

Report No.: FR6N2505-01



FCC RADIO TEST REPORT

FCC ID : TE7KC100

Equipment : Kasa Smart Spot

Brand Name : tp-link
Model Name : KC100

Applicant : TP-Link Technologies Co., Ltd.

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

Shenzhen, 518057 China

Manufacturer : TP-Link Technologies Co., Ltd.

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

Shenzhen, 518057 China

Standard : 47 CFR FCC Part 15.247

The product was received on Oct. 03, 2018, and testing was started from Oct. 17, 2018 and completed on Oct. 29, 2018. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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

Approved by: Sam Chen

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

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

TEL: 886-3-656-9065

FAX: 886-3-656-9085

Report Template No.: CB Ver1.0

Page Number : 1 of 29

Issued Date : Nov. 14, 2018

Report Version : 01

Table of Contents

Histo	ory of this test report	3
Sum	ımary of Test Result	4
1	General Description	5
1.1	Information	5
1.2	Testing Applied Standards	7
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	
2.6	Test Setup Diagram	12
3	Transmitter Test Result	15
3.1	AC Power-line Conducted Emissions	15
3.2	DTS Bandwidth	17
3.3	Maximum Conducted Output Power	18
3.4	Power Spectral Density	
3.5	Emissions in Non-restricted Frequency Bands	
3.6	Emissions in Restricted Frequency Bands	24
4	Test Equipment and Calibration Data	28
Appe	endix A. Test Results of AC Power-line Conducted Emissions	
Appe	endix B. Test Results of DTS Bandwidth	
Appe	endix C. Test Results of Maximum Conducted Output Power	
Appe	endix D. Test Results of Power Spectral Density	
Appe	endix E. Test Results of Emissions in Non-restricted Frequency Bands	
Appe	endix F. Test Results of Emissions in Restricted Frequency Bands	
Appe	endix G. Test Photos	
Phot	tographs of EUT v01	

TEL: 886-3-656-9065 FAX: 886-3-656-9085 Report Template No.: CB Ver1.0 Page Number : 2 of 29 : Nov. 14, 2018

Report No. : FR6N2505-01

Issued Date

Report Version : 01

History of this test report

Report No. : FR6N2505-01

Report No.	Version	Description	Issued Date
FR6N2505-01	01	Initial issue of report	Nov. 14, 2018

TEL: 886-3-656-9065 Page Number : 3 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

Summary of Test Result

Report No. : FR6N2505-01

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

Reviewed by: Sam Chen Report Producer: Viola Huang

TEL: 886-3-656-9065 Page Number : 4 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

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)	2412-2462	1-11 [11]
2400-2483.5	n (HT40)	2422-2452	3-9 [7]

Report No.: FR6N2505-01

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	802.11b	20	1TX
2.4-2.4835GHz	802.11g	20	1TX
2.4-2.4835GHz	802.11n HT20	20	1TX
2.4-2.4835GHz	802.11n HT40	40	1TX

Note:

- ◆ 11b mode uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
- 11g, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- 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.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	-	-	PCB Antenna	N/A	3.59

Note: The EUT has one antenna.

For IEEE 802.11b/g/n mode (1TX/1RX)

Port 1 can be used as transmitting/receiving antenna.

TEL: 886-3-656-9065 Page Number : 5 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11b	0.989	0.048	n/a (DC>=0.98)	n/a (DC>=0.98)
802.11g	0.922	0.353	1.361m	1k
802.11n HT20	0.933	0.301	1.275m	1k
802.11n HT40	0.859	0.66	633.75u	3k

Report No. : FR6N2505-01

NI	ata:
ıν	UIG.

- DC is Duty Cycle.
- DCF is Duty Cycle Factor.

1.1.4 EUT Operational Condition

EUT Power Type	From power adapter or host system					
Beamforming Function		☐ With beamforming ☐ Without beamforming				
Function	☐ Point-to-multipoint ☐ Point-to-point					
Test Software Version	Realtek 11n 8188F USB WLAN MP Version 1.25.20170609					

TEL: 886-3-656-9065 Page Number : 6 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

1.2 Testing Applied Standards

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

Report No.: FR6N2505-01

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- FCC KDB 558074 D01 v05

1.3 Testing Location Information

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

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-CB	Jeff Wu	24.3°C / 53%	Oct. 29, 2018
Radiated Below 1GHz	03CH01-CB	Cola Fan	22°C / 54%	Oct. 17, 2018
Radiated Above 1GHz	03CH01-CB	Cola Fan	22°C / 54%	Oct. 24, 2018 ~ Oct. 28, 2018
AC Conduction	CO02-CB	Rick Yeh	25°C / 55%	Oct. 23, 2018

Test site Designation No. TW0006 with FCC.

1.4 Measurement Uncertainty

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

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	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%
Output Power Measurement	1.33 dB	Confidence levels of 95%
Power Density Measurement	1.27 dB	Confidence levels of 95%
Bandwidth Measurement	9.74 x10 ⁻⁸	Confidence levels of 95%

TEL: 886-3-656-9065 Page Number : 7 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

Test site registered number IC 4086D with Industry Canada.

2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	PowerSetting
802.11b_Nss1,(1Mbps)_1TX	-
2412MHz	63
2437MHz	63
2462MHz	63
802.11g_Nss1,(6Mbps)_1TX	-
2412MHz	46
2417MHz	60
2422MHz	63
2437MHz	63
2452MHz	63
2457MHz	61
2462MHz	54
802.11n HT20_Nss1,(MCS0)_1TX	-
2412MHz	48
2417MHz	59
2422MHz	63
2437MHz	63
2452MHz	63
2457MHz	60
2462MHz	55
802.11n HT40_Nss1,(MCS0)_1TX	-
2422MHz	48
2427MHz	58
2432MHz	60
2437MHz	62
2442MHz	61
2447MHz	60
2452MHz	59

Report No. : FR6N2505-01

TEL: 886-3-656-9065 Page Number : 8 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

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	Normal Link - EUT + Adapter

Report No. : FR6N2505-01

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

Th	e 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	Normal Link - EUT in X axis + Adapter
2	Normal Link - EUT in Z axis + Adapter
3	Normal Link - EUT in Y axis + Adapter
For operating mode 3 is th	e worst case and it was record in this test report.
	СТХ
Operating Mode > 1GHz	The EUT was performed at X axis, Y axis and Z axis position, and the worst case was found at Z axis. So the measurement will follow this same test configuration.
1	EUT in Z axis

TEL: 886-3-656-9065 Page Number : 9 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

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

		Accessories	
Equipment Name	Brand Name	Model Name	Rating
Adapter	MASS POWER	NBS05B050100VUU	INPUT: 100-240V~, 50/60Hz, 0.2A OUTPUT: 5.0V, 1.0A
		Others	
USB cable*1, shielde	d, 2.9m		

Report No. : FR6N2505-01

TEL: 886-3-656-9065 Page Number : 10 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

2.5 Support Equipment

For Test Site No: CO02-CB

Support Equipment			
Equipment	Brand Name	Model Name	FCC ID
NB	DELL	E6430	N/A
AP Router	Planex	GW-AP54SGX	KA220030603014-1

Report No.: FR6N2505-01

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

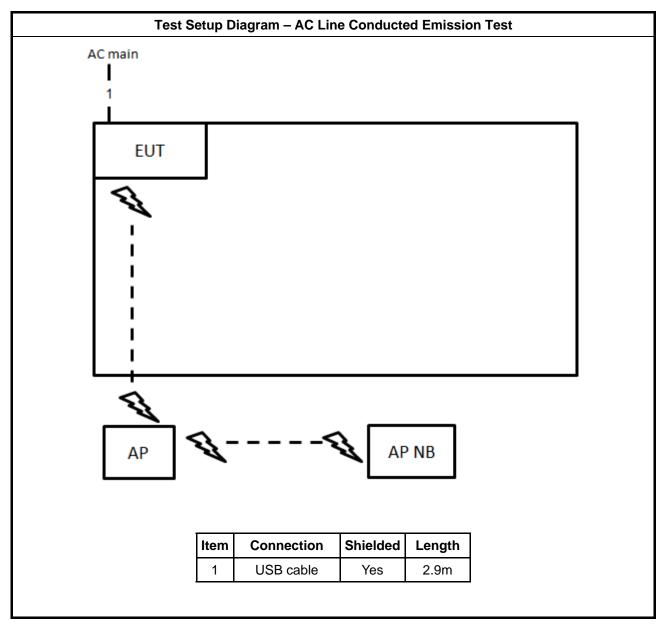
Support Equipment			
Equipment	Brand Name	Model Name	FCC ID
NB	DELL	E4300	N/A
WLAN AP	NETGEAR	WNDR3300v2	PY309300116

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

Support Equipment			
Equipment	Brand Name	Model Name	FCC ID
NB	DELL	E4300	N/A

TEL: 886-3-656-9065 Page Number : 11 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

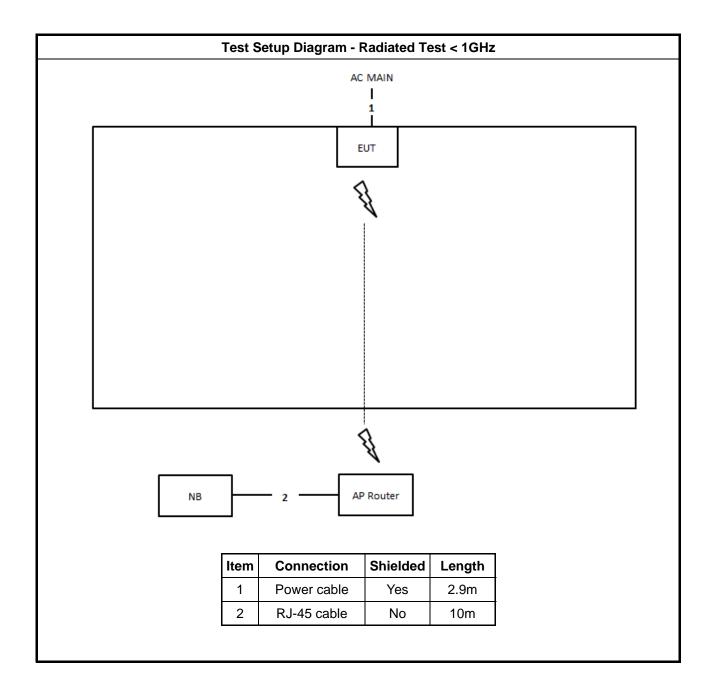
2.6 Test Setup Diagram



Report No. : FR6N2505-01

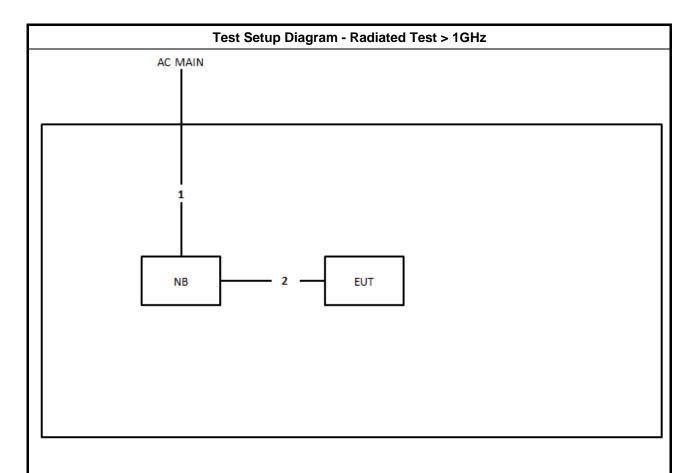
TEL: 886-3-656-9065 Page Number : 12 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

Report No. : FR6N2505-01



TEL: 886-3-656-9065 Page Number : 13 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018





Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	USB cable	Yes	2.9m

TEL: 886-3-656-9065 Page Number : 14 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

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	of the frequency.	

Report No. : FR6N2505-01

3.1.2 Measuring Instruments

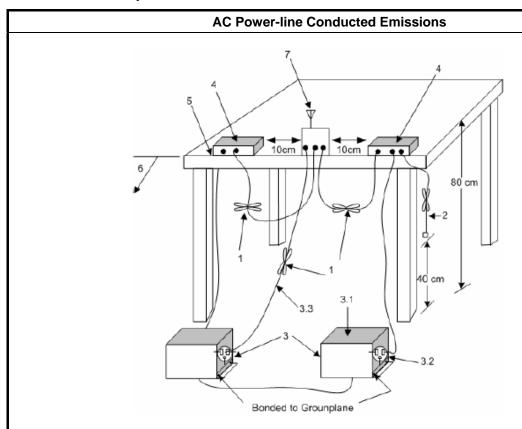
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

TEL: 886-3-656-9065 Page Number : 15 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

3.1.4 Test Setup



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

Report No.: FR6N2505-01

- 2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- 3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
- 3.1—All other equipment powered from additional LISN(s).
- 3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
- 3.3—LISN at least 80 cm from nearest part of EUT chassis.
- 4—Non-EUT components of EUT system being tested.
- 5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
- 6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
- 7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

3.1.5 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

TEL: 886-3-656-9065 Page Number : 16 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

3.2 DTS Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
■ 6 dB bandwidth ≥ 500 kHz.

Report No.: FR6N2505-01

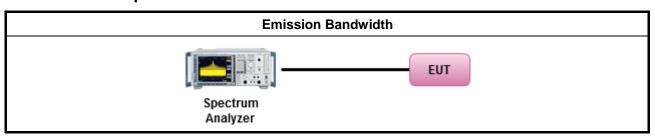
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

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

3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

TEL: 886-3-656-9065 Page Number: 17 of 29
FAX: 886-3-656-9085 Issued Date: Nov. 14, 2018

3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit

- If G_{TX} ≤ 6 dBi, then P_{Out} ≤ 30 dBm (1 W)
- Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 (G_{TX} 6)$ dBm
- Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 (G_{TX} 6)/3$ dBm
- Smart antenna system (SAS):
 - Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 (G_{TX} 6)/3$ dBm
 - Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 (G_{TX} 6)/3$ dBm
 - Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 (G_{TX} 6)/3 + 8$ dB dBm

Report No.: FR6N2505-01

 \mathbf{P}_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, \mathbf{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.

TEL: 886-3-656-9065 Page Number : 18 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

3.3.3 Test Procedures

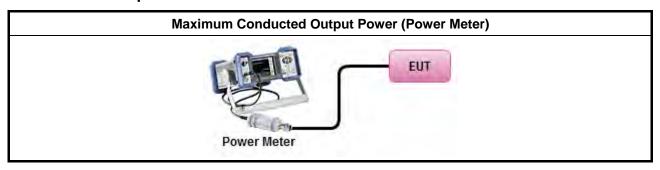
		Test Method
•	Max	imum Peak Conducted Output Power
		Refer as FCC KDB 558074, clause 8.3.1.1 & C63.10 clause 11.9.1.1 (RBW ≥ EBW method).
		Refer as FCC KDB 558074, clause 8.3.1.3 & C63.10 clause 11.9.1.3 (peak power meter).
•	Max	imum Conducted Output Power
	[duty	cycle ≥ 98% or external video / power trigger]
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.2 Method AVGSA-1.
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.3 Method AVGSA-1A. (alternative)
	duty	cycle < 98% and average over on/off periods with duty factor
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.4 Method AVGSA-2.
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.5 Method AVGSA-2A (alternative)
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.6 Method AVGSA-3
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.7 Method AVGSA-3A (alternative)
	Mea	surement using a power meter (PM)
	\boxtimes	Refer as FCC KDB 558074, clause $8.3.2.3 \& C63.10$ clause $11.9.2.3.1$ Method AVGPM (using an RF average power meter).
		Refer as FCC KDB 558074, clause $8.3.2.3 \& C63.10$ clause $11.9.2.3.2$ Method AVGPM-G (using an gate RF average power meter).
•	For	conducted measurement.
	•	If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	•	If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) EIRP _{total} = $P_{total} + DG$

Report No. : FR6N2505-01

 TEL: 886-3-656-9065
 Page Number
 : 19 of 29

 FAX: 886-3-656-9085
 Issued Date
 : Nov. 14, 2018

3.3.4 Test Setup



Report No. : FR6N2505-01

3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

TEL: 886-3-656-9065 Page Number : 20 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

3.4 **Power Spectral Density**

3.4.1 **Power Spectral Density Limit**

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

Report No.: FR6N2505-01

Measuring Instruments

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

3.4.3 **Test Procedures**

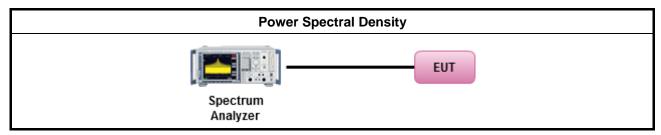
	Test Method
•	Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum 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 8.4 & C63.10 clause 11.10.2 Method PKPSD.
	[duty cycle ≥ 98% or external video / power trigger]
	Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.3 Method AVGPSD-1.
	Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.5 Method AVGPSD-2.
	Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.7 Method AVGPSD-3.
	duty cycle < 98% and average over on/off periods with duty factor
	Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.4 Method AVGPSD-1A. (alternative).
	Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.6 Method AVGPSD-2A. (alternative)
	Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.6 Method AVGPSD-3A. (alternative)
•	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, spectral 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,

TEL: 886-3-656-9065 Page Number : 21 of 29 FAX: 886-3-656-9085 : Nov. 14, 2018 Issued Date

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.

Report No.: FR6N2505-01

3.4.4 Test Setup



3.4.5 Test Result of Power Spectral Density

Refer as Appendix D

TEL: 886-3-656-9065 Page Number : 22 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

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				

Report No.: FR6N2505-01

- Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.
- Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

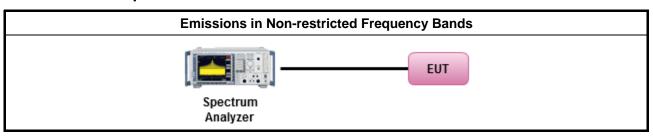
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

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

3.5.4 Test Setup



3.5.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix E

TEL: 886-3-656-9065 Page Number : 23 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

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				

Report No.: FR6N2505-01

- Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
- Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.
- Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

3.6.2 Measuring Instruments

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

TEL: 886-3-656-9065 Page Number : 24 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

3.6.3 Test Procedures

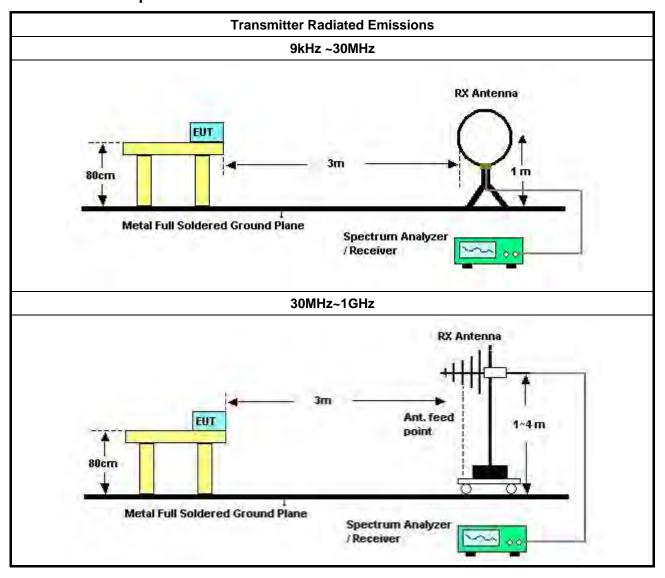
		Test Method						
•	The	average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].						
•		er as ANSI C63.10, clause 6.9.2.2 band-edge testing shall be performed at the lowest frequency nnel and highest frequency channel within the allowed operating band.						
•	For	the transmitter unwanted emissions shall be measured using following options below:						
	Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands.							
		Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle ≥98%).						
		Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).						
		☐ Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW≥1/T).						
		☐ Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW ≥ 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 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.						
•	For	the transmitter band-edge emissions shall be measured using following options below:						
	•	Refer as FCC KDB 558074 clause 8.7 & c63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.						
	•	Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.						
	•	Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).						
	•	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.						

Report No. : FR6N2505-01

 TEL: 886-3-656-9065
 Page Number
 : 25 of 29

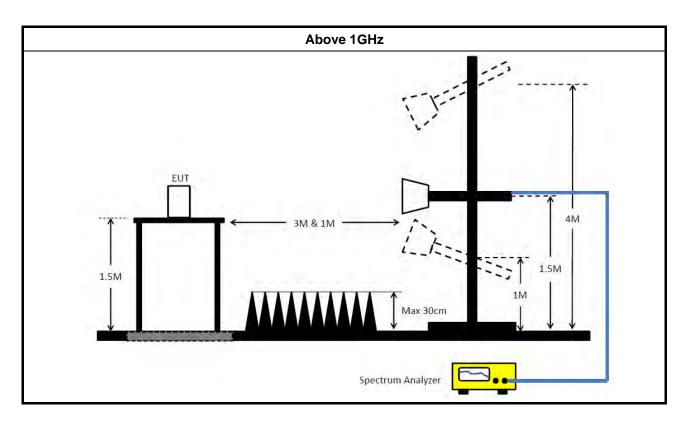
 FAX: 886-3-656-9085
 Issued Date
 : Nov. 14, 2018

3.6.4 Test Setup



Report No. : FR6N2505-01

TEL: 886-3-656-9065 Page Number : 26 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018



Report No.: FR6N2505-01

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.

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

3.6.6 Test Result of Transmitter Radiated Unwanted Emissions

Refer as Appendix F

TEL: 886-3-656-9065 Page Number : 27 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Nov. 24, 2017	Nov. 23, 2018	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 13, 2017	Nov. 12, 2018	Conduction (CO02-CB)
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	Jan. 17, 2018	Jan. 16, 2019	Conduction (CO02-CB)
COND Cable	Woken	Cable	2	0.15MHz ~ 30MHz	Nov. 10, 2017	Nov. 09, 2018	Conduction (CO02-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO02-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 27, 2018	Aug. 26, 2019	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 20, 2017	Nov. 19, 2018	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2018	May 01, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 09, 2018	Jan. 08, 2019	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 23, 2017	Nov. 22, 2018	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100354	9kHz ~ 2.75GHz	Dec. 08, 2017	Dec. 07, 2018	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)

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

Report Template No.: CB Ver1.0

Page Number : 28 of 29 Issued Date : Nov. 14, 2018

Report No. : FR6N2505-01

Report Version : 01

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 21, 2017	Dec. 20, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)

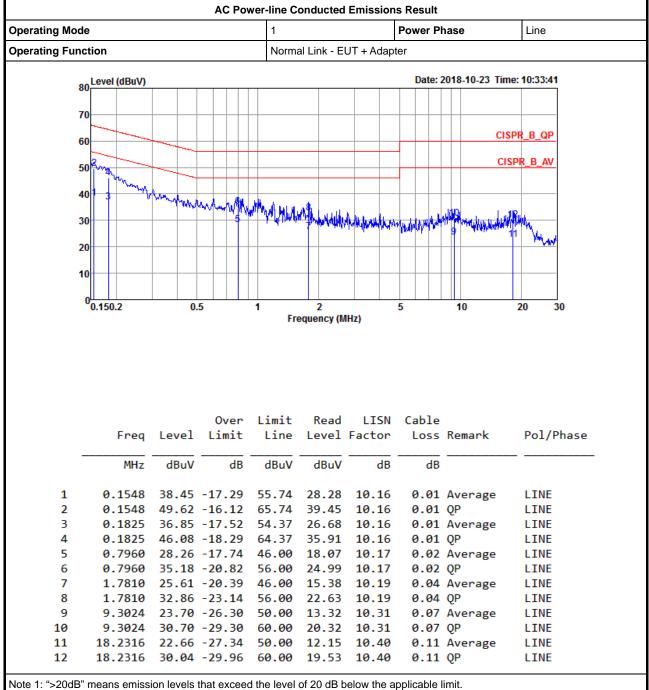
Report No. : FR6N2505-01

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

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

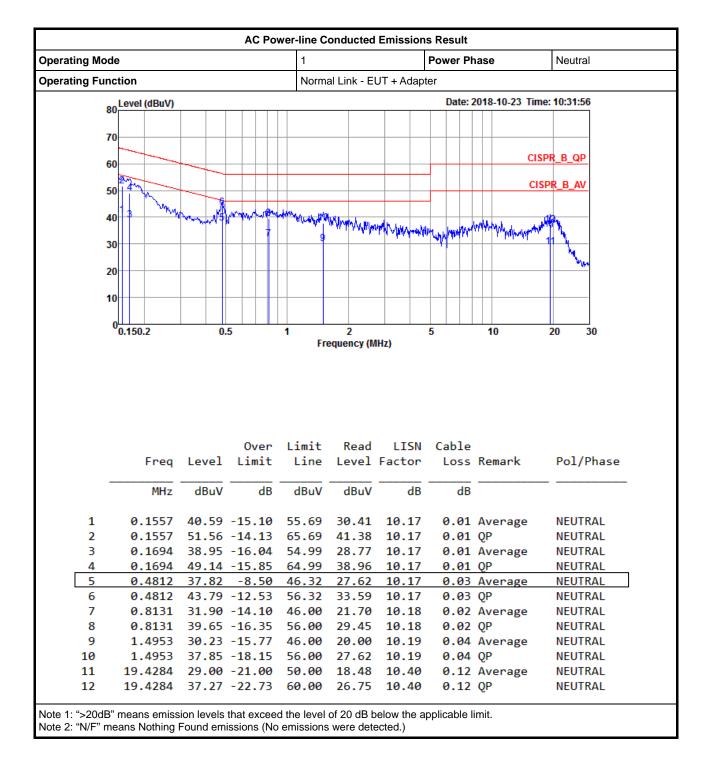
TEL: 886-3-656-9065 Page Number : 29 of 29
FAX: 886-3-656-9085 Issued Date : Nov. 14, 2018





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







EBW Result Appendix B

Summary

Mode	Max-N dB	Max-OBW	ITU-Code	Min-N dB	Min-OBW
	(Hz)	(Hz)		(Hz)	(Hz)
2.4-2.4835GHz	-	-	-	-	-
802.11b_Nss1,(1Mbps)_1TX	10.025M	15.118M	15M1G1D	9.5M	14.248M
802.11g_Nss1,(6Mbps)_1TX	16.325M	19.051M	19M1D1D	16.275M	16.565M
802.11n HT20_Nss1,(MCS0)_1TX	17.35M	19.843M	19M8D1D	16.9M	17.632M
802.11n HT40_Nss1,(MCS0)_1TX	35.7M	36.302M	36M3D1D	35.4M	36.053M

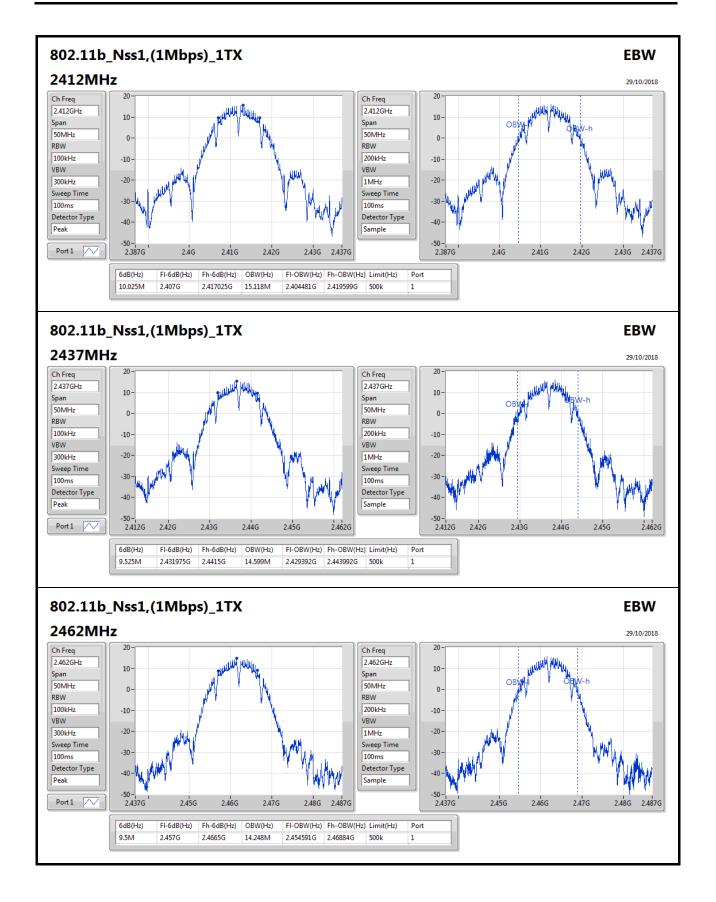
Max-N dB = Maximum 6dB down bandwidth; **Max-OBW** = Maximum 99% occupied bandwidth; **Min-N dB** = Minimum 6dB down bandwidth; **Min-OBW** = Minimum 99% occupied bandwidth;

Result

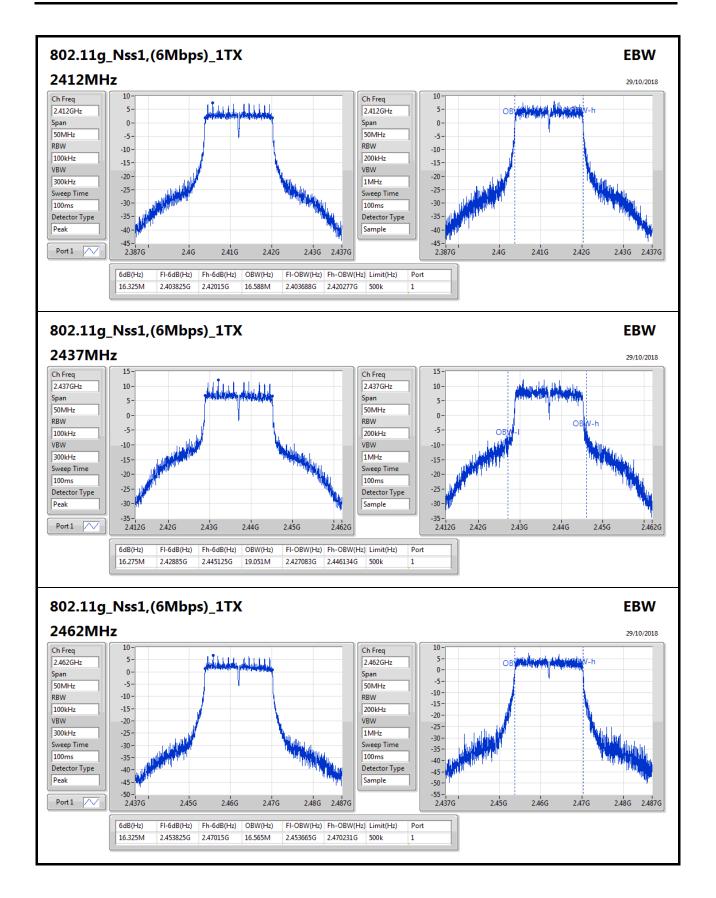
Mode	Result	Limit	Port 1-N dB	Port 1-OBW
		(Hz)	(Hz)	(Hz)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-
2412MHz	Pass	500k	10.025M	15.118M
2437MHz	Pass	500k	9.525M	14.599M
2462MHz	Pass	500k	9.5M	14.248M
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-
2412MHz	Pass	500k	16.325M	16.588M
2437MHz	Pass	500k	16.275M	19.051M
2462MHz	Pass	500k	16.325M	16.565M
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-
2412MHz	Pass	500k	17.35M	17.735M
2437MHz	Pass	500k	16.975M	19.843M
2462MHz	Pass	500k	16.9M	17.632M
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-
2422MHz	Pass	500k	35.65M	36.123M
2437MHz	Pass	500k	35.4M	36.302M
2452MHz	Pass	500k	35.7M	36.053M

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

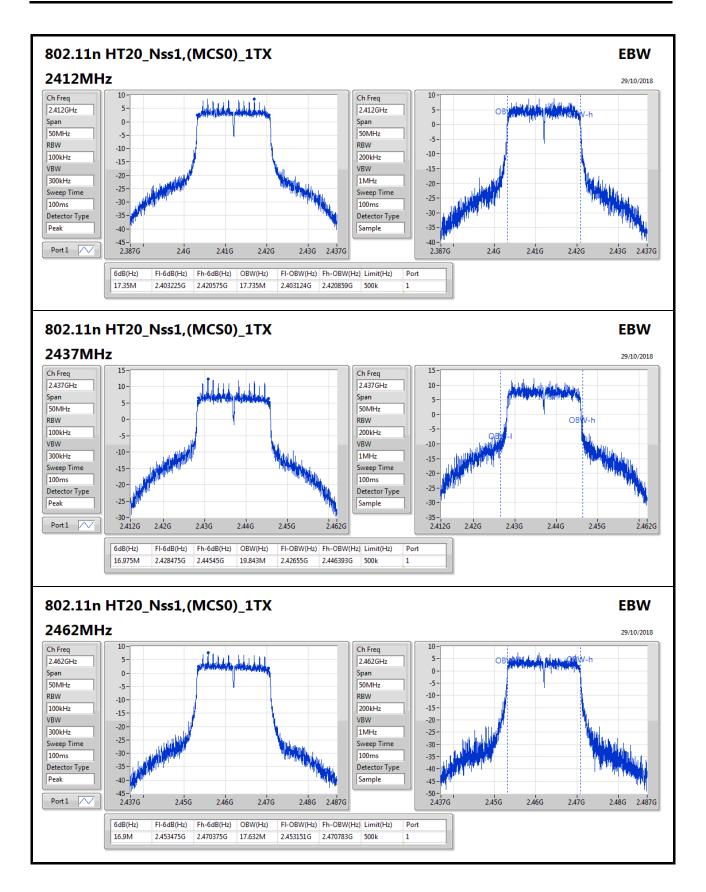




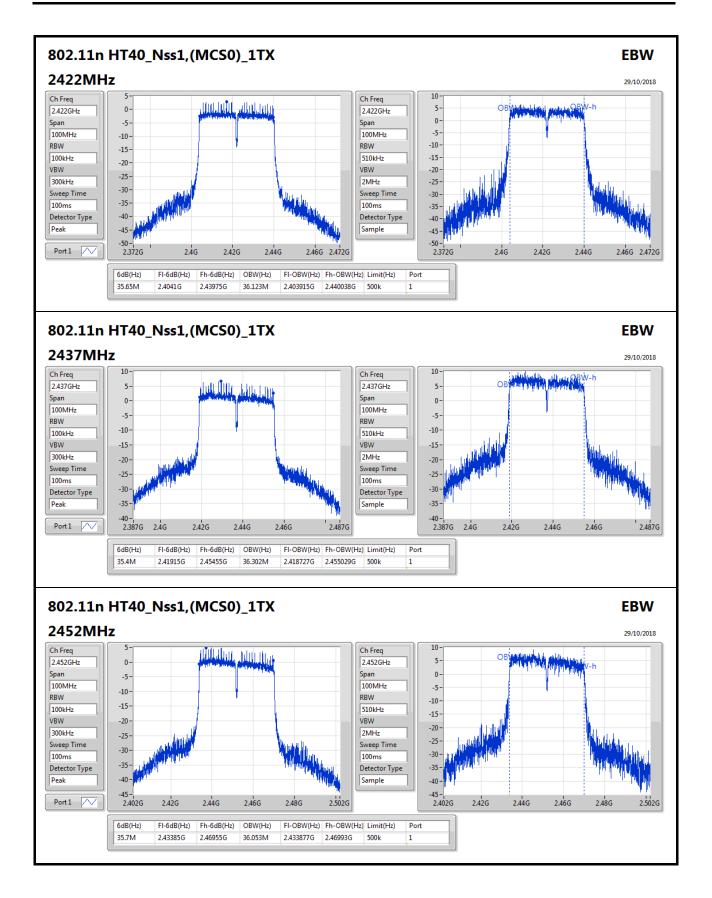












: 5 of 5



AV Power Result Appendix C

Summary

Mode	Total Power	Total Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_1TX	24.13	0.25882
802.11g_Nss1,(6Mbps)_1TX	22.30	0.16982
802.11n HT20_Nss1,(MCS0)_1TX	22.62	0.18281
802.11n HT40_Nss1,(MCS0)_1TX	20.64	0.11588

Result

Mode	Result	DG	Port 1	Total Power	Power Limit
		(dBi)	(dBm)	(dBm)	(dBm)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	3.59	23.95	23.95	30.00
2437MHz	Pass	3.59	24.13	24.13	30.00
2462MHz	Pass	3.59	23.40	23.40	30.00
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	3.59	17.86	17.86	30.00
2417MHz	Pass	3.59	21.62	21.62	30.00
2422MHz	Pass	3.59	22.22	22.22	30.00
2437MHz	Pass	3.59	22.30	22.30	30.00
2452MHz	Pass	3.59	21.84	21.84	30.00
2457MHz	Pass	3.59	20.80	20.80	30.00
2462MHz	Pass	3.59	18.07	18.07	30.00
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-
2412MHz	Pass	3.59	19.04	19.04	30.00
2417MHz	Pass	3.59	21.37	21.37	30.00
2422MHz	Pass	3.59	22.41	22.41	30.00
2437MHz	Pass	3.59	22.62	22.62	30.00
2452MHz	Pass	3.59	21.80	21.80	30.00
2457MHz	Pass	3.59	20.44	20.44	30.00
2462MHz	Pass	3.59	17.91	17.91	30.00
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-
2422MHz	Pass	3.59	16.83	16.83	30.00
2427MHz	Pass	3.59	19.24	19.24	30.00
2432MHz	Pass	3.59	20.26	20.26	30.00
2437MHz	Pass	3.59	20.64	20.64	30.00
2442MHz	Pass	3.59	19.68	19.68	30.00
2447MHz	Pass	3.59	19.39	19.39	30.00
2452MHz	Pass	3.59	18.62	18.62	30.00

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



PSD Result Appendix D

Summary

Mode	PD
	(dBm/RBW)
2.4-2.4835GHz	
802.11b_Nss1,(1Mbps)_1TX	1.61
802.11g_Nss1,(6Mbps)_1TX	-3.12
802.11n HT20_Nss1,(MCS0)_1TX	-2.89
802.11n HT40_Nss1,(MCS0)_1TX	-8.20

RBW=3kHz.

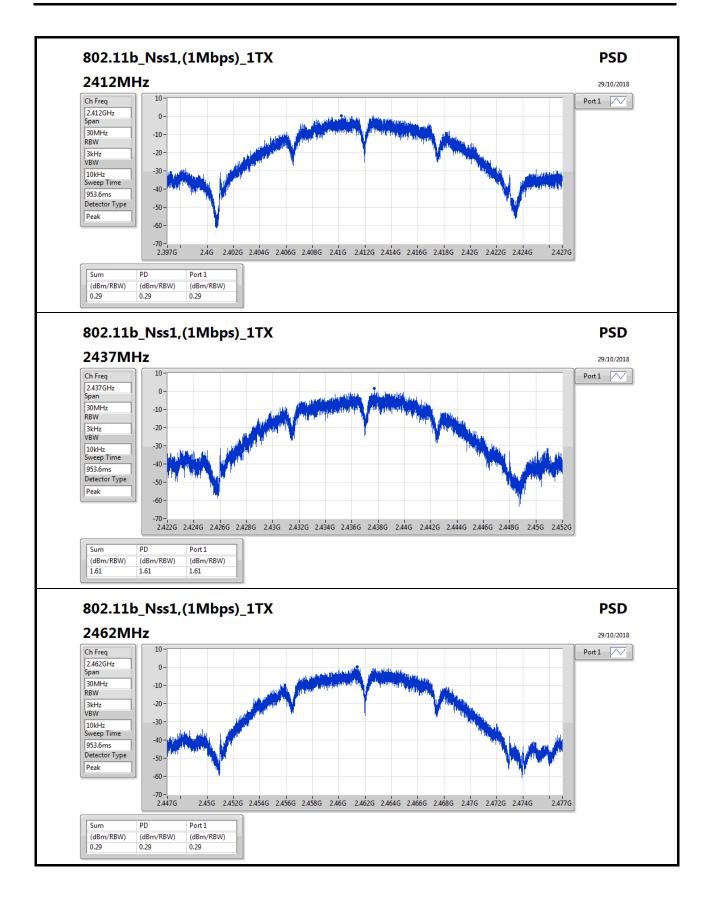
Result

Mode	Result	DG	Port 1	PD	PD Limit
		(dBi)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	3.59	0.29	0.29	8.00
2437MHz	Pass	3.59	1.61	1.61	8.00
2462MHz	Pass	3.59	0.29	0.29	8.00
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	3.59	-6.94	-6.94	8.00
2437MHz	Pass	3.59	-3.12	-3.12	8.00
2462MHz	Pass	3.59	-7.89	-7.89	8.00
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-
2412MHz	Pass	3.59	-7.00	-7.00	8.00
2437MHz	Pass	3.59	-2.89	-2.89	8.00
2462MHz	Pass	3.59	-8.24	-8.24	8.00
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-
2422MHz	Pass	3.59	-11.33	-11.33	8.00
2437MHz	Pass	3.59	-8.20	-8.20	8.00
2452MHz	Pass	3.59	-9.57	-9.57	8.00

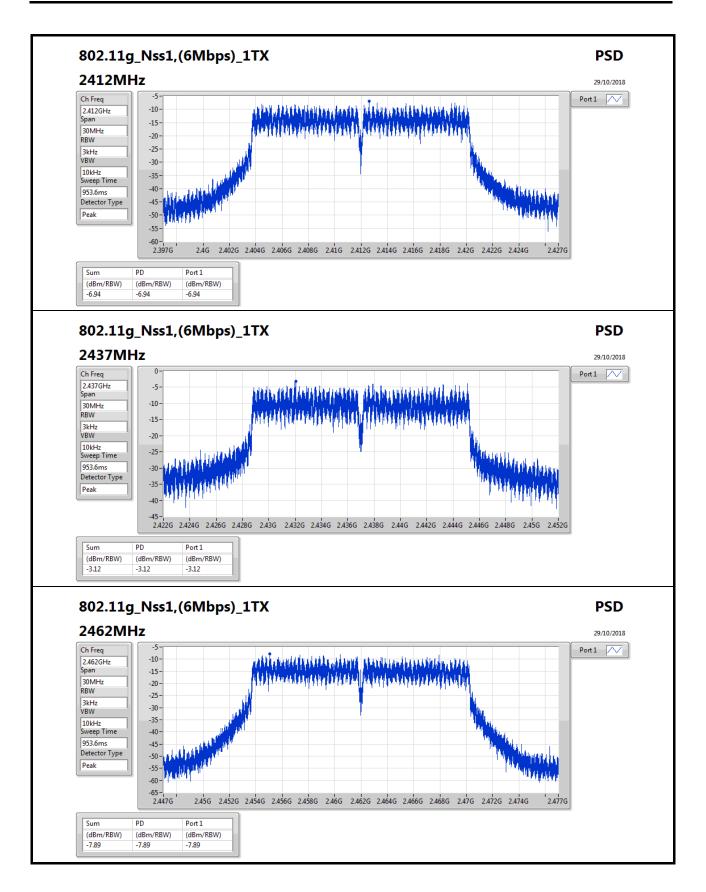
DG = Directional Gain; RBW=3kHz;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; Port X = Port Xpower density;

Page No. : 1 of 5

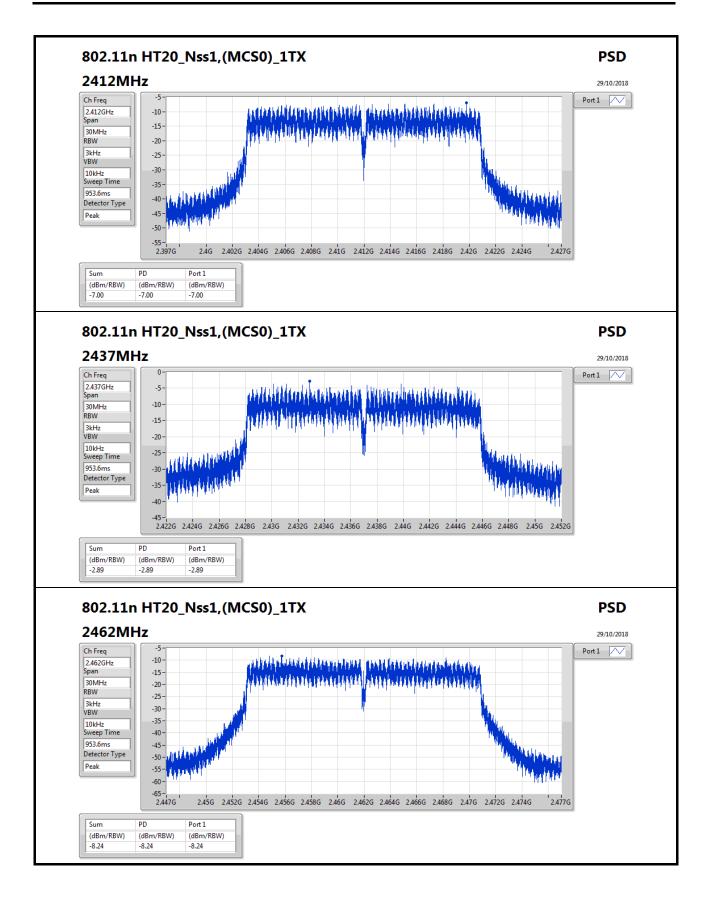




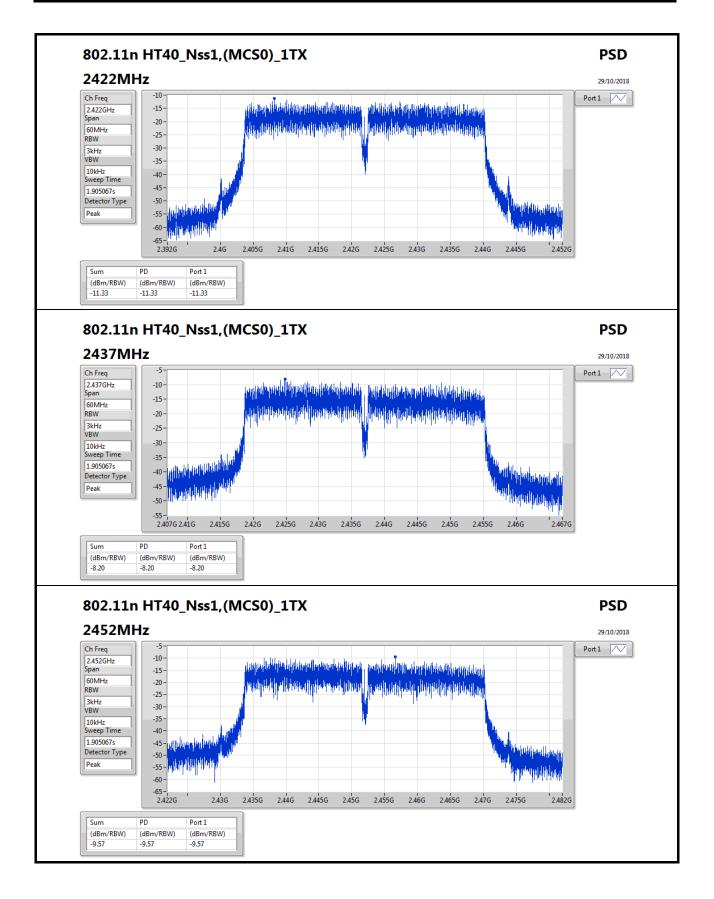














CSE Non-restricted Band Result

Appendix E

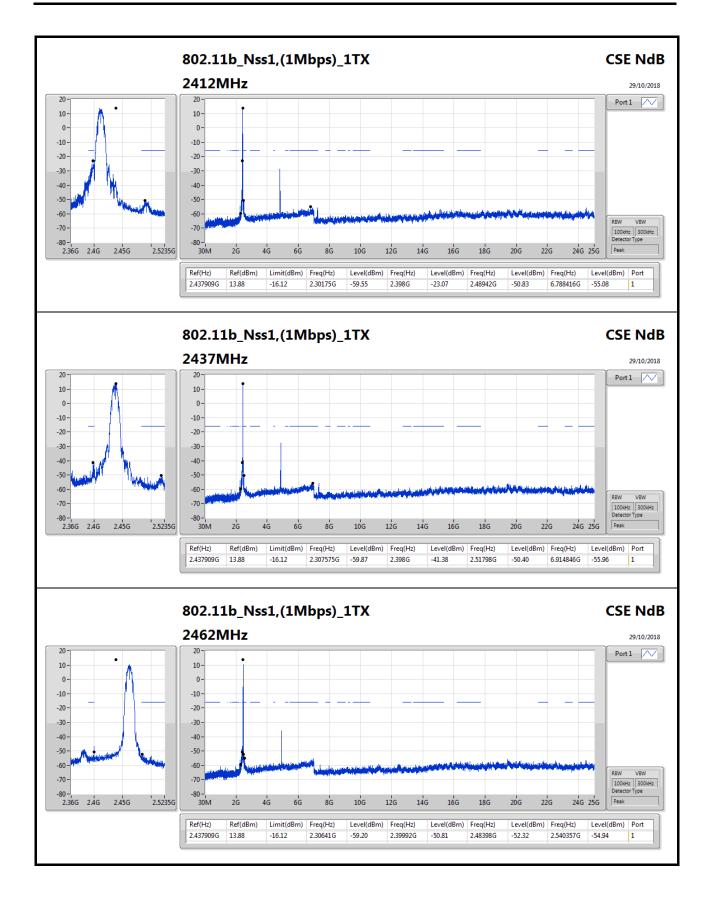
Summary

Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
2.4-2.4835GHz		-	-	-	-	-	-	-	-	-	-	-	-
802.11b_Nss1,(1Mbps)_1TX	Pass	2.437909G	13.88	-16.12	2.30175G	-59.55	2.398G	-23.07	2.48942G	-50.83	6.788416G	-55.08	1
802.11g_Nss1,(6Mbps)_1TX	Pass	2.443253G	4.30	-25.70	900.255M	-60.98	2.39984G	-42.60	2.49078G	-57.90	6.777178G	-55.63	1
802.11n HT20_Nss1,(MCS0)_1TX	Pass	2.432064G	5.01	-24.99	2.309905G	-61.63	2.39976G	-39.33	2.48502G	-56.51	6.805273G	-55.24	1
802.11n HT40_Nss1,(MCS0)_1TX	Pass	2.431897G	2.05	-27.95	2.307405G	-61.13	2.39984G	-37.33	2.49438G	-56.18	6.846067G	-55.85	1

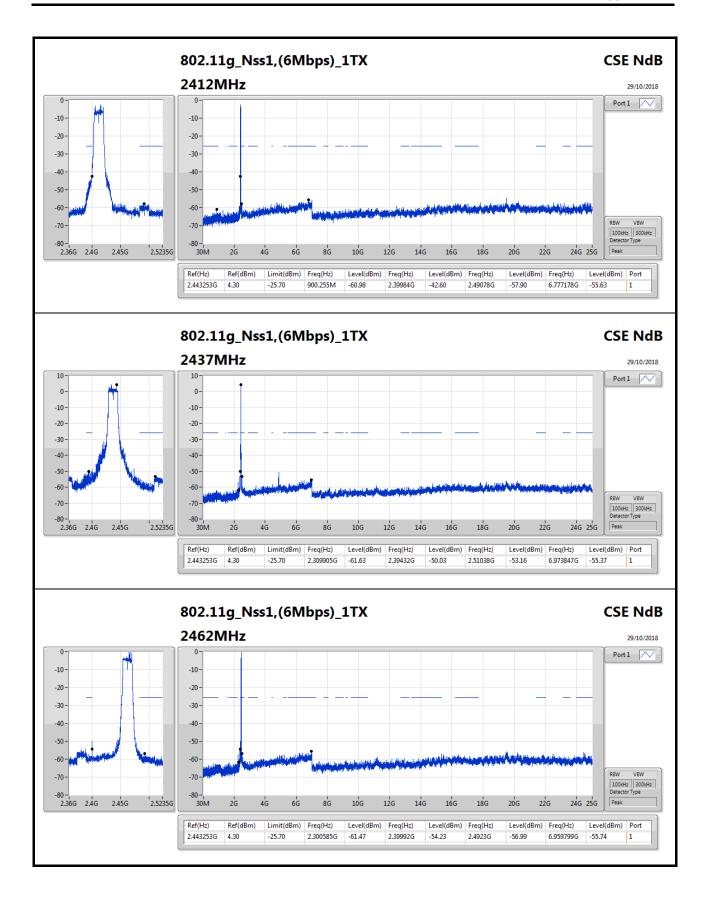
Result

Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.437909G	13.88	-16.12	2.30175G	-59.55	2.398G	-23.07	2.48942G	-50.83	6.788416G	-55.08	1
2437MHz	Pass	2.437909G	13.88	-16.12	2.307575G	-59.87	2.398G	-41.38	2.51798G	-50.40	6.914846G	-55.96	1
2462MHz	Pass	2.437909G	13.88	-16.12	2.30641G	-59.20	2.39992G	-50.81	2.48398G	-52.32	2.540357G	-54.94	1
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.443253G	4.30	-25.70	900.255M	-60.98	2.39984G	-42.60	2.49078G	-57.90	6.777178G	-55.63	1
2437MHz	Pass	2.443253G	4.30	-25.70	2.309905G	-61.63	2.39432G	-50.03	2.51038G	-53.16	6.973847G	-55.37	1
2462MHz	Pass	2.443253G	4.30	-25.70	2.300585G	-61.47	2.39992G	-54.23	2.4923G	-56.99	6.959799G	-55.74	1
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.432064G	5.01	-24.99	2.309905G	-61.63	2.39976G	-39.33	2.48502G	-56.51	6.805273G	-55.24	1
2437MHz	Pass	2.432064G	5.01	-24.99	2.309905G	-61.39	2.39144G	-51.43	2.49686G	-53.09	6.369791G	-56.08	1
2462MHz	Pass	2.432064G	5.01	-24.99	2.302915G	-61.77	2.39992G	-54.72	2.48382G	-56.71	6.996324G	-55.10	1
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2422MHz	Pass	2.431897G	2.05	-27.95	2.307405G	-61.13	2.39984G	-37.33	2.49438G	-56.18	6.846067G	-55.85	1
2437MHz	Pass	2.431897G	2.05	-27.95	2.071535G	-60.57	2.39936G	-39.77	2.48382G	-46.61	6.874113G	-56.10	1
2452MHz	Pass	2.431897G	2.05	-27.95	2.302825G	-60.41	2.39792G	-54.69	2.48414G	-45.95	6.944227G	-54.46	1

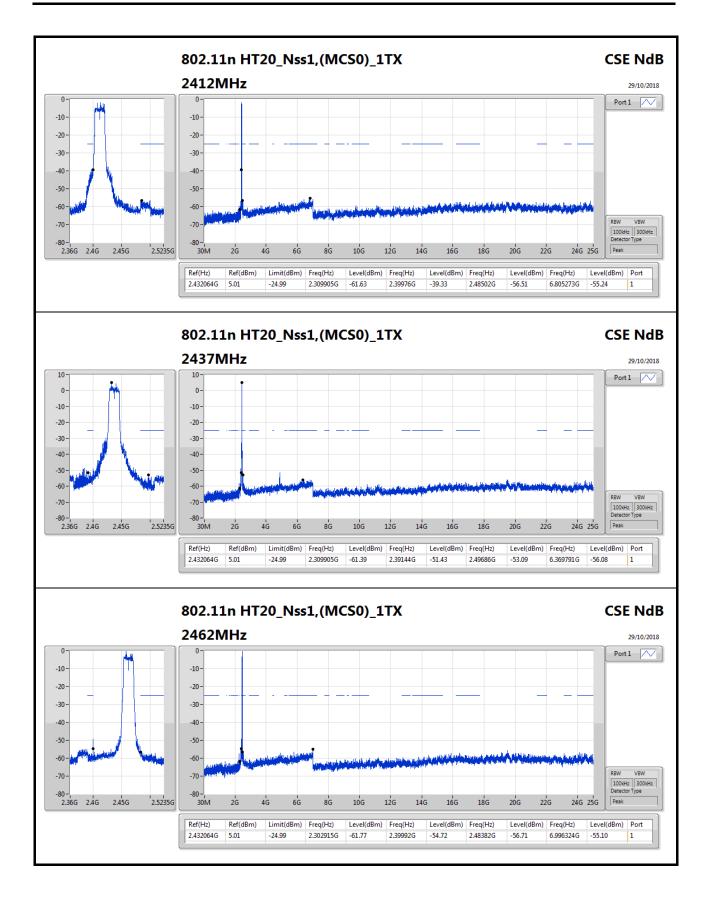






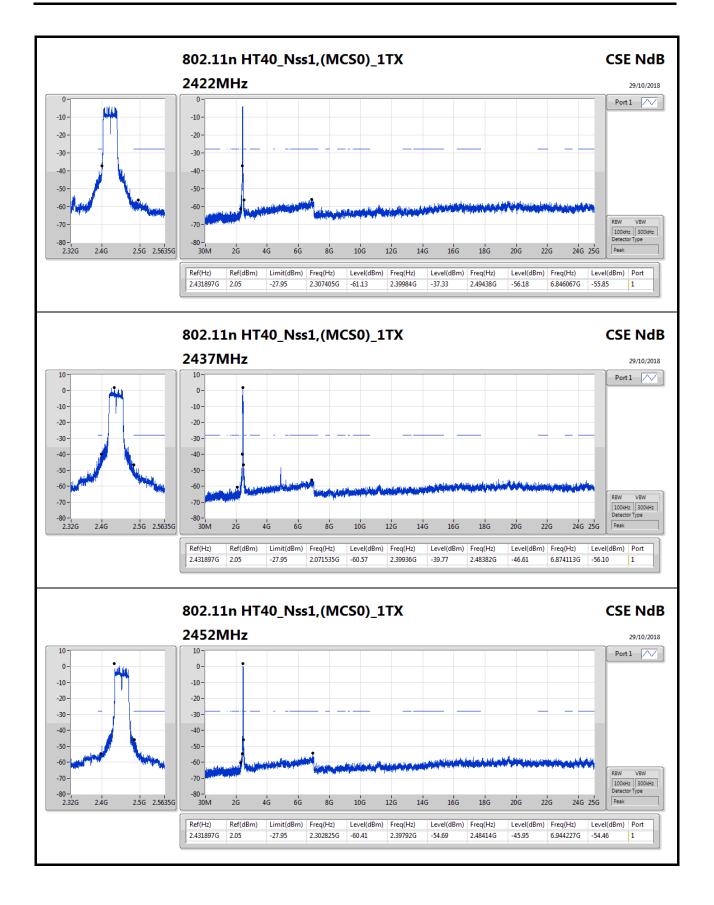




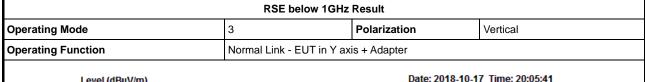


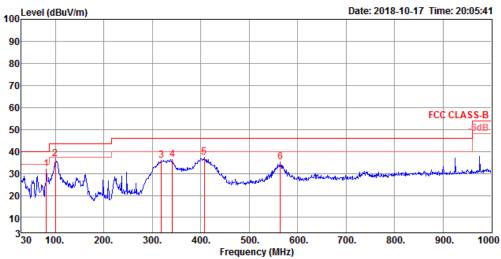
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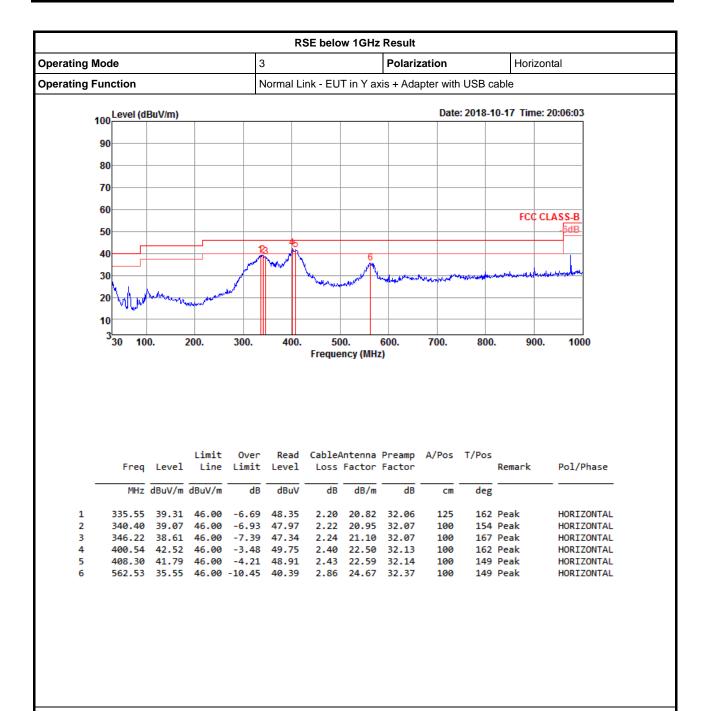




	Freq	Level						Preamp Factor	-	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	81.41	32.02	40.00	-7.98	49.19	1.10	13.59	31.86	125	174	Peak	VERTICAL
2	99.84	36.78	43.50	-6.72	50.33	1.22	17.10	31.87	125	277	Peak	VERTICAL
3	319.06	35.88	46.00	-10.12	45.43	2.14	20.34	32.03	100	184	Peak	VERTICAL
4	341.37	36.26	46.00	-9.74	45.16	2.22	20.95	32.07	100	171	Peak	VERTICAL
5	407.33	37.24	46.00	-8.76	44.37	2.43	22.58	32.14	100	21	Peak	VERTICAL
6	564.47	35.36	46.00	-10.64	40.17	2.87	24.69	32.37	100	184	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.)





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 TX above 1GHz Result

Appendix F.2

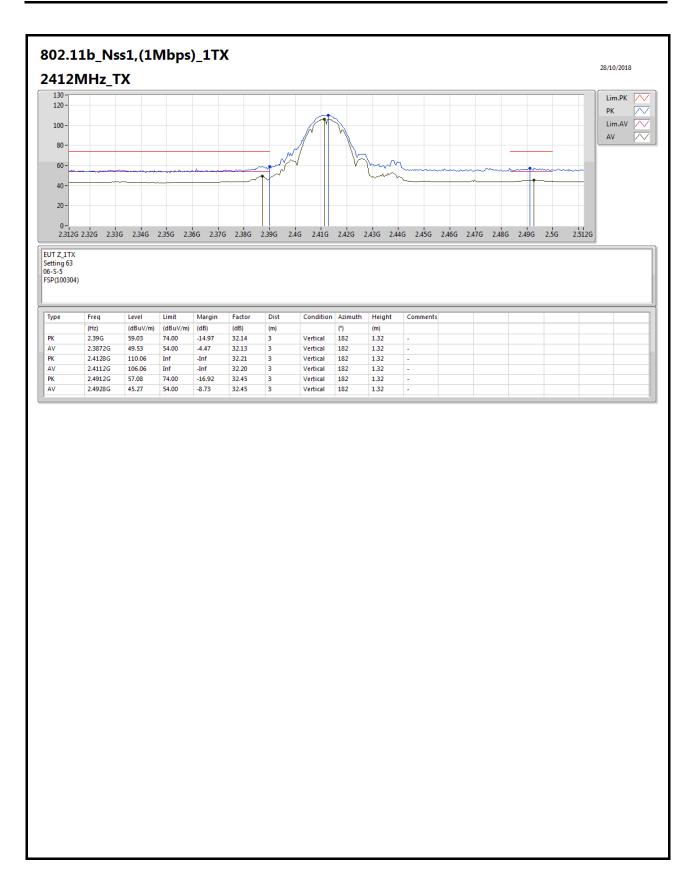
Page No. : 1 of 73

Summary

'n	·												
	Mode	Result	Туре	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
				(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
	2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
	802.11n HT20_Nss1,(MCS0)_1TX	Pass	AV	2.4836G	53.97	54.00	-0.03	32.42	3	Horizontal	298	1.34	-

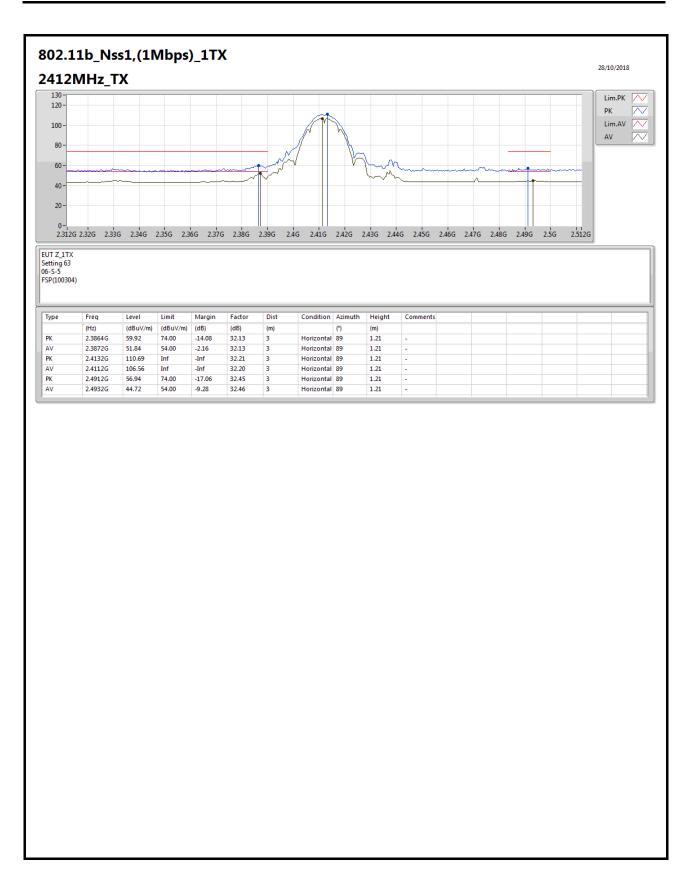
Page No. : 2 of 73





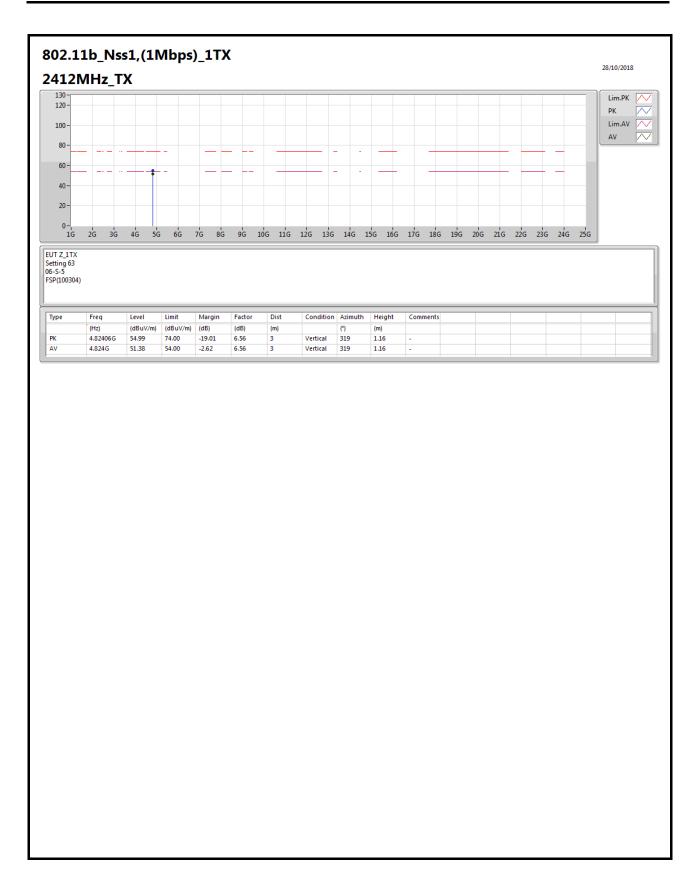
Page No. : 3 of 73





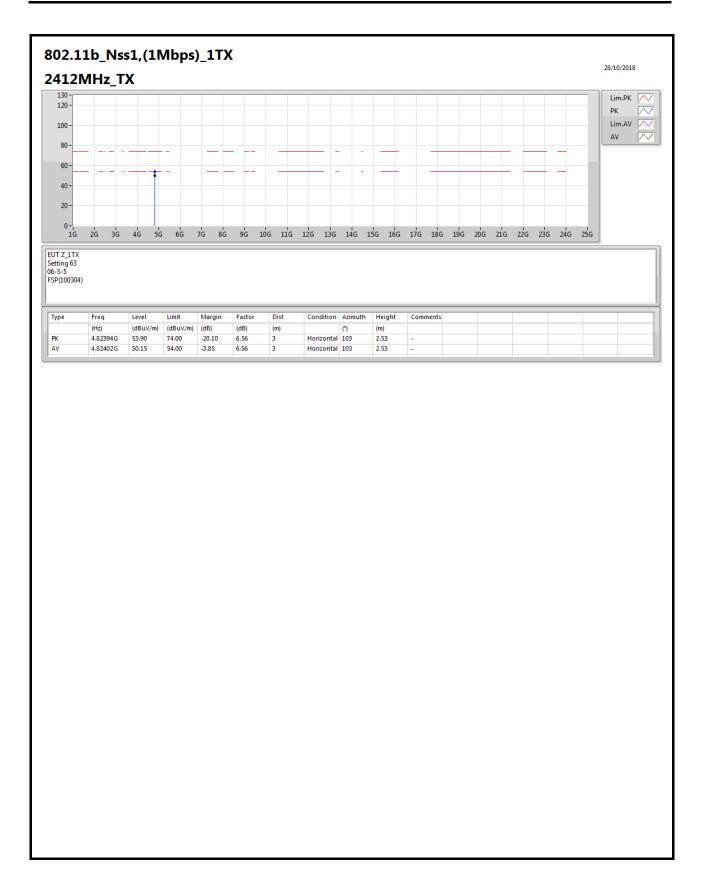
Page No. : 4 of 73





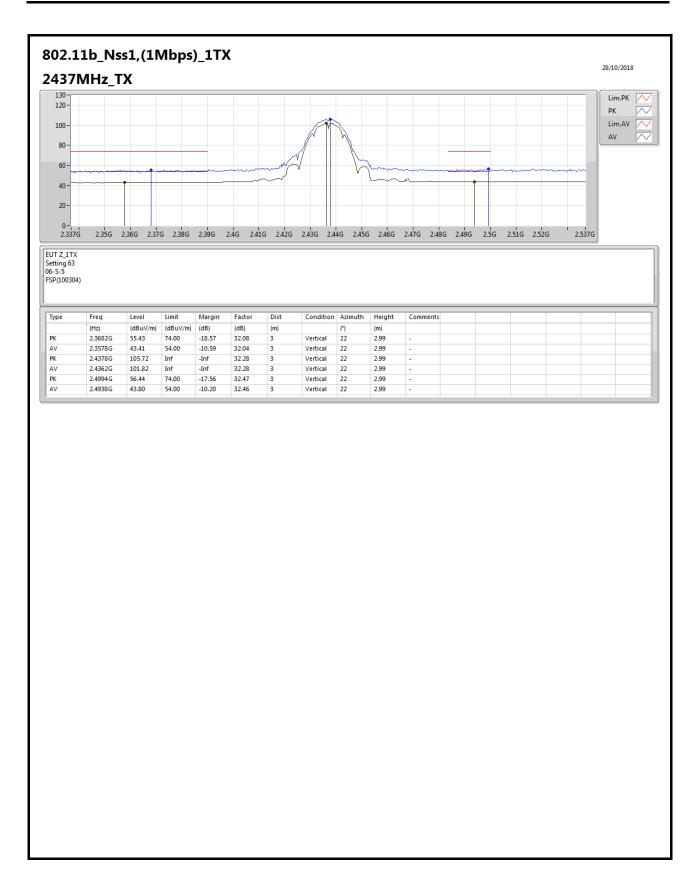
Page No. : 5 of 73





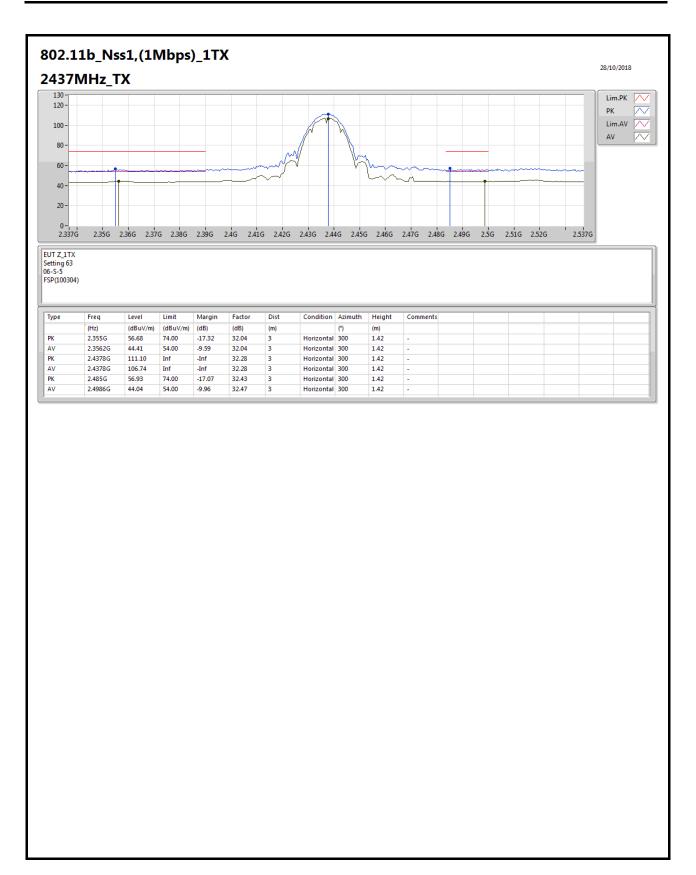
Page No. : 6 of 73





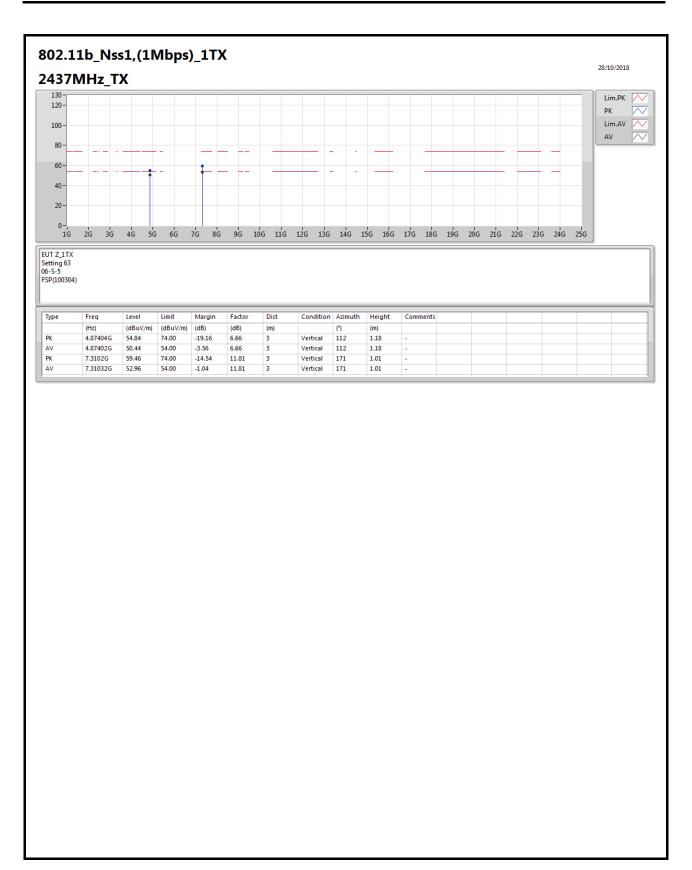
Page No. : 7 of 73





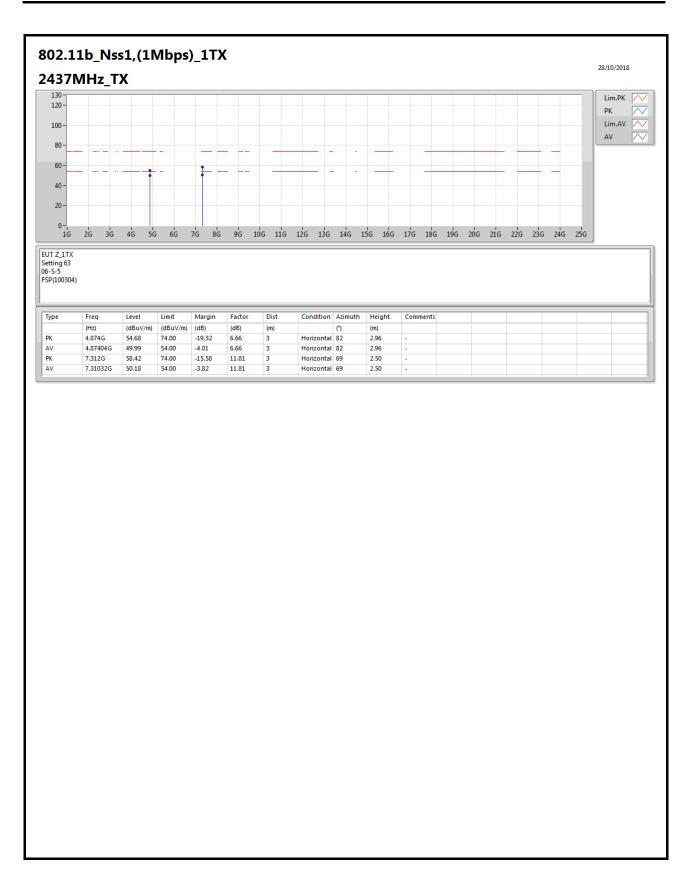
Page No. : 8 of 73





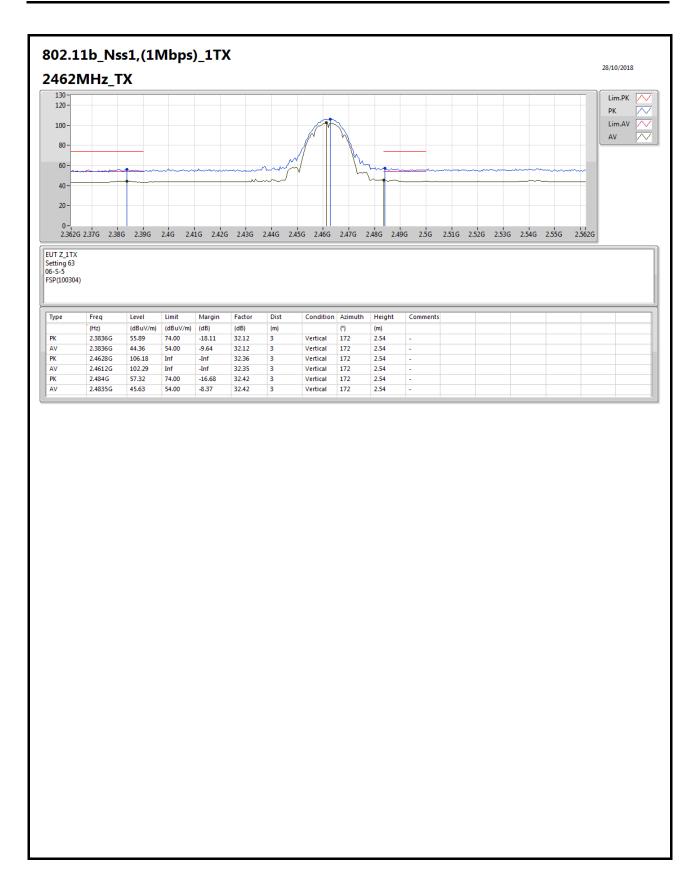
Page No. : 9 of 73





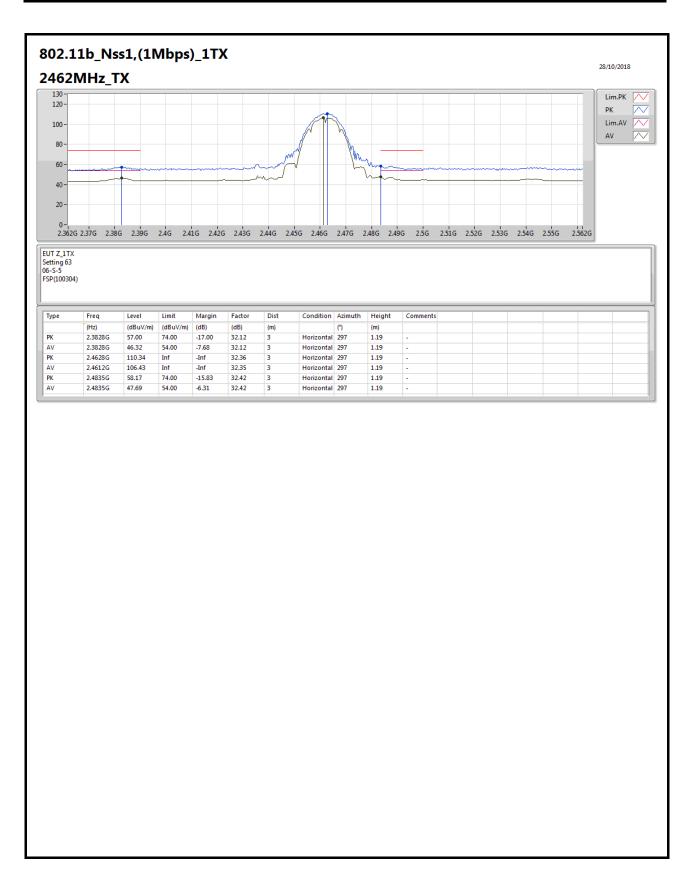
Page No. : 10 of 73





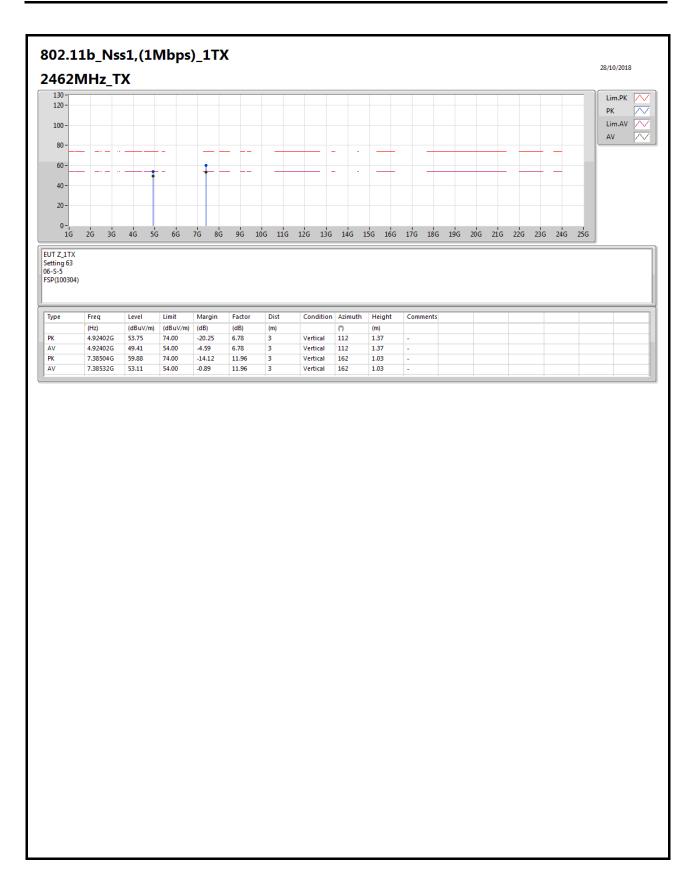
Page No. : 11 of 73





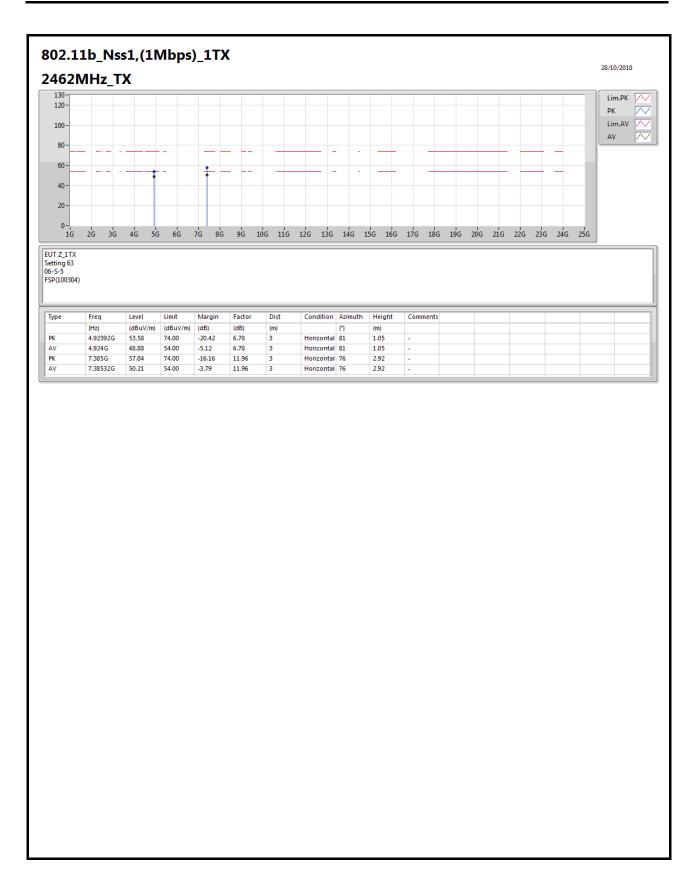
Page No. : 12 of 73





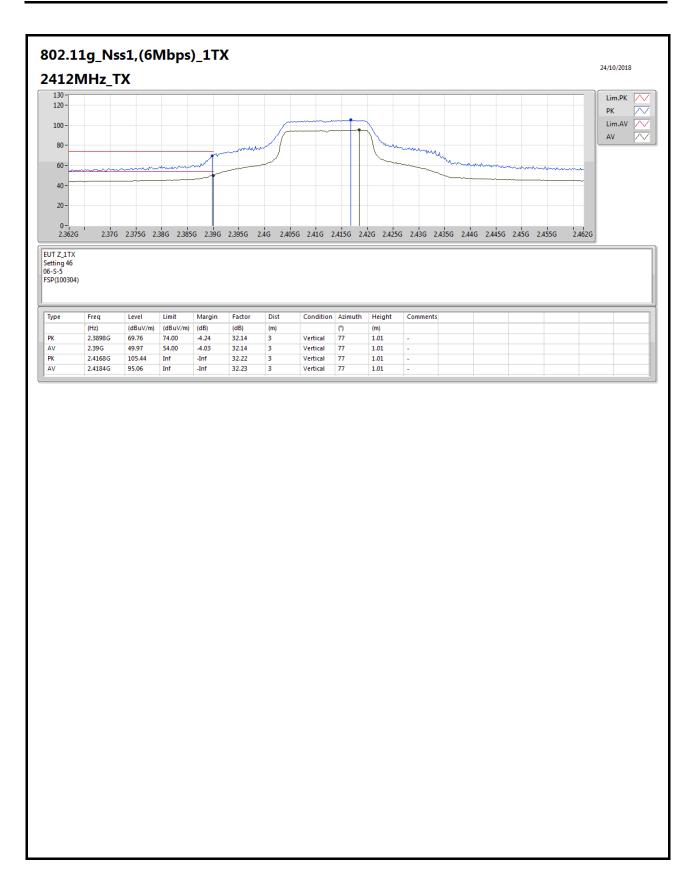
Page No. : 13 of 73





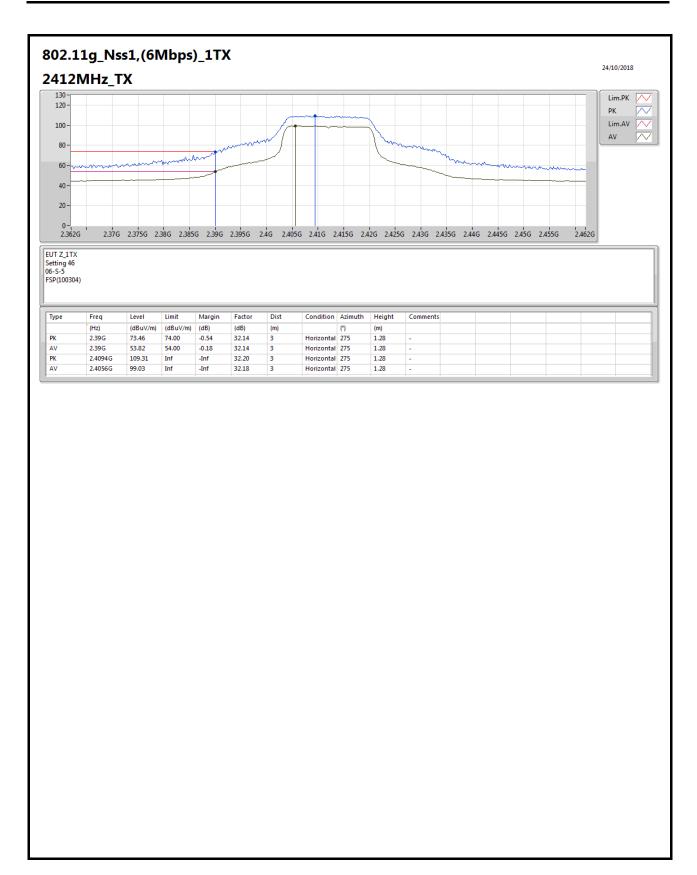
Page No. : 14 of 73





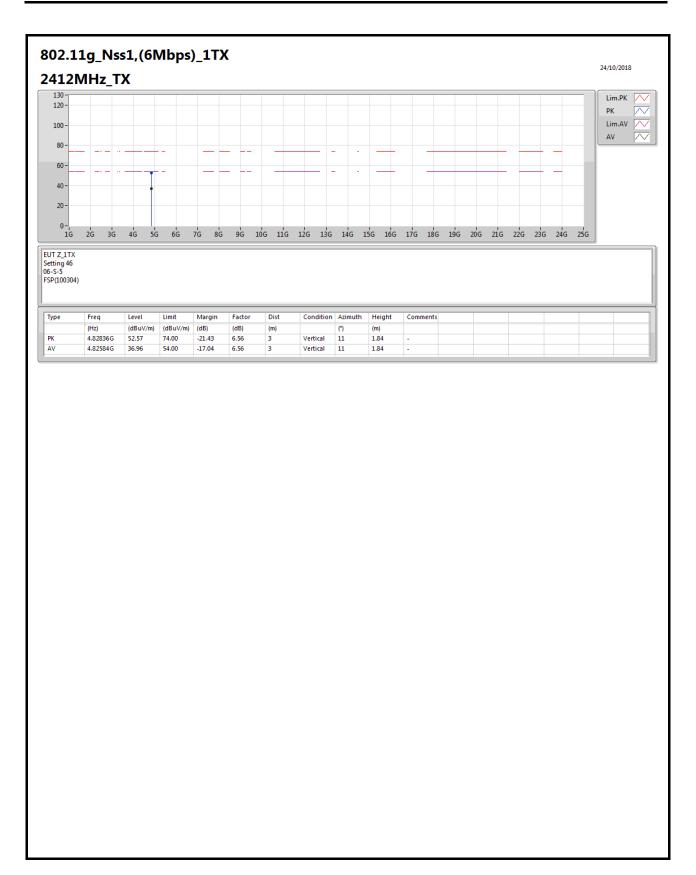
Page No. : 15 of 73





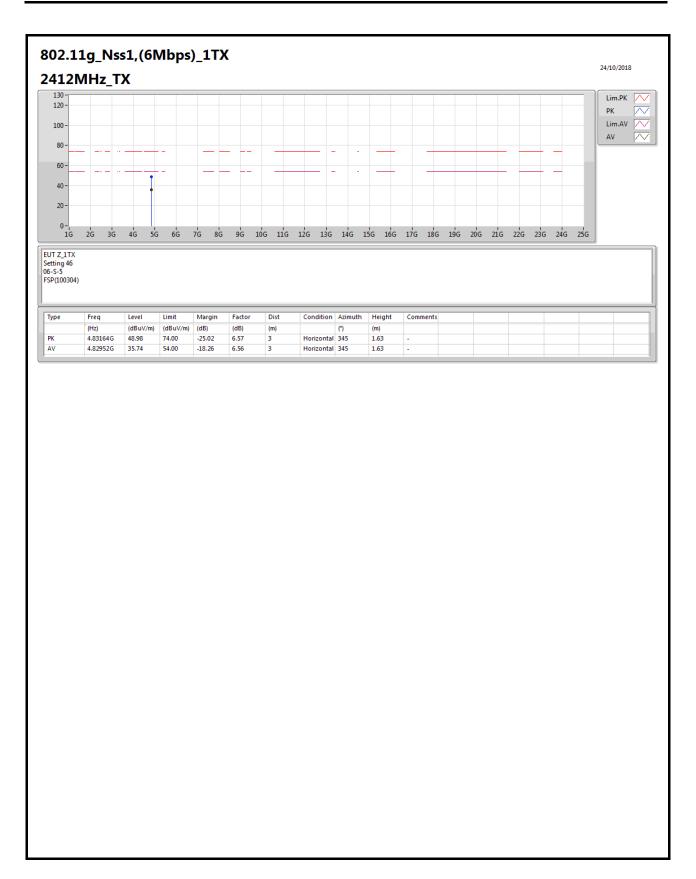
Page No. : 16 of 73





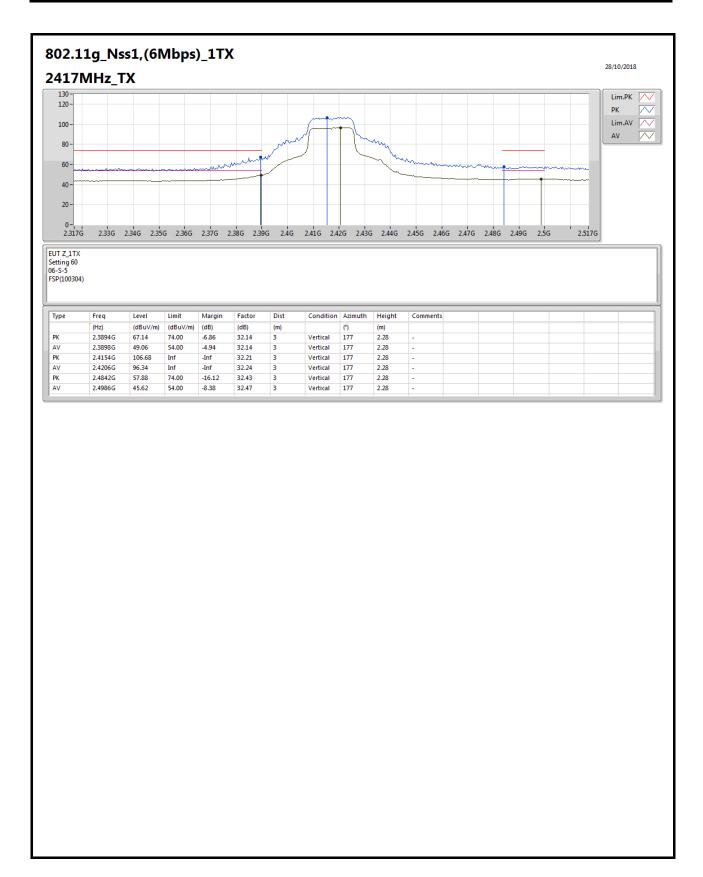
Page No. : 17 of 73





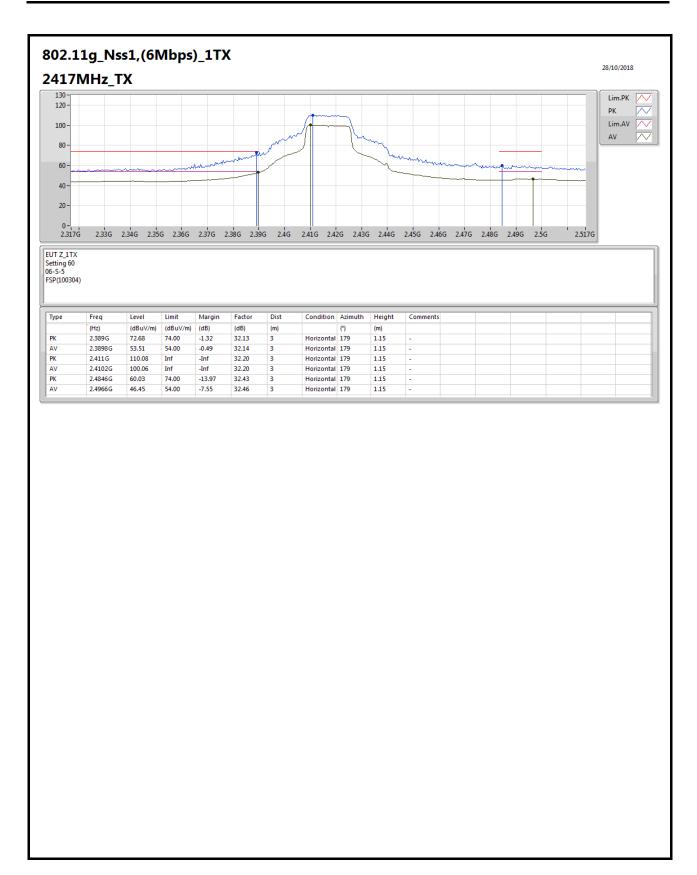
Page No. : 18 of 73





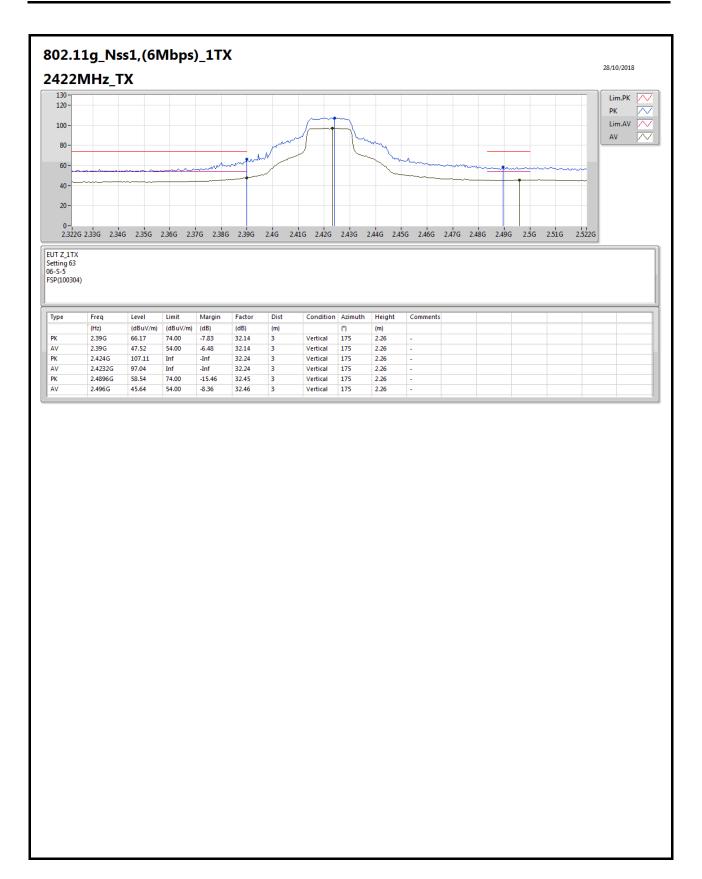
Page No. : 19 of 73





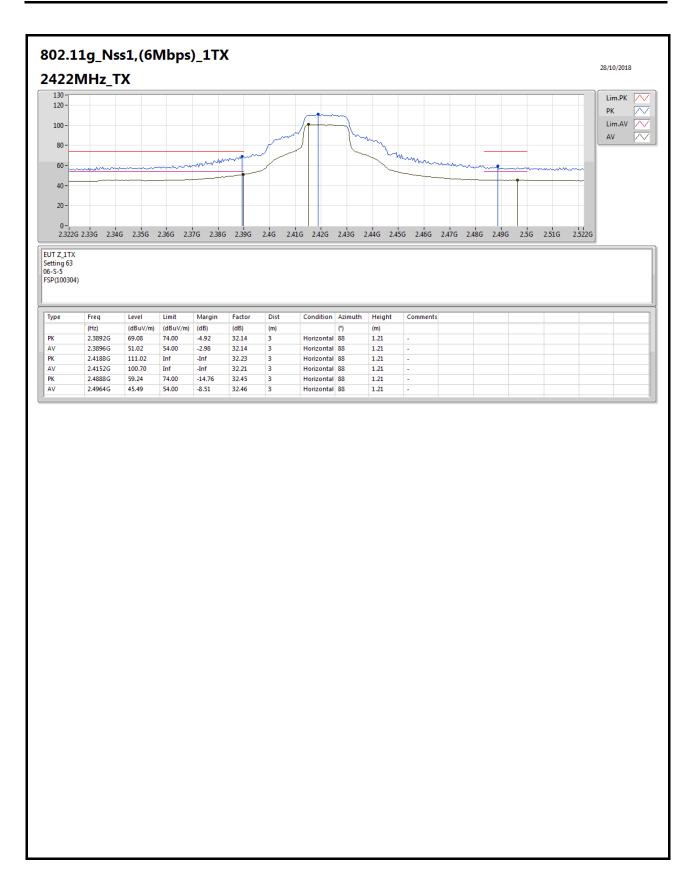
Page No. : 20 of 73





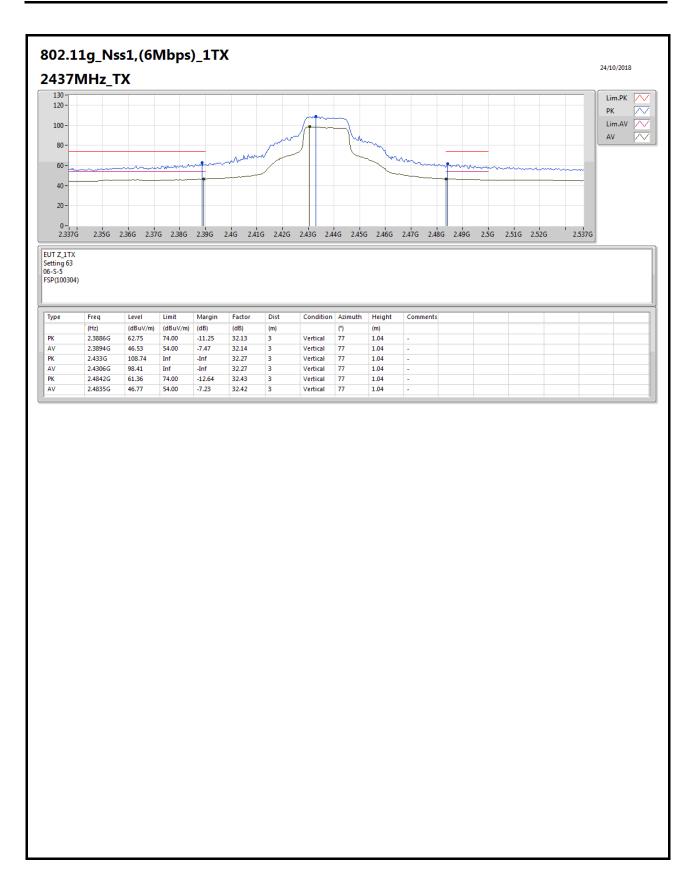
Page No. : 21 of 73





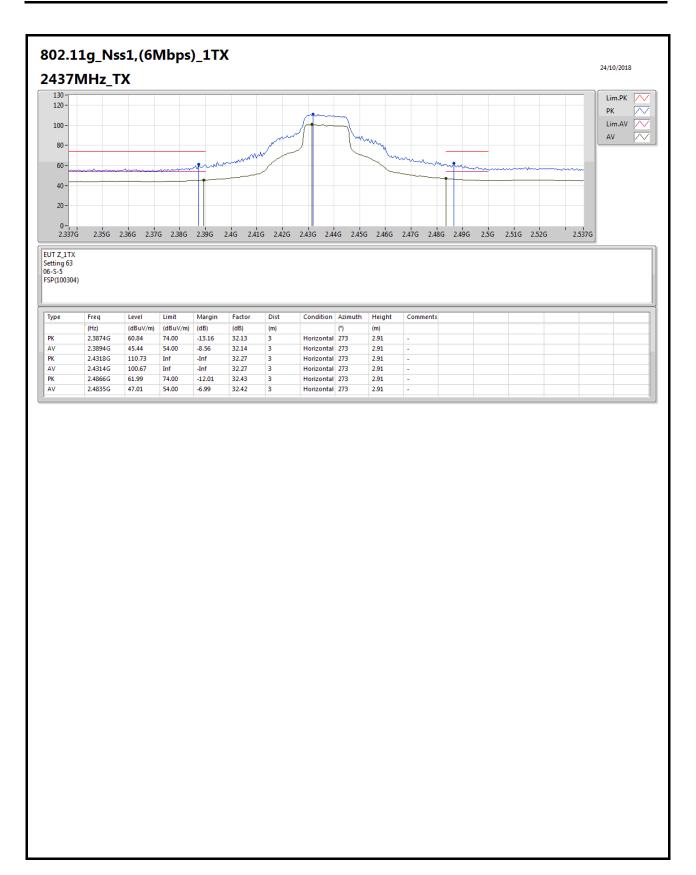
Page No. : 22 of 73





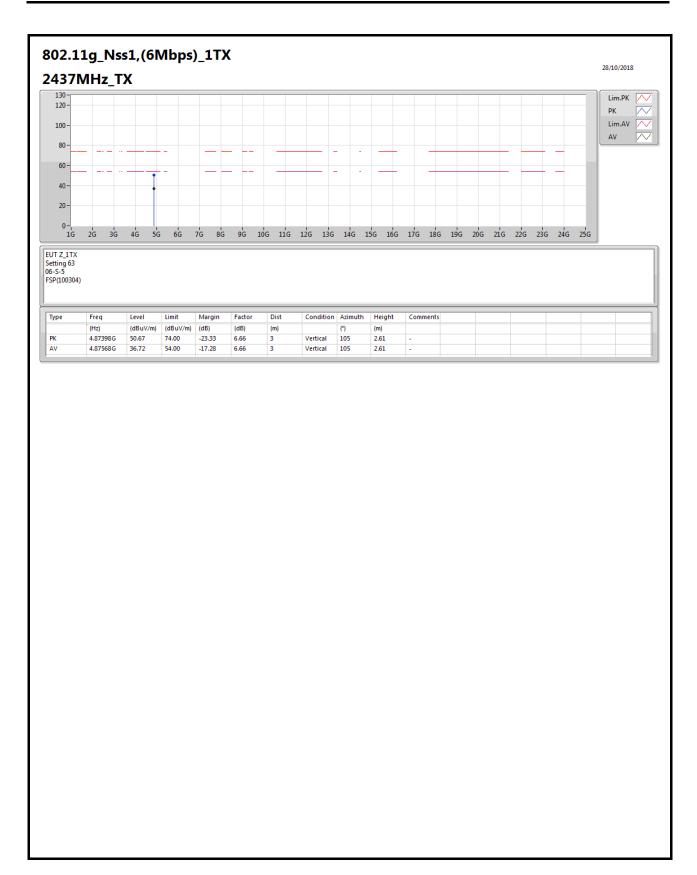
Page No. : 23 of 73





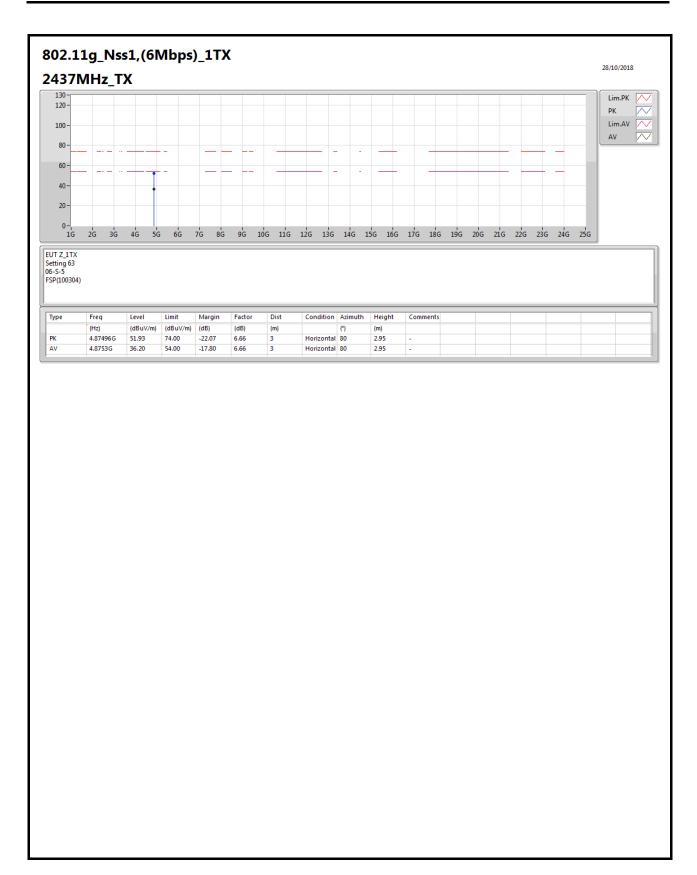
Page No. : 24 of 73



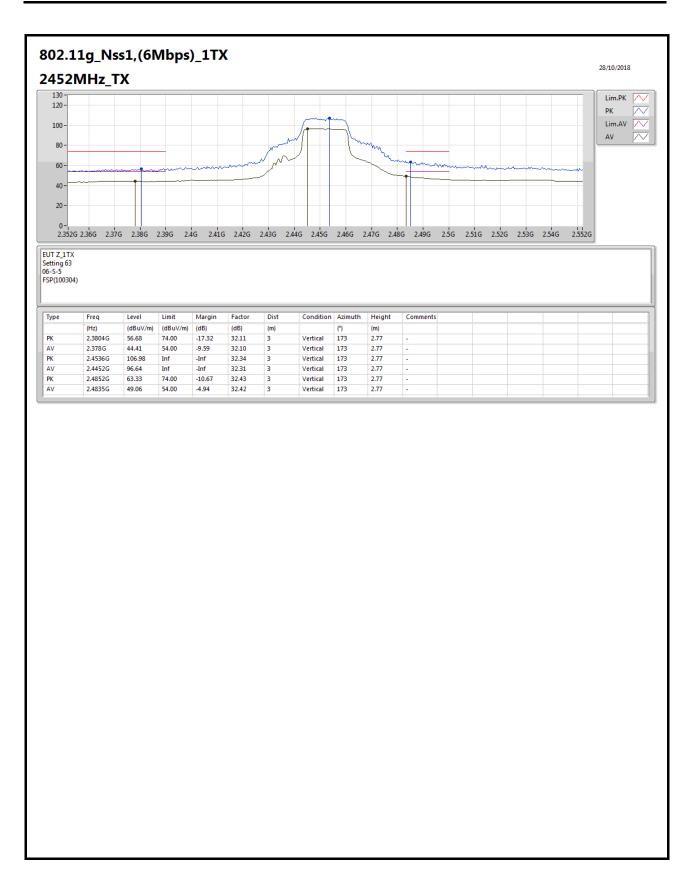


Page No. : 25 of 73



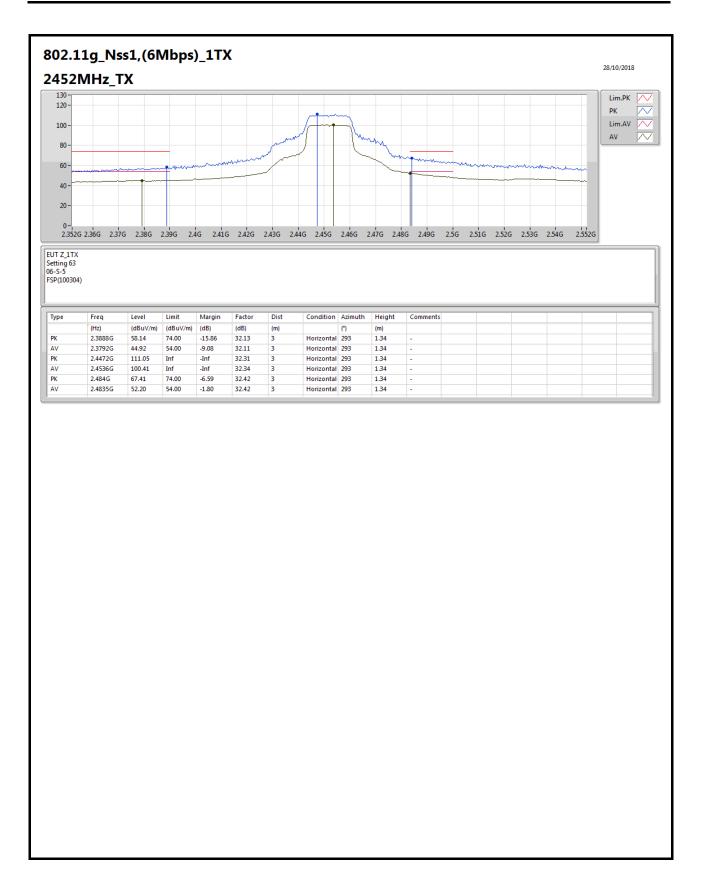






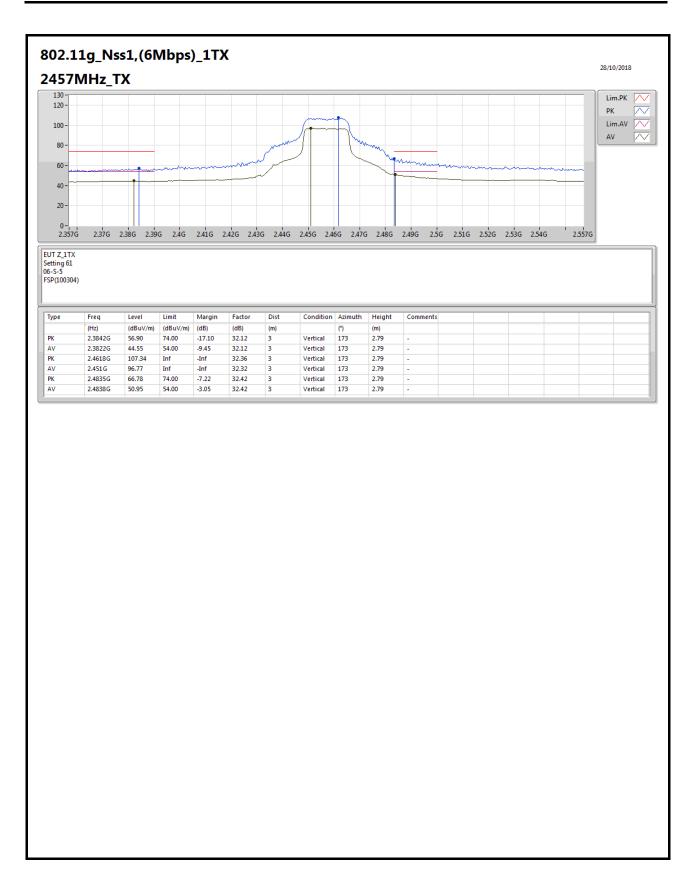
Page No. : 27 of 73





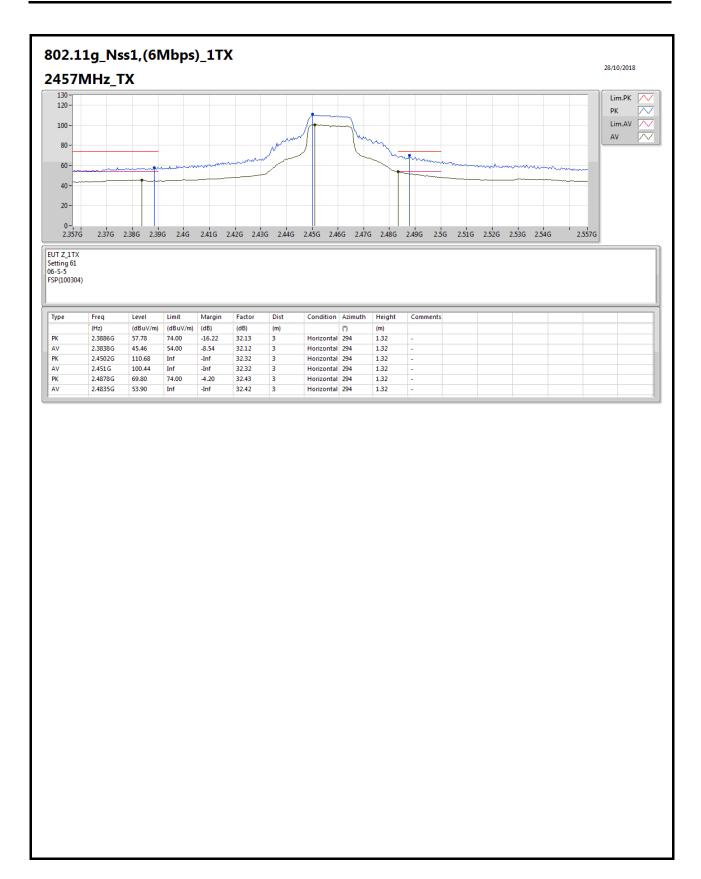
Page No. : 28 of 73





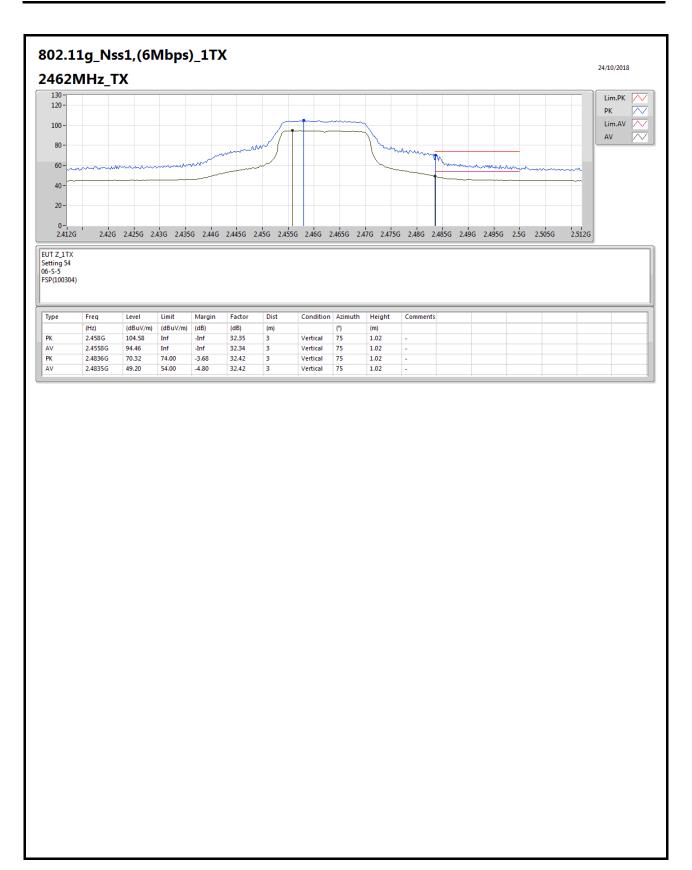
Page No. : 29 of 73



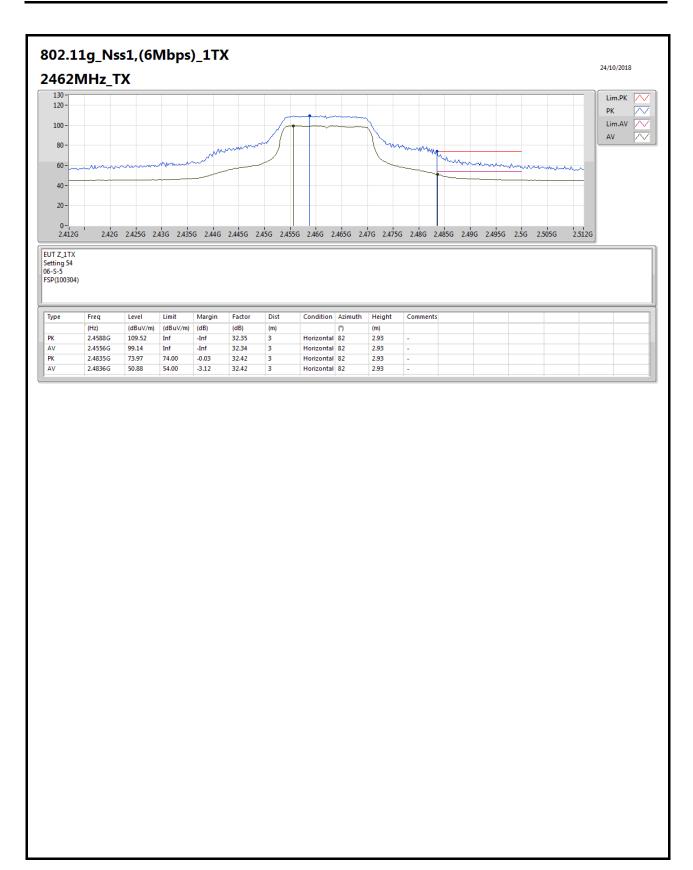


Page No. : 30 of 73



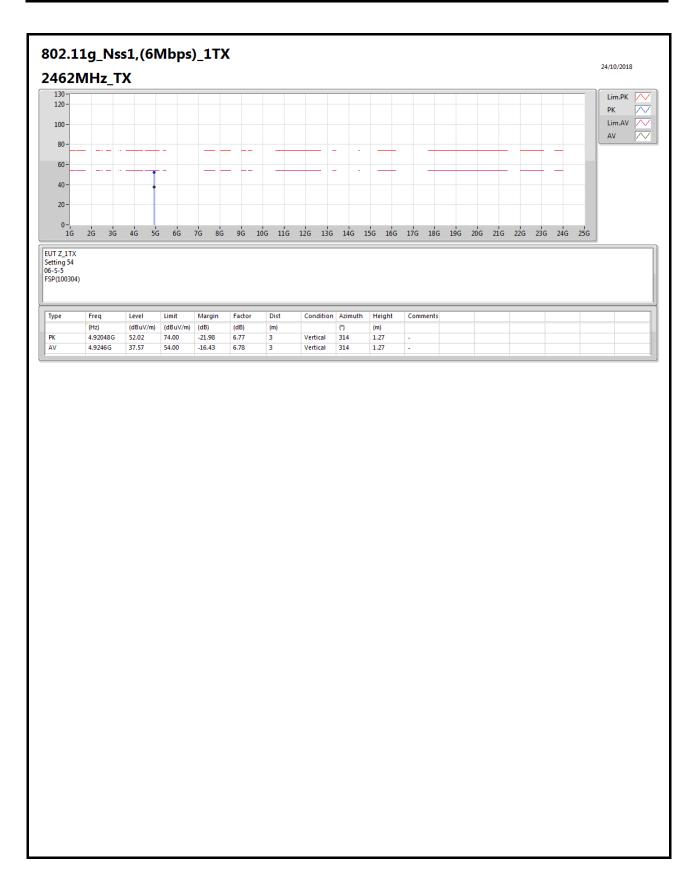






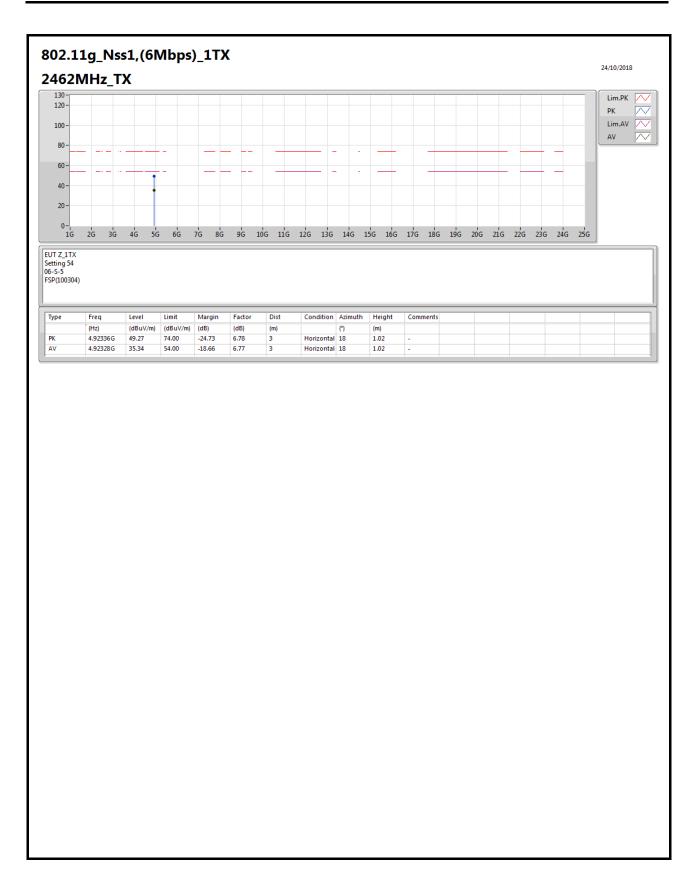
Page No. : 32 of 73





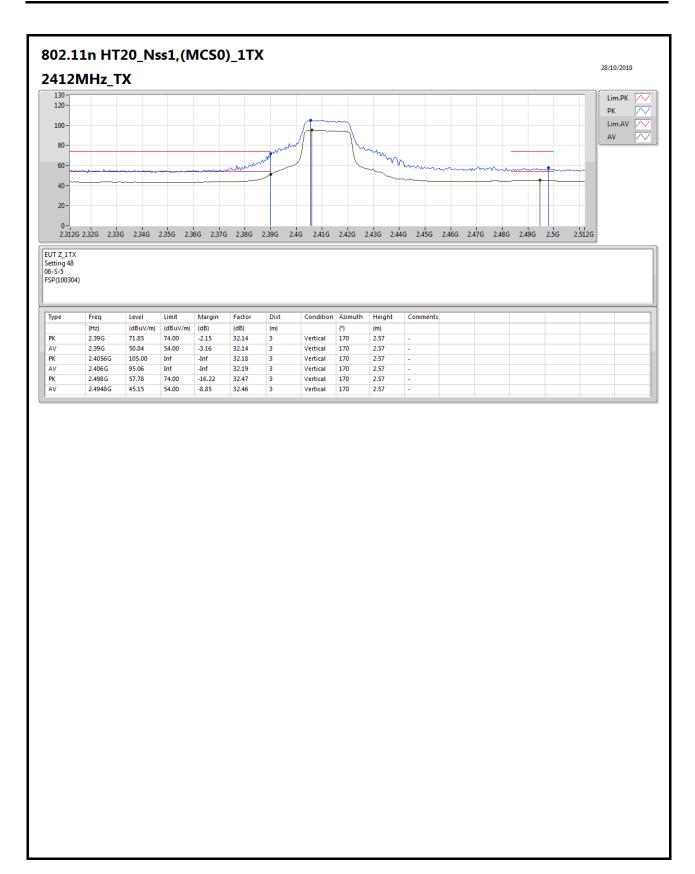
Page No. : 33 of 73





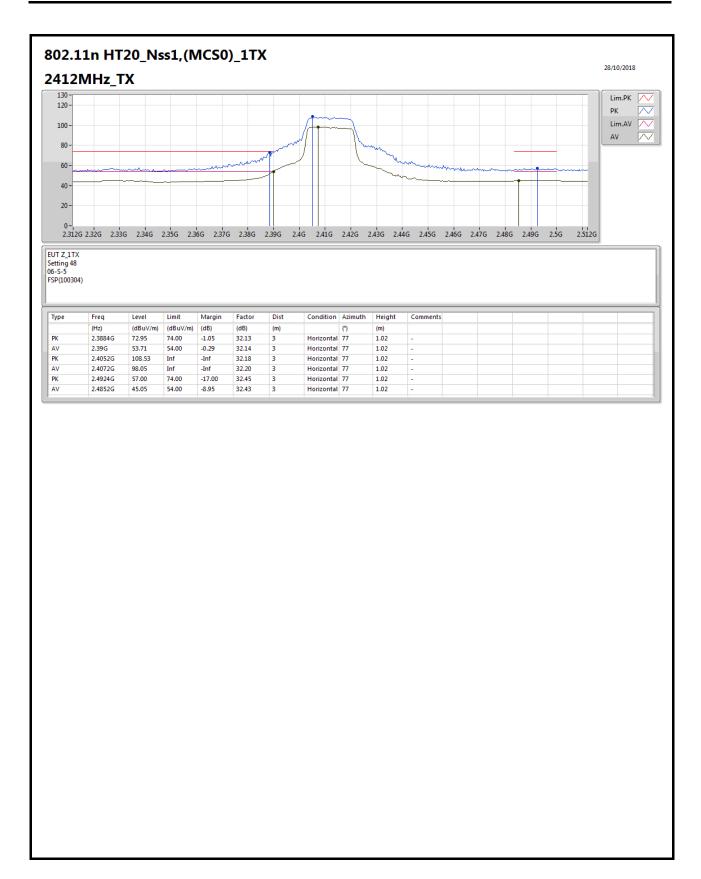
Page No. : 34 of 73





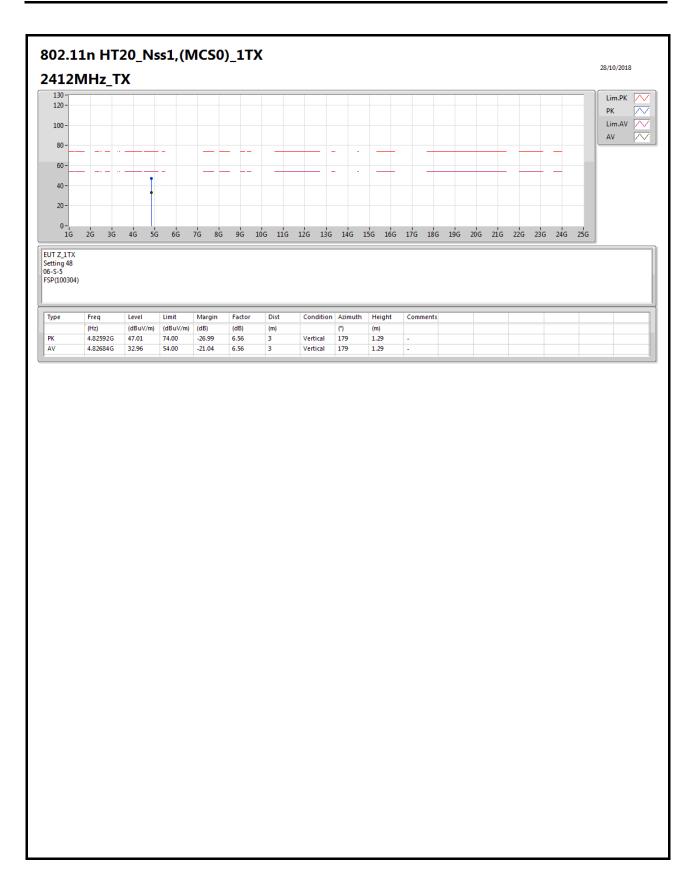
Page No. : 35 of 73





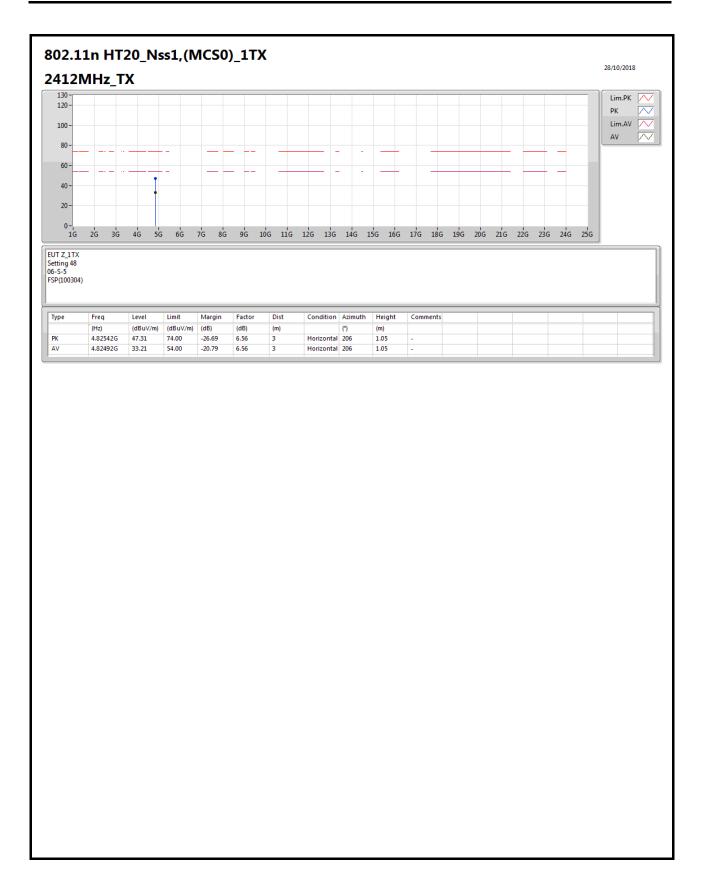
Page No. : 36 of 73



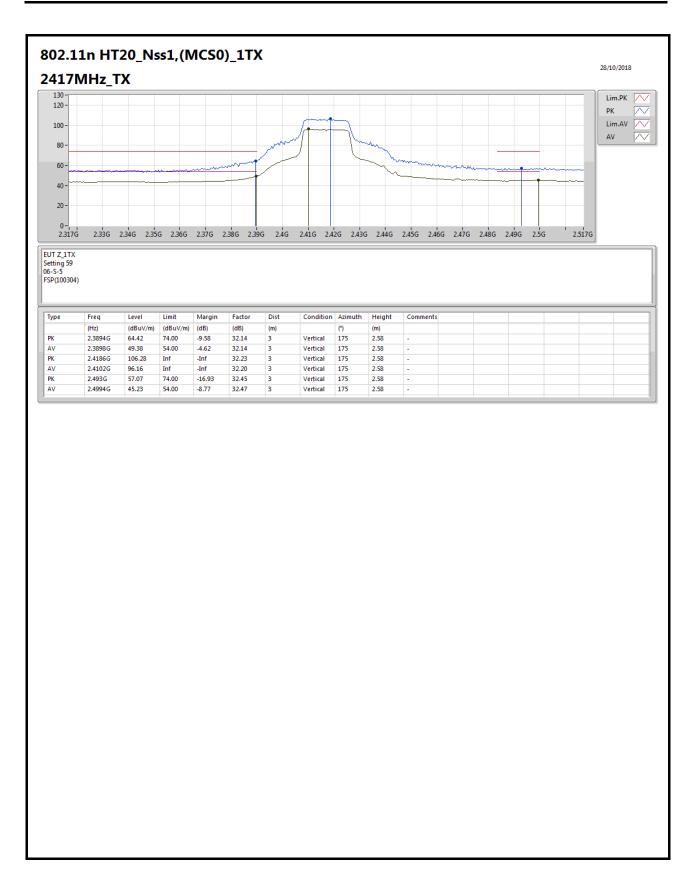


Page No. : 37 of 73



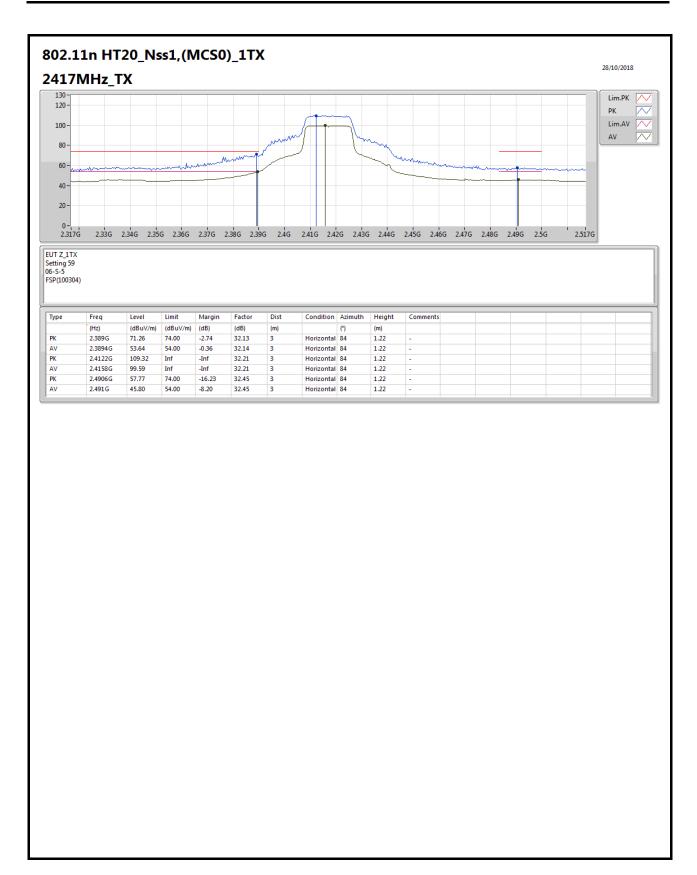






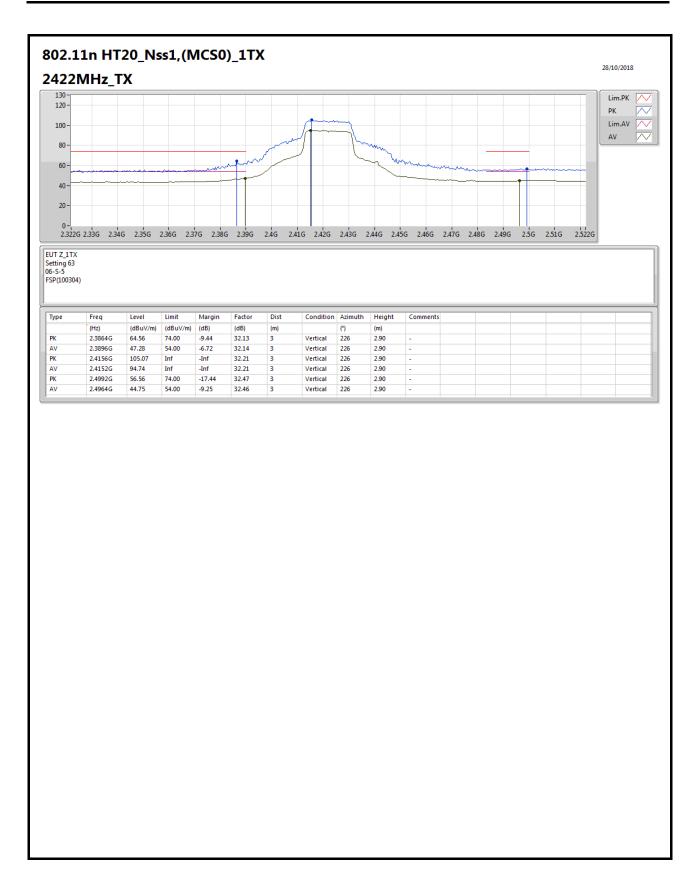
Page No. : 39 of 73





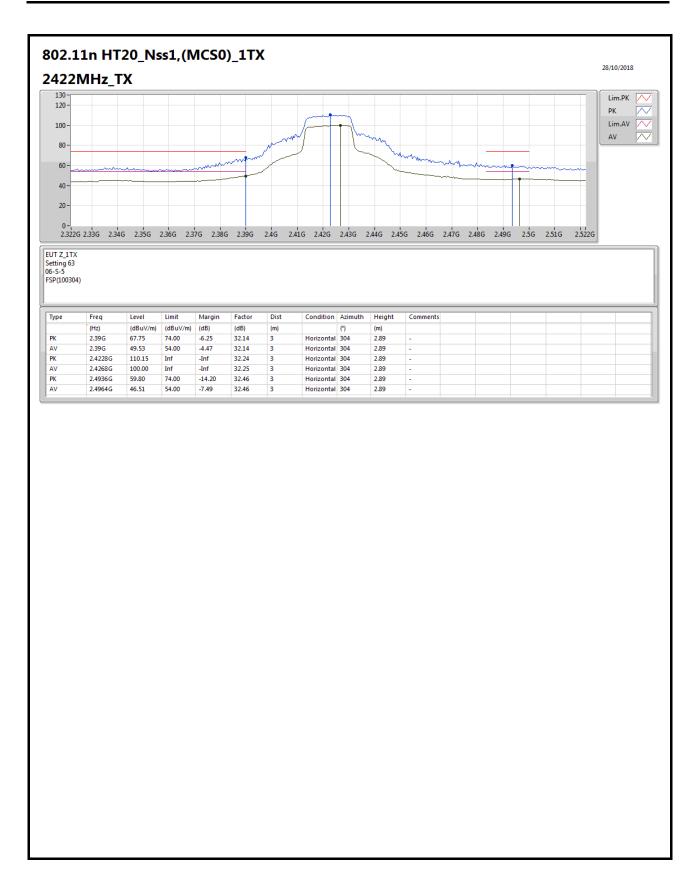
Page No. : 40 of 73





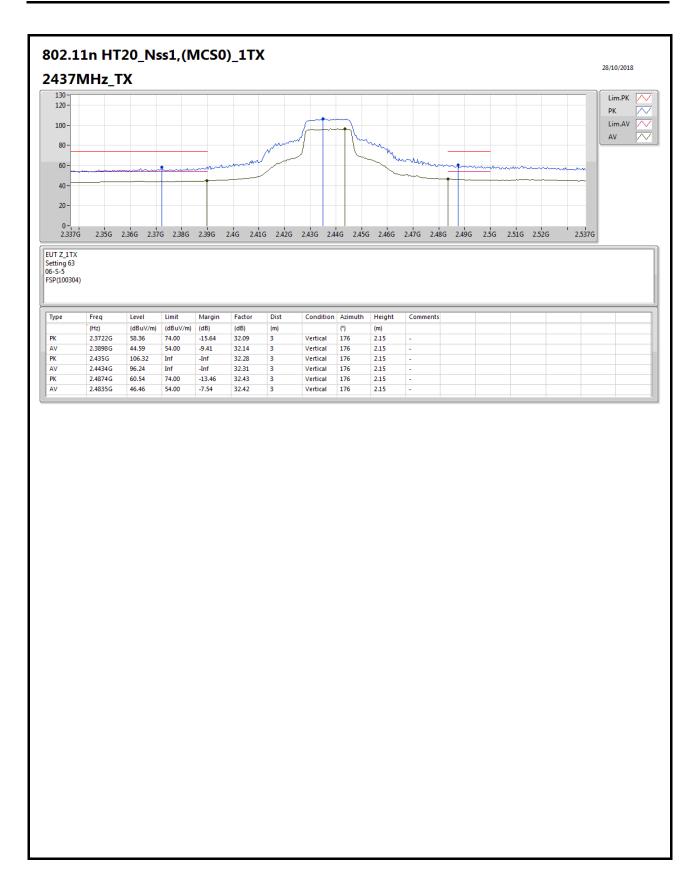
Page No. : 41 of 73





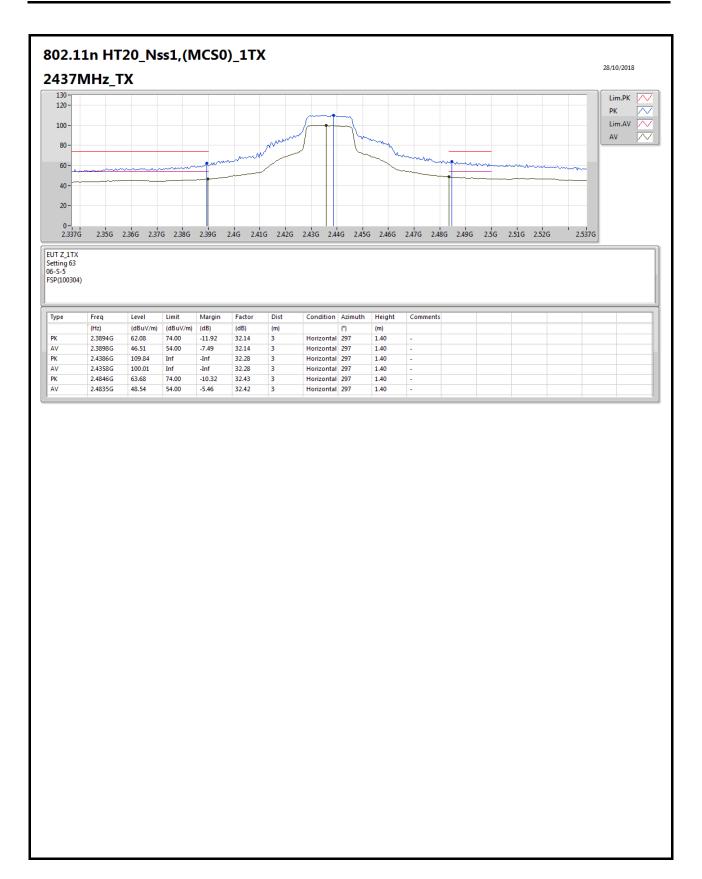
Page No. : 42 of 73





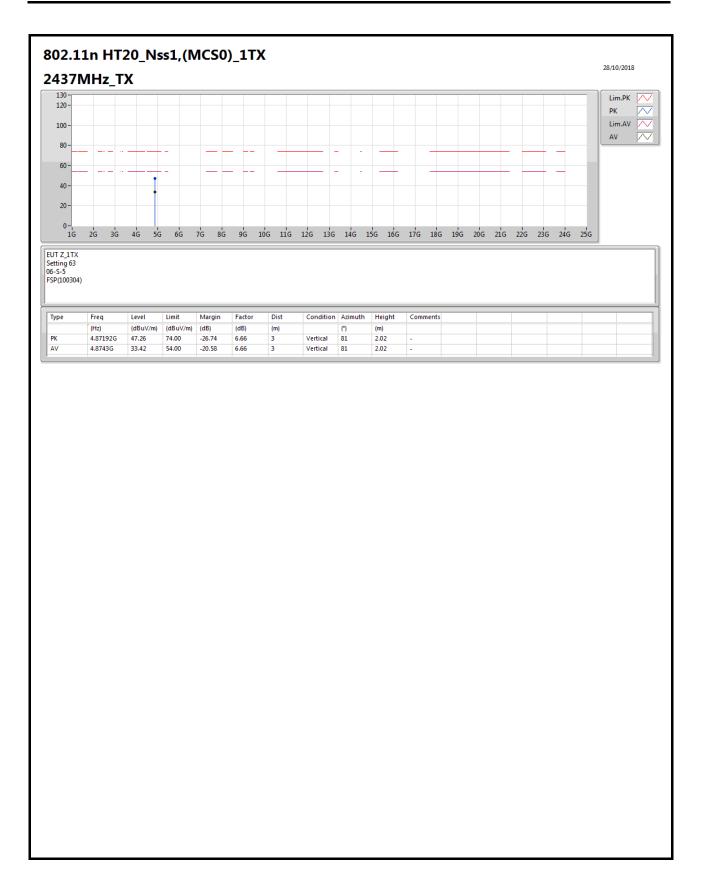
Page No. : 43 of 73





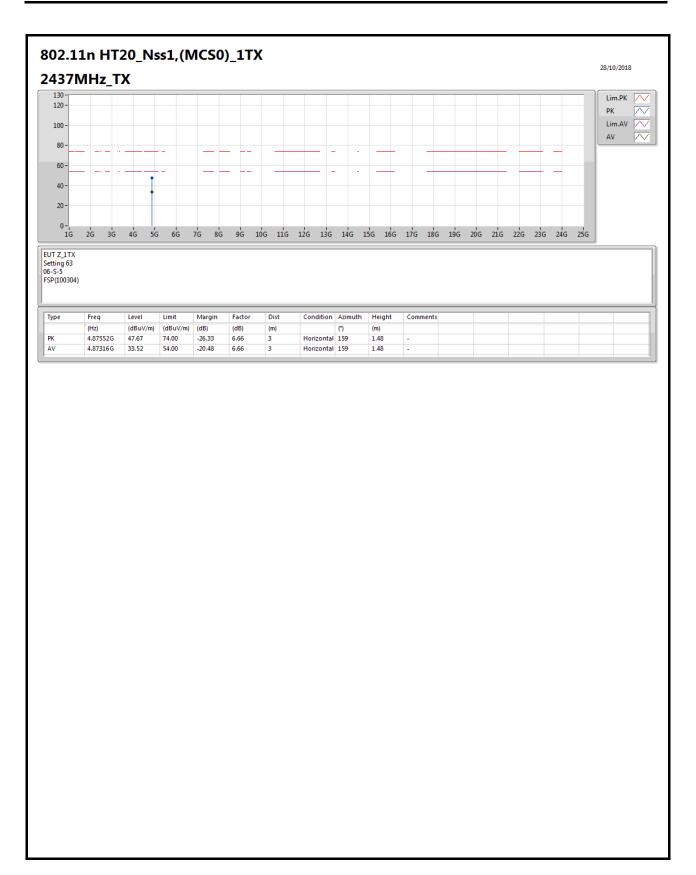
Page No. : 44 of 73





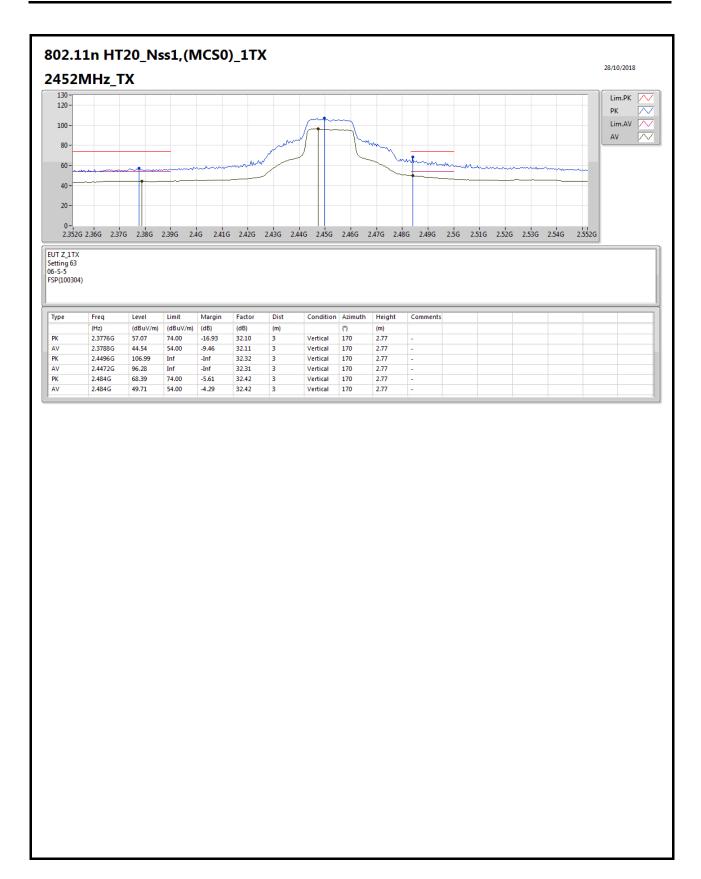
Page No. : 45 of 73





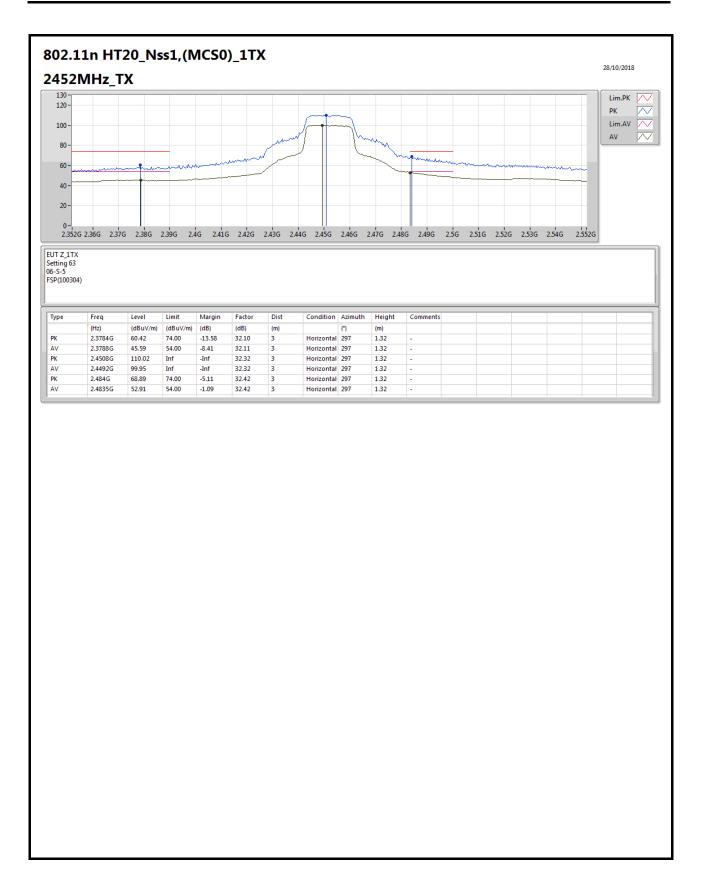
Page No. : 46 of 73





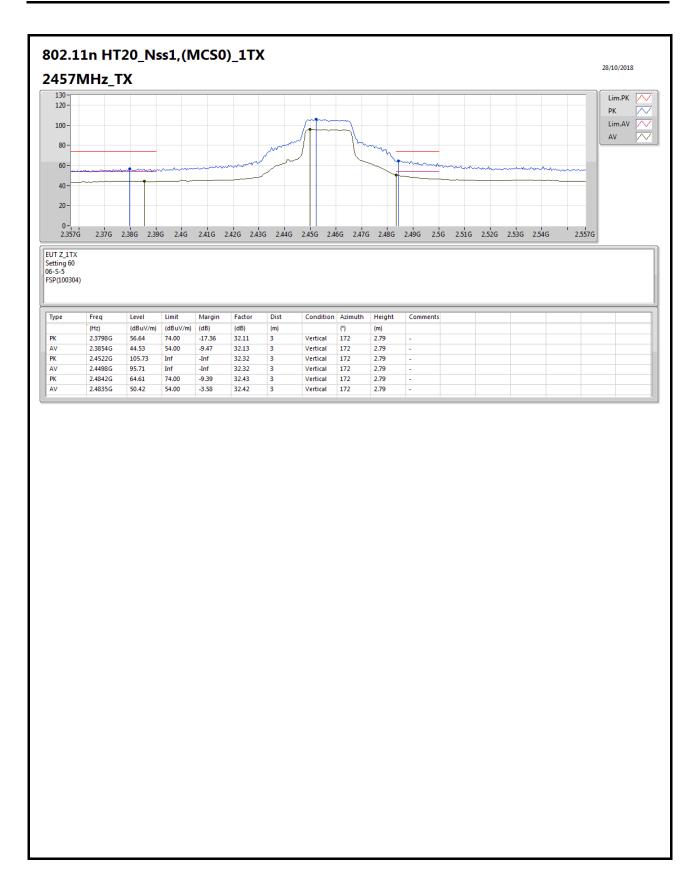
Page No. : 47 of 73





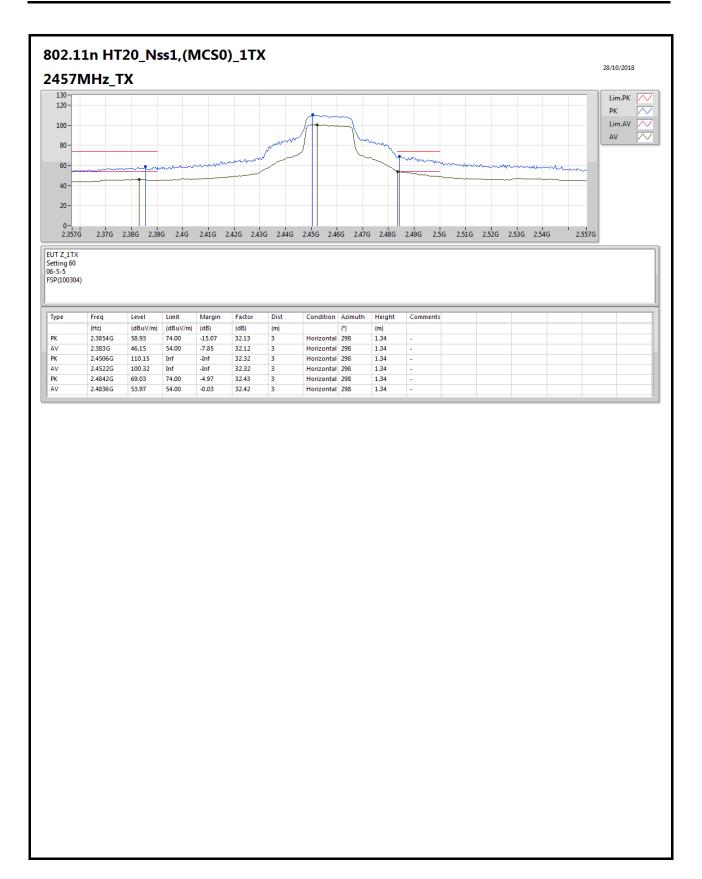
Page No. : 48 of 73





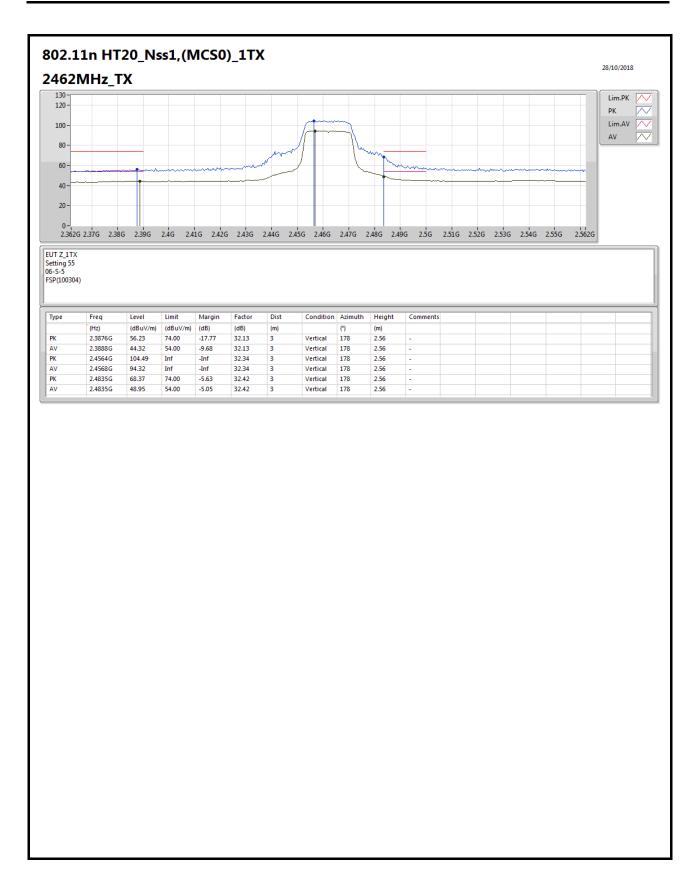
Page No. : 49 of 73





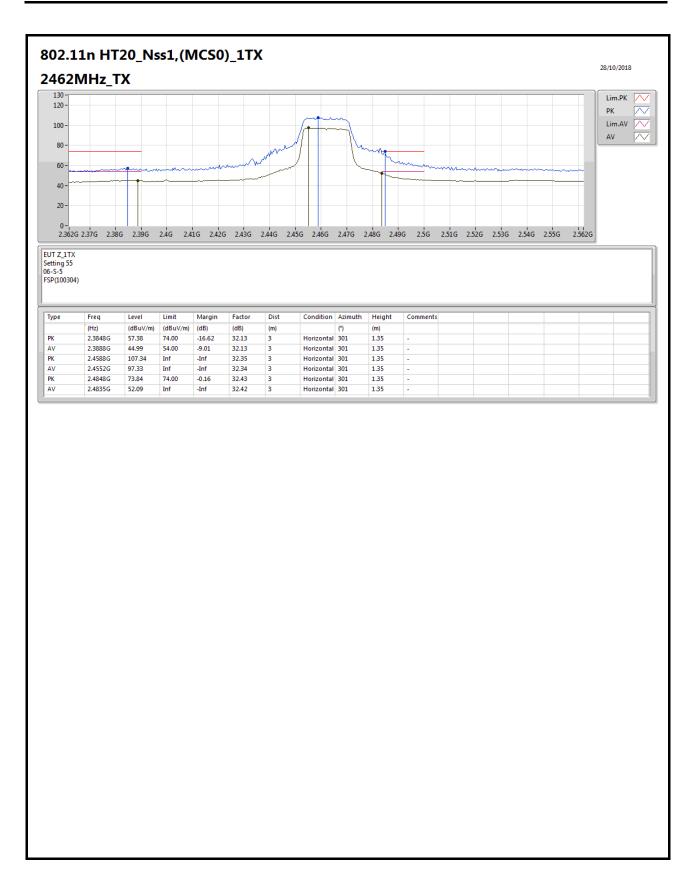
Page No. : 50 of 73





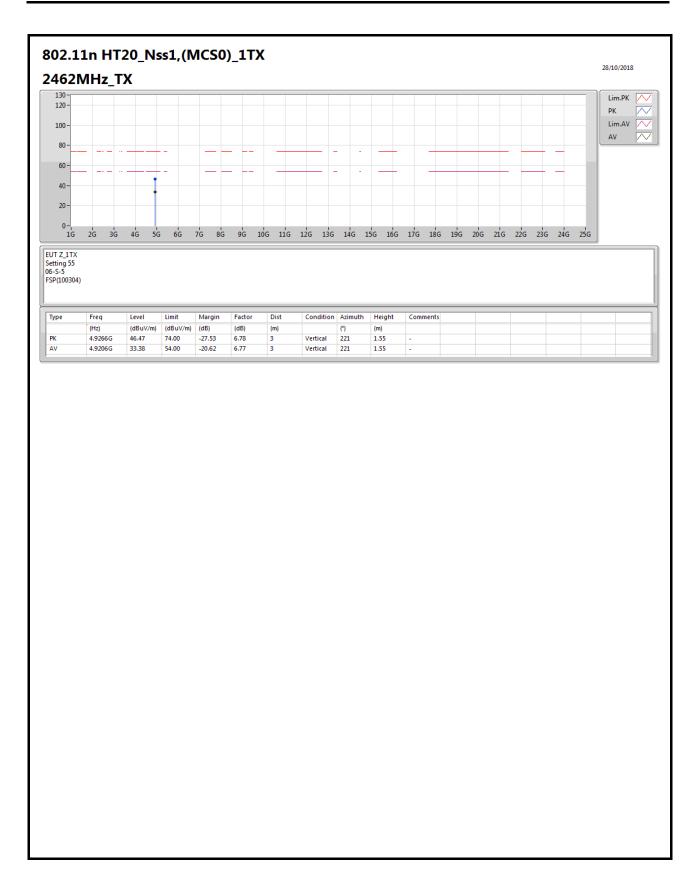
Page No. : 51 of 73





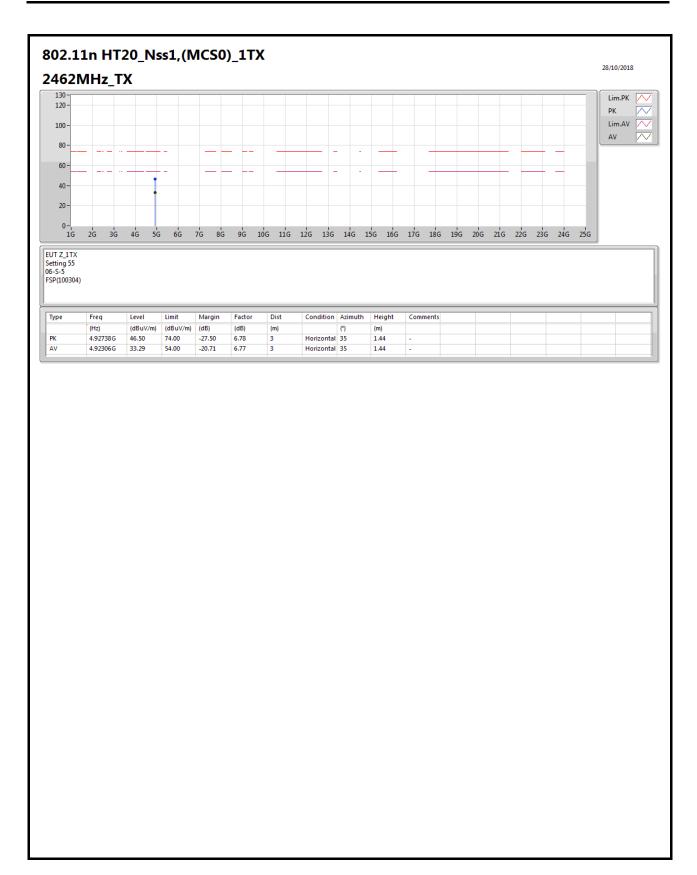
Page No. : 52 of 73





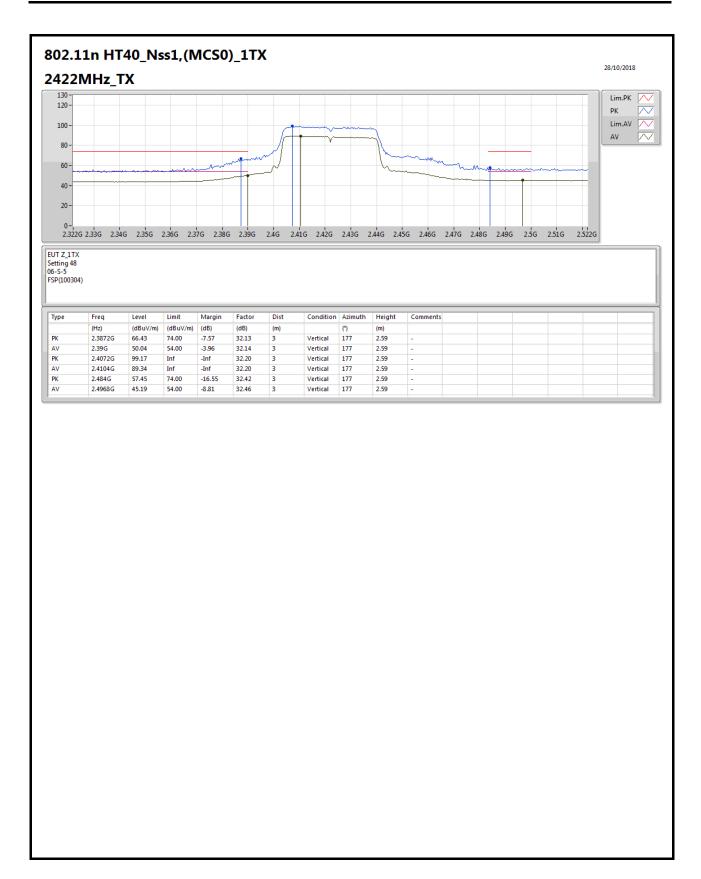
Page No. : 53 of 73





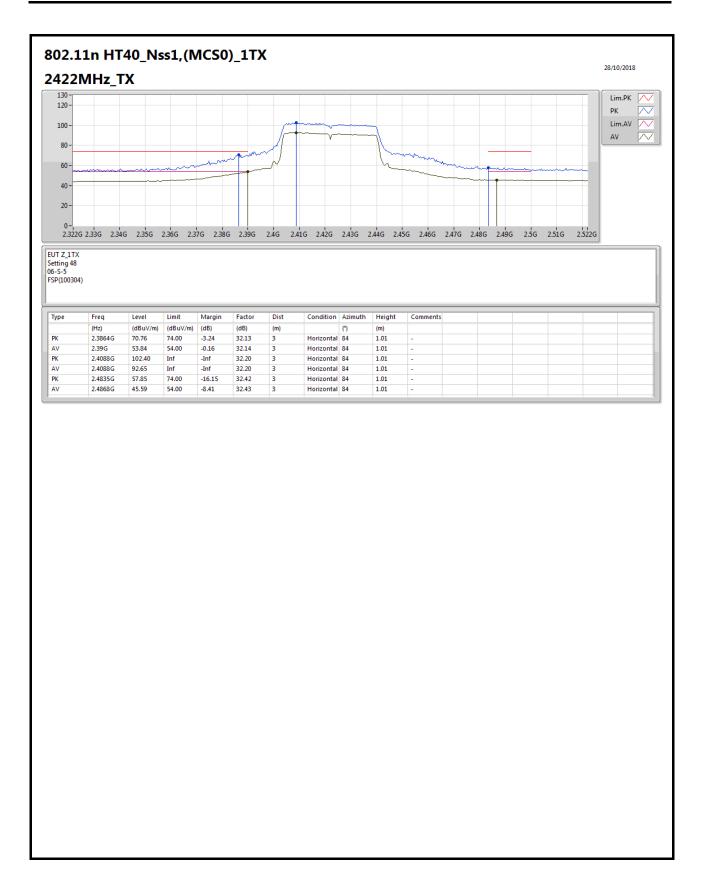
Page No. : 54 of 73





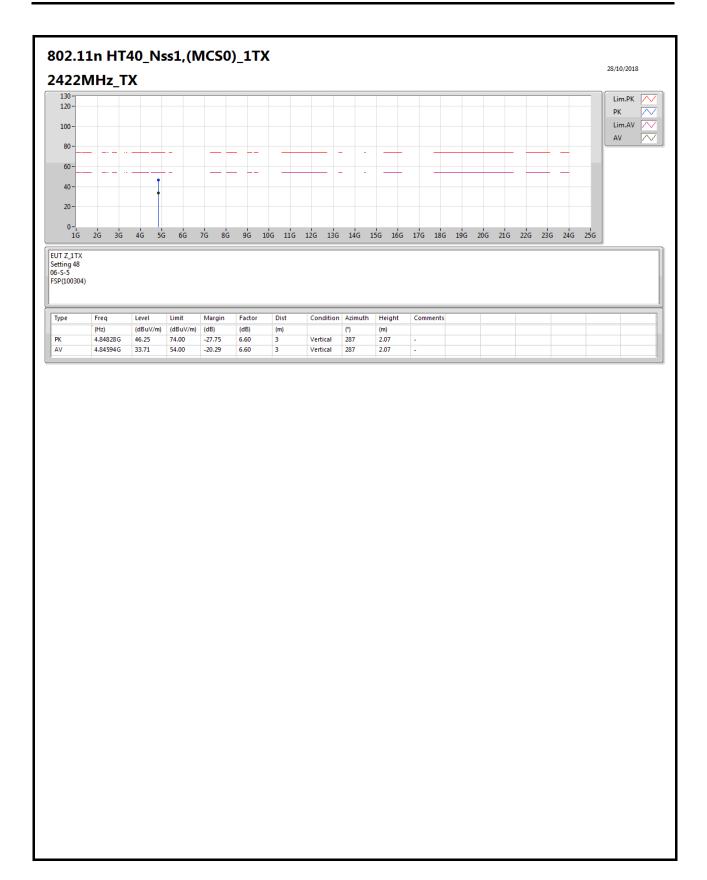
Page No. : 55 of 73





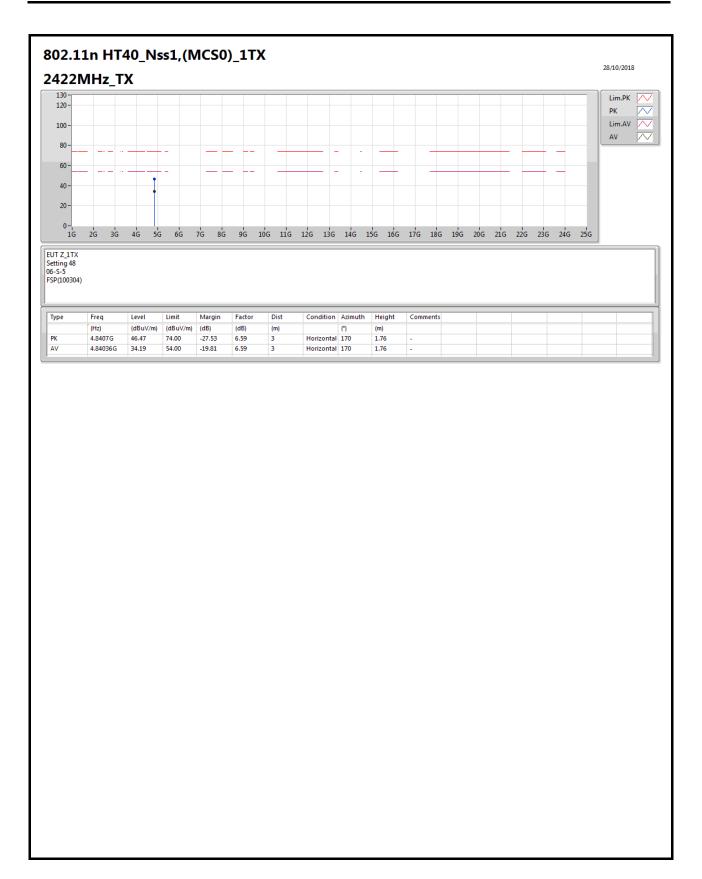
Page No. : 56 of 73





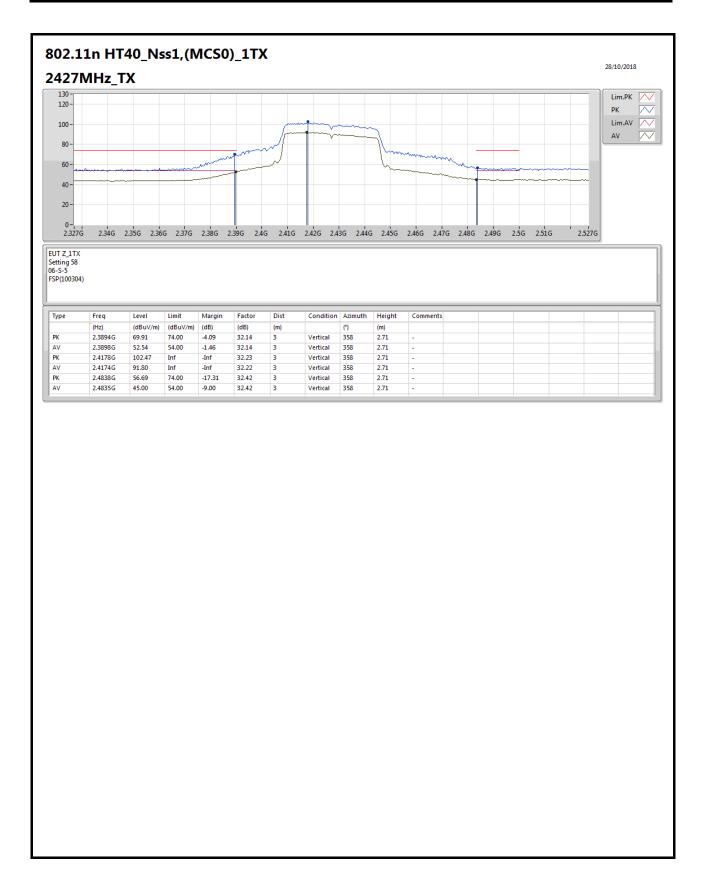
Page No. : 57 of 73





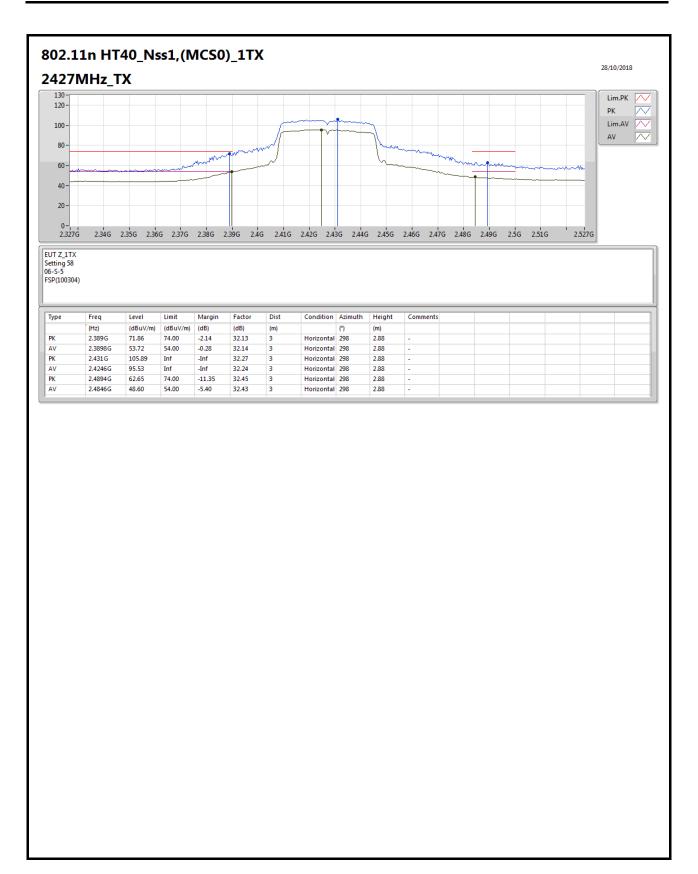
Page No. : 58 of 73





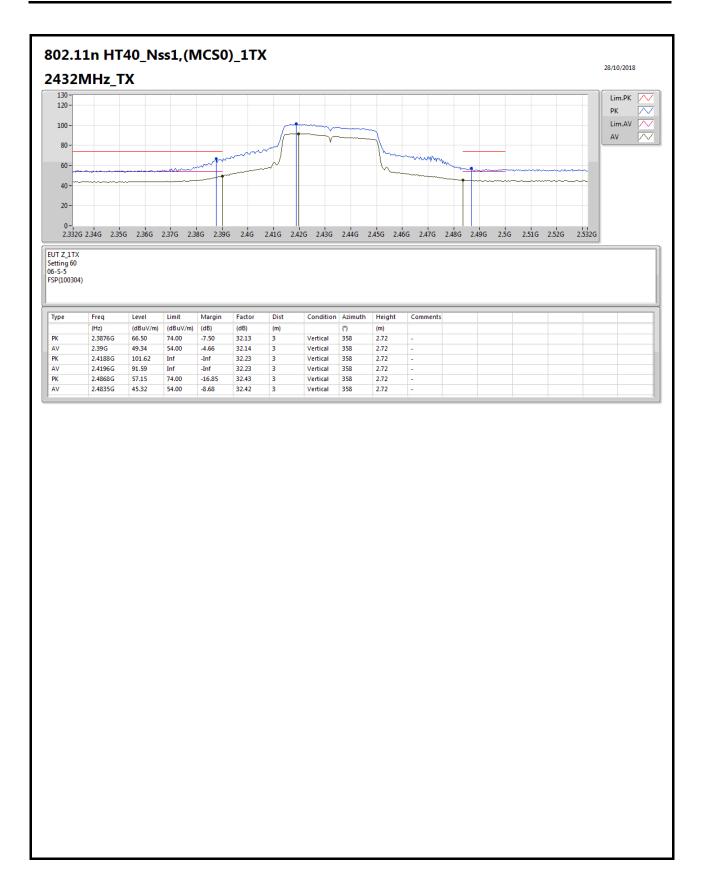
Page No. : 59 of 73





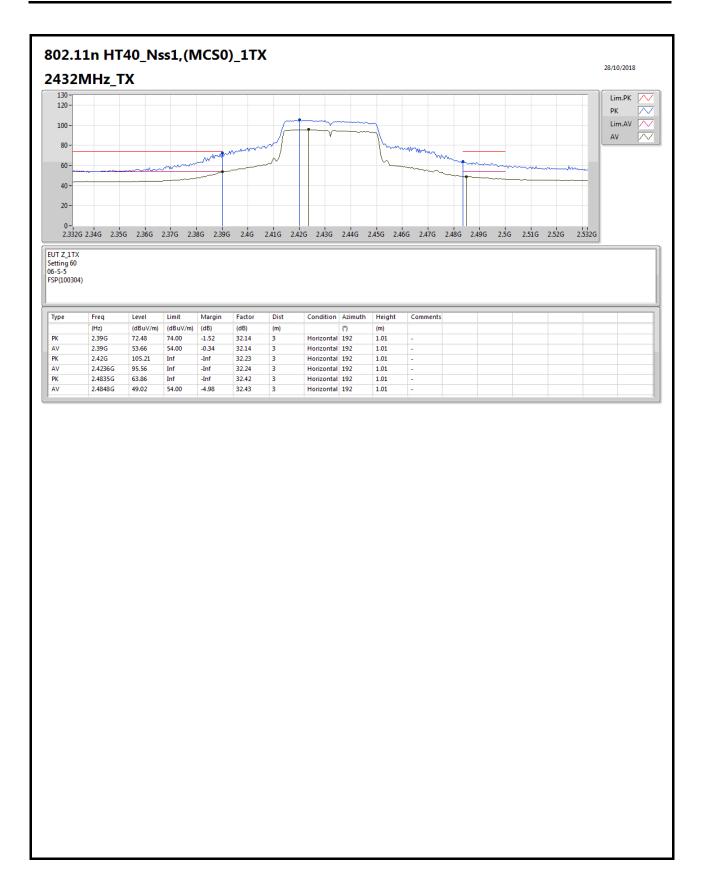
Page No. : 60 of 73





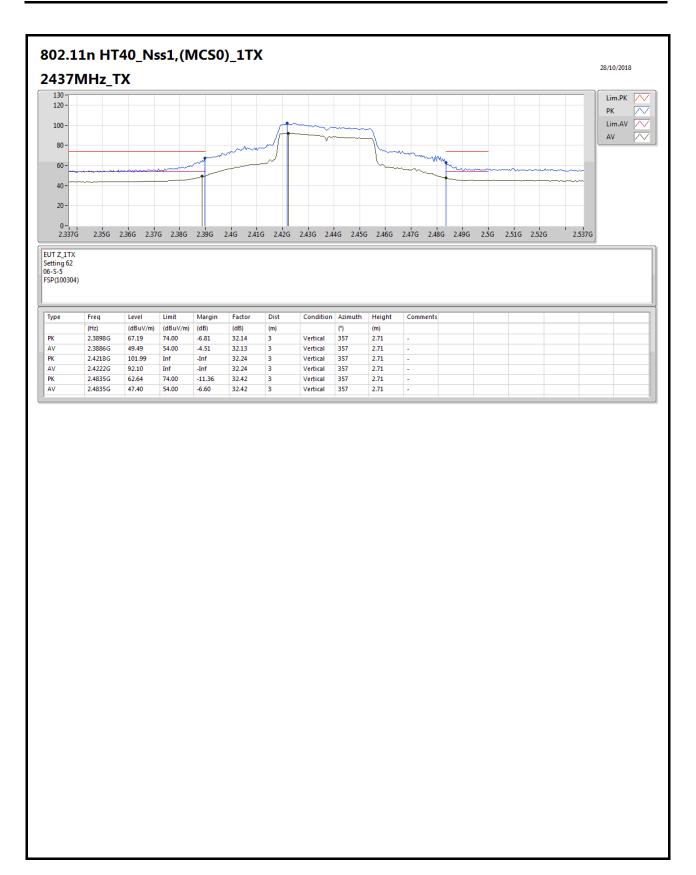
Page No. : 61 of 73





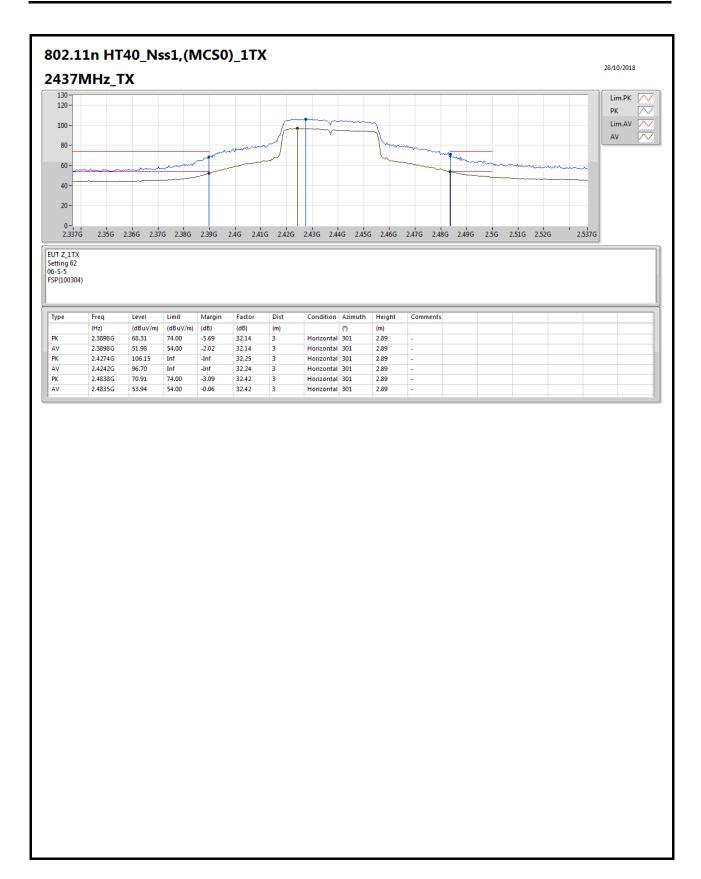
Page No. : 62 of 73





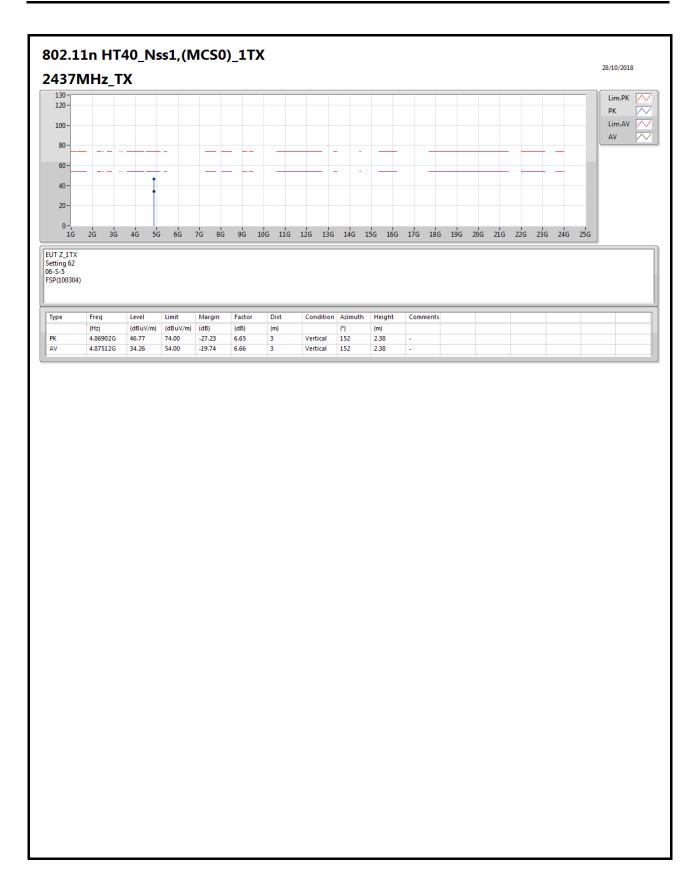
Page No. : 63 of 73





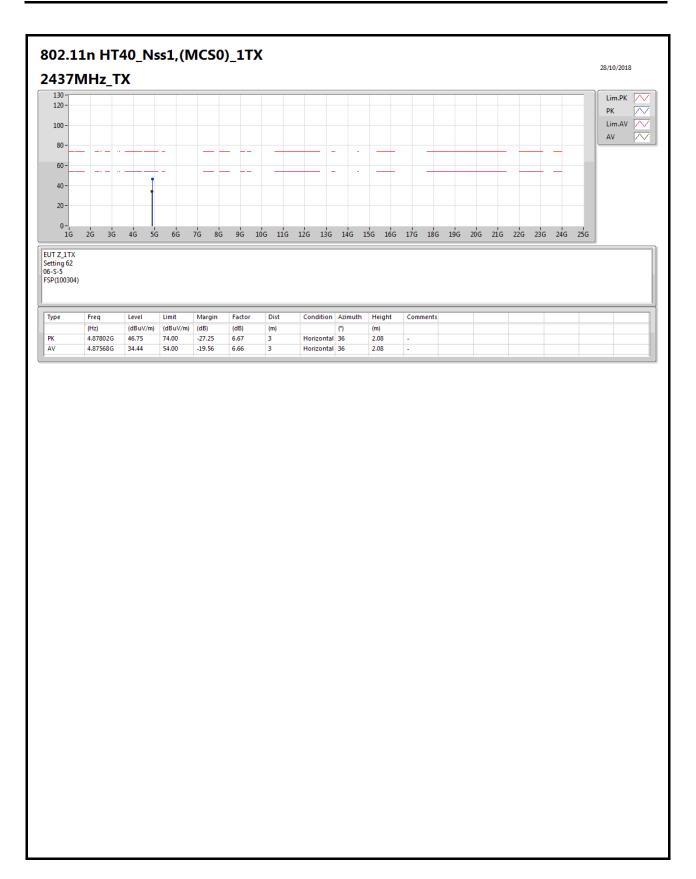
Page No. : 64 of 73





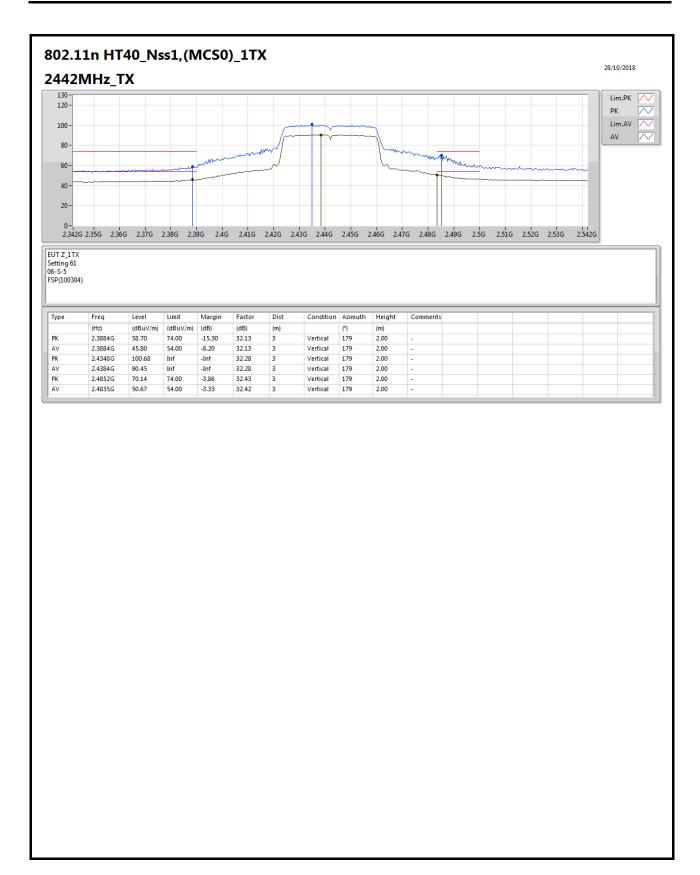
Page No. : 65 of 73





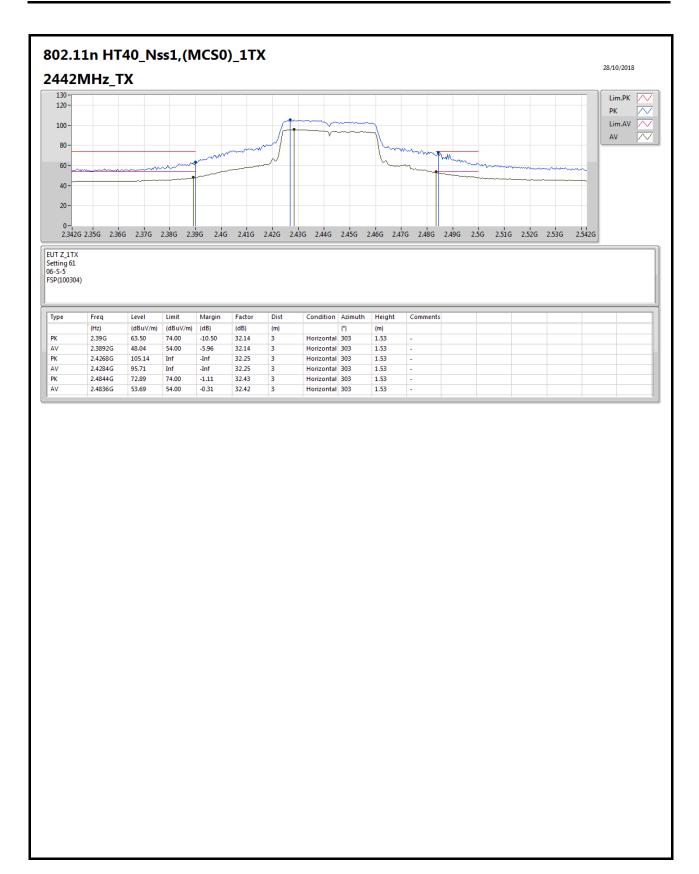
Page No. : 66 of 73





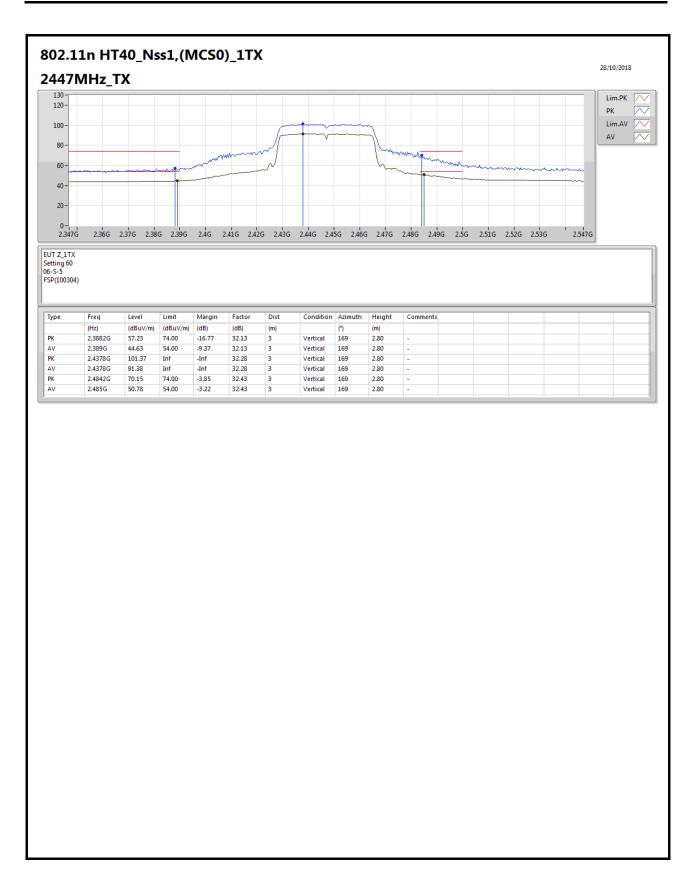
Page No. : 67 of 73





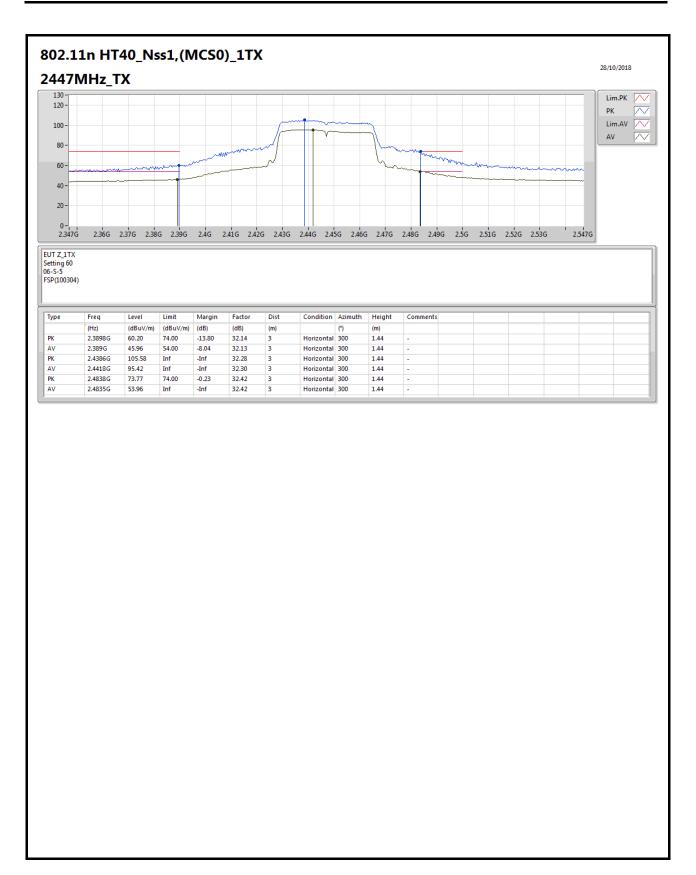
Page No. : 68 of 73





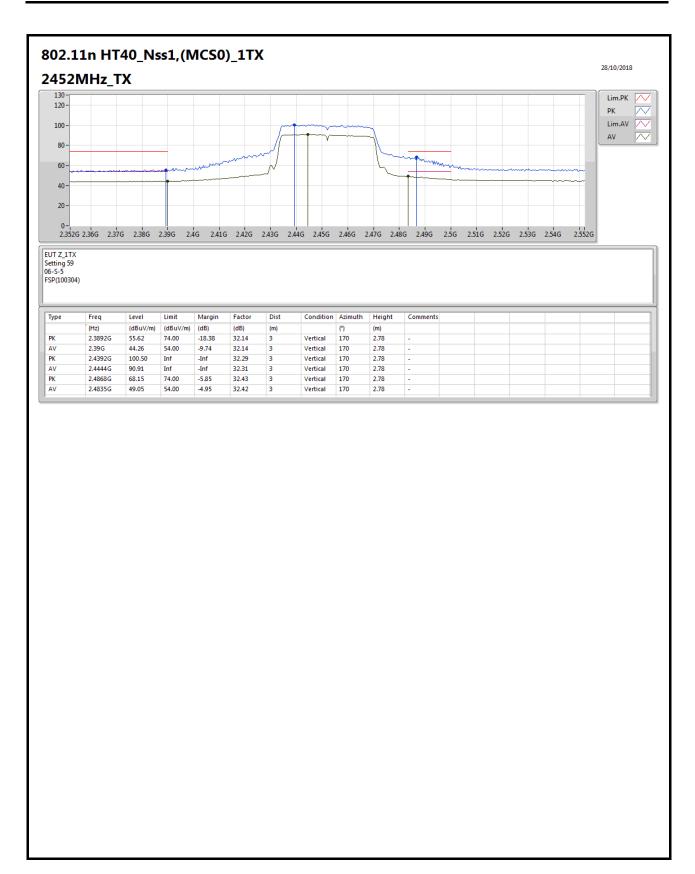
Page No. : 69 of 73





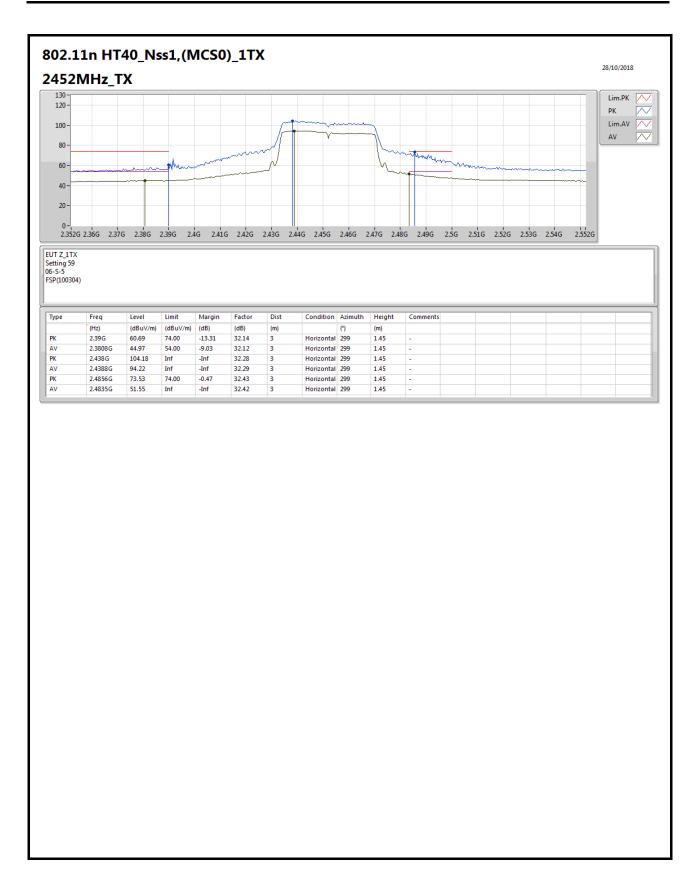
Page No. : 70 of 73





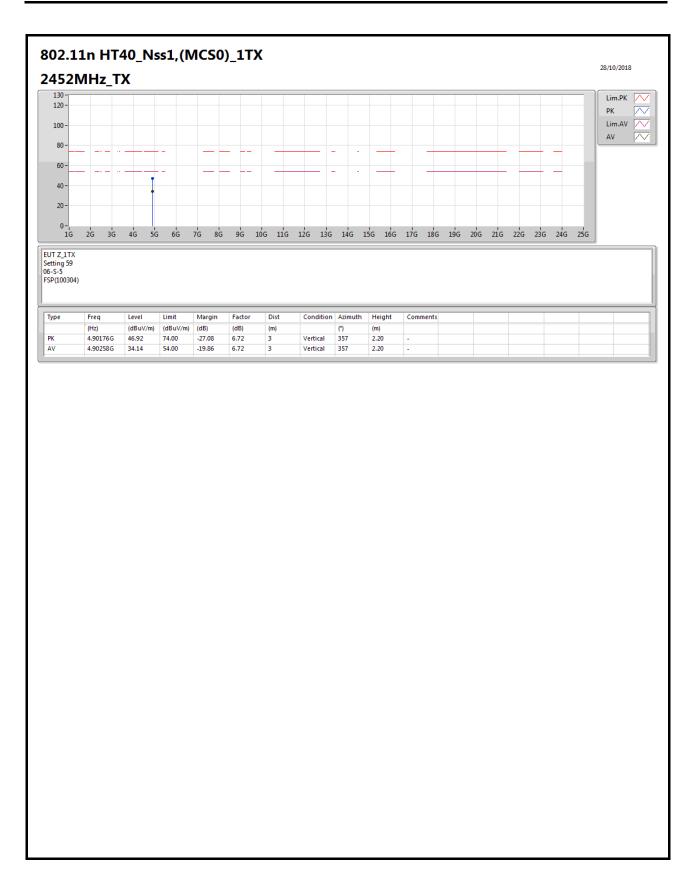
Page No. : 71 of 73





Page No. : 72 of 73





Page No. : 73 of 73



