

FCC Test Report

Equipment : 1000 Mbps Powerline AC900 Wireless Extender
Brand Name : ZYXEL
Model No. : PLA5236
FCC ID : I88PLA5236
Standard : 47 CFR FCC Part 15.407
Operating Band : 5150 MHz – 5250 MHz
5725 MHz – 5850 MHz
Applicant : Zyxel Communications Corporation
No.2 Industry East Road IX, Science
Park,Hsinchu,Taiwan
Manufacturer : Zyxel Communications Corporation
No.2 Industry East Road IX, Science
Park,Hsinchu,Taiwan
Function : ☐ Outdoor; ☒ Indoor; ☐ Fixed P2P
☐ Client

The product sample received on Nov. 28, 2016 and completely tested on Dec. 16, 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.

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	6
1.3	Testing Location Information	7
1.4	Measurement Uncertainty	7
2	TEST CONFIGURATION OF EUT	8
2.1	Test Channel Mode	8
2.2	The Worst Case Measurement Configuration.....	9
2.3	EUT Operation during Test	10
2.4	Accessories	10
2.5	Support Equipment.....	10
2.6	Test Setup Diagram	11
3	TRANSMITTER TEST RESULT	13
3.1	AC Power-line Conducted Emissions	13
3.2	Emission Bandwidth	15
3.3	Maximum Conducted Output Power	16
3.4	Peak Power Spectral Density.....	18
3.5	Unwanted Emissions.....	21
3.6	Frequency Stability.....	25
4	TEST EQUIPMENT AND CALIBRATION DATA	27
APPENDIX A. TEST RESULTS OF AC POWER-LINE CONDUCTED EMISSIONS		
APPENDIX B. TEST RESULTS OF EMISSION BANDWIDTH		
APPENDIX C. TEST RESULTS OF MAXIMUM CONDUCTED OUTPUT POWER		
APPENDIX D. TEST RESULTS OF PEAK POWER SPECTRAL DENSITY		
APPENDIX E. TEST RESULTS OF UNWANTED EMISSIONS		
APPENDIX F. TEST RESULTS OF FREQUENCY STABILITY		
APPENDIX G. TEST RESULTS OF RADIATED EMISSION CO-LOCATION		
APPENDIX H. TEST PHOTOS		

Summary of Test Result

Conformance Test Specifications			
Report Clause	Ref. Std. Clause	Description	Result
1.1.2	15.203	Antenna Requirement	Complied
3.1	15.207	AC Power-line Conducted Emissions	Complied
3.2	15.407(a)	Emission Bandwidth	Complied
3.3	15.407(a)	Maximum Conducted Output Power	Complied
3.4	15.407(a)	Peak Power Spectral Density	Complied
3.5	15.407(b)	Unwanted Emissions	Complied
3.6	15.407(g)	Frequency Stability	Complied



SPORTON INTERNATIONAL INC.
TEL : 886-3-3273456
FAX : 886-3-3270973
FCC ID: I88PLA5236

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
5150-5250	a, n (HT20), ac (VHT20)	5180-5240	36-48 [4]
5725-5850		5745-5825	149-165 [5]
5150-5250	n (HT40), ac (VHT40)	5190-5230	38-46 [2]
5250-5350		5270-5310	54-62 [2]
5150-5250	ac (VHT80)	5210	42 [1]
5250-5350		5290	58 [1]

Band	Mode	BWch (MHz)	Nant
5.2G	11a	20	1
5.2G	HT20	20	2
5.2G	VHT20	20	2
5.2G	HT40	40	2
5.2G	VHT40	40	2
5.2G	VHT80	80	2
5.8G	11a	20	1
5.8G	HT20	20	2
5.8G	VHT20	20	2
5.8G	HT40	40	2
5.8G	VHT40	40	2
5.8G	VHT80	80	2

Note:

- ♦ 5.2G/5.2G-I(IC) is the 5.2GHz Band (5.15-5.25GHz).
- ♦ 5.8G/5.8G-I(IC) is the 5.8GHz Band (5.725-5.850GHz).
- ♦ 11a, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- ♦ VHT20, VHT40, VHT80 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.
- ♦ 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)	
					2.4G	5G
1	ARISTOTLE	RFA-25-Z3-70-100T	Dipole Ant.	I-PEX	1.61	2.78
2	ARISTOTLE	RFA-25-Z3-70-100T	Dipole Ant.	I-PEX	1.61	2.78

Note: The EUT has two antennas.

Chain 1 (Port 1) connect to Ant.1, Chain 2 (Port 2) connect to Ant.2.

<For 2.4GHz Band>

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

Only Chain 1 (Port 1) can be used as transmitting antenna and receiving antenna.

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

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

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

<For 5GHz Band>

For IEEE 802.11a mode <1TX/1RX>:

Only Chain 2 (Port 2) can be used as transmitting antenna and receiving antenna.

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

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

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

1.1.3 Mode Test Duty Cycle

Mode	DC	T(s)	VBW(Hz) ≥ 1/T
11a	0.997	n/a (DC≥0.98)	n/a (DC≥0.98)
VHT20	0.998	n/a (DC≥0.98)	n/a (DC≥0.98)
VHT40	0.963	947.115u	3k
VHT80	0.949	466.346u	3k

1.1.4 EUT Operational Condition

EUT Power Type	Internal power supply		
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 789033 D02 v01r03
- ♦ FCC KDB 644545 D03 v01
- ♦ FCC KDB 662911 D01 v02r01

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	Ron Huang	25°C / 75%	Dec. 05, 2016
Radiated	03CH01-CB	Brian Sun / Stim Sung	22°C / 54%	Dec. 02, 2016~ Dec. 06, 2016
AC Conduction	CO01-CB	Edison Lin	20°C / 58%	Dec. 16, 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

Band	Mode	BWch (MHz)	Nss-Min	Nant	Ch. (MHz)	Range	Power Setting
5.2G	11a	20	1	1(2)	5180	L	87
5.2G	11a	20	1	1(2)	5200	M	98
5.2G	11a	20	1	1(2)	5240	H	95
5.8G	11a	20	1	1(2)	5745	L	105
5.8G	11a	20	1	1(2)	5785	M	105
5.8G	11a	20	1	1(2)	5825	H	105
5.2G	VHT20	20	1,(M0)	2	5180	L	84
5.2G	VHT20	20	1,(M0)	2	5200	M	95
5.2G	VHT20	20	1,(M0)	2	5240	H	91
5.8G	VHT20	20	1,(M0)	2	5745	L	105
5.8G	VHT20	20	1,(M0)	2	5785	M	105
5.8G	VHT20	20	1,(M0)	2	5825	H	105
5.2G	VHT40	40	1,(M0)	2	5190	L	76
5.2G	VHT40	40	1,(M0)	2	5230	H	89
5.8G	VHT40	40	1,(M0)	2	5755	L	105
5.8G	VHT40	40	1,(M0)	2	5795	H	105
5.2G	VHT80	80	1,(M0)	2	5210	S	72
5.8G	VHT80	80	1,(M0)	2	5775	S	89

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	CTX
1	WLAN 2.4GHz
2	WLAN 5GHz
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	Emission Bandwidth Maximum Conducted Output Power Peak Power Spectral Density Frequency Stability Unwanted Emissions
Test Condition	Conducted measurement at transmit chains

The Worst Case Mode for Following Conformance Tests	
Tests Item	Unwanted Emissions
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
Operating Mode < 1GHz	CTX
1	2.4G WLAN_EUT at Y-axis
2	2.4G WLAN_EUT at Z-axis
3	5G WLAN_EUT at Y-axis
4	5G WLAN_EUT at Z-axis
For operating mode 3 is the worst case and it was record in this test report.	
Operating Mode > 1GHz	CTX
The EUT can be placed Z-axis and Y-axis. After evaluating, while EUT at Y-axis generated the worst case. Thus, the test below will follow this configuration.	

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis
Test Condition	Radiated measurement
Operating Mode	Normal Link
1	WLAN 2.4GHz + WLAN 5GHz_EUT at Y-axis
2	WLAN 2.4GHz + WLAN 5GHz_EUT at Z-axis
For operating mode 1 is the worst case and it was record in this test report.	
Refer to Sporton Test Report No.: FA6N2802 for Co-location RF Exposure Evaluation and Appendix G for Radiated Emission Co-location.	

2.3 EUT Operation during Test

During the test, "Mtool 2.0.0.7" under WIN XP was programmed to be in continuously transmitting mode.

2.4 Accessories

RJ-45 Cable*1: Non-Shielded, 1.2m

2.5 Support Equipment

For Test Site No: CO01-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E6430	DoC

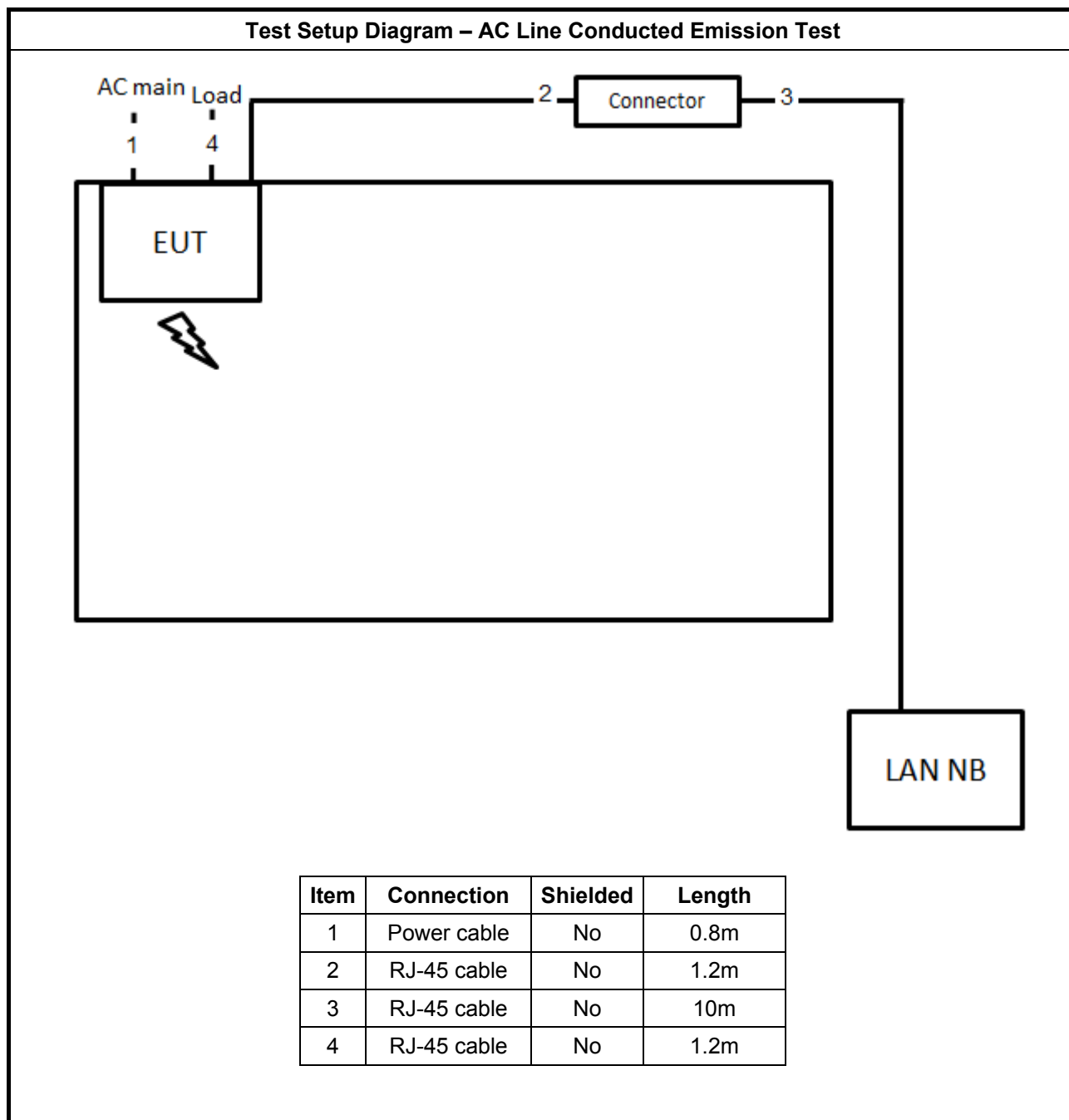
For Test Site No: 03CH01-CB

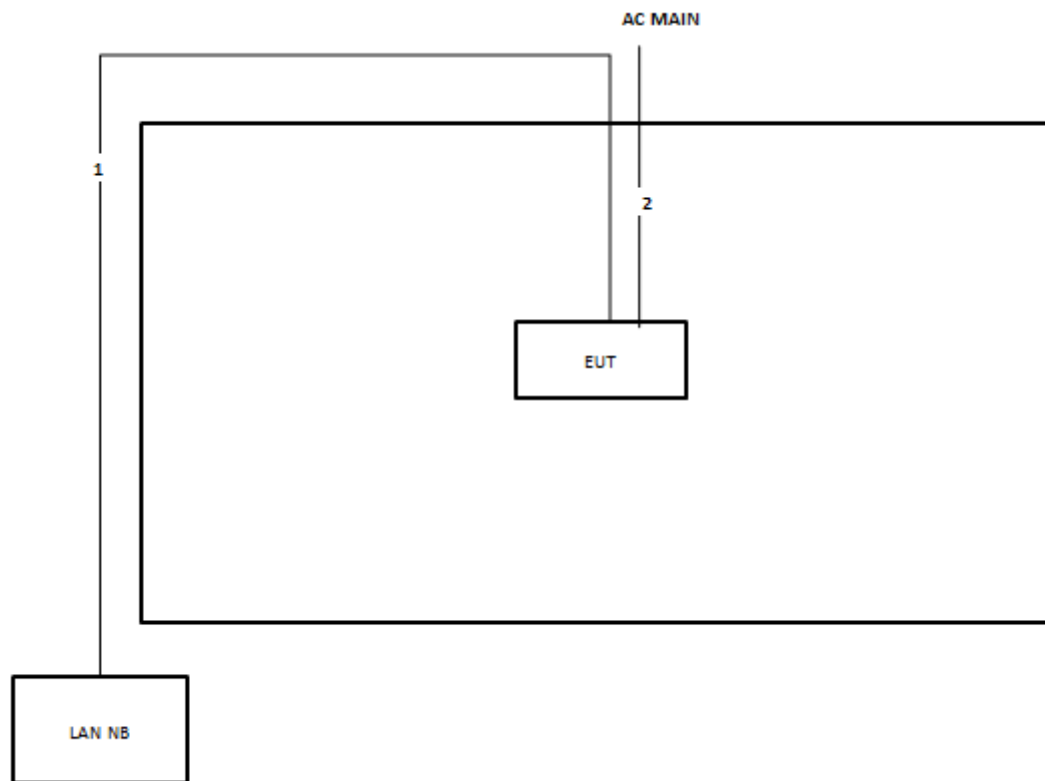
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E4300	DoC

For Test Site No: TH01-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E4300	DoC

2.6 Test Setup Diagram



Test Setup Diagram - Radiated Test


Item	Connection	Shielded	Length
1	RJ-45 cable	No	10m
2	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.

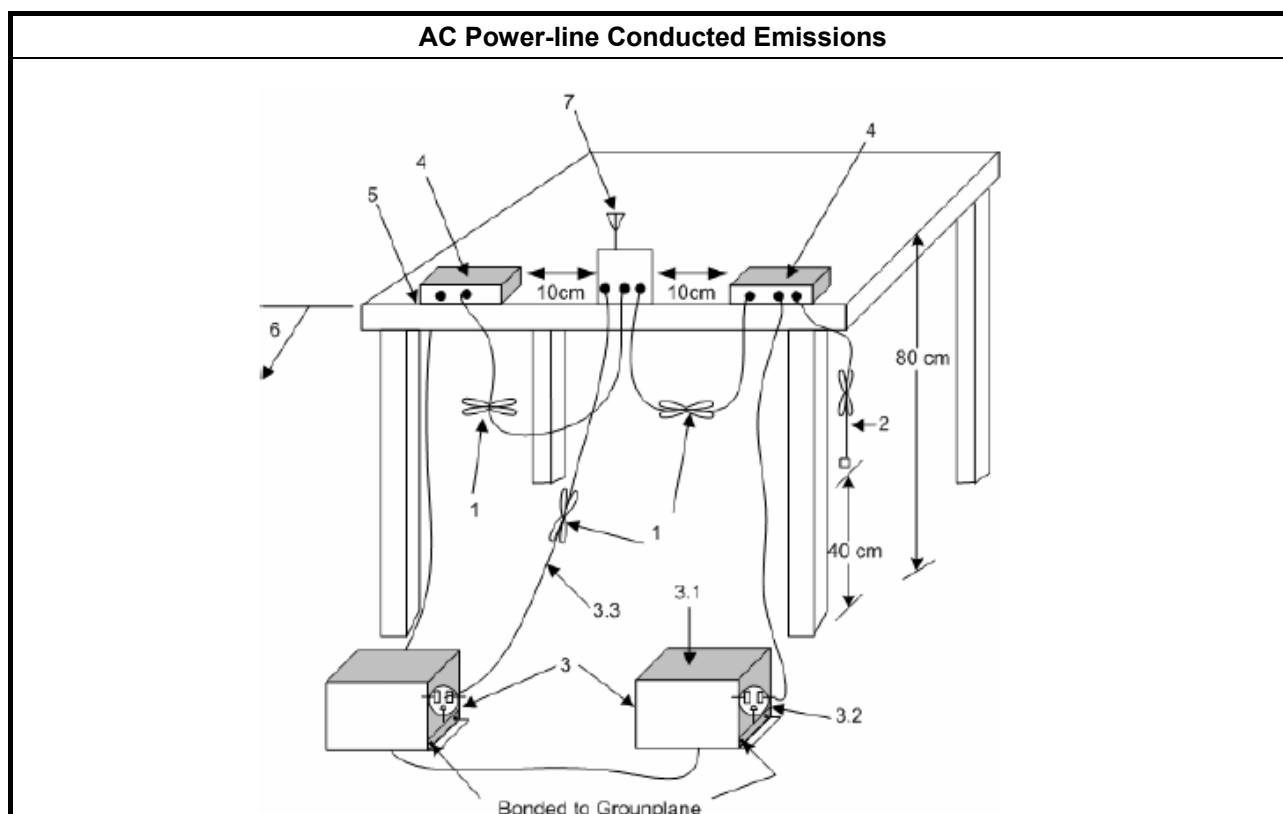
3.1.2 Measuring Instruments

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 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

Emission Bandwidth Limit	
UNII Devices	
☒	For the 5.15-5.25 GHz band, N/A
☐	For the 5.25-5.35 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
☐	For the 5.47-5.725 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
☒	For the 5.725-5.85 GHz band, 6 dB emission bandwidth $\geq$ 500kHz.
LE-LAN Devices	
☐	For the band 5.15-5.25 GHz, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
☐	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz
☐	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz
☐	For the 5.725-5.85 GHz band, 6 dB emission bandwidth $\geq$ 500kHz.

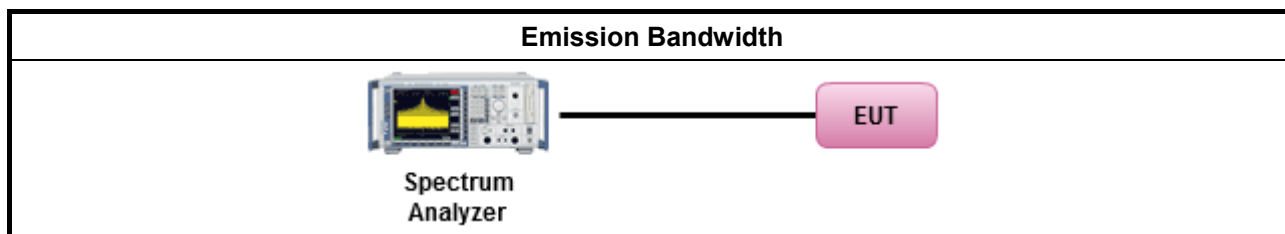
3.2.2 Measuring Instruments

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 789033, clause C for EBW and clause D for OBW measurement.
☐	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
☒	Refer as IC RSS-Gen, clause 4.6 for bandwidth testing.

3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit	
UNII Devices	
☒ For the 5.15-5.25 GHz band:	
	- Outdoor AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$. e.i.r.p. at any elevation angle above 30 degrees ≤ 125mW [21dBm] - Indoor AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ - Point-to-point AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 23$ dBi, then $P_{Out} = 30 - (G_{TX} - 23)$. - Mobile or Portable Client: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.
☐ For the 5.25-5.35 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.	
☐ For the 5.47-5.725 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.	
☒ For the 5.725-5.85 GHz band:	
	- Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$. - Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W.
LE-LAN Devices	
☐ For the 5.15-5.25 GHz band, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.	
☐ For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz	
☐ For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz	
☐ For the 5.725-5.85 GHz band:	
	- Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$. - Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W.
P_{Out} = maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi.	

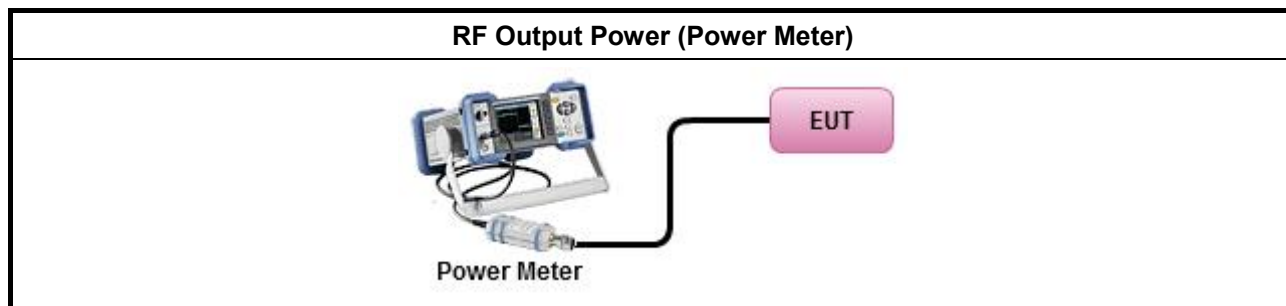
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method	
Maximum Conducted Output Power	
Average over on/off periods with duty factor	
☐	Refer as FCC KDB 789033, clause E Method SA-2 (spectral trace averaging).
☐	Refer as FCC KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)
Wideband RF power meter and average over on/off periods with duty factor	
☒	Refer as FCC KDB 789033, clause E Method PM-G (using an RF average power meter).
For conducted measurement.	
If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.	
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 Conducted Output Power

Refer as Appendix C

3.4 Peak Power Spectral Density

3.4.1 Peak Power Spectral Density Limit

Peak Power Spectral Density Limit	
UNII Devices	
☒ For the 5.15-5.25 GHz band:	
	- Outdoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 17 - (G_{TX} - 6)$. - Indoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 17 - (G_{TX} - 6)$. - Point-to-point AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 23$ dBi, then $P_{Out} = 17 - (G_{TX} - 23)$. - Mobile or Portable Client: the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 11 - (G_{TX} - 6)$.
☐ For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 11 - (G_{TX} - 6)$.	
☐ For the 5.47-5.725 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 11 - (G_{TX} - 6)$.	
☒ For the 5.725-5.85 GHz band:	
	- Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz. If $G_{TX} > 6$ dBi, then $PPSD = 30 - (G_{TX} - 6)$. - Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz.
LE-LAN Devices	
☐ For the 5.15-5.25 GHz band, the peak power spectral density (PPSD) ≤ 4 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 10 dBm/MHz.	
☐ For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 17 dBm/MHz.	
	e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where θ is the angle above the local horizontal plane (of the Earth) as shown below: -13 dBW/MHz for $0^\circ \leq \theta < 8^\circ$; $-13 - 0.716 (\theta - 8)$ dBW/MHz for $8^\circ \leq \theta < 40^\circ$; $-35.9 - 1.22 (\theta - 40)$ dBW/MHz for $40^\circ \leq \theta \leq 45^\circ$; -42 dBW/MHz for $\theta > 45^\circ$
☐ For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 17 dBm/MHz.	
☐ For the 5.725-5.85 GHz band:	
	- Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz. If $G_{TX} > 6$ dBi, then $PPSD = 30 - (G_{TX} - 6)$. - Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz.
PPSD = peak power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz G_{TX} = the maximum transmitting antenna directional gain in dBi.	

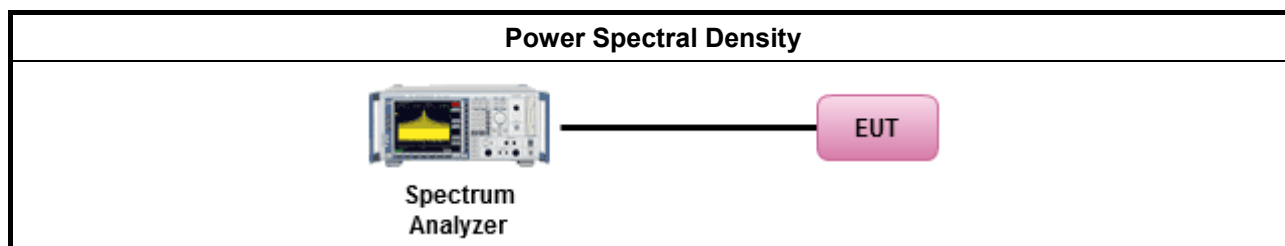
3.4.2 Measuring Instruments

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 shall be used to determine the peak power spectral density and use the peak search function on the spectrum analyzer to find the peak of the spectrum. For the peak power spectral density shall be measured using below options:	
☐ Refer as FCC KDB 789033, F5) power spectral density can be measured using resolution bandwidths < 1 MHz provided that the results are integrated over 1 MHz bandwidth [duty cycle ≥ 98% or external video / power trigger]	
☒ Refer as FCC KDB 789033, clause E Method SA-1 (spectral trace averaging).	
☐ Refer as FCC KDB 789033, clause E Method SA-1 Alt. (RMS detection with slow sweep speed) duty cycle < 98% and average over on/off periods with duty factor	
☒ Refer as FCC KDB 789033, clause E Method SA-2 (spectral trace averaging).	
☐ Refer as FCC KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)	
For conducted measurement.	
If the EUT supports multiple transmit chains using options given below:	
☒ Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.	
☐ Option 2: Measure and sum spectral maxima across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,	
☐ Option 3: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.	
If multiple transmit chains, EIRP PPSD calculation could be following as methods: $PPSD_{total} = PPSD_1 + PPSD_2 + \dots + PPSD_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = PPSD_{total} + DG$	

3.4.4 Test Setup





3.4.5 Test Result of Peak Power Spectral Density

Refer as Appendix D

3.5 Unwanted Emissions

3.5.1 Transmitter Radiated Unwanted Emissions Limit

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

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.

Un-restricted band emissions above 1GHz Limit	
Operating Band	Limit
5.15 - 5.25 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.25 - 5.35 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.47 - 5.725 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.725 - 5.85 GHz	all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

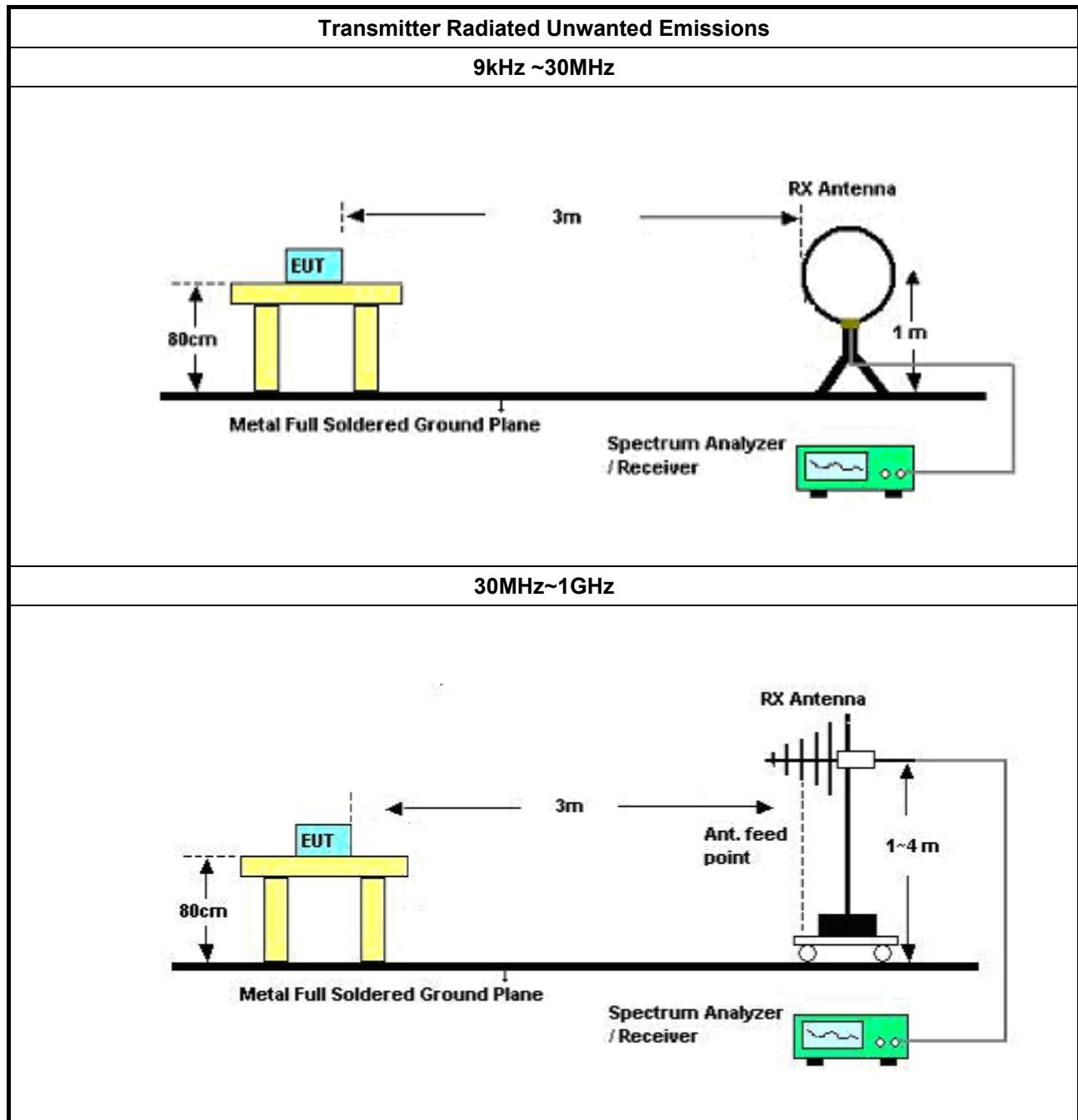
3.5.2 Measuring Instruments

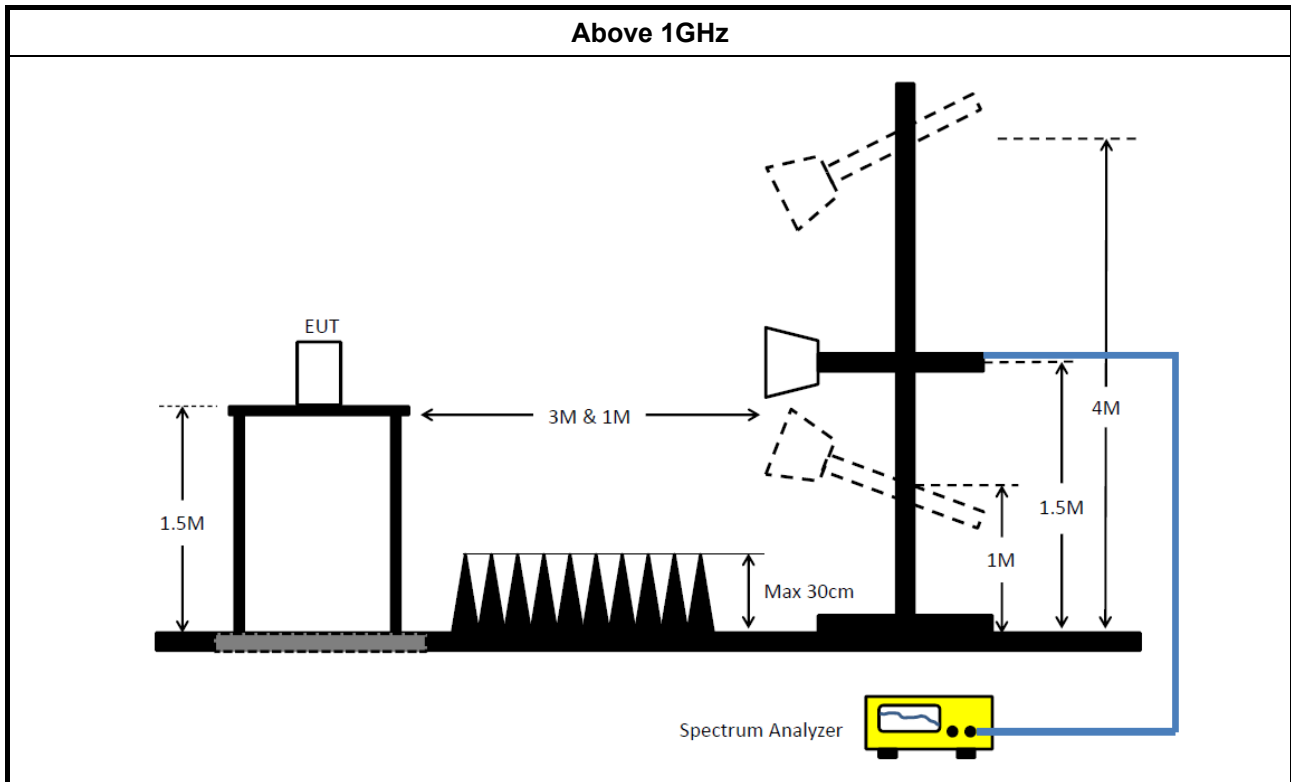
Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method	
Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).	
The average emission levels shall be measured in [duty cycle $\geq$ 98 or duty factor].	
For the transmitter unwanted emissions shall be measured using following options below:	
	Refer as FCC KDB 789033, clause H)2) for unwanted emissions into non-restricted bands.
	Refer as FCC KDB 789033, clause H)1) for unwanted emissions into restricted bands.
	☐ Refer as FCC KDB 789033, H)6) Method AD (Trace Averaging).
	☒ Refer as FCC KDB 789033, H)6) Method VB (Reduced VBW).
	☐ 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 789033, clause H)5) measurement procedure peak limit.
	☐ Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
	For radiated measurement.
	Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.
	Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.
	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1GHz.
	The any unwanted emissions level shall not exceed the fundamental emission level.
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.	

3.5.4 Test Setup





3.5.5 Transmitter Unwanted Emissions (Below 30MHz)

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

3.5.6 Test Result of Transmitter Unwanted Emissions

Refer as Appendix E

3.6 Frequency Stability

3.6.1 Frequency Stability Limit

Frequency Stability Limit
UNII Devices
In-band emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.
LE-LAN Devices
N/A
IEEE Std. 802.11
The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band and ± 25 ppm maximum for the 2.4 GHz band.

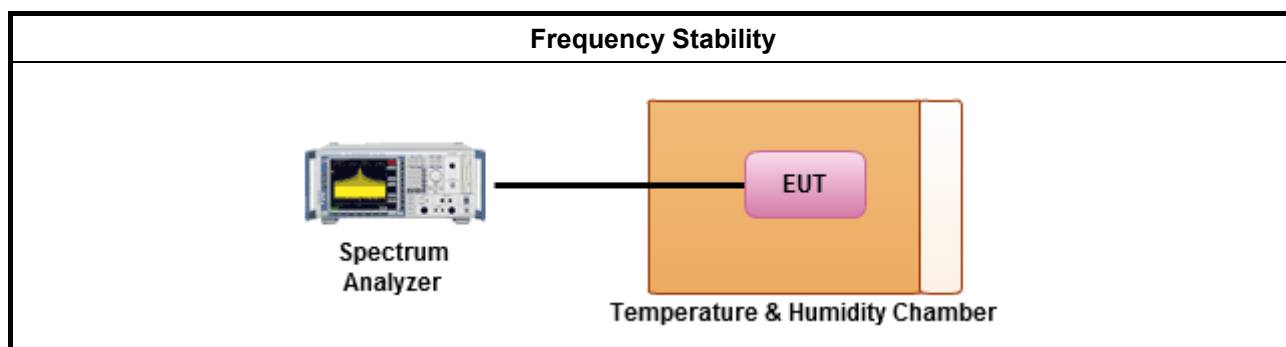
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

Test Method
Refer as ANSI C63.10, clause 6.8 for frequency stability tests
- Frequency stability with respect to ambient temperature - Frequency stability when varying supply voltage - Extreme temperature is 0°C~40°C.

3.6.4 Test Setup





3.6.5 Test Result of Frequency Stability

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	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Nov. 23, 2016	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 15, 2016	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 with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	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)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jun. 28, 2016	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-16+17	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	Oct. 24, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+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	Oct. 24, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Oct. 24, 2016	Radiation (03CH01-CB)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Test Software	Audix	E3	6.2009-I0-7	N/A	N/A	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	101027	9kHz~40GHz	Jul. 26, 2016	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2016	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	MY53410001	50MHz~18GHz	Nov. 22, 2016	Conducted (TH01-CB)

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

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

NCR means Non-Calibration required.



AC Power-line Conducted Emissions Result									
Operating Mode	1			Power Phase			Neutral		
Operating Function	CTX								
Level (dBuV) Date: 2016-12-16 Time: 20:35:01 Frequency (MHz)									
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.2151	32.56	-20.45	53.01	22.47	9.92	0.17	NEUTRAL	Average
2	0.2151	39.82	-23.19	63.01	29.73	9.92	0.17	NEUTRAL	QP
3	0.3035	33.82	-16.33	50.15	23.82	9.92	0.08	NEUTRAL	Average
4	0.3035	42.31	-17.84	60.15	32.31	9.92	0.08	NEUTRAL	QP
5	0.3893	30.83	-17.25	48.08	20.89	9.92	0.02	NEUTRAL	Average
6	0.3893	38.06	-20.02	58.08	28.12	9.92	0.02	NEUTRAL	QP
7	1.0997	26.74	-19.26	46.00	16.15	9.94	0.65	NEUTRAL	Average
8	1.0997	33.39	-22.61	56.00	22.80	9.94	0.65	NEUTRAL	QP
9	2.0659	23.86	-22.14	46.00	13.84	9.96	0.06	NEUTRAL	Average
10	2.0659	30.59	-25.41	56.00	20.57	9.96	0.06	NEUTRAL	QP
11	25.1876	22.39	-27.61	50.00	11.67	10.45	0.27	NEUTRAL	Average
12	25.1876	29.17	-30.83	60.00	18.45	10.45	0.27	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	CTX		

Level (dBuV)

Date: 2016-12-16 Time: 20:33:37

Frequency (MHz)

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.2151	32.51	-20.50	53.01	22.42	9.92	0.17	LINE	Average
2	0.2151	39.89	-23.12	63.01	29.80	9.92	0.17	LINE	QP
3	0.3035	34.08	-16.07	50.15	24.08	9.92	0.08	LINE	Average
4	0.3035	43.05	-17.10	60.15	33.05	9.92	0.08	LINE	QP
5	0.3914	30.34	-17.69	48.03	20.40	9.92	0.02	LINE	Average
6	0.3914	37.50	-20.53	58.03	27.56	9.92	0.02	LINE	QP
7	1.0265	26.81	-19.19	46.00	16.15	9.94	0.72	LINE	Average
8	1.0265	33.64	-22.36	56.00	22.98	9.94	0.72	LINE	QP
9	2.3213	23.87	-22.13	46.00	13.84	9.96	0.07	LINE	Average
10	2.3213	30.73	-25.27	56.00	20.70	9.96	0.07	LINE	QP
11	25.3214	22.63	-27.37	50.00	11.91	10.45	0.27	LINE	Average
12	25.3214	29.31	-30.69	60.00	18.59	10.45	0.27	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.)



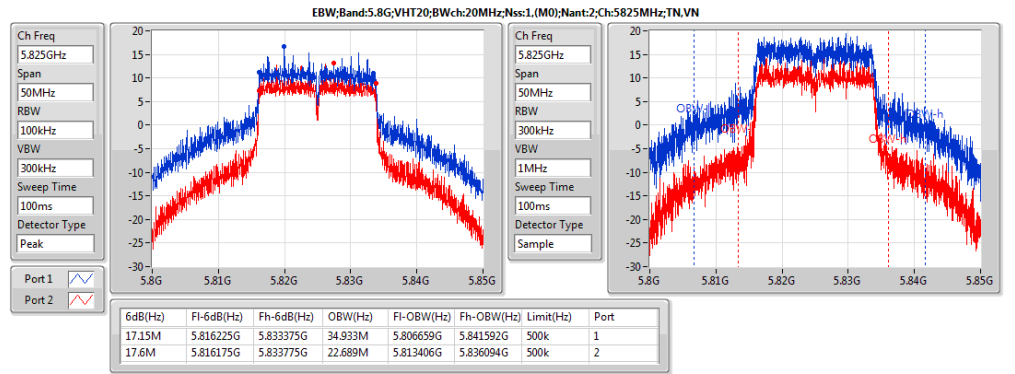
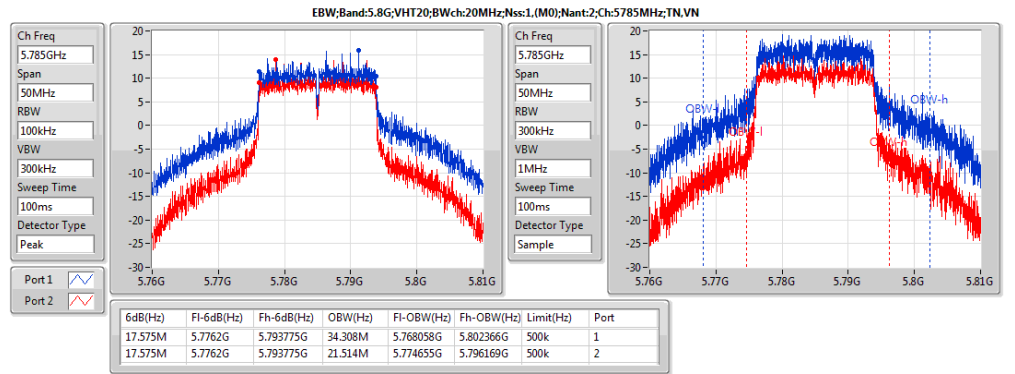
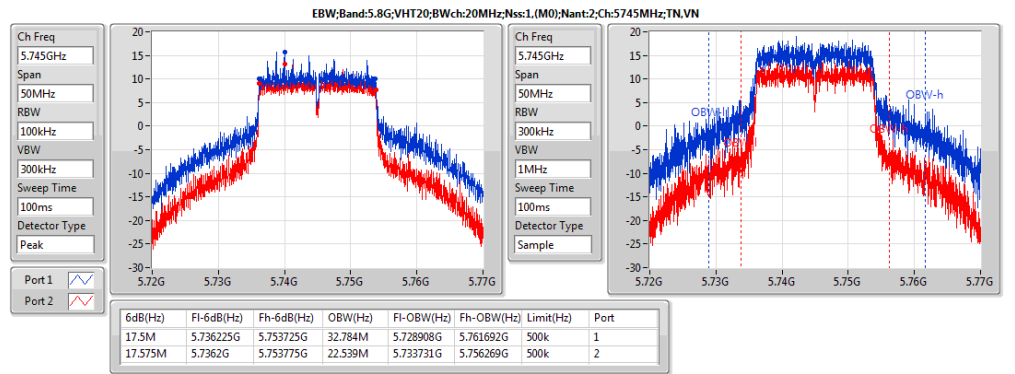
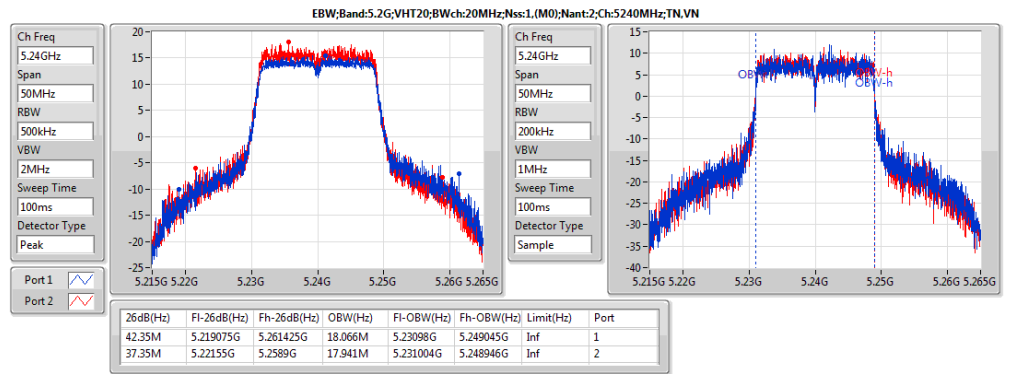
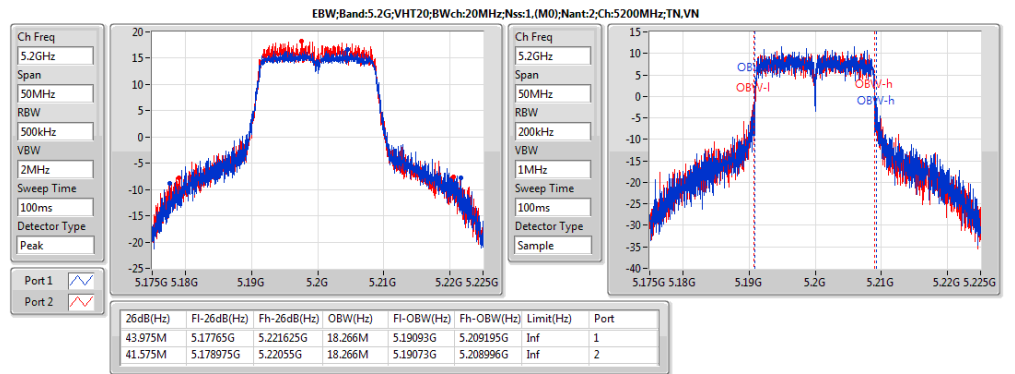
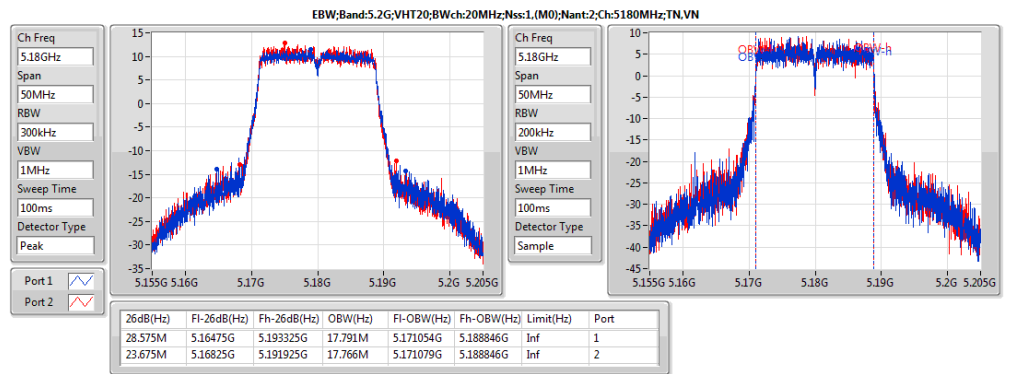
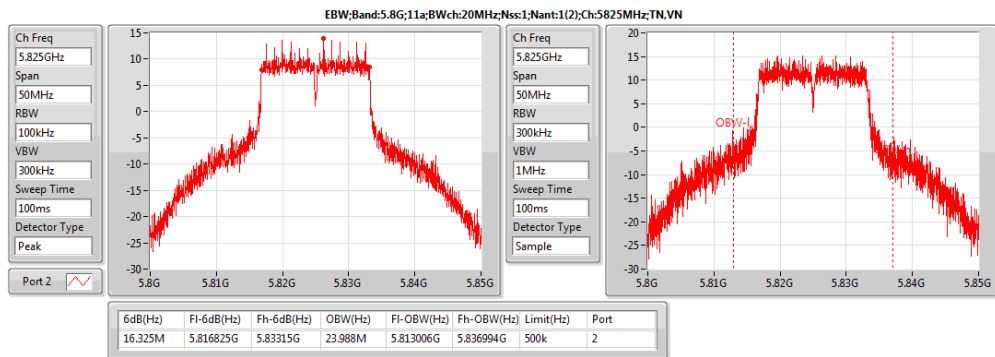
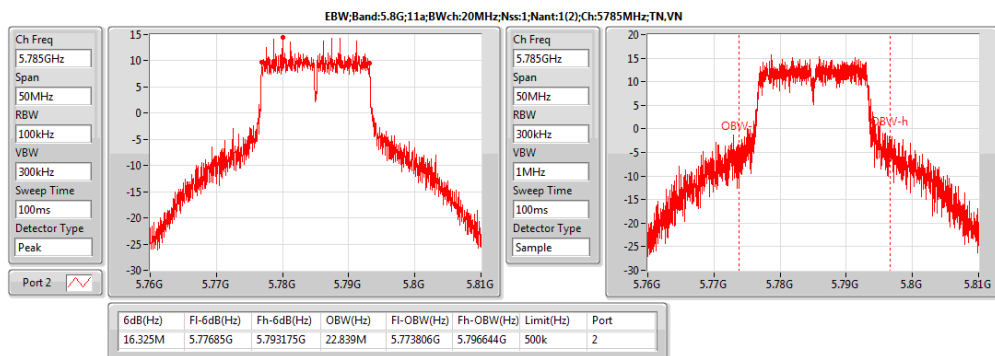
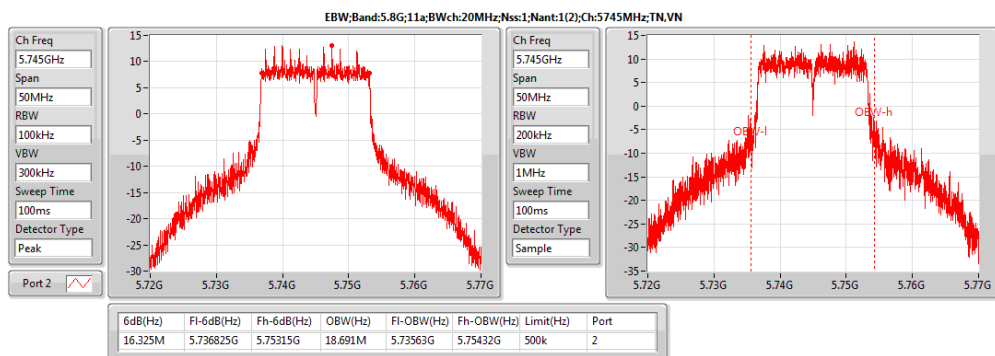
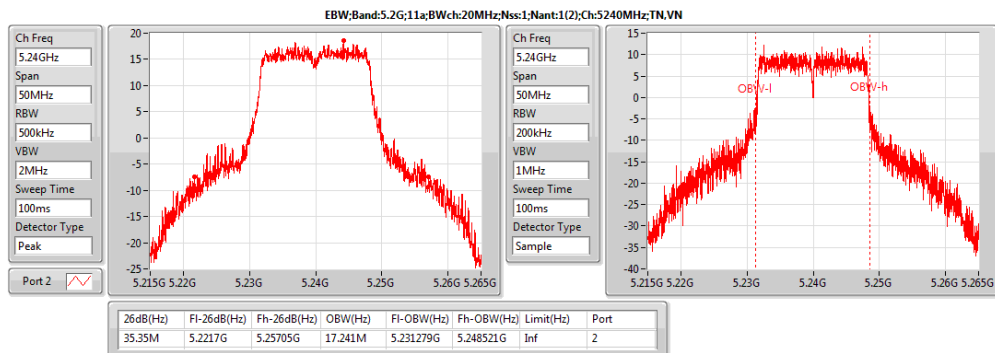
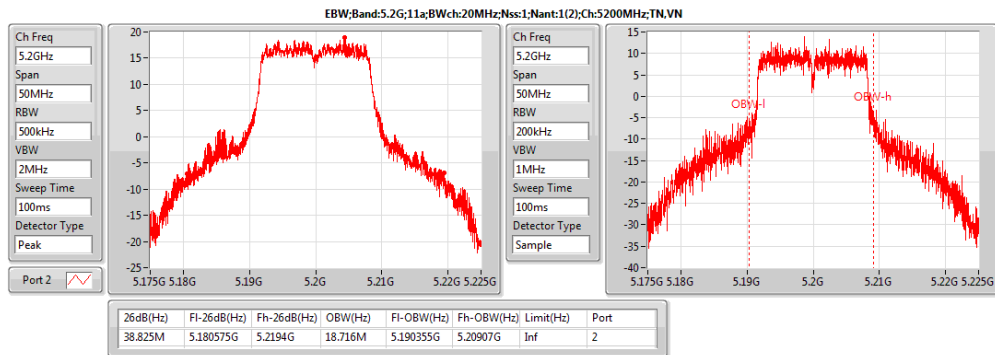
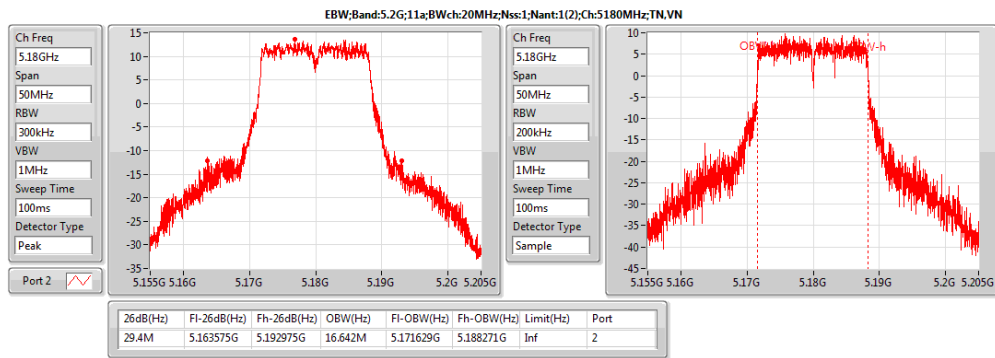
Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
5.2G;11a;Nss1;Ntx1(2)	38.825M	18.716M	18M7D1D	29.4M	16.642M
5.8G;11a;Nss1;Ntx1(2)	16.325M	23.988M	24M0D1D	16.325M	18.691M
5.2G;VHT20;Nss1,(M0);Ntx2	43.975M	18.266M	18M3D1D	23.675M	17.766M
5.8G;VHT20;Nss1,(M0);Ntx2	17.6M	34.933M	34M9D1D	17.15M	21.514M
5.2G;VHT40;Nss1,(M0);Ntx2	94.3M	36.532M	36M5D1D	39.6M	36.232M
5.8G;VHT40;Nss1,(M0);Ntx2	36.35M	51.224M	51M2D1D	35.75M	38.981M
5.2G;VHT80;Nss1,(M0);Ntx2	82M	75.862M	75M9D1D	81.8M	75.662M
5.8G;VHT80;Nss1,(M0);Ntx2	75.7M	75.862M	75M9D1D	75.4M	75.762M



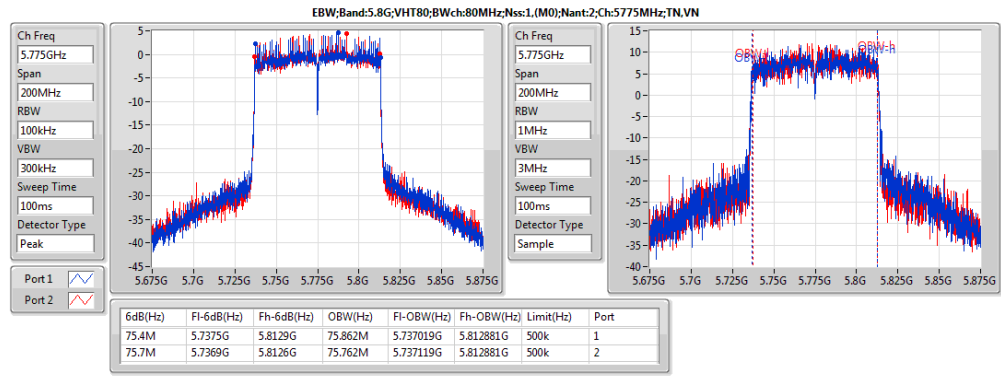
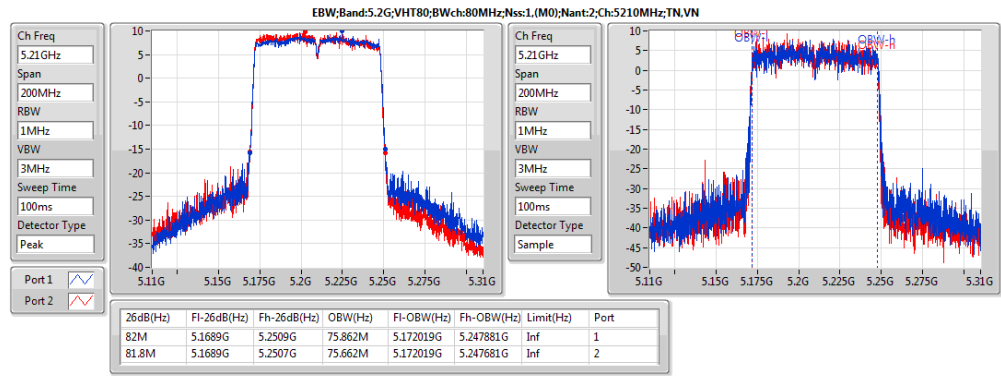
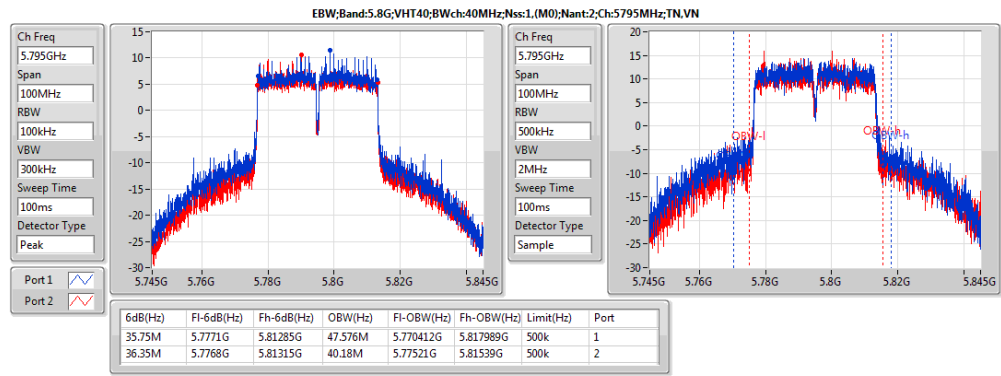
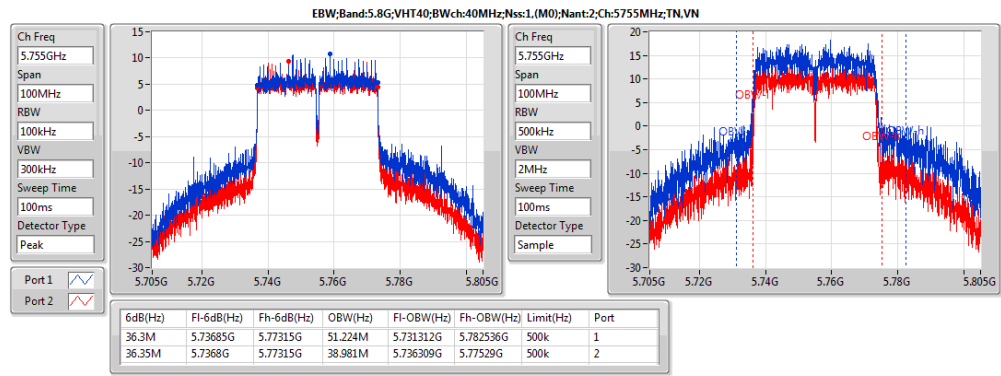
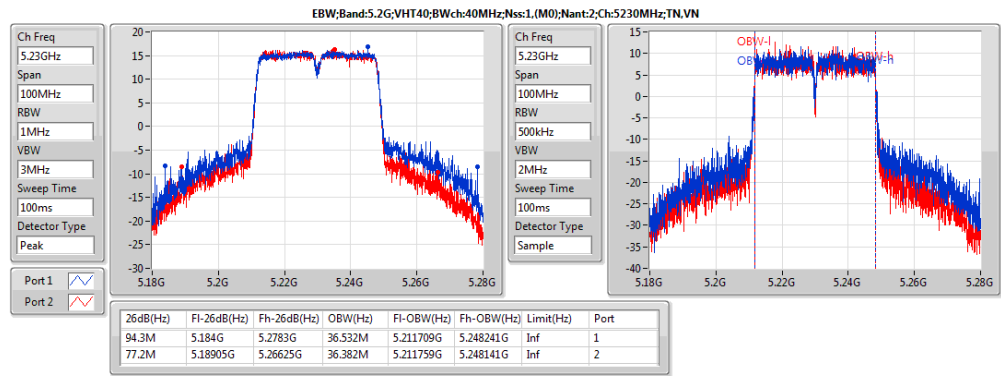
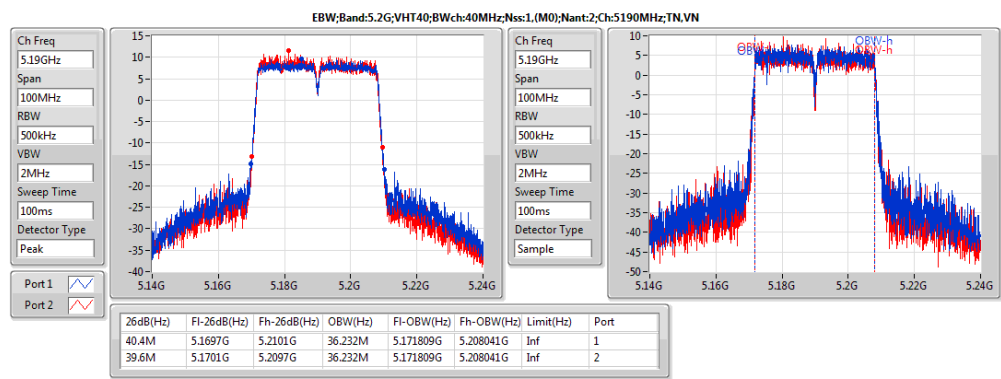
Result

Mode	Result	Limit (Hz)	P1-N dB (Hz)	P1-OBW (Hz)	P2-N dB (Hz)	P2-OBW (Hz)
5.2G;11a;Nss1;Ntx1(2);5180	Pass	Inf			29.4M	16.642M
5.2G;11a;Nss1;Ntx1(2);5200	Pass	Inf			38.825M	18.716M
5.2G;11a;Nss1;Ntx1(2);5240	Pass	Inf			35.35M	17.241M
5.8G;11a;Nss1;Ntx1(2);5745	Pass	500k			16.325M	18.691M
5.8G;11a;Nss1;Ntx1(2);5785	Pass	500k			16.325M	22.839M
5.8G;11a;Nss1;Ntx1(2);5825	Pass	500k			16.325M	23.988M
5.2G;VHT20;Nss1,(M0);Ntx2;5180	Pass	Inf	28.575M	17.791M	23.675M	17.766M
5.2G;VHT20;Nss1,(M0);Ntx2;5200	Pass	Inf	43.975M	18.266M	41.575M	18.266M
5.2G;VHT20;Nss1,(M0);Ntx2;5240	Pass	Inf	42.35M	18.066M	37.35M	17.941M
5.8G;VHT20;Nss1,(M0);Ntx2;5745	Pass	500k	17.5M	32.784M	17.575M	22.539M
5.8G;VHT20;Nss1,(M0);Ntx2;5785	Pass	500k	17.575M	34.308M	17.575M	21.514M
5.8G;VHT20;Nss1,(M0);Ntx2;5825	Pass	500k	17.15M	34.933M	17.6M	22.689M
5.2G;VHT40;Nss1,(M0);Ntx2;5190	Pass	Inf	40.4M	36.232M	39.6M	36.232M
5.2G;VHT40;Nss1,(M0);Ntx2;5230	Pass	Inf	94.3M	36.532M	77.2M	36.382M
5.8G;VHT40;Nss1,(M0);Ntx2;5755	Pass	500k	36.3M	51.224M	36.35M	38.981M
5.8G;VHT40;Nss1,(M0);Ntx2;5795	Pass	500k	35.75M	47.576M	36.35M	40.18M
5.2G;VHT80;Nss1,(M0);Ntx2;5210	Pass	Inf	82M	75.862M	81.8M	75.662M
5.8G;VHT80;Nss1,(M0);Ntx2;5775	Pass	500k	75.4M	75.862M	75.7M	75.762M





EBW Result





Summary

Mode	Sum (dBm)	Sum (W)	EIRP (dBm)	EIRP (W)
5.2G;11a;Nss1;Ntx1(2)	23.90	0.24547	26.68	0.46559
5.8G;11a;Nss1;Ntx1(2)	25.24	0.3342	28.02	0.63387
5.2G;VHT20;Nss1,(M0);Ntx2	26.14	0.41115	28.92	0.77983
5.8G;VHT20;Nss1,(M0);Ntx2	28.75	0.74989	31.53	1.42233
5.2G;VHT40;Nss1,(M0);Ntx2	24.47	0.2799	27.25	0.53088
5.8G;VHT40;Nss1,(M0);Ntx2	27.89	0.61518	30.67	1.16681
5.2G;VHT80;Nss1,(M0);Ntx2	20.31	0.1074	23.09	0.2037
5.8G;VHT80;Nss1,(M0);Ntx2	24.04	0.25351	26.82	0.48084



Result

Mode	Result	DG (dBi)	Sum (dBm)	Sum Lim. (dBm)	EIRP (dBm)	EIRP Lim. (dBm)	P1 (dBm)	P2 (dBm)
5.2G;11a;Nss1;Ntx1(2);5180	Pass	2.78	21.07	30.00	23.85	36.00		21.07
5.2G;11a;Nss1;Ntx1(2);5200	Pass	2.78	23.90	30.00	26.68	36.00		23.90
5.2G;11a;Nss1;Ntx1(2);5240	Pass	2.78	23.36	30.00	26.14	36.00		23.36
5.8G;11a;Nss1;Ntx1(2);5745	Pass	2.78	25.24	30.00	28.02	36.00		25.24
5.8G;11a;Nss1;Ntx1(2);5785	Pass	2.78	25.16	30.00	27.94	36.00		25.16
5.8G;11a;Nss1;Ntx1(2);5825	Pass	2.78	24.94	30.00	27.72	36.00		24.94
5.2G;VHT20;Nss1,(M0);Ntx2;5180	Pass	2.78	23.41	30.00	26.19	36.00	20.36	20.43
5.2G;VHT20;Nss1,(M0);Ntx2;5200	Pass	2.78	26.14	30.00	28.92	36.00	23.04	23.21
5.2G;VHT20;Nss1,(M0);Ntx2;5240	Pass	2.78	25.43	30.00	28.21	36.00	22.33	22.51
5.8G;VHT20;Nss1,(M0);Ntx2;5745	Pass	2.78	28.75	30.00	31.53	36.00	26.46	24.87
5.8G;VHT20;Nss1,(M0);Ntx2;5785	Pass	2.78	28.60	30.00	31.38	36.00	26.40	24.60
5.8G;VHT20;Nss1,(M0);Ntx2;5825	Pass	2.78	28.62	30.00	31.40	36.00	26.48	24.51
5.2G;VHT40;Nss1,(M0);Ntx2;5190	Pass	2.78	21.63	30.00	24.41	36.00	18.86	18.36
5.2G;VHT40;Nss1,(M0);Ntx2;5230	Pass	2.78	24.47	30.00	27.25	36.00	21.84	21.05
5.8G;VHT40;Nss1,(M0);Ntx2;5755	Pass	2.78	27.89	30.00	30.67	36.00	25.30	24.42
5.8G;VHT40;Nss1,(M0);Ntx2;5795	Pass	2.78	27.86	30.00	30.64	36.00	25.29	24.35
5.2G;VHT80;Nss1,(M0);Ntx2;5210	Pass	2.78	20.31	30.00	23.09	36.00	17.39	17.20
5.8G;VHT80;Nss1,(M0);Ntx2;5775	Pass	2.78	24.04	30.00	26.82	36.00	21.23	20.83



Summary

Mode	PD (dBm/RBW)	EIRP.PD (dBm/RBW)
5.2G;11a;Nss1;Ntx1(2)	11.19	13.97
5.8G;11a;Nss1;Ntx1(2)	10.93	13.71
5.2G;VHT20;Nss1,(M0);Ntx2	13.03	18.82
5.8G;VHT20;Nss1,(M0);Ntx2	14.12	19.91
5.2G;VHT40;Nss1,(M0);Ntx2	8.92	14.71
5.8G;VHT40;Nss1,(M0);Ntx2	10.37	16.16
5.2G;VHT80;Nss1,(M0);Ntx2	2.22	8.01
5.8G;VHT80;Nss1,(M0);Ntx2	4.28	10.07



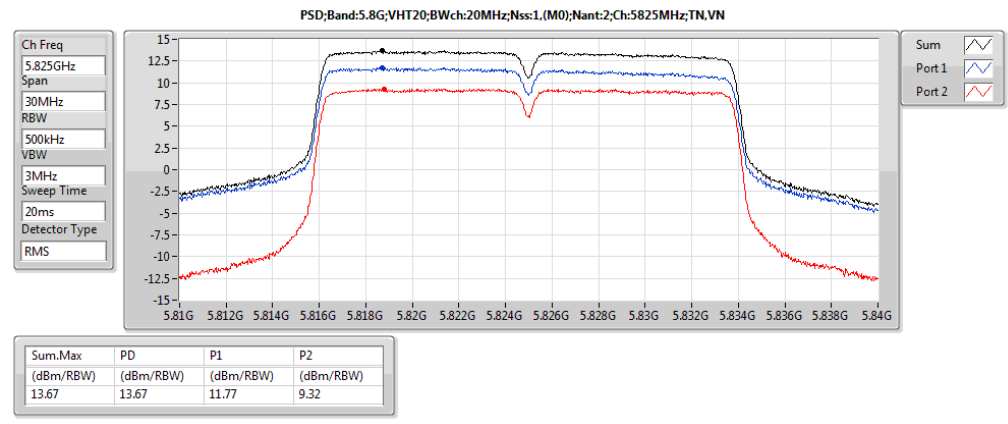
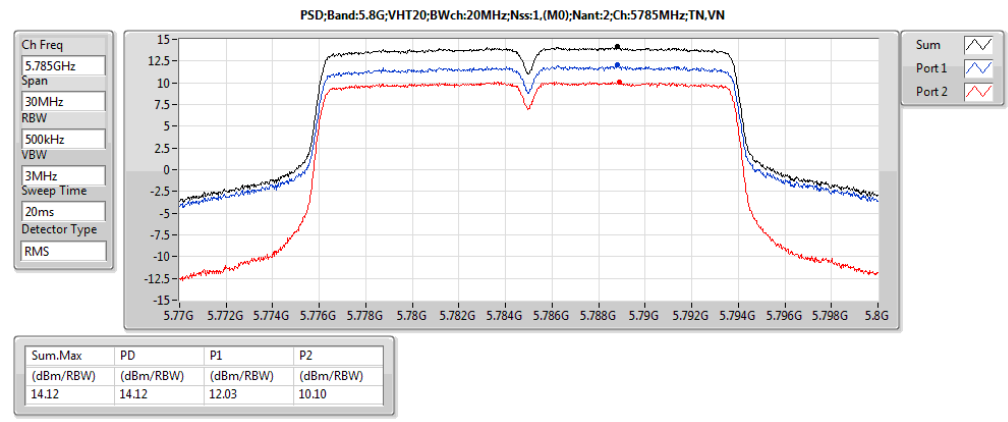
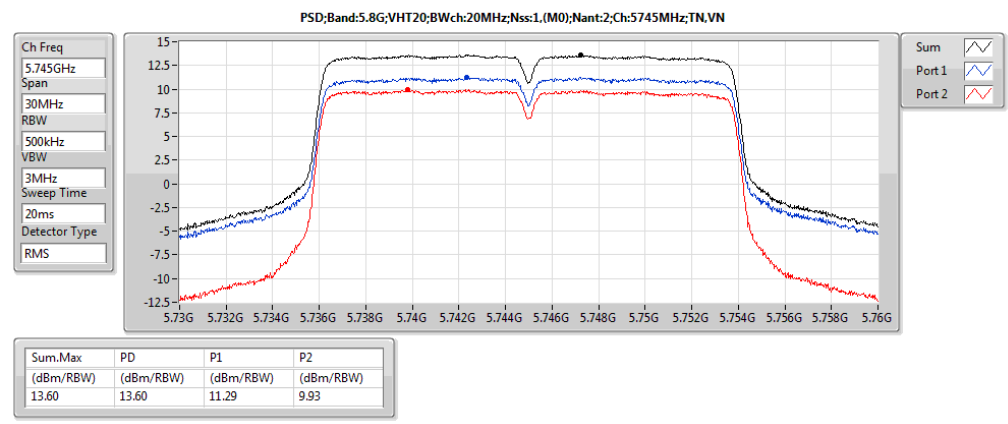
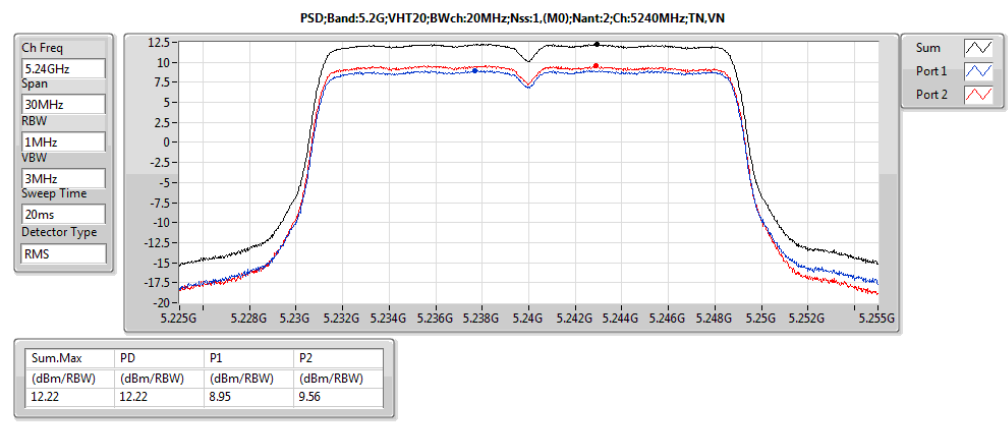
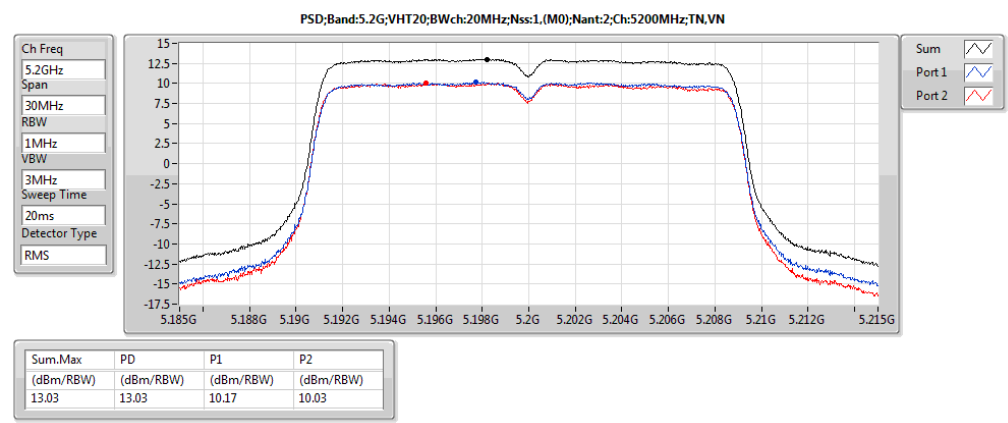
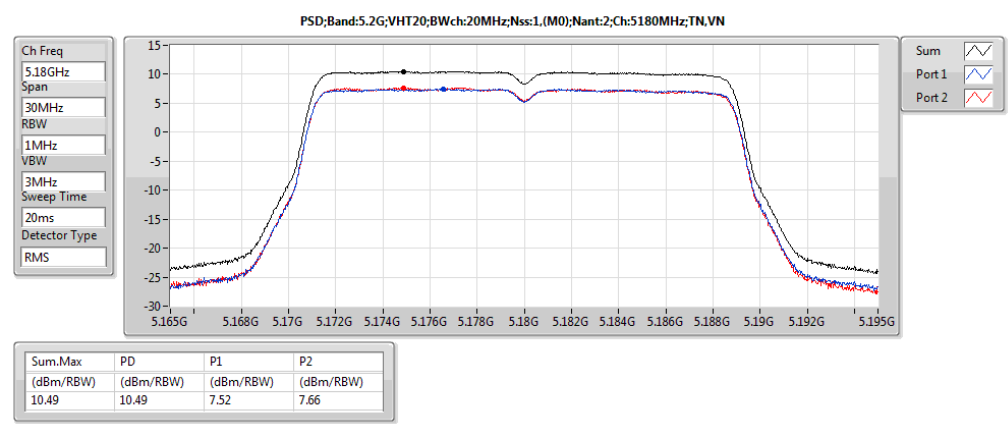
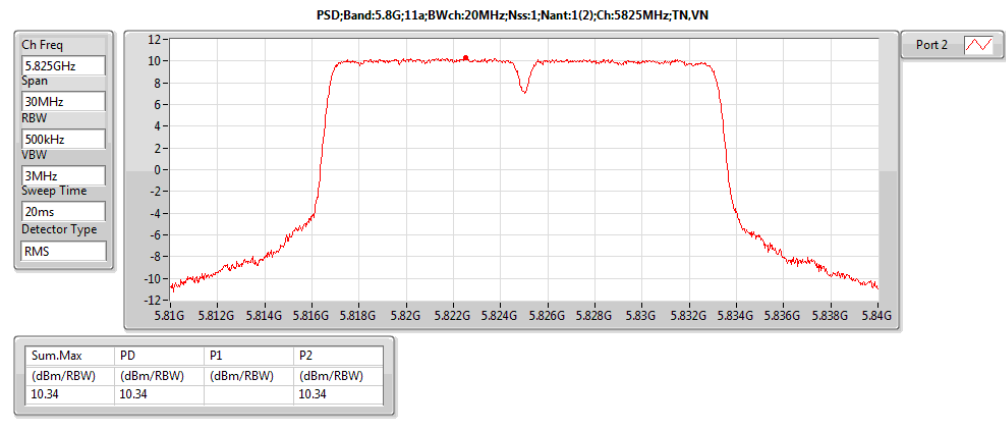
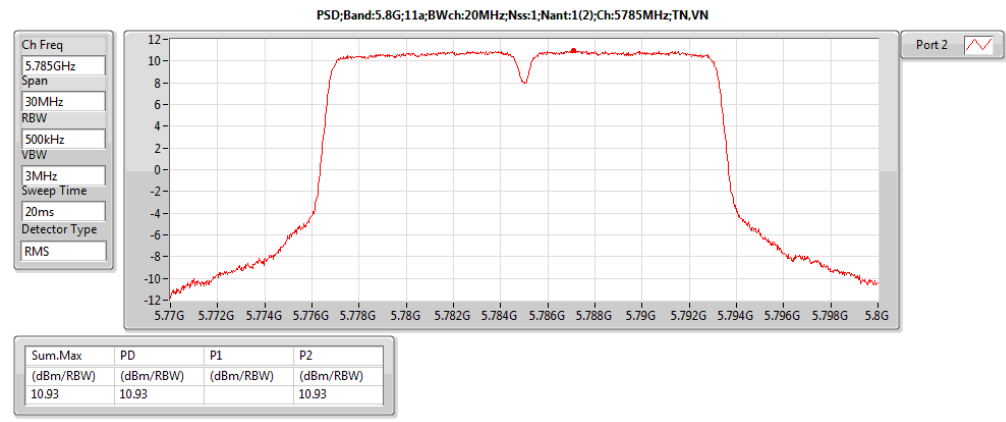
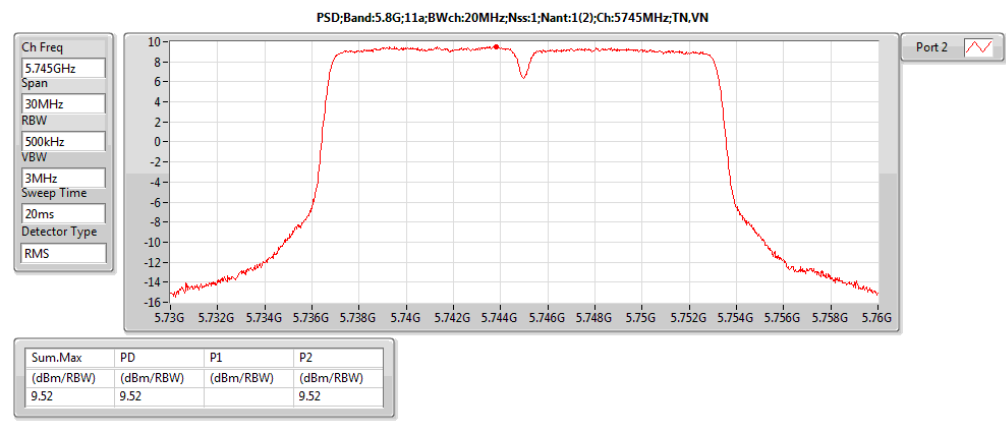
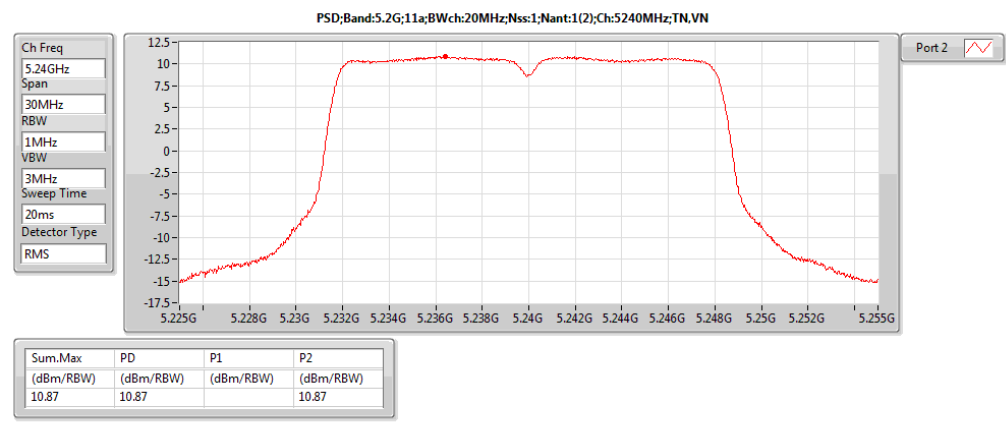
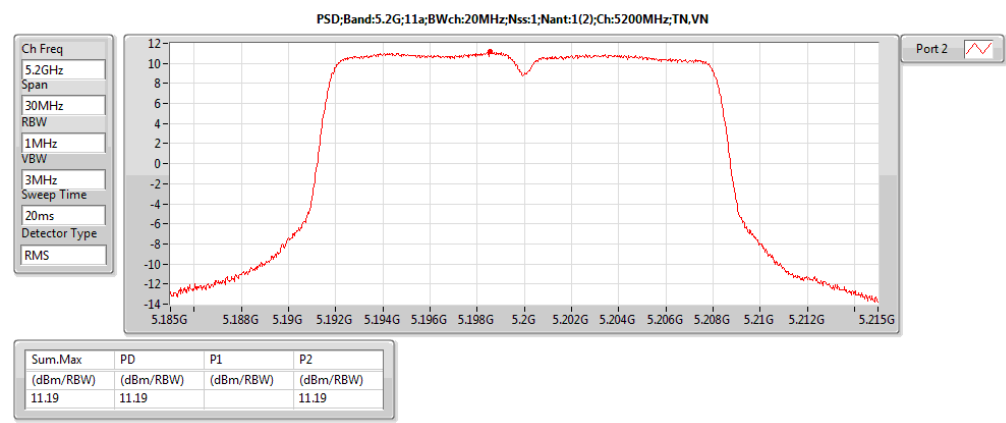
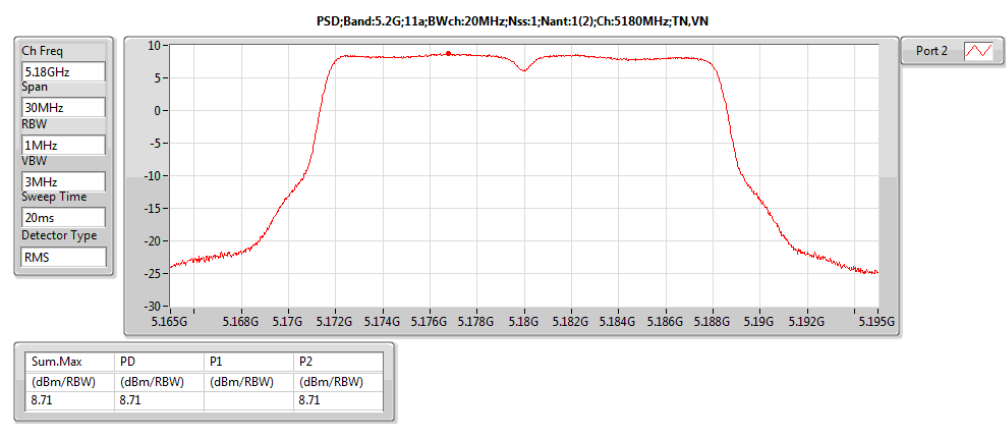
Result

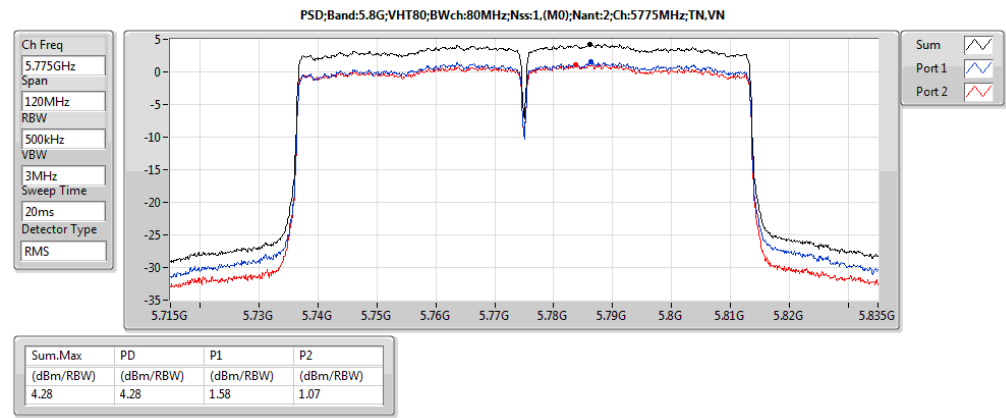
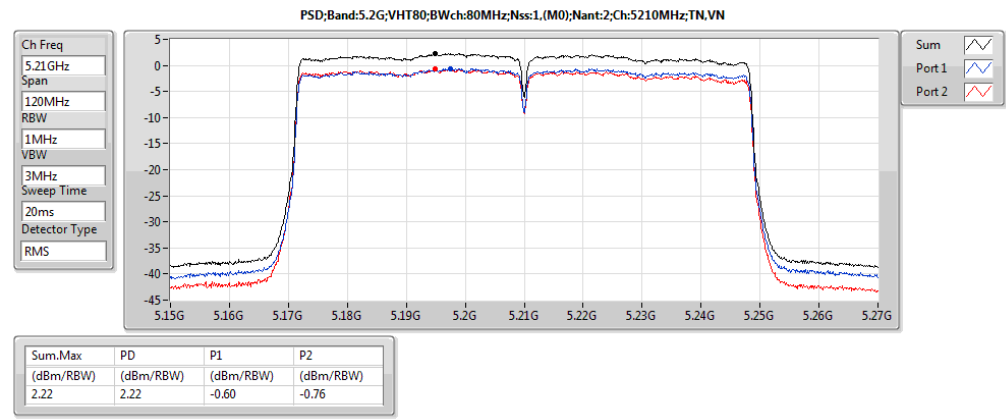
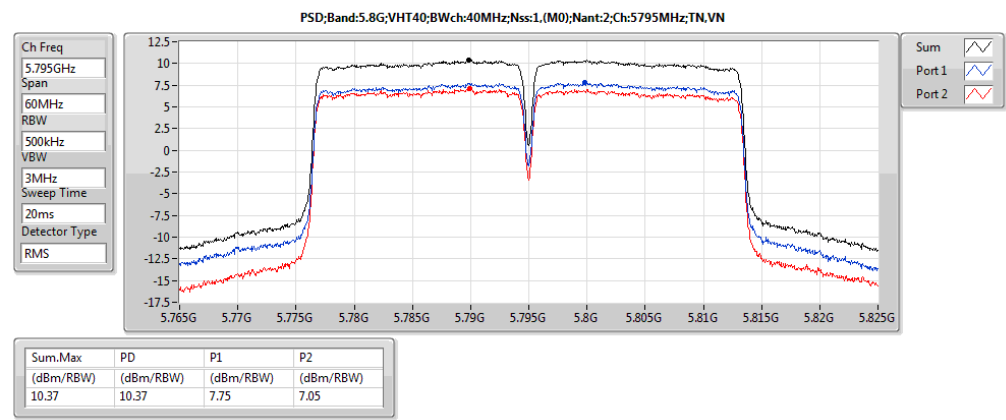
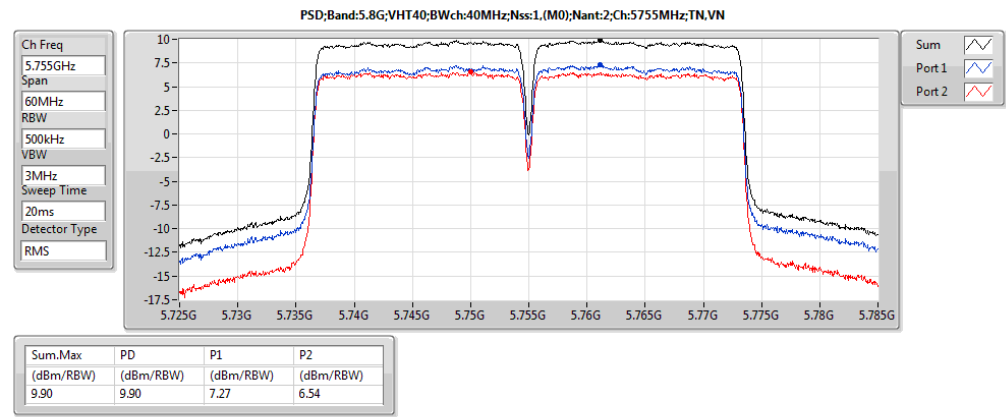
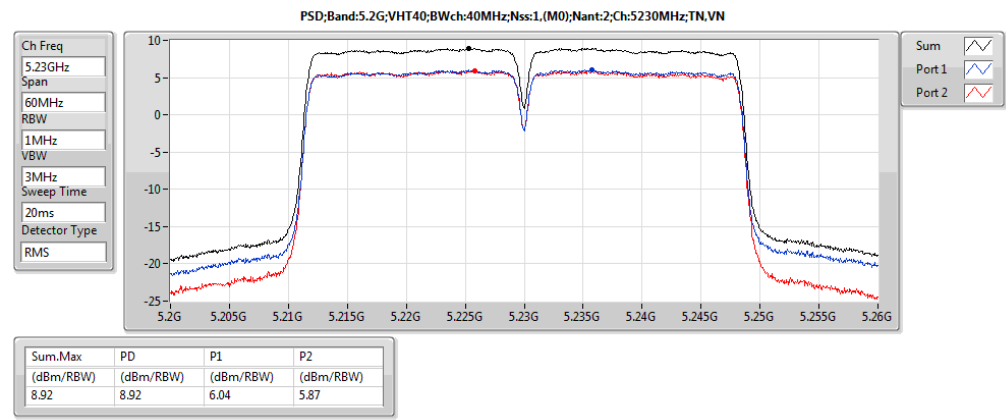
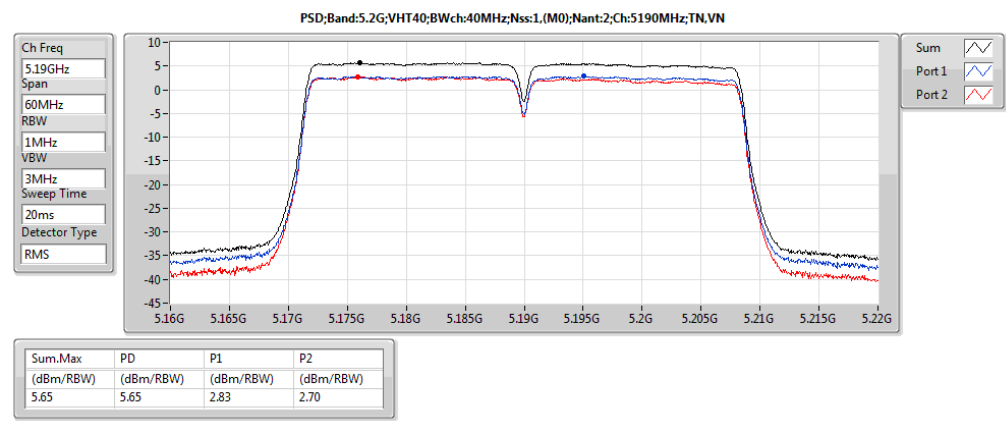
Mode	Result	DG (dBi)	PD (dBm/RBW)	PD.Limit (dBm/RBW)	P1 (dBm/RBW)	P2 (dBm/RBW)
5.2G;11a;Nss1;Ntx1(2);5180	Pass	2.78	8.71	17.00		8.71
5.2G;11a;Nss1;Ntx1(2);5200	Pass	2.78	11.19	17.00		11.19
5.2G;11a;Nss1;Ntx1(2);5240	Pass	2.78	10.87	17.00		10.87
5.8G;11a;Nss1;Ntx1(2);5745	Pass	2.78	9.52	30.00		9.52
5.8G;11a;Nss1;Ntx1(2);5785	Pass	2.78	10.93	30.00		10.93
5.8G;11a;Nss1;Ntx1(2);5825	Pass	2.78	10.34	30.00		10.34
5.2G;VHT20;Nss1,(M0);Ntx2;5180	Pass	5.79	10.49	17.00	7.52	7.66
5.2G;VHT20;Nss1,(M0);Ntx2;5200	Pass	5.79	13.03	17.00	10.17	10.03
5.2G;VHT20;Nss1,(M0);Ntx2;5240	Pass	5.79	12.22	17.00	8.95	9.56
5.8G;VHT20;Nss1,(M0);Ntx2;5745	Pass	5.79	13.60	30.00	11.29	9.93
5.8G;VHT20;Nss1,(M0);Ntx2;5785	Pass	5.79	14.12	30.00	12.03	10.10
5.8G;VHT20;Nss1,(M0);Ntx2;5825	Pass	5.79	13.67	30.00	11.77	9.32
5.2G;VHT40;Nss1,(M0);Ntx2;5190	Pass	5.79	5.65	17.00	2.83	2.70
5.2G;VHT40;Nss1,(M0);Ntx2;5230	Pass	5.79	8.92	17.00	6.04	5.87
5.8G;VHT40;Nss1,(M0);Ntx2;5755	Pass	5.79	9.90	30.00	7.27	6.54
5.8G;VHT40;Nss1,(M0);Ntx2;5795	Pass	5.79	10.37	30.00	7.75	7.05
5.2G;VHT80;Nss1,(M0);Ntx2;5210	Pass	5.79	2.22	17.00	-0.60	-0.76
5.8G;VHT80;Nss1,(M0);Ntx2;5775	Pass	5.79	4.28	30.00	1.58	1.07



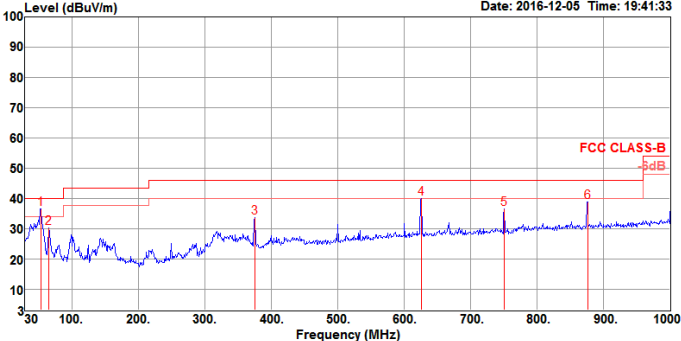
PSD Result

Appendix D



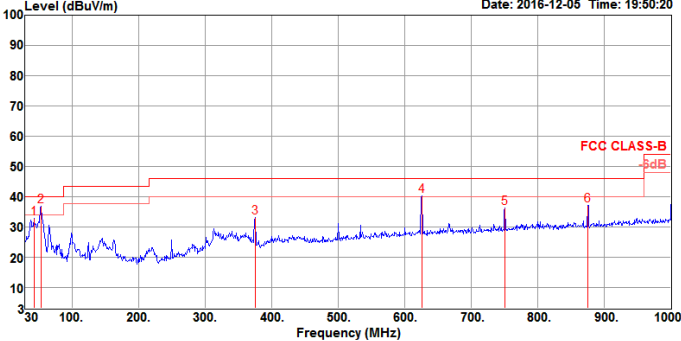




RSE below 1GHz Result												
Operating Mode	3				Polarization				Horizontal			
Operating Function	CTX											
Level (dBuV/m) Date: 2016-12-05 Time: 19:41:33 												
	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	53.28	36.44	40.00	-3.56	53.54	0.81	14.48	32.39	100	247 Peak	HORIZONTAL	
2	65.89	30.12	40.00	-9.88	48.39	0.91	13.23	32.41	125	114 Peak	HORIZONTAL	
3	375.32	33.60	46.00	-12.40	41.61	2.22	22.08	32.31	100	117 Peak	HORIZONTAL	
4	625.58	40.00	46.00	-6.00	43.75	2.88	25.77	32.40	100	128 Peak	HORIZONTAL	
5	750.71	36.42	46.00	-9.58	39.13	3.17	26.40	32.28	125	228 Peak	HORIZONTAL	
6	875.84	38.74	46.00	-7.26	39.57	3.43	27.55	31.81	100	116 Peak	HORIZONTAL	

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

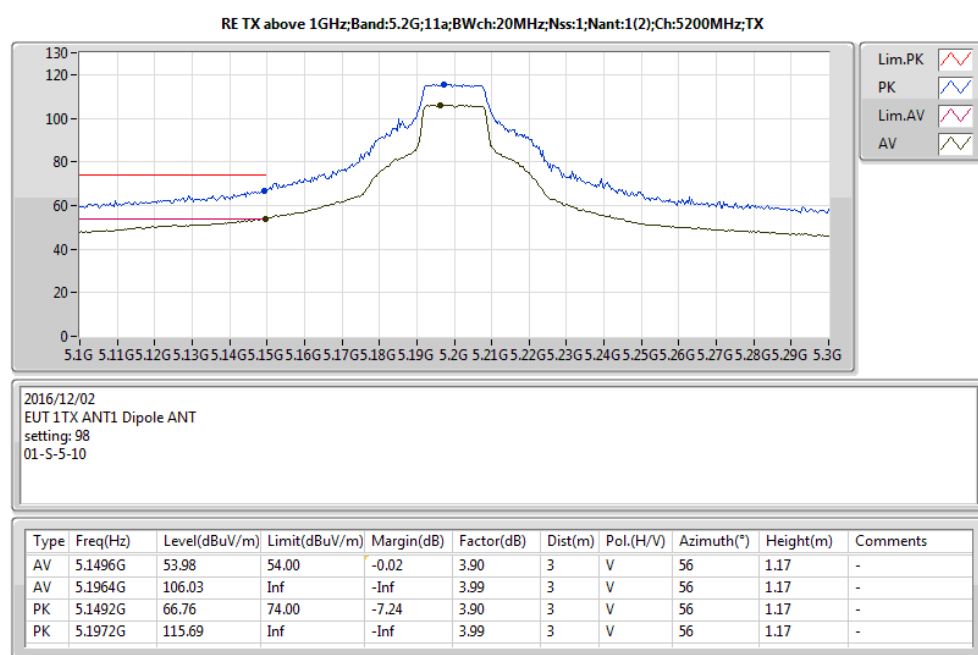
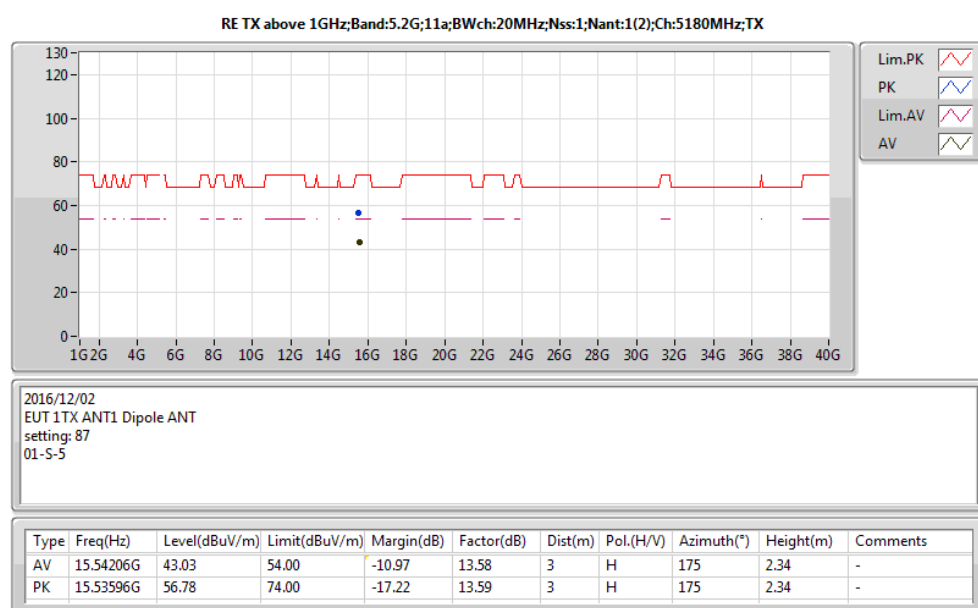
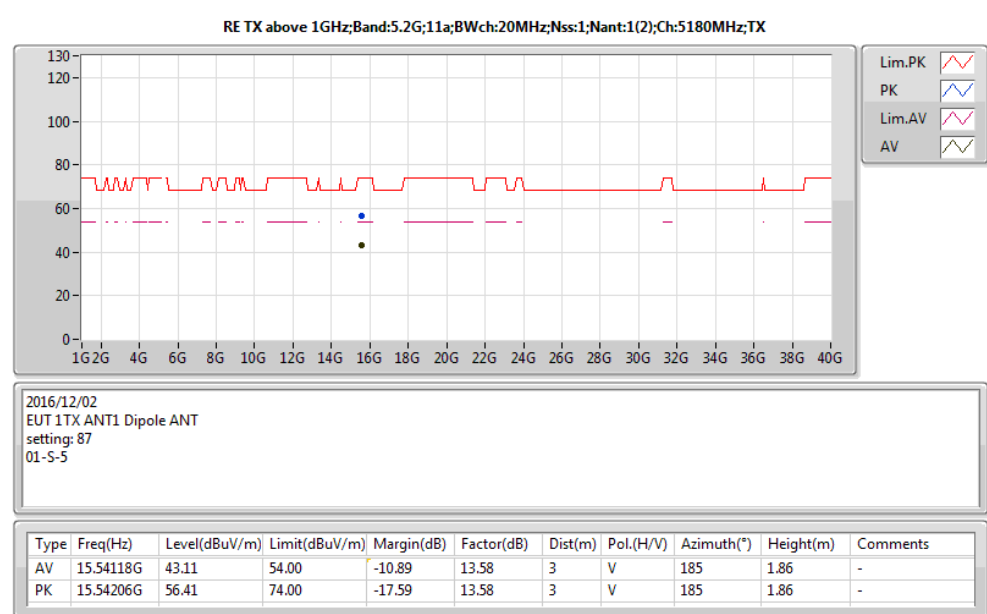
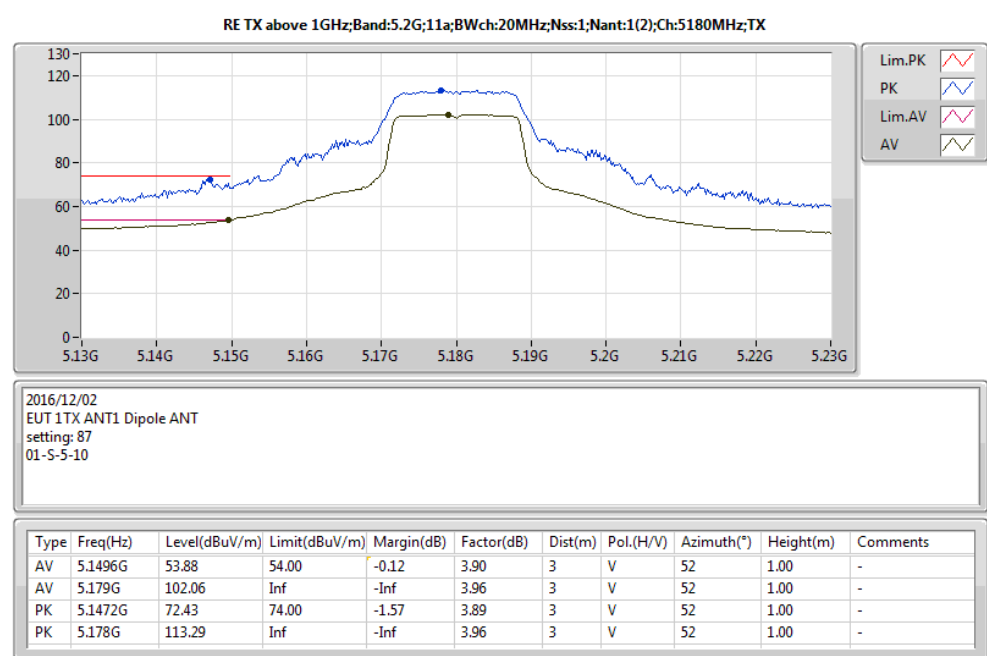
Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

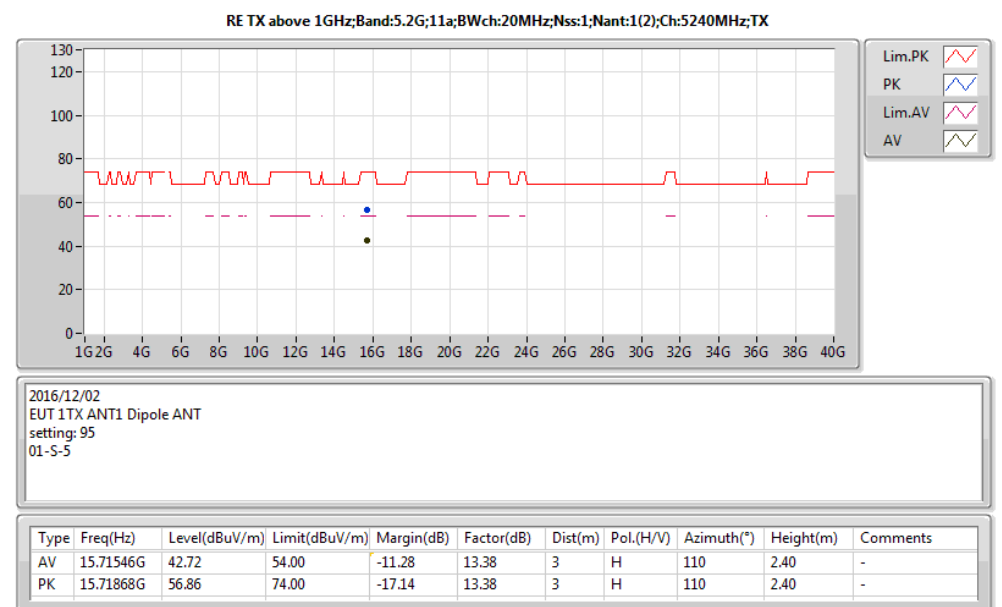
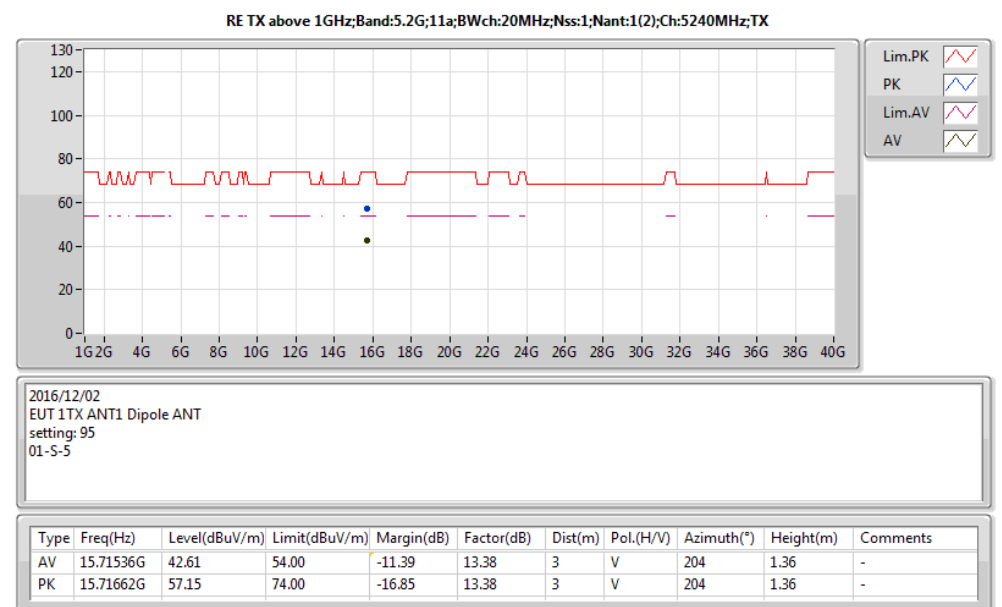
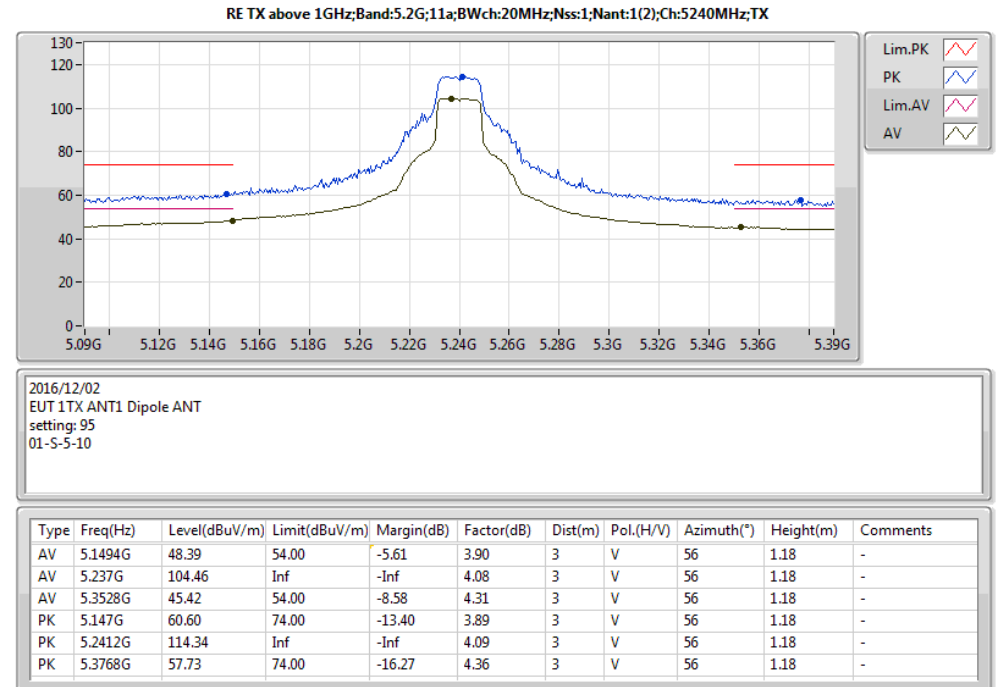
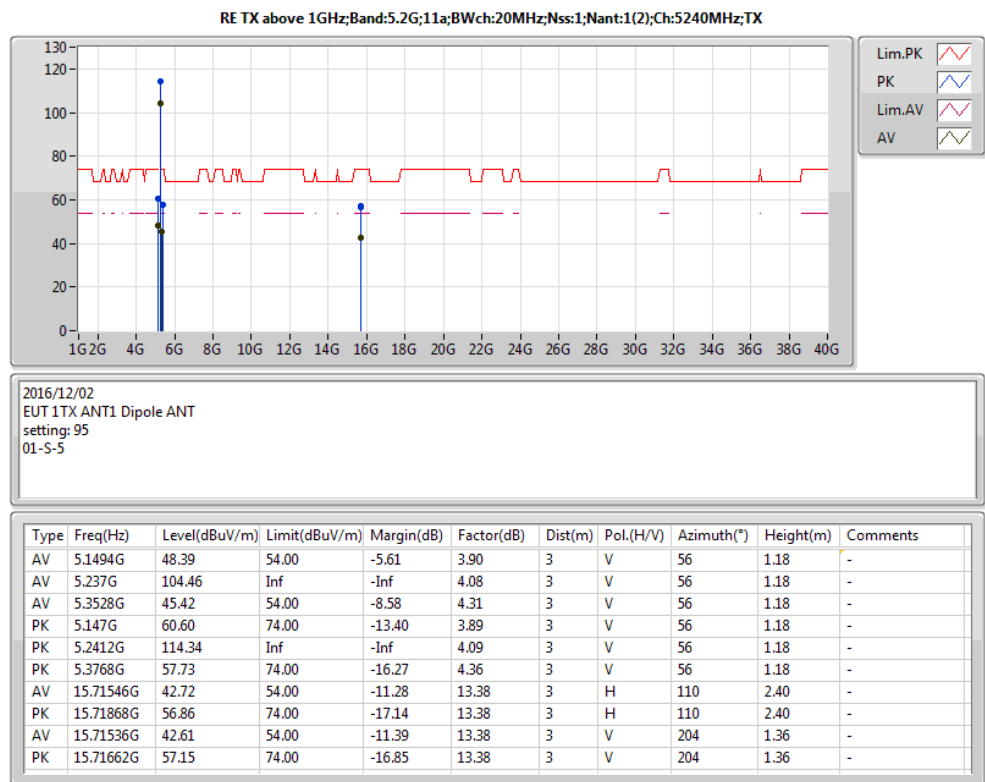
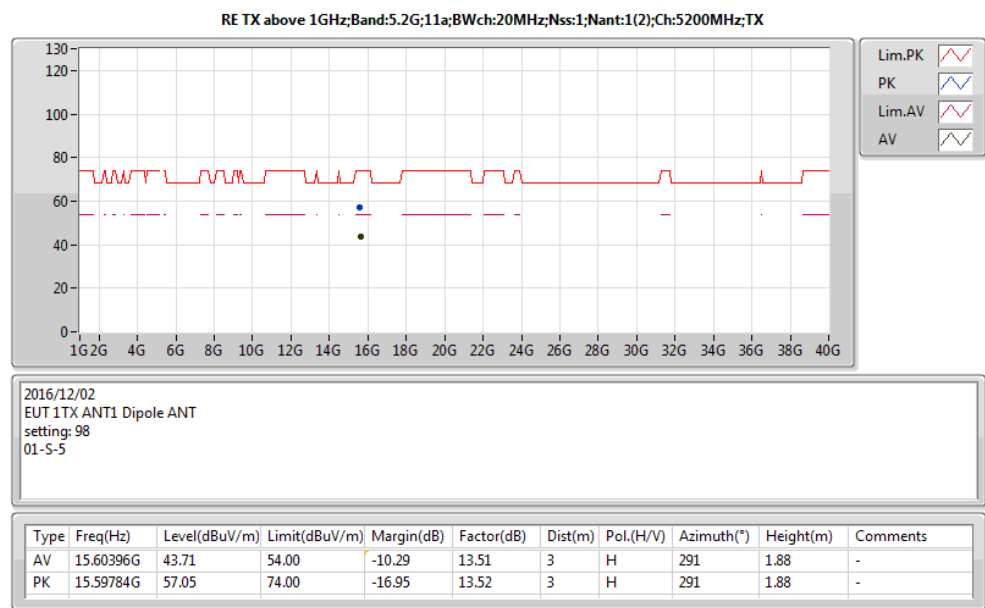
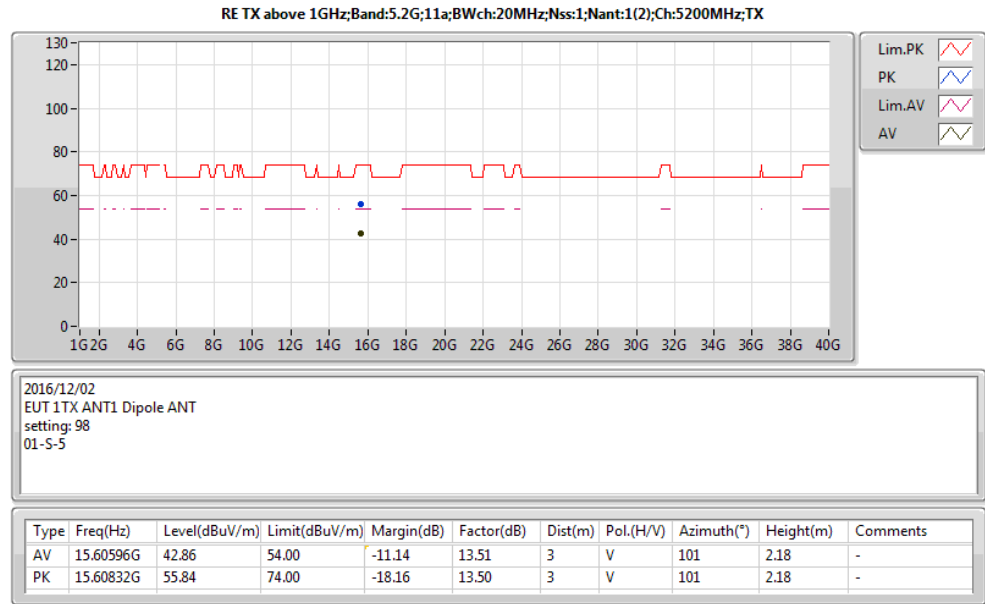
RSE below 1GHz Result																																																																																																												
Operating Mode	3					Power Phase			Vertical																																																																																																			
Operating Function	CTX																																																																																																											
Level (dBuV/m) Date: 2016-12-05 Time: 19:50:20 																																																																																																												
<table><tr><th></th><th>Freq</th><th>Level</th><th>Limit</th><th>Over</th><th>Read</th><th>CableAntenna</th><th>Preamp</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th><th>Pol/Phase</th></tr><tr><th></th><th>MHz</th><th>dBuV/m</th><th>dBuV/m</th><th>dB</th><th>dBuV</th><th>dB</th><th>dB/m</th><th>dB</th><th>cm</th><th>deg</th><th></th></tr><tr><td>1</td><td>42.61</td><td>32.63</td><td>40.00</td><td>-7.37</td><td>45.92</td><td>0.73</td><td>18.56</td><td>32.58</td><td>100</td><td>111 Peak</td><td>VERTICAL</td></tr><tr><td>2</td><td>53.28</td><td>36.90</td><td>40.00</td><td>-3.10</td><td>54.00</td><td>0.81</td><td>14.48</td><td>32.39</td><td>125</td><td>126 Peak</td><td>VERTICAL</td></tr><tr><td>3</td><td>375.32</td><td>33.14</td><td>46.00</td><td>-12.86</td><td>41.15</td><td>2.22</td><td>22.08</td><td>32.31</td><td>100</td><td>135 Peak</td><td>VERTICAL</td></tr><tr><td>4</td><td>625.58</td><td>40.11</td><td>46.00</td><td>-5.89</td><td>43.86</td><td>2.88</td><td>25.77</td><td>32.40</td><td>100</td><td>135 Peak</td><td>VERTICAL</td></tr><tr><td>5</td><td>750.71</td><td>36.08</td><td>46.00</td><td>-9.92</td><td>38.79</td><td>3.17</td><td>26.40</td><td>32.28</td><td>125</td><td>114 Peak</td><td>VERTICAL</td></tr><tr><td>6</td><td>874.87</td><td>37.07</td><td>46.00</td><td>-8.93</td><td>37.90</td><td>3.43</td><td>27.55</td><td>31.81</td><td>100</td><td>149 Peak</td><td>VERTICAL</td></tr></table>														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	42.61	32.63	40.00	-7.37	45.92	0.73	18.56	32.58	100	111 Peak	VERTICAL	2	53.28	36.90	40.00	-3.10	54.00	0.81	14.48	32.39	125	126 Peak	VERTICAL	3	375.32	33.14	46.00	-12.86	41.15	2.22	22.08	32.31	100	135 Peak	VERTICAL	4	625.58	40.11	46.00	-5.89	43.86	2.88	25.77	32.40	100	135 Peak	VERTICAL	5	750.71	36.08	46.00	-9.92	38.79	3.17	26.40	32.28	125	114 Peak	VERTICAL	6	874.87	37.07	46.00	-8.93	37.90	3.43	27.55	31.81	100	149 Peak	VERTICAL
	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	42.61	32.63	40.00	-7.37	45.92	0.73	18.56	32.58	100	111 Peak	VERTICAL																																																																																																	
2	53.28	36.90	40.00	-3.10	54.00	0.81	14.48	32.39	125	126 Peak	VERTICAL																																																																																																	
3	375.32	33.14	46.00	-12.86	41.15	2.22	22.08	32.31	100	135 Peak	VERTICAL																																																																																																	
4	625.58	40.11	46.00	-5.89	43.86	2.88	25.77	32.40	100	135 Peak	VERTICAL																																																																																																	
5	750.71	36.08	46.00	-9.92	38.79	3.17	26.40	32.28	125	114 Peak	VERTICAL																																																																																																	
6	874.87	37.07	46.00	-8.93	37.90	3.43	27.55	31.81	100	149 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.)																																																																																																												

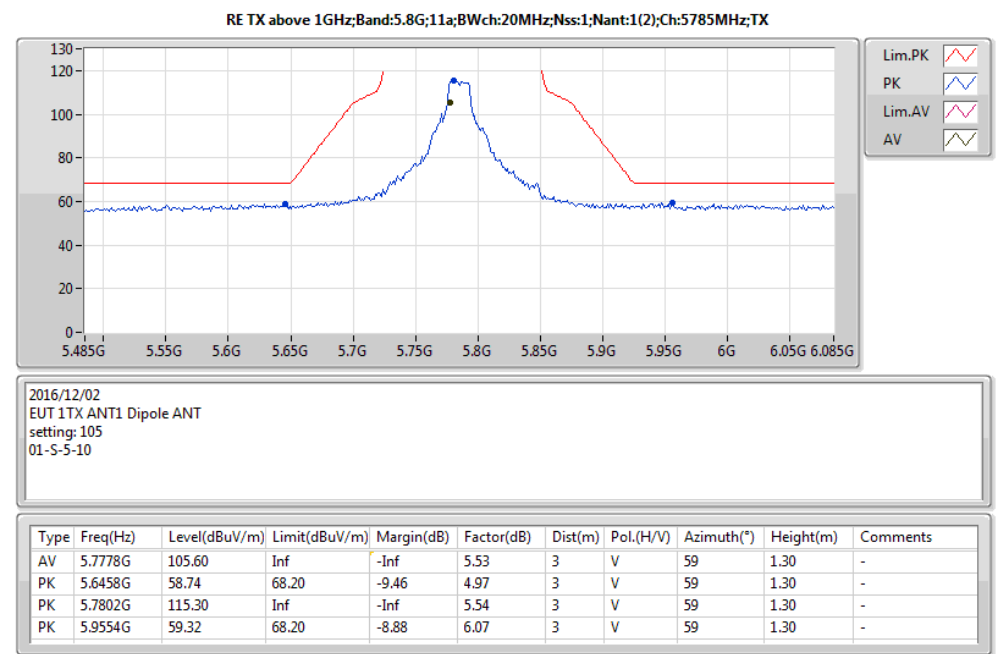
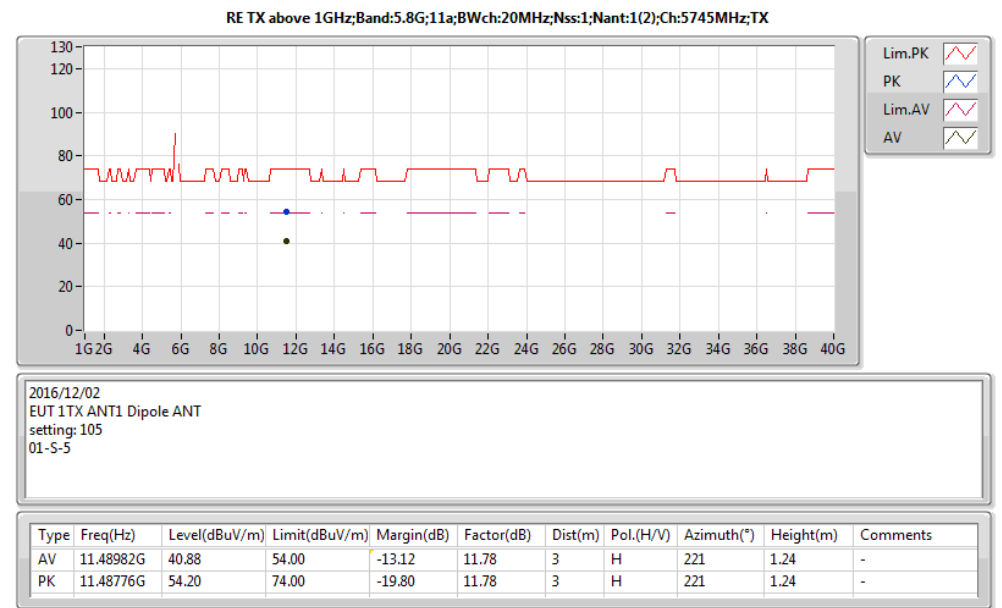
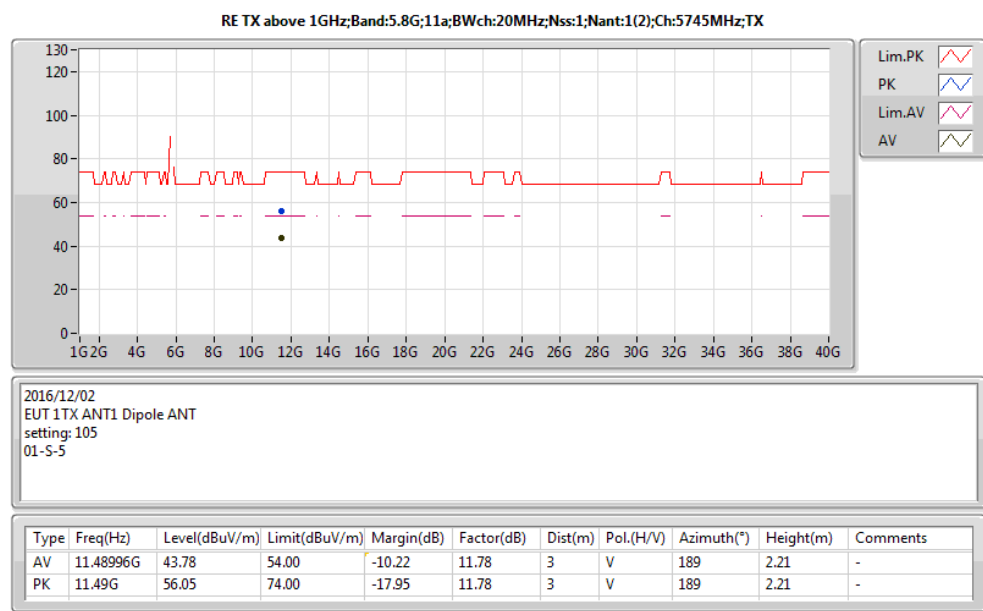
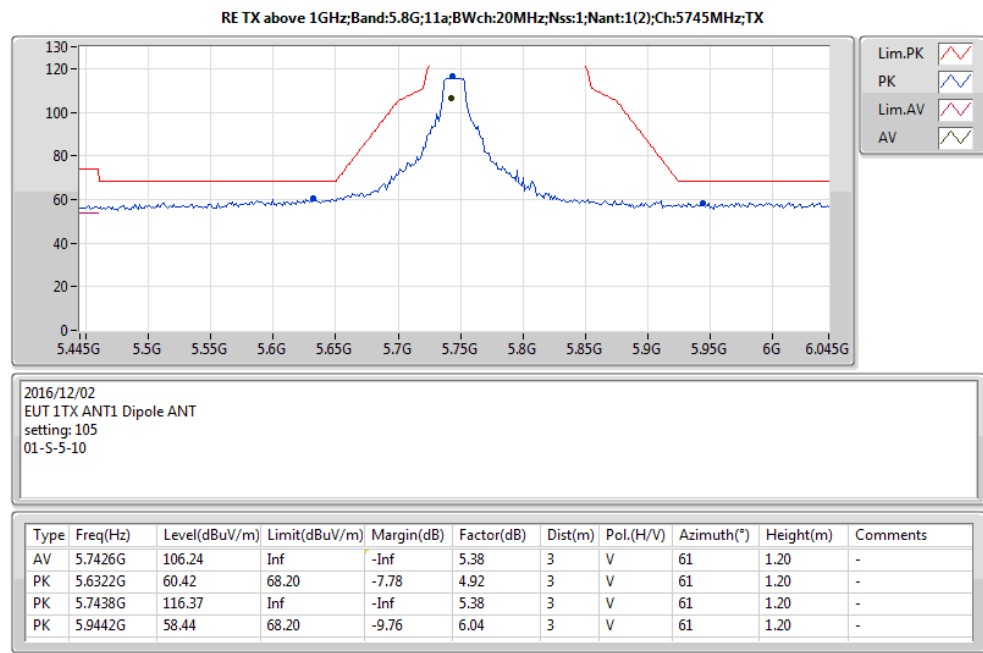


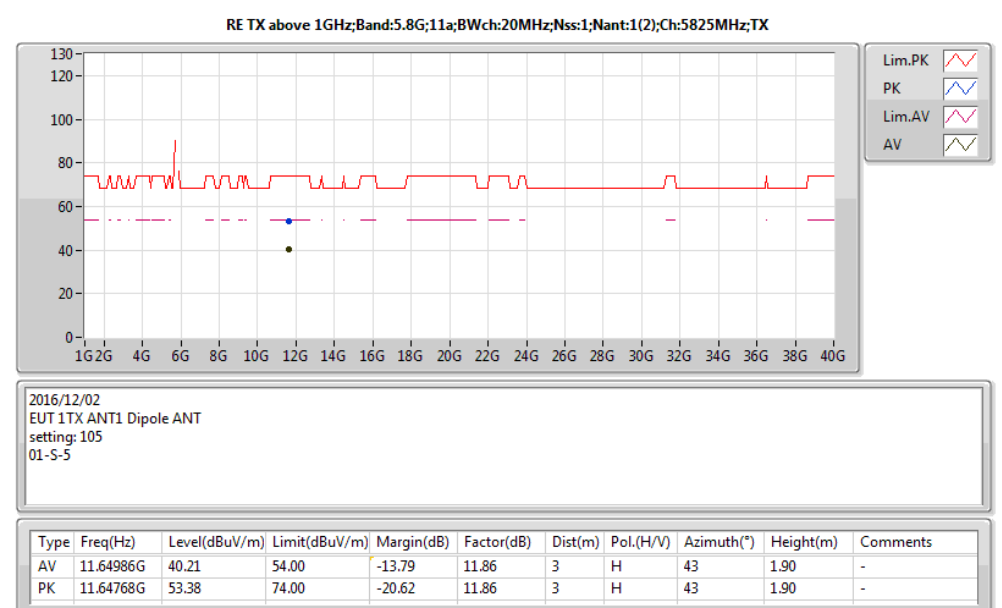
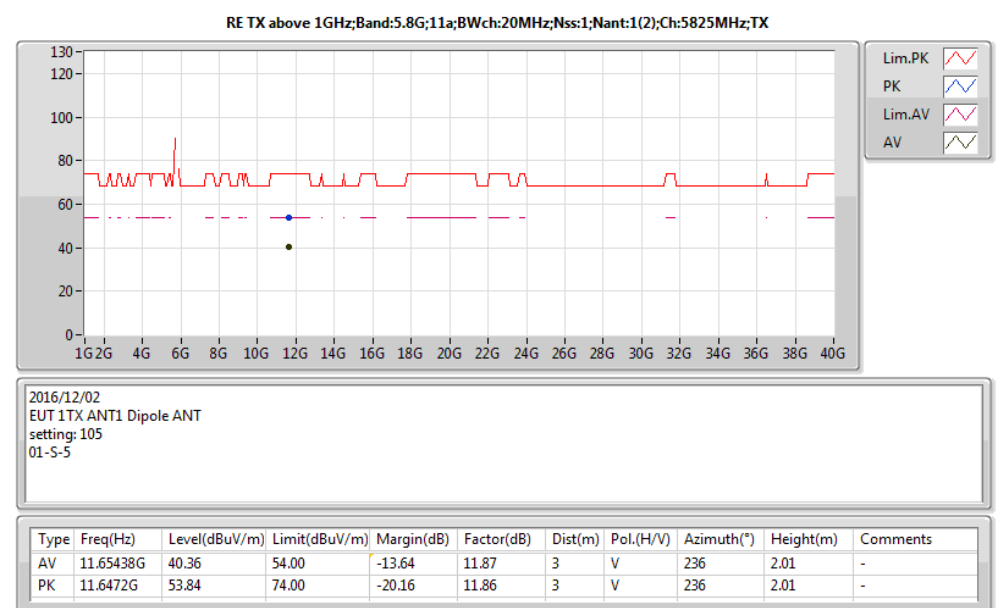
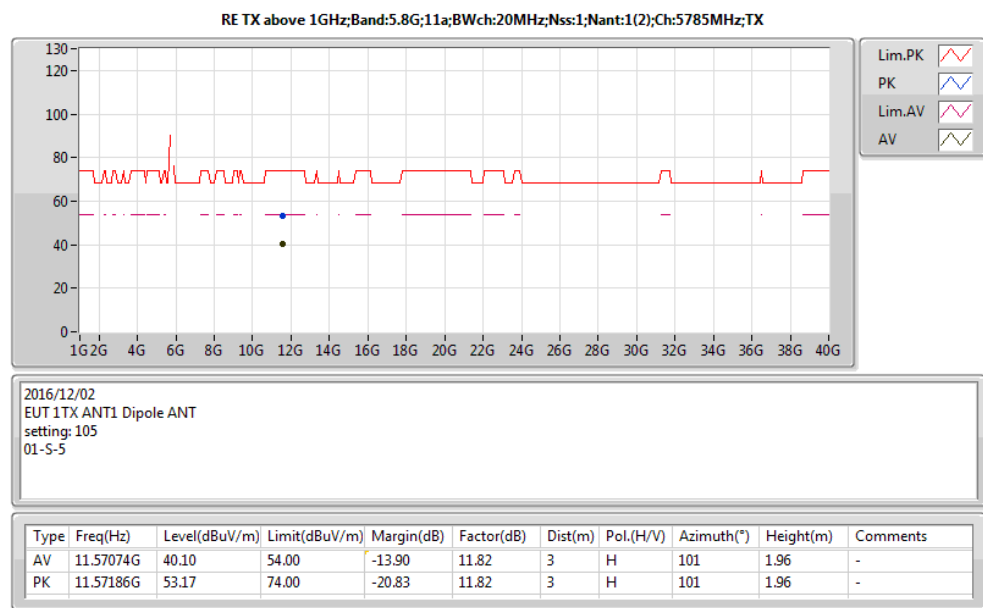
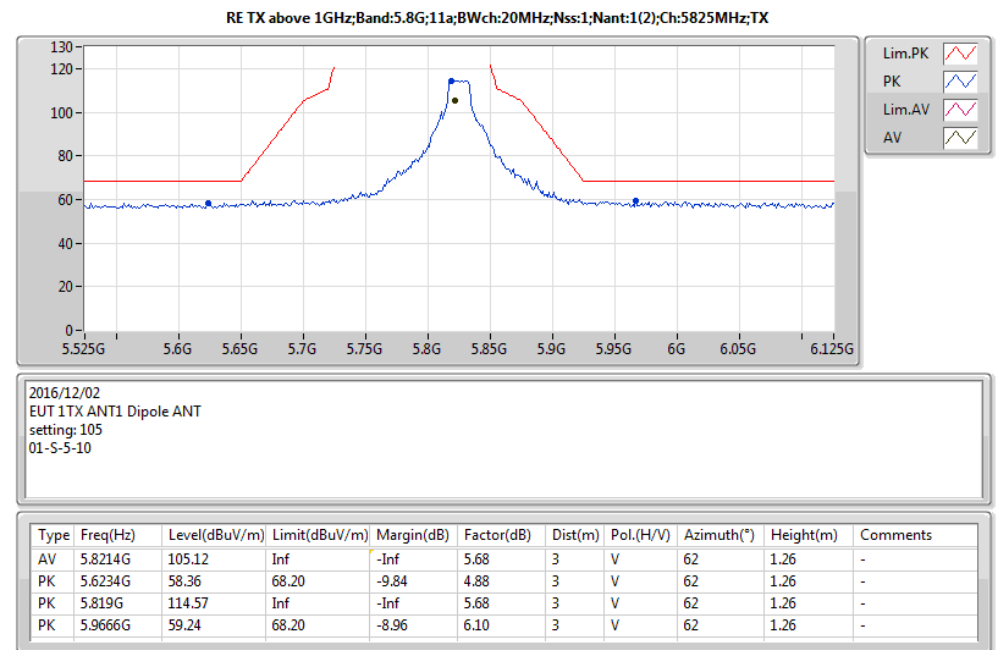
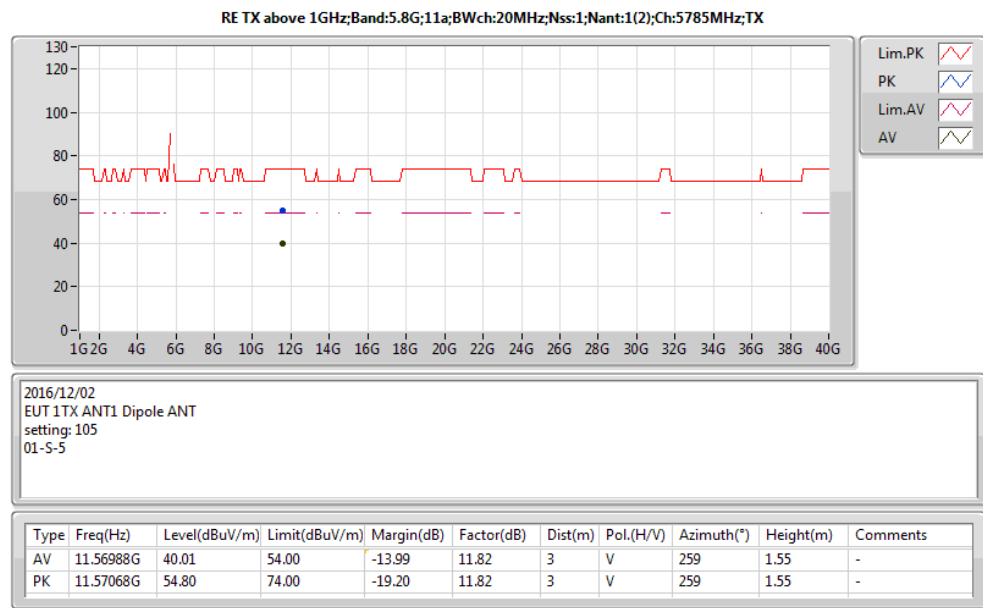
Summary

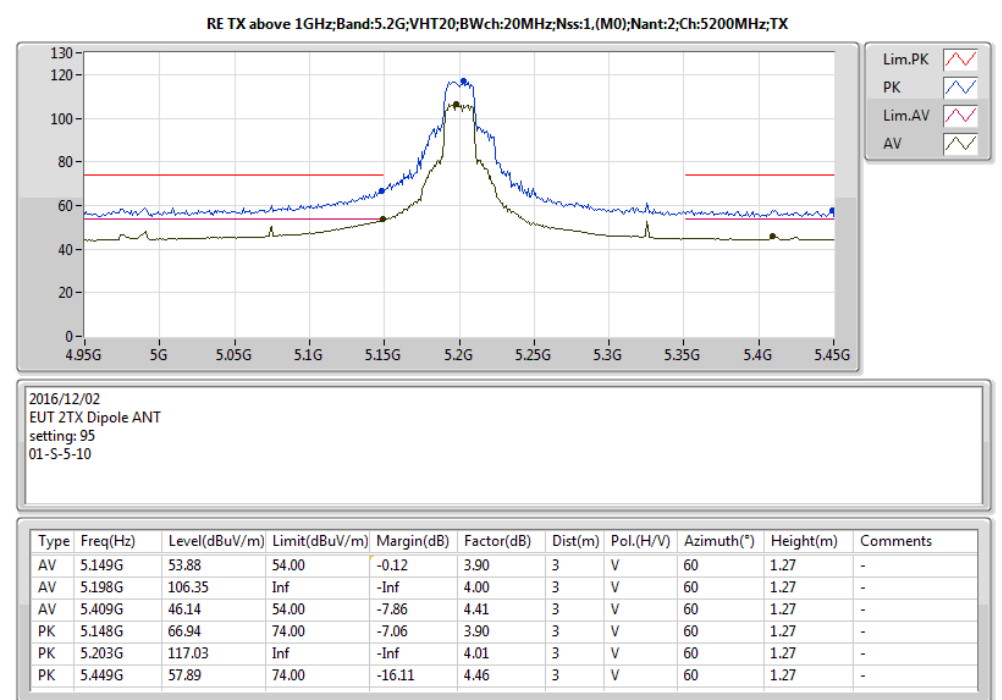
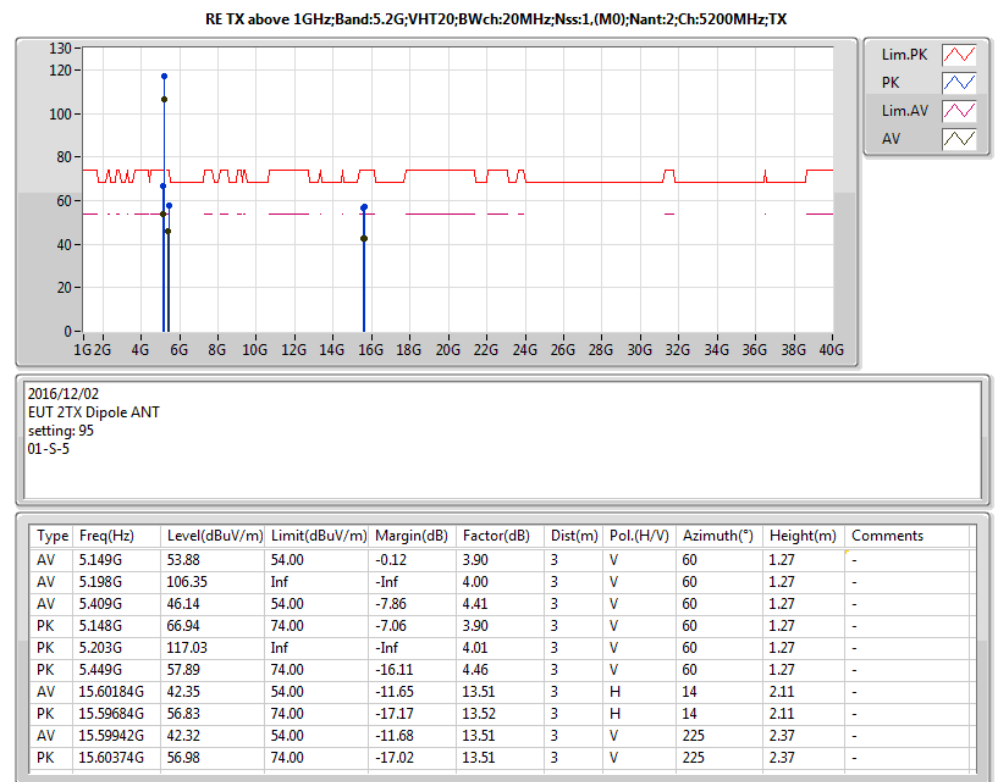
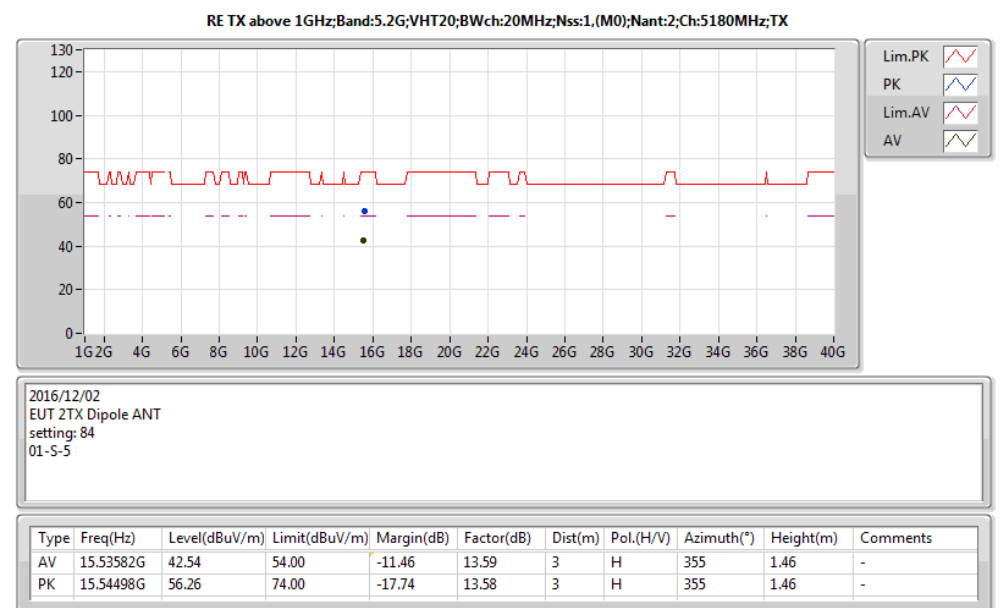
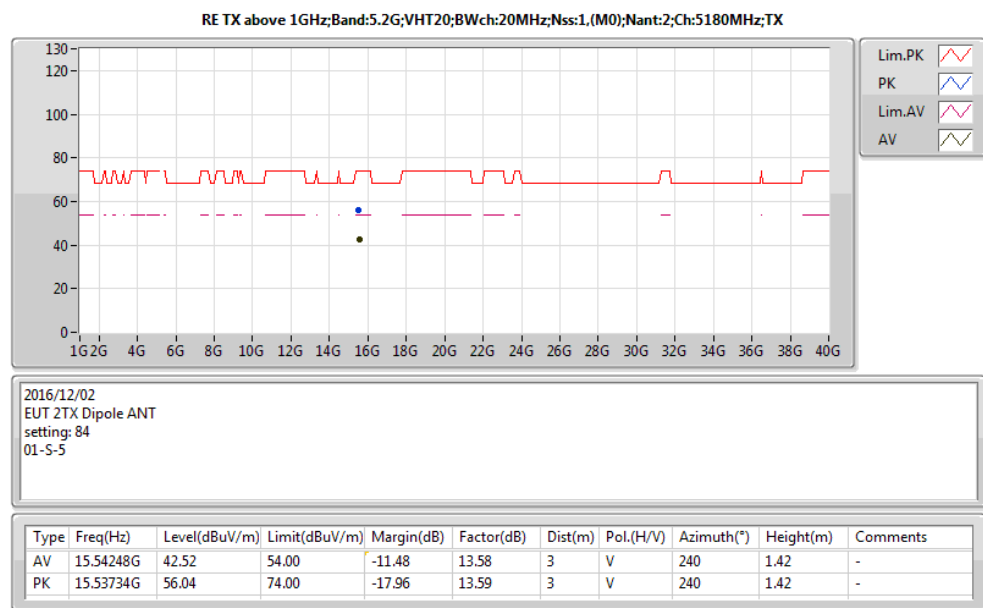
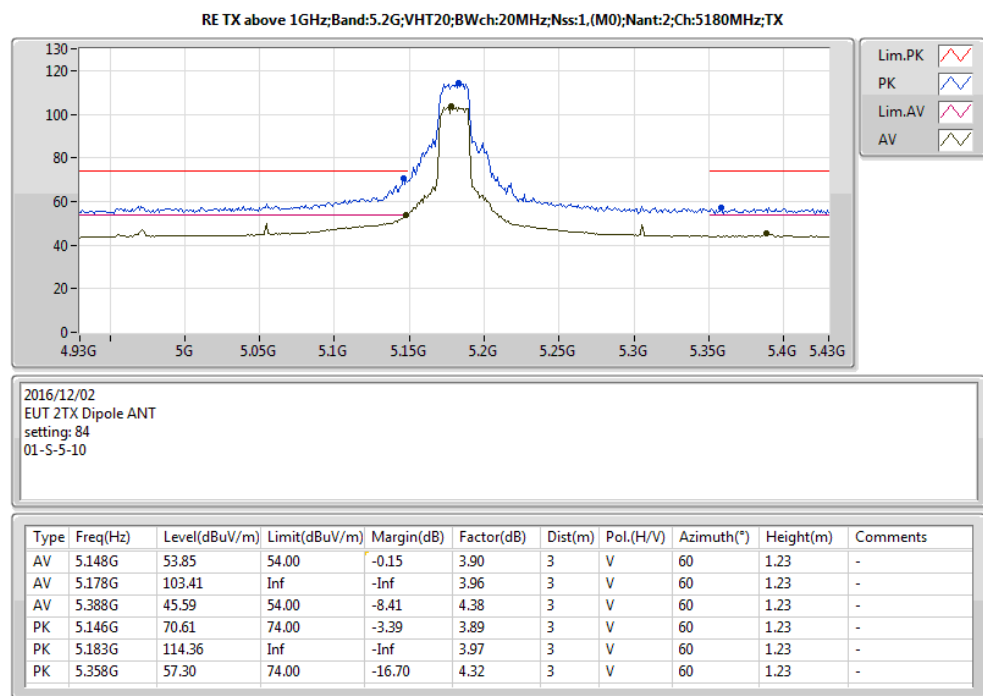
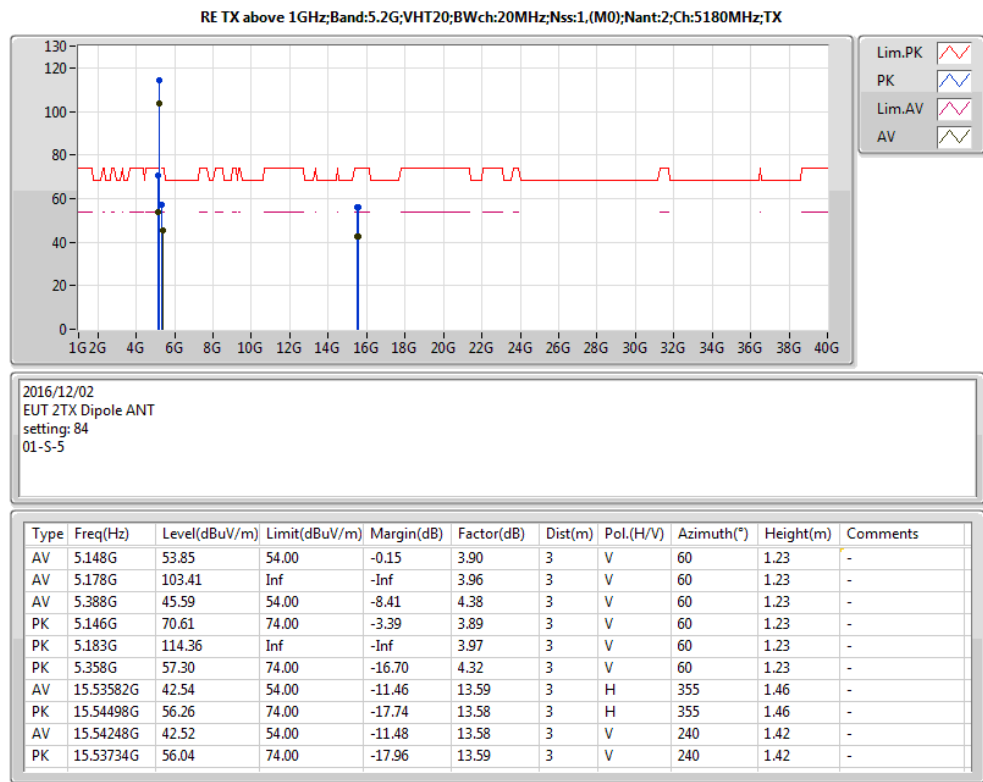
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Pol. (H/V)	Azimuth (°)	Height (m)	Comments
5.2G;11a;Nss1;Ntx1(2);5200;TX	Pass	AV	5.1496G	53.98	54.00	-0.02	3.90	3	V	56	1.17	-

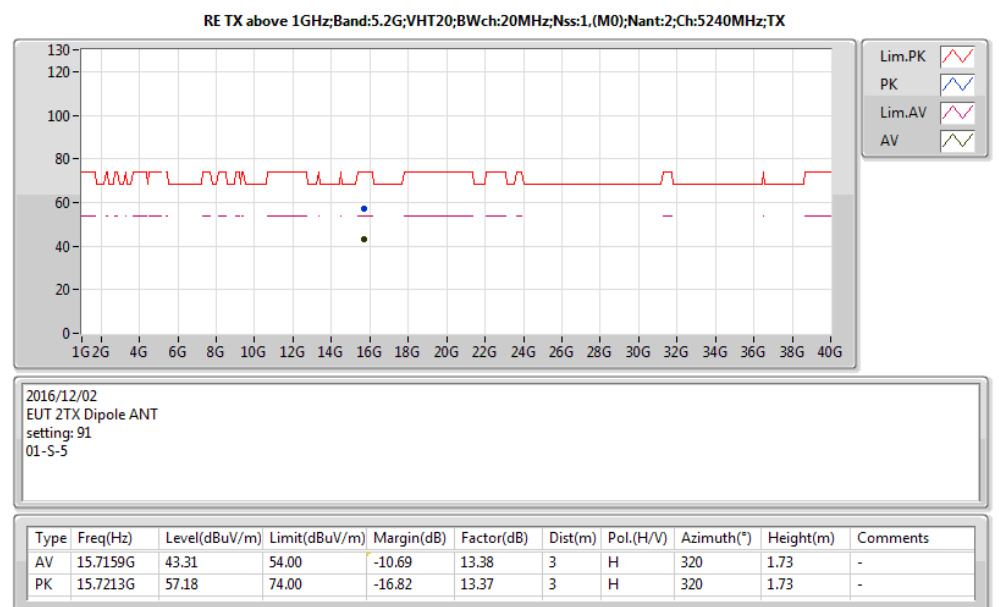
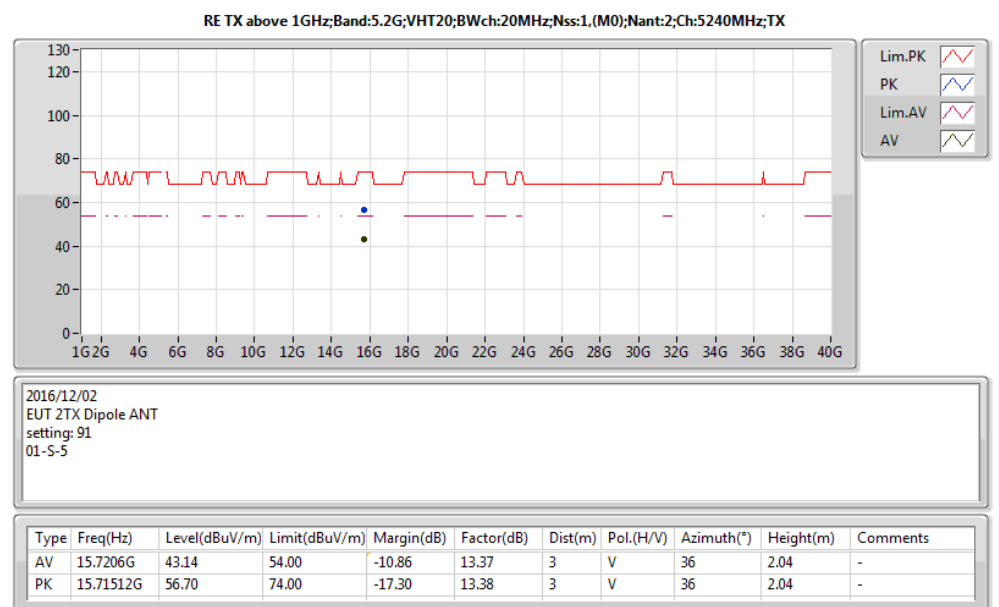
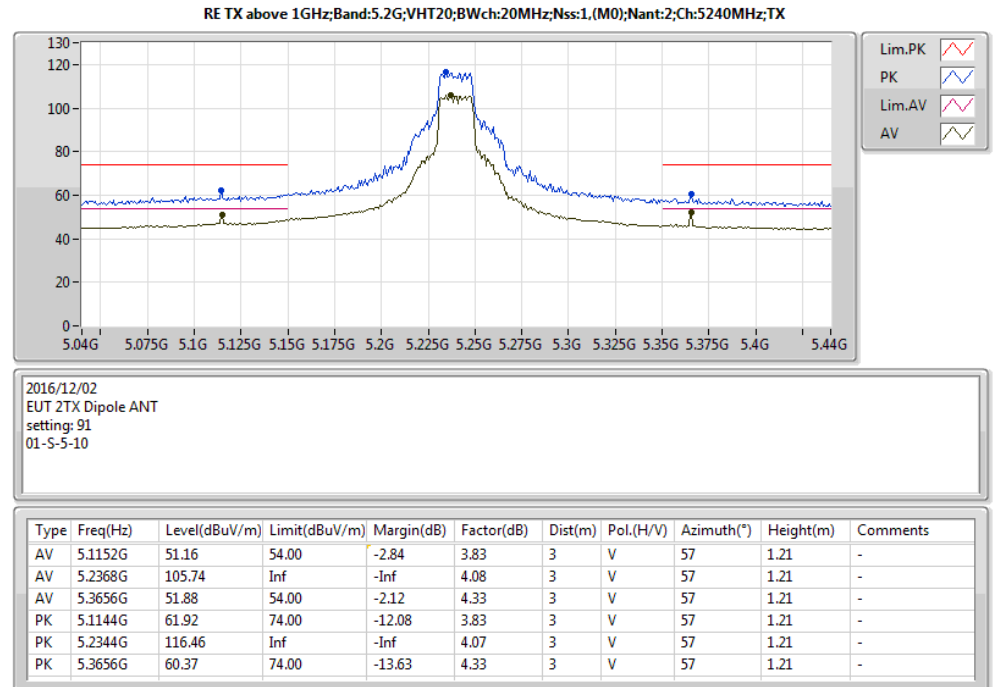
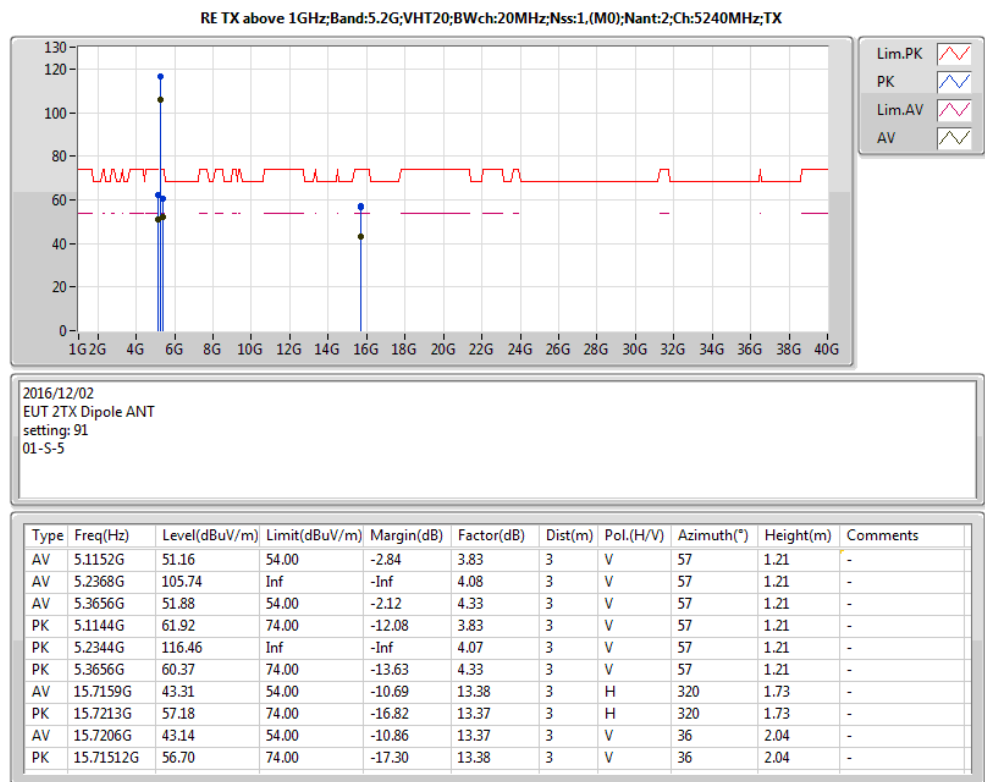
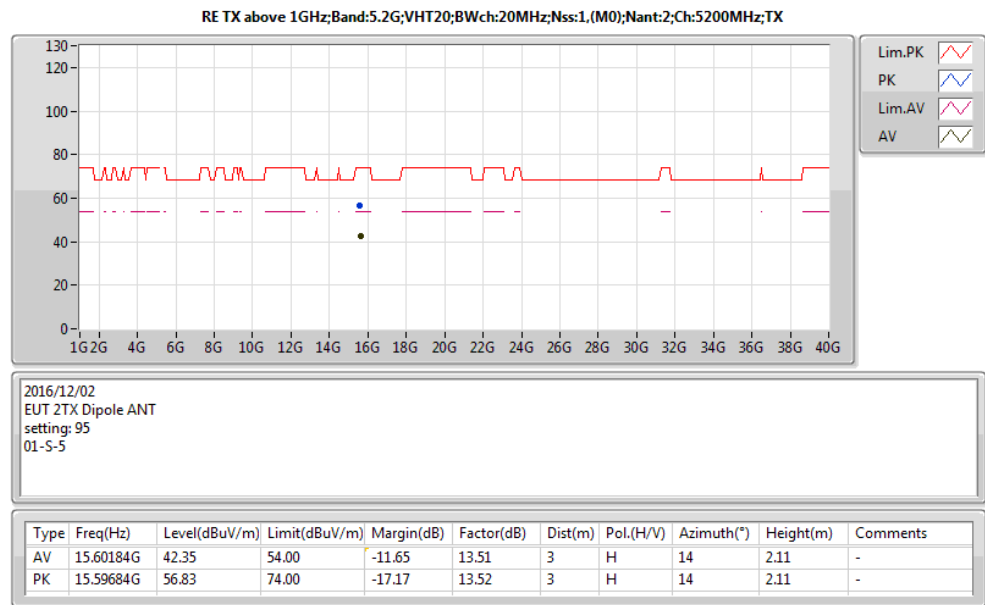
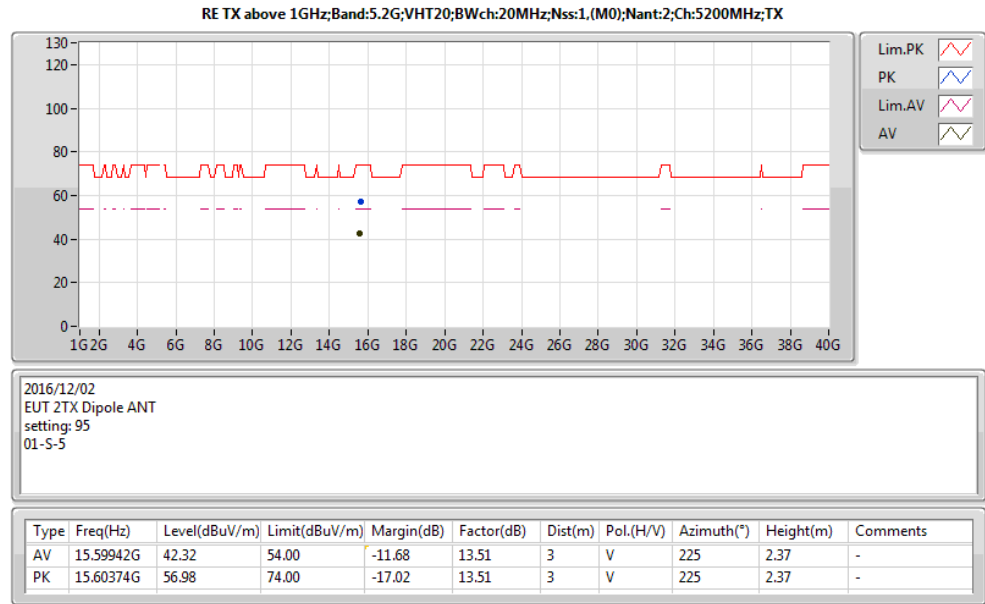


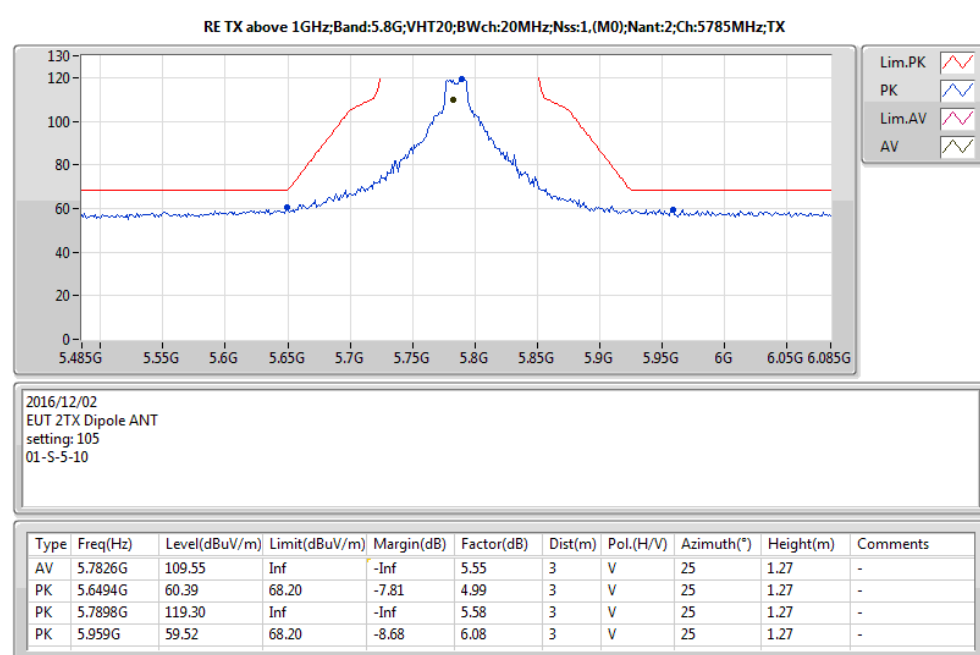
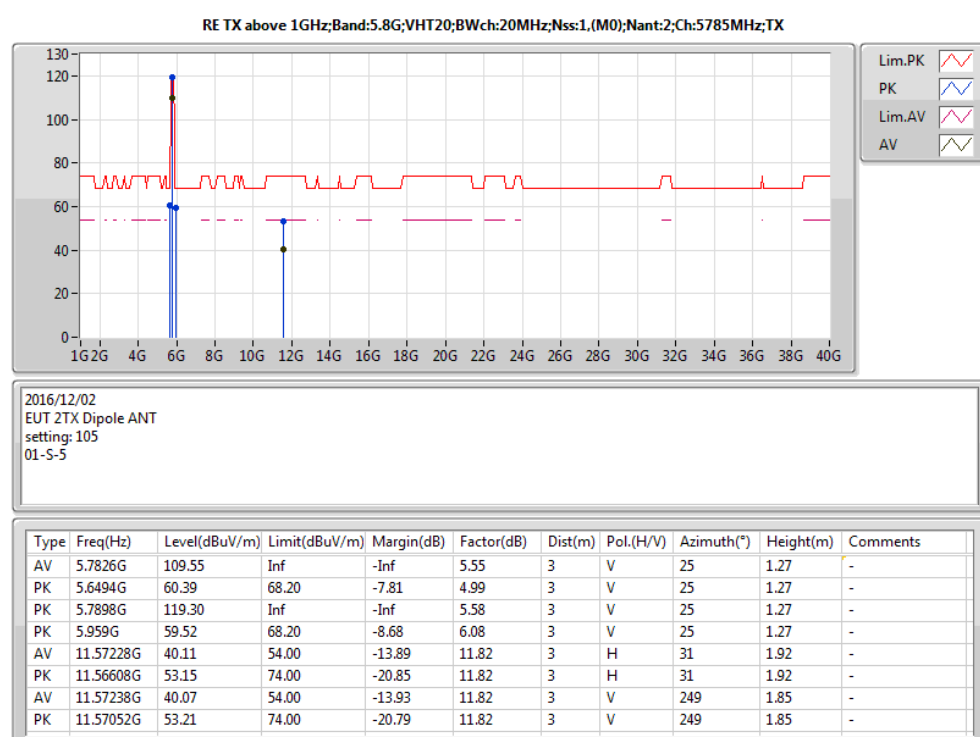
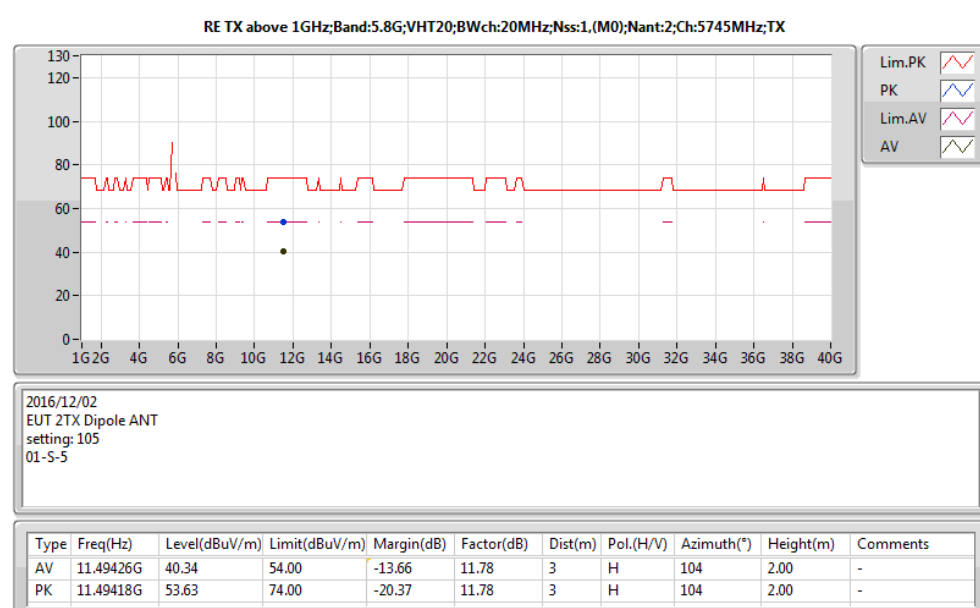
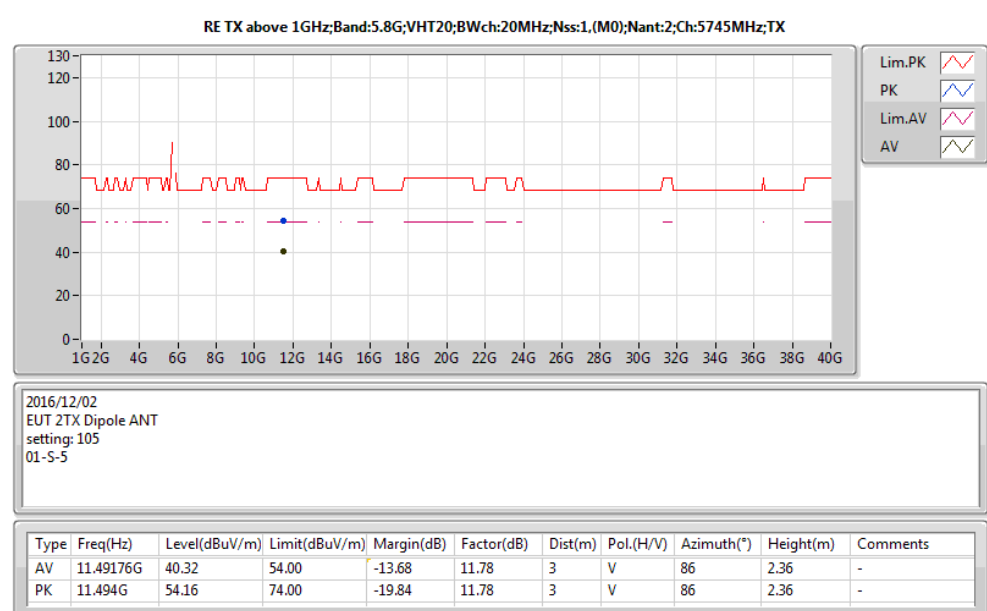
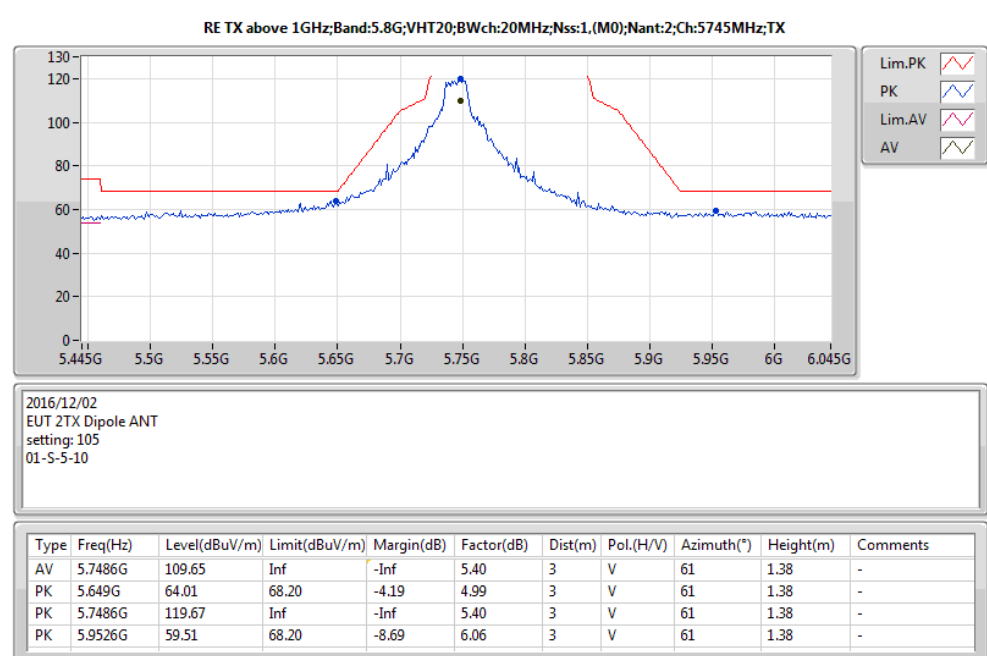
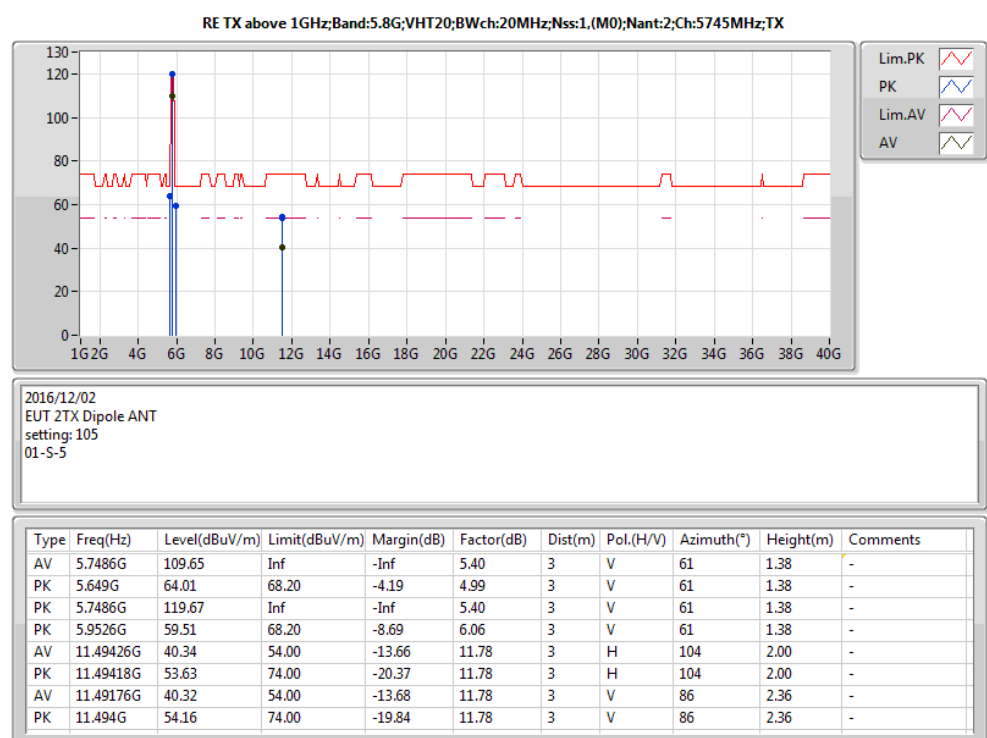


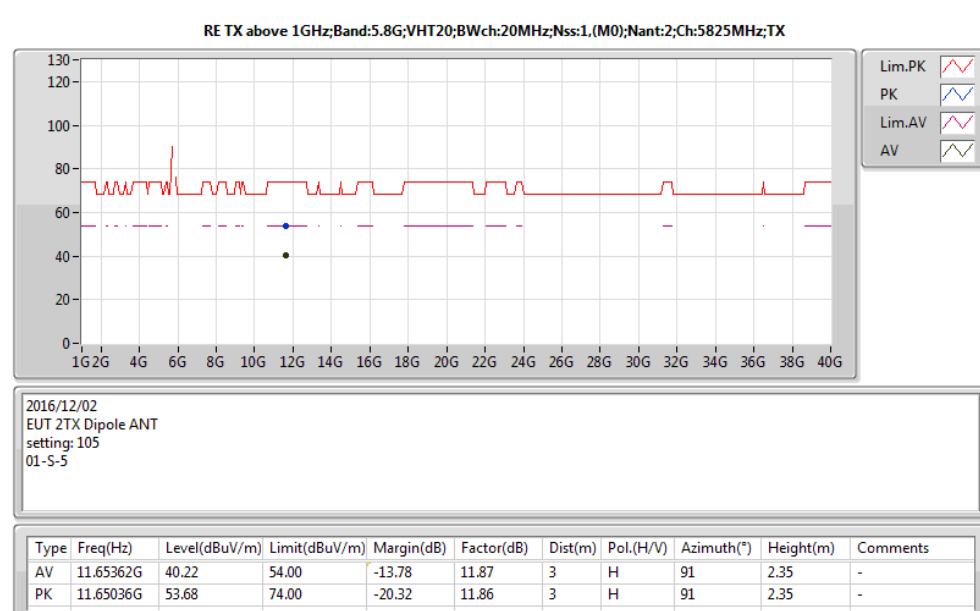
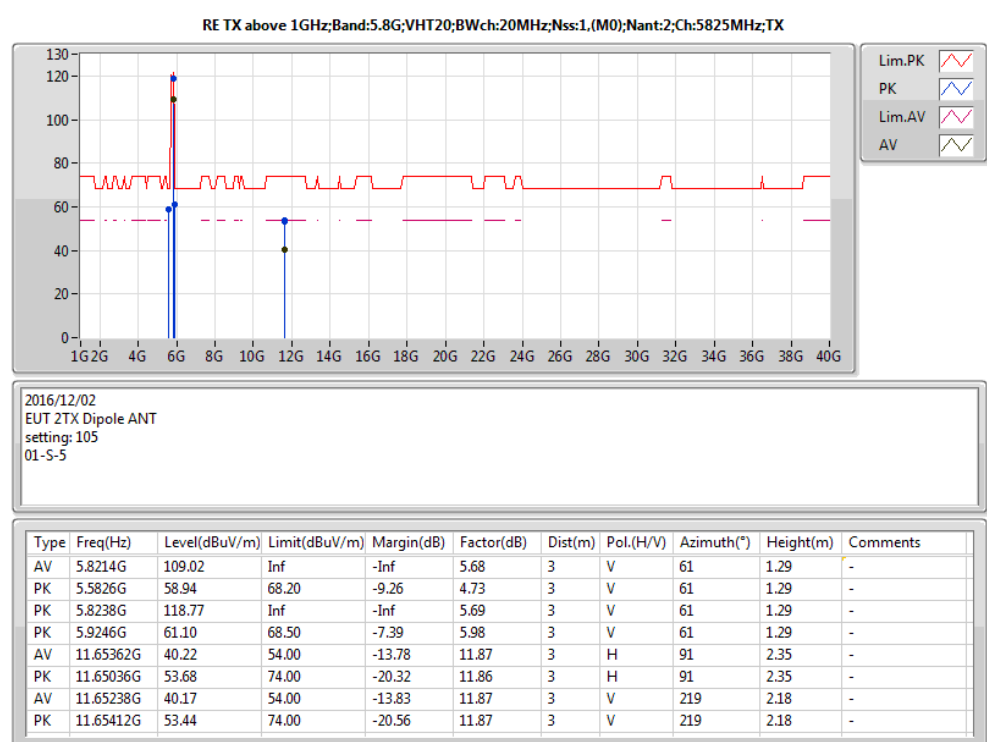
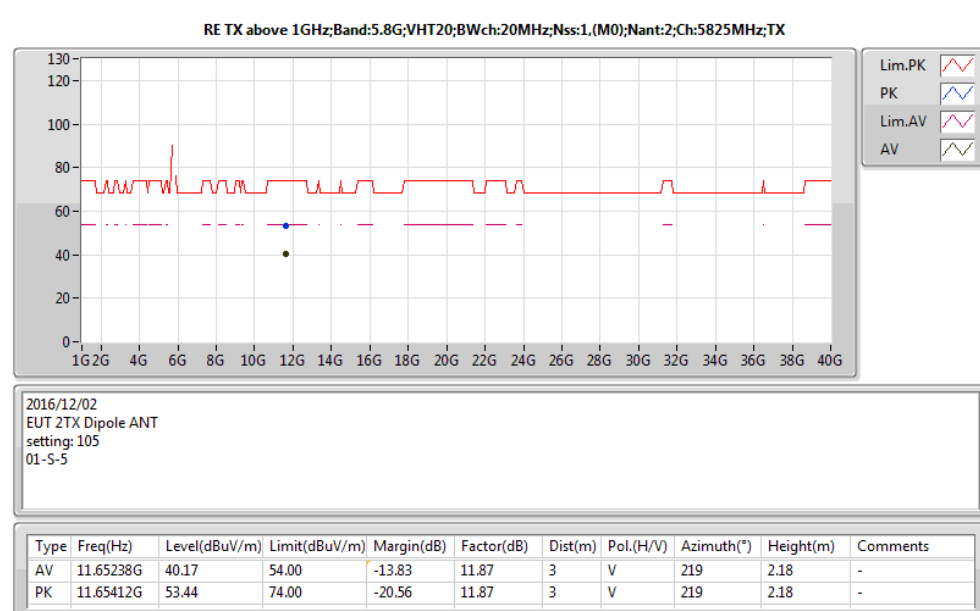
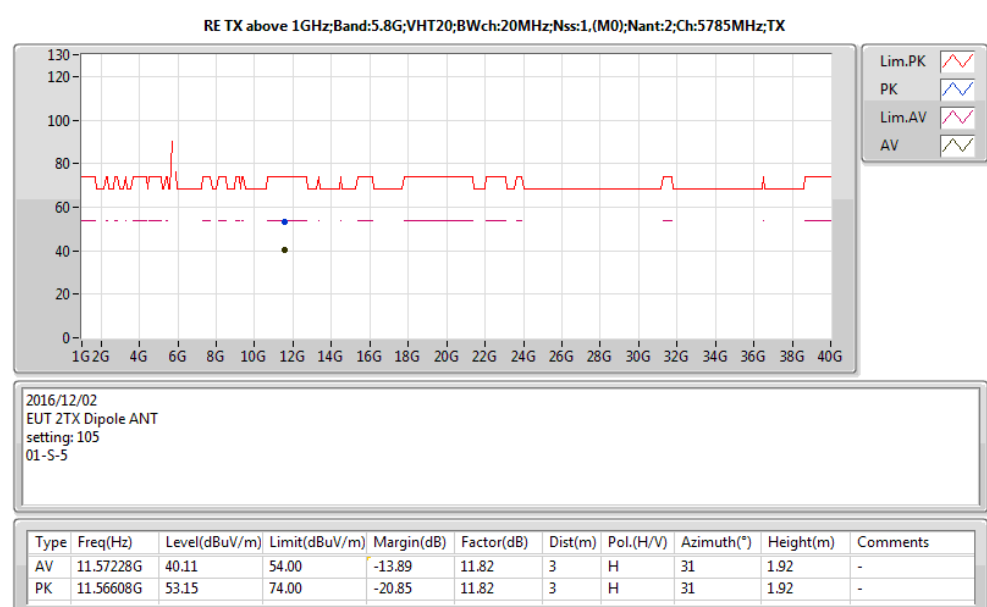
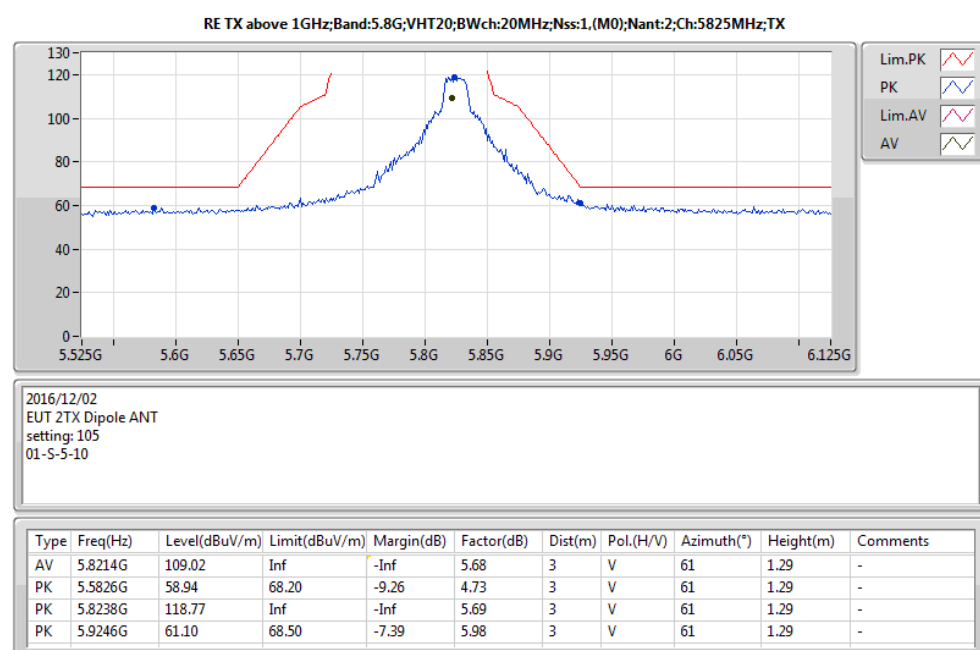
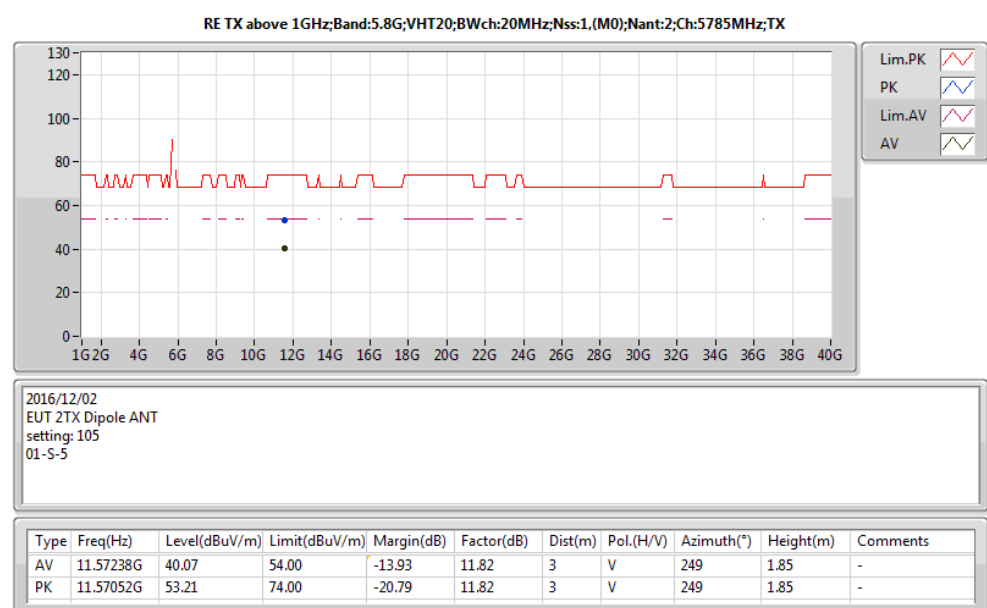


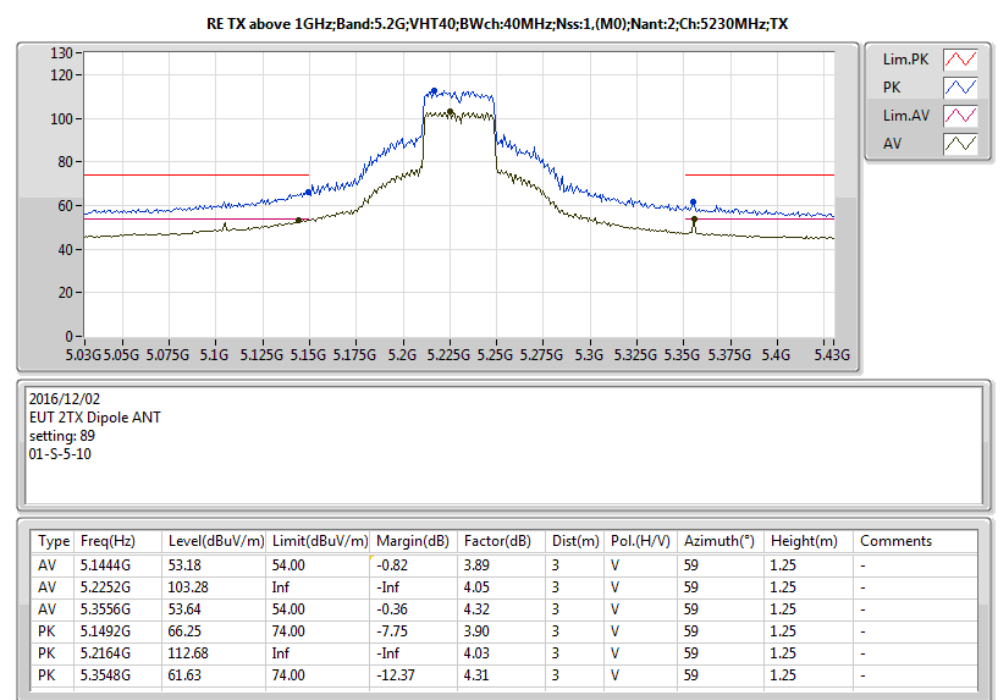
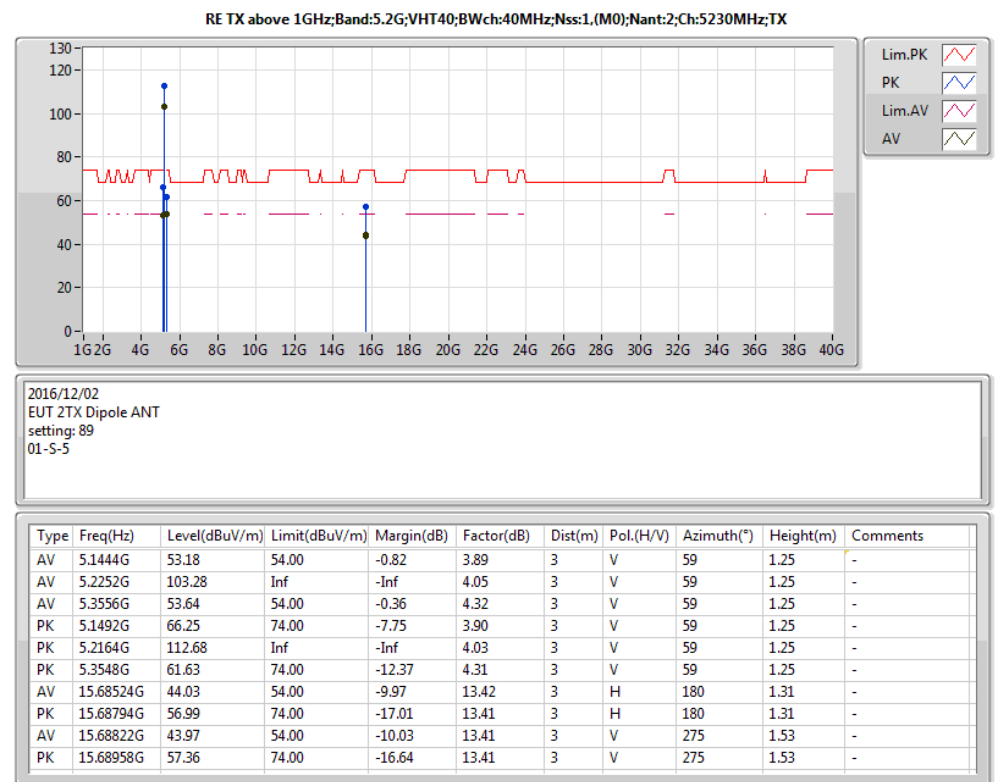
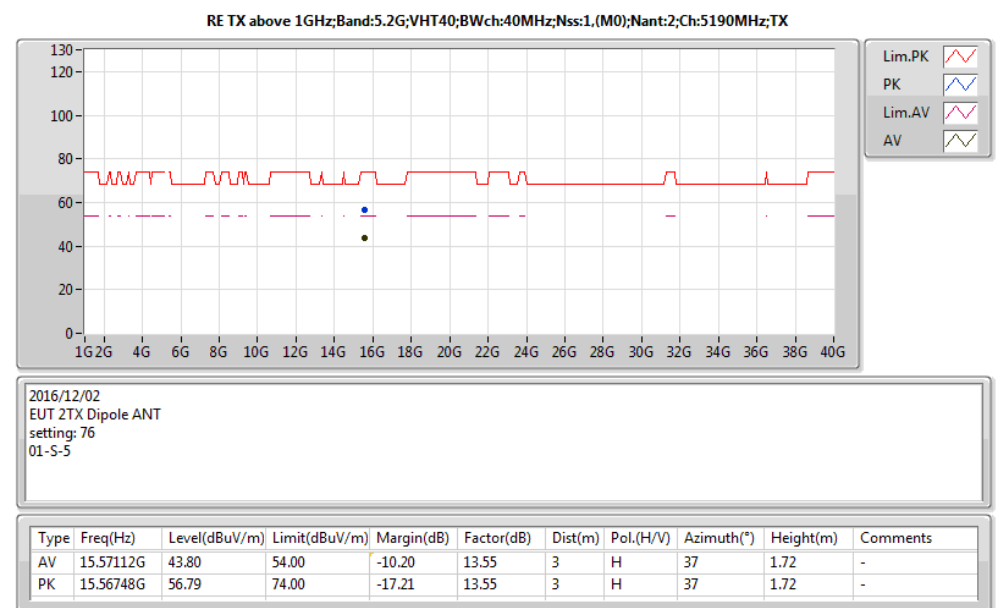
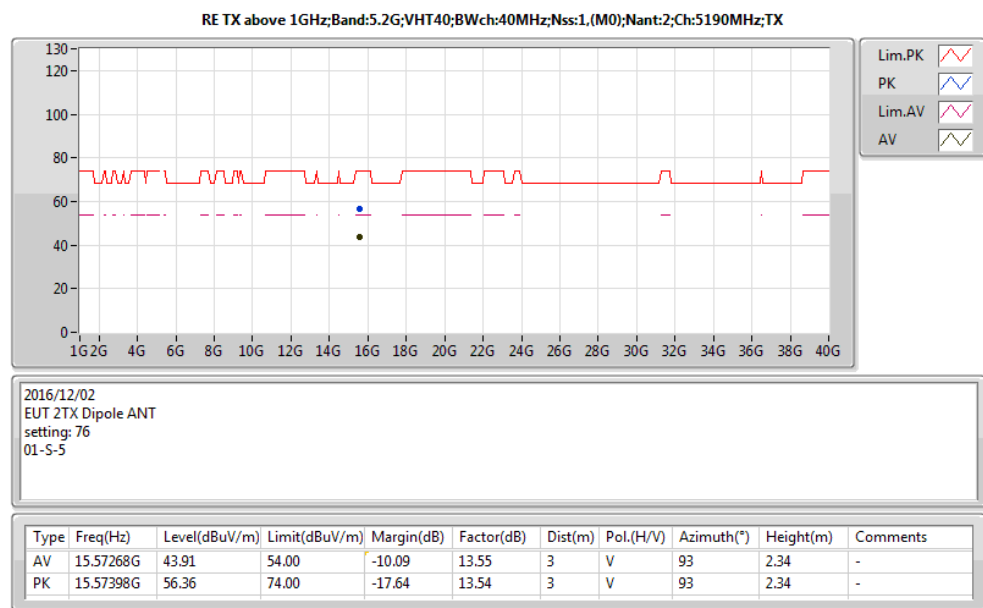
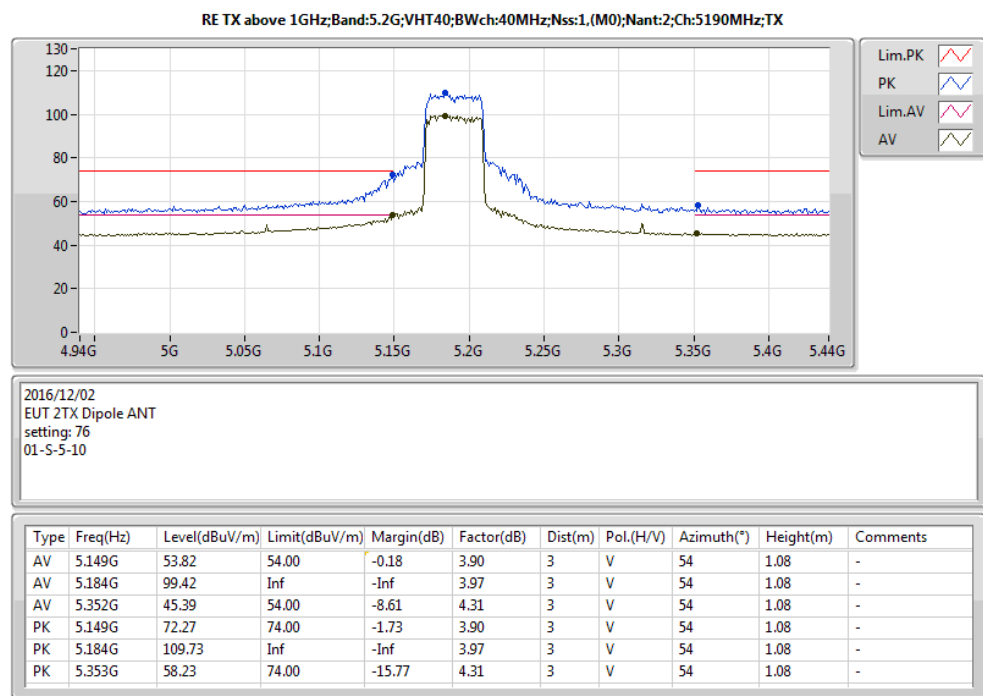
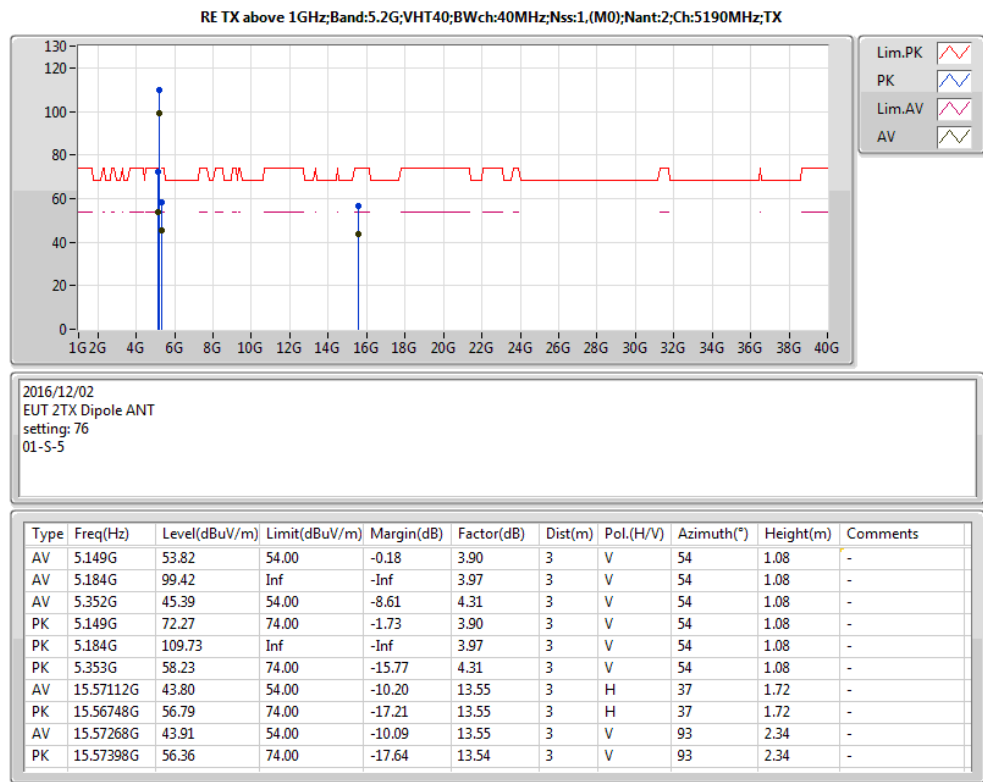


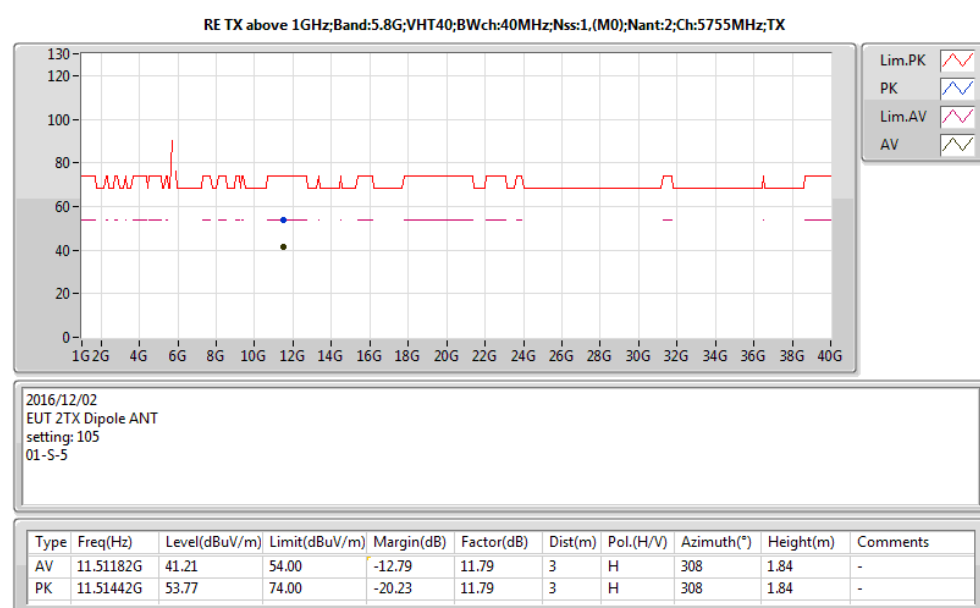
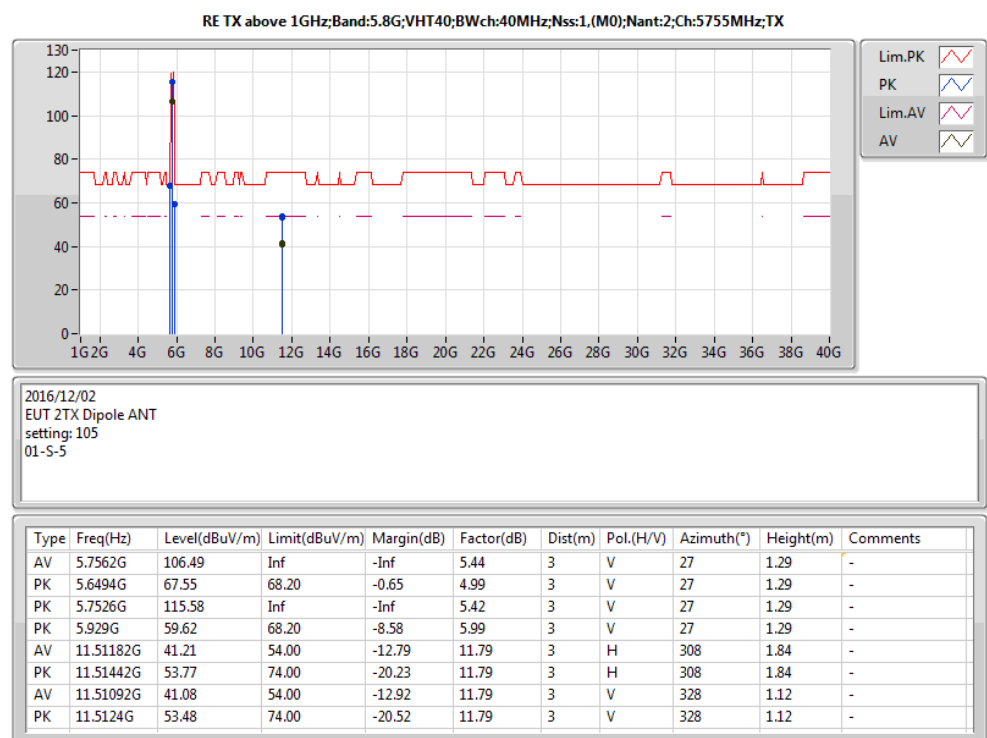
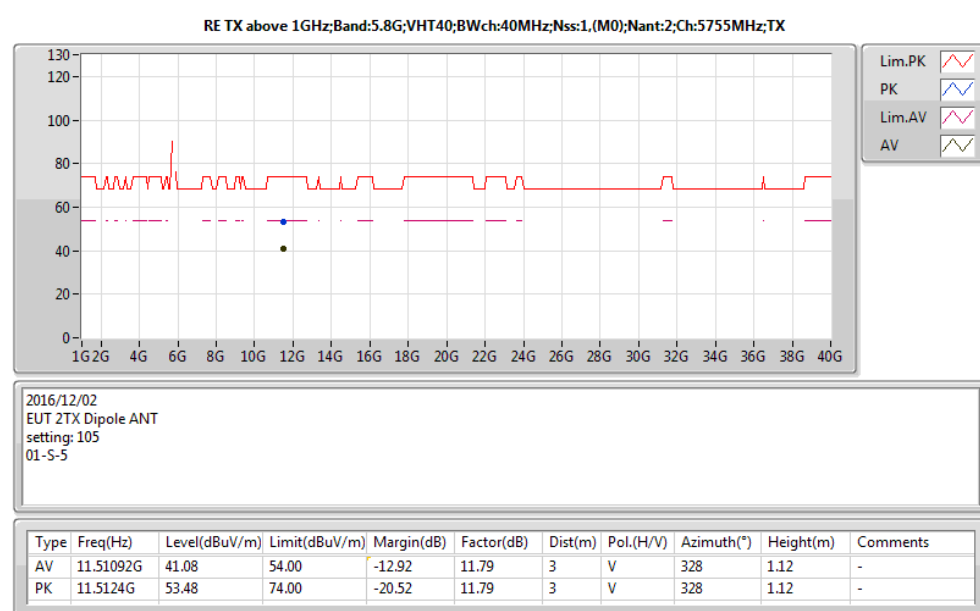
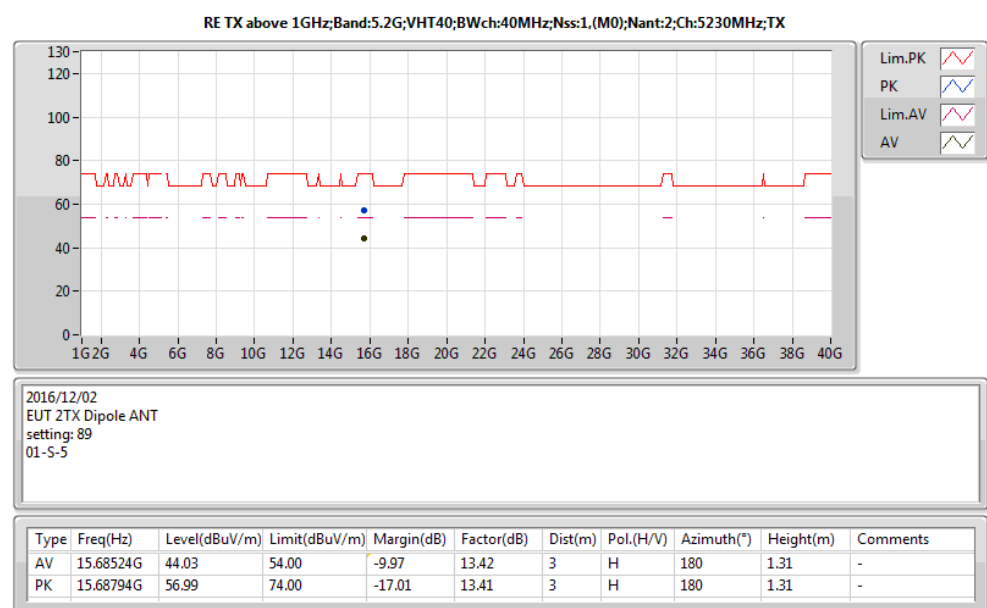
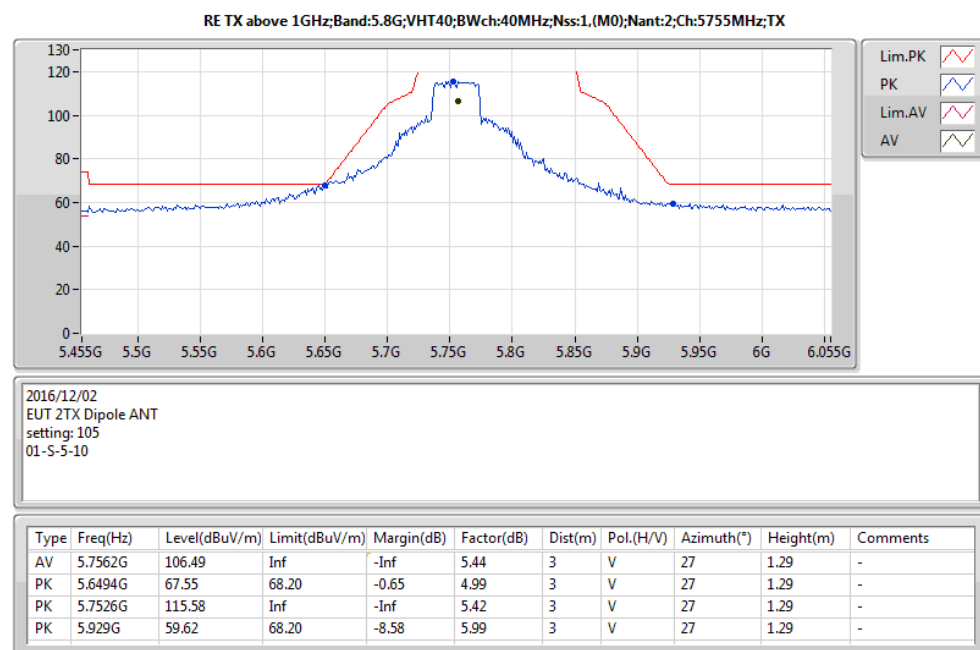
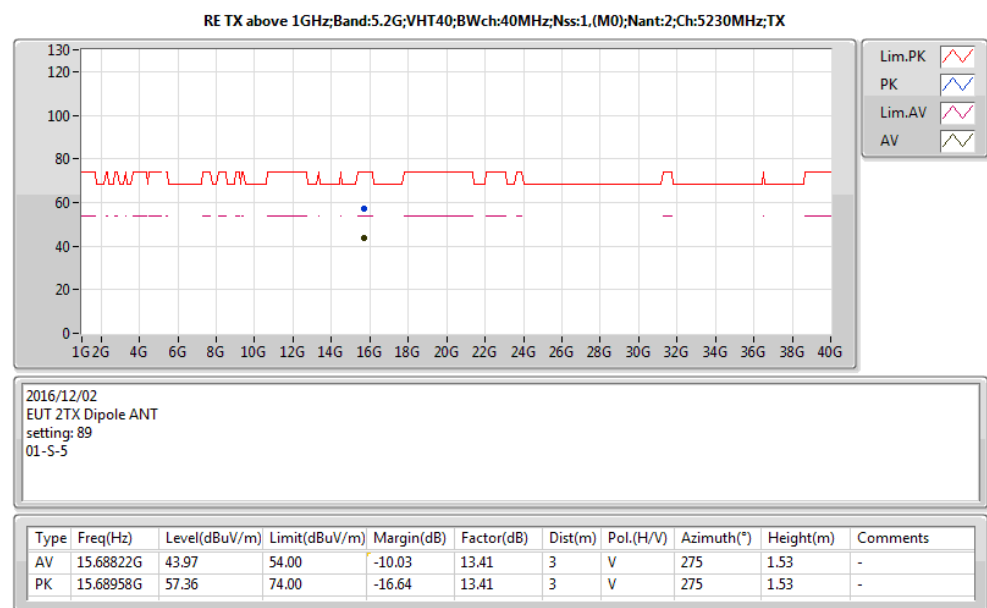


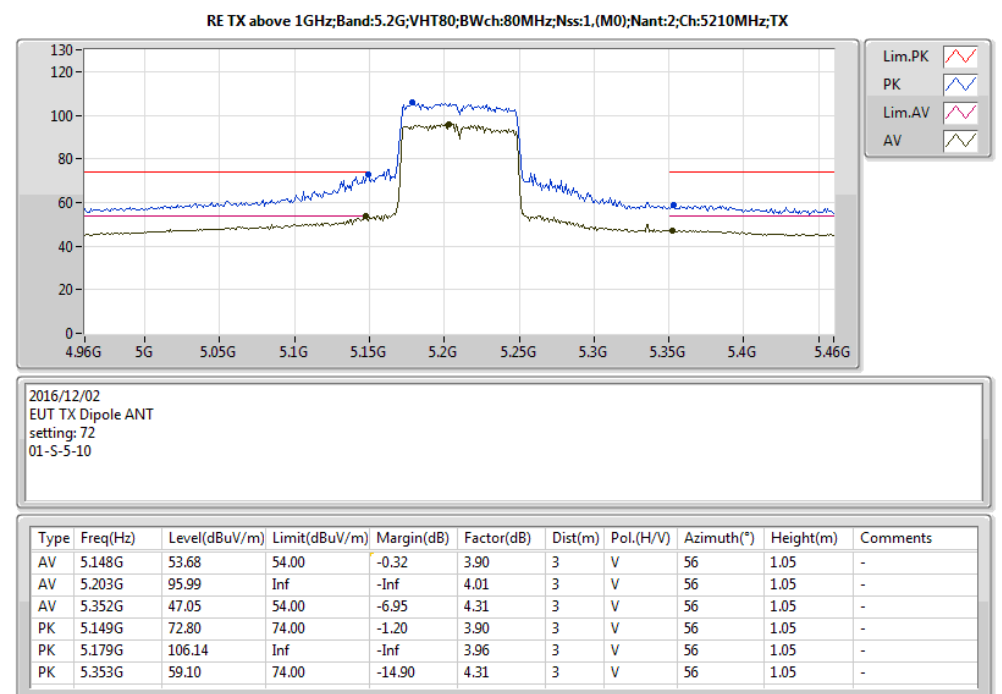
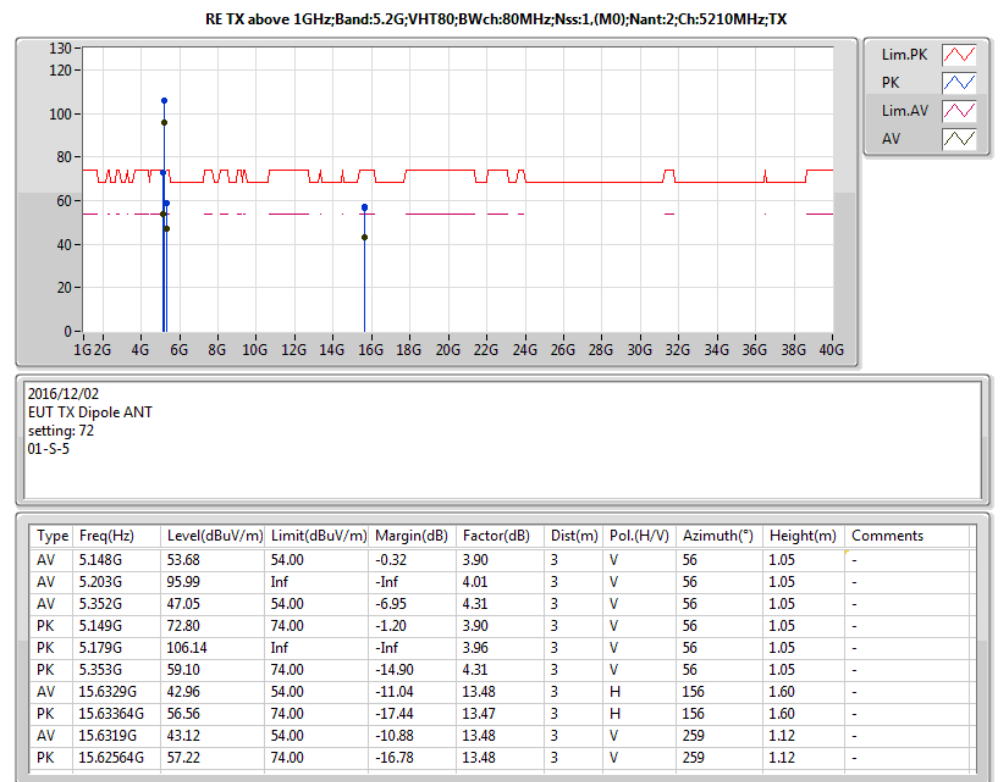
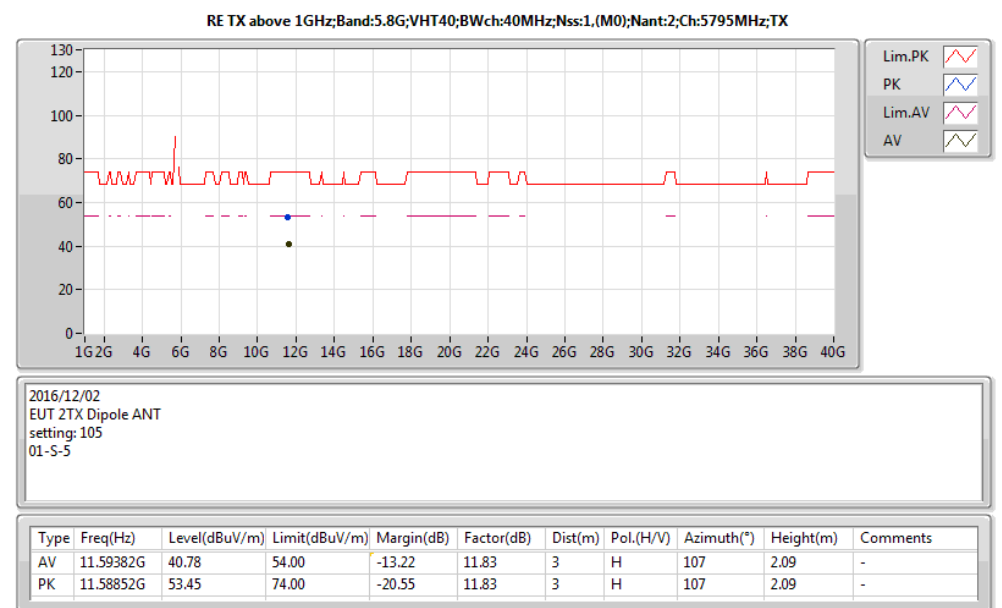
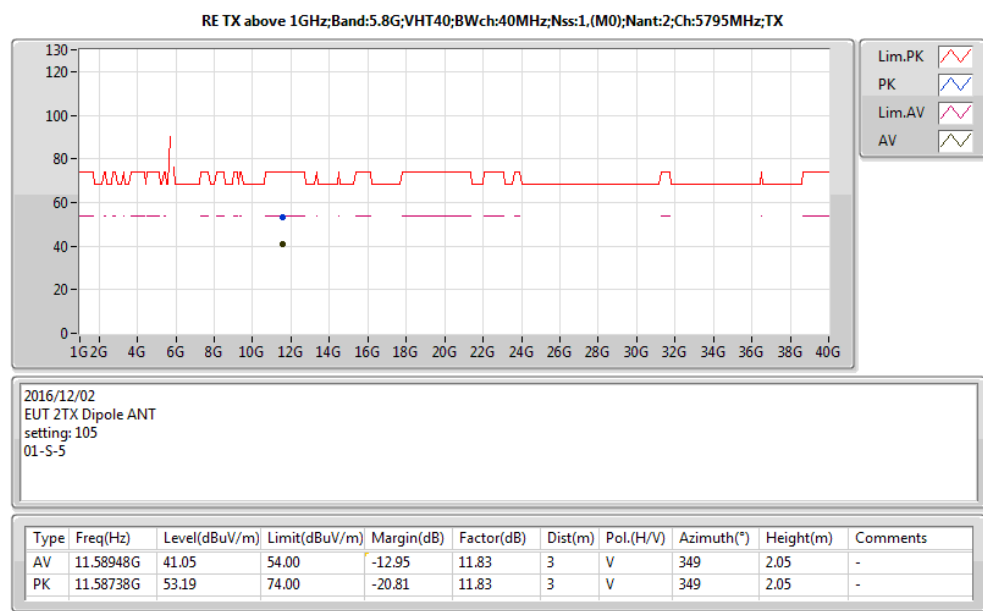
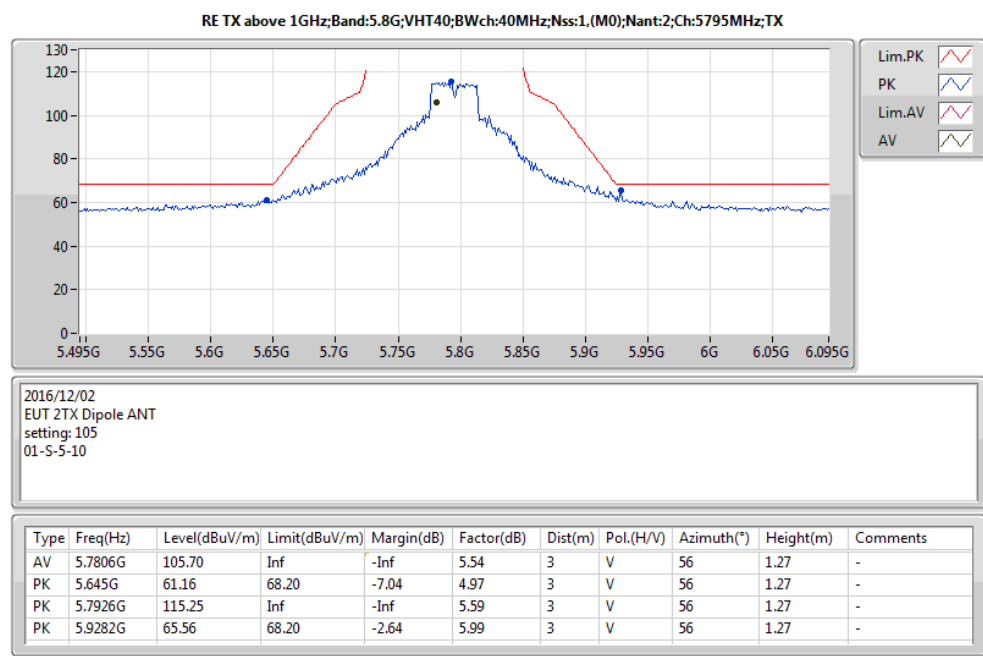
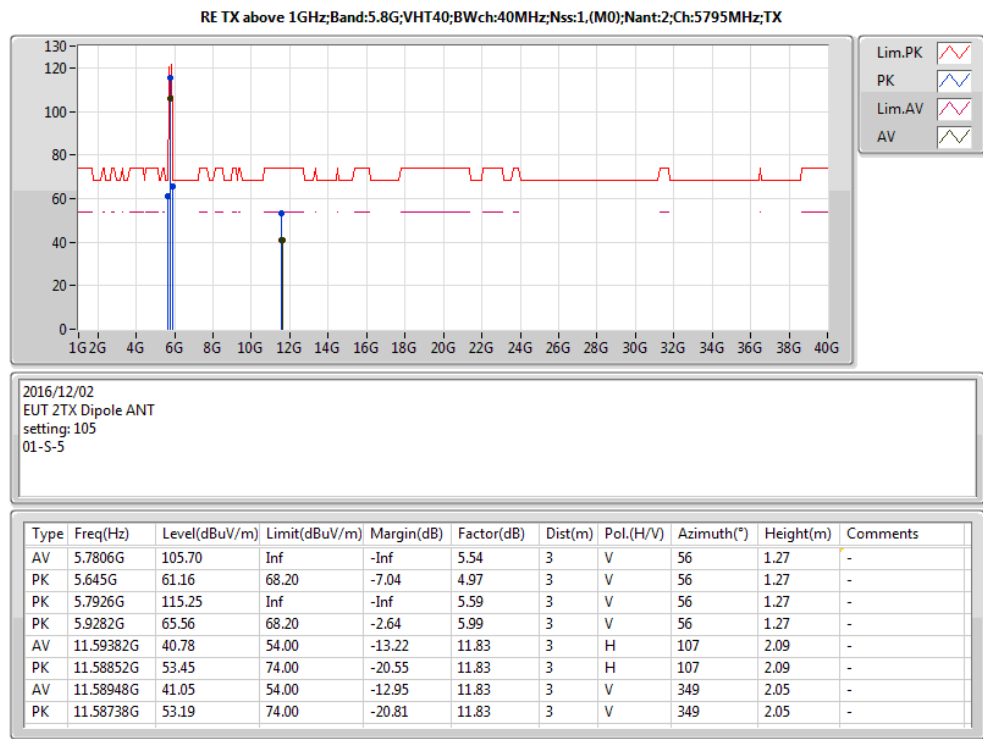


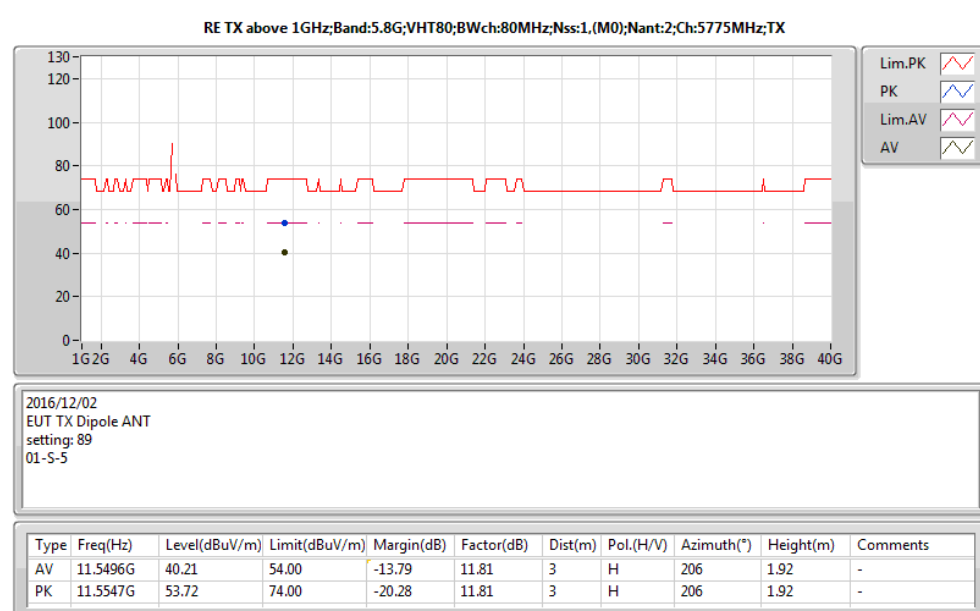
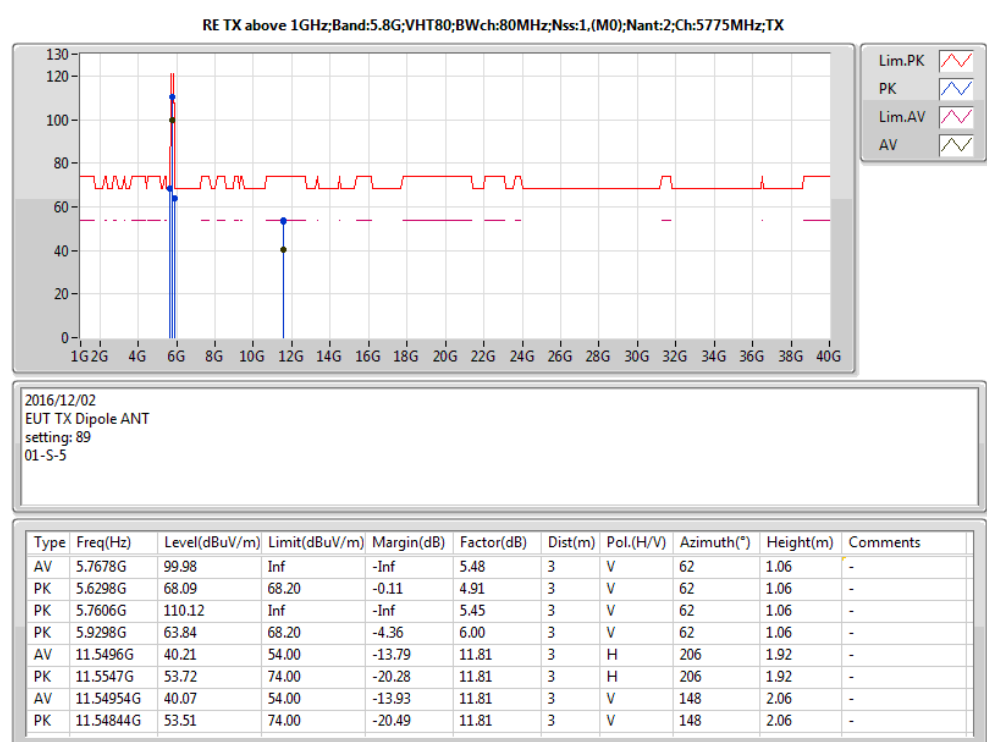
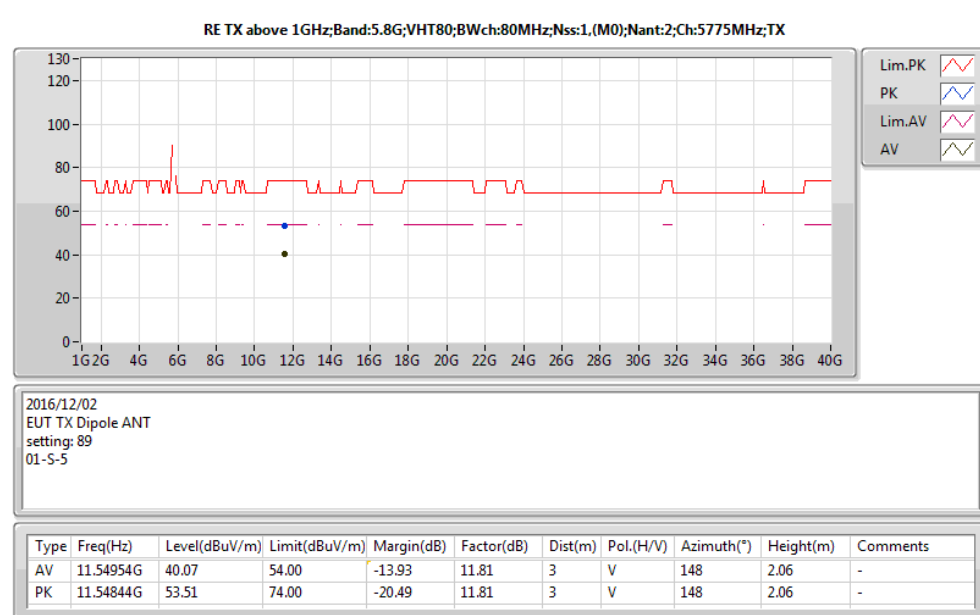
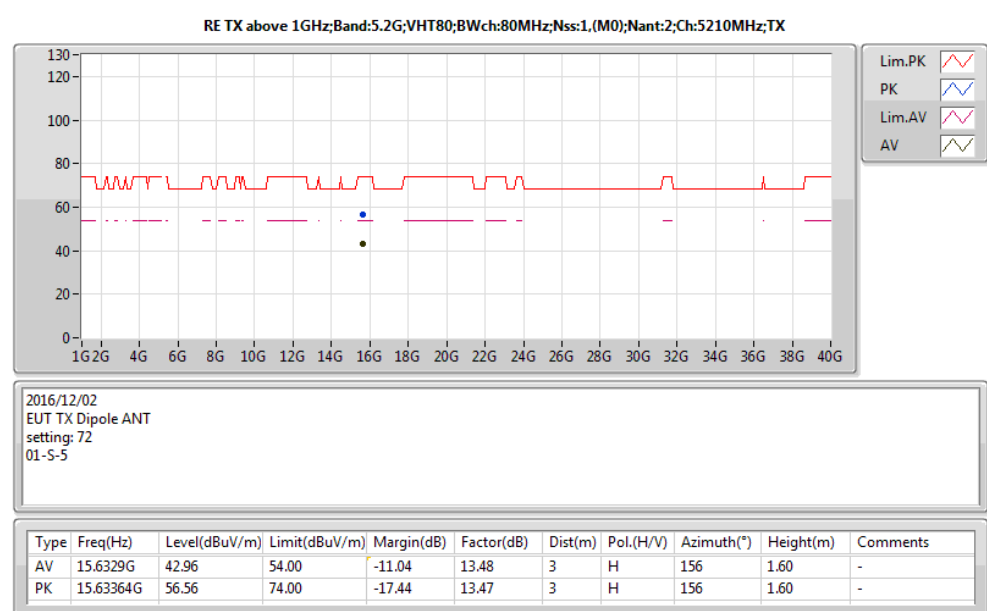
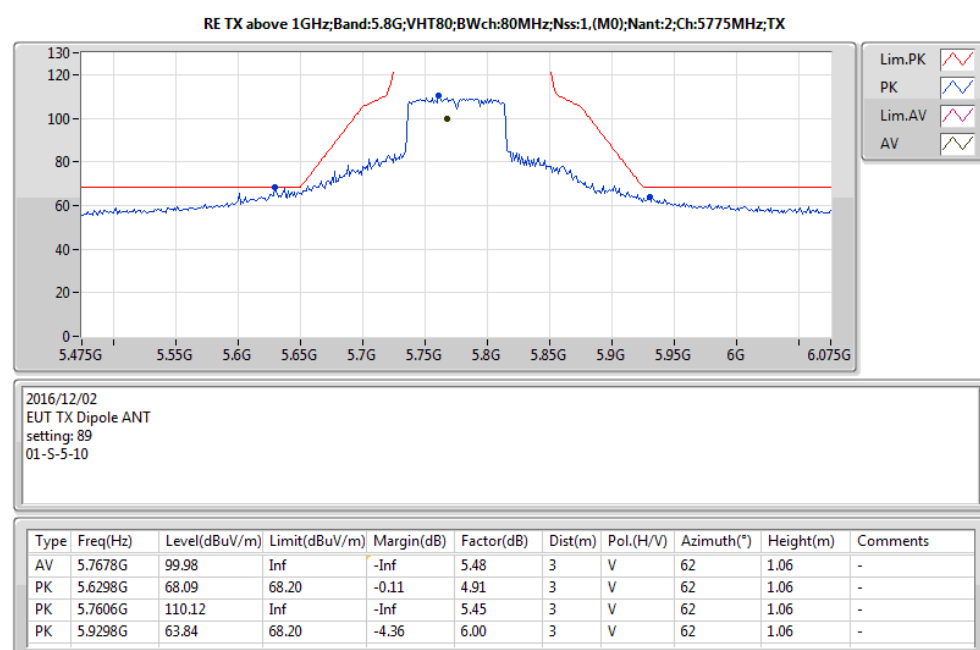
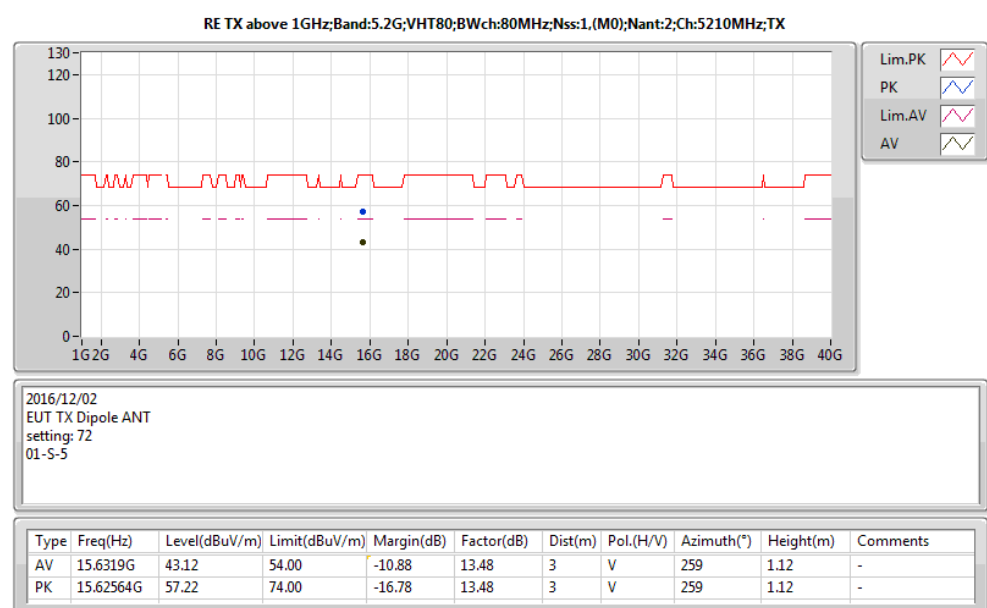














Mode: 20 MHz / Chain 2 (Port 2)

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5200.0152	5200.0150	5200.0149	5200.0146
110.00	5200.0144	5200.0138	5200.0129	5200.0120
93.50	5200.0135	5200.0125	5200.0121	5200.0114
Max. Deviation (MHz)	0.0152	0.0150	0.0149	0.0146
Max. Deviation (ppm)	2.92	2.88	2.87	2.81
Result	Pass			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5200.0160	5200.0156	5200.0146	5200.0144
10	5200.0145	5200.0140	5200.0134	5200.0131
20	5200.0144	5200.0134	5200.0129	5200.0128
30	5200.0060	5200.0051	5200.0041	5200.0035
40	5200.0044	5200.0042	5200.0040	5200.0031
Max. Deviation (MHz)	0.0160	0.0156	0.0146	0.0144
Max. Deviation (ppm)	3.08	3.00	2.81	2.77
Result	Pass			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5785.0149	5785.0144	5785.0136	5785.0133
110.00	5785.0144	5785.0142	5785.0133	5785.0128
93.50	5785.0135	5785.0128	5785.0122	5785.0121
Max. Deviation (MHz)	0.0149	0.0144	0.0136	0.0133
Max. Deviation (ppm)	2.58	2.49	2.35	2.30
Result	Pass			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5785.0164	5785.0154	5785.0151	5785.0146
10	5785.0154	5785.0145	5785.0142	5785.0140
20	5785.0144	5785.0136	5785.0127	5785.0125
30	5785.0060	5785.0054	5785.0051	5785.0042
40	5785.0053	5785.0050	5785.0045	5785.0043
Max. Deviation (MHz)	0.0164	0.0154	0.0151	0.0146
Max. Deviation (ppm)	2.83	2.66	2.61	2.52
Result	Pass			

Mode: 40 MHz / Chain 2 (Port 2)

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5190.0150	5190.0147	5190.0143	5190.0139
110.00	5190.0144	5190.0134	5190.0130	5190.0127
93.50	5190.0141	5190.0131	5190.0126	5190.0116
Max. Deviation (MHz)	0.0150	0.0147	0.0143	0.0139
Max. Deviation (ppm)	2.89	2.83	2.76	2.68
Result	Pass			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5190.0158	5190.0149	5190.0145	5190.0144
10	5190.0151	5190.0148	5190.0146	5190.0145
20	5190.0144	5190.0134	5190.0129	5190.0119
30	5190.0060	5190.0057	5190.0053	5190.0050
40	5190.0052	5190.0044	5190.0035	5190.0026
Max. Deviation (MHz)	0.0158	0.0149	0.0146	0.0145
Max. Deviation (ppm)	3.04	2.87	2.81	2.79
Result	Pass			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5755.0152	5755.0151	5755.0150	5755.0143
110.00	5755.0144	5755.0142	5755.0141	5755.0131
93.50	5755.0139	5755.0134	5755.0124	5755.0117
Max. Deviation (MHz)	0.0152	0.0151	0.0150	0.0143
Max. Deviation (ppm)	2.64	2.62	2.61	2.48
Result	Pass			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5755.0157	5755.0156	5755.0152	5755.0151
10	5755.0156	5755.0154	5755.0147	5755.0145
20	5755.0144	5755.0134	5755.0126	5755.0119
30	5755.0060	5755.0052	5755.0051	5755.0047
40	5755.0050	5755.0046	5755.0038	5755.0031
Max. Deviation (MHz)	0.0157	0.0156	0.0152	0.0151
Max. Deviation (ppm)	2.73	2.71	2.64	2.62
Result	Pass			



Mode: 80 MHz / Chain 2 (Port 2)

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5210.0151	5210.0150	5210.0142	5210.0136
110.00	5210.0144	5210.0136	5210.0133	5210.0125
93.50	5210.0138	5210.0130	5210.0124	5210.0119
Max. Deviation (MHz)	0.0151	0.0150	0.0142	0.0136
Max. Deviation (ppm)	2.90	2.88	2.73	2.61
Result	Pass			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5210.0174	5210.0165	5210.0164	5210.0157
10	5210.0158	5210.0157	5210.0154	5210.0153
20	5210.0144	5210.0139	5210.0137	5210.0133
30	5210.0060	5210.0050	5210.0049	5210.0040
40	5210.0045	5210.0035	5210.0033	5210.0028
Max. Deviation (MHz)	0.0174	0.0165	0.0164	0.0157
Max. Deviation (ppm)	3.34	3.17	3.15	3.01
Result	Pass			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5775.0152	5775.0150	5775.0147	5775.0146
110.00	5775.0144	5775.0139	5775.0130	5775.0128
93.50	5775.0142	5775.0135	5775.0125	5775.0117
Max. Deviation (MHz)	0.0152	0.0150	0.0147	0.0146
Max. Deviation (ppm)	2.63	2.60	2.55	2.53
Result	Pass			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5775.0172	5775.0165	5775.0161	5775.0151
10	5775.0163	5775.0153	5775.0146	5775.0144
20	5775.0144	5775.0141	5775.0137	5775.0131
30	5775.0060	5775.0058	5775.0052	5775.0048
40	5775.0059	5775.0058	5775.0057	5775.0048
Max. Deviation (MHz)	0.0172	0.0165	0.0161	0.0151
Max. Deviation (ppm)	2.98	2.86	2.79	2.61
Result	Pass			