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

DEKRA

ilac-MRA ENAC ENSAYOS Nº 51/LE147

Test report No:
NIE: 63185RRF.099

Partial Test report

USA FCC Part 15.247,15.407, 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.
Unlicensed National Information Infrastructure (U-NII) Devices:
General technical requirements.
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	Headunit with radio and Bluetooth
(*) Trademark	Panasonic
(*) Model and /or type reference	MIB3E_MQB_BTWIFI
Other identification of the product	HW version: X01 SW version: X464 PN: 654.035.869.A FCC ID: WUQ-MIB3HBTWIFI IC: 216R-MIB3HBTWIFI
(*) Features	Bluetooth, WLAN, FM, AM, DAB, USB
Applicant	PANASONIC AUTOMOTIVE SYSTEMS EUROPE GMBH Robert Bosch Str. 27-29, 63225, Langen, Germany
Test method requested, standard	USA FCC Part 15.407 (10-1-19) Edition: Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements. Band U-NII-3 (5725 MHz – 5850 MHz). 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.

	Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017. Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02r01 dated 10/31/2013 ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager RAFAEL LÓPEZ MARTÍN 2020.11.20 12:51:41 +01'00'
Date of issue	2020-11-20
Report template No	FDT08_22 (*) “Data provided by the client”

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Competences and guarantees

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

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

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification has a calibration and maintenance program for its measurement equipment.

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

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.
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 and the Accreditation Bodies.

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 MIB3E_MQB_BTWIFI is an automotive head unit to be installed in cars with the following features: Bluetooth, WLAN, FM, AM, DAB, USB.

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
63185/004	Headunit with radio and Bluetooth	MIB3E_MQB_BT WIFI	PM6-00115 04 20413FF0222	2020/05/05
51929B/228	RF Harness	--	--	2019/01/24

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

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				
	☒	DC: 12 Vdc			
Rated Power ……:	--				
Clock frequencies ……:	--				
Other parameters……:	--				
Software version ……:	X464				
Hardware version……:	X01				
Dimensions in cm (W x H x D)….:	--				
Mounting position……:	☒	Other: Vehicle.			
Modules/parts ……:	Module/parts of test item		Type	Manufacturer	
	--				
Accessories (not part of the test item) ……:	Description		Type	Manufacturer	
	--				
Documents as provided by the applicant……:	Description		File name	Issue date	
	--				

[3] Only for Medical Equipment

Identification of the client

PANASONIC AUTOMOTIVE SYSTEMS EUROPE GMBH
Robert Bosch Str. 27-29, 63225, Langen, Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-06-23
Date (finish)	2020-06-24

Document history

Report number	Date	Description
63185RRF.099	2020-11-20	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: Jaime Barranquero.

Used instrumentation:

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ALBATROSS P29419	N.A.	N.A.
2.	Shielded room	N.A.	N.A.
3.	Ultralog Antenna 30MHz-6GHz ROHDE AND SCHWARZ HL562E_UPG	2019/10	2022/10
4.	EMI Test Receiver 2Hz-44GHz ROHDE AND SCHWARZ ESW44	2019/10	2021/10
5.	Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
6.	Preamplifier 30dB 500MHz-18GHz SCHWARZBECK BBV 9718 C	2020/01	2021/01
7.	HORN ANTENNA 18-40GHz BBHA 9170 SCHWARZBECK	2017/12	2020/12
8.	PRE-AMPLIFIER G>30dB 18-40GHz BONN ELEKTRONIK BLMA 1840-3G	2019/11	2021/11
9.	DC Power Supply 30V/3A 90W, GW INSTEK GPS-3030D	N.A.	N.A.
10.	Digital Multimeter, FLUKE 175	2019/10	2020/10

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), 15.407 (b) / RSS-Gen 8.9, RSS-247 5.5, 6.2.1.2, 6.2.2.2, 6.2.3.2 & 6.2.4.2: - 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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FCC 15.209 (a), 15.247 (d), 15.407 (b) / RSS-Gen 8.9, RSS-247 5.5, 6.2.1.2, 6.2.2.2, 6.2.3.2 & 6.2.4.2 Emission limitations radiated (Transmitter) 15

TEST CONDITIONS

POWER SUPPLY (V):

Vnominal: 12 Vdc

Type of Power Supply: DC external (car battery).

ANTENNA:

Type of Antenna: Integral.

Maximum Declared Antenna Gain for Bluetooth EDR: +1.3 dBi

Maximum Declared Antenna Gain for WLAN 2.4 GHz: +0.4 dBi

Maximum Declared Antenna Gain for WLAN 5 GHz U-NII-1: +0.7 dBi

Maximum Declared Antenna Gain for WLAN 5 GHz U-NII-3: +0.7 dBi

RADIOS AND CHANNELS TESTED:

	Bluetooth EDR / FHSS	
Mode:	PI4DQPSK - 2DH5	
Channel Spacing:	1 MHz	
Frequency Range:	2402 MHz to 2480 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	37	2402
	17	2441
	39	2480

	WLAN 2.4 GHz (IEEE 802.11 bn20) / DTS	
Mode:	802.11 b: 1, 2, 5.5 & 11 Mbps (SISO)	
Channel Spacing:	20 MHz	
Frequency Range:	2412 MHz to 2472 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	1	2412
	11	2462

	WLAN 5 GHz (IEEE 802.11 anac) / U-NII	
Mode:	802.11 a20 SISO: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps.	
Frequency Range:	5150 MHz to 5250 MHz (U-NII-1)	
Channel Spacing:	20 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Mid: 40	5200
Frequency Range:	5725 MHz to 5850 MHz (U-NII-3)	
Channel Spacing:	20 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Mid: 157	5785

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 DTS Meas Guidance v05r2 dated April 2, 2019 and FCC Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017.

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 Basic Rate: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in PI4DQPSK mode because its power is higher.

* WLAN 2.4 GHz: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 802.11 b / 1Mbps mode configuration as this mode was found to transmit higher EIRP than all the other 2.4 GHz WLAN SISO modes.

* WLAN 5 GHz U-NII-1 band: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 802.11 a20 / 6Mbps mode configuration as these modes were found to transmit higher EIRP than all the other 5 GHz WLAN U-NII-1 band SISO modes.

* WLAN 5 GHz U-NII-3 band: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 802.11 a20 / 6Mbps mode configuration as these modes were found to transmit higher EIRP than all the other 5 GHz WLAN U-NII-3 band SISO modes.

TESTED SIMULTANEOUS TRANSMISSION MODES:

*** Co-location Bluetooth, WLAN 2.4 GHz**, with the EUT configured to simultaneously transmit two signals at maximum output power:
Bluetooth EDR in 2DH5 mode, WLAN 2.4GHz in 802.11 b / 1Mbps.

*** Co-location Bluetooth, WLAN 5 GHz U-NII-1 band**, with the EUT configured to simultaneously transmit two signals at maximum output power:
Bluetooth EDR in 2DH5 mode, WLAN 5GHz in 802.11 a20 / 6 Mbps.

*** Co-location Bluetooth, WLAN 5 GHz U-NII-3 band**, with the EUT configured to simultaneously transmit two signals at maximum output power:
Bluetooth EDR in 2DH5 mode, WLAN 5GHz in 802.11 a20 / 6 Mbps.

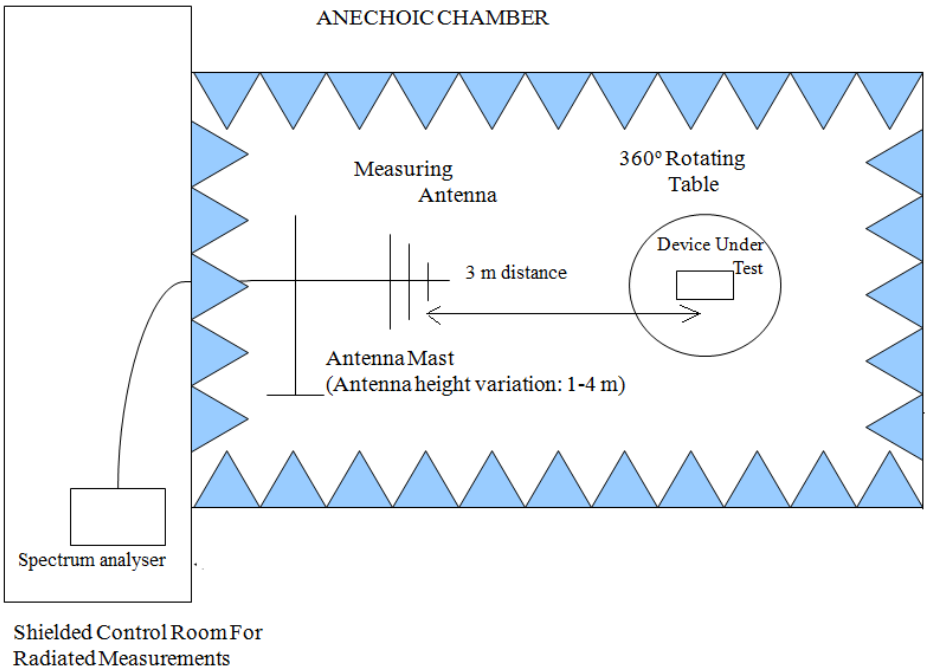
RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the center of the chamber turntable to perform the measurements below 1GHz and The EUT was placed at a height of 1.5 meters above the test chamber floor in the center of the chamber turntable to perform the measurements above 1GHz. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

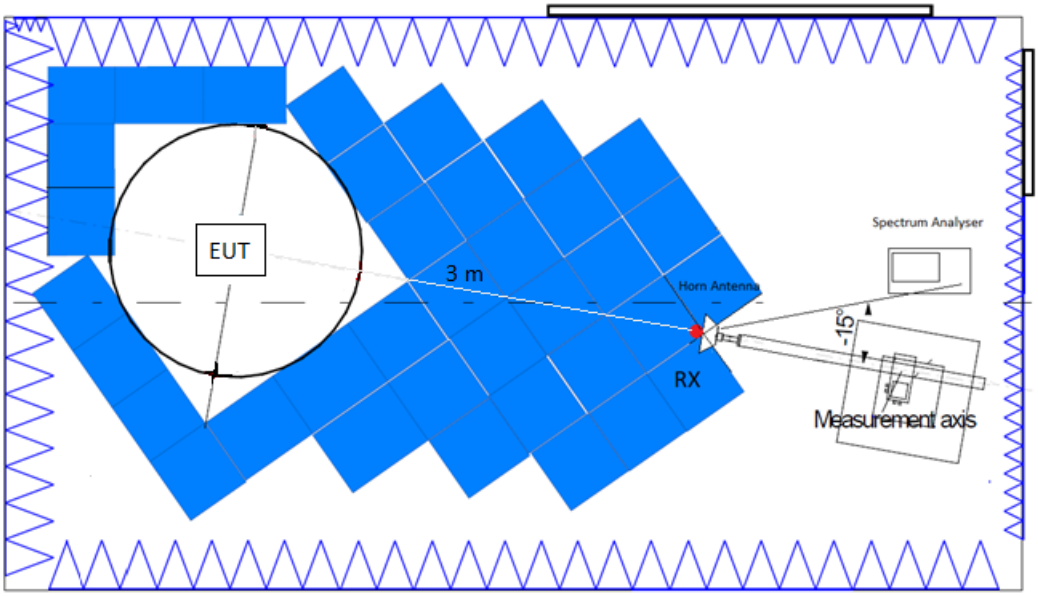
Measurements were made in both horizontal and vertical planes of polarization.

The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor, preamplifier gain (if used) and cable losses.

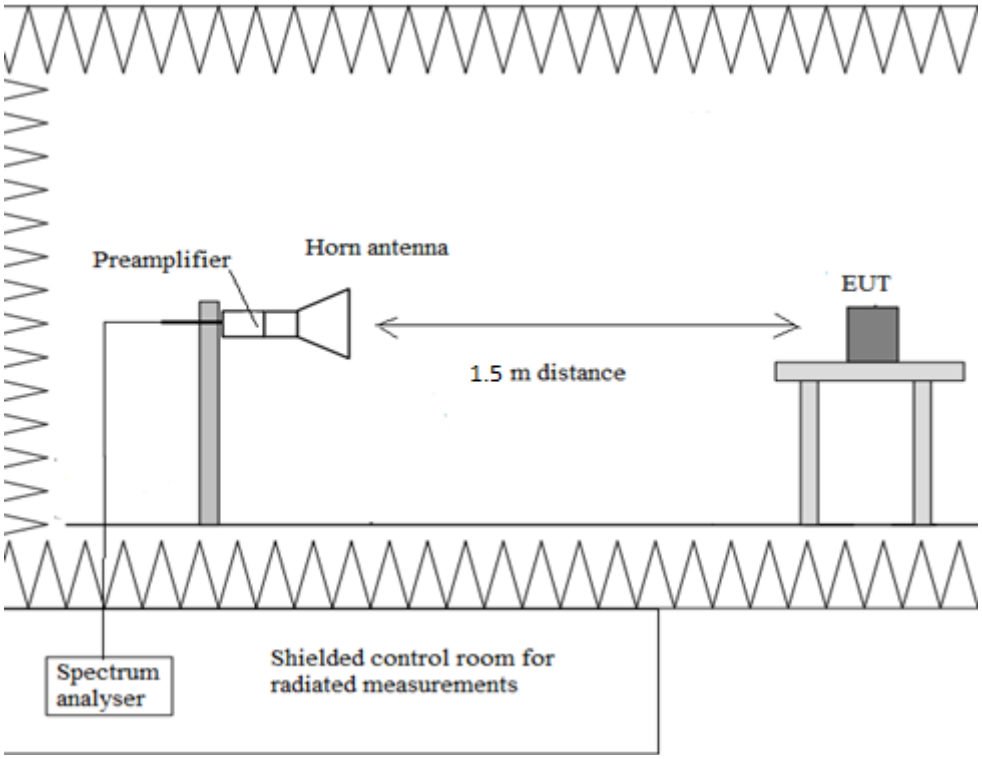
Radiated measurements setup 30 MHz < f < 1 GHz:



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



Radiated measurements setup f > 17 GHz up to 40 GHz:



FCC 15.209 (a), 15.247 (d), 15.407 (b) / RSS-Gen 8.9, RSS-247 5.5, 6.2.1.2, 6.2.2.2, 6.2.3.2 & 6.2.4.2 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 (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	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 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 1.5m for the frequency range 17 GHz-40 GHz and a distance of 3m for frequency range 30MHz-17GHz.

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:

- **Mode Bluetooth EDR, 802.11 b SISO.**

Bluetooth EDR: Low Channel (2402 MHz). PI4DQPSK.
802.11 b SISO: High Channel (2462 MHz), 1Mbps.

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 88 MHz	Quasi-PK	40 dBµV/m
88 MHz to 216 MHz	Quasi -PK	43.5 dBµV/m
216 MHz to 960 MHz	Quasi -PK	46 dBµV/m
960 MHz to 1 GHz	Quasi -PK	54 dBµV/m
1 to 26 GHz	PK	74 dBµV/m(*) (**)
1 to 26 GHz	AVG	54 dBµV/m (**)

(*) Radiated emissions which fall in the non-restricted bands.

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

Frequency range 30 MHz - 1 GHz

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

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

Spurious frequency (MHz)	Emission Level (dBµV/m)	Limit (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
170.553	14.64	43.5	V	Quasi-peak	<± 4.65
287.05	19.12	46	H	Quasi-peak	<± 4.65
362.225	29.68	46	H	Quasi-peak	<± 4.65
425.0325	25.52	46	H	Quasi-peak	<± 4.65
705.6535	25.37	46	H	Quasi-peak	<± 4.65
797.658	29.22	46	H	Quasi-peak	<± 4.65

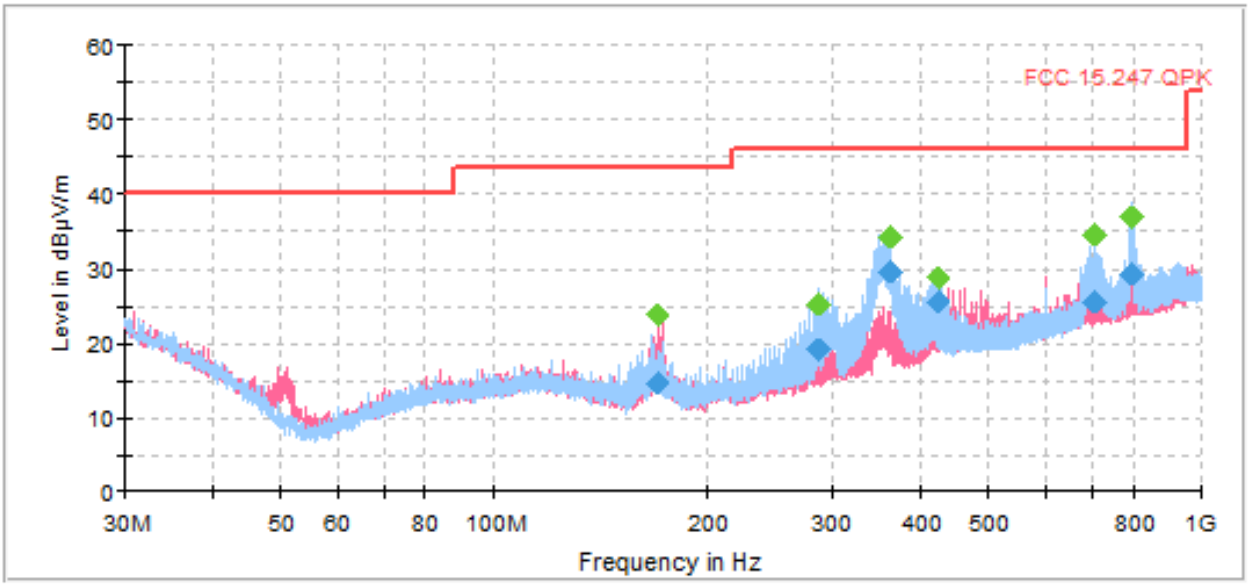
Frequency range 1 - 26 GHz

Spurious frequencies detected closest to the limit:

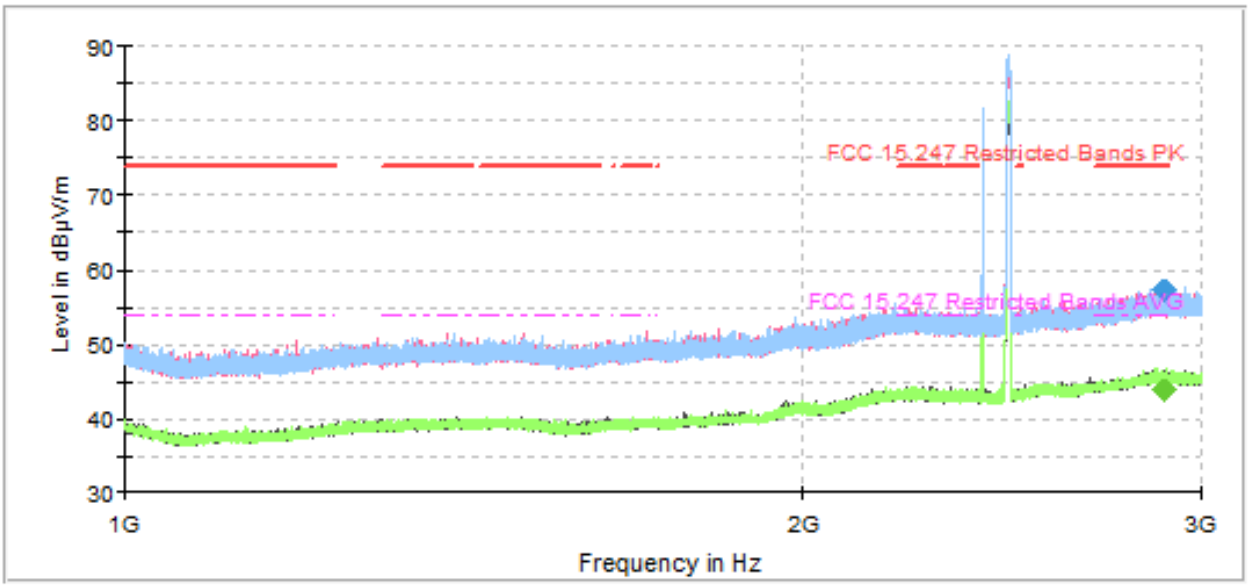
Spurious frequency (GHz)	Emission Level (dBµV/m)	Limit (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
2886.134	57.25	74	V	Peak	<± 3.98
	43.83	54		Average	<± 3.98

Verdict: PASS

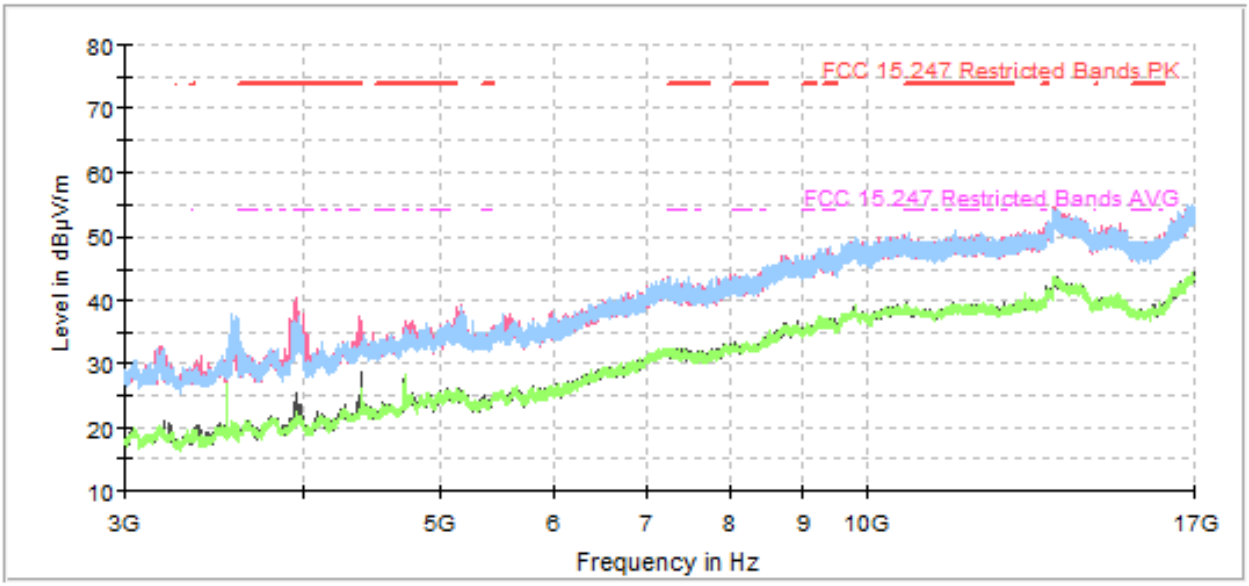
FREQUENCY RANGE 30 MHz - 1 GHz (worst case):

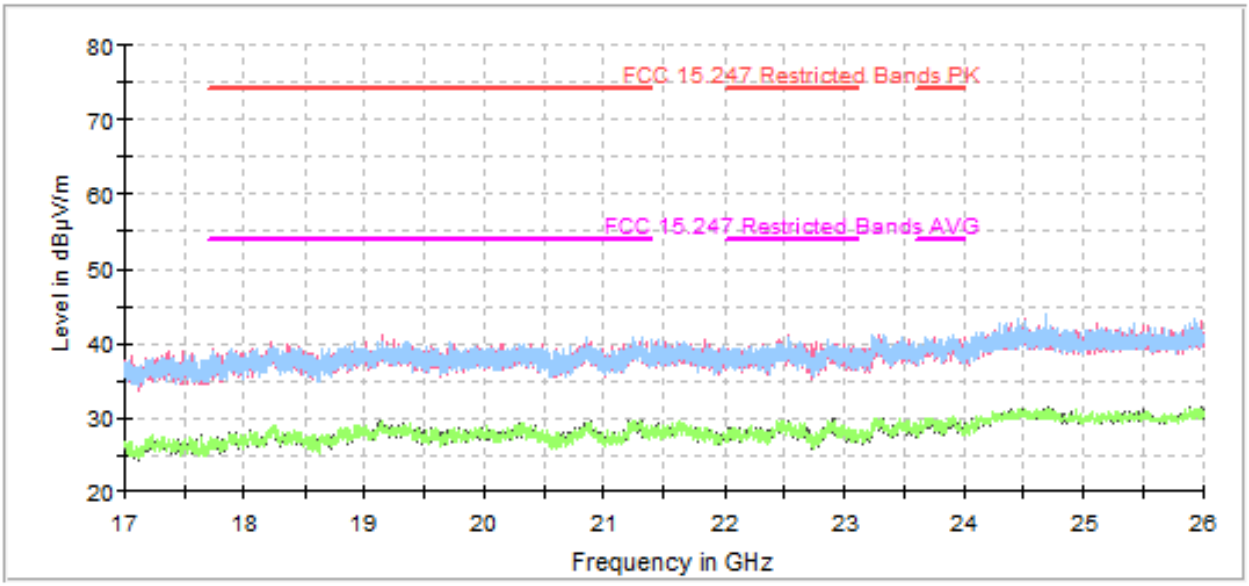


FREQUENCY RANGE 1 – 26 GHz (worst case):



The peaks above the highest limit are the Bluetooth EDR, WLAN 2.4 GHz carrier frequencies.


FCC 15.247 Restricted Bands PK
FCC 15.247 Restricted Bands AVG
Level in dBµV/m
80
70
60
50
40
30
20
10
3G
5G
6
7
8
9
10G
17G
Frequency in Hz


FCC 15.247 Restricted Bands PK
FCC 15.247 Restricted Bands AVG
Level in dBµV/m
80
70
60
50
40
30
20
17
18
19
20
21
22
23
24
25
26
Frequency in GHz

- **Mode Bluetooth EDR, 802.11 a20 U-NII-1 SISO.**

Bluetooth EDR: Mid Channel (2441 MHz). PI4DQPSK.
802.11 a20 SISO: Mid Channel (5200 MHz). 6Mbps.

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 88 MHz	Quasi-PK	40 dBµV/m
88 MHz to 216 MHz	Quasi -PK	43.5 dBµV/m
216 MHz to 960 MHz	Quasi -PK	46 dBµV/m
960 MHz to 1 GHz	Quasi -PK	54 dBµV/m
1 to 26 GHz	PK	74 dBµV/m
26 to 40 GHz	PK	68.23 dBµV/m (*) OR 74 dBµV/m (**)
1 to 40 GHz	AVG	54 dBµV/m (**)

(*) Radiated emissions which fall in the non-restricted bands.

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

Frequency range 30 MHz - 1 GHz

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

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

Spurious frequency (MHz)	Emission Level (dBµV/m)	Limit (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
363.389	26.02	46	H	Quasi-peak	<± 4.65
695.323	26.36	46	H	Quasi-peak	<± 4.65
800.083	31.92	46	H	Quasi-peak	<± 4.65

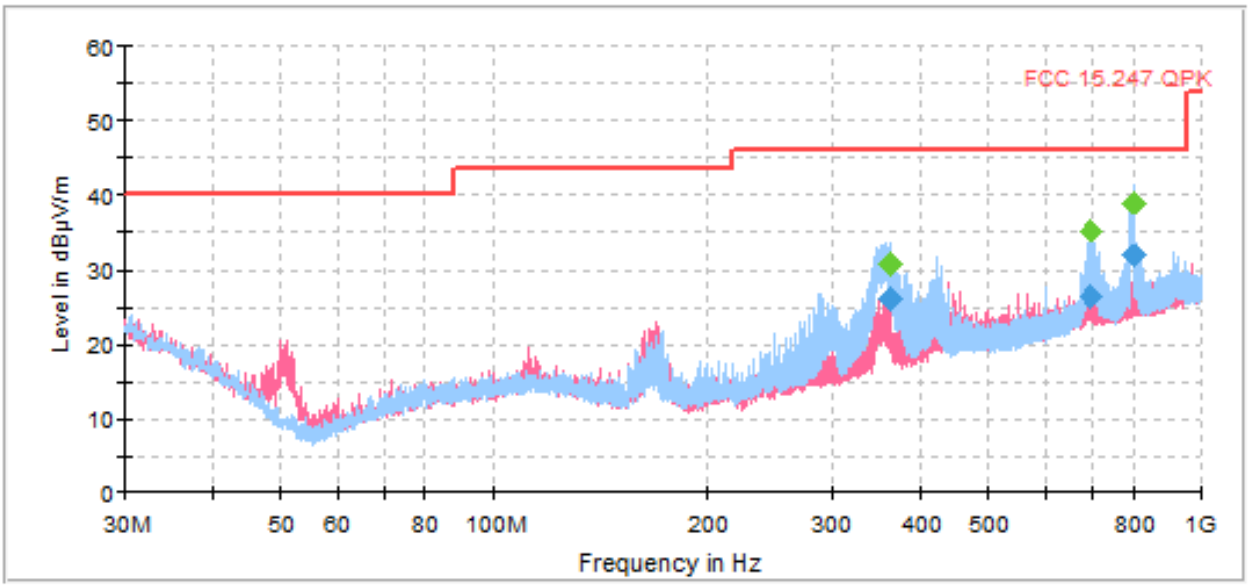
Frequency range 1 - 40 GHz

Spurious frequencies detected closest to the limit:

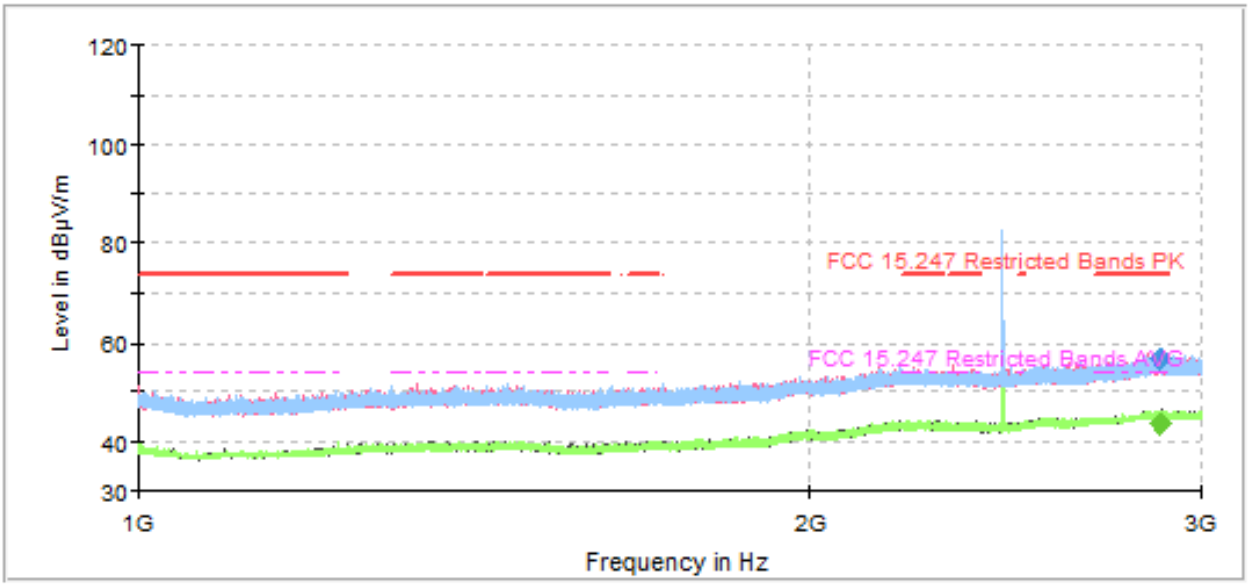
Spurious frequency (GHz)	Emission Level (dBµV/m)	Limit (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
2871.934	56.7	74	V	Peak	<± 3.98
	43.72	54		Average	<± 3.98
4409.571429	45.1	74	V	Peak	<± 4.98

Verdict: PASS

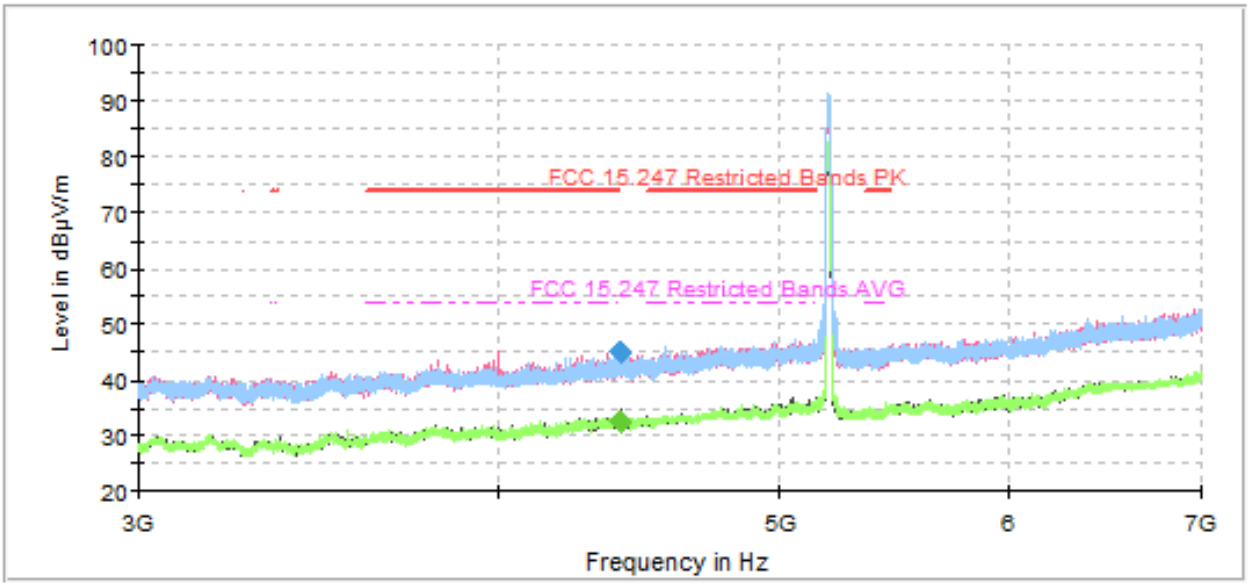
FREQUENCY RANGE 30 MHz - 1 GHz (worst case):



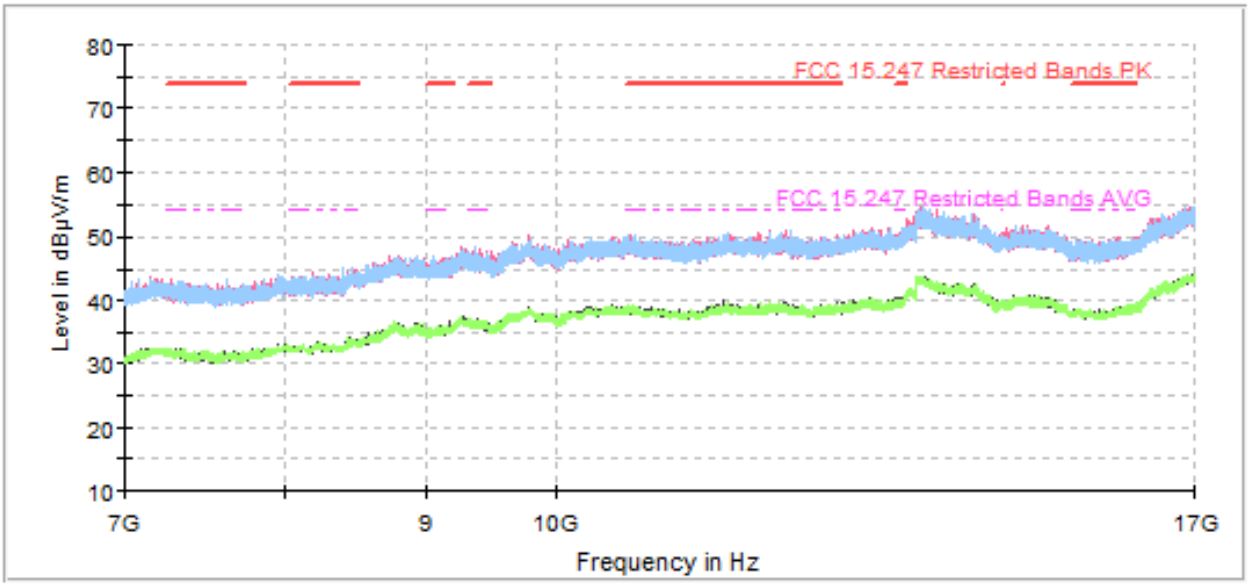
FREQUENCY RANGE 1 – 40 GHz (worst case):

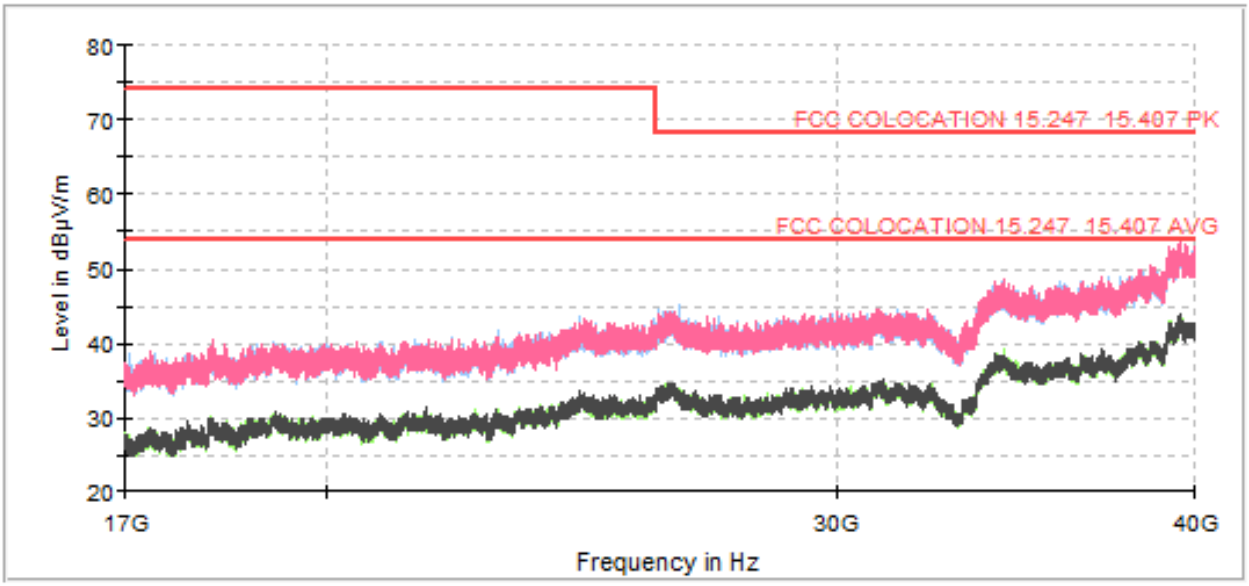


The peak above the highest limit is the Bluetooth EDR carrier frequency.



The peak above the highest limit is the WLAN 5 GHz carrier frequency.




80
70
60
50
40
30
20
Level in dBµV/m
FCC COLOCATION 15.247 -15.407 PK
FCC COLOCATION 15.247- 15.407 AVG
17G
30G
40G
Frequency in Hz

- **Mode Bluetooth EDR, 802.11 a20 U-NII-3 SISO.**

Bluetooth EDR: Middle Channel (2441 MHz). PI4DQPSK.
802.11 a20 SISO: Middle Channel (5785 MHz). 6 Mbps.

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 88 MHz	Quasi-PK	40 dBµV/m
88 MHz to 216 MHz	Quasi -PK	43.5 dBµV/m
216 MHz to 960 MHz	Quasi -PK	46 dBµV/m
960 MHz to 1 GHz	Quasi -PK	54 dBµV/m
1 to 26 GHz	PK	74 dBµV/m
26 to 40 GHz	PK	68.23 dBµV/m (*) OR 74 dBµV/m (**)
1 to 40 GHz	AVG	54 dBµV/m (**)

(*) Radiated emissions which fall in the non-restricted bands.

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

Frequency range 30 MHz - 1 GHz

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

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

Spurious frequency (MHz)	Emission Level (dBµV/m)	Limit (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
357.8115	28.66	46	H	Quasi-peak	<± 4.65
421.88	26.49	46	H	Quasi-peak	<± 4.65
703.4225	24.66	46	H	Quasi-peak	<± 4.65
797.27	30.81	46	H	Quasi-peak	<± 4.65

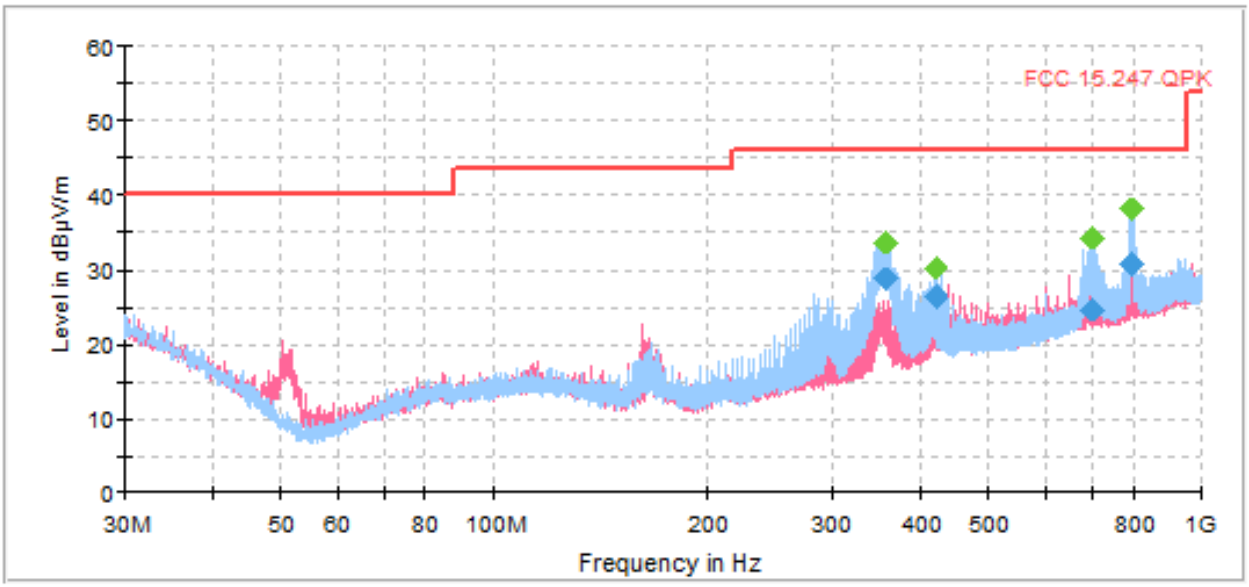
Frequency range 1 - 40 GHz

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

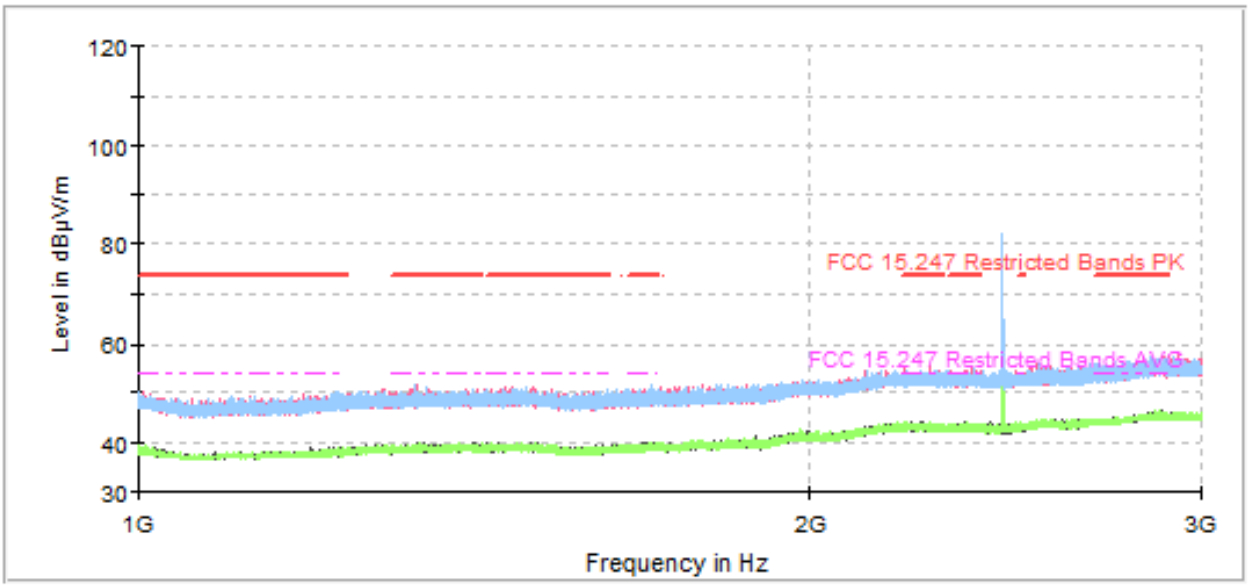
Spurious frequency (GHz)	Emission Level (dBµV/m)	Limit (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
3542	40.5	74	H	Peak	<± 4.98

Verdict: PASS

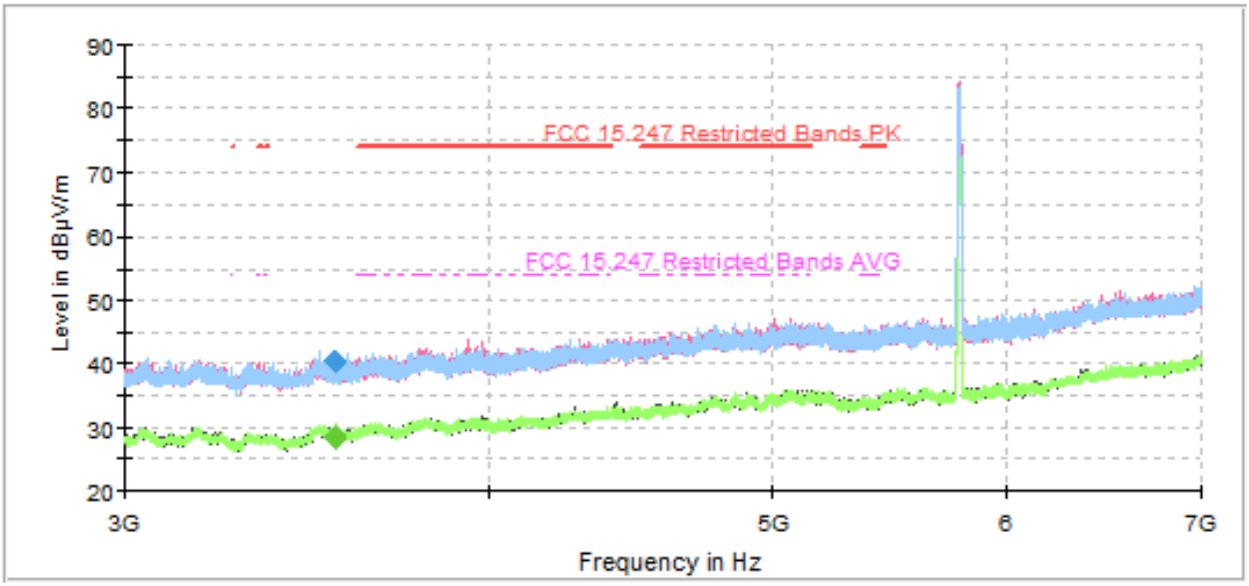
FREQUENCY RANGE 30 MHz - 1 GHz (worst case):



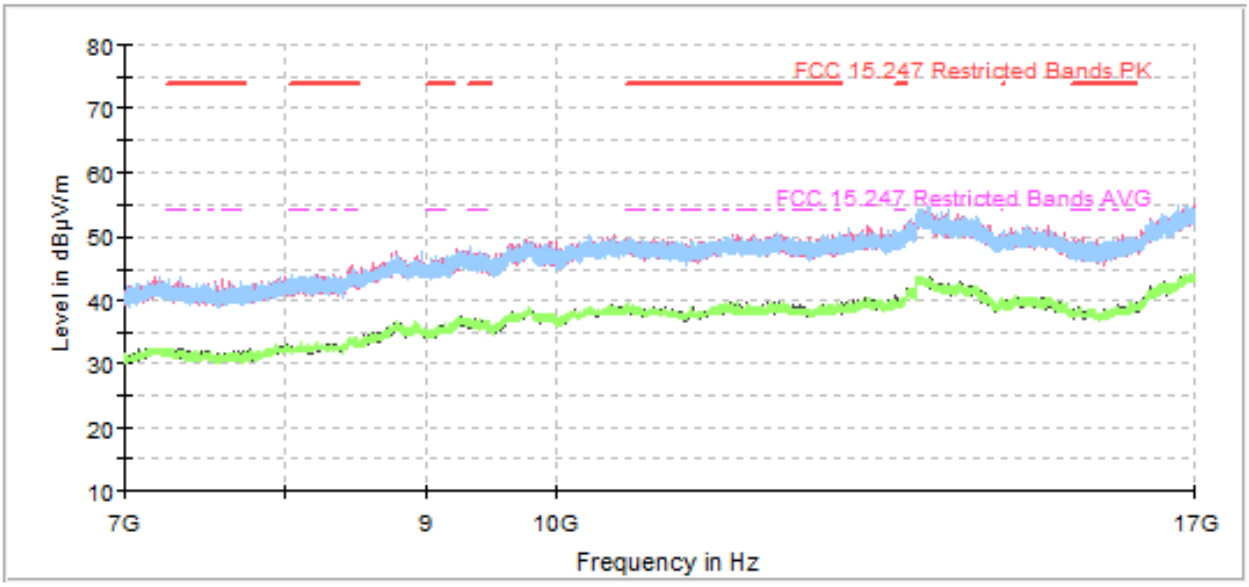
FREQUENCY RANGE 1 – 40 GHz (worst case):

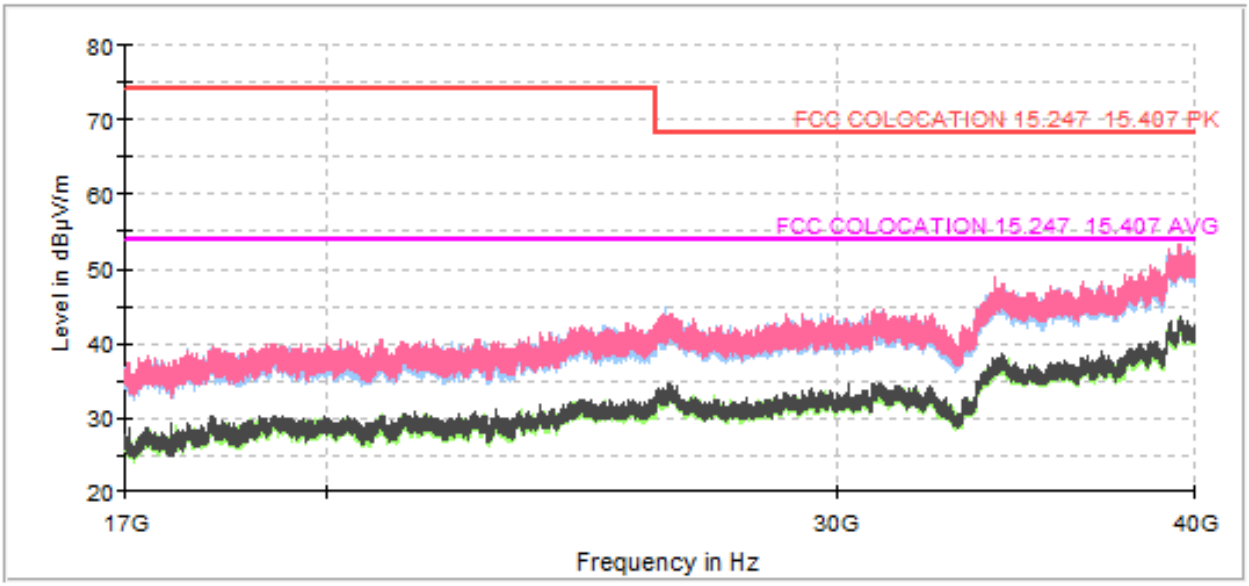


The peak above the highest limit is the Bluetooth EDR carrier frequency.



The peak above the highest limit is the WLAN 5 GHz carrier frequency.




80
70
60
50
40
30
20
Level in dBµV/m
FCC COLOCATION 15.247 -15.407 PK
FCC COLOCATION 15.247- 15.407 AVG
17G
30G
40G
Frequency in Hz