FCC Radio Test Report

FCC ID	:	**RX3-WBU058LGA**
Equipment	:	**IEEE 802.11 a/b/g/n/ac/ax 2x2+Bluetooth v5.2 Wireless Adapter**
Brand Name	:	**Foxconn**
Model Name	:	**WBU058-LGA**
Applicant	:	**Hon Hai Precision Industry Co., Ltd. No.151, Sec. 1, Nankan Rd., Lujhu Dist., Taoyuan City 33859, Taiwan**
Manufacturer	:	**Hon Hai Precision Industry Co., Ltd. No.151, Sec. 1, Nankan Rd., Lujhu Dist., Taoyuan City 33859, Taiwan**
Standard	:	**47 CFR FCC Part 15.407**

The product was received on Sep. 24, 2021, and testing was started from Mar. 16, 2022 and completed on Mar. 16, 2022. We, SPORTON INTERNATIONAL INC. Hsinhua Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Hsinhua Laboratory, the test report shall not be reproduced except in full.

Approved by: Jackson Tsai

SPORTON INTERNATIONAL INC. Hsinhua Laboratory

No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)

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PHOTOGRAPHS OF EUT V01

History of this test report

Report No.	Version	Description	Issued Date
FR192341-01AE	01	Initial issue of report	Mar. 29, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
-	15.207	AC Power-line Conducted Emissions	Not Required	Refer to 1.1.5
3.1	15.407(a)	Emission Bandwidth	PASS	-
3.2	15.407(a)	Maximum Equivalent Isotopically Radiated Power (E.I.R.P.)	PASS	-
3.3	15.407(a)	Peak Power Spectral Density (E.I.R.P.)	PASS	-
3.4	15.407(b)	Unwanted Emissions	PASS	-
-	15.407(d)	Contention-Based Protocol	Not Required	Refer to 1.1.5
-	15.407(g)	Frequency Stability	Not Required	Refer to 1.1.5

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
None

Reviewed by: Ben Tseng
Report Producer: Ann Hou

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
5925 ~ 7125	ax (HEW20)	5955 ~ 7115	1 ~ 233 [59]

Band	Mode	BWch (MHz)	Nant
6.875-7.125GHz	802.11ax HEW20	20	2TX

Note:
- HEW20 use a combination of OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.
- BWch is the nominal channel bandwidth.
- The channel defined in the IEEE Standard P802.11ax™/D6.1.

1.1.2 Antenna Information

Group	Ant.	Brand	Model Name	Antenna Type	Connector
A	1	Foxconn	79012F500-600-G	PIFA	I-PEX
	2	Foxconn	79012F500-600-G	PIFA	I-PEX
B	3	Foxconn	79012F300-600-G	PIFA	I-PEX
	4	Foxconn	79012F300-600-G	PIFA	I-PEX
C	5	Foxconn	79012F400-600-G	PIFA	I-PEX
	6	Foxconn	79012F400-600-G	PIFA	I-PEX

Ant.	Port	Gain (dBi)			
		5925-6425 MHz	6425-6525 MHz	6525-6875 MHz	6875-7125 MHz
1	1	4.34	3.52	4.59	4.95
2	2	4.34	3.52	4.59	4.95
3	1	2.54	2.44	3.35	2.57
4	2	2.54	2.44	3.35	2.57
5	1	3.53	3.21	3.91	4.18
6	2	3.53	3.21	3.91	4.18

Note 1: The EUT has six antennas.

Note 2: EUT can match with above antennas for using. Higher gain (Group A) in each group of antenna was used to perform the worst configuration and result of that was recorded as the final test result.

For 6GHz function:

For IEEE 802.11 ax mode (2TX/2RX)

Port 1 and port 2 could transmit/receive simultaneously.

Note3: Directional gain information

	Maximum Output Power	Power Spectral Density
Non-BF	Directional gain = Max.gain + array gain. For power measurements on IEEE 802.11 devices Array Gain = 0 dB (i.e., no array gain) for N ANT ≤ 4	$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$
BF	$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$	$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$

Ex.

Directional gain(NSS1) formula : $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$

NSS1(g1,1) = $10^{G1/20}$; NSS1(g1,2)= $10^{G2/20}$; gj,k =(Nss1(g1,1) + Nss1(g1,2))^2

DG = 10 log[(Nss1(g1,1) + Nss1(g1,2))^2 / N_{ANT}] => 10 log[($10^{G1/20}$ + $10^{G2/20}$)^2 / N_{ANT}]

5925-6425MHz DG = 10 log[($10^{4.34/20}$ + $10^{4.34/20}$)^2 /N_{ANT}] = 7.35 dBi
6425-6525MHz DG = 10 log[($10^{3.52/20}$ + $10^{3.52/20}$)^2 /N_{ANT}] = 6.53 dBi
6525-6875MHz DG = 10 log[($10^{4.59/20}$ + $10^{4.59/20}$)^2 /N_{ANT}] = 7.60 dBi
6875-7125MHz DG = 10 log[($10^{4.95/20}$ + $10^{4.95/20}$)^2 /N_{ANT}] = 7.96 dBi

1.1.3 EUT Information

Operational Condition				
EUT Power Type	From DC Power supply			
EUT Function	☐	Indoor Access Point	☐	Subordinate
	☒	Indoor Client	☐	Standard Power Access Point
	☐	Dual Client	☐	Standard Client
	☐	Fixed Client		
Beamforming Function	☐	With beamforming	☒	Without beamforming
Resource Unit(802.11ax)	☒	Full RU	☐	Partial RU

Type of EUT		
☒	Stand-alone	
☐	Combined (EUT where the radio part is fully integrated within another device)	
	Combined Equipment - Brand Name / Model No.:	…
☐	Plug-in radio (EUT intended for a variety of host systems)	
	Host System - Brand Name / Model No.:	
☐	Other:	

Note: The above information was declared by manufacturer.

1.1.4 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11ax HEW20_Nss1,(MCS0)_2TX	0.479	3.2	311.25u	10k

Note. If DC < 0.98, the DCF was added while measuring Output power and PSD.

1.1.5 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FR192341AE.

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
The channel frequency 7115MHz was added.	Emission Bandwidth, Maximum Equivalent Isotopically Radiated Power (E.I.R.P.), Peak Power Spectral Density (E.I.R.P.), Unwanted Emissions above 1GHz were evaluated.

1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- KDB 789033 D02 v02r01

The following reference test guidance is not within the scope of accreditation of TAF.

- KDB 987594 D01 v01r02
- KDB 987594 D02 v01r01
- KDB 662911 D01 v02r01
- KDB 412172 D01 v01r01
- KDB 414788 D01 v01r01

1.3 Testing Location Information

Test Lab.：Sporton International Inc. Hsinhua Laboratory				
☒ Hsinhua	**ADD:** No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)			
(TAF: 3785**)**	**TEL:** 886-3-327-3456		**FAX:** 886-3-327-0973	
Test site Designation No. TW3785 with FCC.				
Test Condition	**Test Site No.**	**Test Engineer**	**Test Environment**	**Test Date**
RF Conducted	TH06-HY	Alan Chien	20.1~26.9°C / 50~60%	16/Mar/2022
Radiated	03CH03-HY	Justin Pan	23.6~24.7°C / 54.4~60%	16/Mar/2022
☐ Wen 33rd.St.	**ADD:** No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)			
(TAF: 3785**)**	**TEL:** 886-3-318-0787		**FAX:** 886-3-318-0287	
Test site Designation No. TW0008 with FCC.				

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	**Uncertainty**	**Remark**
Radiated Emission (30MHz ~ 1,000MHz)	4.80 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.30 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.00 dB	Confidence levels of 95%
Conducted Emission	2.00 dB	Confidence levels of 95%
Output Power Measurement	2.14 dB	Confidence levels of 95%
Power Density Measurement	0.26 dB	Confidence levels of 95%
Bandwidth Measurement	0.68 %	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Test Software Version	QATool_Dbgv0.0.2.39

Mode	Power Setting
802.11ax HEW20_Nss1,(MCS0)_2TX	-
7115MHz	-3

2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emission Bandwidth Maximum Equivalent Isotopically Radiated Power (E.I.R.P.) Peak Power Spectral Density (E.I.R.P.)
Test Condition	Conducted measurement at transmit chains

The Worst Case Mode for Following Conformance Tests			
Tests Item	Unwanted Emissions		
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.		
Operating Mode < 1GHz	CTX		
1	DC Power Supply mode		
Operating Mode > 1GHz	CTX		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			
Worst Planes of EUT			V

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis
Operating Mode	CTX
1	2.4GHz WLAN+Bluetooth
2	5GHz WLAN+Bluetooth
3	6GHz WLAN+Bluetooth
Refer to Sporton Test Report No.: FA192341-01 for Co-location RF Exposure Evaluation.	

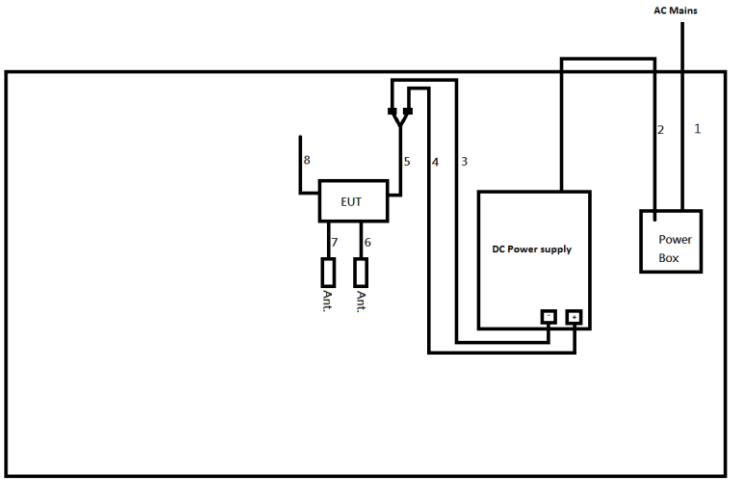
2.3 Support Equipment

Support Equipment – Conducted					
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**	**Remark**
1	Notebook	DELL	E5410	-	-
2	Adapter for NB	DELL	HA65NM130	-	-
3	DC Power Supply	GW	GPS-3030DD	-	-
4	DC Power cable(Red)	MiSUMi	WTN1228-RED	-	-
5	DC Power cable(Black)	MiSUMi	WTN1228-BLACK	-	-

Support Equipment – Radiated					
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**	**Remark**
1	DC Power Supply	GW	GPS-3030DD	-	-
2	DC Power cable(Red)	MiSUMi	WTN1228-RED	-	-
3	DC Power cable(Black)	MiSUMi	WTN1228-BLACK	-	-

2.4 Test Setup Diagram

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)
1	AC Power cable	No	1.8
2	AC Power cable	No	1.8
3	DC Power cable(-)	No	1.0
4	DC Power cable(+)	No	1.0
5	DC Power cable	Yes	0.28
6	Ant. cable	No	0.2
7	Ant. cable	No	0.2
8	USB cable	No	0.25

3 Transmitter Test Result

3.1 Emission Bandwidth

3.1.1 Emission Bandwidth Limit

Emission Bandwidth Limit
UNII Devices
☐ For the 5925-6425 GHz band, N/A
☐ For the 6425-6525 GHz band, N/A
☐ For the 6525-6875 GHz band, N/A
☒ For the 6875-7125 GHz band, N/A

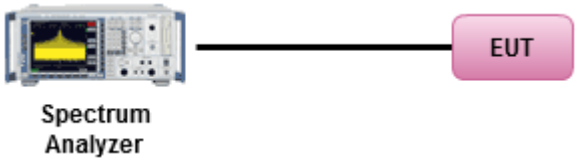
3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method	
▪ For the emission bandwidth shall be measured using one of the options below:	
	☒ Refer as KDB 789033, clause C for EBW and clause D for OBW measurement.
	☐ Refer as ANSI C63.10, clause 6.9.3 for occupied bandwidth testing.
	☐ Refer as IC RSS-Gen, clause 6.7 for bandwidth testing.

3.1.4 Test Setup

Emission Bandwidth


3.1.5 Test Result of Emission Bandwidth

Refer as Appendix A

3.2 Maximum Equivalent Isotopically Radiated Power (E.I.R.P.)

3.2.1 Maximum Equivalent Isotopically Radiated Power (E.I.R.P.) Limit

Maximum Equivalent Isotopically Radiated Power (E.I.R.P.) Limit	
UNII Devices	
☐	For the 5.925 ~ 6.425 GHz band:
	▪ For standard power access point and fixed client device : e.i.r.p < 36 dBm , For outdoor devices, the maximum e.i.r.p. at any elevation angle above 30 degrees not exceed 125 mW (21 dBm).
	▪ For indoor access point : e.i.r.p < 30 dBm.
	▪ For subordinate device control of an indoor access point : e.i.r.p < 30 dBm.
	▪ For client device control of a standard power access point : e.i.r.p < 30 dBm.
	▪ For client device control of an indoor access point : e.i.r.p < 24 dBm.
☐	For the 6.425 ~ 6.525 GHz band:
	▪ For indoor access point : e.i.r.p < 30 dBm.
	▪ For client device control of an indoor access point : e.i.r.p < 24 dBm.
☐	For the 6.525 ~ 6.875 GHz band:
	▪ For standard power access point and fixed client device : e.i.r.p < 36 dBm , For outdoor devices, the maximum e.i.r.p. at any elevation angle above 30 degrees not exceed 125 mW (21 dBm).
	▪ For indoor access point : e.i.r.p < 30 dBm.
	▪ For subordinate device control of an indoor access point : e.i.r.p < 30 dBm.
	▪ For client device control of a standard power access point : e.i.r.p < 30 dBm.
	▪ For client device control of an indoor access point : e.i.r.p < 24 dBm.
☒	For the 6.875 ~ 7.125 GHz band:
	▪ For indoor access point : e.i.r.p < 30 dBm.
	▪ For client device control of an indoor access point : e.i.r.p < 24 dBm.

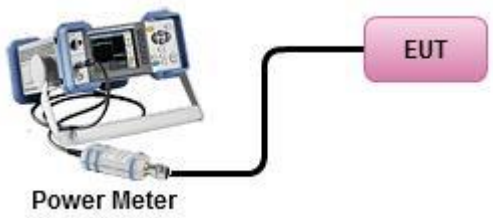
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
▪	Maximum Output Power Setting
	Duty cycle ≥ 98%
	☐ Refer as KDB 789033, clause E Method SA-2 (spectral trace averaging).
	Duty cycle < 98%
	☐ Refer as KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)
	Wideband RF power meter and average over on/off periods with duty factor
	☒ Refer as KDB 789033, clause E Method PM-G (using an RF average power meter).
☒	For conducted measurement.
	▪ If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	▪ If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \ldots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$
☐	For radiated measurement.
	▪ Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1GHz.
	▪ Refer as KDB 789033, clause II A.1.F ”Antenna-port Conducted versus Radiated Testing”
	▪ Refer as KDB 412172, clause 2.2 for EIRP calculation.

3.2.4 Test Setup

Conducted Measurement (Power Meter)


3.2.5 Test Result of Maximum Equivalent Isotopically Radiated Power (E.I.R.P)

Refer as Appendix B

3.3 Peak Power Spectral Density (E.I.R.P.)

3.3.1 Peak Power Spectral Density (E.I.R.P.) Limit

Peak Power Spectral Density (E.I.R.P.) Limit	
UNII Devices	
☐	For the 5.925 ~ 6.425 GHz band:
	▪ For standard power access point and fixed client device : e.i.r.p PSD < 23 dBm/MHz.
	▪ For indoor access point : e.i.r.p PSD < 5 dBm/MHz.
	▪ For subordinate device control of an indoor access point : e.i.r.p PSD < 5 dBm/MHz.
	▪ For client device control of a standard power access point : e.i.r.p PSD < 17 dBm/MHz.
	▪ For client device control of an indoor access point : e.i.r.p PSD < -1 dBm/MHz.
☐	For the 6.425 ~ 6.525 GHz band:
	▪ For indoor access point : e.i.r.p PSD < 5 dBm/MHz.
	▪ For client device control of an indoor access point : e.i.r.p PSD < -1 dBm/MHz.
☐	For the 6.525 ~ 6.875 GHz band:
	▪ For standard power access point and fixed client device : e.i.r.p PSD < 23 dBm/MHz.
	▪ For indoor access point : e.i.r.p PSD < 5 dBm/MHz.
	▪ For subordinate device control of an indoor access point : e.i.r.p PSD < 5 dBm/MHz.
	▪ For client device control of a standard power access point : e.i.r.p PSD < 17 dBm/MHz.
	▪ For client device control of an indoor access point : e.i.r.p PSD < -1 dBm/MHz.
☒	For the 6.875 ~ 7.125 GHz band:
	▪ For indoor access point : e.i.r.p PSD < 5 dBm/MHz.
	▪ For client device control of an indoor access point : e.i.r.p PSD < -1 dBm/MHz.

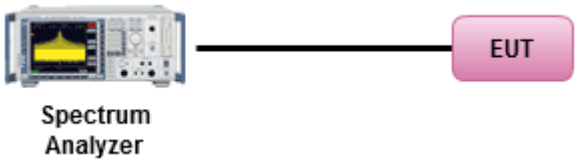
3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method			
▪ Peak power spectral density procedures that the same method as used to determine the conducted output power shall be used to determine the peak power spectral density and use the peak search function on the spectrum analyzer to find the peak of the spectrum. For the peak power spectral density shall be measured using below options:			
	☐	Refer as KDB 789033, F)5) power spectral density can be measured using resolution bandwidths < 1 MHz provided that the results are integrated over 1 MHz bandwidth	
	☐	Refer as KDB 789033, clause E Method SA-2. (spectral trace averaging)	
	☒	Refer as KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)	
☒ For conducted measurement.			
	▪	If the EUT supports multiple transmit chains using options given below:	
		☒	Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.
		☒	Option 2: Measure and sum spectral maxima across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,
		☒	Option 3: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.
	▪	If multiple transmit chains, EIRP PPSD calculation could be following as methods: $PPSD_{total} = PPSD_1 + PPSD_2 + \ldots + PPSD_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = PPSD_{total} + DG$	
☐ For radiated measurement.			
	▪	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1GHz.	
	▪	Refer as KDB 789033, clause II A.1.F ”Antenna-port Conducted versus Radiated Testing”	
	▪	Refer as KDB 412172, clause 2.2 for EIRP calculation.	

3.3.4 Test Setup

Conducted Measurement


3.3.5 Test Result of Peak Power Spectral Density (E.I.R.P.)

Refer as Appendix C

3.4 Unwanted Emissions

3.4.1 Transmitter Unwanted Emissions Limit

Unwanted emissions below 1 GHz and restricted band emissions above 1GHz limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

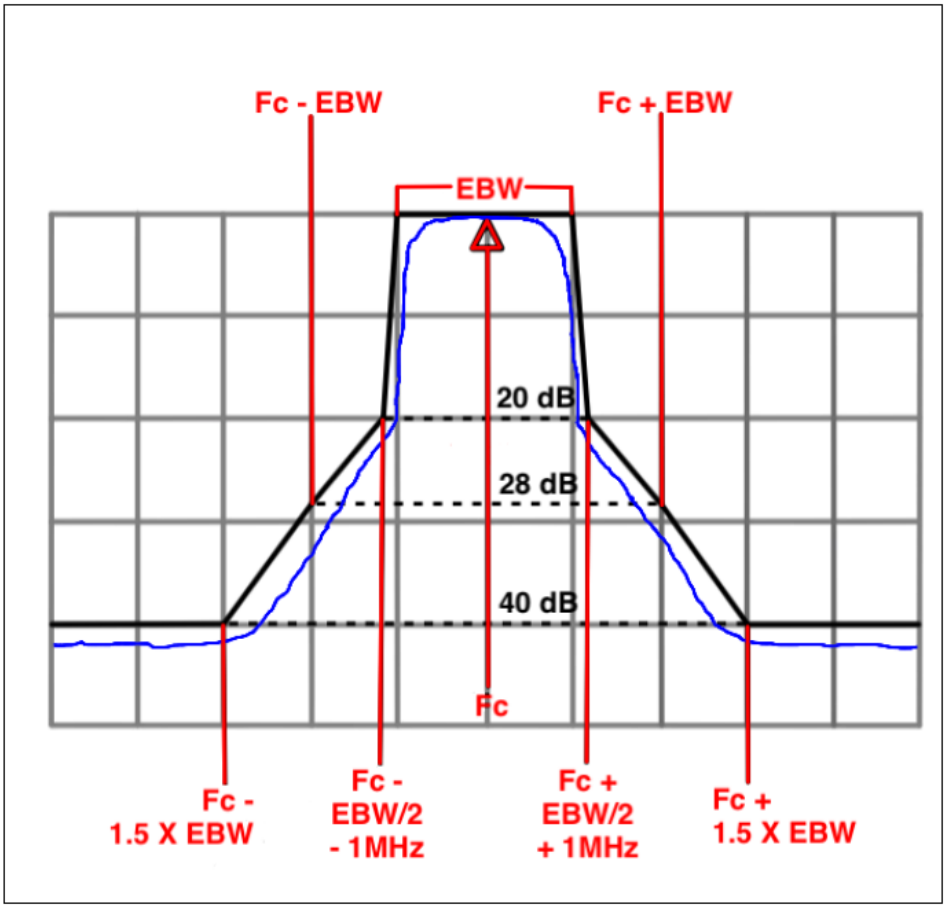
Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m(20 x log (standard distance/ test distance) = 20log(3/1) = 9.54dB.
EX. Above 18GHz emission limit calculation (3m to 1m) = 54dBuV/m at 3m + 9.54dB = 63.54 dBuV/m at 1m.

Un-restricted band emissions above 1GHz Limit	
Frequency	**Limit**
Any outside the 5.945 – 7.125 GHz emission	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
	Note 1: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m(20 x log (standard distance/ test distance) = 20log(3/1) = 9.54dB. EX. Above 18GHz emission limit calculation (3m to 1m) = 68.2dBuV/m at 3m + 9.54dB = 77.74 dBuV/m at 1m.
Frequency	**Emission MASK Limit**
5.945 – 7.125 GHz	Power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's

channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.



3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method		
▪ Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).		
▪ The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
▪ For the transmitter unwanted emissions shall be measured using following options below:		
	▪ Refer as KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.	
	▪ Refer as KDB 789033, clause G)1) for unwanted emissions into restricted bands.	
		☒ Refer as KDB 789033, G)6) Method AD (Trace Averaging). (For unrestricted band measurement)
		☐ Refer as KDB 789033, G)6) Method VB (Reduced VBW).
		☒ Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.(For restricted band average measurement)
		☐ Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
		☒ Refer as KDB 789033, clause G)5) measurement procedure peak limit.
		☐ Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
▪ For emission MASK shall be measured using following options below:		
		☒ Refer as KDB 987594 D02, J) In-Band Emissions
▪ For radiated measurement.		
	▪ Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.	
	▪ Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.	
	▪ Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1GHz.	
▪ The any unwanted emissions level shall not exceed the fundamental emission level.		
▪ All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.		

▪ Use the following spectrum analyzer settings:	
	▪ Set RBW=100 kHz for f < 1 GHz; VBW=3 * RBW; Sweep = auto; Detector function = peak; Trace = max hold.
	▪ Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement. For average measurement, refer as 1.1.4.
▪	KDB 414788 Open-Field Test Sites and Chamber Correlation Justification.
	▪ Based on FCC 15.31(f)(2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field.
	▪ Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

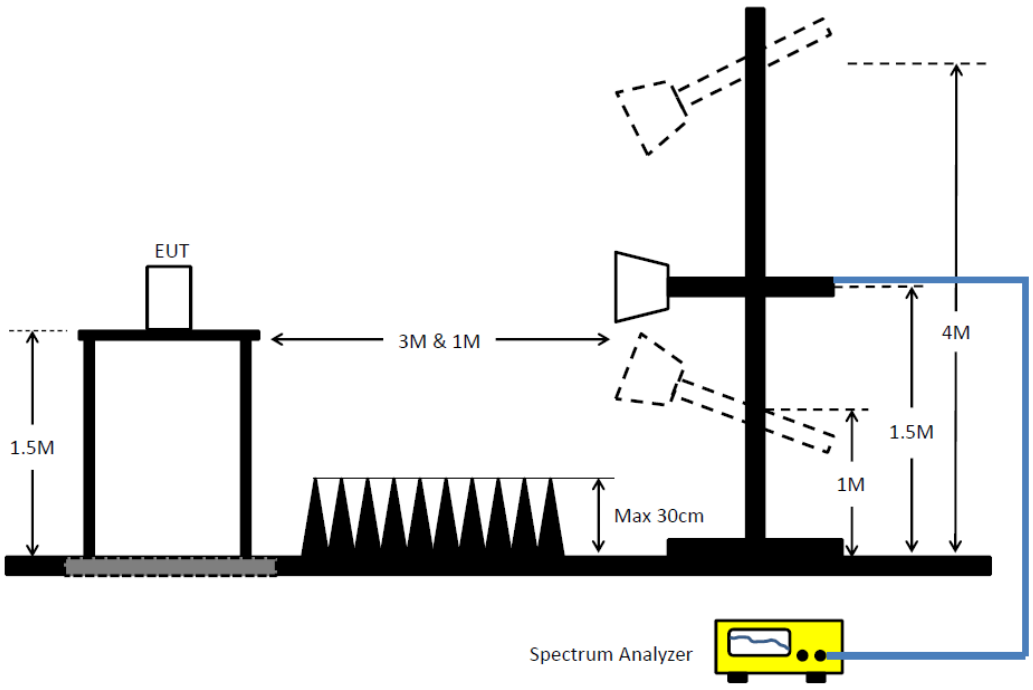
3.4.4 Measurement Results Calculation

The measured Level is calculated using:
Corrected Reading: Raw(Read Level) + AF(Antenna Factor) + CL(Cable Loss) - PA(Preamp Factor)

3.4.5 Test Setup

Transmitter Radiated Unwanted Emissions

Above 1GHz



3.4.6 Test Result of Transmitter Unwanted Emissions

Refer as Appendix D

4 Test Equipment and Calibration Data

Instrument for Conducted Test

Instrument	Manufacturer /Brand	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV 40	101515	10Hz~40GHz	26/Mar/2021	25/Mar/2022
Pulse Sensor	Anritsu	MA2411B	1027452	300MHz~40GHz	25/Mar/2021	24/Mar/2022
Power Meter	Anritsu	ML2495A	1124009	300MHz~40GHz	25/Mar/2021	24/Mar/2022
Signal Generator	R&S	SMB100A	181147	100kHz~40GHz	21/Oct/2021	20/Oct/2022
SENSE 15407_NII	Sporton	v5.10.7.17	N/A	N/A	N/A	N/A

Instrument for Radiated Test

Instrument	Manufacturer /Brand	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz~18GHz 3m	03/Aug/2021	02/Aug/2022
Signal Analyzer	R&S	FSV 40	101515	10Hz~40GHz	26/Mar/2021	25/Mar/2022
Microwave Preamplifier	Agilent	8449B	3008A02326	1GHz~26.5GHz	15/Jul/2021	14/Jul/2022
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1531	1GHz~18GHz	24/Mar/2021	23/Mar/2022
RF CABLE 5+6m	HUBER+SUHNER	SUOFLEX 104	SN MY38596/4+SN 804300/4	1GHz~40GHz	28/Jul/2021	27/Jul/2022
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170614	18GHz~40GHz	12/May/2021	11/May/2022
Preamplifier	MITEQ	TTA1840-35-HG	1864481	18GHz ~ 40GHz	18/Mar/2021	17/Mar/2022

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
6.875-7.125GHz	-	-	-	-	-
802.11ax HEW20_Nss1,(MCS0)_2TX	27.51M	19.13M	19M1D1D	27.3M	19.1M

Max-N dB = Maximum 6dB down bandwidth for 5.725-5.85GHz band / Maximum 26dB down bandwidth for other band;
Max-OBW = Maximum 99% occupied bandwidth;
Min-N dB = Minimum 6dB down bandwidth for 5.725-5.85GHz band / Maximum 26dB down bandwidth for other band;
Min-OBW = Minimum 99% occupied bandwidth

Result

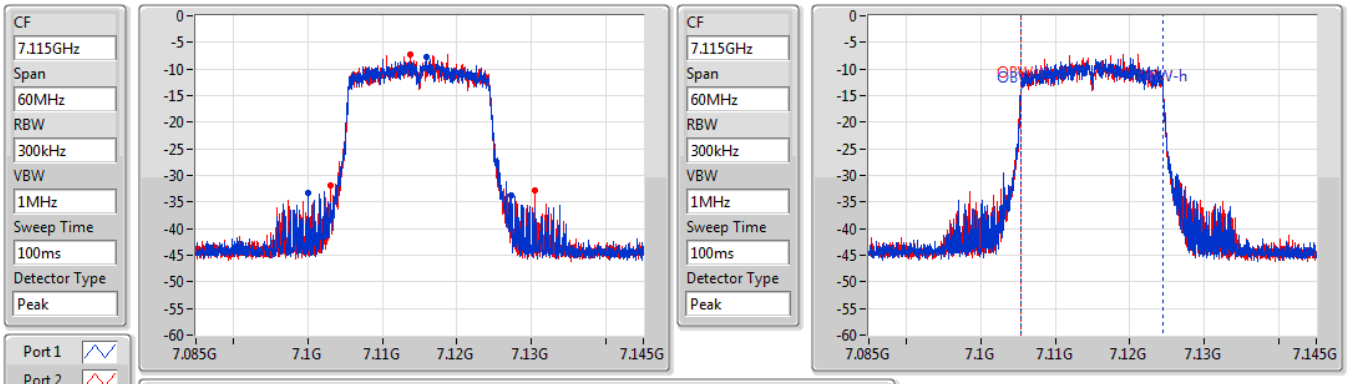
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)	Port 2-N dB (Hz)	Port 2-OBW (Hz)
802.11ax HEW20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
7115MHz	Pass	Inf	27.3M	19.13M	27.51M	19.1M

Port X-N dB = Port X 6dB down bandwidth for 5.725-5.85GHz band / 26dB down bandwidth for other band
Port X-OBW = Port X 99% occupied bandwidth

802.11ax HEW20_Nss1,(MCS0)_2TX EBW

7115MHz

16/03/2022



26dB(Hz)	Fl-26dB(Hz)	Fh-26dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
27.3M	7.09997G	7.12727G	19.13M	7.105375G	7.124505G	Inf	1
27.51M	7.103G	7.13051G	19.1M	7.105405G	7.124505G	Inf	2

Summary

Mode	Total Power (dBm)	Total Power (W)	EIRP (dBm)	EIRP (W)
6.875-7.125GHz	-	-	-	-
802.11ax HEW20_Nss1,(MCS0)_2TX	2.53	0.00179	7.48	0.00560

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11ax HEW20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
7115MHz	Pass	4.95	-0.53	-0.44	2.53	Inf	7.48	24.00

DG = Directional Gain; Port X = Port X output power

Summary

Mode	PD (dBm/RBW)	EIRP PD (dBm/RBW)
6.875-7.125GHz	-	-
802.11ax HEW20_Nss1,(MCS0)_2TX	-9.23	-1.27

RBW = 500kHz for 5.725-5.85GHz band / 1MHz for other band;

Result

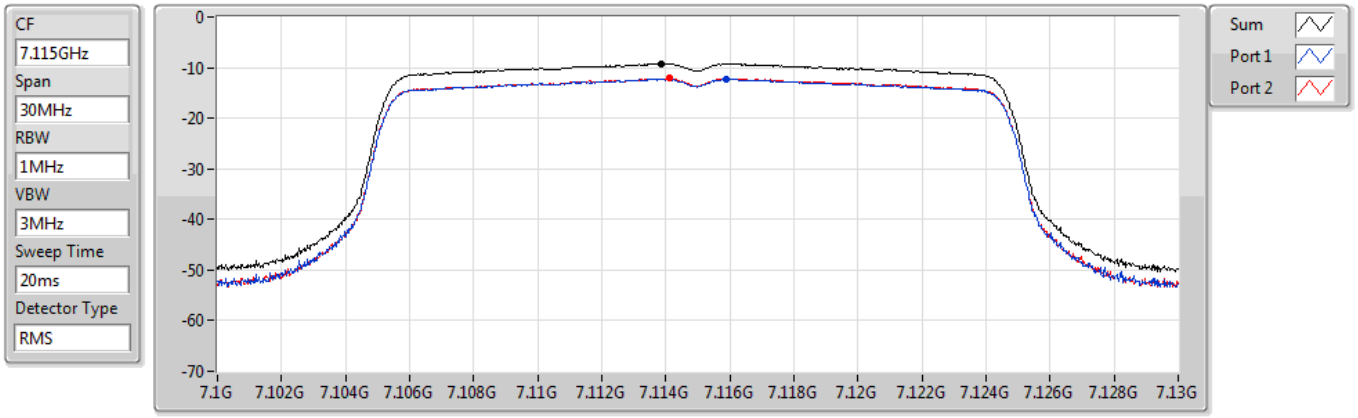
Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	Port 2 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)	EIRP PD (dBm/RBW)	EIRP PD Limit (dBm/RBW)
802.11ax HEW20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
7115MHz	Pass	7.96	-12.25	-12.15	-9.23	Inf	-1.27	-1.00

DG = Directional Gain; RBW = 500kHz for 5.725-5.85GHz band / 1MHz for other band;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; Port X = Port X Power Density;

802.11ax HEW20_Nss1,(MCS0)_2TX PSD

7115MHz

16/03/2022



Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-9.23	-9.23	-12.25	-12.15

Summary

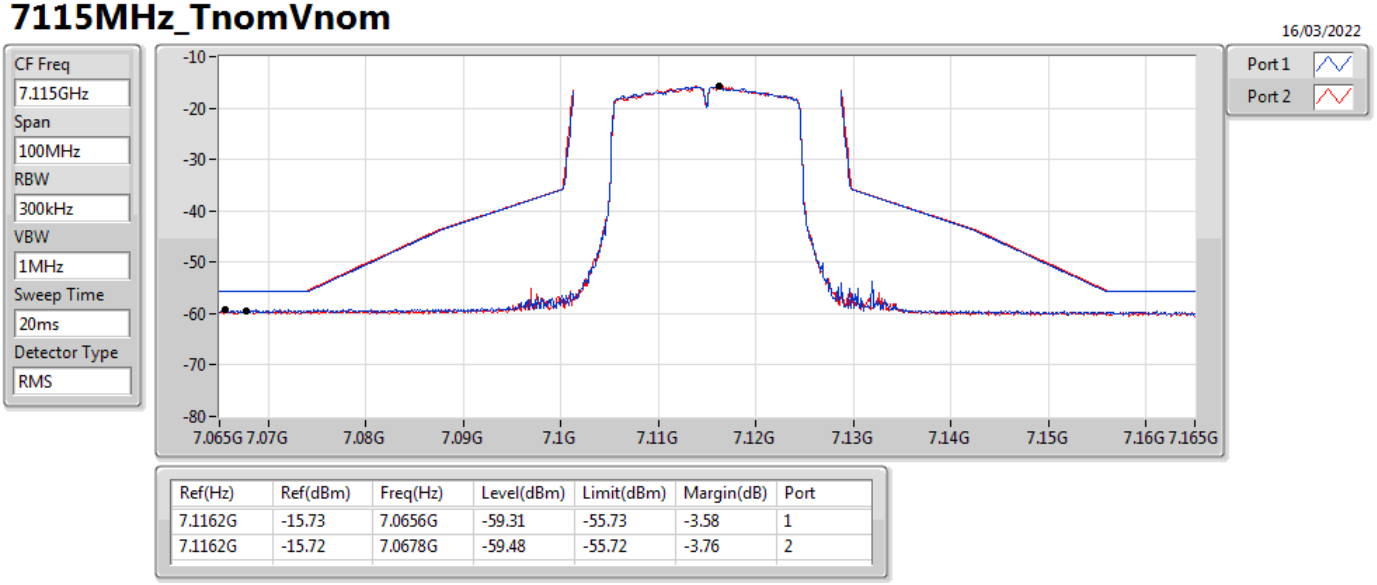
Mode	Result	Ref (Hz)	Ref (dBm)	Freq (Hz)	Level (dBm)	Limit (dBm)	Margin (dB)	Port
6.875-7.125GHz	-	-	-	-	-	-	-	-
802.11ax HEW20_Nss1,(MCS0)_2TX	Pass	7.1162G	-15.73	7.0656G	-59.31	-55.73	-3.58	1

Result

Mode	Result	Ref (Hz)	Ref (dBm)	Freq (Hz)	Level (dBm)	Limit (dBm)	Margin (dB)	Port
802.11ax HEW20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
7115MHz	Pass	7.1162G	-15.73	7.0656G	-59.31	-55.73	-3.58	1
7115MHz	Pass	7.1162G	-15.72	7.0678G	-59.48	-55.72	-3.76	2

802.11ax HEW20_Nss1,(MCS0)_2TX MASK

7115MHz_TnomVnom



Ref(Hz)	Ref(dBm)	Freq(Hz)	Level(dBm)	Limit(dBm)	Margin(dB)	Port
7.1162G	-15.73	7.0656G	-59.31	-55.73	-3.58	1
7.1162G	-15.72	7.0678G	-59.48	-55.72	-3.76	2

Summary

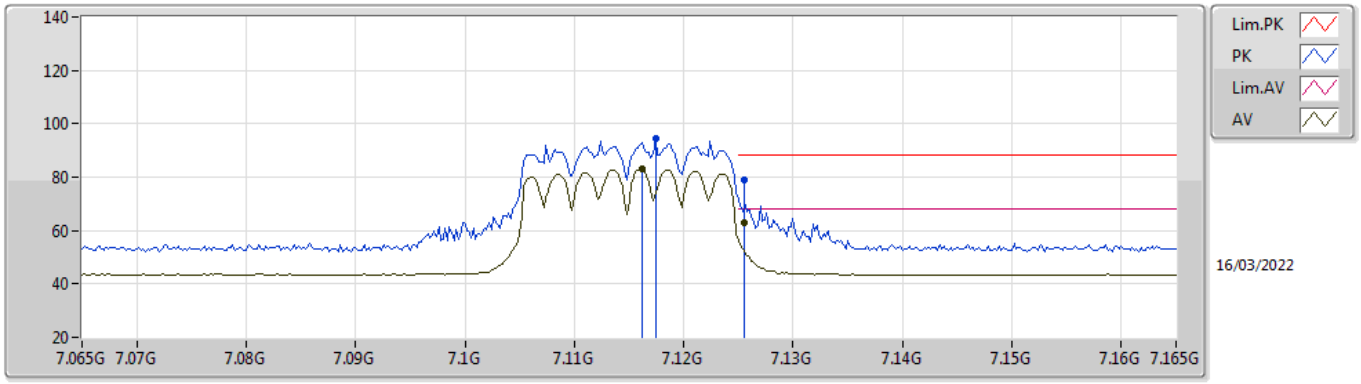
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
6.875-7.125GHz	-	-	-	-	-	-	-	-	-	-	-
802.11ax HEW20_Nss1,(MCS0)_2TX	Pass	RMS	7.1255G	67.90	68.20	-0.30	3	Horizontal	40	1.04	-

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
802.11ax HEW20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-	-	-	-
7115MHz_TX	Pass	PK	7.1174G	94.23	Inf	-Inf	3	Vertical	359	2.39	-
7115MHz_TX	Pass	PK	7.1255G	78.90	88.20	-9.30	3	Vertical	359	2.39	-
7115MHz_TX	Pass	RMS	7.1162G	83.00	Inf	-Inf	3	Vertical	359	2.39	-
7115MHz_TX	Pass	RMS	7.1255G	63.08	68.20	-5.12	3	Vertical	359	2.39	-
7115MHz_TX	Pass	PK	7.1174G	98.39	Inf	-Inf	3	Horizontal	40	1.04	-
7115MHz_TX	Pass	PK	7.1255G	83.94	88.20	-4.26	3	Horizontal	40	1.04	-
7115MHz_TX	Pass	RMS	7.114G	87.23	Inf	-Inf	3	Horizontal	40	1.04	-
7115MHz_TX	Pass	RMS	7.1255G	67.90	68.20	-0.30	3	Horizontal	40	1.04	-
7115MHz_TX	Pass	AV	14.22976G	45.44	68.20	-22.76	3	Vertical	177	1.34	-
7115MHz_TX	Pass	PK	14.23872G	57.78	88.20	-30.42	3	Vertical	177	1.34	-
7115MHz_TX	Pass	AV	14.223G	45.22	68.20	-22.98	3	Horizontal	302	1.50	-
7115MHz_TX	Pass	PK	14.2336G	57.44	88.20	-30.76	3	Horizontal	302	1.50	-

802.11ax HEW20_Nss1,(MCS0)_2TX

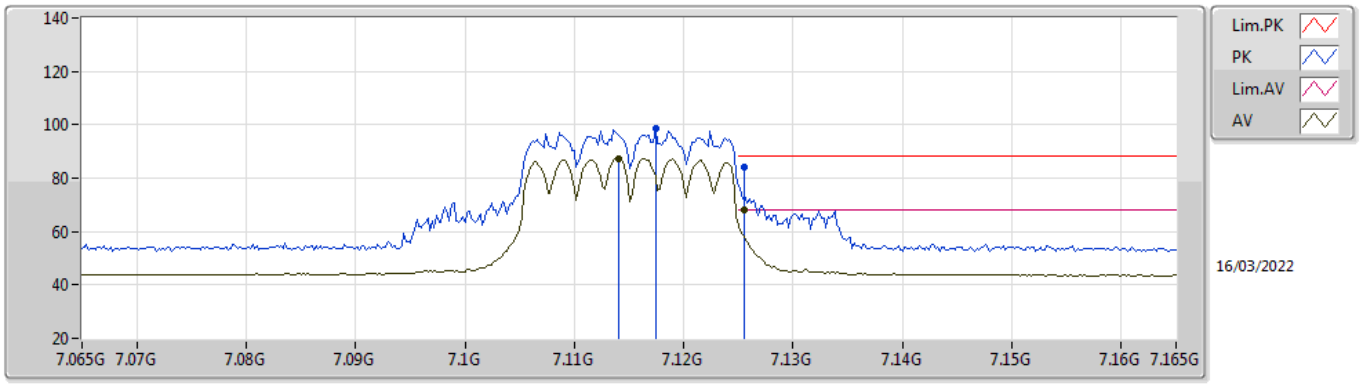
7115MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	7.1174G	94.23	Inf	-Inf	10.00	3	Vertical	359	2.39	-	84.23	36.64	8.11	34.75
PK	7.1255G	78.90	88.20	-9.30	10.06	3	Vertical	359	2.39	-	68.84	36.70	8.11	34.75
RMS	7.1162G	83.00	Inf	-Inf	9.98	3	Vertical	359	2.39	-	73.02	36.63	8.10	34.75
RMS	7.1255G	63.08	68.20	-5.12	10.06	3	Vertical	359	2.39	-	53.02	36.70	8.11	34.75

802.11ax HEW20_Nss1,(MCS0)_2TX

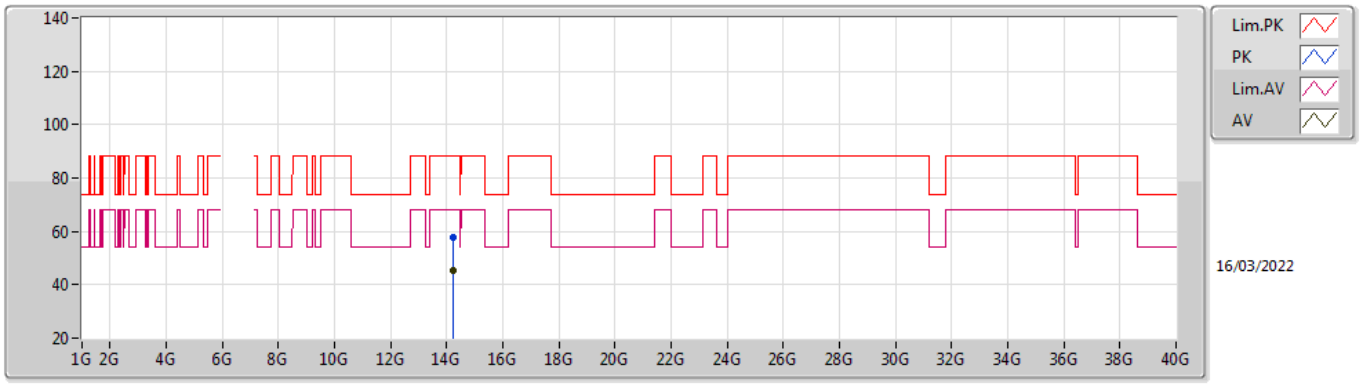
7115MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	7.1174G	98.39	Inf	-Inf	10.00	3	Horizontal	40	1.04	-	88.39	36.64	8.11	34.75
PK	7.1255G	83.94	88.20	-4.26	10.06	3	Horizontal	40	1.04	-	73.88	36.70	8.11	34.75
RMS	7.114G	87.23	Inf	-Inf	9.96	3	Horizontal	40	1.04	-	77.27	36.61	8.10	34.75
RMS	7.1255G	67.90	68.20	-0.30	10.06	3	Horizontal	40	1.04	-	57.84	36.70	8.11	34.75

802.11ax HEW20_Nss1,(MCS0)_2TX

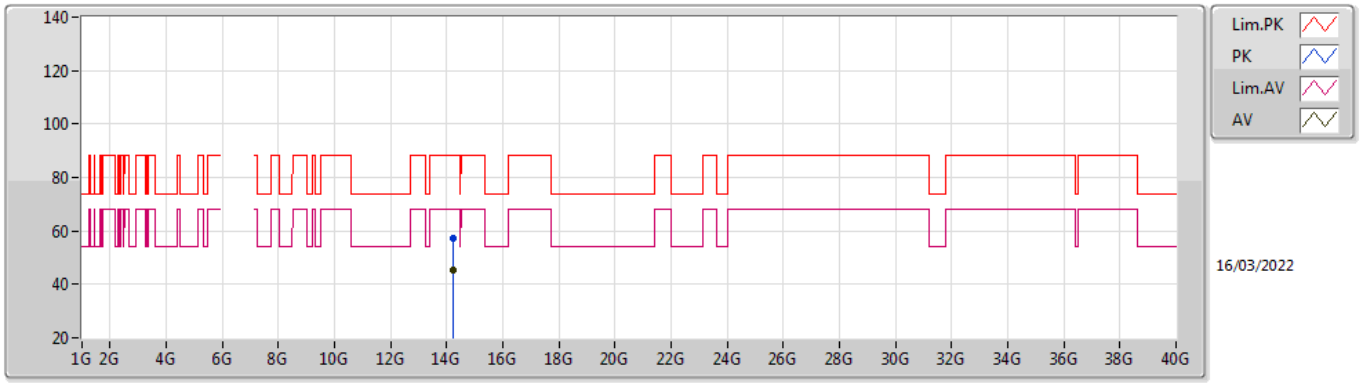
7115MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	14.22976G	45.44	68.20	-22.76	18.06	3	Vertical	177	1.34	-	27.38	40.40	11.08	33.42
PK	14.23872G	57.78	88.20	-30.42	18.06	3	Vertical	177	1.34	-	39.72	40.40	11.08	33.42

802.11ax HEW20_Nss1,(MCS0)_2TX

7115MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	14.223G	45.22	68.20	-22.98	18.06	3	Horizontal	302	1.50	-	27.16	40.40	11.07	33.41
PK	14.2336G	57.44	88.20	-30.76	18.06	3	Horizontal	302	1.50	-	39.38	40.40	11.08	33.42