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:
NIE: 73128RRF.007

Partial Test Report

USA FCC Part 15.31, 15.225, 15.247, 15.209
CANADA RSS-210, RSS-247, RSS-Gen

(*) Identification of item tested	SALTO Neo Cylinder including all mechanical variants
(*) Trademark	SALTO
(*) Model and /or type reference	N0M (Type reference: G1824)
Other identification of the product	FCC ID: UKCN0M IC ID: 10088A-N0M
(*) Features	Bluetooth LE HW version: 2.0 SW version: 0195 (Control FW) + 0186 (FUS FW) + 0187 (BLE FW) + 0148 (Motor FW)
Applicant	SALTO SYSTEMS, S.L. Arkotz 9, Polígono Lanbarren 20180, Oiartzun (Guipúzcoa), Spain
Test method requested, standard	USA FCC Part 15.31 (10-1-21 Edition): Measurement standard. USA FCC Part 15.225 (10-1-21 Edition): Operation within the band 13.110 -14.010. 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-210 Issue 10 (December 2019). CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (March 2019). 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 Industrial & Automotive EMC Lab Manager Firmado digitalmente por 53680346W JOSE MANUEL GOMEZ (C:A29507456)
Date of issue	2023-02-21
Report template No	FDT08_24 (*) "Data provided by the client"

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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.

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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 the EUT is:

From 9 kHz to 30 MHz:	Measurement uncertainty $\leq \pm$ 5.01 dB.
From 30 MHz to 1 GHz:	Measurement uncertainty $\leq \pm$ 4.22 dB.
From 1 to 17 GHz:	Measurement uncertainty $\leq \pm$ 4.71 dB.
From 17 to 26 GHz:	Measurement uncertainty $\leq \pm$ 4.92 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 model N0M (Type reference: G1824) is a SALTO Neo Cylinder with RFID Mifare (ISO 14443A & ISO 15693 standard based) and Bluetooth LE technology.

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 result.

Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Reception
73128C/006	SALTO Neo Cylinder including all mechanical variants	N0M (Type reference: G1824)	-	18/08/2022

Sample S/01 has undergone the test(s): The Radiated tests indicated in the Appendix A.

Test sample description

Ports……:	Port name and description	Cable: Specified max length [m]	Cable: Attached during test	Cable: Shielded	Cable: Coupled to patient(3)		
	-	-	☐	☐	☐		
Supplementary information to the ports……:	-						
Rated power supply ..... :	Voltage and Frequency		Reference poles: L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 6 Vdc (4 x LR1 batteries)					
	☐	DC:					
Rated Power..... :	-						
Clock frequencies..... :	27.12 MHz, 32 MHz, 32.768 KHz						
Other parameters ..... :	N/A						
Software version..... :	0195 (Control FW) + 0186 (FUS FW) + 0187 (BLE FW) + 0148 (Motor FW)						
Hardware version ..... :	2.0						
Dimensions in cm (W x H x D) ... :	3.1 x 3.8 x 7.6 cm						
Mounting position ..... :	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	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, Guipúzcoa, Spain

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-09-01
Date (finish)	2022-09-02

Document history

Report number	Date	Description
73128RRF.007	2023-02-21	First release.

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: Victoria Olmedo, Antonio Manuel Sánchez.

Used instrumentation:

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ALBATROSS PROJECTS GMBH P29419	2020-01	2023-01
2.	Shielded Room ALBATROSS PROJECTS GMBH P29419	N/A	N/A
3.	Active Loop Antenna 9kHz-30MHz SCHWARZBECK FMZB 1519B	2019-11	2022-11
4.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2020-12	2022-12
5.	Ultralog Antenna 30MHz-6GHz, ROHDE AND SCHWARZ HL562E_UPG	2019-10	2022-10
6.	Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019-11	2022-11
7.	Horn Antenna 18-40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2021-03	2024-03
8.	Preamplifier 30 dB 500MHz-18GHz, SCHWARZBECK BBV 9718 C	2022-03	2023-03
9.	Preamplifier G>30 dB 18-40GHz BONN ELEKTRONIK BLMA 1840-3G	N/A	N/A
10.	Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2021-10	2023-10
11.	EMC/RF Testing SW ROHDE AND SCHWARZ EMC32	N/A	N/A

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

FCC PART 15 PARAGRAPH / RSS-247		
Requirement – Test case	**Verdict**	**Remark**
FCC 15.31 (h), FCC 15.209 (a), 15.225 (d), 15.247 (d) / RSS-Gen 8.9, RSS-210 B.6 (a)(iv), RSS-247 5.5: - Emission limitations radiated (Transmitter)	P	(1)
Supplementary information and remarks: (1) Only co-location radiated spurious emission test was requested.		

Appendix A: Test results.

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TEST CONDITIONS

(*) Declared by the Applicant

POWER SUPPLY (*):

Vnominal:	6 Vdc
Vminimum:	5.1 Vdc
Vmaximum:	6.9 Vdc
Type of Power Supply:	DC (4 x LR1 batteries)

ANTENNA (*):

Type of Antenna for Bluetooth Low Energy:	Integral (chip).
Maximum Declared Antenna Gain for Bluetooth Low Energy:	+0.5 dBi
Type of Antenna for NFC 13.56 MHz ISO 14443A:	Integral (PCB).
Maximum Declared Antenna Gain for NFC 13.56 MHz ISO 14443A:	N/A

RADIOS AND CHANNELS TESTED:

	Bluetooth Low Energy / DTS	
Mode:	1M (GFSK - 1DH5)	
Channel Spacing:	2 MHz	
Frequency Range:	2402 MHz to 2480 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Low: 37	2402

	NFC 13.56 MHz ISO 14443A / ASK 100%, OOK (subcarrier fc/16)	
Mode:	Single Channel	
Channel Spacing:	Not Applicable	
Frequency Range:	13.553 - 13.567 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	1	13.56

	NFC 13.56 MHz ISO 15693 / ASK 10% - 30%, OOK (subcarrier fc/32)	
Mode:	Single Channel	
Channel Spacing:	Not Applicable	
Frequency Range:	13.553 - 13.567 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	1	13.56

The EUT was tested in the following operating mode:

- Continuous transmission with a modulated carrier at maximum power in all required channels selecting the supported data rates/modulations types.

During transmitter test the EUT was being controlled by the SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Selected Transmission Modes for each Radio:

The following configurations were selected based on preliminary testing that identified those corresponding to the worst-cases:

* Bluetooth Low Energy: Transmitter radiated spurious emissions tests were performed with the EUT transmitting 1 Mbps in the Low Channel (2402 MHz).

* NFC 13.56 MHz: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in the Single Channel configuration supported by this radio.

TESTED SIMULTANEOUS TRANSMISSION MODES:

*** Simultaneous transmission mode Bluetooth, NFC 13.56 MHz ISO 14443A**, with the EUT configured to simultaneously transmit two signals at maximum output power:

Bluetooth Low Energy in 1 Mbps in the Low Channel (2402 MHz), NFC 13.56 MHz ISO 14443A Single Channel.

*** Simultaneous transmission mode Bluetooth, NFC 13.56 MHz ISO 15693**, with the EUT configured to simultaneously transmit two signals at maximum output power:

Bluetooth Low Energy in 1 Mbps in the Low Channel (2402 MHz), NFC 13.56 MHz ISO 15693 Single Channel.

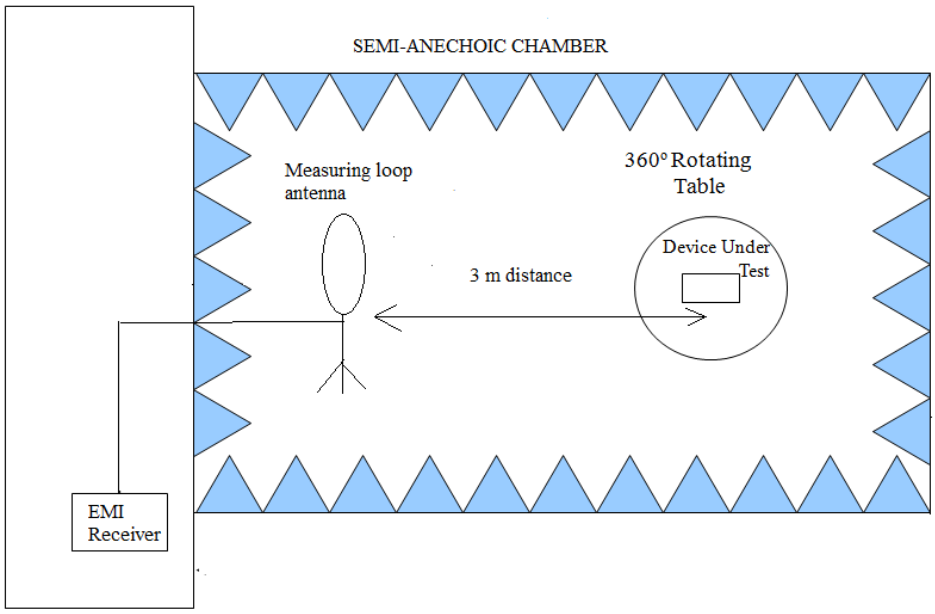
RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m (Loop antenna for the range between 9 kHz to 30 MHz, Bilog antenna for 30 MHz to 1000 MHz, Double ridge horn antenna 1 GHz-17 GHz and horn antenna 17 GHz-26 GHz), at distance of 1.5 m for the frequency range 17 GHz-26 GHz.

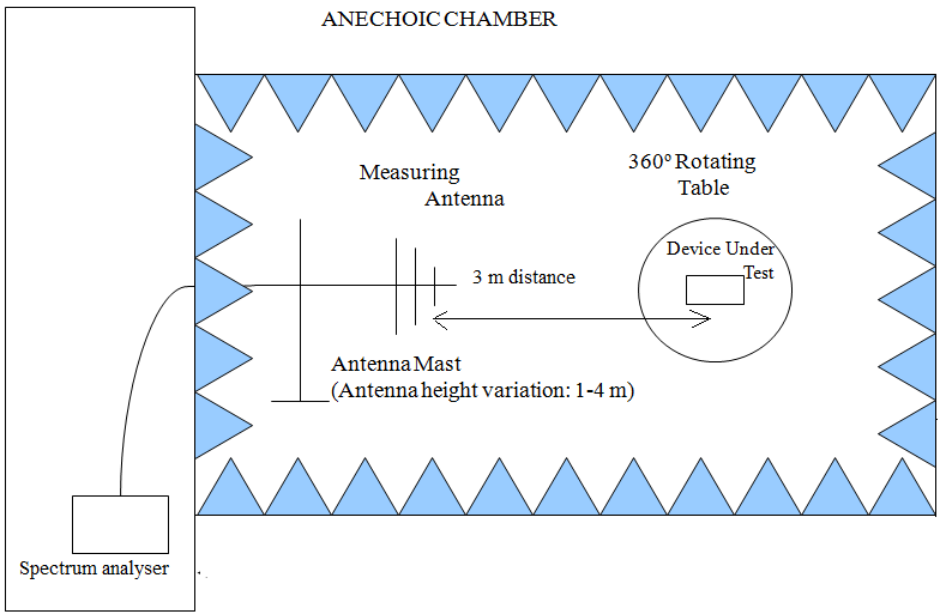
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

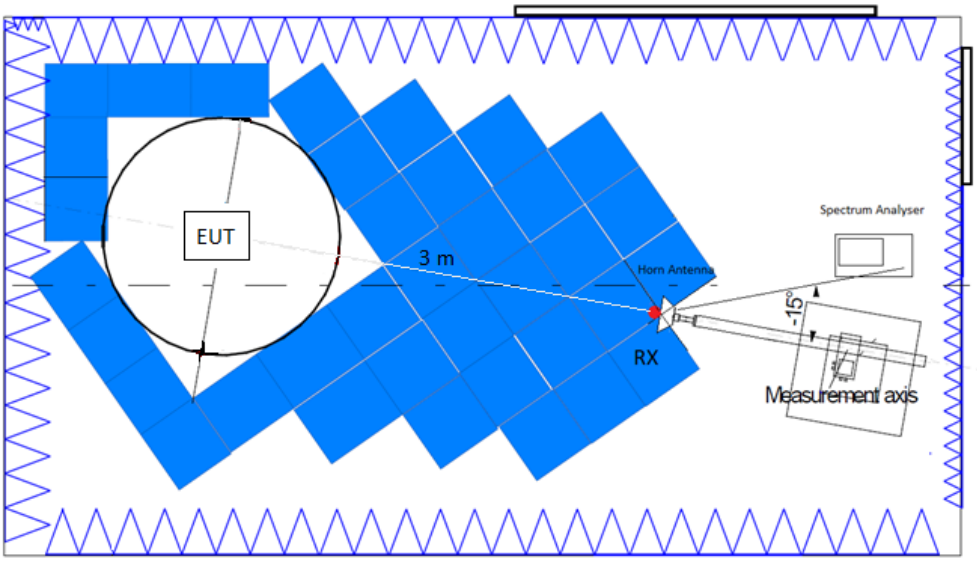
Radiated measurements setup f < 30 MHz:



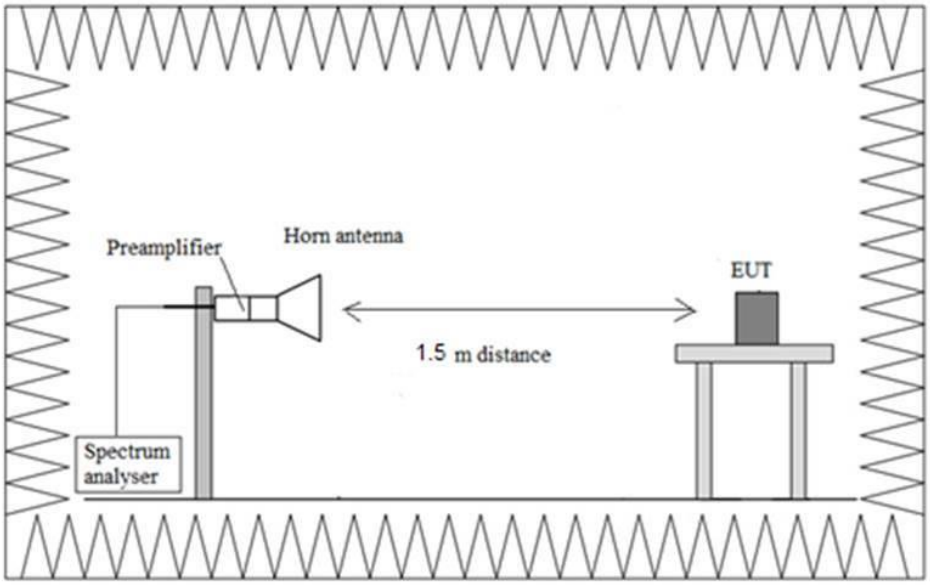
Radiated measurements setup 30 MHz < f < 1 GHz:



Radiated measurements setup f > 1 GHz up to 17 GHz:



Radiated measurements setup f > 17 GHz:



Radiated emissions

SPECIFICATION:

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), appearing outside of the band 13.110 MHz - 14.010 MHz band must also comply with the radiated emission limits specified in §15.209(a) (see §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
960 - 40000	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:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 9 KHz-17 GHz and at distance of 1.5 m for the frequency range 17 GHz-26 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies between 30 MHz up to 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

Test performed on the following worst-cases in all relevant tests channels.

- **Co-Location mode Bluetooth Low Energy, NFC 13.56 MHz ISO 14443A:**

Bluetooth Low Energy:	Low Channel (2402 MHz)
NFC 13.56 MHz ISO 14443A:	Single Channel (13.56 MHz)

Frequency range 9 kHz - 30 MHz:

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

Frequency range 30 MHz - 1 GHz

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

Frequency range 1 - 26 GHz

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

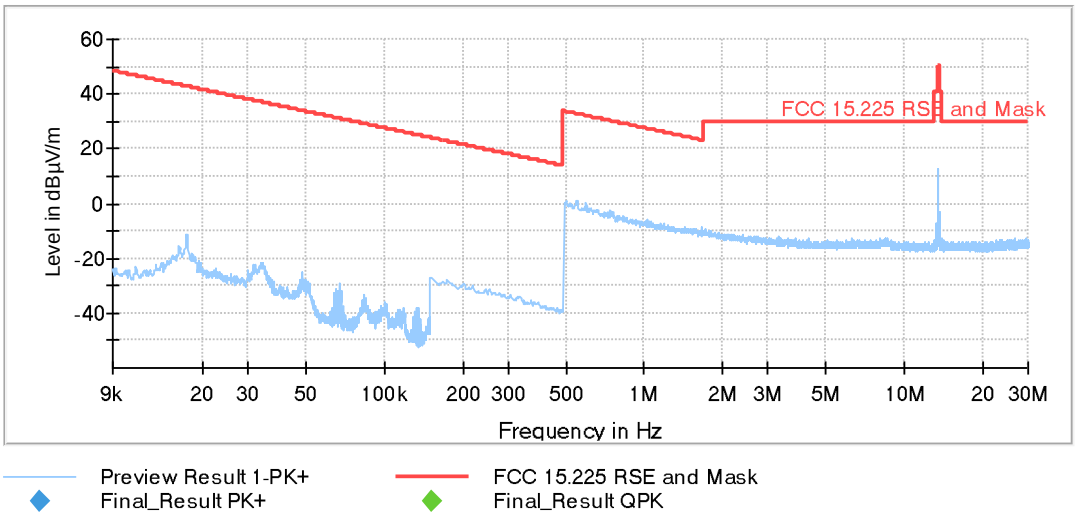
Spurious frequencies detected at less than 20 dB below the limit:

Spurious Frequency (GHz)	Emission Level (dBµV/m)	Duty Cycle Correction (dB)	Corrected Emission Level (dBµV/m)	Polarization	Detector
4.804	42.84	-	-	H	Peak
7.206	50.75	-	-	H	Peak
12.0085	57.69	-	-	V	Peak
	46.74	1.78	48.52		Average
19.217	47.28	-	-	H	Peak

Verdict: PASS

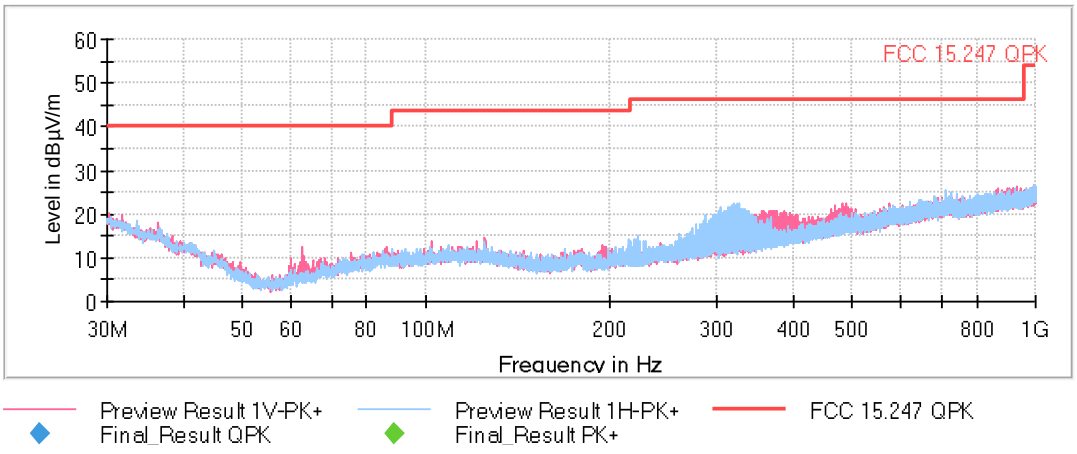
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	PK+	200 Hz	0.1 s	0 dB
150 kHz - 30 MHz	2.25 kHz	PK+	9 kHz	0.1 s	0 dB
30 MHz - 1 GHz	48.5 kHz	PK+	100 kHz	1 s	20 dB
1 GHz - 3 GHz	66.667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
3 GHz - 17 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
17 GHz - 26 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

FREQUENCY RANGE 9 kHz - 30 MHz (worst-case):

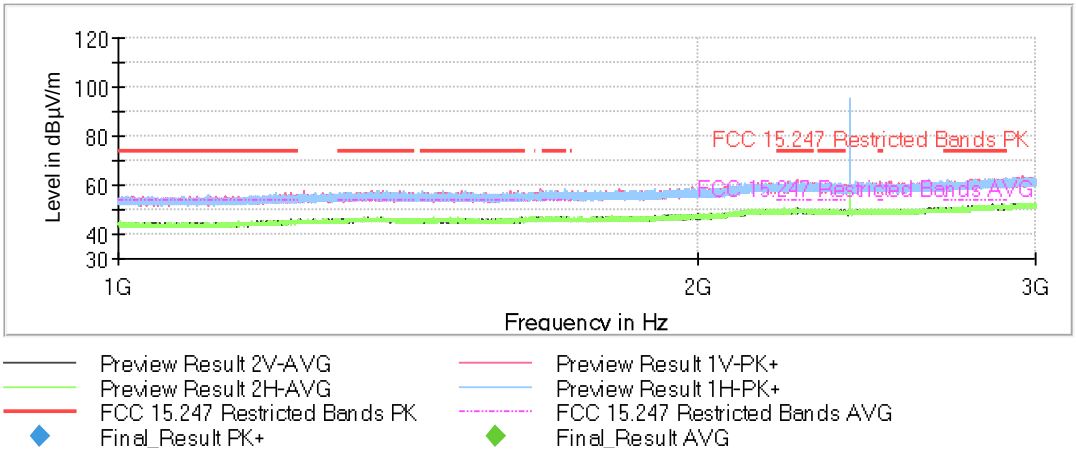


The highest peak is the NFC 13.56 MHz carrier frequency.

FREQUENCY RANGE 30 MHz - 1 GHz (worst-case):

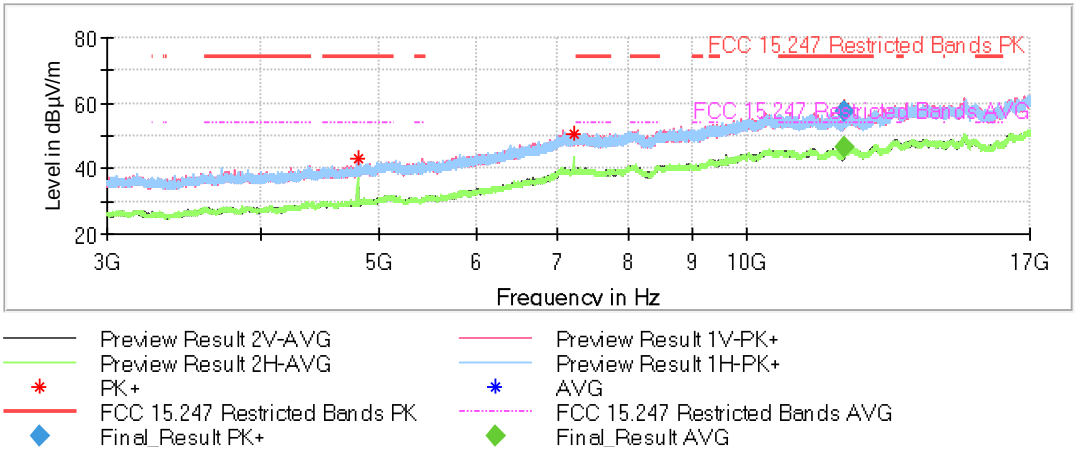


FREQUENCY RANGE 1 - 3 GHz (worst-case):

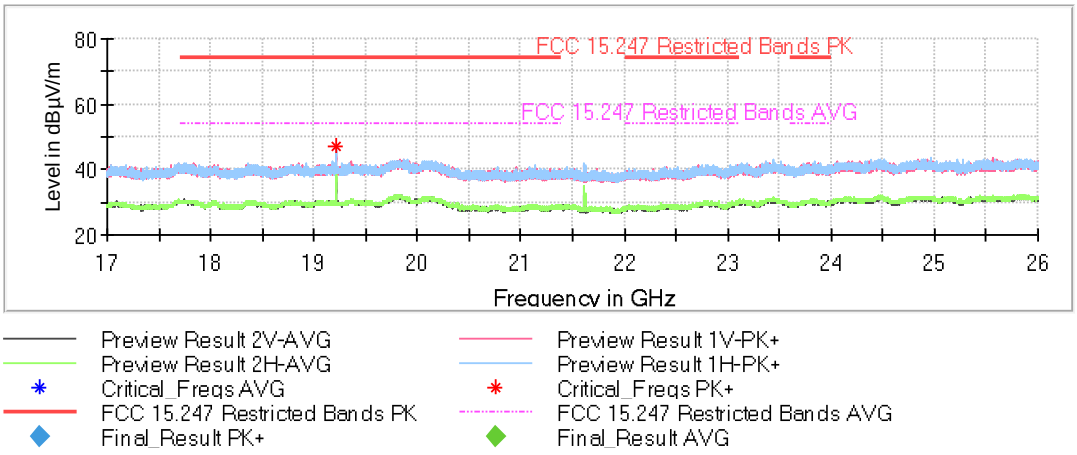


The peak above the limit is the Bluetooth LE carrier frequency.

FREQUENCY RANGE 3 - 17 GHz (worst-case):



FREQUENCY RANGE 17 - 26 GHz (worst-case):



- **Co-Location mode Bluetooth Low Energy, NFC 13.56 MHz ISO 15693:**

Bluetooth Low Energy:	Low Channel (2402 MHz)
NFC 13.56 MHz ISO 15693:	Single Channel (13.56 MHz)

Frequency range 9 kHz - 30 MHz:

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

Frequency range 30 MHz - 1 GHz

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

Frequency range 1 - 26 GHz

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

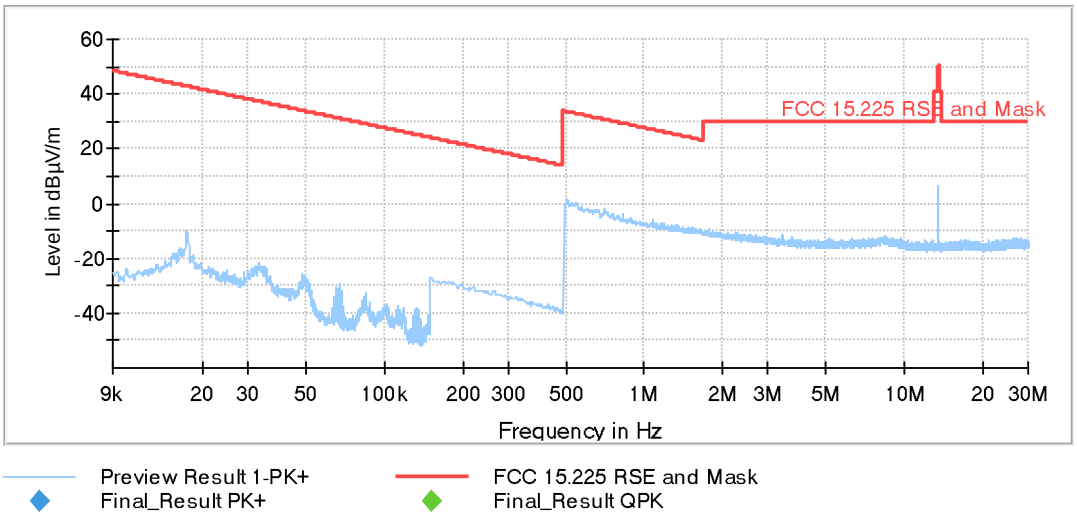
Spurious frequencies detected at less than 20 dB below the limit:

Spurious Frequency (GHz)	Emission Level (dBµV/m)	Duty Cycle Correction (dB)	Corrected Emission Level (dBµV/m)	Polarization	Detector
4.803	42.34	-	-	H	Peak
7.192	50.41	-	-	H	Peak
12.009	58.00	-	-	V	Peak
	48.65	1.78	50.43		Average
19.217	46.09	-	-	H	Peak

Verdict: PASS

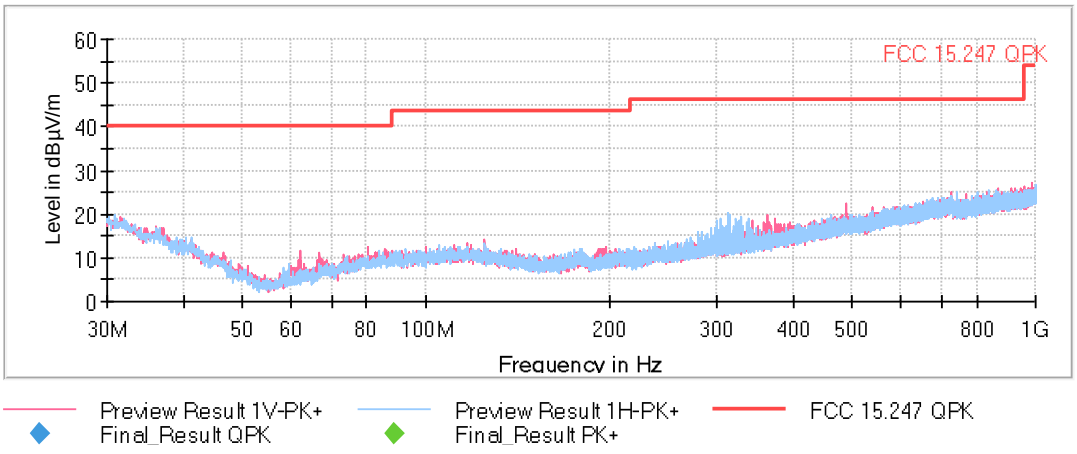
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	PK+	200 Hz	0.1 s	0 dB
150 kHz - 30 MHz	2.25 kHz	PK+	9 kHz	0.1 s	0 dB
30 MHz - 1 GHz	48.5 kHz	PK+	100 kHz	1 s	20 dB
1 GHz - 3 GHz	66.667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
3 GHz - 17 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
17 GHz - 26 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

FREQUENCY RANGE 9 kHz - 30 MHz (worst-case):

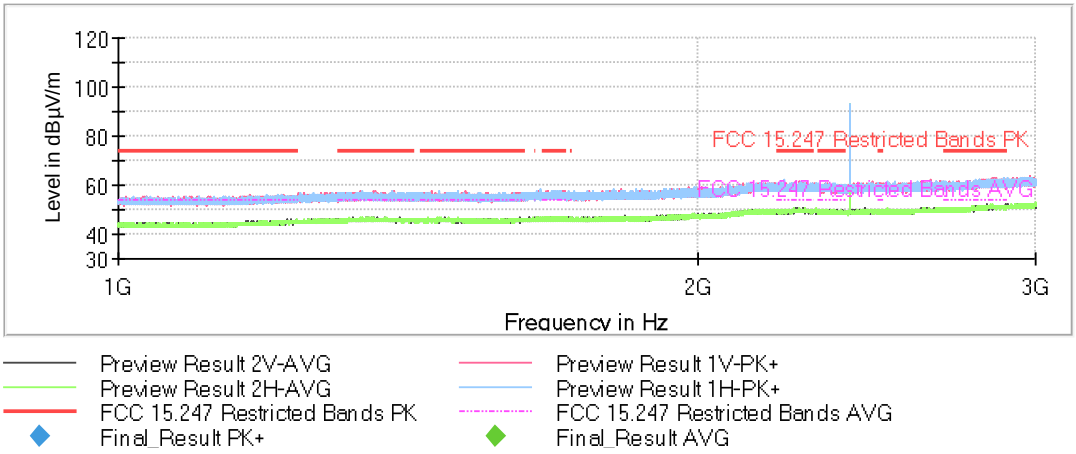


The highest peak is the NFC 13.56 MHz carrier frequency.

FREQUENCY RANGE 30 MHz - 1 GHz (worst-case):

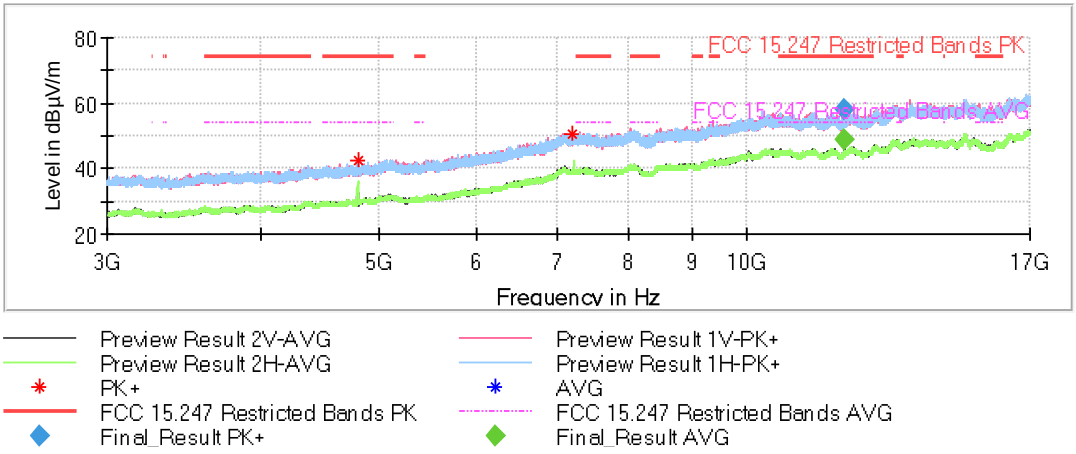


FREQUENCY RANGE 1 - 3 GHz (worst-case):



The peak above the limit is the Bluetooth LE carrier frequency.

FREQUENCY RANGE 3 - 17 GHz (worst-case):



FREQUENCY RANGE 17 - 26 GHz (worst-case):