# RF Test Report

## For

| | |
|---|---|
| **Applicant Name:** | Faurecia clarion electronics Europe |
| Address: | Batiment Lumière – 40 Avenue des Terroirs de France, 75012 Paris – France |
| EUT Name: | SPS (Smart phone Station) |
| Brand Name: | Faurecia |
| Model Number: | SPS |
| Series Model Number: | N/A |

## Issued By

| | |
|---|---|
| **Company Name:** | **BTF Testing Lab (Shenzhen) Co., Ltd.** |
| Address: | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Report Number: | BTF240318R00201 |
| Test Standards: | 47 CFR Part 15.247 |
| Test Conclusion: | Pass |
| FCC ID: | 2BEZMSPS |
| Test Date: | 2024-02-23 to 2024-04-11 |
| Date of Issue: | 2024-04-11 |
| Prepared By: | Chris Liu / Project Engineer |
| Date: | 2024-04-11 |
| Approved By: | Ryan.CJ / EMC Manager |
| Date: | 2024-04-11 |

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| Revision History | | |
|---|---|---|
| Version | Issue Date | Revisions Content |
| R_V0 | 2024-04-11 | Original |
| | | |
| *Note: Once the revision has been made, then previous versions reports are invalid.* | | |

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# 1 Introduction

## 1.1 Identification of Testing Laboratory

| | |
|---|---|
| Company Name: | BTF Testing Lab (Shenzhen) Co., Ltd. |
| Address: | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Phone Number: | +86-0755-23146130 |
| Fax Number: | +86-0755-23146130 |

## 1.2 Identification of the Responsible Testing Location

| | |
|---|---|
| Company Name: | BTF Testing Lab (Shenzhen) Co., Ltd. |
| Address: | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Phone Number: | +86-0755-23146130 |
| Fax Number: | +86-0755-23146130 |
| FCC Registration Number: | 518915 |
| Designation Number: | CN1330 |

## 1.3 Announcement

(1) The test report reference to the report template version v0.
(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
(3) The test report is invalid if there is any evidence and/or falsification.
(4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.
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(6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

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# 2 Product Information

## 2.1 Application Information

| | |
|---|---|
| Company Name: | Faurecia clarion electronics Europe |
| Address: | Batiment Lumière – 40 Avenue des Terroirs de France, 75012 Paris – France |

## 2.2 Manufacturer Information

| | |
|---|---|
| Company Name: | Clarion Hungary electronics KFT. |
| Address: | Jászberényi út 116, 2760 Nagykáta - Hungary |

## 2.3 Factory Information

| | |
|---|---|
| Company Name: | Clarion Hungary electronics KFT. |
| Address: | Jászberényi út 116, 2760 Nagykáta - Hungary |

## 2.4 General Description of Equipment under Test (EUT)

| | |
|---|---|
| EUT Name: | SPS (Smart phone Station) |
| Test Model Number: | SPS |
| Series Model Number: | / |
| Description of Model name differentiation: | / |
| Hardware Version: | HW04 |
| Software Version: | R26 |

## 2.5 Technical Information

| | |
|---|---|
| Power Supply: | DC 12V/7A |
| Operation Frequency: | 2402MHz to 2480MHz |
| Number of Channels: | 79 |
| Modulation Type: | GFSK, π/4 DQPSK, 8DPSK |
| Antenna Type: | PIFA Antenna |
| Antenna Gain#: | 3.3dBi |

Note:

#: The antenna gain provided by the applicant, and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.

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# 3 Summary of Test Results

## 3.1 Test Standards

The tests were performed according to following standards:
**47 CFR Part 15.247:** Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

## 3.2 Uncertainty of Test

| Item | Measurement Uncertainty |
|---|---|
| Conducted Emission Test | 2.56dB |
| Occupied Channel Bandwidth | 69 KHz |
| All emissions, radiated(<1GHz) | 4.12 dB |
| All emissions, radiated(>1GHz) | 4.89dB |
| Temperature | 0.82 °C |
| Humidity | 4.1 % |
| The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. | |

## 3.3 Summary of Test Result

| Item | Standard | Requirement | Result |
|---|---|---|---|
| Antenna requirement | 47 CFR Part 15.247 | Part 15.203 | Pass |
| Conducted Emission at AC power line | 47 CFR Part 15.247 | 47 CFR 15.207(a) | N/A |
| Occupied Bandwidth | 47 CFR Part 15.247 | 47 CFR 15.215(c) | Pass |
| Maximum Conducted Output Power | 47 CFR Part 15.247 | 47 CFR 15.247(b)(1) | Pass |
| Channel Separation | 47 CFR Part 15.247 | 47 CFR 15.247(a)(1) | Pass |
| Number of Hopping Frequencies | 47 CFR Part 15.247 | 47 CFR 15.247(a)(1)(iii) | Pass |
| Dwell Time | 47 CFR Part 15.247 | 47 CFR 15.247(a)(1)(iii) | Pass |
| Emissions in non-restricted frequency bands | 47 CFR Part 15.247 | 47 CFR 15.247(d) | Pass |
| Band edge emissions (Radiated) | 47 CFR Part 15.247 | 47 CFR 15.247(d) | Pass |
| Emissions in restricted frequency bands (below 1GHz) | 47 CFR Part 15.247 | 47 CFR 15.247(d) | Pass |
| Emissions in restricted frequency bands (above 1GHz) | 47 CFR Part 15.247 | 47 CFR 15.247(d) | Pass |

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# 4 Test Configuration

## 4.1 Test Equipment List

| Conducted Emission at AC power line | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Pulse Limiter | SCHWARZBECK | VTSD 9561-F | 00953 | 2023-11-24 | 2024-11-23 |
| Coaxial Switcher | SCHWARZBECK | CX210 | CX210 | 2023-11-24 | 2024-11-23 |
| V-LISN | SCHWARZBECK | NSLK 8127 | 01073 | 2023-11-24 | 2024-11-23 |
| LISN | AFJ | LS16/110VAC | 16010020076 | 2024-02-23 | 2025-02-22 |
| EMI Receiver | ROHDE&SCHWARZ | ESCI3 | 101422 | 2023-11-24 | 2024-11-23 |

| Occupied Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2023-11-24 | 2024-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2023-11-24 | 2024-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2023-11-24 | 2024-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2023-11-24 | 2024-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2023-11-24 | 2024-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2023-11-24 | 2024-11-23 |

| Maximum Conducted Output Power | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2023-11-24 | 2024-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2023-11-24 | 2024-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2023-11-24 | 2024-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2023-11-24 | 2024-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2023-11-24 | 2024-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2023-11-24 | 2024-11-23 |

| Channel Separation | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |

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| | | | | | |
|---|---|---|---|---|---|
| RF Control Unit | Techy | TR1029-1 | / | 2023-11-24 | 2024-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2023-11-24 | 2024-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2023-11-24 | 2024-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2023-11-24 | 2024-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2023-11-24 | 2024-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2023-11-24 | 2024-11-23 |

| **Number of Hopping Frequencies** | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2023-11-24 | 2024-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2023-11-24 | 2024-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2023-11-24 | 2024-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2023-11-24 | 2024-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2023-11-24 | 2024-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2023-11-24 | 2024-11-23 |

| **Dwell Time** | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2023-11-24 | 2024-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2023-11-24 | 2024-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2023-11-24 | 2024-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2023-11-24 | 2024-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2023-11-24 | 2024-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2023-11-24 | 2024-11-23 |

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| Emissions in non-restricted frequency bands | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2023-11-24 | 2024-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2023-11-24 | 2024-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2023-11-24 | 2024-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2023-11-24 | 2024-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2023-11-24 | 2024-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2023-11-24 | 2024-11-23 |

| Band edge emissions (Radiated) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Coaxial cable Multiflex 141 | Schwarzbeck | N/SMA 0.5m | 517386 | 2024-03-24 | 2025-03-23 |
| Preamplifier | SCHWARZBECK | BBV9744 | 00246 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-10m | 21101566 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-10m | 21101570 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-1m | 21101568 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-1m | 21101576 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-2.5m | 21101573 | 2023-11-24 | 2024-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Horn Antenna | SCHWARZBECK | BBHA9170 | 01157 | 2023-11-28 | 2025-11-27 |
| EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI7 | 101032 | 2023-11-24 | 2024-11-23 |
| SIGNAL ANALYZER | ROHDE&SCHWARZ | FSQ40 | 100010 | 2023-11-24 | 2024-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Broadband Preamplilifier | SCHWARZBECK | BBV9718D | 00008 | 2024-03-24 | 2025-03-23 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 2597 | 2022-05-22 | 2024-05-21 |
| EZ_EMC | Frad | FA-03A2 RE+ | / | / | / |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Log periodic antenna | SCHWARZBECK | VULB 9168 | 01328 | 2023-11-28 | 2025-11-27 |

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| Emissions in restricted frequency bands (below 1GHz) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Coaxial cable Multiflex 141 | Schwarzbeck | N/SMA 0.5m | 517386 | 2024-03-24 | 2025-03-23 |
| Preamplifier | SCHWARZBECK | BBV9744 | 00246 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-10m | 21101566 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-10m | 21101570 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-1m | 21101568 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-1m | 21101576 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-2.5m | 21101573 | 2023-11-24 | 2024-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Horn Antenna | SCHWARZBECK | BBHA9170 | 01157 | 2023-11-28 | 2025-11-27 |
| EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI7 | 101032 | 2023-11-24 | 2024-11-23 |
| SIGNAL ANALYZER | ROHDE&SCHWARZ | FSQ40 | 100010 | 2023-11-24 | 2024-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Broadband Preamplilifier | SCHWARZBECK | BBV9718D | 00008 | 2024-03-24 | 2025-03-23 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 2597 | 2022-05-22 | 2024-05-21 |
| EZ_EMC | Frad | FA-03A2 RE+ | / | / | / |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Log periodic antenna | SCHWARZBECK | VULB 9168 | 01328 | 2023-11-28 | 2025-11-27 |

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| Emissions in restricted frequency bands (above 1GHz) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Coaxial cable Multiflex 141 | Schwarzbeck | N/SMA 0.5m | 517386 | 2024-03-24 | 2025-03-23 |
| Preamplifier | SCHWARZBECK | BBV9744 | 00246 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-10m | 21101566 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-10m | 21101570 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-1m | 21101568 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-1m | 21101576 | 2023-11-24 | 2024-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-2.5m | 21101573 | 2023-11-24 | 2024-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Horn Antenna | SCHWARZBECK | BBHA9170 | 01157 | 2023-11-28 | 2025-11-27 |
| EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI7 | 101032 | 2023-11-24 | 2024-11-23 |
| SIGNAL ANALYZER | ROHDE&SCHWARZ | FSQ40 | 100010 | 2023-11-24 | 2024-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Broadband Preamplilifier | SCHWARZBECK | BBV9718D | 00008 | 2024-03-24 | 2025-03-23 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 2597 | 2022-05-22 | 2024-05-21 |
| EZ_EMC | Frad | FA-03A2 RE+ | / | / | / |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Log periodic antenna | SCHWARZBECK | VULB 9168 | 01328 | 2023-11-28 | 2025-11-27 |

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## 4.2 Test Auxiliary Equipment

The EUT was tested as an independent device.

## 4.3 Test Modes

| No. | Test Modes | Description |
|---|---|---|
| TM1 | TX-GFSK (Non-Hopping) | Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation. |
| TM2 | TX-Pi/4DQPSK (Non-Hopping) | Keep the EUT in continuously transmitting mode (non-hopping) with Pi/4DQPSK modulation. |
| TM3 | TX-8DPSK (Non-Hopping) | Keep the EUT in continuously transmitting mode (non-hopping) with 8DPSK modulation. |
| TM4 | TX-GFSK (Hopping) | Keep the EUT in continuously transmitting mode (hopping) with GFSK modulation,. |
| TM5 | TX-Pi/4DQPSK (Hopping) | Keep the EUT in continuously transmitting mode (hopping) with Pi/4DQPSK modulation. |
| TM6 | TX-8DPSK (Hopping) | Keep the EUT in continuously transmitting mode (hopping) with 8DPSK modulation. |

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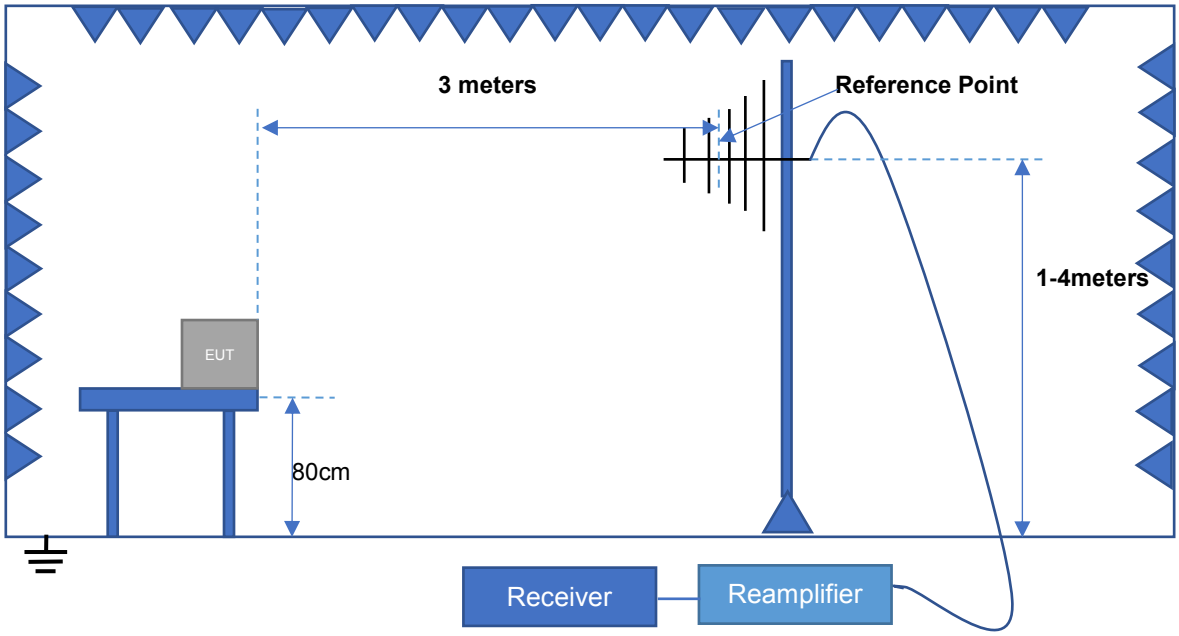
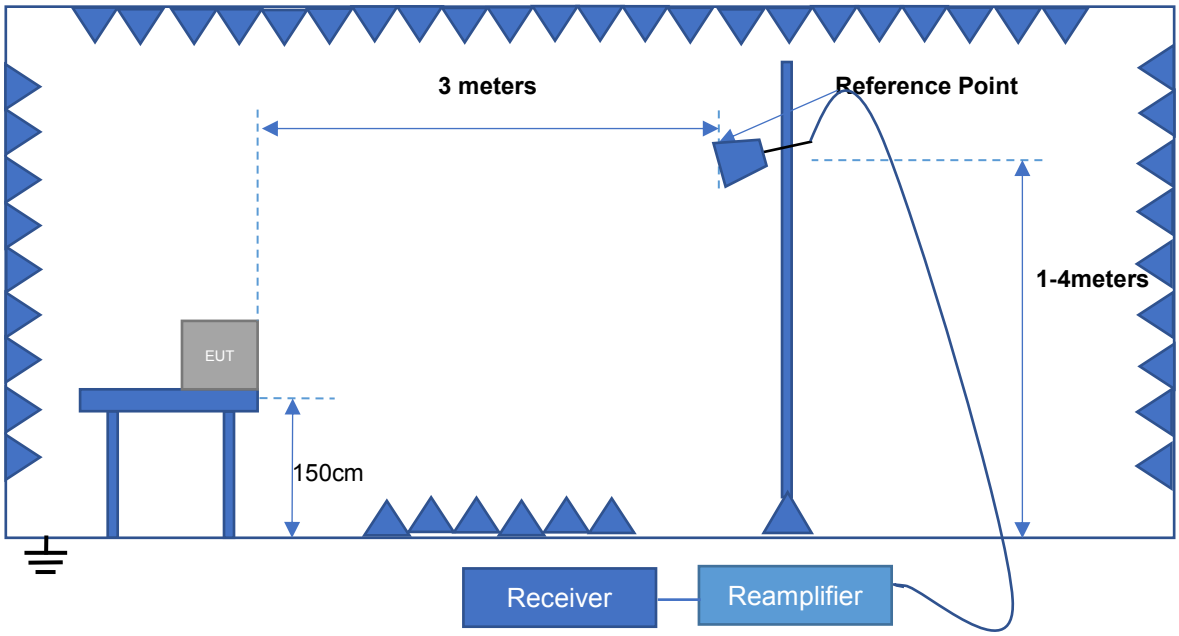
## 4.4 Test Setup

### Test Setup 1




Radiation Test (30MHz – 1GHz)




Radiation Test (Above 1GHz)

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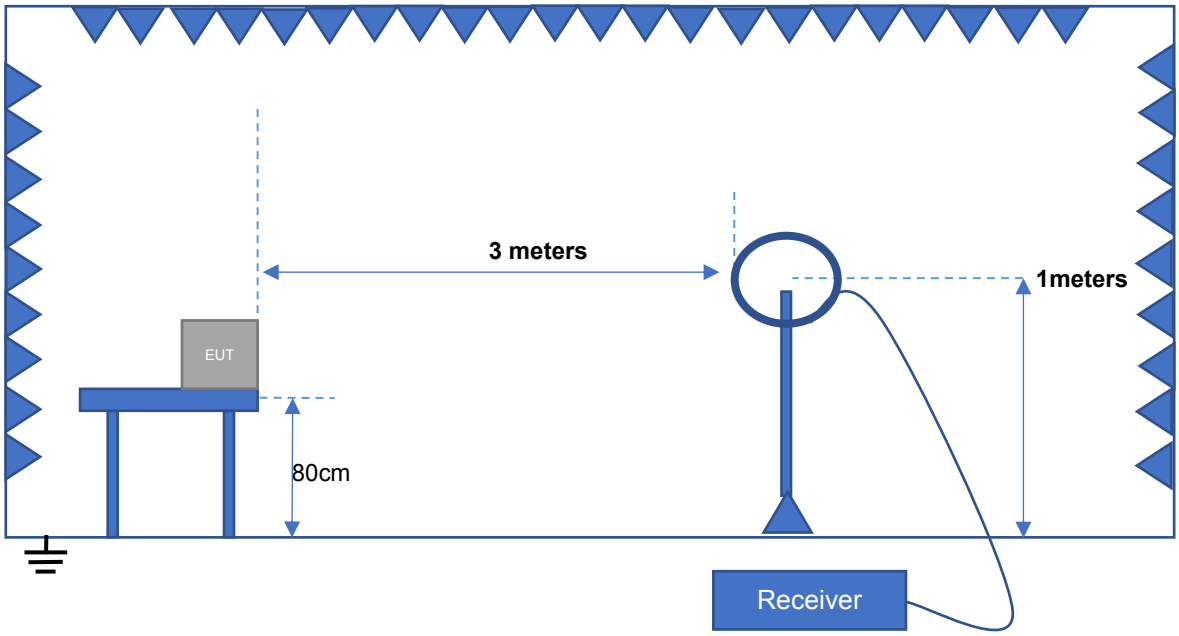
**Test Setup 2**




Radiation Test (9k - 30MHz)

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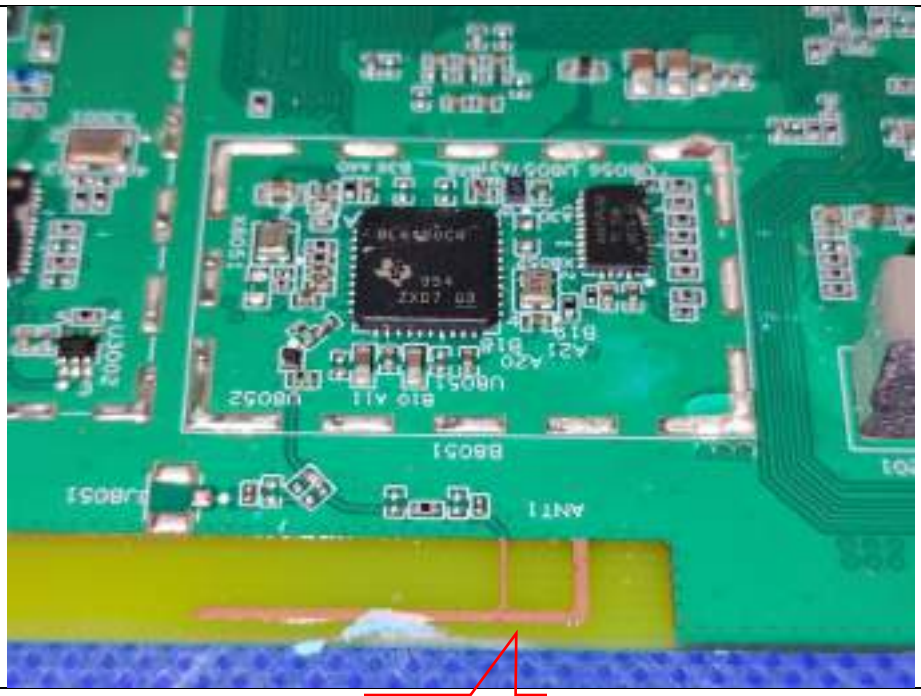
# 5 Evaluation Results (Evaluation)

## 5.1 Antenna requirement

| | |
|---|---|
| Test Requirement: | An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. |

### 5.1.1 Conclusion:



# 6 Radio Spectrum Matter Test Results (RF)

## 6.1 Occupied Bandwidth

| | |
|---|---|
| Test Requirement: | Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. |
| Test Method: | Occupied bandwidth—relative measurement procedure |
| Test Limit: | Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. |
| Procedure: | a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.<br>b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.<br>c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.<br>d) Steps a) through c) might require iteration to adjust within the specified tolerances.<br>e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the<br>reference value.<br>f) Set detection mode to peak and trace mode to max hold.<br>g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).<br>h) Determine the "−xx dB down amplitude" using [(reference value) − xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.<br>i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).<br>j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "-xx dB down amplitude" determined in step h). If a marker is below this "−xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "-xx dB down amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the |

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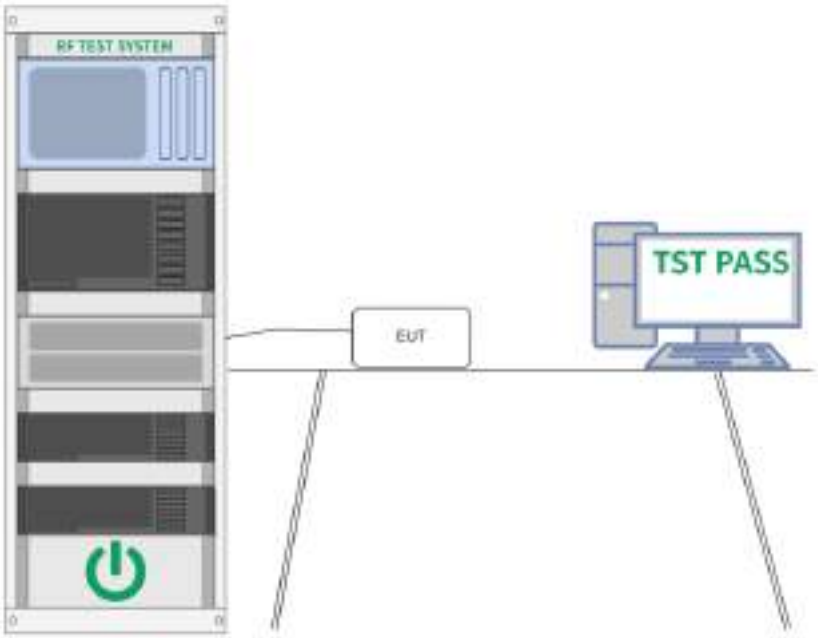
| | |
|---|---|
| | same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.<br>k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s). |

### 6.1.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 25.6 ℃ |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

### 6.1.2 Test Setup Diagram:




### 6.1.3 Test Data:

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## 6.2 Maximum Conducted Output Power

| | |
|---|---|
| Test Requirement: | For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. |
| Test Method: | Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices |
| Test Limit: | For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. |
| Procedure: | This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:<br>a) Use the following spectrum analyzer settings:<br>1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.<br>2) RBW > 20 dB bandwidth of the emission being measured.<br>3) VBW >= RBW.<br>4) Sweep: Auto.<br>5) Detector function: Peak.<br>6) Trace: Max hold.<br>b) Allow trace to stabilize.<br>c) Use the marker-to-peak function to set the marker to the peak of the emission.<br>d) The indicated level is the peak output power, after any corrections for external attenuators and cables.<br>e) A plot of the test results and setup description shall be included in the test report.<br>NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer. |

### 6.2.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 25.6 ℃ |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

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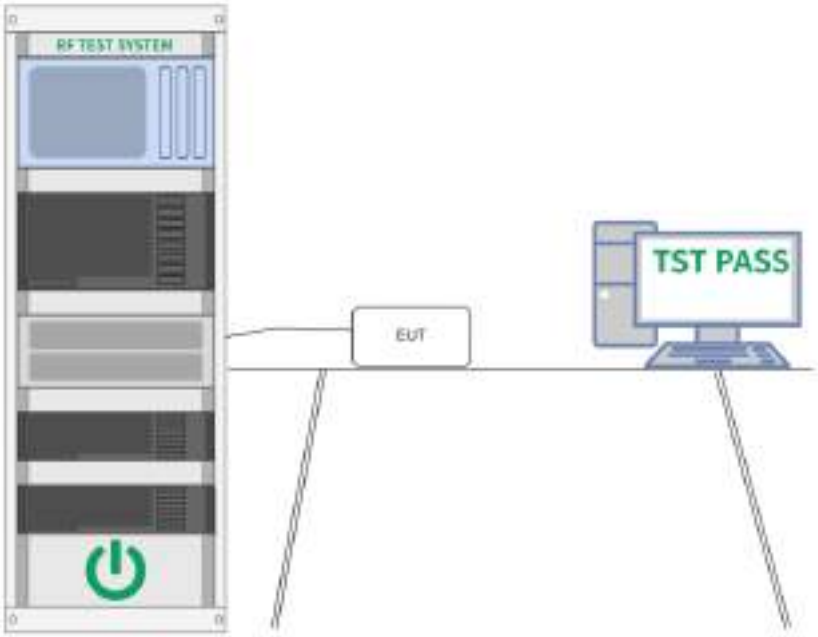
### 6.2.2 Test Setup Diagram:




### 6.2.3 Test Data:

Please Refer to Appendix for Details.

## 6.3 Channel Separation

| | |
|---|---|
| Test Requirement: | 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 Method: | Carrier frequency separation |
| Test Limit: | 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. |
| Procedure: | The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:<br>a) Span: Wide enough to capture the peaks of two adjacent channels.<br>b) 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.<br>c) Video (or average) bandwidth (VBW) ≥ RBW.<br>d) Sweep: Auto.<br>e) Detector function: Peak.<br>f) Trace: Max hold.<br>g) Allow the trace to stabilize.<br>Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report. |

### 6.3.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 25.6 ℃ |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

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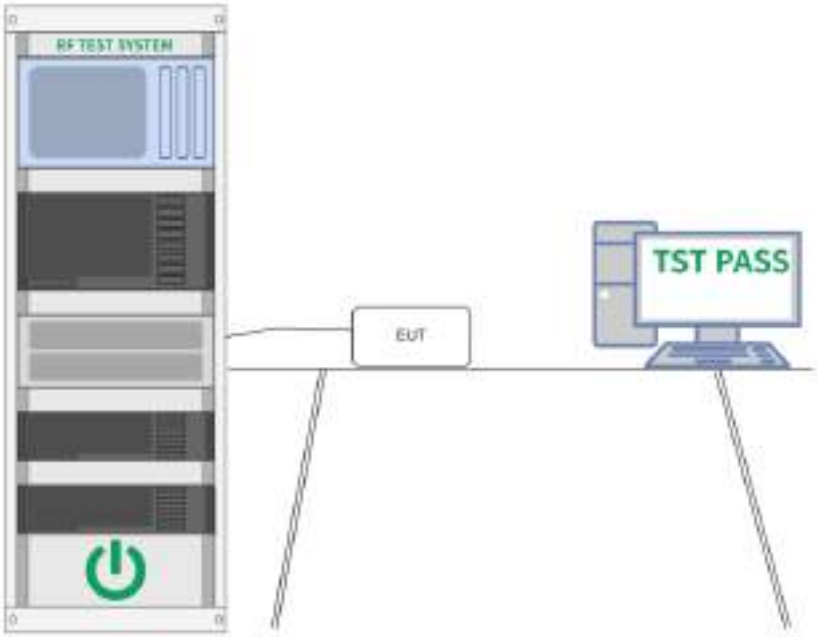
### 6.3.2 Test Setup Diagram:




### 6.3.3 Test Data:

Please Refer to Appendix for Details.

## 6.4 Number of Hopping Frequencies

| | |
|---|---|
| Test Requirement: | Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. |
| Test Method: | Number of hopping frequencies |
| Test Limit: | Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. |
| Procedure: | The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:<br>a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.<br>b) 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.<br>c) VBW ≥ RBW.<br>d) Sweep: Auto.<br>e) Detector function: Peak.<br>f) Trace: Max hold.<br>g) Allow the trace to stabilize.<br>It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report. |

### 6.4.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 25.6 ℃ |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

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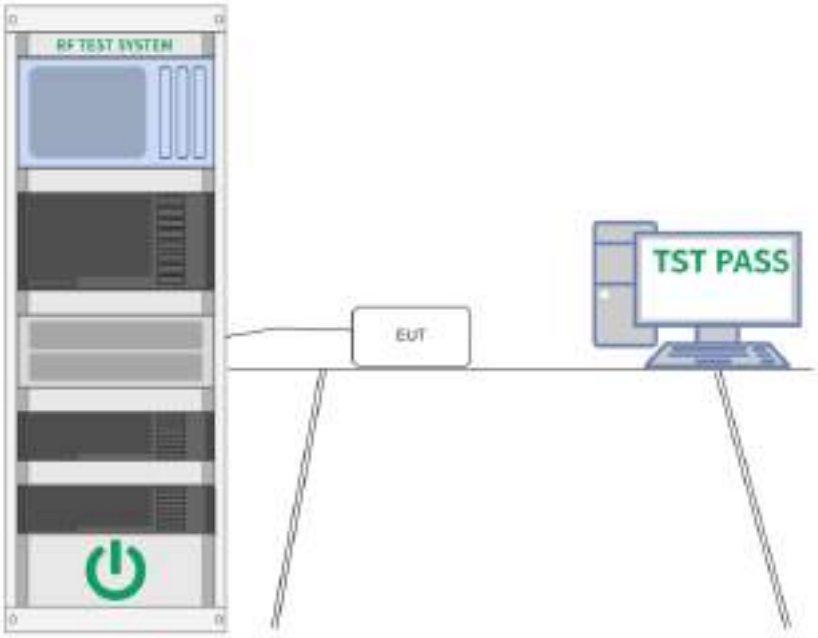
### 6.4.2 Test Setup Diagram:




### 6.4.3 Test Data:

Please Refer to Appendix for Details.

## 6.5 Dwell Time

| | |
|---|---|
| Test Requirement: | Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. |
| Test Method: | Time of occupancy (dwell time) |
| Test Limit: | Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. |
| Procedure: | The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:<br>a) Span: Zero span, centered on a hopping channel.<br>b) RBW shall be <= channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.<br>c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.<br>d) Detector function: Peak.<br>e) Trace: Max hold.<br>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<br>for each variation in transmit time.<br>Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the<br>requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:<br>(Number of hops in the period specified in the requirements) =<br>(number of hops on spectrum analyzer) ×(period specified in the requirements / analyzer sweep time)<br>The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.<br>The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT. |

### 6.5.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 25.6 ℃ |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

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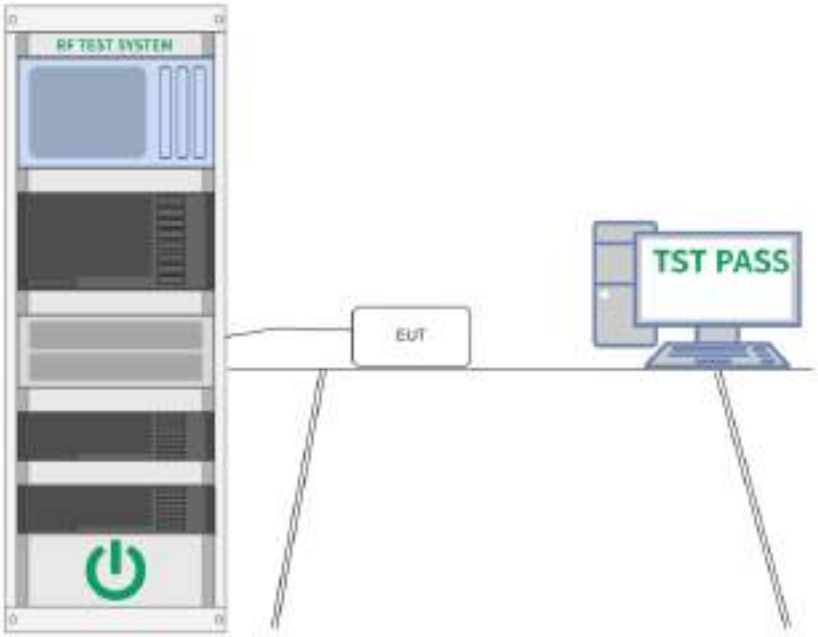
### 6.5.2 Test Setup Diagram:




### 6.5.3 Test Data:

Please Refer to Appendix for Details.

## 6.6 Emissions in non-restricted frequency bands

| | |
|---|---|
| Test Requirement: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. |
| Test Method: | Conducted spurious emissions test methodology |
| Test Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. |
| Procedure: | Conducted spurious emissions shall be measured for the transmit frequency, per 5.5 and 5.6, and at the maximum transmit powers.<br>Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered. |

### 6.6.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 25.6 ℃ |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

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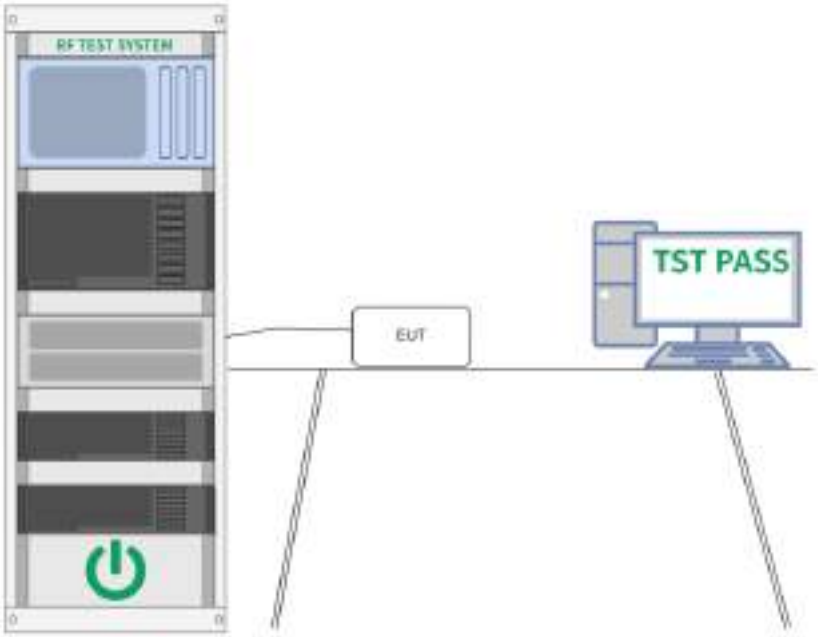
### 6.6.2 Test Setup Diagram:




### 6.6.3 Test Data:

Please Refer to Appendix for Details.

## 6.7 Band edge emissions (Radiated)

<table>
<tr><td>Test Requirement:</td><td colspan="3">In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see §15.205(c)).`</td></tr>
<tr><td>Test Method:</td><td colspan="3">Radiated emissions tests</td></tr>
<tr><td rowspan="9">Test Limit:</td><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
<tr><td colspan="3">** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.</td></tr>
<tr><td>Procedure:</td><td colspan="3">ANSI C63.10-2013 section 6.6.4</td></tr>
<tr><td>Test Setup</td><td colspan="3">See section 4.4 for test setup 1. The photo of test setup please refer to ANNEX</td></tr>
</table>

### 6.7.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 24.9 ℃ |
| Humidity: | 49.4 % |
| Atmospheric Pressure: | 1010 mbar |

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### 6.7.2 Test Data:

TM1 / Band: 2.4G / BW: 1

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2402 | | | | | | | | | |
| V | 2390.00 | 76.27 | 52.12 | 2.73 | 27.38 | 54.26 | 74 | -19.74 | PK |
| V | 2390.00 | 65.69 | 52.12 | 2.73 | 27.38 | 43.68 | 54 | -10.32 | AV |
| V | 2400.00 | 77.52 | 52.16 | 2.78 | 27.41 | 55.55 | 74 | -18.45 | PK |
| V | 2400.00 | 65.07 | 52.16 | 2.78 | 27.41 | 43.1 | 54 | -10.9 | AV |
| H | 2390.00 | 77.26 | 52.12 | 2.73 | 27.38 | 55.25 | 74 | -18.75 | PK |
| H | 2390.00 | 65.44 | 52.12 | 2.73 | 27.38 | 43.43 | 54 | -10.57 | AV |
| H | 2400.00 | 76.82 | 52.16 | 2.78 | 27.41 | 54.85 | 74 | -19.15 | PK |
| H | 2400.00 | 65.96 | 52.16 | 2.78 | 27.41 | 43.99 | 54 | -10.01 | AV |

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2480 | | | | | | | | | |
| V | 2483.50 | 75.23 | 52.23 | 2.86 | 27.44 | 53.3 | 74 | -20.7 | PK |
| V | 2483.50 | 66.57 | 52.23 | 2.86 | 27.44 | 44.64 | 54 | -9.36 | AV |
| V | 2500.00 | 75.63 | 52.26 | 2.88 | 27.49 | 53.74 | 74 | -20.26 | PK |
| V | 2500.00 | 65.88 | 52.26 | 2.88 | 27.49 | 43.99 | 54 | -10.01 | AV |
| H | 2483.50 | 75.34 | 52.23 | 2.86 | 27.44 | 53.41 | 74 | -20.59 | PK |
| H | 2483.50 | 64.69 | 52.23 | 2.86 | 27.44 | 42.76 | 54 | -11.24 | AV |
| H | 2500.00 | 75.18 | 52.26 | 2.88 | 27.49 | 53.29 | 74 | -20.71 | PK |
| H | 2500.00 | 66.39 | 52.26 | 2.88 | 27.49 | 44.5 | 54 | -9.5 | AV |

**Remark:**

1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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TM2/ Band: 2.4G / BW: 1

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2402 | | | | | | | | | |
| V | 2390.00 | 76.24 | 52.12 | 2.73 | 27.38 | 54.23 | 74 | -19.77 | PK |
| V | 2390.00 | 65.59 | 52.12 | 2.73 | 27.38 | 43.58 | 54 | -10.42 | AV |
| V | 2400.00 | 76.44 | 52.16 | 2.78 | 27.41 | 54.47 | 74 | -19.53 | PK |
| V | 2400.00 | 64.56 | 52.16 | 2.78 | 27.41 | 42.59 | 54 | -11.41 | AV |
| H | 2390.00 | 76.74 | 52.12 | 2.73 | 27.38 | 54.73 | 74 | -19.27 | PK |
| H | 2390.00 | 65.46 | 52.12 | 2.73 | 27.38 | 43.45 | 54 | -10.55 | AV |
| H | 2400.00 | 76.68 | 52.16 | 2.78 | 27.41 | 54.71 | 74 | -19.29 | PK |
| H | 2400.00 | 65.69 | 52.16 | 2.78 | 27.41 | 43.72 | 54 | -10.28 | AV |

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2480 | | | | | | | | | |
| V | 2483.50 | 76.52 | 52.23 | 2.86 | 27.44 | 54.59 | 74 | -19.41 | PK |
| V | 2483.50 | 65.14 | 52.23 | 2.86 | 27.44 | 43.21 | 54 | -10.79 | AV |
| V | 2500.00 | 76.69 | 52.26 | 2.88 | 27.49 | 54.8 | 74 | -19.2 | PK |
| V | 2500.00 | 65.52 | 52.26 | 2.88 | 27.49 | 43.63 | 54 | -10.37 | AV |
| H | 2483.50 | 76.63 | 52.23 | 2.86 | 27.44 | 54.7 | 74 | -19.3 | PK |
| H | 2483.50 | 65.14 | 52.23 | 2.86 | 27.44 | 43.21 | 54 | -10.79 | AV |
| H | 2500.00 | 76.96 | 52.26 | 2.88 | 27.49 | 55.07 | 74 | -18.93 | PK |
| H | 2500.00 | 65.25 | 52.26 | 2.88 | 27.49 | 43.36 | 54 | -10.64 | AV |

**Remark:**

1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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TM3/ Band: 2.4G / BW: 1

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2402 | | | | | | | | | |
| V | 2390.00 | 76.14 | 52.12 | 2.73 | 27.38 | 54.13 | 74 | -19.87 | PK |
| V | 2390.00 | 65.63 | 52.12 | 2.73 | 27.38 | 43.62 | 54 | -10.38 | AV |
| V | 2400.00 | 77.85 | 52.16 | 2.78 | 27.41 | 55.88 | 74 | -18.12 | PK |
| V | 2400.00 | 65.87 | 52.16 | 2.78 | 27.41 | 43.9 | 54 | -10.1 | AV |
| H | 2390.00 | 77.84 | 52.12 | 2.73 | 27.38 | 55.83 | 74 | -18.17 | PK |
| H | 2390.00 | 65.99 | 52.12 | 2.73 | 27.38 | 43.98 | 54 | -10.02 | AV |
| H | 2400.00 | 76.88 | 52.16 | 2.78 | 27.41 | 54.91 | 74 | -19.09 | PK |
| H | 2400.00 | 65.89 | 52.16 | 2.78 | 27.41 | 43.92 | 54 | -10.08 | AV |

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2480 | | | | | | | | | |
| V | 2483.50 | 77.44 | 52.23 | 2.86 | 27.44 | 55.51 | 74 | -18.49 | PK |
| V | 2483.50 | 65.25 | 52.23 | 2.86 | 27.44 | 43.32 | 54 | -10.68 | AV |
| V | 2500.00 | 76.89 | 52.26 | 2.88 | 27.49 | 55 | 74 | -19 | PK |
| V | 2500.00 | 65.41 | 52.26 | 2.88 | 27.49 | 43.52 | 54 | -10.48 | AV |
| H | 2483.50 | 77.59 | 52.23 | 2.86 | 27.44 | 55.66 | 74 | -18.34 | PK |
| H | 2483.50 | 65.87 | 52.23 | 2.86 | 27.44 | 43.94 | 54 | -10.06 | AV |
| H | 2500.00 | 76.53 | 52.26 | 2.88 | 27.49 | 54.64 | 74 | -19.36 | PK |
| H | 2500.00 | 66.23 | 52.26 | 2.88 | 27.49 | 44.34 | 54 | -9.66 | AV |

**Remark:**

1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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## 6.8 Radiated Emissions of below 1GHz

<table>
<tr><td>Test Requirement:</td><td colspan="3">In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see §15.205(c)).`</td></tr>
<tr><td>Test Method:</td><td colspan="3">Radiated emissions tests</td></tr>
<tr><td rowspan="9">Test Limit:</td><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
<tr><td colspan="3">** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.</td></tr>
<tr><td>Procedure:</td><td colspan="3">ANSI C63.10-2013 section 6.6.4</td></tr>
<tr><td>Test Setup</td><td colspan="3">See section 4.4 for test setup 1&2. The photo of test setup please refer to ANNEX</td></tr>
</table>

### 6.8.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 24.9 ℃ |
| Humidity: | 49.4 % |
| Atmospheric Pressure: | 1010 mbar |

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### 6.8.2 Test Data(9KHz – 30 MHz):

| Freq. | Reading | Limit | Margin | State |
|---|---|---|---|---|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB) | P/F |
| -- | -- | -- | -- | PASS |
| -- | -- | -- | -- | PASS |

**NOTE:**

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

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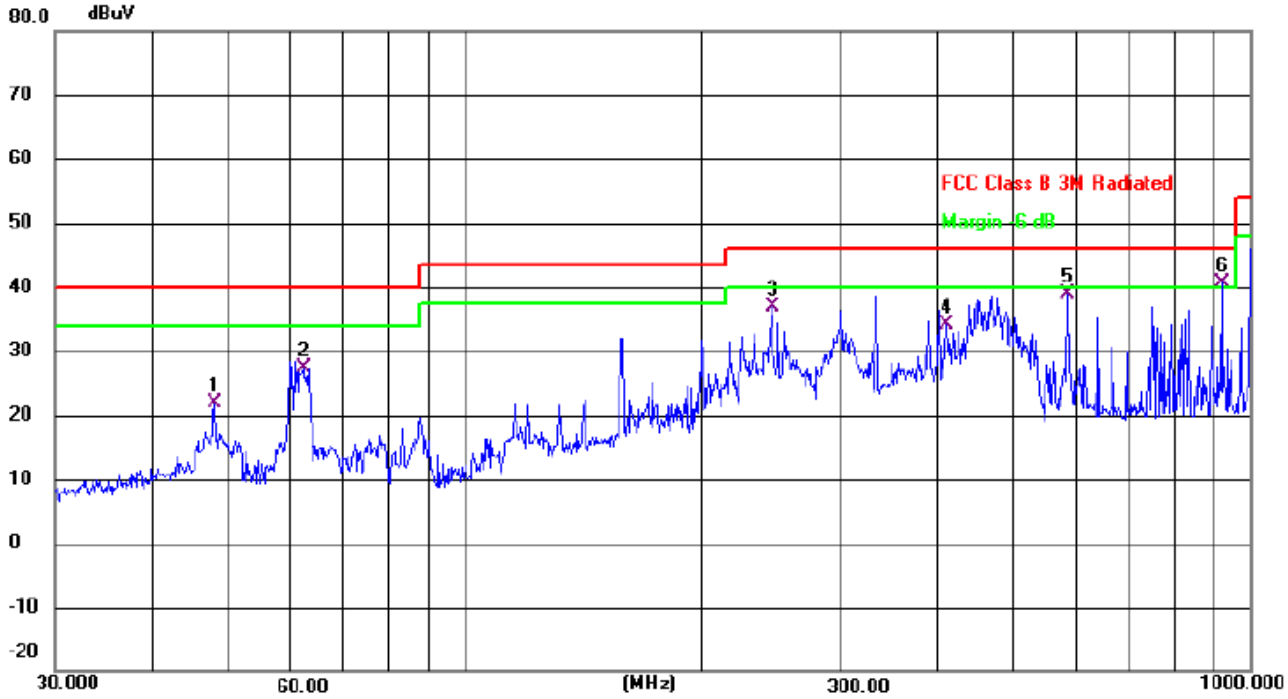
### 6.8.3 Test Data(30MHz – 1GHz):

Note: All the mode have been tested, and only the worst case of GFSK mode are in the report
TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: H




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dB | dB | Detector |
| 1 | | 47.9938 | 35.23 | -13.33 | 21.90 | 40.00 | -18.10 | QP |
| 2 | | 62.2128 | 40.79 | -13.29 | 27.50 | 40.00 | -12.50 | QP |
| 3 | | 245.9507 | 49.73 | -12.89 | 36.84 | 46.00 | -9.16 | QP |
| 4 | | 410.3824 | 43.67 | -9.55 | 34.12 | 46.00 | -11.88 | QP |
| 5 | | 584.7894 | 45.23 | -6.33 | 38.90 | 46.00 | -7.10 | QP |
| 6 | * | 919.2865 | 40.89 | -0.23 | 40.66 | 46.00 | -5.34 | QP |

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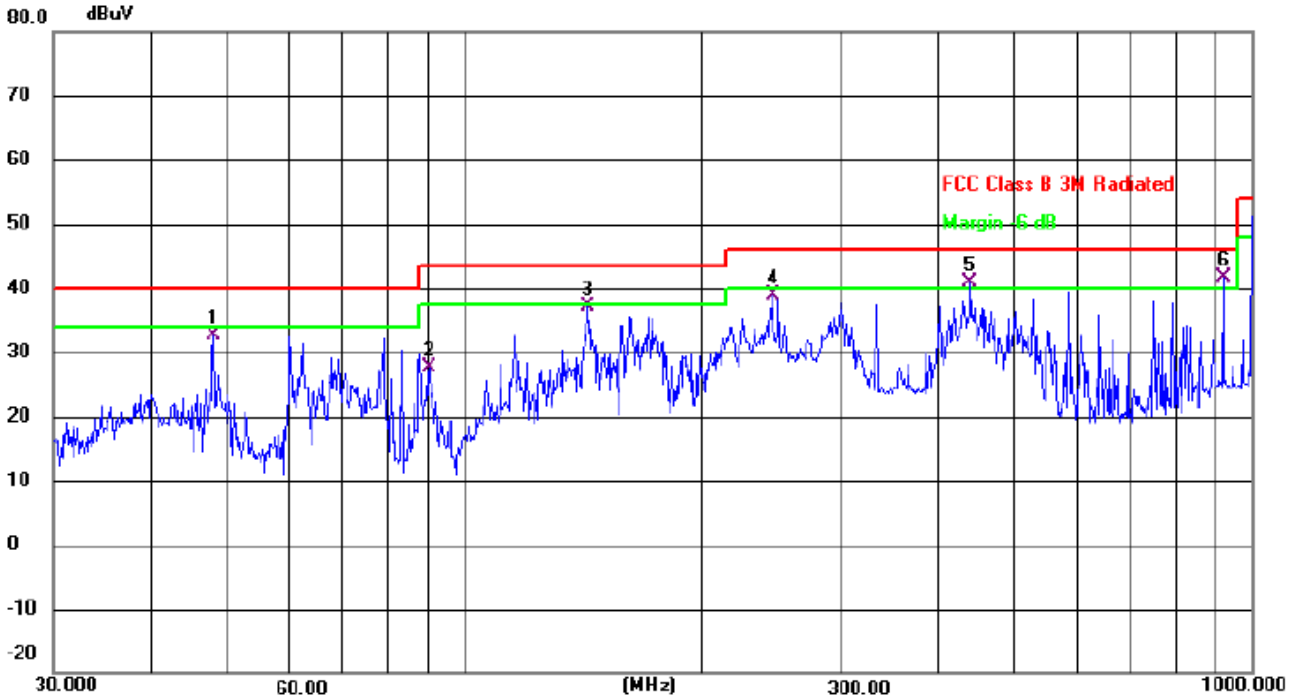
TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: H




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dB | dB | Detector |
| 1 | | 47.9938 | 45.91 | -13.33 | 32.58 | 40.00 | -7.42 | QP |
| 2 | | 90.2202 | 44.68 | -16.99 | 27.69 | 43.50 | -15.81 | QP |
| 3 | | 143.3257 | 54.78 | -17.55 | 37.23 | 43.50 | -6.27 | QP |
| 4 | | 245.9507 | 51.87 | -12.89 | 38.98 | 46.00 | -7.02 | QP |
| 5 | ! | 438.6553 | 49.79 | -8.92 | 40.87 | 46.00 | -5.13 | QP |
| 6 | * | 919.2865 | 41.78 | -0.23 | 41.55 | 46.00 | -4.45 | QP |

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## 6.9 Radiated Emissions of above 1GHz

<table>
<tr><td>Test Requirement:</td><td>In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see §15.205(c)).`</td></tr>
<tr><td>Test Method:</td><td>Radiated emissions tests</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.
</td></tr>
<tr><td>Procedure:</td><td>ANSI C63.10-2013 section 6.6.4</td></tr>
<tr><td>Test Setup</td><td>See section 4.4 for test setup 1. The photo of test setup please refer to ANNEX</td></tr>
</table>

### 6.9.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 24.9 ℃ |
| Humidity: | 49.4 % |
| Atmospheric Pressure: | 1010 mbar |

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### 6.9.2 Test Data:

TM1 / Band: 2.4G / BW: 1

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2402 | | | | | | | | | |
| V | 4804.00 | 113.36 | 52.16 | 2.78 | 27.41 | 91.39 | 114 | -22.61 | PK |
| V | 4804.00 | 105.84 | 52.16 | 2.78 | 27.41 | 83.87 | 94 | -10.13 | AV |
| V | 7206.00 | 77.49 | 51.74 | 3.08 | 31.25 | 60.08 | 74 | -13.92 | PK |
| V | 7206.00 | 60.84 | 51.74 | 3.08 | 31.25 | 43.43 | 54 | -10.57 | AV |
| V | 16133.00 | 54.13 | 51.56 | 7.36 | 41.57 | 51.5 | 74 | -22.5 | PK |
| H | 4804.00 | 113.85 | 52.16 | 2.78 | 27.41 | 91.88 | 114 | -22.12 | PK |
| H | 4804.00 | 104.34 | 52.16 | 2.78 | 27.41 | 82.37 | 94 | -11.63 | AV |
| H | 7206.00 | 76.49 | 51.74 | 3.08 | 31.25 | 59.08 | 74 | -14.92 | PK |
| H | 7206.00 | 59.28 | 51.74 | 3.08 | 31.25 | 41.87 | 54 | -12.13 | AV |
| H | 16133.00 | 55.42 | 51.56 | 7.36 | 41.57 | 52.79 | 74 | -21.21 | PK |
| operation frequency:2441 | | | | | | | | | |
| V | 4882.00 | 112.39 | 52.11 | 2.82 | 27.47 | 90.57 | 114 | -23.43 | PK |
| V | 4882.00 | 105.58 | 52.11 | 2.82 | 27.47 | 83.76 | 94 | -10.24 | AV |
| V | 7323.00 | 77.34 | 51.77 | 3.03 | 31.34 | 59.94 | 74 | -14.06 | PK |
| V | 7323.00 | 60.93 | 51.77 | 3.03 | 31.34 | 43.53 | 54 | -10.47 | AV |
| V | 16128.00 | 54.48 | 51.56 | 7.36 | 41.57 | 51.85 | 74 | -22.15 | PK |
| H | 4882.00 | 112.34 | 52.11 | 2.82 | 27.47 | 90.52 | 114 | -23.48 | PK |
| H | 4882.00 | 104.66 | 52.11 | 2.82 | 27.47 | 82.84 | 94 | -11.16 | AV |
| H | 7323.00 | 76.57 | 51.77 | 3.03 | 31.34 | 59.17 | 74 | -14.83 | PK |
| H | 7323.00 | 59.41 | 51.77 | 3.03 | 31.34 | 42.01 | 54 | -11.99 | AV |
| H | 16128.00 | 55.89 | 51.56 | 7.36 | 41.57 | 53.26 | 74 | -20.74 | PK |
| operation frequency:2480 | | | | | | | | | |
| V | 4960.00 | 113.94 | 52.23 | 2.86 | 27.44 | 92.01 | 114 | -21.99 | PK |
| V | 4960.00 | 106.89 | 52.23 | 2.86 | 27.44 | 84.96 | 94 | -9.04 | AV |
| V | 7440.00 | 78.22 | 51.69 | 3.05 | 31.39 | 60.97 | 74 | -13.03 | PK |
| V | 7440.00 | 60.69 | 51.69 | 3.05 | 31.39 | 43.44 | 54 | -10.56 | AV |
| V | 16135.00 | 54.28 | 51.56 | 7.36 | 41.57 | 51.65 | 74 | -22.35 | PK |
| H | 4960.00 | 113.64 | 52.23 | 2.86 | 27.44 | 91.71 | 114 | -22.29 | PK |
| H | 4960.00 | 105.63 | 52.23 | 2.86 | 27.44 | 83.7 | 94 | -10.3 | AV |
| H | 7440.00 | 77.85 | 51.69 | 3.05 | 31.39 | 60.6 | 74 | -13.4 | PK |
| H | 7440.00 | 59.81 | 51.69 | 3.05 | 31.39 | 42.56 | 54 | -11.44 | AV |
| H | 16135.00 | 54.19 | 51.56 | 7.36 | 41.57 | 51.56 | 74 | -22.44 | PK |

**Remark:**

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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TM2 / Band: 2.4G / BW: 1

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| **operation frequency:2402** | | | | | | | | | |
| V | 4804.00 | 113.39 | 52.16 | 2.78 | 27.41 | 91.42 | 114 | -22.58 | PK |
| V | 4804.00 | 103.95 | 52.16 | 2.78 | 27.41 | 81.98 | 94 | -12.02 | AV |
| V | 7206.00 | 77.23 | 51.74 | 3.08 | 31.25 | 59.82 | 74 | -14.18 | PK |
| V | 7206.00 | 61.58 | 51.74 | 3.08 | 31.25 | 44.17 | 54 | -9.83 | AV |
| V | 16132.00 | 54.94 | 51.56 | 7.36 | 41.57 | 52.31 | 74 | -21.69 | PK |
| H | 4804.00 | 113.36 | 52.16 | 2.78 | 27.41 | 91.39 | 114 | -22.61 | PK |
| H | 4804.00 | 106.48 | 52.16 | 2.78 | 27.41 | 84.51 | 94 | -9.49 | AV |
| H | 7206.00 | 79.43 | 51.74 | 3.08 | 31.25 | 62.02 | 74 | -11.98 | PK |
| H | 7206.00 | 53.85 | 51.74 | 3.08 | 31.25 | 36.44 | 54 | -17.56 | AV |
| H | 16132.00 | 54.76 | 51.56 | 7.36 | 41.57 | 52.13 | 74 | -21.87 | PK |
| **operation frequency:2441** | | | | | | | | | |
| V | 4882.00 | 112.17 | 52.11 | 2.82 | 27.47 | 90.35 | 114 | -23.65 | PK |
| V | 4882.00 | 105.16 | 52.11 | 2.82 | 27.47 | 83.34 | 94 | -10.66 | AV |
| V | 7323.00 | 77.28 | 51.77 | 3.03 | 31.34 | 59.88 | 74 | -14.12 | PK |
| V | 7323.00 | 61.84 | 51.77 | 3.03 | 31.34 | 44.44 | 54 | -9.56 | AV |
| V | 16129.00 | 55.49 | 51.56 | 7.36 | 41.57 | 52.86 | 74 | -21.14 | PK |
| H | 4882.00 | 112.68 | 52.11 | 2.82 | 27.47 | 90.86 | 114 | -23.14 | PK |
| H | 4882.00 | 105.14 | 52.11 | 2.82 | 27.47 | 83.32 | 94 | -10.68 | AV |
| H | 7323.00 | 76.96 | 51.77 | 3.03 | 31.34 | 59.56 | 74 | -14.44 | PK |
| H | 7323.00 | 60.85 | 51.77 | 3.03 | 31.34 | 43.45 | 54 | -10.55 | AV |
| H | 16129.00 | 55.29 | 51.56 | 7.36 | 41.57 | 52.66 | 74 | -21.34 | PK |
| **operation frequency:2480** | | | | | | | | | |
| V | 4960.00 | 113.14 | 52.23 | 2.86 | 27.44 | 91.21 | 114 | -22.79 | PK |
| V | 4960.00 | 105.88 | 52.23 | 2.86 | 27.44 | 83.95 | 94 | -10.05 | AV |
| V | 7440.00 | 77.46 | 51.69 | 3.05 | 31.39 | 60.21 | 74 | -13.79 | PK |
| V | 7440.00 | 60.41 | 51.69 | 3.05 | 31.39 | 43.16 | 54 | -10.84 | AV |
| V | 16132.00 | 54.69 | 51.56 | 7.36 | 41.57 | 52.06 | 74 | -21.94 | PK |
| H | 4960.00 | 113.34 | 52.23 | 2.86 | 27.44 | 91.41 | 114 | -22.59 | PK |
| H | 4960.00 | 104.88 | 52.23 | 2.86 | 27.44 | 82.95 | 94 | -11.05 | AV |
| H | 7440.00 | 76.56 | 51.69 | 3.05 | 31.39 | 59.31 | 74 | -14.69 | PK |
| H | 7440.00 | 59.17 | 51.69 | 3.05 | 31.39 | 41.92 | 54 | -12.08 | AV |
| H | 16132.00 | 55.39 | 51.56 | 7.36 | 41.57 | 52.76 | 74 | -21.24 | PK |

**Remark:**

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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TM3 / Band: 2.4G / BW: 1

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2402 | | | | | | | | | |
| V | 4804.00 | 112.35 | 52.16 | 2.78 | 27.41 | 90.38 | 114 | -23.62 | PK |
| V | 4804.00 | 105.82 | 52.16 | 2.78 | 27.41 | 83.85 | 94 | -10.15 | AV |
| V | 7206.00 | 76.68 | 51.74 | 3.08 | 31.25 | 59.27 | 74 | -14.73 | PK |
| V | 7206.00 | 59.49 | 51.74 | 3.08 | 31.25 | 42.08 | 54 | -11.92 | AV |
| V | 16131.00 | 55.64 | 51.56 | 7.36 | 41.57 | 53.01 | 74 | -20.99 | PK |
| H | 4804.00 | 112.81 | 52.16 | 2.78 | 27.41 | 90.84 | 114 | -23.16 | PK |
| H | 4804.00 | 105.39 | 52.16 | 2.78 | 27.41 | 83.42 | 94 | -10.58 | AV |
| H | 7206.00 | 76.85 | 51.74 | 3.08 | 31.25 | 59.44 | 74 | -14.56 | PK |
| H | 7206.00 | 60.89 | 51.74 | 3.08 | 31.25 | 43.48 | 54 | -10.52 | AV |
| H | 16131.00 | 54.52 | 51.56 | 7.36 | 41.57 | 51.89 | 74 | -22.11 | PK |
| operation frequency:2441 | | | | | | | | | |
| V | 4882.00 | 112.33 | 52.11 | 2.82 | 27.47 | 90.51 | 114 | -23.49 | PK |
| V | 4882.00 | 104.28 | 52.11 | 2.82 | 27.47 | 82.46 | 94 | -11.54 | AV |
| V | 7323.00 | 76.51 | 51.77 | 3.03 | 31.34 | 59.11 | 74 | -14.89 | PK |
| V | 7323.00 | 62.19 | 51.77 | 3.03 | 31.34 | 44.79 | 54 | -9.21 | AV |
| V | 16134.00 | 54.55 | 51.56 | 7.36 | 41.57 | 51.92 | 74 | -22.08 | PK |
| H | 4882.00 | 112.29 | 52.11 | 2.82 | 27.47 | 90.47 | 114 | -23.53 | PK |
| H | 4882.00 | 103.34 | 52.11 | 2.82 | 27.47 | 81.52 | 94 | -12.48 | AV |
| H | 7323.00 | 75.63 | 51.77 | 3.03 | 31.34 | 58.23 | 74 | -15.77 | PK |
| H | 7323.00 | 61.17 | 51.77 | 3.03 | 31.34 | 43.77 | 54 | -10.23 | AV |
| H | 16134.00 | 54.79 | 51.56 | 7.36 | 41.57 | 52.16 | 74 | -21.84 | PK |
| operation frequency:2480 | | | | | | | | | |
| V | 4960.00 | 112.85 | 52.23 | 2.86 | 27.44 | 90.92 | 114 | -23.08 | PK |
| V | 4960.00 | 103.65 | 52.23 | 2.86 | 27.44 | 81.72 | 94 | -12.28 | AV |
| V | 7440.00 | 77.66 | 51.69 | 3.05 | 31.39 | 60.41 | 74 | -13.59 | PK |
| V | 7440.00 | 59.57 | 51.69 | 3.05 | 31.39 | 42.32 | 54 | -11.68 | AV |
| V | 16133.00 | 55.44 | 51.56 | 7.36 | 41.57 | 52.81 | 74 | -21.19 | PK |
| H | 4960.00 | 112.16 | 52.23 | 2.86 | 27.44 | 90.23 | 114 | -23.77 | PK |
| H | 4960.00 | 103.42 | 52.23 | 2.86 | 27.44 | 81.49 | 94 | -12.51 | AV |
| H | 7440.00 | 77.83 | 51.69 | 3.05 | 31.39 | 60.58 | 74 | -13.42 | PK |
| H | 7440.00 | 61.58 | 51.69 | 3.05 | 31.39 | 44.33 | 54 | -9.67 | AV |
| H | 16133.00 | 54.24 | 51.56 | 7.36 | 41.57 | 51.61 | 74 | -22.39 | PK |

**Remark:**

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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# 7 Test Setup Photos

Please refer to the setup photos

# 8 EUT Constructional Details (EUT Photos)

Please refer to the external photos and internal photos.

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# Appendix

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# 1. Bandwidth

## 1.1 OBW

### 1.1.1 Test Result

| Mode | TX Type | Frequency (MHz) | Packet Type | ANT | 99% Occupied Bandwidth (MHz) Result | Verdict |
|---|---|---|---|---|---|---|
| GFSK | SISO | 2402 | DH5 | 1 | 0.8628403941 | Pass |
| | | 2441 | DH5 | 1 | 0.8598094278 | Pass |
| | | 2480 | DH5 | 1 | 0.8652835208 | Pass |
| Pi/4DQPSK | SISO | 2402 | 2DH5 | 1 | 1.174540604 | Pass |
| | | 2441 | 2DH5 | 1 | 1.186257761 | Pass |
| | | 2480 | 2DH5 | 1 | 1.18339899 | Pass |
| 8DPSK | SISO | 2402 | 3DH5 | 1 | 1.170586764 | Pass |
| | | 2441 | 3DH5 | 1 | 1.180330291 | Pass |
| | | 2480 | 3DH5 | 1 | 1.172822073 | Pass |

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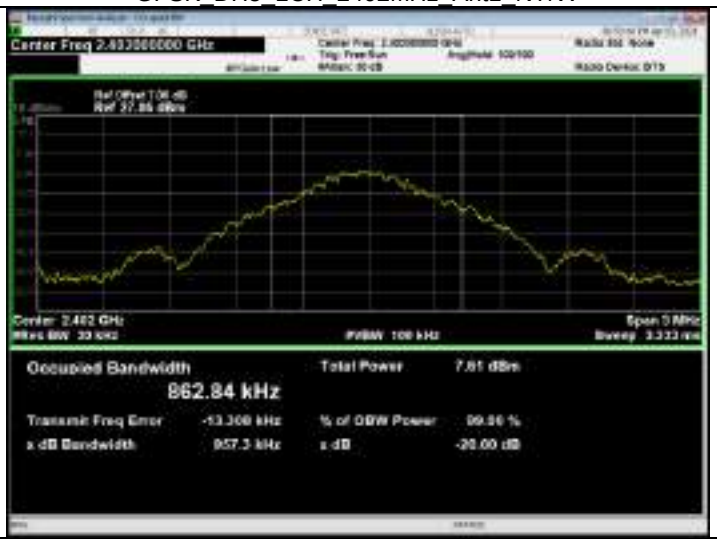
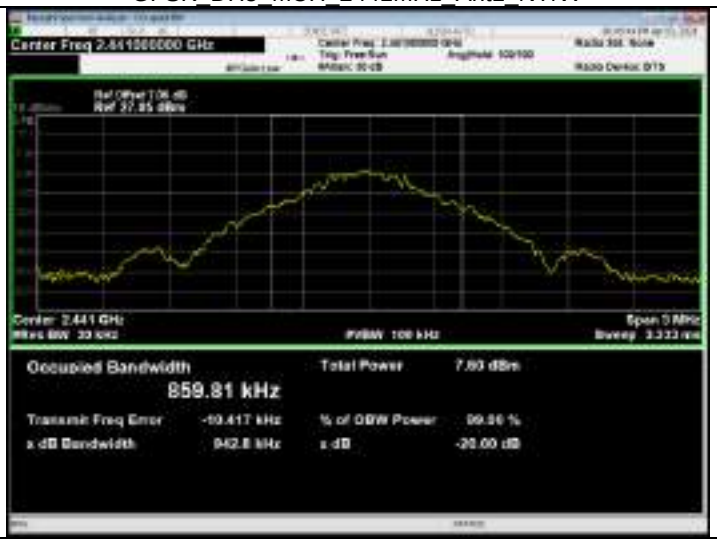
## 1.1.2 Test Graph

| GFSK_DH5_LCH_2402MHz_Ant1_NTNV |
|---|
|  |
| GFSK_DH5_MCH_2441MHz_Ant1_NTNV |
|  |



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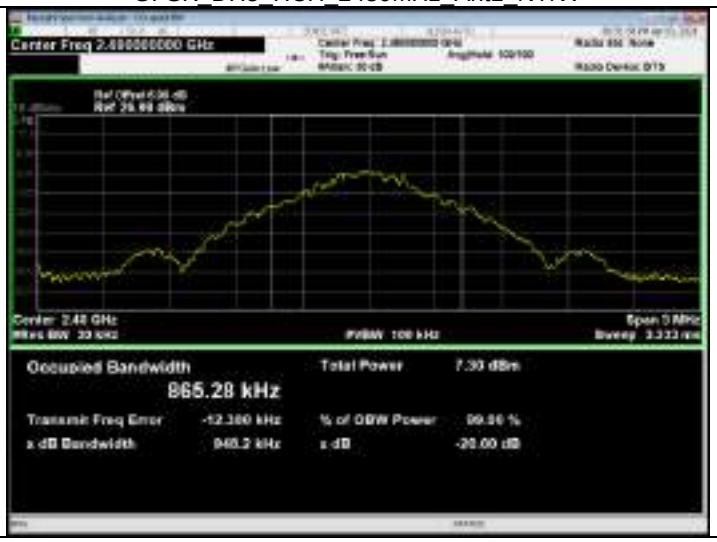
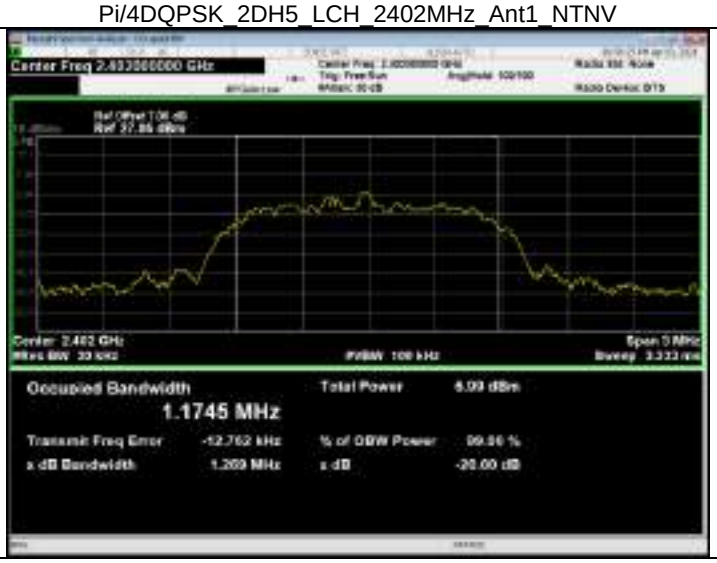
GFSK_DH5_HCH_2480MHz_Ant1_NTNV




Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV

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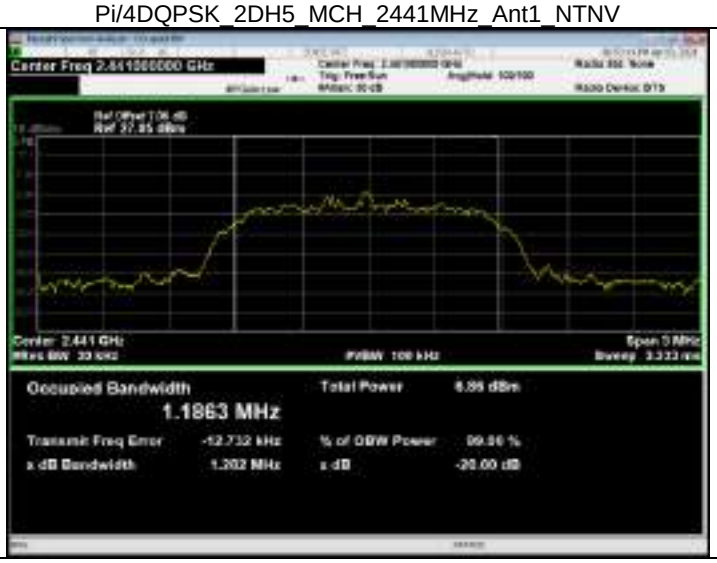
| Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV |
|---|
|  |
| Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV |
| |





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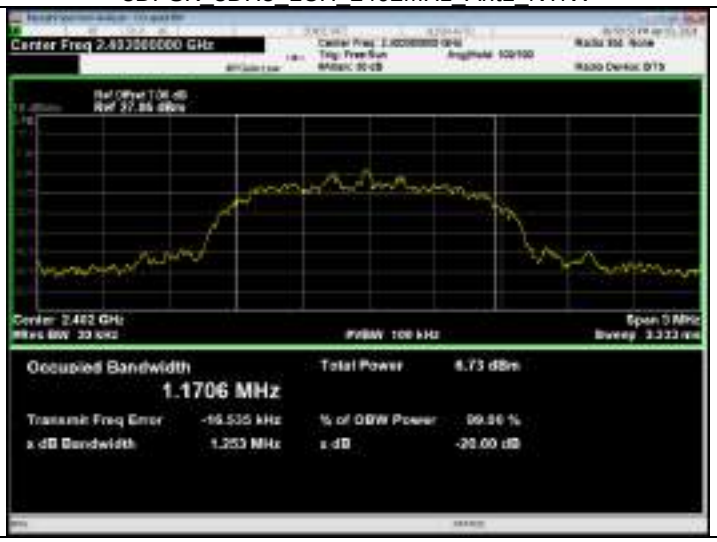
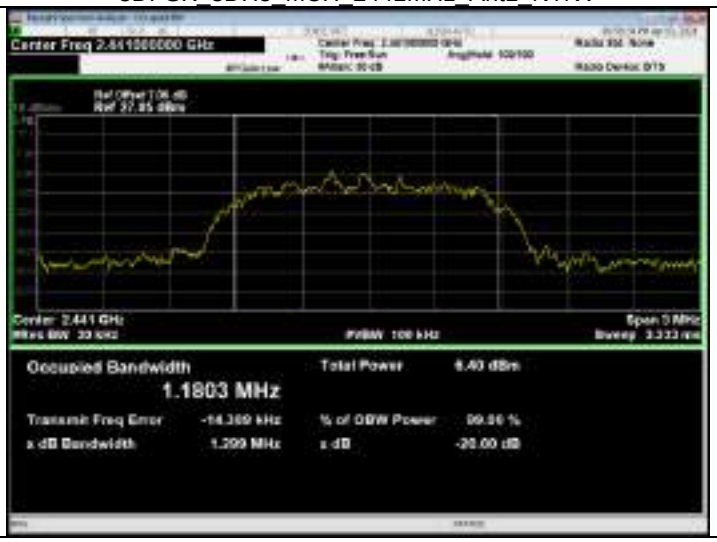
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV




8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV

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| 8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV |
| --- |
| |

## 1.2 20dB BW

### 1.2.1 Test Result

| Mode | TX Type | Frequency (MHz) | Packet Type | ANT | 20dB Bandwidth (MHz) Result | Verdict |
|---|---|---|---|---|---|---|
| GFSK | SISO | 2402 | DH5 | 1 | 0.949 | Pass |
| | | 2441 | DH5 | 1 | 0.944 | Pass |
| | | 2480 | DH5 | 1 | 0.944 | Pass |
| Pi/4DQPSK | SISO | 2402 | 2DH5 | 1 | 1.277 | Pass |
| | | 2441 | 2DH5 | 1 | 1.313 | Pass |
| | | 2480 | 2DH5 | 1 | 1.302 | Pass |
| 8DPSK | SISO | 2402 | 3DH5 | 1 | 1.275 | Pass |
| | | 2441 | 3DH5 | 1 | 1.26 | Pass |
| | | 2480 | 3DH5 | 1 | 1.351 | Pass |

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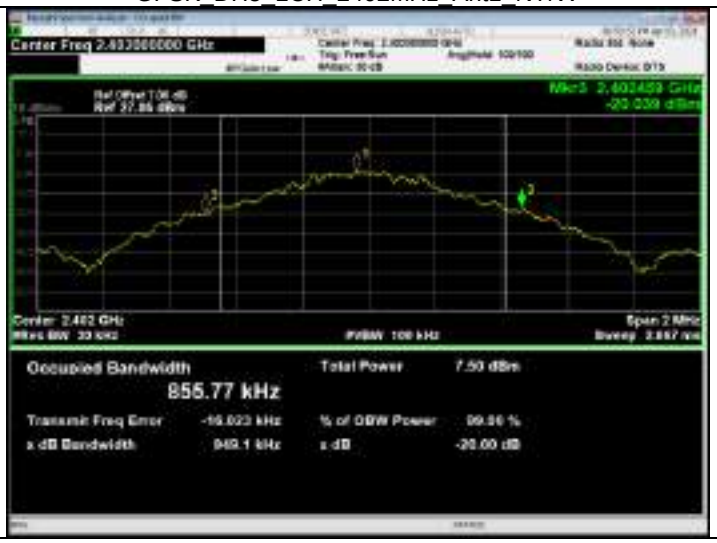
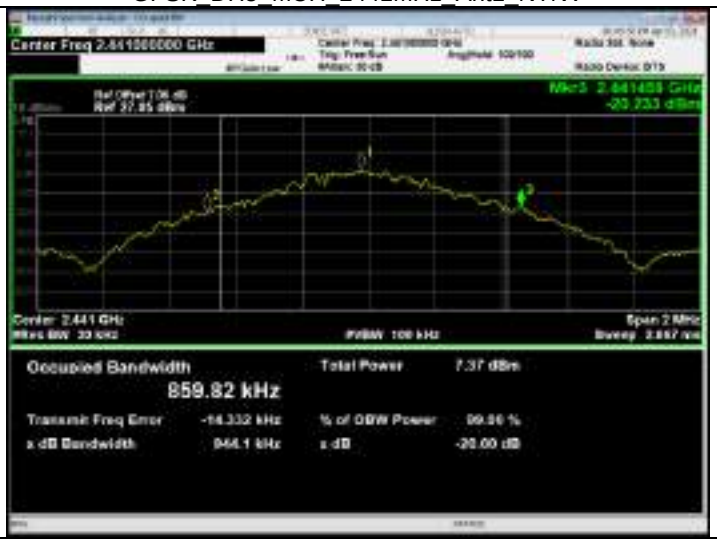
## 1.2.2 Test Graph

| GFSK_DH5_LCH_2402MHz_Ant1_NTNV |
|---|
|  |
| GFSK_DH5_MCH_2441MHz_Ant1_NTNV |
|  |



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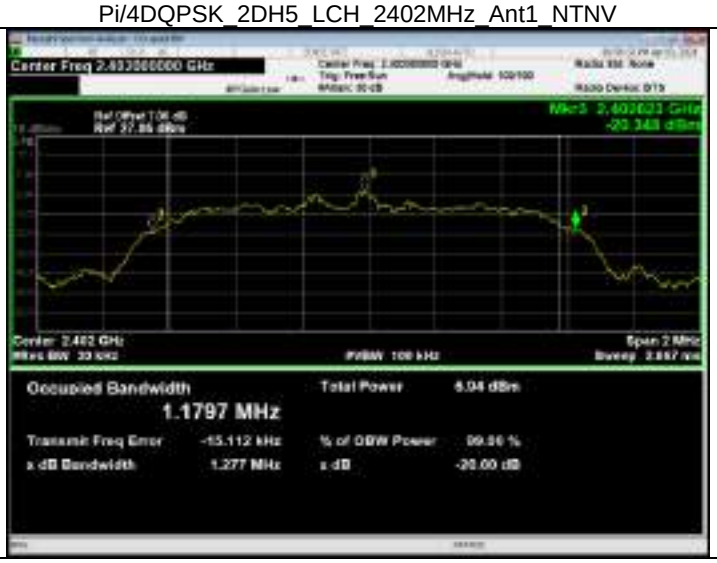
GFSK_DH5_HCH_2480MHz_Ant1_NTNV

Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV

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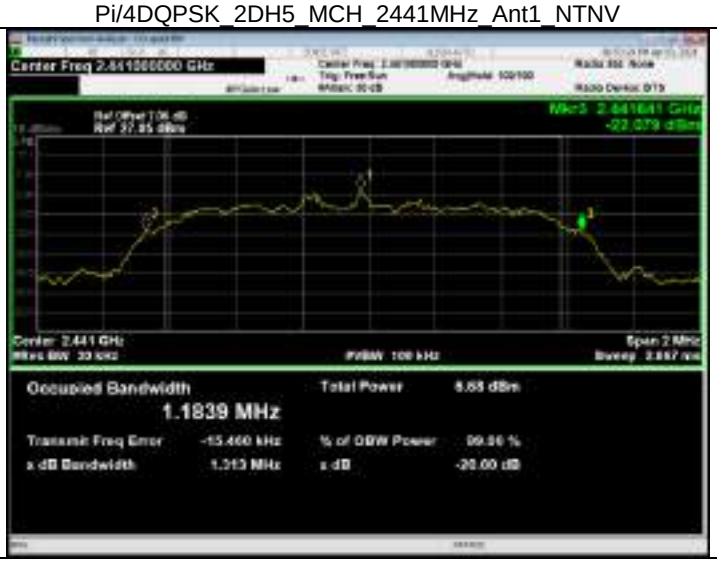
| Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV |
|---|
|  |
| Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV |
| |



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8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV

8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV

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| 8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV |
| --- |
| |



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# 2. Maximum Conducted Output Power

## 2.1 Power

### 2.1.1 Test Result

| Mode | TX Type | Frequency (MHz) | Packet Type | Maximum Peak Conducted Output Power (dBm) | | Verdict |
|---|---|---|---|---|---|---|
| | | | | ANT1 | Limit | |
| GFSK | SISO | 2402 | DH5 | 1.095 | <=30 | Pass |
| | | 2441 | DH5 | 0.987 | <=30 | Pass |
| | | 2480 | DH5 | 0.814 | <=30 | Pass |
| Pi/4DQPSK | SISO | 2402 | 2DH5 | 1.868 | <=20.97 | Pass |
| | | 2441 | 2DH5 | 1.737 | <=20.97 | Pass |
| | | 2480 | 2DH5 | 1.574 | <=20.97 | Pass |
| 8DPSK | SISO | 2402 | 3DH5 | 1.952 | <=20.97 | Pass |
| | | 2441 | 3DH5 | 1.933 | <=20.97 | Pass |
| | | 2480 | 3DH5 | 1.686 | <=20.97 | Pass |
| Note1: Antenna Gain: Ant1: 3.3dBi; | | | | | | |

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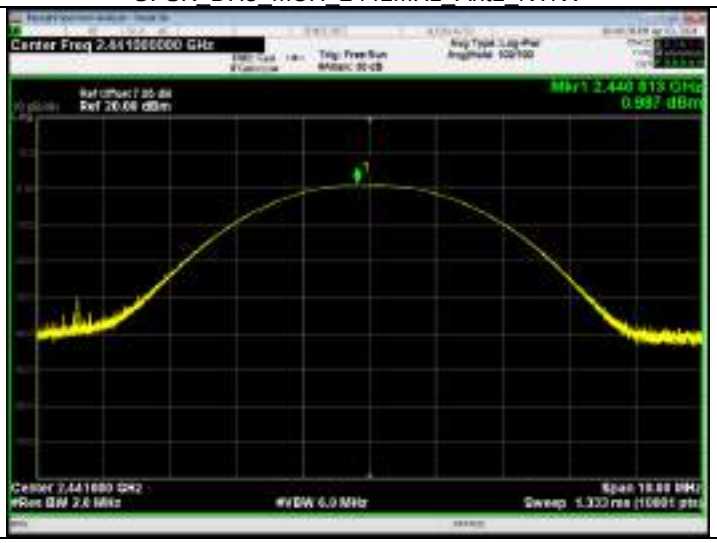
## 2.1.2 Test Graph

| GFSK_DH5_LCH_2402MHz_Ant1_NTNV |
|---|
| |
| GFSK_DH5_MCH_2441MHz_Ant1_NTNV |
|  |

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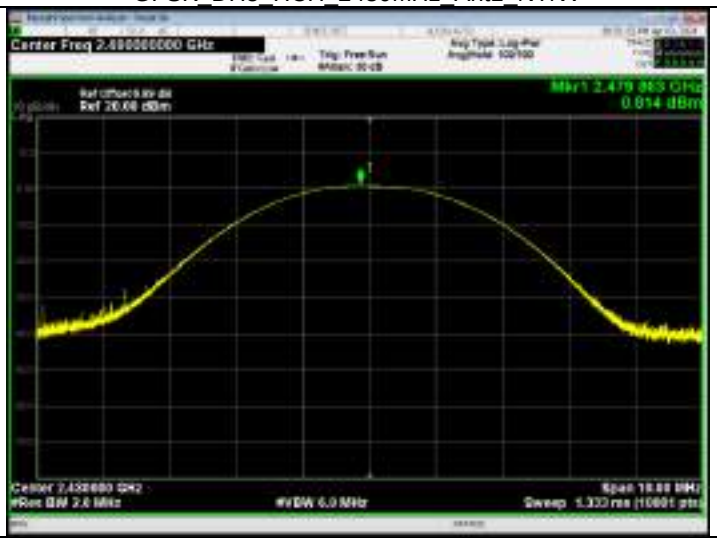
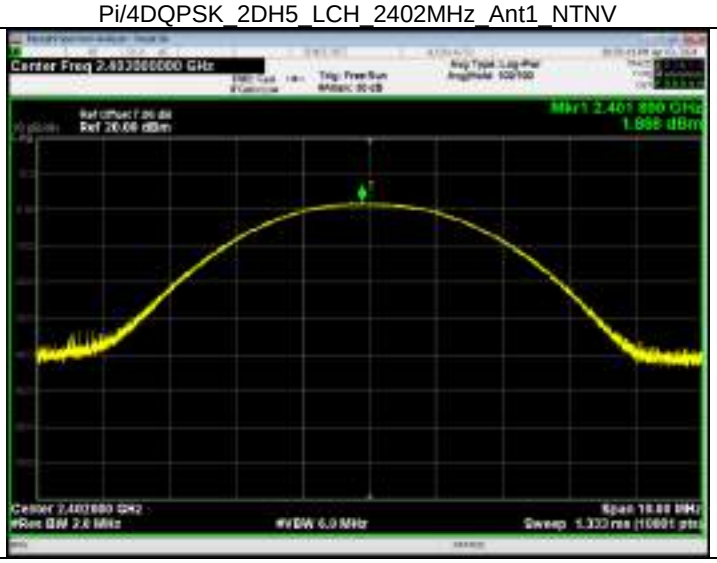
| GFSK_DH5_HCH_2480MHz_Ant1_NTNV |
|---|
|  |
| Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV |
|  |

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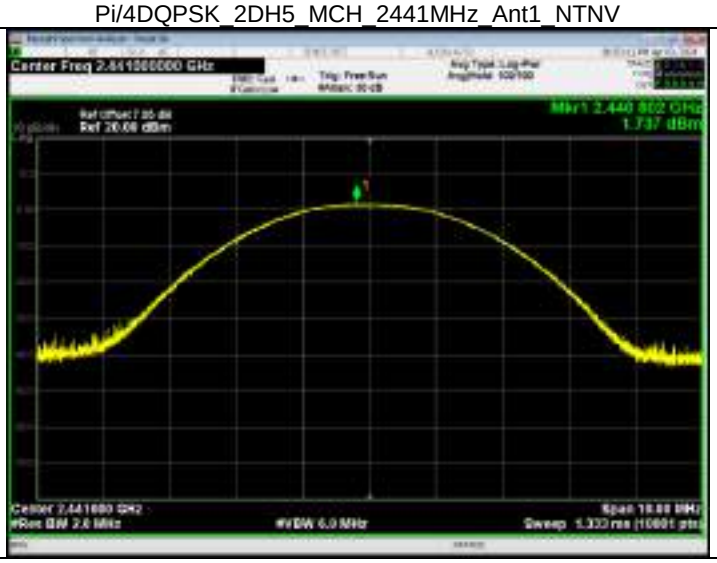
| Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV |
|---|
|  |
| Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV |
| |

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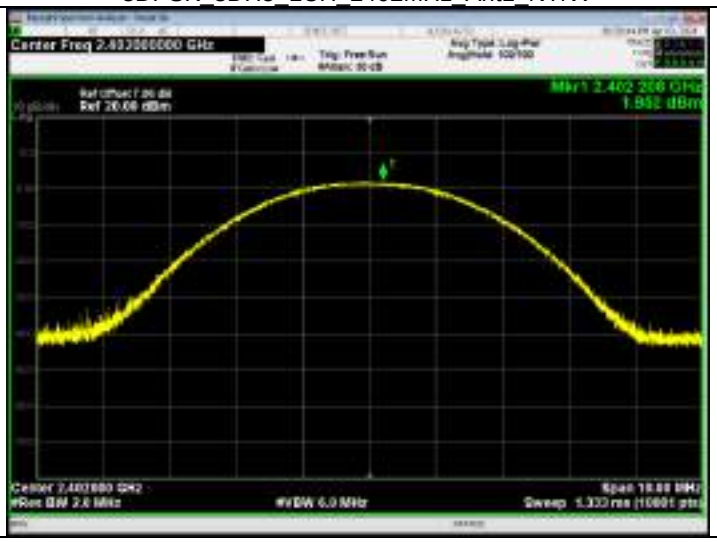
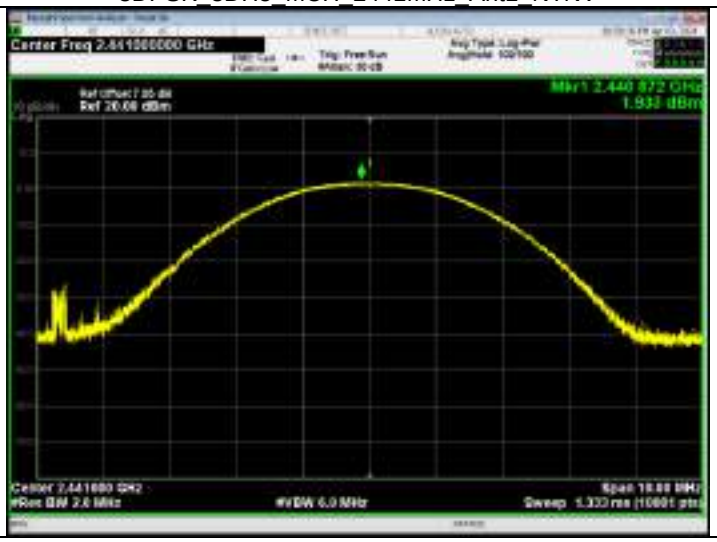
| 8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV |
|---|
|  |
| 8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV |
|  |

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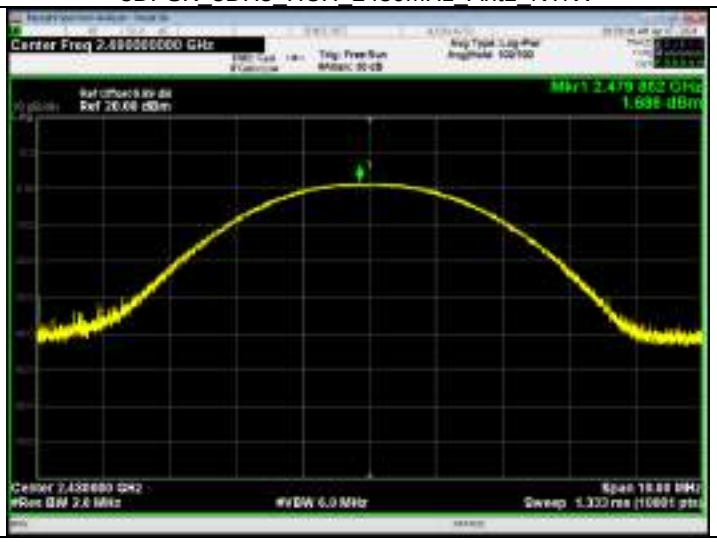
| 8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV |
| --- |
|  |

# 3. Carrier Frequency Separation

## 3.1 Ant1

### 3.1.1 Test Result

| Ant1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mode | TX Type | Frequency (MHz) | Packet Type | Channel Separation (MHz) | 20dB Min Bandwidth (MHz) | Limit (MHz) | Verdict |
| GFSK | SISO | HOPP | DH5 | 1.008 | 0.944 | >=0.631 | Pass |
| Pi/4DQPSK | SISO | HOPP | 2DH5 | 1.008 | 1.277 | >=0.851 | Pass |
| 8DPSK | SISO | HOPP | 3DH5 | 0.888 | 1.26 | >=0.838 | Pass |

### 3.1.2 Test Graph

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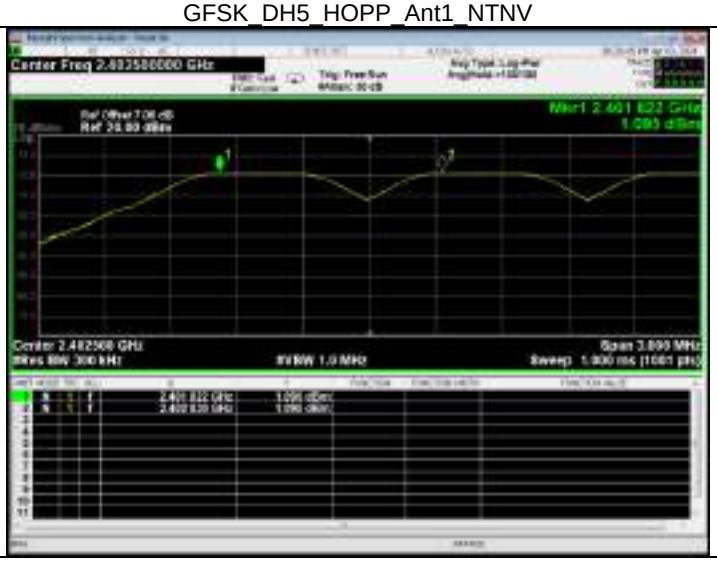
GFSK_DH5_HOPP_Ant1_NTNV




Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV

8DPSK_3DH5_HOPP_Ant1_NTNV

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# 4. Number of Hopping Frequencies

## 4.1 HoppNum

### 4.1.1 Test Result

| Mode | TX Type | Frequency (MHz) | Packet Type | Num of Hopping Frequencies | | Verdict |
|---|---|---|---|---|---|---|
| | | | | ANT1 | Limit | |
| GFSK | SISO | HOPP | DH5 | 79 | >=15 | Pass |
| Pi/4DQPSK | SISO | HOPP | 2DH5 | 79 | >=15 | Pass |
| 8DPSK | SISO | HOPP | 3DH5 | 79 | >=15 | Pass |

### 4.1.2 Test Graph

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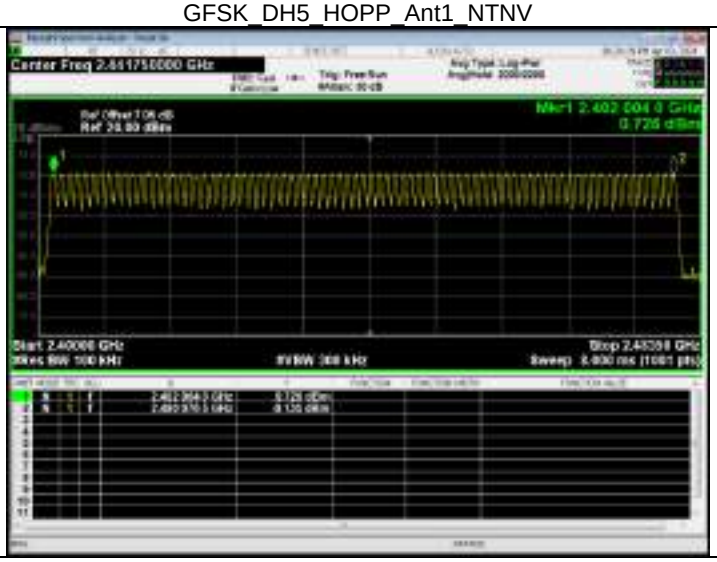
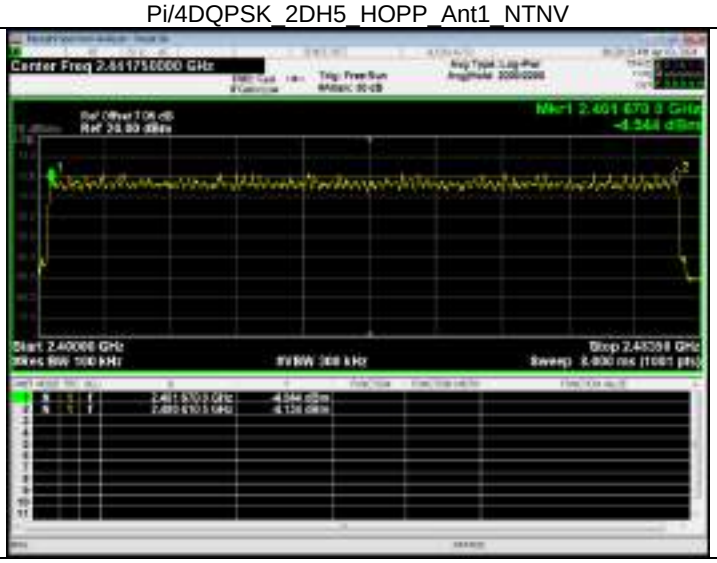
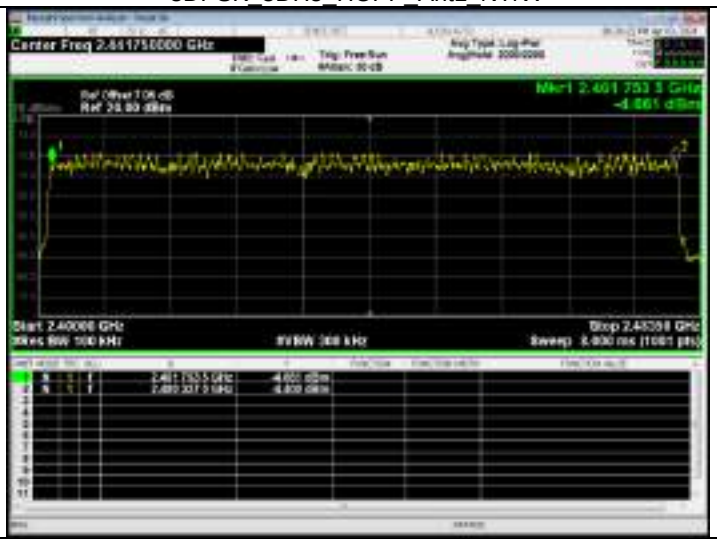
GFSK_DH5_HOPP_Ant1_NTNV




Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV




8DPSK_3DH5_HOPP_Ant1_NTNV

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# 5. Time of Occupancy (Dwell Time)

## 5.1 Ant1

### 5.1.1 Test Result

| Ant1 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mode | TX Type | Frequency (MHz) | Packet Type | Duration of Single Pulse (ms) | Observation Period (s) | Dwell Time (ms) | Limit (ms) | Verdict |
| GFSK | SISO | HOPP | DH1 | 0.383 | 31.600 | 122.56 | <=400 | Pass |
| | | | DH3 | 1.639 | 31.600 | 262.24 | <=400 | Pass |
| | | | DH5 | 2.887 | 31.600 | 307.947 | <=400 | Pass |
| Pi/4DQPSK | SISO | HOPP | 2DH1 | 0.391 | 31.600 | 125.12 | <=400 | Pass |
| | | | 2DH3 | 1.644 | 31.600 | 263.04 | <=400 | Pass |
| | | | 2DH5 | 2.892 | 31.600 | 308.48 | <=400 | Pass |
| 8DPSK | SISO | HOPP | 3DH1 | 0.391 | 31.600 | 125.12 | <=400 | Pass |
| | | | 3DH3 | 0.65 | 31.600 | 104 | <=400 | Pass |
| | | | 3DH5 | 0.895 | 31.600 | 95.467 | <=400 | Pass |

### 5.1.2 Test Graph

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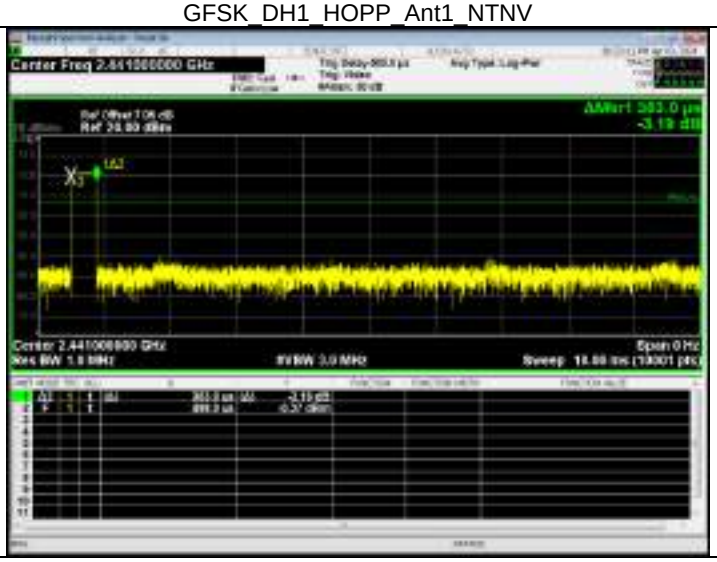
GFSK_DH1_HOPP_Ant1_NTNV

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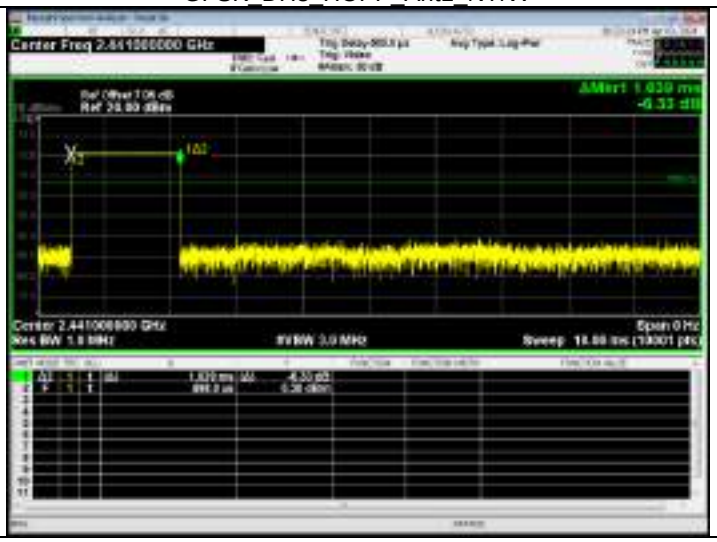
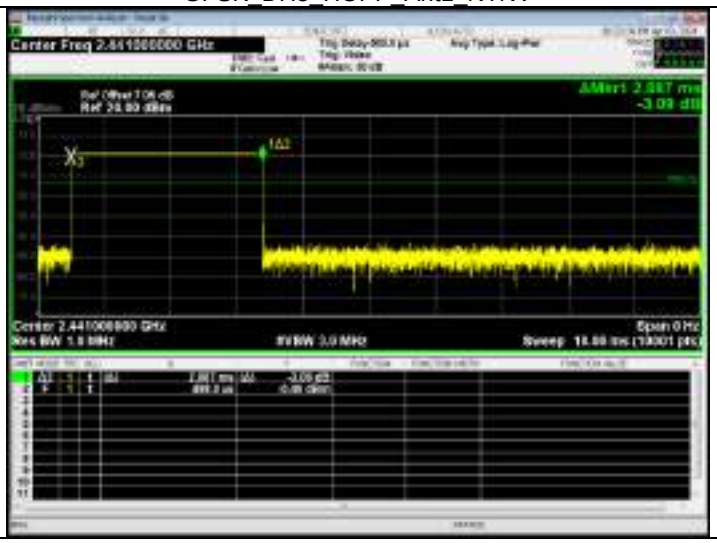



GFSK_DH5_HOPP_Ant1_NTNV

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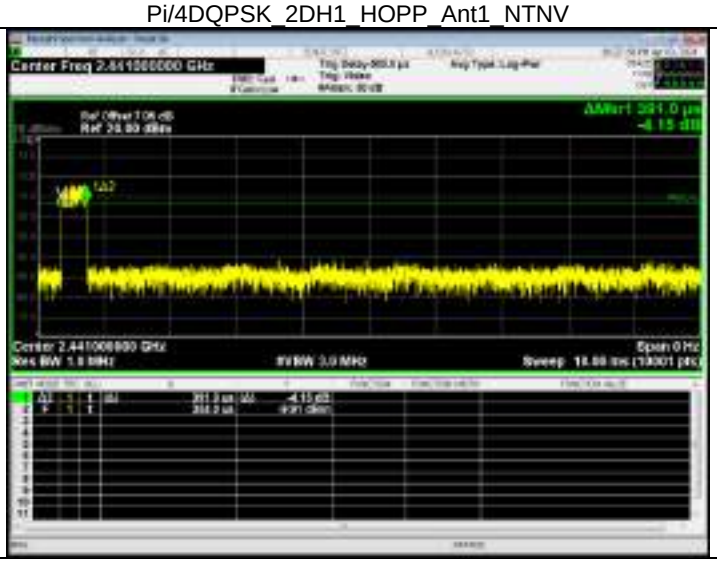
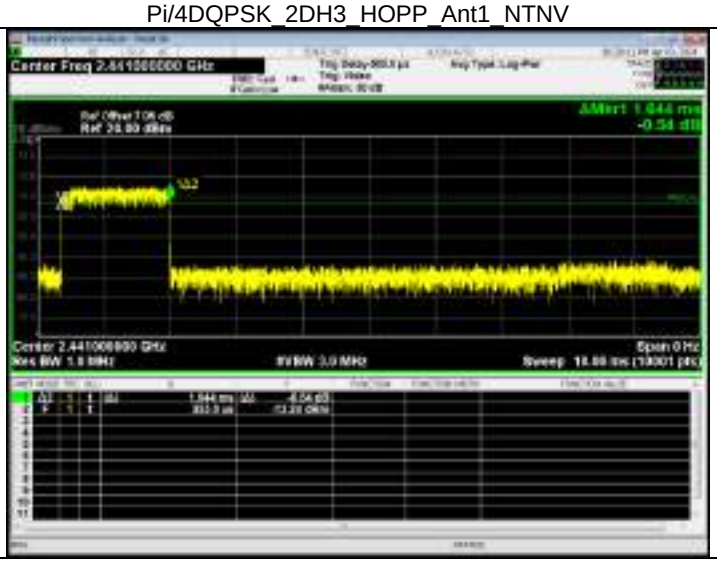
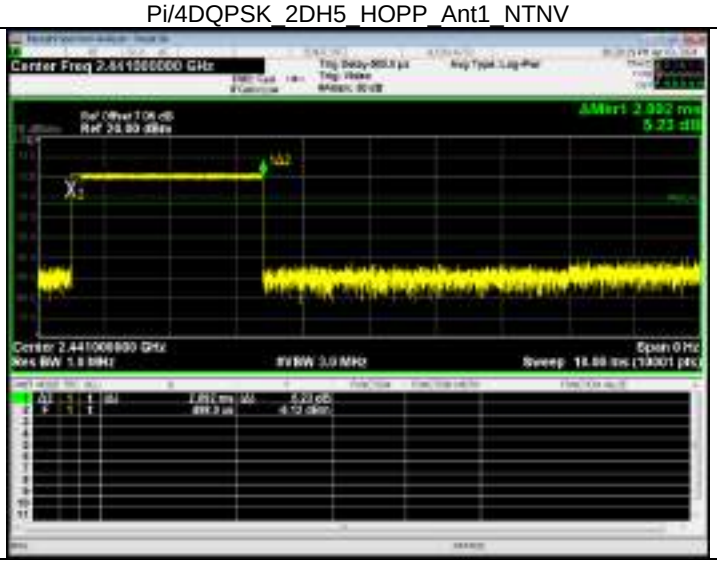
Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV




Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV




Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV

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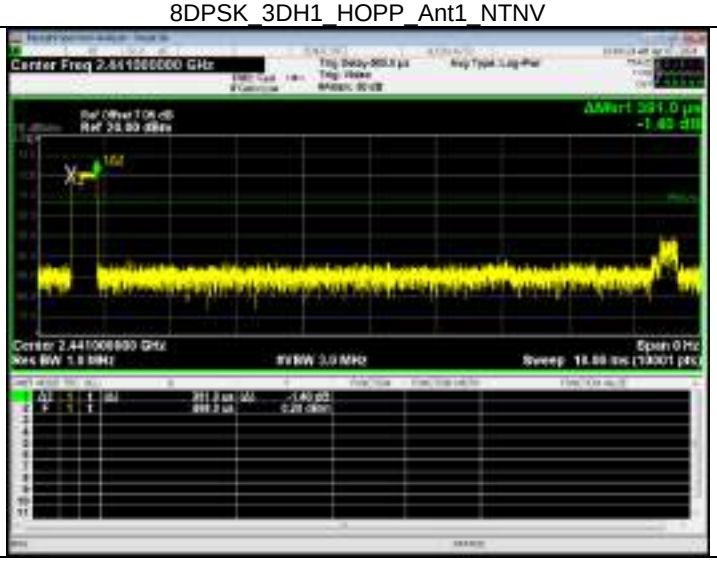
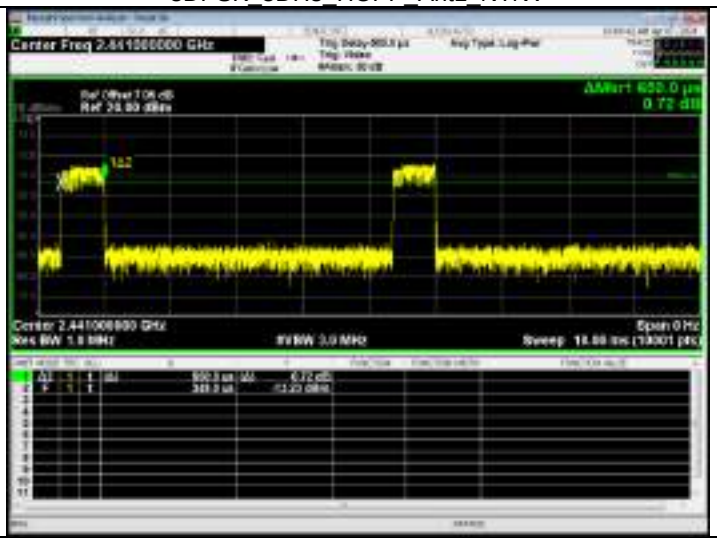
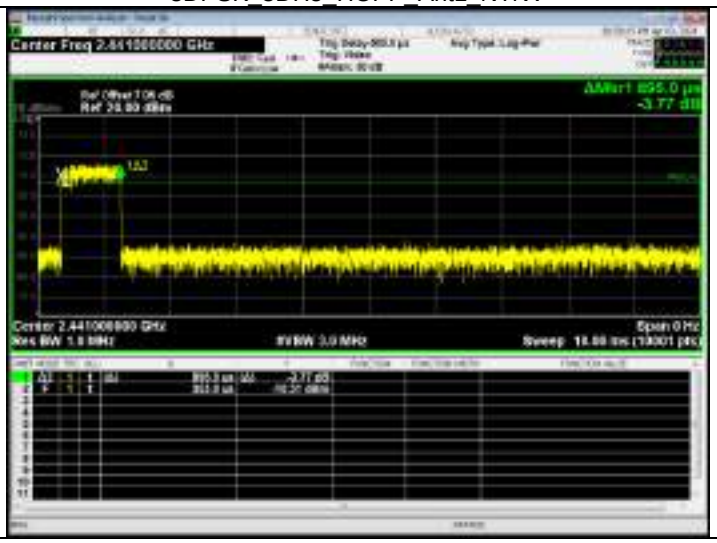
8DPSK_3DH1_HOPP_Ant1_NTNV




8DPSK_3DH3_HOPP_Ant1_NTNV




8DPSK_3DH5_HOPP_Ant1_NTNV

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# 6. Unwanted Emissions In Non-restricted Frequency Bands

## 6.1 Ref

### 6.1.1 Test Result

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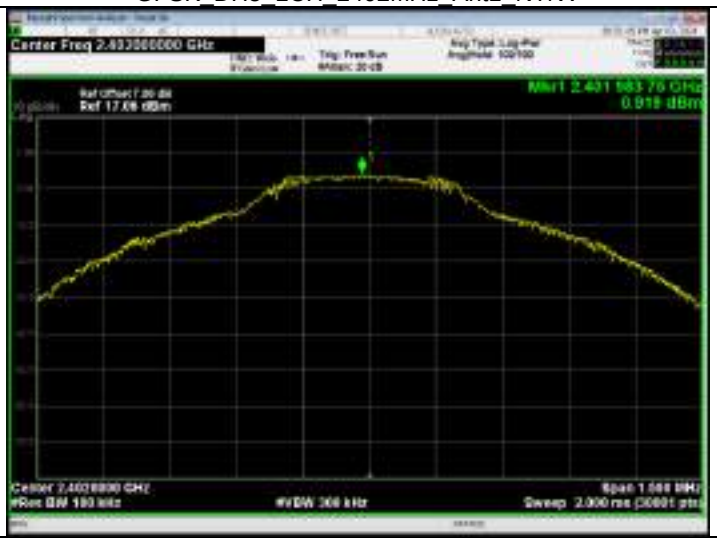
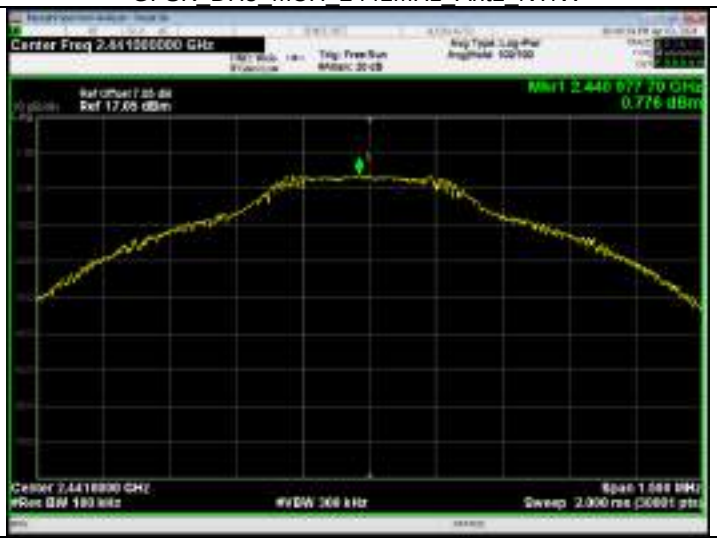
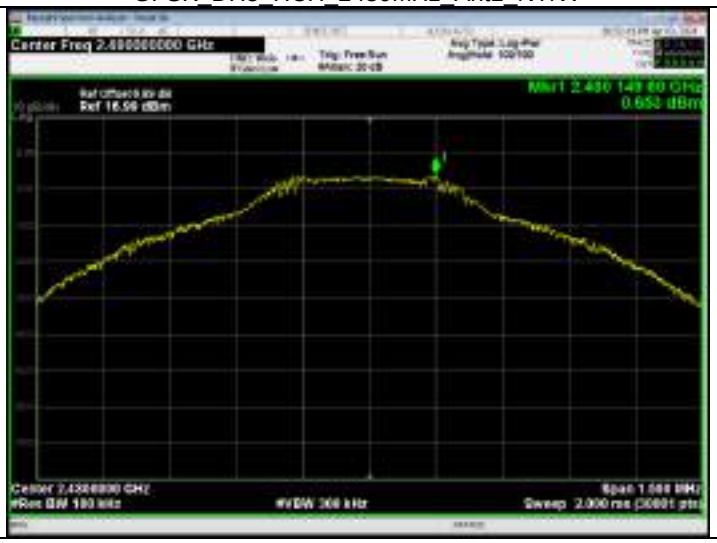


GFSK_DH5_MCH_2441MHz_Ant1_NTNV



GFSK_DH5_HCH_2480MHz_Ant1_NTNV



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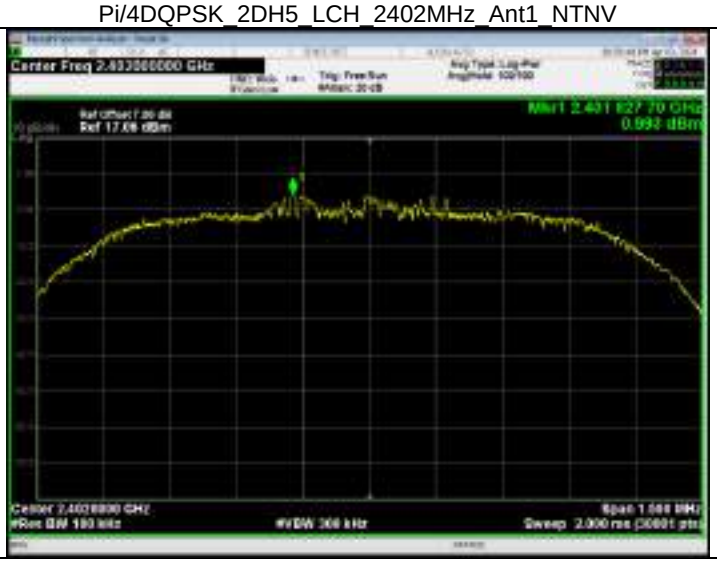
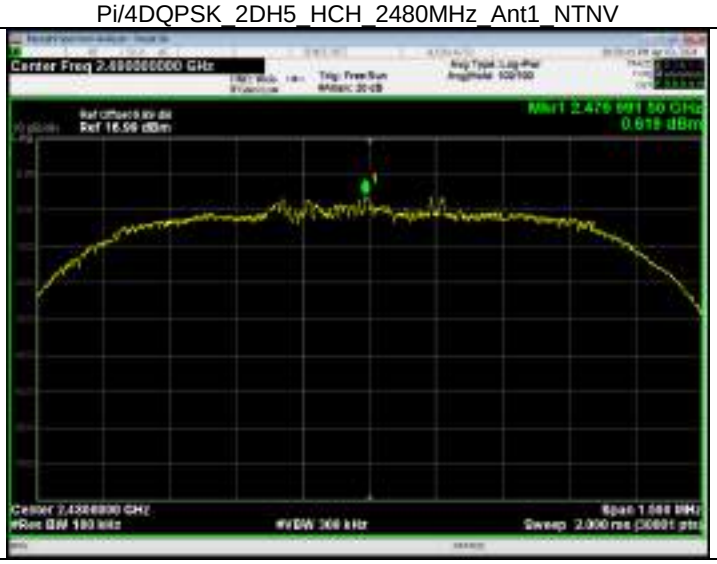
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV

Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



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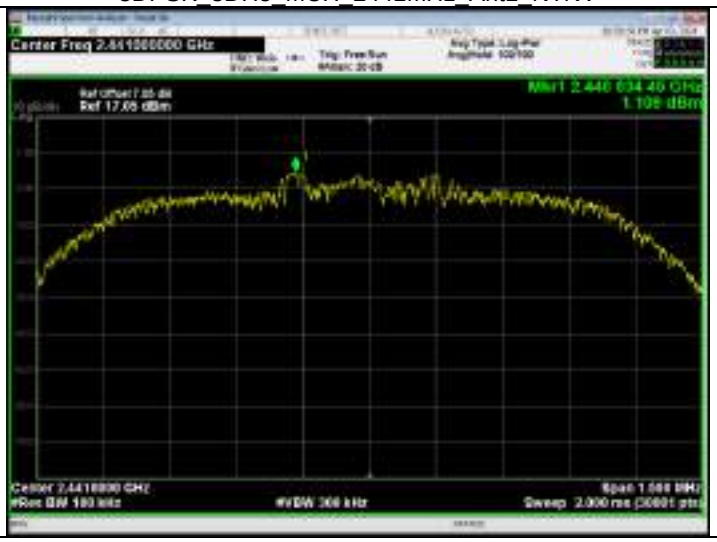
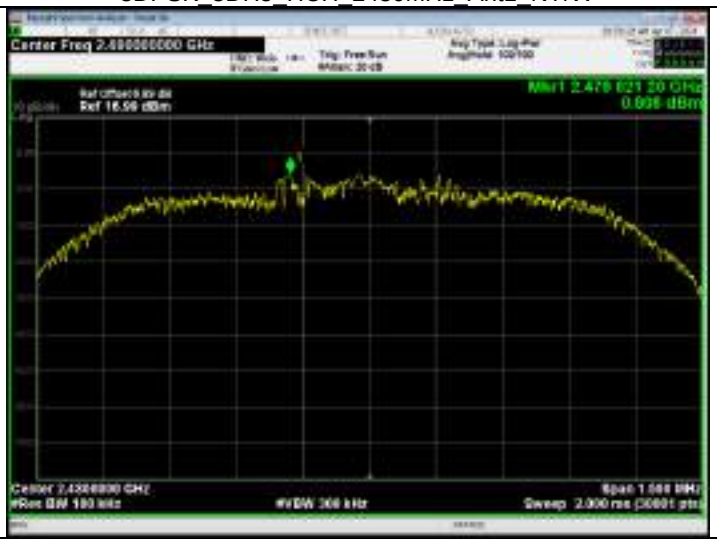
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV

8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



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## 6.2 CSE

### 6.2.1 Test Result

| Mode | TX Type | Frequency (MHz) | Packet Type | ANT | Level of Reference (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|---|---|---|
| GFSK | SISO | 2402 | DH5 | 1 | 6.06 | -13.93 | Pass |
| | | 2441 | DH5 | 1 | 6.06 | -13.93 | Pass |
| | | 2480 | DH5 | 1 | 6.06 | -13.93 | Pass |
| | | HOPP | DH5 | 1 | 6.06 | -13.93 | Pass |
| Pi/4DQPSK | SISO | 2402 | 2DH5 | 1 | 5.57 | -14.42 | Pass |
| | | 2441 | 2DH5 | 1 | 5.57 | -14.42 | Pass |
| | | 2480 | 2DH5 | 1 | 5.57 | -14.42 | Pass |
| | | HOPP | 2DH5 | 1 | 5.57 | -14.42 | Pass |
| 8DPSK | SISO | 2402 | 3DH5 | 1 | 5.84 | -14.17 | Pass |
| | | 2441 | 3DH5 | 1 | 5.84 | -14.17 | Pass |
| | | 2480 | 3DH5 | 1 | 5.84 | -14.17 | Pass |
| | | HOPP | 3DH5 | 1 | 5.84 | -14.17 | Pass |
| Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level. | | | | | | | |

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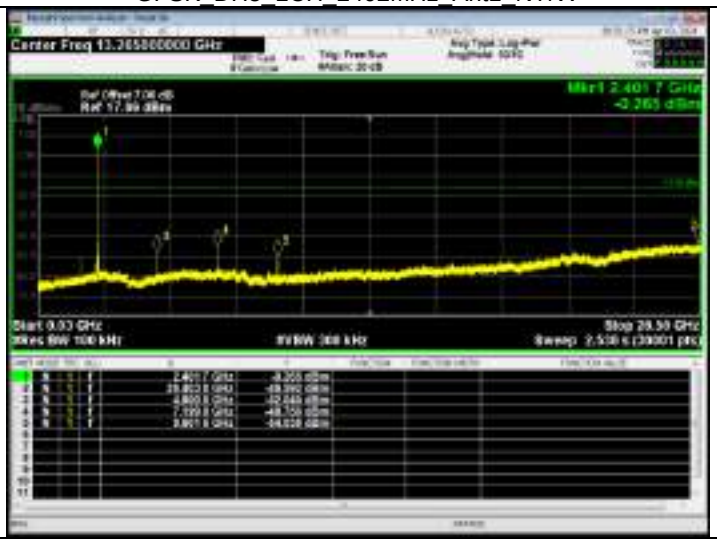
## 6.2.2 Test Graph

| GFSK_DH5_LCH_2402MHz_Ant1_NTNV |
|---|
| |
| GFSK_DH5_LCH_2402MHz_Ant1_NTNV |
|  |

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| GFSK_DH5_MCH_2441MHz_Ant1_NTNV |
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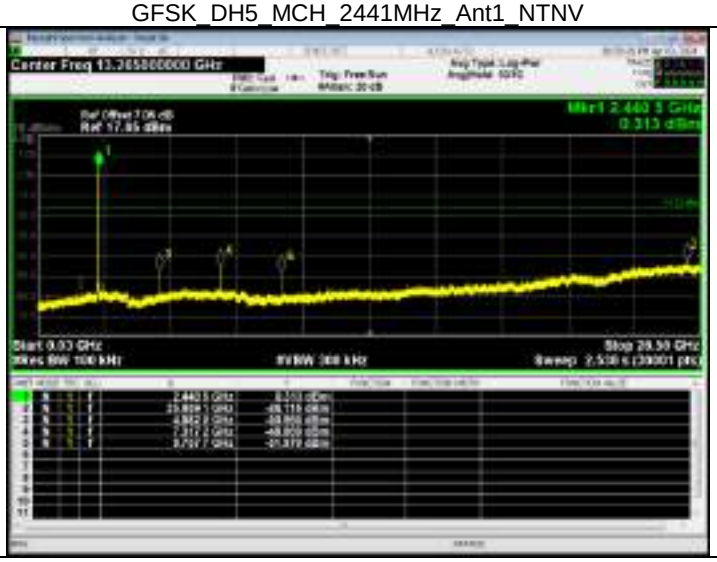
|  |
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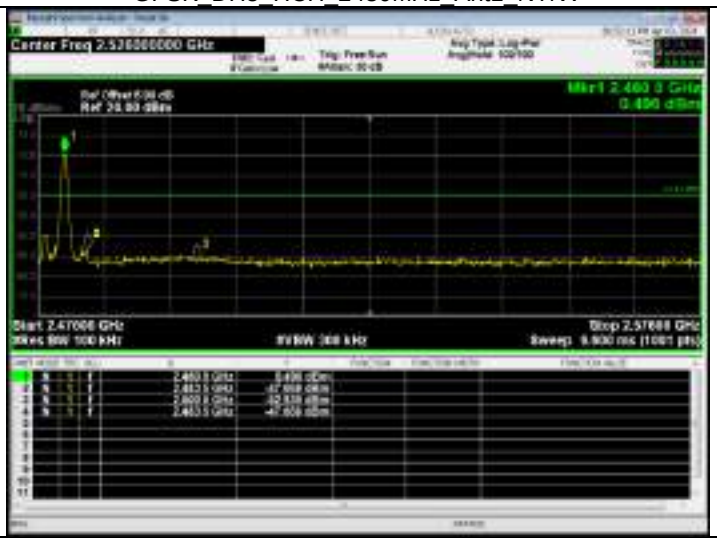
|  |

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| GFSK_DH5_HCH_2480MHz_Ant1_NTNV |
|---|
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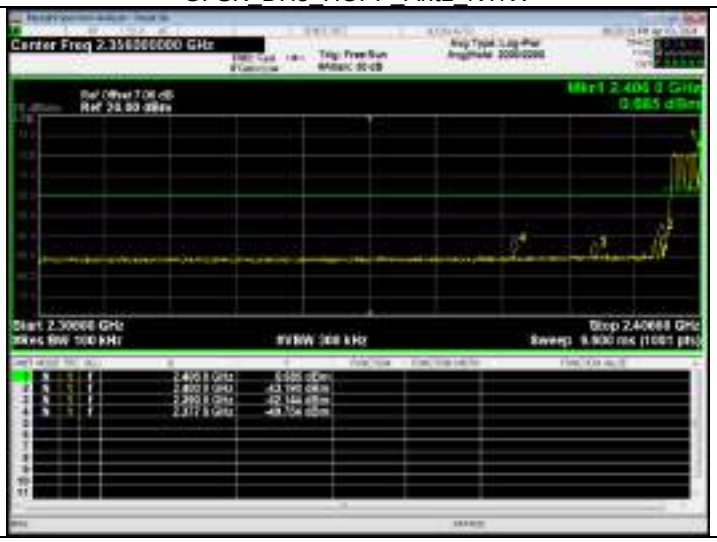
| GFSK_DH5_HOPP_Ant1_NTNV |
|  |

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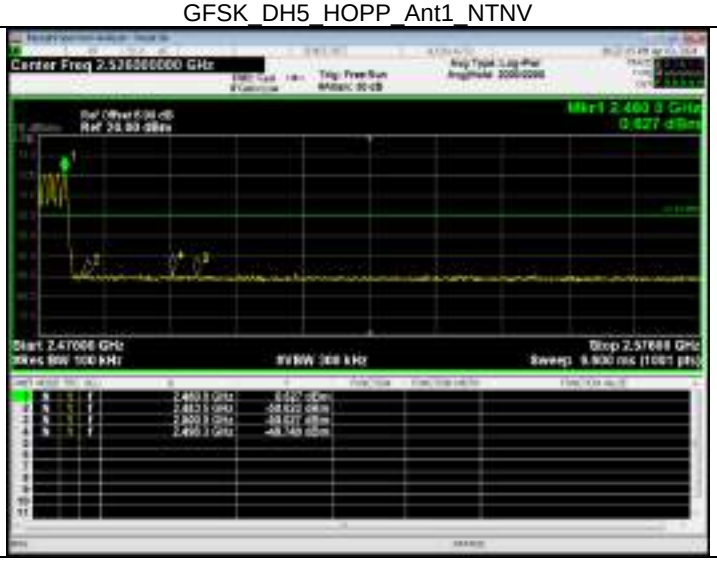
| GFSK_DH5_HOPP_Ant1_NTNV |
| --- |
|  |
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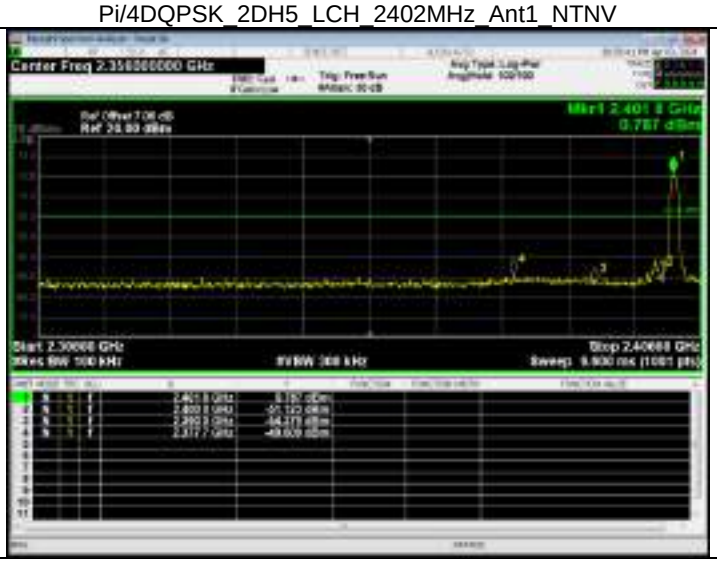
|  |

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| Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV |
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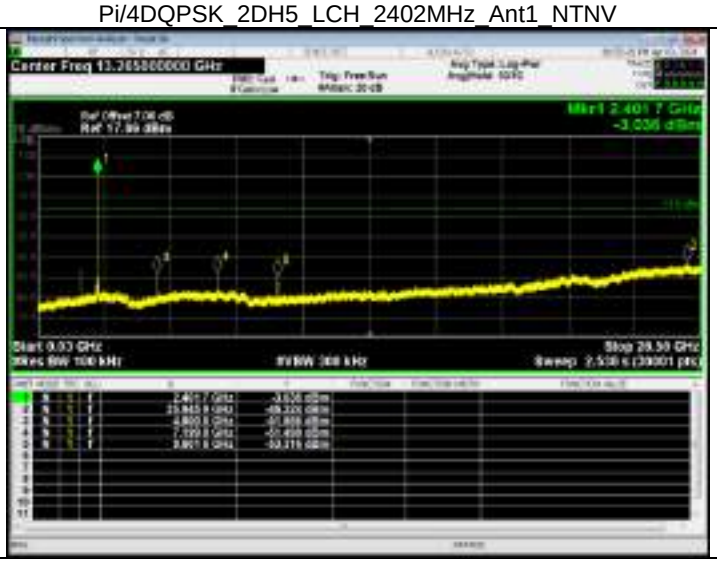
|  |
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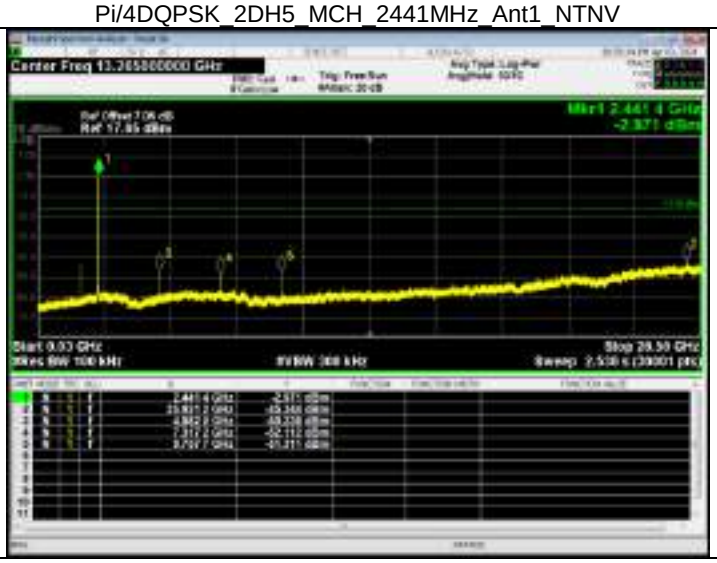
|  |

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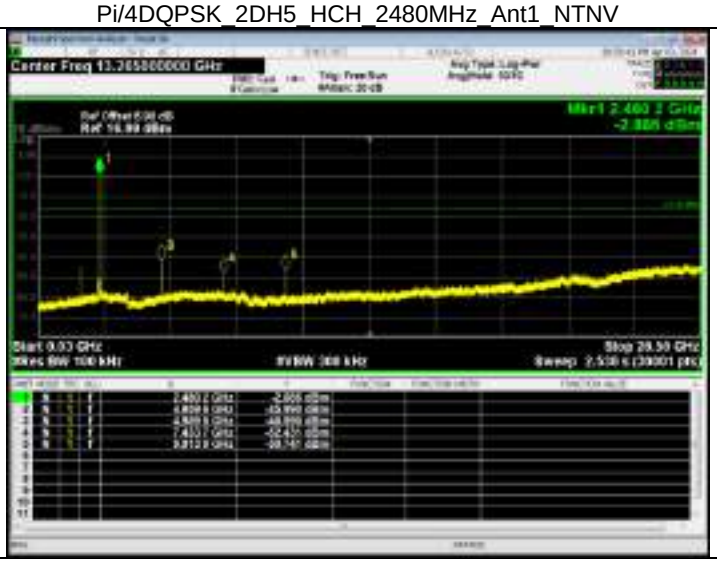
| Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV |
|---|
| |
| Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV |
|  |

| Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV |
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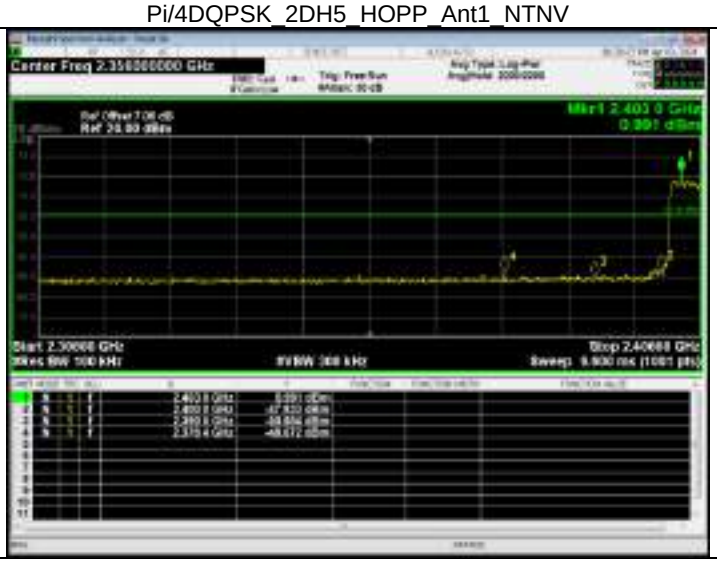
|  |
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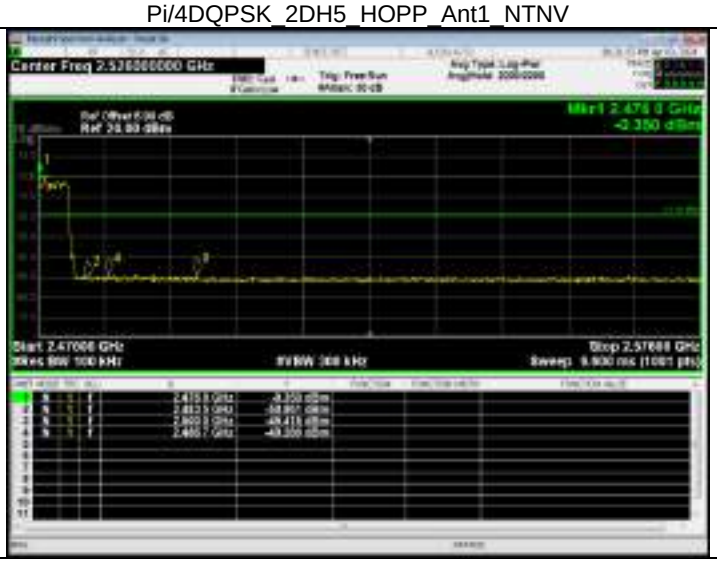
|  |

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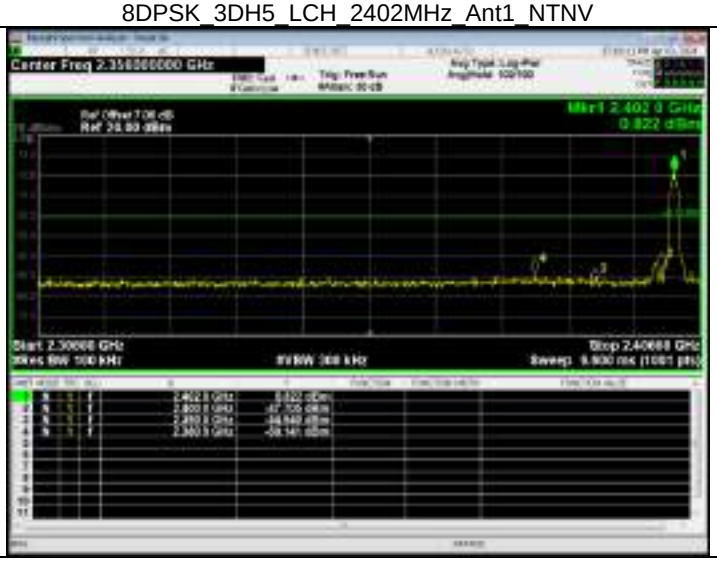
| 8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV |
|---|
|  |
| 8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV |
| |

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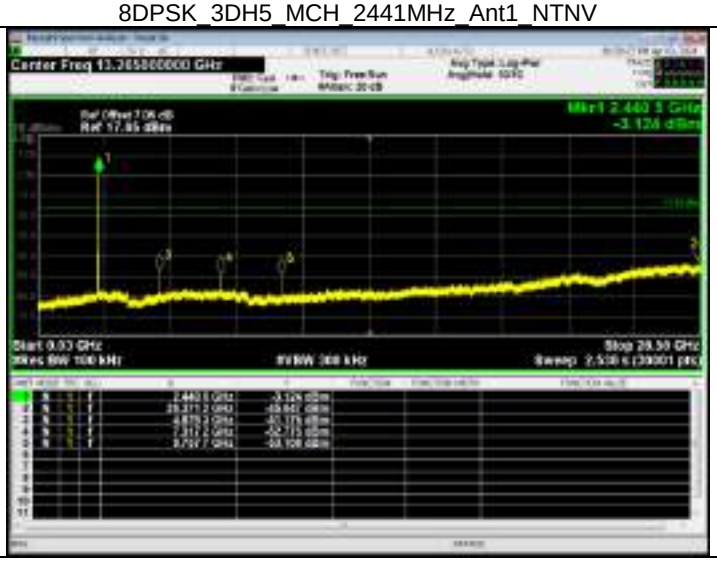
| 8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV |
|---|
|  |
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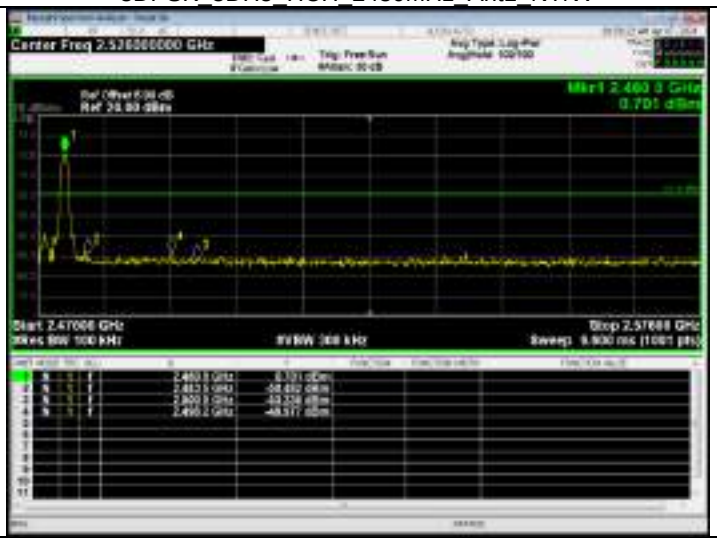
|  |

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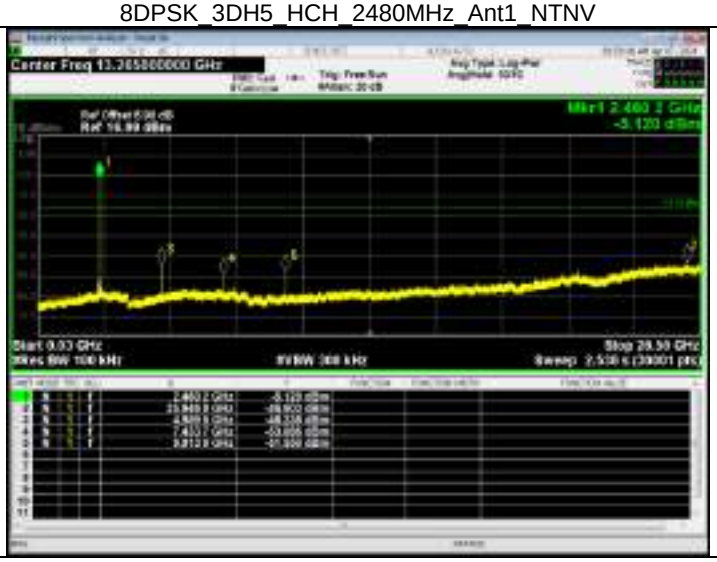
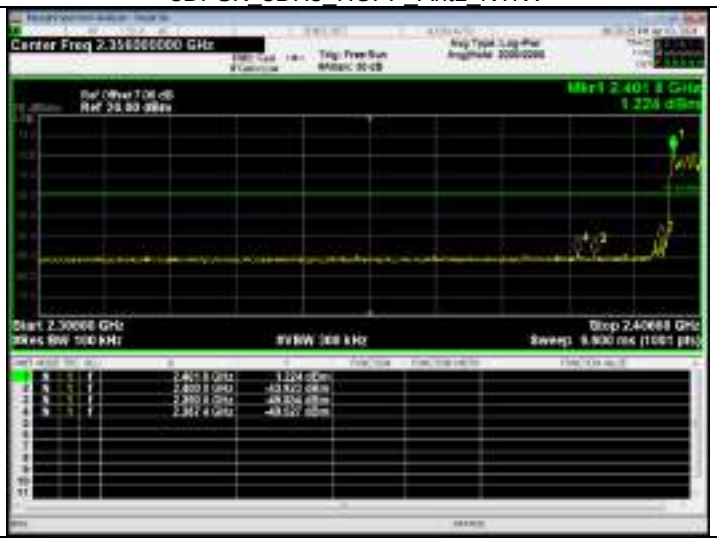
| 8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV |
|---|
|  |
| 8DPSK_3DH5_HOPP_Ant1_NTNV |
|  |

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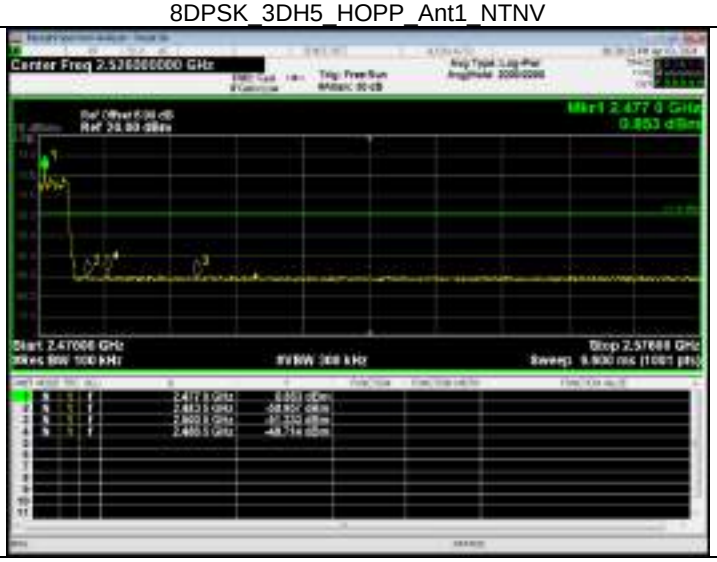
| 8DPSK_3DH5_HOPP_Ant1_NTNV |
| --- |
|  |

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