Report No. : FR281911AA





# **RADIO TEST REPORT**

FCC ID	1	Z3WAIR4985
Equipment		Wi-Fi 6E Smart Mesh System
Brand Name	:	Airties
Model Name	:	Air 4985
Applicant	:	Airties Wireless Networks Sehit Mehmet Mikdat Uluunlu Sokagi No:23 Esentepe, Sisli İstanbul, 34394 Turkey
Manufacturer	4	Airties Wireless Networks Sehit Mehmet Mikdat Uluunlu Sokagi No:23 Esentepe, Sisli İstanbul, 34394 Turkey
Standard	:	47 CFR FCC Part 15.247

The product was received on Aug. 19, 2022, and testing was started from Aug. 24, 2022 and completed on Sep. 21, 2022. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

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

Approved by: Sam Chen

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

TEL : 886-3-656-9065 FAX : 886-3-656-9085 Report Template No.: CB-A10\_10 Ver1.3 Page Number: 1 of 33Issued Date: Dec. 02, 2022Report Version: 01



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### Photographs of EUT v01



# History of this test report

Report No.	Version	Description	Issued Date
FR281911AA	01	Initial issue of report	Dec. 02, 2022



# Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.207	AC Power-line Conducted Emissions	PASS	-
3.2	15.247(a)	DTS Bandwidth	PASS	-
3.3	15.247(b)	Maximum Conducted Output Power	PASS	-
3.4	15.247(e)	Power Spectral Density	PASS	-
3.5	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	-
3.6	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-

### **Declaration of Conformity:**

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

2. The measurement uncertainty please refer to report "Measurement Uncertainty".

### **Comments and Explanations:**

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

Reviewed by: Sam Chen Report Producer: Sandy Chuang



# **1** General Description

# 1.1 Information

# 1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number	
2400-2483.5	b, g, n (HT20), VHT20, ax (HEW20)	2412-2462	1-11 [11]	
2400-2483.5	n (HT40), VHT40, ax (HEW40)	2422-2452	3-9 [7]	

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	802.11b	20	2TX
2.4-2.4835GHz	802.11g	20	2TX
2.4-2.4835GHz	802.11n HT20	20	2TX
2.4-2.4835GHz	802.11n HT20-BF	20	2TX
2.4-2.4835GHz	VHT20	20	2TX
2.4-2.4835GHz	VHT20-BF	20	2TX
2.4-2.4835GHz	802.11ax HEW20	20	2TX
2.4-2.4835GHz	802.11ax HEW20-BF	20	2TX
2.4-2.4835GHz	802.11n HT40	40	2TX
2.4-2.4835GHz	802.11n HT40-BF	40	2TX
2.4-2.4835GHz	VHT40	40	2TX
2.4-2.4835GHz	VHT40-BF	40	2TX
2.4-2.4835GHz	802.11ax HEW40	40	2TX
2.4-2.4835GHz	802.11ax HEW40-BF	40	2TX

Note:

• 11b mode uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.

• 11g, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.

• VHT20, VHT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.

 HEW20, HEW40 use a combination of OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.

• BWch is the nominal channel bandwidth.



## 1.1.2 Antenna Information

		Port				Antonno		
Ant.	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	-	1	AirTies	ANT A00	PCB	N/A	
2	2	-	2	AirTies	ANT A11	PCB	N/A	
3	-	1	-	AirTies	ANT A0X	PCB	N/A	Note 1
4	-	2	-	AirTies	ANT A1X	PCB	N/A	Note 1
5	-	3	-	AirTies	ANT A2X	PCB	N/A	
6	-	4	-	AirTies	ANT A3X	PCB	N/A	

Note 1:

<Antenna Gain>

		Port		Antenna Gain (dBi)					(dBi)			
Ant.	WLAN	WLAN	WLAN	WLAN		WLAN	5GHz			WLAN	6GHz	
	2.4GHz	5GHz	6GHz	2.4GHz	UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 6	UNII 7	UNII 8
1	1	-	1	4.21	-	-	-	-	1.32	1.46	1.76	2.61
2	2	-	2	4.42	-	-	-	-	1.62	1.98	2.47	2.12
3	-	1	-	-	3.49	3.27	2.85	2.09	-	-	-	-
4	-	2	-	-	3.58	2.61	4.52	2.72	-	-	-	-
5	-	3	-	-	2.41	2.6	3.51	5.47	-	-	-	-
6	-	4	-	-	4.45	4.89	4.53	4.93	-	-	-	-
< Dir	ectional	Gain>										

	Directional Gain (dBi)								
Itom			WLAN 5GHz				WLAN 6GHz		
Item WLAN 2.4GHz		UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 6	UNII 7	UNII 8
2T1S	4.52	-	-	-	-	3.75	3.57	4.12	4.26
4T1S	-	4.57	4.92	5.39	5.58	-	-	-	-

Note 2: The above information (except gain) was declared by manufacturer.

The directional gain is measured which follows the procedure of KDB 662911 D03.

Note 3: The EUT has six antennas.:

### For 2.4GHz function:

### For 802.11 b/g/n/VHT/ax (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 802.11a/n/ac/ax (4TX/4RX):

Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

### For 6GHz function:

### For 802.11ax (2TX/2RX):

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

Port 1 and Port 2 could transmit/receive simultaneously.



# 1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11b	0.949	0.23	12.488m	100
802.11g	0.947	0.24	2.066m	1k
802.11ax HEW20-BF	0.949	0.23	2.928m	1k
802.11ax HEW40-BF	0.967	0.15	4.36m	300

Note:

• DC is Duty Cycle.

DCF is Duty Cycle Factor.

# 1.1.4 EUT Operational Condition

EUT Power Type	From Power Adapter					
	With beamforming U Without beamforming					
Beamforming Function	The product has beamforming function for n/VHT/ax in 2.4GHz, n/ac/ax in 5GHz and ax in 6GHz.					
Function	Point-to-multipoint     Point-to-point					
Test Software Version	Mtool V3.2.1.3					
SW version	4.144.8.0_wltest					
HW version	PCB-4985-D01-M01-R02					
Serial Number (For RF TXBF mode)	J48LB2HV100035					
Serial Number (For other test items and RF TX Non-BF mode)	J48LB2HV100110					

Note: The above information was declared by manufacturer.

## 1.1.5 Table for EUT supports functions

Function	Support Band
	WLAN 2.4GHz, WLAN 5GHz UNII 1~3
AP Router	and WLAN 6GHz UNII 5~8
Mesh	WLAN 5GHz UNII 1~3 and WLAN 6GHz UNII 5~8

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

Note 2: The above information was declared by manufacturer.



# **1.2 Applicable Standards**

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

- 47 CFR FCC Part 15.247
- ANSI C63.10-2013

The following reference test guidance is not within the scope of accreditation of TAF.

- FCC KDB 558074 D01 v05r02
- FCC KDB 662911 D03 v01
- FCC KDB 414788 D01 v01r01

# **1.3 Testing Location Information**

Testing Location Information				
Test Lab. : Sportor	Test Lab. : Sporton International Inc. Hsinchu Laboratory			
Hsinchu	Hsinchu ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)			
(TAF: 3787)	TEL: 886-3-656-9065 FAX: 886-3-656-9085			
	Test site Designation No. TW3787 with FCC.			
Conformity Assessment Body Identifier (CABID) TW3787 with ISED.				

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
RF Conducted	TH03-CB	Owen Hsu	25.3~26.2 / 74~77	Aug. 29, 2022~ Sep. 06, 2022
Radiated below 1GHz	03CH05-CB	Chris Lee	25.1~26.4 / 61~66	Sep. 16, 2022~ Sep. 19, 2022
Radiated above 1GHz	03CH02-CB	Gordon Hong	25.1~26.4 / 61~66	Aug. 24, 2022~ Sep. 02, 2022
Radiated Co-location	03CH05-CB	Gordon Hong	25.4~26.5 / 62~65	Sep. 17, 2022
AC Conduction	CO02-CB	Allen Chung	22~23 / 58~59	Sep. 21, 2022

# **1.4 Measurement Uncertainty**

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

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	5.2 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.7 dB	Confidence levels of 95%
Conducted Emission	3.2 dB	Confidence levels of 95%
Output Power Measurement	0.8 dB	Confidence levels of 95%
Power Density Measurement	3.2 dB	Confidence levels of 95%
Bandwidth Measurement	2.0 %	Confidence levels of 95%

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# 2 Test Configuration of EUT

# 2.1 Test Channel Mode

Mode	Power Setting
802.11b_Nss1,(1Mbps)_2TX	-
2412MHz	85
2437MHz	96
2462MHz	87
802.11g_Nss1,(6Mbps)_2TX	-
2412MHz	65
2417MHz	77
2437MHz	89
2457MHz	75
2462MHz	62
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-
2412MHz	62
2417MHz	68
2437MHz	88
2457MHz	74
2462MHz	54
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-
2422MHz	50
2427MHz	54
2437MHz	63
2447MHz	56
2452MHz	53

Note:

• Evaluated HEW20 / HEW40 mode only due to the similar modulation. The power setting of HT20 / HT40 / VHT20 / VHT40 mode are the same or lower than HEW20 / HEW40.

 The EUT supports non-beamforming and beamforming modes, after evaluating, the beamforming mode has been selected to test.



# 2.2 The Worst Case Measurement Configuration

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

The Worst Case Mode for Following Conformance Tests		
Tests Item	DTS Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in Non-restricted Frequency Bands	
Test Condition         Conducted measurement at transmit chains		

Th	The Worst Case Mode for Following Conformance Tests			
Tests Item	Emissions in Restricted Frequency Bands			
Test ConditionRadiated measurementIf EUT consist of multiple antenna assembly (multiple antenna are used i regardless of spatial multiplexing MIMO configuration), the radiated test be performed with highest antenna gain of each antenna type.				
Operating Mode < 1GHz Normal Link				
1 AP Router Mode: EUT in X axis + Adapter				
2 AP Router Mode: EUT in Y axis + Adapter				
3	AP Router Mode: EUT in Z axis + Adapter			
For operating mode 3 is th	e worst case and it was record in this test report.			
	СТХ			
Operating Mode > 1GHz	The EUT was performed at X axis, Y axis and Z axis position. The worst case was found at Z axis, thus the measurement will follow this same test			
1	EUT in Z axis			



The Worst Case Mode for Following Conformance Tests			
Tests Item Simultaneous Transmission Analysis - Radiated Emission Co-location			
Test Condition Radiated measurement			
Operating Mode Normal Link			
The EUT was performed at X axis, Y axis and Z axis position. EUT in Z axis has been evaluated to be the worst case at Emissions in Radiated measurement <above 1ghz=""> ; thus, the measurement will follow this same test configuration.</above>			
1 EUT in Z axis: WLAN 2.4G+WLAN 6GHz			
Refer to Appendix G 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 + WLAN 6GHz		
Refer to Sporton Test Report No.: FA281911 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:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

During the test, the following programs under WIN 7 were executed. The program was executed as follows:

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

### For Normal Link Mode:

During the test, the EUT operation to normal function.



# 2.4 Accessories

	Accessories					
No.	Equipment Name	Brand Name	Model Name	Rating		
1	Adapter	MOSO	MS-V2000R120-024H0-US	Input: 100-240V~50/60Hz, 0.7A max. Output: 12.0V, 2.0A		
Others						
RJ-4	RJ-45 cable*1: Non-shielded, 1.5m					

# 2.5 Support Equipment

### For AC Conduction:

Support Equipment					
No.	Equipment	Brand Name	Model Name	FCC ID	
А	2.5G WAN NB	DELL	E6430	N/A	
В	LAN NB	DELL	E6430	N/A	
С	2.4G NB	DELL	E6430	N/A	
D	5G NB	DELL	E6430	N/A	
Е	6G NB	DELL	E6430	N/A	
F	6G Client	INTEL	AX210	N/A	

### For Radiated (below 1GHz):

Support Equipment						
No.	Equipment	Brand Name	Model Name	FCC ID		
А	LAN NB	DELL	E4300	N/A		
В	2.4G NB	DELL	E4300	N/A		
С	5G NB	DELL	E4300	N/A		
D	6E NB	DELL	E4300	N/A		
E	WAN NB	DELL	E4300	N/A		



# For Radiated (above 1GHz):

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

<Beamforming mode>

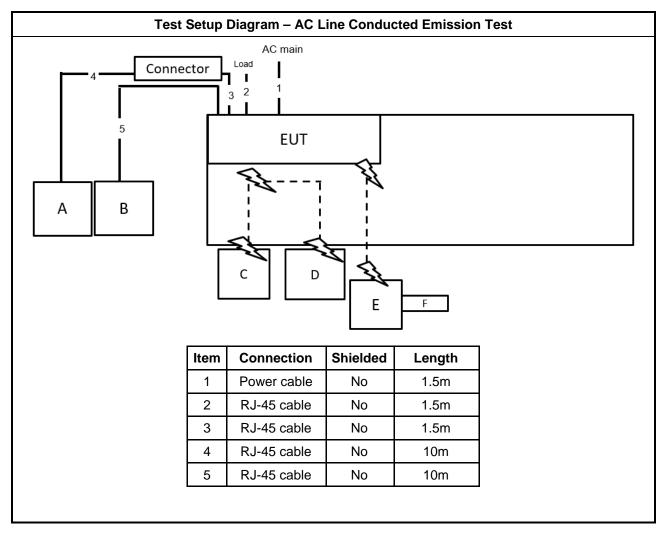
Support Equipment						
No.	No. Equipment Brand Name Model Name FCC ID					
А	NB	DELL	E4300	N/A		
В	WLAN module	Intel	AX210	N/A		
С	NB	DELL	E4300	N/A		

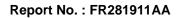
### For RF Conducted:

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

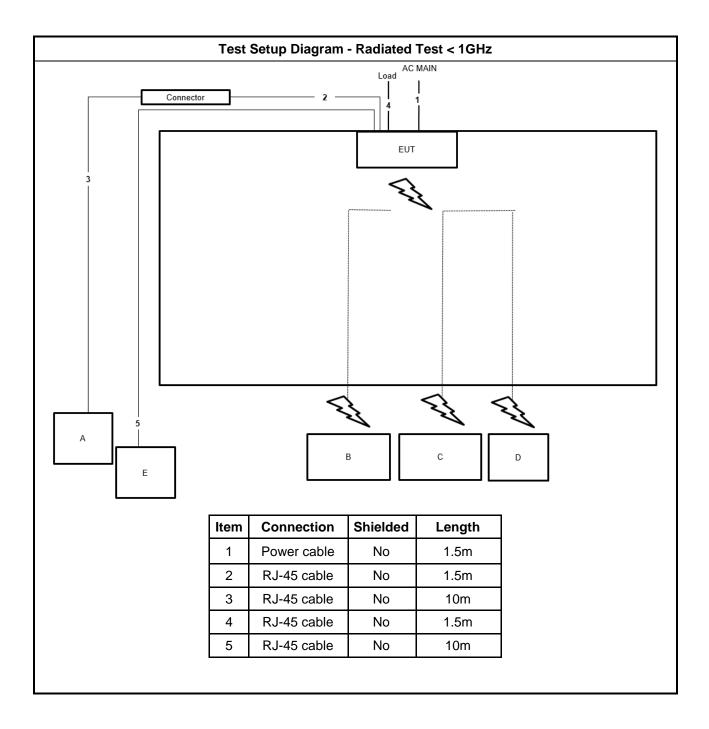


# 2.6 Test Setup Diagram

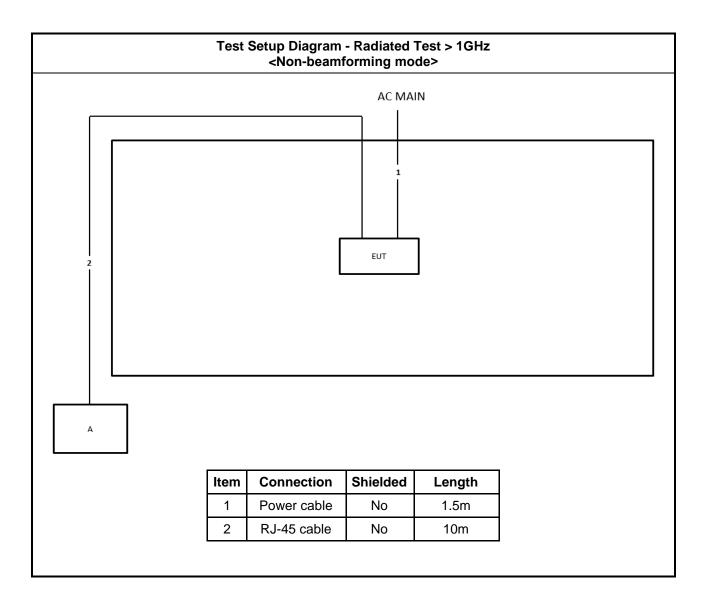




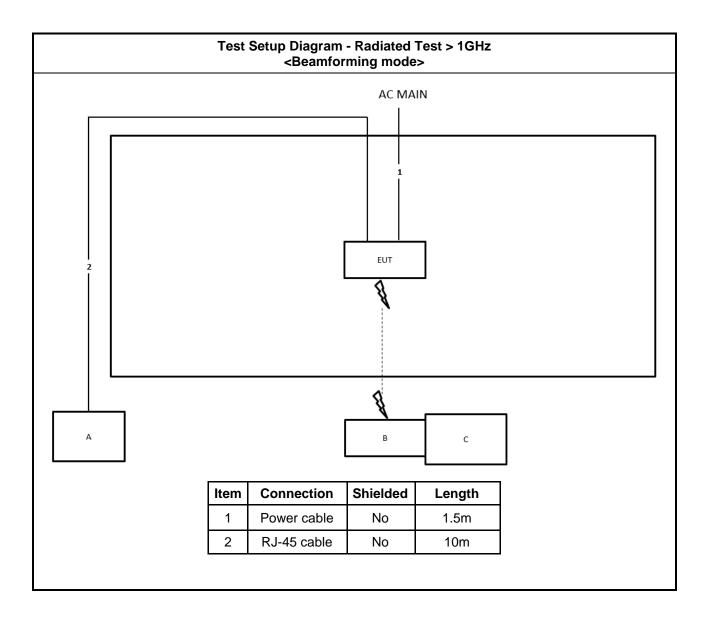














# 3 Transmitter Test Result

# 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					
0.15-0.5 66 - 56 * 56 - 46 *					
0.5-5	56	46			
5-30	60	50			
Note 1: * Decreases with the logarithm of the frequency.					

# 3.1.2 Measuring Instruments

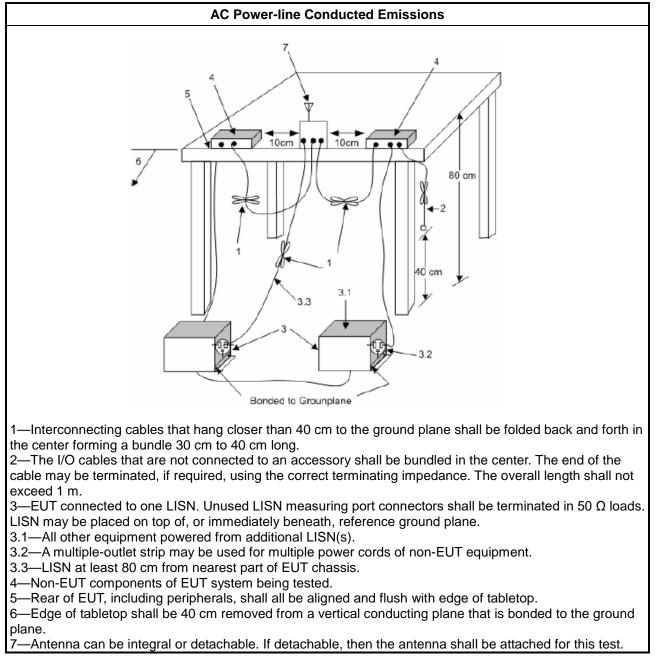
Refer a test equipment and calibration data table in this test report.

# 3.1.3 Test Procedures

**Test Method** 

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

### 3.1.4 Test Setup



## 3.1.5 Measurement Results Calculation

The measured Level is calculated using:

- a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level
- b. Margin = -Limit + Level

# 3.1.6 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A



#### 3.2 **DTS Bandwidth**

#### 3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit		
Systems using digital modulation techniques:		
<ul> <li>6 dB bandwidth ≥ 500 kHz.</li> </ul>		

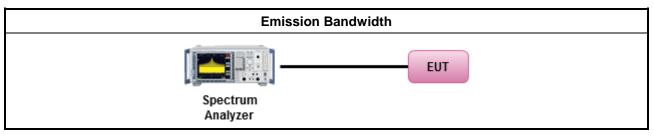
#### 3.2.2 **Measuring Instruments**

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

#### 3.2.3 **Test Procedures**

For				
	the emission bandwidth shall be measured using one of the options below:			
	Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.1 Option 1 for 6 dB bandwidt measurement.			
	Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.2 Option 2 for 6 dB bandwidth measurement.			
	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.			

#### 3.2.4 Test Setup



#### Test Result of Emission Bandwidth 3.2.5

Refer as Appendix B



# 3.3 Maximum Conducted Output Power

# 3.3.1 Maximum Conducted Output Power Limit

### **Maximum Conducted Output Power Limit**

	If $G_{TX} \le 6$ dBi, then $P_{Out} \le 30$ dBm (1 W)
-	If $G_{TX} \leq 6$ dBI, then $P_{Out} \leq 30$ dBm (1 VV)

•	Point-to-multipoint systems	(P2M): If (	G⊤x > 6 dBi,	then $P_{\text{Out}} = 30$	– (G⊤x – 6) dBm
---	-----------------------------	-------------	--------------	----------------------------	-----------------

- Point-to-point systems (P2P): If  $G_{TX} > 6$  dBi, then  $P_{Out} = 30 (G_{TX} 6)/3$  dBm
- Smart antenna system (SAS):
  - Single beam: If  $G_{TX} > 6$  dBi, then  $P_{Out} = 30 (G_{TX} 6)/3$  dBm
  - Overlap beam: If  $G_{TX} > 6 \text{ dBi}$ , then  $P_{Out} = 30 (G_{TX} 6)/3 \text{ dBm}$
  - Aggregate power on all beams: If  $G_{TX} > 6$  dBi, then  $P_{Out} = 30 (G_{TX} 6)/3 + 8$ dB dBm

 $P_{Out}$  = maximum peak conducted output power or maximum conducted output power in dBm,  $G_{TX}$  = the maximum transmitting antenna directional gain in dBi.

# 3.3.2 Measuring Instruments

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

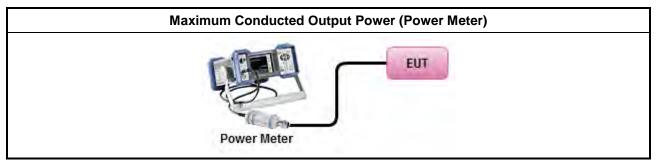


# 3.3.3 Test Procedures

		Test Method
	Max	imum Peak Conducted Output Power
		Refer as FCC KDB 558074, clause 8.3.1.1 & C63.10 clause 11.9.1.1 (RBW ≥ EBW method).
		Refer as FCC KDB 558074, clause 8.3.1.3 & C63.10 clause 11.9.1.3 (peak power meter).
•	Max	imum Conducted Output Power
	[dut	/ cycle ≥ 98% or external video / power trigger]
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.2 Method AVGSA-1.
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.3 Method AVGSA-1A. (alternative)
	duty	cycle < 98% and average over on/off periods with duty factor
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.4 Method AVGSA-2.
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.5 Method AVGSA-2A (alternative)
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.6 Method AVGSA-3
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.7 Method AVGSA-3A (alternative)
	Mea	surement using a power meter (PM)
		Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.1 Method AVGPM (using an RF average power meter).
		Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.2 Method AVGPM-G (using an gate 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.
	•	If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) EIRP <sub>total</sub> = P <sub>total</sub> + DG



# 3.3.4 Test Setup



# 3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C



# 3.4 Power Spectral Density

# 3.4.1 Power Spectral Density Limit

Power Spectral Density Limit

■ Power Spectral Density (PSD) ≤ 8 dBm/3kHz

### 3.4.2 Measuring Instruments

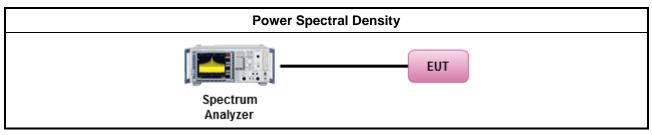
Refer a test equipment and calibration data table in this test report.

### 3.4.3 Test Procedures

	Test Method				
	<ul> <li>Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).</li> </ul>				
	$\square$	Refer as FCC KDB 558	3074, clause 8.4 & C63.10 clause 11.10 Method Max. PSD.		
•	For	conducted measuremer	ıt.		
	•	If The EUT supports m	ultiple transmit chains using options given below:		
		In-band power sp spectrum analyze summing can be p first spectral bin o NTX output to obt	e and sum the spectra across the outputs. Refer as FCC KDB 662911, bectral density (PSD). Sample all transmit ports simultaneously using a r for each transmit port. Where the trace bin-by-bin of each transmit port berformed. (i.e., in the first spectral bin of output 1 is summed with that in the f output 2 and that from the first spectral bin of output 3, and so on up to the ain the value for the first frequency bin of the summed spectrum.). Add up wer) values for the different transmit chains and use this as the new data		
		are measured at maximum value ( summed mathem	e and sum spectral maxima across the outputs. With this technique, spectra each output of the device at the required resolution bandwidth. The peak) of each spectrum is determined. These maximum values are then atically in linear power units across the outputs. These operations shall be ately over frequency spans that have different out-of-band or spurious		
		FCC KDB 662911 and each transmit	e and add 10 log(N) dB, where N is the number of transmit chains. Refer as , In-band power spectral density (PSD). Performed at each transmit chains chains shall be compared with the limit have been reduced with 10 log(N). chains shall be add 10 log(N) to compared with the limit.		



# 3.4.4 Test Setup



# 3.4.5 Test Result of Power Spectral Density

Refer as Appendix D



# 3.5 Emissions in Non-restricted Frequency Bands

# 3.5.1 Emissions in Non-restricted Frequency Bands Limit

Un-restricted Band Emissions Limit		
RF output power procedure Limit (dBc)		
20		
30		

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

## 3.5.2 Measuring Instruments

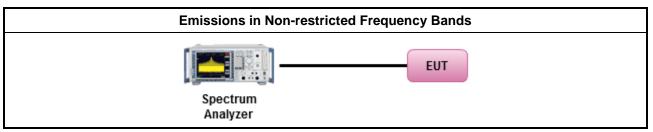
Refer a test equipment and calibration data table in this test report.

## 3.5.3 Test Procedures

Test Method

Refer as FCC KDB 558074, clause 8.5 for unwanted emissions into non-restricted bands.

# 3.5.4 Test Setup



# 3.5.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix E



# 3.6 Emissions in Restricted Frequency Bands

# 3.6.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit					
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)		
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300		
0.490~1.705	24000/F(kHz)	33.8 - 23	30		
1.705~30.0	30	29	30		
30~88	100	40	3		
88~216	150	43.5	3		
216~960	200	46	3		
Above 960	500	54	3		

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

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

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

## 3.6.2 Measuring Instruments

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

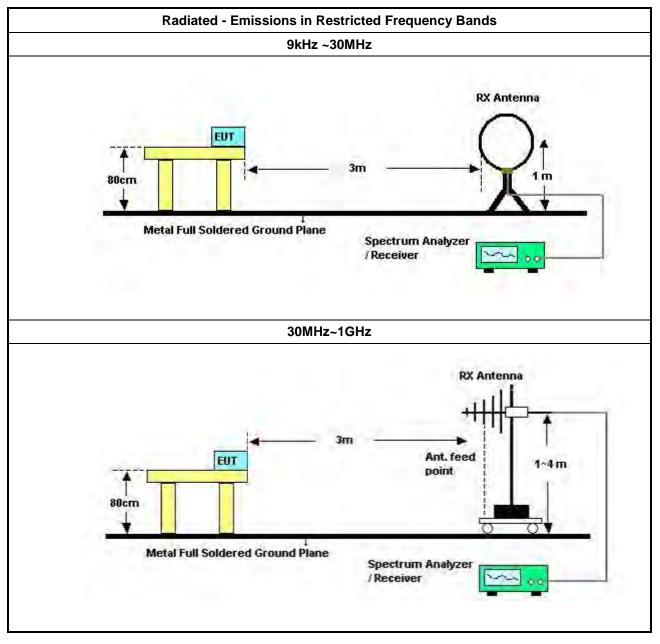


# 3.6.3 Test Procedures

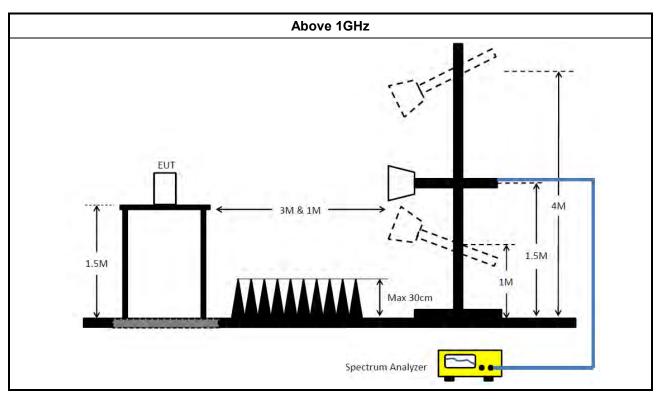
	Test Method									
•	The average emission levels shall be measured in [duty cycle $\geq$ 98 or duty factor].									
•	Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.									
•	<ul> <li>For the transmitter unwanted emissions shall be measured using following options below:</li> </ul>									
	<ul> <li>Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands.</li> </ul>									
	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle ≥98%).									
	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).									
	☑ Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW≥1/T).									
	□ Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW $\ge$ 1/T, where T is pulse time.									
	Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.									
	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.									
•	For the transmitter band-edge emissions shall be measured using following options below:									
	<ul> <li>Refer as FCC KDB 558074 clause 8.7 &amp; C63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.</li> </ul>									
	<ul> <li>Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.</li> </ul>									
	<ul> <li>Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).</li> </ul>									
	<ul> <li>For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below:         <ul> <li>(1) Measure and sum the spectra across the outputs or</li> <li>(2) Measure and add 10 log(N) dB</li> </ul> </li> </ul>									
	<ul> <li>For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.</li> </ul>									



# 3.6.4 Test Setup







## 3.6.5 Measurement Results Calculation

The measured Level is calculated using:

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

## 3.6.6 Emissions in Restricted Frequency Bands (Below 30MHz)

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

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

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

## 3.6.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix F



#### **Test Equipment and Calibration Data** 4

Instrument	Brand Model No. Serial No. Characteristics Calibration Date		Calibration Date	Calibration Due Date	Remark		
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Jan. 07, 2022	Jan. 06, 2023	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Hz ~ 30MHz Dec. 22, 2021 Dec. 21, 2		Conduction (CO02-CB)
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	May 06, 2022	May 05, 2023	Conduction (CO02-CB)
COND Cable	Woken	Cable	2	0.15MHz ~ 30MHz	Oct. 19, 2021	Oct. 18, 2022	Conduction (CO02-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO02-CB)
Pulse Limiter	Schwarzbeck	VTSD 9561F-N	00378	9kHz ~ 30MHz	Mar. 18, 2022	Mar. 17, 2023	Conduction (CO02-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	May 14, 2022	May 13, 2023	Radiation (03CH05-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 03, 2022	Aug. 02, 2023	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 25, 2022	Mar. 24, 2023	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 26, 2022	Apr. 25, 2023	Radiation (03CH05-CB)
Spectrum Analyzer	R&S	FSP40	100304	9kHz ~ 40GHz	Mar. 14, 2022	Mar. 13, 2023	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 17, 2022	Jun. 16, 2023	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	Low Cable-04+23	30MHz~1GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH05-CB	1GHz ~18GHz 3m	Nov. 07, 2021	Nov. 06, 2022	Radiation (03CH05-CB)
Horn Antenna	SCHWARZBE CK	BBHA9120D	BBHA 9120 D-1291	1GHz~18GHz	Jun. 23, 2022	Jun. 22, 2023	Radiation (03CH05-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 22, 2022	Aug. 21, 2023	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC12630SE	980287	1GHz – 26.5GHz	Jul. 01, 2022	Jun. 30, 2023	Radiation (03CH05-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 20, 2022	Jul. 19, 2023	Radiation (03CH05-CB)

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Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-28	1GHz~18GHz Oct. 13, 2021		Oct. 12, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-04+28	1GHz~18GHz Oct. 13, 2021 O		Oct. 12, 2022	Radiation (03CH05-CB)
High Cable	Woken	WCA0929M	40G#5+7	1GHz ~ 40 GHz	Dec. 14, 2021	Dec. 13, 2022	Radiation (03CH05-CB)
High Cable	Woken	WCA0929M	40G#5	1GHz ~ 40 GHz	Dec. 08, 2021	Dec. 07, 2022	Radiation (03CH05-CB)
High Cable	Woken	WCA0929M	40G#7	1GHz ~ 40 GHz	Dec. 14, 2021	Dec. 13, 2022	Radiation (03CH05-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH05-CB)
3m Semi Anechoic Chamber VSWR	RIKEN	SAC-3M	03CH02-CB	1GHz ~18GHz	1GHz ~18GHz Mar. 26, 2022		Radiation (03CH02-CB)
Horn Antenna	EMCO	3115	9610-4976	1GHz ~ 18GHz Apr. 19, 2022		Apr. 18, 2023	Radiation (03CH02-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 22, 2022	Aug. 21, 2023	Radiation (03CH02-CB)
Pre-Amplifier	Agilent	83017A	MY39501305	1GHz ~ 26.5GHz	Jul. 01, 2022	Jun. 30, 2023	Radiation (03CH02-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 20, 2022	Jul. 19, 2023	Radiation (03CH02-CB)
Spectrum analyzer	R&S	FSU	100015	9kHz~26GHz	Oct. 25, 2021	Oct. 24, 2022	Radiation (03CH02-CB)
RF Cable-high	Woken	RG402	High Cable-18	1GHz ~ 18GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH02-CB)
RF Cable-high	Woken	RG402	High Cable-18+19	1GHz ~ 18GHz Oct. 04, 2021		Oct. 03, 2022	Radiation (03CH02-CB)
High Cable	Woken	WCA0929M	40G#5+7	1GHz ~ 40 GHz Dec. 14, 2021		Dec. 13, 2022	Radiation (03CH02-CB)
High Cable	Woken	WCA0929M	40G#5	1GHz ~ 40 GHz Dec. 08, 2		Dec. 07, 2022	Radiation (03CH02-CB)
High Cable	Woken	WCA0929M	40G#7	1GHz ~ 40 GHz	Dec. 14, 2021	Dec. 13, 2022	Radiation (03CH02-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH02-CB)
Spectrum analyzer	R&S	FSV40	101028	9kHz~40GHz	Jan. 07, 2022	Jan. 06, 2023	Conducted (TH03-CB)
Power Sensor	Anritsu	MA2411B	1726195	300MHz~40GHz	Aug. 22, 2021	Aug. 21, 2022	Conducted (TH03-CB)

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Instrument	Brand	Model No.	Serial No.	Characteristics Calibrati Date		Calibration Due Date	Remark
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz Aug. 22, 2021 Aug. 21		Aug. 21, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-11	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-11	1 GHz –18 GHz	Oct. 03, 2022	Oct. 02, 2023	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-12	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-12	1 GHz –18 GHz	Oct. 03, 2022	Oct. 02, 2023	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-13	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-13	1 GHz –18 GHz	Oct. 03, 2022	Oct. 02, 2023	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-14	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-14	1 GHz –18 GHz	Oct. 03, 2022	Oct. 02, 2023	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-15	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-15	1 GHz –18 GHz	Oct. 03, 2022	Oct. 02, 2023	Conducted (TH03-CB)
Switch	SPTCB	SP-SWI	SWI-03	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P1	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P2	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P3	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P4	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P5	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH03-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conducted (TH03-CB)

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

NCR means Non-Calibration required.



# Conducted Emissions at Powerline

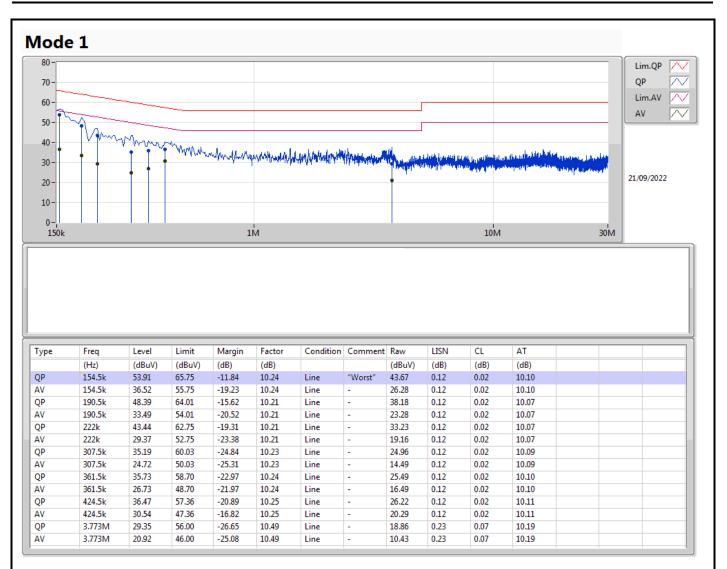
# Appendix A

Summary									
Mode	Result	Туре	Freq	Level	Limit	Margin	Condition		
			(Hz)	(dBuV)	(dBuV)	(dB)			
Mode 1	Pass	QP	154.5k	53.91	65.75	-11.84	Line		



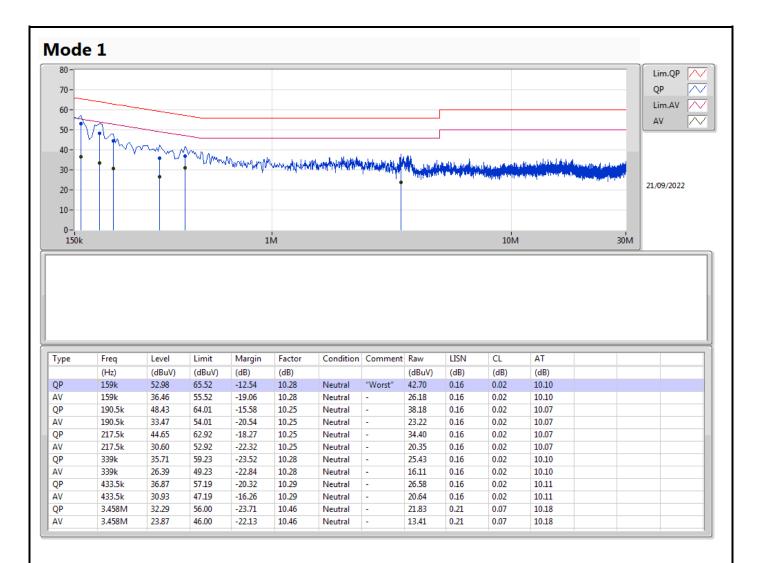
# **Conducted Emissions at Powerline**

# Appendix A





# Appendix A





Mode	Max-N dB	Max-OBW	ITU-Code	Min-N dB	Min-OBW
	(Hz)	(Hz)		(Hz)	(Hz)
2.4-2.4835GHz	-	-	-	-	-
802.11b_Nss1,(1Mbps)_2TX	9.525M	17.016M	17M0G1D	7M	12.119M
802.11g_Nss1,(6Mbps)_2TX	16.35M	25.287M	25M3D1D	16.275M	16.767M
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	18.975M	24.413M	24M4D1D	18.725M	18.991M
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	37.4M	37.781M	37M8D1D	36.25M	37.681M

 $Max\cdot N\ dB = Maximum\ 6dB\ down\ bandwidth;\ Max-OBW = Maximum\ 99\%\ occupied\ bandwidth;\ Min-OBW = Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ Minimum\ 99\%\ occupied\ bandwidth;\ 99\%\ occupied\ bandwidth;\ 90\%\ occupied\ band$ 



#### Result

Mode	Result	Limit	Port 1-N dB	Port 1-OBW	Port 2-N dB	Port 2-OBW
		(Hz)	(Hz)	(Hz)	(Hz)	(Hz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	7M	12.344M	7.55M	12.119M
2437MHz	Pass	500k	9.525M	17.016M	9M	15.742M
2462MHz	Pass	500k	7.55M	12.944M	8M	12.444M
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	16.35M	16.817M	16.3M	16.817M
2437MHz	Pass	500k	16.3M	25.287M	16.275M	22.789M
2462MHz	Pass	500k	16.35M	16.767M	16.35M	16.817M
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	18.975M	19.04M	18.925M	19.065M
2437MHz	Pass	500k	18.825M	24.413M	18.725M	23.588M
2462MHz	Pass	500k	18.95M	18.991M	18.9M	19.04M
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	500k	37.4M	37.681M	36.55M	37.731M
2437MHz	Pass	500k	37.05M	37.781M	36.25M	37.781M
2452MHz	Pass	500k	37.1M	37.681M	36.8M	37.681M

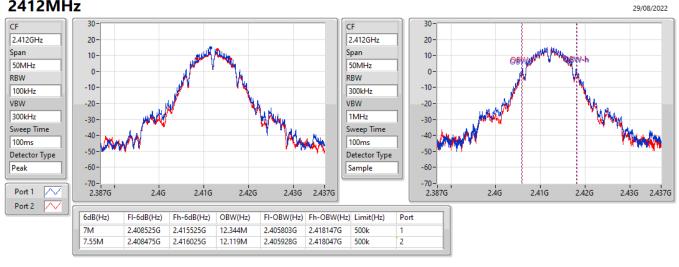
Port X-N dB = Port X 6dB down bandwidth; Port X-OBW = Port X 99% occupied bandwidth



## 802.11b\_Nss1,(1Mbps)\_2TX

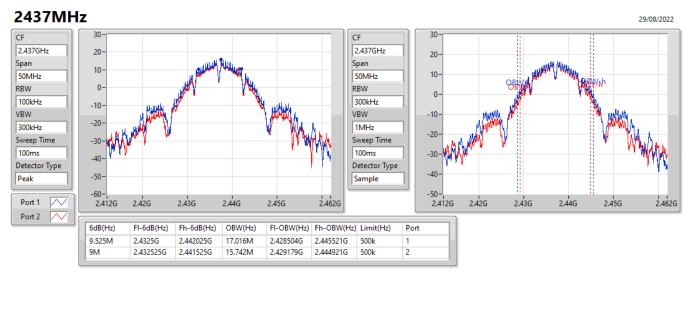
### **EBW**

### 2412MHz



# 802.11b\_Nss1,(1Mbps)\_2TX

#### **EBW**

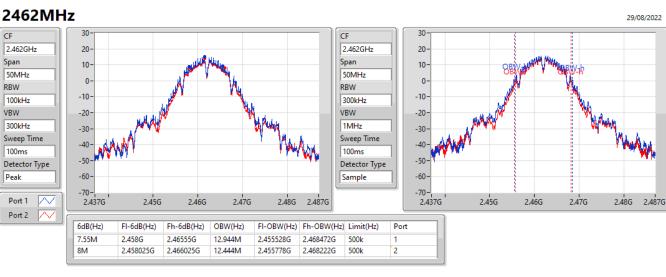


**EBW** 

**EBW** 



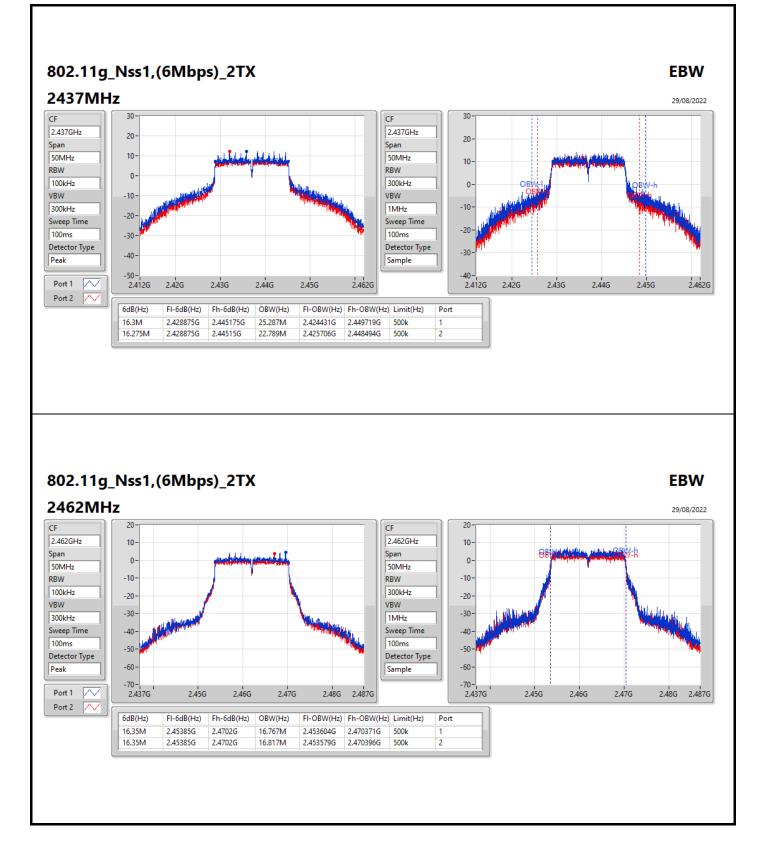
## 802.11b\_Nss1,(1Mbps)\_2TX



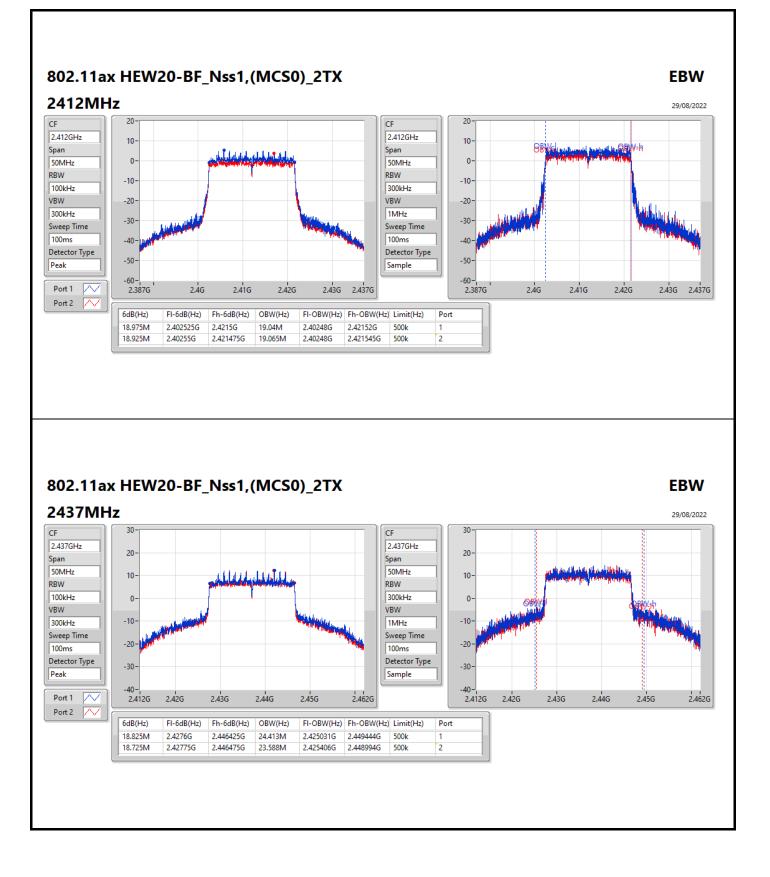
## 802.11g\_Nss1,(6Mbps)\_2TX

#### 2412MHz 29/08/2022 20 20 CF CF 2.412GHz 2.412GHz 10-10 Span Span 0-0-50MHz 50MHz -10--10-RBW RBW 300kHz 100kHz -20--20-VBW VBW -30--30-300kHz 1MHz Sweep Time -40 Sweep Time -40 100ms 100ms -50 -50 Detector Type Detector Type -60--60-Peak Sample -70-2.387G Port 1 2.41G 2.387G 2.4G 2.41G 2.42G 2.43G 2.437G 2.4G 2.42G 2.43G 2.437G Port 2 6dB(Hz) FI-6dB(Hz) Fh-6dB(Hz) OBW(Hz) FI-OBW(Hz) Fh-OBW(Hz) Limit(Hz) Port 16.35M 2.40385G 16.817M 2.403579G 2.420396G 2.4202G 500k 16.3M 2.403875G 500k 2 2.420175G 16.817M 2.403579G 2.420396G

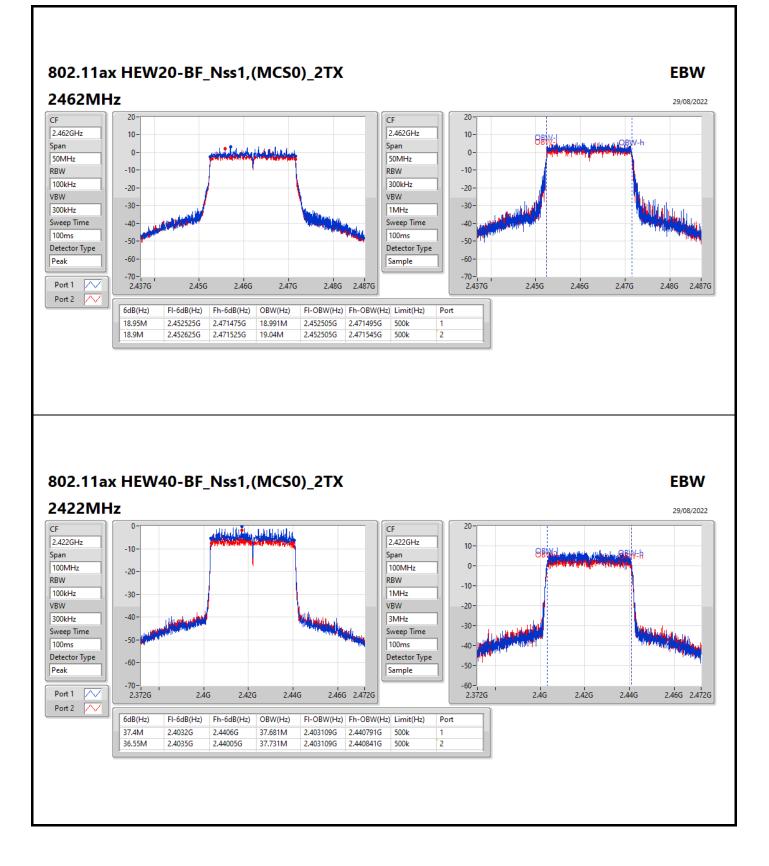




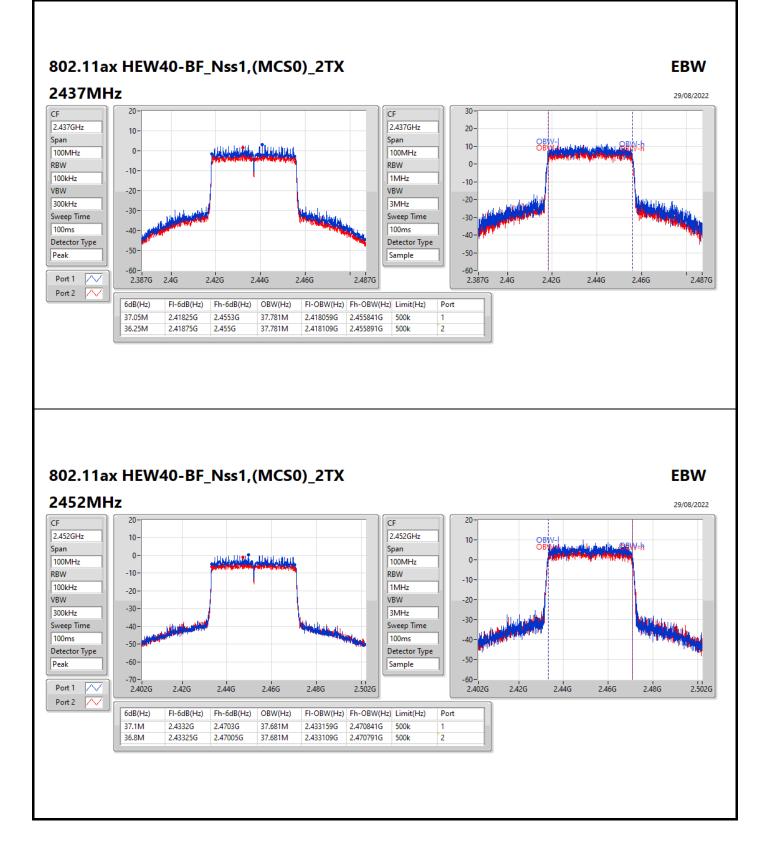














Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_2TX	27.45	0.55590
802.11g_Nss1,(6Mbps)_2TX	25.97	0.39537
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	25.95	0.39355
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	19.46	0.08831



# Appendix C

#### Result

Mode	Result	DG	Port 1	Port 2	Total Power	Power Limit
		(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.42	22.61	21.81	25.24	30.00
2437MHz	Pass	4.42	24.89	23.94	27.45	30.00
2462MHz	Pass	4.42	23.23	22.16	25.74	30.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.42	17.22	15.85	19.60	30.00
2417MHz	Pass	4.42	19.89	19.12	22.53	30.00
2437MHz	Pass	4.42	23.34	22.55	25.97	30.00
2457MHz	Pass	4.42	19.36	18.73	22.07	30.00
2462MHz	Pass	4.42	16.32	15.40	18.89	30.00
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.52	16.66	15.15	18.98	30.00
2417MHz	Pass	4.52	18.08	17.00	20.58	30.00
2437MHz	Pass	4.52	23.07	22.81	25.95	30.00
2457MHz	Pass	4.52	19.37	18.45	21.94	30.00
2462MHz	Pass	4.52	14.88	13.82	17.39	30.00
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	4.52	14.16	12.38	16.37	30.00
2427MHz	Pass	4.52	15.06	13.47	17.35	30.00
2437MHz	Pass	4.52	17.21	15.53	19.46	30.00
2447MHz	Pass	4.52	15.59	13.88	17.83	30.00
2452MHz	Pass	4.52	14.85	13.28	17.15	30.00

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



Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
802.11b_Nss1,(1Mbps)_2TX	1.99
802.11g_Nss1,(6Mbps)_2TX	-0.84
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-0.35
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-9.47

RBW = 3kHz;

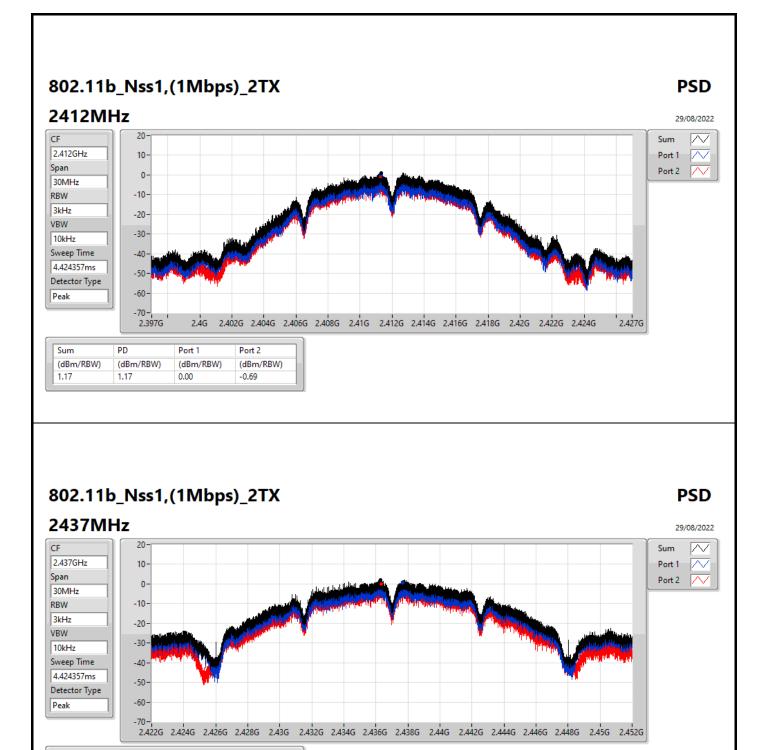


#### Result

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	Port 2 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.52	0.00	-0.69	1.17	8.00
2437MHz	Pass	4.52	0.65	-0.21	1.99	8.00
2462MHz	Pass	4.52	-0.12	-0.82	1.93	8.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.52	-8.74	-10.66	-6.82	8.00
2437MHz	Pass	4.52	-2.64	-2.78	-0.84	8.00
2462MHz	Pass	4.52	-9.73	-9.17	-7.31	8.00
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.52	-8.74	-9.25	-5.98	8.00
2437MHz	Pass	4.52	-3.57	-3.16	-0.35	8.00
2462MHz	Pass	4.52	-11.28	-10.88	-8.07	8.00
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	4.52	-15.00	-17.00	-12.88	8.00
2437MHz	Pass	4.52	-11.87	-13.18	-9.47	8.00
2452MHz	Pass	4.52	-14.38	-15.90	-12.06	8.00

DG = Directional Gain; RBW = 3kHz; PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; Port X = Port X Power Density;





PD

1.99

(dBm/RBW)

Port 1

0.65

(dBm/RBW)

Port 2

-0.21

(dBm/RBW)

Sum

1.99

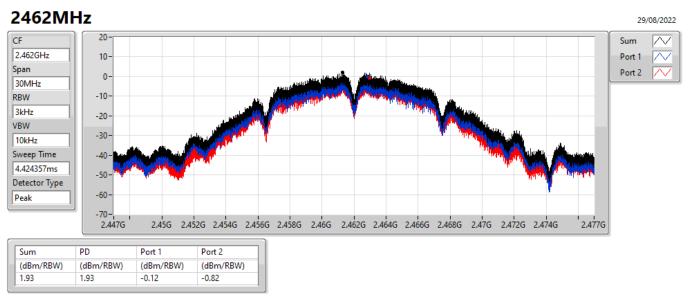
(dBm/RBW)

PSD





# 802.11b\_Nss1,(1Mbps)\_2TX



## 802.11g\_Nss1,(6Mbps)\_2TX

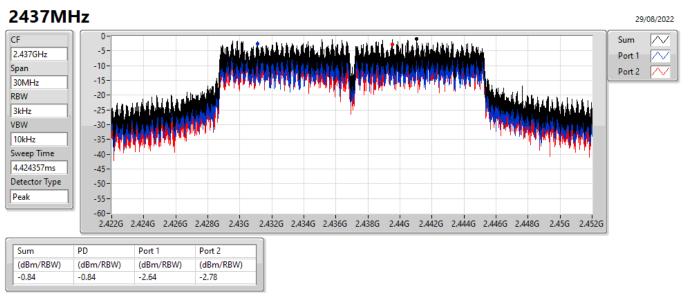
#### 2412MHz 29/08/2022 0 $\square$ CF Sum 2.412GHz $\sim$ -10-Port 1 Span Port 2 -20-30MHz RBW -30-3kHz VBW -40 10kHz -50 Sweep Time 4.424357ms -60 Detector Type -70 Peak -80-2.397G 2.402G 2.404G 2.406G 2.408G 2.41G 2.412G 2.414G 2.416G 2.418G 2.42G 2.422G 2.422G 2.4G 2.427G Sum PD Port 1 Port 2 (dBm/RBW) (dBm/RBW) (dBm/RBW) (dBm/RBW) -6.82 -6.82 -8.74 -10.66

Sporton International Inc. Hsinchu Laboratory

PSD



# 802.11g\_Nss1,(6Mbps)\_2TX



# 802.11g\_Nss1,(6Mbps)\_2TX

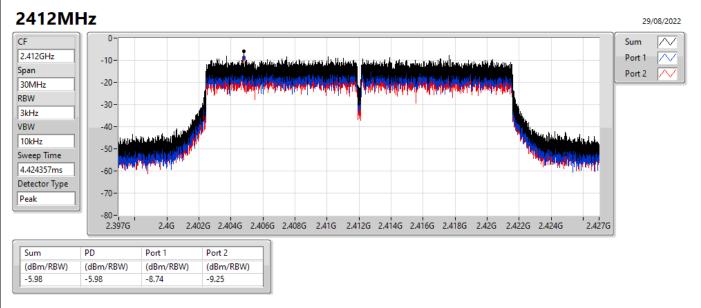
#### 2462MHz 29/08/2022 0 CF $\square$ Sum 2.462GHz $\sim$ -10-Port 1 Span Port 2 -20-30MHz RBW -30-3kHz VBW -40-10kHz -50 Sweep Time 4.424357ms -<mark>60</mark>-Detector Type -70 Peak -<mark>80</mark>-2.447G 2.45G 2.452G 2.454G 2.456G 2.458G 2.46G 2.462G 2.464G 2.466G 2.468G 2.47G 2.472G 2.474G 2.477G Sum PD Port 1 Port 2 (dBm/RBW) (dBm/RBW) (dBm/RBW) (dBm/RBW) -7.31 -7.31 -9.73 -9.17

PSD





# 802.11ax HEW20-BF\_Nss1,(MCS0)\_2TX



## 802.11ax HEW20-BF\_Nss1,(MCS0)\_2TX

#### 2437MHz 29/08/2022 0 CF $\overline{\mathcal{N}}$ Sum 2.437GHz -5- $\sim$ Port 1 Span -10-Port 2 30MHz -15-RBW -20-3kHz VBW -25-10kHz -30 Sweep Time -35 4.424357ms -40-Detector Type -45-Peak -50 2.422G 2.424G 2.426G 2.428G 2.436G 2.432G 2.434G 2.436G 2.438G 2.444G 2.444G 2.4446G 2.4486 2.448G 2.45G 2.452G Sum PD Port 1 Port 2 (dBm/RBW) (dBm/RBW) (dBm/RBW) (dBm/RBW) -0.35 -0.35 -3.57 -3.16

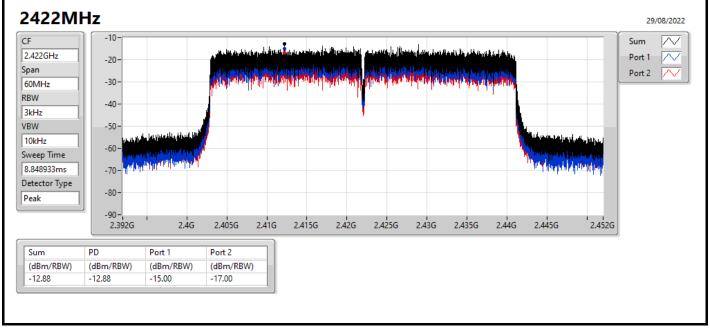
PSD



## 802.11ax HEW20-BF\_Nss1,(MCS0)\_2TX



## 802.11ax HEW40-BF\_Nss1,(MCS0)\_2TX

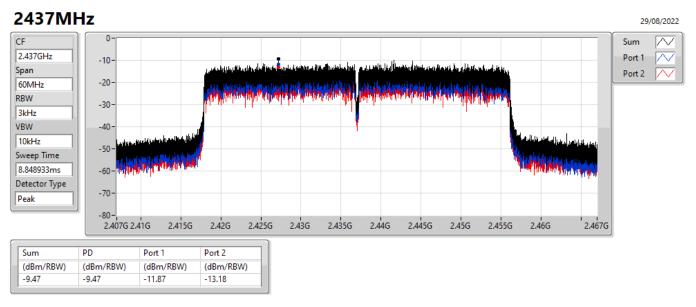


PSD

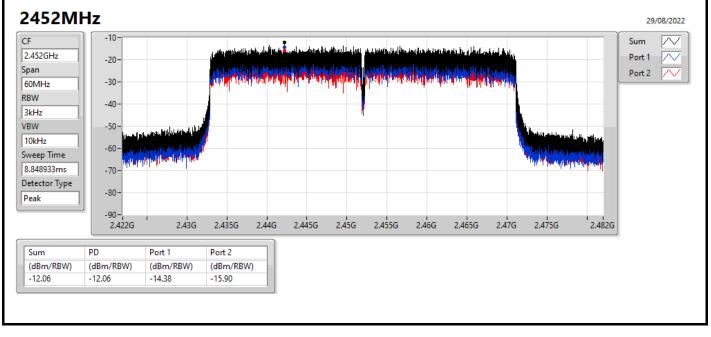




# 802.11ax HEW40-BF\_Nss1,(MCS0)\_2TX



## 802.11ax HEW40-BF\_Nss1,(MCS0)\_2TX





# Appendix E

#### Summary

Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
2.4-2.4835GHz	-	-	-	-	-	-	-	-		-	-	-	-	-	-
802.11b_Nss1,(1Mbps)_2TX	Pass	2.43803G	15.79	-14.21	2.30845G	-52.02	2.39852G	-24.47	2.4G	-23.31	2.48416G	-50.37	17.66985G	-47.38	1
802.11g_Nss1,(6Mbps)_2TX	Pass	2.43202G	12.20	-17.80	2.30117G	-52.00	2.39668G	-28.72	2.4G	-31.36	2.49246G	-50.42	17.65861G	-47.91	1
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	Pass	2.43202G	12.47	-17.53	1.73876G	-52.87	2.39946G	-27.43	2.4G	-31.74	2.48622G	-51.24	17.69514G	-48.37	1
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	Pass	2.44075G	2.99	-27.01	2.30054G	-52.53	2.3998G	-31.62	2.4G	-35.25	2.48562G	-40.49	5.8196G	-47.67	1



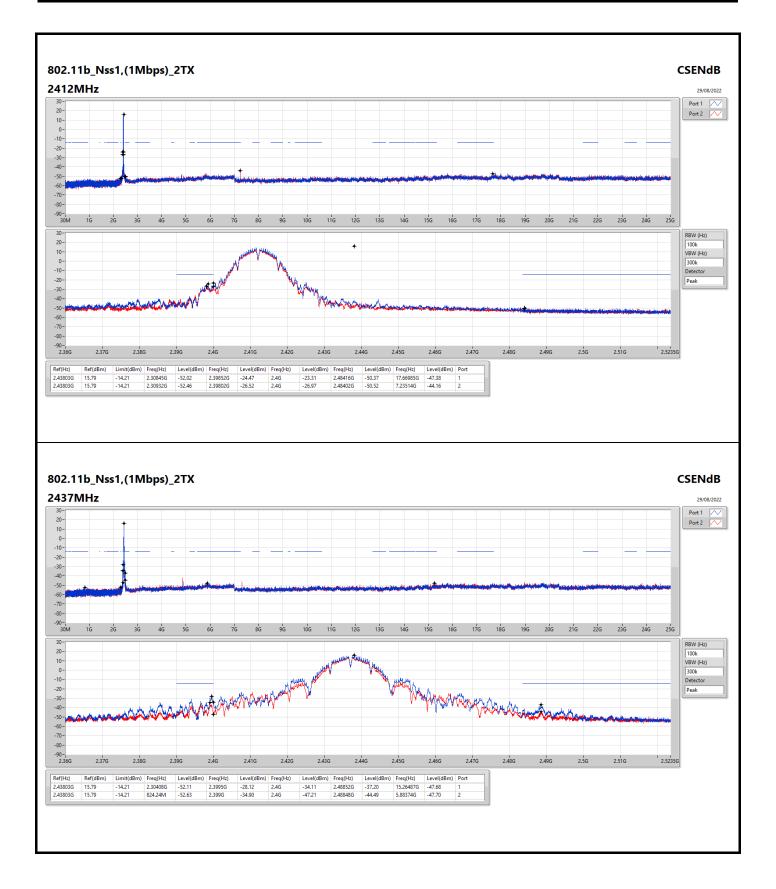
## CSE (Non-restricted Band)

# Appendix E

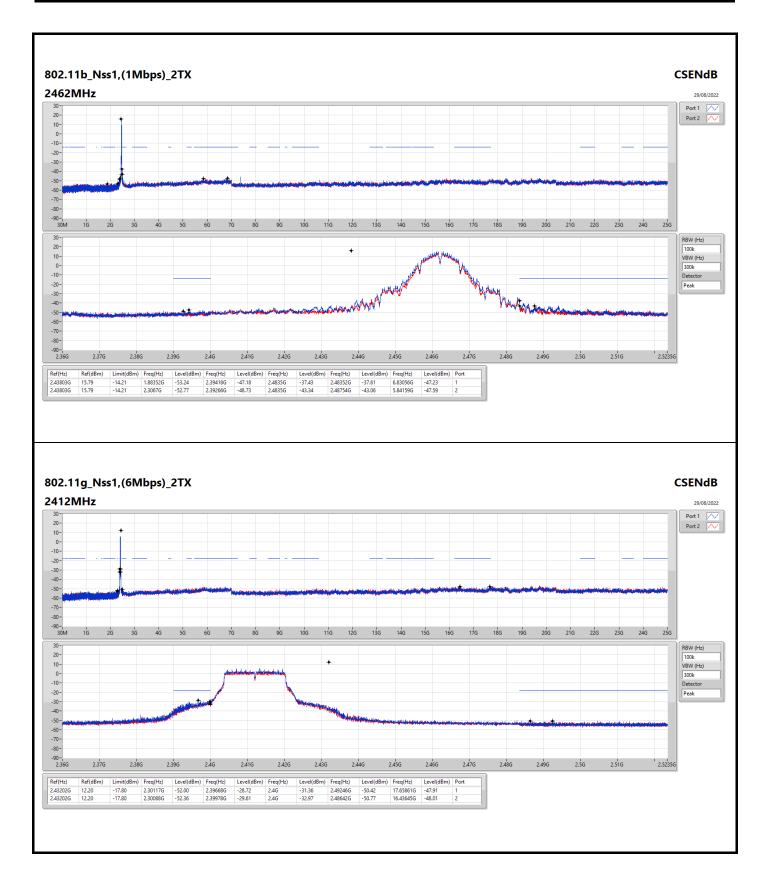
#### Result

Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.43803G	15.79	-14.21	2.30845G	-52.02	2.39852G	-24.47	2.4G	-23.31	2.48416G	-50.37	17.66985G	-47.38	1
2412MHz	Pass	2.43803G	15.79	-14.21	2.30932G	-52.46	2.39802G	-26.52	2.4G	-26.97	2.48402G	-50.52	7.23514G	-44.16	2
2437MHz	Pass	2.43803G	15.79	-14.21	2.30408G	-52.11	2.3995G	-28.12	2.4G	-34.11	2.48852G	-37.20	15.26487G	-47.68	1
2437MHz	Pass	2.43803G	15.79	-14.21	824.24M	-52.63	2.399G	-34.90	2.4G	-47.21	2.48848G	-44.49	5.88374G	-47.70	2
2462MHz	Pass	2.43803G	15.79	-14.21	1.88352G	-53.24	2.39418G	-47.18	2.4835G	-37.43	2.48352G	-37.61	6.83056G	-47.23	1
2462MHz	Pass	2.43803G	15.79	-14.21	2.3067G	-52.77	2.39266G	-48.73	2.4835G	-43.34	2.48754G	-43.06	5.84159G	-47.59	2
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.43202G	12.20	-17.80	2.30117G	-52.00	2.39668G	-28.72	2.4G	-31.36	2.49246G	-50.42	17.65861G	-47.91	1
2412MHz	Pass	2.43202G	12.20	-17.80	2.30088G	-52.36	2.39978G	-29.61	2.4G	-32.97	2.48642G	-50.77	16.43645G	-48.01	2
2437MHz	Pass	2.43202G	12.20	-17.80	2.3035G	-51.84	2.39888G	-31.77	2.4G	-34.08	2.48356G	-35.92	15.32668G	-47.00	1
2437MHz	Pass	2.43202G	12.20	-17.80	2.15816G	-51.37	2.39918G	-32.64	2.4G	-36.56	2.48386G	-36.75	6.74627G	-48.17	2
2462MHz	Pass	2.43202G	12.20	-17.80	893.27M	-52.98	2.391G	-50.57	2.4835G	-41.33	2.48356G	-37.72	16.31002G	-48.14	1
2462MHz	Pass	2.43202G	12.20	-17.80	607.84M	-52.65	2.39074G	-50.41	2.4835G	-42.77	2.48392G	-40.33	6.97104G	-46.27	2
802.11ax HEW20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.43202G	12.47	-17.53	1.73876G	-52.87	2.39946G	-27.43	2.4G	-31.74	2.48622G	-51.24	17.69514G	-48.37	1
2412MHz	Pass	2.43202G	12.47	-17.53	2.07516G	-52.87	2.39972G	-28.38	2.4G	-32.17	2.51672G	-49.55	5.9034G	-47.25	2
2437MHz	Pass	2.43202G	12.47	-17.53	2.30991G	-52.50	2.39986G	-31.96	2.4G	-34.35	2.48356G	-35.70	16.93937G	-48.03	1
2437MHz	Pass	2.43202G	12.47	-17.53	2.30816G	-52.67	2.39648G	-30.95	2.4G	-34.55	2.48368G	-36.25	16.43645G	-47.54	2
2462MHz	Pass	2.43202G	12.47	-17.53	2.19108G	-51.45	2.39392G	-50.33	2.4835G	-42.83	2.48512G	-41.54	5.78259G	-47.65	1
2462MHz	Pass	2.43202G	12.47	-17.53	2.13807G	-52.49	2.3941G	-51.28	2.4835G	-44.60	2.48384G	-44.18	24.74995G	-47.35	2
802.11ax HEW40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2422MHz	Pass	2.44075G	2.99	-27.01	1.7475G	-52.93	2.39688G	-39.48	2.4G	-42.91	2.48354G	-50.91	5.85045G	-47.76	1
2422MHz	Pass	2.44075G	2.99	-27.01	2.30512G	-52.99	2.39708G	-37.41	2.4G	-42.28	2.48582G	-50.84	17.68851G	-48.11	2
2437MHz	Pass	2.44075G	2.99	-27.01	2.30054G	-52.53	2.3998G	-31.62	2.4G	-35.25	2.48562G	-40.49	5.8196G	-47.67	1
2437MHz	Pass	2.44075G	2.99	-27.01	940.28M	-52.99	2.39956G	-33.26	2.4G	-36.16	2.48406G	-43.22	17.61278G	-46.82	2
2452MHz	Pass	2.44075G	2.99	-27.01	2.30454G	-52.33	2.39456G	-47.40	2.4835G	-43.70	2.48446G	-38.35	17.69972G	-47.81	1
2452MHz	Pass	2.44075G	2.99	-27.01	2.30655G	-51.14	2.39804G	-49.86	2.4835G	-43.47	2.4845G	-38.87	5.96543G	-47.47	2

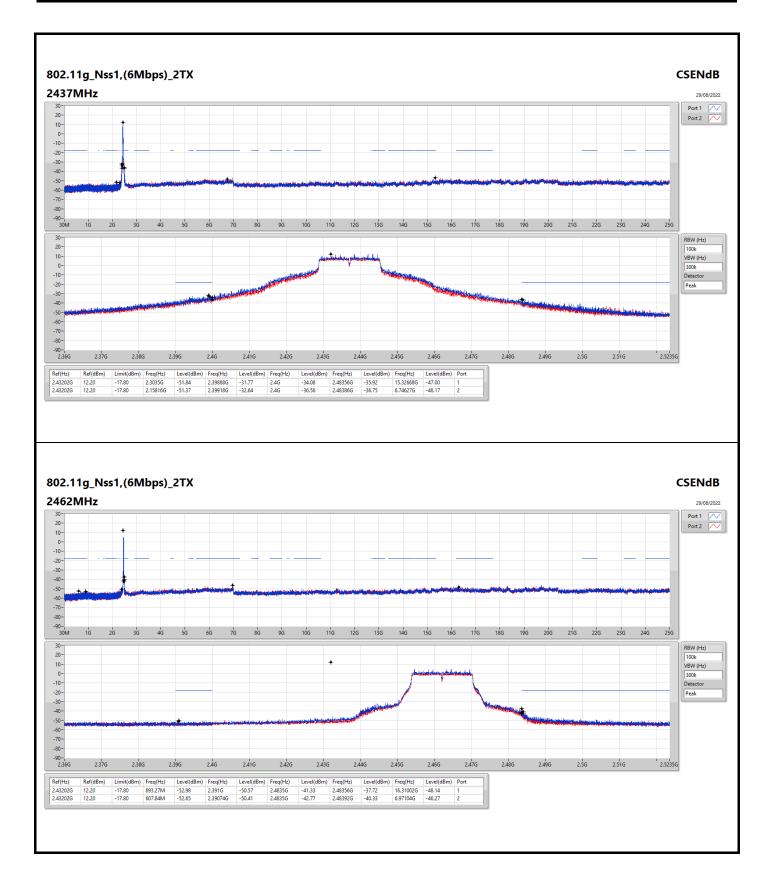




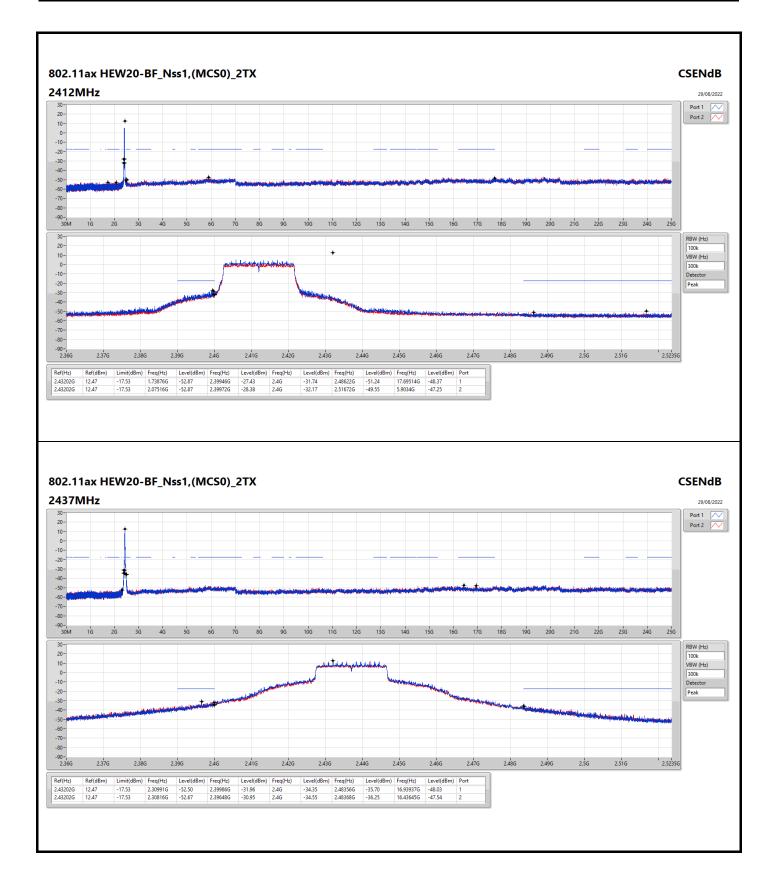




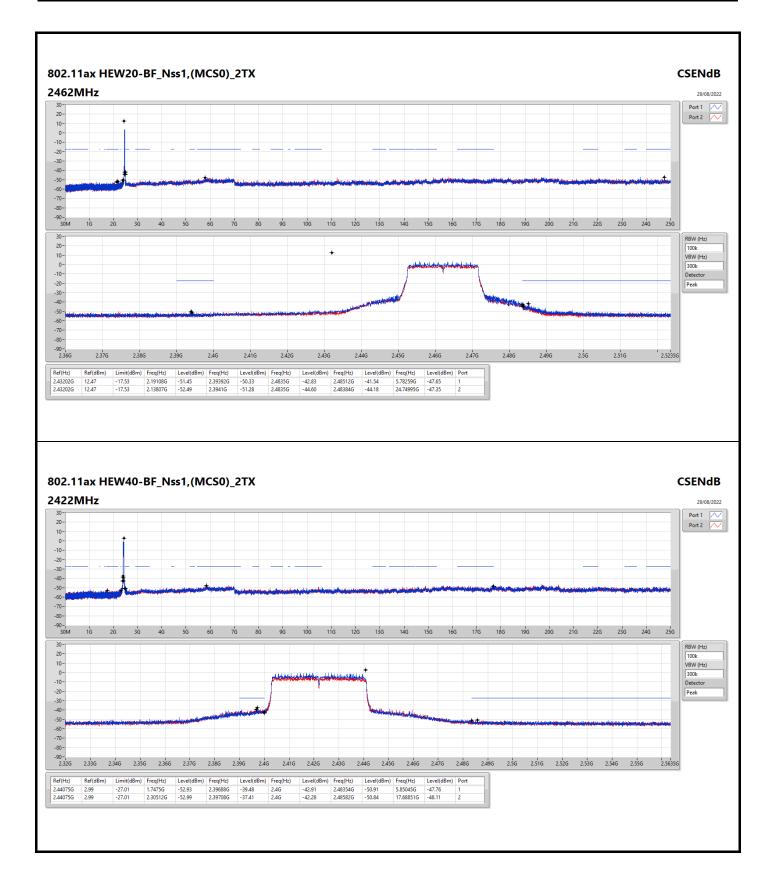




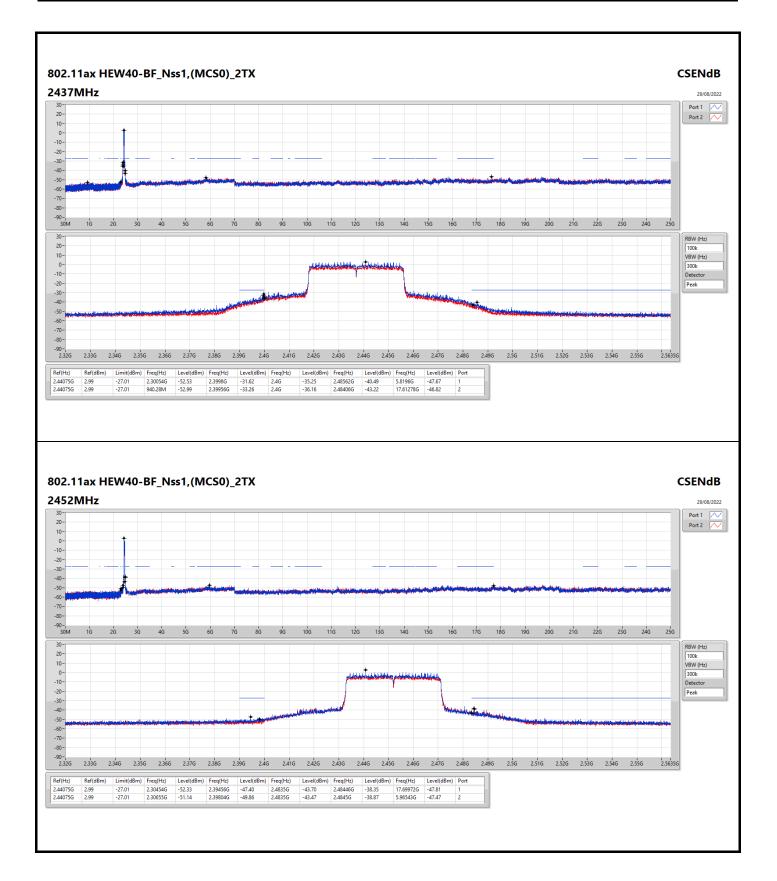














## Radiated Emissions below 1GHz

# Appendix F.1

Summary							
Mode	Result	Туре	Freq	Level	Limit	Margin	Condition
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)	
Mode 3	Pass	QP	51.34M	38.63	40.00	-1.37	Vertical



РК

PK

РК

88M

104.69M

125.06M

30.78

31.24

38.20

43.50

43.50

43.50

-12.72

-12.26

-5.30

-16.34

-13.20

-12.44

3

3

3

### Radiated Emissions below 1GHz

#### Mode 3 80-Lim.QP $\sim$ 70-QP $\sim$ -6dB N 60 -50· 40 -30 -Junkow Allo 20-19/09/2022 10-0-30M 100M 150M 200M 250M 300M 350M 400M 450M 500M 550M 600M 650M 700M 750M 800M 850M 900M 950M 1G Condition Azimuth Height Туре PA Freq Level Limit Margin Factor Dist Comment Raw ΔF CL (Hz) (dBuV/m) (dBuV/m) (dB) (dB/m) (dBuV/m) (dB/m) (dB) (dB) (m) (°) (m) QP 46.49M 37.12 40.00 -2.88 -15.48 Vertical 357 1.00 52.60 15.33 1.03 31.84 3 QP 51.34M 38.63 40.00 -1.37 -17.27 3 Vertical 360 1.00 "Worst" 55.90 13.50 1.10 31.87 РК 67.83M 36.49 40.00 -3.51 -18.50 323 1.00 54.99 12.19 1.26 31.95 3 Vertical -

Vertical

Vertical

Vertical

360

34

261

1.00

1.00

1.00

-

-

\_

47.12

44.44

50.64

14.15

17.25

17.89

1.46

1.52

1.65

31.95

31.97

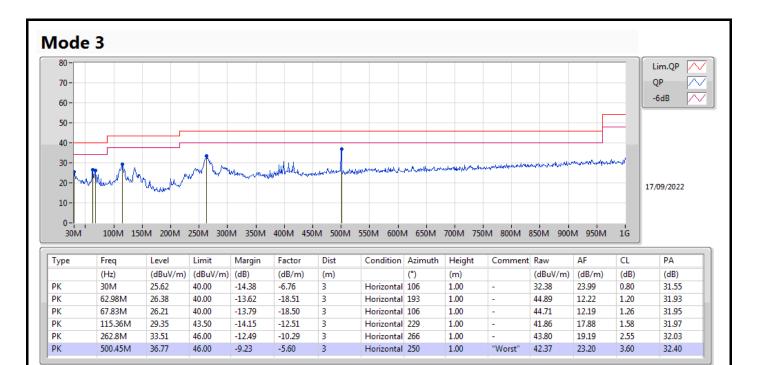
31.98

## Appendix F.1



### Radiated Emissions below 1GHz

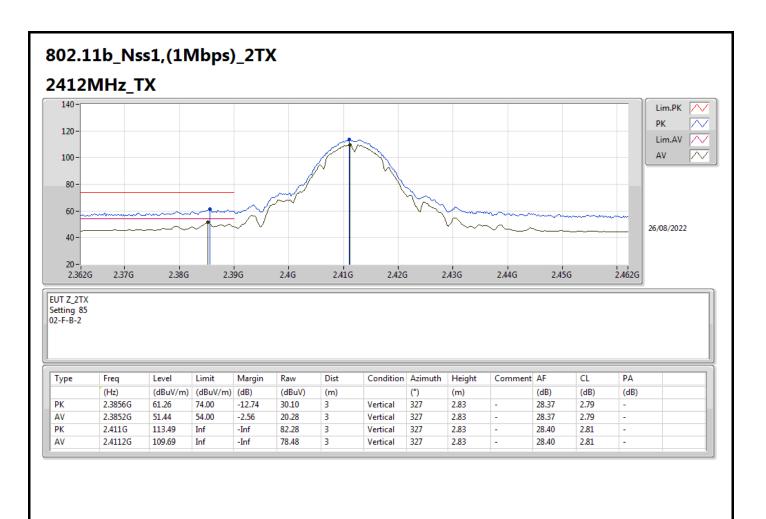
## Appendix F.1



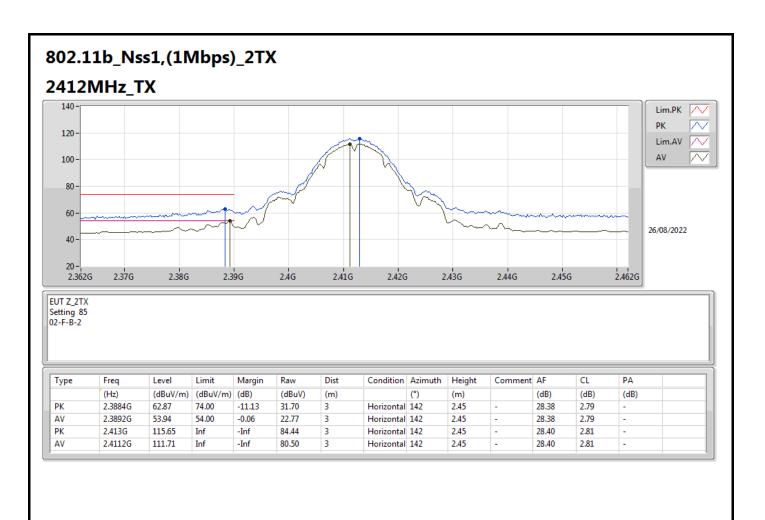


Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-			-	-	-		-	-
802.11b_Nss1,(1Mbps)_2TX	Pass	AV	2.3892G	53.94	54.00	-0.06	3	Horizontal	142	2.45	-

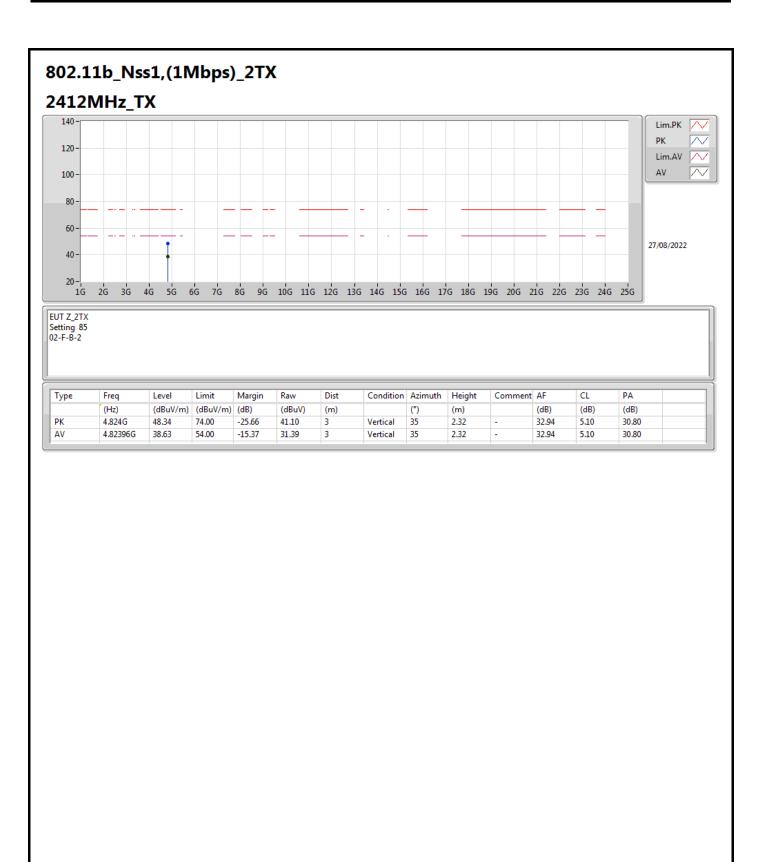




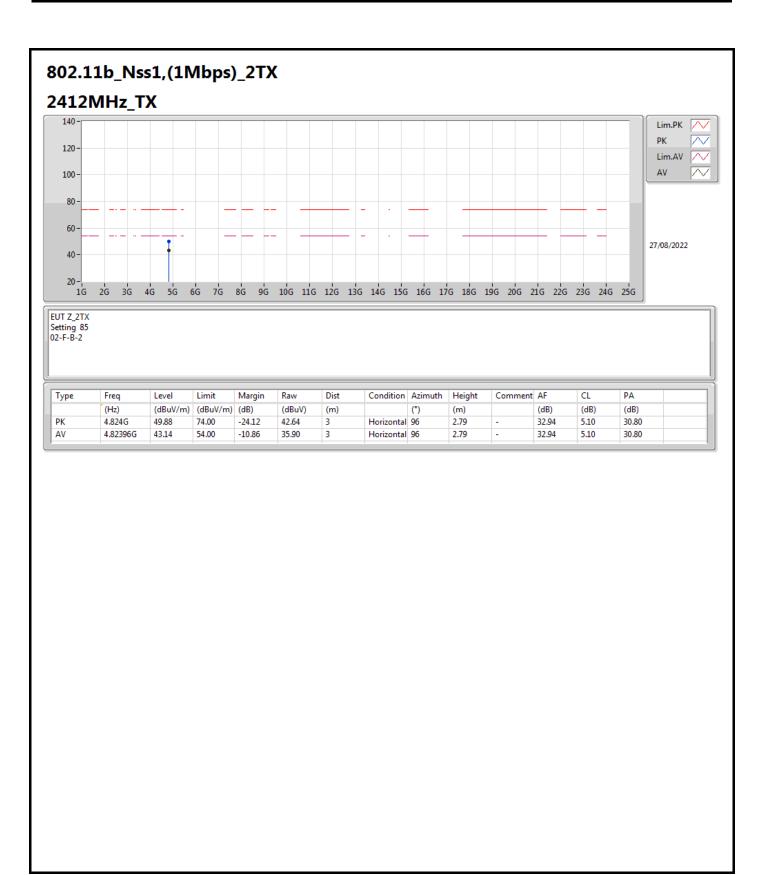




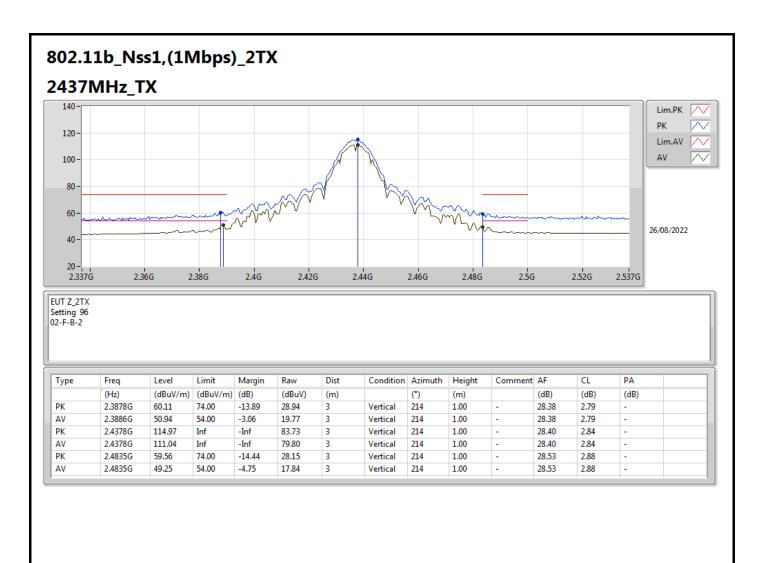




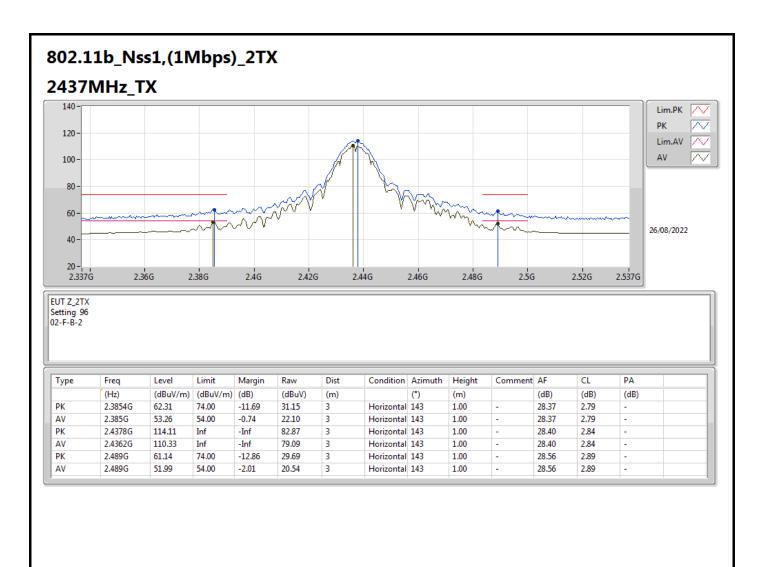




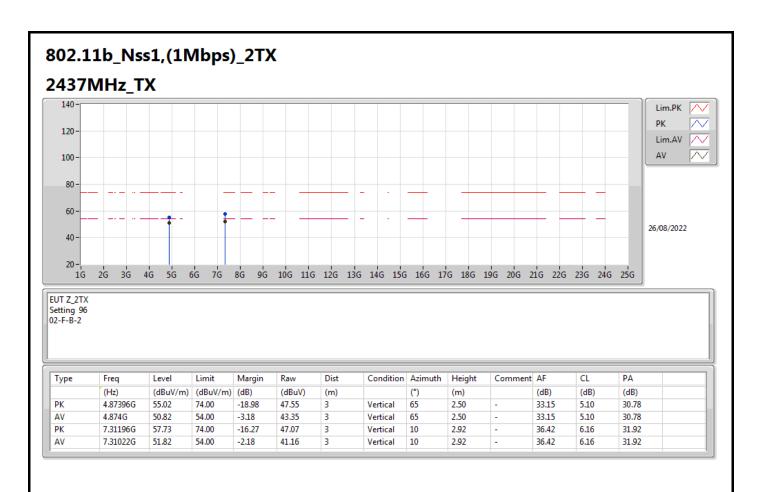




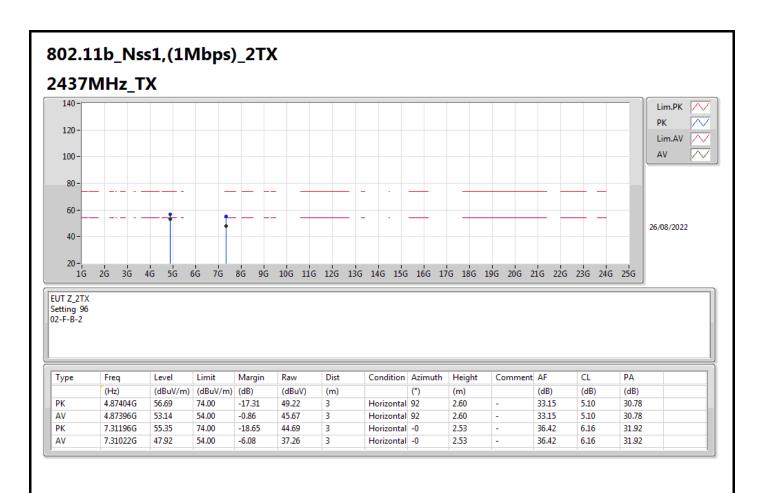




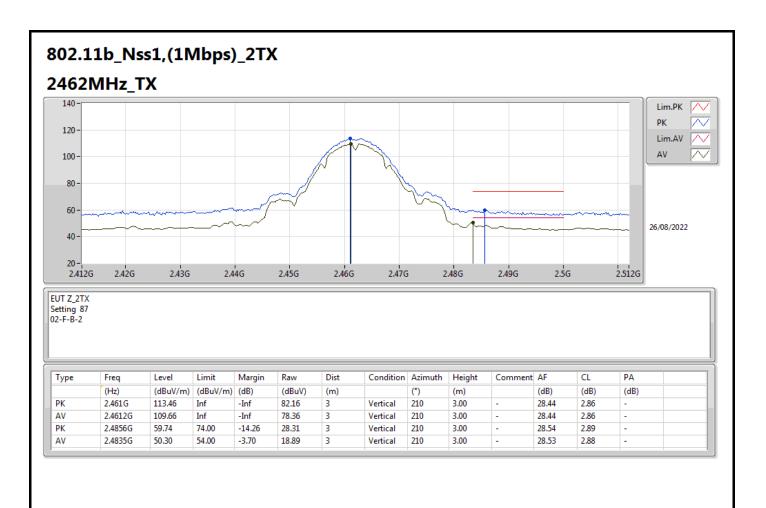




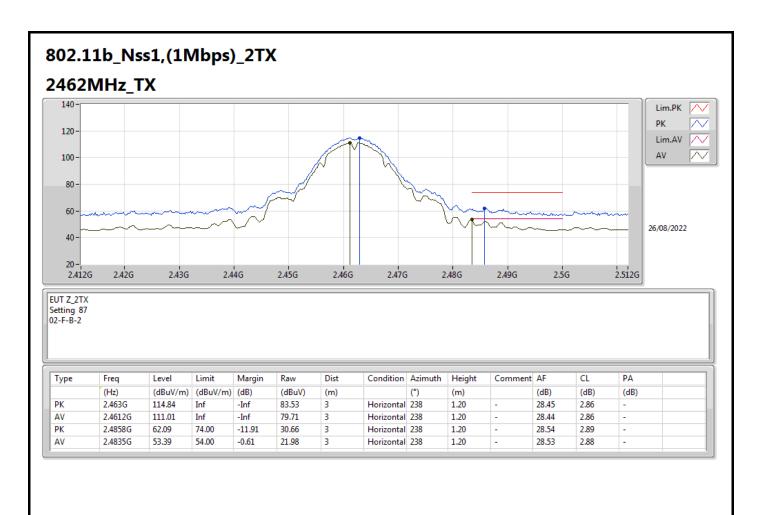




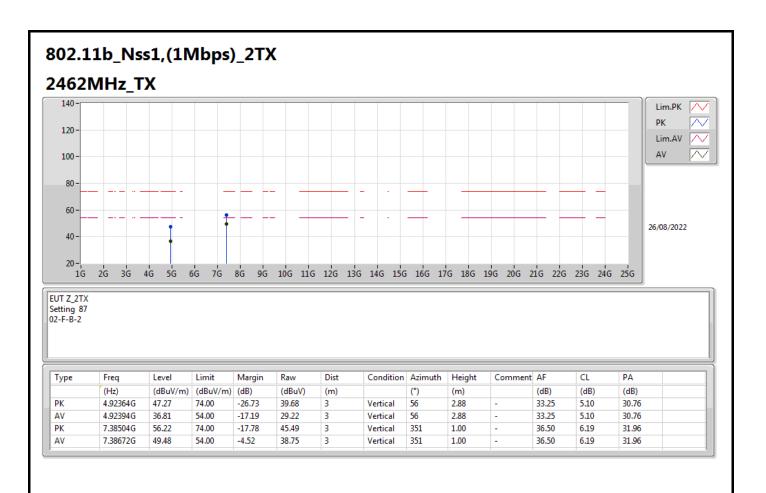




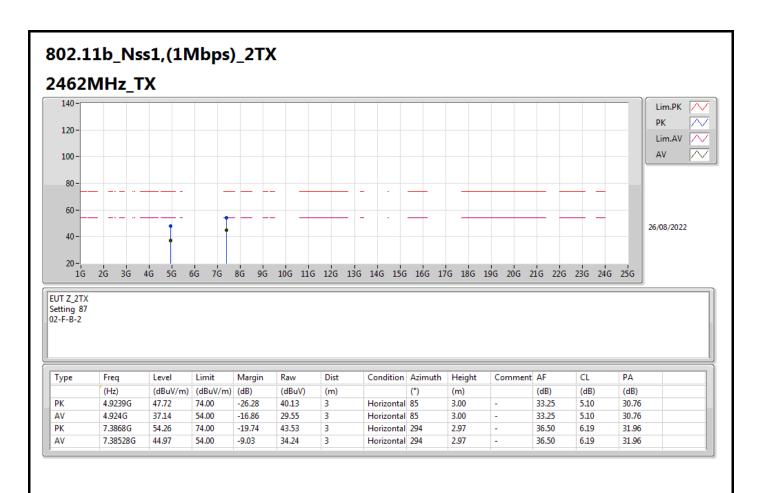




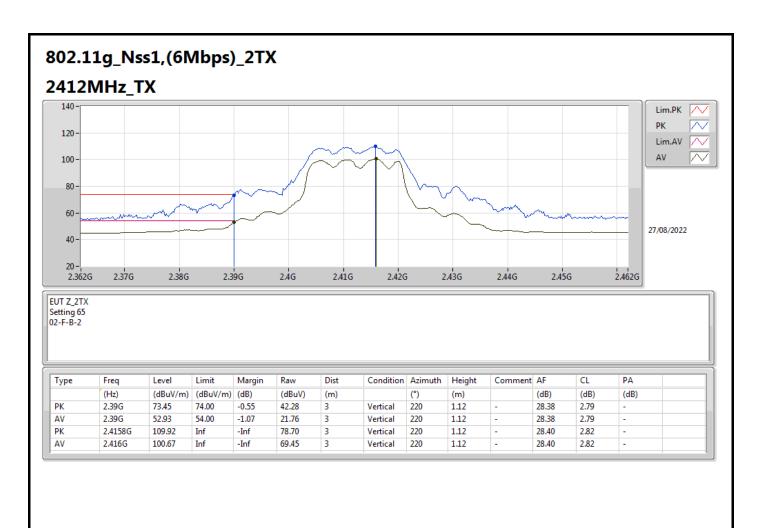




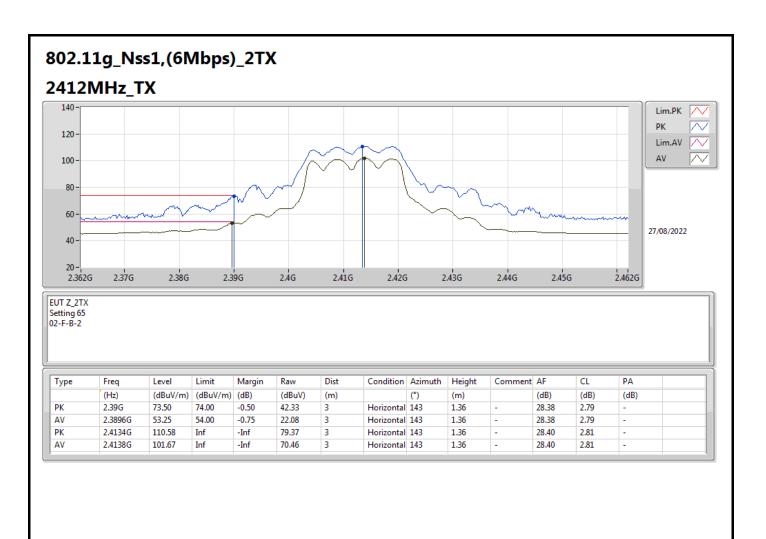




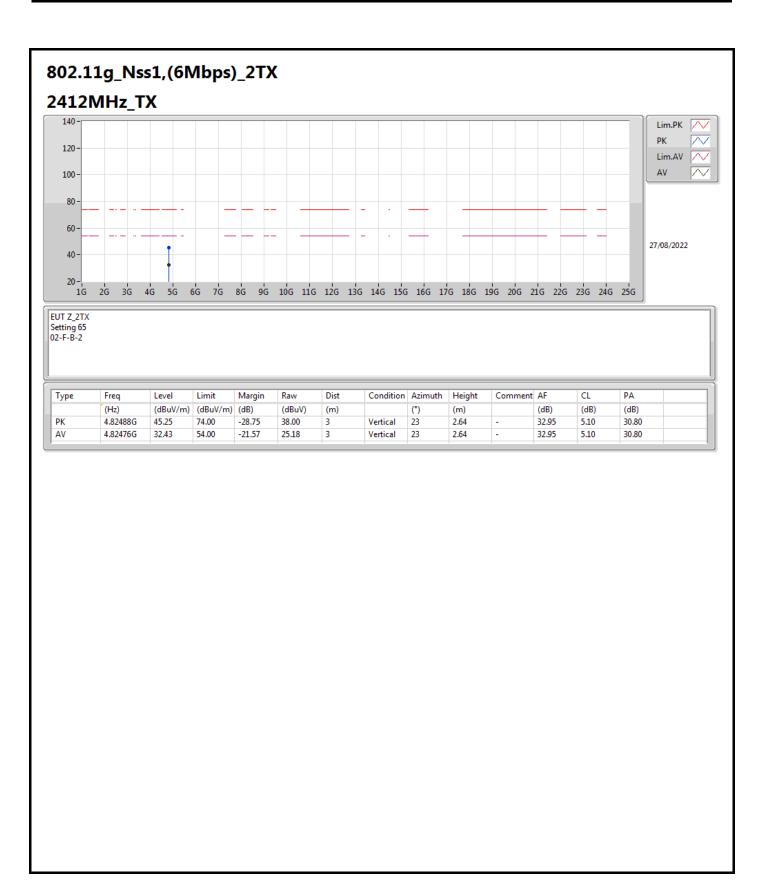




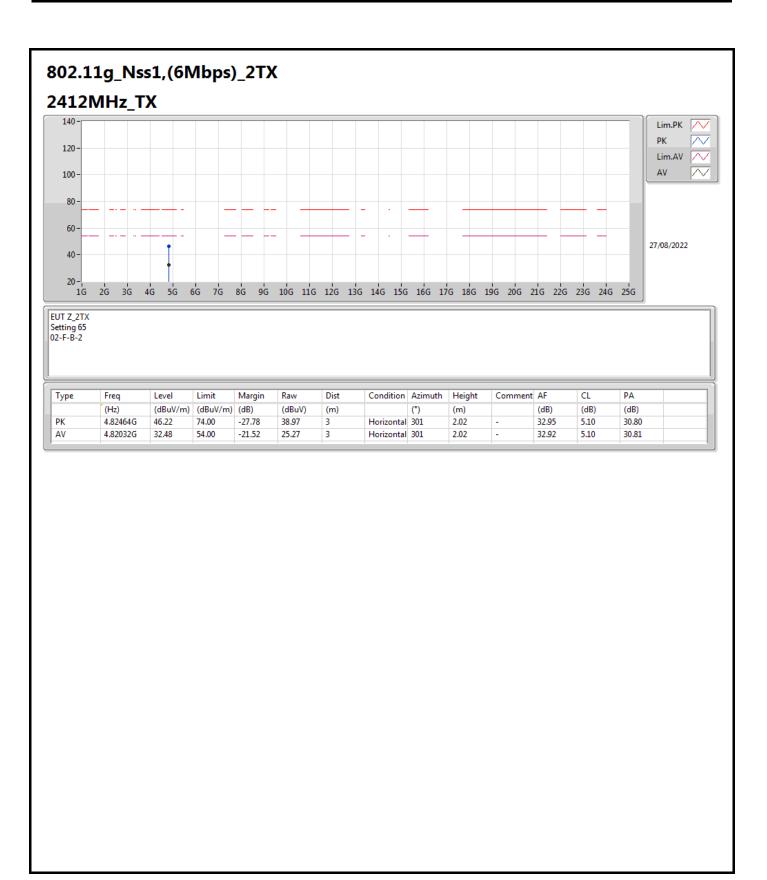




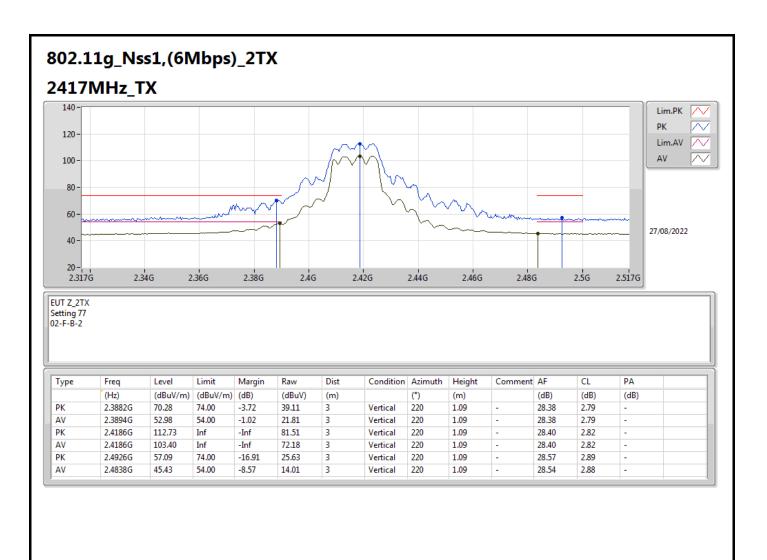




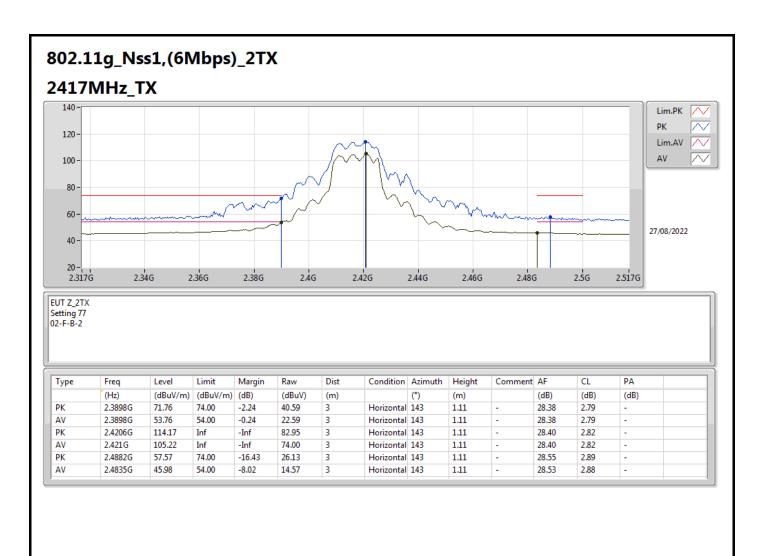




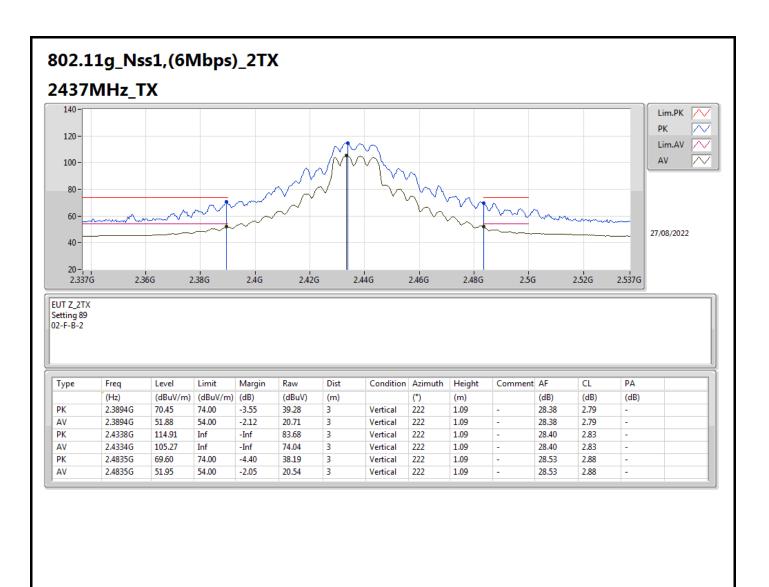




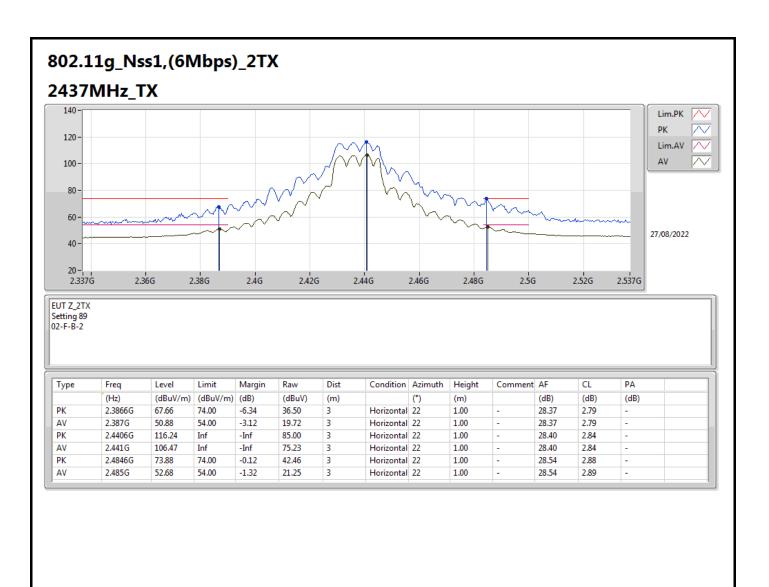




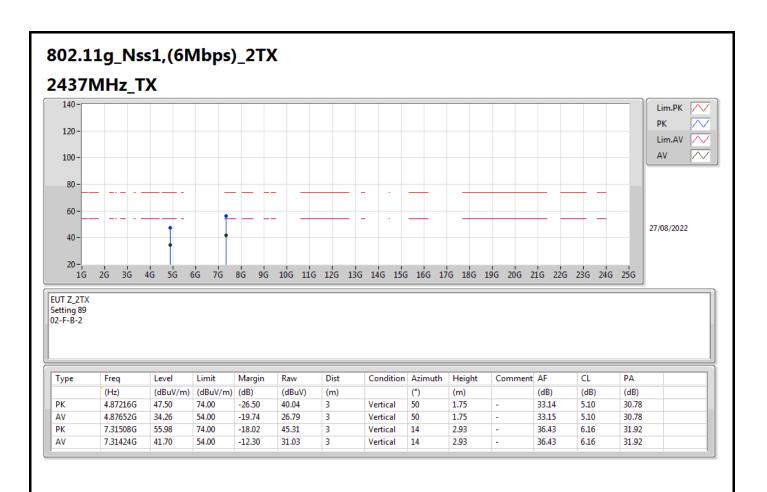




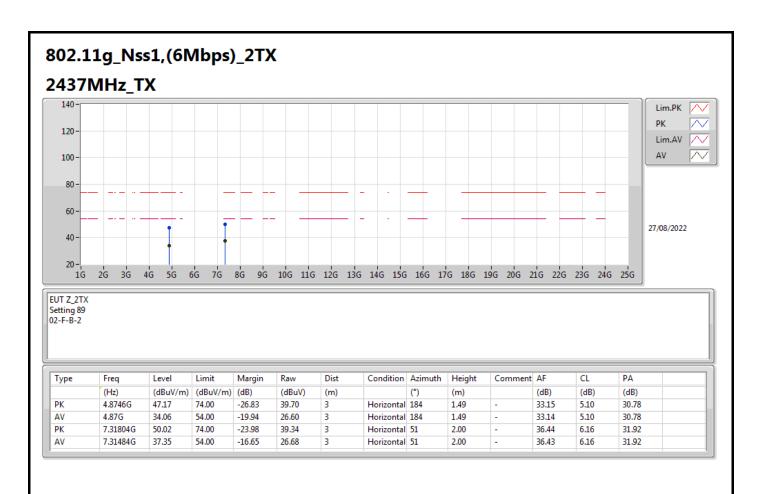




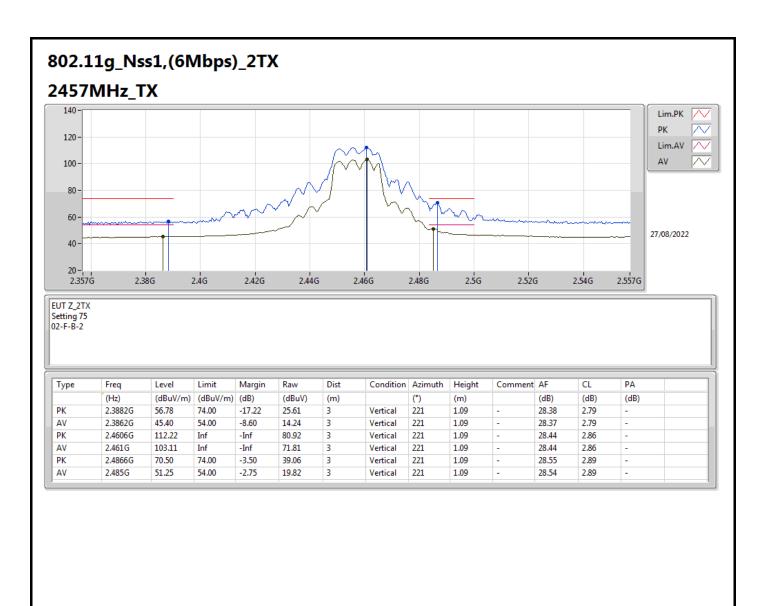




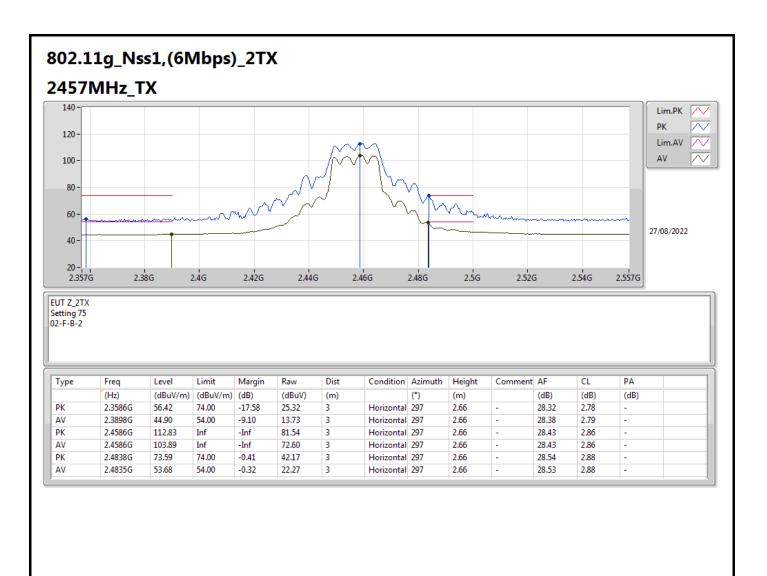




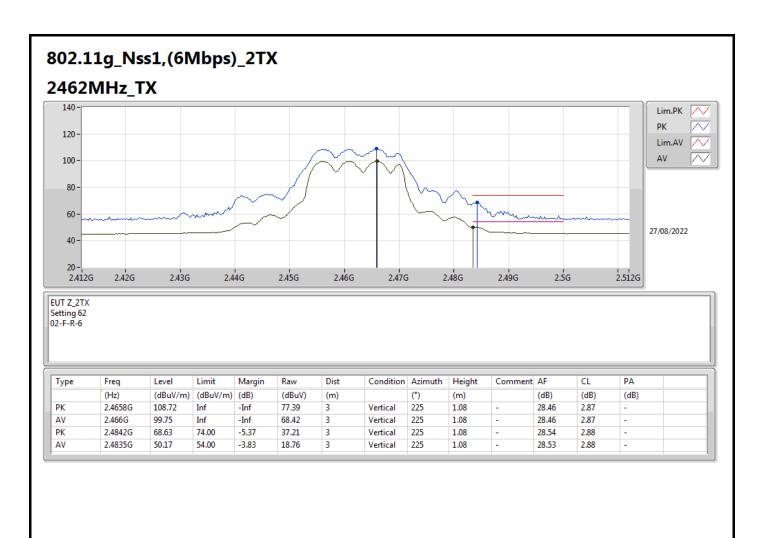




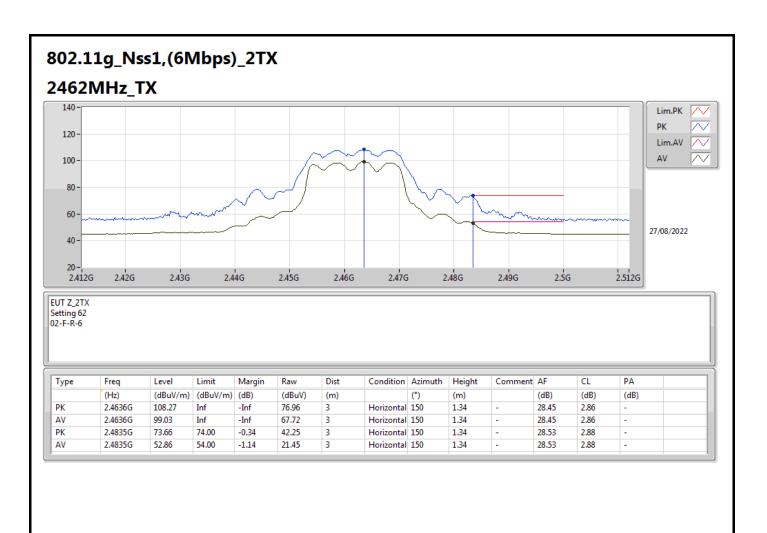




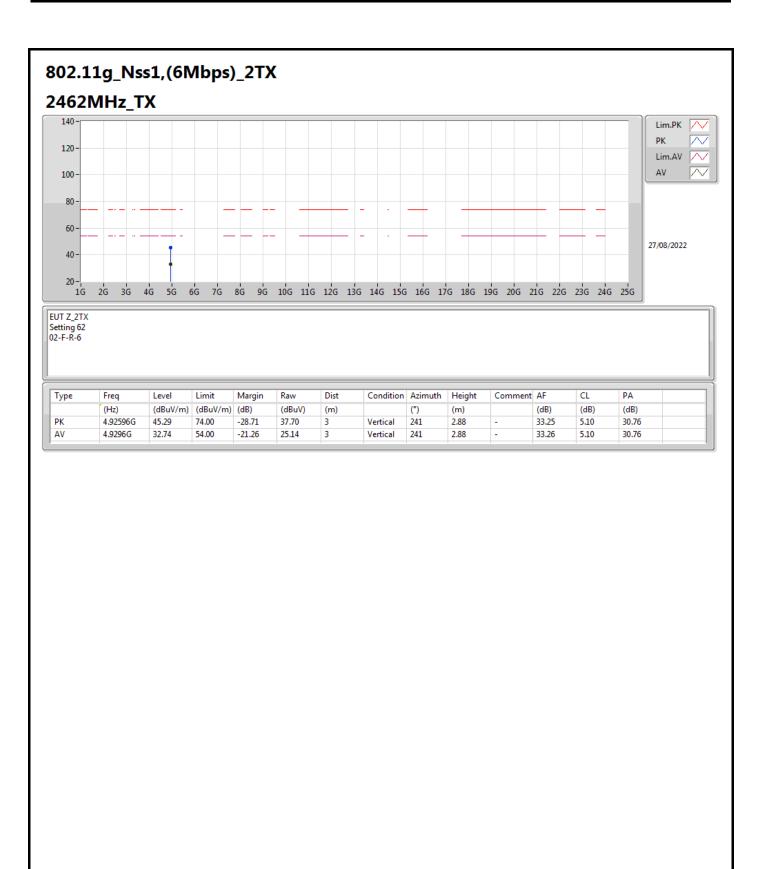




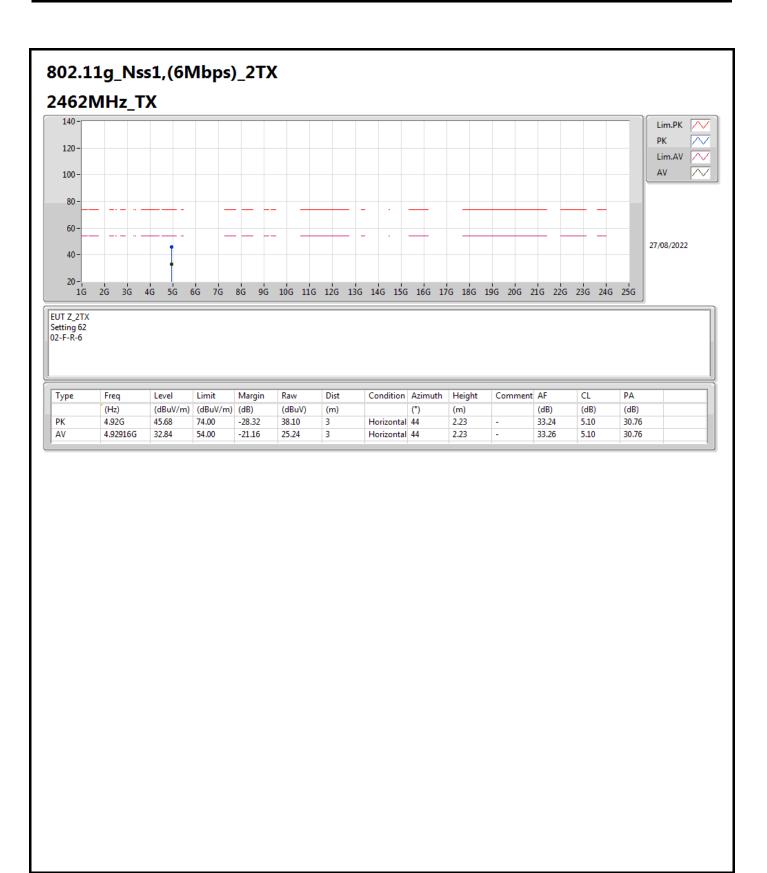










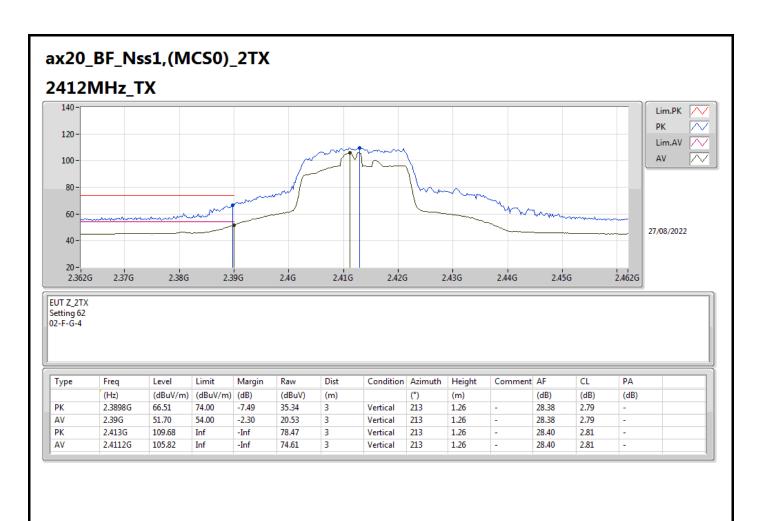




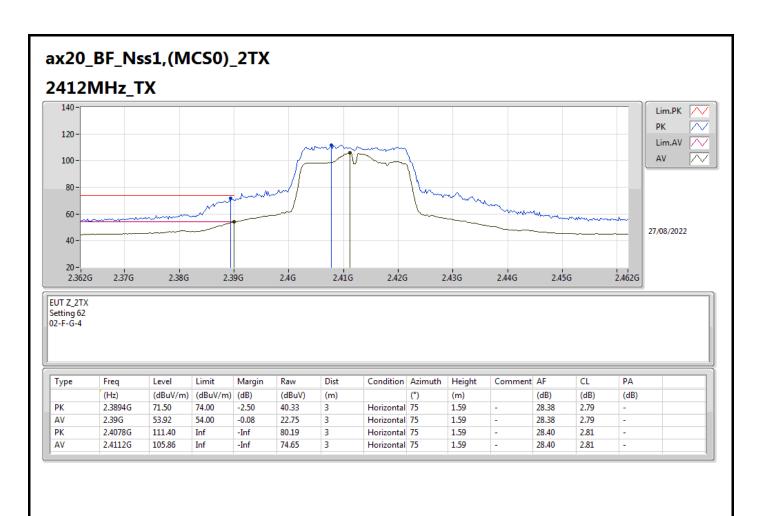
## Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-
ax40_BF_Nss1,(MCS0)_2TX	Pass	AV	2.4835G	53.98	54.00	-0.02	3	Horizontal	330	1.25	-

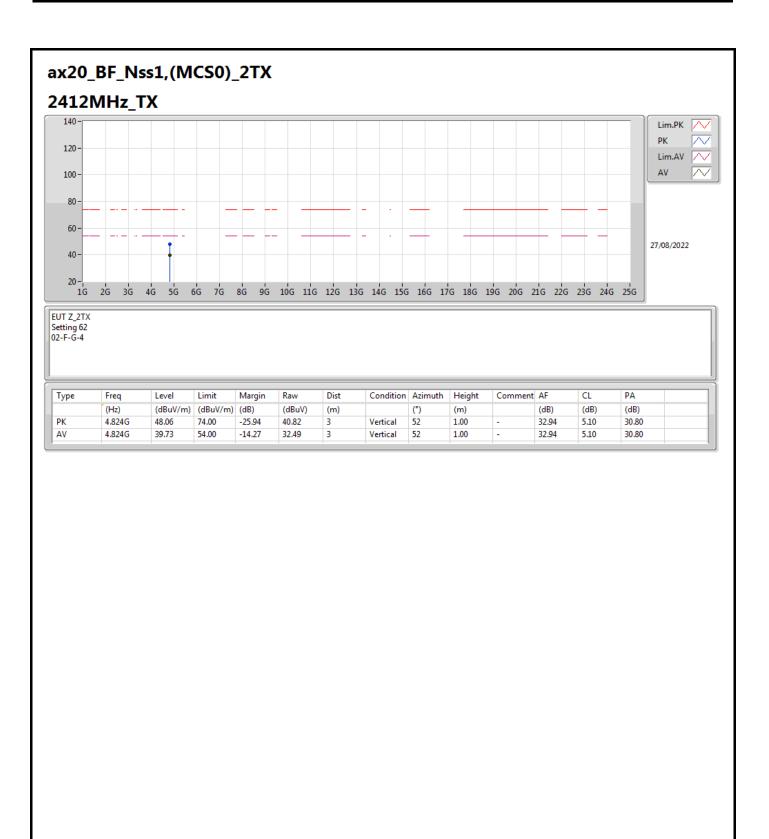




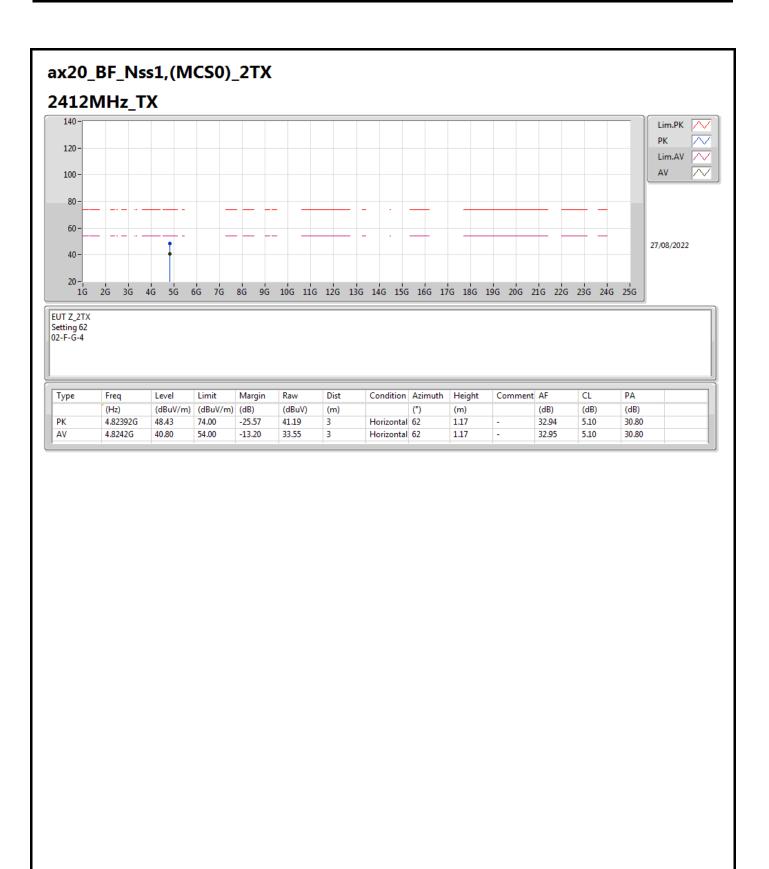




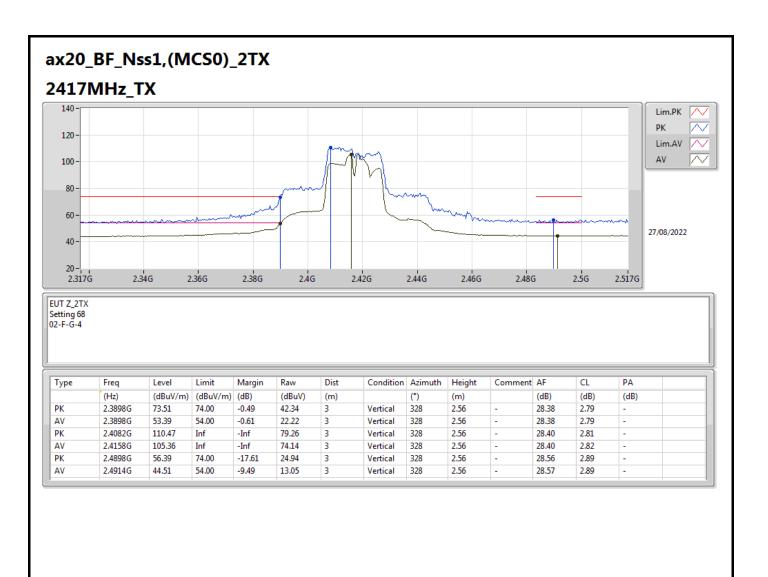




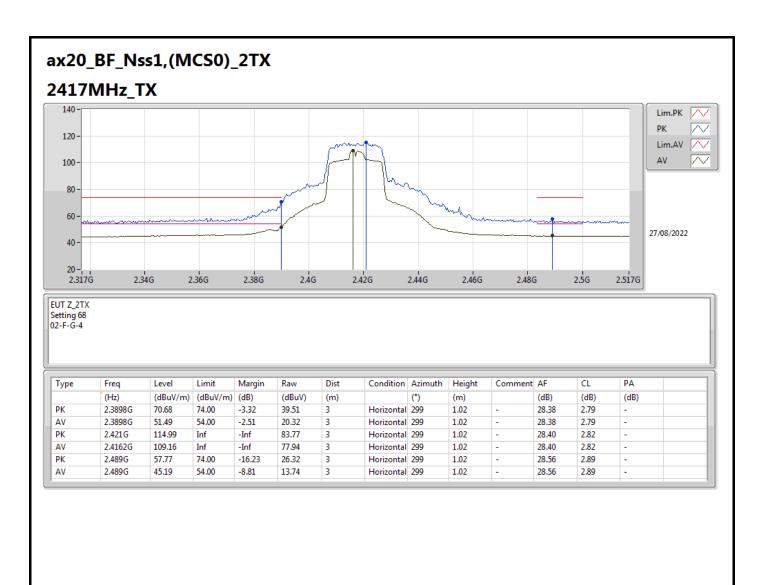




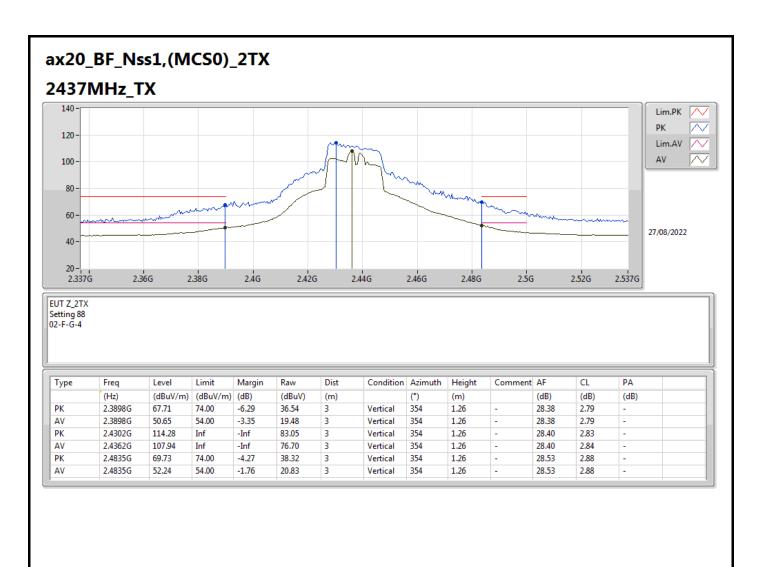




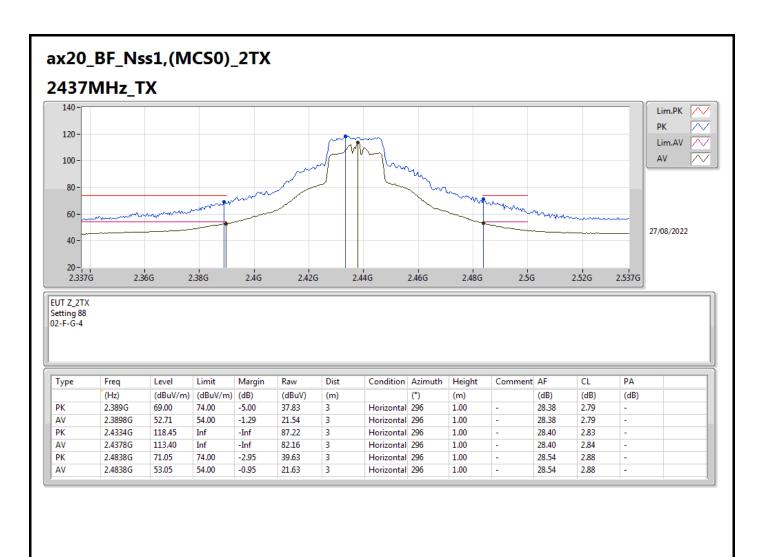




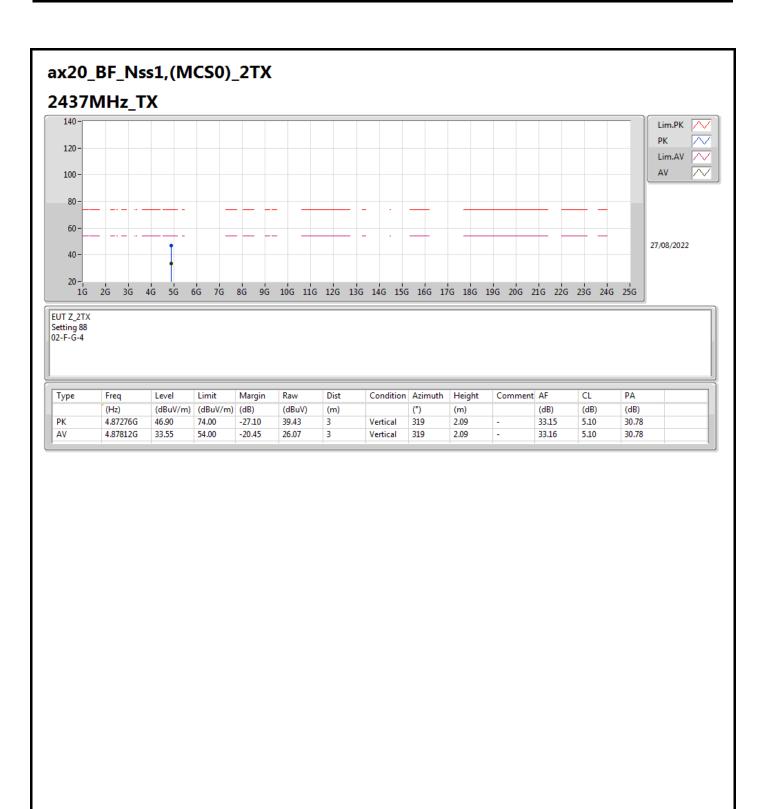




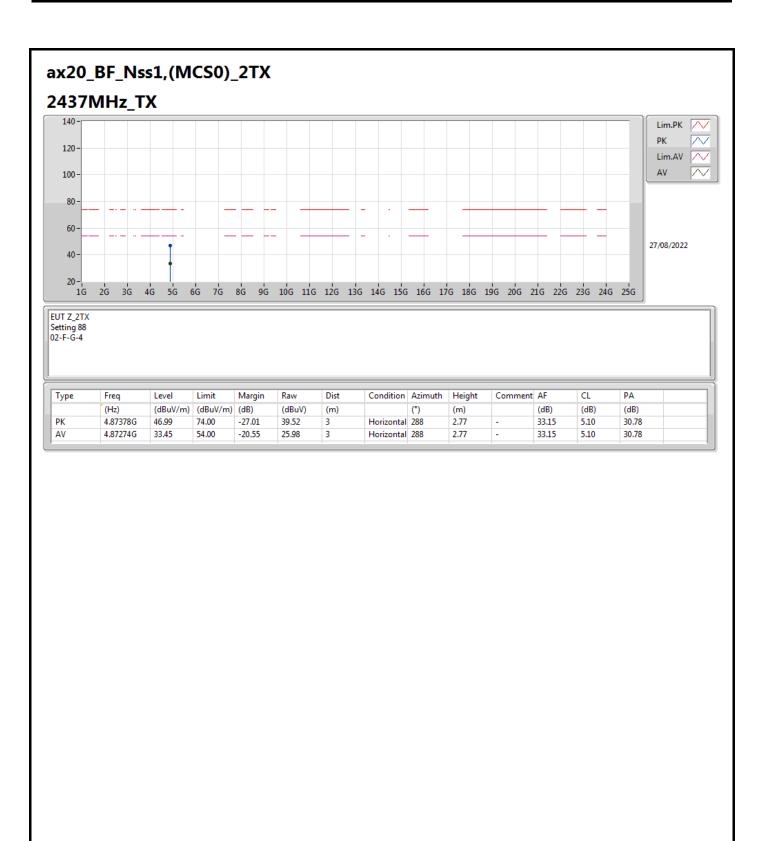




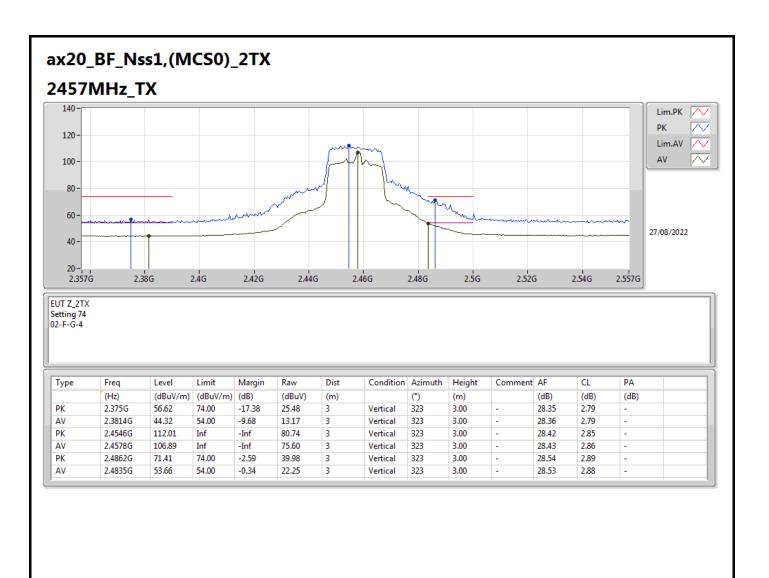




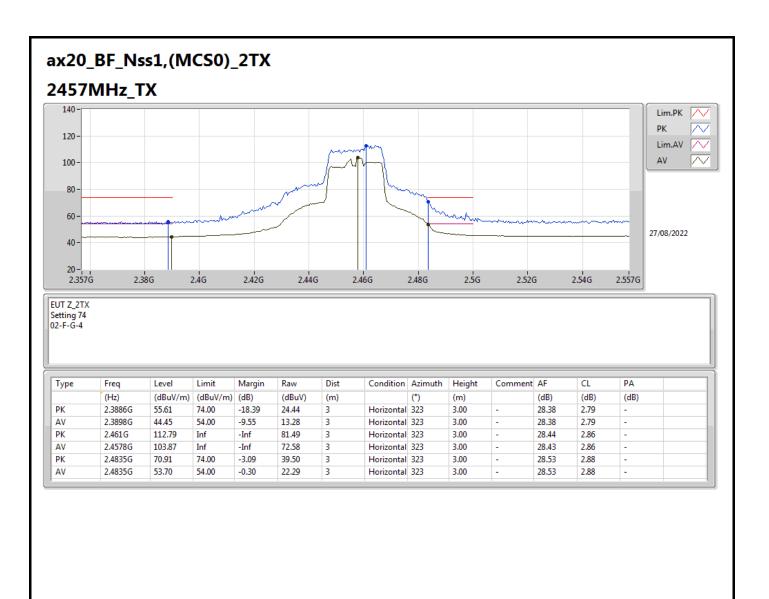




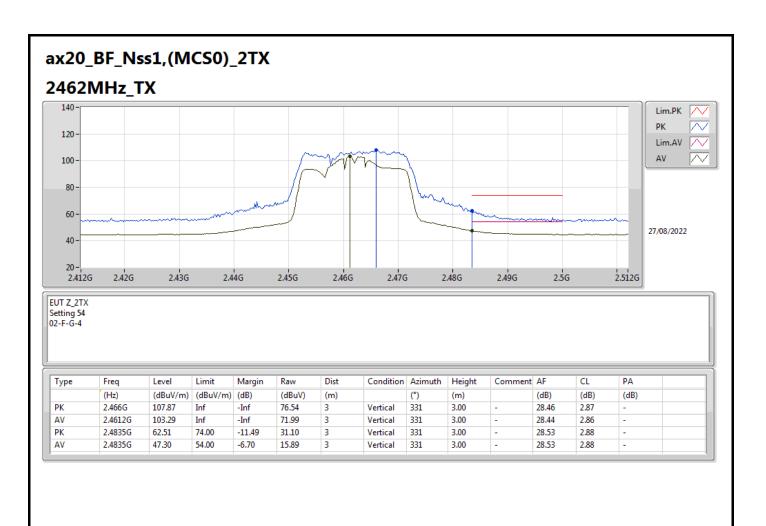




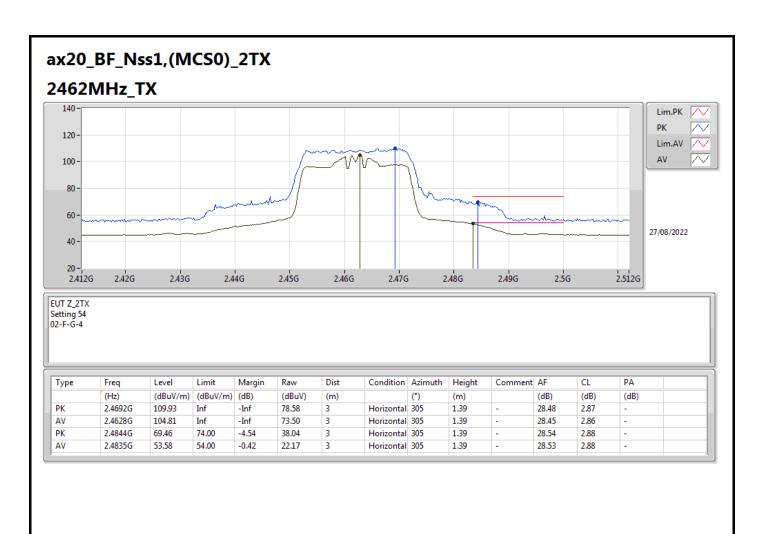




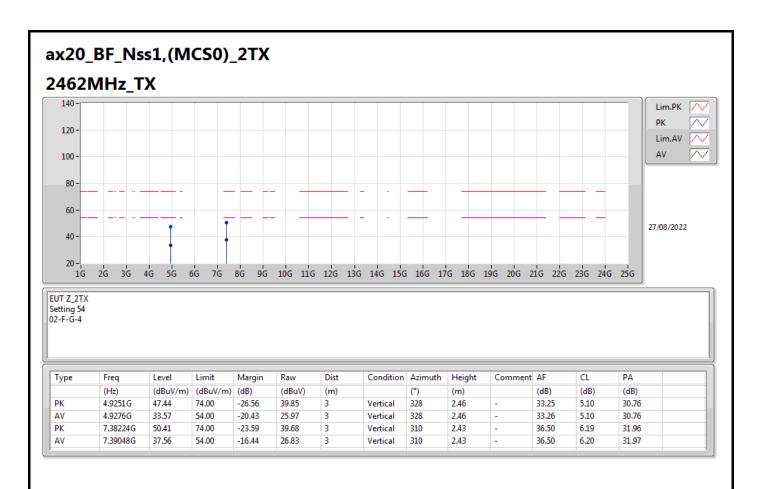




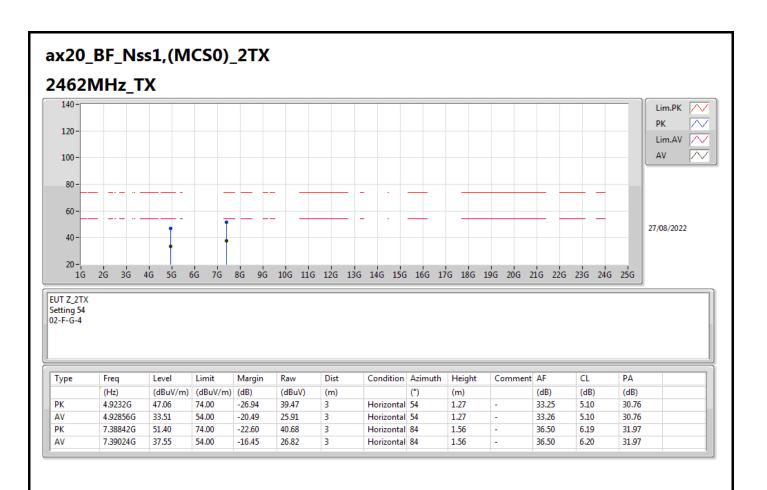




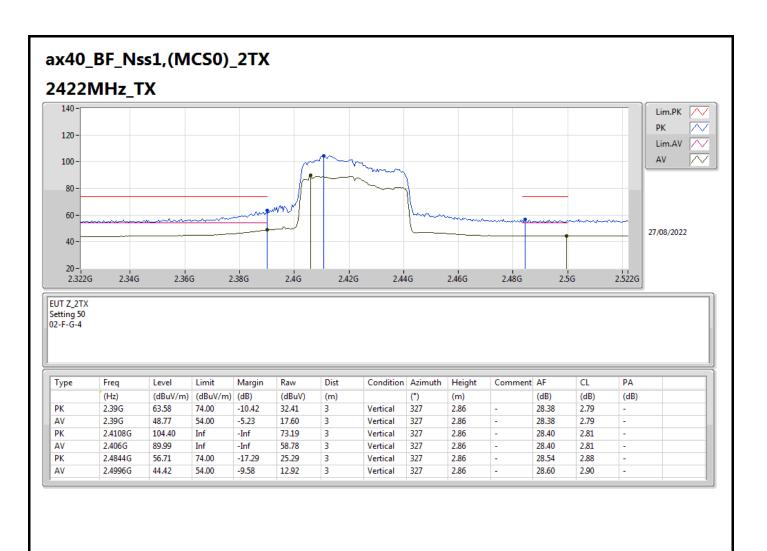




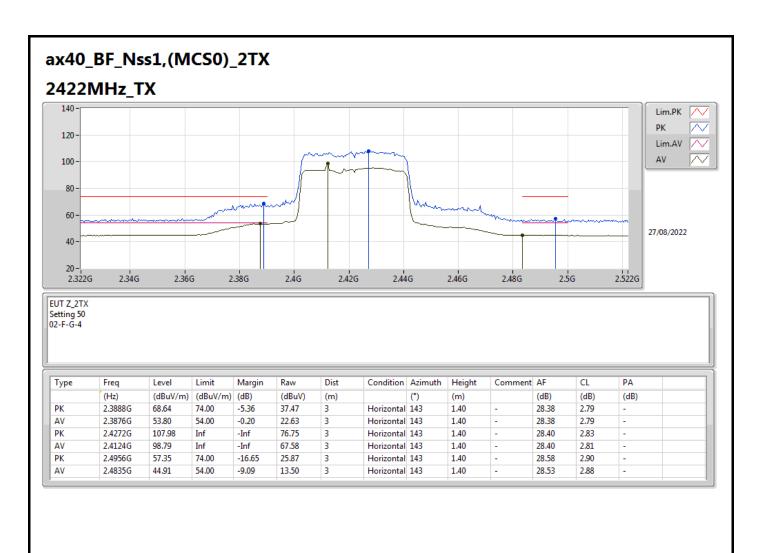




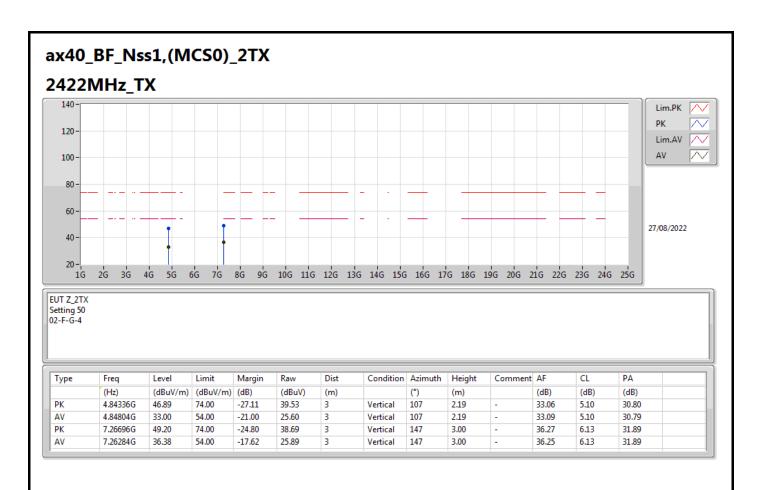




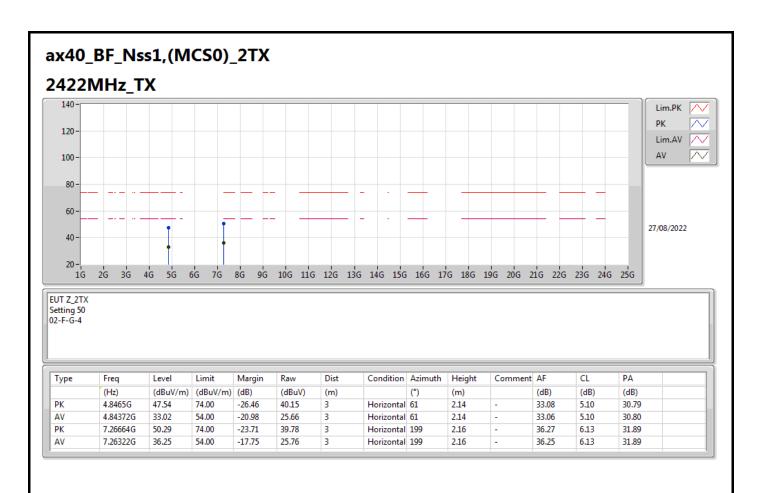




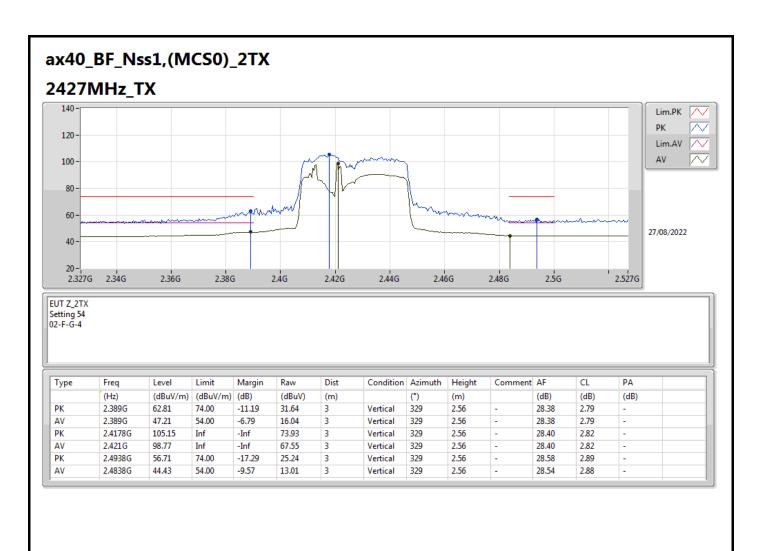




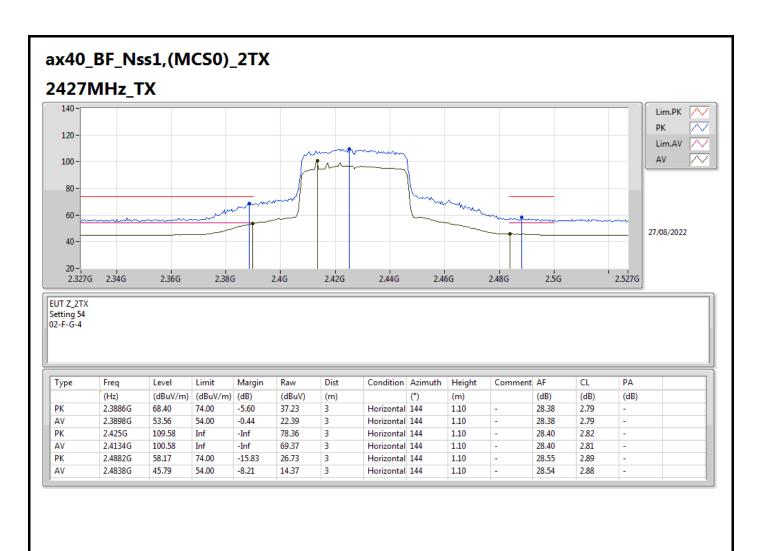




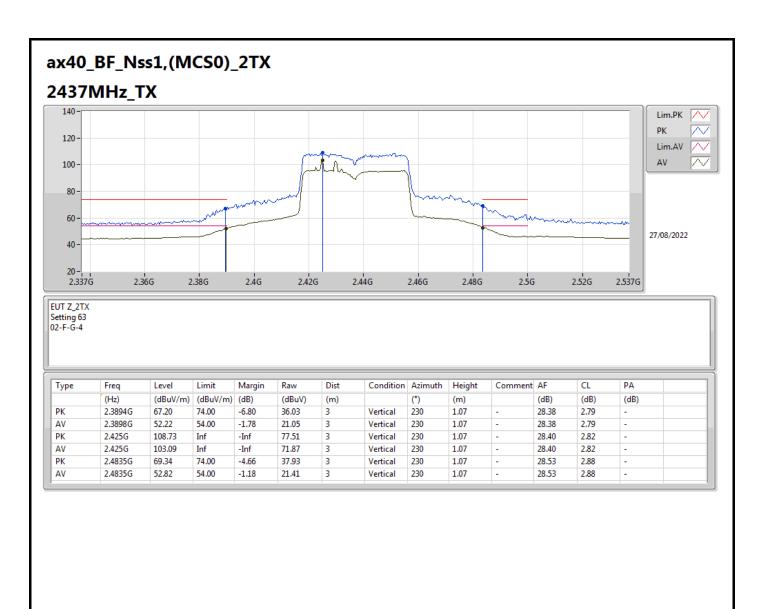




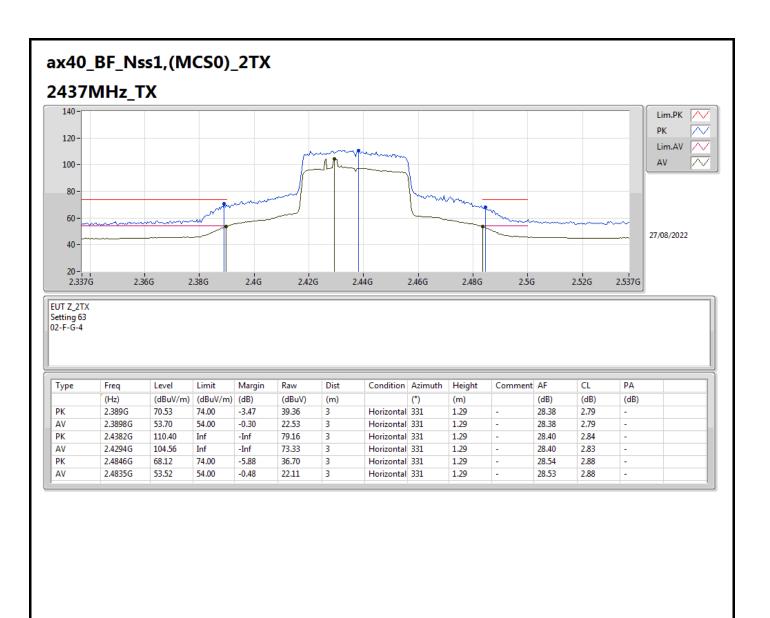




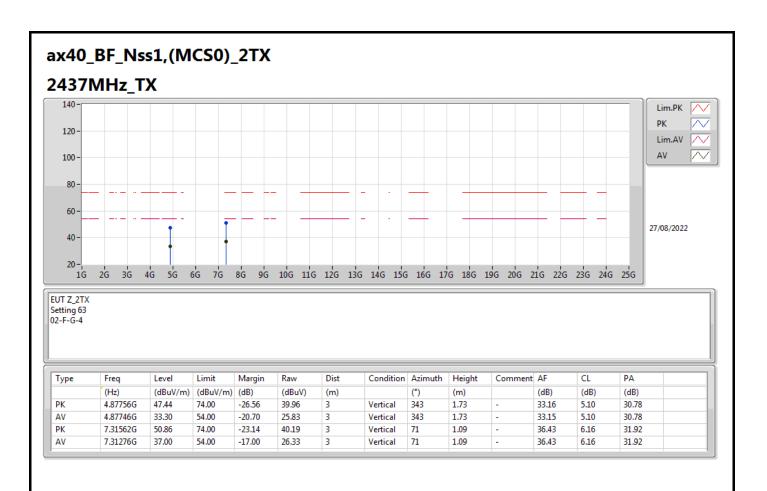




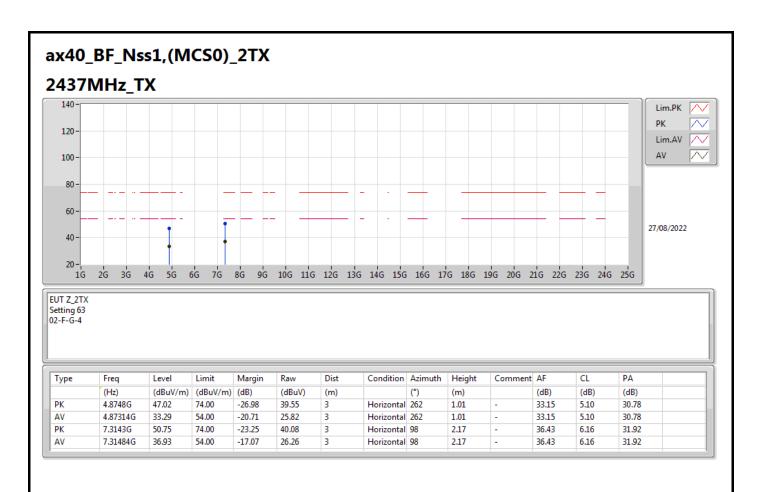




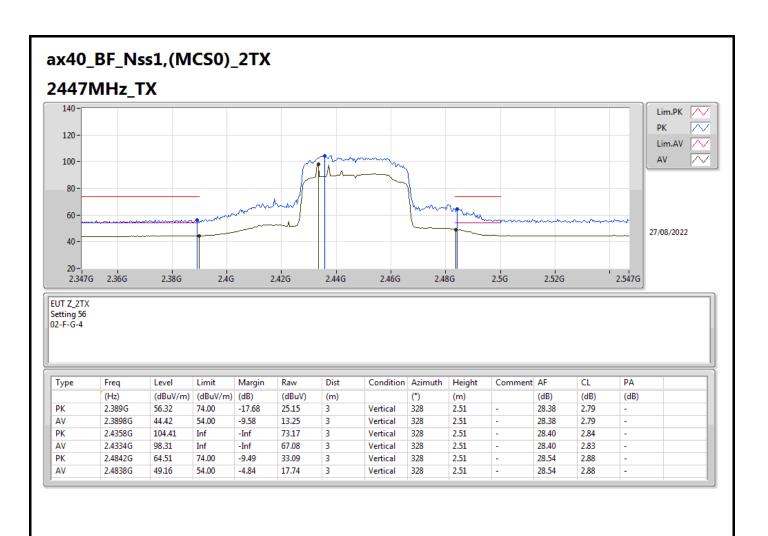




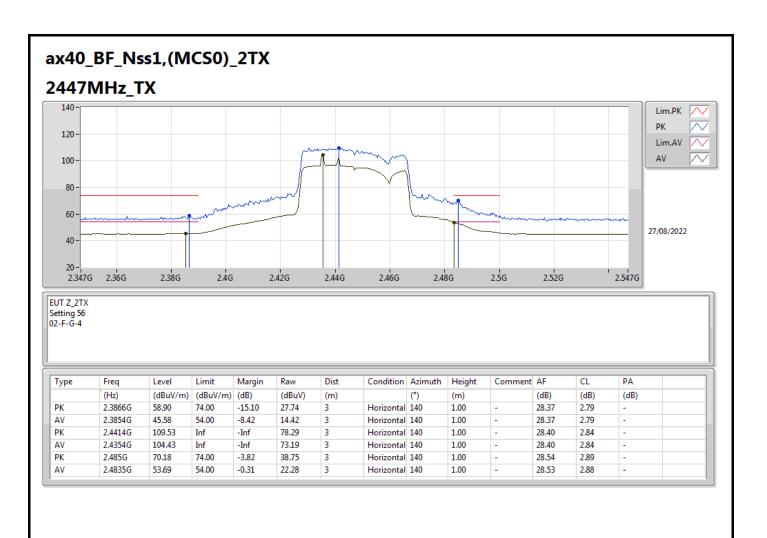




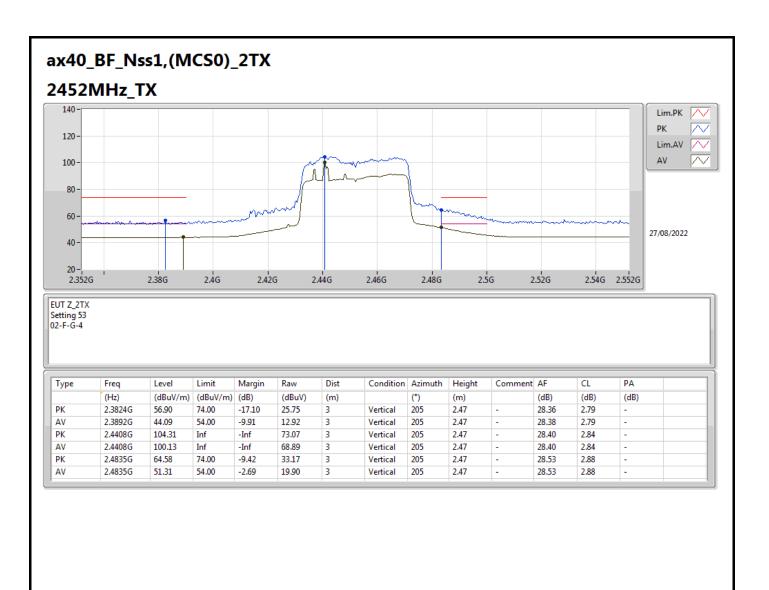




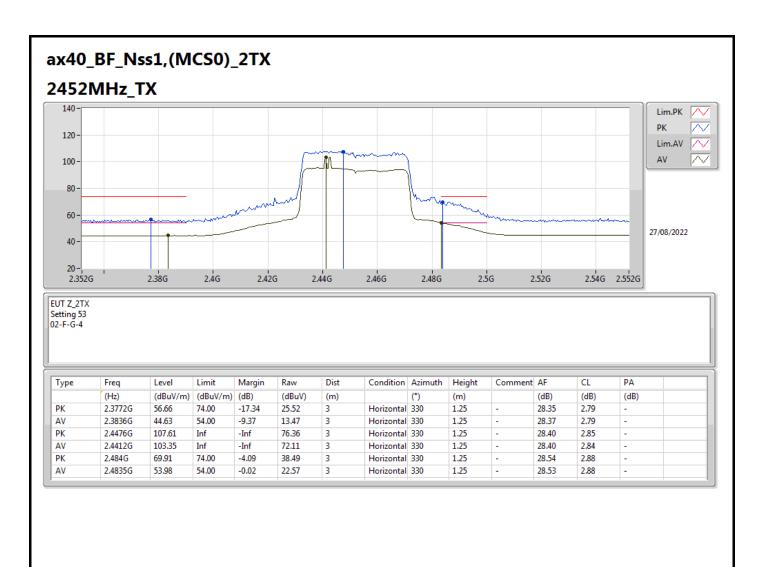




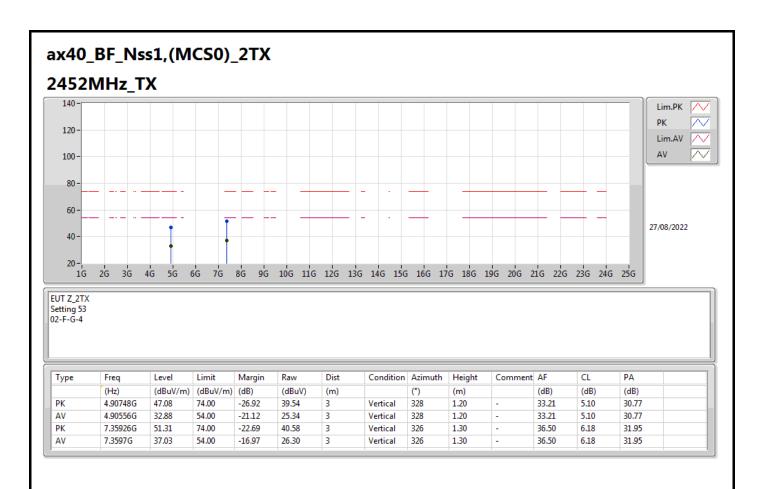




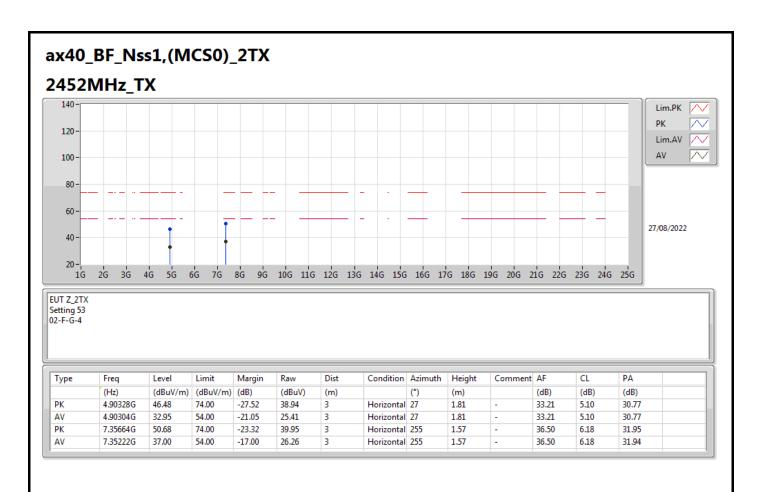














## Radiated Emission Co-location

# Appendix G

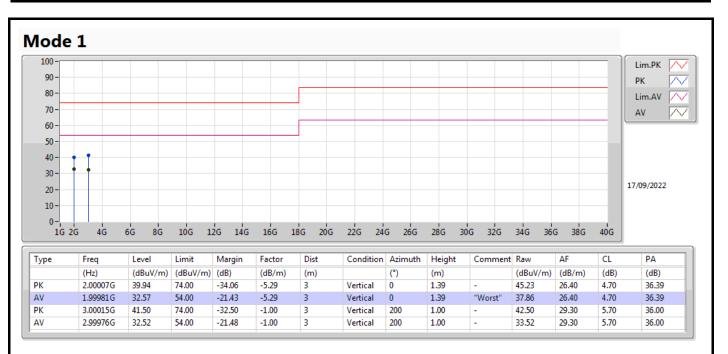
Summary	
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Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 1	Pass	AV	2.99979G	34.03	54.00	-19.97	Horizontal



#### **Radiated Emission Co-location**

# Appendix G





### **Radiated Emission Co-location**

## Appendix G

