Report No.: FR0D0335-01AB



# RADIO TEST REPORT

FCC ID : 2AYRA-03678

Equipment : AC1200 Dual Band Wi-Fi Range Extender

Brand Name : LINKSYS

Model Name : RE6400 V2

Applicant : Linksys USA, Inc.

12045 East Waterfront Drive Playa Vista, CA.

90094, USA

Standard : 47 CFR FCC Part 15.407

The product was received on Oct. 28, 2021, and testing was started from Oct. 30, 2021 and completed on Oct. 30, 2021. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory

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

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

Report Template No.: CB-A12\_1 Ver1.4

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Issued Date : Nov. 24, 2021

Report Version : 01

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**Appendix A. Test Results of Unwanted Emissions** 

**Appendix B. Test Photos** 

Photographs of EUT v01

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# History of this test report

Report No.: FR0D0335-01AB

Report No.	Version	Description	Issued Date
FR0D0335-01AB	01	Initial issue of report	Nov. 24, 2021

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## **Summary of Test Result**

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Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	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.

### **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: Viola Huang

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# 1 General Description

## 1.1 Information

### 1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
5150-5250	o n (UT20) oo (VUT20)	5180-5240	36-48 [4]
5725-5850	a, n (HT20), ac (VHT20)	5745-5825	149-165 [5]
5150-5250	n (UT40) on (V/UT40)	5190-5230	38-46 [2]
5725-5850	n (HT40), ac (VHT40)	5755-5795	151-159 [2]
5150-5250	oo (\/UT90\	5210	42 [1]
5725-5850	ac (VHT80)	5775	155 [1]

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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	802.11n HT20-BF	20	2TX
5.15-5.25GHz	802.11ac VHT20	20	2TX
5.15-5.25GHz	802.11ac VHT20-BF	20	2TX
5.15-5.25GHz	802.11n HT40	40	2TX
5.15-5.25GHz	802.11n HT40-BF	40	2TX
5.15-5.25GHz	802.11ac VHT40	40	2TX
5.15-5.25GHz	802.11ac VHT40-BF	40	2TX
5.15-5.25GHz	802.11ac VHT80	80	2TX
5.15-5.25GHz	802.11ac VHT80-BF	80	2TX
5.725-5.85GHz	802.11a	20	2TX
5.725-5.85GHz	802.11n HT20	20	2TX
5.725-5.85GHz	802.11n HT20-BF	20	2TX
5.725-5.85GHz	802.11ac VHT20	20	2TX
5.725-5.85GHz	802.11ac VHT20-BF	20	2TX
5.725-5.85GHz	802.11n HT40	40	2TX
5.725-5.85GHz	802.11n HT40-BF	40	2TX
5.725-5.85GHz	802.11ac VHT40	40	2TX
5.725-5.85GHz	802.11ac VHT40-BF	40	2TX
5.725-5.85GHz	802.11ac VHT80	80	2TX
5.725-5.85GHz	802.11ac VHT80-BF	80	2TX

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#### 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.

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• BWch is the nominal channel bandwidth.

#### 1.1.2 Antenna Information

Ant.	Port	Brand			n (dBi)		
Ant.	Port	Dianu	Wodel Name	Antenna Type	Connector	2.4GHz	5GHz
1	1	N/A	N/A	Dipole Antenna	I-PEX	3.8	3.8
2	2	N/A	N/A	Dipole Antenna	I-PEX	3.3	3.7

Note: The above information was declared by manufacturer.

### For 2.4GHz Function:

### For IEEE 802.11b/g/n (2TX/2RX):

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

Port 1 and Port 2 could transmit/receive simultaneously.

#### For 5GHz Function:

### For IEEE 802.11a/n/ac (2TX/2RX):

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

Port 1 and Port 2 could transmit/receive simultaneously.

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## 1.1.3 Mode Test Duty Cycle

### <Non-beamforming mode>

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11a	0.958	0.19	1.398m	1k
802.11ac VHT20	0.958	0.19	1.318m	1k
802.11ac VHT40	0.915	0.39	663.462u	3k
802.11ac VHT80	0.849	0.71	326.25u	10k

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<br/>beamforming mode>

Aboutmorning moder						
Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T		
802.11ac VHT20-BF	0.934	0.3	4.983m	300		
802.11ac VHT40-BF	0.889	0.51	2.423m	1k		
802.11ac VHT80-BF	0.771	1.13	1.143m	1k		

Ν	10	٠.	_	

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

### 1.1.4 EUT Operational Condition

EUT Power Type	Internal power supply				
Beamforming Function	$\boxtimes$	With beamforming		Without beamforming	
Beamforning Function	The product has beamforming function for n/ac in 5GHz.				
Function		Outdoor P2M	$\boxtimes$	Indoor P2M	
runction		Fixed P2P		Client	
Test Software Version		<non-beamforming mode=""> MT7663 QA 0.0.2.8 <beamforming mode=""> Putty v0.62</beamforming></non-beamforming>			

Note: The above information was declared by manufacturer.

### 1.1.5 Table for EUT support function

Function
AP Mode
Extender Mode

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## 1.1.6 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FR0D0335AB Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
	After evaluating, the worst case is found at
	802.11ac VHT20 CH40 5200MHz and 11ac
1. Adjusting the parameter of Flash to improve the throughput	VHT40 CH159 5795MHz BF mode and retest
via software change.	these channels only and for above 1GHz will be
	based on original output power to retest
2. Equipping new equipment name: AC1200 Dual Band Wi-Fi	
Range Extender and model name: RE6400 V2 for this	It doesn't affect the test result of this test report.
change.	

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## 1.2 Applicable Standards

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

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47 CFR FCC Part 15

ANSI C63.10-2013

FCC KDB 789033 D02 v02r01

### 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		
Radiated	03CH03-CB	Caster Chang	24.6~25.7 / 56~59	Oct. 30, 2021		

### 1.4 Measurement Uncertainty

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

Test Items	Uncertainty	Remark		
Radiated Emission (1GHz ~ 18GHz)	4.7 dB	Confidence levels of 95%		
Radiated Emission (18GHz ~ 40GHz)	4.2 dB	Confidence levels of 95%		

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## 2 Test Configuration of EUT

## 2.1 The Worst Case Measurement Configuration

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.						
	CTX						
Operating Mode > 1GHz	The EUT was performed at X axis, Y axis and Z axis position for Radiated measurement, and the worst case was found at Y axis. So the measurement will follow this same test configuration.						
1	EUT in Y axis						

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## 2.2 EUT Operation during Test

For CTX Mode:

non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

beamforming mode:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

During the test, the following programs under WIN 7 were executed.

The program was executed as follows:

- 1. During the test, the EUT operation to normal function.
- 2. Executed command fixed test channel under Telnet.
- 3. Executed "Lantest.exe" to link with the remote workstation to transmit and receive packet by Router and transmit duty cycle no less than 98%.

### 2.3 Accessories

N/A

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# 2.4 Support Equipment

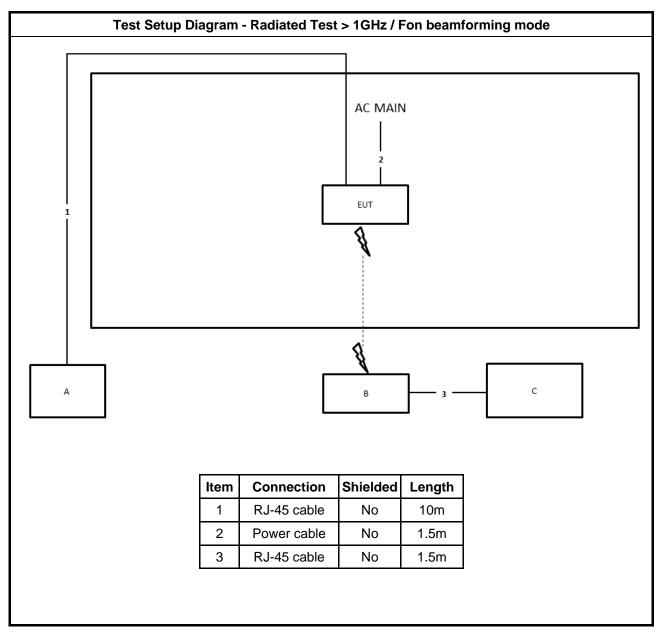
	Support Equipment									
No.	No. Equipment Brand Name Model Name FCC ID									
Α	Notebook	DELL	E4300	N/A						
В	Route	Gemtek	RE6400	N/A						
С	Notebook	DELL	E4300	N/A						

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## 2.5 Test Setup Diagram



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### 3 Transmitter Test Result

### 3.1 Unwanted Emissions

### 3.1.1 Transmitter Unwanted Emissions Limit

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

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

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

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

Un-restricted band emissions above 1GHz Limit								
Operating Band	Limit							
⊠ 5.15 - 5.25 GHz	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.							
☐ 5.85 - 5.895 GHz	(i) For an indoor access point or subordinate device, all emissions at or above							

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5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of - 7 dBm/MHz at or above 5.925 GHz.

(ii) For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of -5 dBm/MHz and shall decrease linearly to an e.i.r.p. of -27 dBm/MHz at or above 5.925 GHz.

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(iii) For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/ MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.

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).

### 3.1.2 Measuring Instruments

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

### 3.1.3 Test Procedures

#### **Test Method**

- Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
- The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
- For the transmitter unwanted emissions shall be measured using following options below:
  - Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.
  - Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.
    - Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
    - Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
    - Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
    - Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
    - Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
    - Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
- For 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.

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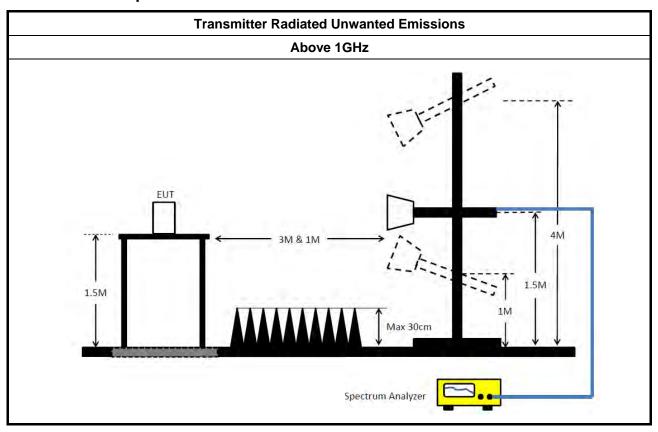
### **Test Method**

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- 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.

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### 3.1.4 Test Setup



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### 3.1.5 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.

### 3.1.6 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.

### 3.1.7 Test Result of Transmitter Unwanted Emissions

Refer as Appendix A

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# 4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark	
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH03-CB	103-CB 1GHz ~18GHz May 06, 2021 May 05, 2022		Radiation (03CH03-CB)		
Horn Antenna	ETS · Lindgren	3115	6821	750MHz~18GHz	Jan. 26, 2021	Jan. 25, 2022	Radiation (03CH03-CB)	
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	3HA9170252 15GHz ~ 40GHz Aug. 05, 2021 Aug.		Aug. 04, 2022	Radiation (03CH03-CB)	
Pre-Amplifier	Agilent	8449B	3008A02097	97 1GHz ~ 26.5GHz Jul. 02, 2021		Jul. 01, 2022	Radiation (03CH03-CB)	
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 13, 2021	Jul. 12, 2022	Radiation (03CH03-CB)	
Spectrum Analyzer	R&S	FSP40	100019	9kHz ~ 40GHz	Jun. 04, 2021	Jun. 03, 2022	Radiation (03CH03-CB)	
RF Cable-high	Woken	RG402	High Cable-20+29	1GHz ~ 18GHz Oct. 04, 2021 Oct. 03		Oct. 03, 2022	Radiation (03CH03-CB)	
RF Cable-high	Woken	RG402	High Cable-29	1GHz ~ 18GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH03-CB)	
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH03-CB)	
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH03-CB)	
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH03-CB)	

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

N.C.R. means Non-Calibration required.

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## RSE TX above 1GHz

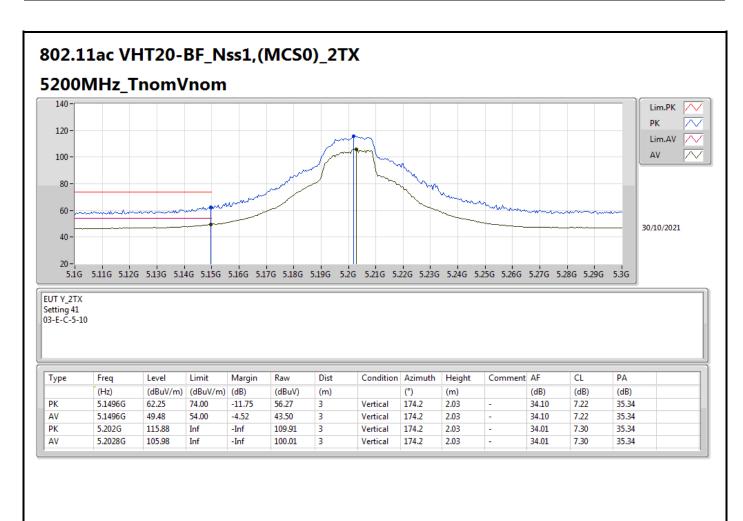
Appendix A

Summary

Mode	Result	Туре	Freq	Level	Limit	Margin	Dist	Condition	Azimuth	Height	Comments
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(m)		(°)	(m)	
5.15-5.25GHz	-	-	-	-	-	-	-	-	-	-	-
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	Pass	AV	15.60282G	53.70	54.00	-0.30	3	Horizontal	316	1.80	-

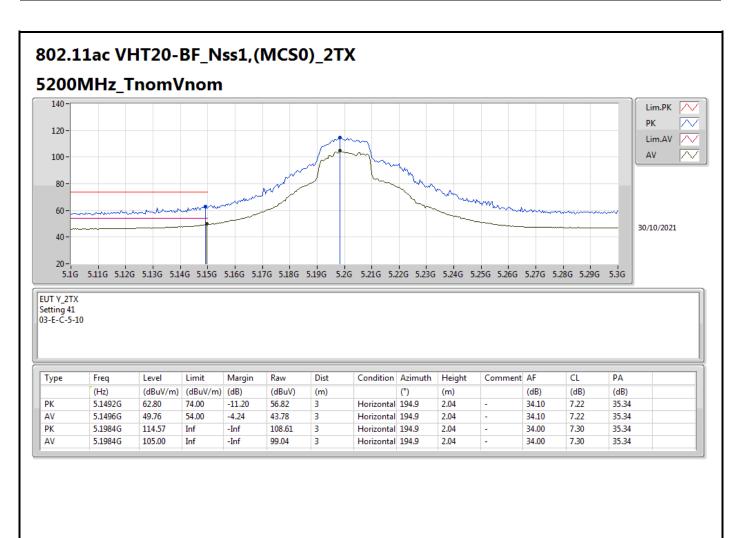
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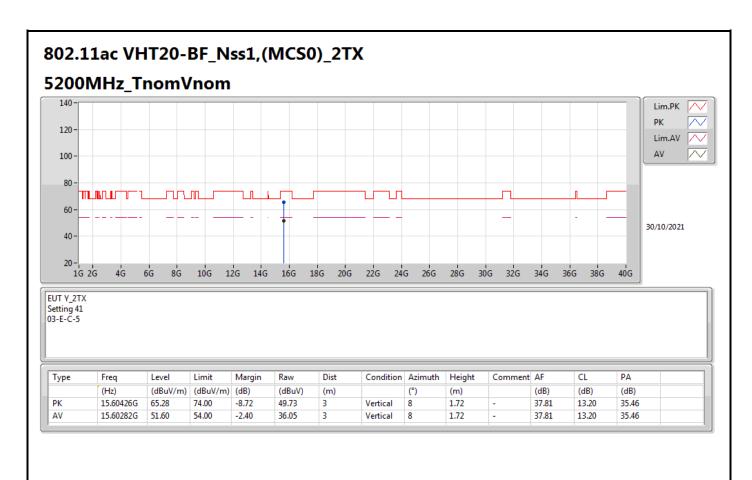
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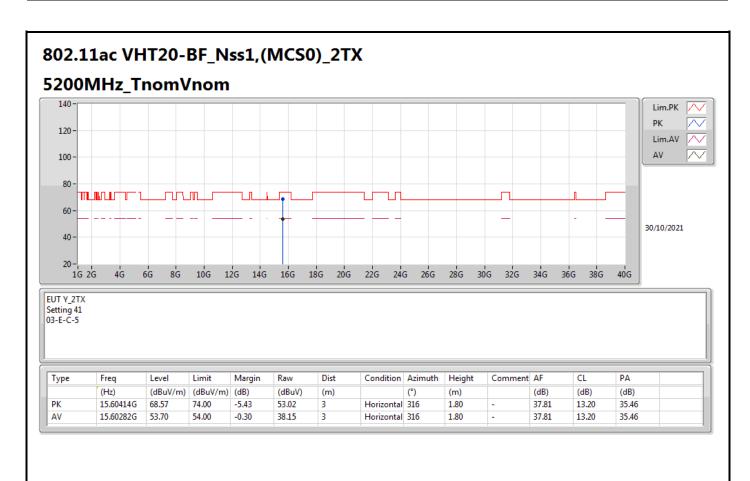
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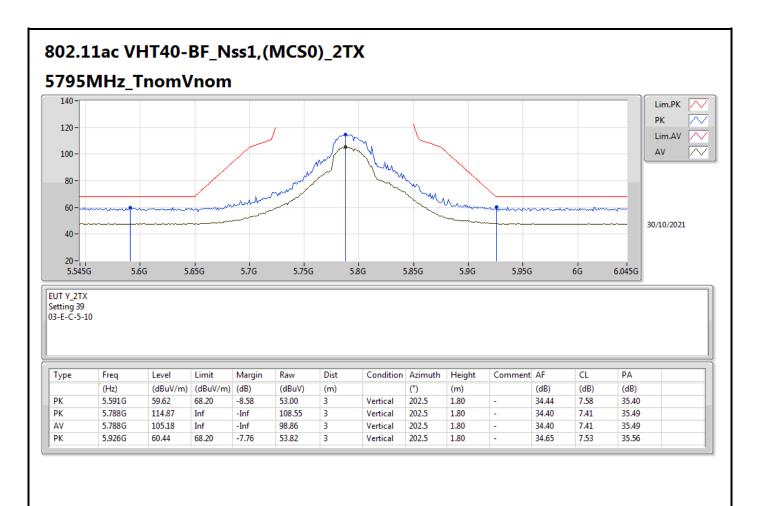
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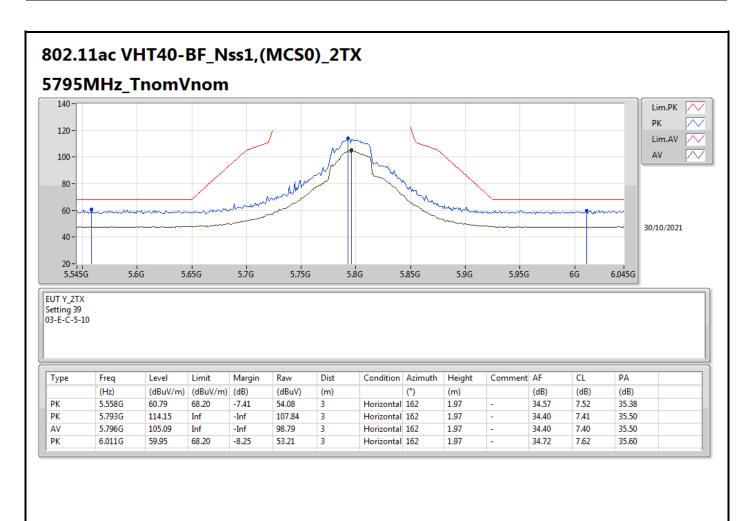
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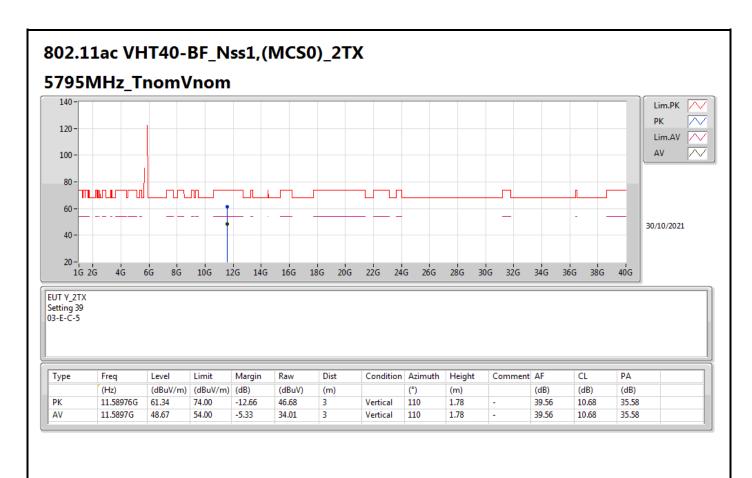
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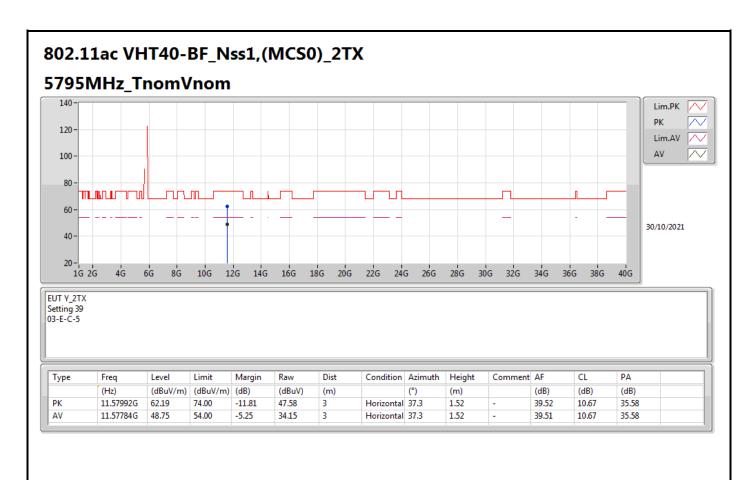
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