



RADIO TEST REPORT

FCC ID : Z8H89FT0075
Equipment : ePMP 6GHz Force 4625 SM
Brand Name : Cambium Networks
Model Name : ePMP 6GHz Force 4625 SM
Model Number : C068940P142A
Applicant : Cambium Networks Inc.
3800 Golf Road, Suite 360 Rolling Meadows, IL
60008, USA
Manufacturer : Cambium Networks, Ltd.
Ashburton, TQ13 7UP, UK
Standard : 47 CFR FCC Part 15.407

The product was received on Jun. 07, 2024, and testing was started from Jun. 07, 2024 and completed on Jun. 17, 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 variant 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: Sam Chen

Sporton International Inc. Hsinchu Laboratory

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



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TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A12_5 Ver1.1



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.407(a)	Emission Bandwidth	PASS	-
3.2	15.407(a)	Maximum Equivalent Isotropically 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	-

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/manufacture 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



1 General Description

1.1 Information

1.1.1 RF General Information

For IEEE 802.11 mode:

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
5925-6425	ax (HEW20)	5955-6415	1-93 [24]
6525-6875		6535-6855	117-181 [17]
5925-6425	ax (HEW40)	5965-6405	3-91 [12]
6525-6875		6565-6845	123-179 [8]
5925-6425	ax (HEW80)	5985-6385	7-87 [6]
6525-6875		6625-6785	135-167 [3]
5925-6425	ax (HEW160)	6025-6345	15-79 [3]
6525-6875		6665	143 [1]

Band	Mode	BWch (MHz)	Nant
5.925-6.425GHz	802.11ax HEW20	20	2TX
5.925-6.425GHz	802.11ax HEW40	40	2TX
5.925-6.425GHz	802.11ax HEW80	80	2TX
5.925-6.425GHz	802.11ax HEW160	160	2TX
6.525-6.875GHz	802.11ax HEW20	20	2TX
6.525-6.875GHz	802.11ax HEW40	40	2TX
6.525-6.875GHz	802.11ax HEW80	80	2TX
6.525-6.875GHz	802.11ax HEW160	160	2TX

For Non-IEEE mode (For Standard Power Access Point and Fixed Client only):

Frequency Range (MHz)	Mode	Ch. Frequency (MHz)
6525-6875	80	6835
6525-6875	160	6795

Band	Mode	BWch (MHz)	Nant
6.525-6.875GHz	80	80	2TX
6.525-6.875GHz	160	160	2TX

Note:

- ♦ For WLAN 6GHz function, the EUT uses a combination of OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.
- ♦ BWch is the nominal channel bandwidth.



1.1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)		
						5GHz UNII 3	6GHz UNII 5	6GHz UNII 7
1	1/2	Cambium	25dBi Dish antenna	Dish	N/A	25.38	25.38	26.22

Note 1: Directional gain information

Type	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 :

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

$$NSS1(g1,1) = 10^{G1/20} ; NSS1(g1,2) = 10^{G2/20} ; NSS1(g1,2) = 10^{G3/20} ; NSS1(g1,2) = 10^{G4/20}$$

$$g_{j,k} = (NSS1(g1,1) + NSS1(g1,2) + NSS1(g1,3) + NSS1(g1,4))^2$$

$$DG = 10 \log[(NSS1(g1,1) + NSS1(g1,2) + NSS1(g1,3) + NSS1(g1,4))^2 / N_{ANT}/N_{SS}] \Rightarrow 10$$

$$\log[(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2 / N_{ANT}]$$

Where ;

Cross-Polarized Antenna

5G UNII-3 G1 = 25.38 dBi; G2 = 25.38 dBi

6E UNII-5 G1 = 25.38 dBi; G2 = 25.38 dBi;

6E UNII-7 G1 = 26.22 dBi; G2 = 26.22 dBi;

5G UNII-3 DG = 25.38 dBi

6E UNII-5 DG = 25.38 dBi

6E UNII-7 DG = 26.22 dBi

Note 2: The above information was declared by manufacturer.



Note 3: The EUT has one antenna.

<5GHz function>

For IEEE 802.11a/n/ac/ax mode (2TX/2RX)

Port 1, Port 2 can be used as transmitting/receiving antenna.

Port 1, Port 2 could transmit/receive simultaneously.

<6GHz function>

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

Port 1, Port 2 can be used as transmitting/receiving antenna.

Port 1, Port 2 could transmit/receive simultaneously.

For Non- IEEE mode (2TX/2RX)

Port 1, Port 2 can be used as transmitting/receiving antenna.

Port 1, Port 2 could transmit/receive simultaneously.

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF (dB)	T (s)	VBW (Hz)_1/T
80_Nss 1,(M0)	0.929	0.32	5.452m	300
160_Nss 1,(M0)	0.927	0.33	5.452m	300

Note:

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

1.1.4 EUT Operational Condition

EUT Power Type	From PoE			
Beamforming Function	☐	With beamforming	☒	Without beamforming
Device Type	☐	Indoor Access Point	☐	Subordinate
	☐	Indoor Client	☒	Standard Power Access Point
	☐	Dual Client	☒	Standard Client
	☒	Fixed Client	☐	Very Low Power
Condition of EUT	☐	Indoor	☒	Outdoor
Channel Puncturing Function	☐	Supported Static Puncturing		
	☐	Supported Dynamic Puncturing		
	☒	Unsupported		
Support RU	☒	Full RU	☐	Partial RU
Test Software Version	For RF Conducted: QSPR V5.0-00199 For other tests: QSPR v5.0-00201			

Note: The above information was declared by manufacturer.

1.1.5 Table for EUT supports functions

Function	5GHz Support Band	6GHz Support Band		Support Non-IEEE Mode in 6GHz
Master	UNII 3	UNII 5	Standard Power Access Point (6SD)	X
		UNII 7		V
Client	UNII 3	UNII 5	Standard Client (6FX)	X
			Fixed Client (6FC)	X
		UNII 7	Standard Client (6FX)	X
			Fixed Client (6FC)	V

Note: The above information was declared by manufacturer.

1.1.6 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FR191618.

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

Modifications	Performance Checking
Enable the frequencies 6835 MHz with Bandwidth 80MHz and 6795 MHz with Bandwidth 160MHz in UNII 7 for 6SD and 6FC modes through SW change.	For 6835 MHz and 6795 MHz with 6SD mode: 1. Emission Bandwidth 2. Maximum Equivalent Isotropically Radiated Power (E.I.R.P.) 3. Peak Power Spectral Density (E.I.R.P.) 4. Unwanted Emissions > 1GHz 5. Emission MASK



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 15.407
- ♦ 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 987594 D02 v02r01
- ♦ FCC KDB 662911 D01 v02r01
- ♦ FCC KDB 412172 D01 v01r01

1.3 Testing Location Information

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu (TAF: 3787)	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) 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 (For other tests)	TH03-CB	Gino Huang	23.7~24.3 / 62~64	Jun. 17, 2024
RF Radiated (E.I.R.P. Power/PSD)	03CH01-CB	Alex Kuo	22~23 / 55~58	Jun. 07, 2024
RF Radiated > 1GHz	03CH01-CB	Alex Kuo	22~23 / 55~58	Jun. 07, 2024

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 (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%



2 Test Configuration of EUT

2.1 Test Channel Mode

Mode
80_Nss1,(MCS0)_2TX
6835MHz
160_Nss1,(MCS0)_2TX
6795MHz

Note:

- ♦ The power of the "Fixed Client" mode was exactly the same as the "Standard-power access point" mode. Thus, only the "Standard-power access point" mode was selected to test.

2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests		
Tests Item	Emission Bandwidth Maximum E.I.R.P. at any elevation angle above 30 degrees Emission MASK	
Test Condition	Conducted measurement at transmit chains	
Operating Mode	1	EUT_Standard Power Access Point

The Worst Case Mode for Following Conformance Tests		
Tests Item	Maximum Equivalent Isotopically Radiated Power (E.I.R.P.) Peak Power Spectral Density (E.I.R.P.) 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	
	After evaluating, EUT in Z axis was the worst case, so the measurement will follow this same test configuration.	
1	EUT in Z axis_Standard Power Access Point	

Note: The PoE listed below is for measurement only and would not be marketed.
Its information is listed below:

Support Unit	Brand	Model Number
PoE	CWT	P015U06

2.3 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



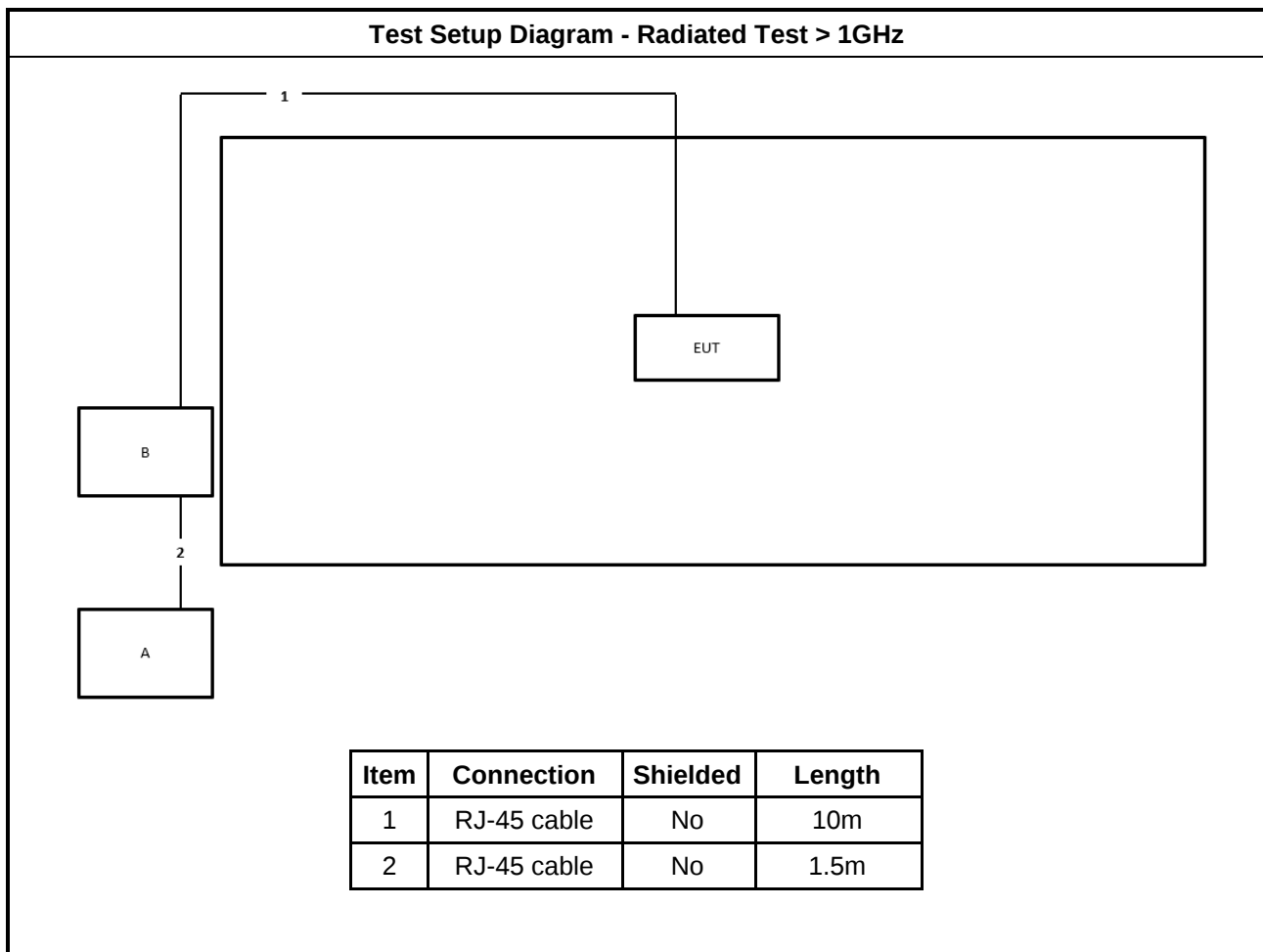
2.4 Accessories

N/A

2.5 Support Equipment

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	Notebook	DELL	E4300	N/A
B	PoE	CWT	P015U06	N/A

2.6 Test Setup Diagram



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
RLAN 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

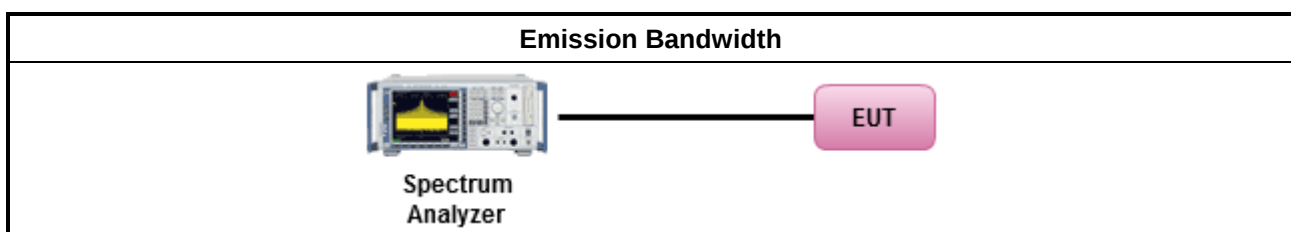
3.1.2 Measuring Instruments

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:	
☒	According to FCC KDB 987594 D02 clause II.C, measurement procedure shall refer to 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.

3.1.4 Test Setup



3.1.5 Test Result of Emission Bandwidth

Refer as Appendix A



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

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

Maximum Equivalent Isotropically 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 very low power device : e.i.r.p < 14 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 very low power device : e.i.r.p < 14 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.
RLAN Devices	
☐ For the 5.925 ~ 7.125 GHz band:	
	■ For low-power indoor access-points & indoor subordinate devices < 30 dBm .
	■ For low-power client devices < 24 dBm.
☐ For the 5.925 ~ 6.875 GHz band:	
	■ For standard-power access points & fixed client devices < 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 standard client devices < 30 dBm.



3.2.2 Measuring Instruments

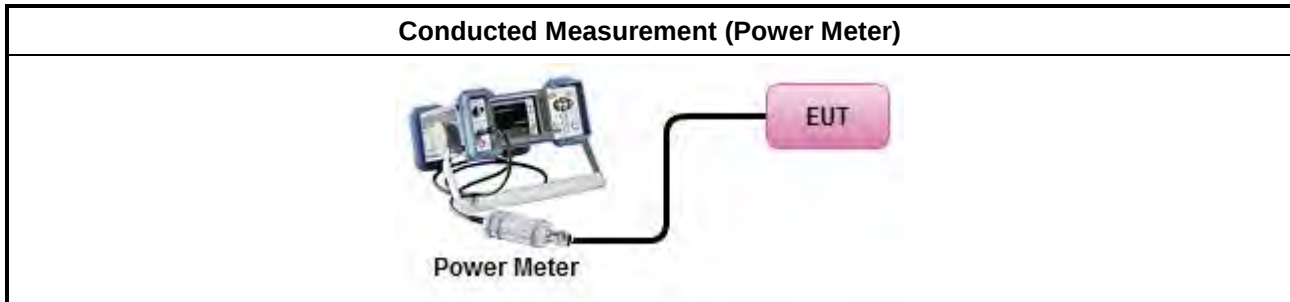
Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

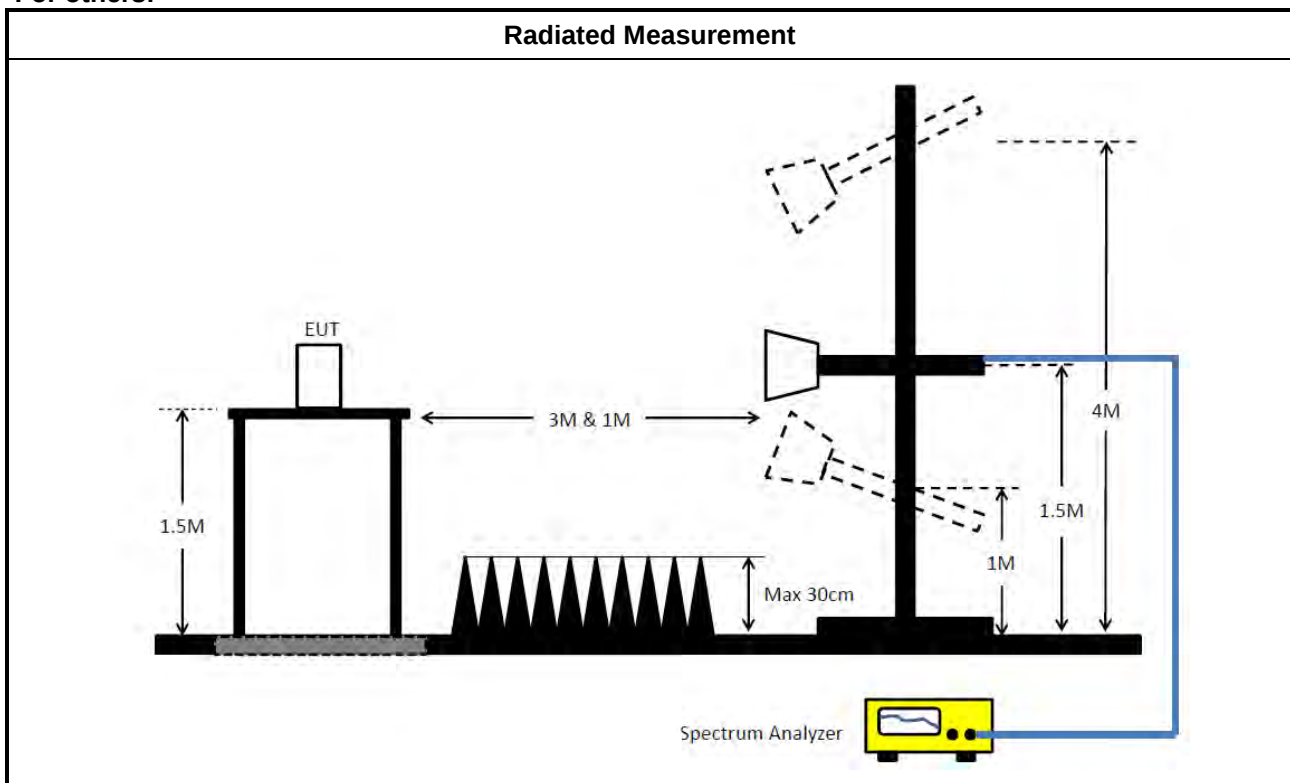
Test Method	
▪ According to FCC KDB 987594 D02 clause II.E, the test measurement procedure shall refer to KDB 789033.	
	Average over on/off periods with duty factor
	☒ For others: Refer as FCC KDB 789033 D02, clause E Method SA-2 (spectral trace averaging). Spectrum analyzer setting: RBW/VBW : 1/3MHz ; Detector : RMS ; Trace mode : Average ; Sweep Count 100.
	☐ Refer as FCC KDB 789033 D02, 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
	☒ For Phi 30°: Refer as FCC KDB 789033 D02, clause E Method PM-G (using an RF average power meter).
☒ For Phi 30°: 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: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$
☒ For others: 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.

3.2.4 Test Setup

For Phi 30°:



For others:



3.2.5 Test Result of Maximum Equivalent Isotropically 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 very low power device : e.i.r.p PSD < -5 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 very low power device : e.i.r.p PSD < -5 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.
RLAN Devices	
☐ For the 5.925 ~ 7.125 GHz band:	
	■ For low-power indoor access-points & indoor subordinate devices < 5 dBm / MHz.
	■ For low-power client devices < -1 dBm / MHz.
☐ For the 5.925 ~ 6.875 GHz band:	
	■ For standard-power access points & fixed client devices < 23 dBm / MHz.
	■ For standard client devices < 17 dBm / MHz.

3.3.2 Measuring Instruments

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

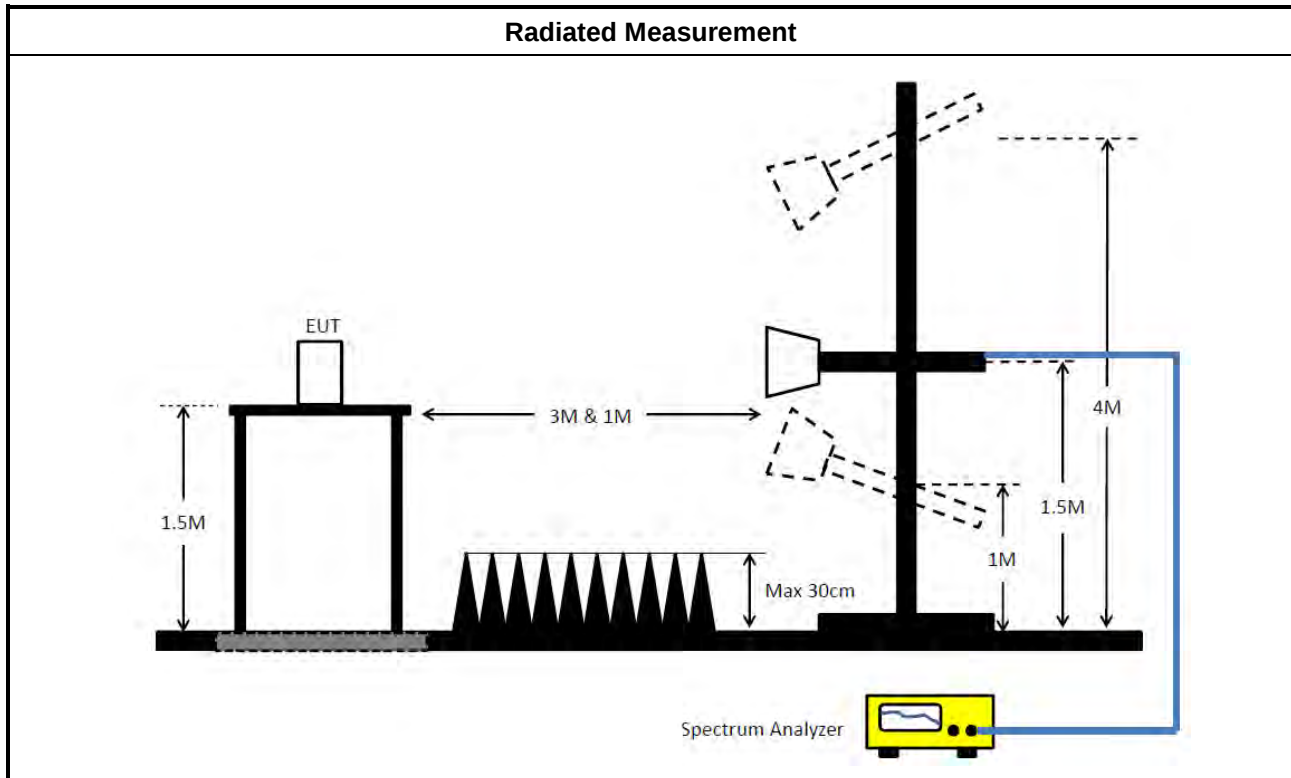


3.3.3 Test Procedures

Test Method	
According to FCC KDB 987594 D02 clause II.F, the measurement procedure shall refer to KDB 789033. 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 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 cycle ≥ 98% or external video / power trigger]	
☒	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	
☒	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)
☐	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: $PPSD_{total} = PPSD_1 + PPSD_2 + \dots + PPSD_n$ (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.

3.3.4 Test Setup



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

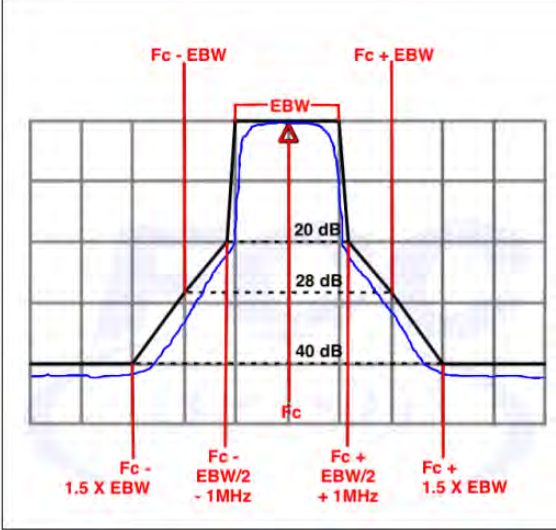
Unwanted emissions below 1 GHz and restricted band emissions above 1GHz limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
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($20 \times \log(\text{standard distance}/\text{test distance}) = 20\log(3/1) = 9.54\text{dB}$).
EX. Above 18GHz emission limit calculation (3m to 1m) = $54\text{dBuV/m at 3m} + 9.54\text{dB} = 63.54\text{dBuV/m at 1m}$.

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($20 \times \log(\text{standard distance}/\text{test distance}) = 20\log(3/1) = 9.54\text{dB}$). EX. Above 18GHz emission limit calculation (3m to 1m) = $68.2\text{dBuV/m at 3m} + 9.54\text{dB} = 77.74\text{dBuV/m at 1m}$. Note 2:-27 dBm EIRP OOBE is measured RMS which is a deviation from the current 15E rules for 5 GHz bands. In addition, 15.35(b) applies where the peak emissions must be limited to no more than 20 dB above the average limit.

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

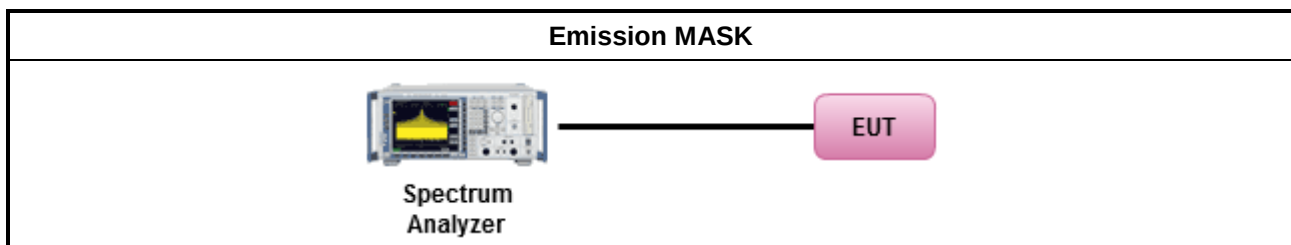
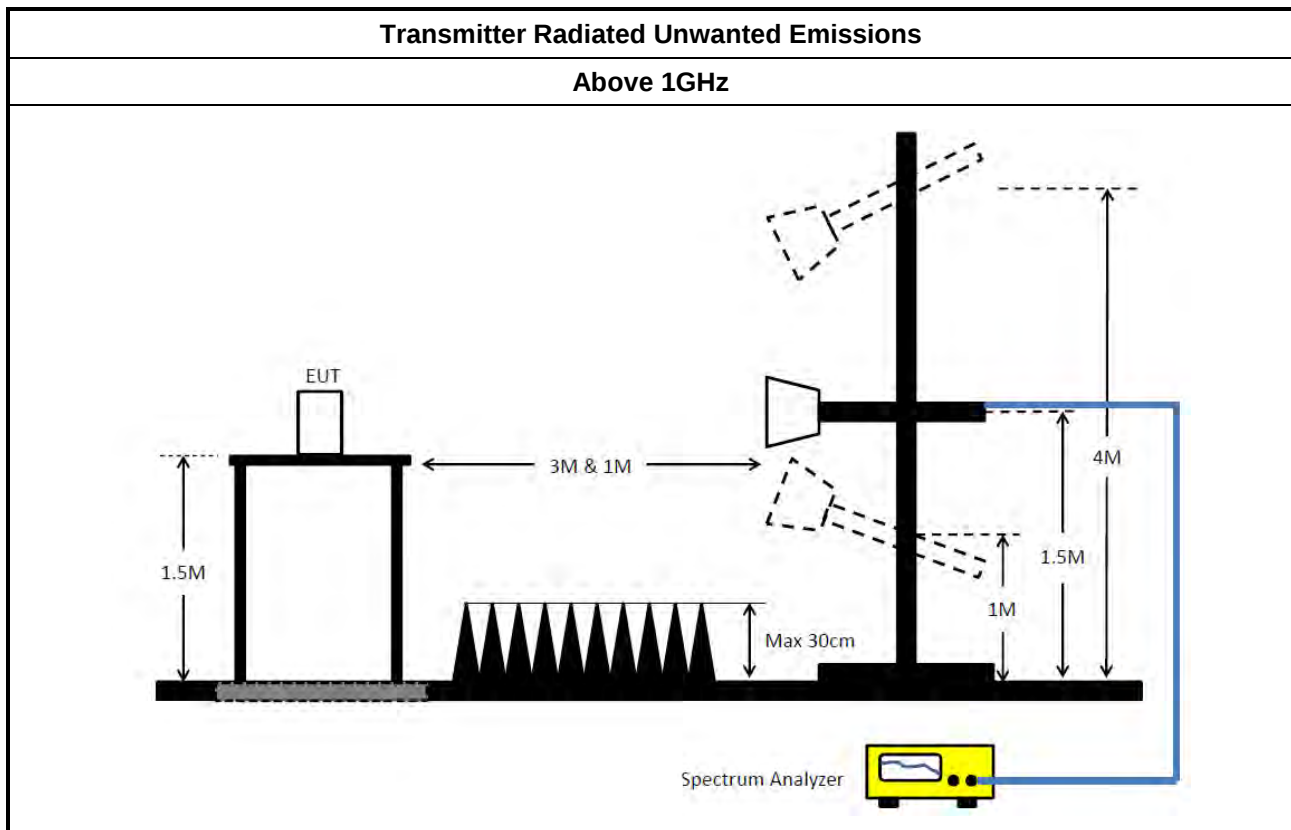
Refer a test equipment and calibration data table in this test report.



3.4.3 Test Procedures

Test Method	
According to FCC KDB 987594 D02 II.G. the unwanted emission measurement procedure shall refer to KDB 789300(except emission MASK). 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 $\geq$ 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). (For unrestricted band measurement)
	☐ 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 $\geq$ 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 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.
	Refer as FCC KDB 789033 D02, clause G)3)d)ii) for Band edge Integration measurements.
For emission MASK shall be measured using following options below:	
	☒ Refer as FCC 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.	

3.4.4 Test Setup



3.4.5 Measurement Results Calculation

The measured Level is calculated using:

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

3.4.6 Test Result of Transmitter Unwanted Emissions

Refer as Appendix D



4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH01-CB	1GHz ~18GHz 3m	May 04, 2024	May 03, 2025	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120D-01816	1GHz~18GHz	Dec. 20, 2023	Dec. 19, 2024	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Sep. 04, 2023	Sep. 03, 2024	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02121	1GHz ~ 26.5GHz	May 17, 2024	May 16, 2025	Radiation (03CH01-CB)
Pre-Amplifier	SGH	SGH184	20221107-3	18GHz ~ 40GHz	Nov. 24, 2023	Nov. 23, 2024	Radiation (03CH01-CB)
Signal Analyzer	R&S	FSV3044	101437	10kHz ~ 44GHz	Nov. 28, 2023	Nov. 27, 2024	Radiation (03CH01-CB)
RF Cable-high	Woken	RG402	High Cable-16	1GHz ~ 18GHz	Nov. 06, 2023	Nov. 05, 2024	Radiation (03CH01-CB)
RF Cable-high	Woken	RG402	High Cable-16+17	1GHz ~ 18GHz	Nov. 06, 2023	Nov. 05, 2024	Radiation (03CH01-CB)
High Cable	Woken	WCA0929M	40G#5+6	1GHz ~ 40GHz	Jan. 11, 2024	Jan. 10, 2025	Radiation (03CH01-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH01-CB)
Band Rejector	MTJ	6G Band Rejector	BRJ-01	1GHz ~ 7.4GHz	Oct. 03, 2023	Oct. 02, 2024	Radiation (03CH01-CB)
Band Rejector	MTJ	6G Band Rejector	BRJ-02	1GHz ~ 8GHz	Oct. 03, 2023	Oct. 02, 2024	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	101028	9kHz~40GHz	Dec. 22, 2023	Dec. 21, 2024	Conducted (TH03-CB)
Power Sensor	Anritsu	MA2411B	1726195	300MHz~40GHz	Sep. 04, 2023	Sep. 03, 2024	Conducted (TH03-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Sep. 04, 2023	Sep. 03, 2024	Conducted (TH03-CB)
RF Cable	Woken	RG402	High Cable-11	30MHz ~18GHz	Oct. 02, 2023	Oct. 01, 2024	Conducted (TH03-CB)
RF Cable	Woken	RG402	High Cable-12	30MHz ~18GHz	Oct. 02, 2023	Oct. 01, 2024	Conducted (TH03-CB)
RF Cable	Woken	RG402	High Cable-13	30MHz ~18GHz	Oct. 02, 2023	Oct. 01, 2024	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-14	1GHz ~18GHz	Oct. 02, 2023	Oct. 01, 2024	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-15	1GHz ~18GHz	Oct. 02, 2023	Oct. 01, 2024	Conducted (TH03-CB)



RADIO TEST REPORT

Report No. : FR191618-08

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Switch	SPTCB	SP-SWI	SWI-03	1~26.5GHz	Oct. 03, 2023	Oct. 02, 2024	Conducted (TH03-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conducted (TH03-CB)

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

NCR means Non-Calibration required.

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
6.525-6.875GHz	-	-	-	-	-
80_Nss1,(MCS0)_2TX	81.62M	77.189M	77M2D1D	81.4M	77.014M
160_Nss1,(MCS0)_2TX	165.44M	155.701M	156MD1D	165M	155.275M

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)
80_Nss1,(MCS0)_2TX	-	-	-	-	-	-
6835MHz	Pass	Inf	81.4M	77.189M	81.62M	77.014M
160_Nss1,(MCS0)_2TX	-	-	-	-	-	-
6795MHz	Pass	Inf	165.44M	155.701M	165M	155.275M

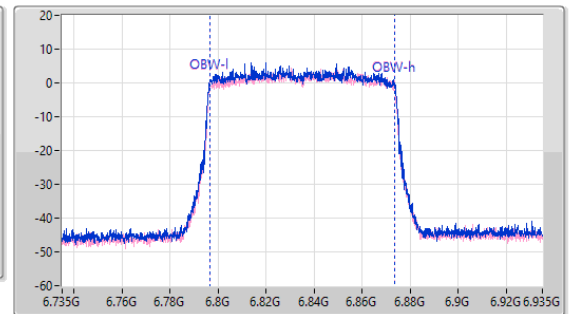
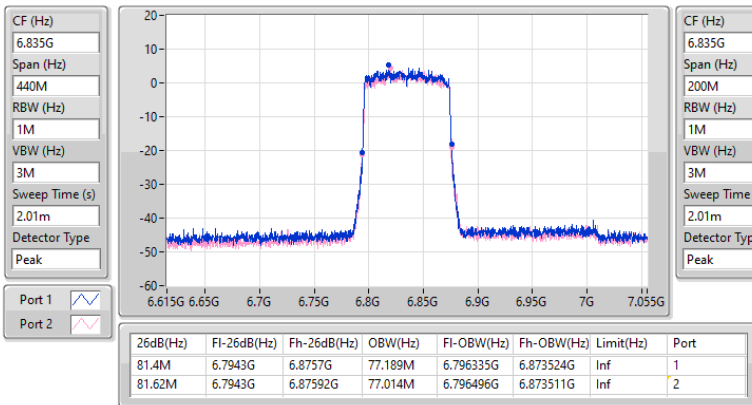
Port X-N dB = Port X 6dB down bandwidth for 5.725-5.85GHz band / 26dB down bandwidth for other band
Port X-OBW = Port X 99% occupied bandwidth

6.525-6.875GHz_80_Nss1,(MCS0)_2TX

EBW

6835MHz

17/06/2024

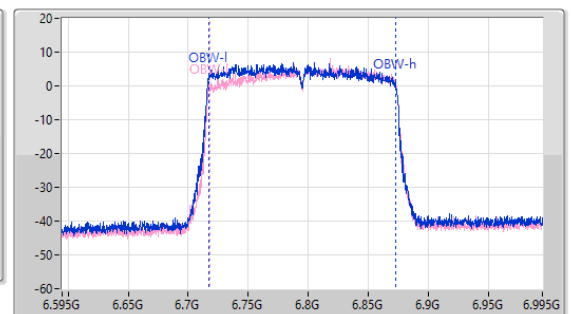
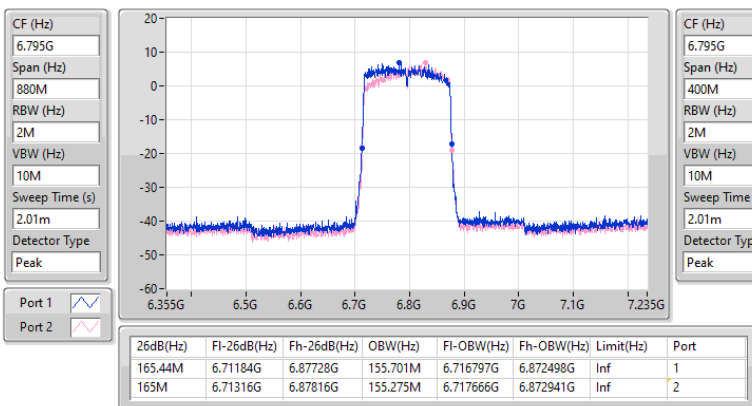


6.525-6.875GHz_160_Nss1,(MCS0)_2TX

EBW

6795MHz

17/06/2024





Summary

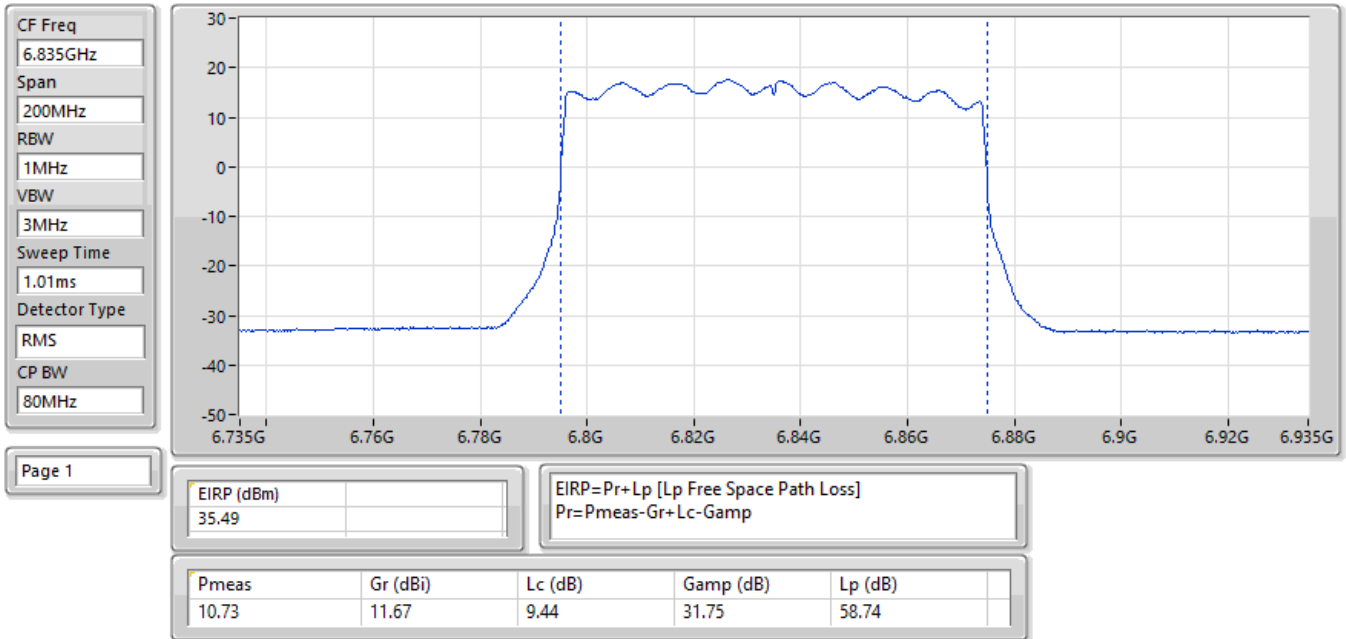
Mode	EIRP (dBm)	EIRP (W)
6.525-6.875GHz	-	-
80_Nss1,(MCS0)_2TX	35.49	3.53997
160_Nss1,(MCS0)_2TX	35.53	3.57273

Result

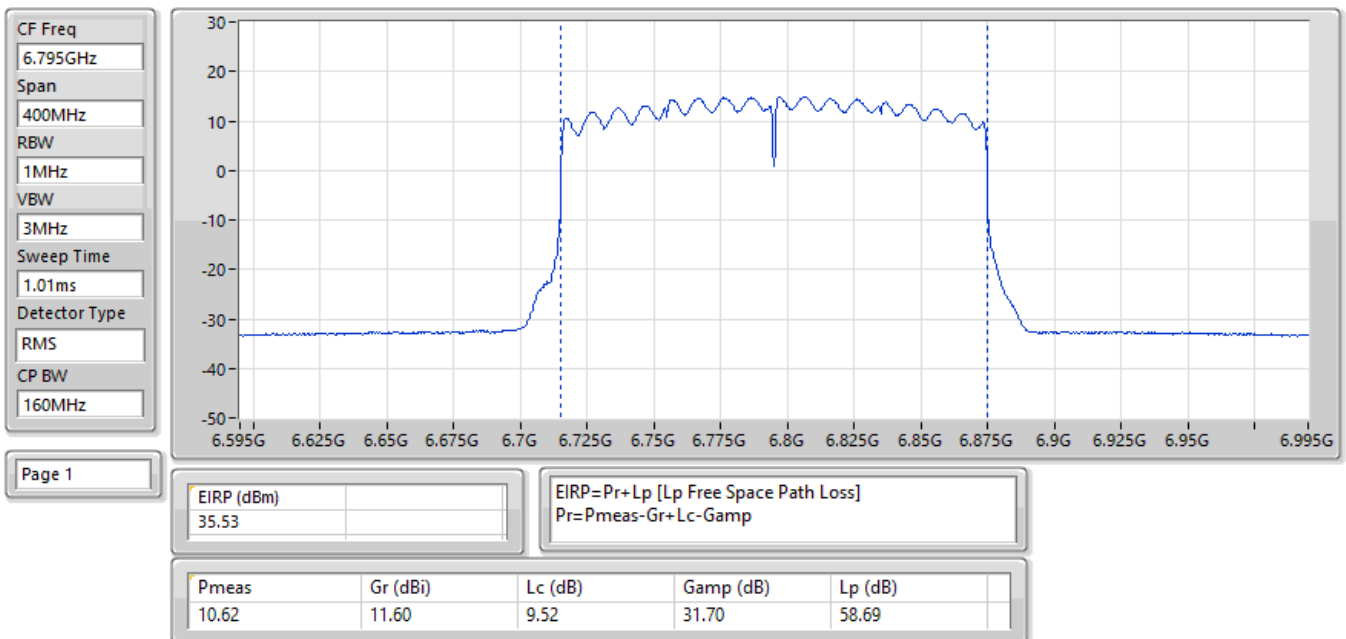
Mode	Result	EIRP (dBm)	EIRP Limit (dBm)
80_Nss1,(MCS0)_2TX	-	-	-
6835MHz	Pass	35.49	36.00
160_Nss1,(MCS0)_2TX	-	-	-
6795MHz	Pass	35.53	36.00

DG = Directional Gain; Port X = Port X output power
Inf = There's no restriction for the limit.

EIRP;Band:6.7G;80;BWch:80MHz;Nss:1,(M0);Nant:2;Ch:6835MHz;TX



EIRP;Band:6.7G;160;BWch:160MHz;Nss:1,(M0);Nant:2;Ch:6795MHz;TX





Average Power-E.I.R.P. at any elevation angle above 30 degrees Appendix B.2

Summary

Mode	Total Power (dBm)	Total Power (W)	EIRP [Phi 30°] (dBm)	EIRP [Phi 30°] (W)
6.525-6.875GHz	-	-	-	-
80_Nss1,(MCS0)_2TX	15.63	0.03656	19.64	0.092045
160_Nss1,(MCS0)_2TX	16.13	0.04102	20.14	0.103276



Average Power-E.I.R.P. at any elevation angle above 30 degrees Appendix B.2

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	EIRP [Phi 30°] (dBm)	EIRP [Phi 30°] (W)
80_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-
6835MHz	Pass	4.01	13.06	12.12	15.63	19.64	21.00
160_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-
6795MHz	Pass	4.01	13.43	12.79	16.13	20.14	21.00

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



Summary

Mode	EIRP PD (dBm/RBW)
6.525-6.875GHz	-
80_Nss1,(MCS0)_2TX	19.31
160_Nss1,(MCS0)_2TX	14.95

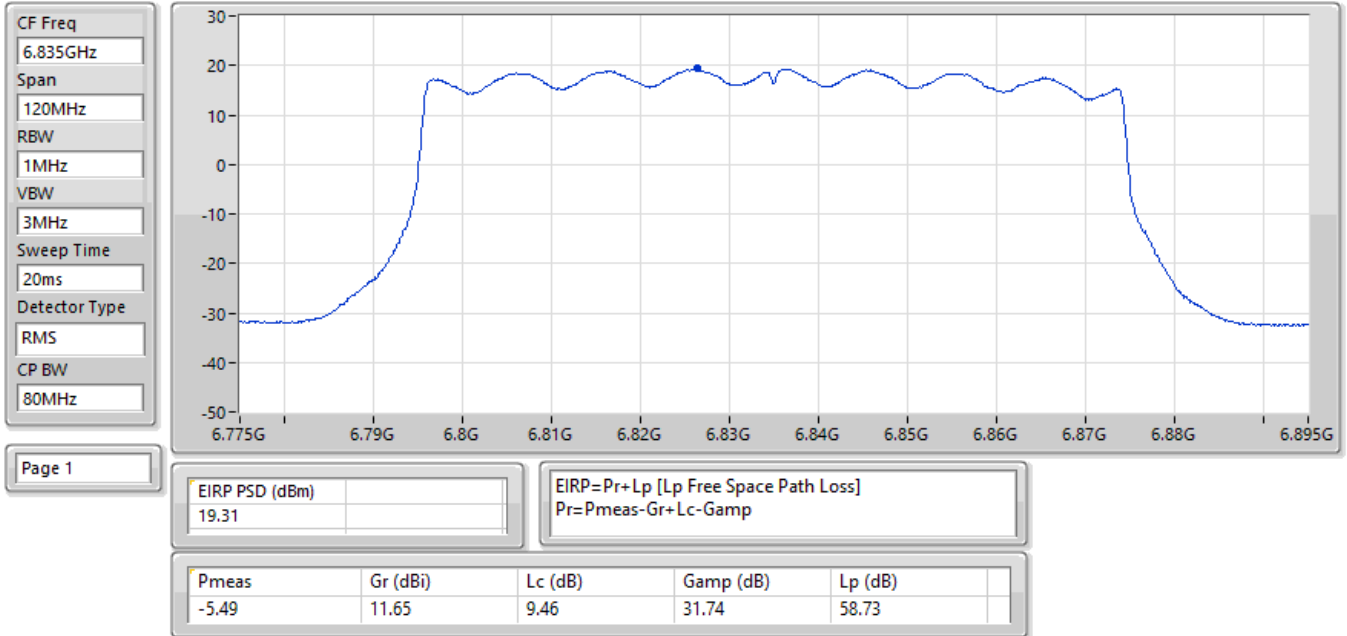
RBW = 500kHz for 5.725-5.85GHz band / 1MHz for other band;

**Result**

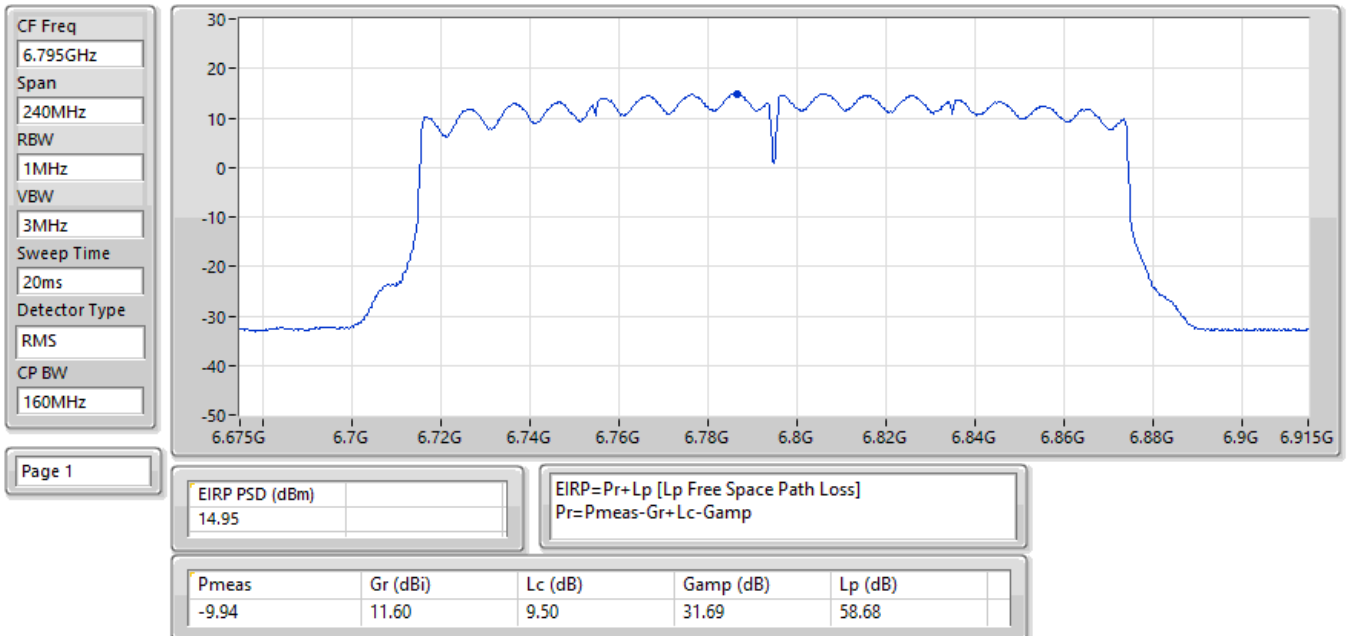
Mode	Result	EIRP PD (dBm/RBW)	EIRP PD Limit (dBm/RBW)
80_Nss1,(MCS0)_2TX	-	-	-
6835MHz	Pass	19.31	23.00
160_Nss1,(MCS0)_2TX	-	-	-
6795MHz	Pass	14.95	23.00

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;
Inf = There's no restriction for the limit.

EIRP PSD;Band:6.7G;80;BWch:80MHz;Nss:1,(M0);Nant:2;Ch:6835MHz;TX



EIRP PSD;Band:6.7G;160;BWch:160MHz;Nss:1,(M0);Nant:2;Ch:6795MHz;TX

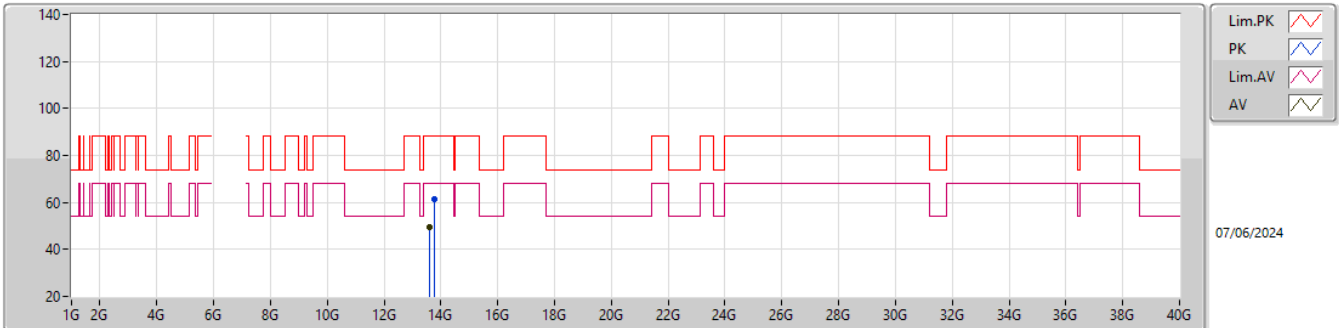


Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
6.525-6.875GHz	-	-	-	-	-	-	-	-	-	-	-
80_Nss1,(MCS0)_2TX	Pass	AV	20.5194G	51.78	63.54	-11.76	1	Vertical	346	1.32	-

6.525-6.875GHz_80_Nss1,(MCS0)_2TX

6835MHz_TX

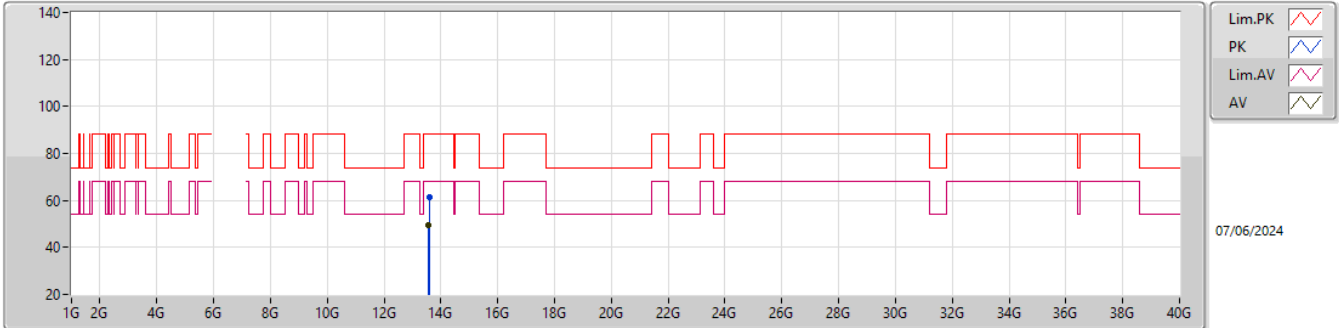


EUT_Z_2TX
Setting 28
01-I-C-6

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA			
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)			
PK	13.7674G	61.42	88.20	-26.78	40.59	3	Vertical	34	1.04	-	40.20	11.79	31.16			
RMS	13.5888G	49.23	68.20	-18.97	28.45	3	Vertical	34	1.04	-	40.14	11.72	31.08			

6.525-6.875GHz_80_Nss1,(MCS0)_2TX

6835MHz_TX

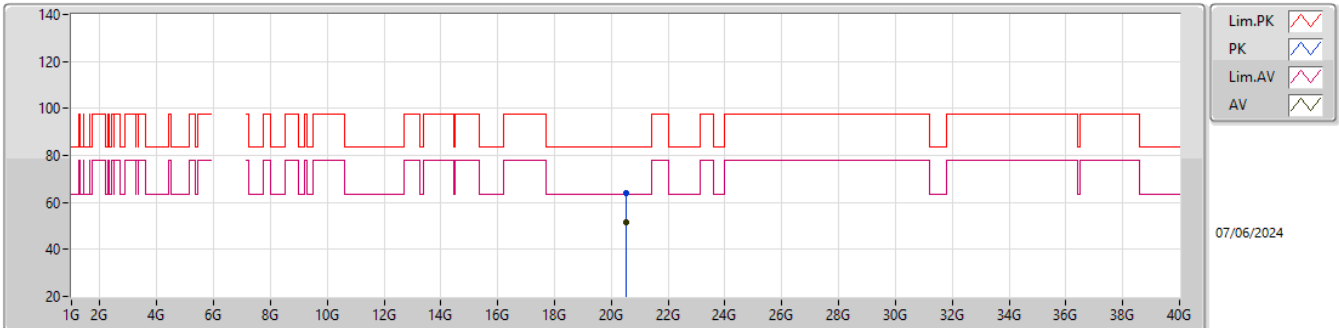


EUT_Z_2TX
Setting 28
01-I-C-6

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)			
PK	13.5946G	61.14	88.20	-27.06	40.37	3	Horizontal	213	1.96	-	40.12	11.73	31.08			
RMS	13.5734G	49.23	68.20	-18.97	28.37	3	Horizontal	213	1.96	-	40.21	11.72	31.07			

6.525-6.875GHz_80_Nss1,(MCS0)_2TX

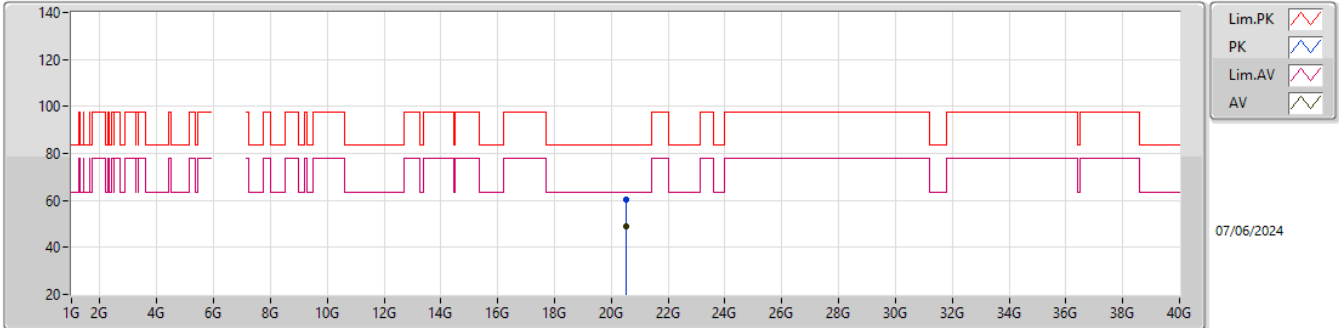
6835MHz_TX

EUT_Z_2TX
Setting 28
01-I-C-6

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)			
PK	20.5202G	63.98	83.54	-19.56	59.77	1	Vertical	346	1.32	-	37.72	15.62	49.13			
AV	20.5194G	51.78	63.54	-11.76	47.57	1	Vertical	346	1.32	-	37.72	15.62	49.13			

6.525-6.875GHz_80_Nss1,(MCS0)_2TX

6835MHz_TX

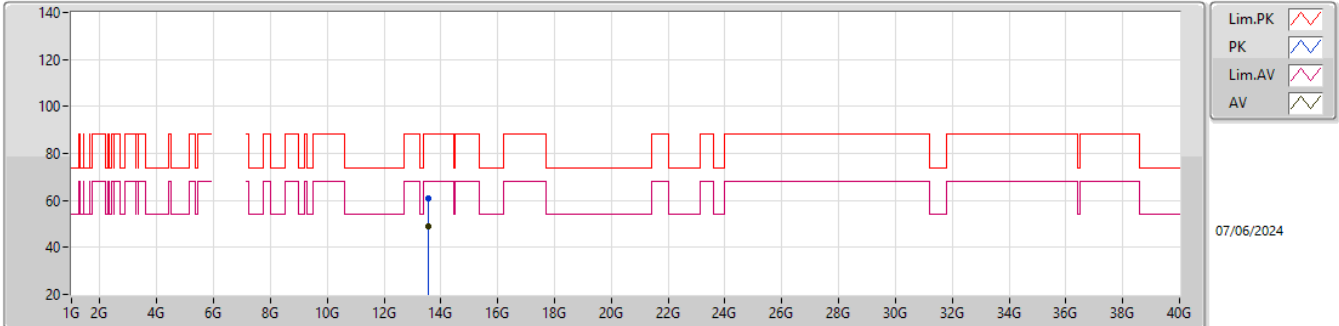


EUT_Z_2TX
Setting 28
01-I-C-6

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA				
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)				
PK	20.5198G	60.42	83.54	-23.12	56.21	1	Horizontal	344	1.46	-	37.72	15.62	49.13				
AV	20.519G	48.96	63.54	-14.58	44.76	1	Horizontal	344	1.46	-	37.71	15.62	49.13				

6.525-6.875GHz_160_Nss1,(MCS0)_2TX

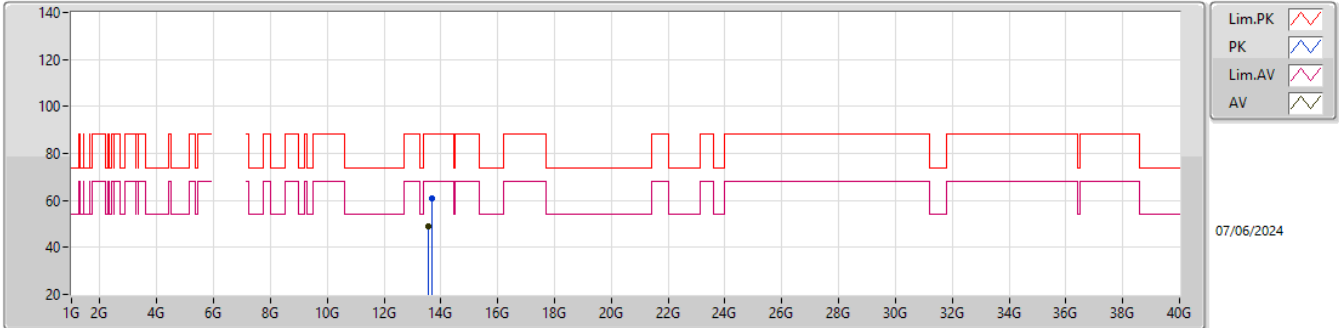
6795MHz_TX

EUT_Z_2TX
Setting 28
01-I-C-6

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)			
PK	13.5741G	60.92	88.20	-27.28	40.07	3	Vertical	228	1.38	-	40.20	11.72	31.07			
RMS	13.5705G	48.97	68.20	-19.23	28.10	3	Vertical	228	1.38	-	40.22	11.72	31.07			

6.525-6.875GHz_160_Nss1,(MCS0)_2TX

6795MHz_TX

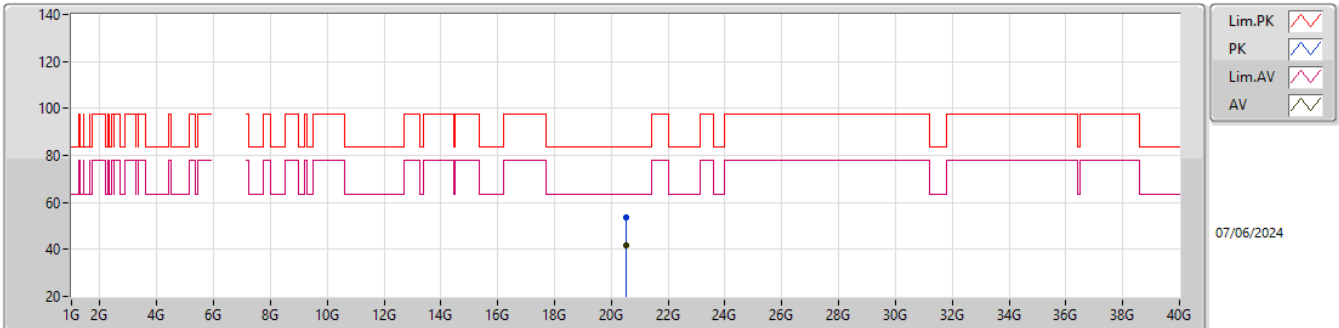


EUT_Z_2TX
Setting 28
01-I-C-6

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA			
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)			
PK	13.695G	60.77	88.20	-27.43	40.04	3	Horizontal	352	1.40	-	40.10	11.76	31.13			
RMS	13.5711G	49.06	68.20	-19.14	28.19	3	Horizontal	352	1.40	-	40.22	11.72	31.07			

6.525-6.875GHz_160_Nss1,(MCS0)_2TX

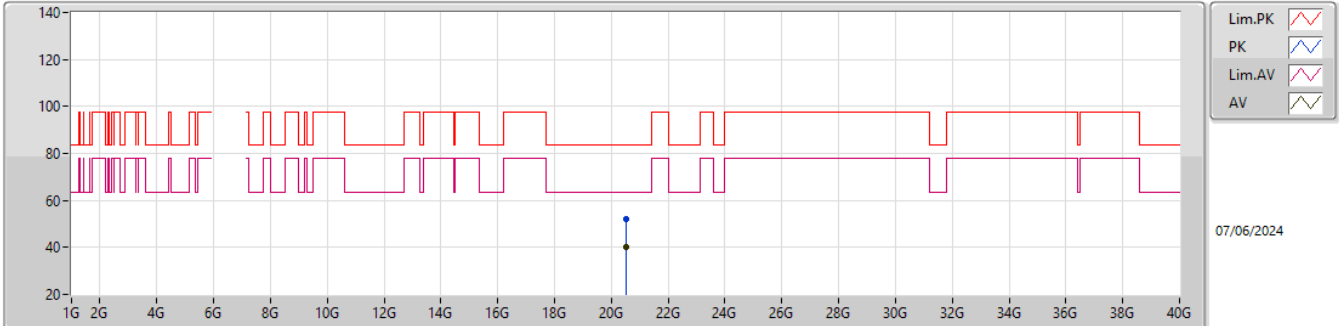
6795MHz_TX

EUT_Z_2TX
Setting 28
01-I-C-6

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)			
PK	20.5194G	53.85	83.54	-29.69	49.64	1	Vertical	340	1.50	-	37.72	15.62	49.13			
AV	20.5092G	41.97	63.54	-21.57	37.84	1	Vertical	340	1.50	-	37.66	15.61	49.14			

6.525-6.875GHz_160_Nss1,(MCS0)_2TX

6795MHz_TX

EUT_Z_2TX
Setting 28
01-I-C-6

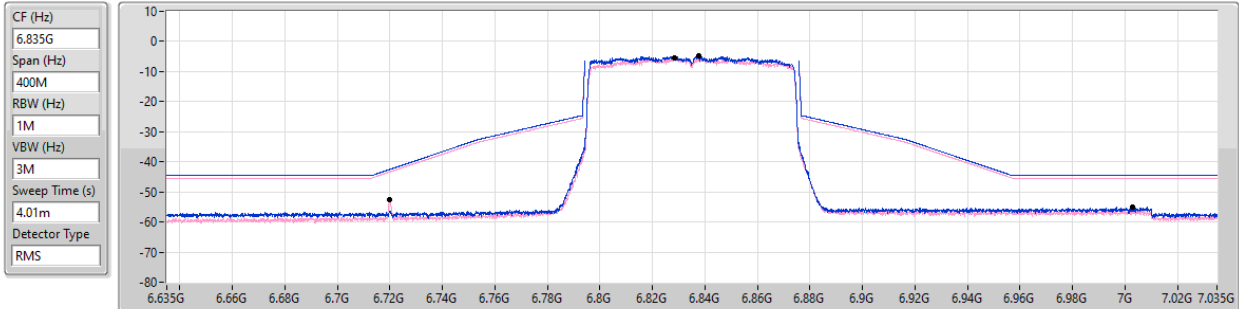
Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA			
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)			
PK	20.5086G	52.01	83.54	-31.53	47.89	1	Horizontal	345	1.48	-	37.65	15.61	49.14			
AV	20.5086G	40.36	63.54	-23.18	36.24	1	Horizontal	345	1.48	-	37.65	15.61	49.14			

6.525-6.875GHz_80_Nss1,(MCS0)_2TX

MASK

6835MHz_TX

17/06/2024



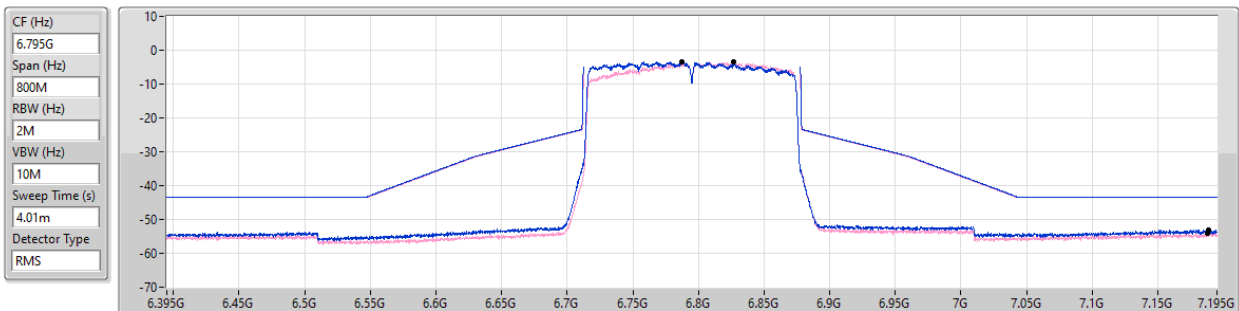
Ref(Hz)	Ref(dBm)	Freq(Hz)	Level(dBm)	Limit(dBm)	Margin(dB)	Port
6.8377G	-4.61	7.0029G	-55.09	-44.61	-10.48	1
6.8284G	-5.54	6.72G	-52.57	-43.36	-9.21	2

6.525-6.875GHz_160_Nss1,(MCS0)_2TX

MASK

6795MHz_TX

17/06/2024



Ref(Hz)	Ref(dBm)	Freq(Hz)	Level(dBm)	Limit(dBm)	Margin(dB)	Port
6.787G	-3.38	7.1884G	-53.02	-43.38	-9.64	1
6.82639G	-3.53	7.1874G	-54.10	-43.53	-10.57	2