

ISED CABid: ES1909

Test Report No:

Lab. Company Number: 4621A

77037RRF.012A1

Partial Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	XS4 Original+ Electronic Lock Series including all mechanical variants
(*) Trademark	SALTO
(*) Model and /or type reference	W60T (Type reference: E2131)
(*) Derived model not tested	XS4 One S Electronic Lock Series including all mechanical variants
Other identification of the product	FCC ID: UKCW60MH. Contains: TCZ-10105567G1 IC: 10088A-W60MH. Contains: 1175F-10105567G1
(*) Features	Bluetooth LE (SoC and Module) HW version: 1.0 SW version: 0174 (Control FW) + 0186 (FUS FW) + 0187 (BLE FW) + 0197 (HSE FW) + 0219 (Motor and battery connection FW)
Applicant	SALTO SYSTEMS, S.L. Arkotz 9, Polígono Lanbarren 20180, Oiartzun, Gipuzkoa, SPAIN
Test method requested, standard	USA FCC Part 15.247 (10-1-21 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-21 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 3 (August 2023). CANADA RSS-Gen Issue 5 amendment 2 (February 2021). 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. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager
Date of issue	2024-02-07
Report template No	FDT08_24 (*) "Data provided by the client"

Index

INDEX	2
ACRONYMS	3
COMPETENCES AND GUARANTEES	3
GENERAL CONDITIONS	4
UNCERTAINTY	4
DATA PROVIDED BY THE CLIENT	4
USAGE OF SAMPLES	5
TEST SAMPLE DESCRIPTION	6
IDENTIFICATION OF THE CLIENT	7
TESTING PERIOD AND PLACE	7
DOCUMENT HISTORY	7
ENVIRONMENTAL CONDITIONS	7
REMARKS AND COMMENTS	9
TESTING VERDICTS	10
SUMMARY	10
APPENDIX A: TEST RESULTS. BLUETOOTH LOW ENERGY 4.2 (1M)	12

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	MIMO Mode
Occ Ch BW	Occupied Channel Bandwidth
PSD	Power Spectrum Density
PeakPower	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.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Testing and Certification S.A.U.

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 $\leq \pm 5,35$ 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 $\leq \pm 4,32$ 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 $\leq \pm 5,51$ 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 $\leq \pm 0,80$ dB

Power Spectral Density: Measurement uncertainty $\leq \pm 0,99$ dB

6dB Bandwidth: Measurement uncertainty $\leq \pm 2,84$ %

Occupied Channel Bandwidth: Measurement uncertainty $\leq \pm 1,17$ %

Conducted Band-edge spurious emissions: Measurement uncertainty $\leq \pm 1,76$ 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 XS4 Original+ Hilton Electronic Lock Series with RFID Mifare (ISO14443A & ISO15693 standard based) and Bluetooth LE technology.
3. The sample undergoing test, XS4 Original+ Electronic Lock, have been selected as a representative sample of XS4 Original+ and XS4 One S Electronic Lock Series.

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.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	77037B_3.1	XS4 Original+ Electronic Lock	W60T	--	2023-09-25	Element Under Test
S/02	77037B_32.1	XS4 Original+ Electronic Lock	W60T	--	2023-09-25	Element Under Test
S/02	77037B_31.1	Battery holder	--	--	2023-09-25	Element Under Test

Notes referenced to samples during the project:

Id	Type
S/01	Sample used for radiated test
S/02	Sample used for conducted test

Test sample description

Ports..... :	Port name and description	Cable				
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
.....	[]	[]	[]	[]	
Supplementary information to the ports..... :					
Rated power supply	Voltage and Frequency		Reference poles			
			L1	L2	L3	N
	[]	AC:	[]	[]	[]	[]
[X]	DC: 4.5 Vdc (3 x LR06 batteries)					
Rated Power	N/A					
Clock frequencies.....:	27.12 MHz, 32 MHz, 32.768 KHz					
Other parameters	N/A					
Software version	0174 (Control FW) + 0186 (FUS FW) + 0187 (BLE FW) + 0197 (HSE FW) + 0219 (Motor and battery connection FW)					
Hardware version	1.0					
Dimensions in cm (W x H x D)	6.7 x 29 x 2.0 cm					
Mounting position	[]	Table top equipment				
	[]	Wall/Ceiling mounted equipment				
	[]	Floor standing equipment				
	[]	Hand-held equipment				
	[X]	Other: Door mounting				
Modules/parts.....:	Module/parts of test item		Type	Manufacturer		
	SoC + Antenna		BLE	ST + JOHANSON		
	Bluetooth LE module		BLE module	SUPRA		
		
Accessories (not part of the test item)	Description		Type	Manufacturer		
		
		
Documents as provided by the applicant.....:	Description		File name	Issue date		
	User manual			
	FW Explanation			
		

⁽³⁾ Only for Medical Equipment

Identification of the client

SALTO SYSTEMS, S.L.
Arkotz 9, Polígono Lanbarren
20180, Oiartzun, Gipuzkoa, SPAIN

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2023-10-04
Date (finish)	2023-10-23

Document history

Report number	Date	Description
77037RRF.012	2023-11-22	First release.
77037RRF.012A1	2024-02-07	Second release. Modification due to typo. This modification test report cancels and replaces the test report 77037RRF.012

Environmental conditions

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Pablo Redondo and Rafael Fernandez.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
4825	SEMIANECHOIC ABSORBER LINED CHAMBER IV	FACT 3 200 STP	ETS LINDGREN	N/A
4826	SHIELDED ROOM	S101	ETS LINDGREN	N/A
4578	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2026-06-01
6142	PRE-AMPLIFIER G>38dB 30MHz-6GHz	BLNA 0360-01N	BONN ELEKTRONIK	2024-06-28
6165	EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2023-11-08
4611	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2026-01-16
4657	HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2026-06-12
8856	PRE-AMPLIFIER G>30dB 18-40GHz	BLMA 1840-4A	BONN ELEKTRONIK	2023-11-02
5705	PRE-AMPLIFIER G>40dB 1-18 GHz	BLMA 0118-1M	BONN ELEKTRONIK	2024-07-26
6157	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2025-01-18
4848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	N/A
6668	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2024-12-14
8848	OPEN SWITCH UNIT UP TO 7.5 GHz	OSP-B157W8 PLUS	ROHDE & SCHWARZ	2024-12-21
7796	EXTENSION FOR OPEN SWITCH UNIT UP TO 40GHz	OSP-B157Wx	ROHDE AND SCHWARZ	2024-03-16
0922	DC POWER SUPPLY 40 V / 40 A	NGPE 40/40	ROHDE AND SCHWARZ	N/A
7759	DIGITAL MULTIMETER	175	FLUKE	2024-11-02
7798	SOFTWARE FOR EMC/RF TESTING	WMS32	ROHDE AND SCHWARZ	N/A

Testing verdicts

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

Summary

Bluetooth Low Energy 4.2 (1M) of SoC

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	-
<u>Supplementary information and remarks:</u>			
None			

Bluetooth Low Energy 4.2 (1M) of Module

FCC PART 15 PARAGRAPH/ RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.247 (a)(2) / RSS-247 5.2. (a)	6 dB Bandwidth	N/M	(1)
FCC 15.247 (b) / RSS-247 5.4. (d)	Maximum output power and antenna gain	N/M	(1)
FCC 15.247 (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	N/M	(1)
FCC 15.247 (e) / RSS-247 5.2. (b)	Power spectral density	N/M	(1)
FCC 15.247 (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	N/M	(1)
<u>Supplementary information and remarks:</u>			
1. Test not requested by the client			

Appendix A: Test results. Bluetooth Low Energy 4.2 (1M)

INDEX

TEST CONDITIONS	14
TEST CASES DETAILS	17
<i>Occupied Channel Bandwidth 99%</i>	17
<i>RSS-247 5.2 (a) / FCC 15.247 (a) (2) 6 dB Bandwidth</i>	21
<i>RSS-247 5.2 (b) / FCC 15.247 (e) Power spectral density</i>	25
<i>RSS-247 5.4 (d) / FCC 15.247 (b) (3) Maximum Peak Conducted output power</i>	29
<i>RSS-247 5.5 / FCC 15.247 (d) Band-edge emissions compliance (Transmitter)</i>	33
<i>RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter)</i>	39

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 4.5Vdc
Type of Power Supply: External power supply (3 x LR06 batteries)

ANTENNA (*):

Type of Antenna: Integral antenna (chip)
Maximum Declared Antenna Gain: 0.5dBi

TEST FREQUENCIES (*):

Modulation	Data rates	Low Channel:	Middle Channel	High Channel
BTLE GFSK	1M 1 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).

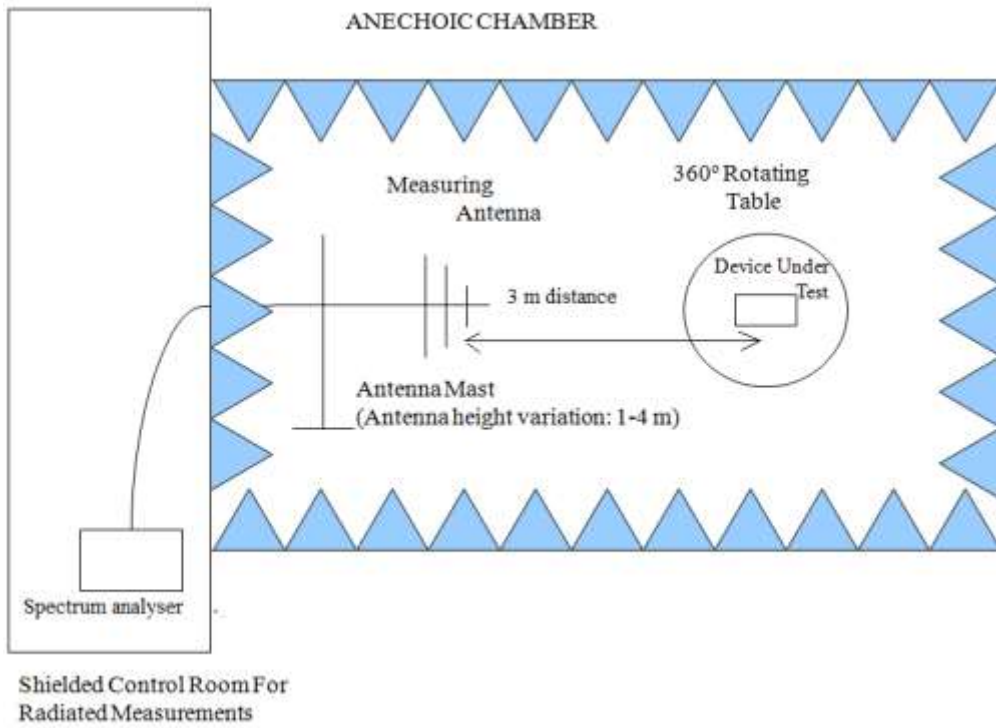
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

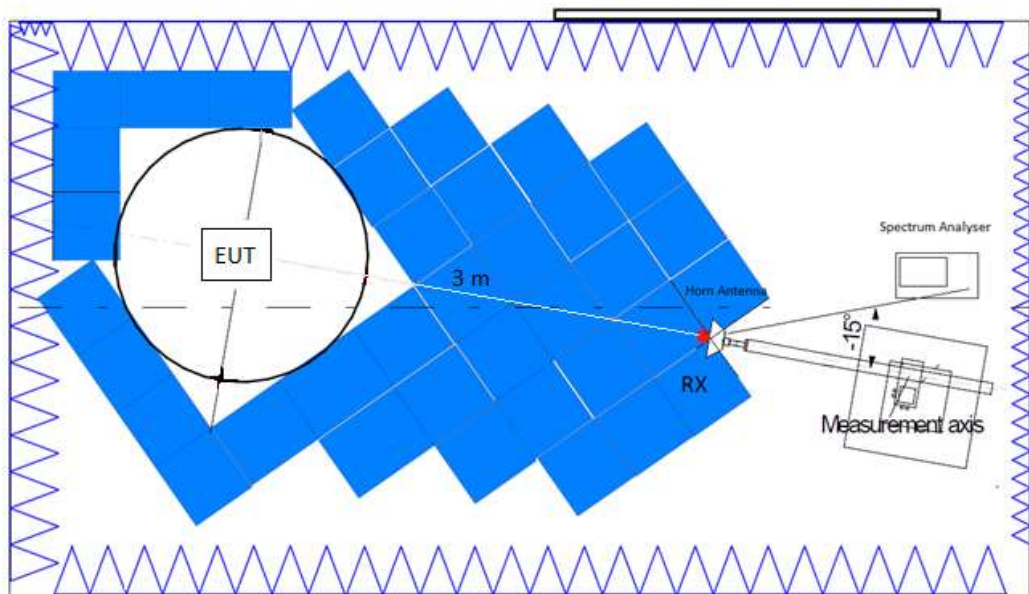
Measurements were made in both horizontal and vertical planes of polarization.

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.

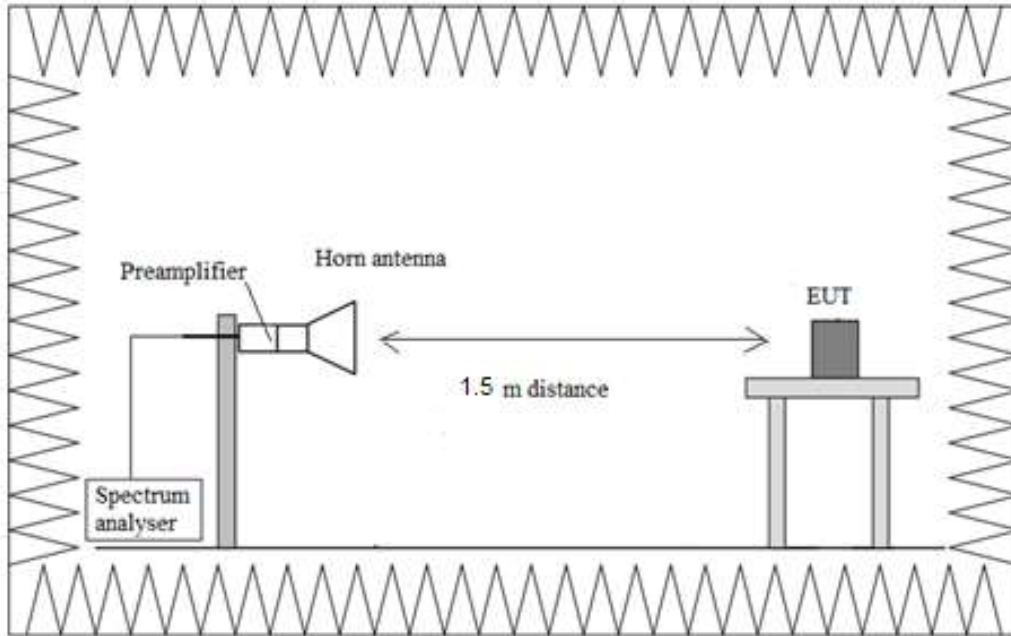
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

Occupied Channel Bandwidth 99%

Results

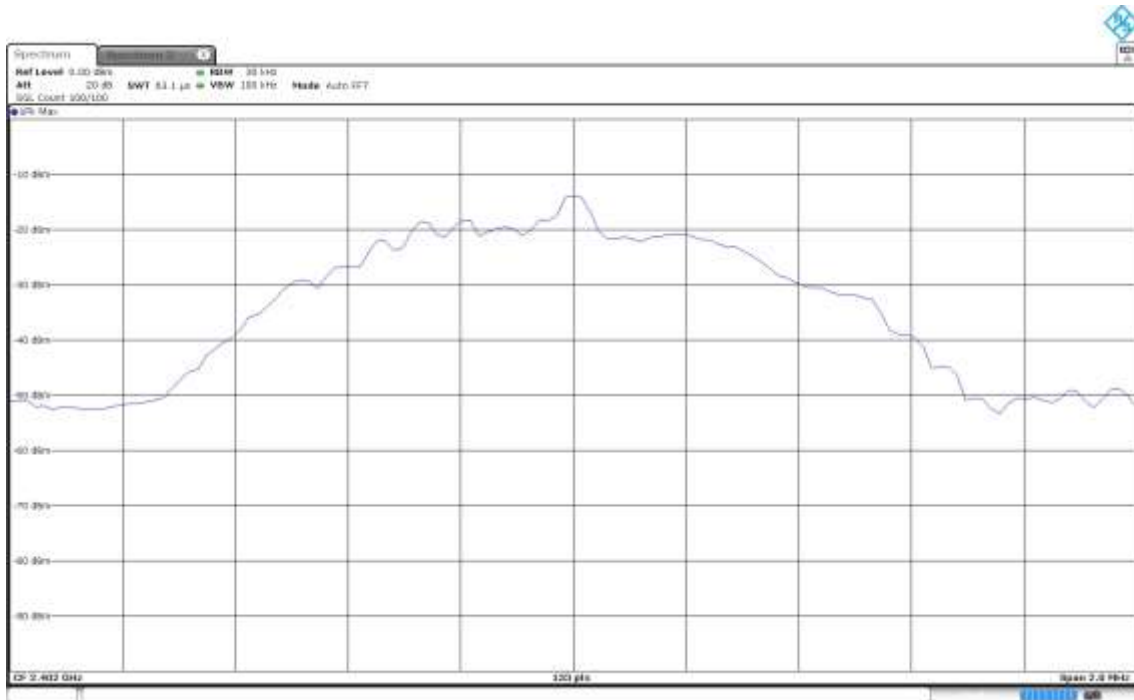
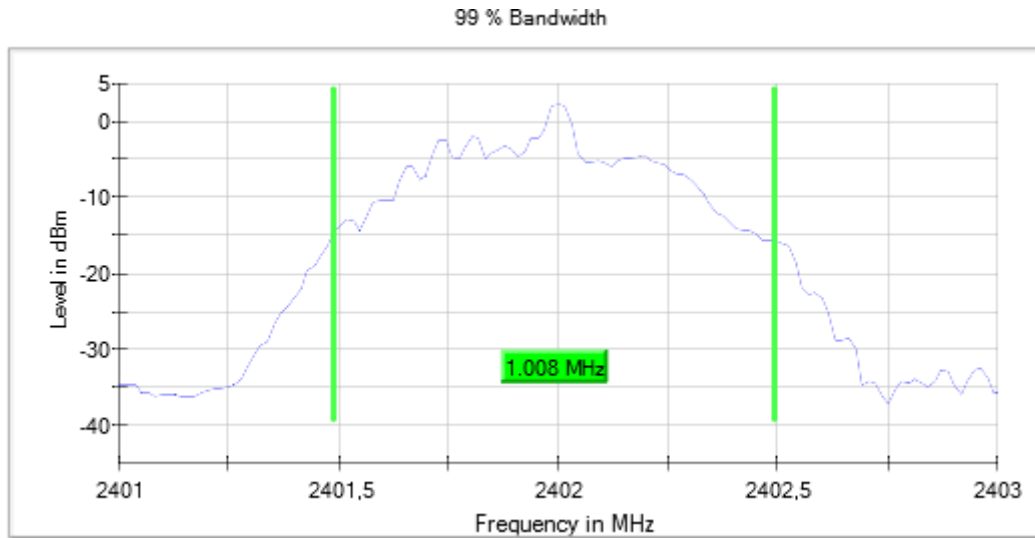
Modulation: BTLE 4.2 (GFSK 1 Mbit/s)

Freq (MHz)	Occ Ch BW (MHz)
2402.00000	1.008
2440.00000	1.008
2480.00000	1.008

Attachments

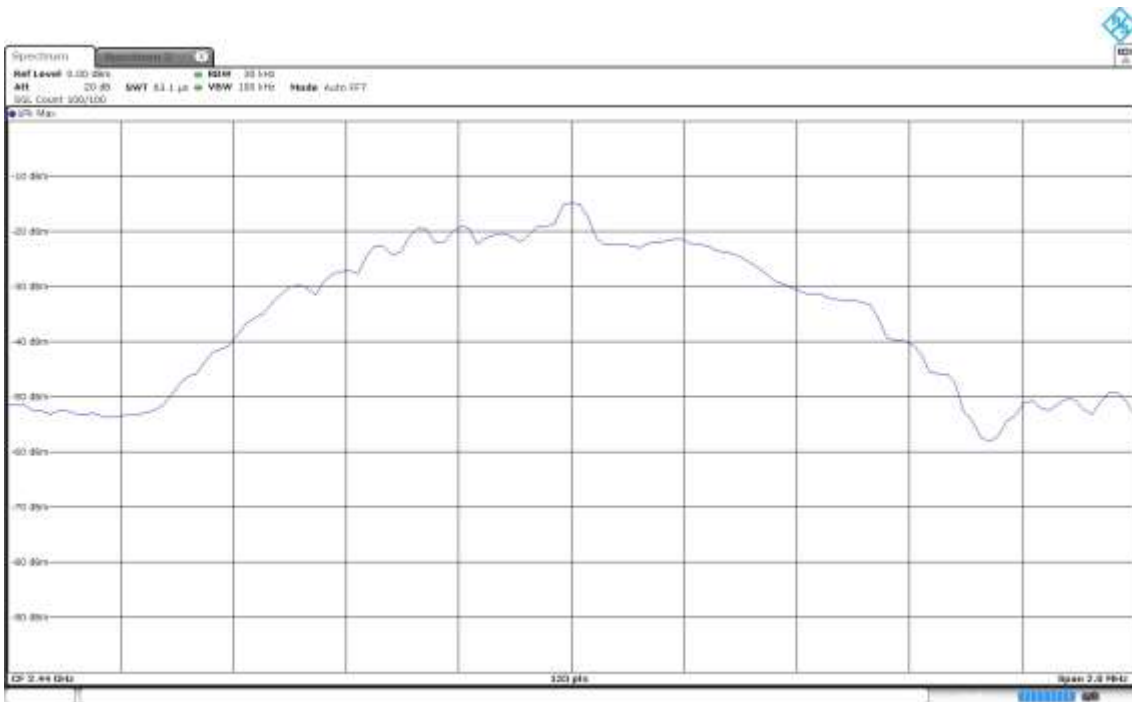
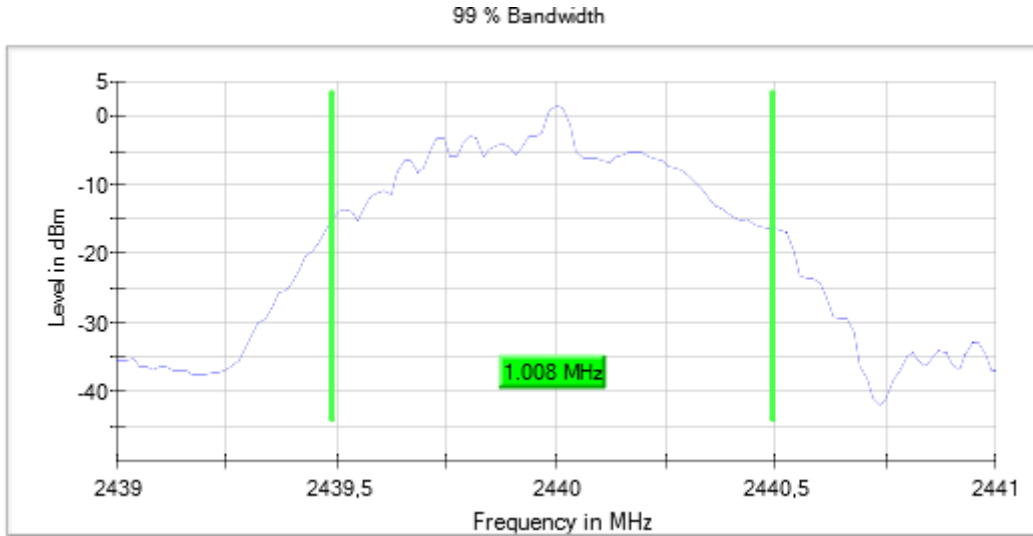
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



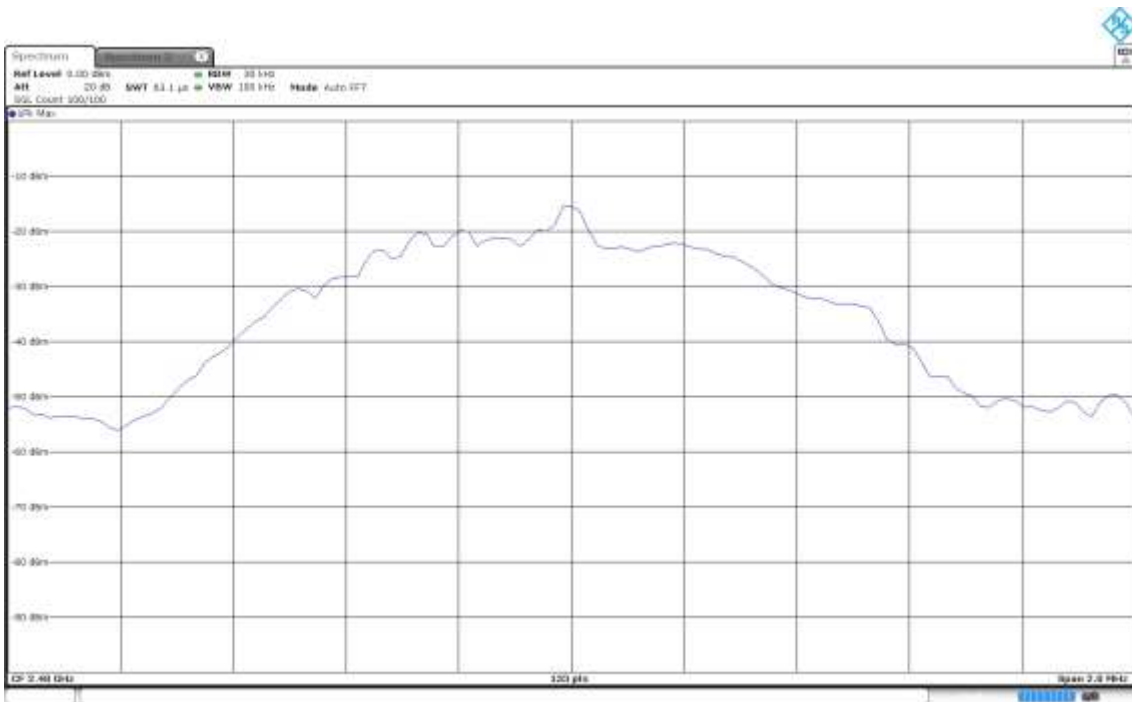
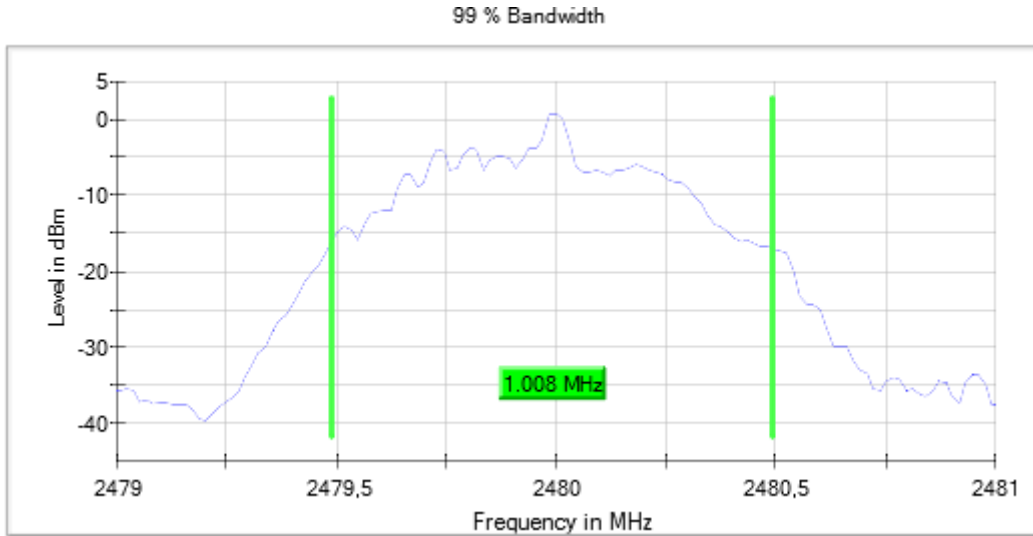
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
MIMO 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.

Results

Modulation: BTLE 4.2 (GFSK 1 Mbit/s)

Freq (MHz)	6 dB Bandwidth (MHz)
2402.00000	0.673
2440.00000	0.673
2480.00000	0.673

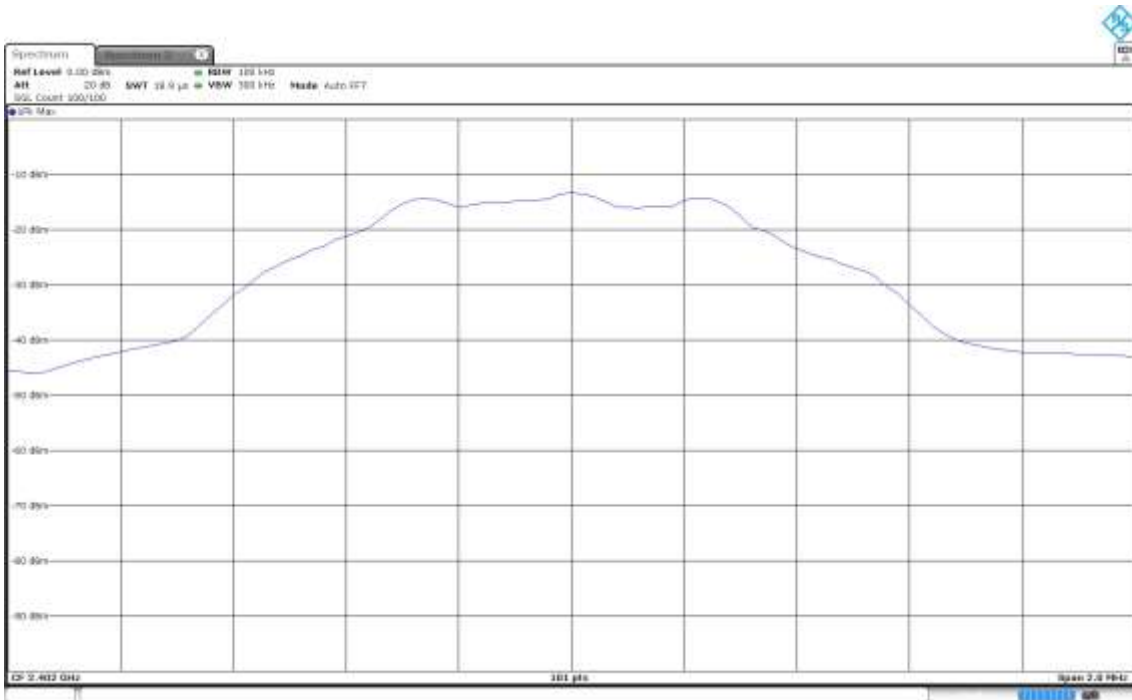
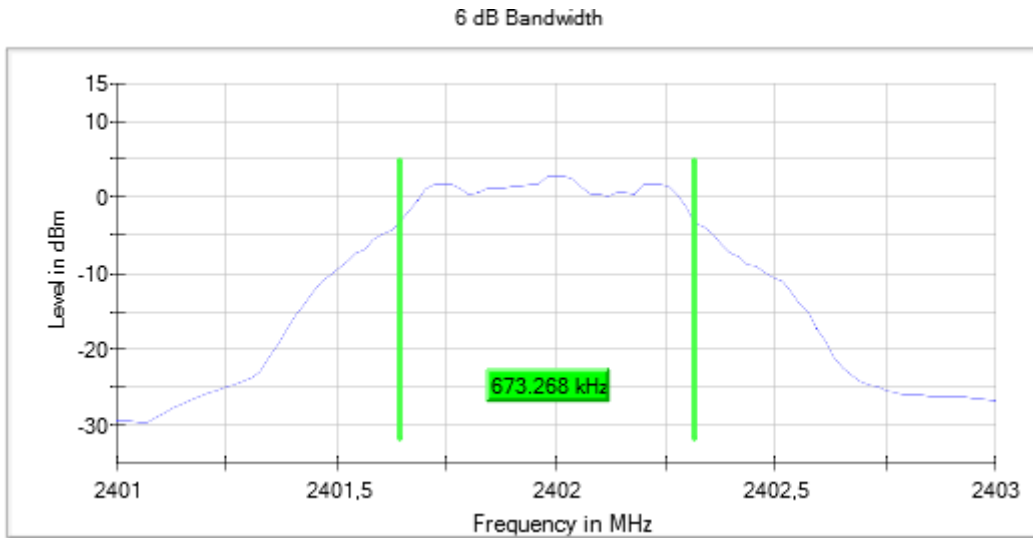
Verdict

Pass

Attachments

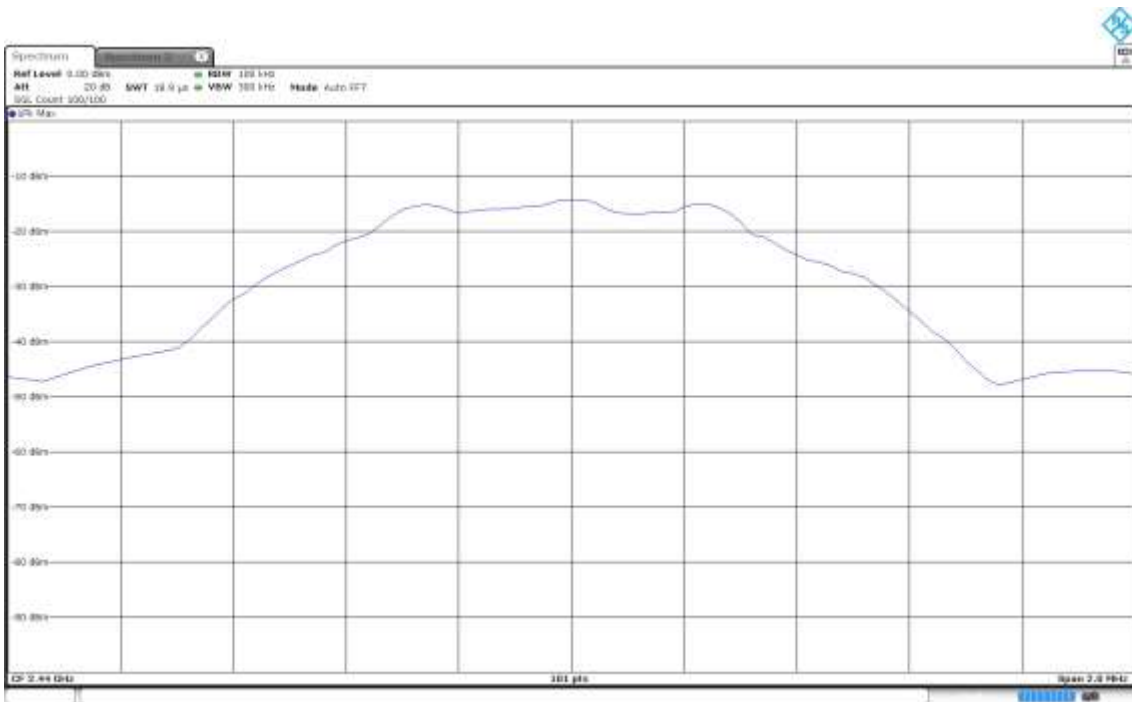
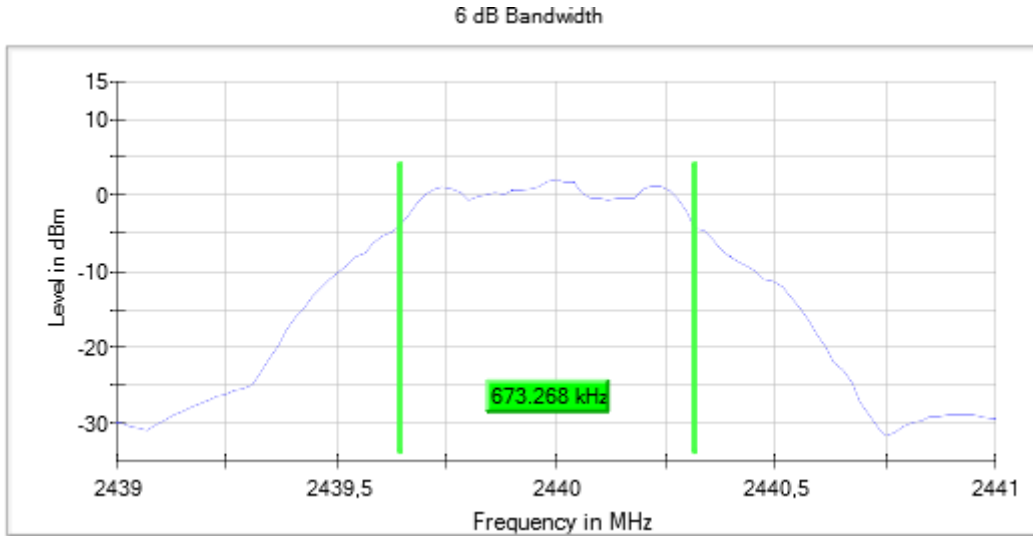
Bandwidth MHz = 1 Modulation = BTLE 4.2 (GFSK 1 Mbit/s)
Frequency MHz = 2402.00000 MIMO Mode = SISO
Active Port = 1

Images:



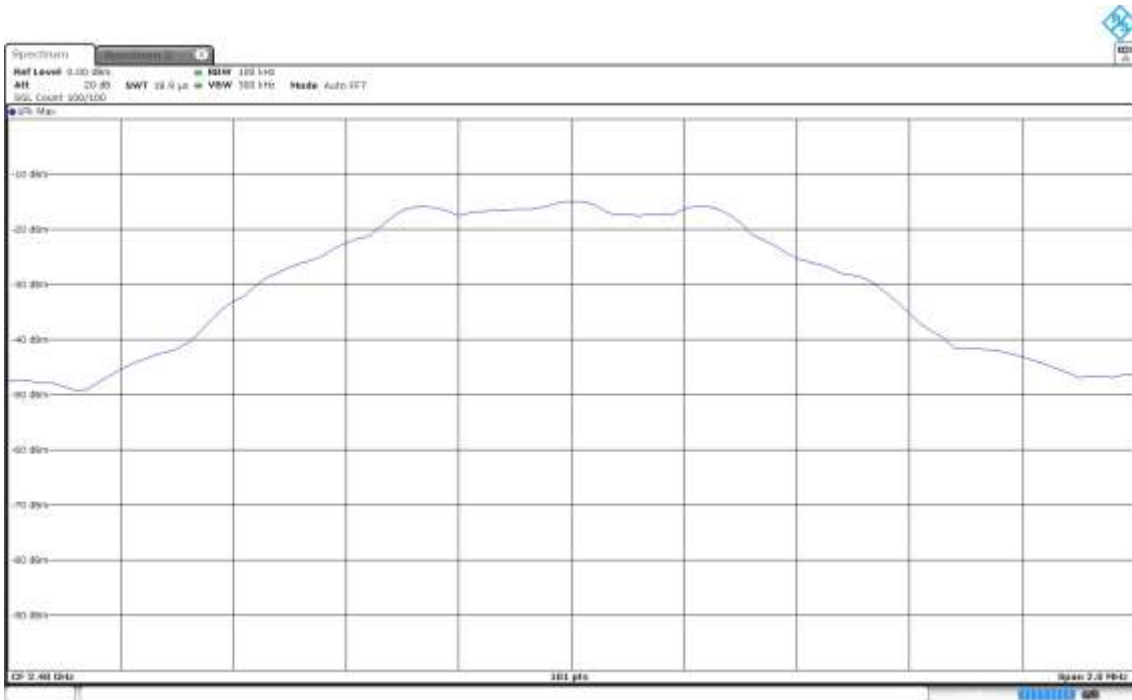
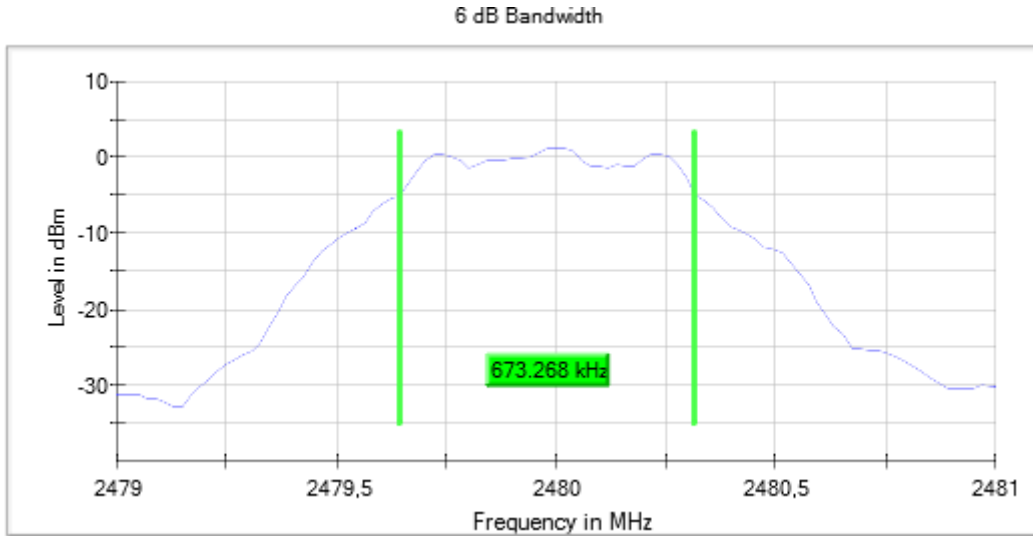
Bandwidth MHz = 1 Modulation = BTLE 4.2 (GFSK 1 Mbit/s)
Frequency MHz = 2440.00000 MIMO Mode = SISO
Active Port = 1

Images:



Bandwidth MHz = 1 Modulation = BTLE 4.2 (GFSK 1 Mbit/s)
Frequency MHz = 2480.00000 MIMO 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.

Results

Modulation: BTLE 4.2 (GFSK 1 Mbit/s)

Freq (MHz)	Measured Freq (MHz)	PSD (dBm)
2402.00000	2402.0075	-3.23
2440.00000	2440.0075	-3.97
2480.00000	2480.0025	-4.74

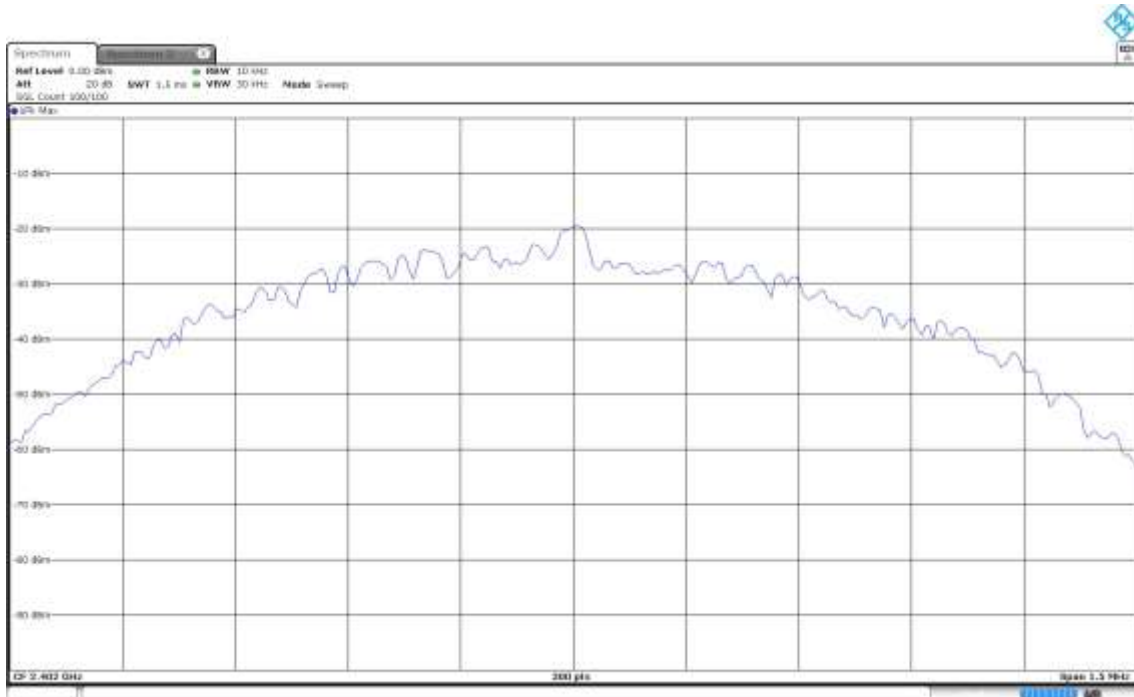
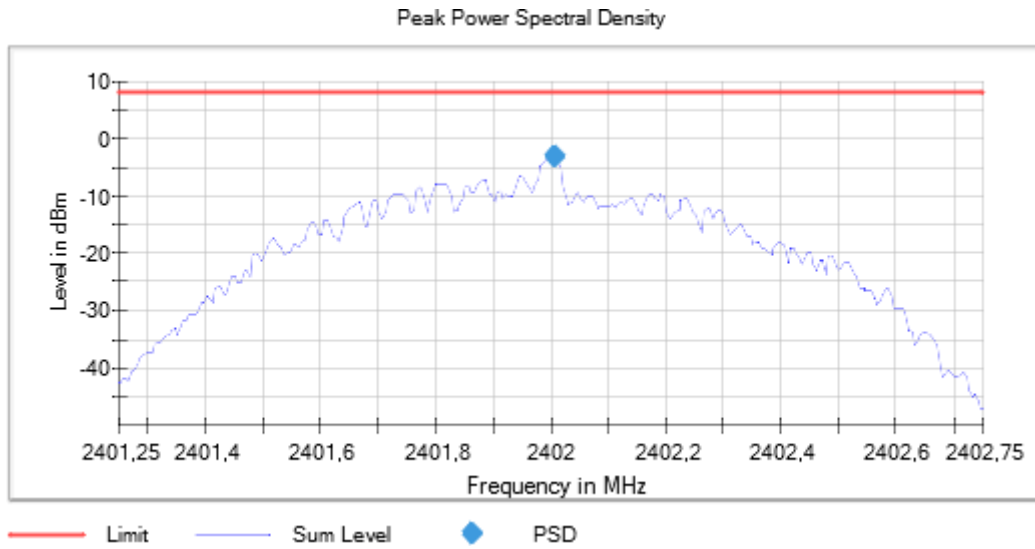
Verdict

Pass

Attachments

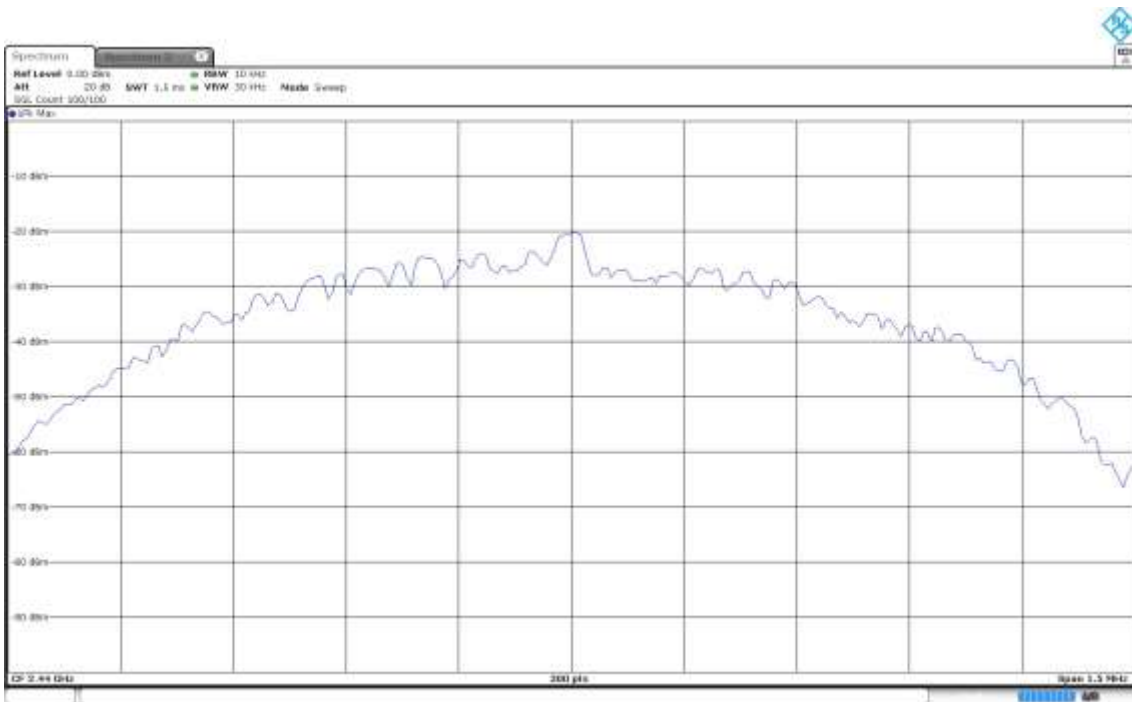
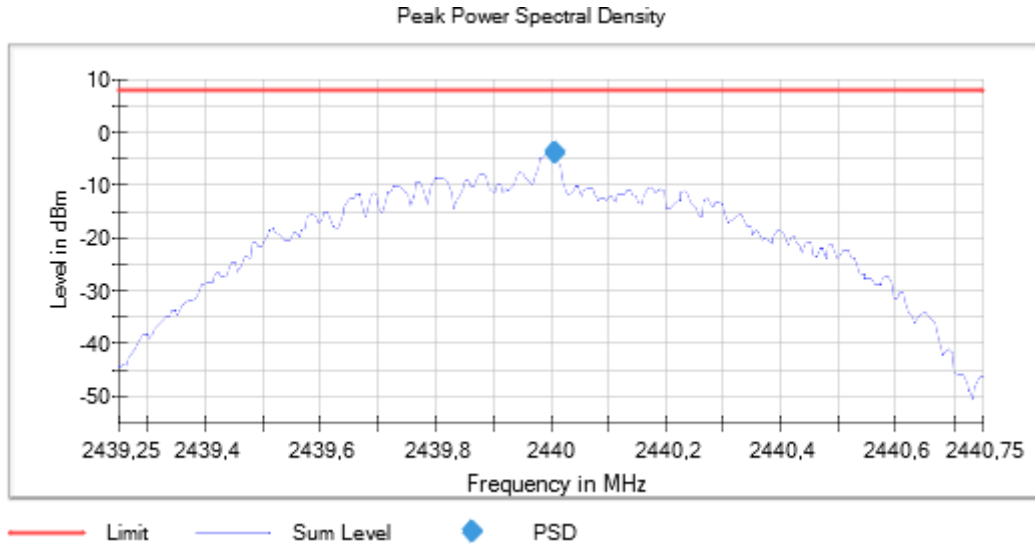
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



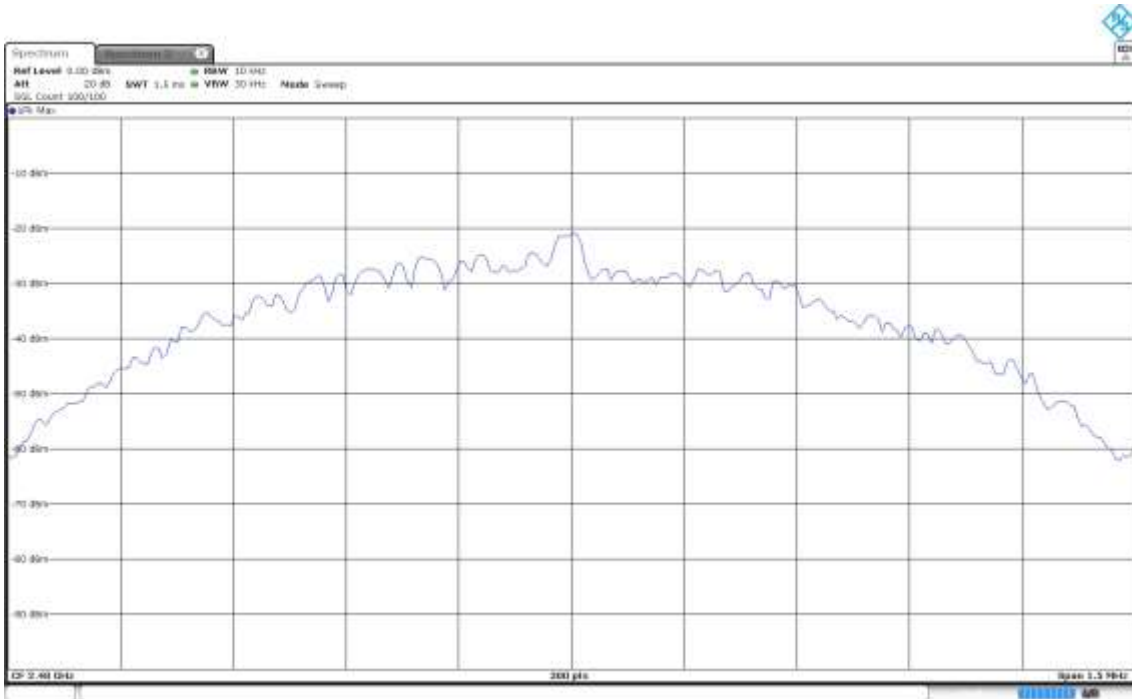
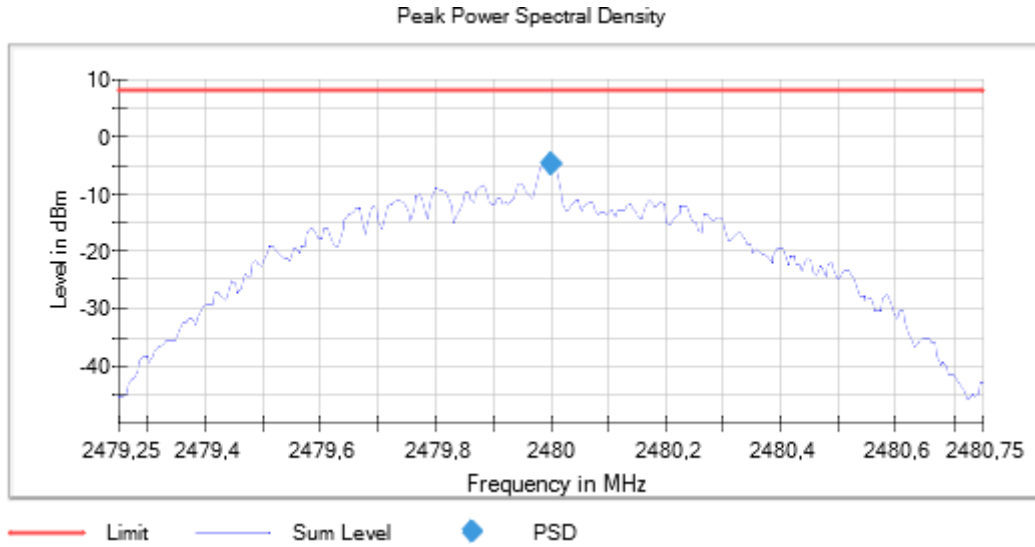
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
MIMO 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) (RSS-247).

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

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

Maximum Declared Antenna Gain: +0.5 dBi

Results

Modulation: BTLE 4.2 (GFSK 1 Mbit/s)

Freq (MHz)	Maximum Conducted Power (dBm)	Maximum EIRP Power (dBm)
2402.0000	2.821	3.321
2440.0000	2.061	2.561
2480.0000	1.359	1.859

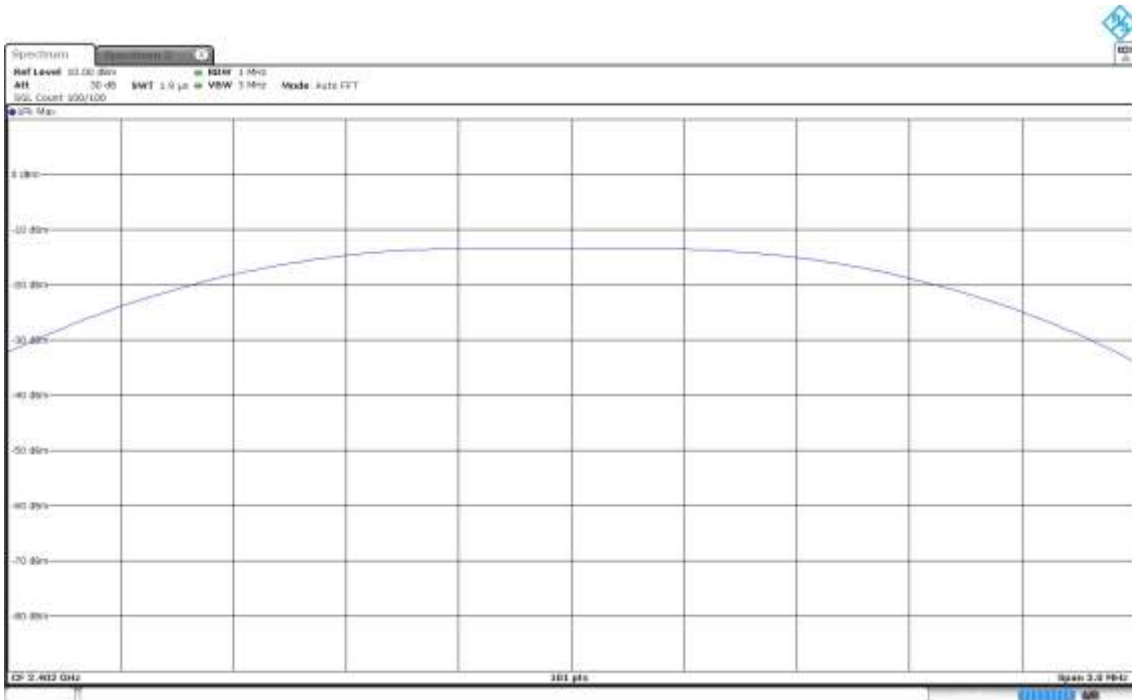
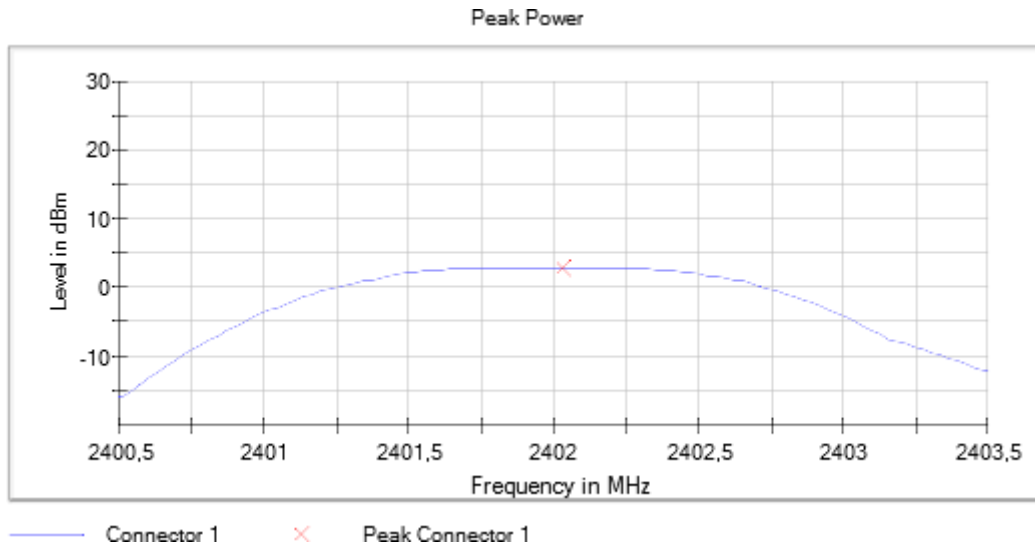
Verdict

Pass

Attachments

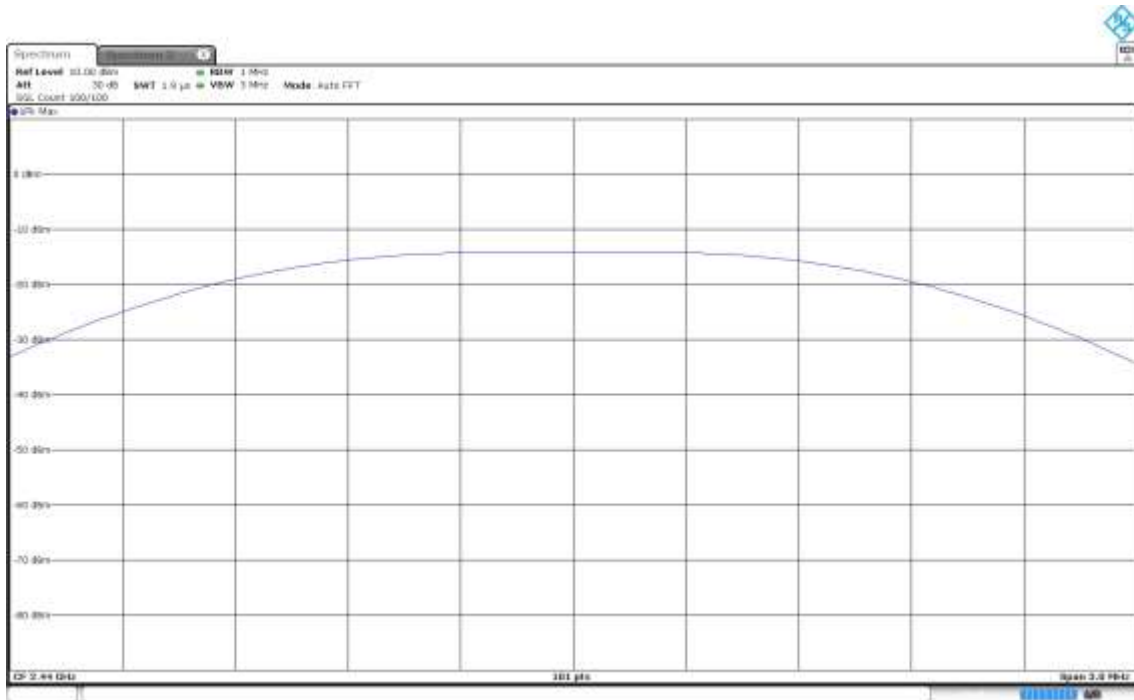
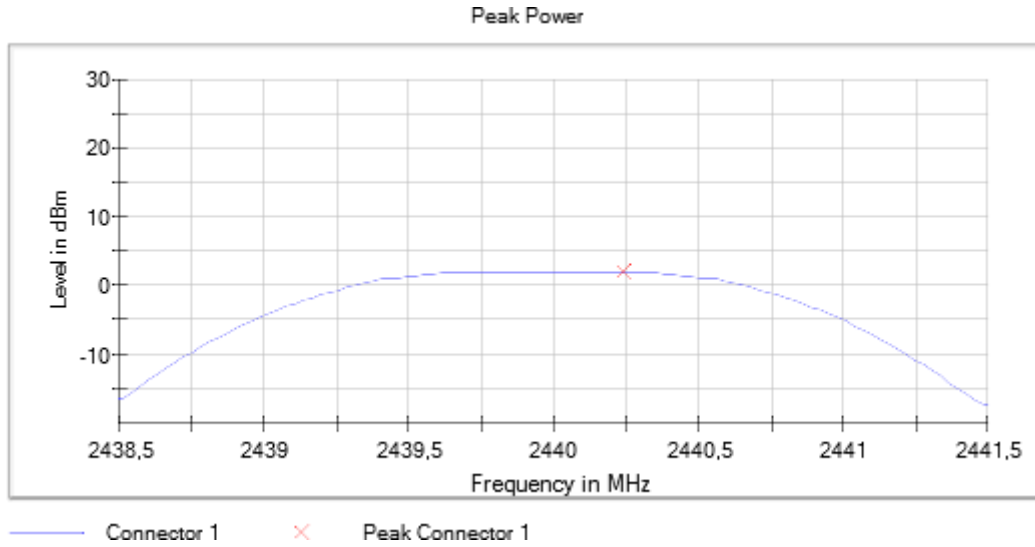
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



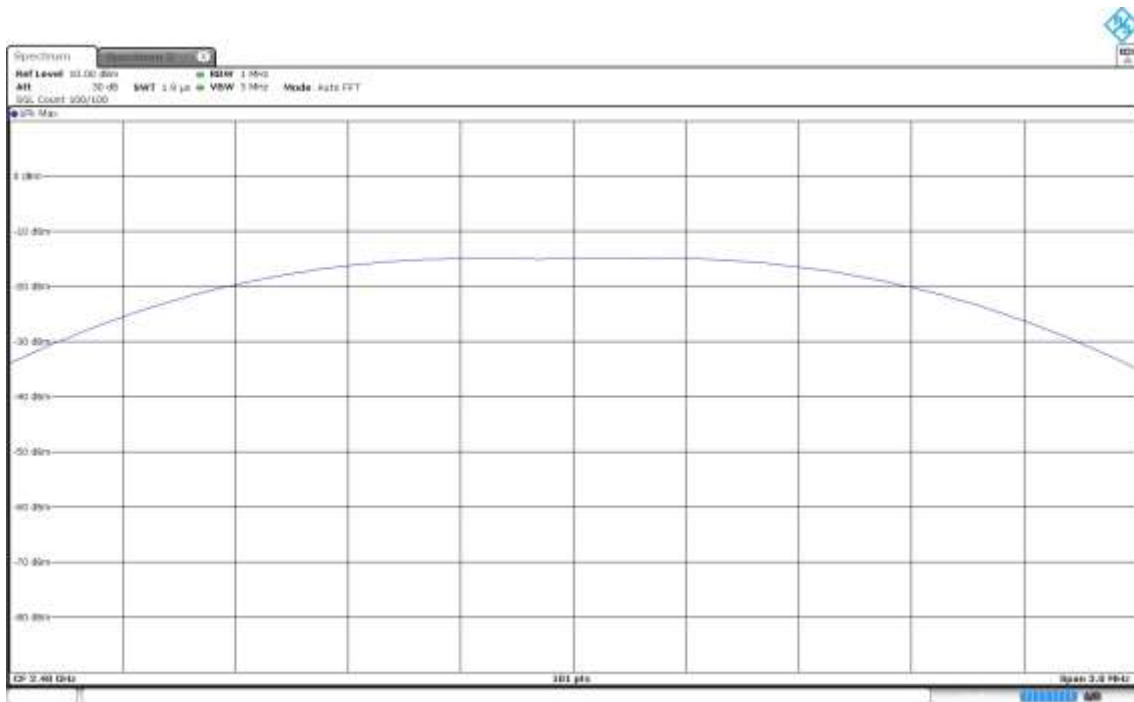
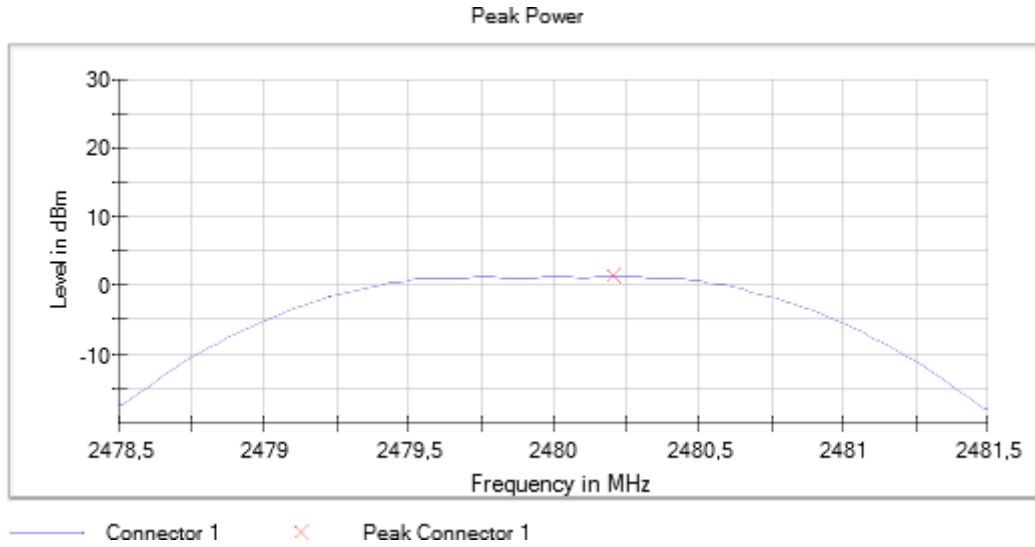
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
 MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
 MIMO 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.

Results

Modulation: BTLE 4.2 (GFSK 1 Mbit/s)

Freq (MHz)	Freq (MHz)	Lvl (dBm)	Limit (dBm)
2402.00000	2340.925000	-50.814	-17.689
	2310.375000	-50.942	
	2340.975000	-50.980	
	2359.475000	-51.096	
	2310.325000	-51.256	
	2371.925000	-51.341	
	2371.975000	-51.344	
	2399.825000	-51.394	
	2399.775000	-51.400	
	2310.425000	-51.566	
	2359.525000	-51.652	
	2359.425000	-51.803	
	2340.875000	-51.913	
	2343.675000	-51.959	
	2399.975000	-52.069	

Freq (MHz)	Freq (MHz)	Lvl (dBm)	Limit (dBm)
2480.00000	2484.625000	-50.988	-18.979
	2484.575000	-51.139	
	2483.975000	-51.139	
	2500.000000	-51.226	
	2499.975000	-51.226	
	2485.075000	-51.232	
	2485.875000	-51.243	
	2485.125000	-51.364	
	2497.225000	-51.378	
	2484.825000	-51.434	
	2484.775000	-51.446	
	2483.925000	-51.462	
	2497.175000	-51.499	
	2493.775000	-51.523	
	2484.025000	-51.527	

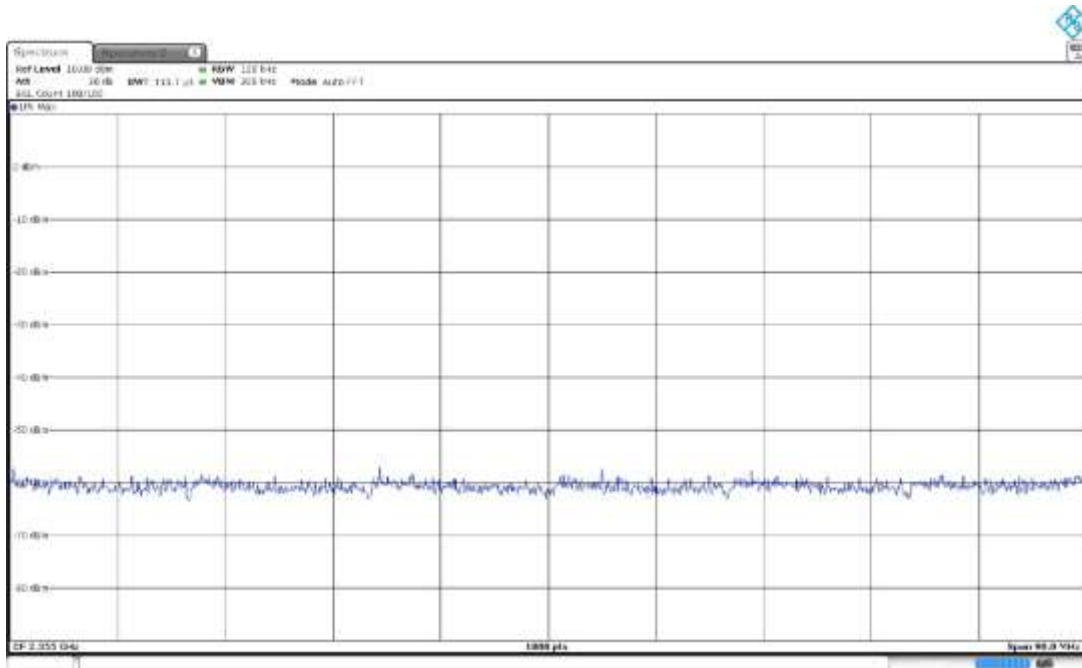
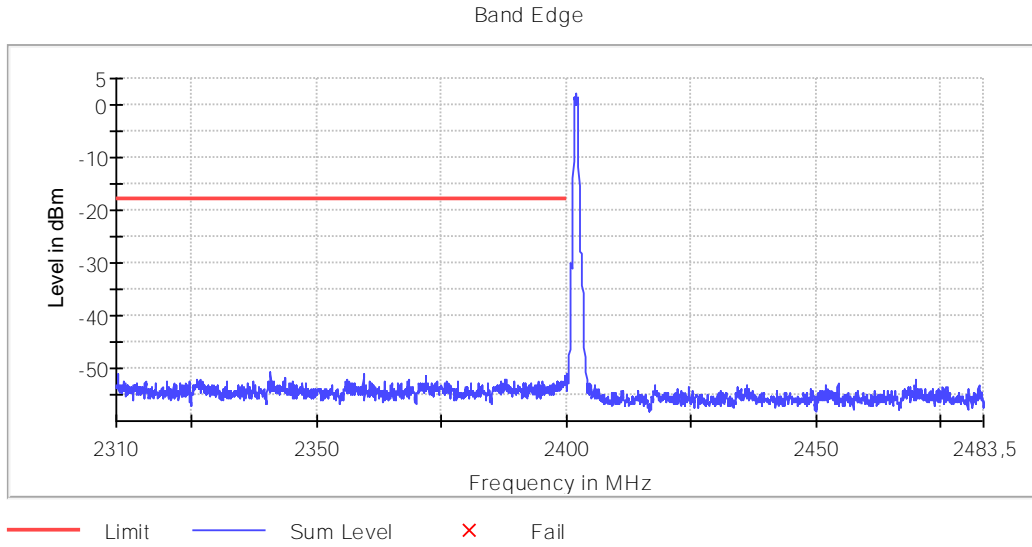
Verdict

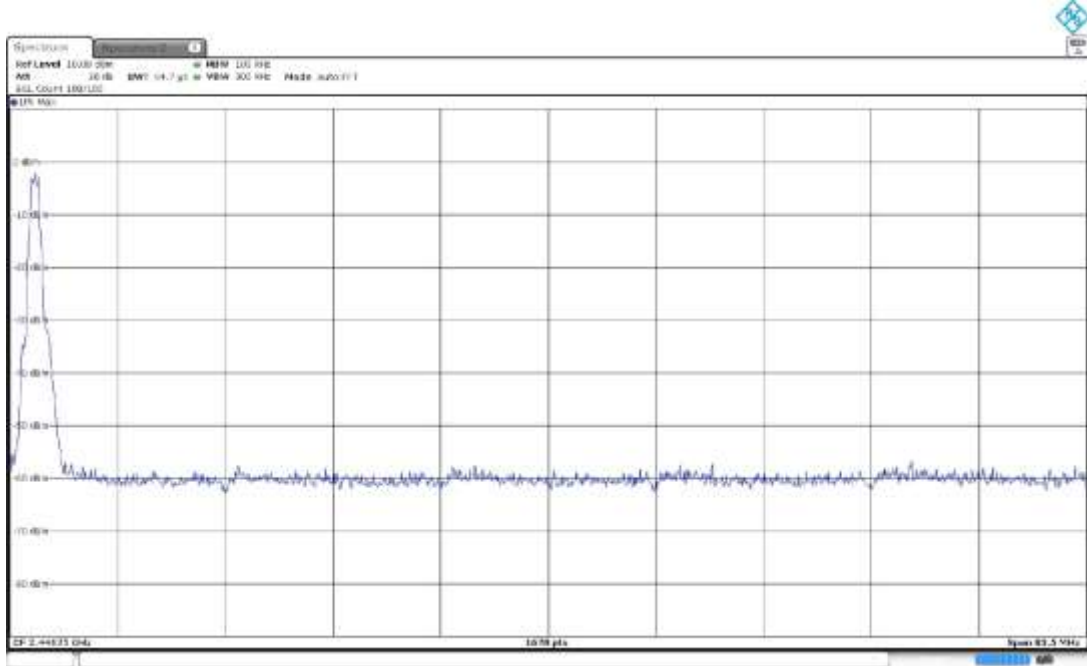
Pass

Attachments

Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:

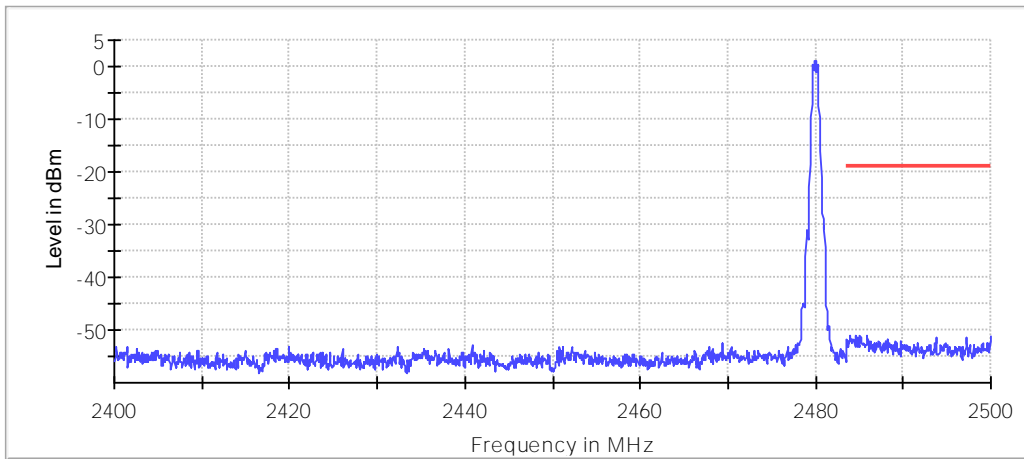




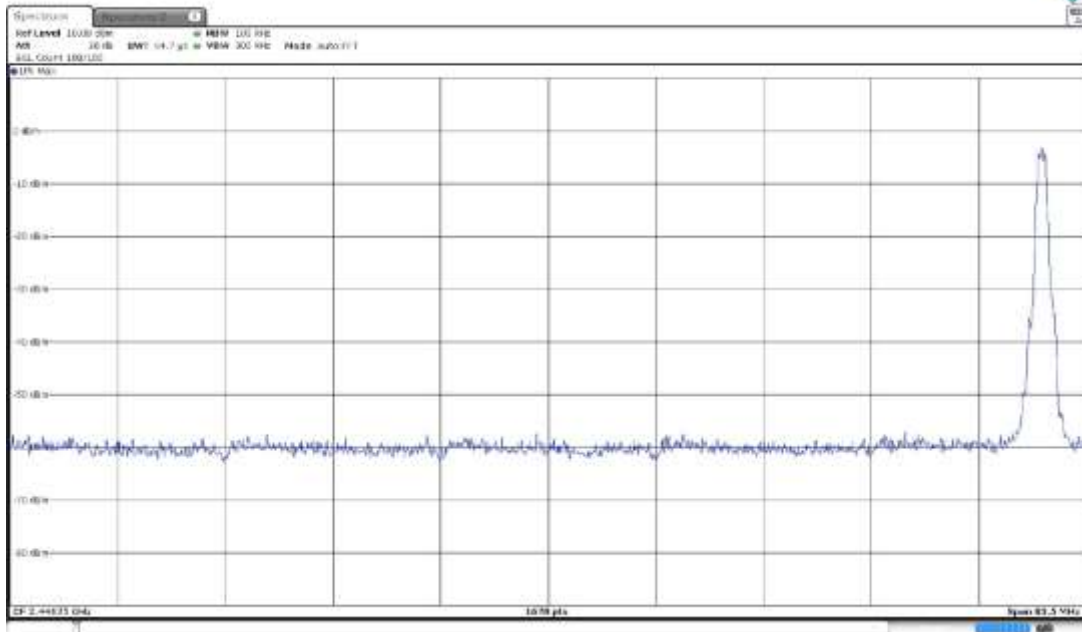
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

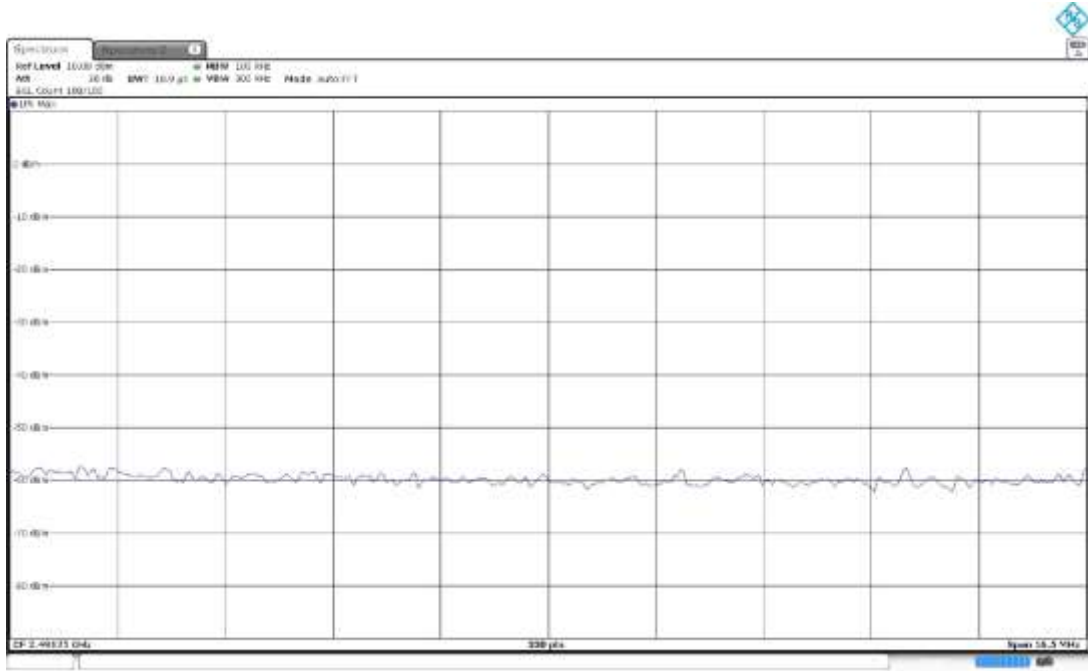
Images:

Band Edge



— Limit — Sum Level × Fail





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 ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	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

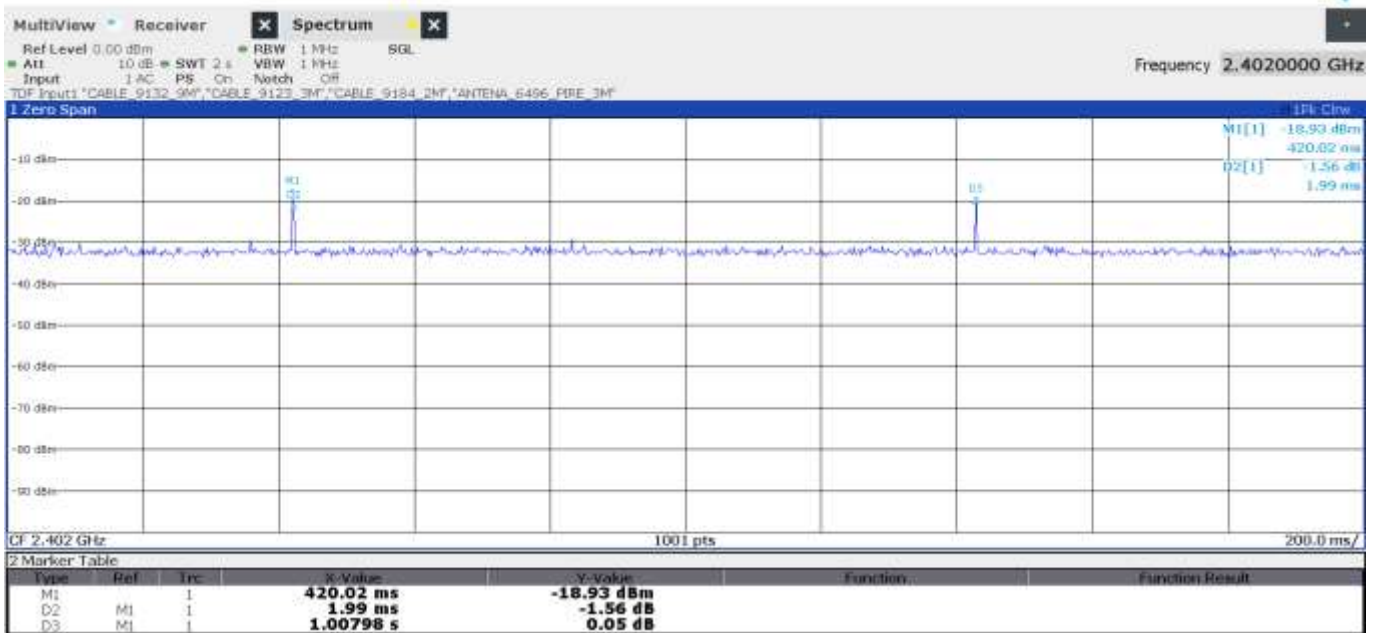
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

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.

Modulation: BTLE 4.2 (GFSK 1 Mbit/s)

Computation of duty-cycle correction factor



According to ANSI C63.10, paragraph 7.5, we can determinate the Duty Cycle in this way:

Duty cycle correction factor $\delta = 20 \cdot \log (\text{Tx ON (ms)} \cdot \text{Number of pulses within 100 ms}) / 100 \text{ ms}$

$$\delta = 20 \log (1.99\text{ms}/100\text{ms}) = -34.02 \text{ dB.}$$

Frequency range 30 MHz – 1 GHz:

Spurious frequencies detected at less than 20 dB below the limit:

Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dB μ V/m)	Pol	Detector
[0.03, 1]	2402.00000	64.0106	21.63	H	QP
	2440.00000	40.7003	27.04	H	QP
		63.9803	20.59	H	QP
		904.5763	27.33	V	QP

Frequency range 1 GHz – 26 GHz:

The results below show the maximum measured levels in the 1 – 26 GHz range including the restricted bands 2.31 – 2.39 GHz and 2.4835 – 2.5 GHz.

Spurious frequencies with peak levels above the average limit (54 dBµV/m at 3 m) are measured with average detector for compliance checking with the average limit.

According to 558074 D01 15.247 Meas Guidance v05r02:

Several measurement methods are available for making average measurements for radiated and antenna-port conducted spurious emission provided that:

- i. The spurious emission fall in restricted band
- ii. Emission are temporally related to the fundamental
- iii. The maximum duty cycle used in determining the reduction factor is hardwired such that under no condition can it be changed or modified by either the device or end user
- iv. documented justification for use of Section 15.35(c) including the measurements used to determine the worst-case duty cycle must be included in the test report, and
- v. the duty cycle correction factor is the worst case operational duty cycle based on the maximum transmission time in any 100 msec period.

If the above criteria are satisfied, one of the following measurement techniques may be used:

Applying a duty cycle correction to the Peak measurement – First, a Peak measurement is made using the Peak detector function of a spectrum analyzer. The spectrum analyzer settings should be such that it meets the requirements of 11.12.2.4 in ANSI C63.10 for making a Peak measurement. Then the operational duty cycle of the EUT may be subtracted from the Peak reading to derive the RMS average value. If the EUT supports more than one operational duty cycle the worst-case value should be used, i.e., the highest operational duty cycle.

* Real Duty Cycle correction factor: -34.02 dB

Freq (MHz)	Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Corrected RMS Unwanted Lvl (dBµV/m)	Pol	Detector
2402.00000	[3, 17]	4803.3750	55.67	--	V	PK
			--	21.65		AVG
		9607.1250	59.24	--	V	PK
		12010.7500	53.17	--	V	PK
			--	19.15		AVG
14413.5000		54.50	--	H	PK	
2440.00000		4879.5000	55.30	--	V	PK
			--	21.28		AVG
		7319.4375	48.64	--	H	PK
			--	14.62		AVG
	9760.6875	54.49	--	V	PK	
12198.8750	50.56	--	V	PK		
	--	16.54		AVG		

Freq (MHz)	Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Corrected RMS Unwanted Lvl (dBµV/m)	Pol	Detector
2480.00000	[3, 17]	4959.1250	51.94	--	V	PK
			--	17.92		AVG
		7440.6250	52.76	--	H	PK
			--	18.74		AVG
		9919.0625	55.38	--	V	PK
		12399.2500	50.53	--	V	PK
			--	16.51		AVG
		14882.0625	54.49	--	V	PK

Verdict

Pass

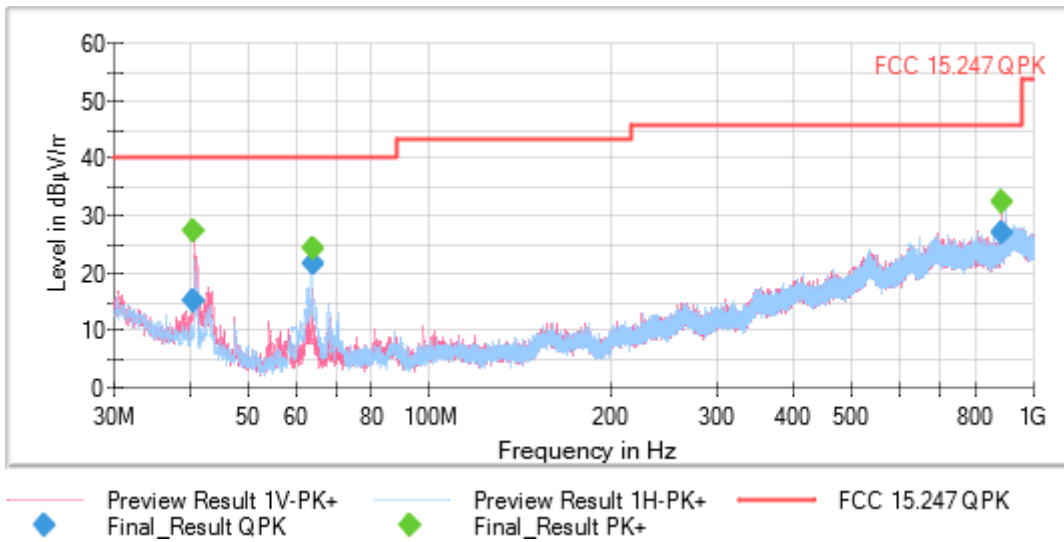
Attachments

Spectrum Analyzer Parameters:

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESR 7]					
30 MHz - 1 GHz	30,312 kHz	PK+	100 kHz	1 s	0 dB
1 GHz - 3 GHz	30,769 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
Receiver: [FSV 40]					
3 GHz - 17 GHz	437,5 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
17 GHz - 26 GHz	300 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

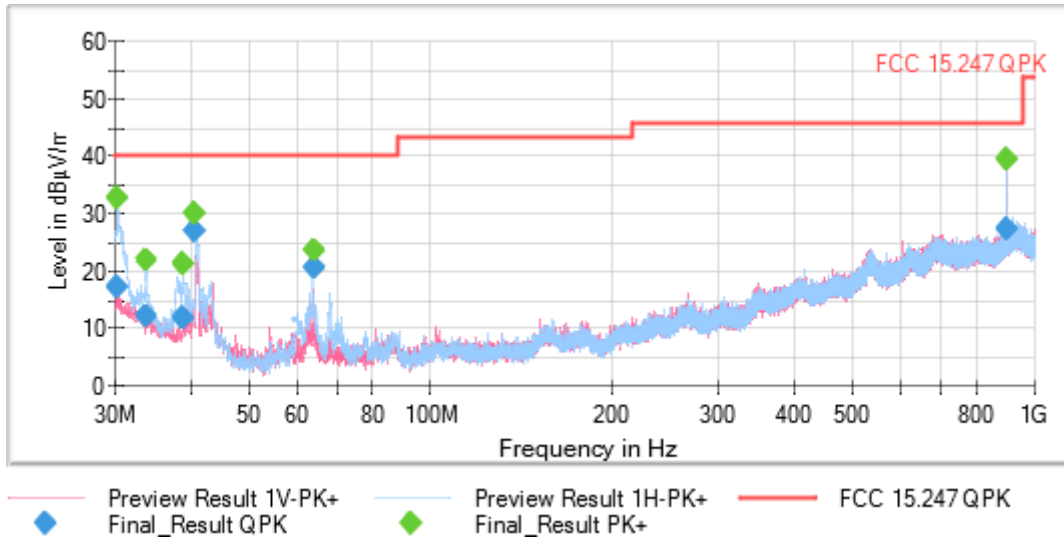
Frequency Range GHz = [0.03, 1] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

Images:



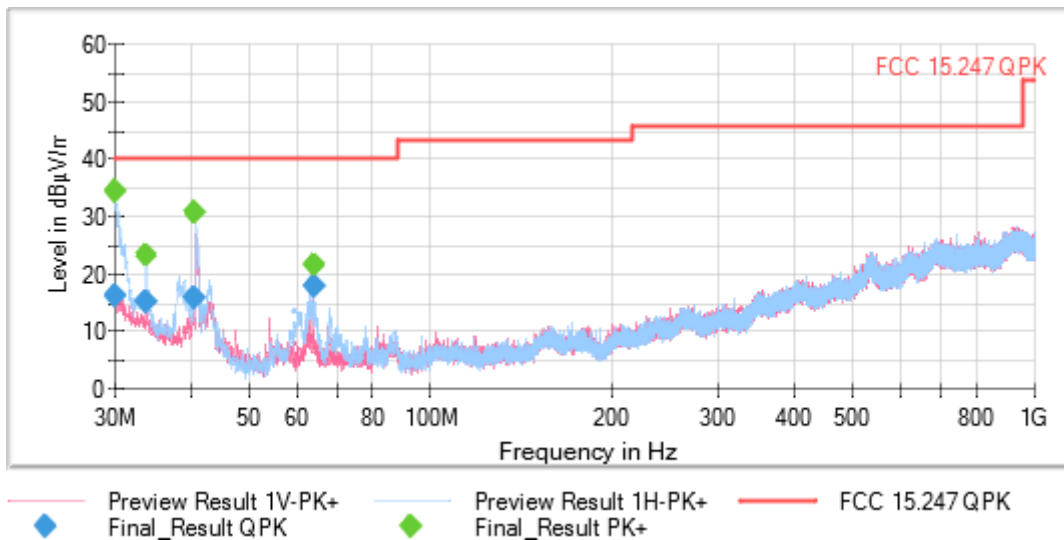
Frequency Range GHz = [0.03, 1] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

Images:



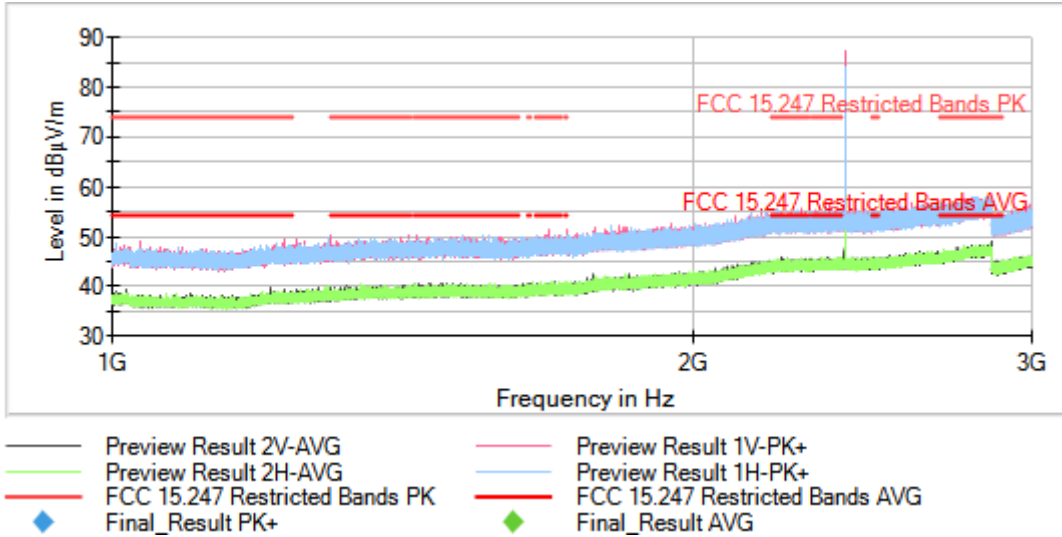
Frequency Range GHz = [0.03, 1] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

Images:

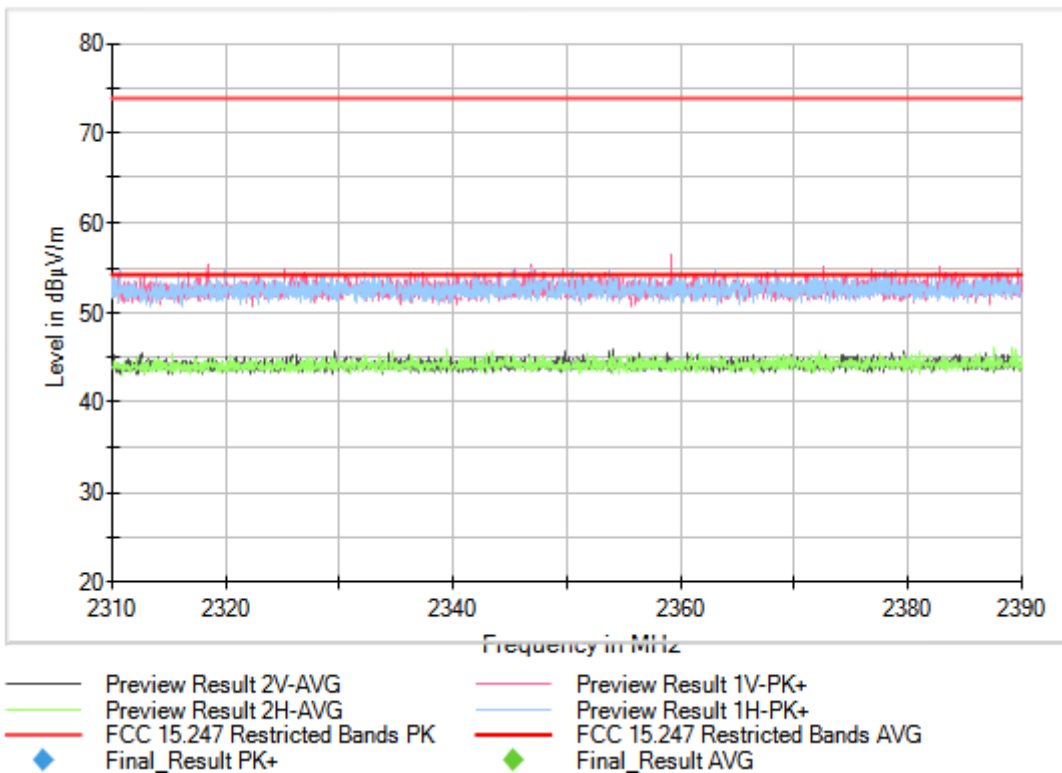


Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

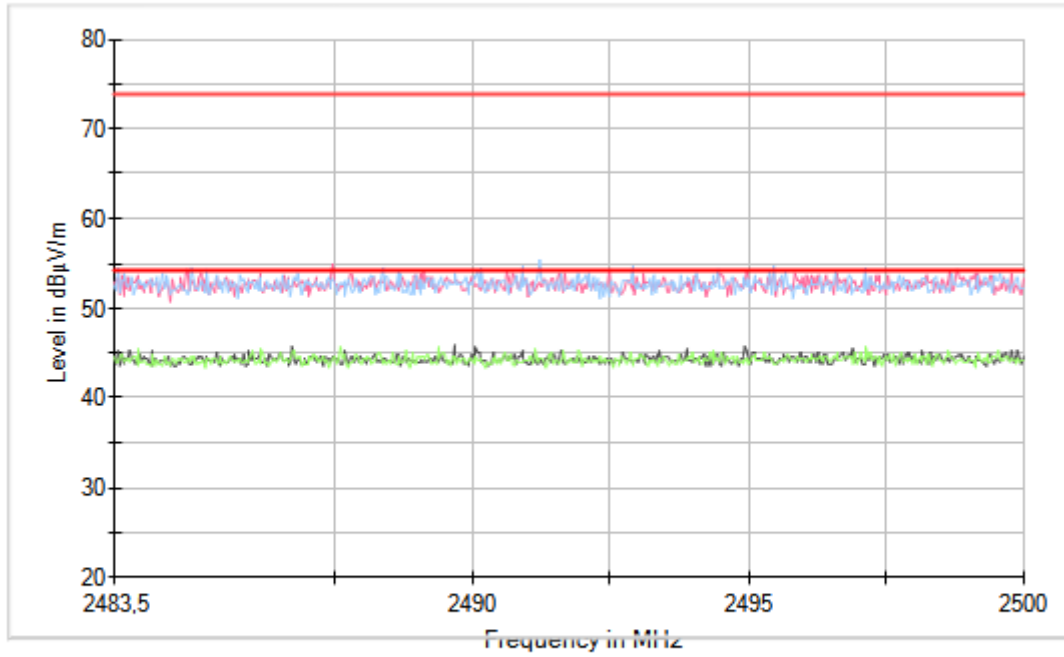
Images:



Full Spectrum



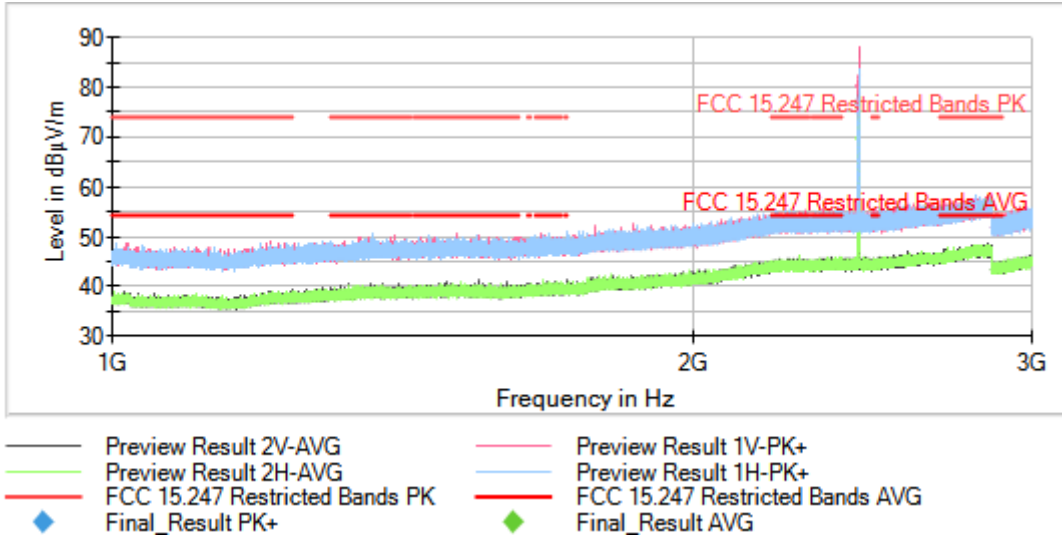
Full Spectrum



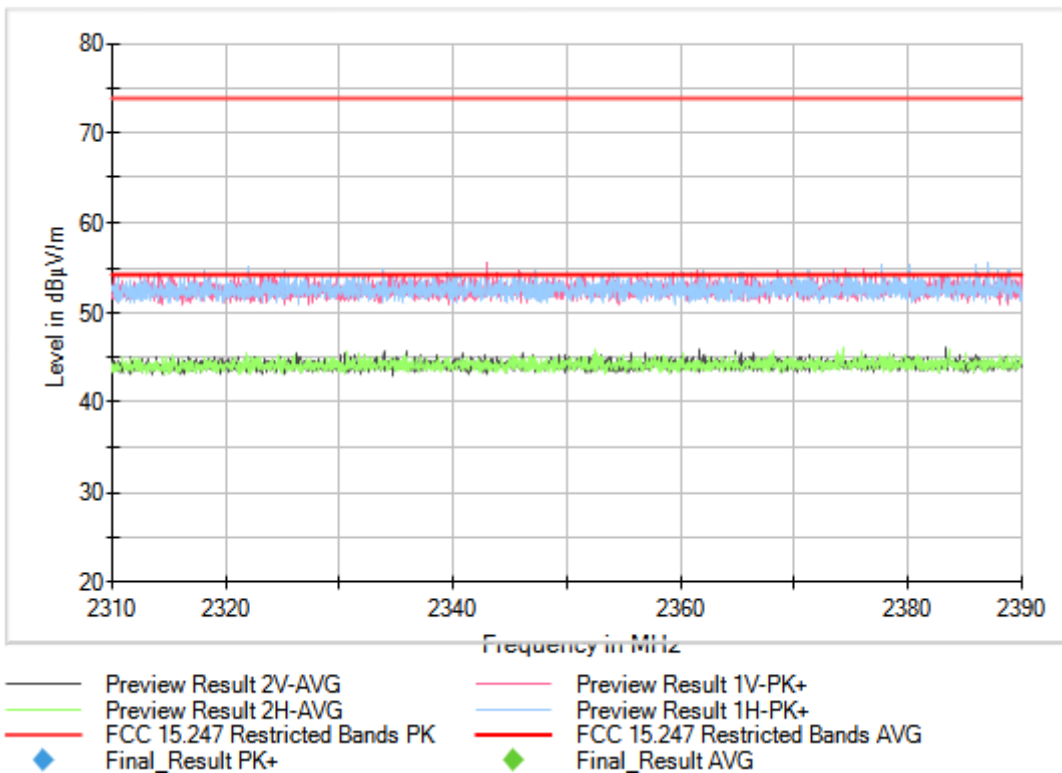
- Preview Result 2V-AVG
- Preview Result 2H-AVG
- FCC 15.247 Restricted Bands PK
- Final_Result PK+
- Preview Result 1V-PK+
- Preview Result 1H-PK+
- FCC 15.247 Restricted Bands AVG
- Final_Result AVG

Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

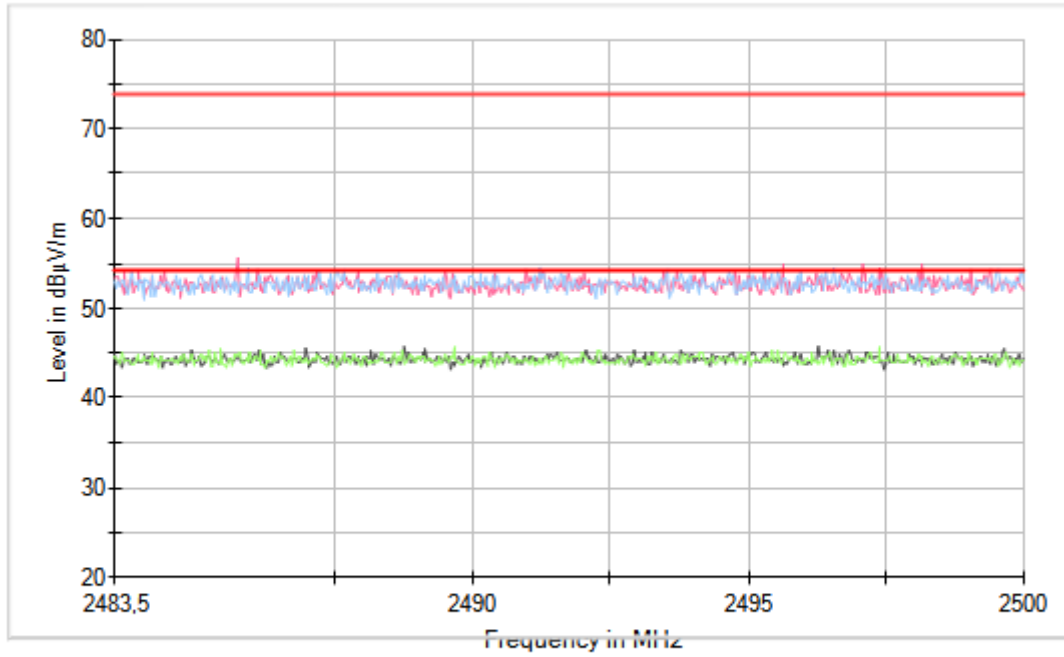
Images:



Full Spectrum



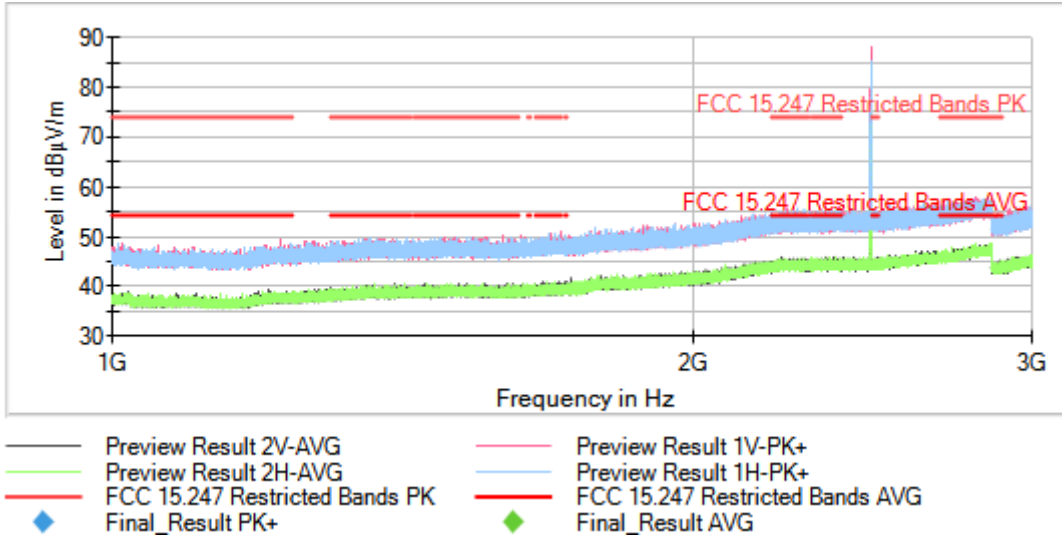
Full Spectrum



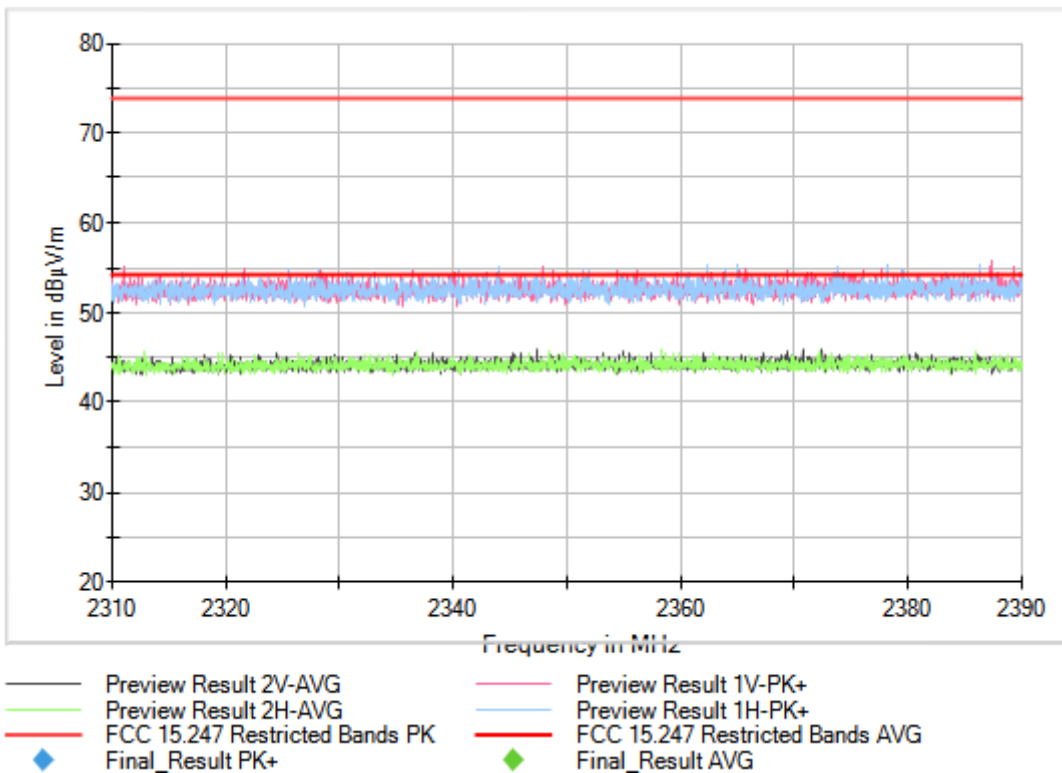
- Preview Result 2V-AVG
- Preview Result 2H-AVG
- FCC 15.247 Restricted Bands PK
- Final_Result PK+
- Preview Result 1V-PK+
- Preview Result 1H-PK+
- FCC 15.247 Restricted Bands AVG
- Final_Result AVG

Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

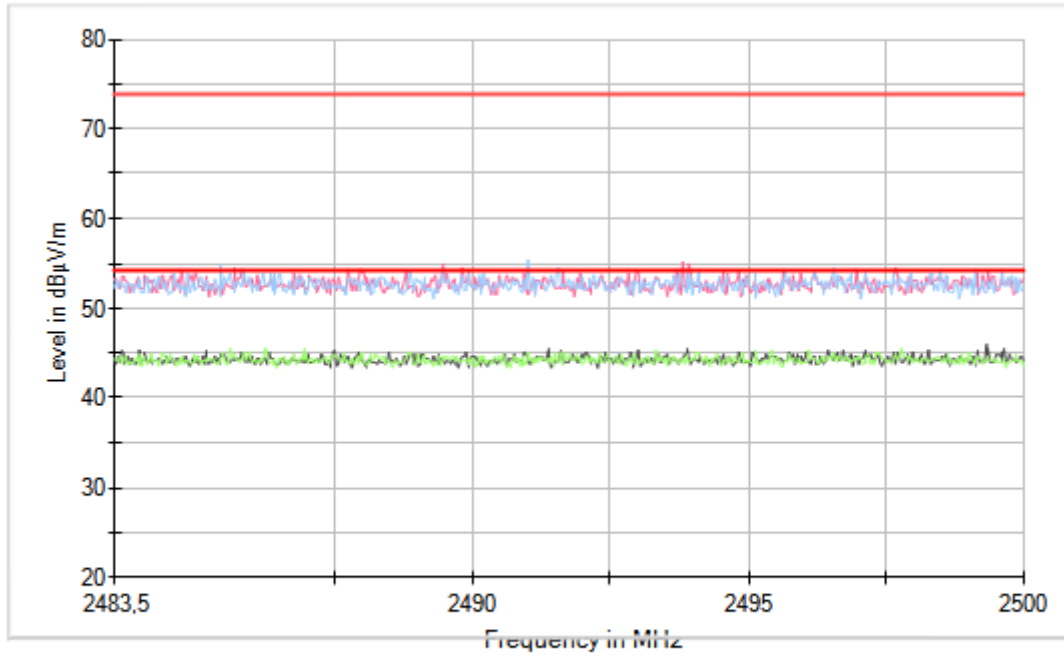
Images:



Full Spectrum



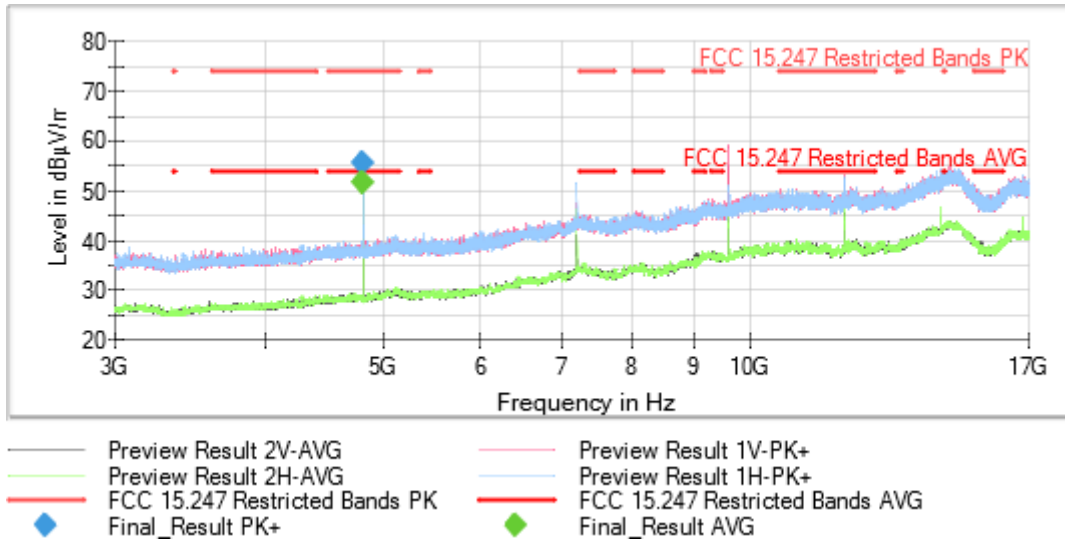
Full Spectrum



- Preview Result 2V-AVG
- Preview Result 2H-AVG
- FCC 15.247 Restricted Bands PK
- Preview Result 1V-PK+
- Preview Result 1H-PK+
- FCC 15.247 Restricted Bands AVG
- Final_Result PK+
- Final_Result AVG

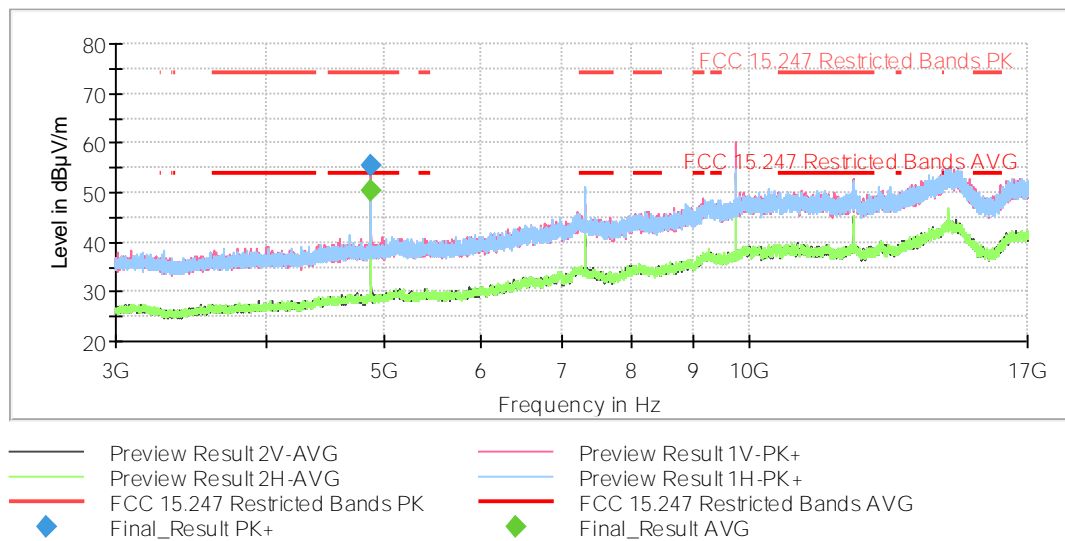
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

Images:



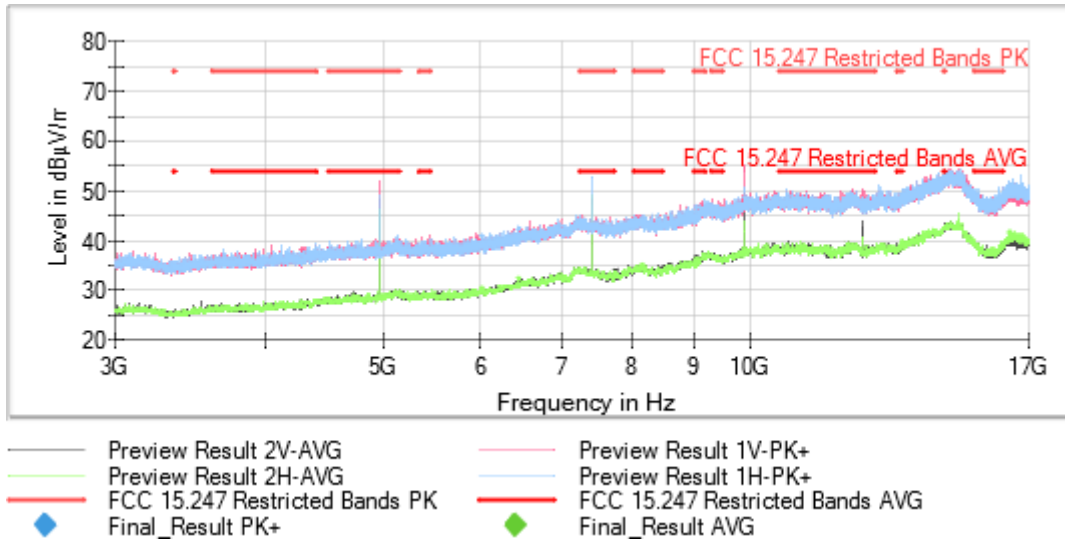
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

Images:



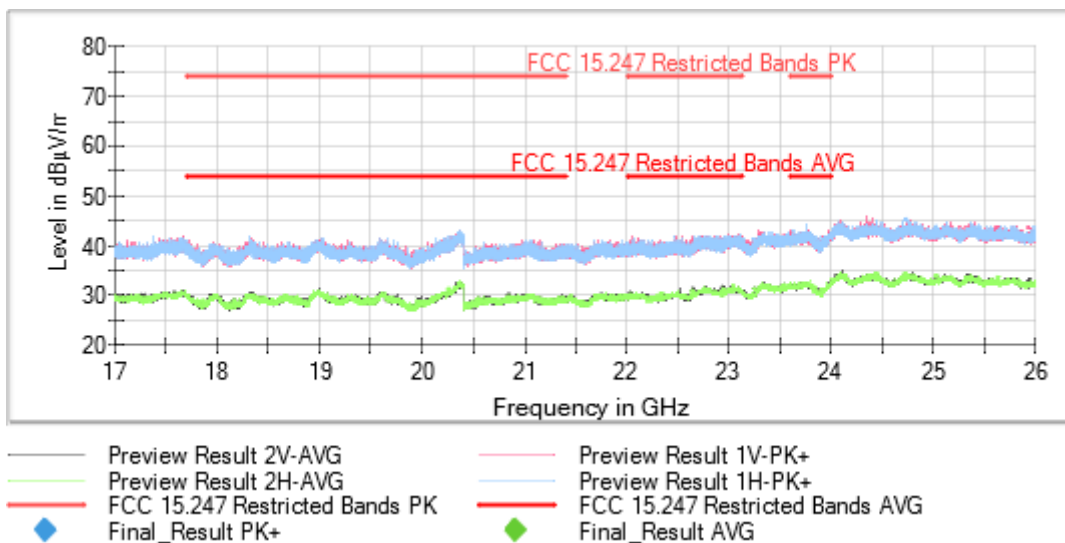
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

Images:



Frequency Range GHz = [17, 26] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = The spurious signals detected do not depend on the operating channel
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

Images:



This plot is valid for all channels