DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

Test report No:

NIE: 69270RRF.001A1

Partial Test report

USA FCC Part 15.31(h), Part 22, Part 24, Part 15.209, Part 15.247

(*) Identification of item tested	Right soccer shin guard
(*) Trademark	Humanox Soccer
(*) Model and /or type reference	HUOX 50 Soccer shin guard (Right)
Other identification of the product	HW version: 2.0 SW version: 29 FCC ID: 2A292-HUX5R25
(*) Features	Bluetooth LE, GSM
Applicant	Humanox Soccer, S.A. Lugar de la Oropéndola, Calle “D”, 1, - C.P. 11500 – El Puerto de Santa María (Cádiz), Spain.
Test method requested, standard	USA FCC Part 15.31(h) (10-1-20 Edition): Measurement standard. USA FCC Part 22 (10-1-20 Edition): Public Mobile Services. USA FCC Part 24 (10-1-20 Edition): Personal Communications Services. USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits; general requirements. USA FCC Part 15.247 (10-1-20 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. 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. KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices. ANSI C63.26-2015.
Approved by (name / position & signature)	Rafael López EMC Consumer & RF Lab. Manager 2021.12.09 16:36:18 +01'00'
Date of issue	2021-12-09
Report template No	FDT08_23 (*) “Data provided by the client”

Index

Competences and guarantees 3
General conditions 3
Uncertainty 3
Data provided by the client 3
Usage of samples 4
Test sample description 5
Identification of the client 6
Testing period and place 6
Document history 6
Environmental conditions 6
Remarks and comments 7
Testing verdicts 8
Summary 8
Appendix A: Test results FCC Part 22, 15.247, 15.209 9
Appendix B: Test results FCC Part 24, 15.247, 15.209. 21

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 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.

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 HUOX 50 Soccer shin guard (Right) is a Soccer shin guard with IoT 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	Date of reception
67113/034	Soccer shin guard	HUOX 50 Soccer shin guard (Right)	---	2021/04/29

Sample S/01 has undergone the following test(s): The tests indicated in the Appendixes A and B.

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…… :	N/A				

Rated power supply .....:	Voltage and Frequency		Reference poles			
			L1	L2	L3	N	PE
	☐		☐	☐	☐	☐	☐
	☐	DC: 3.8 V					

Rated Power .....:	Not provided data
Clock frequencies.....:	Not provided data
Other parameters .....:	Not provided data
Software version .....:	v28
Hardware version .....:	v2.0
Dimensions in cm (W x H x D) ....:	8 x 17 x0.8
Mounting position .....:	☒ Other: Shinbone of the football player

Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	Right soccer shin guard		Humanox Soccer
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		

(3) Only for Medical Equipment

Identification of the client

Humanox Soccer, S.A.

Lugar de la Oropéndola, Calle “D”, 1, - C.P. 11500 –
El Puerto de Santa María (Cádiz), Spain.

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-11-08
Date (finish)	2021-11-09

Document history

Report number	Date	Description
69270RRF.001	2021-12-0930	First release
69270RRF.001A1	2021-12-09	First modification: typo correction on antenna gain value. This modification test report cancels and replaces the test report 69270RRF.001.

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: José Manuel Jiménez, Nicolás Salguero and Pablo Redondo.

Used instrumentation:

Radiated Measurements

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2.	Shielded Room ETS LINDGREN S101	N.A.	N.A.
3.	Hybrid Bilog Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/04	2023/04
4.	Pre-amplifier G>40dB 10MHz-6GHz Bonn Elektronik BLNA 0160-01N	2021/03	2022/03
5.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2020/12	2022/12
6.	Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2019/11	2022/11
7.	Pre-amplifier, G>40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2021/06	2022/06
8.	Signal and spectrum analyzer 2Hz-50GHz Rhode and Schwarz FSW50	2020/07	2022/07
9.	Broadband Horn antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
10.	Pre-amplifier G>30dB 17-40 GHz BONN ELEKTRONIK BLMA 1840-4A	2021/09	2022/09

Testing verdicts

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

Summary

FCC PART 15 / FCC PART 22 / FCC PART 24 PARAGRAPH			
Requirement – Test case		**Verdict**	**Remark**
FCC 15.31 (h), FCC 15.209 (a), FCC 15.247 (d), FCC 22.917 FCC 24.238	Emission limitations radiated (Transmitter)	P	(1)
Supplementary information and remarks: (1) Only Co-location radiated spurious emission test was requested.			

Appendix A: Test results FCC Part 22, 15.247, 15.209

INDEX

TEST CONDITIONS 11
Radiated emissions 13

TEST CONDITIONS

POWER SUPPLY (V):

V nonimal: 3.8 Vdc.

Type of Power Supply: Internal battery.

ANTENNA:

Maximum Declared Gain for Bluetooth LE: +3.3 dBi
Maximum Declared Gain for 2G Band 850: +1.62 dBi

TEST FREQUENCIES:

	CELLULAR 2G (Band 850)	
Band:	2G Band 850	
Frequency Range:	824 – 849 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Middle: 190	836.6

	BLUETOOTH
Mode:	Bluetooth Low Energy 5.0
Channel Spacing:	2 MHz
Frequency Range:	2400 MHz to 2483.5 MHz
Transmit Channel:	Advertising mode

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 DTS Meas Guidance v05r02 dated April 2, 2019.

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 signalling unit to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Transmission modes selected with each radio:

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

* Cellular 2G: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 2G band 850 configuration as this channel was found to transmit higher EIRP than all the other 2G channels.

* Bluetooth Low Energy: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Bluetooth Low Energy (GFSK) advertising mode.

Simultaneous transmission modes selected:

1. Cellular 2G Band 850, Bluetooth Low Energy Co-Location with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular 2G in Band 850 / Middle Channel and Bluetooth Low Energy / GFSK.

Radiated emissions

SPECIFICATION:

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

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 - 25000	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 when measuring with peak detector function.

1. 2G Band 850 & 26 (Part 22). FCC §2.1053 & §22.917.

FCC §22.917:

> (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

METHOD:

The measurement was performed with the EUT inside an anechoic chamber.

The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency of the co-located radios up to 26 GHz.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna.
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

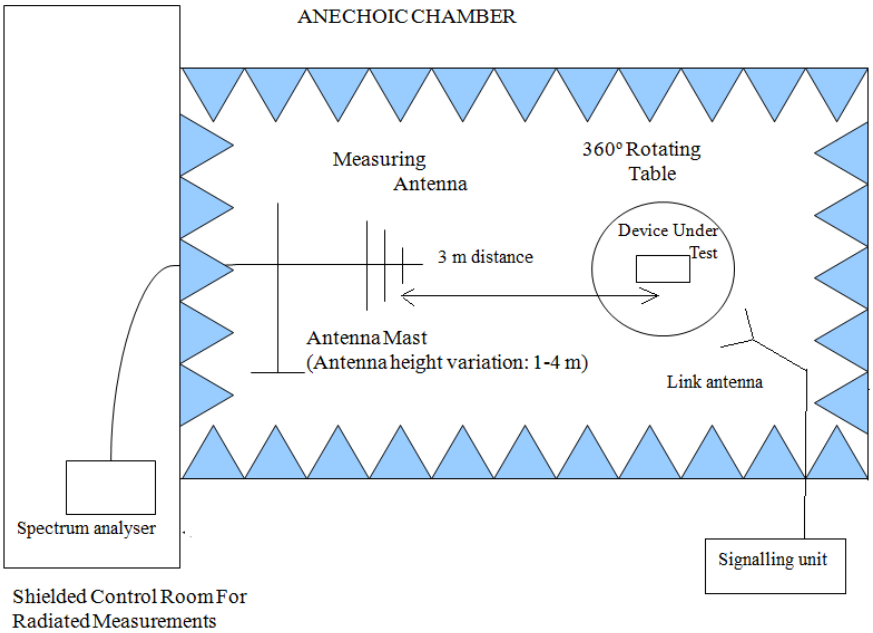
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

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

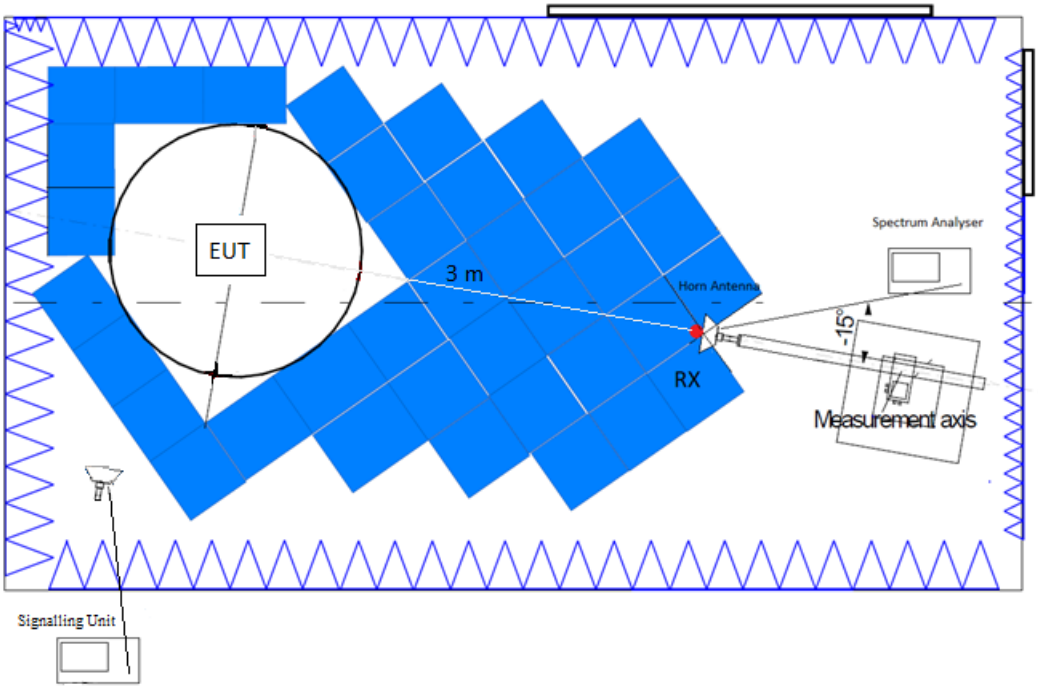
These measurements have been performed in order to check the impact of the Co-Location of all radio interfaces (that can be transmitting simultaneously).

TEST SETUP:

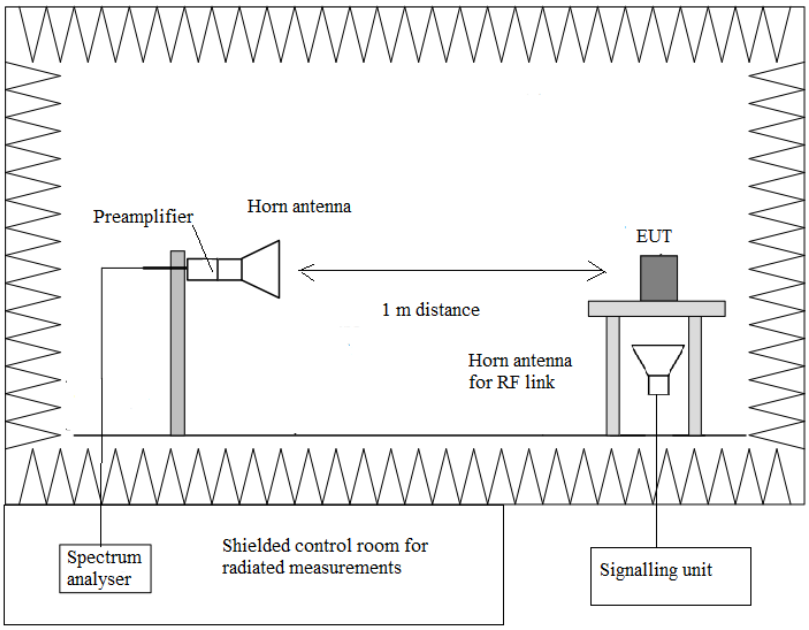
Radiated measurements below 1 GHz.



Radiated measurements setup between 1 GHz to 17 GHz.



Radiated measurements above 17 GHz.



RESULTS:

1. **Co-Location mode Cellular 2G Band 850 + Bluetooth Low Energy:**

2G Band 850: Middle Channel (836.6 MHz).
Bluetooth Low Energy: Advertising mode.

LIMIT: The spurious frequencies were measured at 3 meter. The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 8.366 GHz	Peak	43 + 10 log (P) dB = -13 dBm → 82.23 dBµV/m
8.366 to 26 GHz	Peak	74 dBµV/m (*)
	Average	54 dBµV/m (*)

(*) Radiated emissions which fall in the restricted bands, as defined in §15.205(a).

Frequency range 30 MHz - 1 GHz

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

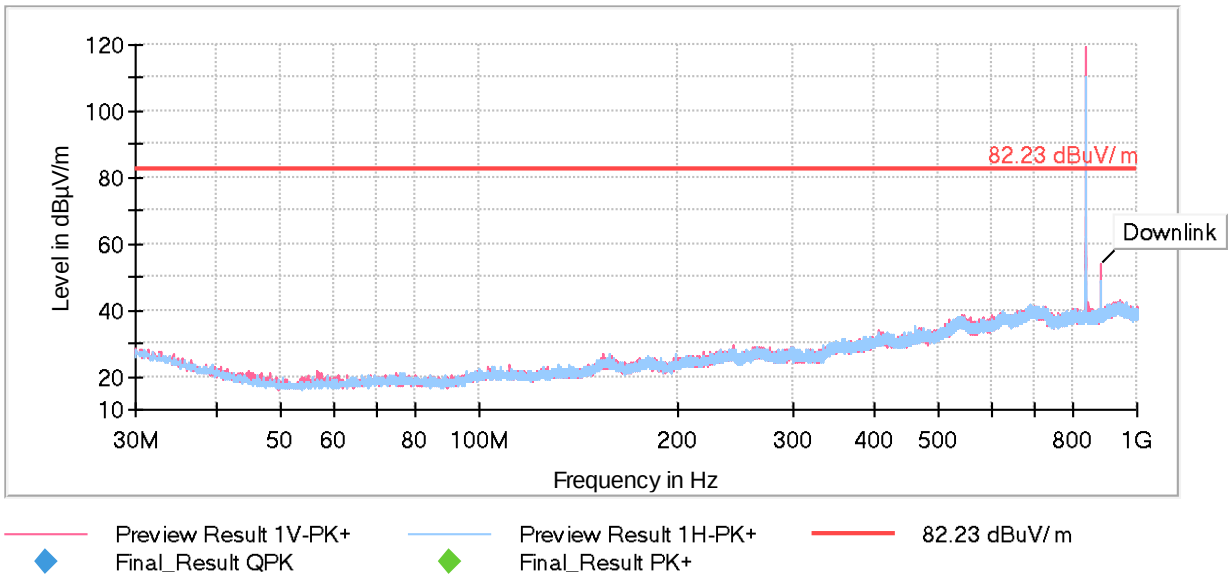
Frequency range 1 - 26 GHz

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

Measurement uncertainty (dB)
<±4.99 for f < 1GHz
<±4.98 for f ≥ 1 GHz up to 3 GHz
<±4.98 for f ≥ 3 GHz up to 17 GHz
<±5.08 for f ≥ 17 GHz up to 26 GHz

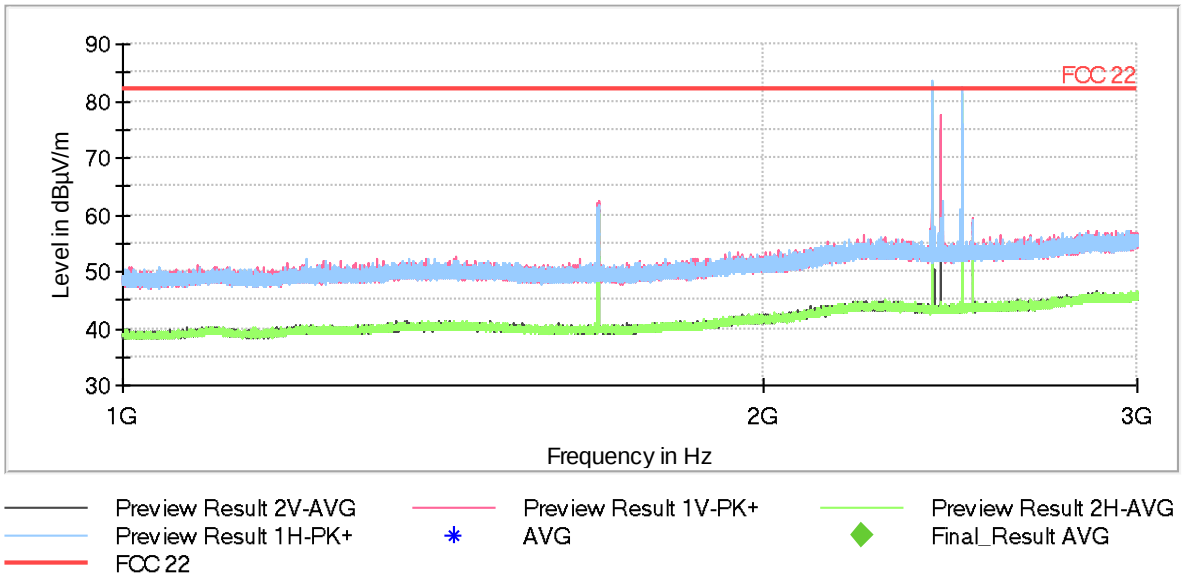
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



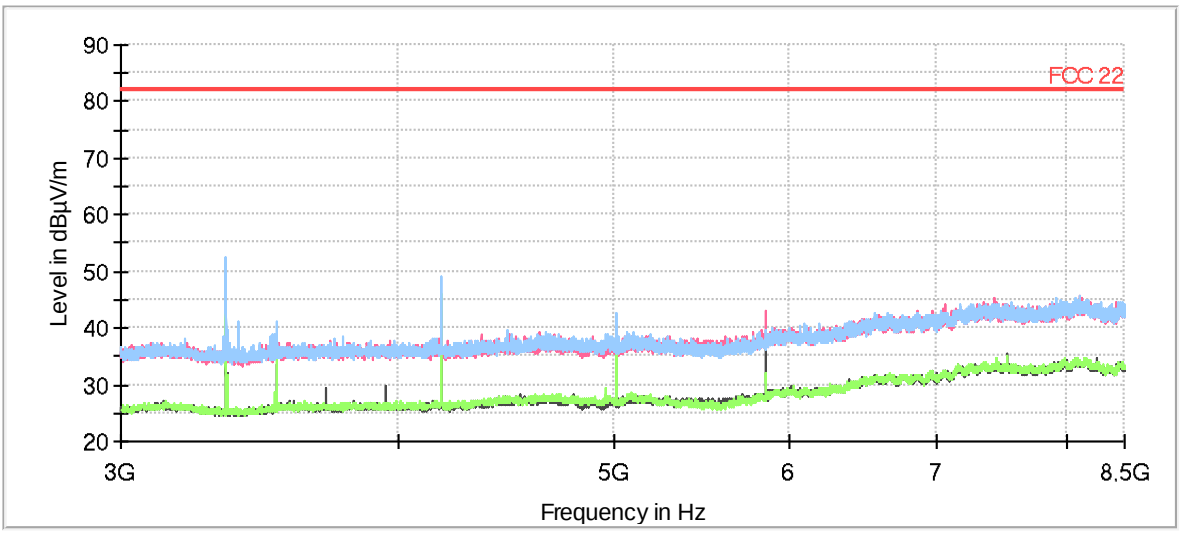
The peak above the limit is the Carrier frequency 2G Band 850 (836.6 MHz).

FREQUENCY RANGE 1 – 3GHz

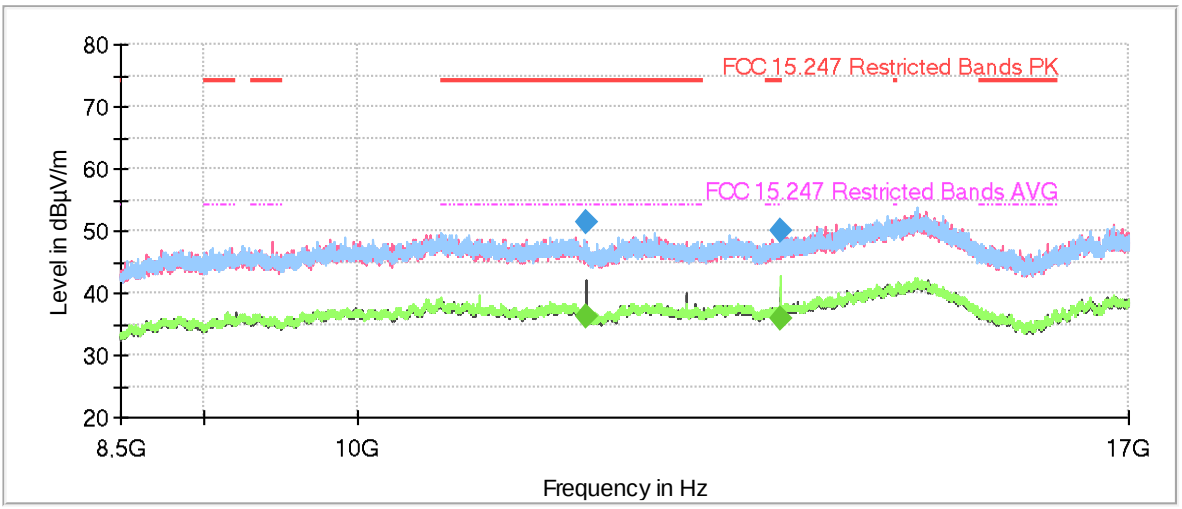


The peak above the limit is the Carrier frequency Bluetooth Low Energy Advertising mode.

FREQUENCY RANGE 3 – 17 GHz

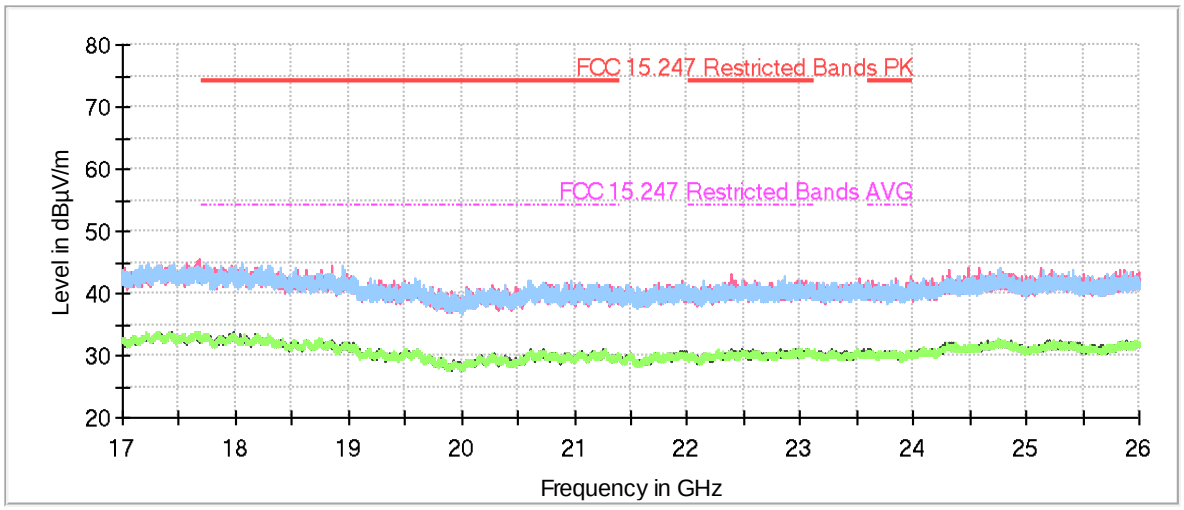


Preview Result 2V-AVG
Preview Result 1V-PK+
Preview Result 2H-AVG
Preview Result 1H-PK+
FCC 22
Final_Result PK+
Final_Result AVG
AVG



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

FREQUENCY RANGE 17 - 26 GHz



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

Appendix B: Test results FCC Part 24, 15.247, 15.209.

INDEX

TEST CONDITIONS 23
Radiated emissions 25

TEST CONDITIONS

POWER SUPPLY (V):

V nonimal: 3.8 Vdc.

Type of Power Supply: Internal battery.

ANTENNA:

Maximum Declared Gain for Bluetooth LE: +3.3 dBi
Maximum Declared Gain for 2G Band 850: +1.62 dBi

TEST FREQUENCIES:

	CELLULAR 2G	
Band:	2G Band 1900	
Frequency Range:	1850-1915 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Mid: 661	1880

	BLUETOOTH
Mode:	Bluetooth Low Energy 5.0
Channel Spacing:	2 MHz
Frequency Range:	2400 MHz to 2483.5 MHz
Transmit Channel:	Advertising mode

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 DTS Meas Guidance v05r02 dated April 2, 2019.

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 signalling unit to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Transmission modes selected with each radio:

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

* Cellular 2G: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 2G band 1900 configuration as this channel was found to transmit higher EIRP than all the other 2G channels.

* Bluetooth Low Energy: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Bluetooth Low Energy (GFSK) advertising mode.

Simultaneous transmission modes selected:

1. Cellular 2G Band 1900, Bluetooth Low Energy Co-Location, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular 2G Band 1900/ MIddle Channel and Bluetooth Low Energy GFSK.

Radiated emissions

SPECIFICATION:

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

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 - 25000	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.

1. 2G Band 1900. FCC §2.1053 & §24.238.

FCC §24.238:

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

METHOD:

The measurement was performed with the EUT inside an anechoic chamber.

The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency of the co-located radios up to 26 GHz.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna.
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

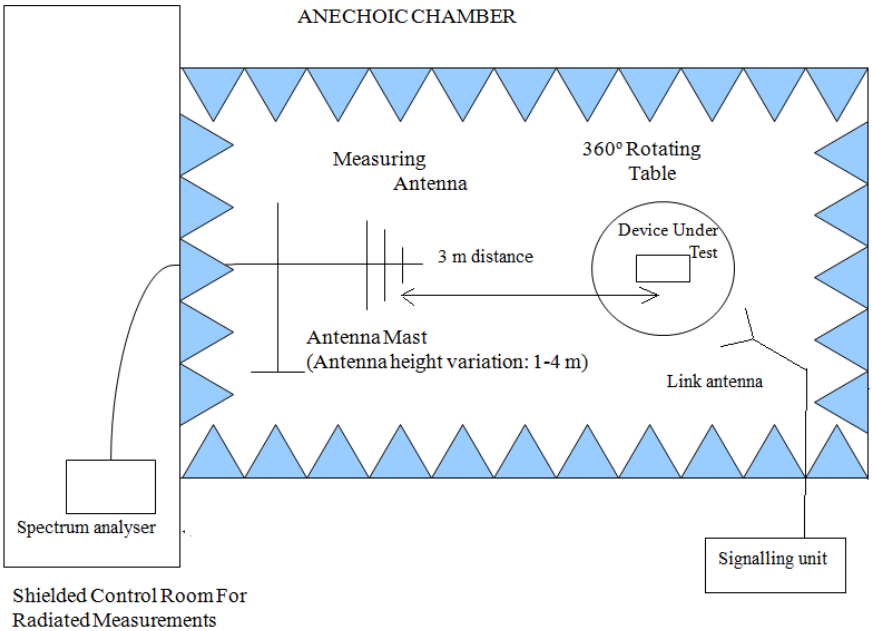
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

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

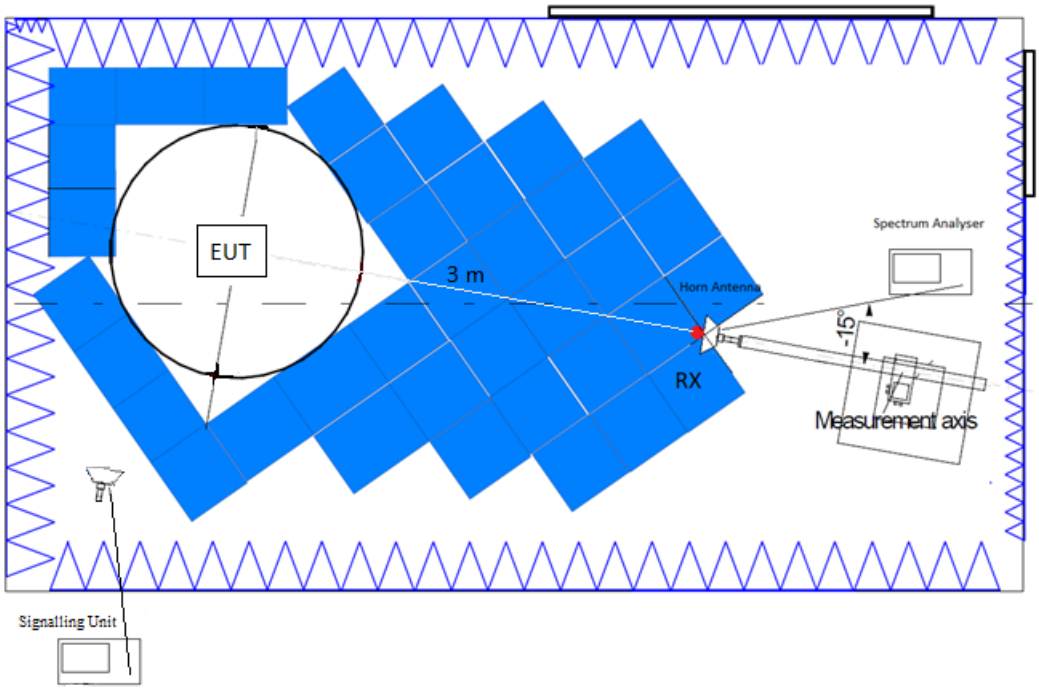
These measurements have been performed in order to check the impact of the Co-Location of all radio interfaces (that can be transmitting simultaneously).

TEST SETUP:

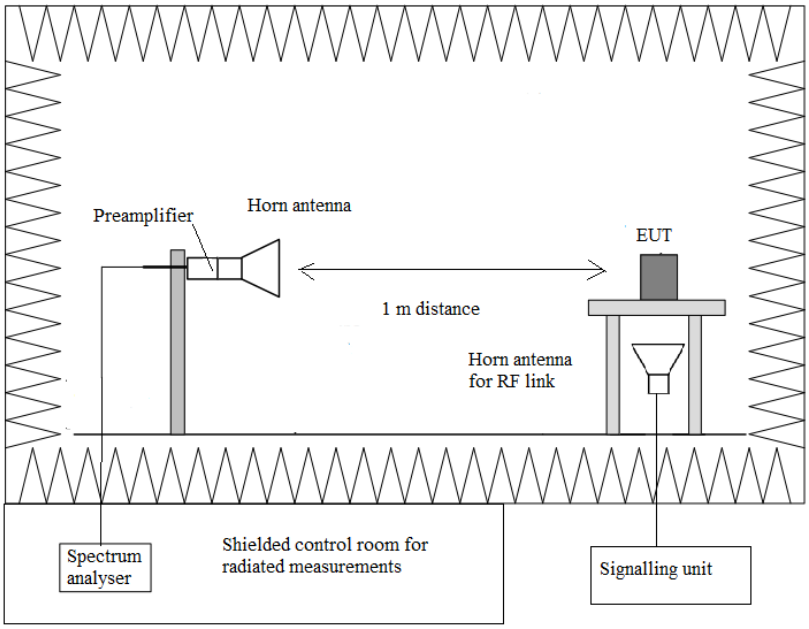
Radiated measurements below 1 GHz.



Radiated measurements setup between 1 GHz to 17 GHz.



Radiated measurements above 17 GHz.



RESULTS:

1. **Co-Location mode Cellular 2G Band 1900, Bluetooth Low Energy:**

2G Band 1900: Middle Channel (1880 MHz).
Bluetooth Low Energy: Advertising mode.

LIMIT: The spurious frequencies were measured at 3 meter. The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 18.8 GHz	Peak	43 + 10 log (P) dB = -13 dBm → 82.23 dBµV/m
18.8 to 26 GHz	Peak	74 dBµV/m (*)
	Average	54 dBµV/m (*)

(*) Radiated emissions which fall in the restricted bands, as defined in §15.205(a).

Frequency range 30 MHz - 1 GHz

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

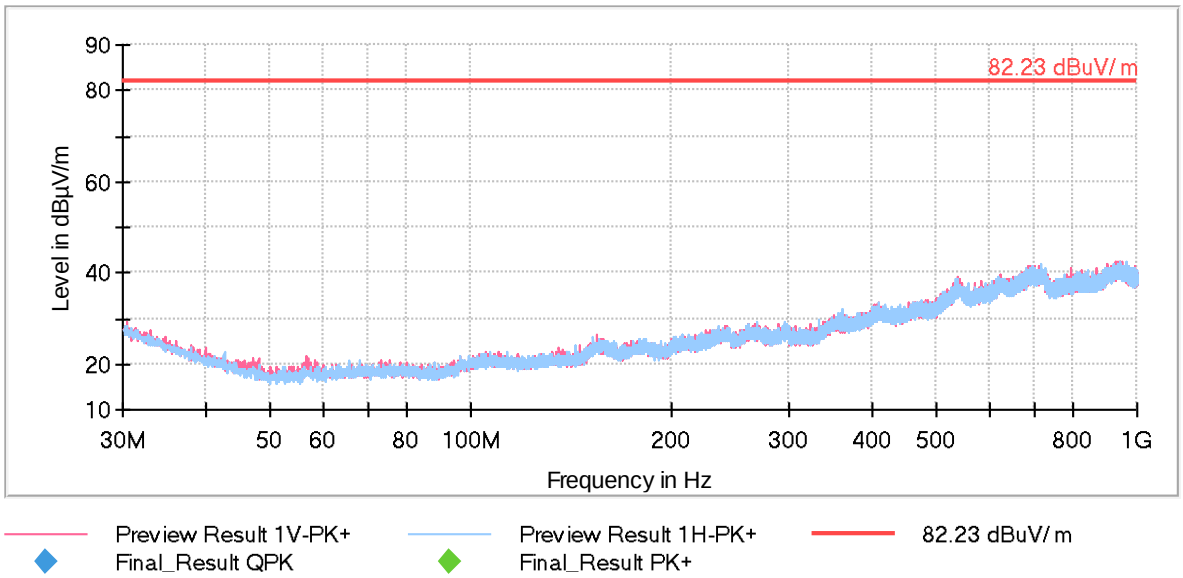
Frequency range 1 - 26 GHz

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

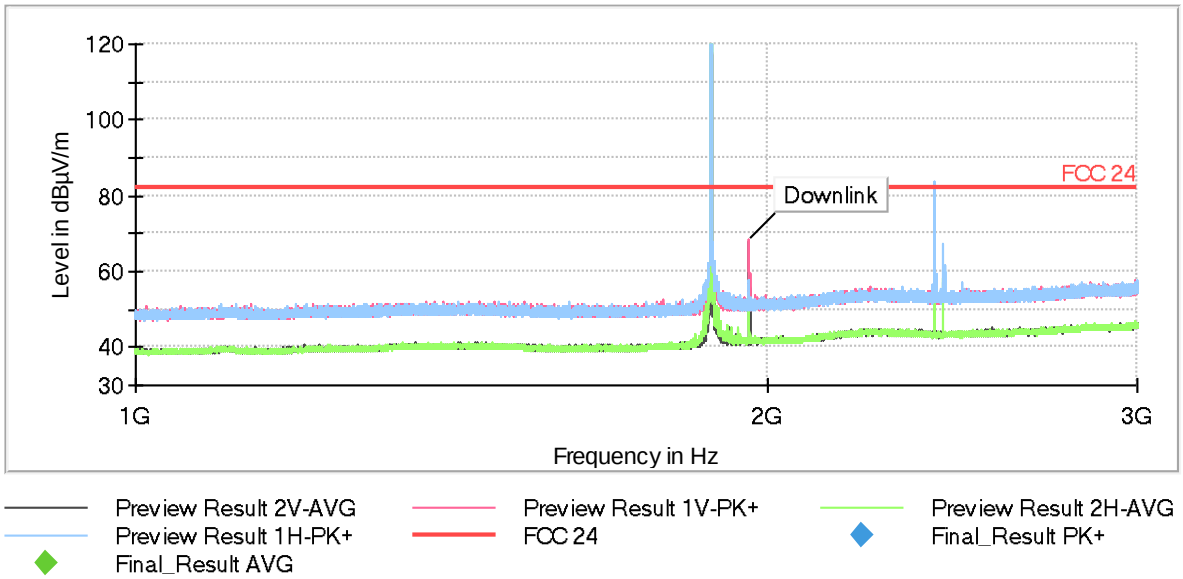
Measurement uncertainty (dB)
<±4.99 for f < 1GHz
<±4.98 for f ≥ 1 GHz up to 3 GHz
<±4.98 for f ≥ 3 GHz up to 17 GHz
<±5.08 for f ≥ 17 GHz up to 26 GHz

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



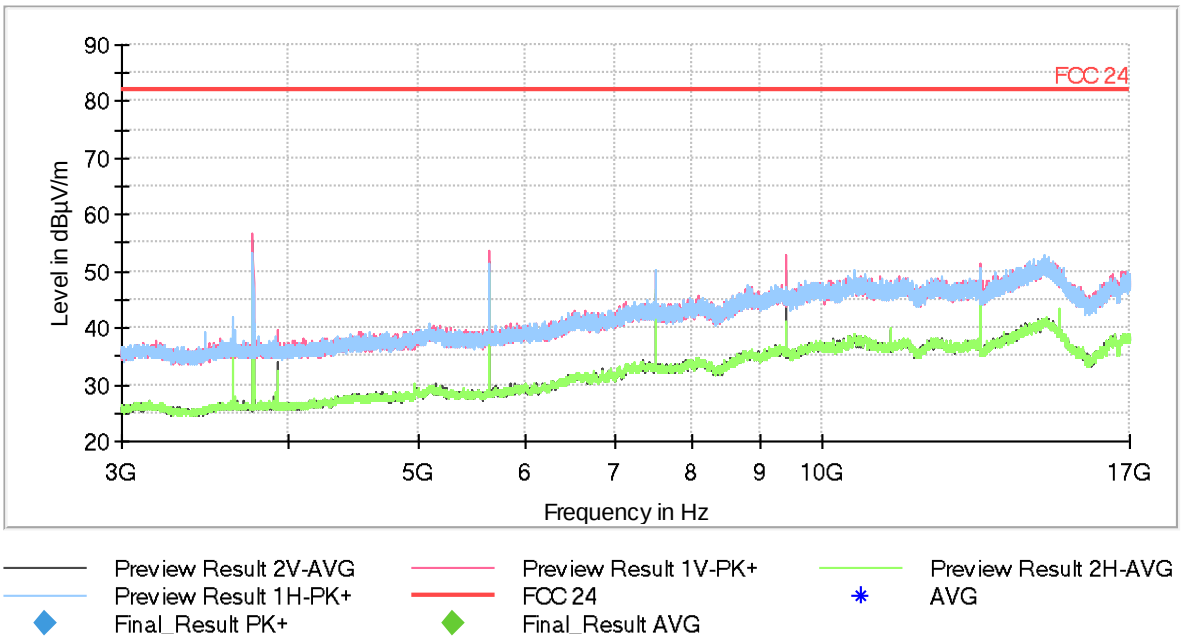
FREQUENCY RANGE 1 – 3GHz



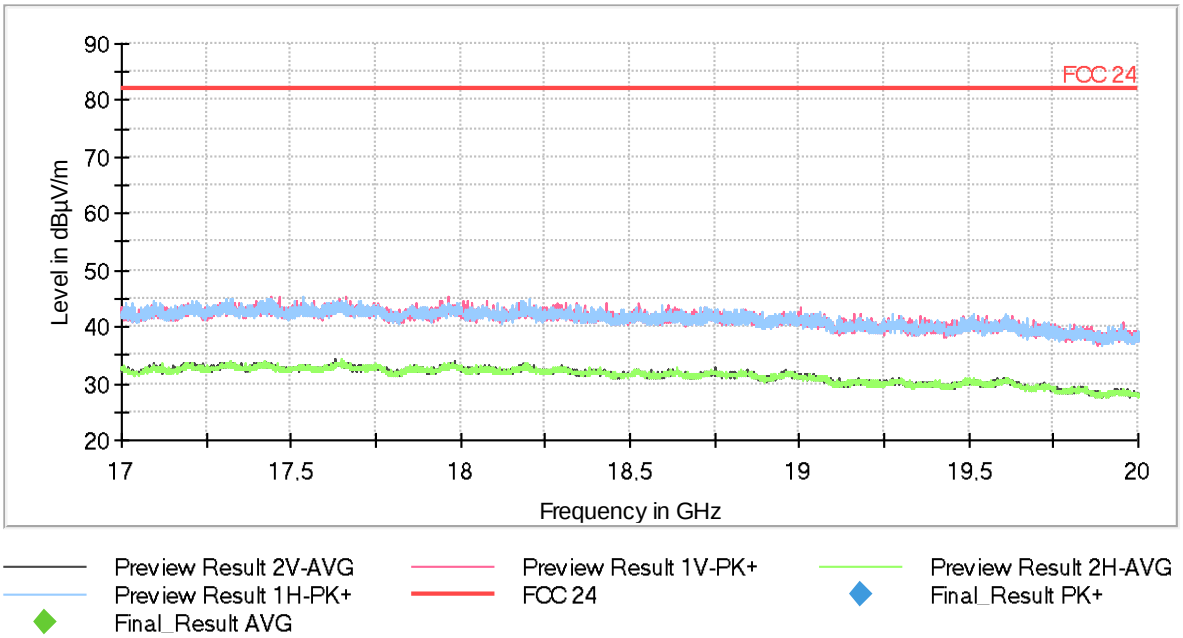
The peak above the limit on the left is the Carrier frequency 2G Band 1900 (1880 MHz).

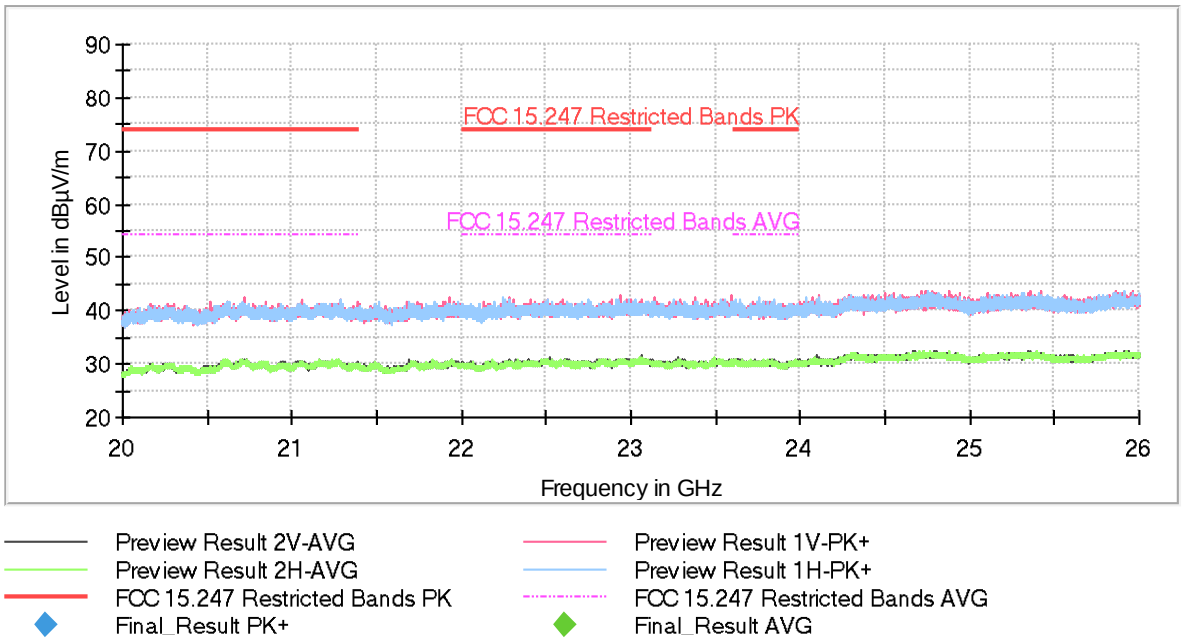
The peak above the limit on the right is the Carrier frequency Bluetooth Low Energy Advertising mode.

FREQUENCY RANGE 3 – 17 GHz



FREQUENCY RANGE 17 - 26 GHz




90
80
70
60
50
40
30
20
Level in dBµV/m
FCC 15.247 Restricted Bands PK
FCC 15.247 Restricted Bands AVG
20
21
22
23
24
25
26
Frequency in GHz
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