



# FCC RADIO TEST REPORT

FCC ID

· 2ADZRHA020WB

Equipment

: Nokia Wi-Fi Beacon

**Brand Name** 

: Nokia

Model Name

: HA-020W-B

Applicant

: Nokia Shanghai Bell Co. Ltd.

No. 388, Ninggiao Rd. Pilot Free Trade Zone

Shanghai, China 201206

Manufacturer

: Nokia Shanghai Bell Co. Ltd.

No. 388, Ninggiao Rd. Pilot Free Trade Zone

Shanghai, China 201206

Standard

: 47 CFR FCC Part 15.407

The product was received on Jan. 31, 2019, and testing was started from Feb. 01, 2019 and completed on Mar. 05, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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

Approved by: Sam Chen

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

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

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: Mar. 21, 2019

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Photographs of EUT v01

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Issued Date : Mai Report Version : 02

# History of this test report

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		Issued Date
01	Initial issue of report	Mar. 18, 2019
02	Revising the Multiple Listing, Please refer to Chapter 1.1.5.	Mar. 21, 2019
		+

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# **Summary of Test Result**

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

### **Comments and Explanations:**

- 1. The test configuration, test mode and test software were written in this test report are declared by the manufacturer.
- 2. 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: Sandy Chuang** 

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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	a, n (HT20), ac (VHT20)	5180-5240	36-48 [4]
5725-5850	a, 11 (11120), ac (111120)	5745-5825	149-165 [5]
5150-5250	n (HT40), ac (VHT40)	5190-5230	38-46 [2]
5725-5850	11 (11140), ac (111140)	5755-5795	151-159 [2]
5150-5250	ac (VHT80)	5210	42 [1]
5725-5850	40 (************************************	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.
- Nss-Min is the minimum number of spatial streams.
- Nant is the number of outputs. e.g., 2(2,3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.

#### 1.1.2 Antenna Information

#### <Main Source Antenna>

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
7	. 0.0	1		/ and and a sype		2.4GHz	5GHz
1	1	Airgain	M5X30CT-G45U	Copper tube Ant.	I-PEX	-	3
2	2	Airgain	M5X30CT-B80U	Copper tube Ant.	I-PEX	-	3
3	1	Airgain	N01NSAAA-T7-PK1-B130	PCB Ant.	N/A	3	-
4	2	Airgain	N01NSAAA-T7-PK1-G85	PCB Ant.	N/A	3	-

#### <Second Source Antenna>

Ant.	Port	Brand Holder	Model Name	Antenna Type	Connector	Gain (dBi)	
7	. 0.1	Brana Fronco	model Hamo	/ antonna Typo		2.4GHz	5GHz
1	1	ShangHai Signal Plus Technology Co.,Ltd.	6011F000118	Copper tube Ant.	I-PEX	-	3
2	2	ShangHai Signal Plus Technology Co.,Ltd.	6011F000119	Copper tube Ant.	I-PEX	-	3
3	1	ShangHai Signal Plus Technology Co.,Ltd.	6011F000116	PCB Ant.	N/A	3	-
4	2	ShangHai Signal Plus Technology Co.,Ltd.	6011F000117	PCB Ant.	N/A	3	-

Note 1: The above information was declared by manufacturer.

Note 2: The EUT was only tested for Main Source Antenna.

Note 3:

#### <For 2.4GHz Band>

#### For IEEE 802.11b mode<1TX/1RX>:

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

#### For IEEE 802.11g/n mode<2TX/2RX>:

Port 1 and Port 2 will transmit/receive the same signal simultaneously.

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

#### <For 5GHz Band>

#### For IEEE 802.11a/n/ac mode <2TX/2RX>:

Port 1 and Port 2 will transmit/receive the same signal simultaneously.

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

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### 1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11a	0.948	0.232	2.068m	1k
802.11ac VHT20	0.987	0.057	n/a (DC>=0.98)	n/a (DC>=0.98)
802.11ac VHT20-BF	0.944	0.25	3.84m	300
802.11ac VHT40	0.971	0.128	953.75u	3k
802.11ac VHT40-BF	0.942	0.259	4.61m	300
802.11ac VHT80	0.945	0.246	461.25u	3k
802.11ac VHT80-BF	0.89	0.506	5.103m	300

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## 1.1.4 EUT Operational Condition

EUT Power Type	Fro	From Power Adapter			
Beamforming Function		With beamforming		Without beamforming	
	Note: The product has beamforming function for 802.11n/ac in 5GHz				
Function		Outdoor P2M	$\boxtimes$	Indoor P2M	
1 diletion		Fixed P2P		Client	
Test Software Version	MTool: 3.1.0.1				

Note: The above information was declared by manufacturer.

### 1.1.5 Table for Multiple Listing

The EUT has two market sale set which are identical to each other in all aspects except for the following table:

Brand Name	Model Name	Unit	Part Number	Adapter	RJ-45 cable
Nokia	HA-020W-B	KIT_HA-020W-B	3FE 47855 AA	V	V
Nokia		EMA_HA-020W-B	3FE 47856 AA	-	-

From the above table, model: HA-020W-B for unit: KIT\_HA-020W-B was selected as representative model for the test and its data was recorded in this report.

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## 1.2 Testing Applied 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
- FCC KDB 662911 D01 v02r01
- FCC KDB 412172 D01 v01r01

## 1.3 Testing Location Information

	Testing Location							
	HWA YA ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)							
		TEL	:	886-3-327-3456 FAX : 886-3-327-0973				
$\boxtimes$	JHUBEI	ADD	:	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.				
		TEL	:	886-3-656-9065 FAX : 886-3-656-9085				

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-CB	Owen Hsu	19~21 ℃ / 52~54%	Mar. 04, 2019 ~ Mar. 05, 2019
Radiated (Below 1GHz)	03CH01-CB	KJ Huang	22~23.4°C / 54~59%	Feb. 28, 2019
Radiated (Above 1GHz)	03CH01-CB	Eason Chen	21~23°C / 53~55%%	Mar. 02, 2019
AC Conduction	CO01-CB	GN Hou	23.2~23.8°C / 51~53%	Feb. 01, 2019

Test site Designation No. TW0006 with FCC.

## 1.4 Measurement Uncertainty

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

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.0 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%
Output Power Measurement	1.33 dB	Confidence levels of 95%
Power Density Measurement	1.27 dB	Confidence levels of 95%
Bandwidth Measurement	9.74 x10 <sup>-8</sup>	Confidence levels of 95%

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Test site registered number IC 4086B with Industry Canada.

# 2 Test Configuration of EUT

# 2.1 Test Channel Mode

Mode	PowerSetting
802.11a_Nss1,(6Mbps)_2TX	-
5180MHz	45
5200MHz	45
5240MHz	74
5745MHz	96
5785MHz	98
5825MHz	98
802.11ac VHT20_Nss1,(MCS0)_2TX	-
5180MHz	51
5200MHz	53
5240MHz	79
5745MHz	98
5785MHz	98
5825MHz	98
802.11ac VHT40_Nss1,(MCS0)_2TX	-
5190MHz	60
5230MHz	60
5755MHz	98
5795MHz	98
802.11ac VHT80_Nss1,(MCS0)_2TX	-
5210MHz	61
5775MHz	91
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	-
5180MHz	45
5200MHz	47
5240MHz	82
5745MHz	86
5785MHz	98
5825MHz	98
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	-
5190MHz	60
5230MHz	58
5755MHz	98
5795MHz	98
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	
5210MHz	62

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Mode	PowerSetting
5775MHz	89

#### Note:

- VHT20/VHT40 covers HT20/HT40, due to same modulation. The power setting for 802.11n HT20 and HT40 are the same or lower than 802.11ac VHT20 and VHT40.
- There are two modes of EUT, one is beamforming mode, and the other is non-beamforming mode for 802.11n/ac in 5GHz. All test results were recorded in the report.

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# 2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests			
Tests Item	Tests Item AC power-line conducted emissions		
Condition AC power-line conducted measurement for line and neutral			
Operating Mode Normal Link			
1	1 EUT with Main Source Antenna and adapter 1 (Router Mode)		
2 EUT with Main Source Antenna and adapter 2 (Router Mode)			
For operating mode 1 is the worst case and it was record in this test report.			

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

Th	The Worst Case Mode for Following Conformance Tests			
Tests Item	Unwanted Emissions			
Radiated measurement  If EUT consist of multiple antenna assembly (multiple antenna are used in regardless of spatial multiplexing MIMO configuration), the radiated test significant be performed with highest antenna gain of each antenna type.				
Operating Mode < 1GHz	Operating Mode < 1GHz Normal Link			
1	EUT with Main Source Antenna and adapter 1 (Router Mode)			
2	EUT with Main Source Antenna and adapter 2 (Router Mode)			
For operating mode 2 is the worst case and it was record in this test report.				
Operating Mode > 1GHz	СТХ			
1	EUT with Main Source Antenna and adapter 1 (Router Mode)			

The Worst Case Mode for Following Conformance Tests			
Tests Item Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation			
Operating Mode	Operating Mode		
1 WLAN 2.4GHz + WLAN 5GHz			
Refer to Sporton Test Report No.: FA921805 for Co-location RF Exposure Evaluation.			

Note 1: The EUT can only be used in Y axis position.

Note 2: The EUT supports router mode and mesh mode. Only the router mode was tested and recorded in this test report that is designated by the manufacturer.

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# 2.3 EUT Operation during Test

For CTX Mode:

#### <Non-beamforming mode>

The EUT was programmed to be in continuously transmitting mode.

#### <br/> <br/> de>

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

During the test, the following programs under WIN XP 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 DOS.
- 3. Executed "Lantest.exe" to link with the remote workstation to transmit and receive packet by Wireless AP and transmit duty cycle no less than 98%.

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For Normal Link:

During the test, the EUT operation to normal function.

#### 2.4 Accessories

	Accessories					
Equipment Name	Brand Holder	Model Name	Rating			
Adapter 1	SHENZHEN RUIDE ELECTRONICAL INDUSTRIAL CO., LTD	RD1201000-C55-26MG	Input: 100-240V~50/60Hz, 0.6A MAX Output: 12V, 1A			
Adapter 2	DONGGUAN SHILONG FUHUA ELECTRONIC CO., LTD	UES12LU-120100SPA	Input: 100-240V~50/60Hz, 0.5A Output: 12.0V, 1.0A			
	Other					
RJ-45 Cable*1	: Non-Shielded, 1m					

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# 2.5 Support Equipment

For Test Site No: CO01-CB

Support Equipment				
No. Equipment Brand Name Model Name FCC ID				
Α	LAN NB	DELL	E6430	N/A
В	2.4G NB	DELL	E6430	N/A
С	5G NB	DELL	E6430	N/A
D	WAN NB	DELL	E6430	N/A

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For Test Site No: 03CH01-CB (below 1GHz)

	Support Equipment					
No.	No. Equipment Brand Name Model Name FCC ID					
Α	LAN NB	DELL	E4300	N/A		
В	2.4G NB	DELL	E4300	N/A		
С	5G NB	DELL	E4300	N/A		
D	WAN NB	DELL	E4300	N/A		

## For Test Site No: 03CH01-CB (above 1GHz)

<Non-beamforming mode>

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

<br/>
<br/>
de>

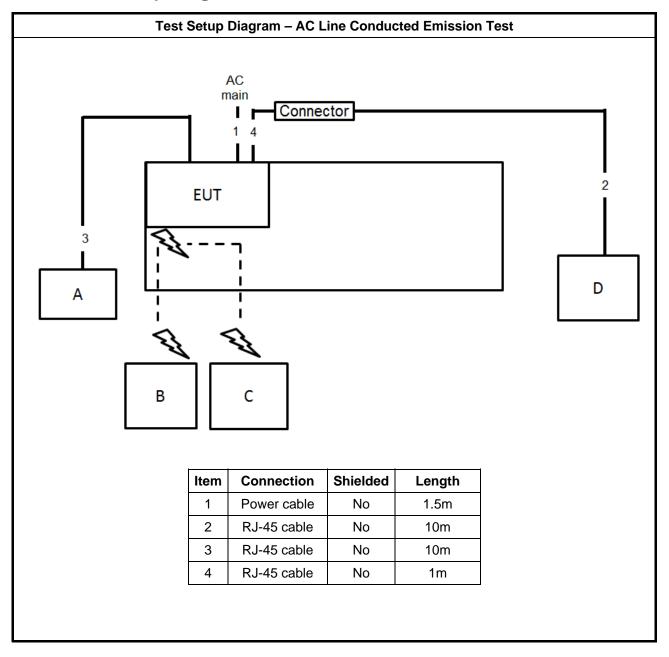
	Support Equipment				
No.	No. Equipment Brand Name Model Name FCC ID				
Α	NB	DELL	E4300	N/A	
В	NB	DELL	E4300	N/A	
С	WLAN module	Boardcom	BCM943162ZP	QDS-BRCM1075	

For Test Site No: TH01-CB

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

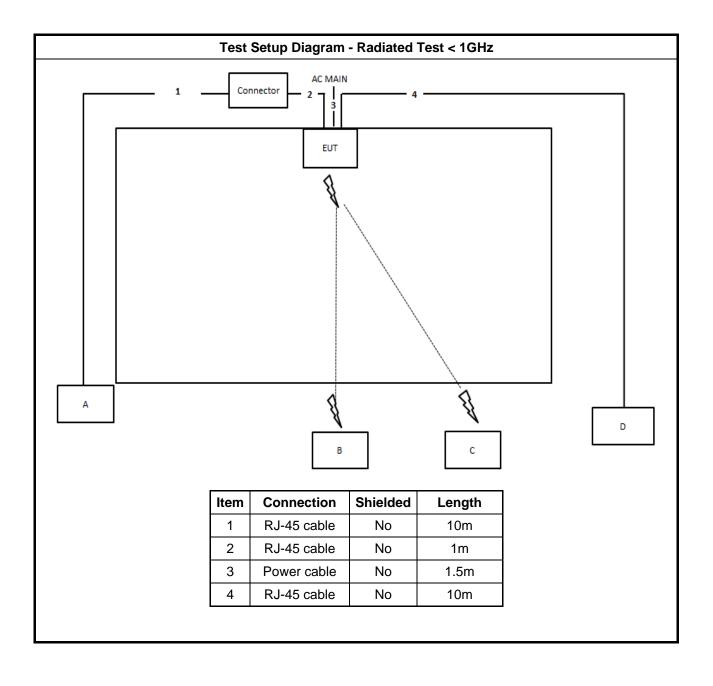
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# 2.6 Test Setup Diagram



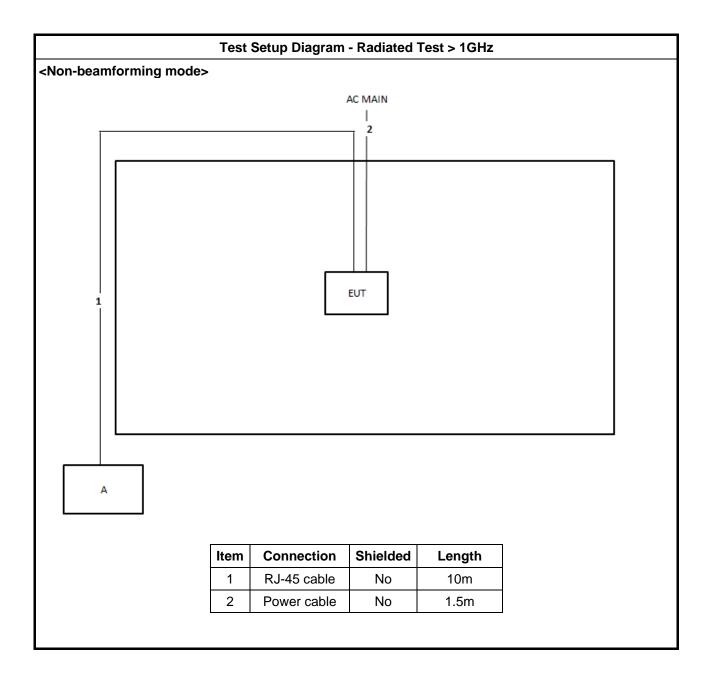
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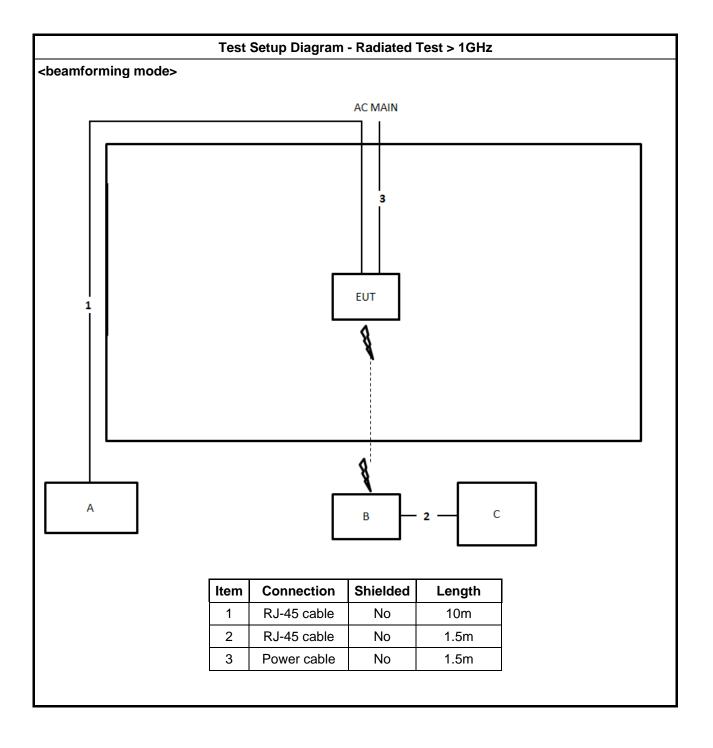


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## 3 Transmitter Test Result

## 3.1 AC Power-line Conducted Emissions

### 3.1.1 AC Power-line Conducted Emissions Limit

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

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## 3.1.2 Measuring Instruments

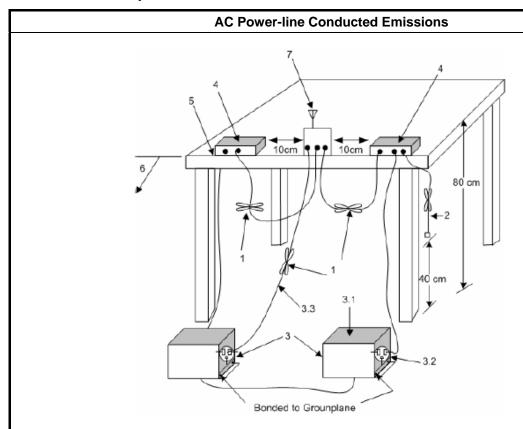
Refer a test equipment and calibration data table in this test report.

### 3.1.3 Test Procedures

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

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### 3.1.4 Test Setup



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

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- 2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- 3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$  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 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

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## 3.2 Emission Bandwidth

### 3.2.1 Emission Bandwidth Limit

	Emission Bandwidth Limit					
UNI	UNII 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, 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.					

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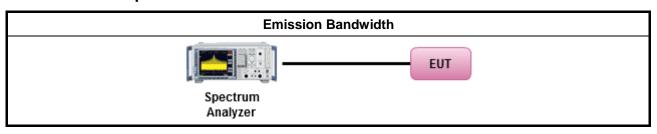
### 3.2.2 Measuring Instruments

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

#### 3.2.3 Test Procedures

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

## 3.2.4 Test Setup



### 3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

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# 3.3 Maximum Conducted Output Power

## 3.3.1 Maximum Conducted Output Power Limit

	Maximum Conducted Output Power Limit
UNI	I Devices
$\boxtimes$	For the 5.15-5.25 GHz band:
	<ul> <li>Outdoor AP: the maximum conducted output power (P<sub>Out</sub>) shall not exceed the lesser of 1 W. If G<sub>TX</sub> &gt; 6 dBi, then P<sub>Out</sub> = 30 - (G<sub>TX</sub> - 6). e.i.r.p. at any elevation angle above 30 degrees ≤ 125mW [21dBm]</li> </ul>
	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 <sub>Out</sub> ) shall not exceed the lesser of 250 mW. If G <sub>TX</sub> > 6 dBi, then P <sub>Out</sub> = 24 - (G <sub>TX</sub> - 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 $P_{Out} = 30 - (G_{TX} - 6)$ .
	<ul> <li>Point-to-point systems (P2P): the maximum conducted output power (P<sub>Out</sub>) shall not exceed the lesser of 1 W.</li> </ul>
LE-	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:
	<ul> <li>Point-to-multipoint systems (P2M): the maximum conducted output power (P<sub>Out</sub>) shall not exceed the lesser of 1 W. If G<sub>TX</sub> &gt; 6 dBi, then P<sub>Out</sub> = 30 - (G<sub>TX</sub> - 6).</li> </ul>
	<ul> <li>Point-to-point systems (P2P): the maximum conducted output power (P<sub>Out</sub>) shall not exceed the lesser of 1 W.</li> </ul>
	= maximum conducted output power in dBm, = the maximum transmitting antenna directional gain in dBi.

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## 3.3.2 Measuring Instruments

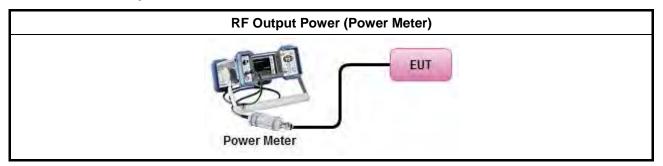
Refer a test equipment and calibration data table in this test report.

#### 3.3.3 Test Procedures

	Test Method					
•	Maximum Conducted Output Power					
	Average over on/off periods with duty factor					
	Refer as FCC KDB 789033, clause E Method SA-2 (spectral trace averaging).					
	Refer as FCC KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)					
	Wideband RF power meter and average over on/off periods with duty factor					
	Refer as FCC KDB 789033, clause E Method PM-G (using an RF average power meter).					
•	For conducted measurement.					
	■ If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.					
	<ul> <li>If multiple transmit chains, EIRP calculation could be following as methods:</li> <li>P<sub>total</sub> = P<sub>1</sub> + P<sub>2</sub> + + P<sub>n</sub></li> <li>(calculated in linear unit [mW] and transfer to log unit [dBm])</li> <li>EIRP<sub>total</sub> = P<sub>total</sub> + DG</li> </ul>					

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### 3.3.4 Test Setup



## 3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

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# 3.4 Peak Power Spectral Density

## 3.4.1 Peak Power Spectral Density Limit

	Peak Power Spectral Density Limit						
UNI	UNII Devices						
$\boxtimes$	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 17dBm/MHz. If $G_{TX} > 23$ dBi, then $P_{Out} = 17 - (G_{TX} - 23)$ .						
	■ Mobile or Portable Client: the peak power spectral density (PPSD) $\leq$ 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 $-$ ( $G_{TX} - 6$ ).						
$\boxtimes$	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= $30 - (G_{TX} - 6)$ .						
	<ul> <li>Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz.</li> </ul>						
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.						
	<ul> <li>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:</li> <li>-13 dBW/MHz for 0° ≤ θ &lt; 8°; -13 − 0.716 (θ-8) dBW/MHz for 8° ≤ θ &lt; 40°</li> <li>-35.9 − 1.22 (θ-40) dBW/MHz for 40° ≤ θ ≤ 45°; -42 dBW/MHz for θ &gt; 45°</li> </ul>						
	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= $30 - (G_{TX} - 6)$ .						
	<ul> <li>Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz.</li> </ul>						
pow	$\mathbf{SD}$ = peak power spectral density that he same method as used to determine the conducted output wer shall be used to determine the power spectral density. And power spectral density in dBm/MHz $_{c}$ = the maximum transmitting antenna directional gain in dBi.						

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## 3.4.2 Measuring Instruments

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

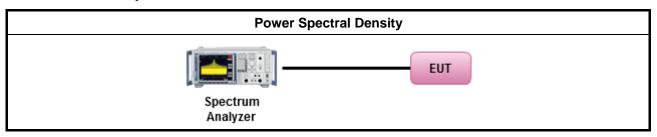
### 3.4.3 Test Procedures

		Test Method				
•	outp funct	s power spectral density procedures that the same method as used to determine the conducted out power shall be used to determine the peak power spectral density and use the peak search cion 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, F)5) power spectral density can be measured using resolution bandwidths < 1 MHz provided that the results are integrated over 1 MHz bandwidth					
	[duty	cycle ≥ 98% or external video / power trigger]				
	$\boxtimes$	Refer as FCC KDB 789033, clause E Method SA-1 (spectral trace averaging).				
		Refer as FCC KDB 789033, 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, clause E Method SA-2 (spectral trace averaging).				
		Refer as FCC KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)				
•	For o	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 $				

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## 3.4.4 Test Setup



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## 3.4.5 Test Result of Peak Power Spectral Density

Refer as Appendix D

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#### 3.5 Unwanted Emissions

#### 3.5.1 Transmitter Unwanted Emissions Limit

Unwanted emissions below 1 GHz and restricted band emissions above 1GHz limit						
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)			
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300			
0.490~1.705	24000/F(kHz)	33.8 - 23	30 30			
1.705~30.0	30	29				
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.			

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

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linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

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### 3.5.2 Measuring Instruments

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

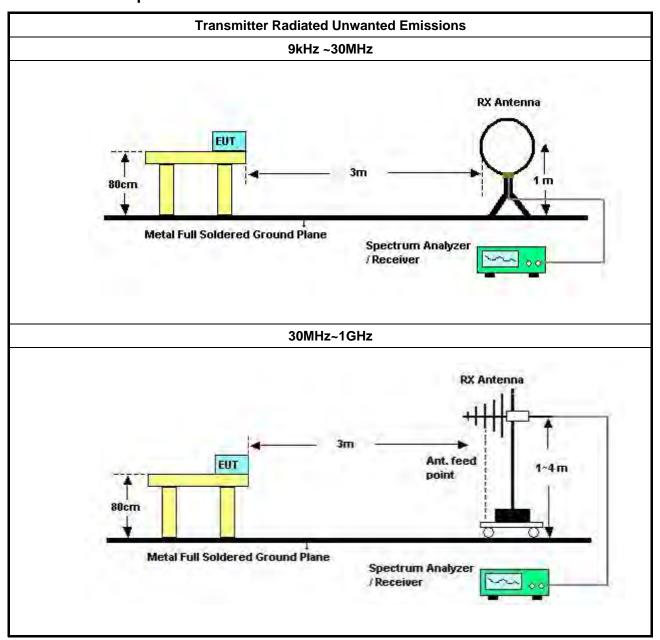
#### 3.5.3 Test Procedures

#### **Test Method**

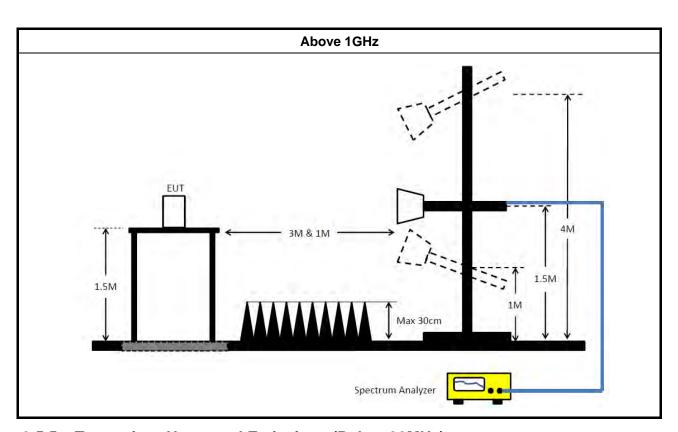
- Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
- The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
- For the transmitter unwanted emissions shall be measured using following options below:
  - Refer as FCC KDB 789033, 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.
  - 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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### 3.5.4 Test Setup



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## 3.5.5 Transmitter Unwanted Emissions (Below 30MHz)

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 10 harmonic or 40 GHz, whichever is appropriate.

## 3.5.6 Test Result of Transmitter Unwanted Emissions

Refer as Appendix E

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# 4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 28, 2019	Jan. 29, 2020	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16- 2	04083	150kHz ~ 100MHz	Dec. 24, 2018	Dec. 23, 2019	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Jan. 11, 2019	Jan. 10, 2020	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	150kHz ~ 30MHz	May 22, 2018	May 21, 2019	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 27, 2018	Aug. 26, 2019	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 13, 2018	Nov. 12, 2019	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2018	May 01, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 08, 2019	Jan. 07, 2020	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Jan. 31, 2019	Jan. 30, 2020	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS	100359	9kHz ~ 2.75GHz	Jul. 03, 2018	Jul. 02, 2019	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	101027	9kHz~40GHz	Jun. 22, 2018	Jun. 21, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)

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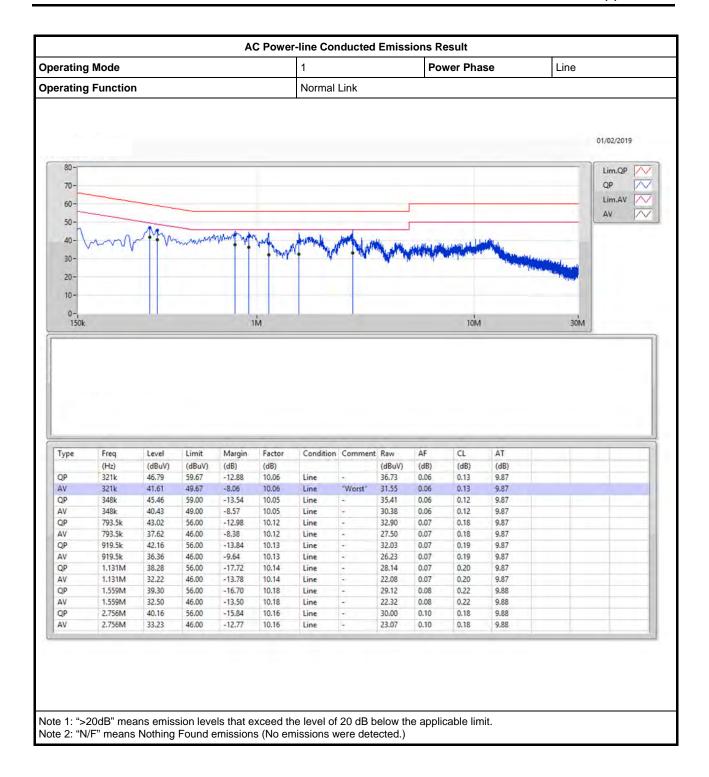
Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-28	1 GHz –26.5 GHz	Nov. 19, 2018	Nov. 18, 2019	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 05, 2018	Nov. 04, 2019	Conducted (TH01-CB)

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

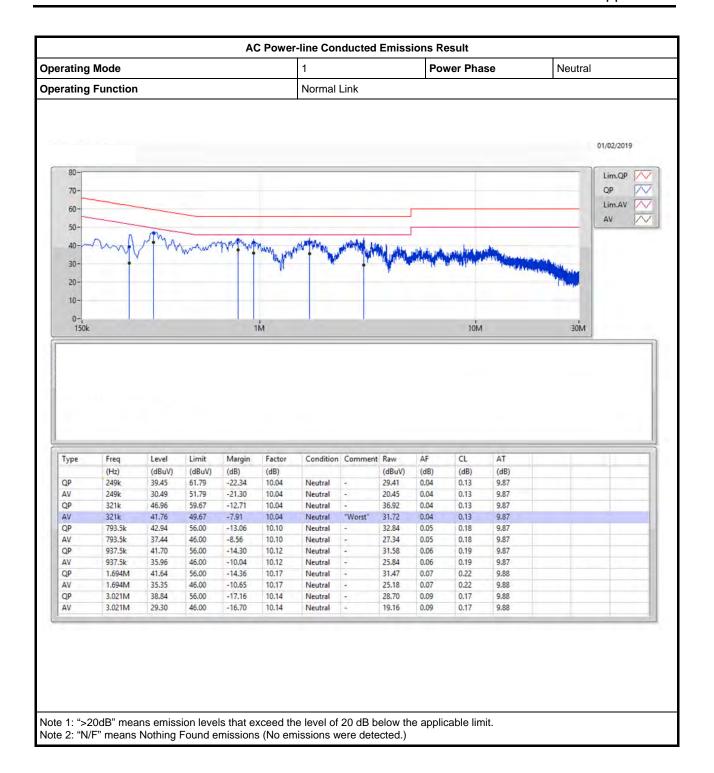
NCR means Non-Calibration required.

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## AC Power-line Conducted Emissions Result



## AC Power-line Conducted Emissions Result





Appendix B EBW Result

**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	20.45M	16.725M	16M7D1D	20.25M	16.65M
802.11ac VHT20_Nss1,(MCS0)_2TX	20.725M	17.825M	17M8D1D	20.4M	17.75M
802.11ac VHT40_Nss1,(MCS0)_2TX	41.45M	36.6M	36M6D1D	40.75M	36.5M
802.11ac VHT80_Nss1,(MCS0)_2TX	83M	75.8M	75M8D1D	82M	75.7M
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	20.775M	17.85M	17M8D1D	20.375M	17.75M
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	41.2M	36.6M	36M6D1D	40.85M	36.5M
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	82.5M	75.9M	75M9D1D	82.3M	75.8M
5.725-5.85GHz	-	-	-	-	-
802.11a_Nss1,(6Mbps)_2TX	16.325M	17.325M	17M3D1D	15.9M	16.925M
802.11ac VHT20_Nss1,(MCS0)_2TX	17.575M	18.175M	18M2D1D	17.525M	18.025M
802.11ac VHT40_Nss1,(MCS0)_2TX	36.25M	37.15M	37M1D1D	36.05M	36.9M
802.11ac VHT80_Nss1,(MCS0)_2TX	75.3M	75.9M	75M9D1D	75.1M	75.8M
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	17.575M	18.2M	18M2D1D	16.875M	17.75M
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	36.3M	37.15M	37M1D1D	35.95M	36.8M
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	75.5M	75.8M	75M8D1D	75.1M	75.8M

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

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EBW Result Appendix B

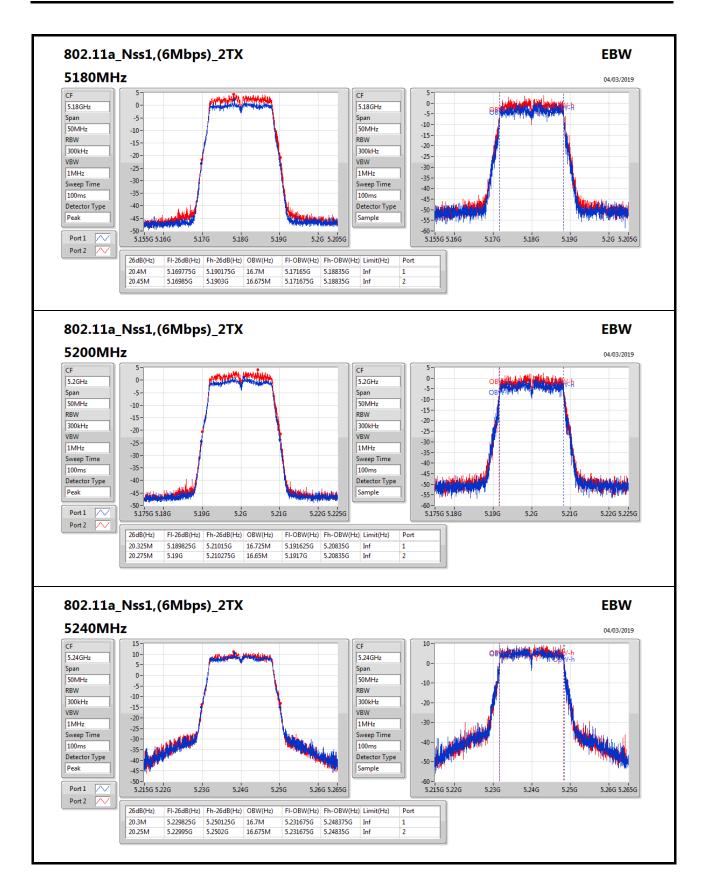
#### Result

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	20.4M	16.7M	20.45M	16.675M
5200MHz	Pass	Inf	20.325M	16.725M	20.275M	16.65M
5240MHz	Pass	Inf	20.3M	16.7M	20.25M	16.675M
5745MHz	Pass	500k	16.3M	16.925M	16.325M	16.975M
5785MHz	Pass	500k	15.9M	17.25M	16.325M	17.075M
5825MHz	Pass	500k	16.3M	17.3M	16.325M	17.325M
802.11ac VHT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	Inf	20.725M	17.825M	20.475M	17.8M
5200MHz	Pass	Inf	20.675M	17.825M	20.4M	17.8M
5240MHz	Pass	Inf	20.675M	17.75M	20.5M	17.8M
5745MHz	Pass	500k	17.55M	18.025M	17.575M	18.05M
5785MHz	Pass	500k	17.525M	18.1M	17.55M	18.075M
5825MHz	Pass	500k	17.525M	18.175M	17.575M	18.15M
802.11ac VHT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5190MHz	Pass	Inf	41.2M	36.5M	40.75M	36.55M
5230MHz	Pass	Inf	41.45M	36.55M	40.9M	36.6M
5755MHz	Pass	500k	36.25M	37.1M	36.25M	36.9M
5795MHz	Pass	500k	36.05M	37.15M	36.1M	37M
802.11ac VHT80_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	Inf	83M	75.7M	82M	75.8M
5775MHz	Pass	500k	75.3M	75.8M	75.1M	75.9M
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	Inf	20.675M	17.75M	20.375M	17.75M
5200MHz	Pass	Inf	20.75M	17.85M	20.475M	17.775M
5240MHz	Pass	Inf	20.775M	17.8M	20.475M	17.8M
5745MHz	Pass	500k	17.55M	17.75M	17.575M	17.775M
5785MHz	Pass	500k	16.875M	18.2M	17.575M	18.15M
5825MHz	Pass	500k	17.55M	18.175M	17.575M	18.2M
802.11ac VHT40-BF_Nss1,(MCS0)_2TX		-	=	=	-	=
5190MHz	Pass	Inf	41.15M	36.6M	40.85M	36.5M
5230MHz	Pass	Inf	41.2M	36.55M	40.9M	36.6M
5755MHz	Pass	500k	36.05M	37.05M	36.3M	36.8M
5795MHz	Pass	500k	36.15M	37.15M	35.95M	36.85M
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	Inf	82.3M	75.8M	82.5M	75.9M
5775MHz	Pass	500k	75.5M	75.8M	75.1M	75.8M

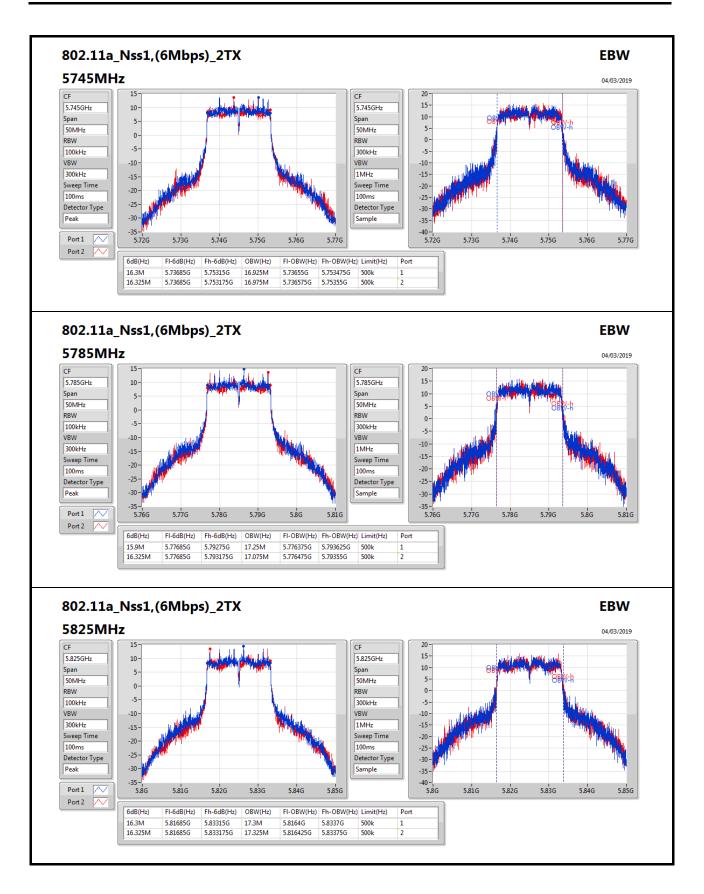
Port X-N dB = Port X 6dB down bandwidth for 5.725-5.85GHz band / 26dB down bandwidth for other band Port X-OBW = Port X 99% occupied bandwidth;

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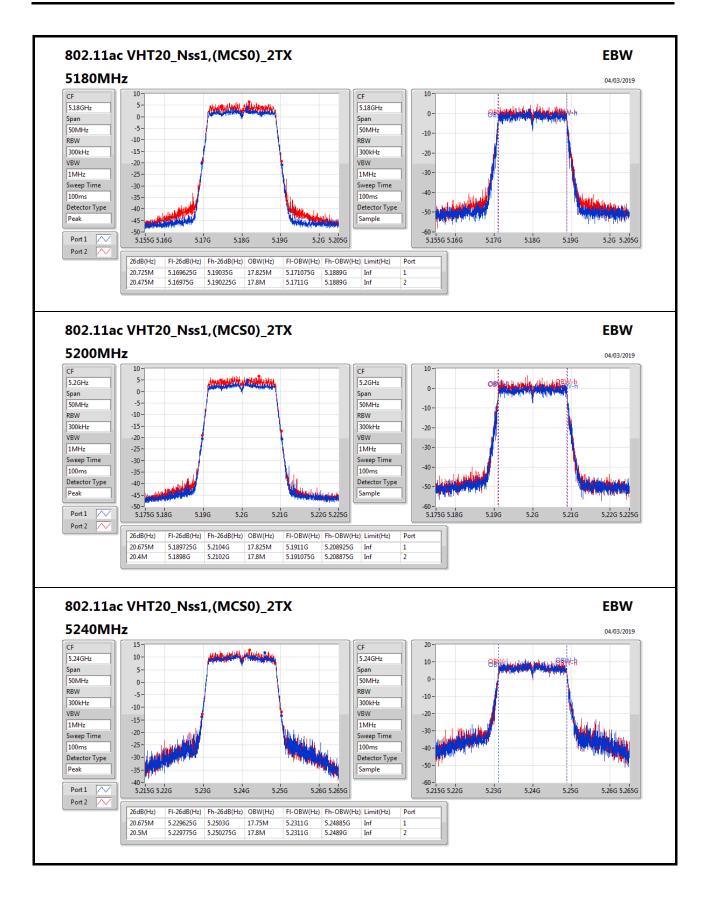




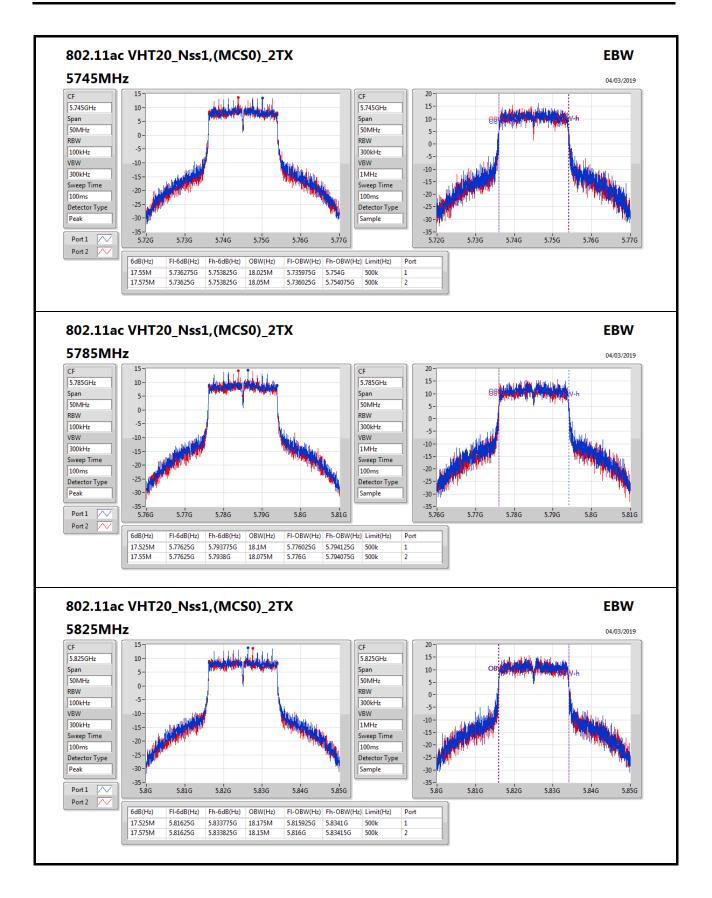




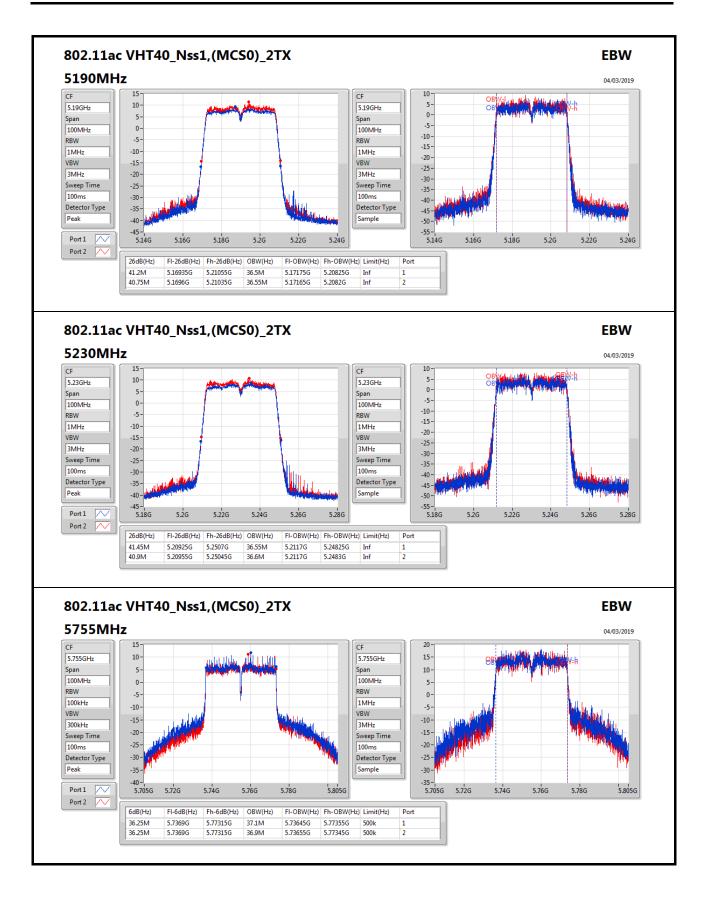




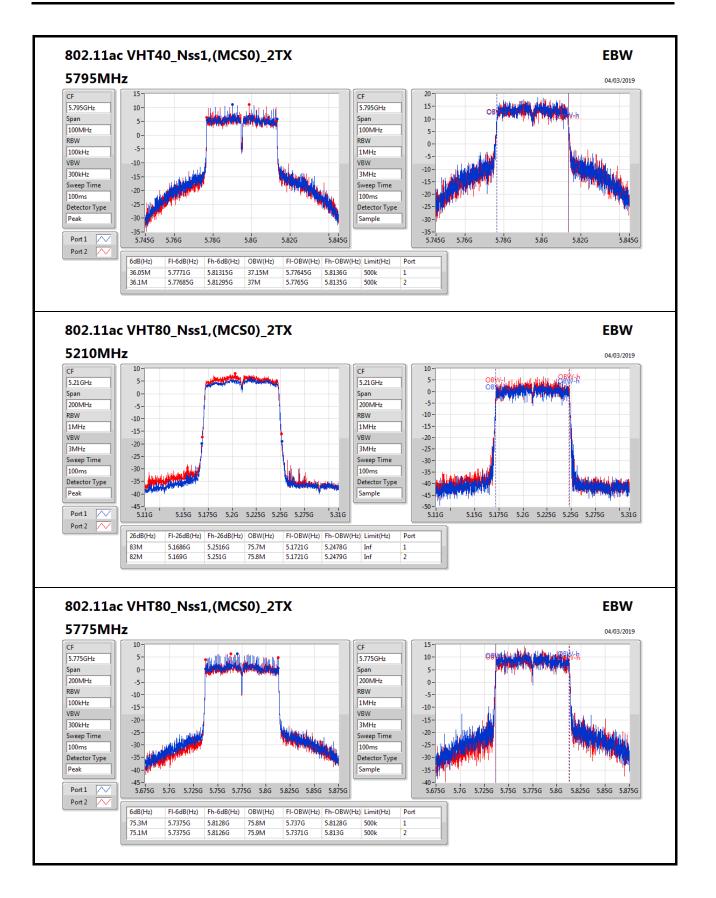




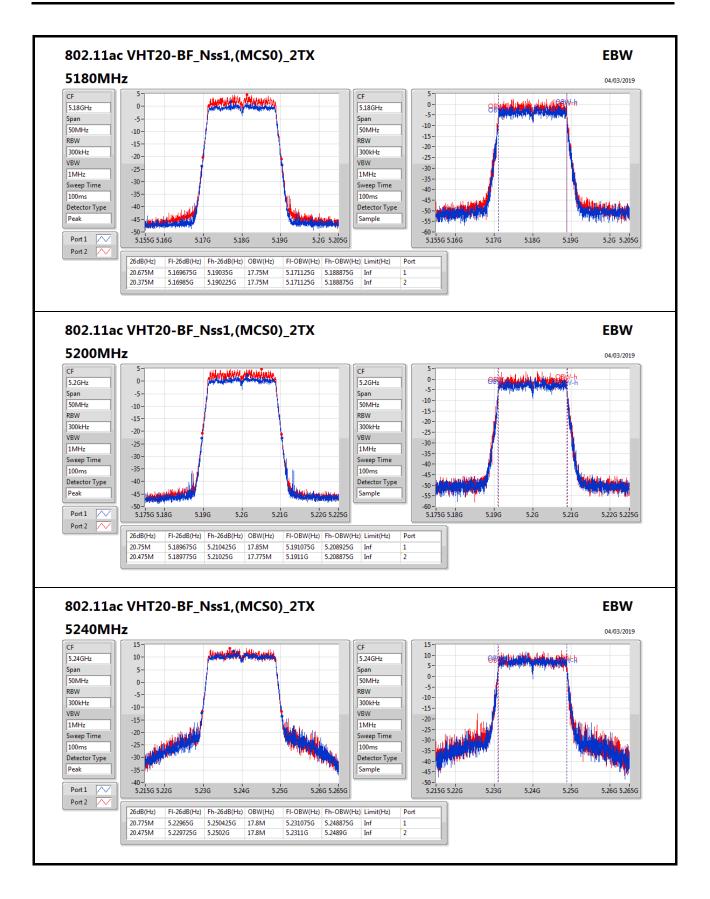




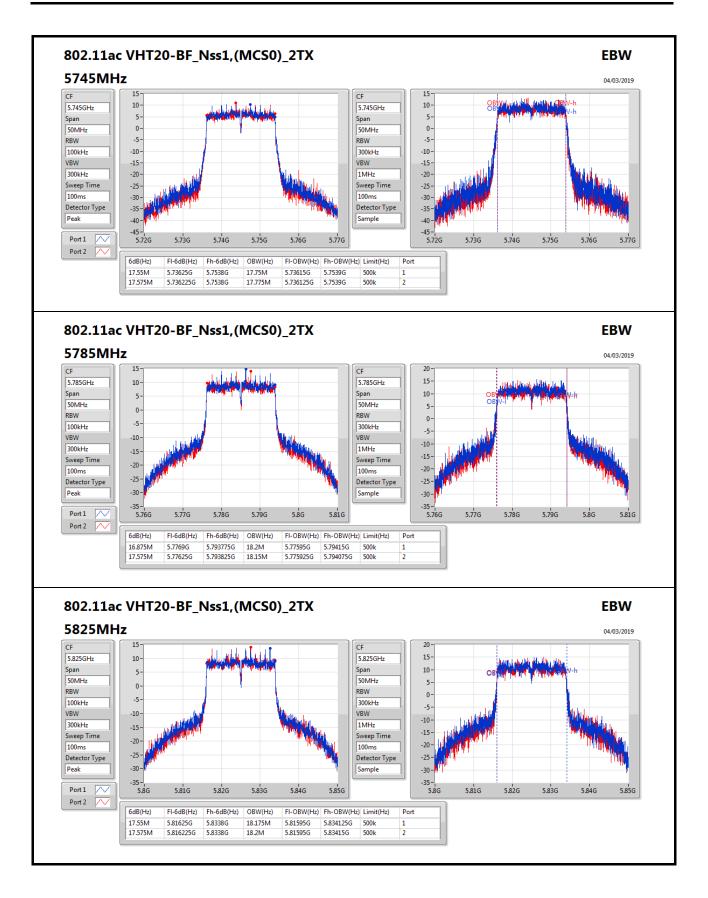




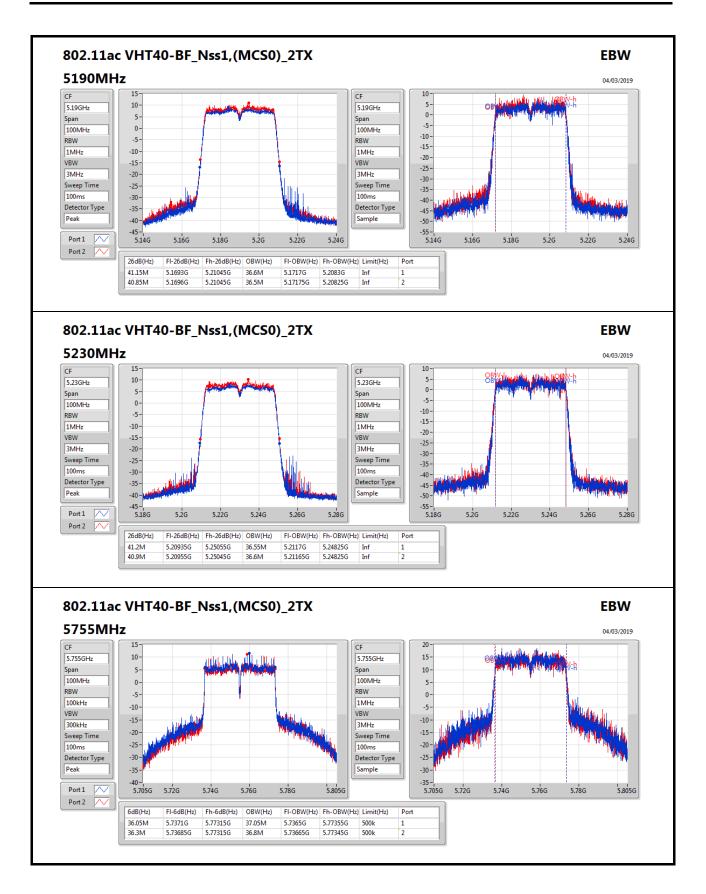


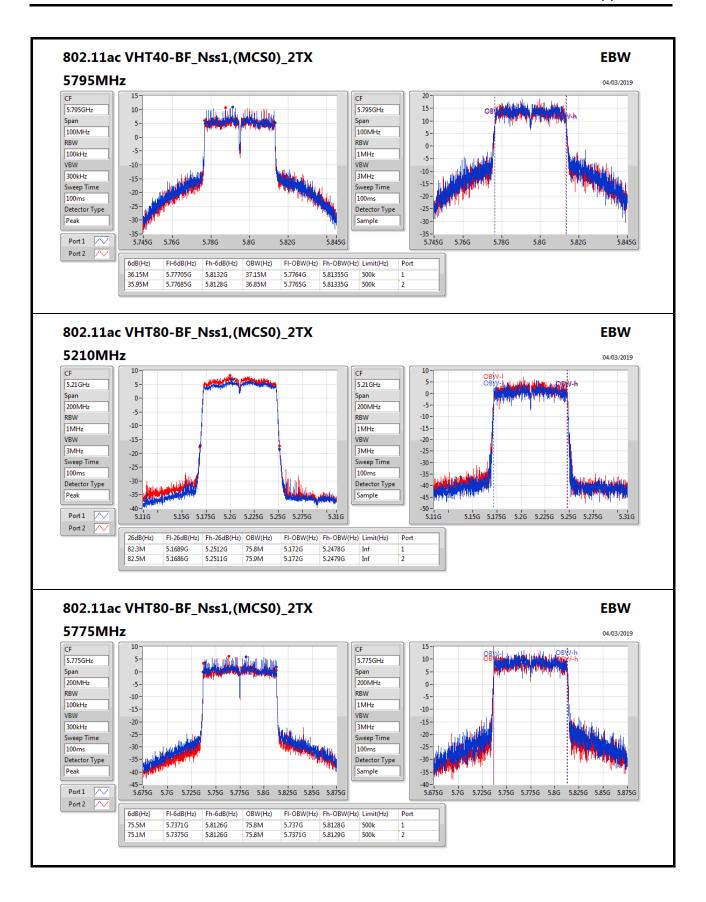














Power Result Appendix C

**Summary** 

Mode	Total Power	Total Power
	(dBm)	(W)
5.15-5.25GHz	-	-
802.11a_Nss1,(6Mbps)_2TX	22.08	0.16144
802.11ac VHT20_Nss1,(MCS0)_2TX	23.63	0.23067
802.11ac VHT40_Nss1,(MCS0)_2TX	18.24	0.06668
802.11ac VHT80_Nss1,(MCS0)_2TX	18.60	0.07244
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	24.69	0.29444
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	17.79	0.06012
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	19.07	0.08072
5.725-5.85GHz	-	-
802.11a_Nss1,(6Mbps)_2TX	28.26	0.66988
802.11ac VHT20_Nss1,(MCS0)_2TX	28.12	0.64863
802.11ac VHT40_Nss1,(MCS0)_2TX	28.04	0.63680
802.11ac VHT80_Nss1,(MCS0)_2TX	26.06	0.40365
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	28.09	0.64417
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	28.12	0.64863
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	25.72	0.37325

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Power Result Appendix C

#### Result

Mode	Result	DG	Port 1	Port 2	Total Power Powe		
		(dBi)	(dBm)	(dBm)	(dBm)	(dBm)	
802.11a_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	
5180MHz	Pass	3.00	10.91	12.53	14.81	30.00	
5200MHz	Pass	3.00	10.34	12.15	14.35	30.00	
5240MHz	Pass	3.00	19.41	19.48	22.46	30.00	
5745MHz	Pass	3.00	24.8	24.71	27.77	30.00	
5785MHz	Pass	3.00	25.33	25.17	28.26	30.00	
5825MHz	Pass	3.00	25.17	25.00	28.10	30.00	
802.11ac VHT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5180MHz	Pass	3.00	13.01	13.98	16.53	30.00	
5200MHz	Pass	3.00	13.66	14.83	17.29	30.00	
5240MHz	Pass	3.00	20.24	20.96	23.63	30.00	
5745MHz	Pass	3.00	25.28	24.93	28.12	30.00	
5785MHz	Pass	3.00	25.67	24.35	28.07	30.00	
5825MHz	Pass	3.00	25.49	24.22	27.91	30.00	
802.11ac VHT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5190MHz	Pass	3.00	14.79	15.04	17.93	30.00	
5230MHz	Pass	3.00	15.05	15.41	18.24	30.00	
5755MHz	Pass	3.00	25.16	24.9	28.04	30.00	
5795MHz	Pass	3.00	24.93	24.62	27.79	30.00	
802.11ac VHT80_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5210MHz	Pass	3.00	15.12	16.01	18.60	30.00	
5775MHz	Pass	3.00	23.85	22.06	26.06	30.00	
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5180MHz	Pass	6.01	10.02	12.54	14.47	29.99	
5200MHz	Pass	6.01	11.27	12.92	15.18	29.99	
5240MHz	Pass	6.01	21.59	21.76	24.69	29.99	
5745MHz	Pass	6.01	22.14	21.97	25.07	29.99	
5785MHz	Pass	6.01	25.49	24.45	28.01	29.99	
5825MHz	Pass	6.01	24.83	25.31	28.09	29.99	
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5190MHz	Pass	6.01	14.88	14.67	17.79	29.99	
5230MHz	Pass	6.01	14.18	14.83	17.53	29.99	
5755MHz	Pass	6.01	25.46	24.06	27.83	29.99	
5795MHz	Pass	6.01	25.21	25.00	28.12	29.99	
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5210MHz	Pass	6.01	15.18	16.79	19.07	29.99	
5775MHz	Pass	6.01	22.96	22.44	25.72	29.99	

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



PSD Result Appendix D

**Summary** 

Mode	PD
	(dBm/RBW)
5.15-5.25GHz	
802.11a_Nss1,(6Mbps)_2TX	8.49
802.11ac VHT20_Nss1,(MCS0)_2TX	9.86
802.11ac VHT40_Nss1,(MCS0)_2TX	1.32
802.11ac VHT80_Nss1,(MCS0)_2TX	-1.07
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	10.56
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	1.41
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	-0.50
5.725-5.85GHz	
802.11a_Nss1,(6Mbps)_2TX	11.75
802.11ac VHT20_Nss1,(MCS0)_2TX	11.41
802.11ac VHT40_Nss1,(MCS0)_2TX	8.52
802.11ac VHT80_Nss1,(MCS0)_2TX	3.86
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	11.56
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	8.56
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	3.51

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

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Appendix D **PSD Result** 

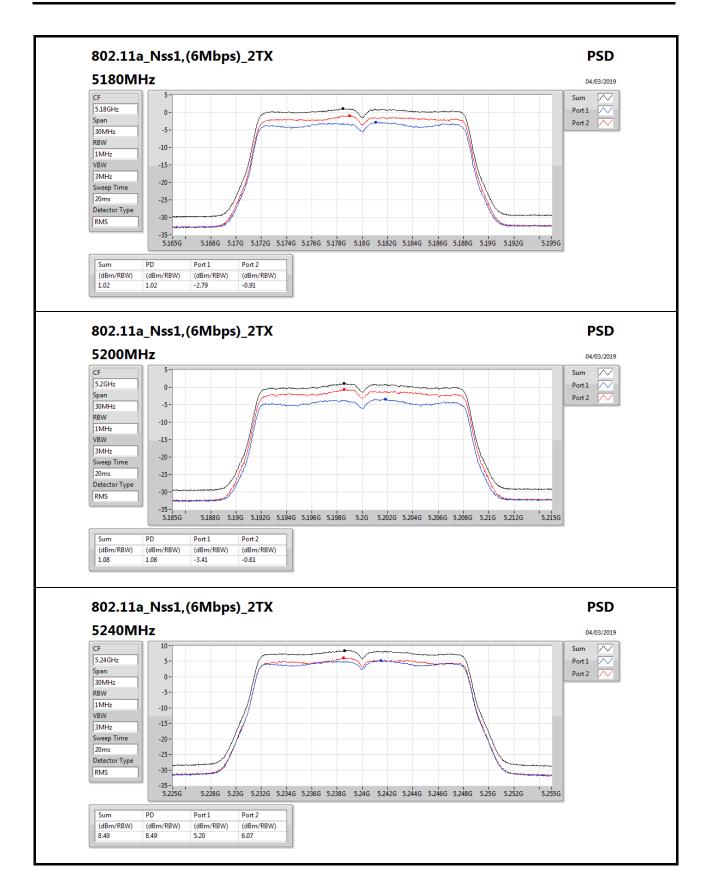
#### Result

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	6.01	-2.79	-0.91	1.02	16.99	
5200MHz	Pass	6.01	-3.41	-0.61	1.08	16.99	
5240MHz	Pass	6.01	5.20	6.07	8.49	16.99	
5745MHz	Pass	6.01	8.37	8.77	11.03	29.99	
5785MHz	Pass	6.01	9.29	9.05	11.61	29.99	
5825MHz	Pass	6.01	8.98	9.08	11.75	29.99	
802.11ac VHT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5180MHz	Pass	6.01	-1.21	0.21	2.48	16.99	
5200MHz	Pass	6.01	-0.76	0.77	2.98	16.99	
5240MHz	Pass	6.01	6.72	7.22	9.86	16.99	
5745MHz	Pass	6.01	8.50	8.78	11.20	29.99	
5785MHz	Pass	6.01	8.82	8.62	11.41	29.99	
5825MHz	Pass	6.01	8.41	8.08	11.00	29.99	
802.11ac VHT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5190MHz	Pass	6.01	-2.10	-1.01	1.32	16.99	
5230MHz	Pass	6.01	-2.56	-1.70	0.75	16.99	
5755MHz	Pass	6.01	6.05	5.78	8.52	29.99	
5795MHz	Pass	6.01	5.77	5.67	8.43	29.99	
802.11ac VHT80_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5210MHz	Pass	6.01	-4.39	-3.43	-1.07	16.99	
5775MHz	Pass	6.01	1.26	0.96	3.86	29.99	
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5180MHz	Pass	6.01	-3.35	-1.33	0.67	16.99	
5200MHz	Pass	6.01	-2.49	-0.81	1.32	16.99	
5240MHz	Pass	6.01	7.48	7.73	10.56	16.99	
5745MHz	Pass	6.01	6.43	6.32	8.94	29.99	
5785MHz	Pass	6.01	8.97	8.80	11.56	29.99	
5825MHz	Pass	6.01	8.68	8.70	11.52	29.99	
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5190MHz	Pass	6.01	-2.04	-0.95	1.41	16.99	
5230MHz	Pass	6.01	-2.49	-1.56	0.81	16.99	
5755MHz	Pass	6.01	6.02	5.78	8.56	29.99	
5795MHz	Pass	6.01	6.09	5.70	8.52	29.99	
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5210MHz	Pass	6.01	-3.89	-3.13	-0.50	16.99	
5775MHz	Pass	6.01	0.99	0.68	3.51	29.99	

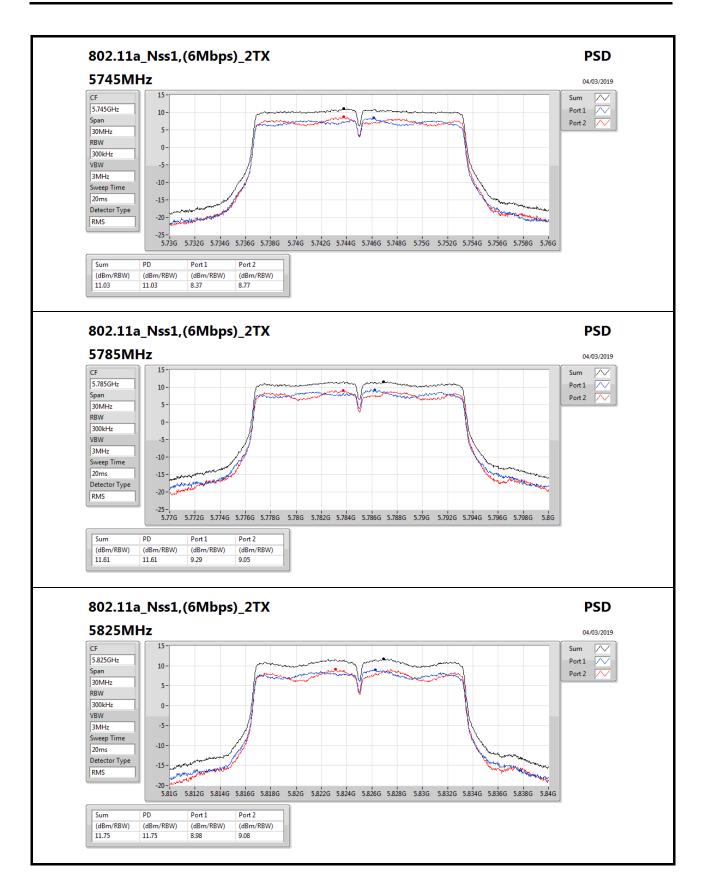
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DG = Directional Gain; RBW = 500kHz for 5.725-5.85GHz band / 1MHz for other band;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; Port X = Port Xpower density;

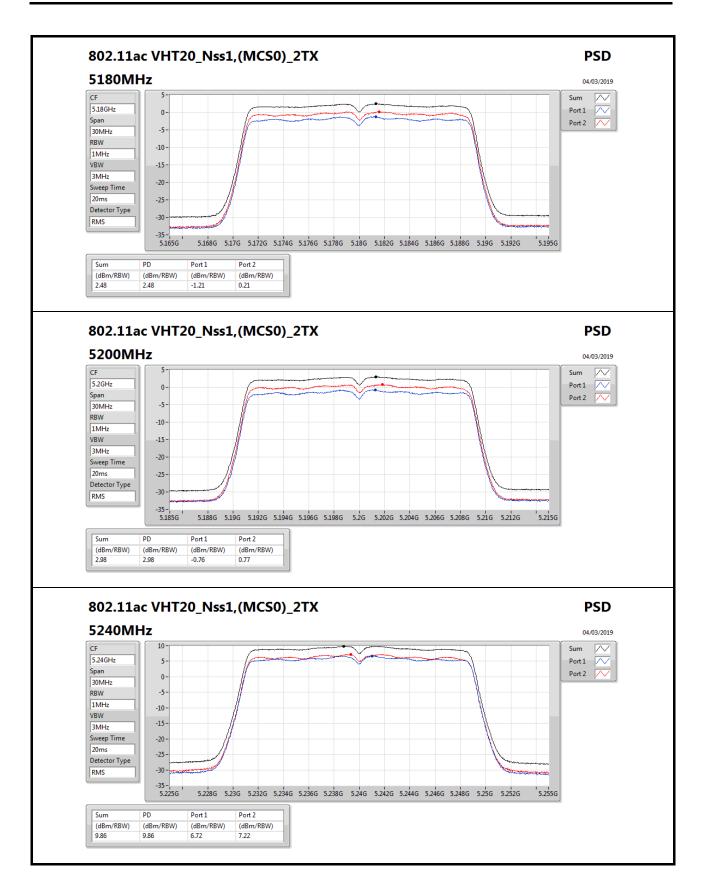




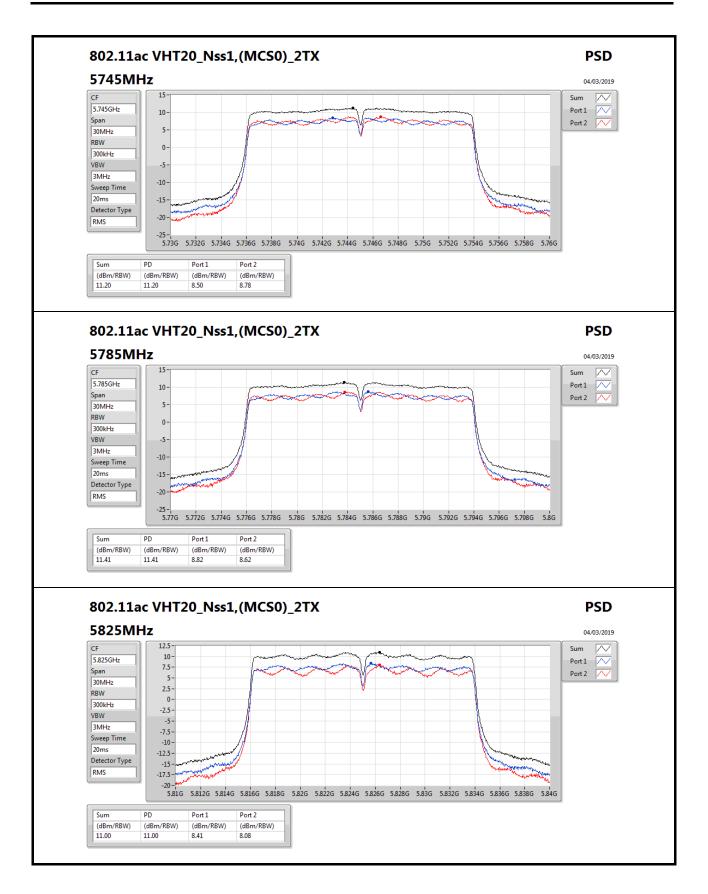




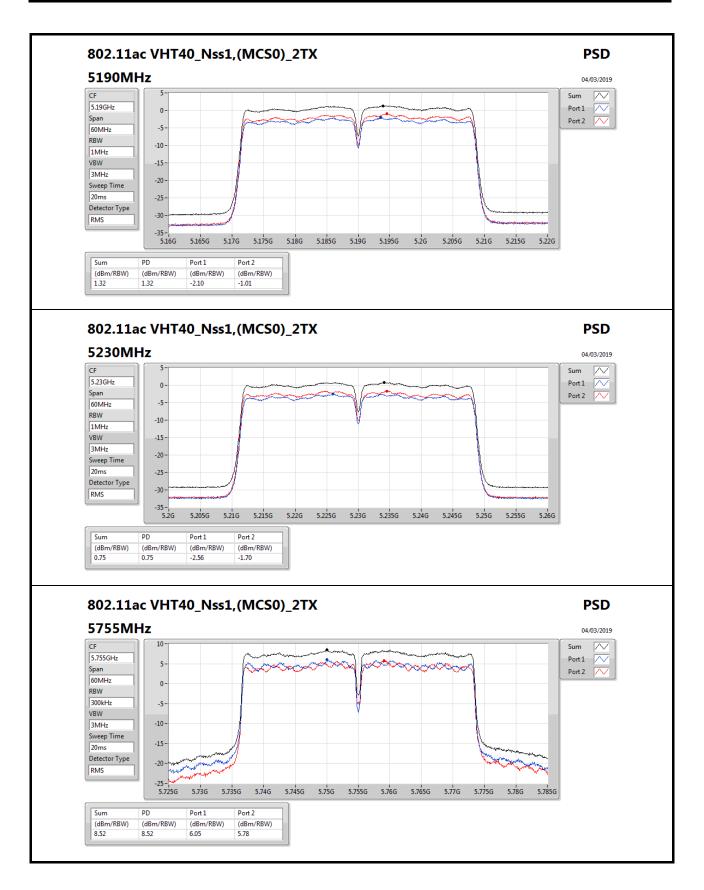




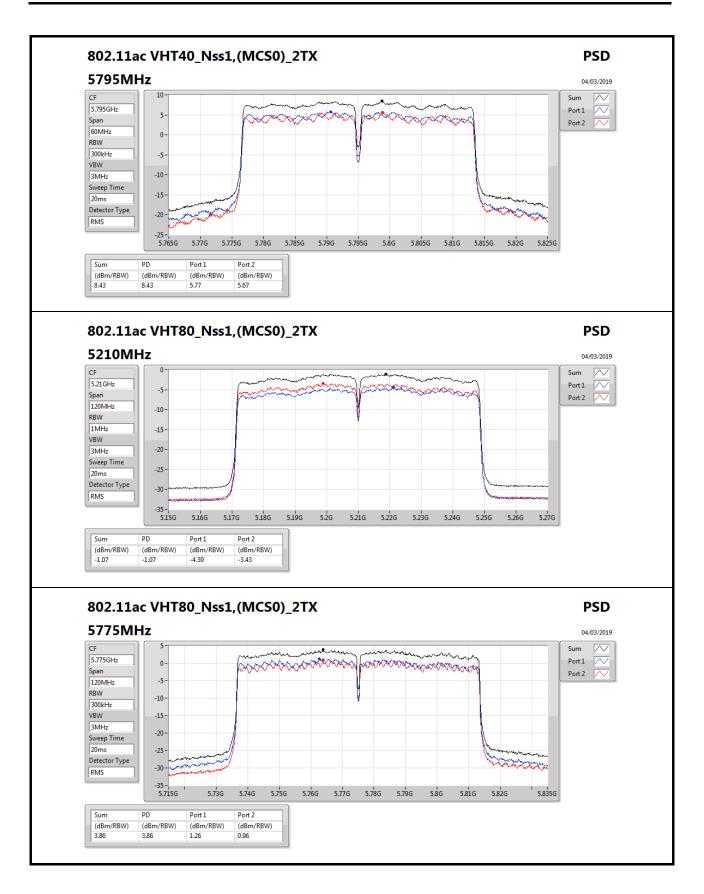






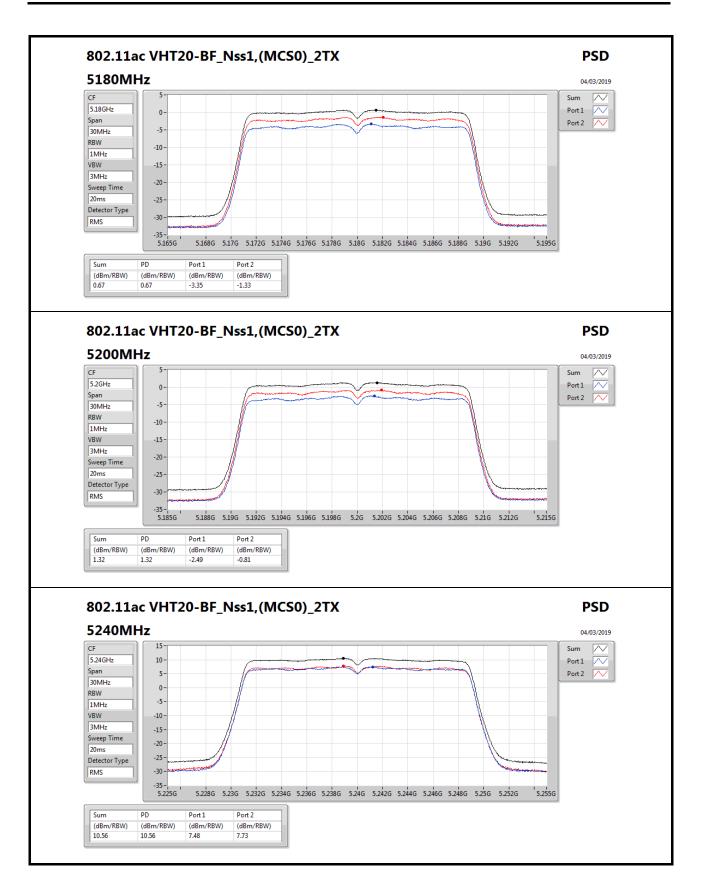




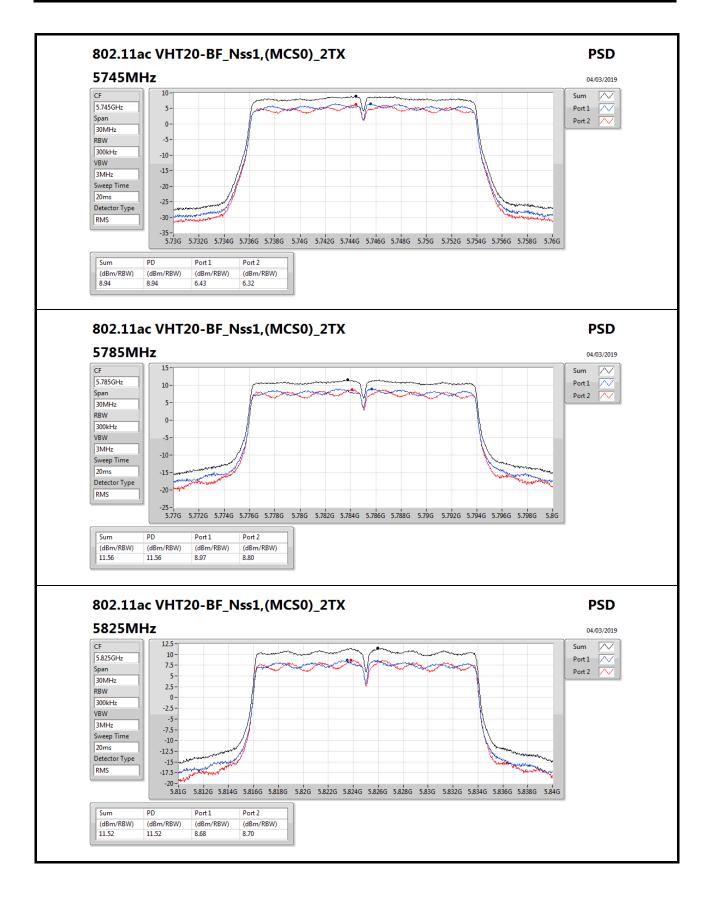








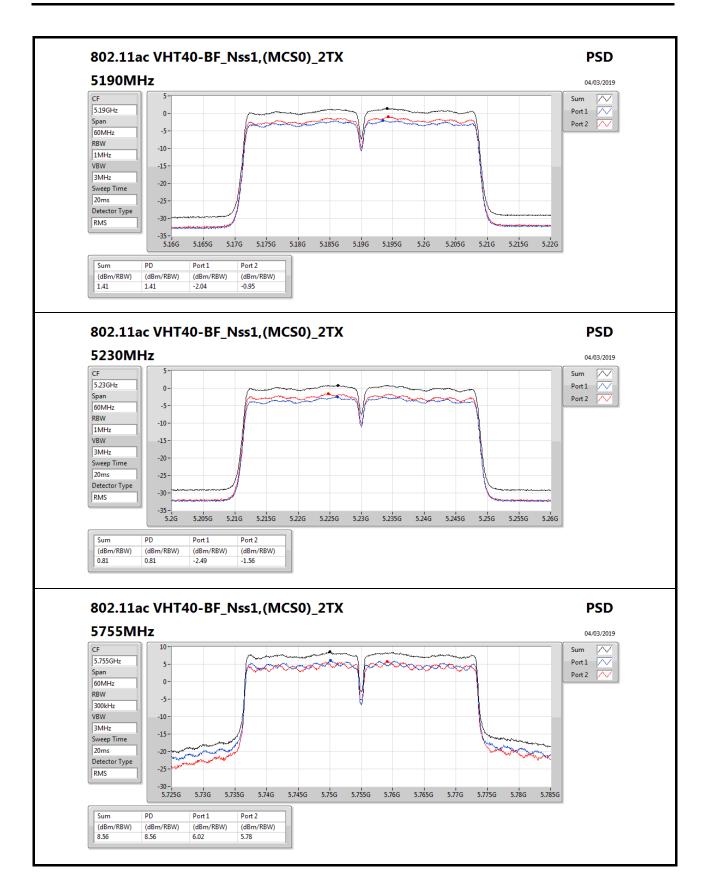




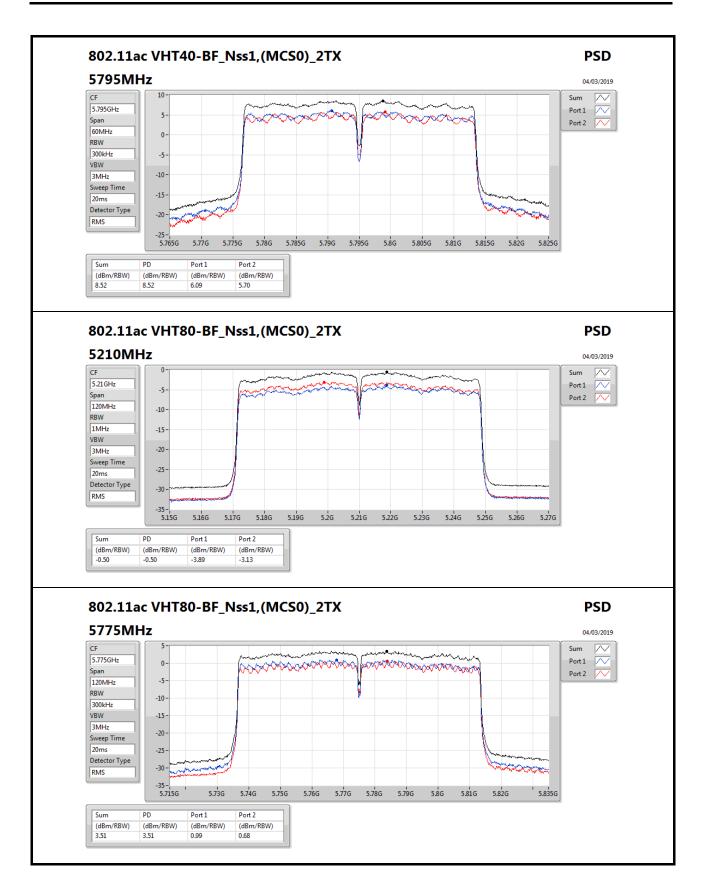
Appendix D

Appendix D







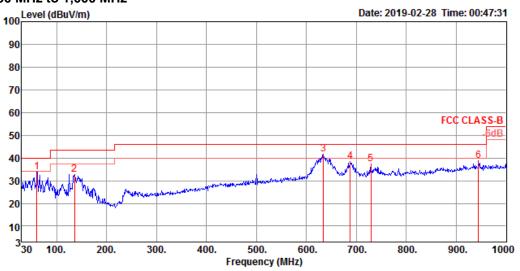




## Radiated Emission below 1GHz Result

30 MHz to 1,000 MHz **Test Mode** Mode 2 **Frequency Range** 

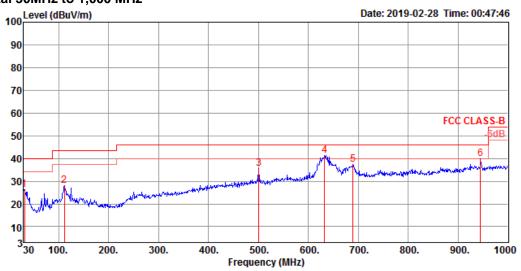
## Vertical 30 MHz to 1,000 MHz



			Limit	0ver	Read	CableA	ntenna	Preamp	A/Pos	T/Pos		
	Freq	Level	Line	Limit	Level	Loss	Factor	Factor			Remark	Pol/Phase
	MHZ	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	60.07	33.72	40.00	-6.28	53.02	1.12	12.16	32.58	100	188	Peak	VERTICAL
2	135.73	32.67	43.50	-10.83	45.91	1.85	17.43	32.52	100	214	Peak	VERTICAL
3	634.31	41.52	46.00	-4.48	44.52	4.90	24.62	32.52	125	85	Peak	VERTICAL
4	687.66	38.30	46.00	-7.70	40.85	5.21	24.74	32.50	100	136	Peak	VERTICAL
5	729.37	37.53	46.00	-8.47	39.60	5.30	25.09	32.46	125	124	Peak	VERTICAL
6	944.71	38.91	46.00	-7.09	37.61	6.29	26.41	31.40	100	55	Peak	VERTICAL



## Horizontal 30MHz to 1,000 MHz



	Freq	Level		Over Limit						1/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	31.94	26.38	40.00	-13.62	35.22	0.67	23.09	32.60	100	273	Peak	HORIZONTAL
2	111.48	27.92	43.50	-15.58	41.21	1.62	17.63	32.54	100	106	Peak	HORIZONTAL
3	500.45	35.46	46.00	-10.54	40.60	4.11	23.19	32.44	100	294	Peak	HORIZONTAL
4	632.37	41.43	46.00	-4.57	44.46	4.88	24.61	32.52	100	192	Peak	HORIZONTAL
5	689.60	37.21	46.00	-8.79	39.75	5.22	24.74	32.50	200	177	Peak	HORIZONTAL
6	944.71	39.82	46.00	-6.18	38.52	6.29	26.41	31.40	200	2	Peak	HORIZONTAL



# RSE TX above 1GHz Result

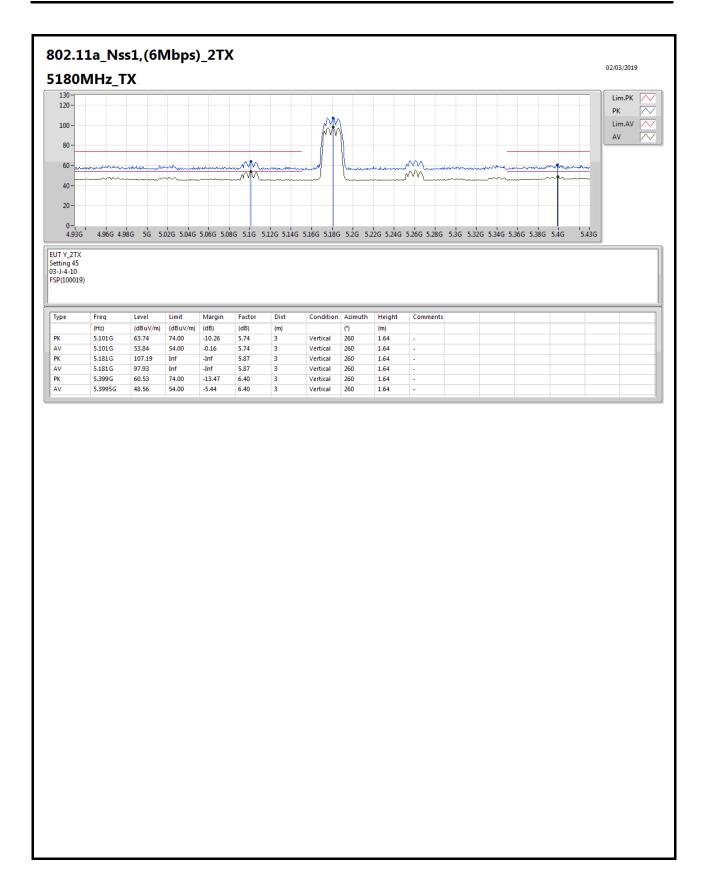
Appendix E.2

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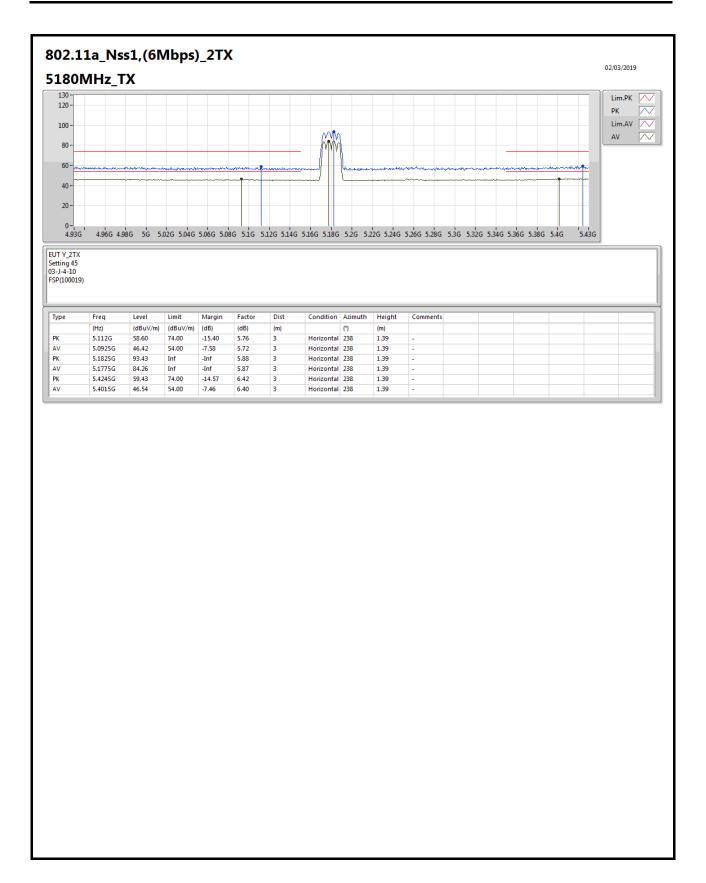
**Summary** 

Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth	Height (m)	Comments
5.725-5.85GHz	-	-	-	-	- (abaviii)	- -	-	-	-	-	-	-
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	Pass	PK	5.6585G	74.45	74.49	-0.04	6.36	3	Vertical	266	1.58	-

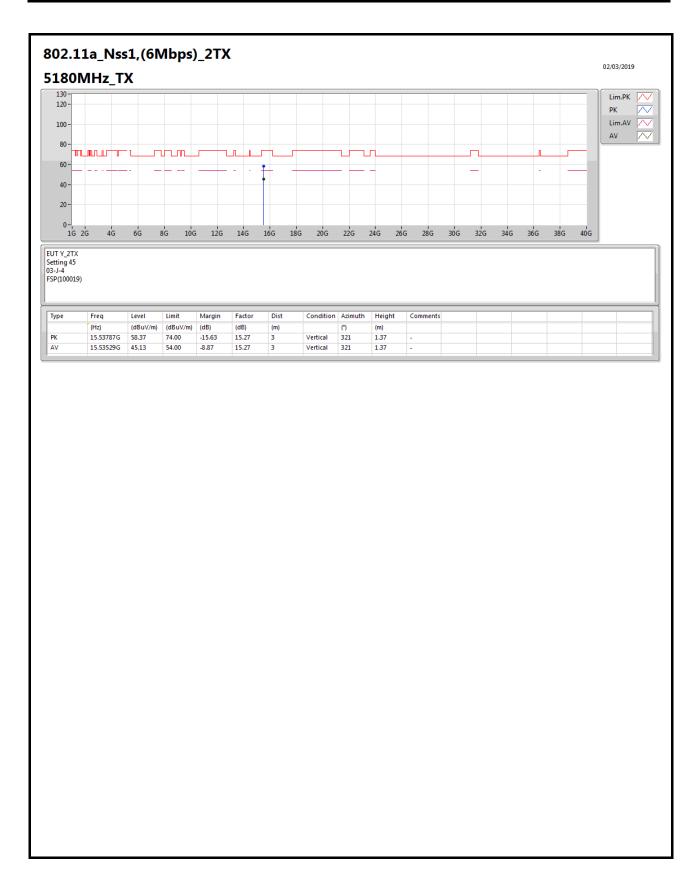




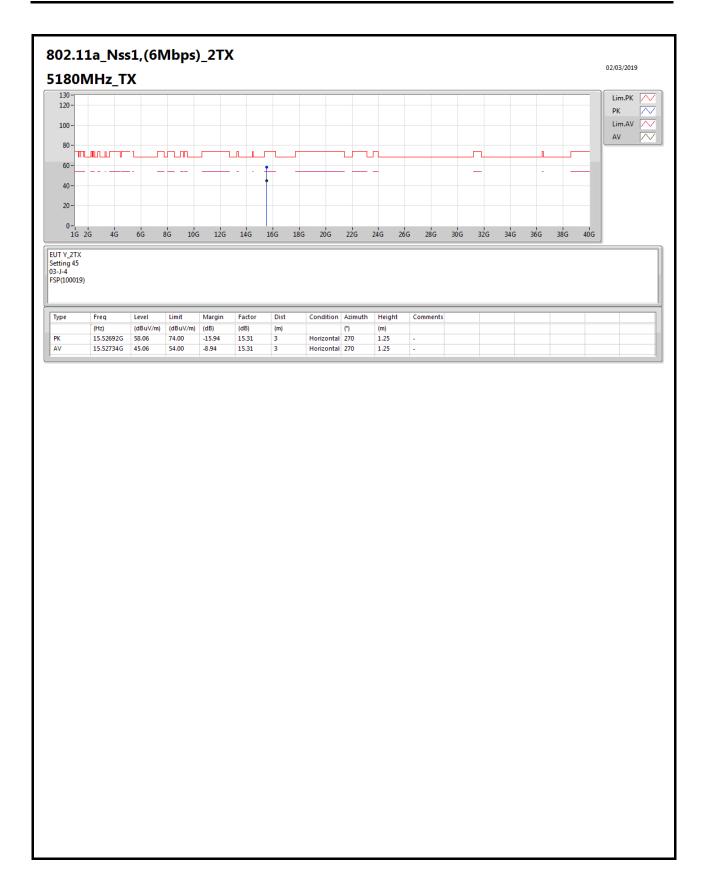






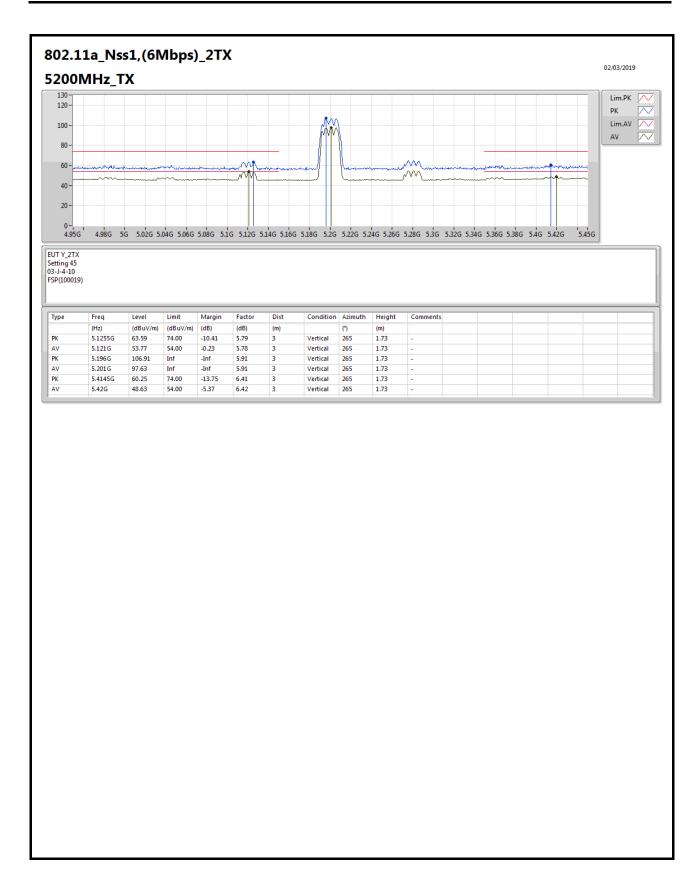




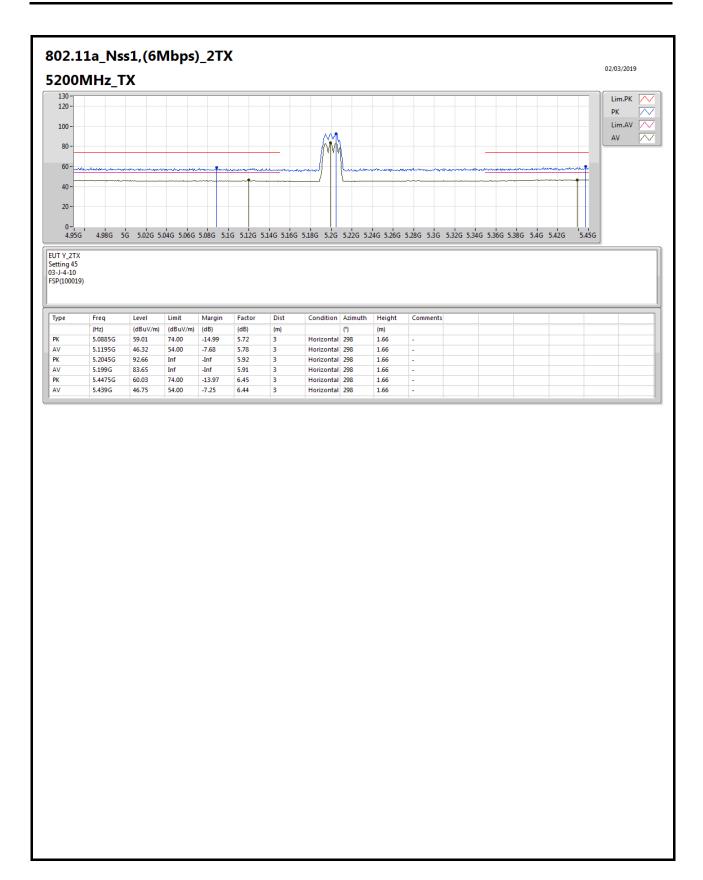


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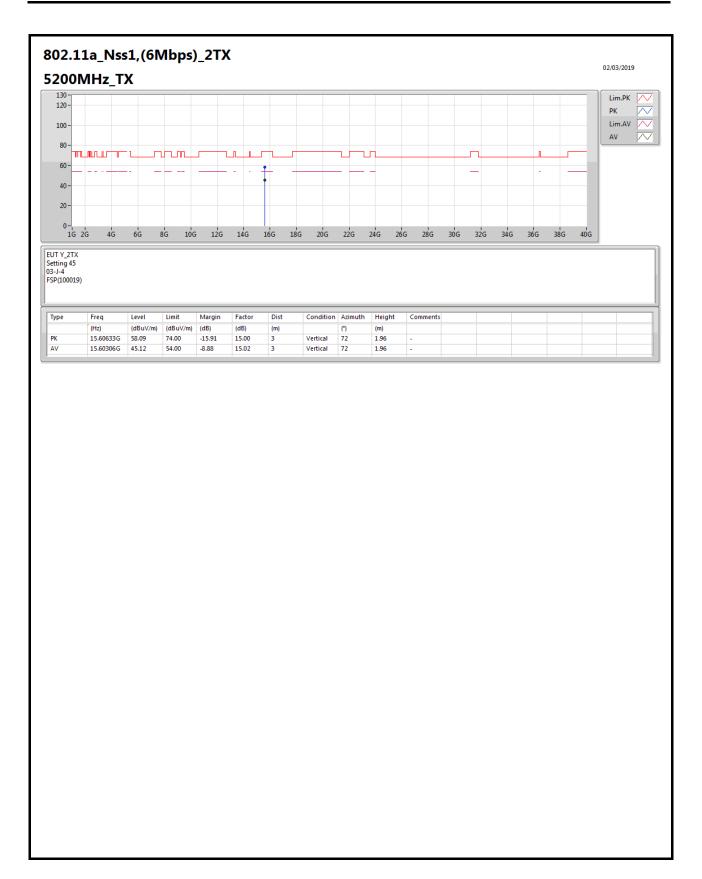






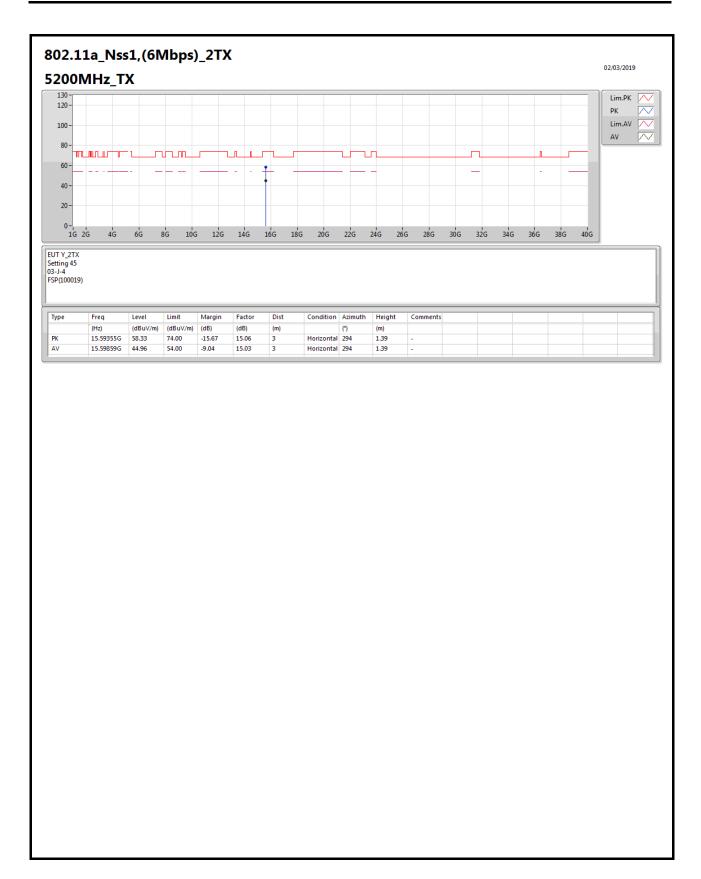
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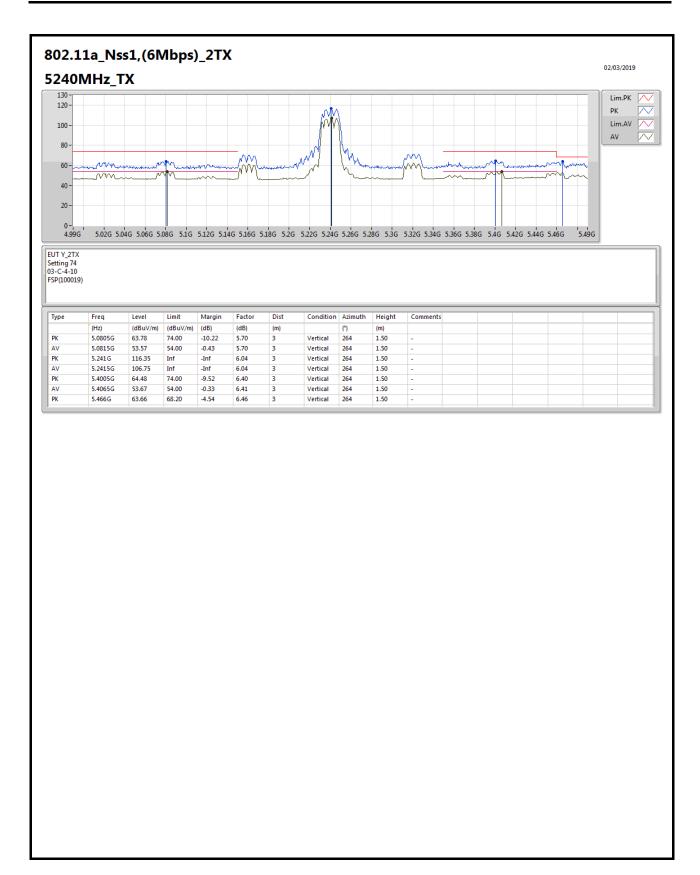
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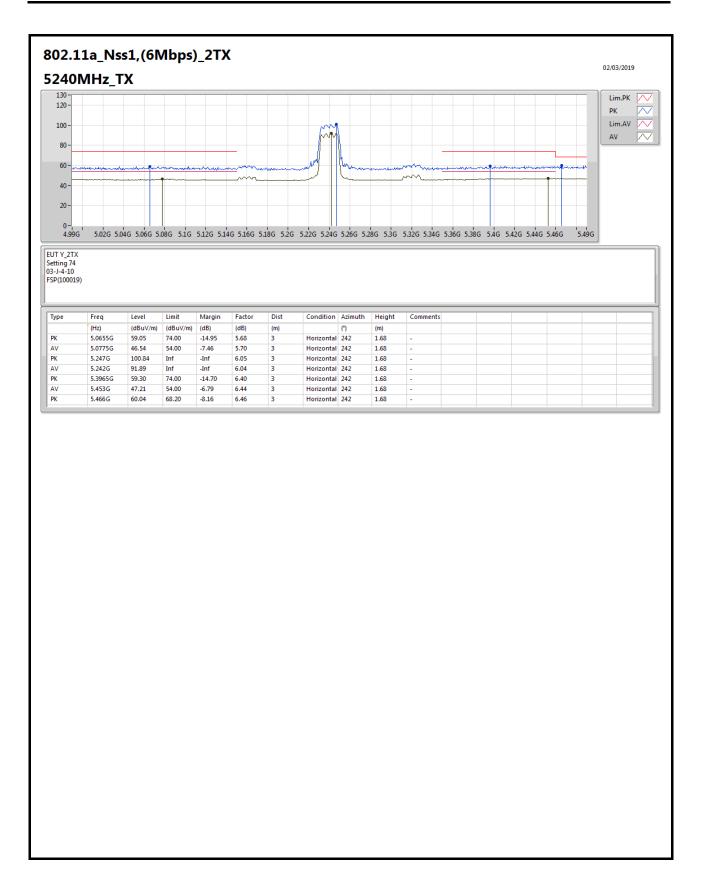
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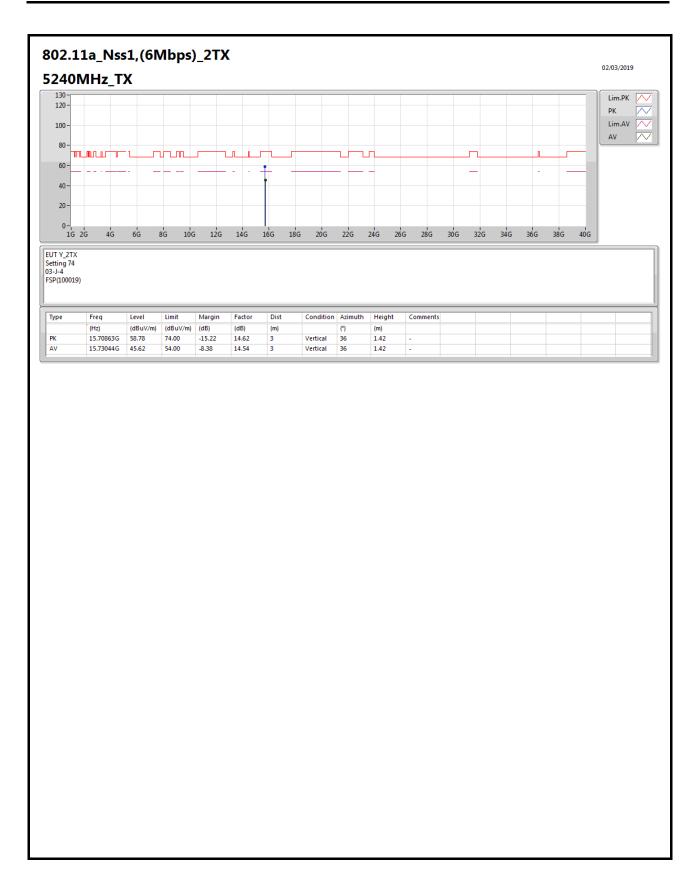
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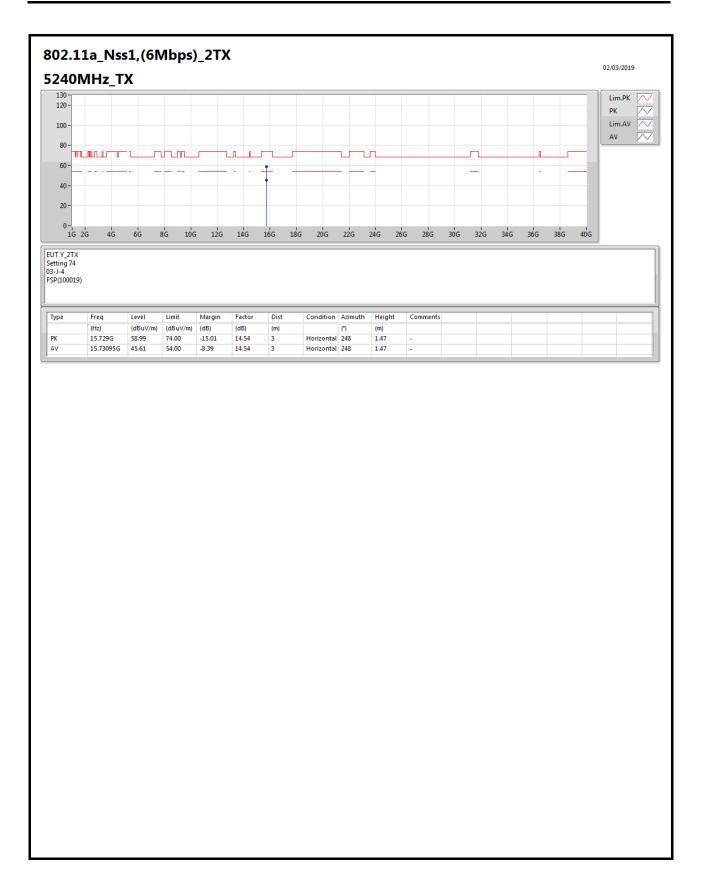
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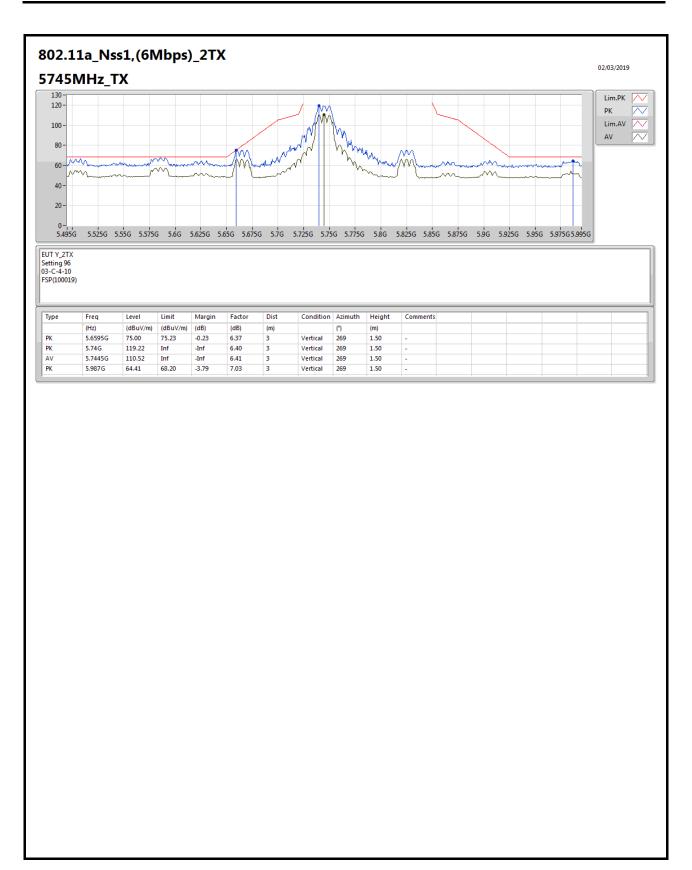
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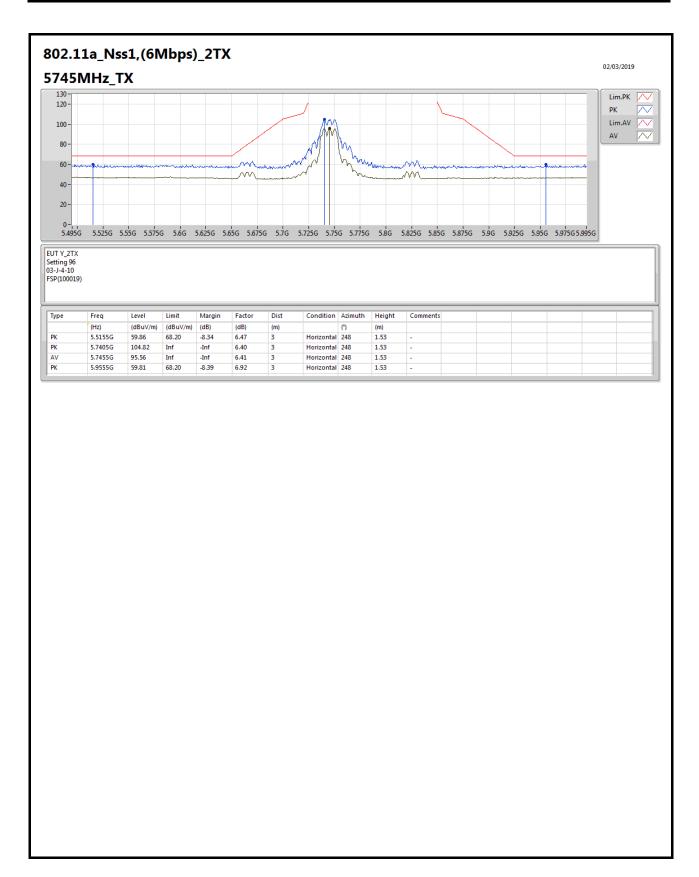
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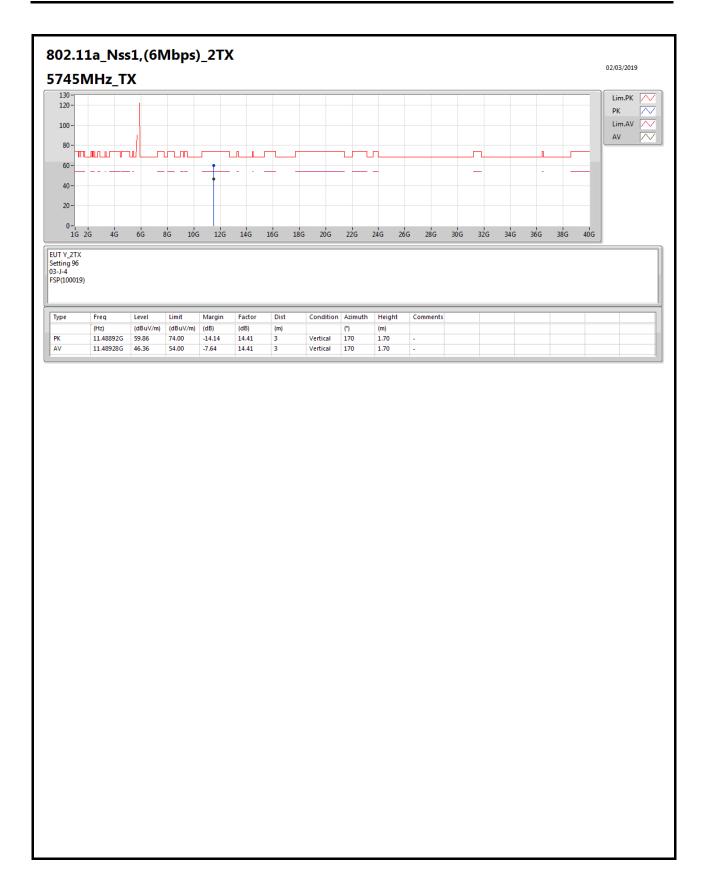
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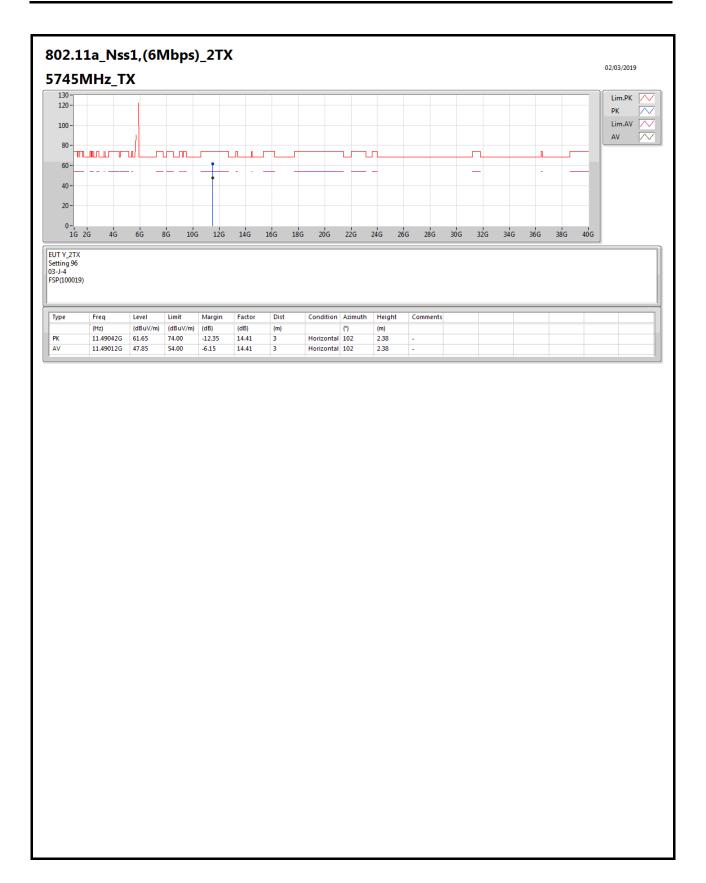
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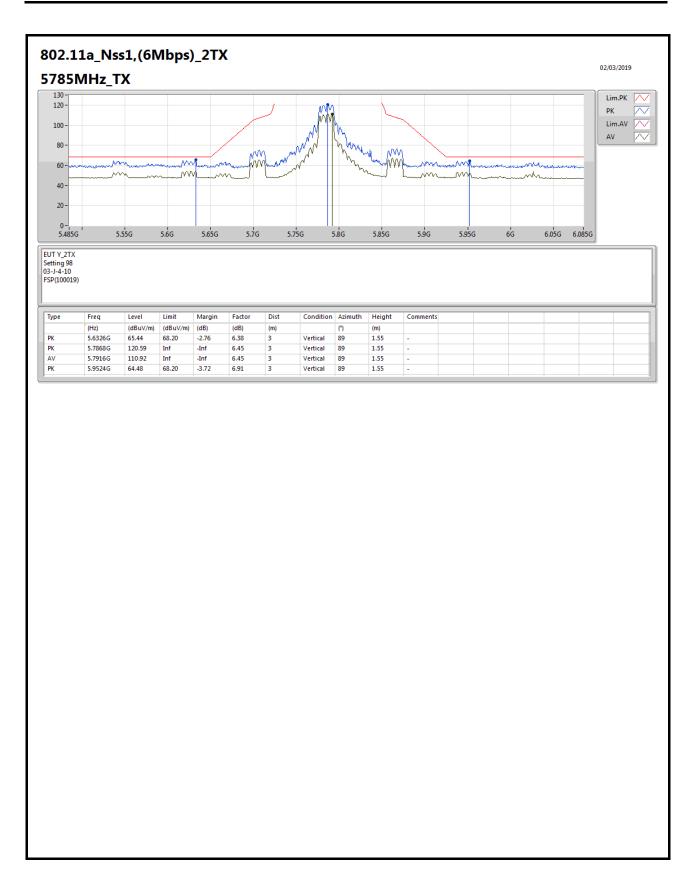
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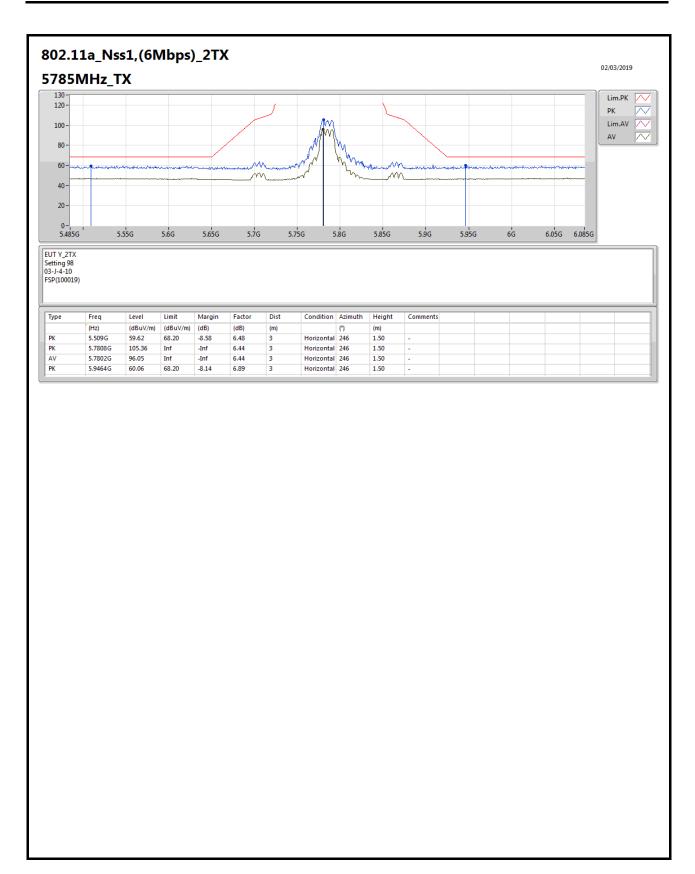
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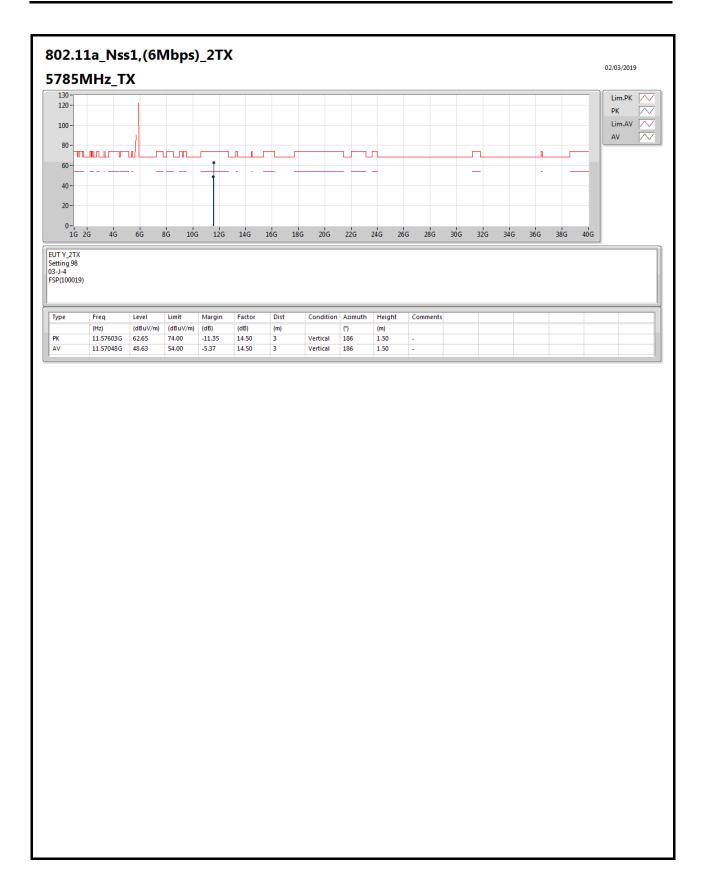
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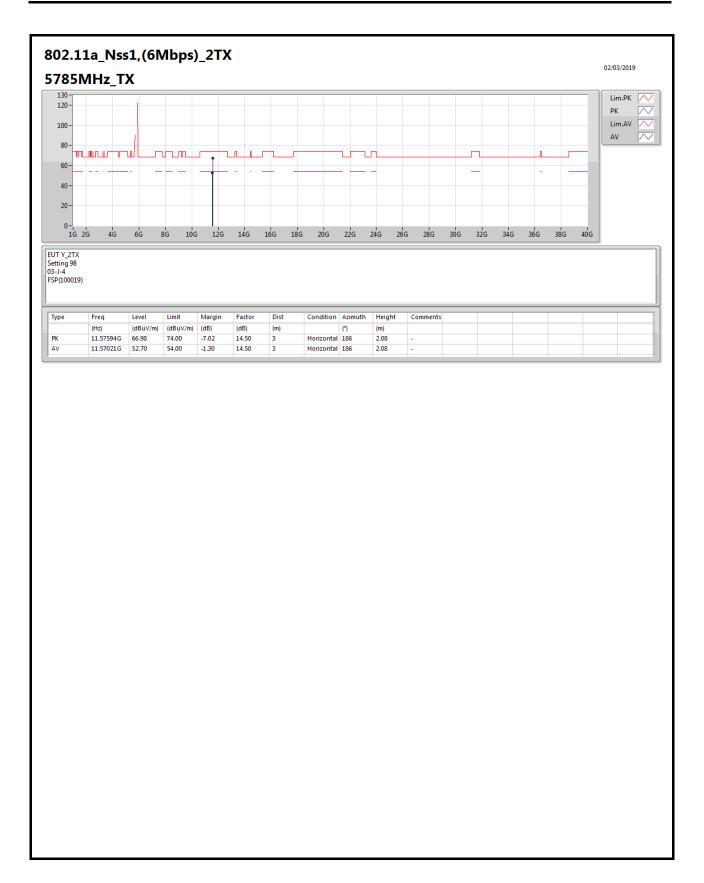
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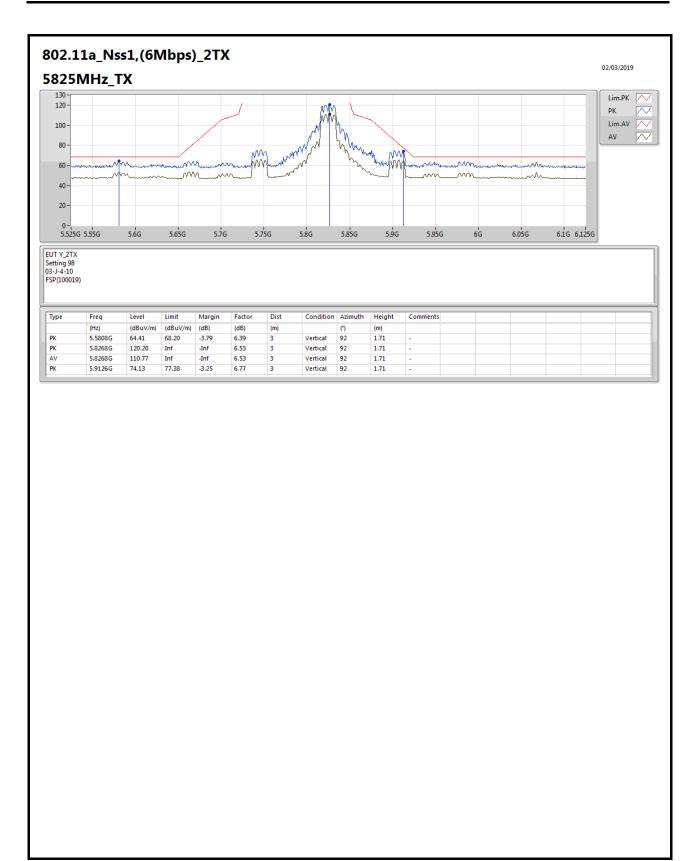
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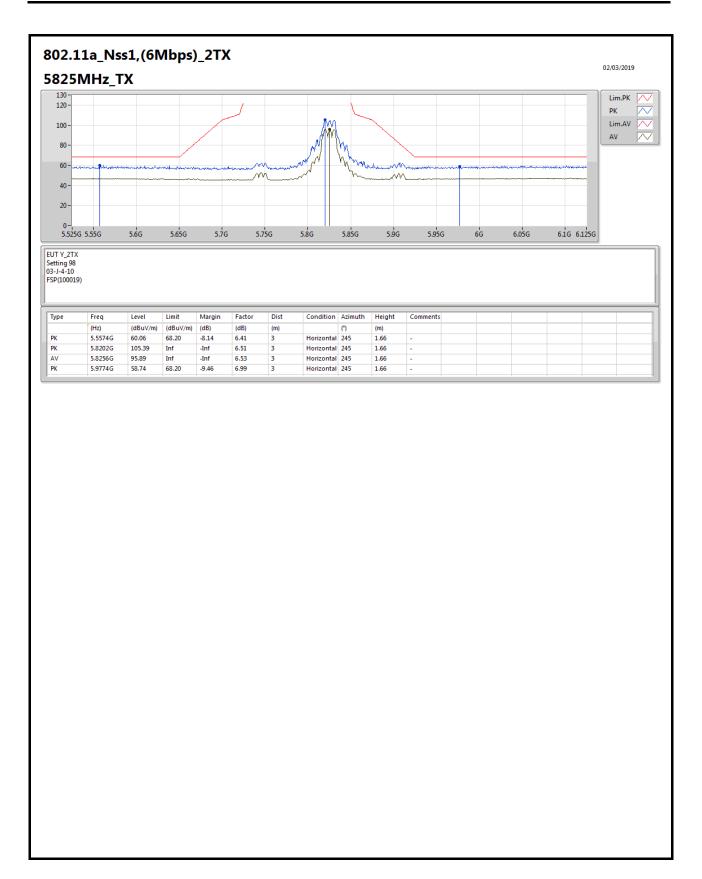
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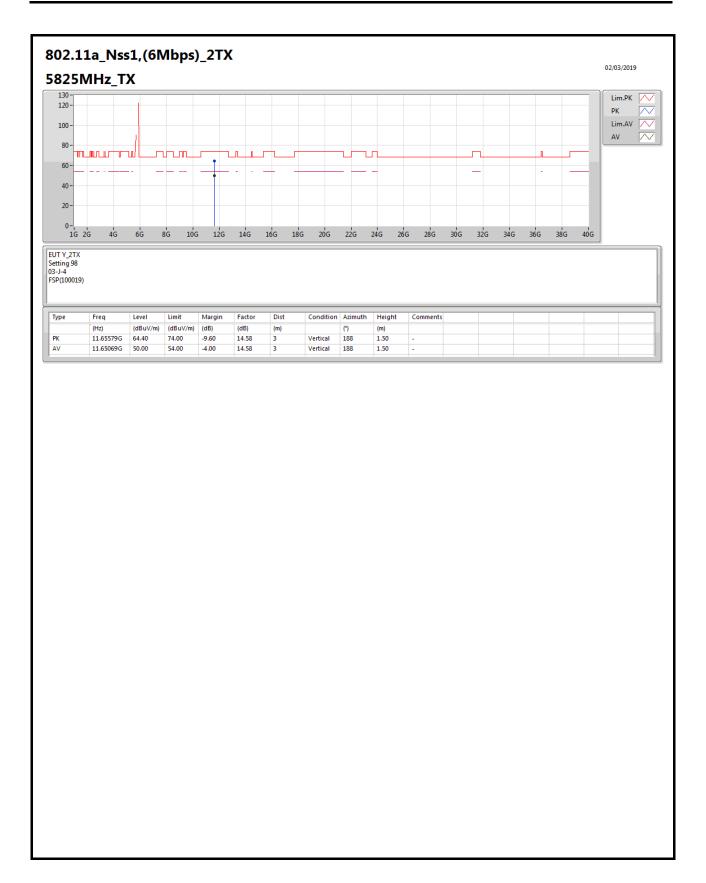
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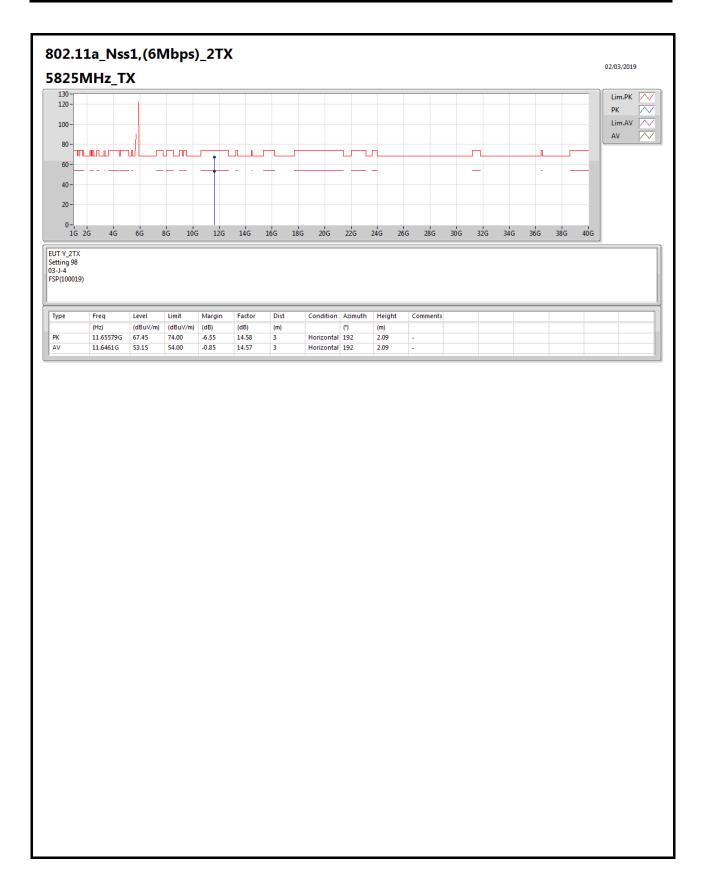
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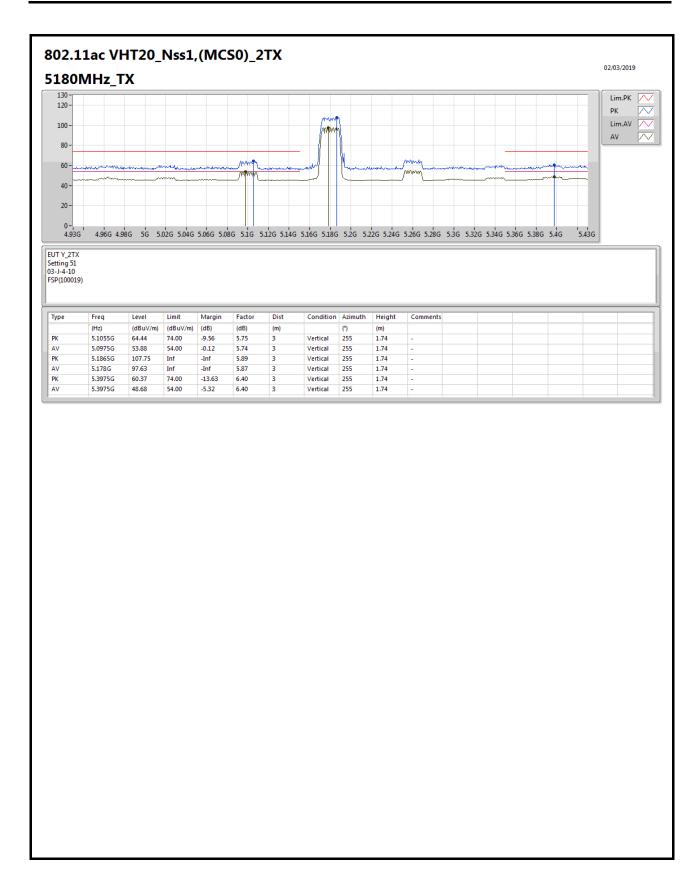
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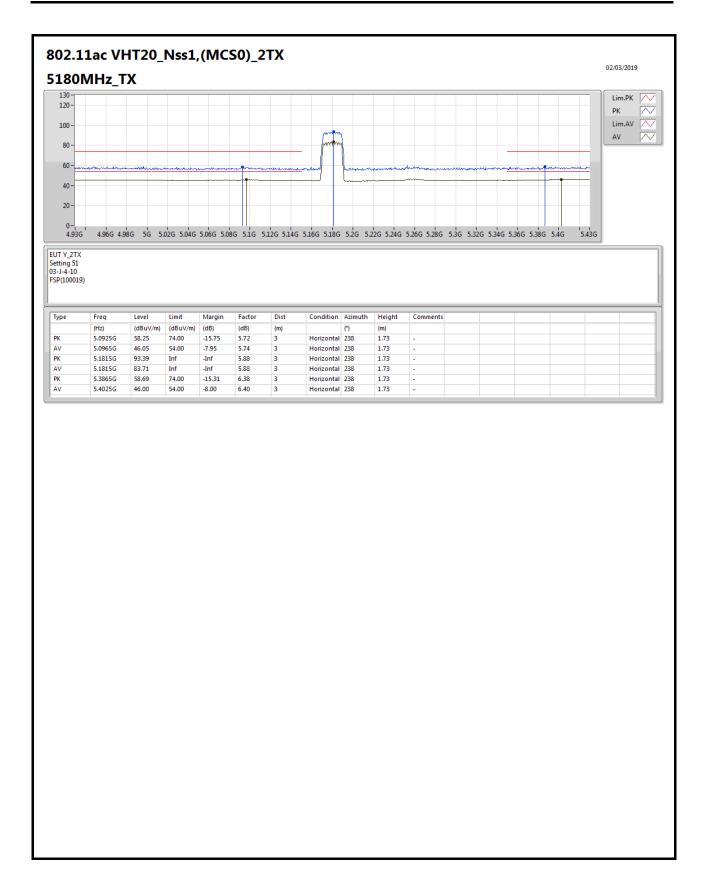
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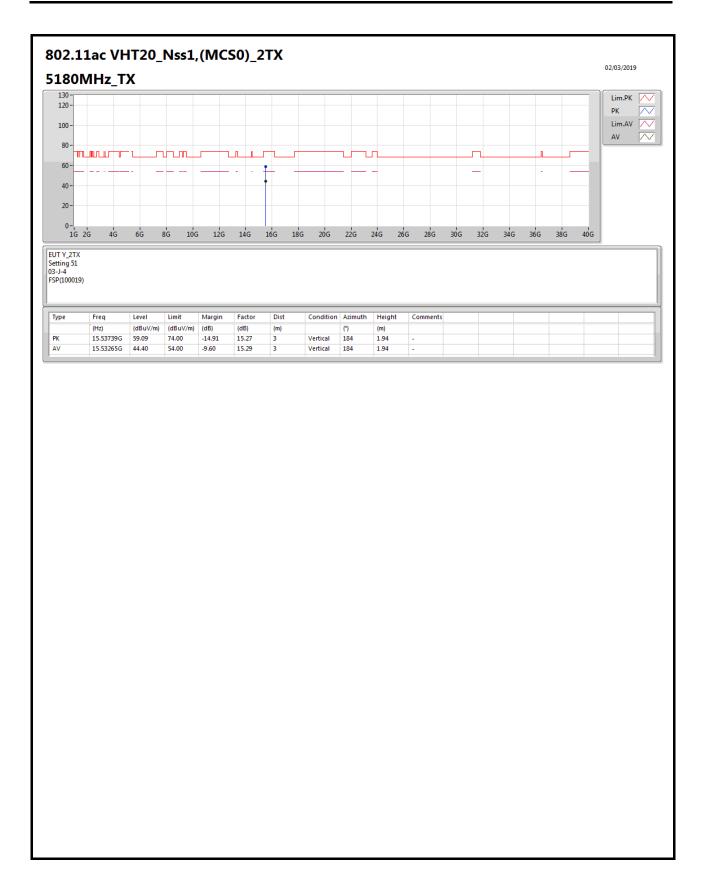
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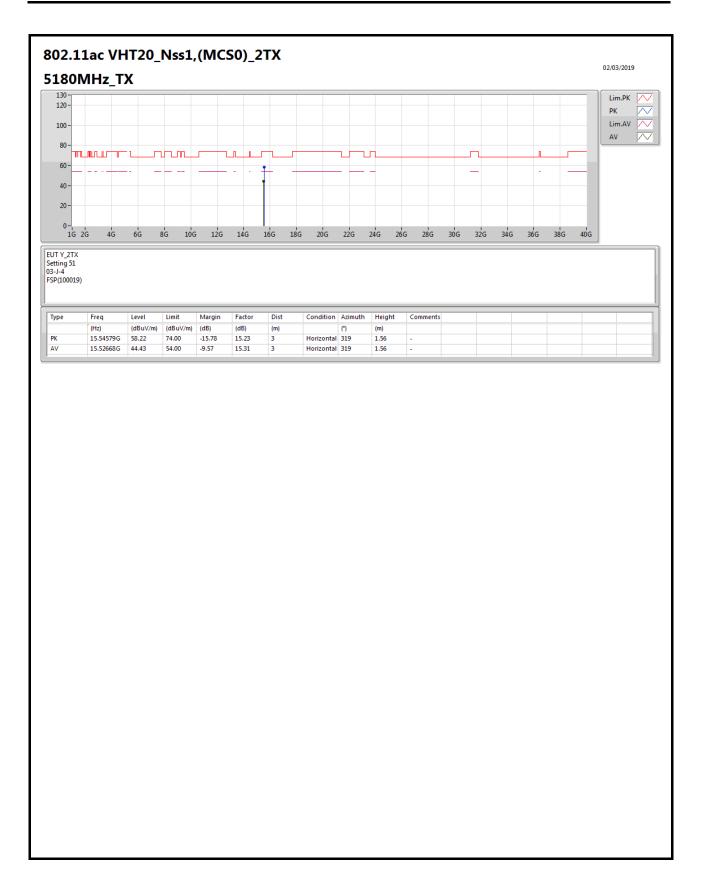
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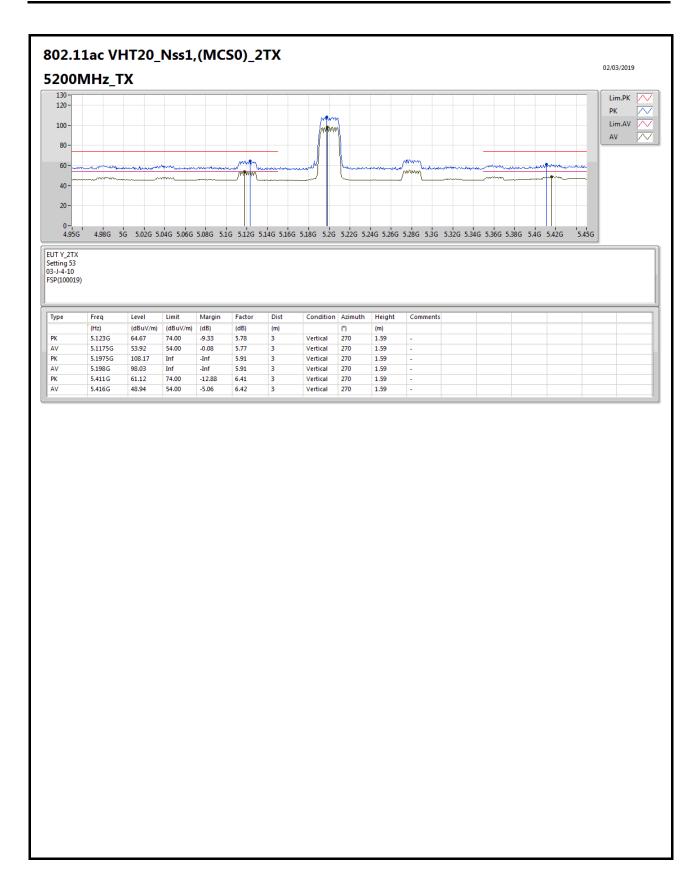
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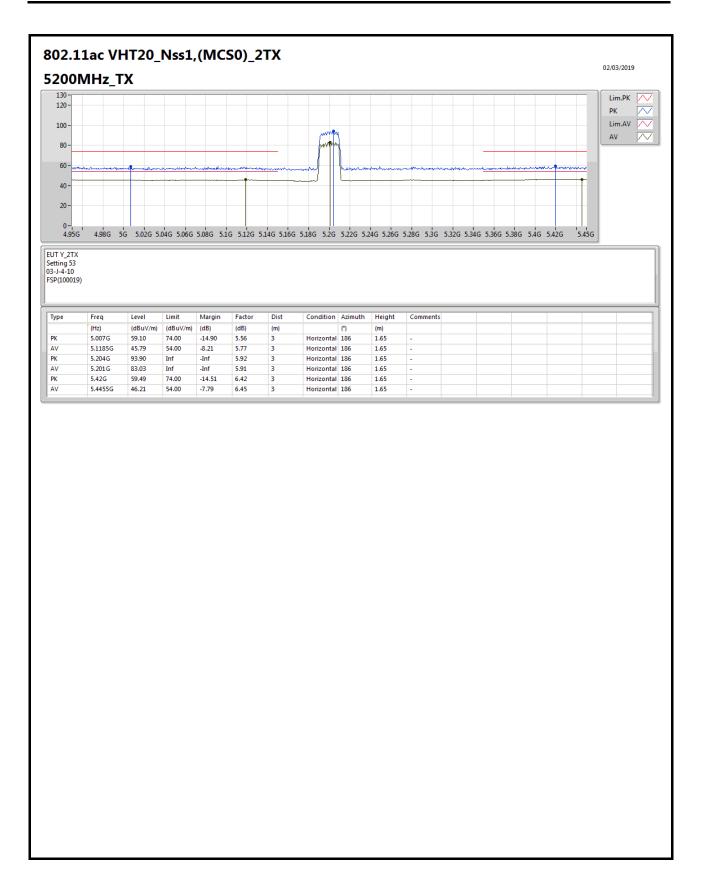
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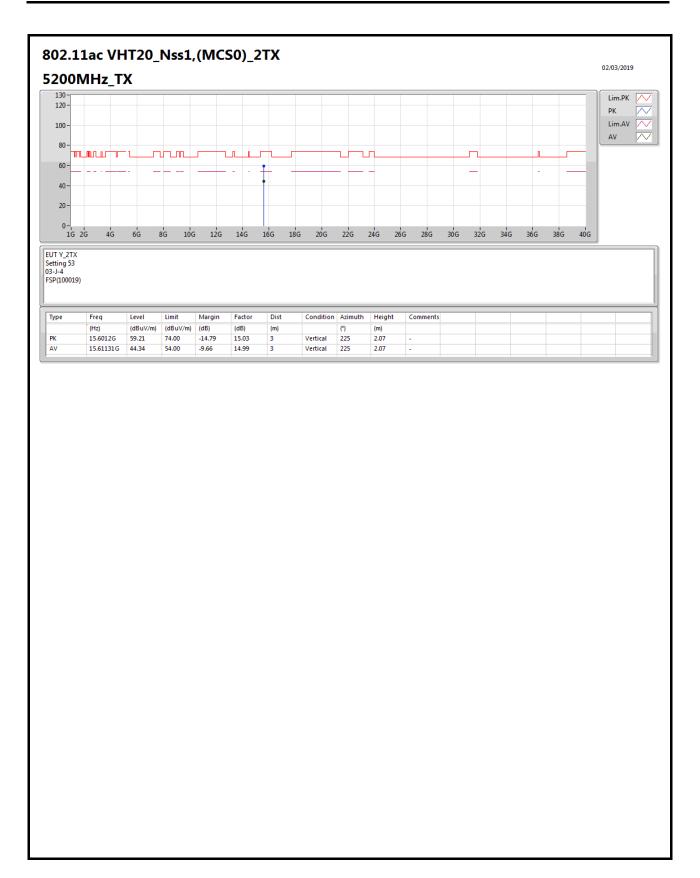
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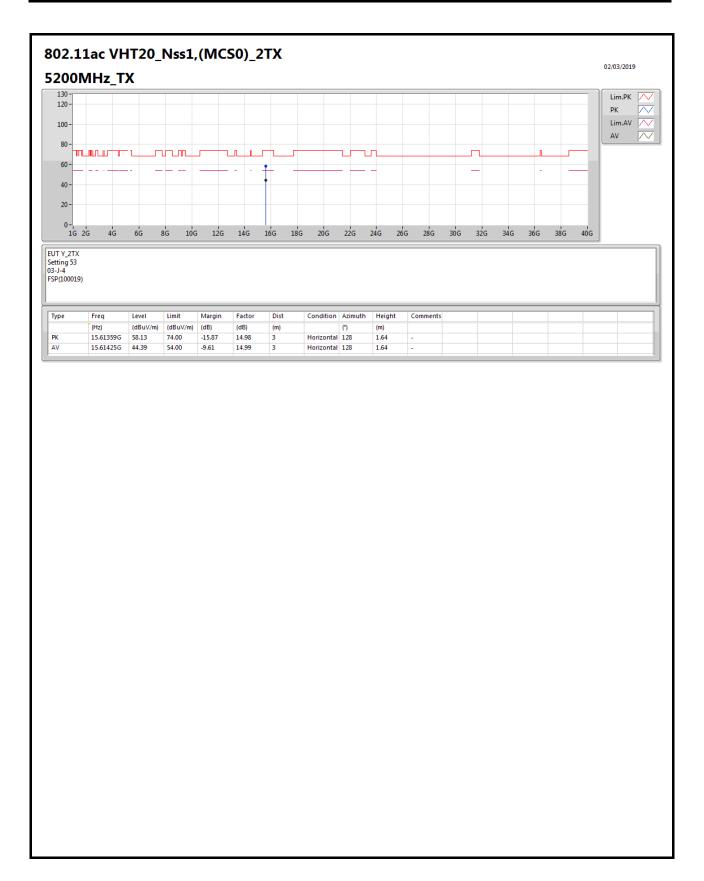
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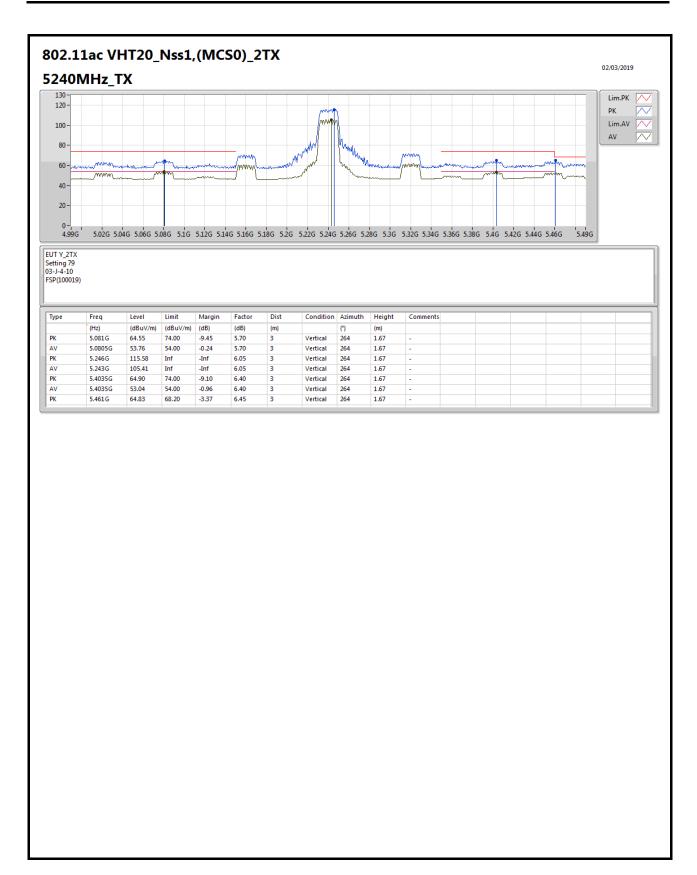
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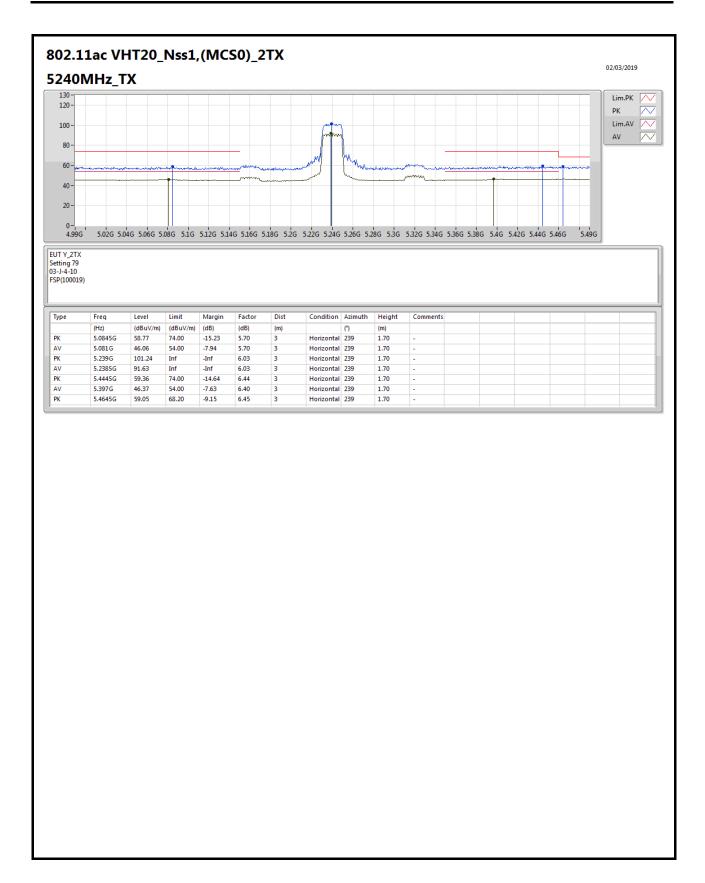


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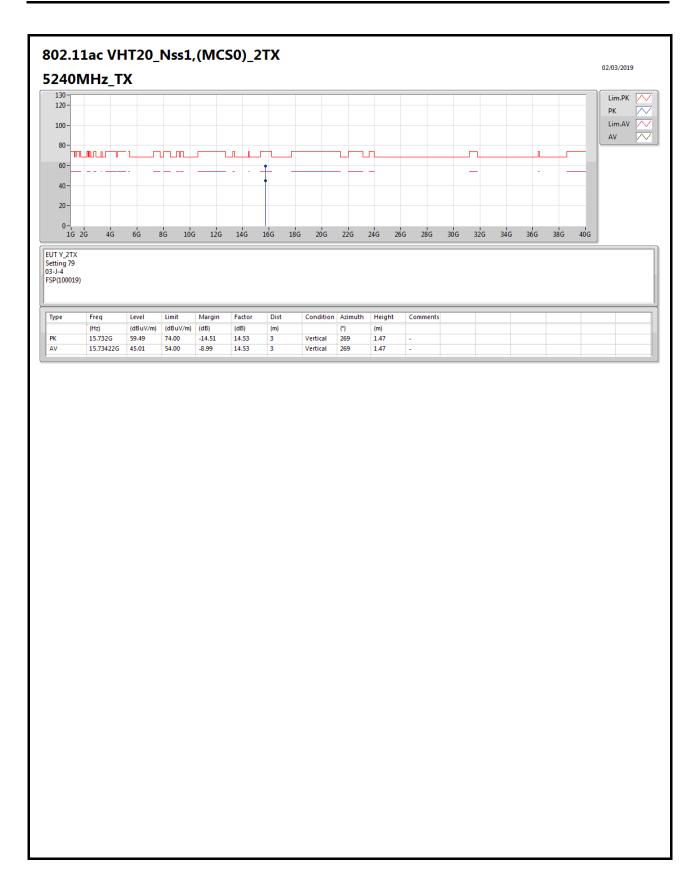






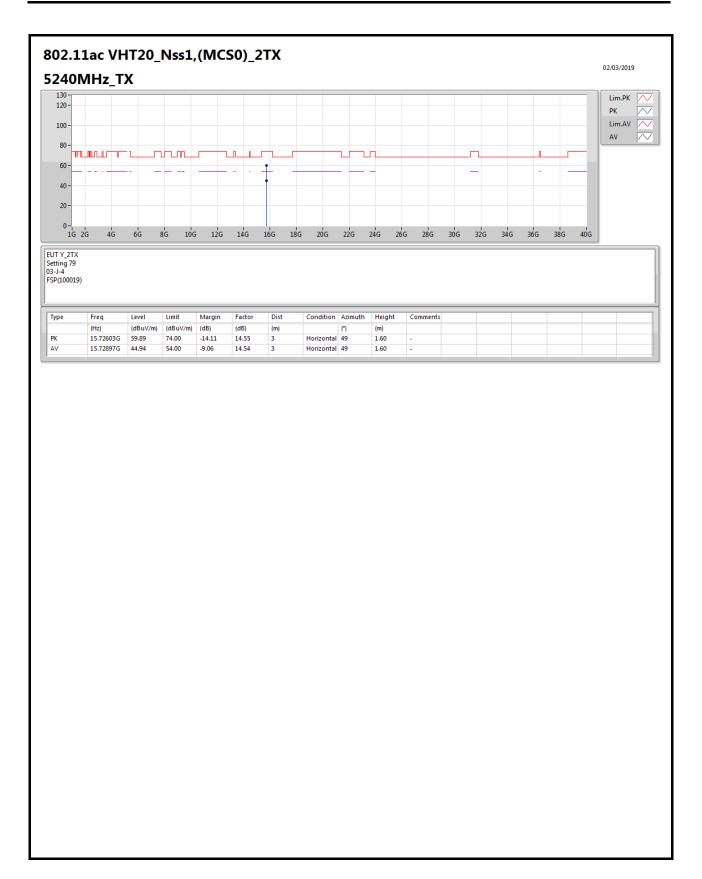
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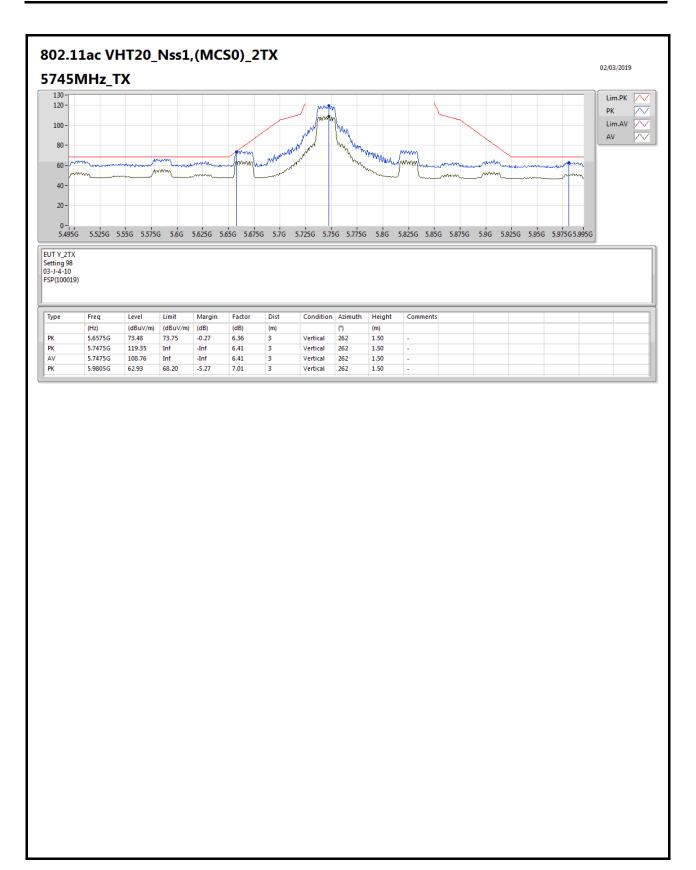
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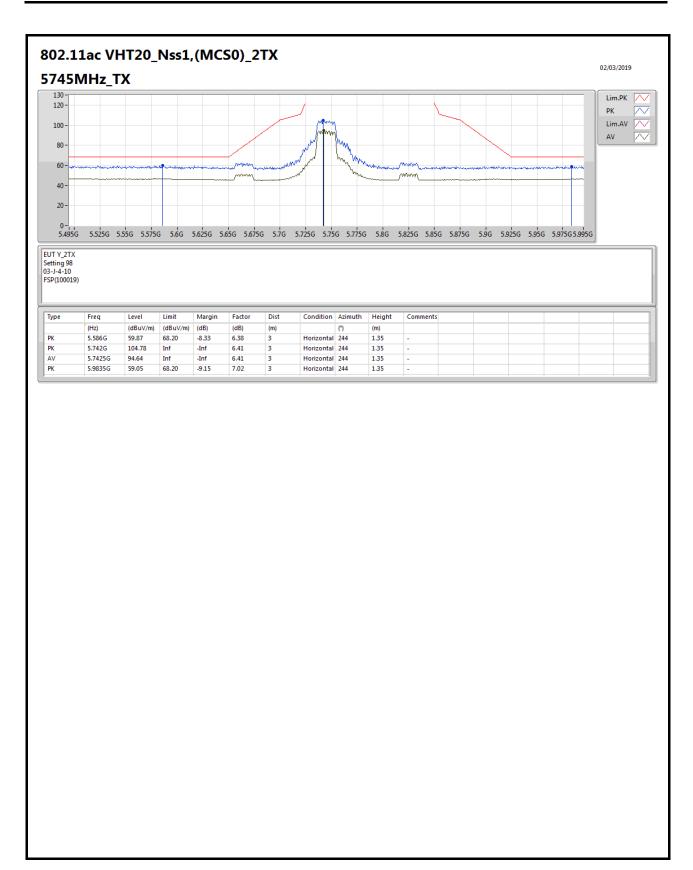
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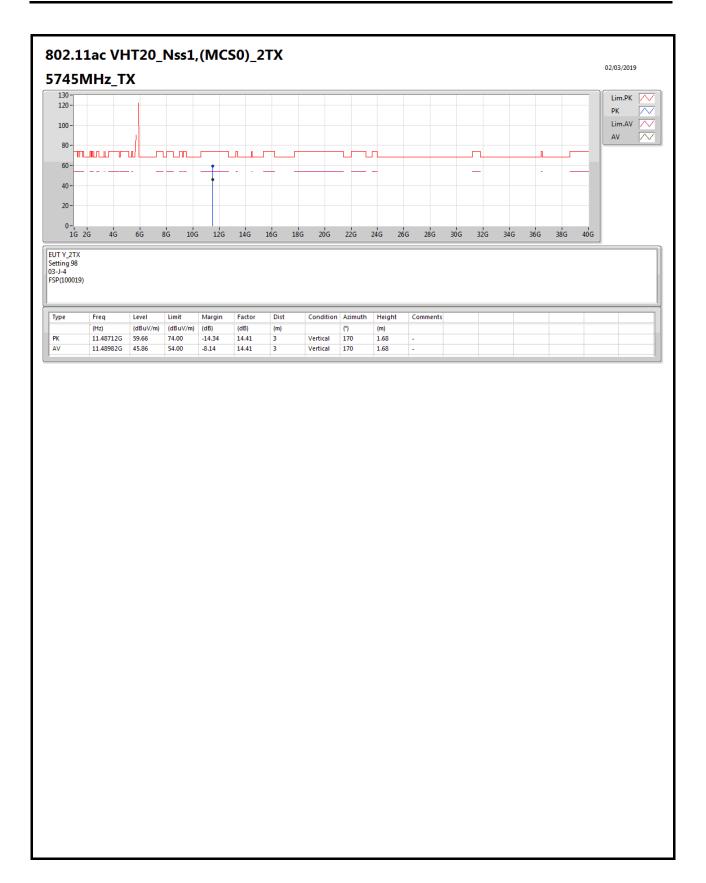
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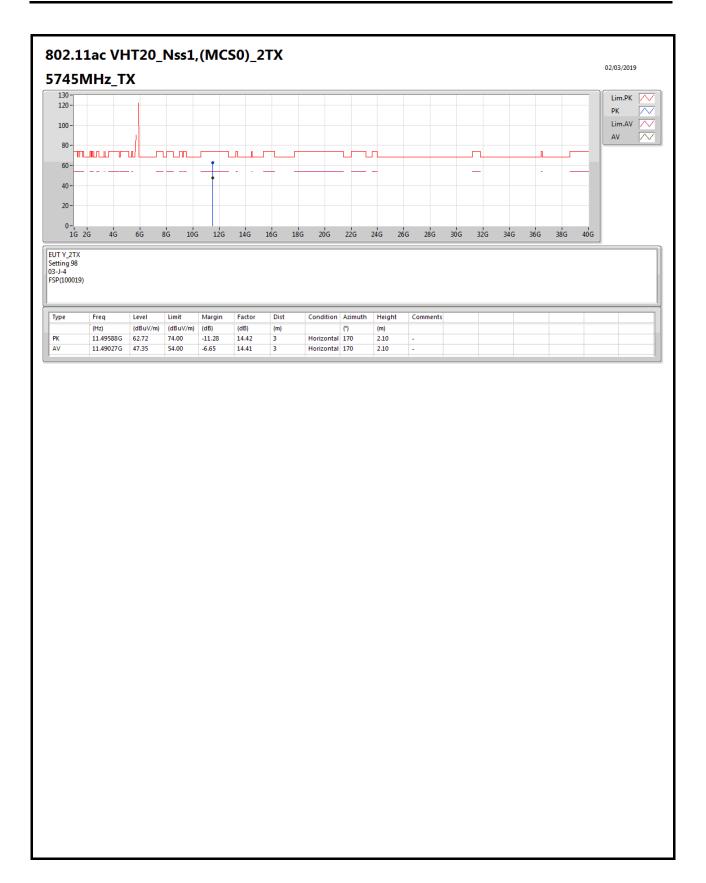
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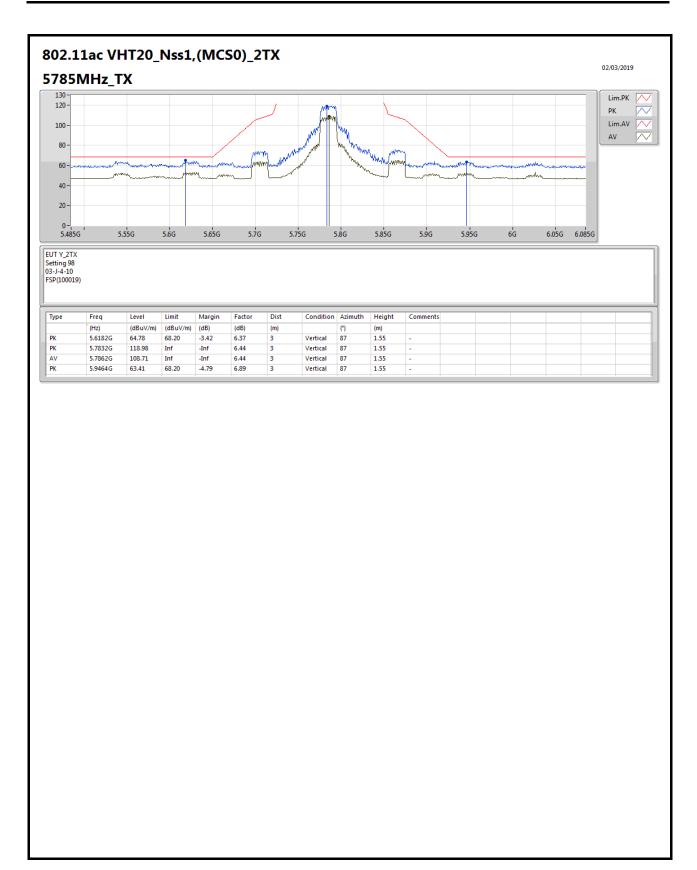
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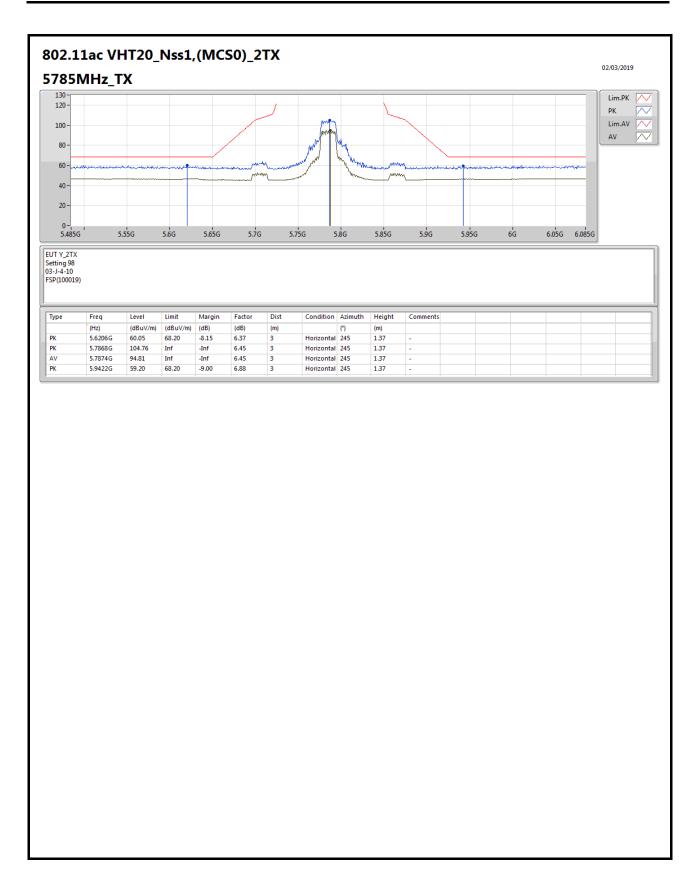
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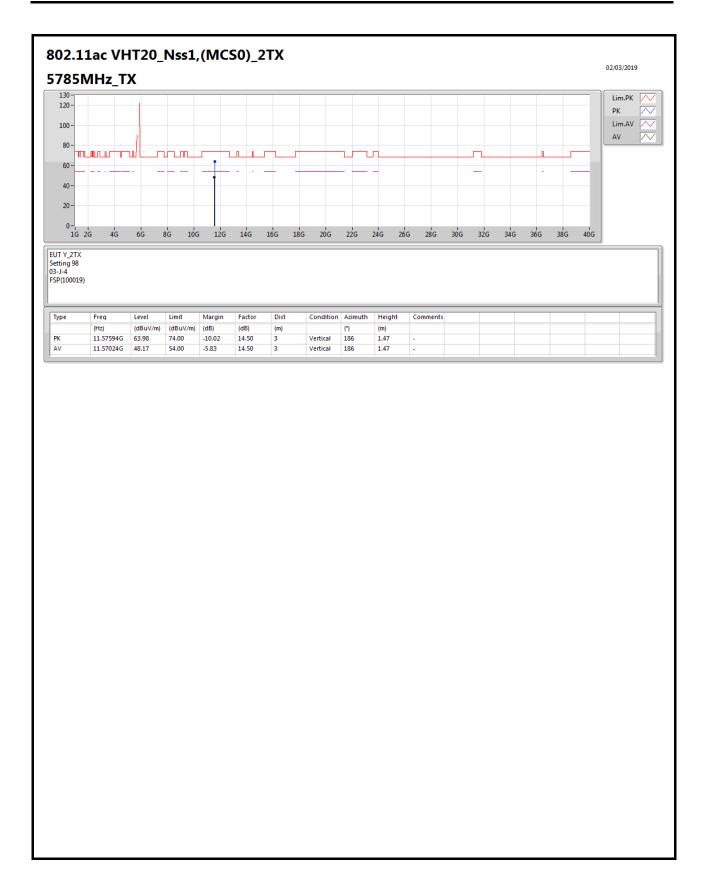
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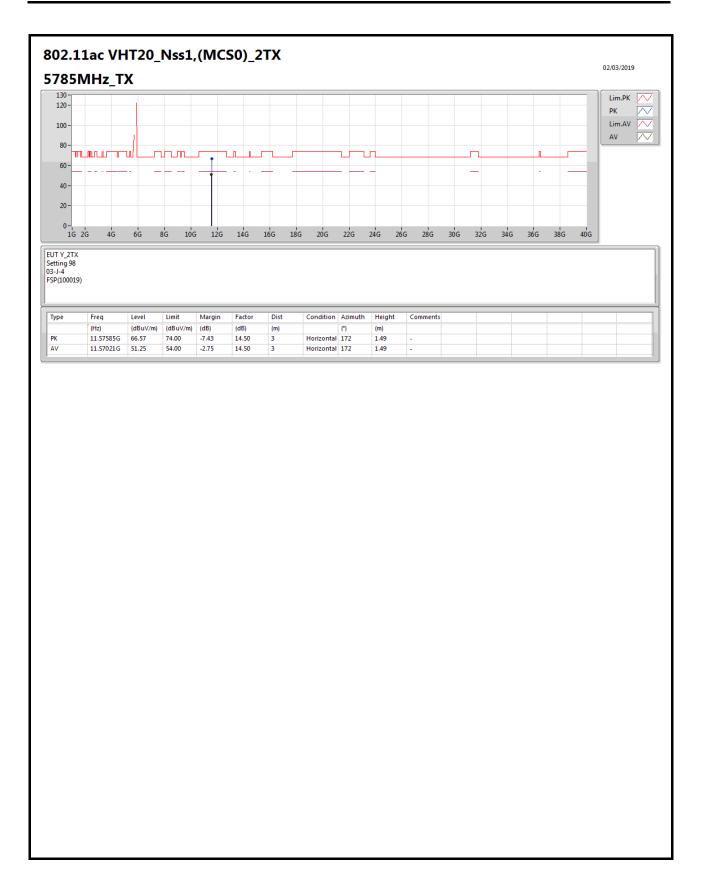
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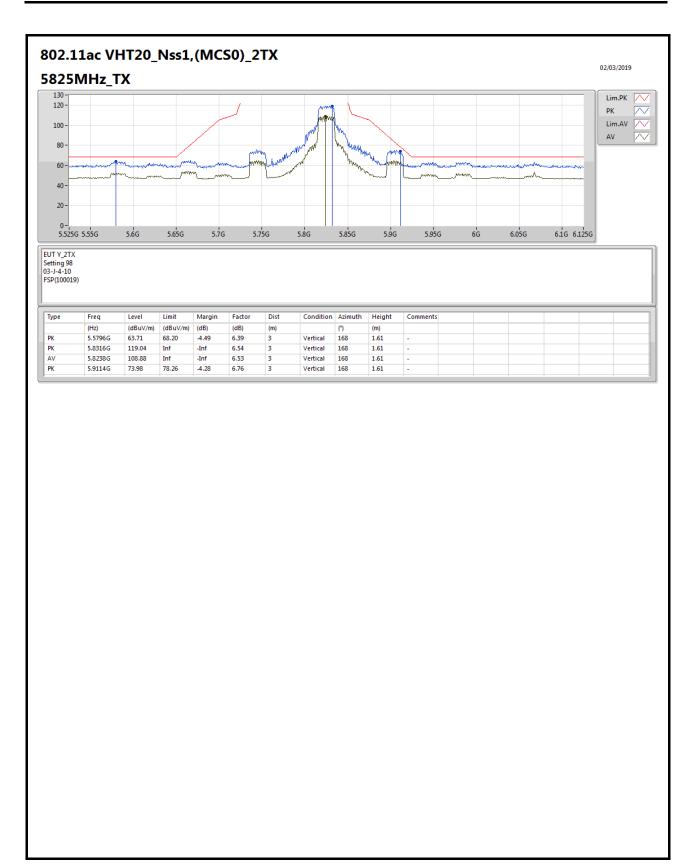
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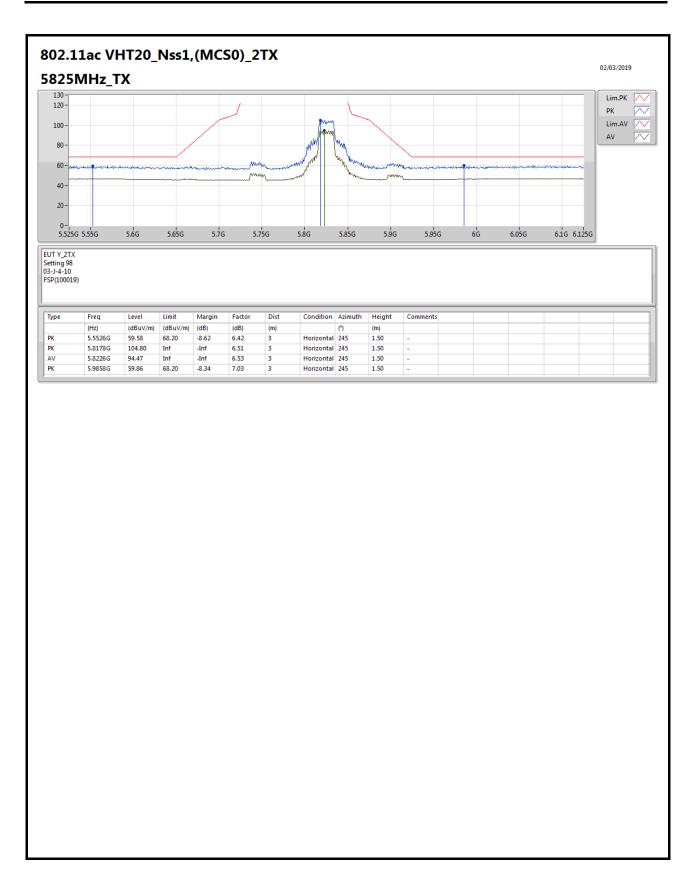
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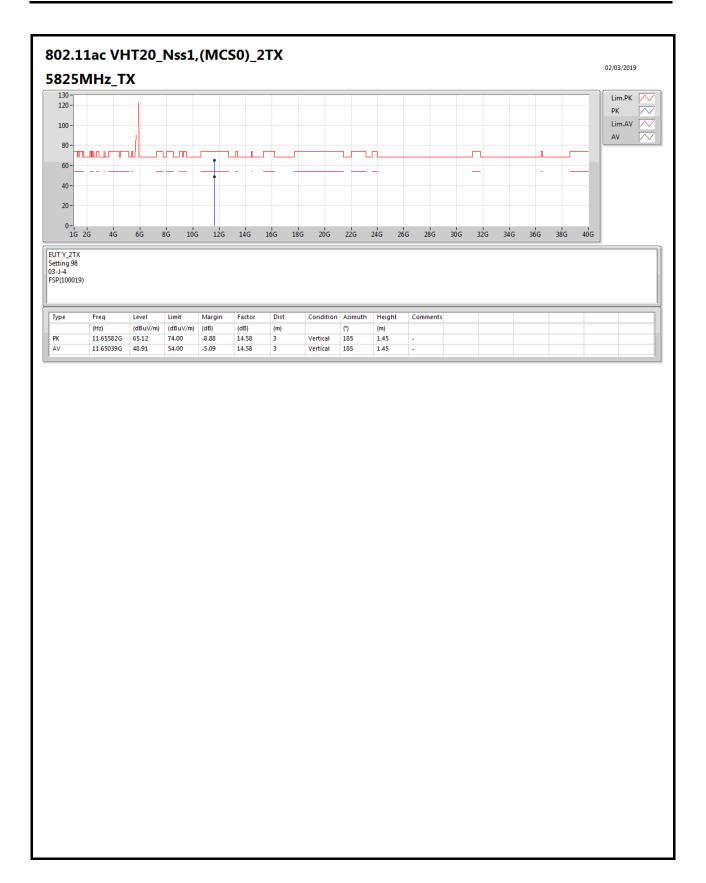
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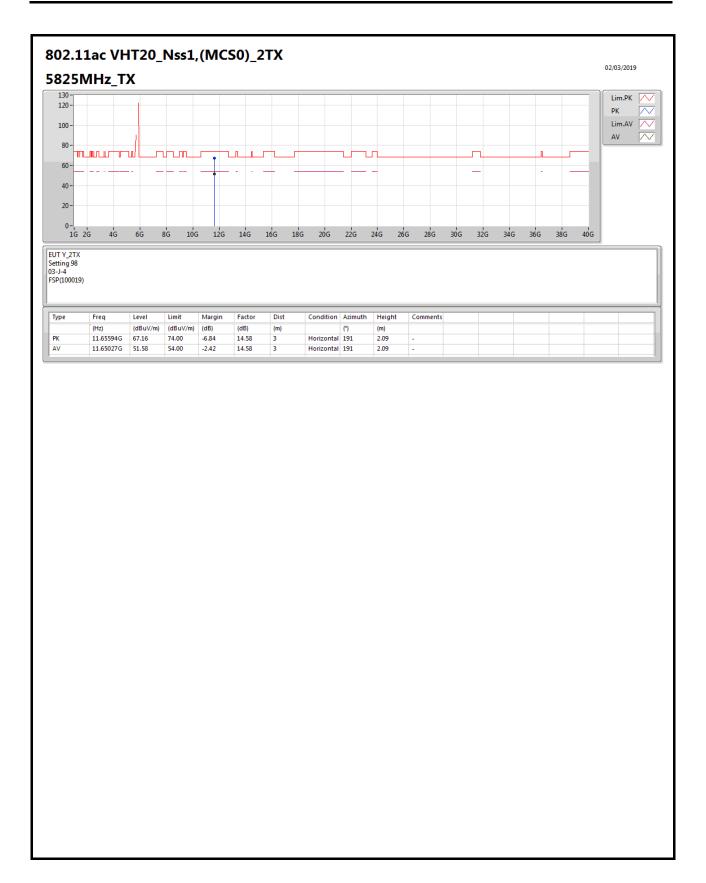
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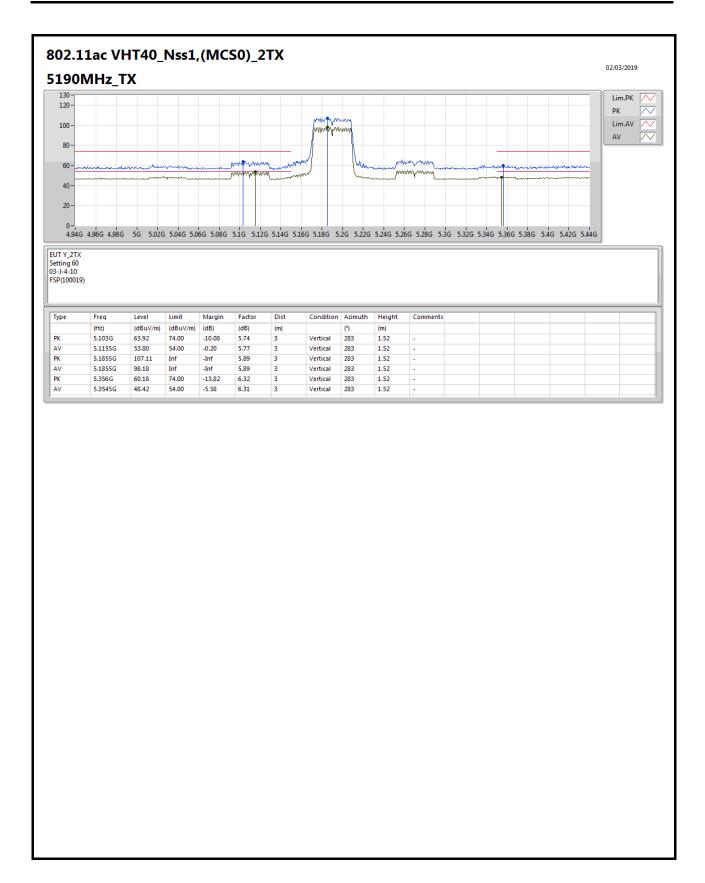
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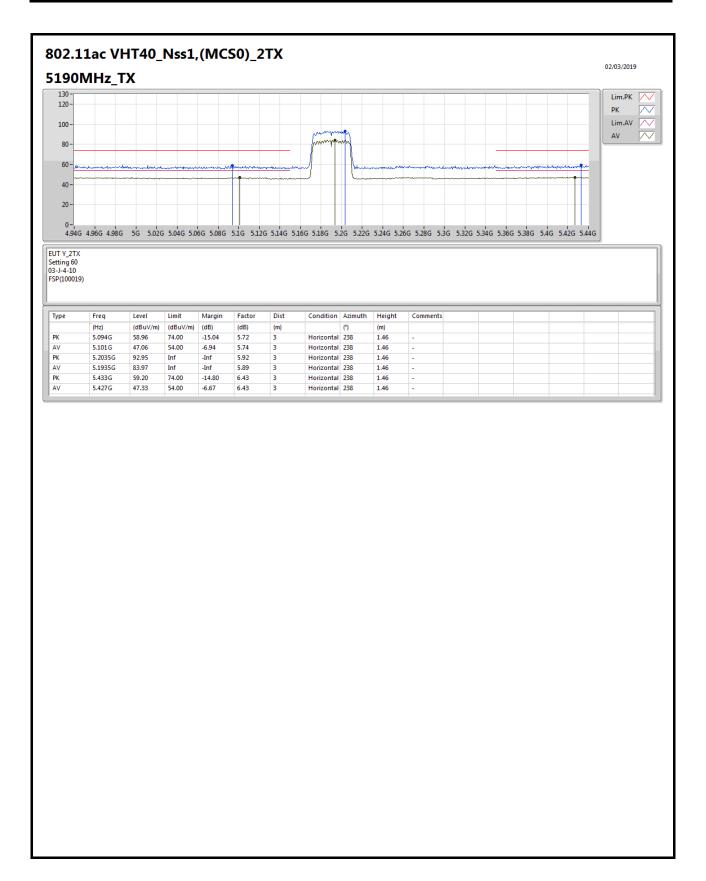
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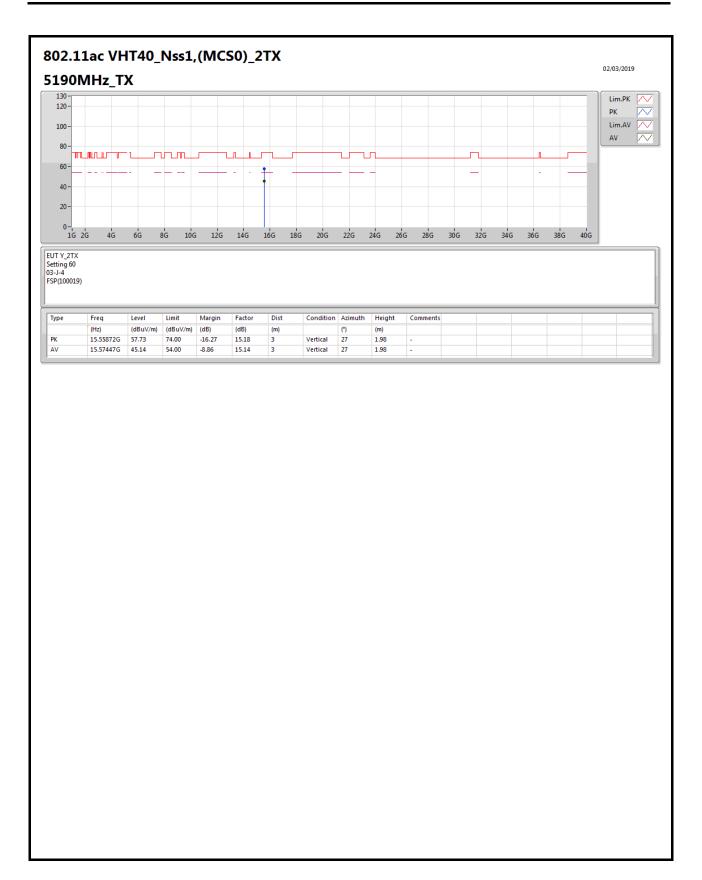
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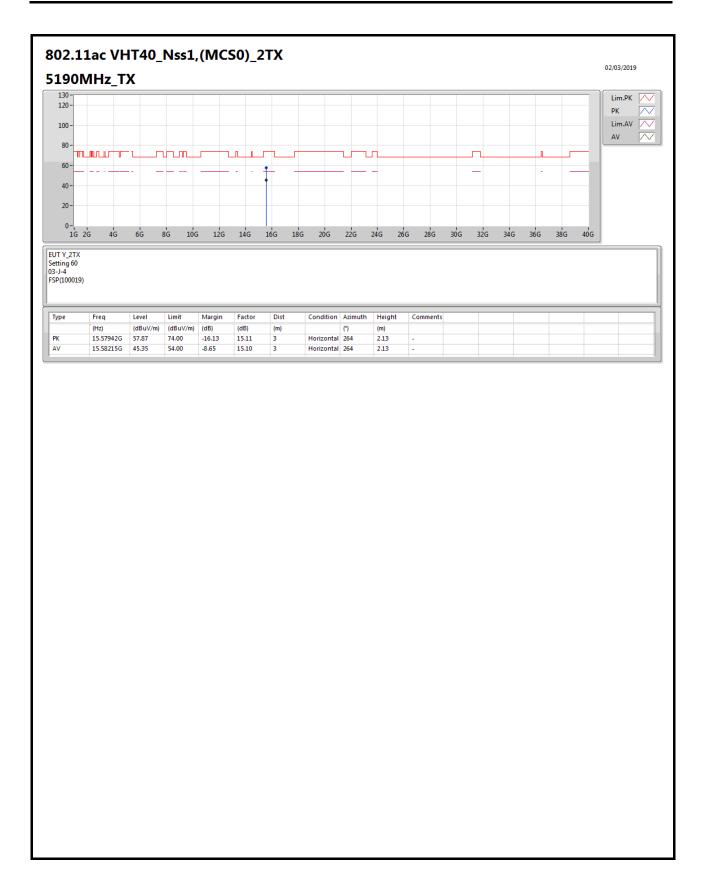
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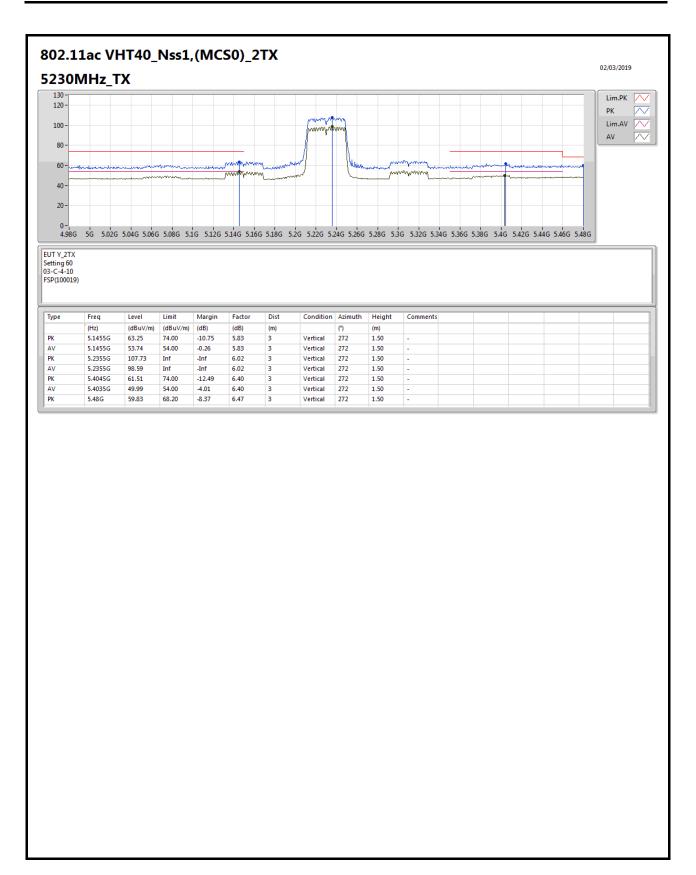
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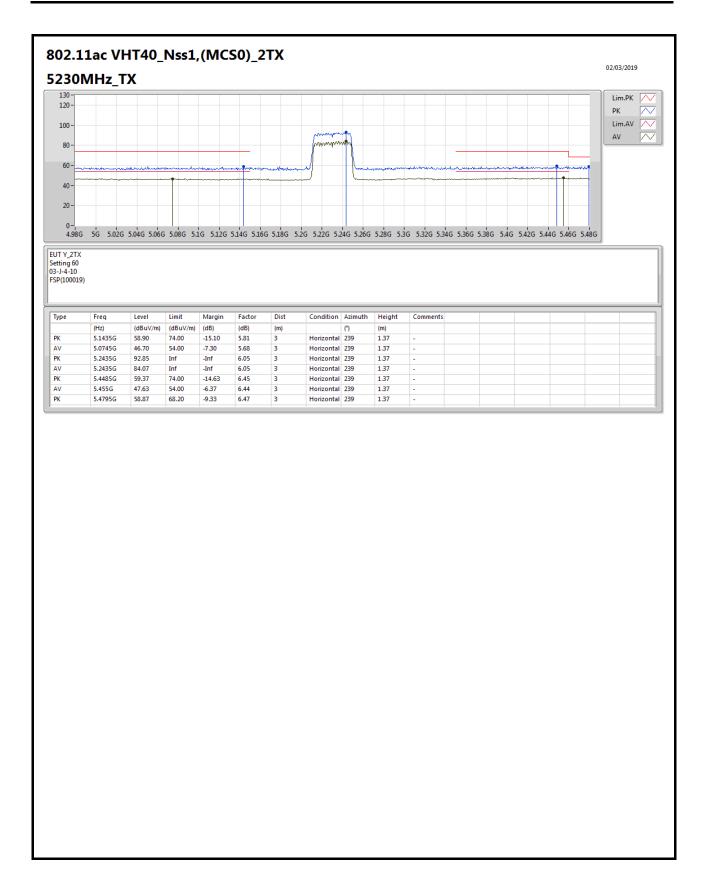
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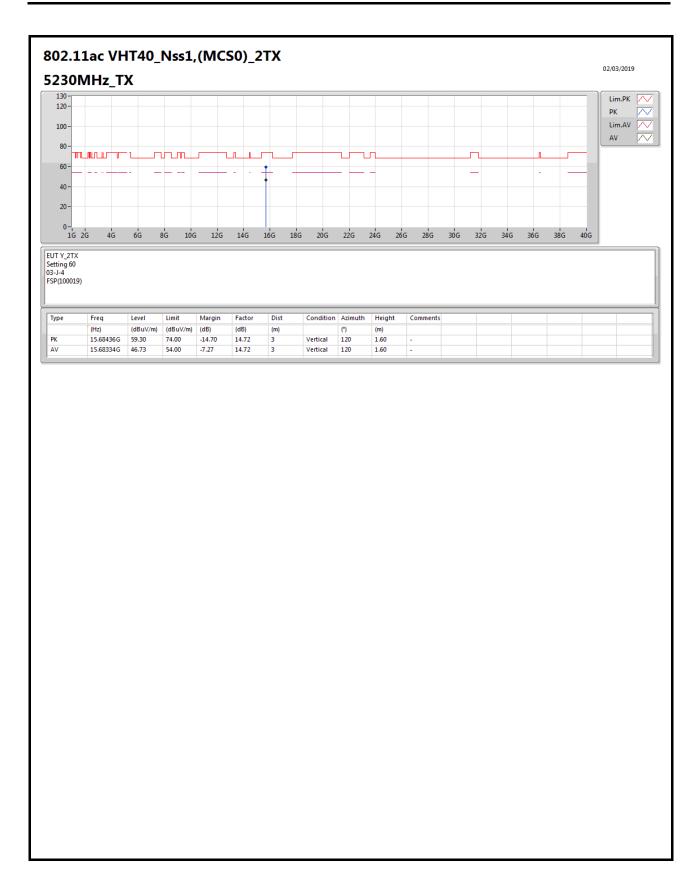
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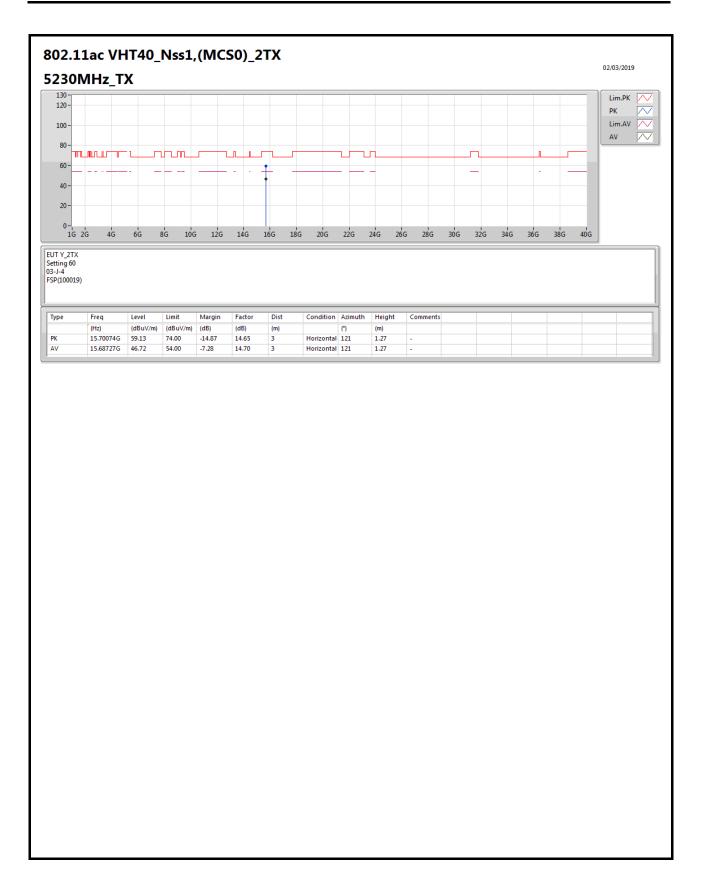
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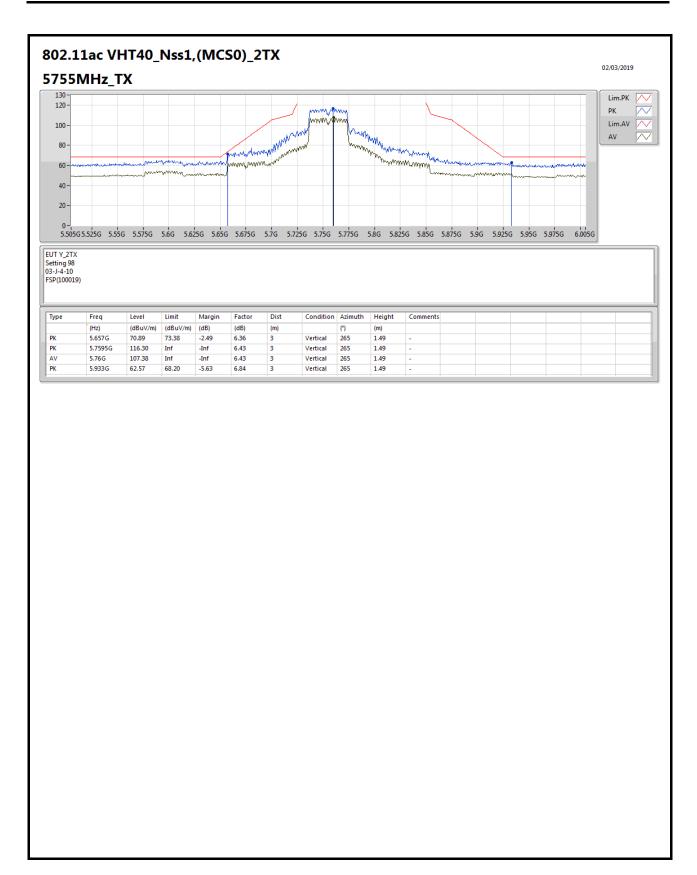
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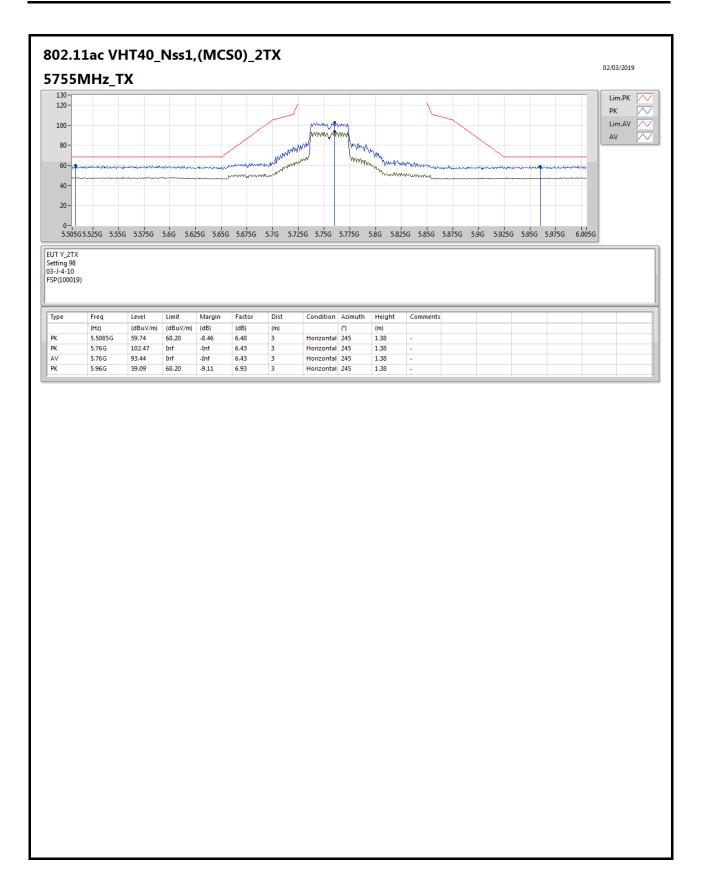
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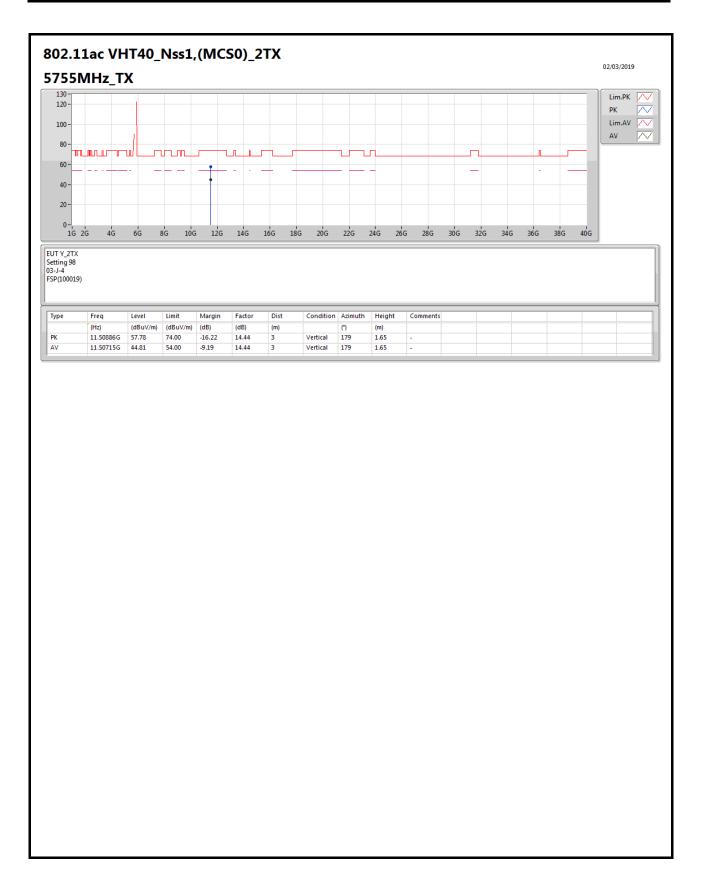
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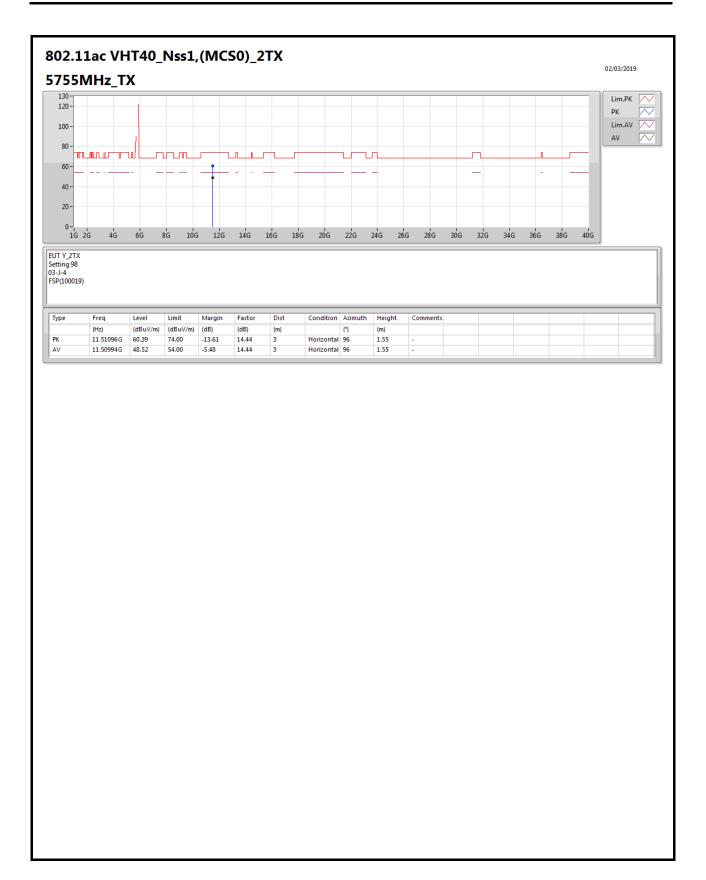
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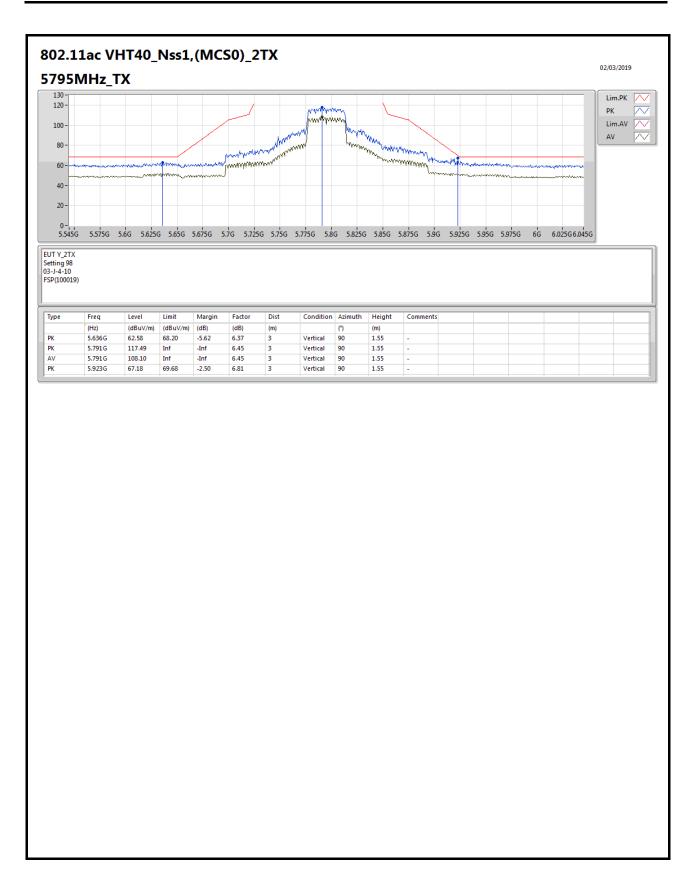
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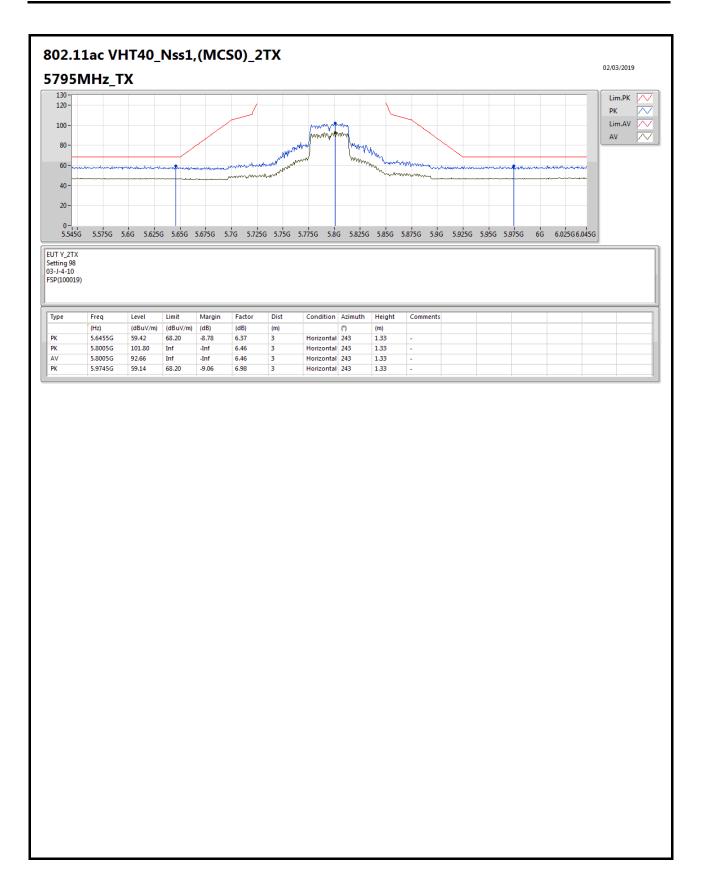
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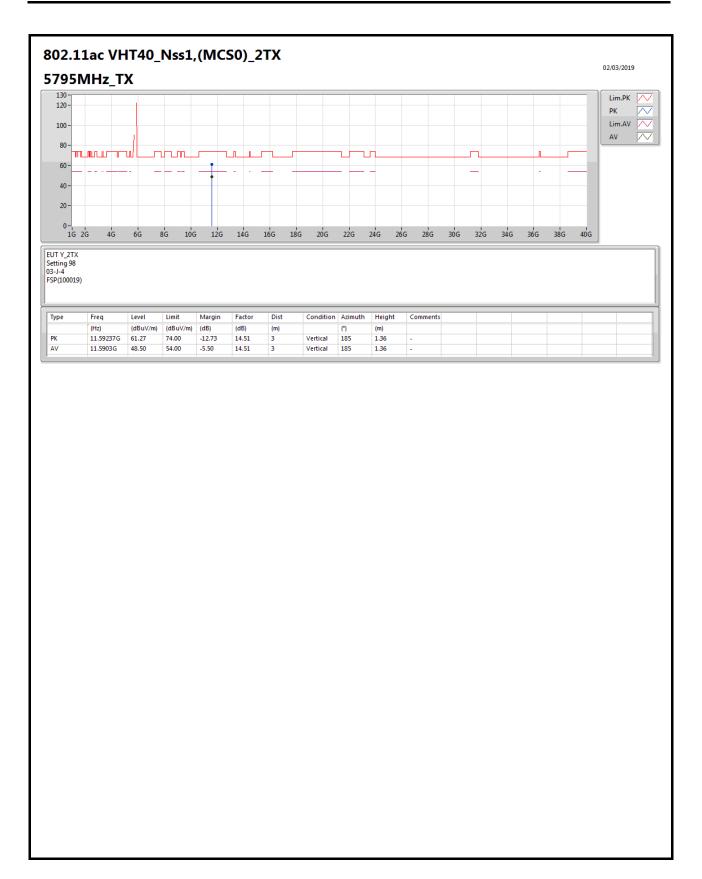
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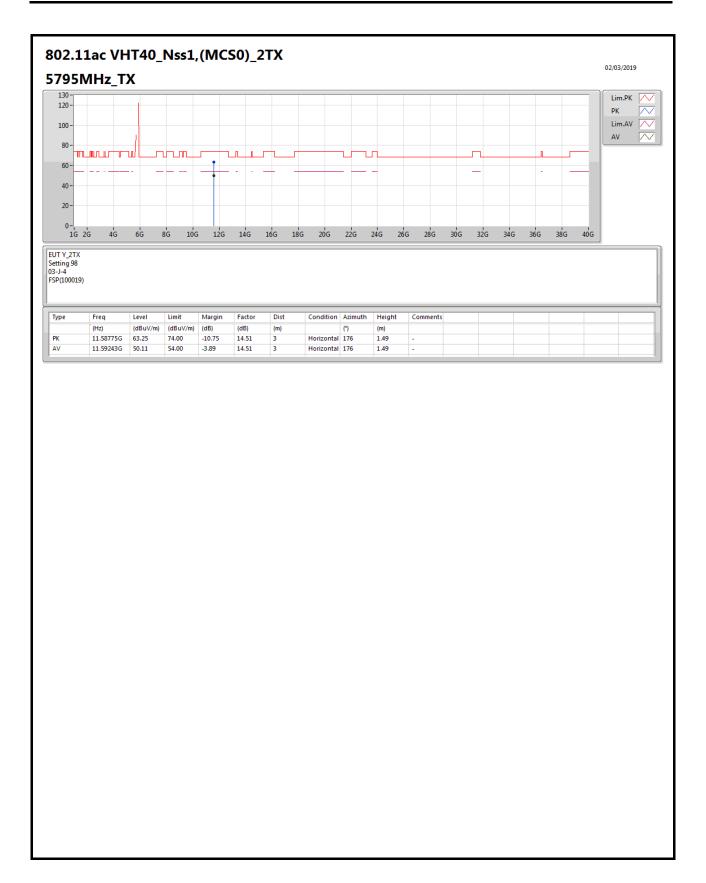
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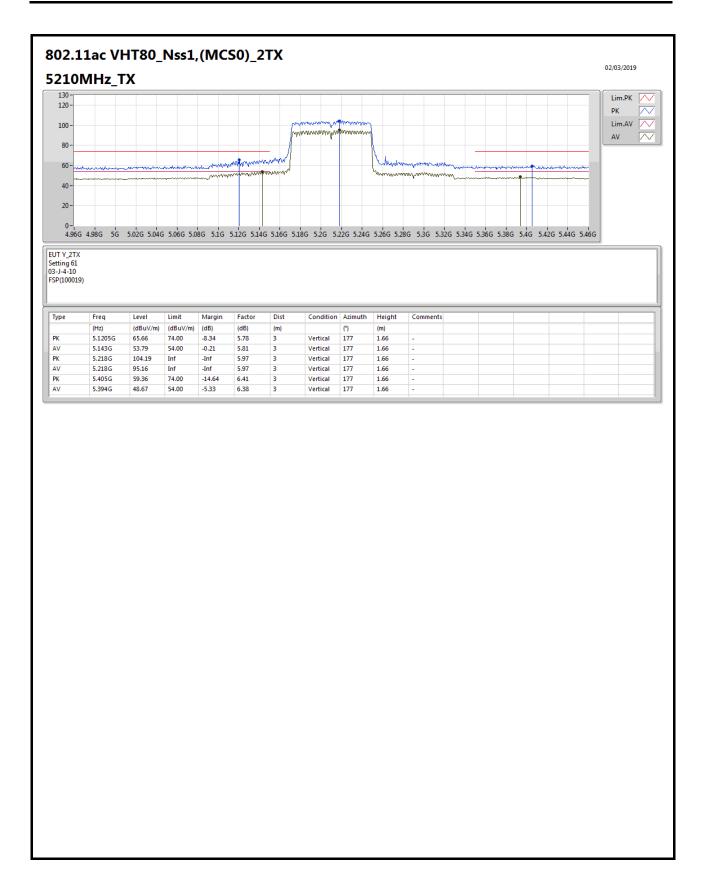
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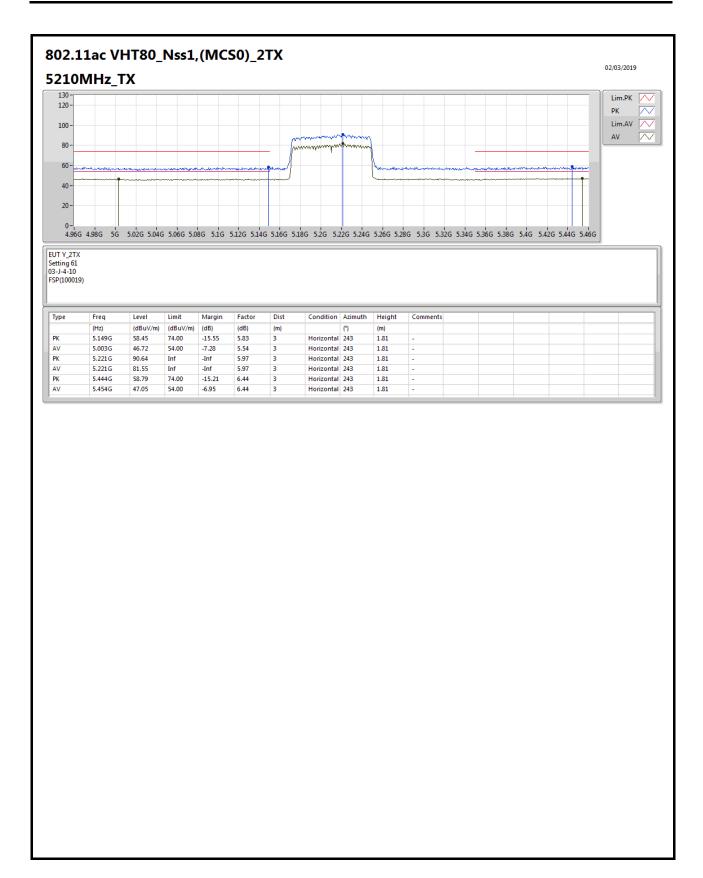
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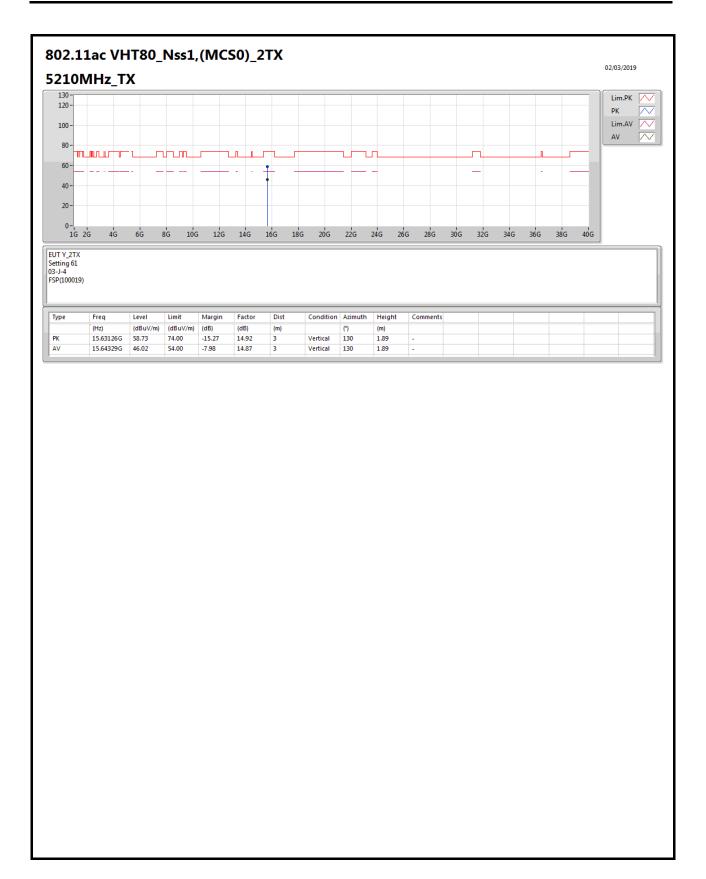
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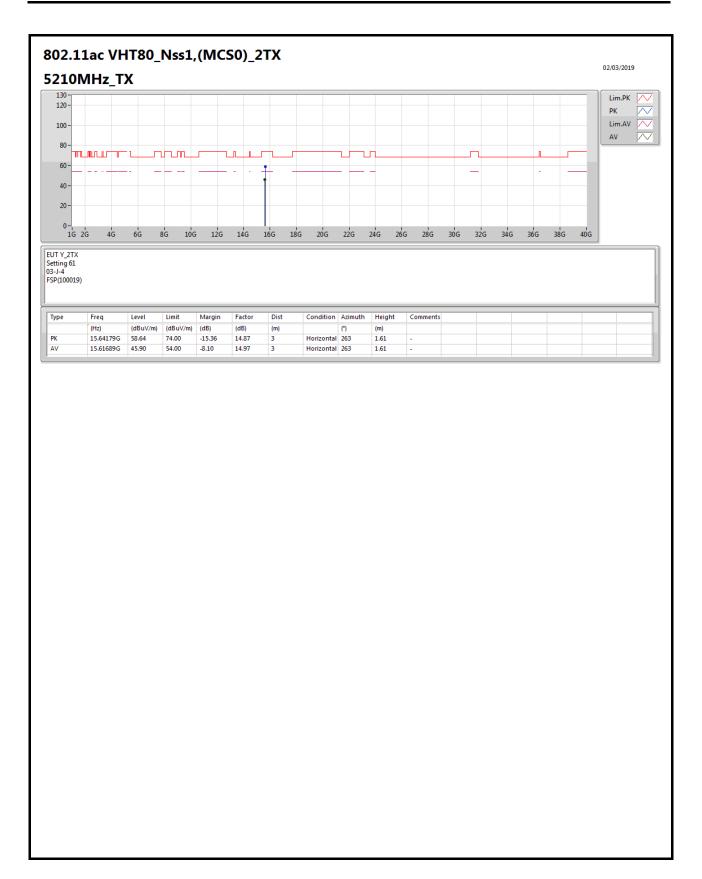
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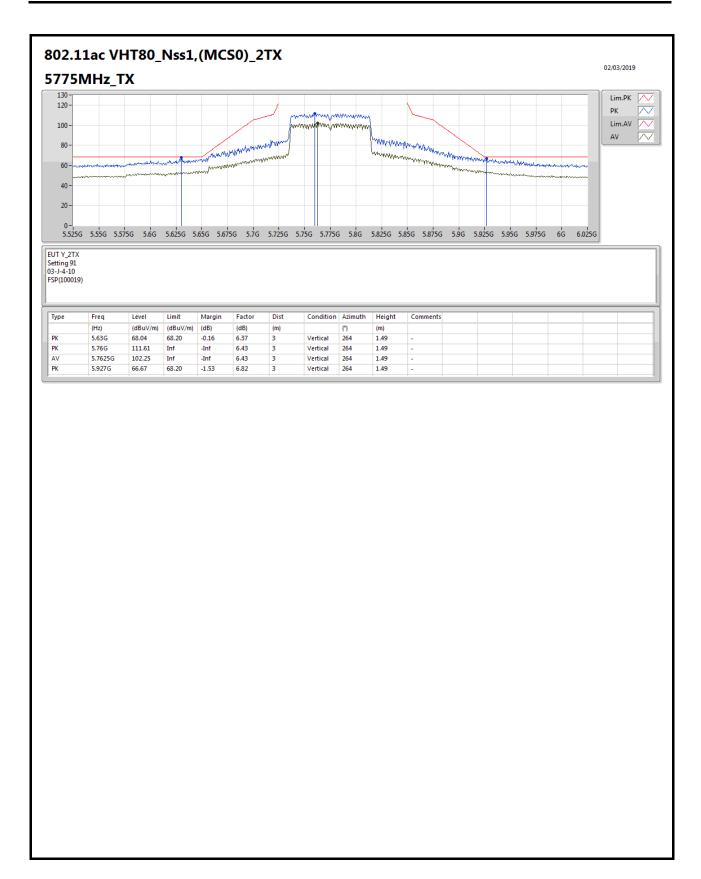
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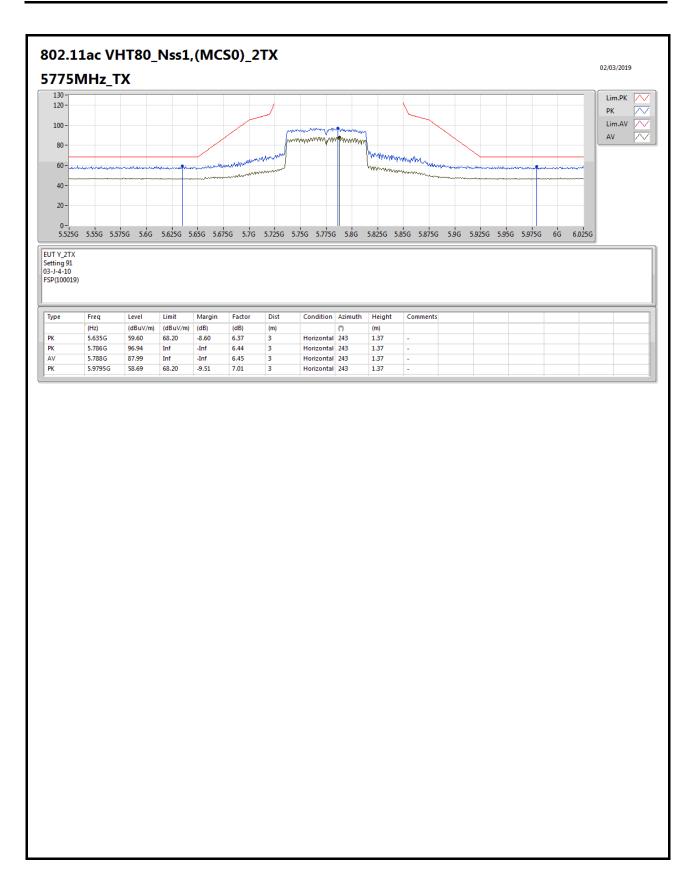
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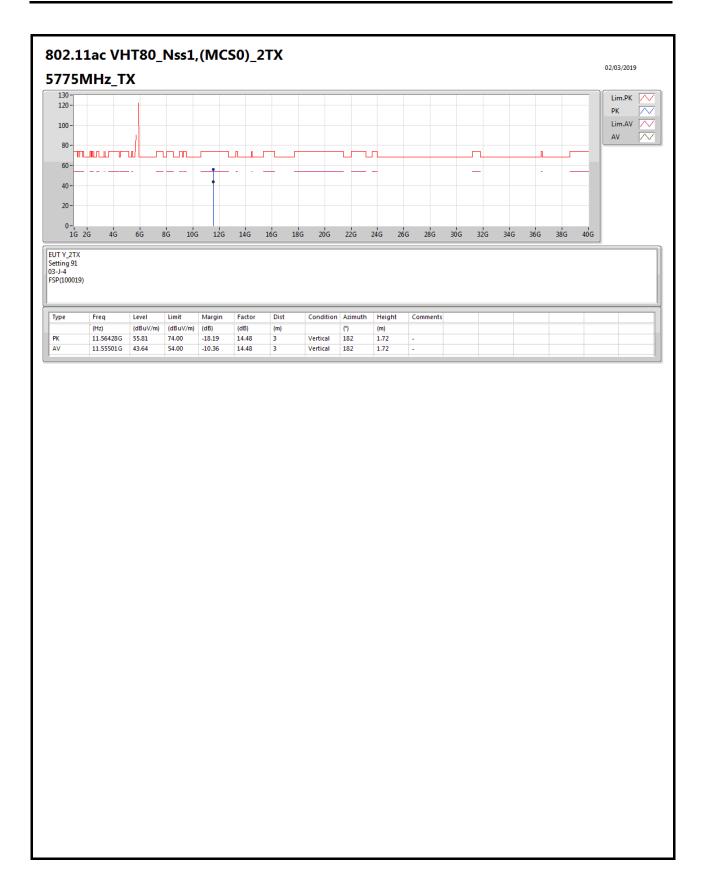
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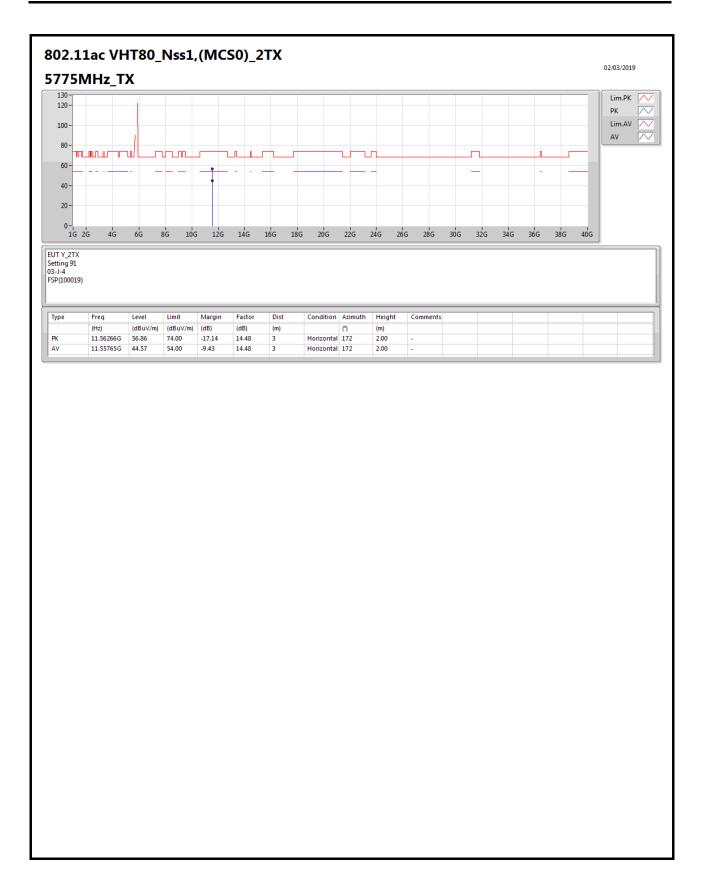
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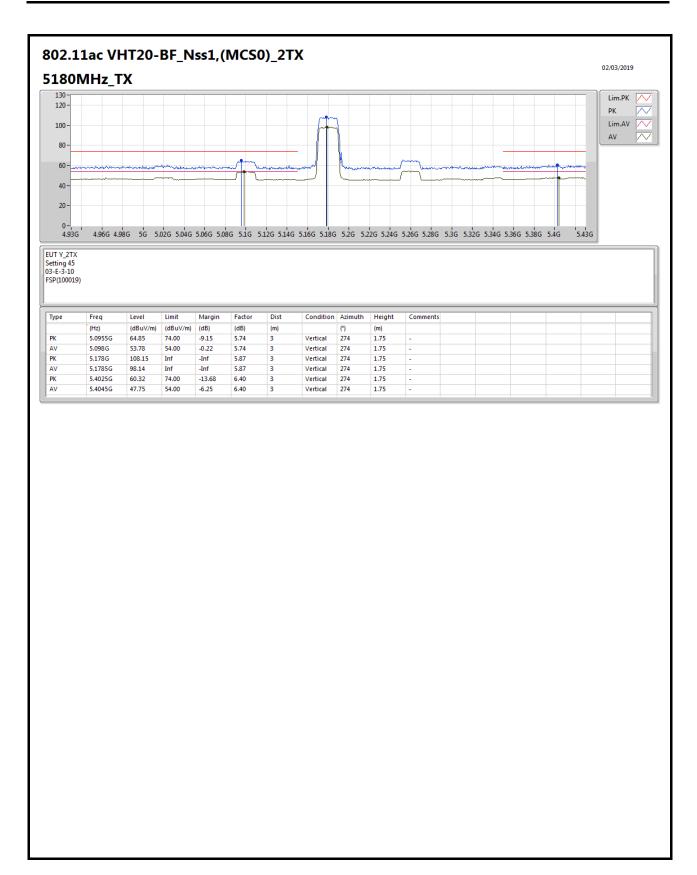
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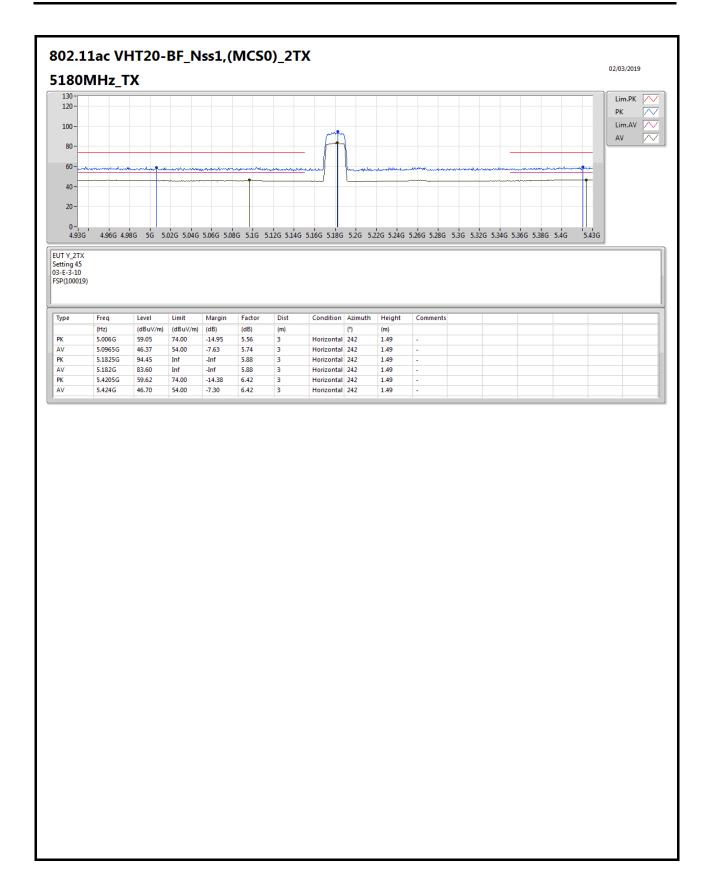
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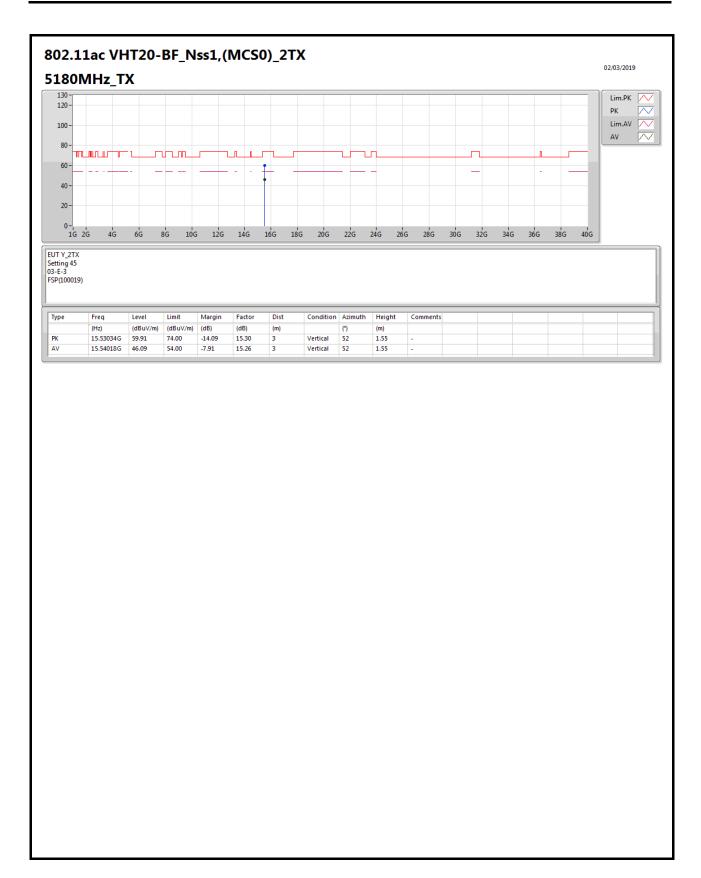
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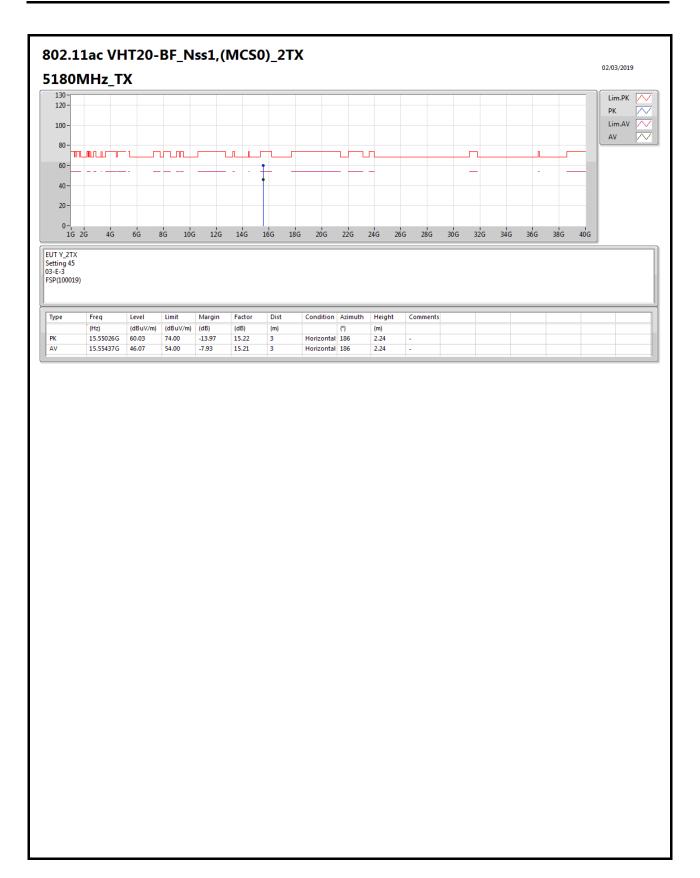
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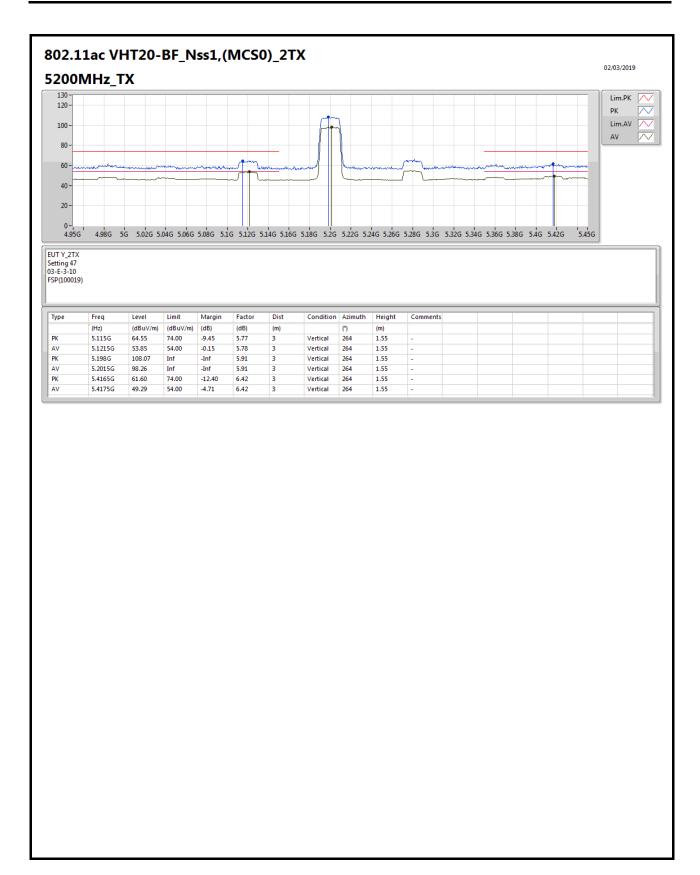
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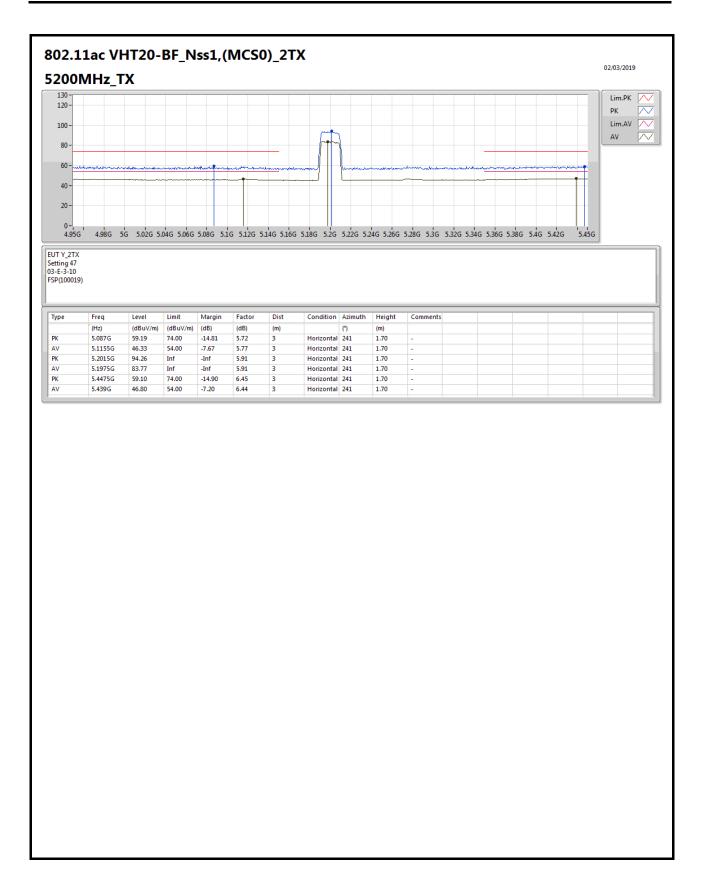
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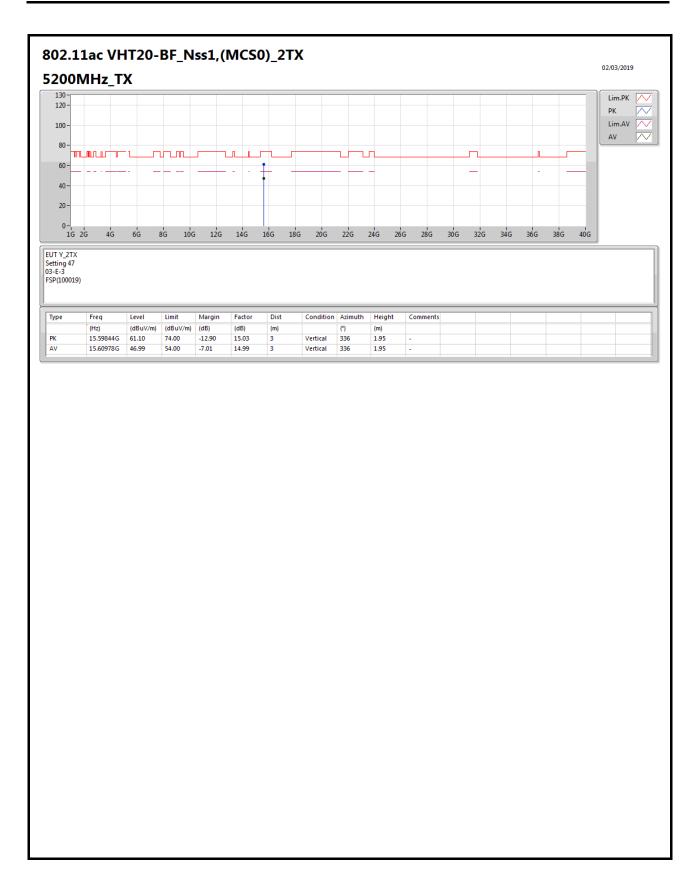
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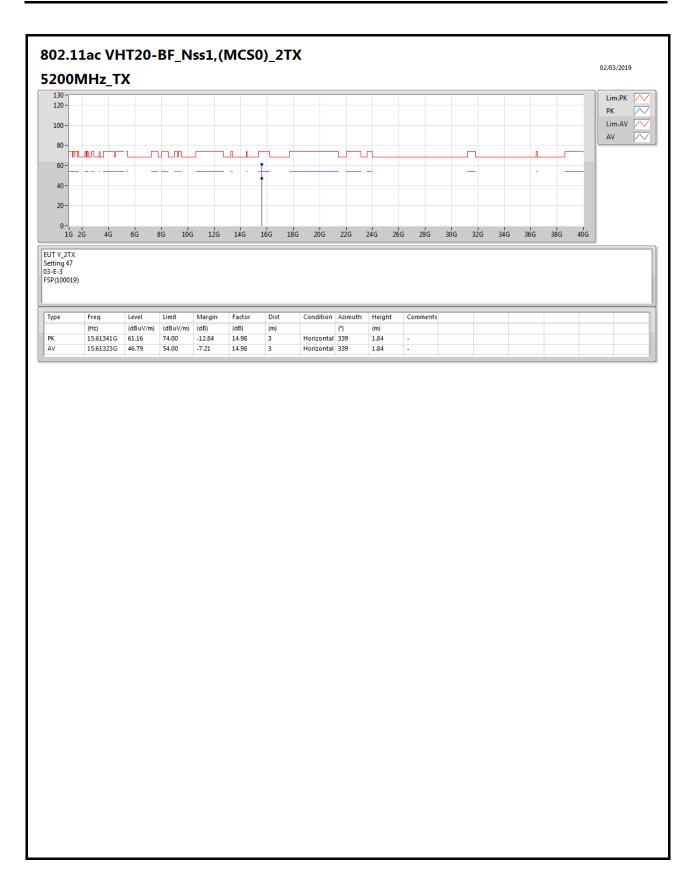
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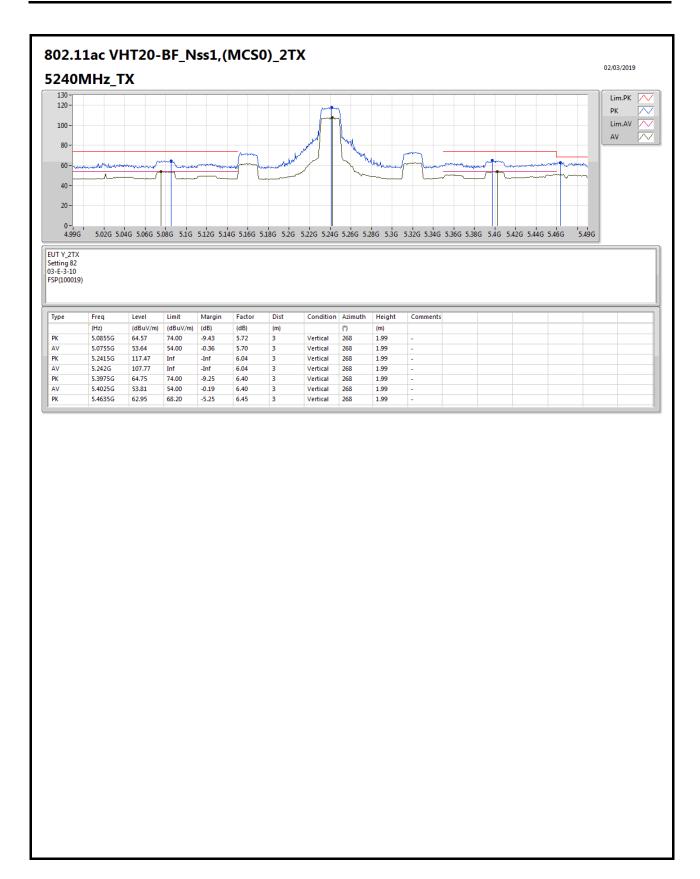
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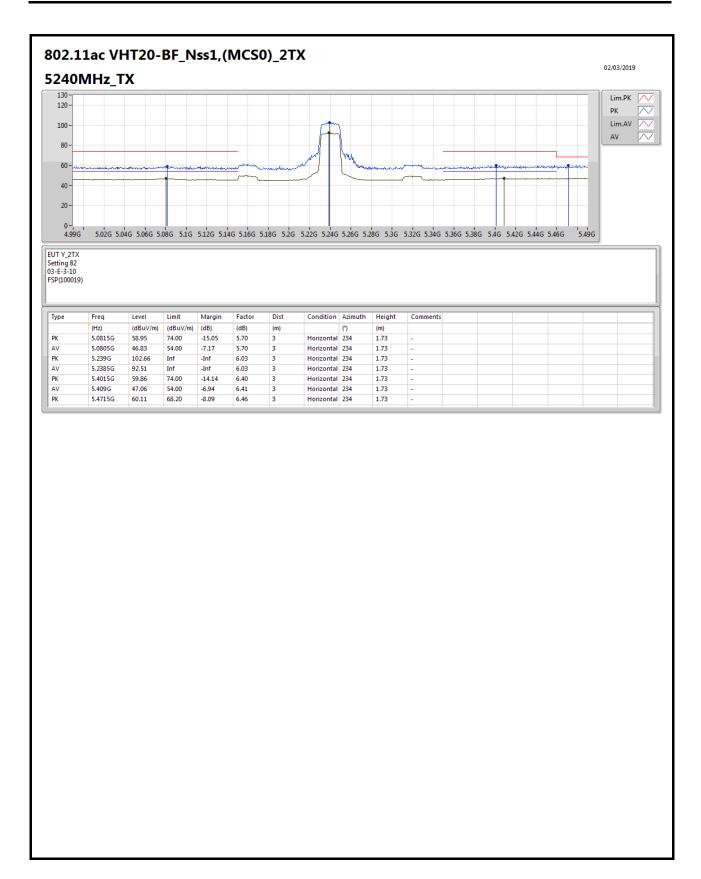
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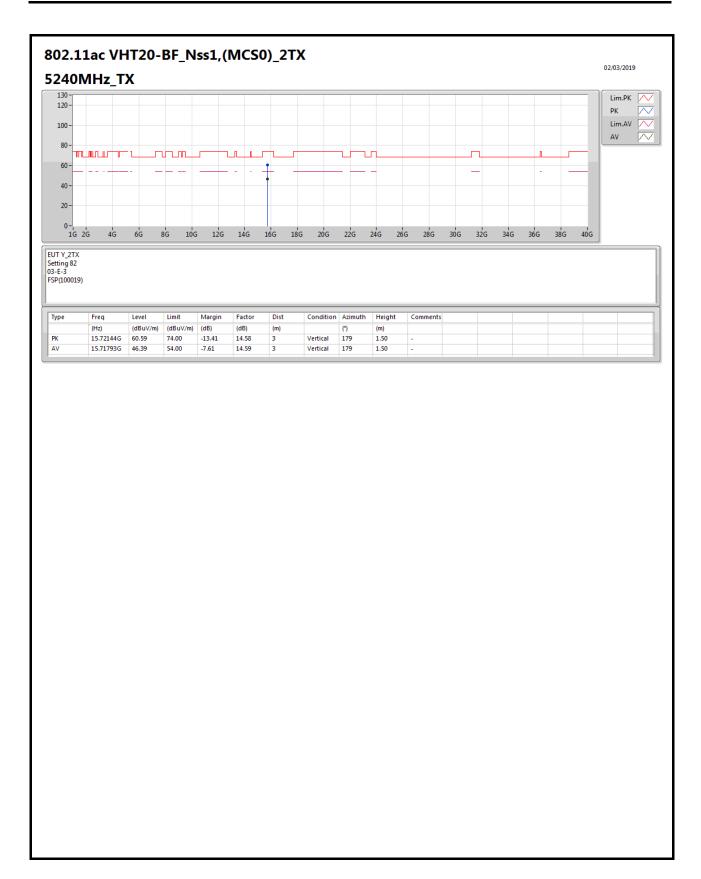
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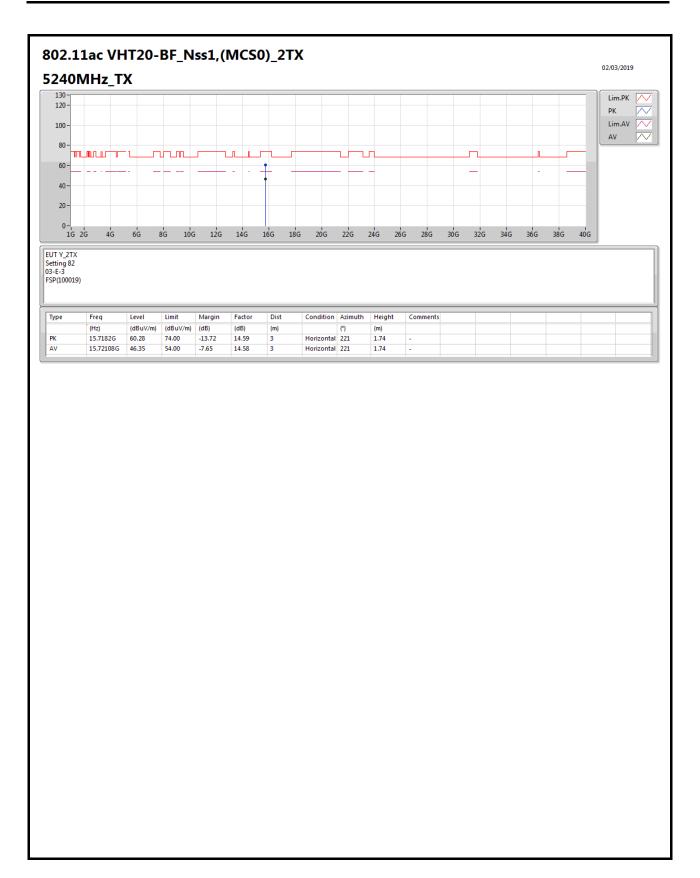
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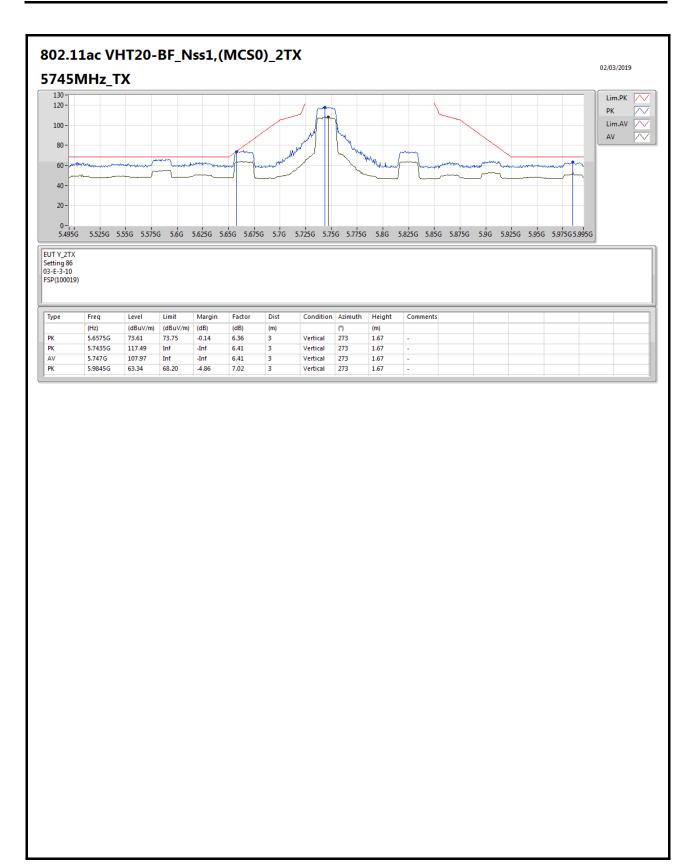
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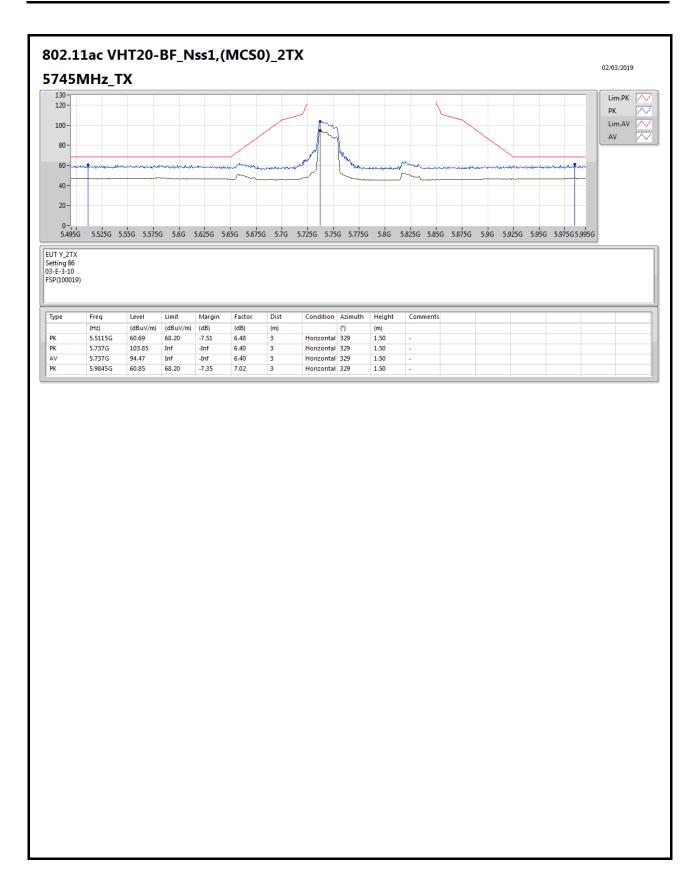
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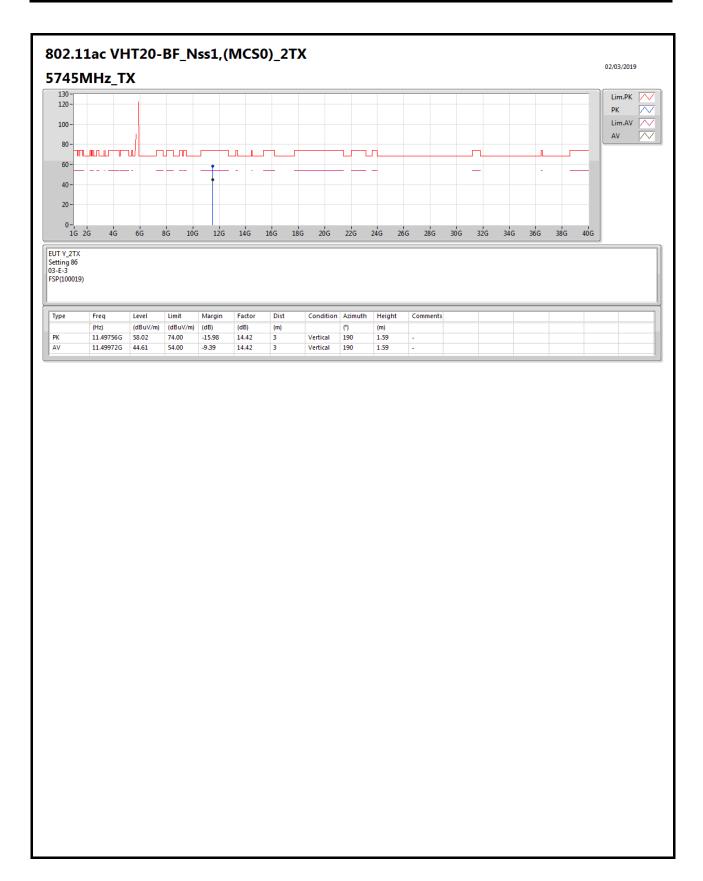
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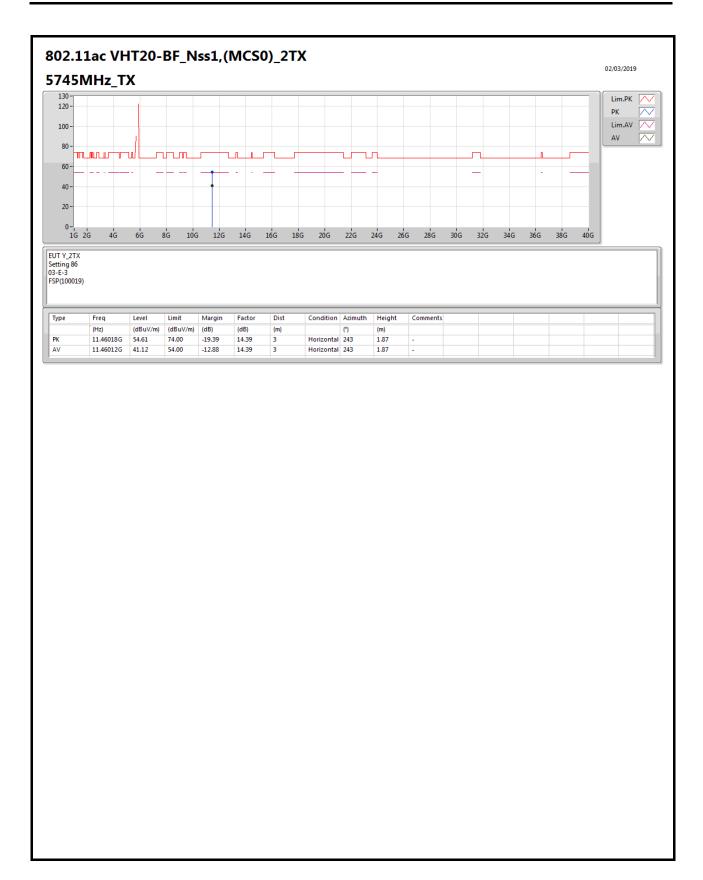
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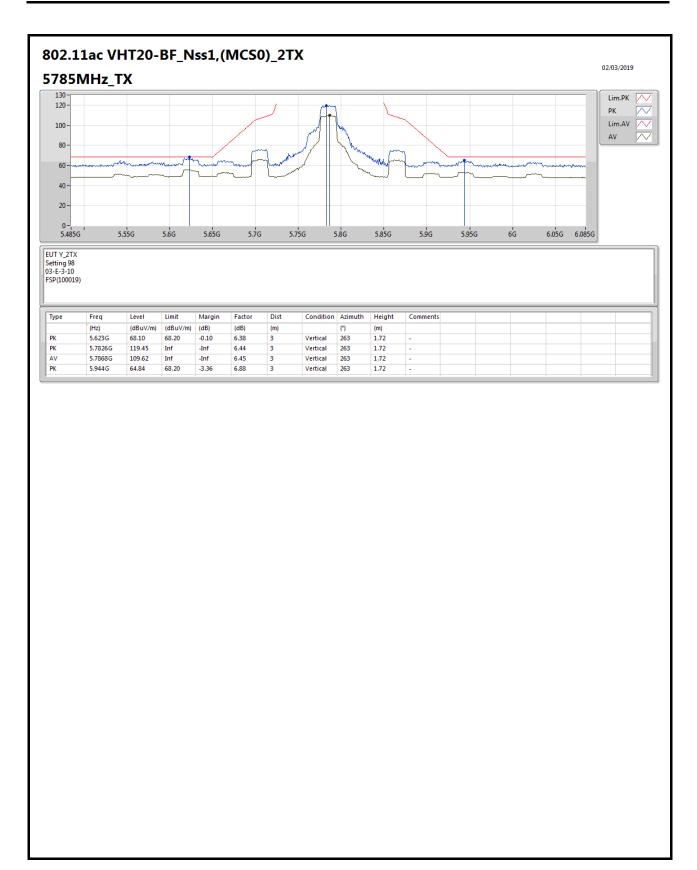
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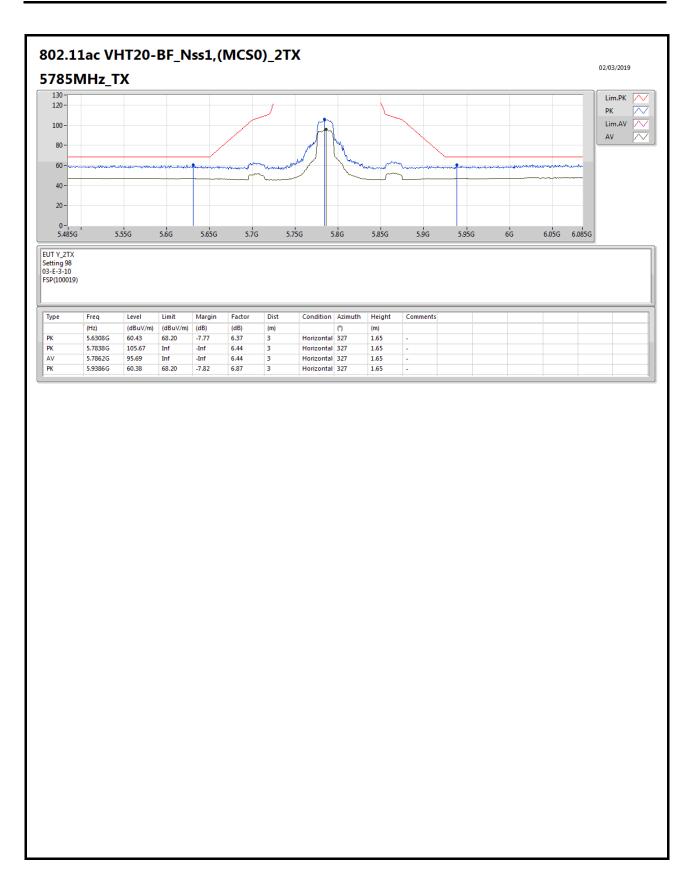
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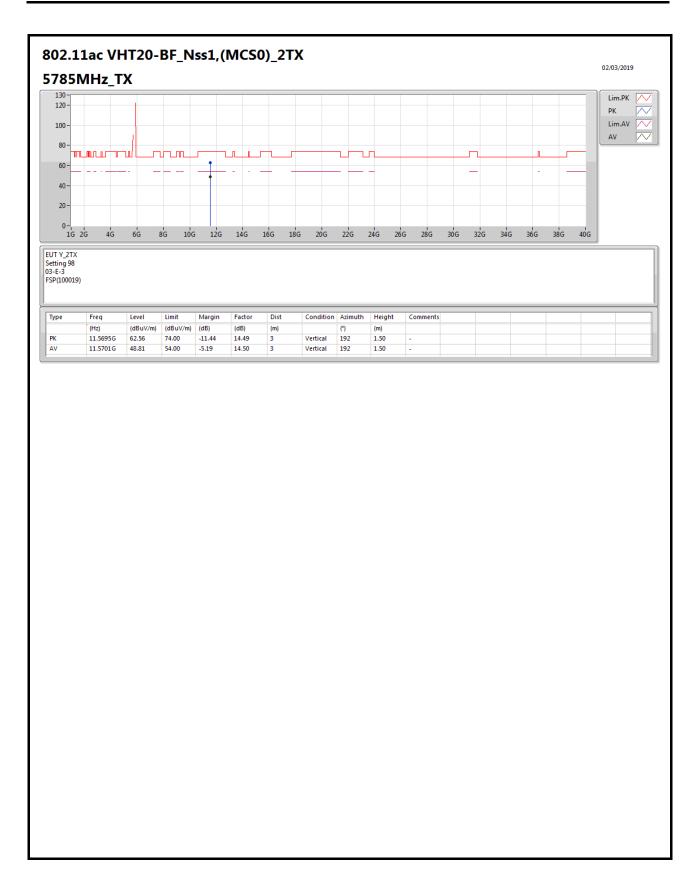
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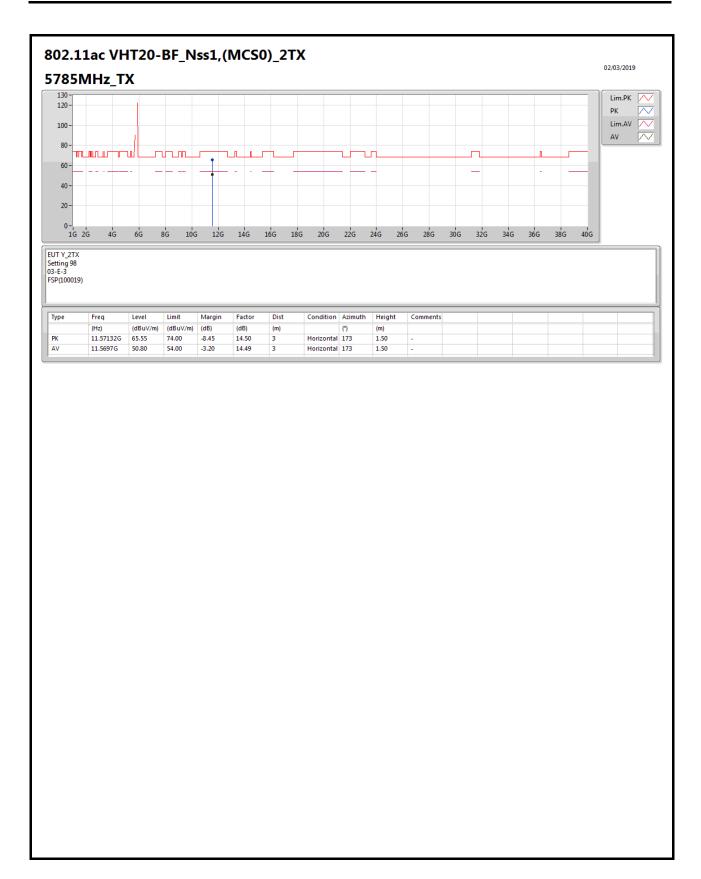
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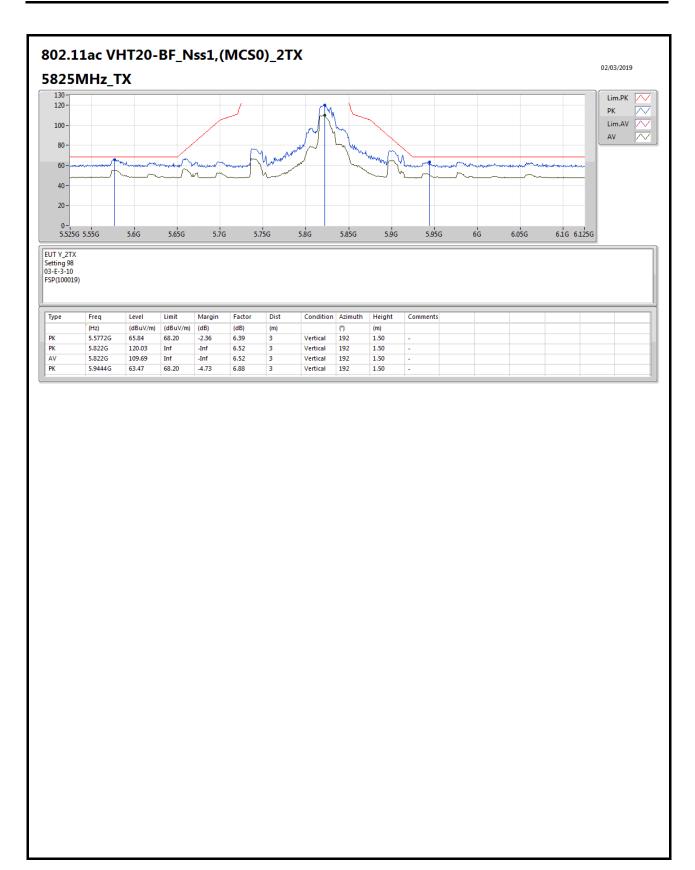
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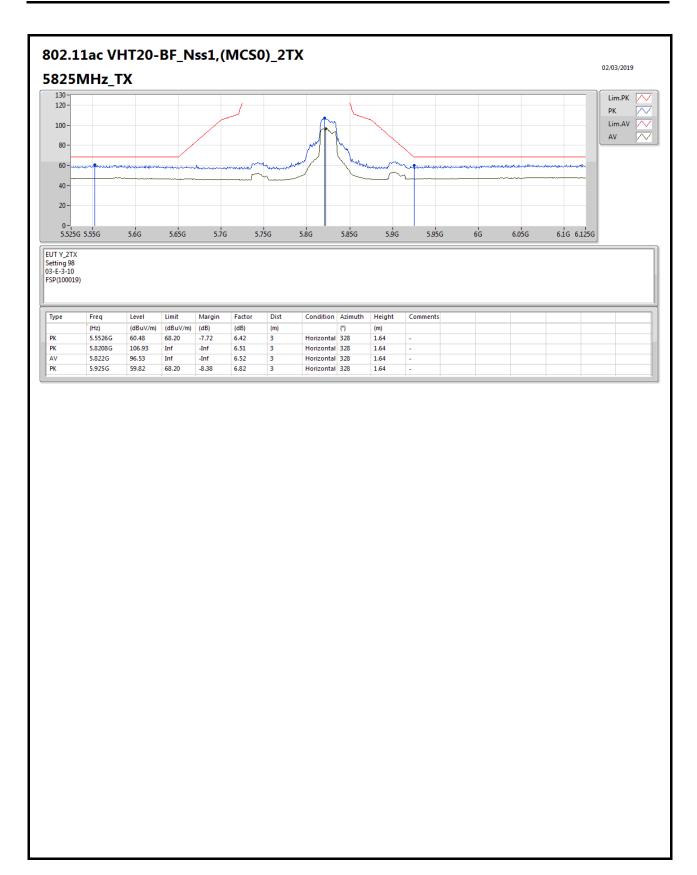
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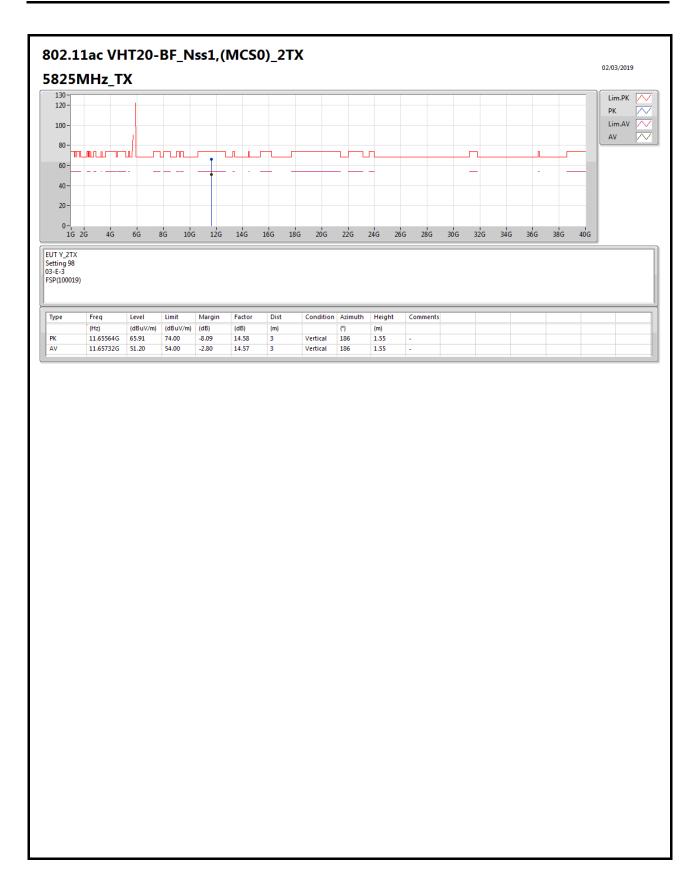
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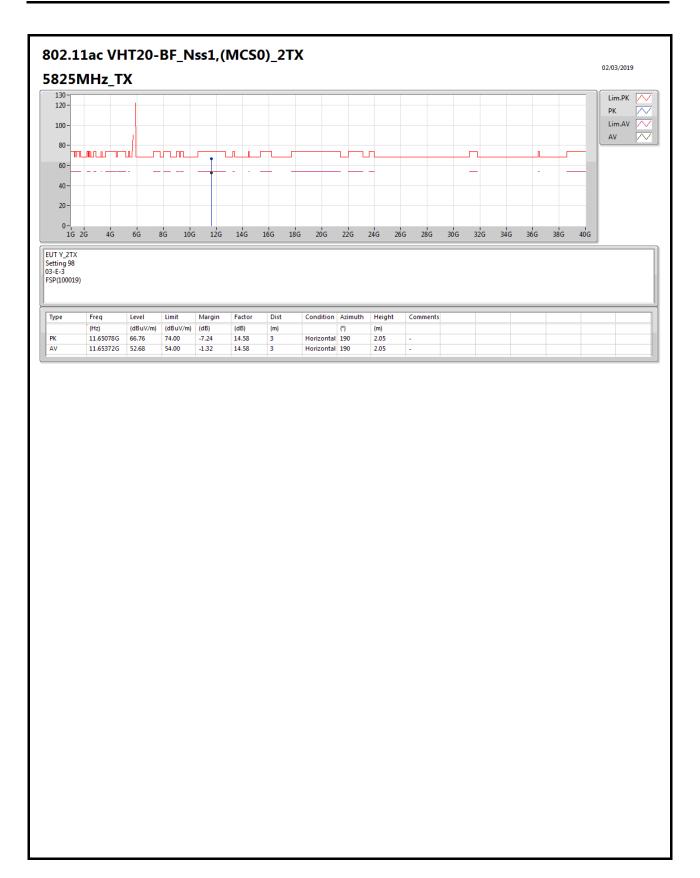
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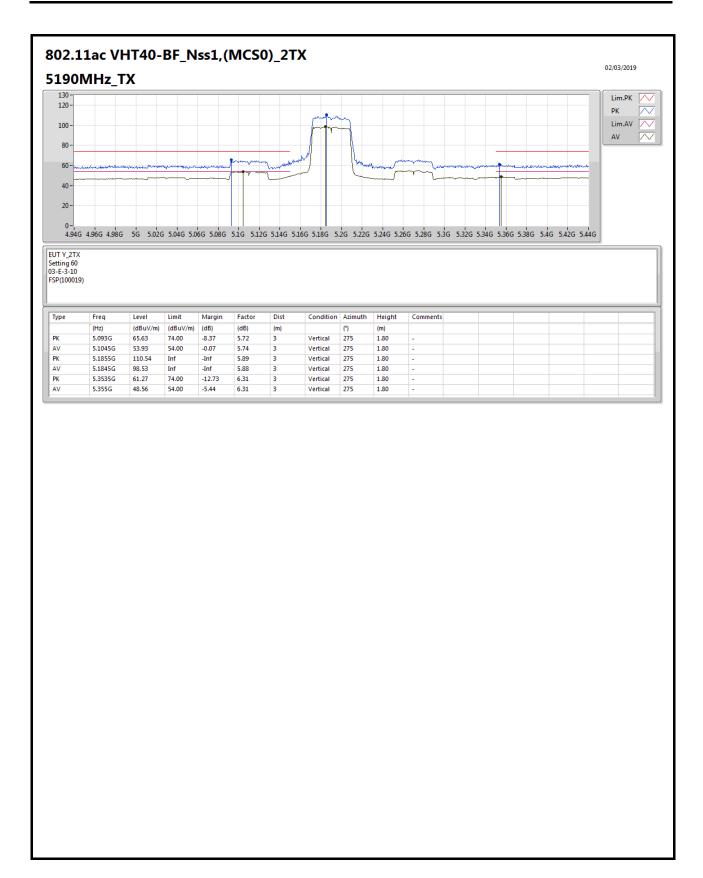
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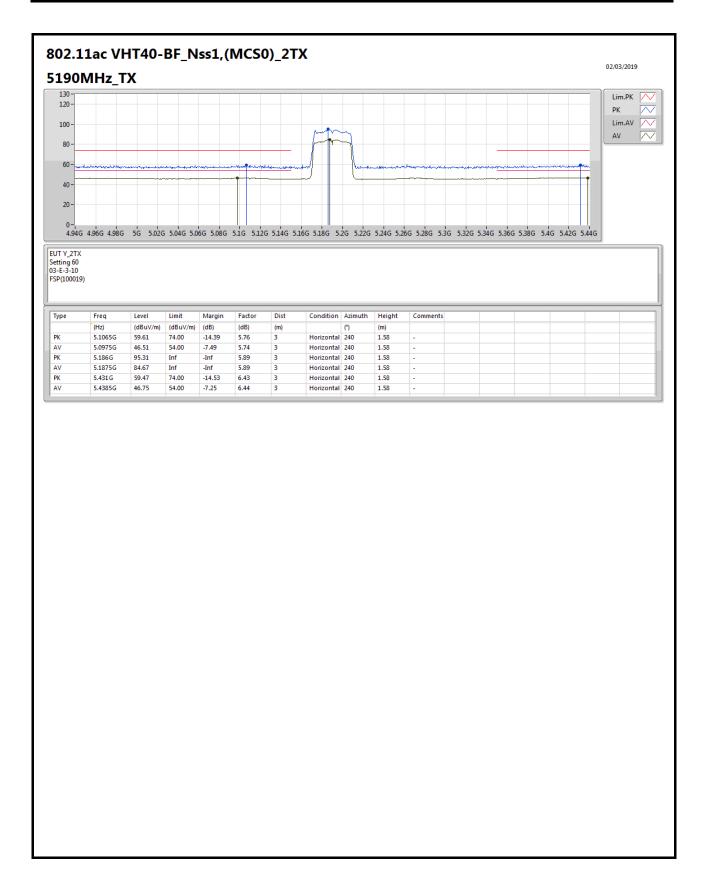
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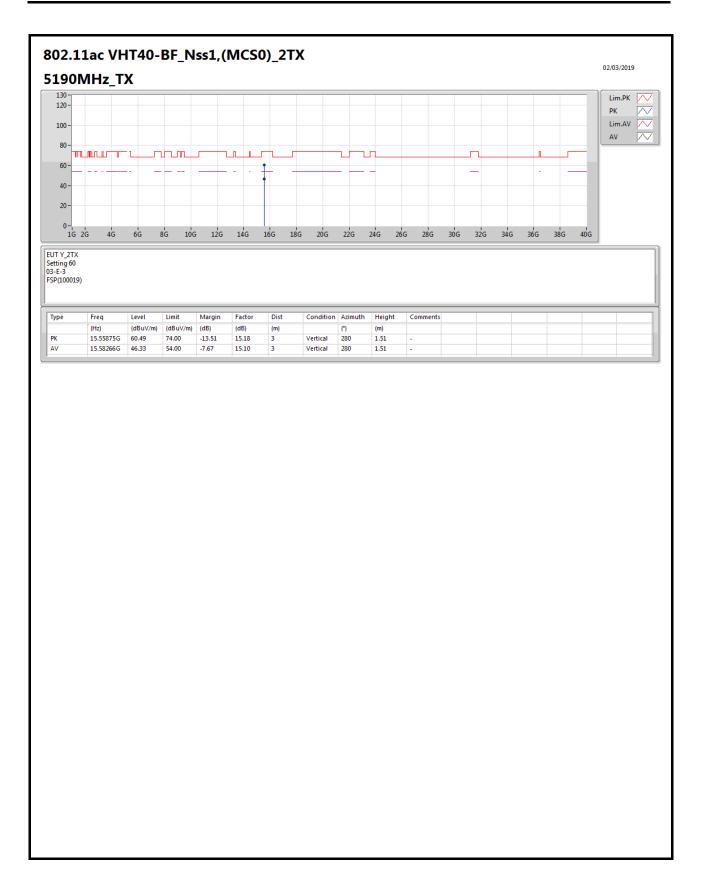
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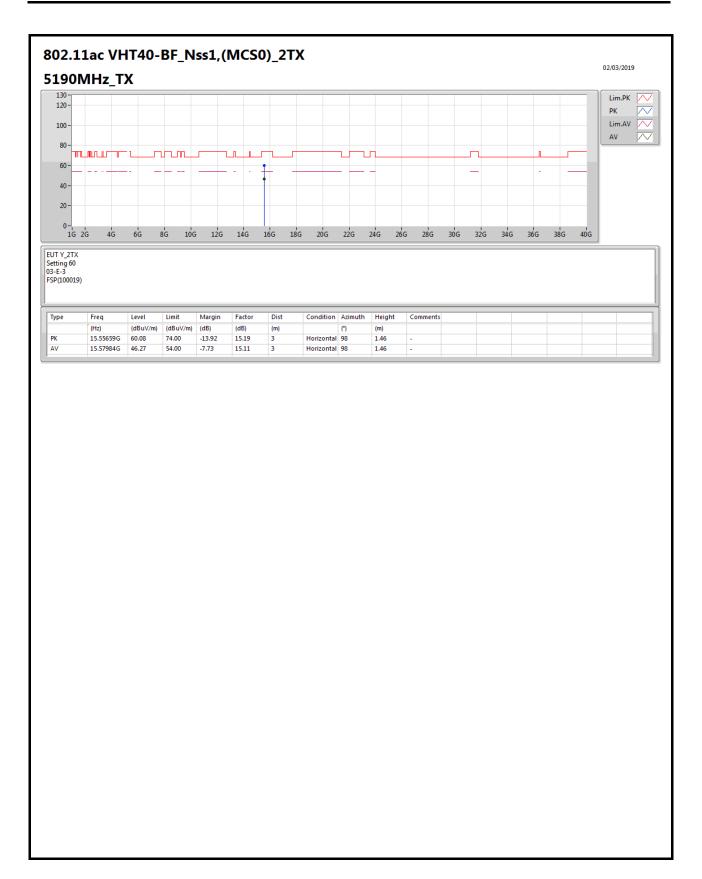
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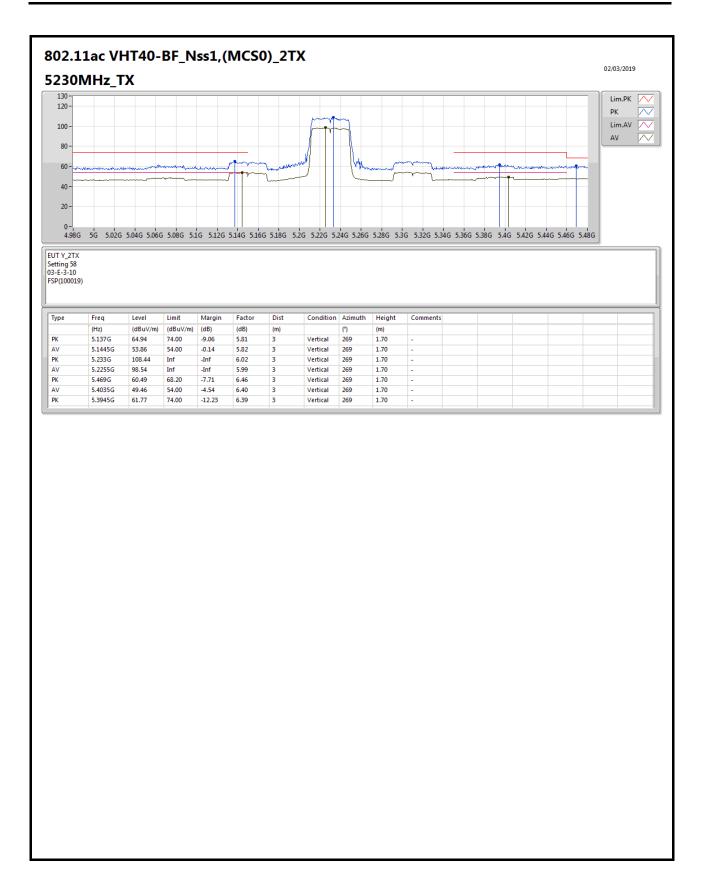
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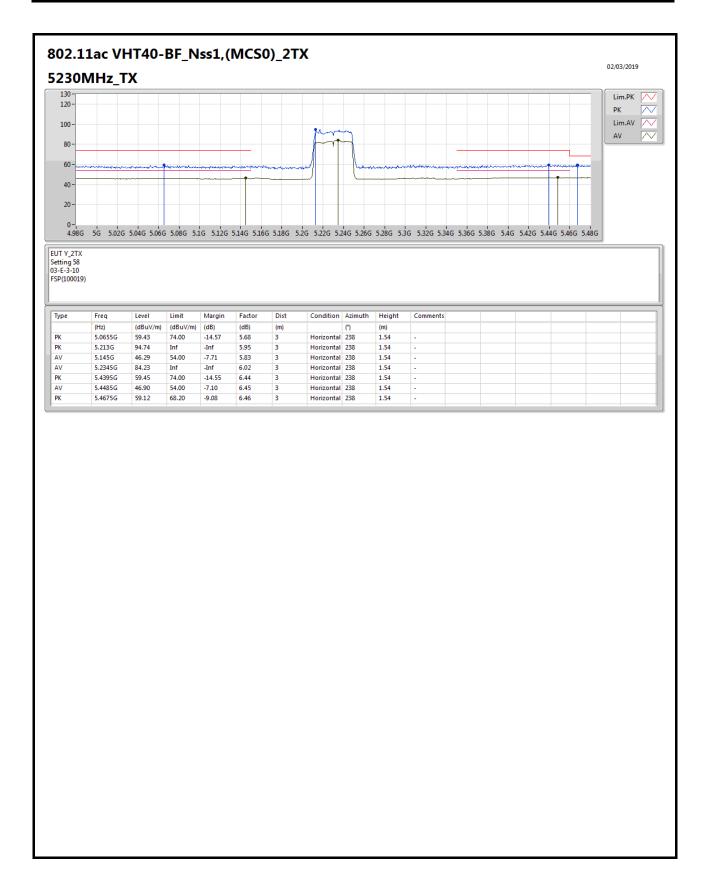
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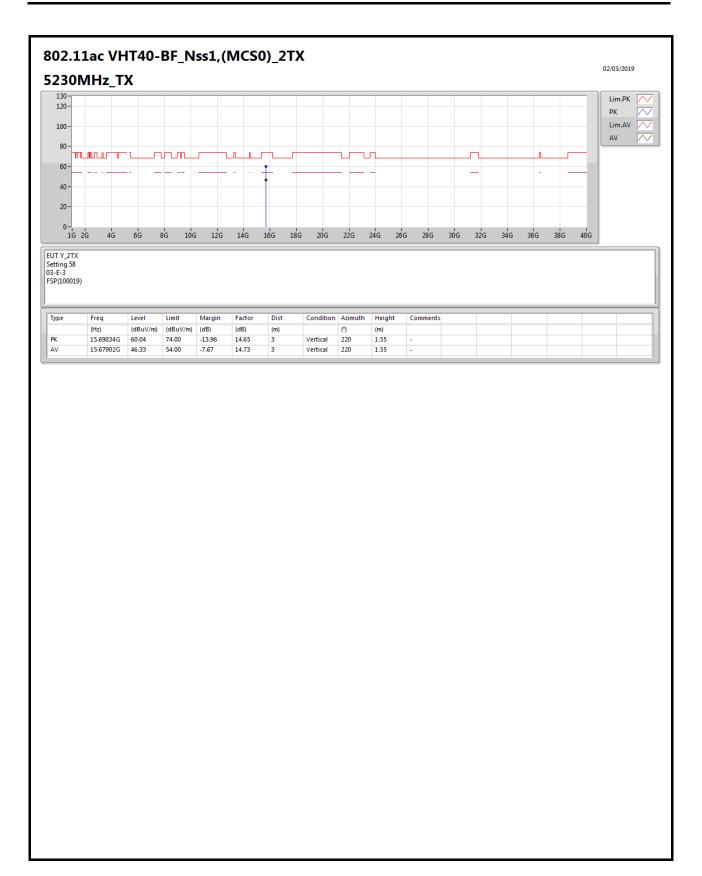
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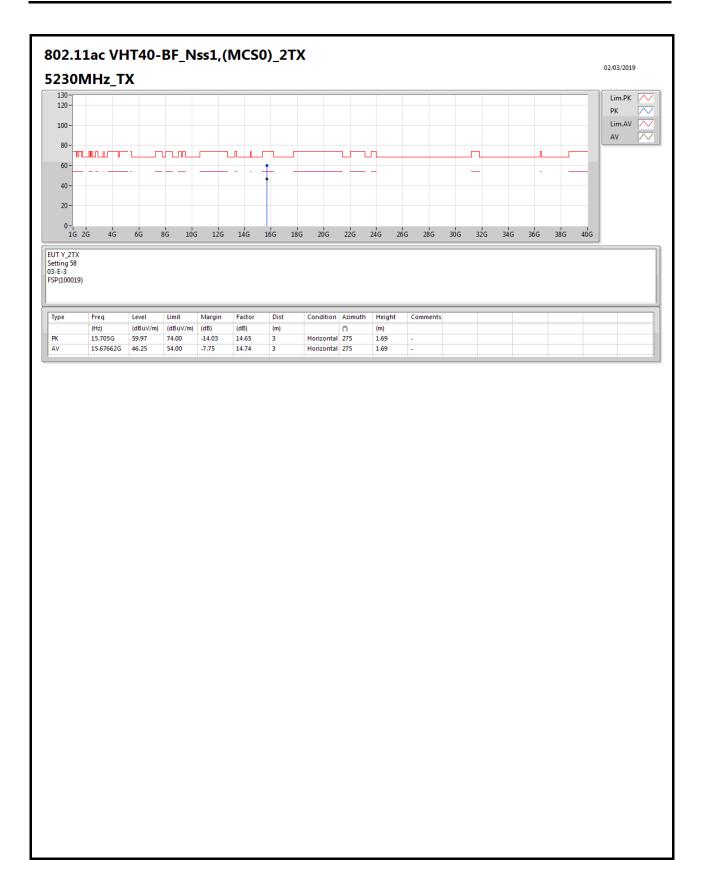
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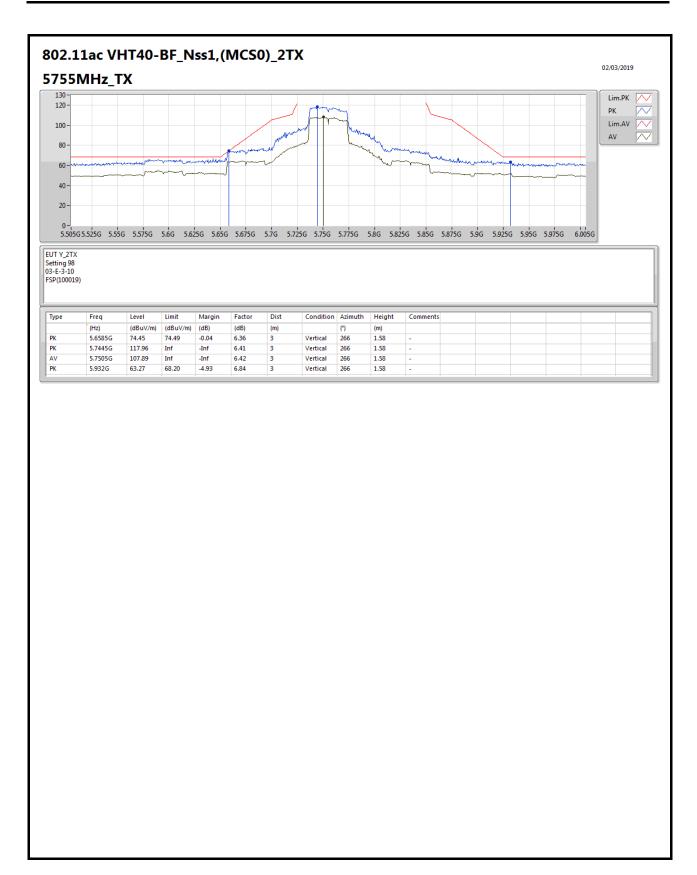
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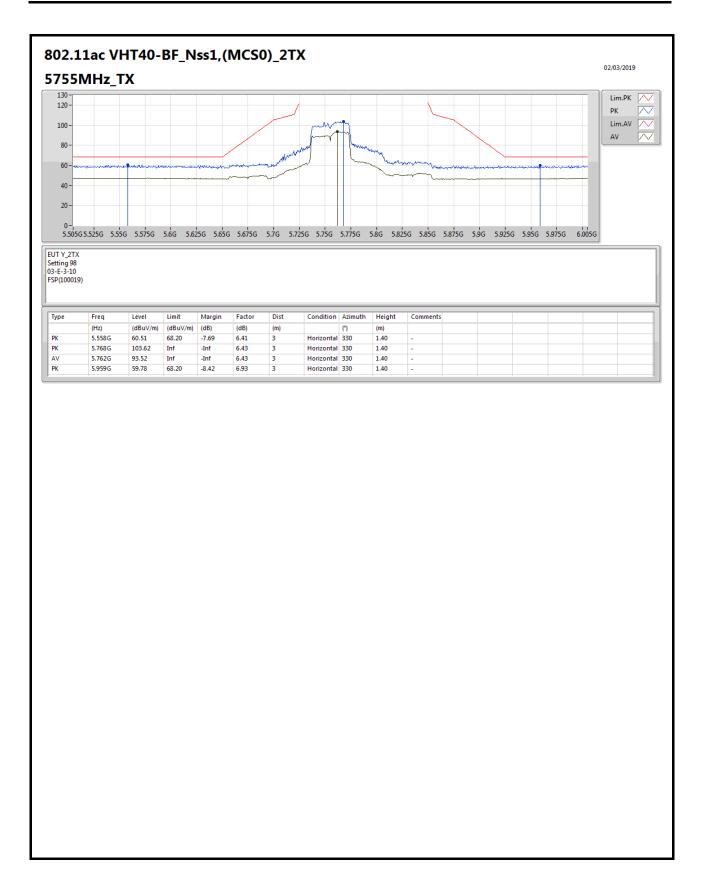
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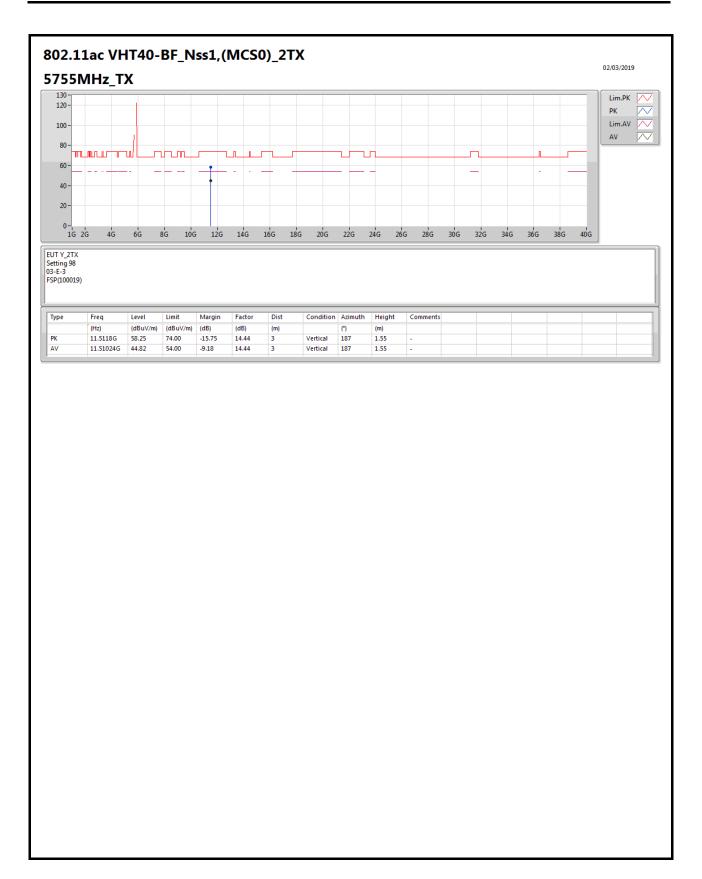
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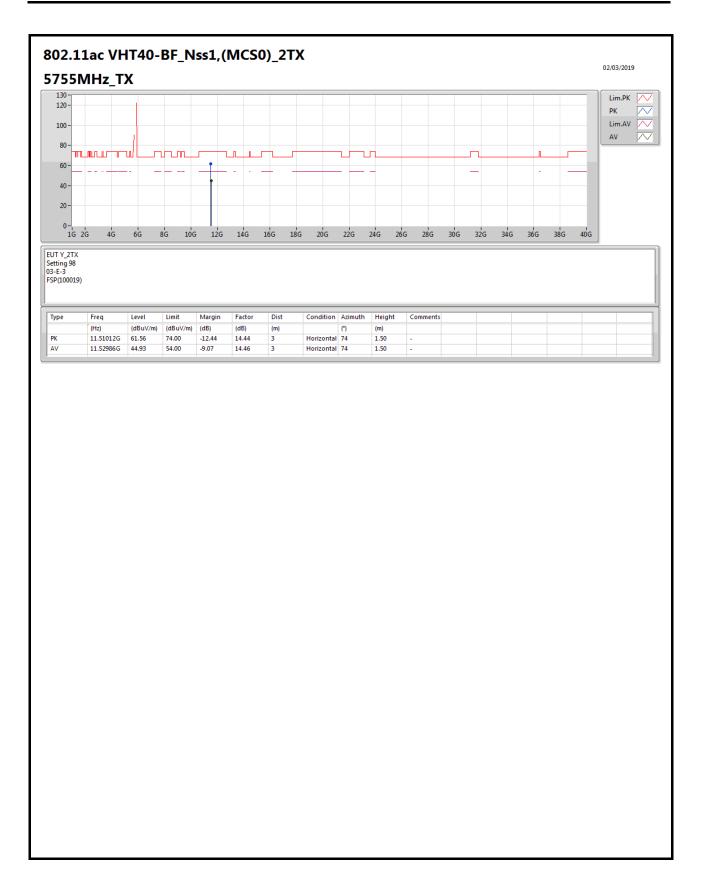
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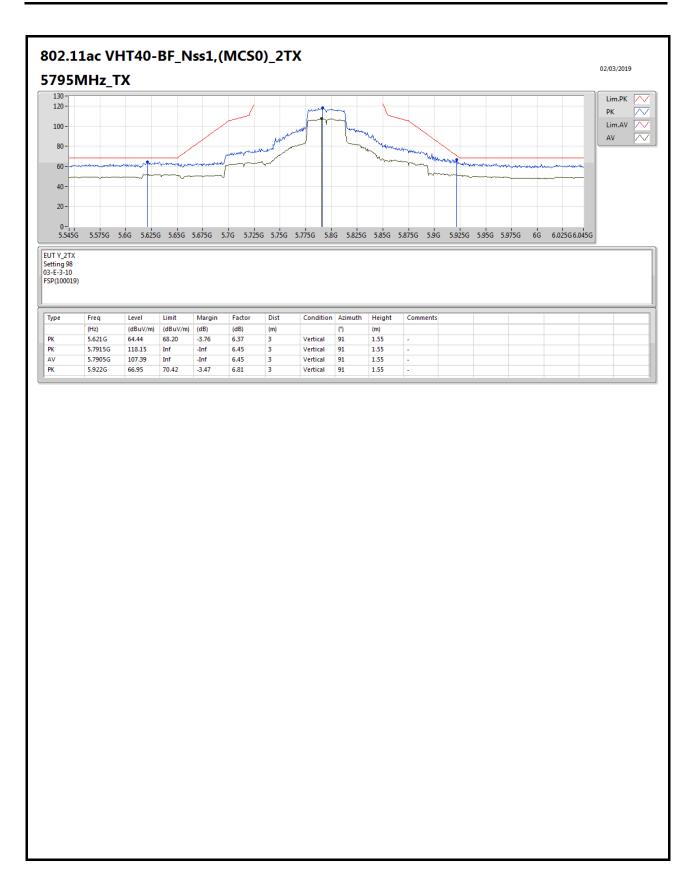
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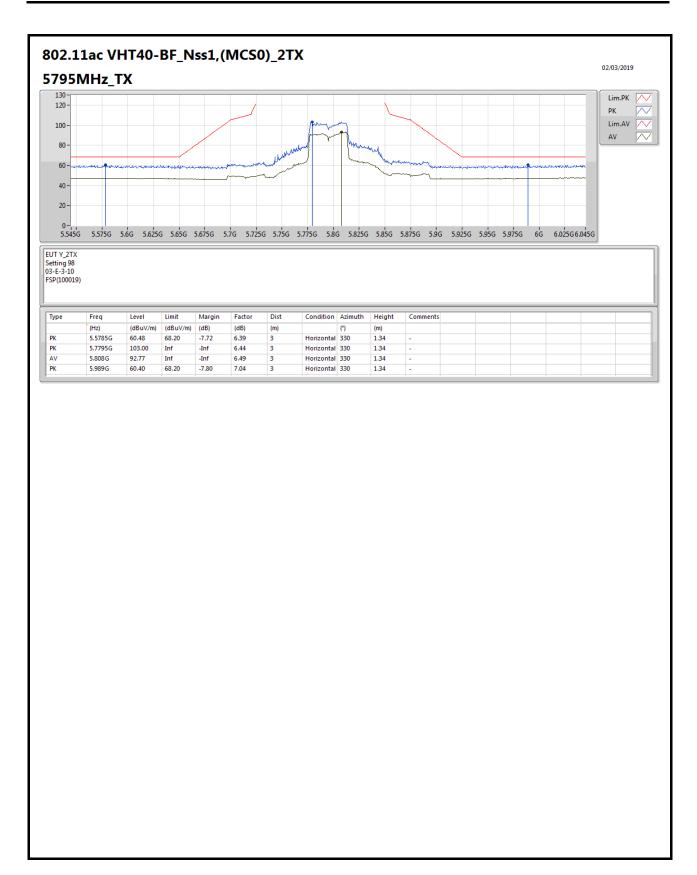
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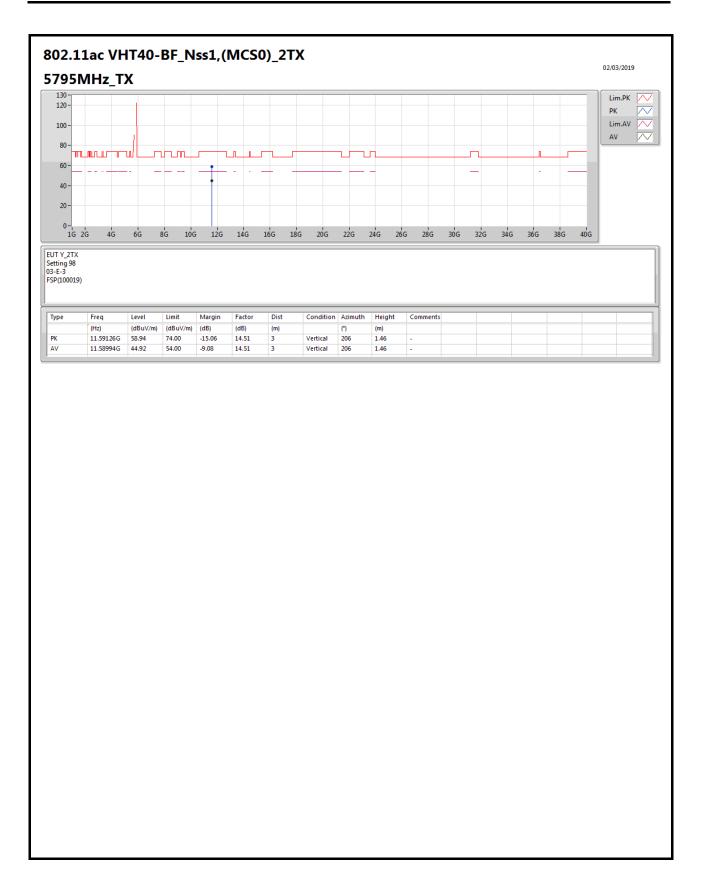
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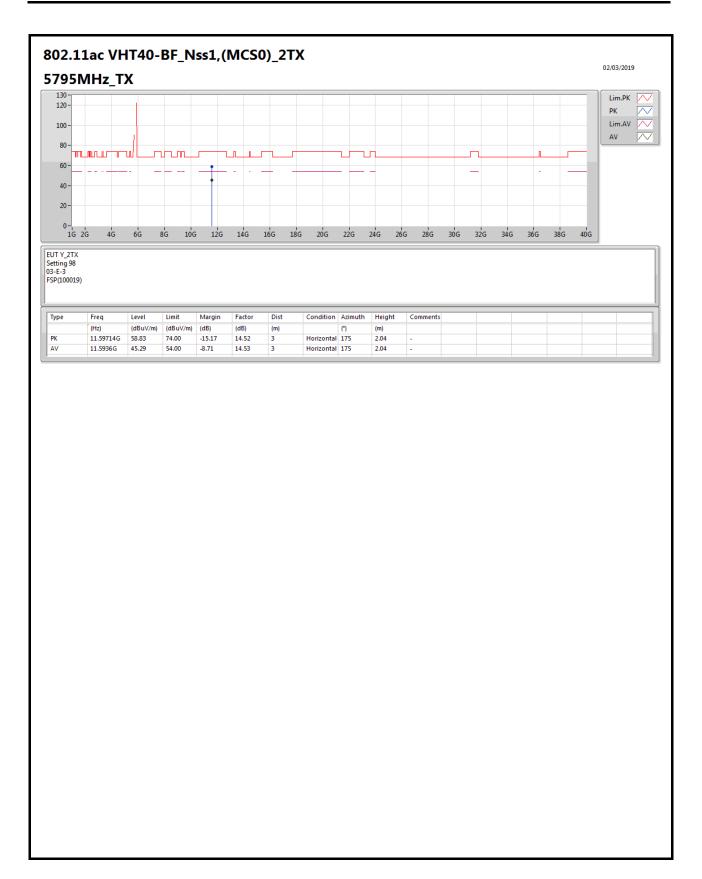
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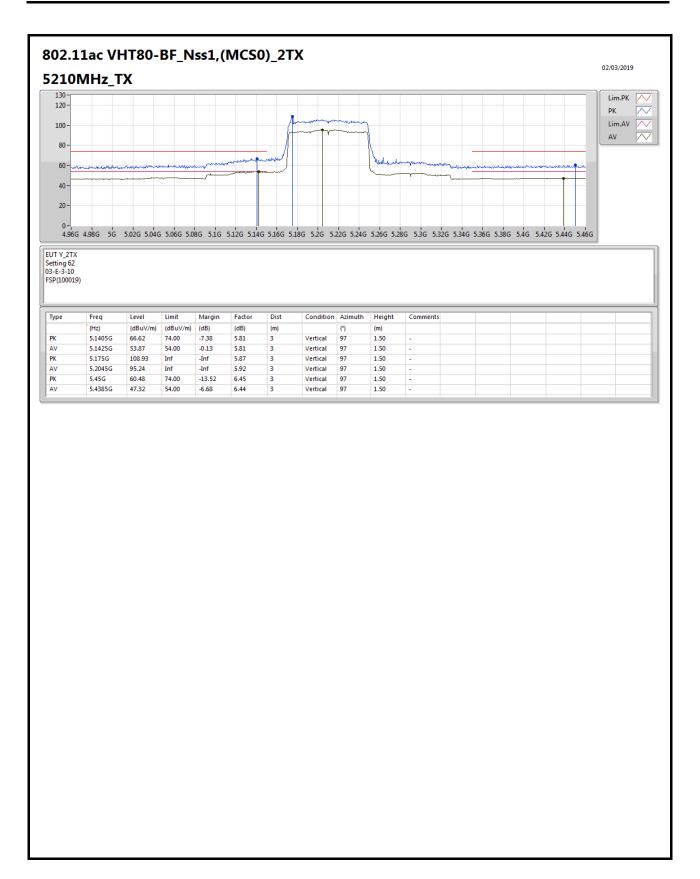


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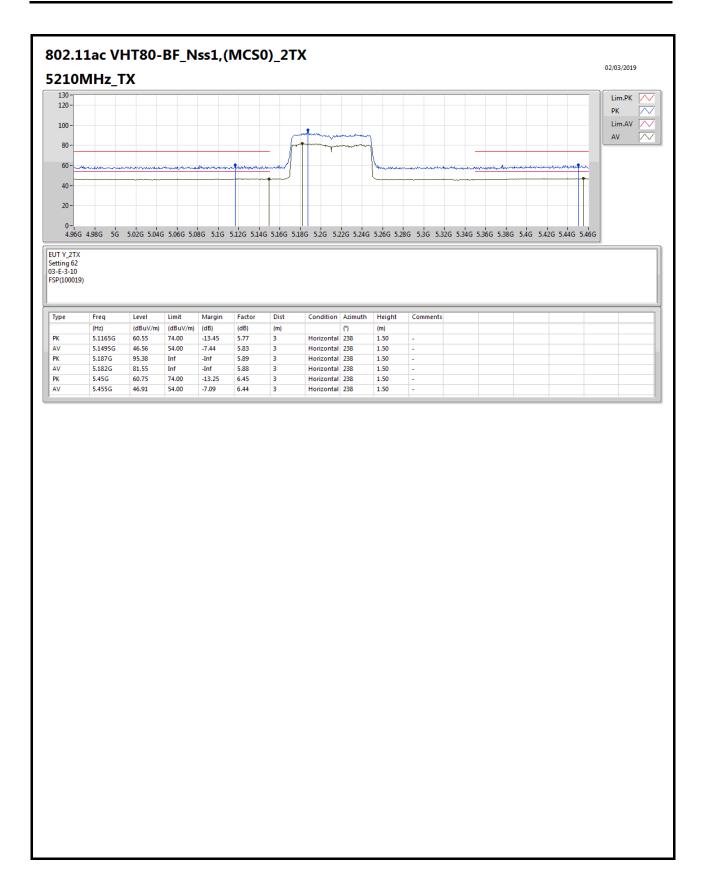






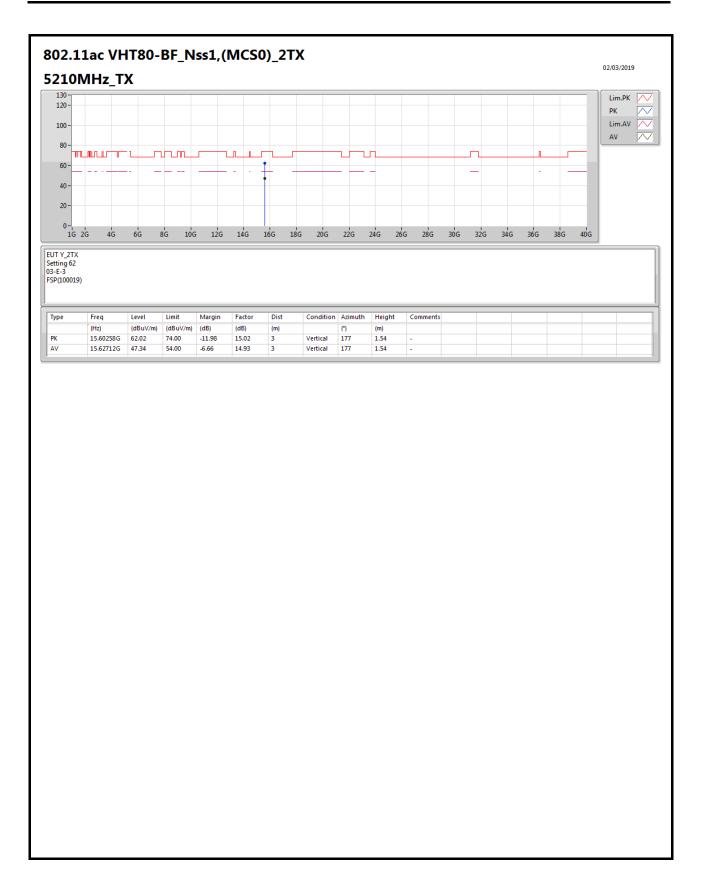
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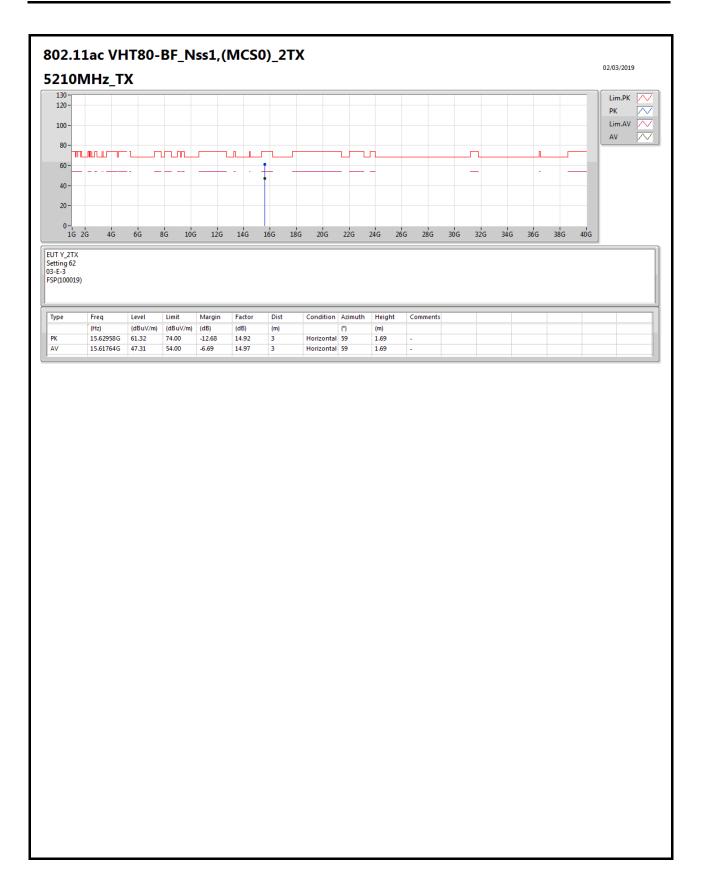
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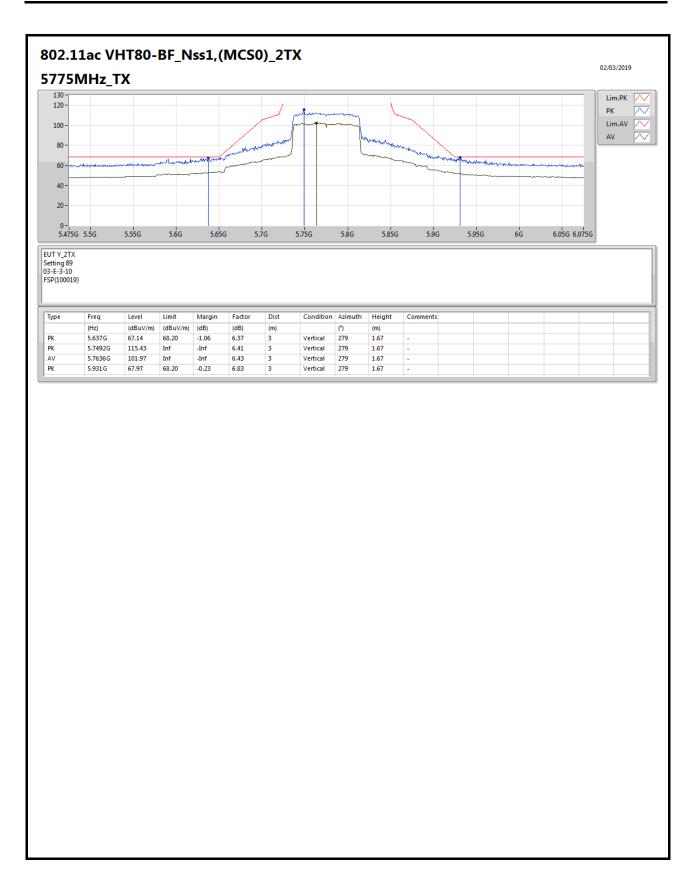
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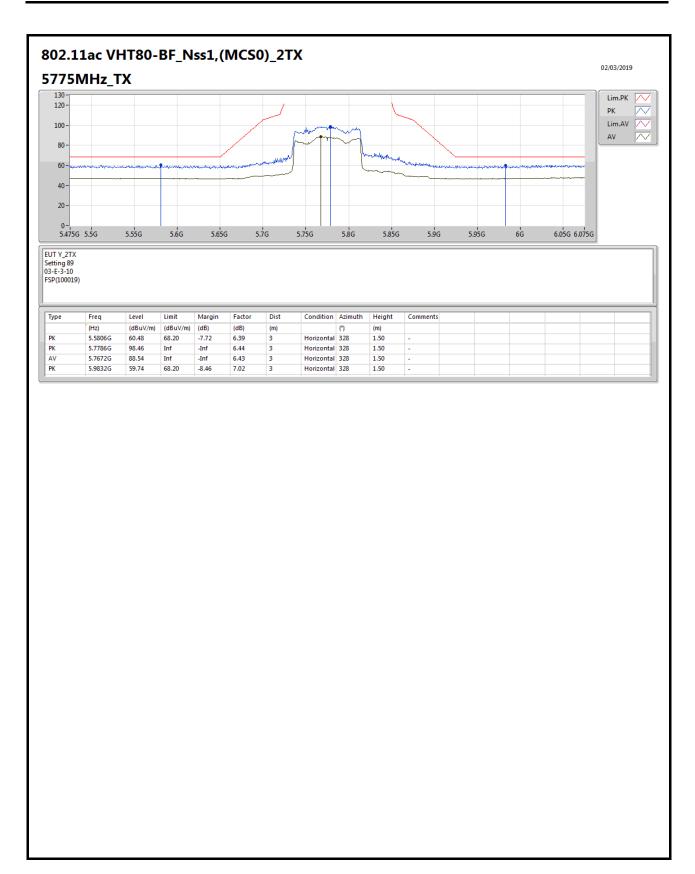
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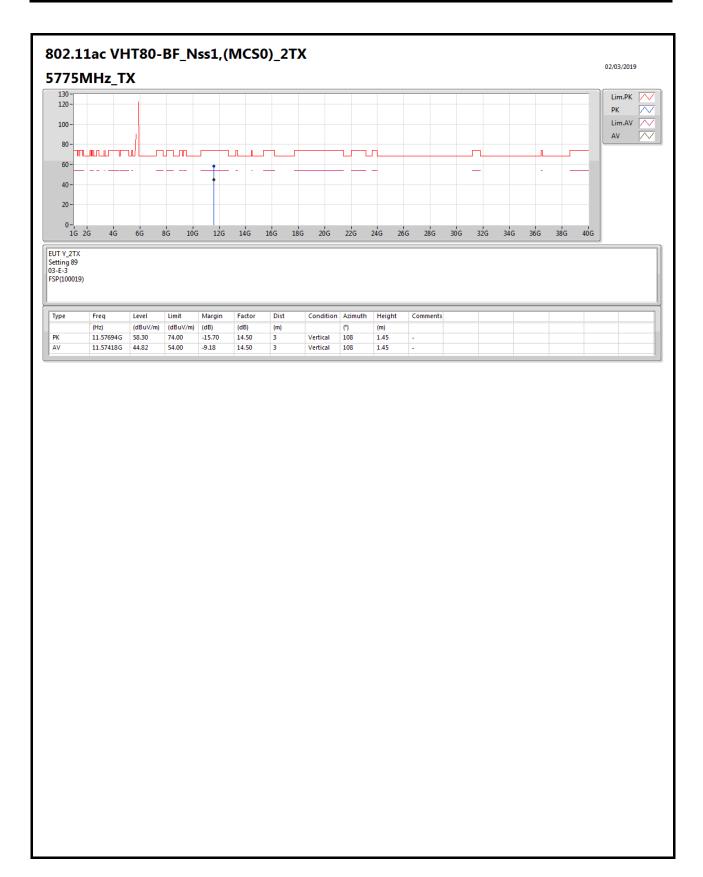
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