



Report No.: FR1N0819AB

RADIO TEST REPORT

FCC ID : 2AXJ4X20V3

Equipment : AX1800 Whole Home Mesh Wi-Fi 6 System

Brand Name : tp-link

Model Name : Deco X20, Deco X21

Applicant : TP-Link Corporation Limited

Room 901, 9/F., New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hong

Kong

Manufacturer : TP-Link Corporation Limited

Room 901, 9/F., New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hong

Kong

Standard : 47 CFR FCC Part 15.407

The product was received on Nov. 10, 2021, and testing was started from Nov. 24, 2021 and completed on Feb. 07, 2022. 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: Sam Chen

Sporton International Inc. Hsinchu Laboratory

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TEL: 886-3-656-9065

FAX: 886-3-656-9085

Report Template No.: CB-A12_1 Ver1.4

Page Number

: 1 of 32

Issued Date

: Mar. 01, 2022

Report Version : 01

Table of Contents

Histo	ory of this test report	3
Sumi	mary of Test Result	4
1	General Description	5
1.1	Information	5
1.2	Applicable Standards	8
1.3	Testing Location Information	8
1.4	Measurement Uncertainty	9
2	Test Configuration of EUT	10
2.1	Test Channel Mode	10
2.2	The Worst Case Measurement Configuration	12
2.3	EUT Operation during Test	13
2.4	Accessories	13
2.5	Support Equipment	14
2.6	Test Setup Diagram	15
3	Transmitter Test Result	18
3.1	AC Power-line Conducted Emissions	18
3.2	Emission Bandwidth	20
3.3	Maximum Output Power	21
3.4	Power Spectral Density	23
3.5	Unwanted Emissions	26
4	Test Equipment and Calibration Data	30

Appendix A. Test Results of AC Power-line Conducted Emissions

Appendix B. Test Results of Emission Bandwidth

Appendix C. Test Results of Maximum Output Power

Appendix D. Test Results of Power Spectral Density

Appendix E. Test Results of Unwanted Emissions

Appendix F. Test Results of Radiated Emission Co-location

Appendix G. Test Photos

Photographs of EUT v01

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

Report Template No.: CB-A12_1 Ver1.4

Page Number : 2 of 32

Issued Date : Mar. 01, 2022

Report No.: FR1N0819AB

Report Version : 01

History of this test report

Report No.: FR1N0819AB

Report No.	Version	Description	Issued Date
FR1N0819AB	01	Initial issue of report	Mar. 01, 2022

TEL: 886-3-656-9065 Page Number : 3 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

Summary of Test Result

Report No.: FR1N0819AB

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 Output Power	PASS	-
3.4	15.407(a)	Power Spectral Density	PASS	-
3.5	15.407(b)	Unwanted Emissions	PASS	-

Declaration of Conformity:

- The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
- 2. The measurement uncertainty please refer to report "Measurement Uncertainty".

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen
Report Producer: Penny Kao

TEL: 886-3-656-9065 Page Number : 4 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
5150-5250	a, n (HT20), ac (VHT20),	5180-5240	36-48 [4]
5725-5850	ax (HEW20)	5745-5825	149-165 [5]
5150-5250	n (HT40), ac (VHT40), ax (HEW40)	5190-5230	38-46 [2]
5725-5850		5755-5795	151-159 [2]
5150-5250	ac (VHT80), ax (HEW80)	5210	42 [1]
5725-5850		5775	155 [1]

Report No.: FR1N0819AB

Band	Mode	BWch (MHz)	Nant
5.15-5.25GHz	802.11a	20	2TX
5.15-5.25GHz	802.11n HT20	20	2TX
5.15-5.25GHz	802.11ac VHT20	20	2TX
5.15-5.25GHz	802.11ax HEW20	20	2TX
5.15-5.25GHz	802.11n HT40	40	2TX
5.15-5.25GHz	802.11ac VHT40	40	2TX
5.15-5.25GHz	802.11ax HEW40	40	2TX
5.15-5.25GHz	802.11ac VHT80	80	2TX
5.15-5.25GHz	802.11ax HEW80	80	2TX
5.725-5.85GHz	802.11a	20	2TX
5.725-5.85GHz	802.11n HT20	20	2TX
5.725-5.85GHz	802.11ac VHT20	20	2TX
5.725-5.85GHz	802.11ax HEW20	20	2TX
5.725-5.85GHz	802.11n HT40	40	2TX
5.725-5.85GHz	802.11ac VHT40	40	2TX
5.725-5.85GHz	802.11ax HEW40	40	2TX
5.725-5.85GHz	802.11ac VHT80	80	2TX
5.725-5.85GHz	802.11ax HEW80	80	2TX

Note:

- 11a, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- VHT20, VHT40, VHT80 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM, modulation.
- HEW20, HEW40, HEW80 use a combination of OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.
- BWch is the nominal channel bandwidth.

TEL: 886-3-656-9065 Page Number : 5 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

1.1.2 Antenna Information

	P	ort					Gain (dBi)		
Ant.	WLAN		Brand	Model Name	Antenna Type	Connector	WLAN		AN Hz
	2.4GHz	5GHz					2.4GHz	UNII 1	UNII 3
1	1	1	TP-LINK	3101502757	PCB	I-Pex	1.94	0.97	0.94
2	2	2	TP-LINK	3101502756	PCB	I-Pex	1.93	0.90	0.85

Report No.: FR1N0819AB

Note 1: The above information was declared by manufacturer.

For 2.4GHz WLAN function

IEEE 802.11b/g/n/VHT/ax mode (2TX/2RX):

Port 1 and Port 2 could be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

For 5GHz WLAN function

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

Port 1 and Port 2 could be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

Note 2: Directional gain information

Maximum Output Power	Power Spectral Density
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	$Directional Gain = 10 \cdot log \left[\frac{\sum\limits_{j=1}^{N_{AST}} \left\{ \sum\limits_{k=1}^{N_{AST}} g_{j,k} \right\}^{2}}{N_{ANT}} \right]$

Ex.

Directional Gain (NSS1) formula:

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

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

$$gj,k = (Nss1(g1,1) + Nss1(g1,2) + Nss1(g1,3) + Nss1(g1,4))^2$$

DG =
$$10 \log[(Nss1(g1,1) + Nss1(g1,2) + Nss1(g1,3) + Nss1(g1,4))^2 / N_{ANT}] \Rightarrow 10$$

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

Where;

2.4GHz DG = 4.95 dBi

5 GHz U-NII-1 DG =3.95 dBi

5 GHz U-NII-3 DG =3.91 dBi

 TEL: 886-3-656-9065
 Page Number : 6 of 32

 FAX: 886-3-656-9085
 Issued Date : Mar. 01, 2022

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11a	0.96	0.18	1.398m	1k
802.11ac VHT20	0.96	0.18	1.318m	1k
802.11ac VHT40	0.92	0.36	656.875u	3k
802.11ac VHT80	0.852	0.7	325u	10k
802.11ax HEW20	0.942	0.26	1.018m	1k
802.11ax HEW40	0.904	0.44	538.125u	3k
802.11ax HEW80	0.828	0.82	287.5u	10k

Report No.: FR1N0819AB

N	Oto.	•

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

1.1.4 EUT Operational Condition

EUT Power Type	From	From Power Adapter			
Beamforming Function		☐ With beamforming ☐ Without beamforming			
		Outdoor P2M	\boxtimes	Indoor P2M	
Function		Fixed P2P		Client	
	\boxtimes	Point-to-multipoint		Point-to-point	
Test Software Version	QA UI (MT7915) : version 0.0.2.15			15	

Note: The above information was declared by manufacturer.

1.1.5 Table for EUT supports functions

Function	
AP Router	
Mesh	

Note 1: After evaluating, AP Router was selected to test and record in the report.

Note 2: The above information was declared by manufacturer.

1.1.6 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Model Name	Description
Deco X20	All the models are identical, the different model names served as a
Deco X21	marketing strategy.

Note 1: From the above models, model: Deco X20 was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

TEL: 886-3-656-9065 Page Number: 7 of 32 FAX: 886-3-656-9085 Issued Date: Mar. 01, 2022

1.2 Applicable Standards

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

Report No.: FR1N0819AB

- 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 662911 D01 v02r01
- FCC KDB 412172 D01 v01r01
- FCC KDB 414788 D01 v01r01

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	TH01-CB	Serway Li	22~23.4 / 59~63	Jan. 28, 2022∼ Feb. 07, 2022
Radiated (Below 1GHz)	03CH05-CB	Ken Yeh	24.1-25.2 / 55-58	Nov. 24, 2021
Radiated (Above 1GHz)	03CH04-CB	Kevin Huang	24.2-26.1 / 55-58	Nov. 24, 2021~ Jan. 29, 2022
Radiated (Co-location)	03CH05-CB	Kevin Huang	22.7-23.8 / 55-58	Nov. 24, 2021~ Jan. 29, 2022
AC Conduction	CO01-CB	Allen Chung	20~22 / 50~51	Nov. 30, 2021

TEL: 886-3-656-9065 Page Number : 8 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

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)

Report No.: FR1N0819AB

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.0 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.5 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.2 dB	Confidence levels of 95%
Conducted Emission	2.5 dB	Confidence levels of 95%
Output Power Measurement	1.3 dB	Confidence levels of 95%
Power Density Measurement	2.5 dB	Confidence levels of 95%
Bandwidth Measurement	0.9%	Confidence levels of 95%

TEL: 886-3-656-9065 Page Number : 9 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	Power Setting	
802.11a_Nss1,(6Mbps)_2TX	-	
5180MHz	19.5	
5200MHz	23.5	
5240MHz	22	
5745MHz	26.5	
5785MHz	28	
5825MHz	28.5	
802.11ac VHT20_Nss1,(MCS0)_2TX	-	
5180MHz	19	
5200MHz	24	
5240MHz	22.5	
5745MHz	26	
5785MHz	27	
5825MHz	27	
802.11ac VHT40_Nss1,(MCS0)_2TX	-	
5190MHz	17	
5230MHz	22	
5755MHz	26.5	
5795MHz	28	
802.11ac VHT80_Nss1,(MCS0)_2TX	-	
5210MHz	17	
5775MHz	25	
802.11ax HEW20_Nss1,(MCS0)_2TX	-	
5180MHz	19	
5200MHz	24.5	
5240MHz	22.5	
5745MHz	26	
5785MHz	27	
5825MHz	27	
802.11ax HEW40_Nss1,(MCS0)_2TX	-	
5190MHz	17	

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

Report Template No.: CB-A12_1 Ver1.4

Page Number : 10 of 32
Issued Date : Mar. 01, 2022

Report No.: FR1N0819AB

Report Version : 01

Mode	Power Setting	
5230MHz	22	
5755MHz	26.5	
5795MHz	28	
802.11ax HEW80_Nss1,(MCS0)_2TX	-	
5210MHz	17	
5775MHz	25	

Report No.: FR1N0819AB

Note:

Evaluated VHT20/VHT40/VHT80 mode only due to the similar modulation.
 The power setting of HT20/HT40 mode are the same or lower than VHT20/VHT40.

TEL: 886-3-656-9065 Page Number : 11 of 32 FAX: 886-3-656-9085 Ssued Date : Mar. 01, 2022

2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests			
Tests Item AC power-line conducted emissions			
Condition AC power-line conducted measurement for line and neutral Test Voltage: 120V / 60Hz			
Operating Mode Normal Link			
1	EUT + Adapter		

Report No.: FR1N0819AB

The Worst Case Mode for Following Conformance Tests		
Tests Item	Emission Bandwidth Maximum Output Power Power Spectral Density Unwanted Emissions	
Test Condition	Conducted measurement at transmit chains	

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.				
Operating Mode < 1GHz	Normal Link				
1	EUT in X axis + Adapter				
2	EUT in Y axis + Adapter				
3	EUT in Z axis + Adapter				
For operating mode 2 is th	For operating mode 2 is the worst case and it was record in this test report.				
	СТХ				
Operating Mode > 1GHz	The EUT was performed at X axis, Y axis and Z axis position. The worst case was found at Z axis, thus the measurement will follow this same test configuration.				
1	EUT in Z axis				

TEL: 886-3-656-9065 Page Number : 12 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

The Worst Case Mode for Following Conformance Tests			
Tests Item Simultaneous Transmission Analysis - Radiated Emission Co-location			
Test Condition Radiated measurement			
	Normal Link		
Operating Mode	The EUT was performed at X axis, Y axis and Z axis position. EUT in Z axis has been evaluated to be the worst case at Unwanted Emissions <above 1ghz="">; thus, the measurement will follow this same test configuration.</above>		
1 EUT in Z axis: WLAN 2.4GHz + WLAN 5GHz			
Refer to Appendix F for Radiated Emission Co-location.			

Report No.: FR1N0819AB

The Worst Case Mode for Following Conformance Tests			
Tests Item Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation			
Operating Mode			
1 WLAN 2.4GHz + WLAN 5GHz			
Refer to Sporton Test Report No.: FA1N0819 for Co-location RF Exposure Evaluation.			

2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.

2.4 Accessories

Accessories				
No.	No. Equipment Name Brand Model Rating			
1	Adapter	TP-Link	T120120-2B4	Input: 100-240V~50/60Hz, 0.4A Output: 12V, 1.2A

TEL: 886-3-656-9065 Page Number : 13 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

2.5 Support Equipment

For AC Conduction:

Support Equipment						
No.	No. Equipment Brand Name Model Name FCC ID					
Α	LAN PC	DELL	T3400	N/A		
В	2.4G NB	DELL	E6430	N/A		
С	5G NB	DELL	E6430	N/A		
D	Router	ASUS	RP-N53	N/A		

Report No.: FR1N0819AB

For Radiated (below 1GHz):

	Support Equipment						
No.	No. Equipment Brand Name Model Name FCC ID						
Α	Notebook	DELL	E4300	N/A			
В	Notebook	DELL	E4300	N/A			
С	Notebook	DELL	E4300	N/A			
D	WLAN AP	NETGEAR	WNDR3300v2	PY309300116			

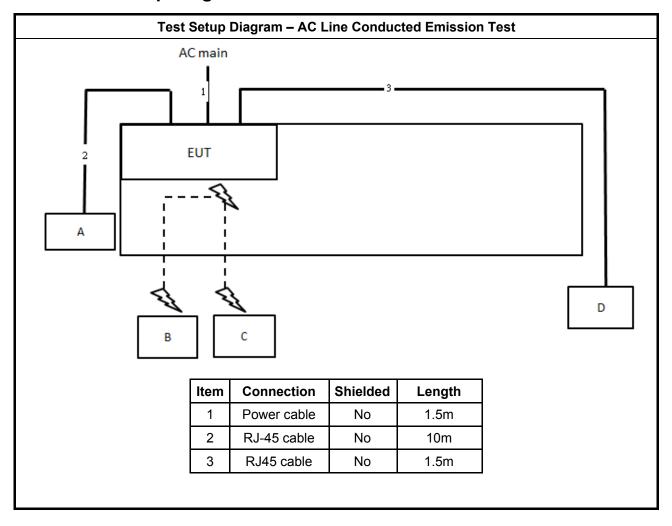
For Radiated (above 1GHz) and RF Conducted:

Support Equipment						
No. Equipment Brand Name Model Name FCC ID						
Α	Notebook	DELL	E4300	N/A		

TEL: 886-3-656-9065 Page Number : 14 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

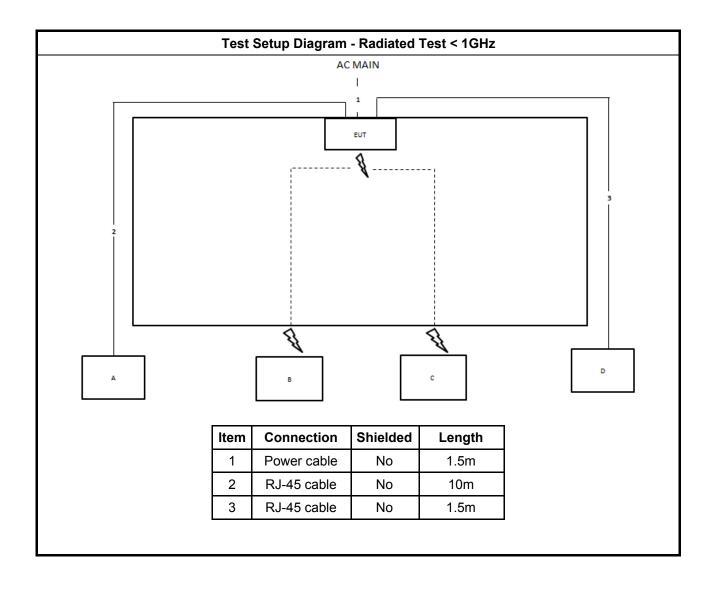
RADIO TEST REPORT Report No. : FR1N0819AB

2.6 Test Setup Diagram



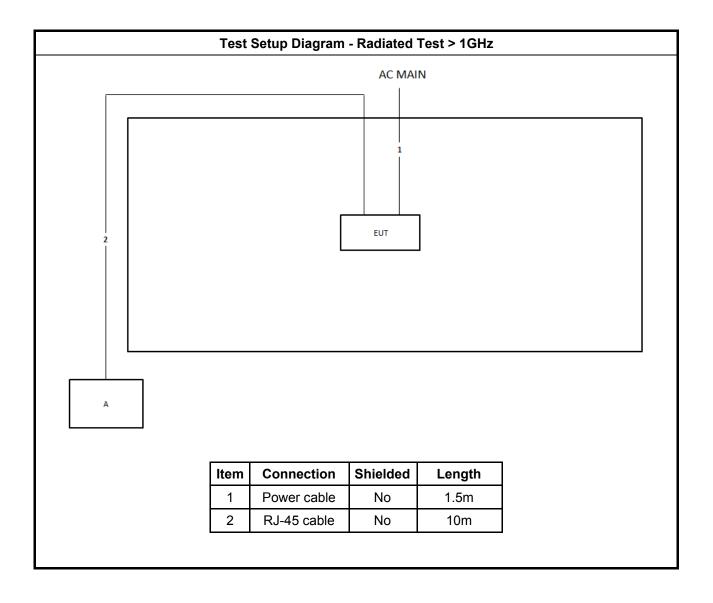
TEL: 886-3-656-9065 Page Number : 15 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

Report No.: FR1N0819AB



TEL: 886-3-656-9065 Page Number : 16 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

Report No.: FR1N0819AB



TEL: 886-3-656-9065 Page Number : 17 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

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					
0.5-5	56	46			
5-30	60	50			
Note 1: * Decreases with the logarithm of the frequency.					

Report No.: FR1N0819AB

3.1.2 Measuring Instruments

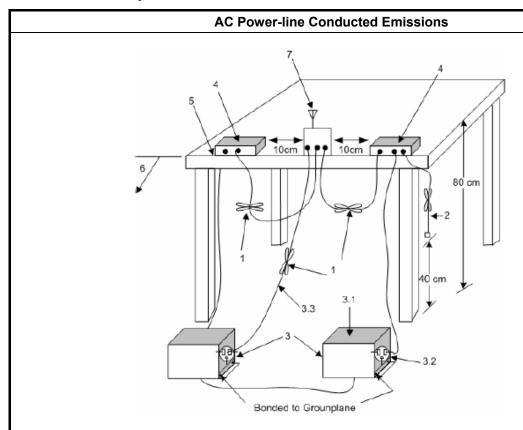
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

TEL: 886-3-656-9065 Page Number : 18 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

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.

Report No.: FR1N0819AB

- 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

TEL: 886-3-656-9065 Page Number : 19 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

3.2 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

	Emission Bandwidth Limit
UNI	I Devices
\boxtimes	For the 5.15-5.25 GHz band, N/A
	For the 5.25-5.35 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
	For the $5.47-5.725$ GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
\boxtimes	For the 5.725-5.85 GHz band, 26 dB emission bandwidth ,N/A. 6 dB emission bandwidth ≥ 500kHz.
LE-	LAN Devices
	For the band 5.15-5.25 GHz, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz
	For the $5.47-5.6$ GHz band and $5.65-5.725$ GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or $17+10$ log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz
	For the 5.725-5.85 GHz band, 6 dB emission bandwidth ≥ 500kHz.

Report No.: FR1N0819AB

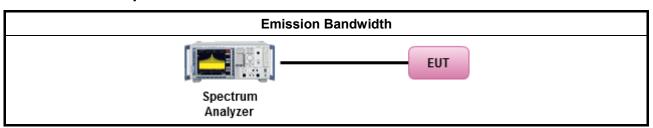
3.2.2 Measuring Instruments

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 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

TEL: 886-3-656-9065 Page Number : 20 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

3.3 Maximum Output Power

3.3.1 Limit

	Maximum Output Power Limit					
UNI	NII Devices					
\boxtimes	For the 5.15-5.25 GHz band:					
	 Outdoor AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If G_{TX} > 6 dBi, then P_{Out} = 30 - (G_{TX} - 6). e.i.r.p. at any elevation angle above 30 degrees ≤ 125mW [21dBm] 					
	■ Indoor AP: the maximum conducted output power (P _{Out}) shall not exceed the lesser of 1 W. If G _{TX} > 6 dBi, then P _{Out} = 30 – (G _{TX} – 6)					
	Point-to-point AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W If $G_{TX} > 23$ dBi, then $P_{Out} = 30 - (G_{TX} - 23)$.					
	Mobile or Portable Client: the maximum conducted output power (P _{Out}) shall not exceed the lesser of 250 mW. If G _{TX} > 6 dBi, then P _{Out} = 24 – (G _{TX} – 6).					
	For the 5.25-5.35 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If G_{TX} > 6 dBi, then P_{Out} = 24 – (G_{TX} – 6).					
	For the 5.47-5.725 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If G_{TX} > 6 dBi, then P_{Out} = 24 – (G_{TX} – 6).					
\boxtimes	For the 5.725-5.85 GHz band:					
	 Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If G_{TX} > 6 dBi, then P_{Out} = 30 - (G_{TX} - 6). 					
	 Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. 					
Ė	LAN Devices					
	For the 5.15-5.25 GHz band, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.					
	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz					
	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz					
	For the 5.725-5.85 GHz band:					
	Point-to-multipoint systems (P2M): the maximum conducted output power (P _{Out}) shall not exceed the lesser of 1 W. If G _{TX} > 6 dBi, then P _{Out} = 30 − (G _{TX} − 6).					
	 Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. 					
	t = maximum conducted output power in dBm, = the maximum transmitting antenna directional gain in dBi.					

Report No.: FR1N0819AB

3.3.2 Measuring Instruments

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

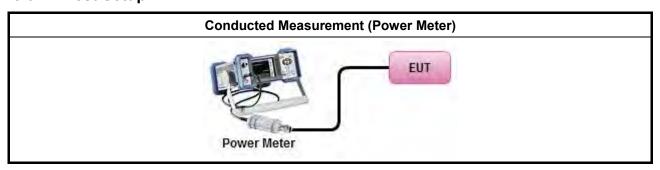
TEL: 886-3-656-9065 Page Number : 21 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

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)
	Wideband RF power meter and average over on/off periods with duty factor
	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.

Report No.: FR1N0819AB

3.3.4 Test Setup



3.3.5 Test Result of Maximum Output Power

Refer as Appendix C

TEL: 886-3-656-9065 Page Number : 22 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

3.4 Power Spectral Density

3.4.1 Limit

Peak Power Spectral Density Limit				
UNII Devices				
For the 5.15-5.25 GHz band:				
 Outdoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If G_{TX} > 6 dBi, then P_{Out} = 17 – (G_{TX} – 6). 				
 Indoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If G_{TX} > 6 dBi, then P_{Out} = 17 − (G_{TX} − 6). 				
■ Point-to-point AP: the peak power spectral density (PPSD) shall not exceed the lesser of $17 dBm/MHz$. If $G_{TX} > 23 dBi$, then $P_{Out} = 17 - (G_{TX} - 23)$.				
 Mobile or Portable Client: the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If G_{TX} > 6 dBi, then PPSD= 11 – (G_{TX} – 6) 				
For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) \leq 11 dBm/MHz. If $G_{TX} >$ 6 dBi, then PPSD= 11 – ($G_{TX} - 6$).				
For the 5.47-5.725 GHz band, the peak power spectral density (PPSD) \leq 11 dBm/MHz. If $G_{TX} >$ 6 dBi, then PPSD= 11 – ($G_{TX} -$ 6).				
Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz. If $G_{TX} > 6$ dBi, then PPSD= 30 – ($G_{TX} - 6$).				
 Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz. 				
LE-LAN Devices				
☐ For the 5.15-5.25 GHz band, the e.i.r.p. peak power spectral density (PPSD) \leq 10 dBm/MHz.				
☐ For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) \leq 11 dBm/MHz.				
 e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where θ is the angle above the local horizontal plane (of the Earth) as shown below: -13 dBW/MHz for 0° ≤ θ < 8°; -13 − 0.716 (θ-8) dBW/MHz for 8° ≤ θ < 40° -35.9 − 1.22 (θ-40) dBW/MHz for 40° ≤ θ ≤ 45°; -42 dBW/MHz for θ > 45° 				
\square For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the peak power spectral density (PPSD) \leq 11 dBm/MHz.				
For the 5.725-5.85 GHz band:				
Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) \leq 30 dBm/500kHz. If $G_{TX} > 6$ dBi, then PPSD= $30 - (G_{TX} - 6)$.				
 Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz. 				
PPSD = peak power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz G_{TX} = the maximum transmitting antenna directional gain in dBi.				

Report No.: FR1N0819AB

3.4.2 Measuring Instruments

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

TEL: 886-3-656-9065 Page Number : 23 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

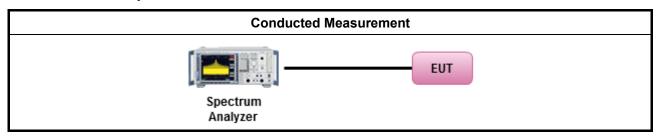
3.4.3 Test Procedures

		Test Method			
•	outp func	k 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 + + 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.			

Report No.: FR1N0819AB

TEL: 886-3-656-9065 Page Number : 24 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

3.4.4 Test Setup



Report No.: FR1N0819AB

3.4.5 Test Result of Power Spectral Density

Refer as Appendix D

TEL: 886-3-656-9065 Page Number : 25 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

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				

Report No.: FR1N0819AB

- 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			
	e.i.r.p27 dBm [68.2 dBuV/m@3m]			
☐ 5.25 - 5.35 GHz	e.i.r.p27 dBm [68.2 dBuV/m@3m]			
☐ 5.47 - 5.725 GHz	e.i.r.p27 dBm [68.2 dBuV/m@3m]			
⊠ 5.725 - 5.85 GHz	all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.			

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).

TEL: 886-3-656-9065 Page Number : 26 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method

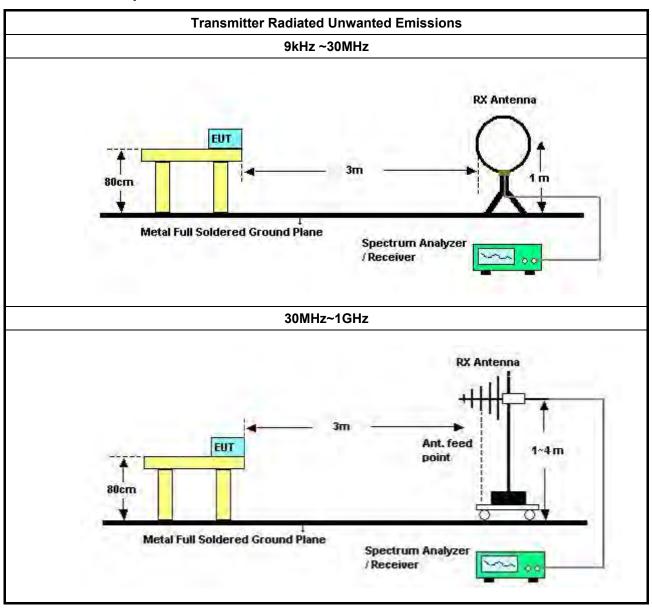
Report No.: FR1N0819AB

- 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.

TEL: 886-3-656-9065 Page Number : 27 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

RADIO TEST REPORT Report No. : FR1N0819AB

3.5.4 Test Setup



TEL: 886-3-656-9065 Page Number : 28 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

Above 1GHz

BUT

3M & 1M

1.5M

Max 30cm

Spectrum Analyzer

Report No.: FR1N0819AB

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

TEL: 886-3-656-9065 Page Number : 29 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022

4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Mar. 03, 2021	Mar. 02, 2022	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50- 16-2	04083	150kHz ~ 100MHz	Jan. 06, 2021	Jan. 05, 2022	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Mar. 07, 2021	Mar. 06, 2022	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwa rz	ESH3-Z2	100430	9kHz ~ 30MHz	Jan. 30, 2021	Jan. 29, 2022	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	May 19, 2021	May 18, 2022	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 14, 2021	Apr. 13, 2022	Radiation (03CH05-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 09, 2021	Aug. 08, 2022	Radiation (03CH05-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH05-CB	1GHz ~18GHz 3m	Nov. 07, 2021	Nov. 06, 2022	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 26, 2021	Mar. 25, 2022	Radiation (03CH05-CB)
Horn Antenna	SCHWARZBE CK	BBHA9120D	BBHA 9120 D-1291	1GHz~18GHz	Oct. 14, 2021	Oct. 13, 2022	Radiation (03CH05-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 05, 2021	Aug. 04, 2022	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 27, 2021	Apr. 26, 2022	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC12630SE	980287	1GHz – 26.5GHz	Jul. 02, 2021	Jul. 01, 2022	Radiation (03CH05-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 13, 2021	Jul. 12, 2022	Radiation (03CH05-CB)
Signal Analyzer	R&S	FSV40	101903	9kHz ~ 40GHz	Mar. 22, 2021	Mar. 21, 2022	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 21, 2021	Jun. 20, 2022	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	Low Cable-04+23	30MHz~1GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-28	1GHz~18GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-04+28	1GHz~18GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH05-CB)

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

Report Template No.: CB-A12_1 Ver1.4

Page Number : 30 of 32 Issued Date : Mar. 01, 2022

Report No.: FR1N0819AB

Report Version : 01

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH05-CB)
Test Software	SPORTON	SENSE	V5.10 -		N.C.R.	N.C.R.	Radiation (03CH05-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH04-CB	1GHz ~18GHz 3m	Feb. 25, 2021	Feb. 24, 2022	Radiation (03CH04-CB)
Horn Antenna	ETS · Lindgren	3115	00143147	750MHz~18GHz	Oct. 25, 2021	Oct. 24, 2022	Radiation (03CH04-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 05, 2021	Aug. 04, 2022	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	83017A	MY53270063	0.5GHz ~ 26.5GHz	Jul. 12, 2021	Jul. 11, 2022	Radiation (03CH04-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 13, 2021	Jul. 12, 2022	Radiation (03CH04-CB)
Spectrum Analyzer	R&S	FSP40	100142	9kHz~40GHz	Feb. 19, 2021	Feb. 18, 2022	Radiation (03CH04-CB
RF Cable-high	Woken	RG402	High Cable-21	ligh Cable-21 1GHz - 18GHz		Oct. 03, 2022	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-21+67	1GHz - 18GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1			Jul. 14, 2022	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH04-CB)
Test Software	SPORTON	SENSE	V5.10	V5.10 -		N.C.R.	Radiation (03CH04-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	May 21, 2021	May 20, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-30	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
Switch	SPTCB	SP-SWI	SWI-01	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	SWI-01-P1	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	SWI-01-P2	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	SWI-01-P3	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)

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

Report Template No.: CB-A12_1 Ver1.4

Page Number : 31 of 32 Issued Date : Mar. 01, 2022

Report No.: FR1N0819AB

Report Version : 01

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	SWI-01-P4	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	SWI-01-P5	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
Power Sensor	Agilent	E9327A	US40442088	50MHz~18GHz	Feb. 23, 2021	Feb. 22, 2022	Conducted (TH01-CB)
Power Meter	Agilent	E4416A	GB41291199	50MHz~18GHz	Feb. 23, 2021	Feb. 22, 2022	Conducted (TH01-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conducted (TH01-CB)

Report No.: FR1N0819AB

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

NCR means Non-Calibration required.

TEL: 886-3-656-9065 Page Number : 32 of 32 FAX: 886-3-656-9085 Issued Date : Mar. 01, 2022



Conducted Emissions at Powerline

Appendix A

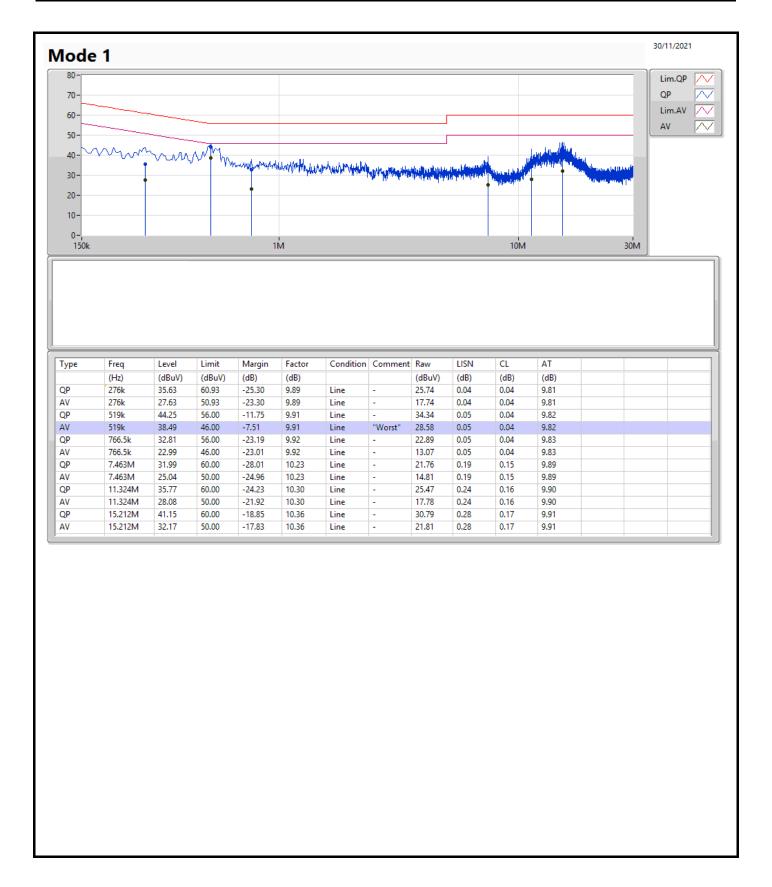
Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	AV	519k	38.49	46.00	-7.51	Line

Sporton International Inc. Hsinchu Laboratory Page No. : 1 of 3

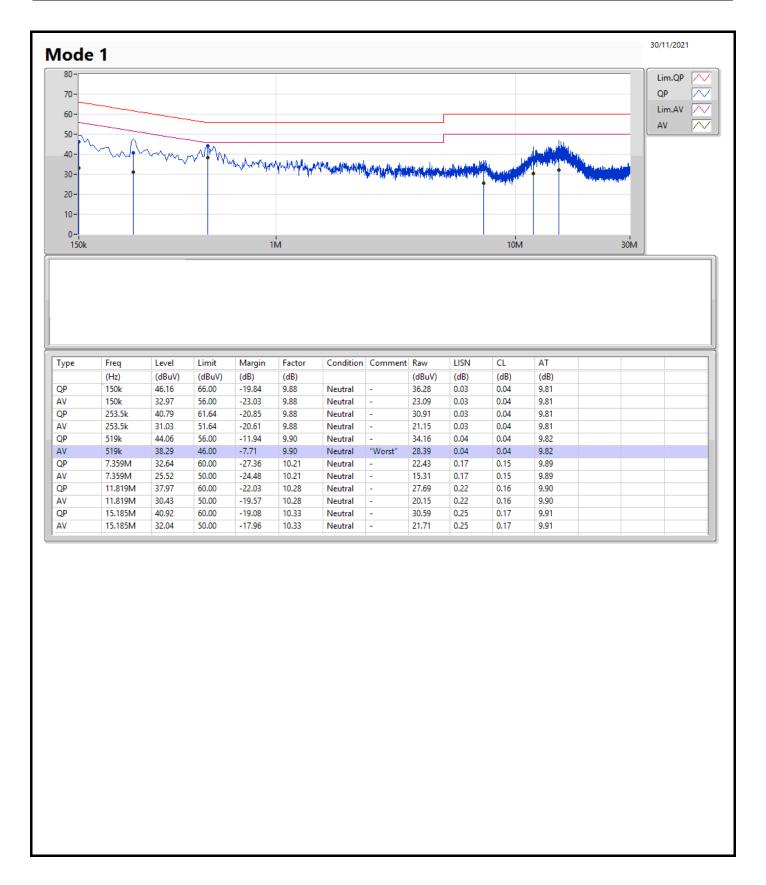
Report No. : FR1N0819AB





Page No. : 2 of 3
Report No. : FR1N0819AB





Page No. : 3 of 3

Report No. : FR1N0819AB



Appendix B **EBW**

Summary

Mode	Max-N dB	Max-OBW	ITU-Code	Min-N dB	Min-OBW
	(Hz)	(Hz)		(Hz)	(Hz)
5.15-5.25GHz	-	-	-	-	-
802.11a_Nss1,(6Mbps)_2TX	40.68M	27.406M	27M4D7W	21.66M	16.702M
802.11ac VHT20_Nss1,(MCS0)_2TX	41.91M	28.216M	28M2D7W	22.08M	17.661M
802.11ac VHT40_Nss1,(MCS0)_2TX	65.4M	39.7M	39M7D7W	40.26M	36.222M
802.11ac VHT80_Nss1,(MCS0)_2TX	102.24M	75.202M	75M2D7W	79.68M	74.963M
802.11ax HEW20_Nss1,(MCS0)_2TX	56.49M	37.931M	37M9D7W	22.62M	18.891M
802.11ax HEW40_Nss1,(MCS0)_2TX	74.22M	42.279M	42M3D7W	39.66M	37.721M
802.11ax HEW80_Nss1,(MCS0)_2TX	80.28M	77.121M	77M1D7W	80.28M	76.882M
5.725-5.85GHz	-	-	-	-	-
802.11a_Nss1,(6Mbps)_2TX	16.29M	44.468M	44M5D7W	15.03M	22.489M
802.11ac VHT20_Nss1,(MCS0)_2TX	17.55M	44.378M	44M4D7W	15.06M	22.369M
802.11ac VHT40_Nss1,(MCS0)_2TX	32.52M	79.04M	79M0D7W	25.02M	50.555M
802.11ac VHT80_Nss1,(MCS0)_2TX	75.12M	97.871M	97M9D7W	71.28M	83.478M
802.11ax HEW20_Nss1,(MCS0)_2TX	18.45M	43.988M	44M0D7W	16.26M	22.279M
802.11ax HEW40_Nss1,(MCS0)_2TX	35.76M	76.162M	76M2D7W	28.8M	50.435M
802.11ax HEW80_Nss1,(MCS0)_2TX	75.12M	89.475M	89M5D7W	70.08M	81.919M

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

Sporton International Inc. Hsinchu Laboratory

Page No. Report No. : FR1N0819AB



Appendix B **EBW**

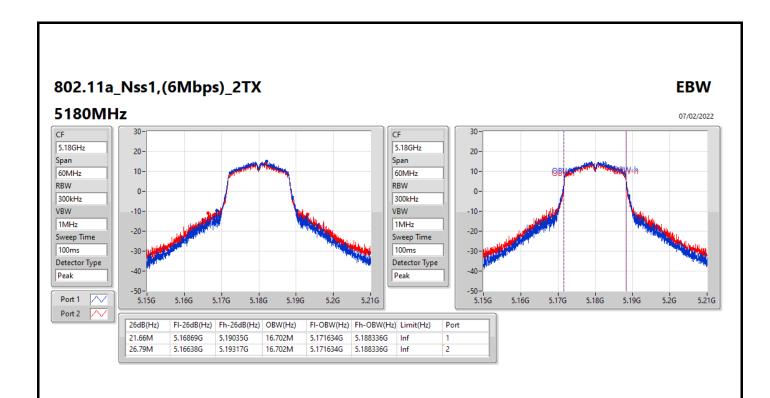
Result

Mode	Result	Limit	Port 1-N dB	Port 1-OBW	Port 2-N dB	Port 2-OBW
		(Hz)	(Hz)	(Hz)	(Hz)	(Hz)
802.11a_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
5180MHz	Pass	Inf	21.66M	16.702M	26.79M	16.702M
5200MHz	Pass	Inf	35.49M	22.009M	40.68M	27.406M
5240MHz	Pass	Inf	27.63M	16.852M	33.6M	19.61M
5745MHz	Pass	500k	15.06M	22.489M	15.3M	32.234M
5785MHz	Pass	500k	15.03M	28.576M	16.29M	43.658M
5825MHz	Pass	500k	15.03M	27.916M	15.9M	44.468M
802.11ac VHT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	Inf	22.08M	17.691M	24.48M	17.661M
5200MHz	Pass	Inf	37.29M	23.658M	41.91M	28.216M
5240MHz	Pass	Inf	28.05M	17.931M	36.6M	20.75M
5745MHz	Pass	500k	15.06M	22.369M	15.42M	27.316M
5785MHz	Pass	500k	15.09M	26.747M	17.55M	44.378M
5825MHz	Pass	500k	15.06M	24.078M	17.28M	39.31M
802.11ac VHT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5190MHz	Pass	Inf	40.68M	36.222M	40.26M	36.222M
5230MHz	Pass	Inf	51.48M	36.762M	65.4M	39.7M
5755MHz	Pass	500k	32.52M	50.555M	30M	58.651M
5795MHz	Pass	500k	30M	59.19M	25.02M	79.04M
802.11ac VHT80_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	Inf	79.68M	74.963M	102.24M	75.202M
5775MHz	Pass	500k	75.12M	83.478M	71.28M	97.871M
802.11ax HEW20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	Inf	22.62M	18.981M	26.64M	18.981M
5200MHz	Pass	Inf	48.42M	30.375M	56.49M	37.931M
5240MHz	Pass	Inf	30.81M	18.891M	37.17M	20.54M
5745MHz	Pass	500k	16.26M	22.279M	17.55M	27.766M
5785MHz	Pass	500k	17.64M	27.166M	18.45M	43.988M
5825MHz	Pass	500k	17.01M	24.708M	17.58M	40M
802.11ax HEW40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5190MHz	Pass	Inf	39.66M	37.721M	44.4M	37.841M
5230MHz	Pass	Inf	51.42M	38.141M	74.22M	42.279M
5755MHz	Pass	500k	35.76M	50.435M	32.64M	57.571M
5795MHz	Pass	500k	32.58M	58.171M	28.8M	76.162M
802.11ax HEW80_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	Inf	80.28M	76.882M	80.28M	77.121M
5775MHz	Pass	500k	75.12M	81.919M	70.08M	89.475M

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

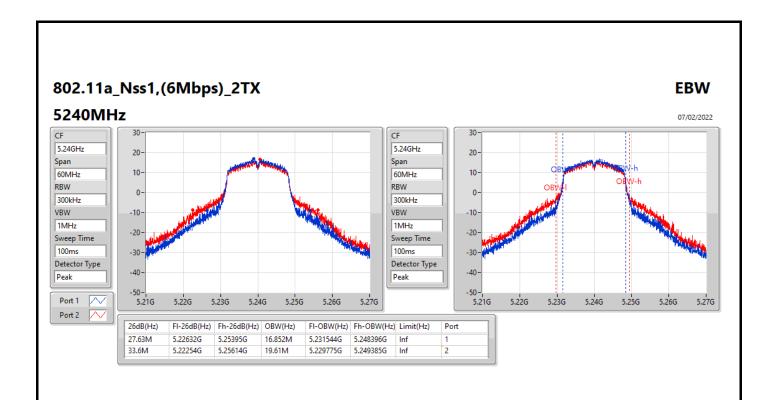
Sporton International Inc. Hsinchu Laboratory

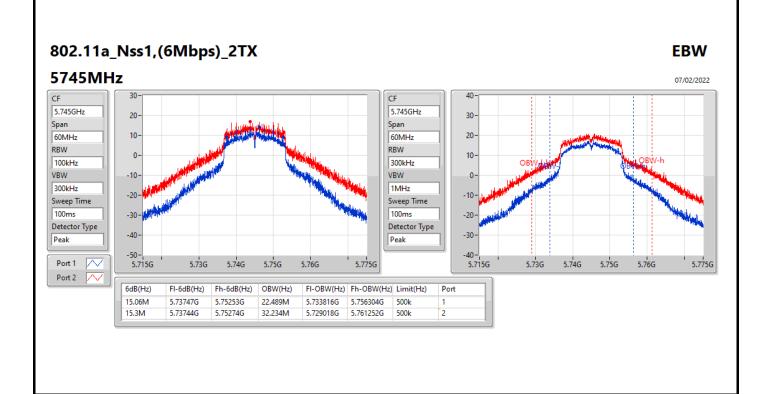
Page No. Report No. : FR1N0819AB





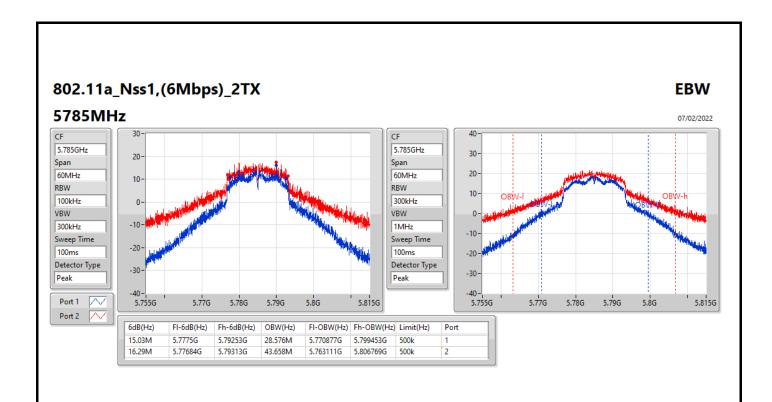
Page No. : 3 of 17 Report No. : FR1N0819AB

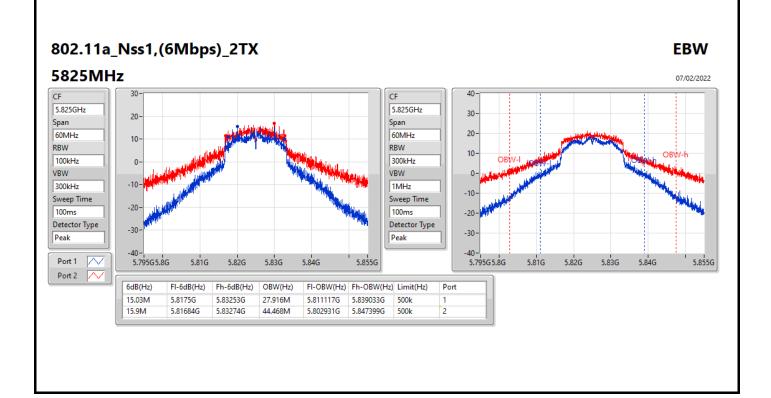




Page No. : 4 of 17

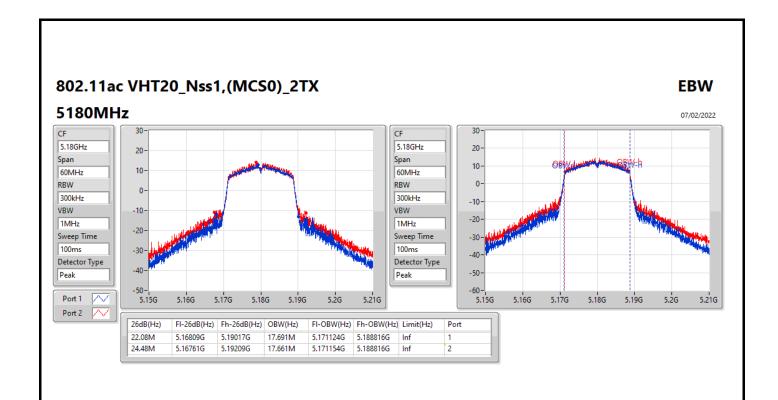
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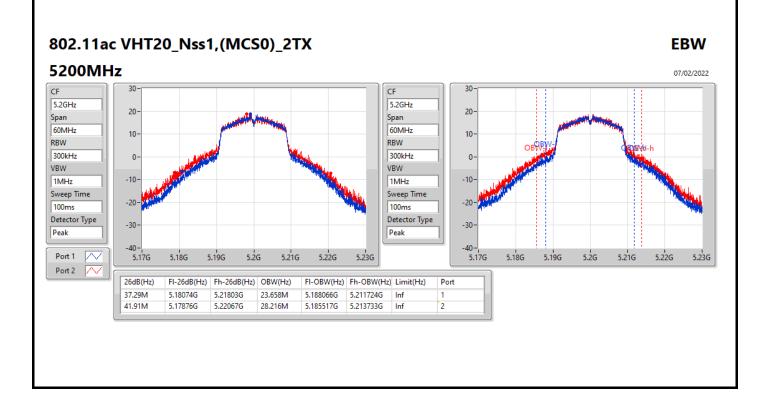




Page No. : 5 of 17

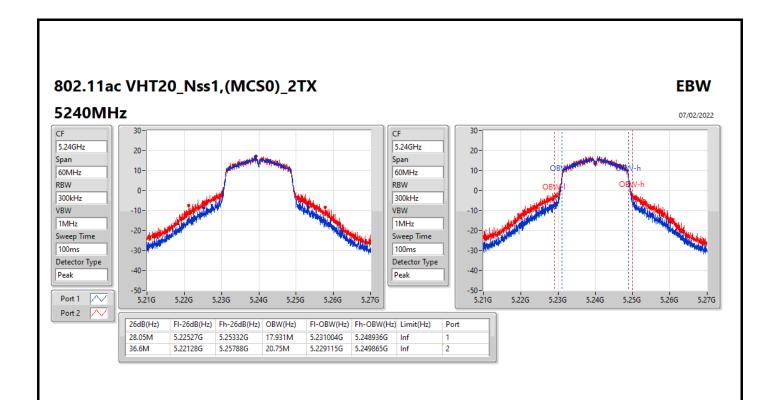
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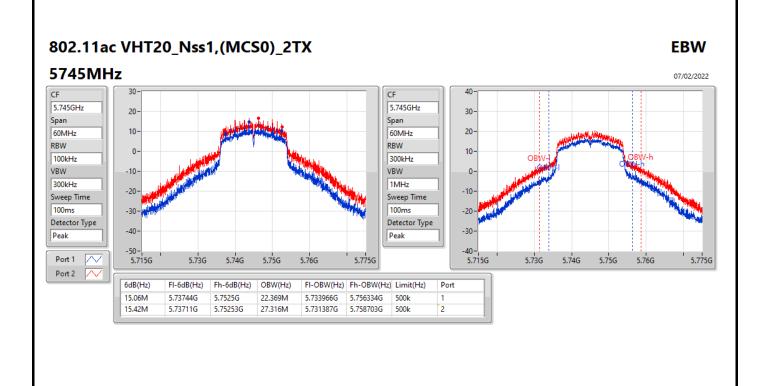




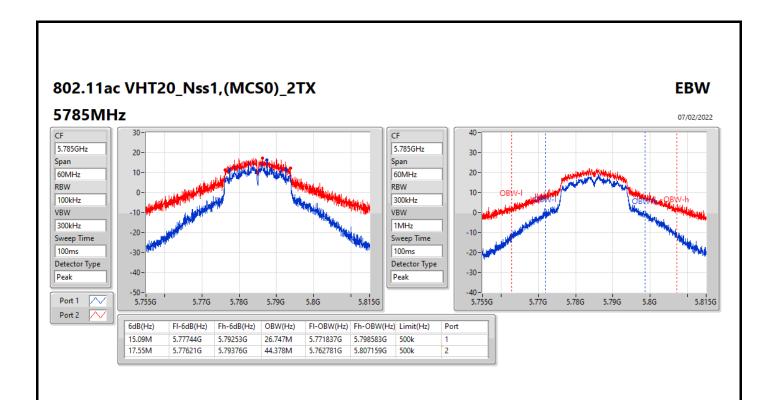
Page No. : 6 of 17

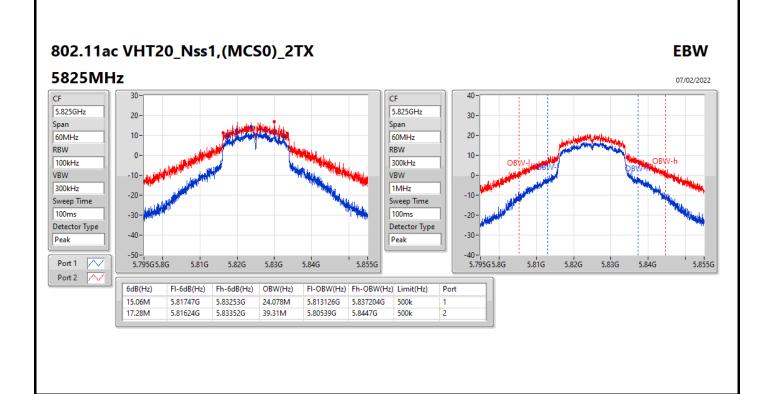
Report No. : FR1N0819AB





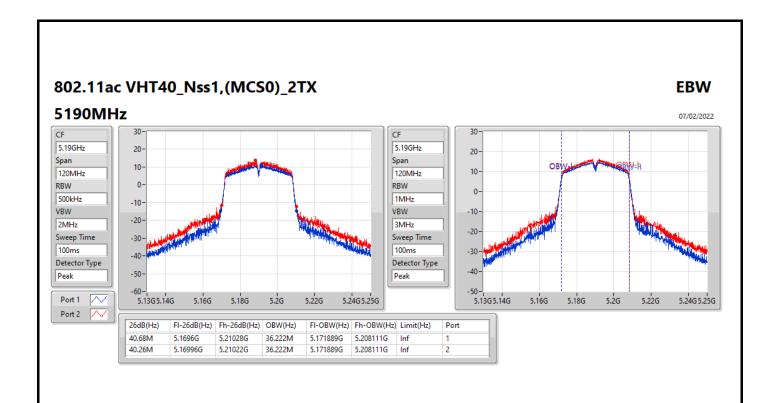
Page No. : 7 of 17 Report No. : FR1N0819AB

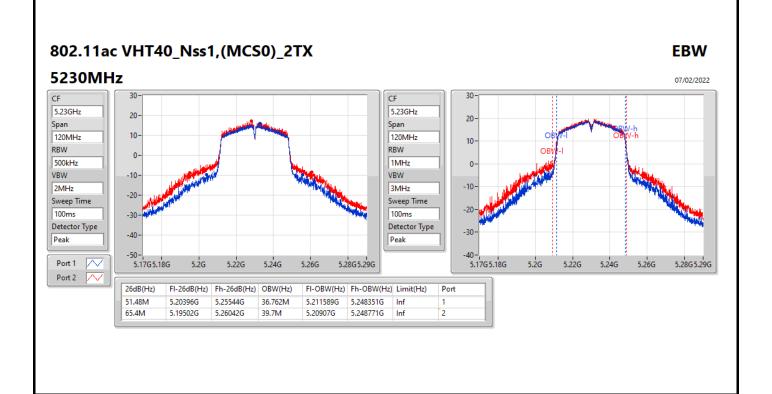




Page No. : 8 of 17

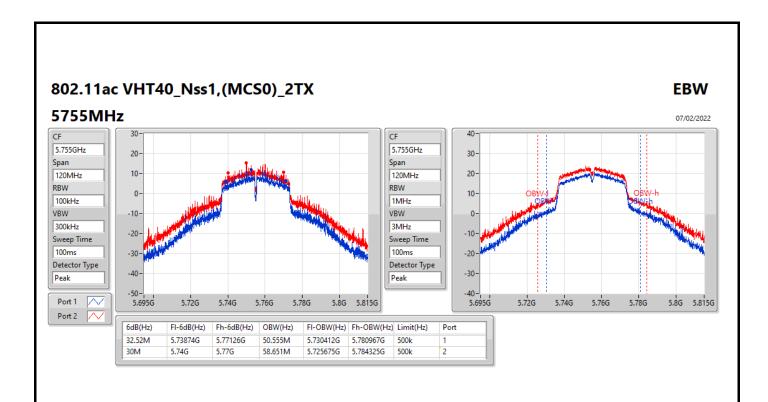
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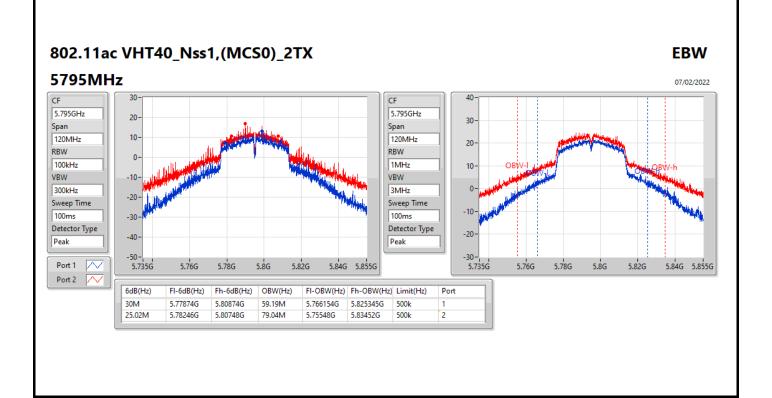




Page No. : 9 of 17

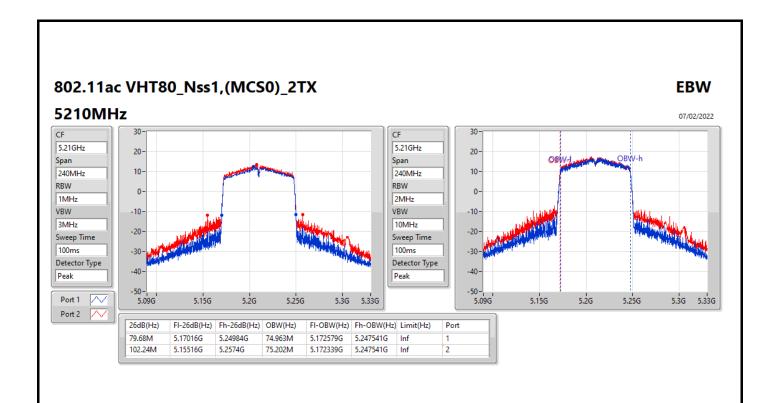
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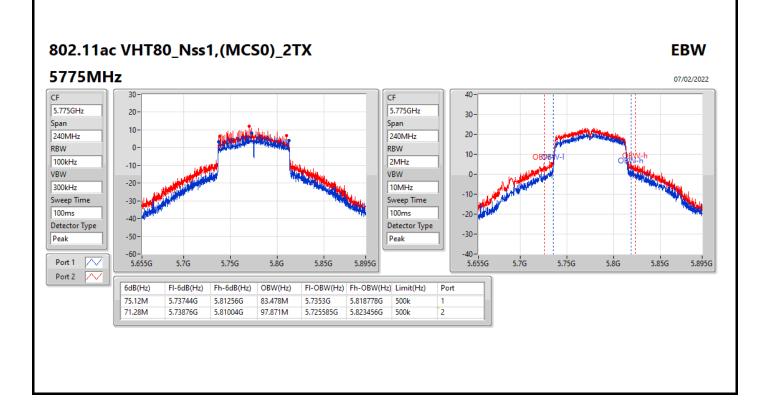




Page No. : 10 of 17

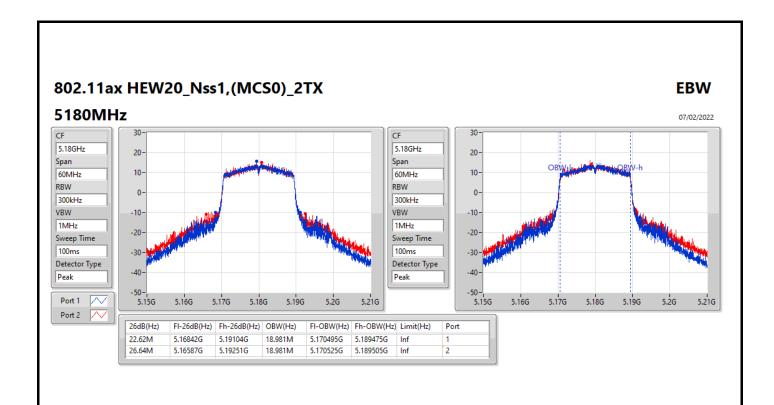
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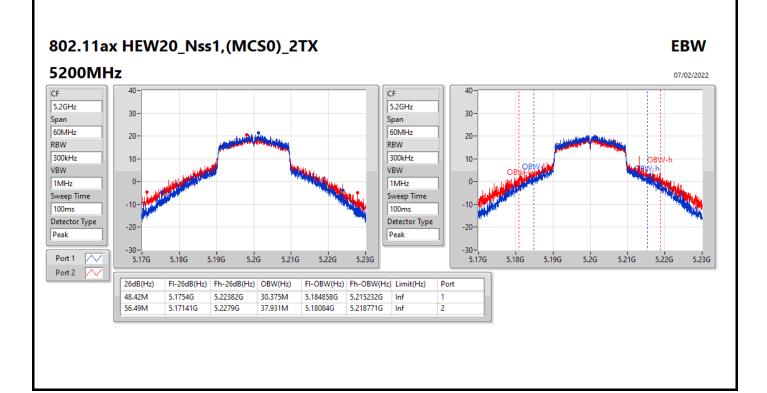




Page No. : 11 of 17

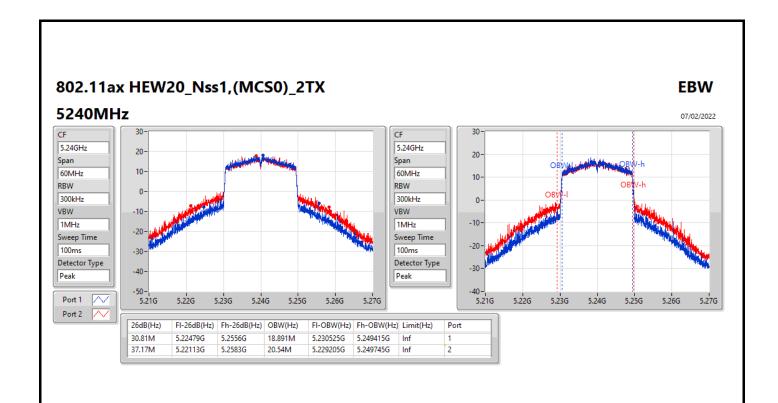
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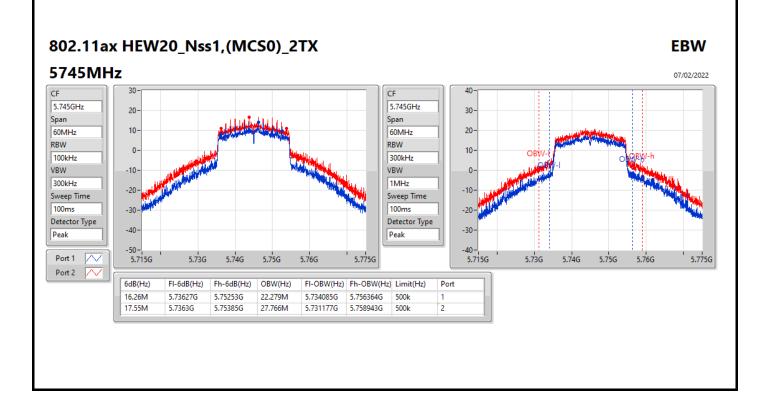




Page No. : 12 of 17

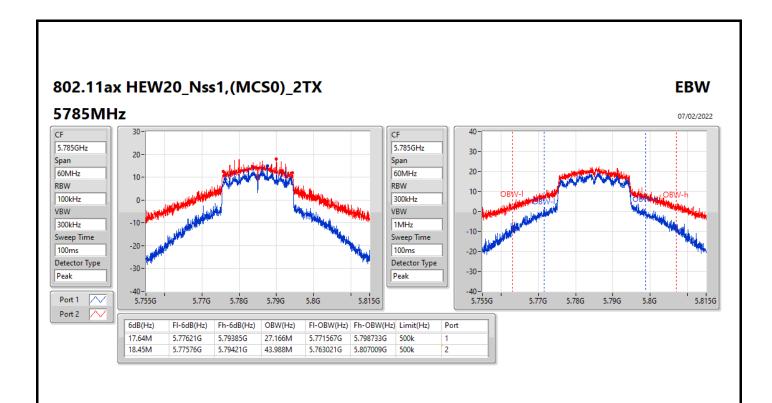
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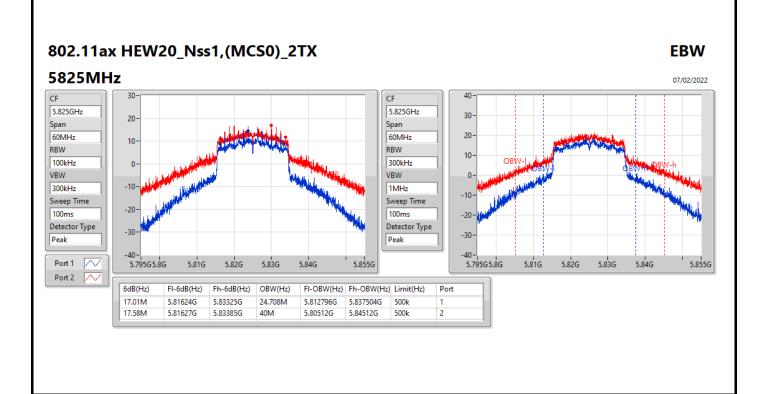




Page No. : 13 of 17

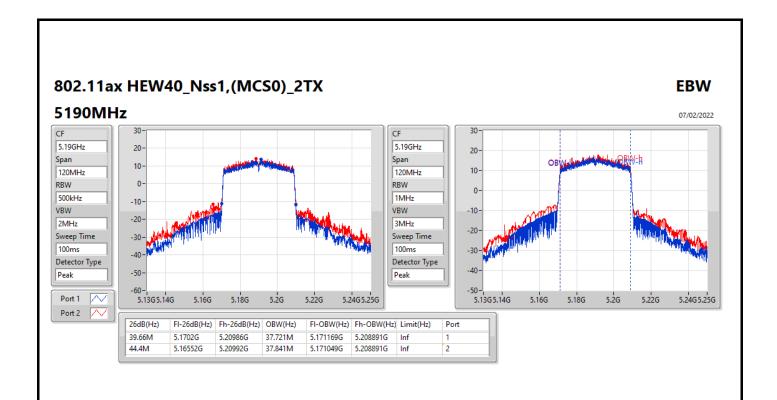
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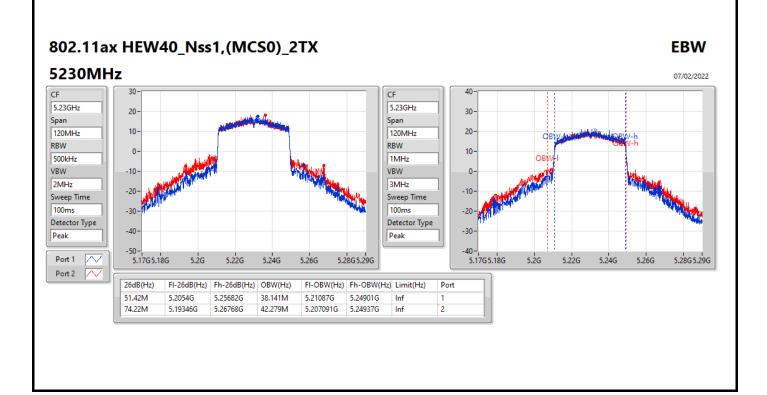




Page No. : 14 of 17

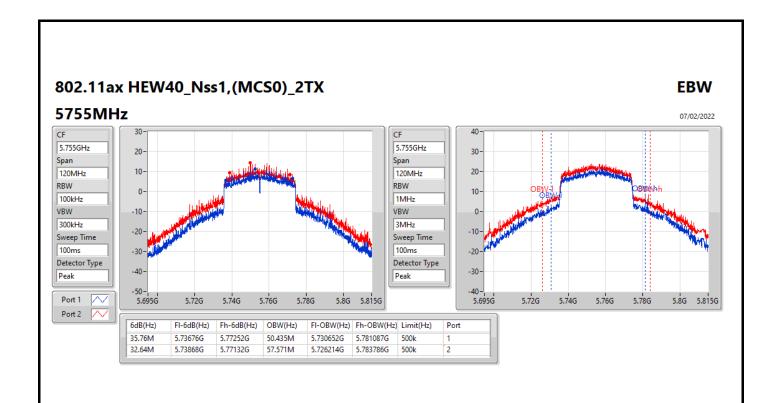
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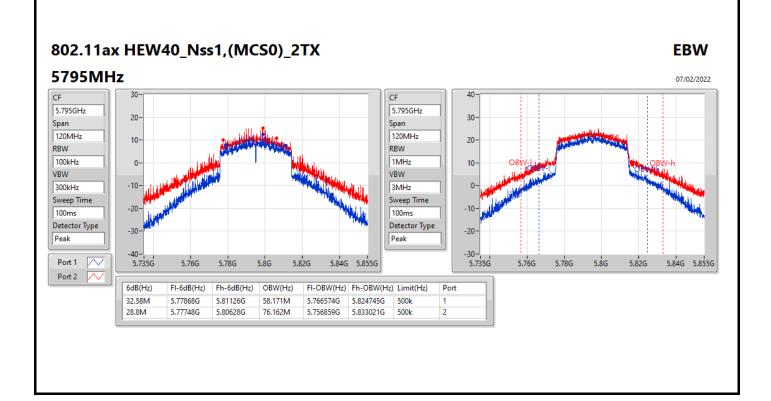




Page No. : 15 of 17

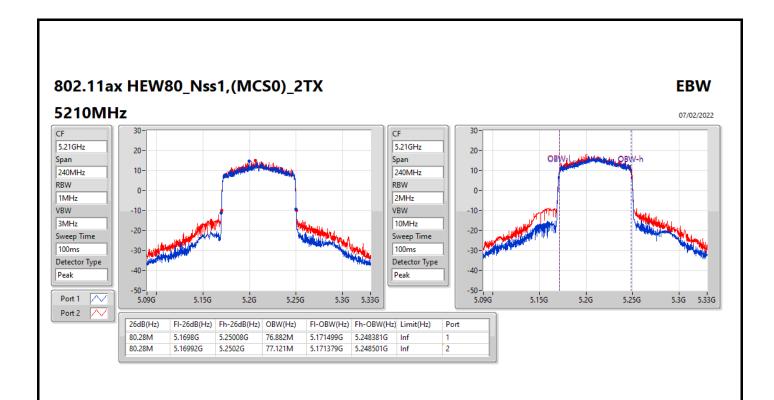
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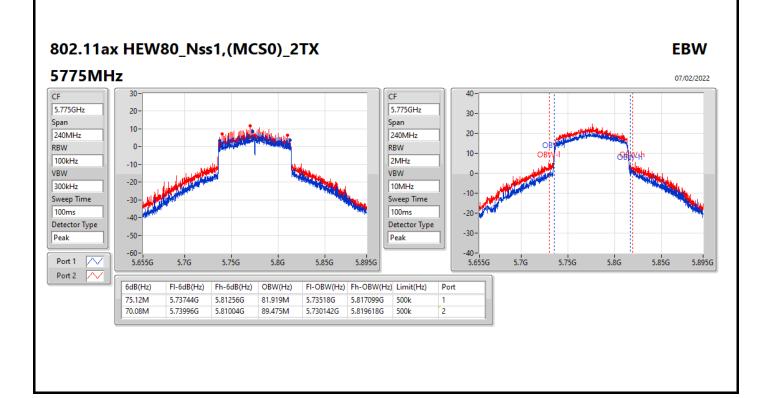




Page No. : 16 of 17

Report No. : FR1N0819AB





Page No. : 17 of 17

Report No. : FR1N0819AB



Average Power Appendix C

Summary

Mode	Total Power	Total Power
	(dBm)	(W)
5.15-5.25GHz	-	-
802.11a_Nss1,(6Mbps)_2TX	28.01	0.63241
802.11ac VHT20_Nss1,(MCS0)_2TX	28.19	0.65917
802.11ac VHT40_Nss1,(MCS0)_2TX	26.10	0.40738
802.11ac VHT80_Nss1,(MCS0)_2TX	22.52	0.17865
802.11ax HEW20_Nss1,(MCS0)_2TX	28.55	0.71614
802.11ax HEW40_Nss1,(MCS0)_2TX	25.97	0.39537
802.11ax HEW80_Nss1,(MCS0)_2TX	22.47	0.17660
5.725-5.85GHz	-	-
802.11a_Nss1,(6Mbps)_2TX	29.86	0.96828
802.11ac VHT20_Nss1,(MCS0)_2TX	29.94	0.98628
802.11ac VHT40_Nss1,(MCS0)_2TX	29.85	0.96605
802.11ac VHT80_Nss1,(MCS0)_2TX	27.57	0.57148
802.11ax HEW20_Nss1,(MCS0)_2TX	29.99	0.99770
802.11ax HEW40_Nss1,(MCS0)_2TX	29.55	0.90157
802.11ax HEW80_Nss1,(MCS0)_2TX	27.60	0.57544

Sporton International Inc. Hsinchu Laboratory

Page No. : 1 of 2 Report No. : FR1N0819AB



Average Power Appendix C

Result

Mode	Result	DG	Port 1	Port 2	Total Power	Power Limit
		(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
802.11a_Nss1,(6Mbps)_2TX	-	-	=	-	-	-
5180MHz	Pass	0.97	22.21	21.06	24.68	30.00
5200MHz	Pass	0.97	25.79	24.04	28.01	30.00
5240MHz	Pass	0.97	23.92	22.78	26.40	30.00
5745MHz	Pass	0.94	23.83	26.71	28.51	30.00
5785MHz	Pass	0.94	25.29	28.00	29.86	30.00
5825MHz	Pass	0.94	25.13	27.54	29.51	30.00
802.11ac VHT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	0.97	20.33	20.77	23.57	30.00
5200MHz	Pass	0.97	25.31	25.05	28.19	30.00
5240MHz	Pass	0.97	23.54	23.50	26.53	30.00
5745MHz	Pass	0.94	23.64	26.45	28.28	30.00
5785MHz	Pass	0.94	24.83	28.34	29.94	30.00
5825MHz	Pass	0.94	23.95	27.17	28.86	30.00
802.11ac VHT40_Nss1,(MCS0)_2TX	-	-		-	-	-
5190MHz	Pass	0.97	19.43	19.71	22.58	30.00
5230MHz	Pass	0.97	23.14	23.04	26.10	30.00
5755MHz	Pass	0.94	24.13	26.81	28.68	30.00
5795MHz	Pass	0.94	25.60	27.81	29.85	30.00
802.11ac VHT80_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	0.97	19.23	19.77	22.52	30.00
5775MHz	Pass	0.94	23.33	25.52	27.57	30.00
802.11ax HEW20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	0.97	20.58	20.89	23.75	30.00
5200MHz	Pass	0.97	25.68	25.39	28.55	30.00
5240MHz	Pass	0.97	23.72	23.55	26.65	30.00
5745MHz	Pass	0.94	23.79	26.49	28.36	30.00
5785MHz	Pass	0.94	24.98	28.34	29.99	30.00
5825MHz	Pass	0.94	24.17	27.27	29.00	30.00
802.11ax HEW40_Nss1,(MCS0)_2TX	-	-		-	-	-
5190MHz	Pass	0.97	19.25	19.77	22.53	30.00
5230MHz	Pass	0.97	23.12	22.79	25.97	30.00
5755MHz	Pass	0.94	24.04	26.51	28.46	30.00
5795MHz	Pass	0.94	25.13	27.61	29.55	30.00
802.11ax HEW80_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	0.97	19.28	19.64	22.47	30.00
5775MHz	Pass	0.94	23.38	25.54	27.60	30.00

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

Page No. : 2 of 2

Report No. : FR1N0819AB



Summary

Mode	PD (dBm/RBW)
5.15-5.25GHz	-
802.11a_Nss1,(6Mbps)_2TX	16.67
802.11ac VHT20_Nss1,(MCS0)_2TX	16.82
802.11ac VHT40_Nss1,(MCS0)_2TX	11.90
802.11ac VHT80_Nss1,(MCS0)_2TX	5.38
802.11ax HEW20_Nss1,(MCS0)_2TX	16.73
802.11ax HEW40_Nss1,(MCS0)_2TX	11.39
802.11ax HEW80_Nss1,(MCS0)_2TX	5.38
5.725-5.85GHz	-
802.11a_Nss1,(6Mbps)_2TX	17.05
802.11ac VHT20_Nss1,(MCS0)_2TX	17.05
802.11ac VHT40_Nss1,(MCS0)_2TX	13.91
802.11ac VHT80_Nss1,(MCS0)_2TX	9.22
802.11ax HEW20_Nss1,(MCS0)_2TX	16.61
802.11ax HEW40_Nss1,(MCS0)_2TX	13.58
802.11ax HEW80_Nss1,(MCS0)_2TX	9.06

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

Page No. : 1 of 17

Report No. : FR1N0819AB



Appendix D **PSD**

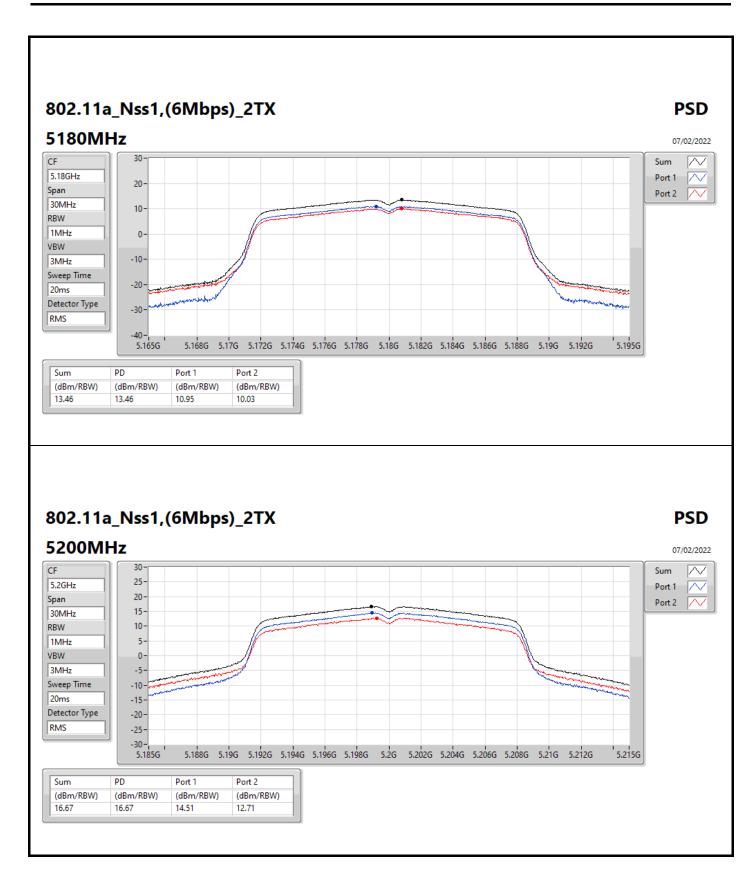
Result

Mode	Result	DG	Port 1	Port 2	PD	PD Limit
		(dBi)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
802.11a_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
5180MHz	Pass	3.95	10.95	10.03	13.46	17.00
5200MHz	Pass	3.95	14.51	12.71	16.67	17.00
5240MHz	Pass	3.95	12.73	11.52	15.13	17.00
5745MHz	Pass	3.91	11.66	14.17	16.02	30.00
5785MHz	Pass	3.91	13.25	14.86	17.05	30.00
5825MHz	Pass	3.91	12.94	14.18	16.57	30.00
802.11ac VHT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	3.95	9.07	9.38	12.17	17.00
5200MHz	Pass	3.95	14.01	13.73	16.82	17.00
5240MHz	Pass	3.95	12.52	12.32	15.35	17.00
5745MHz	Pass	3.91	11.09	13.66	15.54	30.00
5785MHz	Pass	3.91	13.00	15.12	17.05	30.00
5825MHz	Pass	3.91	11.10	13.91	15.67	30.00
802.11ac VHT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5190MHz	Pass	3.95	5.07	5.66	8.34	17.00
5230MHz	Pass	3.95	9.14	8.85	11.90	17.00
5755MHz	Pass	3.91	8.85	11.01	13.03	30.00
5795MHz	Pass	3.91	10.13	11.75	13.91	30.00
802.11ac VHT80_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	3.95	2.29	2.72	5.38	17.00
5775MHz	Pass	3.91	5.03	7.36	9.22	30.00
802.11ax HEW20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	3.95	8.75	9.00	11.82	17.00
5200MHz	Pass	3.95	13.95	13.64	16.73	17.00
5240MHz	Pass	3.95	12.16	11.98	14.99	17.00
5745MHz	Pass	3.91	10.84	13.30	15.12	30.00
5785MHz	Pass	3.91	12.43	14.70	16.61	30.00
5825MHz	Pass	3.91	11.37	13.61	15.55	30.00
802.11ax HEW40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5190MHz	Pass	3.95	4.61	5.47	7.96	17.00
5230MHz	Pass	3.95	8.69	8.24	11.39	17.00
5755MHz	Pass	3.91	8.37	10.58	12.45	30.00
5795MHz	Pass	3.91	9.58	11.46	13.58	30.00
802.11ax HEW80_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	3.95	2.10	2.76	5.38	17.00
5775MHz	Pass	3.91	5.07	7.30	9.06	30.00

Sporton International Inc. Hsinchu Laboratory : 2 of 17 Page No.

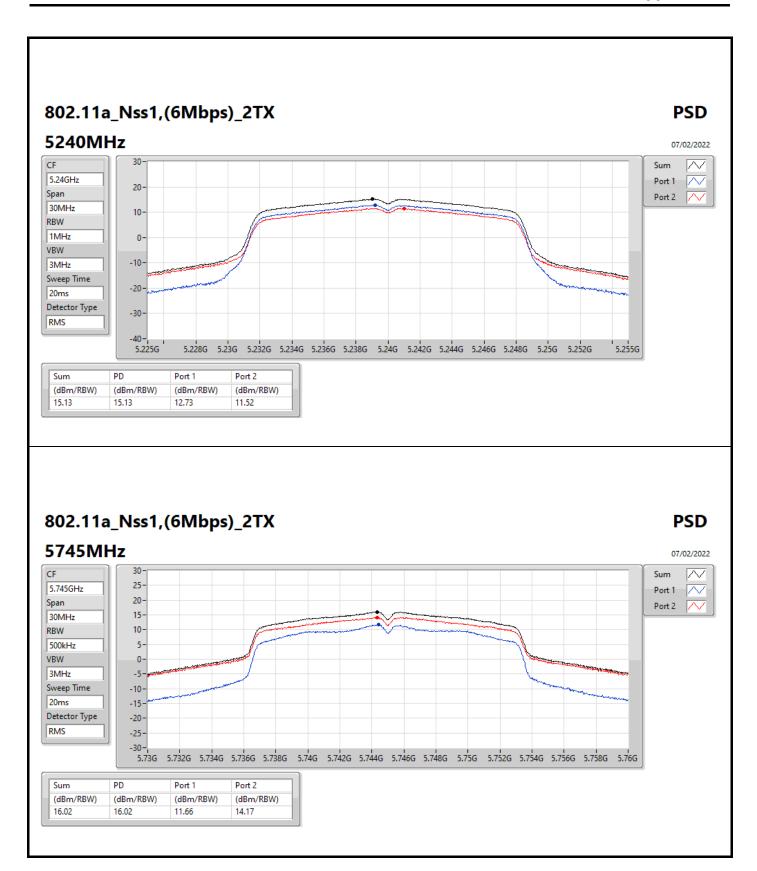
Report No. : FR1N0819AB

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;



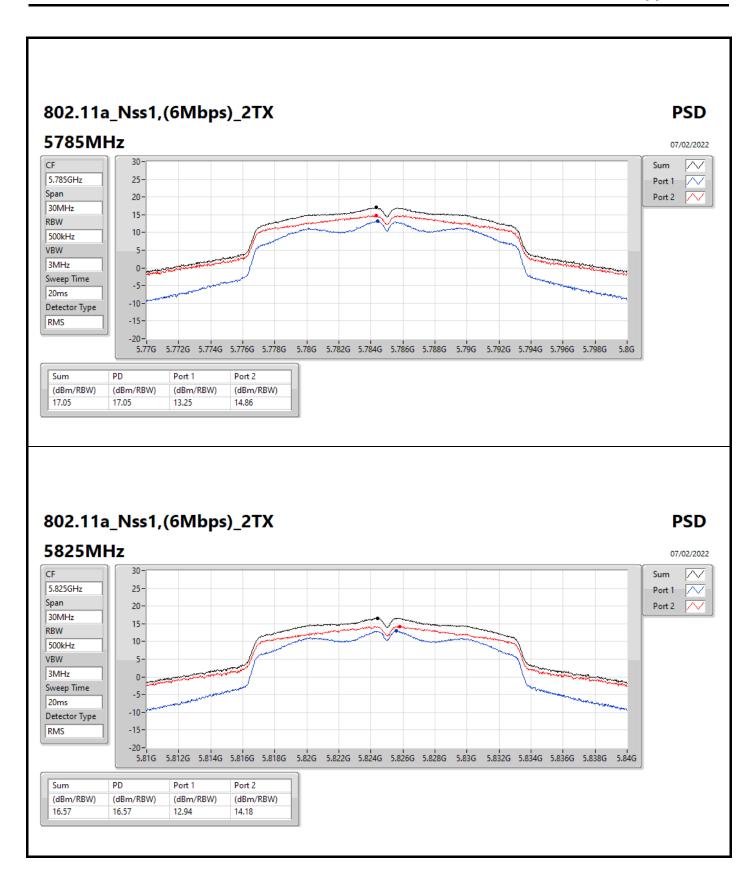
Page No. : 3 of 17

Report No. : FR1N0819AB

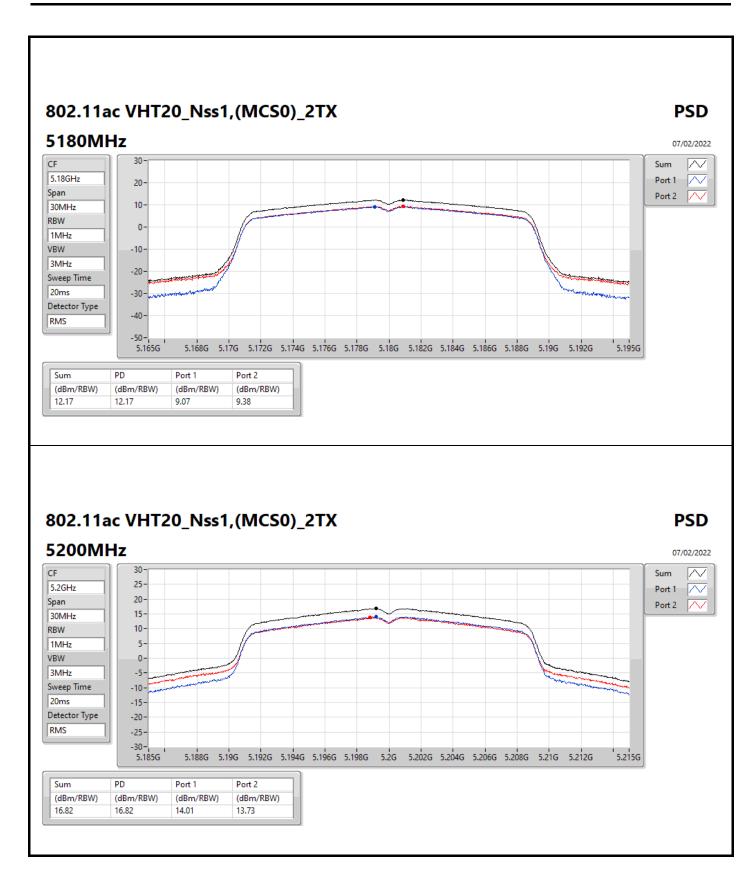


Page No. : 4 of 17

Report No. : FR1N0819AB

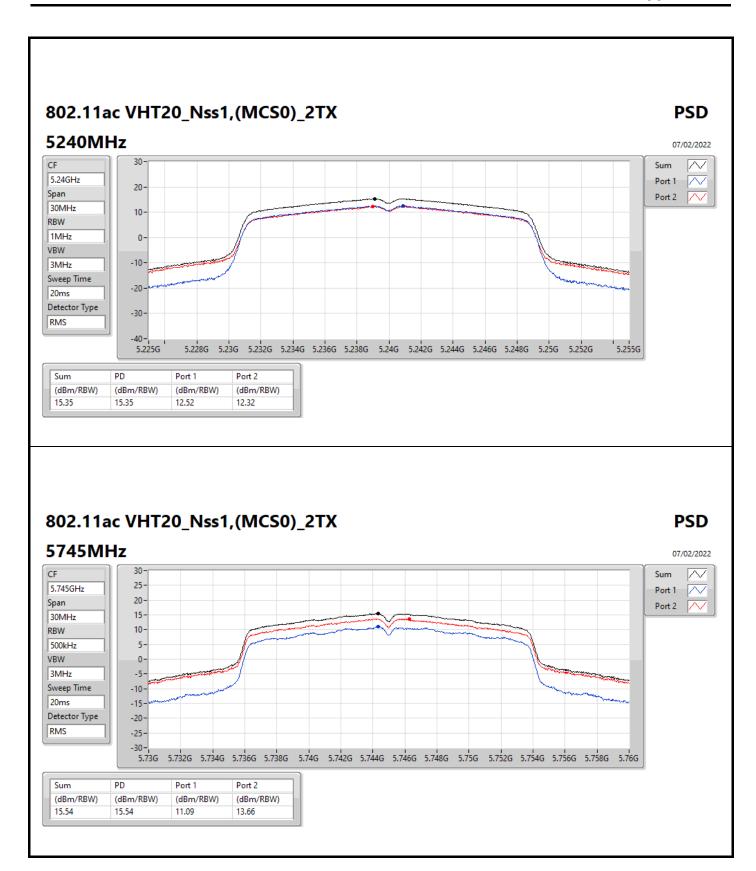


Page No. : 5 of 17
Report No. : FR1N0819AB

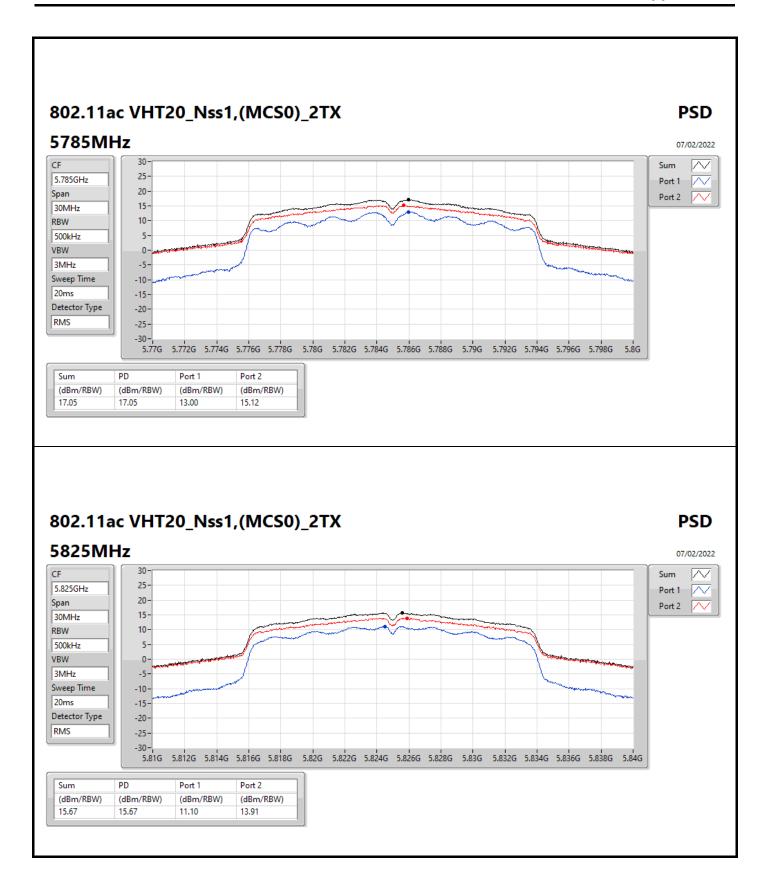


Page No. : 6 of 17

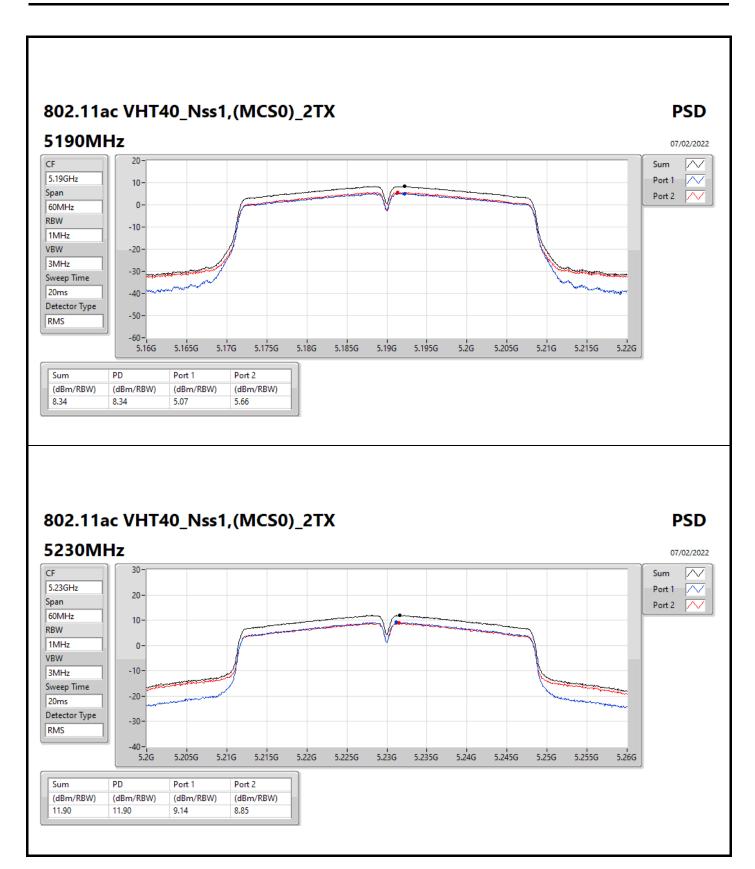
Report No. : FR1N0819AB



Page No. : 7 of 17
Report No. : FR1N0819AB

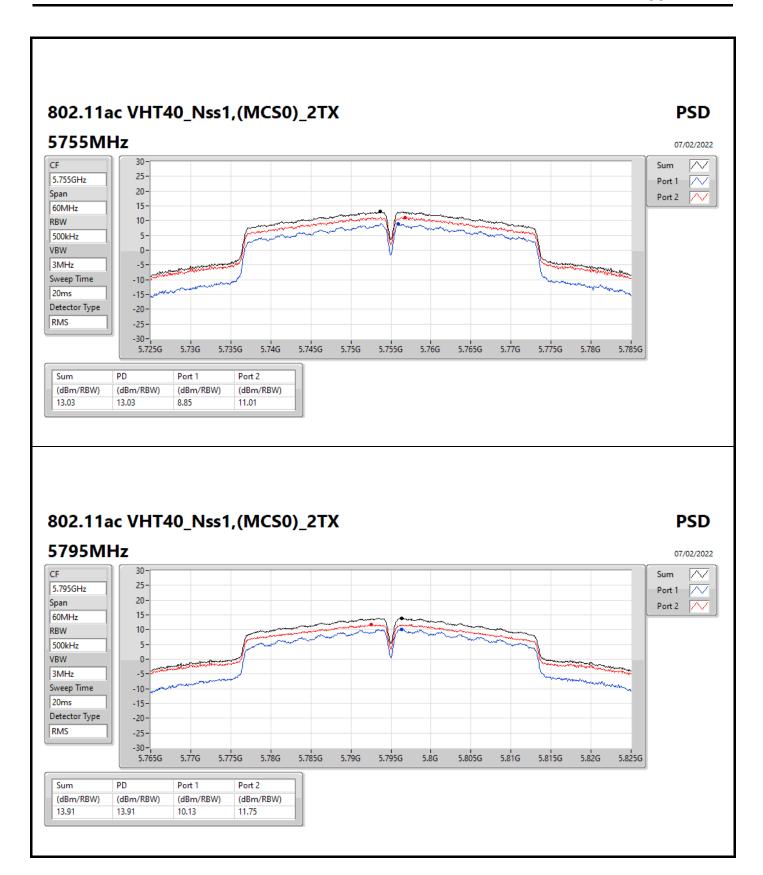


Page No. : 8 of 17
Report No. : FR1N0819AB



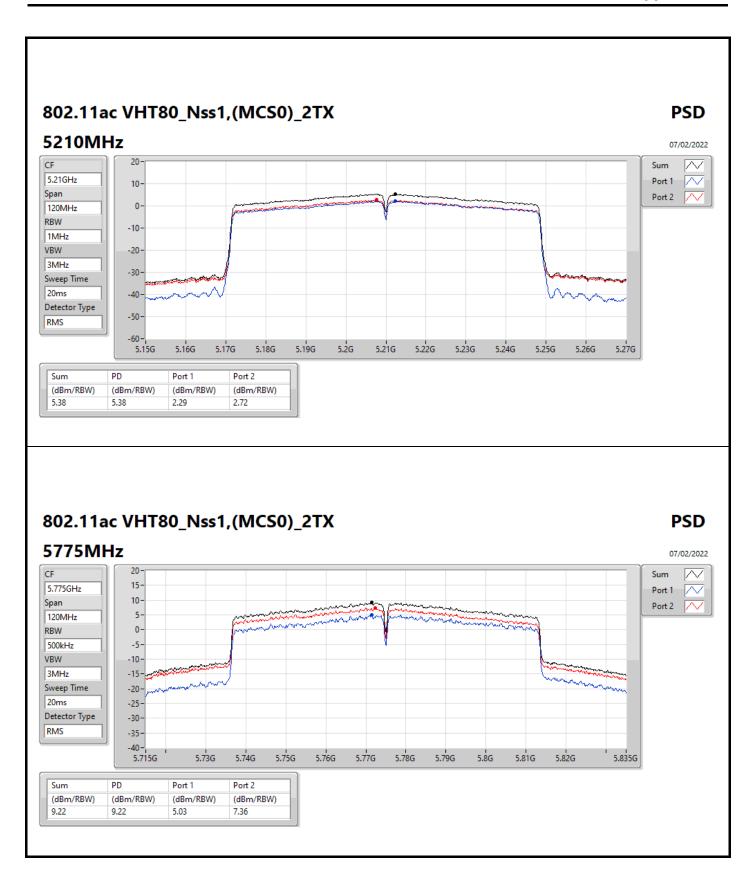
Page No. : 9 of 17

Report No. : FR1N0819AB



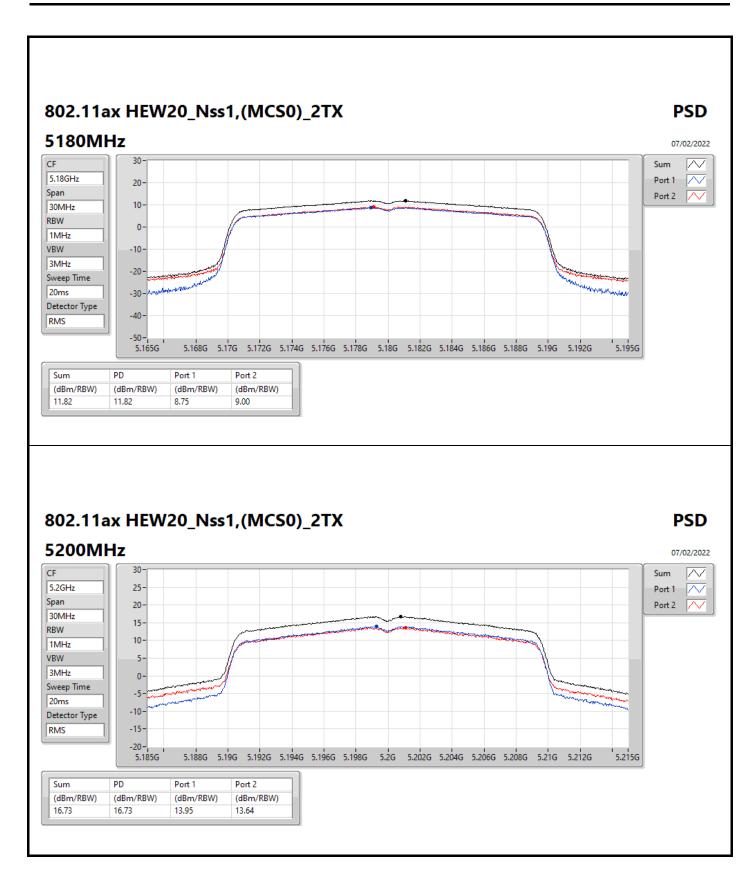
Page No. : 10 of 17

Report No. : FR1N0819AB



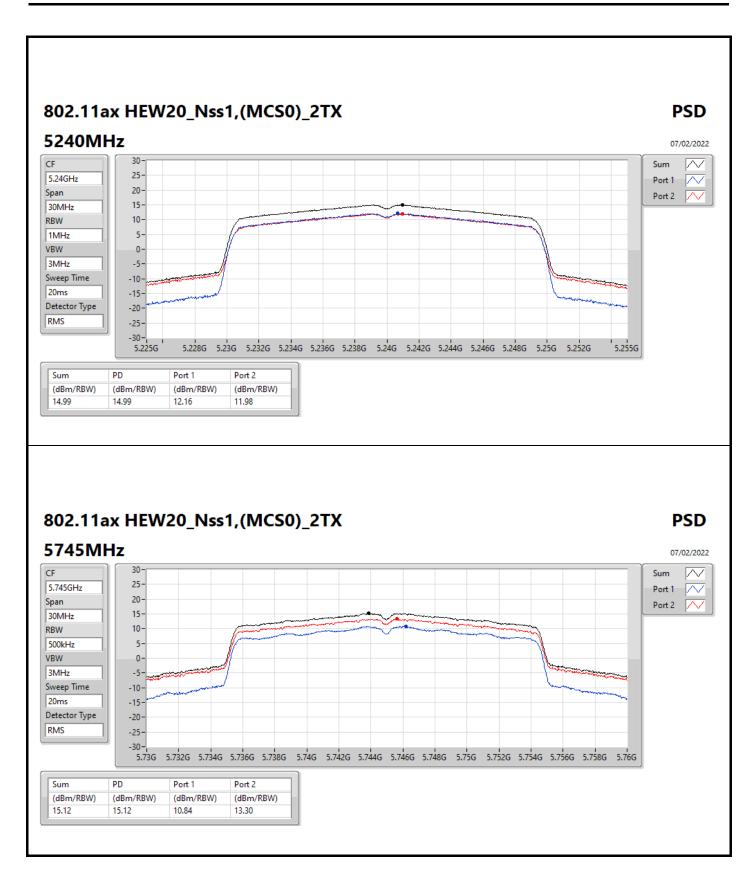
Page No. : 11 of 17

Report No. : FR1N0819AB



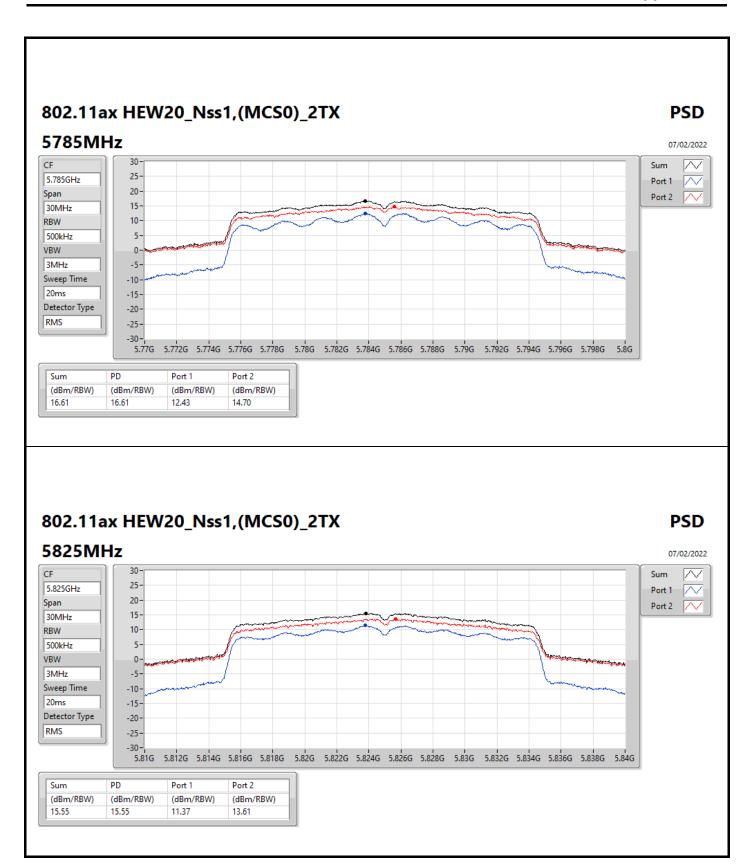
Page No. : 12 of 17

Report No. : FR1N0819AB



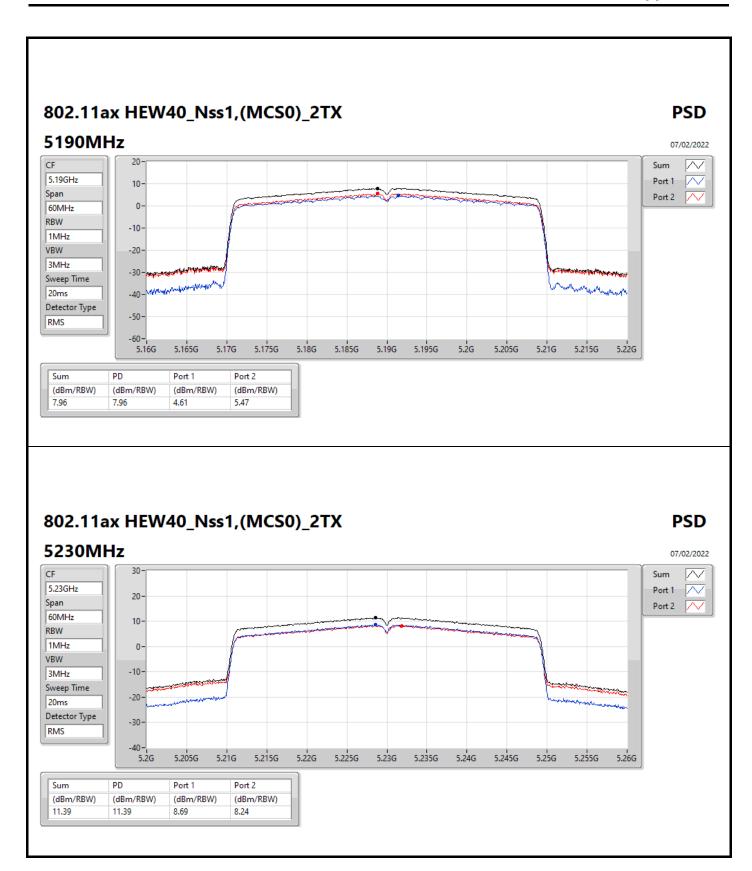
Page No. : 13 of 17

Report No. : FR1N0819AB



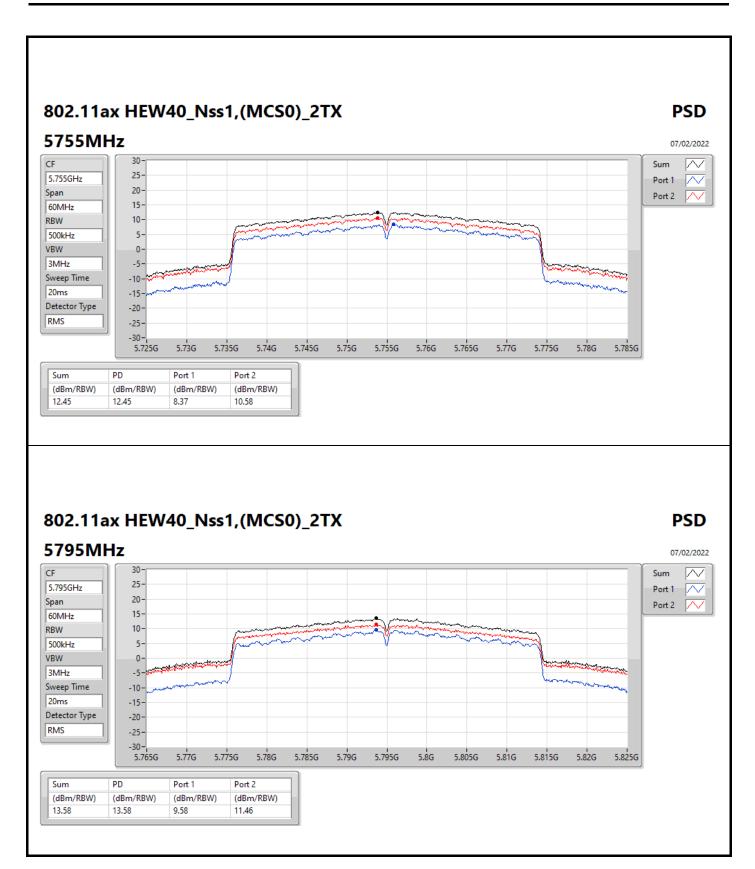
Page No. : 14 of 17

Report No. : FR1N0819AB



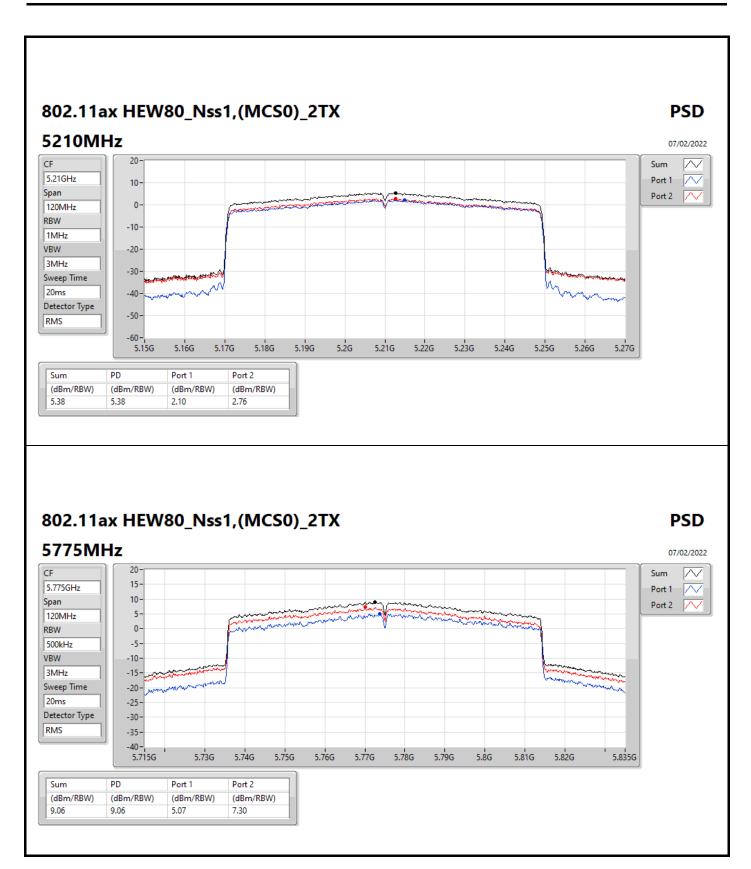
Page No. : 15 of 17

Report No. : FR1N0819AB



Page No. : 16 of 17

Report No. : FR1N0819AB



Page No. : 17 of 17

Report No. : FR1N0819AB



Radiated Emissions below 1GHz

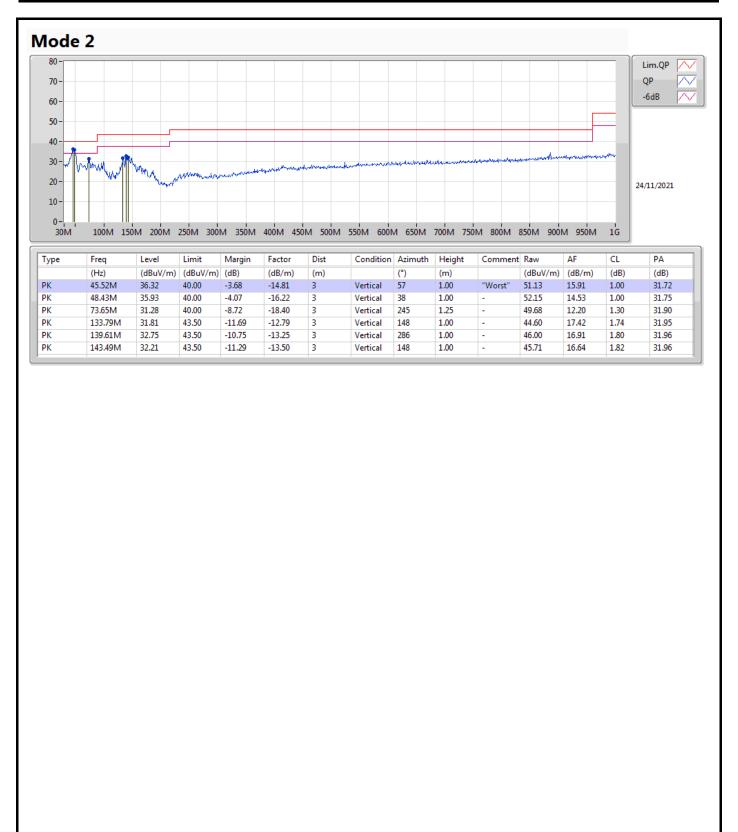
Appendix E.1

Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 2	Pass	PK	45.52M	36.32	40.00	-3.68	Vertical

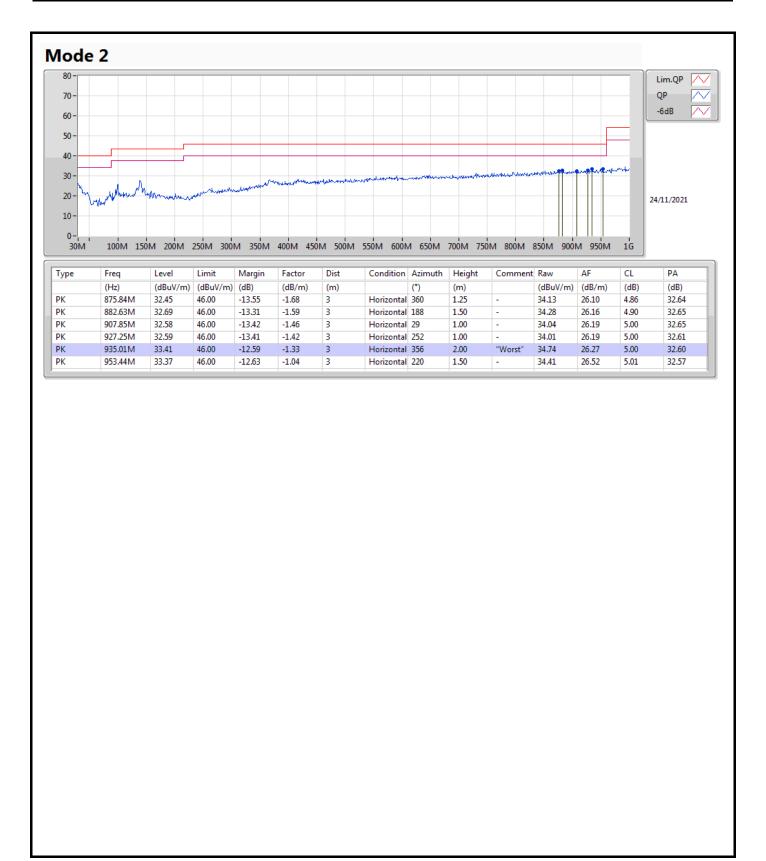
Sporton International Inc. Hsinchu Laboratory Page No. : 1 of 3

Report No. : FR1N0819AB



Page No. : 2 of 3
Report No. : FR1N0819AB





Page No. : 3 of 3

Report No. : FR1N0819AB



RSE TX above 1GHz

Appendix E.2

Summary

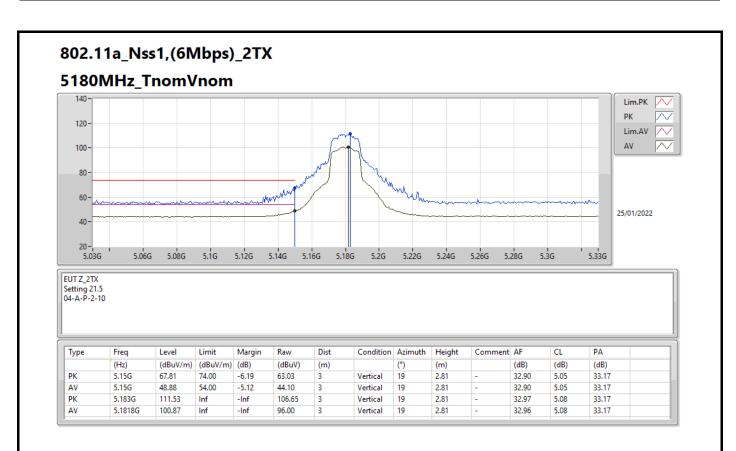
Mode	Result	Type	Freq	Level	Limit	Margin	Dist	Condition	Azimuth	Height	Comments
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(m)		(°)	(m)	
5.725-5.85GHz	-	-	-	-	-	-	-	-	-	-	-
802.11ax HEW20_Nss1,(MCS0)_2TX	Pass	PK	17.23296G	68.18	68.20	-0.02	3	Vertical	313	1.50	-

Sporton International Inc. Hsinchu Laboratory

Page No. : 1 of 121

Report No. : FR1N0819AB

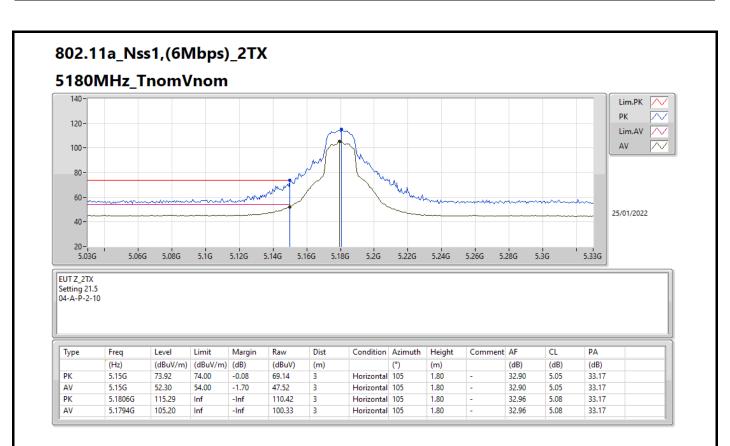




Page No. : 2 of 121

Report No. : FR1N0819AB

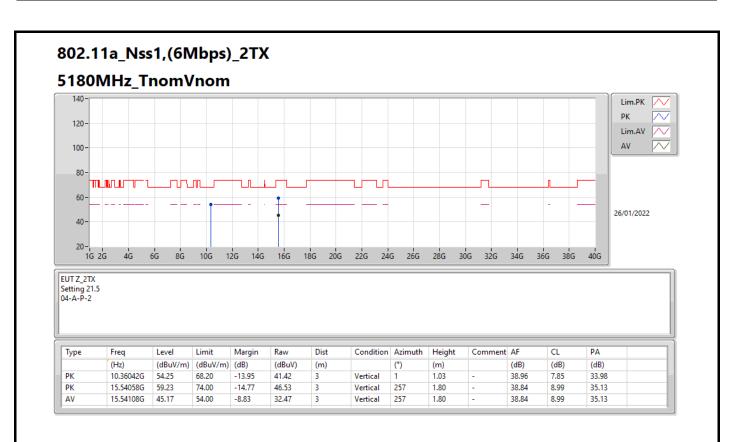




Page No. : 3 of 121

Report No. : FR1N0819AB

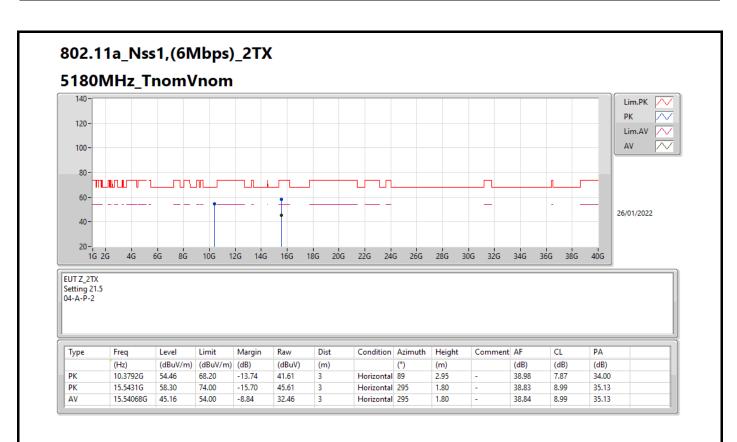




Page No. : 4 of 121

Report No. : FR1N0819AB

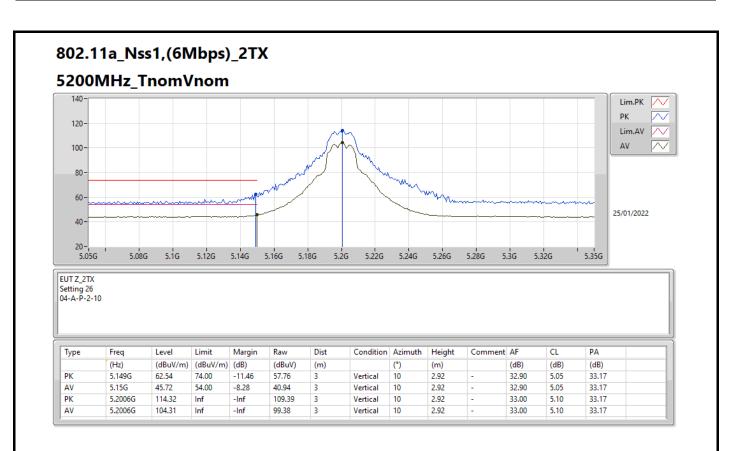




Page No. : 5 of 121

Report No. : FR1N0819AB

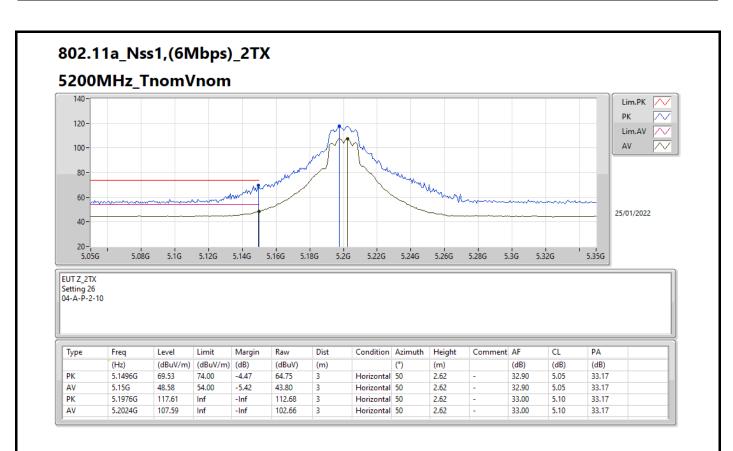




Page No. : 6 of 121

Report No. : FR1N0819AB

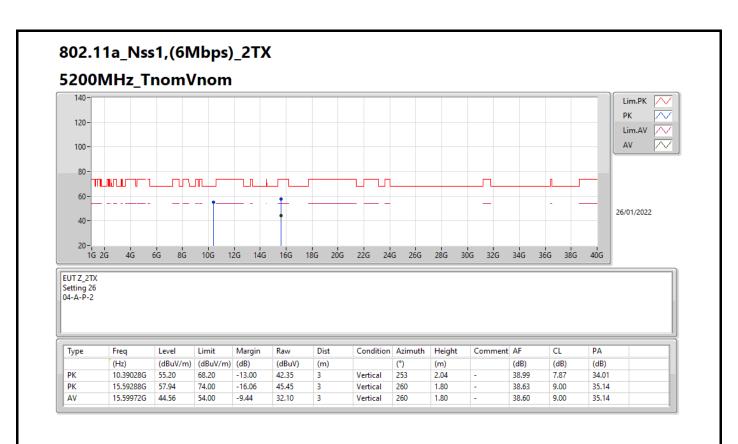




Page No. : 7 of 121

Report No. : FR1N0819AB

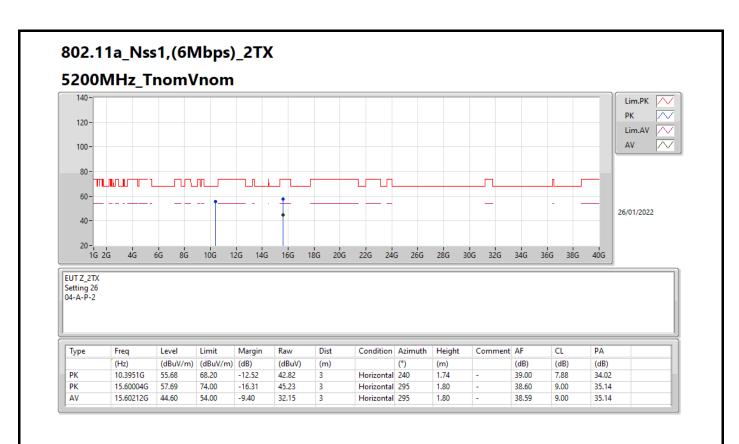




Page No. : 8 of 121

Report No. : FR1N0819AB

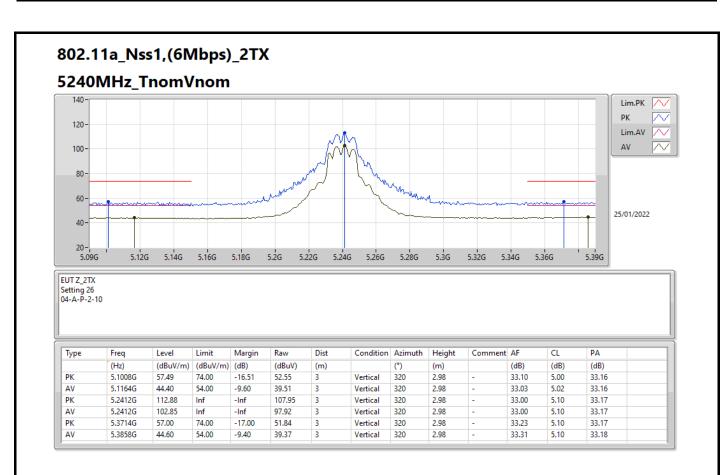




Page No. : 9 of 121

Report No. : FR1N0819AB

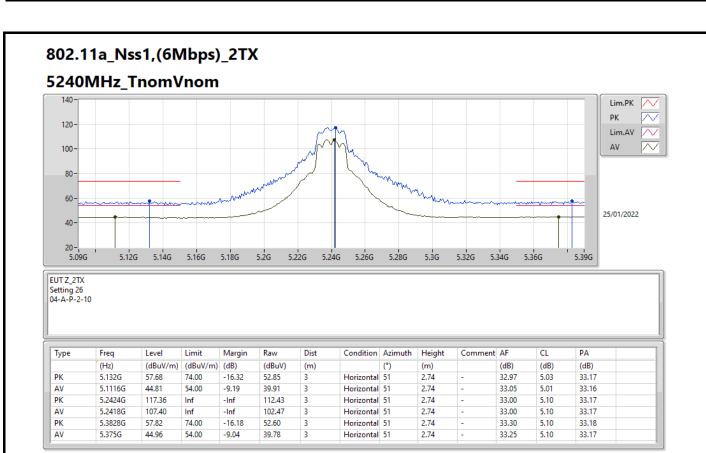




Page No. : 10 of 121

Report No. : FR1N0819AB

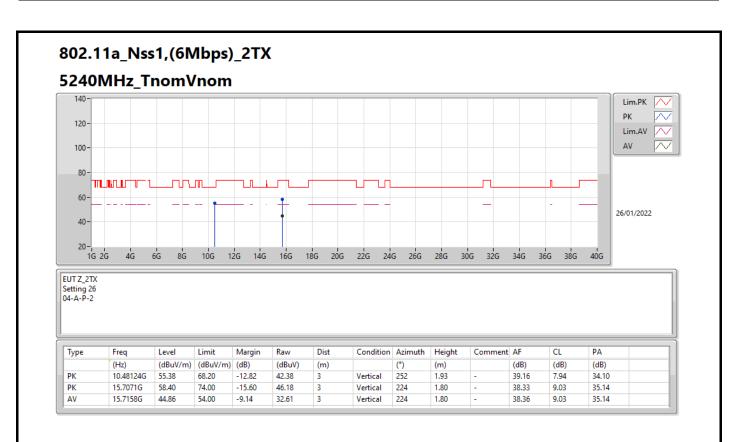




Page No. : 11 of 121

Report No. : FR1N0819AB

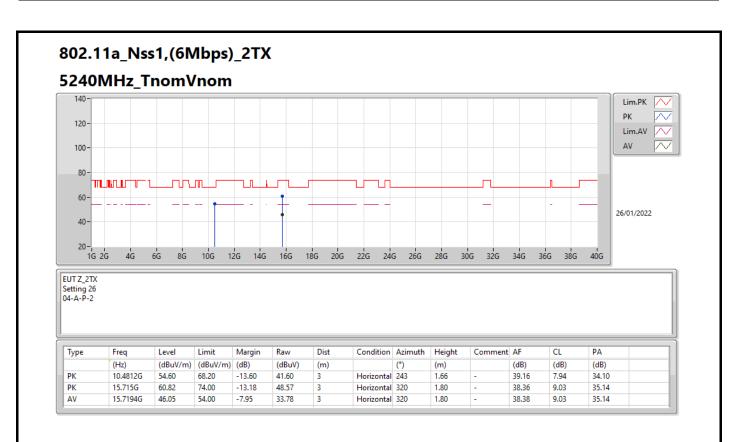




Page No. : 12 of 121

Report No. : FR1N0819AB

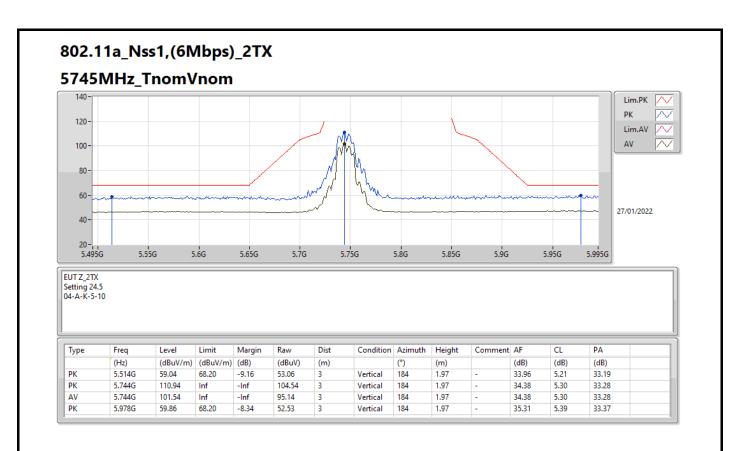




Page No. : 13 of 121

Report No. : FR1N0819AB

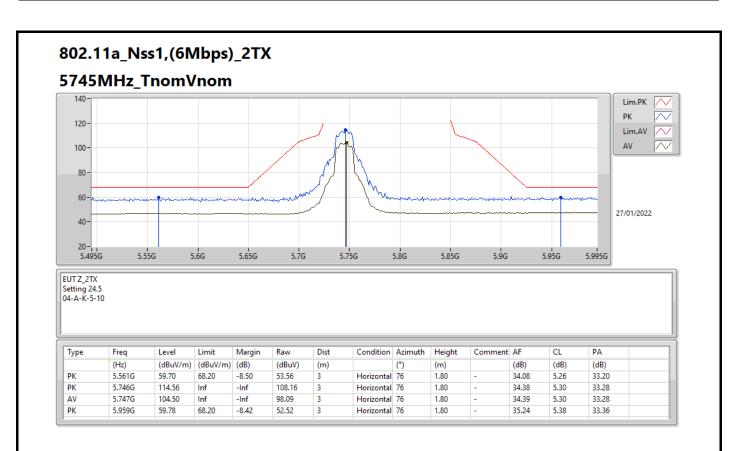




Page No. : 14 of 121

Report No. : FR1N0819AB

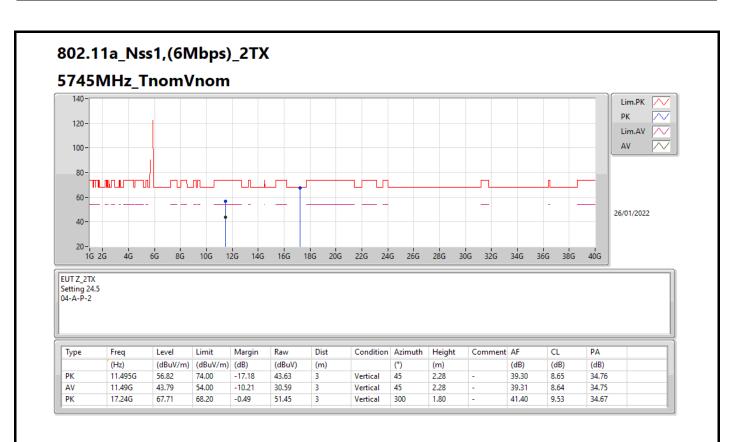




Page No. : 15 of 121

Report No. : FR1N0819AB

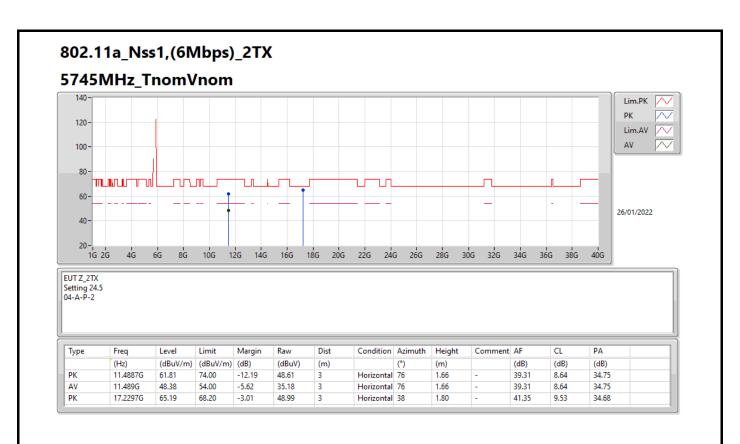




Page No. : 16 of 121

Report No. : FR1N0819AB

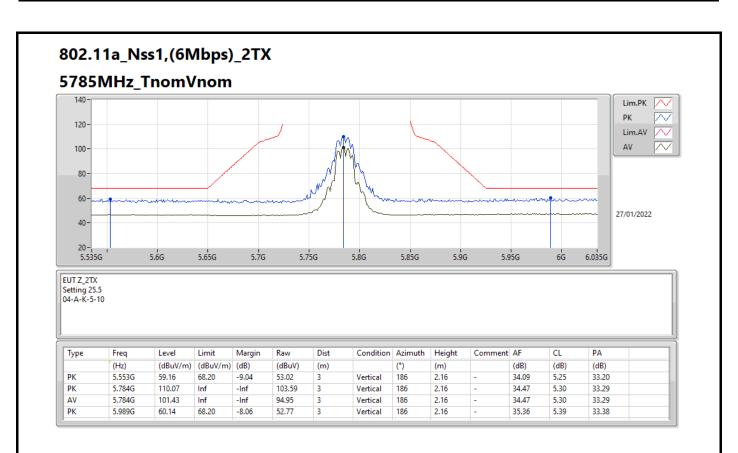




Page No. : 17 of 121

Report No. : FR1N0819AB

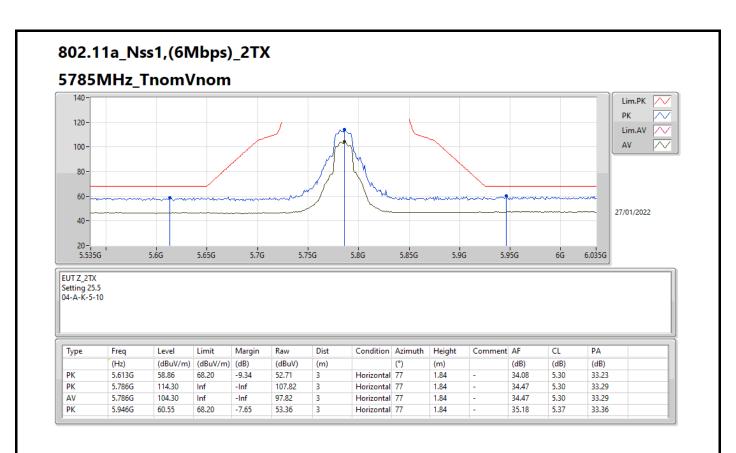




Page No. : 18 of 121

Report No. : FR1N0819AB

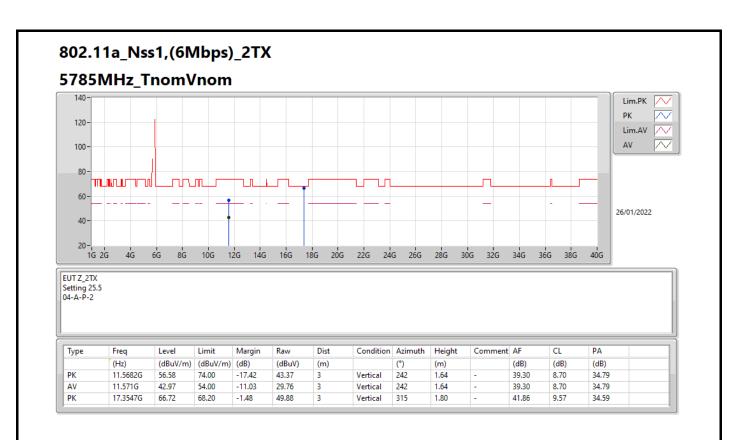




Page No. : 19 of 121

Report No. : FR1N0819AB

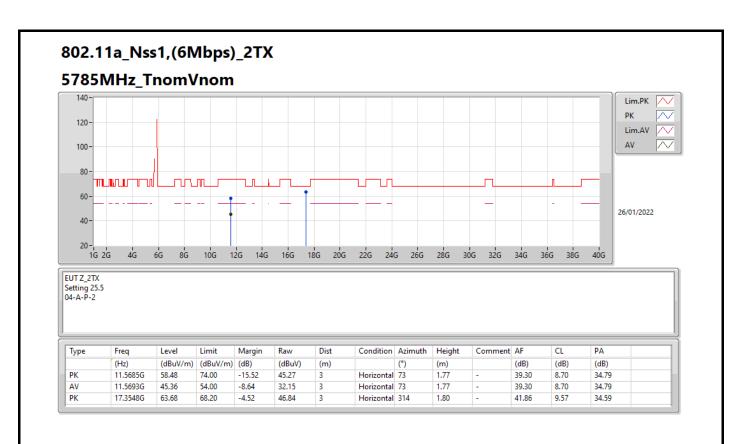




Page No. : 20 of 121

Report No. : FR1N0819AB

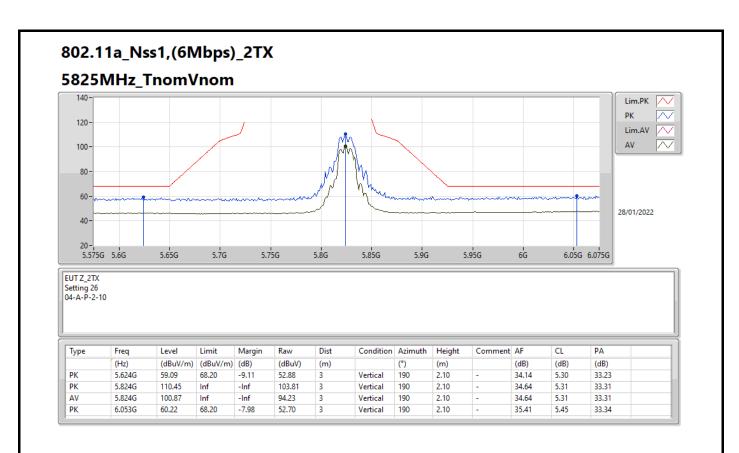




Page No. : 21 of 121

Report No. : FR1N0819AB

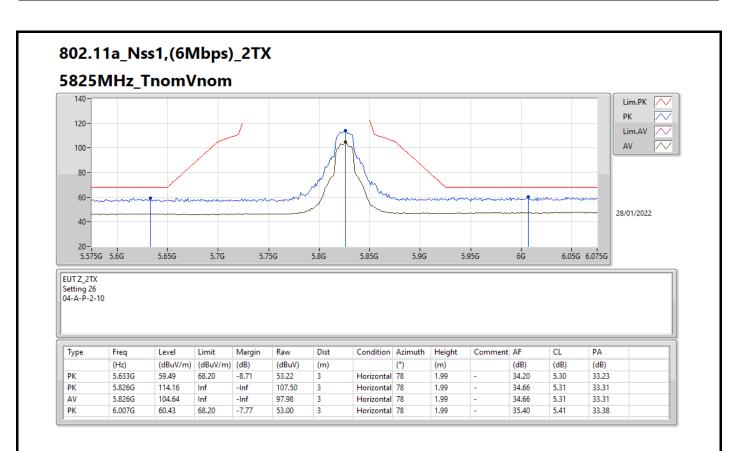




Page No. : 22 of 121

Report No. : FR1N0819AB

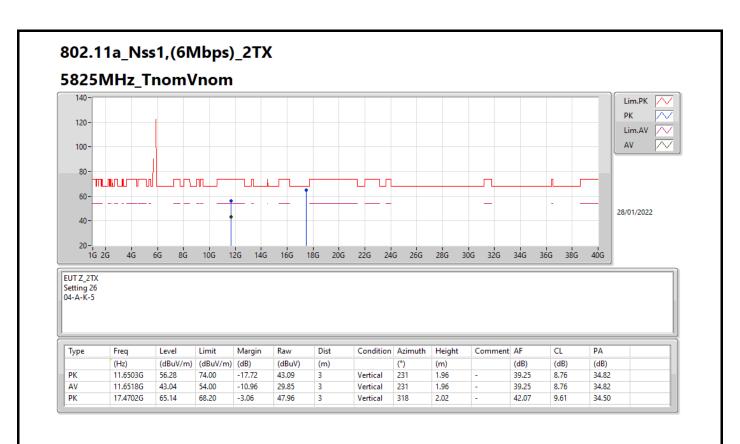




Page No. : 23 of 121

Report No. : FR1N0819AB

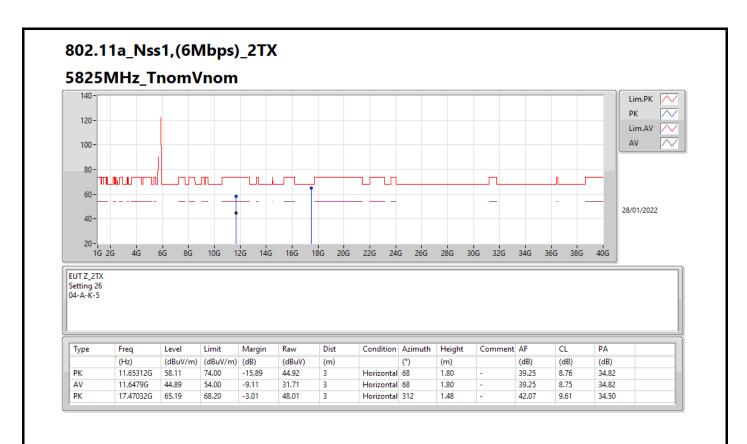




Page No. : 24 of 121

Report No. : FR1N0819AB

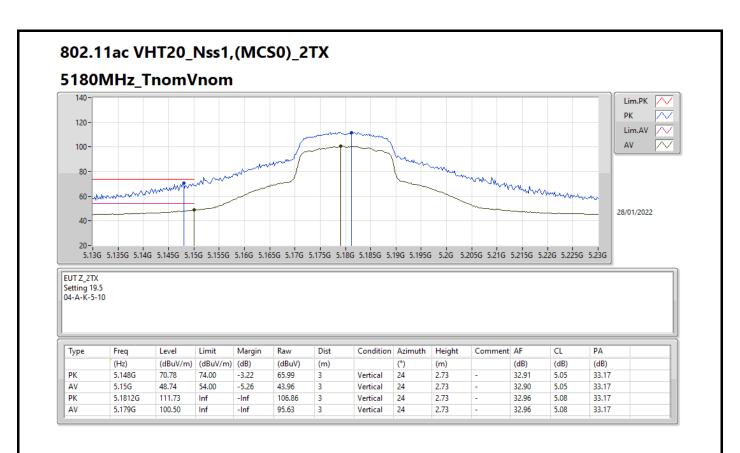




Page No. : 25 of 121

Report No. : FR1N0819AB

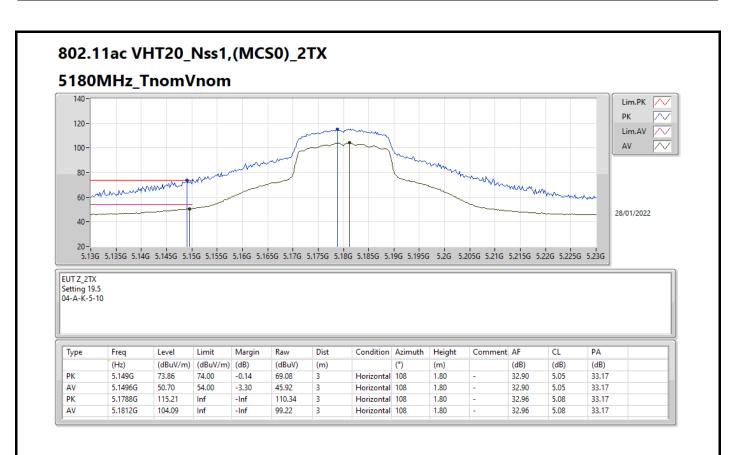




Page No. : 26 of 121

Report No. : FR1N0819AB

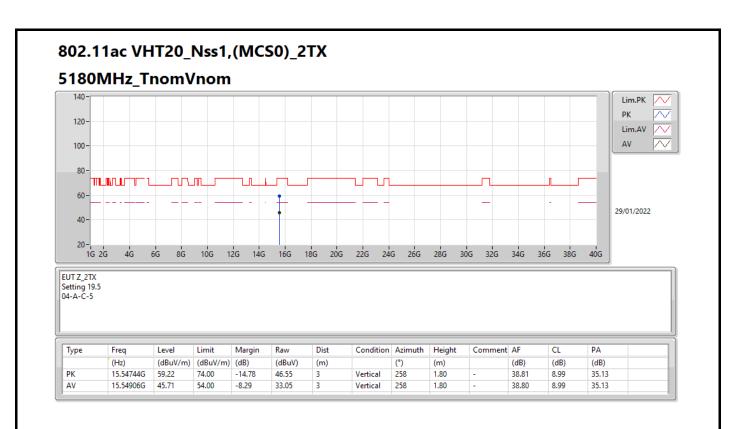




Page No. : 27 of 121

Report No. : FR1N0819AB

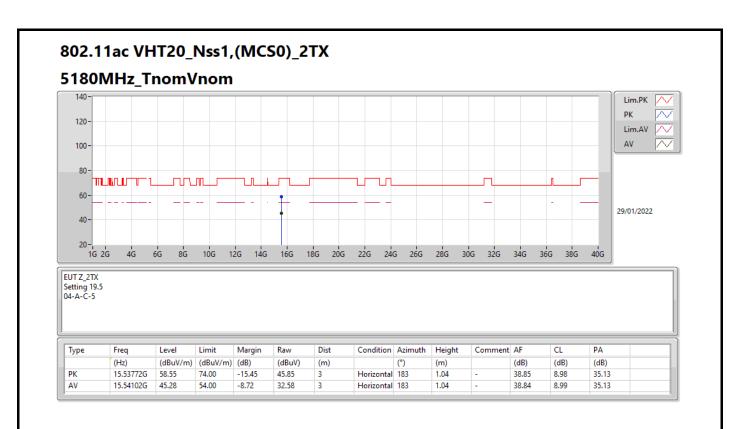




Page No. : 28 of 121

Report No. : FR1N0819AB

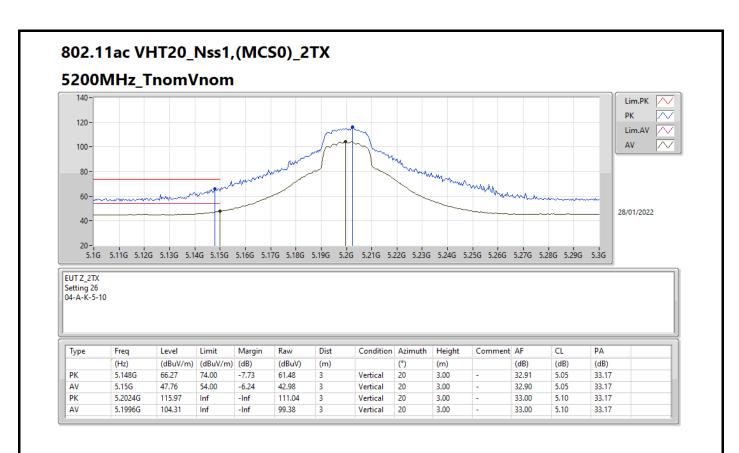




Page No. : 29 of 121

Report No. : FR1N0819AB

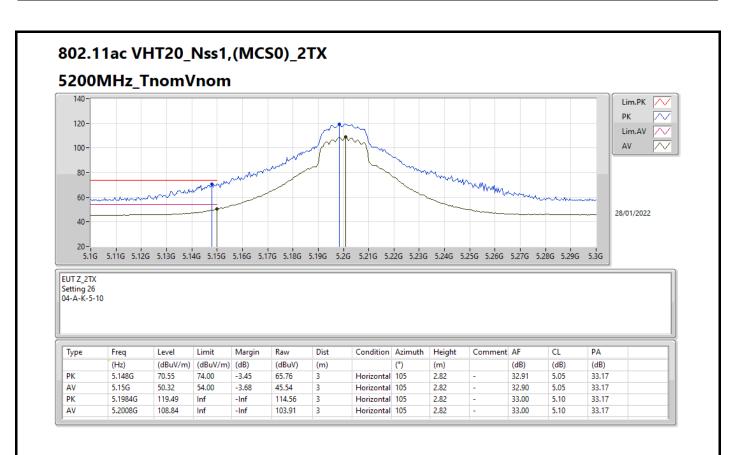




Page No. : 30 of 121

Report No. : FR1N0819AB

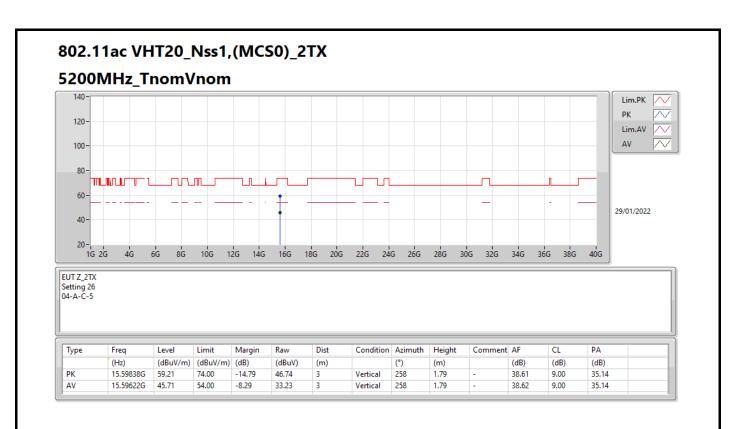




Page No. : 31 of 121

Report No. : FR1N0819AB

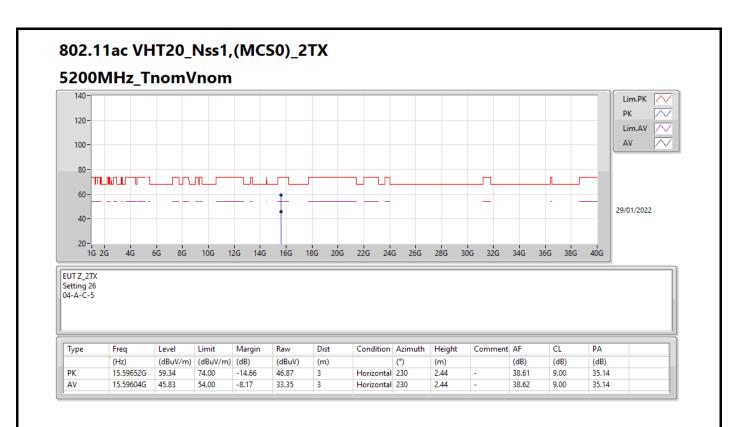




Page No. : 32 of 121

Report No. : FR1N0819AB

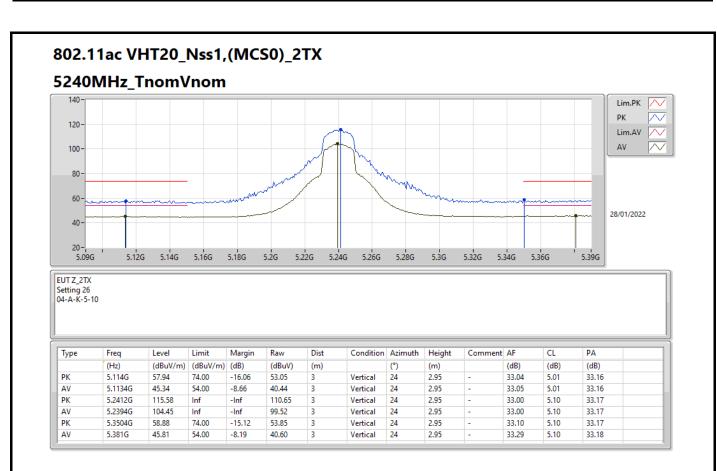




Page No. : 33 of 121

Report No. : FR1N0819AB

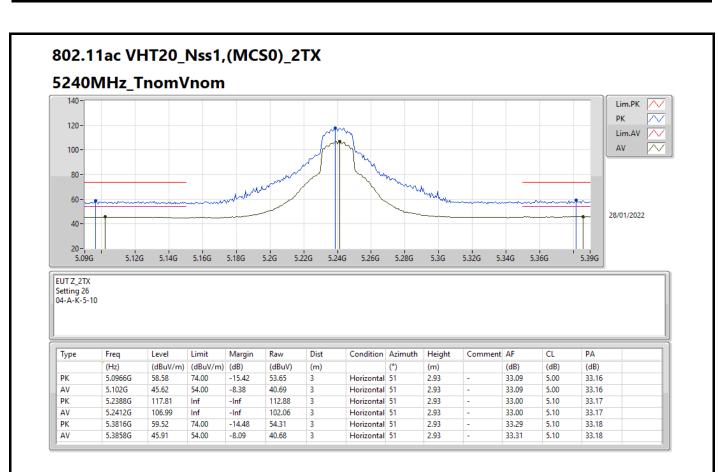




Page No. : 34 of 121

Report No. : FR1N0819AB

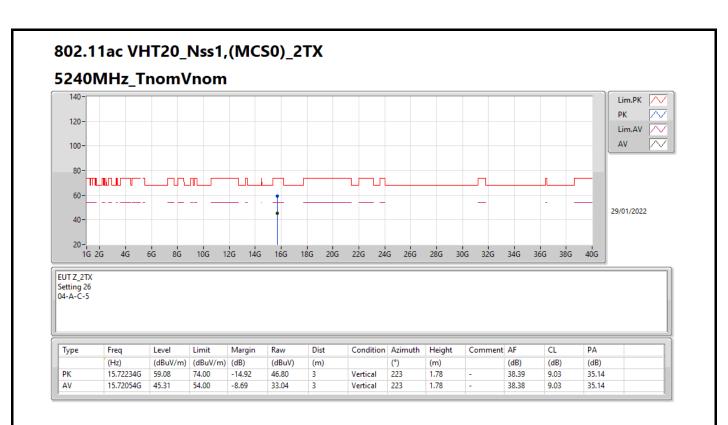




Page No. : 35 of 121

Report No. : FR1N0819AB

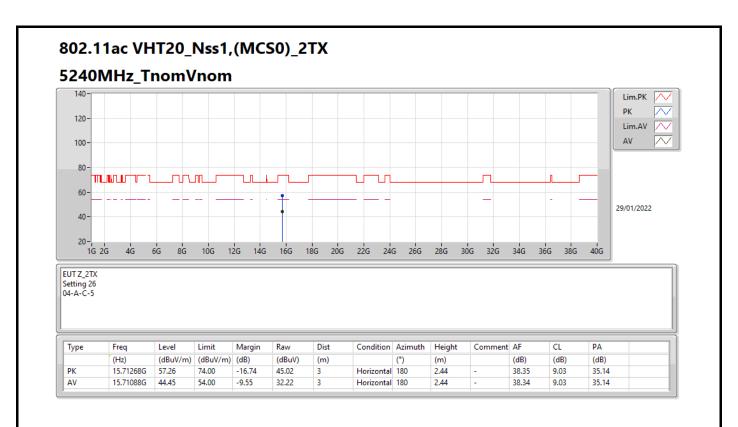




Page No. : 36 of 121

Report No. : FR1N0819AB

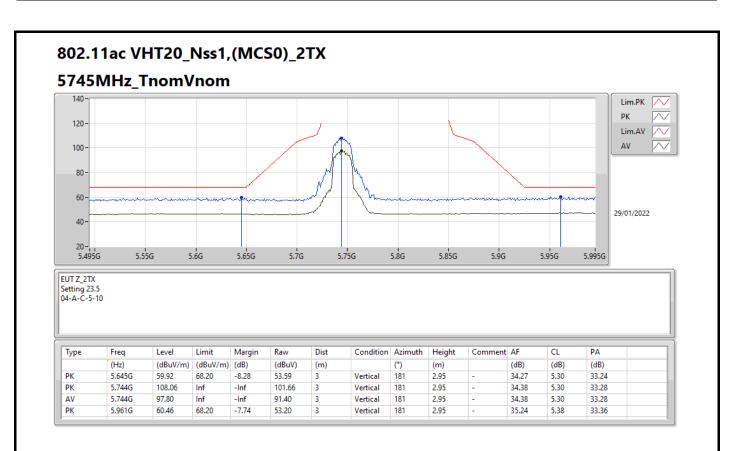




Page No. : 37 of 121

Report No. : FR1N0819AB

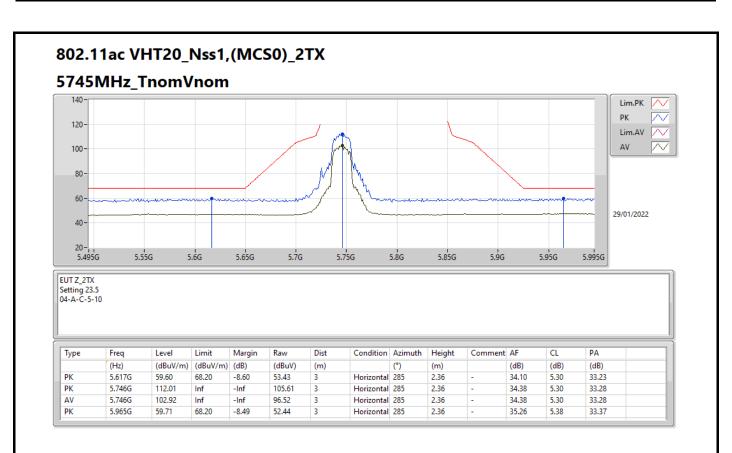




Page No. : 38 of 121

Report No. : FR1N0819AB

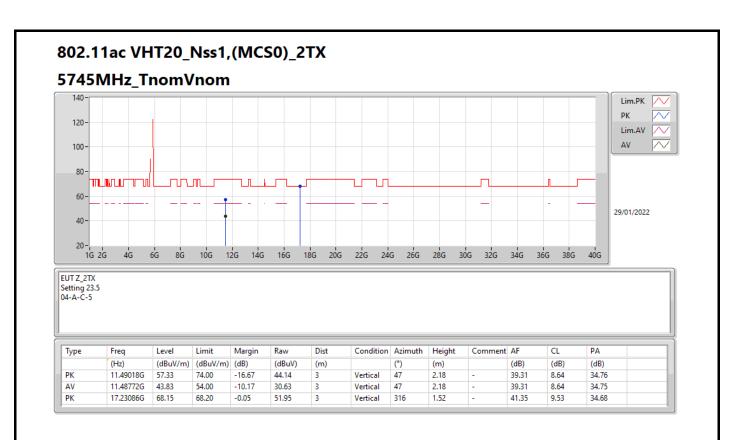




Page No. : 39 of 121

Report No. : FR1N0819AB

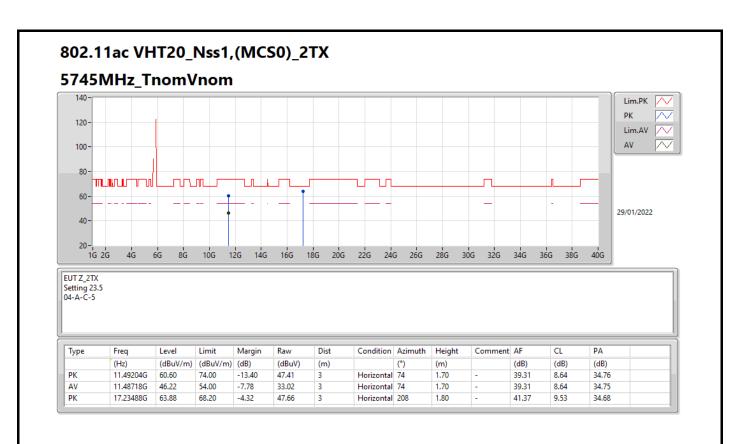




Page No. : 40 of 121

Report No. : FR1N0819AB

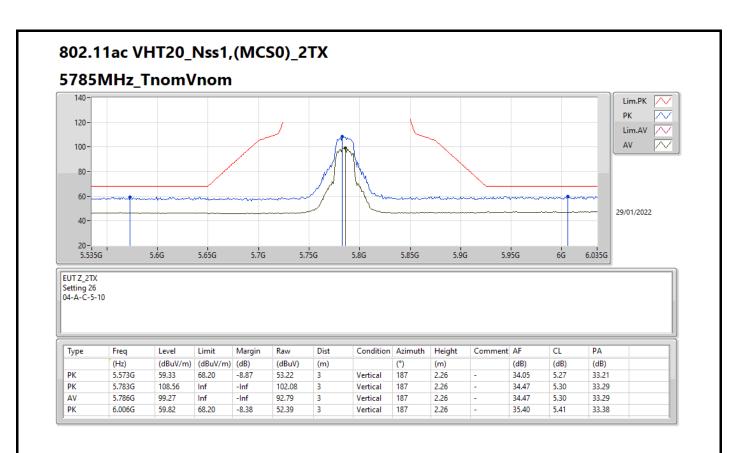




Page No. : 41 of 121

Report No. : FR1N0819AB

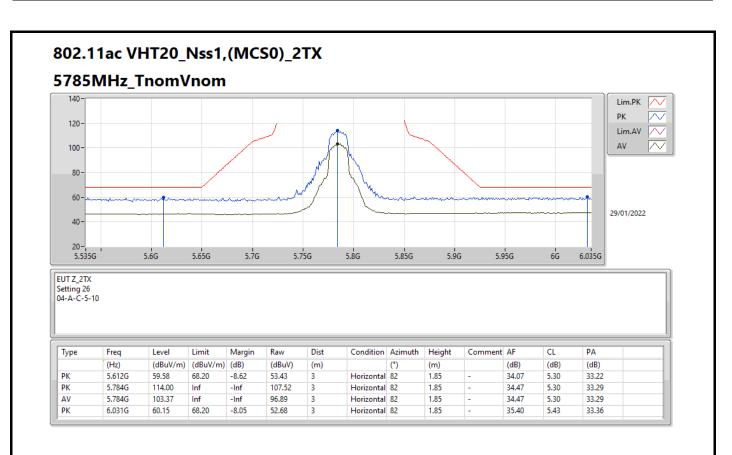




Page No. : 42 of 121

Report No. : FR1N0819AB

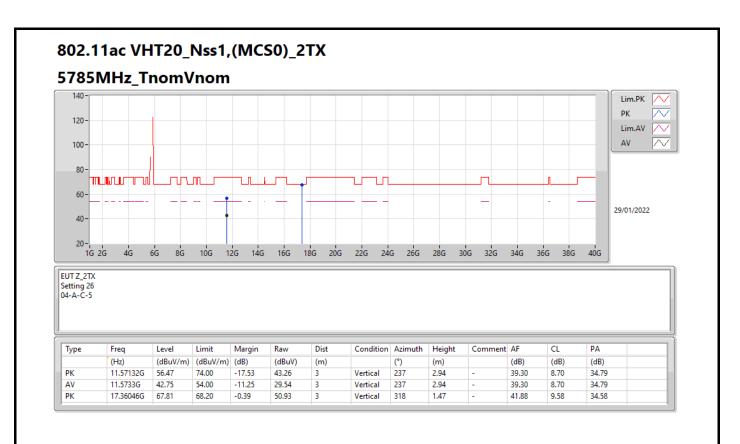




Page No. : 43 of 121

Report No. : FR1N0819AB

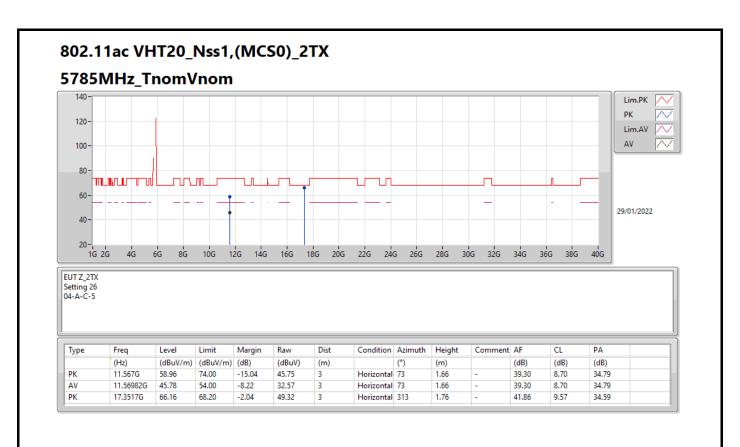




Page No. : 44 of 121

Report No. : FR1N0819AB

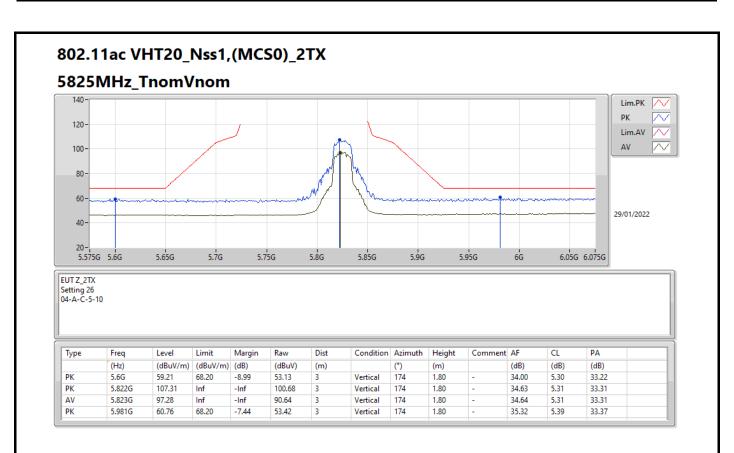




Page No. : 45 of 121

Report No. : FR1N0819AB

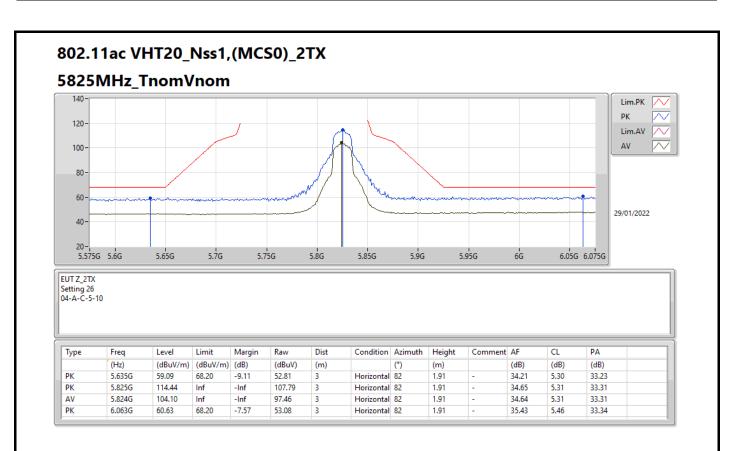




Page No. : 46 of 121

Report No. : FR1N0819AB

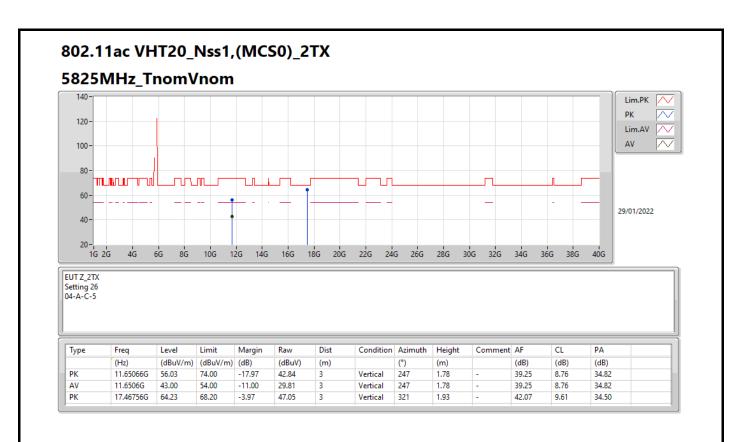




Page No. : 47 of 121

Report No. : FR1N0819AB

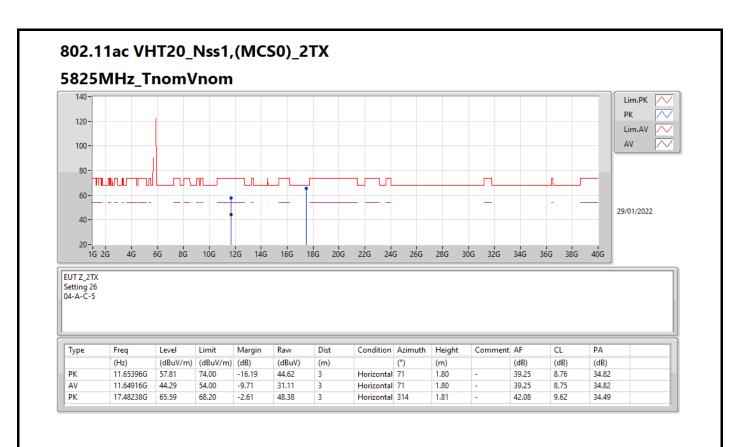




Page No. : 48 of 121

Report No. : FR1N0819AB

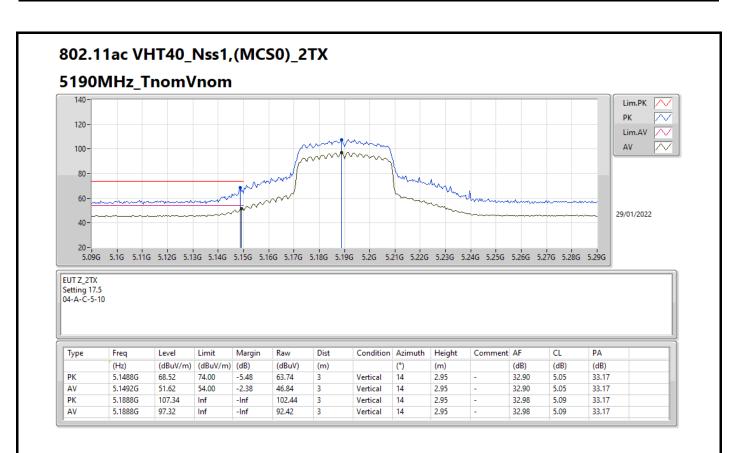




Page No. : 49 of 121

Report No. : FR1N0819AB

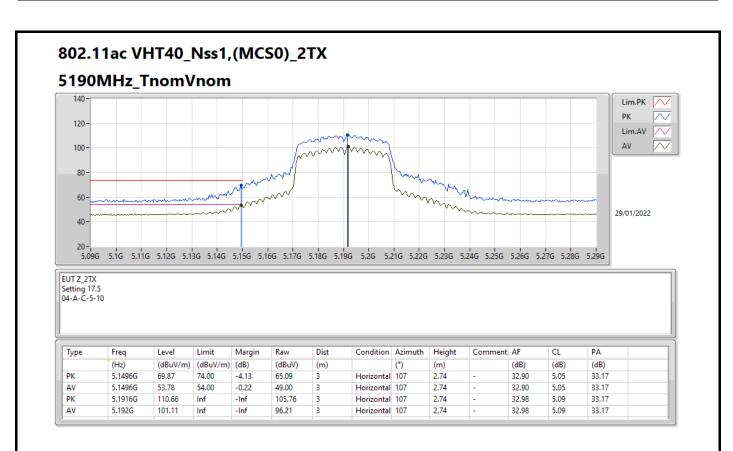




Page No. : 50 of 121

Report No. : FR1N0819AB

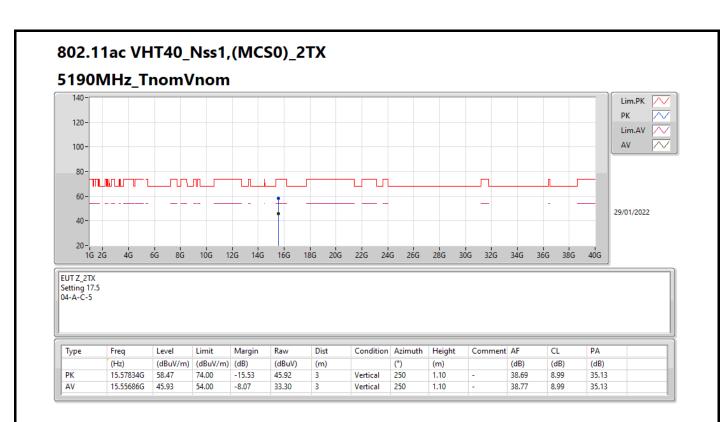




Page No. : 51 of 121

Report No. : FR1N0819AB

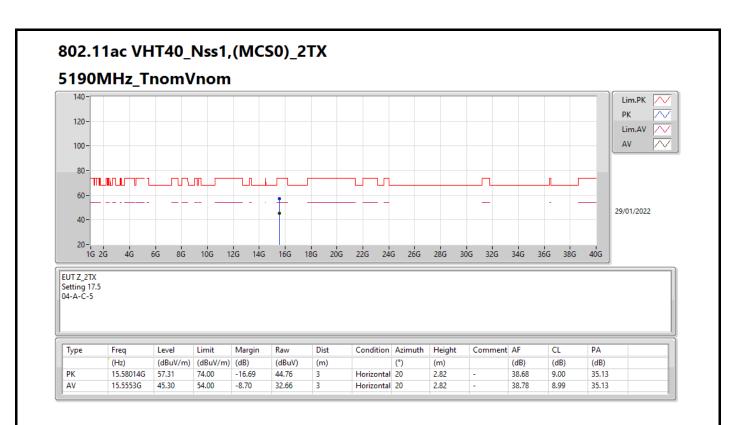




Page No. : 52 of 121

Report No. : FR1N0819AB

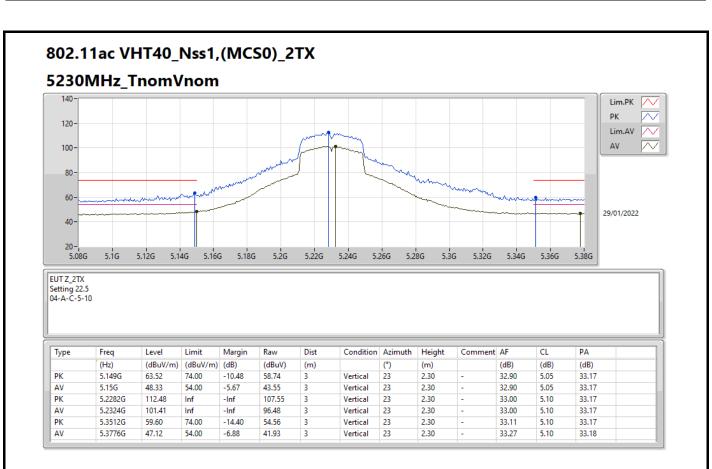




Page No. : 53 of 121

Report No. : FR1N0819AB

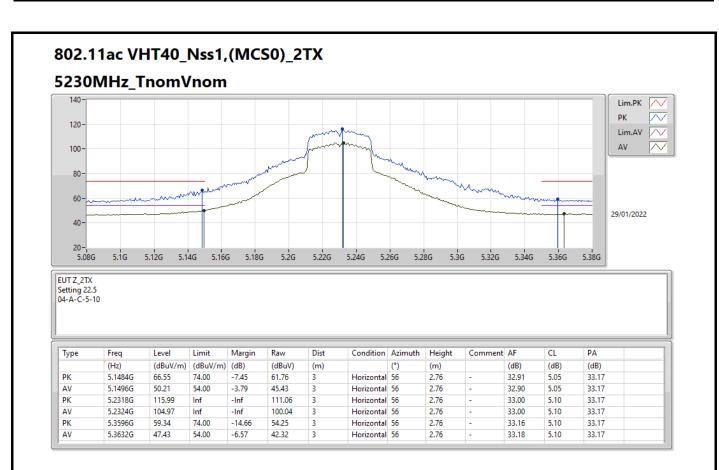




Page No. : 54 of 121

Report No. : FR1N0819AB

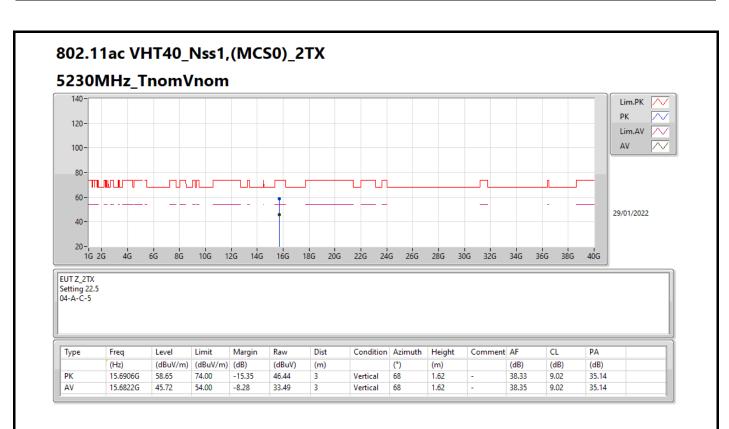




Page No. : 55 of 121

Report No. : FR1N0819AB

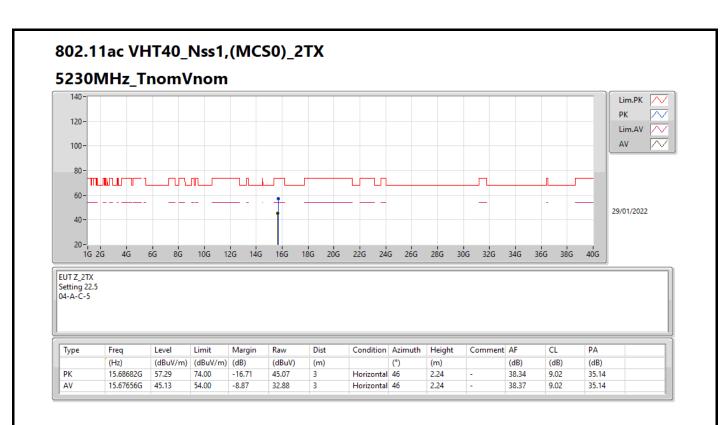




Page No. : 56 of 121

Report No. : FR1N0819AB

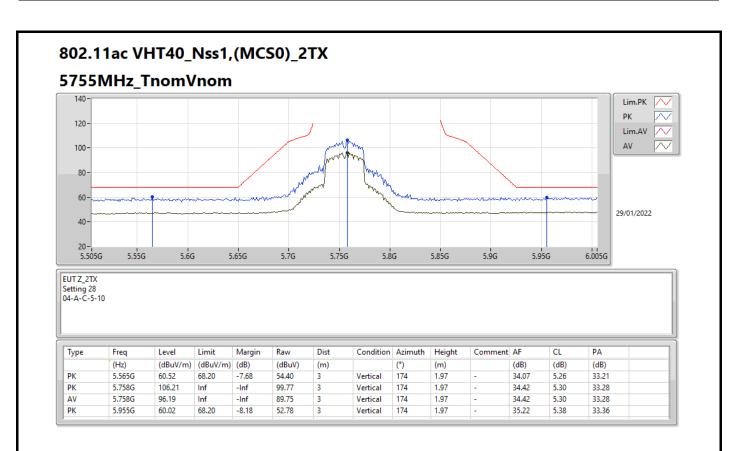




Page No. : 57 of 121

Report No. : FR1N0819AB

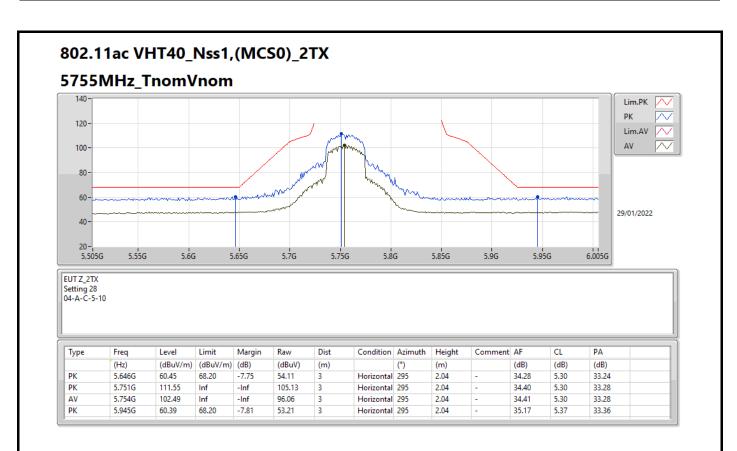




Page No. : 58 of 121

Report No. : FR1N0819AB

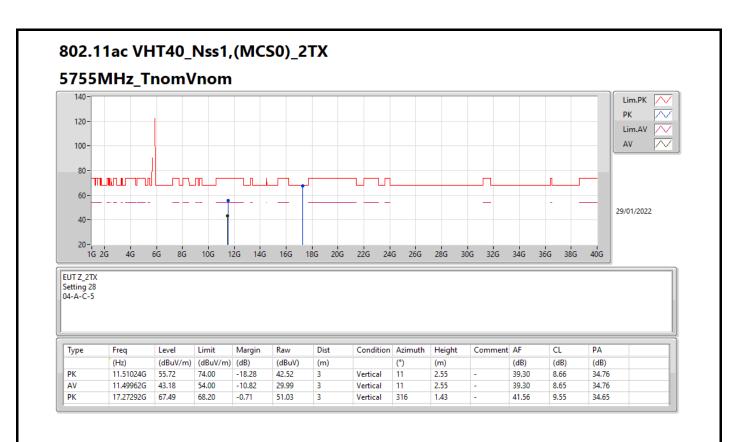




Page No. : 59 of 121

Report No. : FR1N0819AB

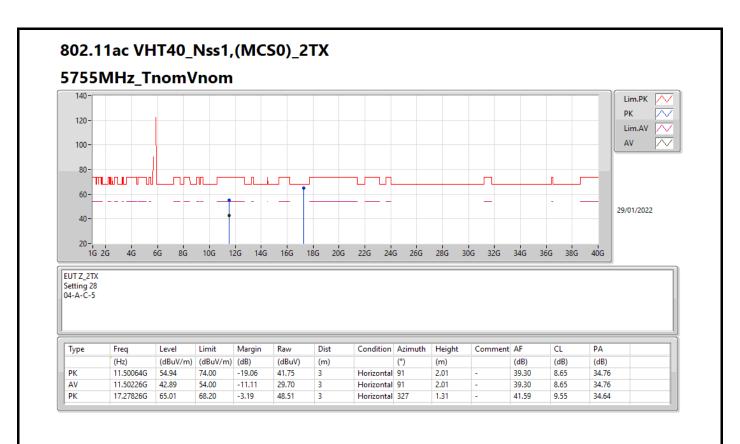




Page No. : 60 of 121

Report No. : FR1N0819AB

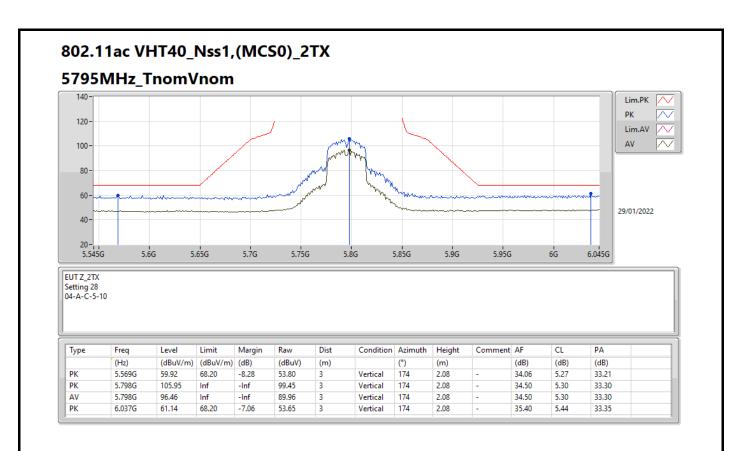




Page No. : 61 of 121

Report No. : FR1N0819AB

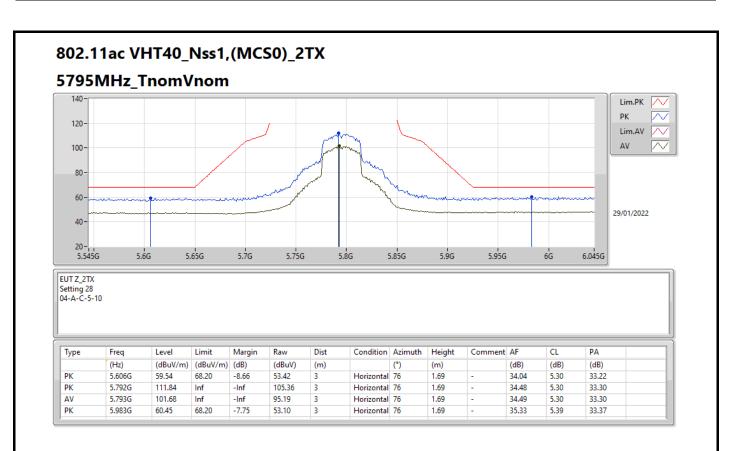




Page No. : 62 of 121

Report No. : FR1N0819AB

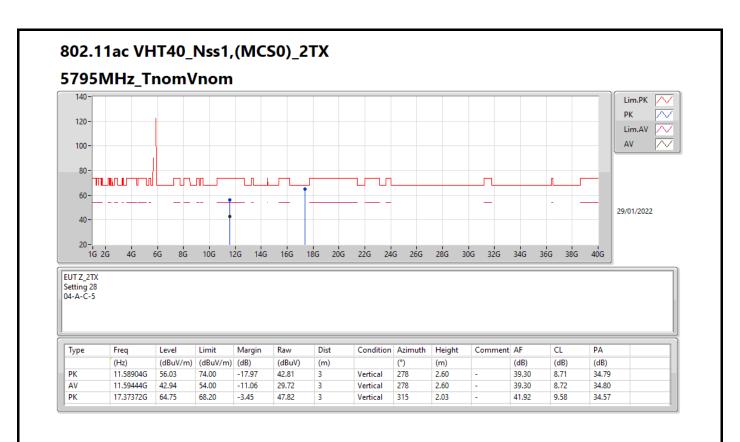




Page No. : 63 of 121

Report No. : FR1N0819AB

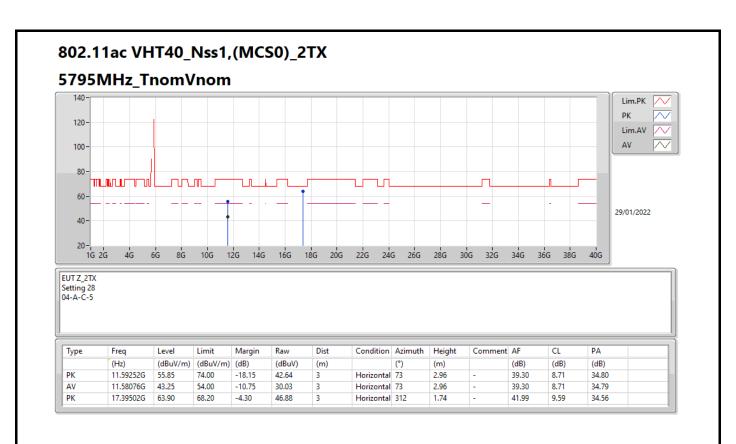




Page No. : 64 of 121

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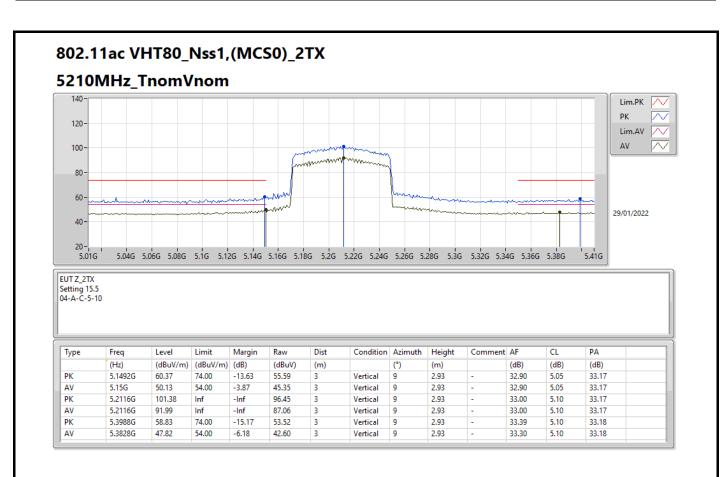




Page No. : 65 of 121

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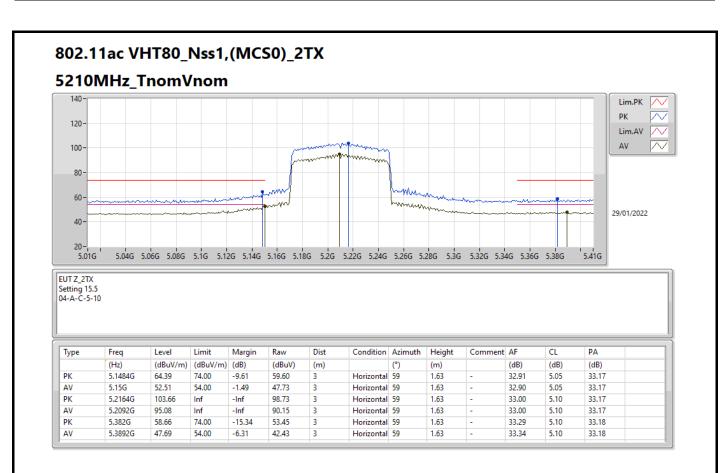




Page No. : 66 of 121

Report No. : FR1N0819AB

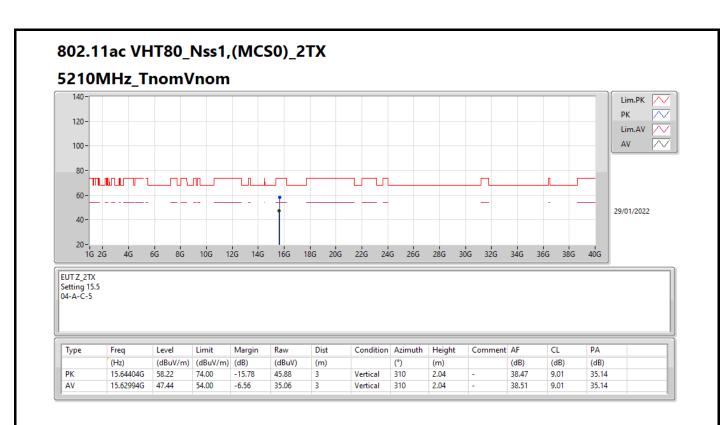




Page No. : 67 of 121

Report No. : FR1N0819AB

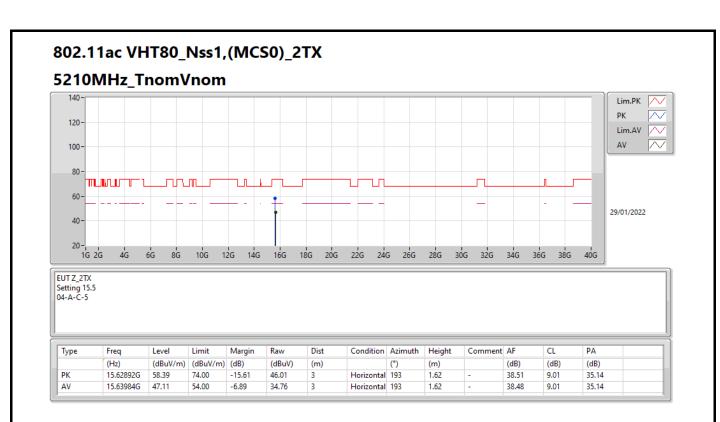




Page No. : 68 of 121

Report No. : FR1N0819AB

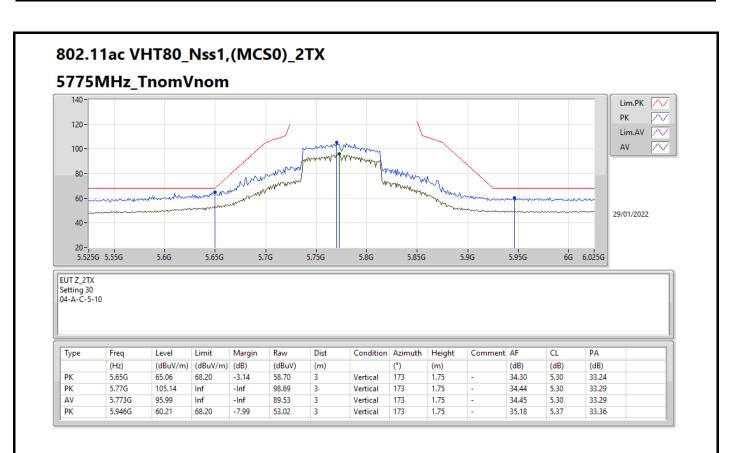




Page No. : 69 of 121

Report No. : FR1N0819AB

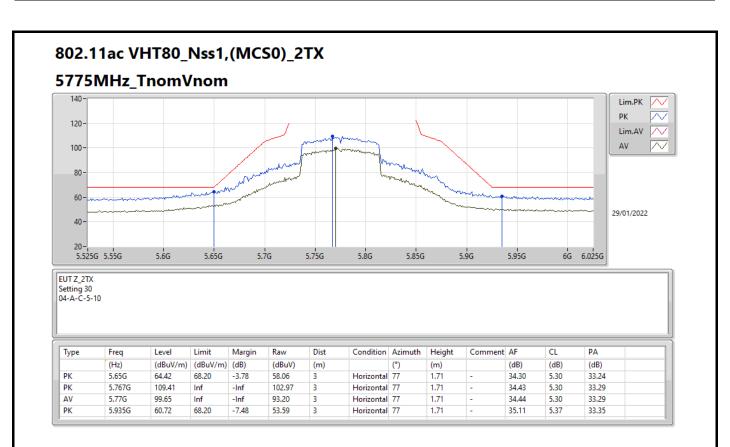




Page No. : 70 of 121

Report No. : FR1N0819AB

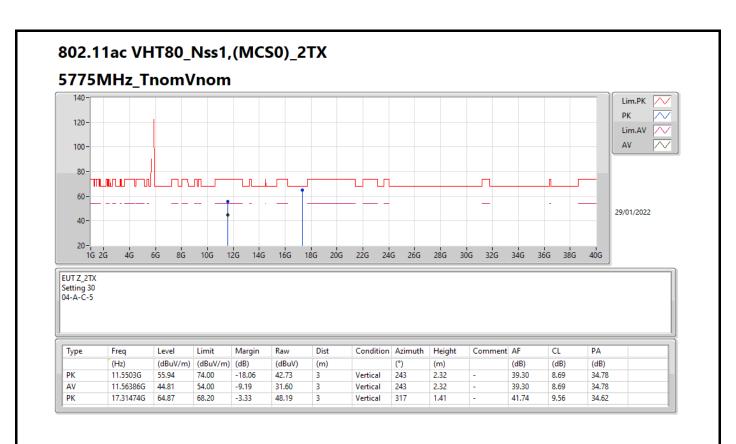




Page No. : 71 of 121

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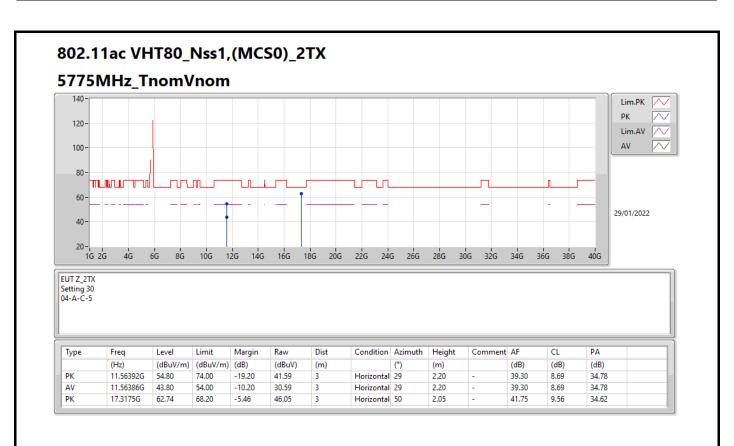




Page No. : 72 of 121

Report No. : FR1N0819AB

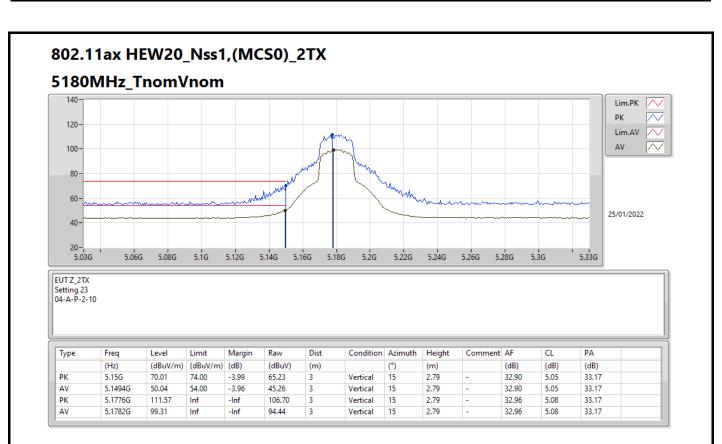




Page No. : 73 of 121

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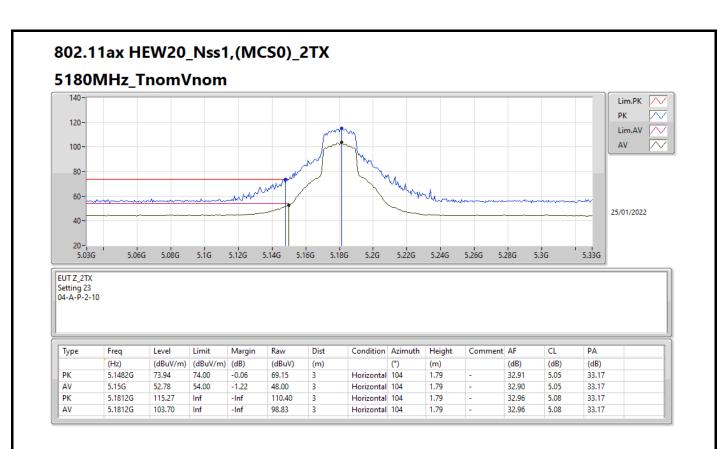




Page No. : 74 of 121

Report No. : FR1N0819AB

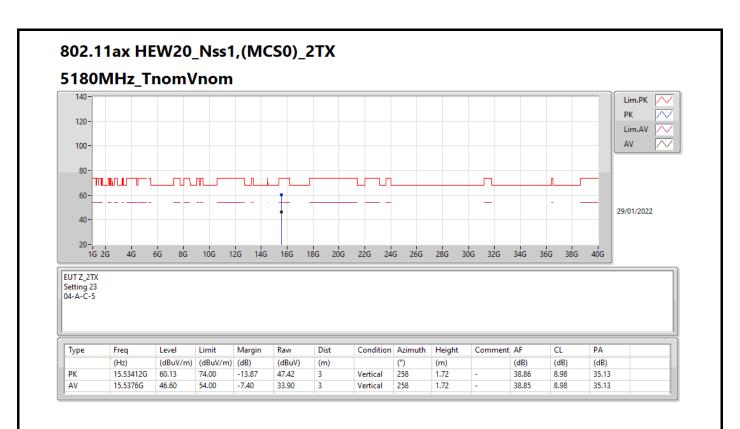




Page No. : 75 of 121

Report No. : FR1N0819AB

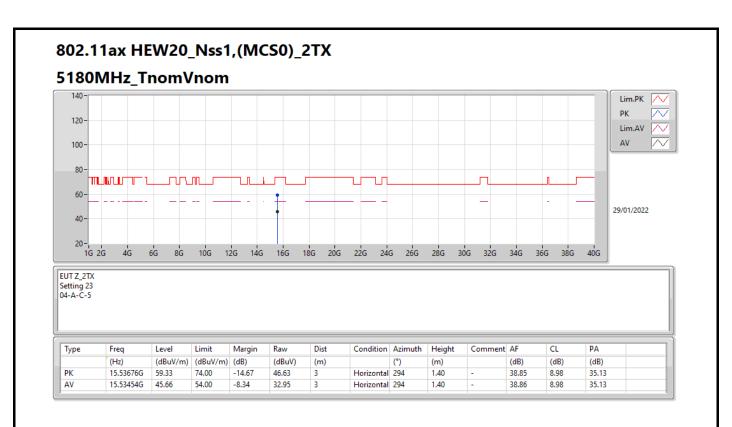




Page No. : 76 of 121

Report No. : FR1N0819AB

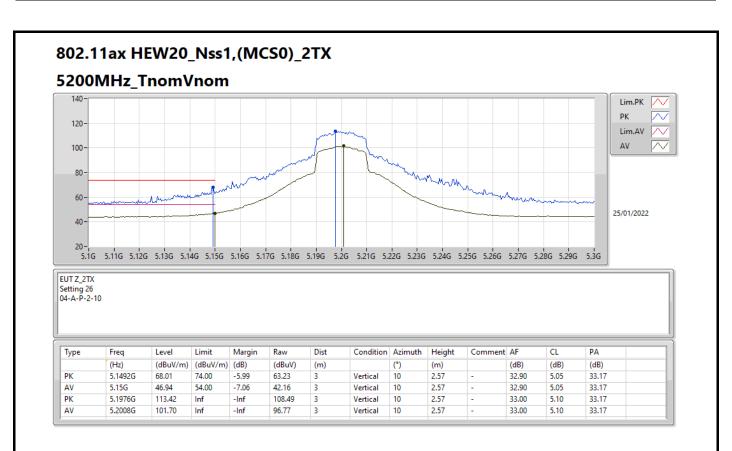




Page No. : 77 of 121

Report No. : FR1N0819AB

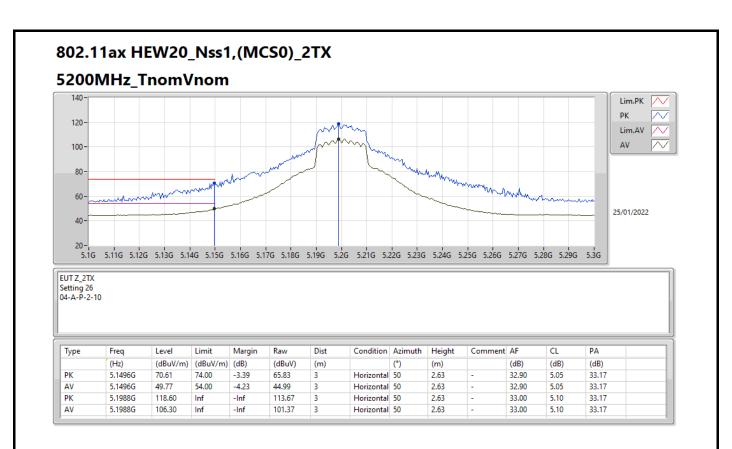




Page No. : 78 of 121

Report No. : FR1N0819AB

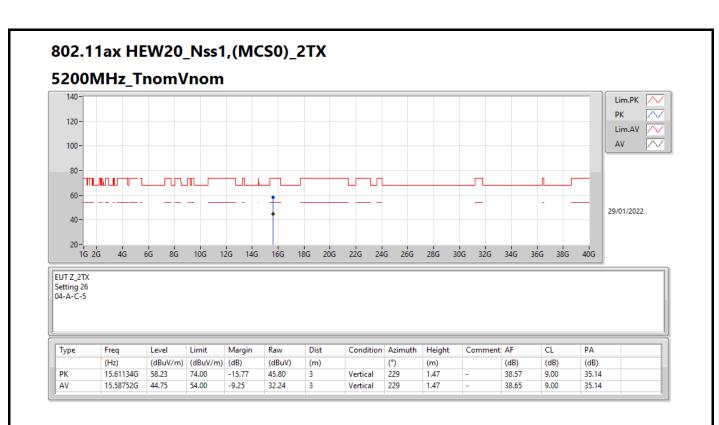




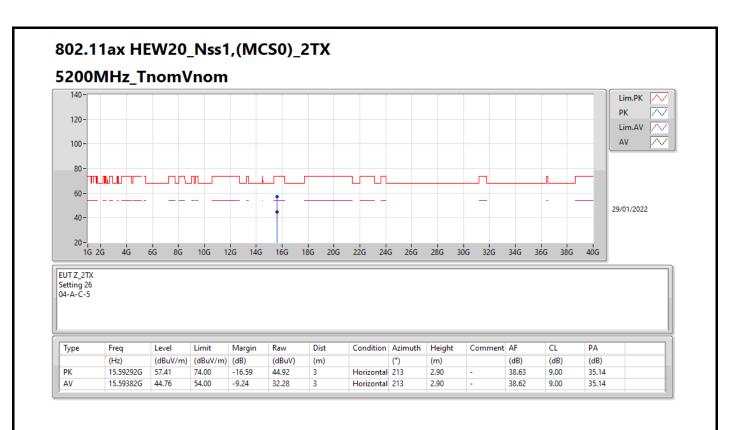
Page No. : 79 of 121

Report No. : FR1N0819AB





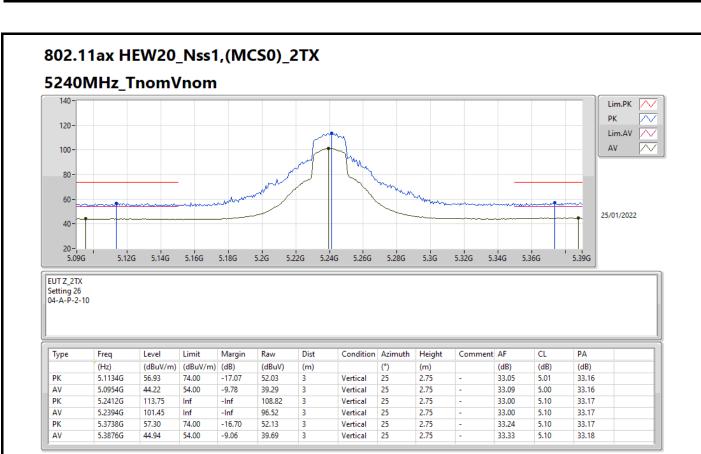




Page No. : 81 of 121

Report No. : FR1N0819AB

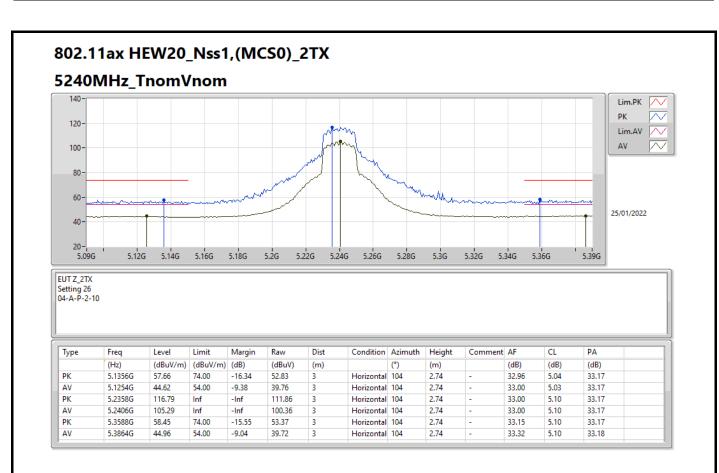




Page No. : 82 of 121

Report No. : FR1N0819AB

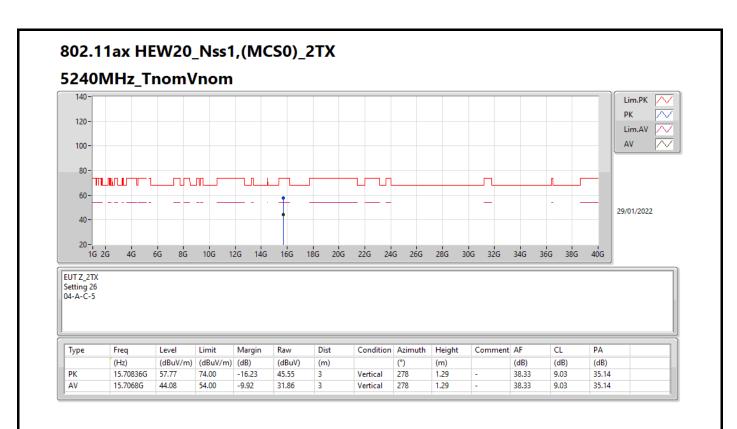




Page No. : 83 of 121

Report No. : FR1N0819AB

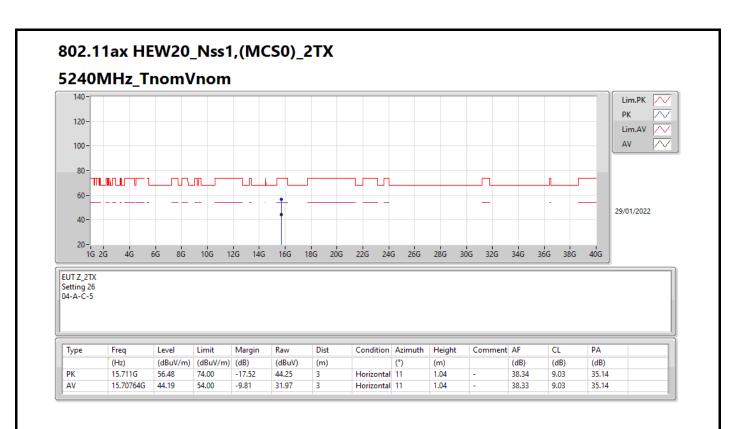




Page No. : 84 of 121

Report No. : FR1N0819AB

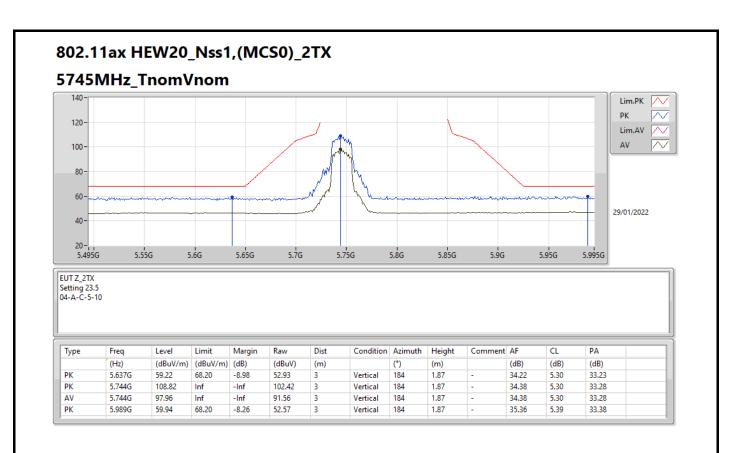




Page No. : 85 of 121

Report No. : FR1N0819AB

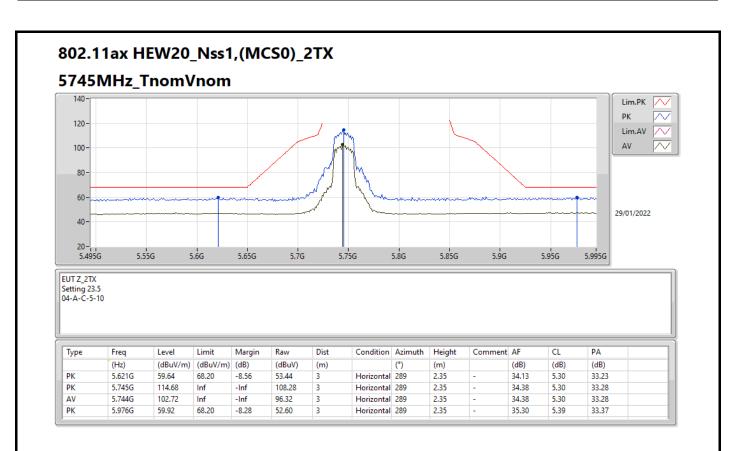




Page No. : 86 of 121

Report No. : FR1N0819AB

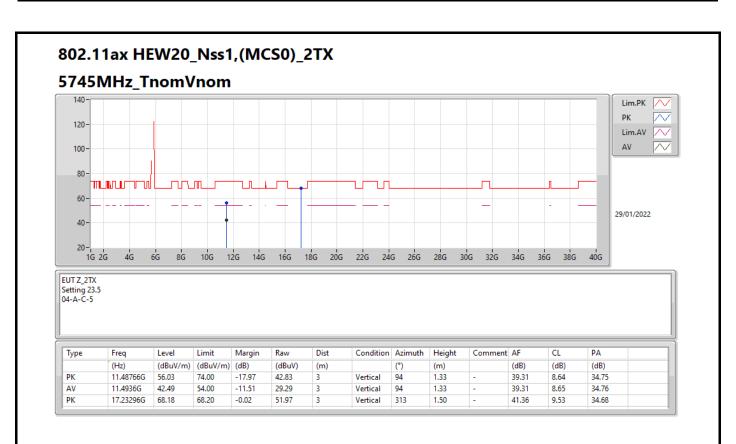




Page No. : 87 of 121

Report No. : FR1N0819AB

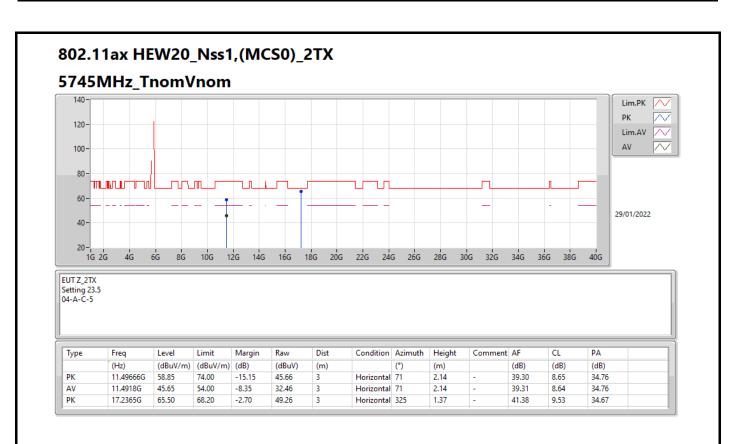




Page No. : 88 of 121

Report No. : FR1N0819AB

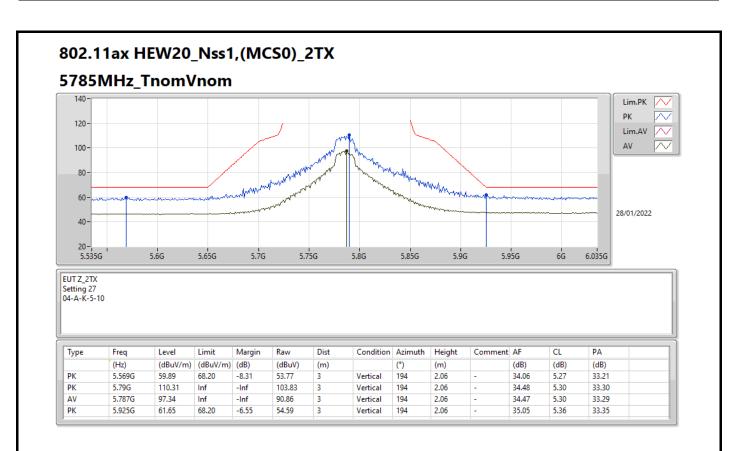




Page No. : 89 of 121

Report No. : FR1N0819AB

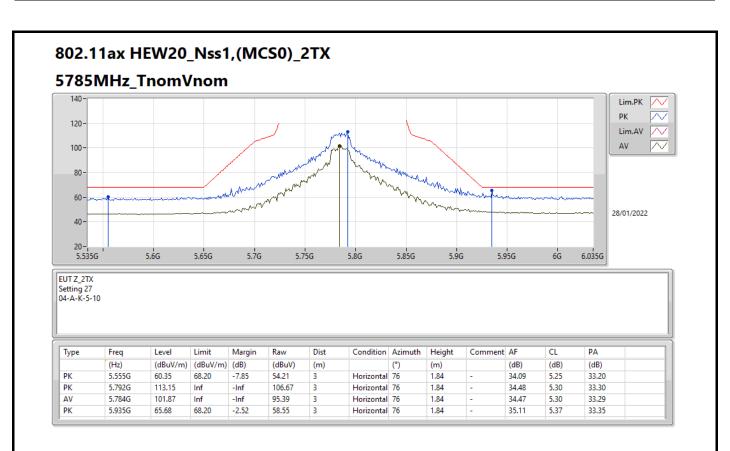




Page No. : 90 of 121

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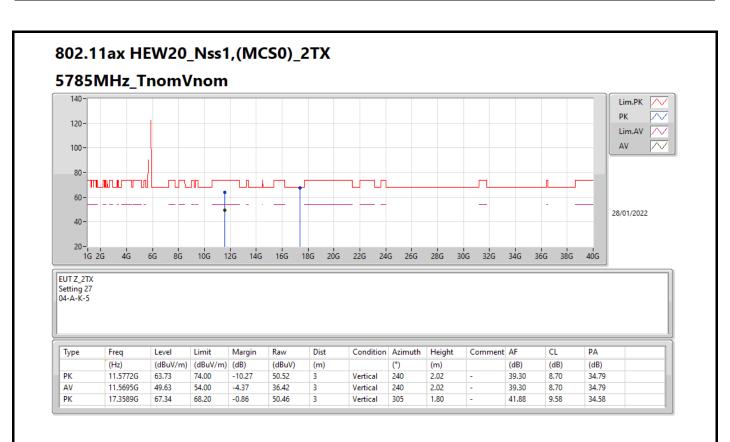




Page No. : 91 of 121

Report No. : FR1N0819AB

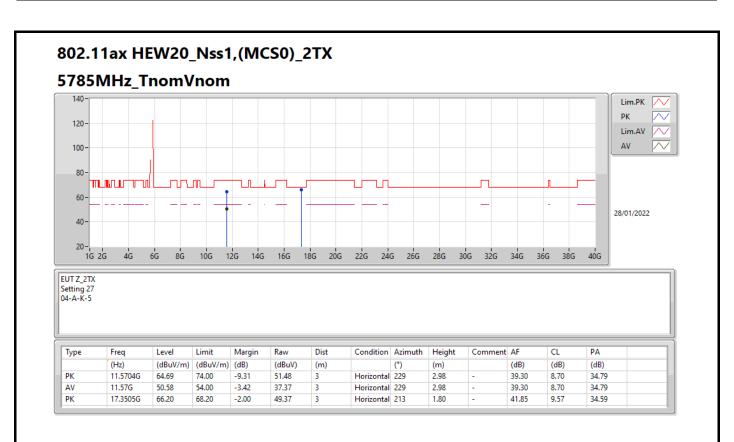




Page No. : 92 of 121

Report No. : FR1N0819AB

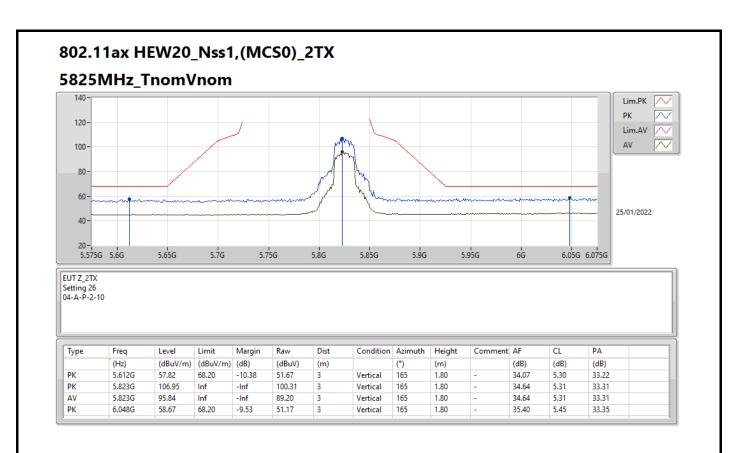




Page No. : 93 of 121

Report No. : FR1N0819AB

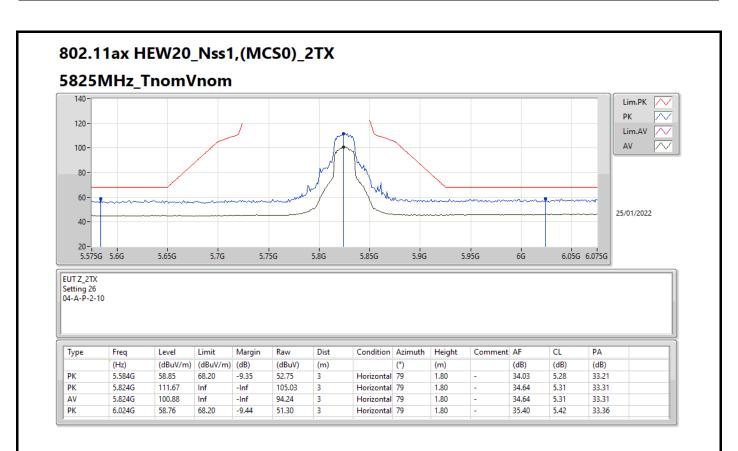




Page No. : 94 of 121

Report No. : FR1N0819AB

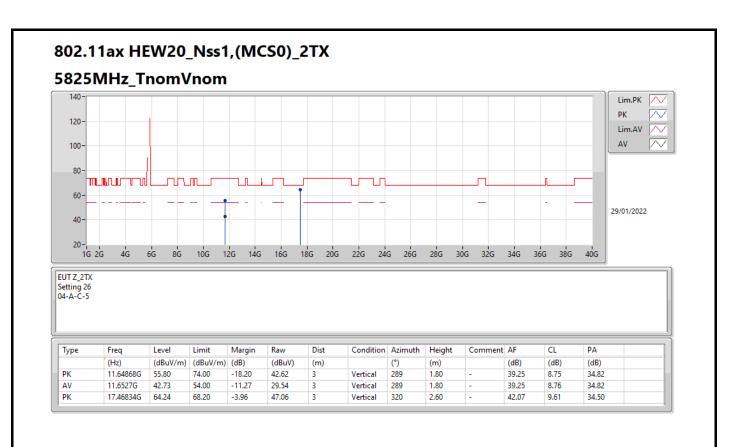




Page No. : 95 of 121

Report No. : FR1N0819AB

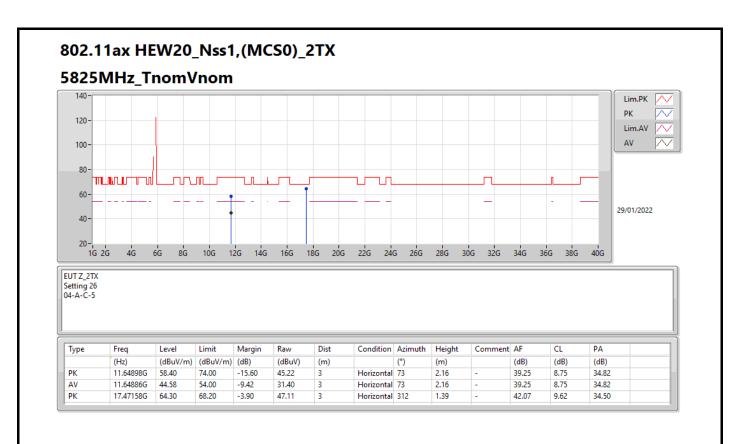




Page No. : 96 of 121

Report No. : FR1N0819AB

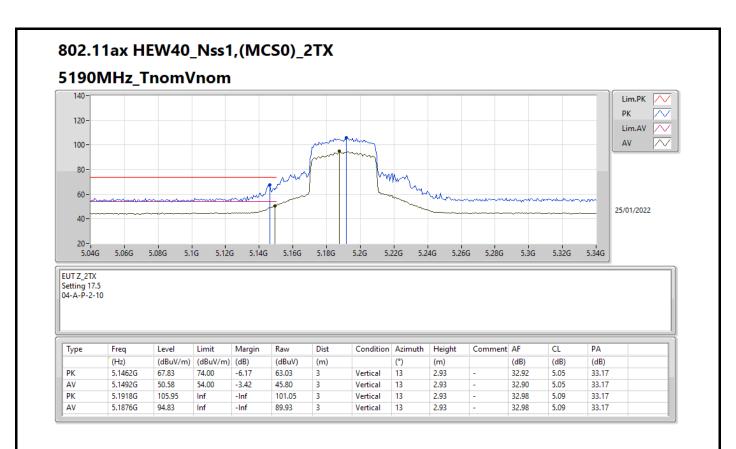




Page No. : 97 of 121

Report No. : FR1N0819AB

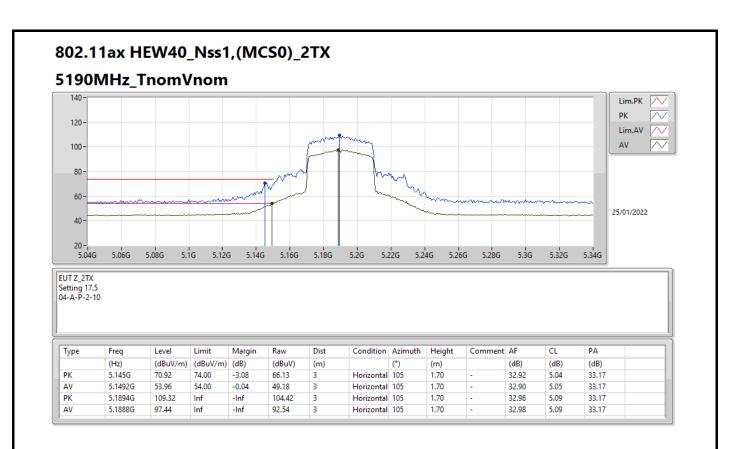




Page No. : 98 of 121

Report No. : FR1N0819AB

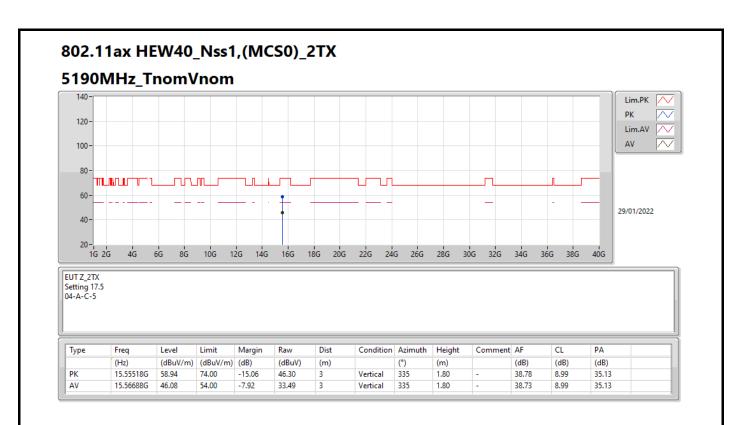




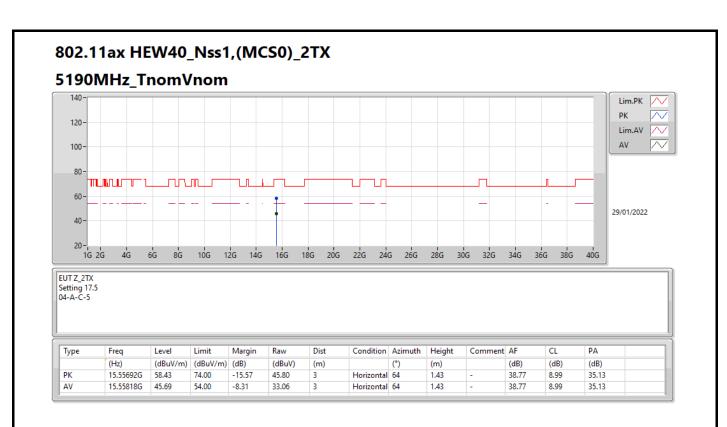
Page No. : 99 of 121

Report No. : FR1N0819AB





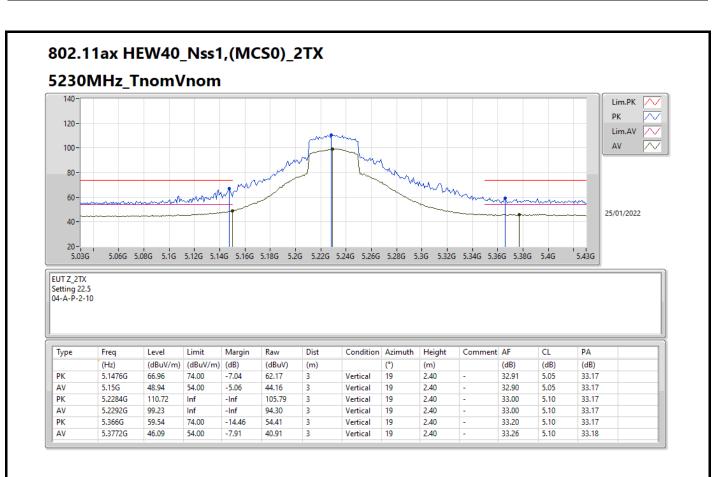




Page No. : 101 of 121

Report No. : FR1N0819AB

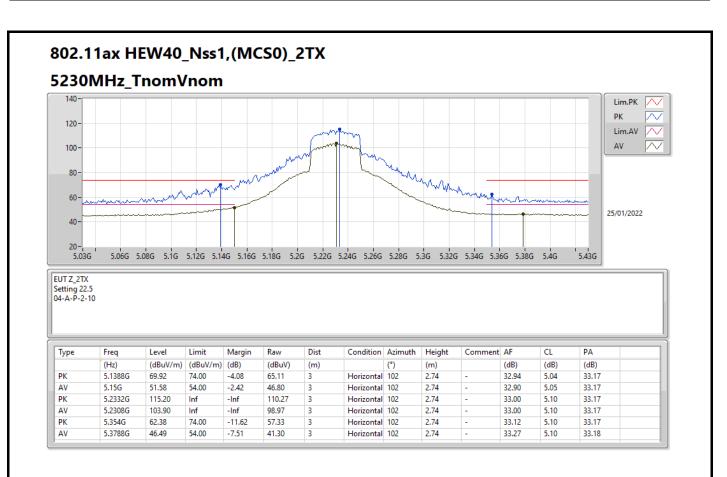




Page No. : 102 of 121

Report No. : FR1N0819AB

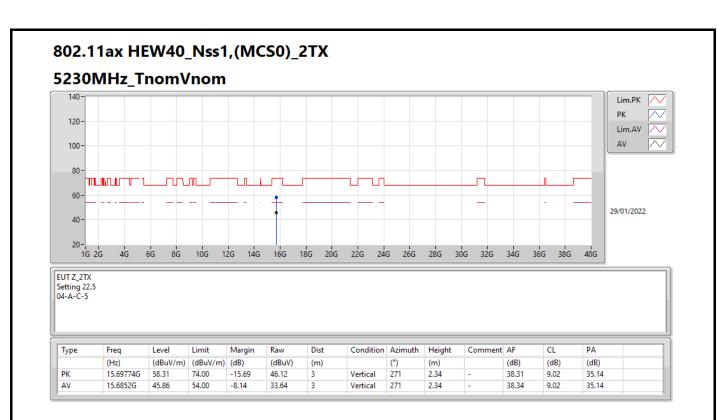




Page No. : 103 of 121

Report No. : FR1N0819AB

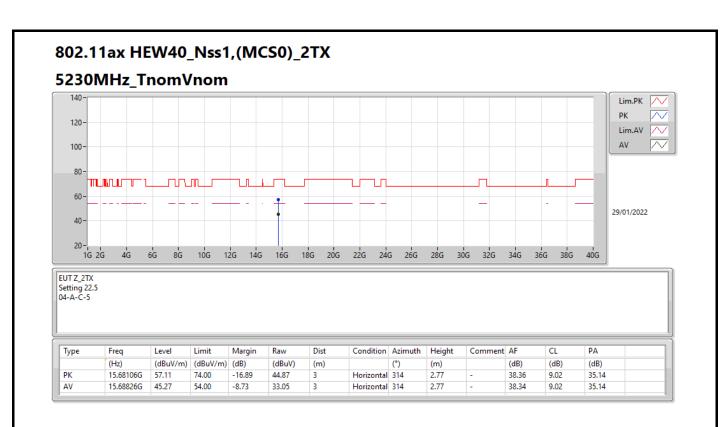




Page No. : 104 of 121

Report No. : FR1N0819AB

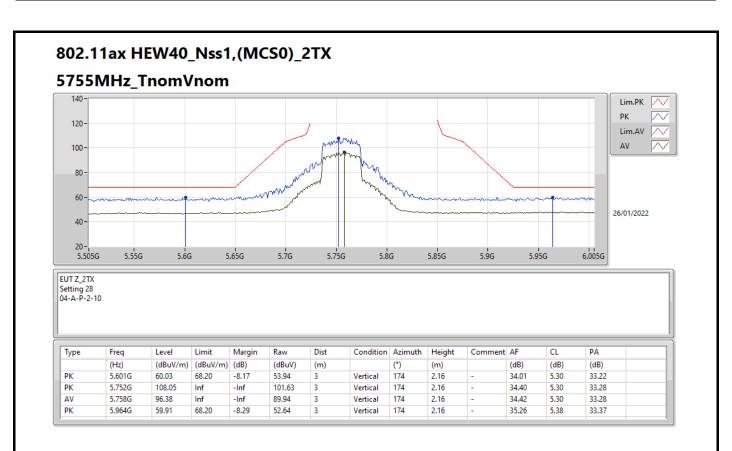




Page No. : 105 of 121

Report No. : FR1N0819AB

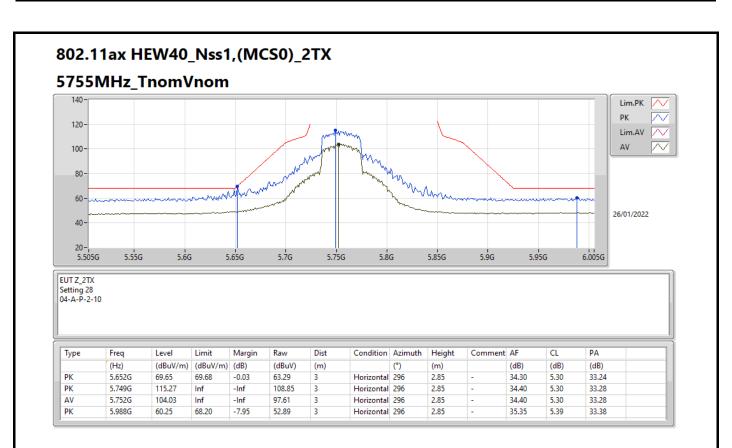




Page No. : 106 of 121

Report No. : FR1N0819AB

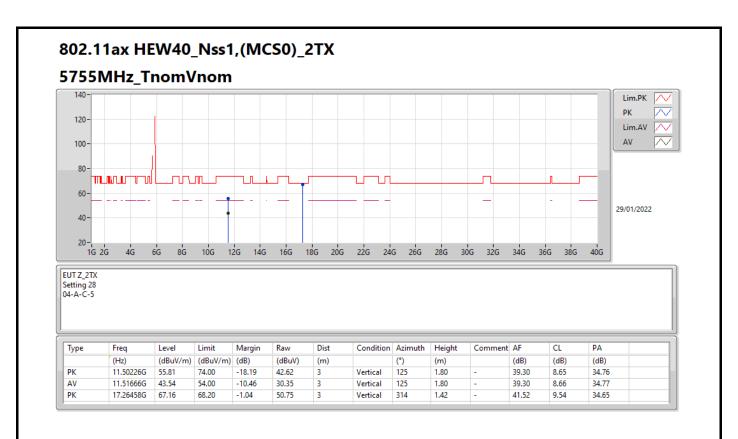




Page No. : 107 of 121

Report No. : FR1N0819AB

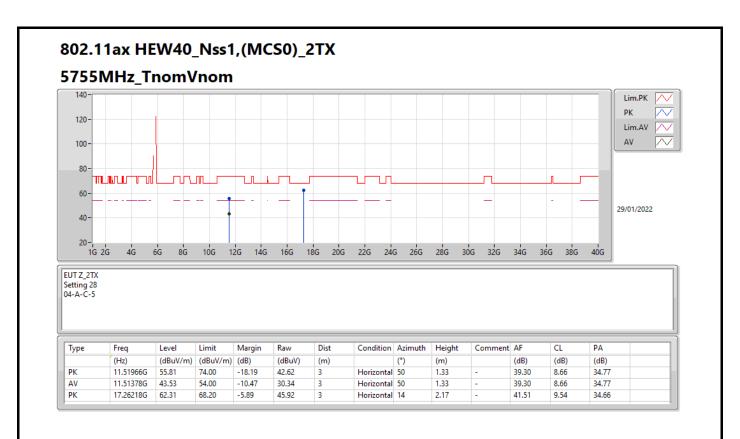




Page No. : 108 of 121

Report No. : FR1N0819AB

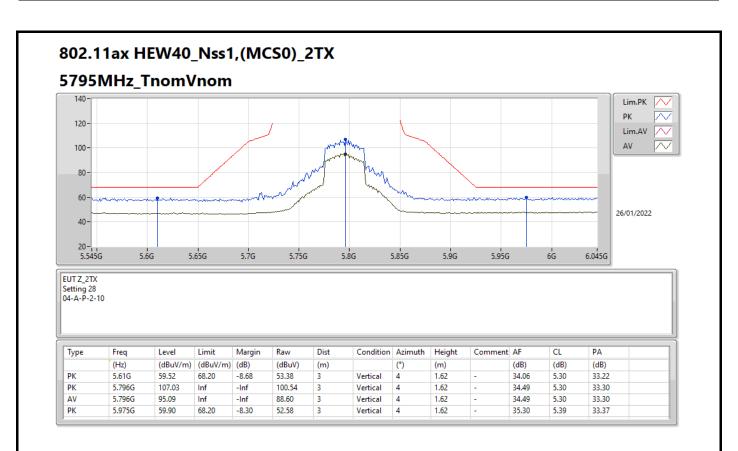




Page No. : 109 of 121

Report No. : FR1N0819AB

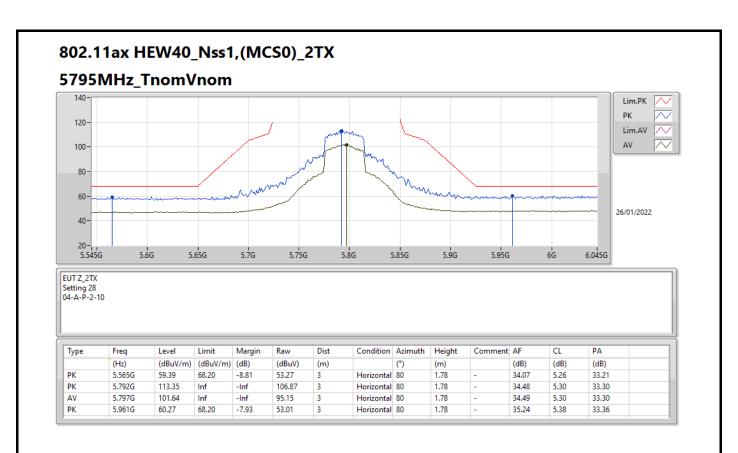




Page No. : 110 of 121

Report No. : FR1N0819AB

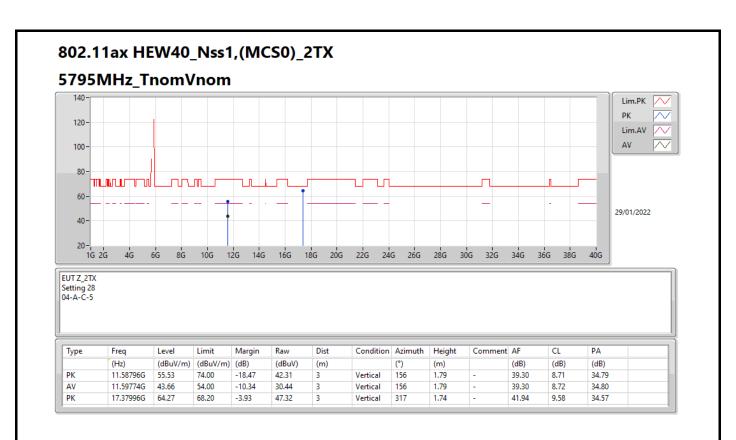




Page No. : 111 of 121

Report No. : FR1N0819AB

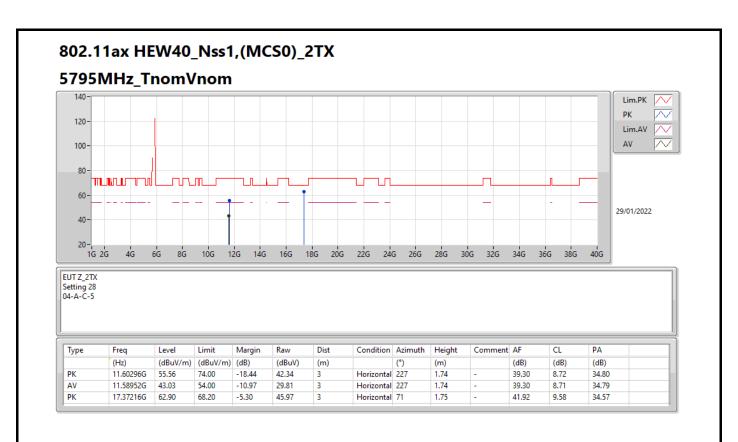




Page No. : 112 of 121

Report No. : FR1N0819AB

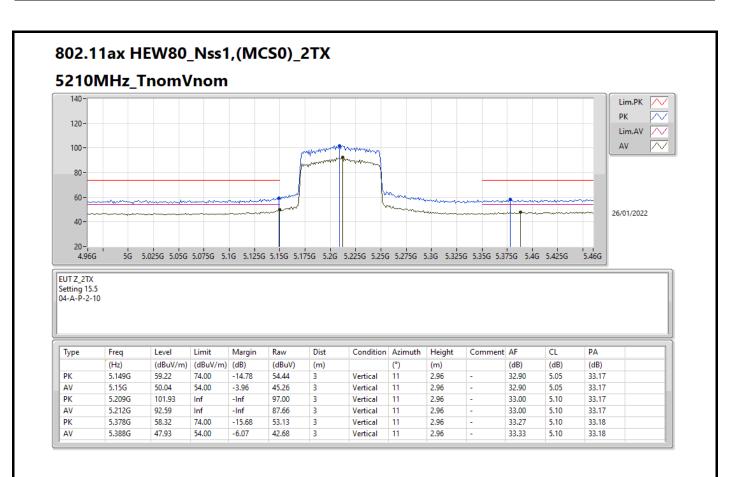




Page No. : 113 of 121

Report No. : FR1N0819AB

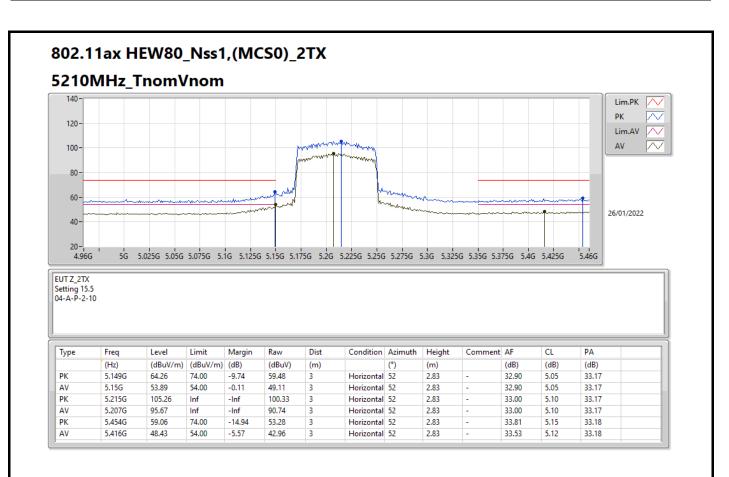




Page No. : 114 of 121

Report No. : FR1N0819AB

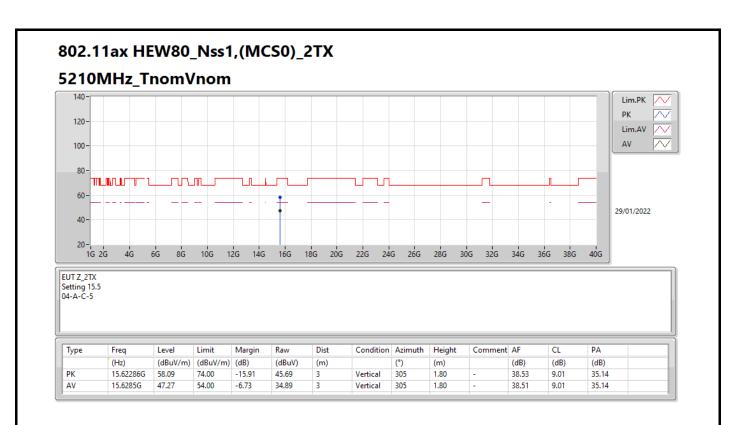




Page No. : 115 of 121

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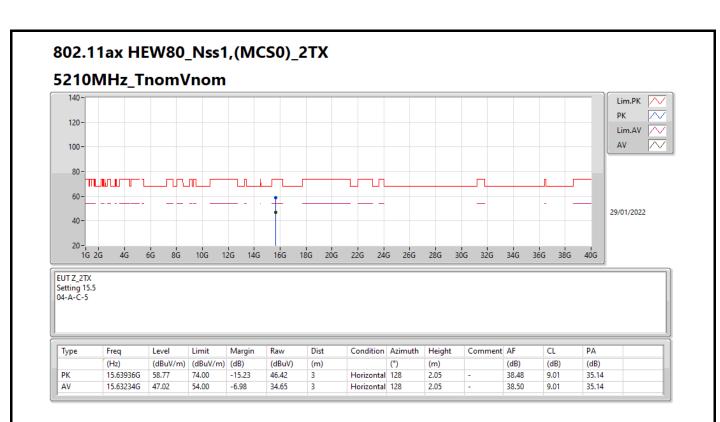




Page No. : 116 of 121

Report No. : FR1N0819AB

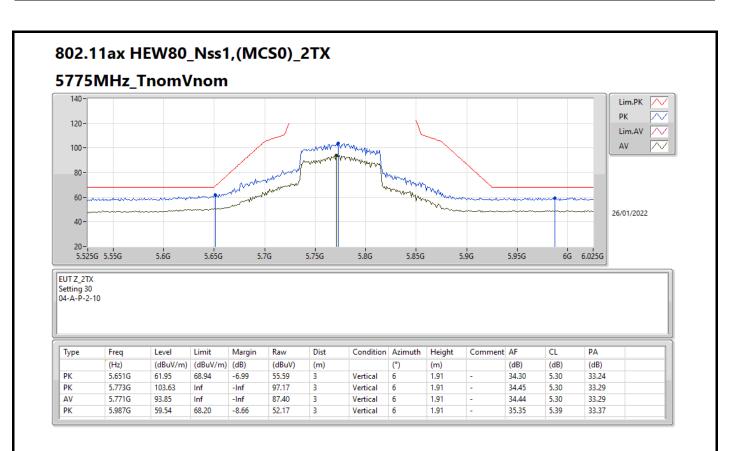




Page No. : 117 of 121

Report No. : FR1N0819AB

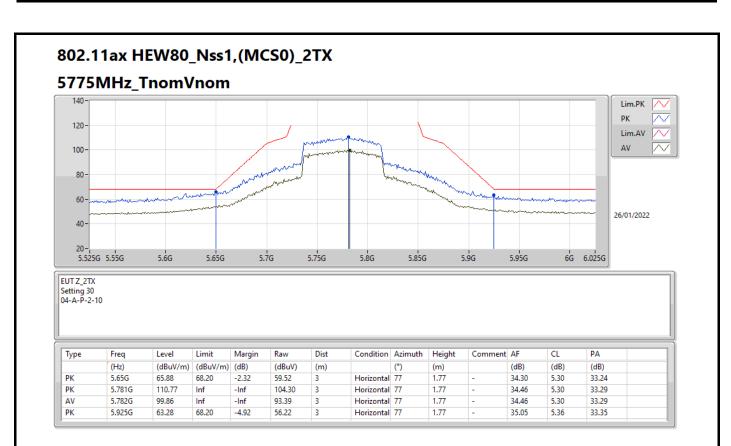




Page No. : 118 of 121

Report No. : FR1N0819AB

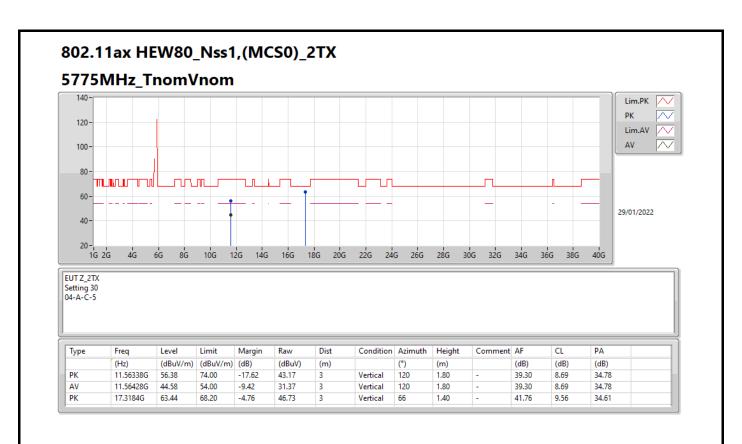




Page No. : 119 of 121

Report No. : FR1N0819AB

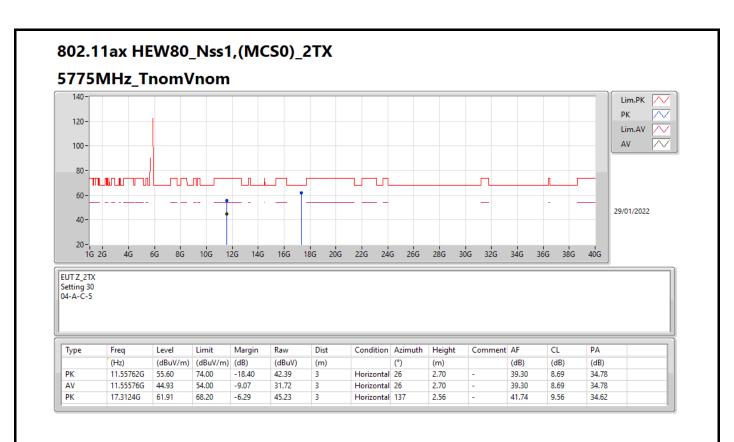




Page No. : 120 of 121

Report No. : FR1N0819AB





Page No. : 121 of 121

Report No. : FR1N0819AB



Radiated Emissions above 1GHz_Co-location

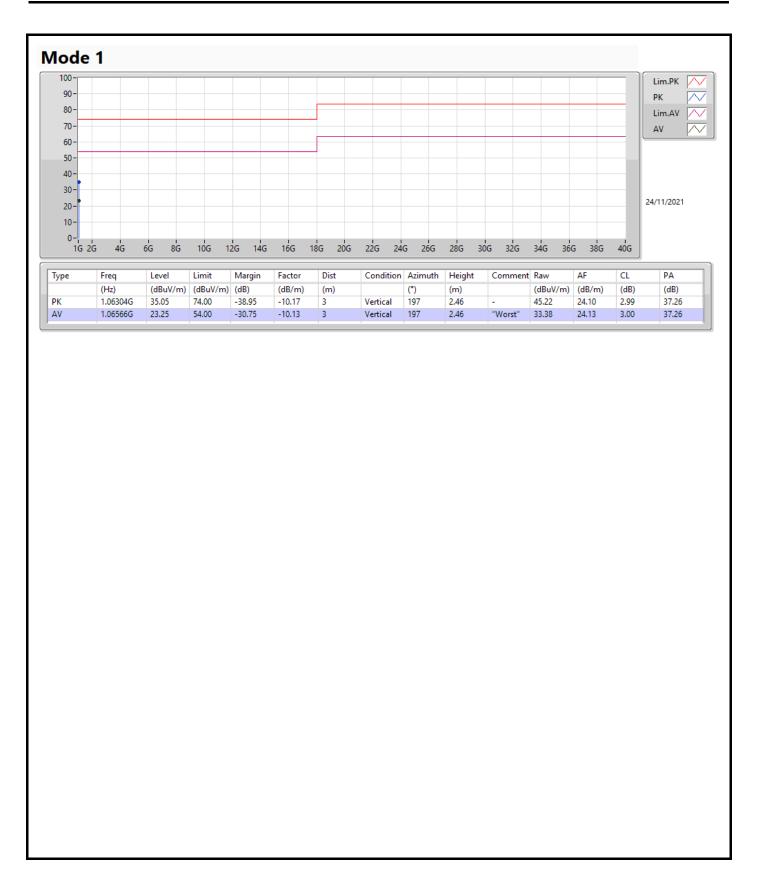
Appendix F

Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 1	Pass	AV	1.06566G	23.25	54.00	-30.75	Vertical

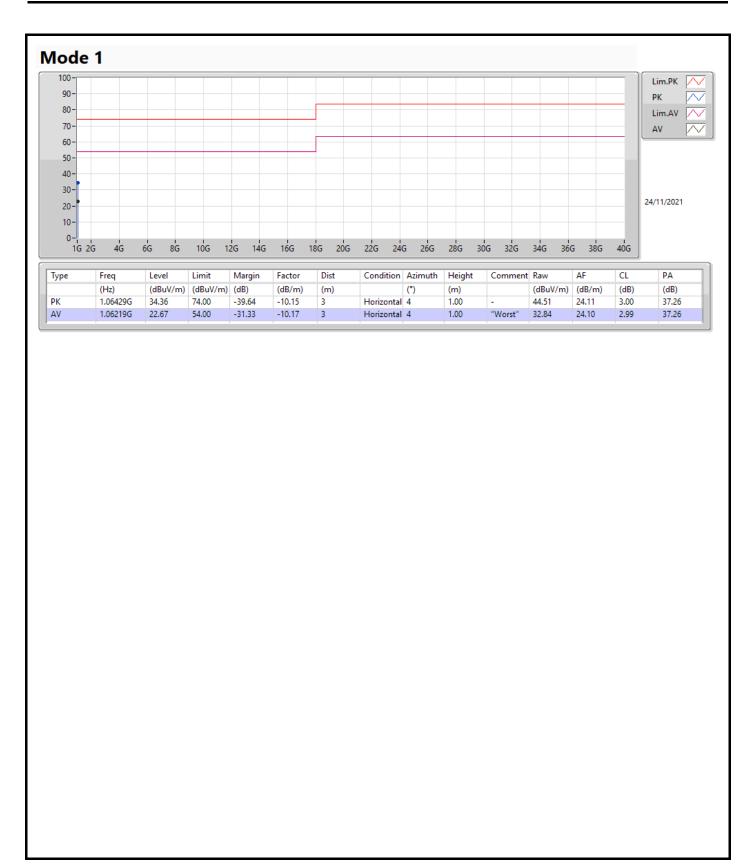
Sporton International Inc. Hsinchu Laboratory

Page No. : 1 of 3 Report No. : FR1N0819AB



Page No. : 2 of 3

Report No. : FR1N0819AB



Page No. : 3 of 3

Report No. : FR1N0819AB