

Report No.: FR3N2709AE

RADIO TEST REPORT

FCC ID : TLZ-CU5XX

Equipment : Wireless MCU with Integrated Tri-radio Wi-Fi 6 +

BLE 5.3/802.15.4 LGA module, Wireless MCU with Integrated Wi Fi 6 and Bluetooth Low Energy 5. 3

Module

Brand Name : AzureWave

Model Name : AW-CU570, AW-CU598

Applicant : AzureWave Technologies, Inc.

8F., No.94, Baozhong Rd., Xindian Dist., New

Taipei City, Taiwan 231

Manufacturer : AzureWave Technologies, Inc.

8F., No.94, Baozhong Rd., Xindian Dist., New

Taipei City, Taiwan 231

Standard: 47 CFR FCC Part 15.407

The product was received on Dec. 12, 2023, and testing was started from Feb. 07, 2024 and completed on Jun. 14, 2024. We, Sporton International Inc. Hsinchu 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 report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Rex Liao

Sporton International Inc. Hsinchu Laboratory

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TEL: 886-3-656-9065 FAX: 886-3-656-9085

Report Template No.: CB-A12_6 Ver2.0

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Issued Date : Jun. 28, 2024

Report Version : 01

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Appendix D. Test Results of EIRP Power Spectral Density

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Photographs of EUT v01

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History of this test report

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Report No.	Version	Description	Issued Date
FR3N2709AE	01	Initial issue of report	Jun. 28, 2024

Summary of Test Result

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Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.207	AC Power-line Conducted Emissions	PASS	-
3.2	15.407(a)	Emission Bandwidth	PASS	-
3.3	15.407(a)	Maximum EIRP Output Power	PASS	-
3.4	15.407(a)	EIRP Power Spectral Density	PASS	-
3.5	15.407(b)	Unwanted Emissions	PASS	-

Conformity Assessment Condition:

- 1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
- 2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Sam Chen

Report Producer: Sophia Shiung

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1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz) IEEE Std. 802.11		Ch. Frequency (MHz)	Channel Number
5725-5895	a, n (HT20), ac (VHT20), ax (HEW20)	5845-5885	169-177 [3]

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Band	Mode	BWch (MHz)	Nant
5.85-5.895GHz	802.11a	20	1TX
5.85-5.895GHz	802.11n HT20	20	1TX
5.85-5.895GHz	802.11ac VHT20	20	1TX
5.85-5.895GHz	802.11ax HEW20	20	1TX

Note:

- ◆ 11a, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- VHT20 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.
- HEW20 use a combination of OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.
- BWch is the nominal channel bandwidth.

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1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	ARISTOTLE	RFA-27-C38H1-C198	Dipole	u.FL	
2	Molex	2128600011	Dipole	u.FL	Note 1
3	LYNwave	2570	РСВ	N/A	

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Note 1:

A 1	Port				Gain (dBi)			
Ant.	WLAN 2.4GHz	WLAN 5GHz	Bluetooth	Thread	WLAN 2.4GHz	WLAN 5GHz	Bluetooth	Thread
1	-	1	-	-	3	5	3	3
2	1	-	1	1	Note 2			
3	1	1	1	1	2.2	4.4	2.2	2.2

Note 2: The Ant. 2 has one RF cable (Brand: TE Connectivity / Model Name: Linx Connectivity / Remark: 11.5cm), and its gains are listed below.

Ant.			Gain (dBi)		
Ant.		WLAN 2.4GHz	WLAN 5GHz	Bluetooth	Thread
	Max Peak Gain	5.3	4.5	5.3	5.3
2	Cable Loss	0.34	0.34	0.34	0.34
	Net Gain	4.96	4.16	4.96	4.96

Note 3: The above information was declared by manufacturer.

Note 4: For RF Conducted tests:

The Ant. 2 in WLAN 2.4GHz / Bluetooth / Thread and the Ant. 1 in WLAN 5GHz have higher gain than others in the same band. Therefore, they were selected to perform the test.

For AC Conduction and Radiated tests:

The EUT has two types of antenna. The antennas with higher gain in each band of each type were selected to test and their data were recorded in this report. Thus, Ant. 1 & Ant. 3 were selected to test WLAN 5GHz, and Ant. 2 & Ant. 3 were selected to test WLAN 2.4GHz / Bluetooth / Thread.

Note 5: For 2.4GHz function:

For IEEE 802.11 b/g/n/VHT/ax (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

For 5GHz function:

For IEEE 802.11a/n/ac/ax (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

For bluetooth function (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

For Thread function (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

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1.1.3 Mode Test Duty Cycle

Mode	DC	DCF (dB)	T (s)	VBW (Hz)_1/T
802.11a_Nss 1,(6D)	0.992	0.03	n/a (DC>=0.98)	n/a (DC>=0.98)
802.11ax HEW20_Nss 1,(M0)	0.987	0.06	n/a (DC>=0.98)	n/a (DC>=0.98)

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N	oto:	
N	OLE.	

- DC is Duty Cycle.
- DCF is Duty Cycle Factor.

1.1.4 EUT Operational Condition

EUT Power Type	Fror	n host system		
Beamforming Function		With beamforming	\boxtimes	Without beamforming
Function	\boxtimes	Point-to-multipoint		Point-to-point
		Indoor Access Point		Subordinate
Device Type		Indoor Client		
		Fixed Access Point		Fixed Client
Channel Puncturing Function		Supported	\boxtimes	Unsupported
Support RU	\boxtimes	Full RU		Partial RU
Test Software Version	Dut	DutApiMimoApApp 2.0.0.2		

Note: The above information was declared by manufacturer.

1.1.5 Table for Multiple Listing

The two EUTs are identical except for the difference listed below:

EUT	Equipment Name	Model Name	Thread Function	
1	Wireless MCU with Integrated Tri-radio Wi-Fi 6 +	AW-CU570	V	
1	BLE 5.3/802.15.4 LGA module	AVV-CU570	V	
2	Wireless MCU with Integrated Wi Fi 6 and	AVA CLIEGO	v	
2	Bluetooth Low Energy 5. 3 Module	AW-CU598	^	

Note 1: From the above EUTs, EUT 1 (AW-CU570) was selected as representative EUT for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

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1.2 Applicable Standards

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

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

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

- FCC KDB 412172 D01 v01r01
- FCC KDB 414788 D01 v01r01
- FCC KDB 291074 D02 v01

1.3 Testing Location Information

Testing Location Information

Test Lab.: Sporton International Inc. Hsinchu Laboratory

Hsinchu ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

(TAF: 3787) TEL: 886-3-656-9065 FAX: 886-3-656-9085

Test site Designation No. TW3787 with FCC.

Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
RF Conducted	TH02-CB	Mason Chan	24.6~25.2 / 66~69	May 06, 2024~ May 07, 2024
Radiated < 1GHz	03CH01-CB	Paul Hu	22.4-23.5 / 55-58	Feb. 07, 2024~
Radialed < 1GHz	03CH04-CB	Faui Hu	21-22 / 56-59	May 23, 2024
Radiated > 1GHz	03CH04-CB	Paul Hu	21~22 / 56~59	May 03, 2024~ May 06, 2024
AC Conduction	CO01-CB	Tim Chen	20~21 / 63~64	Feb. 22, 2024~ Jun. 14, 2024

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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)

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Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.1 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.1 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.2 dB	Confidence levels of 95%
Conducted Emission	3.1 dB	Confidence levels of 95%
Output Power Measurement	0.8 dB	Confidence levels of 95%
Power Density Measurement	3.1 dB	Confidence levels of 95%
Bandwidth Measurement	2.2%	Confidence levels of 95%

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2 Test Configuration of EUT

2.1 Test Channel Mode

Mode
802.11a_Nss1,(6Mbps)_1TX
5845MHz
5865MHz
5885MHz
802.11ax HEW20_Nss1,(MCS0)_1TX
5845MHz
5865MHz
5885MHz

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Note:

 Evaluated HEW20 mode only, due to similar modulation. The power setting of HT20 / VHT20 modes are the same or lower than HEW20.

2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests			
Tests Item	Tests Item AC power-line conducted emissions		
Condition	Condition AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz		
Operating Mode	СТХ		
1	EUT 1 + Ant. 2_Thread		
2	EUT 1 + Ant. 2_Bluetooth		
3	EUT 1 + Ant. 2_WLAN 2.4GHz		
4 EUT 1 + Ant. 1_WLAN 5GHz			
5	5 EUT 1 + Ant. 3_Thread		
6	EUT 1 + Ant. 3_Bluetooth		
7	7 EUT 1 + Ant. 3_WLAN 2.4GHz		
8	8 EUT 1 + Ant. 3_WLAN 5GHz		
For operating, mode 6 is t	he worst case and it was recorded in this test report.		

Tł	The Worst Case Mode for Following Conformance Tests			
Tests Item	Maxi	Emission Bandwidth Maximum EIRP Output Power EIRP Power Spectral Density		
Test Condition	Cond	Conducted measurement at transmit chains		
Test Mode	1	1 EUT 1 + Ant. 1		

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Th	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.			
	СТХ			
Operating Mode < 1GHz	The EUT was performed at X axis, Y axis and Z axis position in Radiated Emission test > 1GHz, and the worst case was found at Y axis. Thus, the measurement will follow this same test configuration.			
1	EUT 1 in Y axis + Ant. 2_WLAN 2.4GHz			
2	EUT 1 in Y axis + Ant. 2_Bluetooth			
3	EUT 1 in Y axis + Ant. 2_Thread			
4	EUT 1 in Y axis + Ant. 1_WLAN 5GHz			
5	EUT 1 in Y axis + Ant. 3_WLAN 2.4GHz			
6	EUT 1 in Y axis + Ant. 3_Bluetooth			
7	EUT 1 in Y axis + Ant. 3_Thread			
8	EUT 1 in Y axis + Ant. 3_WLAN 5GHz			
For operating, mode 2 is the	ne worst case and it was recorded in this test report.			
	СТХ			
Operating Mode > 1GHz	The EUT was performed at X axis, Y axis and Z axis position, and the worst case was found at Y axis. Thus, the measurement will follow this same test configuration.			
1	EUT 1 in Y axis + Ant. 1			
2	EUT 1 in Y axis + Ant. 3			

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2.3 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.4 Accessories

N/A

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2.5 Support Equipment

For AC Conduction:

	Support Equipment			
No.	lo. Equipment Brand Name Model Name FCC ID			
Α	Fixture	AzureWave	2570-i4	N/A
В	B NB DELL E6430 N/A			

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For Radiated < 1GHz:

	Support Equipment			
No.	No. Equipment Brand Name Model Name FCC ID			
Α	Fixture	AzureWave	2570-i4	N/A
В	B DC Power Supply MOTECH LPS-305 N/A			

For Radiated > 1GHz:

	Support Equipment			
No.	No. Equipment Brand Name Model Name FCC ID			
Α	Fixture	AzureWave	2570-i4	N/A
В	DC Power Supply	MOTECH	LPS-305	N/A
С	NB	DELL	E4300	N/A

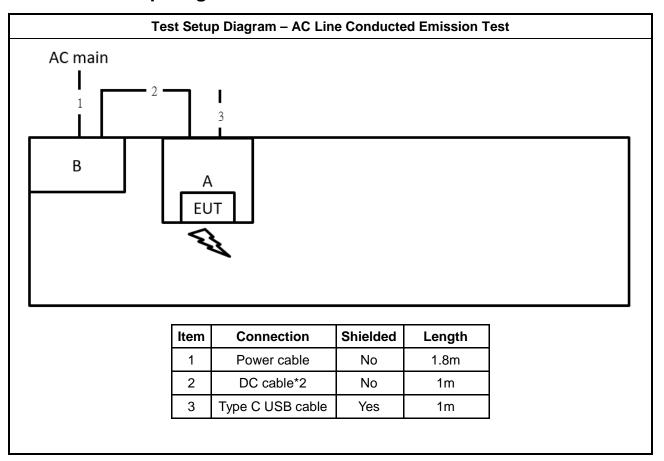
For RF Conducted:

	Support Equipment				
No.	No. Equipment Brand Name Model Name FCC ID			FCC ID	
Α	NB	DELL	E4300	N/A	
В	B Fixture AzureWave 2570-i4 N/A				

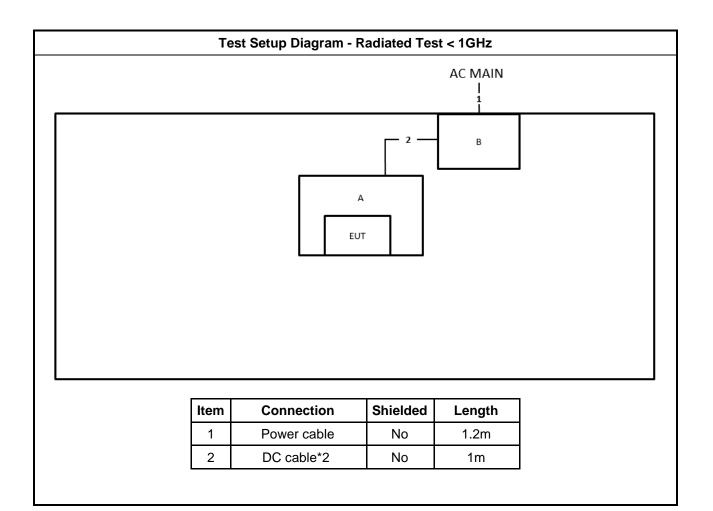
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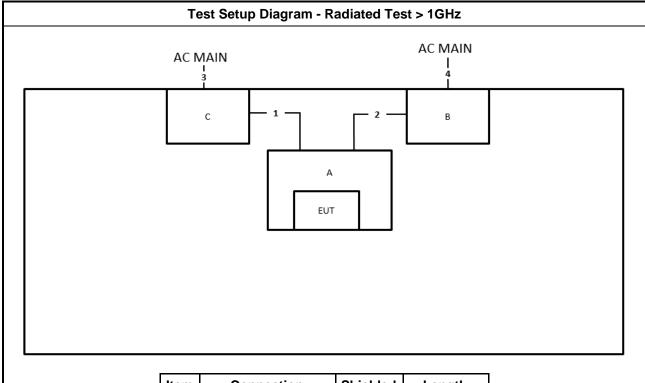
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2.6 Test Setup Diagram



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Item	Connection	Shielded	Length
1	USB to Type C cable	Yes	1m
2	DC cable*2	No	1m
3	Power cable	No	1.7m
4	Power cable	No	1.2m

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3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit				
Frequency Emission (MHz)	Quasi-Peak	Average		
0.15-0.5	66 - 56 *	56 - 46 *		
0.5-5	56	46		
5-30	60	50		
Note 1: * Decreases with the logarithm of the frequency.				

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3.1.2 Measuring Instruments

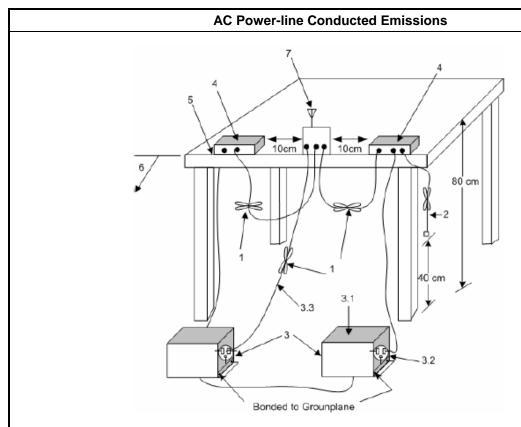
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

	Test Method
\boxtimes	Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

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3.1.4 Test Setup



1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.

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- 2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- 3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
- 3.1—All other equipment powered from additional LISN(s).
- 3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
- 3.3—LISN at least 80 cm from nearest part of EUT chassis.
- 4—Non-EUT components of EUT system being tested.
- 5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
- 6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
- 7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

3.1.5 Measurement Results Calculation

The measured Level is calculated using:

- a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level
- b. Margin = -Limit + Level

3.1.6 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

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3.2 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

	Emission Bandwidth Limit						
UNI	JNII Devices						
	For the 5.85-5.895 GHz band, 26 dB emission bandwidth ,N/A. 6 dB emission bandwidth ≥ 500kHz.						
LE-I	LAN Devices						
	For the 5.85-5.895 GHz band, 26 dB emission bandwidth ,N/A. 6 dB emission bandwidth ≥ 500kHz.						

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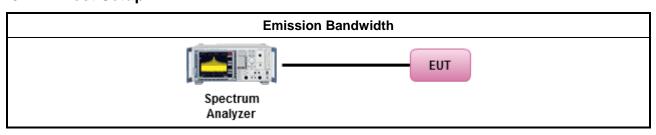
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

	Test Method								
•	For the emission bandwidth shall be measured using one of the options below:								
	\boxtimes	Refer as FCC KDB 789033 D02, clause C for EBW and clause D for OBW measurement.							
	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.								
		Refer as IC RSS-Gen, clause 4.6 for bandwidth testing.							

3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

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3.3 Maximum EIRP Output Power

3.3.1 Limit

	Maximum EIRP Output Power Limit							
UNI	II Devices							
\boxtimes	For the 5.85-5.895 GHz band:							
	■ Indoor AP & subordinate device < 36 dBm							
	■ Client device < 30 dBm							
LE-	LAN Devices							
	For the 5.85-5.895 GHz band:							
	■ Indoor AP & subordinate device < 36 dBm							
	■ Indoor client device < 30 dBm							
	■ Fixed outdoor AP device < 36 dBm							
	Fixed outdoor client device < 30 dBm							

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3.3.2 Measuring Instruments

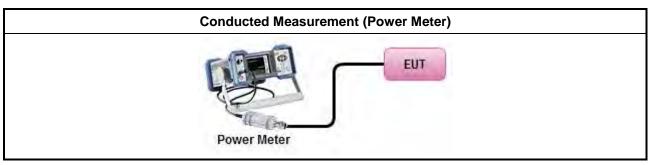
Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

	Test Method							
	Average over on/off periods with duty factor							
	Refer as FCC KDB 789033 D02, clause E Method SA-2 (spectral trace averaging).							
		Refer as FCC KDB 789033 D02, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)						
	Wid	eband RF power meter and average over on/off periods with duty factor						
	\boxtimes	Refer as FCC KDB 789033 D02, clause E Method PM-G (using an RF average power meter).						
\boxtimes	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: $P_{total} = P_1 + P_2 + + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$						
	For	radiated measurement.						
	•	Refer as FCC KDB 789033 D02 clause II A.1.F "Antenna-port Conducted versus Radiated Testing"						
	•	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1GHz.						
	•	Refer as FCC KDB 412172 D01 clause 2.2 for EIRP calculation.						

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3.3.4 Test Setup



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3.3.5 Test Result of Maximum EIRP Output Power

Refer as Appendix C

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3.4 EIRP Power Spectral Density

3.4.1 Limit

	EIRP Power Spectral Density Limit						
UNI	UNII Devices						
\boxtimes	For the 5.85-5.895 GHz band:						
	■ Indoor AP & subordinate device < 20dBm/MHz						
	Client device < 14dBm/MHz						
LE-	LAN Devices						
	For the 5.85-5.895 GHz band:						
	■ Indoor AP & subordinate device < 20 dBm/MHz						
	■ Indoor client device < 14 dBm/MHz						
	Fixed outdoor AP device < 23 dBm/MHz						
	■ Fixed outdoor client device < 17 dBm/MHz						

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3.4.2 Measuring Instruments

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

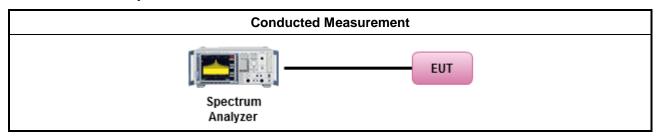
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3.4.3 Test Procedures

		Test Method								
•	outp func	c power spectral density procedures that the same method as used to determine the conducted ut power shall be used to determine the peak power spectral density and use the peak search tion on the spectrum analyzer to find the peak of the spectrum. For the peak power spectral density be measured using below options:								
		Refer as FCC KDB 789033 D02, F)5) power spectral density can be measured using resolution bandwidths < 1 MHz provided that the results are integrated over 1 MHz bandwidth								
	[duty	v cycle ≥ 98% or external video / power trigger]								
	\boxtimes	Refer as FCC KDB 789033 D02, clause E Method SA-1 (spectral trace averaging).								
		Refer as FCC KDB 789033 D02, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)								
	duty	cycle < 98% and average over on/off periods with duty factor								
	\boxtimes	Refer as FCC KDB 789033 D02, clause E Method SA-2 (spectral trace averaging).								
		Refer as FCC KDB 789033 D02, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)								
\boxtimes	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 FCC KDB 789033 D02 clause II A.1.F "Antenna-port Conducted versus Radiated Testing"								
	•	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1GHz.								
	•	Refer as FCC KDB 412172 D01 clause 2.2 for EIRP calculation.								

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3.4.4 Test Setup



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3.4.5 Test Result of EIRP Power Spectral Density

Refer as Appendix D

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3.5 Unwanted Emissions

3.5.1 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					

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- 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.

	Un-restricted band emissions above 1GHz Limit
Operating Band	Limit
UNII Devices 5.85 - 5.895 GHz	(i) For an indoor access point or subordinate device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of - 7 dBm/MHz at or above 5.925 GHz. (ii) For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of -5 dBm/MHz and shall decrease linearly to an e.i.r.p. of -27 dBm/MHz at or above 5.925 GHz. (iii) For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/ MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.725 GHz.
LE-LAN Devices 5.85 - 5.895 GHz	(i) Fixed outdoor access points and fixed outdoor client devices shall not exceed -27 dBm/MHz e.i.r.p. spectral density at or above the 5895 MHz band edge. (ii) Indoor access points or indoor subordinate devices shall not exceed 15 dBm/MHz e.i.r.p. spectral density at the 5895 MHz band edge and shall decrease linearly to not exceed -7 dBm/MHz e.i.r.p. spectral density at or above 5925 MHz. (iii) Client devices shall not exceed -5 dBm/MHz e.i.r.p. spectral density at the 5895 MHz band edge and shall decrease linearly to not exceed -27 dBm/MHz e.i.r.p. spectral density at or above 5925 MHz.

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Note 1: 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).

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3.5.2 Measuring Instruments

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

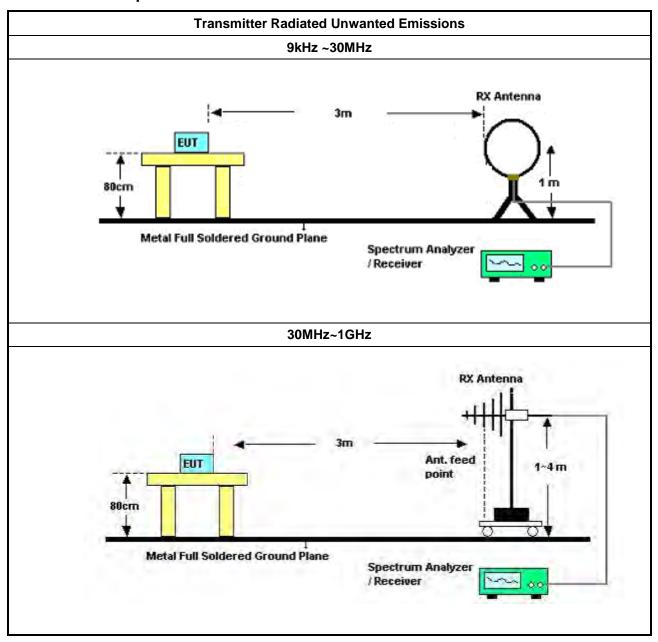
3.5.3 Test Procedures

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 FCC KDB 789033 D02, clause G)2) for unwanted emissions into non-restricted bands.
 - Refer as FCC KDB 789033 D02, clause G)1) for unwanted emissions into restricted bands.
 - Refer as FCC KDB 789033 D02, G)6) Method AD (Trace Averaging).
 - Refer as FCC KDB 789033 D02, 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.
 - Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
 - Refer as FCC KDB 789033 D02, clause G)5) measurement procedure peak limit.
 - Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
- 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.



3.5.4 Test Setup



Above 1GHz

BUT

3M & 1M

1.5M

Max 30cm

Spectrum Analyzer

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3.5.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

3.5.6 Transmitter Unwanted Emissions (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10th harmonic or 40 GHz, whichever is appropriate.

3.5.7 Test Result of Transmitter Unwanted Emissions

Refer as Appendix E

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4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	May 18, 2023	May 17, 2024	Conduction (CO01-CB)
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Mar. 01, 2024	Feb. 28, 2025	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Dec. 29, 2023	Dec. 28, 2024	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Apr. 27, 2023	Apr. 26, 2024	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Apr. 24, 2024	Apr. 23, 2025	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Feb. 08, 2024	Feb. 07, 2025	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	Oct. 17, 2023	Oct. 16, 2024	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6121	65417	9kHz - 30MHz	Oct. 13, 2023	Oct. 12, 2024	Radiation (03CH01-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH01-CB	30MHz ~ 1GHz	Jan. 18, 2024	Jan. 17, 2025	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Feb. 19, 2023	Feb. 18, 2024	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Feb. 18, 2024	Feb. 17, 2025	Radiation (03CH01-CB)
Pre-Amplifier	SGH	SGH0301	20230109-2	10M~1GHz	Jun. 23, 2023	Jun. 22, 2024	Radiation (03CH01-CB)
Signal Analyzer	R&S	FSV3044	101437	10kHz ~ 44GHz	Nov. 28, 2023	Nov. 27, 2024	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 13, 2023	Jun. 12, 2024	Radiation (03CH01-CB)
RF Cable-low	Woken	RG402	Low Cable-31+32	30MHz ~ 1GHz Nov. 06, 2023 Nov. 0		Nov. 05, 2024	Radiation (03CH01-CB)
Test Software	SPORTON	SENSE	V5.10	- N.C.R. N.C.R.		N.C.R.	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6121	65417	9kHz - 30MHz Oct. 13, 2023 Oct. 12, 2024		Oct. 12, 2024	Radiation (03CH04-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH04-CB	30MHz ~ 1GHz	Aug. 01, 2023	Jul. 31, 2024	Radiation (03CH04-CB)

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Calibration Calibration Model No. Serial No. Characteristics Instrument **Brand** Remark **Due Date** Date **BILOG** Schaffner & CBL6112B & 22021&AT-N06 Radiation ANTENNA with 30MHz ~ 1GHz Oct. 07, 2023 Oct. 06, 2024 **EMCI** N-6-06 (03CH04-CB) 07 6 dB attenuator Radiation Pre-Amplifier **EMCI** EMC330N 980391 20MHz ~ 3GHz May 23, 2023 May 22, 2024 (03CH04-CB) Radiation Pre-Amplifier **EMCI** EMC330N 980391 20MHz ~ 3GHz May 22, 2024 May 21, 2025 (03CH04-CB) Spectrum Radiation FSP40 100142 9kHz~40GHz R&S Mar. 21, 2023 Mar. 20, 2024 (03CH04-CB Analyzer Spectrum Radiation R&S FSP40 100142 9kHz~40GHz Mar. 19, 2024 Mar. 18, 2025 Analyzer (03CH04-CB **FMI Test** Radiation R&S **ESCS** 826547/017 9kHz ~ 2.75GHz Jun. 13, 2023 Jun. 12, 2024 Receiver (03CH04-CB) Low Radiation RF Cable-low Woken RG402 30MHz - 1GHz Oct. 02, 2023 Oct. 01, 2024 Cable-03+67 (03CH04-CB) 3m Semi Anechoic 1GHz ~18GHz Radiation 03CH04-CB TDK SAC-3M Feb. 22, 2024 Feb. 21, 2025 Chamber (03CH04-CB) 3m **VSWR** 750MHz~ Radiation 00143147 Horn Antenna ETS · Lindgren 3115 Oct. 04, 2023 Oct. 03, 2024 18GHz (03CH04-CB) Radiation **BBHA 9170** BBHA9170252 15GHz ~ 40GHz Horn Antenna Schwarzbeck Sep. 04, 2023 Sep. 03, 2024 (03CH04-CB) 0.5GHz ~ Radiation Pre-Amplifier 83017A MY53270063 Jun. 30, 2023 Agilent Jun. 29, 2024 26.5GHz (03CH04-CB) Radiation 20221107-3 SGH SGH184 18GHz ~ 40GHz Pre-Amplifier Nov. 24, 2023 Nov. 23, 2024 (03CH04-CB) Radiation 1GHz - 18GHz RF Cable-high Woken RG402 High Cable-21 Oct. 02, 2023 Oct. 01, 2024 (03CH04-CB) Radiation Hiah RG402 1GHz - 18GHz RF Cable-high Woken Oct. 02, 2023 Oct. 01, 2024 Cable-21+67 (03CH04-CB) Radiation High Cable Woken WCA0929M 40G#5+6 1GHz ~ 40GHz Jan. 11, 2024 Jan. 10, 2025 (03CH04-CB) Radiation **SPORTON Test Software** SENSE V5.10 N.C.R. N.C.R. (03CH04-CB) Conducted Spectrum FSV40 9kHz~40GHz R&S 101027 Aug. 14, 2023 Aug. 13, 2024 analyzer (TH02-CB) 300MHz~ Conducted Power Sensor Oct. 19, 2023 Oct. 18, 2024 Anritsu MA2411B 1126203 40GHz (TH02-CB) 300MHz~ Conducted Power Meter Anritsu ML2495A 1210004 Oct. 19, 2023 Oct. 18, 2024 40GHz (TH02-CB) Conducted RF Cable-high Woken RG402 High Cable-01 1GHz - 18GHz Oct. 02, 2023 Oct. 01, 2024 (TH02-CB) Conducted RG402 High Cable-02 1GHz - 18GHz Oct. 01, 2024 RF Cable-high Woken Oct. 02, 2023 (TH02-CB) Conducted RF Cable-high Woken RG402 High Cable-03 1GHz - 18GHz Oct. 02, 2023 Oct. 01, 2024 (TH02-CB)

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Instrument	Brand	Model No.	Model No. Serial No. Characteristics		Calibration Due Date	Remark	
RF Cable-high	Woken	RG402	High Cable-04	1GHz – 18GHz	Oct. 02, 2023	Oct. 01, 2024	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-05	1GHz – 18GHz	Oct. 02, 2023	Oct. 01, 2024	Conducted (TH02-CB)
Switch	SPTCB	SP-SWI	SWI-02	1–26.5GHz	Oct. 03, 2023	Oct. 02, 2024	Conducted (TH02-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conducted (TH02-CB)

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Note: Calibration Interval of instruments listed above is one year.

NCR means Non-Calibration required.

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Conducted Emissions at Powerline

Appendix A

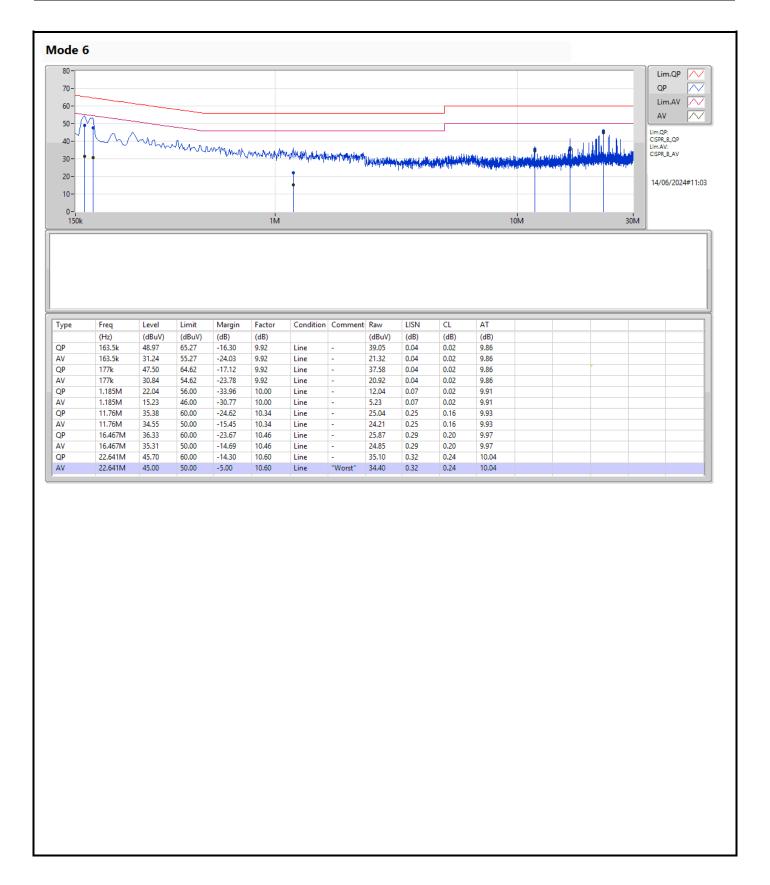
Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 6	Pass	AV	22.641M	45.00	50.00	-5.00	Line

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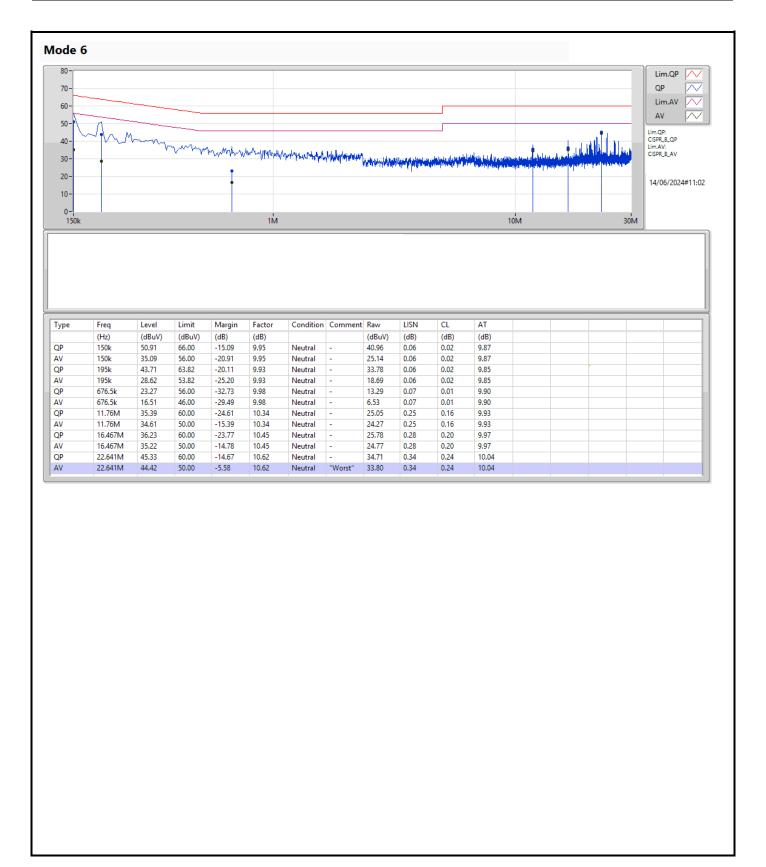




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Appendix B **EBW**

Summary

Mode	Max-N dB	Max-OBW	ITU-Code	Min-N dB	Min-OBW
	(Hz)	(Hz)		(Hz)	(Hz)
5.85-5.895GHz	-	=	=	-	-
802.11a_Nss1,(6Mbps)_1TX	16.555M	16.668M	16M7D1D	16.555M	16.58M
802.11ax HEW20_Nss1,(MCS0)_1TX	18.26M	18.766M	18M8D1D	17.105M	18.641M

 $\label{eq:max-NdB} Max-N\,dB = Maximum\,6dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,other\,band;\\ Max-OBW = Maximum\,99\%\,occupied\,bandwidth;\\ Min-N\,dB = Minimum\,6dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,other\,band;\\ Min-OBW = Minimum\,99\%\,occupied\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,other\,band;\\ Min-OBW = Minimum\,99\%\,occupied\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,band\,/\,Maximum\,26dB\,down\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.725-5.85GHz\,bandwidth\,for\,5.72$

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Appendix B **EBW**

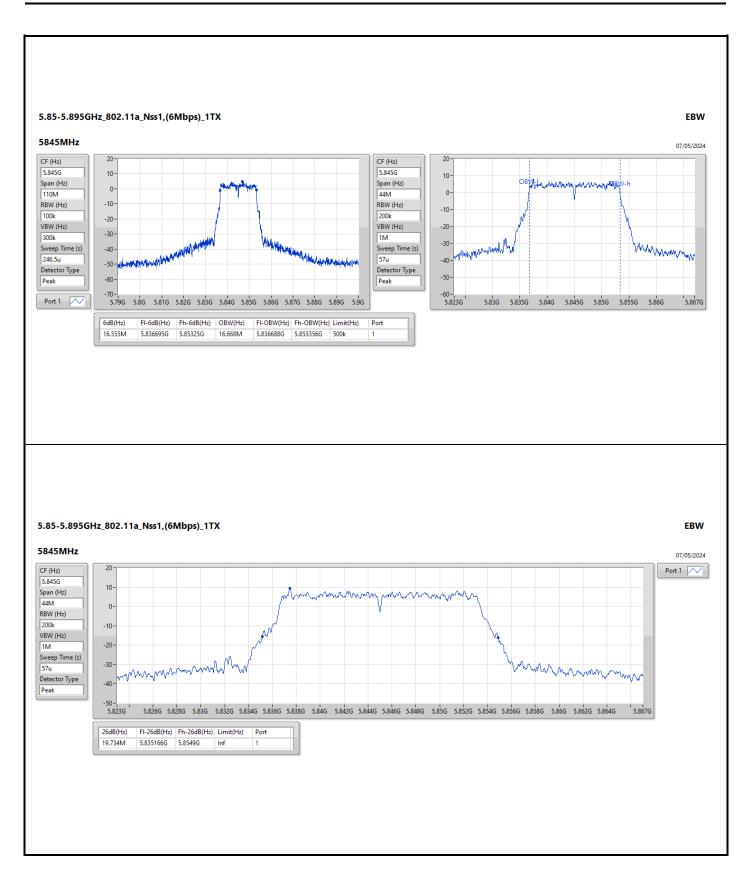
Result

Mode	Result	Limit	Port 1-N dB	Port 1-OBW
		(Hz)	(Hz)	(Hz)
802.11a_Nss1,(6Mbps)_1TX	-	-	-	-
5845MHz	Pass	500k	16.555M	16.668M
5865MHz	Pass	500k	16.555M	16.624M
5885MHz	Pass	500k	16.555M	16.58M
802.11ax HEW20_Nss1,(MCS0)_1TX	-	ī	=	-
5845MHz	Pass	500k	17.105M	18.666M
5865MHz	Pass	500k	18.26M	18.766M
5885MHz	Pass	500k	17.985M	18.641M

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

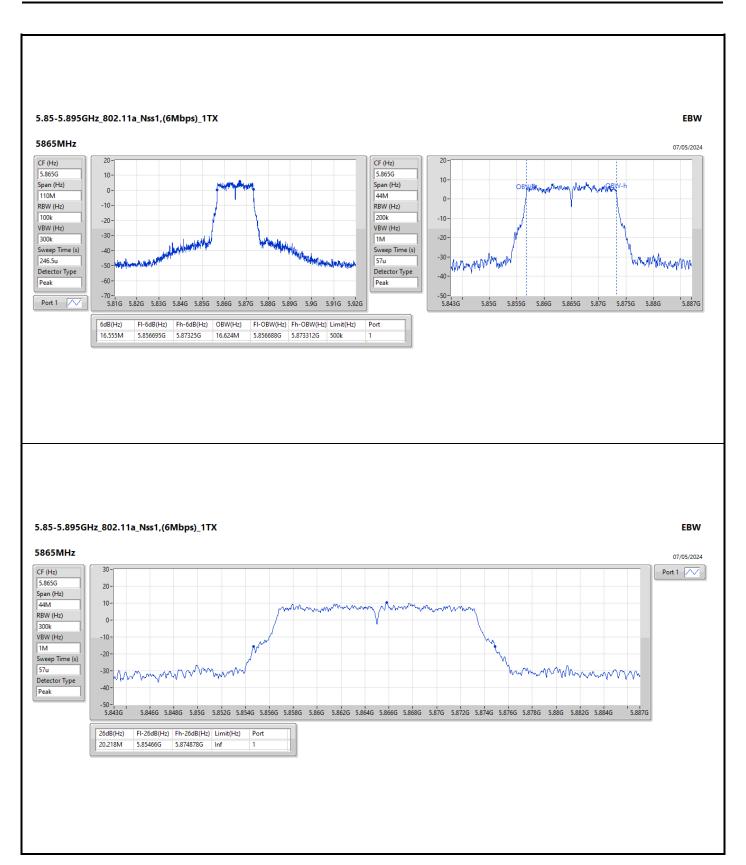
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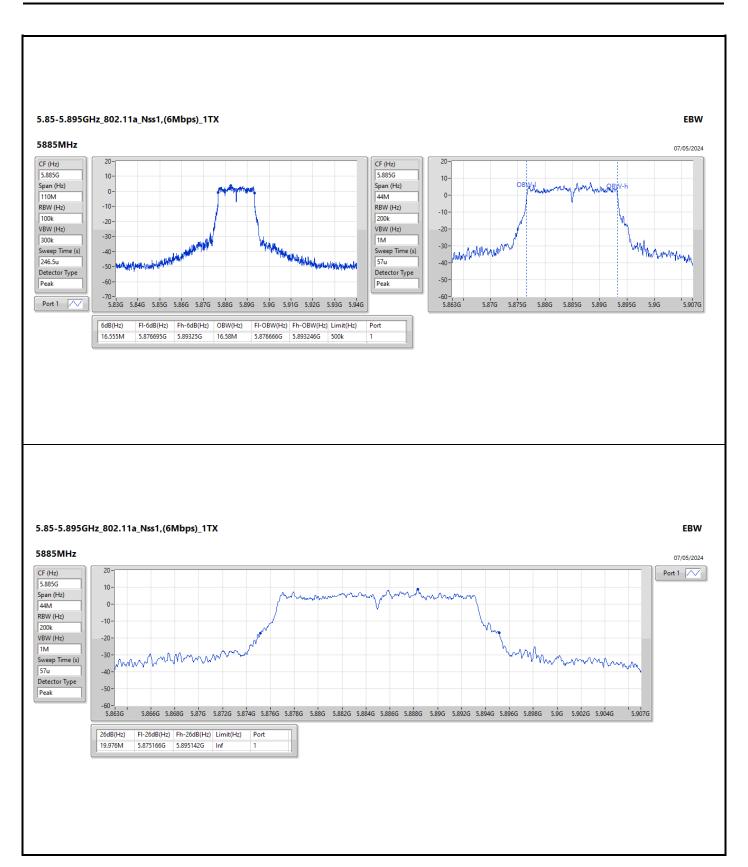
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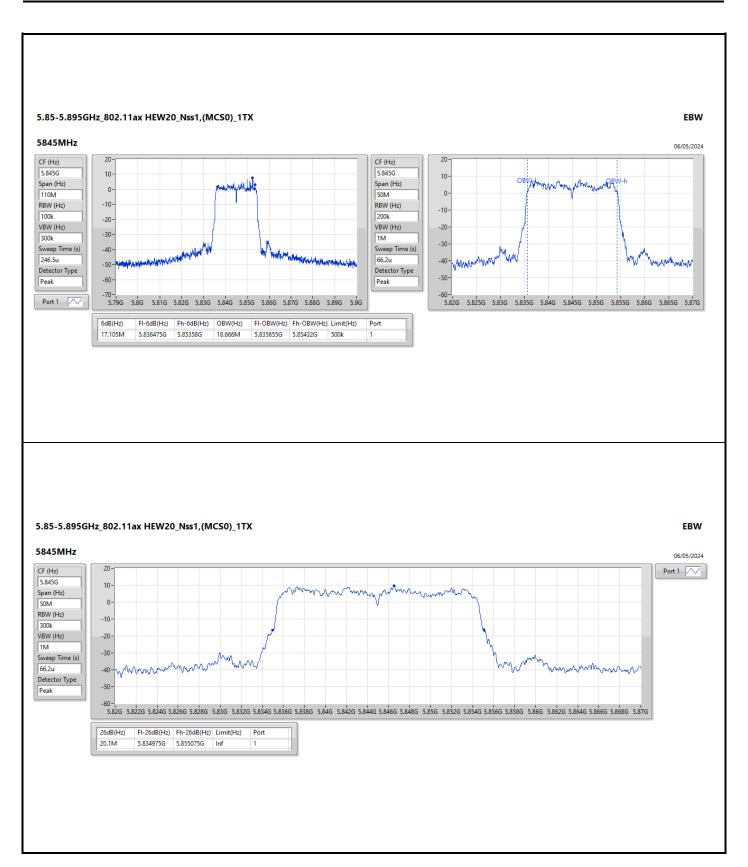
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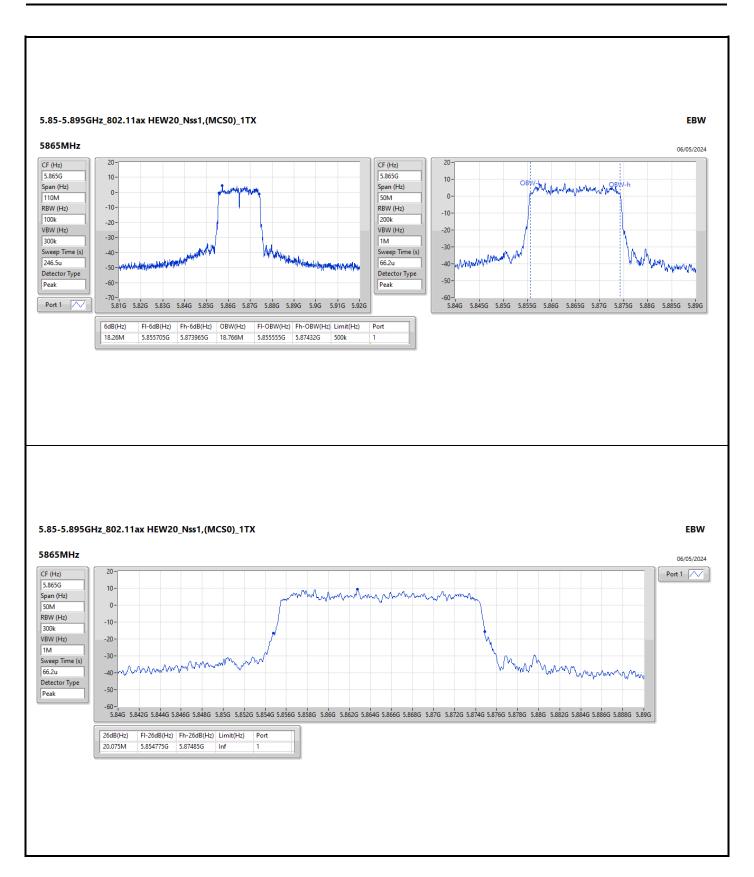
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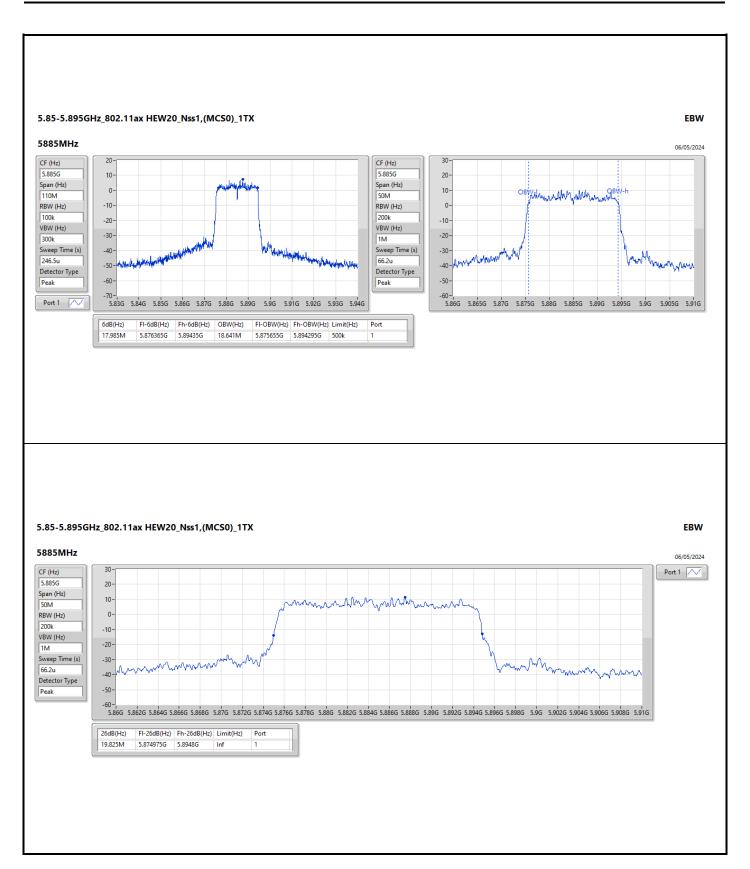
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Appendix C Average Power

Summary

Mode	Total Power	Total Power	EIRP	EIRP
	(dBm)	(W)	(dBm)	(W)
5.85-5.895GHz	-	-	=	-
802.11a_Nss1,(6Mbps)_1TX	19.80	0.09550	24.80	0.30200
802.11ax HEW20_Nss1,(MCS0)_1TX	19.18	0.08279	24.18	0.26182

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Average Power Appendix C

Result

Mode	Result	DG	Port 1	Total Power	Power Limit	EIRP	EIRP Limit
		(dBi)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
802.11a_Nss1,(6Mbps)_1TX	-	-	-	-	-	-	-
5845MHz	Pass	5.00	18.44	18.44	30.00	23.44	30.00
5865MHz	Pass	5.00	19.80	19.80	Inf	24.80	30.00
5885MHz	Pass	5.00	17.93	17.93	Inf	22.93	30.00
802.11ax HEW20_Nss1,(MCS0)_1TX		-		-	i e	=	-
5845MHz	Pass	5.00	18.21	18.21	30.00	23.21	30.00
5865MHz	Pass	5.00	17.90	17.90	Inf	22.90	30.00
5885MHz	Pass	5.00	19.18	19.18	Inf	24.18	30.00

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

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PSD Appendix D

Summary

Mode	PD	EIRP PD
	(dBm/RBW)	(dBm/RBW)
5.85-5.895GHz	-	-
802.11a_Nss1,(6Mbps)_1TX	7.49	12.49
802.11ax HEW20_Nss1,(MCS0)_1TX	6.57	11.57

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

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Appendix D **PSD**

Result

Mode	Result	DG	Port 1	PD	PD Limit	EIRP PD	EIRP PD Limit
		(dBi)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW) (dBm/RBW)		(dBm/RBW)
802.11a_Nss1,(6Mbps)_1TX	-	-	-	-	-	-	-
5845MHz	Pass	5.00	5.69	5.69	Inf	10.69	14.00
5865MHz	Pass	5.00	7.49	7.49	Inf	12.49	14.00
5885MHz	Pass	5.00	5.65	5.65	Inf	10.65	14.00
802.11ax HEW20_Nss1,(MCS0)_1TX	-	=	ī	ī	-	=	-
5845MHz	Pass	5.00	5.12	5.12	Inf	10.12	14.00
5865MHz	Pass 5.0		5.25	5.25	Inf	10.25	14.00
5885MHz	Pass	5.00	6.57	6.57	Inf	11.57	14.00

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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;

Appendix D **PSD**



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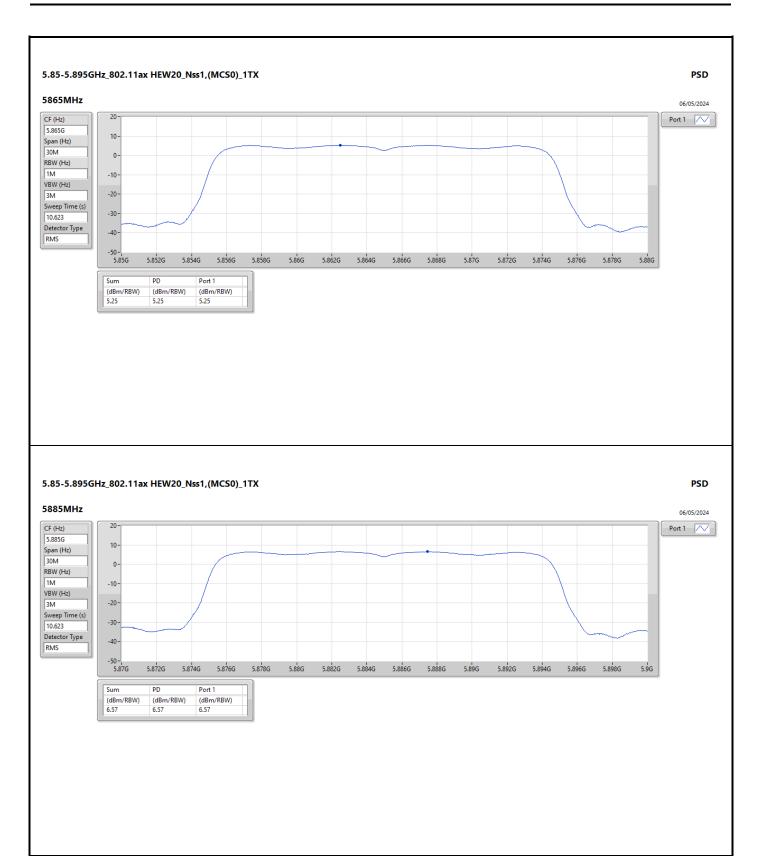
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Radiated Emissions below 1GHz

Appendix E.1

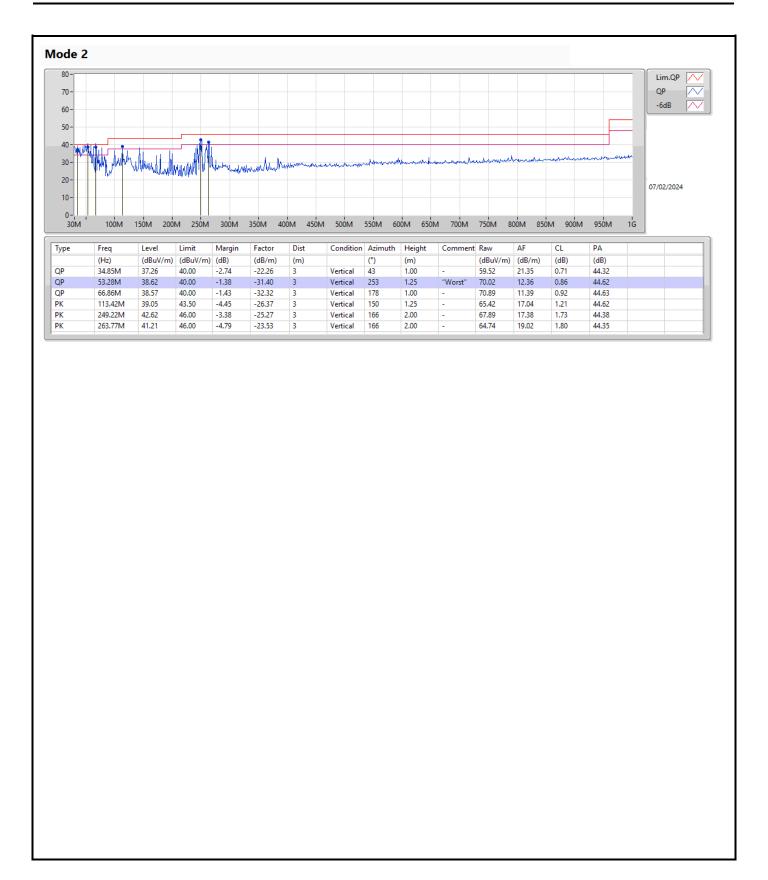
Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 2	Pass	QP	53.28M	38.62	40.00	-1.38	Vertical

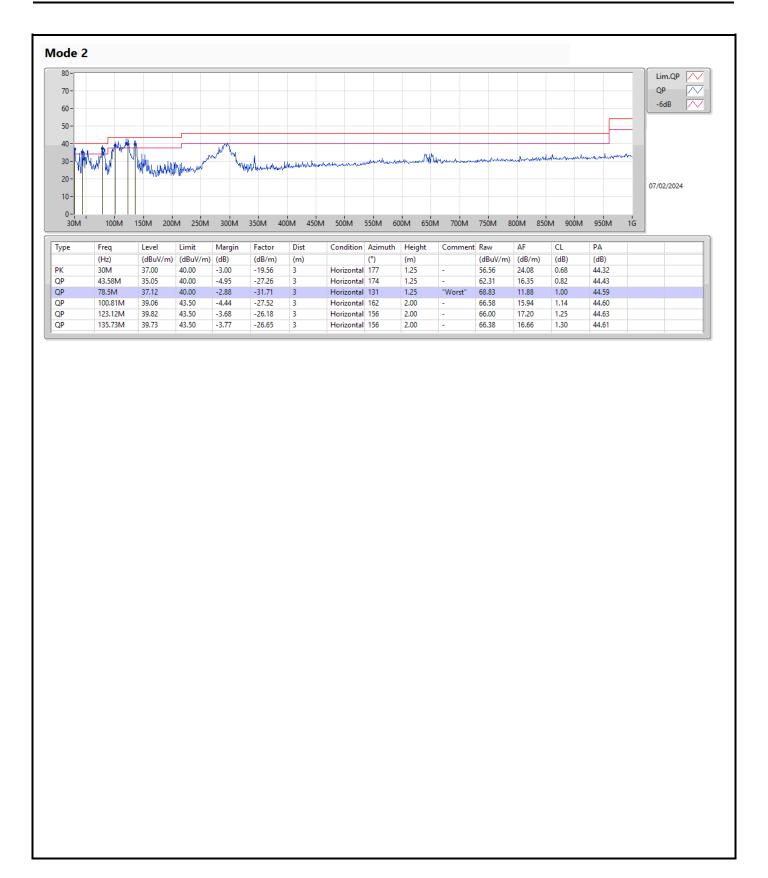
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RSE TX above 1GHz_Dipole Antenna

Appendix E.2

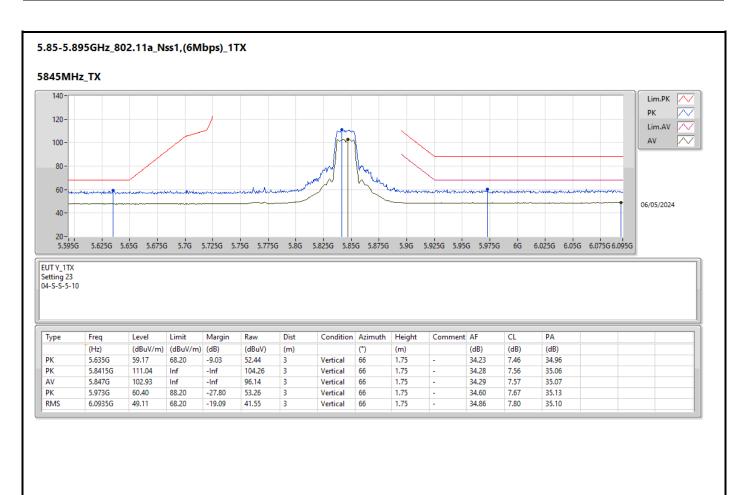
Summary

Mode	Result	Туре	Freq	Level	Limit	Margin	Dist	Condition	Azimuth	Height	Comments
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(m)		(°)	(m)	
5.85-5.895GHz	-	-	-	-	-	-	-	-			-
802.11a_Nss1,(6Mbps)_1TX	Pass	AV	11.68968G	52.93	54.00	-1.07	3	Horizontal	239	1.77	-

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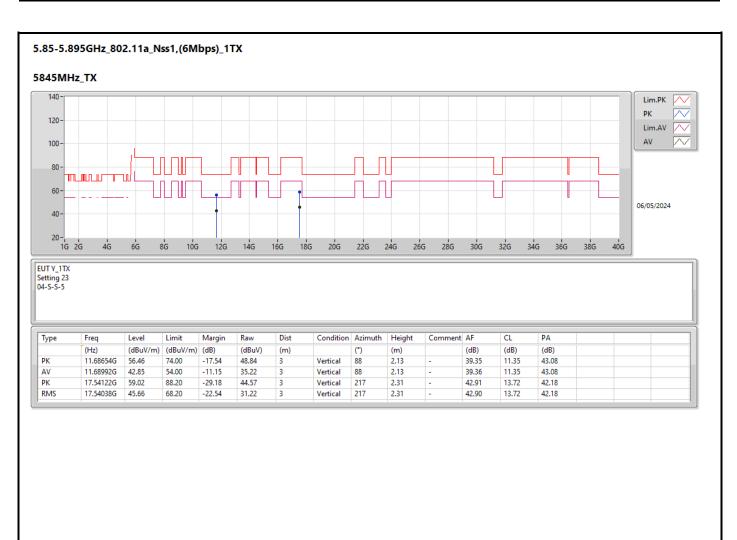




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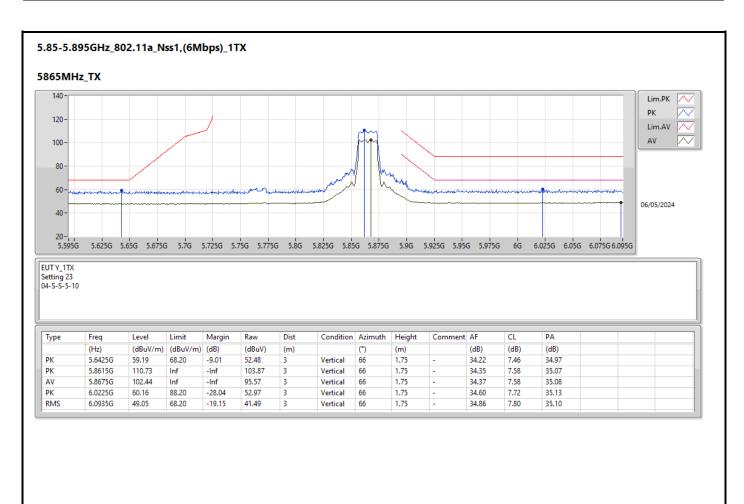




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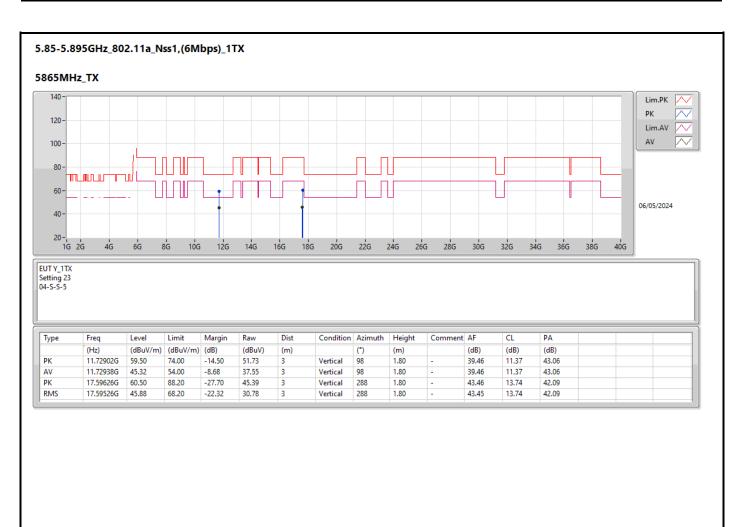
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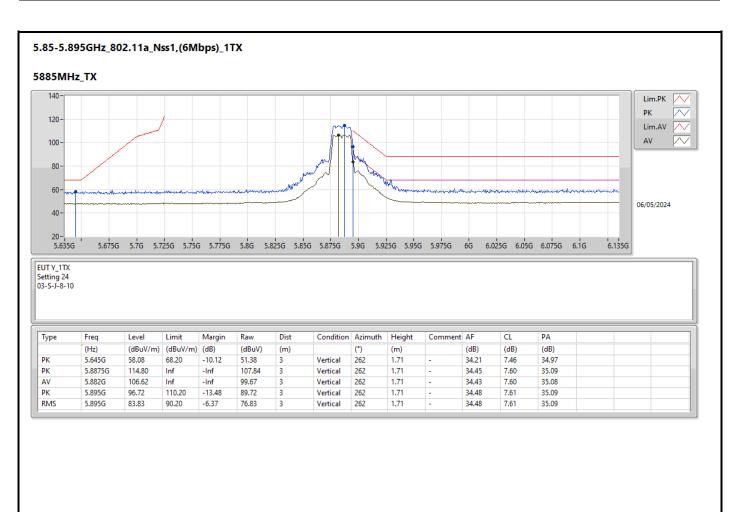




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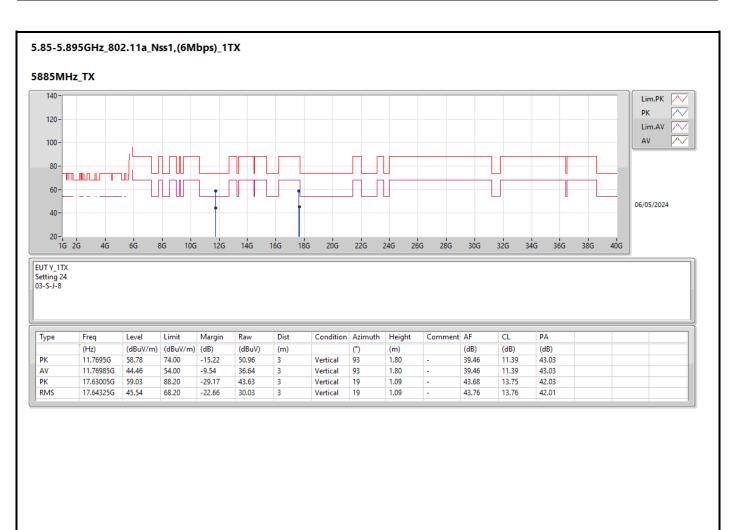
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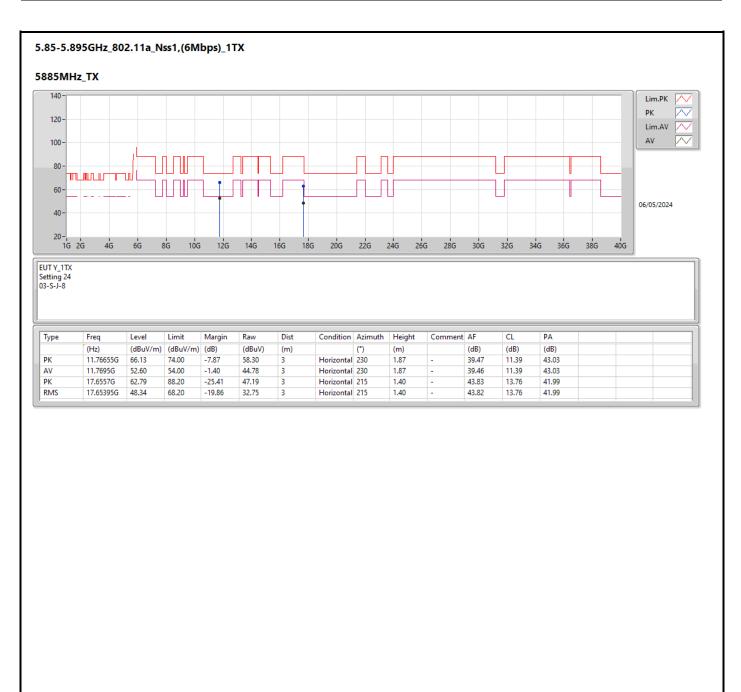




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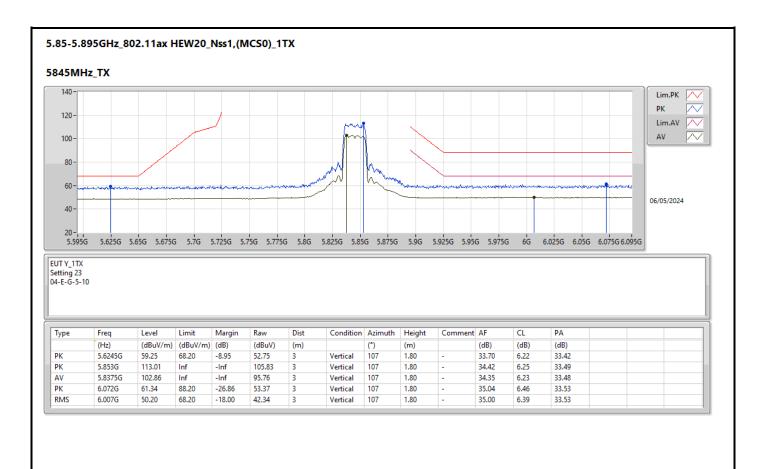




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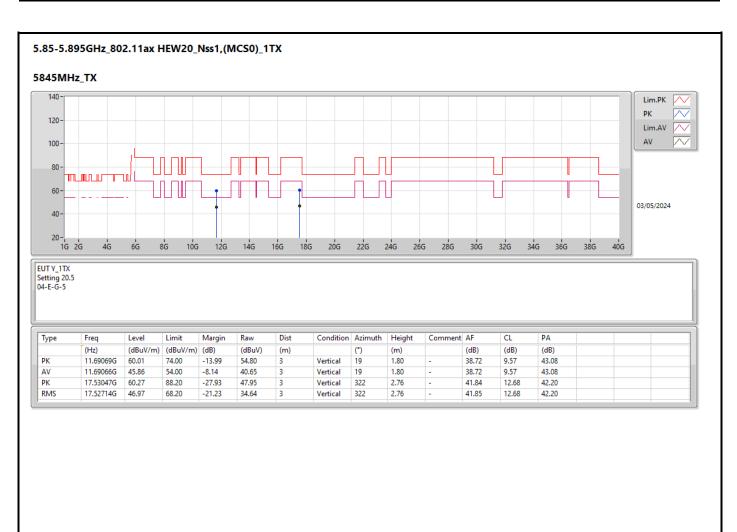
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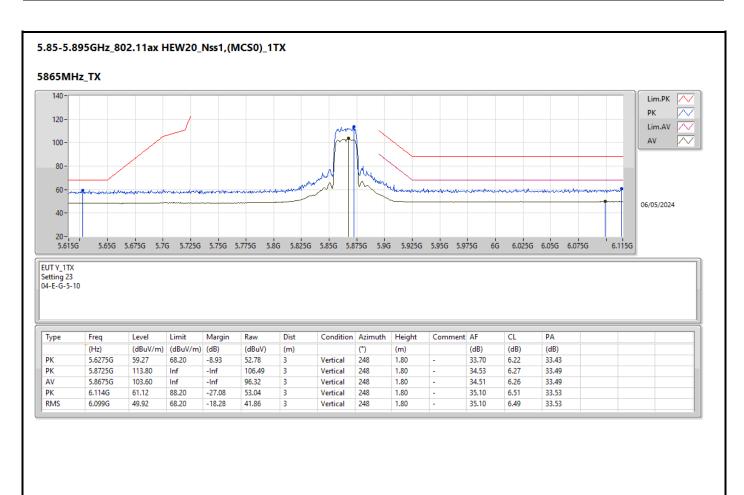




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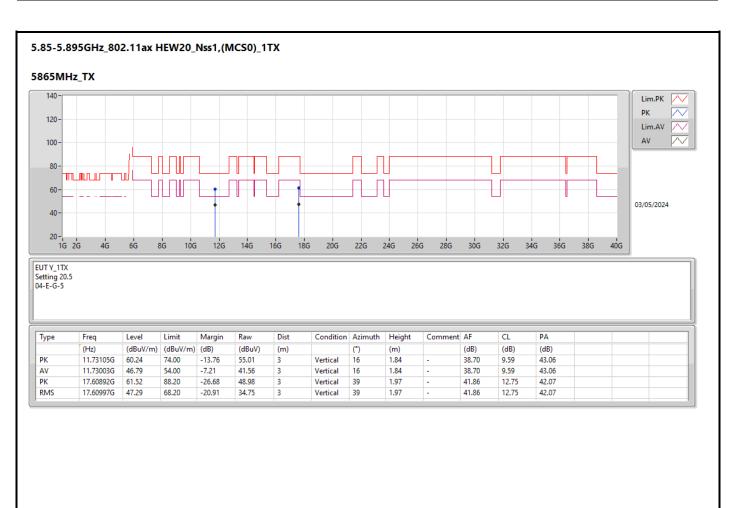




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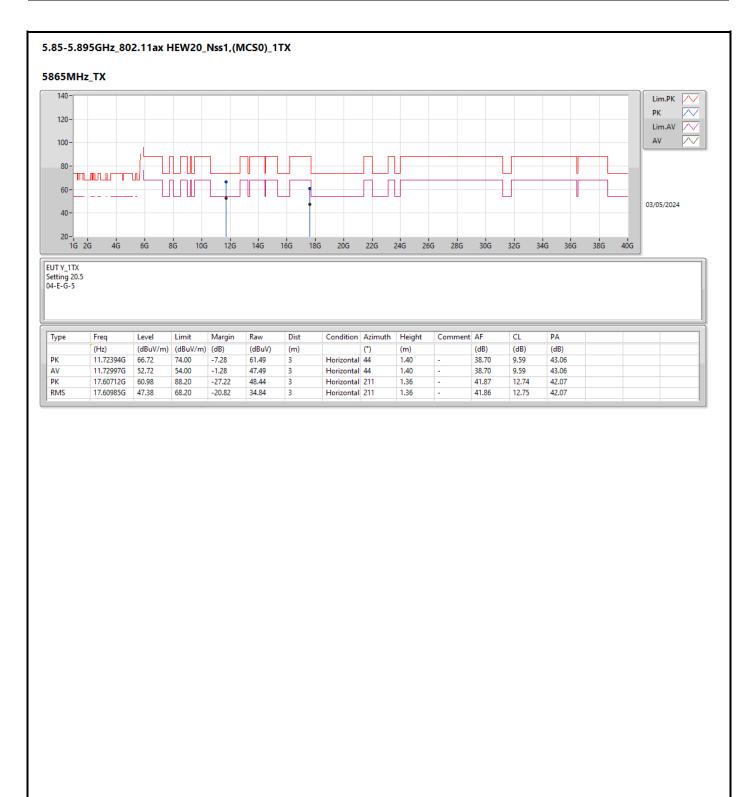




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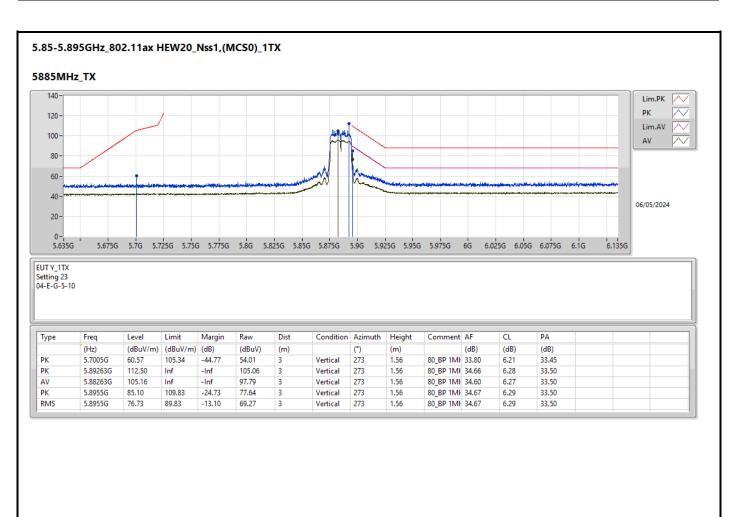




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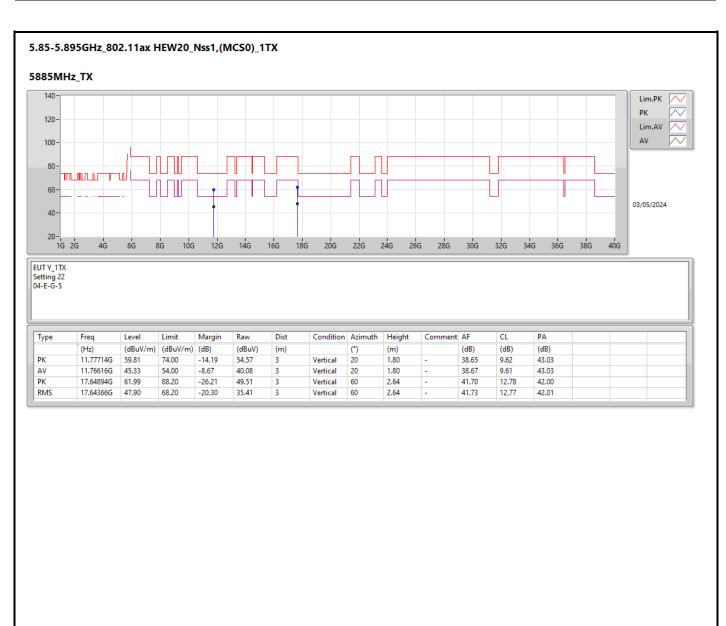




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RSE TX above 1GHz_PCB Antenna

Appendix E.3

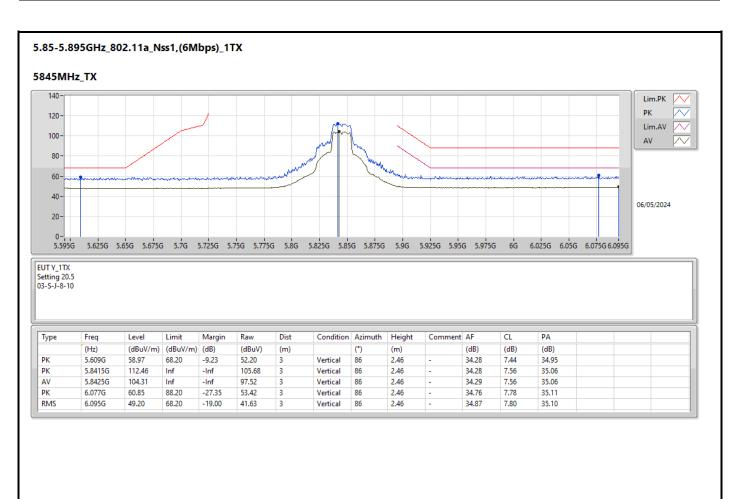
Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth	Height (m)	Comments
5.85-5.895GHz			- (112)	- (ubuviii)	(ubuviii)	(ub) -	-	-	-	-	-
802.11ax HEW20_Nss1,(MCS0)_1TX	Pass	AV	11.72997G	52.95	54.00	-1.05	3	Horizontal	44	1.46	-

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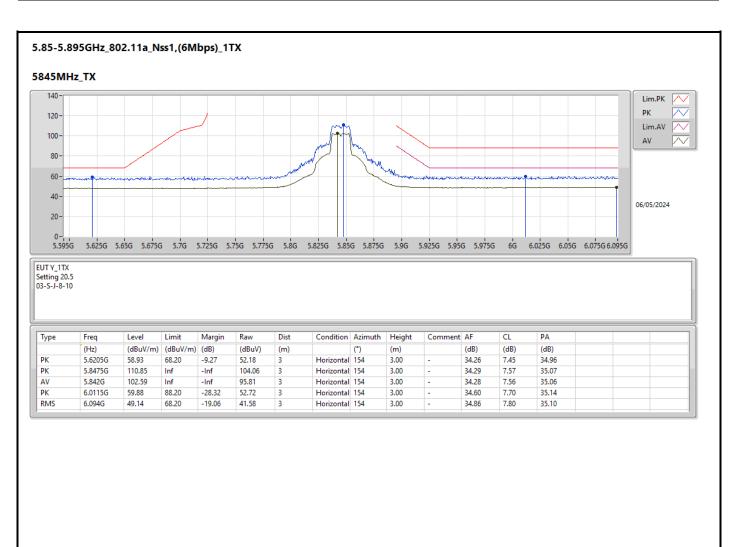




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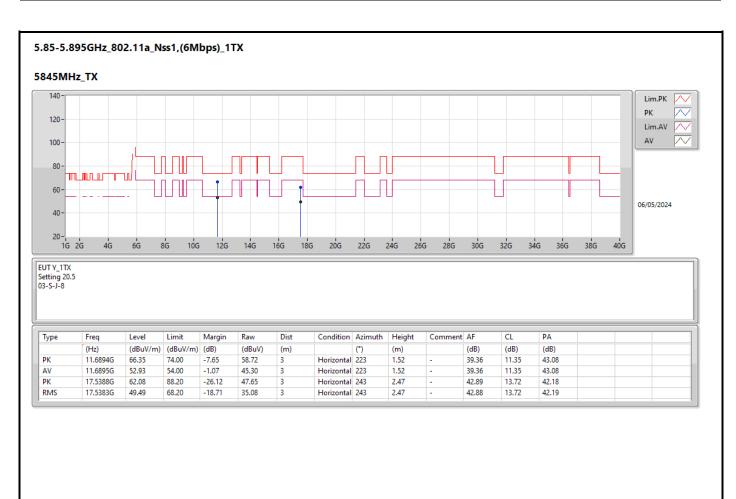
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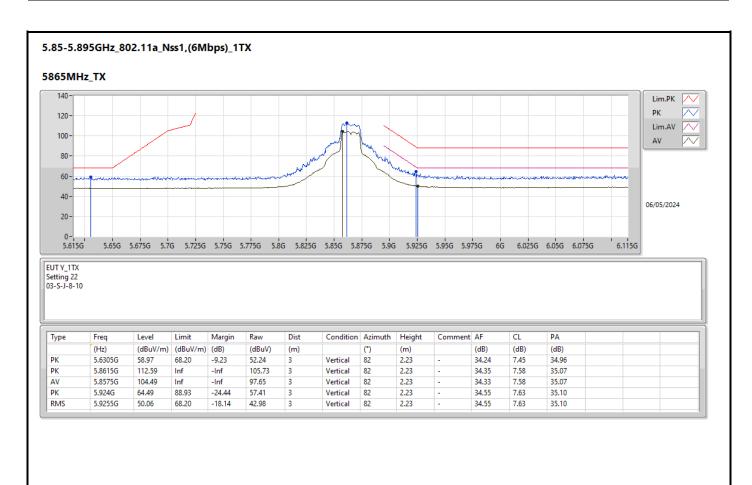
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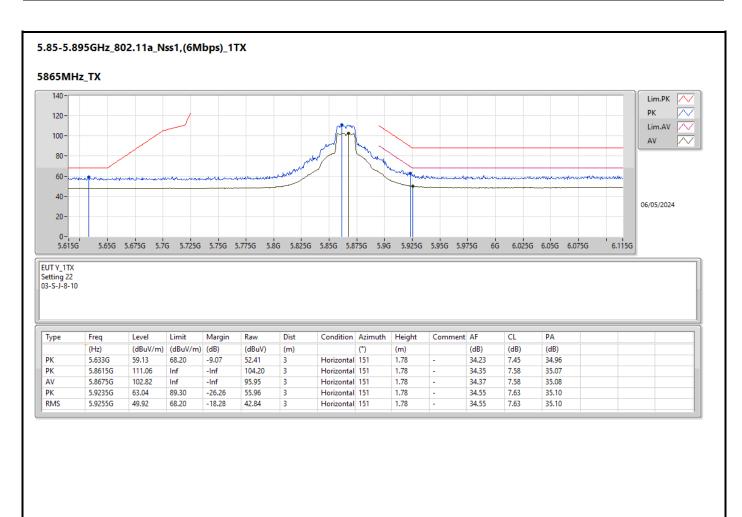
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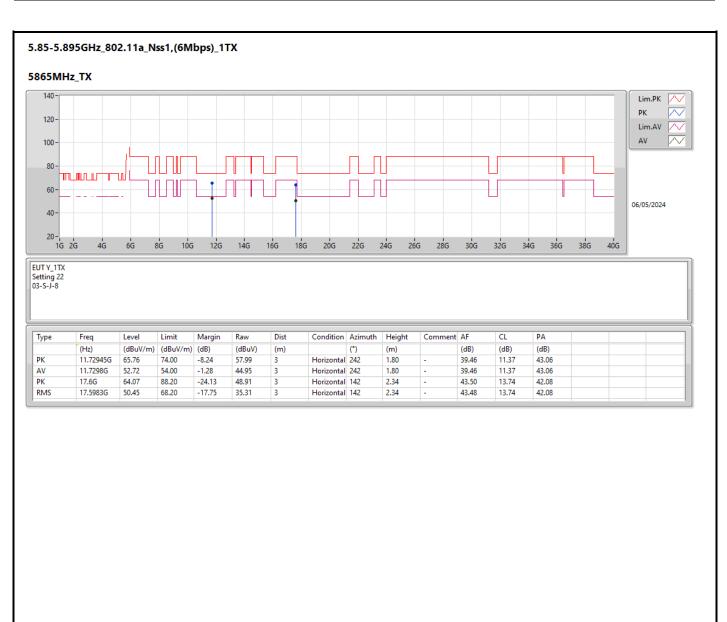




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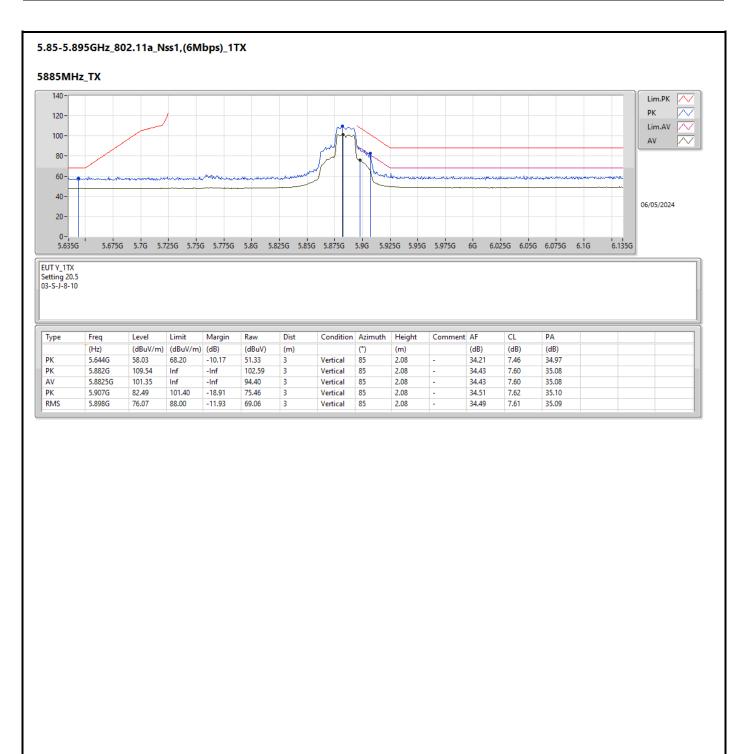




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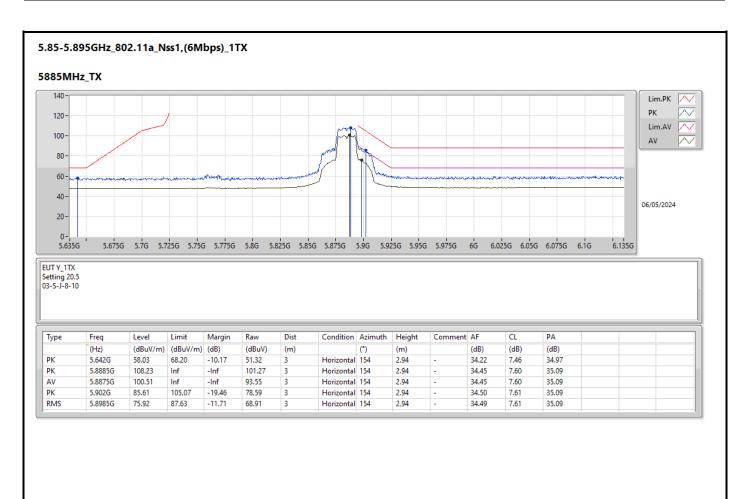




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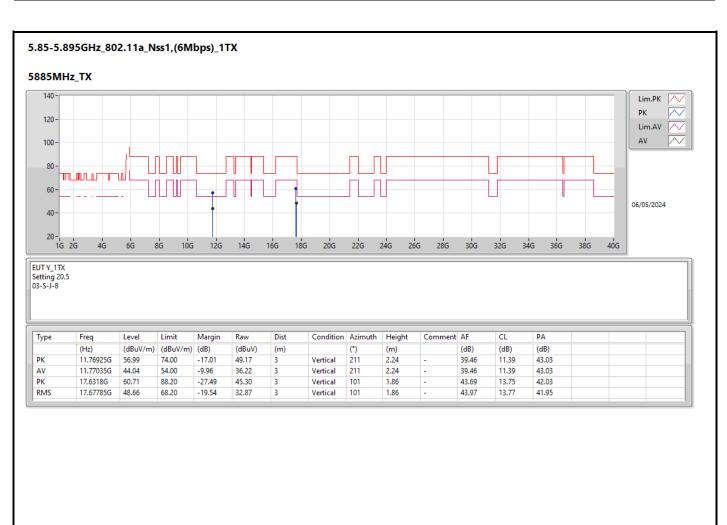




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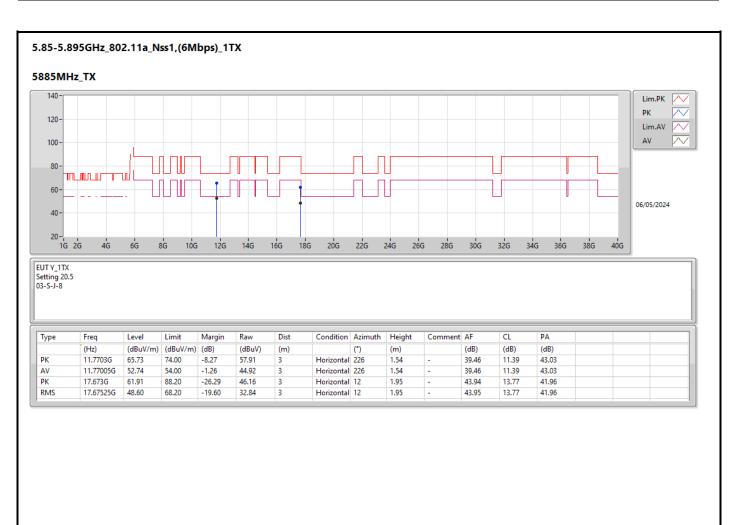




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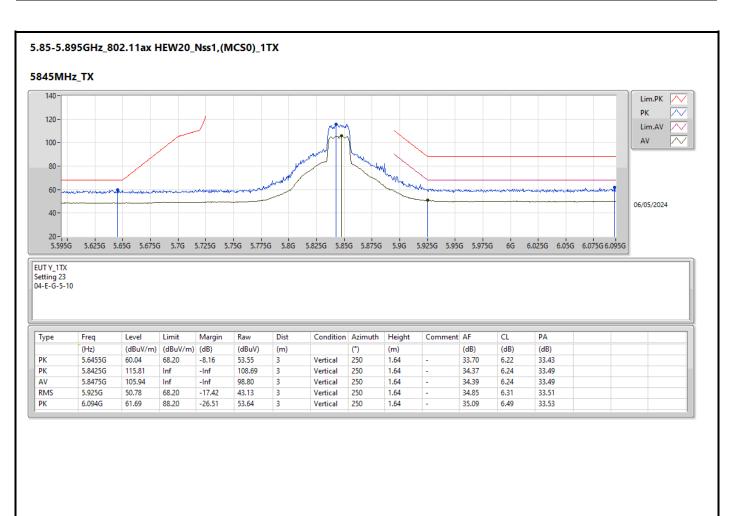




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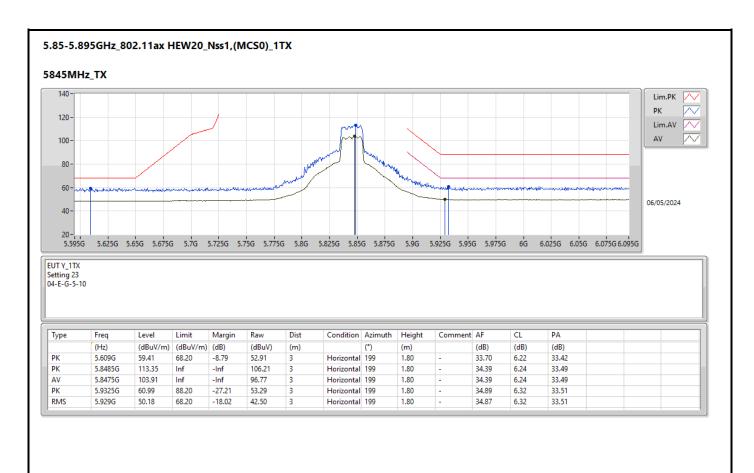




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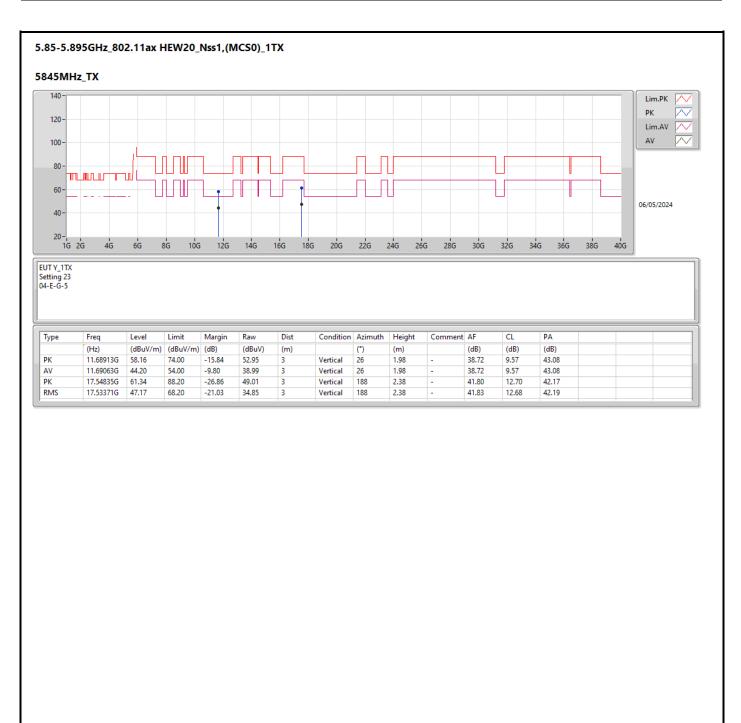




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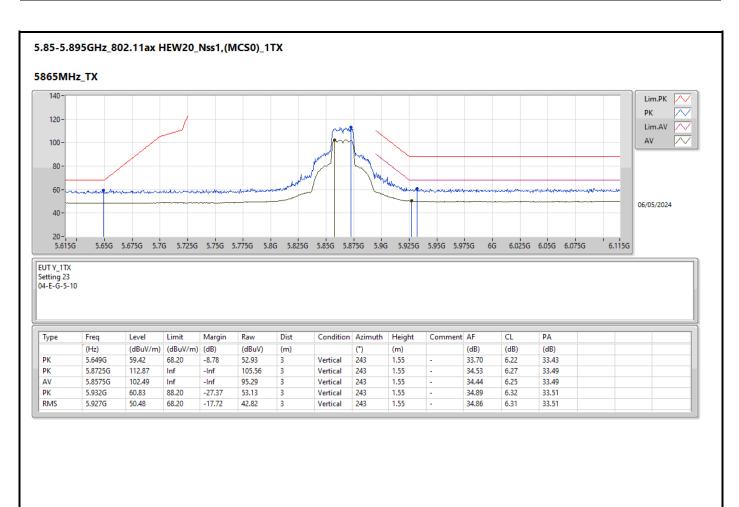




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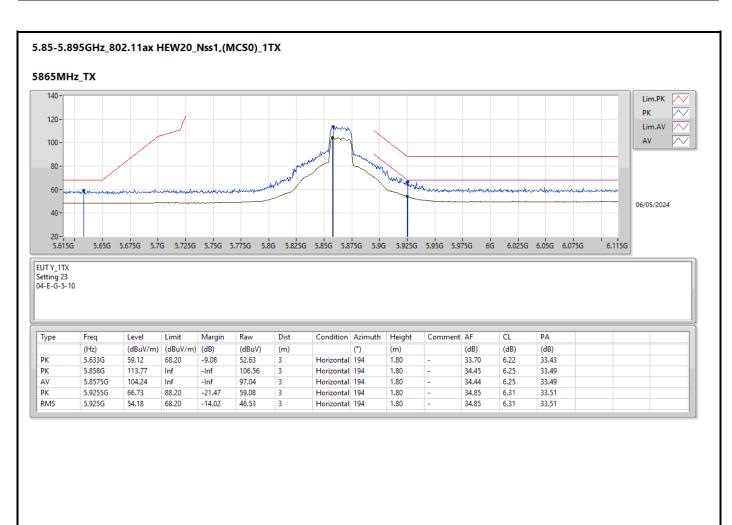




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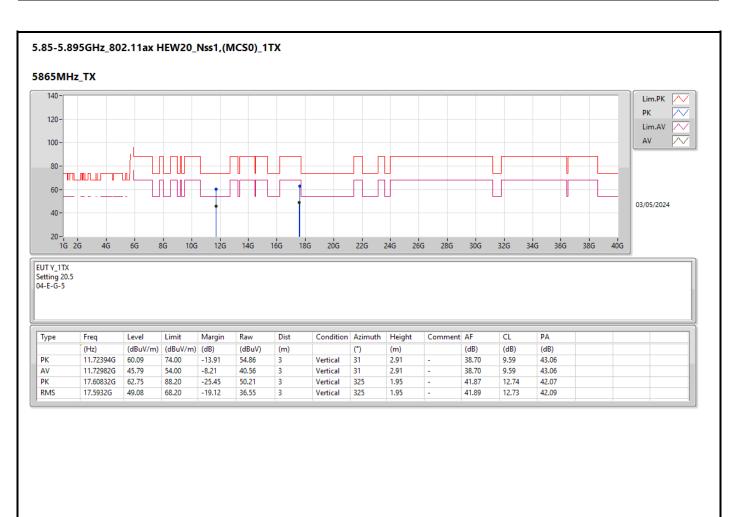




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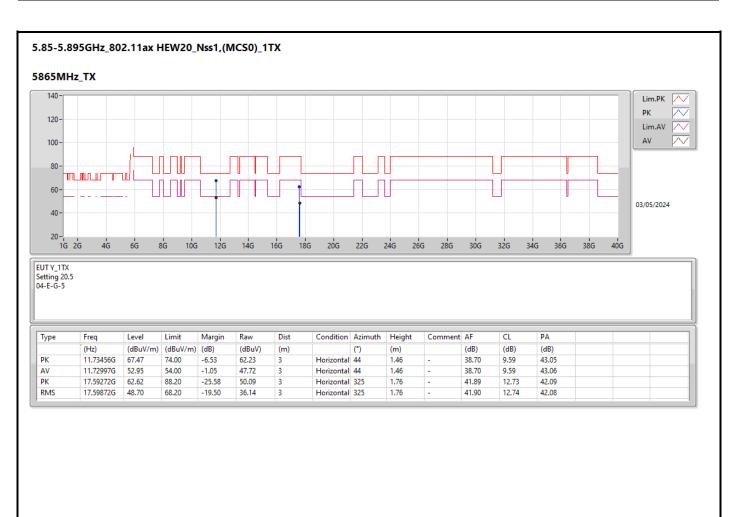




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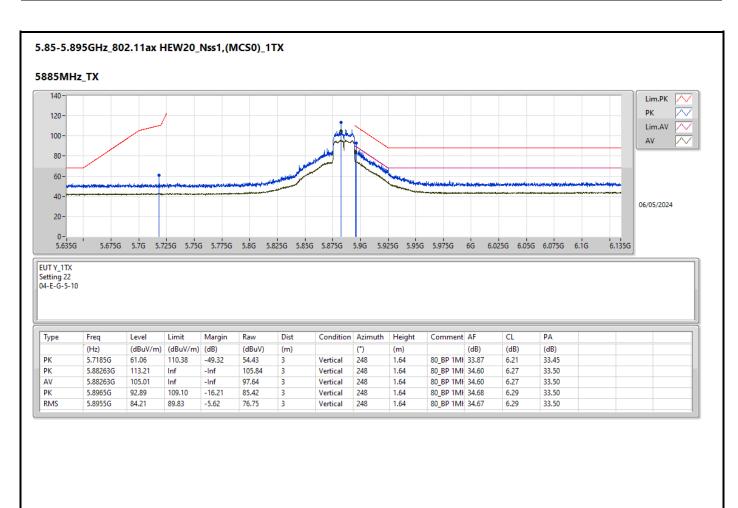




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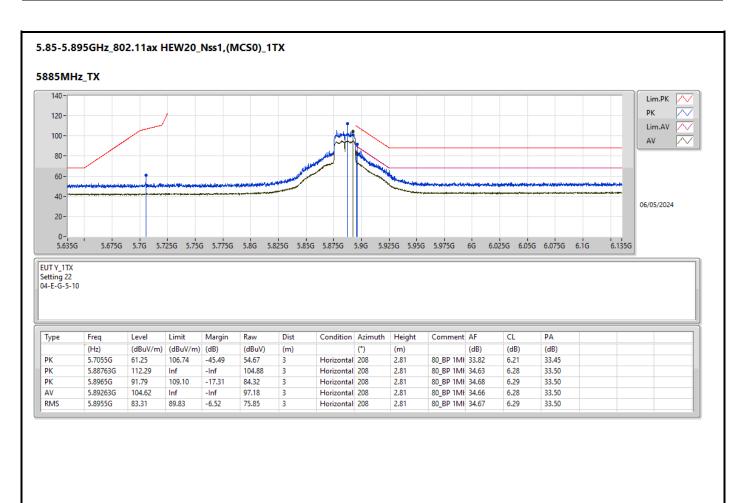




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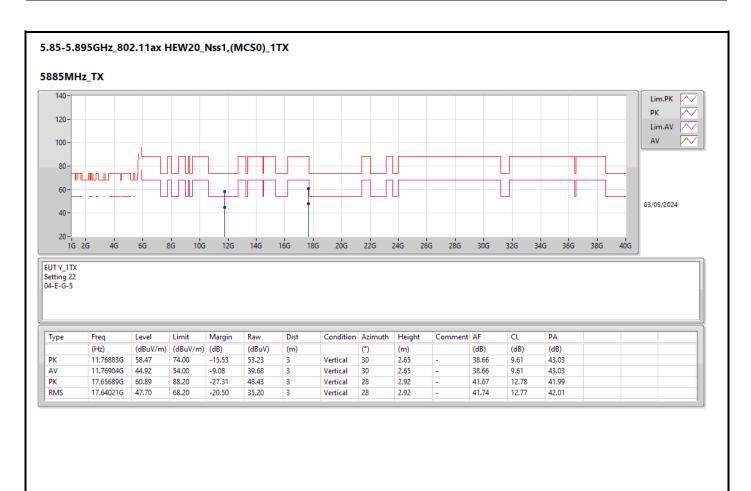




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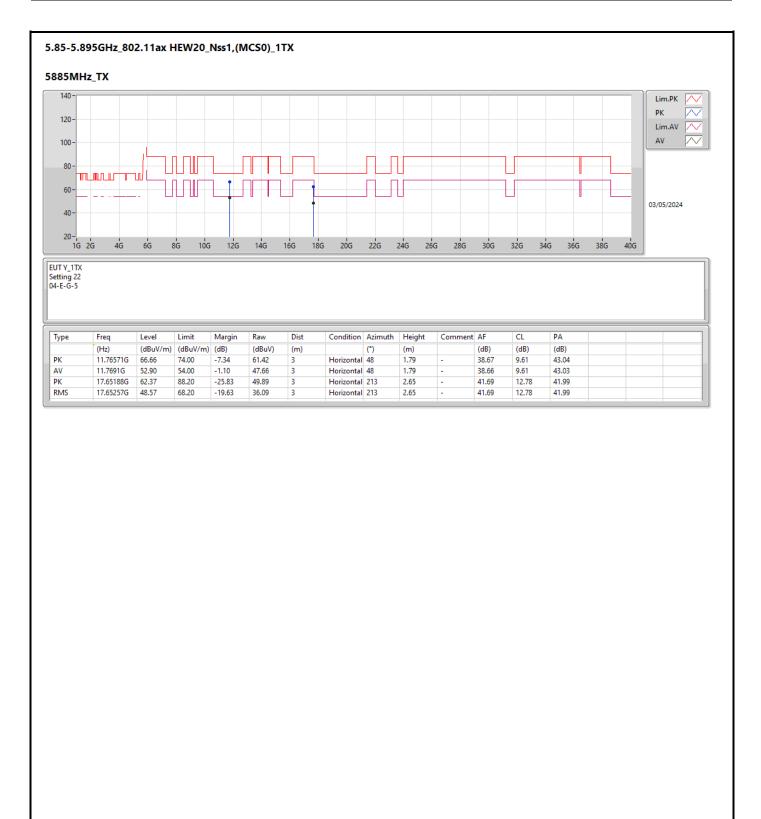




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