# 10. Number of Hopping Frequency Measurement

## 10.1 Provisions Applicable

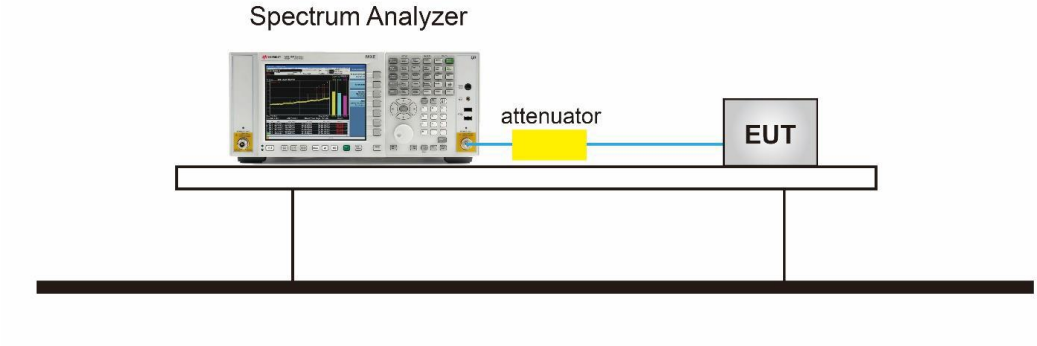
This frequency hopping system must employ a minimum of 15 hopping channels.

## 10.2 Measurement Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span = The frequency band of operation. Depending on the number of channels the device
2. supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
3. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
4. VBW ⩾ RBW
5. Sweep time = Auto couple
6. Detector = Peak
7. Trace mode = Max hold
8. Allow the trace to stabilize
9. Input compensation coefficient (dB) = Cable Loss (dB) + Attenuator attenuation value (dB)

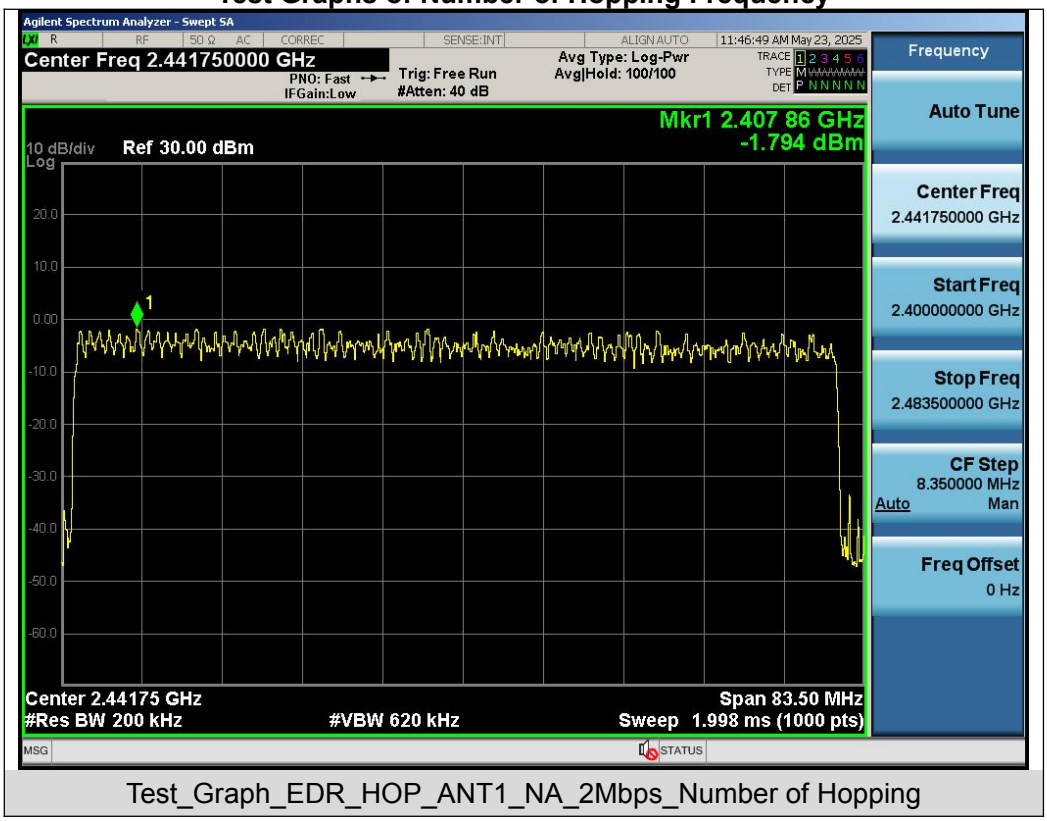
## 10.3 Measurement Setup (Block Diagram of Configuration)




## 10.4 Measurement Result

| Test Data of Number of Hopping Frequency | | | |
|---|---|---|---|
| Test Mode | Number of Hopping Frequency | Limits | Pass or Fail |
| π /4-DQPSK Hopping | 79 | >=15 | Pass |

**Test Graphs of Number of Hopping Frequency**




Test_Graph_EDR_HOP_ANT1_NA_2Mbps_Number of Hopping

Note: All mode rates are tested and evaluated, π /4-DQPSK modulated 2DH5 mode is the worst case and documented in the report.

# 11. Time of Occupancy (Dwell Time) Measurement

## 11.1 Provisions Applicable

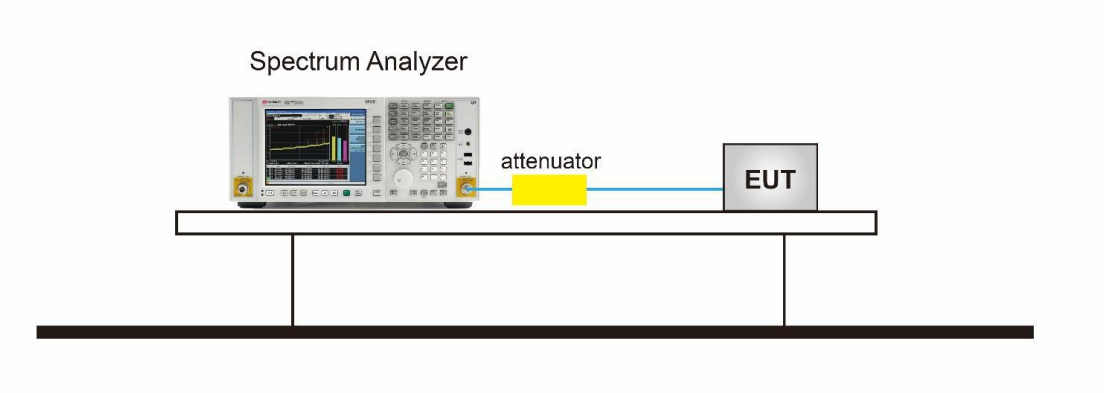
The maximum permissible time of occupancy is 400ms within a period of 400ms multiplied by the number of hopping channels employed.

## 11.2 Measurement Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span = Zero span, centered on a hopping channel.
2. RBW shall be ⩽ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3. VBW ⩾ RBW
4. Sweep time = As necessary to capture the entire dwell time per hopping channel
5. Detector = Peak
6. Trace mode = Free Run
7. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time. An oscilloscope may be used instead of a spectrum analyzer. The EUT shall show compliance with the appropriate regulatory limit for the number of hopping channels. A plot of the data shall be included in the test report.
8. Input compensation coefficient (dB) = Cable Loss (dB) + Attenuator attenuation value (dB)

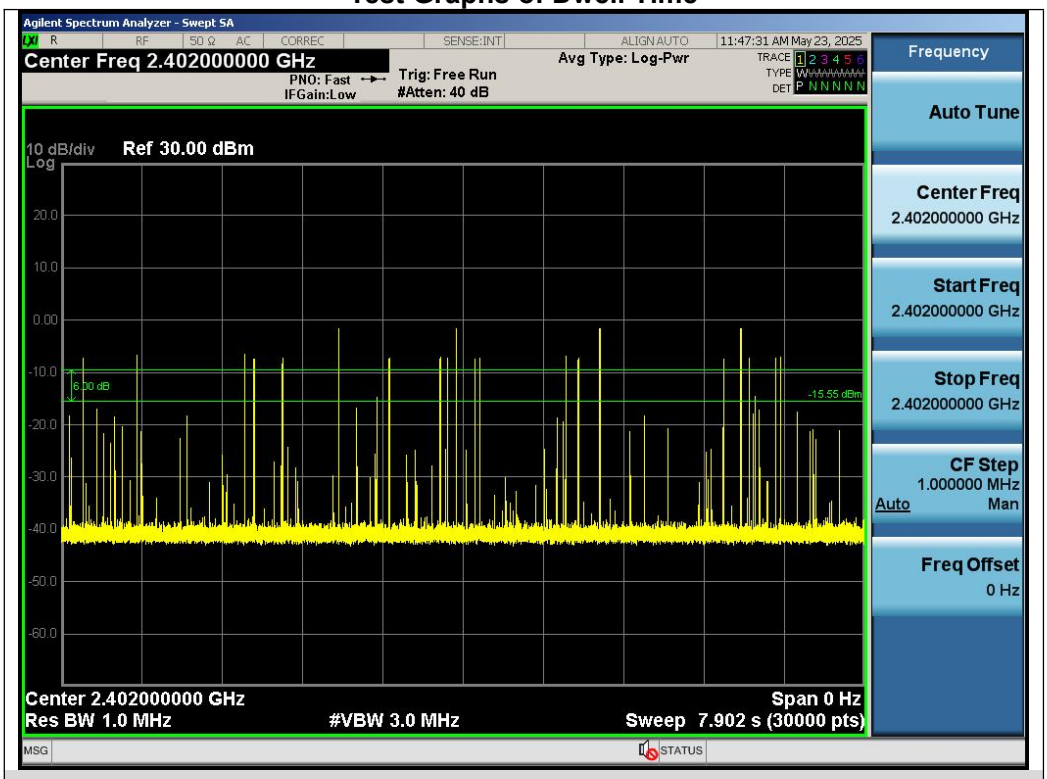
## 11.3 Measurement Setup (Block Diagram of Configuration)



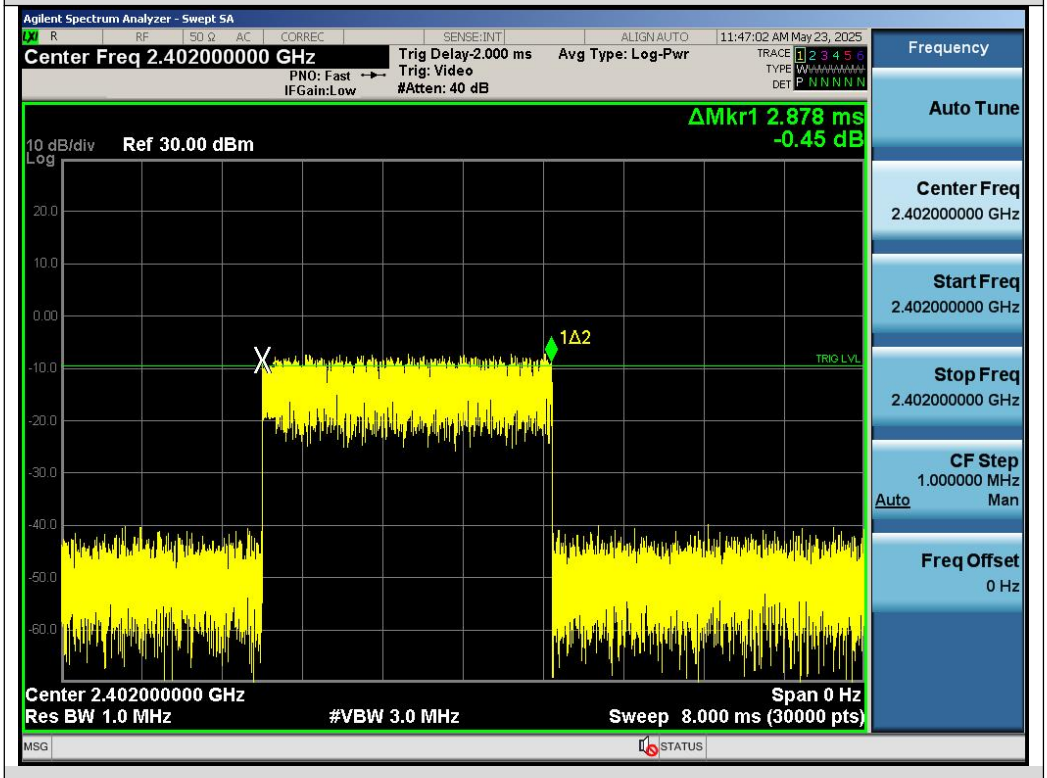

## 11.4 Measurement Result

| Test Data of Dwell Time | | | | | |
|---|---|---|---|---|---|
| Channel | Time of Pulse for 2DH5 (ms) | Number of hops in the period specified in the requirements | Dwell Time (ms) | Limit (ms) | Pass or Fail |
| 2402 | 2.753 | 3.0*4 | 33.036 | 400 | Pass |
| 2441 | 2.753 | 10.0*4 | 110.120 | 400 | Pass |
| 2480 | 2.753 | 9.0*4 | 99.108 | 400 | Pass |

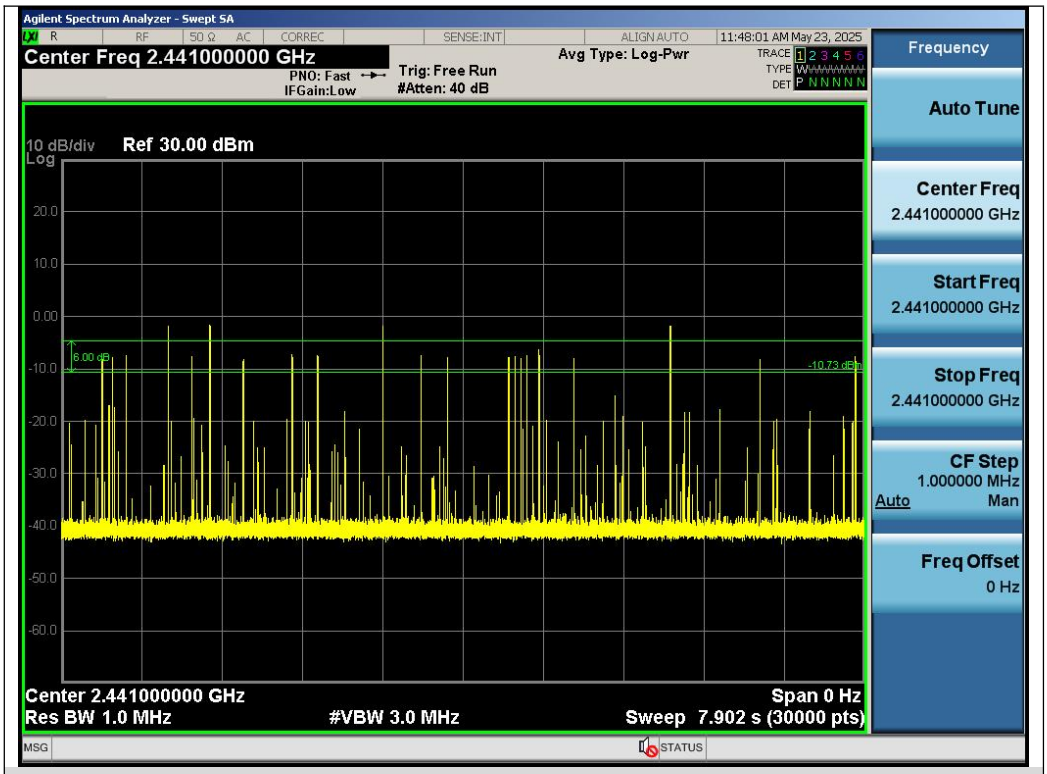
## Test Graphs of Dwell Time



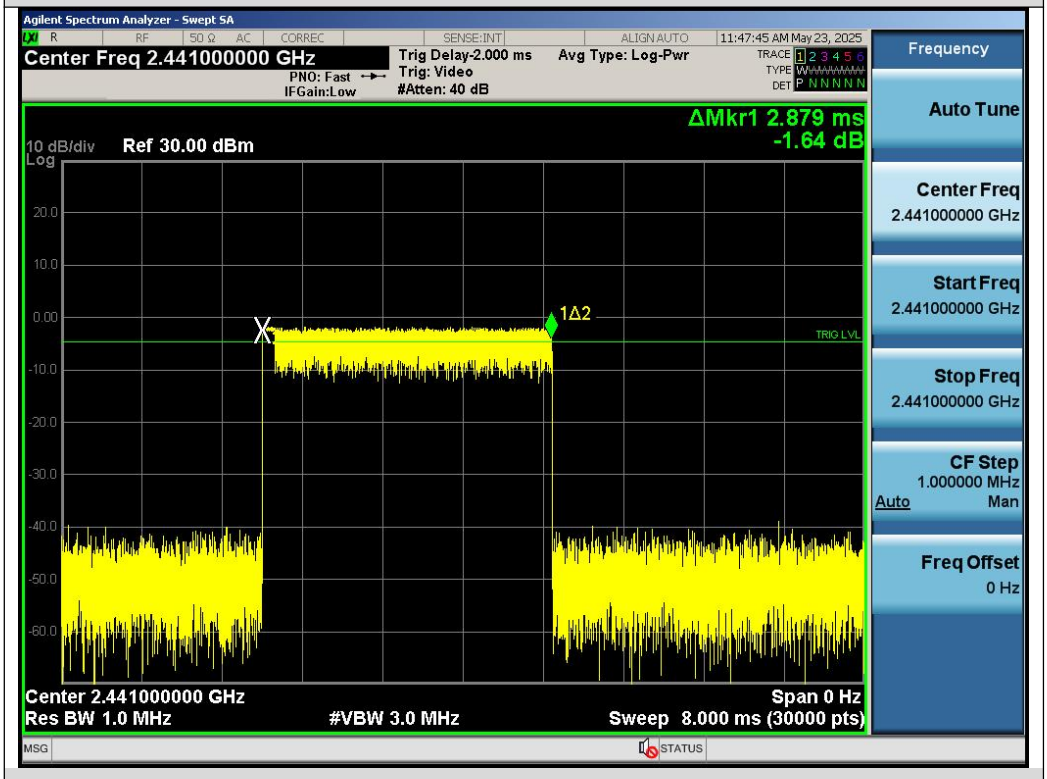

Test_Graph_EDR_HOP_ANT1_NA_2Mbps_2402_Number of Busrt



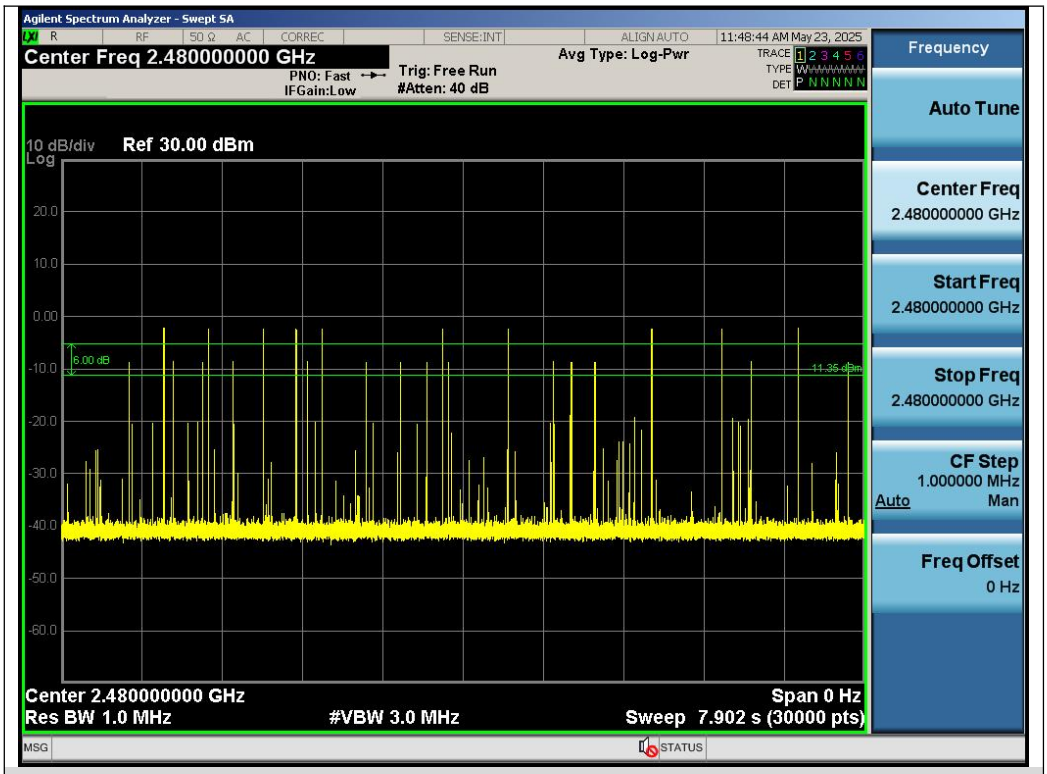

Test_Graph_EDR_HOP_ANT1_NA_2Mbps_2402_Time per Burst



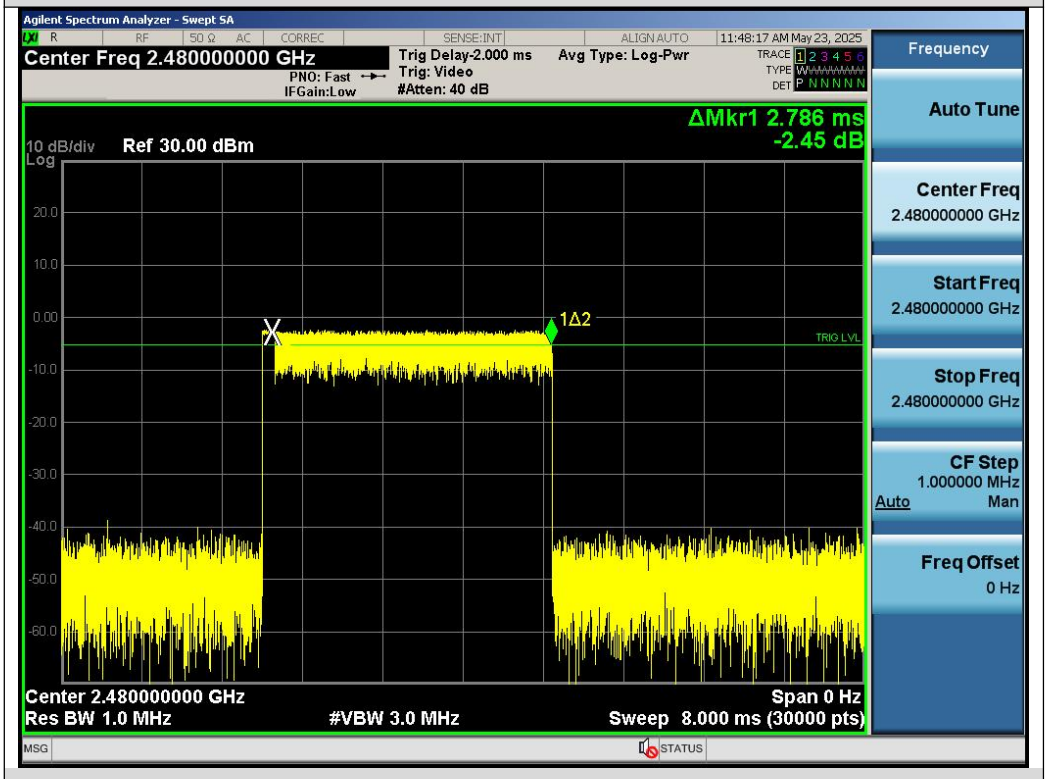

Test_Graph_EDR_HOP_ANT1_NA_2Mbps_2441_Number of Busrt




Test_Graph_EDR_HOP_ANT1_NA_2Mbps_2441_Time per Burst




Test_Graph_EDR_HOP_ANT1_NA_2Mbps_2480_Number of Busrt




Test_Graph_EDR_HOP_ANT1_NA_2Mbps_2480_Time per Burst

Note: All mode rates are tested and evaluated, π /4-DQPSK modulated 2DH5 mode is the worst case and documented in the report.

# 12. Frequency Separation Measurement

## 12.1 Provisions Applicable

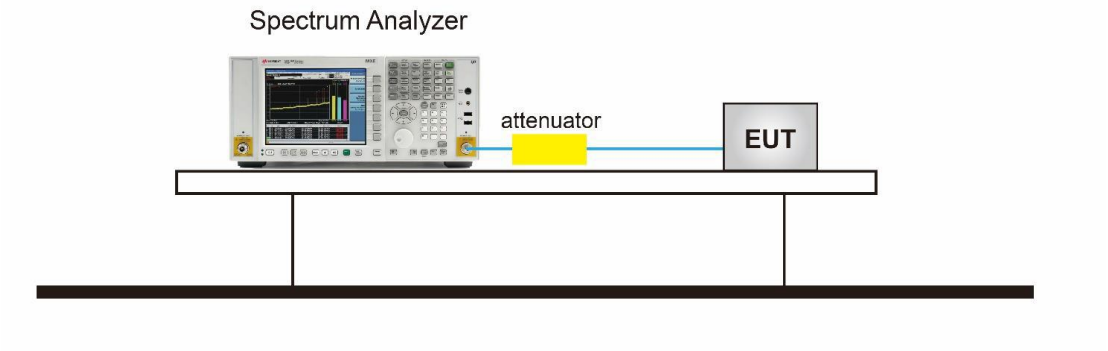
When the power is less than 0.125W: The minimum permissible channel separation for this system is 2/3 the value of the 20dB BW.
When the power is less than 1W: The minimum permissible channel separation for this system is 20dB BW.

## 12.2 Measurement Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.
2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. Video (or average) bandwidth (VBW) ⩾ RBW.
4. Sweep: Auto.
5. Detector function: Peak.
6. Trace: Max hold. g) Allow the trace to stabilize.
7. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.
8. Input compensation coefficient (dB) = Cable Loss (dB) + Attenuator attenuation value (dB)

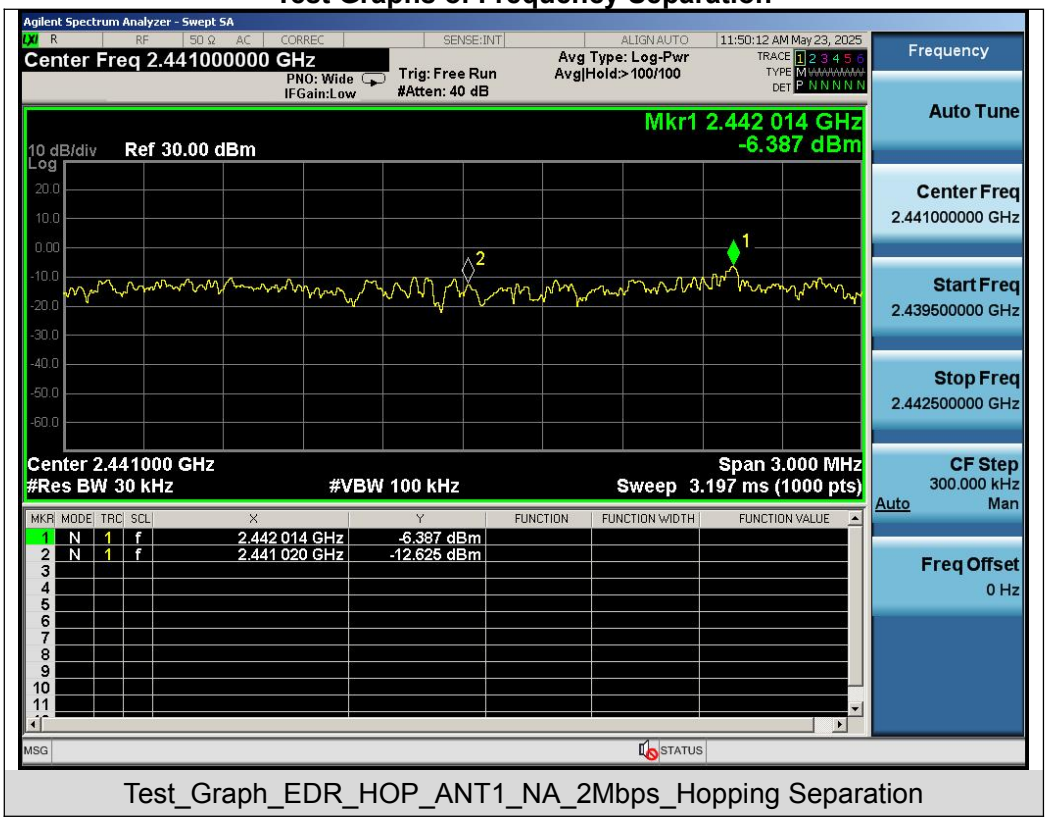
## 12.3 Measurement Setup (Block Diagram of Configuration)




## 12.4 Measurement Result

| Test Data of Frequency Separation | | | |
|---|---|---|---|
| Test Mode | Channel Separation (MHz) | Limits (MHz) | Pass or Fail |
| π /4-DQPSK Hopping | 0.994 | ≥0.879 | Pass |

**Test Graphs of Frequency Separation**




Test_Graph_EDR_HOP_ANT1_NA_2Mbps_Hopping Separation

Note: All mode rates are tested and evaluated, π /4-DQPSK modulated 2DH5 mode is the worst case and documented in the report.

# 13. AC Power Line Conducted Emission Test

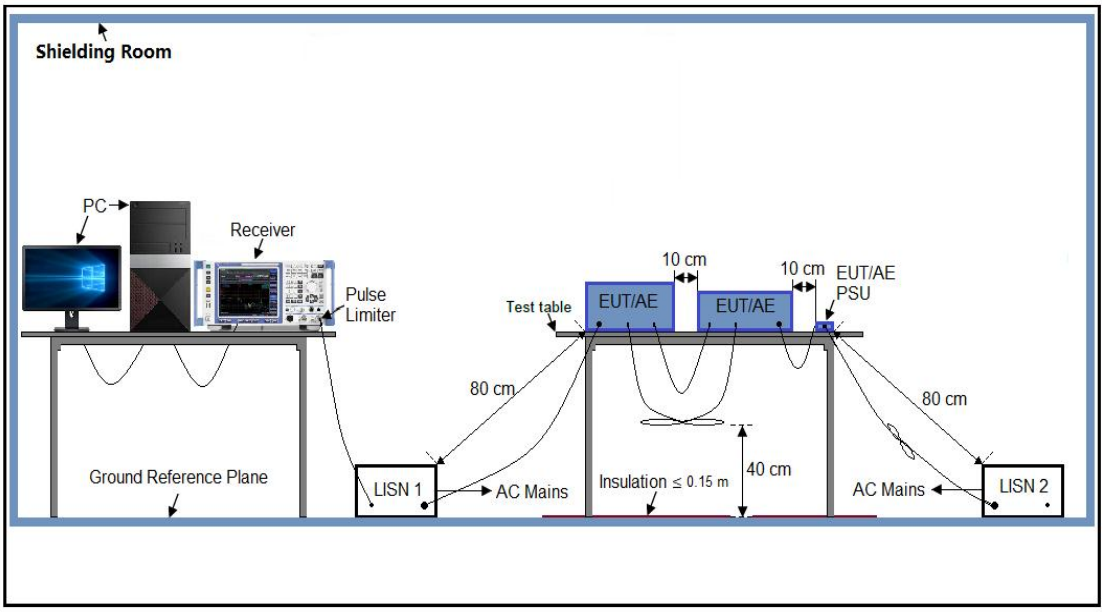
## 13.1 Measurement Limit

| Frequency | Maximum RF Line Voltage | |
|---|---|---|
| | Q.P. (dBμV) | Average (dBμV) |
| 150kHz~500kHz | 66-56 | 56-46 |
| 500kHz~5MHz | 56 | 46 |
| 5MHz~30MHz | 60 | 50 |

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

## 13.2 Measurement Setup (Block Diagram of Configuration)



### 13.3 Preliminary Procedure of Line Conducted Emission Test

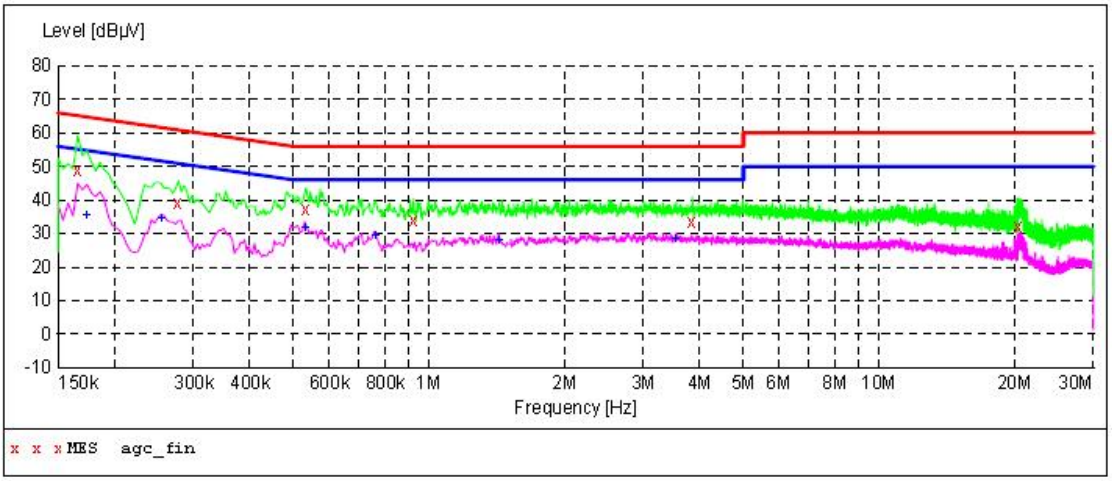
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipment received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power from PC which received AC120V/60Hz power from a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side).
7. Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
8. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
9. During the above scans, the emissions were maximized by cable manipulation.
10. The test mode(s) were scanned during the preliminary test.
11. Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

### 13.4 Final Procedure of Line Conducted Emission Test

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
3. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
4. The test data of the worst case condition(s) was reported on the Summary Data page.
5. A conducted emission is calculated by the following equation:
   - Measurement Level (dBμV) = Receiver reading (dBμV) + Transd (dB)
   - Transd (dB)= AMN Factor(dB)+Cable Loss(dB)+Attenuation(dB)
   - Margin= Limit-Level

### 13.5 Measurement Result

| AC Power Line Conducted Emission Test | | | |
|---|---|---|---|
| Test Mode | Mode 1 | LISN Line | Hot Side |




***MEASUREMENT RESULT: "agc_fin"***

2025/5/13 11:28

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line |
|---|---|---|---|---|---|---|
| 0.166000 | 49.00 | 10.3 | 65 | 16.2 | QP | L1 |
| 0.278000 | 39.30 | 10.3 | 61 | 21.6 | QP | L1 |
| 0.534000 | 37.30 | 10.3 | 56 | 18.7 | QP | L1 |
| 0.926000 | 33.90 | 10.4 | 56 | 22.1 | QP | L1 |
| 3.854000 | 33.50 | 10.6 | 56 | 22.5 | QP | L1 |
| 20.458000 | 32.10 | 14.9 | 60 | 27.9 | QP | L1 |

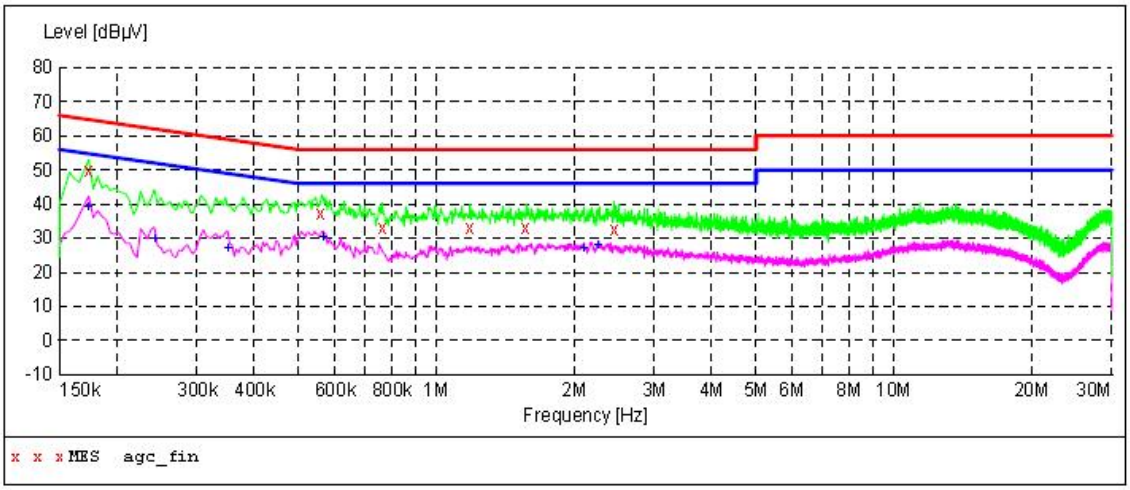
***MEASUREMENT RESULT: "agc_fin2"***

2025/5/13 11:28

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line |
|---|---|---|---|---|---|---|
| 0.174000 | 35.50 | 10.3 | 55 | 19.3 | AV | L1 |
| 0.254000 | 34.30 | 10.3 | 52 | 17.3 | AV | L1 |
| 0.530000 | 31.80 | 10.3 | 46 | 14.2 | AV | L1 |
| 0.758000 | 29.20 | 10.3 | 46 | 16.8 | AV | L1 |
| 1.426000 | 27.90 | 10.4 | 46 | 18.1 | AV | L1 |
| 3.546000 | 28.40 | 10.6 | 46 | 17.6 | AV | L1 |

**RESULT: PASS**

| AC Power Line Conducted Emission Test | | | |
|---|---|---|---|
| Test Mode | Mode 1 | LISN Line | Neutral Side |




***MEASUREMENT RESULT: "agc_fin"***

2025/5/13 11:32

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line |
|---|---|---|---|---|---|---|
| 0.174000 | 50.00 | 10.3 | 65 | 14.8 | QP | L1 |
| 0.562000 | 37.20 | 10.3 | 56 | 18.8 | QP | L1 |
| 0.762000 | 33.10 | 10.3 | 56 | 22.9 | QP | L1 |
| 1.186000 | 32.90 | 10.4 | 56 | 23.1 | QP | L1 |
| 1.574000 | 33.00 | 10.4 | 56 | 23.0 | QP | L1 |
| 2.446000 | 32.40 | 10.5 | 56 | 23.6 | QP | L1 |

***MEASUREMENT RESULT: "agc_fin2"***

2025/5/13 11:32

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line |
|---|---|---|---|---|---|---|
| 0.174000 | 39.10 | 10.3 | 55 | 15.7 | AV | L1 |
| 0.242000 | 29.90 | 10.3 | 52 | 22.1 | AV | L1 |
| 0.350000 | 27.20 | 10.3 | 49 | 21.8 | AV | L1 |
| 0.566000 | 30.10 | 10.3 | 46 | 15.9 | AV | L1 |
| 2.106000 | 27.20 | 10.4 | 46 | 18.8 | AV | L1 |
| 2.258000 | 27.90 | 10.5 | 46 | 18.1 | AV | L1 |

**RESULT: PASS**

## Appendix I: Photographs of Test Setup

Refer to the Report No.: AGC03285250401AP01

## Appendix II: Photographs of Test EUT

Refer to the Report No.: AGC03285250401AP02

# Conditions of Issuance of Test Reports

1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the “Company”) solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the “Clients”).
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4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
5. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
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7. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.
9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

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