



# **FCC RADIO TEST REPORT**

FCC ID : TE7RE505X

Equipment : AX1500 Wi-Fi Range Extender

Brand Name : tp-link

Model Name : RE505X

Applicant: TP-Link Technologies Co., Ltd.

Building 24 (floors 1,3,4,5) and 28 (floors1-4), Central Science and Technology Park, Nanshan

Shenzhen, 518057 China

Manufacturer : TP-Link Technologies Co., Ltd.

Building 24 (floors 1,3,4,5) and 28 (floors1-4), Central Science and Technology Park, Nanshan

Shenzhen, 518057 China

Standard: 47 CFR FCC Part 15.407

The product was received on Sep. 23, 2019, and testing was started from Oct. 21, 2019 and completed on Nov. 04, 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.)

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

Report Template No.: CB-A12\_1 Ver1.0

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Issued Date : Dec. 23, 2019

Report Version : 01

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Appendix G. Test Photos Photographs of EUT v01

Appendix F. Test Results of Radiated Emission Co-location

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# History of this test report

Report No. : FR991919AB

Report No.	Version	Description	Issued Date
FR991919AB	01	Initial issue of report	Dec. 23, 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: Wendy Pan

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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), ax (HEW20)	5180-5240	36-48 [4]
5725-5850		5745-5825	149-165 [5]
5150-5250	n (HT40), ac (VHT40), ax (HEW40)	5190-5230	38-46 [2]
5725-5850		5755-5795	151-159 [2]
5150-5250	ac (VHT80), ax (HEW80)	5210	42 [1]
5725-5850		5775	155 [1]

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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	802.11ac VHT20	20	2TX
5.15-5.25GHz	802.11ac VHT20-BF	20	2TX
5.15-5.25GHz	802.11ax HEW20	20	2TX
5.15-5.25GHz	802.11ax HEW20-BF	20	2TX
5.15-5.25GHz	802.11n HT40	40	2TX
5.15-5.25GHz	802.11ac VHT40	40	2TX
5.15-5.25GHz	802.11ac VHT40-BF	40	2TX
5.15-5.25GHz	802.11ax HEW40	40	2TX
5.15-5.25GHz	802.11ax HEW40-BF	40	2TX
5.15-5.25GHz	802.11ac VHT80	80	2TX
5.15-5.25GHz	802.11ac VHT80-BF	80	2TX
5.15-5.25GHz	802.11ax HEW80	80	2TX
5.15-5.25GHz	802.11ax HEW80-BF	80	2TX
5.725-5.85GHz	802.11a	20	2TX
5.725-5.85GHz	802.11n HT20	20	2TX
5.725-5.85GHz	802.11ac VHT20	20	2TX
5.725-5.85GHz	802.11ac VHT20-BF	20	2TX
5.725-5.85GHz	802.11ax HEW20	20	2TX
5.725-5.85GHz	802.11ax HEW20-BF	20	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

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Band	Mode	BWch (MHz)	Nant
5.725-5.85GHz	802.11ax HEW40	40	2TX
5.725-5.85GHz	802.11ax HEW40-BF	40	2TX
5.725-5.85GHz	802.11ac VHT80	80	2TX
5.725-5.85GHz	802.11ac VHT80-BF	80	2TX
5.725-5.85GHz	802.11ax HEW80	80	2TX
5.725-5.85GHz	802.11ax HEW80-BF	80	2TX

#### Note:

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

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#### 1.1.2 Antenna Information

	Po	ort					Gain	(dBi)
Ant.	WLAN 2.4GHz	WLAN 5GHz	Brand	Model Name	Antenna Type		WLAN 2.4GHz	WLAN 5GHz
1	1	2	tp-link	3101502662	Dipole	I-PEX	3	5
2	2	1	tp-link	3101502662	Dipole	I-PEX	3	5

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Note: The above information was declared by manufacturer.

#### For 2.4GHz function:

#### 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 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/ax mode (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

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11a	0.952	0.21	2.065m	1k
802.11ac VHT20-BF	0.933	0.3	3.84m	300
802.11ac VHT40-BF	0.945	0.25	3.025m	1k
802.11ac VHT80-BF	0.958	0.19	3.69m	300
802.11ax HEW20-BF	0.949	0.23	3.21m	1k
802.11ax HEW40-BF	0.944	0.25	3.248m	1k
802.11ax HEW80-BF	0.937	0.28	4.17m	300

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- 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		
	For 802.11ac/ax in 5GHz					
Function		Outdoor P2M	$\boxtimes$	Indoor P2M		
i dilotion		Fixed P2P		Client		
Test Software Version	For non- beamforming: Mtool ver 3.1.0.3 For beamforming: LanTest(v2.0.0.2) \times Telnet					

Note: The above information was declared by manufacturer.

## 1.1.5 Table for EUT support function.

Function
AP (Master) Mode
Extender (Master + Client without radar detection) Mode

Note: The EUT supports AP and Extender mode, Extender mode only for AC power-line conducted emissions and Unwanted Emissions below 1GHz were tested and recorded in this test report by manufacturer request.

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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
- FCC KDB 662911 D01 v02r01
- FCC KDB 412172 D01 v01r01
- FCC KDB 414788 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			
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	Eddie Weng	24~25.8°C / 57~59%	Oct. 21, 2019 ~ Nov. 04, 2019
Radiated<1GHz	03CH05-CB	Paul Chen	23.7~25.8°C / 55~60%	Oct. 21, 2019
Radiated>1GHz	03CH06-CB	KJ Chang	24.1~25.7°C / 55~58%	Oct. 16, 2019 ~ Nov. 04, 2019
AC Conduction	CO01-CB	Wei Li	23~24°C / 56~59%	Oct. 29, 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)	4.3 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.3 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	5.1 dB	Confidence levels of 95%
Conducted Emission	2.4 dB	Confidence levels of 95%
Output Power Measurement	1.5 dB	Confidence levels of 95%
Power Density Measurement	2.4 dB	Confidence levels of 95%
Bandwidth Measurement	2%	Confidence levels of 95%

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Test site registered number IC 4086D with Industry Canada.

# 2 Test Configuration of EUT

## 2.1 Test Channel Mode

Mode	Power Setting
802.11a_Nss1,(6Mbps)_2TX	-
5180MHz	75
5200MHz	92
5240MHz	90
5745MHz	86
5785MHz	85
5825MHz	85
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	-
5180MHz	71
5200MHz	168
5240MHz	158
5745MHz	150
5785MHz	168
5825MHz	141
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	-
5190MHz	38
5230MHz	126
5755MHz	141
5795MHz	126
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	-
5210MHz	35
5775MHz	60
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-
5180MHz	63
5200MHz	178
5240MHz	158
5745MHz	150
5785MHz	150
5825MHz	150
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-
5190MHz	35
5230MHz	126
5755MHz	141
5795MHz	126
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	-
5210MHz	42

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Mode	Power Setting
5775MHz	75

- Note:1. There are two modes of EUT. One is beamforming mode, and the other is non-beamforming mode, after evaluating, beamforming mode has been evaluated to be the worst case, so it was selected to test and record in this test report.
  - 2.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.

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# 2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests				
Tests Item AC power-line conducted emissions				
Condition AC power-line conducted measurement for line and neutral				
Operating Mode	Normal Link			
1	Extender Mode			

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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	e Worst Case Mode for Following Conformance Tests			
Tests Item	Unwanted Emissions			
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.			
Operating Mode < 1GHz	Normal Link			
1	Extender Mode - EUT in Y axis + antenna in vertical			
2	Extender Mode - EUT in Z axis + antenna in 90°			
3	Extender Mode - EUT in Z axis + antenna in 180°			
For operating mode 3 is th	e worst case and it was record in this test report.			
Operating Mode > 1GHz	CTX			
The EUT was performed at Y axis + antenna in vertical, Z axis + antenna in 90° and Z axis + antenna in 180 position, and the worst case was found at Z axis + antenna in 180°. So the measurement will follow thi same test configuration.				
1	EUT in Z axis + antenna in 180°			

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The Worst Case Mode for Following Conformance Tests			
Tests Item Simultaneous Transmission Analysis - Radiated Emission Co-location			
Test Condition Radiated measurement			
	Normal Link		
Operating Mode	The EUT was performed at Y axis + antenna in vertical, Z axis + antenna in 90° and Z axis + antenna in 180° position, and the worst case was found at EUT in Z axis + antenna in 180°. So the measurement will follow this same test configuration.		
1	WLAN 2.4GHz + WLAN 5GHz - EUT in Z axis + antenna in 180°		
Refer to Appendix F for Radiated Emission Co-location.			

The Worst Case Mode for Following Conformance Tests			
Tests Item Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation			
Operating Mode			
1	WLAN 2.4GHz + WLAN 5GHz		
Refer to Sporton Test Report No.: FA991919 for Co-location RF Exposure Evaluation.			

## 2.3 EUT Operation during Test

For CTX Mode:

#### non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

#### beamforming 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(v2.0.0.2).exe" to link with the remote workstation to transmit and receive packet by Wireless AP and transmit duty cycle no less than 98%.

#### For Normal Link:

During the test, the EUT operation to normal function.

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#### 2.4 **Accessories**

N/A

#### **Support Equipment** 2.5

#### For AC Conduction:

1017	i di Ao donauction.				
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	AP Router	ASUS	RP-N53	MSQ-RPN53	

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For Radiated (below 1GHz):

	Support Equipment						
No.	Equipment	Brand Name	Model Name	FCC ID			
Α	Notebook	DELL	E4300	N/A			
В	Notebook	DELL	E4300	N/A			
С	Notebook	DELL	E4300	N/A			
D	WLAN AP	tp-link	RE505	N/A			

# For Radiated (above 1GHz) and RF Conducted: Non-beamforming mode:

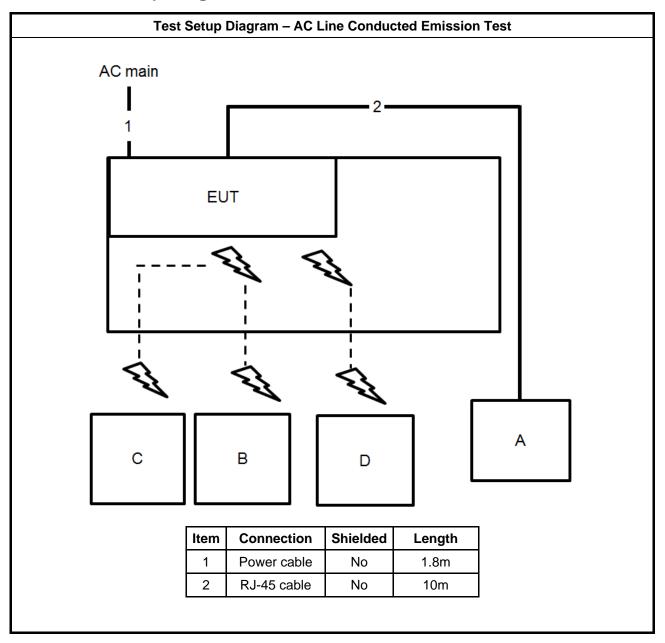
Support Equipment					
No.	Equipment	Brand Name	Model Name	FCC ID	
Α	Notebook	DELL	E4300	N/A	

Bbeamforming mode:

Support Equipment							
No. Equipment Brand Name Model Name FCC ID							
Α	Notebook	DELL	E4300	N/A			
В	RX device	TP-Link	RE505	N/A			
С	Notebook	DELL	E4300	N/A			

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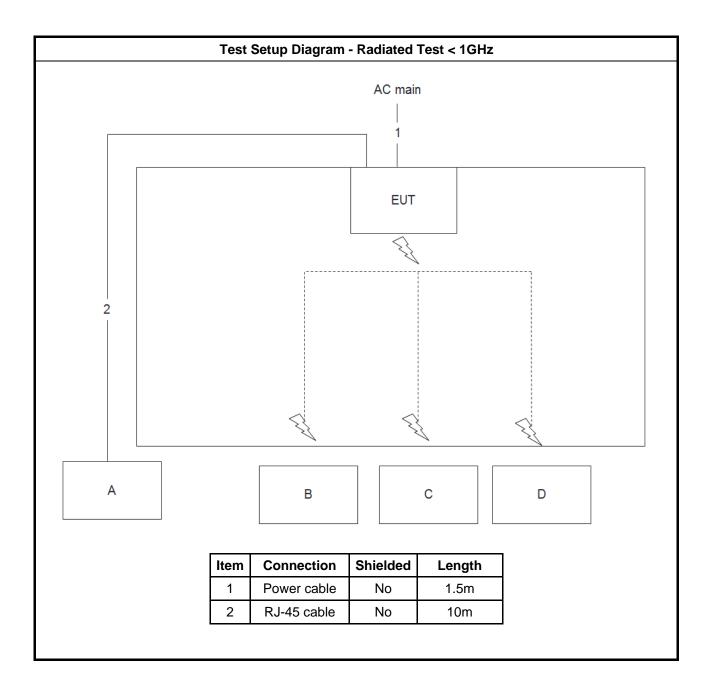
# 2.6 Test Setup Diagram



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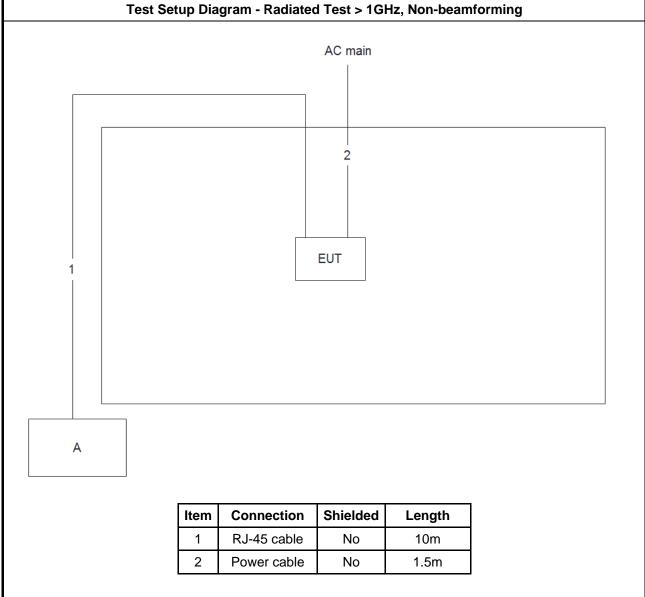
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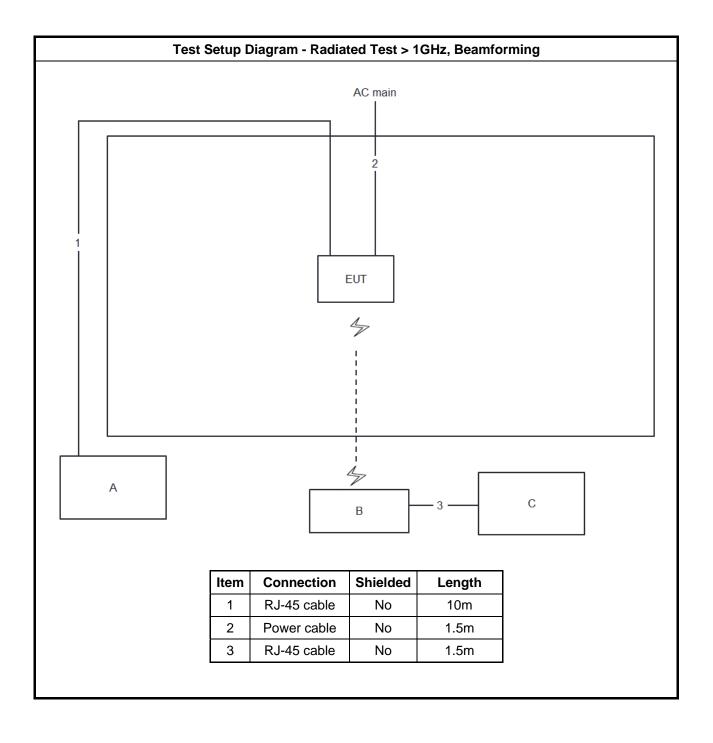
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Test Setup Diagram - Radiated Test > 1GHz, Non-beamforming



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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.

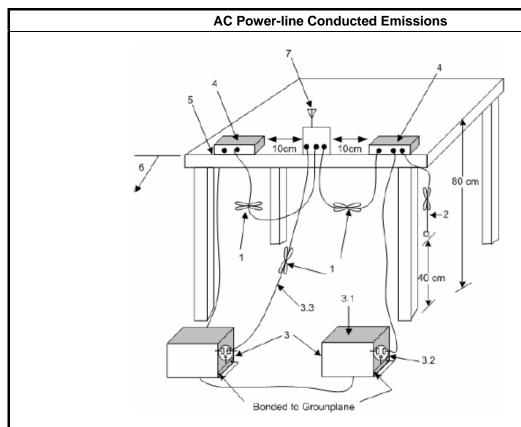
### 3.1.3 Test Procedures

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					
UN	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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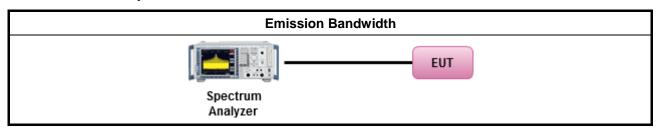
## 3.2.2 Measuring Instruments

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:
	Outdoor AP: the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 1 W. If $G_{TX}$ > 6 dBi, then $P_{Out}$ = 30 - ( $G_{TX}$ - 6). e.i.r.p. at any elevation angle above 30 degrees $\leq$ 125mW [21dBm]
	Indoor AP: the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$
	Point-to-point AP: the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 1 W If $G_{TX} > 23$ dBi, then $P_{Out} = 30 - (G_{TX} - 23)$ .
	Mobile or Portable Client: the maximum conducted output power (P <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).
	For the 5.725-5.85 GHz band:
	Point-to-multipoint systems (P2M): the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ .
	Point-to-point systems (P2P): the maximum conducted output power (P <sub>Out</sub> ) shall not exceed the lesser of 1 W.
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:
	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> > 6 dBi, then P <sub>Out</sub> = 30 − (G <sub>TX</sub> − 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>
	e = maximum conducted output power in dBm, = the maximum transmitting antenna directional gain in dBi.

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## 3.3.2 Measuring Instruments

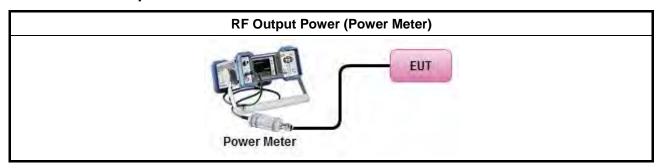
Refer a test equipment and calibration data table in this test report.

#### 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	I Devices					
$\boxtimes$	For the 5.15-5.25 GHz band:					
	<ul> <li>Outdoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If G<sub>TX</sub> &gt; 6 dBi, then P<sub>Out</sub> = 17 - (G<sub>TX</sub> - 6).</li> </ul>					
	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) ≤ 30 dBm/500kHz. If $G_{TX} > 6$ dBi, then PPSD= $30 - (G_{TX} - 6)$ .					
	Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz.					
LE-	LAN Devices					
	For the 5.15-5.25 GHz band, the e.i.r.p. peak power spectral density (PPSD) ≤ 10 dBm/MHz.					
	For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) ≤ 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	<b>SD</b> = peak power spectral density that he same method as used to determine the conducted output ver shall be used to determine the power spectral density. And power spectral density in dBm/MHz = 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.

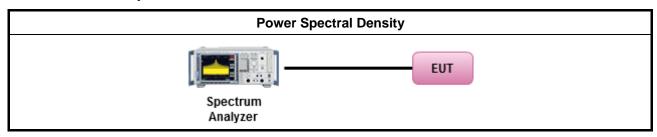
### 3.4.3 Test Procedures

		Test Method					
•	outp func	eak power spectral density procedures that the same method as used to determine the conducted utput power shall be used to determine the peak power spectral density and use the peak search unction on the spectrum analyzer to find the peak of the spectrum. For the peak power spectral density hall 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	v 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	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			
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.			

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

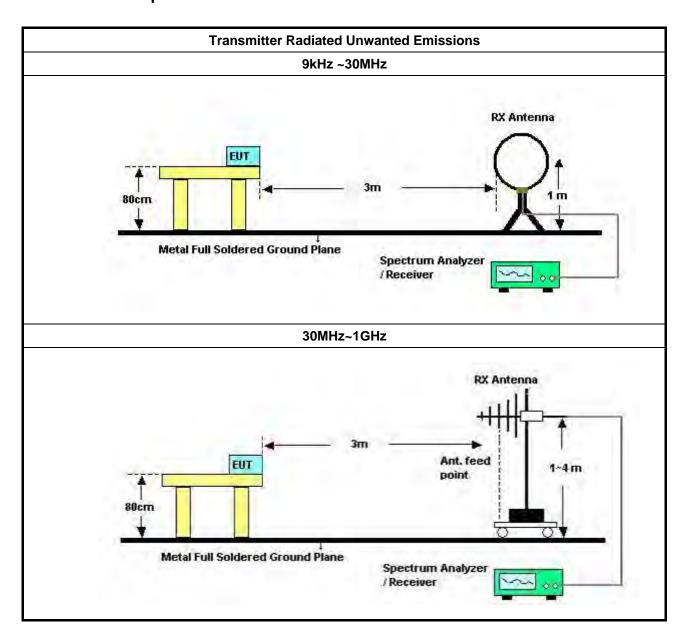
#### **Test Method**

- 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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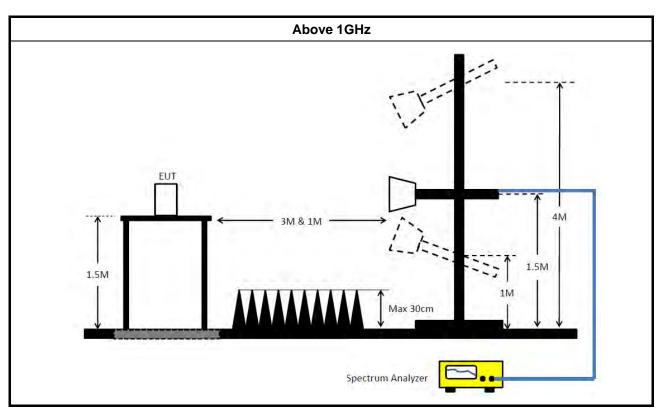
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### 3.5.4 Test Setup



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#### 3.5.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

#### 3.5.6 Transmitter Unwanted Emissions (Below 30MHz)

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

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

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

#### 3.5.7 Test Result of Transmitter Unwanted Emissions

Refer as Appendix E

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# 4 Test Equipment and Calibration Data

Instrument	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	9kHz ~ 30MHz	May 21, 2019	May 20, 2020	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 29, 2019	Mar. 28, 2020	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESE & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 28, 2019	Mar. 27, 2020	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	May 01, 2019	Apr. 30, 2020	Radiation (03CH05-CB)
Spectrum Analyzer	R&S	FSP40	100304	9kHz ~ 40GHz	Aug. 15, 2019	Aug. 14, 2020	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	May 15, 2019	May 14, 2020	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	LOW Cable-04+23	30MHz~1GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH05-CB)
Horn Antenna	SCHWARZBE CK	BBHA9120D	9120D-1292	1GHz~18GHz	Jul. 17, 2019	Jul. 16, 2020	Radiation (03CH06-CB)
Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170507	15GHz ~ 40GHz	Jun. 12, 2019	Jun. 11, 2020	Radiation (03CH06-CB)
Pre-Amplifier	Agilent	83017A	MY53270064	0.5GHz ~ 26.5GHz	May 08, 2019	May 07, 2020	Radiation (03CH06-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 03, 2019	Jul. 02, 2020	Radiation (03CH06-CB)
Spectrum analyzer	R&S	FSP40	100080	9kHz~40GHz	Oct. 21, 2019	Oct. 20, 2020	Radiation (03CH06-CB)
RF Cable-high	HUBER+SUH NER	RG402	High Cable-05	1GHz~18GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH06-CB)
RF Cable-high	HUBER+SUH NER	RG402	High Cable-05+24	1GHz~18GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH06-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH06-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH06-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Feb. 25, 2019	Feb. 24, 2020	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-06	1 GHz – 26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	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)
RF Cable-high	Woken	RG402	High Cable-28	1 GHz –26.5 GHz	Nov. 18, 2019	Nov. 17, 2020	Conducted (TH01-CB)
Power Sensor	Agilent	E9327A	US40442088	50MHz~18GHz	Jan. 15, 2019	Jan. 14, 2020	Conducted (TH01-CB)
Power Meter	Agilent	E4416A	GB41291199	50MHz~18GHz	Jan. 15, 2019	Jan. 14, 2020	Conducted (TH01-CB)

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

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

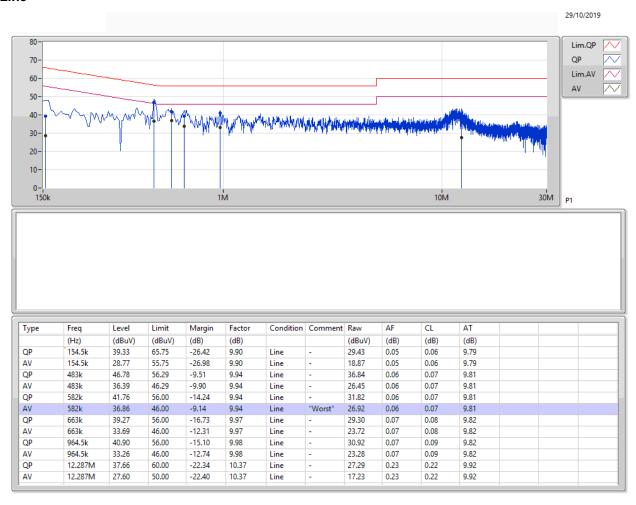
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### **AC Power Port Conducted Emission Result**

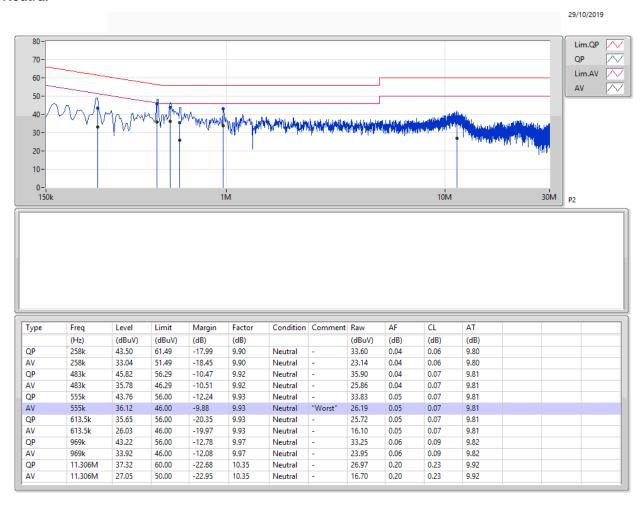
Test Mode Mode 1	Frequency Range	0.15 MHz to 30 MHz
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#### Line





#### Neutral





**EBW** Appendix B

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	44.7M	23.763M	23M8D7W	22.025M	16.492M	
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	45.9M	23.568M	23M6D7W	23.37M	17.841M	
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	79.62M	36.702M	36M7D7W	40.62M	36.222M	
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	81.84M	75.922M	75M9D7W	80.76M	75.682M	
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	51.57M	24.438M	24M4D7W	21.75M	18.981M	
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	79.5M	38.021M	38M0D7W	40.02M	37.541M	
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	81M	77.121M	77M1D7W	80.64M	76.882M	
5.725-5.85GHz	-	-	-	-	-	
802.11a_Nss1,(6Mbps)_2TX	16.325M	22.489M	22M5D7W	16.25M	17.966M	
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	17.67M	43.718M	43M7D7W	17.37M	27.946M	
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	36.3M	59.01M	59M0D7W	35.28M	53.493M	
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	75.48M	75.922M	75M9D7W	74.76M	75.922M	
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	18.96M	34.003M	34M0D7W	18.6M	31.184M	
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	37.5M	59.79M	59M8D7W	34.98M	53.433M	
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	76.08M	77.601M	77M6D7W	75.12M	77.361M	

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;

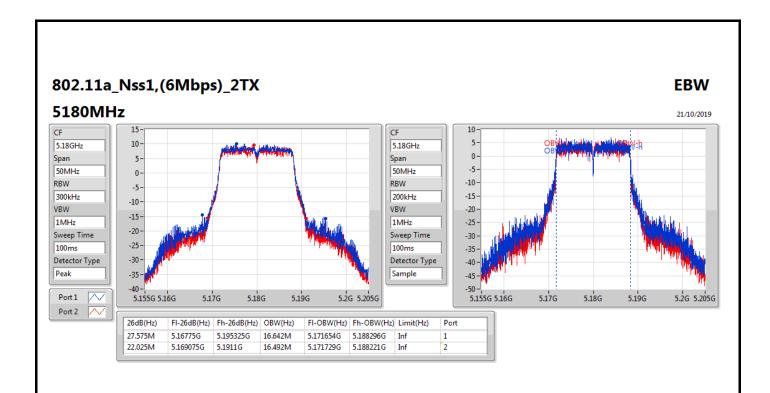


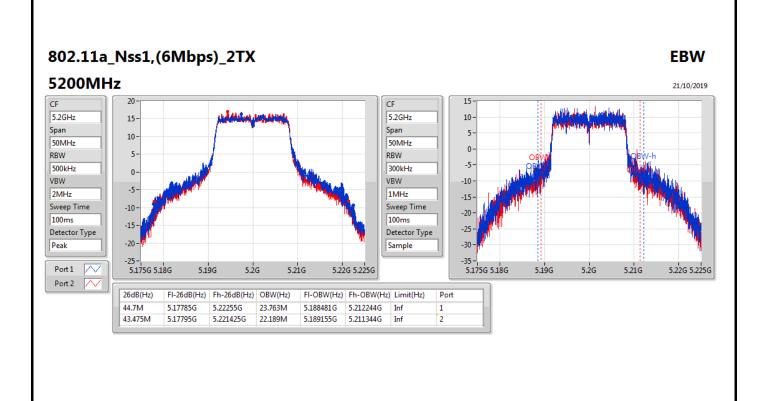
EBW Appendix B

#### Result

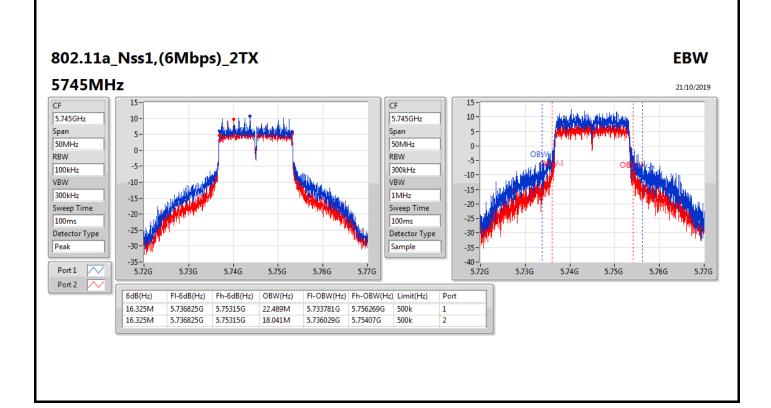
Mode	Result	Limit	Port 1-N dB	Port 1-OBW	Port 2-N dB	Port 2-OBW
		(Hz)	(Hz)	(Hz)	(Hz)	(Hz)
802.11a_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
5180MHz	Pass	Inf	27.575M	16.642M	22.025M	16.492M
5200MHz	Pass	Inf	44.7M	23.763M	43.475M	22.189M
5240MHz	Pass	Inf	43.45M	19.165M	42.2M	18.316M
5745MHz	Pass	500k	16.325M	22.489M	16.325M	18.041M
5785MHz	Pass	500k	16.325M	20.365M	16.3M	17.966M
5825MHz	Pass	500k	16.25M	21.139M	16.325M	19.49M
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	Inf	29.1M	17.871M	23.37M	17.841M
5200MHz	Pass	Inf	45.9M	23.568M	44.82M	21.439M
5240MHz	Pass	Inf	43.86M	19.55M	40.86M	18.681M
5745MHz	Pass	500k	17.64M	28.456M	17.58M	28.816M
5785MHz	Pass	500k	17.67M	43.718M	17.61M	43.448M
5825MHz	Pass	500k	17.64M	28.066M	17.37M	27.946M
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5190MHz	Pass	Inf	40.62M	36.222M	40.74M	36.282M
5230MHz	Pass	Inf	75.12M	36.642M	79.62M	36.702M
5755MHz	Pass	500k	35.28M	59.01M	36.3M	58.471M
5795MHz	Pass	500k	36.3M	53.913M	36.3M	53.493M
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	Inf	81.84M	75.922M	80.76M	75.682M
5775MHz	Pass	500k	74.76M	75.922M	75.48M	75.922M
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5180MHz	Pass	Inf	29.04M	18.981M	21.75M	18.981M
5200MHz	Pass	Inf	51.57M	24.438M	48.63M	21.079M
5240MHz	Pass	Inf	44.67M	19.7M	45.69M	19.4M
5745MHz	Pass	500k	18.96M	31.184M	18.96M	31.274M
5785MHz	Pass	500k	18.66M	32.744M	18.84M	33.553M
5825MHz	Pass	500k	18.6M	33.523M	18.63M	34.003M
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5190MHz	Pass	Inf	40.08M	37.601M	40.02M	37.541M
5230MHz	Pass	Inf	79.5M	38.021M	78.84M	38.021M
5755MHz	Pass	500k	37.5M	59.55M	37.44M	59.79M
5795MHz	Pass	500k	35.46M	53.433M	34.98M	53.553M
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
5210MHz	Pass	Inf	80.64M	77.121M	81M	76.882M
5775MHz	Pass	500k	76.08M	77.361M	75.12M	77.601M

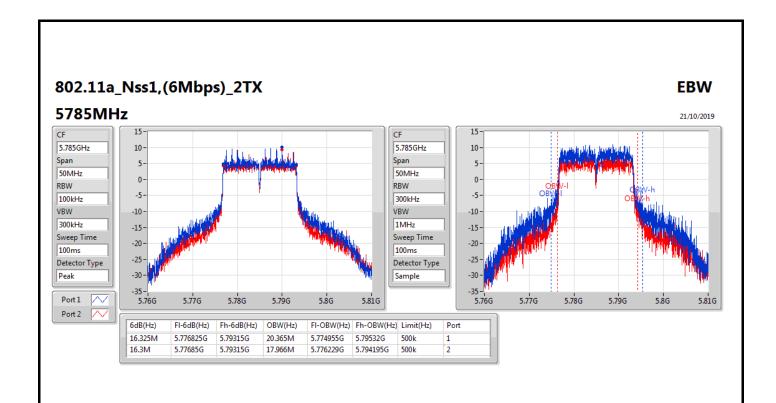
Port X-N dB = Port X 6dB down bandwidth for 5.725-5.85GHz band / 26dB down bandwidth for other band Port X-OBW = Port X 99% occupied bandwidth;

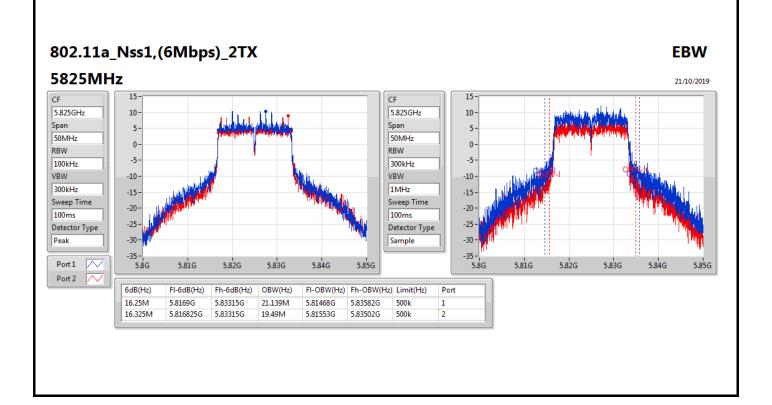


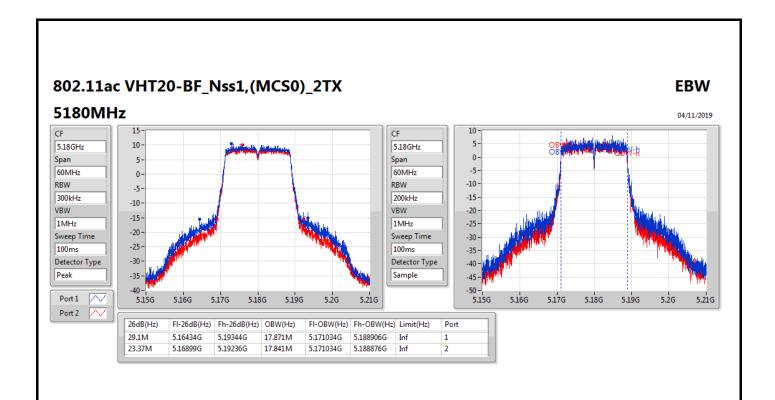


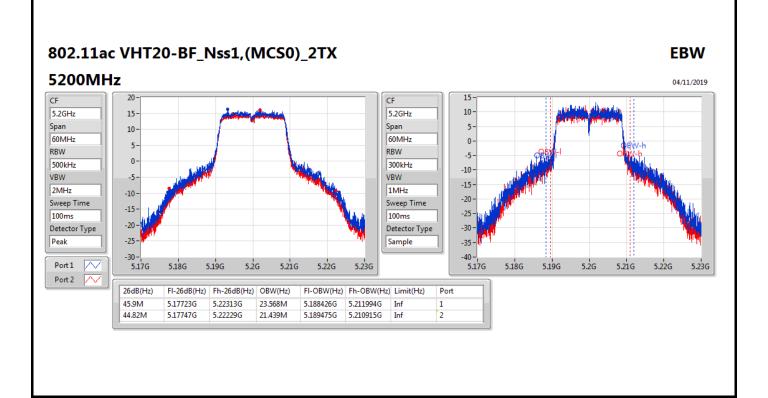


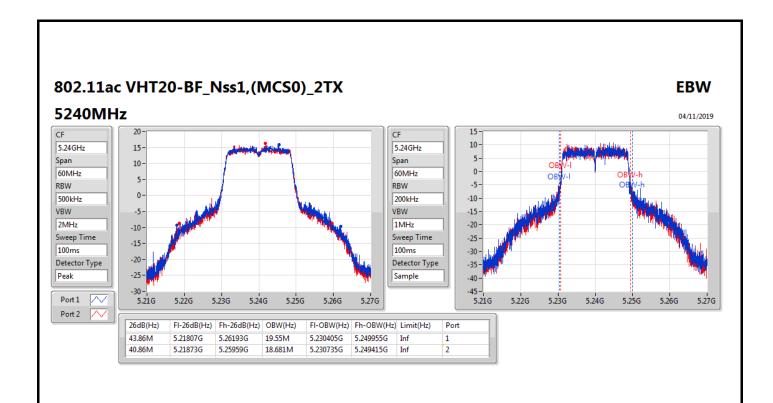


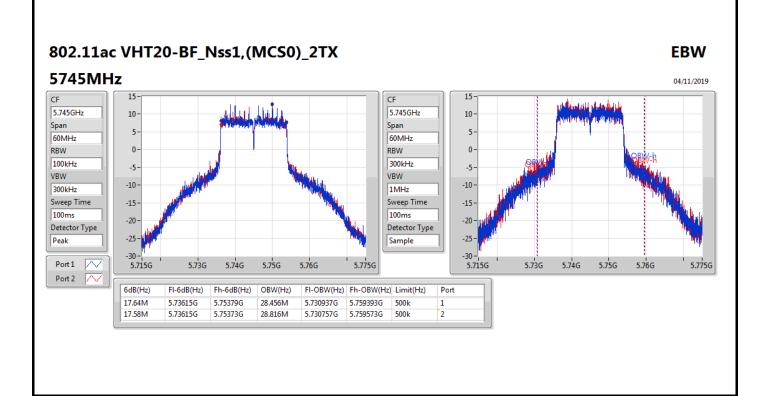


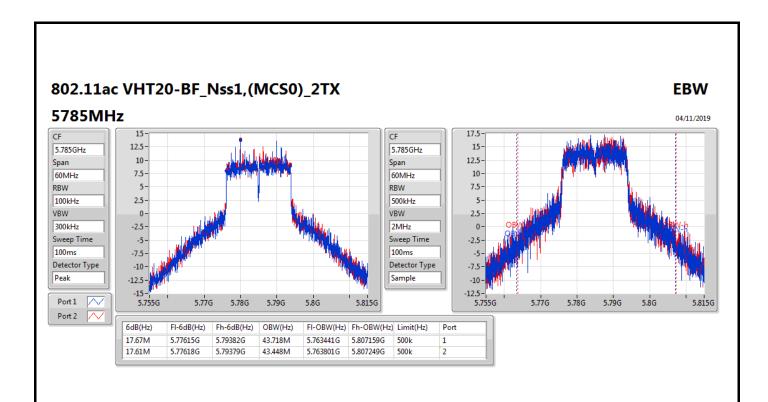


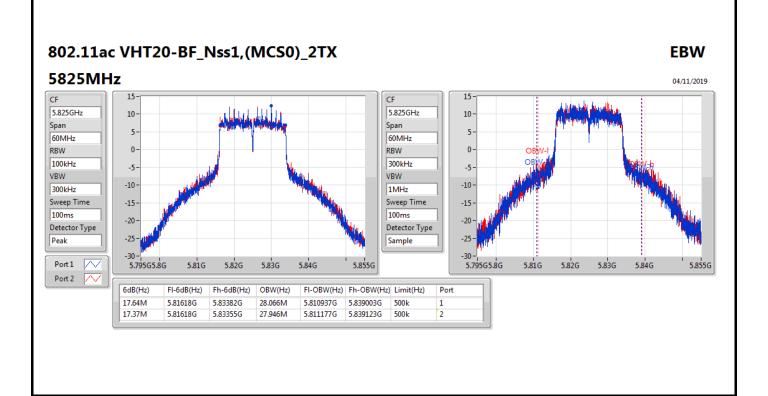


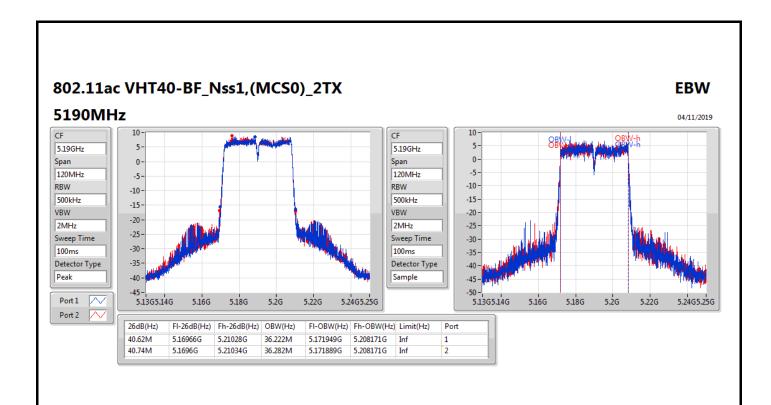


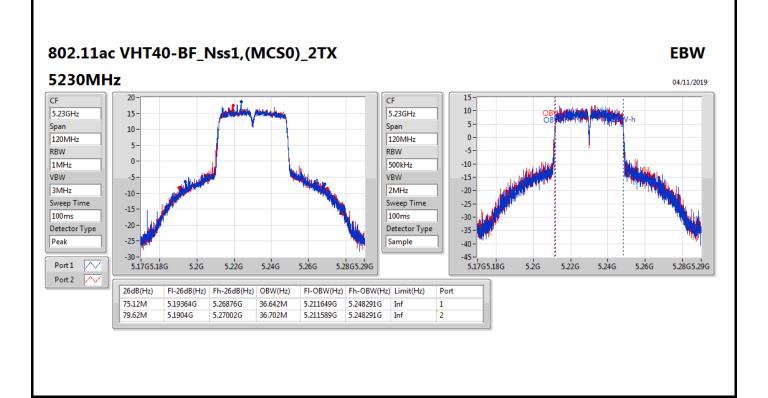


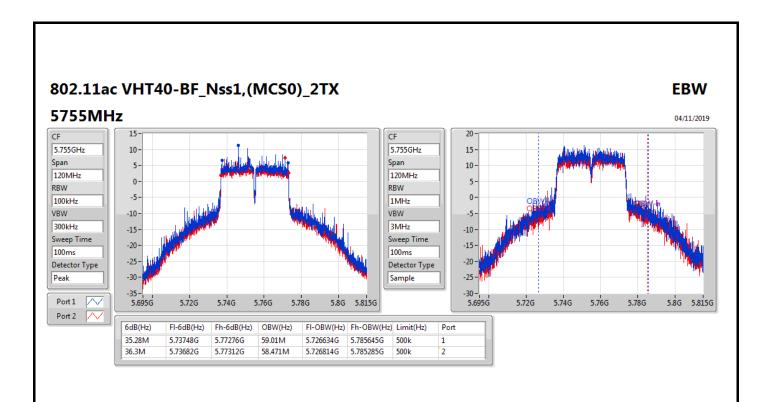


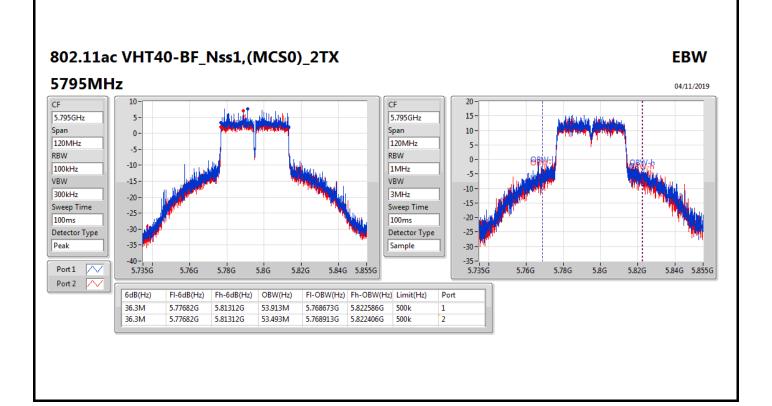


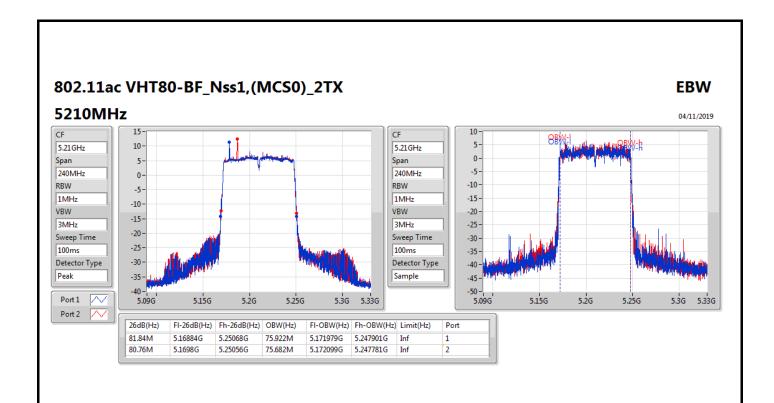


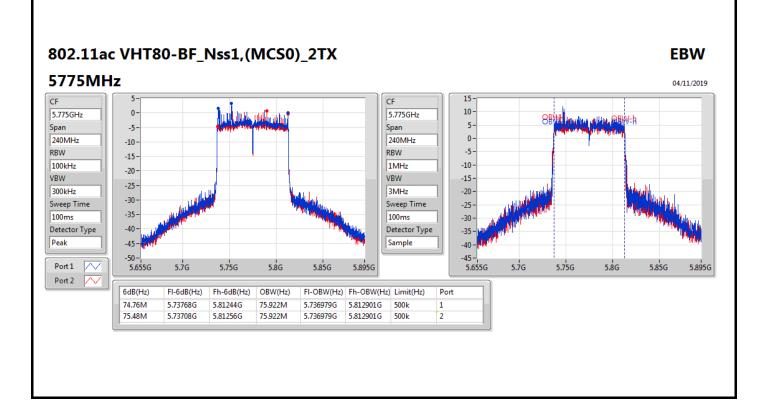


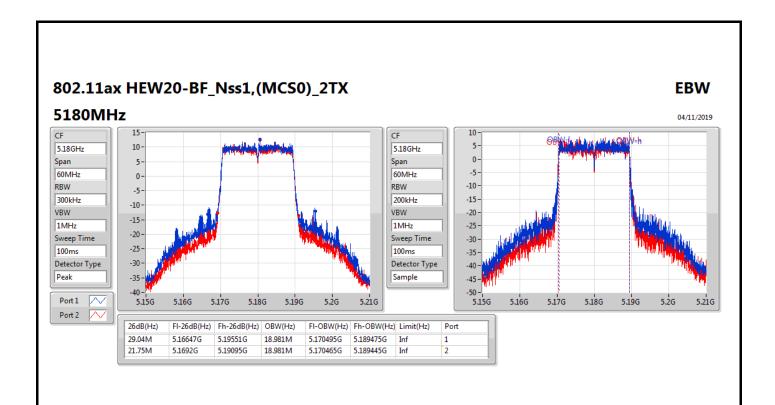


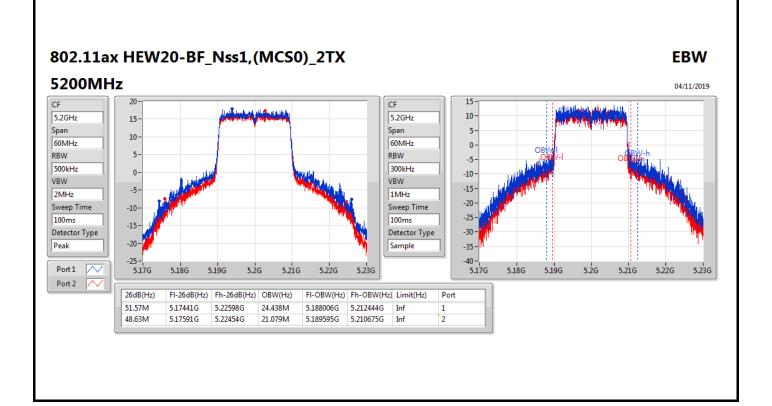


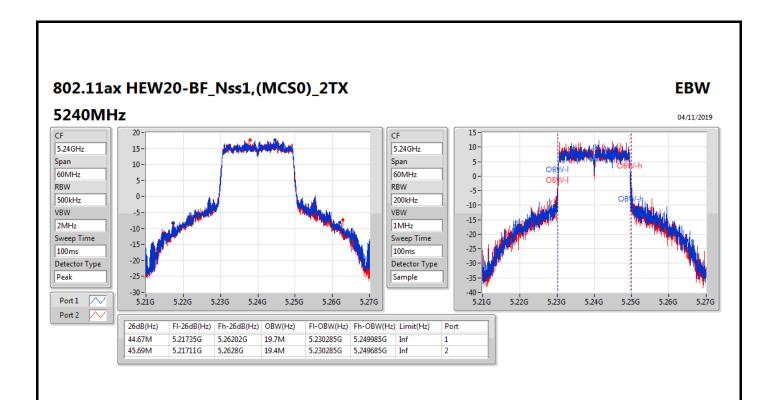


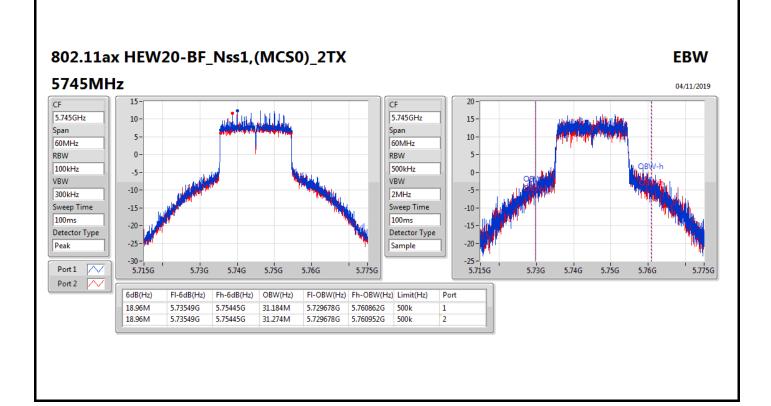


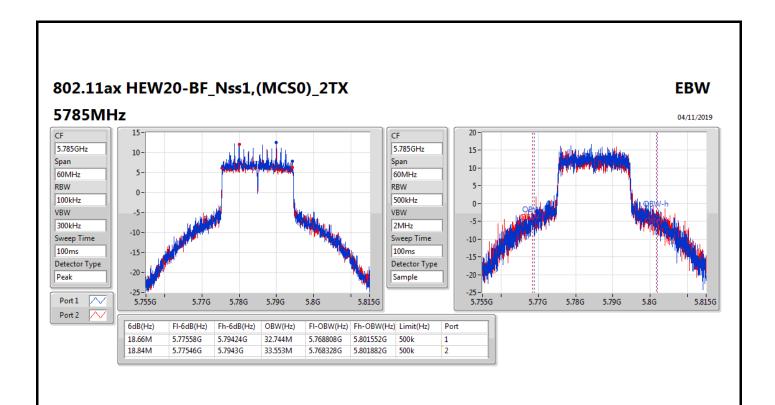


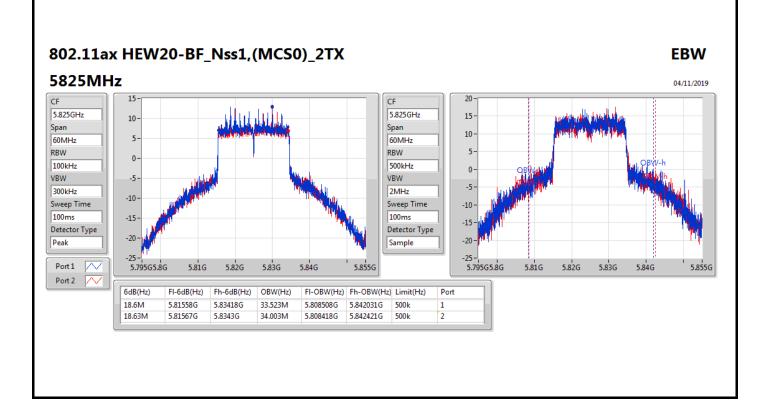


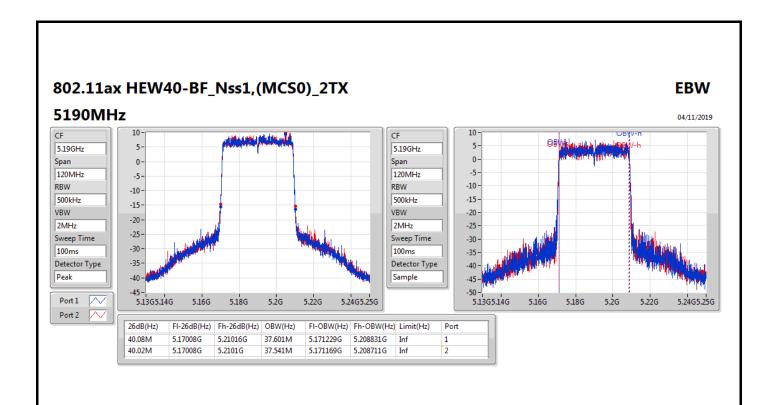


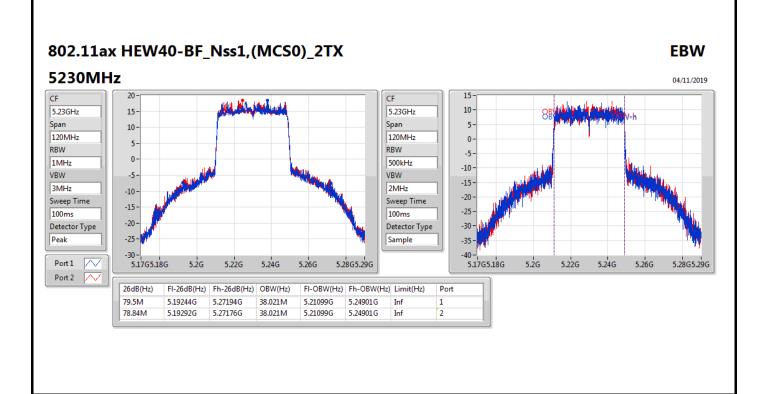


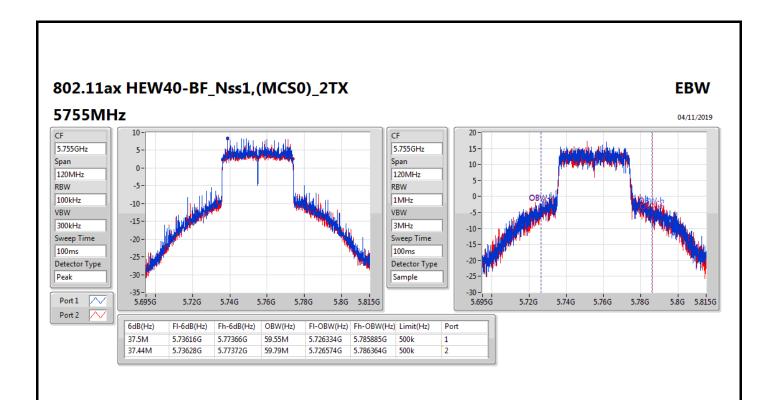


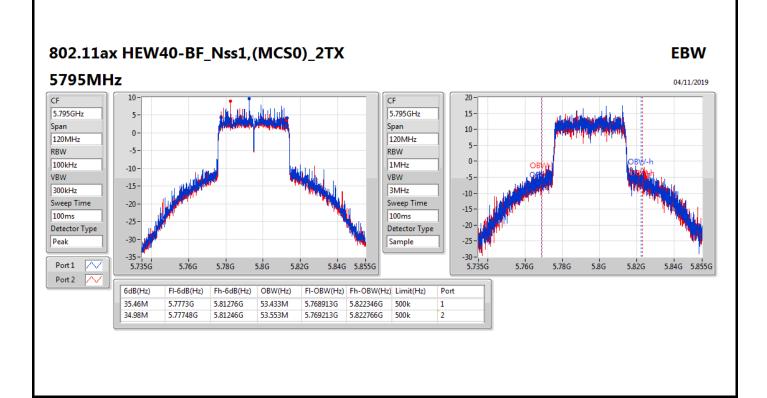


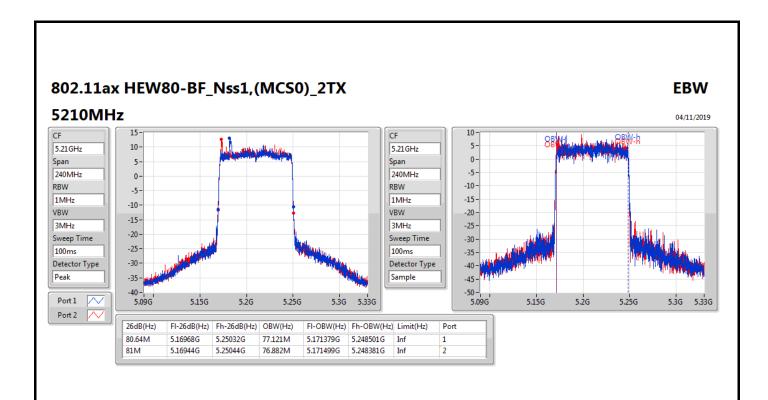


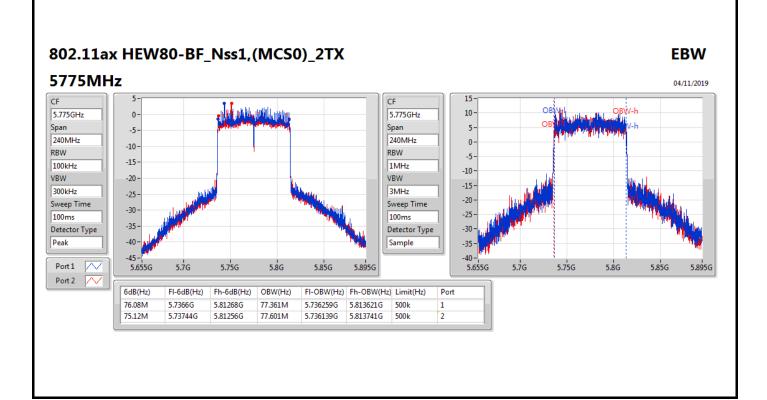














Average Power Appendix C

Summary

Mode	Total Power	Total Power
	(dBm)	(W)
5.15-5.25GHz	-	-
802.11a_Nss1,(6Mbps)_2TX	26.36	0.43251
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	25.60	0.36308
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	23.21	0.20941
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	17.50	0.05623
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	24.51	0.28249
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	23.81	0.24044
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	18.29	0.06745
5.725-5.85GHz	-	-
802.11a_Nss1,(6Mbps)_2TX	25.33	0.34119
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	25.73	0.37411
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	24.82	0.30339
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	20.20	0.10471
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	25.27	0.33651
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	24.46	0.27925
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	21.13	0.12972



Average Power Appendix C

### Result

Mode	Result	DG	Port 1	Port 2	Total Power	Power Limit	
		(dBi)	(dBm)	(dBm)	(dBm)	(dBm)	
802.11a_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	
5180MHz	Pass	5.00	19.37	18.68	22.05	30.00	
5200MHz	Pass	5.00	23.51	23.18	26.36	30.00	
5240MHz	Pass	5.00	22.52	22.19	25.37	30.00	
5745MHz	Pass	5.00	22.61	22.01	25.33	30.00	
5785MHz	Pass	5.00	22.09	21.3	24.72	30.00	
5825MHz	Pass	5.00	22.03	21.2	24.65	30.00	
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5180MHz	Pass	8.01	17.58	17.3	20.45	27.99	
5200MHz	Pass	8.01	21.58	21.03	24.32	27.99	
5240MHz	Pass	8.01	22.57	22.61	25.60	27.99	
5745MHz	Pass	8.01	21.89	22.03	24.97 25.73	27.99	
5785MHz	Pass	8.01	22.87	22.57		27.99	
5825MHz	Pass	8.01	21.26	21.65	24.47	27.99	
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5190MHz	Pass	8.01	15.23	15.02	18.14	27.99	
5230MHz	Pass	8.01	20.32	20.08	23.21	27.99	
5755MHz	Pass	8.01	22.13	21.46	24.82	27.99	
5795MHz	Pass	8.01	20.86	20.21	23.56	27.99	
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5210MHz	Pass	8.01	14.29	14.68	17.50	27.99	
5775MHz	Pass	8.01	17.42	16.94	20.20	27.99	
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5180MHz	Pass	8.01	17.95	17.27	20.63	27.99	
5200MHz	Pass	8.01	22	20.93	24.51	27.99	
5240MHz	Pass	8.01	21.08	21.13	24.12	27.99	
5745MHz	Pass	8.01	21.87	22.27	25.08	27.99	
5785MHz	Pass	8.01	21.91	21.56	24.75	27.99	
5825MHz	Pass	8.01	21.99	22.52	25.27	27.99	
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5190MHz	Pass	8.01	15.25	15.32	18.30	27.99	
5230MHz	Pass	8.01	21.04	20.54	23.81	27.99	
5755MHz	Pass	8.01	21.83	21.03	24.46	27.99	
5795MHz	Pass	8.01	20.94	20.48	23.73	27.99	
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5210MHz	Pass	8.01	15.27	15.29	18.29	27.99	
5775MHz	Pass	8.01	18.45	17.76	21.13	27.99	

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



Page No.

: 1 of 12

**Summary** 

Mode	PD
	(dBm/RBW)
5.15-5.25GHz	-
802.11a_Nss1,(6Mbps)_2TX	12.63
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	13.01
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	8.6
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	-0.59
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	12.13
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	8.18
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	0.49
5.725-5.85GHz	-
802.11a_Nss1,(6Mbps)_2TX	9.86
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	12.18
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	7.65
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	0.43
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	10.87
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	7.52
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	1.42

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

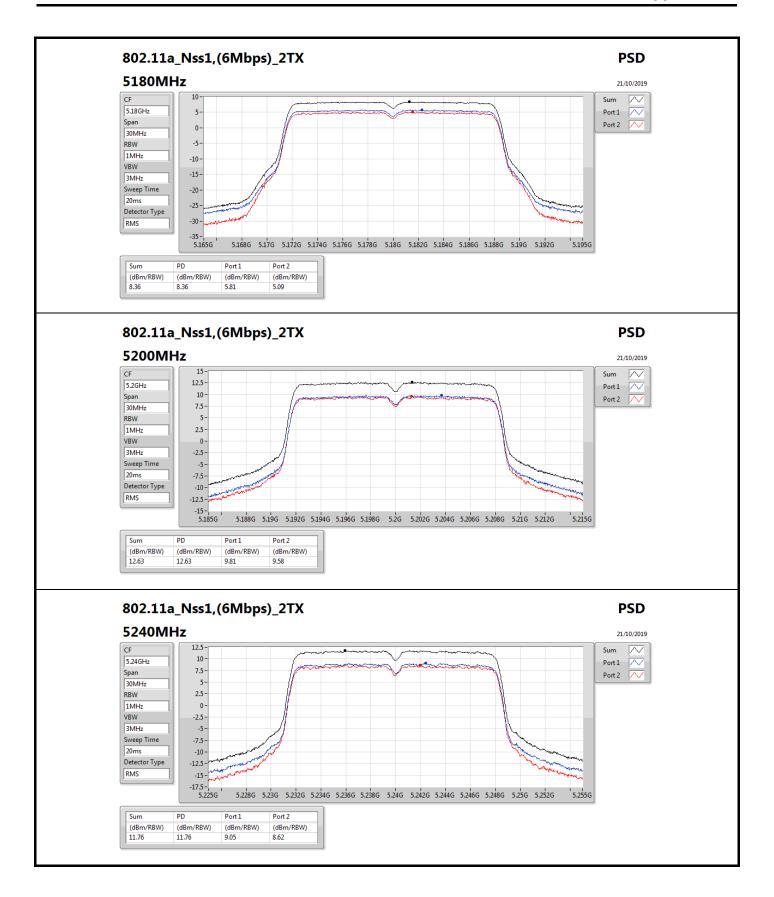


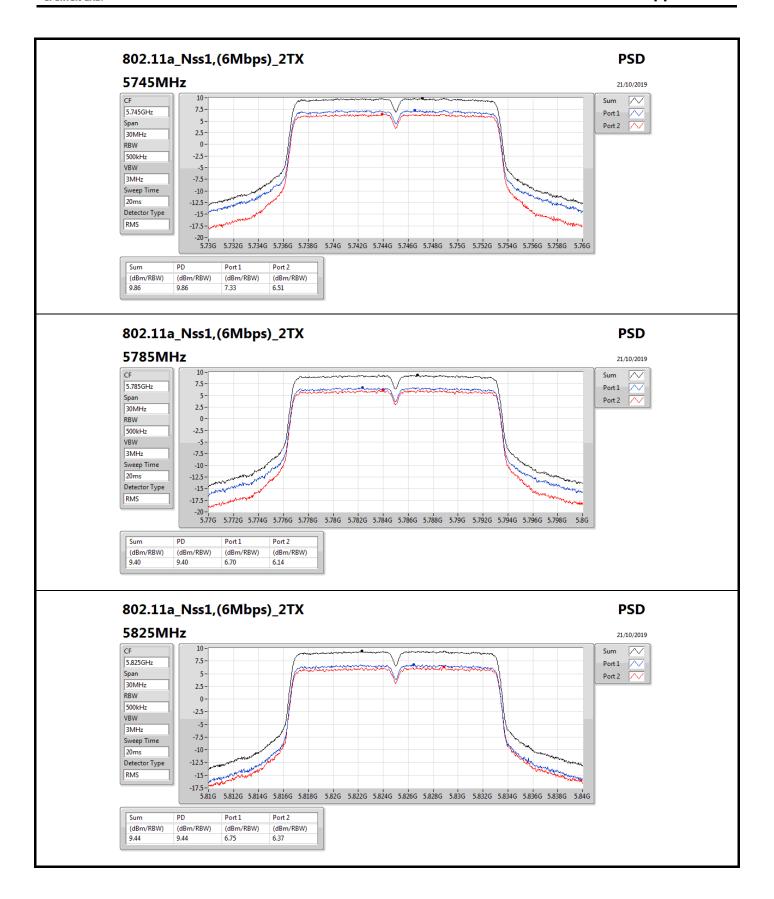
Appendix D **PSD** 

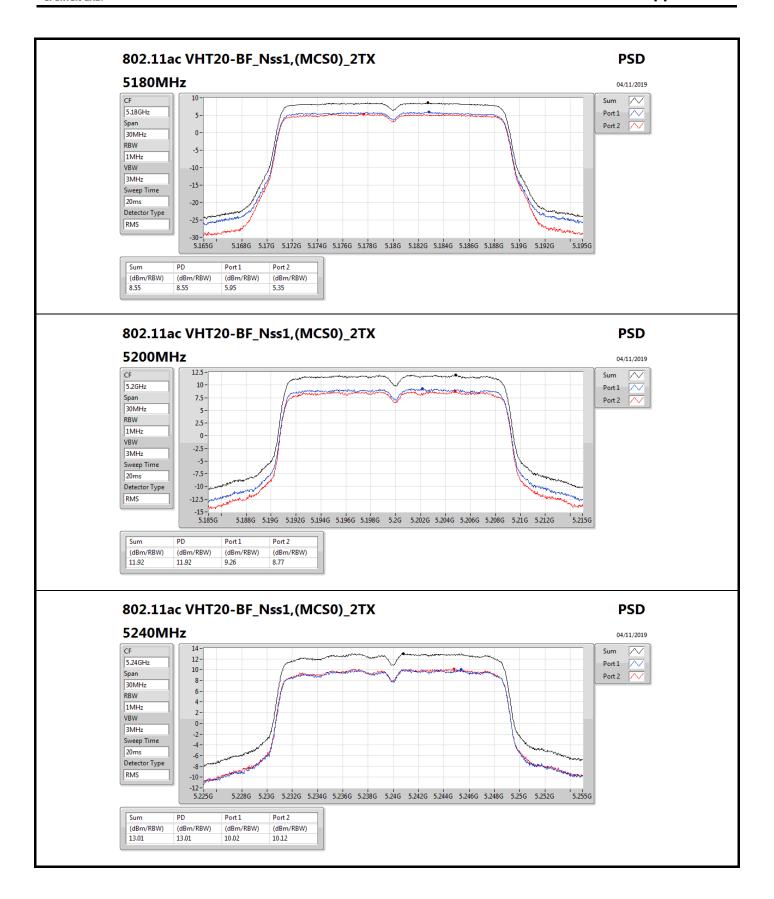
### Result

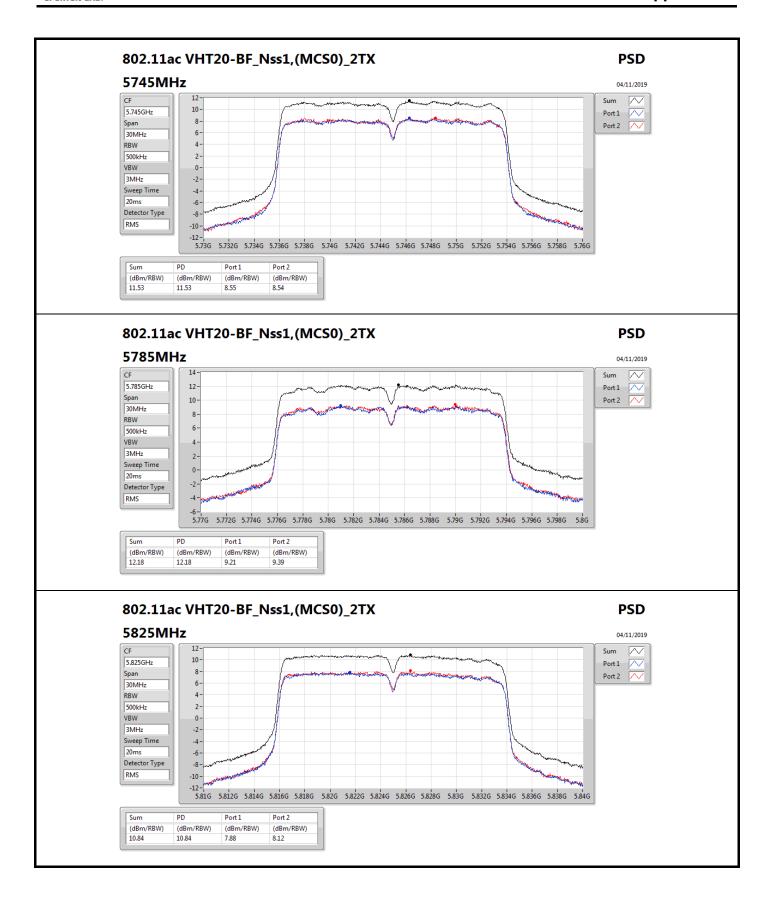
Mode	Result	DG	Port 1	Port 2	PD	PD Limit	
		(dBi)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	
802.11a_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	
5180MHz	Pass	8.01	5.81	5.09	8.36	14.99	
5200MHz	Pass	8.01	9.81	9.58	12.63	14.99	
5240MHz	Pass	8.01	9.05	8.62	11.76	14.99	
5745MHz	Pass	8.01	7.33	6.51	9.86	27.99	
5785MHz	Pass	8.01	6.7	6.14	9.40	27.99	
5825MHz	Pass	8.01	6.75	6.37	9.44	27.99	
802.11ac VHT20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5180MHz	Pass	8.01	5.95	5.35	8.55	14.99	
5200MHz	Pass	8.01	9.26	8.77	11.92	14.99	
5240MHz	Pass	8.01	10.02	10.12	13.01	14.99	
5745MHz	Pass	8.01	8.55	8.54	11.53	27.99	
5785MHz	Pass	8.01	9.21	9.39	12.18	27.99	
5825MHz	Pass	8.01	7.88	8.12	10.84	27.99	
802.11ac VHT40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5190MHz	Pass	8.01	0.98	1.23	4.09	14.99	
5230MHz	Pass	8.01	5.65	5.72	8.60	14.99	
5755MHz	Pass	8.01	5.12	4.25	7.65	27.99	
5795MHz	Pass	8.01	4.16	3.34	6.72	27.99	
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5210MHz	Pass	8.01	-3.52	-3.36	-0.59	14.99	
5775MHz	Pass	8.01	-2.19	-2.92	0.43	27.99	
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5180MHz	Pass	8.01	5.61	4.81	8.20	14.99	
5200MHz	Pass	8.01	9.6	9.04	12.13	14.99	
5240MHz	Pass	8.01	8.67	8.71	11.63	14.99	
5745MHz	Pass	8.01	7.95	7.63	10.72	27.99	
5785MHz	Pass	8.01	7.61	7.14	10.27	27.99	
5825MHz	Pass	8.01	8.07	7.85	10.87	27.99	
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5190MHz	Pass	8.01	0.15	0.3	3.16	14.99	
5230MHz	Pass	8.01	5.24	5.45	8.18	14.99	
5755MHz	Pass	8.01	4.92	4.34	7.52	27.99	
5795MHz	Pass	8.01	3.8	3.49	6.59	27.99	
802.11ax HEW80-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	
5210MHz	Pass	8.01	-2.48	-2.39	0.49	14.99	
5775MHz	Pass	8.01	-1.39	-1.8	1.42	27.99	

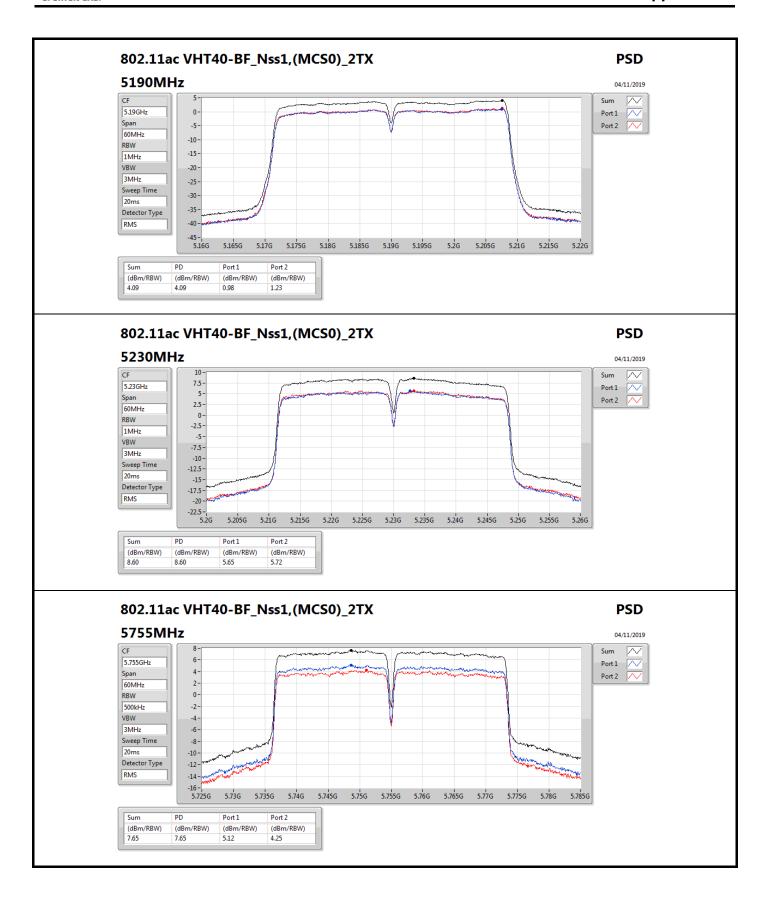
DG = Directional Gain; RBW = 500 kHz for 5.725-5.85GHz band / 1MHz for other band;
 PD = trace bin-by-bin of each transmits port summing can be performed maximum power density;

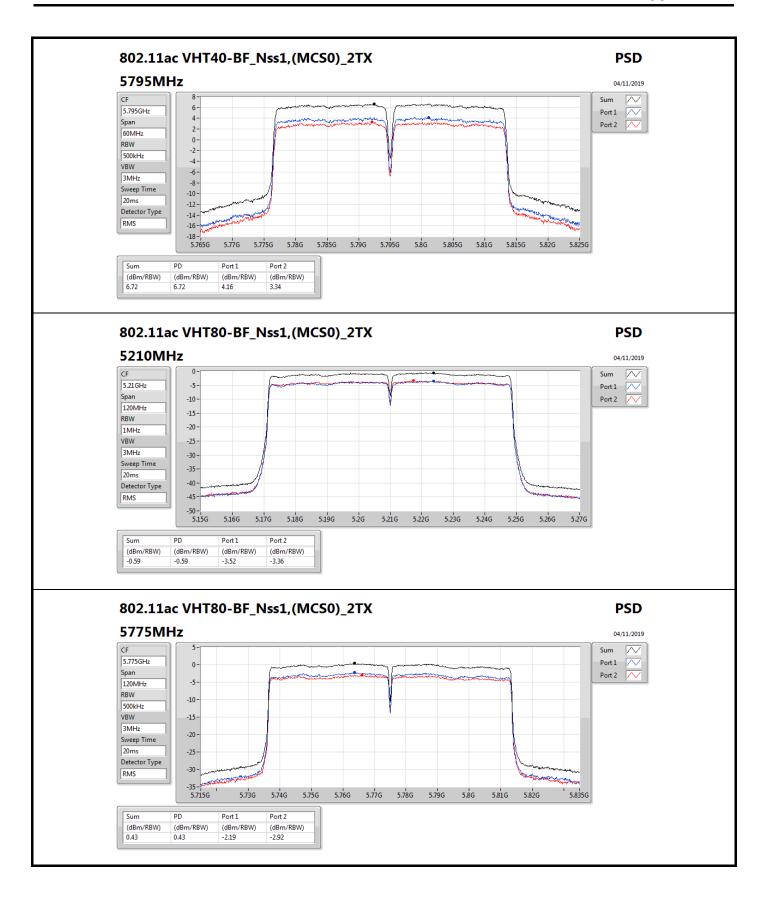


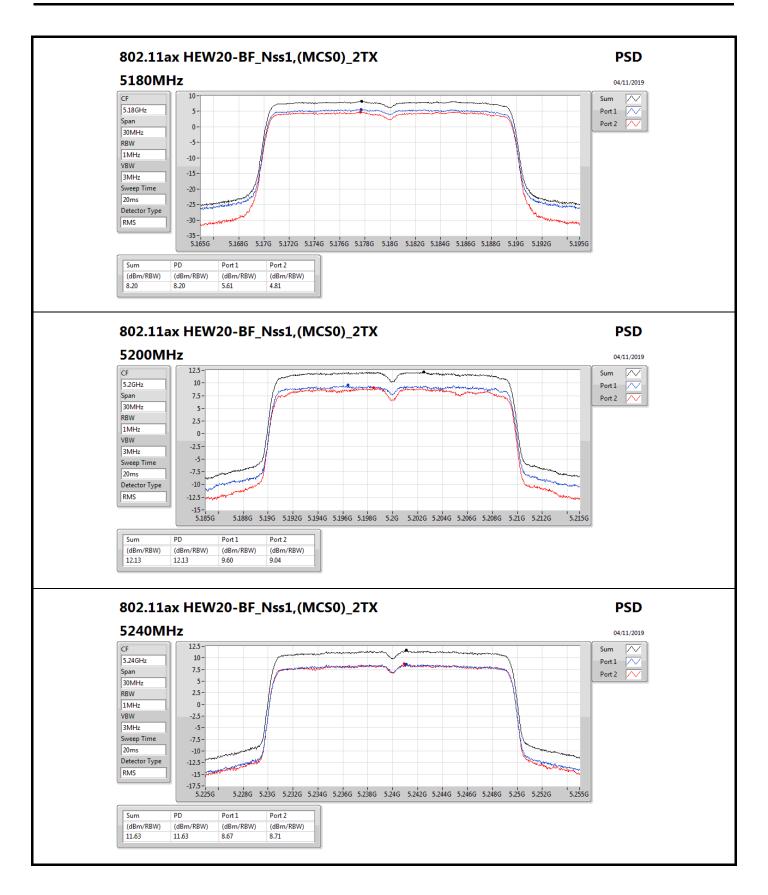


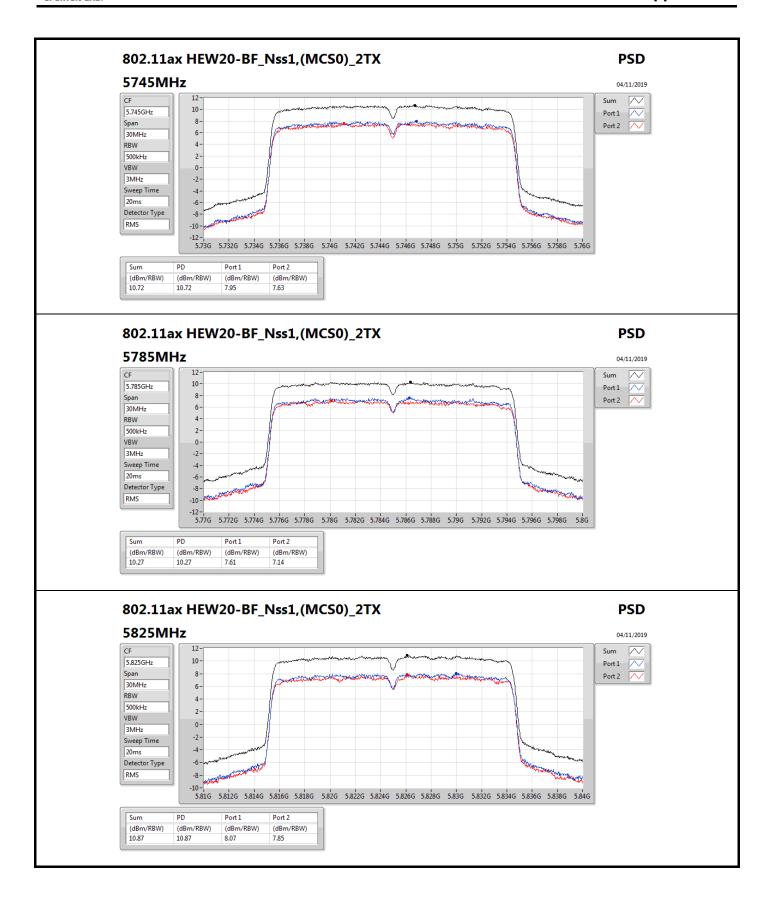


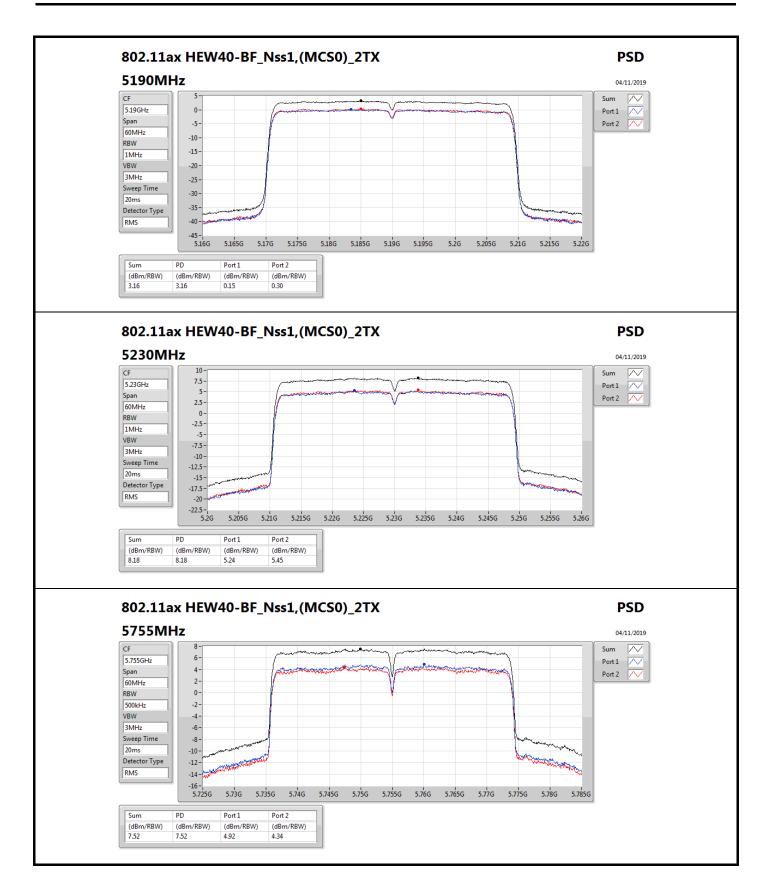


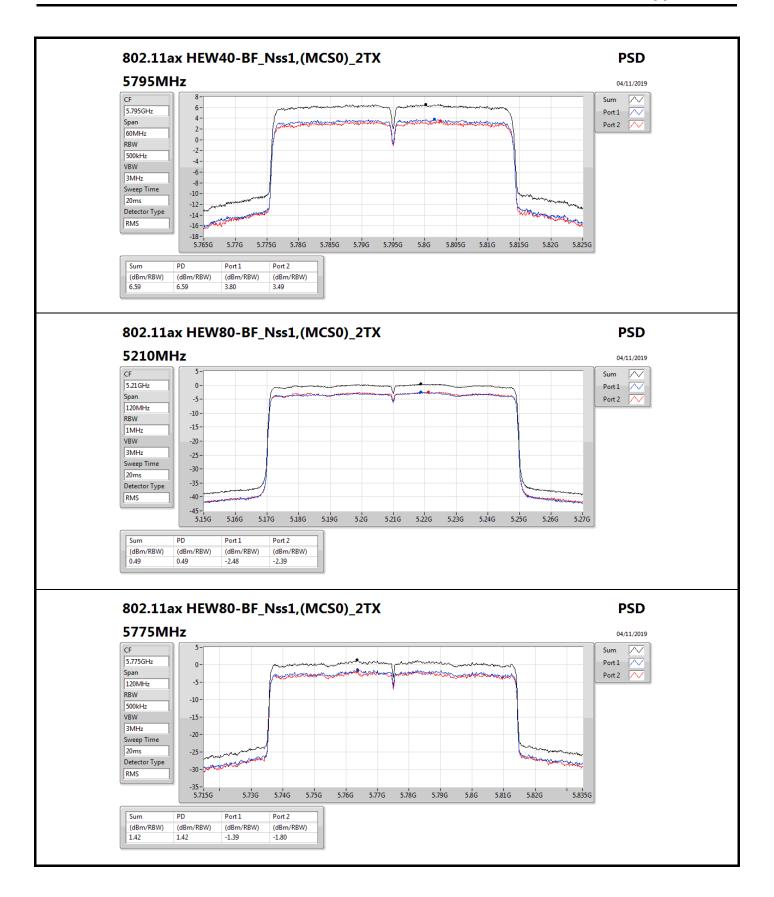








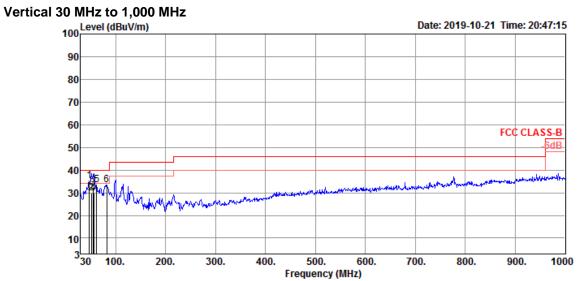






## Radiated Emission below 1GHz Result

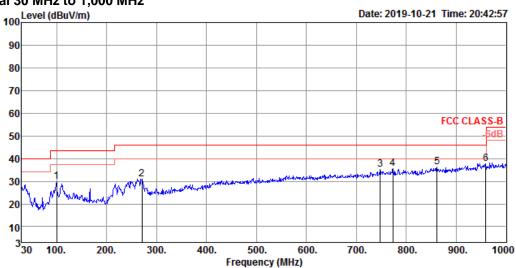
30 MHz to 1,000 MHz **Test Mode** Mode 3 **Frequency Range** 



	Freq	Level		Over Limit						T/Pos	Remark	Pol/Phase
		dBu\//m	dBuV/m		dBuV	——dB	dB/m	dB		deg		
	1112	ubuv/iii	ubuv/III	ub	ubuv	ub	ub/iii	ub	CIII	ucg		
1	47.46	35.16	40.00	-4.84	51.58	1.28	15.01	32.71	100	320	Peak	VERTICAL
2	51.34	29.78	40.00	-10.22	47.61	1.33	13.55	32.71	150	357	QP	VERTICAL
3	54.25	32.04	40.00	-7.96	50.59	1.37	12.73	32.65	300	281	QP	VERTICAL
4	56.19	29.97	40.00	-10.03	48.80	1.39	12.39	32.61	100	45	QP	VERTICAL
5	62.01	33.44	40.00	-6.56	52.42	1.46	12.05	32.49	125	358	Peak	VERTICAL
6	82.38	33.59	40.00	-6.41	51.32	1.69	13.06	32.48	150	111	Peak	VERTICAL



## Horizontal 30 MHz to 1,000 MHz



	Freq	Level				CableAntenna Preamp A Loss Factor Factor				T/Pos	Remark	Pol/Phase
-	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	Cm	deg		
1	99.84	29.89	43.50	-13.61	43.64	1.88	16.73	32.36	300	35	Peak	HORIZONTAL
2	270.56	30.89	46.00	-15.11	41.15	3.19	18.95	32.40	150	189	Peak	HORIZONTAL
3	747.80	35.17	46.00	-10.83	36.44	5.46	25.35	32.08	125	207	Peak	HORIZONTAL
4	773.02	35.53	46.00	-10.47	36.63	5.55	25.54	32.19	200	305	Peak	HORIZONTAL
5	861.29	36.14	46.00	-9.86	35.92	5.88	26.06	31.72	125	101	Peak	HORIZONTAL
6	959.26	37.81	46.00	-8.19	36.24	6.30	26.56	31.29	150	78	Peak	HORIZONTAL



# RSE TX above 1GHz

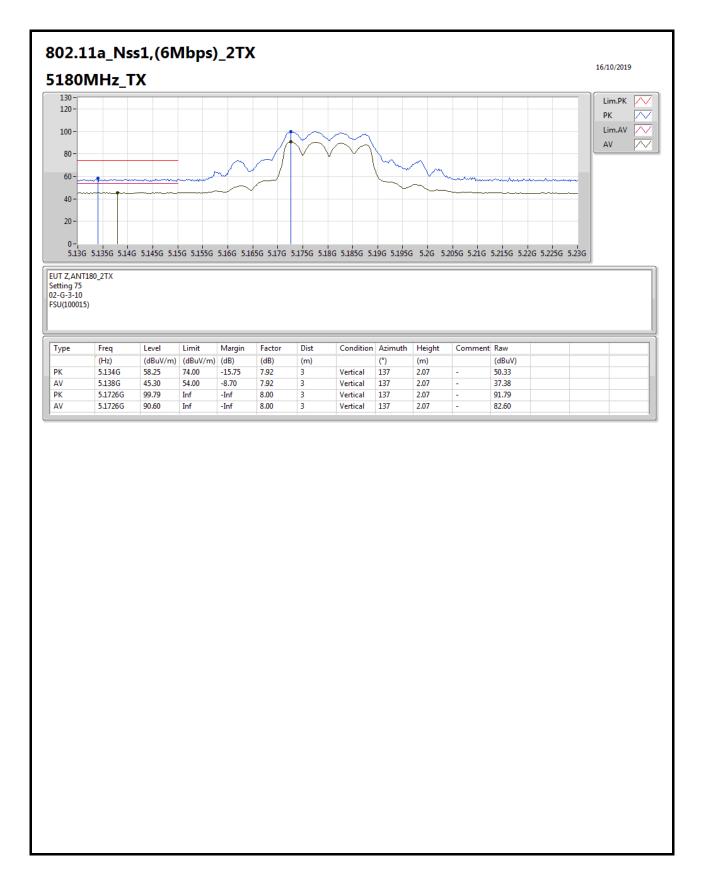
Appendix E.2

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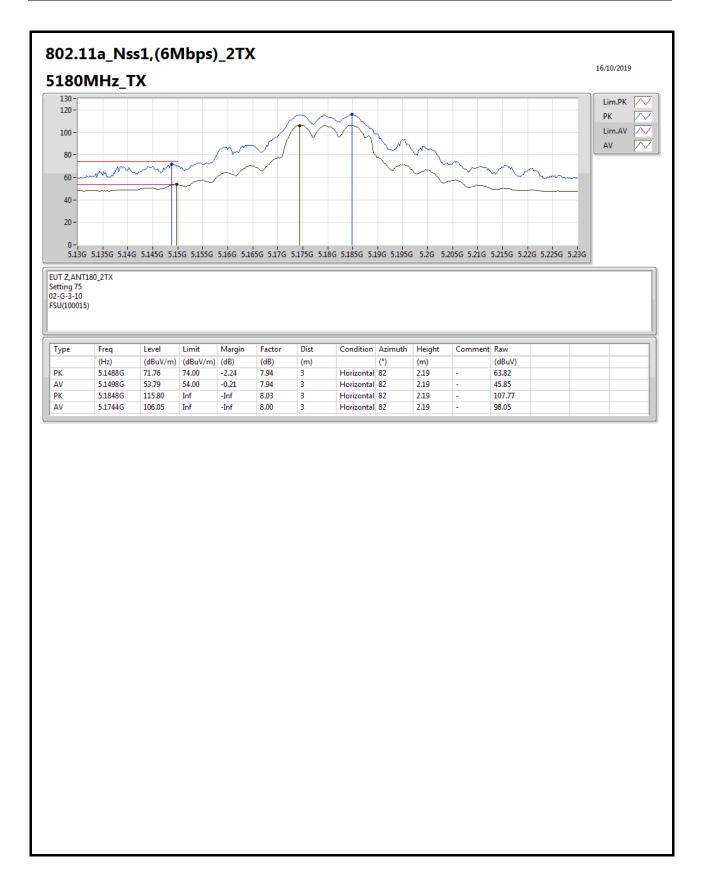
**Summary** 

Mode	Result	Туре	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
5.725-5.85GHz	-	-	-	-	-	-	-	-	-	-	-	-
802.11ac VHT80-BF_Nss1,(MCS0)_2TX	Pass	PK	5.926G	68.13	68.20	-0.07	6.15	3	Horizontal	83	1.95	-

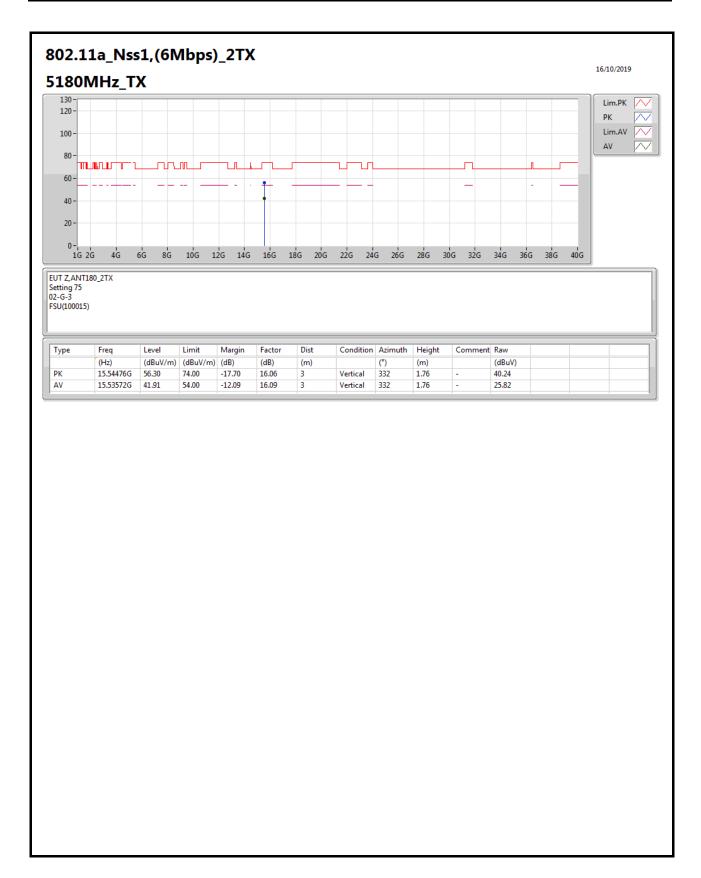




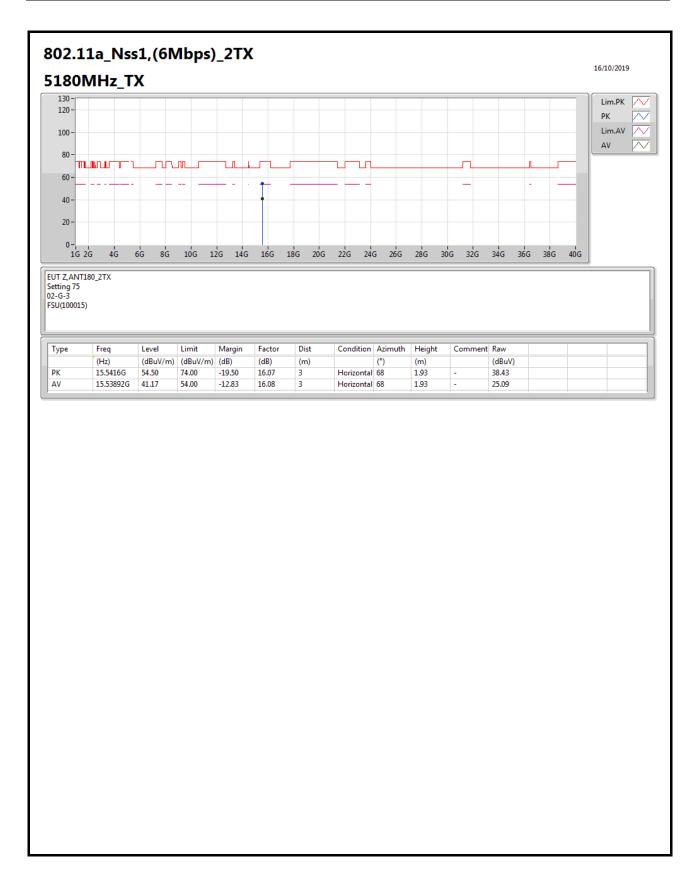




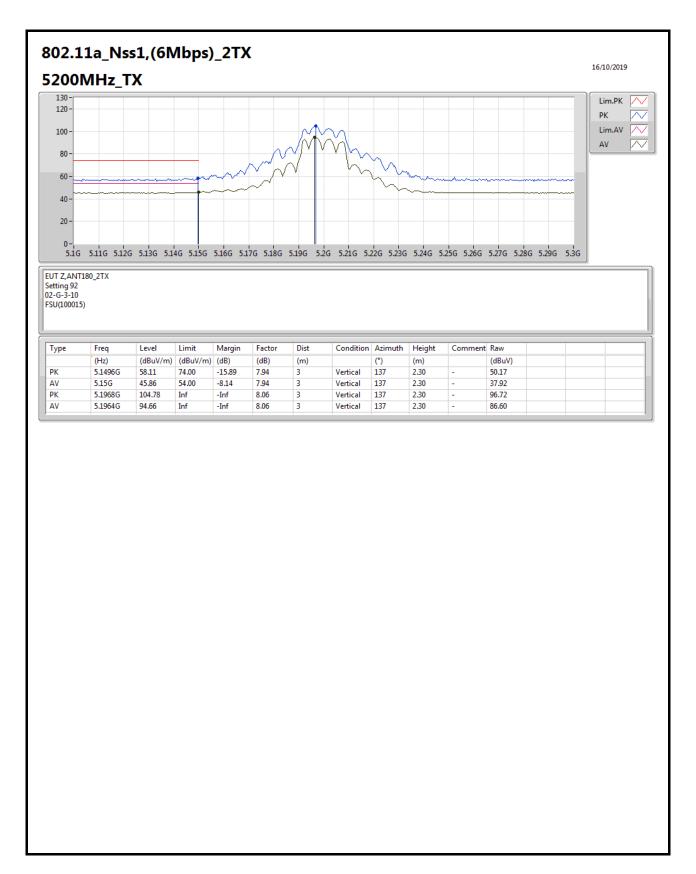




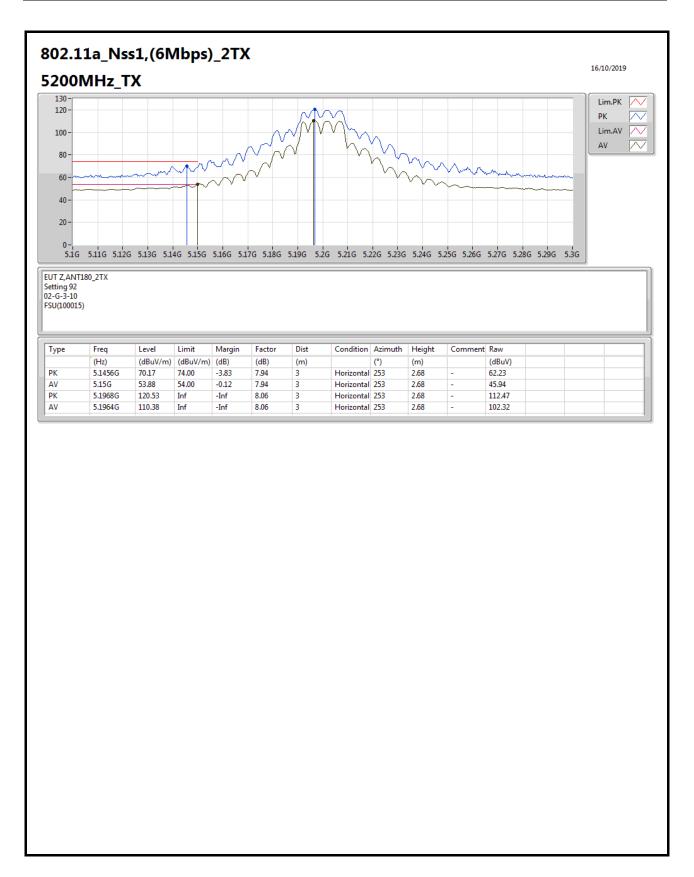




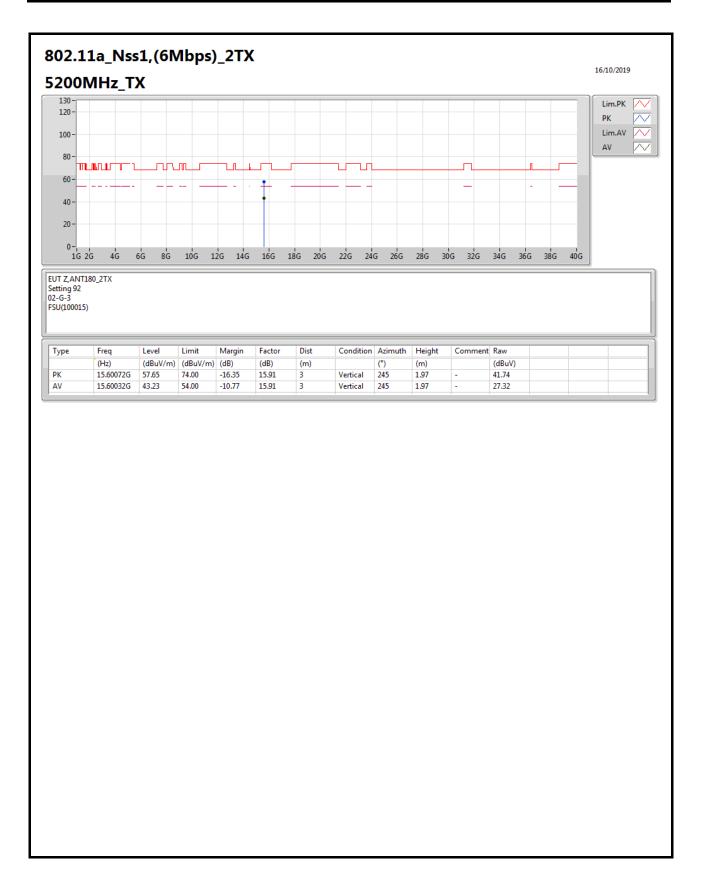




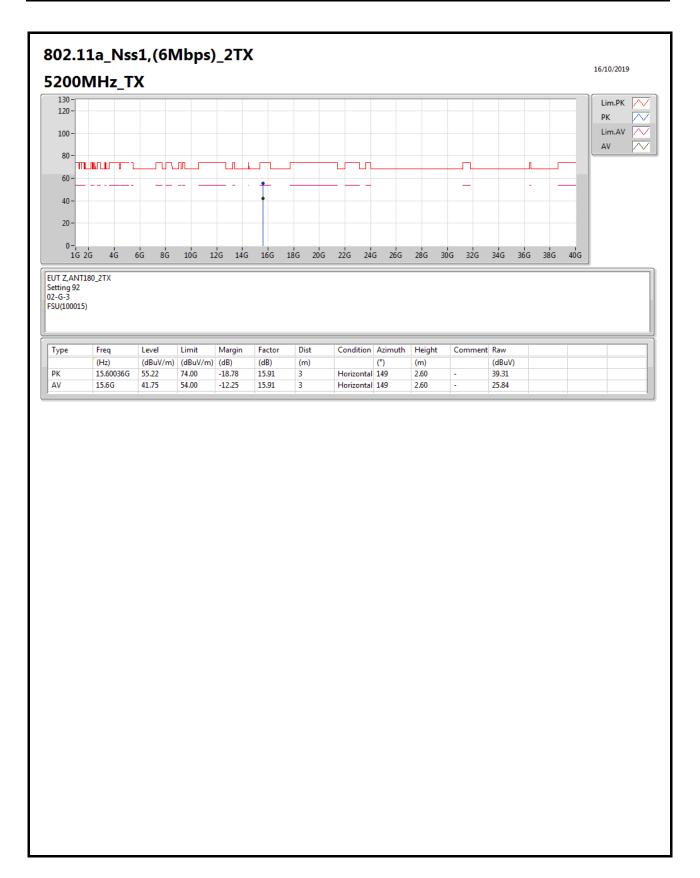




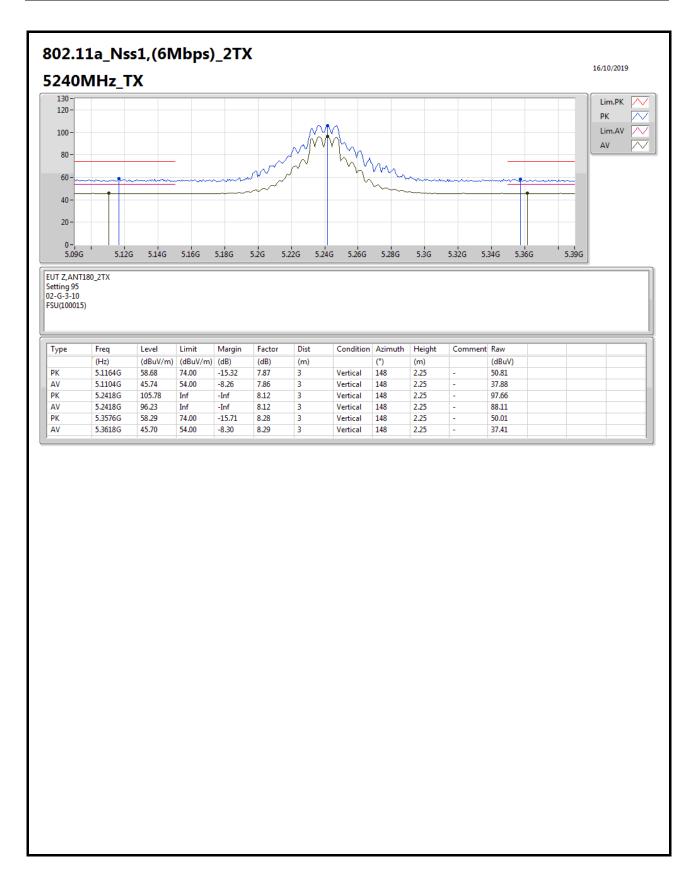




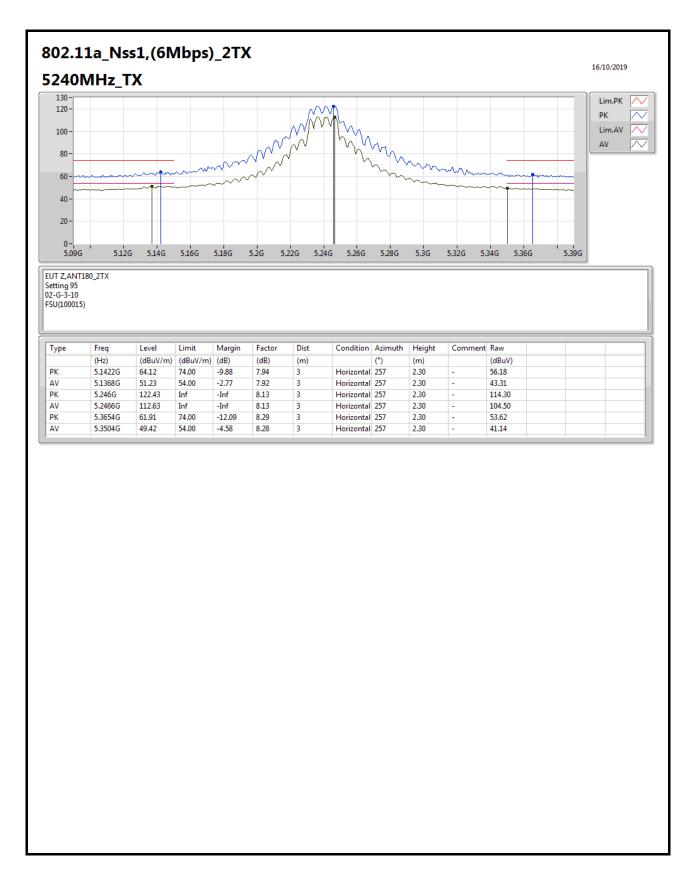




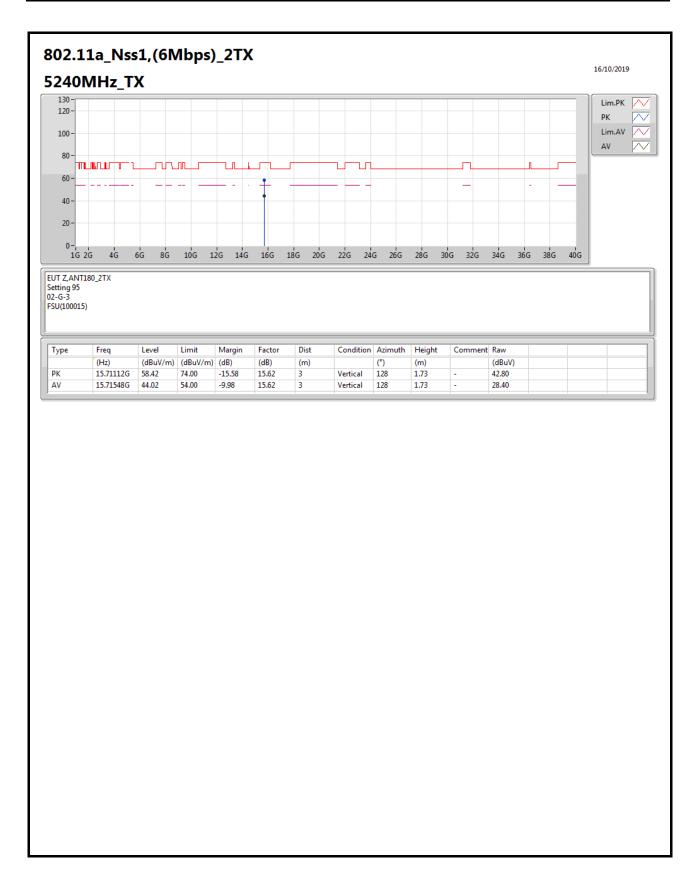






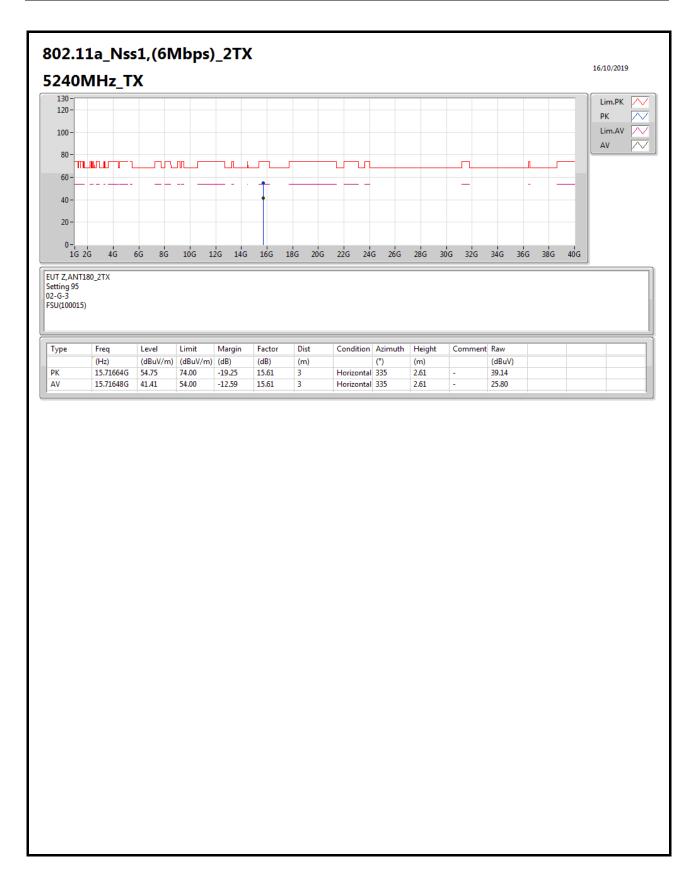






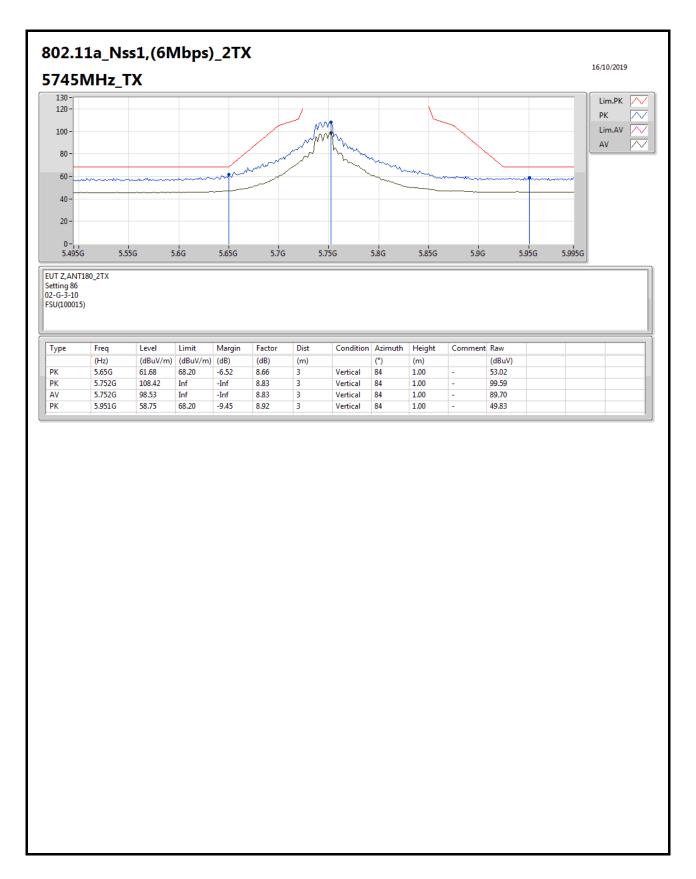
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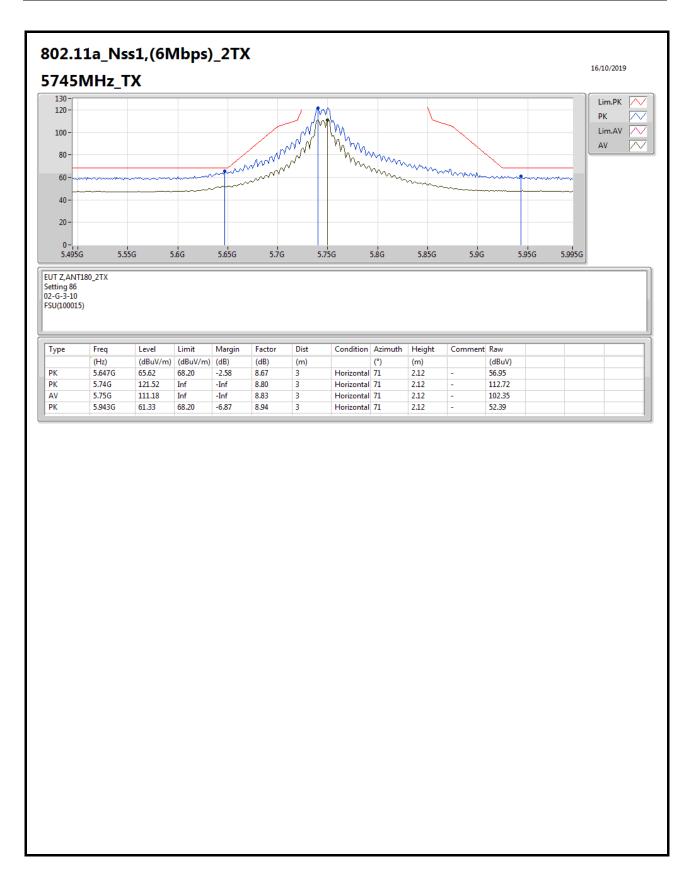


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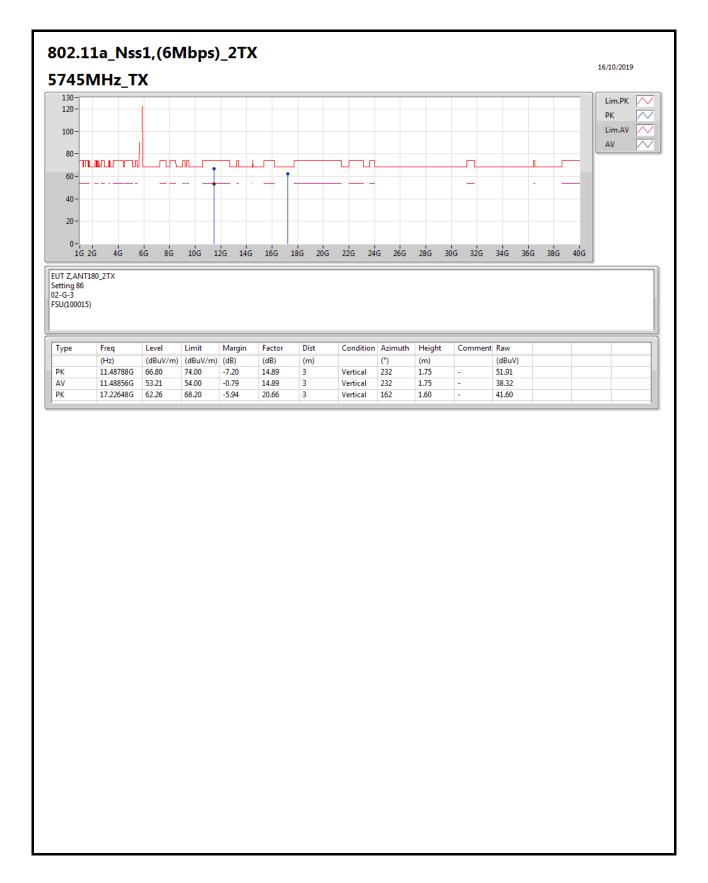






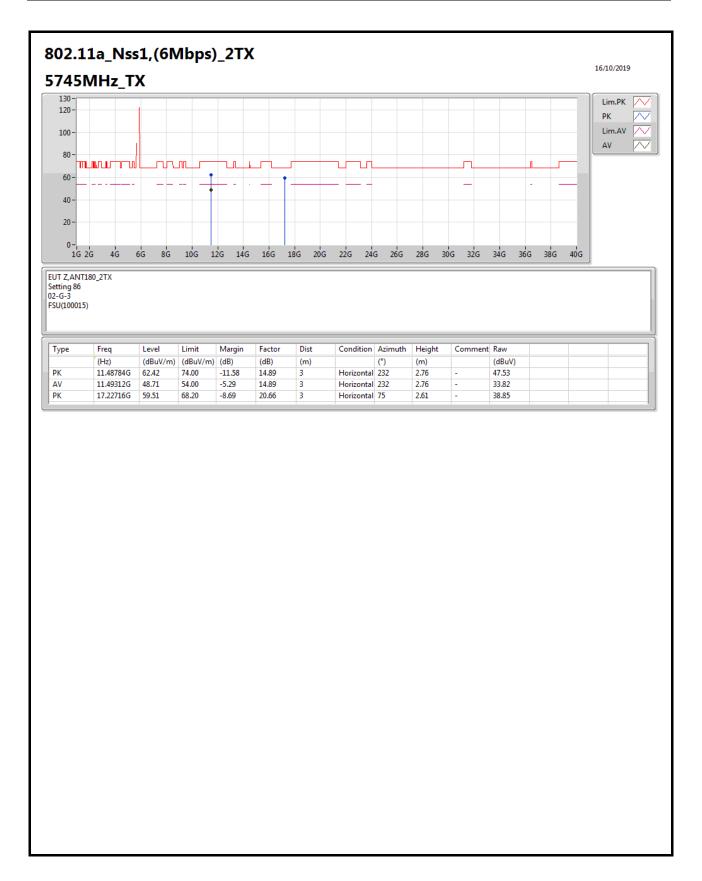






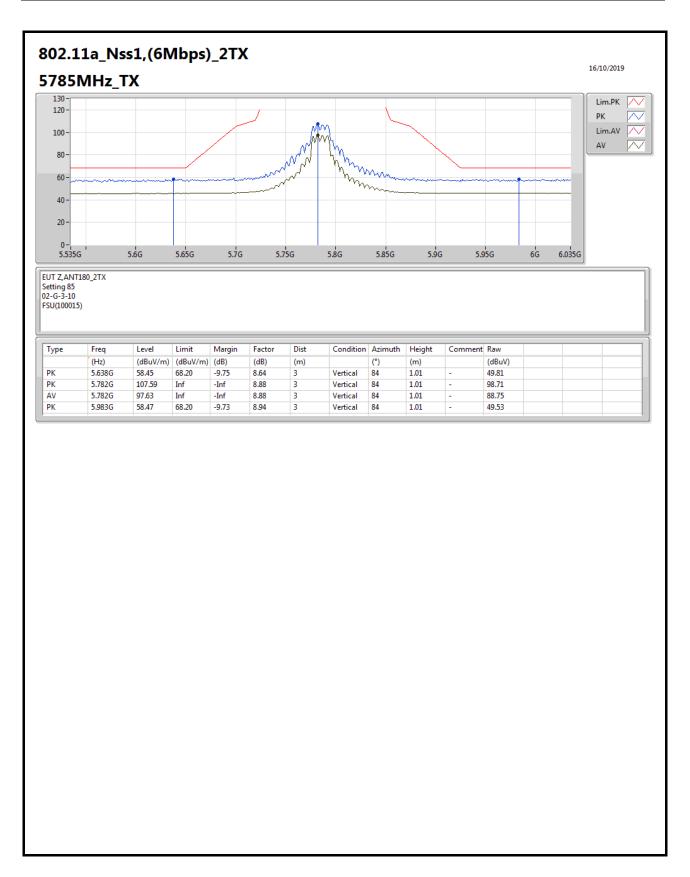
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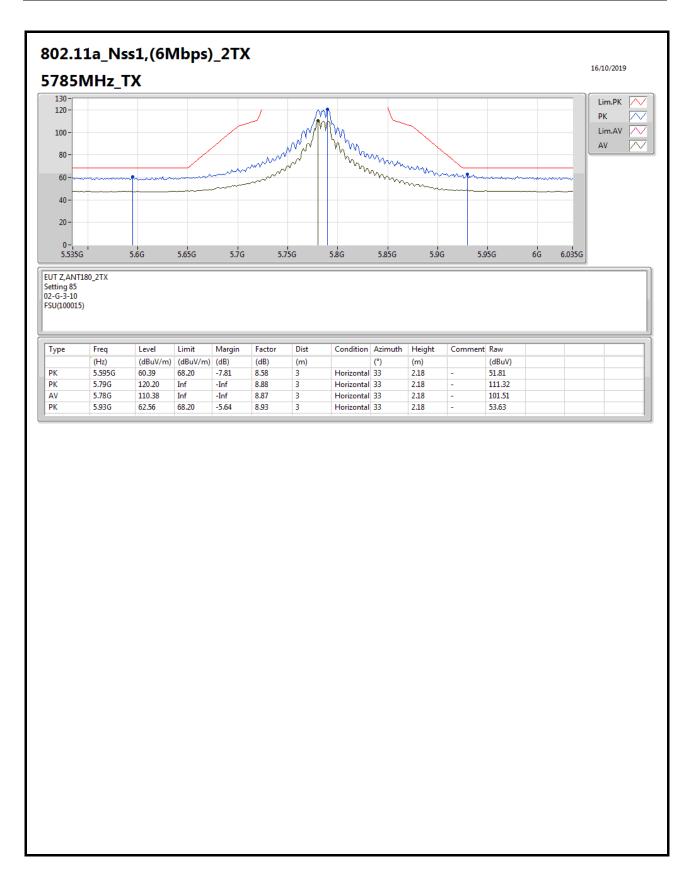


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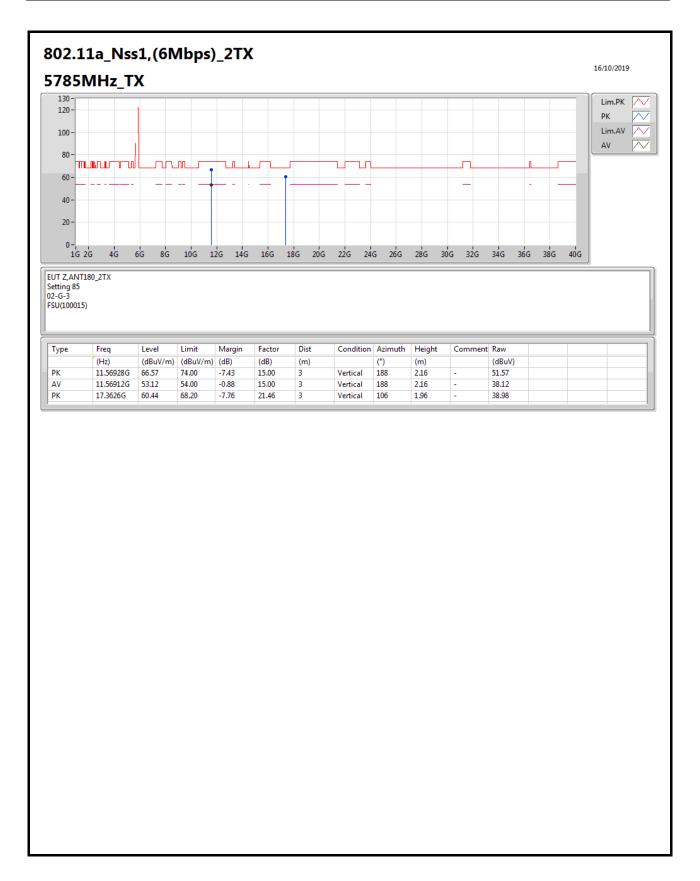




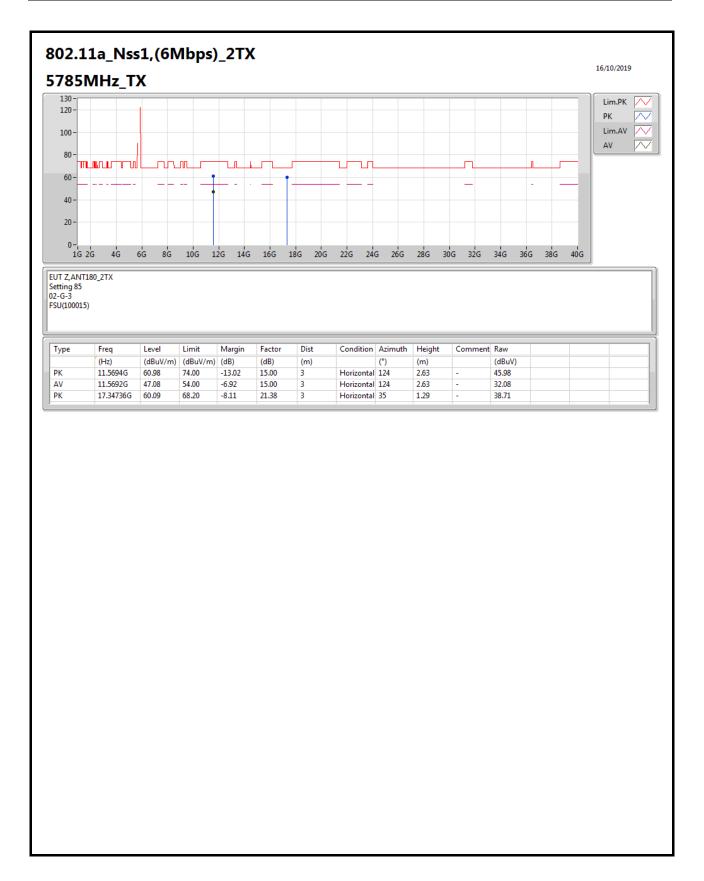


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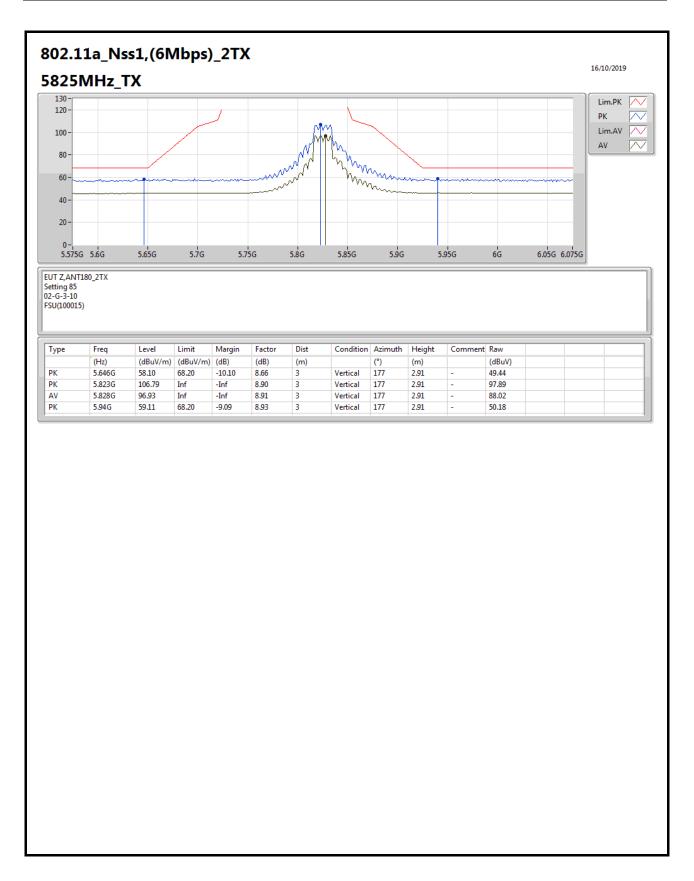




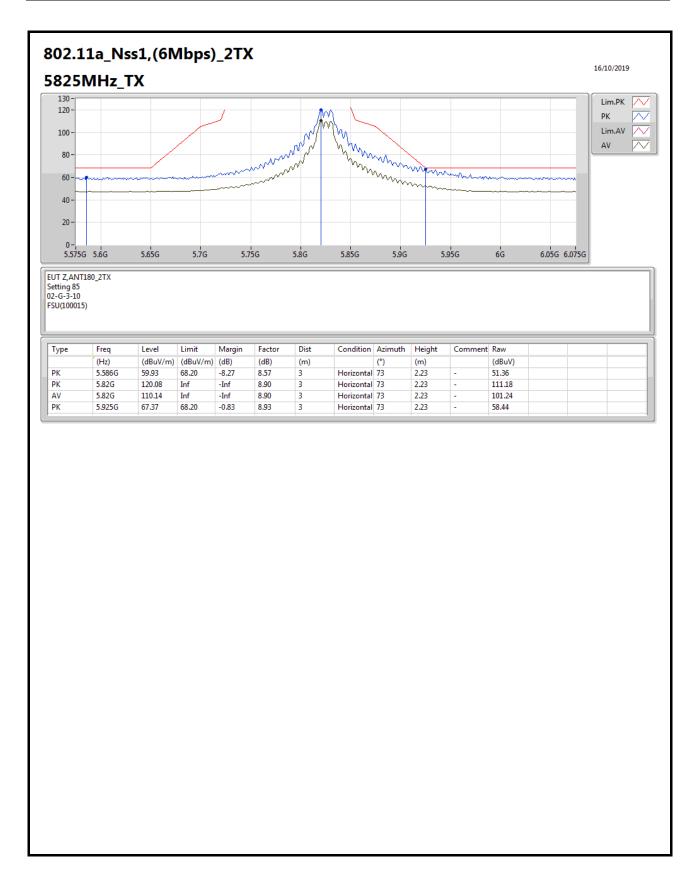


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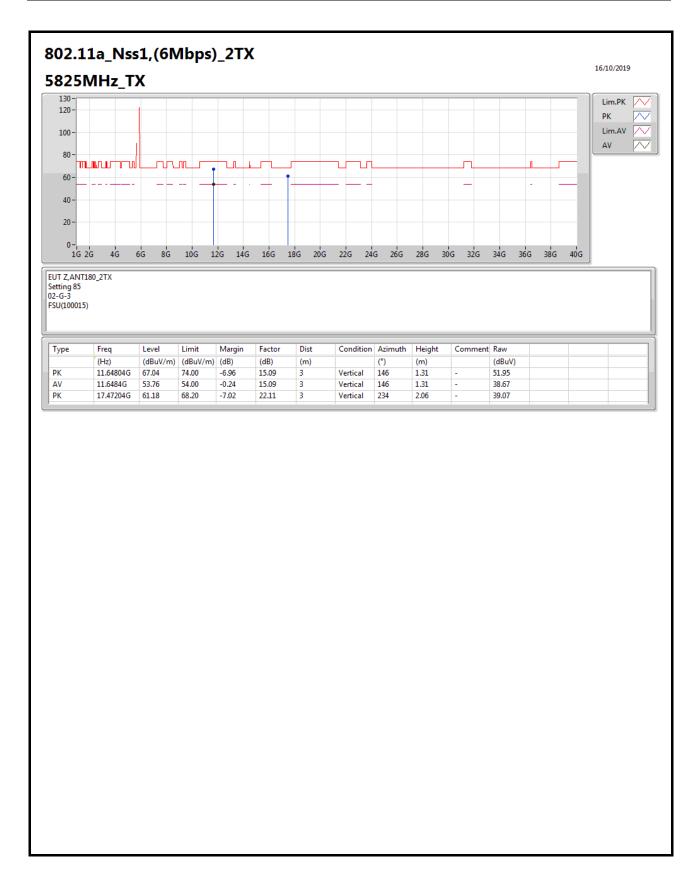




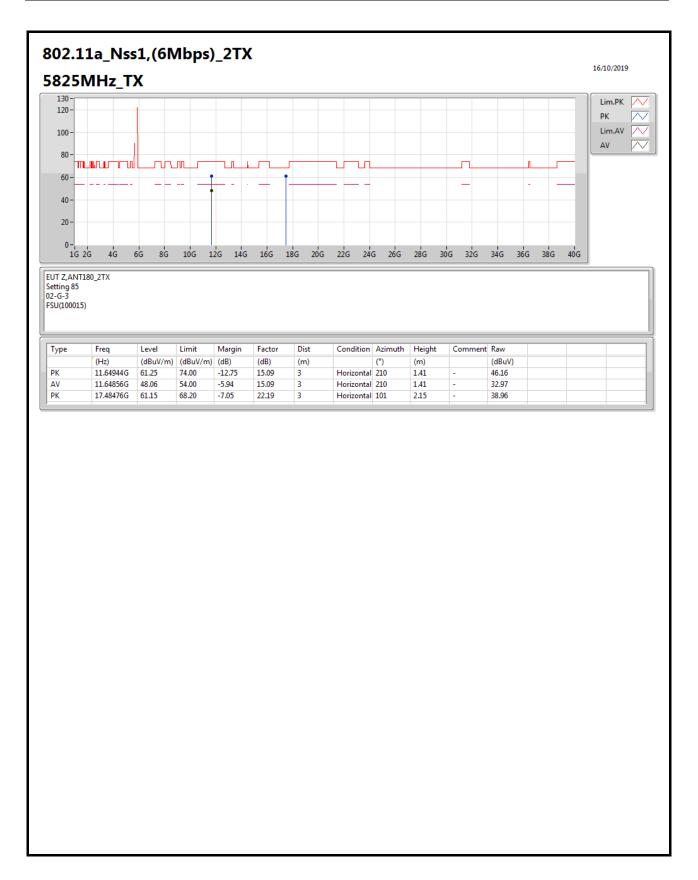






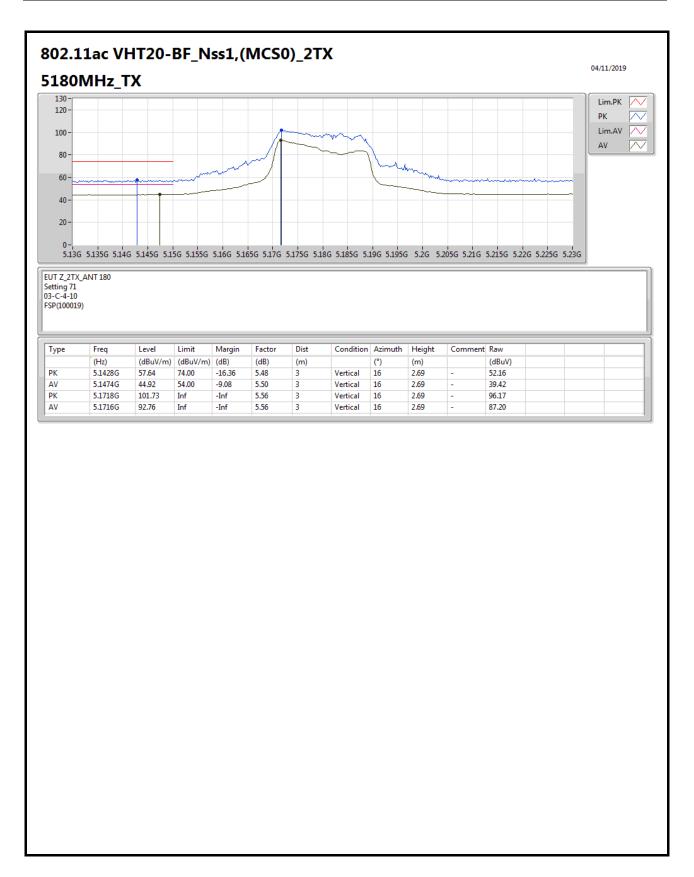




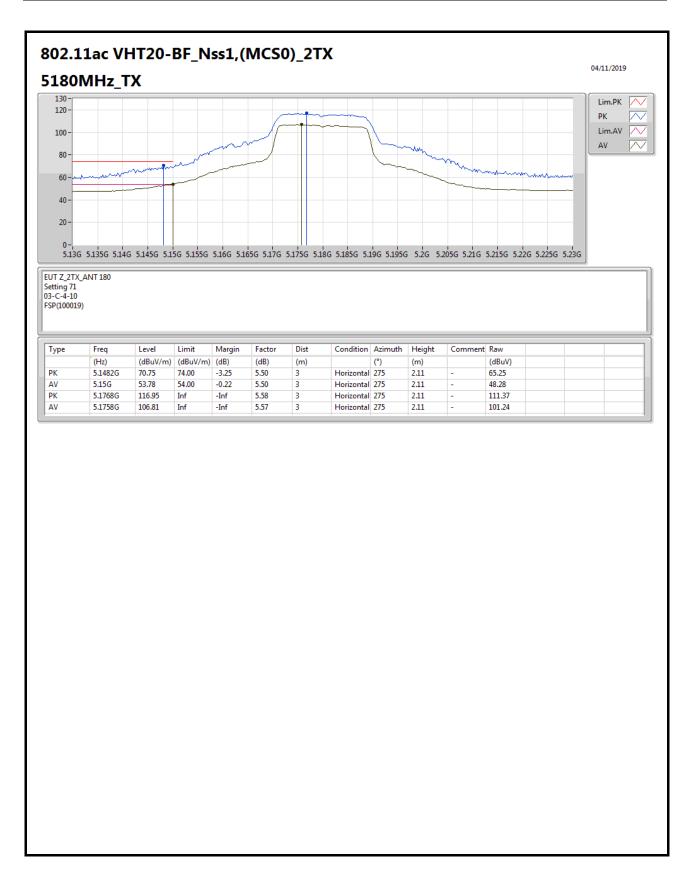


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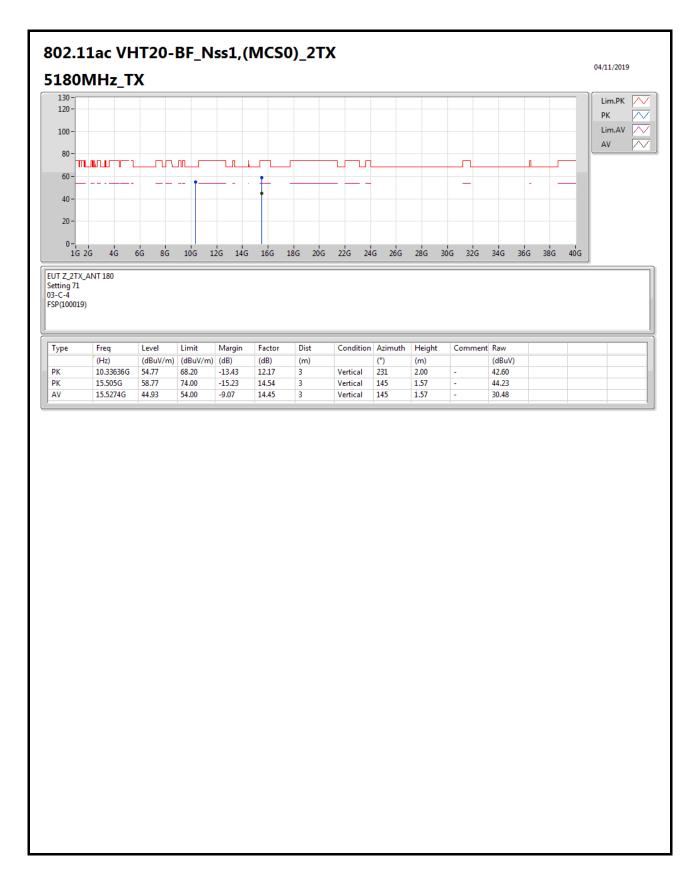






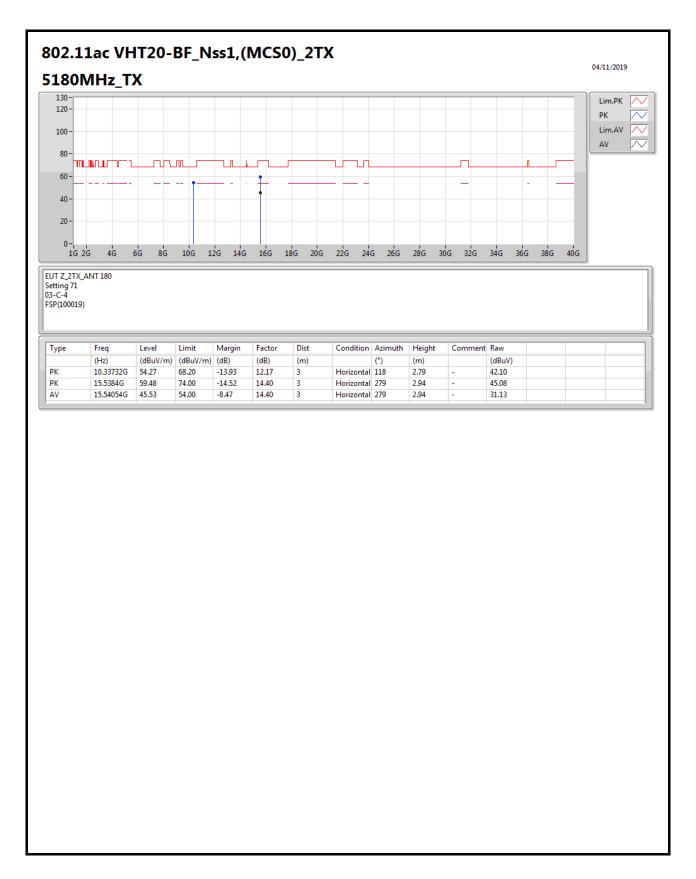




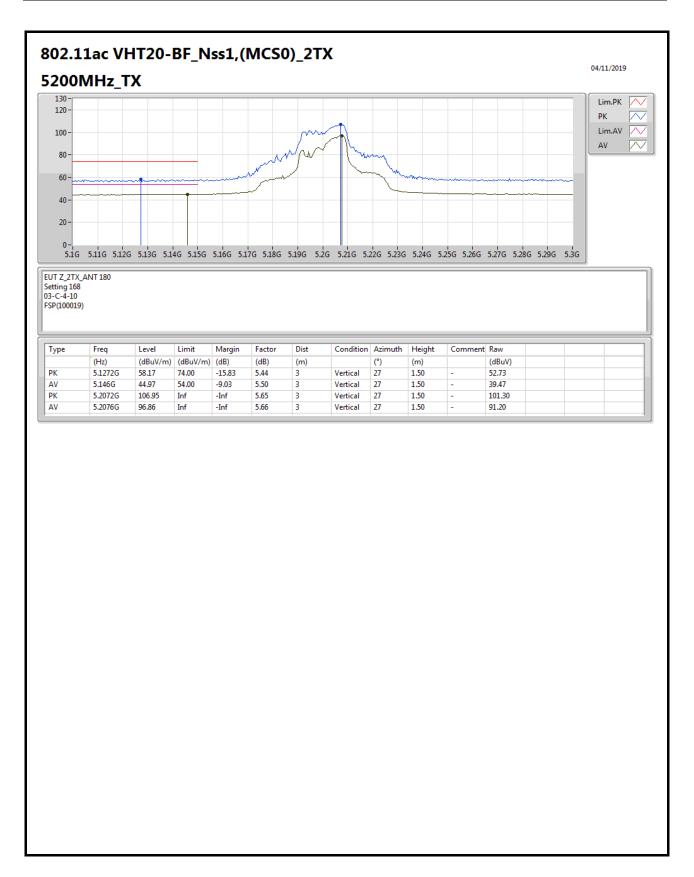


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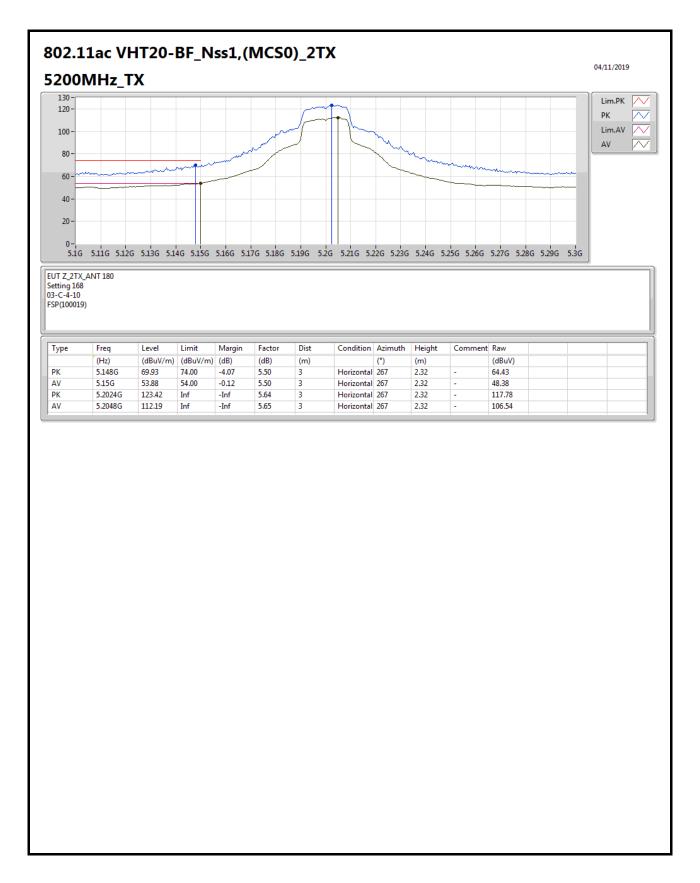




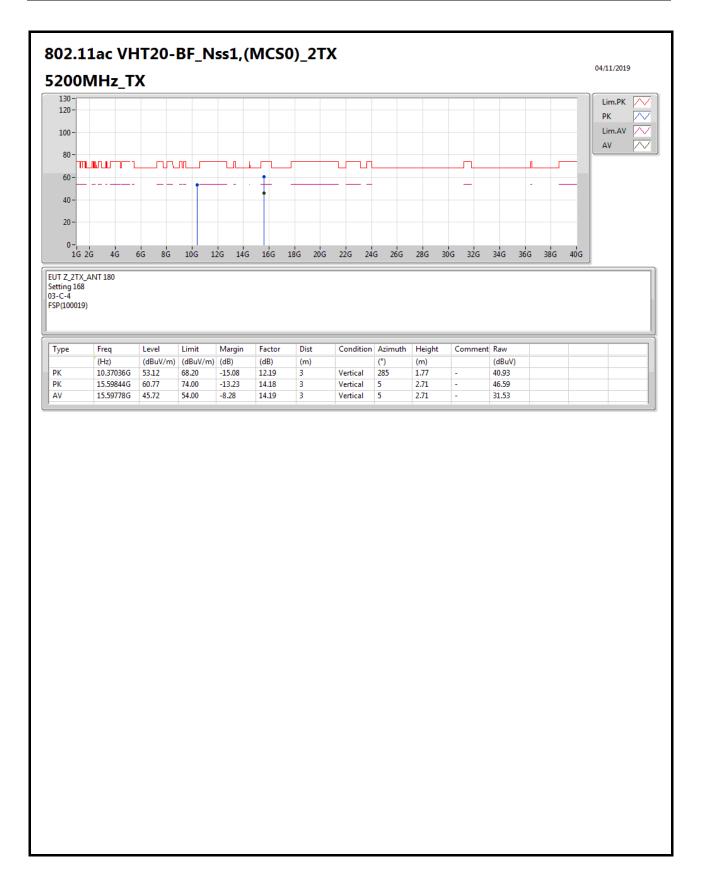




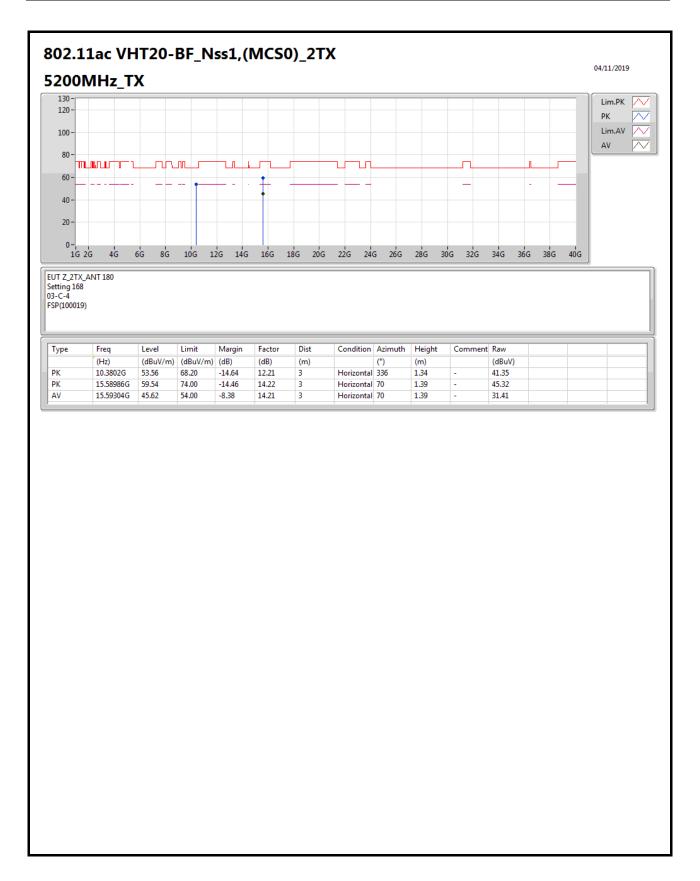




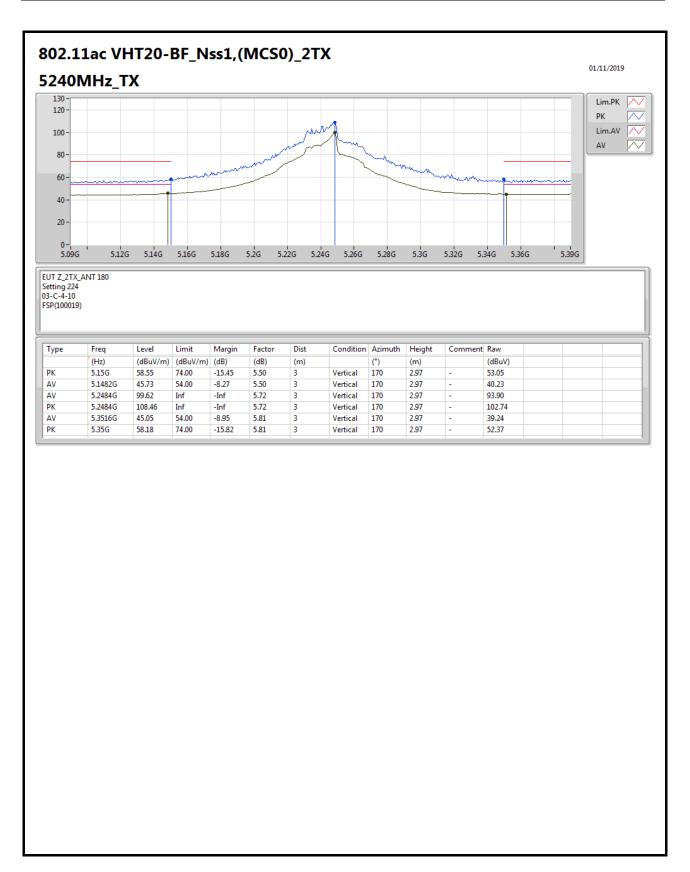




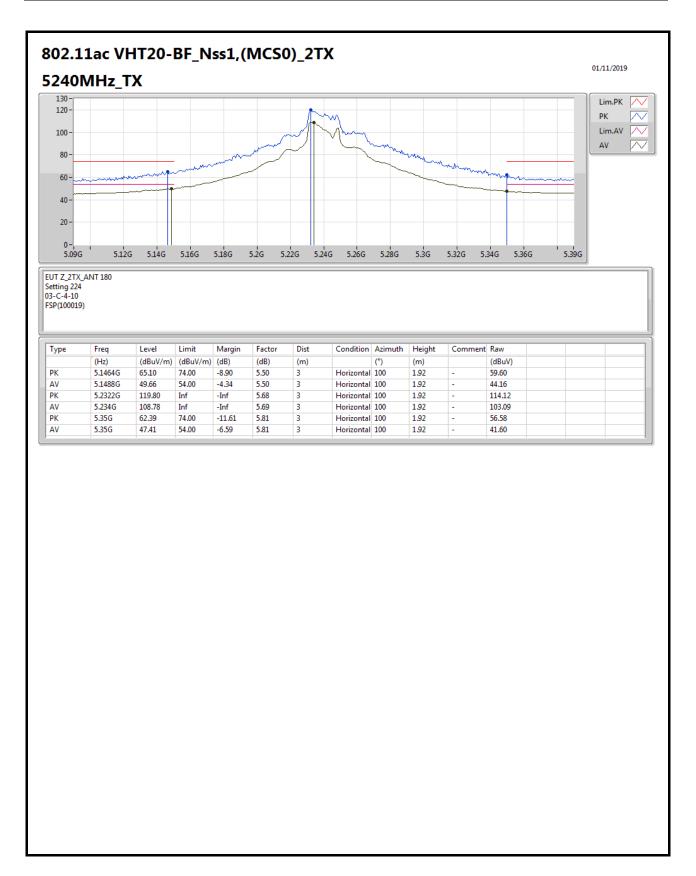




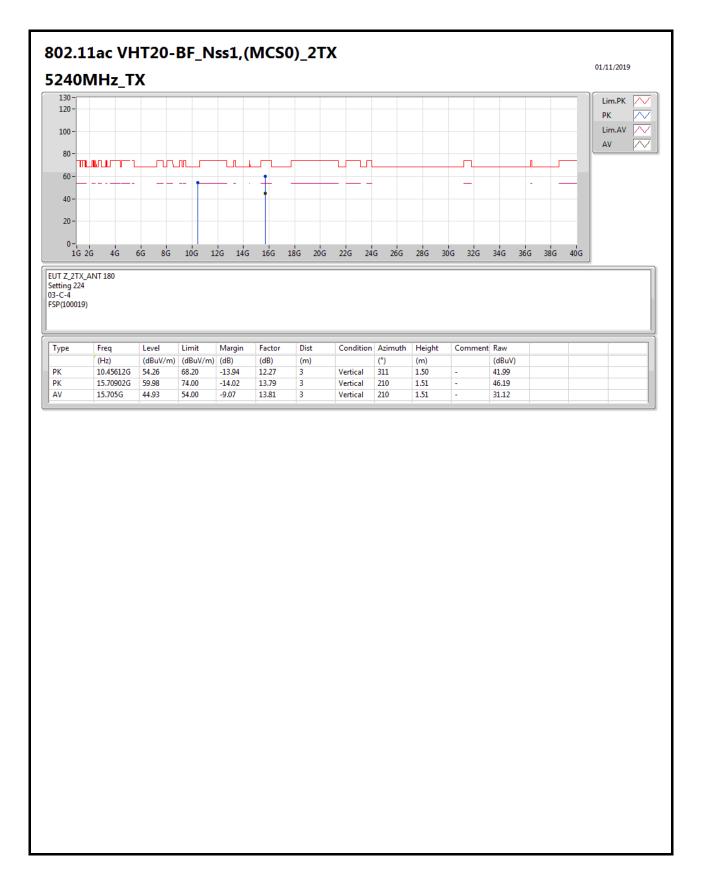




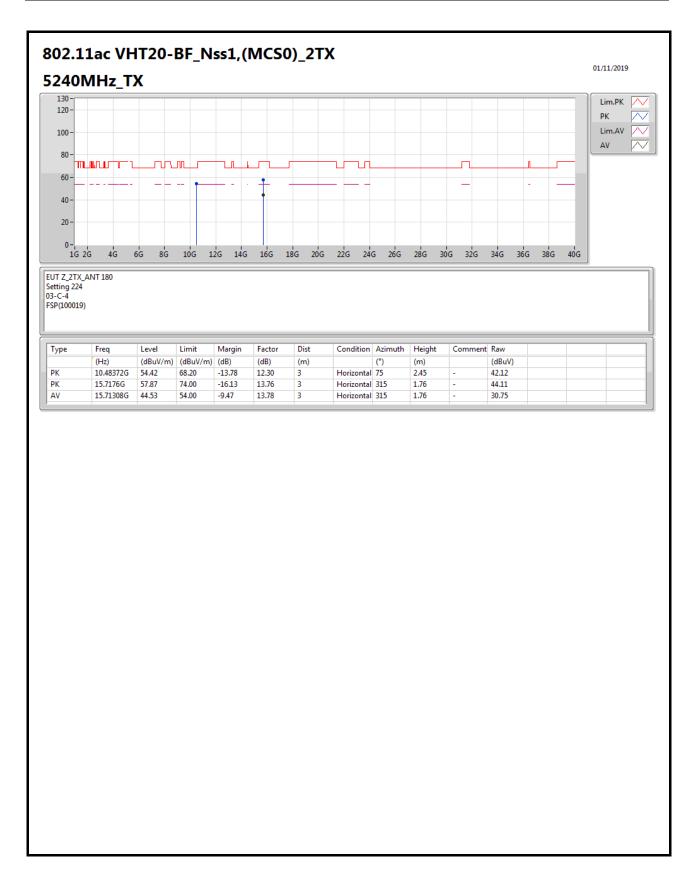




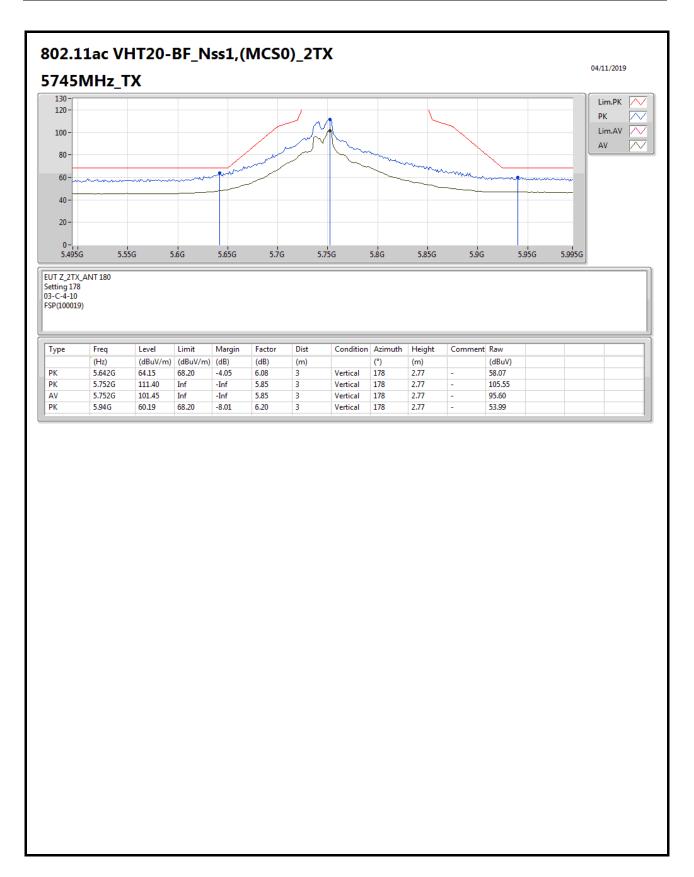




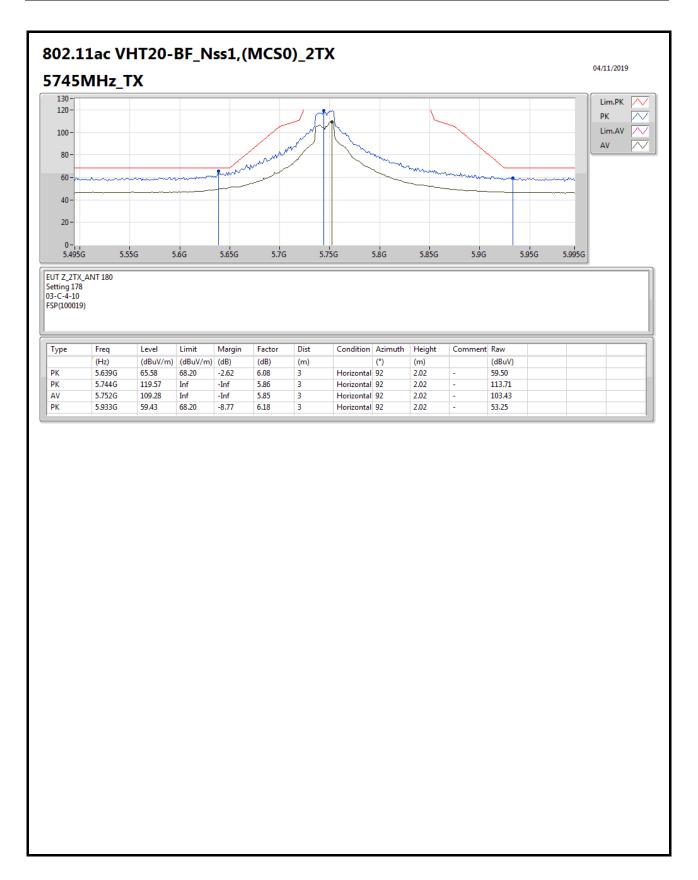






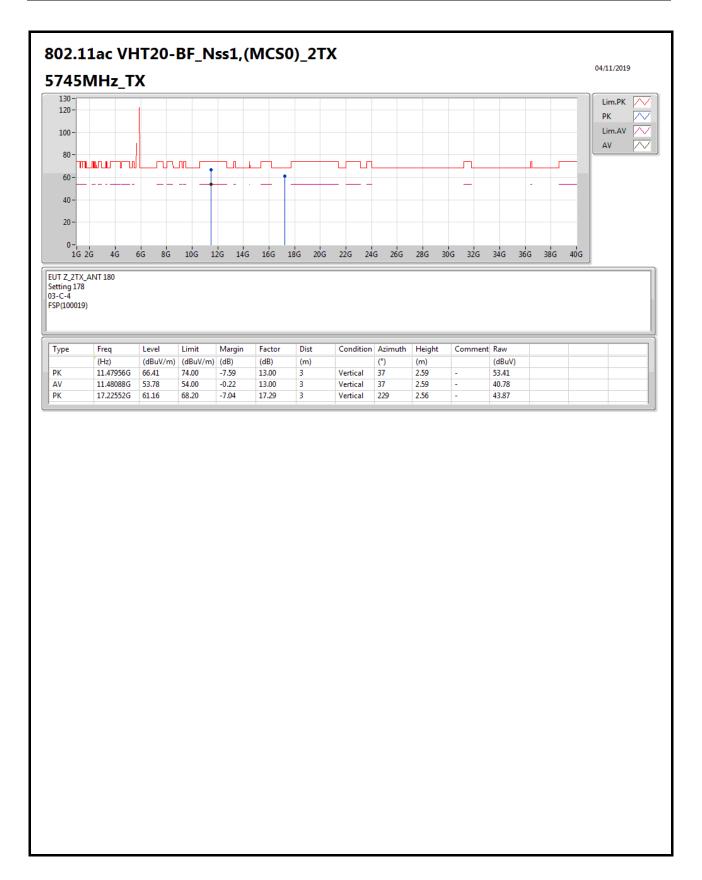






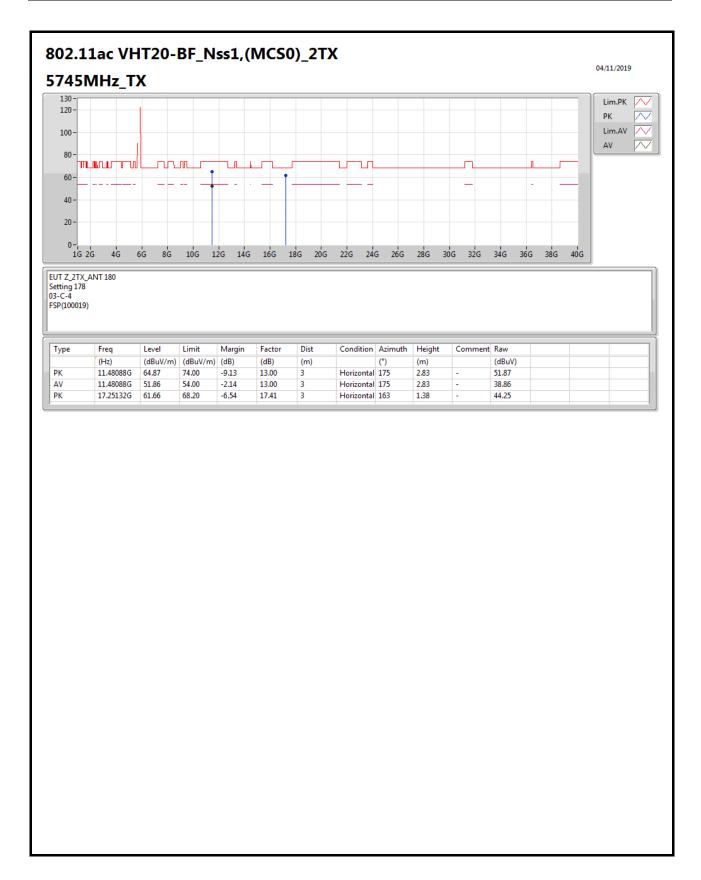
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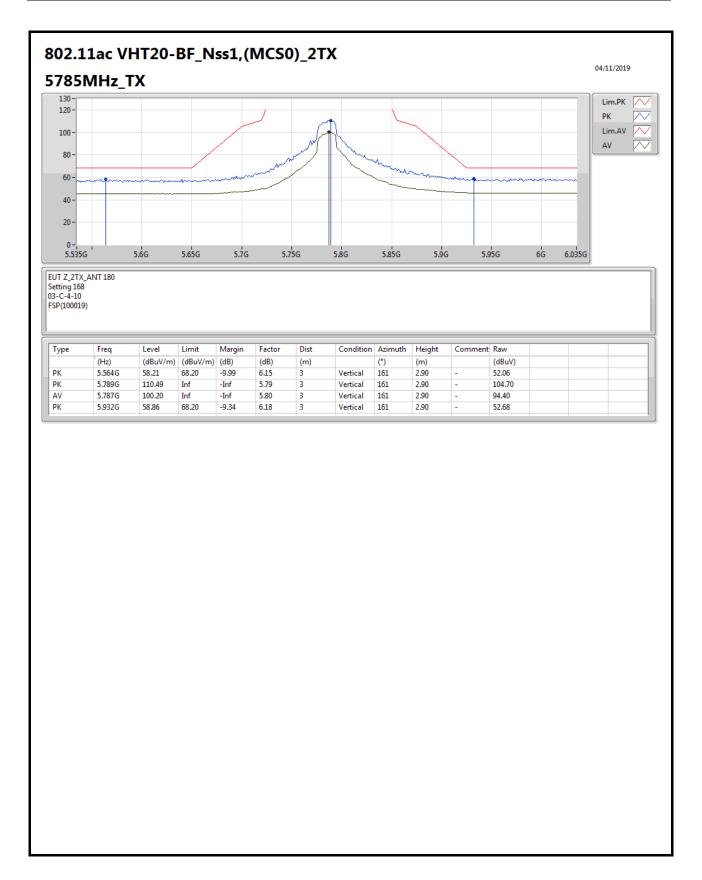
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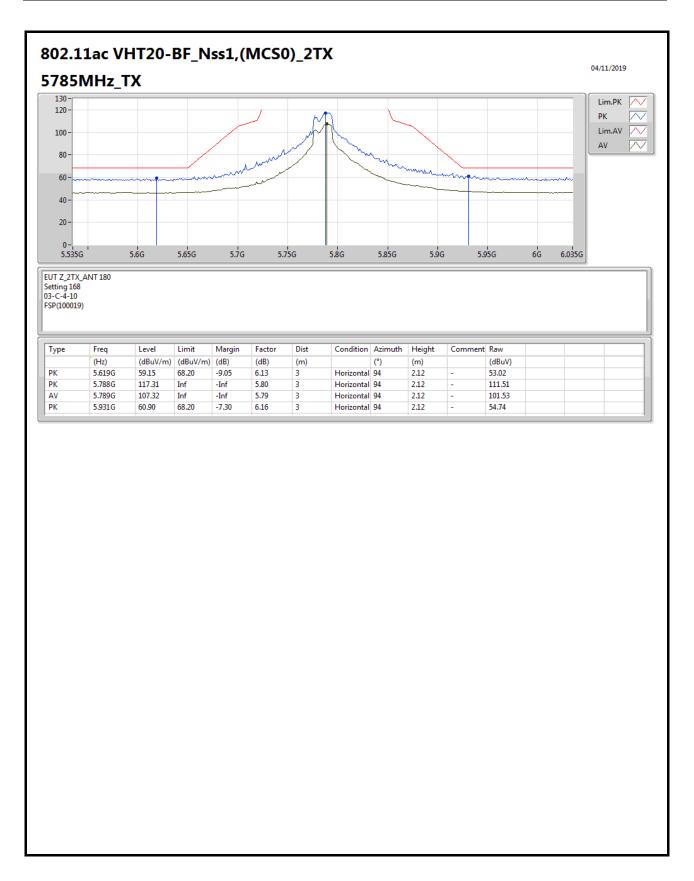
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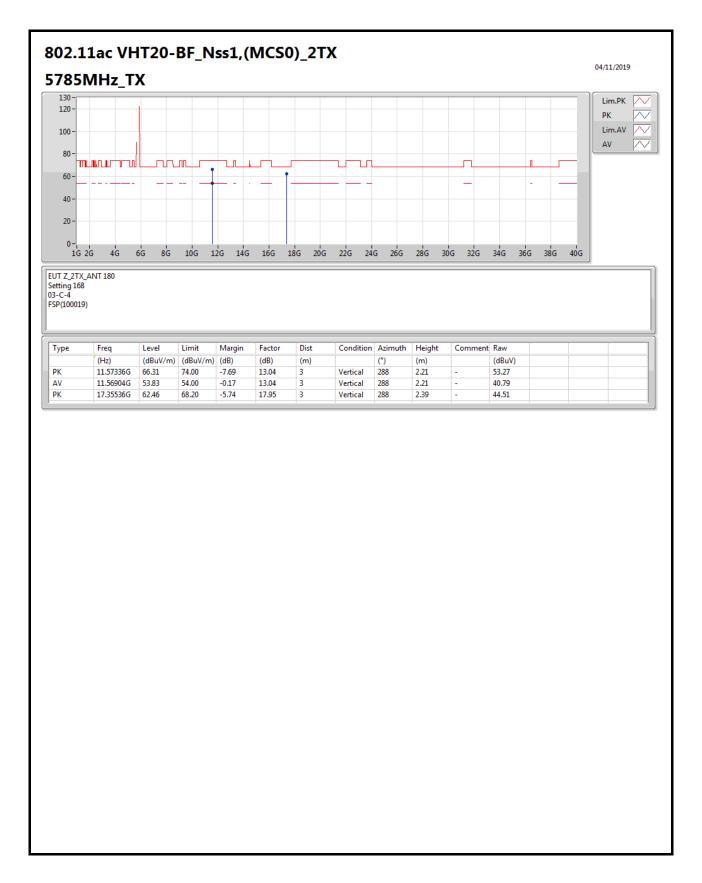


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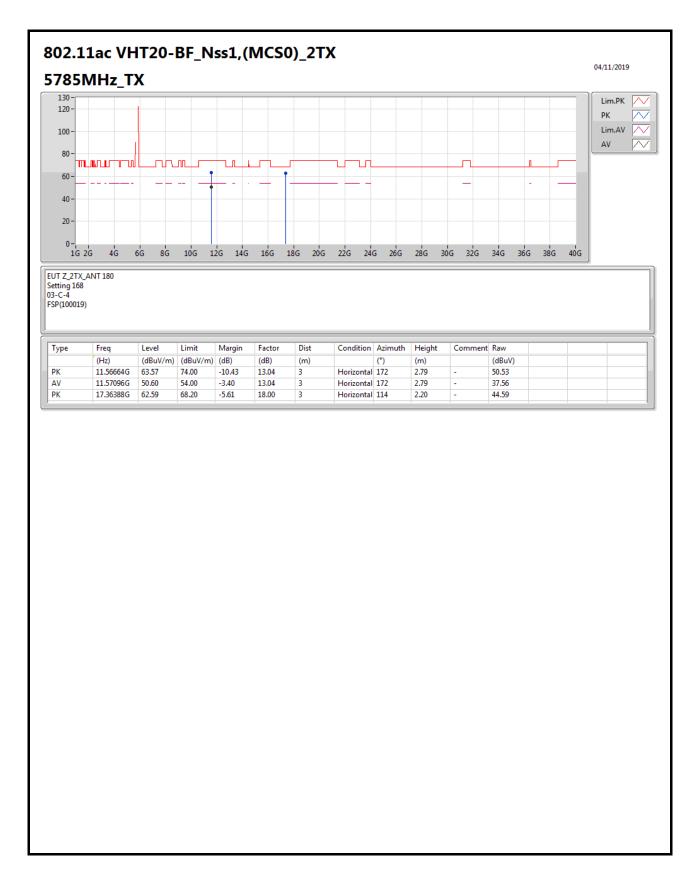




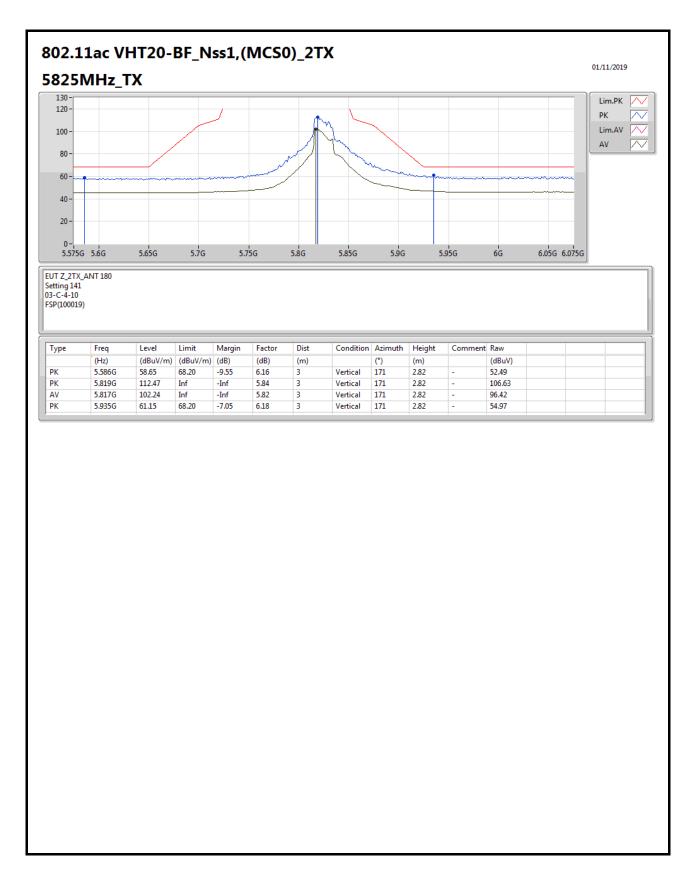


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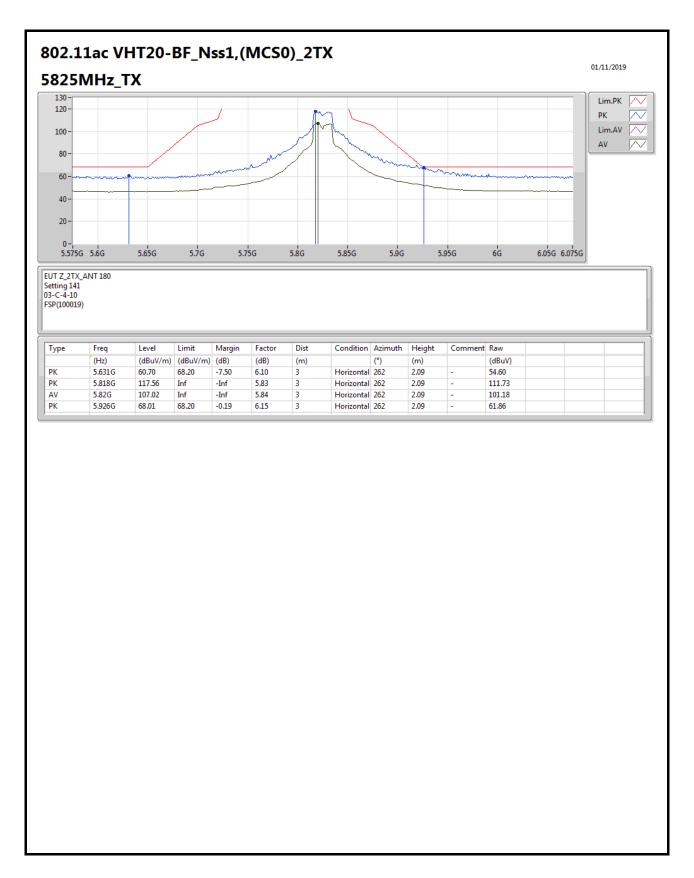






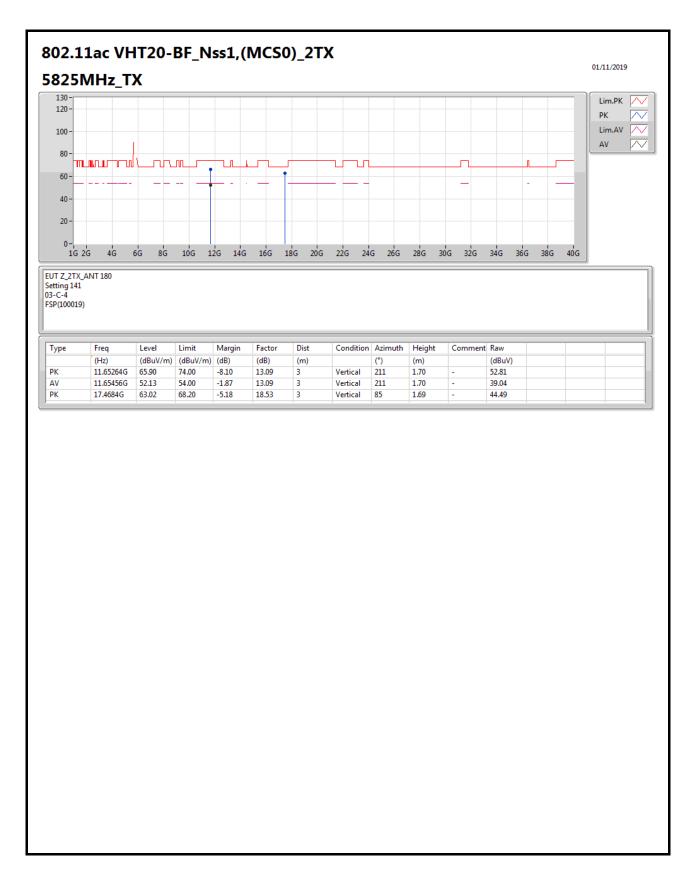
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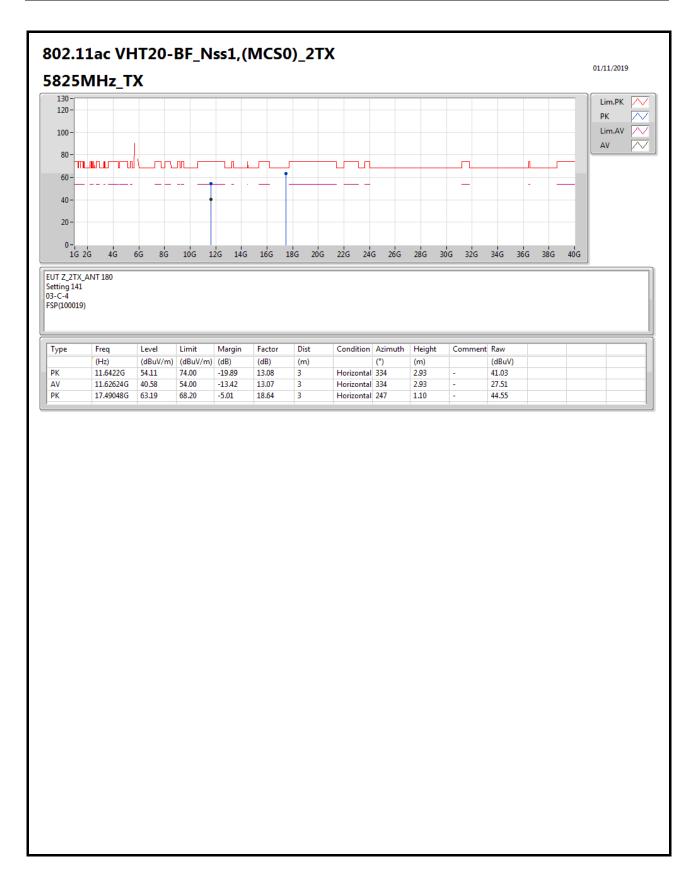
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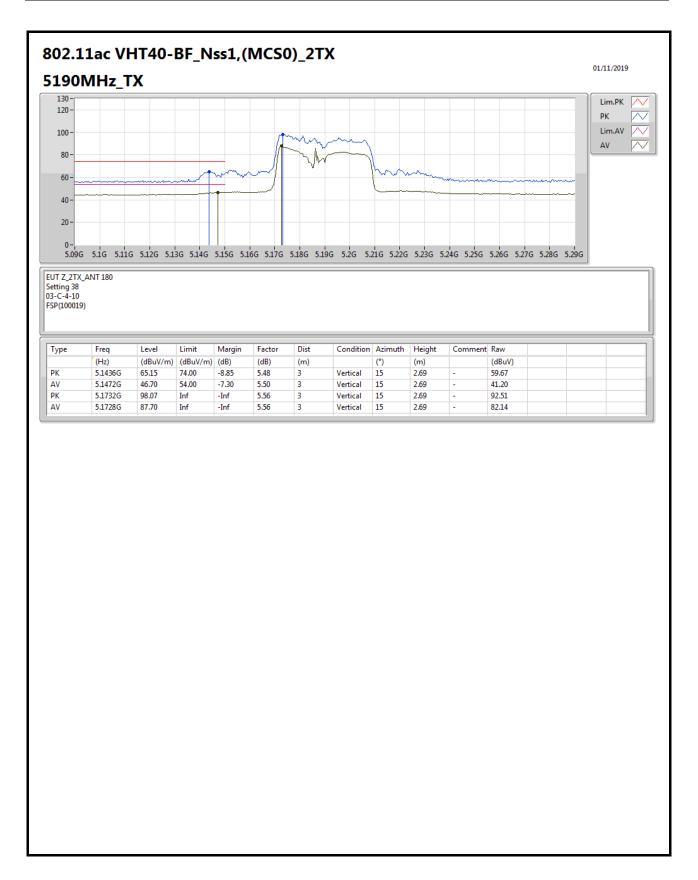
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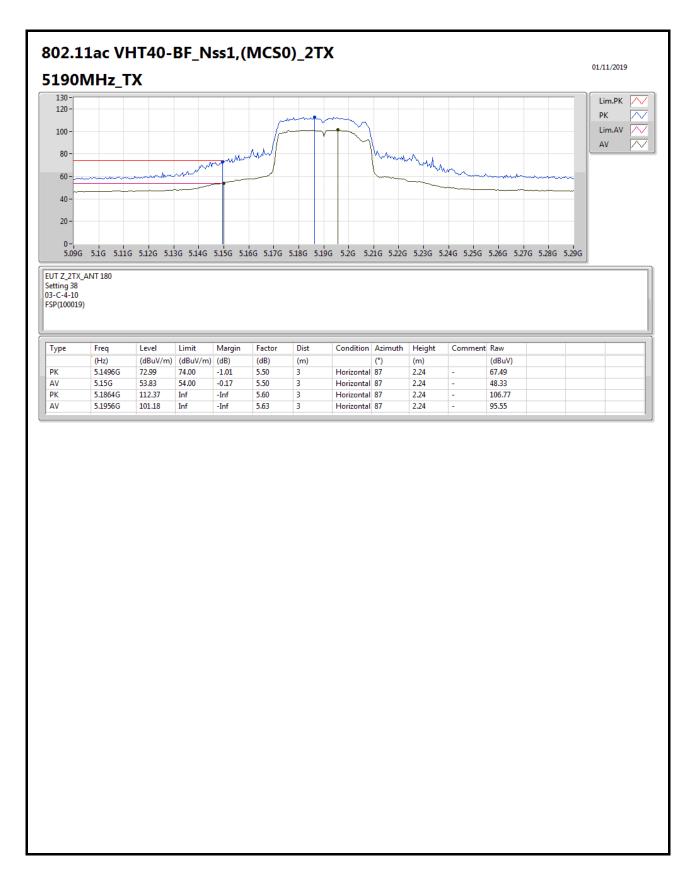
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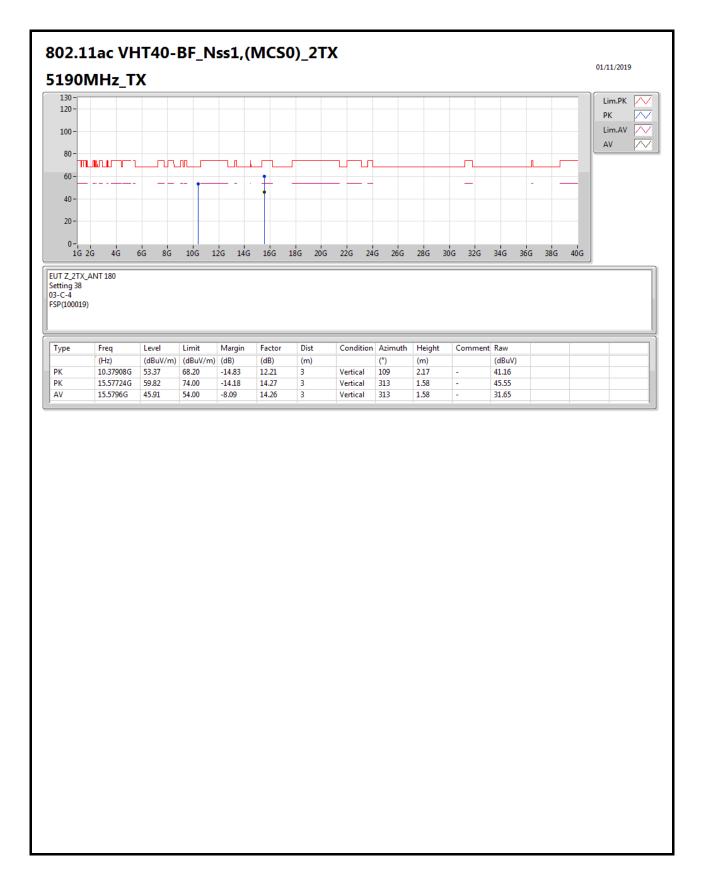


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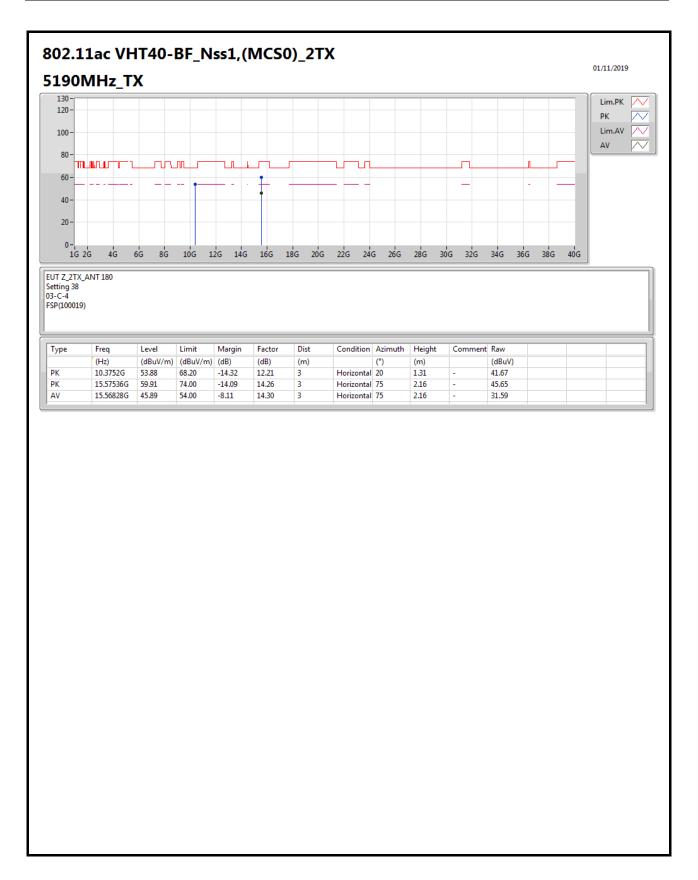






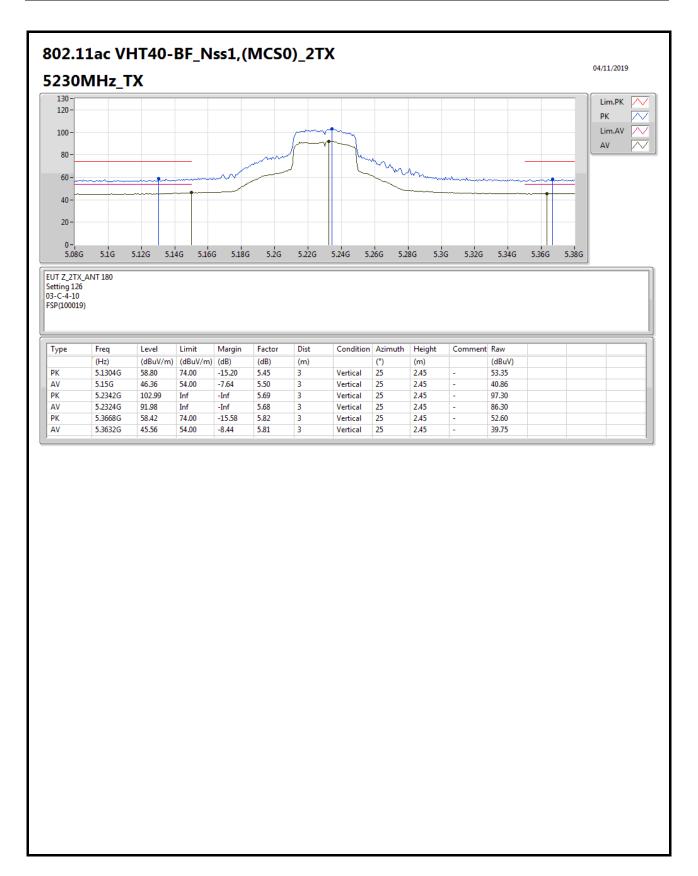
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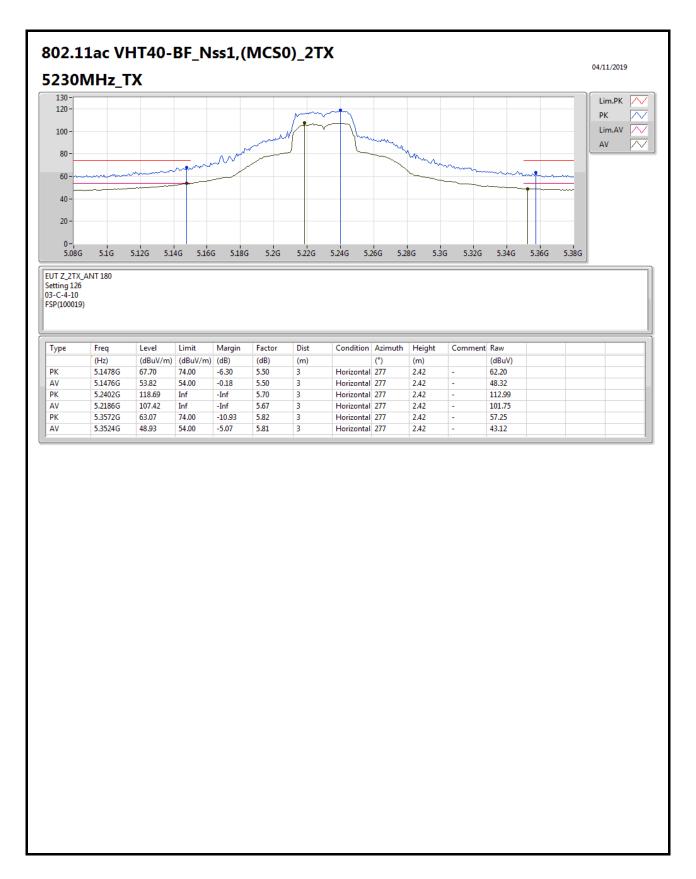


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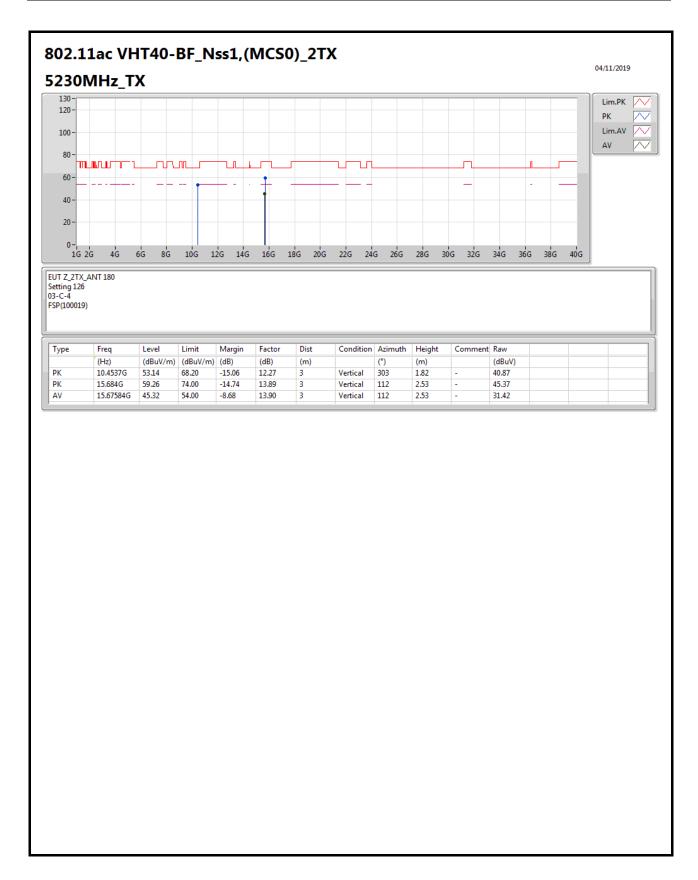






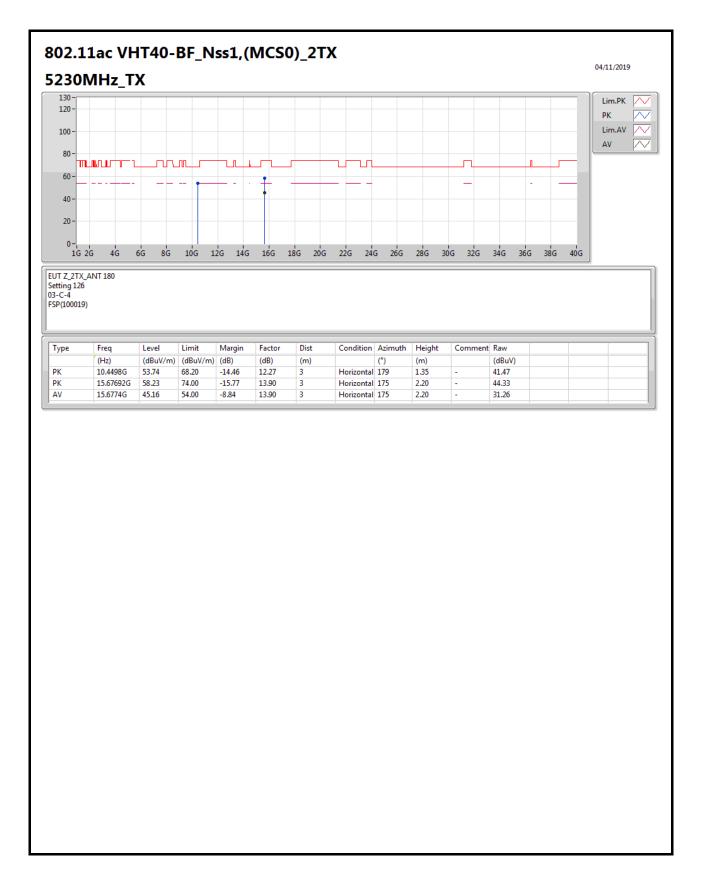
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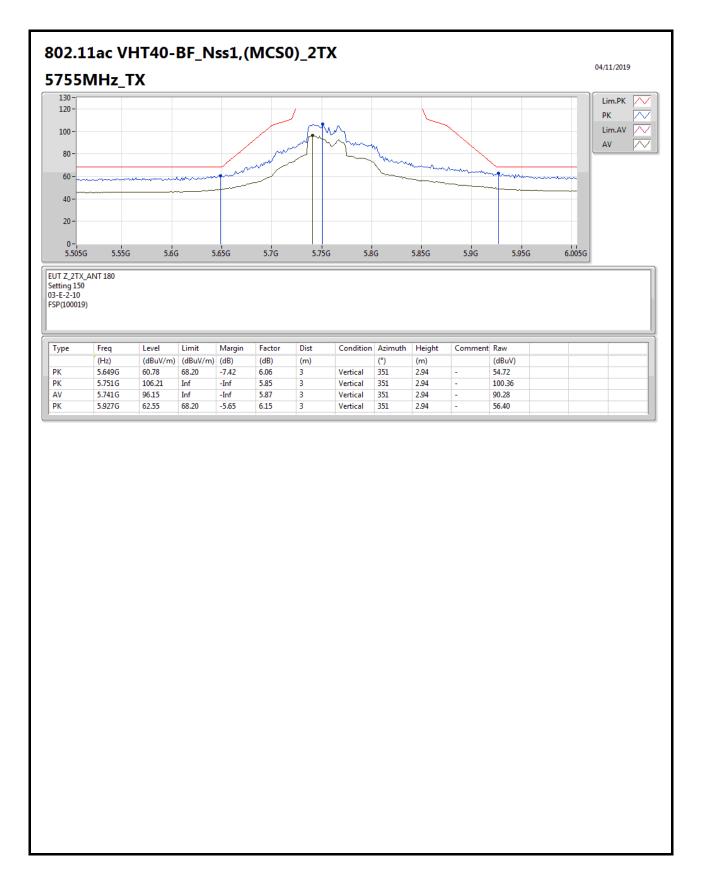


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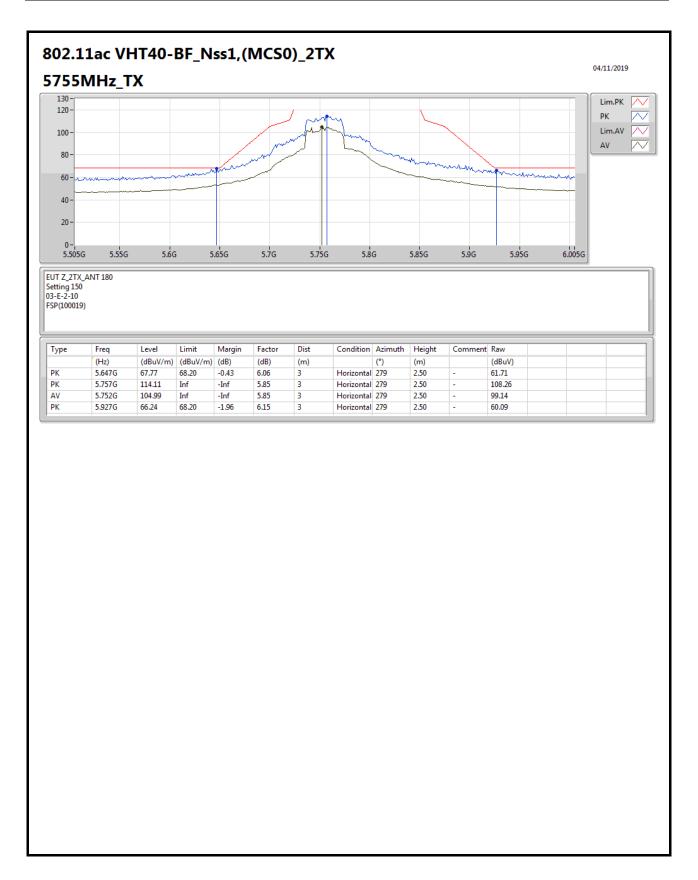




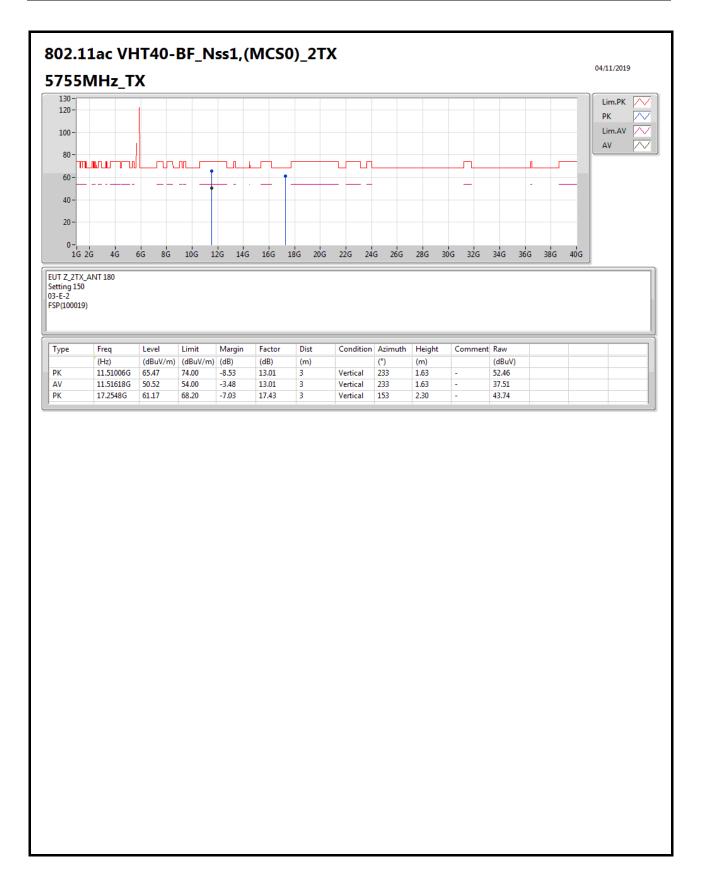






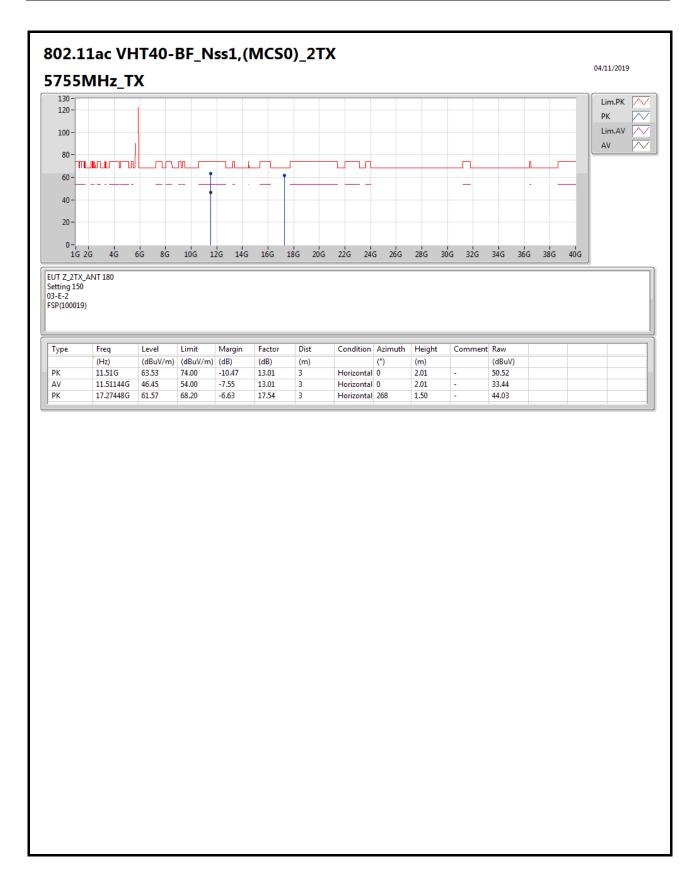




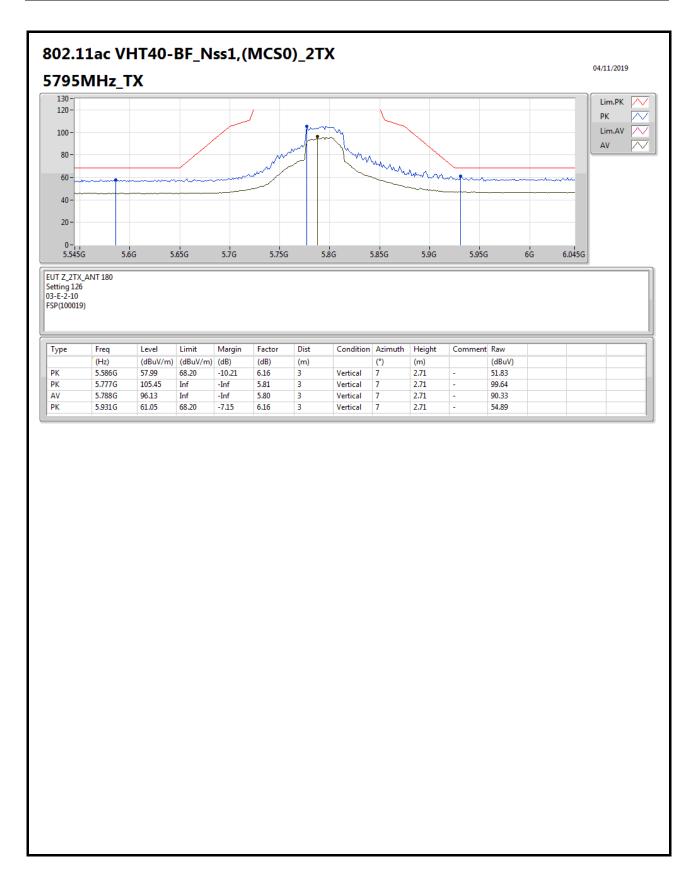


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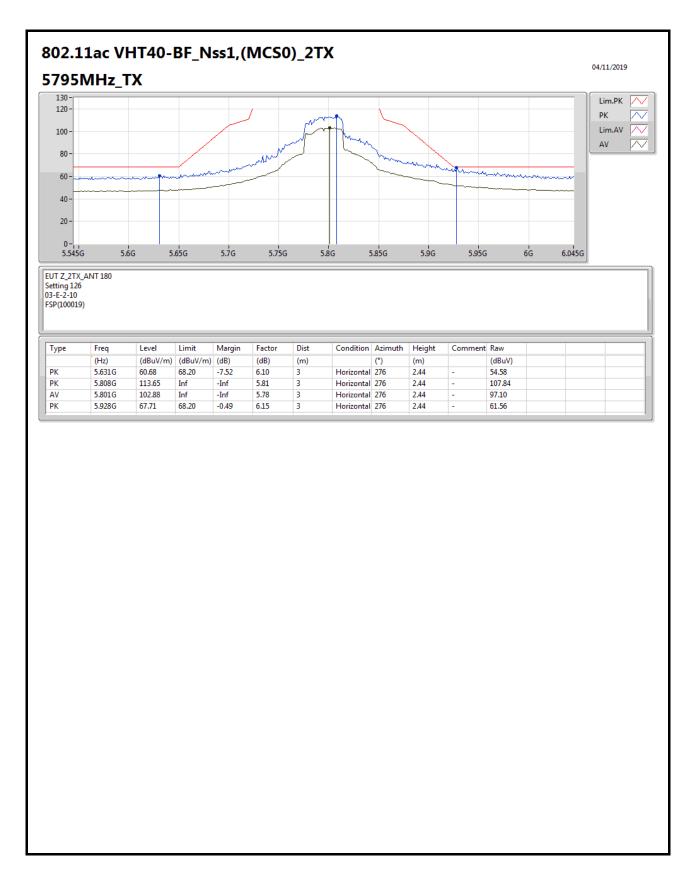






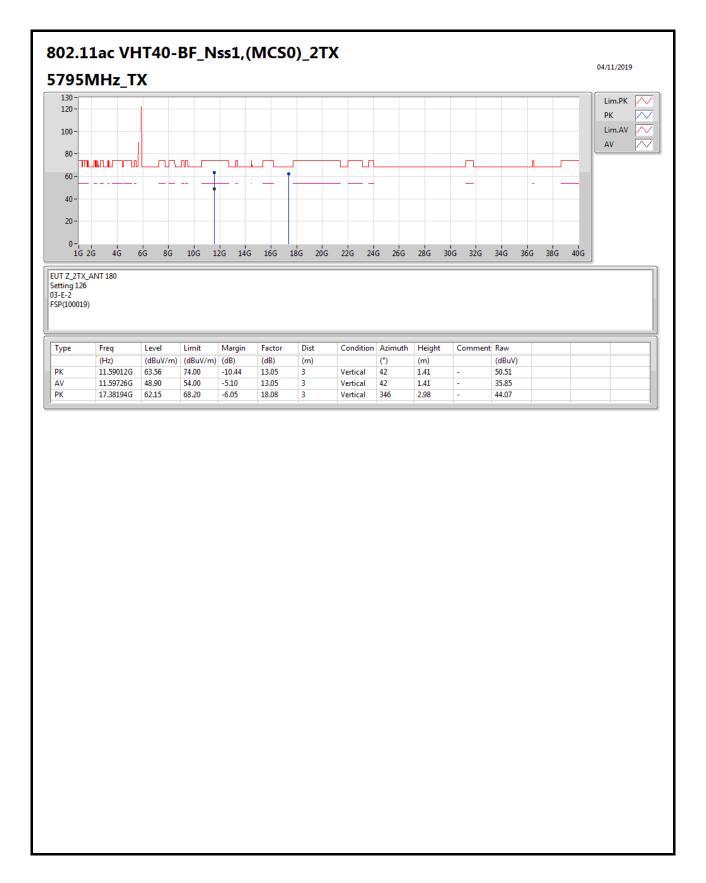
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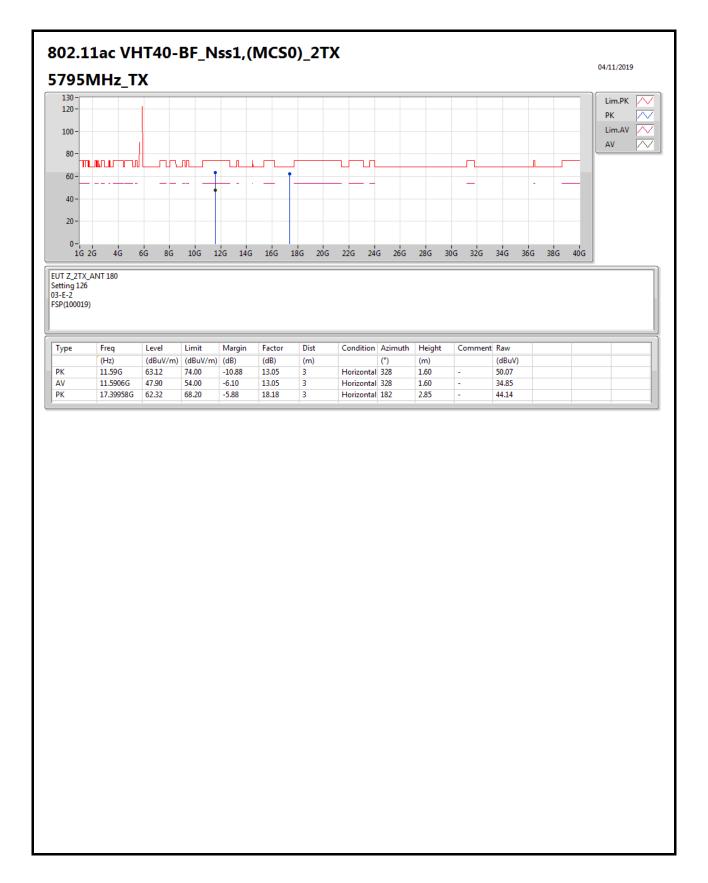


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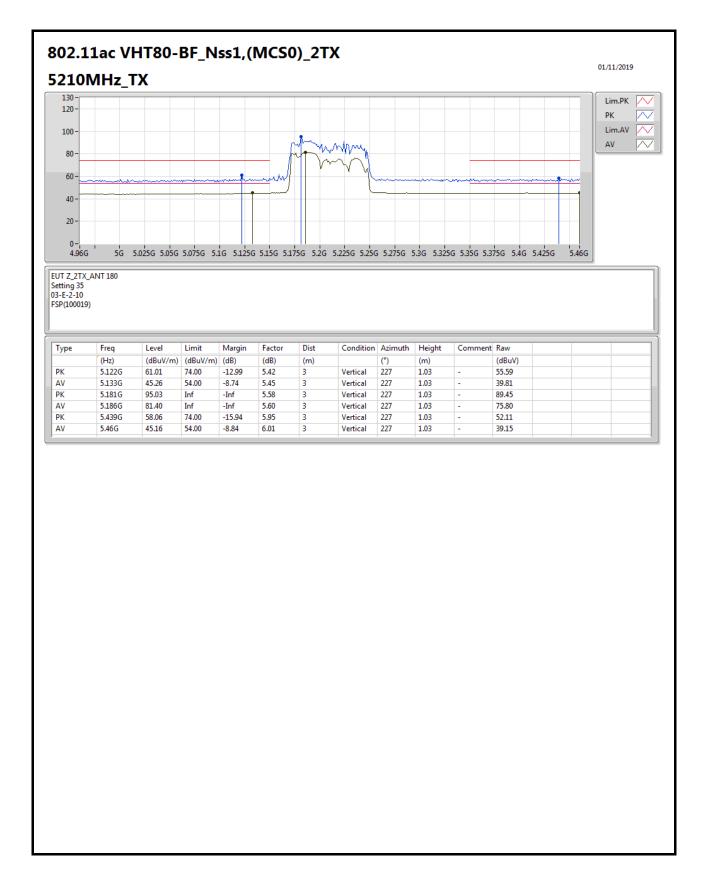




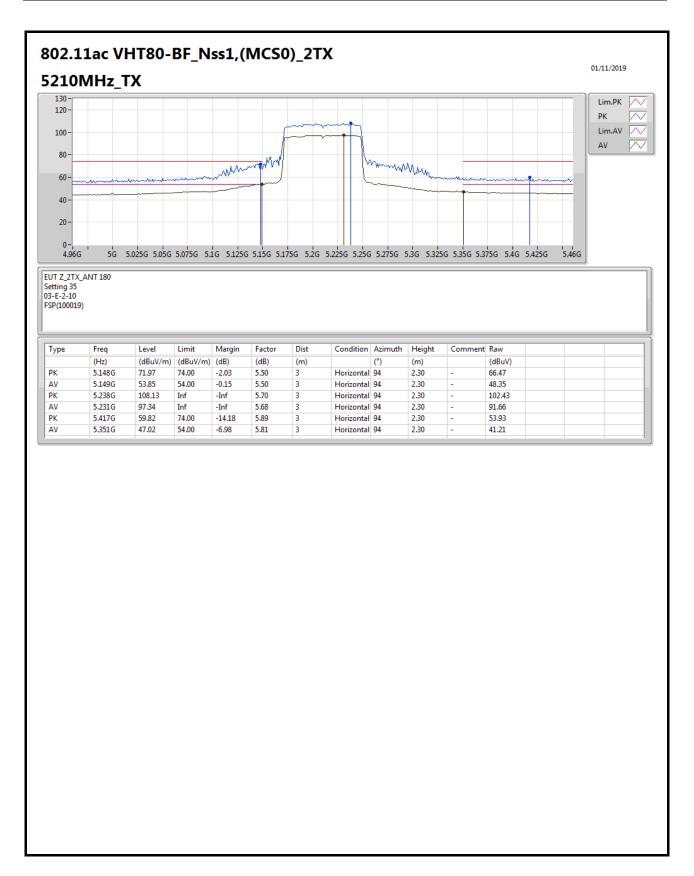




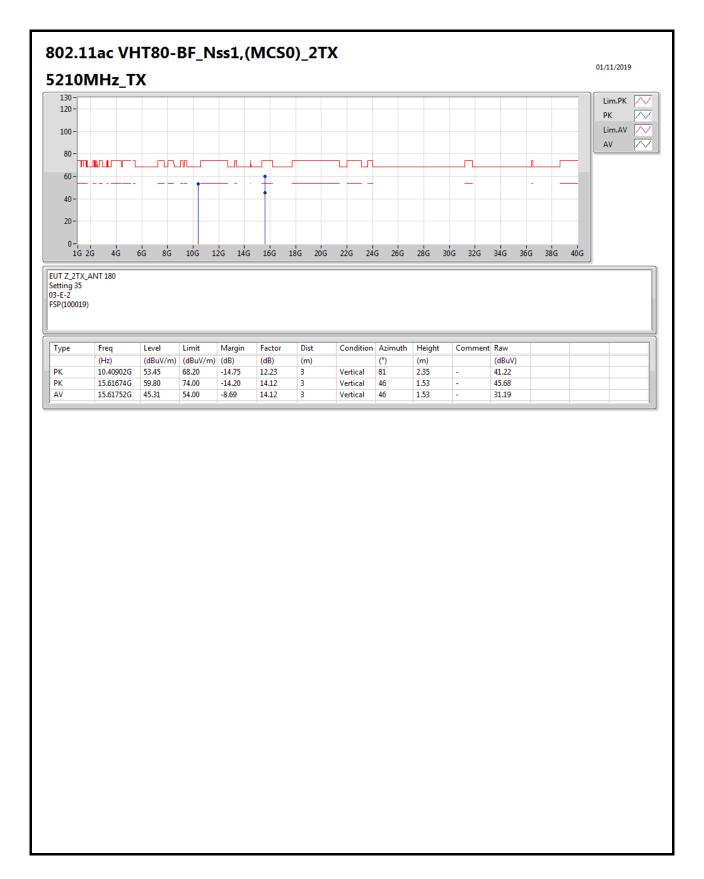






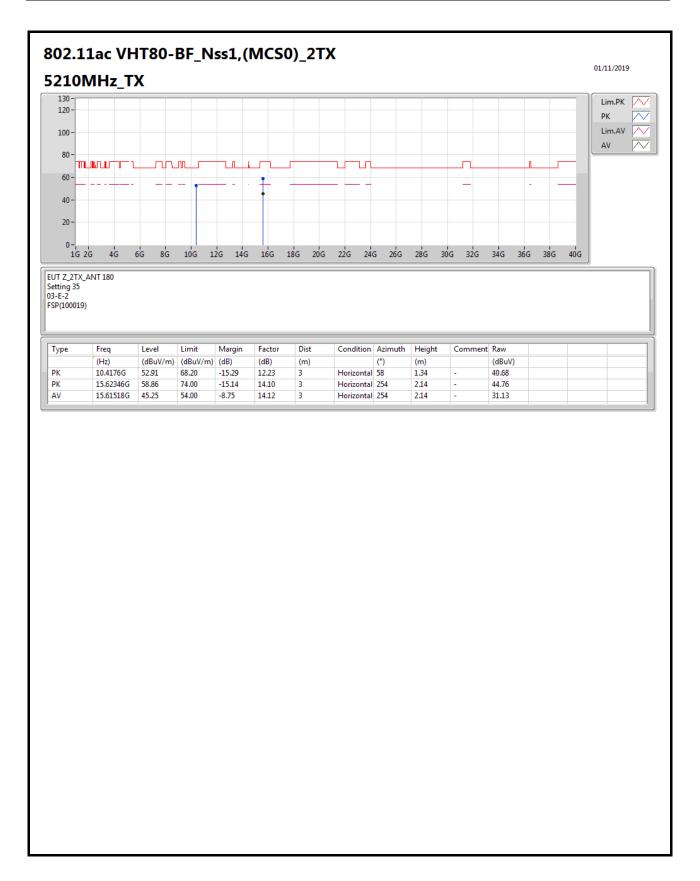




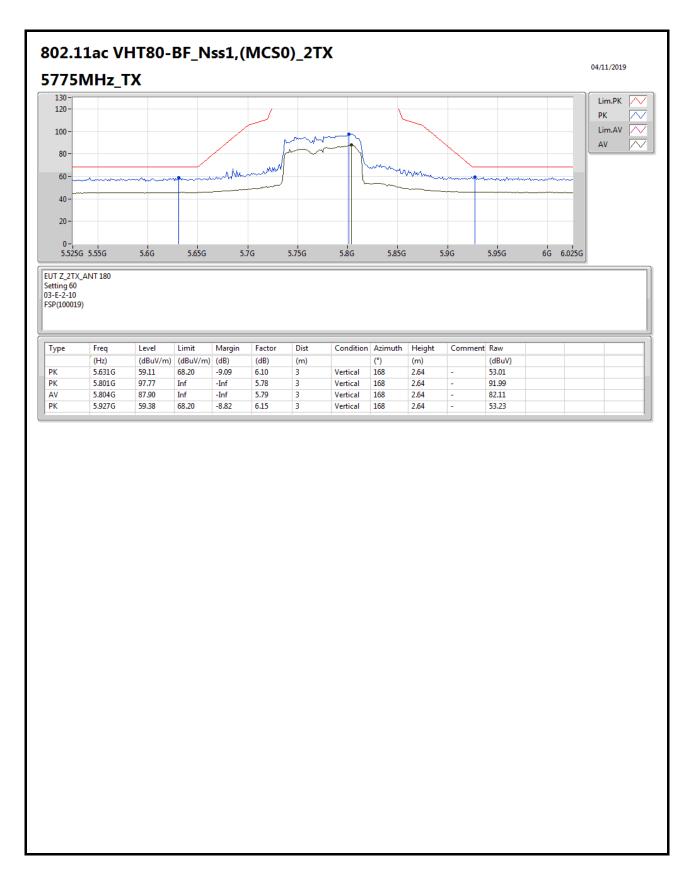


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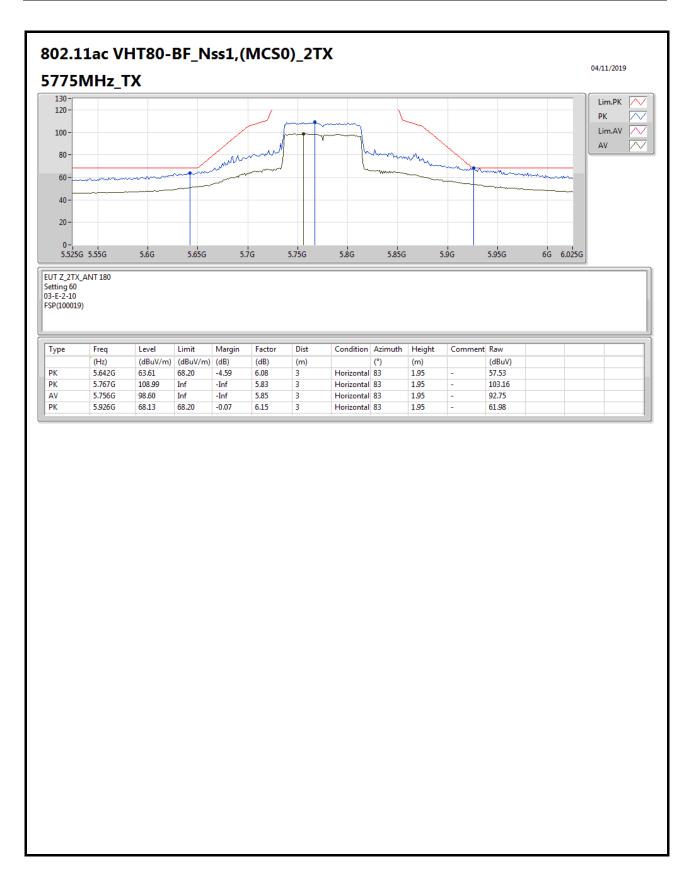






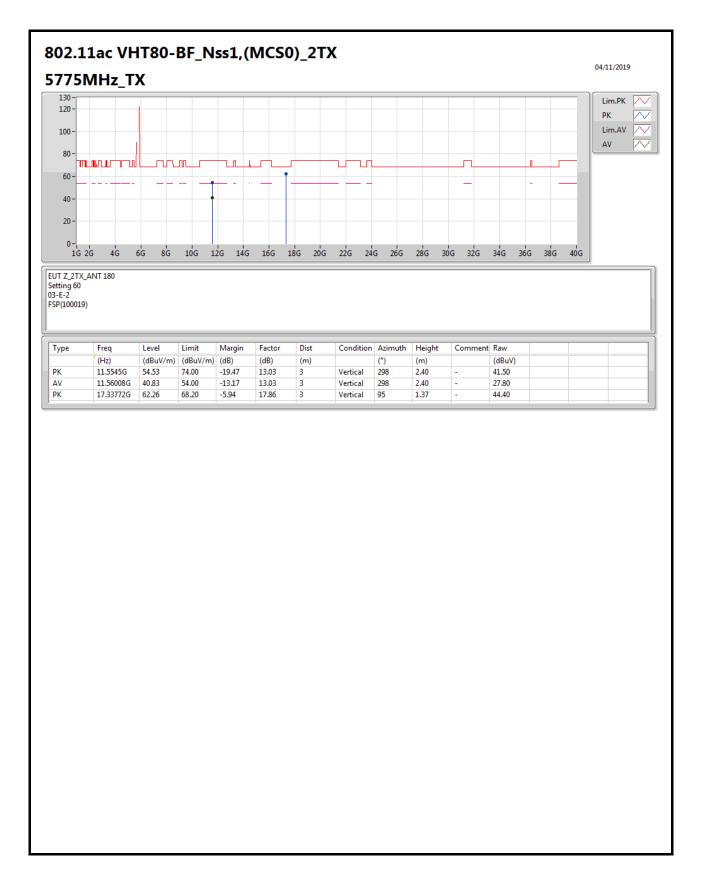
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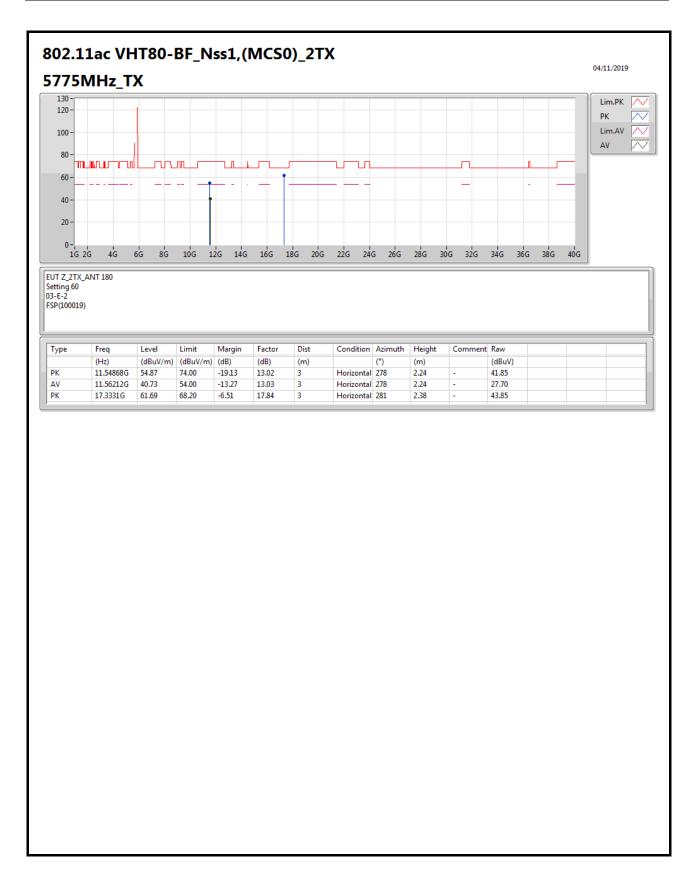
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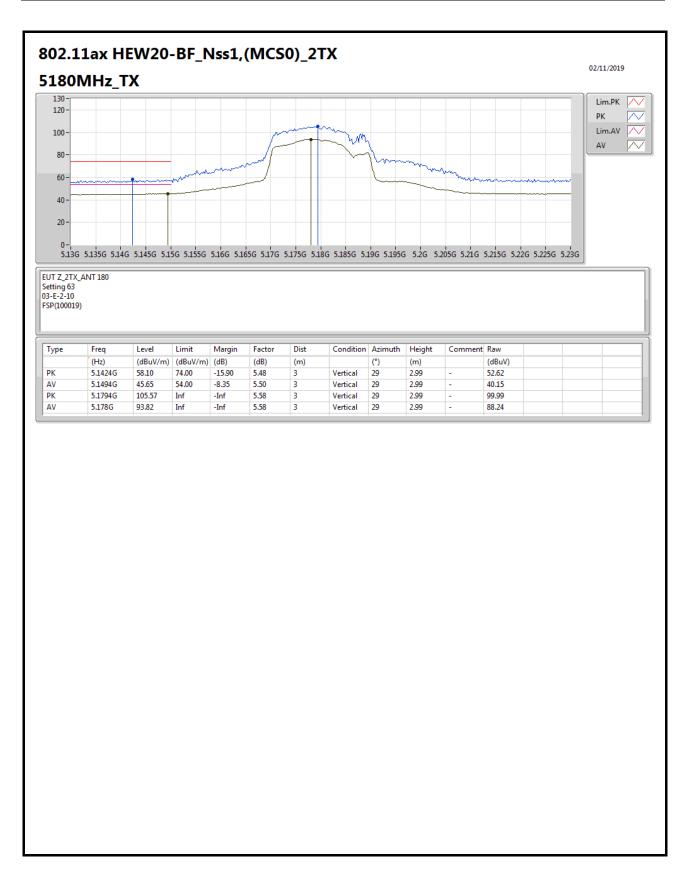
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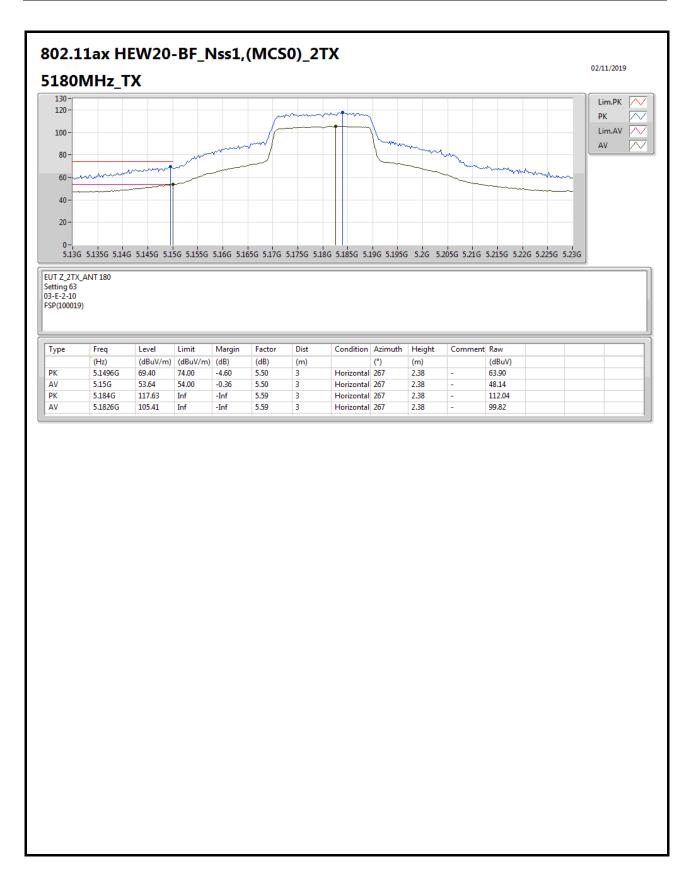
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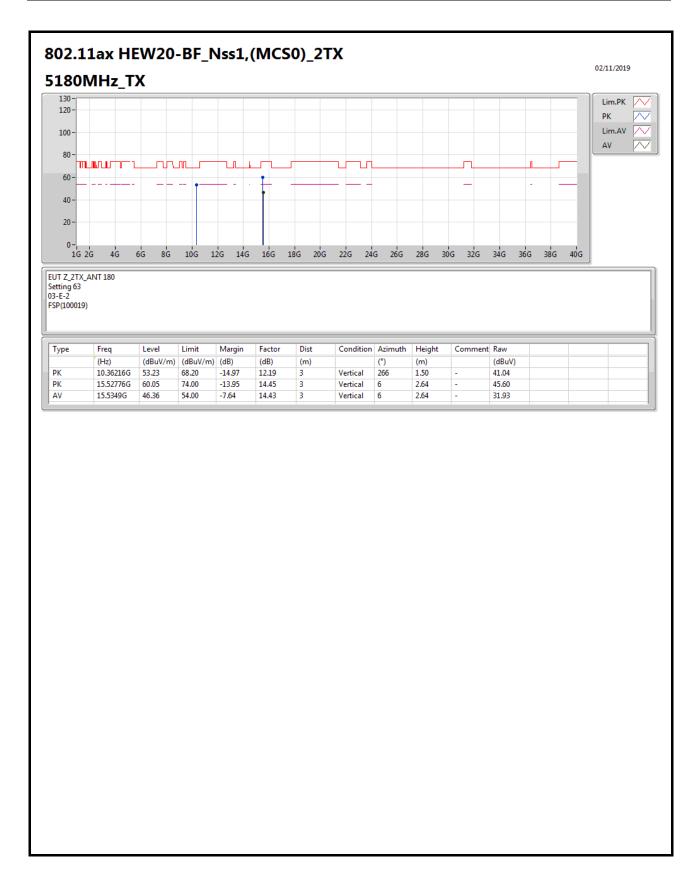


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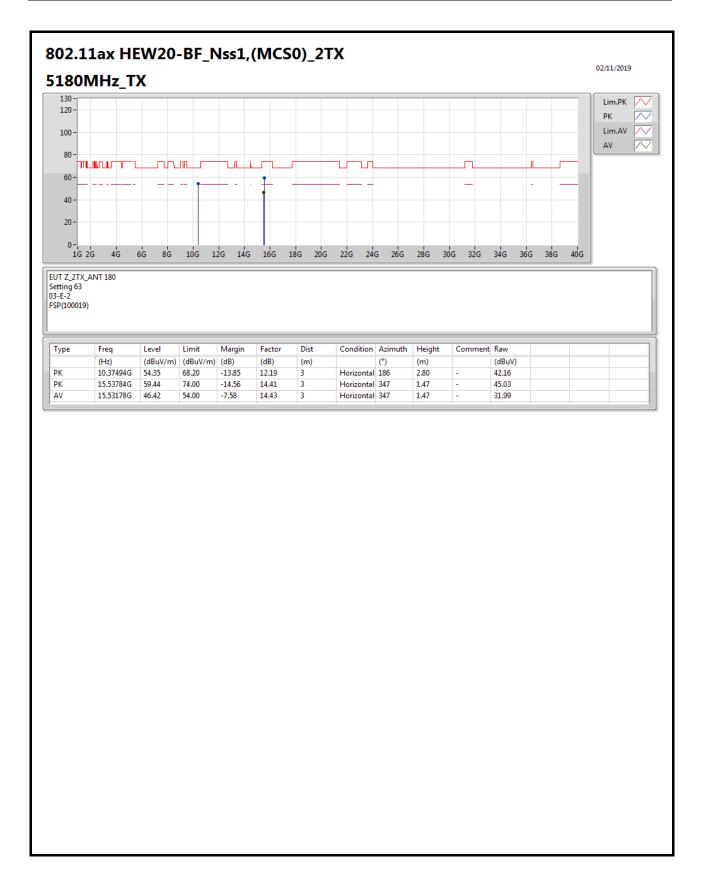




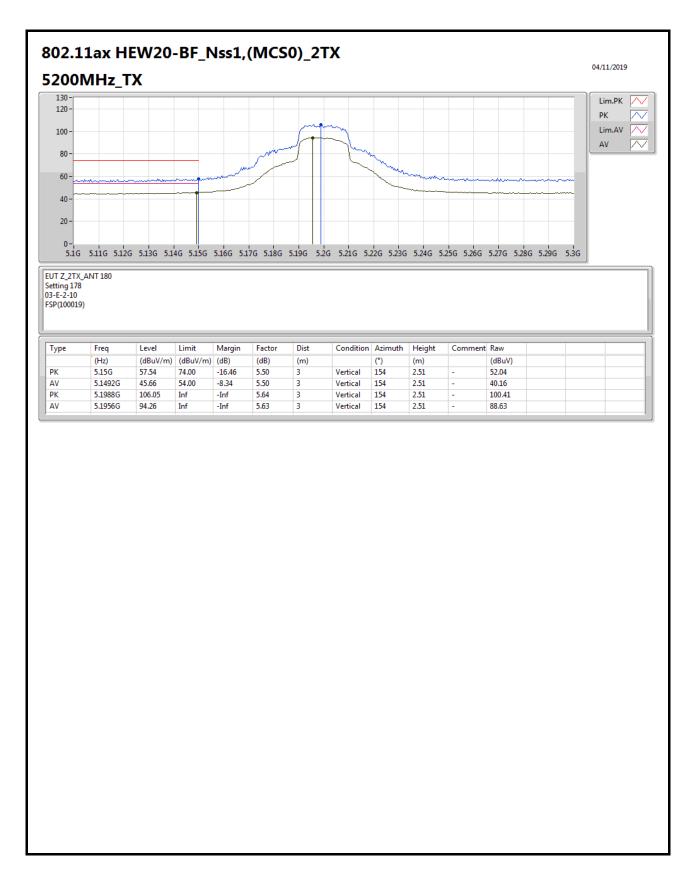


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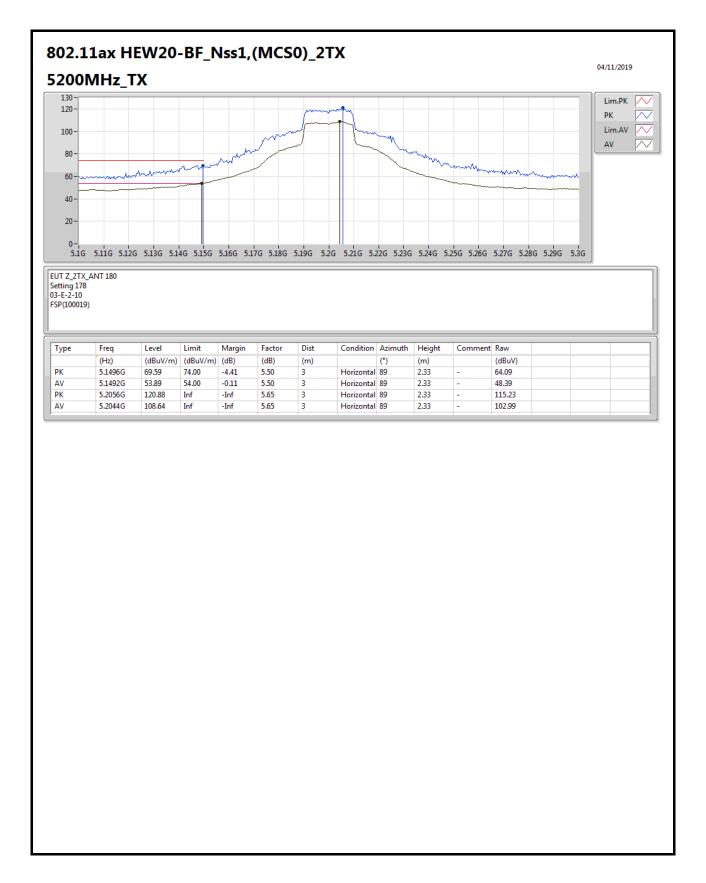






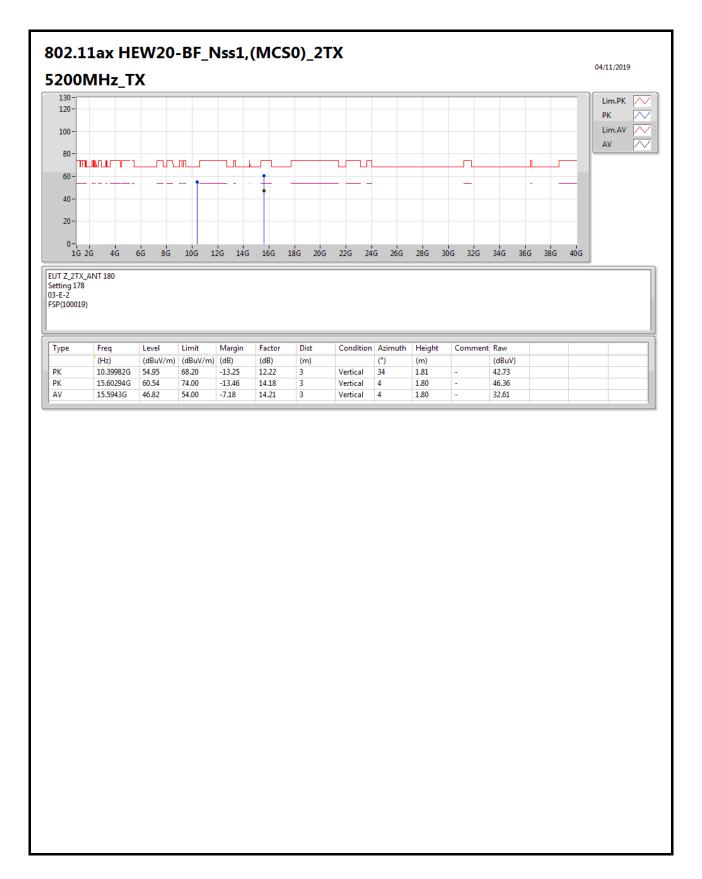




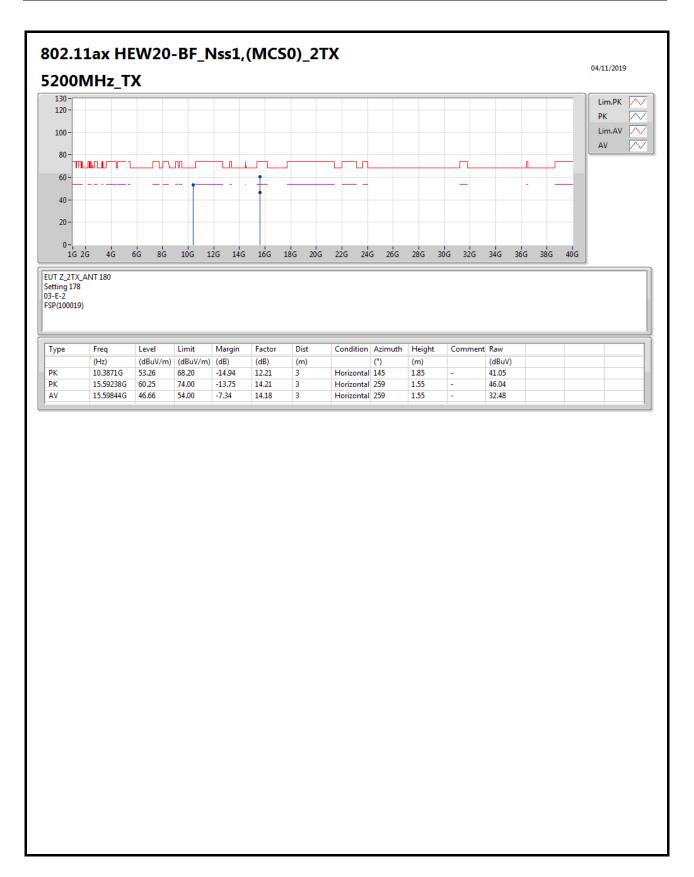


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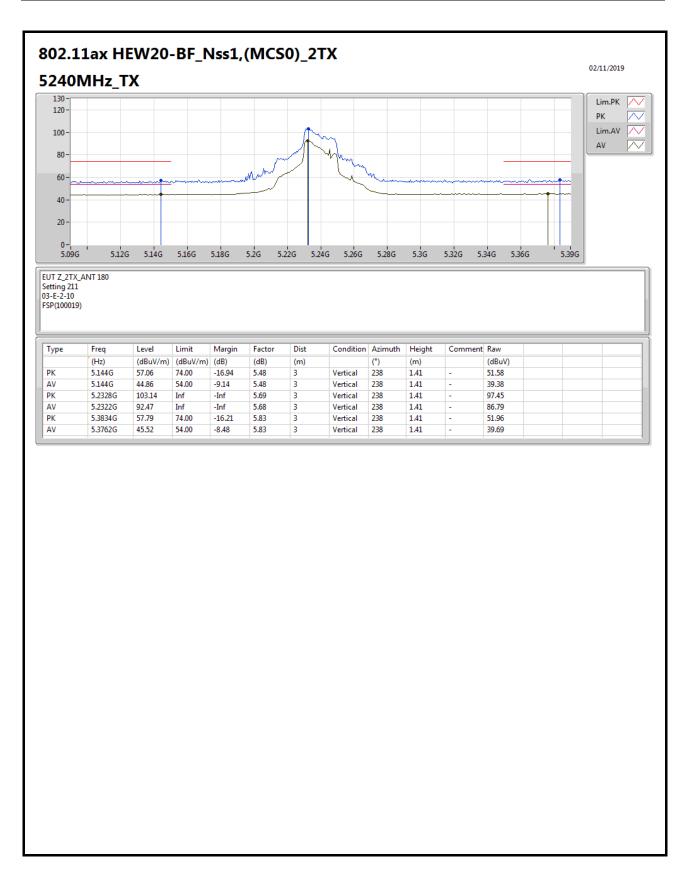




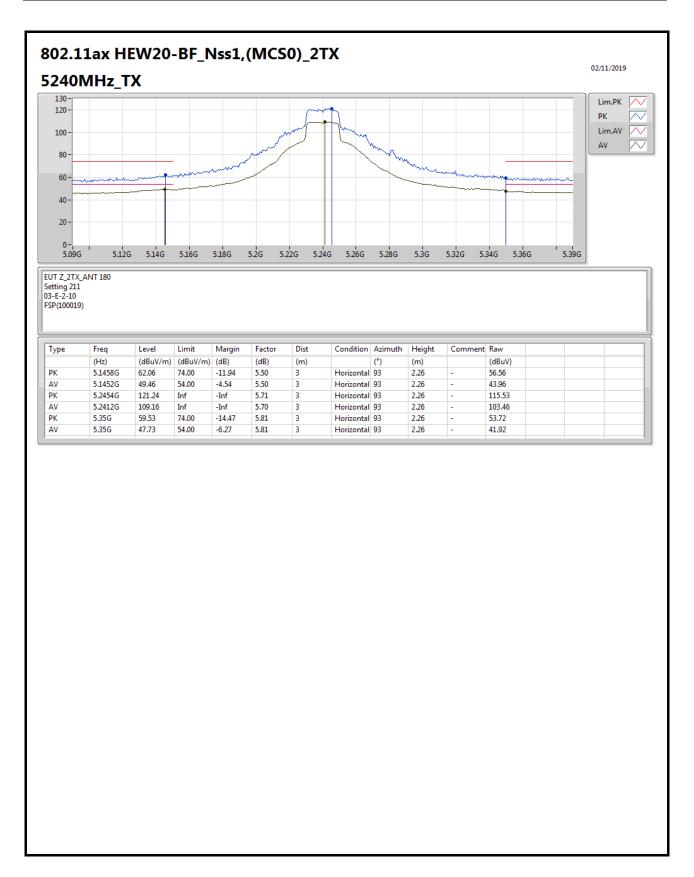






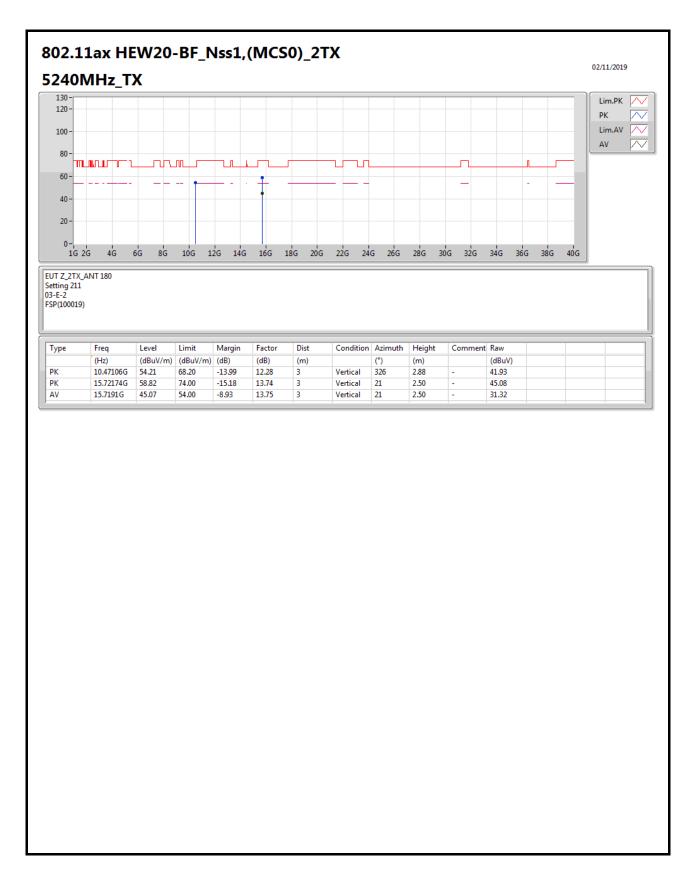






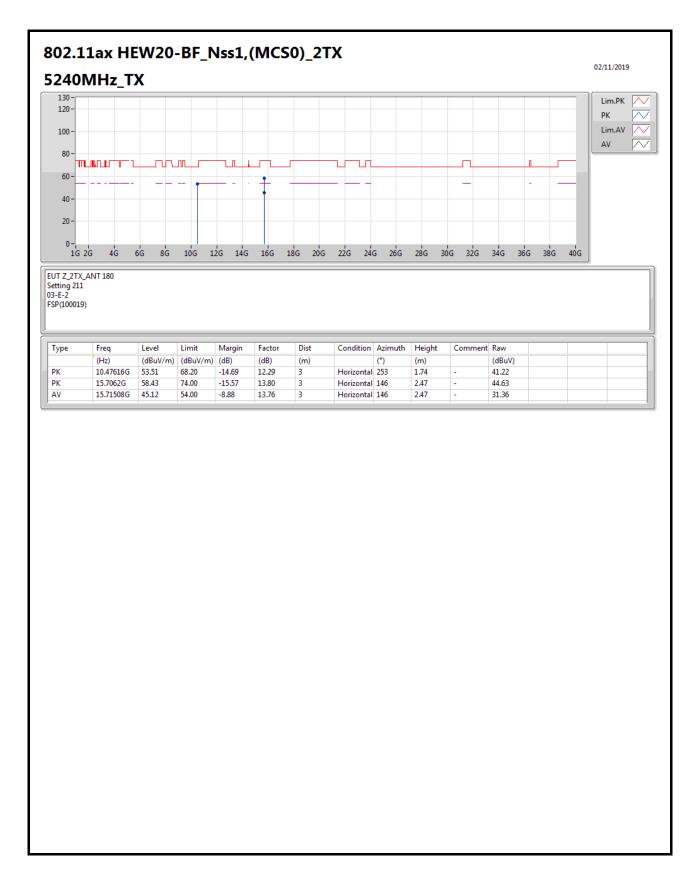
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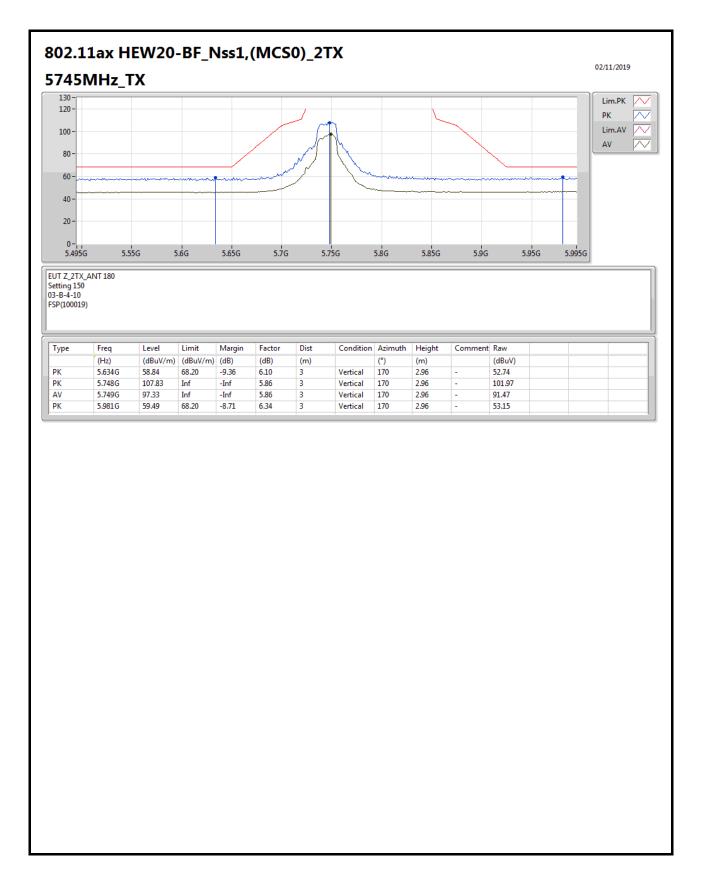
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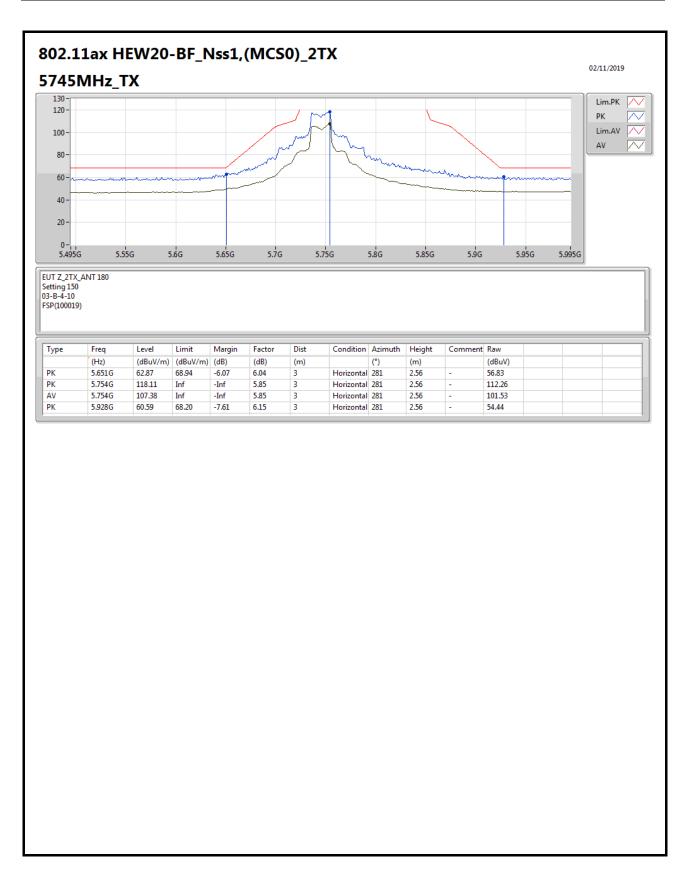


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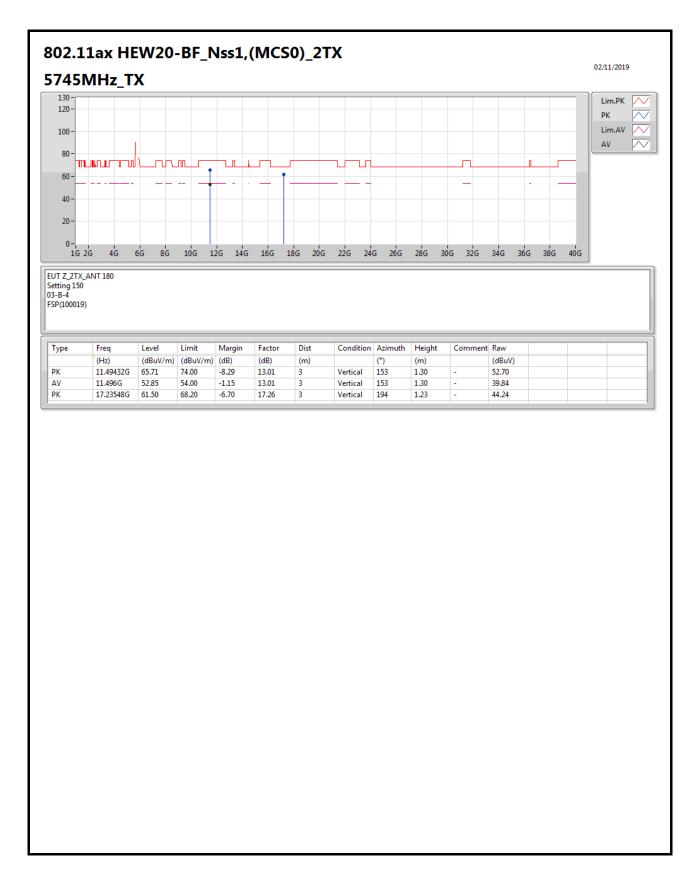




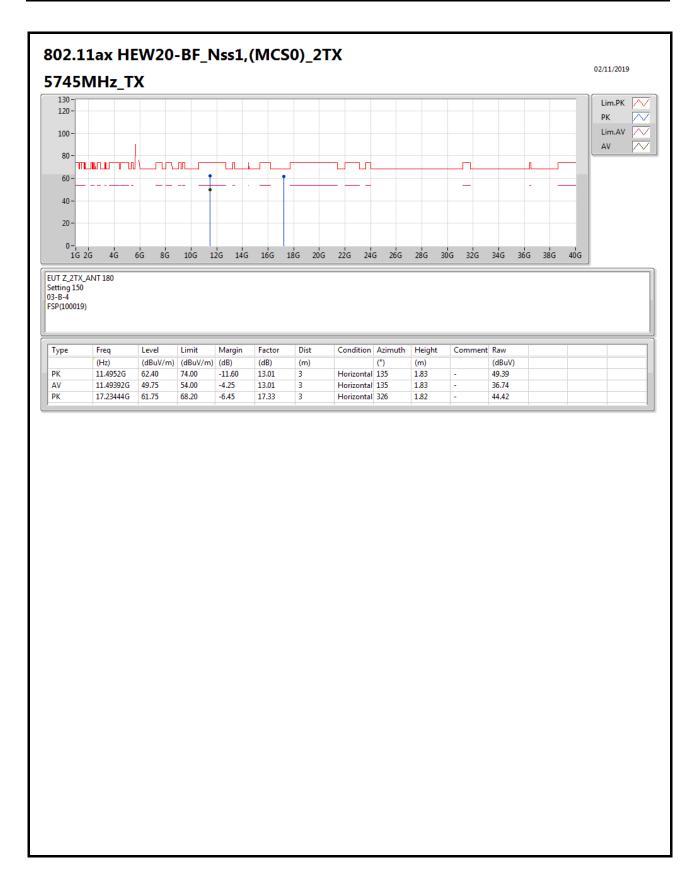


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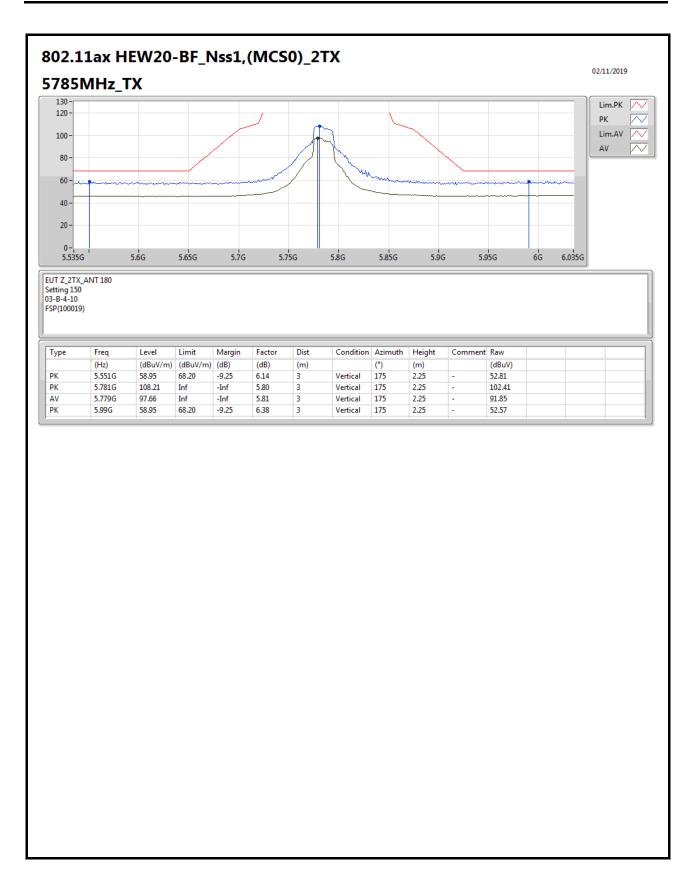




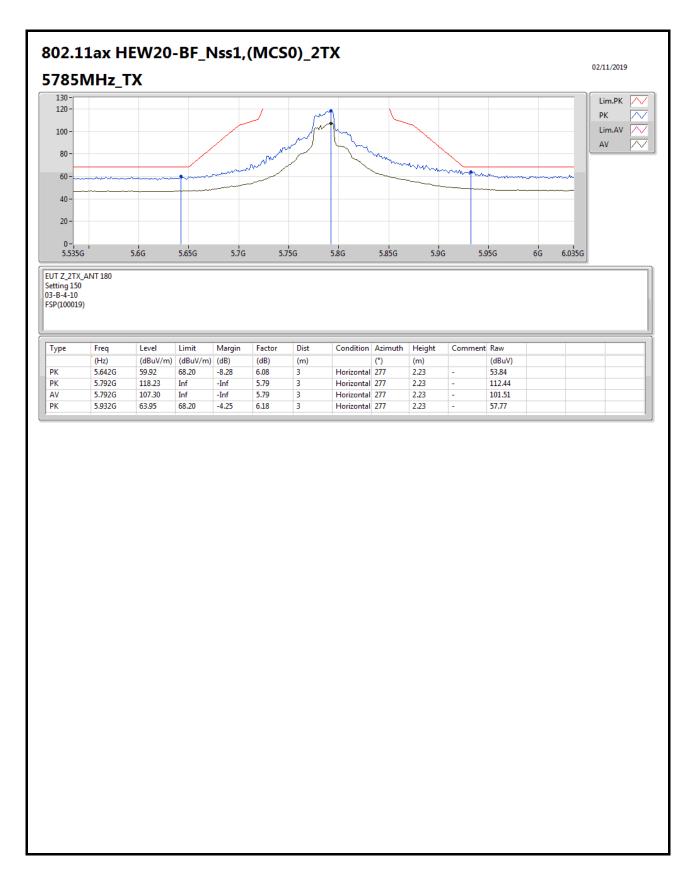




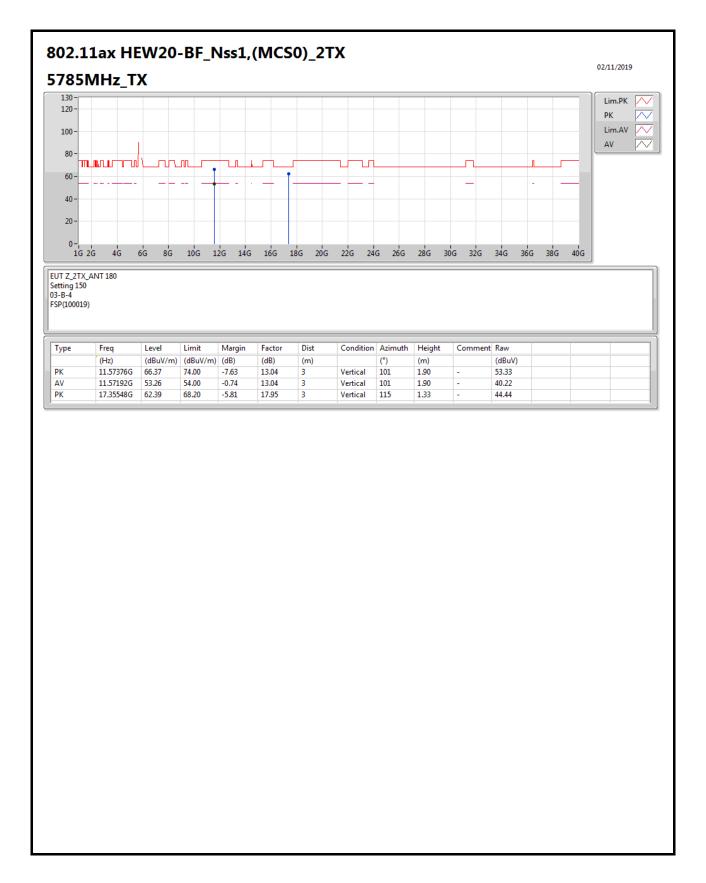
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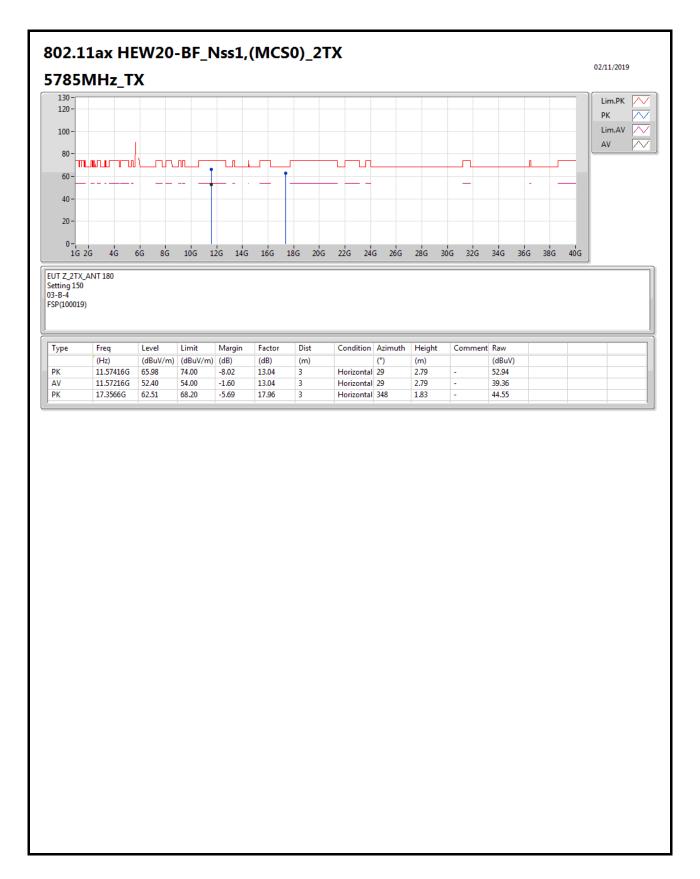




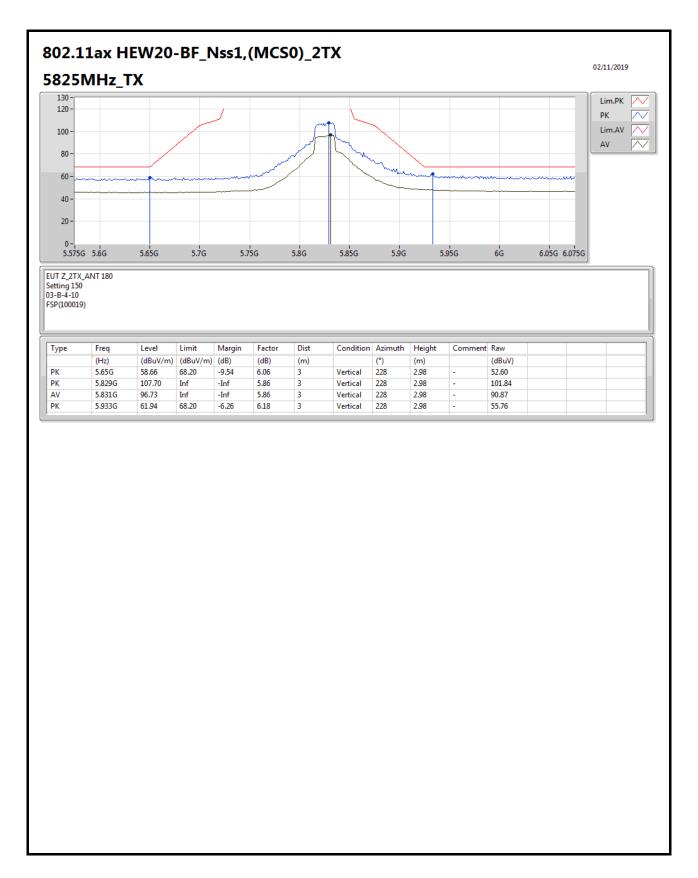






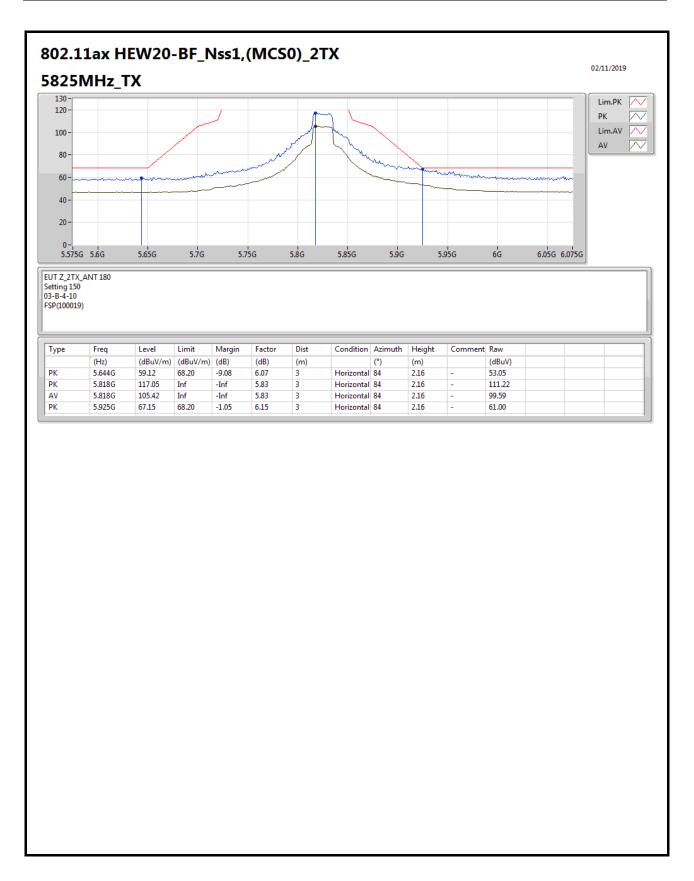






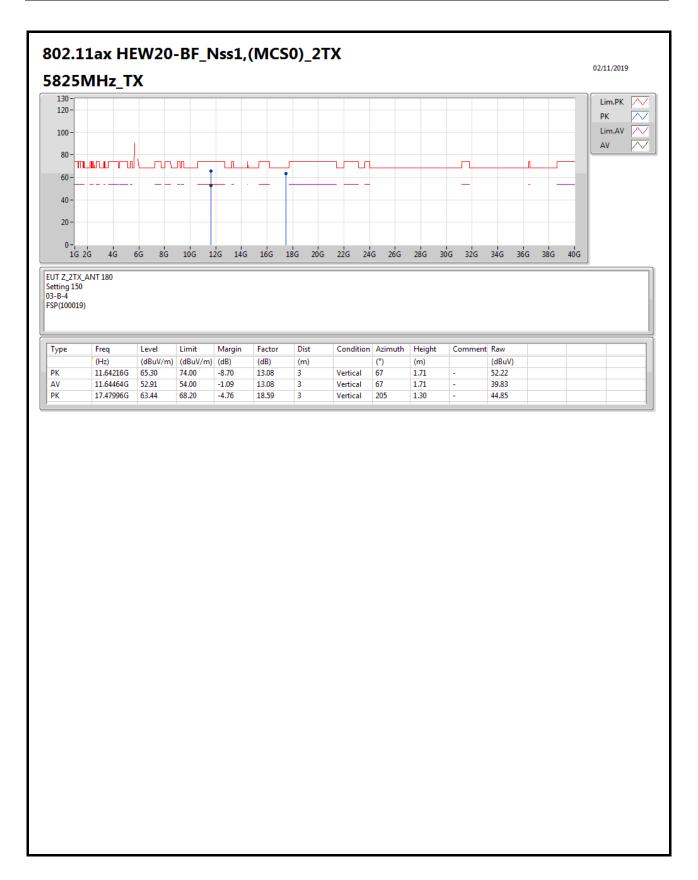
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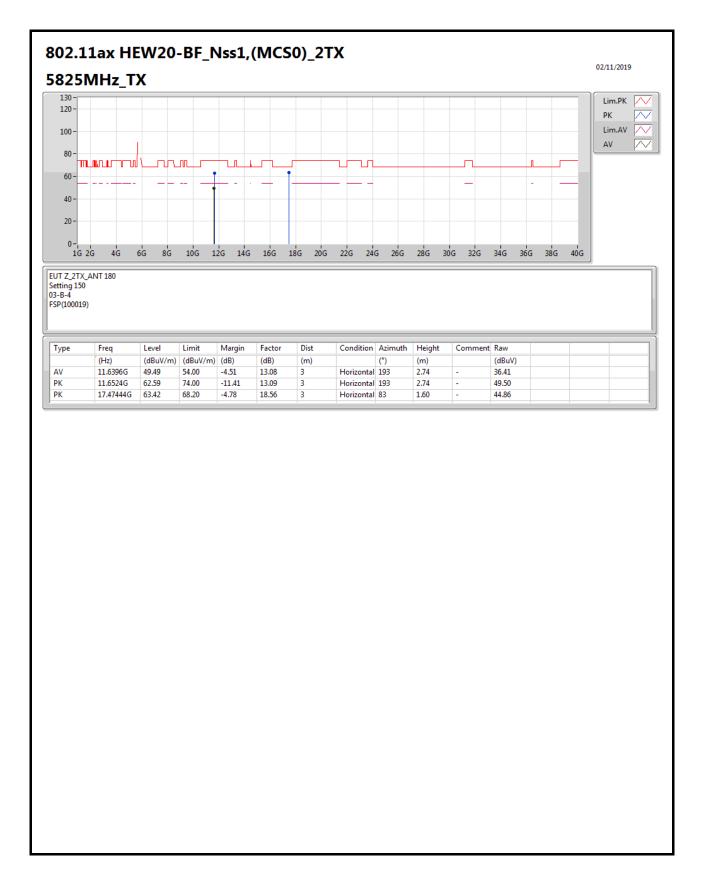


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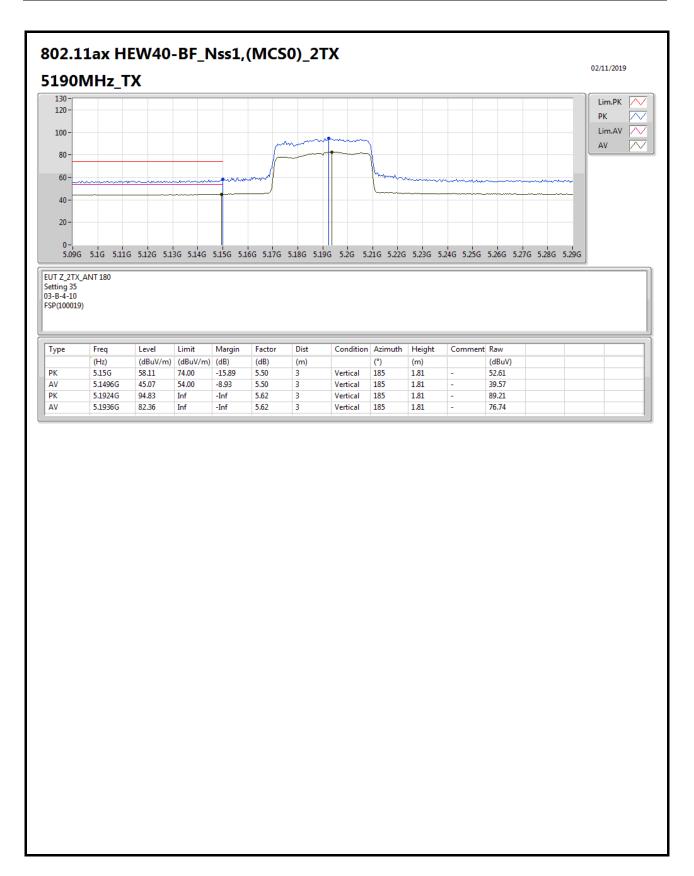






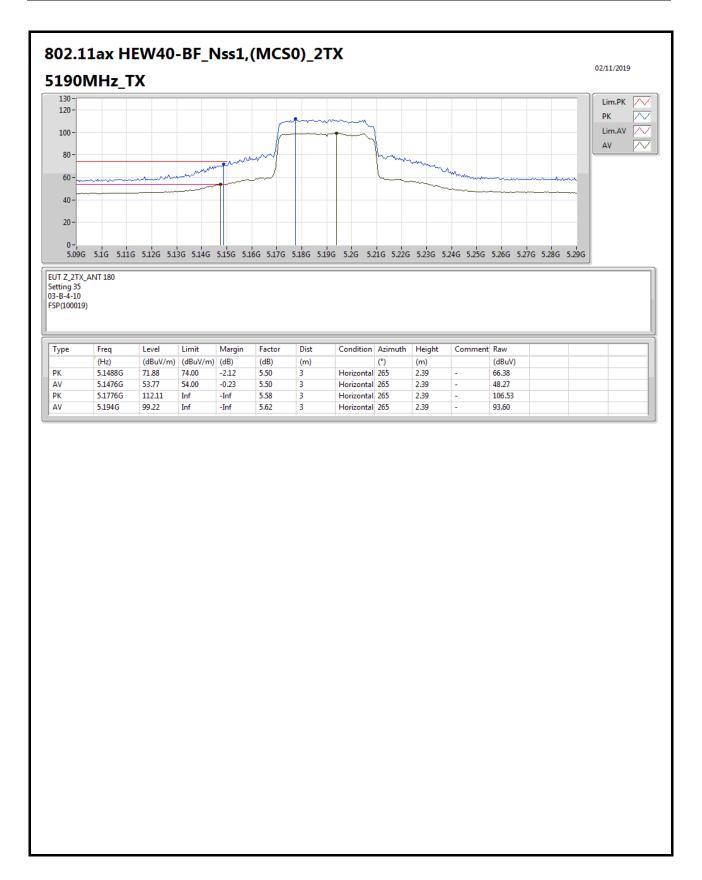




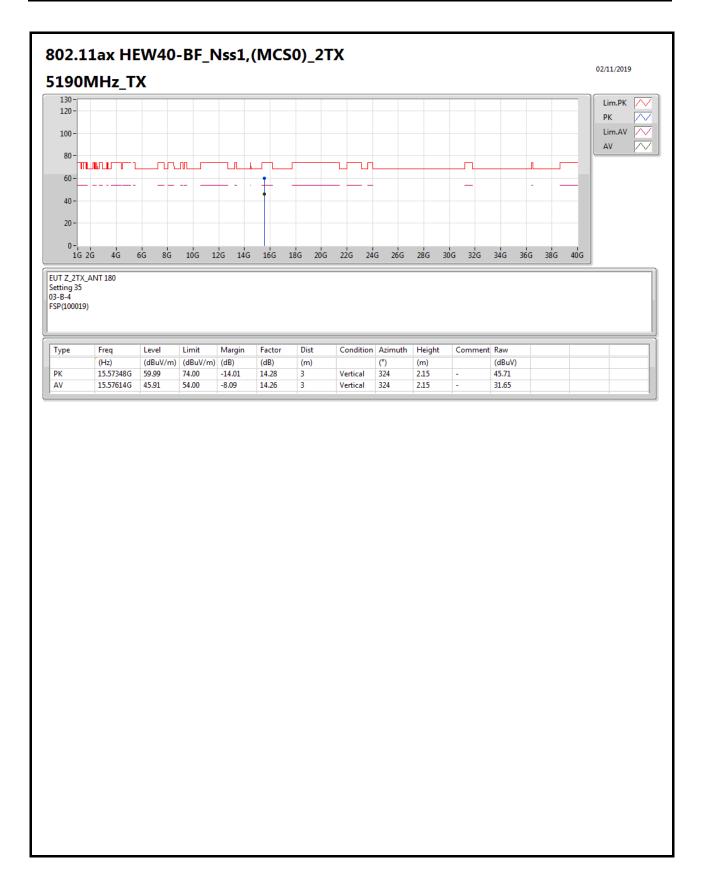


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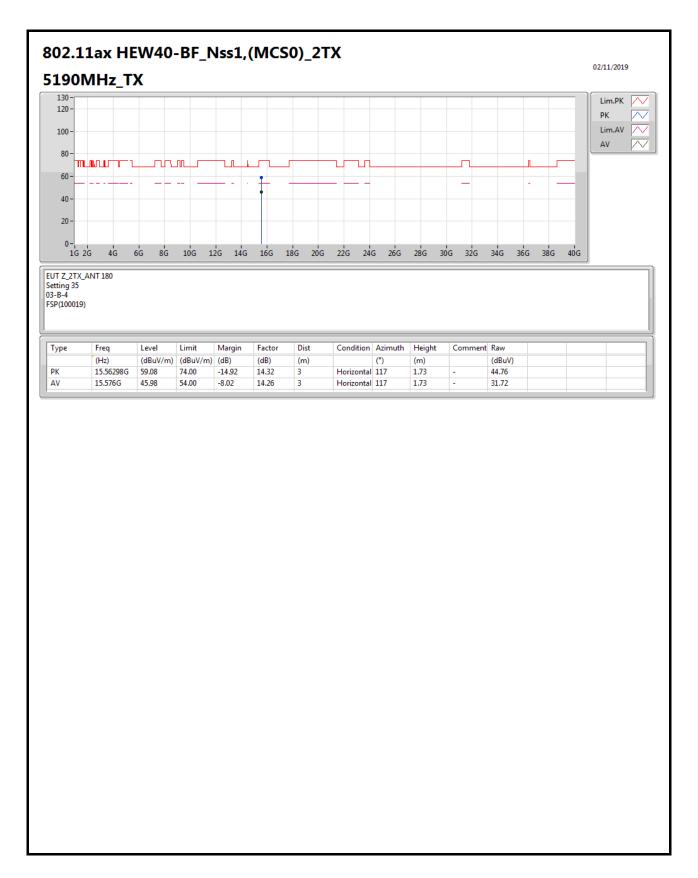




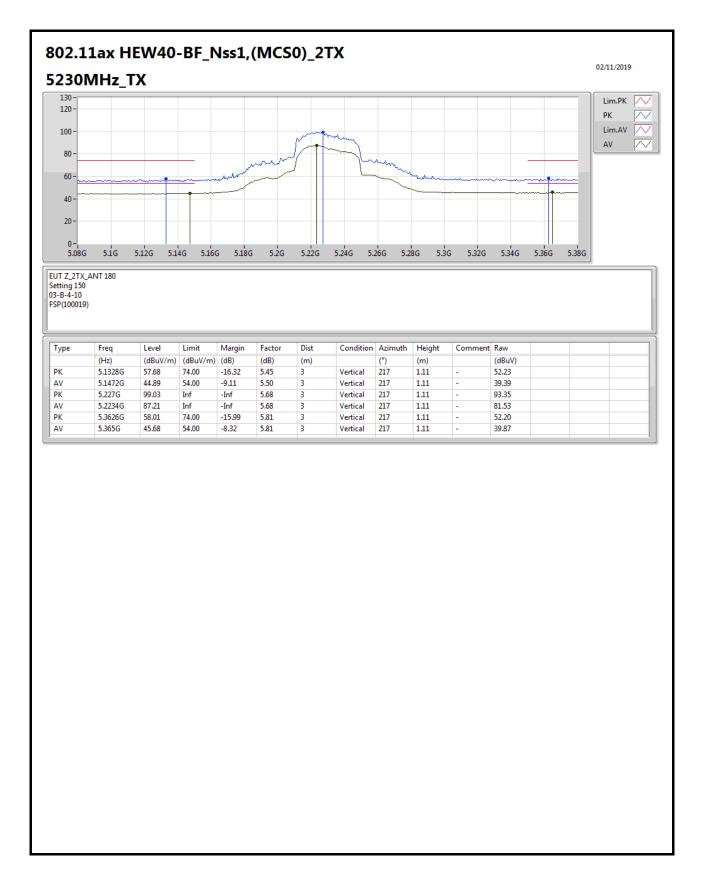


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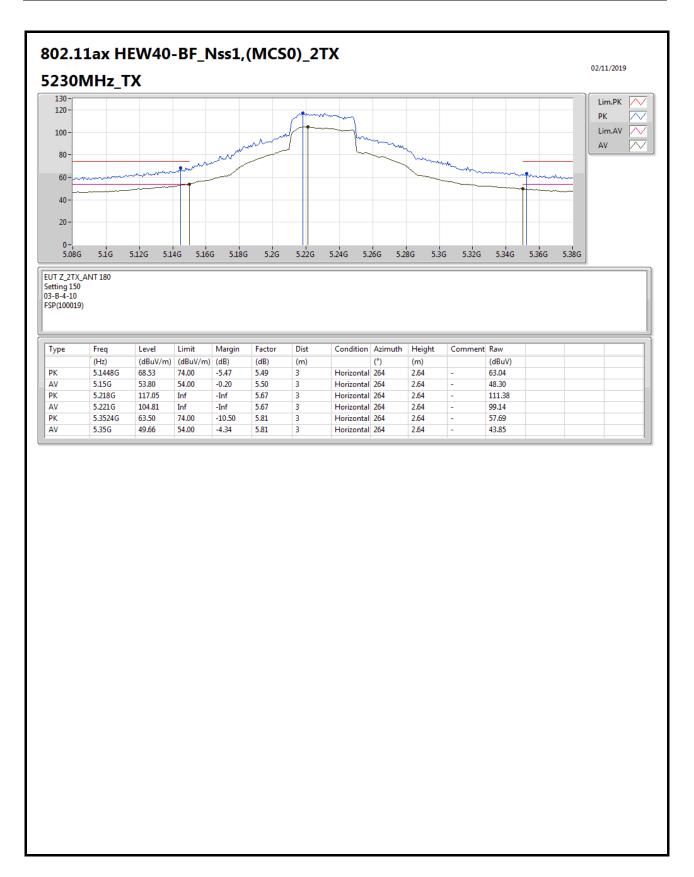




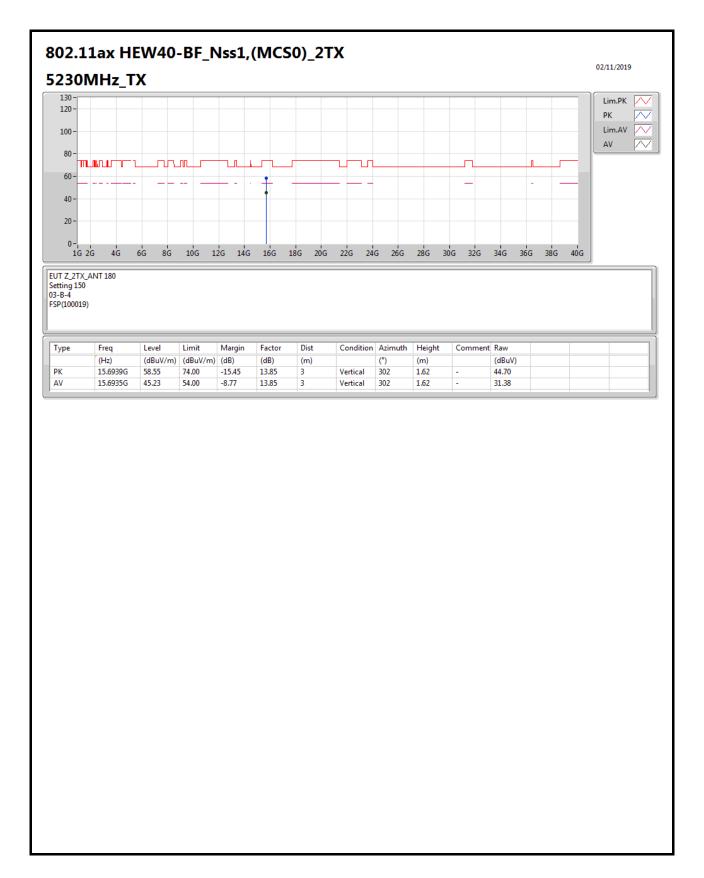






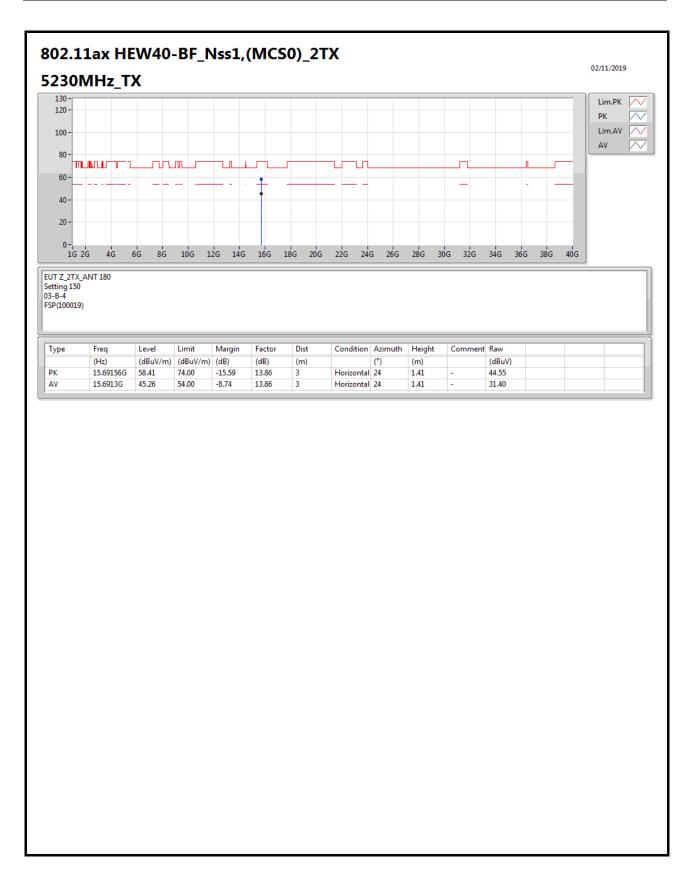




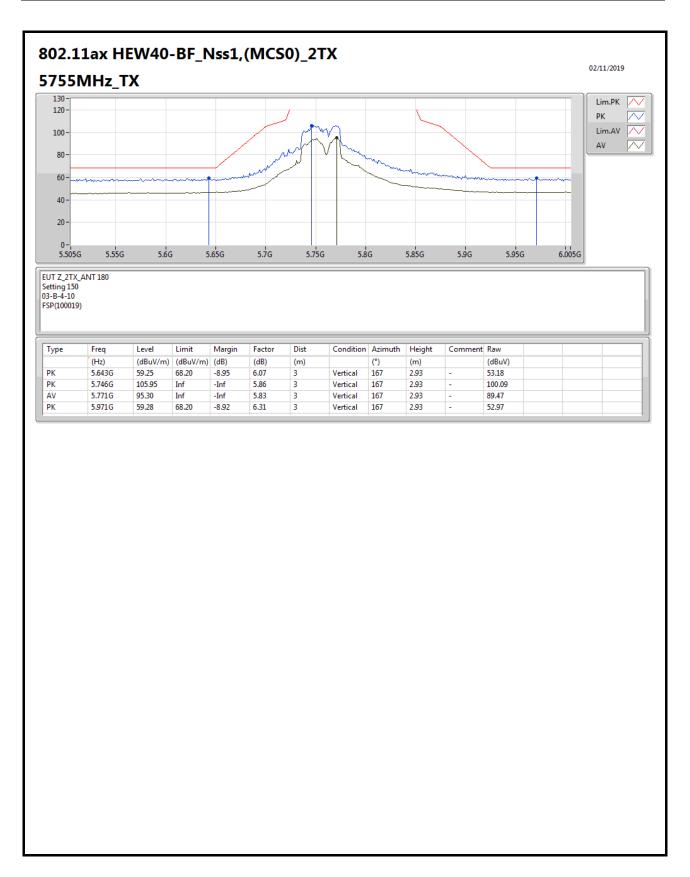


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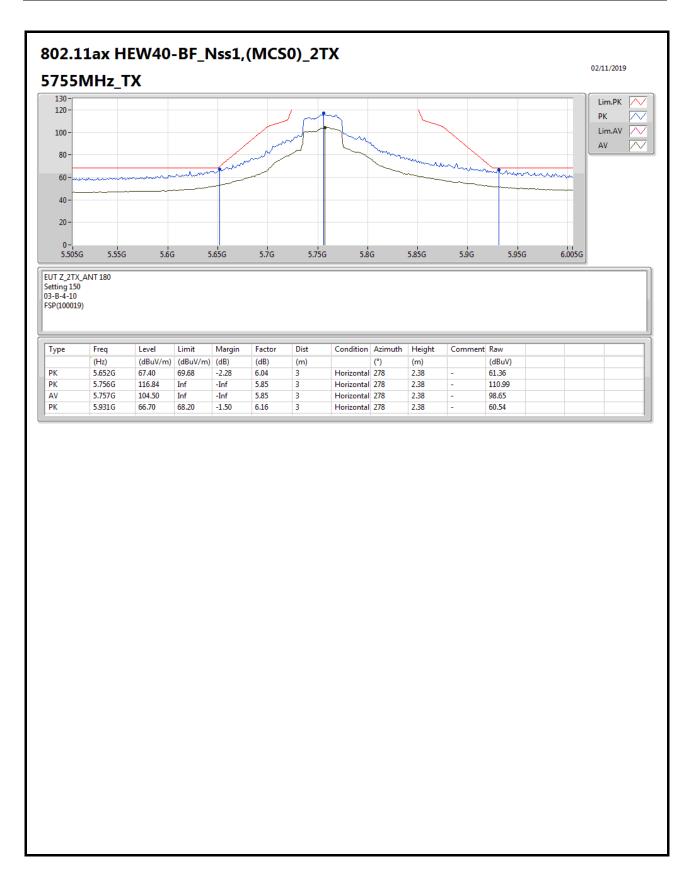




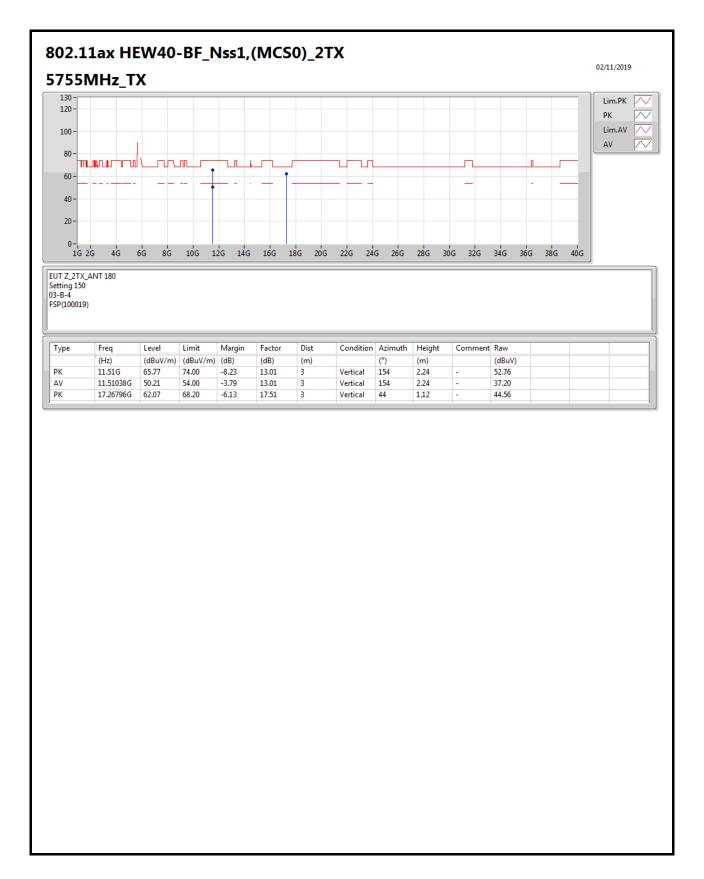






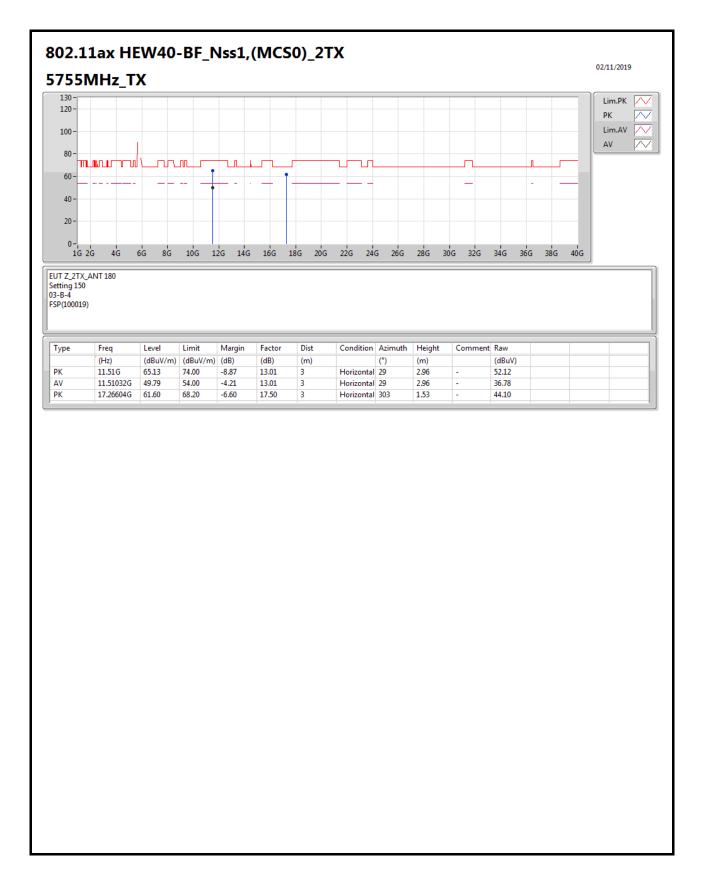




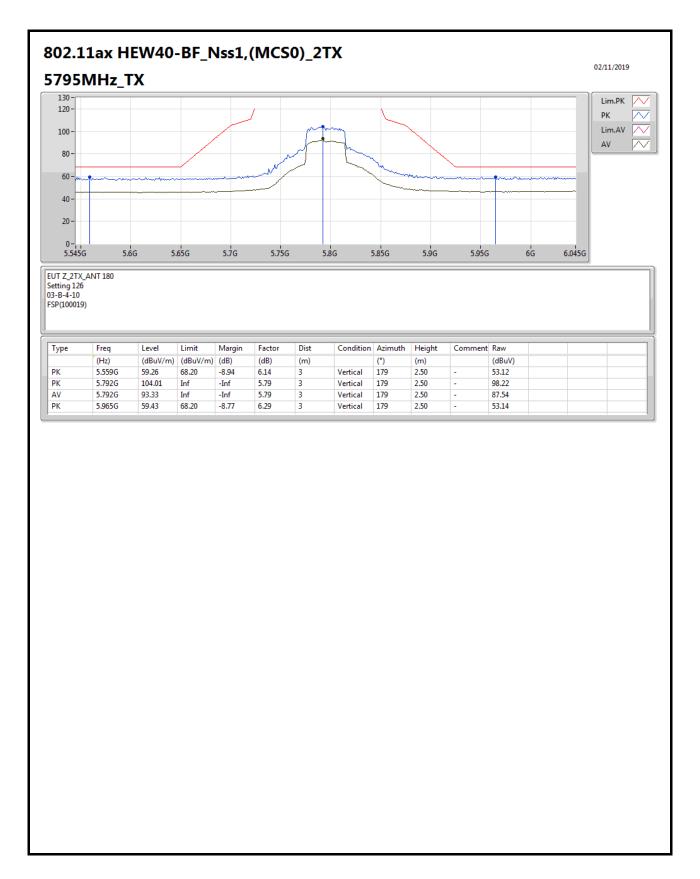


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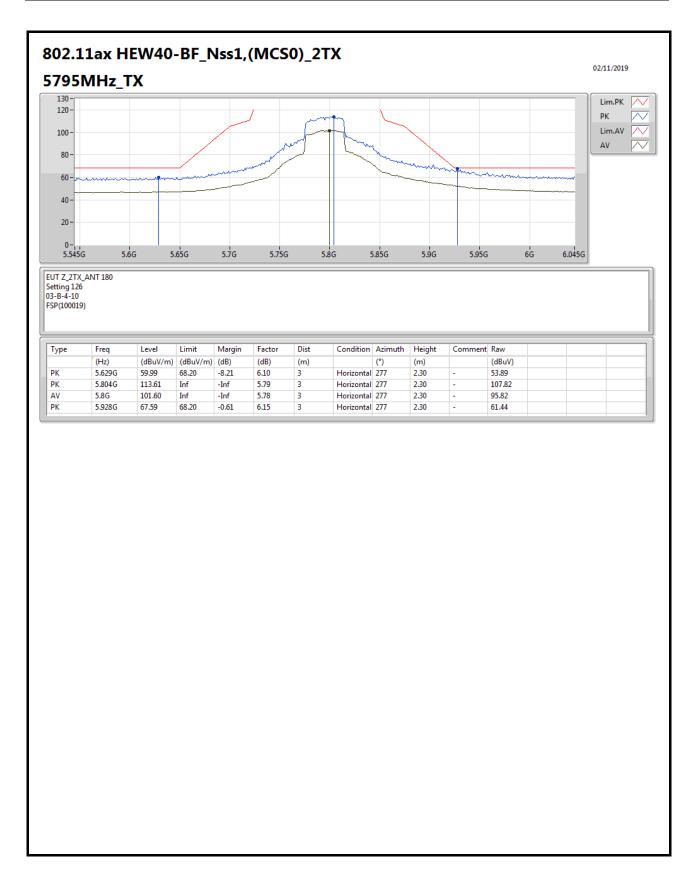






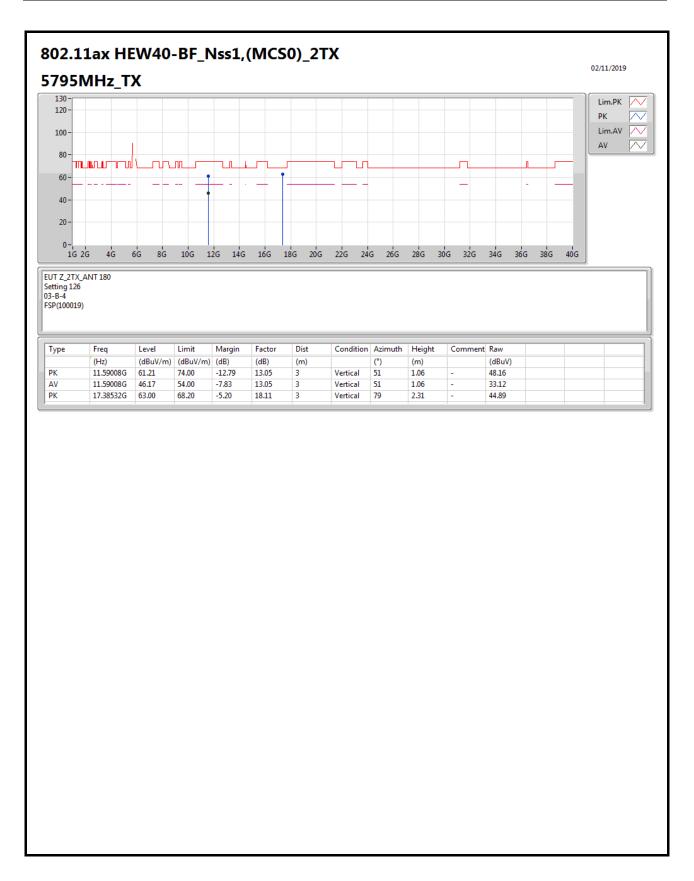






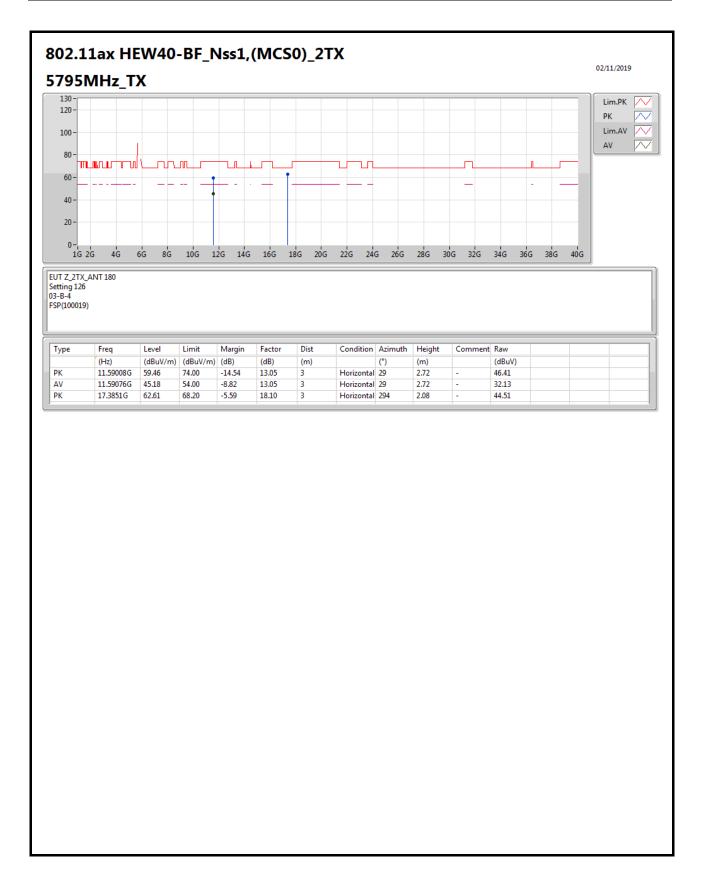
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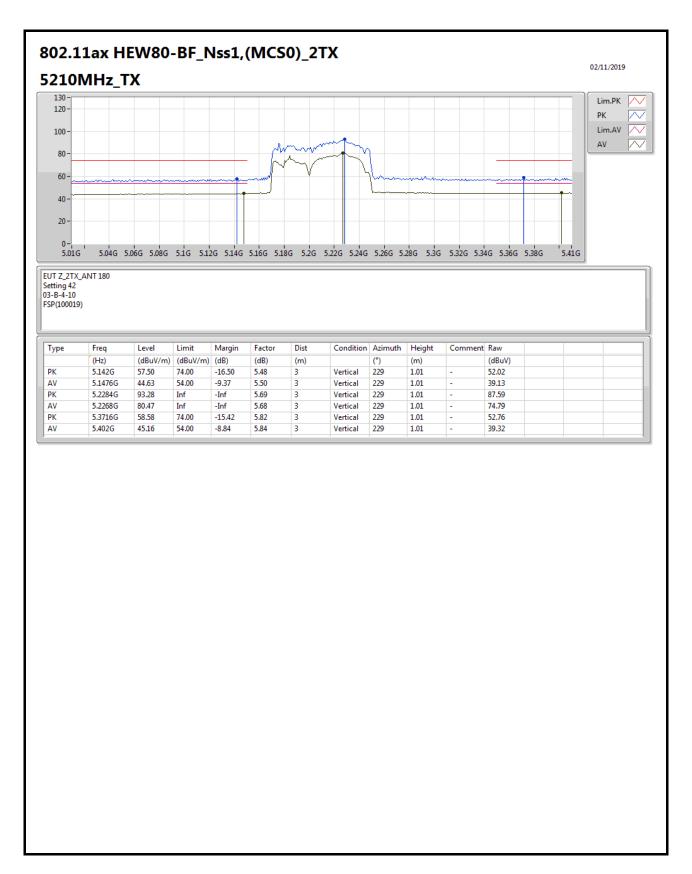
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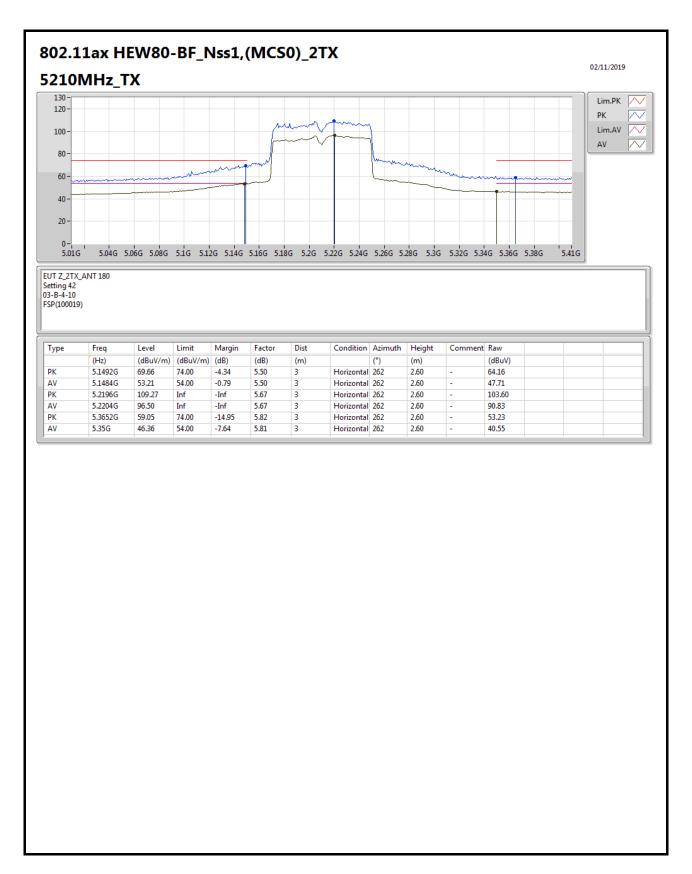
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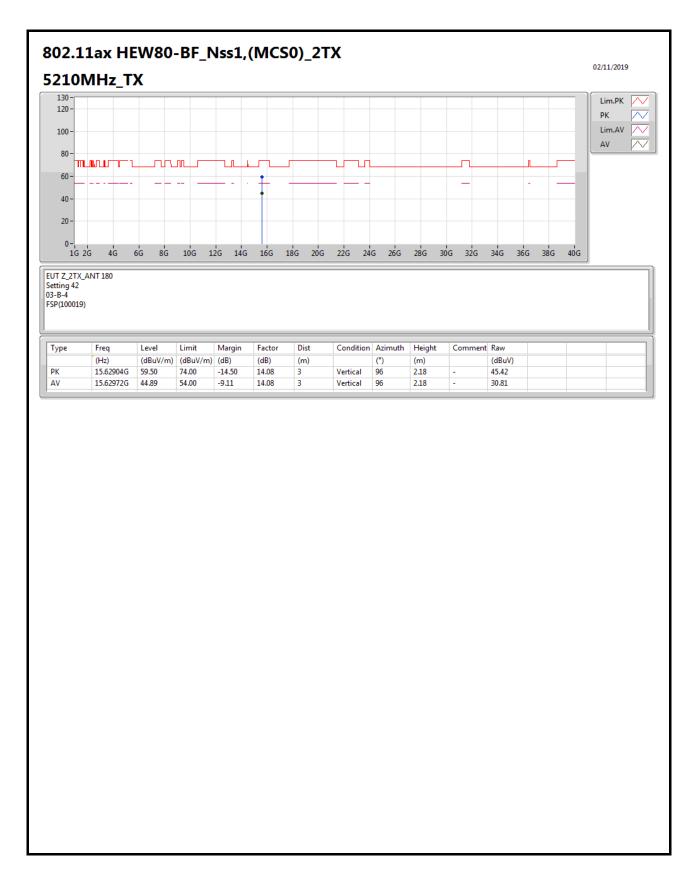
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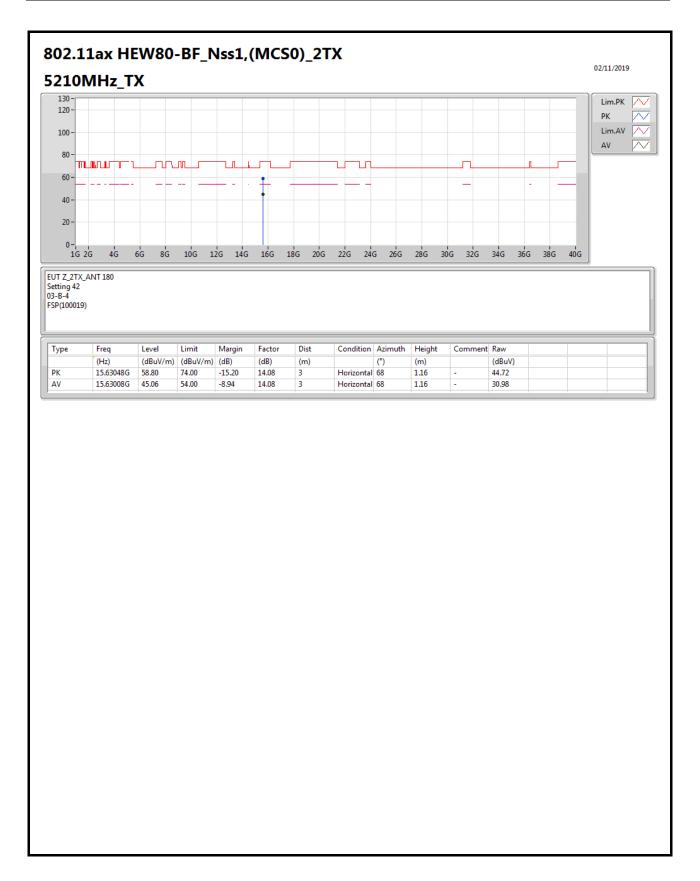
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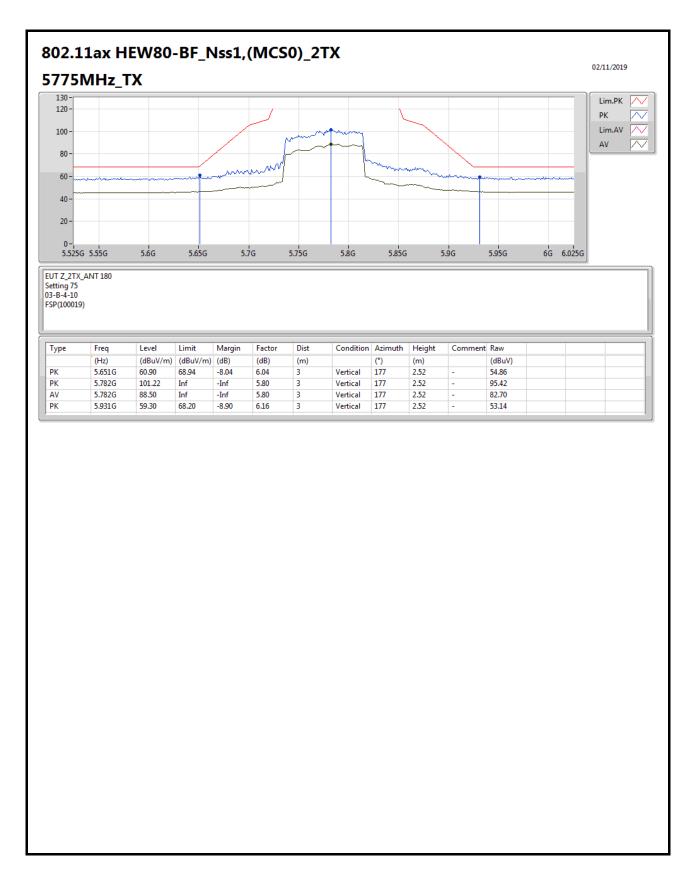


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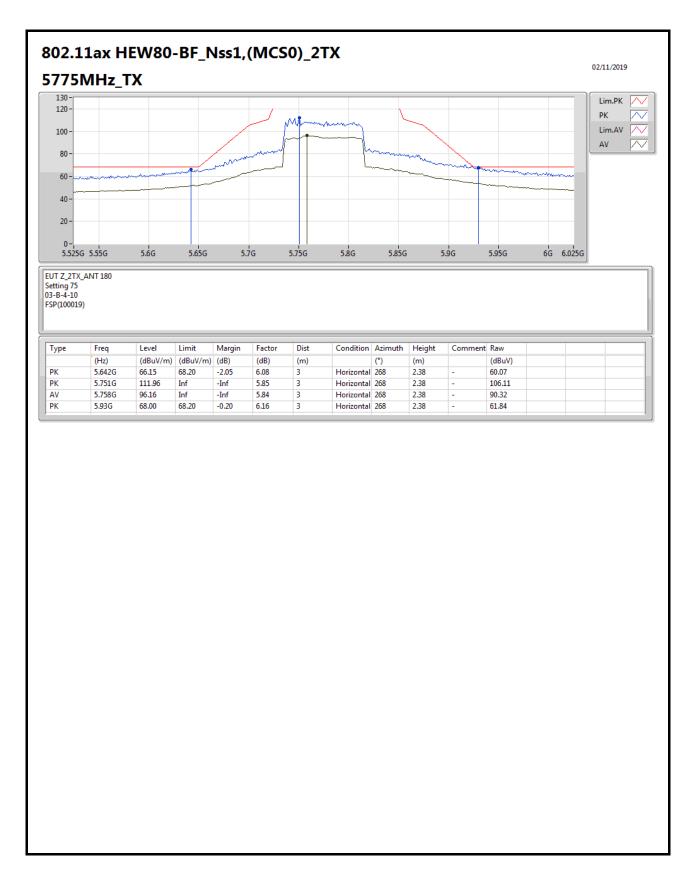






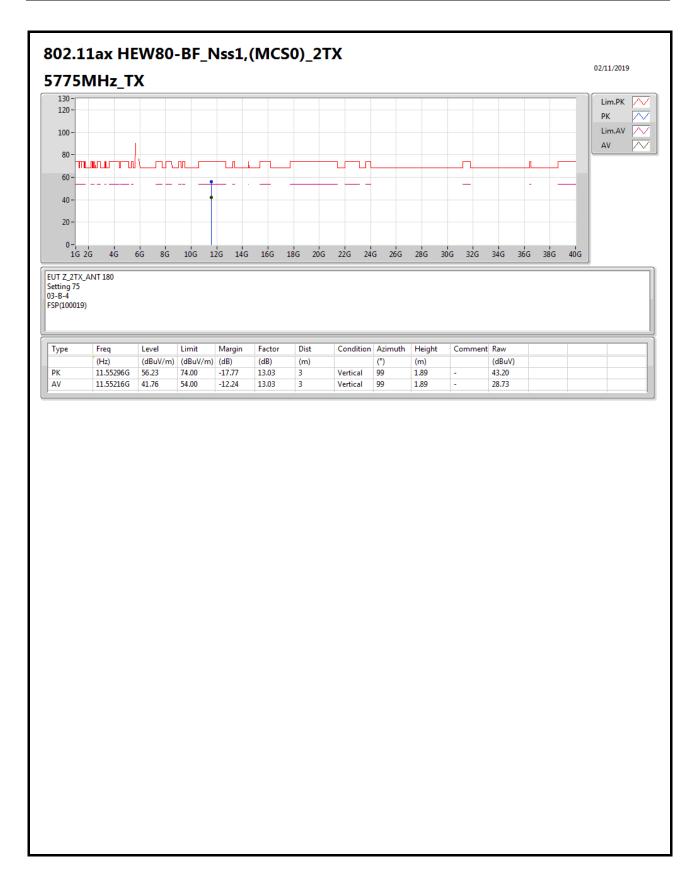
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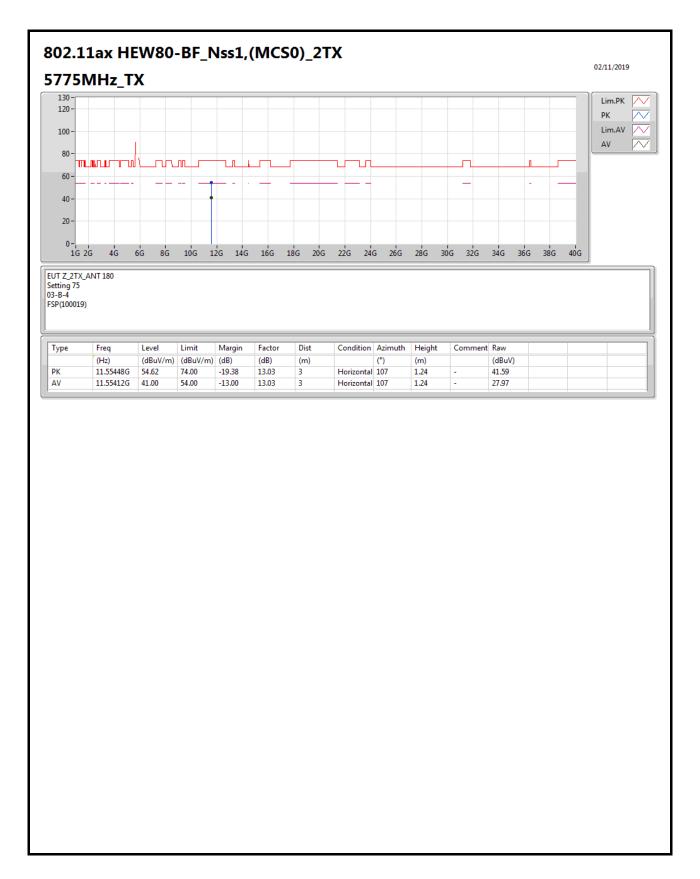
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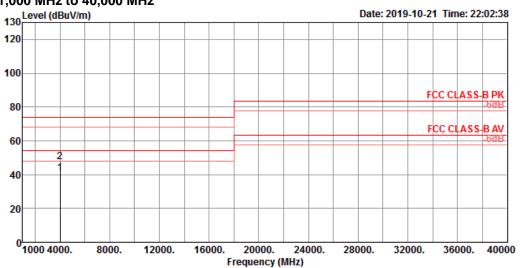






Test Mode	Mode 1	Frequency Range	1,000 MHz to 40,000 MHz

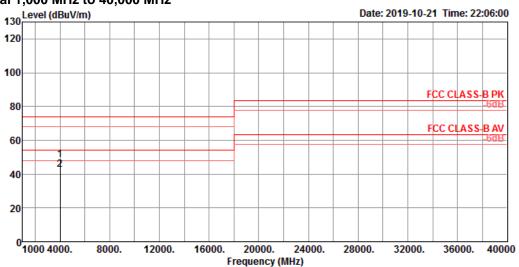
## Vertical 1,000 MHz to 40,000 MHz



	Freq	Level						Preamp Factor			Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4000.01	40.62	54.00	-13.38	38.92	4.40	29.50	32.20	115	246	Average	VERTICAL
2	4000.20	47.53	74.00	-26.47	45.83	4.40	29.50	32.20	115	246	Peak	VERTICAL



## Horizontal 1,000 MHz to 40,000 MHz



	Freq	Level		Over Limit						T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	3999.88	48.56	74.00	-25.44	46.86	4.40	29.50	32.20	100	193	Peak	HORIZONTAL
2	3999.99	42.71	54.00	-11.29	41.01	4.40	29.50	32.20	100	193	Average	HORIZONTAL