

ISED CABid: ES1909

Lab. Company Number: 4621A

Test Report No:

81238RRF.005A1

Partial Test Report

USA FCC Part 15.407, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Automotive infotainment System IDC
(*) Trademark	BMW
(*) Model and /or type reference	IDCEVO-EES25
Other identification of the product	Type variant B506 FCC ID: T8GIDCEVOEES25 IC: 6434A-IDCEVOEES25
(*) Features	HW version: 1.1.7_B506 SW version: 25W10_4_1
Applicant	Harman Becker Automotive Systems GMBH Becker-Goering-STR. 16; 76307 Karlsbad. GERMANY
Test method requested, standard	USA FCC Part 15.407 (10-1-23) Edition: Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements. USA FCC Part 15.209 (10-1-23) Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 4 (July 2025). CANADA RSS-Gen Issue 5 Amendment 2 (February 2021). 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 C63.10-2020 + Cor.1-2023 + C63.10a-2024 + Errata to C63.10a-2024: American National Standard for Testing Unlicensed Wireless Devices.
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	2025-12-15
Report template No	FDT08_26 (*) "Data provided by the client"

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Acronyms

Acronym ID	Acronym Description
Detector	Detector used
Freq	Frequency
Freq Rng	Frequency Range
MP	Measurement Point
Mod	Modulation
Operation Band	Operation Band
Pol	Polarization
Port	Active Port
RU	Resource Unit
Unwanted Freq	Unwanted Emissions Frequency
Unwanted Lvl	Unwanted Emissions Level

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 appropriate scope of accreditation that covers the performed tests in this report.

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.

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.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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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 $\leq \pm 5,35$ 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 $\leq \pm 4,32$ dB with factor ($k = 2$).

The total uncertainty of the measurement system for the radiated emissions of EUT from 17 GHz to 40 GHz is:
Measurement uncertainty $\leq \pm 5,55$ 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 consists of a Automotive infotainment SystemIDC.

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 results. The laboratory is not responsible for such information and it is not covered by accreditation.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	79405_157.1	Headunit (Radio)	IDCEVO- EES25	HBB506S920S69U	2025-04-11	Element Under Test
S/01	79405_10.1	Fakra - 2 Antenna Cable	--	--	2025-01-21	Auxiliary Element
S/01	79405_28.1	Module Circuit Board	--	--	2025-01-21	Auxiliary Element
S/01	79405_29.1	Fakra cable	--	--	2025-01-21	Auxiliary Element
S/01	79405_30.1	Main Harness 800mm	--	--	2025-01-21	Auxiliary Element
S/01	79405_32.1	Ethernet cable	--	--	2025-01-21	Auxiliary Element
S/01	79405_39.1	Adapter Tplink	--	--	2025-01-21	Auxiliary Element

Notes referenced to samples during the project:

Id	Type
S/01	Sample used for Radiated tests

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient⁽³⁾		
			[X]	[X]			
				[X]			
				[X]			
			[X]				
			[X]				
			[X]				
			[X]				
			[X]				
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
		AC:					
		AC:					
	[X]	DC: 12 Vdc					
	DC:						
Rated Power							
Clock frequencies.....							
Other parameters							
Software version		25W10_4_1					

Hardware version	1.1.7_B506		
Dimensions in cm (W x H x D)	200x45x147,5		
Mounting position		Table top equipment	
		Wall/Ceiling mounted equipment	
		Floor standing equipment	
		Hand-held equipment	
	[X]	Other: automotive dashboard	
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

Harman Becker Automotive Systems GMBH
Becker-Goering-STR. 16; 76307 Karlsbad. GERMANY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U. Severo Ochoa 6. 29590 Campanillas (Málaga)
Date (start)	2025-08-05
Date (finish)	2025-08-06

Document history

Report number	Date	Description
81238RRF.005	2025-09-29	First release.
81238RRF.005A1	2025-12-15	Second release. Modification due to typos. This test reports cancels and replaces to 81238RRF.005

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: Rubén Mora Fernandez.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
10304	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2026-10-01
07763	HORN ANTENNA 1-18GHz	BBHA 9120D	SCHWARZBECK MESS-ELEKTRONIK	2026-01-16
07769	PREAMPLIFIER 30dB 500MHz-18GHz	BBV 9718 C	SCHWARZBECK	2026-03-17
08130	SEMIANECHOIC ABSORBER LINED CHAMBER	P29419	ALBATROSS	--
08134	SHIELDED ROOM	P29419	ALBATROSS PROJECTS GMBH	--
04848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	--
07550	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2026-04-23
07549	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2026-04-23

Testing

Testing verdicts

Fail	F
Inconclusive	I
Not applicable	N/A
Not measured	N/M
Pass	P

Summary

Common requirements for all bands

FCC PART 15 PARAGRAPH / RSS-247		
Requirement – Test case	Verdict	Remark
Duty Cycle	N/M	
99% Occupied Bandwidth	N/M	
26 dB Emission Bandwidth (EBW)	N/M	
<u>Supplementary information and remarks:</u> (1) Not required		

U-NII-1 Band: 5.15 - 5.25 GHz

FCC PART 15 PARAGRAPH			
Requirement – Test case		Verdict	Remark
FCC 15.407 (a)(1)(iv)	Transmitter Maximum conducted Output Power	N/A	(1)
FCC 15.407 (a)(1)(iv)	Transmitter Maximum Power Spectral Density	N/A	(1)
FCC 15.407 (b)(1)	Transmitter Out of Band Radiated Emissions	P	
FCC 15.407 (b)(1)	Transmitter Band Edge Radiated Emissions	P	
<u>Supplementary information and remarks:</u> Partial tests apply only			

RSS-247			
Requirement – Test case		Verdict	Remark
RSS-247 7.3.1.2	Transmitter Maximum Conducted Output Power	N/A	(1)
RSS-247 7.3.1.2	Transmitter Maximum Power Spectral Density	N/A	(1)
RSS-247 7.3.1.3	Transmitter Out of Band Radiated Emissions	P	
RSS-247 7.3.1.3	Transmitter Band Edge Radiated Emissions	P	
<u>Supplementary information and remarks:</u> Partial tests apply only			

U-NII-3: 5.725 GHz – 5.85 GHz Band:

FCC PART 15 PARAGRAPH			
Requirement – Test case		Verdict	Remark
FCC 15.407 (e)	6 dB Bandwidth	N/A	(1)
FCC 15.407 (a)(3)(i)	Transmitter Maximum Conducted Output Power	N/A	(1)
FCC 15.407 (a)(3)(i)	Transmitter Maximum Power Spectral Density	N/A	(1)
FCC 15.407 (b)(4)	Transmitter Out of Band Radiated Emissions	P	
FCC 15.407 (b)(4)	Transmitter Band Edge Radiated Emissions	P	
<u>Supplementary information and remarks:</u> Partial tests apply only			

RSS-247			
Requirement – Test case		Verdict	Remark
RSS-247 7.3.4.2	6 dB Bandwidth	N/A	(1)
RSS-247 7.3.4.3	Transmitter Maximum Conducted Output Power	N/A	(1)
RSS-247 7.3.4.3	Transmitter Maximum Power Spectral Density	N/A	(1)
RSS-247 7.3.4.4	Transmitter Band Edge Radiated Emissions	P	
RSS-247 7.3.4.4	Transmitter Out of Band Radiated Emissions	P	
<u>Supplementary information and remarks:</u> Partial tests apply only			

Appendix A: Tests results for the U-NII-1 Band 5.15–5.25 GHz

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TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	12Vdc
Type of Power Supply:	External power supply (Vehicle Battery)

ANTENNA (*):

Type of Antenna:	External
Antenna Gain:	
Port 2: -1.25 dBi	
Port 4: -2.42 dBi	

Directional Antenna Gain Calculations for CDD MIMO In-Band Measurements (for PSD test):

For 2Tx CDD MIMO modes, in accordance with KDB 662911 D01 v02r01 Section F)2)f)(ii) y F)2)e)ii), directional gain, directional gain was calculated as follows:

$$\begin{aligned}
 N_{SS} &= 1, N_{ANT} = 2, G_{ANT0} = -1.25, G_{ANT1} = -2.42 \\
 \text{Directional Gain} &= 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{k=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right] = 10 \log \left[\frac{\sum_{j=1}^1 \left(\sum_{k=1}^2 g_{j,k} \right)^2}{2} \right] \\
 &= 10 \log \left[\frac{(g_{1,1} + g_{1,2})^2}{2} \right] = 10 \log \left[\frac{(10^{\frac{G_1}{20}} + 10^{\frac{G_2}{20}})^2}{2} \right] = 10 \log \left[\frac{(10^{\frac{-1.25}{20}} + 10^{\frac{-2.42}{20}})^2}{2} \right] = 1.2 \text{ dBi}
 \end{aligned}$$

TEST FREQUENCIES (*):

Technology Tested:	WLAN (IEEE 802.11 a,n,ac,ax) 2x2 / U-NII-1	
	802.11 ax HE20: MCS0 to MCS11 MIMO 2x2 – RU	
Setting of cores / ports:	2+4	
Beamforming:	No.	
Frequency Range:	5150 MHz to 5250 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 36	5180

The test set-up was made in accordance to the general provisions of 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:

- Continuously transmitting with a modulated carrier at maximum power in all required channels using the supported data rates/modulations types.

The field strength at the band edges was evaluated for each mode on the lowest and highest channels at the rated power for the channel under test.

For all modes, the EUT was configured in test mode using a software application. The application was used to enable a continuous transmission and to select the test channels as required. The client supplied instructions to configure the EUT. The customer supplied a document containing the setup instructions.

Only it has been requested one mode based on the worst case on the results of test report 79405RRF.006.

RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz 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-26 GHz (17 GHz-40 GHz horn antenna).

For radiated emissions in the range 17 GHz-26 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.

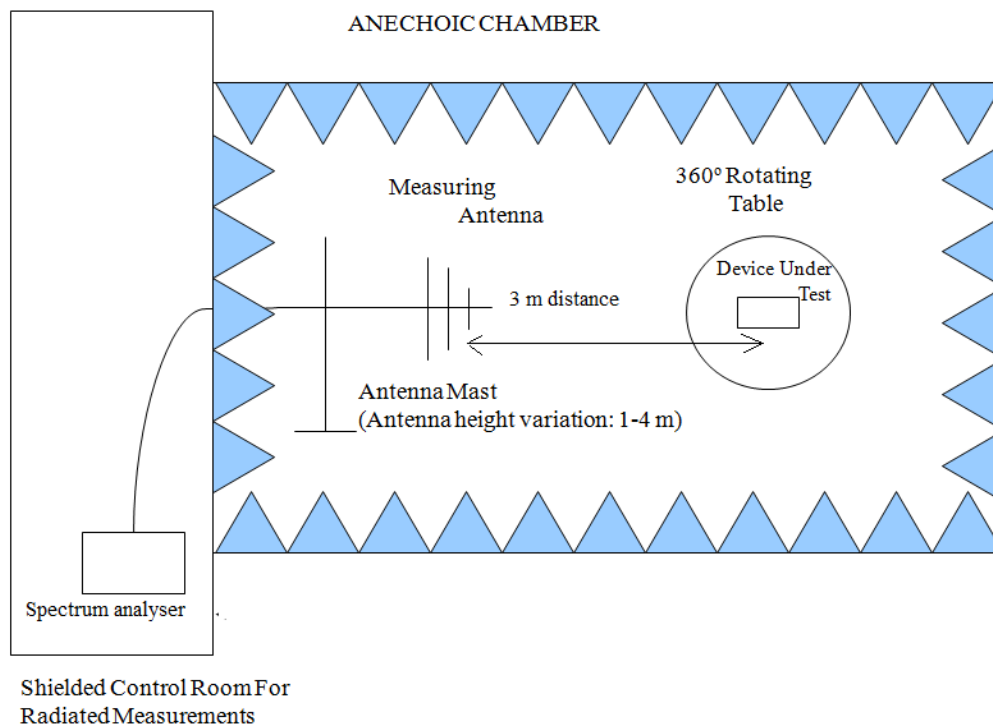
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

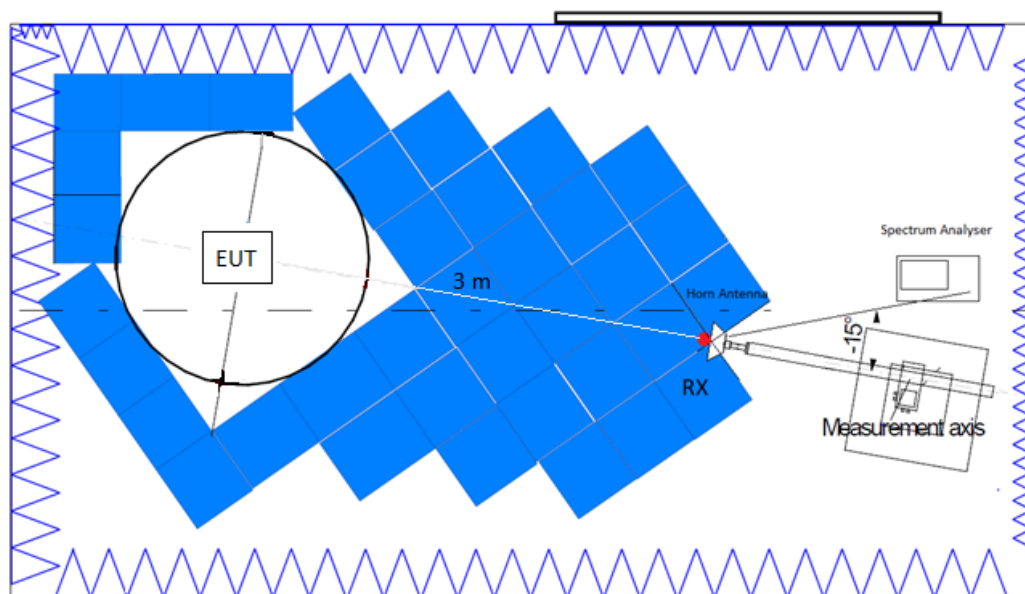
The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor and cable loss.

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.

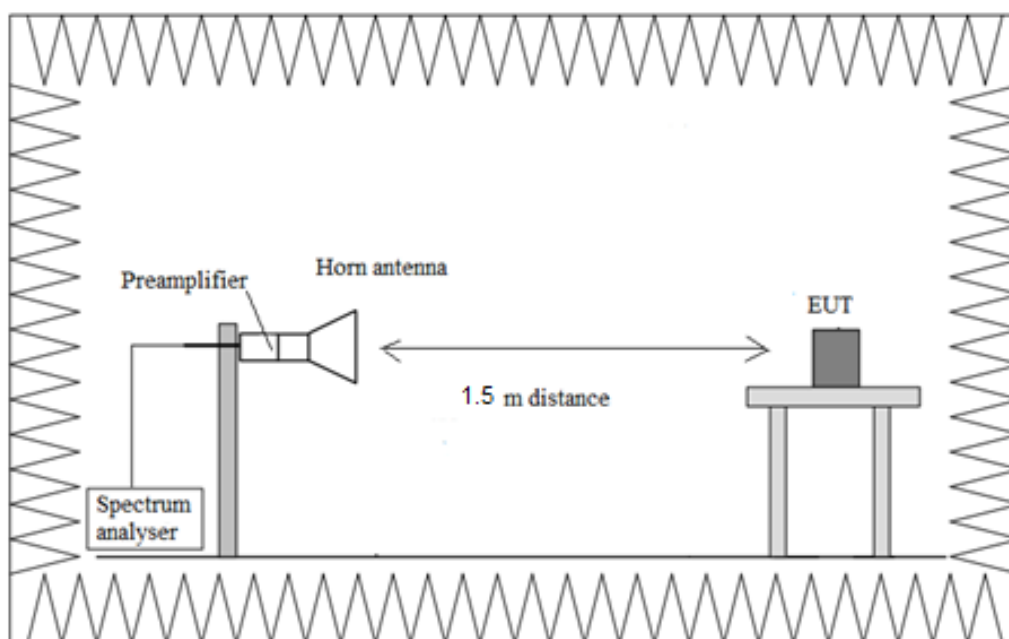
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

FCC 47 CFR Part 15.407 / RSS-247 / RSS-248

RSS-247 6.2.1.2 / FCC 15.407 (b) (1) (6) [Rse] Transmitter Out of Band Radiated Emissions For transmitters operating in the 5.15–5.25 GHz

Limits

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.23 dBμV/m at 3 m distance).

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)	-	300
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.

Results

Modulation: 802.11ax HE20 (OFDMA MCS0)

Operation Band (MHz)	Port	Freq Rng (GHz)	Freq (MHz)	Subcarrier Mode	Unwanted Freq (MHz)	Unwanted Lvl (dBμV/m)	Pol	Detector
[5150, 5250]	1+2	[7, 17]	5180.00000	RU	15514.580333	59.72	H	PK
		15514.580333			43.94	H	AVG	
		[17, 40]			19999.200000	45.51	H	PK
					20719.866667	46.04	V	PK
					25900.233333	48.34	H	PK

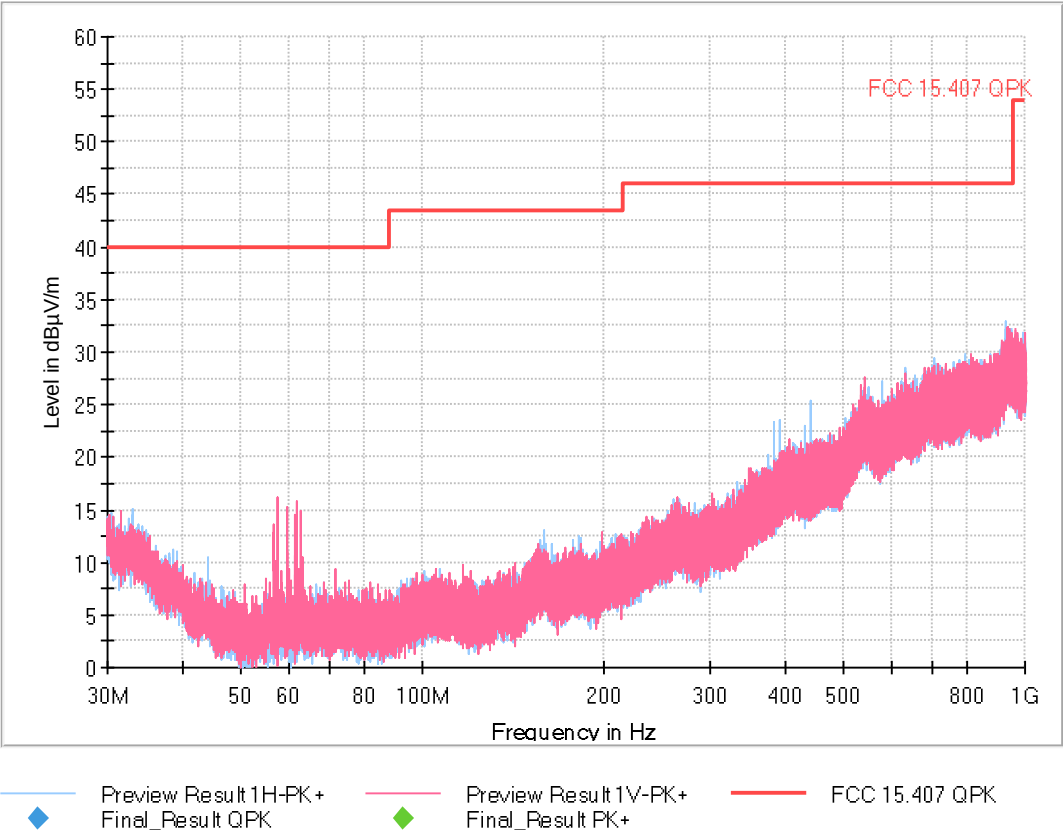
Verdict

Pass

Attachments

Operation Band MHz = [5150, 5250] Active Port = 1+2
Frequency Range GHz = [0.03, 1] Frequency MHz = 5180.00000
Modulation = 802.11ax HE20 (OFDMA MCS0) Subcarrier Mode = RU

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	30 MHz - 1 GHz	4,85 kHz	PK+	100 kHz	1 s	30 dB

Operation Band MHz = [5150, 5250]

Active Port = 1+2

Frequency Range GHz = [1, 7]

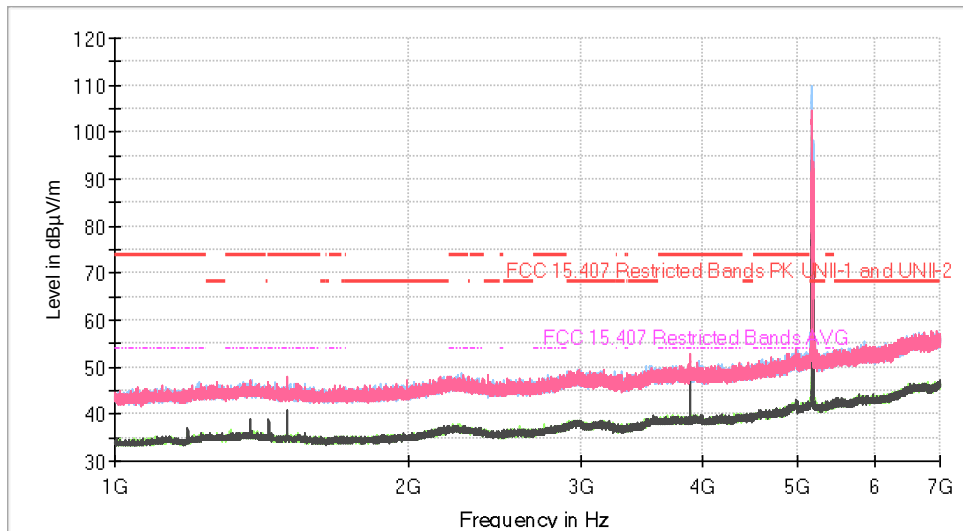
Frequency MHz = 5180.00000

Modulation = 802.11ax HE20 (OFDMA MCS0)

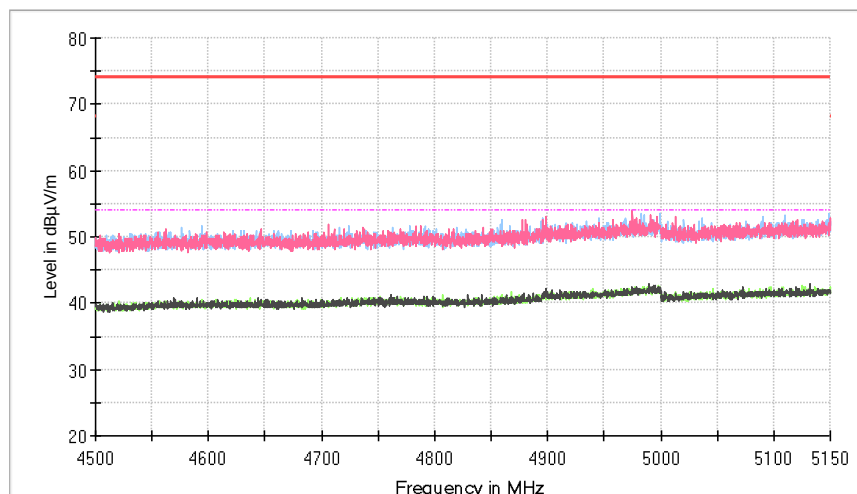
Subcarrier Mode = RU

Images:

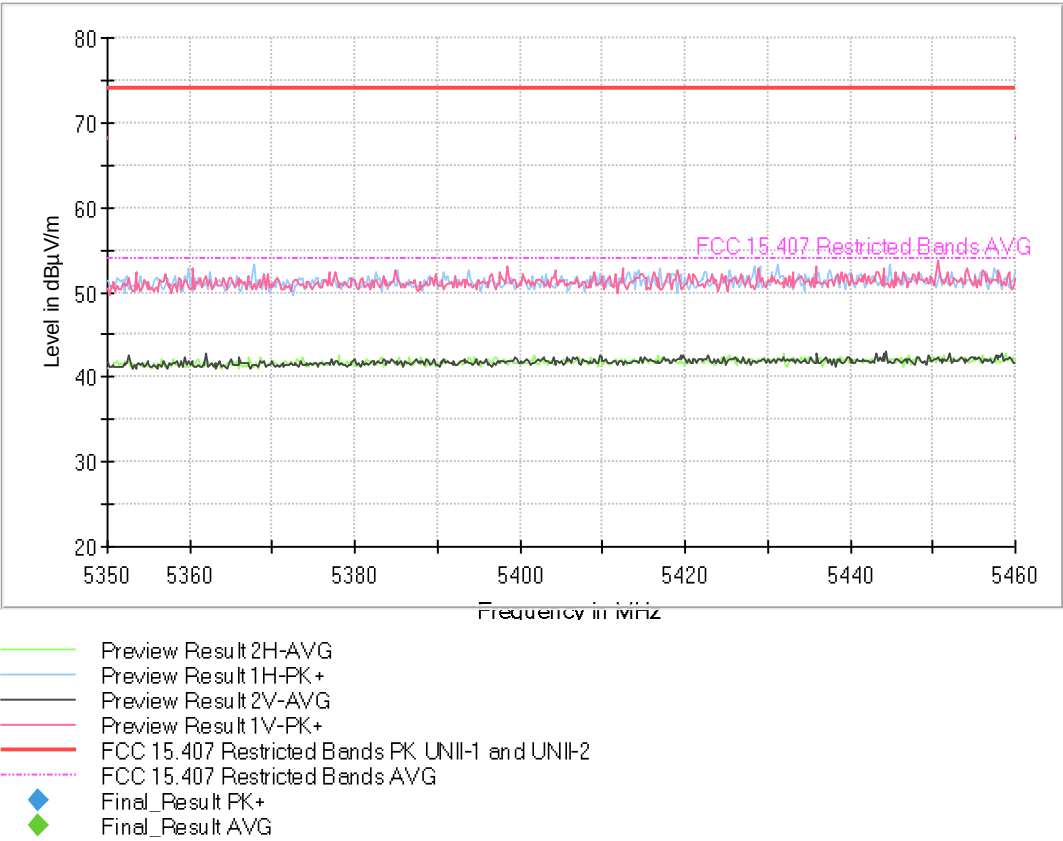
Full Spectrum



- Preview Result 2H-AVG
- Preview Result 1H-PK+
- Preview Result 2V-AVG
- Preview Result 1V-PK+
- FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
- FCC 15.407 Restricted Bands AVG
- Final_Result PK+
- Final_Result AVG



- Preview Result 2H-AVG
- Preview Result 1H-PK+
- Preview Result 2V-AVG
- Preview Result 1V-PK+
- FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
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- Final_Result PK+
- Final_Result AVG

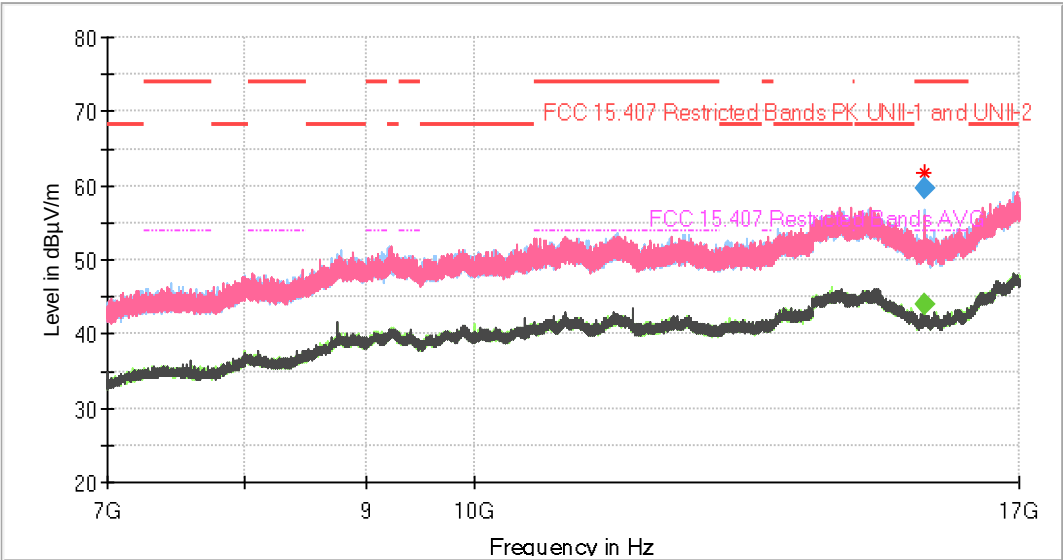


Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	1 GHz - 7 GHz	200 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Operation Band MHz = [5150, 5250] Active Port = 1+2
Frequency Range GHz = [7, 17] Frequency MHz = 5180.00000
Modulation = 802.11ax HE20 (OFDMA MCS0) Subcarrier Mode = RU

Images:



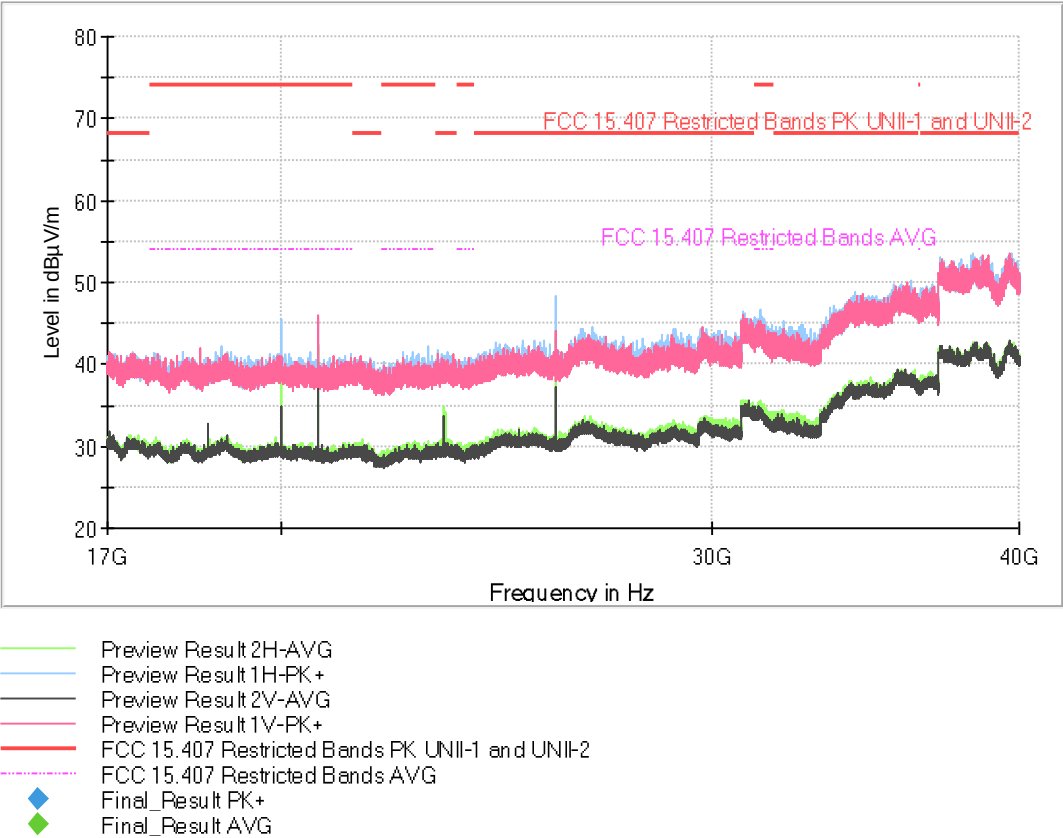
- Preview Result 2H-AVG
- Preview Result 1H-PK+
- Preview Result 2V-AVG
- Preview Result 1V-PK+
- PK+
- AVG
- FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
- FCC 15.407 Restricted Bands AVG
- Final_Result PK+
- Final_Result AVG

Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	7 GHz - 17 GHz	333,333 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Operation Band MHz = [5150, 5250] Active Port = 1+2
Frequency Range GHz = [17, 40] Frequency MHz = 5180.00000
Modulation = 802.11ax HE20 (OFDMA MCS0) Subcarrier Mode = RU

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	17 GHz - 40 GHz	766,667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

RSS-247 7.3.1.3 / FCC 15.407 (b) (1) [Bandedge] Transmitter Out of Band Radiated Emissions for UNII-1

Limits

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.20 dBμV/m at 3 m distance).

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)	-	300
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: Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz.

Frequency range tested for Radiated emissions:

Start frequency: no radiofrequency signal generated in the device found below 10th sub-harmonic, no further investigation required.

Stop frequency: it has been performed the radiated spurious emissions until 10th harmonic.

Results

Modulation: 802.11ax HE20 (OFDMA MCS0)

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

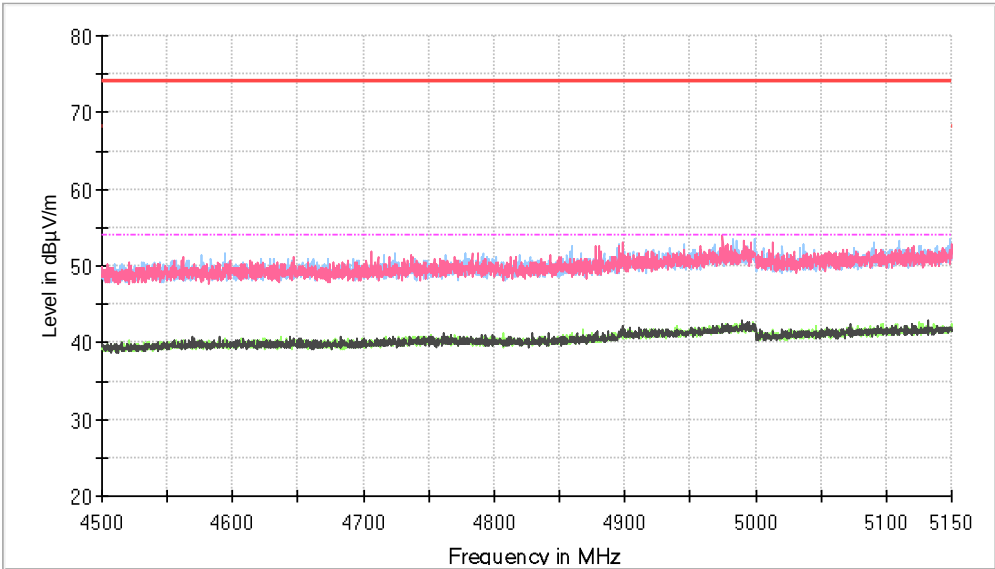
Verdict

Pass

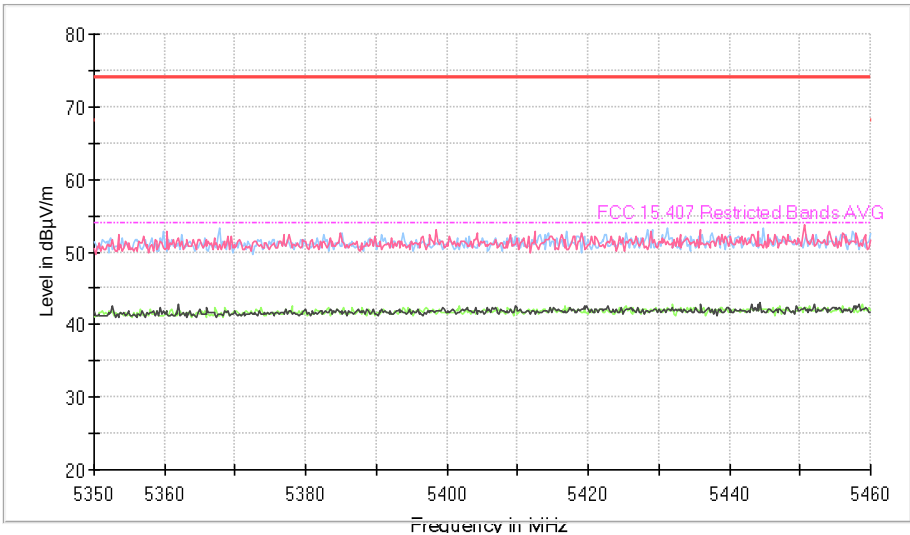
Attachments

Operation Band MHz = [5150, 5250] Active Port = 1+2
Frequency Range GHz = [1, 7] Frequency MHz = 5180.00000
Modulation = 802.11n HT20 (OFDM MCS0) Resource Unit Tone/Index = -

Images:



Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG



Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

Appendix B: Tests results for the U-NII-3 Band 5.725–5.85 GHz

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TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	12Vdc
Type of Power Supply:	External power supply (Vehicle Battery)

ANTENNA (*):

Type of Antenna:	External
Antenna Gain:	
Port 2: -1.25 dBi	
Port 4: -2.42 dBi	

Directional Antenna Gain Calculations for CDD MIMO In-Band Measurements (for PSD test):

For 2Tx CDD MIMO modes, in accordance with KDB 662911 D01 v02r01 Section F)2)f)(ii) y F)2)e)ii), directional gain, directional gain was calculated as follows:

$$\begin{aligned}
 N_{SS} &= 1, N_{ANT} = 2, G_{ANT0} = -1.25, G_{ANT1} = -2.42 \\
 \text{Directional Gain} &= 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{k=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right] = 10 \log \left[\frac{\sum_{j=1}^1 \left(\sum_{k=1}^2 g_{j,k} \right)^2}{2} \right] \\
 &= 10 \log \left[\frac{(g_{1,1} + g_{1,2})^2}{2} \right] = 10 \log \left[\frac{(10^{\frac{G_1}{10}} + 10^{\frac{G_2}{10}})^2}{2} \right] = 10 \log \left[\frac{(10^{\frac{-1.25}{10}} + 10^{\frac{-2.42}{10}})^2}{2} \right] = 1.2 \text{ dBi}
 \end{aligned}$$

TEST FREQUENCIES (*):

Technology Tested:	WLAN (IEEE 802.11 a,n,ac,ax) 2x2 / U-NII-3	
	802.11 ax HE20: MCS0 to MCS11 MIMO 2x2 – RU	
Setting of cores / ports:	2+4	
Beamforming:	No.	
Frequency Range:	5725 MHz to 5850 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	High (165)	5825

The test set-up was made in accordance to the general provisions of 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:

- Continuously transmitting with a modulated carrier at maximum power in all required channels using the supported data rates/modulations types.

The field strength at the band edges was evaluated for each mode on the lowest and highest channels at the rated power for the channel under test.

For all modes, the EUT was configured in test mode using a software application. The application was used to enable a continuous transmission and to select the test channels as required. The client supplied instructions to configure the EUT. The customer supplied a document containing the setup instructions.

Only it has been requested one mode based on the worst case on the results of test report 79405RRF.006.

RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz 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-26 GHz (17 GHz-40 GHz horn antenna).

For radiated emissions in the range 17 GHz-26 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.

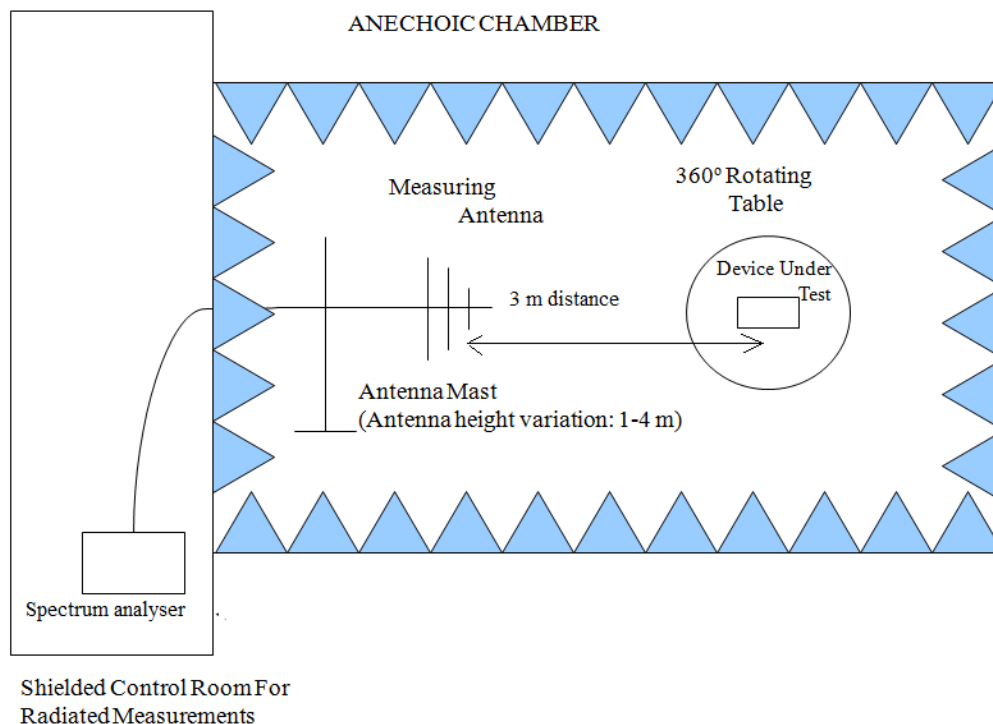
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

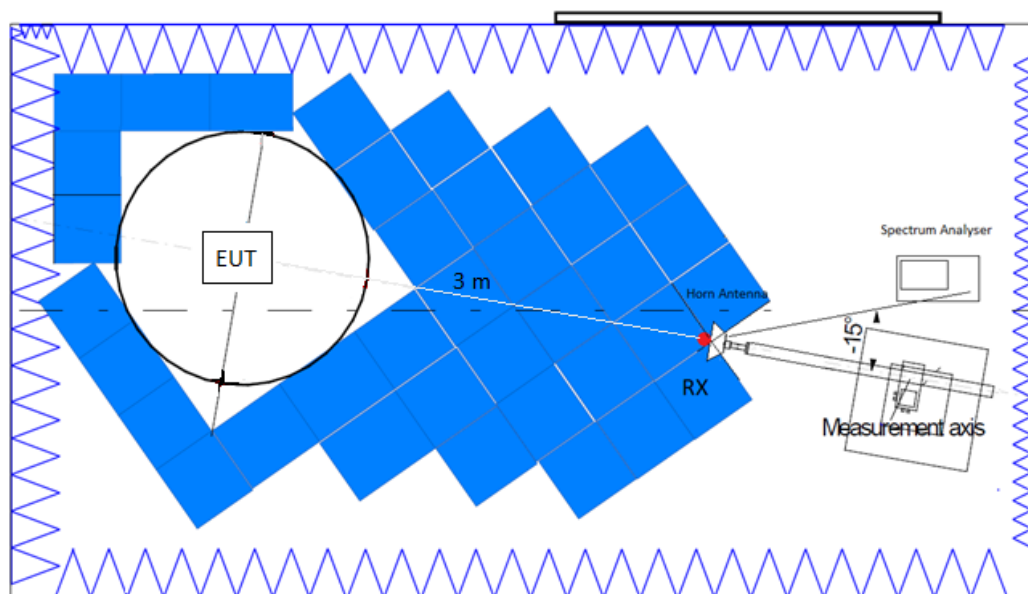
The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor and cable loss.

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.

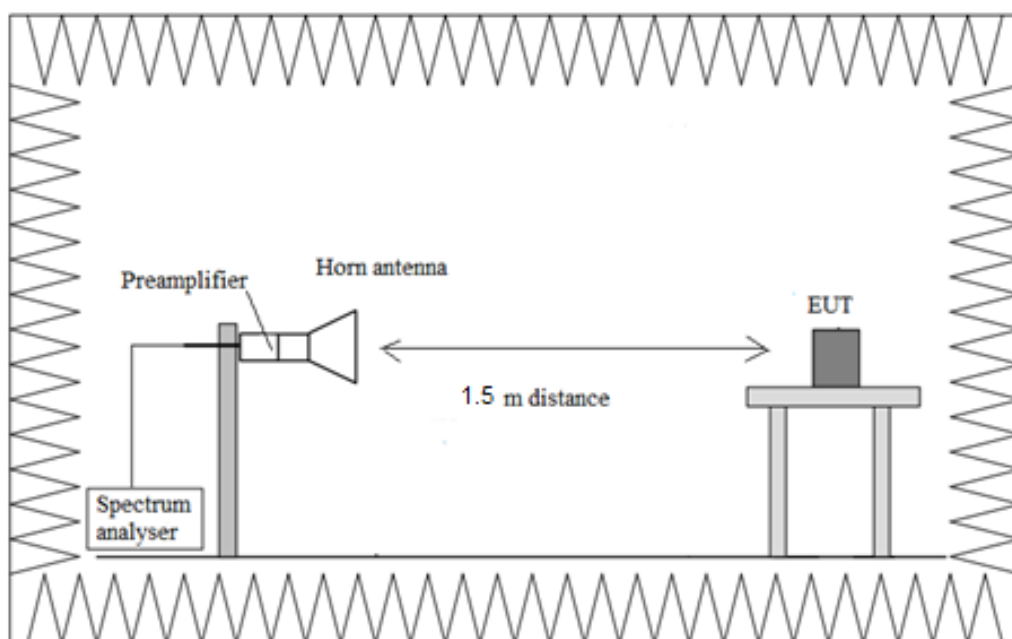
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

FCC 47 CFR Part 15.407 / RSS-247 / RSS-248

RSS-247 7.3.4.4 / FCC 15.407 (b) (4) (6) [Rse] Transmitter Out of Band Radiated Emissions For transmitters operating solely in the 5.725-5.850 GHz band

Limits

FCC 15.407: For transmitters operating in the 5.725–5.85 GHz band: all emissions shall be limited to a level of –27 dBm/MHz (68.23 dBμV/m at 3 m distance) at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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)	-	300
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.

Results

Modulation: 802.11ax HE20 (OFDMA MCS0)

Operation Band (MHz)	Port	Freq Rng (GHz)	Freq (MHz)	Subcarrier Mode	Unwanted Freq (MHz)	Unwanted Lvl (dBμV/m)	Pol	Detector
[5725, 5850]	1+2	[7, 17]	5180.00000	RU	11667.013000	63.99	V	PK
					11667.013000	51.34	V	AVG
					17499.100000	53.27	H	PK
					19999.200000	43.41	H	PK
					23299.700000	48.02	H	PK
					29124.833333	45.15	H	PK

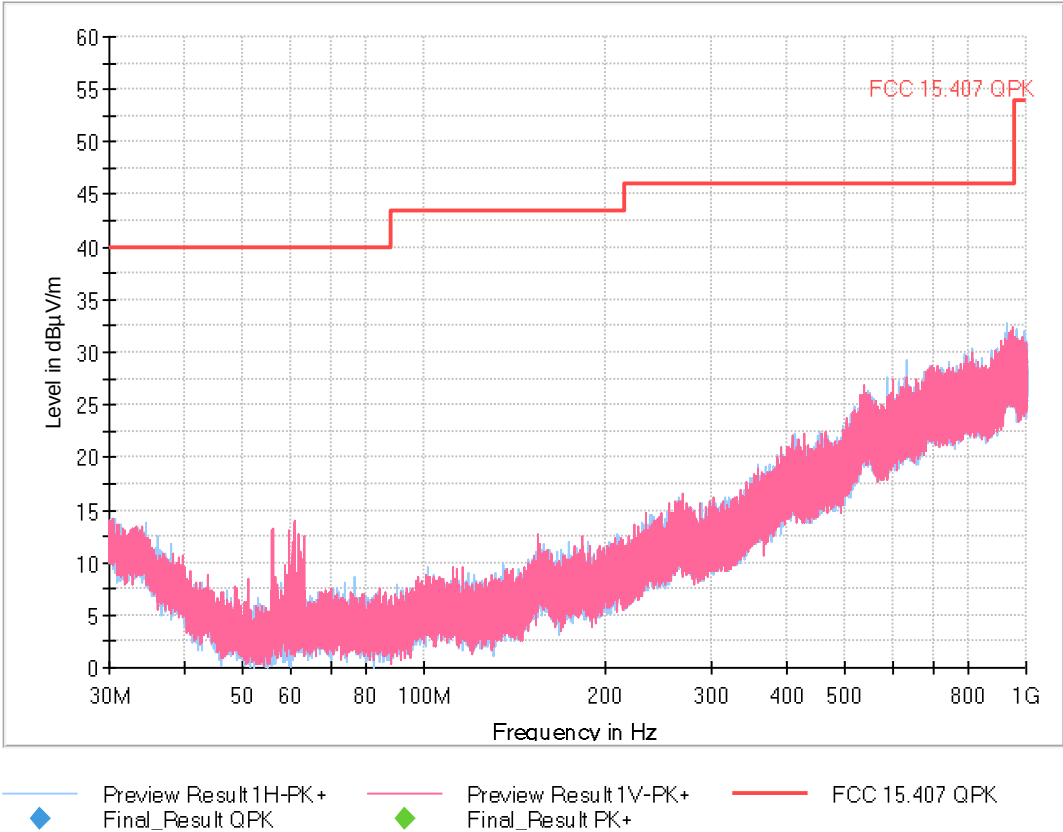
Verdict

Pass

Attachments

Operation Band MHz = [5725, 5850] Active Port = 1+2
Frequency Range GHz = [0.03, 1] Frequency MHz = 5825.00000
Modulation = 802.11ax HE20 (OFDMA MCS0) Subcarrier Mode = RU

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	30 MHz - 1 GHz	4,85 kHz	PK+	100 kHz	1 s	30 dB

Operation Band MHz = [5725, 5850]

Active Port = 1+2

Frequency Range GHz = [1, 7]

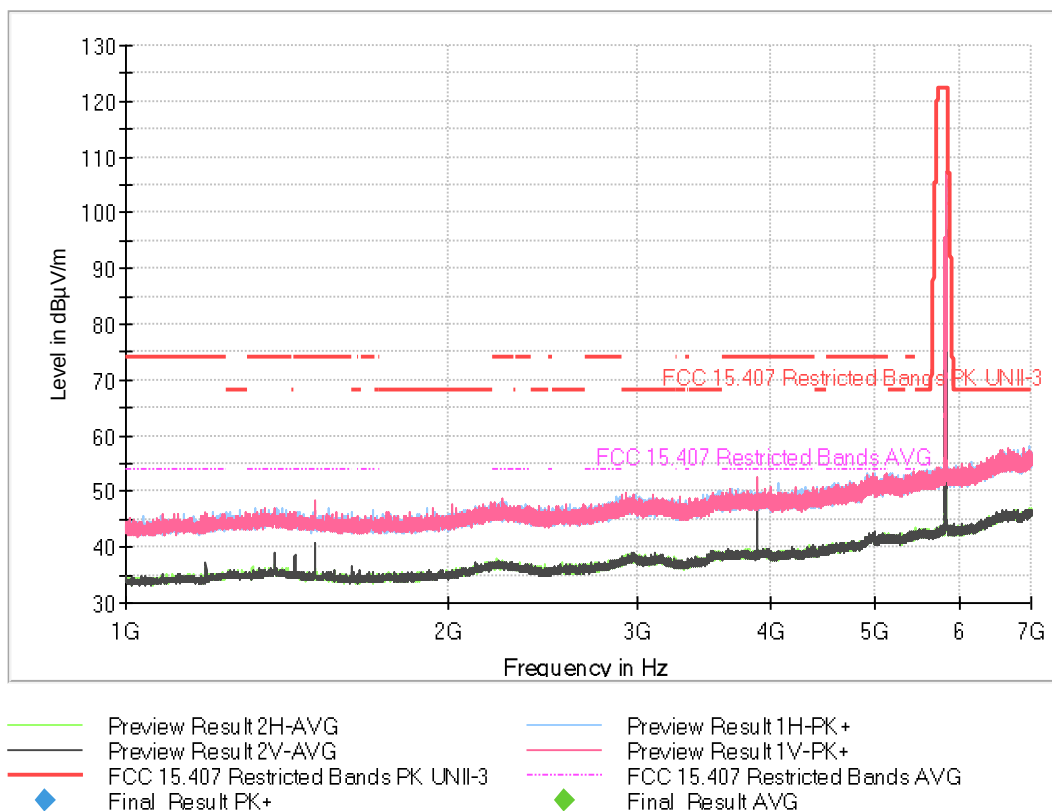
Frequency MHz = 5825.00000

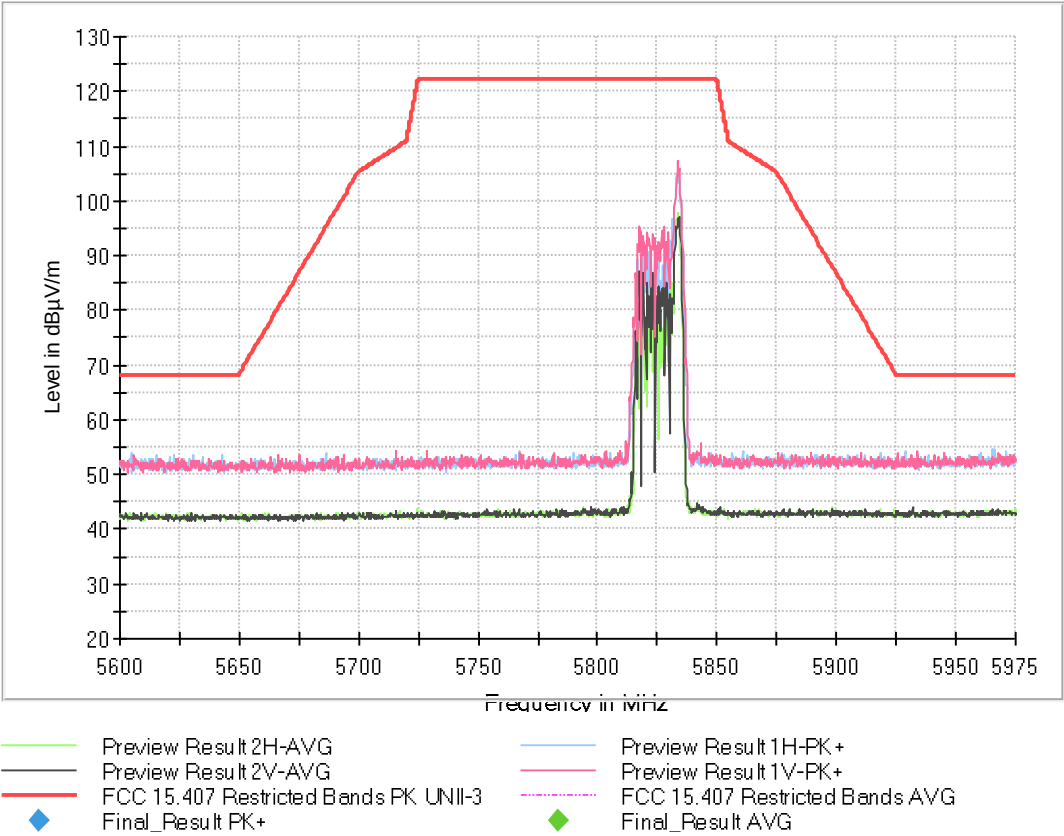
Modulation = 802.11ax HE20 (OFDMA MCS0)

Subcarrier Mode = RU

Images:

Full Spectrum



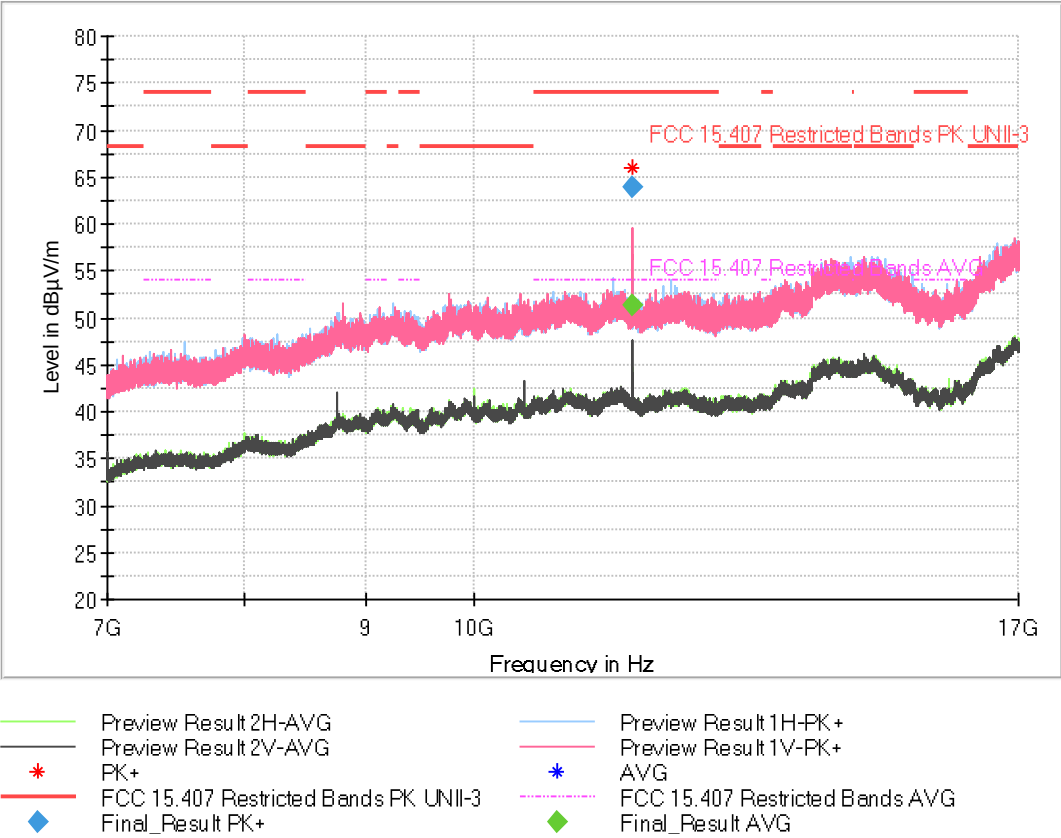


Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	1 GHz - 7 GHz	200 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Operation Band MHz = [5725, 5850] Active Port = 1+2
Frequency Range GHz = [7, 17] Frequency MHz = 5825.00000
Modulation = 802.11ax HE20 (OFDMA MCS0) Subcarrier Mode = RU

Images:



Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	7 GHz - 17 GHz	333,333 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Operation Band MHz = [5725, 5850]

Active Port = 1+2

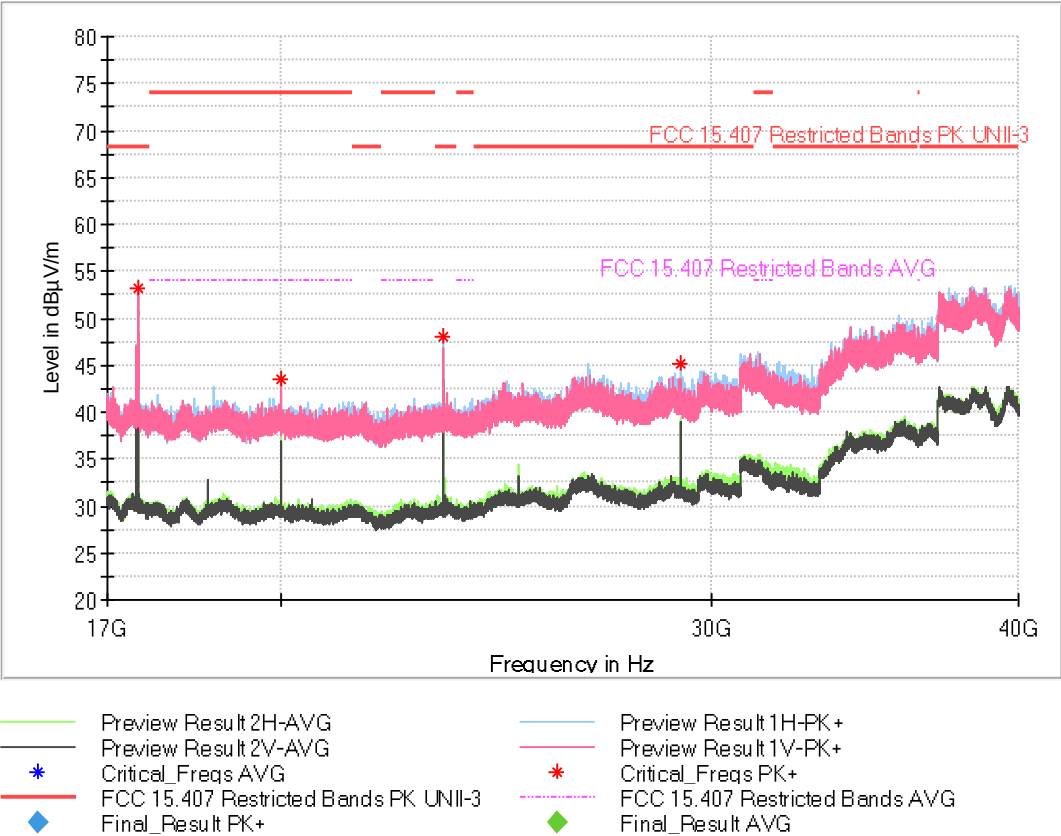
Frequency Range GHz = [17, 40]

Frequency MHz = 5825.00000

Modulation = 802.11ax HE20 (OFDMA MCS0)

Subcarrier Mode = RU

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	17 GHz - 40 GHz	766,667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

RSS-247 7.3.4.4 / FCC 15.407 (b) (4) [Bndedge] Transmitter Band Edge Radiated Emissions for UNII-3

Limits

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.20 dBμV/m at 3 m distance).

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)	-	300
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.

Results

Modulation: 802.11ax HE20 (OFDMA MCS0)

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

Verdict

Pass

Attachments

Operation Band MHz = [5725, 5850]

Active Port = 1+2

Frequency Range GHz = [1, 7]

Frequency MHz = 5825.00000

Modulation = 802.11n HT20 (OFDM MCS0)

Resource Unit Tone/Index = -

Images:

