DEKRA Testing and Certification, S.A.U.
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C.I.F. A29507456

ISED CABid: ES1909

Lab. Company Number: 4621A

Test Report No:
77037RRF.016A2

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	W40MH (Type reference: E2131)
(*) Derived model not tested	XS4 One S Electronic Lock Series including all mechanical variants
Other identification of the product	FCC ID: UKCW40MH IC: 10088A-W40MH
(*) Features	Bluetooth LE 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 Firmado digitalmente por 53680346W JOSE MANUEL GOMEZ (C:A29507456)
Date of issue	2024-02-07
Report template No	FDT08_24 (*) "Data provided by the client"

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Acronyms

Acronym ID	Acronym Description
Detector	Detector used
Equipment	Equipment Type
Freq	Frequency
Freq Rng	Frequency Range
MP	Measurement Point
Mod	Modulation
Mode	MIMO Mode
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).

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+ KPP 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 Nº	Date of Reception	Application
S/01	77037B_52.1	XS4 Original+ Electronic Lock	W40MH	--	2023-09-28	Element Under Test

Notes referenced to samples during the project:

Id	Type
S/01	Sample used for radiated testing

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	PE
	[ ]	AC:	[ ]	[ ]	[ ]	[ ]	[ ]
	[X]	DC: 4.5 Vdc (3 x LR03 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) ....:	External part: 4.0 x 28.2 x 2.0 cm Internal part: 4.0 x 13.7 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	
	.....			.....		.....	
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)	2023-10-03
Date (finish)	2023-10-16

Document history

Report number	Date	Description
77037RRF.016	2023-11-07	First release.
77037RRF.016A1	2024-12-21	Second release. Modification due to missing information. This modification test report cancels and replaces the test report 77037RRF.016
77037RRF.016A2	2024-02-07	Second release. Modification due to typo. This modification test report cancels and replaces the test report 77037RRF.016A1

Environmental conditions

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Rafael Fernandez and Sergio Carrasco.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
6791	SEMIANECHOIC ABSORBER LINED CHAMBER IV	FACT 3 200 STP	ETS LINDGREN	N/A
6792	SHIELDED ROOM	S101	ETS LINDGREN	N/A
6143	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2023-10-29
6145	PRE-AMPLIFIER G>40dB 10MHz-6GHz	BLNA 0160-01N	BONN ELEKTRONIK	2024-05-30
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
7817	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2023-12-30
4848	SOFTWARE FOR EMC/RF TESTING	EMC32	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).

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)	P	--
Supplementary information and remarks: 1. Test not requested by the client			

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

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RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter) *15*

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 4.5Vdc

Type of Power Supply: External power supply (3 x LR03 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.

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).

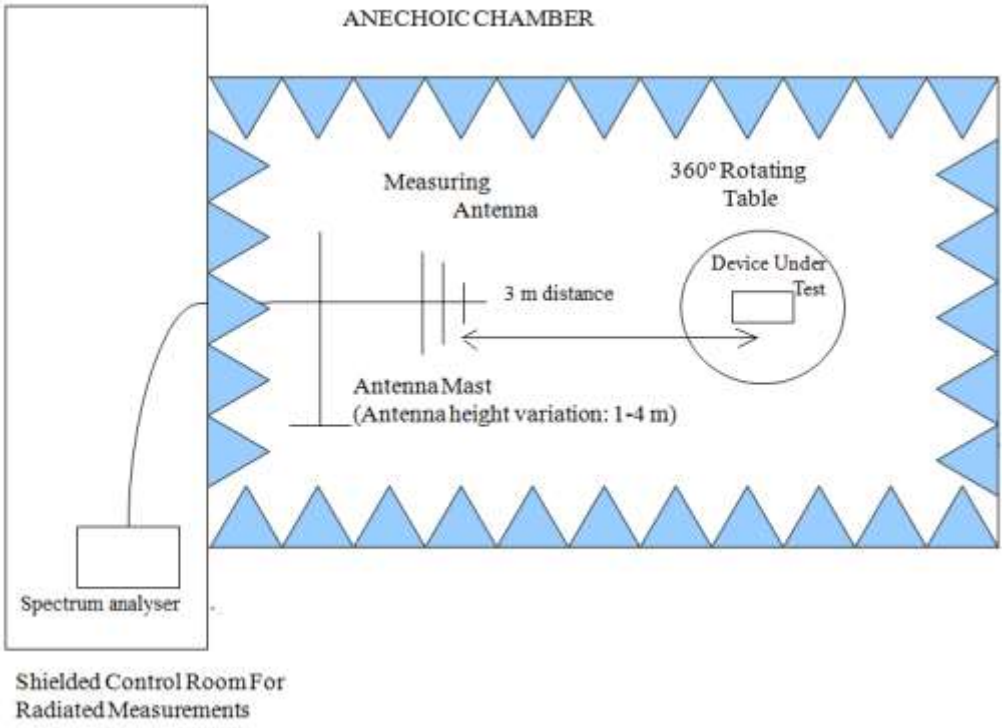
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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.

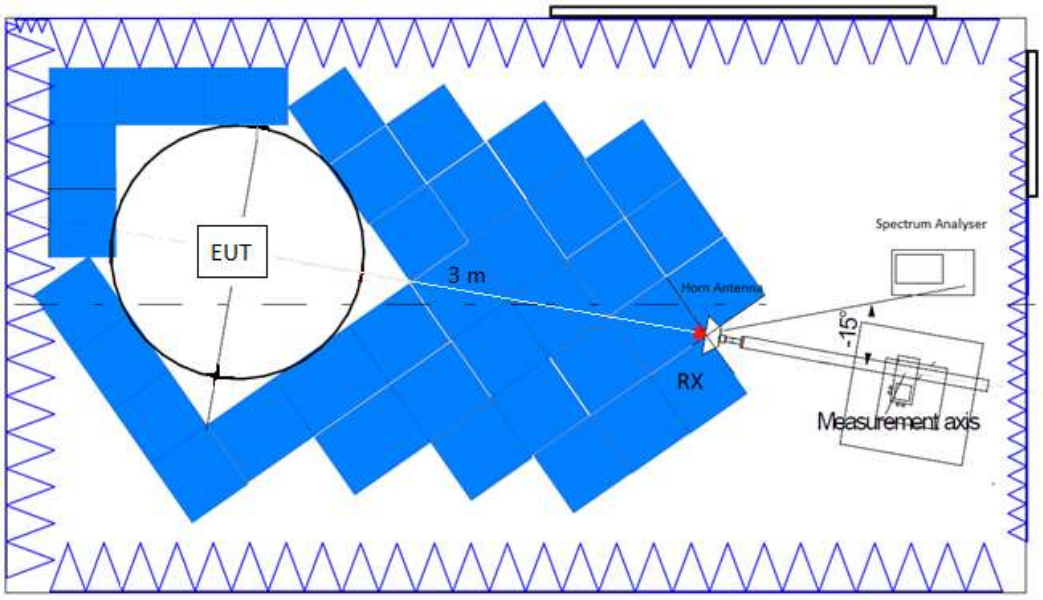
Measurements were made in both horizontal and vertical planes of polarization.

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.

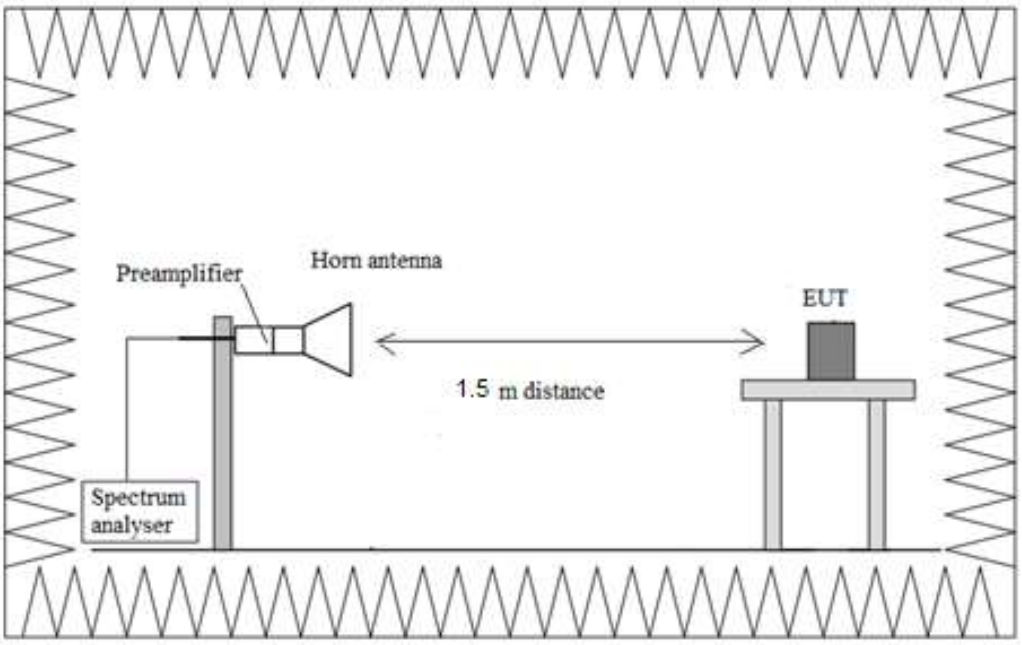
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



TEST CASES DETAILS

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.

Results

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 δ = 20 * log (Tx ON (ms) * Number of pulses within 100 ms) / 100 ms

δ = 20 log (1.99ms/100ms) = -34.02 dB.

Frequency range 30 MHz – 1 GHz:

The spurious signals detected do not depend on the operating channel.

No spurious frequencies detected at less than 20 dB below the limit.

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 spurios 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]	4804.2500	51.92	--	V	PK
			--	17.90		AVG
		7205.6875 (*)	55.94	--	H	PK
		12011.1875	52.60	--	H	PK
			--	18.58		AVG
		14413.5000 (*)	54.60	--	H	PK
2440.00000		4880.3750	49.53	--	V	PK
			--	15.51		AVG
		7319.4375	56.34	--	H	PK
			--	9.81		AVG
		9758.9375 (**)	54.99	--	V	PK
		12200.1875	50.96	--	H	PK
			--	16.94		AVG
2480.00000		4959.1250	48.46	--	V	PK
			--	10.44		AVG
		7439.3125	58.23	--	V	PK
			--	24.21		AVG
		12401.0000	50.69	--	V	PK
			--	12.67		AVG

(*): This frequencies are not within any restricted band. The emission levels were measured with a RBW = 100 kHz and the measured radiated carrier level was 82.13 dBµV/m with RBW = 100 kHz. The emission levels are therefore more than 20 dB below the carrier level as indicated in FCC 15.247 (d).

(**): This frequency is not within any restricted band. The emission level was measured with a RBW = 100 kHz and the measured radiated carrier level was 88.84 dBµV/m with RBW = 100 kHz. The emission level is therefore more than 20 dB below the carrier level as indicated in FCC 15.247 (d).

Verdict

Pass

Attachments

Spectrum Analyzer Parameters:

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44]					
30 MHz - 1 GHz	30,312 kHz	PK+	100 kHz	1 s	0 dB
Receiver: [ESR 7]					
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)

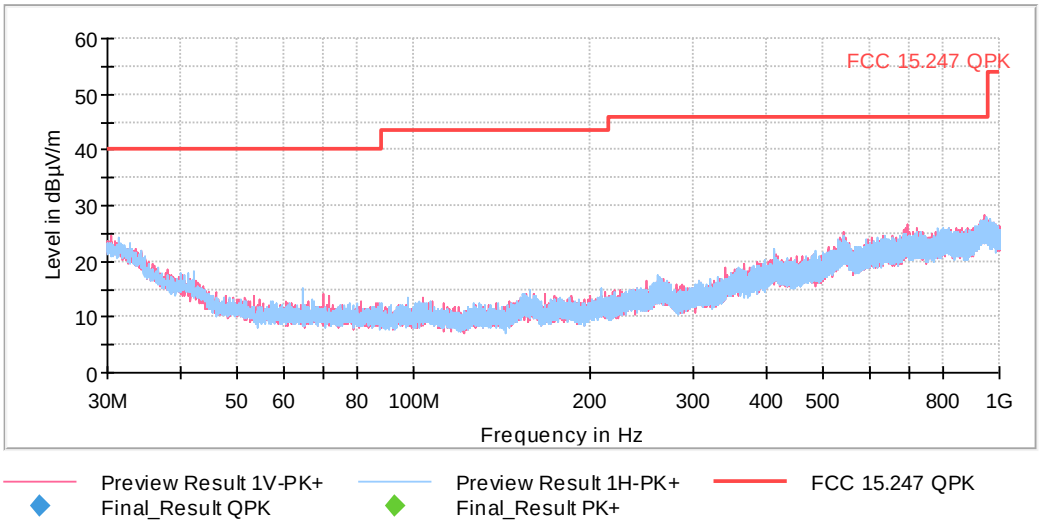
Frequency MHz = The spurious signals detected do not depend on the operating channel

MIMO Mode = SISO

Measurement Point = 1

Active Port = 1

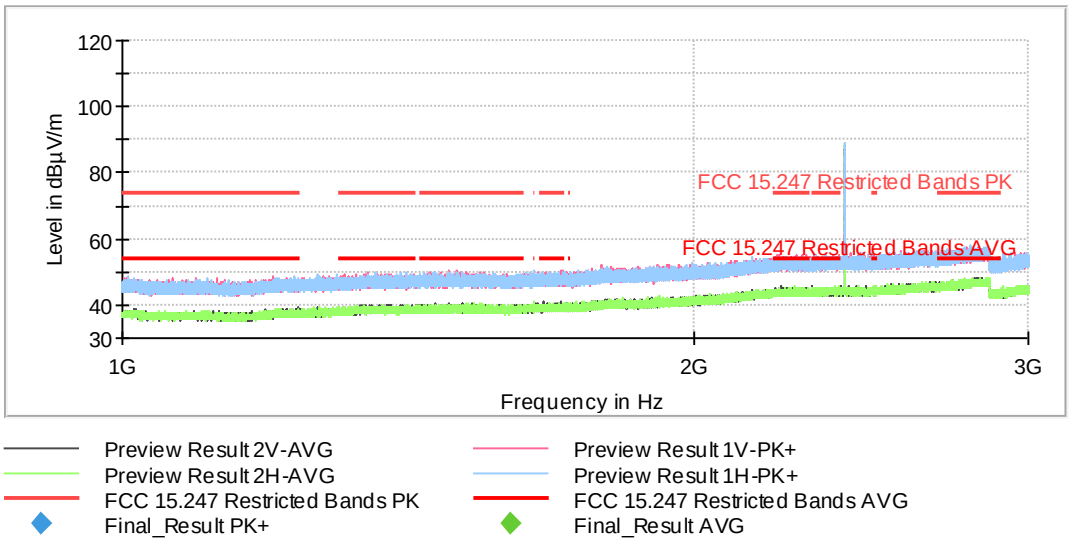
Images:



This plot is valid for all channels

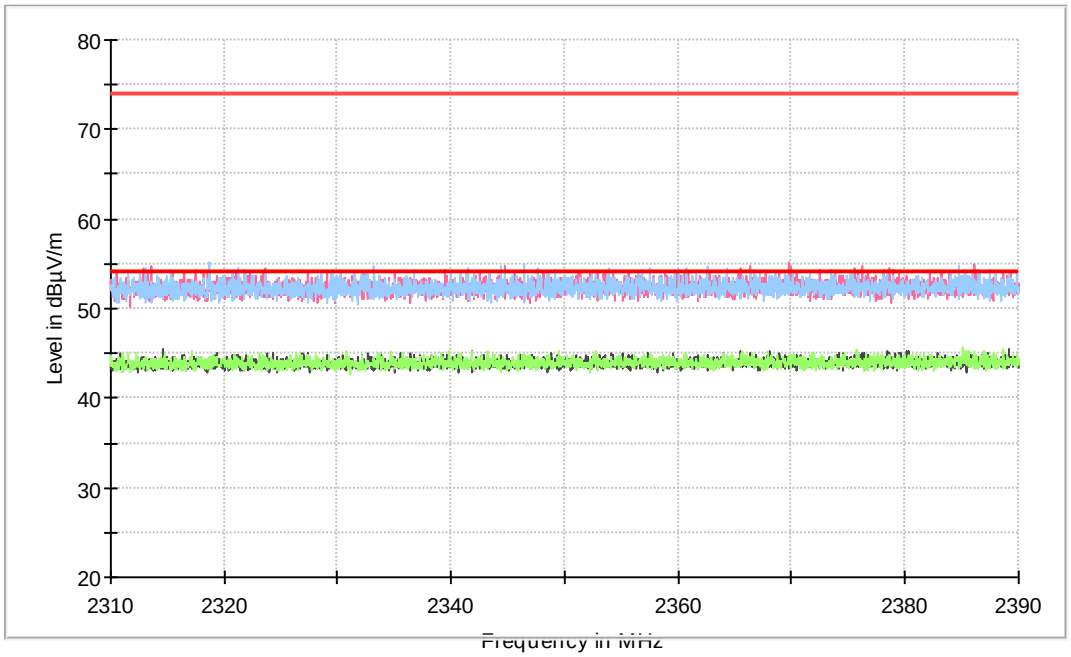
Frequency Range GHz = [1, 3]
Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 4.2 (GFSK 1 Mbit/s)
Frequency MHz = 2402.00000
MIMO Mode = SISO
Measurement Point = 1
Active Port = 1

Images:



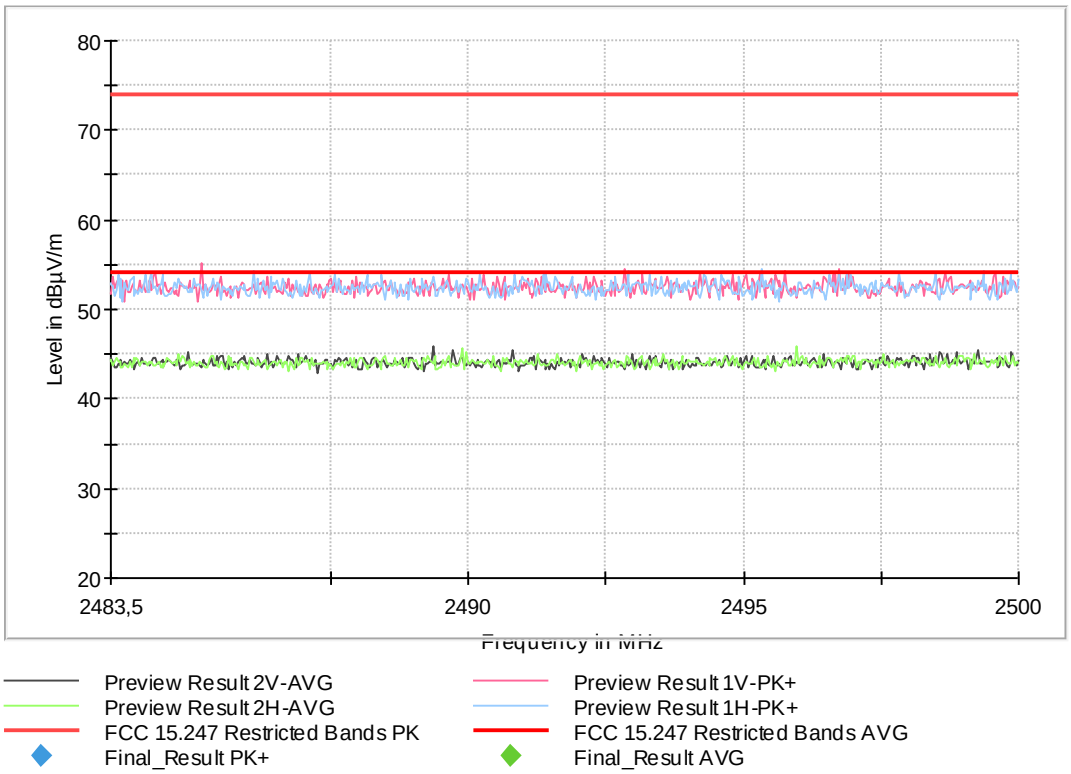
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 Restricted Bands PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

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

Full Spectrum



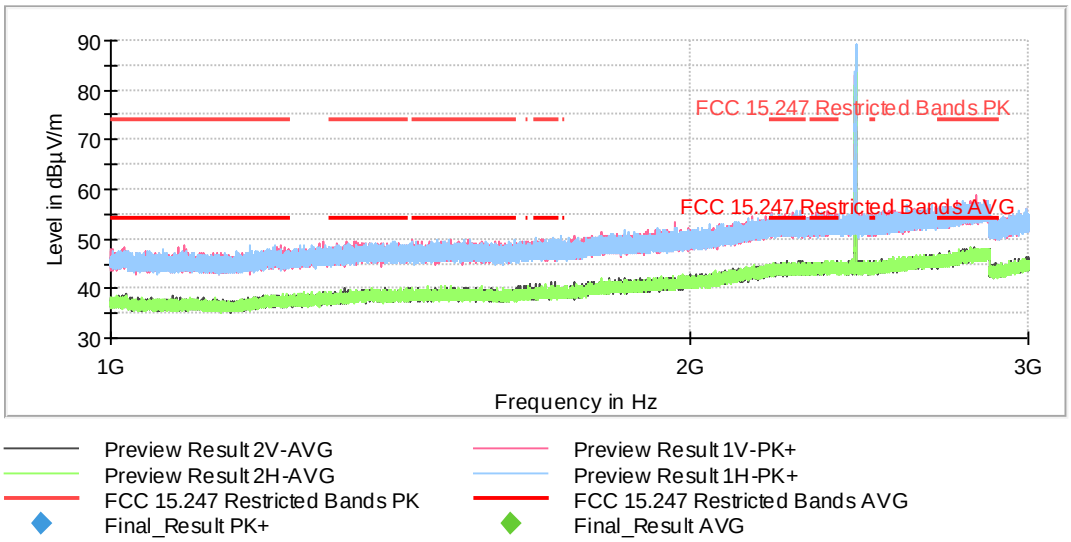
Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000

MIMO Mode = SISO Measurement Point = 1

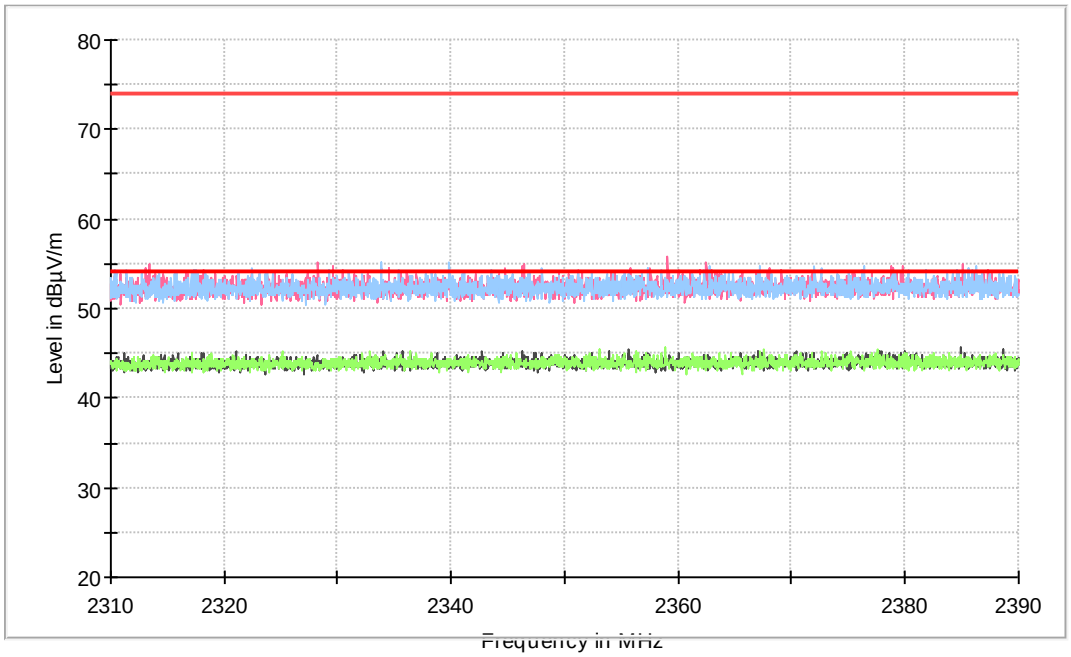
Active Port = 1

Images:



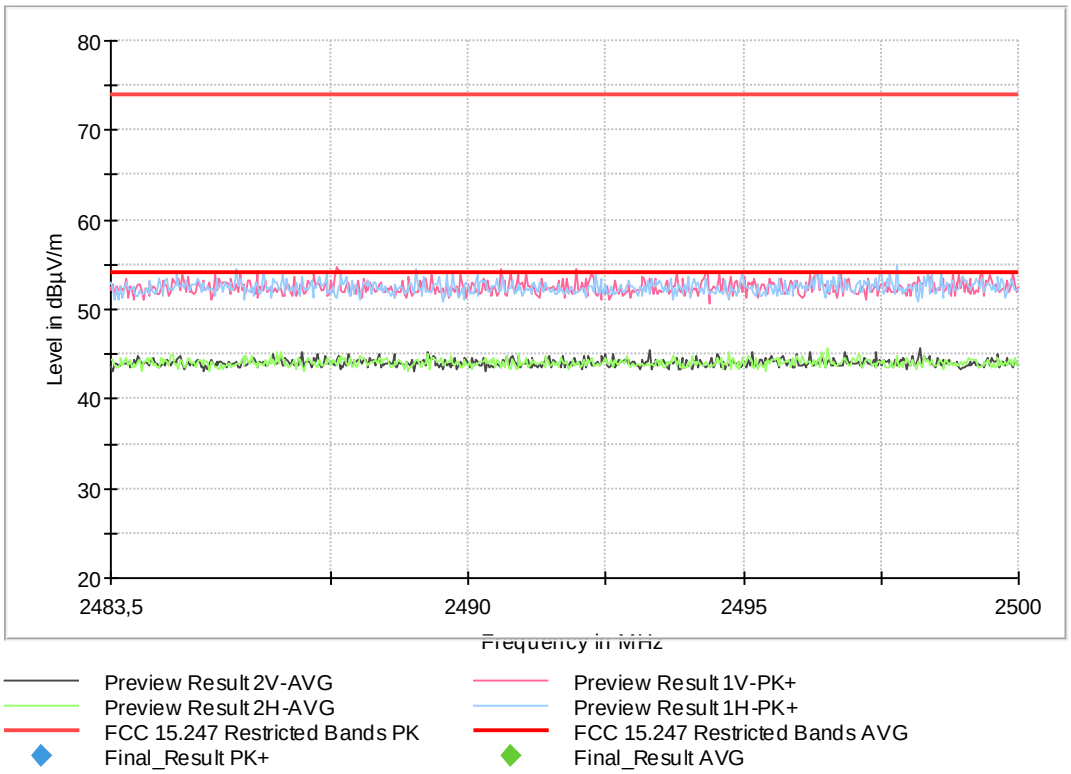
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 Restricted Bands PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

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

Full Spectrum



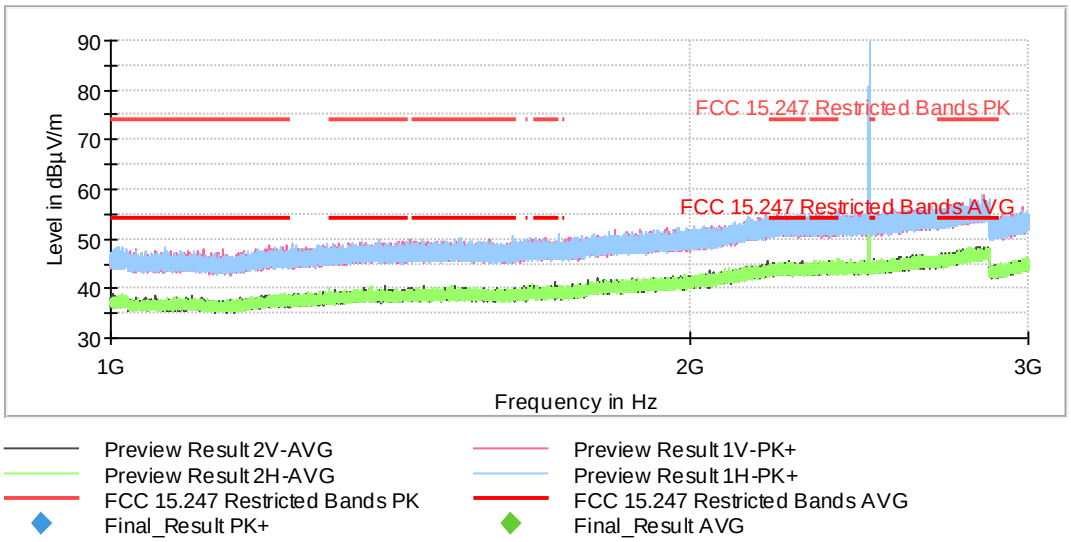
Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)

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

MIMO Mode = SISO Measurement Point = 1

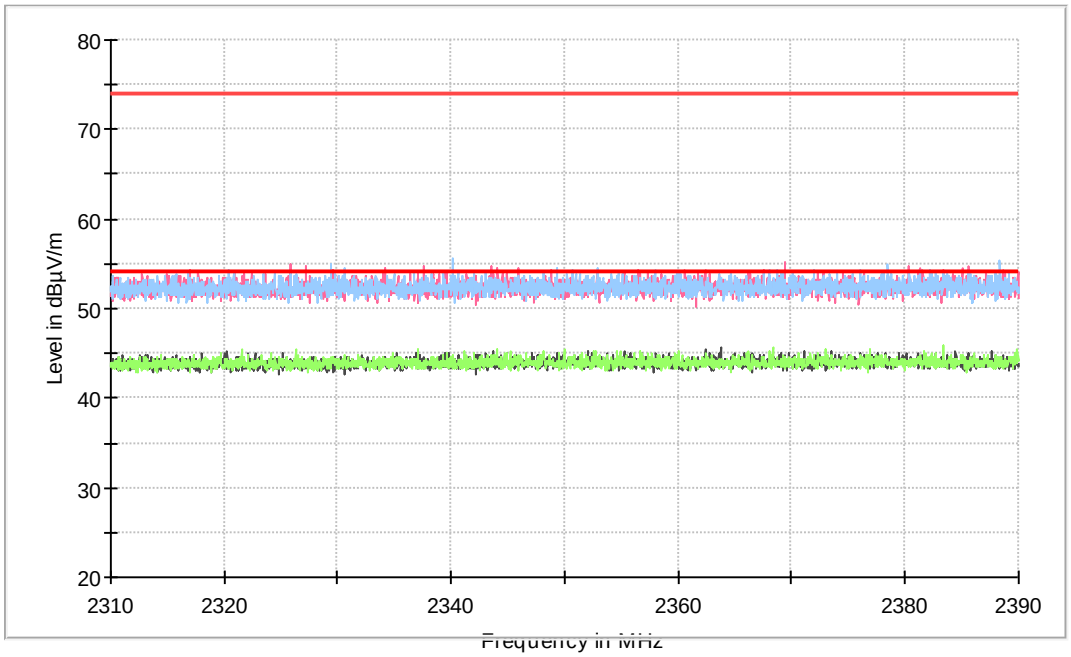
Active Port = 1

Images:



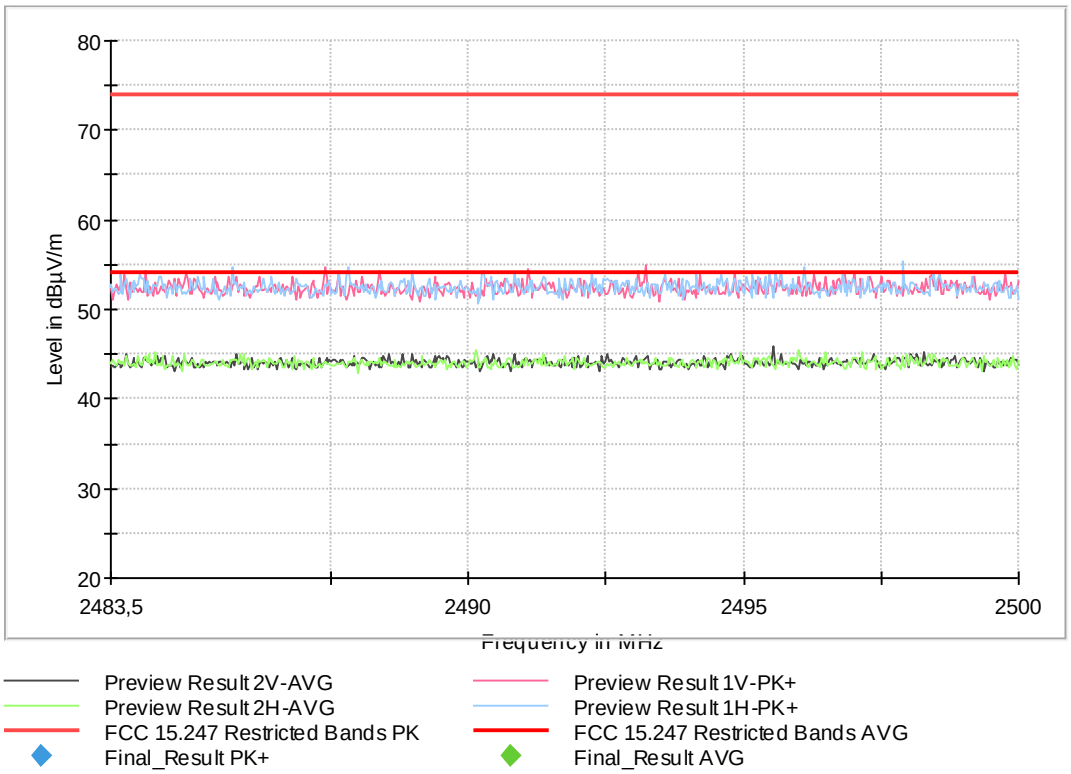
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 Restricted Bands PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

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

Full Spectrum



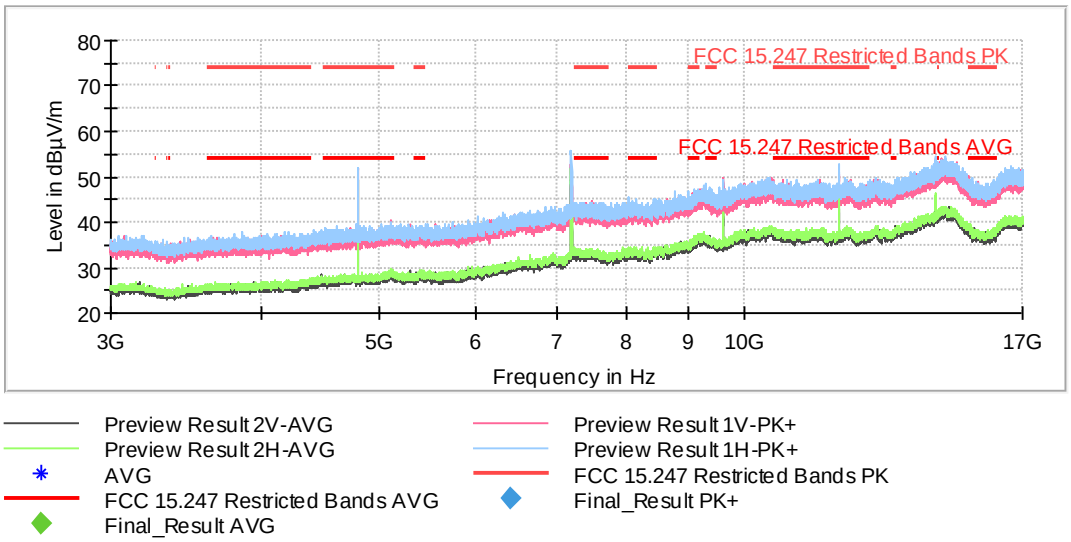
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000

MIMO Mode = SISO Measurement Point = 1

Active Port = 1

Images:



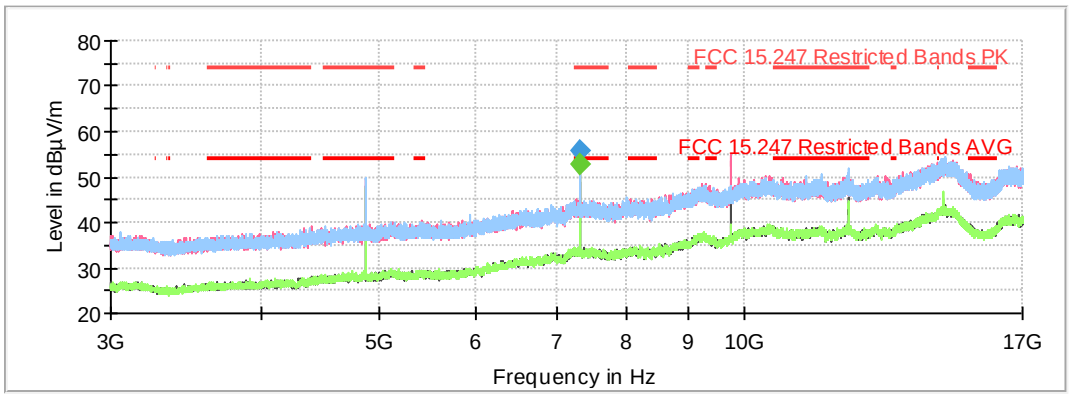
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 4.2 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000

MIMO Mode = SISO Measurement Point = 1

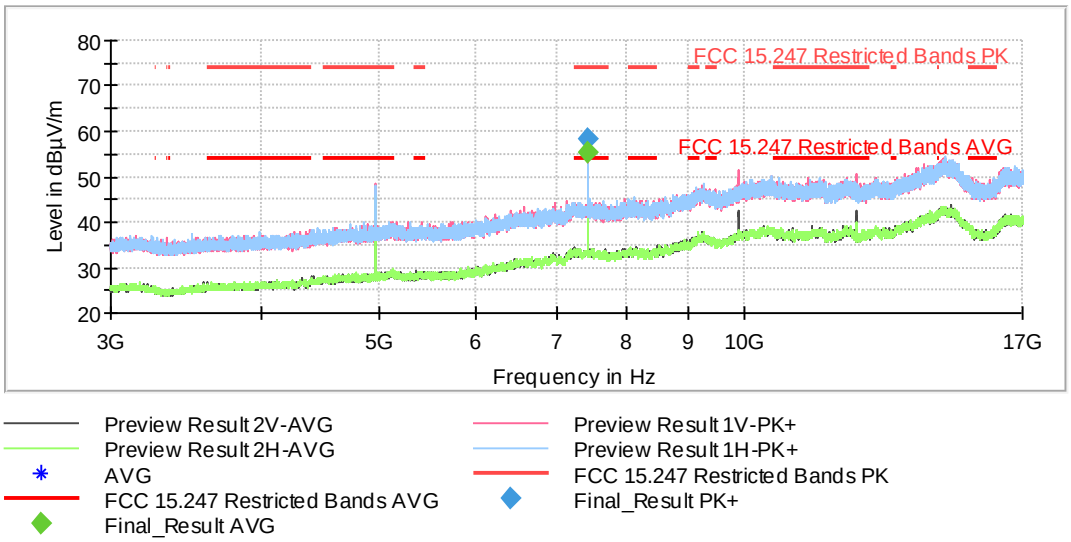
Active Port = 1

Images:



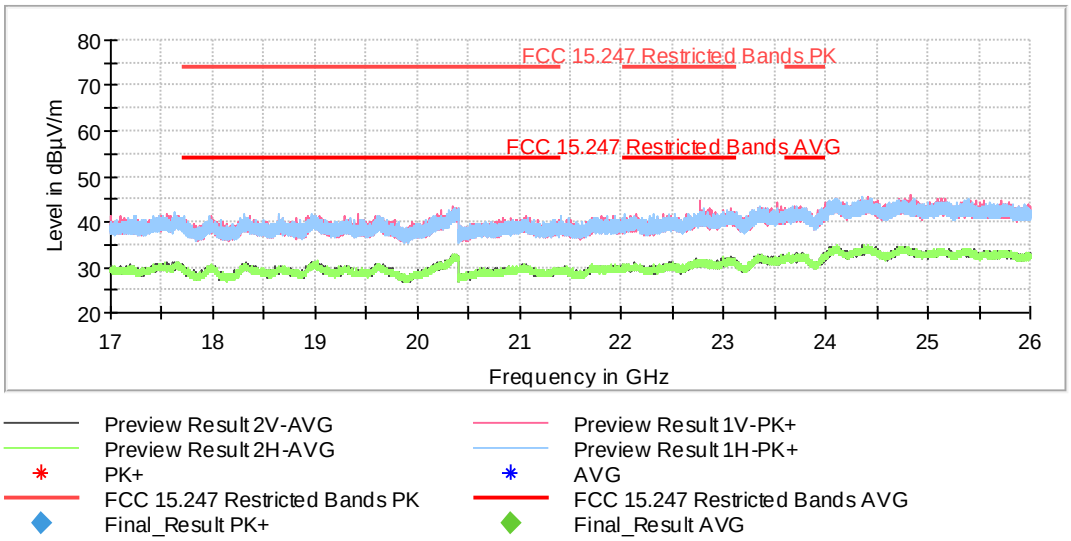
Frequency Range GHz = [3, 17]
Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 4.2 (GFSK 1 Mbit/s)
Frequency MHz = 2480.00000
MIMO Mode = SISO
Measurement Point = 1
Active Port = 1

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