**DEKRA Testing and Certification, S.A.U.**
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29507456

ISED CABid: ES1909
Lab. Company Number: 4621A

Test Report No:
79045RRF.007A1

# Test Report
## USA FCC Part 15.247, 15.209
## CANADA RSS-247, RSS-Gen

| | |
|---|---|
| (*) Identification of item tested | Device to track Pet using LTE, BLE, WiFi and GNSS |
| (*) Trademark | DATAMARS, Kippy |
| (*) Model and /or type reference | PetLinkDOG US v1 |
| (*) Derived model not tested | PetLinkDOG US a1 |
| Other identification of the product | FCC ID: NDX-PLDOG1<br>IC: 8521A-PLDOG1 |
| (*) Features | LTE CAT-M1, Bluetooth LE, GNSS, WIFI scan (RX ONLY)<br>HW version: 6V2 US<br>SW version: 10.4.64 |
| Applicant | DATAMARS SA<br>via Industria 16, Lamone, N/A 6814 Switzerland |
| Test method requested, standard | USA FCC Part 15.247 (10-1-23 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.<br>USA FCC Part 15.209 (10-1-23 Edition): Radiated emission limits; general requirements.<br>CANADA RSS-247 Issue 3 (August 2023).<br>CANADA RSS-Gen Issue 5 amendment 2 (February 2021).<br>Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019.<br>ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices. |
| Summary | IN COMPLIANCE |
| Approved by (name / position & signature) | José Manuel Gómez Galván<br>EMC Consumer & RF<br>Lab. Manager<br>Firmado digitalmente por 53680346W JOSE MANUEL GOMEZ (C:A29507456) |
| Date of issue | 2024-11-13 |
| Report template No | FDT08_25<br>(*) "Data provided by the client" |

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# Acronyms

| Acronym ID | Acronym Description |
|---|---|
| BW | Bandwidth |
| Detector | Detector used |
| Ebw | Emission Bandwidth |
| Equipment | Equipment Type |
| Freq | Frequency |
| Freq Rng | Frequency Range |
| Inband Peak Lvl | Inband Peak Level |
| Lvl | Level |
| MP | Measurement Point |
| Mod | Modulation |
| Mode | Mode |
| Occ Ch BW | Occupied Channel Bandwidth |
| PSD | Power Spectral Density |
| Peak Power | Maximum Peak Conducted Output Power |
| Pol | Polarization |
| Port | Active Port |
| Unwanted Freq | Unwanted Emissions Frequency |
| Unwanted Lvl | Unwanted Emissions Level |

# Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification S.A.U. is an FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification S.A.U. is an ISED-recognized accredited testing laboratory, CABid: ES1909, Company Number: 4621A, with the appropriate scope of accreditation that covers the performed tests in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

# General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

# Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

The total uncertainty of the measurement system for the radiated emissions of EUT from 30 MHz to 1 GHz is:
Measurement uncertainty ≤ ± 5,35 dB with factor (k = 2).

The total uncertainty of the measurement system for the radiated emissions of EUT from 1 GHz to 17 GHz is:
Measurement uncertainty ≤ ± 4,32 dB with factor (k = 2).

The total uncertainty of the measurement system for the radiated emissions of EUT from 17 GHz to 26 GHz is:
Measurement uncertainty ≤ ± 5,51 dB with factor (k = 2).

The total uncertainty of the measurement system for the conducted testing of EUT is:
RF Peak Output Power: Measurement uncertainty ≤ ± 0,80 dB
Power Spectral Density: Measurement uncertainty ≤ ± 0,99 dB
6dB Bandwidth: Measurement uncertainty ≤ ± 2,84 %
Occupied Channel Bandwidth: Measurement uncertainty ≤ ± 1,17 %
Conducted Band-edge spurious emissions: Measurement uncertainty ≤ ± 1,76 dB

# Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").

2. The sample consists of a Pet tracker. Device to track Pet using LTE, BLE, WiFi and GNSS.

3. Declaration of Similarity/Family:

# Declaration of Similarity – PetLinkDOG US a1 and PetLinkDOG US v1

Lamone, 19 Aug 2024

Datamars SA, with its registered office at Via Industria 16, 6814 Lamone, Switzerland, declares that the following products:

- PetLinkDOG US a1
- PetLinkDOG US v1

have exactly the same features, except that have a different SIM provider.

The models are identical from the RF point of view, and the difference described above do not lead to different RF performance or behaviour between the devices.

Datamars SA

Damien Pachoud
Chief Production and Technology Officer

DR003759

DATAMARS

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results. The laboratory is not responsible for such information and it is not covered by accreditation.

# Usage of samples

Samples undergoing test have been selected by: The client.

| Id | Control Number | Description | Model | Serial Nº | Date of Reception | Application |
|---|---|---|---|---|---|---|
| S/01 | 79045B_4.1 | Device to track Pet | PetLinkDOG US v1 | - | 2024-04-22 | Element Under Test |
| S/01 | 79045B_6.1 | USB Charging cable | - | - | 2024-04-22 | Auxiliary Element |
| S/02 | 79045B_12.1 | Device to track Pet | PetLinkDOG US v1 | - | 2024-06-17 | Element Under Test |

Notes referenced to samples during the project:

| Id | Type |
|---|---|
| S/01 | Sample used for radiated tests. |
| S/02 | Sample used for conducted tests. |

# Test sample description

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ports…… : | Port name and description | Cable | | | | | |
| | | Specified max length [m] | Attached during test | Shielded | Coupled to patient(3) | | |
| | serial com on USB | 1.5 m | [X] | [ ] | [ ] | | |
| | SMA cable | 0.03 m | [X] | [ ] | [ ] | | |
| Supplementary information to the ports…… : | ..... | | | | | | |
| Rated power supply ..... : | Voltage and Frequency | | Reference poles | | | | |
| | | | L1 | L2 | L3 | N | PE |
| | [ ] | AC: ..... | [ ] | [ ] | [ ] | [ ] | [ ] |
| | [X] | DC: Li-ion polymer 4.4 max voltage, 650mAh, Feten Energy, FTN-P952525 | | | | | |
| Rated Power..... : | 3W | | | | | | |
| Clock frequencies..... : | 32 MHz, 32.768 kHz, 26 MHz | | | | | | |
| Other parameters ..... : | ..... | | | | | | |
| Software version..... : | 10.4.64 | | | | | | |
| Hardware version ..... : | 6V2 US | | | | | | |
| Dimensions in cm (W x H x D) ... : | 65x34x21mm3 | | | | | | |
| Mounting position ..... : | [ ] | Table top equipment | | | | | |
| | [ ] | Wall/Ceiling mounted equipment | | | | | |
| | [ ] | Floor standing equipment | | | | | |
| | [ ] | Hand-held equipment | | | | | |
| | [X] | Other: ..... | | | | | |
| Modules/parts..... : | Module/parts of test item | | Type | Manufacturer | | | |
| | Modem LTE | | ME310G1WW0 | Telit | | | |
| | GNSS receiver | | MIA-M10Q | UBLOX | | | |
| | BLE | | nRF52832 | Nordic Semi | | | |
| | WIFI scanner | | ESP8684H2 | Espressif Systems | | | |
| Accessories (not part of the test item) ..... : | Description | | Type | Manufacturer | | | |
| | USB charging cable EU | | CMA-052022-0 | CFE Electronic Co | | | |
| | USB charging cable US | | CMA-052021-0 | CFE Electronic Co | | | |
| Documents as provided by the applicant..... : | Description | | File name | Issue date | | | |
| | ..... | | ..... | ..... | | | |

(3) Only for Medical Equipment

# Identification of the client

DATAMARS SA
via Industria 16, 6814 Lamone, Switzerland

# Testing period and place

| | |
|---|---|
| **Test Location** | DEKRA Testing and Certification S.A.U. |
| **Date (start)** | 2024-06-19 |
| **Date (finish)** | 2024-07-04 |

# Document history

| Report number | Date | Description |
|---|---|---|
| 79045RRF.007 | 2024-09-10 | First release. |
| 79045RRF.007A1 | 2024-11-13 | Second release. It is modified to correct antenna gain value.<br>This modification test report cancels and replaces the test report 79045RRF.007 |

# Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |
| **Relative humidity** | Min. = 20 %<br>Max. = 75 % |

In the semianechoic chamber, the following limits were not exceeded during the test:

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |
| **Relative humidity** | Min. = 20 %<br>Max. = 75 % |

In the chamber for conducted measurements, the following limits were not exceeded during the test:

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |
| **Relative humidity** | Min. = 20 %<br>Max. = 75 % |

# Remarks and comments

The tests have been performed by the technical personnel: Sergio Carrasco and Valentin Andarias Diaz.

Used instrumentation:

| Control No. | Equipment | Model | Manufacturer | Next Calibration |
|---|---|---|---|---|
| 06791 | SEMIANECHOIC ABSORBER LINED CHAMBER IV | FACT 3 200 STP | ETS LINDGREN | N/A |
| 06792 | SHIELDED ROOM | S101 | ETS LINDGREN | N/A |
| 06609 | ETHERNET TEMPERATURE AND HUMIDITY LOGGER | HWg-STE | HW GROUP | 2025-04-22 |
| 06615 | ETHERNET TEMPERATURE AND HUMIDITY LOGGER | HWg-STE | HW GROUP | 2025-04-04 |
| 06143 | HYBRID BILOG ANTENNA 30MHz-6GHz | 3142E | ETS LINDGREN | 2027-01-22 |
| 06144 | PRE-AMPLIFIER G>40dB 10MHz-6GHz | BLNA 0160-01N | BONN ELEKTRONIK | 2024-07-25 |
| 06496 | HORN ANTENNA 1-18GHz | BBHA 9120 D | SCHWARZBECK | 2026-12-01 |
| 03783 | PRE-AMPLIFIER G>30dB 1GHz-18GHz | BLMA 0118-3A | BONN ELEKTRONIK | 2025-03-15 |
| 08866 | EMI TEST RECEIVER 2Hz-44GHz | ESW44 | ROHDE AND SCHWARZ | 2026-06-12 |
| 04657 | HORN ANTENNA 18-40GHz | BBHA 9170 | SCHWARZBECK | 2026-06-12 |
| 08856 | PRE-AMPLIFIER G>30dB 18-40GHz | BLMA 1840-4A | BONN ELEKTRONIK | 2025-02-27 |
| 06157 | SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz | FSV40 | ROHDE AND SCHWARZ | 2025-01-18 |
| 07760 | DIGITAL MULTIMETER | 175 | FLUKE | 2024-11-08 |
| 04848 | SOFTWARE FOR EMC/RF TESTING | EMC32 | ROHDE AND SCHWARZ | N/A |
| 06793 | SHIELDED ROOM | S101 | ETS LINDGREN | N/A |
| 06611 | TEMPERATURE AND HUMIDITY PROBE | HWg-STE | HW GROUP | 2025-04-04 |
| 06668 | SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz | FSV40 | ROHDE AND SCHWARZ | 2024-12-14 |
| 00922 | POWER SUPPLY DC 40 V / 40 A | NGPE 40/40 | ROHDE AND SCHWARZ | N/A |
| 05850 | DIGITAL MULTIMETER | 179 | FLUKE | 2024-11-02 |
| 07798 | WMS32 | WMS32 | ROHDE AND SCHWARZ | N/A |
| 08848 | OPEN SWITCH UNIT UP TO 7.5 GHz | OSP-B157W8 PLUS | ROHDE & SCHWARZ | 2024-12-21 |
| 07791 | SIGNAL GENERATOR 8kHz-6GHz | SMB100B | ROHDE AND SCHWARZ | 2026-03-15 |

| Control No. | Equipment | Model | Manufacturer | Next Calibration |
|---|---|---|---|---|
| 07793 | SIGNAL GENERATOR 8kHz-6GHz | SMBV100B | ROHDE AND SCHWARZ | 2026-03-11 |
| 08847 | VECTOR SIGNAL GENERATOR 100kHz-7.5GHz | SMW200A | ROHDE AND SCHWARZ | 2025-09-29 |

# Testing verdicts

| | |
|---|---|
| Fail | F |
| Inconclusive | I |
| Not applicable | N/A |
| Not measured | N/M |
| Pass | P |

# Summary

## Bluetooth Low Energy 5.0 (2M):

| FCC PART 15 PARAGRAPH/ RSS-247 | | | |
|---|---|---|---|
| **Requirement – Test case** | | **Verdict** | **Remark** |
| FCC 15.247 (a)(2) / RSS-247 5.2. (a) | 6 dB Bandwidth | P | |
| FCC 15.247 (b) / RSS-247 5.4. (d) | Maximum output power and antenna gain | P | |
| FCC 15.247 (d) / RSS-247 5.5. | Band-edge emissions compliance (Transmitter) | P | |
| FCC 15.247 (e) / RSS-247 5.2. (b) | Power spectral density | P | |
| FCC 15.247 (d) / RSS-247 5.5. | Emission limitations radiated (Transmitter) | P | |
| Supplementary information and remarks:<br>None. | | | |

# **Appendix A:** Test results. Bluetooth Low Energy 5.0 (2M)

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# TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

| | |
|---|---|
| Vnominal: | 3.85 Vdc |
| Type of Power Supply: | Li-ion external battery. |

ANTENNA (*):

| | |
|---|---|
| Type of Antenna: | Monopole on Flex PCB (internal antenna). |
| Maximum Declared Antenna Gain: | -5.49 dBi |

TEST FREQUENCIES (*):

| Modulation | Data rates | Low Channel: | Middle Channel | High Channel |
|---|---|---|---|---|
| BTLE GFSK | 2M 2 Mbit/s | 2402 MHz | 2440 MHz | 2480 MHz |

During transmitter test the EUT was controlled by a SW tool provided by the client to operate in a continuous transmit mode on the modulation schemes and test channels as required.

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the TS8997 using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.


RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and 1 GHz-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1.5 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

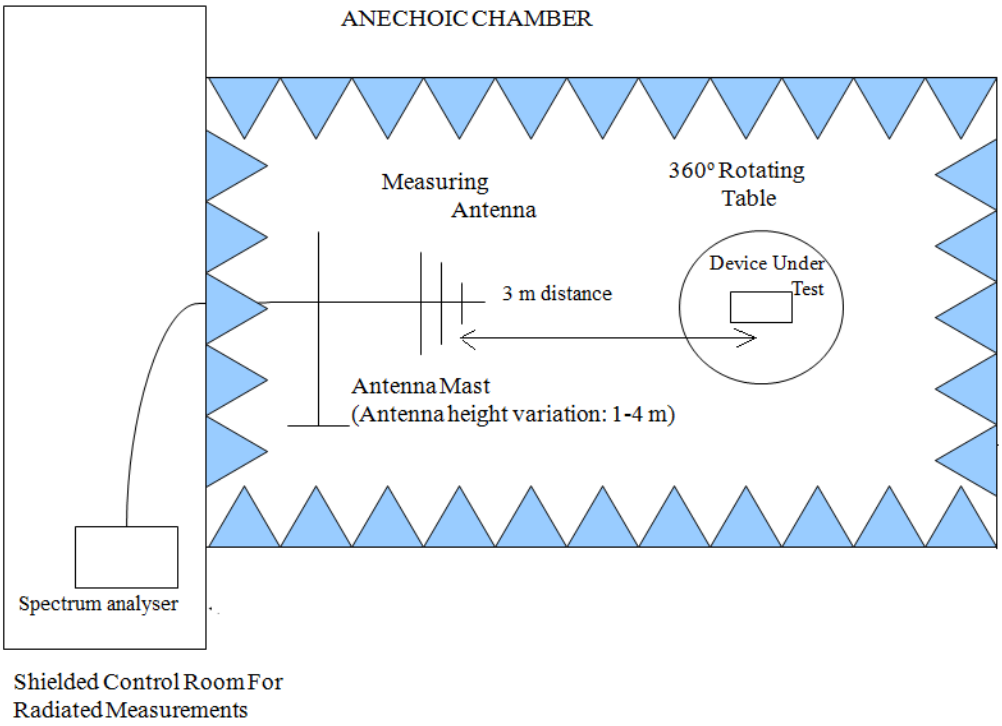
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

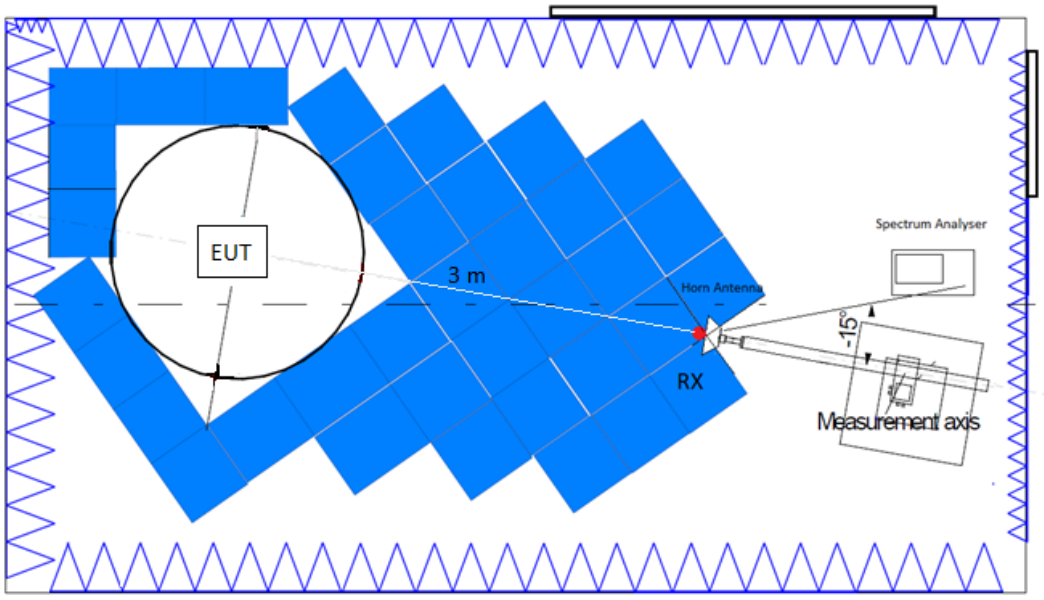
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

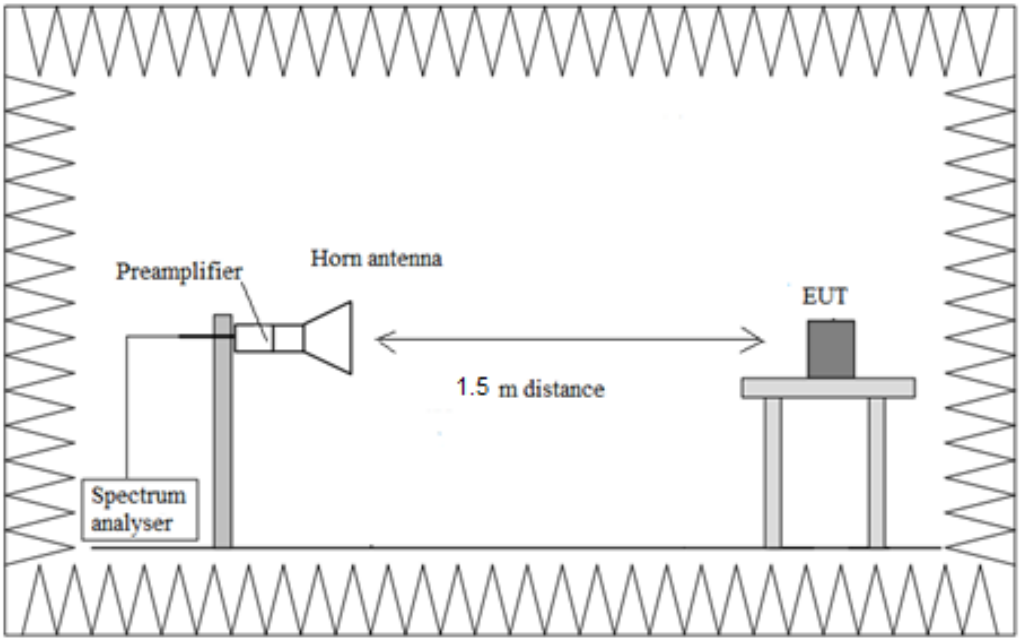
Radiated measurements setup from 30 MHz to 1 GHz:




Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



# TEST CASES DETAILS

## Occupied Channel Bandwidth 99%

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Mode: SISO

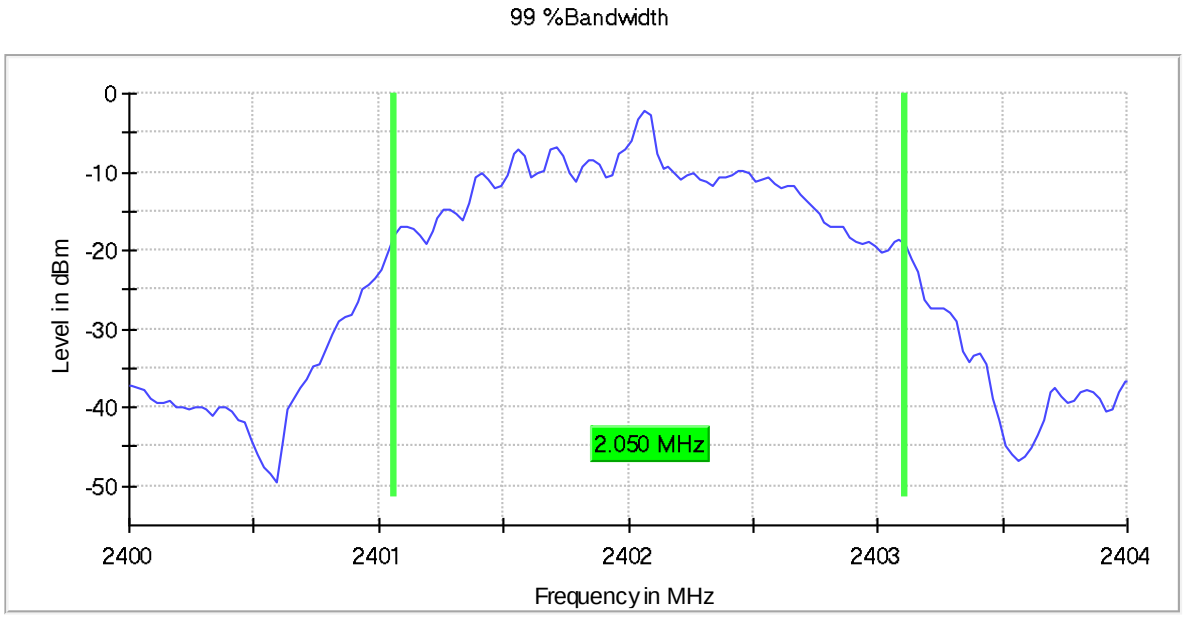
***Results***

| Equipment | BW (MHz) | Freq (MHz) | Port | Occ Ch BW (MHz) |
|---|---|---|---|---|
| Digital Transmission System (DTS) | 2 | 2402.00000 | 1 | 2.050 |
| | | 2440.00000 | | 2.075 |
| | | 2480.00000 | | 2.075 |

### *Attachments*

| | |
|---|---|
| Equipment Type = Digital Transmission System (DTS) | Bandwidth MHz = 2 |
| Modulation = BTLE 5.0 (GFSK 2 Mbit/s) | Frequency MHz = 2402.00000 |
| Mode = SISO | Active Port = 1 |

**Images:**

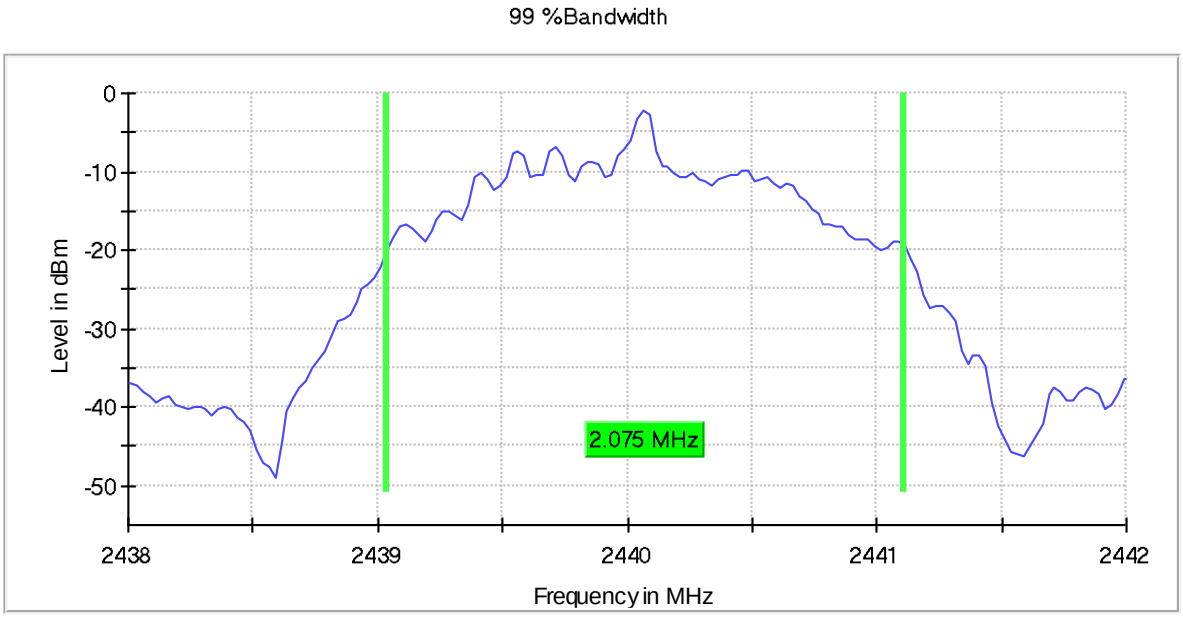


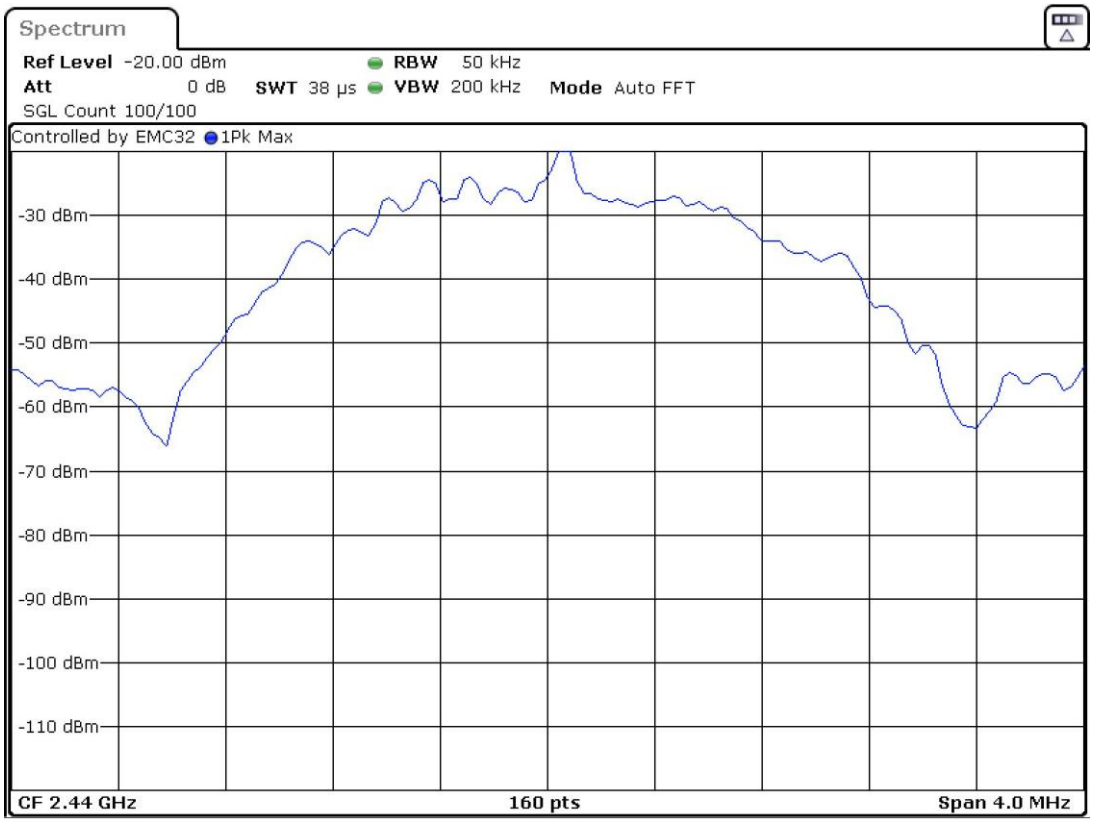

Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000

Mode = SISO Active Port = 1

**Images:**



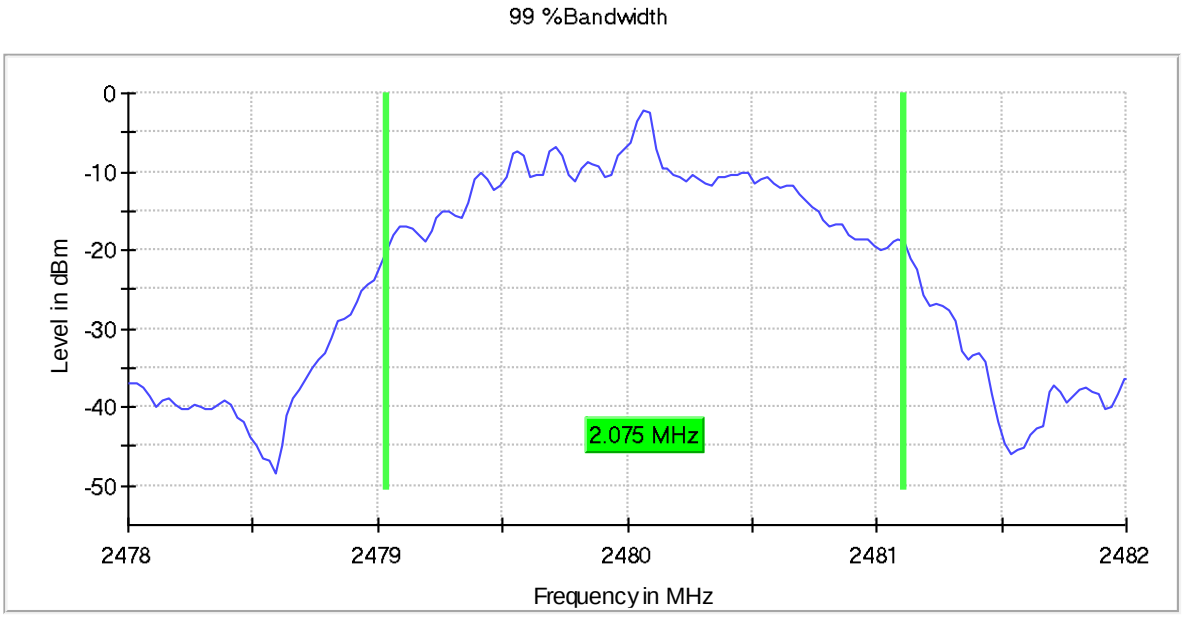



Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000

Mode = SISO Active Port = 1

**Images:**




# RSS-247 5.2 (a) / FCC 15.247 (a) (2) 6 dB Bandwidth

***Limits***

The minimum 6 dB bandwidth shall be at least 500 kHz.

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Mode: SISO

***Results***

| BW (MHz) | Freq (MHz) | Port | Ebw (MHz) |
|---|---|---|---|
| 2 | 2402.00000 | 1 | 1.188 |
| | 2440.00000 | | 1.188 |
| | 2480.00000 | | 1.188 |

***Verdict***

Pass

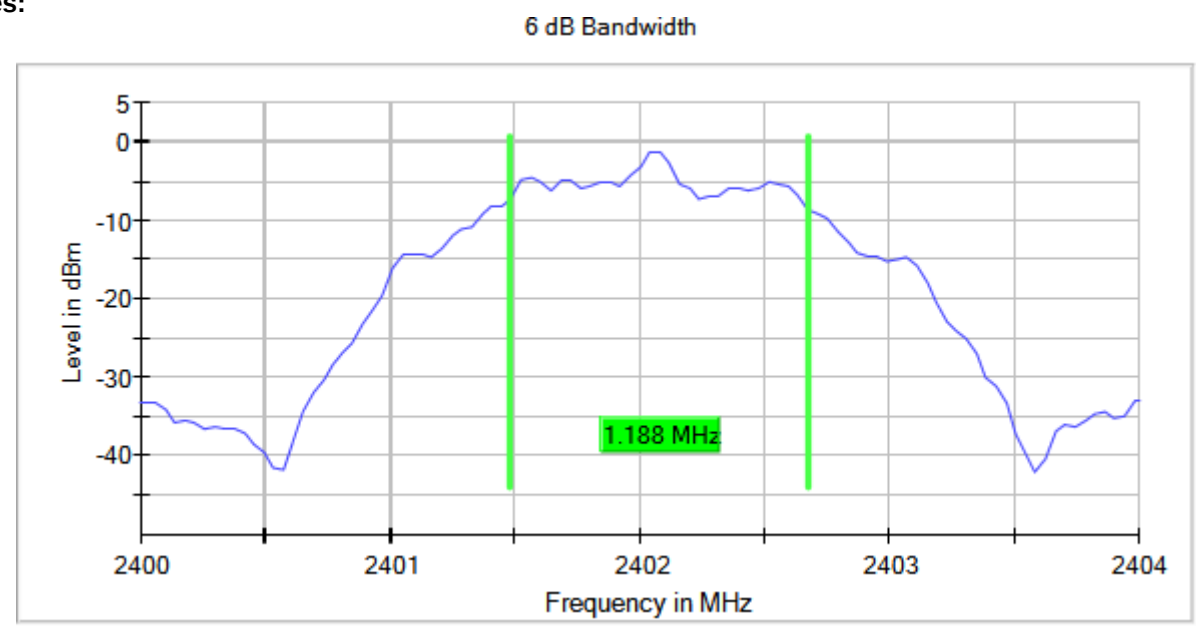
### *Attachments*

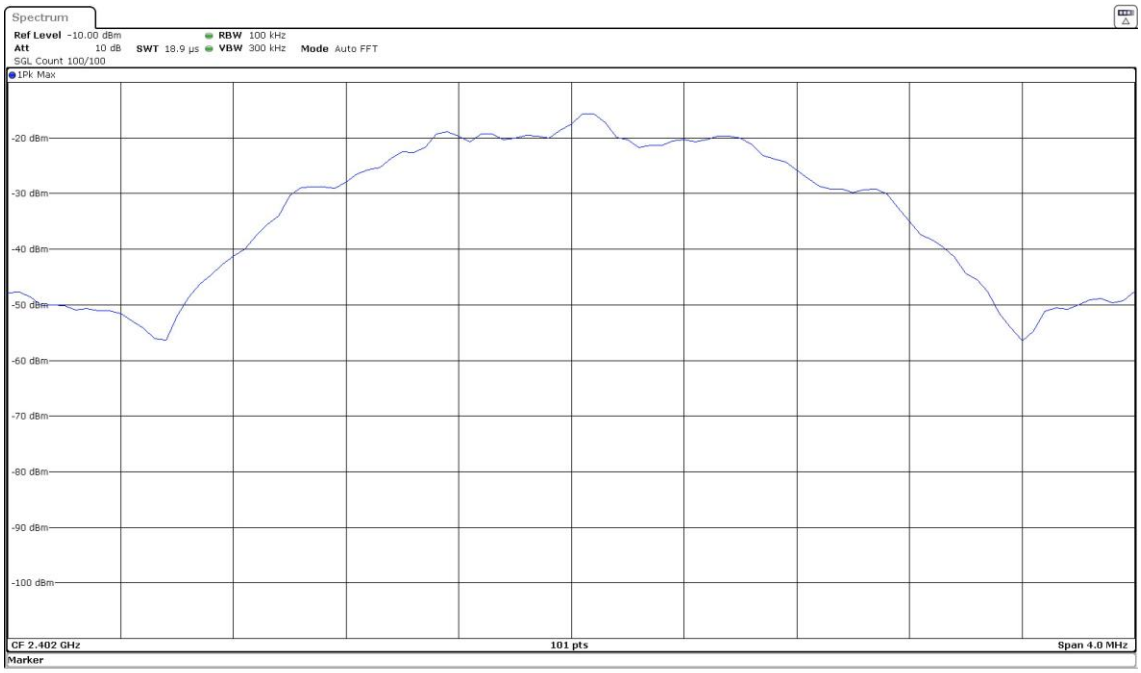
Bandwidth MHz = 2 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Frequency MHz = 2402.00000 Mode = SISO

Active Port = 1

**Images:**



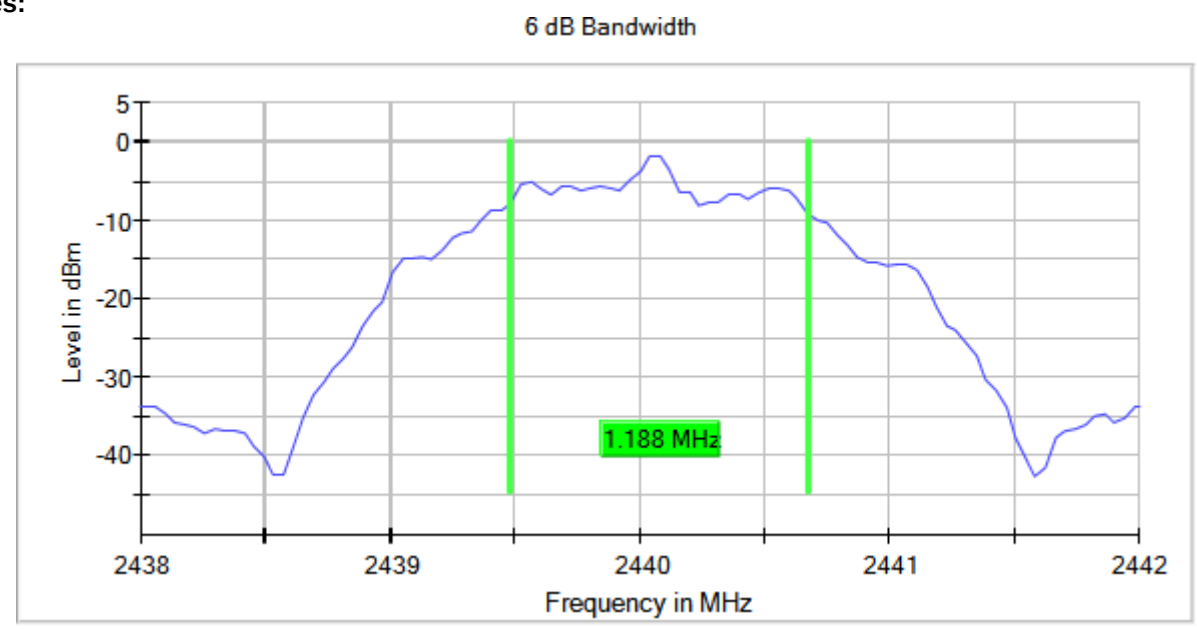



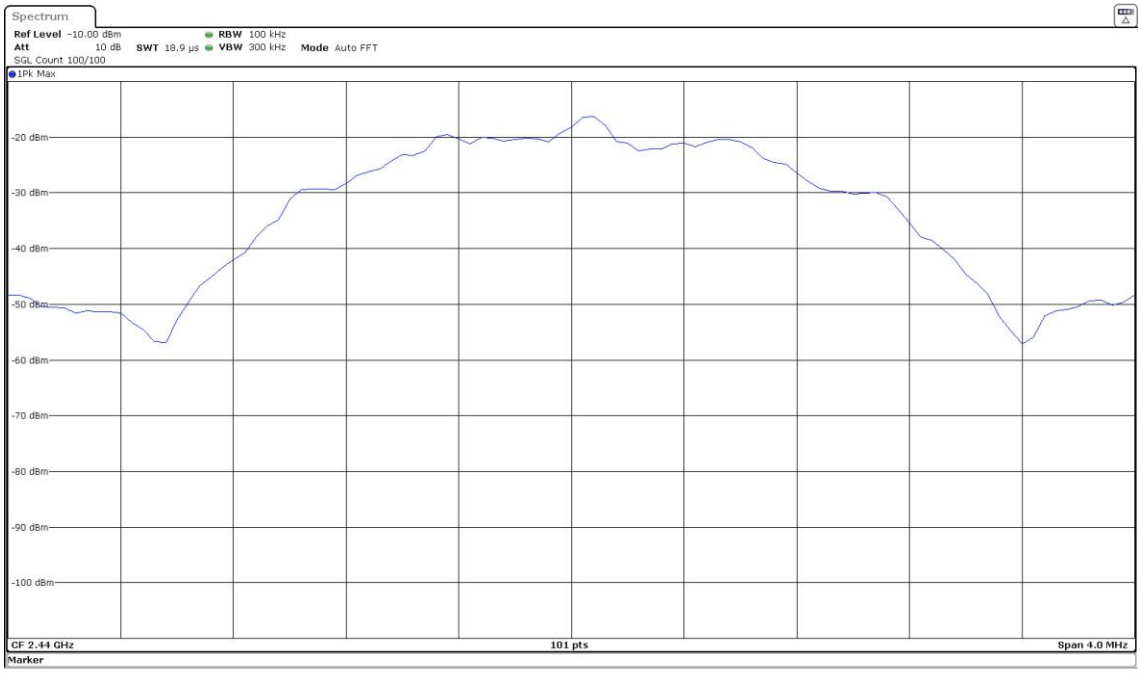
Bandwidth MHz = 2 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Frequency MHz = 2440.00000 Mode = SISO

Active Port = 1

**Images:**



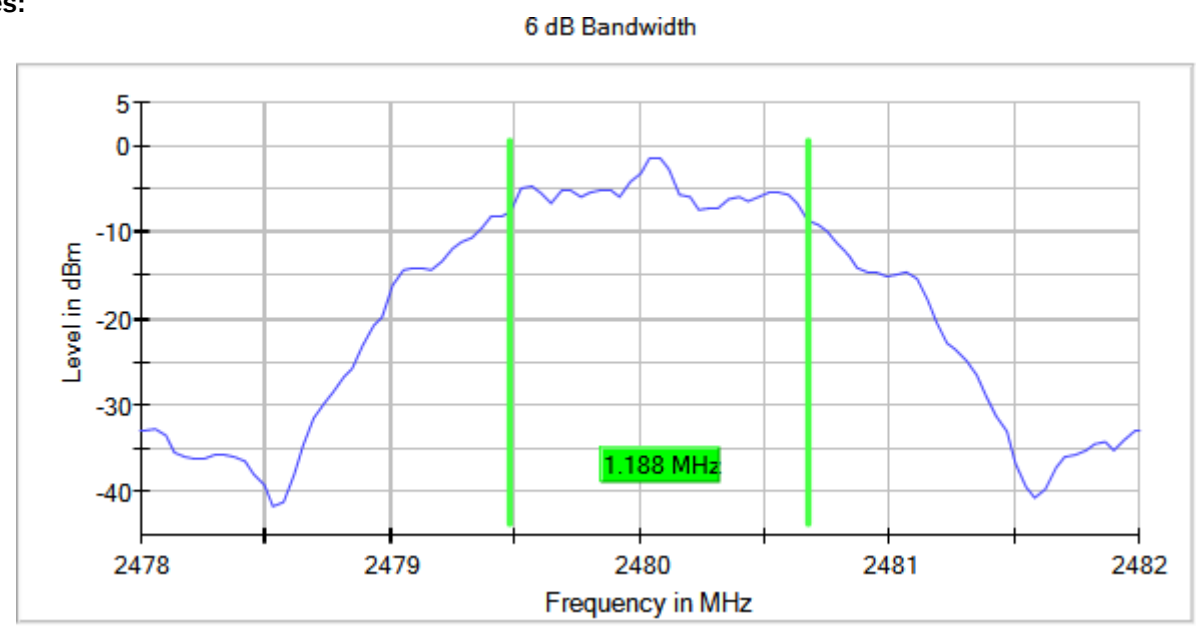



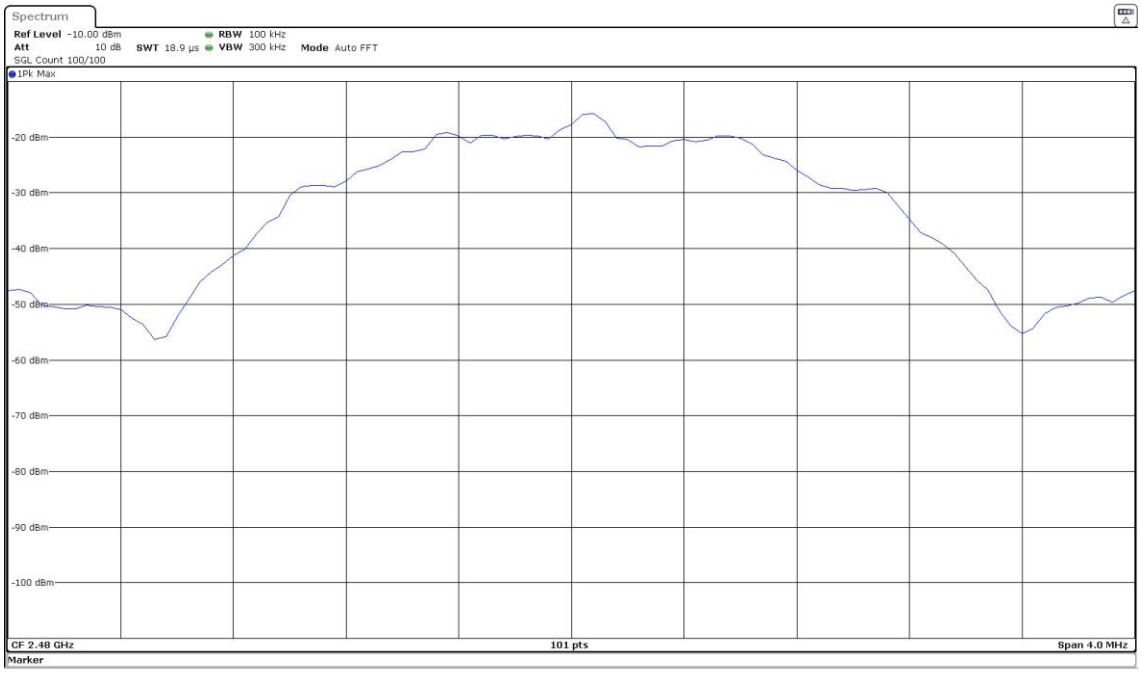
Bandwidth MHz = 2 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Frequency MHz = 2480.00000 Mode = SISO

Active Port = 1

**Images:**



# RSS-247 5.2 (b) / FCC 15.247 (e) Power spectral density

***Limits***

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Mode: SISO

***Results***

| Equipment | BW (MHz) | Freq (MHz) | Port | PSD (dBm) |
|---|---|---|---|---|
| Digital Transmission System (DTS) | 2 | 2402.00000 | 1 | -11.16 |
| | | 2440.00000 | | -11.78 |
| | | 2480.00000 | | -11.26 |

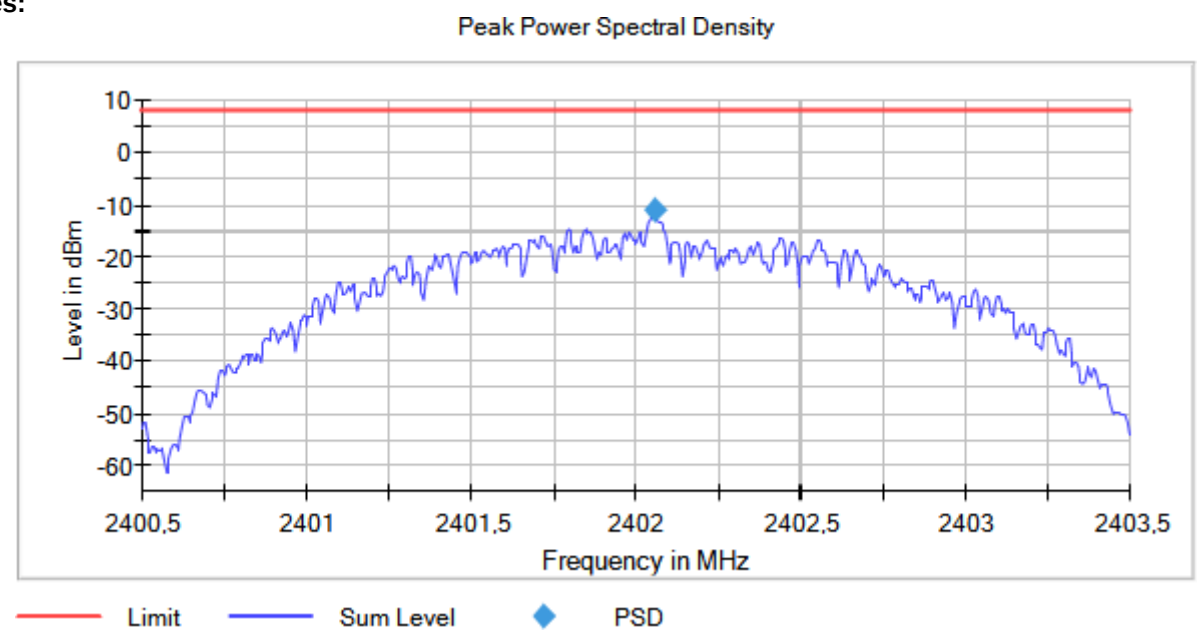
***Verdict***

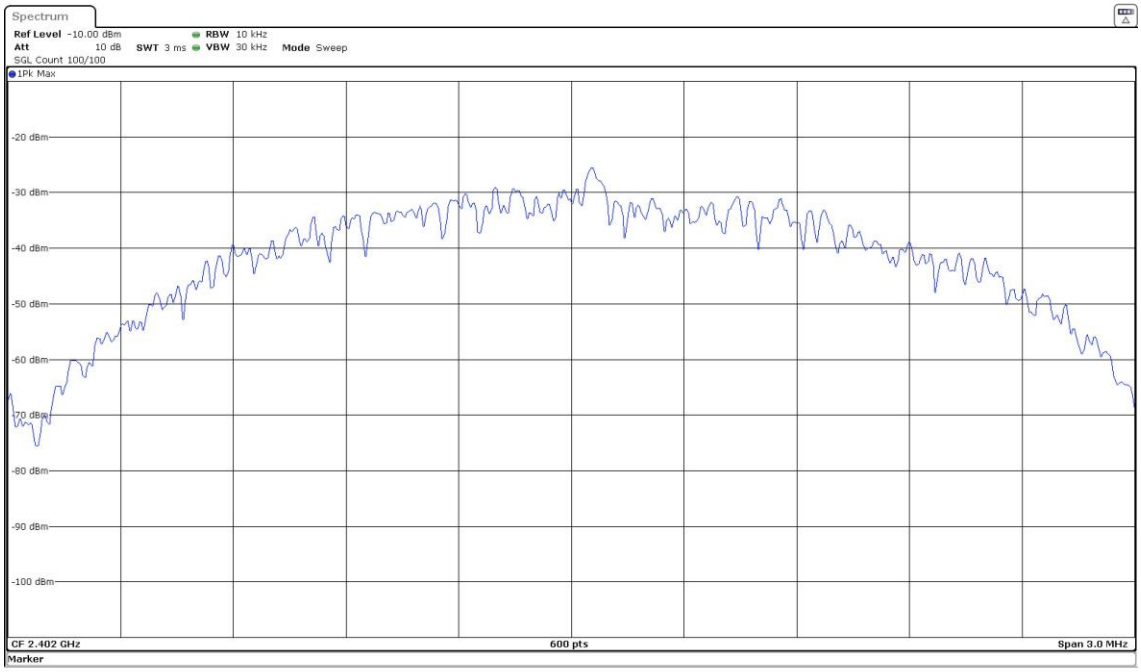
Pass

### *Attachments*

| | |
|---|---|
| Equipment Type = Digital Transmission System (DTS) | Bandwidth MHz = 2 |
| Modulation = BTLE 5.0 (GFSK 2 Mbit/s) | Frequency MHz = 2402.00000 |
| Mode = SISO | Active Port = 1 |

**Images:**



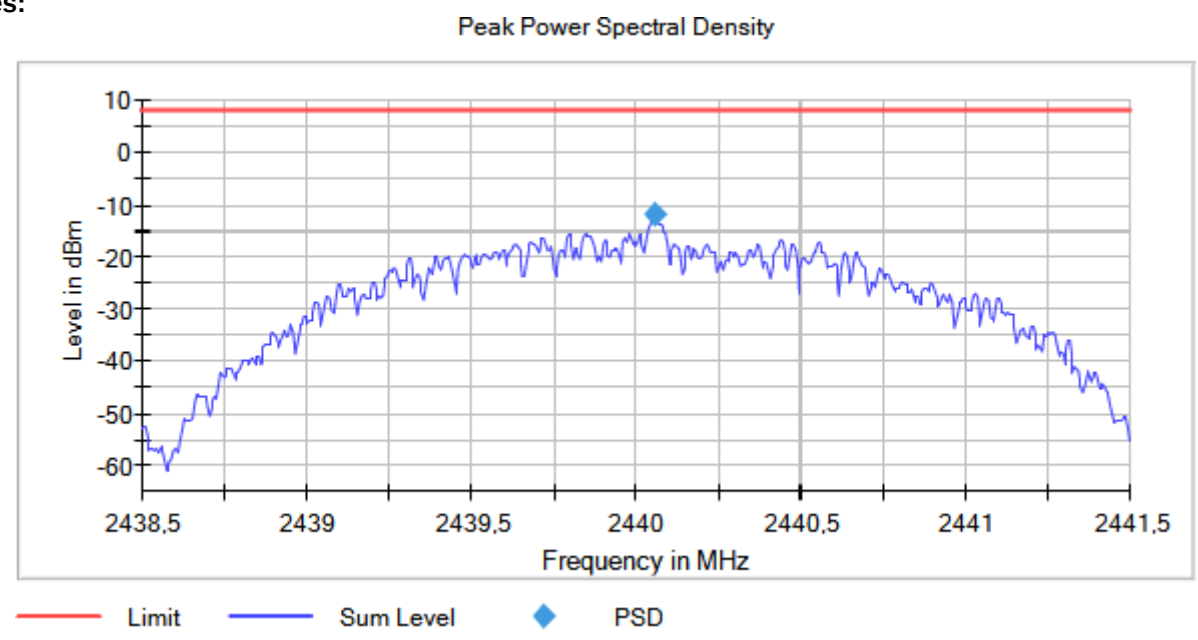



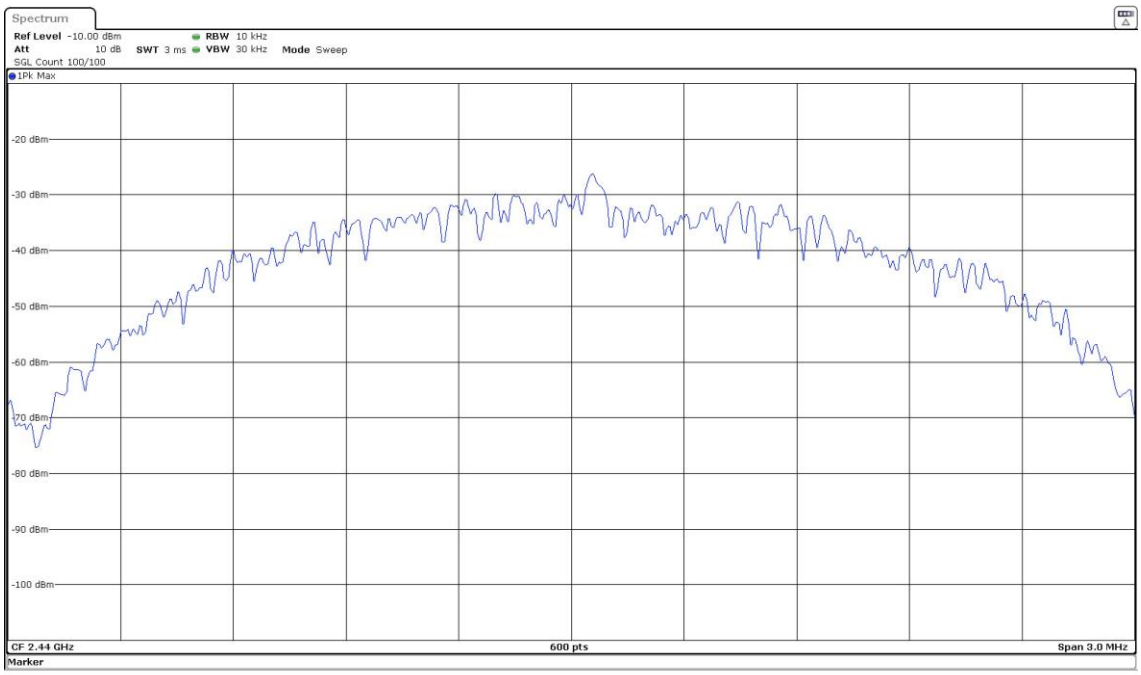
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000

Mode = SISO Active Port = 1

**Images:**



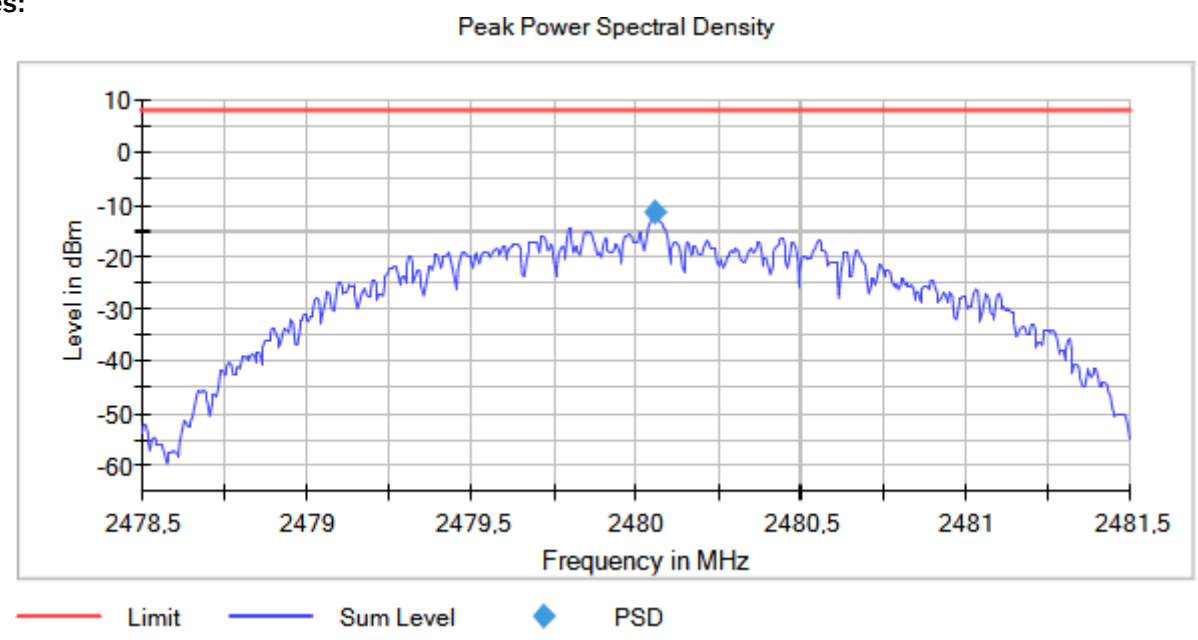



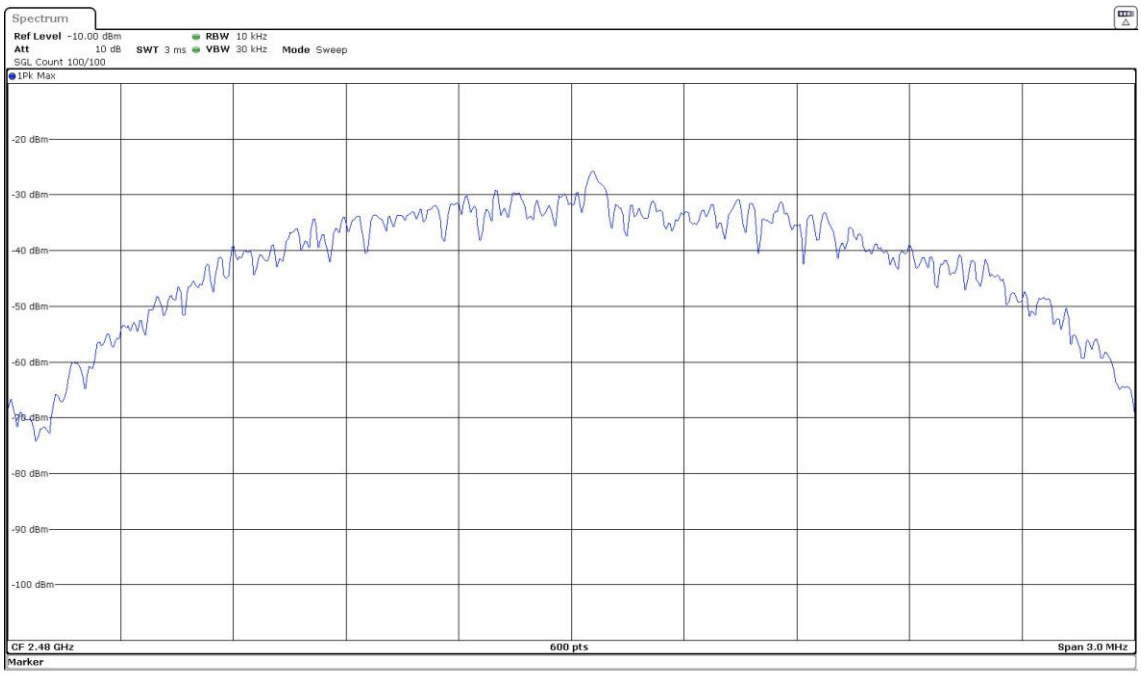
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000

Mode = SISO Active Port = 1

**Images:**



# RSS-247 5.4 (d) / FCC 15.247 (b) (3) Maximum Peak Conducted output power

***Limits***

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Mode: SISO

***Results***

The maximum peak conducted output power level in the fundamental emission was measured using the method according to point 11.9.1.1 ”RBW ≥ DTS bandwidth” of ANSI C.63.10-2013.

| Equipment | BW (MHz) | Freq (MHz) | Port | Peak Power (dBm) |
|---|---|---|---|---|
| Digital Transmission System (DTS) | 2 | 2402.00000 | 1 | -1.1750 |
| | | 2440.00000 | | -1.8280 |
| | | 2480.00000 | | -1.3440 |

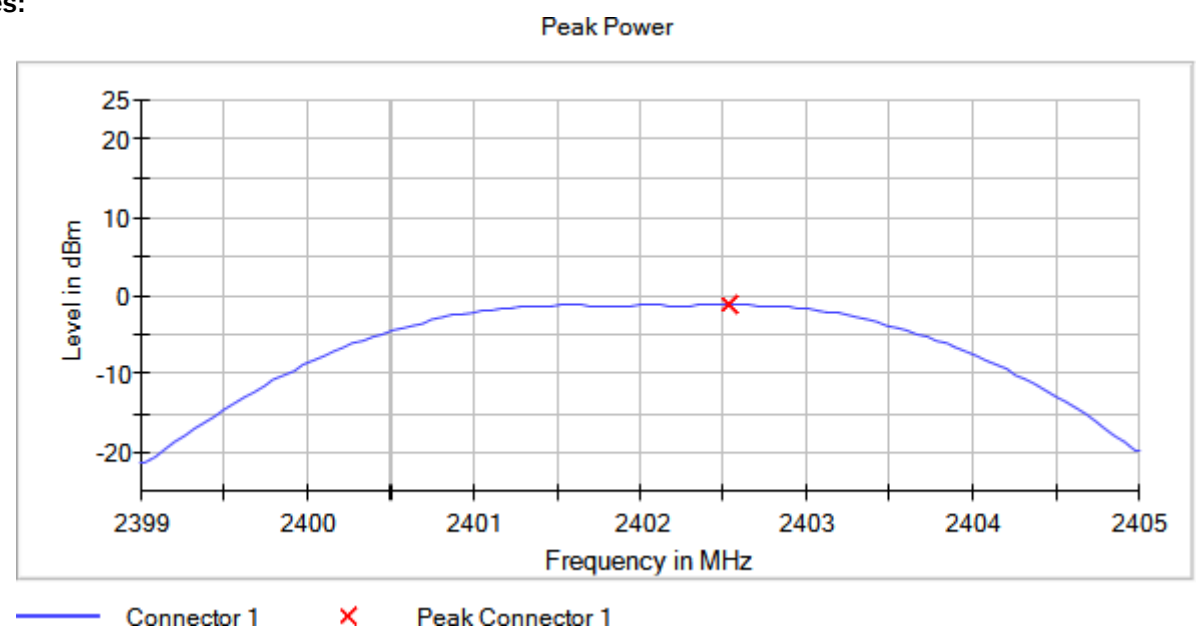
***Verdict***

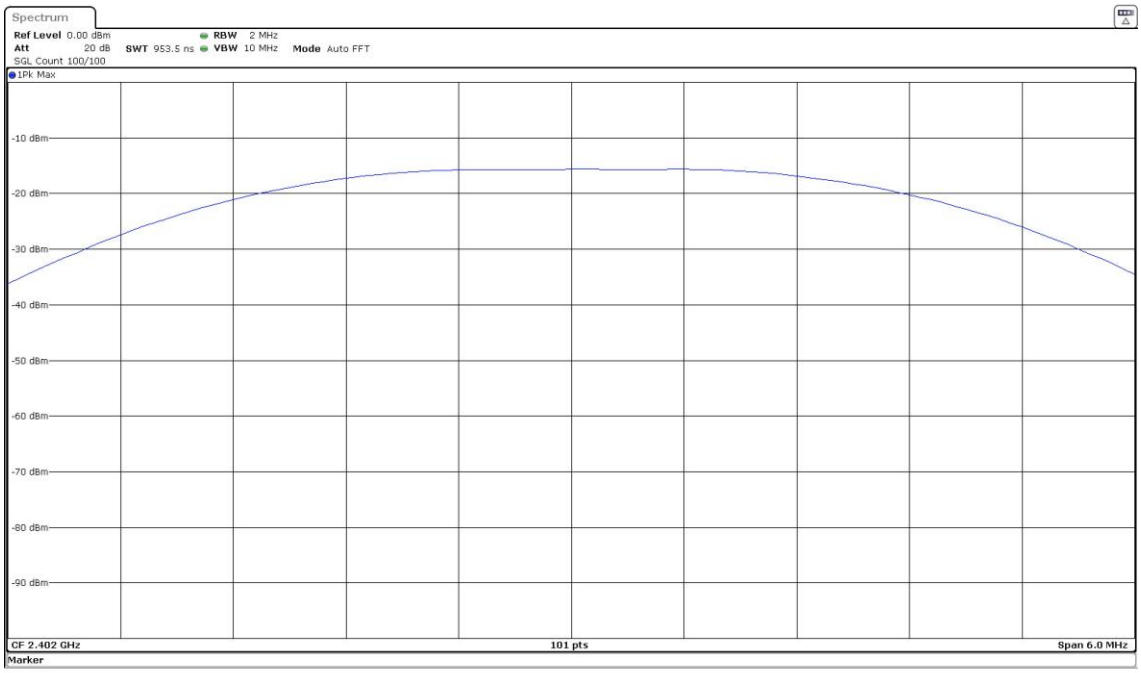
Pass

### *Attachments*

| | |
|---|---|
| Equipment Type = Digital Transmission System (DTS) | Bandwidth MHz = 2 |
| Modulation = BTLE 5.0 (GFSK 2 Mbit/s) | Frequency MHz = 2402.00000 |
| Mode = SISO | Active Port = 1 |

**Images:**



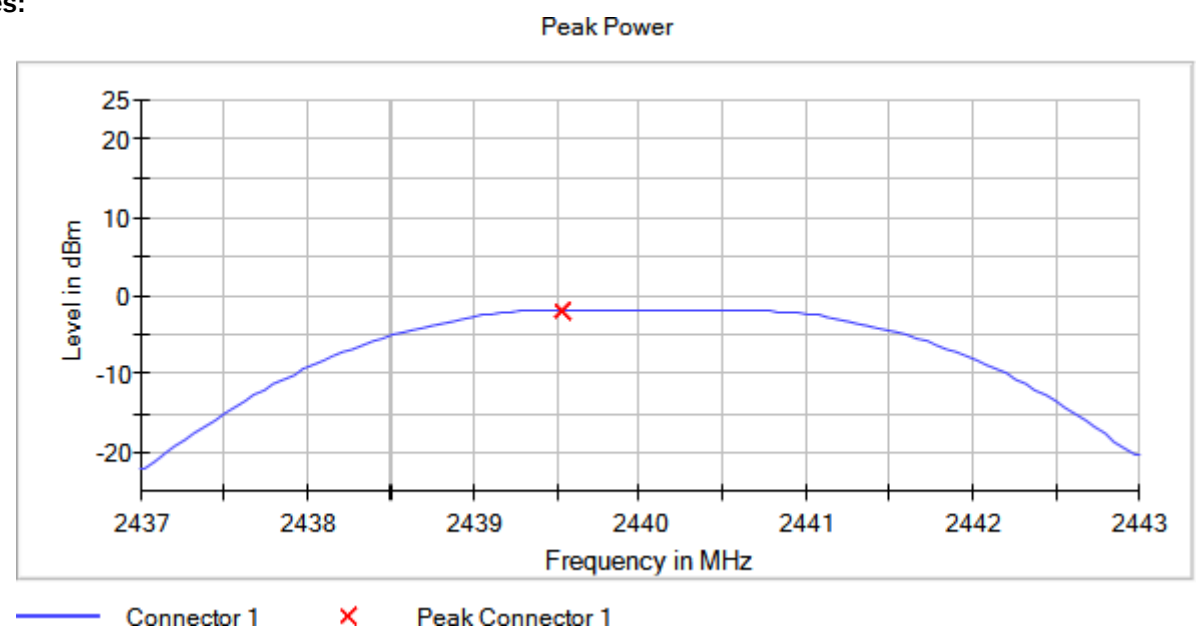



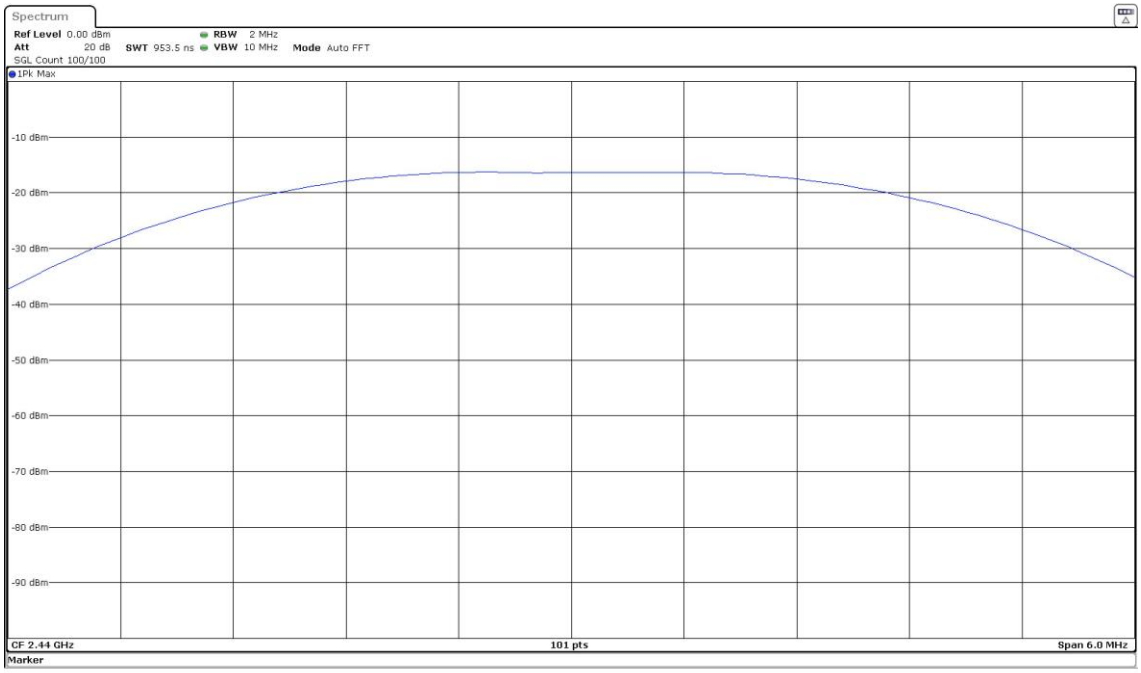
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000

Mode = SISO Active Port = 1

**Images:**



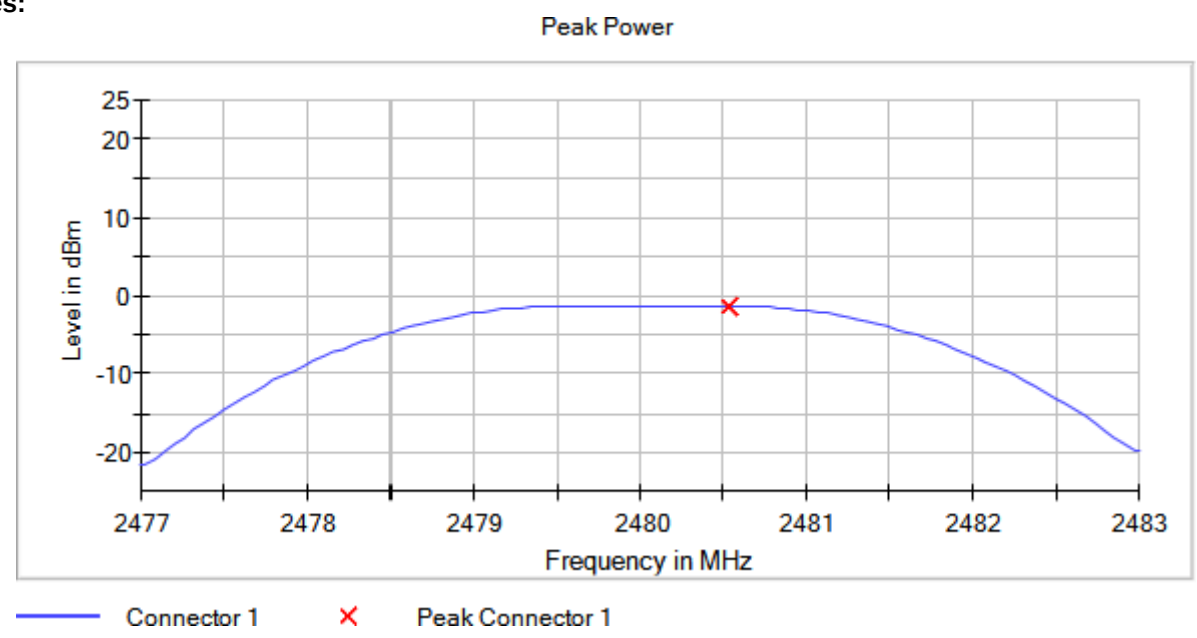



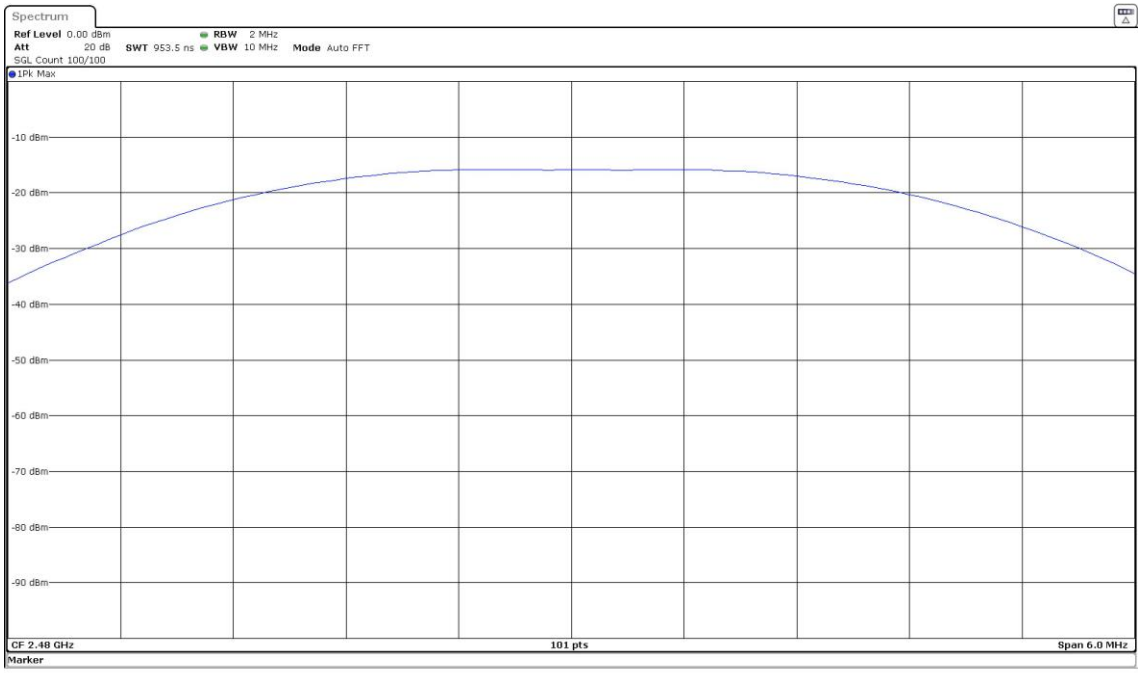
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000

Mode = SISO Active Port = 1

**Images:**



# RSS-247 5.5 / FCC 15.247 (d) Band-edge emissions compliance (Transmitter)

***Limits***

In any 100 kHz bandwidths outside the frequency band in which the 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Mode: SISO

***Results***

Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

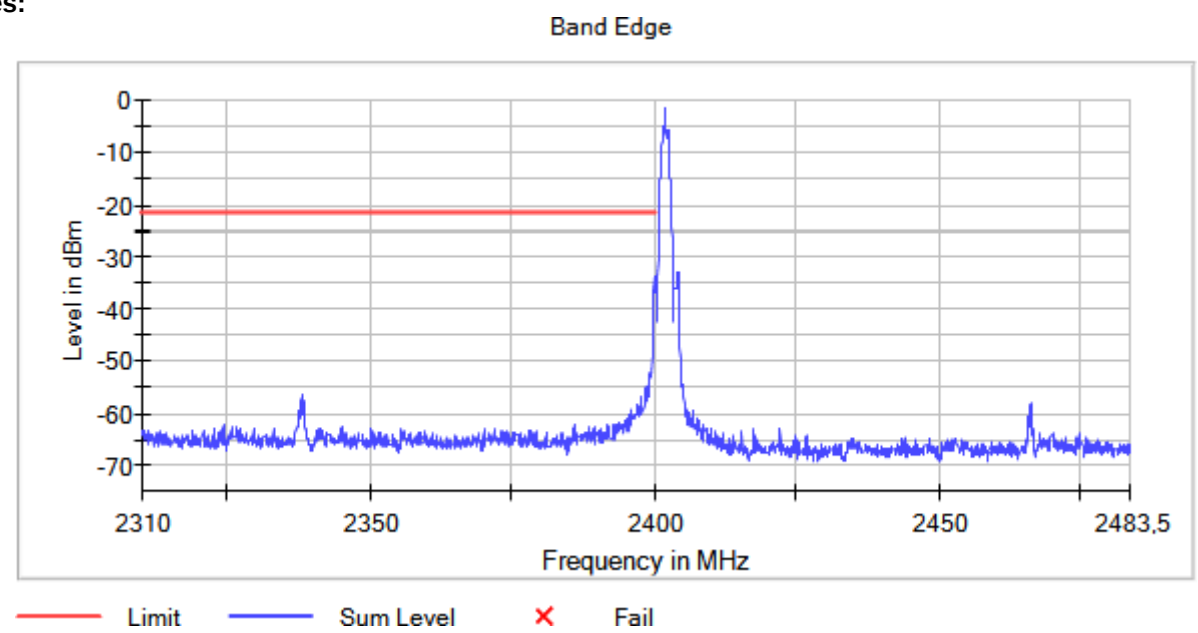
***Verdict***

Pass

### *Attachments*

Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s)
Frequency MHz = 2402.00000
Mode = SISO
Active Port = 1

**Images:**




**Tables:**
Spectrum Analyzer Parameters 1

| Setting | Instrument Value | Target Value |
|---|---|---|
| Start Frequency | 2.31000 GHz | 2.31000 GHz |
| Stop Frequency | 2.40000 GHz | 2.40000 GHz |
| Span | 90.000 MHz | 90.000 MHz |
| RBW | 100.000 kHz | <= 100.000 kHz |
| VBW | 300.000 kHz | >= 300.000 kHz |
| SweepPoints | 1800 | ~ 1800 |
| Sweeptime | 113.672 µs | AUTO |
| Reference Level | 0.000 dBm | 0.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| Sweeptype | FFT | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 8 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.00 dB | 0.50 dB |

## Spectrum Analyzer Parameters 2

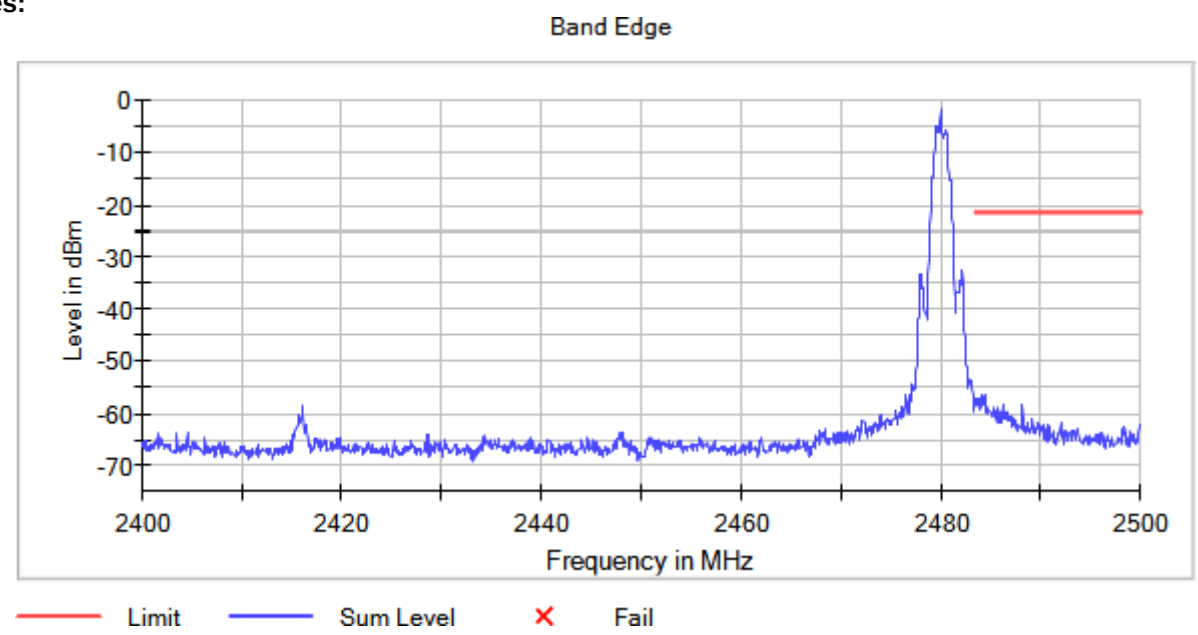
| Setting | Instrument Value | Target Value |
|---|---|---|
| Start Frequency | 2.40000 GHz | 2.40000 GHz |
| Stop Frequency | 2.48350 GHz | 2.48350 GHz |
| Span | 83.500 MHz | 83.500 MHz |
| RBW | 100.000 kHz | <= 100.000 kHz |
| VBW | 300.000 kHz | >= 300.000 kHz |
| SweepPoints | 1670 | ~ 1670 |
| Sweeptime | 94.727 µs | AUTO |
| Reference Level | 0.000 dBm | 0.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| Sweeptype | FFT | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 6 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.22 dB | 0.50 dB |

Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000

Mode = SISO Active Port = 1

**Images:**




**Tables:**

Spectrum Analyzer Parameters 1

| Setting | Instrument Value | Target Value |
|---|---|---|
| Start Frequency | 2.31000 GHz | 2.31000 GHz |
| Stop Frequency | 2.40000 GHz | 2.40000 GHz |
| Span | 90.000 MHz | 90.000 MHz |
| RBW | 100.000 kHz | <= 100.000 kHz |
| VBW | 300.000 kHz | >= 300.000 kHz |
| SweepPoints | 1800 | ~ 1800 |
| Sweeptime | 113.672 µs | AUTO |
| Reference Level | 0.000 dBm | 0.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| Sweeptype | FFT | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 8 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.00 dB | 0.50 dB |

## Spectrum Analyzer Parameters 2

| Setting | Instrument Value | Target Value |
|---|---|---|
| Start Frequency | 2.40000 GHz | 2.40000 GHz |
| Stop Frequency | 2.48350 GHz | 2.48350 GHz |
| Span | 83.500 MHz | 83.500 MHz |
| RBW | 100.000 kHz | <= 100.000 kHz |
| VBW | 300.000 kHz | >= 300.000 kHz |
| SweepPoints | 1670 | ~ 1670 |
| Sweeptime | 94.727 µs | AUTO |
| Reference Level | 0.000 dBm | 0.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| Sweeptype | FFT | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 6 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.22 dB | 0.50 dB |

# RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter)

***Limits***

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)/RSS-Gen):

| Frequency Range (MHz) | Field strength (µV/m) | Field strength (dBµV/m) | Measurement distance (m) |
|---|---|---|---|
| 0.009-0.490 | 2400/F(kHz) | - | 300 |
| 0.490-1.705 | 24000/F(kHz) | - | 30 |
| 1.705 - 30.0 | 30 | - | 30 |
| 30 - 88 | 100 | 40 | 3 |
| 88 - 216 | 150 | 43.5 | 3 |
| 216 - 960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

The emission limits shown in the above table are based on measurements employing 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.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247: Attenuation below the general field strength limits specified in RSS-Gen is not required.

***Frequency range tested for Radiated emissions:***

Start frequency: no radiofrequency signal generated in the device found below 10$^{th}$ sub-harmonic, no further investigation required.
Stop frequency: it has been performed the radiated spurious emissions until 10$^{th}$ harmonic.

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Mode: SISO

***Results***

| Freq Rng (GHz) | Equipment | Freq (MHz) | Port | Unwanted Freq (MHz) | Unwanted Lvl (dBµV/m) | Pol | Detector |
|---|---|---|---|---|---|---|---|
| [0.03, 1] | Digital Transmission System (DTS) | 2402.00000 | 1 | 47.975 | 23.74 | V | PK |
| | | | | | 21.05 | | QP |
| | | | | 53.917 | 20.86 | V | PK |
| | | | | | 12.61 | | QP |
| | | | | 97.324 | 22.02 | V | PK |
| | | | | | 17.92 | | QP |
| | | 2440.00000 | | 48.006 | 25.35 | V | PK |
| | | | | | 22.89 | | QP |
| | | | | 51.522 | 18.44 | V | PK |
| | | | | | 11.46 | | QP |
| | | | | 95.718 | 26.76 | V | PK |
| | | | | | 21.99 | | QP |
| | | 2480.00000 | | 48.036 | 24.78 | V | PK |
| | | | | | 22.49 | | QP |
| | | | | 50.673 | 20.33 | V | PK |
| | | | | | 13.91 | | QP |
| | | | | 77.409 | 19.79 | V | PK |
| | | | | | 11.81 | | QP |
| | | | | 98.082 | 27.20 | V | PK |
| | | | | | 20.75 | | QP |
| [1, 3] | | 2480.00000 | | 2483.538 | 56.40 | V | PK |
| | | | | | 42.19 | | AVG |

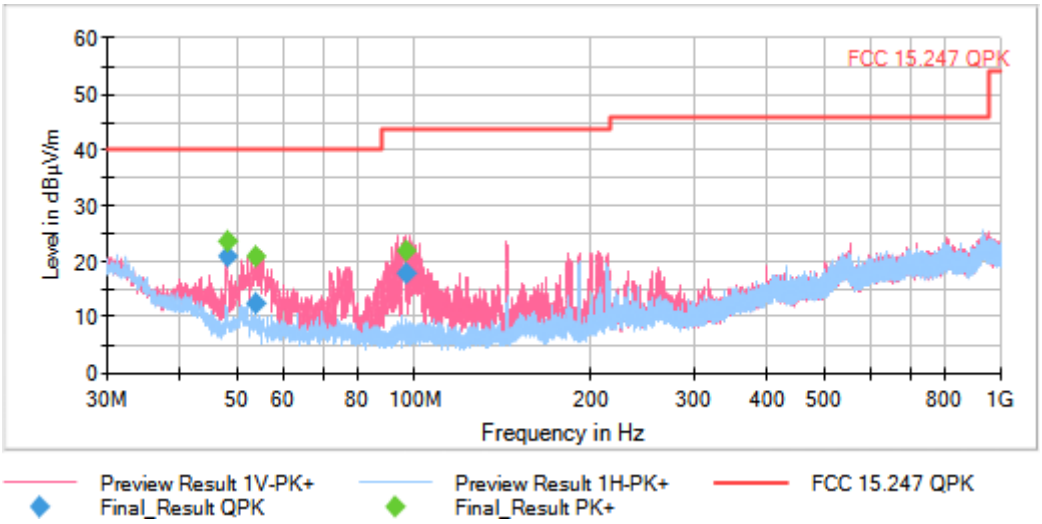
***Verdict***

Pass

### *Attachments*

| | |
|---|---|
| Frequency Range GHz = [0.03, 1] | Equipment Type = Digital Transmission System (DTS) |
| Modulation = BTLE 5.0 (GFSK 2 Mbit/s) | Frequency MHz = 2402.00000 |
| Mode = SISO | Active Port = 1 |

**Images:**




**Tables:**
Spectrum Analyzer Parameters

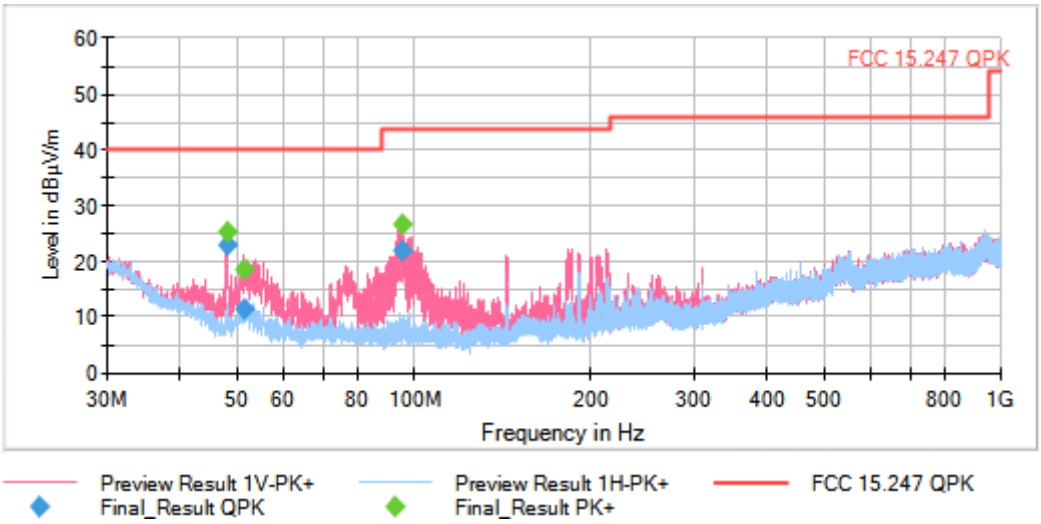
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 30 MHz - 1 GHz | 30,312 kHz | PK+ | 100 kHz | 1 s | 0 dB |

Frequency Range GHz = [0.03, 1] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000

Mode = SISO Active Port = 1

**Images:**




**Tables:**

Spectrum Analyzer Parameters

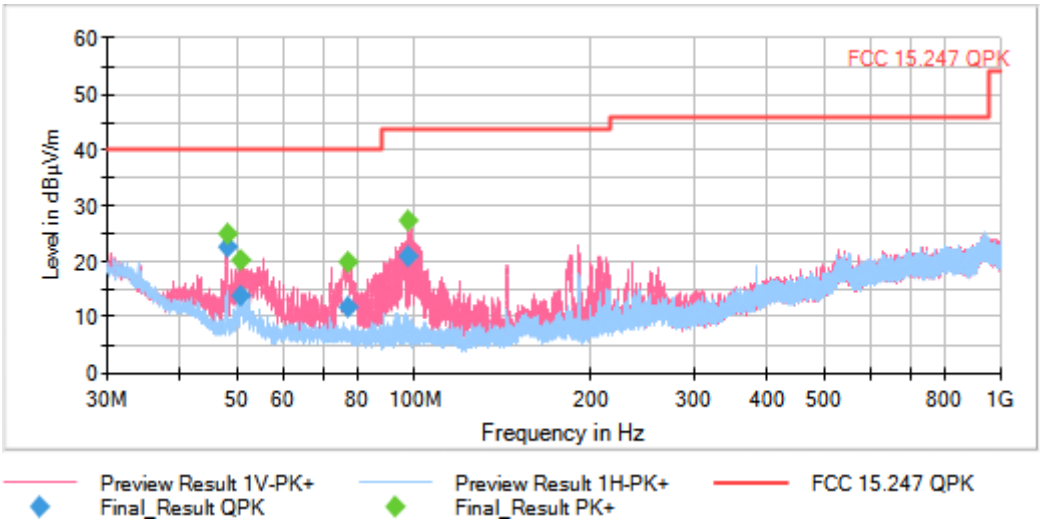
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 30 MHz - 1 GHz | 30,312 kHz | PK+ | 100 kHz | 1 s | 0 dB |

Frequency Range GHz = [0.03, 1] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000

Mode = SISO Active Port = 1

**Images:**



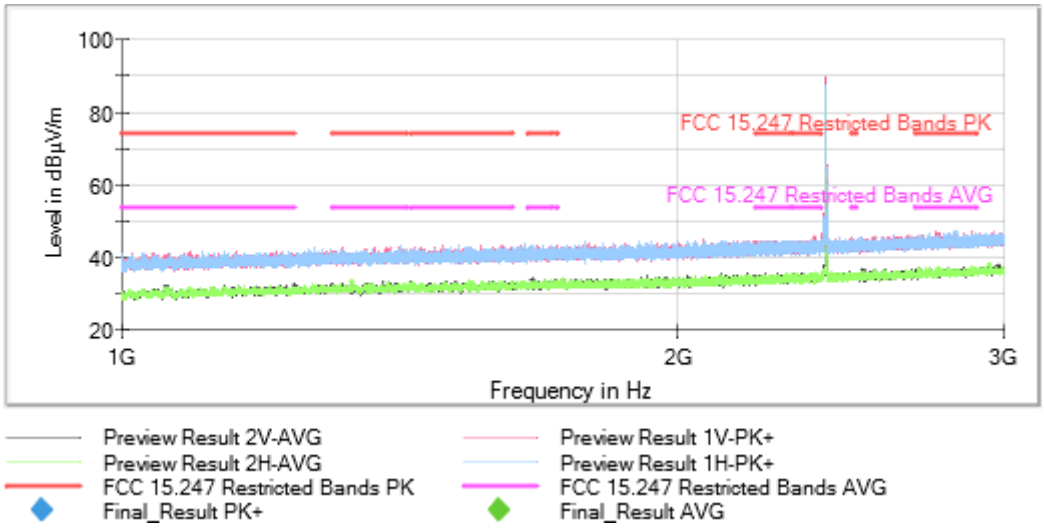

**Tables:**

Spectrum Analyzer Parameters

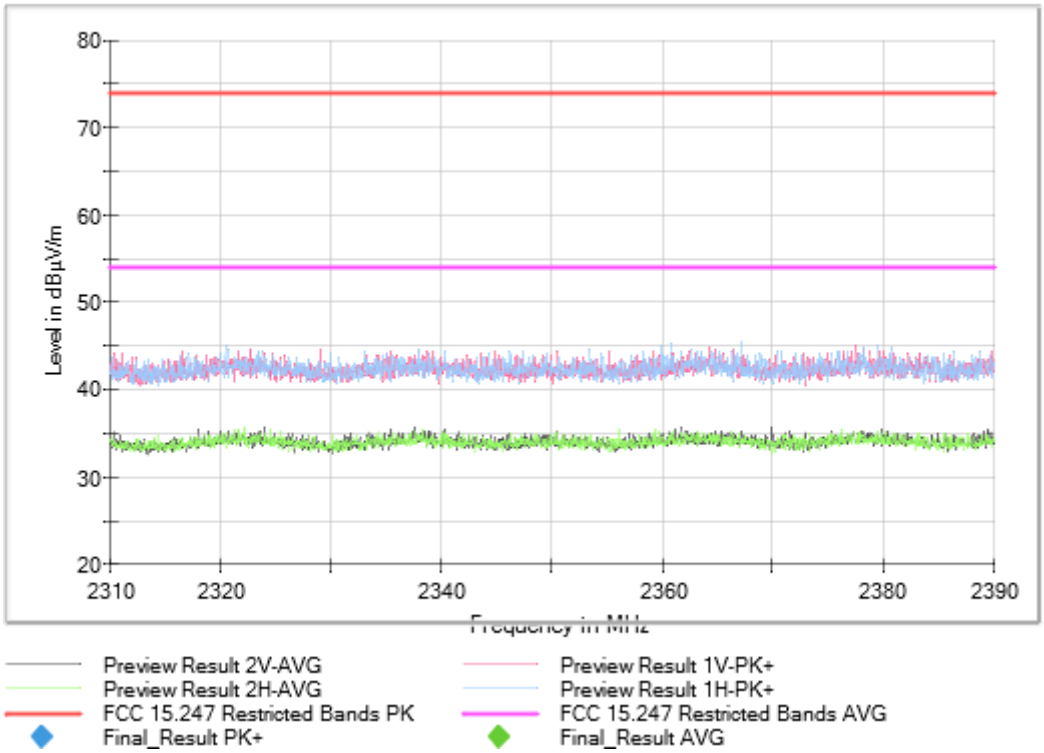
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 30 MHz - 1 GHz | 30,312 kHz | PK+ | 100 kHz | 1 s | 0 dB |

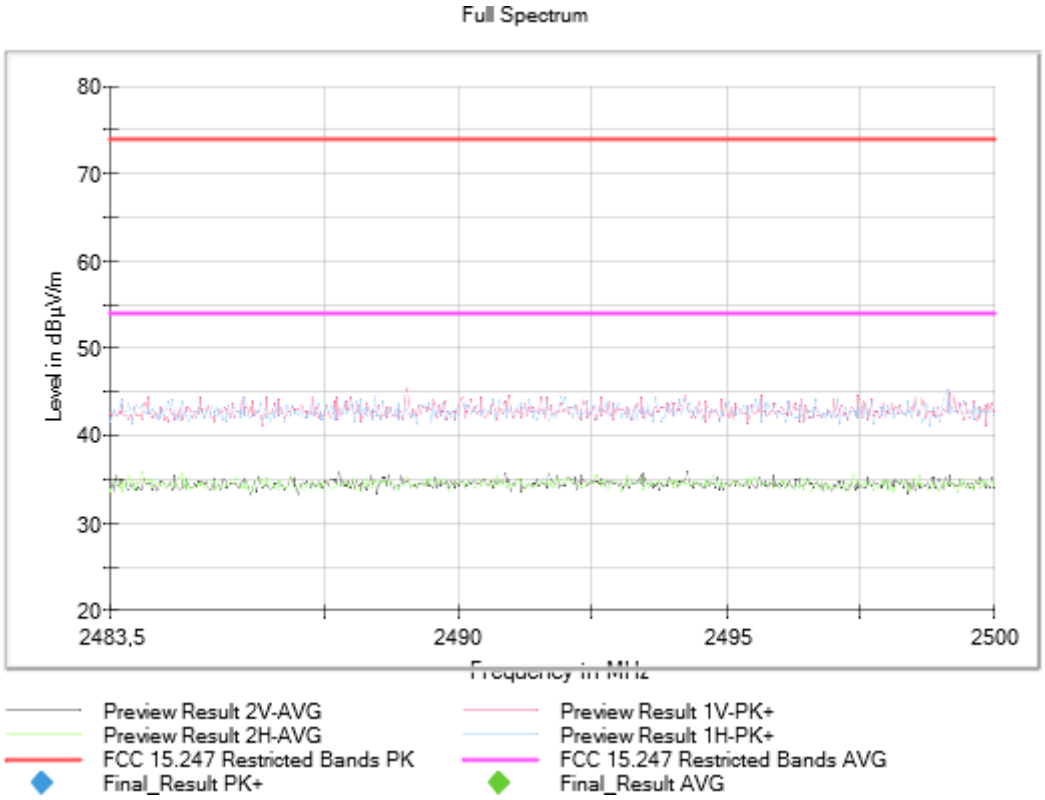
| | |
|---|---|
| Frequency Range GHz = [1, 3] | Equipment Type = Digital Transmission System (DTS) |
| Modulation = BTLE 5.0 (GFSK 2 Mbit/s) | Frequency MHz = 2402.00000 |
| Mode = SISO | Active Port = 1 |

**Images:**




Full Spectrum



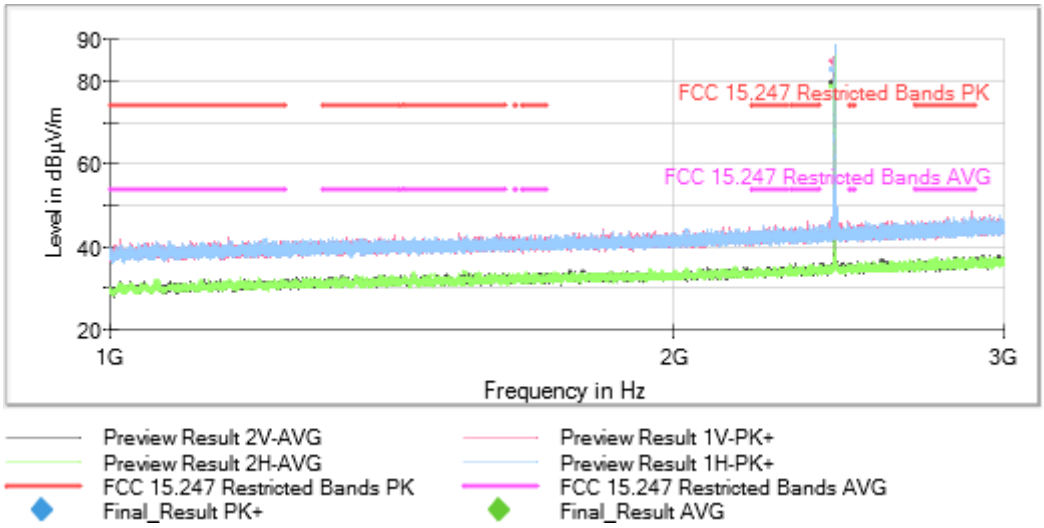



**Tables:**
Spectrum Analyzer Parameters

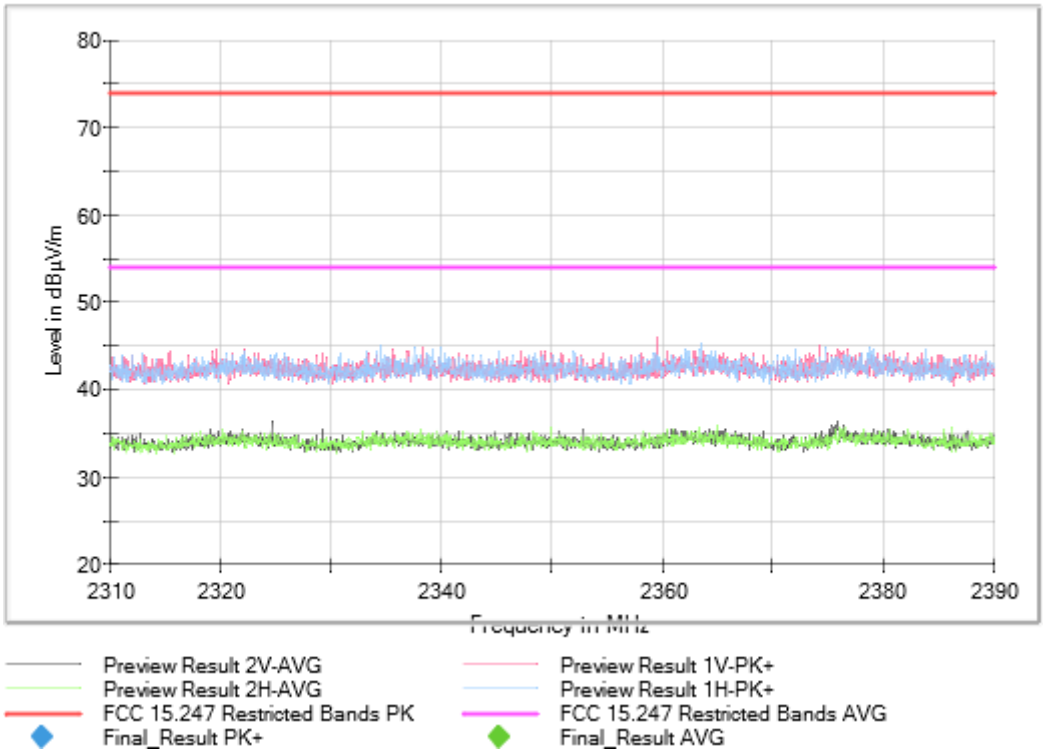
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 1 GHz - 3 GHz | 30,769 kHz | PK+ ; AVG | 1 MHz | 1 s | 0 dB |

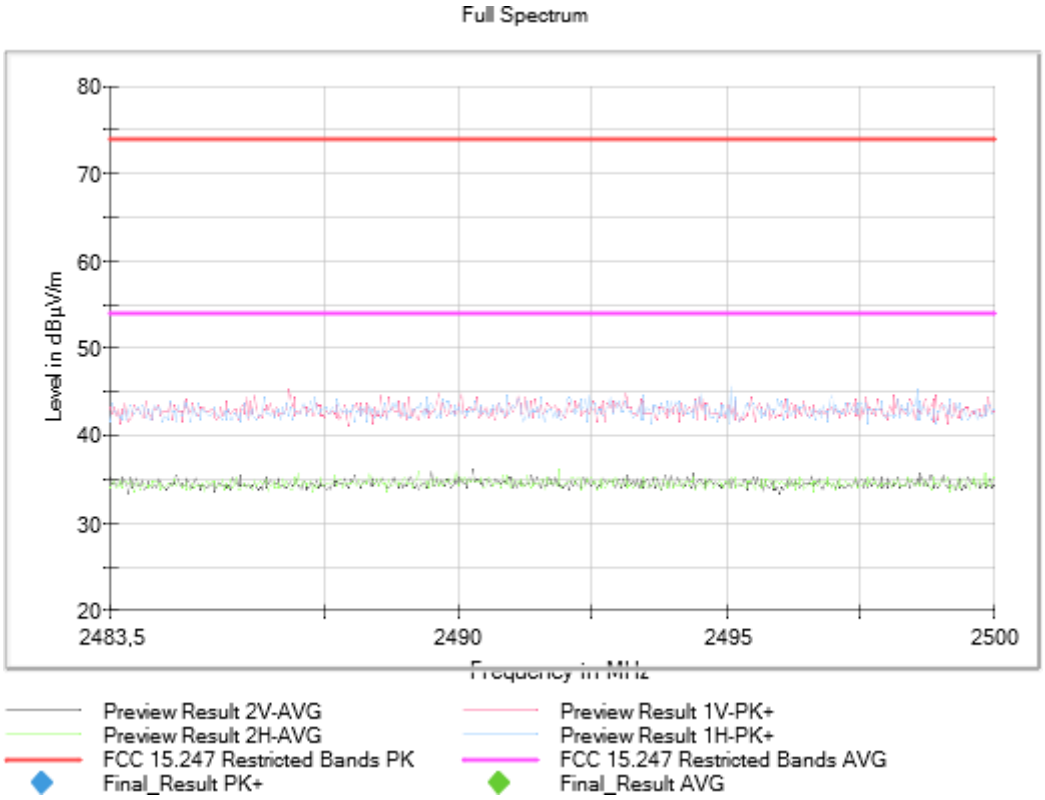
| | |
|---|---|
| Frequency Range GHz = [1, 3] | Equipment Type = Digital Transmission System (DTS) |
| Modulation = BTLE 5.0 (GFSK 2 Mbit/s) | Frequency MHz = 2440.00000 |
| Mode = SISO | Active Port = 1 |

**Images:**




Full Spectrum



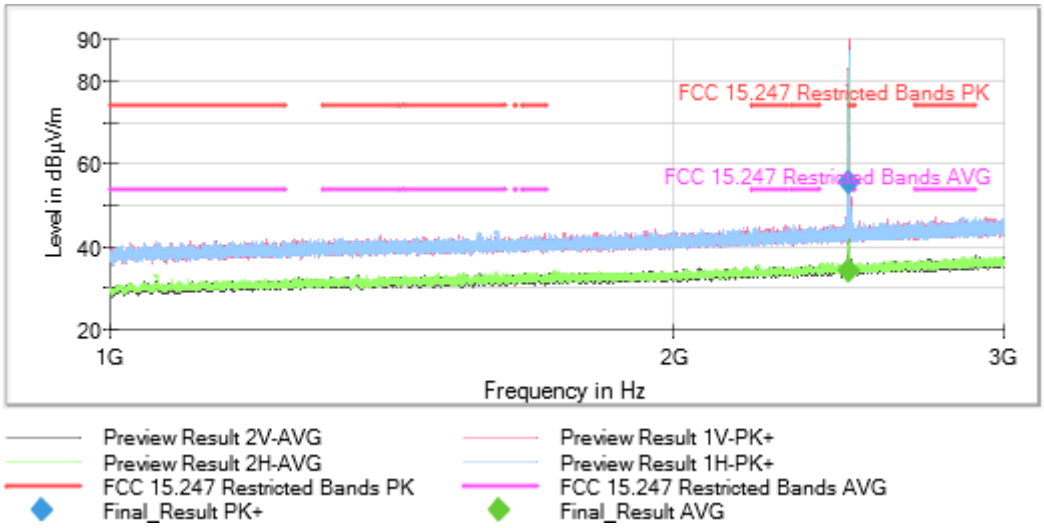



**Tables:**
Spectrum Analyzer Parameters

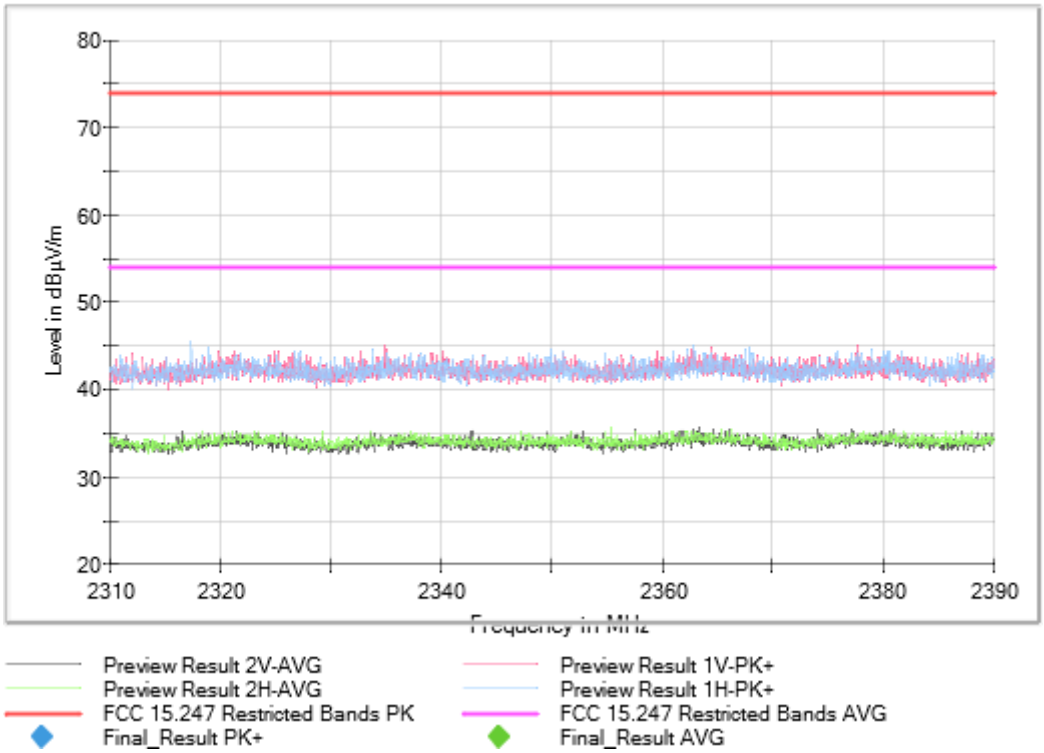
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 1 GHz - 3 GHz | 30,769 kHz | PK+ ; AVG | 1 MHz | 1 s | 0 dB |

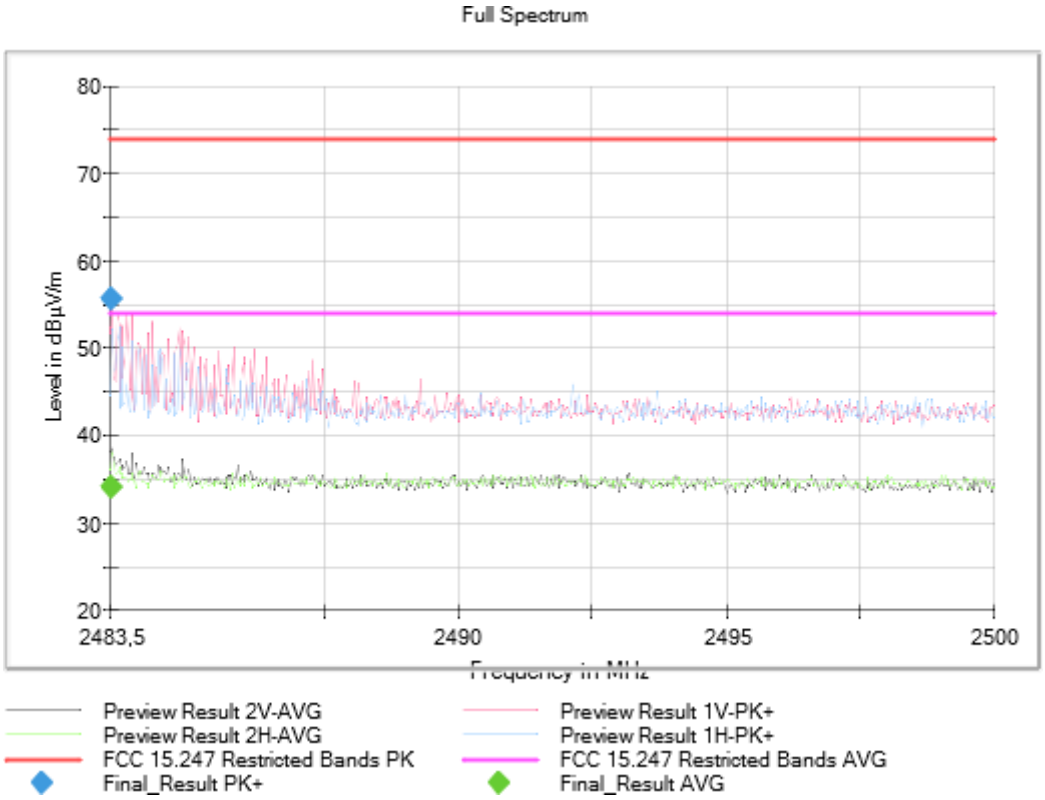
| | |
|---|---|
| Frequency Range GHz = [1, 3] | Equipment Type = Digital Transmission System (DTS) |
| Modulation = BTLE 5.0 (GFSK 2 Mbit/s) | Frequency MHz = 2480.00000 |
| Mode = SISO | Active Port = 1 |

**Images:**




Full Spectrum






**Tables:**
Spectrum Analyzer Parameters

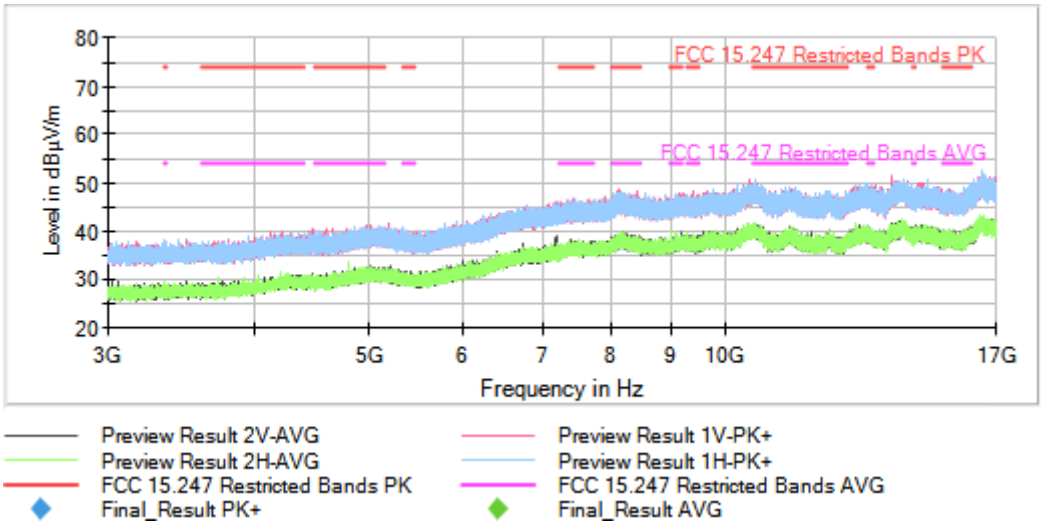
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 1 GHz - 3 GHz | 30,769 kHz | PK+ ; AVG | 1 MHz | 1 s | 0 dB |

Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2402.00000

Mode = SISO Active Port = 1

**Images:**




**Tables:**

Spectrum Analyzer Parameters

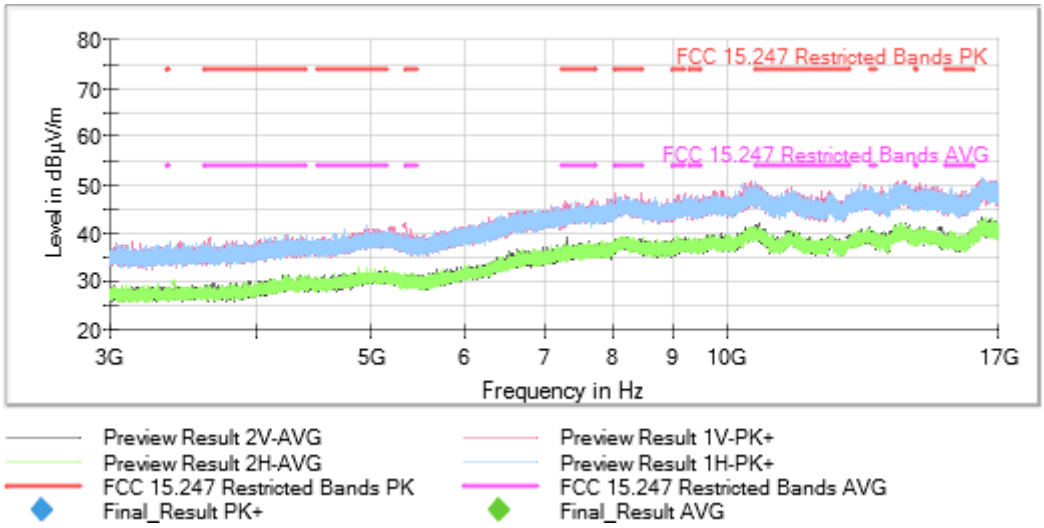
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 3 GHz - 17 GHz | 140 kHz | PK+ ; AVG | 1 MHz | 1 s | 30 dB |

Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000

Mode = SISO Active Port = 1

**Images:**




**Tables:**

Spectrum Analyzer Parameters

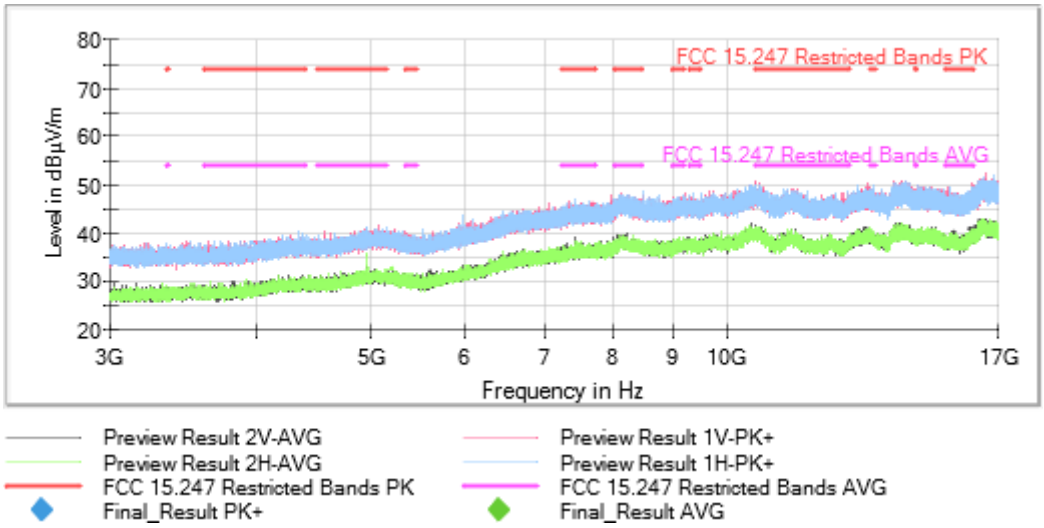
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 3 GHz - 17 GHz | 140 kHz | PK+ ; AVG | 1 MHz | 1 s | 30 dB |

Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000

Mode = SISO Active Port = 1

**Images:**




**Tables:**

Spectrum Analyzer Parameters

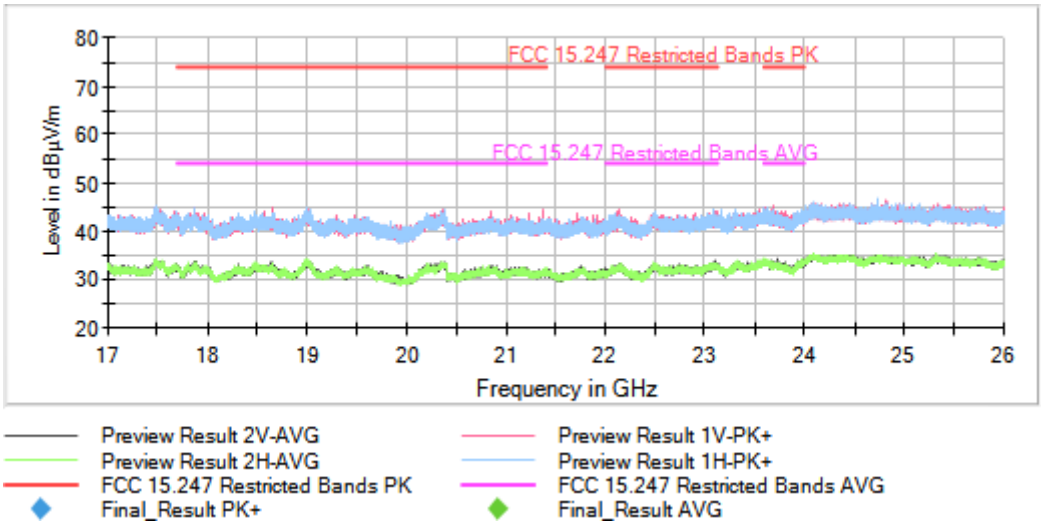
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 3 GHz - 17 GHz | 140 kHz | PK+ ; AVG | 1 MHz | 1 s | 30 dB |

Frequency Range GHz = [17, 26] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2402.00000

Mode = SISO Active Port = 1

**Images:**




**Tables:**

Spectrum Analyzer Parameters

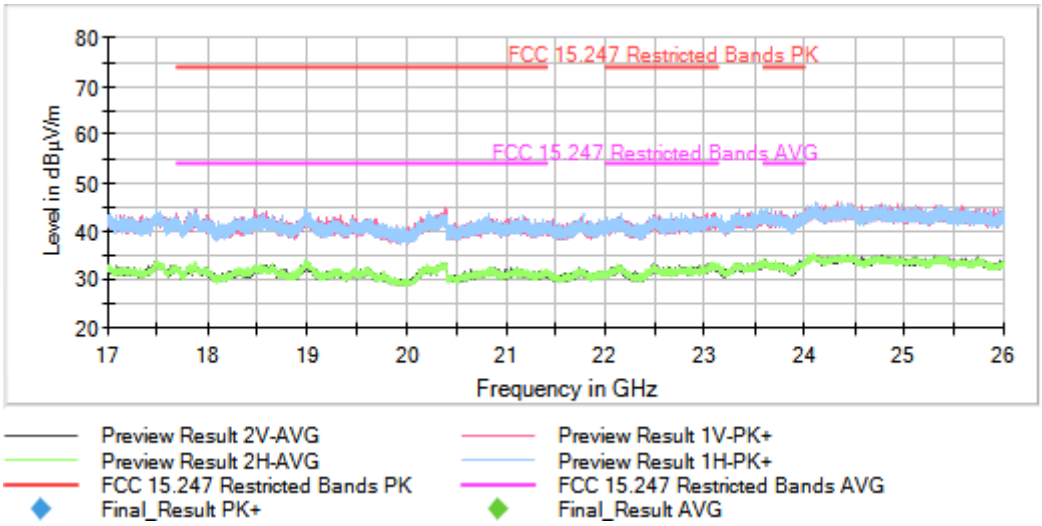
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 17 GHz - 26 GHz | 300 kHz | PK+ ; AVG | 1 MHz | 1 s | 0 dB |

Frequency Range GHz = [17, 26] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000

Mode = SISO Active Port = 1

**Images:**




**Tables:**

Spectrum Analyzer Parameters

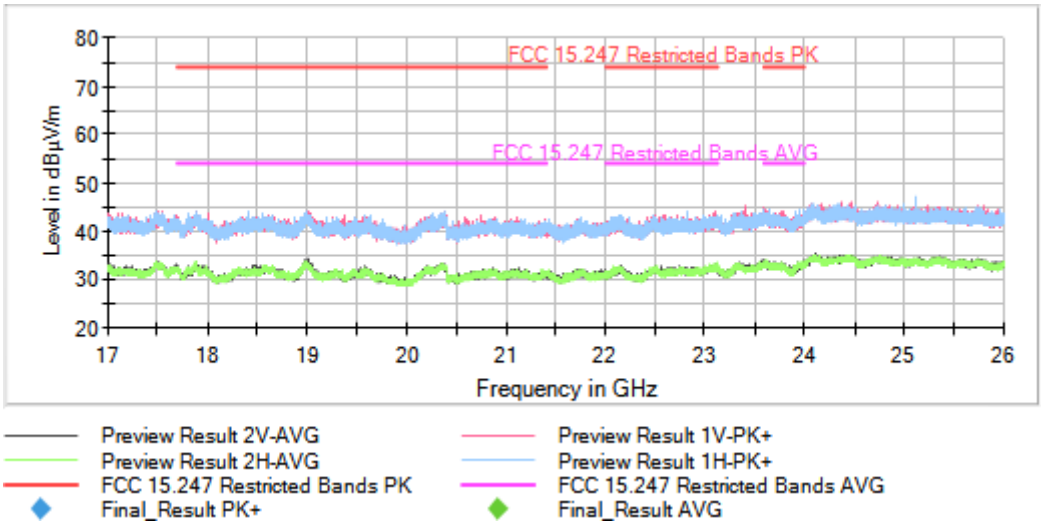
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 17 GHz - 26 GHz | 300 kHz | PK+ ; AVG | 1 MHz | 1 s | 0 dB |

Frequency Range GHz = [17, 26] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000

Mode = SISO Active Port = 1

**Images:**




**Tables:**

Spectrum Analyzer Parameters

| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| 17 GHz - 26 GHz | 300 kHz | PK+ ; AVG | 1 MHz | 1 s | 0 dB |