

Test report No:
NIE: 61876RRF.003A1

Partial Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

Radio Frequency Devices.

Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.

Radiated emission limits; general requirements.

Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Wireless headphone
(*) Trademark	Unity
(*) Model and /or type reference	UAR-100
Other identification of the product	HW version: C4.5.4 SW version: 0.28.6 FCC ID: 2AYFG001 IC: 26790-001
(*) Features	Bluetooth, Bluetooth LE, WIFI
Applicant	HED Technologies CTN, Chemin Des Aulx, 18 (3rd floor), CH-1228 Plan-Les-Ouates, Geneva, Switzerland
Test method requested, standard	USA FCC Part 15.247 (10-1-19) Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-19) Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (March 2019). -Transmitter out of band radiated emissions with simultaneous transmissions. 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)	Rafael López EMC Consumer & RF Lab. Manager
Date of issue	2021-04-16
Report template No	FDT08_23 (*) "Data provided by the client"

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Competences and guarantees

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DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

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DEKRA Testing and Certification 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 at the time of performance of the test.

DEKRA Testing and Certification 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.

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General conditions

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Uncertainty

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

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 of the model UAR-100x is a none foldable with an adjustable headband based on WIFI and Bluetooth technologies.

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 under test have been selected by: The client.

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

Control Nº	Description	Model	Serial Nº	Date of reception
61876C/001	Wireless headphone	UAR-100	047 001 AA0L 00067	2021/01/05

Auxiliary elements used with the Sample S/01:

Control Nº	Description	Model	Serial Nº	Date of reception
65857B/005	TTL Cable	--	--	2020/08/25
65857B/006	TTL Cable	--	--	2020/08/25

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

Test sample description

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient	
	N/A						
Supplementary information to the ports..... :	N/A						
Rated power supply	Voltage and Frequency			Reference poles			
				L1	L2	L3	N
	<input type="checkbox"/>	AC:					
	<input checked="" type="checkbox"/>	DC: 5 Vdc (Internal battery). Battery charge by means of an AC/DC.					
Rated Power	Not provided data						
Clock frequencies..... :	Not provided data						
Other parameters	Not provided data						
Software version	0.28.6						
Hardware version	C4.5.4						
PCB versions..... :	- Left Carrier: C4.5.4 - Right audio: C4.5.3 - Left USB: C4.5.1 - Left mics: C4.5.0 - Right mics: C4.5.0 - Top mics: C4.5.0						
Dimensions in cm (W x H x D)	Not provided data						
Mounting position	X	Other: Wearable device					
Modules/parts..... :	Module/parts of test item			Type		Manufacturer	
	N/A						
Accessories (not part of the test item)	Description			Type		Manufacturer	
	N/A						
Documents as provided by the applicant..... :	Description			File name		Issue date	
	N/A						

Identification of the client

HED Technologies
CTN, Chemin Des Aulx, 18 (3rd floor), CH-1228 Plan-Les-Ouates - Geneva - Switzerland

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-02-12
Date (finish)	2021-02-17

Document history

Report number	Date	Description
61876RRF.003	2021-04-16	First release.
61876RRF.003A1	2021-04-16	The Model name, FCC ID and IC of the device have been corrected: Model name: UAR-100 FCC ID: 2AYFG001 IC: 26790-001

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 %

Remarks and comments

The tests have been performed by the technical personnel: Victoria Olmedo and Jaime Barranquero.

Used instrumentation:

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber VI ALBATROSS P29419	2020/01	2023/01
2.	Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/04	2023/04
3.	Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
4.	Horn Antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2021/01	2024/01
5.	EMI Test Receiver 2Hz-44GHz, ROHDE AND SCHWARZ ESW44	2019/10	2021/10
6.	Preamplifier 30 dB 500MHz-18GHz, SCHWARZBECK BBV 9718 C	2021/02	2022/02
7.	Preamplifier G>30 dB 18-40GHz BONN ELEKTRONIK BLMA 1840-3G	2019/11	2021/11

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 15.209 (a), 15.247 (d) / RSS-Gen 8.9, RSS-247 5.5: - Emission limitations radiated (Transmitter)	P	(1)
<u>Supplementary information and remarks:</u> (1) Only co-location radiated spurious emission test was requested.		

Appendix A: Test results.

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15.209 (a), 15.247 (d) / RSS-Gen 8.9, RSS-247 5.5 Emission limitations radiated (Transmitter).....	15

TEST CONDITIONS

POWER SUPPLY:

Vnominal: 5 Vdc
Type of Power Supply: Battery or AC/DC adapter.

ANTENNA:

Type of Antenna: Internal.
Maximum Declared Antenna Gain Bluetooth EDR/LE: +1.4 dBi
Maximum Declared Antenna Gain WLAN 2.4 GHz: +1.4 dBi

RADIOS AND CHANNELS TESTED:

- Co-Location mode Bluetooth EDR, WLAN 2.4 GHz: (Worst case)

	Bluetooth EDR / FHSS	
Mode:	Basic Rate (Pi/4-DQPSK - 2DH5)	
Channel Spacing:	1 MHz	
Frequency Range:	2402 MHz to 2480 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 0	2402

	WLAN 2.4 GHz (IEEE 802.11 b/g/n20) / DTS	
Mode:	802.11 b: 1 Mbps	
Channel Spacing:	20 MHz	
Frequency Range:	2412 MHz to 2472 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	High: 11	2462

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 Mode for each Radio:

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

* Bluetooth Enhanced Data Rate: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Bluetooth EDR / Low Channel in Pi/4-DQPSK mode configuration as this mode was found as the worst case for spurious emissions than all the other Bluetooth EDR modes.

* WLAN 2.4 GHz: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 802.11 b / High Channel in 1 Mbps mode configuration as this mode was found as the worst case for spurious emissions than all the other 2.4 GHz WLAN SISO modes.

TESTED SIMULTANEOUS TRANSMISSION MODES:

* **Co-Location mode Bluetooth Enhanced Data Rate, WLAN 2.4 GHz**, with the EUT configured to simultaneously transmit three signals at maximum output power:

Bluetooth EDR / Low Channel in Pi/4-DQPSK, WLAN 2.4GHz in 802.11 b / High Channel in 1 Mbps.

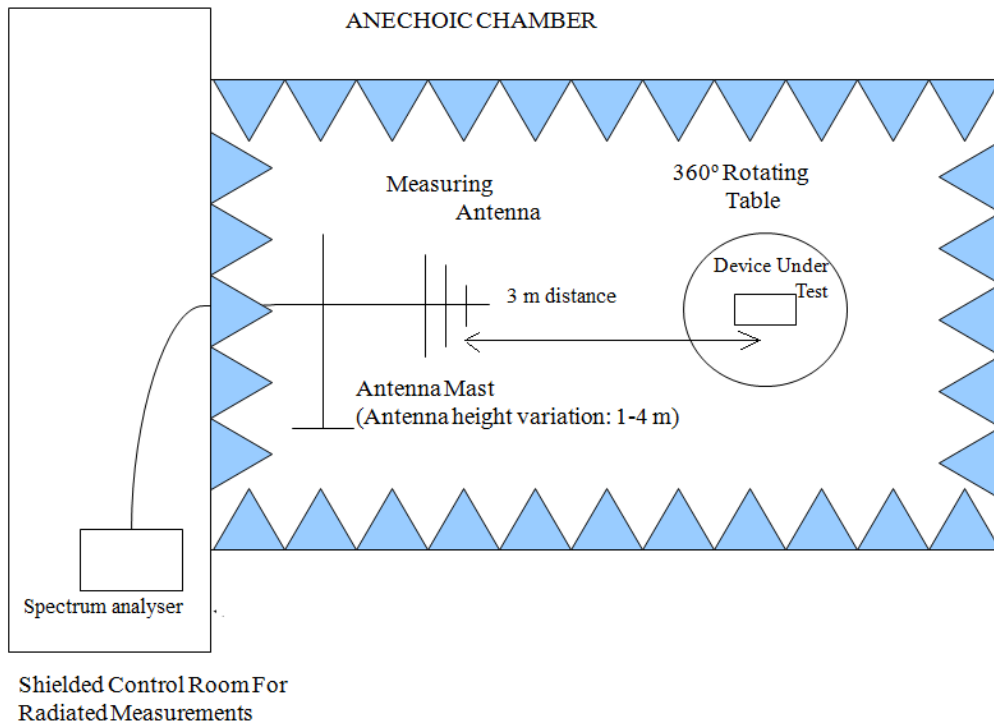
RADIATED MEASUREMENTS:

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 and Bilog antenna for 30 MHz to 1000 MHz) and at distance of 1 m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-26 GHz horn antenna).

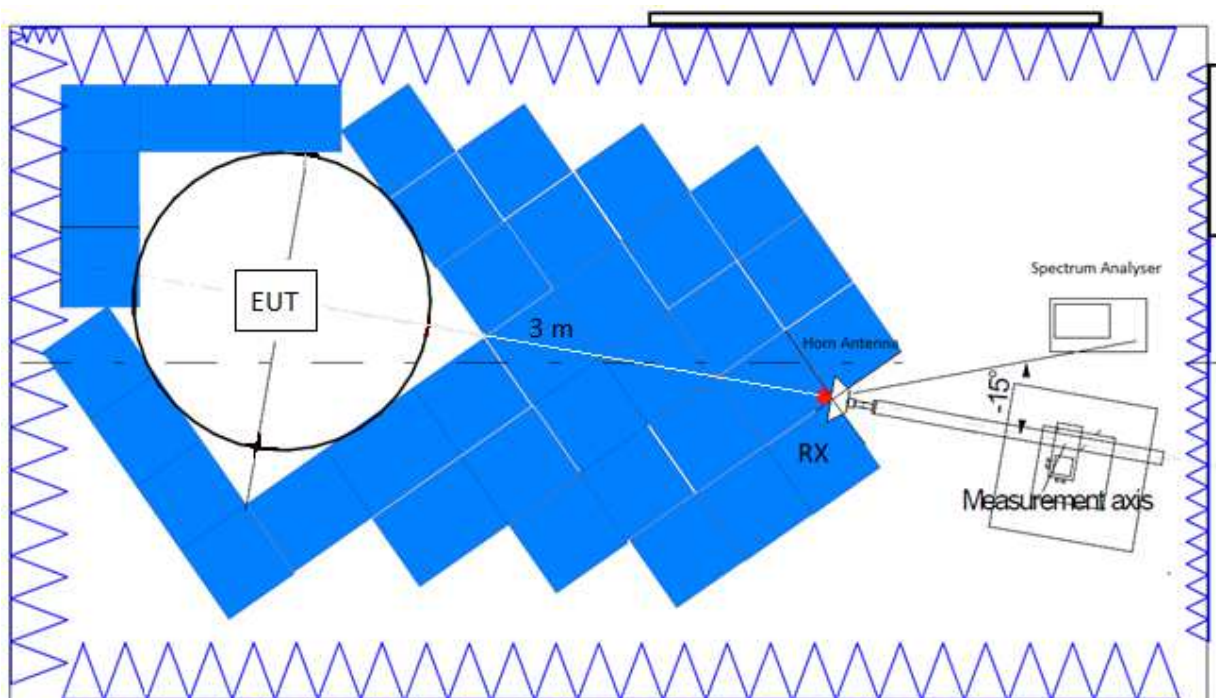
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

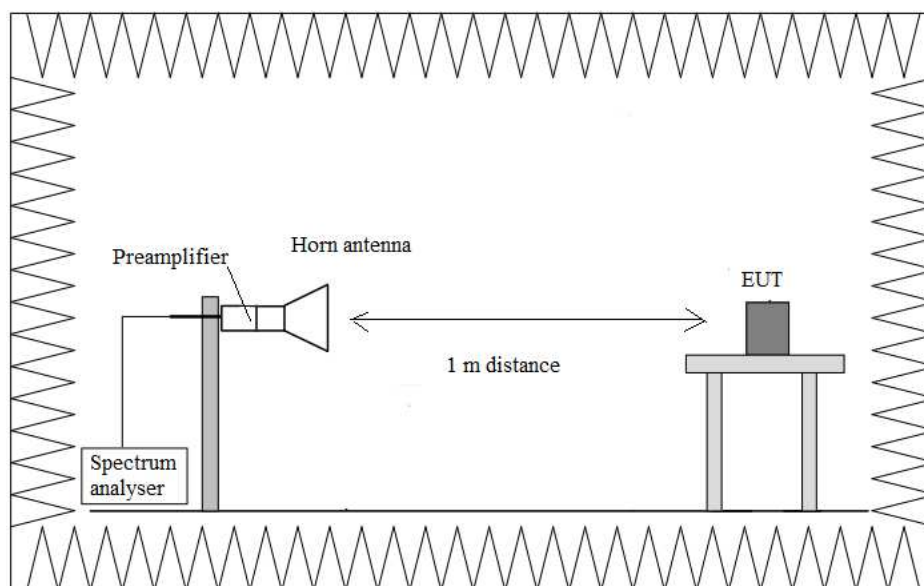
Radiated measurements setup $30 \text{ MHz} < f < 1 \text{ GHz}$:



Radiated measurements setup $f > 1 \text{ GHz}$ up to 17 GHz :



Radiated measurements setup $f > 17$ GHz up to 26 GHz:



15.209 (a), 15.247 (d) / RSS-Gen 8.9, RSS-247 5.5 Emission limitations radiated (Transmitter)

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 ($\mu\text{V/m}$)	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	29.54	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 360° 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 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 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.

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

- **Co-Location mode Bluetooth EDR, 802.11 b.**

Bluetooth EDR: Low Channel (2402 MHz). Pi/4-DQPSK.
802.11 b: High Channel (2462 MHz). BW 20 MHz. 1 Mbps.

Frequency range 30 MHz - 1 GHz:

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode.

Spurious frequencies detected closest to the limit:

Spurious frequency (MHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
289.911500	30.08	H	Quasi-Peak	<± 5.1

Measurement uncertainty (dB): <± 5.1

Frequency range 1 - 26 GHz:

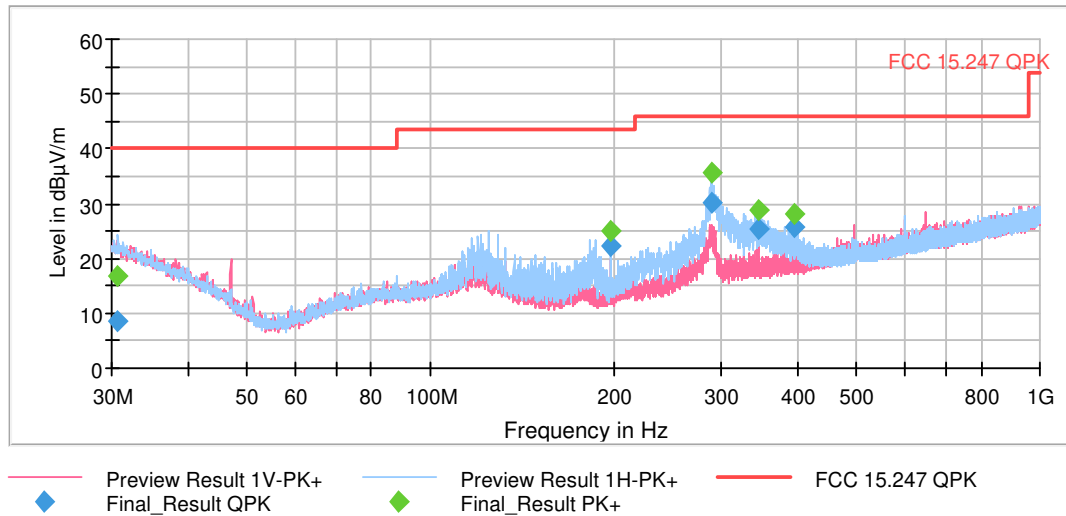
Spurious frequencies detected closest to the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
7.387	48.14	V	Peak	<± 4.6

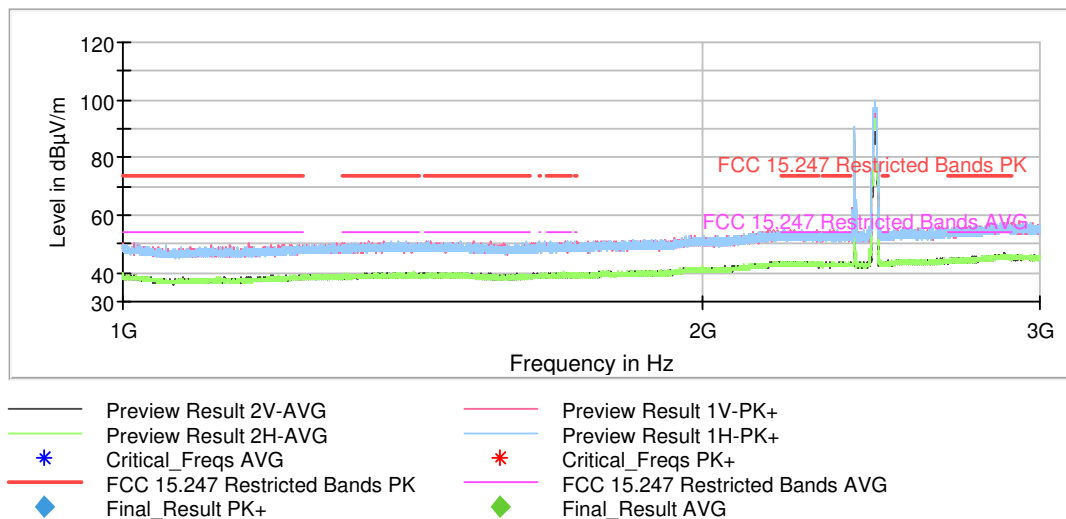
Measurement Uncertainty (dB): 1 GHz to 17 GHz <± 4.6
17 GHz to 26 GHz <± 4.89

Verdict: PASS

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

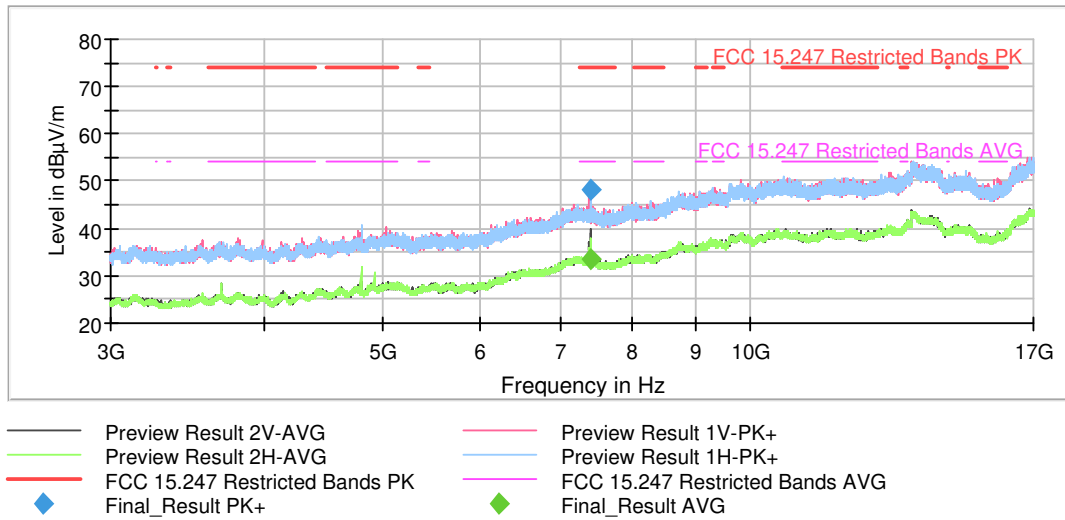


FREQUENCY RANGE 1 - 3 GHz (worst case):



The peaks above the highest limit are the Bluetooth EDR carrier frequencies.

FREQUENCY RANGE 3 - 17 GHz (worst case):



FREQUENCY RANGE 17 - 26 GHz (worst case):

