



## Appendix O

### RF Test Data for Zigbee(Conducted Measurement)

**Product Name: SmartHub**

**Test Model: SmartHub v2**

#### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23.8° C   |
| Relative Humidity: | 52.2%     |
| ATM Pressure:      | 100.0 kPa |
| Test Engineer:     | Ling Zhu  |
| Supervised by:     | Li Huan   |



Shenzhen LCS Compliance Testing Laboratory Ltd.  
Add: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China  
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com  
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O.1 DTS Bandwidth

Test Result

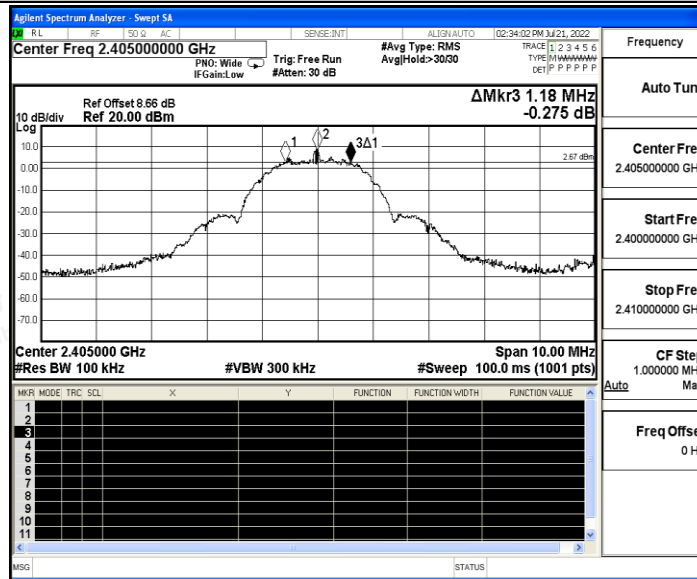
| TestMode | Antenna | Channel | DTS BW [MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|---------|--------------|----------|----------|------------|---------|
| ZIGB     | Ant1    | 2405    | 1.180        | 2404.410 | 2405.590 | 0.5        | PASS    |
|          |         | 2440    | 1.080        | 2439.450 | 2440.530 | 0.5        | PASS    |
|          |         | 2480    | 1.070        | 2479.420 | 2480.490 | 0.5        | PASS    |



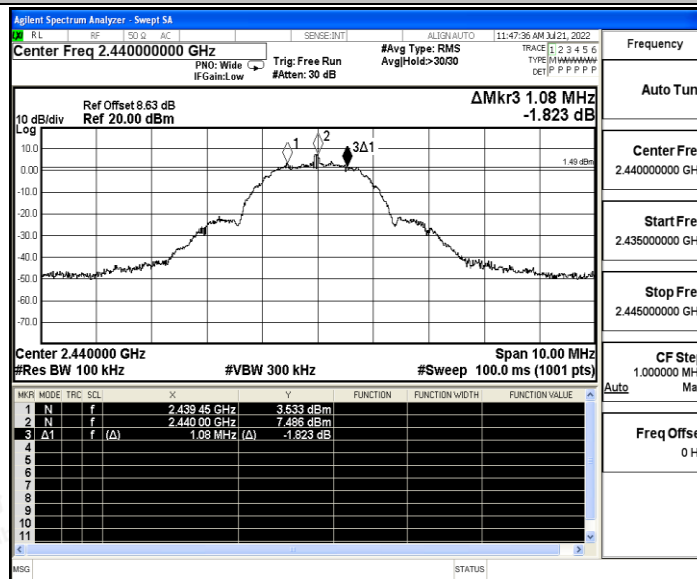


## Test Graphs

ZIGB\_Ant1\_2405

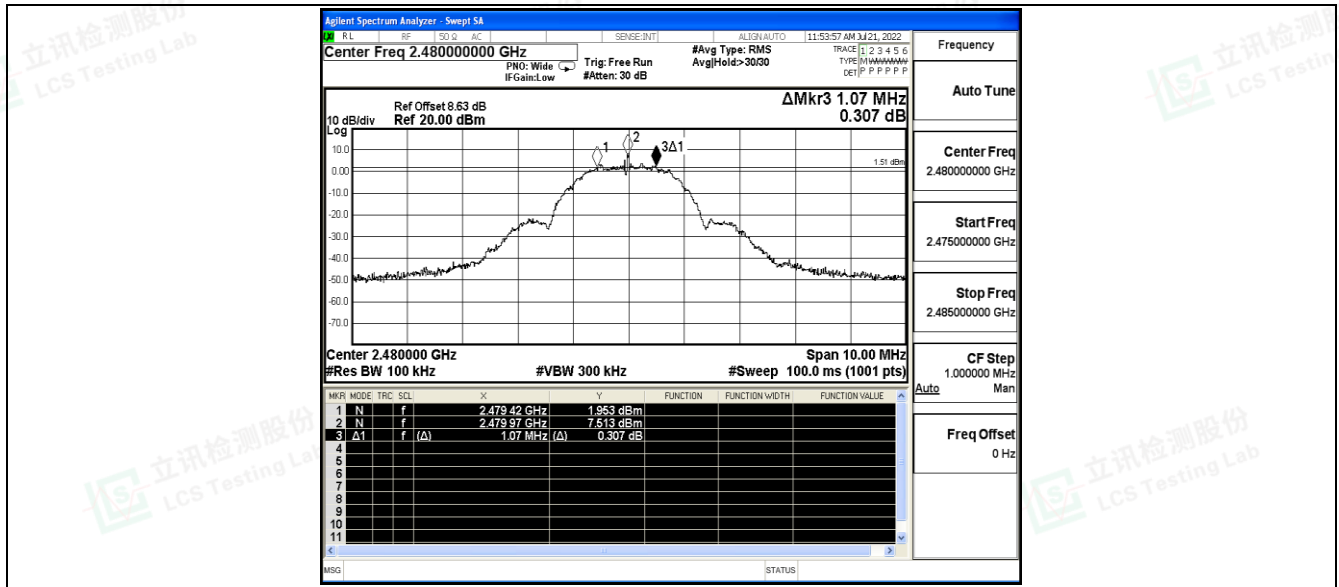


ZIGB\_Ant1\_2440



ZIGB\_Ant1\_2480







O.2 Maximum peak conducted output power

Test Result

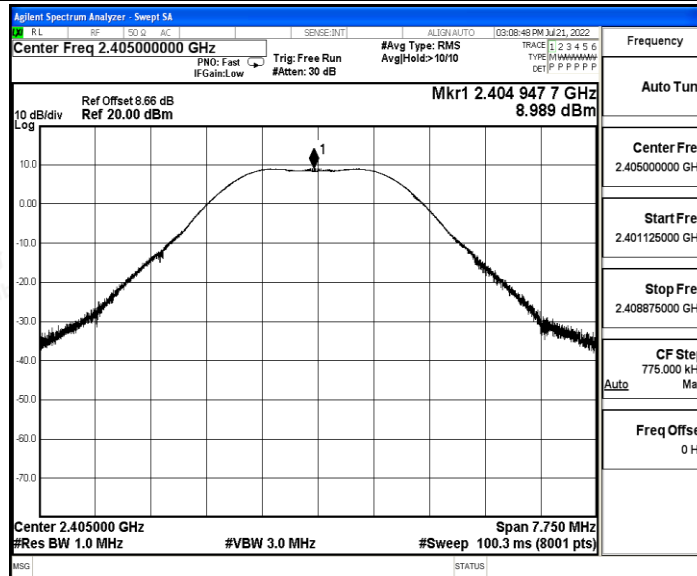
| TestMode | Antenna | Channel | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|---------|-------------|------------|---------|
| ZIGB     | Ant1    | 2405    | 8.99        | ≤30        | PASS    |
|          |         | 2440    | 8.21        | ≤30        | PASS    |
|          |         | 2480    | 7.54        | ≤30        | PASS    |



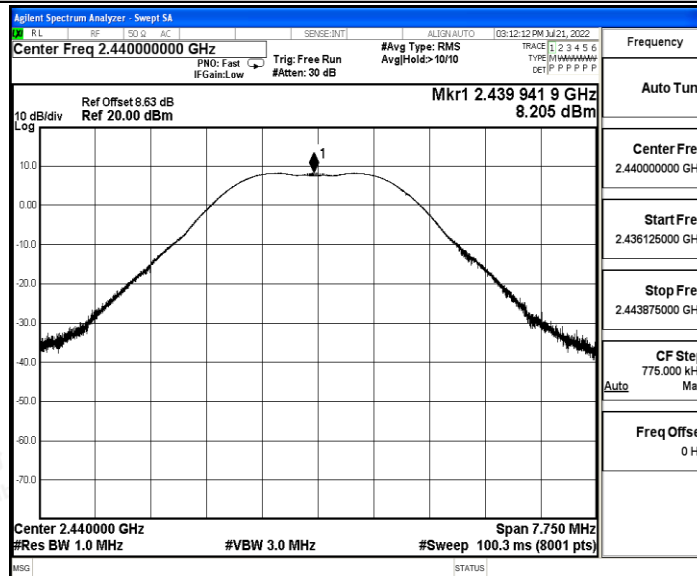


## Test Graphs

ZIGB\_Ant1\_2405

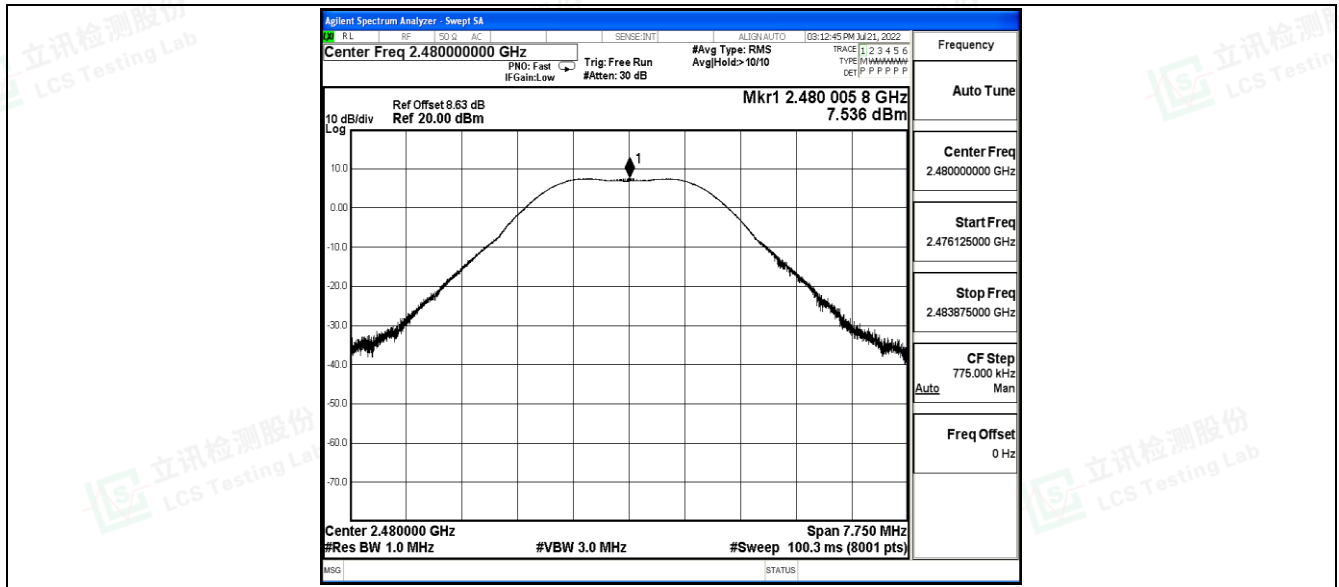


ZIGB\_Ant1\_2440



ZIGB\_Ant1\_2480







O.3 Maximum power spectral density

Test Result

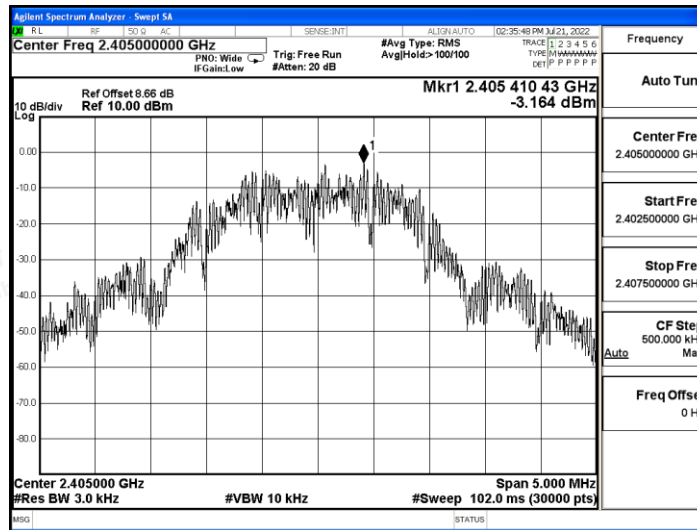
| TestMode | Antenna | Channel | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|----------|---------|---------|------------------|-----------------|---------|
| ZIGB     | Ant1    | 2405    | -3.16            | ≤8.00           | PASS    |
|          |         | 2440    | -3.62            | ≤8.00           | PASS    |
|          |         | 2480    | -4.36            | ≤8.00           | PASS    |



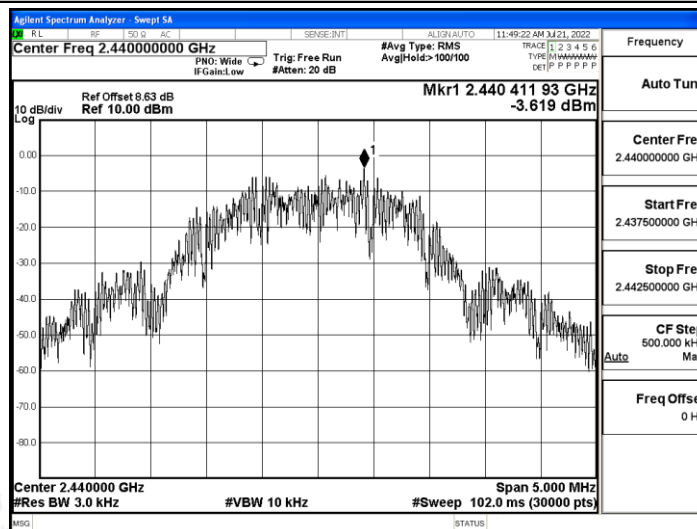


## Test Graphs

ZIGB\_Ant1\_2405

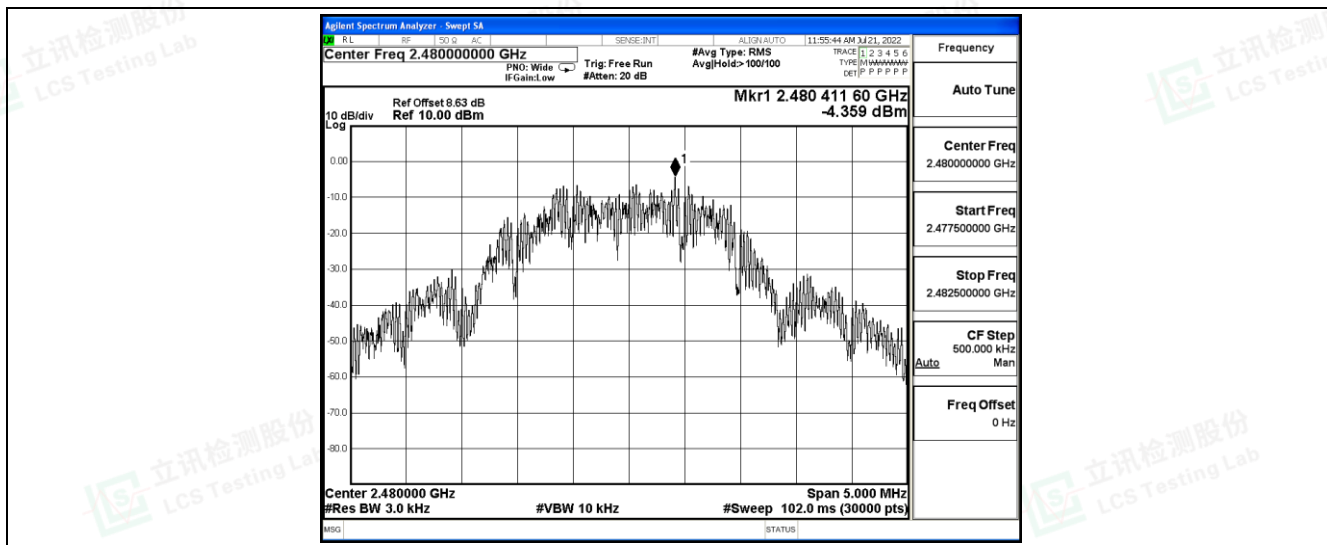


ZIGB\_Ant1\_2440



ZIGB\_Ant1\_2480







### O.4 Band edge measurements

#### Test Result

| TestMode | Antenna | ChName | Channel | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|--------|---------|---------------|-------------|------------|---------|
| ZIGB     | Ant1    | Low    | 2405    | 7.81          | -47.81      | ≤-12.19    | PASS    |
|          |         | High   | 2480    | 7.47          | -45.54      | ≤-12.53    | PASS    |

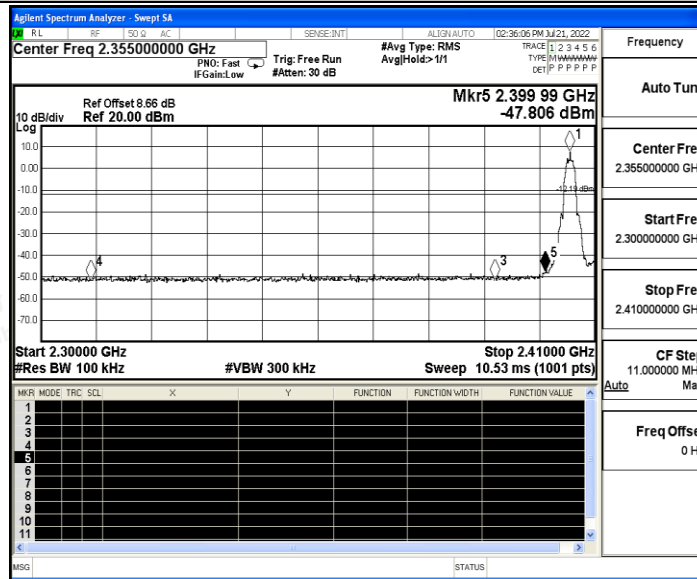


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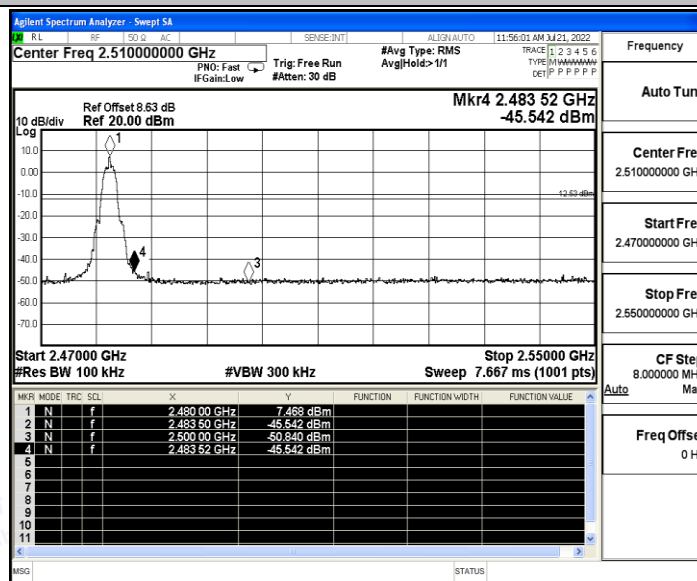


## Test Graphs

ZIGB\_Ant1\_Low\_2405



ZIGB\_Ant1\_High\_2480





## O.5 Conducted Spurious Emission

### Test Result

| TestMode | Antenna | Channel | FreqRange<br>[MHz] | RefLevel<br>[dBm] | Result[dBm] | Limit[dBm]    | Verdict |
|----------|---------|---------|--------------------|-------------------|-------------|---------------|---------|
| ZIGB     | Ant1    | 2405    | Reference          | 7.61              | 7.61        | ---           | PASS    |
|          |         |         | 30~1000            | 7.61              | -58.22      | $\leq -12.39$ | PASS    |
|          |         |         | 1000~26500         | 7.61              | -36.23      | $\leq -12.39$ | PASS    |
|          |         | 2440    | Reference          | 5.30              | 5.30        | ---           | PASS    |
|          |         |         | 30~1000            | 5.30              | -59.19      | $\leq -14.7$  | PASS    |
|          |         |         | 1000~26500         | 5.30              | -38.53      | $\leq -14.7$  | PASS    |
|          |         | 2480    | Reference          | 2.96              | 2.96        | ---           | PASS    |
|          |         |         | 30~1000            | 2.96              | -58.23      | $\leq -17.04$ | PASS    |
|          |         |         | 1000~26500         | 2.96              | -39.76      | $\leq -17.04$ | PASS    |

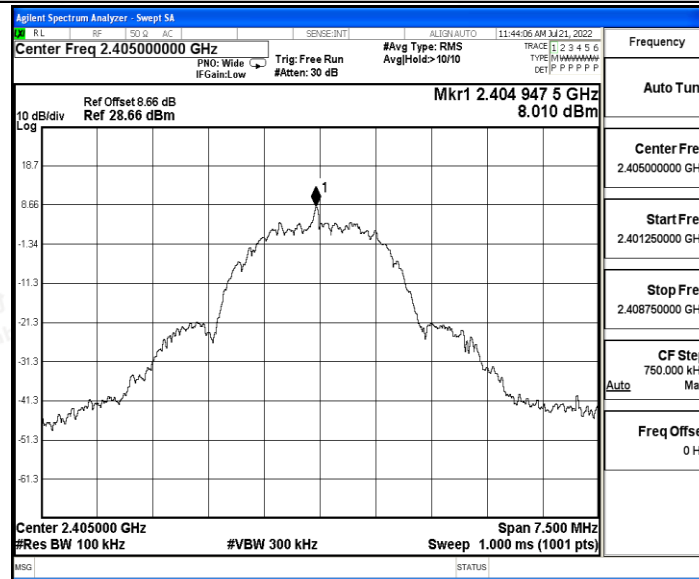


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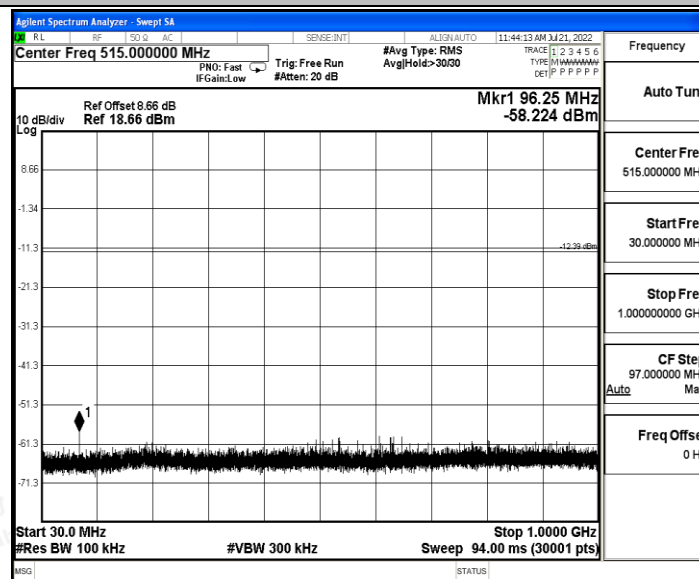


## Test Graphs

ZIGB\_Ant1\_2405\_0~Reference

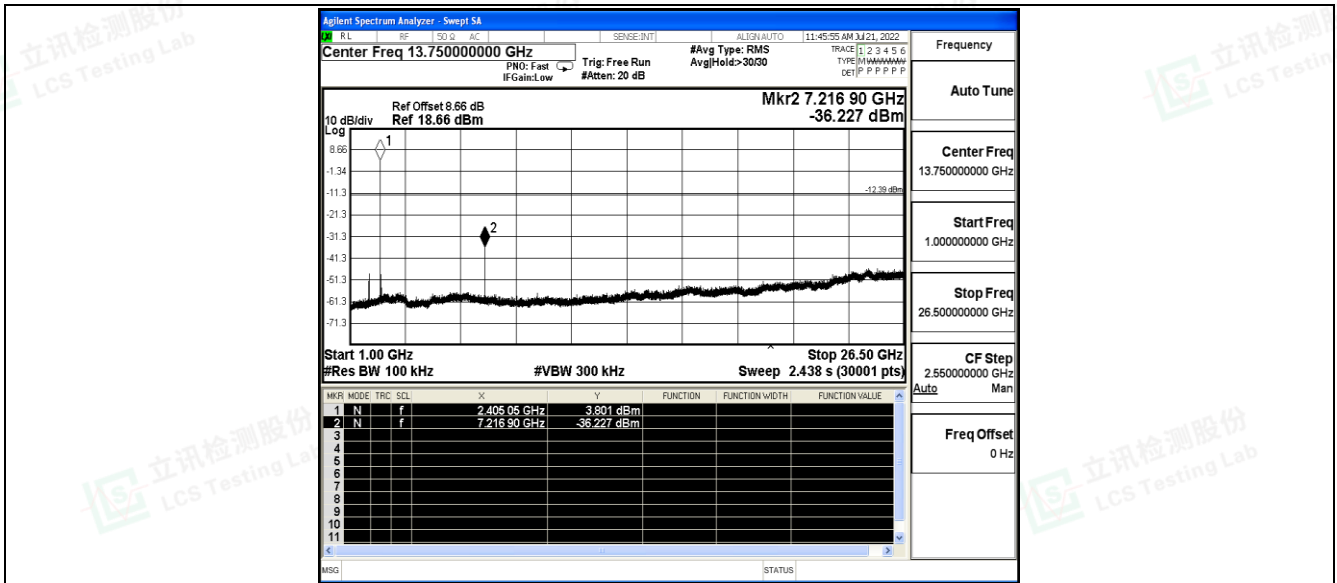


ZIGB\_Ant1\_2405\_30~1000

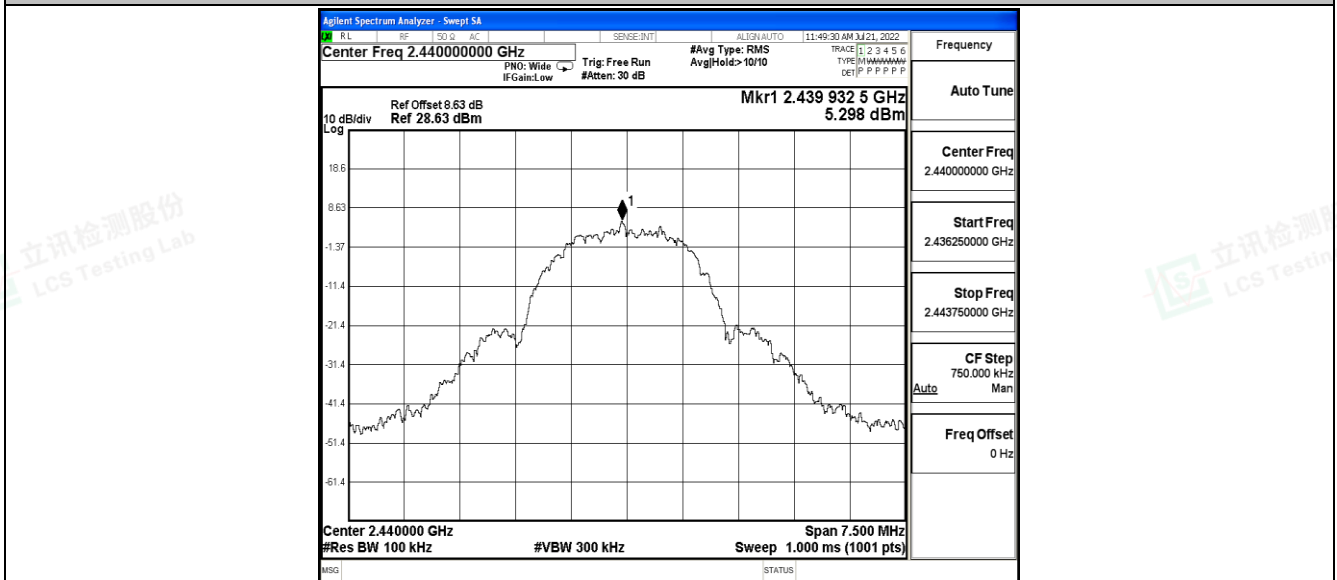


ZIGB\_Ant1\_2405\_1000~26500



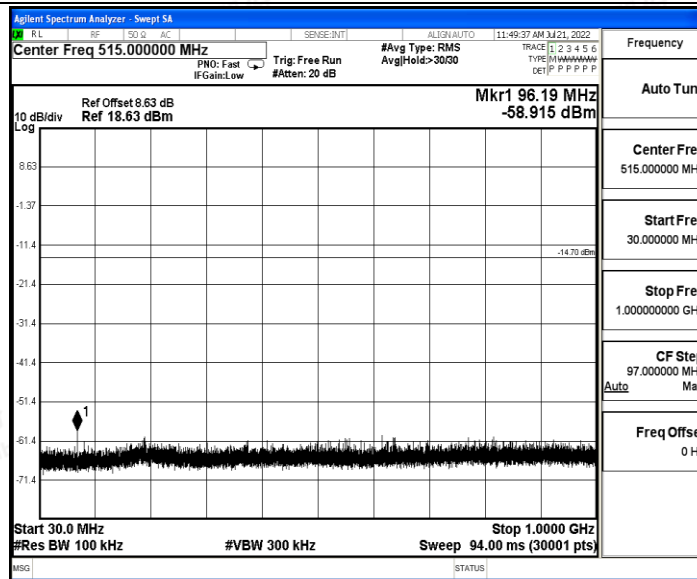


ZIGB\_Ant1\_2440\_0~Reference

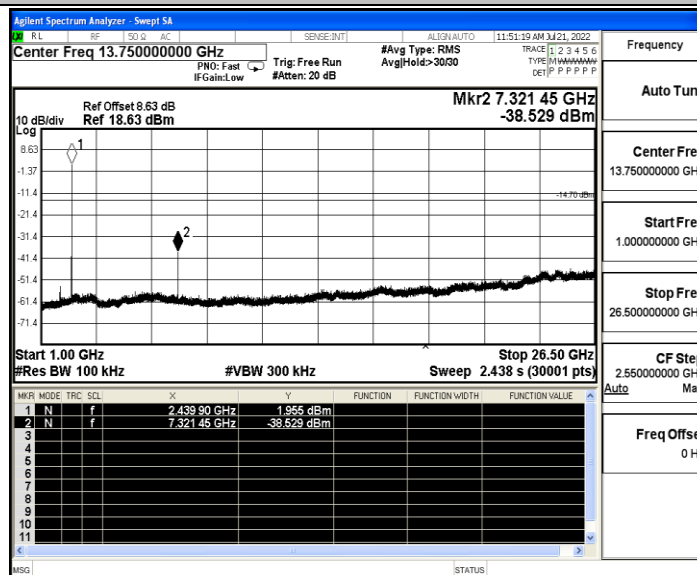


ZIGB\_Ant1\_2440\_30~1000



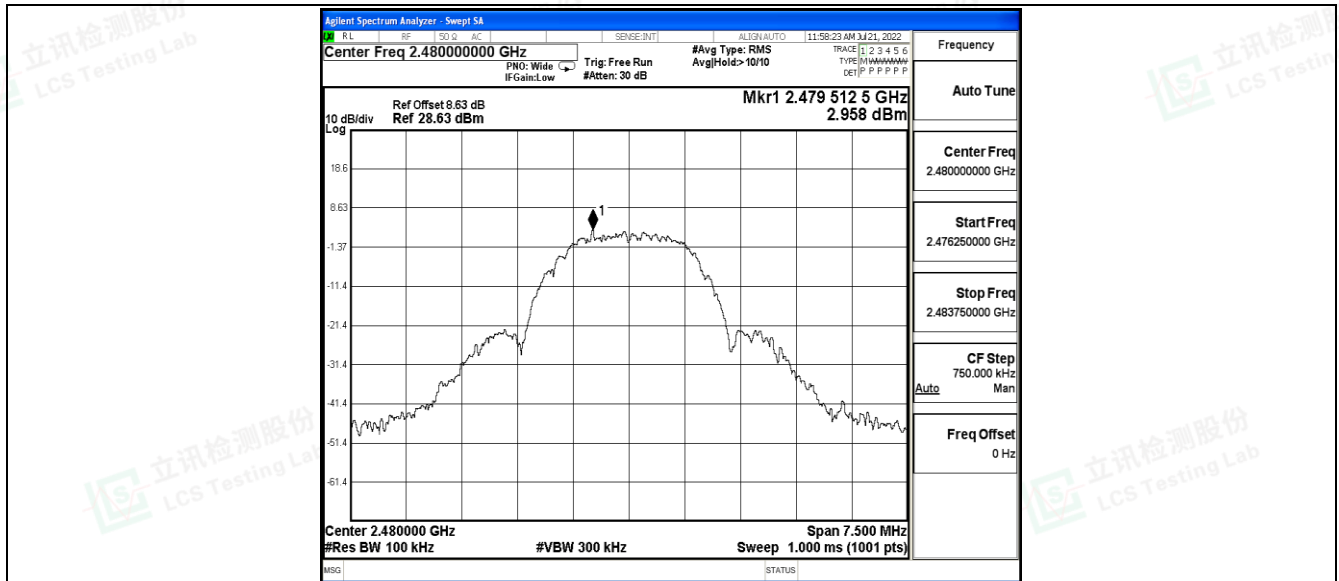


ZIGB\_Ant1\_2440\_1000~26500

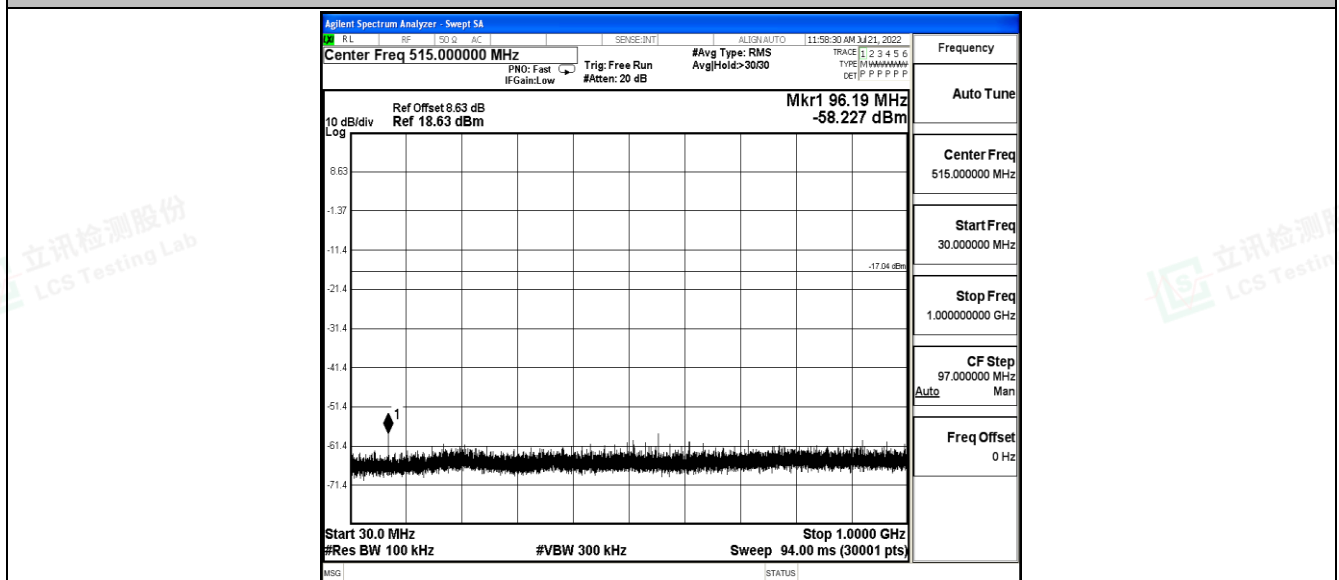


ZIGB\_Ant1\_2480\_0~Reference



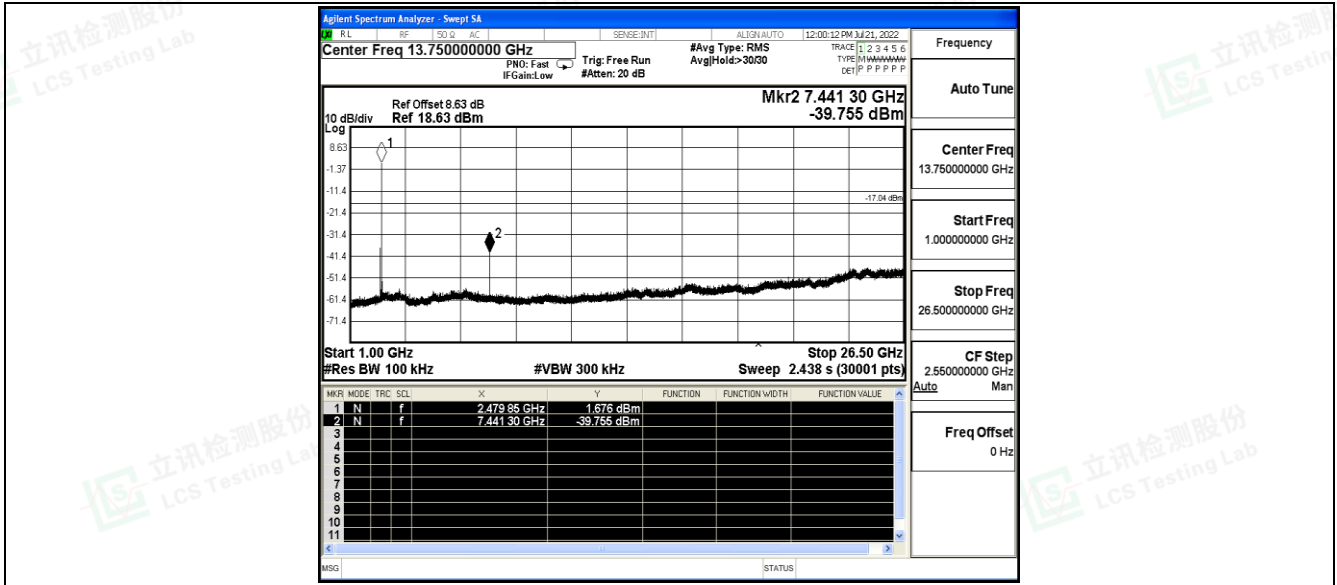


ZIGB\_Ant1\_2480\_30~1000



ZIGB\_Ant1\_2480\_1000~26500







O.6 Duty Cycle

Test Result

| TestMode | Antenna | Channel | Transmission Duration [ms] | Transmission Period [ms] | Duty Cycle [%] | Factor | 1/T |
|----------|---------|---------|----------------------------|--------------------------|----------------|--------|-----|
| ZIGB     | Ant1    | 2405    | 20.00                      | 20.00                    | 100.00         | 0.00   | 1   |
|          |         | 2440    | 20.00                      | 20.00                    | 100.00         | 0.00   | 1   |
|          |         | 2480    | 20.00                      | 20.00                    | 100.00         | 0.00   | 1   |

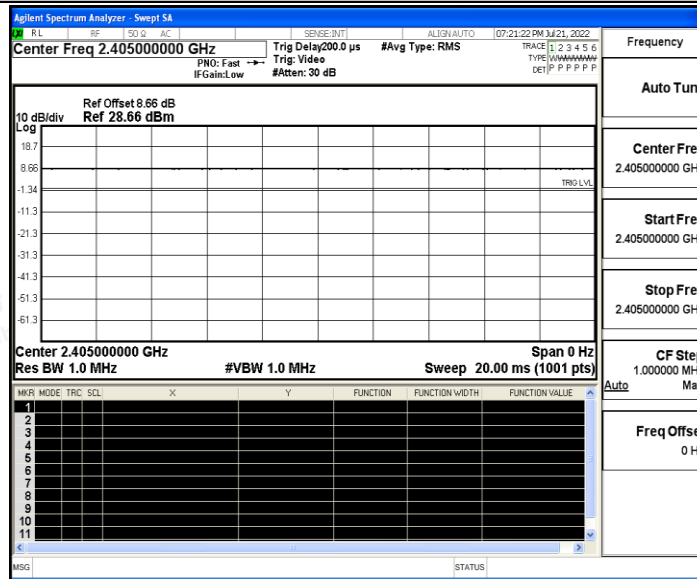


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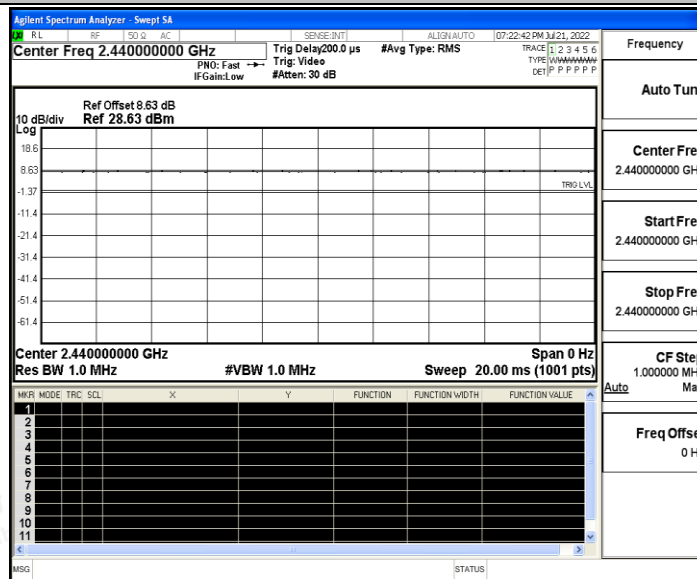


## Test Graphs

ZIGB\_Ant1\_2405

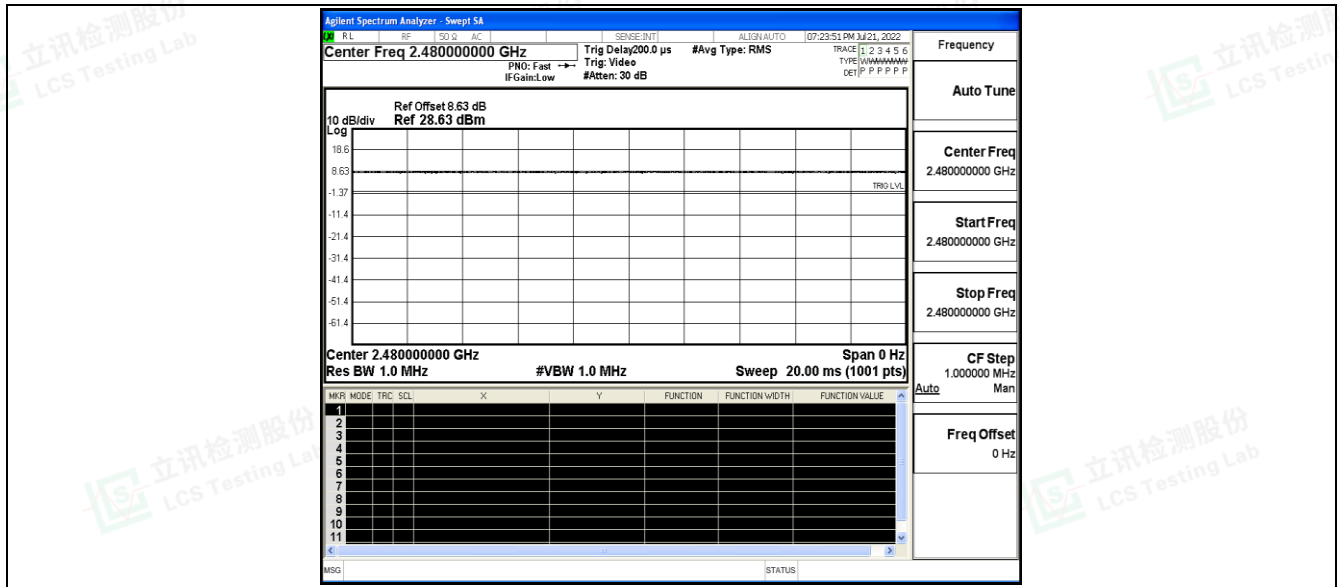


ZIGB\_Ant1\_2440



ZIGB\_Ant1\_2480







## O.7 Emissions in Restricted Bands

### Test Result

| TestMode | Antenna | ChName | Channel | Detector | Freq.<br>[MHz] | Result<br>[dBm] | Limit<br>[dBm] | Verdict |
|----------|---------|--------|---------|----------|----------------|-----------------|----------------|---------|
| ZIGB     | Ant1    | Low    | 2405    | AV       | 2310.000       | -48.44          | ≤-41.20        | PASS    |
|          |         |        |         | AV       | 2389.540       | -48.07          | ≤-41.20        | PASS    |
|          |         |        |         | AV       | 2390.000       | -48.08          | ≤-41.20        | PASS    |
|          |         |        |         | Peak     | 2310.000       | -38.68          | ≤-21.20        | PASS    |
|          |         |        |         | Peak     | 2383.270       | -36.4           | ≤-21.20        | PASS    |
|          |         |        |         | Peak     | 2390.000       | -37.81          | ≤-21.20        | PASS    |
|          |         | High   | 2480    | AV       | 2483.500       | -43.82          | ≤-41.20        | PASS    |
|          |         |        |         | AV       | 2483.520       | -43.82          | ≤-41.20        | PASS    |
|          |         |        |         | AV       | 2500.000       | -47.49          | ≤-41.20        | PASS    |
|          |         |        |         | Peak     | 2483.500       | -30.35          | ≤-21.20        | PASS    |
|          |         |        |         | Peak     | 2483.520       | -30.35          | ≤-21.20        | PASS    |
|          |         |        |         | Peak     | 2500.000       | -37.9           | ≤-21.20        | PASS    |

Note:

1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

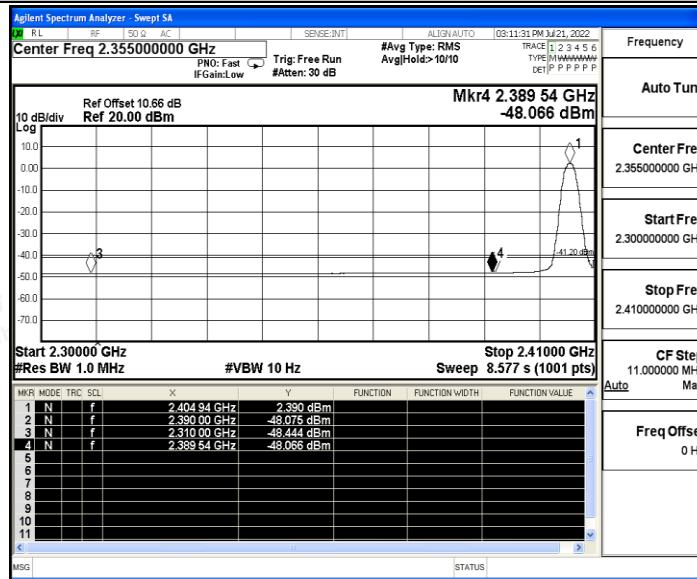


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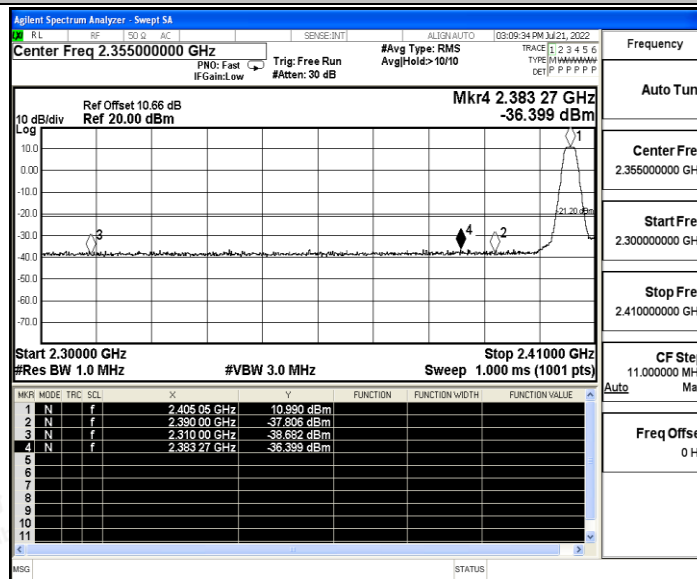


## Test Graphs

ZIGB\_Ant1\_Low\_2405\_AV

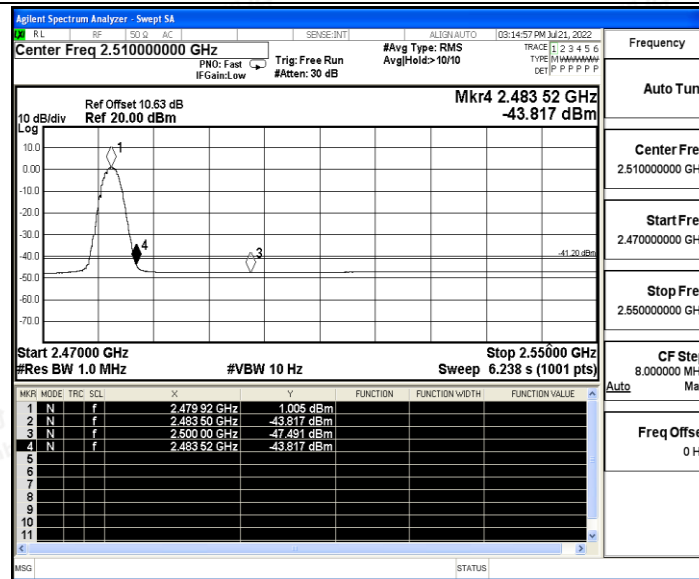


ZIGB\_Ant1\_Low\_2405\_Peak



ZIGB\_Ant1\_High\_2480\_AV





ZIGB\_Ant1\_High\_2480\_Peak

