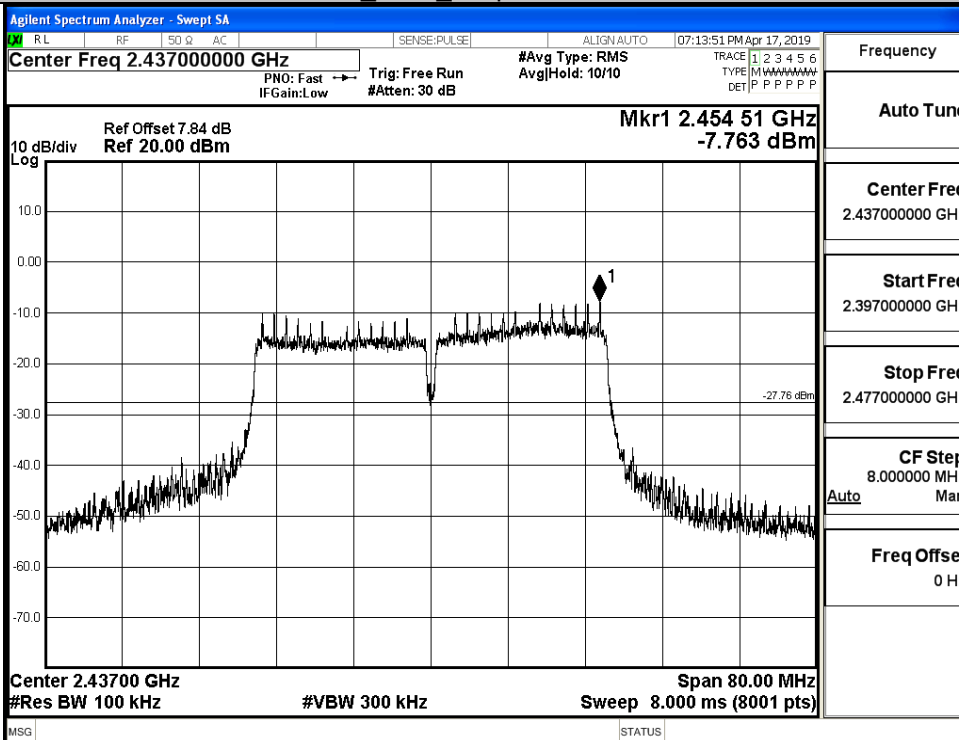
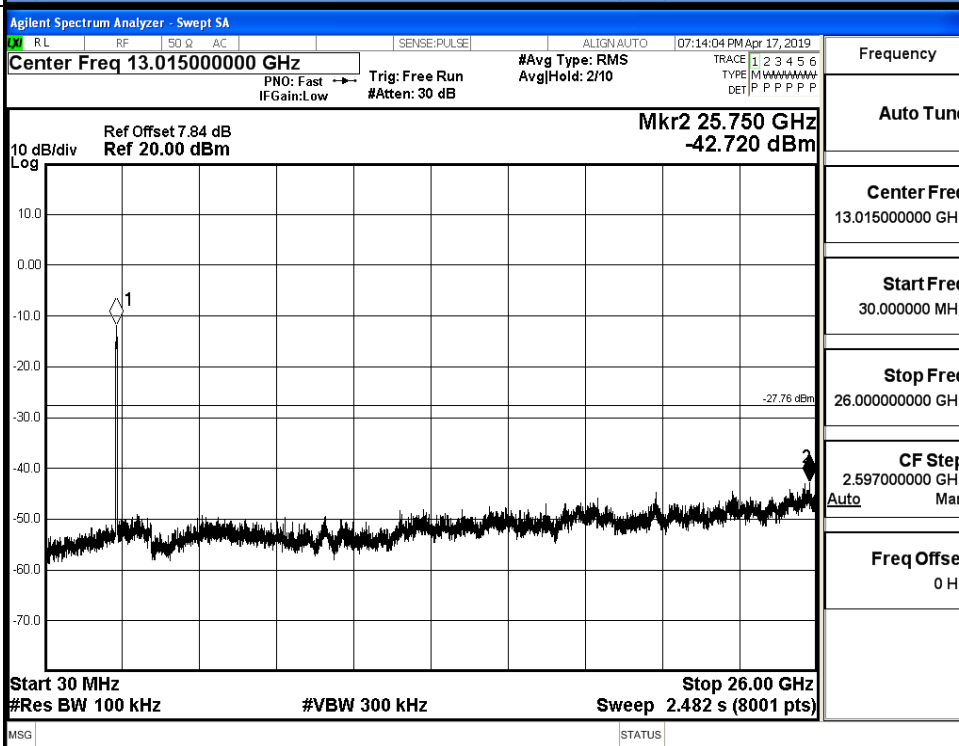
## 11N20SISO HCH Graphs

Pref/11N20  
SISO/HCHPuw/11N20  
SISO/HCH

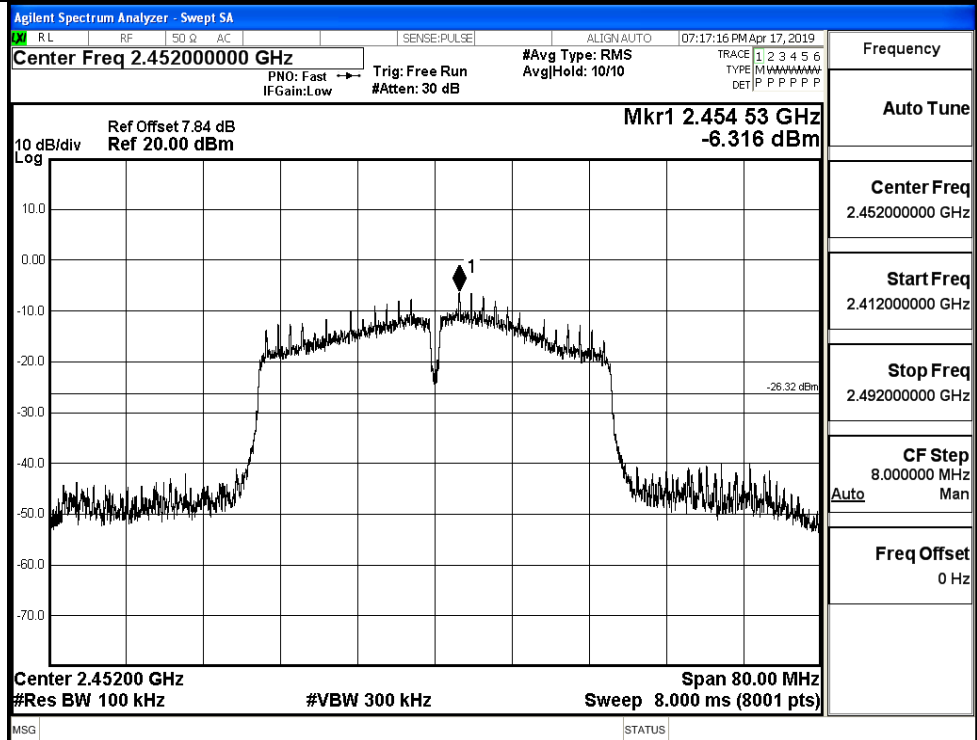
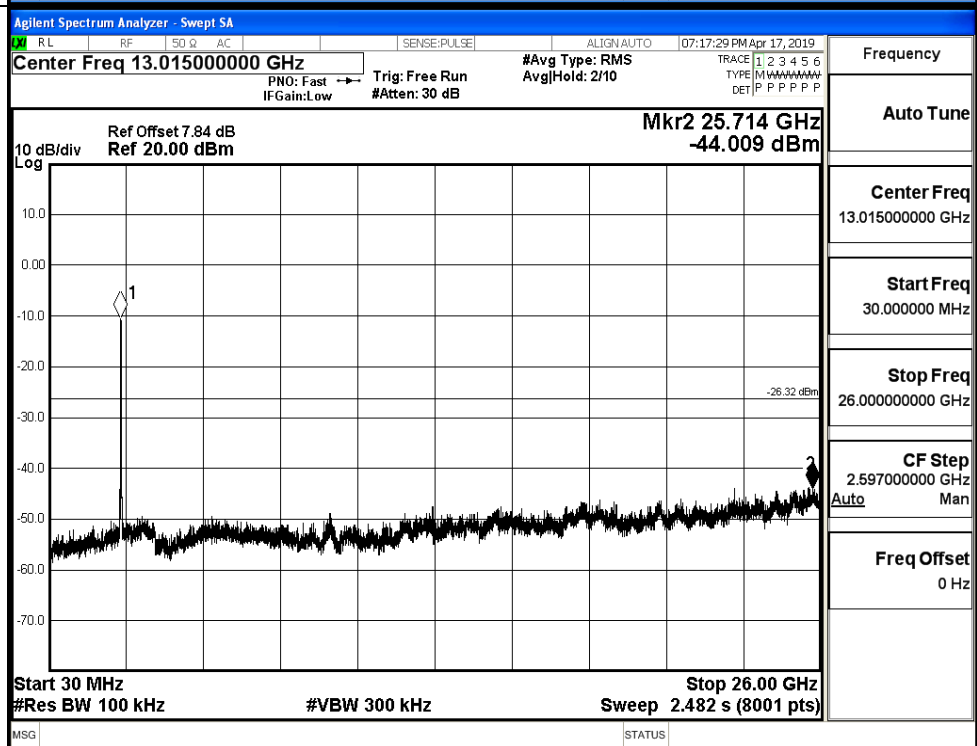
## 11N40SISO LCH Graphs

Pref/11N40  
SISO/LCHPuw/11N40  
SISO/LCH

## 11N40SISO\_MCH\_Graphs

Pref/11N40  
SISO/MCHPuw/11N40  
SISO/MCH

## 11N40SISO HCH Graphs

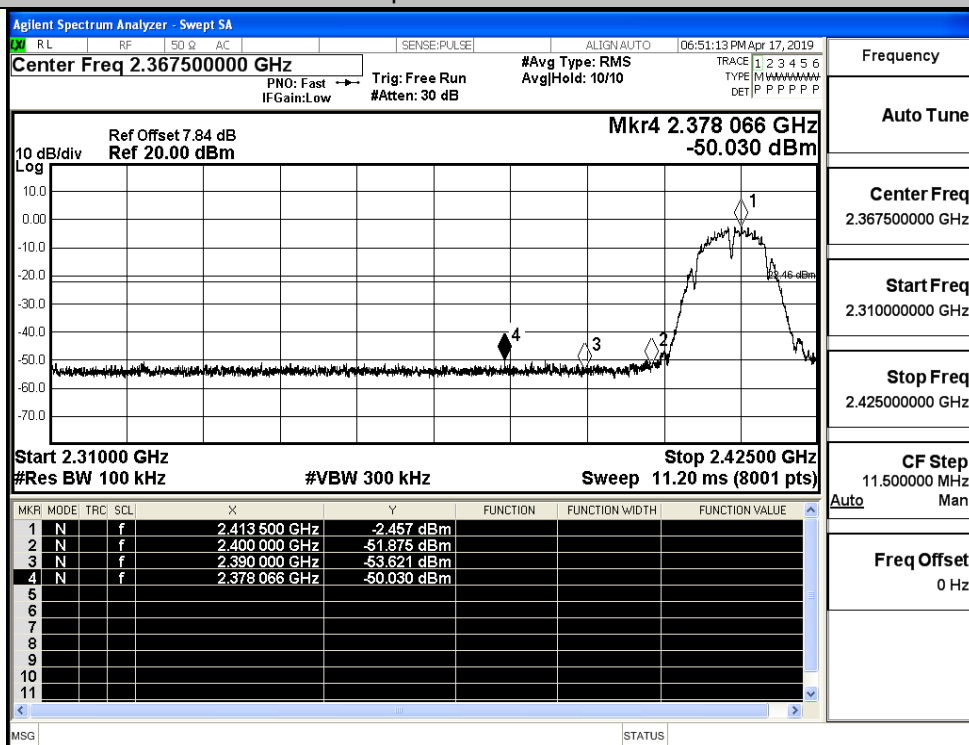
Pref/11N40  
SISO/HCHPuw/11N40  
SISO/HCH

## C.6 Band-edge for RF Conducted Emissions

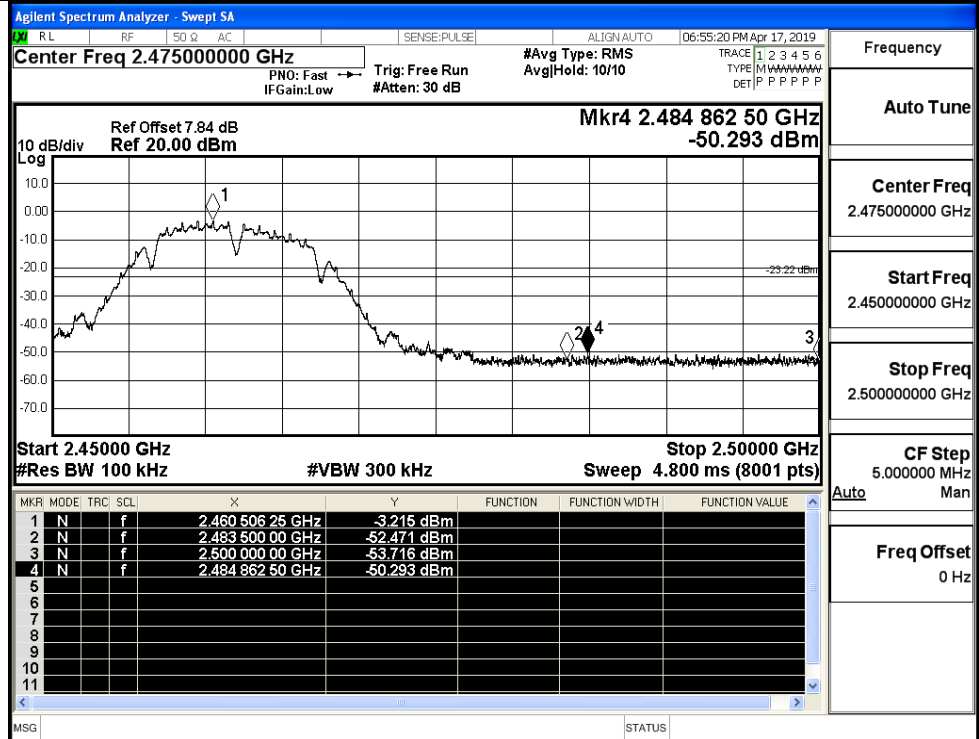
| Mode      | Channel | Carrier Power[dBm] | Max.Spurious Level [dBm] | Limit [dBm] | Verdict |
|-----------|---------|--------------------|--------------------------|-------------|---------|
| 11B       | LCH     | -2.457             | -50.030                  | -22.46      | PASS    |
|           | HCH     | -3.215             | -50.293                  | -23.22      | PASS    |
| 11G       | LCH     | -5.936             | -49.135                  | -25.94      | PASS    |
|           | HCH     | -5.015             | -49.515                  | -25.02      | PASS    |
| 11N20SISO | LCH     | -5.639             | -50.218                  | -25.64      | PASS    |
|           | HCH     | -5.137             | -49.283                  | -25.14      | PASS    |
| 11N40SISO | LCH     | -6.908             | -47.174                  | -26.91      | PASS    |
|           | HCH     | -6.277             | -40.465                  | -26.28      | PASS    |

## Test Graphs

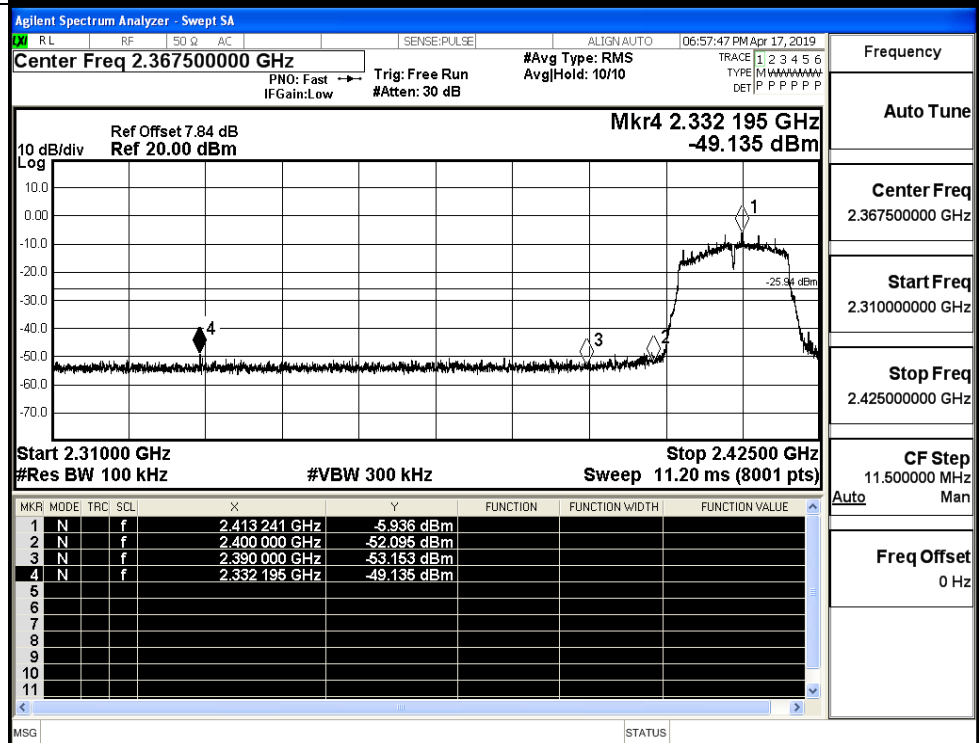
11B/LCH



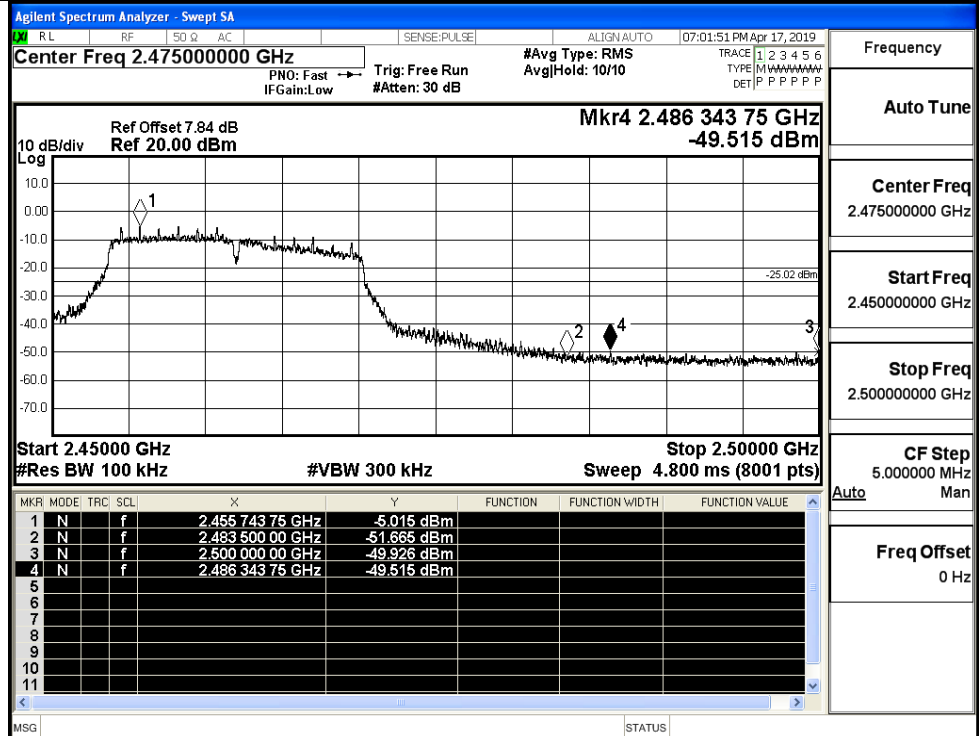
11B/HCH



11G/LCH



11G/HCH



Frequency

Auto Tune

Center Freq

2.475000000 GHz

Start Freq

2.450000000 GHz

Stop Freq

2.500000000 GHz

CF Step

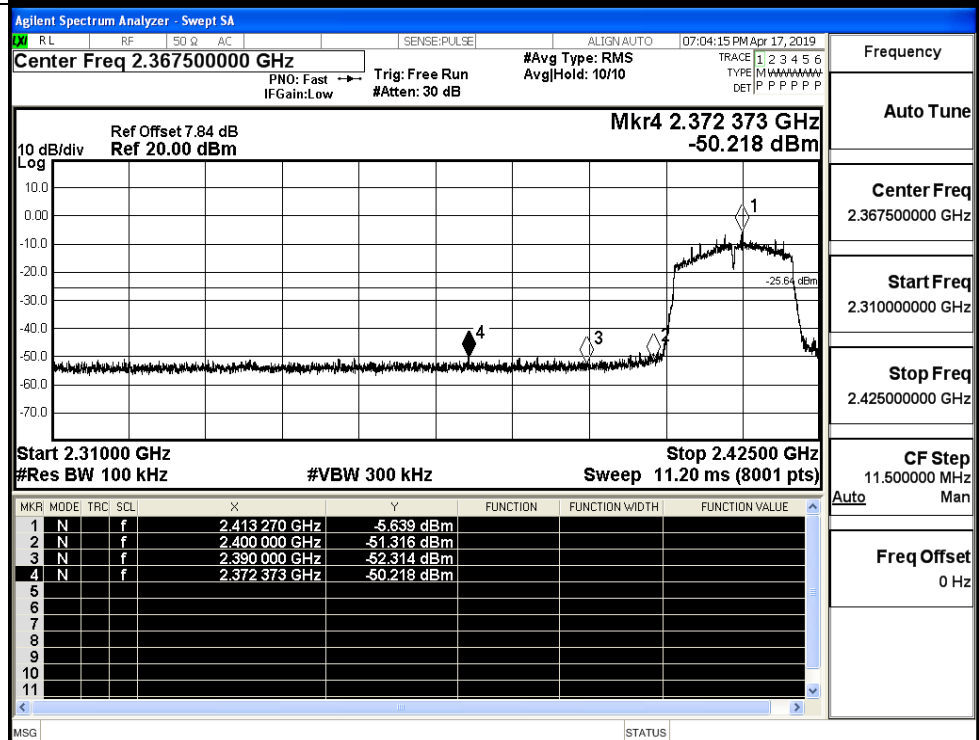
5.000000 MHz

Auto Man

Freq Offset

0 Hz

11N20SISO/LCH



Frequency

Auto Tune

Center Freq

2.367500000 GHz

Start Freq

2.310000000 GHz

Stop Freq

2.425000000 GHz

CF Step

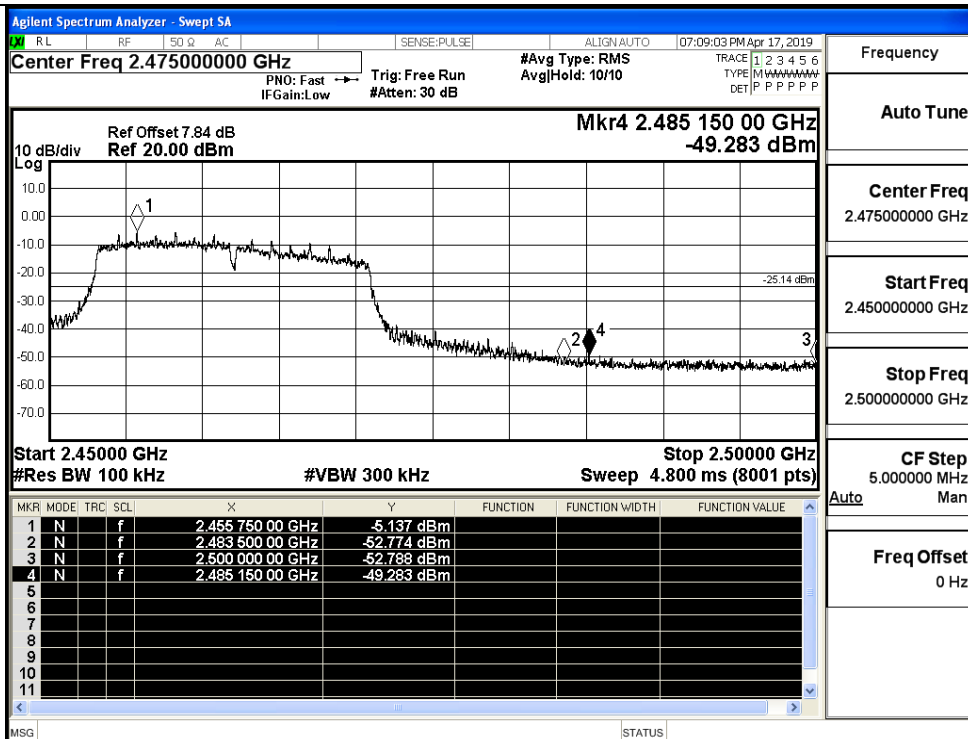
11.500000 MHz

Auto Man

Freq Offset

0 Hz

11N20SISO/HCH



Frequency

Auto Tune

Center Freq  
2.475000000 GHz

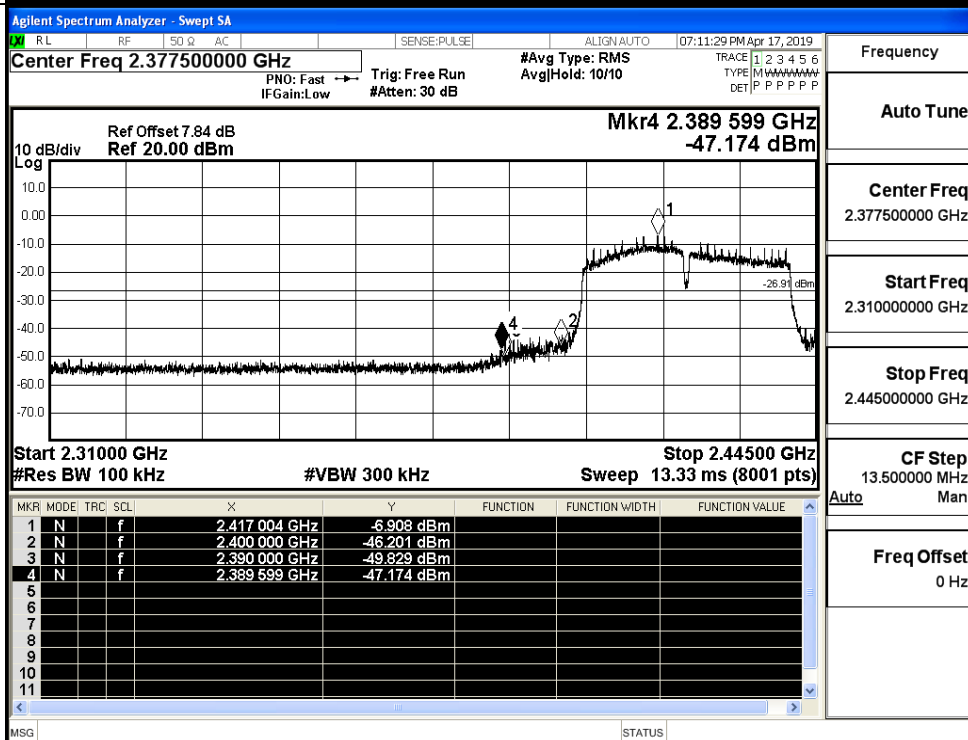
Start Freq  
2.450000000 GHz

Stop Freq  
2.500000000 GHz

CF Step  
5.000000 MHz

Freq Offset  
0 Hz

11N40SISO/LCH



Frequency

Auto Tune

Center Freq  
2.377500000 GHz

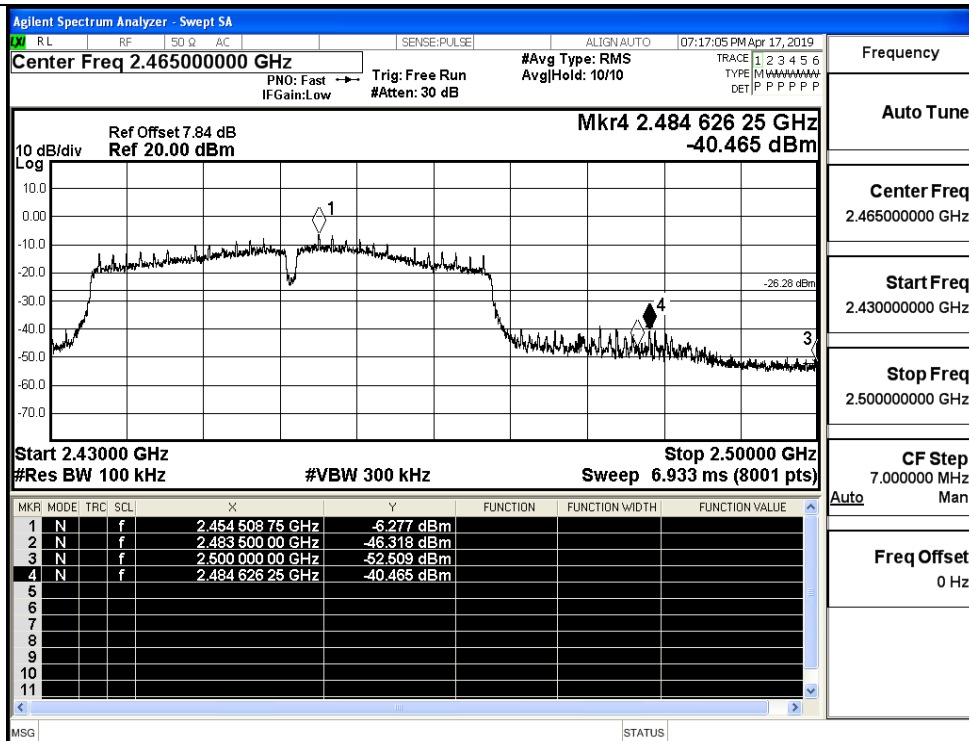
Start Freq  
2.310000000 GHz

Stop Freq  
2.445000000 GHz

CF Step  
13.500000 MHz

Freq Offset  
0 Hz

11N40SISO/HCH

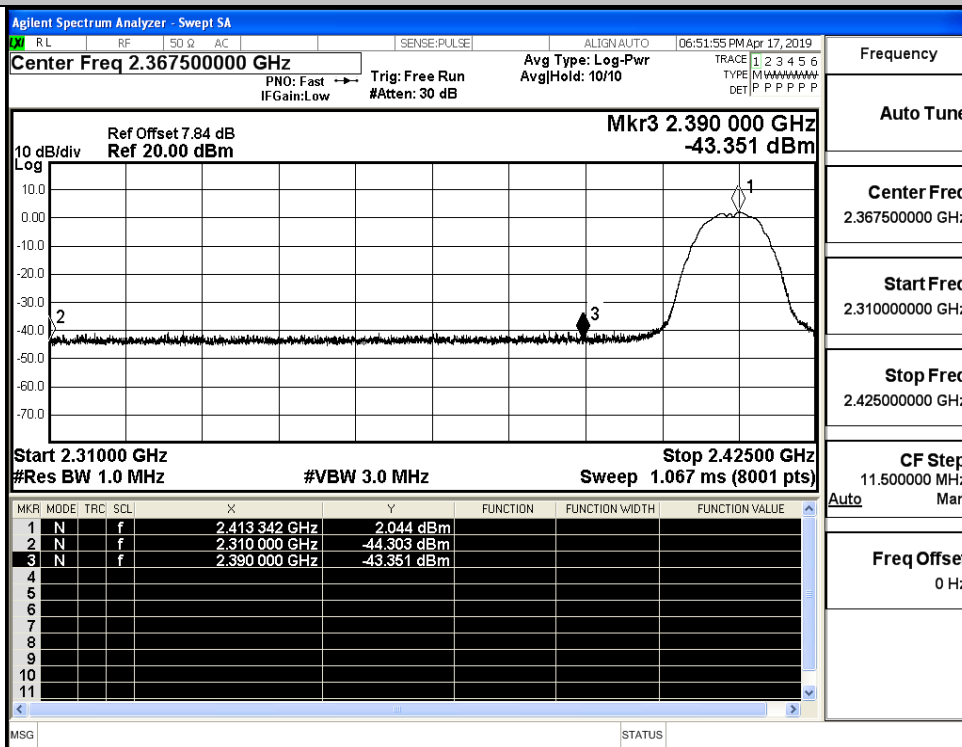


## C.7 Restrict-band band-edge measurements

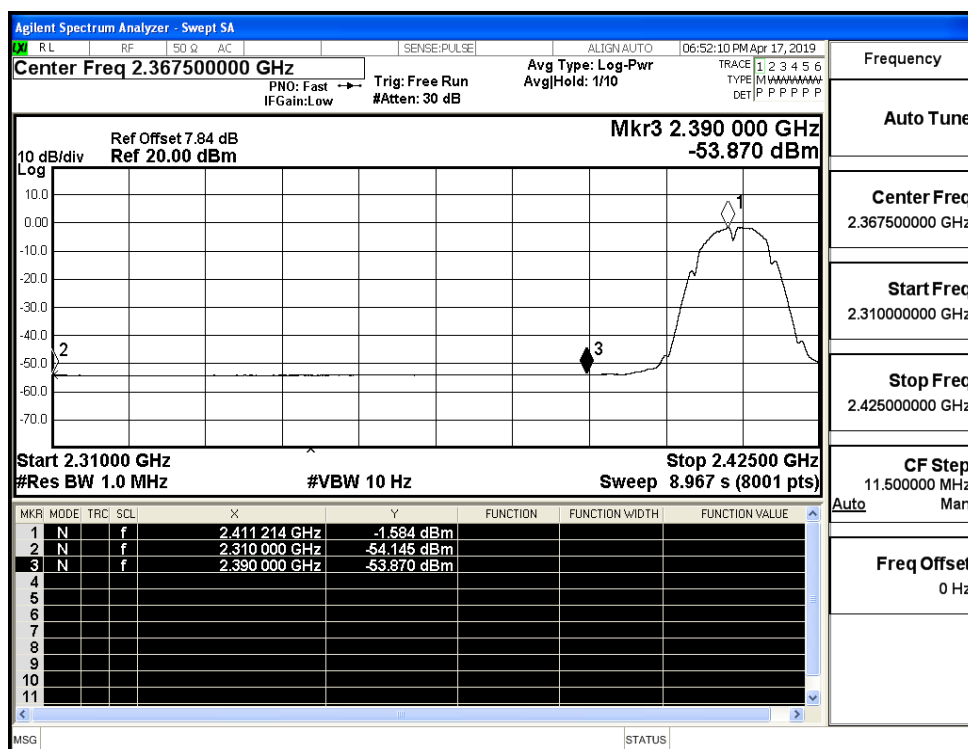
| Test Mode  | Test Channel | Ant  | Freq.  | Power [dBm] | Gain | Ground Factor | E [dBuV/m] | Detector | Limit [dBuV/m] | Verdict |
|------------|--------------|------|--------|-------------|------|---------------|------------|----------|----------------|---------|
| 11B        | 2412         | Ant1 | 2310.0 | -44.30      | 2.0  | 0             | 52.95      | PEAK     | 74             | PASS    |
|            | 2412         | Ant1 | 2310.0 | -54.15      | 2.0  | 0             | 43.11      | AV       | 54             | PASS    |
|            | 2412         | Ant1 | 2390.0 | -43.35      | 2.0  | 0             | 53.91      | PEAK     | 74             | PASS    |
|            | 2412         | Ant1 | 2390.0 | -53.87      | 2.0  | 0             | 43.39      | AV       | 54             | PASS    |
|            | 2462         | Ant1 | 2483.5 | -42.72      | 2.0  | 0             | 54.53      | PEAK     | 74             | PASS    |
|            | 2462         | Ant1 | 2483.5 | -53.50      | 2.0  | 0             | 43.76      | AV       | 54             | PASS    |
|            | 2462         | Ant1 | 2500.0 | -42.02      | 2.0  | 0             | 55.24      | PEAK     | 74             | PASS    |
|            | 2462         | Ant1 | 2500.0 | -53.57      | 2.0  | 0             | 43.69      | AV       | 54             | PASS    |
| 11G        | 2412         | Ant1 | 2310.0 | -44.49      | 2.0  | 0             | 52.77      | PEAK     | 74             | PASS    |
|            | 2412         | Ant1 | 2310.0 | -54.18      | 2.0  | 0             | 43.08      | AV       | 54             | PASS    |
|            | 2412         | Ant1 | 2390.0 | -43.67      | 2.0  | 0             | 53.59      | PEAK     | 74             | PASS    |
|            | 2412         | Ant1 | 2390.0 | -53.72      | 2.0  | 0             | 43.54      | AV       | 54             | PASS    |
|            | 2462         | Ant1 | 2483.5 | -40.07      | 2.0  | 0             | 57.19      | PEAK     | 74             | PASS    |
|            | 2462         | Ant1 | 2483.5 | -52.19      | 2.0  | 0             | 45.07      | AV       | 54             | PASS    |
|            | 2462         | Ant1 | 2500.0 | -42.90      | 2.0  | 0             | 54.36      | PEAK     | 74             | PASS    |
|            | 2462         | Ant1 | 2500.0 | -53.49      | 2.0  | 0             | 43.77      | AV       | 54             | PASS    |
| 11N20 SISO | 2412         | Ant1 | 2310.0 | -42.75      | 2.0  | 0             | 54.51      | PEAK     | 74             | PASS    |
|            | 2412         | Ant1 | 2310.0 | -54.16      | 2.0  | 0             | 43.10      | AV       | 54             | PASS    |
|            | 2412         | Ant1 | 2390.0 | -43.10      | 2.0  | 0             | 54.16      | PEAK     | 74             | PASS    |
|            | 2412         | Ant1 | 2390.0 | -53.67      | 2.0  | 0             | 43.59      | AV       | 54             | PASS    |
|            | 2462         | Ant1 | 2483.5 | -40.43      | 2.0  | 0             | 56.83      | PEAK     | 74             | PASS    |
|            | 2462         | Ant1 | 2483.5 | -51.86      | 2.0  | 0             | 45.40      | AV       | 54             | PASS    |
|            | 2462         | Ant1 | 2500.0 | -41.33      | 2.0  | 0             | 55.92      | PEAK     | 74             | PASS    |
|            | 2462         | Ant1 | 2500.0 | -53.51      | 2.0  | 0             | 43.75      | AV       | 54             | PASS    |
| 11N40 SISO | 2422         | Ant1 | 2310.0 | -44.16      | 2.0  | 0             | 53.10      | PEAK     | 74             | PASS    |
|            | 2422         | Ant1 | 2310.0 | -54.17      | 2.0  | 0             | 43.08      | AV       | 54             | PASS    |

|  |      |      |        |        |     |   |       |      |    |      |
|--|------|------|--------|--------|-----|---|-------|------|----|------|
|  | 2422 | Ant1 | 2390.0 | -34.00 | 2.0 | 0 | 63.26 | PEAK | 74 | PASS |
|  | 2422 | Ant1 | 2390.0 | -51.24 | 2.0 | 0 | 46.02 | AV   | 54 | PASS |
|  | 2452 | Ant1 | 2483.5 | -32.86 | 2.0 | 0 | 64.39 | PEAK | 74 | PASS |
|  | 2452 | Ant1 | 2483.5 | -49.48 | 2.0 | 0 | 47.78 | AV   | 54 | PASS |
|  | 2452 | Ant1 | 2500.0 | -42.56 | 2.0 | 0 | 54.70 | PEAK | 74 | PASS |
|  | 2452 | Ant1 | 2500.0 | -53.43 | 2.0 | 0 | 43.82 | AV   | 54 | PASS |

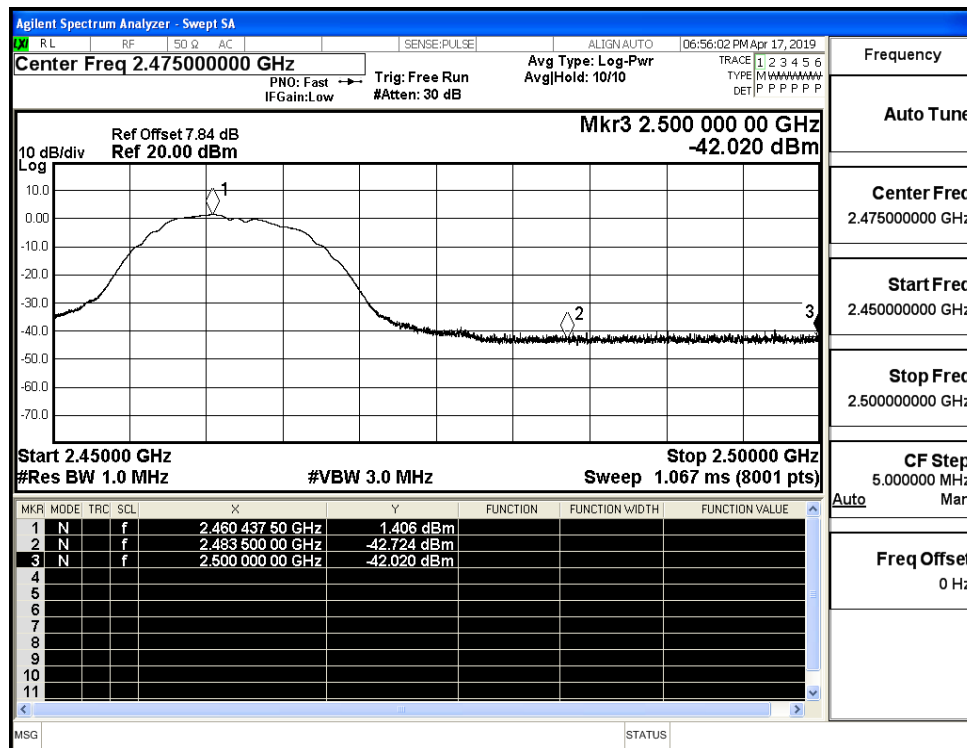
## Restrict-band band-edge measurements\_11B\_2412\_Ant1\_PEAK



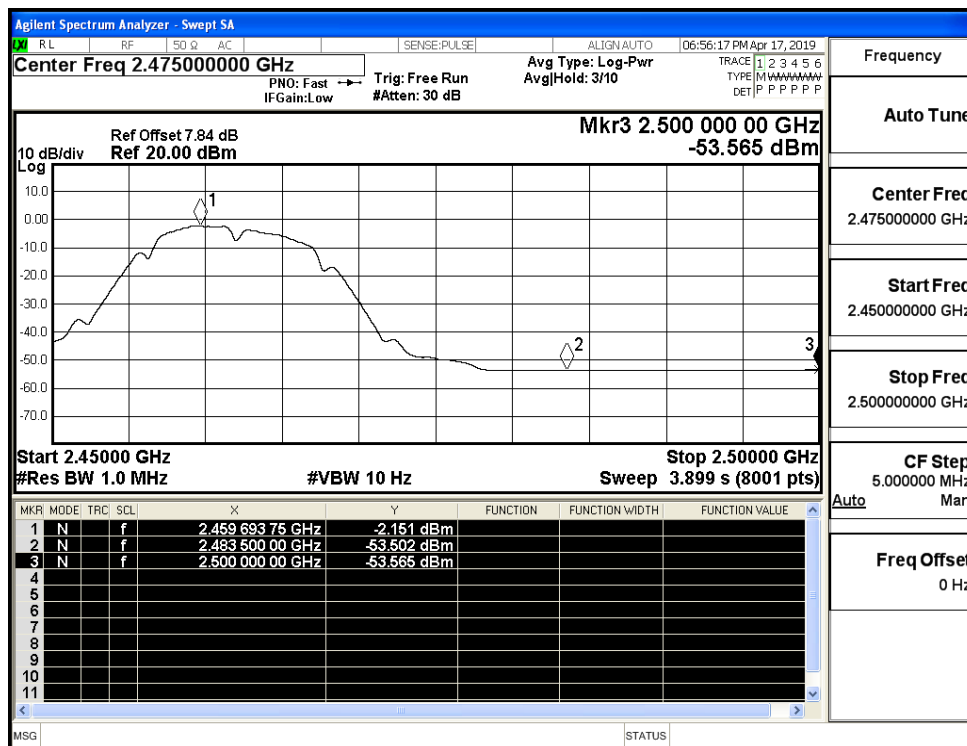
## Restrict-band band-edge measurements\_11B\_2412\_Ant1\_AV



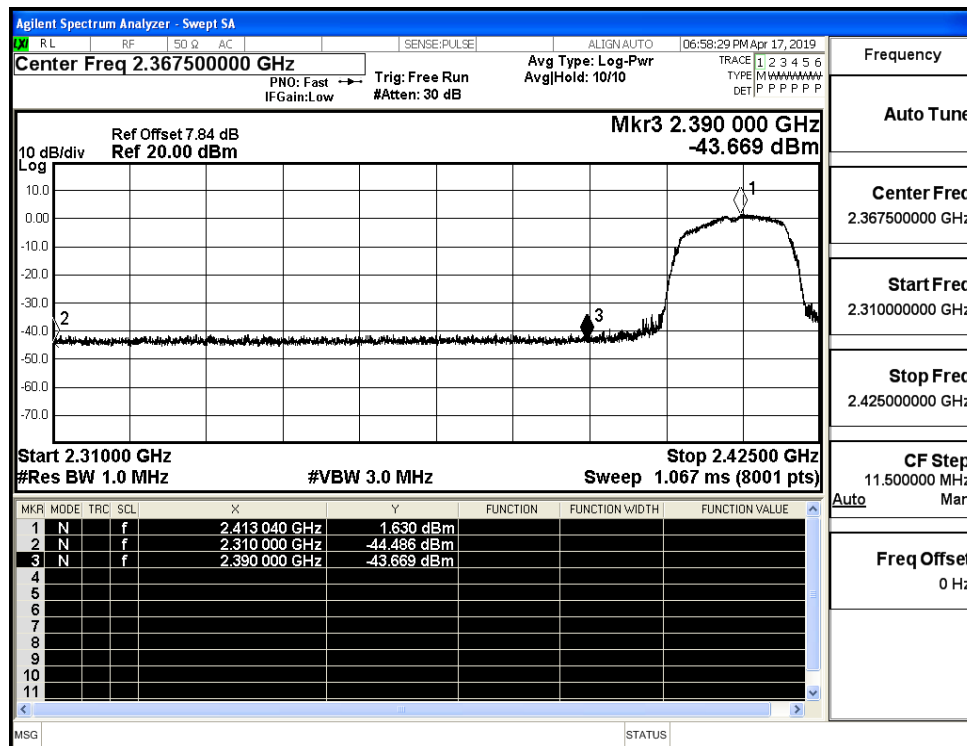
## Restrict-band band-edge measurements\_11B\_2462\_Ant1\_PEAK



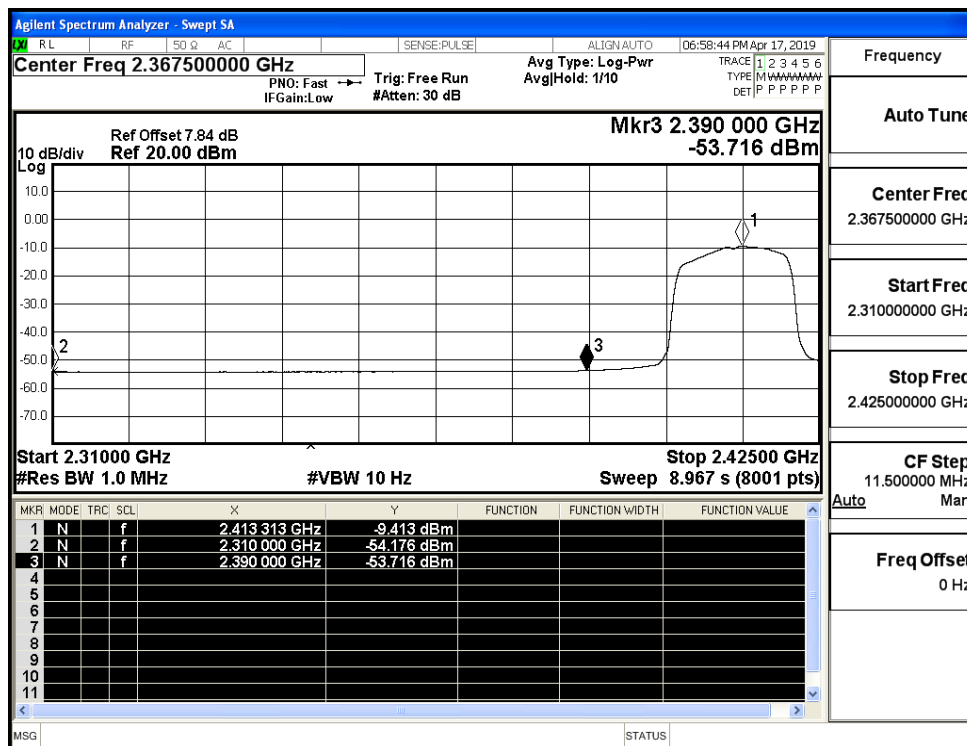
## Restrict-band band-edge measurements\_11B\_2462\_Ant1\_AV



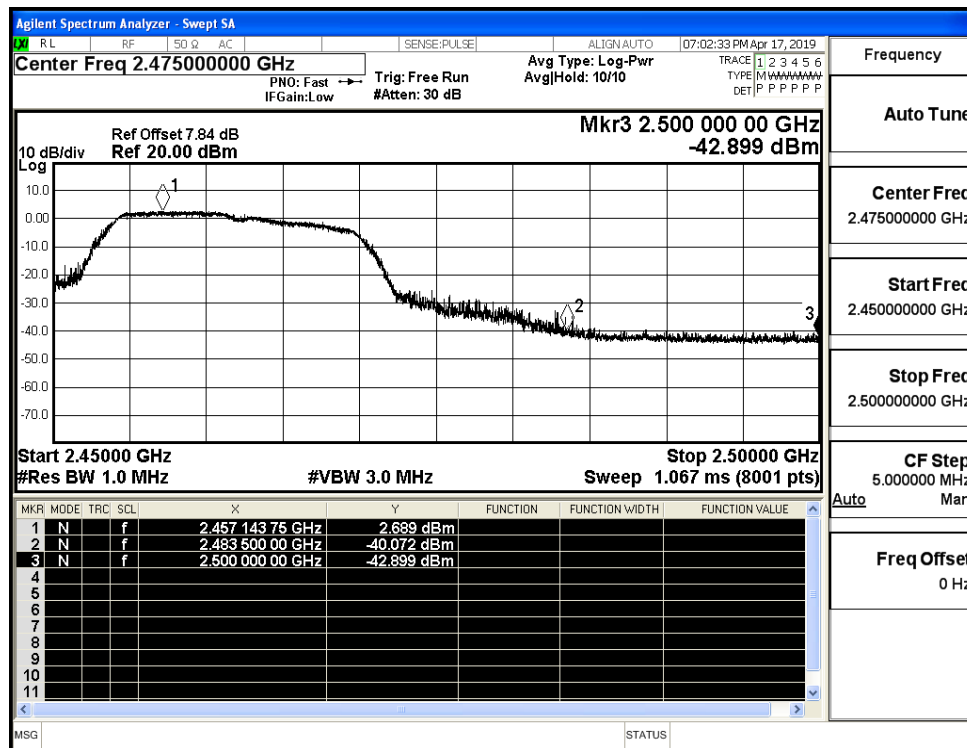
## Restrict-band band-edge measurements\_11G\_2412\_Ant1\_PEAK



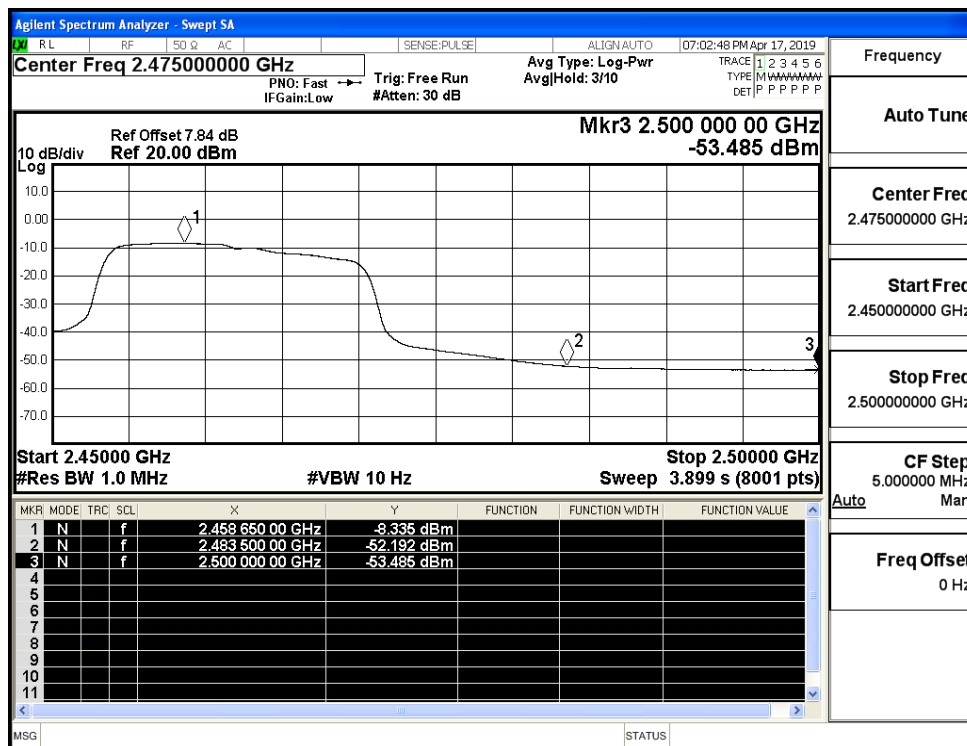
## Restrict-band band-edge measurements\_11G\_2412\_Ant1\_AV



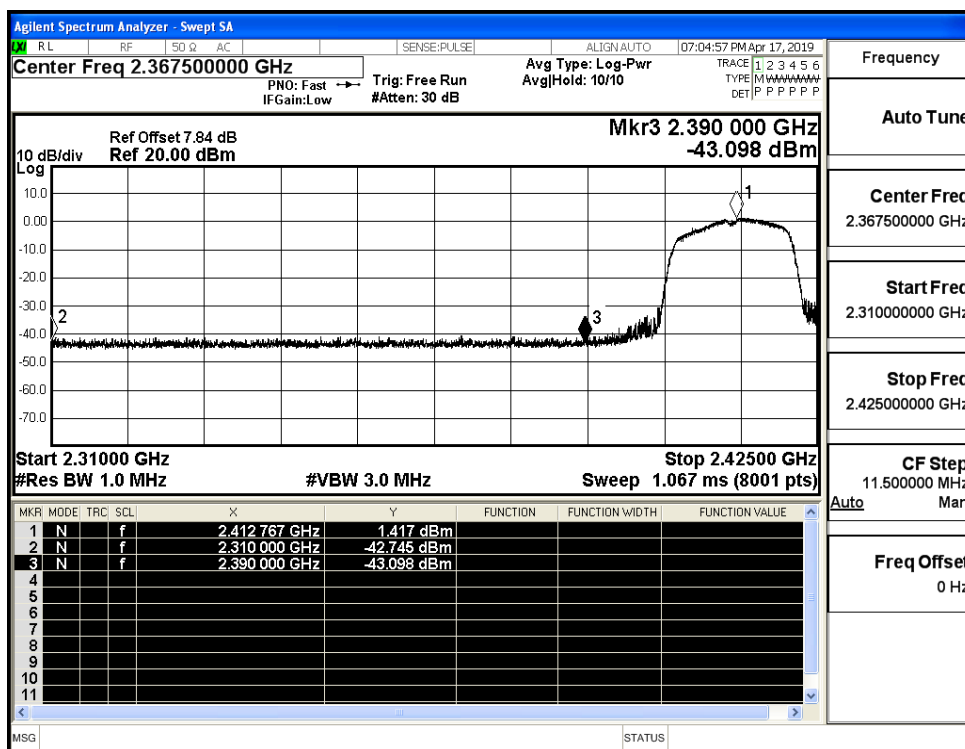
## Restrict-band band-edge measurements\_11G\_2462\_Ant1\_PEAK



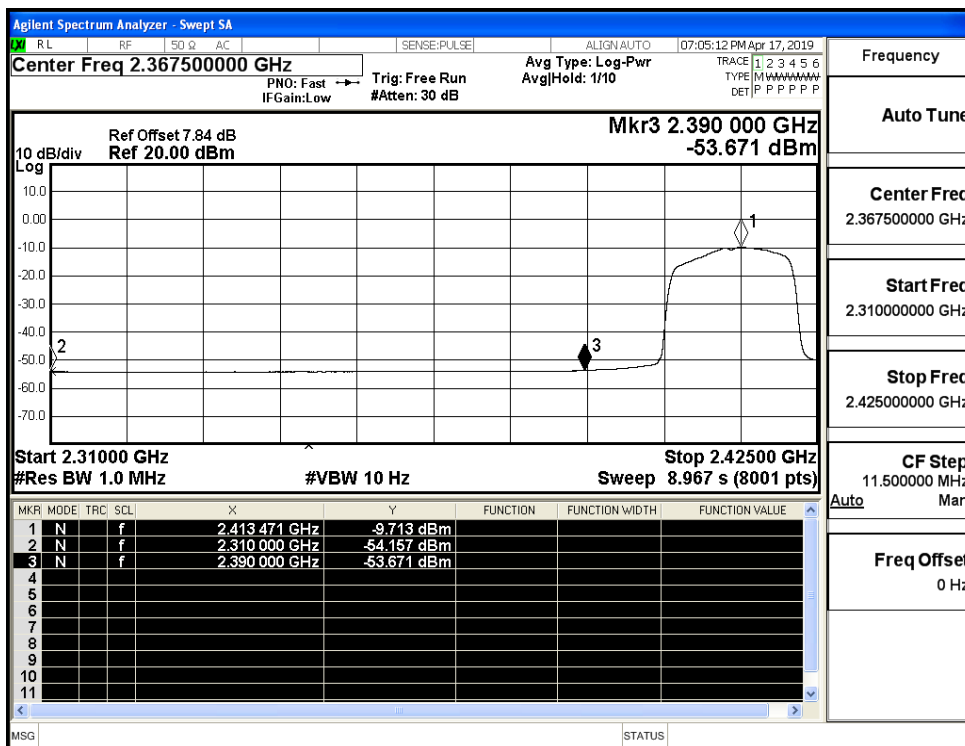
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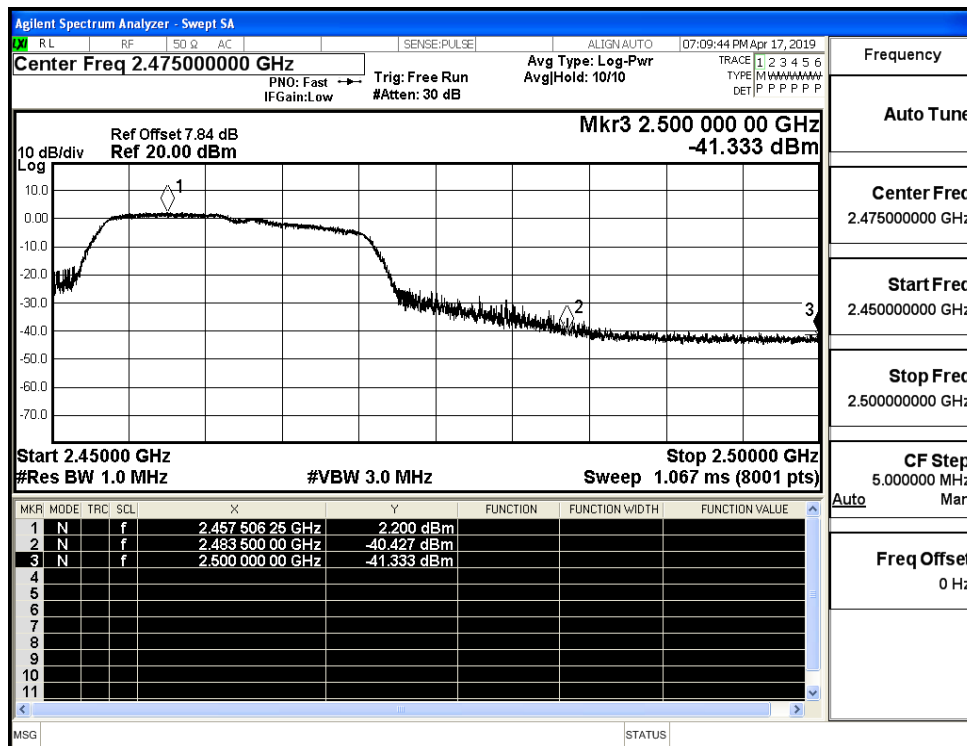
## Restrict-band band-edge measurements\_11N20SISO\_2412\_Ant1\_PEAK



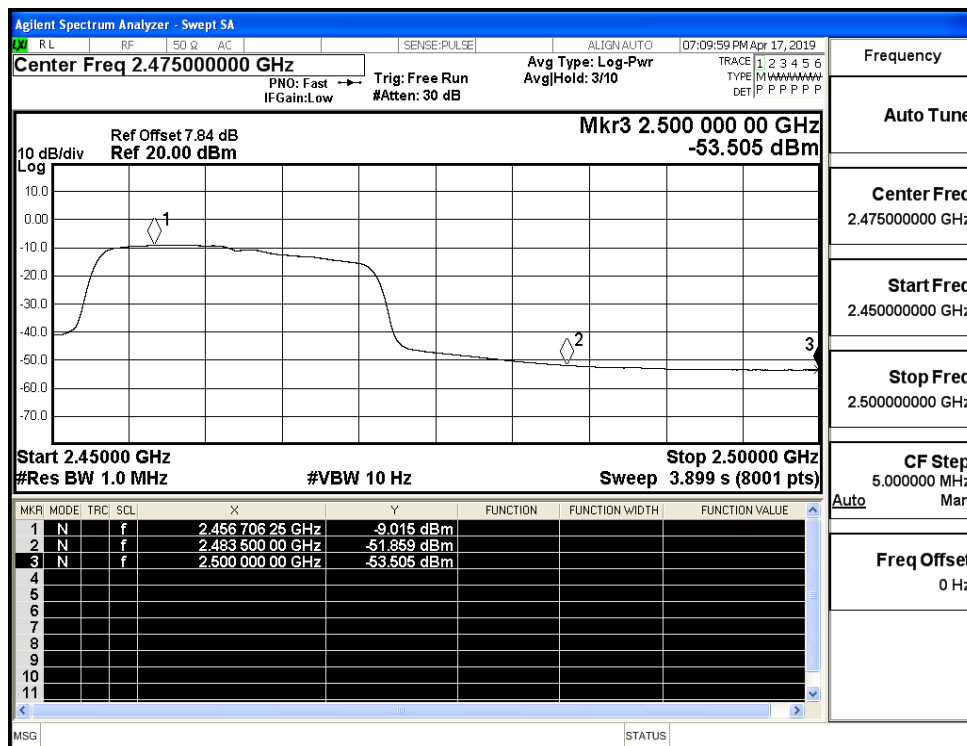
## Restrict-band band-edge measurements\_11N20SISO\_2412\_Ant1\_AV



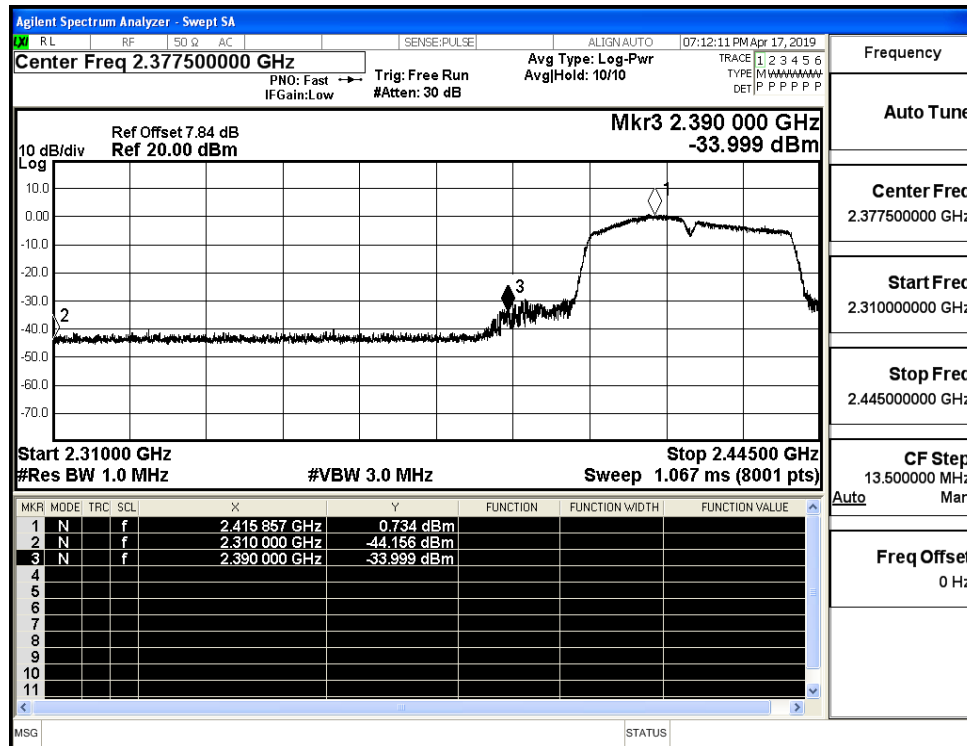
## Restrict-band band-edge measurements\_11N20SISO\_2462\_Ant1\_PEAK



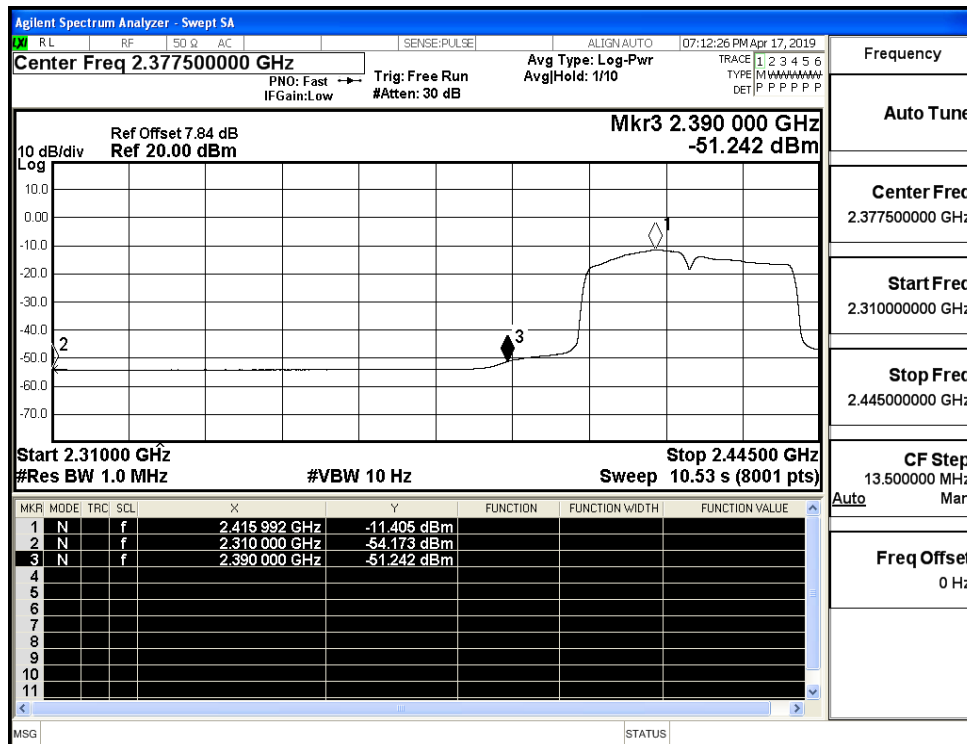
## Restrict-band band-edge measurements\_11N20SISO\_2462\_Ant1\_AV



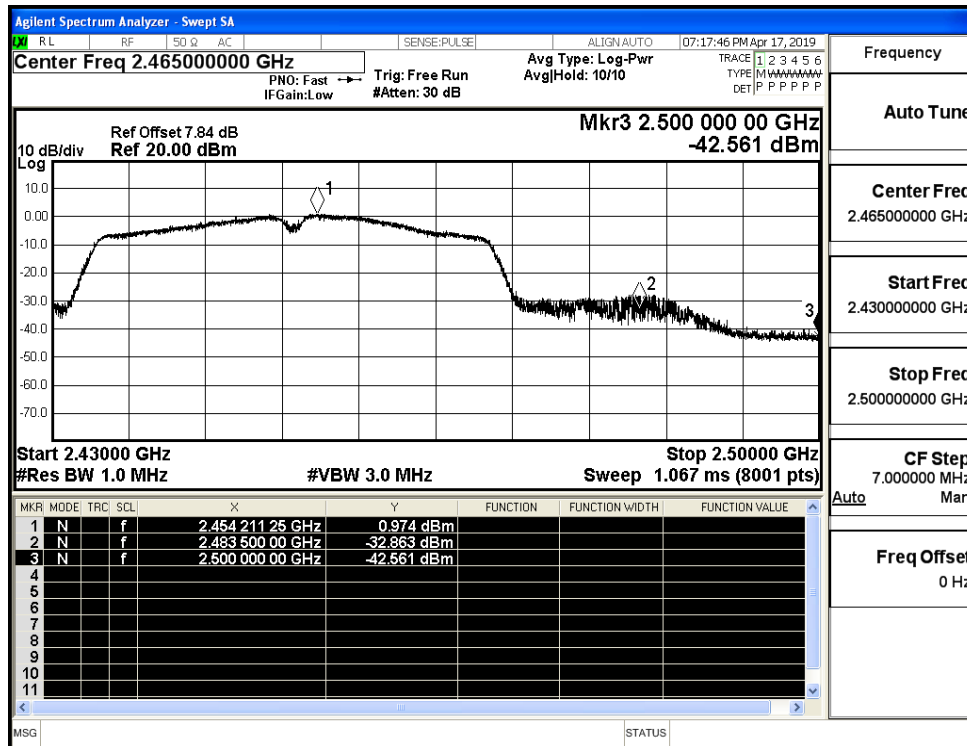
## Restrict-band band-edge measurements\_11N40SISO\_2422\_Ant1\_PEAK



## Restrict-band band-edge measurements\_11N40SISO\_2422\_Ant1\_AV



## Restrict-band band-edge measurements\_11N40SISO\_2452\_Ant1\_PEAK



## Restrict-band band-edge measurements\_11N40SISO\_2452\_Ant1\_AV

