Company: HP Inc

Test of: 0960-4025 and 0960-4034

To: FCC 15.247 & IC RSS-247 (FHSS)

Report No.: MARS11-U13 FHSS Rev B WiFi/BT Module

**COMPLETE TEST REPORT**

# COMPLETE TEST REPORT

FROM

Test of: HP Inc 0960-4025 and 0960-4034

to

To: FCC 15.247 & IC RSS-247 (FHSS)

Test Report Serial No.: MARS11-U13 FHSS Rev B WiFi/BT Module

This report supersedes: MARS11-U13 FHSS Rev A

| | |
|---|---|
| Applicant: | HP Inc<br>1115 SE 164th Ave., Suite 210,<br>Vancouver,<br>Washington 98683,<br>USA |
| Product Function | 802.11 a/b/g/n SDIO dual band with BT/BLE |
| Issue Date: | 27th October 2017 |

**This Test Report is Issued Under the Authority of:**

**MiCOM Labs, Inc.**
575 Boulder Court
Pleasanton California 94566
USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com

ACCREDITED
TESTING CERT #2381.01

**MiCOM Labs is an ISO 17025 Accredited Testing Laboratory**

# Table of Contents

# 1. ACCREDITATION, LISTINGS & RECOGNITION

## 1.1. TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2005. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

ilac-MRA A2LA

**Accredited Laboratory**

A2LA has accredited

**MICOM LABS**

*Pleasanton, CA*

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 4th day of February 2016.

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2017

*For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.*

## 1.2. RECOGNITION

MiCOM Labs, Inc has widely recognized wireless testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA countries. MiCOM Labs test reports are accepted globally.

| Country | Recognition Body | Status | Phase | Identification No. |
|---|---|---|---|---|
| USA | Federal Communications Commission (FCC) | TCB | - | US0159<br>Listing #: 102167 |
| Canada | Industry Canada (IC) | FCB | APEC MRA 2 | US0159<br>Listing #: 4143A-2<br>4143A-3 |
| Japan | MIC (Ministry of Internal Affairs and Communication) | CAB | APEC MRA 2 | RCB 210 |
| | VCCI | -- | -- | A-0012 |
| Europe | European Commission | NB | EU MRA | NB 2280 |
| Australia | Australian Communications and Media Authority (ACMA) | CAB | APEC MRA 1 | US0159 |
| Hong Kong | Office of the Telecommunication Authority (OFTA) | CAB | APEC MRA 1 | |
| Korea | Ministry of Information and Communication Radio Research Laboratory (RRL) | CAB | APEC MRA 1 | |
| Singapore | Infocomm Development Authority (IDA) | CAB | APEC MRA 1 | |
| Taiwan | National Communications Commission (NCC)<br>Bureau of Standards, Metrology and Inspection (BSMI) | CAB | APEC MRA 1 | |
| Vietnam | Ministry of Communication (MIC) | CAB | APEC MRA 1 | |

EU MRA – European Union Mutual Recognition Agreement.
NB – Notified Body
APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement. Recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing
Phase II – recognition for both product testing and certification

## 1.3. PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

Accredited Product Certification Body

A2LA has accredited

MICOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 4th day of February 2016.

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2017

*For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.*

United States of America – Telecommunication Certification Body (TCB)
Industry Canada – Certification Body, CAB Identifier – US0159
Europe – Notified Body (NB), NB Identifier - 2280
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

## 2. DOCUMENT HISTORY

| Document History | | |
|---|---|---|
| Revision | Date | Comments |
| Draft | 23rd August 2017 | Draft report for client review. |
| Rev A | 11th October 2017 | Initial release. |
| Rev B | 27th October 2017 | Removed module photographs. |
| . | | |
| . | | |
| . | | |
| . | | |

In the above table the latest report revision will replace all earlier versions.

# 3. TEST RESULT CERTIFICATE

| | | | |
|---|---|---|---|
| **Manufacturer:** | HP Inc<br>1115 SE 164th Ave., Suite 210,<br>Vancouver,<br>Washington 98683,<br>USA | **Tested By:** | MiCOM Labs, Inc.<br>575 Boulder Court<br>Pleasanton<br>California 94566 USA |
| **Model:** | HP Part # 0960-4025 and<br>HP Part # 0960-4034 | **Telephone:** | +1 925 462 0304 |
| | | **Fax:** | +1 925 462 0306 |
| **Type Of Equipment:** | WLAN BT Radio module | | |
| **S/N's:** | D80F99748D64, D80F99748D68 | | |
| **Test Date(s):** | 28 July - 02 August 2017 | **Website:** | www.micomlabs.com |

| STANDARD(S) | TEST RESULTS |
|---|---|
| FCC 15.247 & IC RSS-247 (FHSS) | EQUIPMENT COMPLIES |

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

**Notes:**

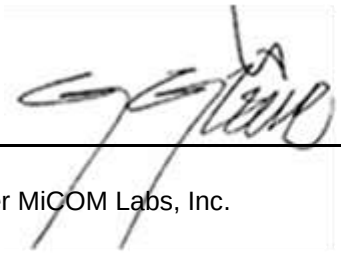
1. This document reports conditions under which testing was conducted and the results of testing performed.

2. Details of test methods used have been recorded and kept on file by the laboratory.

3. Test results apply only to the item(s) tested.

A2LA ACCREDITED TESTING CERT #2381.01

**Approved & Released for MiCOM Labs, Inc. by**:



Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

# 4. REFERENCES AND MEASUREMENT UNCERTAINTY

## 4.1. Normative References

| REF. | PUBLICATION | YEAR | TITLE |
|---|---|---|---|
| I | A2LA | June 2015 | R105 - Requirement's When Making Reference to A2LA Accreditation Status |
| II | ANSI C63.10 | 2013 | American National Standard for Testing Unlicensed Wireless Devices |
| III | ANSI C63.4 | 2014 | American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| IV | CISPR 32 | 2012 | Electromagnetic compatibility of multimedia equipment - Emission requirements |
| V | ETSI TR 100 028 | 2001-12 | Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics |
| VI | FCC 47 CFR Part 15, Subpart B | 2014 | Title 47: Telecommunication PART 15—RADIO FREQUENCY DEVICES, SubPart B; Unintentional Radiators |
| VII | FCC 47 CFR Part 15.247 | 2016 | Radio Frequency Devices; Subpart C – Intentional Radiators |
| VIII | FCC Public Notice DA 00-705 | March 2000 | Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems |
| IX | ICES-003 | Issue 6 Jan 2016 | Spectrum Management and Telecommunications; Interference-Causing Equipment Standard. Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement. |
| X | M 3003 | Edition 3 Nov.2012 | Expression of Uncertainty and Confidence in Measurements |
| XI | RSS-247 Issue 2 | Feb 2017 | Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices |
| XII | RSS-Gen Issue 4 | November 2014 | General Requirements and Information for the Certification of Radiocommunication Equipment |
| XIII | FCC 47 CFR Part 2.1033 | 2016 | FCC requirements and rules regarding photographs and test setup diagrams. |

## 4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

# 5. PRODUCT DETAILS AND TEST CONFIGURATIONS

## 5.1. Technical Details

| Details | Description |
|---|---|
| Purpose: | Test of the HP Inc 0960-4025 and 0960-4034 Bluetooth Radio in FHSS mode to FCC 15.247 & IC RSS-247 (FHSS). |
| Applicant: | HP Inc<br>1115 SE 164th Ave., Suite 210,<br>Vancouver,<br>Washington 98683,<br>USA |
| Manufacturer: | HP Inc |
| Laboratory performing the tests: | MiCOM Labs, Inc.<br>575 Boulder Court<br>Pleasanton California 94566 USA |
| Test report reference number: | MARS11-U13 FHSS Rev B WiFi/BT Module |
| Date EUT received: | 12th June 2017 |
| Standard(s) applied: | FCC 15.247 & IC RSS-247 (FHSS) |
| Dates of test (from - to): | 28 July - 02 August 2017 |
| No of Units Tested: | 2 |
| Product Family Name: | VCVRA-1712 |
| Model(s): | Model: HP Inc.'s VCVRA-1712<br>Part numbers: 0960-4025 and 0960-4034 |
| Location for use: | Indoors |
| Declared Frequency Range(s): | 2400 - 2483.5 MHz; |
| Type of Modulation: | Bluetooth - FHSS |
| EUT Modes of Operation: | 2400 - 2483.5 MHz: DH1; 3DH5; |
| Declared Nominal Output Power: | 6 dBm |
| Transmit/Receive Operation: | Transceiver - Full Duplex |
| Rated Input Voltage and Current: | 3.3V+/-10%, 1A |
| Operating Temperature Range: | Declared Range 0°C to 70°C |
| ITU Emission Designator: | 1M22G1D |
| Equipment Dimensions: | 37mm x 40mm |
| Weight: | 0.3 oz |
| Hardware Rev: | V4 |
| Software Rev: | P130 |

## 5.2. Scope Of Test Program

**HP Inc 0960-4025 and 0960-4034**
The scope of the test program was to test the HP Inc 0960-4025 and 0960-4034 Bluetooth Radio in FHSS mode in the frequency ranges 2400 - 2483.5 MHz; for compliance against the following specification:

**FCC 15.247 & IC RSS-247 (FHSS)**
Radio Frequency Devices; Subpart C – Intentional Radiators

**Industry Canada RSS-247**
Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices

The product is available as 2 model variants;-

0960-4025 has U.FL connectors to enable connection to external antennas.

0960-4034 has integral antennas only.

PCB Manufacturing Variation
Testing commenced on Rev 3.1 of the wireless device using VCVRA-1712 pcb's.

For manufacturability, HP agreed to remove an extra set of holes on the digital interface connector. This is designated as the Rev 4 design.

**Differences:** All traces and pads remained however holes are not drilled on the two extra connections, and thus the connector cannot be loaded into the wrong location.

**Verification:** The differences between Revision 3.1 and Revision 4 of the VCVRA-1712 radio were reviewed, tested and judged to have no significant effect on device compliance.

## 5.3. Equipment Model(s) and Serial Number(s)

| Type | Description | Manufacturer | Model | Serial no. | Delivery Date |
|---|---|---|---|---|---|
| EUT | 802.11 a/b/g/n SDIO dual band 2.4G/5GHz WLAN with BT/BLE | HP Inc | Model: HP Inc.'s VCVRA-1712 Part numbers: 0960-4025 and 0960-4034 | D80F99748D64, D80F99748D68 | 12th June 2017 |
| Support | Latitude Laptop, Linux | Dell | E6410 | 654C3Q1 | 12th June 2017 |
| Support | STYX SD Adapter Board | HP Inc | AB_W8977_STYX_ADAPTER_V1 | - | 12th June 2017 |

The product is available as 2 model variants;-

0960-4025 has U.FL connectors to enable connection to external antennas.

0960-4034 has integral antennas only.

## 5.4. Antenna Details

| Type | Manufacturer | Model | Family | Gain (dBi) | BF Gain | Dir BW | X-Pol | Frequency Band (MHz) |
|---|---|---|---|---|---|---|---|---|
| integral | HP | Integral | 5 | 2.5 | - | 360 | - | 2400 - 2483.5 |
| external | YAGEO | ANTX300P002B24553 | 5 | 0.7 | - | 360 | - | 2400 - 2483.5 |

BF Gain - Beamforming Gain
Dir BW - Directional BeamWidth
X-Pol - Cross Polarization

## 5.5. Cabling and I/O Ports

| Port Type | Max Cable Length | # of Ports | Screened | Conn Type | Data Type | Bit Rate |
|---|---|---|---|---|---|---|
| 24 | 5 | 1 | -- | SD | Data | 10/100 |

## 5.6. Test Configurations

Results for the following configurations are provided in this report:

| Operational Mode(s) (802.11a/b/g/n/ac) | Data Rate with Highest Power MBit/s | Channel Frequency (MHz) | | |
|---|---|---|---|---|
| | | Low | Mid | High |
| **2400 - 2483.5 MHz** | | | | |
| DH1 | 1 | 2,402.00 | 2,440.00 | 2,480.00 |
| DH5 | 3 | 2,402.00 | 2,440.00 | 2,480.00 |

## 5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:
1. NONE

## 5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:
1. NONE

# 6. TEST SUMMARY

List of Measurements

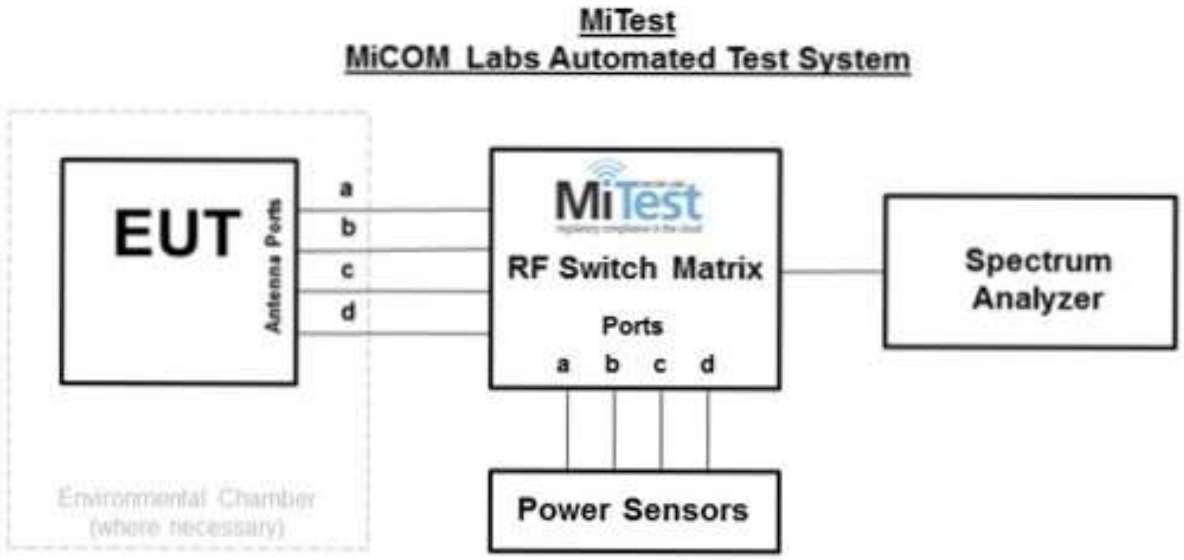
| Test Header | Result | Data Link |
|---|---|---|
| 20 dB & 99% Bandwidth | Complies | View Data |
| Frequency Hopping Tests | Complies | - |
| Number of Hopping Channels | Complies | View Data |
| Channel Separation | Complies | View Data |
| Dwell Time | Complies | View Data |
| Channel Occupancy | Complies | View Data |
| Output Power | Complies | View Data |
| Emissions | Complies | - |
| (1) Conducted Emissions | Complies | - |
| (i) Conducted Unwanted Spurious Emissions | Complies | View Data |
| (ii) Conducted Band-Edge Emissions | Complies | View Data |
| (2) Radiated Emissions | Complies | - |
| (i) TX Spurious & Restricted Band Emissions | Complies | View Data |
| (ii) Restricted Edge & Band-Edge Emissions | Complies | View Data |
| (3) Digital Emissions (0.03 - 1 GHz) | Complies | View Data |
| (4) AC Wireline Emissions | Not Applicable | See Note 1 |

Note 1: EUT is DC Powered.

# 7. TEST EQUIPMENT CONFIGURATION(S)

## 7.1. Conducted

Conducted RF Emission Test Set-up(s) The following tests were performed using the conducted test set-up shown in the diagram below.




**Conducted Test Measurement Setup**

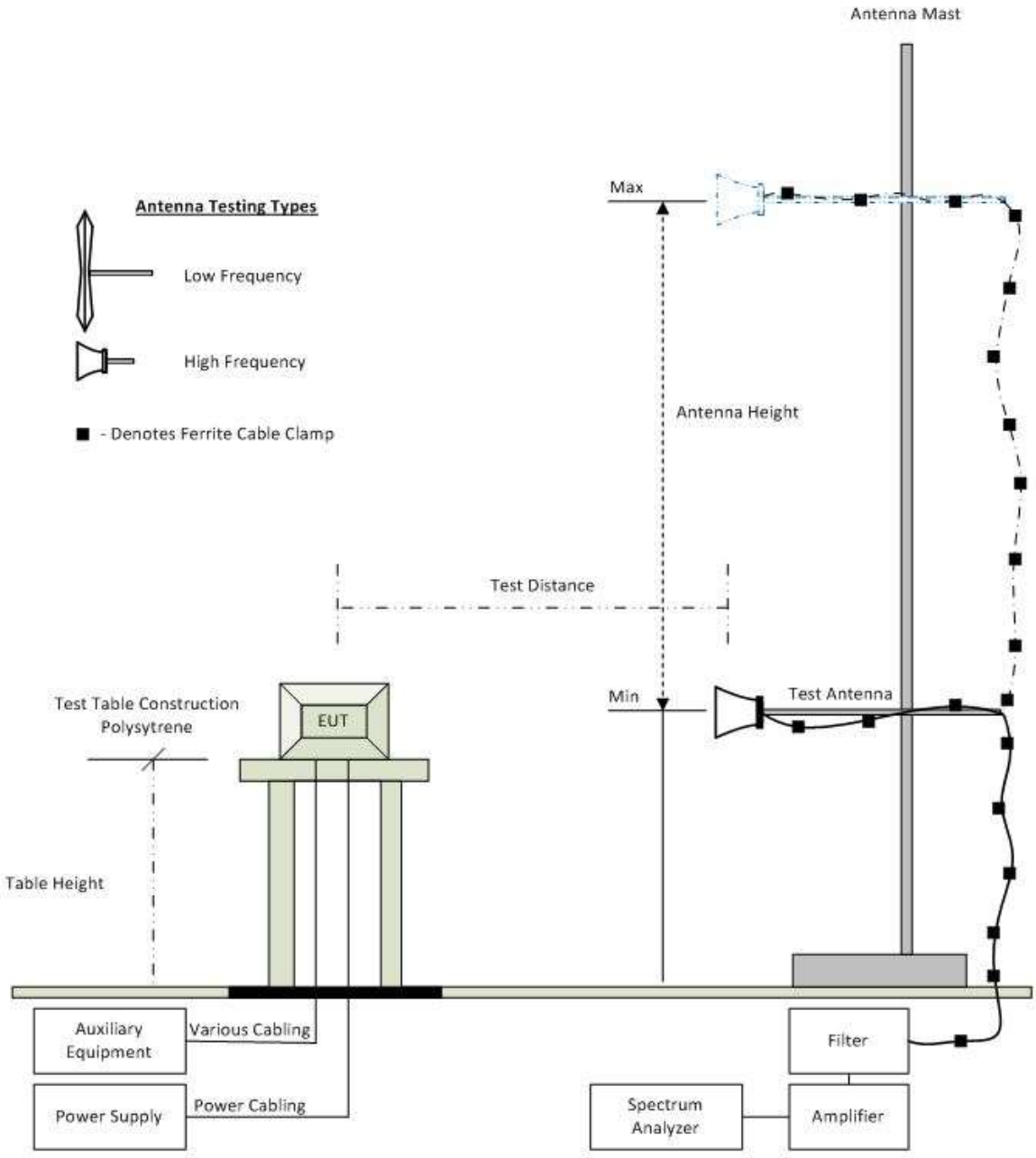
A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

| Asset# | Description | Manufacturer | Model# | Serial# | Calibration Due Date |
|---|---|---|---|---|---|
| #3 SA | MiTest Box to SA | Fairview Microwave | SCA1814-0101-72 | #3 SA | 2 Oct 2017 |
| #3P1 | EUT to MiTest box port 1 | Fairview Microwave | SCA1814-0101-72 | #3P1 | 2 Oct 2017 |
| #3P2 | EUT to MiTest box port 2 | Fairview Microwave | SCA1814-0101-72 | #3P2 | 2 Oct 2017 |
| #3P3 | EUT to MiTest box port 3 | Fairview Microwave | SCA1814-0101-72 | #3P3 | 2 Oct 2017 |
| #3P4 | EUT to MiTest box port 4 | Fairview Microwave | SCA1812-0101-72 | #3P4 | 2 Oct 2017 |
| 158 | Barometer/Thermometer | Control Company | 4196 | E2846 | 30 Nov 2017 |
| 249 | Resistance Thermometer | Thermotronics | GR2105-02 | 9340 #2 | 23 Oct 2017 |

| | | | | | |
|---|---|---|---|---|---|
| 287 | Rohde & Schwarz 40 GHz Receiver | Rhode & Schwarz | ESIB40 | 100201 | 2 May 2018 |
| 361 | Desktop for RF#1, Labview Software installed | Dell | Vostro 220 | WS RF#1 | Not Required |
| 378 | Rohde & Schwarz 40 GHz Receiver with Generator | Rhode & Schwarz | ESIB40 | 100107/040 | 4 Aug 2017 |
| 390 | USB Power Head 50MHz - 24GHz -60 to +20dBm | Agilent | U2002A | MY50000103 | 17 Oct 2017 |
| 398 | MiTest RF Conducted Test Software | MiCOM | MiTest ATS | Version 4.1 | Not Required |
| 405 | DC Power Supply 0-60V | Agilent | 6654A | MY4001826 | Cal when used |
| 408 | USB to GPIB interface | National Instruments | GPIB-USB HS | 14C0DE9 | Not Required |
| 436 | USB Wideband Power Sensor | Boonton | 55006 | 8731 | 14 Sep 2017 |
| 441 | USB Wideband Power Sensor | Boonton | 55006 | 9179 | 25 Sep 2017 |
| 443 | 4x4 RF Switch Box | MiCOM Labs | MiTest 4X4 RF Switch Box | MIC003 | 2 Oct 2017 |
| 445 | PoE Injector | D-Link | DPE-101GL | QTAH1E2000625 | Not Required |
| 75 | Environmental Chamber | Thermatron | SE-300-2-2 | 27946 | 24 Nov 2017 |

## 7.2. Radiated Emissions - 3m Chamber

The following tests were performed using the radiated test set-up shown in the diagram below.
Radiated emissions below 1GHz. Radiated Emissions above 1GHz.




**Radiated Emission Test Setup**

A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

| Asset# | Description | Manufacturer | Model# | Serial# | Calibration Due Date |
|---|---|---|---|---|---|
| 158 | Barometer/Thermometer | Control Company | 4196 | E2846 | 30 Nov 2017 |
| 170 | Video System Controller for Semi Anechoic Chamber | Panasonic | WV-CU101 | 04R08507 | Not Required |
| 287 | Rohde & Schwarz 40 GHz Receiver | Rhode & Schwarz | ESIB40 | 100201 | 2 May 2018 |
| 301 | 5470 to 5725 MHz Notch Filter | Microtronics | RBC50704 | 001 | 30 Oct 2017 |
| 302 | 5150 to 5350 MHz Notch Filter | Microtronics | BRC50703 | 002 | 30 Oct 2017 |
| 303 | 5725 to 5875 MHz Notch filter | Microtronics | BRC50705 | 003 | 30 Oct 2017 |
| 330 | Variac 0-280 Vac | Staco Energy Co | 3PN1020B | 0546 | Cal when used |
| 338 | Sunol 30 to 3000 MHz Antenna | Sunol | JB3 | A052907 | 30 Oct 2017 |
| 341 | 900MHz Notch Filter | EWT | EWT-14-0199 | H1 | 30 Oct 2017 |
| 342 | 2.4 GHz Notch Filter | EWT | EWT-14-0203 | H1 | 30 Oct 2017 |
| 343 | 5.15 GHz Notch Filter | EWT | EWT-14-0200 | H1 | 30 Oct 2017 |
| 344 | 5.35 GHz Notch Filter | EWT | EWT-14-0201 | H1 | 30 Oct 2017 |
| 345 | 5.46 GHz Notch Filter | EWT | EWT-14-0202 | H1 | 30 Oct 2017 |
| 373 | 26III RMS Multimeter | Fluke | Fluke 26 series III | 76080720 | 26 Oct 2017 |
| 378 | Rohde & Schwarz 40 GHz Receiver with Generator | Rhode & Schwarz | ESIB40 | 100107/040 | 4 Nov 2017 |
| 393 | DC - 1050 MHz Low Pass Filter | Microcircuits | VLFX-1050 | N/A | 30 Oct 2017 |
| 396 | 2.4 GHz Notch Filter | Microtronics | BRM50701 | 001 | 30 Oct 2017 |
| 397 | Amp 10 - 2500MHz | MiCOM Labs | Amp 10 - 2500 MHz | NA | 9 Oct 2017 |
| 399 | ETS 1-18 GHz Horn Antenna | ETS | 3117 | 00154575 | 10 Oct 2017 |
| 406 | Amplifier for Radiated Emissions | MiCOM Labs | 40dB 1 to 18GHz Amp | 0406 | 9 Oct 2017 |
| 410 | Desktop Computer | Dell | Inspiron 620 | WS38 | Not Required |
| 411 | Mast/Turntable Controller | Sunol Sciences | SC98V | 060199-1D | Not Required |
| 412 | USB to GPIB Interface | National Instruments | GPIB-USB HS | 11B8DC2 | Not Required |
| 413 | Mast Controller | Sunol Science | TWR95-4 | 030801-3 | Not Required |
| 414 | DC Power Supply 0-60V | HP | 6274 | 1029A01285 | Cal when used |

| | | | | | |
|---|---|---|---|---|---|
| 415 | Turntable Controller | Sunol Sciences | Turntable Controller | None | Not Required |
| 416 | Gigabit ethernet filter | ETS-Lingren | Gigafoil 260366 | None | Not Required |
| 447 | MiTest Rad Emissions Test Software | MiCOM | Rad Emissions Test Software Version 1.0 | 447 | Not Required |
| 462 | Schwarzbeck cable from Antenna to Amplifier. | Schwarzbeck | AK 9513 | 462 | 30 Oct 2017 |
| 463 | Schwarzbeck cable from Amplifier to Bulkhead. | Schwarzbeck | AK 9513 | 463 | 30 Oct 2017 |
| 464 | Schwarzbeck cable from Bulkhead to Receiver | Schwarzbeck | AK 9513 | 464 | 30 Oct 2017 |
| 480 | Cable - Bulkhead to Amp | SRC Haverhill | 157-3050360 | 480 | 30 Oct 2017 |
| 481 | Cable - Bulkhead to Receiver | SRC Haverhill | 151-3050787 | 481 | 30 Oct 2017 |
| 482 | Cable - Amp to Antenna | SRC Haverhill | 157-3051574 | 482 | 30 Oct 2017 |
| 87 | Uninterruptible Power Supply | Falcon Electric | ED2000-1/2LC | F3471 02/01 | Cal when used |
| VLF-1700 | Low pass filter DC-1700 MHz | Mini Circuits | VLF-1700 | None | 30 Oct 2017 |

# 8. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by MiTest. MiTest is an automated test system developed by MiCOM Labs. MiTest is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.


The MiCOM Labs "MiTest" Automated Test System" (Patent Pending)

# 9. TEST RESULTS

## 20 dB & 99% Bandwidth

| Conducted Test Conditions for 20 dB and 99% Bandwidth | | | |
|---|---|---|---|
| **Standard:** | FCC CFR 47:15.247 | **Ambient Temp. (ºC):** | 24.0 - 27.5 |
| **Test Heading:** | 20 dB and 99 % Bandwidth | **Rel. Humidity (%):** | 32 - 45 |
| **Standard Section(s):** | 15.247 (a)(1)(i)/(ii) | **Pressure (mBars):** | 999 - 1001 |
| **Reference Document(s):** | See Normative References | | |

**Test Procedure for 20 dB and 99% Bandwidth Measurement**

The bandwidth at 20 dB and 99 % was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

Testing was performed under ambient conditions at nominal voltage. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

**Limits for 20 dB and 99% Bandwidth**

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(ii) Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

**Equipment Configuration for 20 dB 99% Bandwidth**

| | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Duty Cycle (%):** | 99 |
| **Data Rate:** | 1.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Test Frequency | Measured 20 dB Bandwidth (MHz) Port(s) | | | | 20 dB Bandwidth (MHz) | | Limit | Lowest Margin |
|---|---|---|---|---|---|---|---|---|
| MHz | a | b | c | d | Highest | Lowest | MHz | MHz |
| 2402.0 | 1.110 | | | | 1.110 | 1.110 | | -- |
| 2440.0 | 1.118 | | | | 1.118 | 1.118 | | -- |
| 2480.0 | 1.114 | | | | 1.114 | 1.114 | | -- |

| Test Frequency | Measured 99% Bandwidth (MHz) Port(s) | | | | Maximum 99% Bandwidth (MHz) | | |
|---|---|---|---|---|---|---|---|
| MHz | a | b | c | d | | | |
| 2402.0 | 0.946 | | | | 0.946 | | |
| 2440.0 | 0.962 | | | | 0.962 | | |
| 2480.0 | 0.946 | | | | 0.946 | | |

| **Traceability to Industry Recognized Test Methodologies** | |
|---|---|
| Work Instruction: | WI-03 MEASURING RF SPECTRUM MASK |
| Measurement Uncertainty: | ±2.81 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for 20 dB 99% Bandwidth | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Duty Cycle (%):** | 99 |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Test Frequency | Measured 20 dB Bandwidth (MHz) Port(s) | | | | 20 dB Bandwidth (MHz) | | Limit | Lowest Margin |
|---|---|---|---|---|---|---|---|---|
| MHz | a | b | c | d | Highest | Lowest | MHz | MHz |
| 2402.0 | 1.383 | | | | 1.383 | 1.383 | | -- |
| 2440.0 | 1.383 | | | | 1.383 | 1.383 | | -- |
| 2480.0 | 1.391 | | | | 1.391 | 1.391 | | -- |

| Test Frequency | Measured 99% Bandwidth (MHz) Port(s) | | | | Maximum 99% Bandwidth (MHz) | | |
|---|---|---|---|---|---|---|---|
| MHz | a | b | c | d | | | |
| 2402.0 | 1.222 | | | | 1.222 | | |
| 2440.0 | 1.222 | | | | 1.222 | | |
| 2480.0 | 1.222 | | | | 1.222 | | |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-03 MEASURING RF SPECTRUM MASK |
| Measurement Uncertainty: | ±2.81 dB |

Note: click the links in the above matrix to view the graphical image (plot).

## 9.1. Frequency Hopping Tests

| Conducted Test Conditions for Frequency Hopping Measurements | | | |
|---|---|---|---|
| **Standard:** | FCC CFR 47:15.247 | **Ambient Temp. (ºC):** | 24.0 - 27.5 |
| **Test Heading:** | Frequency Hopping Tests | **Rel. Humidity (%):** | 32 - 45 |
| **Standard Section(s):** | 15.247 (a)(1)(i)/(ii) | **Pressure (mBars):** | 999 - 1001 |
| **Reference Document(s):** | See Normative References, FCC Public Notice DA 00-705 | | |

**Test Procedure for Frequency Hopping Measurements**

These tests cover the following measurements:

i) channel separation
ii) channel occupancy
iii) dwell time
iv) number of hopping frequencies

Frequency hopping testing was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency or hopping mode.

Testing was performed under ambient conditions at nominal voltage. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

**Limits for Frequency Hopping Measurements**

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(ii) Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

(iii) Frequency 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.

### 9.1.1. Number of Hopping Channels

| Equipment Configuration for Number of Hopping Channels | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Antenna:** | Not Applicable |
| **Data Rate:** | 1.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **Duty Cycle (%):** | 99.0 | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Frequency Range (MHz) | Number of Hopping Channels | Limit | Pass / Fail |
|---|---|---|---|
| 2400.0-2428.0 | 27 | -- | -- |
| 2428.0-2456.0 | 26 | -- | -- |
| 2456.0-2483.5 | 24 | -- | -- |
| **Total number of Hops** | 78 | **15** | **Pass** |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-03 MEASURING RF SPECTRUM MASK |
| Measurement Uncertainty: | ±2.81 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Number of Hopping Channels | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Antenna:** | Not Applicable |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **Duty Cycle (%):** | 99.0 | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Frequency Range (MHz) | Number of Hopping Channels | Limit | Pass / Fail |
|---|---|---|---|
| 2400.0-2428.0 | 27 | -- | -- |
| 2428.0-2456.0 | 26 | -- | -- |
| 2456.0-2483.5 | 25 | -- | -- |
| **Total number of Hops** | **78** | **15** | **Pass** |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-03 MEASURING RF SPECTRUM MASK |
| Measurement Uncertainty: | ±2.81 dB |

Note: click the links in the above matrix to view the graphical image (plot).

### 9.1.2. Channel Separation

| Equipment Configuration for Channel Separation | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Antenna:** | Not Applicable |
| **Data Rate:** | 1.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **Duty Cycle (%):** | 99.0 | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Center Frequency (MHz) | Chan Separation (MHz) | Limit (MHz) | Pass / Fail |
|---|---|---|---|
| 2440.0 | 1.00 | 0.642 | Pass |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-03 MEASURING RF SPECTRUM MASK |
| Measurement Uncertainty: | ±2.81 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Channel Separation | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Antenna:** | Not Applicable |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **Duty Cycle (%):** | 99.0 | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Center Frequency (MHz) | Chan Separation (MHz) | Limit (MHz) | Pass / Fail |
|---|---|---|---|
| 2440.0 | 1.004 | 0.814 | Pass |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-03 MEASURING RF SPECTRUM MASK |
| Measurement Uncertainty: | ±2.81 dB |

Note: click the links in the above matrix to view the graphical image (plot).

### 9.1.3. Dwell Time & Channel Occupancy

| | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Antenna:** | Not Applicable |
| **Data Rate:** | 1.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **Duty Cycle (%):** | 99.0 | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Channel Frequency(MHz) | Dwell Time (Single Burst) (uS) | Channel Occupancy (mS) | Observation Period (S) | Channel Occupancy Limit (mS) | Pass / Fail |
|---|---|---|---|---|---|
| 2440 | 405.814 | 1.620 | 0.40 | 400.000 | Pass |

| **Traceability to Industry Recognized Test Methodologies** | |
|---|---|
| Work Instruction: | |
| Measurement Uncertainty: | |

| | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Antenna:** | Not Applicable |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **Duty Cycle (%):** | 99.0 | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Channel Frequency(MHz) | Dwell Time (Single Burst) (S) | Channel Occupancy (mS) | Observation Period (S) | Channel Occupancy Limit (mS) | Pass / Fail |
|---|---|---|---|---|---|
| 2440 | 0.002840 | 5.680 | 0.40 | 400.000 | Pass |

| **Traceability to Industry Recognized Test Methodologies** | |
|---|---|
| Work Instruction: | |
| Measurement Uncertainty: | |

Note: click the links in the above matrix to view the graphical image (plot).

## 9.2. Output Power

| Conducted Test Conditions for Fundamental Emission Output Power | | | |
|---|---|---|---|
| **Standard:** | FCC CFR 47:15.247 | **Ambient Temp. (ºC):** | 24.0 - 27.5 |
| **Test Heading:** | Output Power | **Rel. Humidity (%):** | 32 - 45 |
| **Standard Section(s):** | 15.247 (a)(1), (b)(1)/(2)/(3) | **Pressure (mBars):** | 999 - 1001 |
| **Reference Document(s):** | See Normative References | | |

**Test Procedure for Fundamental Emission Output Power Measurement**

In the case of average power measurements an average power sensor was utilized.

For peak power measurements the spectrum analyzer built-in power function was used to integrate peak power over the 20 dB bandwidth.

Testing was performed under ambient conditions, nominal voltage. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured, summed (Σ) and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.
Supporting Information
Calculated Power = A + G + Y+ 10 log (1/x) dBm

A = Total Power [10*Log10 ($10^{a/10}$ + $10^{b/10}$ + $10^{c/10}$ + $10^{d/10}$)]
G = Antenna Gain
Y = Beamforming Gain
x = Duty Cycle (average power measurements only)

**Limits for Fundamental Emission Output Power**

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following for frequency hopping systems:

(1) 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.

(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and

antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

| Equipment Configuration for Output Power Peak | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 1.00 MBit/s | **Antenna Gain (dBi):** | 0.70 |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Test Frequency | Measured Output Power (dBm) Port(s) | | | | Calculated Total Power Σ Port(s) | Limit | Margin | EUT Power Setting |
|---|---|---|---|---|---|---|---|---|
| MHz | a | b | c | d | dBm | dBm | dB | |
| **2402.0** | 6.21 | | | | 6.21 | 30.00 | -23.79 | 10.00 |
| **2440.0** | 6.57 | | | | 6.57 | 30.00 | -23.43 | 9.00 |
| **2480.0** | 7.25 | | | | 7.25 | 30.00 | -22.75 | 8.00 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-01 MEASURING RF OUTPUT POWER |
| Measurement Uncertainty: | ±1.33 dB |

The above measurements are true pulse readings and therefore a Duty Cycling correction factor is not required.

| Equipment Configuration for Output Power Peak | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | 0.70 |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Test Frequency | Measured Output Power (dBm) Port(s) | | | | Calculated Total Power Σ Port(s) | Limit | Margin | EUT Power Setting |
|---|---|---|---|---|---|---|---|---|
| MHz | a | b | c | d | dBm | dBm | dB | |
| **2402.0** | 5.58 | | | | 5.58 | 30.00 | -24.42 | 10.00 |
| **2440.0** | 5.43 | | | | 5.43 | 30.00 | -24.57 | 10.00 |
| **2480.0** | 5.40 | | | | 5.40 | 30.00 | -24.60 | 10.00 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-01 MEASURING RF OUTPUT POWER |
| Measurement Uncertainty: | ±1.33 dB |

The above measurements are true pulse readings and therefore a Duty Cycling correction factor is not required.

## 9.3. Emissions

### 9.3.1. Conducted Emissions

| Conducted Test Conditions for Transmitter Conducted Spurious and Band-Edge Emissions | | | |
|---|---|---|---|
| **Standard:** | FCC CFR 47:15.247 | **Ambient Temp. (ºC):** | 24.0 - 27.5 |
| **Test Heading:** | Transmitter Conducted Spurious and Band-Edge Emissions | **Rel. Humidity (%):** | 32 - 45 |
| **Standard Section(s):** | 15.247 (d) | **Pressure (mBars):** | 999 - 1001 |
| **Reference Document(s):** | See Normative References | | |

**Test Procedure for Transmitter Conducted Spurious and Band-Edge Emissions Measurement**

Transmitter Conducted Spurious and Band-Edge emissions were measured at a limit of 30 dBc (average detector) or 20 dBc (peak detector) below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Measurements were made while EUT was operating in transmit mode of operation at the appropriate centre frequency closest to the band-edge. Emissions were maximized during the measurement and limits derived from the peak spectral power and drawn on each plot.

Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured separately. Testing was performed under ambient conditions at nominal voltage only.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

**Limits Transmitter Conducted Spurious and Band-Edge Emissions**

(d) 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. 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)).

### 9.3.1.1. Conducted Unwanted Spurious Emissions

| Equipment Configuration for Unwanted Emissions Peak | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Duty Cycle (%):** | 99 |
| **Data Rate:** | 1.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Test Frequency | Frequency Range | Unwanted Emissions Peak (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Port a | | Port b | | Port c | | Port d | |
| MHz | MHz | SE | Limit | SE | Limit | SE | Limit | SE | Limit |
| **2402.0** | 30.0 - 26000.0 | -43.704 | -11.43 | | | | | | |
| **2440.0** | 30.0 - 26000.0 | -43.263 | -11.85 | | | | | | |
| **2480.0** | 30.0 - 26000.0 | -42.950 | -12.72 | | | | | | |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Unwanted Emissions Peak | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Duty Cycle (%):** | 99 |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| Test Frequency | Frequency Range | Unwanted Emissions Peak (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Port a | | Port b | | Port c | | Port d | |
| MHz | MHz | SE | Limit | SE | Limit | SE | Limit | SE | Limit |
| **2402.0** | 30.0 - 26000.0 | -43.190 | -13.68 | | | | | | |
| **2440.0** | 30.0 - 26000.0 | -43.125 | -19.33 | | | | | | |
| **2480.0** | 30.0 - 26000.0 | -42.872 | -16.98 | | | | | | |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

### 9.3.1.2. Conducted Band-Edge Emissions

| Equipment Configuration for Conducted Low Band-Edge Emissions (Hopping) Peak | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 1.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Channel Frequency:** | 2402.0 MHz | | | | | |
| **Band-Edge Frequency:** | 2400.0 MHz | | | | | |
| **Test Frequency Range:** | 2350.0 - 2405.0 MHz | | | | | |
| **Port(s)** | **Band-Edge Markers and Limit** | | | **Revised Limit** | | **Margin** |
| | **M1 Amplitude (dBm)** | **Plot Limit (dBm)** | **M2 Frequency (MHz)** | **Amplitude (dBm)** | **M2A Frequency (MHz)** | **(MHz)** |
| **a** | -47.89 | -10.60 | 2401.50 | | | -1.500 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Conducted Low Band-Edge Emissions (Hopping) Peak | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Channel Frequency:** | 2402.0 MHz | | | | | |
| **Band-Edge Frequency:** | 2400.0 MHz | | | | | |
| **Test Frequency Range:** | 2350.0 - 2405.0 MHz | | | | | |
| **Port(s)** | **Band-Edge Markers and Limit** | | | **Revised Limit** | | **Margin** |
| | **M1 Amplitude (dBm)** | **Plot Limit (dBm)** | **M2 Frequency (MHz)** | **Amplitude (dBm)** | **M2A Frequency (MHz)** | **(MHz)** |
| **a** | -49.36 | -13.53 | 2401.80 | | | -1.800 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Conducted Low Band-Edge Emissions (Static) Peak | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Channel Frequency:** | 2402.0 MHz | | | | | |
| **Band-Edge Frequency:** | 2400.0 MHz | | | | | |
| **Test Frequency Range:** | 2350.0 - 2405.0 MHz | | | | | |
| **Port(s)** | **Band-Edge Markers and Limit** | | | **Revised Limit** | | **Margin** |
| | **M1 Amplitude (dBm)** | **Plot Limit (dBm)** | **M2 Frequency (MHz)** | **Amplitude (dBm)** | **M2A Frequency (MHz)** | **(MHz)** |
| **a** | -42.15 | -10.70 | 2401.40 | | | -1.400 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Conducted Low Band-Edge Emissions (Static) Peak | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Channel Frequency:** | 2402.0 MHz | | | | | |
| **Band-Edge Frequency:** | 2400.0 MHz | | | | | |
| **Test Frequency Range:** | 2350.0 - 2405.0 MHz | | | | | |
| **Port(s)** | **Band-Edge Markers and Limit** | | | **Revised Limit** | | **Margin** |
| | **M1 Amplitude (dBm)** | **Plot Limit (dBm)** | **M2 Frequency (MHz)** | **Amplitude (dBm)** | **M2A Frequency (MHz)** | **(MHz)** |
| **a** | -39.88 | -13.51 | 2401.30 | | | -1.300 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Conducted Upper Band-Edge Emissions (Hopping) Peak | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 1.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Channel Frequency:** | 2480.0 MHz | | | | | |
| **Band-Edge Frequency:** | 2483.5 MHz | | | | | |
| **Test Frequency Range:** | 2478.0 - 2534.0 MHz | | | | | |
| **Port(s)** | **Band-Edge Markers and Limit** | | | **Revised Limit** | | **Margin** |
| | **M3 Amplitude (dBm)** | **Plot Limit (dBm)** | **M2 Frequency (MHz)** | **Amplitude (dBm)** | **M2A Frequency (MHz)** | **(MHz)** |
| **a** | -49.09 | -11.61 | 2480.40 | | | -3.100 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Conducted Upper Band-Edge Emissions (Hopping) Peak | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Channel Frequency:** | 2480.0 MHz | | | | | |
| **Band-Edge Frequency:** | 2483.5 MHz | | | | | |
| **Test Frequency Range:** | 2478.0 - 2534.0 MHz | | | | | |
| **Port(s)** | **Band-Edge Markers and Limit** | | | **Revised Limit** | | **Margin** |
| | **M3 Amplitude (dBm)** | **Plot Limit (dBm)** | **M2 Frequency (MHz)** | **Amplitude (dBm)** | **M2A Frequency (MHz)** | **(MHz)** |
| **a** | -48.96 | -14.48 | 2480.50 | | | -3.000 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Conducted Upper Band-Edge Emissions (Static) Peak | | | |
|---|---|---|---|
| **Variant:** | DH1 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 1.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Channel Frequency:** | 2480.0 MHz | | | | | |
| **Band-Edge Frequency:** | 2483.5 MHz | | | | | |
| **Test Frequency Range:** | 2478.0 - 2533.0 MHz | | | | | |
| **Port(s)** | **Band-Edge Markers and Limit** | | | **Revised Limit** | | **Margin** |
| | **M3 Amplitude (dBm)** | **Plot Limit (dBm)** | **M2 Frequency (MHz)** | **Amplitude (dBm)** | **M2A Frequency (MHz)** | **(MHz)** |
| **a** | -48.17 | -11.56 | 2480.50 | | | -3.000 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

| Equipment Configuration for Conducted Upper Band-Edge Emissions (Static) Peak | | | |
|---|---|---|---|
| **Variant:** | DH5 | **Duty Cycle (%):** | 99.0 |
| **Data Rate:** | 3.00 MBit/s | **Antenna Gain (dBi):** | Not Applicable |
| **Modulation:** | FHSS | **Beam Forming Gain (Y)(dB):** | Not Applicable |
| **TPC:** | Not Applicable | **Tested By:** | SB |
| **Engineering Test Notes:** | | | |

**Test Measurement Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Channel Frequency:** | 2480.0 MHz | | | | | |
| **Band-Edge Frequency:** | 2483.5 MHz | | | | | |
| **Test Frequency Range:** | 2478.0 - 2533.0 MHz | | | | | |
| **Port(s)** | **Band-Edge Markers and Limit** | | | **Revised Limit** | | **Margin** |
| | **M3 Amplitude (dBm)** | **Plot Limit (dBm)** | **M2 Frequency (MHz)** | **Amplitude (dBm)** | **M2A Frequency (MHz)** | **(MHz)** |
| **a** | -47.77 | -14.43 | 2480.60 | | | -2.900 |

| Traceability to Industry Recognized Test Methodologies | |
|---|---|
| Work Instruction: | WI-05 MEASUREMENT OF SPURIOUS EMISSIONS |
| Measurement Uncertainty: | <=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB |

Note: click the links in the above matrix to view the graphical image (plot).

### 9.3.2. Radiated Emissions

| Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions (Restricted Bands) | | | |
|---|---|---|---|
| **Standard:** | FCC CFR 47:15.247 | **Ambient Temp. (ºC):** | 20.0 - 24.5 |
| **Test Heading:** | Radiated Spurious and Band-Edge Emissions | **Rel. Humidity (%):** | 32 - 45 |
| **Standard Section(s):** | 15.205, 15.209 | **Pressure (mBars):** | 999 - 1001 |
| **Reference Document(s):** | See Normative References | | |

**Test Procedure for Radiated Spurious and Band-Edge Emissions** (Restricted Bands)

Radiated emissions for restricted bands above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned. Measurements on any restricted band frequency or frequencies above 1 GHz are based on the use of measurement instrumentation employing peak and average detectors. All measurements were performed using a resolution bandwidth of 1 MHz.

Test configuration and setup for Radiated Spurious and Band-Edge Measurement were per the Radiated Test Set-up specified in this document.

Limits for Restricted Bands
Peak emission: 74 dBuV/m
Average emission: 54 dBuV/m

Field Strength Calculation
The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.
FS = R + AF + CORR - FO

where:
FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

Example:
Given receiver input reading of 51.5 dBmV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength (FS) of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBmV/m

Conversion between dBmV/m (or dBmV) and mV/m (or mV) are as follows:
Level (dBmV/m) = 20 * Log (level (mV/m))

40 dBmV/m = 100 mV/m
48 dBmV/m = 250 mV/m
**Restricted Bands of Operation (15.205)**

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| Frequency Band | | | |
|---|---|---|---|
| **MHz** | **MHz** | **MHz** | **GHz** |
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | | | |

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this section:

(1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle.

(2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.

(3) Cable locating equipment operated pursuant to §15.213.

(4) Any equipment operated under the provisions of §15.253, 15.255, and 15.256 in the frequency band 75-85 GHz, or §15.257 of this part.

(5) Biomedical telemetry devices operating under the provisions of §15.242 of this part are not subject to the restricted band 608-614 MHz but are subject to compliance within the other restricted bands.

(6) Transmitters operating under the provisions of subparts D or F of this part.

(7) Devices operated pursuant to §15.225 are exempt from complying with this section for the 13.36-13.41 MHz band only.

(8) Devices operated in the 24.075-24.175 GHz band under §15.245 are exempt from complying with the requirements of this section for the 48.15-48.35 GHz and 72.225-72.525 GHz bands only, and shall not exceed the limits specified in §15.245(b).

(9) Devices operated in the 24.0-24.25 GHz band under §15.249 are exempt from complying with the requirements of this section for the 48.0-48.5 GHz and 72.0-72.75 GHz bands only, and shall not exceed the limits specified in §15.249(a).

(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).

### 9.3.2.3. TX Spurious & Restricted Band Emissions

| Equipment Configuration for TX Spurious & Restricted Band Emissions | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2402.00 | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2245.90 | 64.11 | 2.64 | -12.14 | 54.61 | Max Peak | Vertical | 142 | 269 | 74.0 | -19.4 | Pass |
| #2 | 2245.90 | 36.98 | 2.64 | -12.14 | 27.48 | Max Avg | Vertical | 142 | 269 | 54.0 | -26.5 | Pass |
| #3 | 4803.81 | 58.61 | 3.51 | -11.12 | 51.00 | Max Peak | Horizontal | 117 | 356 | 74.0 | -23.0 | Pass |
| #4 | 4803.81 | 45.66 | 3.51 | -11.12 | 38.05 | Max Avg | Horizontal | 117 | 356 | 54.0 | -16.0 | Pass |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for TX Spurious & Restricted Band Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2440.00 | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 9 | **Tested By:** | JMH |

**Test Measurement Results**

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2441.06 | 52.84 | 2.72 | -11.72 | 43.84 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| #2 | 4882.10 | 60.13 | 3.63 | -11.26 | 52.50 | Max Peak | Horizontal | 114 | 353 | 74.0 | -21.5 | Pass |
| #3 | 4882.10 | 47.14 | 3.63 | -11.26 | 39.51 | Max Avg | Horizontal | 114 | 353 | 54.0 | -14.5 | Pass |
| #4 | 7323.04 | 55.43 | 4.26 | -7.26 | 52.43 | Max Peak | Vertical | 101 | 351 | 74.0 | -21.6 | Pass |
| #5 | 7323.04 | 41.32 | 4.26 | -7.26 | 38.32 | Max Avg | Vertical | 101 | 351 | 54.0 | -15.7 | Pass |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for TX Spurious & Restricted Band Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2480.00 | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 8 | **Tested By:** | JMH |

**Test Measurement Results**

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2479.81 | 52.50 | 2.72 | -11.65 | 43.57 | Fundamental | Horizontal | 150 | 0 | -- | -- | |
| #2 | 4959.65 | 62.54 | 3.57 | -11.48 | 54.63 | Max Peak | Horizontal | 109 | 352 | 74.0 | -19.4 | Pass |
| #3 | 4959.65 | 48.29 | 3.57 | -11.48 | 40.38 | Max Avg | Horizontal | 109 | 352 | 54.0 | -13.6 | Pass |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for TX Spurious & Restricted Band Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2446.02 | 54.89 | 2.71 | -11.70 | 45.90 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| #2 | 4958.24 | 63.08 | 3.57 | -11.48 | 55.17 | Max Peak | Horizontal | 98 | 0 | 74.0 | -18.8 | Pass |
| #3 | 4958.24 | 37.35 | 3.57 | -11.48 | 29.44 | Max Avg | Horizontal | 98 | 0 | 54.0 | -24.6 | Pass |
| #4 | 7326.47 | 55.57 | 4.27 | -7.26 | 52.58 | Max Peak | Vertical | 123 | 354 | 74.0 | -21.4 | Pass |
| #5 | 7326.47 | 35.05 | 4.27 | -7.26 | 32.06 | Max Avg | Vertical | 123 | 354 | 54.0 | -21.9 | Pass |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

| Equipment Configuration for TX Spurious & Restricted Band Emissions | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2402.00 | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

| Test Measurement Results |
|---|
| Click here to view measurement data... |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. |

**Equipment Configuration for TX Spurious & Restricted Band Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2440.00 | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2440.95 | 51.50 | 2.72 | -11.72 | 42.50 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| #2 | 4881.70 | 59.01 | 3.62 | -11.26 | 51.37 | Max Peak | Horizontal | 114 | 355 | 74.0 | -22.6 | Pass |
| #3 | 4881.70 | 49.72 | 3.62 | -11.26 | 42.08 | Max Avg | Horizontal | 114 | 355 | 54.0 | -11.9 | Pass |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for TX Spurious & Restricted Band Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2480.00 | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2479.86 | 49.56 | 2.72 | -11.65 | 40.63 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| #2 | 4959.88 | 62.41 | 3.57 | -11.48 | 54.50 | Max Peak | Horizontal | 116 | 353 | 74.0 | -19.5 | Pass |
| #3 | 4959.88 | 53.90 | 3.57 | -11.48 | 45.99 | Max Avg | Horizontal | 116 | 353 | 54.0 | -8.0 | Pass |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for TX Spurious & Restricted Band Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2441.40 | 50.36 | 2.72 | -11.72 | 41.36 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| #2 | 4953.28 | 57.47 | 3.55 | -11.47 | 49.55 | Max Peak | Horizontal | 167 | 358 | 74.0 | -24.5 | Pass |
| #3 | 4953.28 | 39.19 | 3.55 | -11.47 | 31.27 | Max Avg | Horizontal | 167 | 358 | 54.0 | -22.7 | Pass |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. Hopping | | | | | | | | | | | | |

| Equipment Configuration for TX Spurious & Restricted Band Emissions | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2402.00 | **Data Rate:** | 1.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

| Test Measurement Results |
|---|
| Click here to view measurement data... |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload |

| Equipment Configuration for TX Spurious & Restricted Band Emissions | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2440.00 | **Data Rate:** | 1.00 MBit/s |
| **Power Setting:** | 9 | **Tested By:** | JMH |

| Test Measurement Results |
|---|
| Click here to view measurement data... |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload |

| Equipment Configuration for TX Spurious & Restricted Band Emissions | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2480.00 | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 8 | **Tested By:** | JMH |

| Test Measurement Results |
|---|
| Click here to view measurement data... |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload |

| Equipment Configuration for TX Spurious & Restricted Band Emissions | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping | **Data Rate:** | 1.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

| Test Measurement Results |
|---|
| Click here to view measurement data... |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload |

| Equipment Configuration for TX Spurious & Restricted Band Emissions | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2402.00 | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

| Test Measurement Results |
|---|
| Click here to view measurement data... |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload. |

**Equipment Configuration for TX Spurious & Restricted Band Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2440.00 | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 1728.16 | 64.02 | 2.45 | -14.71 | 51.76 | Peak (NRB) | Horizontal | 150 | 360 | -- | -- | Pass |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload. | | | | | | | | | | | | |

| Equipment Configuration for TX Spurious & Restricted Band Emissions | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2480.00 | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

| Test Measurement Results |
|---|
| Click here to view measurement data... |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload. |

| Equipment Configuration for TX Spurious & Restricted Band Emissions | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

| Test Measurement Results |
|---|
| Click here to view measurement data... |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload. Hopping |

### 9.3.2.4. Restricted Edge & Band-Edge Emissions

| Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2402.00 | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2388.78 | 31.01 | 2.68 | 32.04 | 65.73 | Max Peak | Vertical | 156 | 357 | 74.0 | -8.3 | Pass |
| #2 | 2390.00 | 1.53 | 2.69 | 32.04 | 36.26 | Max Avg | Vertical | 156 | 357 | 54.0 | -17.7 | Pass |
| #3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping Mode | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2316.73 | 2.45 | 2.67 | 31.71 | 36.83 | Max Avg | Vertical | 156 | 357 | 54.0 | -17.2 | Pass |
| #2 | 2388.56 | 25.43 | 2.68 | 32.04 | 60.15 | Max Peak | Vertical | 156 | 357 | 74.0 | -13.9 | Pass |
| #3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. Hopping | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2402.00 | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2383.62 | 21.97 | 2.68 | 31.99 | 56.64 | Max Peak | Vertical | 156 | 357 | 74.0 | -17.4 | Pass |
| #2 | 2390.00 | 2.00 | 2.69 | 32.04 | 36.73 | Max Avg | Vertical | 156 | 357 | 54.0 | -17.3 | Pass |
| #3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping Mode | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2386.31 | 24.57 | 2.68 | 32.01 | 59.26 | Max Peak | Vertical | 156 | 357 | 74.0 | -14.7 | Pass |
| #2 | 2390.00 | 2.00 | 2.69 | 32.04 | 36.73 | Max Avg | Vertical | 156 | 357 | 54.0 | -17.3 | Pass |
| #3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. Hopping | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2402.00 | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2379.68 | 24.69 | 2.69 | 31.96 | 59.34 | Max Peak | Vertical | 195 | 361 | 74.0 | -14.7 | Pass |
| #2 | 2387.76 | 11.08 | 2.68 | 32.03 | 45.79 | Max Avg | Vertical | 195 | 361 | 54.0 | -8.2 | Pass |
| #3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping Mode | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2341.20 | 22.18 | 2.68 | 31.70 | 56.56 | Max Peak | Vertical | 195 | 361 | 74.0 | -17.4 | Pass |
| #2 | 2389.90 | 1.04 | 2.69 | 32.04 | 35.77 | Max Avg | Vertical | 195 | 361 | 54.0 | -18.2 | Pass |
| #3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. Hopping | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2402.00 | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2310.90 | 16.76 | 2.67 | 31.72 | 51.15 | Max Peak | Vertical | 195 | 361 | 74.0 | -22.9 | Pass |
| #2 | 2390.00 | 1.04 | 2.69 | 32.04 | 35.77 | Max Avg | Vertical | 195 | 361 | 54.0 | -18.2 | Pass |
| #3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping Mode | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2348.83 | 19.33 | 2.65 | 31.69 | 53.67 | Max Peak | Vertical | 195 | 361 | 74.0 | -20.3 | Pass |
| #2 | 2374.64 | 1.99 | 2.70 | 31.91 | 36.60 | Max Avg | Vertical | 195 | 361 | 54.0 | -17.4 | Pass |
| #3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. Hopping | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2480.00 | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 8 | **Tested By:** | JMH |

**Test Measurement Results**

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2483.50 | 2.46 | 2.73 | 32.37 | 37.56 | Max Avg | Vertical | 151 | 274 | 54.0 | -16.4 | Pass |
| #3 | 2502.66 | 27.62 | 2.73 | 32.40 | 62.75 | Max Peak | Vertical | 151 | 274 | 74.0 | -11.3 | Pass |
| #2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping Mode | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 8 | **Tested By:** | JMH |

**Test Measurement Results**

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #2 | 2490.93 | 27.44 | 2.74 | 32.38 | 62.56 | Max Peak | Vertical | 151 | 274 | 74.0 | -11.4 | Pass |
| #3 | 2548.95 | 2.86 | 2.75 | 32.49 | 38.10 | Max Avg | Vertical | 151 | 274 | 54.0 | -15.9 | Pass |
| #1 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. Hopping | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2480.00 | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2483.50 | 6.27 | 2.73 | 32.37 | 41.37 | Max Avg | Vertical | 151 | 274 | 54.0 | -12.6 | Pass |
| #3 | 2491.17 | 24.22 | 2.74 | 32.38 | 59.34 | Max Peak | Vertical | 151 | 274 | 74.0 | -14.7 | Pass |
| #2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | Integral | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 2.50 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping Mode | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #2 | 2484.02 | 23.41 | 2.73 | 32.37 | 58.51 | Max Peak | Vertical | 151 | 274 | 74.0 | -15.5 | Pass |
| #3 | 2534.37 | 2.45 | 2.74 | 32.46 | 37.65 | Max Avg | Vertical | 151 | 274 | 54.0 | -16.4 | Pass |
| #1 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. Hopping | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2480.00 | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2483.50 | 3.29 | 2.73 | 32.37 | 38.39 | Max Avg | Vertical | 162 | 49 | 54.0 | -15.6 | Pass |
| #3 | 2490.11 | 24.66 | 2.74 | 32.38 | 59.78 | Max Peak | Vertical | 162 | 49 | 74.0 | -14.2 | Pass |
| #2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | 8DPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping Mode | **Data Rate:** | 3.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #2 | 2487.47 | 27.23 | 2.73 | 32.37 | 62.33 | Max Peak | Vertical | 162 | 49 | 74.0 | -11.7 | Pass |
| #3 | 2520.62 | 1.53 | 2.74 | 32.44 | 36.71 | Max Avg | Vertical | 162 | 49 | 54.0 | -17.3 | Pass |
| #1 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. Hopping | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | 2480.00 | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2483.50 | 5.07 | 2.73 | 32.37 | 40.17 | Max Avg | Vertical | 162 | 49 | 54.0 | -13.8 | Pass |
| #3 | 2485.15 | 24.30 | 2.73 | 32.37 | 59.40 | Max Peak | Vertical | 162 | 49 | 74.0 | -14.6 | Pass |
| #2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. | | | | | | | | | | | | |

**Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions**

| | | | |
|---|---|---|---|
| **Antenna:** | YAGEO ANTX300P002B24553 | **Variant:** | Pi_4 DQPSK |
| **Antenna Gain (dBi):** | 0.70 | **Modulation:** | FHSS |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | 99 |
| **Channel Frequency (MHz):** | Hopping Mode | **Data Rate:** | 2.00 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

**Test Measurement Results**

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| #1 | 2483.50 | 1.54 | 2.73 | 32.37 | 36.64 | Max Avg | Vertical | 162 | 49 | 54.0 | -17.4 | Pass |
| #3 | 2485.45 | 22.20 | 2.73 | 32.37 | 57.30 | Max Peak | Vertical | 162 | 49 | 74.0 | -16.7 | Pass |
| #2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot. Hopping | | | | | | | | | | | | |

### 9.3.3. Digital Emissions (0.03 - 1 GHz)

| Radiated Test Conditions for Radiated Digital Emissions (0.03 – 1 GHz) | | | |
|---|---|---|---|
| **Standard:** | FCC CFR 47:15.247 | **Ambient Temp. (ºC):** | 20.0 - 24.5 |
| **Test Heading:** | Digital Emissions | **Rel. Humidity (%):** | 32 - 45 |
| **Standard Section(s):** | 15.209 | **Pressure (mBars):** | 999 - 1001 |
| **Reference Document(s):** | See Normative References | | |

**Test Procedure for Radiated Digital Emissions (0.03 – 1 GHz)**

Testing 30M-1 GHz was performed in a 3-meter anechoic chamber using a CISPR compliant receiver. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. To further maximize emissions the receive antenna was varied between 1 and 4 meters. The emissions are recorded with receiver in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

Test configuration and setup for Radiated Spurious and Band-Edge Measurement were per the Radiated Test Set-up specified in this document.

**Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

FS = R + AF + CORR

where:
FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

For example:
Given a Receiver input reading of 51.5dBmV; Antenna Factor of 8.5dB; Cable Loss of 1.3dB; Falloff Factor of 0dB, an Amplifier Gain of 26dB and Notch Filter Loss of 1dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3dBmV/m

Conversion between dBmV/m (or dBmV) and mV/m (or mV) are done as:

Level (dBmV/m) = 20 * Log (level (mV/m))

40 dBmV/m = 100mV/m
48 dBmV/m = 250mV/m

**Limits for Radiated Digital Emissions (0.03 – 1 GHz)**

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength | | Measurement Distance (m) |
|---|---|---|---|
| | µV/m (microvolts/meter) | dBµV/m (dB microvolts/meter) | |
| 0.009-0.490 | 2400/F(kHz) | -- | 300 |
| 0.490-1.705 | 24000/F(kHz) | -- | 30 |
| 1.705-30.0 | 30 | 29.5 | 30 |
| 30-88 | 100** | 40 | 3 |
| 88-216 | 150** | 43.5 | 3 |
| 216-960 | 200** | 46.0 | 3 |
| Above 960 | 500 | 54.0 | 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. (b) In the emission table above, the tighter limit applies at the band edges. (c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. (d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. (e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part. (f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device. (g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

| Equipment Configuration for Radiated Digital Emissions | | | |
|---|---|---|---|
| **Antenna:** | Yangeo | **Variant:** | FHSS |
| **Antenna Gain (dBi):** | Not Applicable | **Modulation:** | |
| **Beam Forming Gain (Y):** | Not Applicable | **Duty Cycle (%):** | |
| **Channel Frequency (MHz):** | 2439.00 | **Data Rate:** | 1 MBit/s |
| **Power Setting:** | 10 | **Tested By:** | JMH |

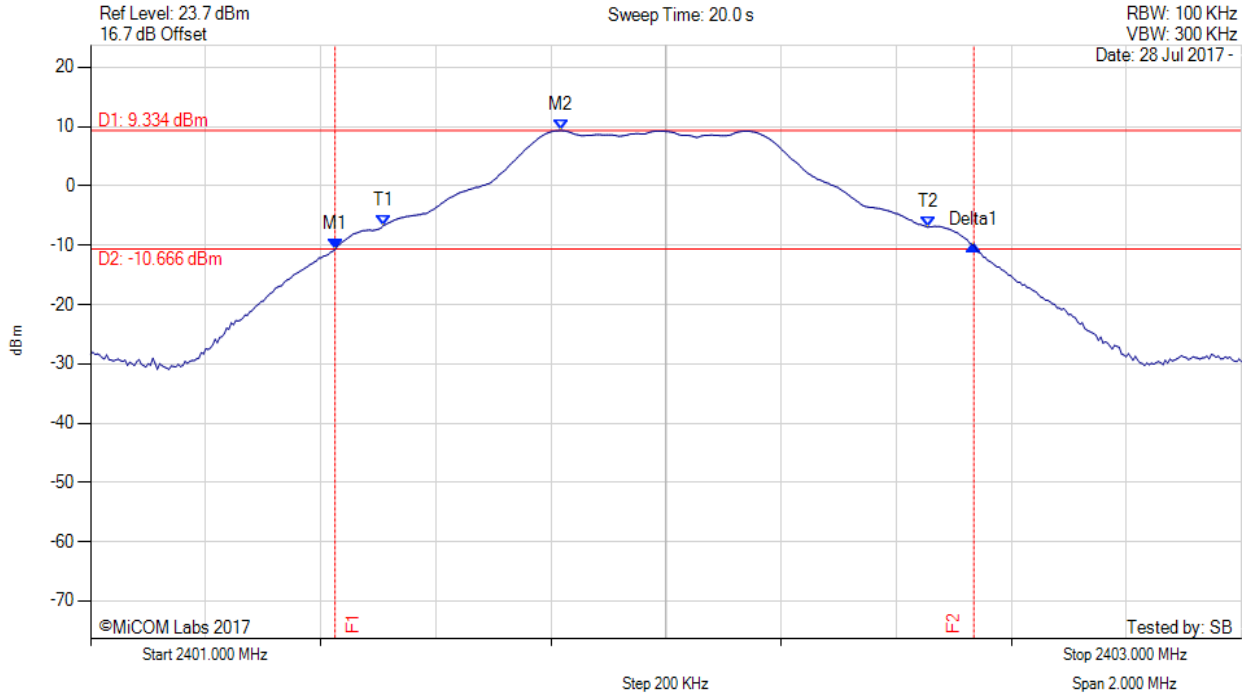
| Test Measurement Results |
|---|
| Click here to view measurement data... |
| Test Notes: EUT powered by 5V ps, connected to Laptop via SD slot.Laptop put in suspend mode to limit 50 MHz harmonics. |

# A. APPENDIX - GRAPHICAL IMAGES

## A.1. 20 dB & 99% Bandwidth

20 dB 99% BANDWIDTH

Variant: DH1, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

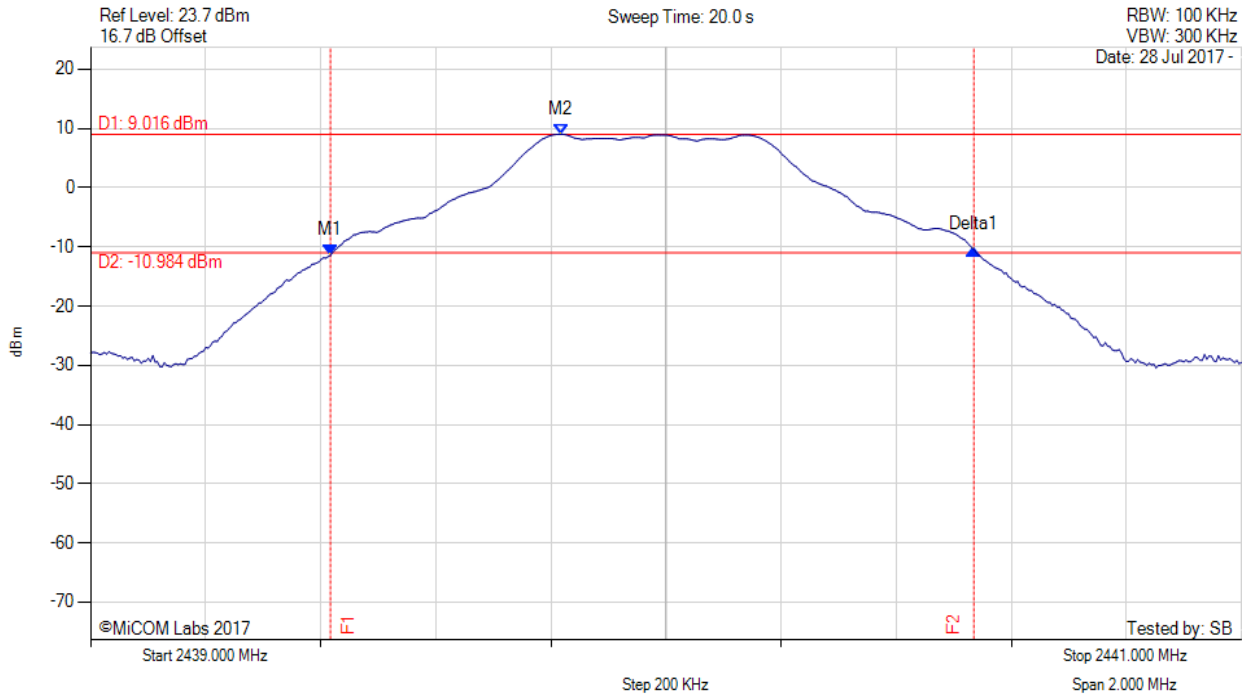



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = MAX HOLD | M1 : 2401.425 MHz : -10.750 dBm<br>M2 : 2401.818 MHz : 9.334 dBm<br>Delta1 : 1.110 MHz : 0.750 dB<br>T1 : 2401.509 MHz : -6.627 dBm<br>T2 : 2402.455 MHz : -6.969 dBm<br>OBW : 946 KHz | Measured 20 dB Bandwidth: 1.110 MHz<br>Limit: kHz<br>Margin: #VALUE! MHz |

back to matrix

20 dB 99% BANDWIDTH

Variant: DH1, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

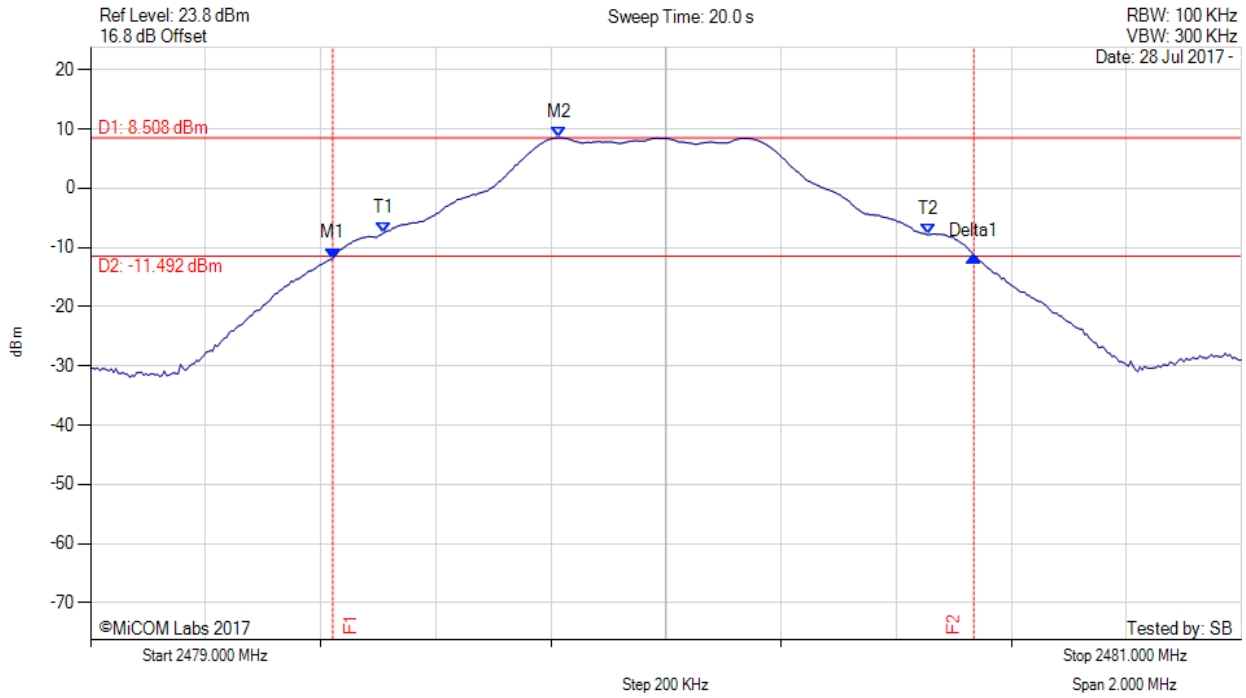



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = MAX HOLD | M1 : 2439.417 MHz : -11.449 dBm<br>M2 : 2439.818 MHz : 9.016 dBm<br>Delta1 : 1.118 MHz : 1.025 dB<br>T1 : 0 Hz : 500.000 dBm<br>T2 : 0 Hz : 500.000 dBm<br>OBW : 962 KHz | Measured 20 dB Bandwidth: 1.118 MHz<br>Limit: kHz<br>Margin: #VALUE! MHz |

back to matrix

20 dB 99% BANDWIDTH

Variant: DH1, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

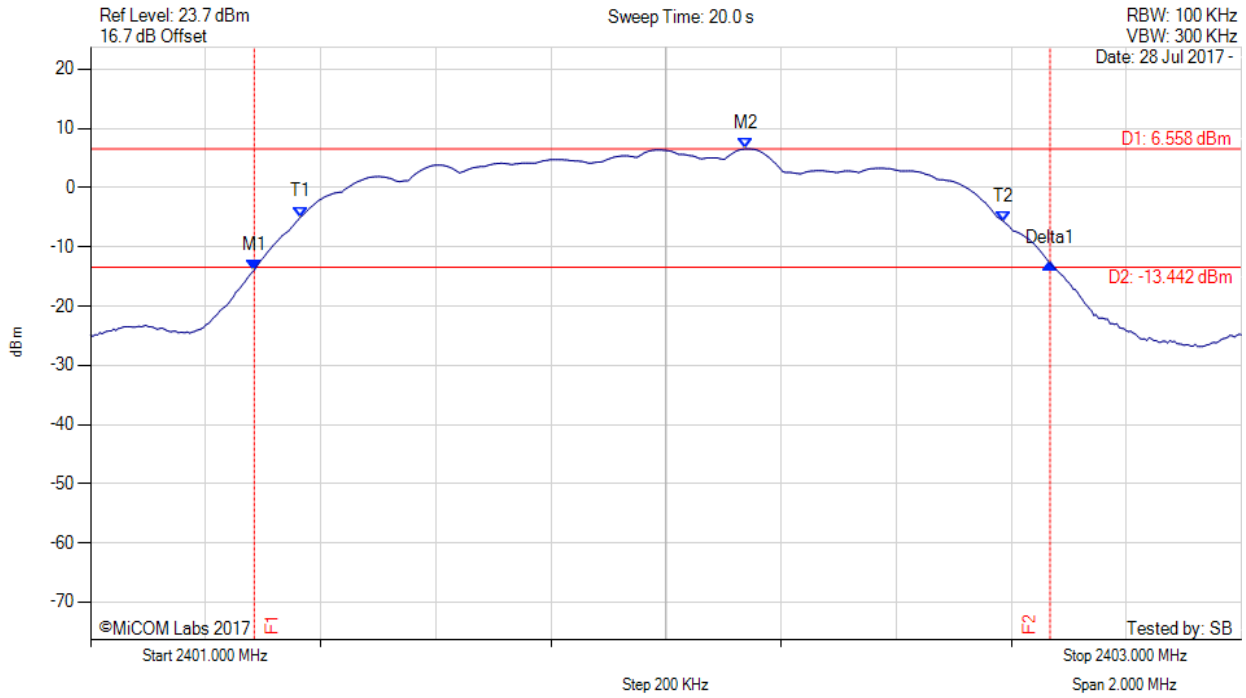



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = MAX HOLD | M1 : 2479.421 MHz : -11.870 dBm<br>M2 : 2479.814 MHz : 8.508 dBm<br>Delta1 : 1.114 MHz : 0.451 dB<br>T1 : 2479.509 MHz : -7.571 dBm<br>T2 : 2480.455 MHz : -7.859 dBm<br>OBW : 946 KHz | Measured 20 dB Bandwidth: 1.114 MHz<br>Limit: kHz<br>Margin: #VALUE! MHz |

back to matrix

20 dB 99% BANDWIDTH

Variant: DH5, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

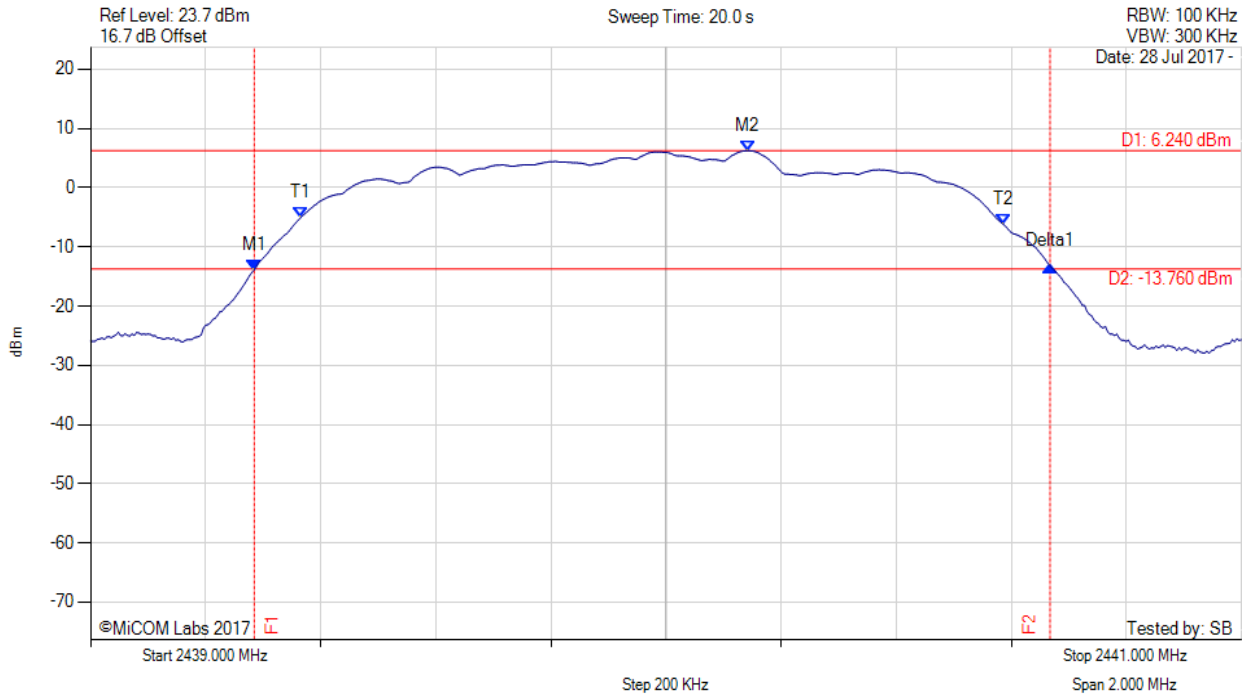



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = MAX HOLD | M1 : 2401.285 MHz : -13.934 dBm<br>M2 : 2402.138 MHz : 6.558 dBm<br>Delta1 : 1.383 MHz : 1.218 dB<br>T1 : 2401.365 MHz : -4.949 dBm<br>T2 : 2402.587 MHz : -5.765 dBm<br>OBW : 1.222 MHz | Measured 20 dB Bandwidth: 1.383 MHz<br>Limit: kHz<br>Margin: #VALUE! MHz |

back to matrix

20 dB 99% BANDWIDTH

Variant: DH5, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

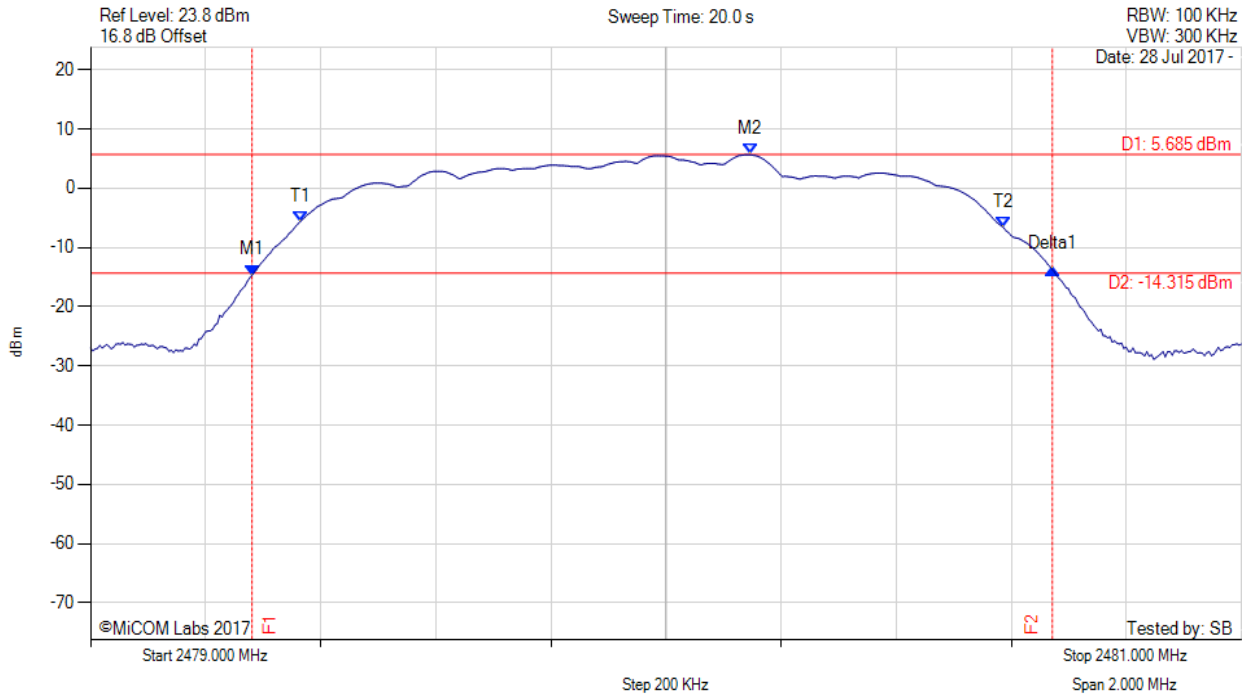



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = MAX HOLD | M1 : 2439.285 MHz : -13.865 dBm<br>M2 : 2440.142 MHz : 6.240 dBm<br>Delta1 : 1.383 MHz : 0.685 dB<br>T1 : 2439.365 MHz : -5.124 dBm<br>T2 : 2440.587 MHz : -6.277 dBm<br>OBW : 1.222 MHz | Measured 20 dB Bandwidth: 1.383 MHz<br>Limit: kHz<br>Margin: #VALUE! MHz |

back to matrix

20 dB 99% BANDWIDTH

Variant: DH5, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc




| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = MAX HOLD | M1 : 2479.281 MHz : -14.676 dBm<br>M2 : 2480.146 MHz : 5.685 dBm<br>Delta1 : 1.391 MHz : 0.966 dB<br>T1 : 2479.365 MHz : -5.602 dBm<br>T2 : 2480.587 MHz : -6.702 dBm<br>OBW : 1.222 MHz | Measured 20 dB Bandwidth: 1.391 MHz<br>Limit: kHz<br>Margin: #VALUE! MHz |

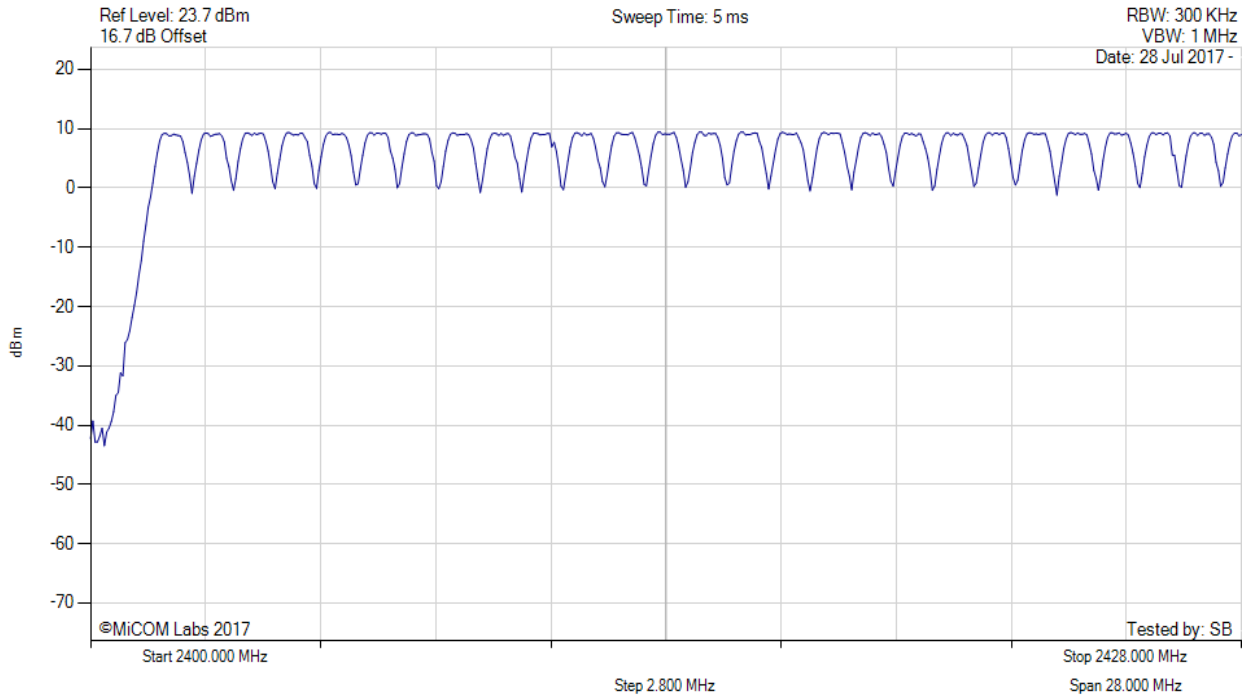
back to matrix

## A.2. Frequency Hopping Tests

### A.2.1. Number of Hopping Channels

NUMBER OF HOPPING CHANNELS

Variant: DH1, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

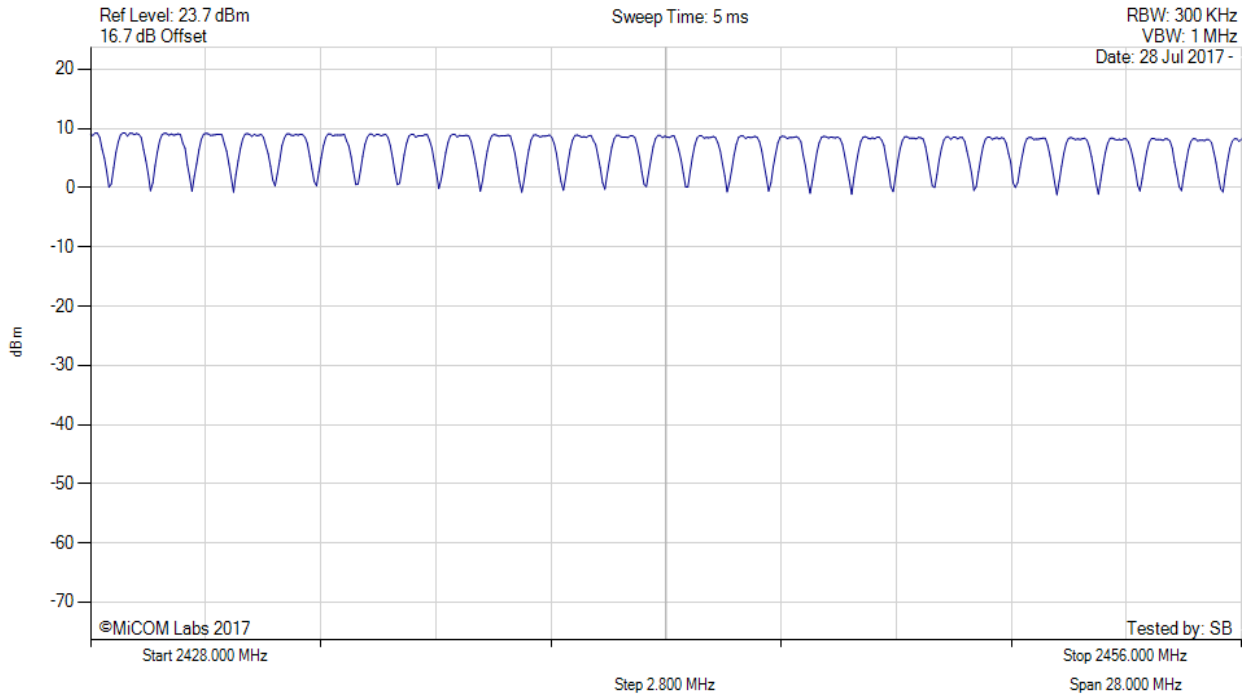



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | | Channel Frequency: 2440.00 MHz |

back to matrix

NUMBER OF HOPPING CHANNELS

Variant: DH1, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

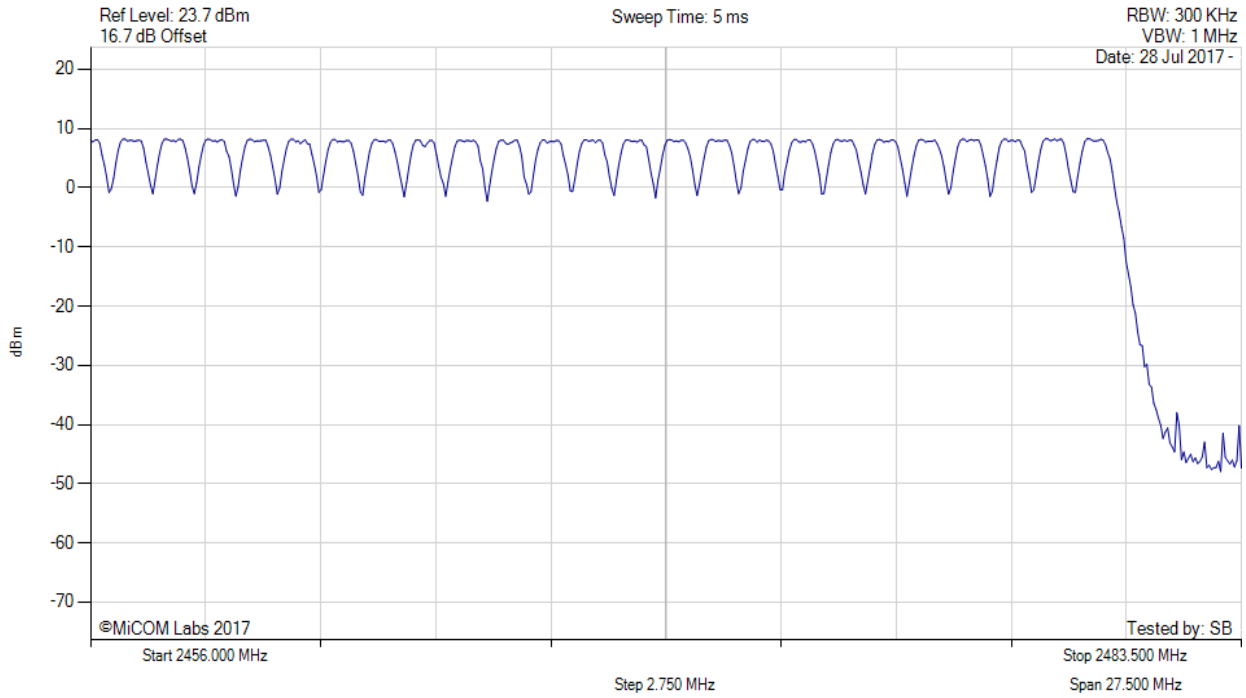



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | | Channel Frequency: 2440.00 MHz |

back to matrix

NUMBER OF HOPPING CHANNELS

Variant: DH1, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

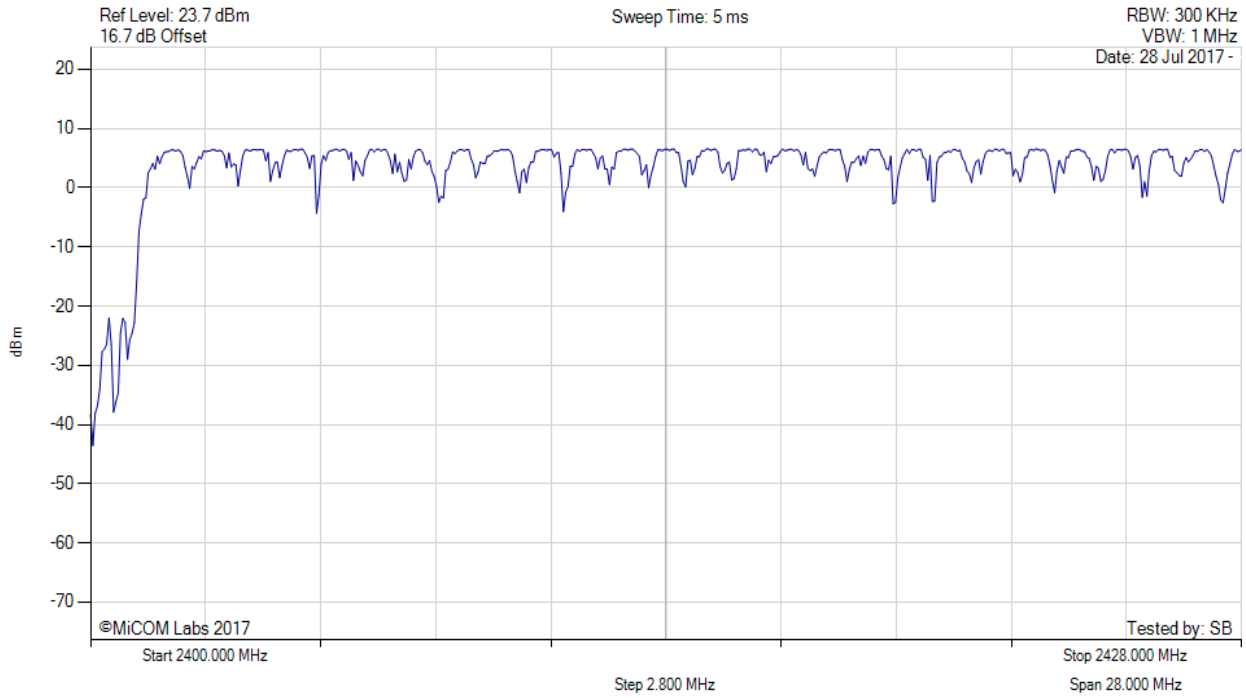



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | | Channel Frequency: 2440.00 MHz |

back to matrix

NUMBER OF HOPPING CHANNELS

Variant: DH5, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

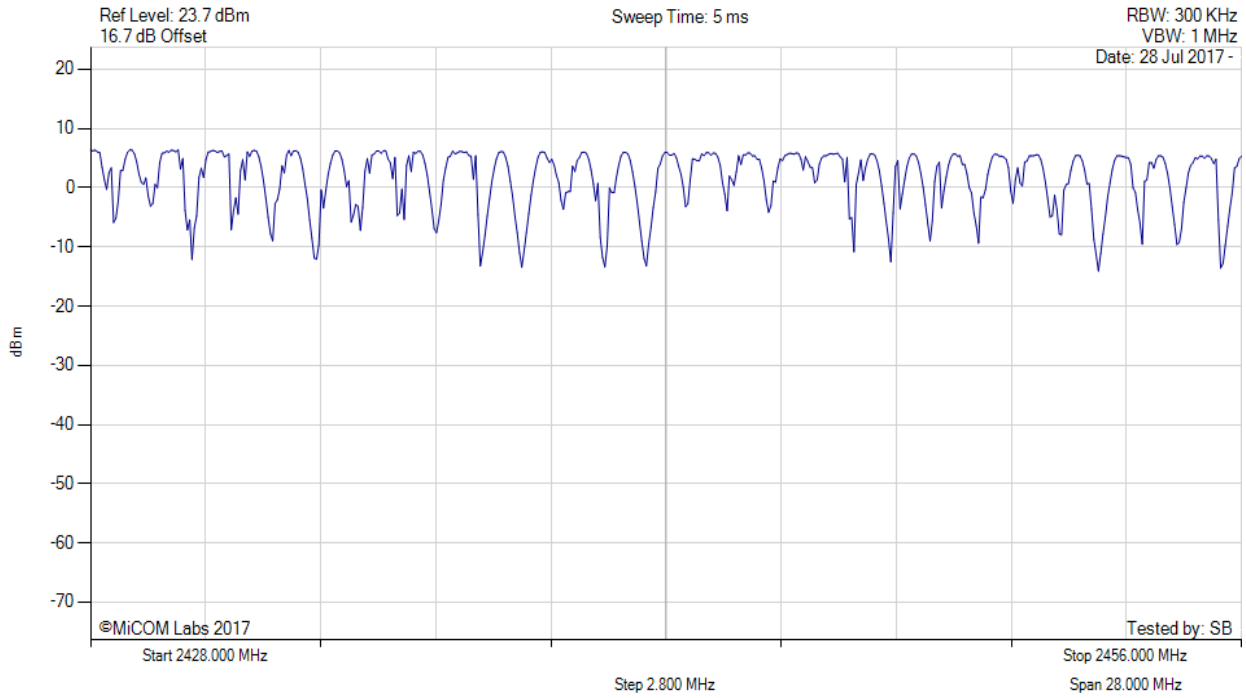



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | | Channel Frequency: 2440.00 MHz |

back to matrix

NUMBER OF HOPPING CHANNELS

Variant: DH5, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

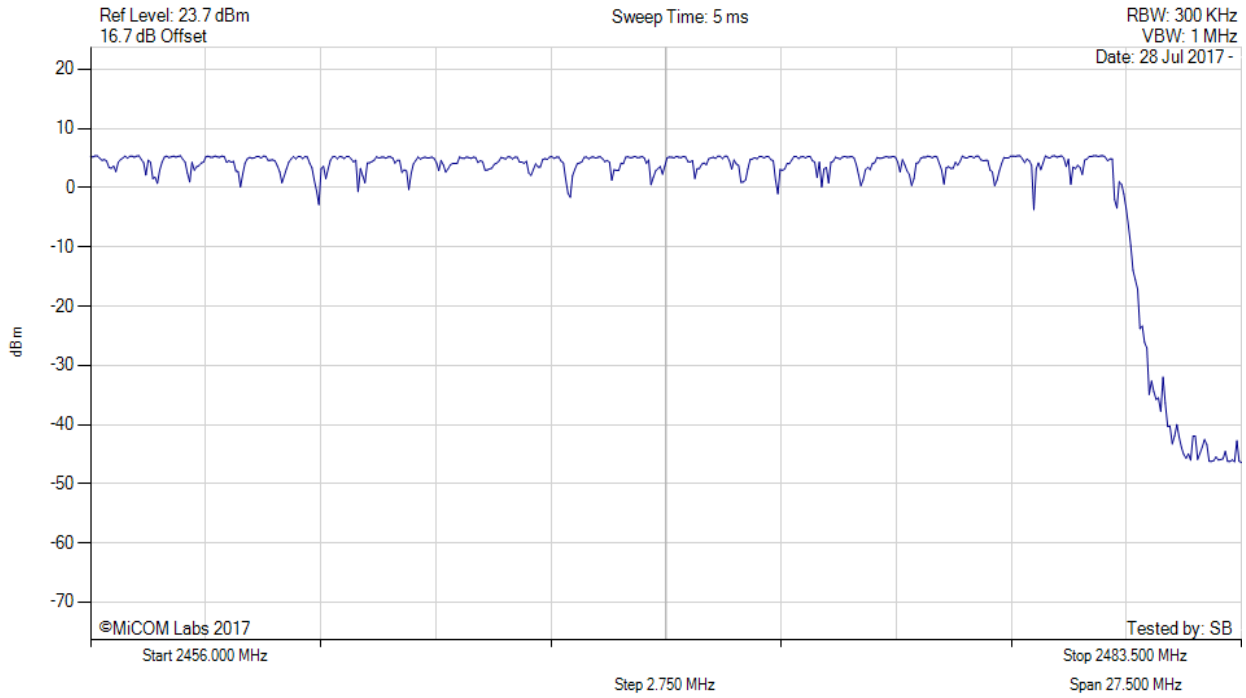



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | | Channel Frequency: 2440.00 MHz |

back to matrix

NUMBER OF HOPPING CHANNELS

Variant: DH5, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



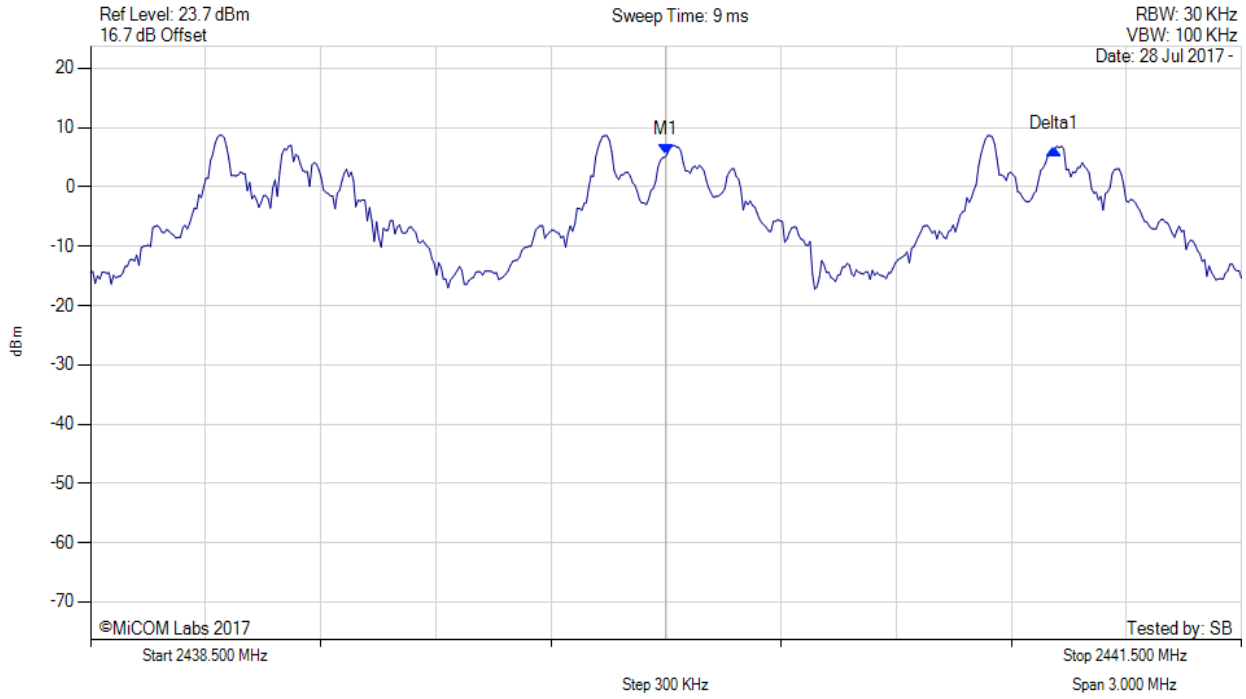

| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | | Channel Frequency: 2440.00 MHz |

back to matrix

## A.2.2. Channel Separation

CHANNEL SEPARATION

Variant: DH1, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

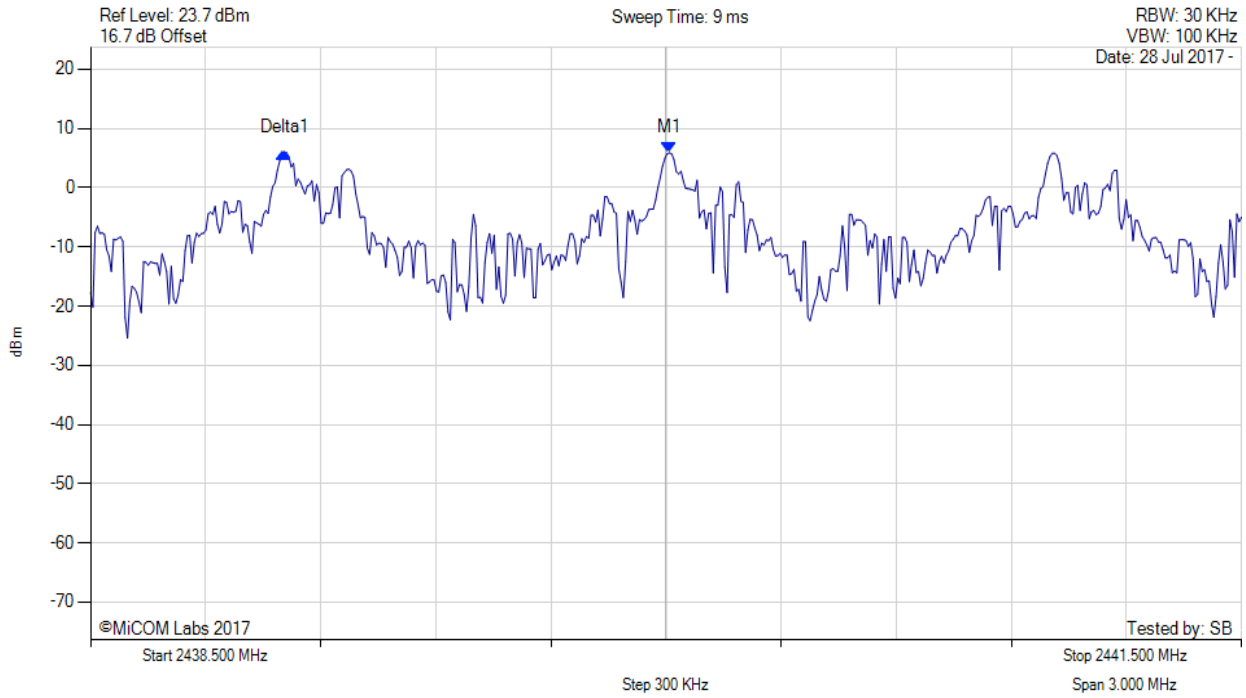



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2440.000 MHz : 5.476 dBm<br>Delta1 : 1.012 MHz : 0.881 dB | Channel Frequency: 2440.00 MHz |

back to matrix

CHANNEL SEPARATION

Variant: DH5, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



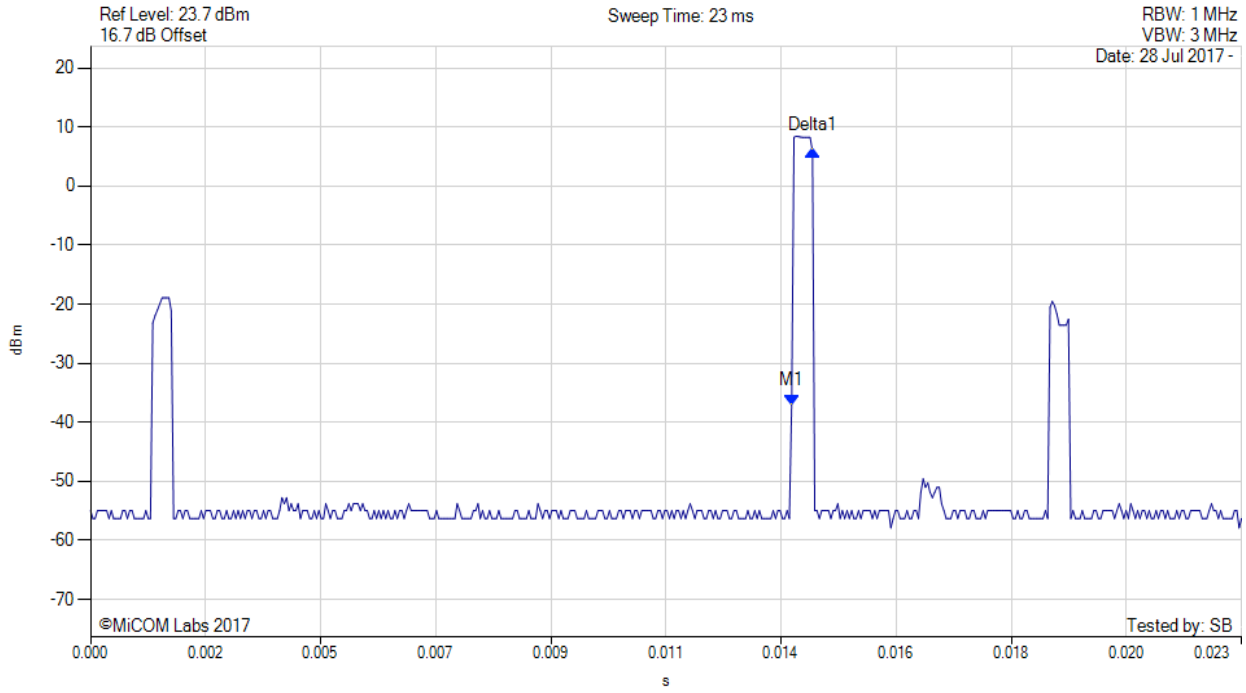

| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2440.009 MHz : 5.876 dBm<br>Delta1 : -1004008 Hz : 0.049 dB | Channel Frequency: 2440.00 MHz |

back to matrix

## A.2.3. Dwell Time

DWELL TIME

Variant: DH1, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

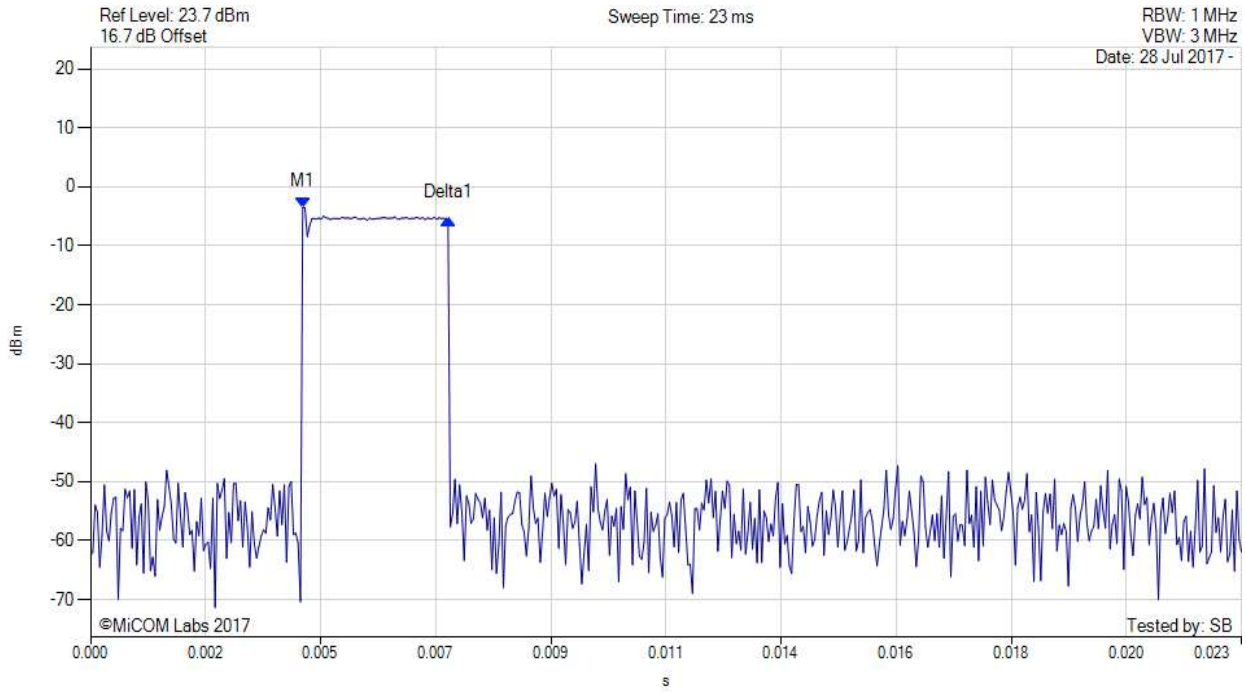



| Analyzer Setup | Marker:Time:Amplitude | Test Results |
|---|---|---|
| Detector = RMS<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1(2440.00 MHz) : 0.014 s : -37.058 dBm<br>Delta1(2440.00 MHz) : 0.40581 ms : 43.013 dB | Channel Frequency: 2440.00 MHz |

back to matrix

DWELL TIME

Variant: DH5, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



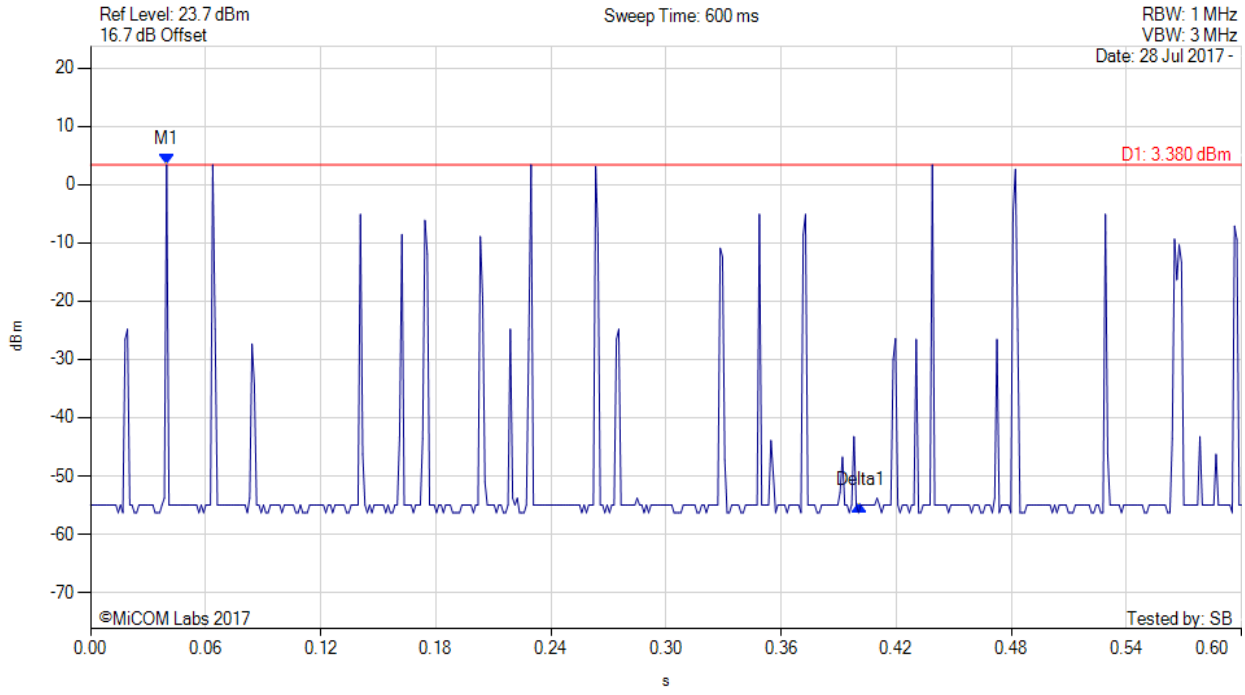

| Analyzer Setup | Marker:Time:Amplitude | Test Results |
|---|---|---|
| Detector = SAMPLE<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1(2440.00 MHz) : 0.004 s : -3.465 dBm<br>Delta1(2440.00 MHz) : 0.002840 s : -1.861 dB | Channel Frequency: 2440.00 MHz |

back to matrix

## A.2.4. Channel Occupancy

CHANNEL OCCUPANCY

Variant: DH1, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

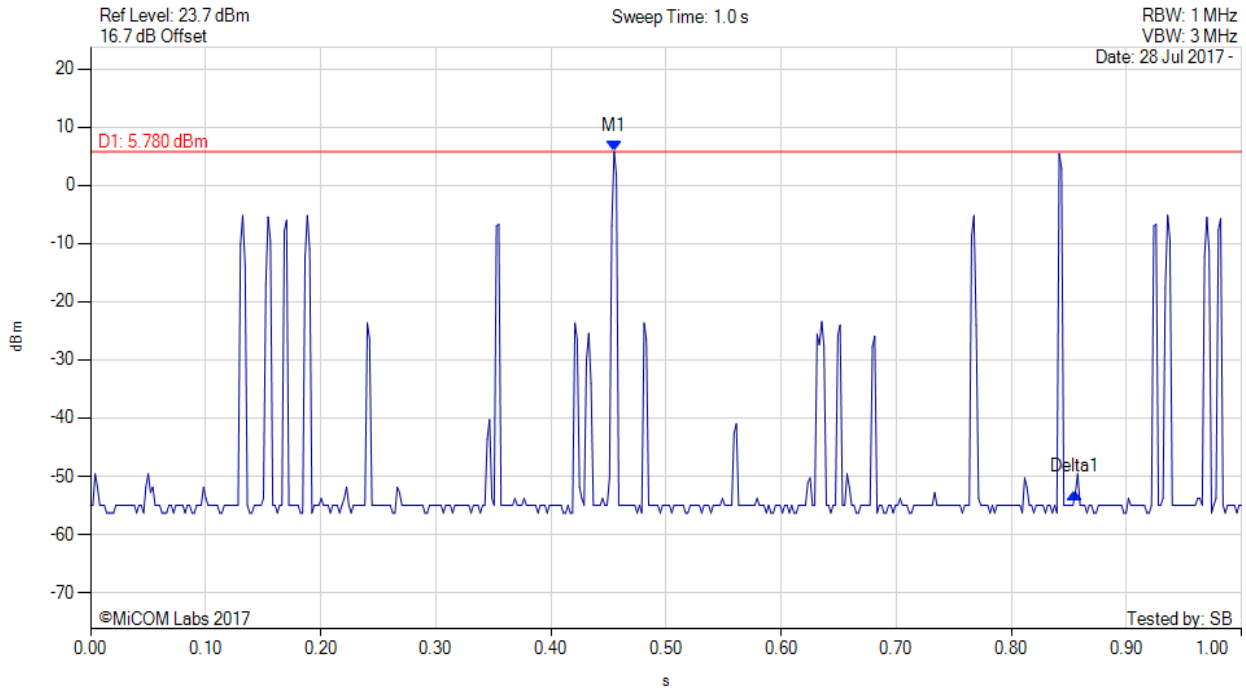



| Analyzer Setup | Marker:Time:Amplitude | Test Results |
|---|---|---|
| Detector = RMS<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1(2440.00 MHz) : 0.040 s : 3.379 dBm<br>Delta1(2440.00 MHz) : 0.362 s : -58.343 dB | Channel Frequency: 2440.00 MHz |

back to matrix

CHANNEL OCCUPANCY

Variant: DH5, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc




| Analyzer Setup | Marker:Time:Amplitude | Test Results |
|---|---|---|
| Detector = RMS<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1(24.40 GHz) : 0.455 s : 5.776 dBm<br>Delta1(24.40 GHz) : 0.400 s : -58.557 dB | Channel Frequency: 2440.00 MHz |

back to matrix

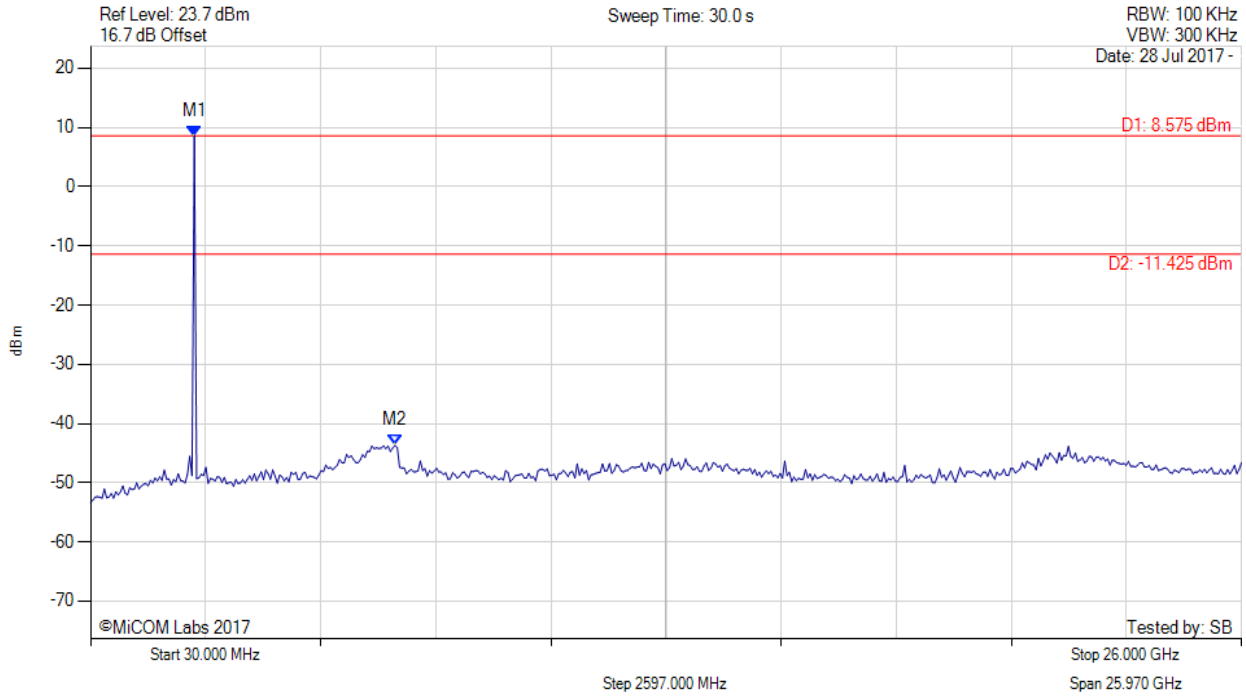
# A.3. Emissions

## A.3.1. Conducted Emissions

### A.3.1.1. Conducted Unwanted Spurious Emissions

UNWANTED EMISSIONS PEAK

Variant: DH1, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

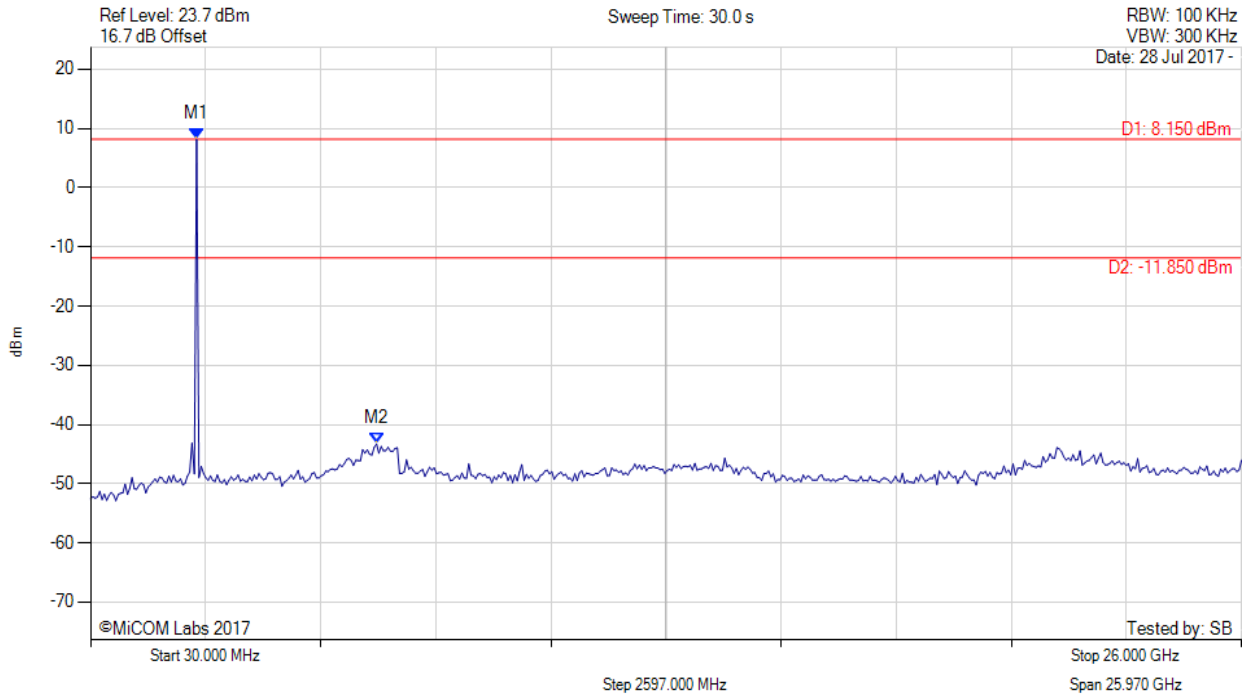



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2371.984 MHz : 8.575 dBm<br>M2 : 6899.820 MHz : -43.704 dBm | Limit: -11.43 dBm<br>Margin: -32.27 dB |

back to matrix

UNWANTED EMISSIONS PEAK

Variant: DH1, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

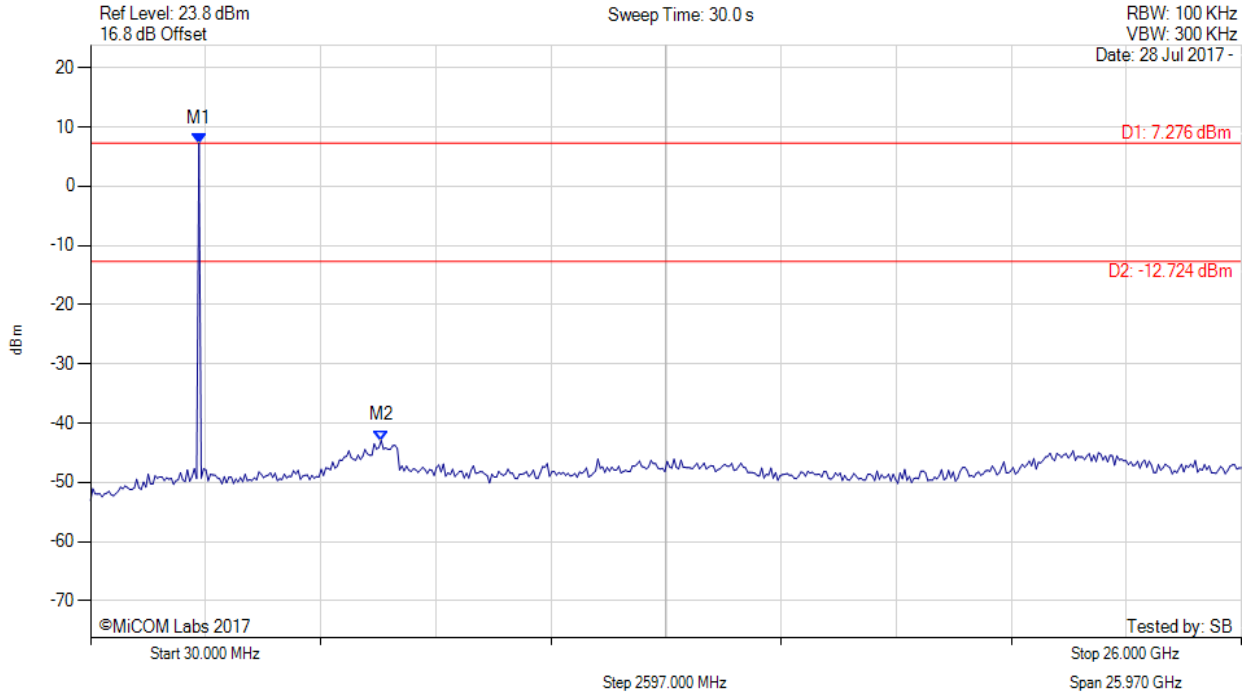



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2424.028 MHz : 8.150 dBm<br>M2 : 6483.467 MHz : -43.263 dBm | Limit: -11.85 dBm<br>Margin: -31.41 dB |

back to matrix

UNWANTED EMISSIONS PEAK

Variant: DH1, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

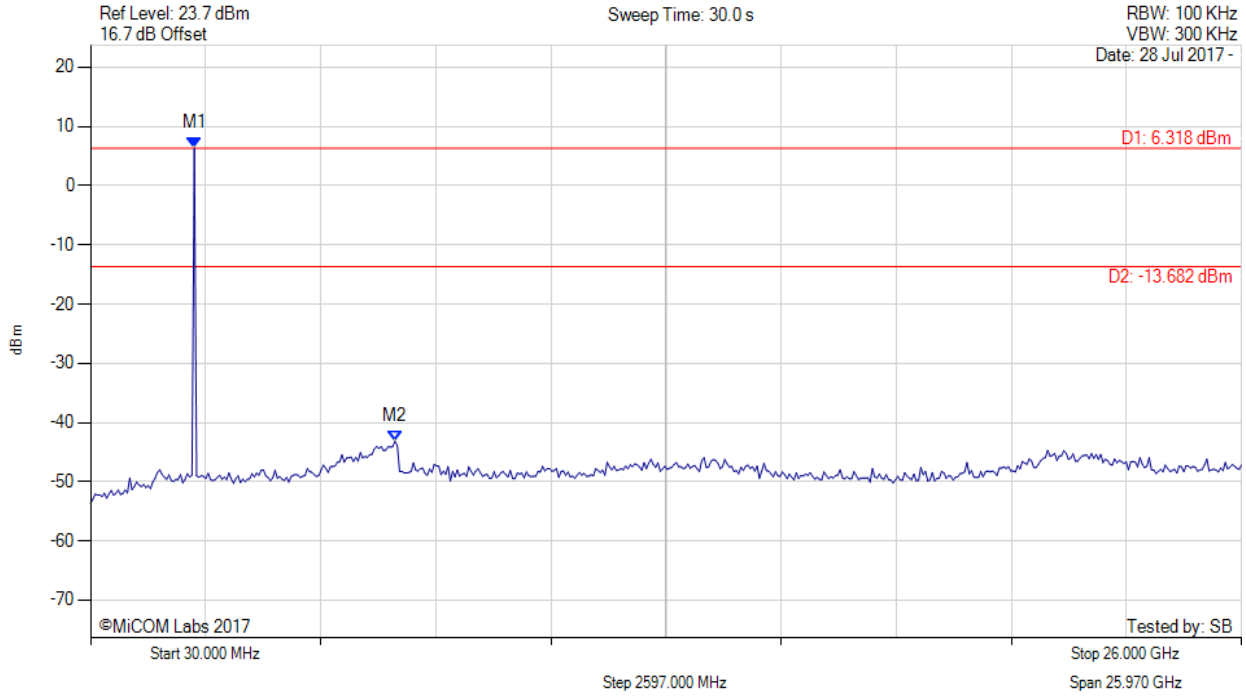



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2476.072 MHz : 7.276 dBm<br>M2 : 6587.555 MHz : -42.950 dBm | Limit: -12.72 dBm<br>Margin: -30.23 dB |

back to matrix

UNWANTED EMISSIONS PEAK

Variant: DH5, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

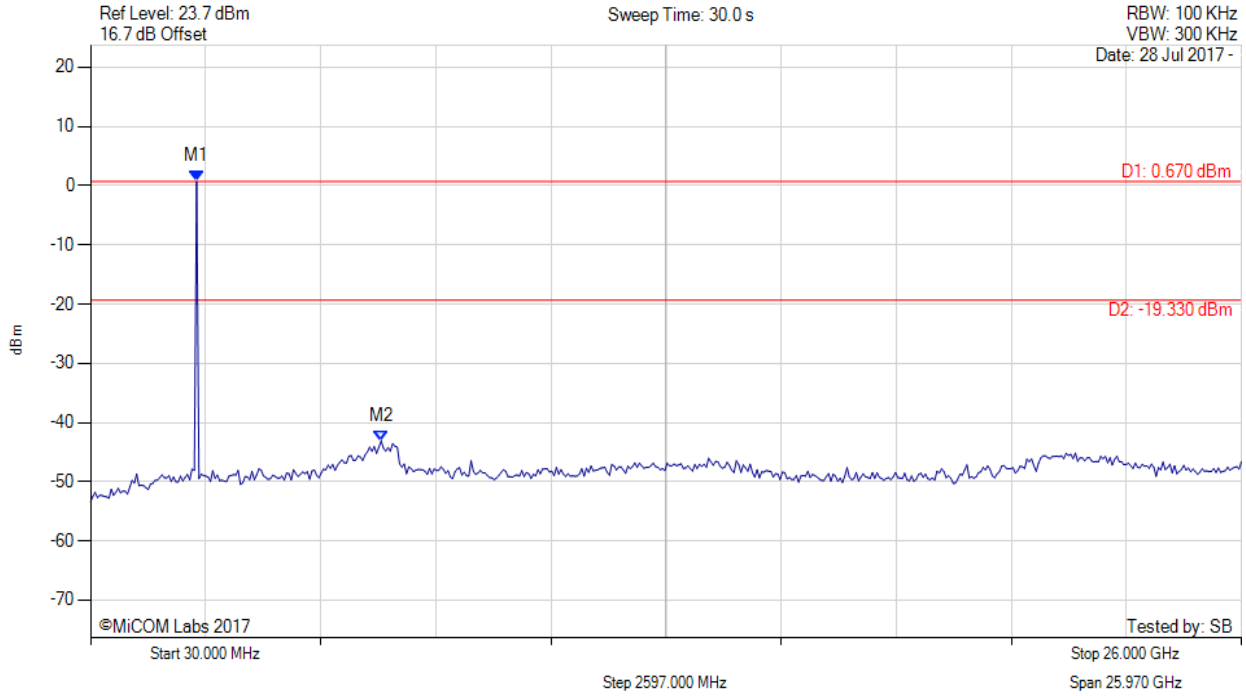



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2371.984 MHz : 6.318 dBm<br>M2 : 6899.820 MHz : -43.190 dBm | Limit: -13.68 dBm<br>Margin: -29.51 dB |

back to matrix

UNWANTED EMISSIONS PEAK

Variant: DH5, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

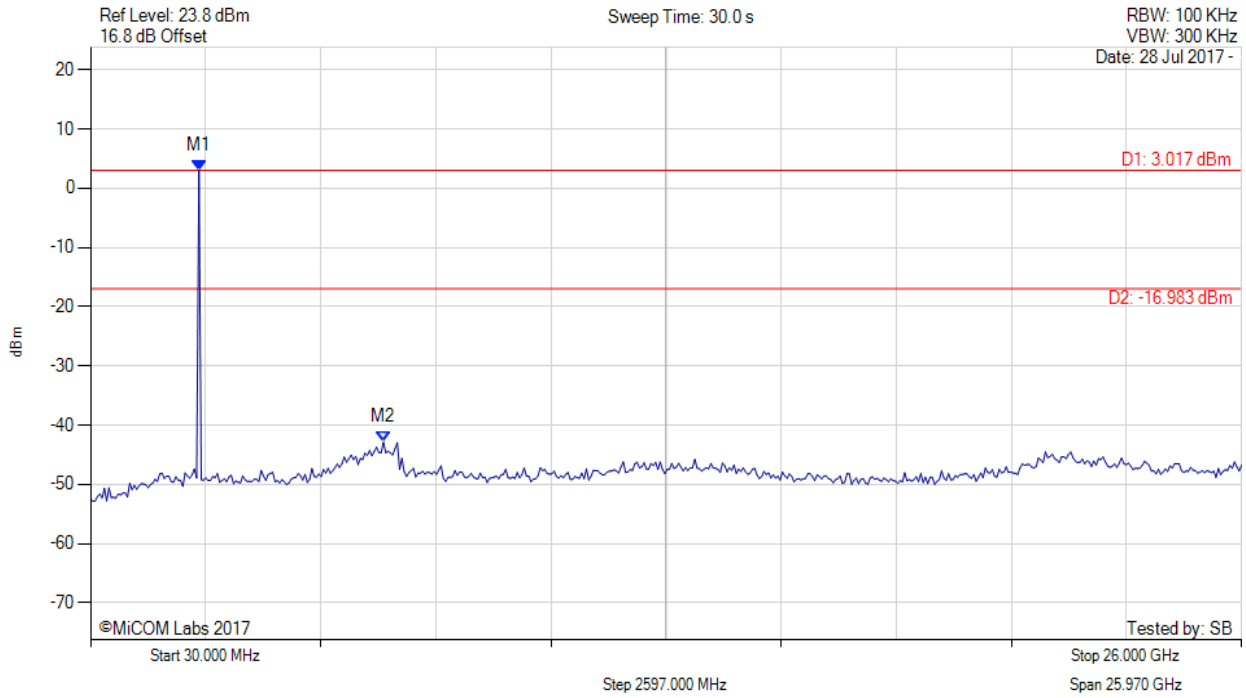



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2424.028 MHz : 0.670 dBm<br>M2 : 6587.555 MHz : -43.125 dBm | Limit: -19.33 dBm<br>Margin: -23.80 dB |

back to matrix

UNWANTED EMISSIONS PEAK

Variant: DH5, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



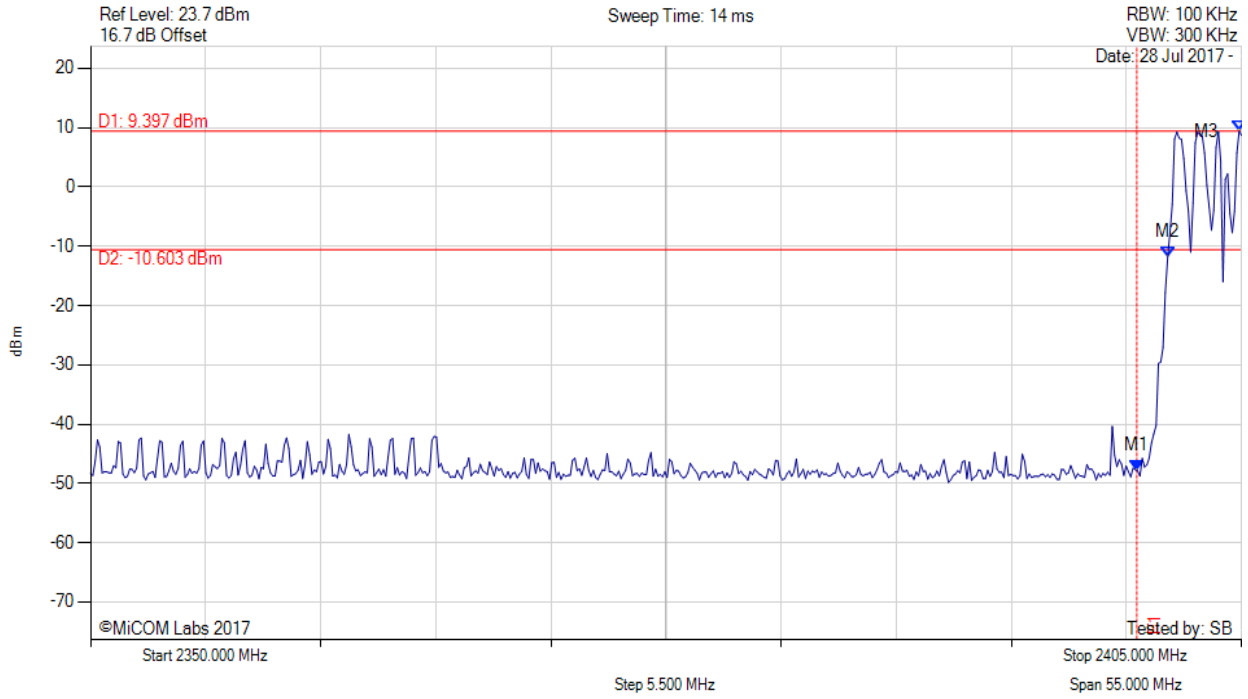

| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2476.072 MHz : 3.017 dBm<br>M2 : 6639.599 MHz : -42.872 dBm | Limit: -16.98 dBm<br>Margin: -25.89 dB |

back to matrix

### A.3.1.2. Conducted Band-Edge Emissions

CONDUCTED LOW BAND-EDGE EMISSIONS (HOPPING) PEAK

Variant: DH1, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

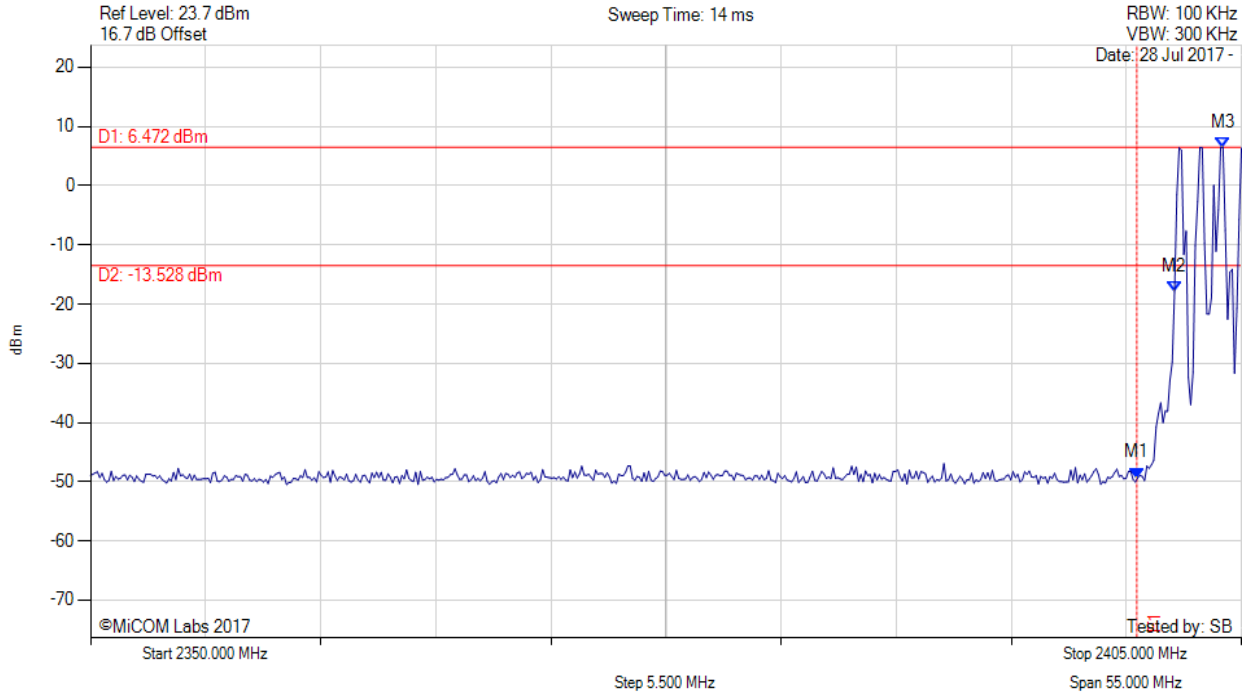



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2400.000 MHz : -47.886 dBm<br>M2 : 2401.473 MHz : -11.909 dBm<br>M3 : 2404.890 MHz : 9.397 dBm | Channel Frequency: 2402.00 MHz |

back to matrix

CONDUCTED LOW BAND-EDGE EMISSIONS (HOPPING) PEAK

Variant: DH5, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

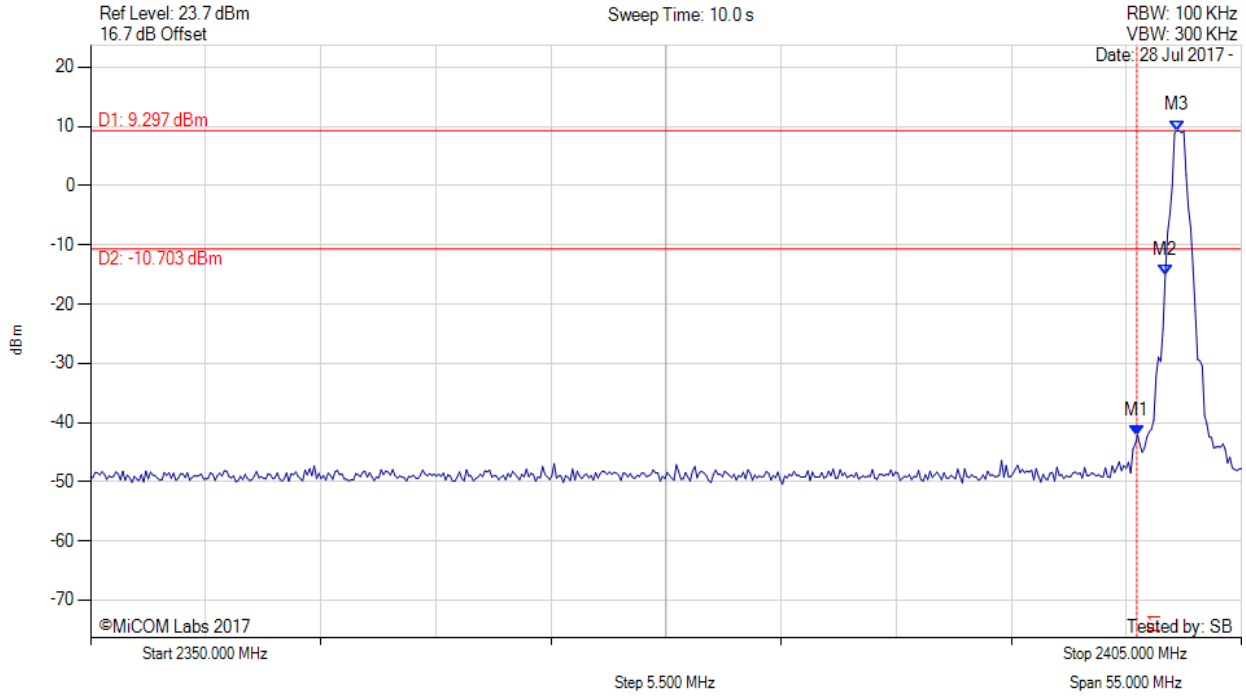



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2400.000 MHz : -49.360 dBm<br>M2 : 2401.804 MHz : -17.953 dBm<br>M3 : 2404.118 MHz : 6.472 dBm | Channel Frequency: 2402.00 MHz |

back to matrix

CONDUCTED LOW BAND-EDGE EMISSIONS (STATIC) PEAK

Variant: DH1, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

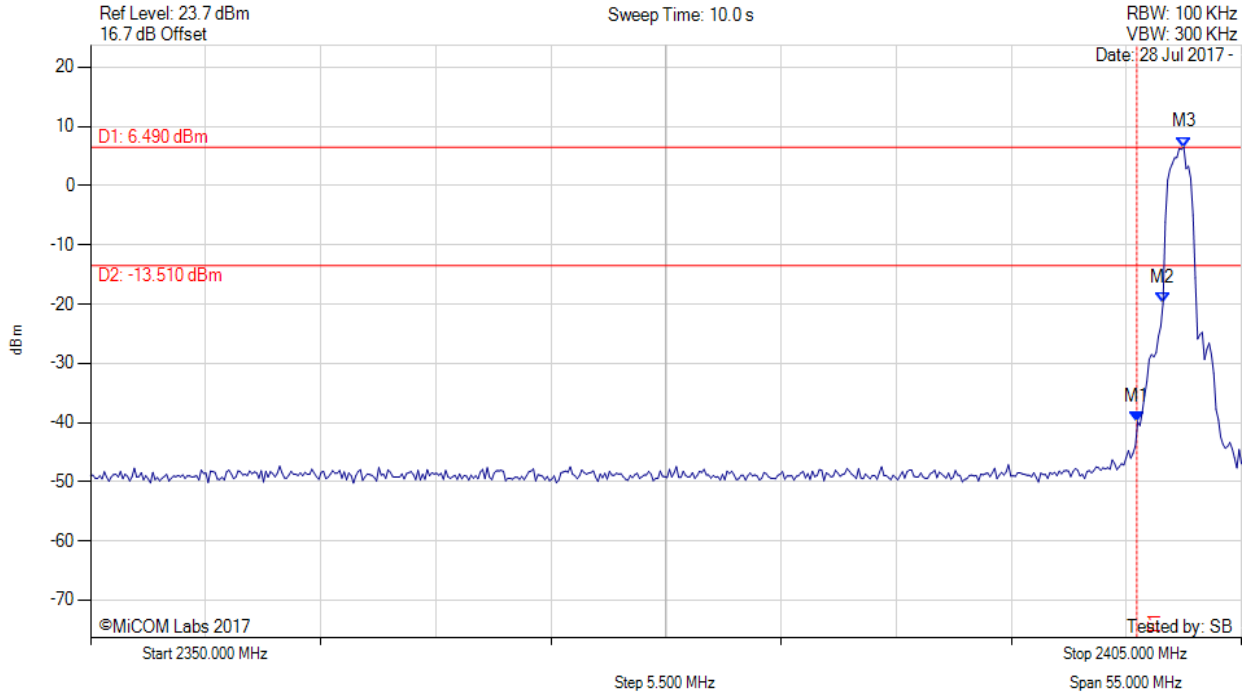



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2400.000 MHz : -42.153 dBm<br>M2 : 2401.363 MHz : -15.029 dBm<br>M3 : 2401.914 MHz : 9.297 dBm | Channel Frequency: 2402.00 MHz |

back to matrix

CONDUCTED LOW BAND-EDGE EMISSIONS (STATIC) PEAK

Variant: DH5, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

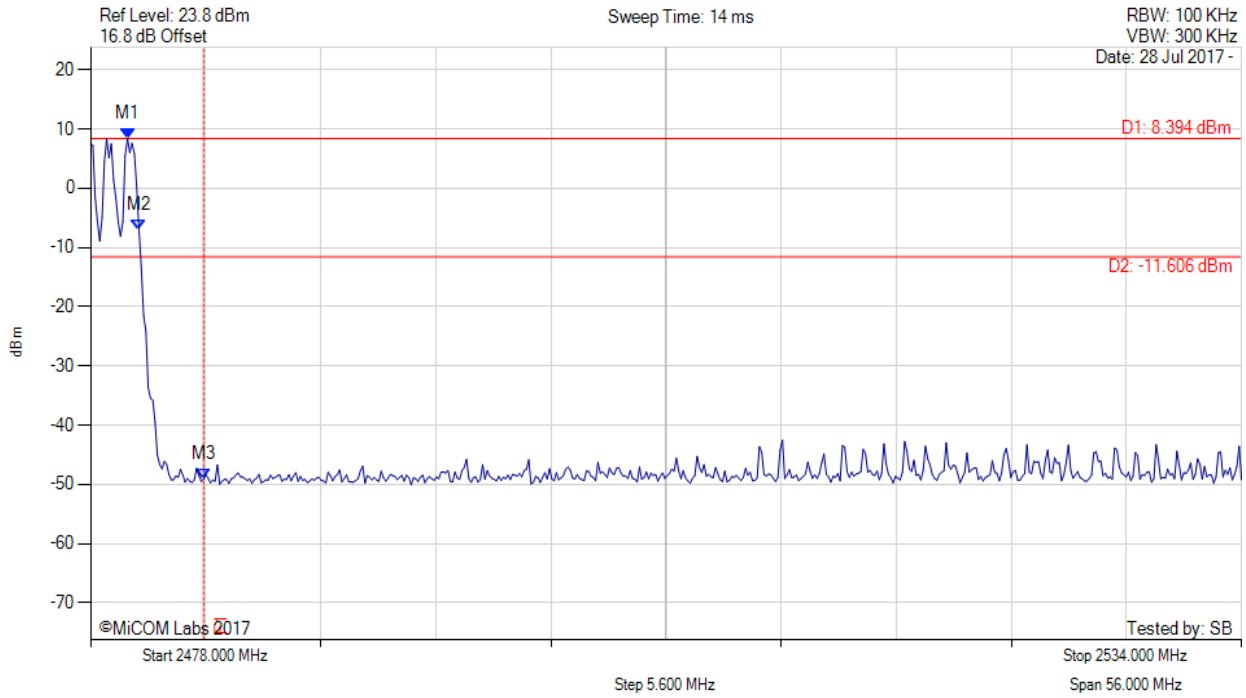



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2400.000 MHz : -39.883 dBm<br>M2 : 2401.253 MHz : -19.897 dBm<br>M3 : 2402.244 MHz : 6.490 dBm | Channel Frequency: 2402.00 MHz |

back to matrix

CONDUCTED UPPER BAND-EDGE EMISSIONS (HOPPING) PEAK

Variant: DH1, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

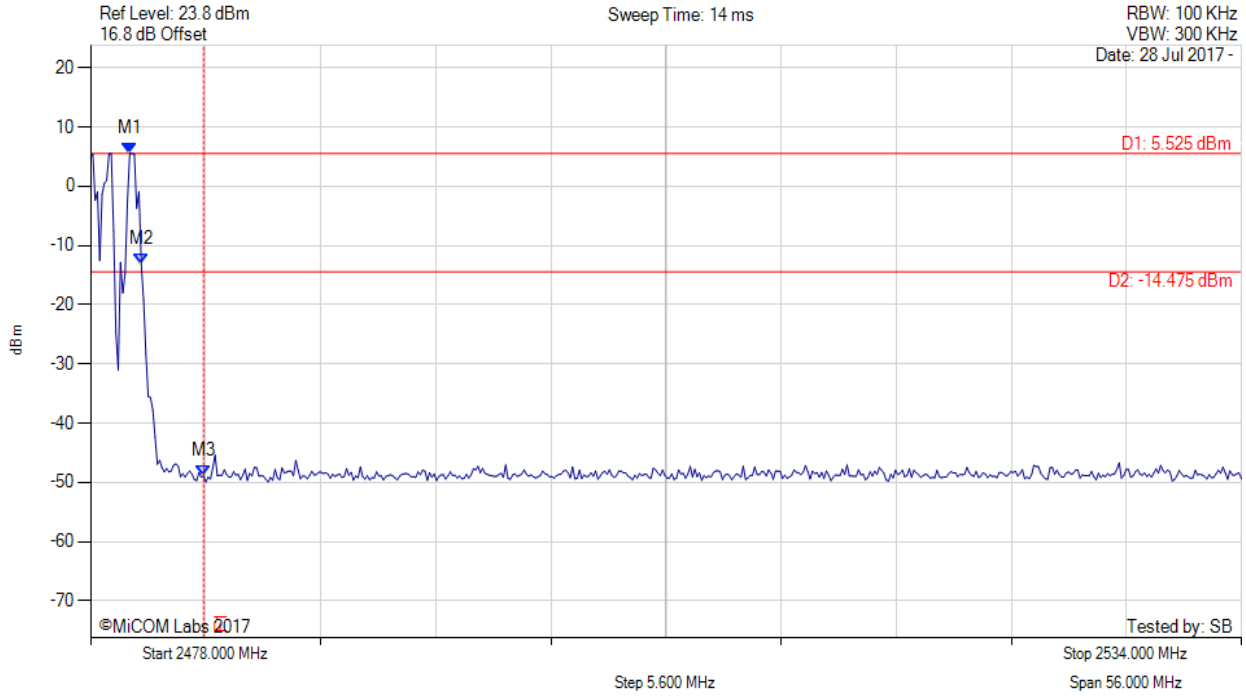



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2479.796 MHz : 8.394 dBm<br>M2 : 2480.357 MHz : -6.991 dBm<br>M3 : 2483.500 MHz : -49.091 dBm | Channel Frequency: 2480.00 MHz |

back to matrix

CONDUCTED UPPER BAND-EDGE EMISSIONS (HOPPING) PEAK

Variant: DH5, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

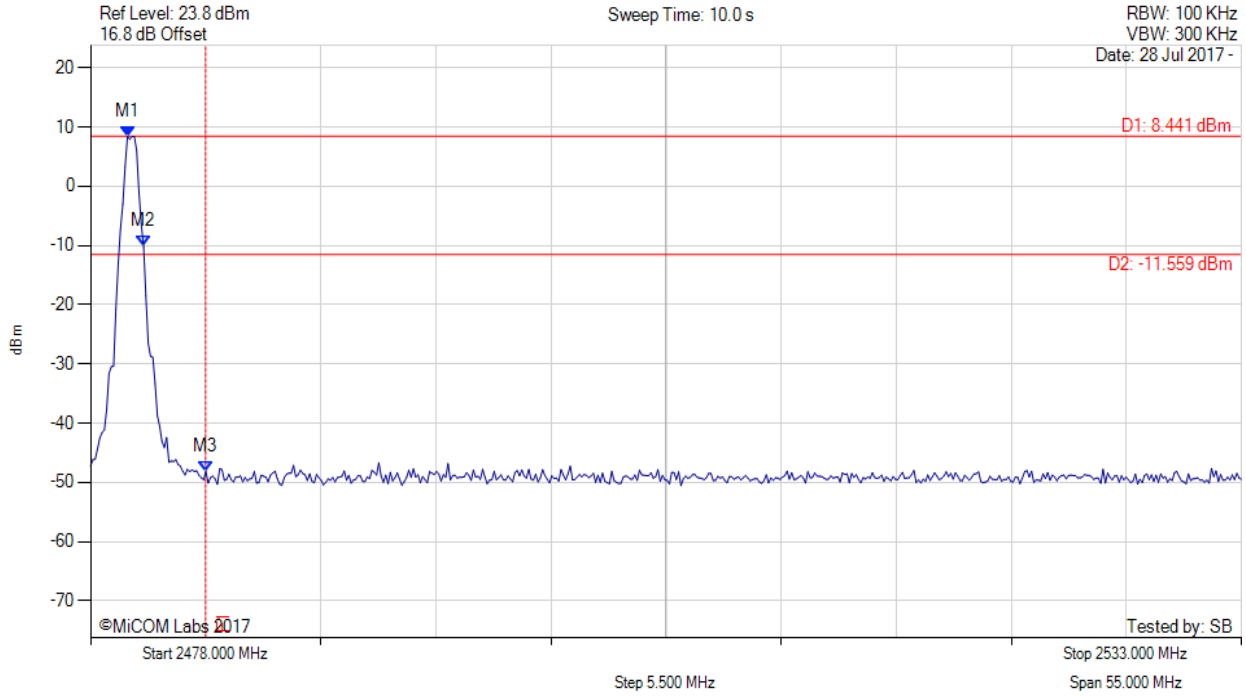



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2479.908 MHz : 5.525 dBm<br>M2 : 2480.469 MHz : -13.153 dBm<br>M3 : 2483.500 MHz : -48.963 dBm | Channel Frequency: 2480.00 MHz |

back to matrix

CONDUCTED UPPER BAND-EDGE EMISSIONS (STATIC) PEAK

Variant: DH1, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

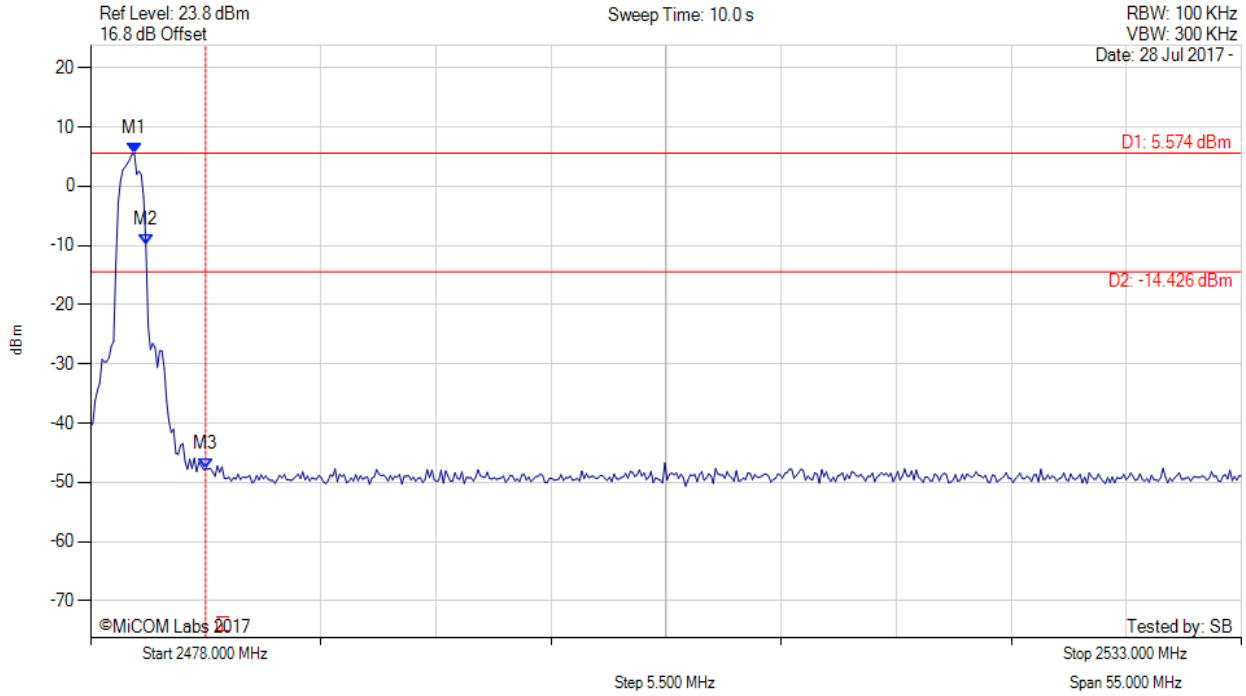



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2479.764 MHz : 8.441 dBm<br>M2 : 2480.535 MHz : -10.190 dBm<br>M3 : 2483.500 MHz : -48.174 dBm | Channel Frequency: 2480.00 MHz |

back to matrix

CONDUCTED UPPER BAND-EDGE EMISSIONS (STATIC) PEAK

Variant: DH5, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

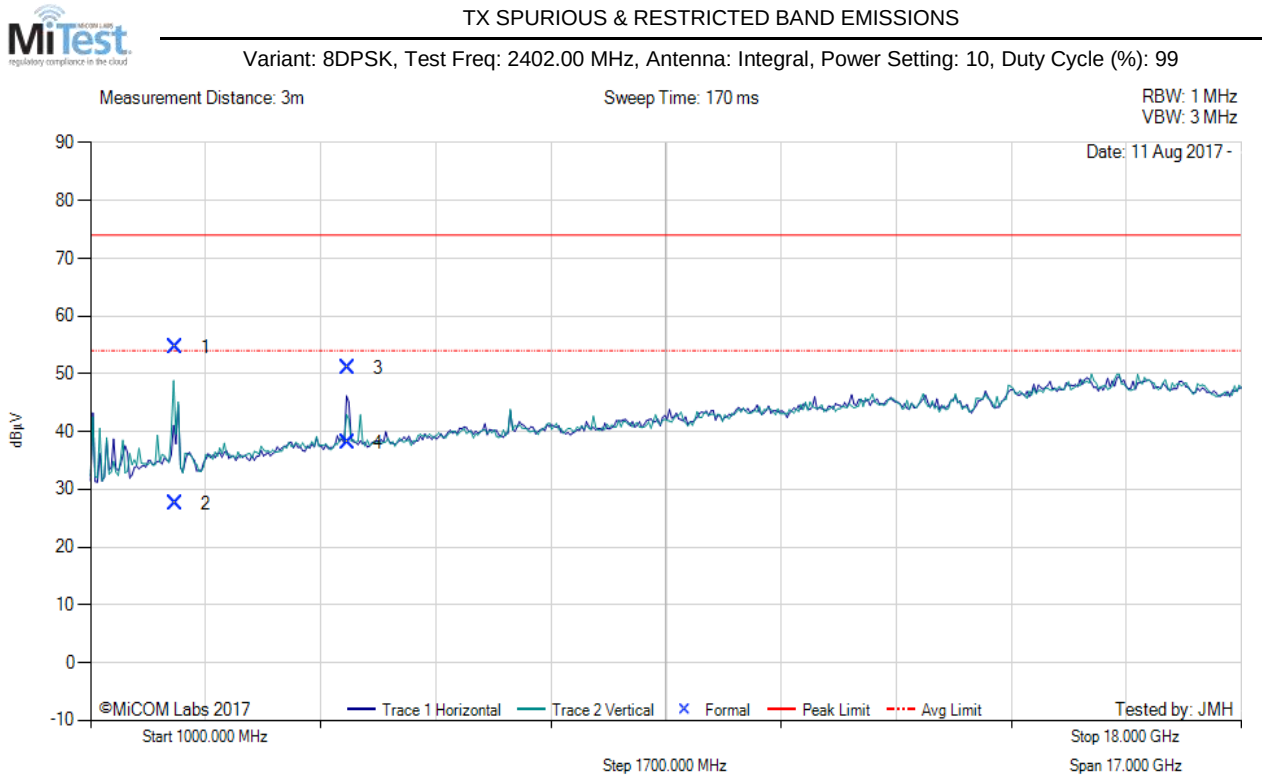



| Analyzer Setup | Marker:Frequency:Amplitude | Test Results |
|---|---|---|
| Detector = MAX PEAK<br>Sweep Count = 0<br>RF Atten (dB) = 20<br>Trace Mode = VIEW | M1 : 2480.094 MHz : 5.574 dBm<br>M2 : 2480.645 MHz : -9.822 dBm<br>M3 : 2483.500 MHz : -47.770 dBm | Channel Frequency: 2480.00 MHz |

back to matrix

## A.3.2. Radiated Emissions

### A.3.2.3. TX Spurious & Restricted Band Emissions



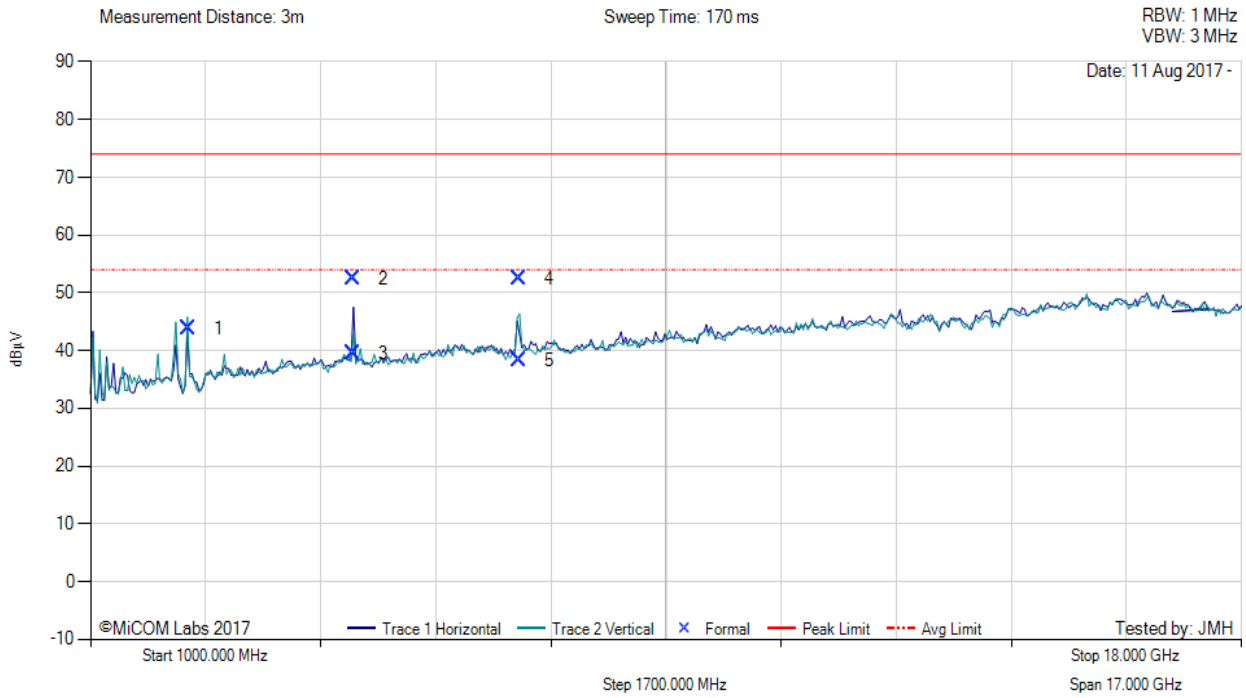

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2245.90 | 64.11 | 2.64 | -12.14 | 54.61 | Max Peak | Vertical | 142 | 269 | 74.0 | -19.4 | Pass |
| 2 | 2245.90 | 36.98 | 2.64 | -12.14 | 27.48 | Max Avg | Vertical | 142 | 269 | 54.0 | -26.5 | Pass |
| 3 | 4803.81 | 58.61 | 3.51 | -11.12 | 51.00 | Max Peak | Horizontal | 117 | 356 | 74.0 | -23.0 | Pass |
| 4 | 4803.81 | 45.66 | 3.51 | -11.12 | 38.05 | Max Avg | Horizontal | 117 | 356 | 54.0 | -16.0 | Pass |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 8DPSK, Test Freq: 2440.00 MHz, Antenna: Integral, Power Setting: 9, Duty Cycle (%): 99



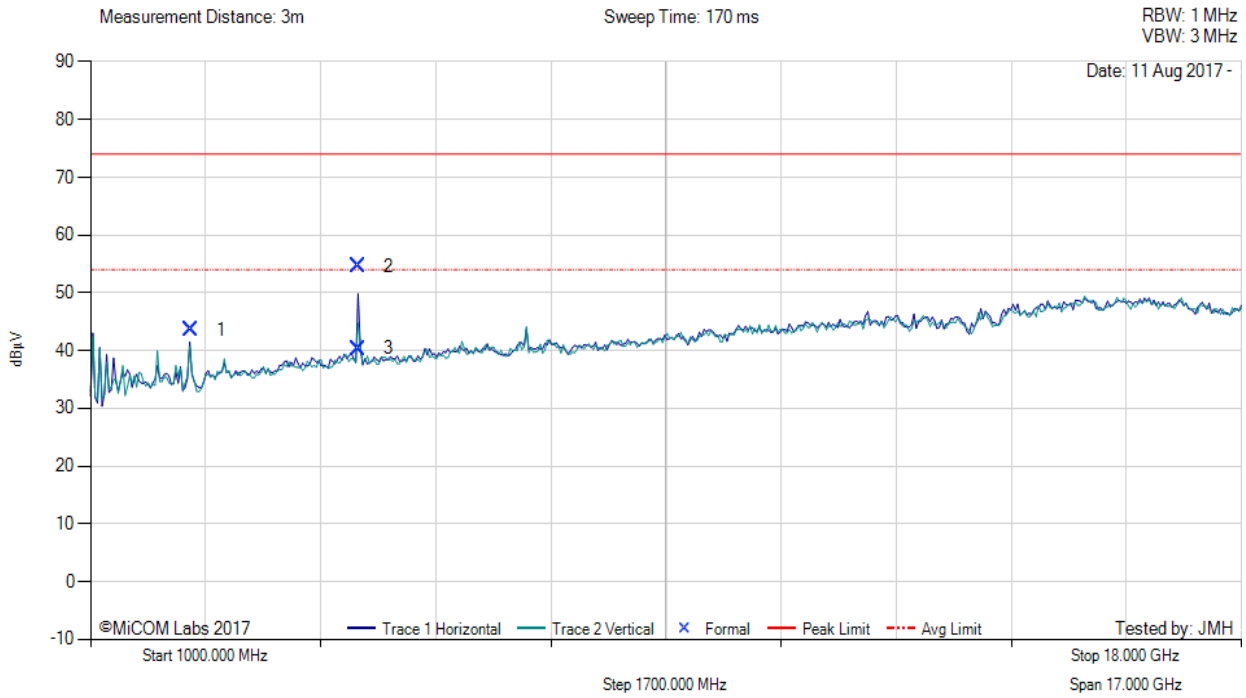

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2441.06 | 52.84 | 2.72 | -11.72 | 43.84 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| 2 | 4882.10 | 60.13 | 3.63 | -11.26 | 52.50 | Max Peak | Horizontal | 114 | 353 | 74.0 | -21.5 | Pass |
| 3 | 4882.10 | 47.14 | 3.63 | -11.26 | 39.51 | Max Avg | Horizontal | 114 | 353 | 54.0 | -14.5 | Pass |
| 4 | 7323.04 | 55.43 | 4.26 | -7.26 | 52.43 | Max Peak | Vertical | 101 | 351 | 74.0 | -21.6 | Pass |
| 5 | 7323.04 | 41.32 | 4.26 | -7.26 | 38.32 | Max Avg | Vertical | 101 | 351 | 54.0 | -15.7 | Pass |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 8DPSK, Test Freq: 2480.00 MHz, Antenna: Integral, Power Setting: 8, Duty Cycle (%): 99



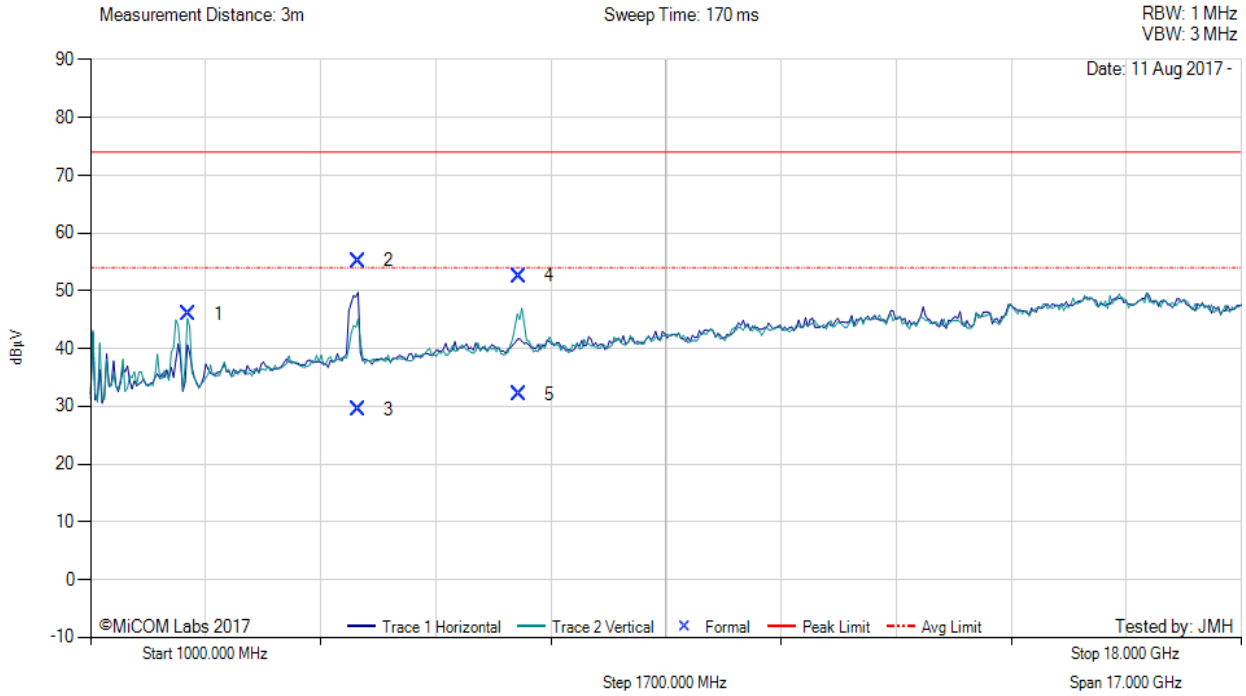

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2479.81 | 52.50 | 2.72 | -11.65 | 43.57 | Fundamental | Horizontal | 150 | 0 | -- | -- | |
| 2 | 4959.65 | 62.54 | 3.57 | -11.48 | 54.63 | Max Peak | Horizontal | 109 | 352 | 74.0 | -19.4 | Pass |
| 3 | 4959.65 | 48.29 | 3.57 | -11.48 | 40.38 | Max Avg | Horizontal | 109 | 352 | 54.0 | -13.6 | Pass |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 8DPSK, Test Freq: Hopping, Antenna: Integral, Power Setting: 10, Duty Cycle (%): 99



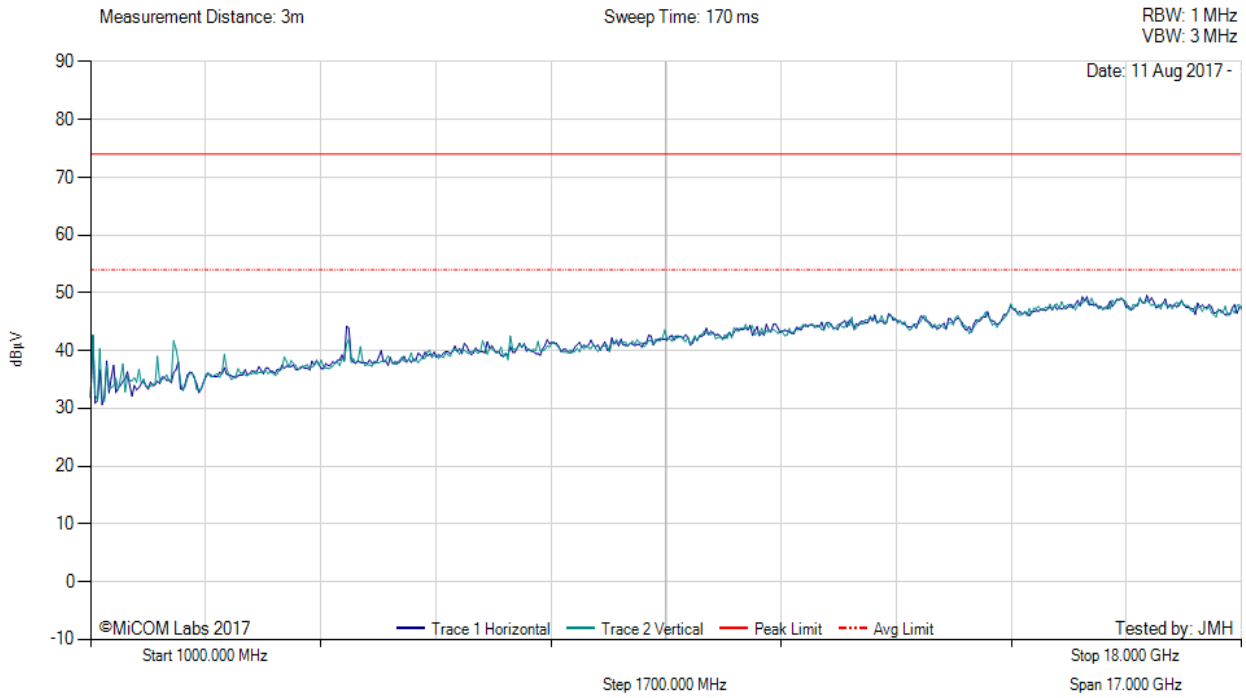

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2446.02 | 54.89 | 2.71 | -11.70 | 45.90 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| 2 | 4958.24 | 63.08 | 3.57 | -11.48 | 55.17 | Max Peak | Horizontal | 98 | 0 | 74.0 | -18.8 | Pass |
| 3 | 4958.24 | 37.35 | 3.57 | -11.48 | 29.44 | Max Avg | Horizontal | 98 | 0 | 54.0 | -24.6 | Pass |
| 4 | 7326.47 | 55.57 | 4.27 | -7.26 | 52.58 | Max Peak | Vertical | 123 | 354 | 74.0 | -21.4 | Pass |
| 5 | 7326.47 | 35.05 | 4.27 | -7.26 | 32.06 | Max Avg | Vertical | 123 | 354 | 54.0 | -21.9 | Pass |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2402.00 MHz, Antenna: Integral, Power Setting: 10, Duty Cycle (%): 99



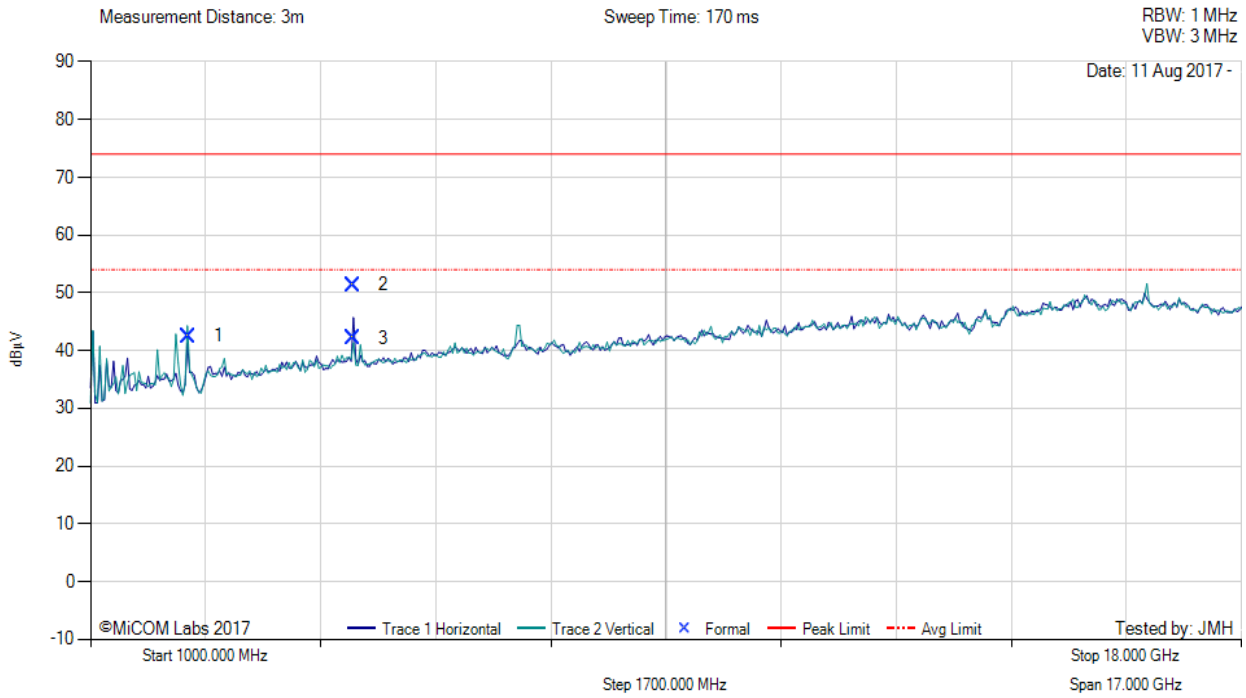

There are no emissions found within 6dB of the limit line.

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2440.00 MHz, Antenna: Integral, Power Setting: 10, Duty Cycle (%): 99



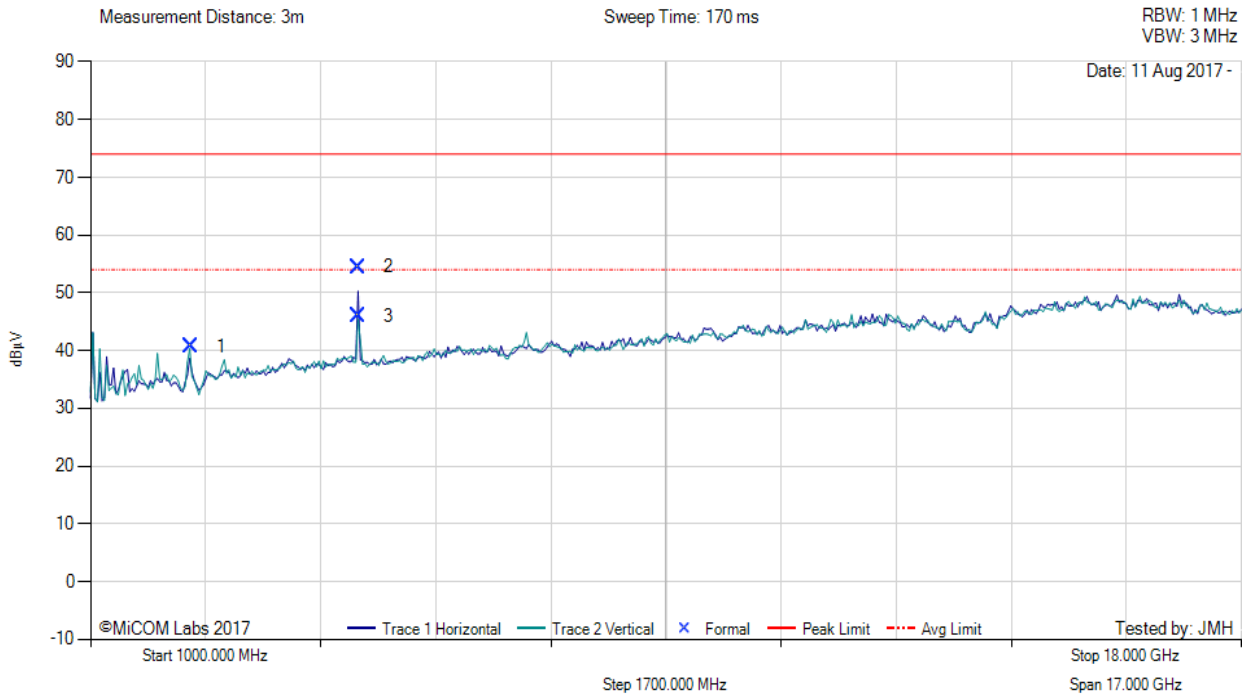

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2440.95 | 51.50 | 2.72 | -11.72 | 42.50 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| 2 | 4881.70 | 59.01 | 3.62 | -11.26 | 51.37 | Max Peak | Horizontal | 114 | 355 | 74.0 | -22.6 | Pass |
| 3 | 4881.70 | 49.72 | 3.62 | -11.26 | 42.08 | Max Avg | Horizontal | 114 | 355 | 54.0 | -11.9 | Pass |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2480.00 MHz, Antenna: Integral, Power Setting: 10, Duty Cycle (%): 99



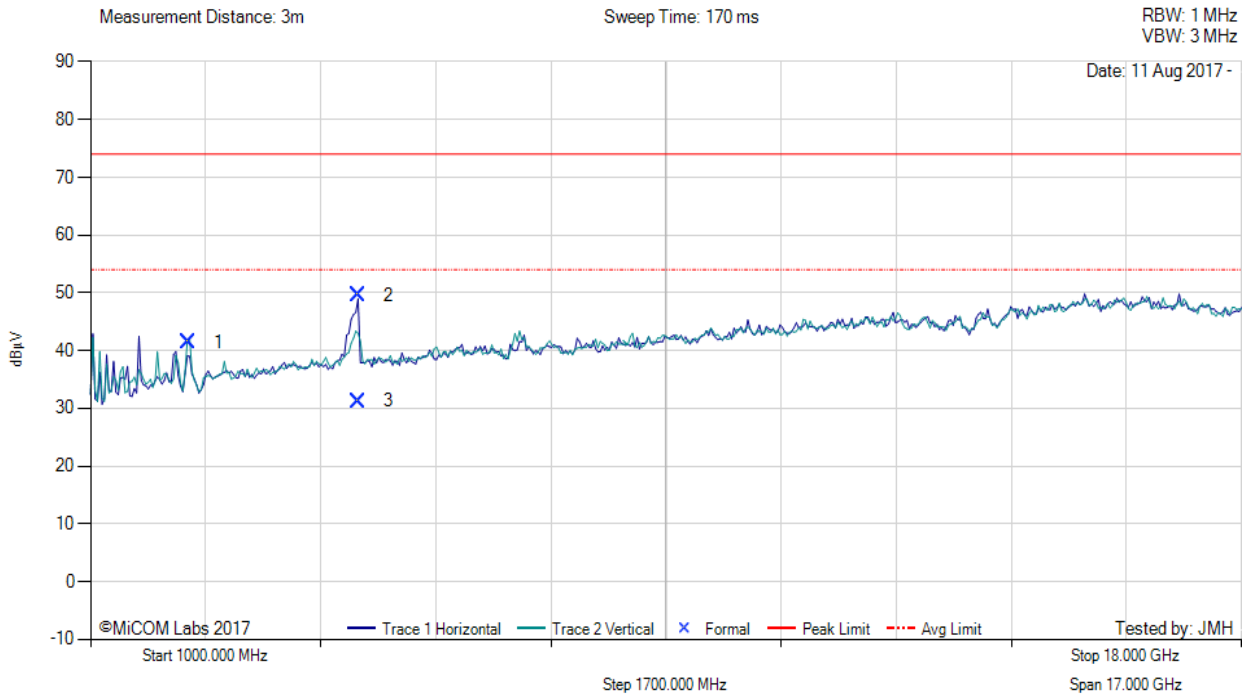

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2479.86 | 49.56 | 2.72 | -11.65 | 40.63 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| 2 | 4959.88 | 62.41 | 3.57 | -11.48 | 54.50 | Max Peak | Horizontal | 116 | 353 | 74.0 | -19.5 | Pass |
| 3 | 4959.88 | 53.90 | 3.57 | -11.48 | 45.99 | Max Avg | Horizontal | 116 | 353 | 54.0 | -8.0 | Pass |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: Hopping, Antenna: Integral, Power Setting: 10, Duty Cycle (%): 99



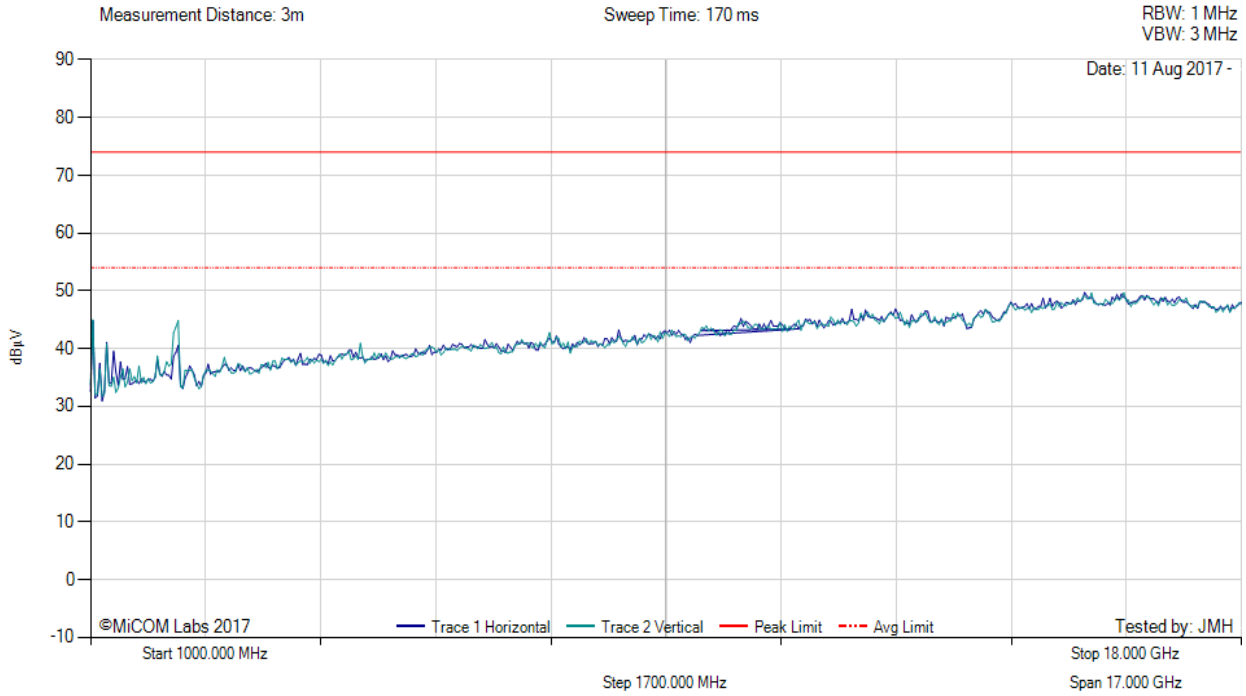

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2441.40 | 50.36 | 2.72 | -11.72 | 41.36 | Fundamental | Vertical | 100 | 0 | -- | -- | |
| 2 | 4953.28 | 57.47 | 3.55 | -11.47 | 49.55 | Max Peak | Horizontal | 167 | 358 | 74.0 | -24.5 | Pass |
| 3 | 4953.28 | 39.19 | 3.55 | -11.47 | 31.27 | Max Avg | Horizontal | 167 | 358 | 54.0 | -22.7 | Pass |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. Hopping

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 8DPSK, Test Freq: 2402.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



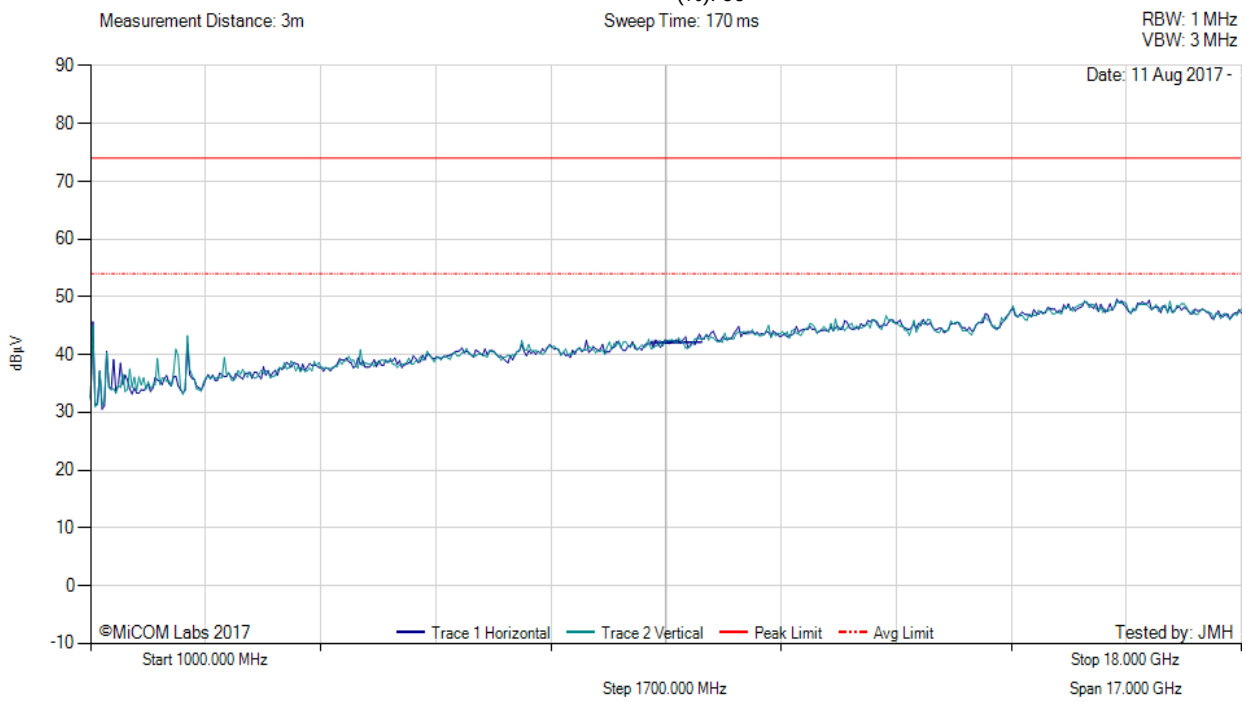

There are no emissions found within 6dB of the limit line.

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 8DPSK, Test Freq: 2440.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 9, Duty Cycle (%): 99



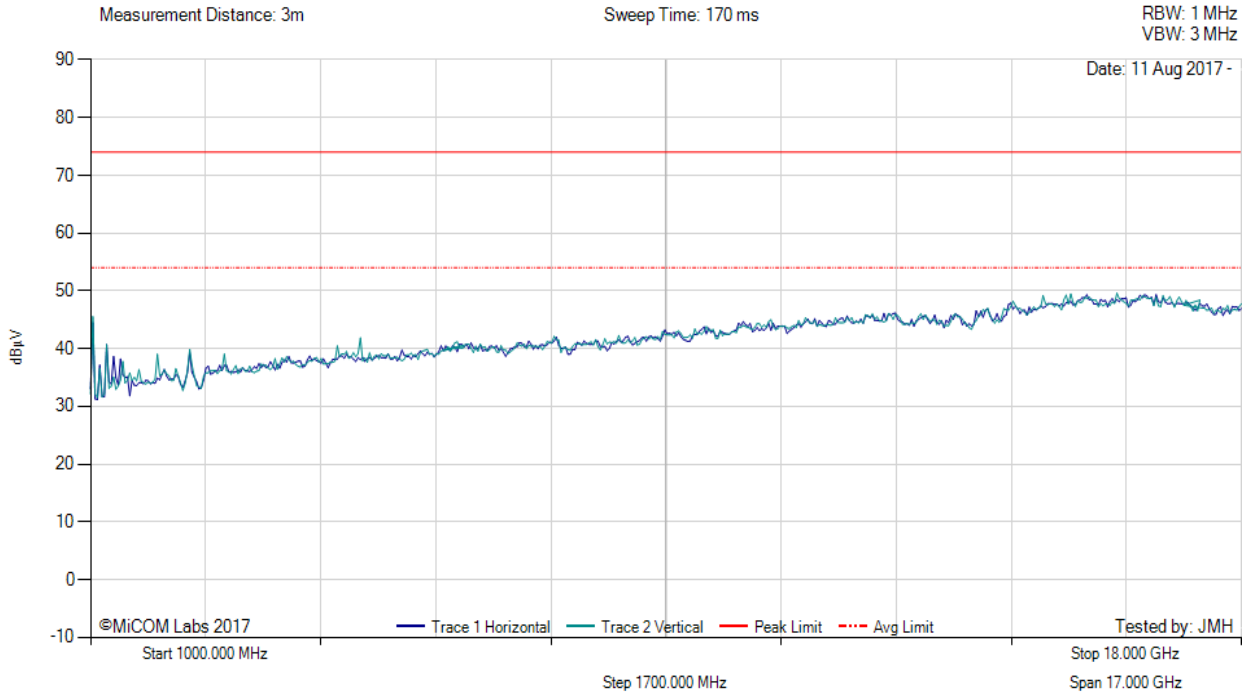

There are no emissions found within 6dB of the limit line.

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 8DPSK, Test Freq: 2480.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 8, Duty Cycle (%): 99



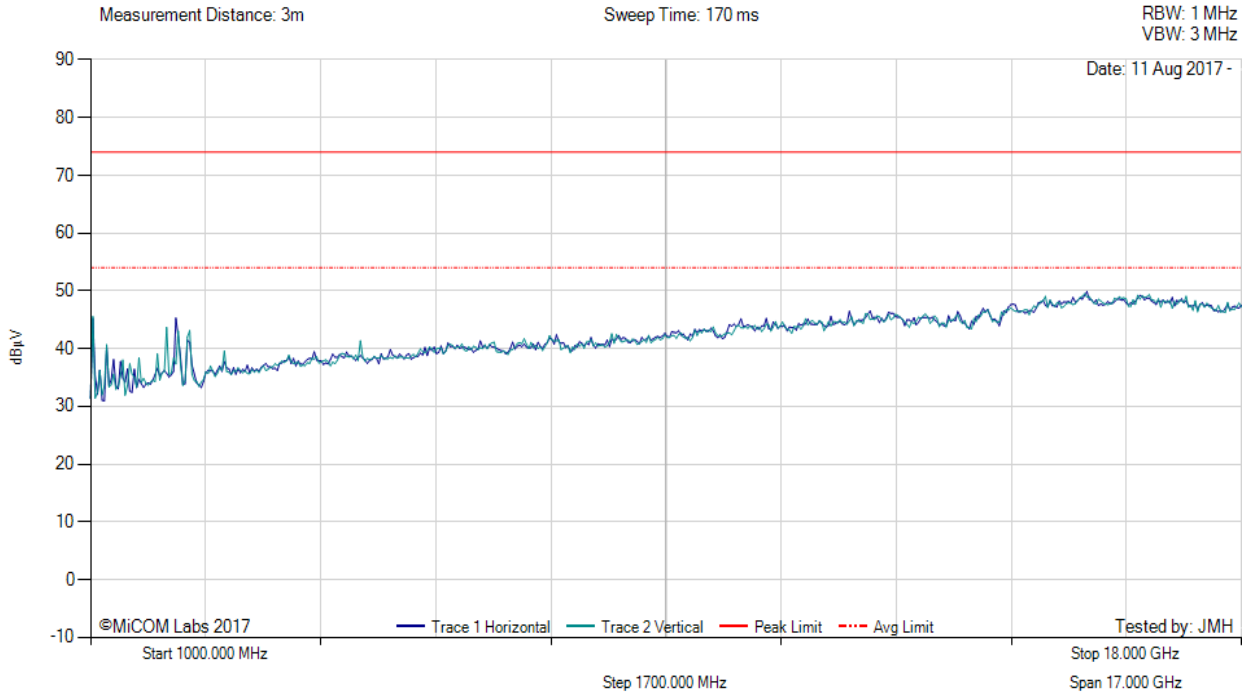

There are no emissions found within 6dB of the limit line.

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 8DPSK, Test Freq: Hopping, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



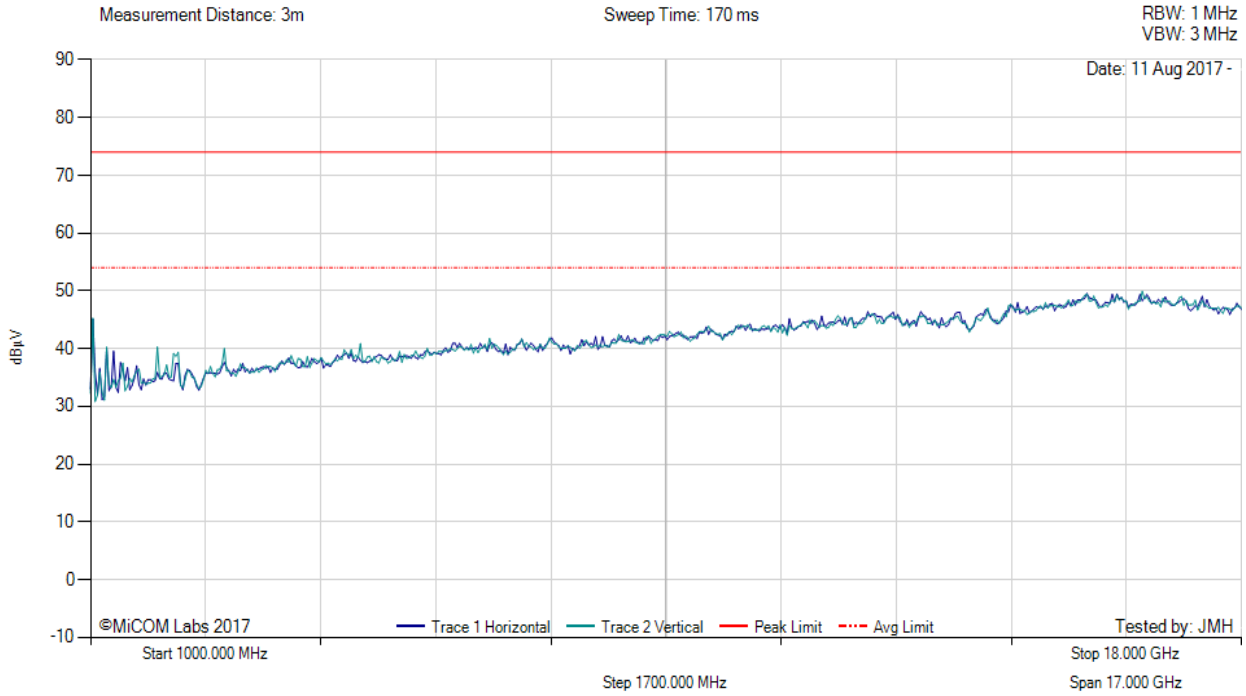

There are no emissions found within 6dB of the limit line.

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2402.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



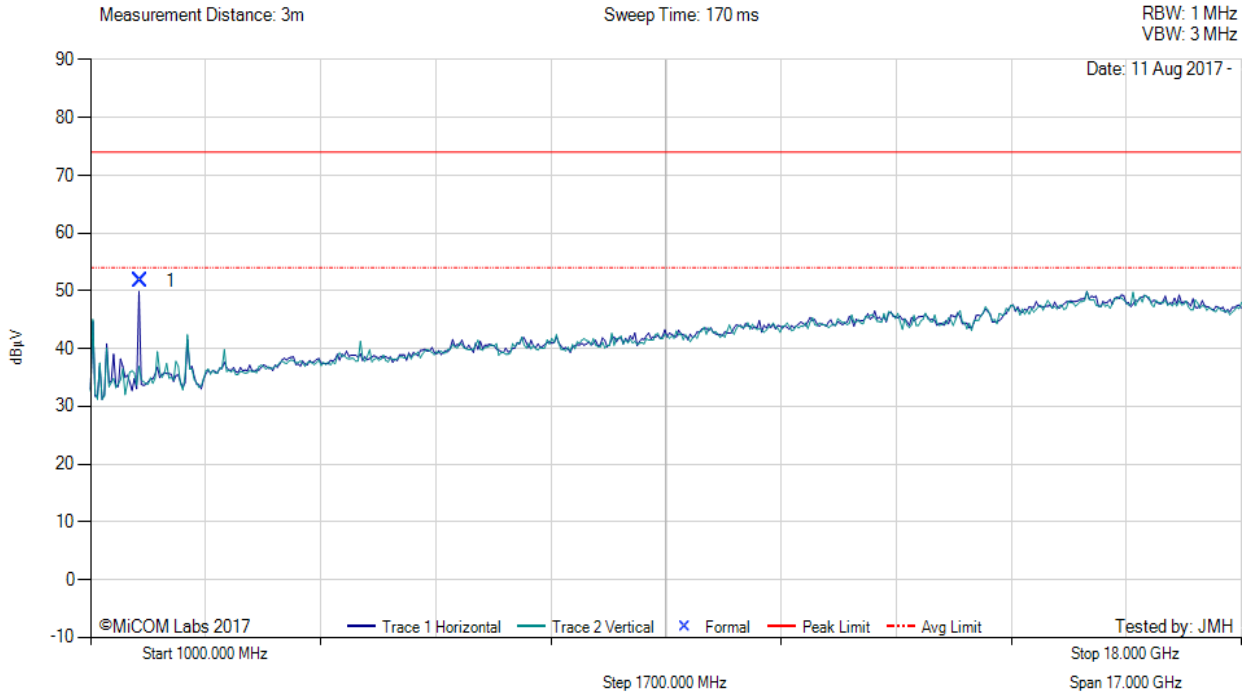

There are no emissions found within 6dB of the limit line.

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2440.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



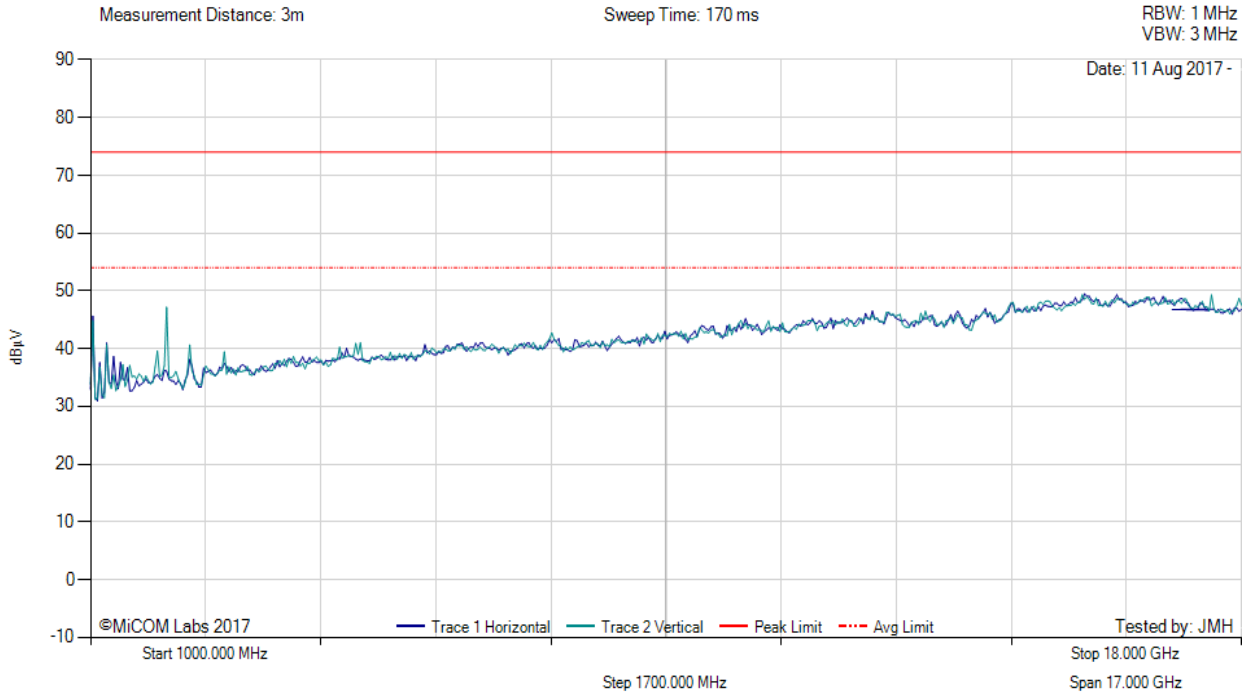

| 1000.00 - 18000.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 1728.16 | 64.02 | 2.45 | -14.71 | 51.76 | Peak (NRB) | Horizontal | 150 | 360 | -- | -- | Pass |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2480.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



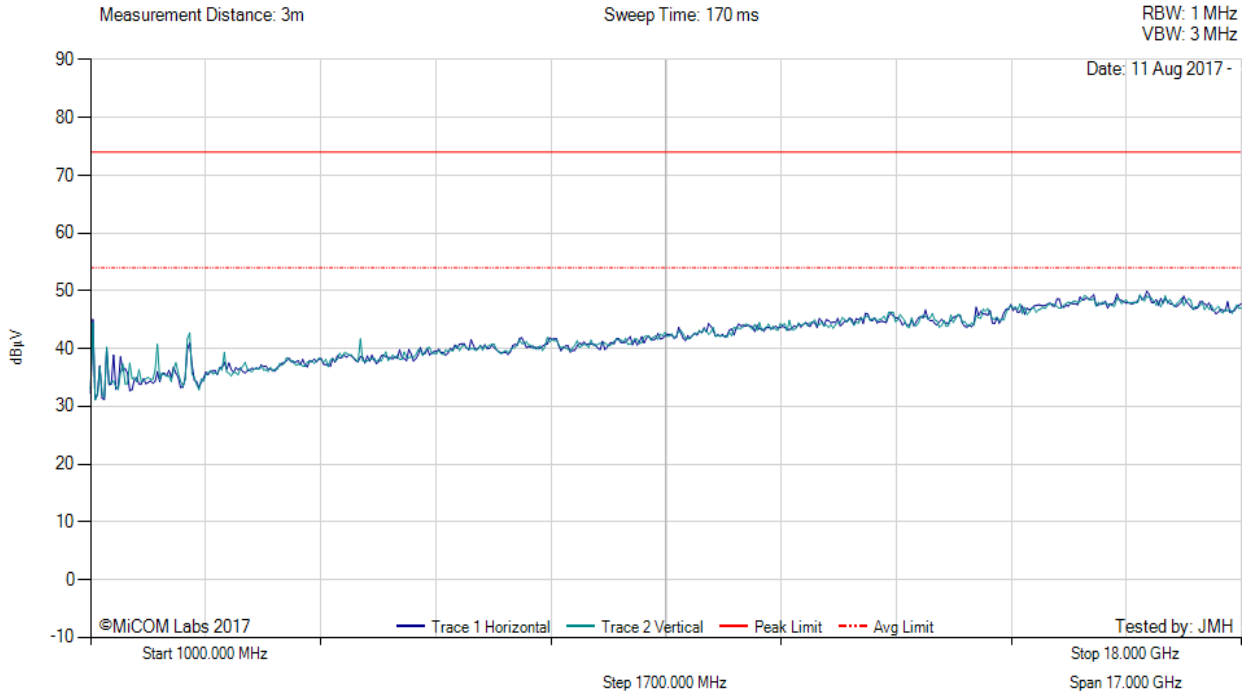

There are no emissions found within 6dB of the limit line.

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload.

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: Hopping, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99

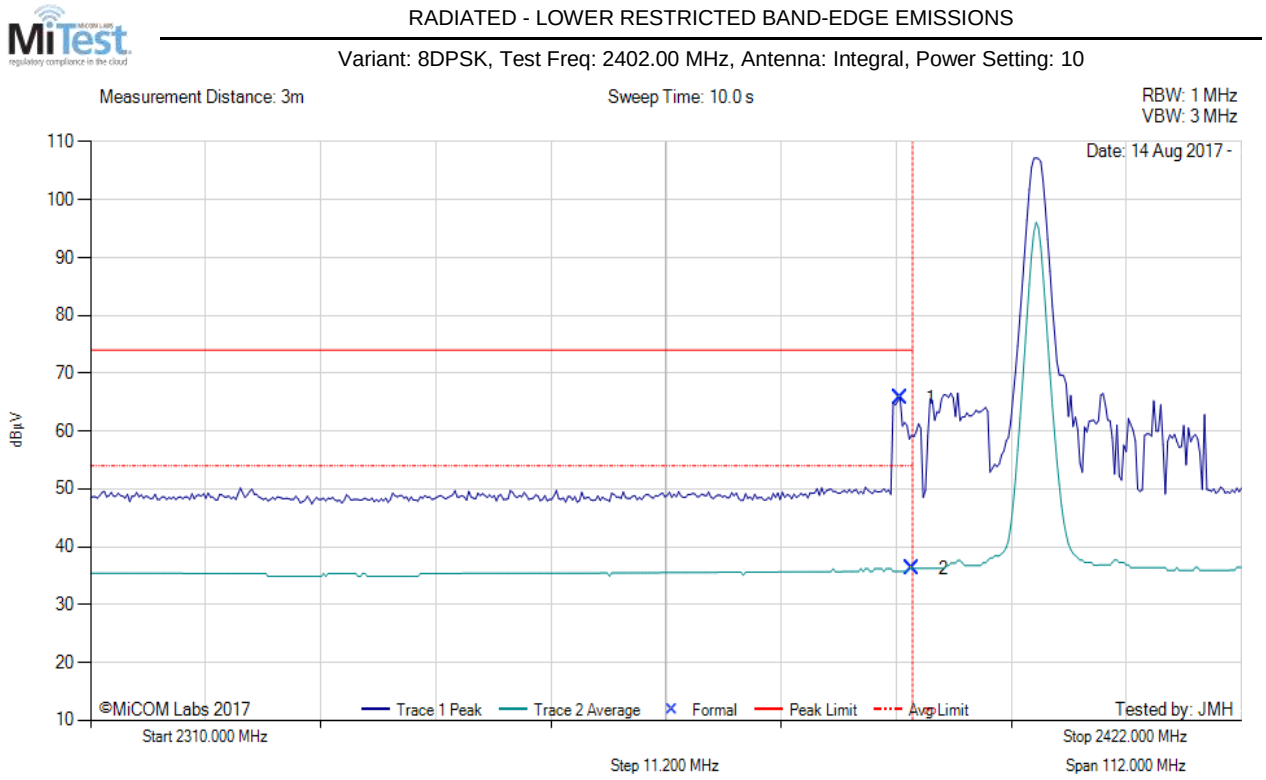



There are no emissions found within 6dB of the limit line.

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. 2.4 G Notch in front of amp to prevent overload. Hopping

back to matrix

### A.3.2.4. Restricted Edge & Band-Edge Emissions



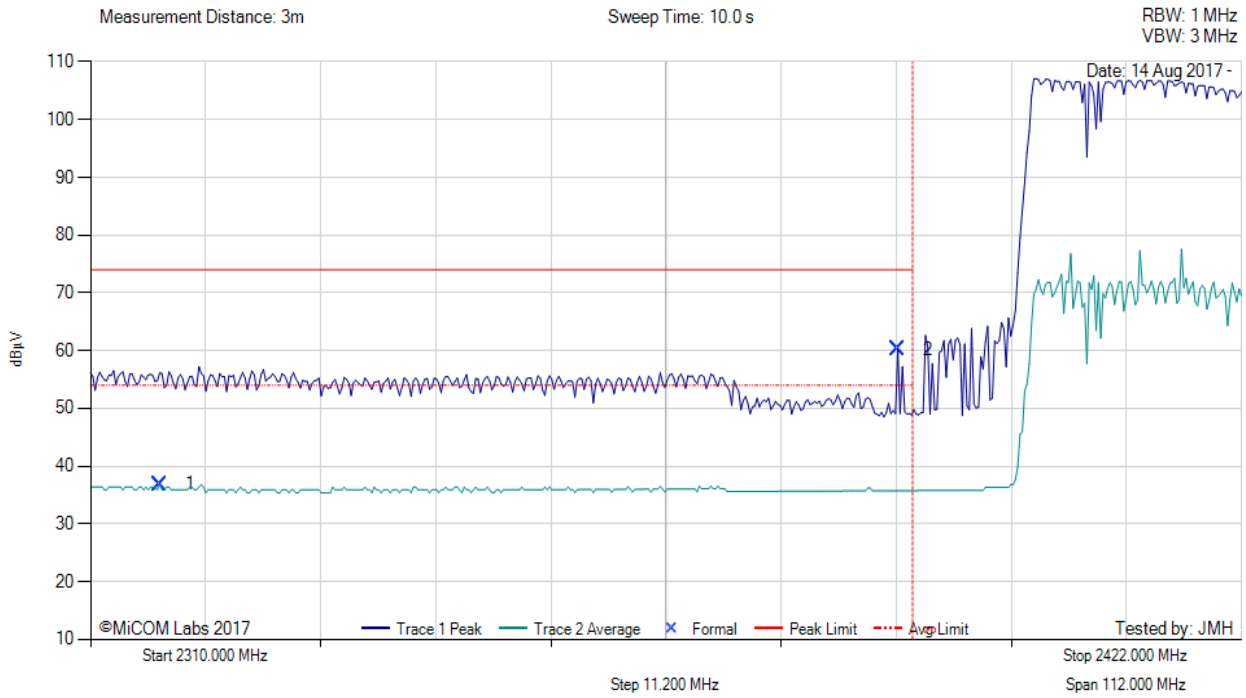

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2388.78 | 31.01 | 2.68 | 32.04 | 65.73 | Max Peak | Vertical | 156 | 357 | 74.0 | -8.3 | Pass |
| 2 | 2390.00 | 1.53 | 2.69 | 32.04 | 36.26 | Max Avg | Vertical | 156 | 357 | 54.0 | -17.7 | Pass |
| 3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: 8DPSK, Test Freq: Hopping, Antenna: Integral, Power Setting: 10



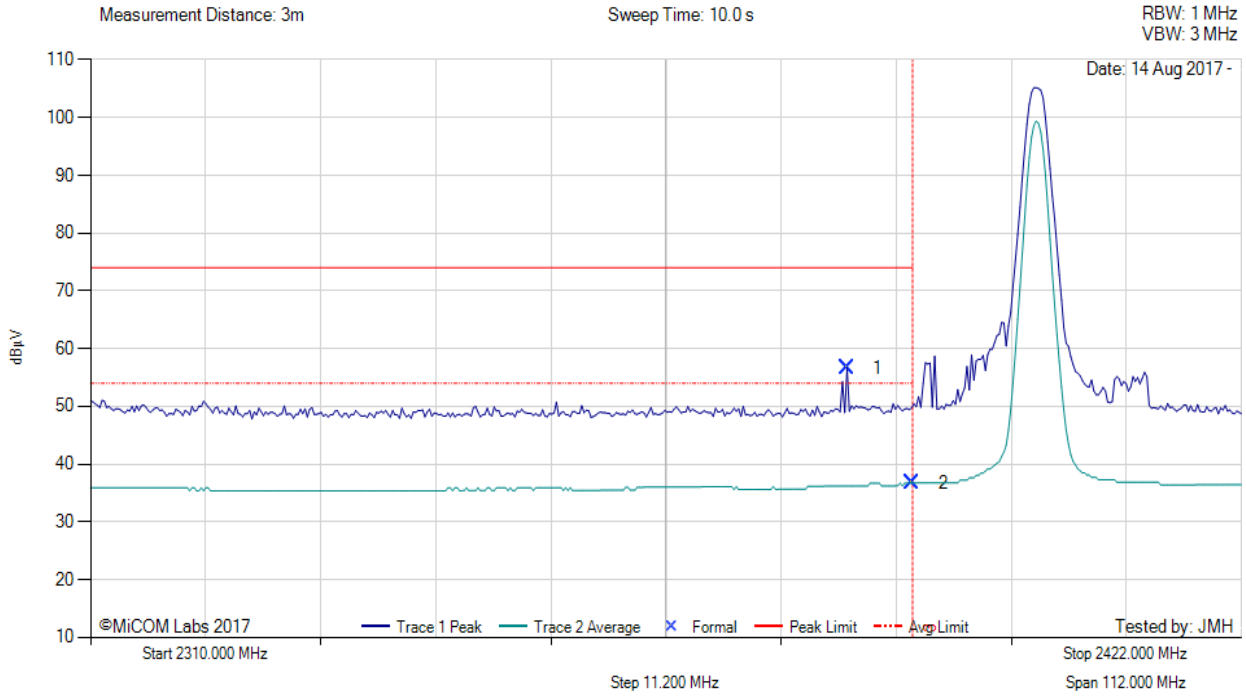

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2316.73 | 2.45 | 2.67 | 31.71 | 36.83 | Max Avg | Vertical | 156 | 357 | 54.0 | -17.2 | Pass |
| 2 | 2388.56 | 25.43 | 2.68 | 32.04 | 60.15 | Max Peak | Vertical | 156 | 357 | 74.0 | -13.9 | Pass |
| 3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. Hopping

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2402.00 MHz, Antenna: Integral, Power Setting: 10



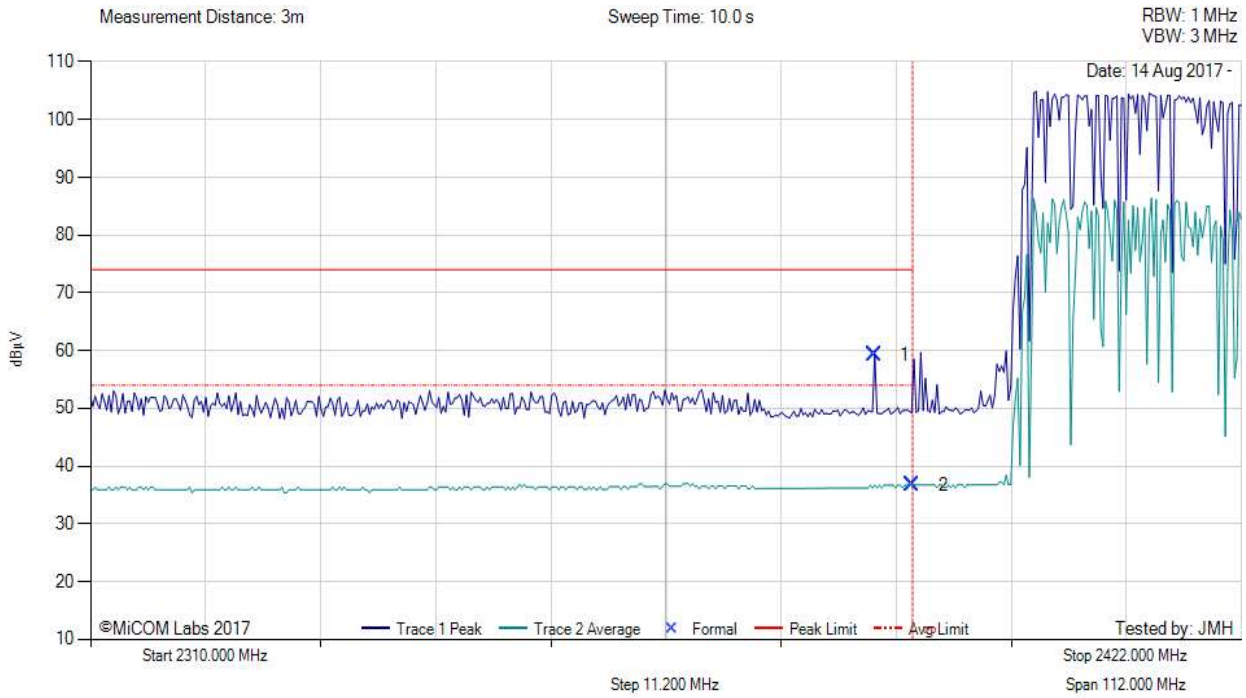

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2383.62 | 21.97 | 2.68 | 31.99 | 56.64 | Max Peak | Vertical | 156 | 357 | 74.0 | -17.4 | Pass |
| 2 | 2390.00 | 2.00 | 2.69 | 32.04 | 36.73 | Max Avg | Vertical | 156 | 357 | 54.0 | -17.3 | Pass |
| 3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: Hopping, Antenna: Integral, Power Setting: 10



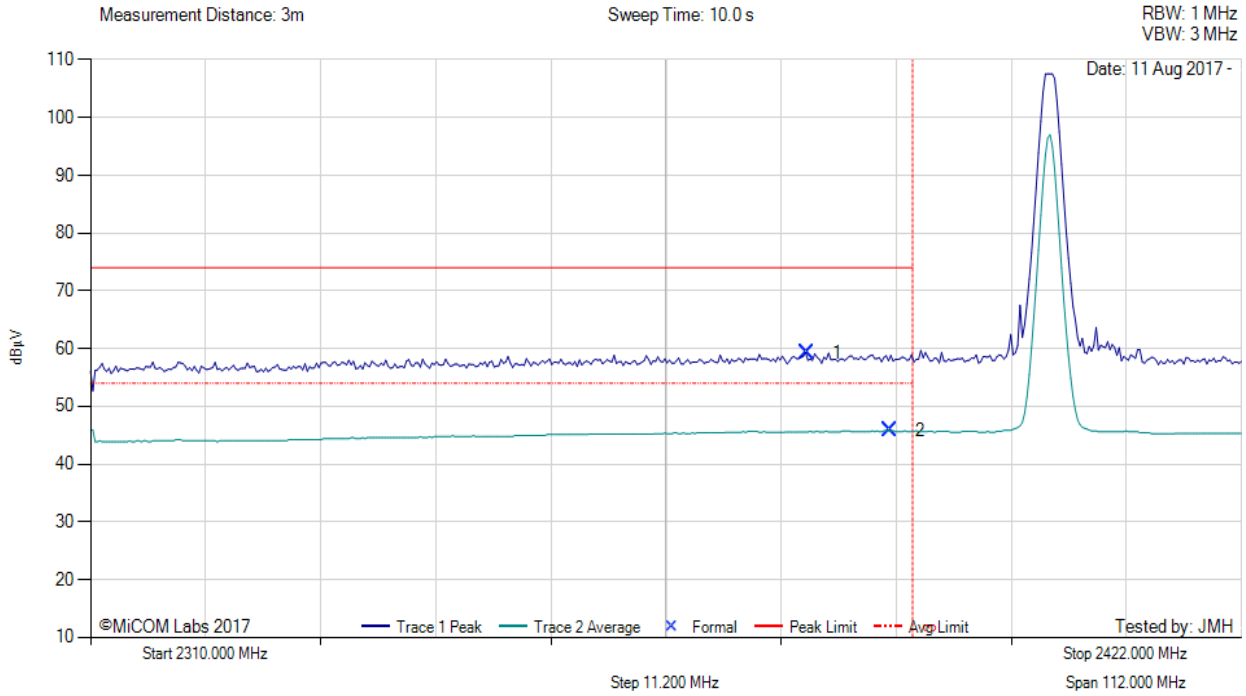

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2386.31 | 24.57 | 2.68 | 32.01 | 59.26 | Max Peak | Vertical | 156 | 357 | 74.0 | -14.7 | Pass |
| 2 | 2390.00 | 2.00 | 2.69 | 32.04 | 36.73 | Max Avg | Vertical | 156 | 357 | 54.0 | -17.3 | Pass |
| 3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. Hopping

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: 8DPSK, Test Freq: 2402.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



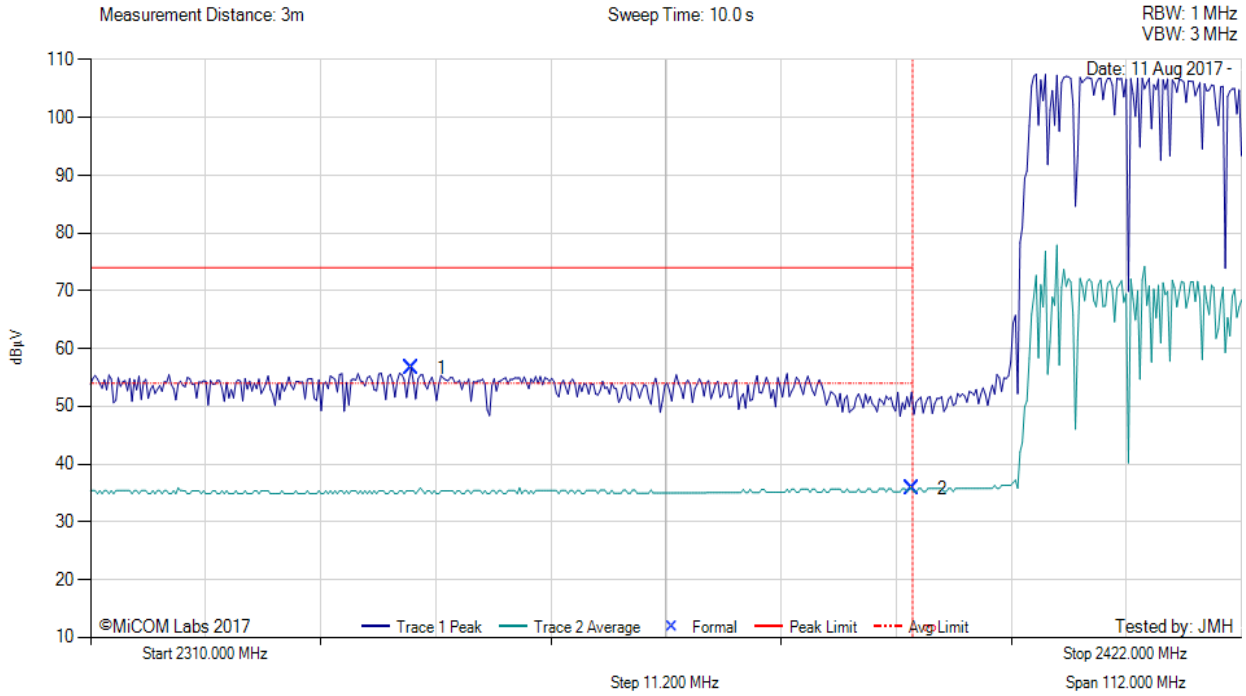

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2379.68 | 24.69 | 2.69 | 31.96 | 59.34 | Max Peak | Vertical | 195 | 361 | 74.0 | -14.7 | Pass |
| 2 | 2387.76 | 11.08 | 2.68 | 32.03 | 45.79 | Max Avg | Vertical | 195 | 361 | 54.0 | -8.2 | Pass |
| 3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: 8DPSK, Test Freq: Hopping, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



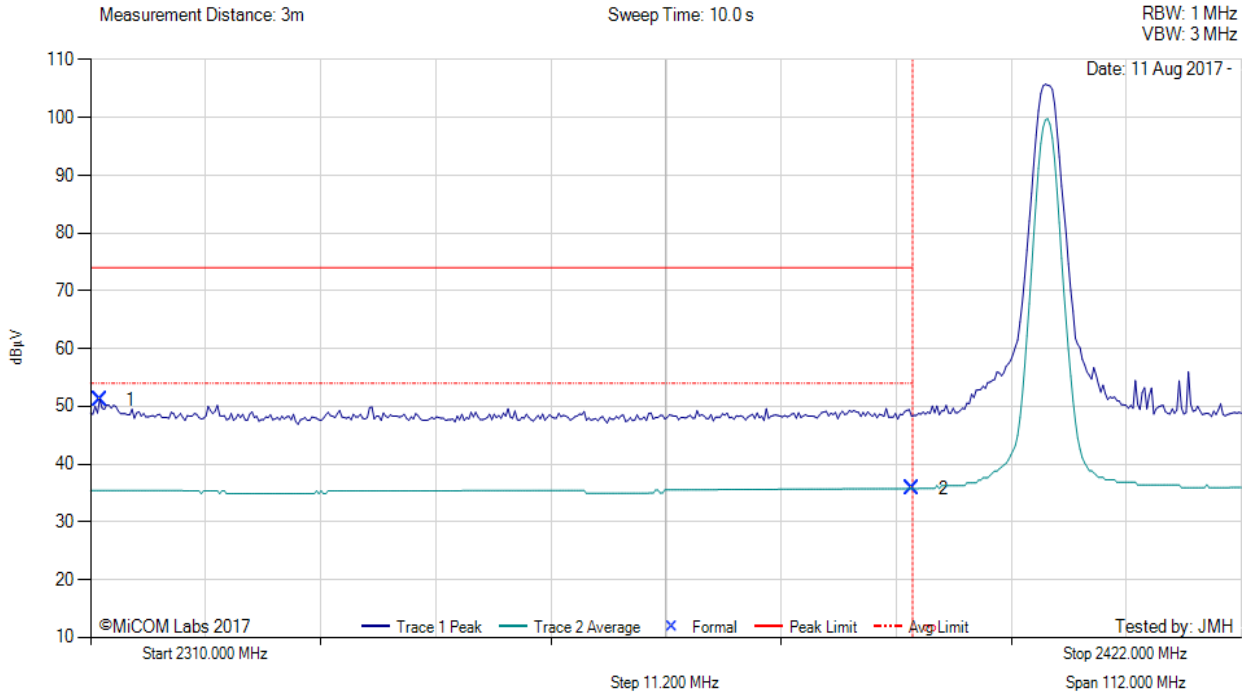

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2341.20 | 22.18 | 2.68 | 31.70 | 56.56 | Max Peak | Vertical | 195 | 361 | 74.0 | -17.4 | Pass |
| 2 | 2389.90 | 1.04 | 2.69 | 32.04 | 35.77 | Max Avg | Vertical | 195 | 361 | 54.0 | -18.2 | Pass |
| 3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. Hopping

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2402.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



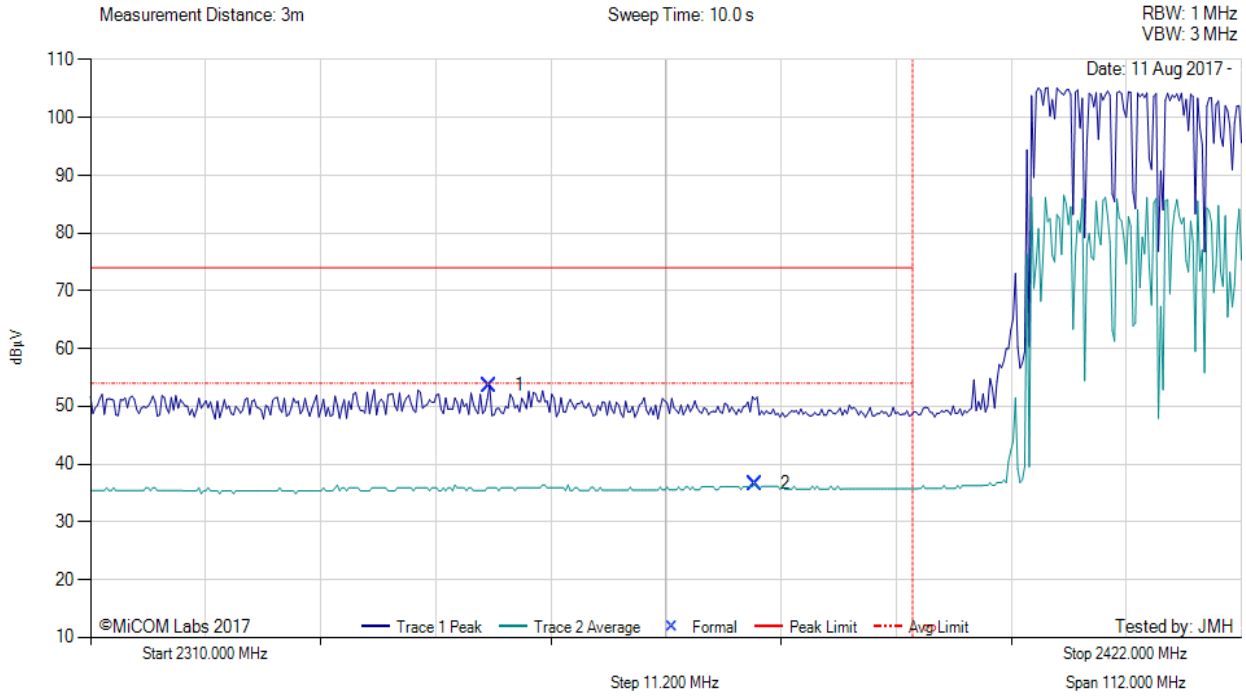

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2310.90 | 16.76 | 2.67 | 31.72 | 51.15 | Max Peak | Vertical | 195 | 361 | 74.0 | -22.9 | Pass |
| 2 | 2390.00 | 1.04 | 2.69 | 32.04 | 35.77 | Max Avg | Vertical | 195 | 361 | 54.0 | -18.2 | Pass |
| 3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: Hopping, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



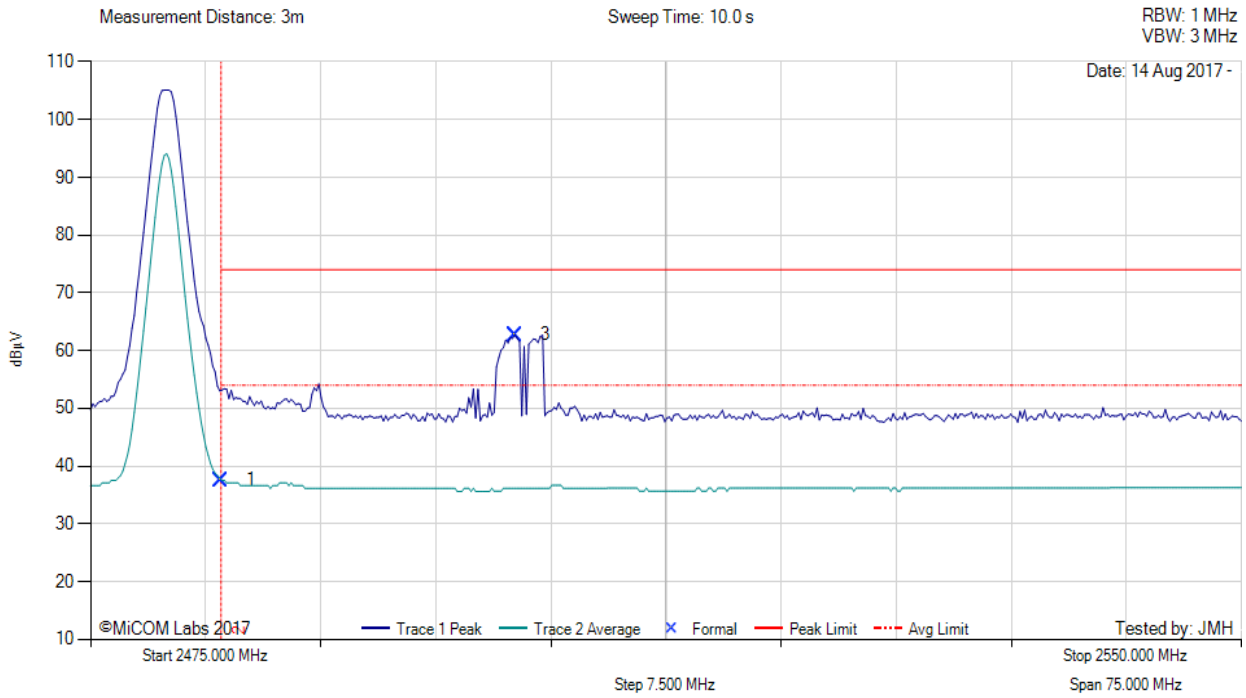

| 2310.00 - 2422.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2348.83 | 19.33 | 2.65 | 31.69 | 53.67 | Max Peak | Vertical | 195 | 361 | 74.0 | -20.3 | Pass |
| 2 | 2374.64 | 1.99 | 2.70 | 31.91 | 36.60 | Max Avg | Vertical | 195 | 361 | 54.0 | -17.4 | Pass |
| 3 | 2390.00 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. Hopping

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: 8DPSK, Test Freq: 2480.00 MHz, Antenna: Integral, Power Setting: 8



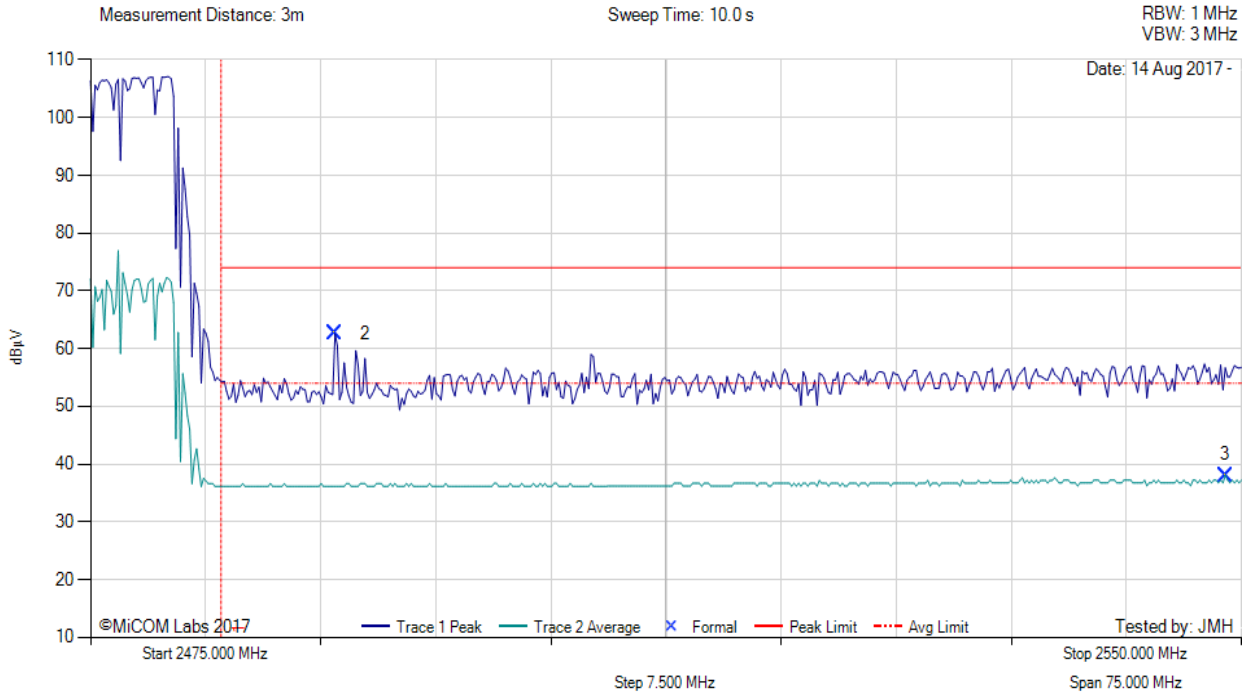

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2483.50 | 2.46 | 2.73 | 32.37 | 37.56 | Max Avg | Vertical | 151 | 274 | 54.0 | -16.4 | Pass |
| 3 | 2502.66 | 27.62 | 2.73 | 32.40 | 62.75 | Max Peak | Vertical | 151 | 274 | 74.0 | -11.3 | Pass |
| 2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: 8DPSK, Test Freq: Hopping, Antenna: Integral, Power Setting: 8



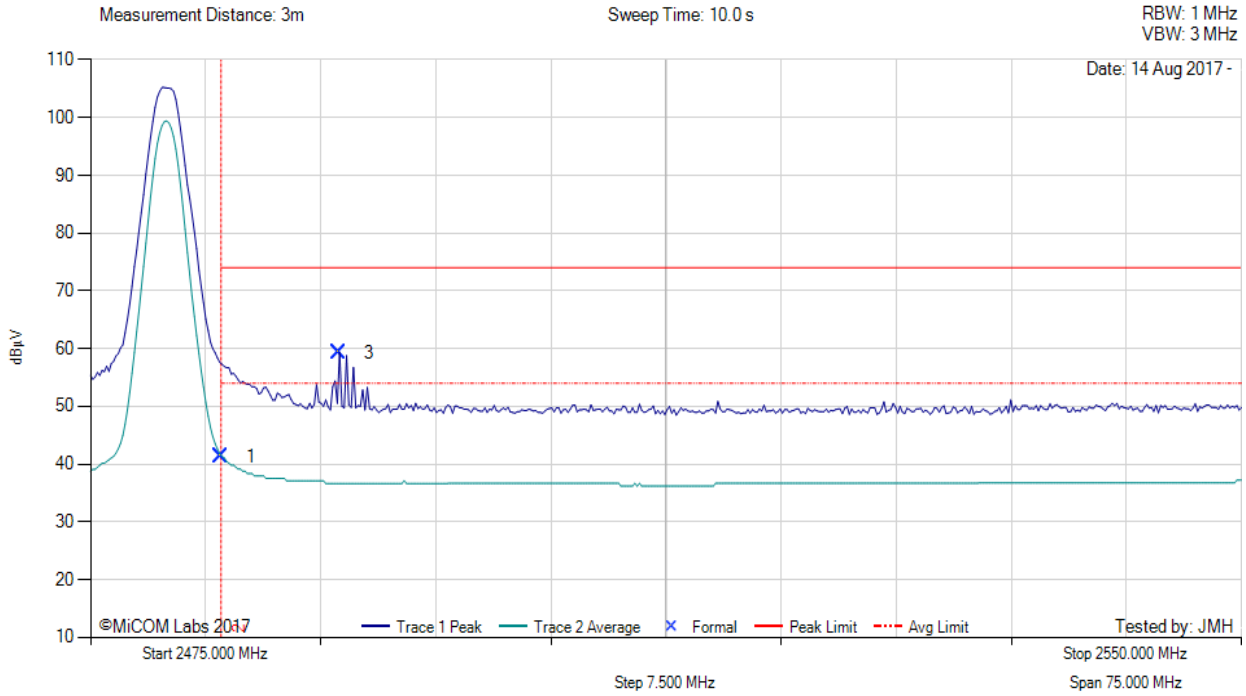

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 2 | 2490.93 | 27.44 | 2.74 | 32.38 | 62.56 | Max Peak | Vertical | 151 | 274 | 74.0 | -11.4 | Pass |
| 3 | 2548.95 | 2.86 | 2.75 | 32.49 | 38.10 | Max Avg | Vertical | 151 | 274 | 54.0 | -15.9 | Pass |
| 1 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. Hopping

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2480.00 MHz, Antenna: Integral, Power Setting: 10



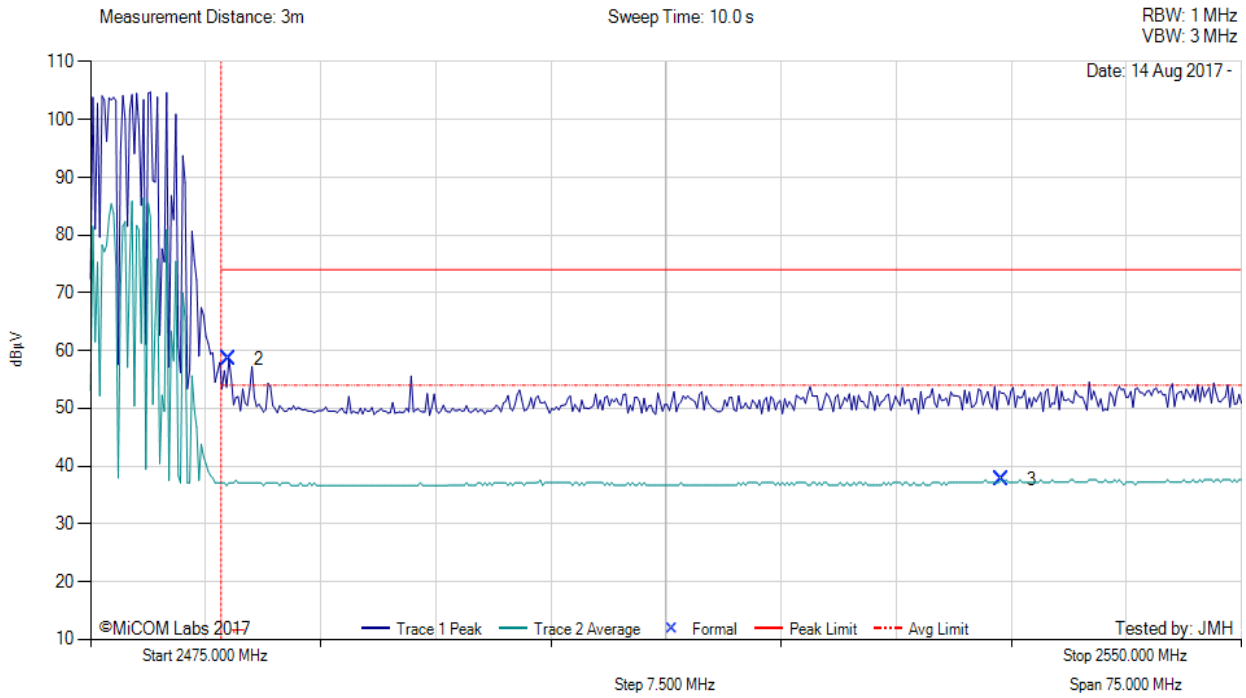

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2483.50 | 6.27 | 2.73 | 32.37 | 41.37 | Max Avg | Vertical | 151 | 274 | 54.0 | -12.6 | Pass |
| 3 | 2491.17 | 24.22 | 2.74 | 32.38 | 59.34 | Max Peak | Vertical | 151 | 274 | 74.0 | -14.7 | Pass |
| 2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: Hopping, Antenna: Integral, Power Setting: 10



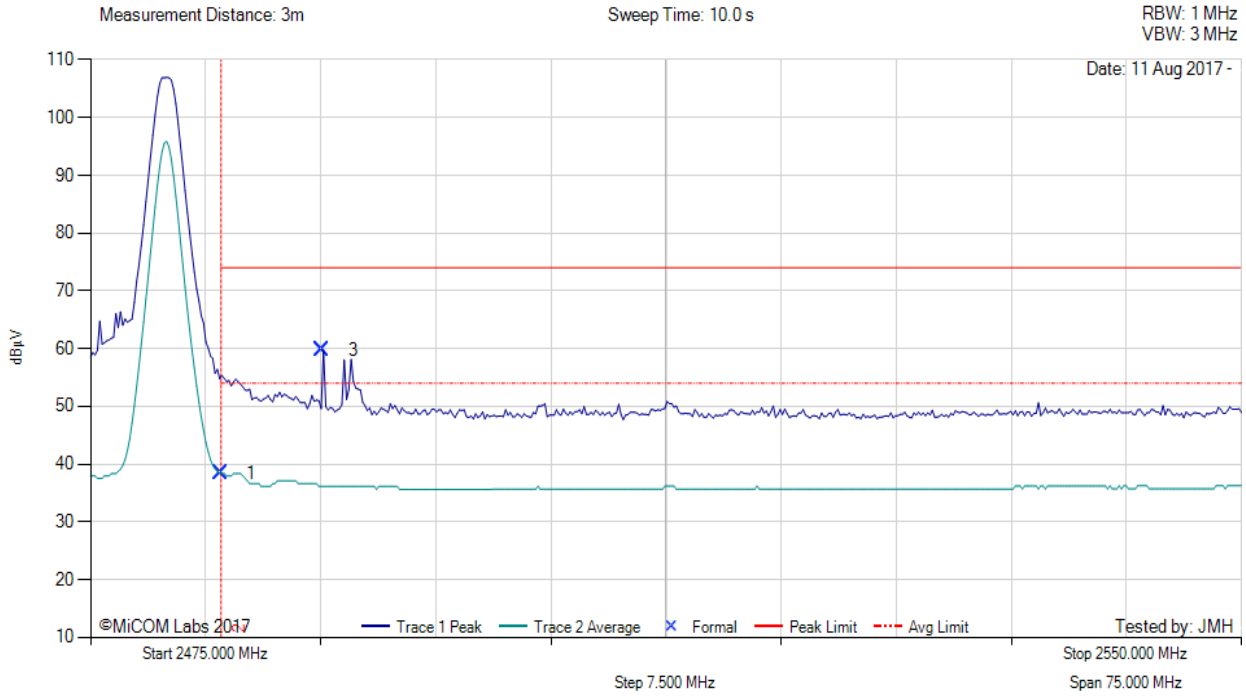

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 2 | 2484.02 | 23.41 | 2.73 | 32.37 | 58.51 | Max Peak | Vertical | 151 | 274 | 74.0 | -15.5 | Pass |
| 3 | 2534.37 | 2.45 | 2.74 | 32.46 | 37.65 | Max Avg | Vertical | 151 | 274 | 54.0 | -16.4 | Pass |
| 1 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. Hopping

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: 8DPSK, Test Freq: 2480.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



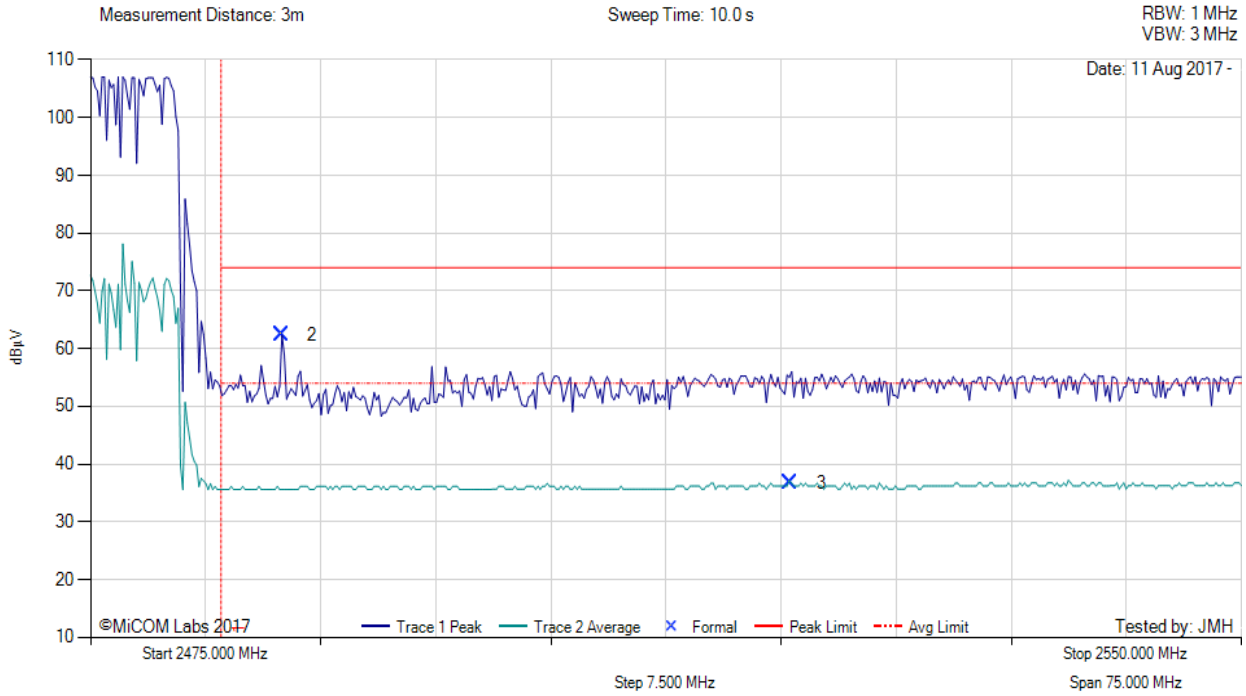

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2483.50 | 3.29 | 2.73 | 32.37 | 38.39 | Max Avg | Vertical | 162 | 49 | 54.0 | -15.6 | Pass |
| 3 | 2490.11 | 24.66 | 2.74 | 32.38 | 59.78 | Max Peak | Vertical | 162 | 49 | 74.0 | -14.2 | Pass |
| 2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: 8DPSK, Test Freq: Hopping, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



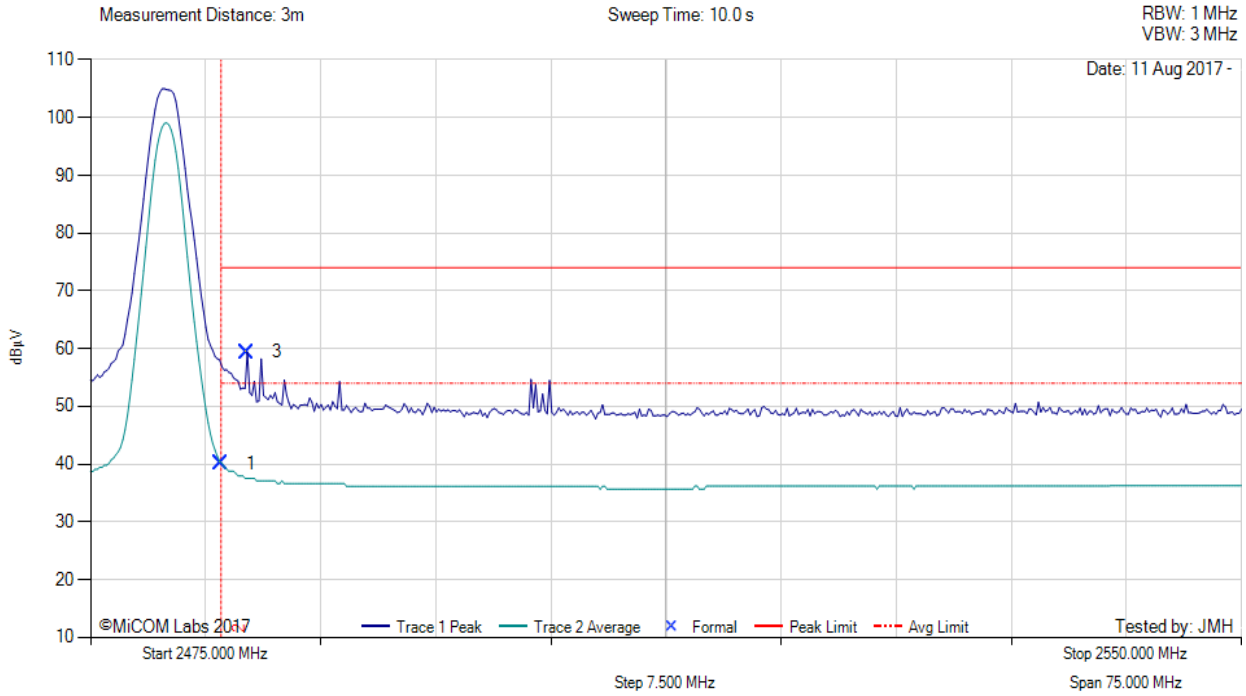

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 2 | 2487.47 | 27.23 | 2.73 | 32.37 | 62.33 | Max Peak | Vertical | 162 | 49 | 74.0 | -11.7 | Pass |
| 3 | 2520.62 | 1.53 | 2.74 | 32.44 | 36.71 | Max Avg | Vertical | 162 | 49 | 54.0 | -17.3 | Pass |
| 1 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. Hopping

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: 2480.00 MHz, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99



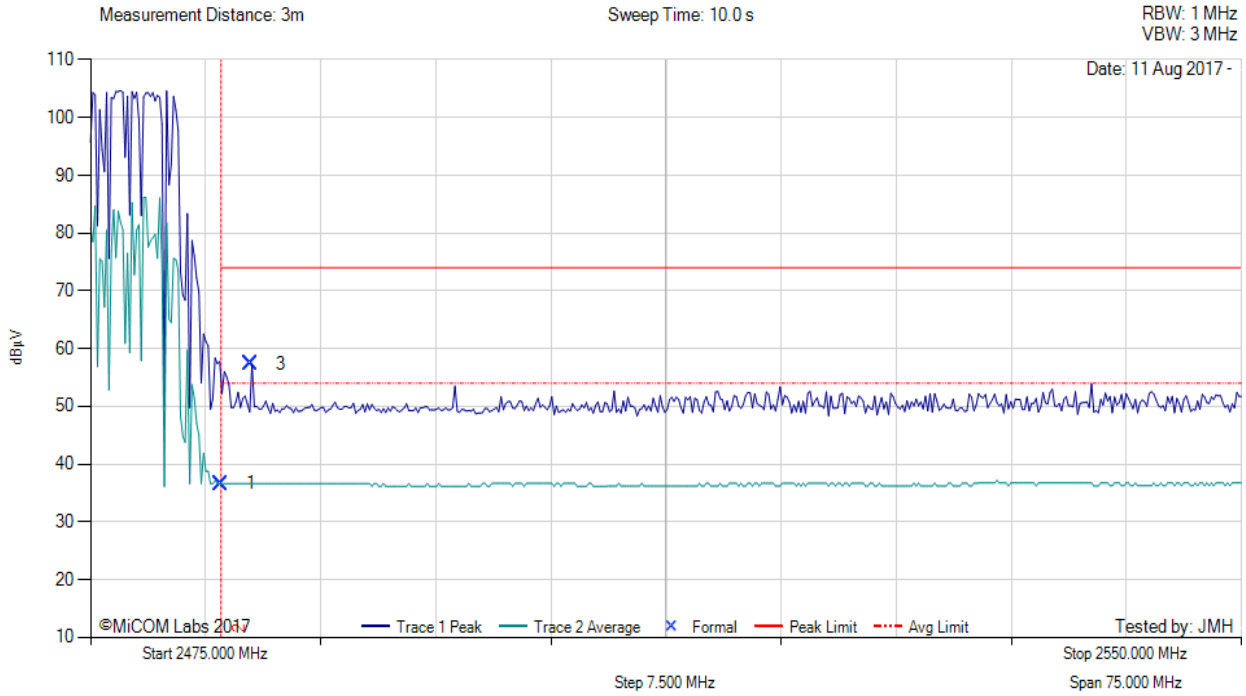

| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2483.50 | 5.07 | 2.73 | 32.37 | 40.17 | Max Avg | Vertical | 162 | 49 | 54.0 | -13.8 | Pass |
| 3 | 2485.15 | 24.30 | 2.73 | 32.37 | 59.40 | Max Peak | Vertical | 162 | 49 | 74.0 | -14.6 | Pass |
| 2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: Pi_4 DQPSK, Test Freq: Hopping, Antenna: YAGEO ANTX300P002B24553, Power Setting: 10, Duty Cycle (%): 99

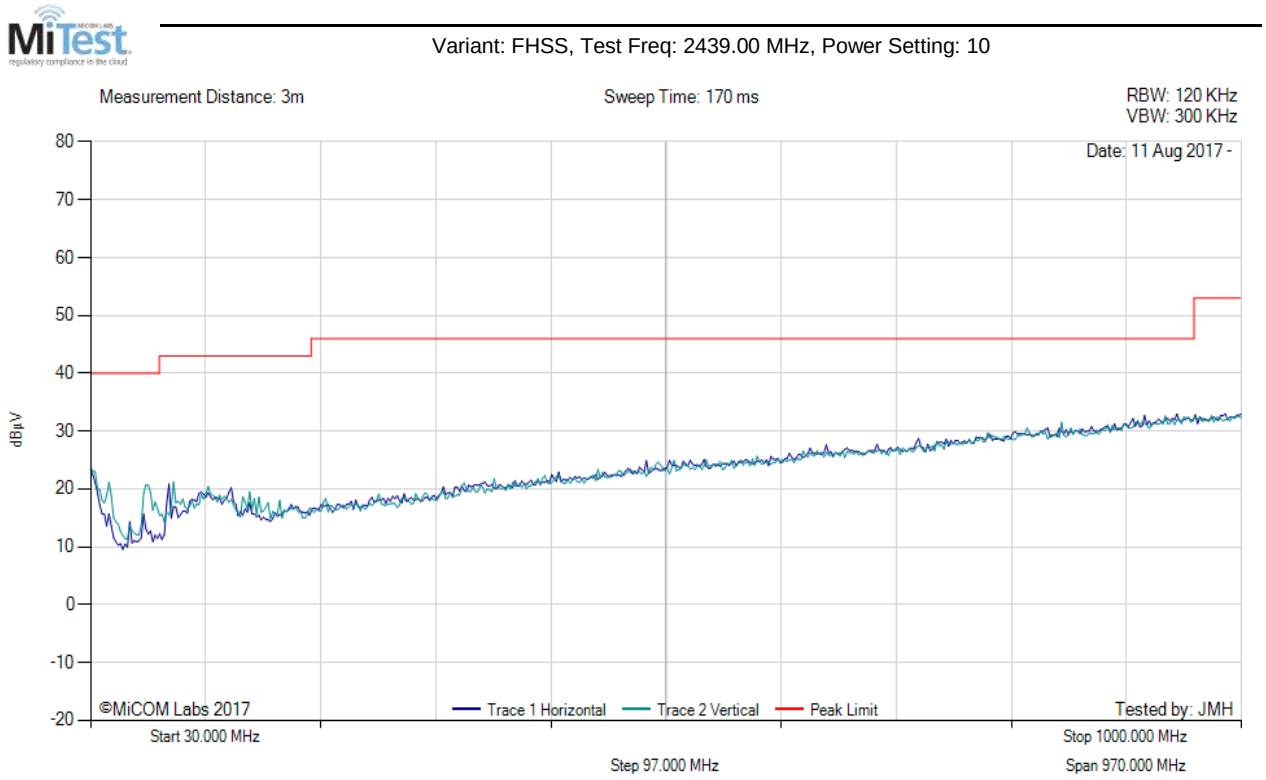



| 2475.00 - 2550.00 MHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Num** | **Frequency MHz** | **Raw dBµV** | **Cable Loss dB** | **AF dB** | **Level dBµV/m** | **Measurement Type** | **Pol** | **Hgt cm** | **Azt Deg** | **Limit dBµV/m** | **Margin dB** | **Pass /Fail** |
| 1 | 2483.50 | 1.54 | 2.73 | 32.37 | 36.64 | Max Avg | Vertical | 162 | 49 | 54.0 | -17.4 | Pass |
| 3 | 2485.45 | 22.20 | 2.73 | 32.37 | 57.30 | Max Peak | Vertical | 162 | 49 | 74.0 | -16.7 | Pass |
| 2 | 2483.50 | -- | -- | -- | -- | Restricted-Band | -- | -- | -- | -- | -- | -- |

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot. Hopping

back to matrix

## A.3.3. Digital Emissions (0.03 - 1 GHz)




There are no emissions found within 6dB of the limit line.

**Test Notes:** EUT powered by 5V ps, connected to Laptop via SD slot.Laptop put in suspend mode to limit 50 MHz harmonics.

back to matrix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