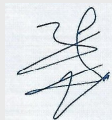


ISED CABid: ES1909
Lab. Company Number: 4621A

Test Report No:
72691RRF.008

Partial Test Report

USA FCC Part 15.31(h), 15.247, 15.407, 15.209
CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Automotive Infotainment System
(*) Trademark	Mercedes-Benz
(*) Model and /or type reference	NTG7Q PREMIUMPLUS LF2
Other identification of the product	FCC ID: 2AOUZNTG7QPRPLF2 IC: 23650-NTG7QPRPLF2
(*) Features	FM/AM/DAB/DVBT, USB, Bluetooth, WLAN, GNSS HW version: D15 SW version: E444.204
Applicant	CONTINENTAL AUTOMOTIVE TECHNOLOGIES GMBH VDO-Strasse 1, 64832 Babenhausen, Germany
Test method requested, standard	USA FCC Part 15.31(h) (10-1-21 Edition): Measurement standards. USA FCC Part 15.407 (10-1-21) Edition: Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements. 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 2 (February 2017). 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. 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. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices. - Transmitter out of band radiated emissions with simultaneous transmissions.
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	2023-08-03
Report template No.	FDT08_24 (*) "Data provided by the client"

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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 is an FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification 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.

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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 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 $\leq \pm 5.01$ 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 $\leq \pm 4.22$ dB (with factor $k = 2$).

The total uncertainty of the measurement system for the radiated emissions of EUT from 17 GHz to 26.5 GHz is:
Measurement uncertainty $\leq \pm 4.71$ dB (with factor $k = 2$).

The total uncertainty of the measurement system for the radiated emissions of EUT from 26.5 GHz to 40 GHz is:
Measurement uncertainty $\leq \pm 4.92$ 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 of the model NTG7Q PREMIUMPLUS LF2 is an Automotive head unit to be installed in cars with the following features: FM/AM/DAB/DVBT, USB, Bluetooth, WLAN and GNSS.

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.

Id	Control Number	Description	Model	Serial N°	Date Reception	of	Application
S/01	72691_014.1	Automotive Infotainment System	NTG7Q PREMIUMPLUS LF2	COM620PB003702	24-05-2023		Element Under Test
S/01	72691L_2.1	Harness Small	--	---	2023-05-18		Auxiliary Element
S/01	74915_32.1	4 way cable-Fraka connector	--	--	2023-03-07		Auxiliary Element

Notes referenced to samples during the project:

Id	Type
S/01	Radiated tests.

Test sample description

Ports.....:	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	Car Connector A		>3m	☒	☐	☐	
	Car Connector B		>3m	☒	☐	☐	
	Display Connector DID/PIP/RVC		>3m	☒	☒	☐	
	USB Connector		<3m	☒	☒	☐	
	Eth Connector		1,82 m	☒	☐	☐	
	BT/WLAN-Antenna		>3m	☒	☒	☐	
Supplementary information to the ports.....:	GNSS						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐ AC:	☐	☐	☐	☐	☐	
☒ DC:	12V car battery / attenuator (9.5-15.5 V normal operation)						
Rated Power.....:	12V						
Clock frequencies.....:	See schematics						
Other parameters	See technical description						
Software version.....:	E444.204						
Hardware version	D15						
Dimensions in cm (W x H x D) ...:	182 x 78 x 160 mm						
Mounting position	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Automotive Infotainment Head Unit					
Modules/parts.....:	Module/parts of test item		Type		Manufacturer		
	N/A		-		-		
Accessories (not part of the test item)	Description		Type		Manufacturer		
	Display		-		L.G.		
	HARM Neco RasPi / headless		-		HBAS		
	Cable harness		-		HBAS		
	BT/WLAN-Antenna		-		Hirschmann		
Documents as provided by the applicant	Description		File name		Issue date		
	Technical Description		Technical Description NTG7Q_A20 200717 SOP2 AllVariant_NXP DRAFT.pdf		A20		
	Test set-up instruction		NTG7QTest setupScript_230313_v3 4.pdf		v3		

Identification of the client

CONTINENTAL AUTOMOTIVE TECHNOLOGIES GMBH
VDO-Strasse 1, 64832 Babenhausen, Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2023-06-22
Date (finish)	2023-06-23

Document history

Report number	Date	Description
72691RRF.008	2023-08-03	72691RRF.008

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: Álvaro Gutiérrez.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
6165	EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2023-11-08
4657	HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2026-06-12
4578	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2026-06-01
8856	PRE-AMPLIFIER G>30dB 18-40GHz	BLMA 1840-4A	BONN ELEKTRONIK	2023-11-02
6142	PRE-AMPLIFIER G>38dB 30MHz-6GHz	BLNA 0360-01N	BONN ELEKTRONIK	2024-06-28
5705	PRE-AMPLIFIER G>40dB 1-18 GHz	BLMA 0118-1M	BONN ELEKTRONIK	2023-07-21
4825	SEMIANECHOIC ABSORBER LINED CHAMBER	FACT 3 200 STP	ETS LINDGREN	N/A
6668	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2024-12-14
4716	SIGNAL AND SPECTRUM ANALYZER 2Hz-50GHz	FSW50	ROHDE AND SCHWARZ	2024-08-12
4848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	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), 15.209 (a), 15.247 (d), 15.407 (b) / RSS-Gen 8.9, RSS-247 5.5, 6.2.1.2, 6.2.4.2: - 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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TEST CONDITIONS11

FCC 15.31 (h), 15.209 (a), 15.247 (d), 15.407 (b) / RSS-Gen 8.9, RSS-247 5.5, 6.2.1.2 & 6.2.4.2

Emission limitations radiated (Transmitter).....15

TEST CONDITIONS

(*): Declared by the Applicant.

POWER SUPPLY (*):

Vnominal: 13.2 Vdc
Type of Power Supply: External DC (vehicle battery).

ANTENNA (*):

802.11 bgn20 SISO:

Type of Antenna: External.
Maximum Declared Antenna Gain: +2.4 dBi.

802.11 a20 / n2040 / ac2040 / ac80 SISO:

Type of Antenna: External.
Maximum Declared Antenna Gain: +2.5 dBi.

RADIOS AND CHANNELS TESTED:

Bluetooth EDR / FHSS		
Mode:	Basic Rate (GFSK - 1DH5)	
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 2462 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	High: 11	2462

WLAN 5 GHz (IEEE 802.11 a20/n2040/ac204080) / U-NII-1		
Mode:	802.11 n40: index MSC0.	
Frequency Range:	5150 MHz to 5250 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 38	5190

	WLAN 5 GHz (IEEE 802.11 a20/n2040/ac204080) / U-NII-3	
Mode:	802.11 A20: index OFDM.	
Frequency Range:	5725 MHz to 5850 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 149	5745

The modulations and channels configured for each technology are the worst-case combinations in terms of spurious emissions, based on preliminary testing.

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:

TESTED SIMULTANEOUS TRANSMISSION MODES:

*** Co-location Bluetooth EDR, WLAN 2.4 GHz, WLAN 5 GHz band U-NII-1**, with the EUT configured to simultaneously transmit two signals at maximum output power:

Bluetooth Basic Rate in 1-DH5 mode, WLAN 2.4 GHz in 802.11 b / 1 Mbps, WLAN 5 GHz band U-NII-1 in 802.11 n / 40 / MCS0.

*** Co-location Bluetooth EDR, WLAN 2.4 GHz, WLAN 5 GHz band U-NII-3**, with the EUT configured to simultaneously transmit two signals at maximum output power:

Bluetooth Basic Rate in 1-DH5 mode, WLAN 2.4 GHz in 802.11 b / 1 Mbps, WLAN 5 GHz band U-NII-3 in 802.11 A / 20 / OFDM.

RADIATED MEASUREMENTS:

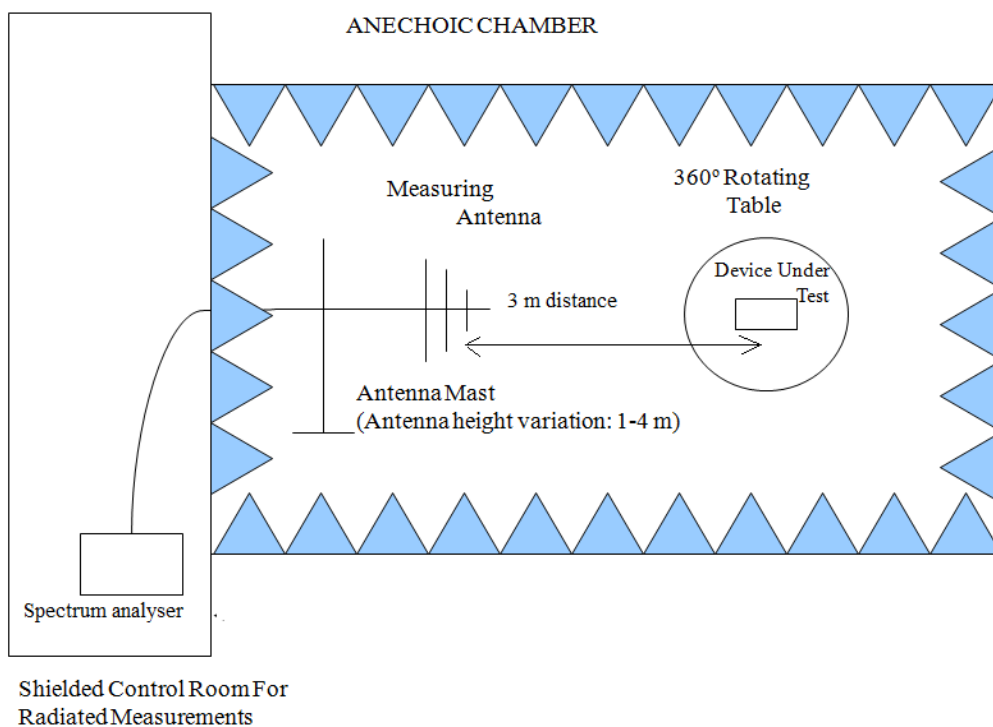
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1 GHz and 1 GHz-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1.5 m for the frequency range 17 GHz-40 GHz (17 GHz-40 GHz horn antenna).

For radiated emissions in the range 17 GHz-40 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.

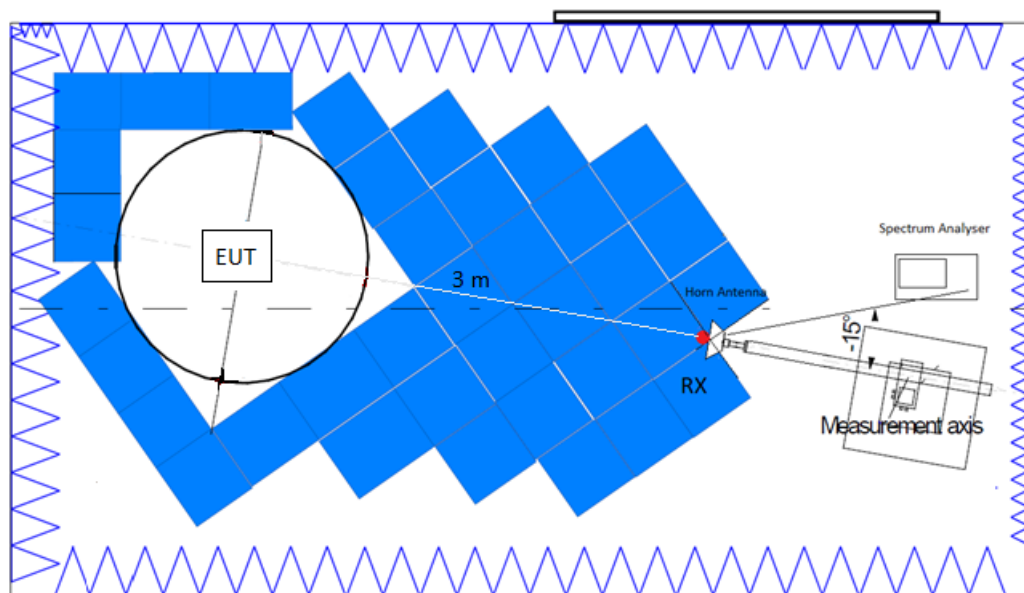
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

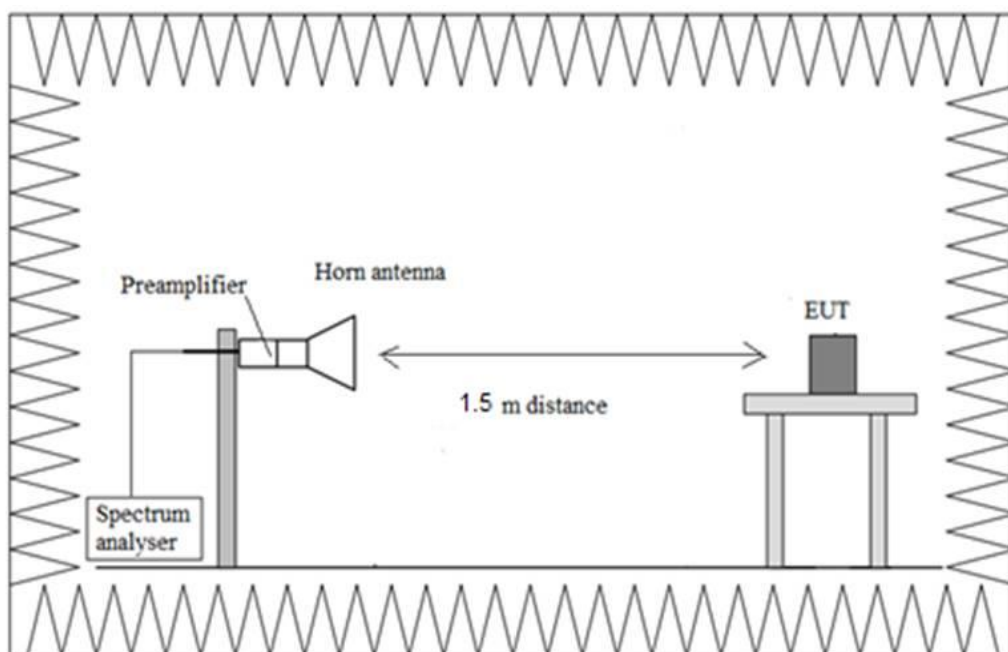
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



FCC 15.31 (h), 15.209 (a), 15.247 (d), 15.407 (b) / RSS-Gen 8.9, RSS-247 5.5, 6.2.1.2 & 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 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-17 GHz and at distance of 1.5 m for the frequency range 17 GHz-40GHz.

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, WLAN 2.4 GHz, WLAN 5 GHz U-NII-1:**

Bluetooth EDR:	Low Channel (2402 MHz). Basic Rate. GFSK.
WLAN 2.4 GHz 802.11 b:	High Channel (2462 MHz). BW: 20 MHz. 1 Mbps.
WLAN 5 GHz U-NII-1 802.11 n40:	Low Channel (5190 MHz). BW: 40 MHz. MCS0.

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-peak	40 dBµV/m
88 MHz to 216 MHz	Quasi-peak	43.5 dBµV/m
216 MHz to 960 MHz	Quasi-peak	46 dBµV/m
960 MHz to 1 GHz	Quasi-peak	54 dBµV/m
1 GHz to 26 GHz	Peak	74 dBµV/m
26 to 40 GHz	Peak	68.23 dBµV/m (*) OR 74 dBµV/m (**)
1 to 40 GHz	Average	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.

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

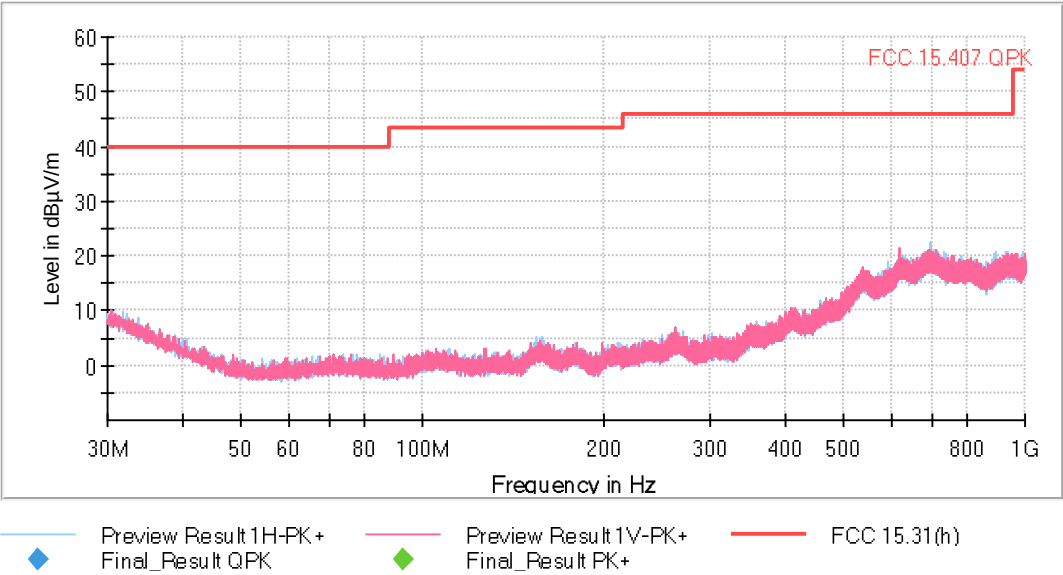
Frequency range 1 - 40 GHz:

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)
10644.665000	53.96	40.40
4999.600000	53.47	40.70
5149.800000	61.69	39.23

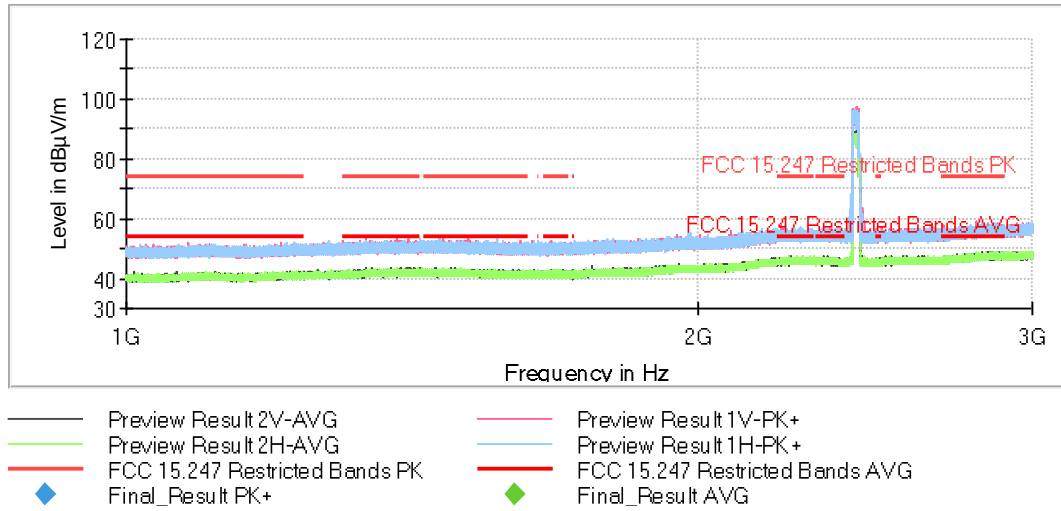
Verdict: PASS

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	30.312 kHz	PK+	100 kHz	1 s	0 dB
1 - 6.5 GHz	100 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
6.5 - 17 GHz	105 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
17 - 26 GHz	300 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
26 - 40 GHz	766.667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

FREQUENCY RANGE 30 MHz - 1 GHz:



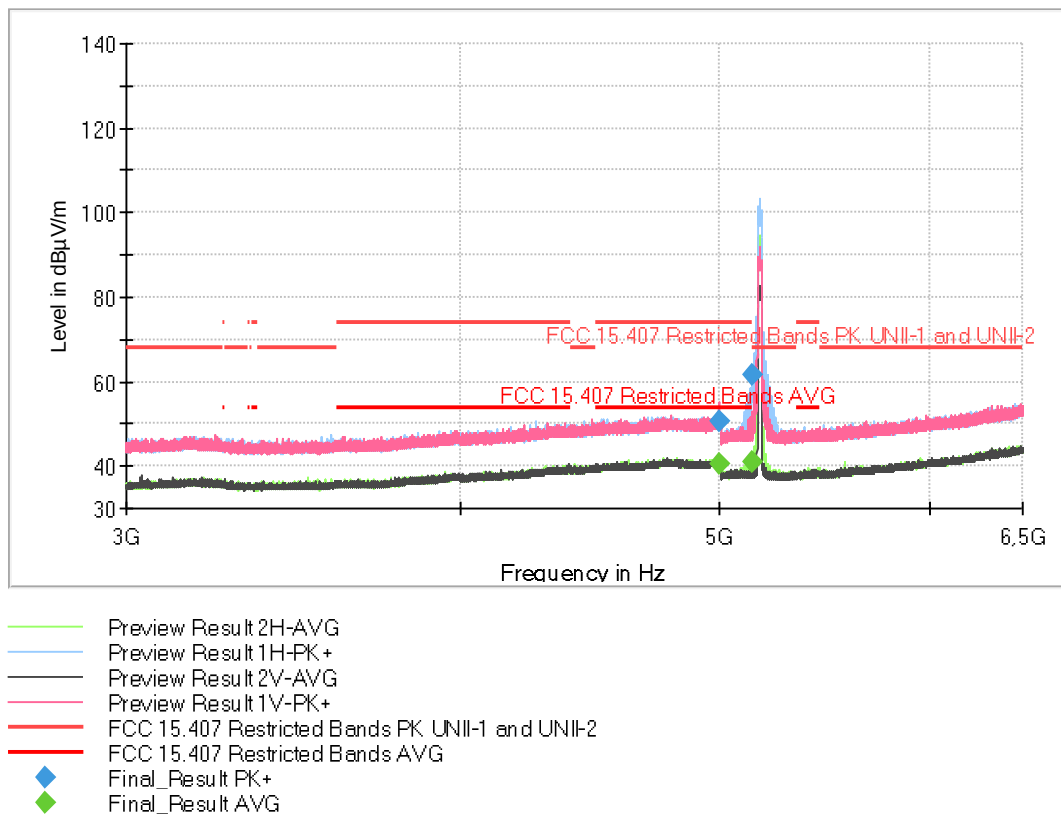
FREQUENCY RANGE 1 - 3 GHz:



The peak above the limit is the WLAN 2.4 GHz carrier frequency.

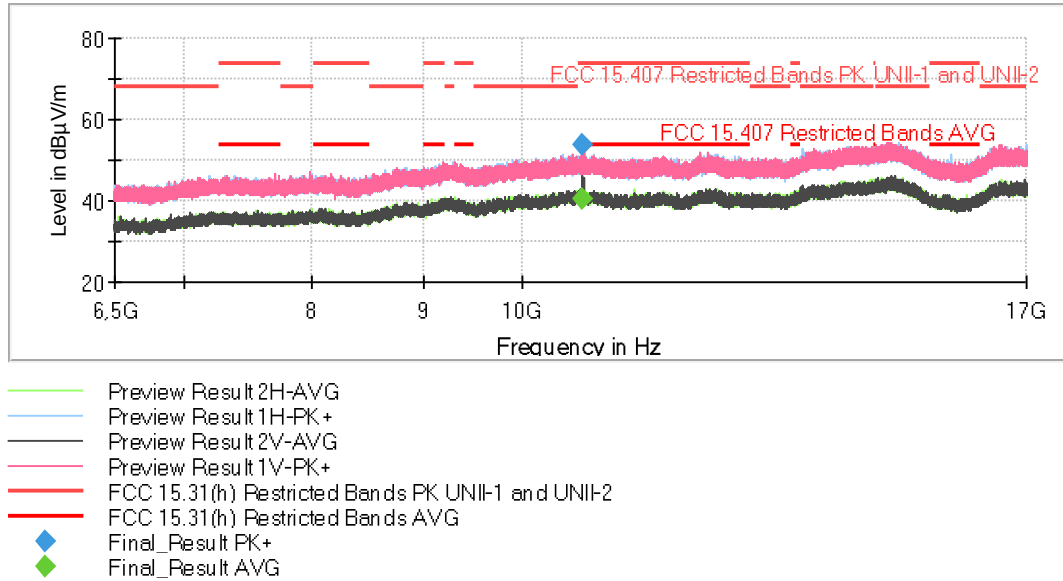
FREQUENCY RANGE 3 - 6.5 GHz:

Full Spectrum

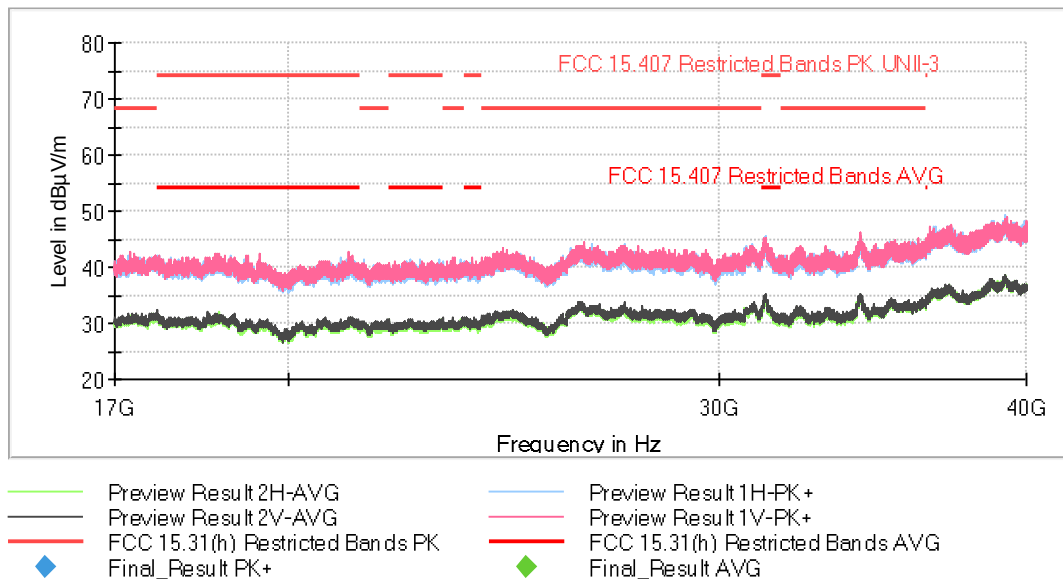


The peak above the highest limit is the WLAN 5 GHz band U-NII-1 carrier frequency.

FREQUENCY RANGE 6.5 - 17 GHz:



FREQUENCY RANGE 17 - 40 GHz:



• **Co-location mode Bluetooth EDR, WLAN 2.4 GHz, WLAN 5 GHz U-NII-3:**

Bluetooth EDR: Low Channel (2402 MHz). Basic Rate. GFSK.
WLAN 2.4 GHz 802.11 b: HighChannel (2462 MHz). BW: 20 MHz. 1 Mbps.
WLAN 5 GHz U-NII-3 802.11 A20: Low Channel (5745 MHz). BW: 20 MHz. OFDM 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-peak	40 dBμV/m
88 MHz to 216 MHz	Quasi-peak	43.5 dBμV/m
216 MHz to 960 MHz	Quasi-peak	46 dBμV/m
960 MHz to 1 GHz	Quasi-peak	54 dBμV/m
1 GHz to 26 GHz	Peak	74 dBμV/m
26 to 40 GHz	Peak	68.23 dBμV/m (*) OR 74 dBμV/m (**)
1 to 40 GHz	Average	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.

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

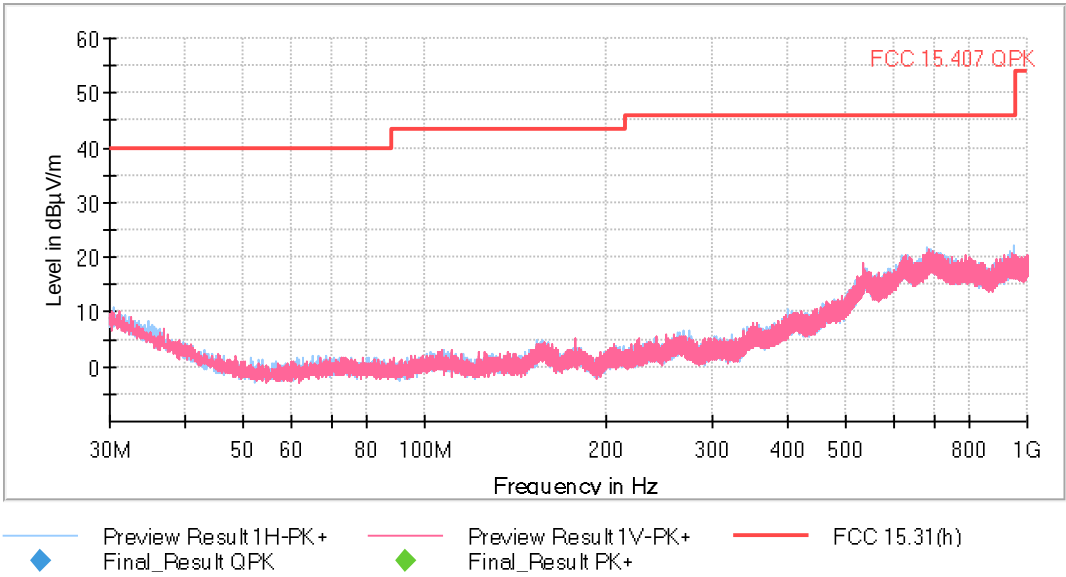
Frequency range 1 - 40 GHz:

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)
4985.500000	52.84	39.88
10643.405000	54.20	41.64

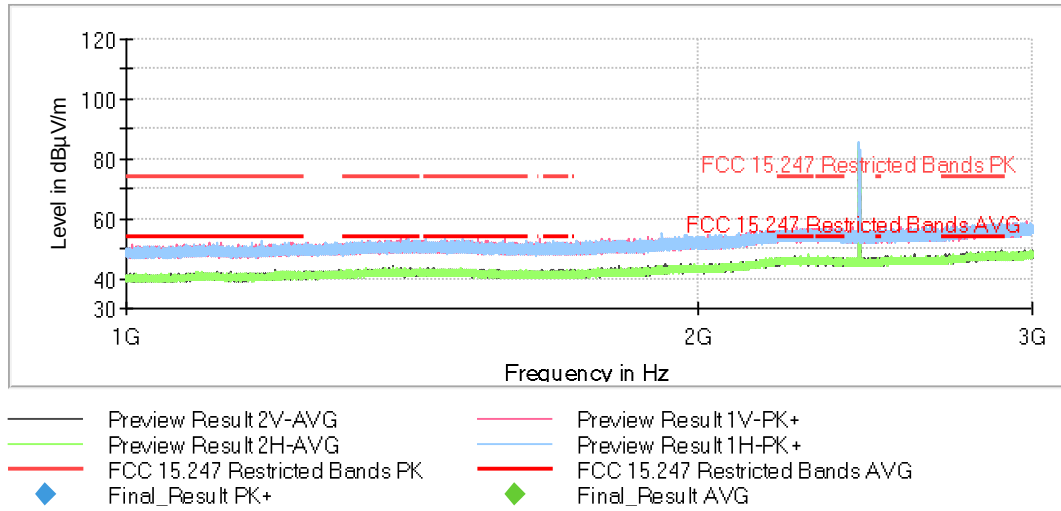
Verdict: PASS

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	30.312 kHz	PK+	100 kHz	1 s	0 dB
1 GHz - 6.5 GHz	100 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
6.5 GHz - 17 GHz	105 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
17 GHz - 26 GHz	300 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
26 GHz - 40 GHz	766.667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

FREQUENCY RANGE 30 MHz - 1 GHz:



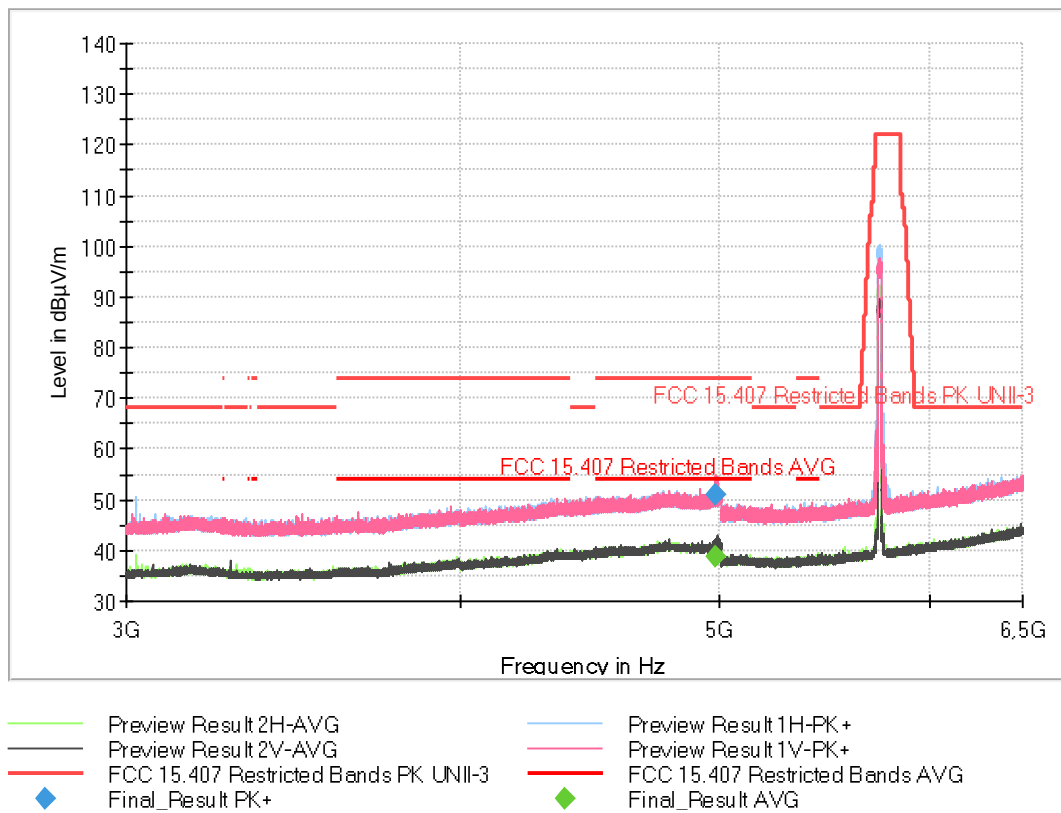
FREQUENCY RANGE 1 - 3 GHz:



The peak above the limit is the WLAN 2.4 GHz carrier frequency.

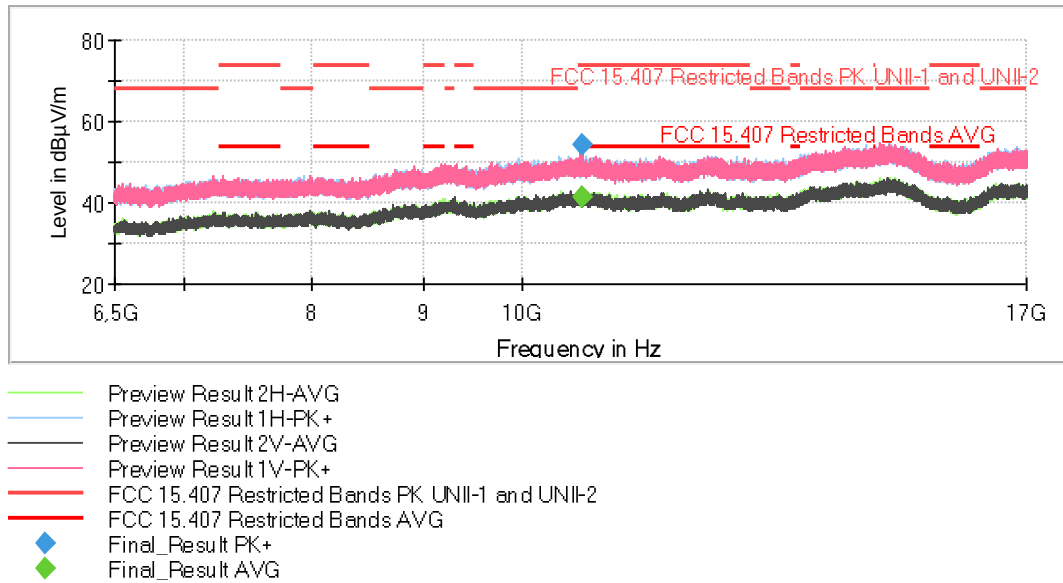
FREQUENCY RANGE 3 - 6.5 GHz:

Full Spectrum



The peak above the highest limit is the WLAN 5 GHz band U-NII-3 carrier frequency.

FREQUENCY RANGE 6.5 - 17 GHz:



FREQUENCY RANGE 17 - 40 GHz:

