

Radio Test Report

Equipment : 802.11a/b/g/n/ac RTL8821CE Combo module
Brand Name : REALTEK
Model No. : RTL8821CE
FCC ID : TX2-RTL8821CE
Standard : 47 CFR FCC Part 15.247
(Modified to account for the Chile's allocation of 2400-2483.5 MHz)
Operating Band : 2400 MHz – 2483.5 MHz
Function : ☒ Point-to-multipoint; ☐ Point-to-point
Applicant : Realtek Semiconductor Corp.
No. 2, Innovation Road II, Hsinchu Science Park,
Hsinchu 300, Taiwan
Manufacturer : Realtek Semiconductor Corp.
No. 2, Innovation Road II, Hsinchu Science Park,
Hsinchu 300, Taiwan

The product sample received on Sep. 30, 2016 and completely tested on Nov. 29, 2016. We, SPORTON, 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. (Modified to account for the Chile's allocation of 2400-2483.5 MHz)

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


Cliff Chang
SPORTON INTERNATIONAL INC.





Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Testing Applied Standards	8
1.3	Testing Location Information	8
1.4	Measurement Uncertainty	8
2	TEST CONFIGURATION OF EUT	9
2.1	Test Channel Mode	9
2.2	The Worst Case Measurement Configuration.....	10
2.3	EUT Operation during Test	13
2.4	Accessories	14
2.5	Support Equipment.....	14
2.6	Test Setup Diagram	15
3	TRANSMITTER TEST RESULT	18
3.1	AC Power-line Conducted Emissions	18
3.2	DTS Bandwidth	20
3.3	Maximum EIRP Output Power Measurement	21
3.4	Power Spectral Density	23
3.5	Emissions in Non-restricted Frequency Bands	25
3.6	Emissions in Restricted Frequency Bands.....	26
4	TEST EQUIPMENT AND CALIBRATION DATA	30
APPENDIX A. TEST RESULTS OF AC POWER-LINE CONDUCTED EMISSIONS		
APPENDIX B. TEST RESULTS OF DTS BANDWIDTH		
APPENDIX C. TEST RESULTS OF MAXIMUM EIRP OUTPUT POWER		
APPENDIX D. TEST RESULTS OF POWER SPECTRAL DENSITY		
APPENDIX E. TEST RESULTS OF EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS		
APPENDIX F. TEST RESULTS OF EMISSIONS IN RESTRICTED FREQUENCY BANDS		
APPENDIX G. TEST RESULTS OF RADIATED EMISSION CO-LOCATION		
APPENDIX H. TEST PHOTOS		
APPENDIX I. ANTENNA LIST		

Summary of Test Result

Conformance Test Specifications (Modified to account for the Chile's allocation of 2400-2483.5 MHz)				
Report Clause	Ref. Std. Clause	Description	Limit	Result
1.1.2	15.203	Antenna Requirement	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	FCC 15.207	Complied
3.2	15.247(a)	DTS Bandwidth	≥500kHz	Complied
3.3	15.247(b)	Maximum EIRP Output Power	Power [dBm]:21.76	Complied
3.4	15.247(e)	Power Spectral Density	PSD [dBm/3kHz]:8	Complied
3.5	15.247(d)	Emissions in Non-restricted Frequency Bands	Non-Restricted Bands: > 30 dBc	Complied
3.6	15.247(d)	Emissions in Restricted Frequency Bands	Restricted Bands: FCC 15.209	Complied



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FCC ID: TX2-RTL8821CE

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), ac (VHT20)	2412-2472	1-13 [13]
2400-2483.5	n (HT40), ac (VHT40)	2422-2462	3-11 [9]

Band	Mode	BWch (MHz)	Nant
2.4G	11b	20	1
2.4G	11g	20	1
2.4G	HT20	20	1
2.4G	VHT20	20	1
2.4G	HT40	40	1
2.4G	VHT40	40	1

Note:

- ♦ 2.4G is the 2.4GHz Band (2.4-2.4835GHz).
- ♦ 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.
- ♦ BWch is the nominal channel bandwidth.
- ♦ Nss-Min is the minimum number of spatial streams.
- ♦ Nant is the number of outputs. e.g., 2(2,3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
					2.4GHz	5GHz
1	LYNwave	ALA110-222050-300011	PIFA Antenna	IPEX MHF4	3.5	5
2	PSA	RFDPA171320EMLB301	Dipole Antenna	IPEX MHF4	3.14	5

Note: 1. The EUT has two types of antenna and there are above only records higher gain of same type antenna.

2. For more information, refer to Appendix I. Antenna List.

3. There are four configurations for EUT.

4. Chain 1: Connect to Ant. 1 or Ant. 2, Chain 2: Connect to Ant. 1 or Ant. 2

EUT	Configuration	Antenna Chain	Description
EUT 1	Config.1 Diversity	2 chains	The EUT supports the antenna with TX/RX diversity function for WLAN and Bluetooth. (Ex. Assume chain 1 was selected to conduct transmitting function in WLAN, so chain 2 was selected in Bluetooth Mode. Vice versa.) WLAN 2.4GHz and Bluetooth will be transmitting from the different chains; WLAN 5GHz and Bluetooth will be transmitting from the same chain. WLAN function (1TX, 1RX) / Bluetooth function (1TX, 1RX) The EUT supports 1TX/1RX function, and it supports TX/RX diversity function. Both chain 1 and chain 2 could be used as transmitting/receiving antenna, but only one of them could transmit/receive at the same time.
EUT 2	Config.2 Fixed	2 chains	WLAN function (1TX, 1RX) / Bluetooth function (1TX, 1RX) Chain 2 is designated for WLAN (2.4GHz), Chain 1 is designated for WLAN (5GHz) and Bluetooth.
EUT 3	Config.3 Single	1 chain	WLAN function (1TX, 1RX) / Bluetooth function (1TX, 1RX) WLAN and BT share a common chain, where WLAN (2.4GHz) and BT couldn't transmit/receive at the same time, but WLAN (5GHz) and BT could transmit/receive at the same time.
EUT 4	Config.4 Single	1 chain	WLAN function (1TX, 1RX) / Bluetooth function (1TX, 1RX) WLAN and BT share a common chain, where WLAN (2.4GHz) and BT couldn't transmit/receive at the same time, but WLAN (5GHz) and BT could transmit/receive at the same time.

Note 1: After evaluating, EUT 1 has been evaluated to be the worst case, so it was performed for all tests.

For WLAN 2.4GHz function:

Chain 2 generated the worst case in configuration 1, so it was selected to test and record in the report.

For WLAN 5GHz and Bluetooth function:

Chain 1 generated the worst case in configuration 1, so it was selected to test and record in the report.

Note 2: EUT 3 and EUT 4 were retested Emissions in Restricted Frequency Bands for 2.4GHz and

Unwanted Emissions for 5GHz only. And after evaluating, the worst case is found at 802.11b/g CH13 and 5GHz 802.11a CH 36, 802.11ac VHT40 CH62, and retest this channel only.

1.1.3 Mode Test Duty Cycle

Mode	DC	T(s)	VBW(Hz) $\geq 1/T$
11b	0.985	n/a (DC $\geq$ 0.98)	n/a (DC $\geq$ 0.98)
11g	0.981	n/a (DC $\geq$ 0.98)	n/a (DC $\geq$ 0.98)
VHT20	0.985	n/a (DC $\geq$ 0.98)	n/a (DC $\geq$ 0.98)
VHT40	0.981	n/a (DC $\geq$ 0.98)	n/a (DC $\geq$ 0.98)

1.1.4 EUT Operational Condition

EUT Power Type	From host system		
Beamforming Function	☐ With beamforming	☒ Without beamforming	

1.2 Testing Applied Standards

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

- ♦ 47 CFR FCC Part 15
- ♦ ANSI C63.10-2013
- ♦ FCC KDB 558074 D01 v03r05
- ♦ FCC KDB 662911 D01 v02r01
- ♦ FCC KDB 644545 D01 v01r02

1.3 Testing Location Information

Testing Location				
☐	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.	TEL : 886-3-327-3456	FAX : 886-3-318-0055
☒	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°C / 58%	Nov. 15, 2016 Nov. 23 2016
RF Conducted (Maximum EIRP Output Power)	TH01-CB	Gary Chu	24°C / 58%	Nov. 28 2016
Radiated	03CH01-CB	Lucke Hsieh, Paul Chen	22°C / 54%	Oct. 20, 2016 Nov. 29, 2016
AC Conduction	CO01-CB	Kane Liu	23°C / 60%	Oct. 15, 2016

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

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)	3.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Test Software Version	Realtek									
Mode	Test Frequency (MHz)									
	NCB: 20MHz					NCB: 40MHz				
	2412 MHz	2437 MHz	2462 MHz	2467 MHz	2472 MHz	2422 MHz	2437 MHz	2452 MHz	2457 MHz	2462 MHz
802.11b	38	43	43	35	26	-	-	-	-	-
802.11g	47	55	51	48	34	-	-	-	-	-
802.11ac MCS0/Nss1 VHT20	44	56	50	48	30	-	-	-	-	-
802.11ac MCS0/Nss1 VHT40	-	-	-	-	-	42	50	46	47	39

Note:

- ♦ Test range channel consist of L (Low Ch.), M (Middle Ch.), H (High Ch.), S (Single Ch.) and C (Straddle Band Ch.).
- ♦ 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.

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	EUT 1 with Ant. 1 (wireless 2.4GHz + Bluetooth 4.2)
2	EUT 1 with Ant. 1 (wireless 5GHz + Bluetooth 4.2)
Mode 1 has been evaluated to be the worst case between Mode 1~2, thus measurement for Mode 3 will follow this same test mode.	
3	EUT 1 with Ant. 2 (wireless 2.4GHz + Bluetooth 4.2)
For operating mode 1 is the worst case and it was record in this test report.	

The Worst Case Mode for Following Conformance Tests	
Tests Item	DTS Bandwidth Maximum EIRP Output Power Power Spectral Density Emissions in Non-restricted Frequency Bands
Test Condition	Conducted measurement at transmit chains
Test Mode	1 EUT 1 with Ant. 1

Note: For Conducted measurement Test: only the higher gain antenna "Ant. 1" was selected to perform the test and recorded in this report.

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emissions in Restricted Frequency Bands
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
Operating Mode < 1GHz	Normal Link
1	EUT 1 Y axis with Ant. 1 (wireless 2.4GHz + Bluetooth 4.2)
2	EUT 1 Y axis with Ant. 1 (wireless 5GHz + Bluetooth 4.2)
Mode 1 has been evaluated to be the worst case between Mode 1~2, thus measurement for Mode 3 will follow this same test mode.	
3	EUT 1 Z axis with Ant. 1 (wireless 2.4GHz + Bluetooth 4.2)
Mode 3 has been evaluated to be the worst case between Mode 1~3, thus measurement for Mode 4 will follow this same test mode.	
4	EUT 1 Z axis with Ant. 2 (wireless 2.4GHz + Bluetooth 4.2)
For operating mode 3 is the worst case and it was record in this test report.	
Operating Mode > 1GHz	CTX
The EUT was performed at X axis, Y axis and Z axis position for Radiated emission test, and the worst case was found at X axis. So the measurement will follow this same test configuration.	
1	EUT 1 X axis with Ant. 1
2	EUT 1 X axis with Ant. 2
3	EUT 3 X axis with Ant. 1
4	EUT 3 X axis with Ant. 2
5	EUT 4 X axis with Ant. 1
6	EUT 4 X axis with Ant. 2

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis
Test Condition	Radiated measurement
Operating Mode	Normal Link
1	EUT 1 X axis with Ant. 1 (wireless 2.4GHz + Bluetooth 4.2)
2	EUT 1 Y axis with Ant. 1 (wireless 2.4GHz + Bluetooth 4.2)
3	EUT 1 Z axis with Ant. 1 (wireless 2.4GHz + Bluetooth 4.2)
4	EUT 1 X axis with Ant. 1 (wireless 5GHz + Bluetooth 4.2)
5	EUT 1 Y axis with Ant. 1 (wireless 5GHz + Bluetooth 4.2)
6	EUT 1 Z axis with Ant. 1 (wireless 5GHz + Bluetooth 4.2)
7	EUT 1 X axis with Ant. 2 (wireless 2.4GHz + Bluetooth 4.2)
8	EUT 1 Y axis with Ant. 2 (wireless 2.4GHz + Bluetooth 4.2)
9	EUT 1 Z axis with Ant. 2 (wireless 2.4GHz + Bluetooth 4.2)
10	EUT 1 X axis with Ant. 2 (wireless 5GHz + Bluetooth 4.2)
11	EUT 1 Y axis with Ant. 2 (wireless 5GHz + Bluetooth 4.2)
12	EUT 1 Z axis with Ant. 2 (wireless 5GHz + Bluetooth 4.2)
Mode 3 has been evaluated to be the worst case between Mode 1~3, thus measurement for Mode 13 will follow this same test mode.	
13	EUT 4 Z axis with Ant. 1 (wireless 2.4GHz + Bluetooth 4.2)
Mode 6 has been evaluated to be the worst case between Mode 4~6, thus measurement for Mode 14 will follow this same test mode.	
14	EUT 4 Z axis with Ant. 1 (wireless 5GHz + Bluetooth 4.2)
Mode 9 has been evaluated to be the worst case between Mode 7~9, thus measurement for Mode 15 will follow this same test mode.	
15	EUT 4 Z axis with Ant. 2 (wireless 2.4GHz + Bluetooth 4.2)
Mode 12 has been evaluated to be the worst case between Mode 10~12, thus measurement for Mode 16 will follow this same test mode.	
16	EUT 4 Z axis with Ant. 2 (wireless 5GHz + Bluetooth 4.2)
Mode 3 has been evaluated to be the worst case between Mode 1~3, thus measurement for Mode 17 will follow this same test mode.	
17	EUT 3 Z axis with Ant. 1 (wireless 2.4GHz + Bluetooth 4.2)
Mode 6 has been evaluated to be the worst case between Mode 4~6, thus measurement for Mode 18 will follow this same test mode.	
18	EUT 3 Z axis with Ant. 1 (wireless 5GHz + Bluetooth 4.2)
Mode 9 has been evaluated to be the worst case between Mode 7~9, thus measurement for Mode 19 will follow this same test mode.	
19	EUT 3 Z axis with Ant. 2 (wireless 2.4GHz + Bluetooth 4.2)
Mode 12 has been evaluated to be the worst case between Mode 10~12, thus measurement for Mode 20 will follow this same test mode.	



20	EUT 3 Z axis with Ant. 2 (wireless 5GHz + Bluetooth 4.2)
Mode 18 and Mode 19 are worst test result among Mode 1 ~ Mode 20, and the test result of those two modes are selected to record in the test report. Refer to Sporton Test Report No.: FA692918-03 for Co-location RF Exposure Evaluation and Appendix G for Radiated Emission Co-location.	

2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.

2.4 Accessories

N/A

2.5 Support Equipment

For Test Site No: CO01-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB*2	DELL	E6430	DoC
2	Earphone	SHYARO CHI	MIC-04	DoC
3	Mouse	HP	FM100	DoC
4	Test fixture*2	REALTEK	N/A	N/A
5	AP Router	Planex	GW-AP54SGX	KA220030603014-1
6	Device	REALTEK	RTL8821CE	TX2-RTL8821CE

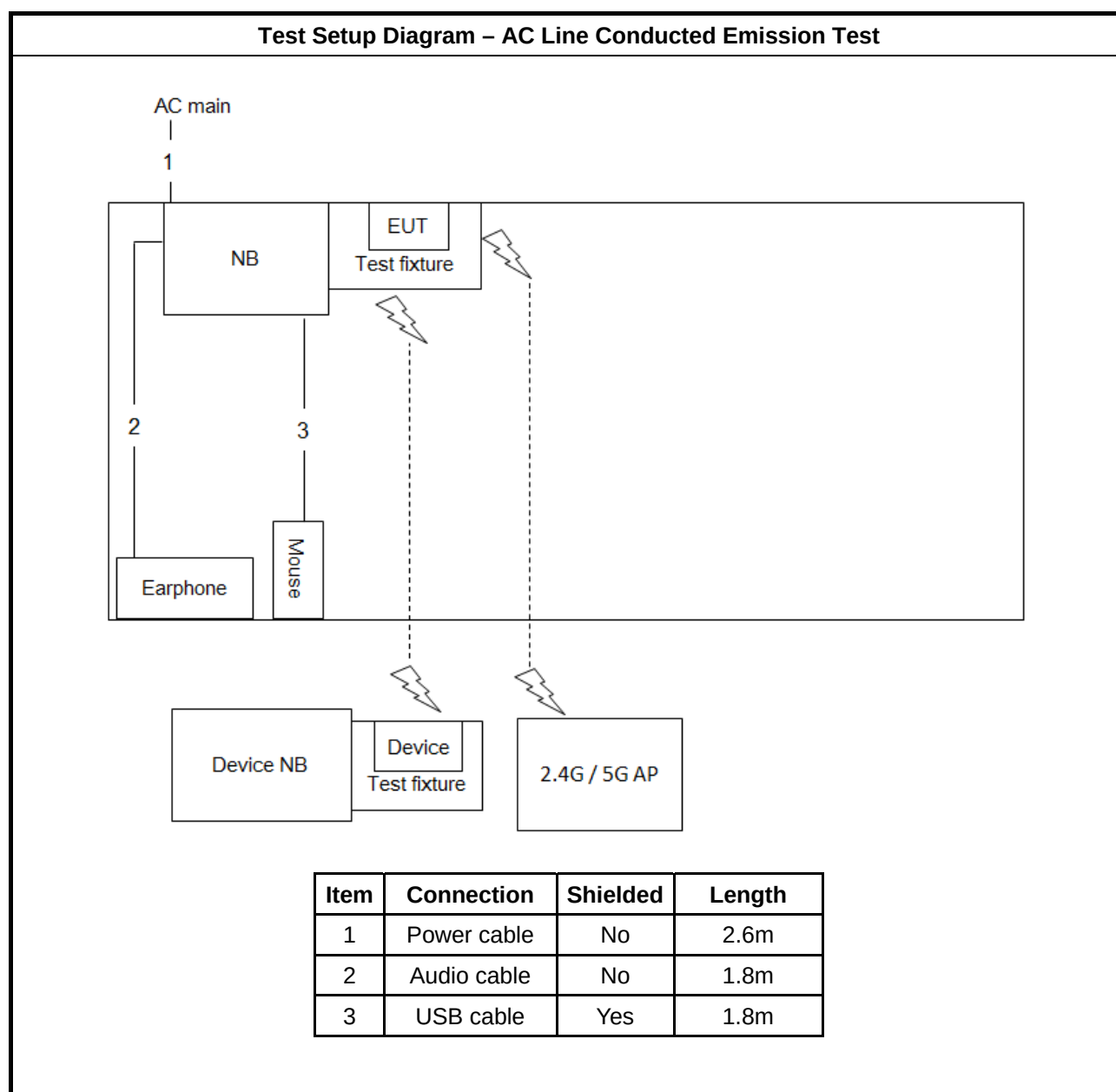
For Test Site No: 03CH01-CB (below 1GHz)

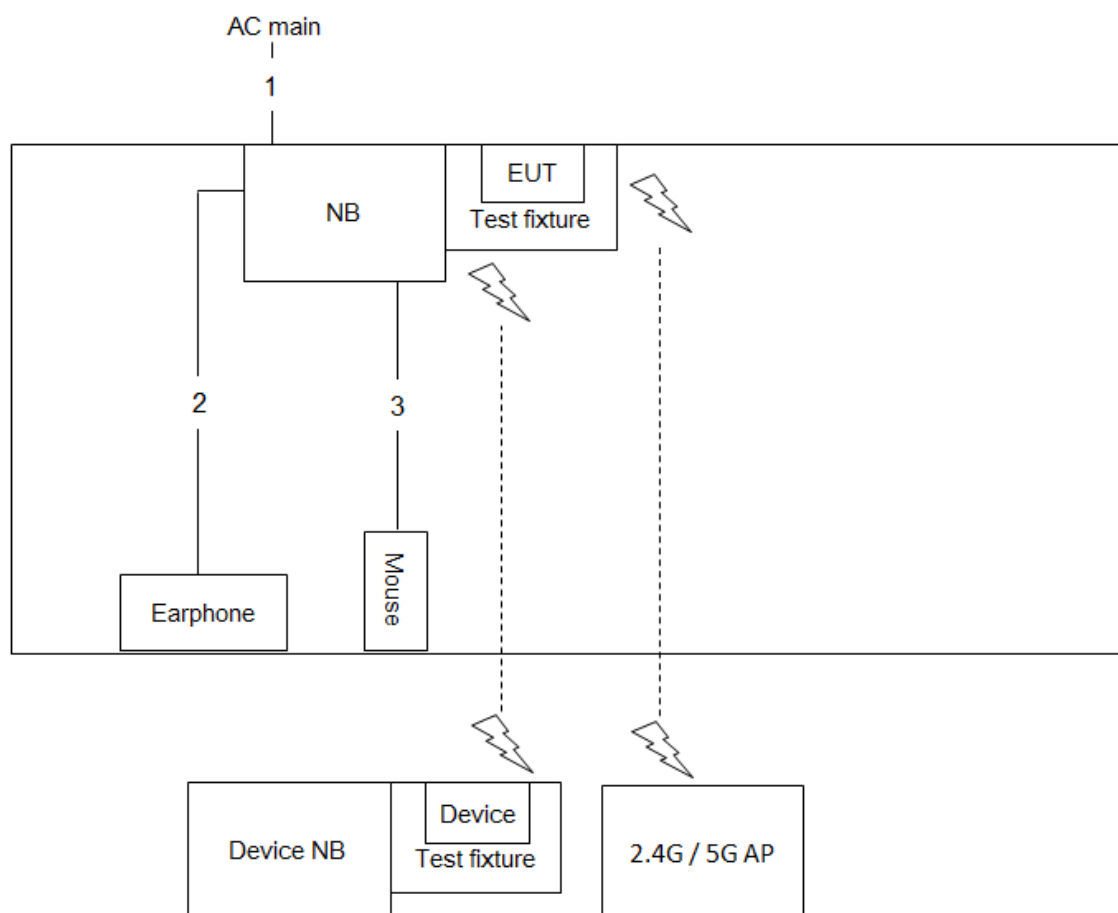
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB*2	DELL	E4300	DoC
2	Mouse	Logitech	M-U0026	DoC
3	Earphone	SHYARO CHI	MIC-04	N/A
4	Test fixture*2	REALTEK	N/A	N/A
5	WLAN AP	D-LINK	DIR860L	KA2IR860LA1
6	Device	REALTEK	RTL8821CE	TX2-RTL8821CE

For Test Site No: 03CH01-CB (above 1GHz) and TH01-CB

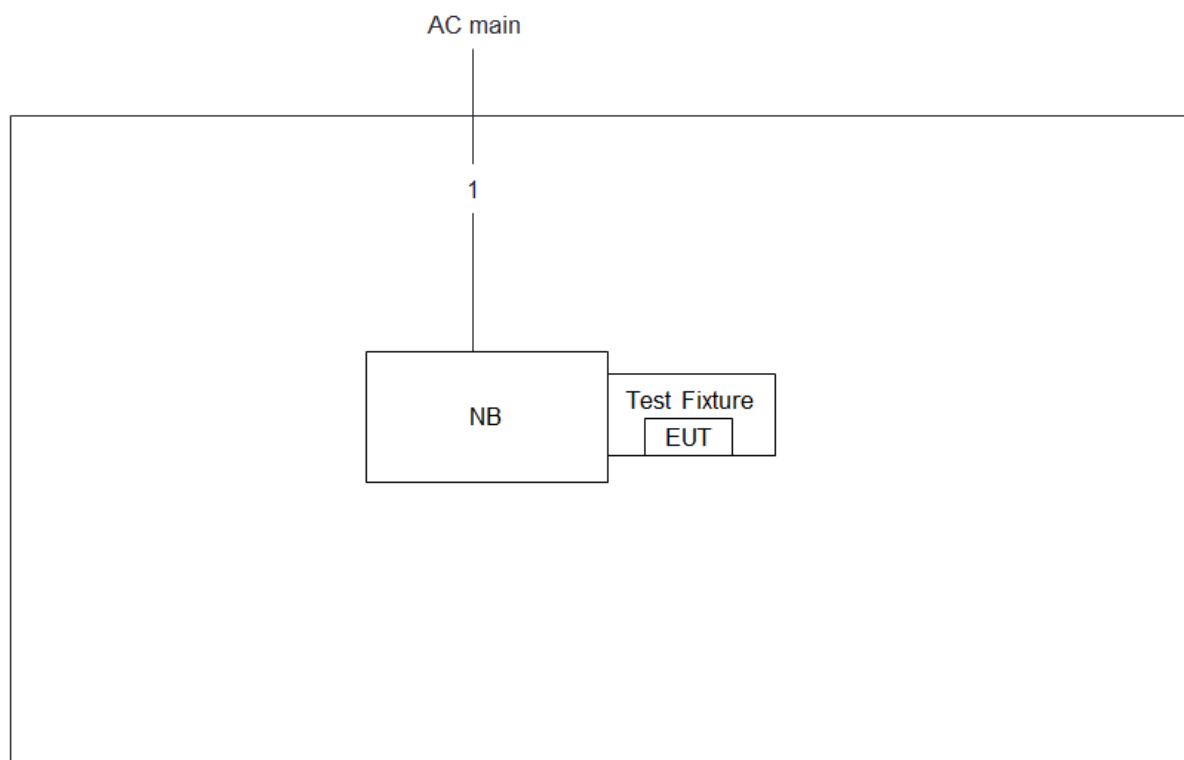
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E4300	DoC
2	Test fixture	REALTEK	N/A	N/A

2.6 Test Setup Diagram



Test Setup Diagram - Radiated Test < 1GHz


Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	Audio cable	No	1.1m
3	USB cable	Yes	1.8m

Test Setup Diagram - Radiated Test > 1GHz


Item	Connection	Shielded	Length
1	Power cable	No	1.5m

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.

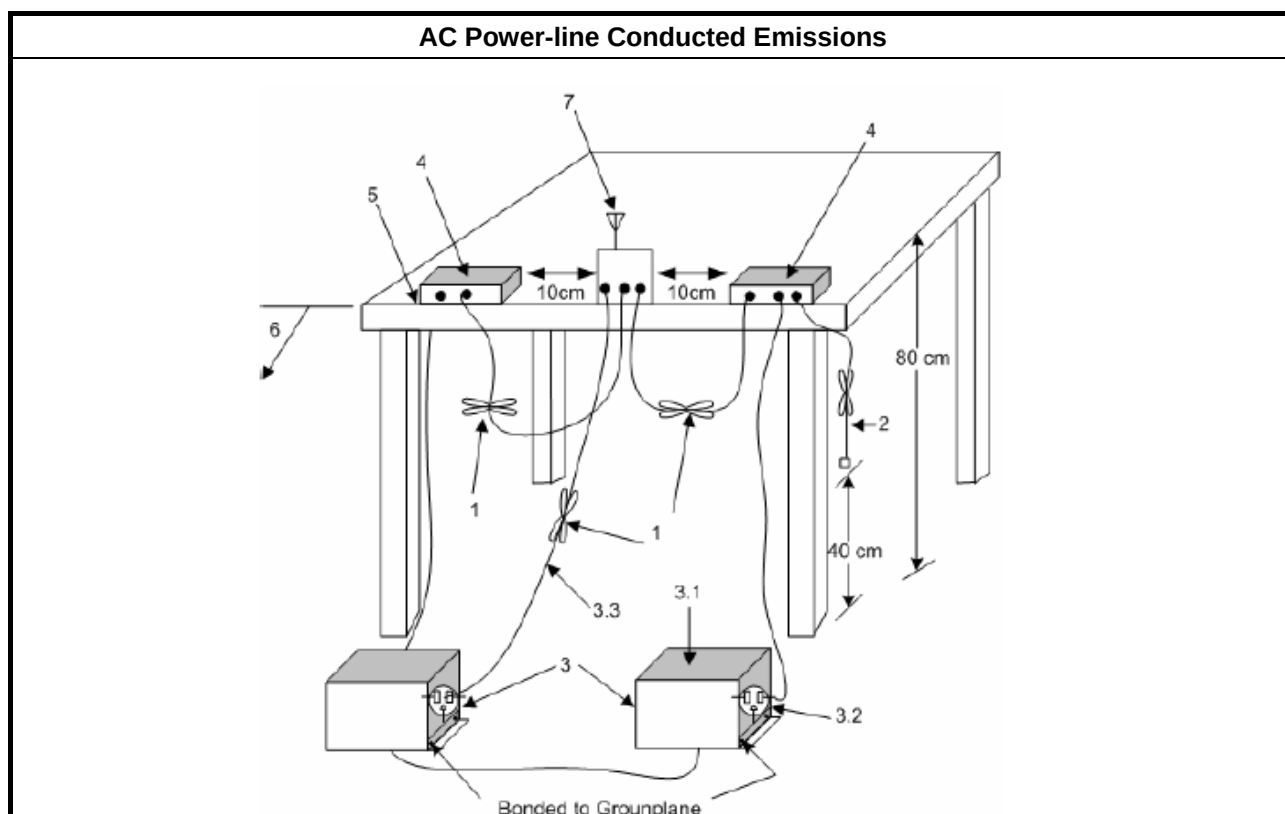
3.1.2 Measuring Instruments

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 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:	
▪	6 dB bandwidth $\geq$ 500 kHz.

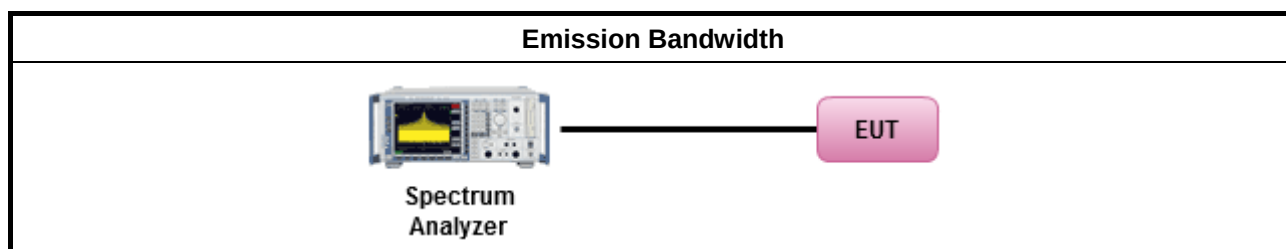
3.2.2 Measuring Instruments

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:
☒	Refer as FCC KDB 558074, clause 8.1 Option 1 for 6 dB bandwidth measurement.
☐	Refer as FCC KDB 558074, clause 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



3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

3.3 Maximum EIRP Output Power Measurement

3.3.1 Maximum EIRP Output Power Limit

The EIRP limit for output power is 21.76dB(150mW).

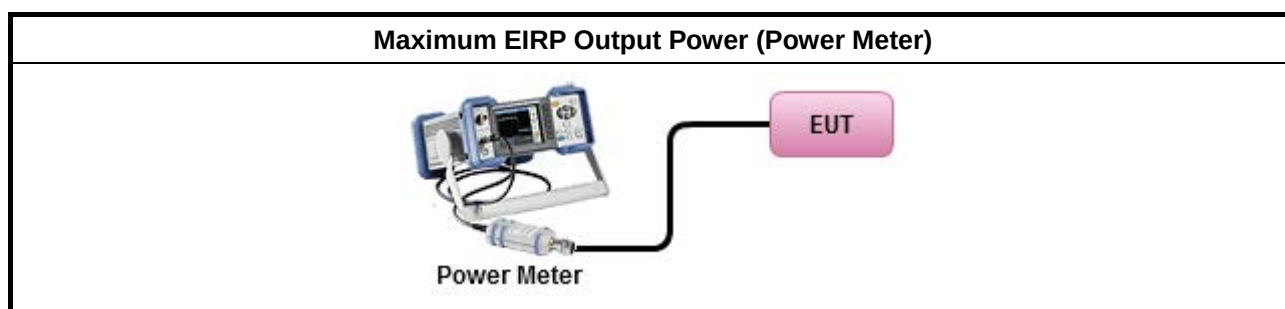
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method	
Maximum Peak Conducted Output Power	
☐	Refer as FCC KDB 558074, clause 9.1.1 Option 1 (RBW ≥ EBW method).
☐	Refer as FCC KDB 558074, clause 9.1.2 Option 2 (peak power meter for VBW ≥ DTS BW)
Maximum Conducted Output Power	
[duty cycle ≥ 98% or external video / power trigger]	
☐	Refer as FCC KDB 558074, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging).
☐	Refer as FCC KDB 558074, clause 9.2.2.3 Method AVGSA-1 Alt. (slow sweep speed)
duty cycle < 98% and average over on/off periods with duty factor	
☐	Refer as FCC KDB 558074, clause 9.2.2.4 Method AVGSA-2 (spectral trace averaging).
☐	Refer as FCC KDB 558074, clause 9.2.2.5 Method AVGSA-2 Alt. (slow sweep speed)
RF power meter and average over on/off periods with duty factor or gated trigger	
☒	Refer as FCC KDB 558074, clause 9.2.3 Method AVGPM-G (using an RF average power meter).
☐	Refer as FCC KDB 558074, clause 9.1.2 PKPM1 Peak power meter method.
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: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$	

3.3.4 Test Setup





3.3.5 Test Result of Maximum EIRP 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

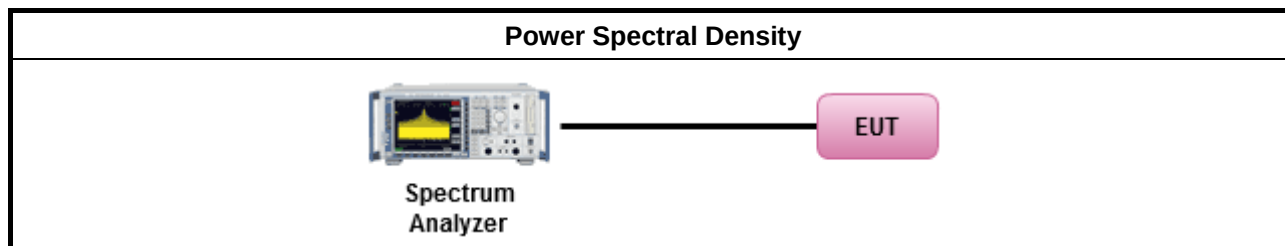
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method
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).
☒ Refer as FCC KDB 558074, clause 10.2 Method PKPSD (RBW=3-100kHz; Detector=peak). [duty cycle $\geq 98\%$ or external video / power trigger]
☐ Refer as FCC KDB 558074, clause 10.3 Method AVGPS-1 (spectral trace averaging).
☐ Refer as FCC KDB 558074, clause 10.4 Method AVGPS-2 (slow sweep speed)
duty cycle $< 98\%$ and average over on/off periods with duty factor
☐ Refer as FCC KDB 558074, clause 10.5 Method AVGPS-1 Alt (spectral trace averaging).
☐ Refer as FCC KDB 558074, clause 10.6 Method AVGPS-2 Alt. (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.

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 (dB)
Peak output power procedure	20
Average output power procedure	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.	

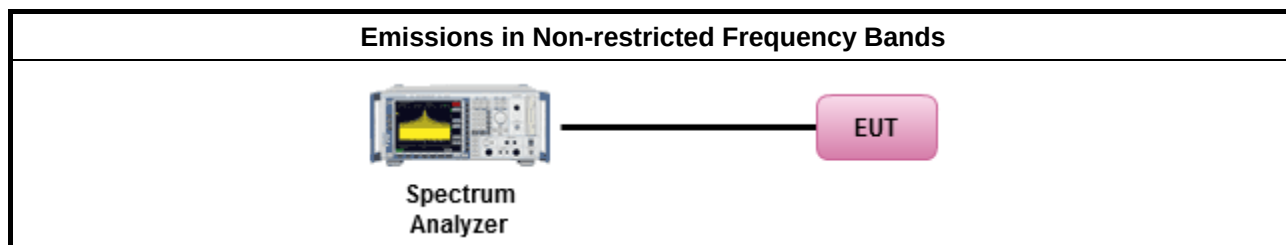
3.5.2 Measuring Instruments

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 11 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.

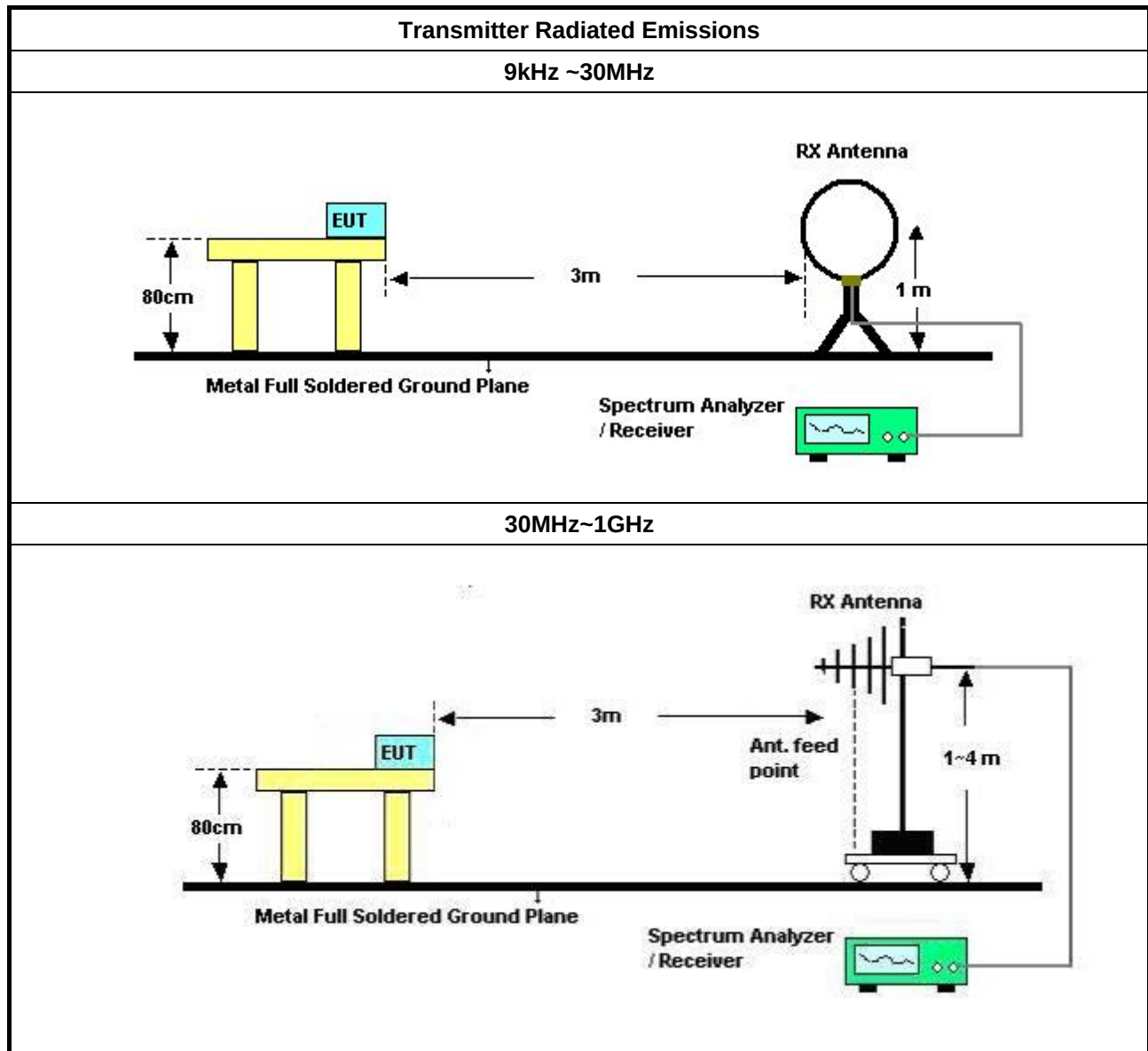
3.6.2 Measuring Instruments

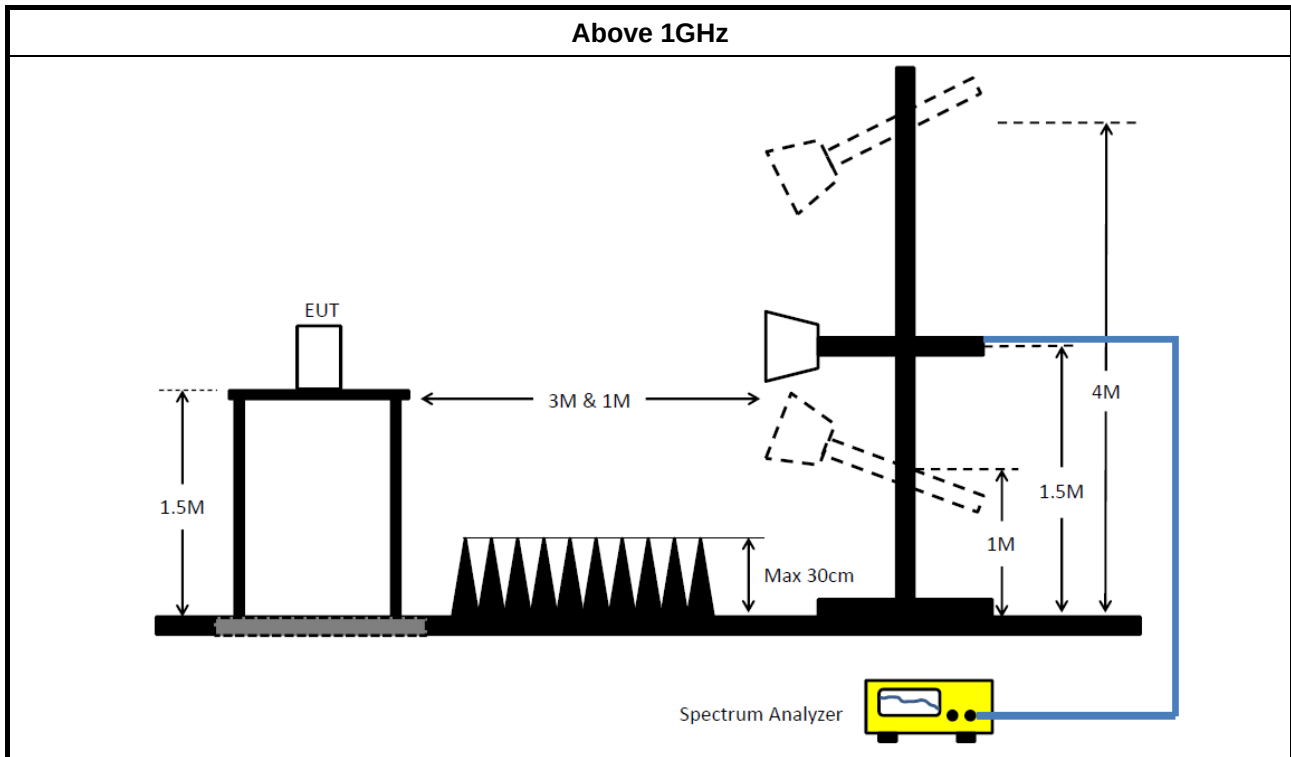
Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Test Method	
The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].	
Refer as ANSI C63.10, clause 6.9.2.2 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.	
For the transmitter unwanted emissions shall be measured using following options below:	
	Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
	☐ Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$)
	☐ Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
	☒ Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW $\geq 1/T$).
	☐ Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq 1/T$, where T is pulse time.
	☐ Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
	☒ Refer as FCC KDB 558074, clause 12.2.4 measurement procedure peak limit.
For the transmitter band-edge emissions shall be measured using following options below:	
	Refer as FCC KDB 558074 clause 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.
	Refer as FCC KDB 558074, clause 13.2 (ANSI C63.10, clause 6.9.3) for marker-delta method for band-edge measurements.
	Refer as FCC KDB 558074, clause 13.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2.	
	For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add $10 \log(N)$ dB
	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.

3.6.4 Test Setup





3.6.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

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

3.6.6 Test Result of Transmitter Radiated Unwanted Emissions

Refer as Appendix F



4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 27, 2016	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 08, 2015	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 23, 2015	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 24, 2016	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	TESEQ	CBL6112D	37880	20MHz ~ 2GHz	Aug. 30, 2016	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 10, 2016	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 25, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Mar. 15, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 18, 2016	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 21, 2016	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 16, 2016	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Oct. 24, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 24, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Oct. 24, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	18GHz ~ 40 GHz	Oct. 24, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)



Radio Test Report

Report No. : FR692918-03AA

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-high	Woken	High Cable-40G-2	N/A	18GHz ~ 40 GHz	Oct. 24, 2016	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-10-7	N/A	N/A	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 09, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY54320014	50MHz~18GHz	Apr. 20, 2016	Conducted (TH01-CB)

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

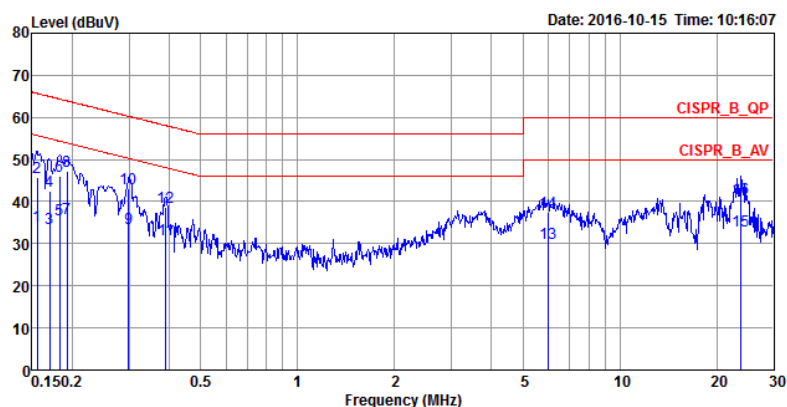
“*” Calibration Interval of instruments listed above is two years.

N.C.R means Non-Calibration required.



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Neutral
Operating Function	Normal Link		

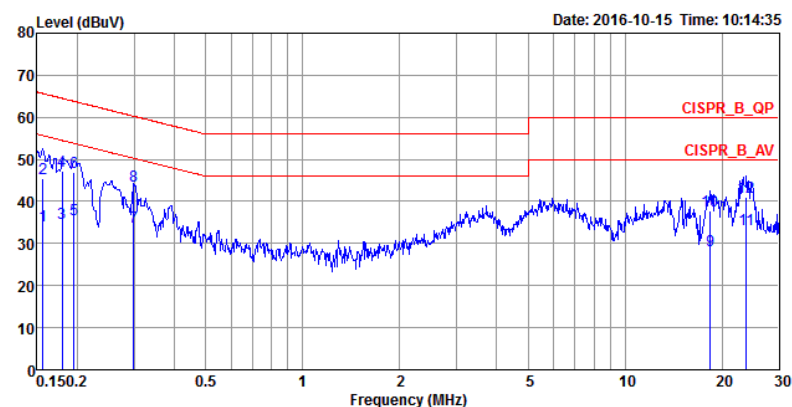


	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1557	34.37	-21.32	55.69	24.19	10.02	0.16	NEUTRAL	Average
2	0.1557	45.74	-19.95	65.69	35.56	10.02	0.16	NEUTRAL	QP
3	0.1703	33.52	-21.42	54.94	23.33	10.02	0.17	NEUTRAL	Average
4	0.1703	42.57	-22.37	64.94	32.38	10.02	0.17	NEUTRAL	QP
5	0.1825	35.83	-18.54	54.37	25.73	9.92	0.18	NEUTRAL	Average
6	0.1825	45.96	-18.41	64.37	35.86	9.92	0.18	NEUTRAL	QP
7	0.1924	35.97	-17.96	53.93	25.86	9.92	0.19	NEUTRAL	Average
8	0.1924	47.33	-16.60	63.93	37.22	9.92	0.19	NEUTRAL	QP
9	0.2987	33.72	-16.56	50.28	23.71	9.92	0.09	NEUTRAL	Average
10	0.2987	43.15	-17.13	60.28	33.14	9.92	0.09	NEUTRAL	QP
11	0.3893	30.96	-17.12	48.08	21.02	9.92	0.02	NEUTRAL	Average
12	0.3893	38.65	-19.43	58.08	28.71	9.92	0.02	NEUTRAL	QP
13	5.9925	30.21	-19.79	50.00	20.05	10.04	0.12	NEUTRAL	Average
14	5.9925	37.51	-22.49	60.00	27.35	10.04	0.12	NEUTRAL	QP
15	23.7616	33.16	-16.84	50.00	22.49	10.41	0.26	NEUTRAL	Average
16	23.7616	40.69	-19.31	60.00	30.02	10.41	0.26	NEUTRAL	QP

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1565	34.34	-21.31	55.65	24.15	10.02	0.17	LINE	Average
2	0.1565	45.53	-20.12	65.65	35.34	10.02	0.17	LINE	QP
3	0.1796	34.85	-19.65	54.50	24.75	9.92	0.18	LINE	Average
4	0.1796	47.16	-17.34	64.50	37.06	9.92	0.18	LINE	QP
5	0.1955	35.62	-18.18	53.80	25.51	9.92	0.19	LINE	Average
6	0.1955	46.98	-16.82	63.80	36.87	9.92	0.19	LINE	QP
7	0.2987	33.87	-16.41	50.28	23.86	9.92	0.09	LINE	Average
8	0.2987	43.55	-16.73	60.28	33.54	9.92	0.09	LINE	QP
9	18.4258	28.29	-21.71	50.00	17.78	10.28	0.23	LINE	Average
10	18.4258	37.79	-22.21	60.00	27.28	10.28	0.23	LINE	QP
11	23.7616	33.29	-16.71	50.00	22.62	10.41	0.26	LINE	Average
12	23.7616	41.12	-18.88	60.00	30.45	10.41	0.26	LINE	QP

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)



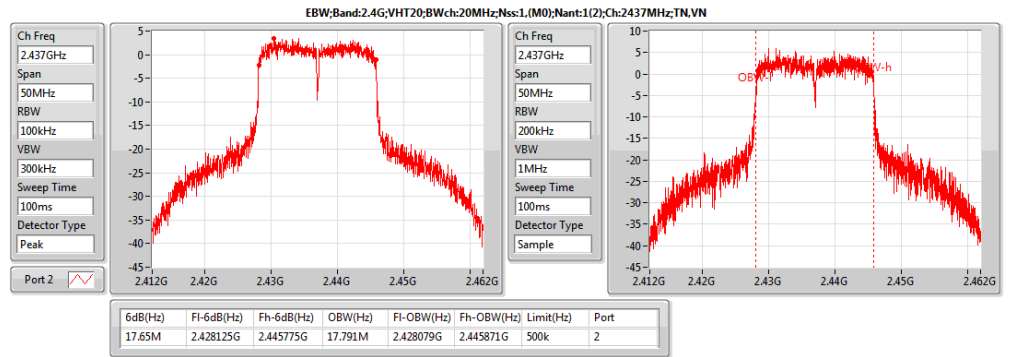
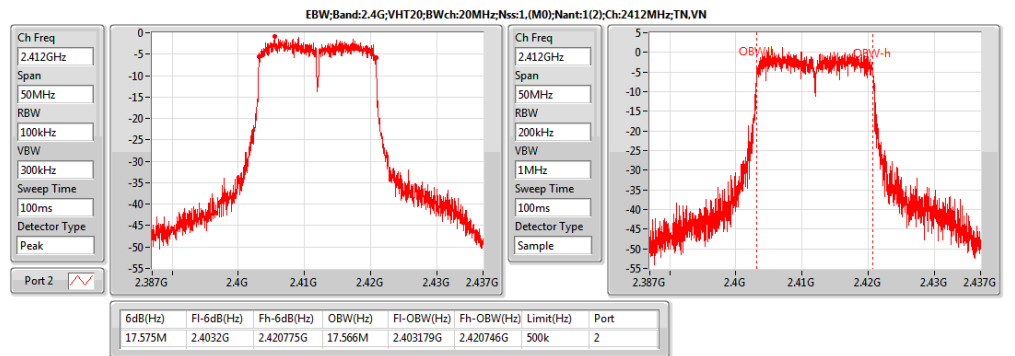
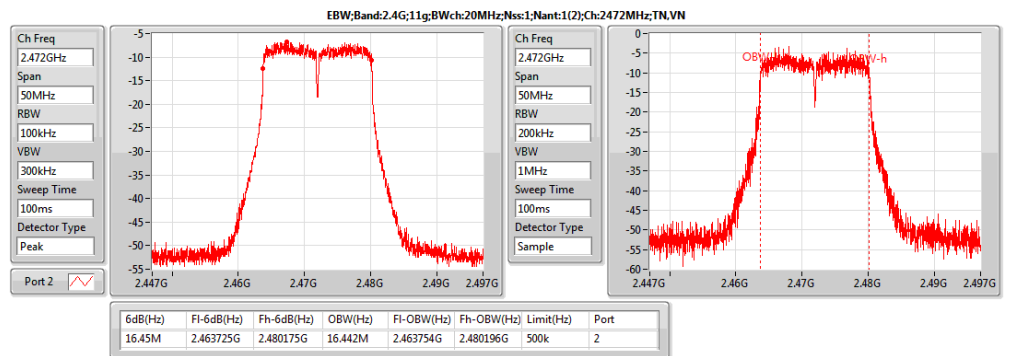
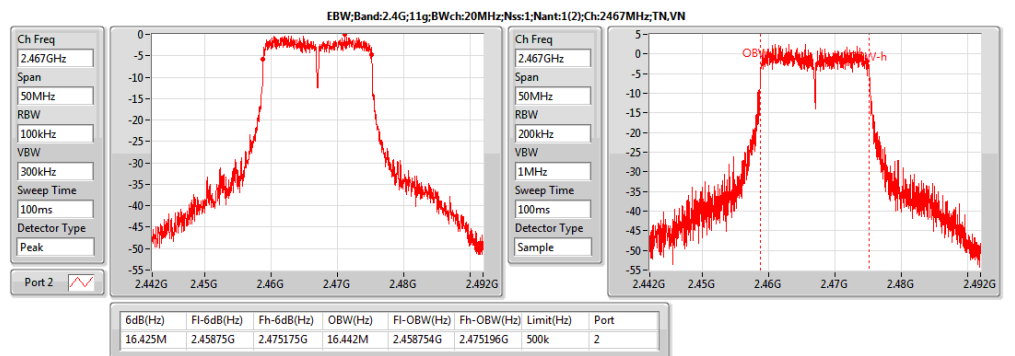
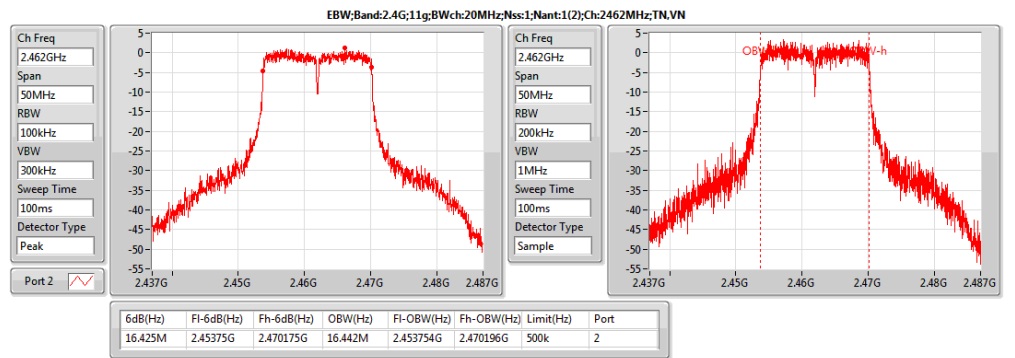
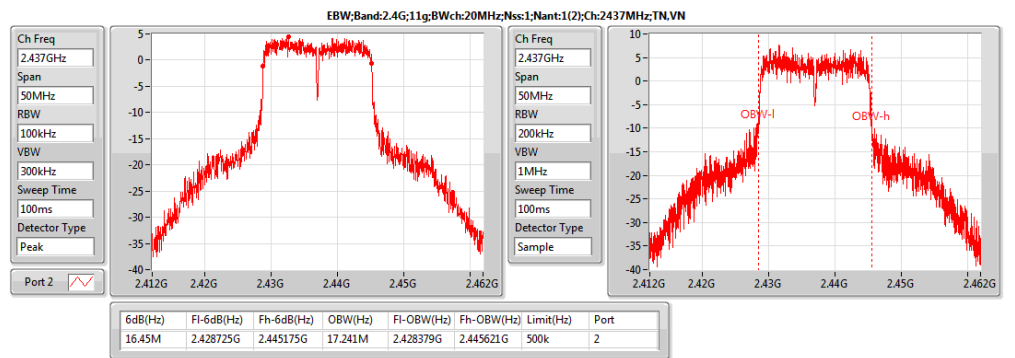
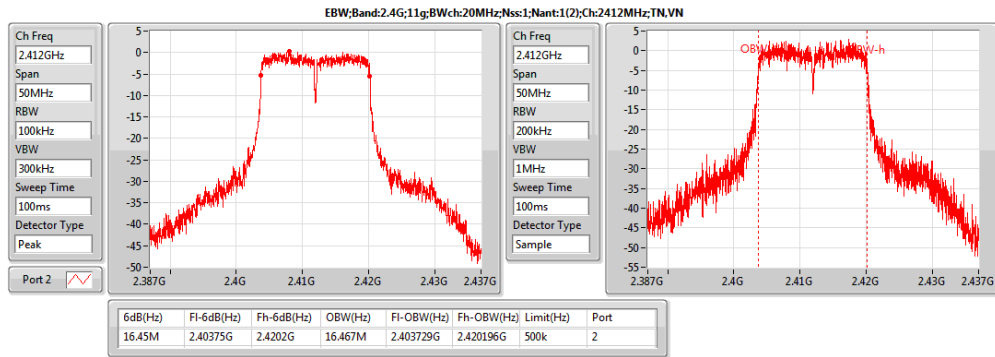
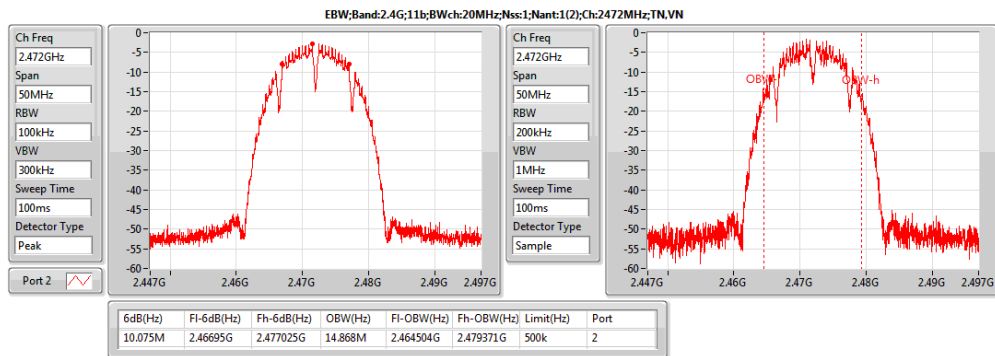
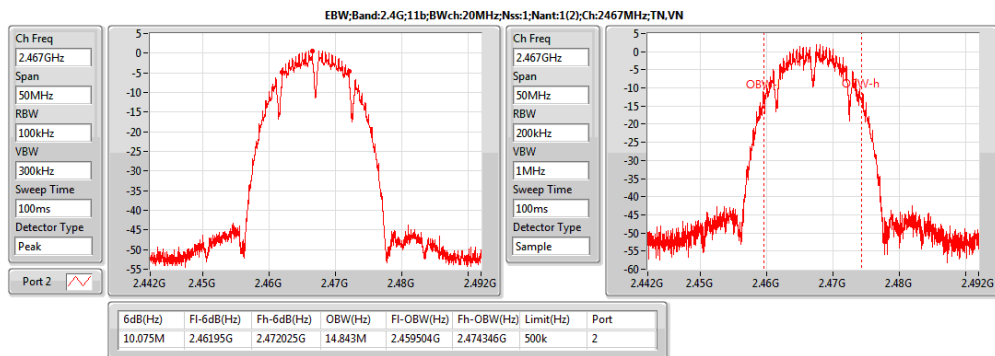
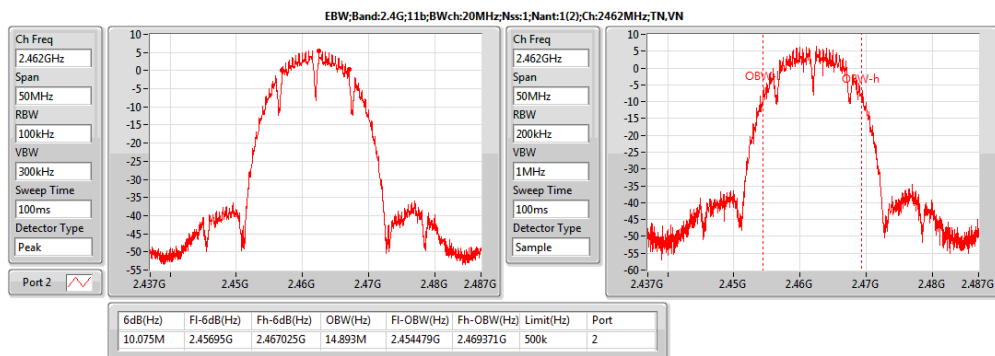
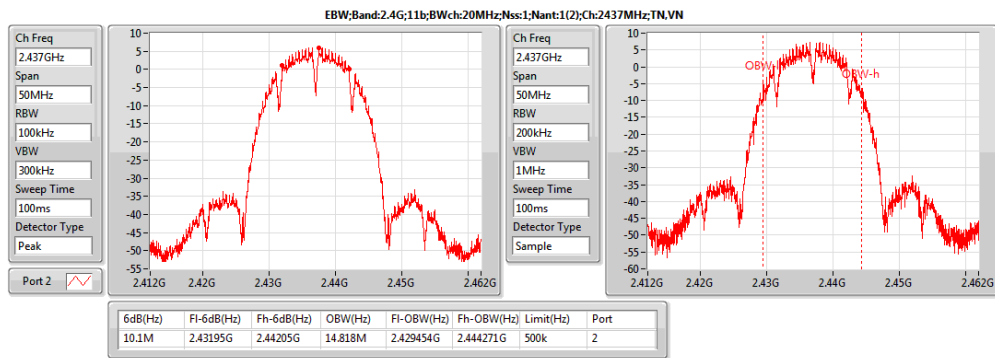
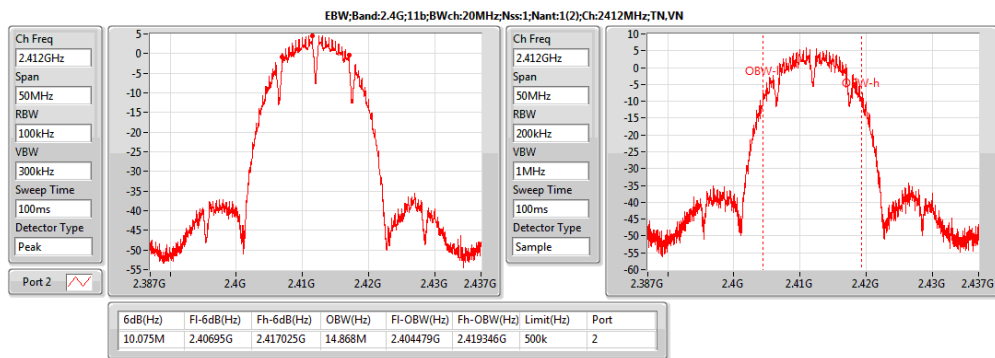
Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4G;11b;Nss1;Ntx1(2)	10.1M	14.893M	14M9G1D	10.075M	14.818M
2.4G;11g;Nss1;Ntx1(2)	16.45M	17.241M	17M2D1D	16.425M	16.442M
2.4G;VHT20;Nss1,(M0);Ntx1(2)	17.65M	17.791M	17M8D1D	17.575M	17.566M
2.4G;VHT40;Nss1,(M0);Ntx1(2)	36.35M	36.082M	36M1D1D	36.35M	35.932M



Result

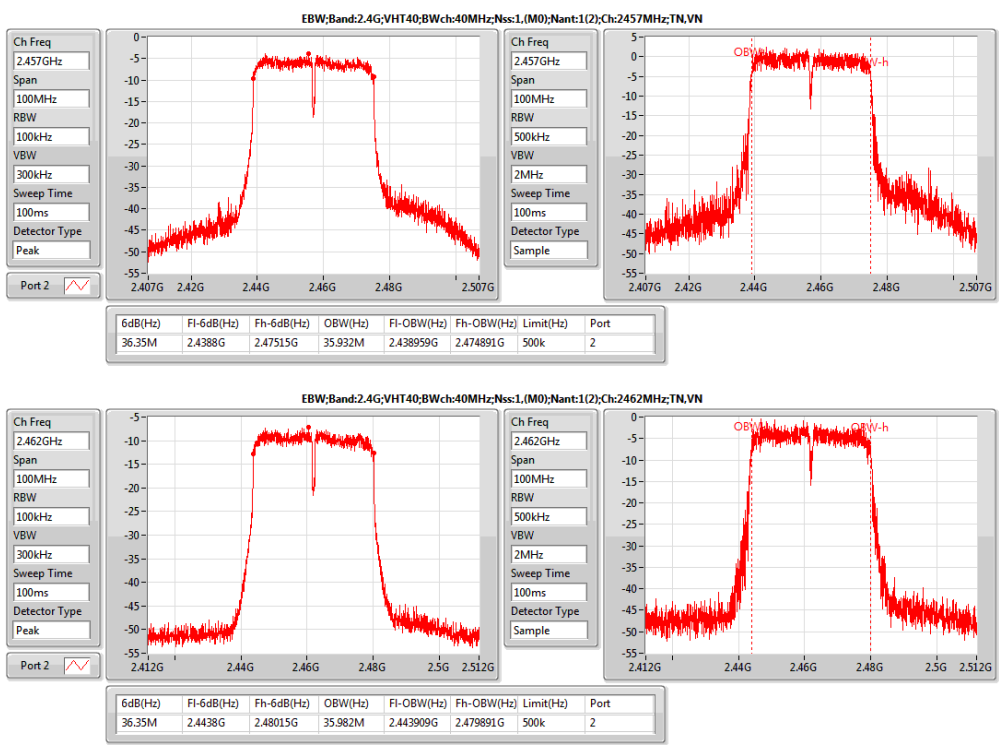
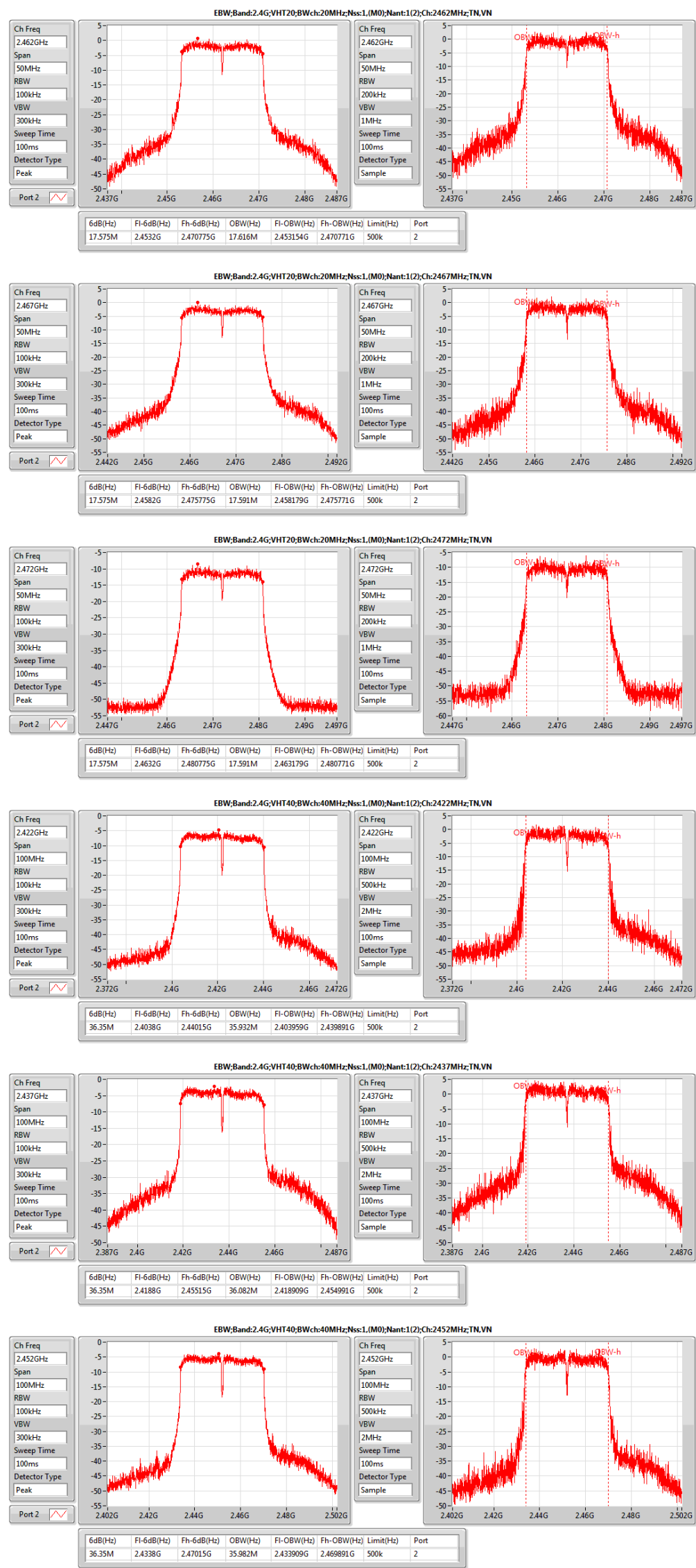
Mode	Result	Limit (Hz)	P2-N dB (Hz)	P2-OBW (Hz)
2.4G;11b;Nss1;Ntx1(2);2412	Pass	500k	10.075M	14.868M
2.4G;11b;Nss1;Ntx1(2);2437	Pass	500k	10.1M	14.818M
2.4G;11b;Nss1;Ntx1(2);2462	Pass	500k	10.075M	14.893M
2.4G;11b;Nss1;Ntx1(2);2467	Pass	500k	10.075M	14.843M
2.4G;11b;Nss1;Ntx1(2);2472	Pass	500k	10.075M	14.868M
2.4G;11g;Nss1;Ntx1(2);2412	Pass	500k	16.45M	16.467M
2.4G;11g;Nss1;Ntx1(2);2437	Pass	500k	16.45M	17.241M
2.4G;11g;Nss1;Ntx1(2);2462	Pass	500k	16.425M	16.442M
2.4G;11g;Nss1;Ntx1(2);2467	Pass	500k	16.425M	16.442M
2.4G;11g;Nss1;Ntx1(2);2472	Pass	500k	16.45M	16.442M
2.4G;VHT20;Nss1,(M0);Ntx1(2);2412	Pass	500k	17.575M	17.566M
2.4G;VHT20;Nss1,(M0);Ntx1(2);2437	Pass	500k	17.65M	17.791M
2.4G;VHT20;Nss1,(M0);Ntx1(2);2462	Pass	500k	17.575M	17.616M
2.4G;VHT20;Nss1,(M0);Ntx1(2);2467	Pass	500k	17.575M	17.591M
2.4G;VHT20;Nss1,(M0);Ntx1(2);2472	Pass	500k	17.575M	17.591M
2.4G;VHT40;Nss1,(M0);Ntx1(2);2422	Pass	500k	36.35M	35.932M
2.4G;VHT40;Nss1,(M0);Ntx1(2);2437	Pass	500k	36.35M	36.082M
2.4G;VHT40;Nss1,(M0);Ntx1(2);2452	Pass	500k	36.35M	35.982M
2.4G;VHT40;Nss1,(M0);Ntx1(2);2457	Pass	500k	36.35M	35.932M
2.4G;VHT40;Nss1,(M0);Ntx1(2);2462	Pass	500k	36.35M	35.982M





EBW Result

Appendix B



Result

Mode	Frequency	Conducted Power (dBm)	EIRP Power (dBm)	Max. EIRP Limit (dBm)	Result
		Chain 2			
802.11b	2412 MHz	16.14	19.64	21.76	Complies
	2437 MHz	17.86	21.36	21.76	Complies
	2462 MHz	17.29	20.79	21.76	Complies
	2467 MHz	13.59	17.09	21.76	Complies
	2472 MHz	9.13	12.63	21.76	Complies
802.11g	2412 MHz	16.29	19.79	21.76	Complies
	2437 MHz	18.01	21.51	21.76	Complies
	2462 MHz	16.03	19.53	21.76	Complies
	2467 MHz	14.82	18.32	21.76	Complies
	2472 MHz	9.04	12.54	21.76	Complies
802.11ac MCS0/Nss1 VHT20	2412 MHz	14.72	18.22	21.76	Complies
	2437 MHz	18.21	21.71	21.76	Complies
	2462 MHz	15.15	18.65	21.76	Complies
	2467 MHz	14.32	17.82	21.76	Complies
	2472 MHz	6.93	10.43	21.76	Complies
802.11ac MCS0/Nss1 VHT40	2422 MHz	13.73	17.23	21.76	Complies
	2437 MHz	15.84	19.34	21.76	Complies
	2452 MHz	14.20	17.70	21.76	Complies
	2457 MHz	15.37	18.87	21.76	Complies
	2462 MHz	11.55	15.05	21.76	Complies



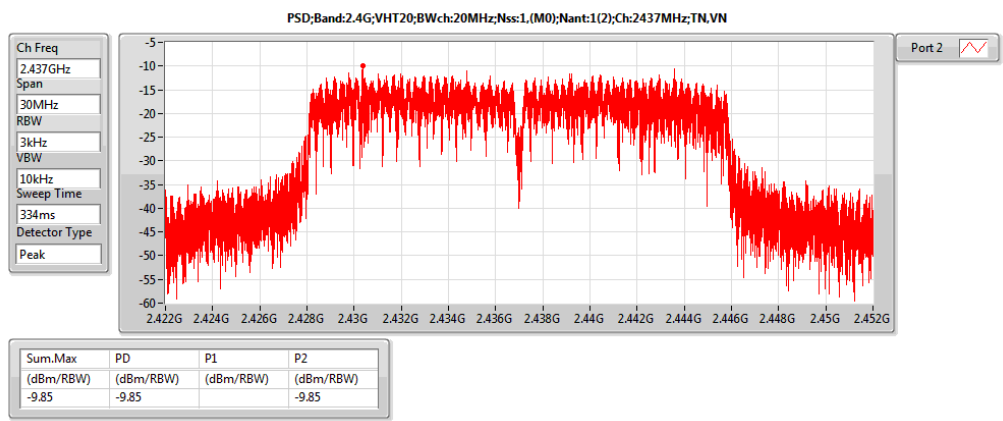
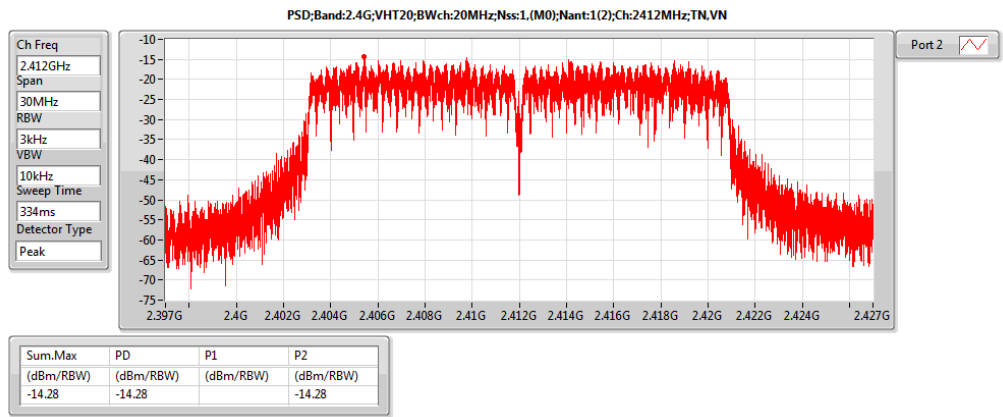
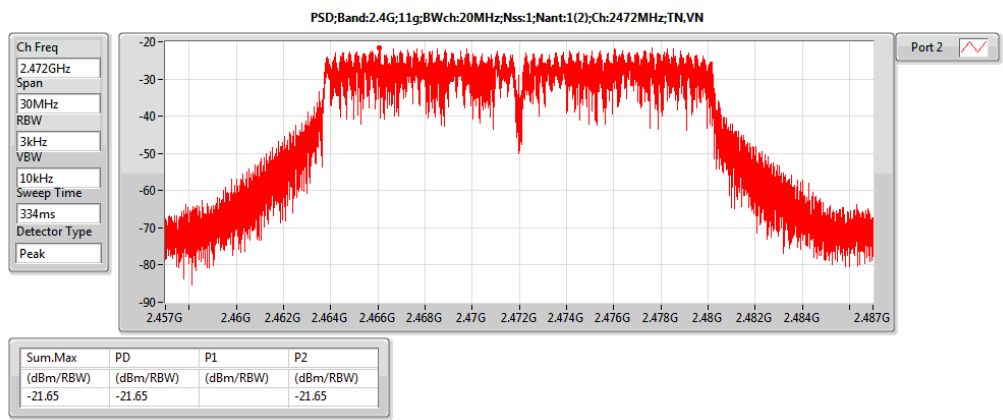
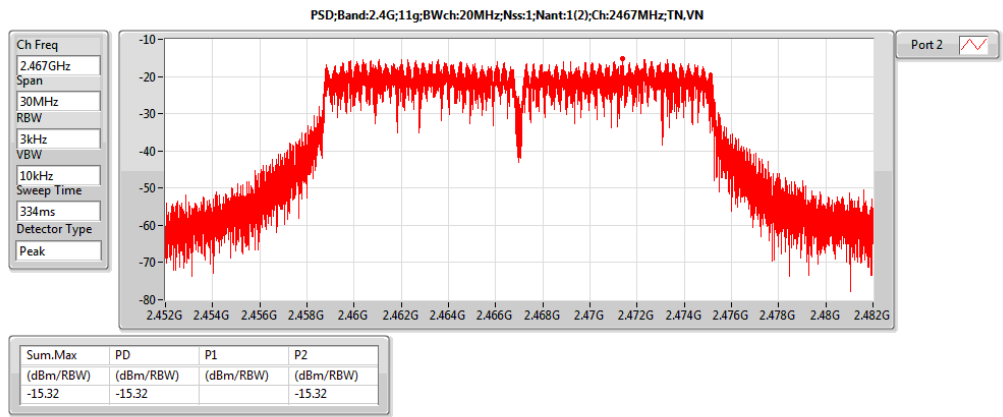
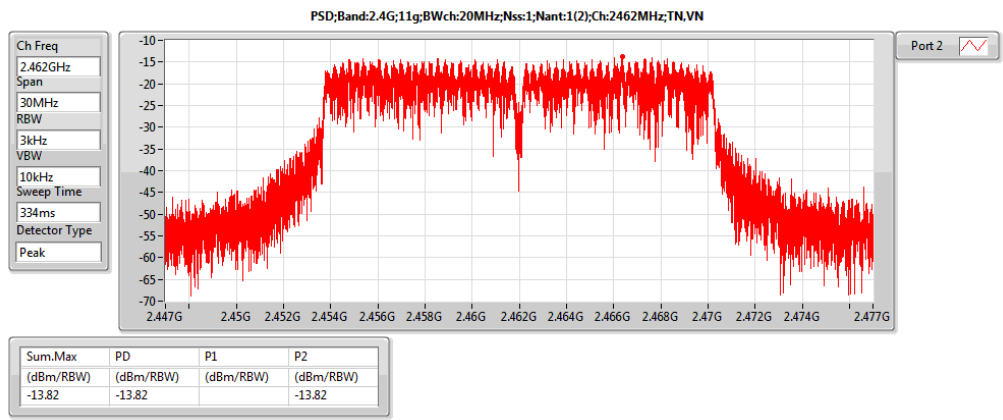
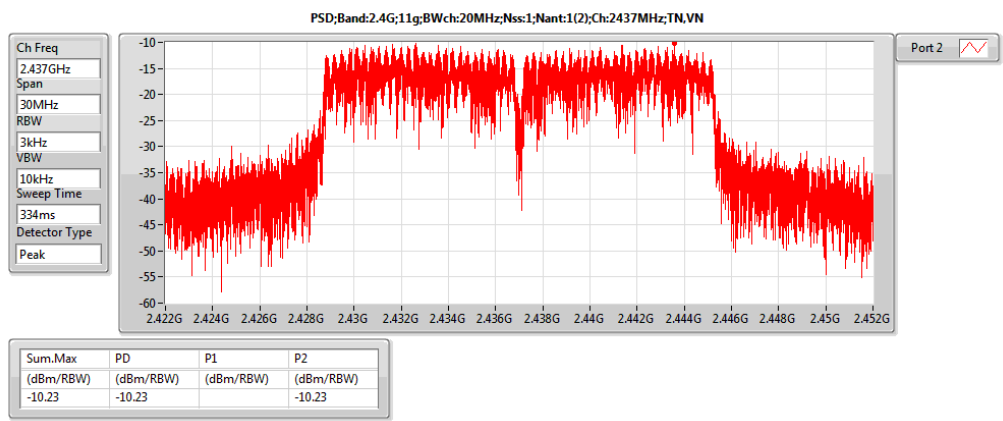
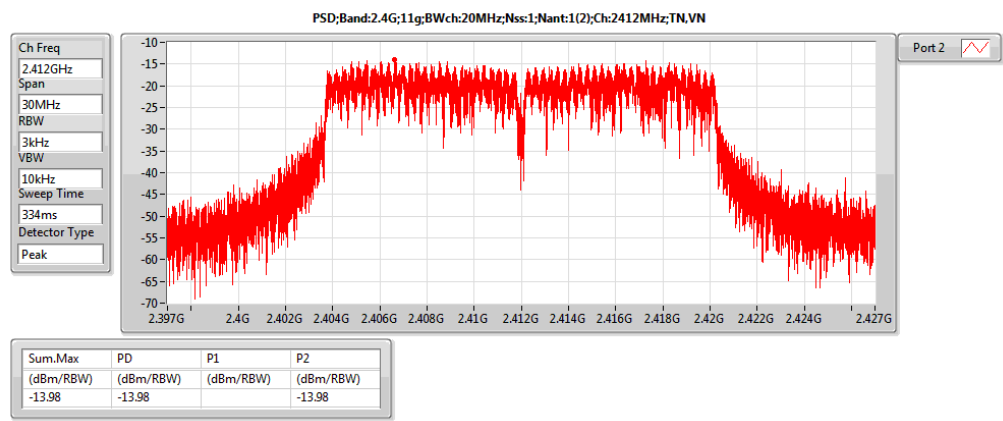
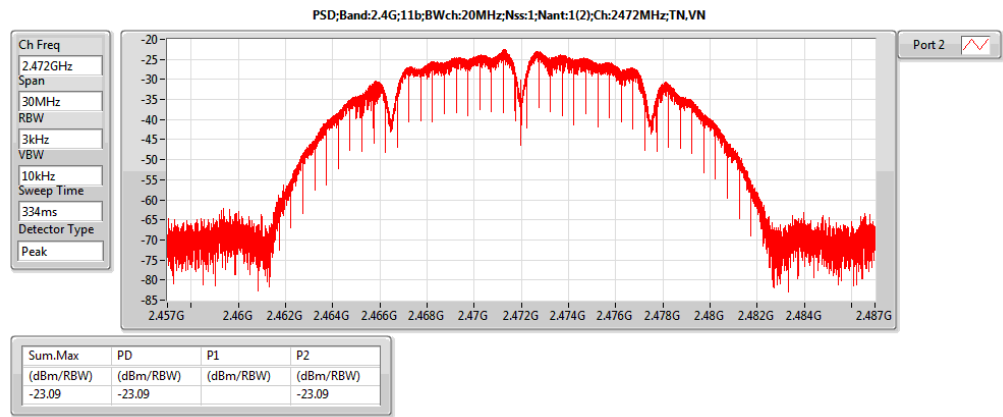
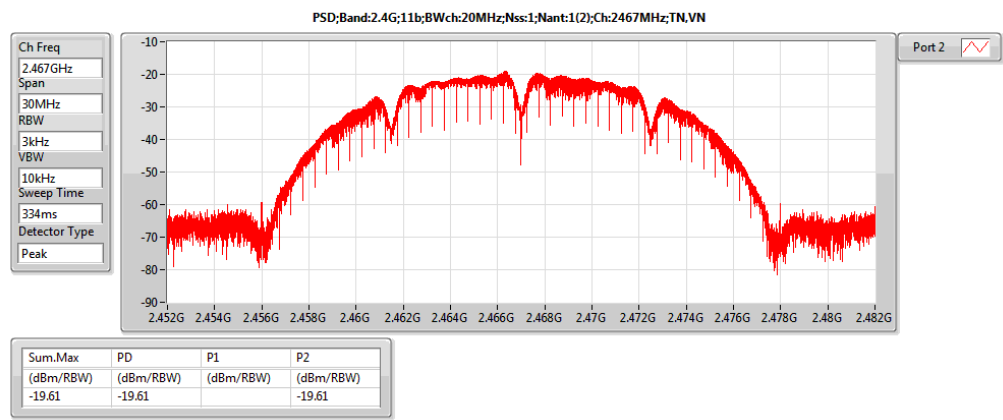
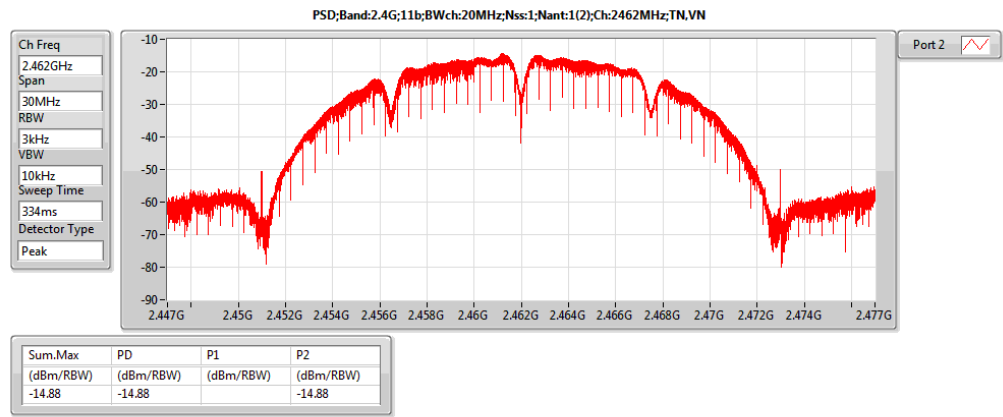
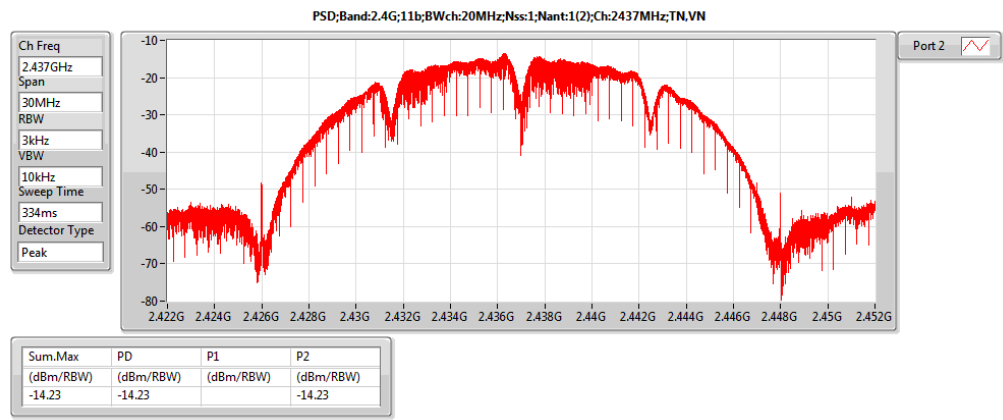
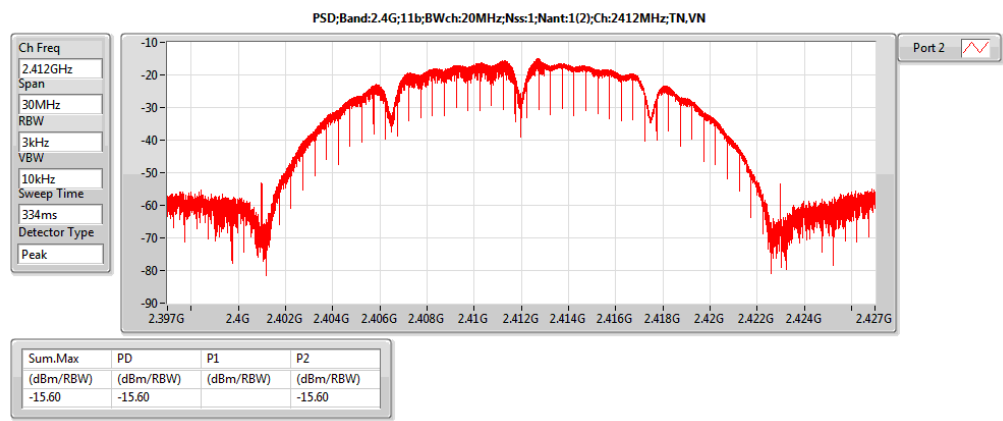
Summary

Mode	PD (dBm/RBW)	EIRP.PD (dBm/RBW)
2.4G;11b;Nss1;Ntx1(2)	-14.23	-10.73
2.4G;11g;Nss1;Ntx1(2)	-10.23	-6.73
2.4G;VHT20;Nss1,(M0);Ntx1(2)	-9.85	-6.35
2.4G;VHT40;Nss1,(M0);Ntx1(2)	-15.32	-11.82



Result

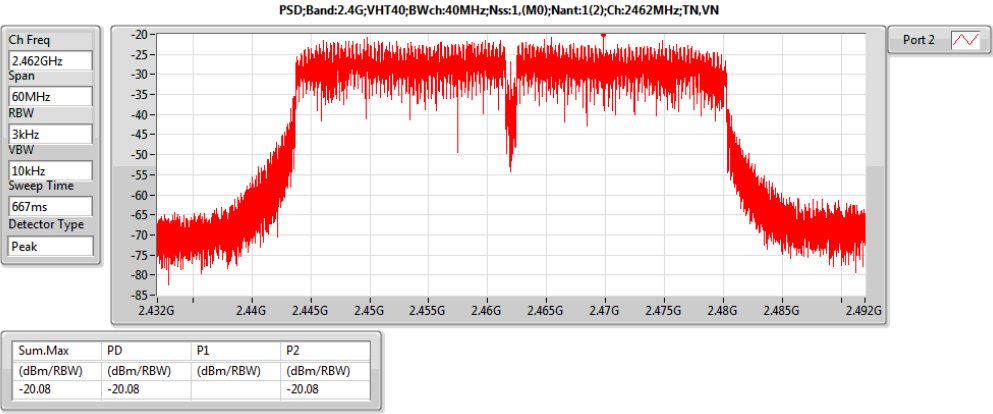
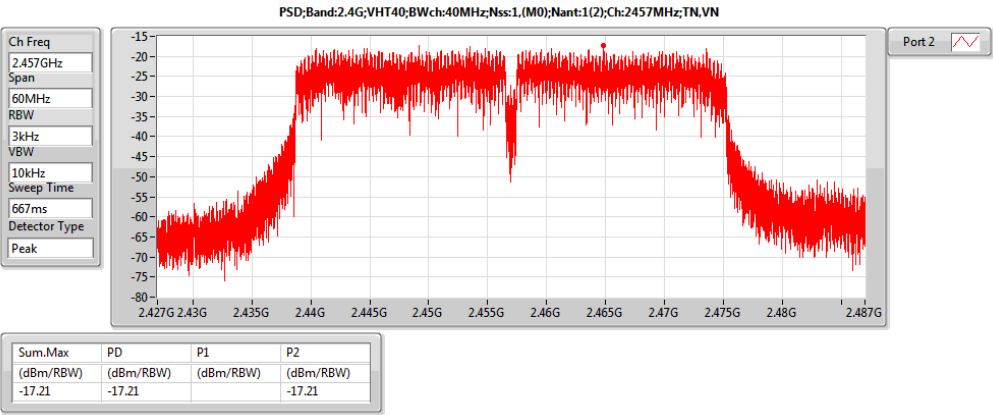
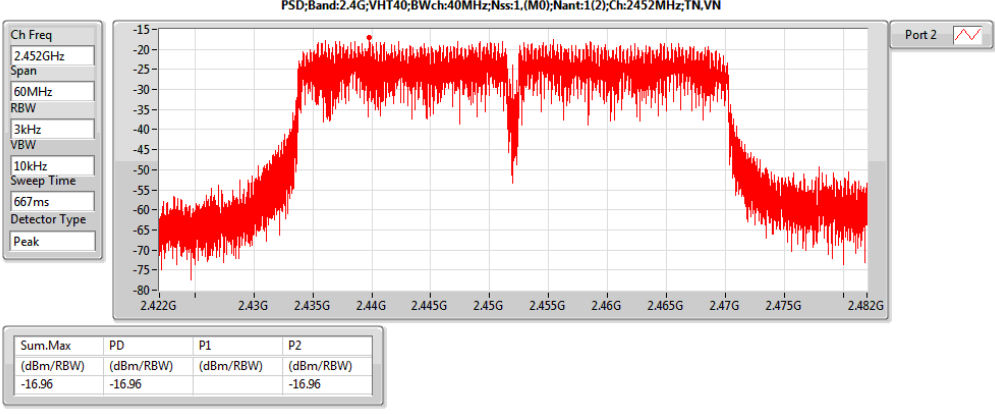
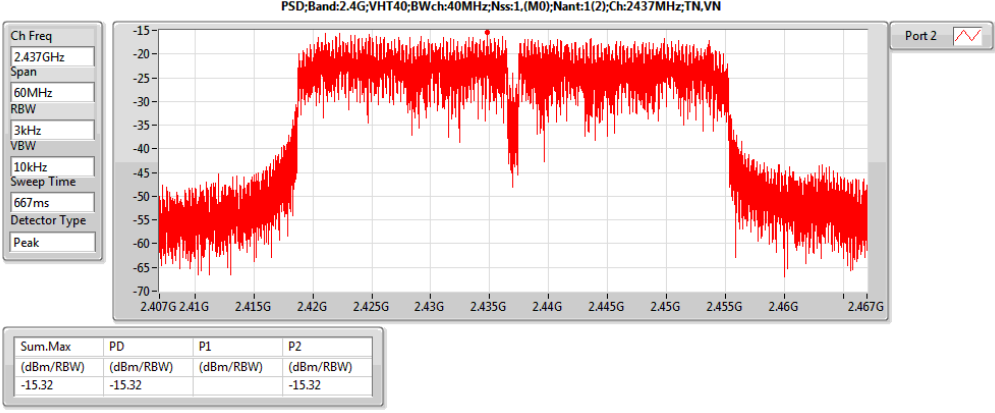
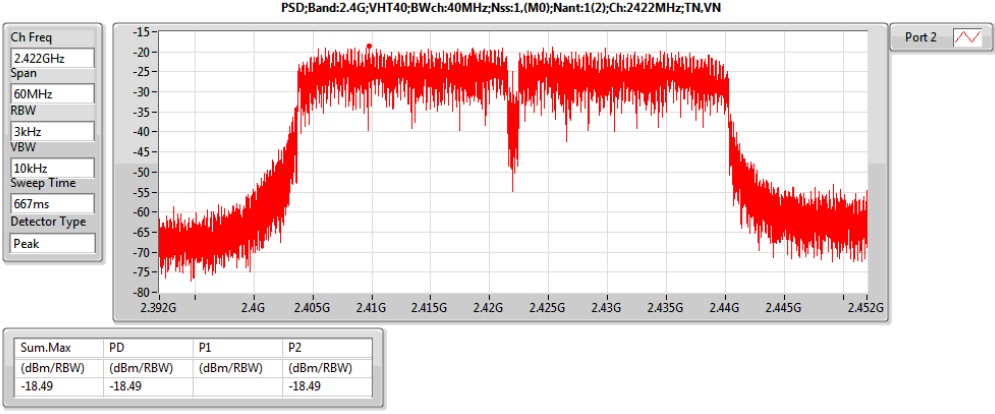
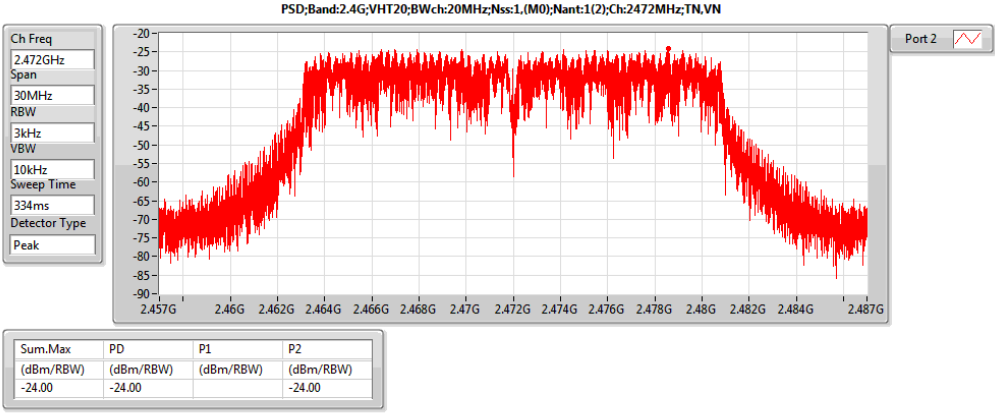
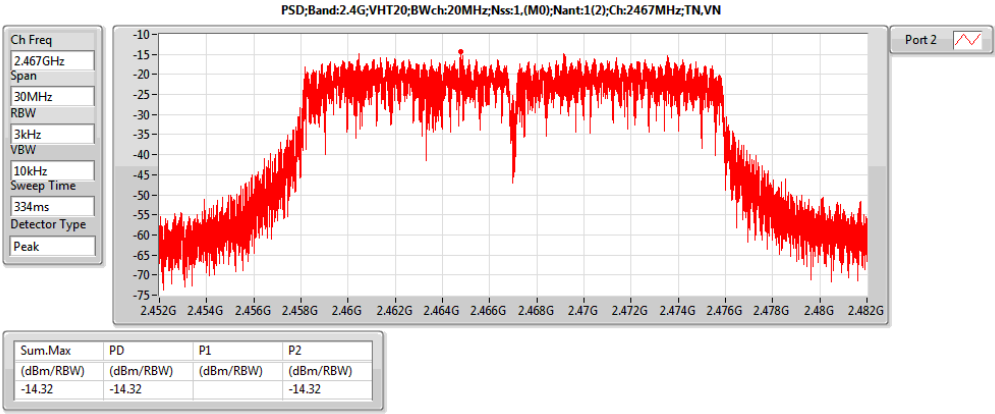
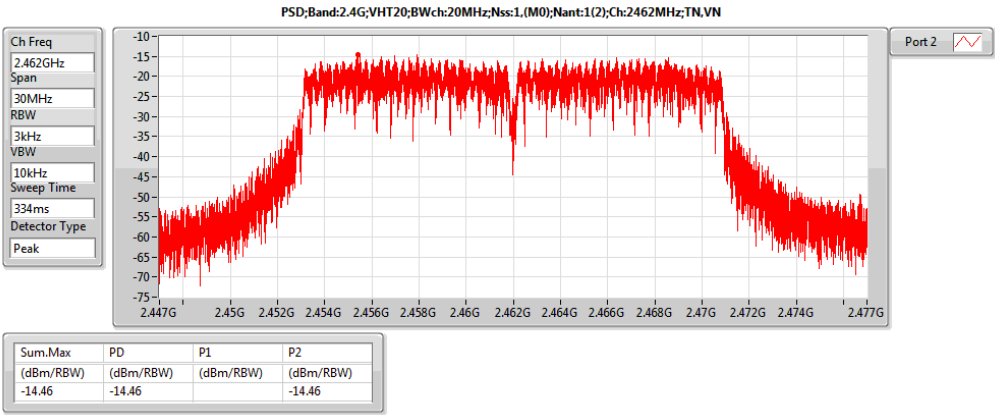
Mode	Result	Meas.RBW (Hz)	Lim.RBW (Hz)	BWCF (dB)	DG (dBi)	PD (dBm/RBW)	PD.Limit (dBm/RBW)	EIRP.PD (dBm/RBW)	EIRP.PD.Li m (dBm/RBW)	P2 (dBm/RBW)
2.4G;11b;Nss1;Ntx1(2);2412	Pass	3k	3k	0.00	3.50	-15.60	8.00	-12.10	Inf	-15.60
2.4G;11b;Nss1;Ntx1(2);2437	Pass	3k	3k	0.00	3.50	-14.23	8.00	-10.73	Inf	-14.23
2.4G;11b;Nss1;Ntx1(2);2462	Pass	3k	3k	0.00	3.50	-14.88	8.00	-11.38	Inf	-14.88
2.4G;11b;Nss1;Ntx1(2);2467	Pass	3k	3k	0.00	3.50	-19.61	8.00	-16.11	Inf	-19.61
2.4G;11b;Nss1;Ntx1(2);2472	Pass	3k	3k	0.00	3.50	-23.09	8.00	-19.59	Inf	-23.09
2.4G;11g;Nss1;Ntx1(2);2412	Pass	3k	3k	0.00	3.50	-13.98	8.00	-10.48	Inf	-13.98
2.4G;11g;Nss1;Ntx1(2);2437	Pass	3k	3k	0.00	3.50	-10.23	8.00	-6.73	Inf	-10.23
2.4G;11g;Nss1;Ntx1(2);2462	Pass	3k	3k	0.00	3.50	-13.82	8.00	-10.32	Inf	-13.82
2.4G;11g;Nss1;Ntx1(2);2467	Pass	3k	3k	0.00	3.50	-15.32	8.00	-11.82	Inf	-15.32
2.4G;11g;Nss1;Ntx1(2);2472	Pass	3k	3k	0.00	3.50	-21.65	8.00	-18.15	Inf	-21.65
2.4G;VHT20;Nss1,(M0);Ntx1(2);2412	Pass	3k	3k	0.00	3.50	-14.28	8.00	-10.78	Inf	-14.28
2.4G;VHT20;Nss1,(M0);Ntx1(2);2437	Pass	3k	3k	0.00	3.50	-9.85	8.00	-6.35	Inf	-9.85
2.4G;VHT20;Nss1,(M0);Ntx1(2);2462	Pass	3k	3k	0.00	3.50	-14.46	8.00	-10.96	Inf	-14.46
2.4G;VHT20;Nss1,(M0);Ntx1(2);2467	Pass	3k	3k	0.00	3.50	-14.32	8.00	-10.82	Inf	-14.32
2.4G;VHT20;Nss1,(M0);Ntx1(2);2472	Pass	3k	3k	0.00	3.50	-24.00	8.00	-20.50	Inf	-24.00
2.4G;VHT40;Nss1,(M0);Ntx1(2);2422	Pass	3k	3k	0.00	3.50	-18.49	8.00	-14.99	Inf	-18.49
2.4G;VHT40;Nss1,(M0);Ntx1(2);2437	Pass	3k	3k	0.00	3.50	-15.32	8.00	-11.82	Inf	-15.32
2.4G;VHT40;Nss1,(M0);Ntx1(2);2452	Pass	3k	3k	0.00	3.50	-16.96	8.00	-13.46	Inf	-16.96
2.4G;VHT40;Nss1,(M0);Ntx1(2);2457	Pass	3k	3k	0.00	3.50	-17.21	8.00	-13.71	Inf	-17.21
2.4G;VHT40;Nss1,(M0);Ntx1(2);2462	Pass	3k	3k	0.00	3.50	-20.08	8.00	-16.58	Inf	-20.08





PSD Result

Appendix D





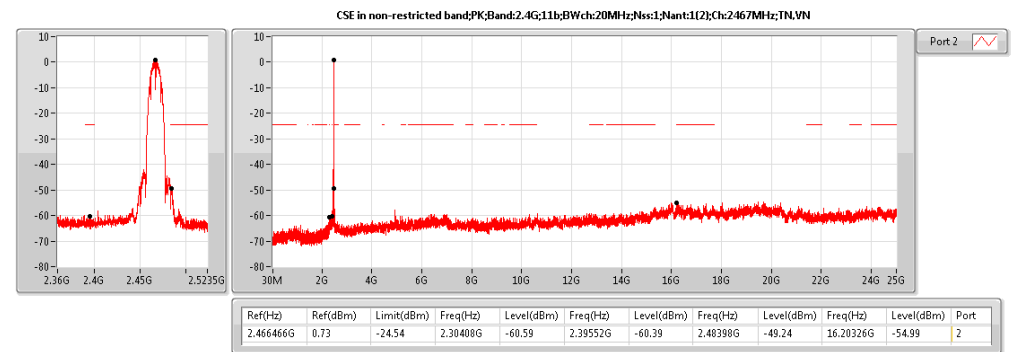
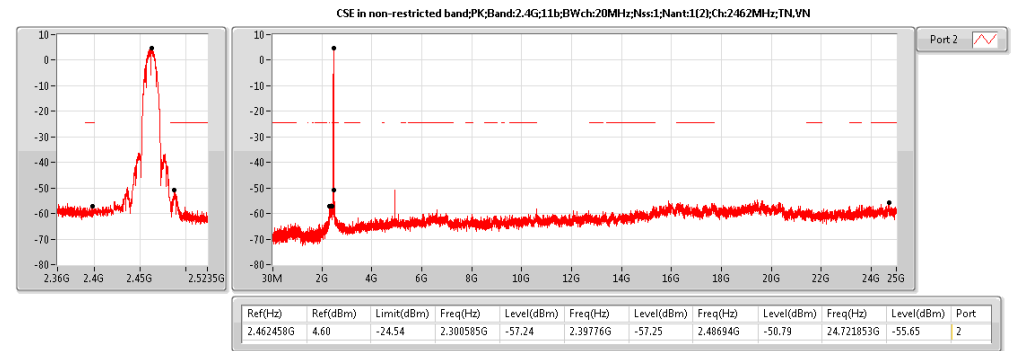
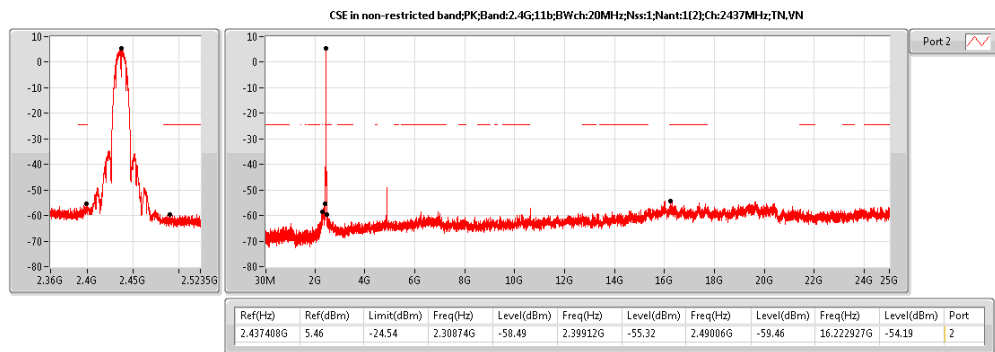
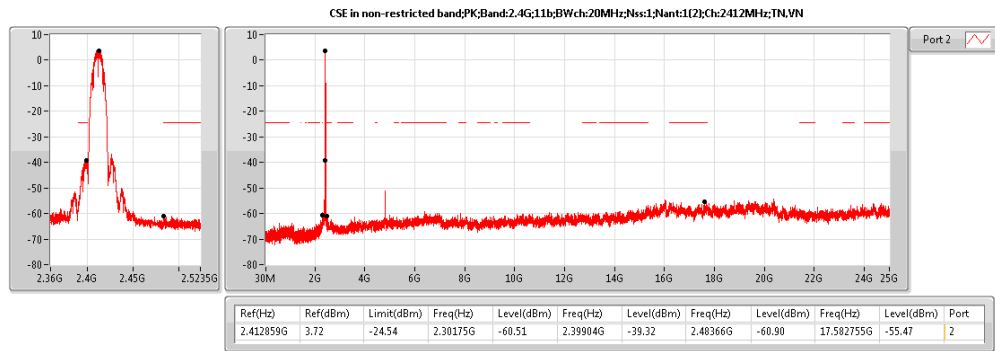
Summary

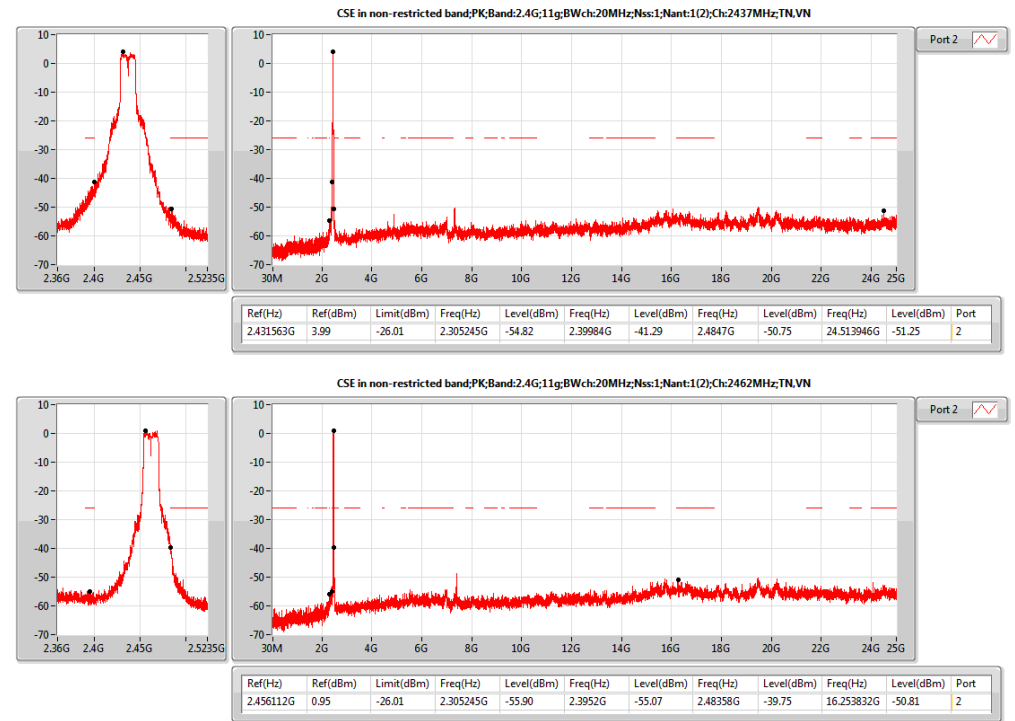
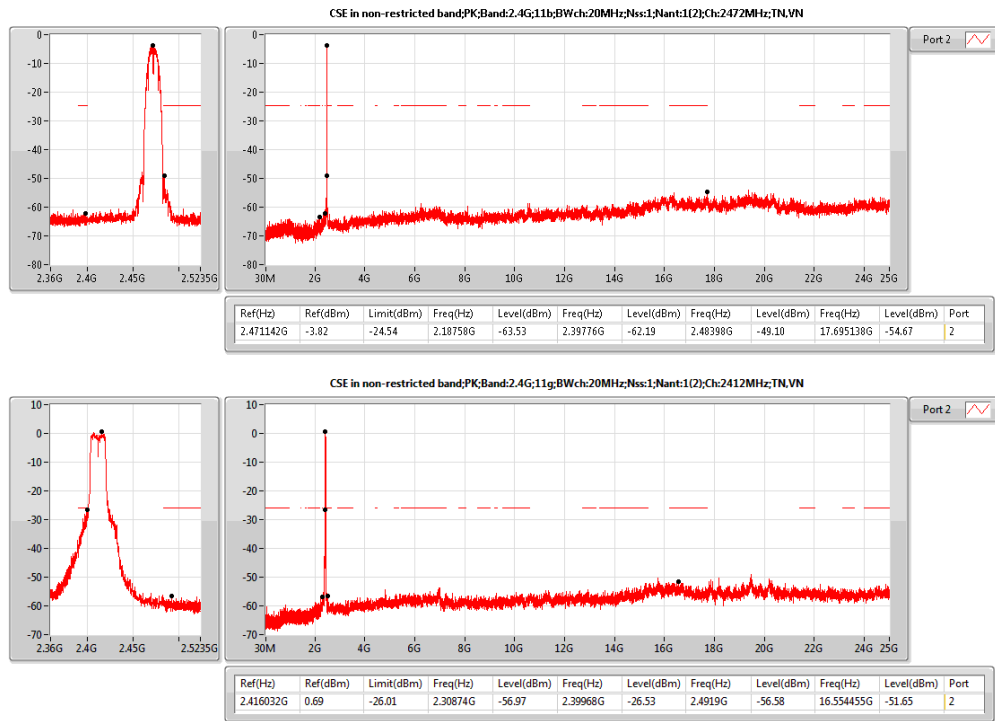
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4G;11g;Nss1;Ntx1(2);2412	Pass	2.416032G	0.69	-26.01	2.30874G	-56.97	2.39968G	-26.53	2.4919G	-56.58	16.554455G	-51.65	2

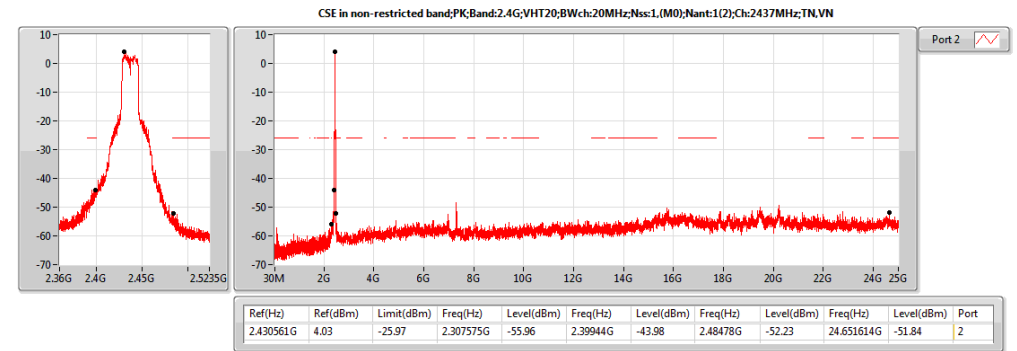
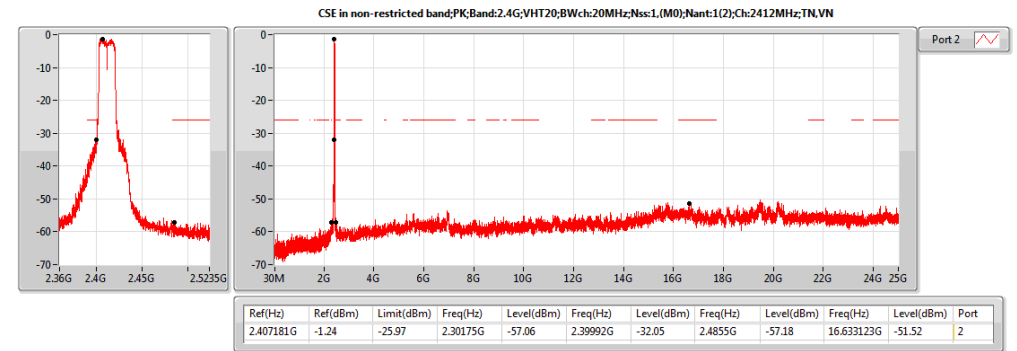
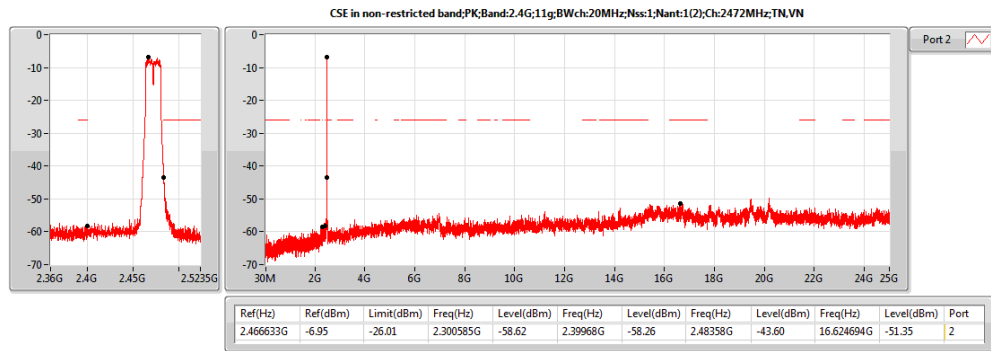
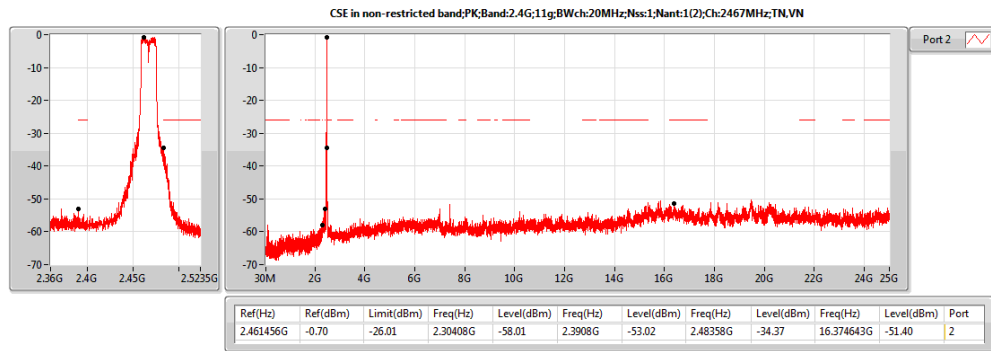


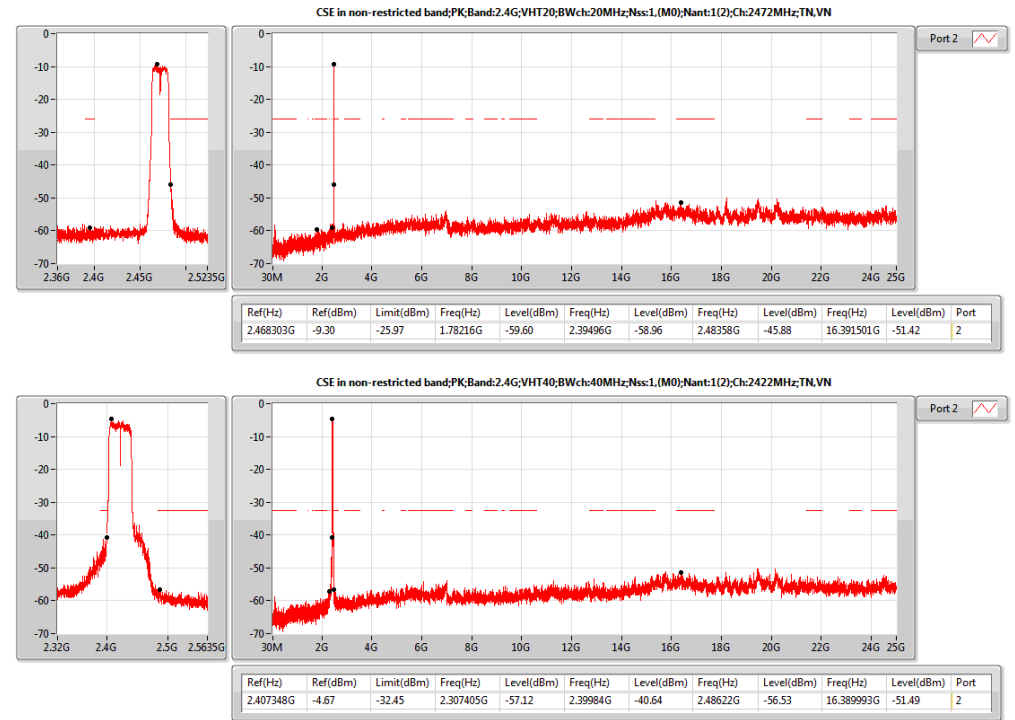
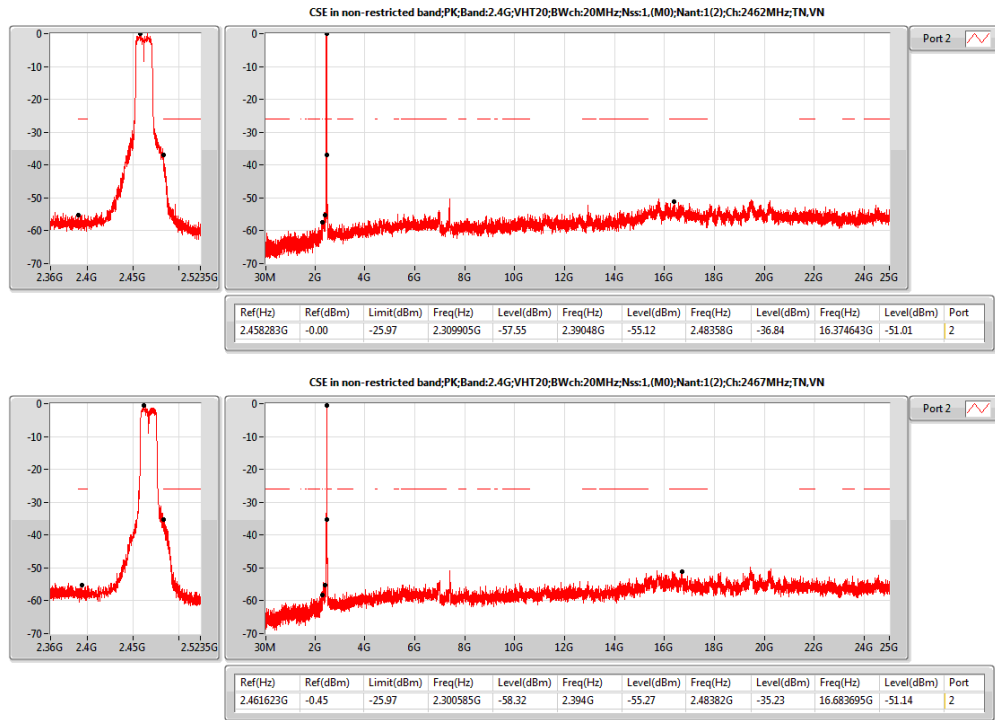
Result

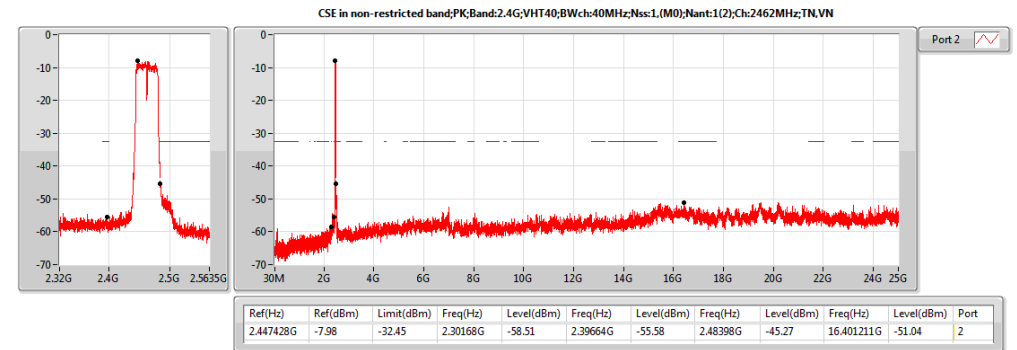
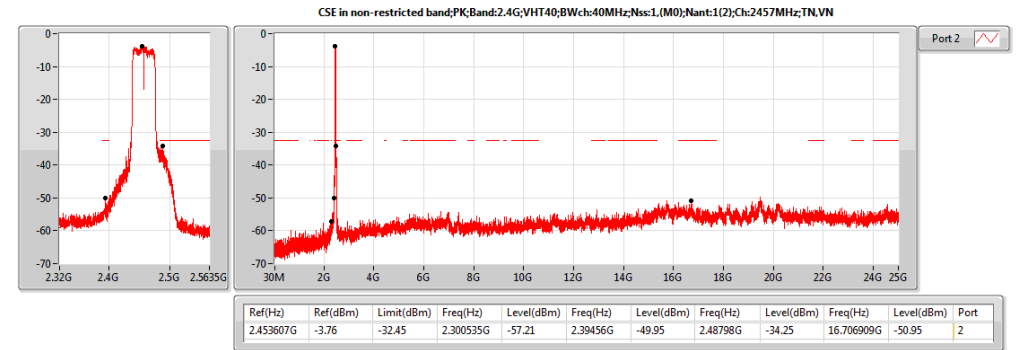
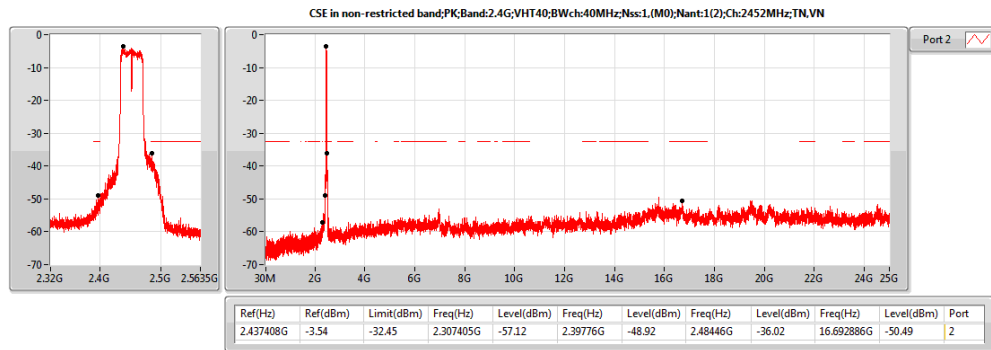
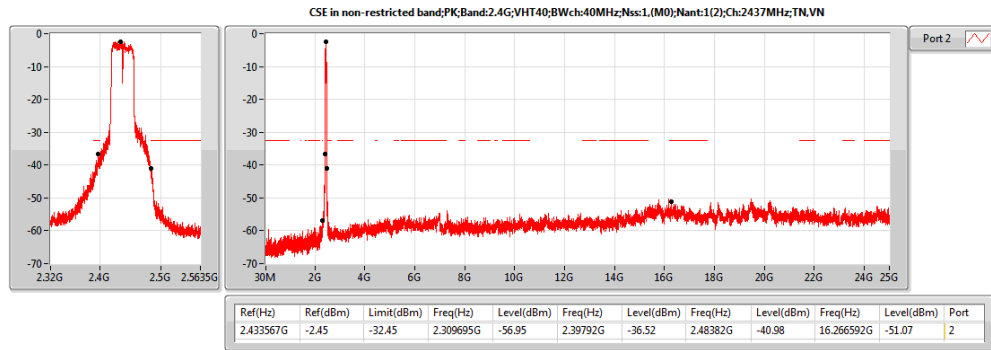
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4G;11b;Nss1;Ntx1(2);2412	Pass	2.412859G	3.72	-24.54	2.30175G	-60.51	2.39904G	-39.32	2.48366G	-60.90	17.582755G	-55.47	2
2.4G;11b;Nss1;Ntx1(2);2437	Pass	2.437408G	5.46	-24.54	2.30874G	-58.49	2.39912G	-55.32	2.49006G	-59.46	16.222927G	-54.19	2
2.4G;11b;Nss1;Ntx1(2);2462	Pass	2.462458G	4.60	-24.54	2.300585G	-57.24	2.39776G	-57.25	2.48694G	-50.79	24.721853G	-55.65	2
2.4G;11b;Nss1;Ntx1(2);2467	Pass	2.466466G	0.73	-24.54	2.30408G	-60.59	2.39552G	-60.39	2.48398G	-49.24	16.20326G	-54.99	2
2.4G;11b;Nss1;Ntx1(2);2472	Pass	2.471142G	-3.82	-24.54	2.18758G	-63.53	2.39776G	-62.19	2.48398G	-49.10	17.695138G	-54.67	2
2.4G;11g;Nss1;Ntx1(2);2412	Pass	2.416032G	0.69	-26.01	2.30874G	-56.97	2.39968G	-26.53	2.4919G	-56.58	16.554455G	-51.65	2
2.4G;11g;Nss1;Ntx1(2);2437	Pass	2.431563G	3.99	-26.01	2.305245G	-54.82	2.39984G	-41.29	2.4847G	-50.75	24.513946G	-51.25	2
2.4G;11g;Nss1;Ntx1(2);2462	Pass	2.456112G	0.95	-26.01	2.305245G	-55.90	2.3952G	-55.07	2.48358G	-39.75	16.253832G	-50.81	2
2.4G;11g;Nss1;Ntx1(2);2467	Pass	2.461456G	-0.70	-26.01	2.30408G	-58.01	2.3908G	-53.02	2.48358G	-34.37	16.374643G	-51.40	2
2.4G;11g;Nss1;Ntx1(2);2472	Pass	2.466633G	-6.95	-26.01	2.300585G	-58.62	2.39968G	-58.26	2.48358G	-43.60	16.624694G	-51.35	2
2.4G;VHT20;Nss1,(M0);Ntx1(2);2412	Pass	2.407181G	-1.24	-25.97	2.30175G	-57.06	2.39992G	-32.05	2.4855G	-57.18	16.633123G	-51.52	2
2.4G;VHT20;Nss1,(M0);Ntx1(2);2437	Pass	2.430561G	4.03	-25.97	2.307575G	-55.96	2.39944G	-43.98	2.48478G	-52.23	24.651614G	-51.84	2
2.4G;VHT20;Nss1,(M0);Ntx1(2);2462	Pass	2.458283G	-0.00	-25.97	2.309905G	-57.55	2.39048G	-55.12	2.48358G	-36.84	16.374643G	-51.01	2
2.4G;VHT20;Nss1,(M0);Ntx1(2);2467	Pass	2.461623G	-0.45	-25.97	2.300585G	-58.32	2.394G	-55.27	2.48382G	-35.23	16.683695G	-51.14	2
2.4G;VHT20;Nss1,(M0);Ntx1(2);2472	Pass	2.468303G	-9.30	-25.97	1.78216G	-59.60	2.39496G	-58.96	2.48358G	-45.88	16.391501G	-51.42	2
2.4G;VHT40;Nss1,(M0);Ntx1(2);2422	Pass	2.407348G	-4.67	-32.45	2.307405G	-57.12	2.39984G	-40.64	2.48622G	-56.53	16.389993G	-51.49	2
2.4G;VHT40;Nss1,(M0);Ntx1(2);2437	Pass	2.433567G	-2.45	-32.45	2.309695G	-56.95	2.39792G	-36.52	2.48382G	-40.98	16.266592G	-51.07	2
2.4G;VHT40;Nss1,(M0);Ntx1(2);2452	Pass	2.437408G	-3.54	-32.45	2.307405G	-57.12	2.39776G	-48.92	2.48446G	-36.02	16.692886G	-50.49	2
2.4G;VHT40;Nss1,(M0);Ntx1(2);2457	Pass	2.453607G	-3.76	-32.45	2.300535G	-57.21	2.39456G	-49.95	2.48798G	-34.25	16.706909G	-50.95	2
2.4G;VHT40;Nss1,(M0);Ntx1(2);2462	Pass	2.447428G	-7.98	-32.45	2.30168G	-58.51	2.39664G	-55.58	2.48398G	-45.27	16.401211G	-51.04	2

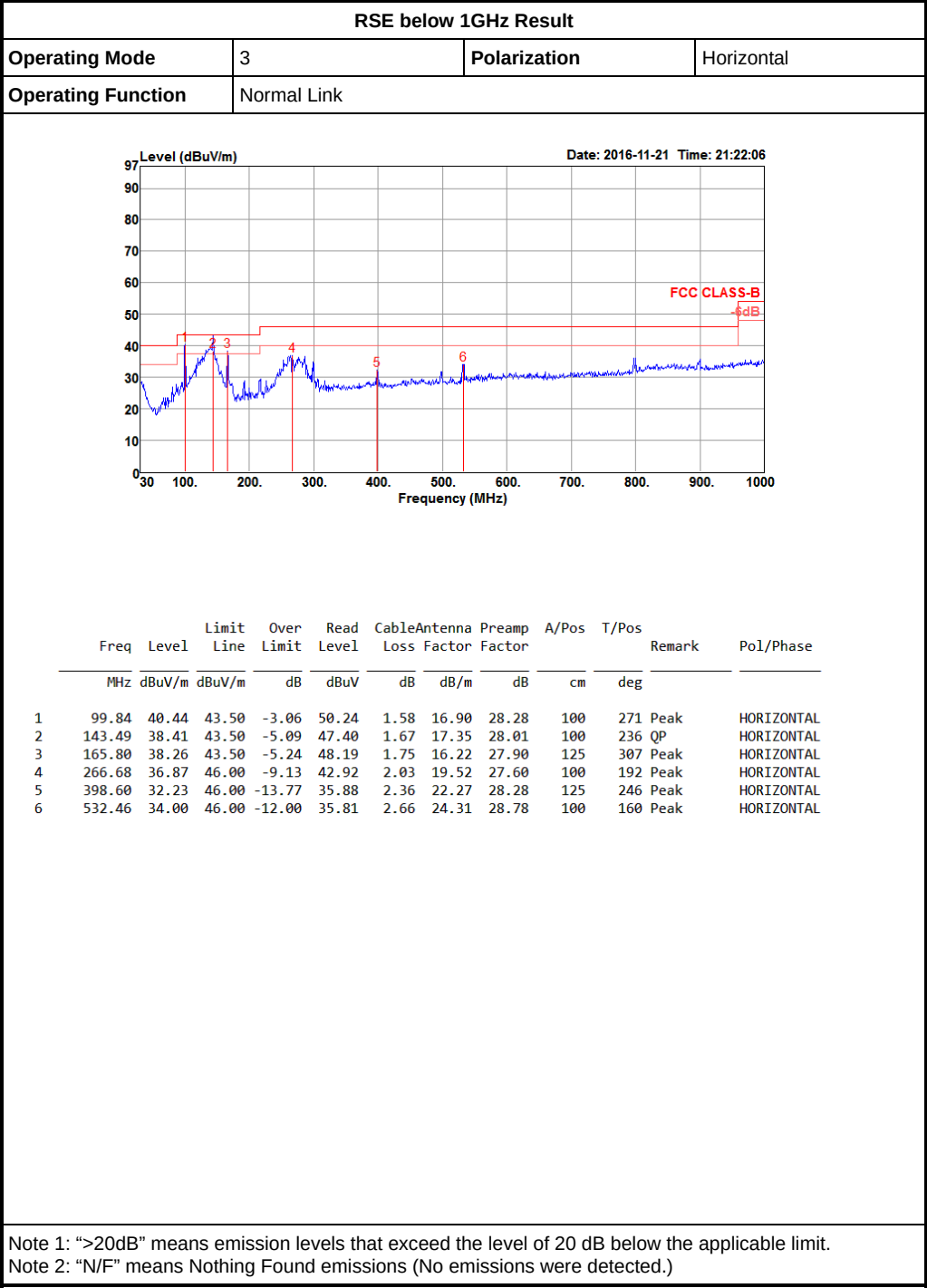












RSE below 1GHz Result

Operating Mode

3

Power Phase

Vertical

Operating Function

Normal Link

Level (dBuV/m)

Date: 2016-11-21 Time: 21:16:18

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	99.84	38.82	43.50	-4.68	48.62	1.58	16.90	28.28	100	284 Peak	VERTICAL
2	143.49	34.84	43.50	-8.66	43.83	1.67	17.35	28.01	150	139 Peak	VERTICAL
3	165.80	31.10	43.50	-12.40	41.03	1.75	16.22	27.90	125	109 Peak	VERTICAL
4	273.47	37.93	46.00	-8.07	44.17	2.05	19.30	27.59	100	231 Peak	VERTICAL
5	398.60	34.60	46.00	-11.40	38.25	2.36	22.27	28.28	100	217 Peak	VERTICAL
6	533.43	36.77	46.00	-9.23	38.53	2.67	24.35	28.78	150	255 Peak	VERTICAL

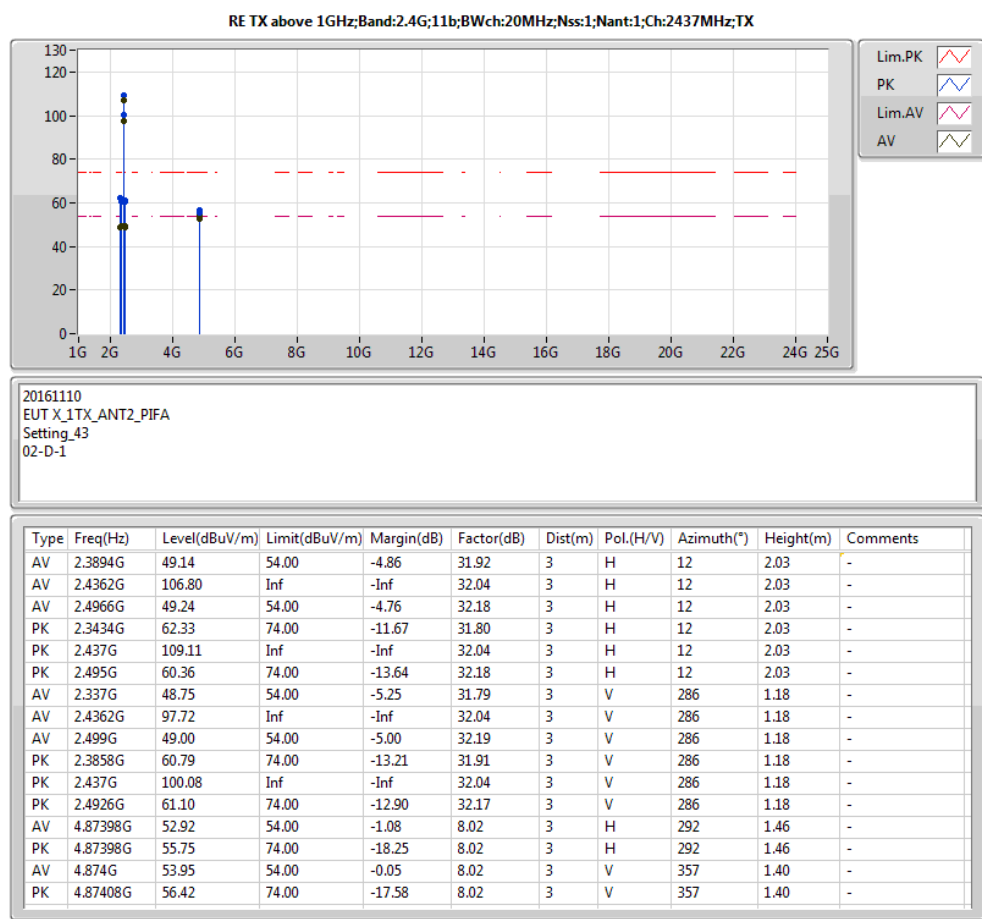
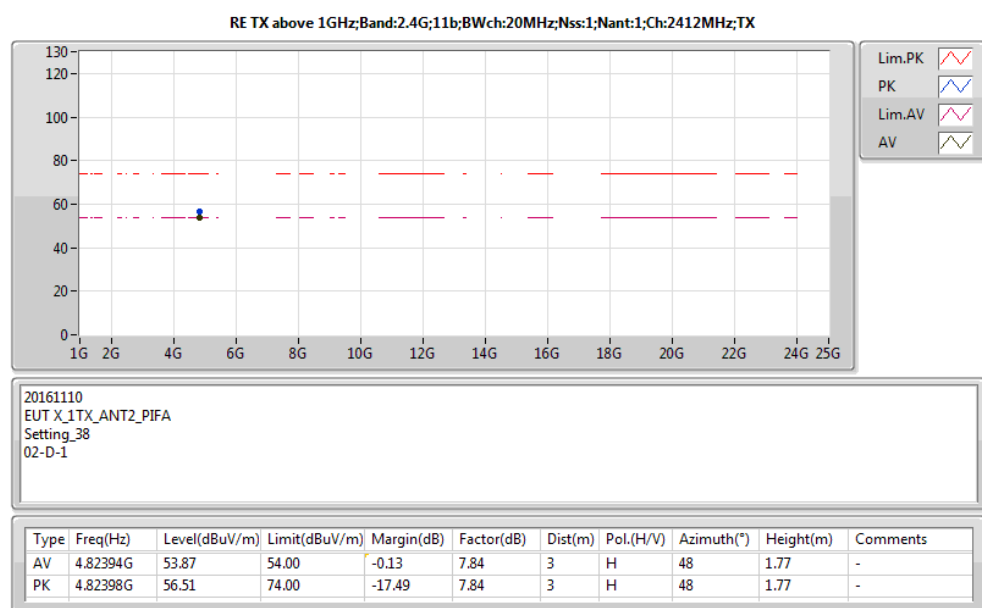
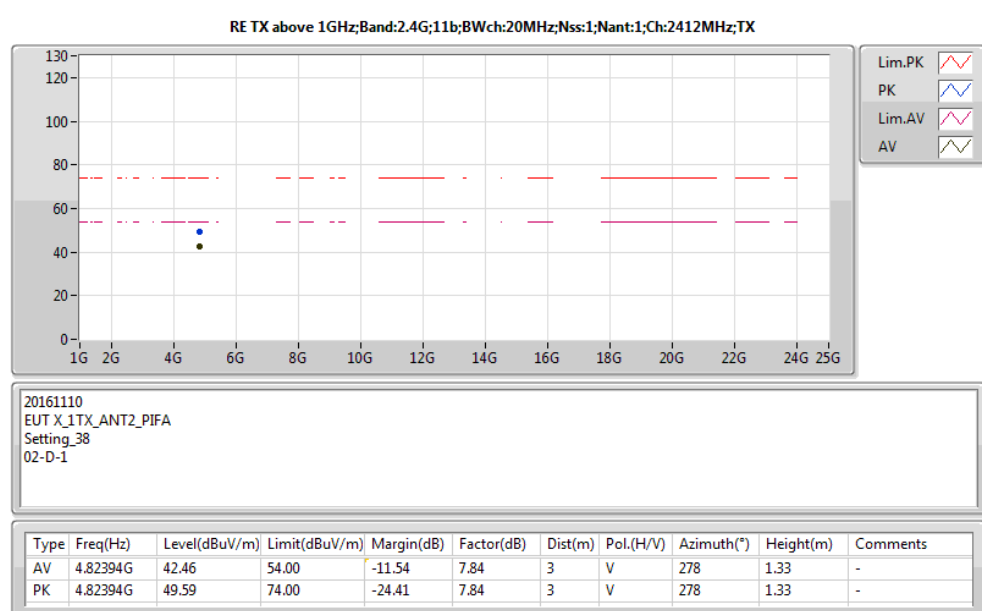
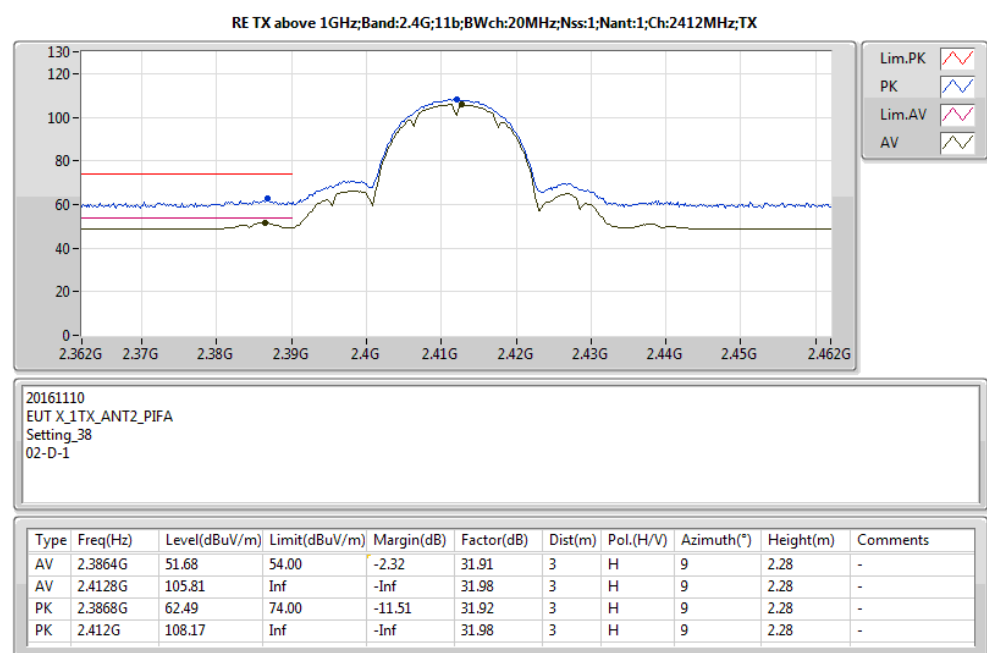
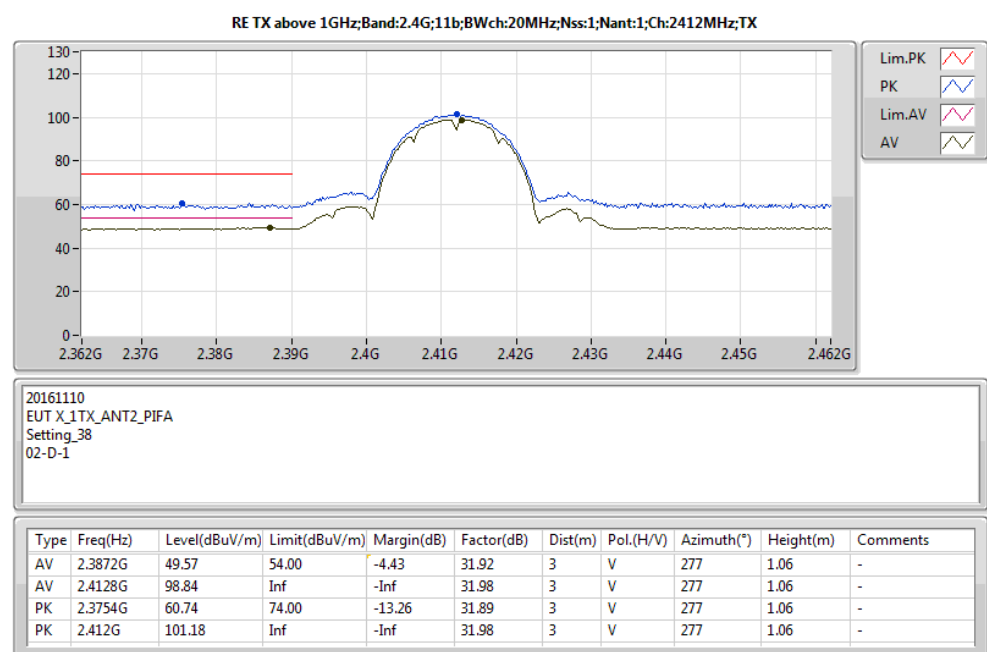
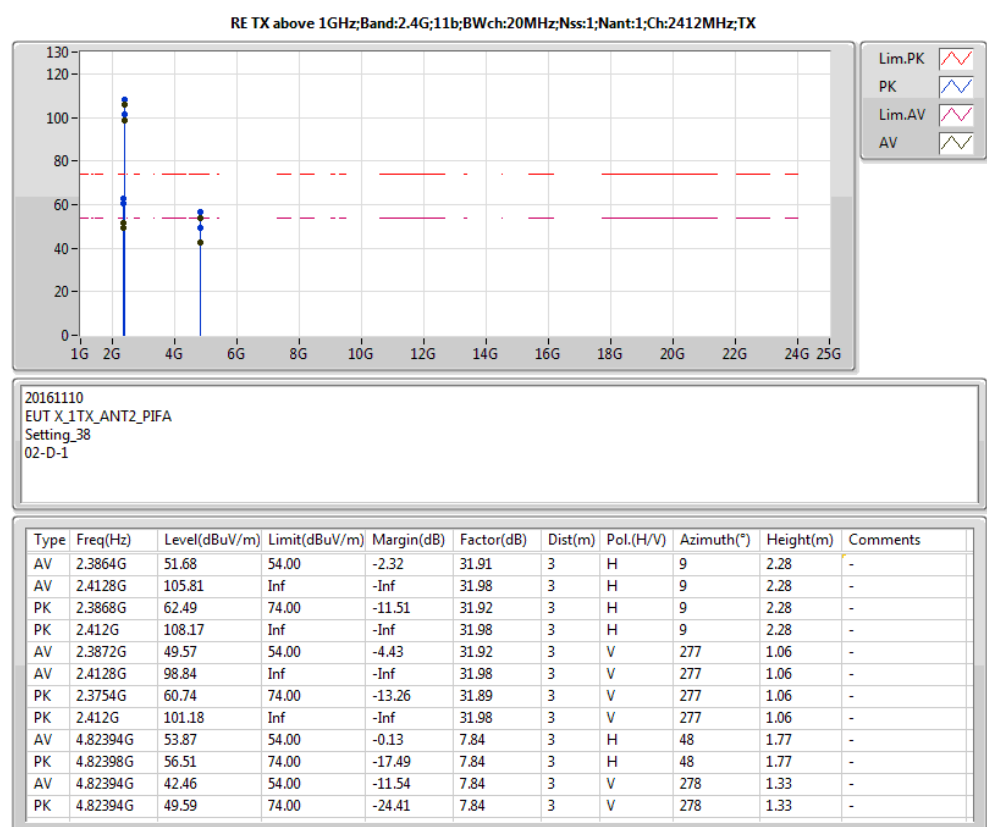
Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.

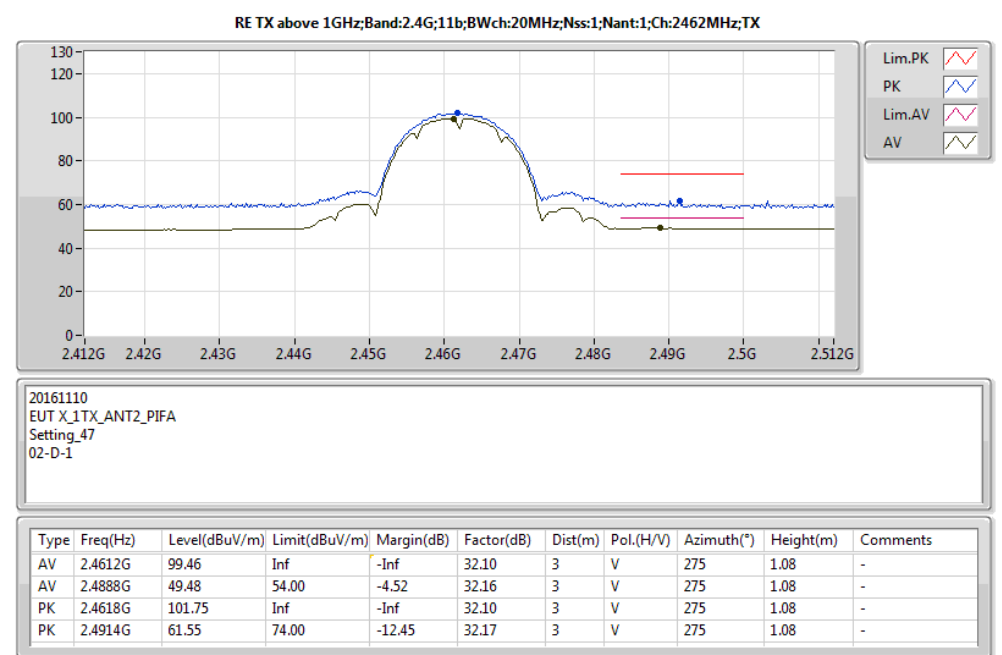
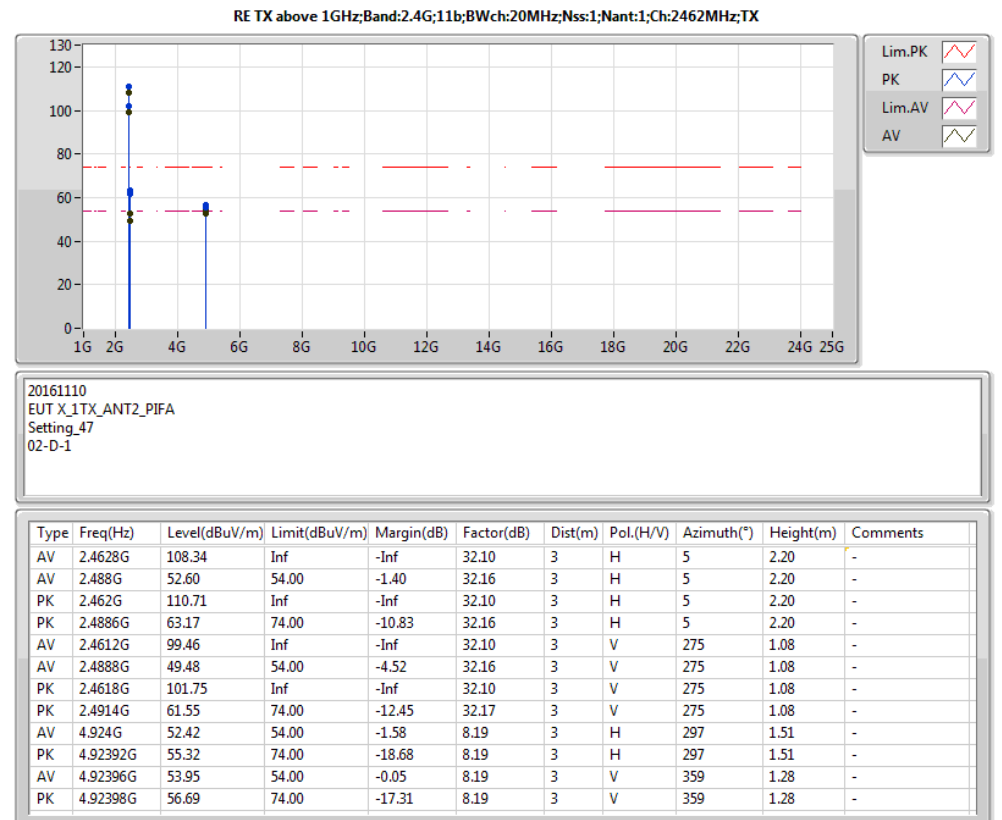
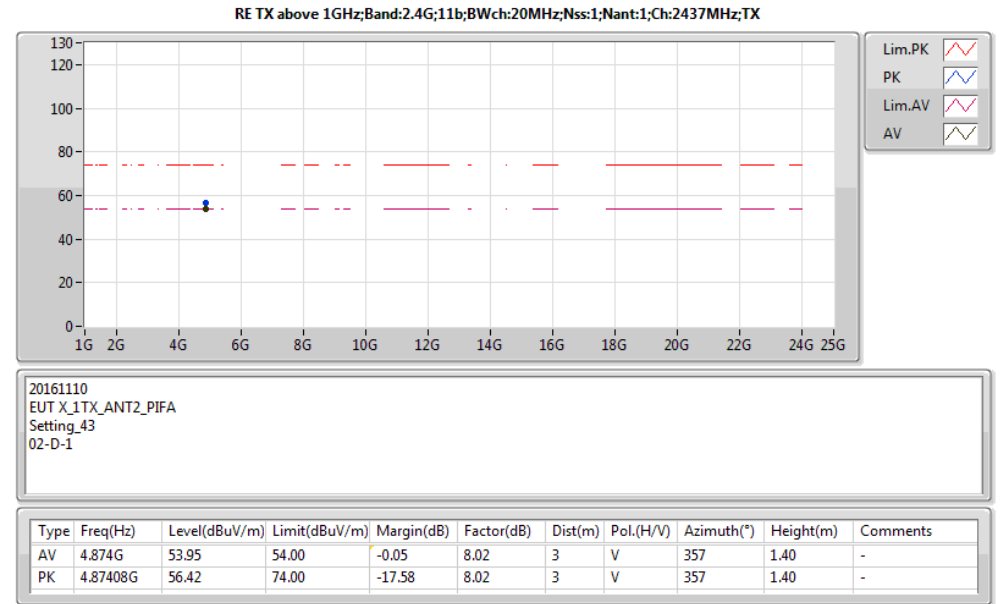
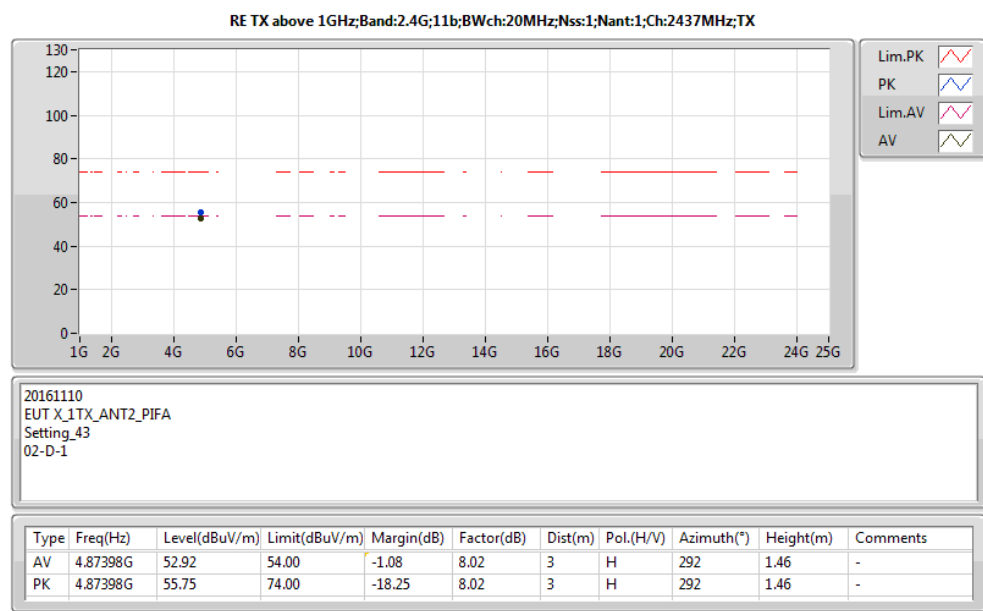
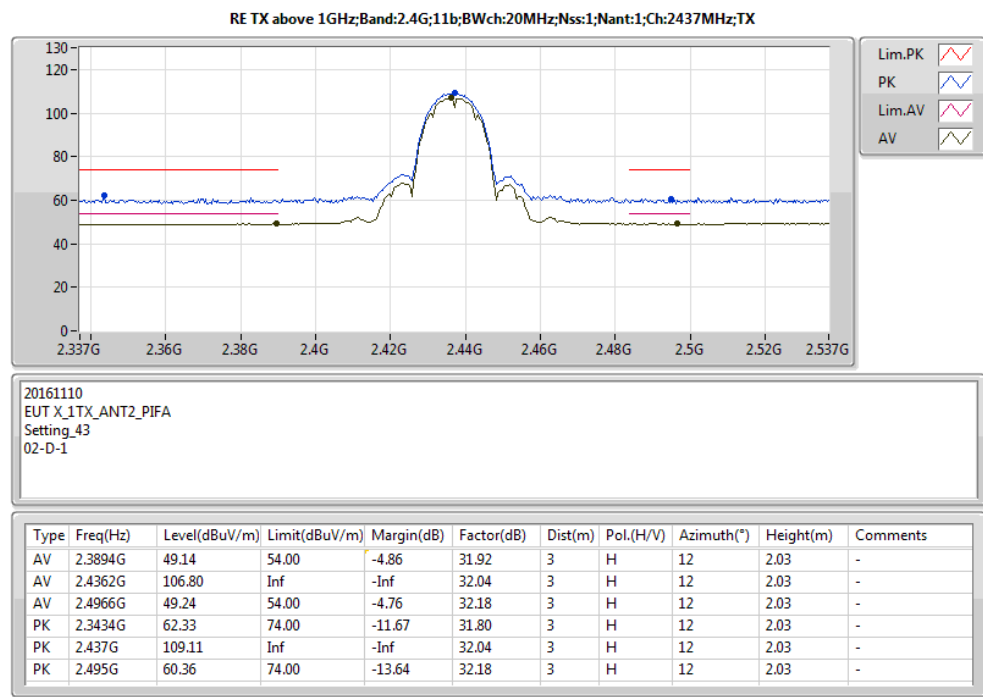
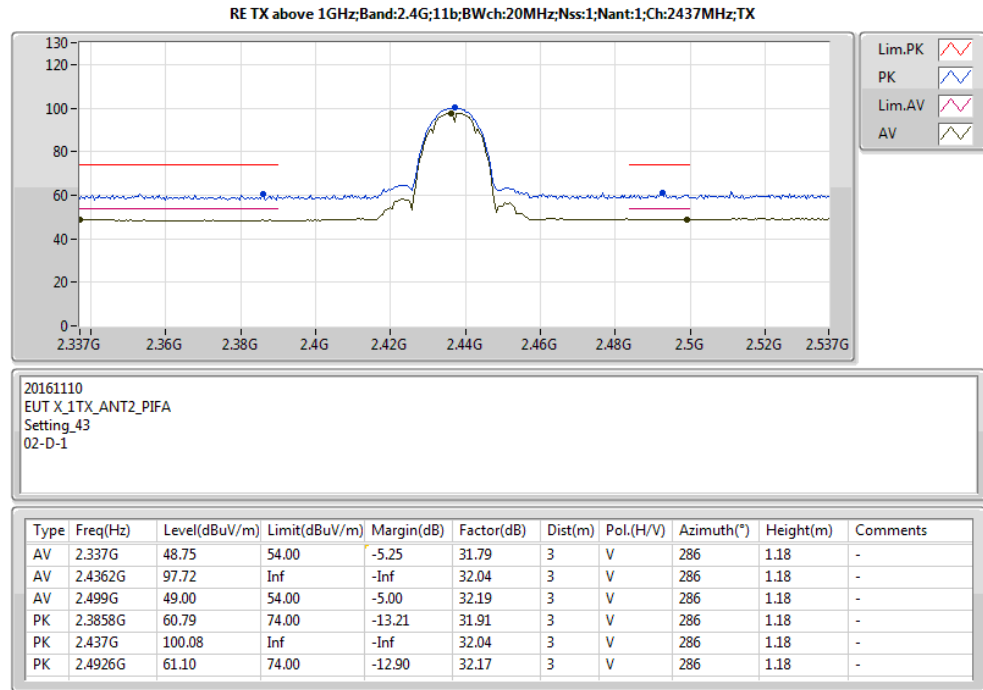
Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

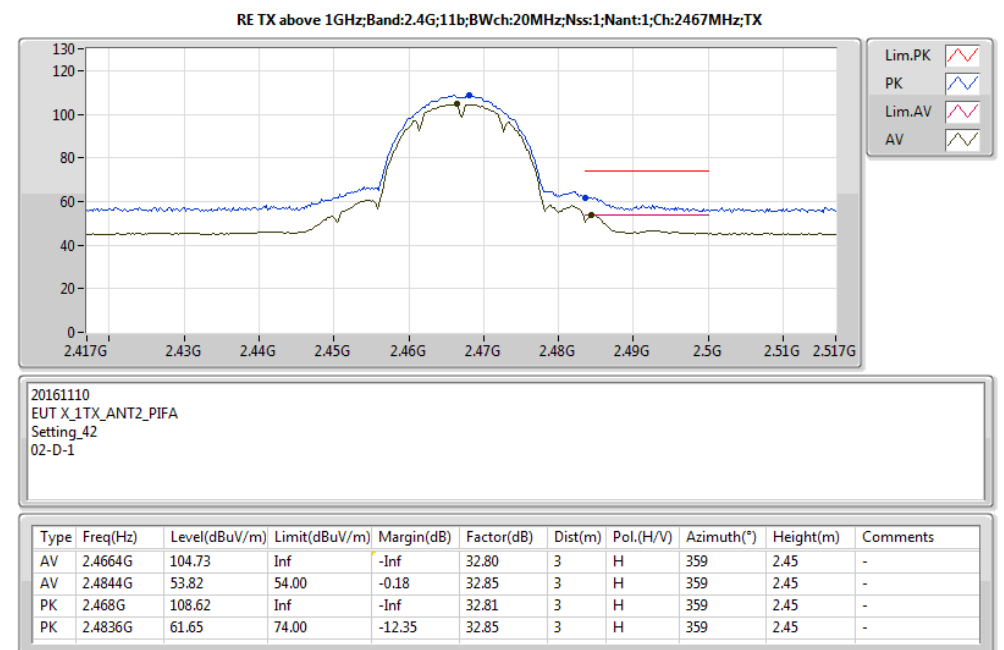
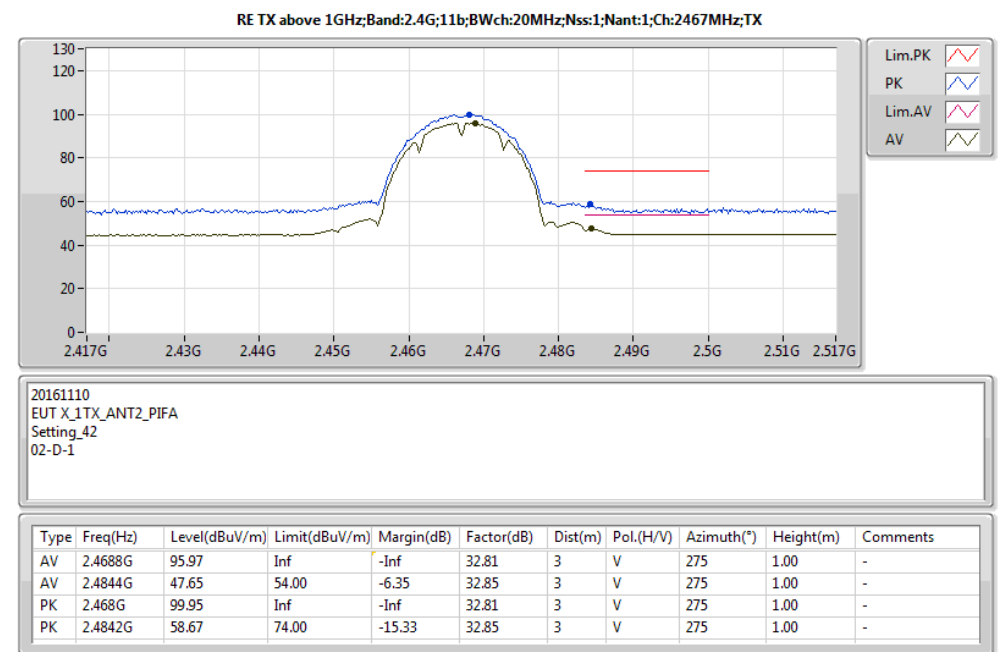
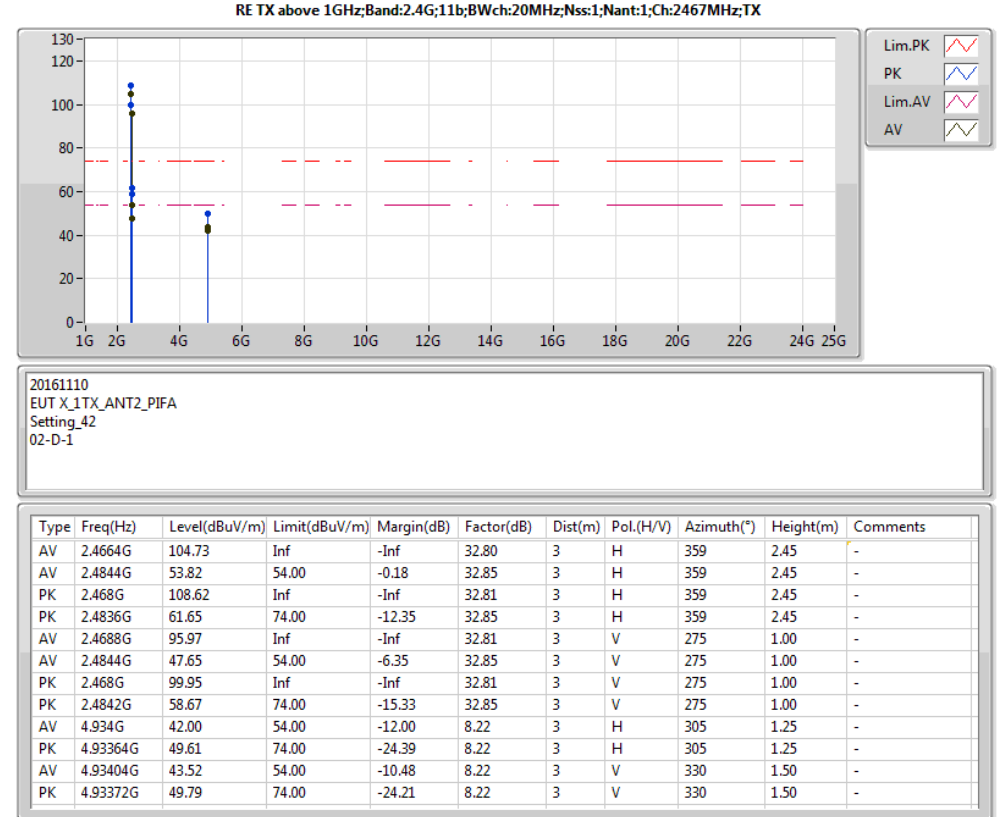
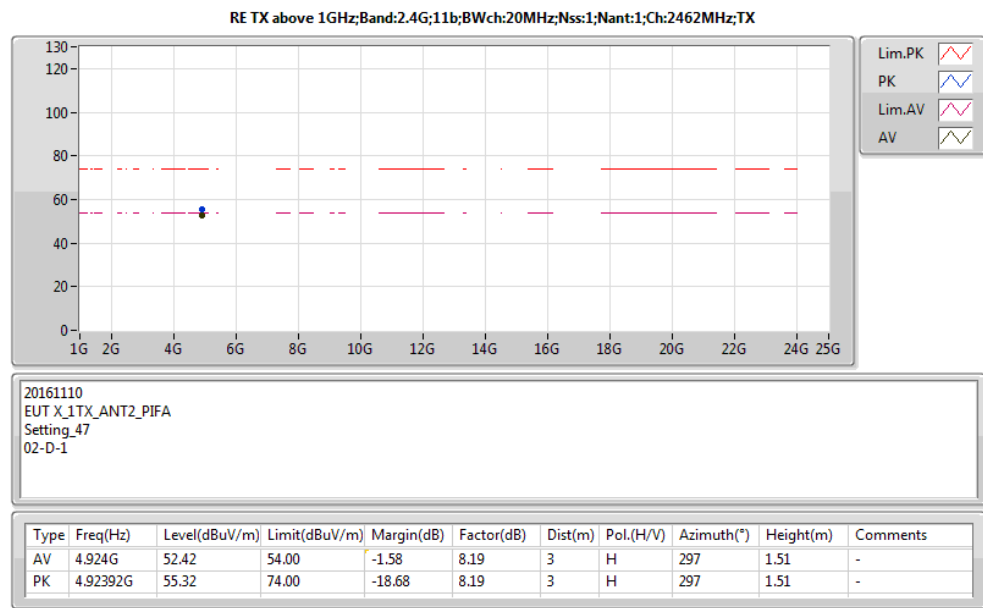
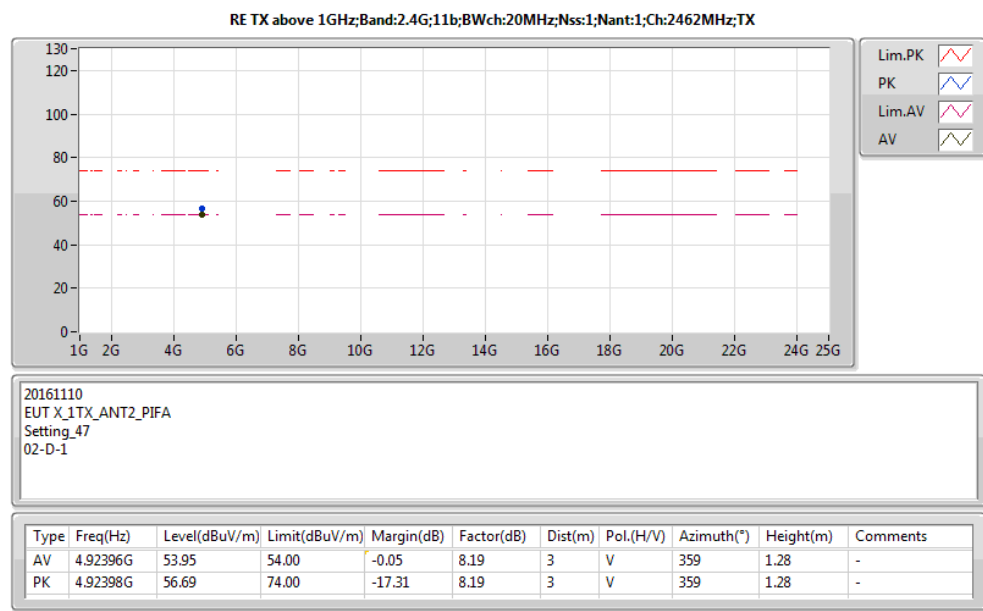
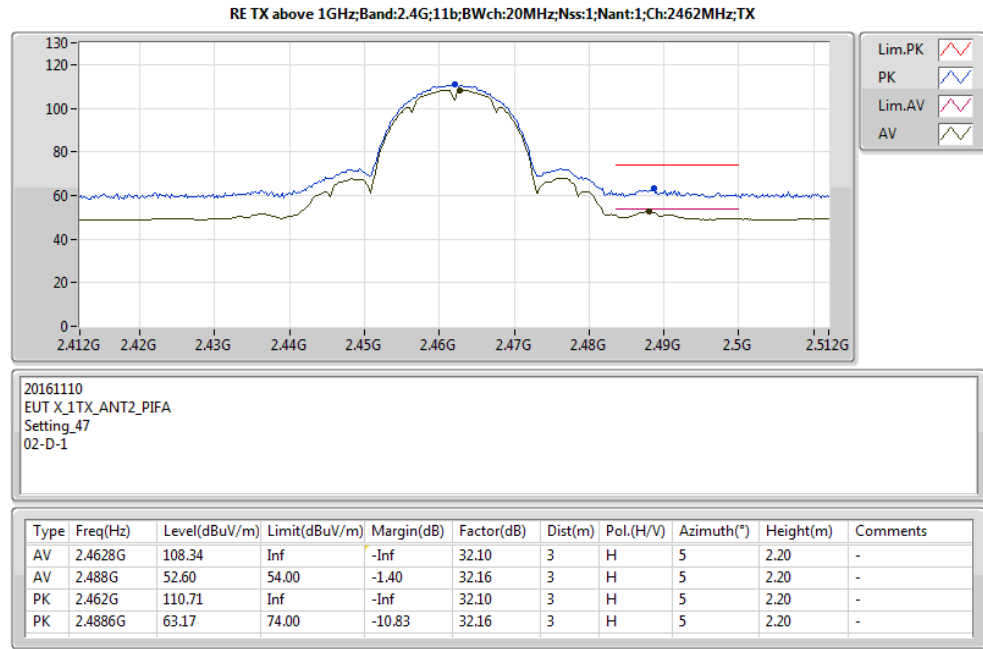


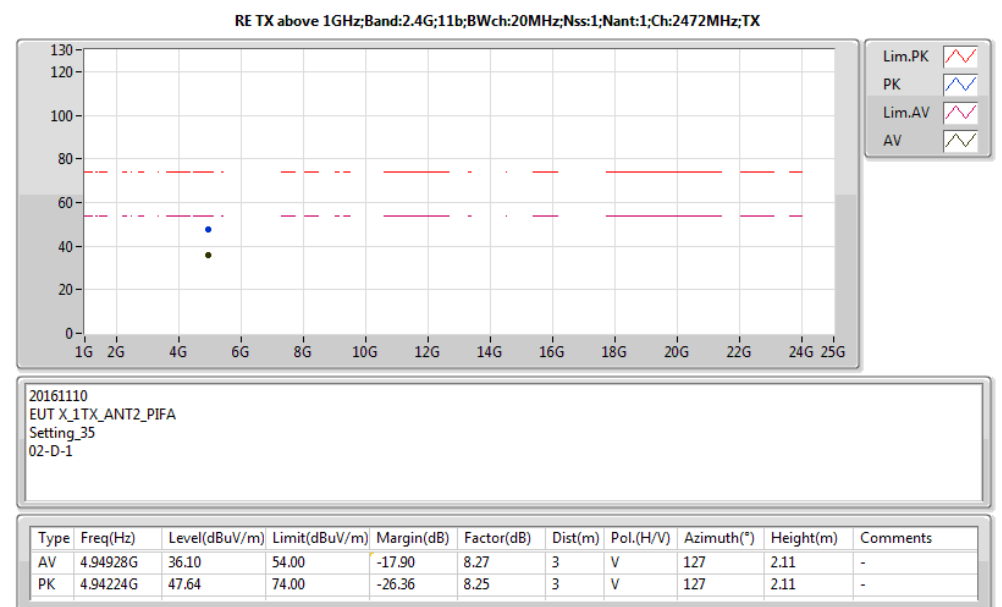
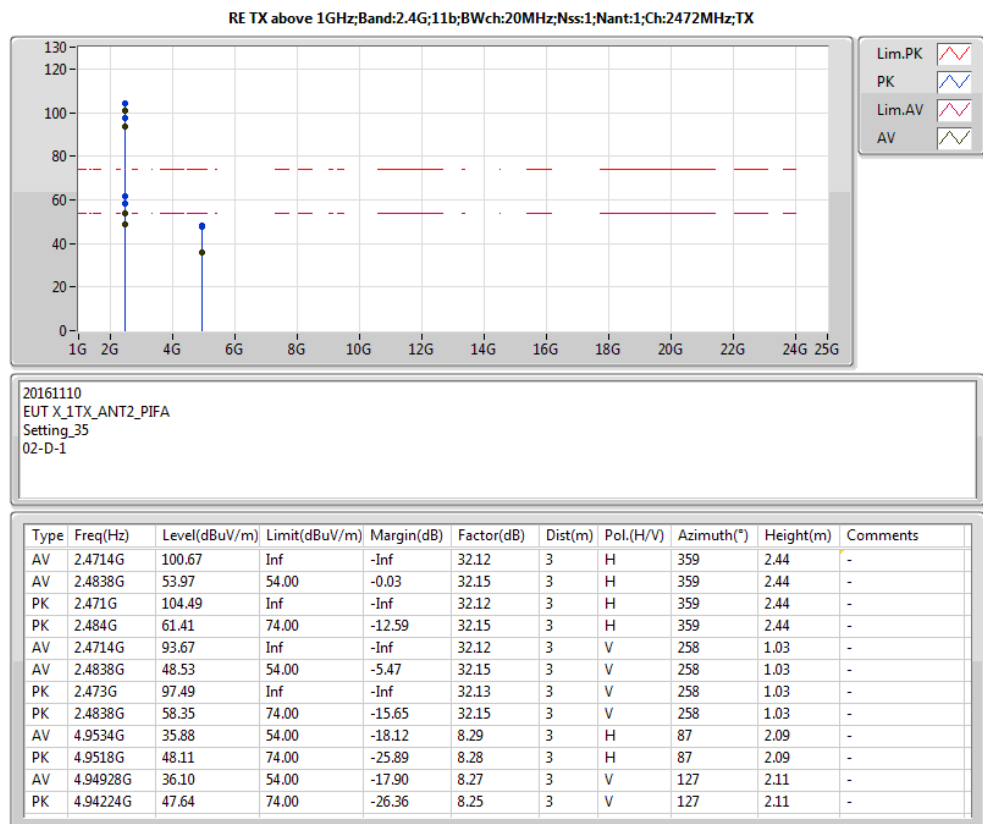
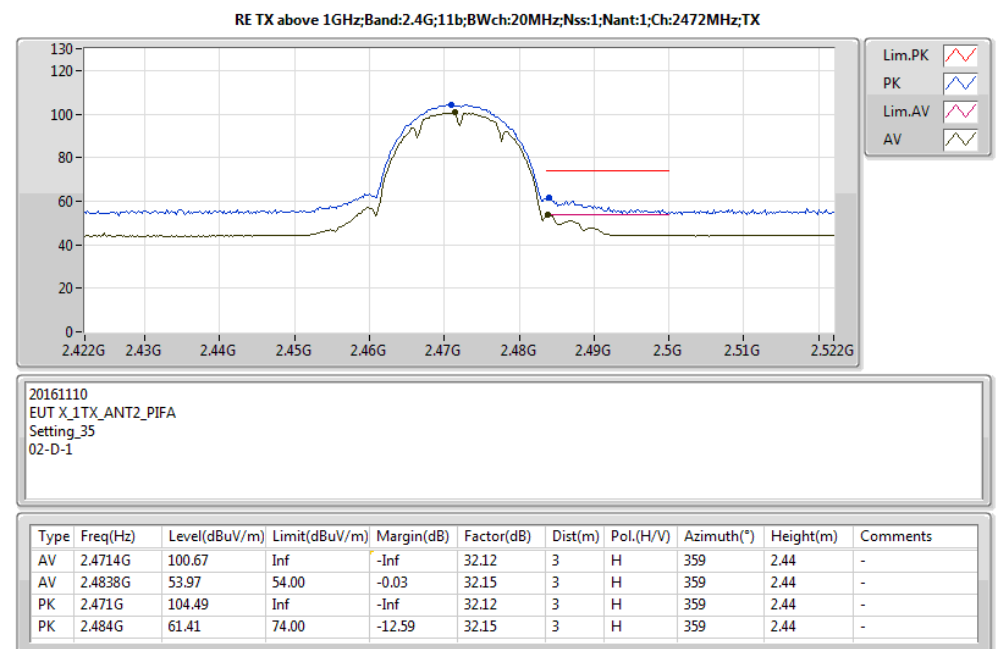
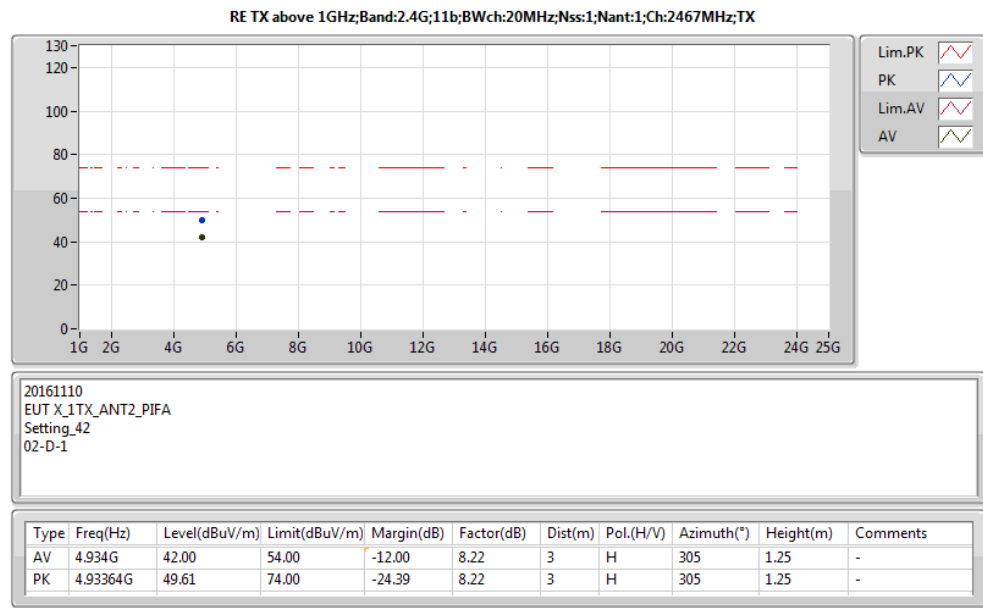
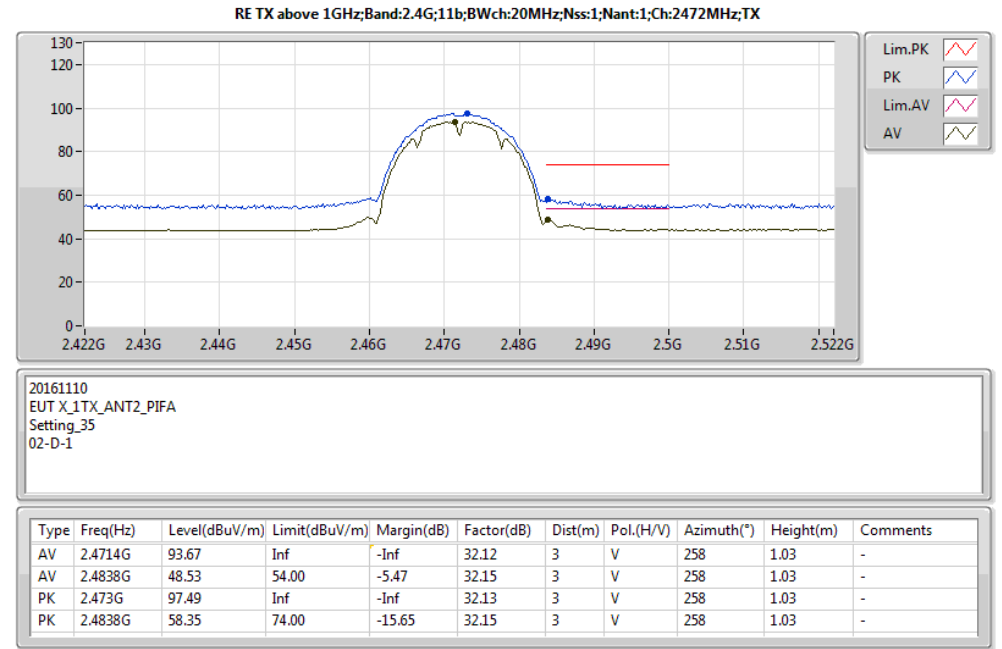
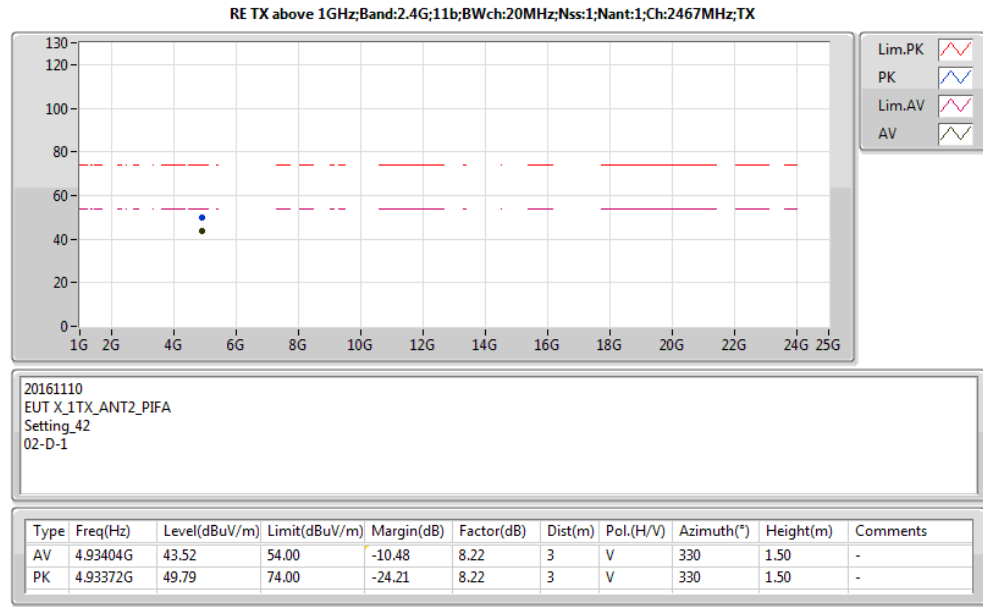
Summary

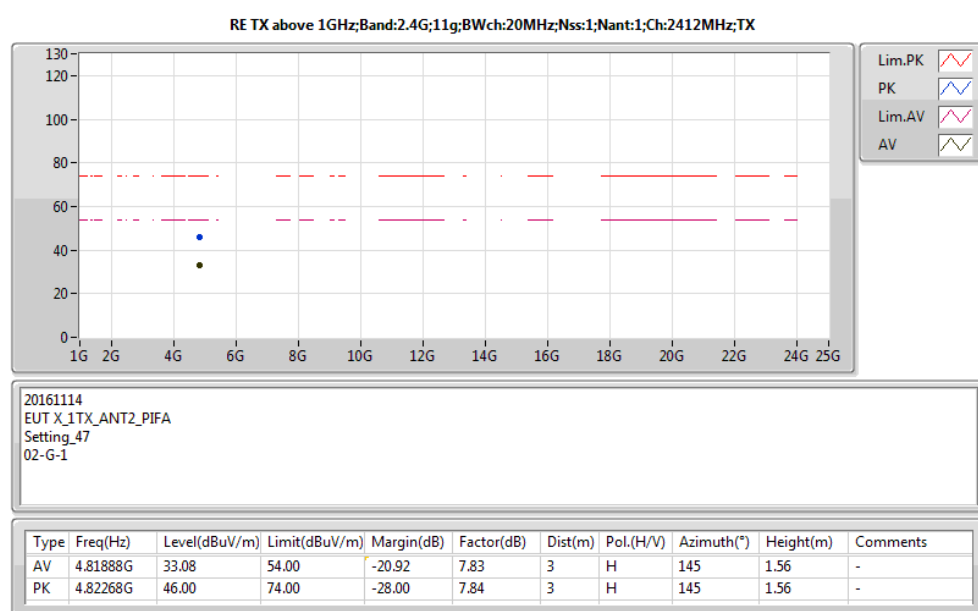
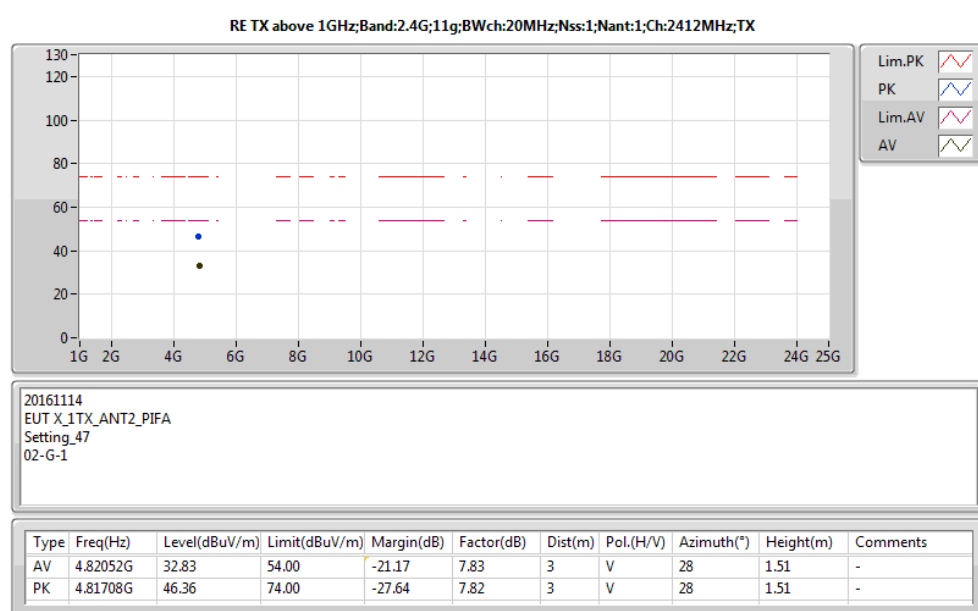
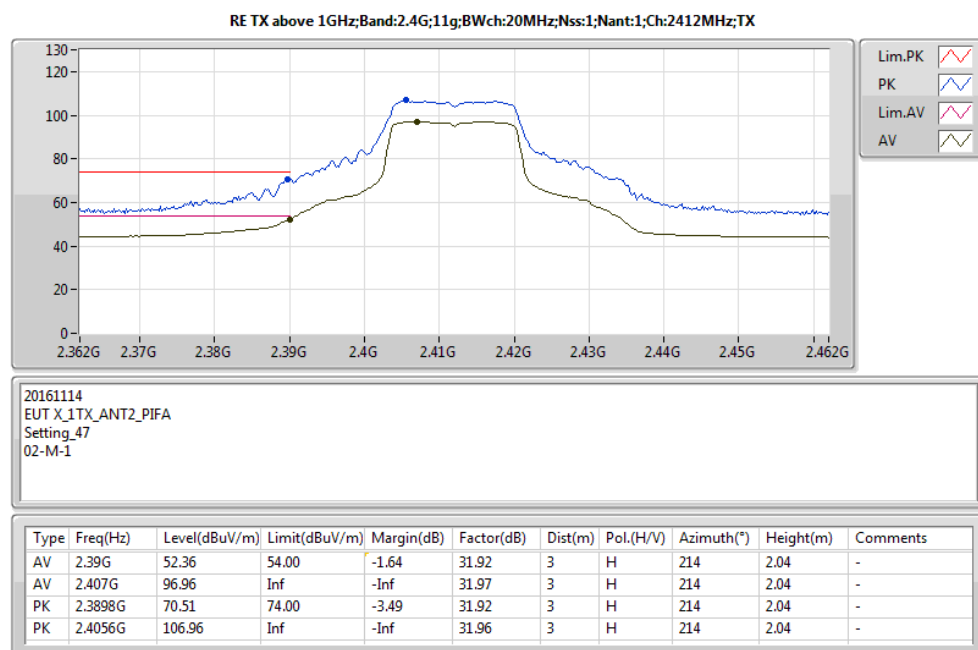
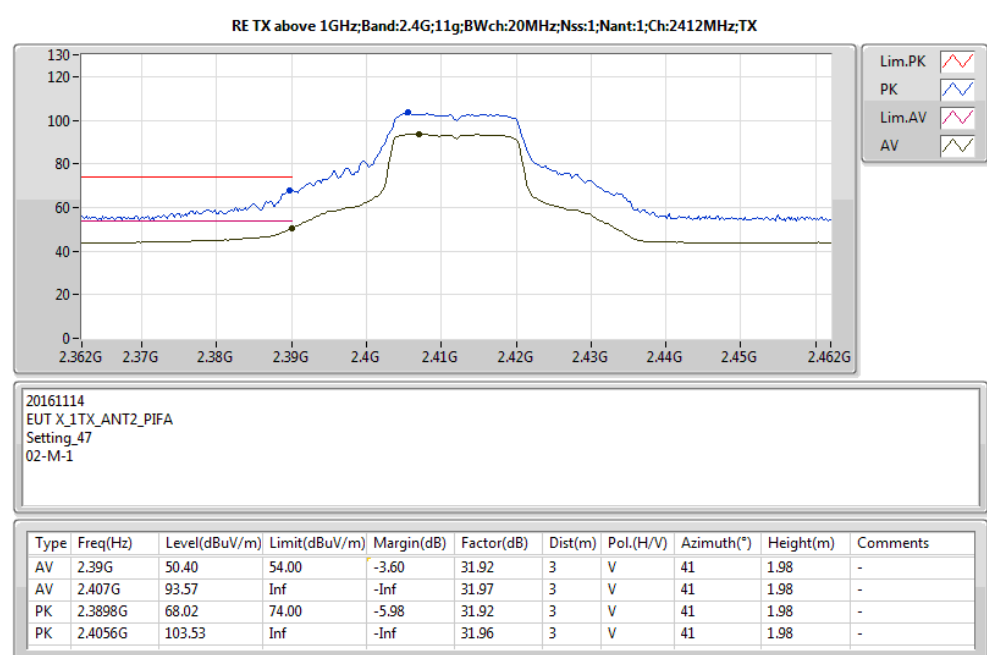
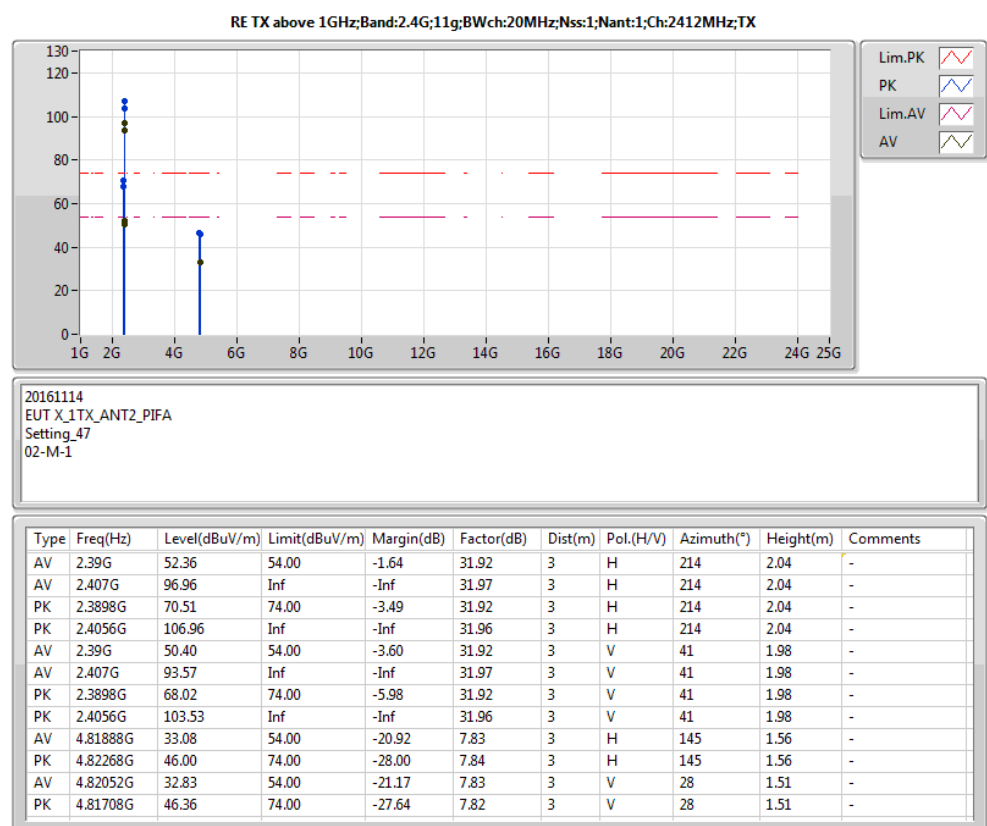
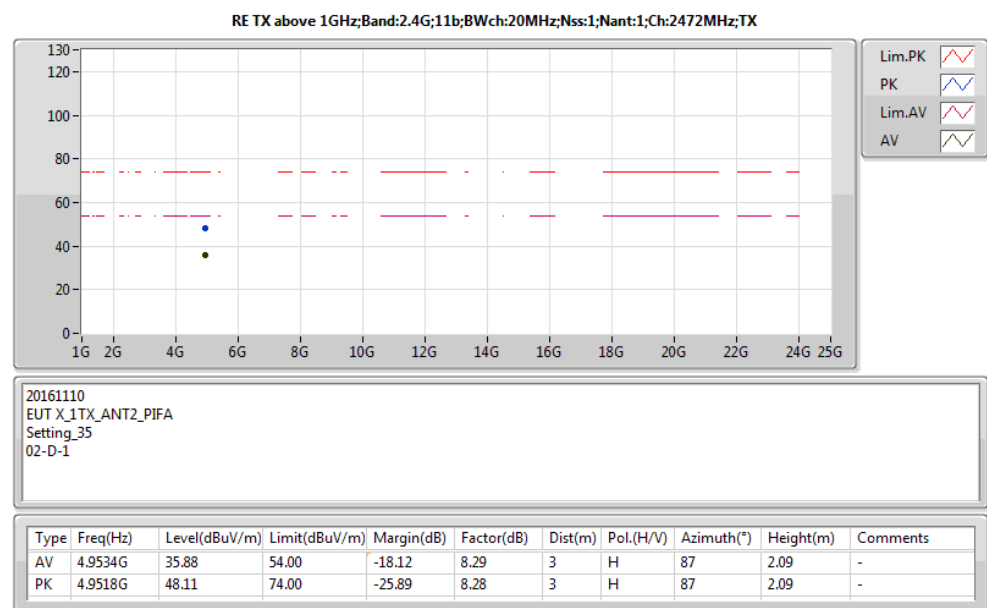
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2.4G;11b;Nss1;Ntx1;2472	Pass	AV	2.4838G	53.97	54.00	-0.03	32.15	3	H	359	2.44	-

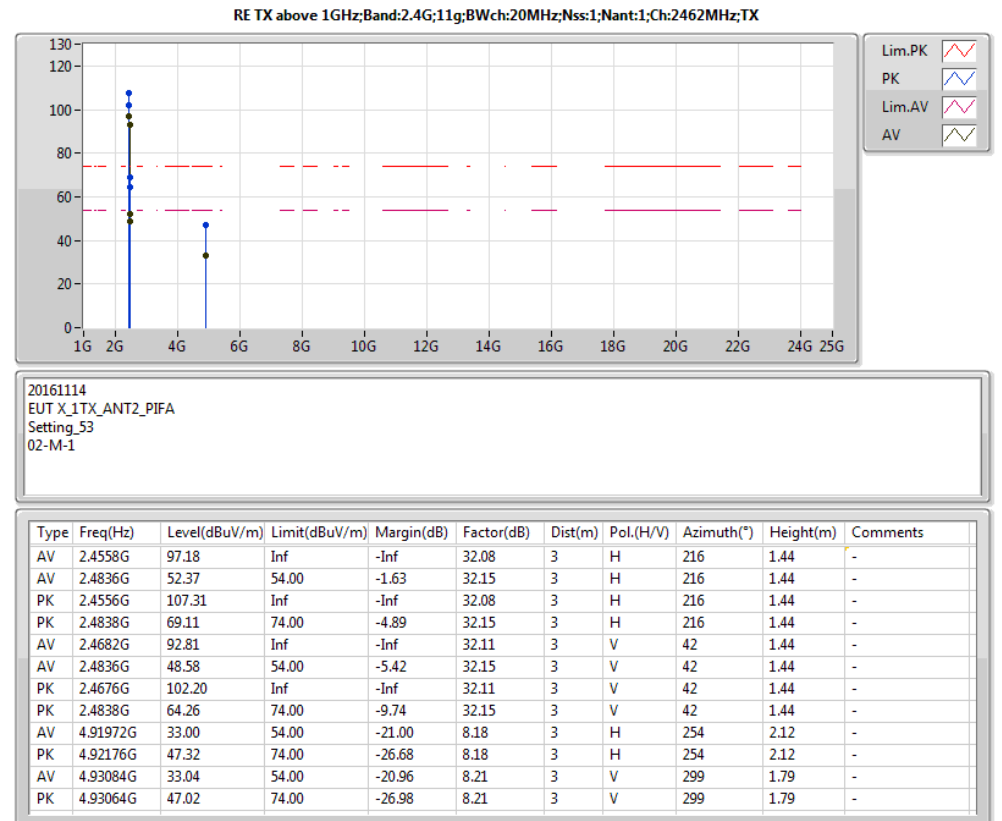
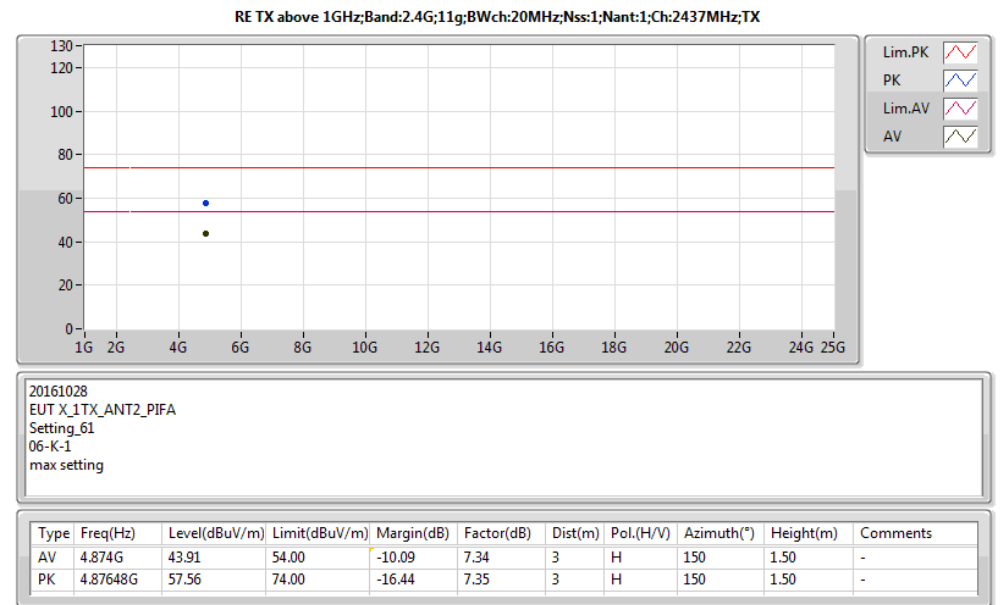
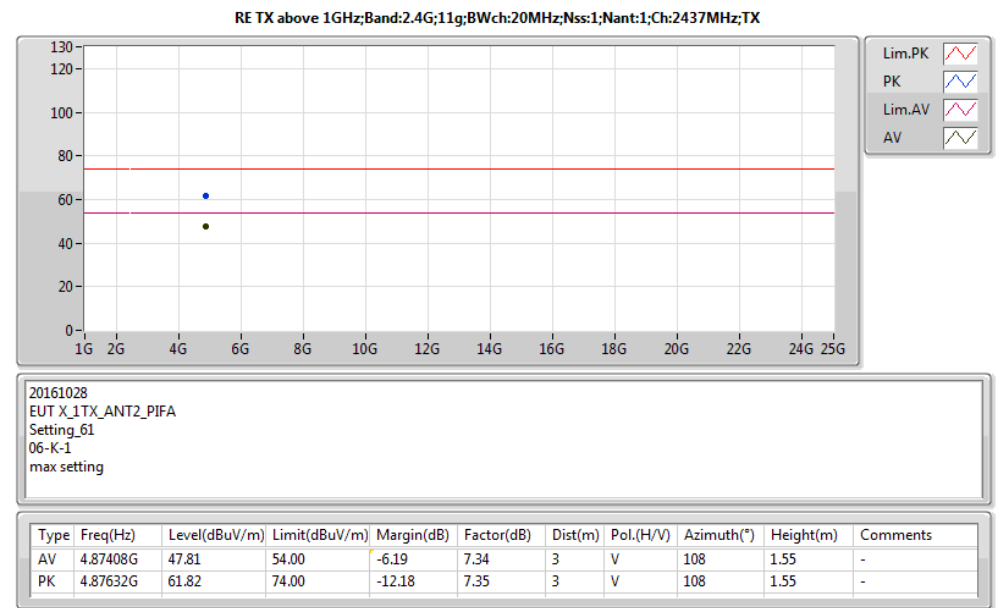
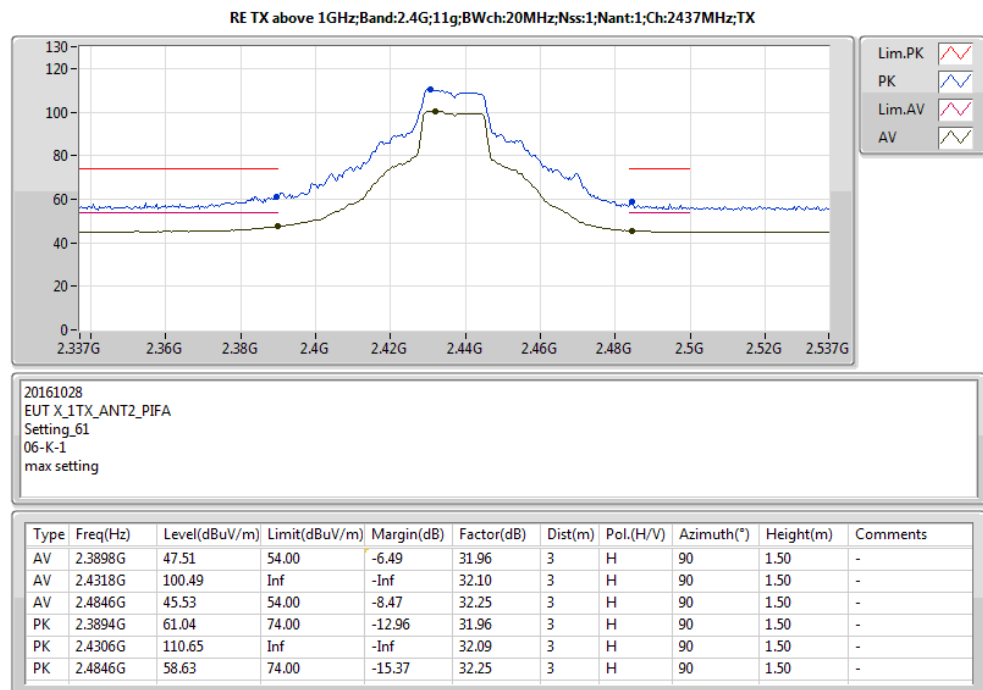
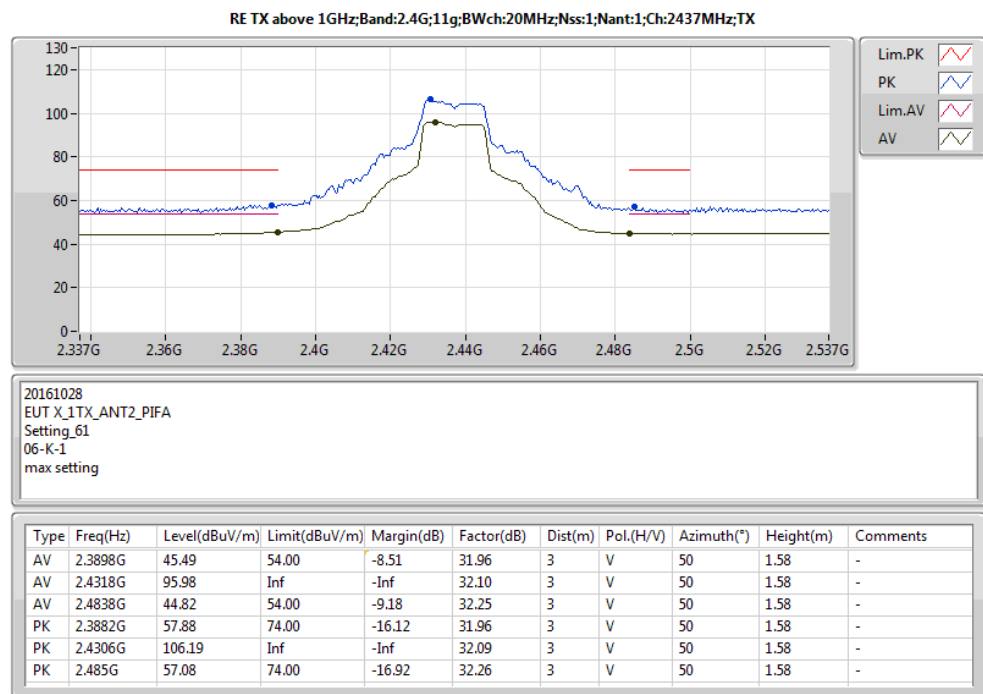
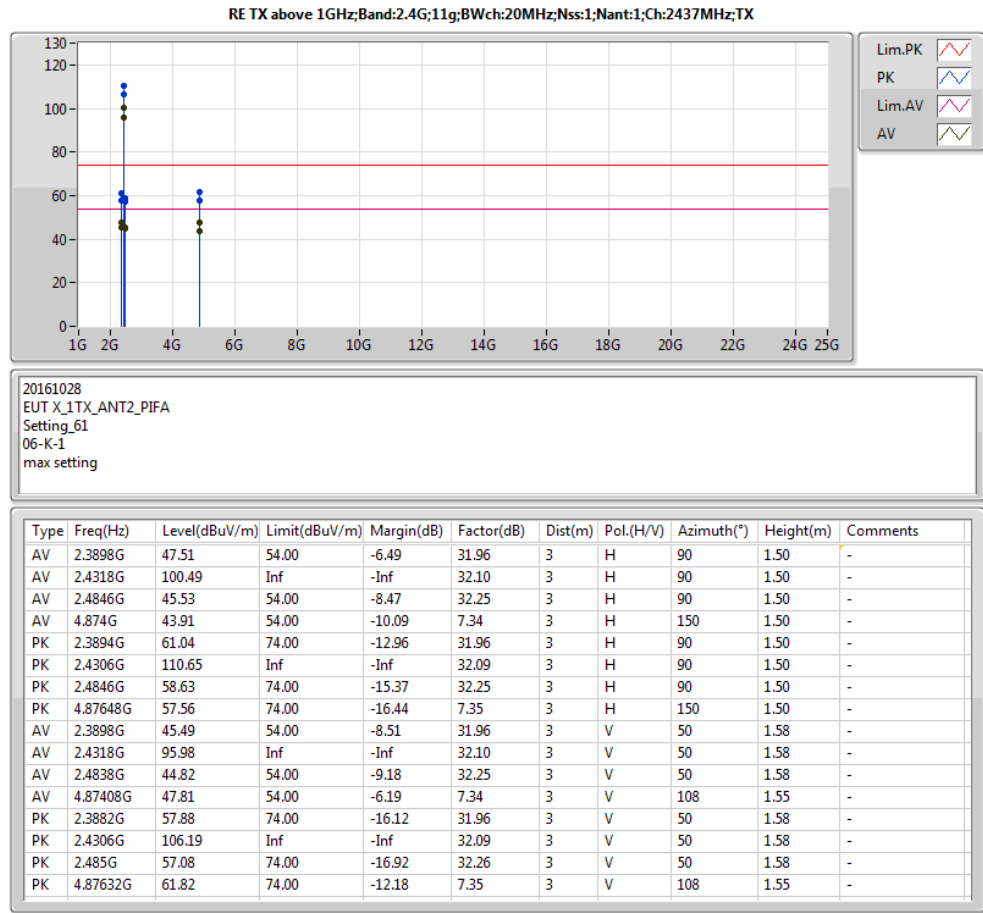


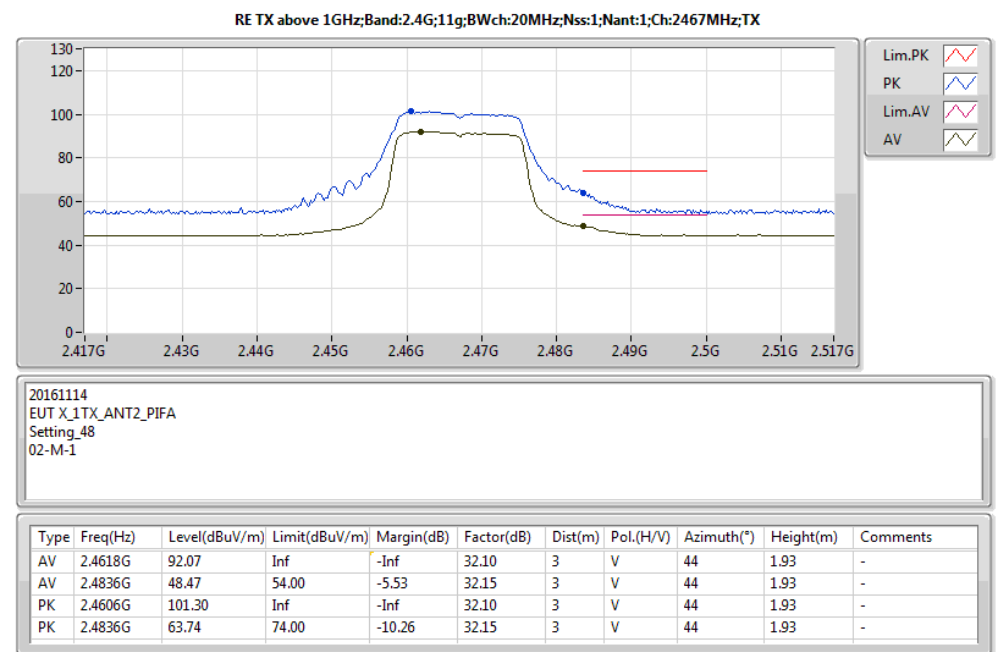
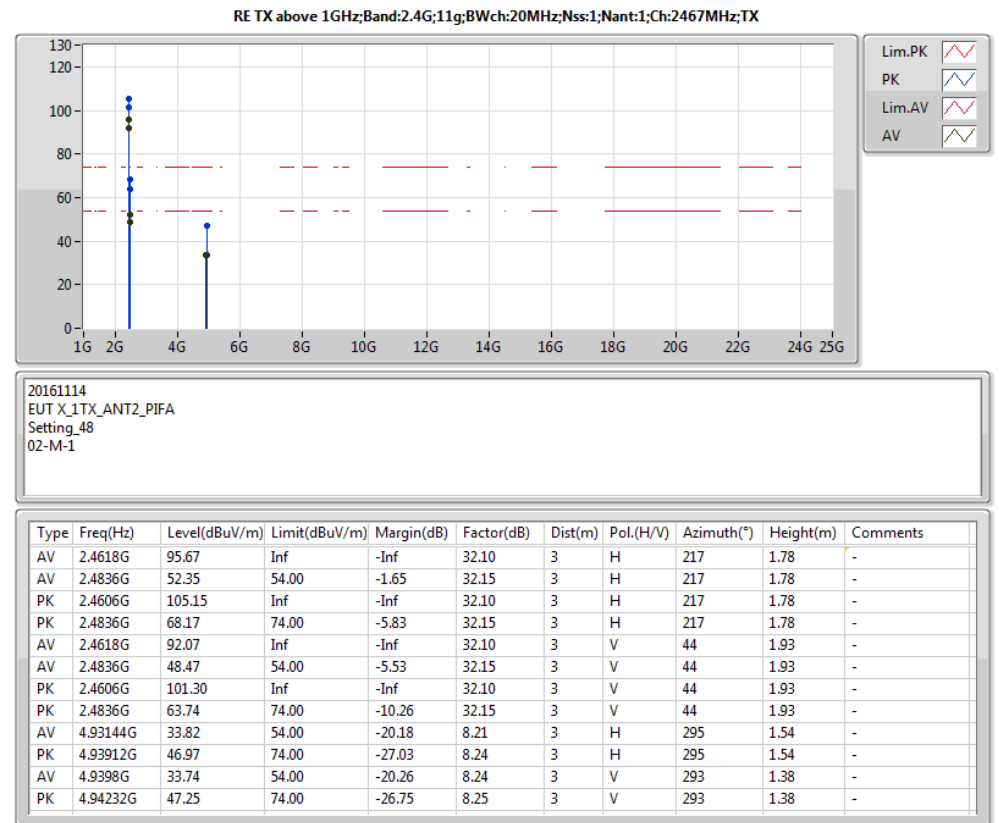
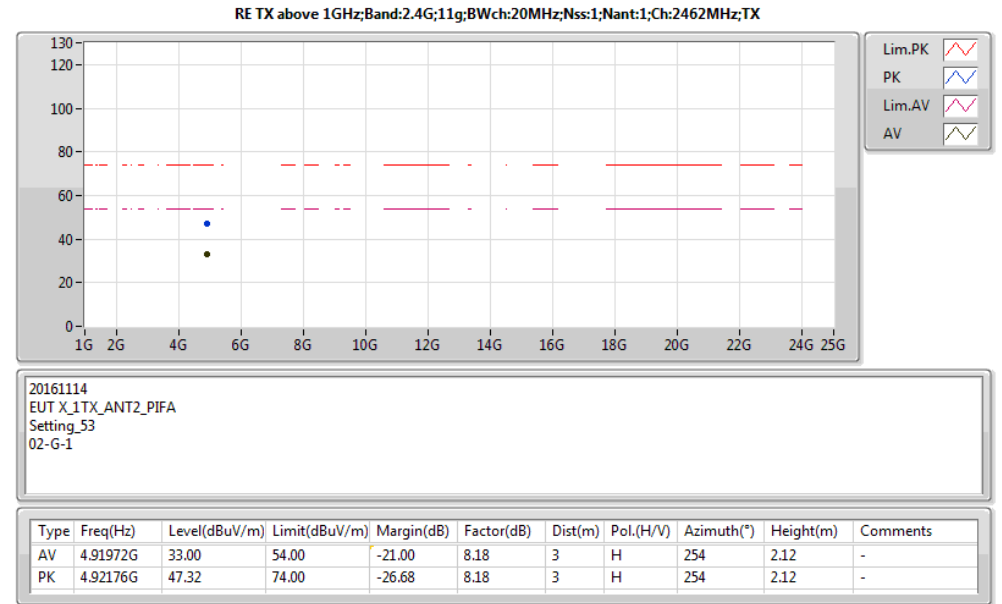
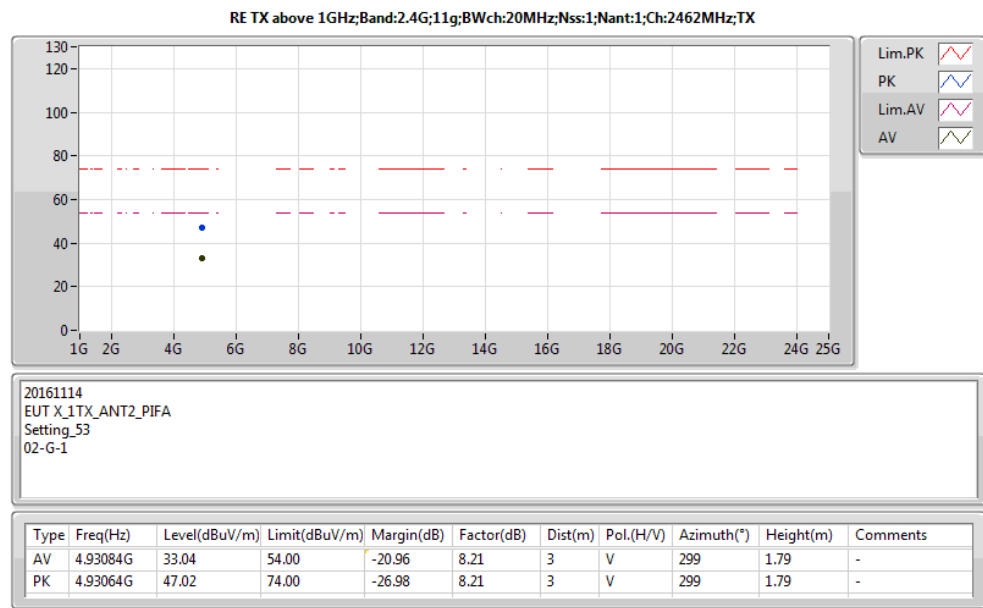
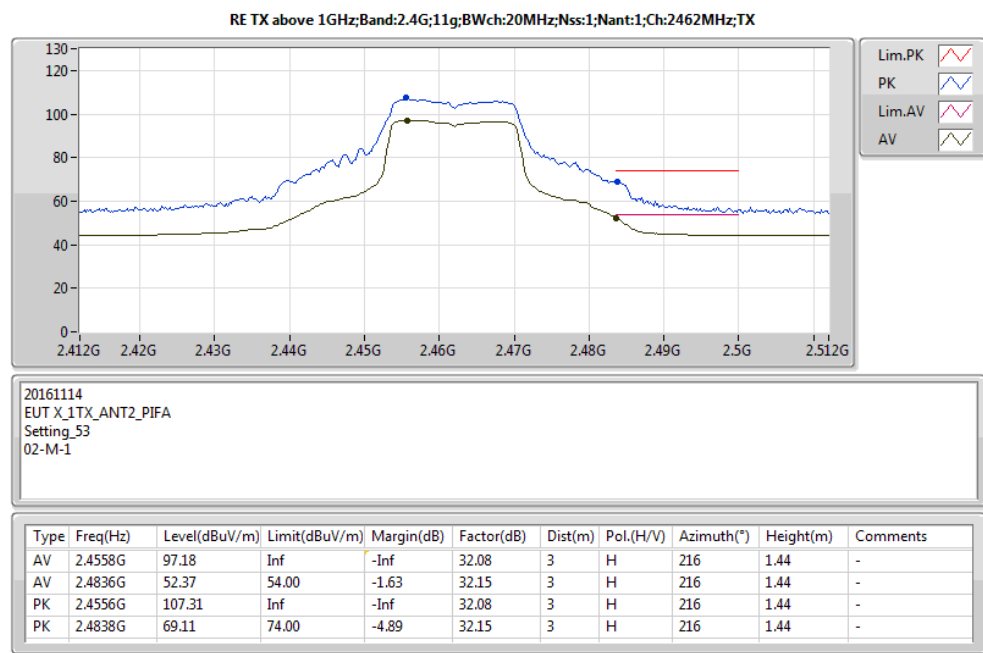
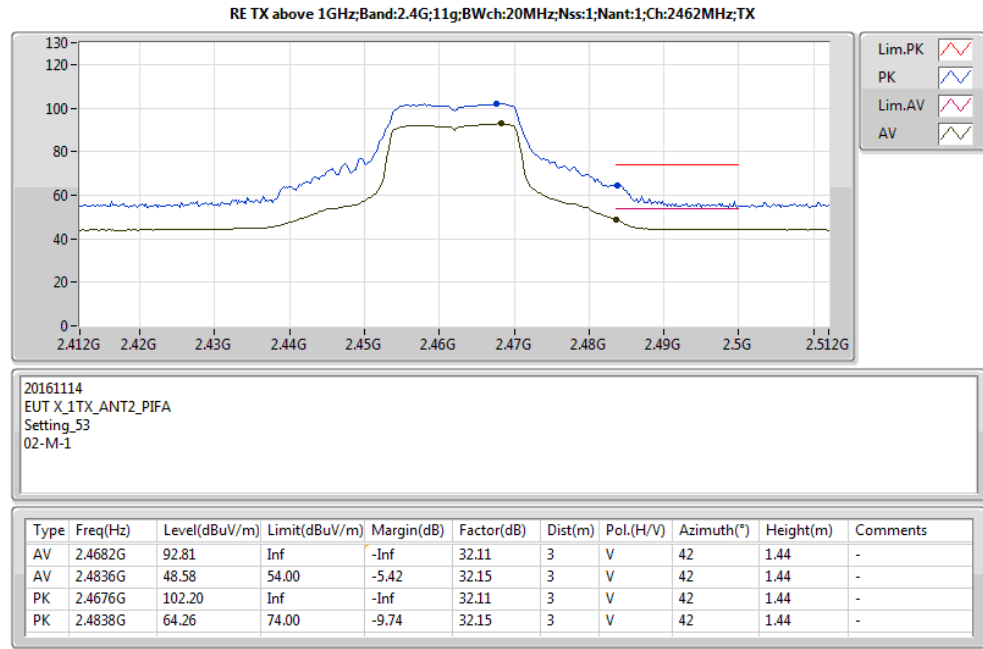


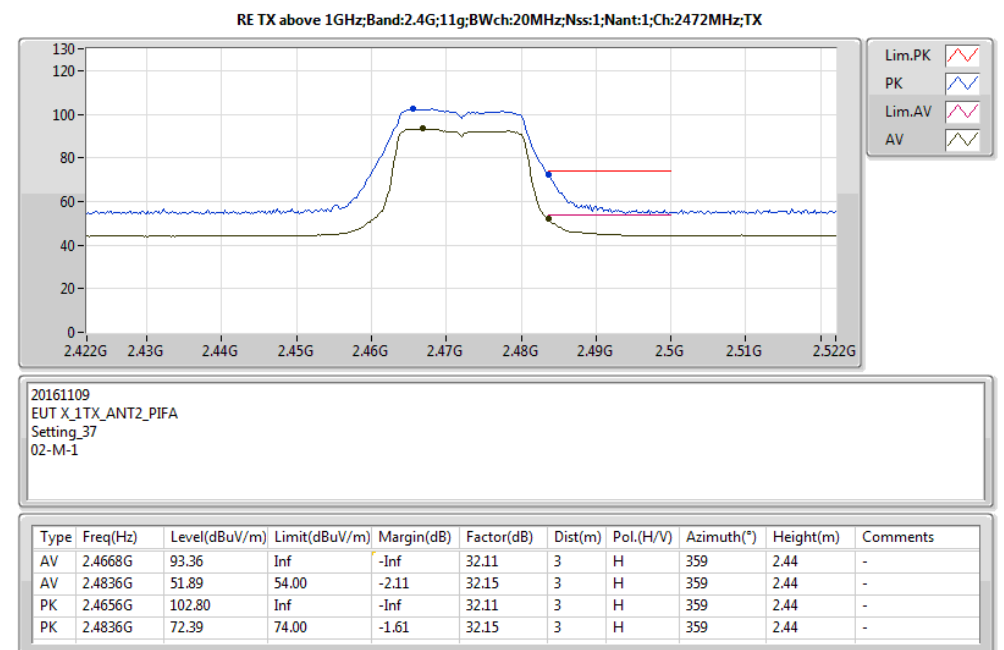
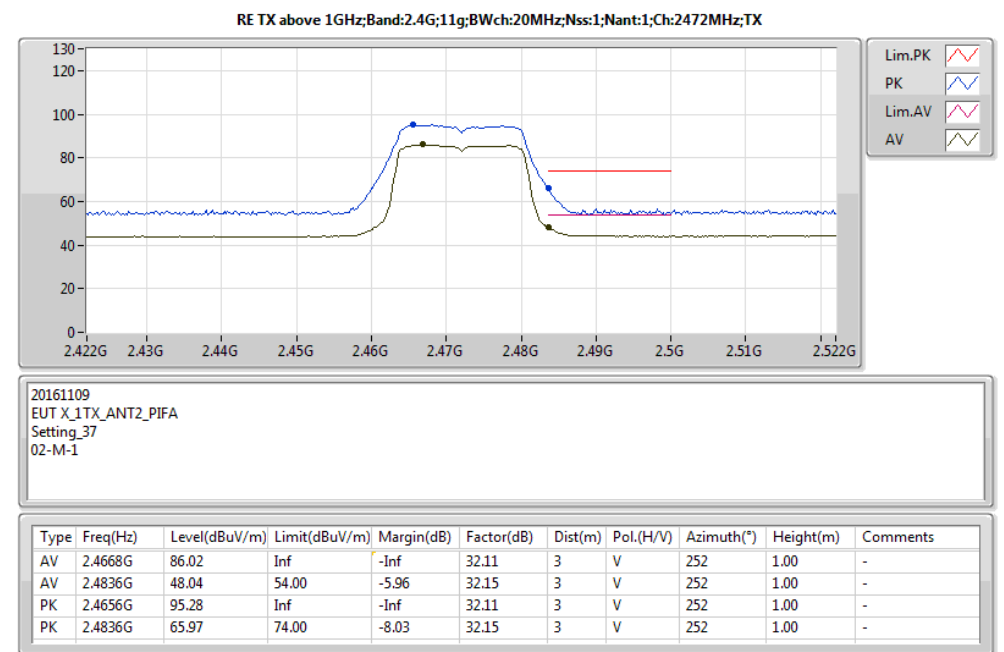
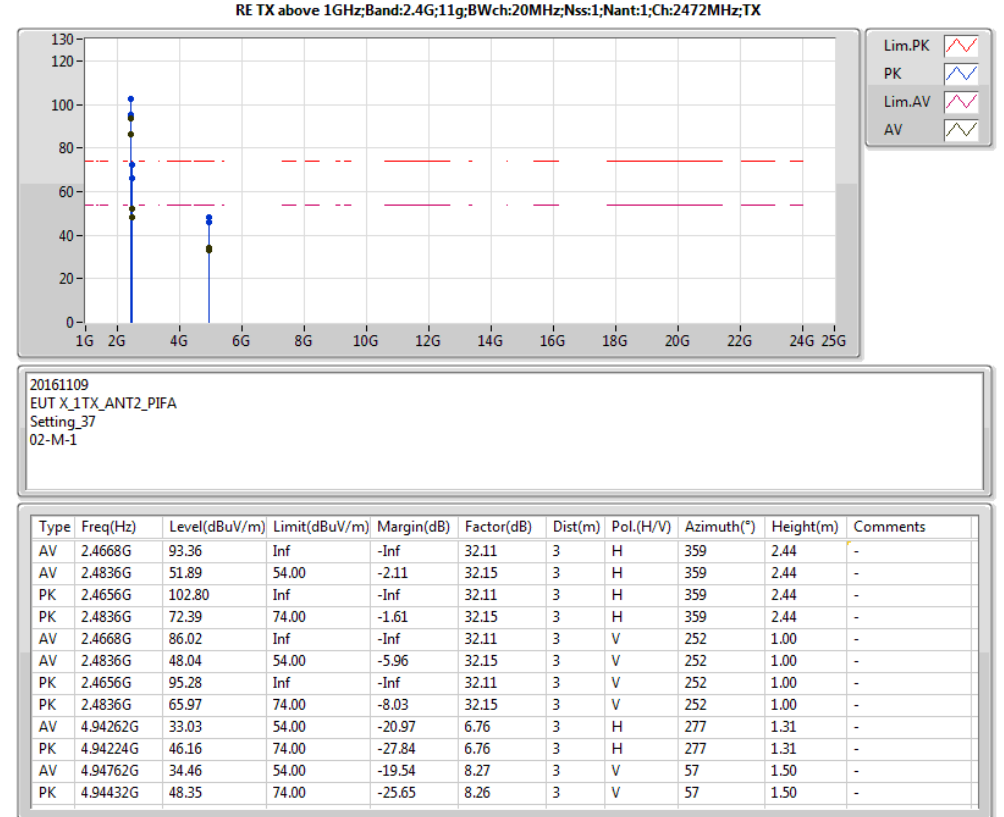
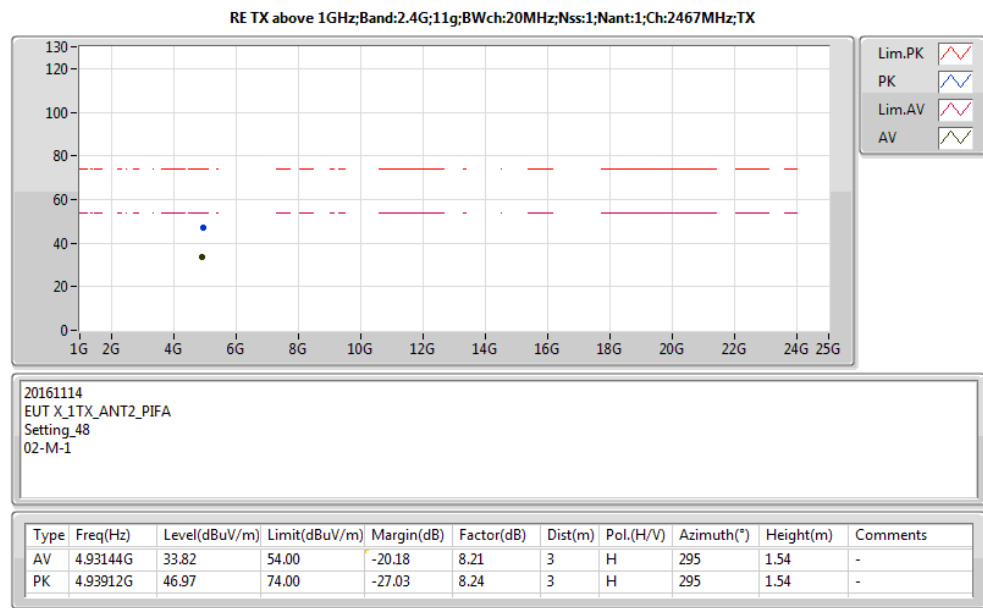
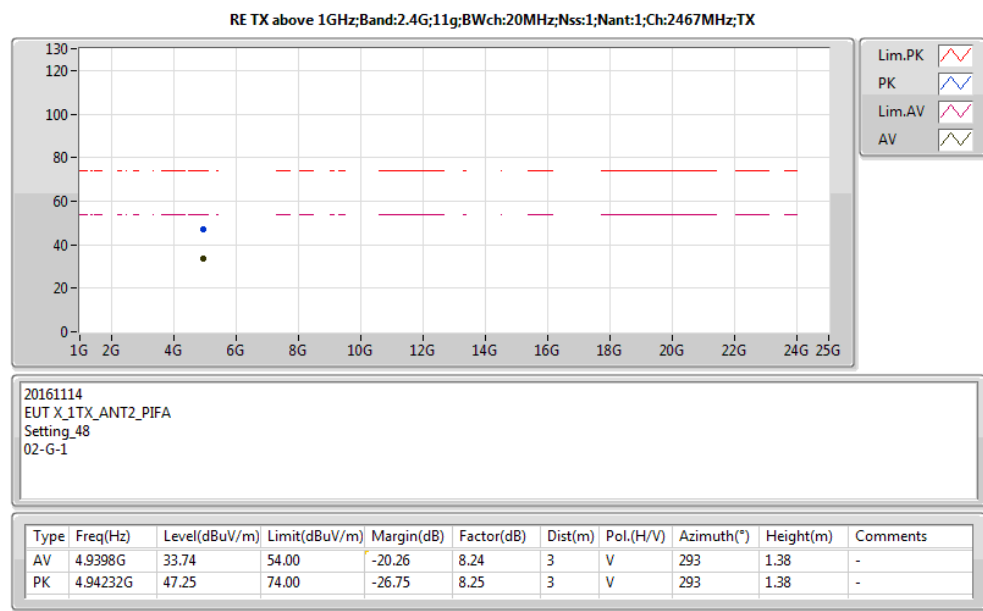
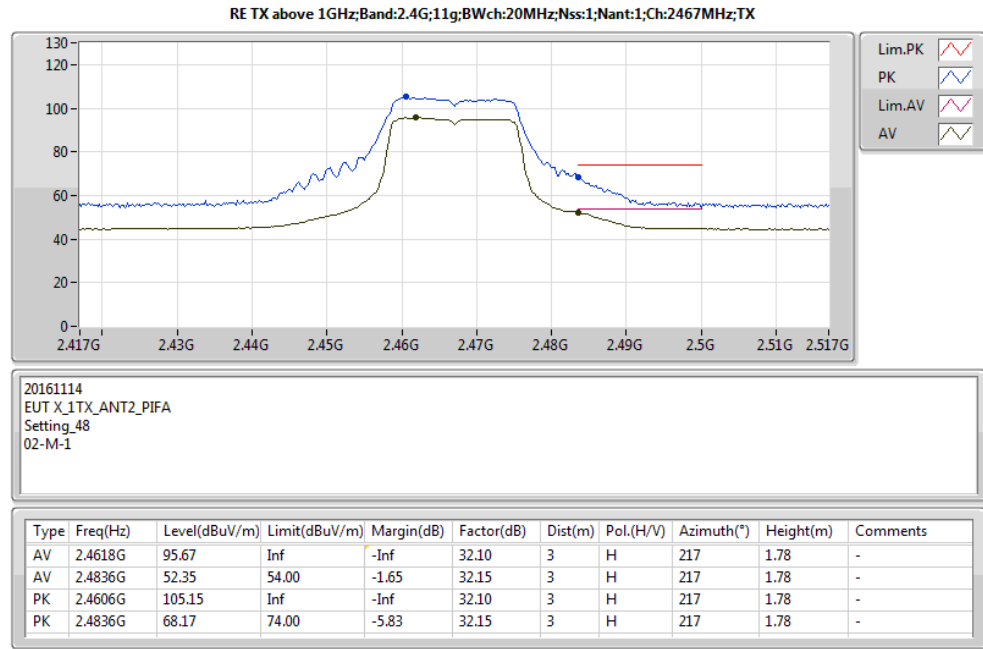


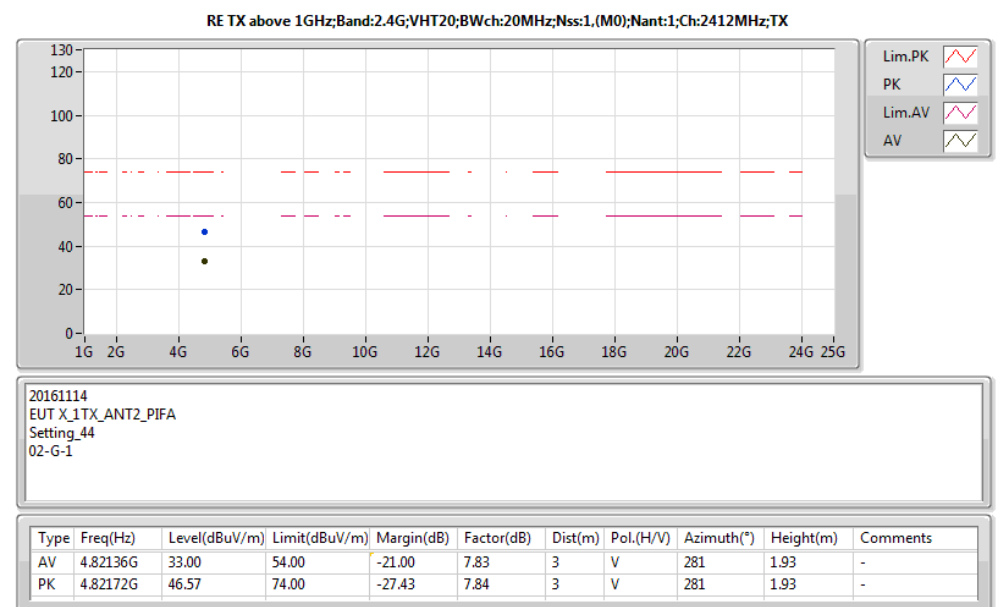
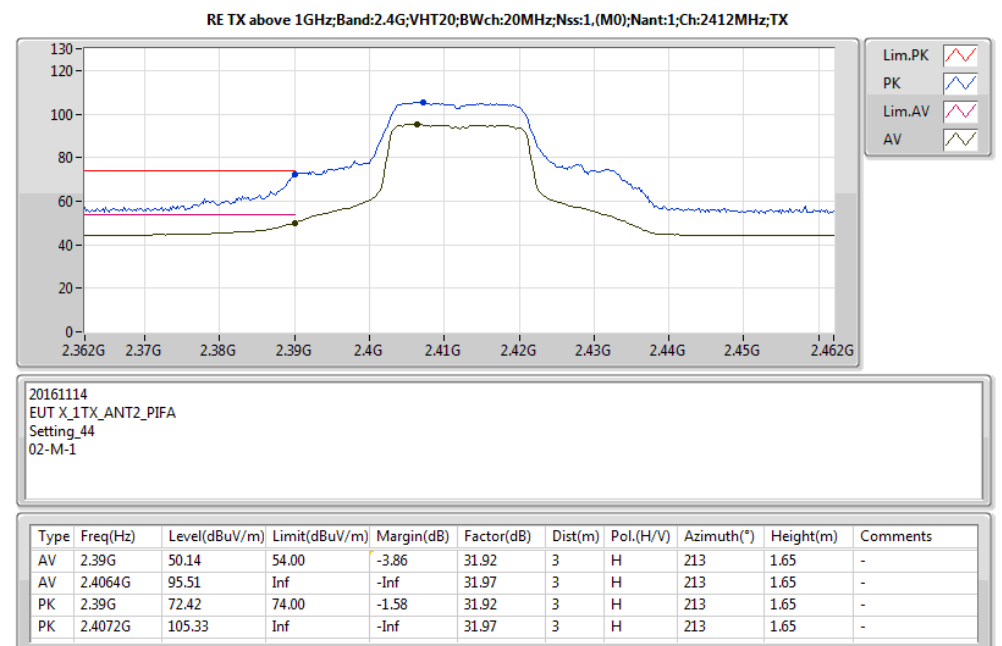
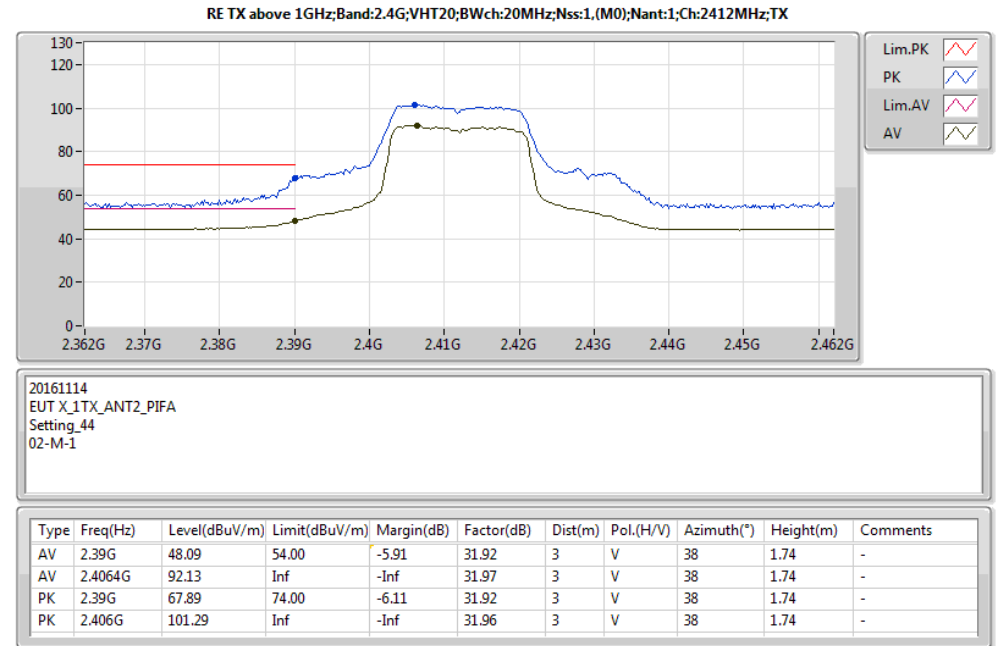
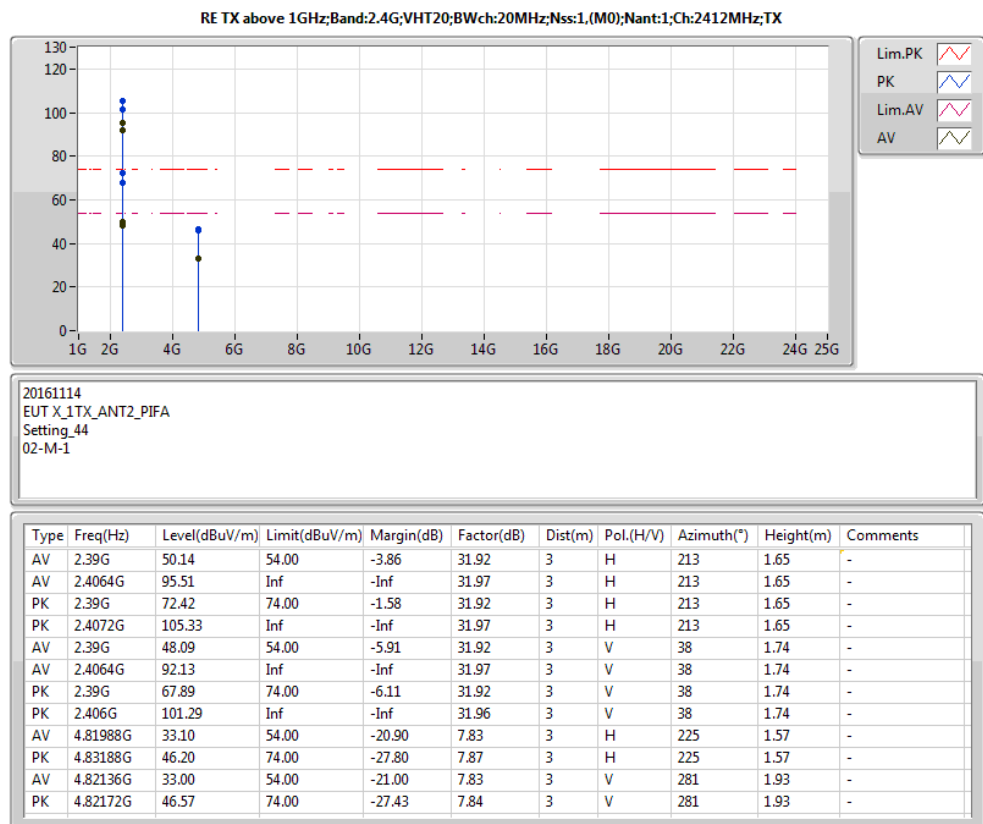
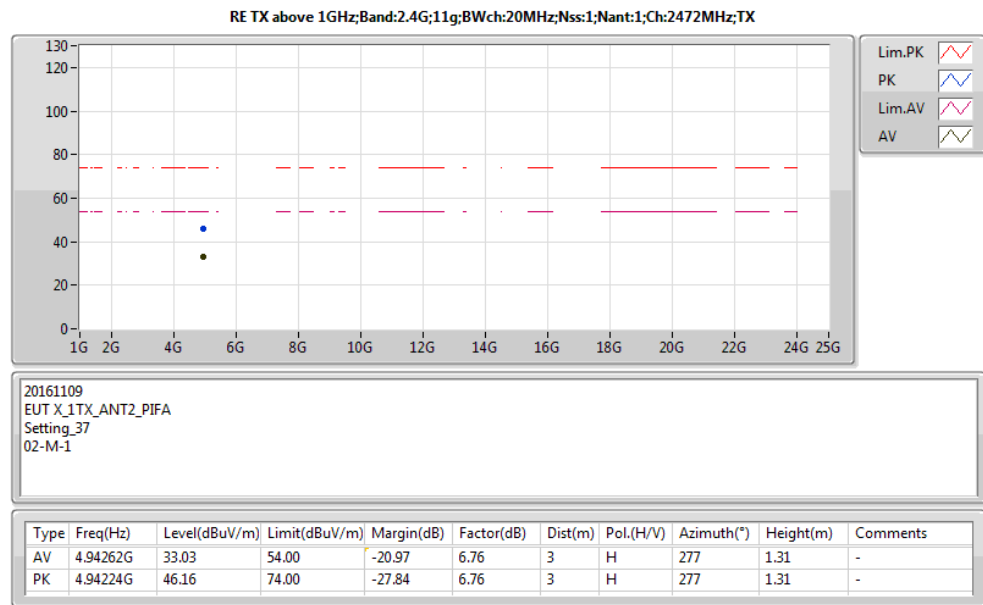
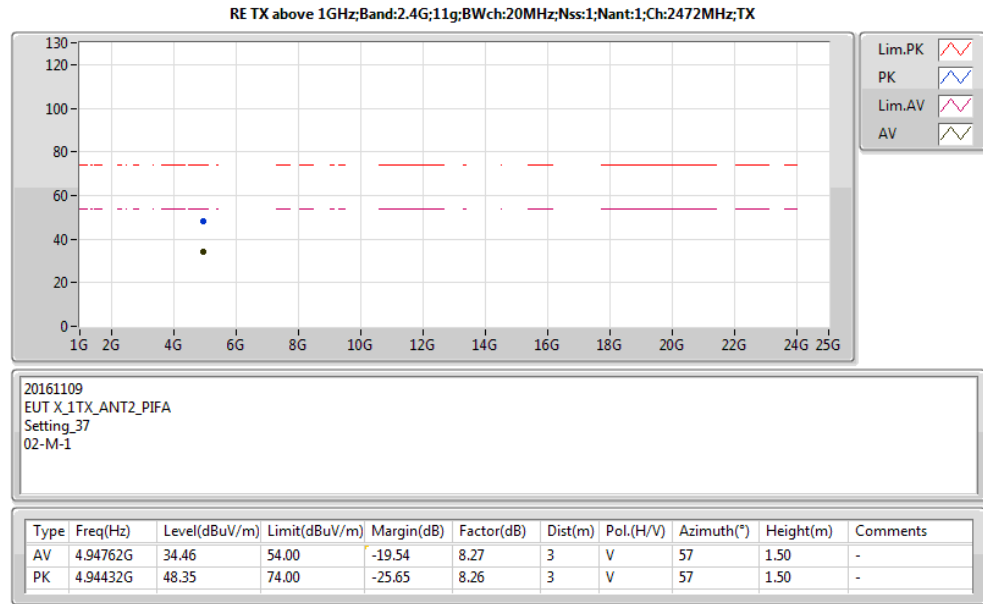


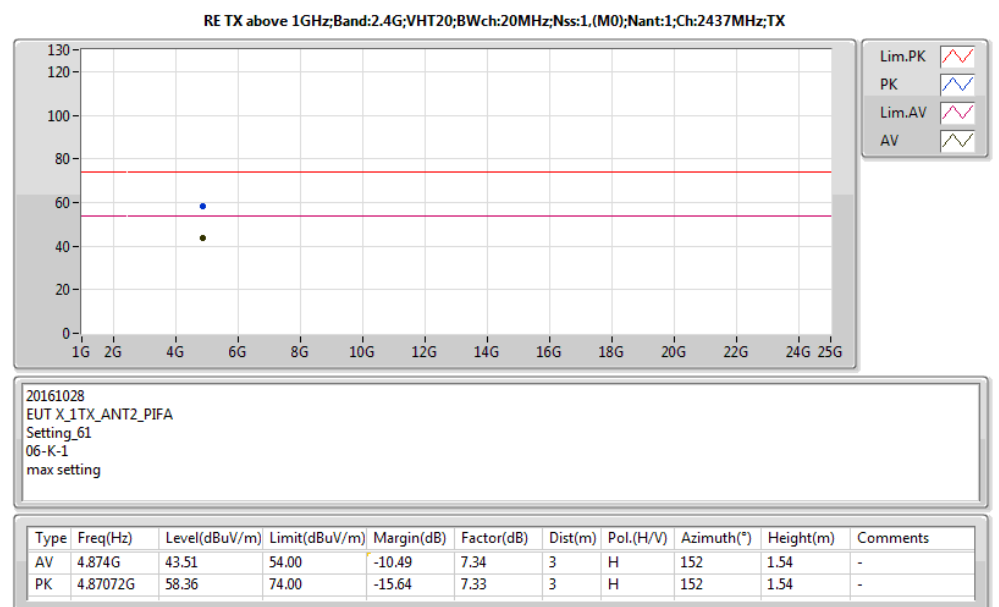
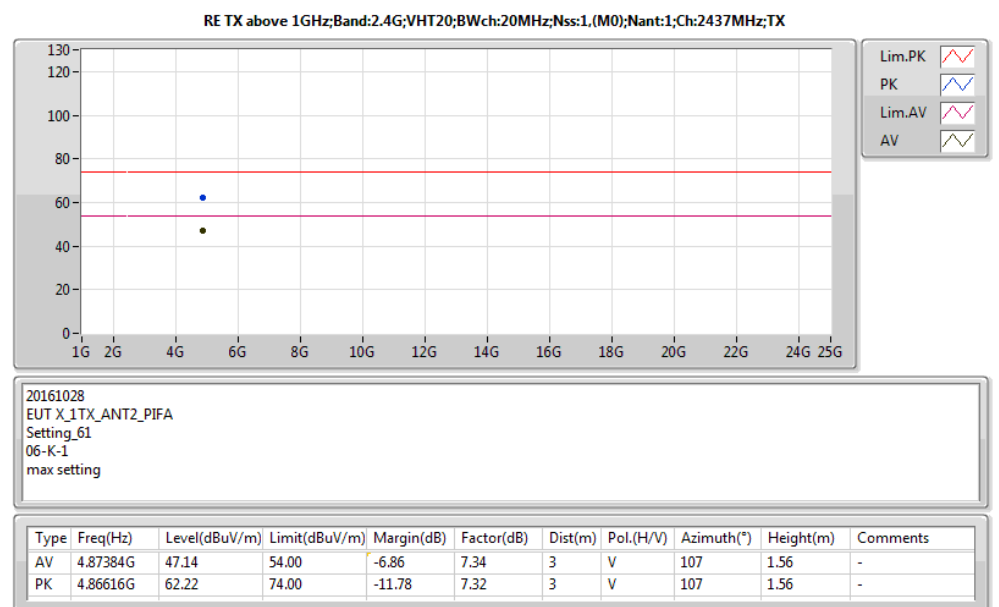
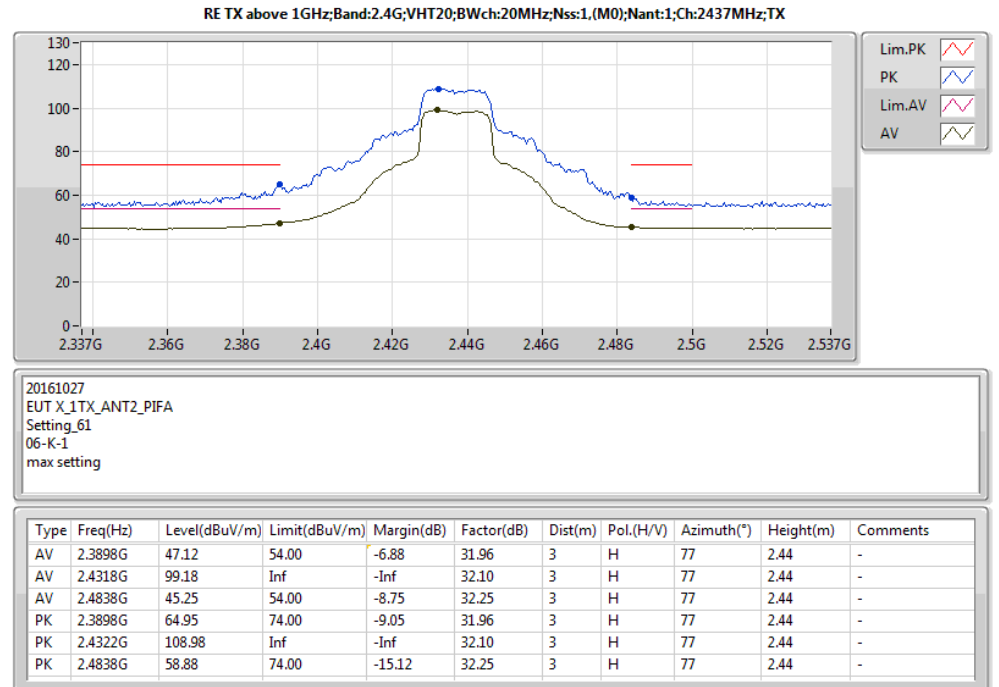
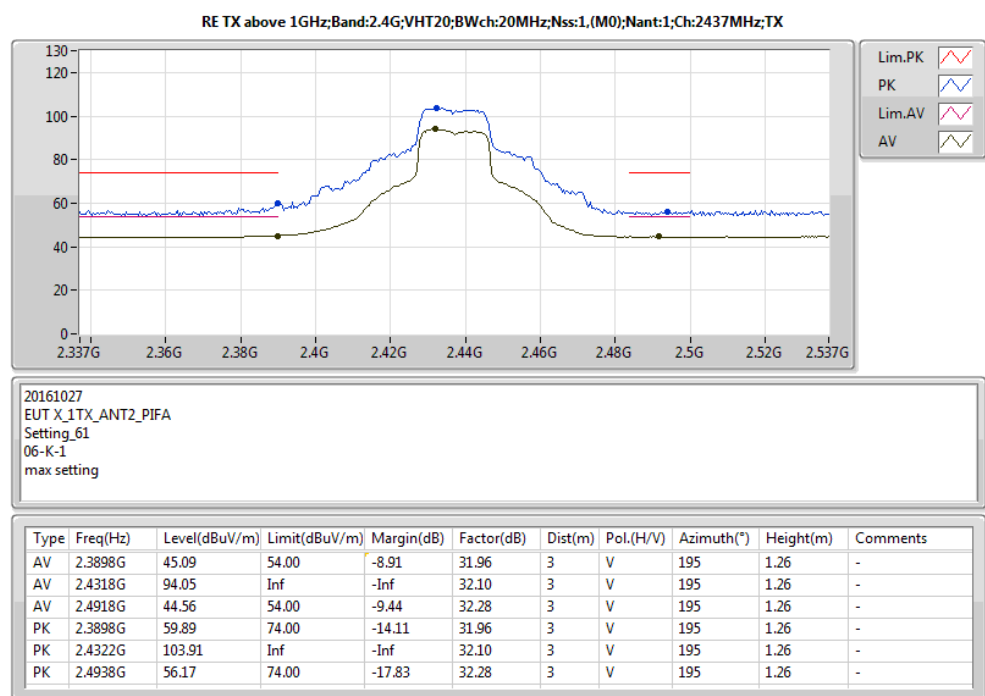
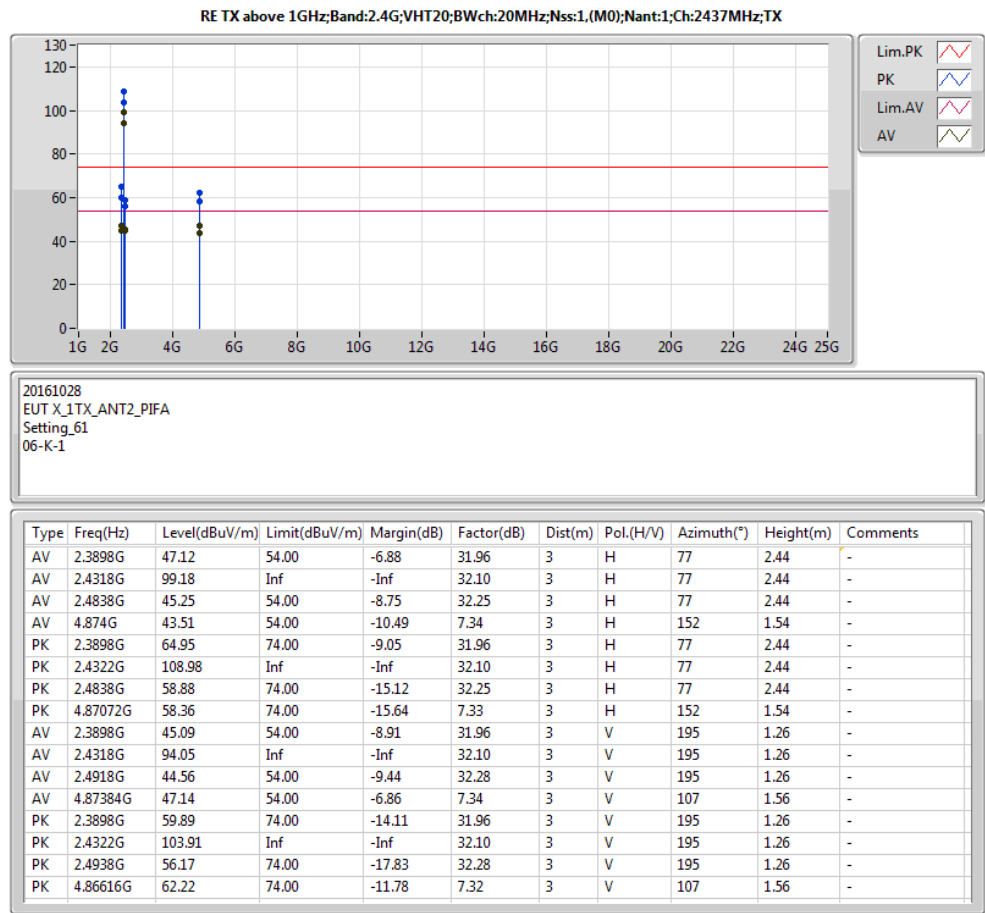
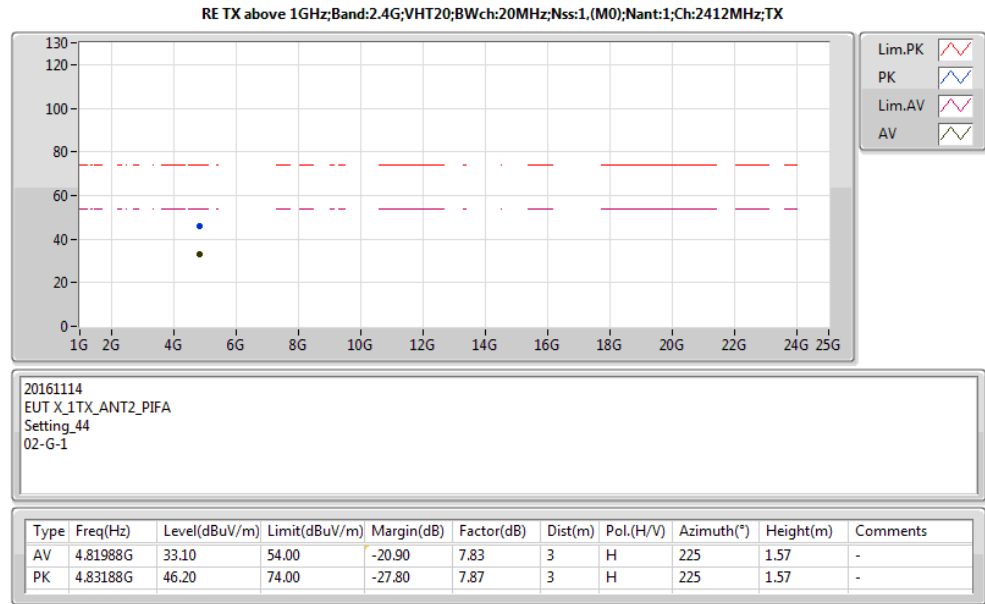


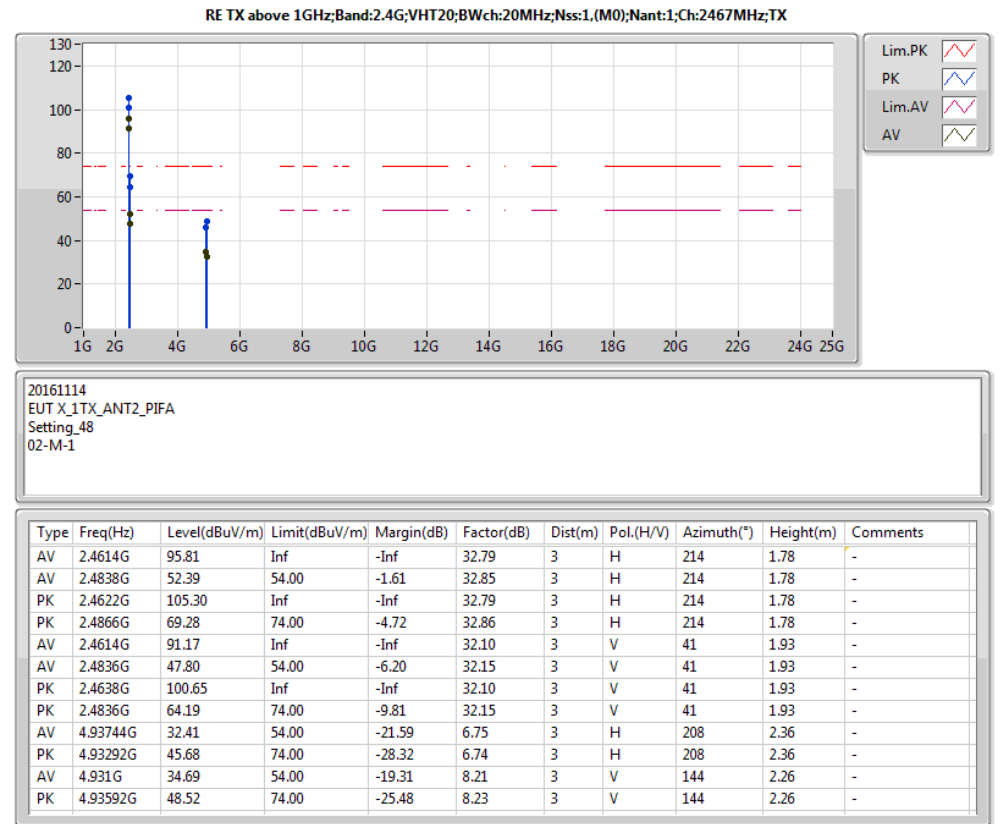
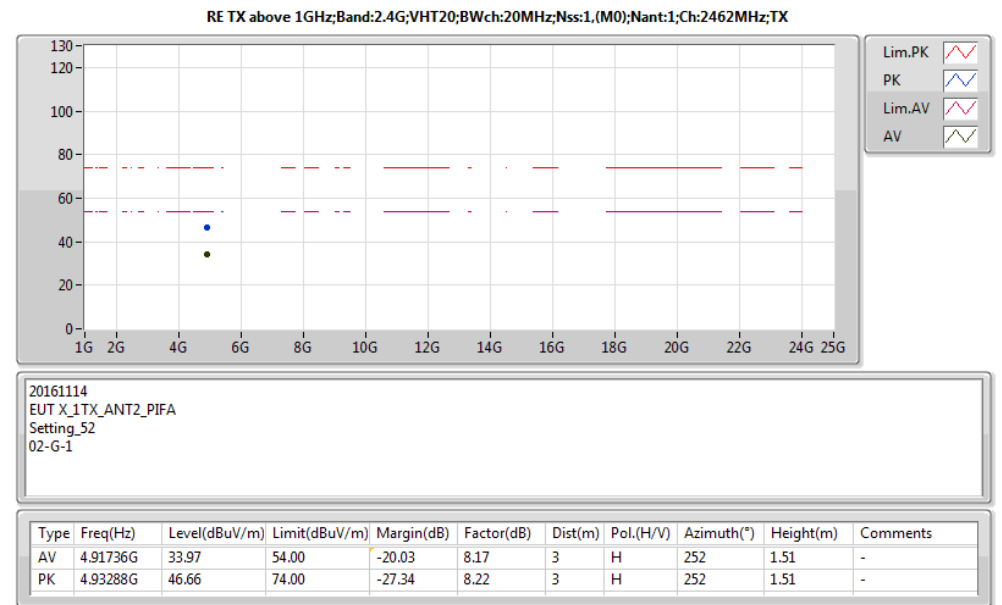
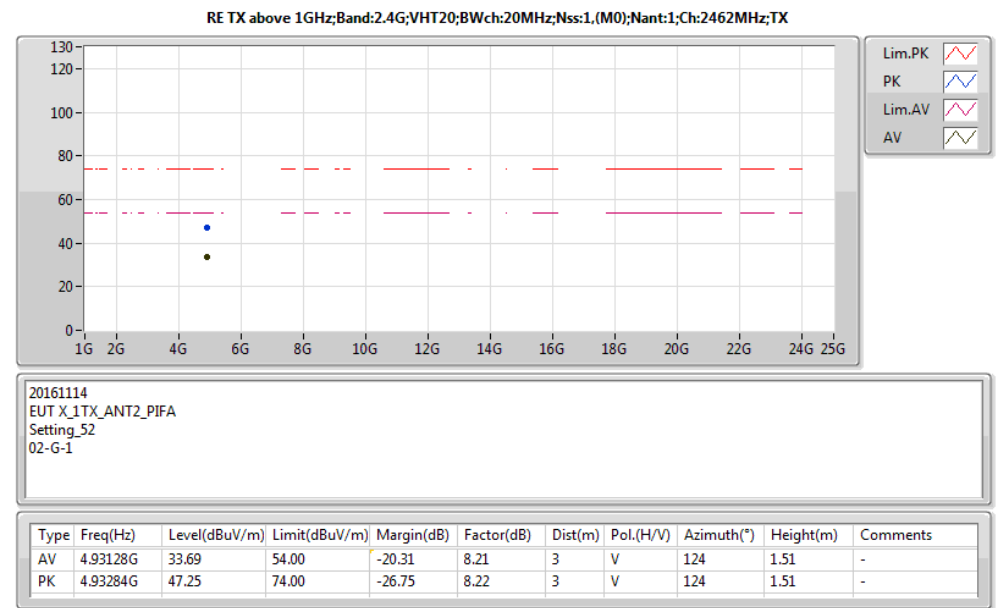
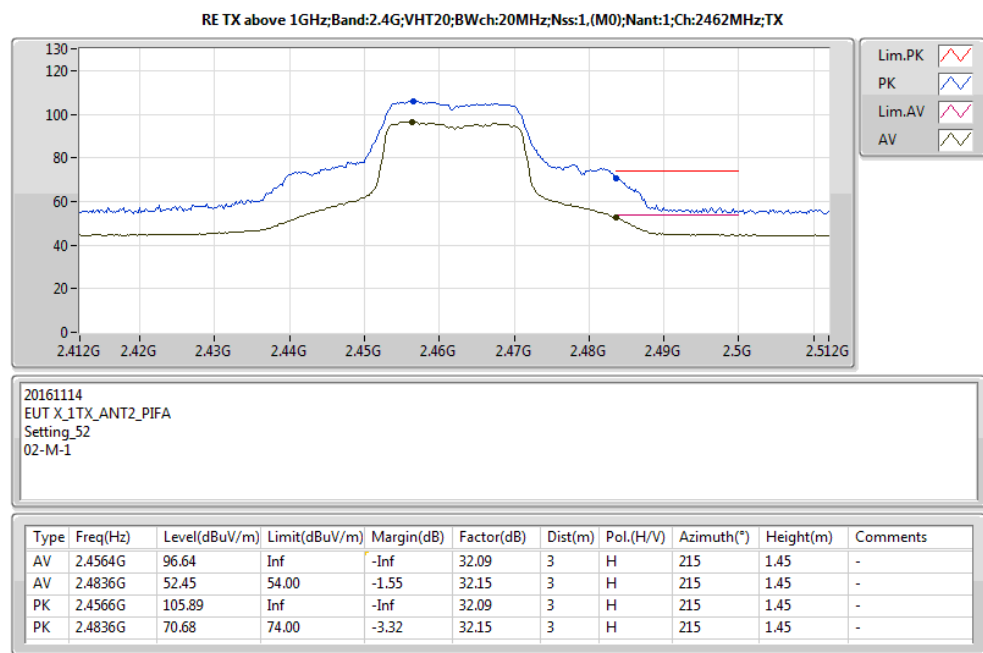
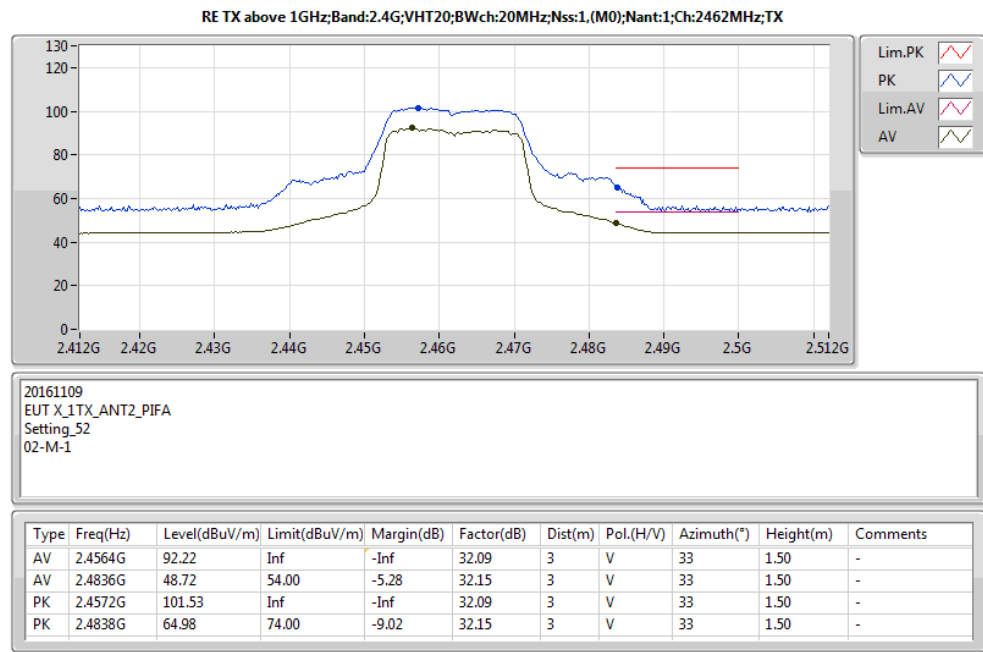
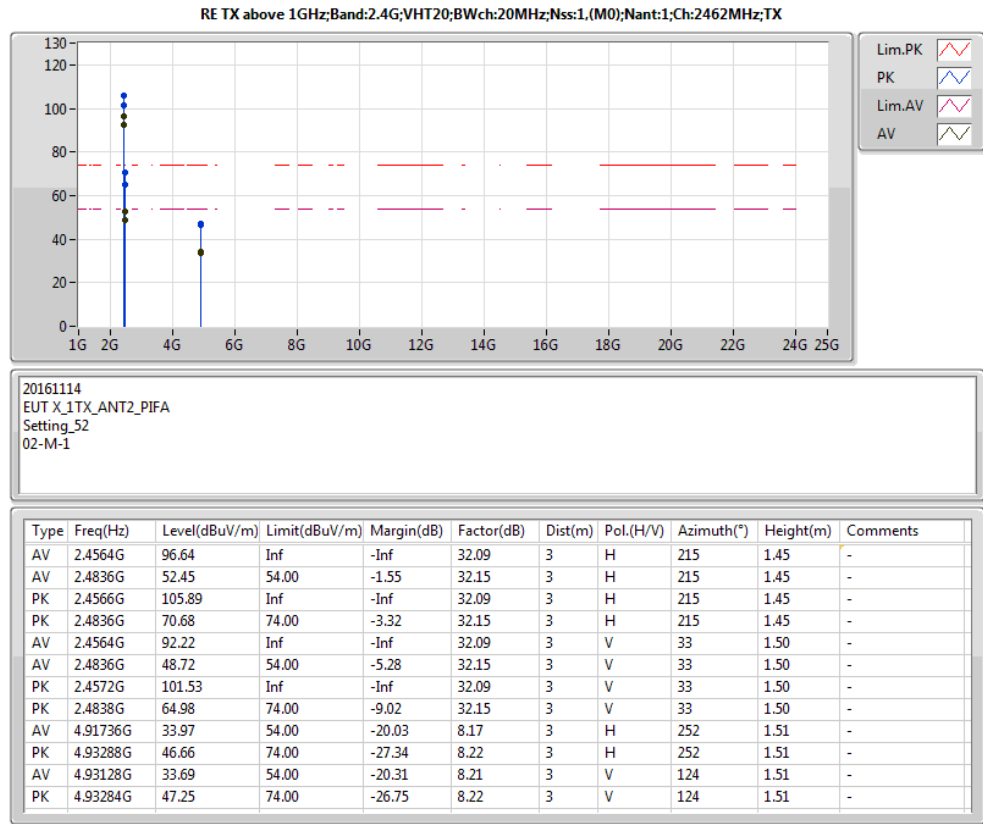


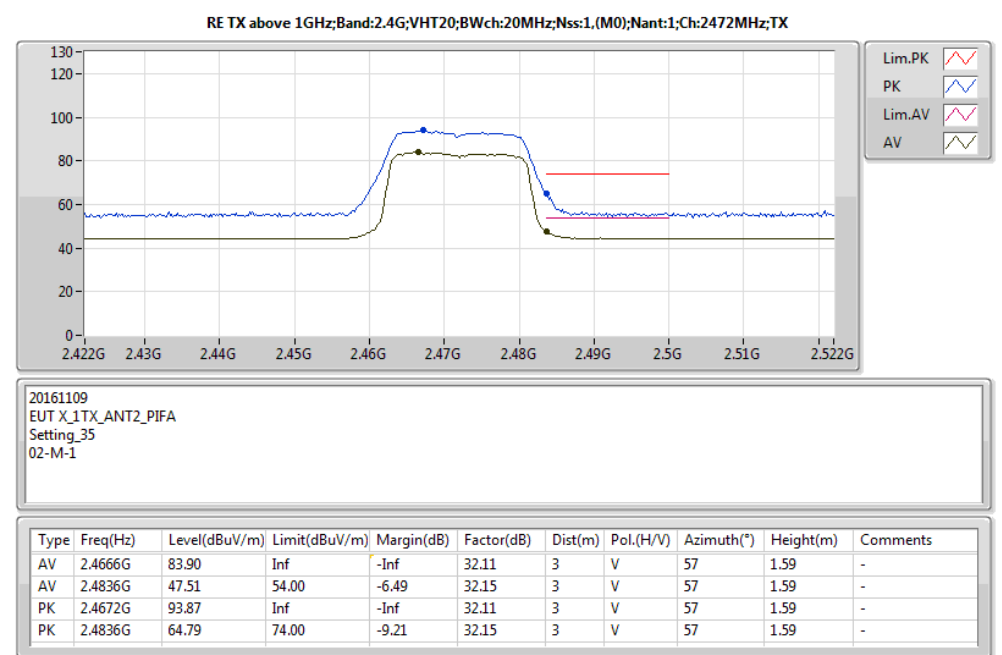
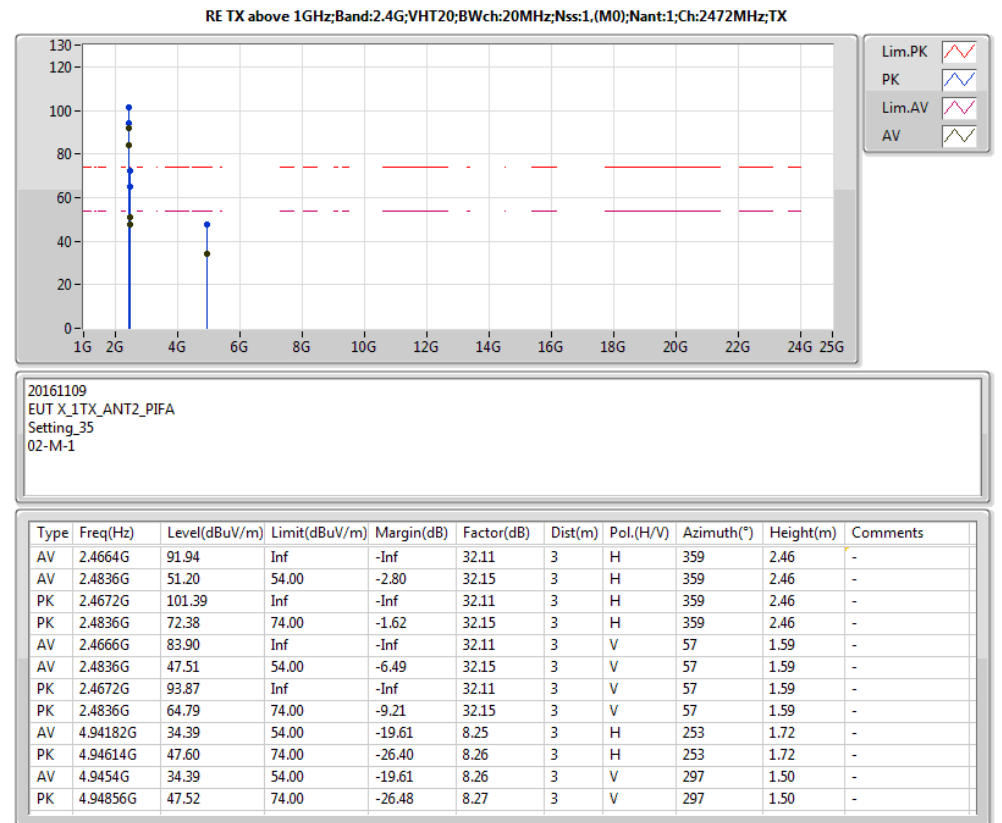
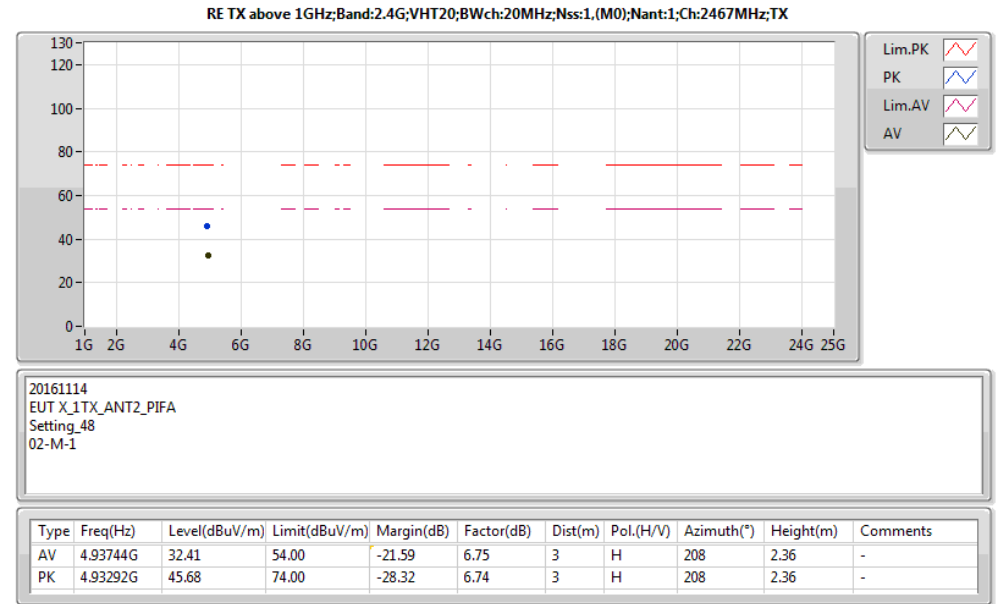
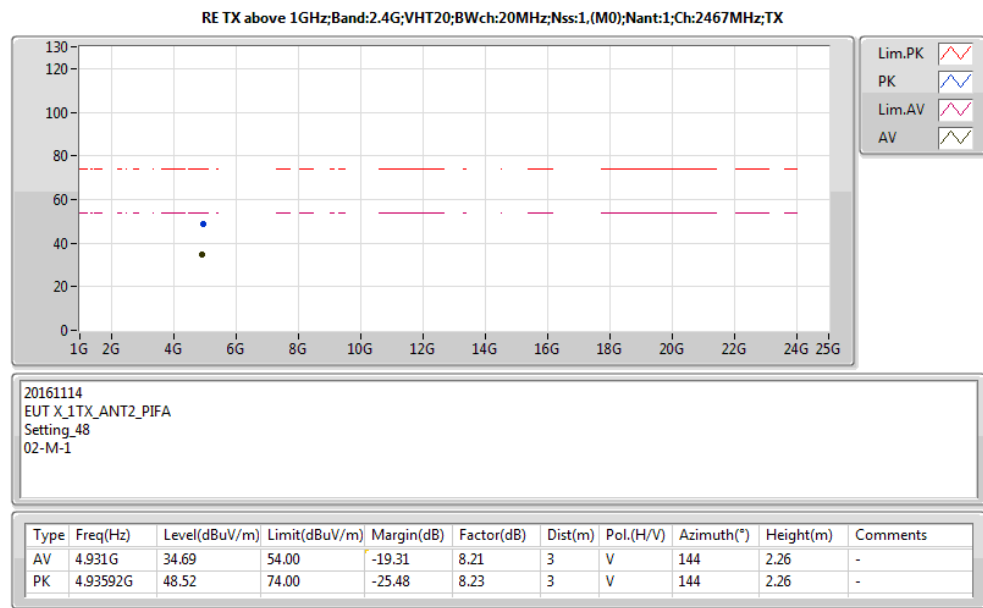
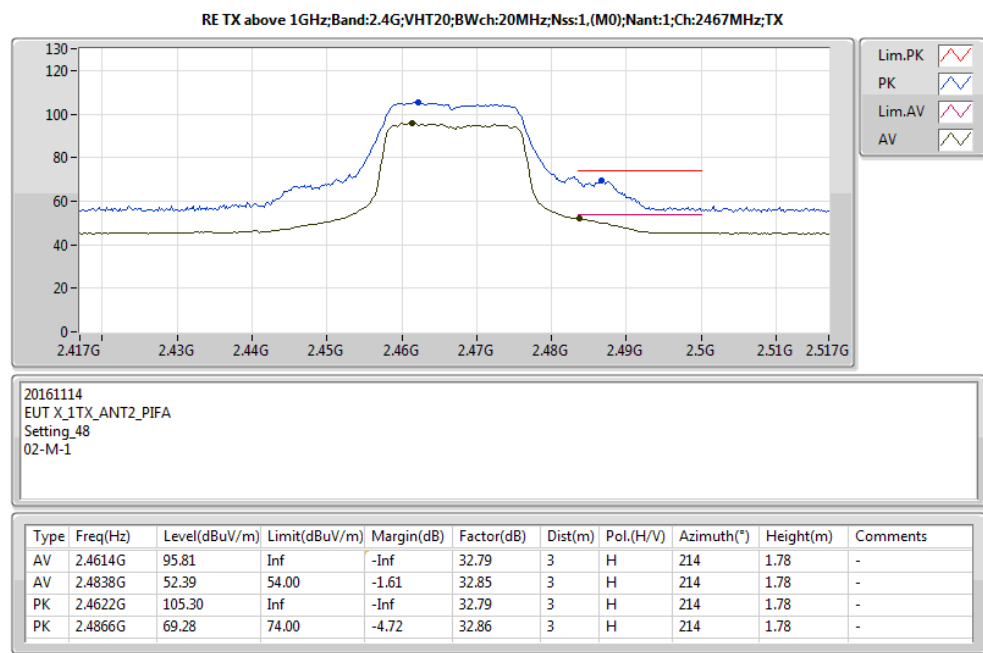
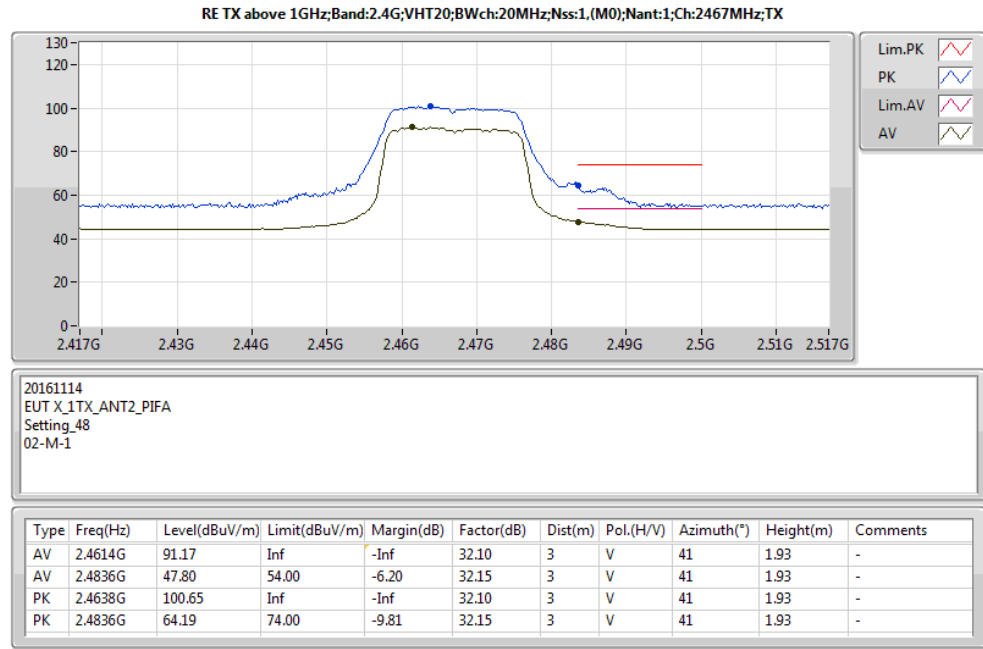


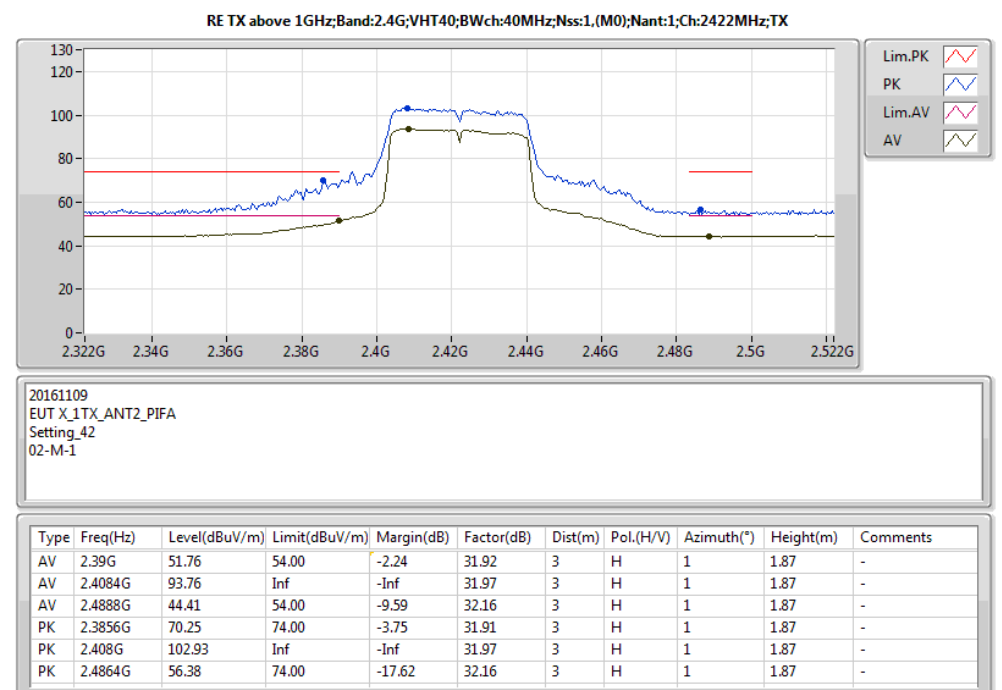
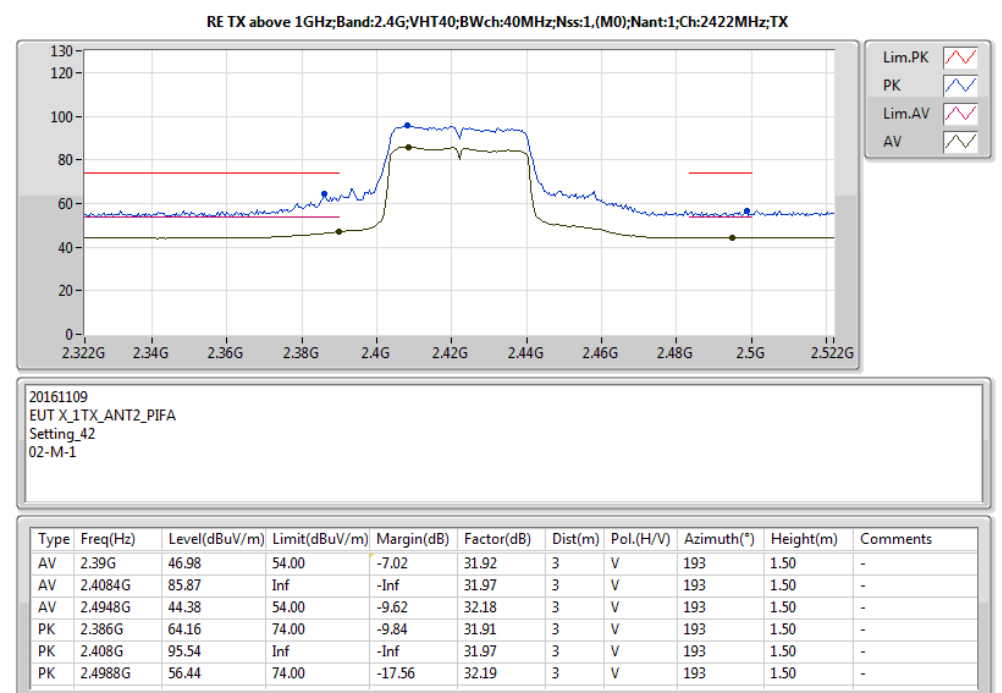
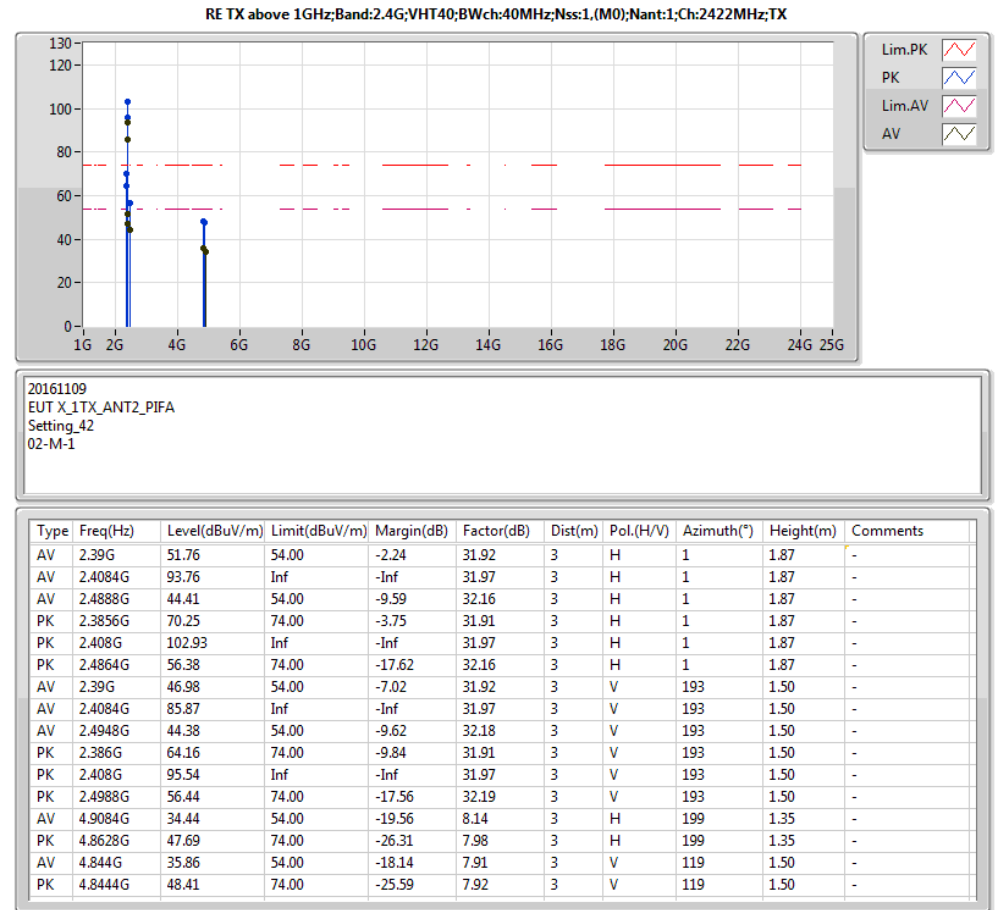
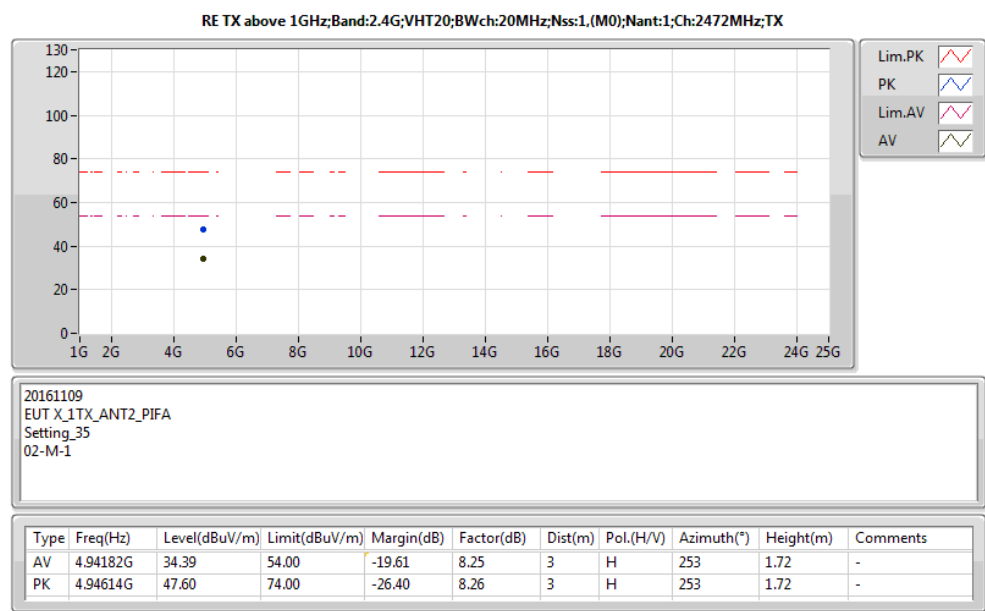
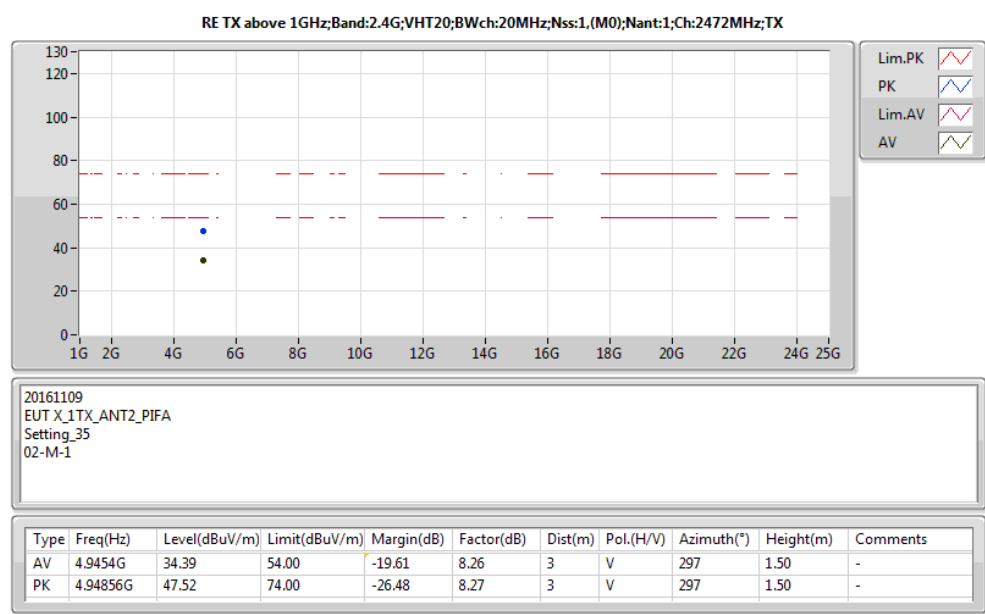
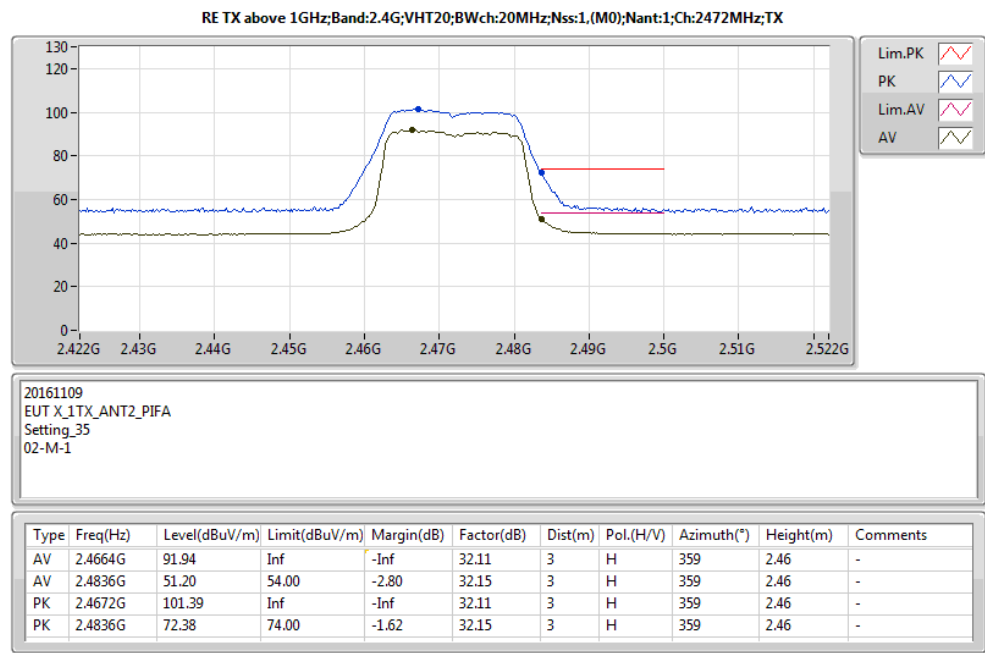


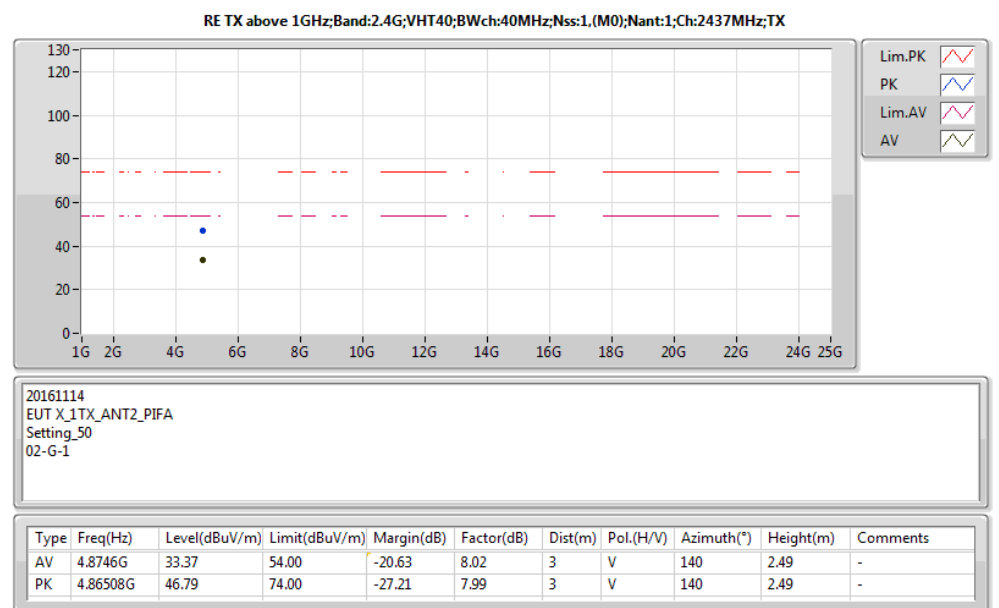
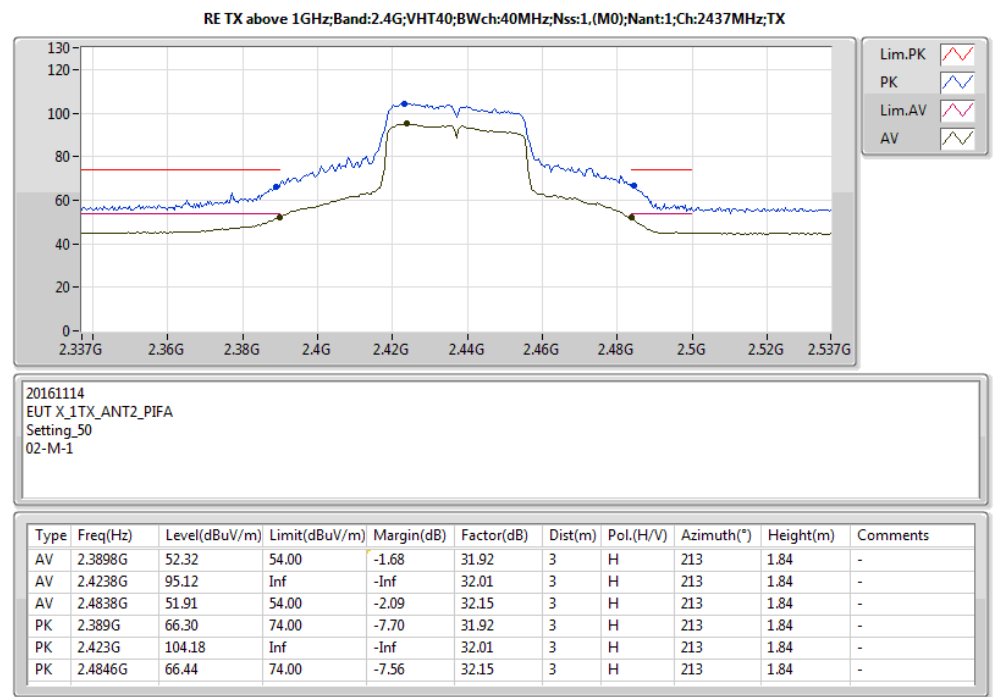
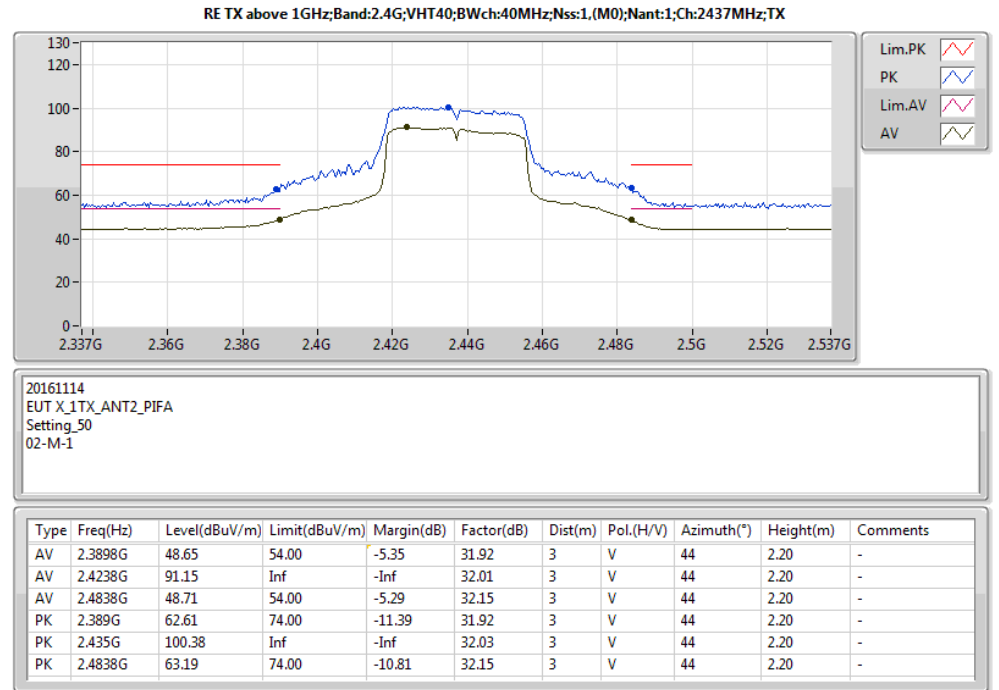
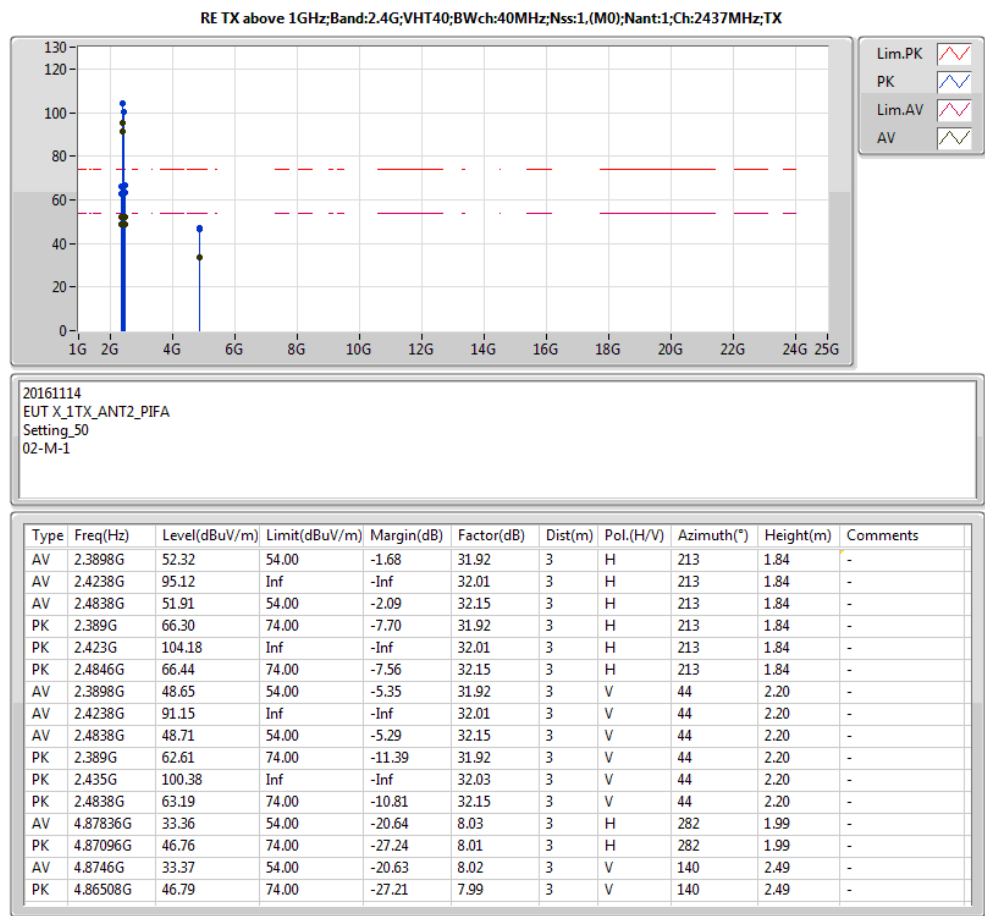
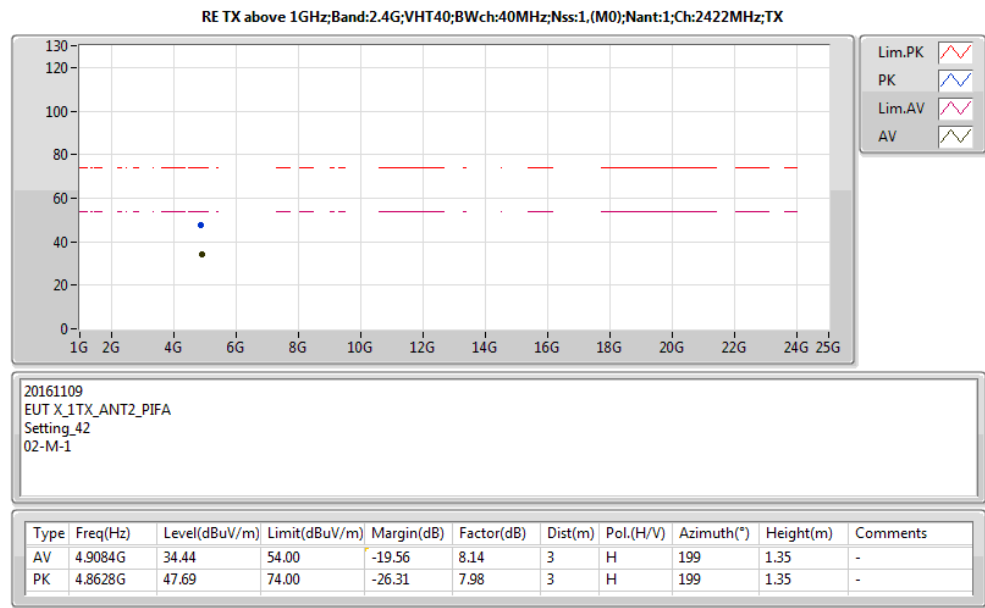
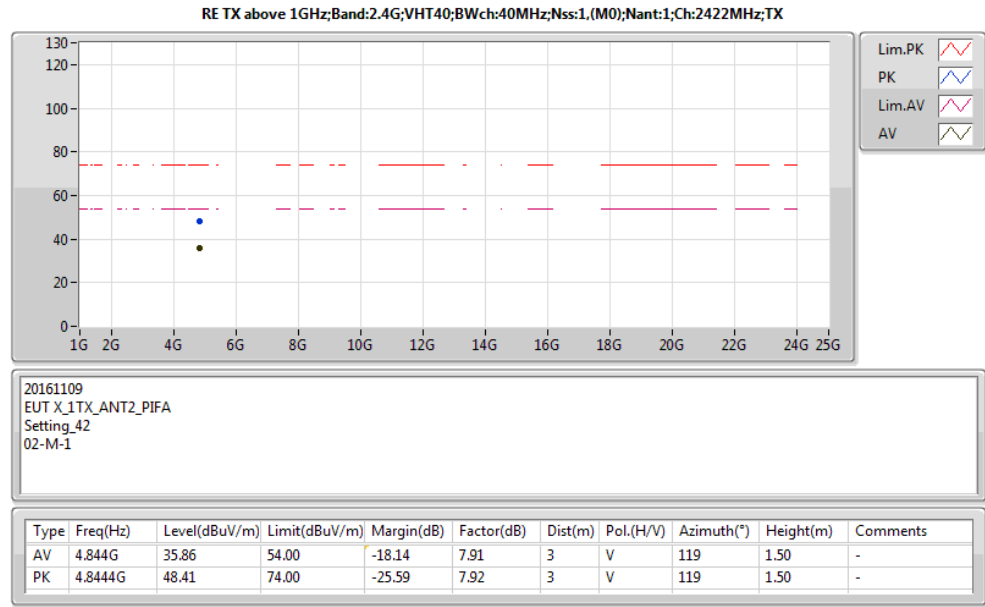


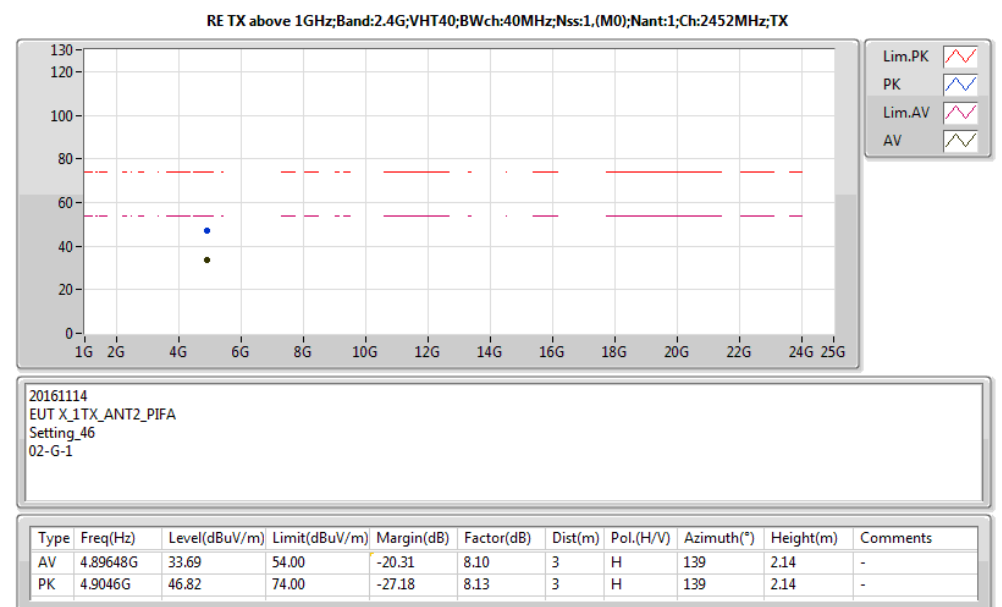
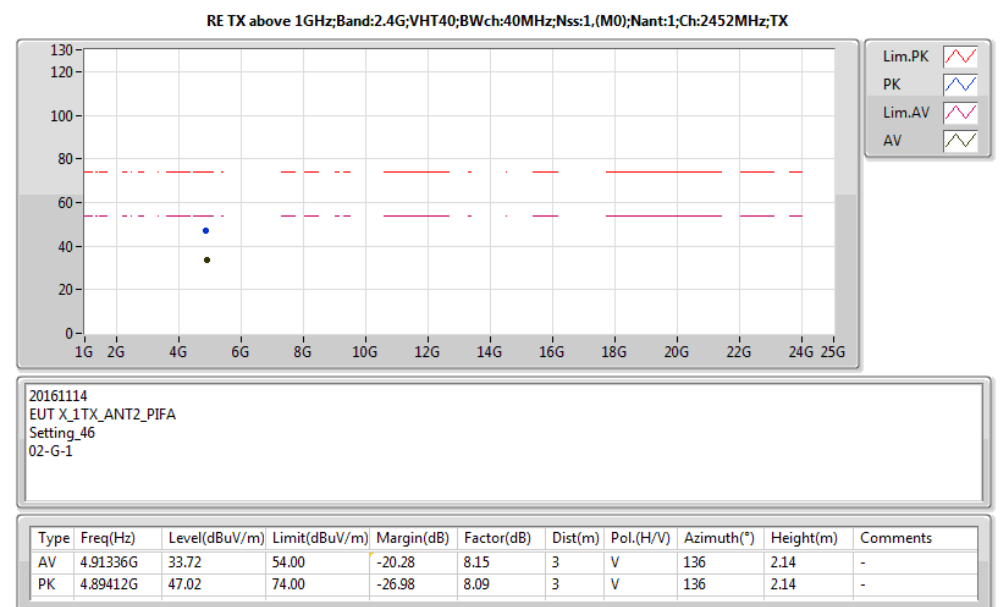
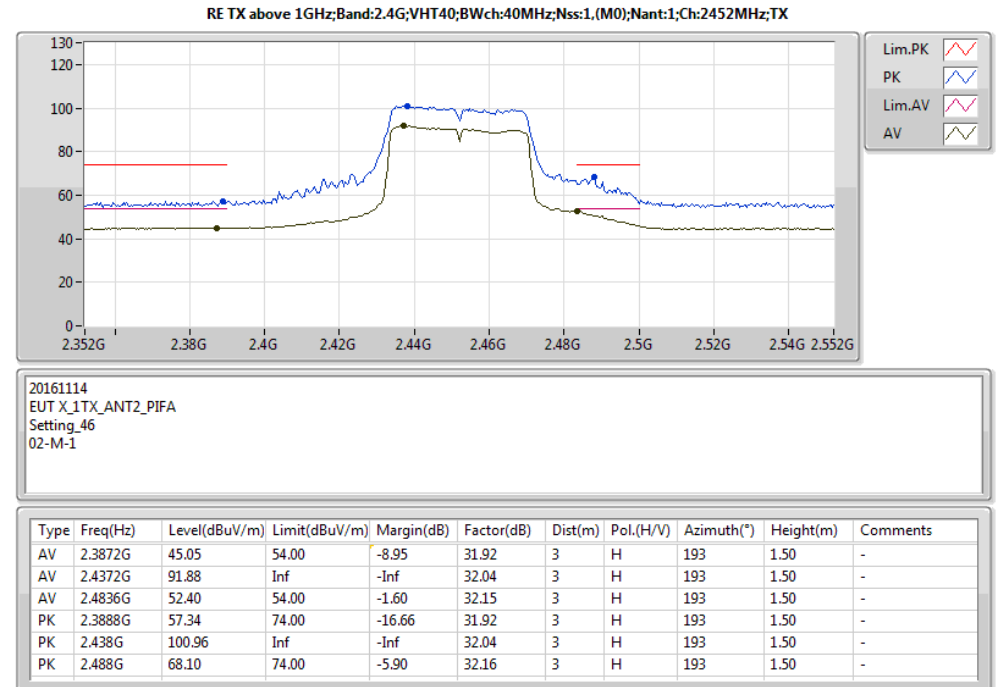
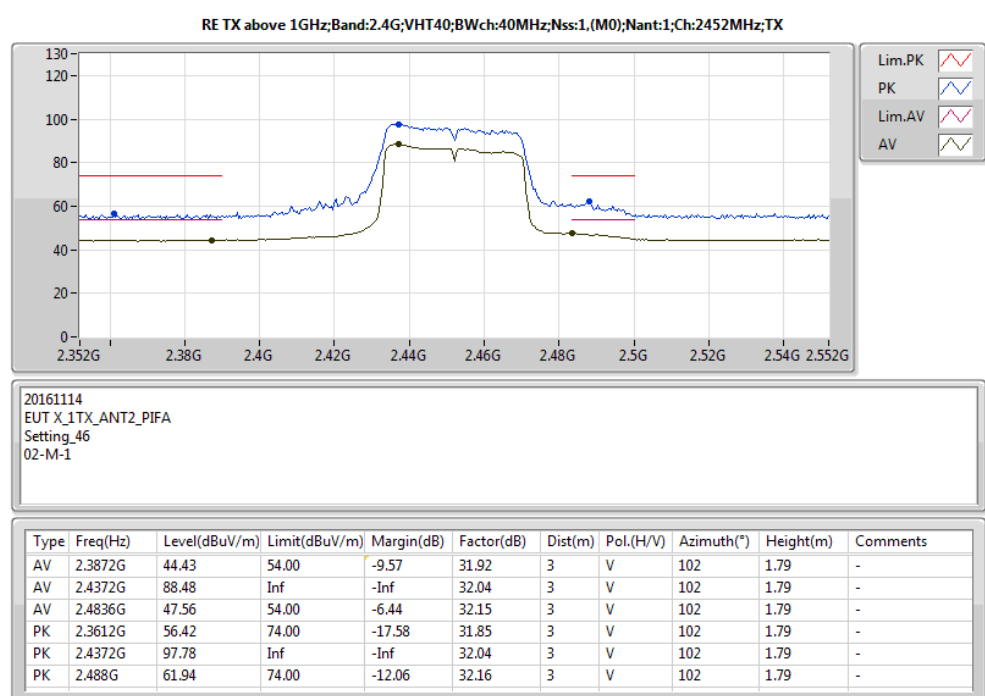
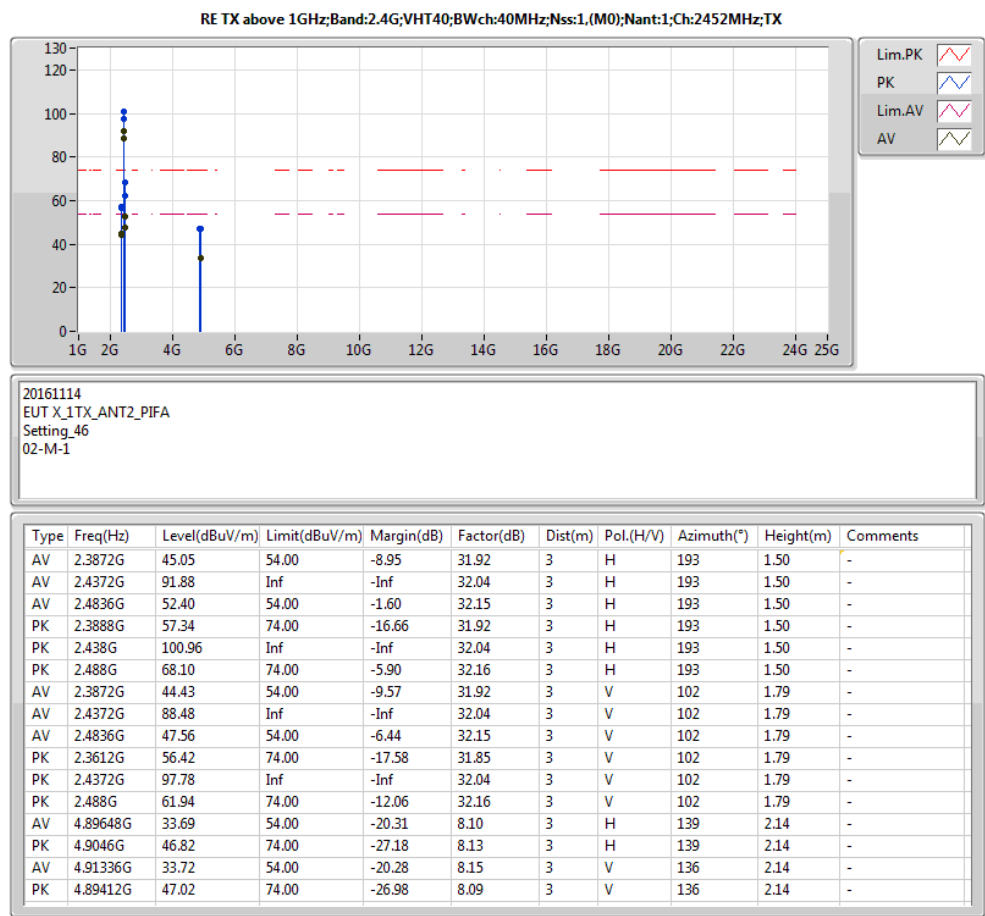
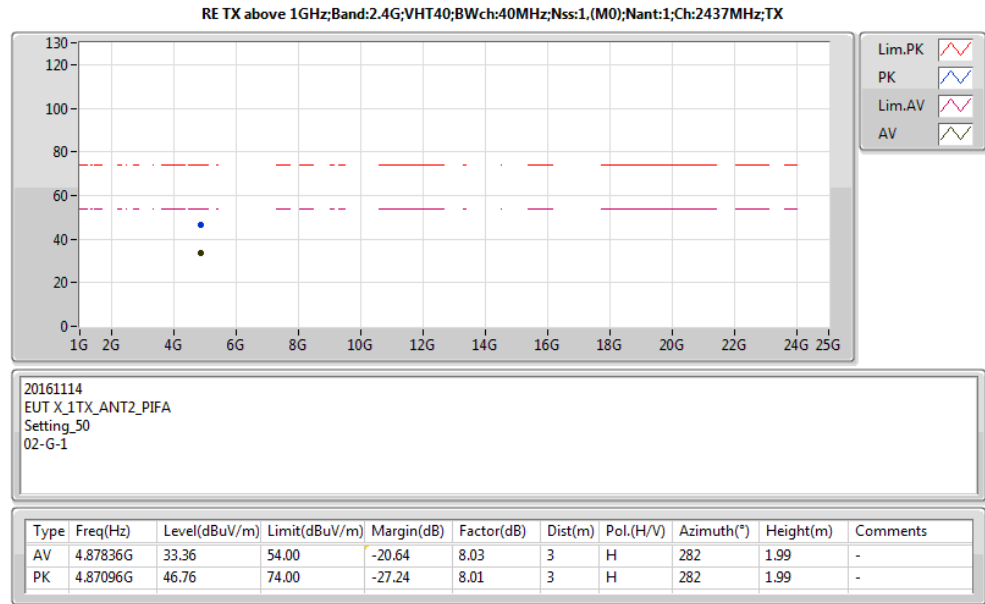


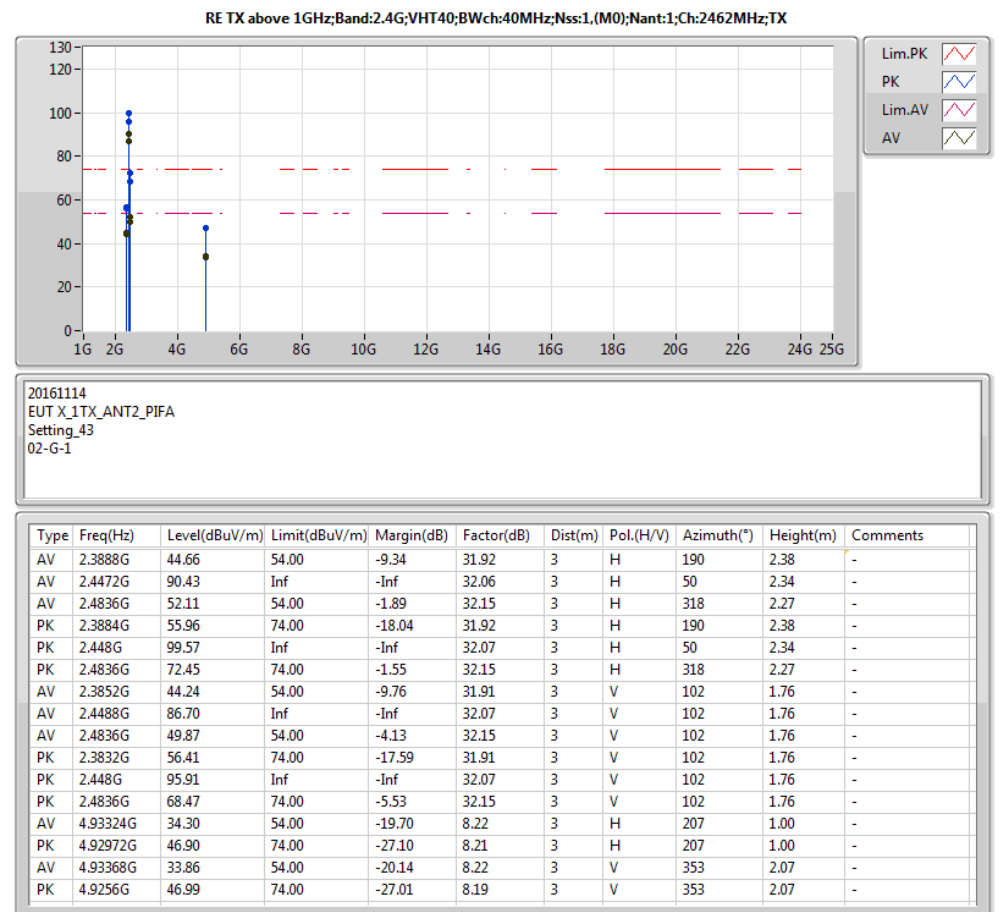
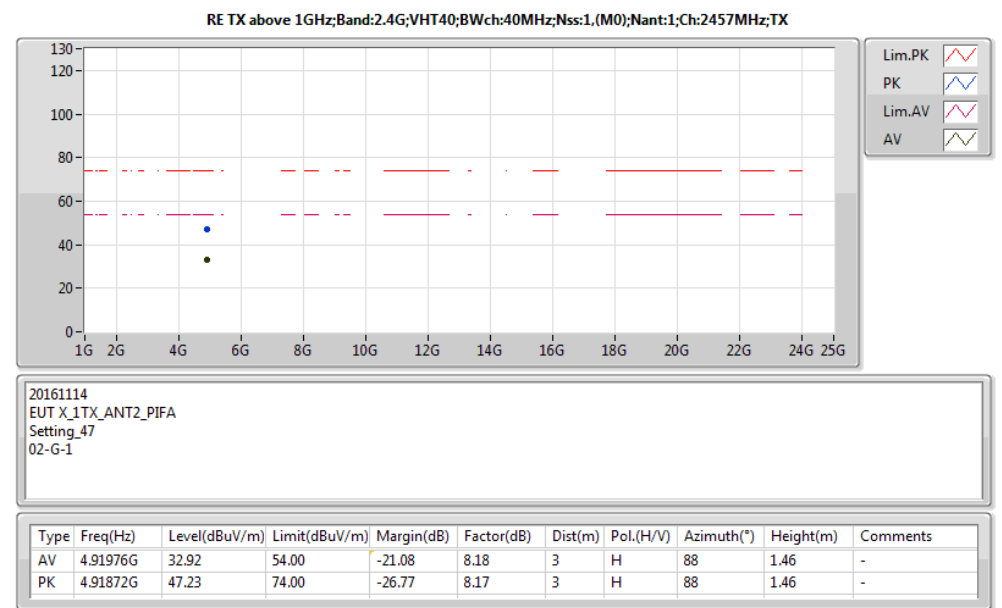
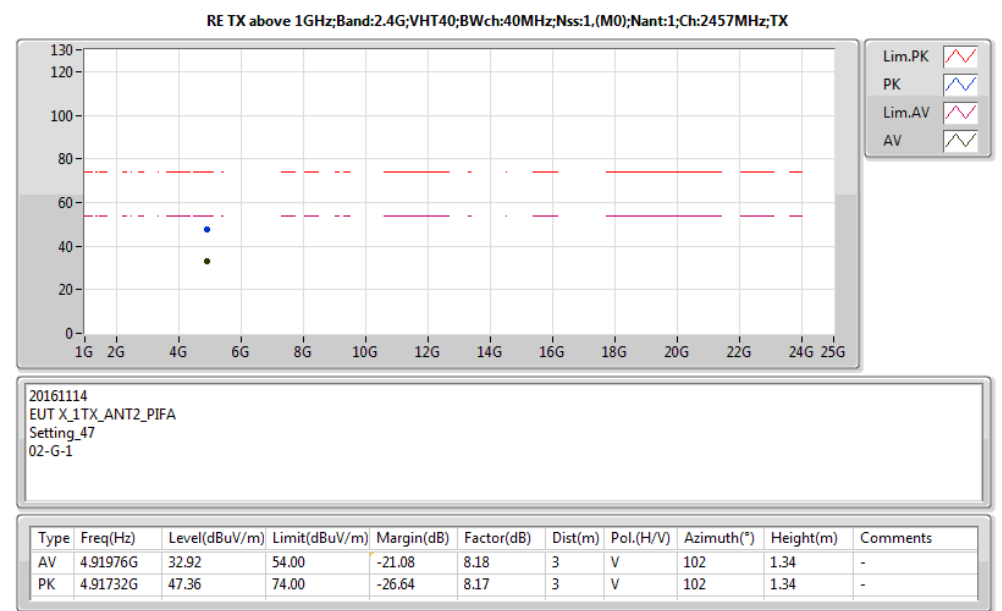
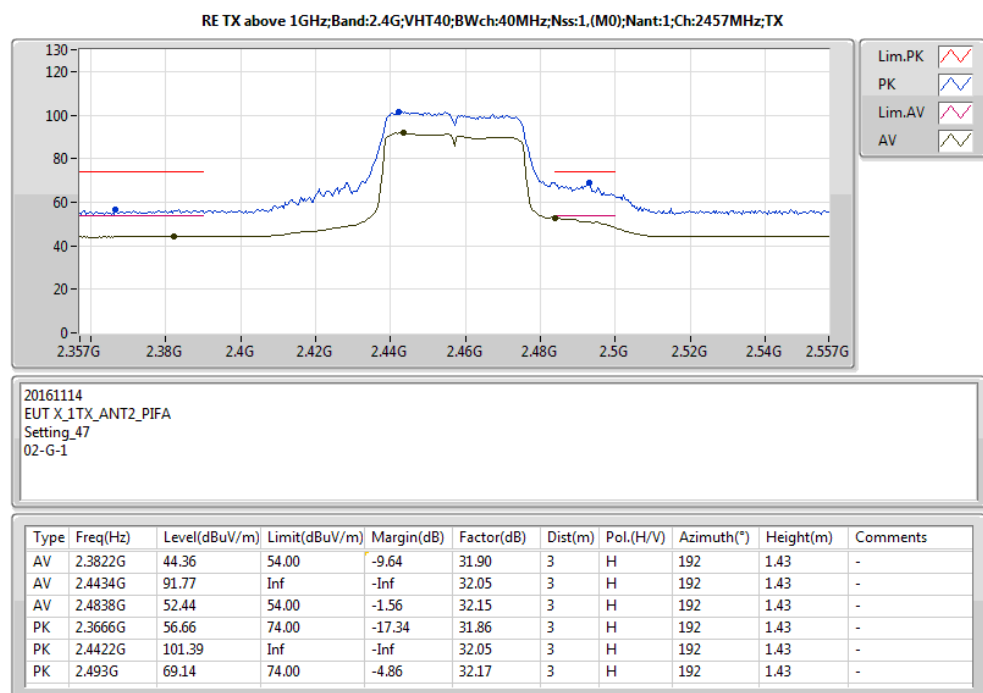
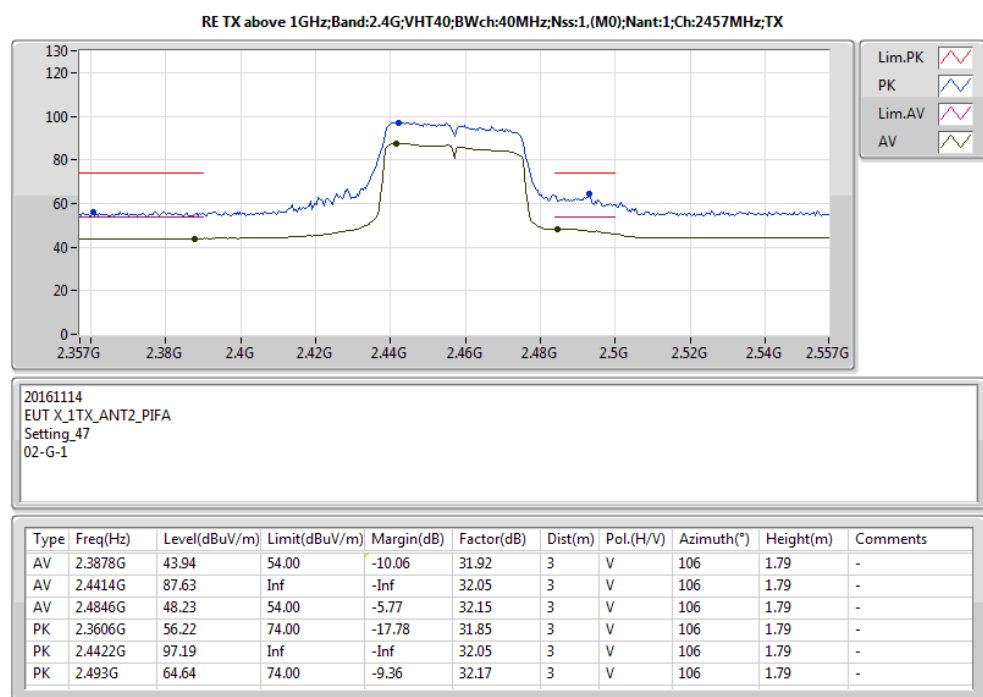
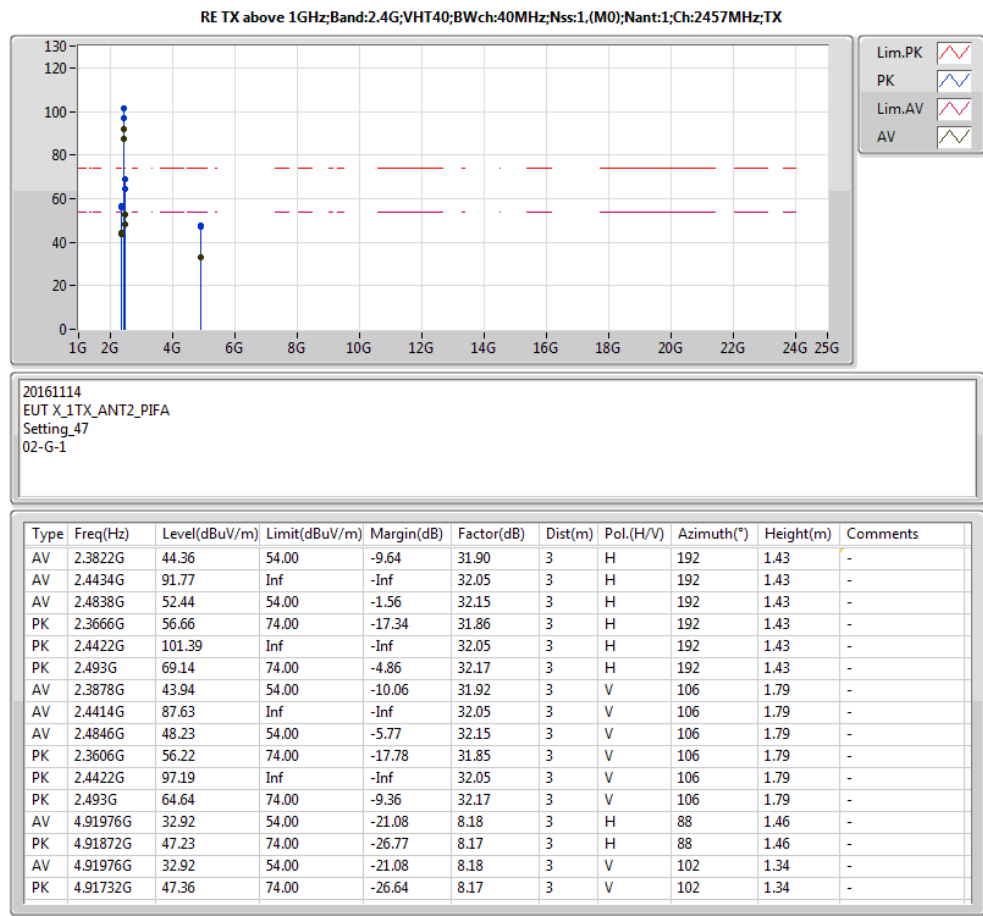


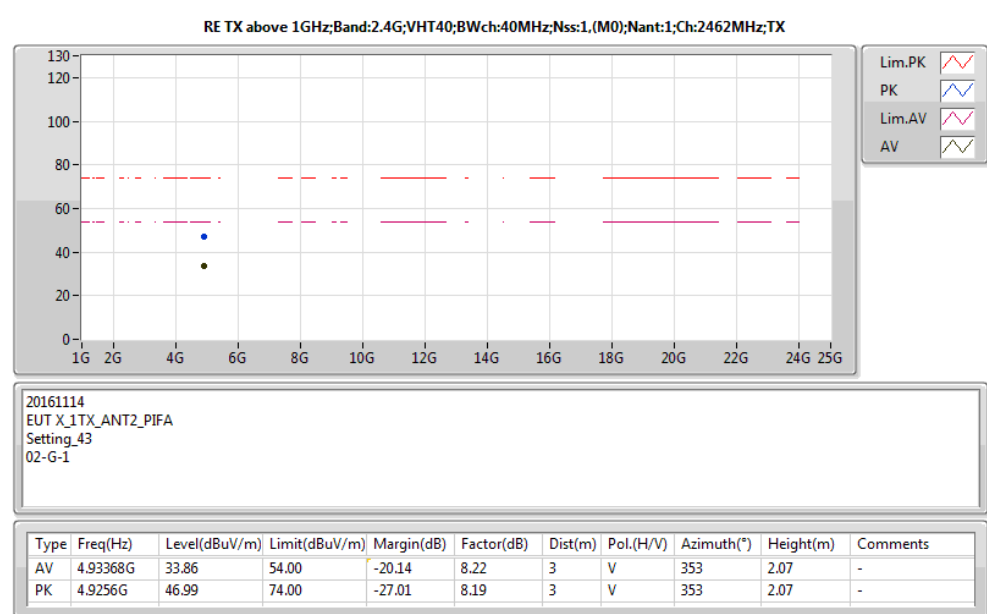
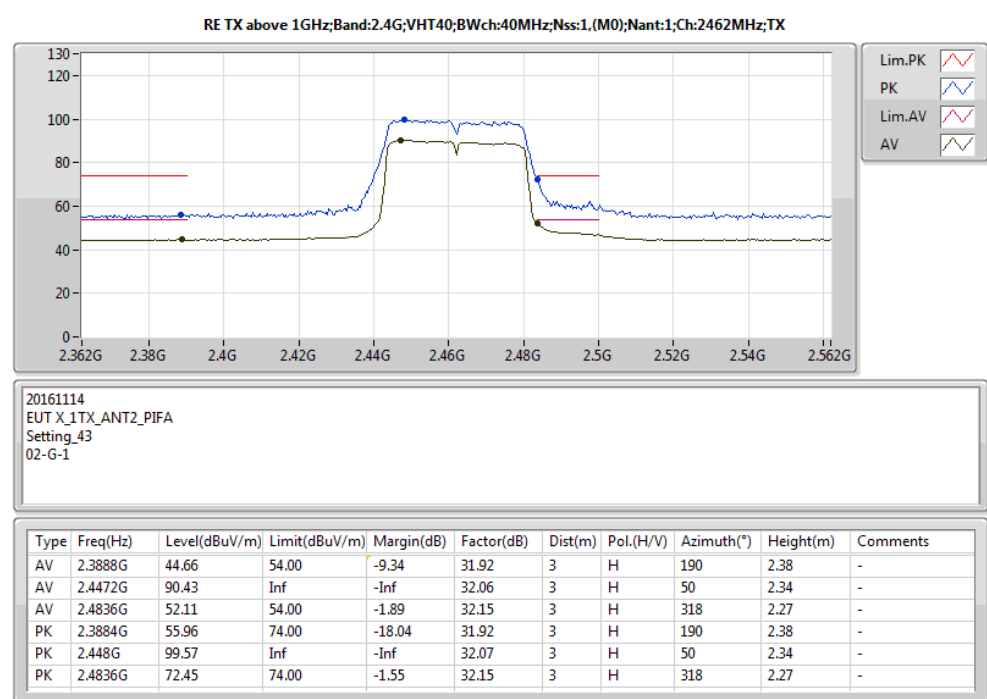
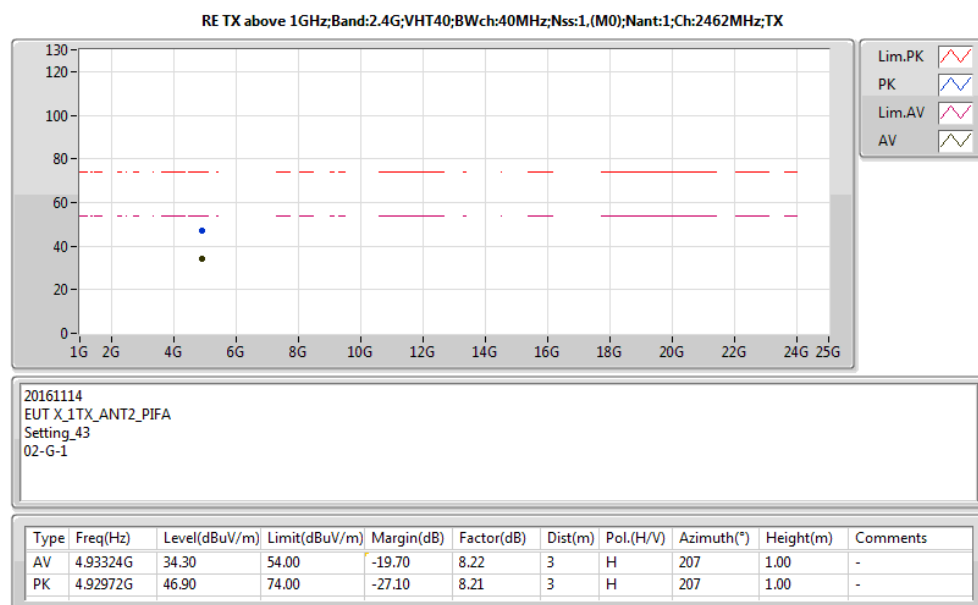
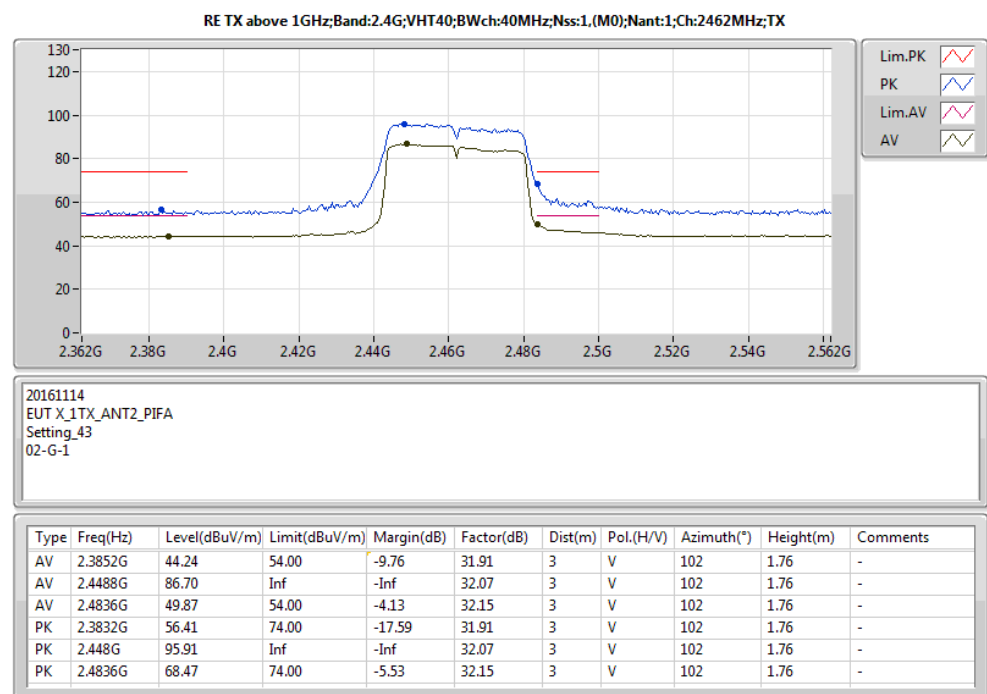








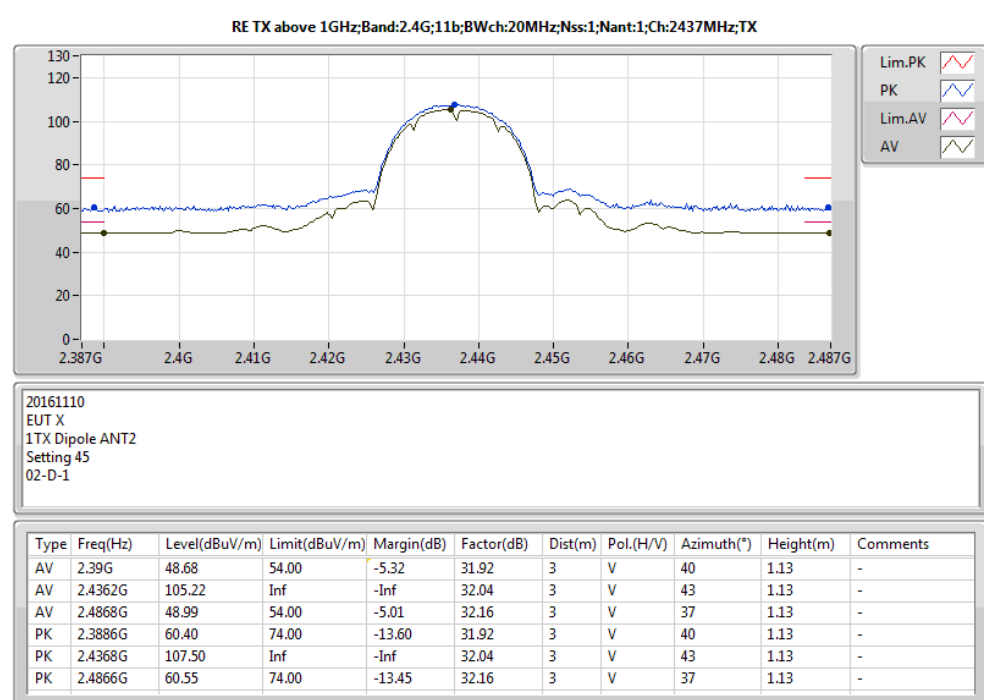
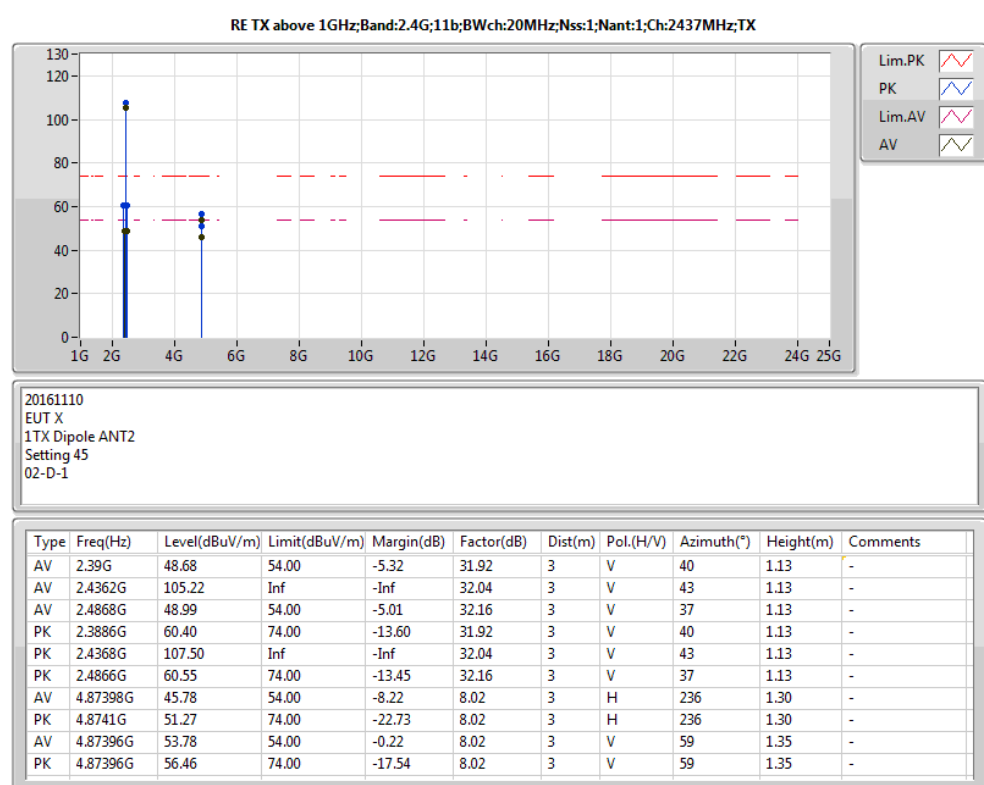
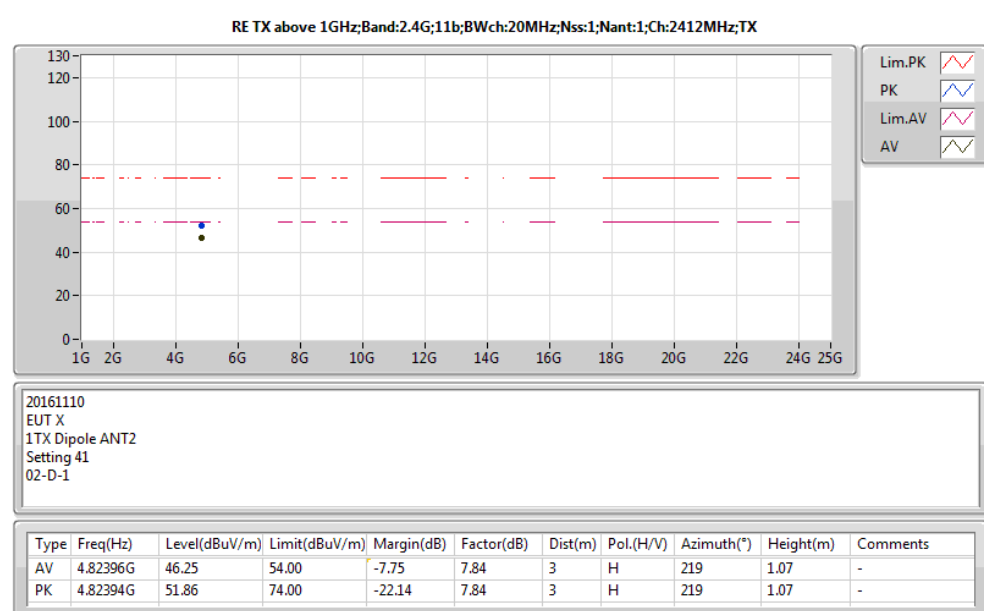
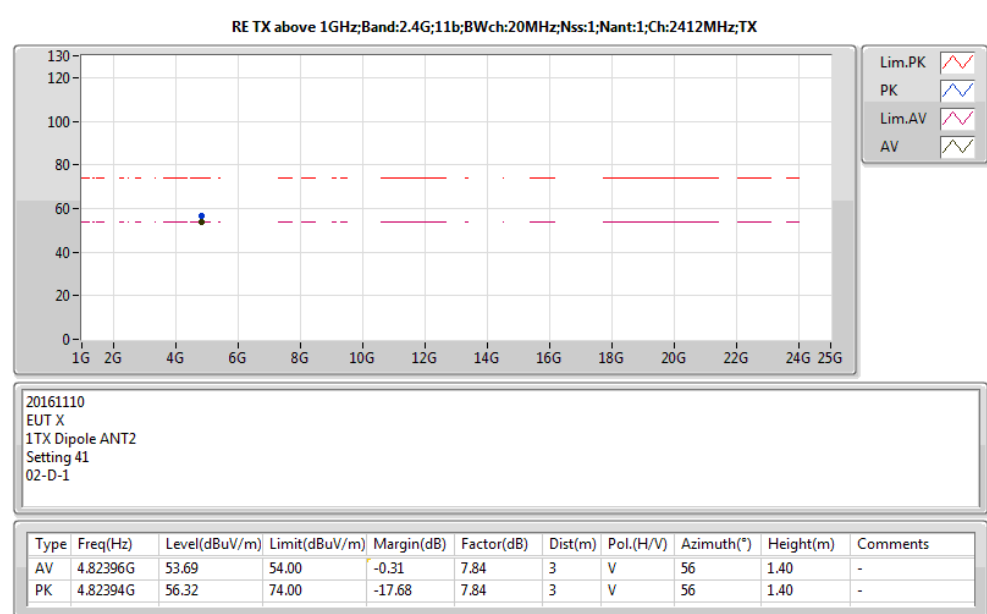
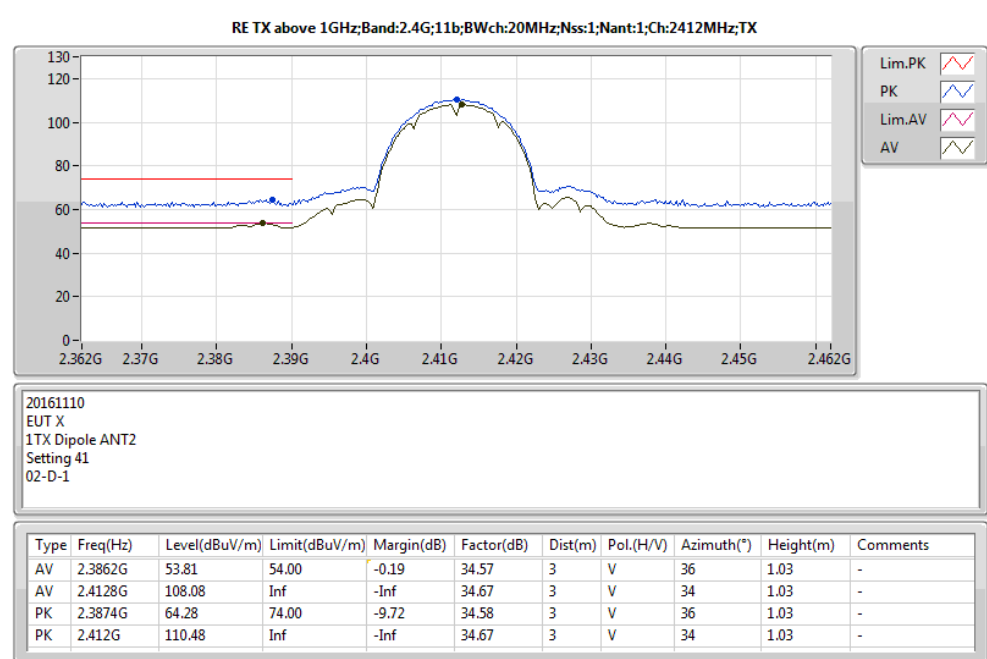
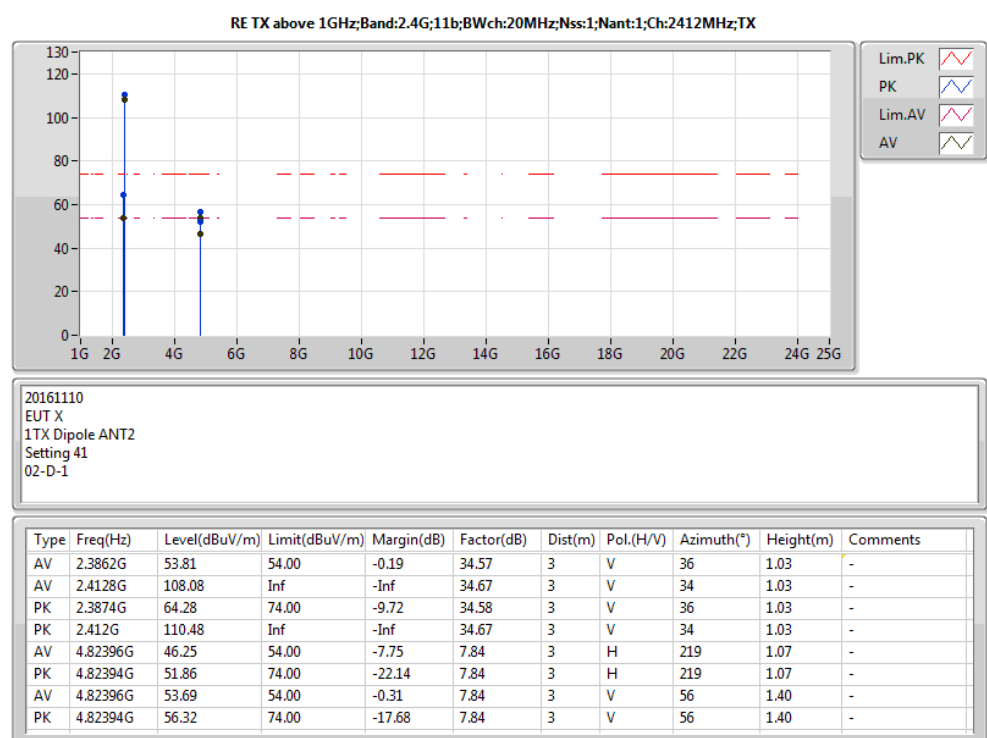


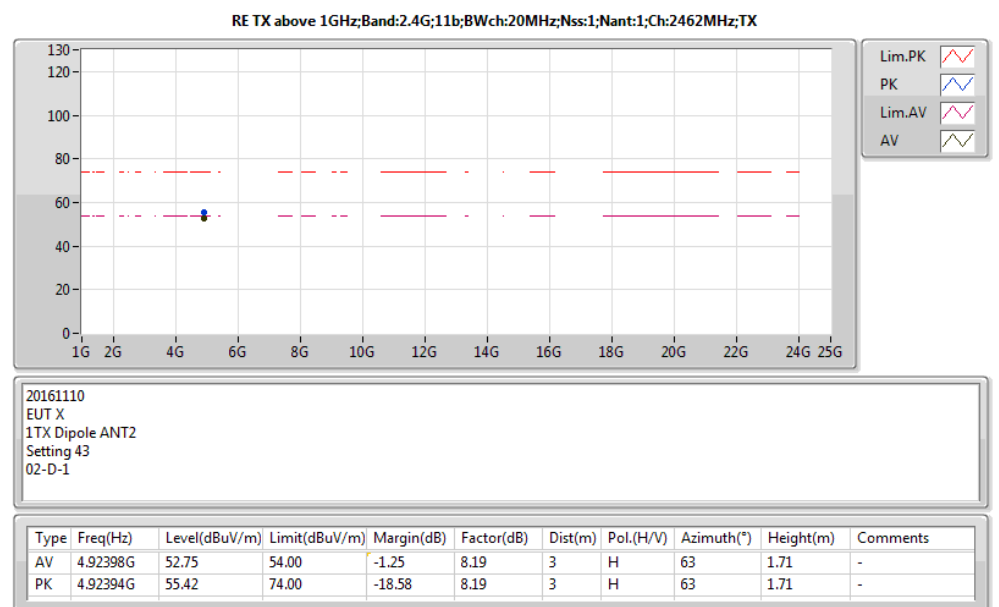
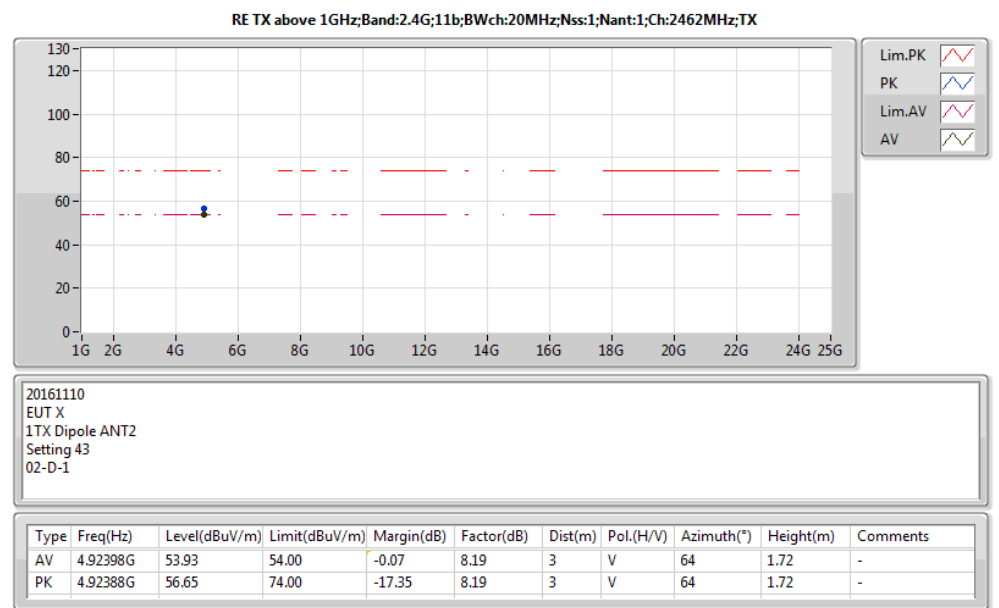
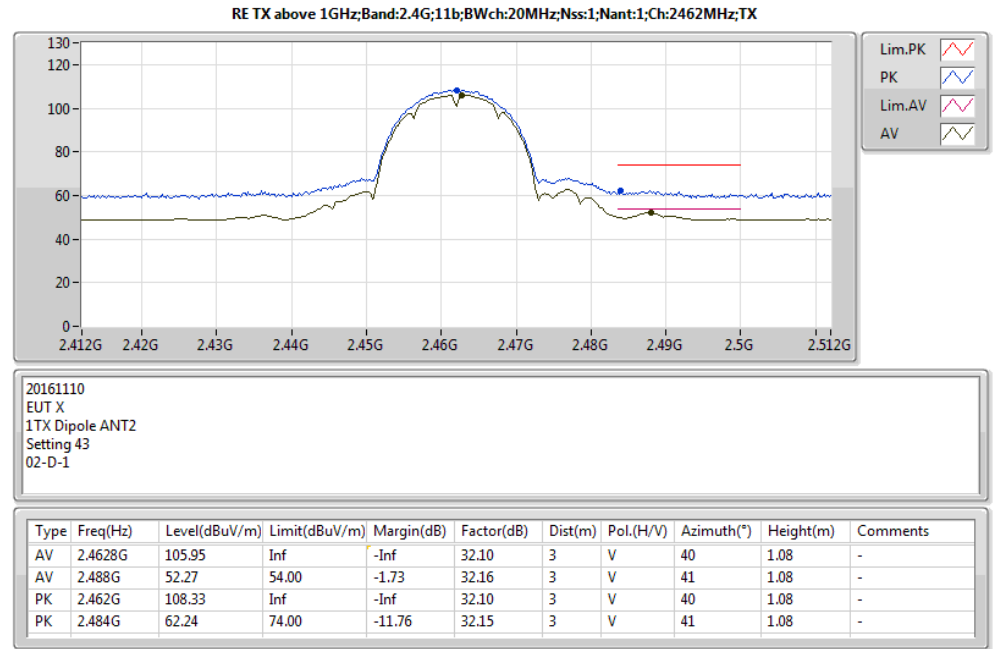
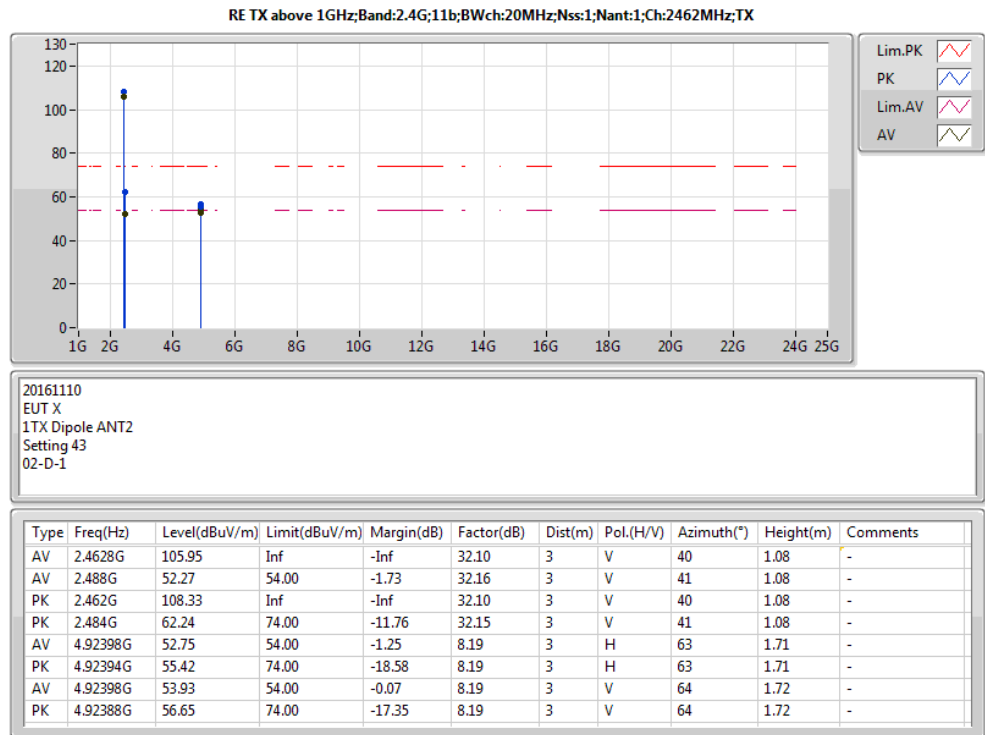
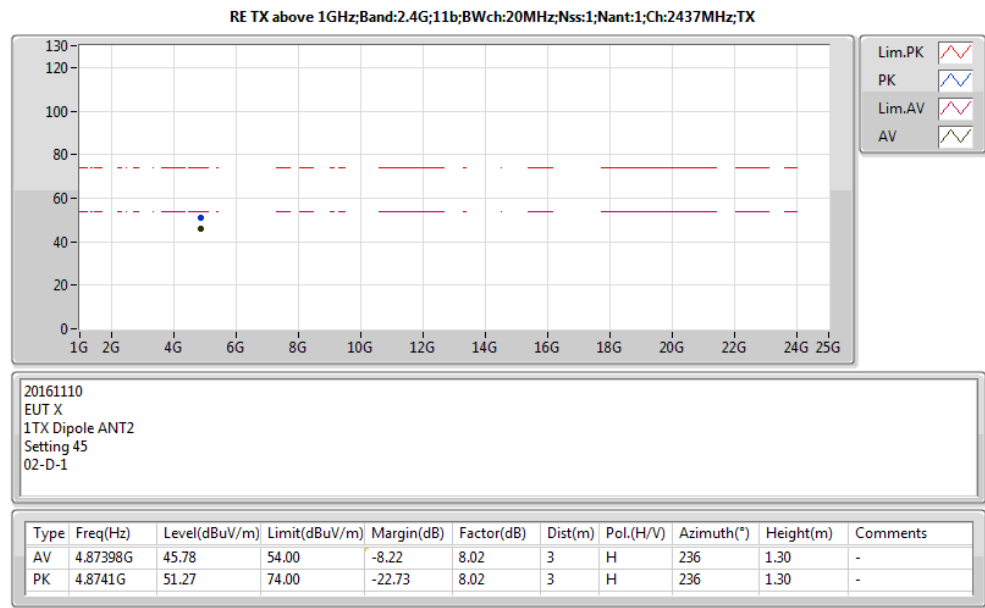
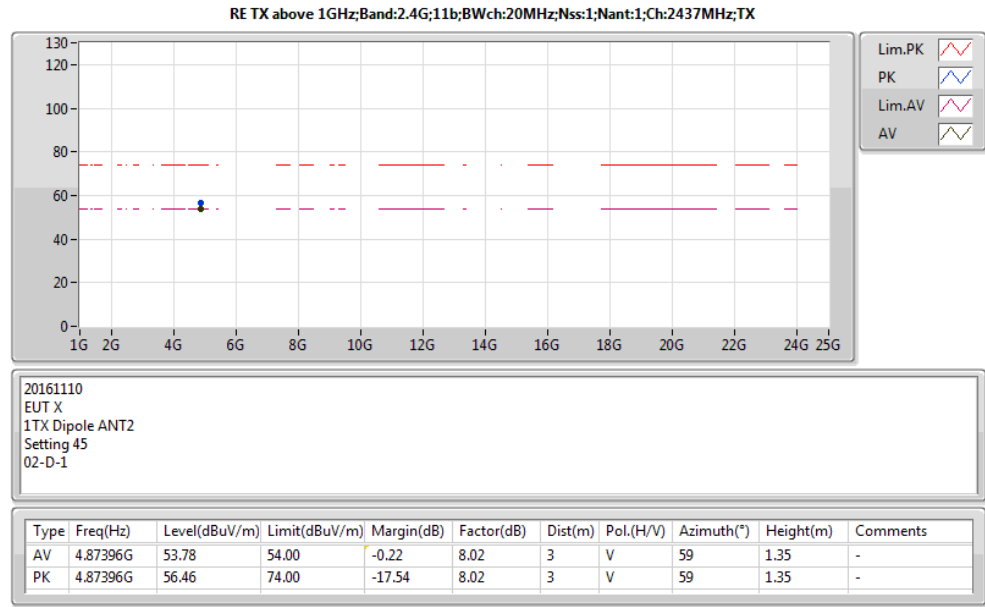


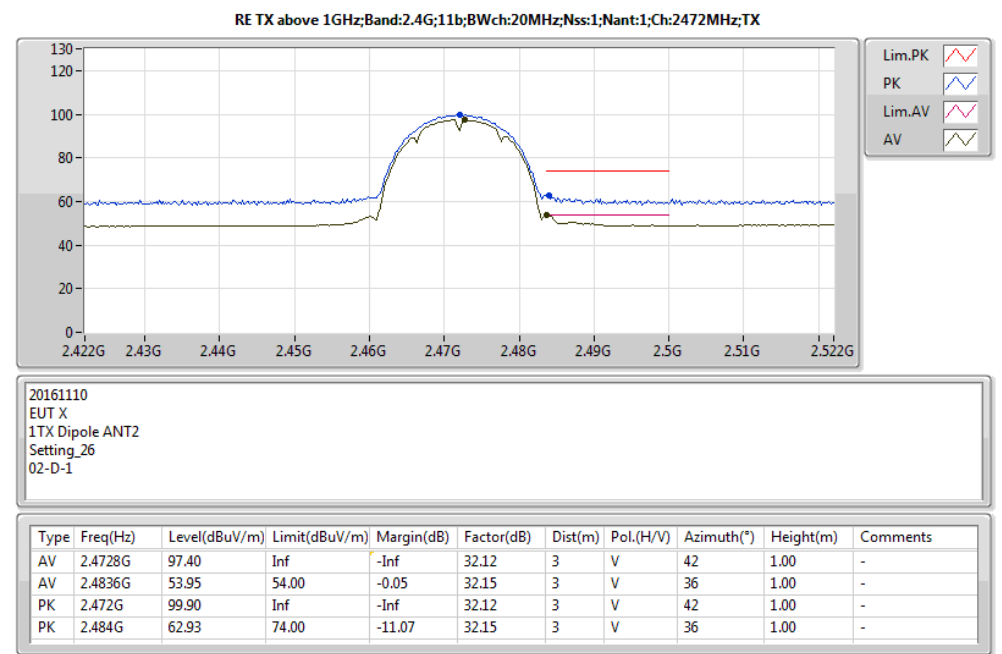
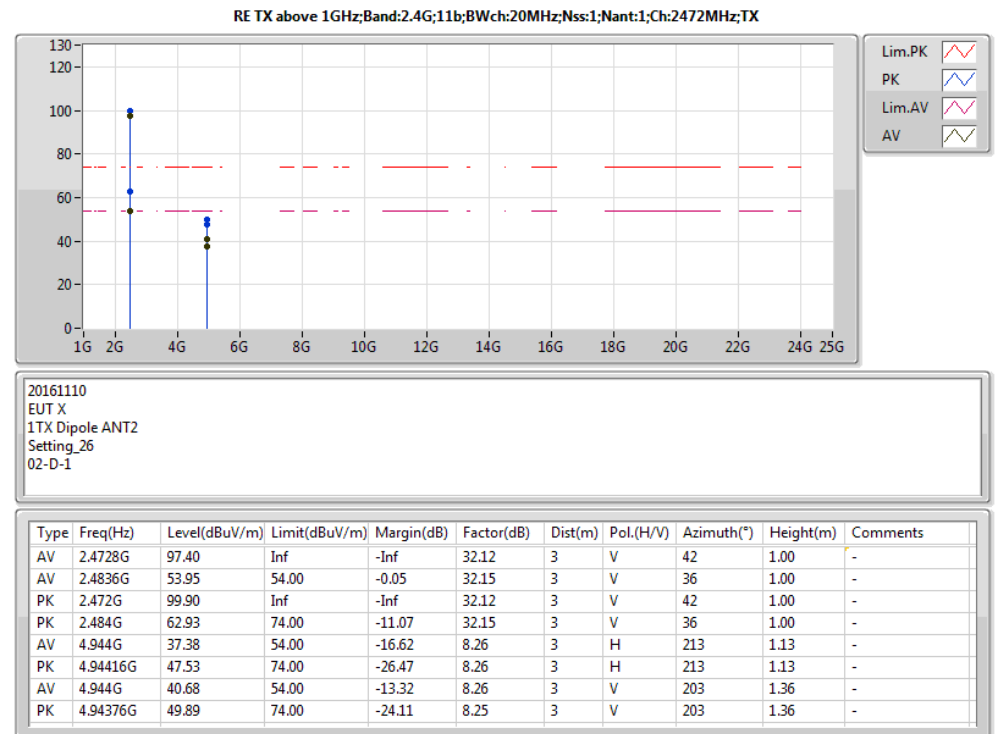
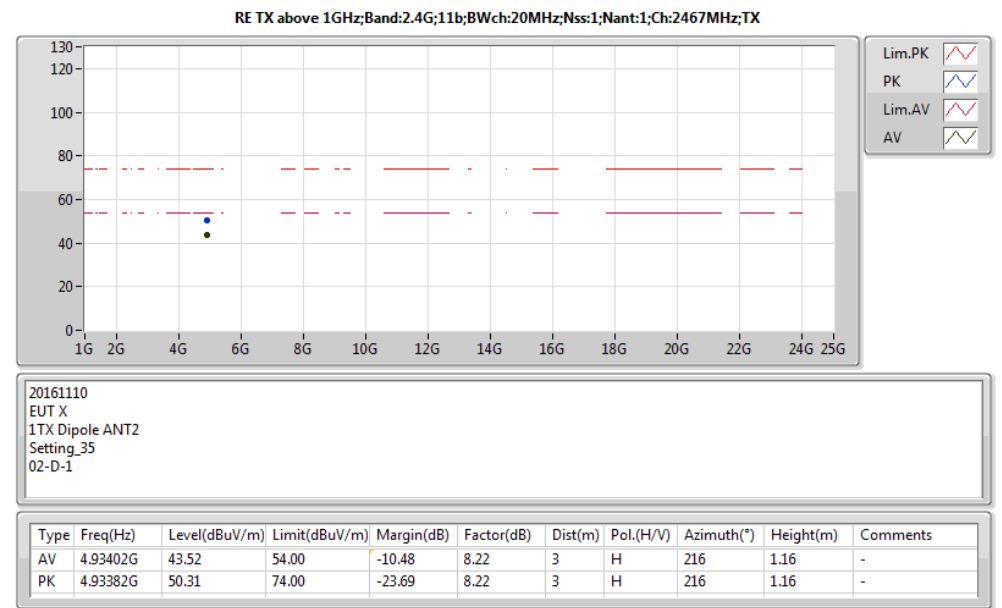
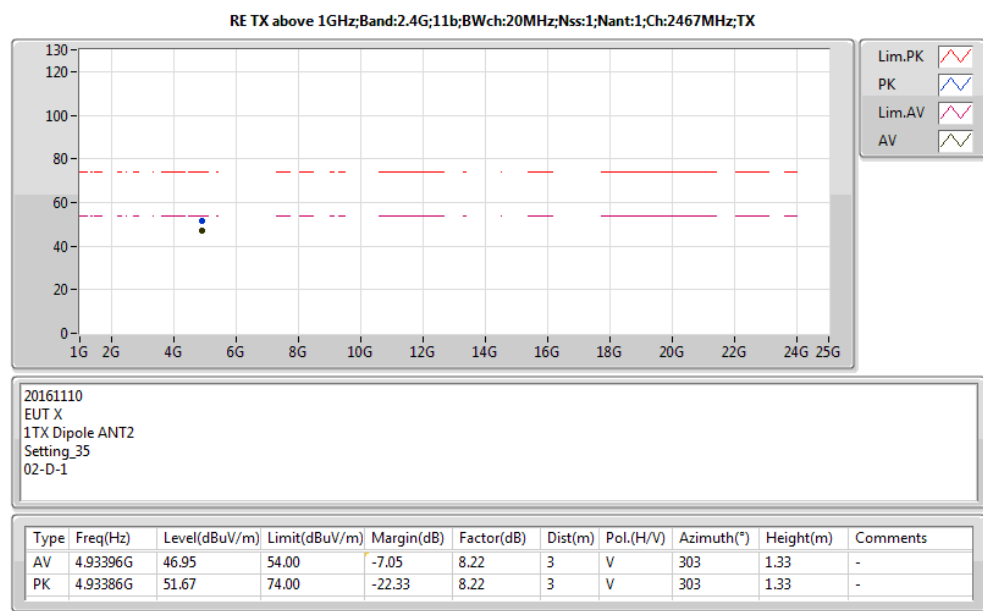
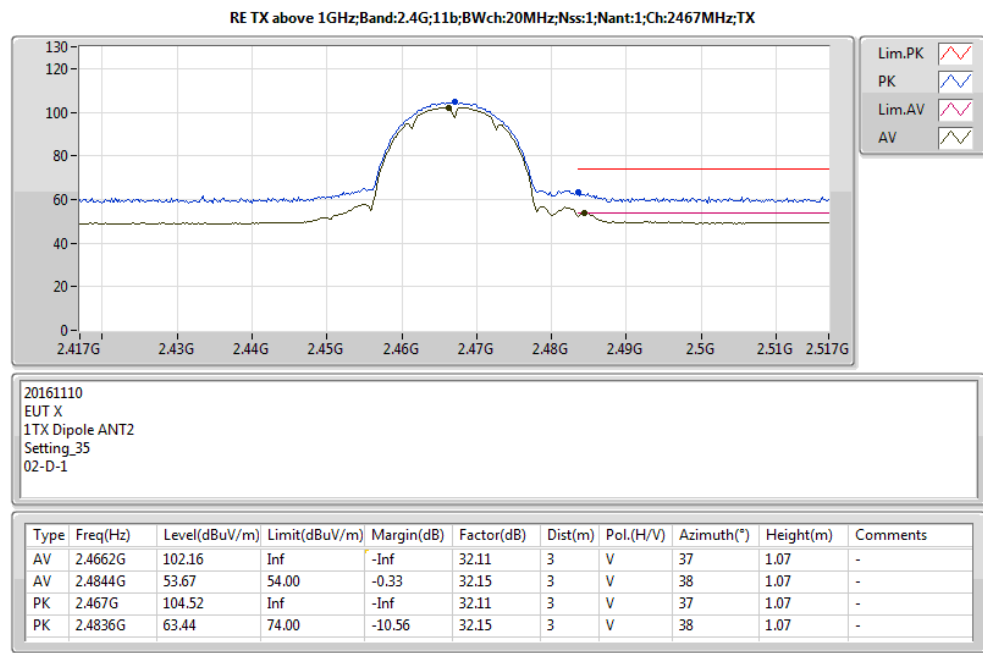
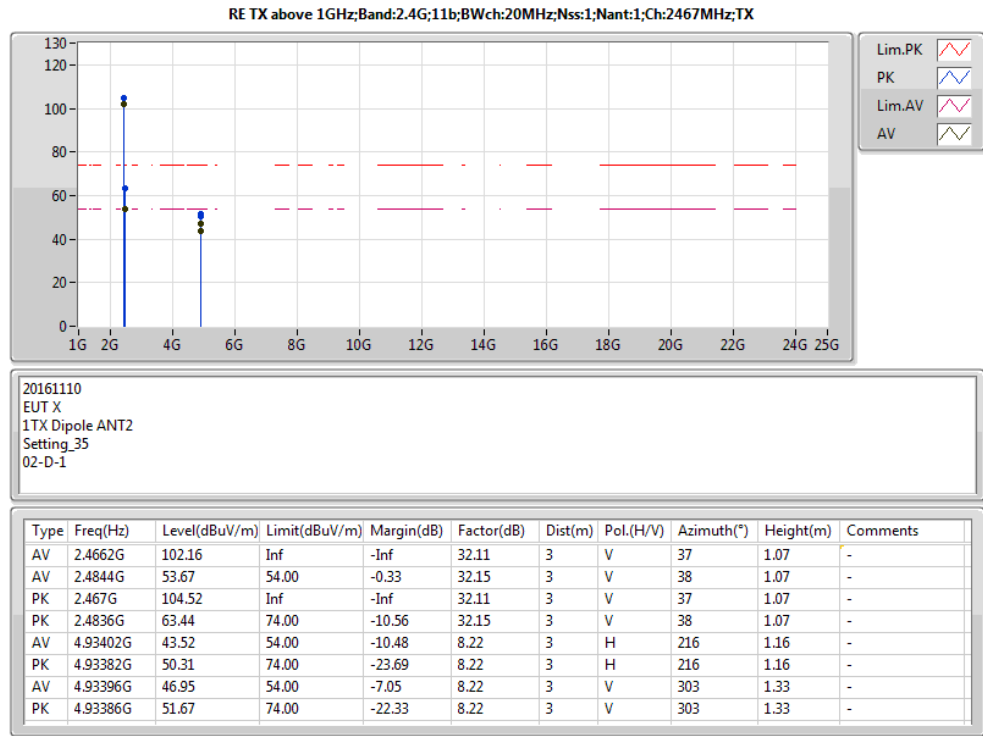


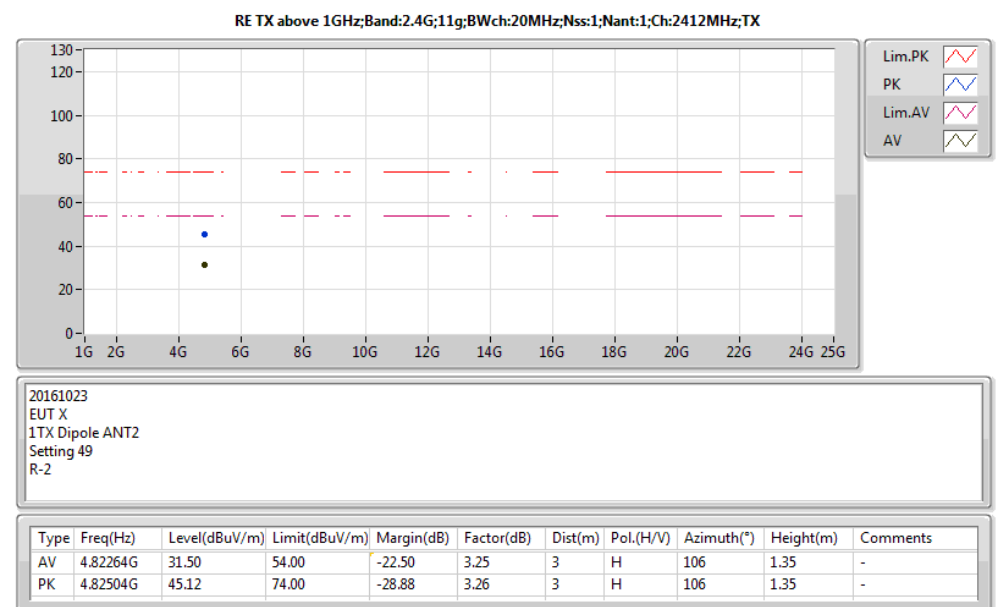
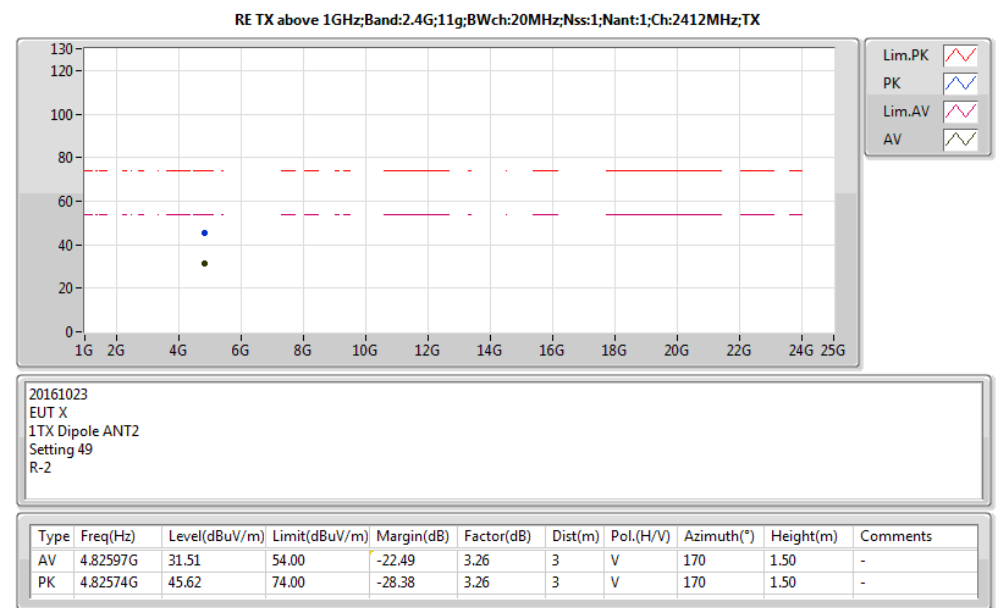
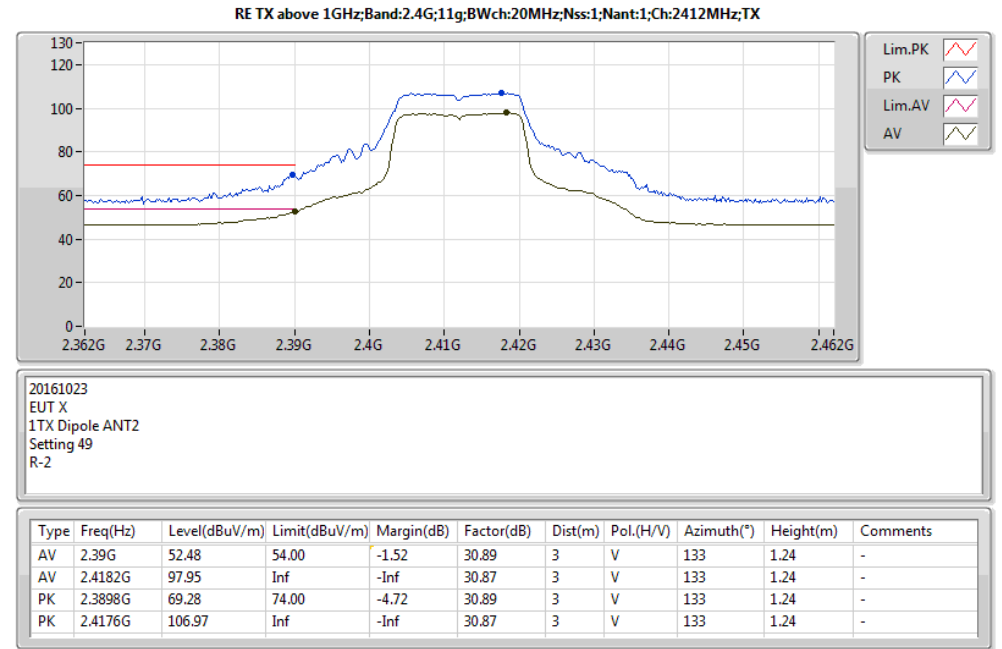
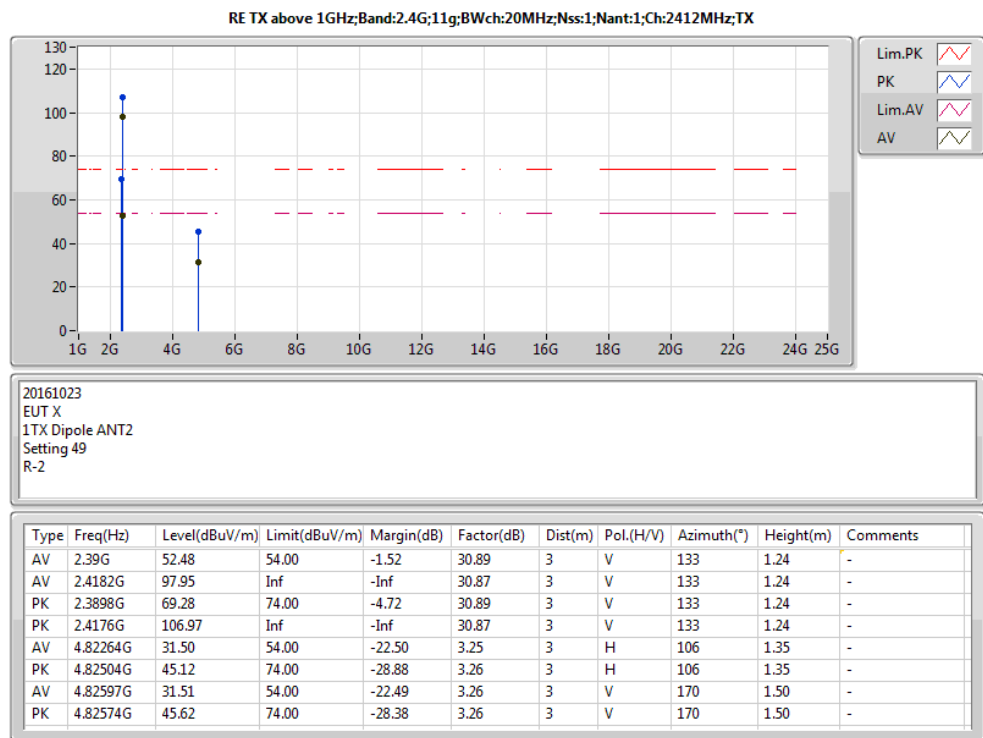
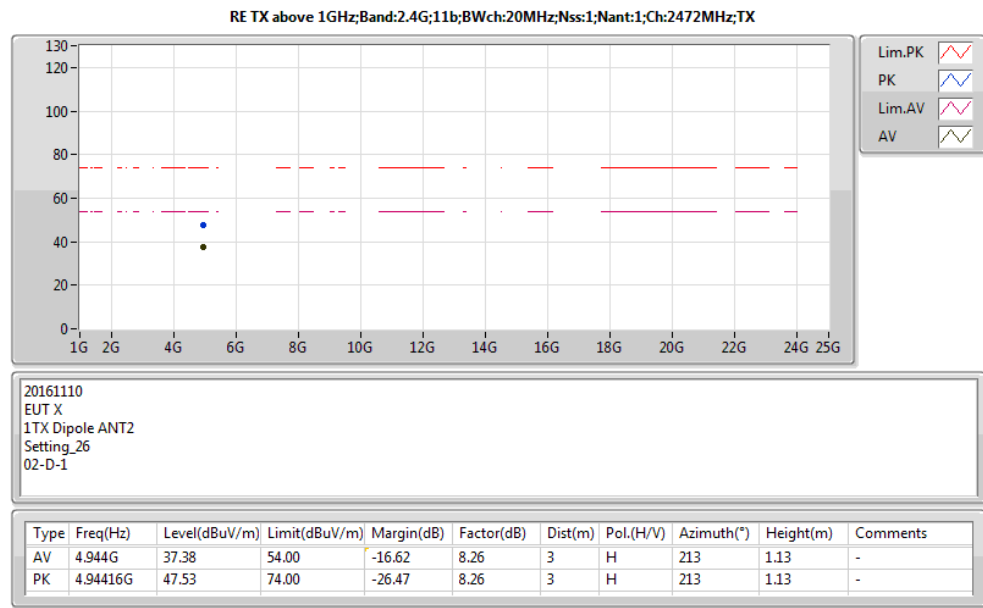
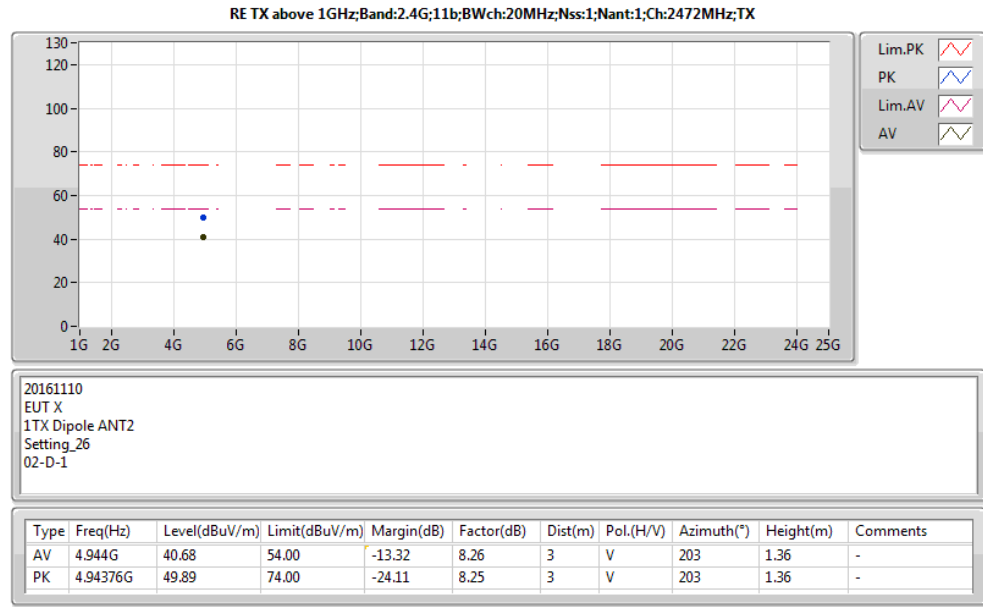
Summary

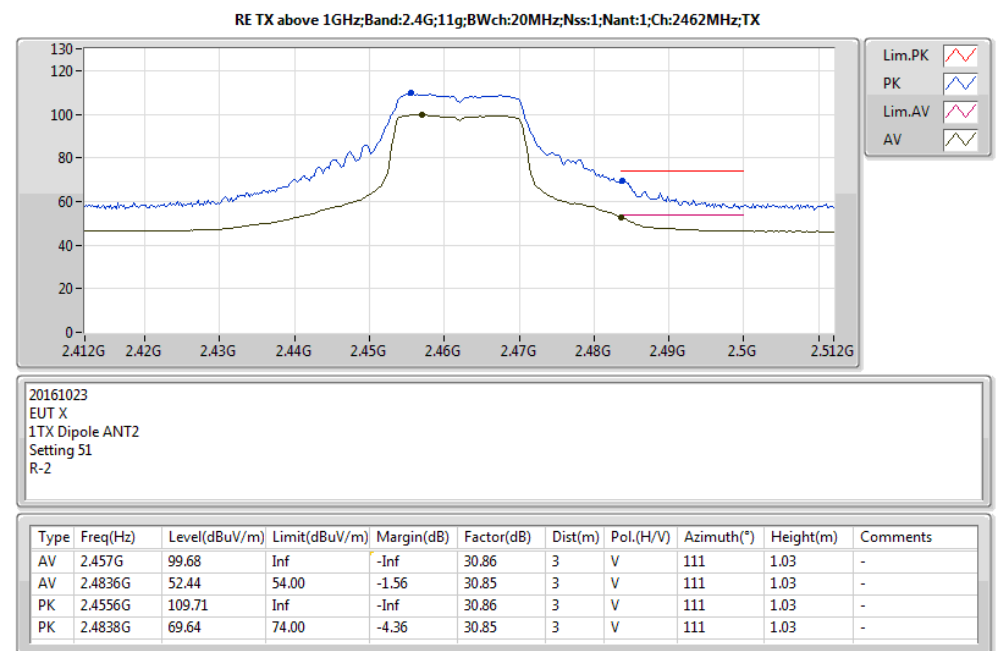
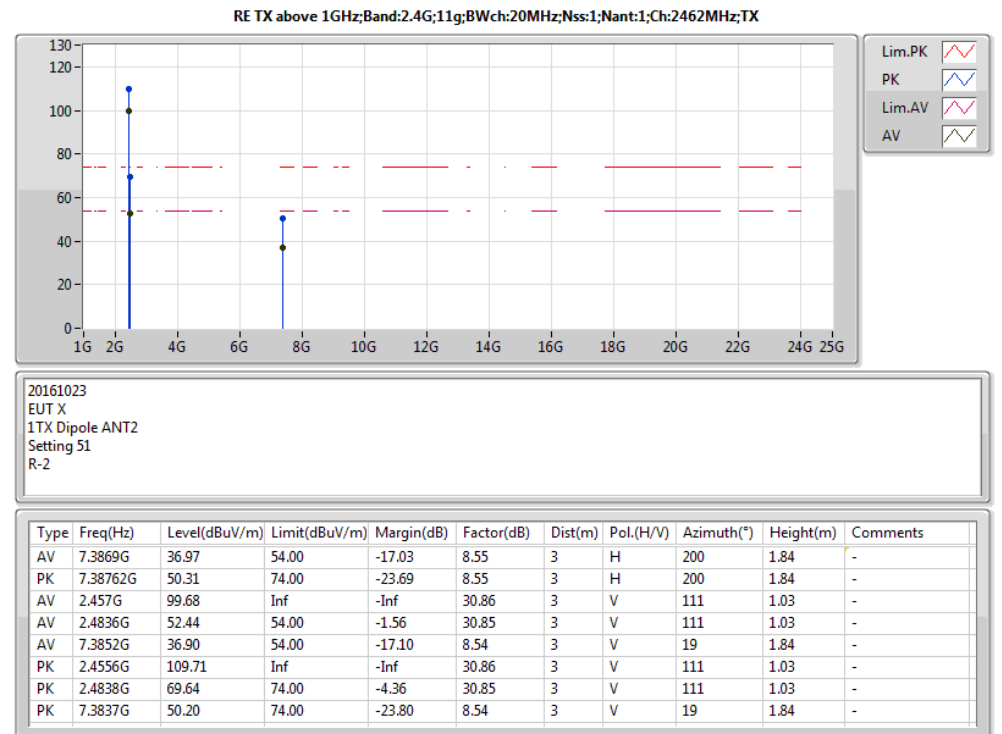
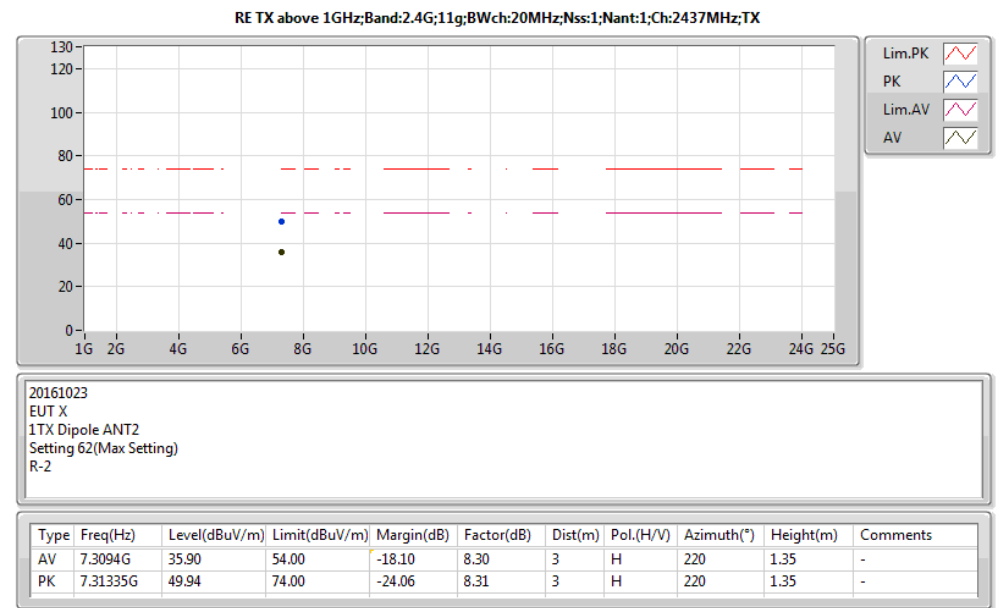
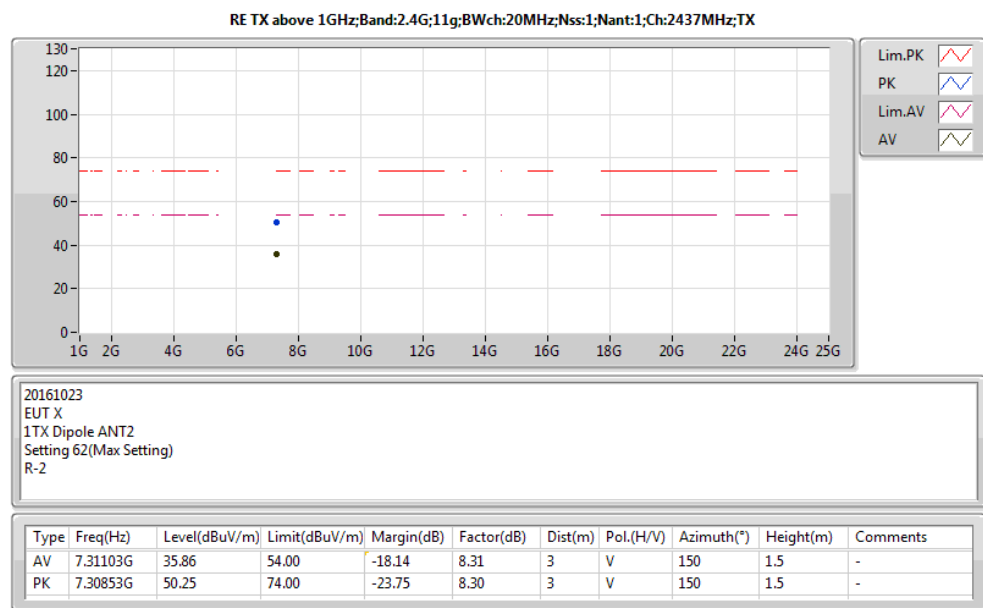
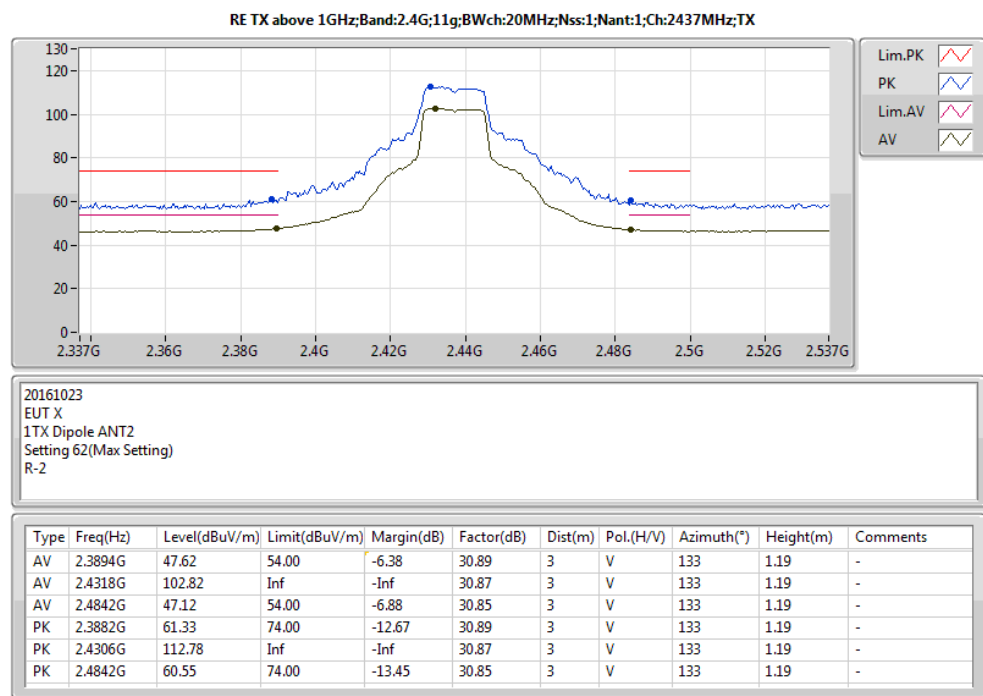
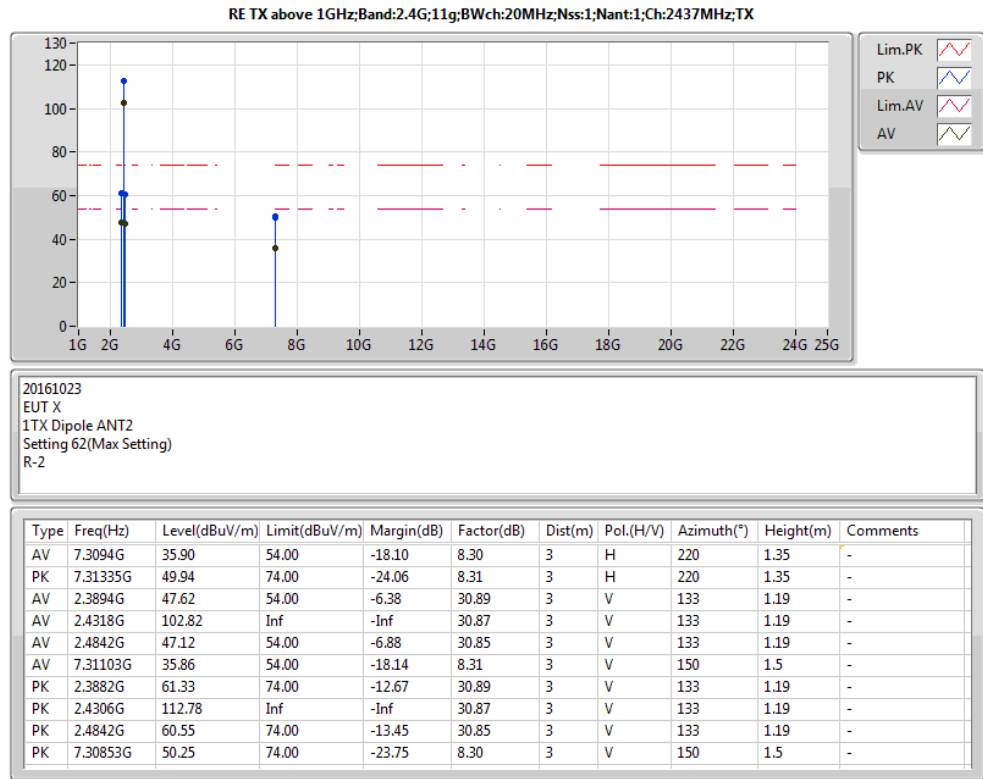
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Pol. (H/V)	Azimuth (°)	Height (m)	Comments
2.4G;11b;Nss1;Ntx1;2472	Pass	AV	2.4836G	53.95	54.00	-0.05	32.15	3	V	36	1.00	-

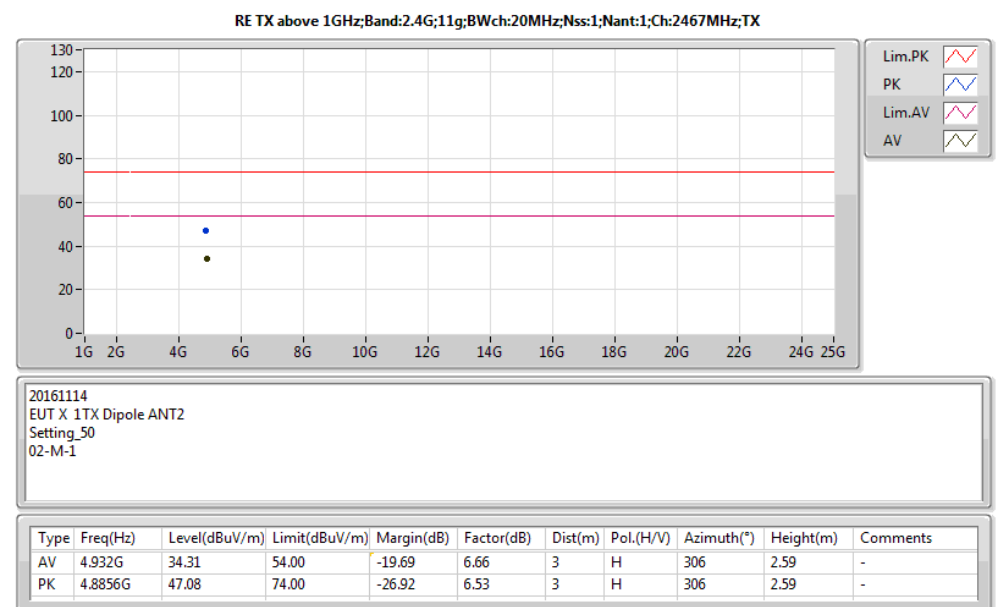
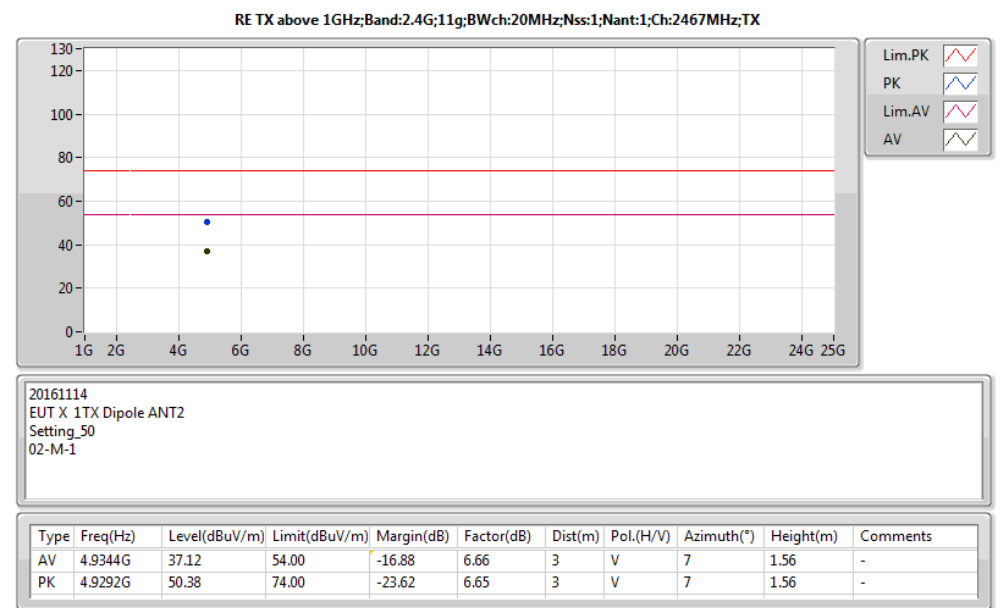
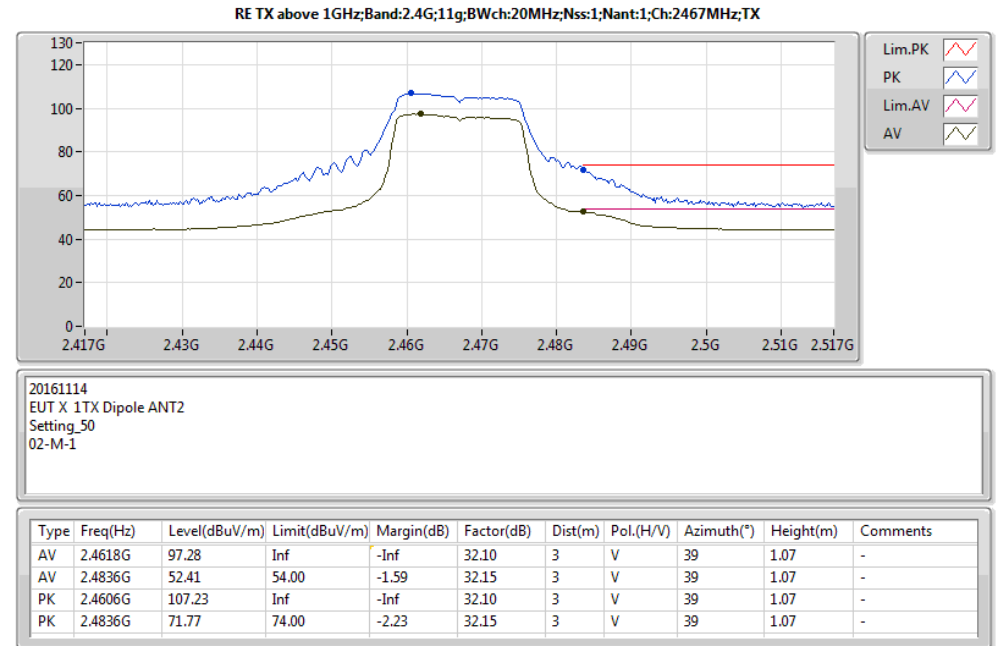
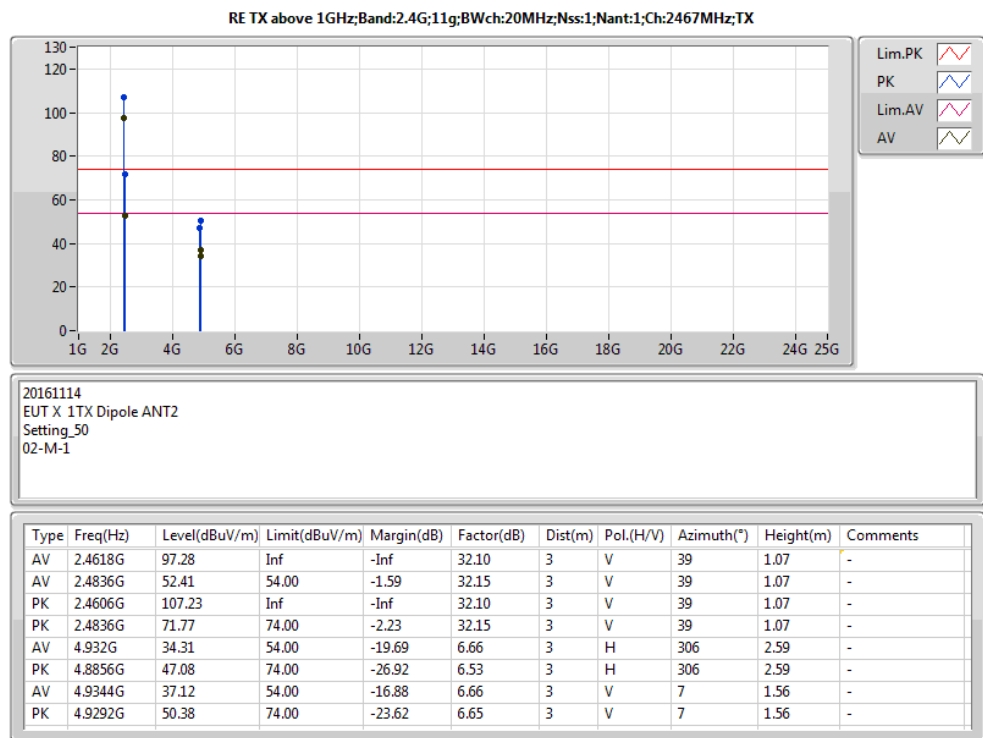
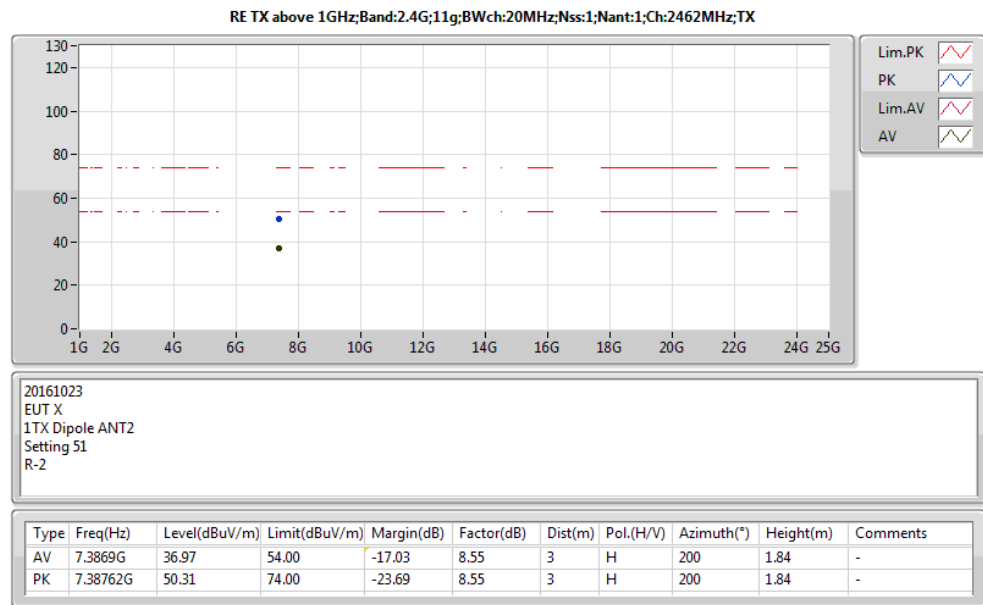
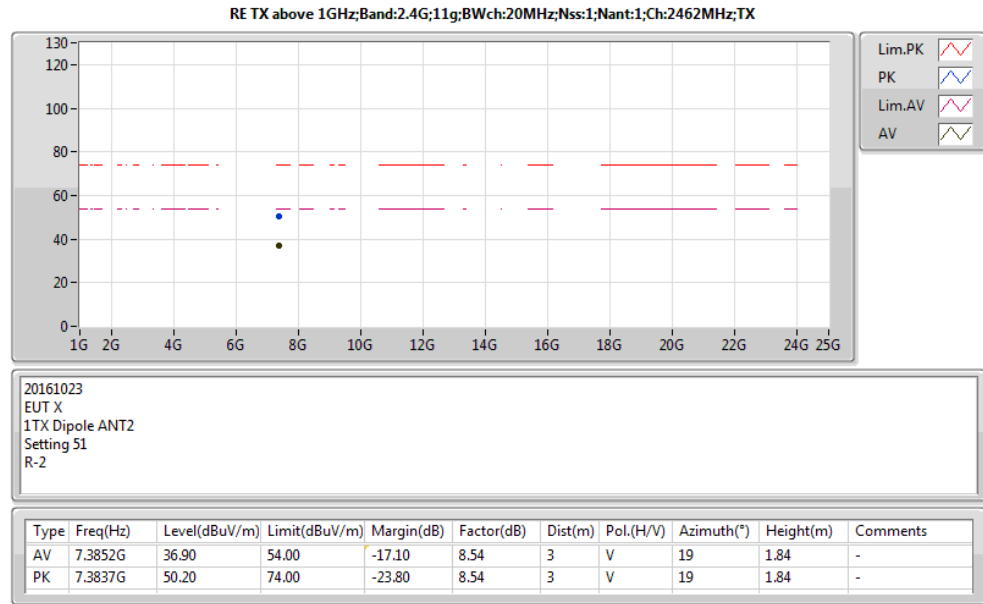


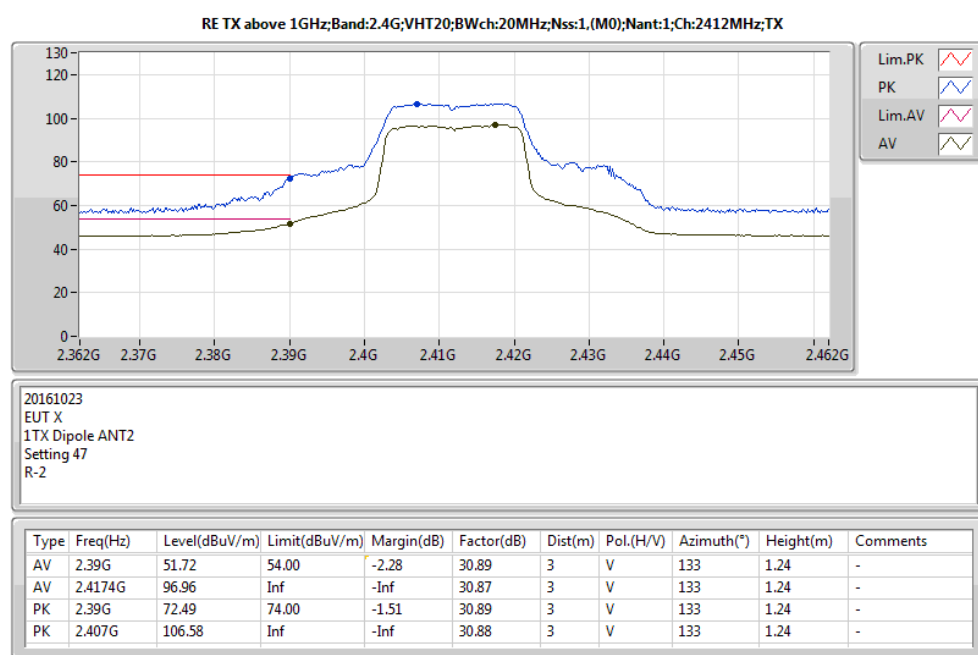
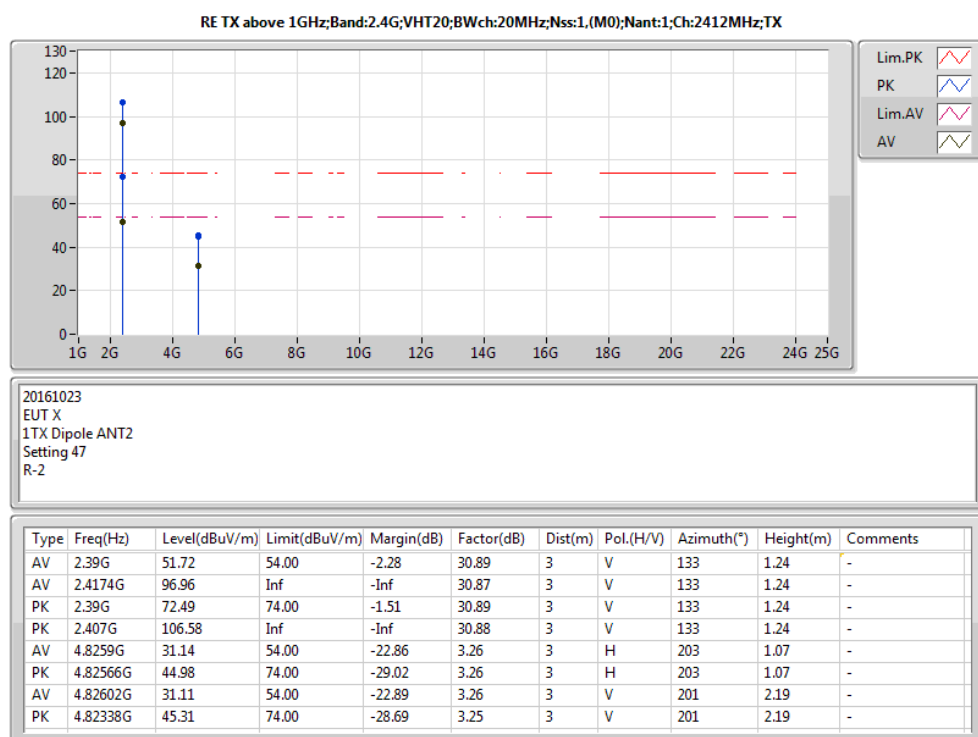
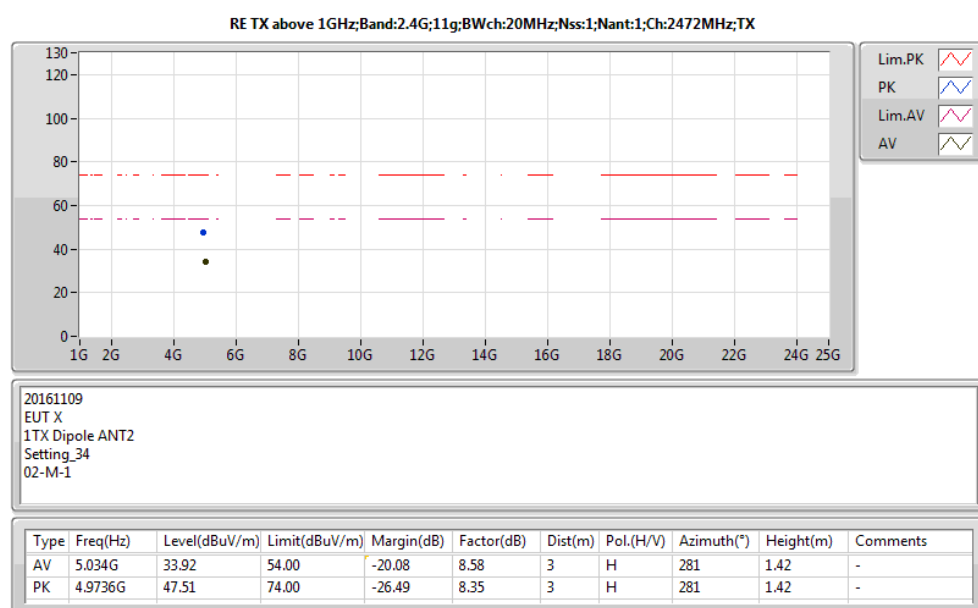
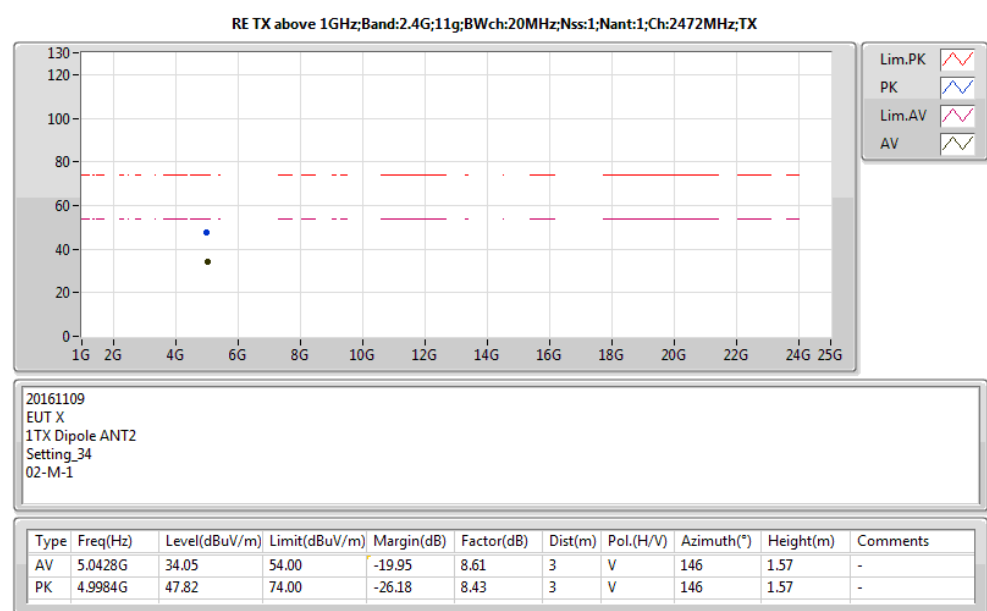
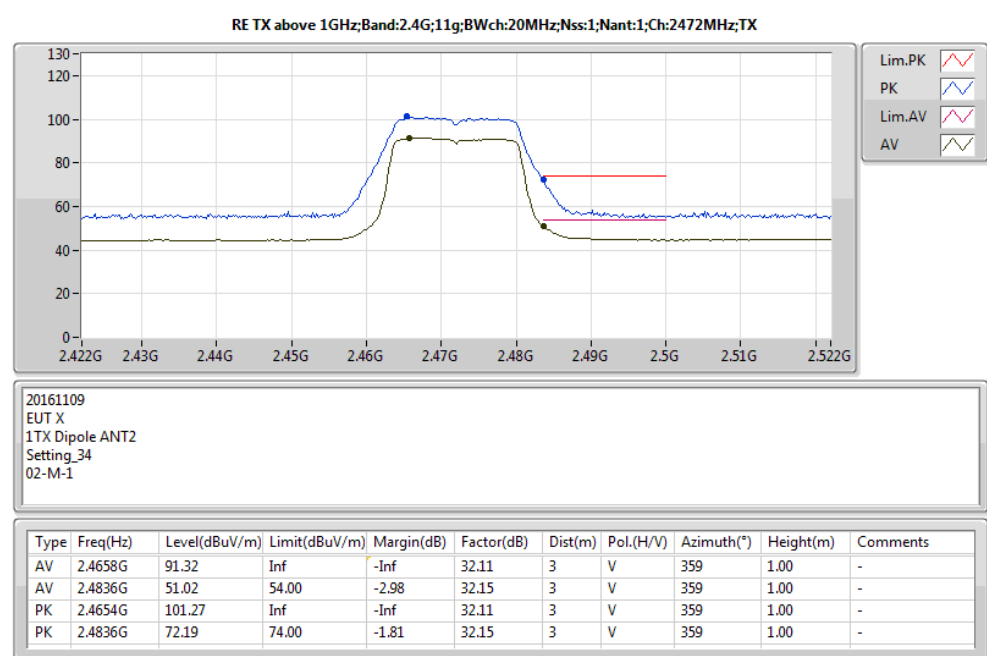
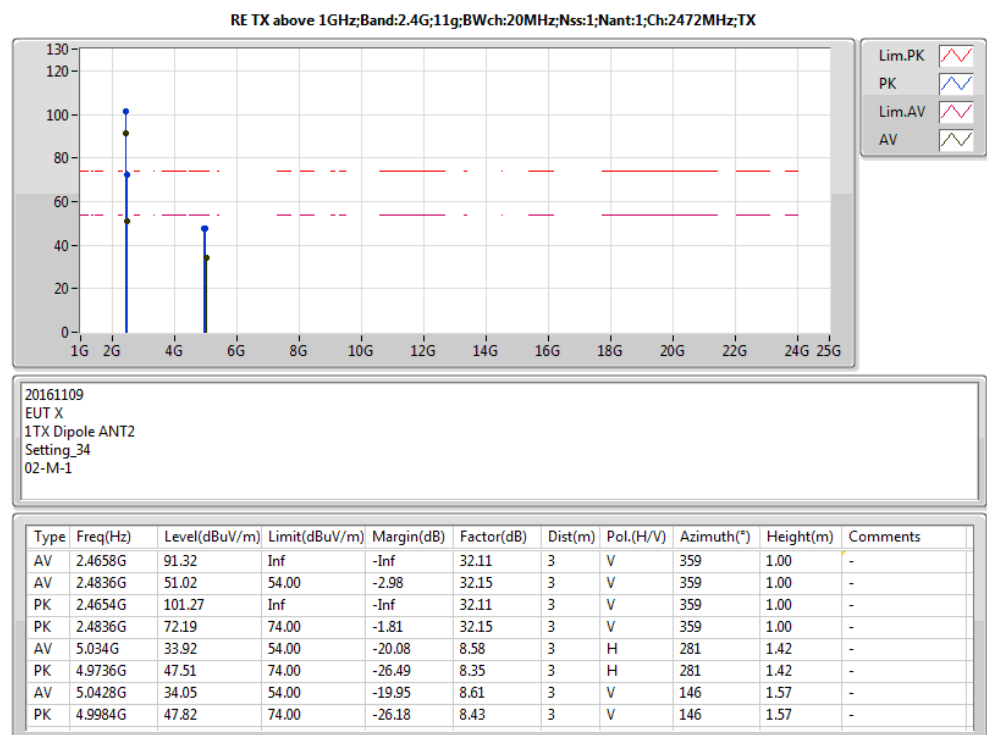


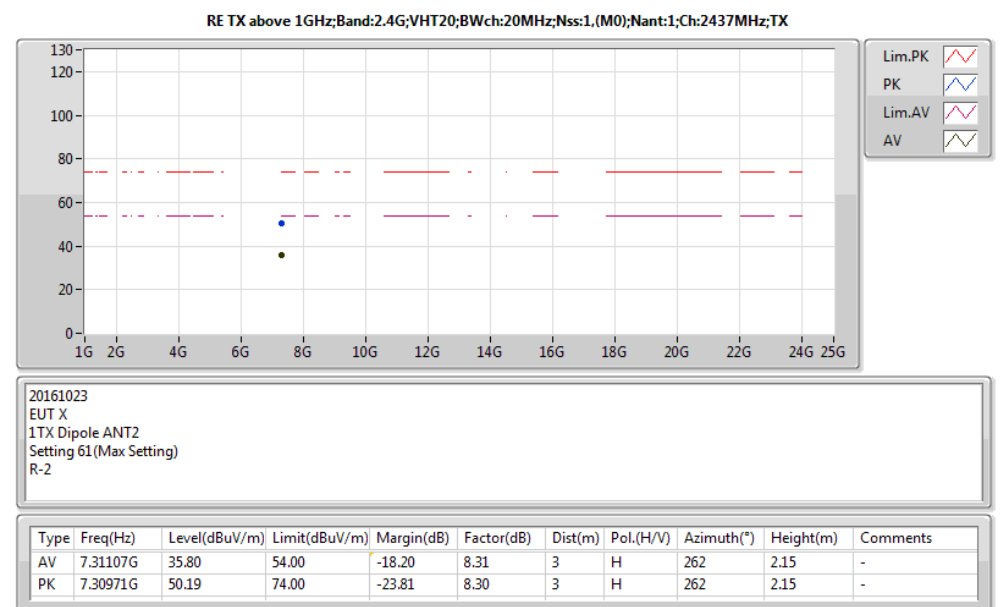
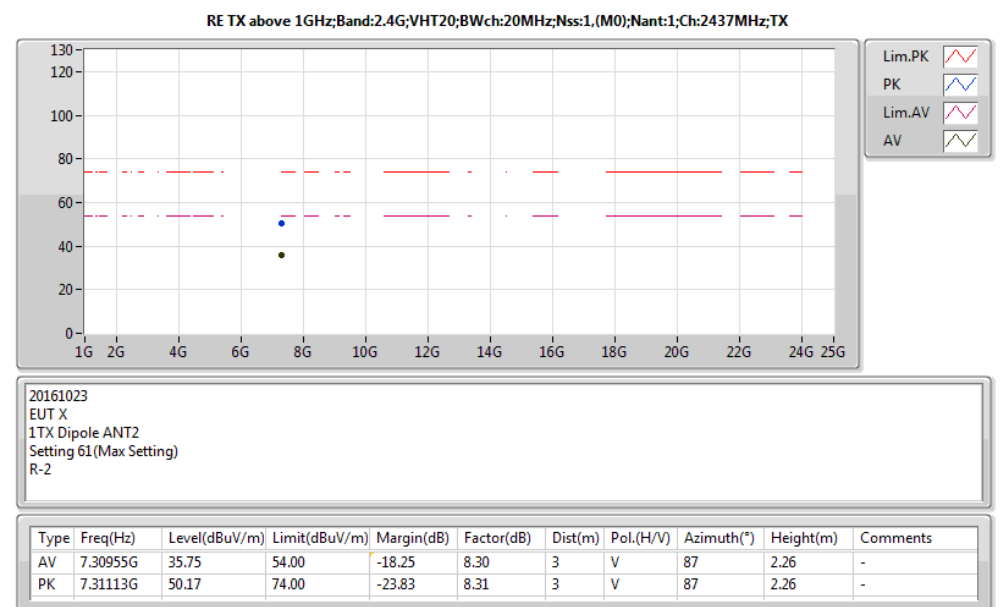
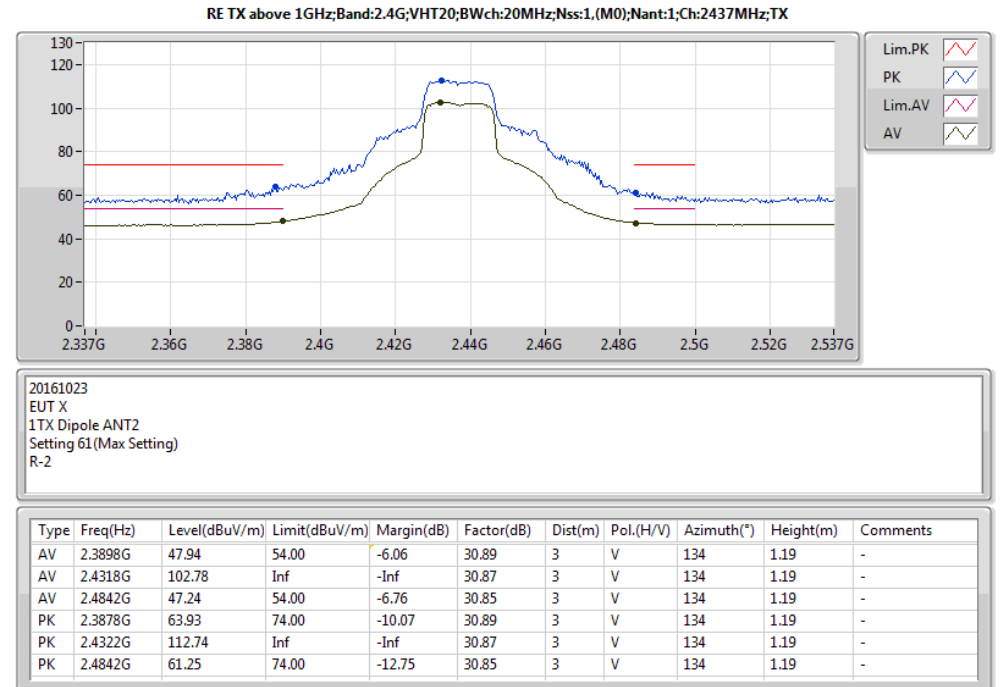
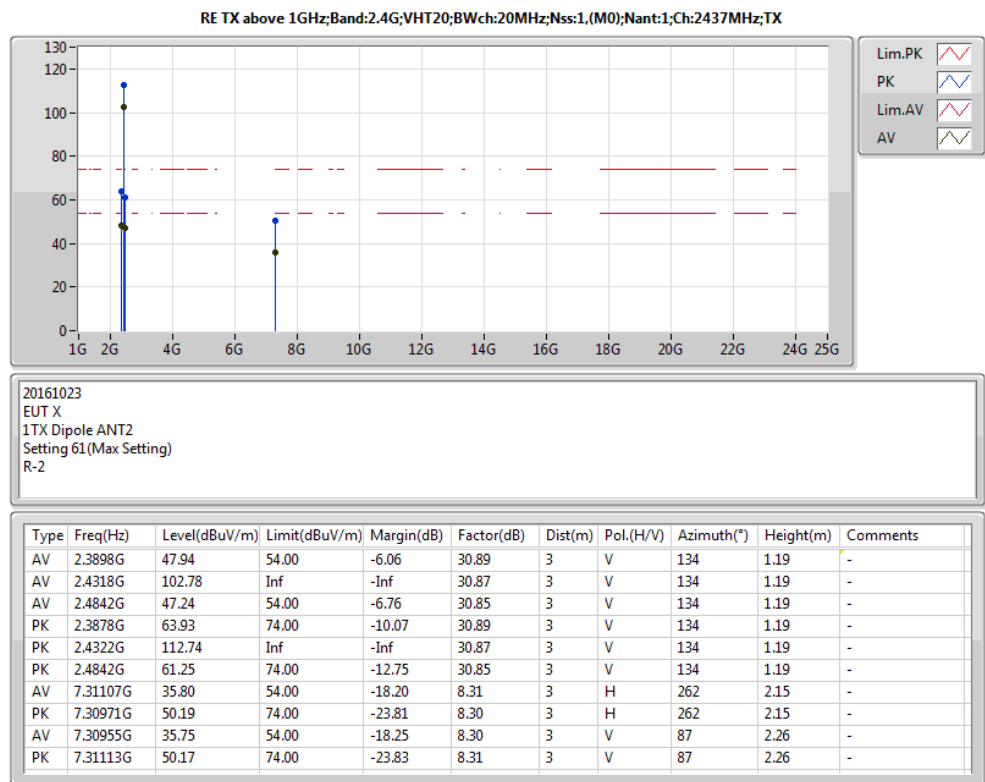
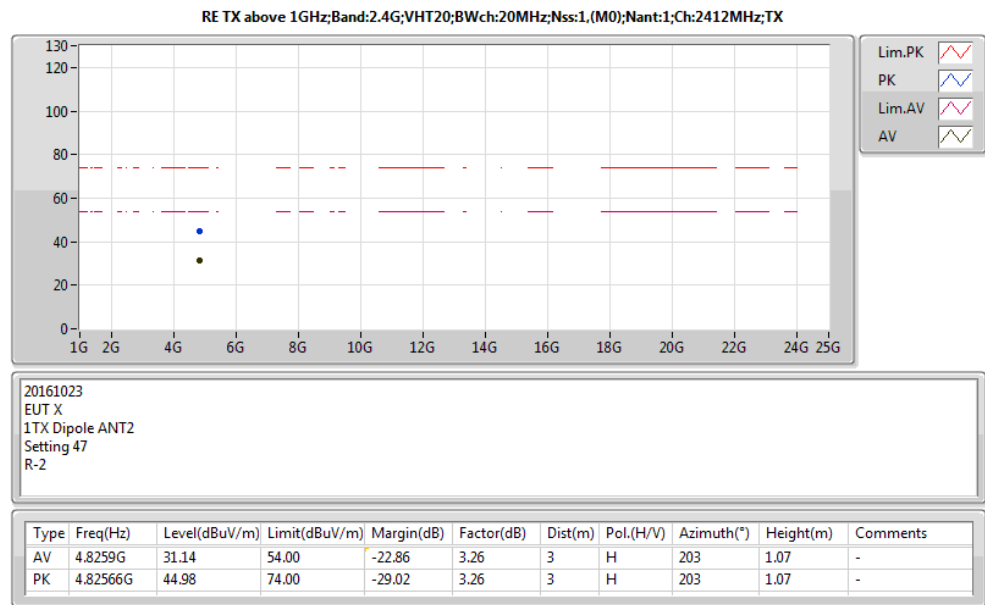
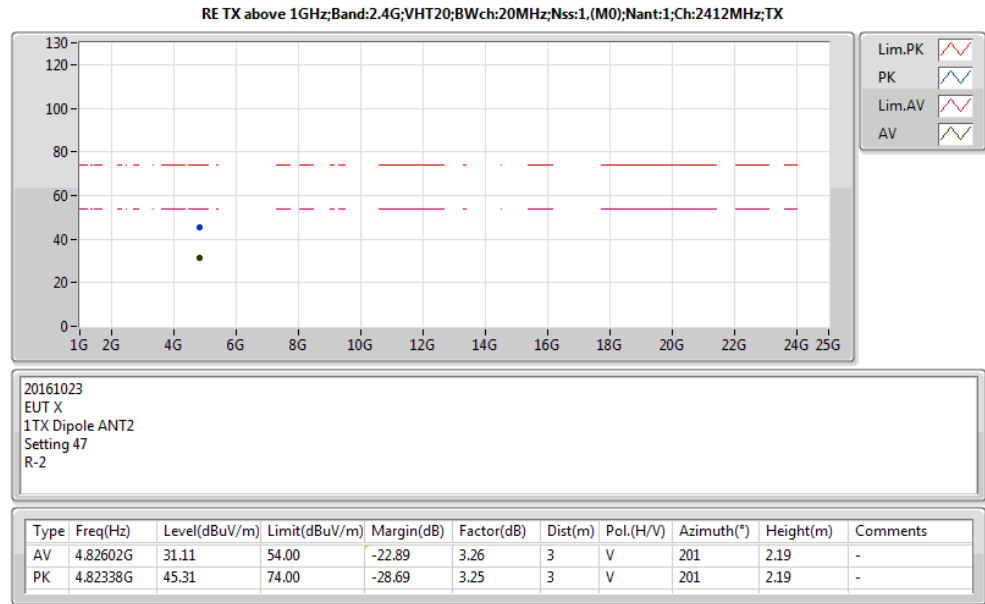


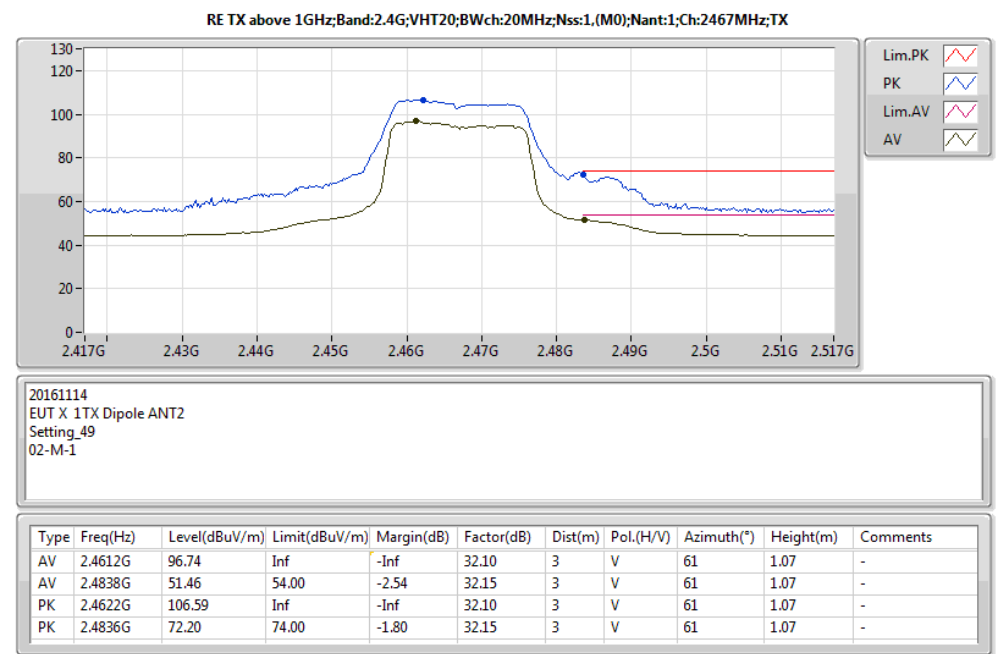
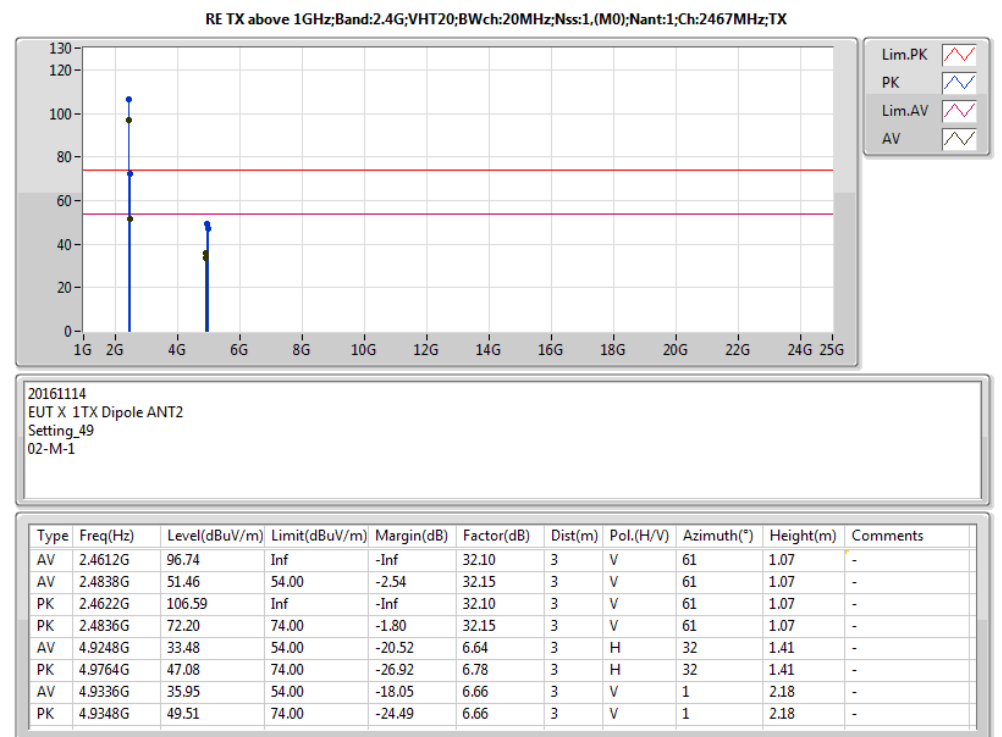
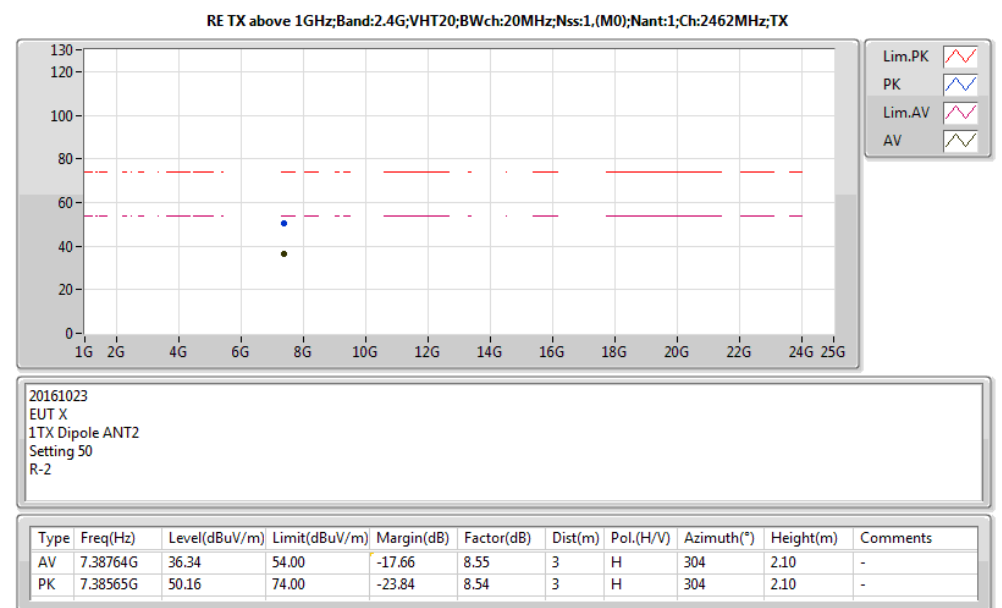
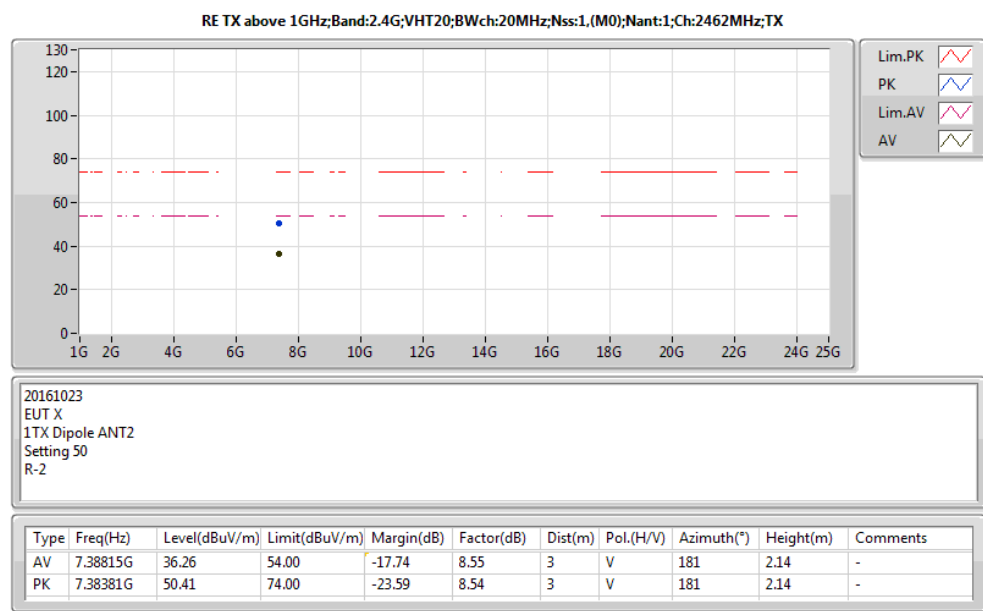
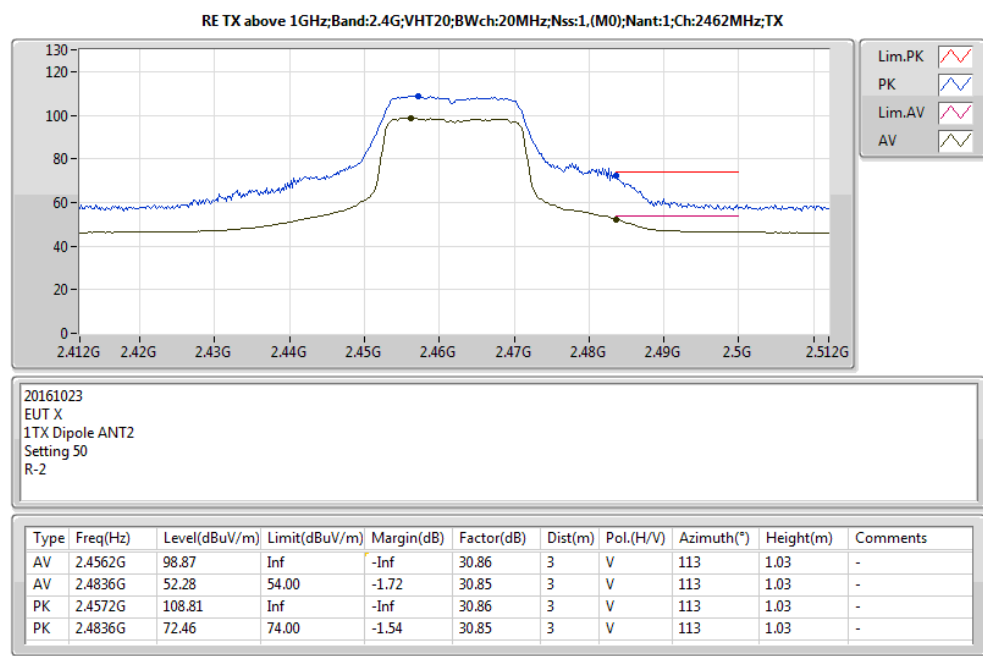
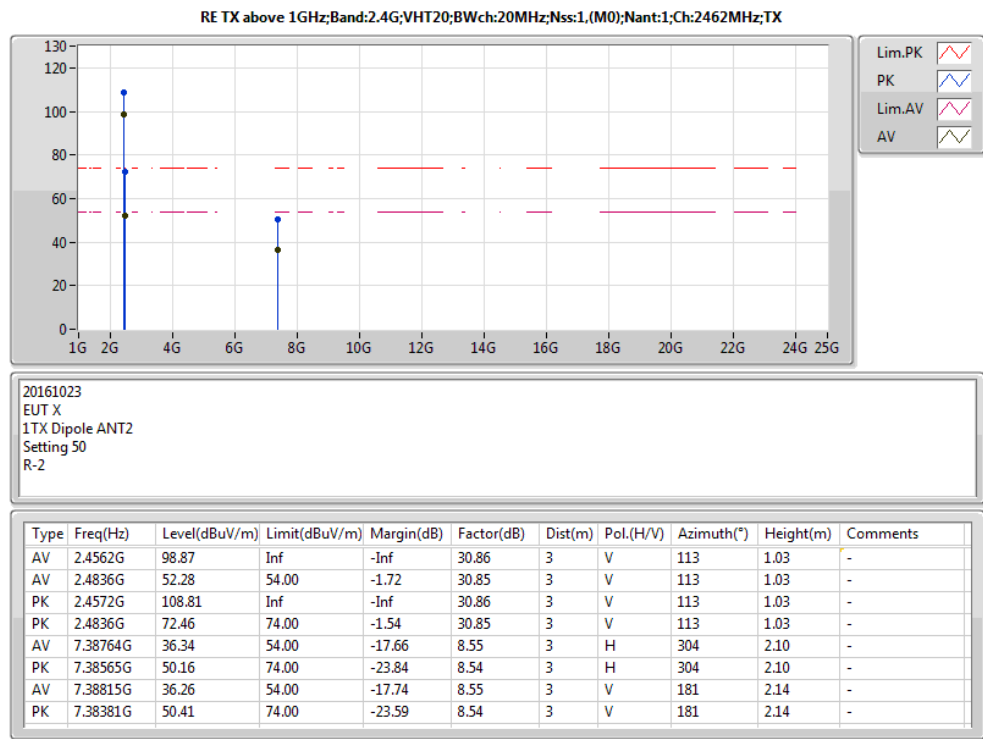


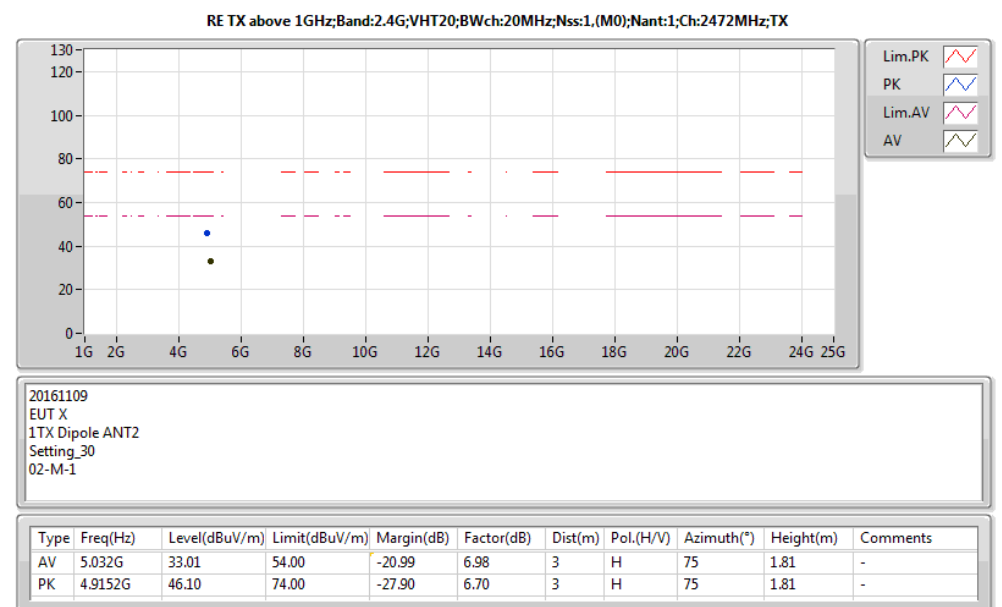
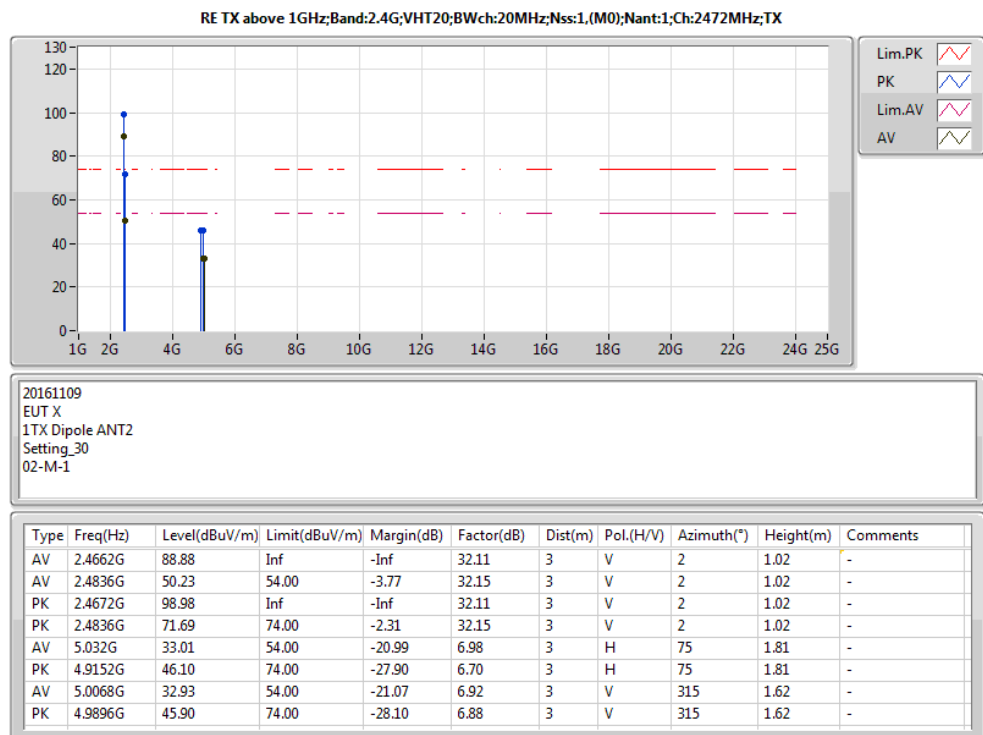
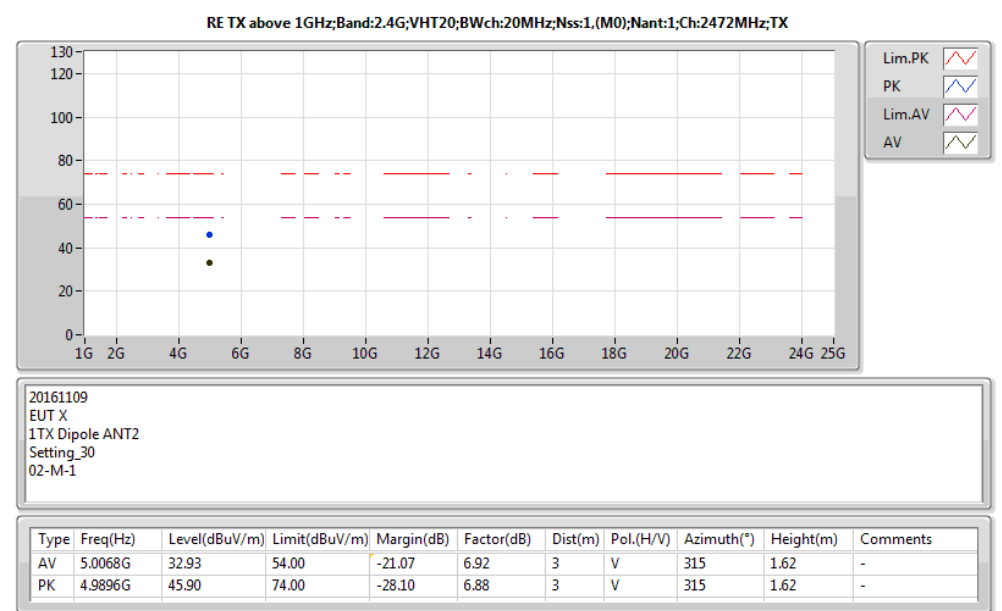
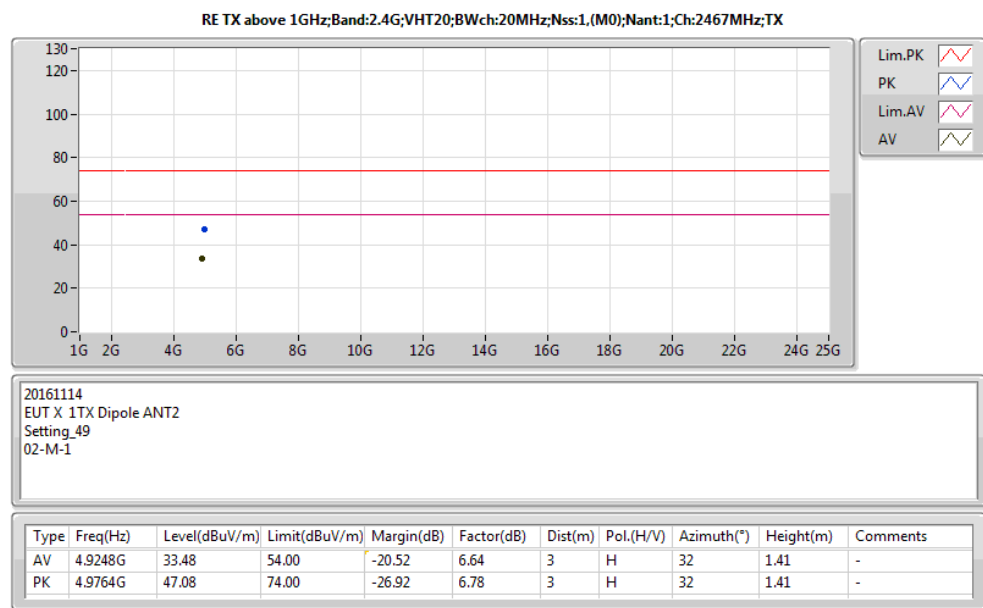
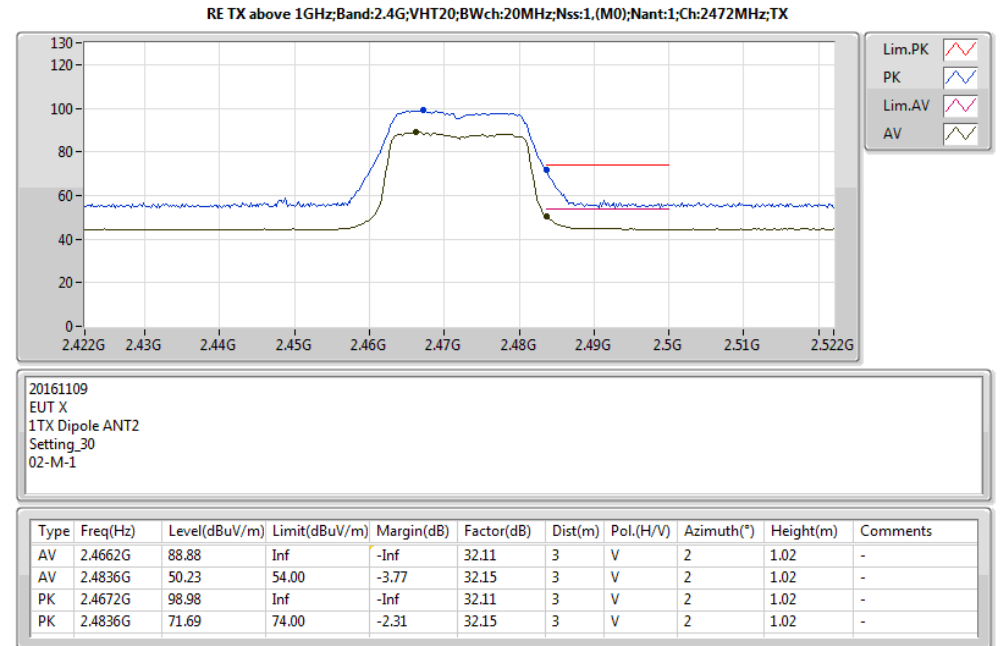
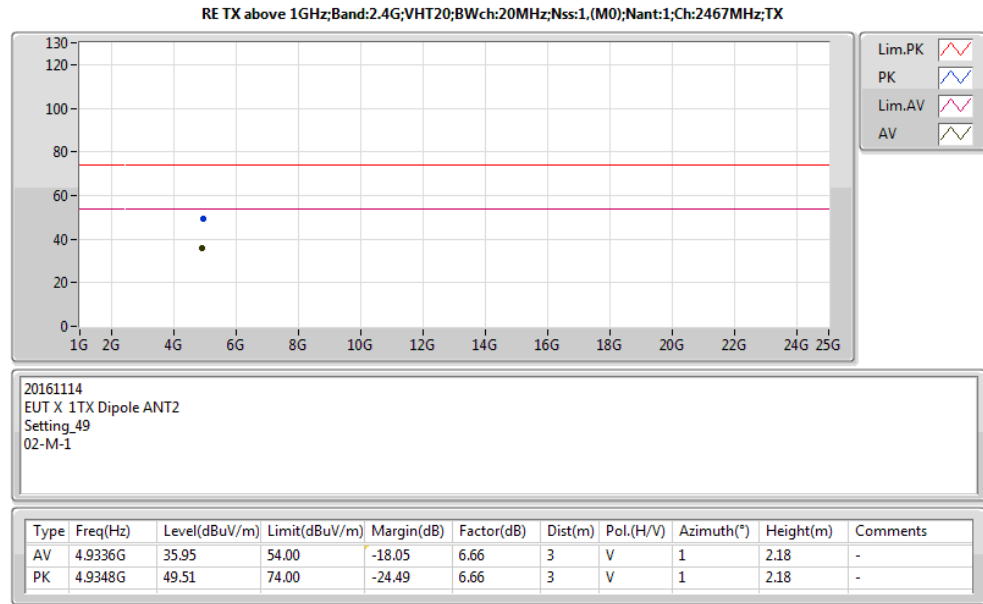


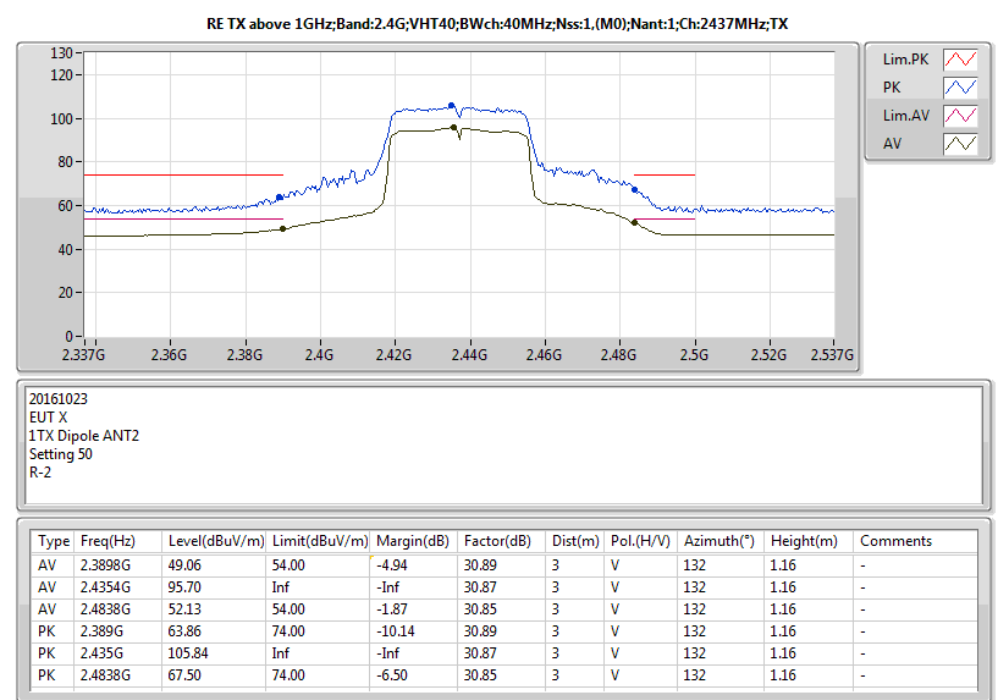
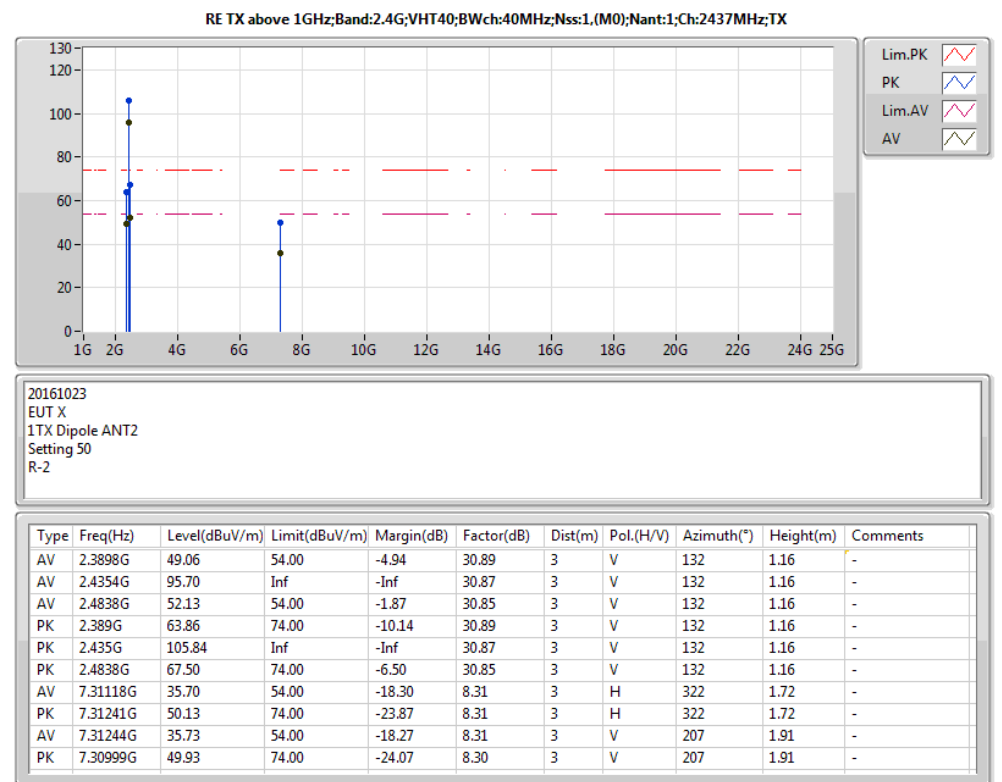
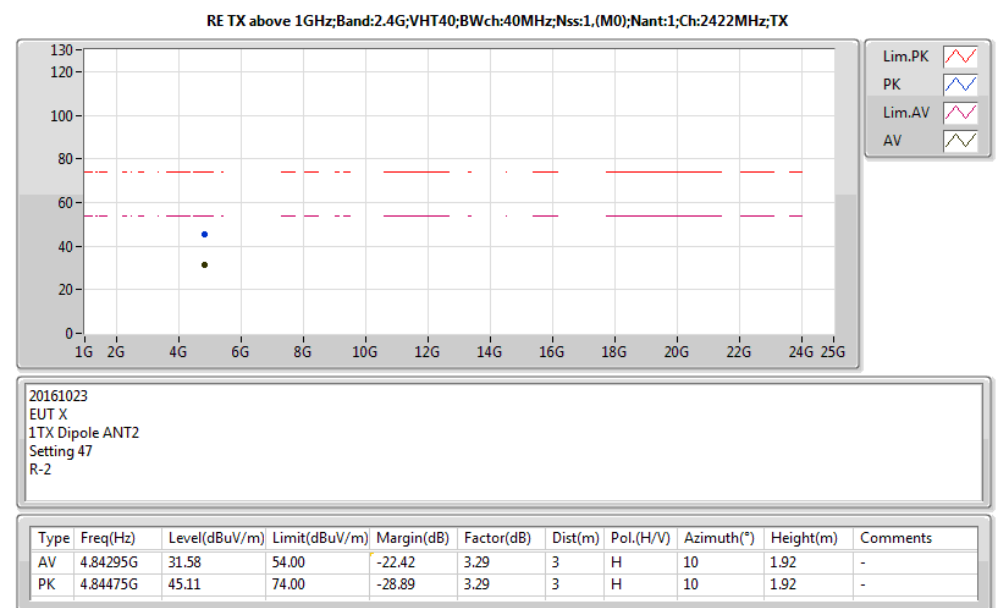
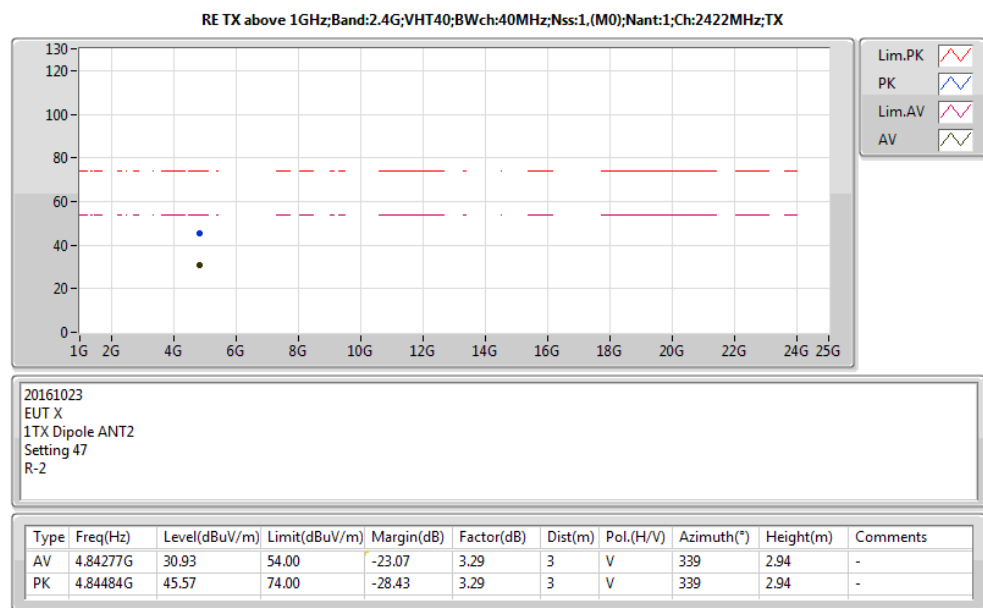
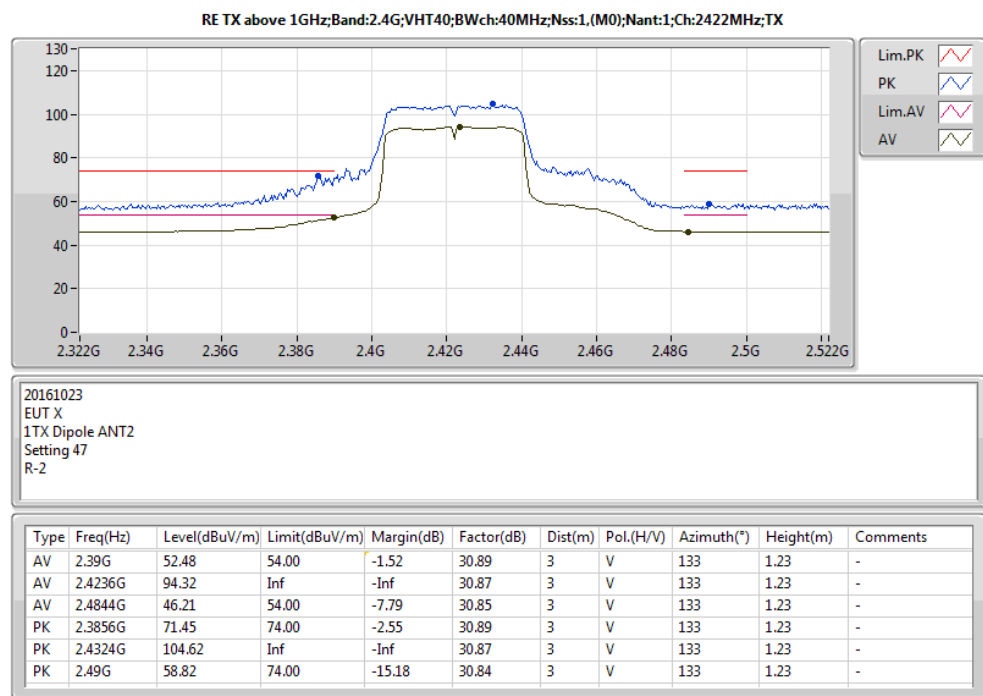
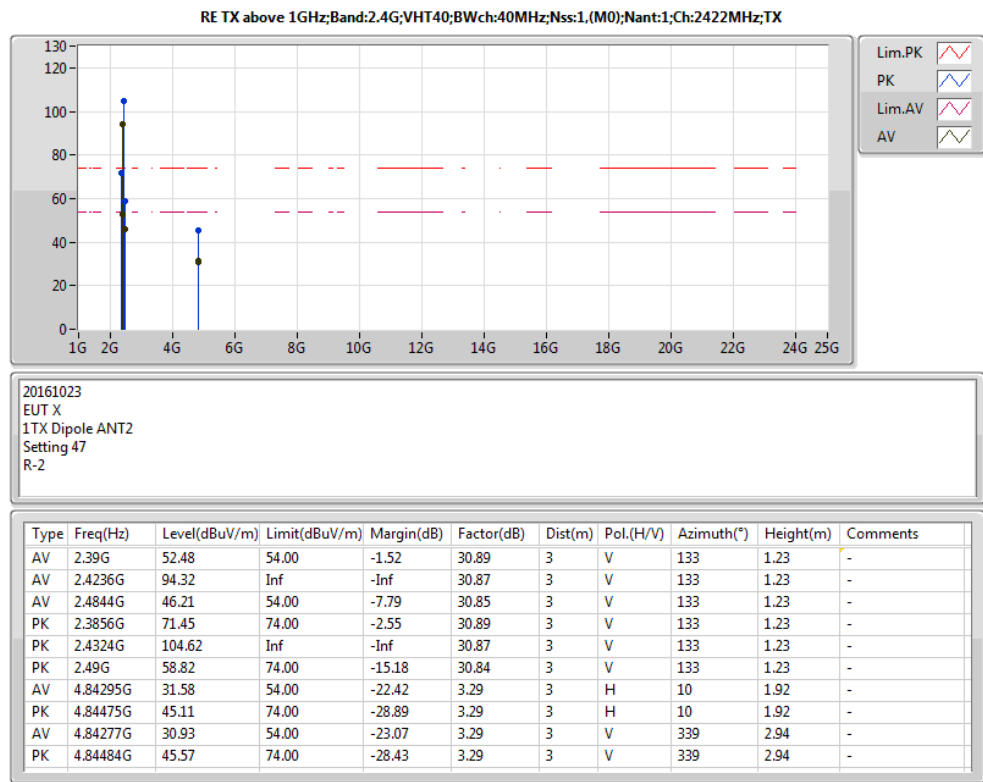


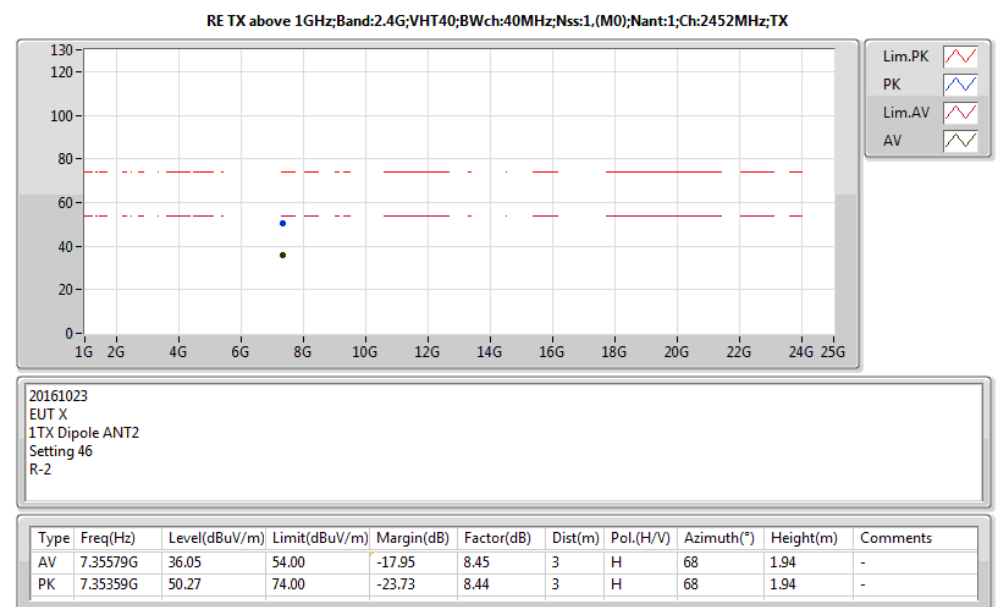
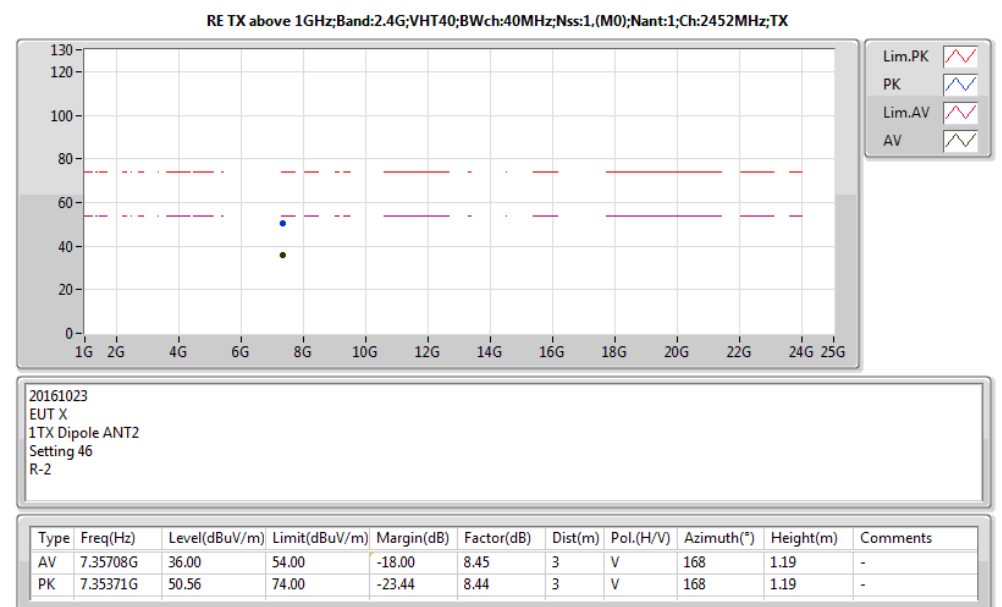
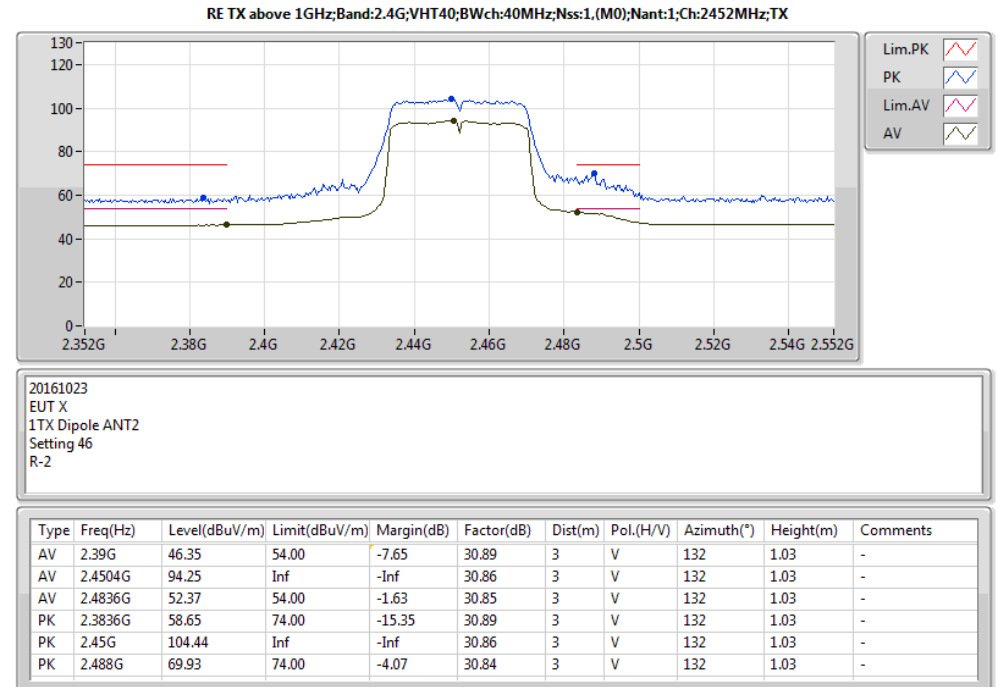
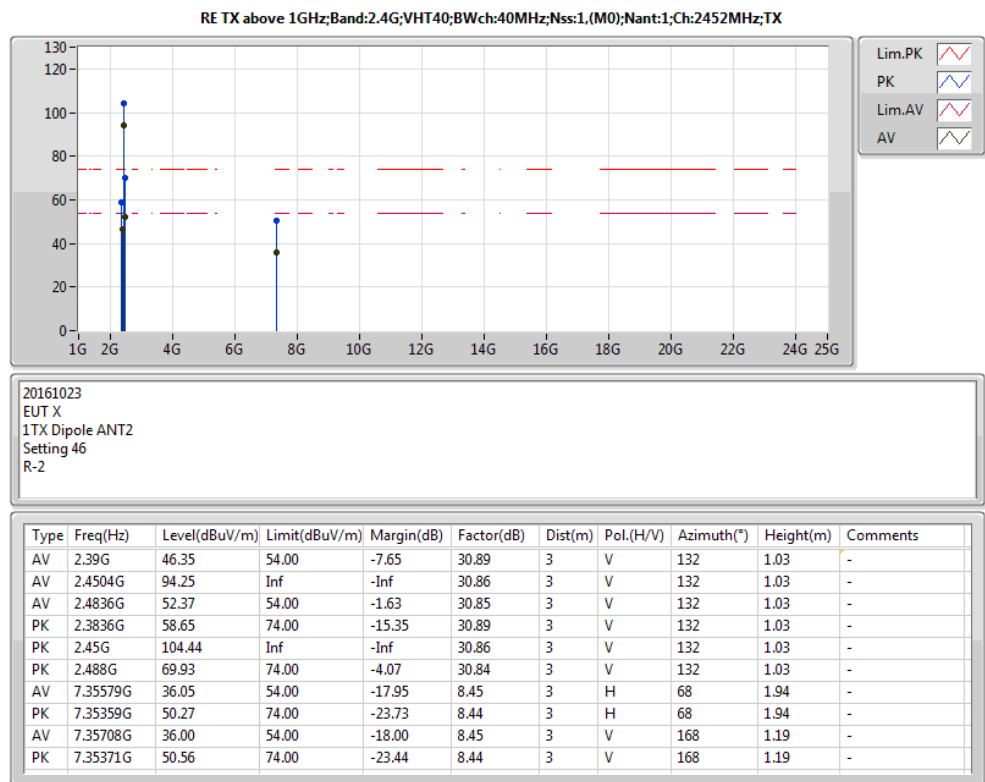
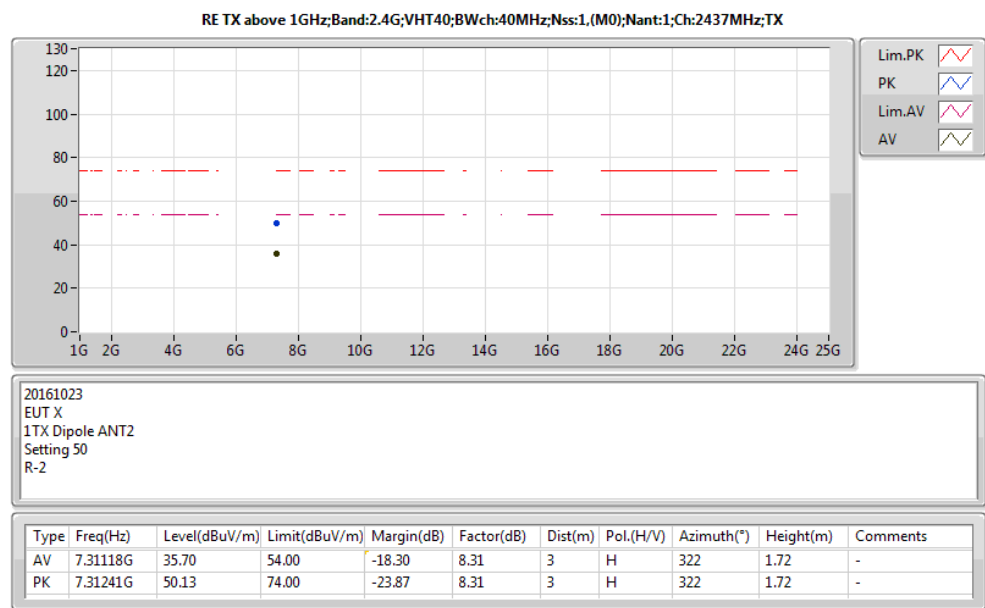
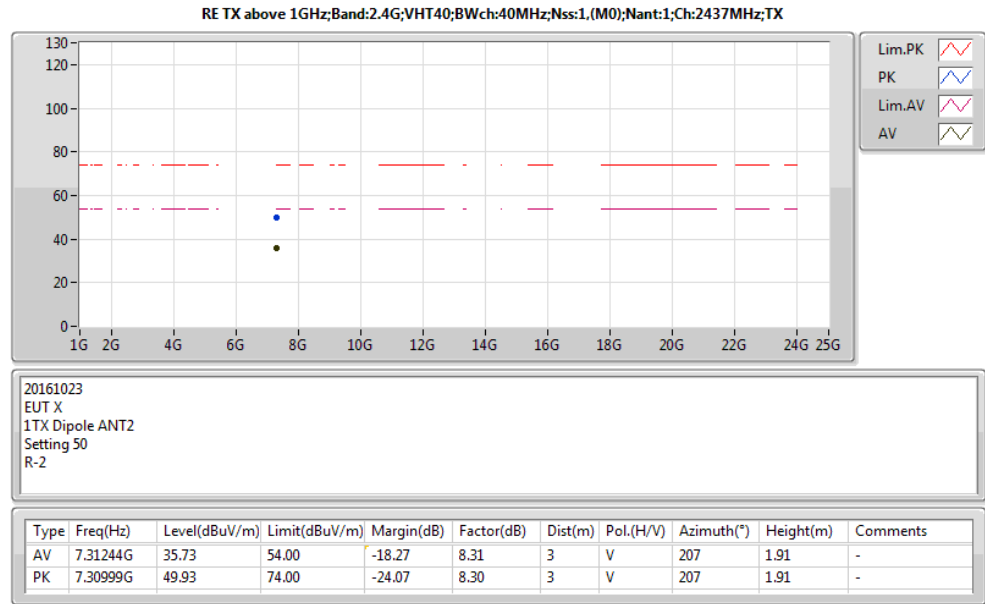


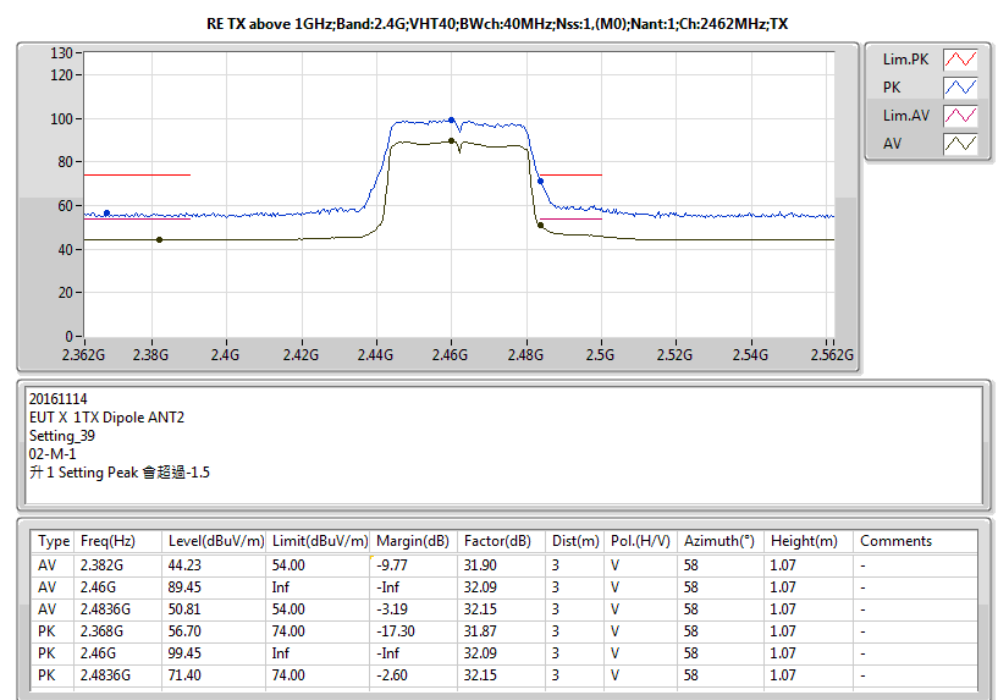
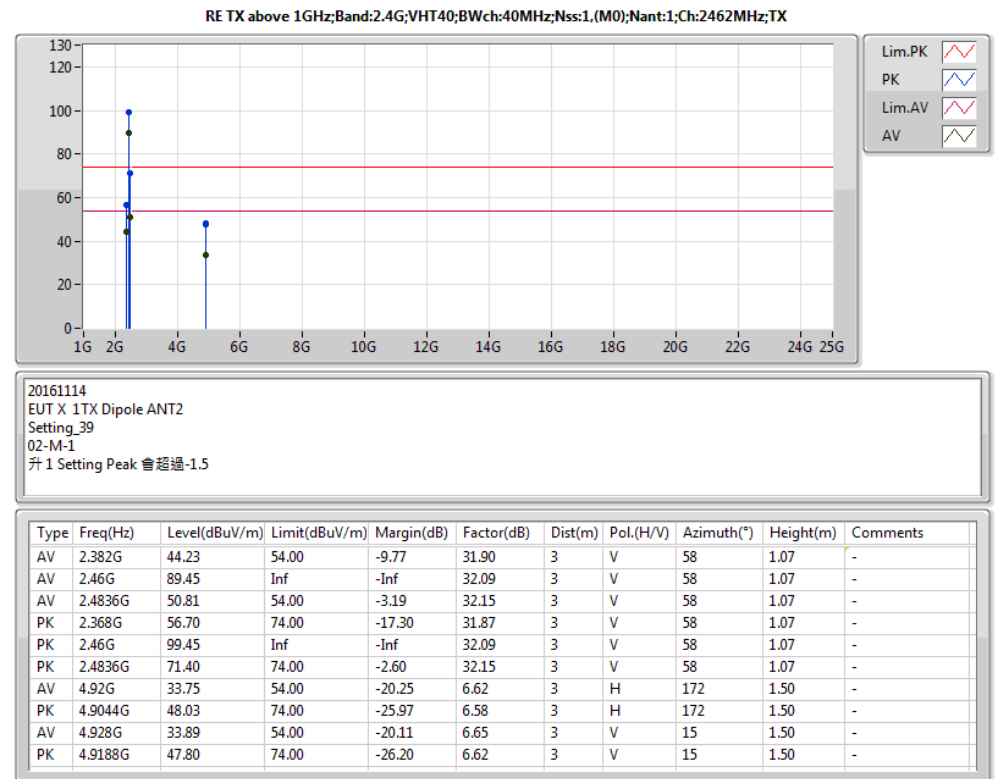
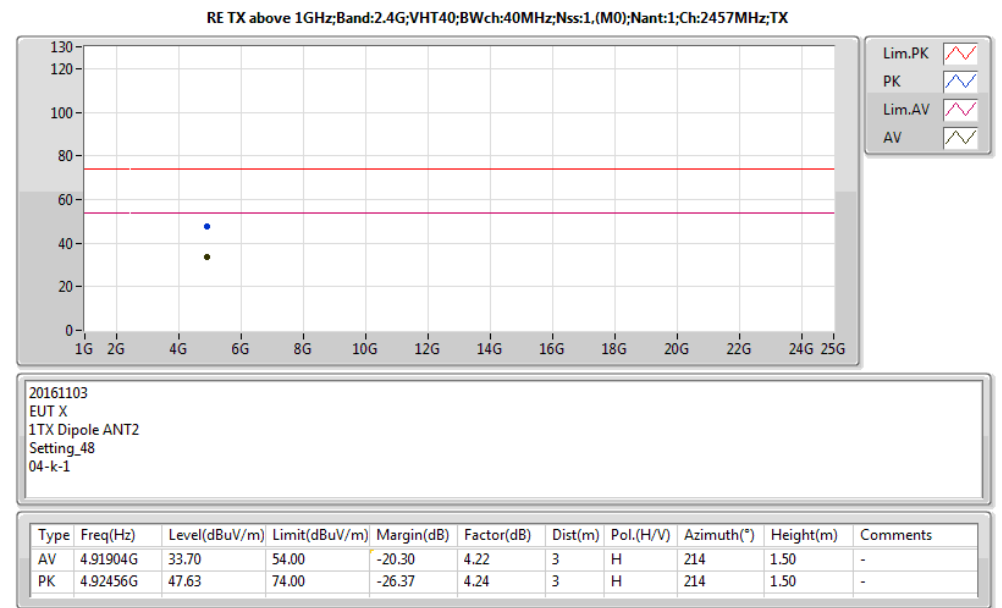
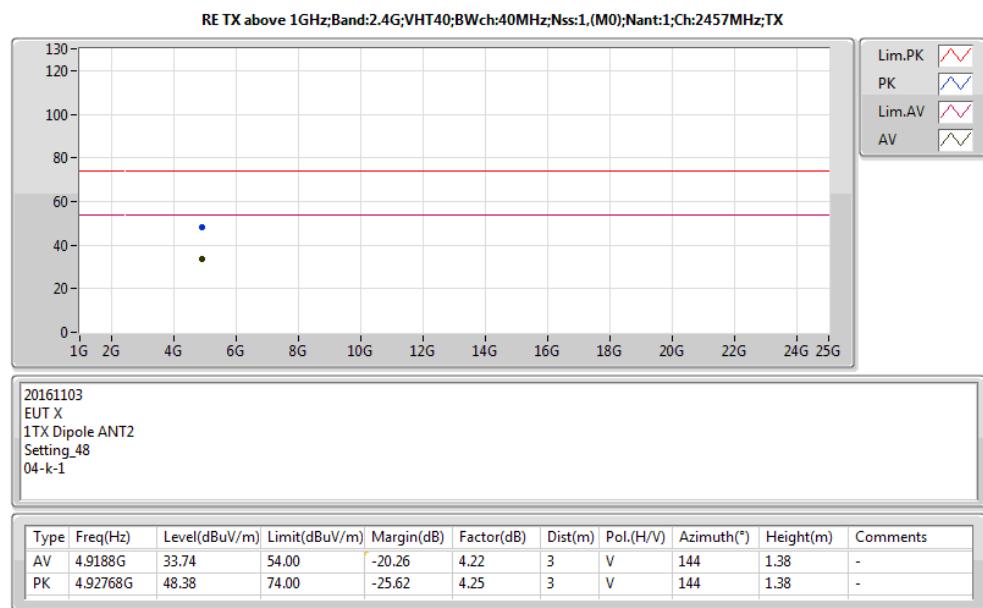
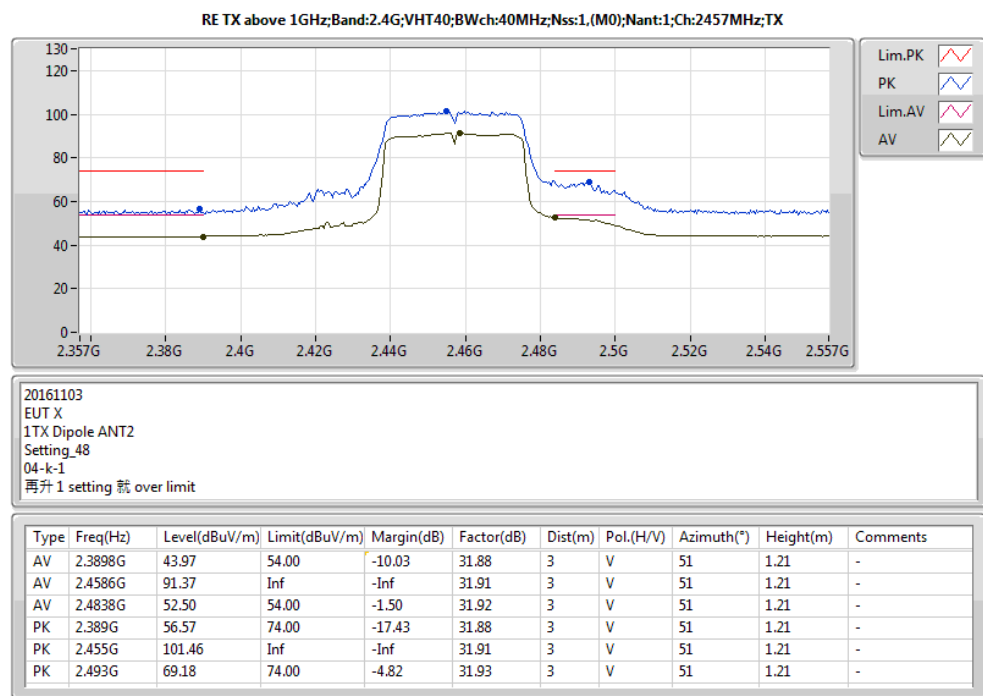
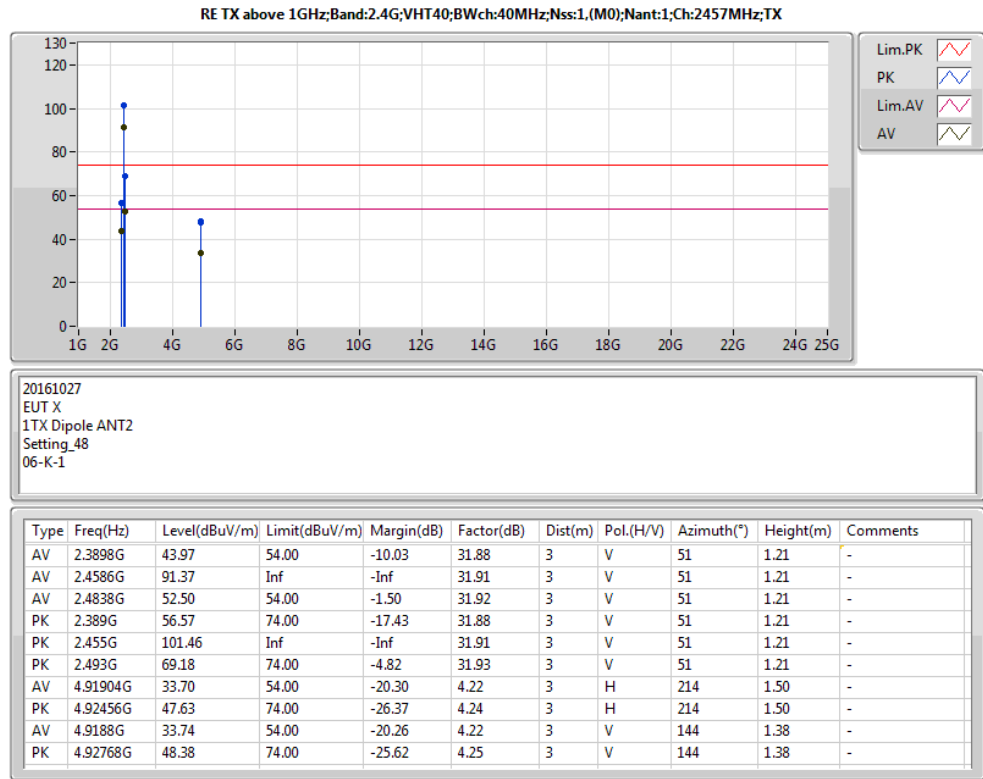


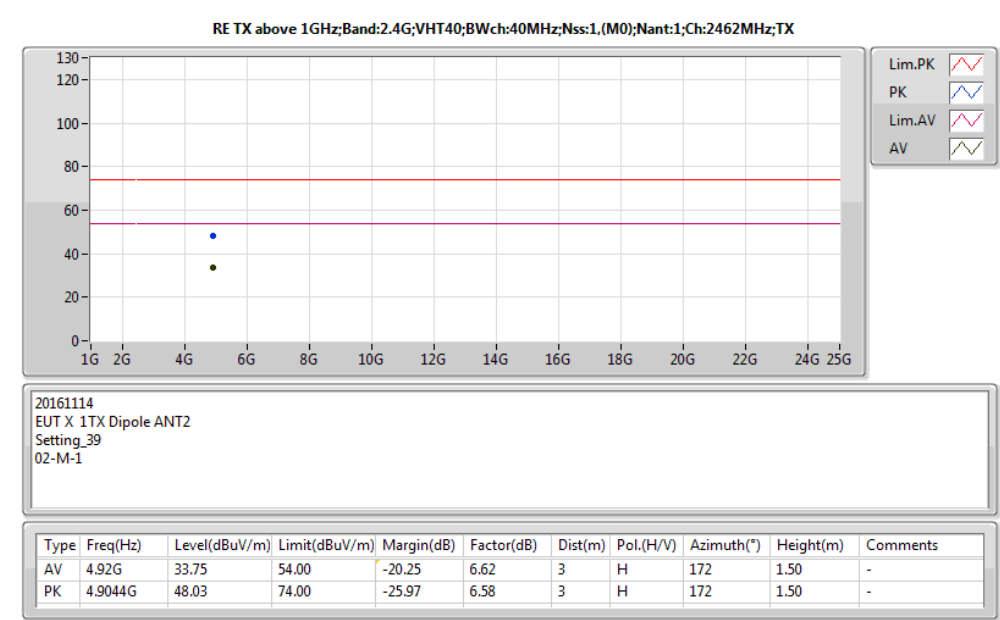
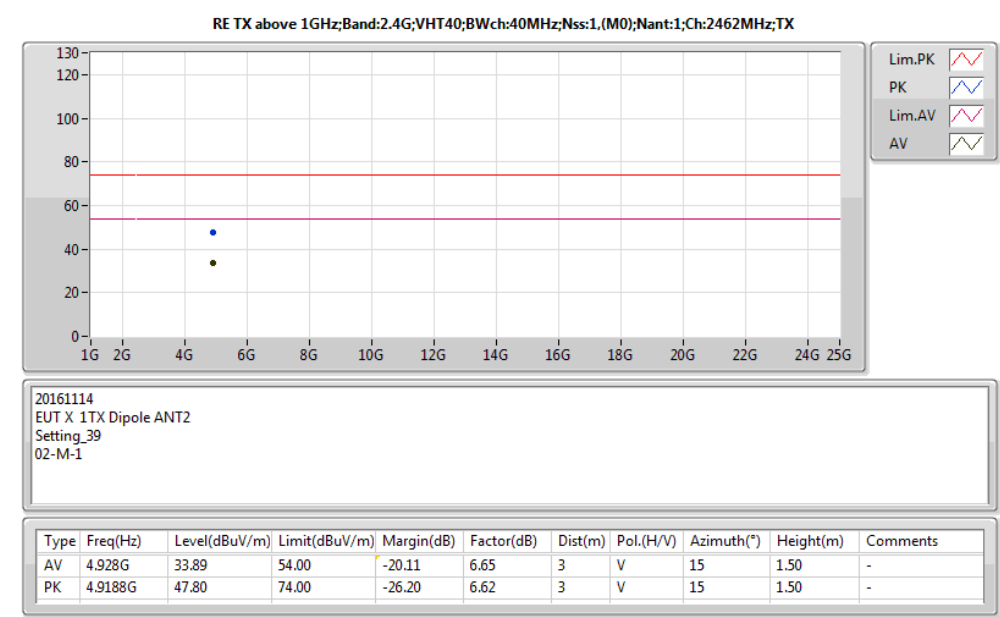








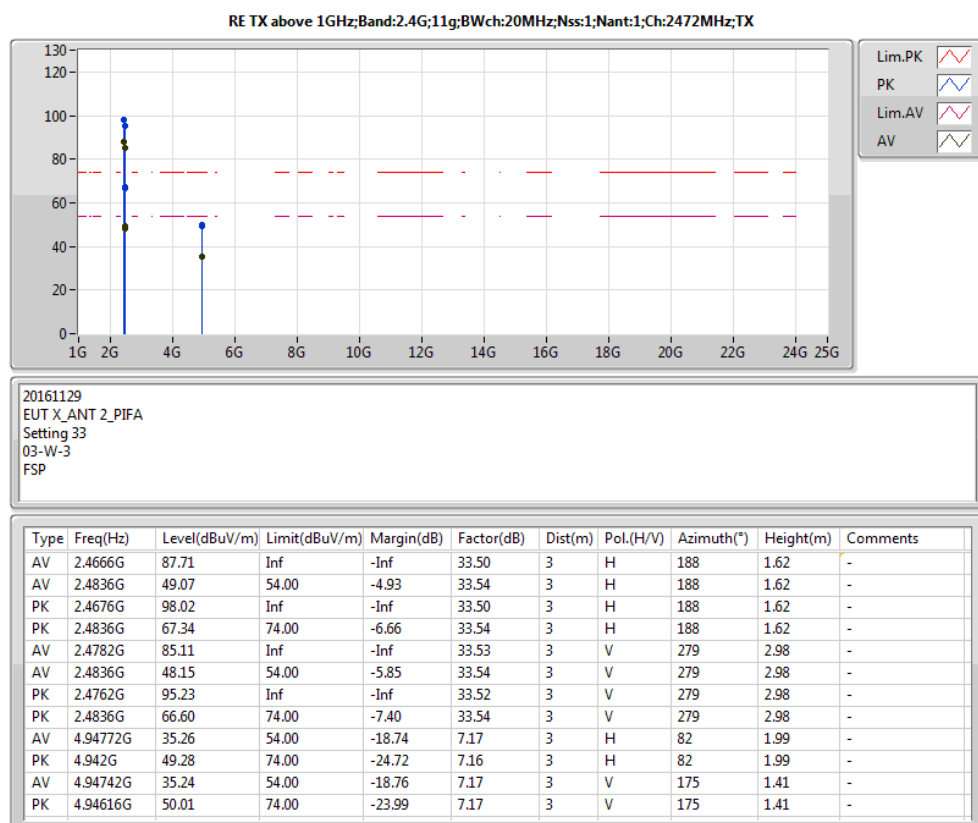
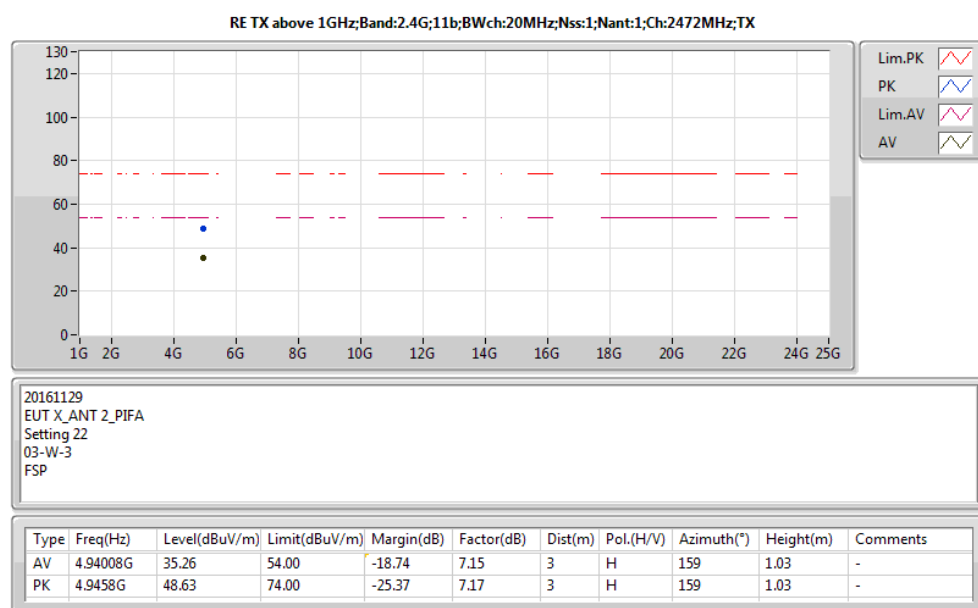
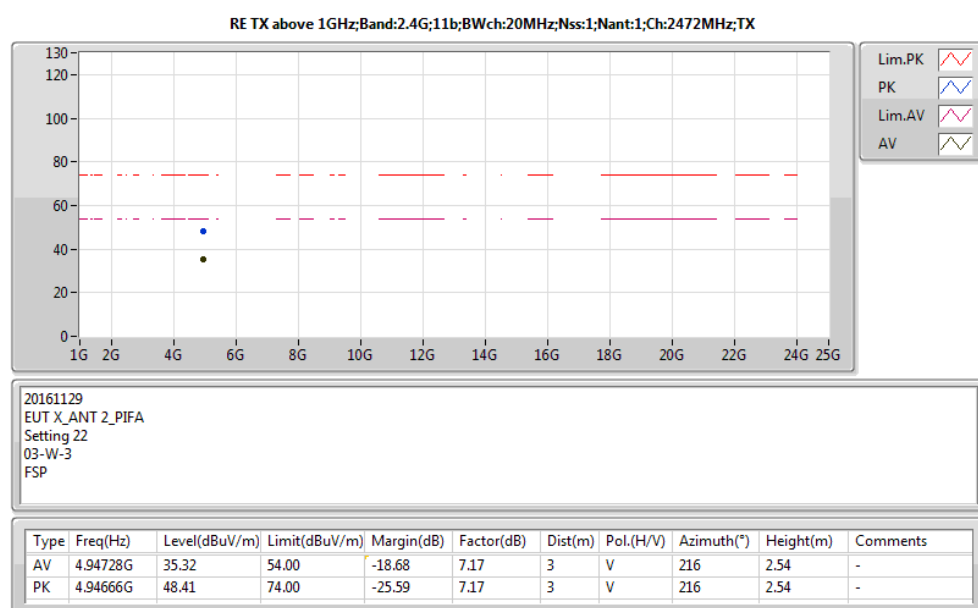
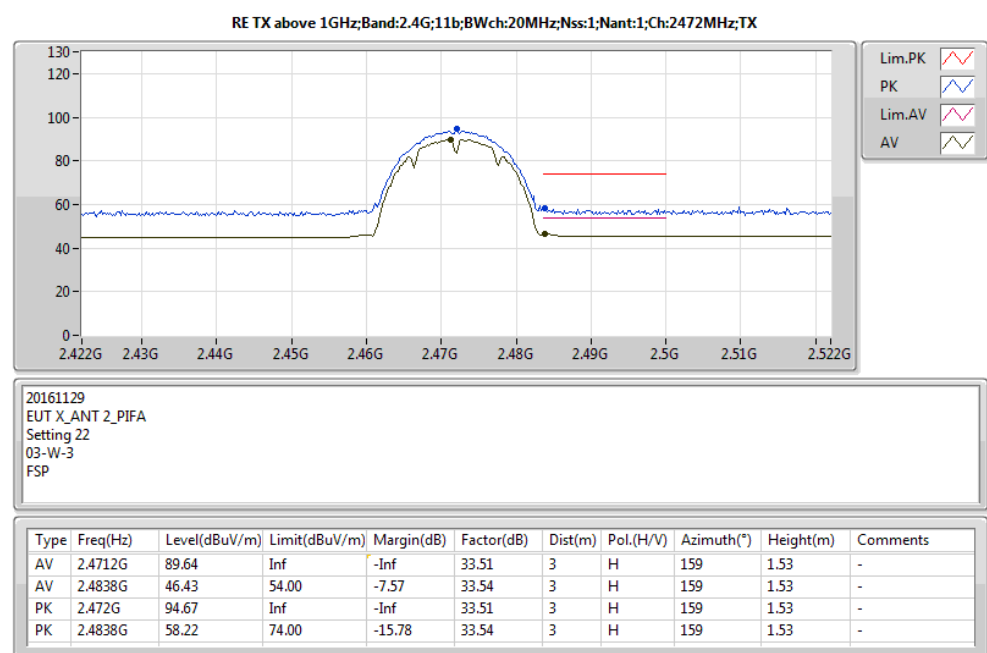
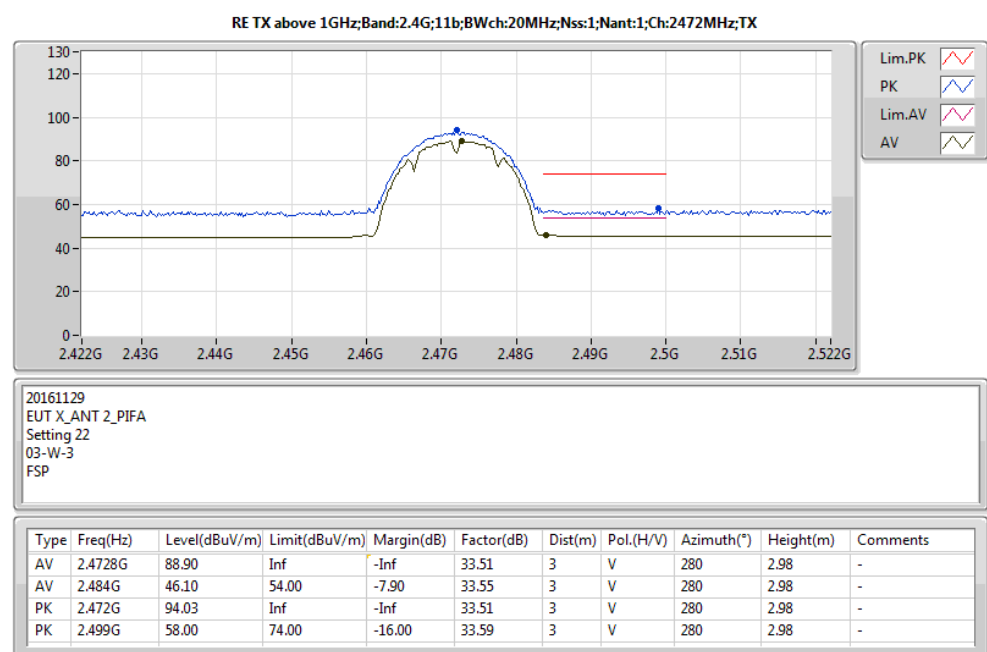
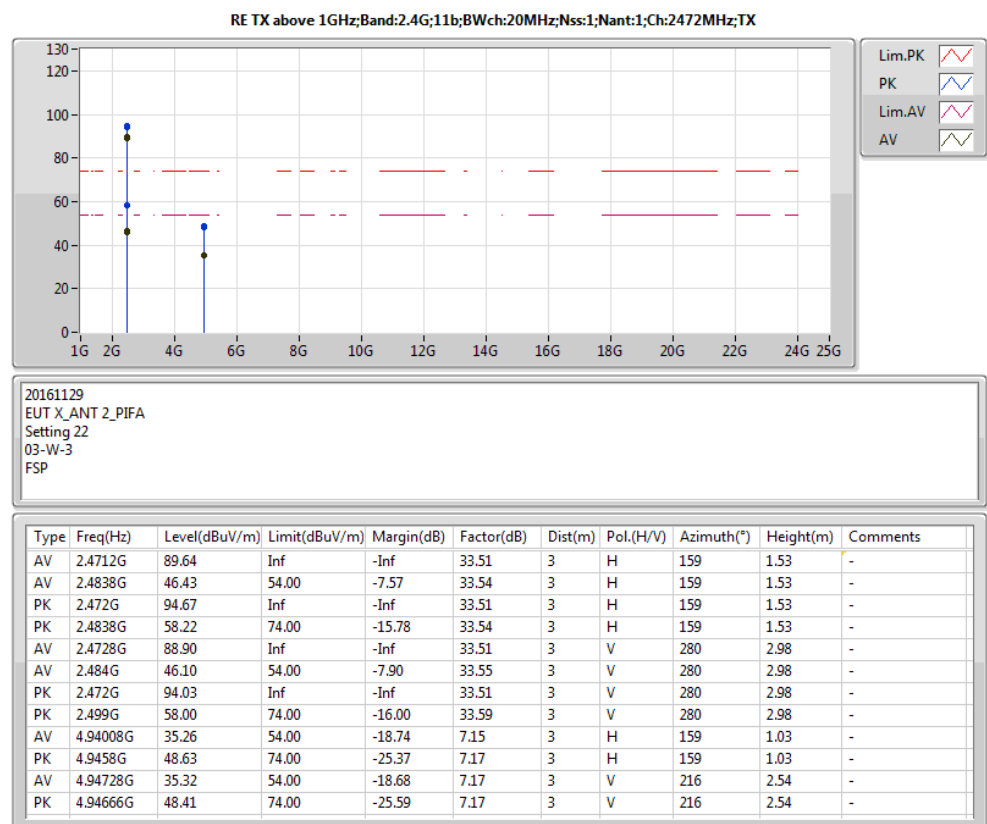


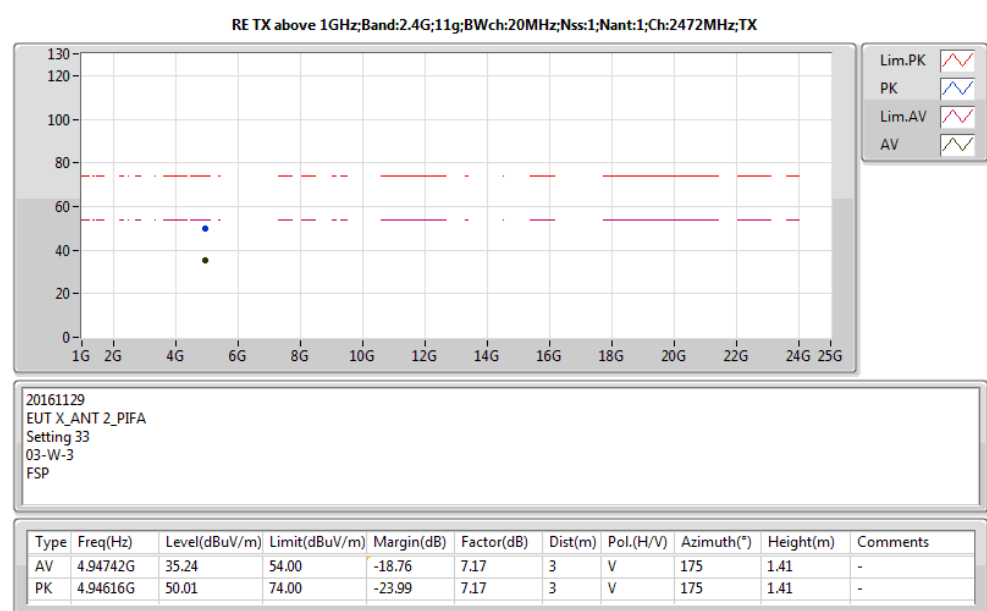
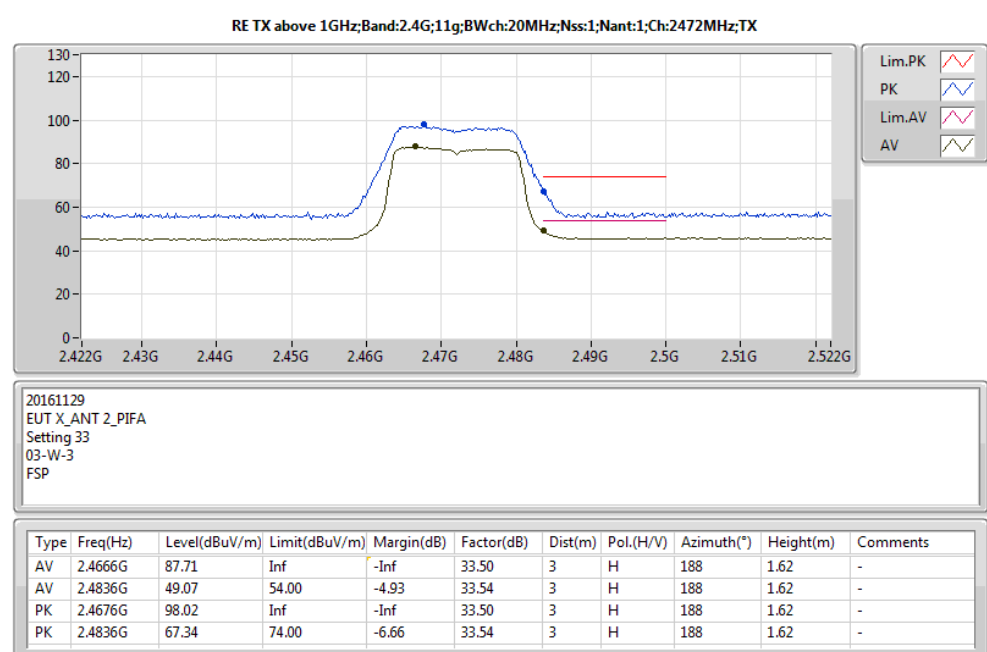
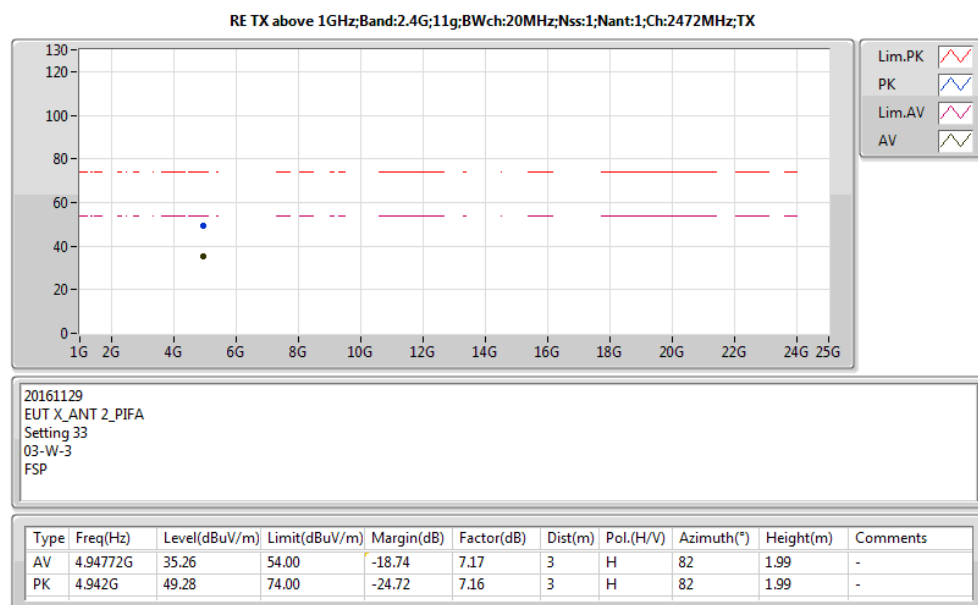
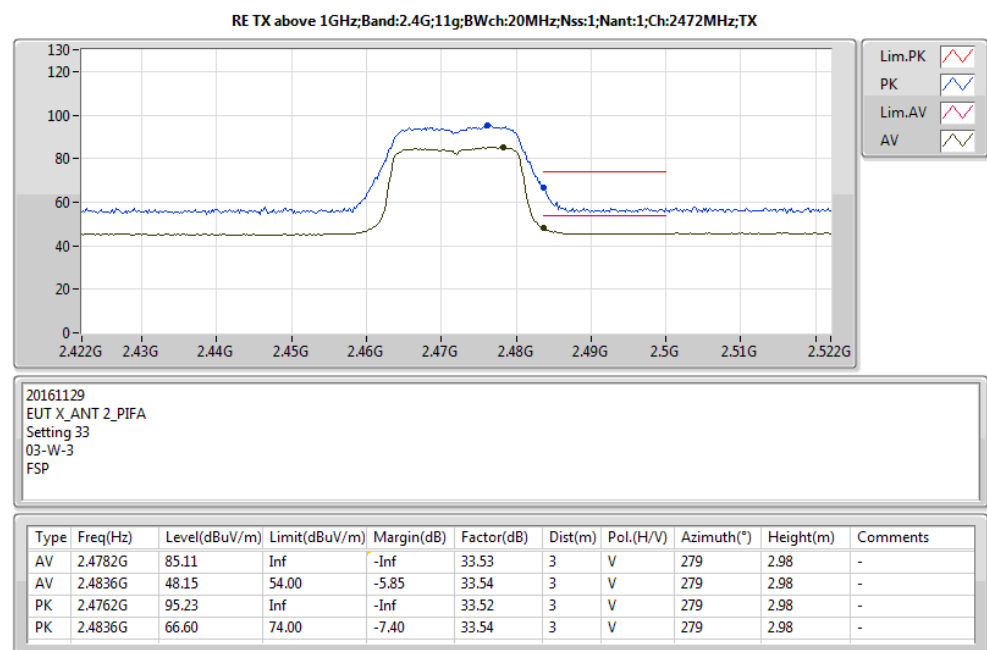




Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Pol. (H/V)	Azimuth (°)	Height (m)	Comments
2.4G;11g;Nss1;Ntx1;2472	Pass	AV	2.4836G	49.07	54.00	-4.93	33.54	3	H	188	1.62	-

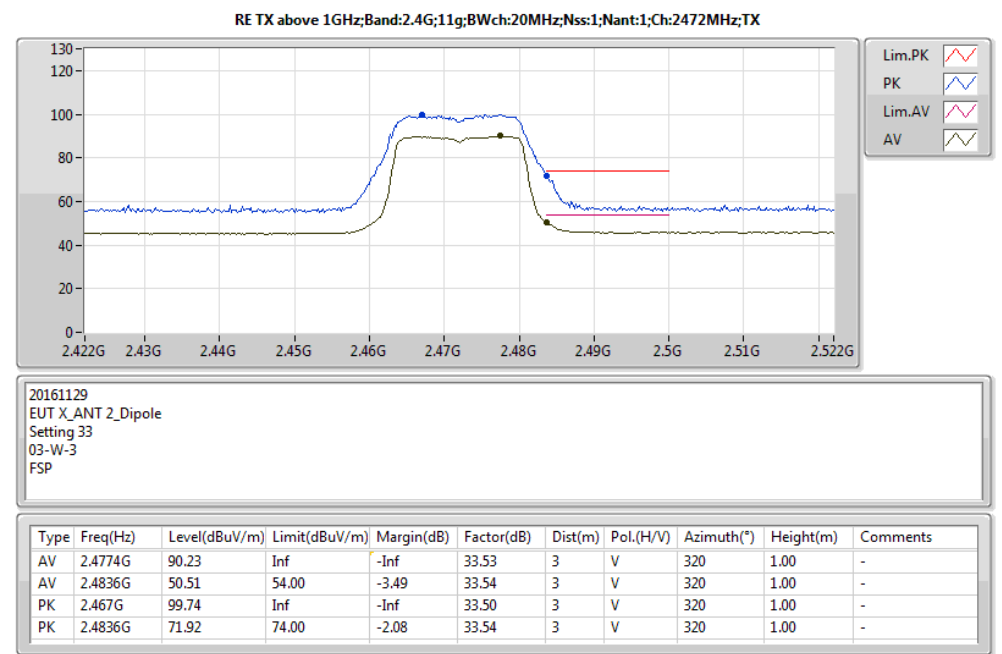
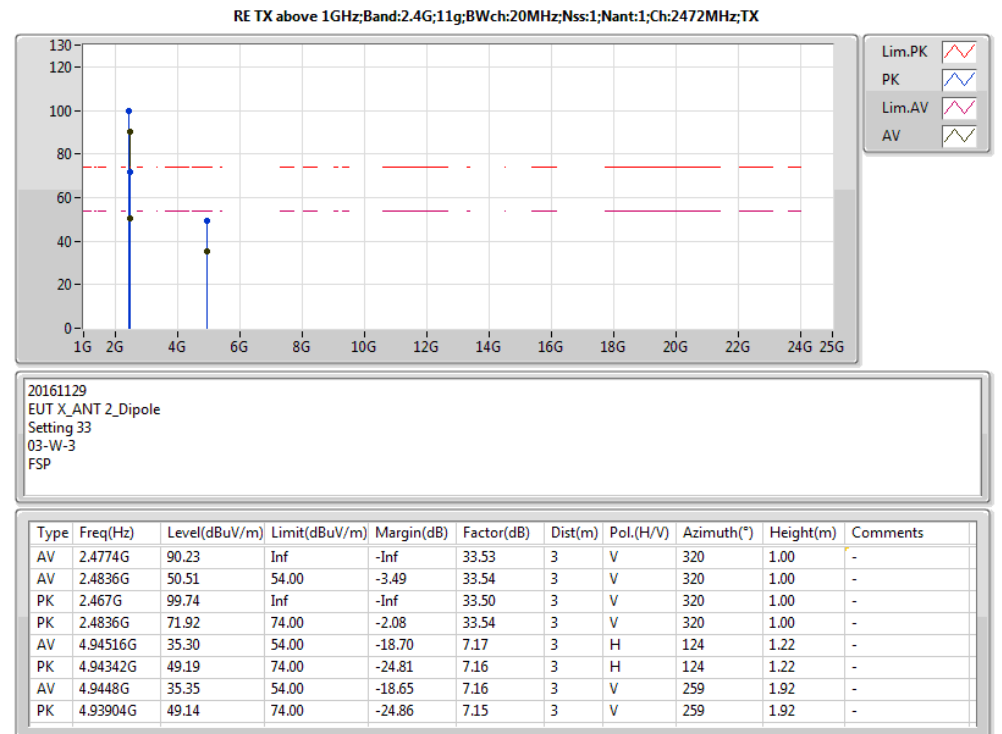
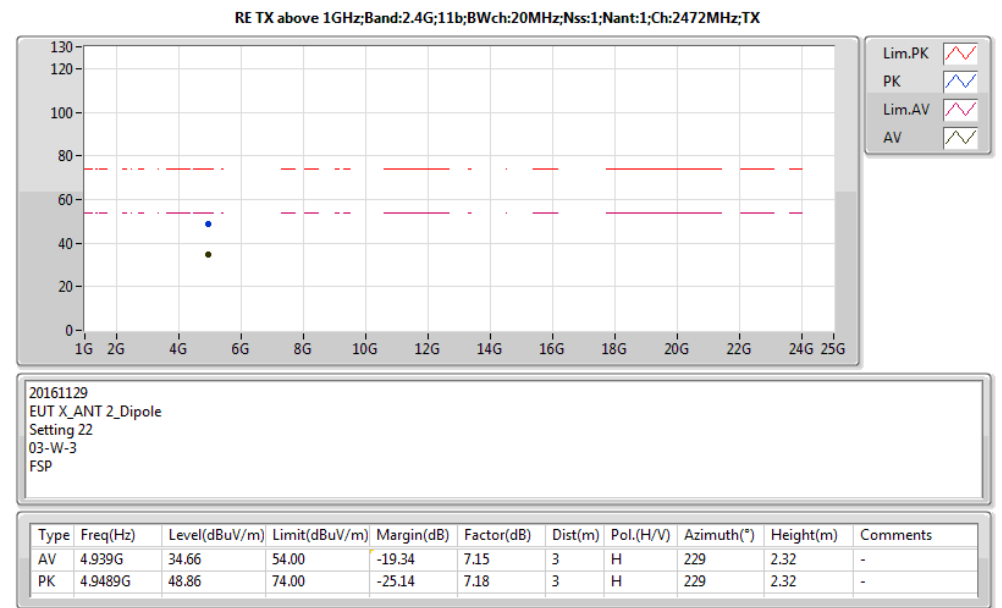
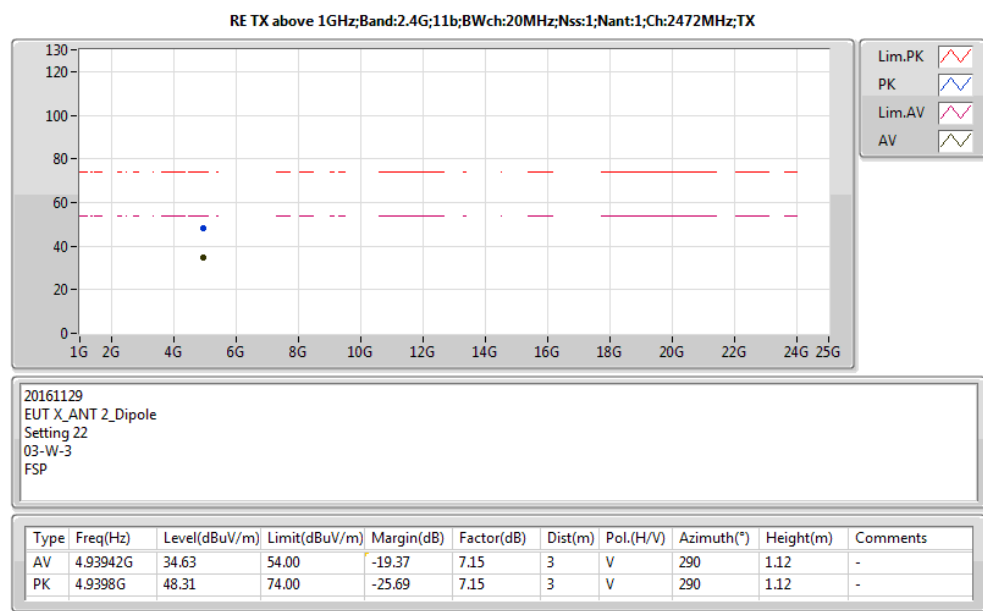
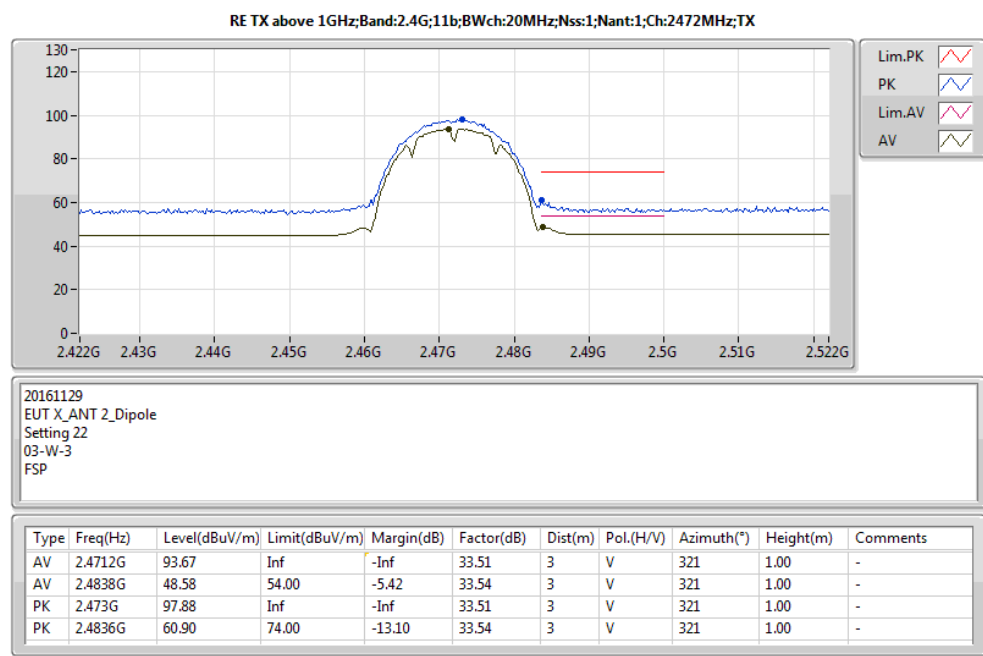
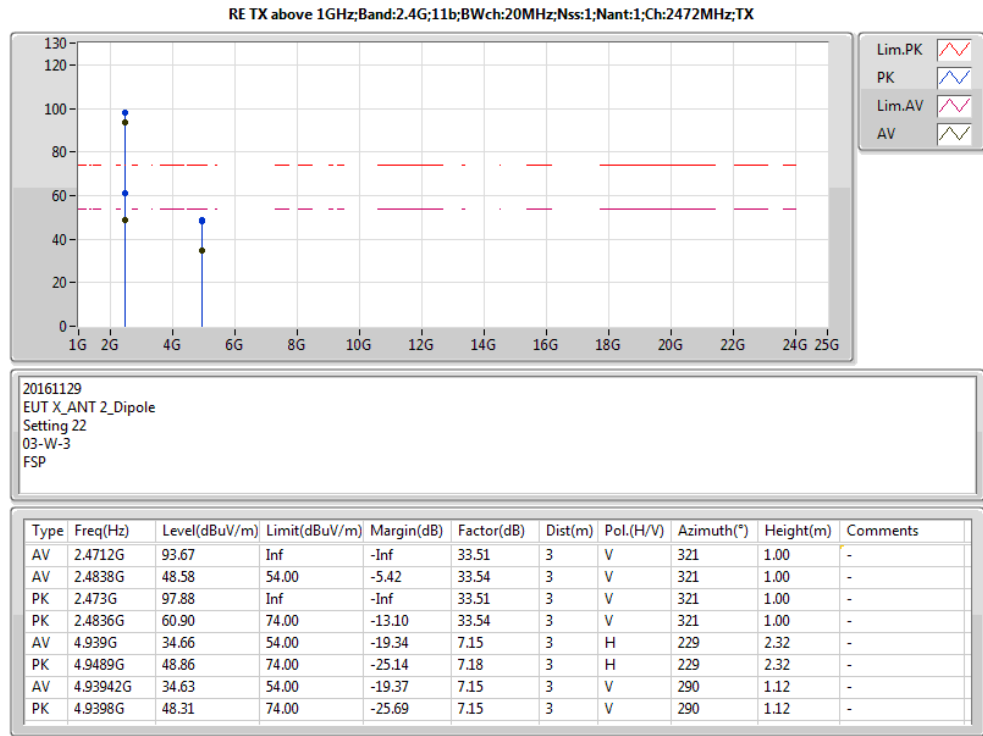


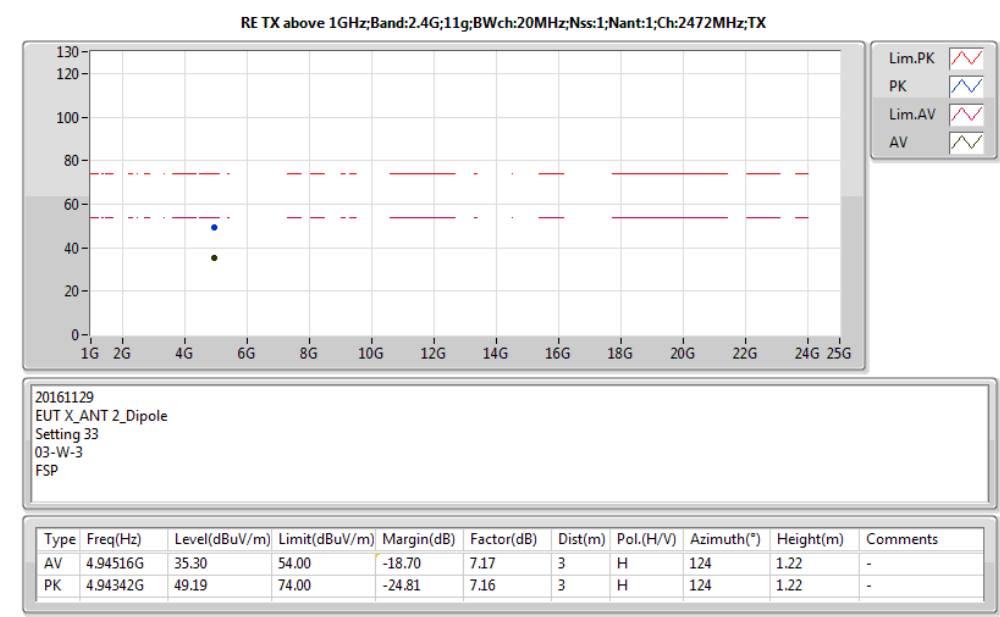
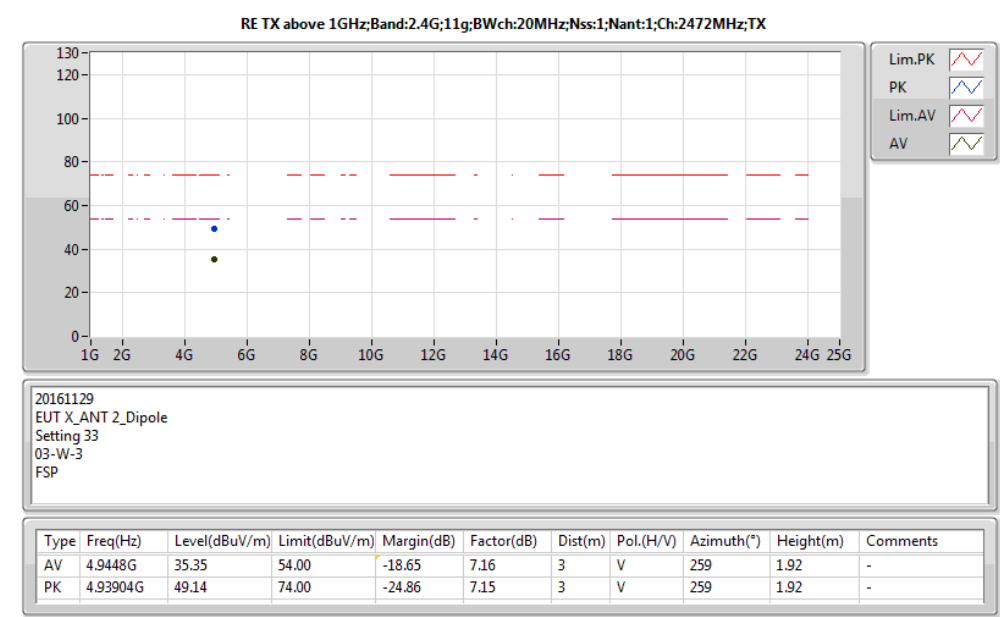




Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Pol. (H/V)	Azimuth (°)	Height (m)	Comments
2.4G;11g;Nss1;Ntx1;2472	Pass	PK	2.4836G	71.92	74.00	-2.08	33.54	3	V	320	1.00	-

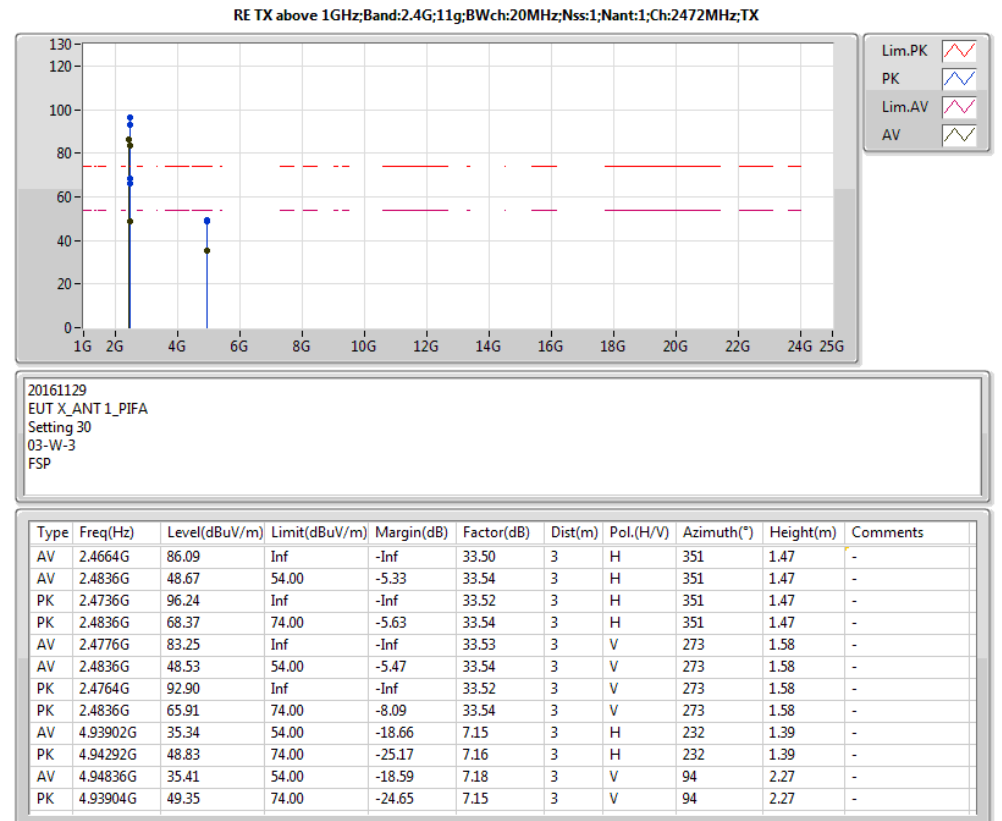
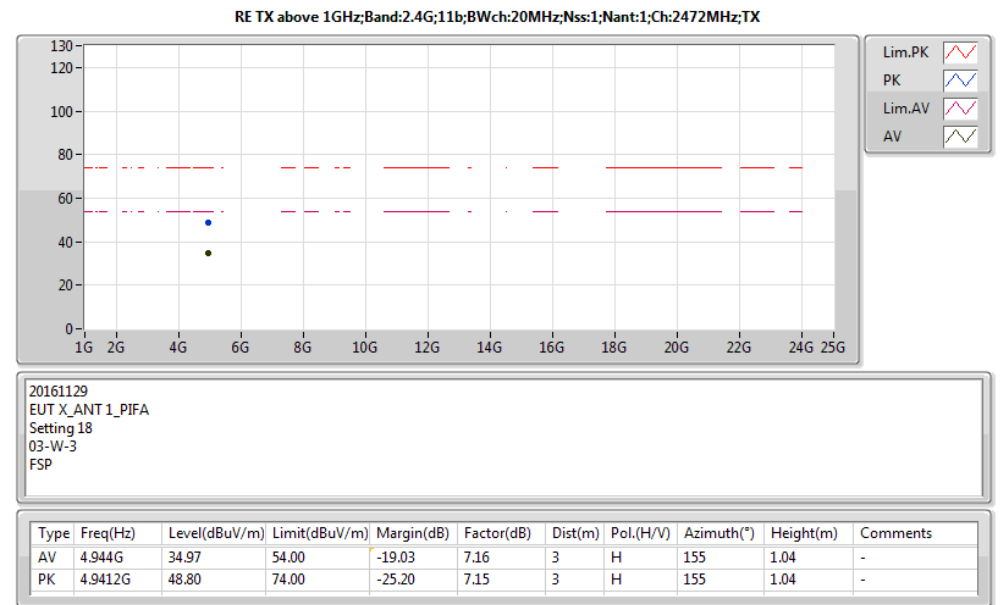
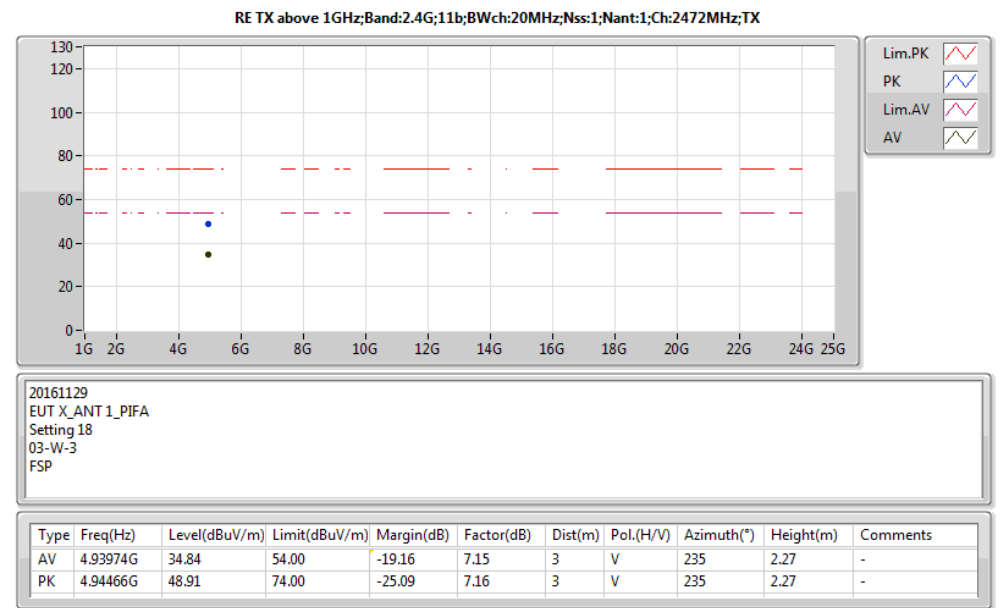
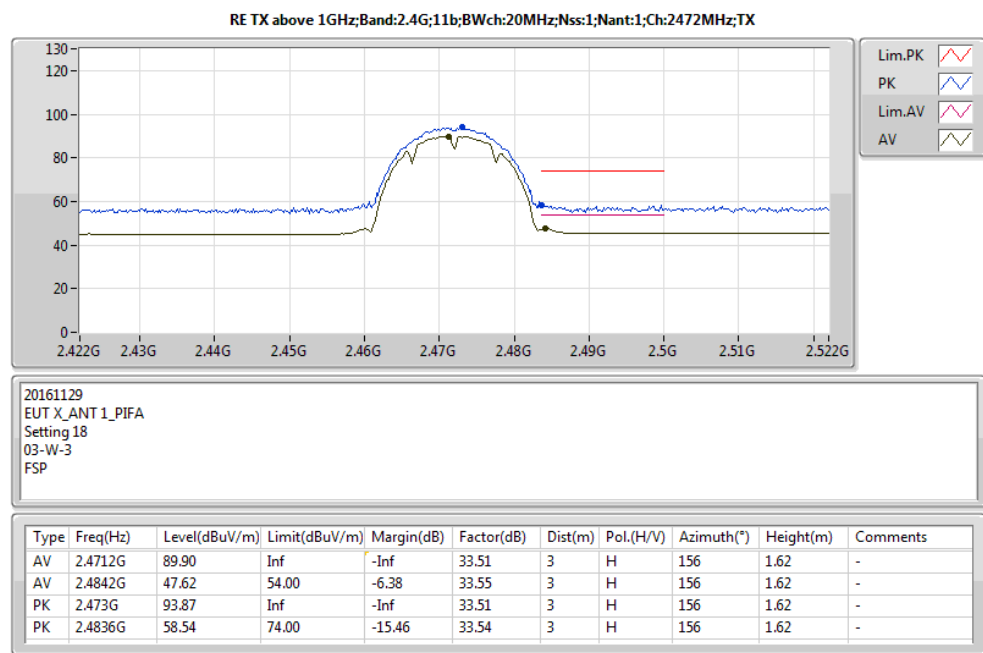
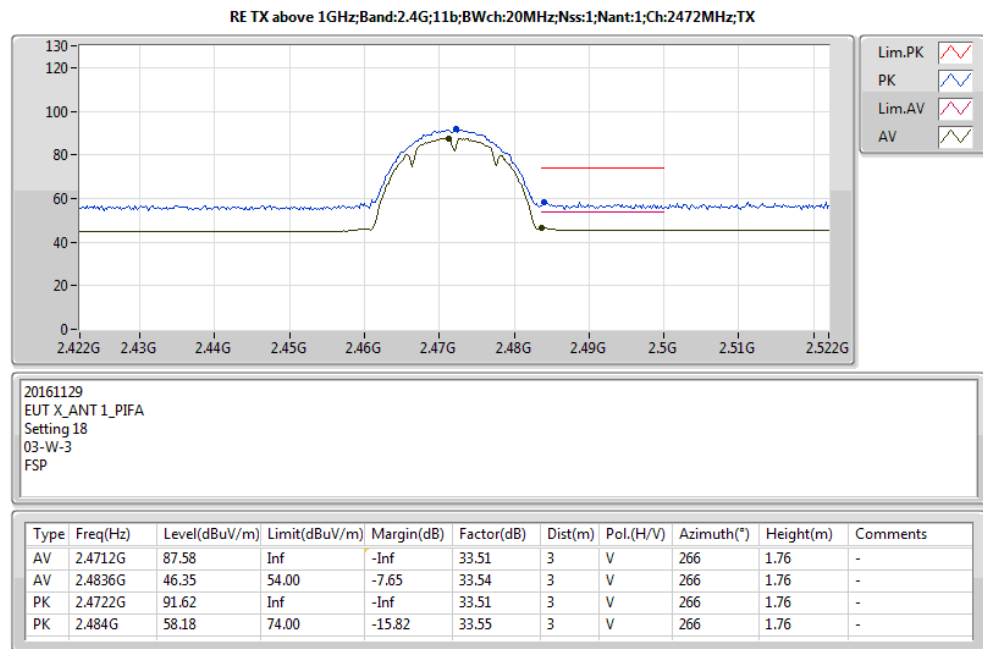
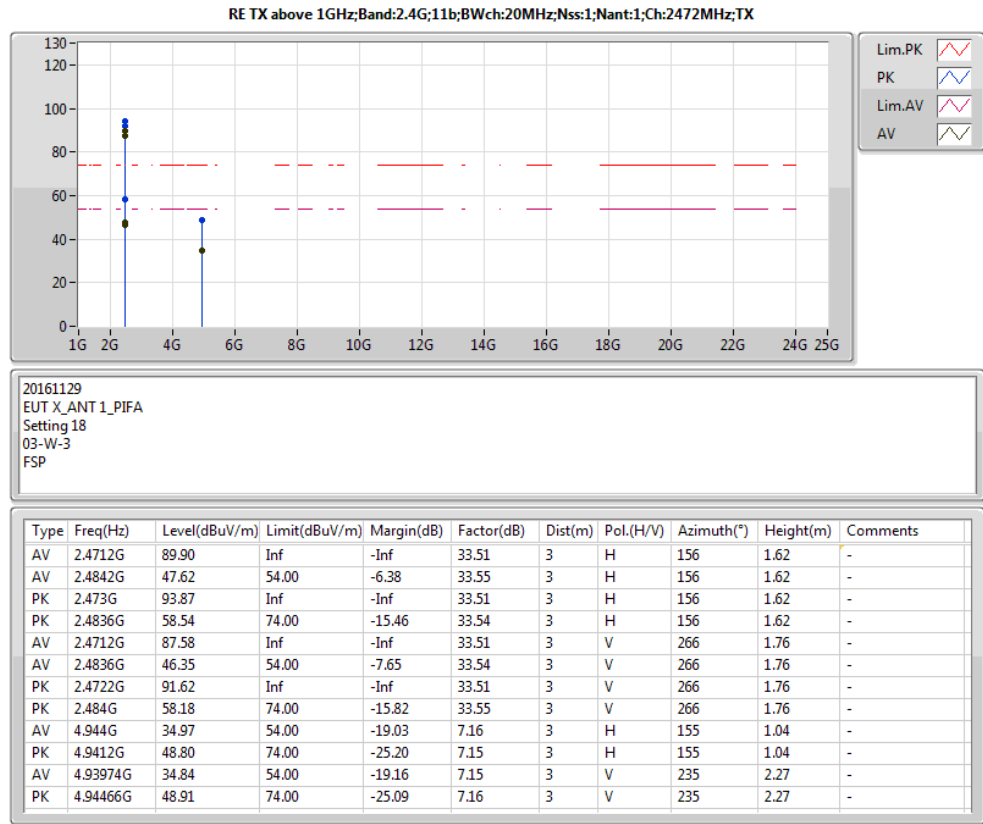


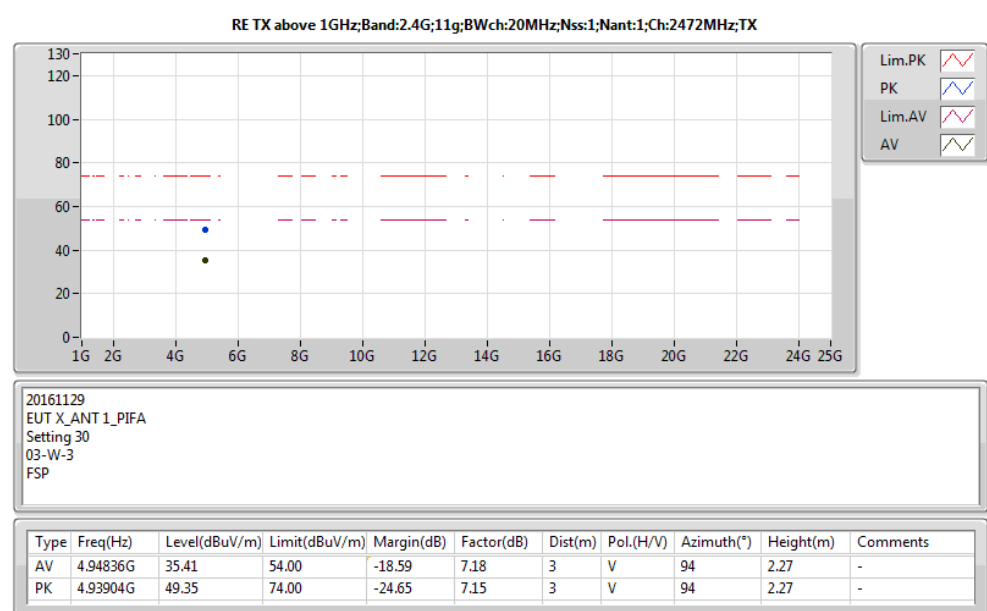
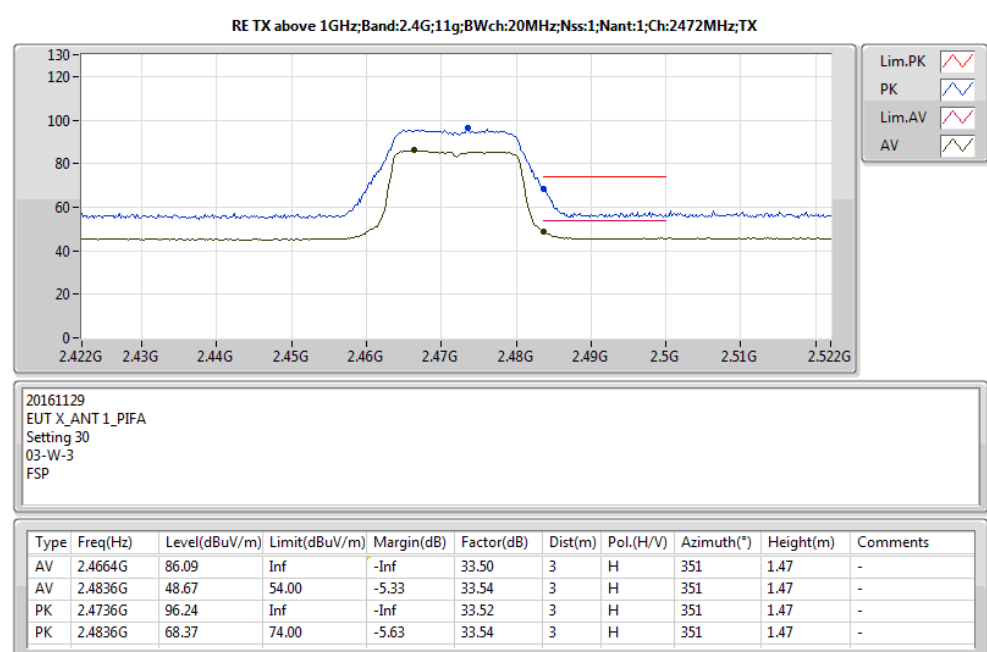
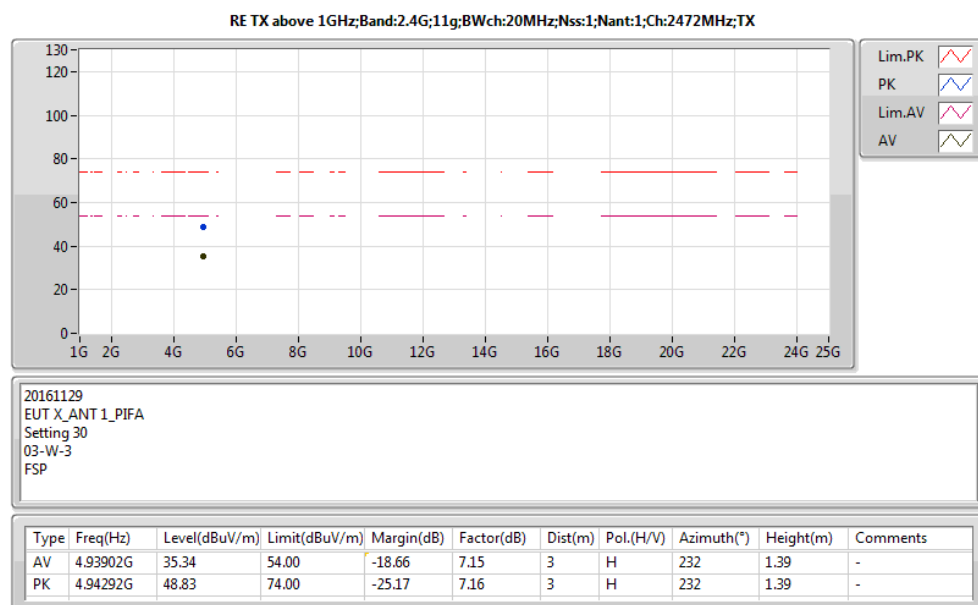
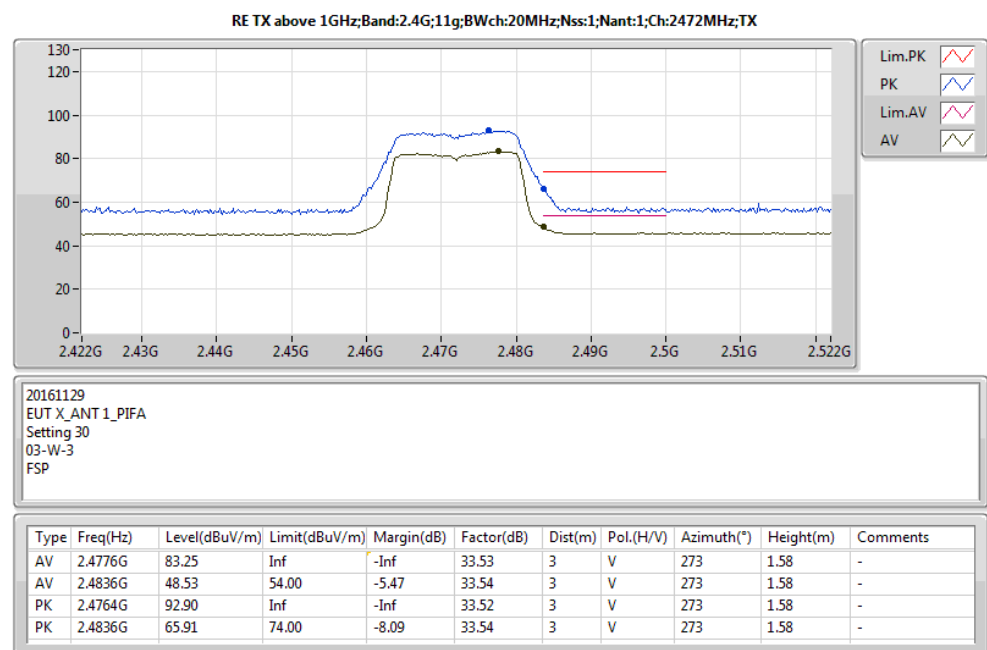




Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Pol. (H/V)	Azimuth (°)	Height (m)	Comments
2.4G;11g;Nss1;Ntx1;2472	Pass	AV	2.4836G	48.67	54.00	-5.33	33.54	3	H	351	1.47	-

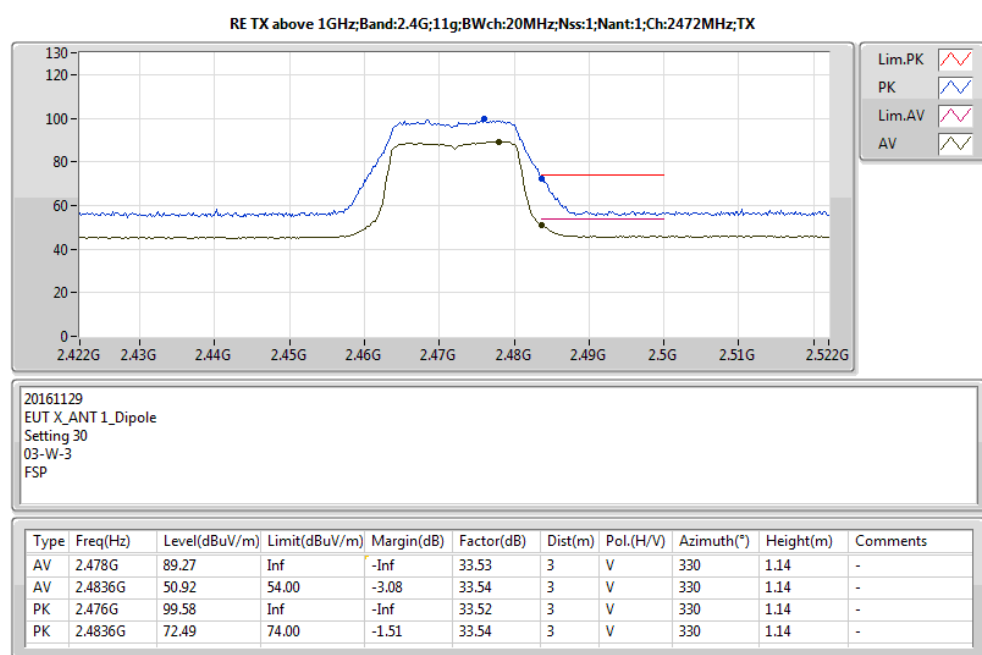
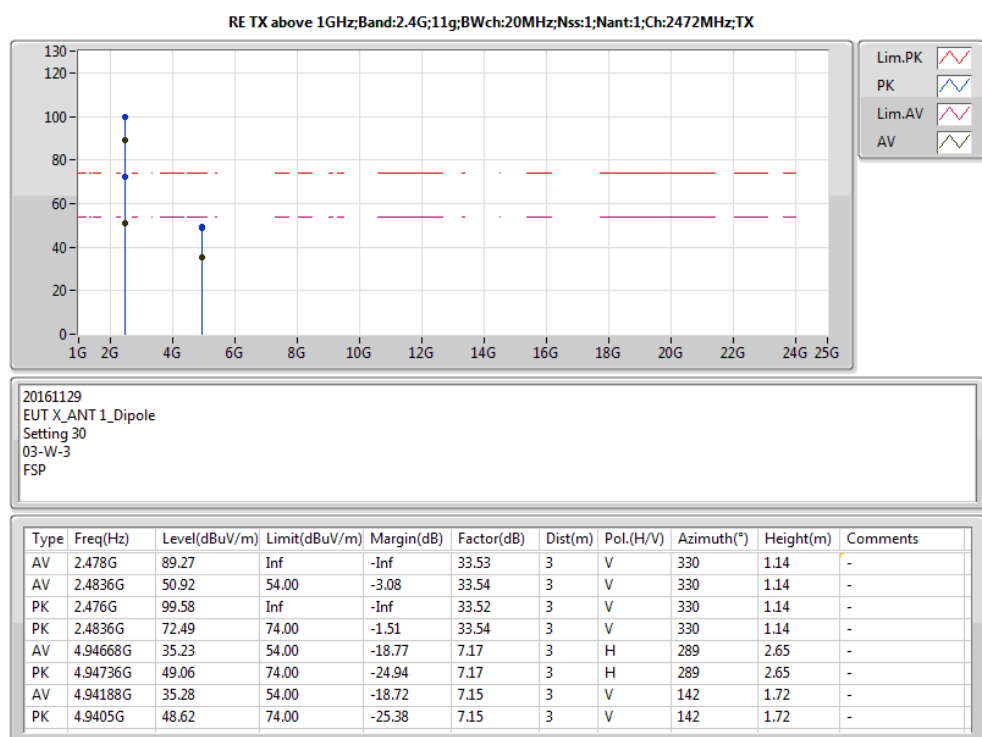
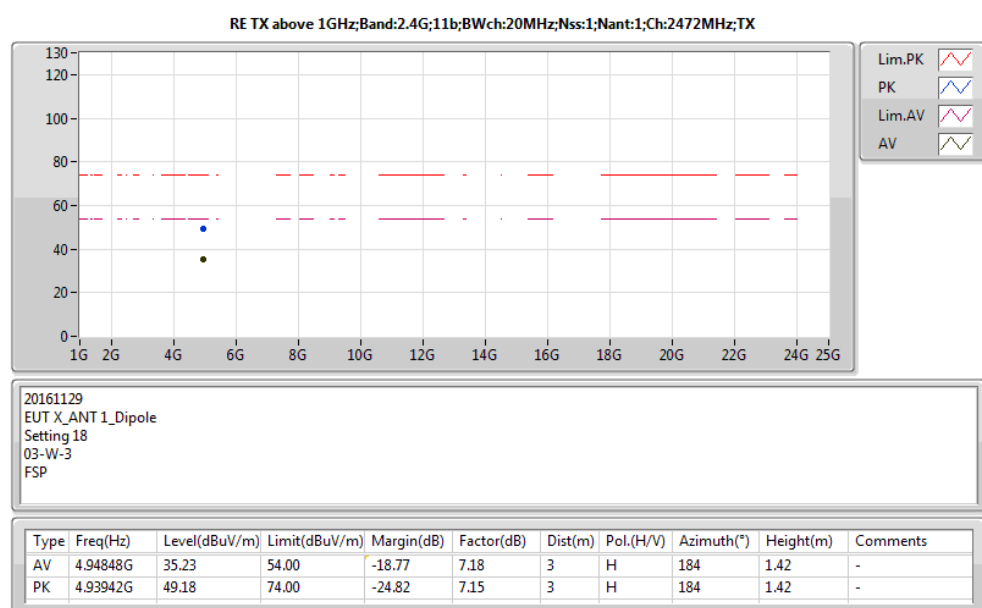
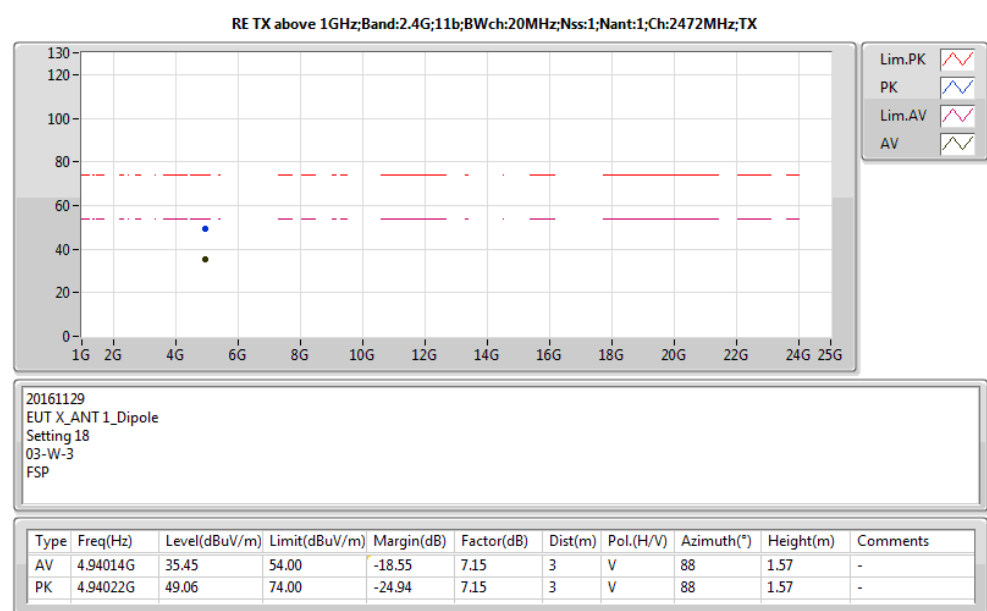
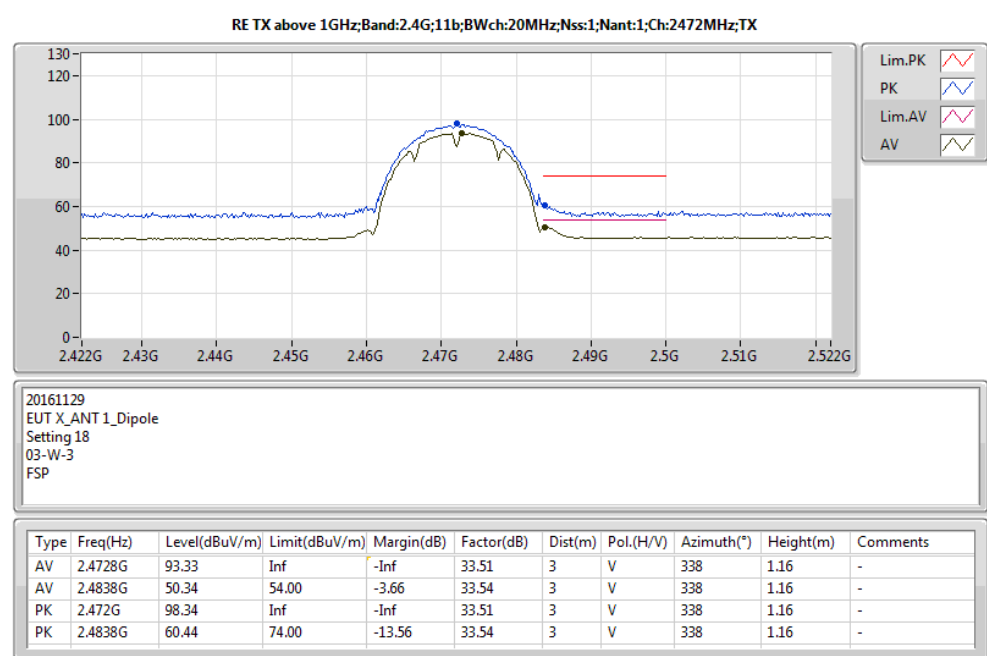
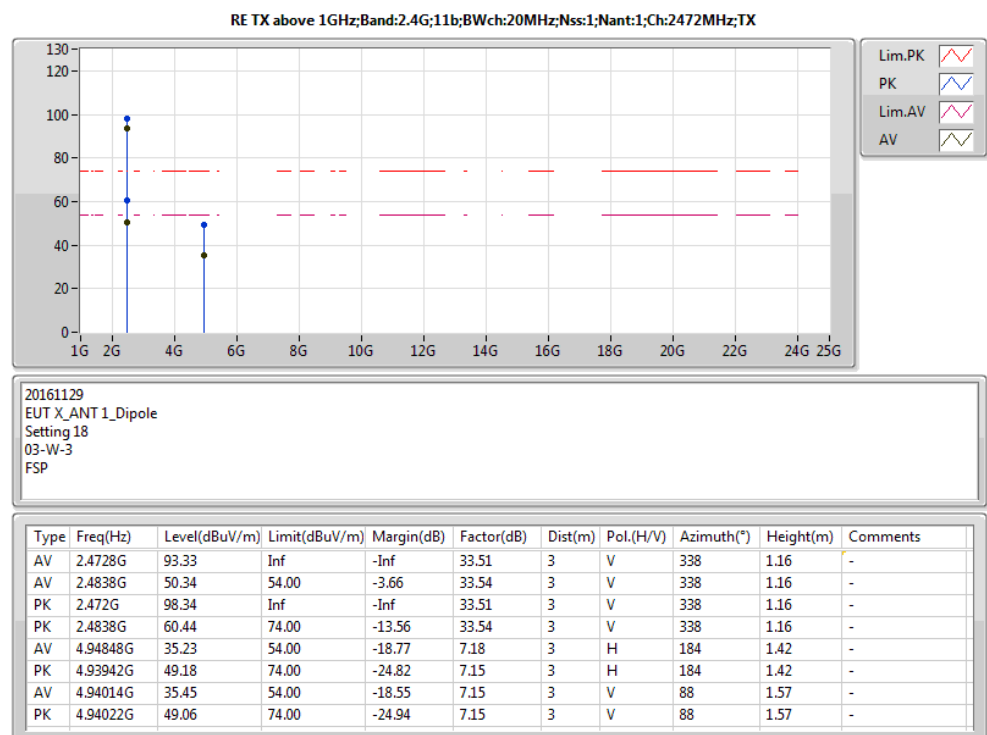


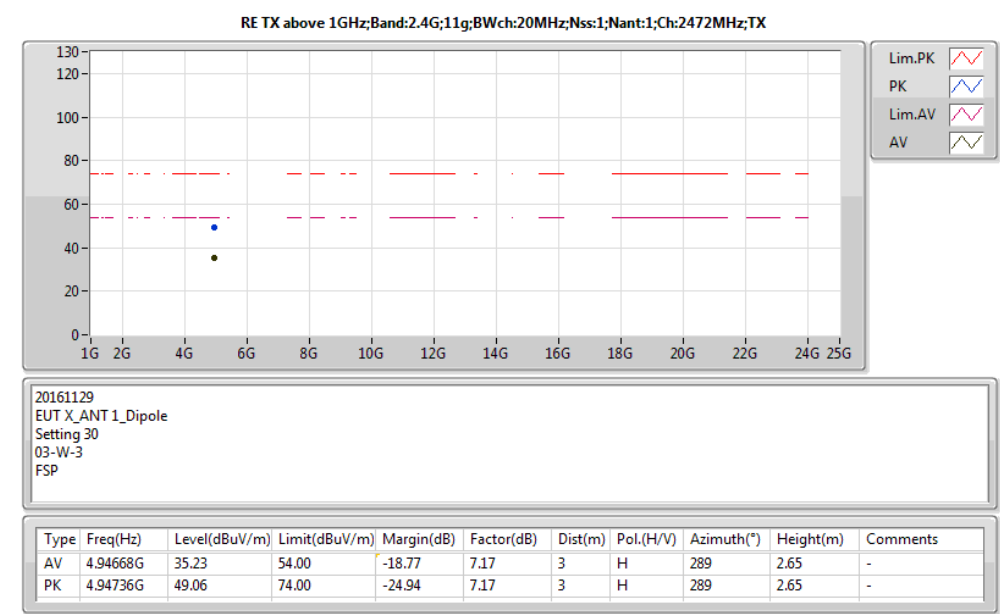
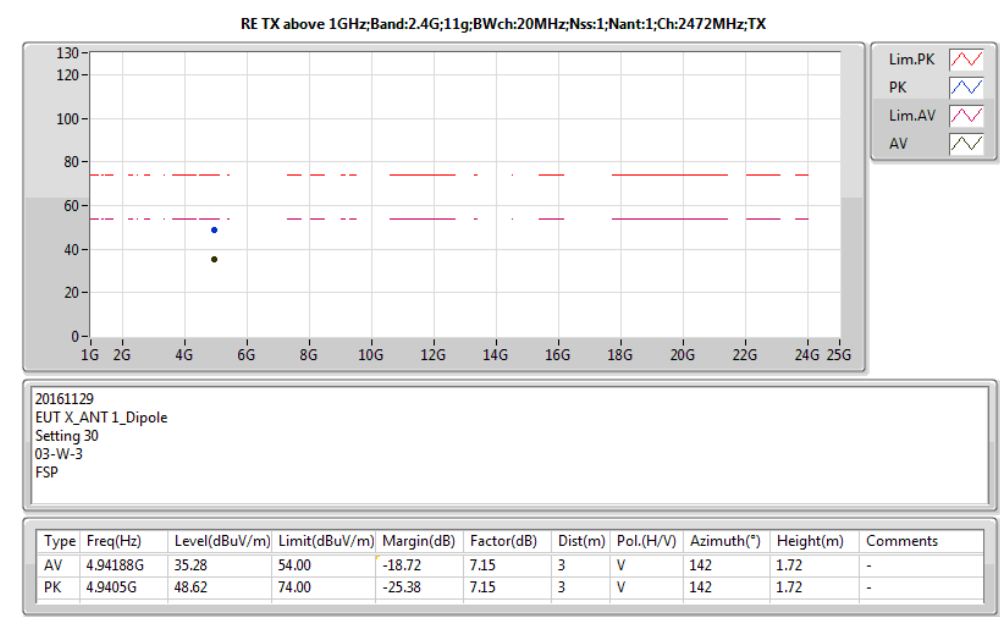


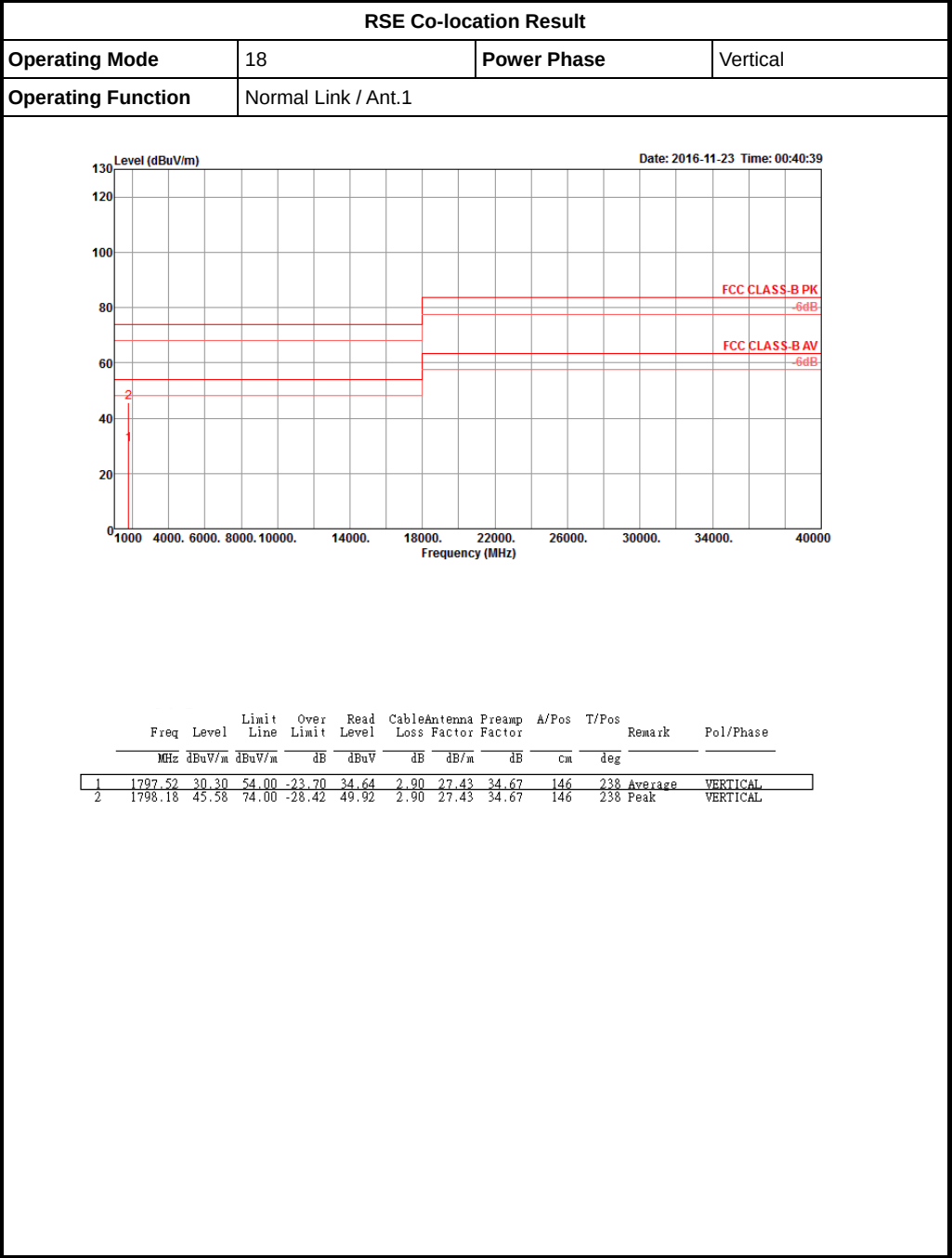
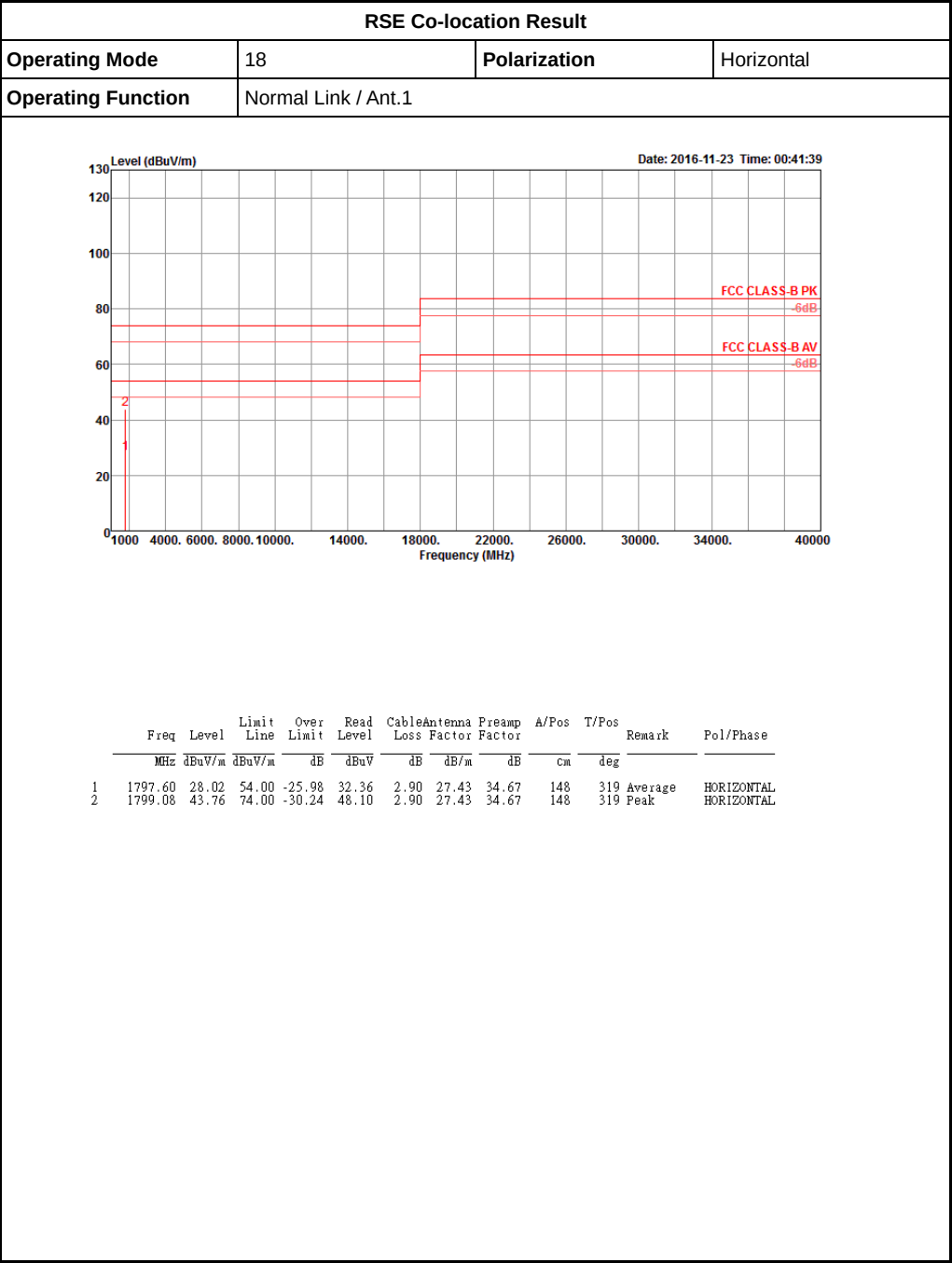


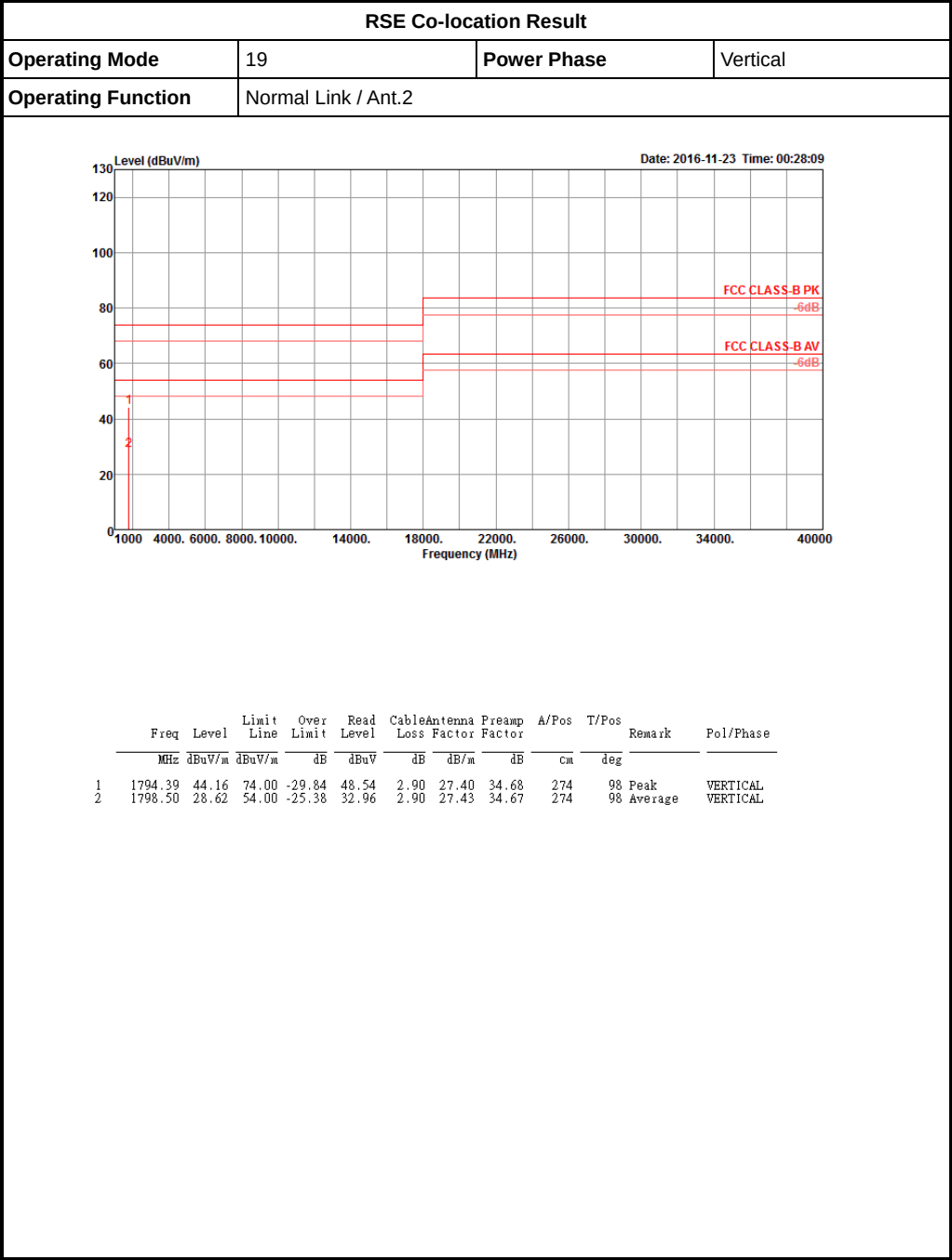
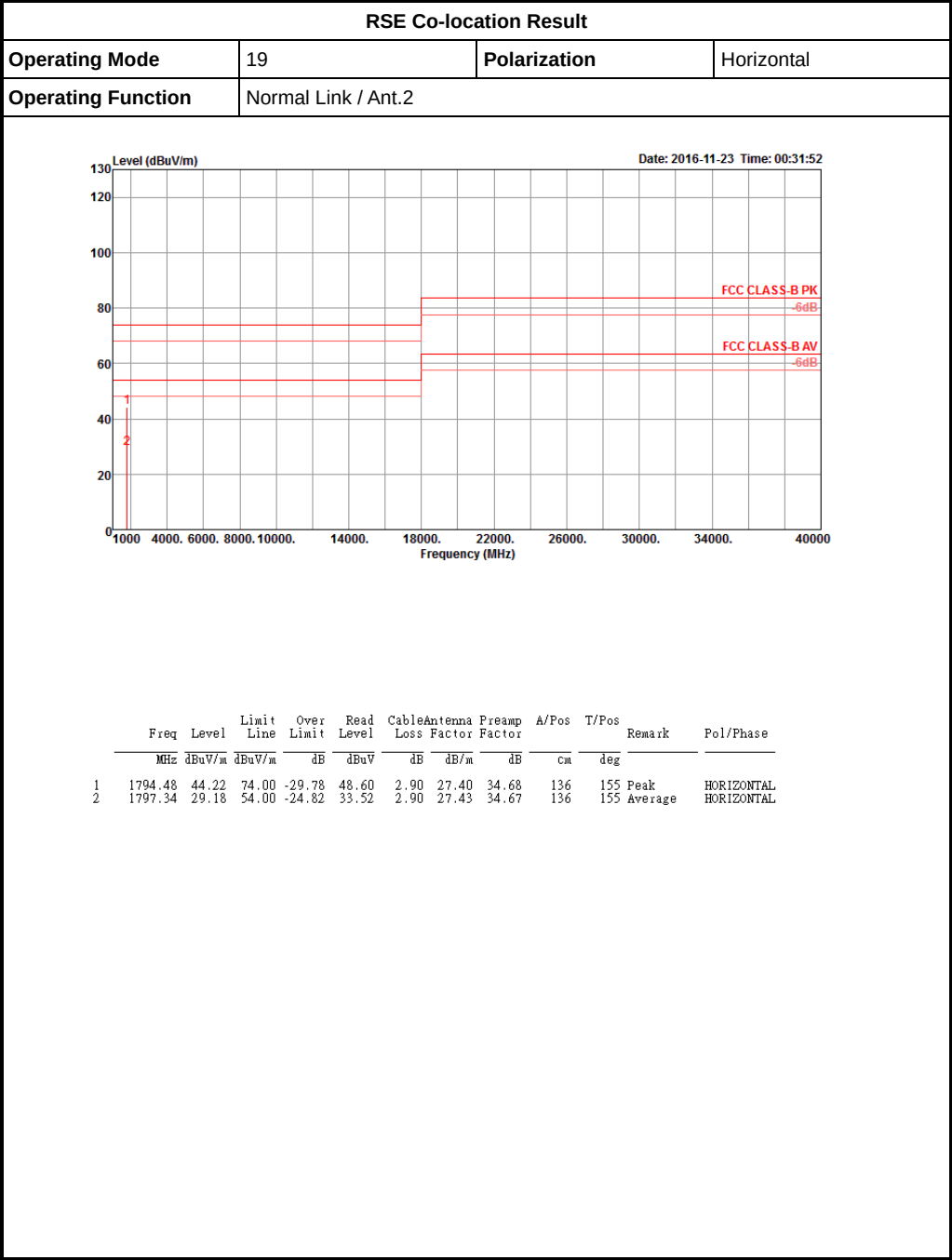
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Pol. (H/V)	Azimuth (°)	Height (m)	Comments
2.4G;11g;Nss1;Ntx1;2472	Pass	PK	2.4836G	72.49	74.00	-1.51	33.54	3	V	330	1.14	-









1. Photographs of Conducted Emissions Test Configuration

Test Mode: Mode 1

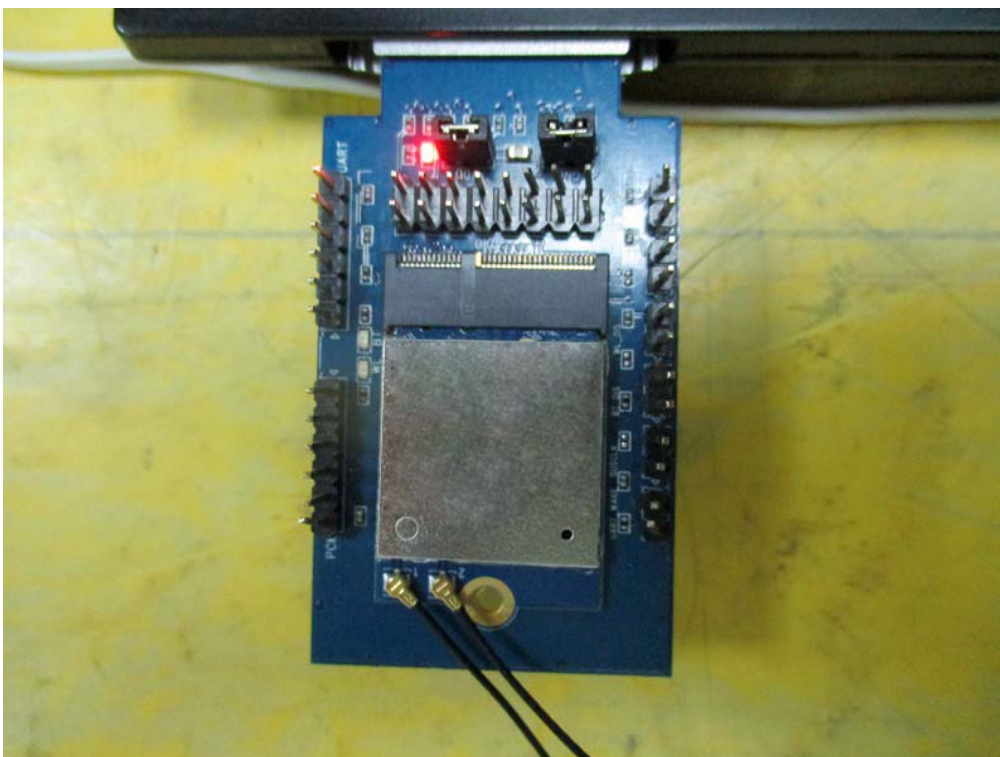
FRONT VIEW



REAR VIEW



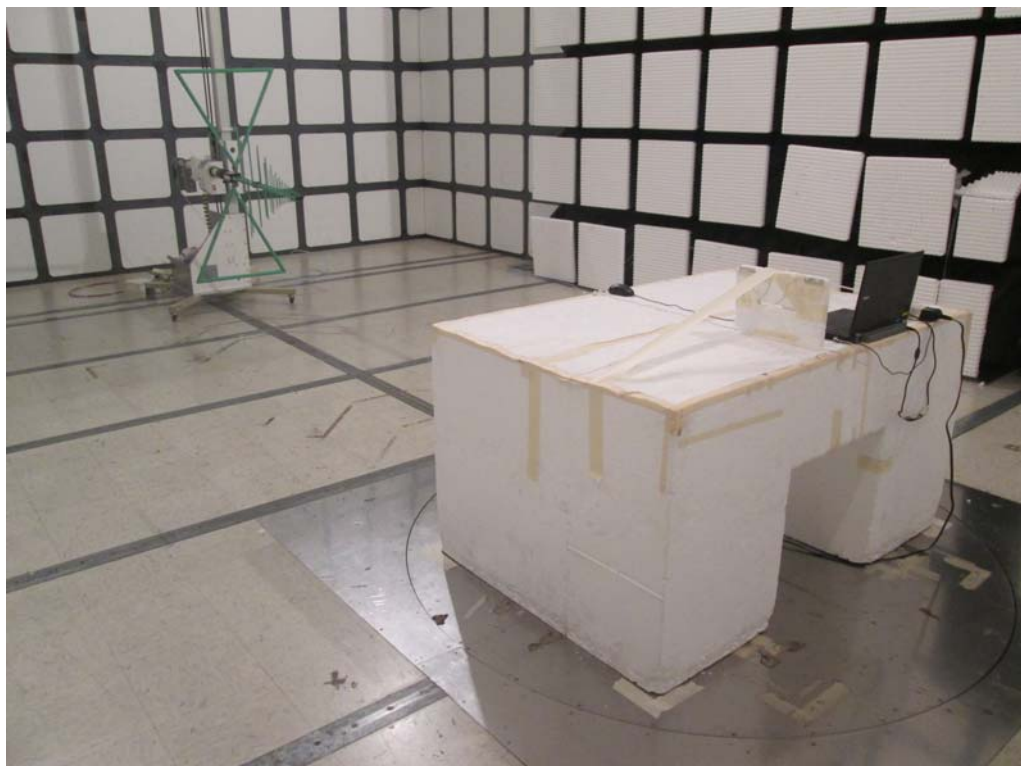
CLOSE-UP VIEW



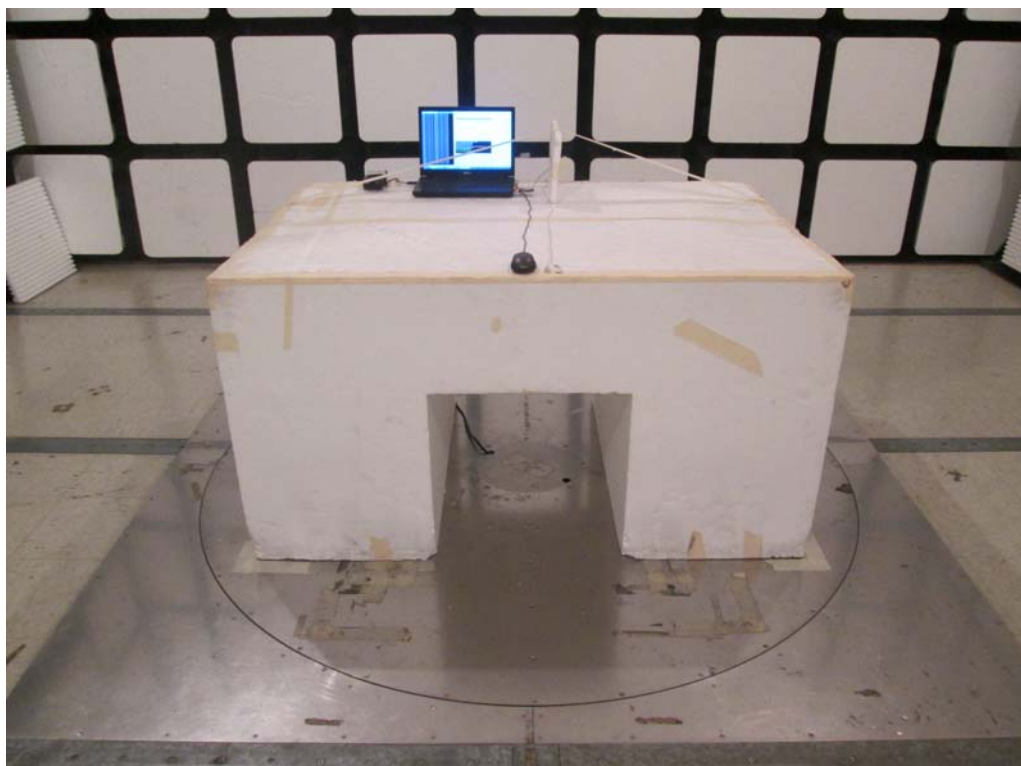
2. Photographs of Radiated Emissions Test Configuration

Test Configuration: 30MHz~1GHz / Test Mode: Mode 3

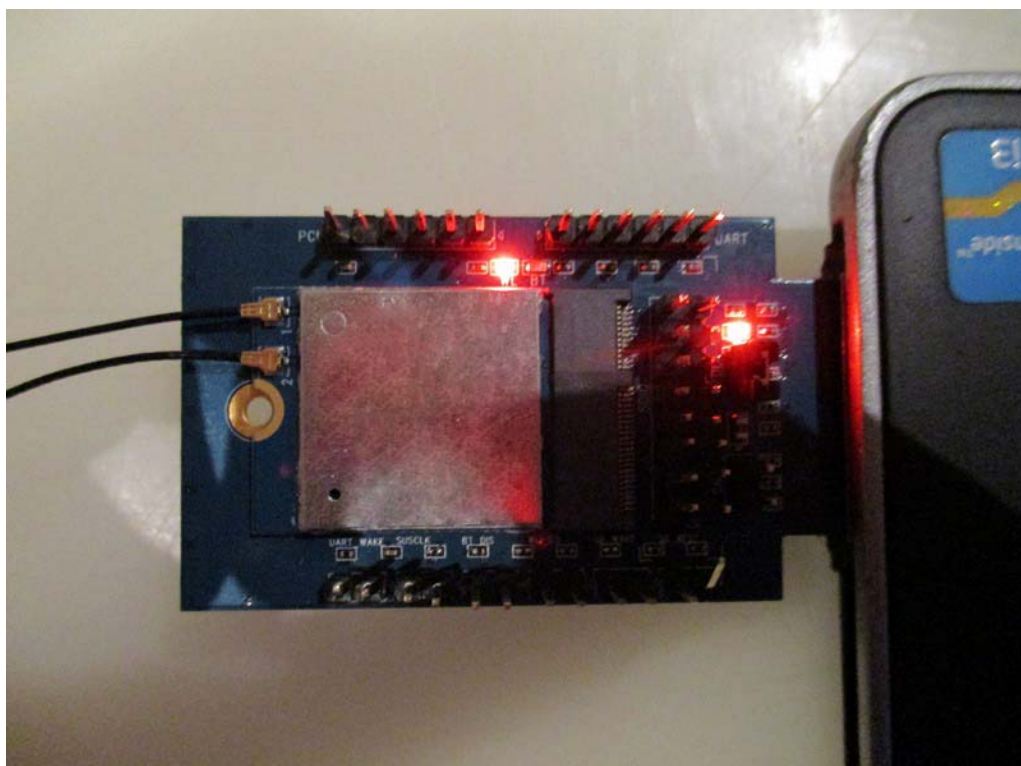
FRONT VIEW



REAR VIEW

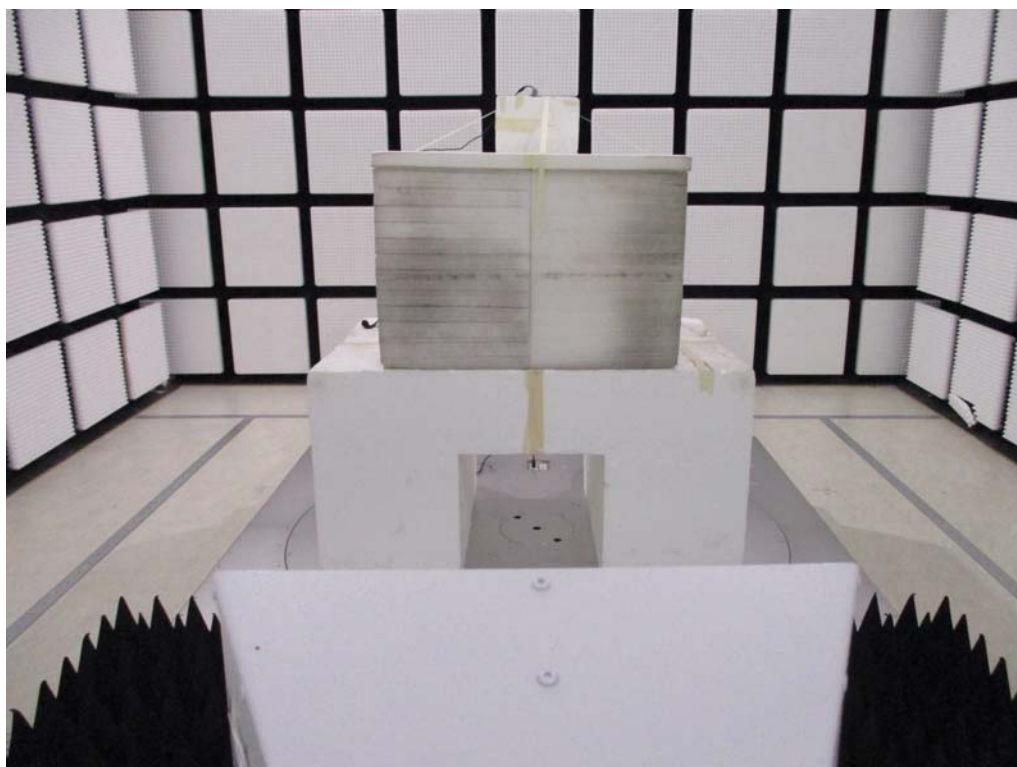


CLOSE-UP VIEW

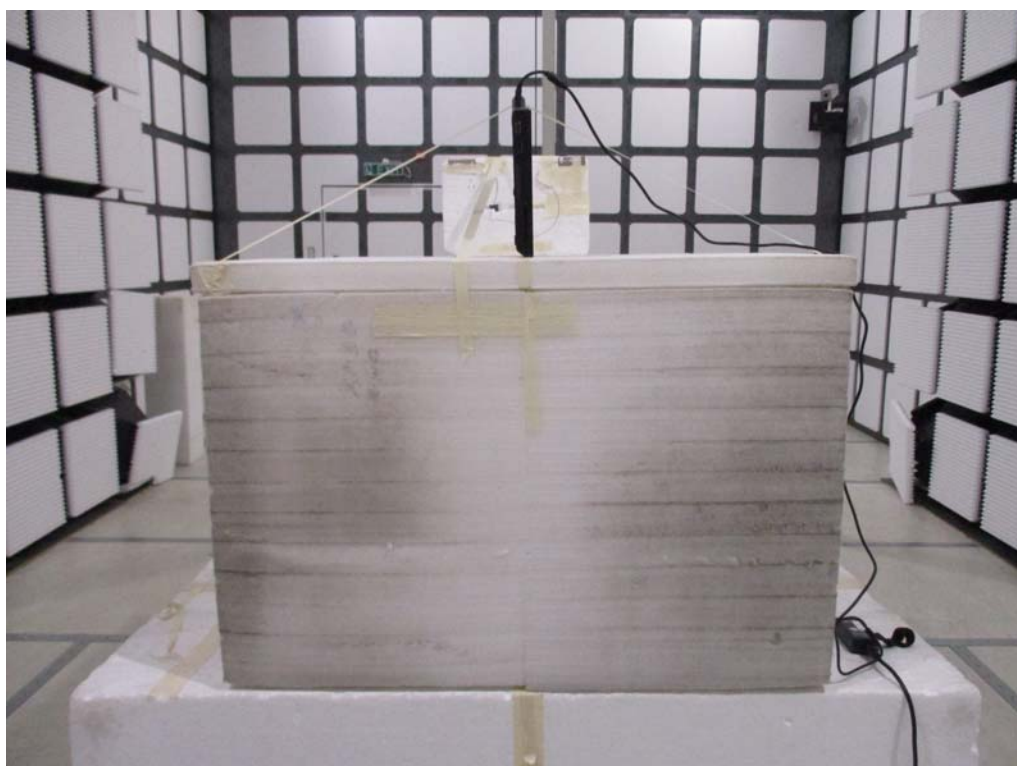


Test Configuration: Above 1GHz / Test Mode: Mode 1

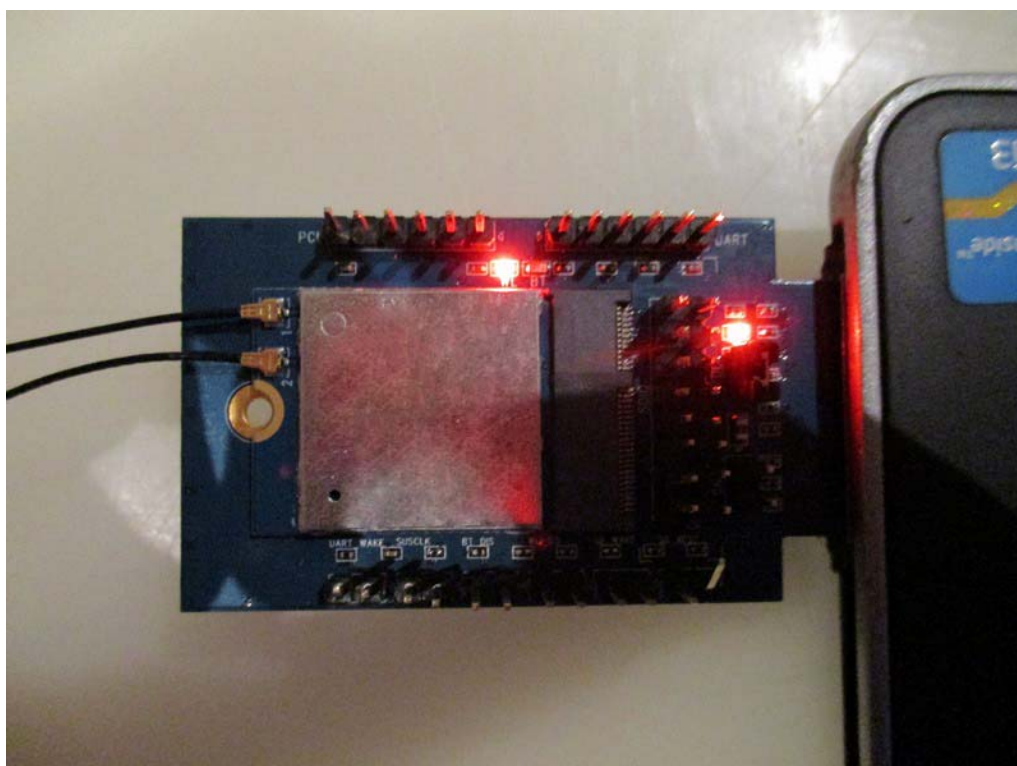
FRONT VIEW



REAR VIEW

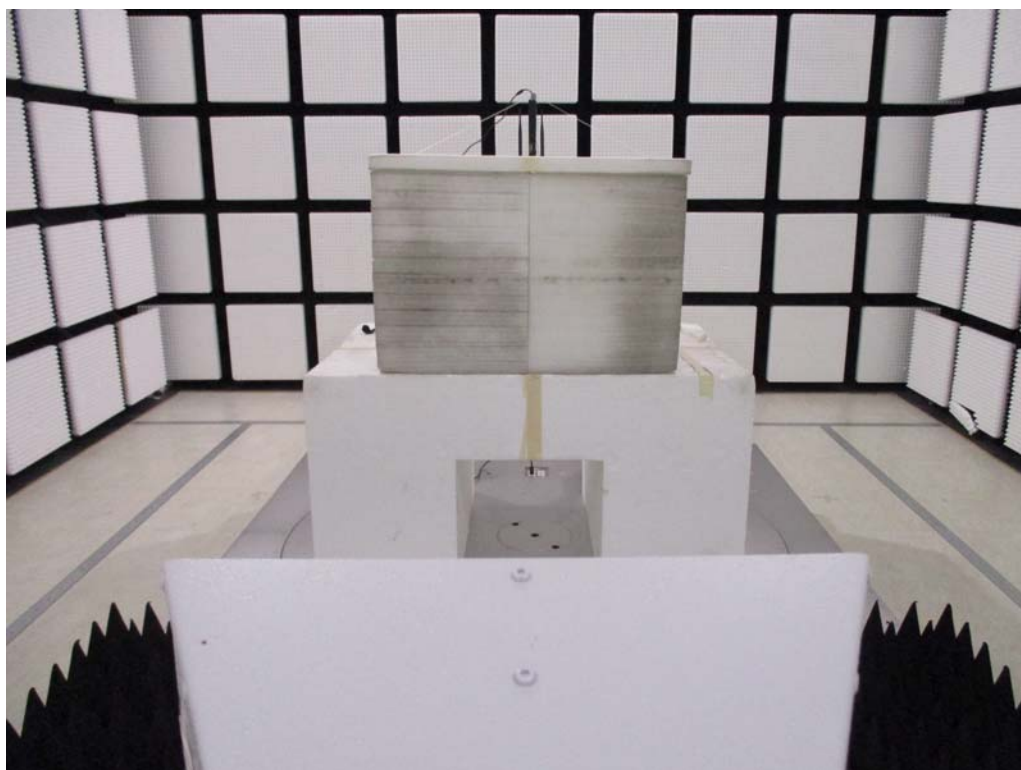


CLOSE-UP VIEW

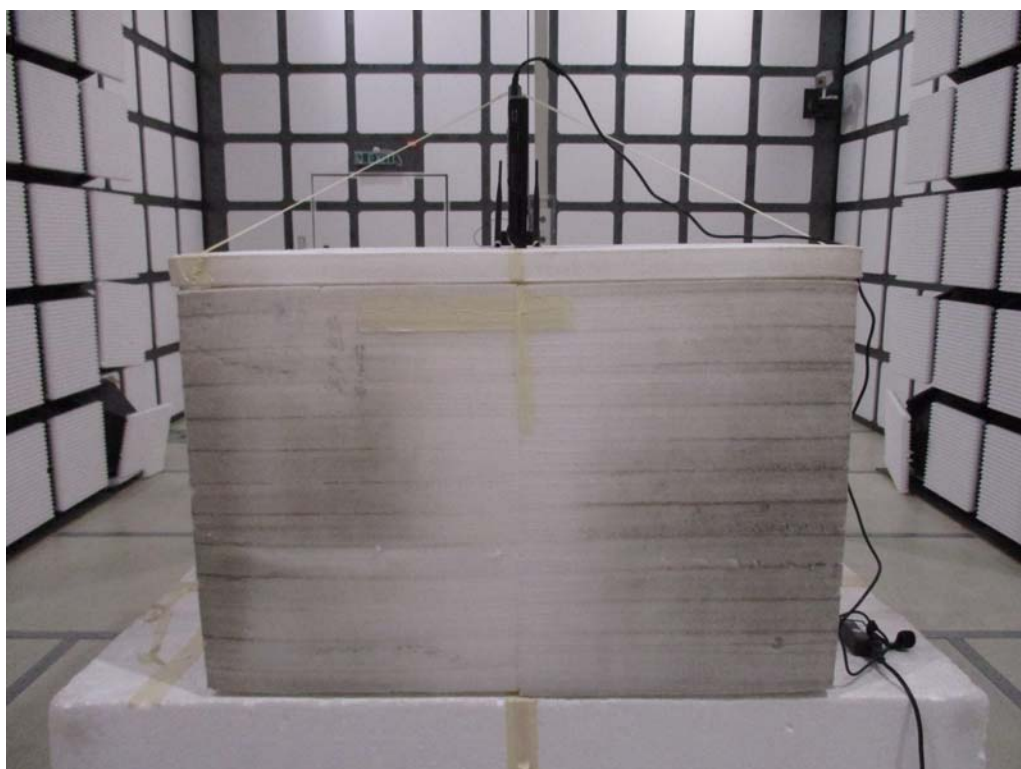


Test Mode: Mode 2

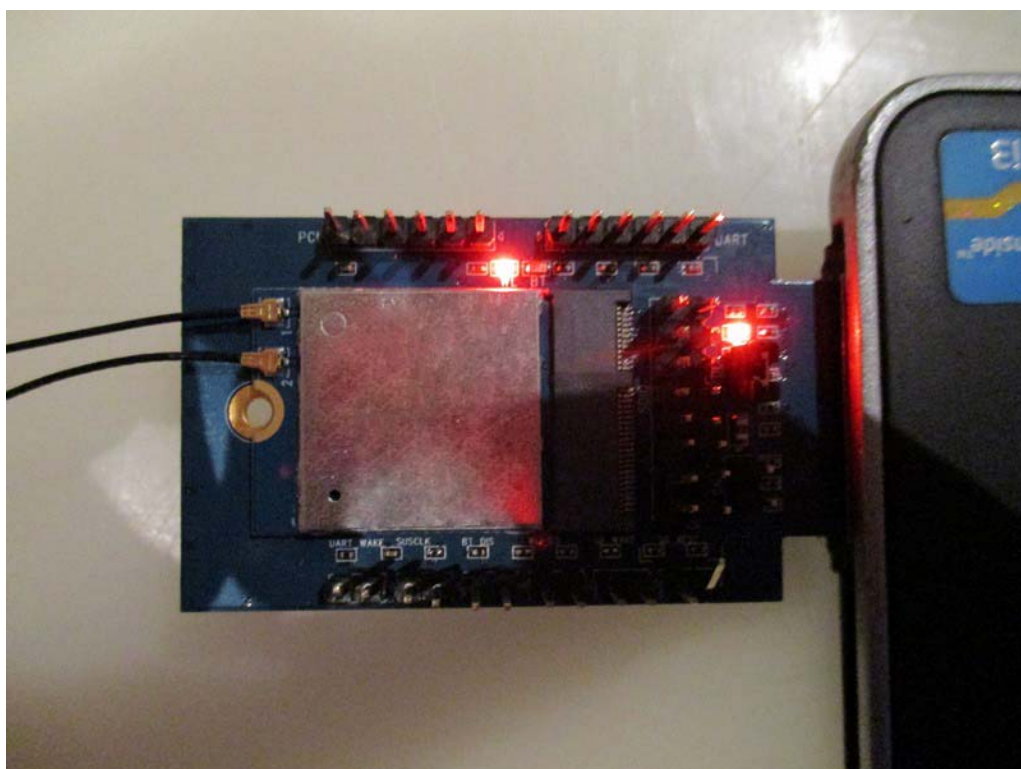
FRONT VIEW



REAR VIEW

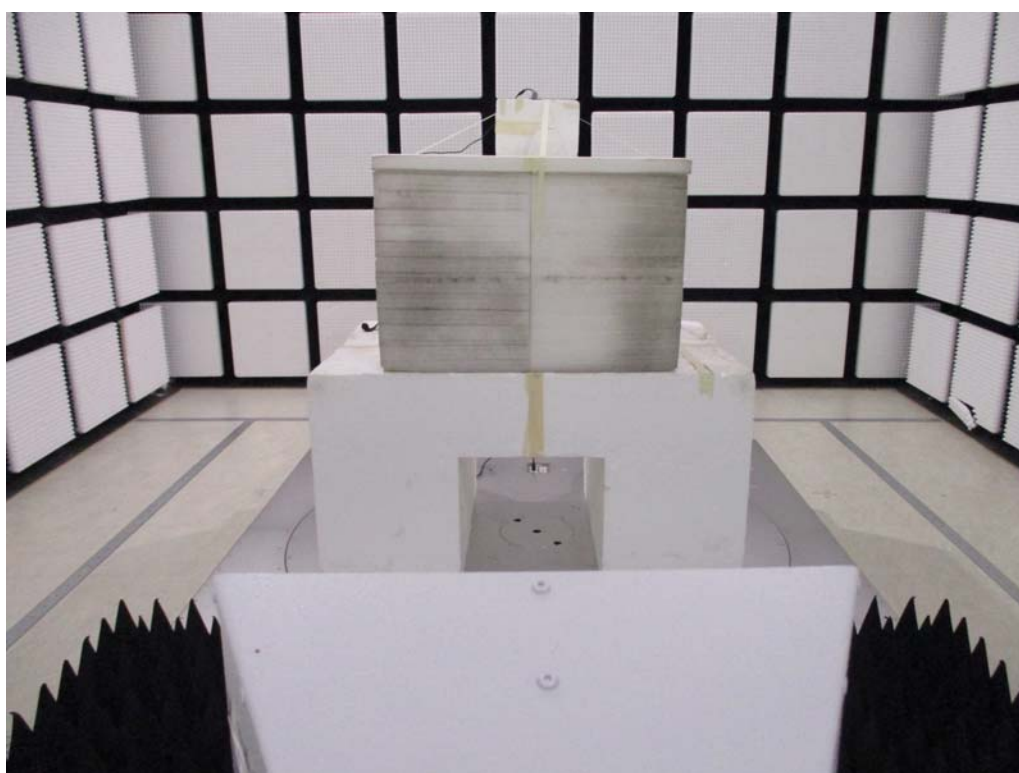


CLOSE-UP VIEW

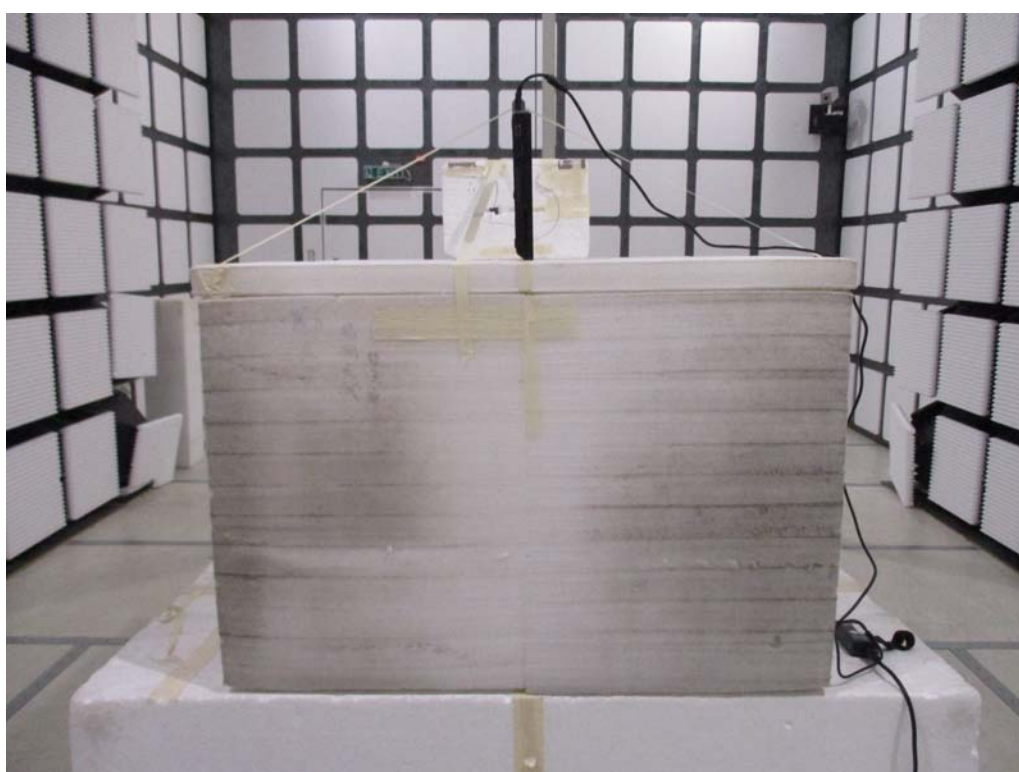


Test Mode: Mode 3

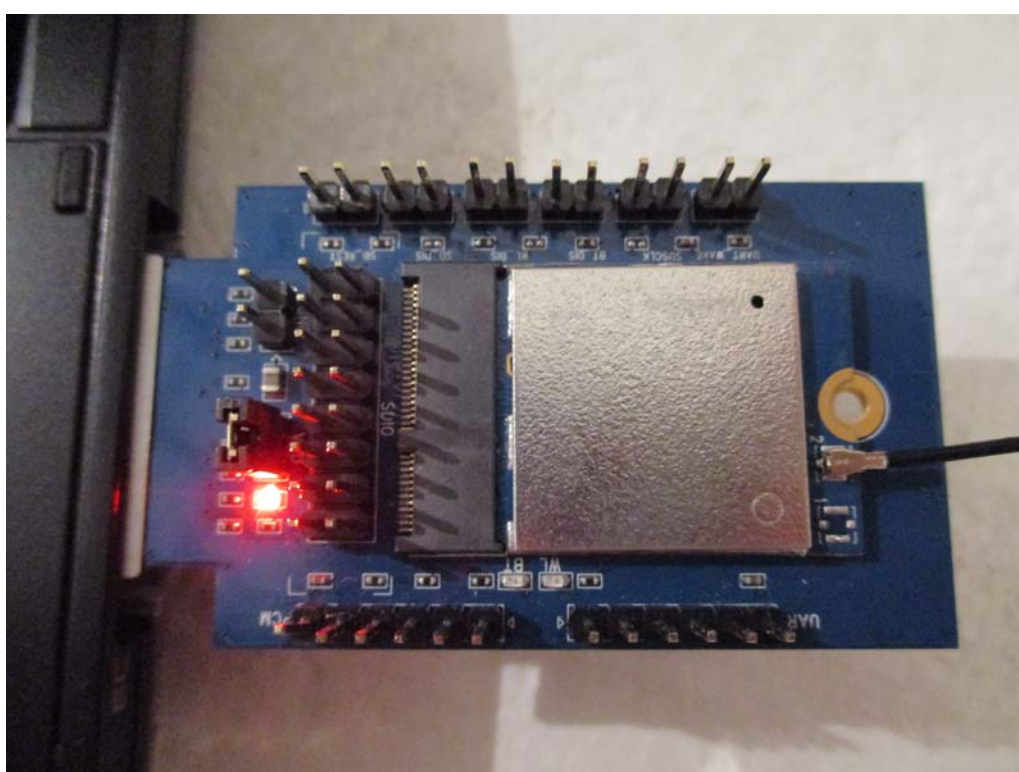
FRONT VIEW



REAR VIEW

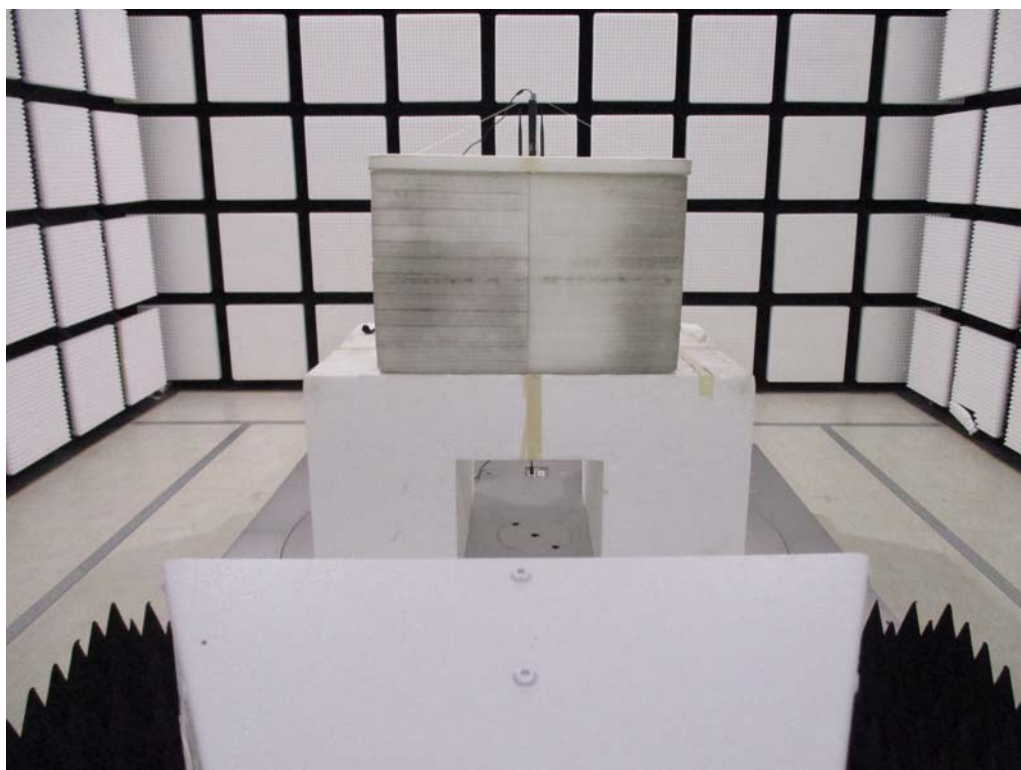


CLOSE-UP VIEW

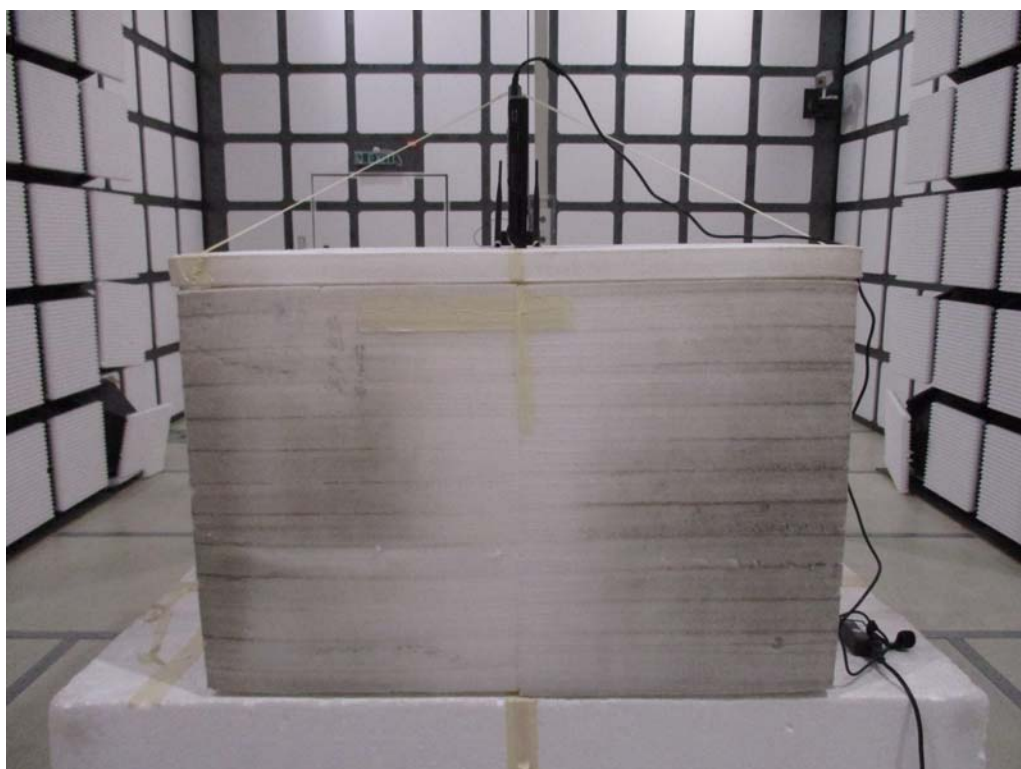


Test Mode: Mode 4

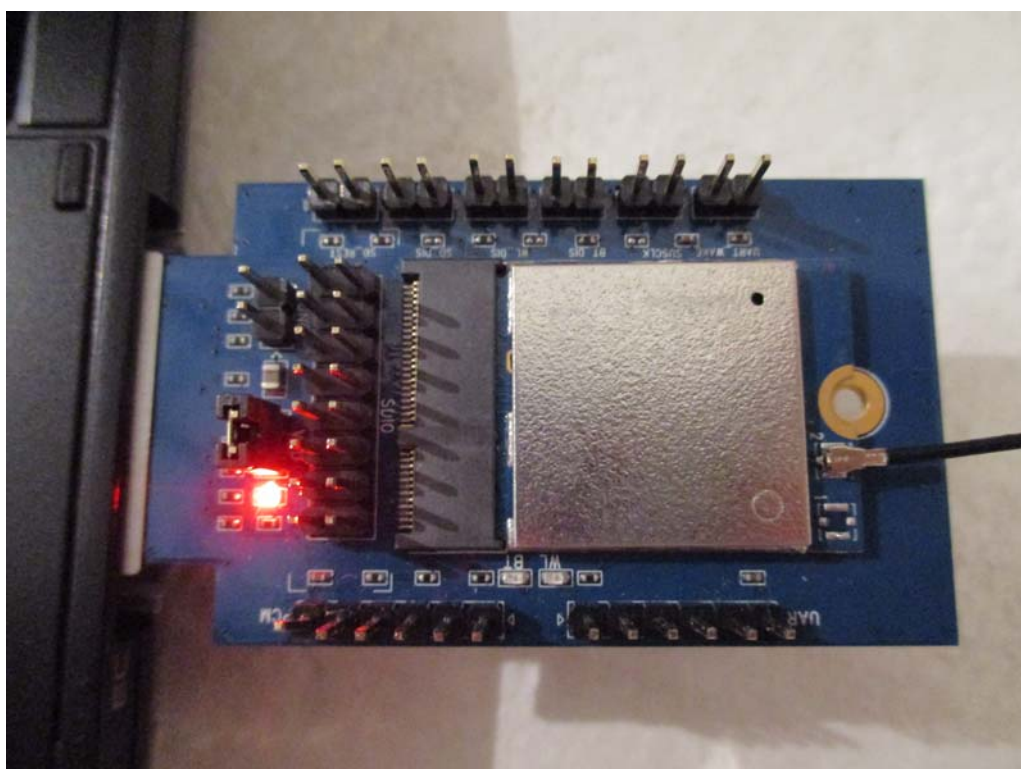
FRONT VIEW



REAR VIEW

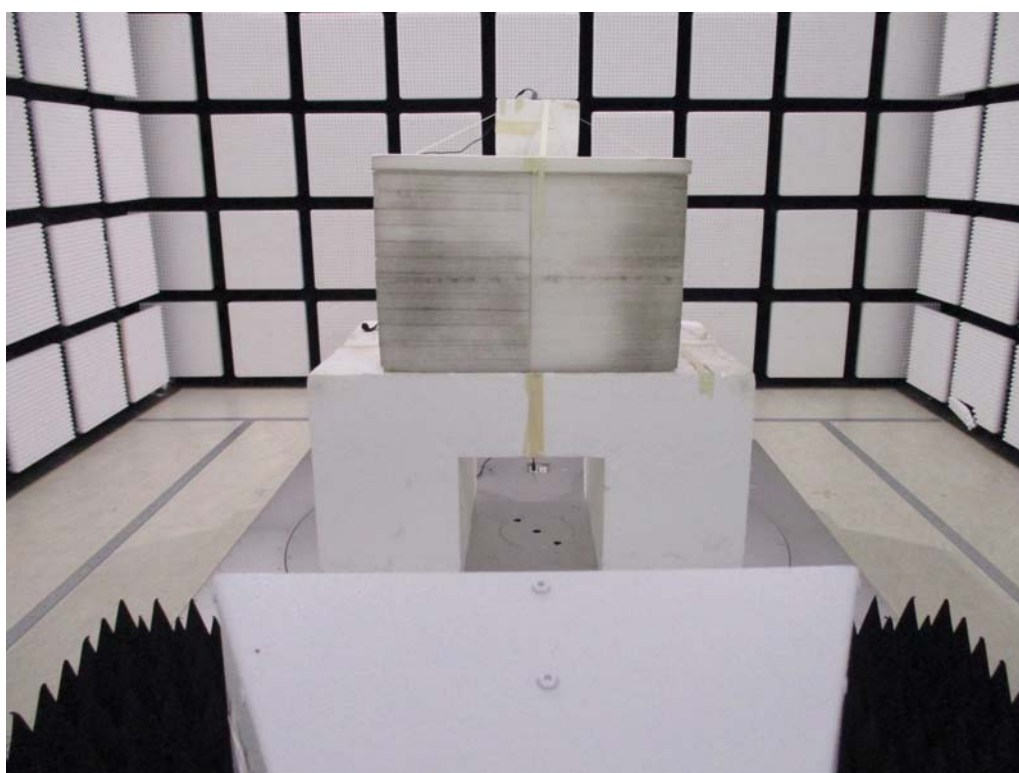


CLOSE-UP VIEW

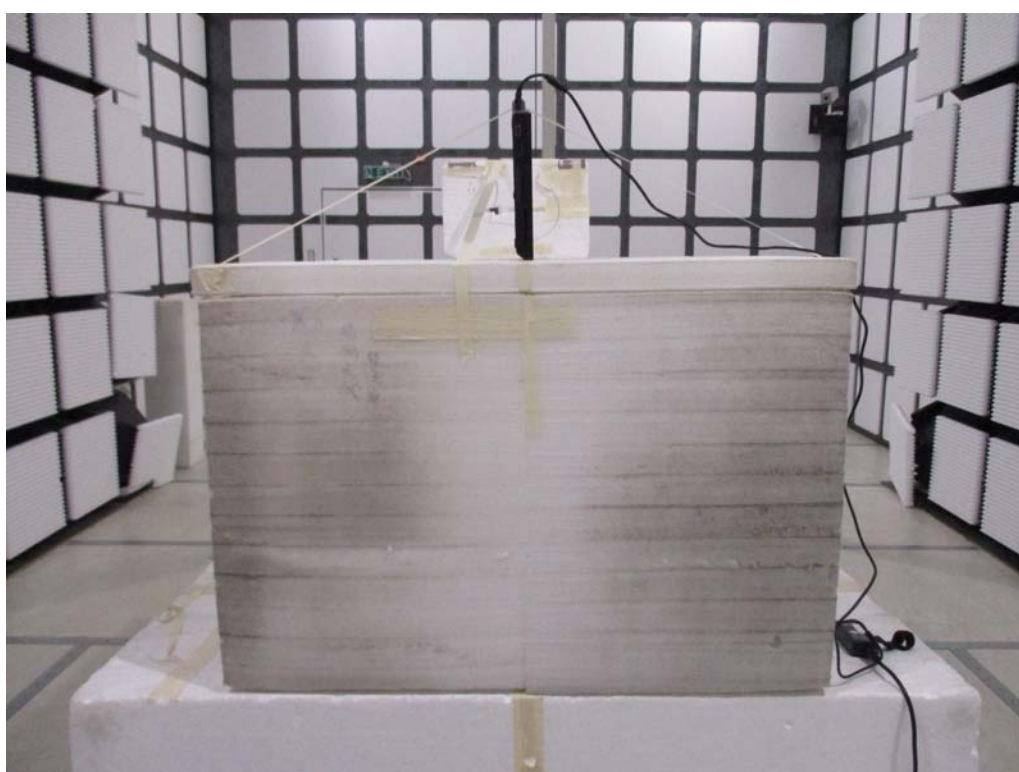


Test Mode: Mode 5

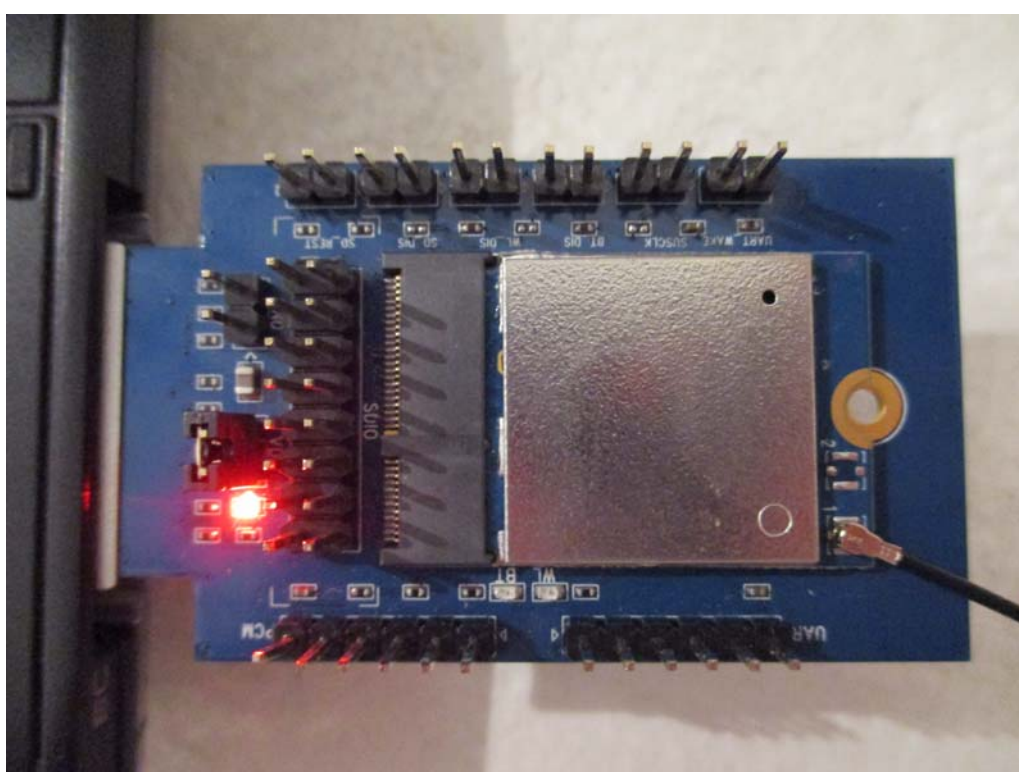
FRONT VIEW



REAR VIEW

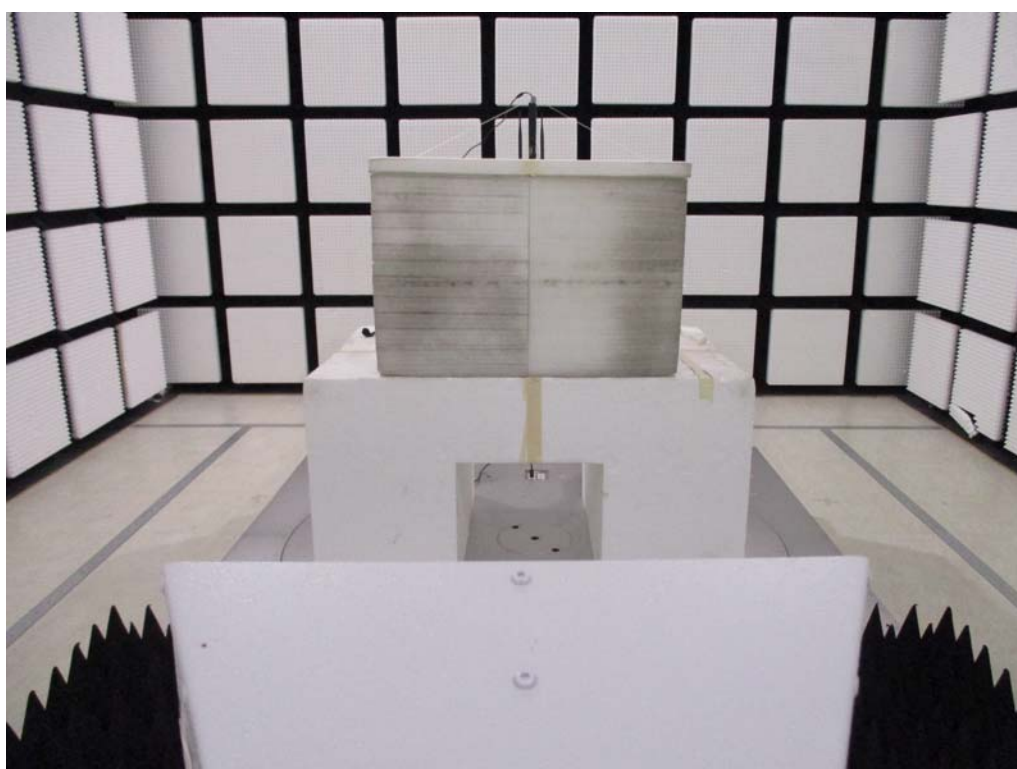


CLOSE-UP VIEW

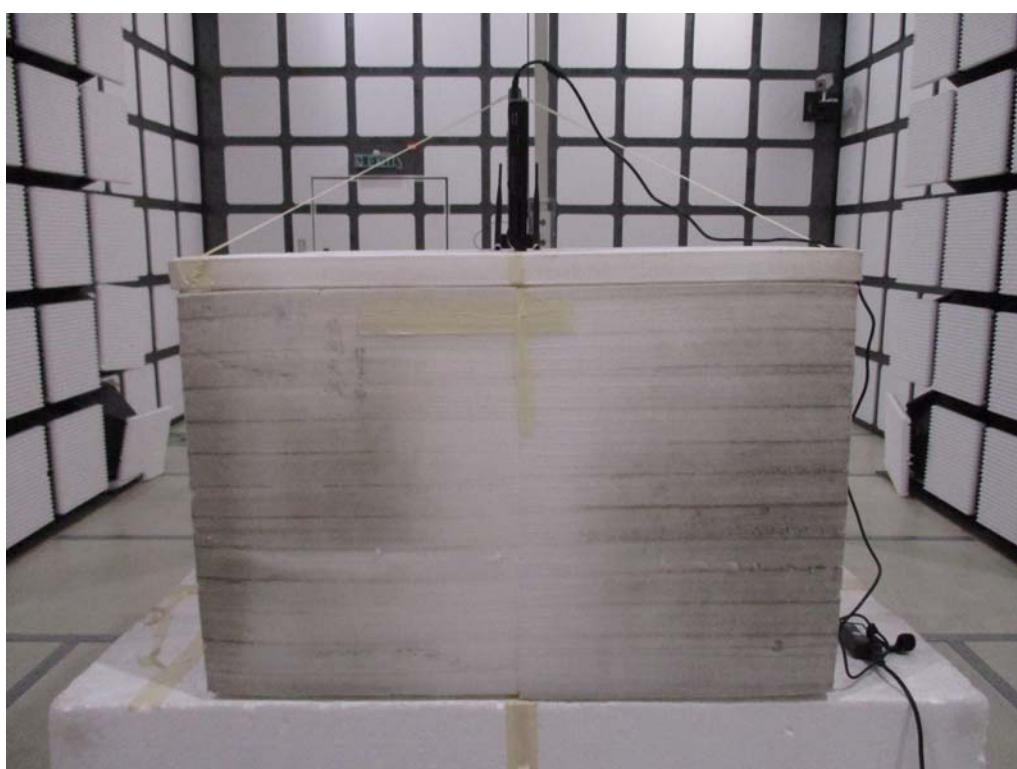


Test Mode: Mode 6

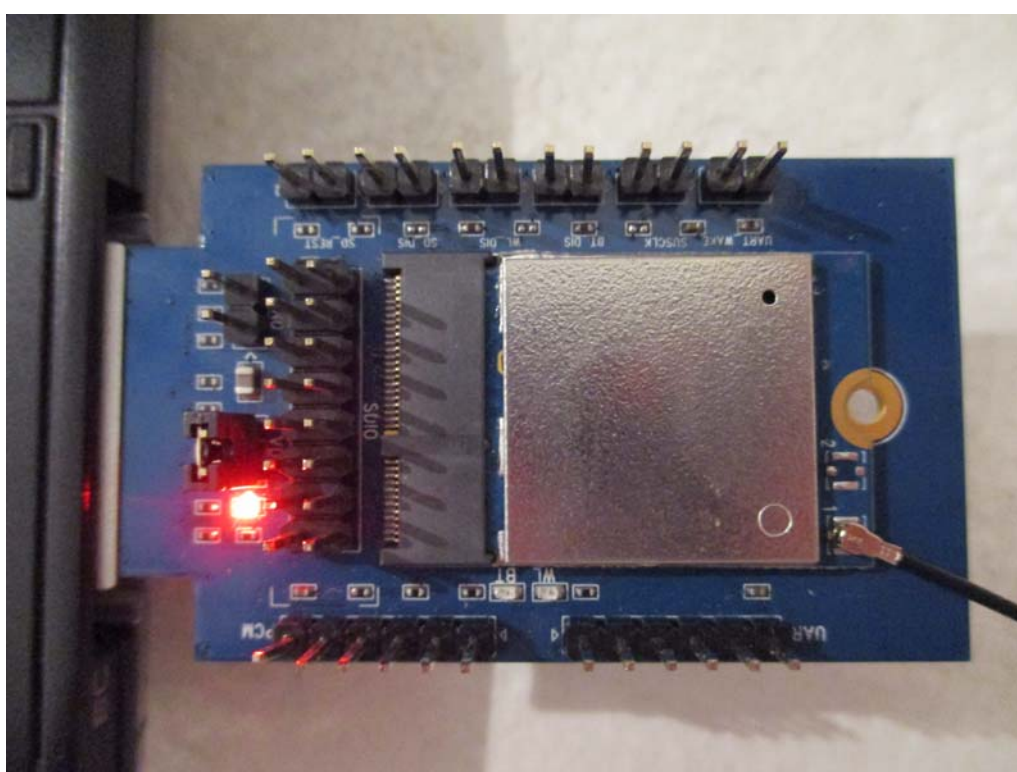
FRONT VIEW



REAR VIEW



CLOSE-UP VIEW



Appendix I. Antenna List

1. Table for Filed Antenna

No.	Brand	Ant. Type	Con. Type	Peak Gain (dBi)		Model No.
				2.4GHz	5GHz	
01	LYNwave	PIFA	IPEX	3.5	5	ALA110-222050-300011
02	Walsin	DIPOLE	IPEX	3.14	5	RFDPA171320EMLB301
03	HONGLIN	PIFA	IPEX	1.58	1.21	DC33001FH00
04	LUXSHARE-ICT	PIFA	IPEX	-0.5	0.5	DC33001FC00
05	SPEEDWIRE	PIFA	IPEX	-0.97	1.93	DC33001FG00
06	HONGLIN	PIFA	IPEX	-0.78	-2.39	DC33001FF00
07	LUXSHARE-ICT	PIFA	IPEX	-0.3	-0.3	DC33001FD00
08	SPEEDWIRE	PIFA	IPEX	-0.98	2.78	DC33001FE00
09	Tongda	PIFA	IPEX	TX1: 0.02 TX2: -0.46	-0.20 -0.93	TX1: T-543-9021099-A TX2: T-543-9021099-A
10	LUXSHAR E-ICT	PIFA	IPEX	TX1: -3.90 TX2: -1.70	-1.20 -2.90	TX1: DC33001FY20 TX2: DC33001FY30
11	LUXSHAR E-ICT	PIFA	IPEX	TX1: -1.80 TX2: -1.40	-0.90 -2.50	TX1: DC33001FY00 TX2: DC33001FY10
12	LUXSHAR E-ICT	PIFA	IPEX	TX1: -3.30 TX2: -2.20	-1.30 -2.60	TX1: DC33001G000 TX2: DC33001G010
13	LUXSHAR E-ICT	PIFA	IPEX	TX1: -1.60 TX2: -1.30	-1.90 -0.90	TX1: DC33001G020 TX2: DC33001G030
14	LUXSHAR E-ICT	PIFA	IPEX	TX1: -5.10 TX2: -1.30	-3.10 -0.80	TX1: DC33001G310 TX2: DC33001G300
15	Smart Approach	PIFA	IPEX	TX1: 0.60 TX2: 0.32	0.43 2.15	TX1: SE-EQFFG-006 TX2: SE-EQFFG-006
16	Foxconn	PIFA	IPEX	TX1: 0.54 TX2: 1.43	0.64 2.20	TX1: ANTP2M1-CQA23-EH TX2: ANTP2M1-CQA23-EH
17	Foxconn	PIFA	IPEX	TX1: 0.15 TX2: 1.13	-0.30 -0.64	TX1: ANTP2M1-CQA22-EH TX2: ANTP2M1-CQA22-EH
18	INPAQ	PIFA	IPEX	TX1: 0.88 TX2: 0.51	3.05 2.57	TX1: DQ60PLBLB12 TX2: DQ60PLBLB12
19	LUXSHAR E-ICT	PIFA	IPEX	TX1: -4.50 TX2: -3.40	-0.50 -0.80	TX1: DC33001G320 TX2: DC33001G330
20	Smart Approach	PIFA	IPEX	TX1: -0.29 TX2: 0.46	1.02 1.12	TX1: SE-EQFFG-005 TX2: SE-EQFFG-005

21	INNOWAVE	PIFA	IPEX	TX1: 2.82 TX2: 2.72	2.08 2.96	TX1: S79-1805520-I73 TX2: S79-1805510-I73
22	Speedwire	PIFA	IPEX	TX1: -0.03 TX2: -1.31	-0.58 -0.03	TX1: DC33001G210 TX2: DC33001G200
23	Speedwire	PIFA	IPEX	TX1: -1.88 TX2: -4.51	-0.59 -0.33	TX1: DC33001FZ00 TX2: DC33001FZ10
24	Speedwire	PIFA	IPEX	TX1: -1.55 TX2: -3.99	0.38 1.78	TX1: DC33001FZ20 TX2: DC33001FZ30
25	Speedwire	PIFA	IPEX	TX1: -1.41 TX2: -2.16	0.09 0.13	TX1: DC33001G120 TX2: DC33001G130
26	Speedwire	PIFA	IPEX	TX1: -1.27 TX2: -2.02	0.08 0.42	TX1: DC33001G100 TX2: DC33001G110
27	Speedwire	PIFA	IPEX	TX1: -1.13 TX2: -0.17	-1.95 -0.52	TX1: DC33001G220 TX2: DC33001G230
28	High-Tek	PIFA	IPEX	TX1: 1.01 TX2: -1.19	2.90 1.06	TX1: DC33001RM00 TX2: DC33001RM10
29	Tongda	PIFA	IPEX	TX1: -2.05 TX2: -1.08	1.44 1.00	TX1: DC33001RN00 TX2: DC33001RN10
30	High-Tek	PIFA	IPEX	TX1: -0.86 TX2: -2.59	0.63 -0.21	TX1: 0ACCN014021N TX2: 0ACCN014021N
31	Smart Approach	PIFA	IPEX	TX1: 0.38 TX2: 1.43	0.73 2.91	TX1: SE-ECAL1-001 TX2: SE-ECAL1-001
32	LUXSHARE-ICT	PIFA	IPEX	TX1: -3.60 TX2: -2.00	-0.60 -2.90	TX1: LA22RF826-1H TX2: LA22RF825-1H
33	Speed	PIFA	IPEX	TX1: -1.46 TX2: -1.59	0.14 2.39	TX1: F.0G.JV-0048-003-00 TX2: F.0G.JV-0048-004-00
34	Amphenol	PIFA	IPEX	TX1: 1.68 TX2: 0.18	-0.71 -1.71	TX1: 6717-FA TX2: 6719-FB
35	Speed	PIFA	IPEX	TX1: 1.50 TX2: -0.12	0.38 -0.14	TX1: M.Z2.ZV-0001-001 TX2: M.Z2.ZV-0001-002
36	LUXSHARE-ICT	PIFA	IPEX	TX1: -1.40 TX2: -3.60	-0.20 -2.80	TX1: 025.900KY.0001 TX2: 025.900KZ.0001
37	WNC	PIFA	IPEX	TX1: -0.89 TX2: 0.38	0.63 -1.41	TX1: 025.900KY.0001 TX2: 025.900KZ.0001
38	Jieng-Tai	PIFA	IPEX	TX1: 1.93 TX2: 0.15	1.23 1.39	TX1: 7KYQUTAN000372 TX2: 7KYQUTAN000372

39	TONGDA	PIFA	IPEX	TX1: 0.76 TX2: 0.66	0.75 0.85	TX1: T-543-9051117-B TX2: T-543-9051117-B
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