


Japan Test Report

Equipment : Sterling-LWB5 Module
Model No. : 450-0168, 450-0169
(Refer to item 1.1.1 for more details)
Brand Name : Laird
Applicant : Laird Technologies
Address : W66N220 Commerce Court, Cedarburg,
Wisconsin 53012, USA
Standard : Article 2 Paragraph 1 Item 19
Received Date : May 23, 2018
Tested Date : May 26 ~ Oct. 04, 2018

Measurement was conducted by the following test method:
the test method of Ordinance Concerning Technical Regulations Conformity Certification
etc. of Specified Radio Equipment in Annex 1, the Ministry of Internal Affairs and
Communication notification in Annex "43" of Article 88, Paragraph 1 and ARIB STD-T66.

We, International Certification Corp., would like to declare that the tested sample has been
evaluated and in compliance with the requirement of the above standards. The test results
contained in this report refer exclusively to the product. It may be duplicated completely for
legal use with the approval of the applicant. It shall not be reproduced except in full without
the written approval of our laboratory.

Reviewed by:


James Fan / Assistant Manager

Approved by:


Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
JR770305-01AC	Rev. 01	Initial issue	Oct. 08, 2018

Summary of Test Results

Ref. Std. Clause	Description	Result
3.2(2)(3)	Antenna Power	Pass
3.2(4)	Frequency Tolerance	Pass
3.2(6)	Transmitter Spurious Emission	Pass
3.2(7)	Occupied Bandwidth	Pass
3.2(8)	Spreading Bandwidth	Pass
3.2(9)	Spreading Factor	Pass
3.3(1)	Receiver Emission	Pass
3.4.1	Interference prevention function	Pass
3.4.1(3)	Carrier Sense	Pass

1 General Description

1.1 Information

1.1.1 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description
Laird	450-0168	Sterling-LWB5 Module	U.FL Module
	450-0169		Chip Antenna Module

1.1.2 Specification of the Equipment under Test (EUT)

Power Type	3.3Vdc from host
Type(s) of Modulation / Technology	DBPSK, DQPSK, CCK / DSSS 64QAM, 16QAM, QPSK, BPSK / OFDM
Frequency Range (MHz)	2412~2472 MHz
Total Channel Number	13
Operating Mode: IEEE Std. 802.11 / Data rate (Mbps)	802.11b: Up to 11 Mbps 802.11g: Up to 54 Mbps 802.11n HT 20 (MCS 0~7) 802.11n HT 40 (MCS 0~7)
HW Version	1.0
SW Version	6.37.39.77

1.1.3 Antenna Details

Ant. No.	Band/ Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)				
				2400~2483.5	5150~5250	5250~5350	5470~5725	5725~5850
1	LSR/001-0009	Dipole	IPEX U.FL	2	2			
2	LSR/FlexPIFA 001-0016	PIFA	IPEX U.FL	2.5	3			
3	LSR/001-0012	Dipole	IPEX U.FL	2	2			
4	Johanson P/N: 2450AD14A5500#	Chip	IPEX U.FL	1	4			

Note: Please refer to Appendix I for more details about antenna pattern and other information.

1.1.4 Antenna Power

Operating Mode	Rated Power (mW/MHz)	Measured Conducted Power (mW/MHz))	Radiated Power (mW/MHz)
11b	2.00	1.75388	3.11889
11g	1.00	0.74645	1.32739
11n HT20	0.50	0.46666	0.82985
11n HT40	0.15	0.11272	0.20045

1.1.5 Channel List

Frequency band (MHz)		2400~2483.5	
802.11b / g / n HT 20		802.11n HT 40	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	3	2422
2	2417	4	2427
3	2422	5	2432
4	2427	6	2437
5	2432	7	2442
6	2437	8	2447
7	2442	9	2452
8	2447	10	2457
9	2452	11	2462
10	2457	-	-
11	2462	-	-
12	2467	-	-
13	2472	-	-

1.1.6 Test Tool and Power Setting

Test Tool
Sterling WLAN RF Eval Tool, v. 2.10.0.0

Power Setting							
Channel	Frequency (MHz)	802.11b	802.11g	802.11n HT20	Channel	Frequency (MHz)	802.11n HT40
1	2412	14	14	12	3	2422	9
7	2442	14	14	12	7	2442	9
13	2472	14	14	12	11	2462	9

1.1.7 Protection Method for High Frequency and Modulation Section

Protected Method	Description
Shielding Case	RF and Modulation components are covered with shielding case and this shielding case is soldered

Photo
(Chip Antenna Module)

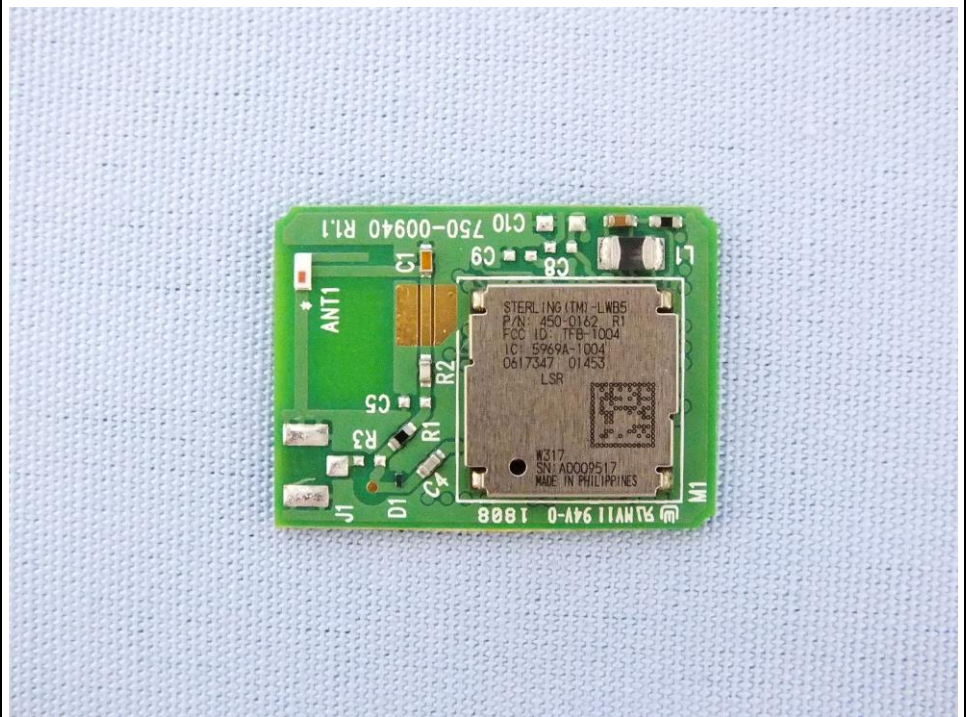
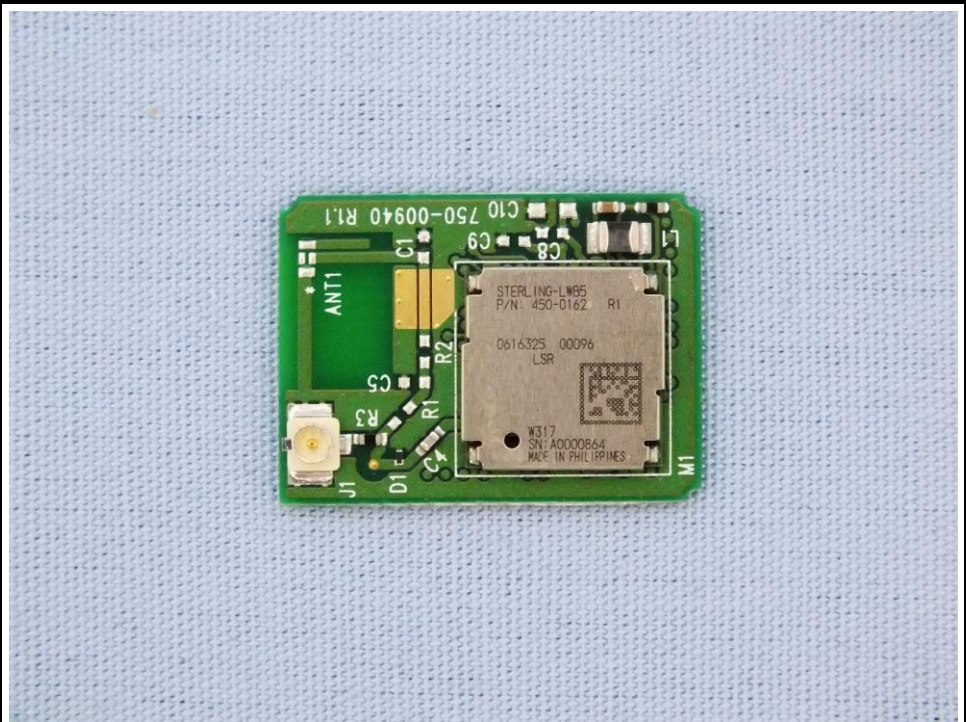


Photo
(U.FL Module)



1.2 Test Equipment and Calibration Data

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 16, 2018	Apr. 15, 2019
Power Meter	Anritsu	ML2495A	1241002	Oct. 16, 2017	Oct. 15, 2018
Power Sensor	Anritsu	MA2411B	1207366	Oct. 16, 2017	Oct. 15, 2018
Signal Generator	R&S	SMB100A	175727	Oct. 26, 2017	Oct. 25, 2018
DC POWER SOURCE	GW INSTEK	GPC-6030D	EM892433	Oct. 26, 2017	Oct. 25, 2018
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note 1: Calibration Interval of instruments listed above is one year. Note 2: Above instruments are calibrated by Electronics Testing Center					

1.3 Testing Applied Standards

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

Article 2 Paragraph 1 Item 19

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))

Measurement Uncertainty	
Parameters	Uncertainty
Frequency error	±33.988 Hz
Bandwidth	±33.988 Hz
Conducted power	±0.537 dB
TX Conducted emission	±2.308 dB
RX Conducted emission	±2.525 dB

2 Test Configuration

2.1 Testing Location and Conditions

Test Site	Site Category	Ambient Condition	Tested By
TH01-WS	OVEN Room	25°C / 65%	Chris Zeng

2.2 Supporting Units

Support Unit	Brand	Model	FCC ID
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2.3 The Worst Test Modes and Channel Details

Test item	Mode	Test channel
Antenna Power Frequency Tolerance Transmitter Spurious Emission Occupied Bandwidth Spreading Bandwidth Collateral Emission of Receiver Interference prevention function	11b, 11g, 11n HT20	1 / 7 / 13
	11n HT40	3 / 7 / 11
Spreading Factor	11b	1 / 7 / 13
Carrier Sense Capability	11n HT40	3 / 7 / 11

3 Transmitter Test Results

3.1 Antenna Power

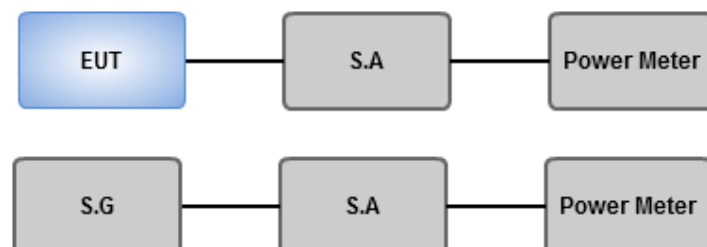
3.1.1 Limit of Antenna Power

Mode	Limit	Tolerance
1) FH, FH+DS, FH+OFDM	3 mW / MHz	+20 % , -80 %
2) OFDM(Narrow- bandwidht), DS	10 mW / MHz	
3) Other than 1) & 2)	10mW	
4) OFDM (Wide-band)	5 mW / MHz	

3.1.2 Test Procedures

1. A power meter is connected on the IF output port of the spectrum analyzer. Adjust the spectrum analyzer to have the center frequency the same with the measured carrier. RBW=VBW=1MHz, detector mode is positive peak. Turn off the averaging function and use zero span.
2. The calibrating signal power shall be reduced to 0 dBm and it shall be verified that the power meter reading also reduces by 10 dB. Connect the equipment to be measured. Using the following settings of the spectrum analyzer in combination with "max hold" function, find the frequency of highest power output in the power envelope: center frequency equal to operating frequency; RBW & VBW: 1 MHz; detector mode: positive peak; averaging: off; span: 3 times the spectrum width; amplitude: adjust for middle of the instrument's range. The frequency found shall be recorded.
3. Set the center frequency of the spectrum analyzer to the found frequency and switch to zero span. The power meter indicates the measured power density "E". Remove the EUT and put the replacing standard signal generator (SSG). Set the standard signal generator (SSG) at same frequency and transmit on, then set SSG output power at Pt to give the equivalent output level of "E".
4. Calculate antenna power density by the formula below $PD = Pt + 10 \cdot \log(1/x)$.
x: The duty cycle of the EUT in continuously transmitting mode.
Pt: Output power of the SSG.
5. Antenna Power Error is definition that actual measure antenna power tolerance between + 20% to - 80% power range that base on manufacturer declare the conducted power density.

3.1.3 Test Setup



3.1.4 Test Result of Maximum Transmit Power

Reference Documents	Test Mode
Appendix A1, A2	11b (20MHz)
Appendix A1, A2	11g (20MHz)
Appendix A1, A2	11n (20MHz)
Appendix A1, A2	11n (40MHz)

3.2 Frequency Tolerance

3.2.1 Limit of Frequency Tolerance

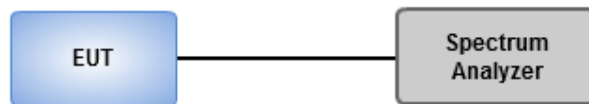
Frequency tolerance shall be +/- 50ppm.

3.2.2 Test Procedures

1. Set Span = 150kHz, RBW = 1kHz, VBW = 30kHz, Sweep time = Auto, detector = Peak.
2. Use Peak search function to find the max peak value and record this value (RF).
3. Calculate frequency tolerance by below formula
$$FT(ppm) = \{ (RF) - (MF) / (MF) \} \times 1000000$$

(FT: Frequency Tolerance, RF: Reading Frequency, MF: Measurement Frequency.)

3.2.3 Test Setup



3.2.4 Test Result of Frequency Tolerance

Reference Documents	Test Mode
Appendix B	11b (20MHz)
Appendix B	11g (20MHz)
Appendix B	11n (20MHz)
Appendix B	11n (40MHz)

3.3 Occupied Bandwidth

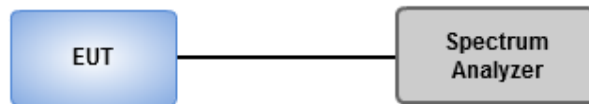
3.3.1 Limit of Occupied Bandwidth

Mode	Limit (MHz)
FH	83.5
FH+DS	83.5
FH+OFDM	83.5
OFDM(Narrow- bandwidth), DS	26
Others	26
OFDM (Wide-band)	38

3.3.2 Test Procedures

1. Set Span = 40MHz, RBW = VBW = 300kHz, detector = Peak, Sweep time = Auto.
2. Enable OBW function of spectrum analyzer to measure OBW and capture test plot.

3.3.3 Test Setup



3.3.4 Test Result of Occupied Bandwidth

Reference Documents	Test Mode
Appendix C	11b (20MHz)
Appendix C	11g (20MHz)
Appendix C	11n (20MHz)
Appendix C	11n (40MHz)

3.4 Spreading Bandwidth and Factor

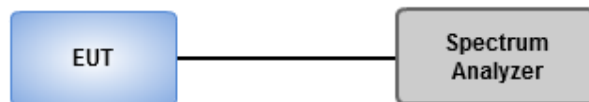
3.4.1 Limit of Spreading Bandwidth and Factor

Item	Limit
Spreading bandwidth	$\geq 500\text{kHz}$
Spreading factor for DSSS (operates at 2400~2483.5 MHz)	≥ 5
Spreading factor for DSSS (operates at 2471~2497 MHz)	≥ 10

3.4.2 Test Procedures

1. Set Span = 20MHz, RBW = VBW = 300kHz, detector = Peak, Sweep time = Auto.
2. Enable OBW (90%) function of spectrum analyzer to measure OBW (90%) and capture test plot.

3.4.3 Test Setup



3.4.4 Test Result of Spreading Bandwidth and Factor

Reference Documents	Test Mode
Appendix D	11b (20MHz)

3.5 Transmitter Spurious Emissions

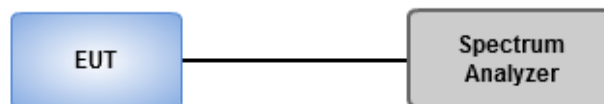
3.5.1 Limit of Transmitter Spurious Emissions

Item	Limits
Tx Spurious Emission	$\leq 2.5 \mu\text{W}$ ($2387\text{MHz} > f$; $2496.5\text{MHz} < f$).
	$\leq 25 \mu\text{W}$. ($2387\text{MHz} \leq f < 2400\text{MHz}$) and ($2483.5\text{MHz} < f \leq 2496.5\text{MHz}$).

3.5.2 Test Procedures

1. Set EUT to transmit at rated power and channel to perform test.
2. Set RBW = VBW = 1MHz, Detector type = Peak, Sweep time = Auto.
3. Following above setting of spectrum analyzer to measure spurious emission of 30~12500 MHz.

3.5.3 Test Setup



3.5.4 Test Result of Transmitter Spurious Emissions

Reference Documents	Test Mode
Appendix E	11b (20MHz)
Appendix E	11g (20MHz)
Appendix E	11n (20MHz)
Appendix E	11n (40MHz)

3.6 Carrier Sense Measurement

3.6.1 Limit of Carrier Sense Measurement

Limits
EUT shall not transmit any waves when carrier wave inject into EUT

3.6.2 Test Procedures

1. Set RBW = VBW = 1MHz, Detector type = Peak, Sweep time = Auto, Span = 50 MHz.
2. Set EUT to normal operating mode and link up with companion equipment
3. Turn off the EUT transmission
4. Turn on the Signal Generator output to send carrier wave to EUT then turn on the EUT transmission

Power level of carrier wave at EUT is as below

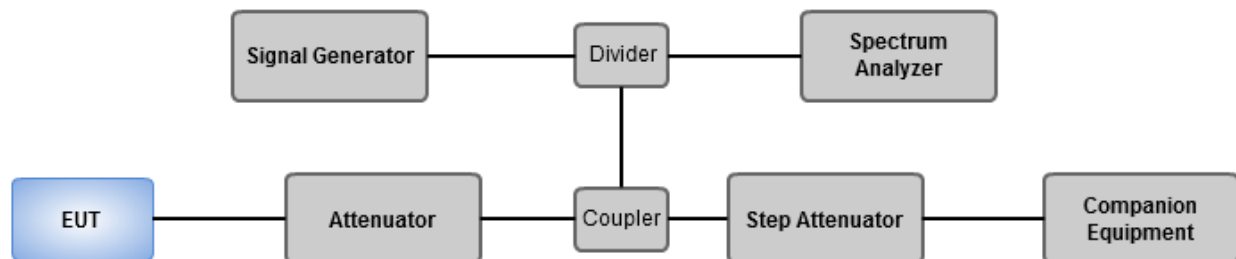
$$Pcs \text{ (dBm)} = 22.79 + Gr - 20\log(F)$$

Gr: Antenna gain (dBi)

F : Transmission Frequency (MHz)

5. Check the EUT does not transmit any waves

3.6.3 Test Setup



3.6.4 Test Result of Carrier Sense

Reference Documents	Test Mode
Appendix F	11n (40MHz)

3.7 Interference Prevention Function

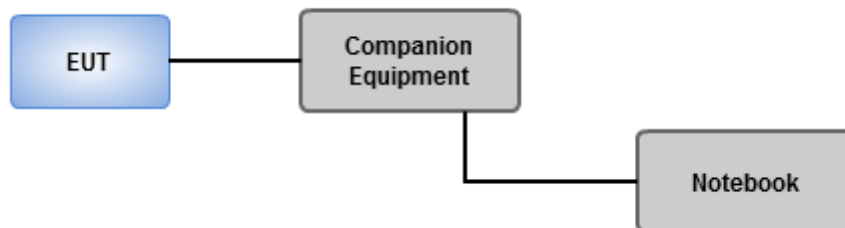
3.7.1 Limit of Interference Prevention Function

Limits
The identification code shall be 48 bits long

3.7.2 Test Procedures

1. Set EUT under operating mode and link up with companion equipment
2. Check communication status between EUT and companion equipment is normal
3. Confirm the MAC address of EUT

3.7.3 Test Setup



3.7.4 Test Result of Interference Prevention Function

Reference Documents	Test Mode
Appendix G	11b (20MHz)
Appendix G	11g (20MHz)
Appendix G	11n (20MHz)
Appendix G	11n (40MHz)

4 Receiver Test Results

4.1 Receiver Spurious Emissions

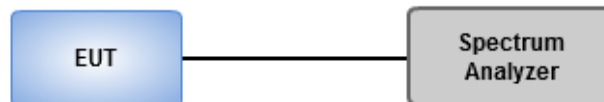
4.1.1 Limit of Receiver Spurious Emissions

Item	Limits
Rx Spurious Emission	$\leq 4\text{nW}$ ($f < 1\text{GHz}$).
	$\leq 20\text{nW}$ ($1\text{GHz} \leq f$).

4.1.2 Test Procedures

1. Set EUT under receiving condition to perform test
2. Set RBW = VBW = 100kHz, detector = Peak, Sweep time = Auto for emission measurement below 1GHz.
3. Set RBW = VBW=1MHz, detector = Peak, Sweep time = Auto for emission measurement above 1GHz.

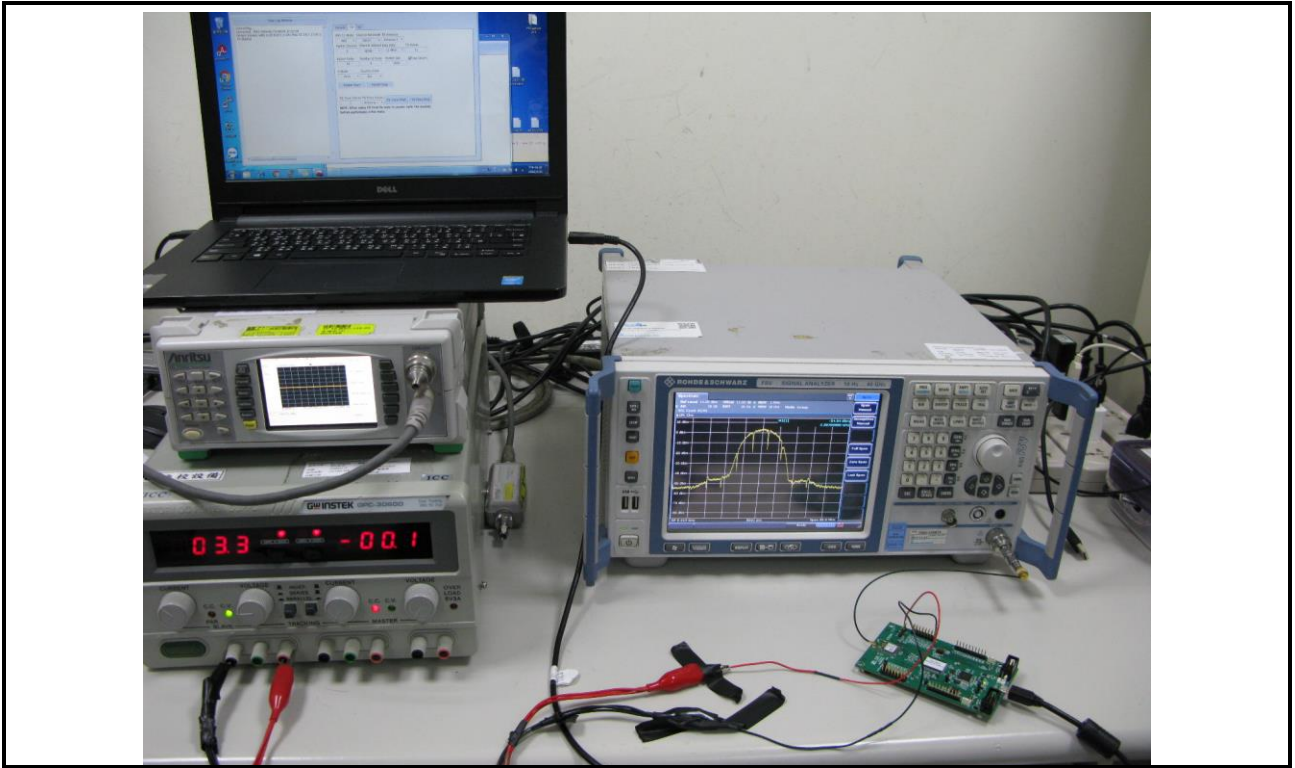
4.1.3 Test Setup



4.1.4 Test Result of Receiver Spurious Emissions

Reference Documents	Test Mode
Appendix H	11b (20MHz)
Appendix H	11g (20MHz)
Appendix H	11n (20MHz)
Appendix H	11n (40MHz)

5 Photographs of the Test Configuration



6 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

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City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information

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Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==



Power Tolerance Result

Appendix A.1

Summary

Mode	Result	Power (dBm/MHz)	Power (mW/MHz)	Declare (mW/MHz)	Tolerance (%)	Limit+ (%)	Limit- (%)
2.4-2.4835GHz	-	-	-	-	-	-	-
802.11b_Nss1_1TX	Pass	2.44	1.75388	2.00	-12.31	20	-80
802.11g_Nss1_1TX	Pass	-2.29	0.59020	1.00	-40.98	20	-80
802.11n HT20_Nss1,(MCS0)_1TX	Pass	-3.31	0.46666	0.50	-6.67	20	-80
802.11n HT40_Nss1,(MCS0)_1TX	Pass	-10.29	0.09354	0.15	-37.64	20	-80

Result

Mode	Result	Power (dBm/MHz)	Power (mW/MHz)	Declare (mW/MHz)	Tolerance (%)	Limit+ (%)	Limit- (%)
802.11b_Nss1_1TX	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.05	1.60325	2.00	-19.84	20	-80
2412MHz_TnomVmin	Pass	2.36	1.72187	2.00	-13.91	20	-80
2412MHz_TnomVmax	Pass	2.44	1.75388	2.00	-12.31	20	-80
2442MHz_TnomVnom	Pass	1.95	1.56675	2.00	-21.66	20	-80
2442MHz_TnomVmin	Pass	1.87	1.53815	2.00	-23.09	20	-80
2442MHz_TnomVmax	Pass	1.97	1.57398	2.00	-21.30	20	-80
2472MHz_TnomVnom	Pass	1.40	1.38038	2.00	-30.98	20	-80
2472MHz_TnomVmin	Pass	1.54	1.42561	2.00	-28.72	20	-80
2472MHz_TnomVmax	Pass	1.43	1.38995	2.00	-30.50	20	-80
802.11g_Nss1_1TX	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	-1.27	0.74645	1.00	-25.36	20	-80
2412MHz_TnomVmin	Pass	-1.30	0.74131	1.00	-25.87	20	-80
2412MHz_TnomVmax	Pass	-1.32	0.73790	1.00	-26.21	20	-80
2442MHz_TnomVnom	Pass	-1.56	0.69823	1.00	-30.18	20	-80
2442MHz_TnomVmin	Pass	-1.59	0.69343	1.00	-30.66	20	-80
2442MHz_TnomVmax	Pass	-1.59	0.69343	1.00	-30.66	20	-80
2472MHz_TnomVnom	Pass	-2.14	0.61094	1.00	-38.91	20	-80
2472MHz_TnomVmin	Pass	-2.08	0.61944	1.00	-38.06	20	-80
2472MHz_TnomVmax	Pass	-2.29	0.59020	1.00	-40.98	20	-80
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	-3.38	0.45920	0.50	-8.16	20	-80
2412MHz_TnomVmin	Pass	-3.31	0.46666	0.50	-6.67	20	-80
2412MHz_TnomVmax	Pass	-3.40	0.45709	0.50	-8.58	20	-80
2442MHz_TnomVnom	Pass	-3.98	0.39994	0.50	-20.01	20	-80
2442MHz_TnomVmin	Pass	-3.58	0.43853	0.50	-12.29	20	-80
2442MHz_TnomVmax	Pass	-3.75	0.42170	0.50	-15.66	20	-80
2472MHz_TnomVnom	Pass	-4.55	0.35075	0.50	-29.85	20	-80
2472MHz_TnomVmin	Pass	-4.38	0.36475	0.50	-27.05	20	-80
2472MHz_TnomVmax	Pass	-4.45	0.35892	0.50	-28.22	20	-80



Power Tolerance Result

Appendix A.1

Mode	Result	Power (dBm/MHz)	Power (mW/MHz)	Declare (mW/MHz)	Tolerance (%)	Limit+ (%)	Limit- (%)
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2422MHz_TnomVnom	Pass	-9.48	0.11272	0.15	-24.85	20	-80
2422MHz_TnomVmin	Pass	-9.61	0.10940	0.15	-27.07	20	-80
2422MHz_TnomVmax	Pass	-9.60	0.10965	0.15	-26.90	20	-80
2442MHz_TnomVnom	Pass	-9.58	0.11015	0.15	-26.56	20	-80
2442MHz_TnomVmin	Pass	-9.78	0.10520	0.15	-29.87	20	-80
2442MHz_TnomVmax	Pass	-9.69	0.10740	0.15	-28.40	20	-80
2462MHz_TnomVnom	Pass	-10.11	0.09750	0.15	-35.00	20	-80
2462MHz_TnomVmin	Pass	-10.10	0.09772	0.15	-34.85	20	-80
2462MHz_TnomVmax	Pass	-10.29	0.09354	0.15	-37.64	20	-80



Power Result

Appendix A.2

Summary

Mode	Power (dBm/MHz)	Power (mW/MHz)	EIRP (dBm/MHz)	EIRP (mW/MHz)
2.4-2.4835GHz	-	-	-	-
802.11b_Nss1_1TX	2.44	1.75388	4.94	3.11889
802.11g_Nss1_1TX	-1.27	0.74645	1.23	1.32739
802.11n HT20_Nss1,(MCS0)_1TX	-3.31	0.46666	-0.81	0.82985
802.11n HT40_Nss1,(MCS0)_1TX	-9.48	0.11272	-6.98	0.20045

PD = Antenna Power (Power Density)sum by P1;

P1 = Port 1 PD;; ENBF = Equivalent Noise Bandwidth Factor;

Result

Mode	Result	Gain (dBi)	ENBF (dB)	P1 (dBm/MHz)	Power (dBm/MHz)	Power (mW/MHz)	Power Lim. (mW/MHz)	EIRP (dBm/MHz)	EIRP (mW/MHz)	EIRP Lim. (mW/MHz)
802.11b_Nss1_1TX	-	-	-	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.50	0.49	2.05	2.05	1.60325	10	4.55	2.85102	16.368
2412MHz_TnomVmin	Pass	2.50	0.49	2.36	2.36	1.72187	10	4.86	3.06196	16.368
2412MHz_TnomVmax	Pass	2.50	0.49	2.44	2.44	1.75388	10	4.94	3.11889	16.368
2442MHz_TnomVnom	Pass	2.50	0.49	1.95	1.95	1.56675	10	4.45	2.78612	16.368
2442MHz_TnomVmin	Pass	2.50	0.49	1.87	1.87	1.53815	10	4.37	2.73527	16.368
2442MHz_TnomVmax	Pass	2.50	0.49	1.97	1.97	1.57398	10	4.47	2.79898	16.368
2472MHz_TnomVnom	Pass	2.50	0.49	1.40	1.40	1.38038	10	3.90	2.45471	16.368
2472MHz_TnomVmin	Pass	2.50	0.49	1.54	1.54	1.42561	10	4.04	2.53513	16.368
2472MHz_TnomVmax	Pass	2.50	0.49	1.43	1.43	1.38995	10	3.93	2.47172	16.368
802.11g_Nss1_1TX	-	-	-	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.50	0.49	-1.27	-1.27	0.74645	10	1.23	1.32739	16.368
2412MHz_TnomVmin	Pass	2.50	0.49	-1.30	-1.30	0.74131	10	1.20	1.31826	16.368
2412MHz_TnomVmax	Pass	2.50	0.49	-1.32	-1.32	0.73790	10	1.18	1.31220	16.368
2442MHz_TnomVnom	Pass	2.50	0.49	-1.56	-1.56	0.69823	10	0.94	1.24165	16.368
2442MHz_TnomVmin	Pass	2.50	0.49	-1.59	-1.59	0.69343	10	0.91	1.23310	16.368
2442MHz_TnomVmax	Pass	2.50	0.49	-1.59	-1.59	0.69343	10	0.91	1.23310	16.368
2472MHz_TnomVnom	Pass	2.50	0.49	-2.14	-2.14	0.61094	10	0.36	1.08643	16.368
2472MHz_TnomVmin	Pass	2.50	0.49	-2.08	-2.08	0.61944	10	0.42	1.10154	16.368
2472MHz_TnomVmax	Pass	2.50	0.49	-2.29	-2.29	0.59020	10	0.21	1.04954	16.368
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.50	0.49	-3.38	-3.38	0.45920	10	-0.88	0.81658	16.368
2412MHz_TnomVmin	Pass	2.50	0.49	-3.31	-3.31	0.46666	10	-0.81	0.82985	16.368
2412MHz_TnomVmax	Pass	2.50	0.49	-3.40	-3.40	0.45709	10	-0.90	0.81283	16.368



Power Result

Appendix A.2

Mode	Result	Gain (dBi)	ENBF (dB)	P1 (dBm/MHz)	Power (dBm/MHz)	Power (mW/MHz)	Power Lim. (mW/MHz)	EIRP (dBm/MHz)	EIRP (mW/MHz)	EIRP Lim. (mW/MHz)
2442MHz_TnomVnom	Pass	2.50	0.49	-3.98	-3.98	0.39994	10	-1.48	0.71121	16.368
2442MHz_TnomVmin	Pass	2.50	0.49	-3.58	-3.58	0.43853	10	-1.08	0.77983	16.368
2442MHz_TnomVmax	Pass	2.50	0.49	-3.75	-3.75	0.42170	10	-1.25	0.74989	16.368
2472MHz_TnomVnom	Pass	2.50	0.49	-4.55	-4.55	0.35075	10	-2.05	0.62373	16.368
2472MHz_TnomVmin	Pass	2.50	0.49	-4.38	-4.38	0.36475	10	-1.88	0.64863	16.368
2472MHz_TnomVmax	Pass	2.50	0.49	-4.45	-4.45	0.35892	10	-1.95	0.63826	16.368
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-	-	-	-
2422MHz_TnomVnom	Pass	2.50	0.49	-9.48	-9.48	0.11272	5	-6.98	0.20045	8.184
2422MHz_TnomVmin	Pass	2.50	0.49	-9.61	-9.61	0.10940	5	-7.11	0.19454	8.184
2422MHz_TnomVmax	Pass	2.50	0.49	-9.60	-9.60	0.10965	5	-7.10	0.19498	8.184
2442MHz_TnomVnom	Pass	2.50	0.49	-9.58	-9.58	0.11015	5	-7.08	0.19588	8.184
2442MHz_TnomVmin	Pass	2.50	0.49	-9.78	-9.78	0.10520	5	-7.28	0.18707	8.184
2442MHz_TnomVmax	Pass	2.50	0.49	-9.69	-9.69	0.10740	5	-7.19	0.19099	8.184
2462MHz_TnomVnom	Pass	2.50	0.49	-10.11	-10.11	0.09750	5	-7.61	0.17338	8.184
2462MHz_TnomVmin	Pass	2.50	0.49	-10.10	-10.10	0.09772	5	-7.60	0.17378	8.184
2462MHz_TnomVmax	Pass	2.50	0.49	-10.29	-10.29	0.09354	5	-7.79	0.16634	8.184

PD = Antenna Power (Power Density)sum by P1;

P1 = Port 1 PD; ENBF = Equivalent Noise Bandwidth Factor;



Frequency Tolerance Result

Appendix B

Summary

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
2.4-2.4835GHz	-	-	-	-	-	-	-
802.11b_Nss1_1TX	Pass	2.472G	2.47199421G	-2.342	±50	1	-
802.11g_Nss1_1TX	Pass	2.472G	2.47199407G	-2.4	±50	1	-
802.11n HT20_Nss1,(MCS0)_1TX	Pass	2.472G	2.47199397G	-2.441	±50	1	-
802.11n HT40_Nss1,(MCS0)_1TX	Pass	2.442G	2.44199426G	-2.35	±50	1	-



Frequency Tolerance Result

Appendix B

Result

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
802.11b_Nss1_1TX	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.412G	2.41199584G	-1.726	±50	1	-
2412MHz_TnomVmin	Pass	2.412G	2.41199568G	-1.789	±50	1	-
2412MHz_TnomVmax	Pass	2.412G	2.41199556G	-1.841	±50	1	-
2442MHz_TnomVnom	Pass	2.442G	2.44199481G	-2.124	±50	1	-
2442MHz_TnomVmin	Pass	2.442G	2.44199472G	-2.164	±50	1	-
2442MHz_TnomVmax	Pass	2.442G	2.44199464G	-2.194	±50	1	-
2472MHz_TnomVnom	Pass	2.472G	2.47199438G	-2.272	±50	1	-
2472MHz_TnomVmin	Pass	2.472G	2.47199429G	-2.312	±50	1	-
2472MHz_TnomVmax	Pass	2.472G	2.47199421G	-2.342	±50	1	-
802.11g_Nss1_1TX	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.412G	2.41199545G	-1.886	±50	1	-
2412MHz_TnomVmin	Pass	2.412G	2.41199535G	-1.927	±50	1	-
2412MHz_TnomVmax	Pass	2.412G	2.41199526G	-1.965	±50	1	-
2442MHz_TnomVnom	Pass	2.442G	2.44199459G	-2.217	±50	1	-
2442MHz_TnomVmin	Pass	2.442G	2.44199453G	-2.242	±50	1	-
2442MHz_TnomVmax	Pass	2.442G	2.44199447G	-2.263	±50	1	-
2472MHz_TnomVnom	Pass	2.472G	2.47199416G	-2.364	±50	1	-
2472MHz_TnomVmin	Pass	2.472G	2.47199411G	-2.383	±50	1	-
2472MHz_TnomVmax	Pass	2.472G	2.47199407G	-2.4	±50	1	-
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.412G	2.41199517G	-2.001	±50	1	-
2412MHz_TnomVmin	Pass	2.412G	2.4119951G	-2.032	±50	1	-
2412MHz_TnomVmax	Pass	2.412G	2.41199503G	-2.062	±50	1	-
2442MHz_TnomVnom	Pass	2.442G	2.44199443G	-2.282	±50	1	-
2442MHz_TnomVmin	Pass	2.442G	2.44199437G	-2.304	±50	1	-
2442MHz_TnomVmax	Pass	2.442G	2.44199433G	-2.32	±50	1	-
2472MHz_TnomVnom	Pass	2.472G	2.47199403G	-2.414	±50	1	-
2472MHz_TnomVmin	Pass	2.472G	2.471994G	-2.427	±50	1	-
2472MHz_TnomVmax	Pass	2.472G	2.47199397G	-2.441	±50	1	-
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2422MHz_TnomVnom	Pass	2.422G	2.42199505G	-2.043	±50	1	-
2422MHz_TnomVmin	Pass	2.422G	2.42199493G	-2.092	±50	1	-
2422MHz_TnomVmax	Pass	2.422G	2.42199485G	-2.127	±50	1	-
2442MHz_TnomVnom	Pass	2.442G	2.44199431G	-2.331	±50	1	-
2442MHz_TnomVmin	Pass	2.442G	2.44199428G	-2.342	±50	1	-
2442MHz_TnomVmax	Pass	2.442G	2.44199426G	-2.35	±50	1	-



Frequency Tolerance Result

Appendix B

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
2462MHz_TnomVnom	Pass	2.462G	2.46199448G	-2.243	±50	1	-
2462MHz_TnomVmin	Pass	2.462G	2.46199438G	-2.284	±50	1	-
2462MHz_TnomVmax	Pass	2.462G	2.46199431G	-2.313	±50	1	-



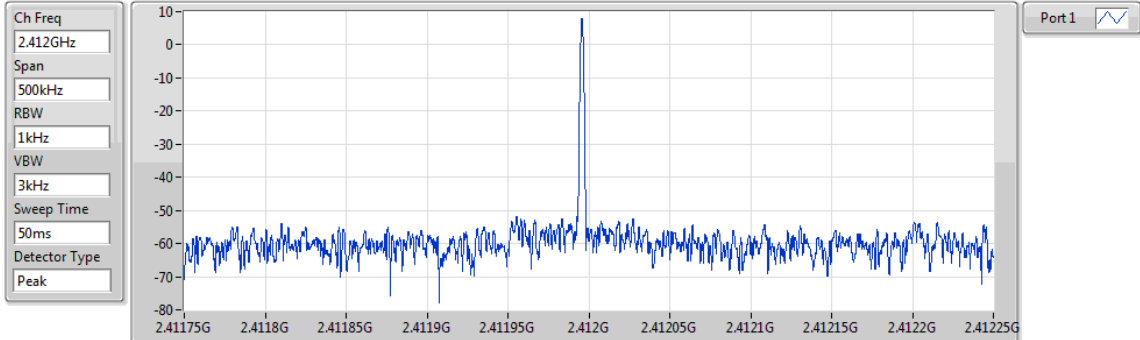
Frequency Tolerance Result

Appendix B

802.11b_Nss1_1TX

Freq. Stability

2412MHz_TnomVnom

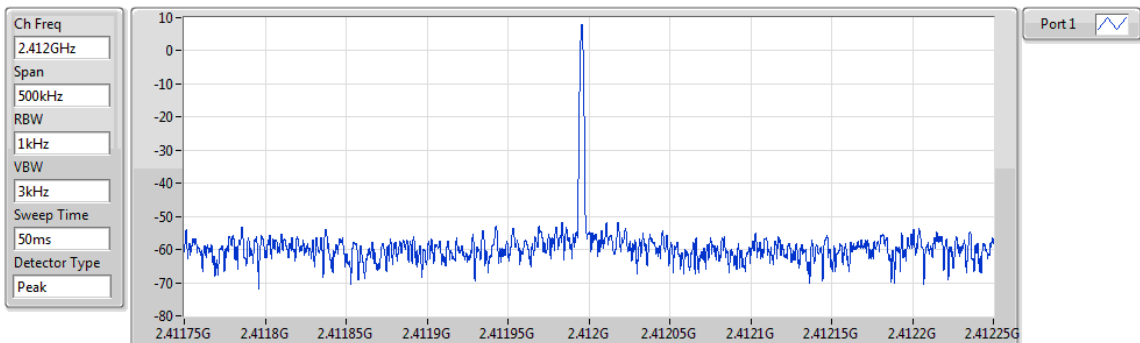


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.412G	2.41199584G	NaN	NaN	-1.726	±50	1	-

802.11b_Nss1_1TX

Freq. Stability

2412MHz_TnomVmin

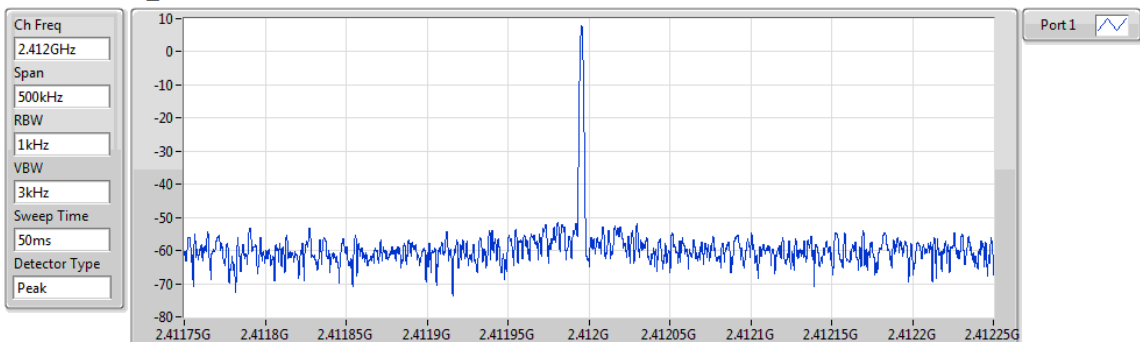


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.412G	2.41199568G	NaN	NaN	-1.789	±50	1	-

802.11b_Nss1_1TX

Freq. Stability

2412MHz_TnomVmax



Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.412G	2.41199556G	NaN	NaN	-1.841	±50	1	-



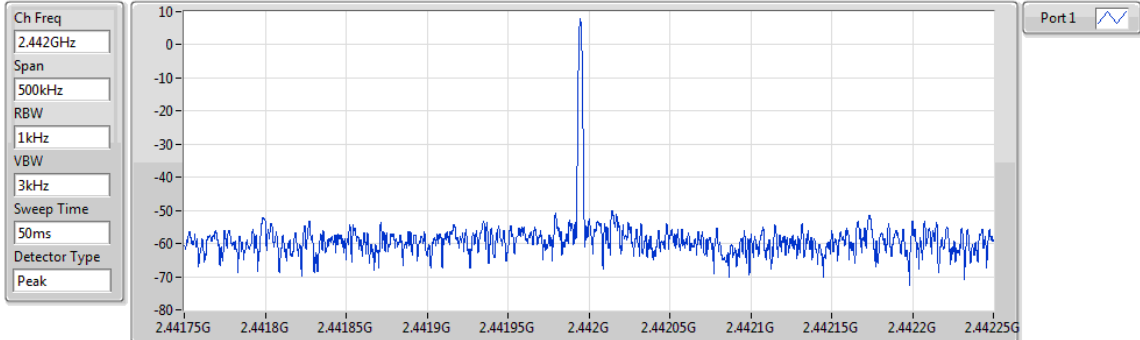
Frequency Tolerance Result

Appendix B

802.11b_Nss1_1TX

Freq. Stability

2442MHz_TnomVnom

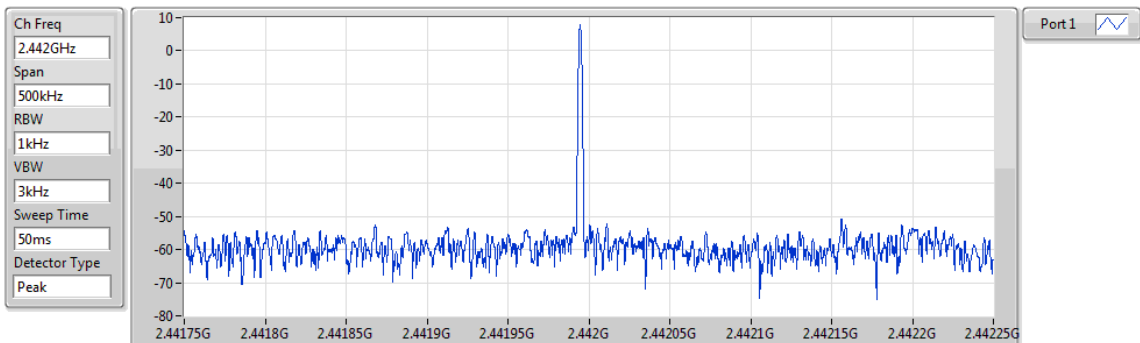


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.442G	2.44199481G	NaN	NaN	-2.124	±50	1	-

802.11b_Nss1_1TX

Freq. Stability

2442MHz_TnomVmin

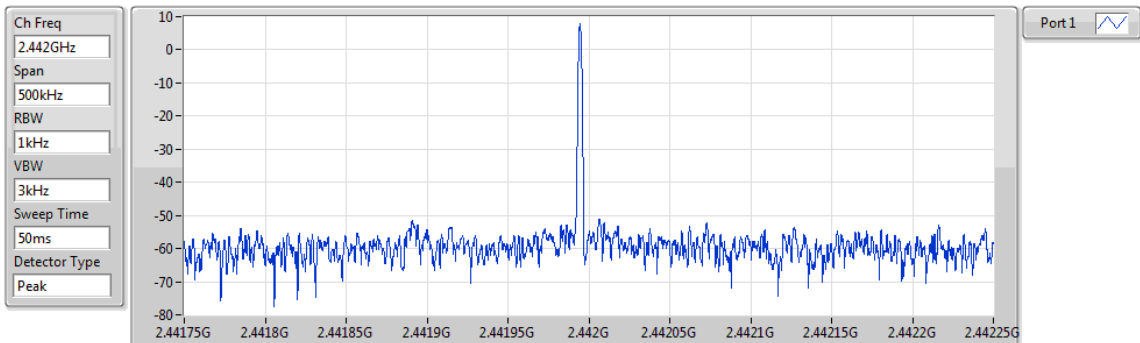


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.442G	2.44199472G	NaN	NaN	-2.164	±50	1	-

802.11b_Nss1_1TX

Freq. Stability

2442MHz_TnomVmax



Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.442G	2.44199464G	NaN	NaN	-2.194	±50	1	-



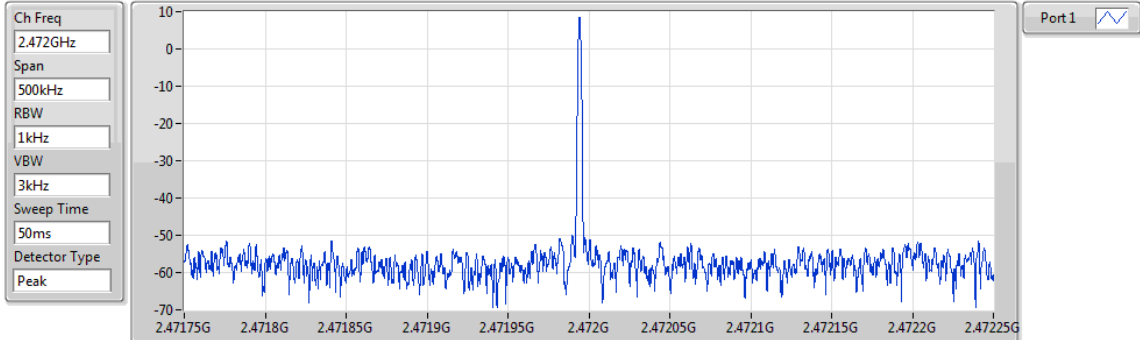
Frequency Tolerance Result

Appendix B

802.11b_Nss1_1TX

Freq. Stability

2472MHz_TnomVnom

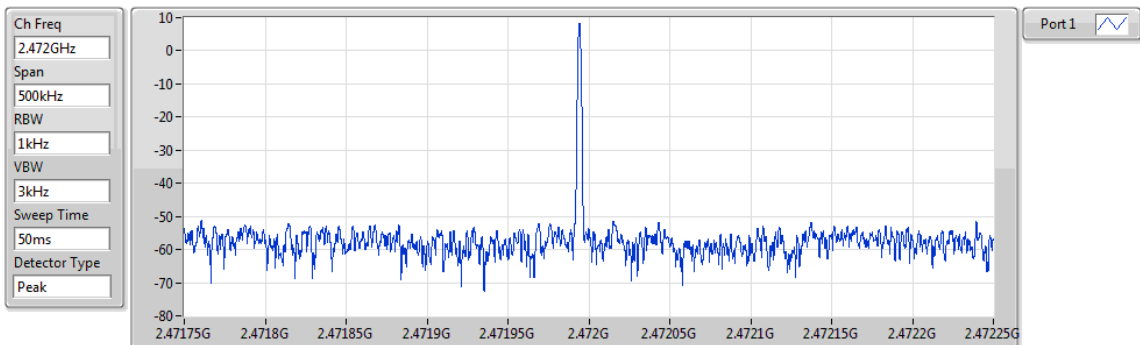


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.472G	2.47199438G	NaN	NaN	-2.272	±50	1	-

802.11b_Nss1_1TX

Freq. Stability

2472MHz_TnomVmin

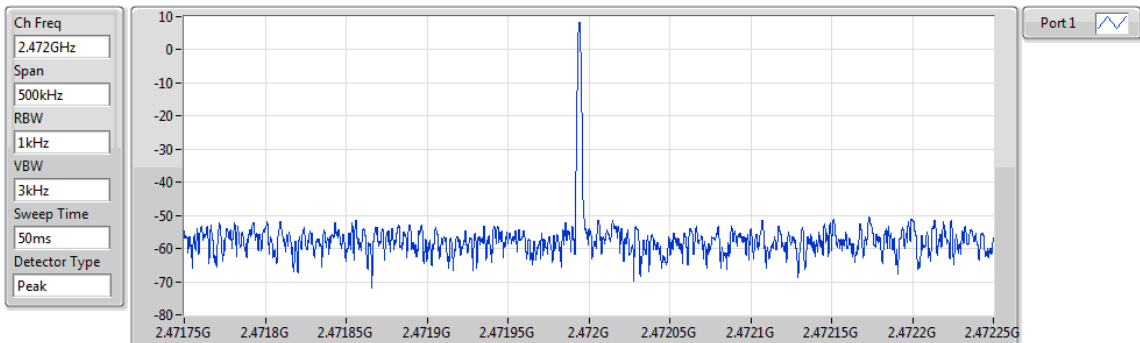


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.472G	2.47199429G	NaN	NaN	-2.312	±50	1	-

802.11b_Nss1_1TX

Freq. Stability

2472MHz_TnomVmax



Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.472G	2.47199421G	NaN	NaN	-2.342	±50	1	-



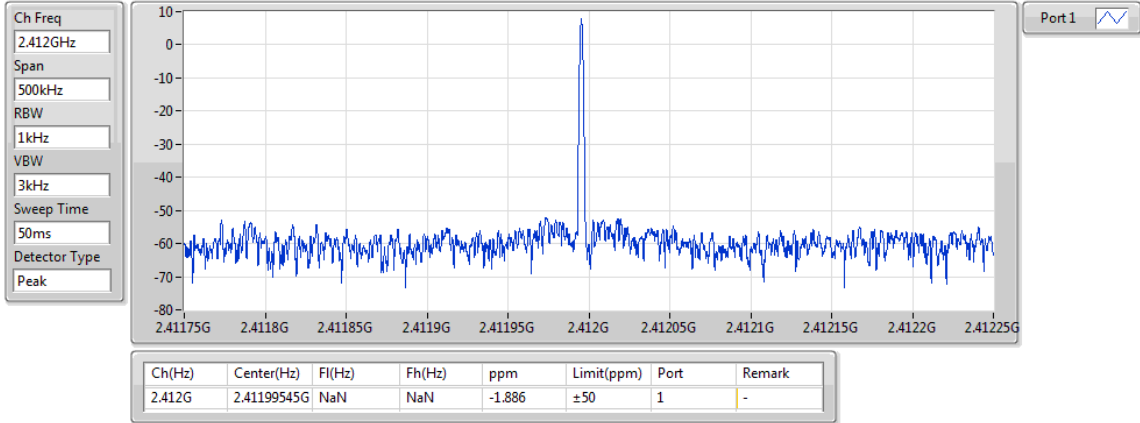
Frequency Tolerance Result

Appendix B

802.11g_Nss1_1TX

Freq. Stability

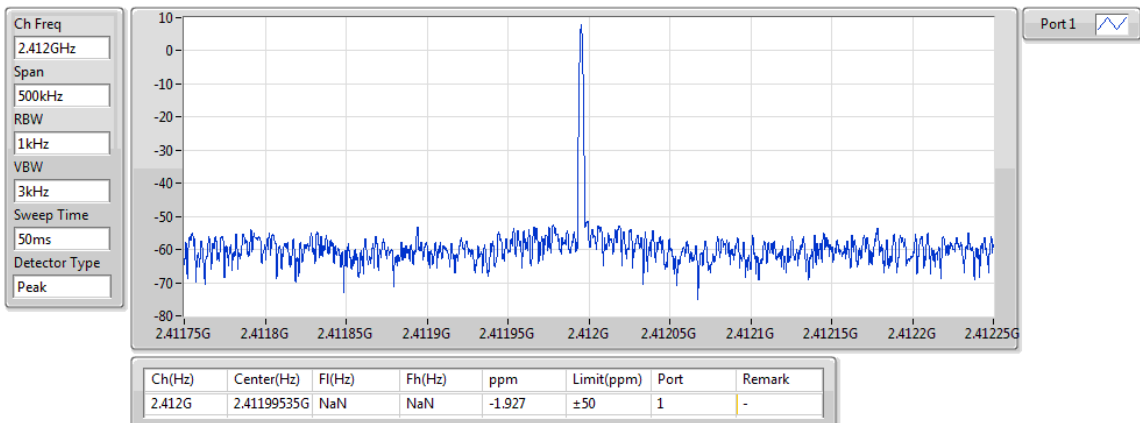
2412MHz_TnomVnom



802.11g_Nss1_1TX

Freq. Stability

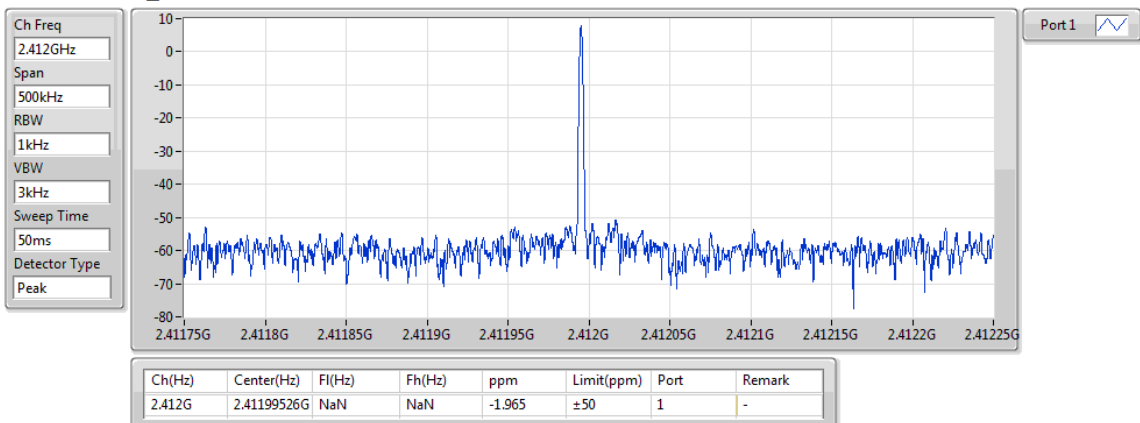
2412MHz_TnomVmin



802.11g_Nss1_1TX

Freq. Stability

2412MHz_TnomVmax





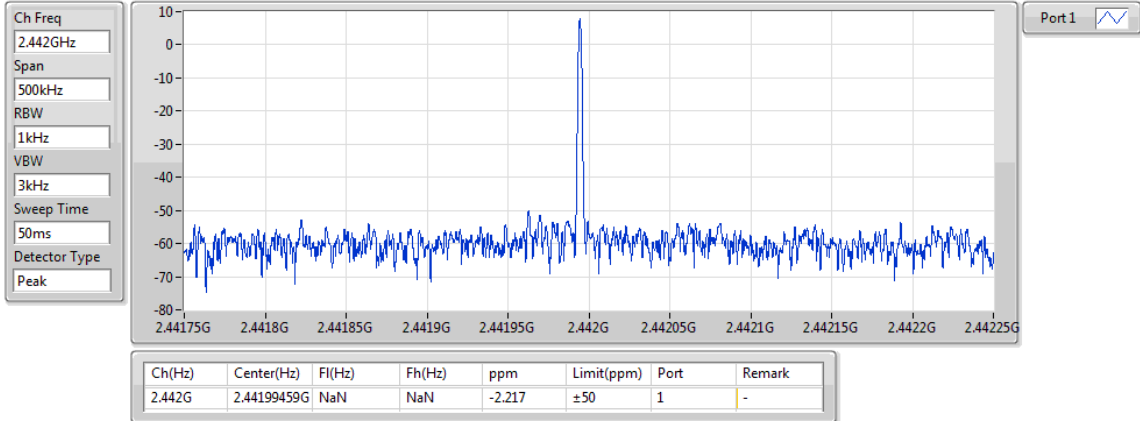
Frequency Tolerance Result

Appendix B

802.11g_Nss1_1TX

Freq. Stability

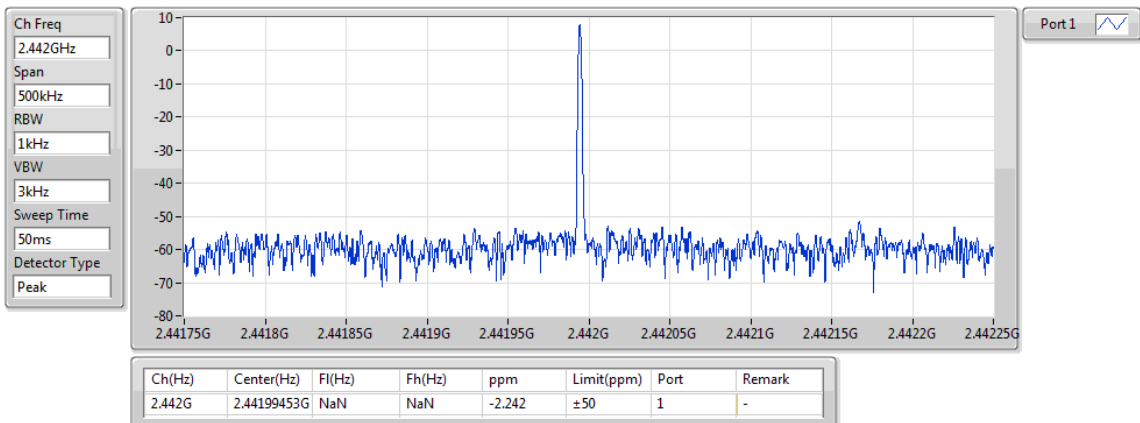
2442MHz_TnomVnom



802.11g_Nss1_1TX

Freq. Stability

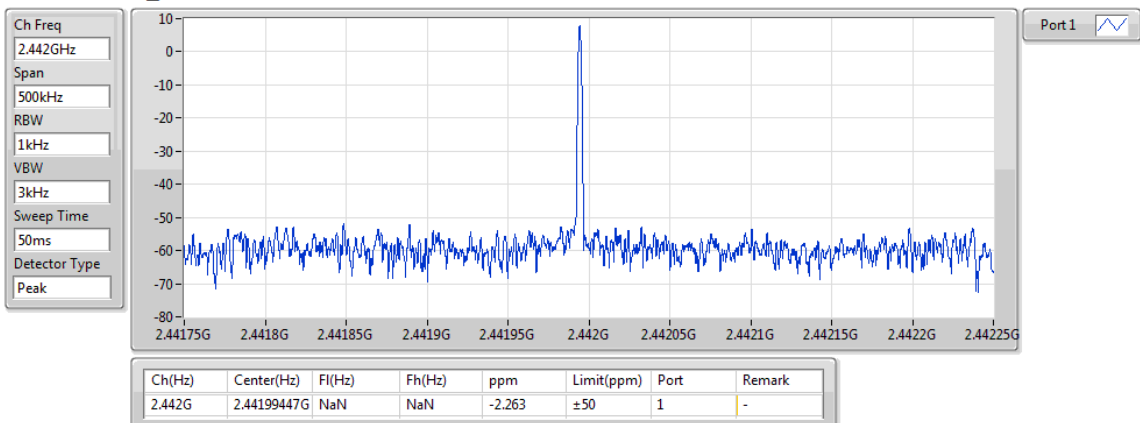
2442MHz_TnomVmin



802.11g_Nss1_1TX

Freq. Stability

2442MHz_TnomVmax





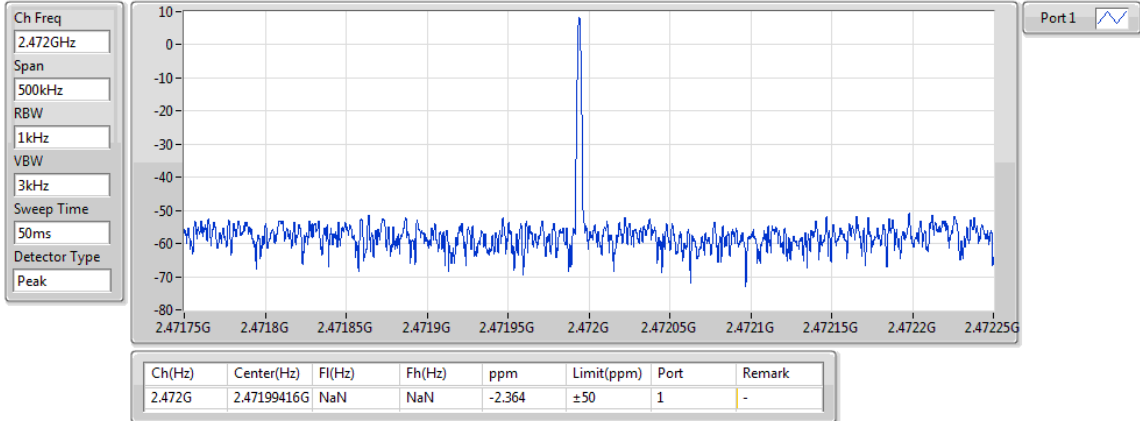
Frequency Tolerance Result

Appendix B

802.11g_Nss1_1TX

Freq. Stability

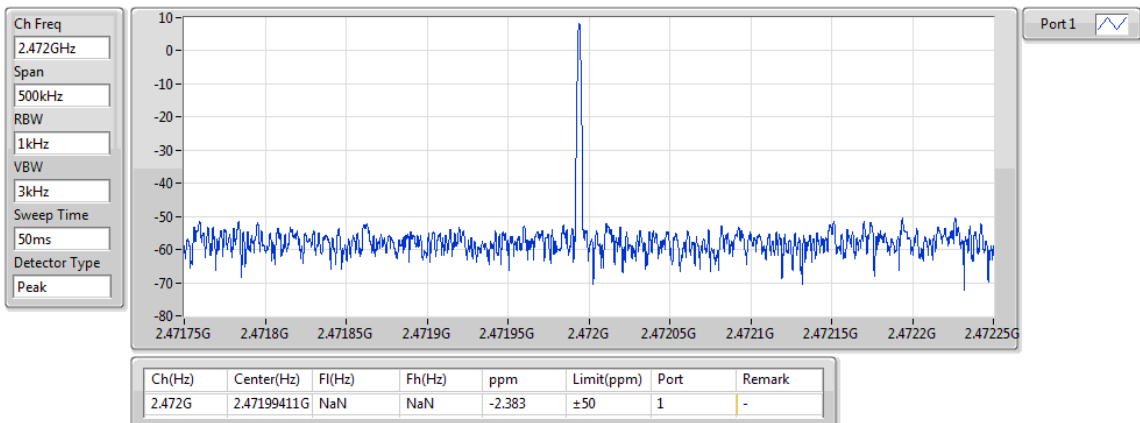
2472MHz_TnomVnom



802.11g_Nss1_1TX

Freq. Stability

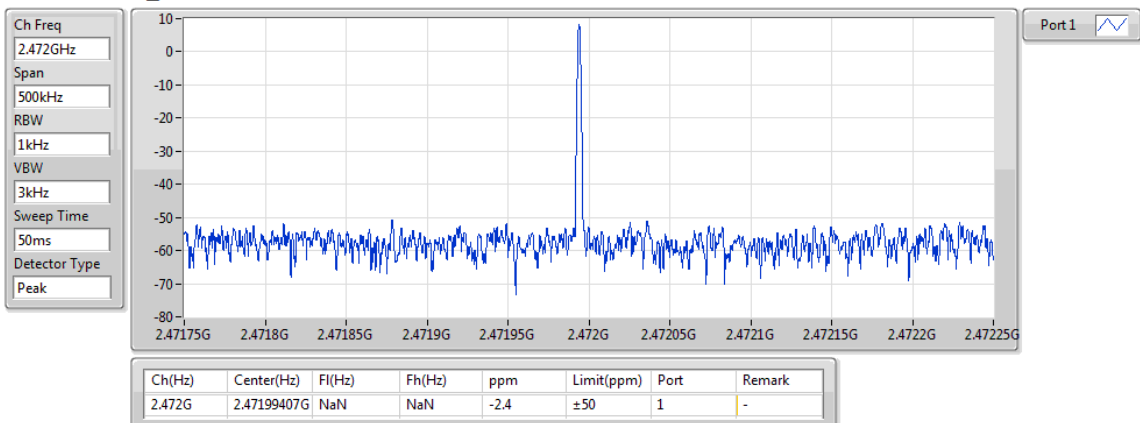
2472MHz_TnomVmin



802.11g_Nss1_1TX

Freq. Stability

2472MHz_TnomVmax





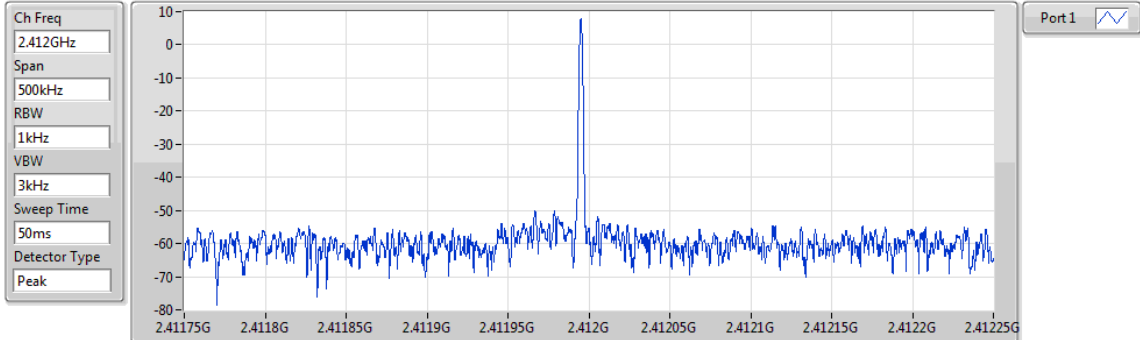
Frequency Tolerance Result

Appendix B

802.11n HT20_Nss1,(MCS0)_1TX

Freq. Stability

2412MHz_TnomVnom

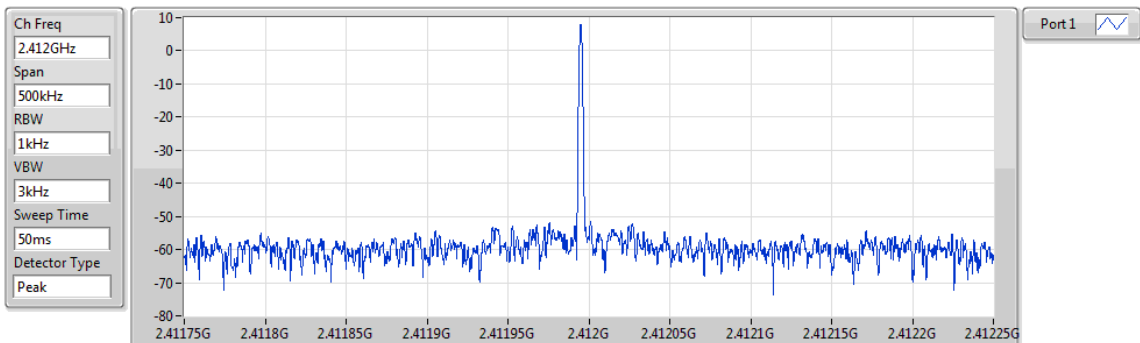


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.412G	2.41199517G	NaN	NaN	-2.001	±50	1	-

802.11n HT20_Nss1,(MCS0)_1TX

Freq. Stability

2412MHz_TnomVmin

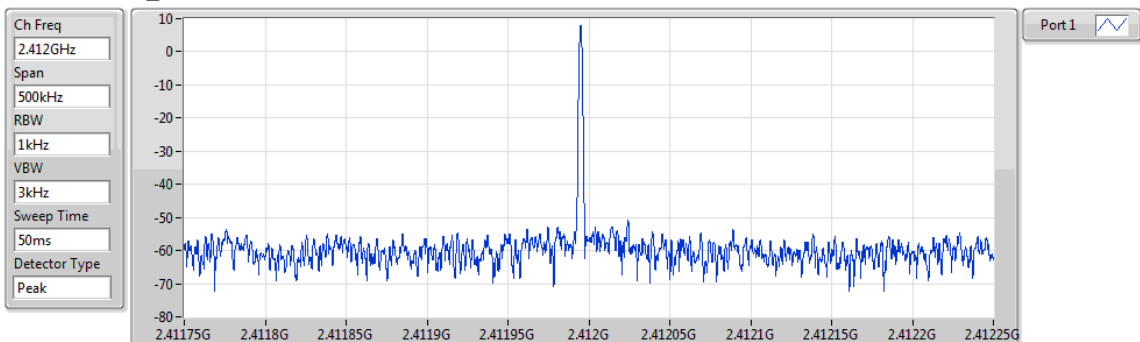


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.412G	2.4119951G	NaN	NaN	-2.032	±50	1	-

802.11n HT20_Nss1,(MCS0)_1TX

Freq. Stability

2412MHz_TnomVmax



Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.412G	2.41199503G	NaN	NaN	-2.062	±50	1	-



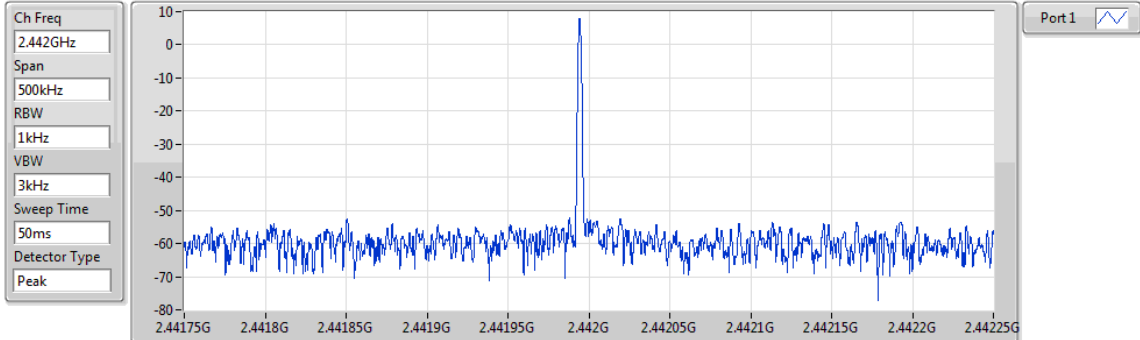
Frequency Tolerance Result

Appendix B

802.11n HT20_Nss1,(MCS0)_1TX

Freq. Stability

2442MHz_TnomVnom

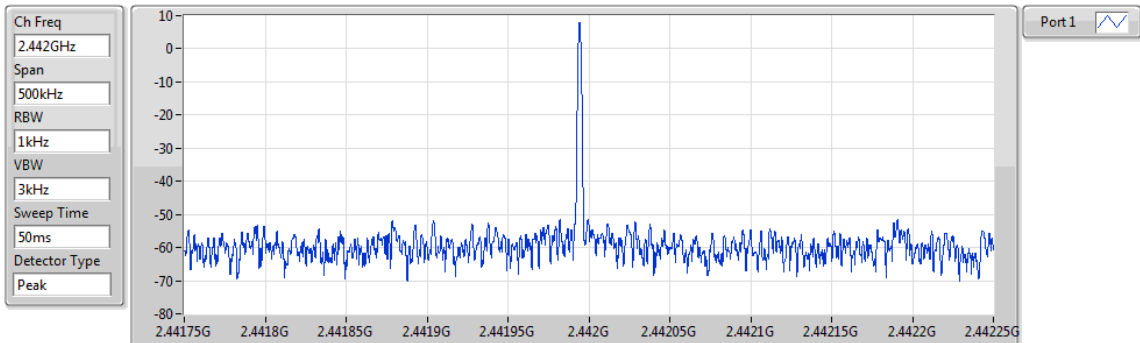


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.442G	2.44199443G	NaN	NaN	-2.282	±50	1	-

802.11n HT20_Nss1,(MCS0)_1TX

Freq. Stability

2442MHz_TnomVmin

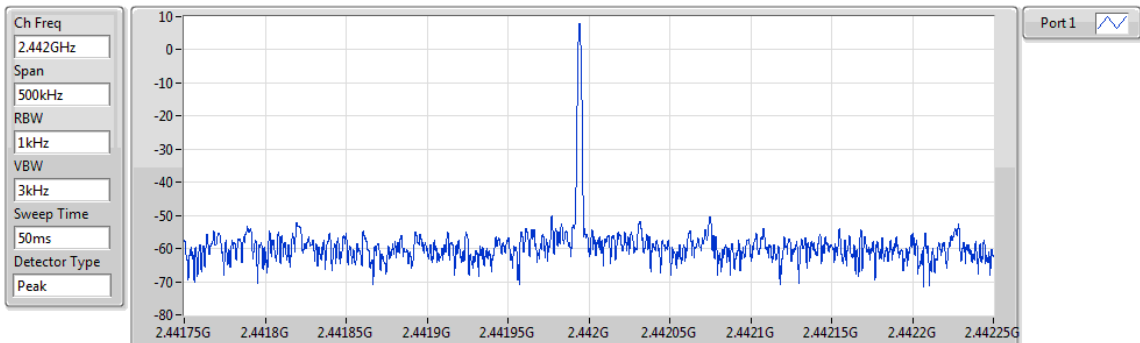


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.442G	2.44199437G	NaN	NaN	-2.304	±50	1	-

802.11n HT20_Nss1,(MCS0)_1TX

Freq. Stability

2442MHz_TnomVmax



Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.442G	2.44199433G	NaN	NaN	-2.32	±50	1	-



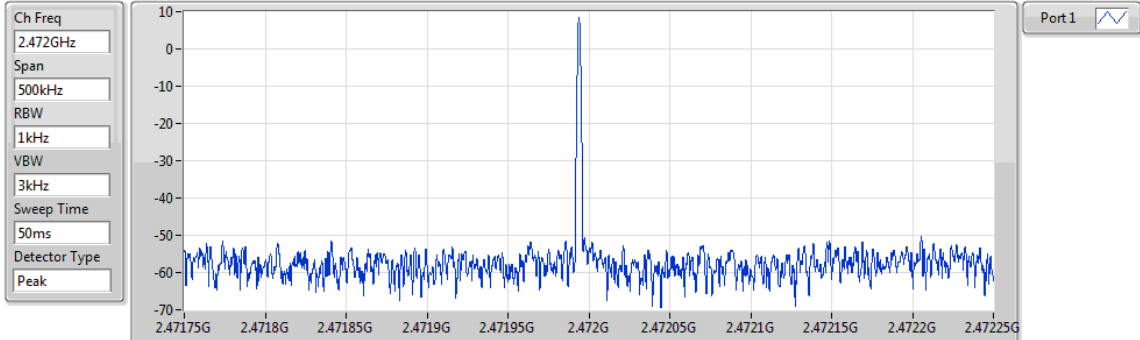
Frequency Tolerance Result

Appendix B

802.11n HT20_Nss1,(MCS0)_1TX

Freq. Stability

2472MHz_TnomVnom

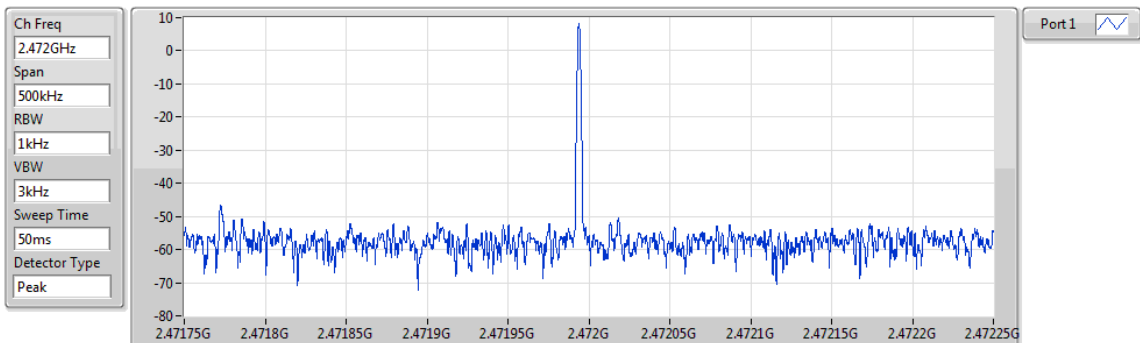


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.472G	2.47199403G	NaN	NaN	-2.414	±50	1	-

802.11n HT20_Nss1,(MCS0)_1TX

Freq. Stability

2472MHz_TnomVmin

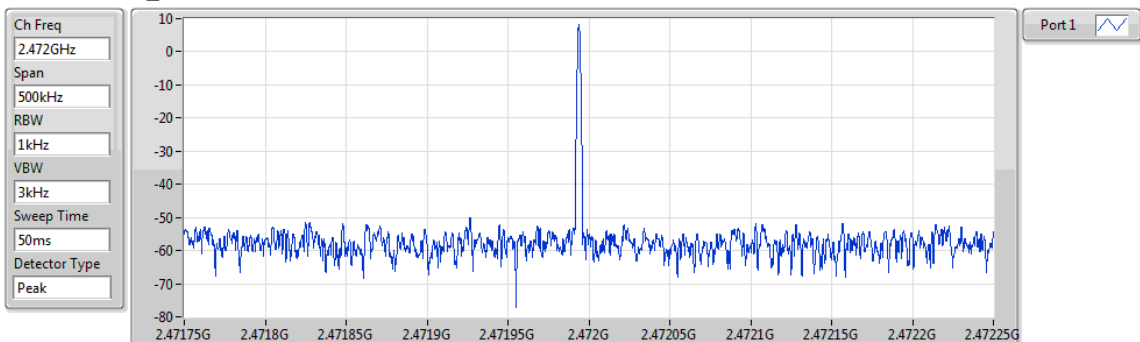


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.472G	2.471994G	NaN	NaN	-2.427	±50	1	-

802.11n HT20_Nss1,(MCS0)_1TX

Freq. Stability

2472MHz_TnomVmax



Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.472G	2.47199397G	NaN	NaN	-2.441	±50	1	-



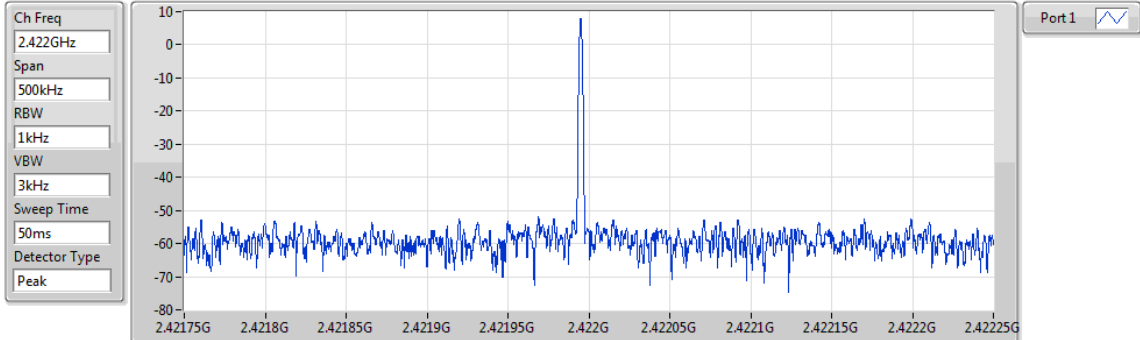
Frequency Tolerance Result

Appendix B

802.11n HT40_Nss1,(MCS0)_1TX

Freq. Stability

2422MHz_TnomVnom

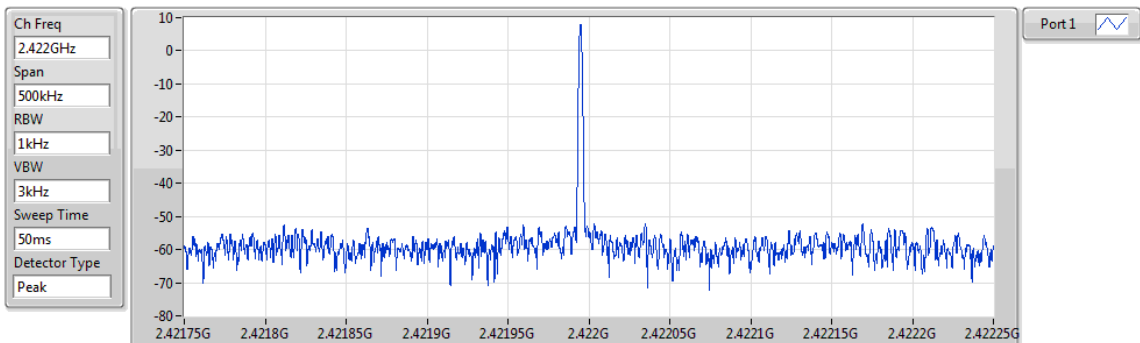


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.422G	2.42199505G	NaN	NaN	-2.043	±50	1	-

802.11n HT40_Nss1,(MCS0)_1TX

Freq. Stability

2422MHz_TnomVmin

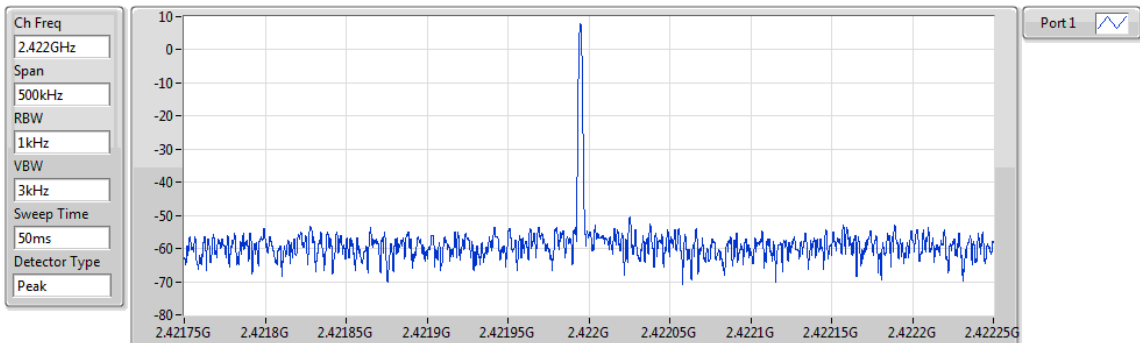


Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.422G	2.42199493G	NaN	NaN	-2.092	±50	1	-

802.11n HT40_Nss1,(MCS0)_1TX

Freq. Stability

2422MHz_TnomVmax



Ch(Hz)	Center(Hz)	Fl(Hz)	Fh(Hz)	ppm	Limit(ppm)	Port	Remark
2.422G	2.42199485G	NaN	NaN	-2.127	±50	1	-



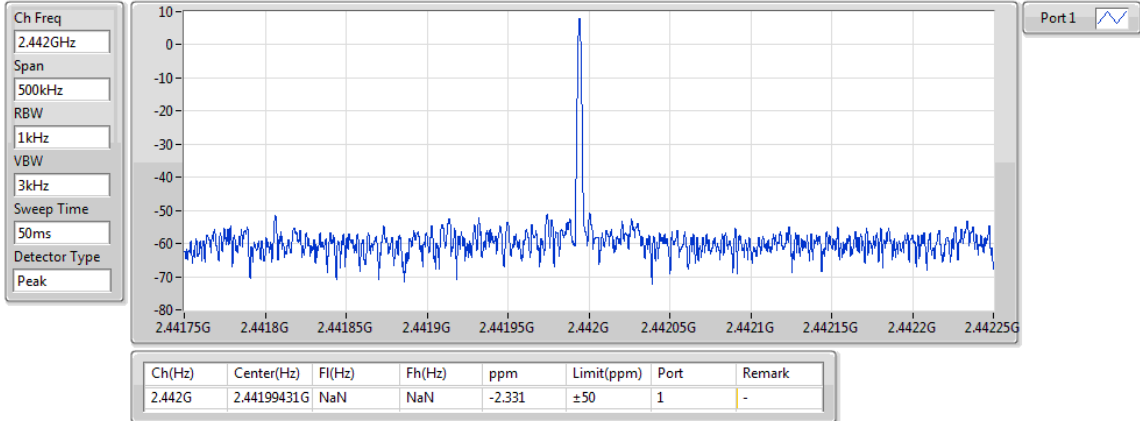
Frequency Tolerance Result

Appendix B

802.11n HT40_Nss1,(MCS0)_1TX

Freq. Stability

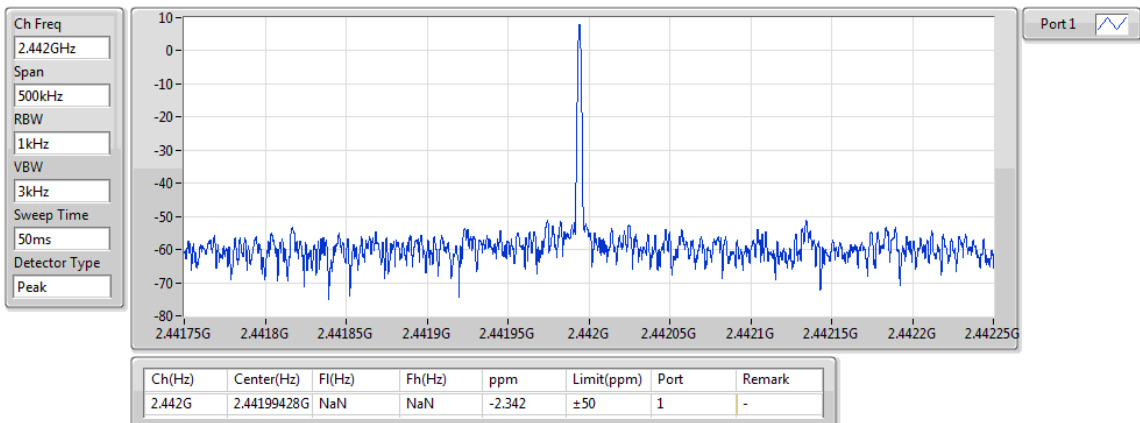
2442MHz_TnomVnom



802.11n HT40_Nss1,(MCS0)_1TX

Freq. Stability

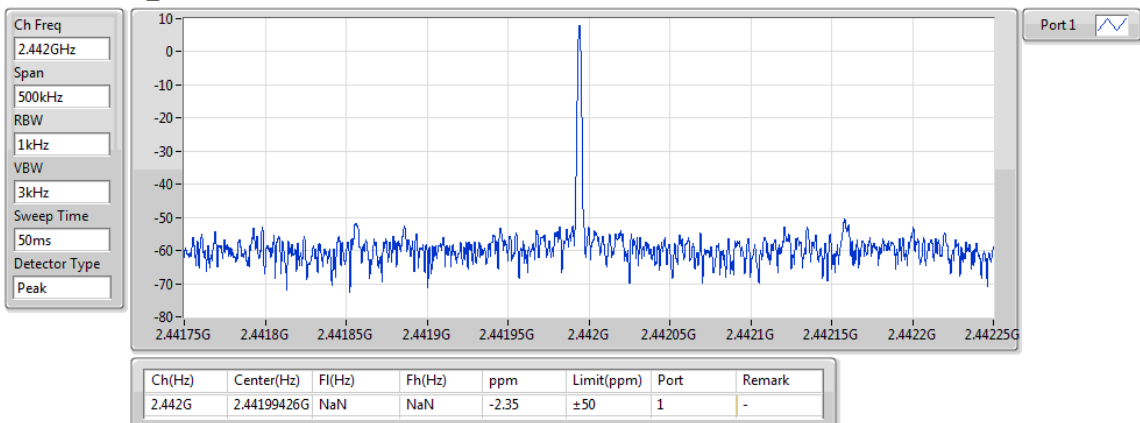
2442MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

Freq. Stability

2442MHz_TnomVmax





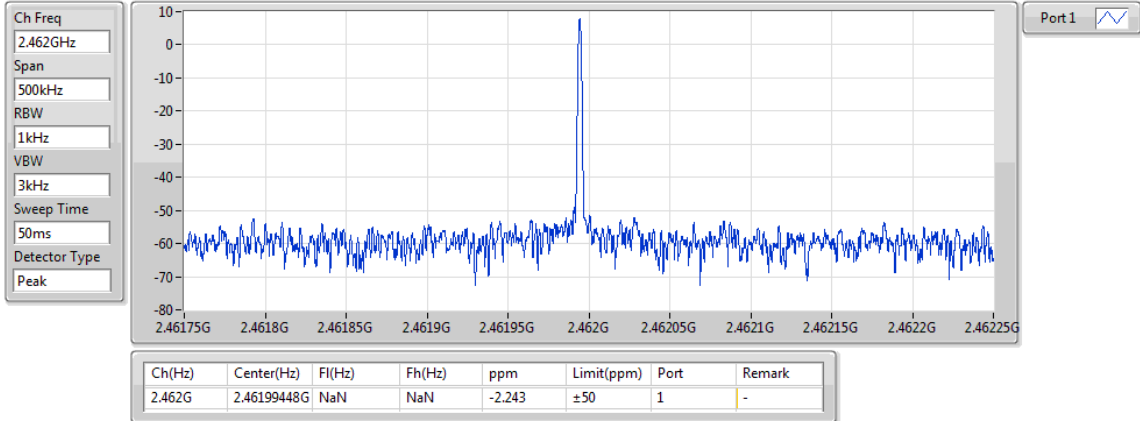
Frequency Tolerance Result

Appendix B

802.11n HT40_Nss1,(MCS0)_1TX

Freq. Stability

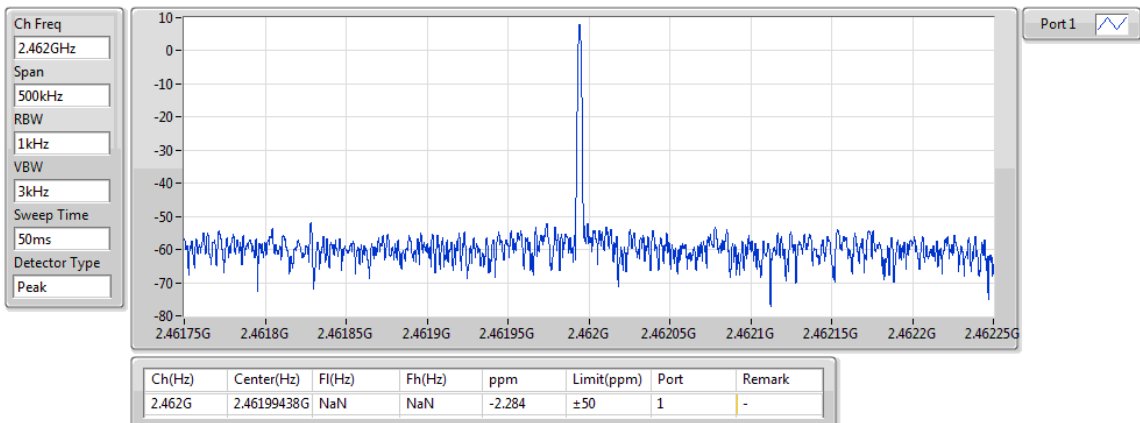
2462MHz_TnomVnom



802.11n HT40_Nss1,(MCS0)_1TX

Freq. Stability

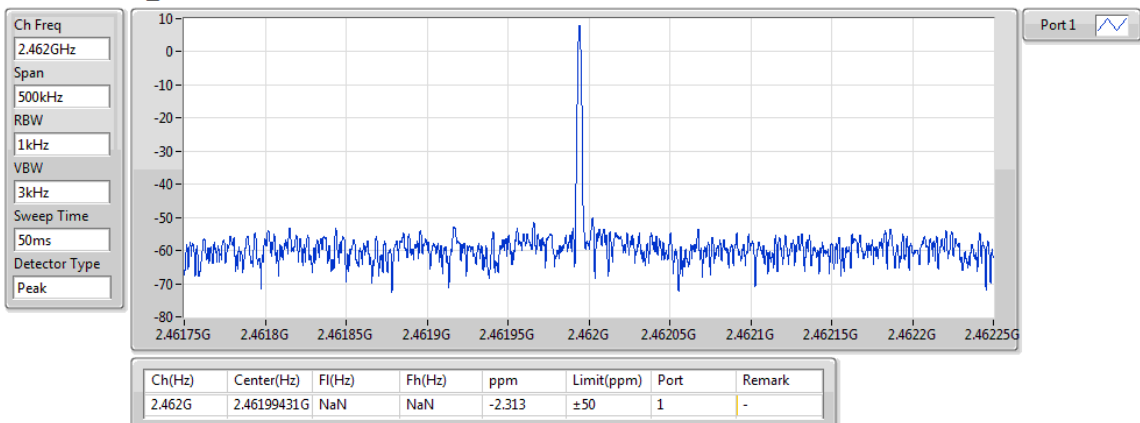
2462MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

Freq. Stability

2462MHz_TnomVmax





Occupied Bandwidth Result

Appendix C

Summary

Mode	Max-OBW (MHz)	ITU-Code	Min-OBW (MHz)
2.4-2.4835GHz	-	-	-
802.11b_Nss1_1TX	11.274	11M3G1D	11.174
802.11g_Nss1_1TX	17.151	17M2D1D	17.091
802.11n HT20_Nss1,(MCS0)_1TX	18.171	18M2D1D	18.151
802.11n HT40_Nss1,(MCS0)_1TX	36.822	36M8D1D	36.782

Max-OBW = Maximum99% occupied bandwidth; **Min-OBW** = Minimum99% occupied bandwidth;

Result

Mode	Result	Limit (MHz)	P1-OBW (MHz)
802.11b_Nss1_1TX	-	-	-
2412MHz_TnomVnom	Pass	26	11.194
2412MHz_TnomVmin	Pass	26	11.214
2412MHz_TnomVmax	Pass	26	11.174
2442MHz_TnomVnom	Pass	26	11.214
2442MHz_TnomVmin	Pass	26	11.274
2442MHz_TnomVmax	Pass	26	11.194
2472MHz_TnomVnom	Pass	26	11.214
2472MHz_TnomVmin	Pass	26	11.234
2472MHz_TnomVmax	Pass	26	11.254
802.11g_Nss1_1TX	-	-	-
2412MHz_TnomVnom	Pass	26	17.131
2412MHz_TnomVmin	Pass	26	17.111
2412MHz_TnomVmax	Pass	26	17.091
2442MHz_TnomVnom	Pass	26	17.111
2442MHz_TnomVmin	Pass	26	17.131
2442MHz_TnomVmax	Pass	26	17.091
2472MHz_TnomVnom	Pass	26	17.151
2472MHz_TnomVmin	Pass	26	17.151
2472MHz_TnomVmax	Pass	26	17.151
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-
2412MHz_TnomVnom	Pass	26	18.171
2412MHz_TnomVmin	Pass	26	18.171
2412MHz_TnomVmax	Pass	26	18.151
2442MHz_TnomVnom	Pass	26	18.171
2442MHz_TnomVmin	Pass	26	18.151
2442MHz_TnomVmax	Pass	26	18.151
2472MHz_TnomVnom	Pass	26	18.151
2472MHz_TnomVmin	Pass	26	18.151
2472MHz_TnomVmax	Pass	26	18.151



Occupied Bandwidth Result

Appendix C

Mode	Result	Limit (MHz)	P1-OBW (MHz)
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-
2422MHz_TnomVnom	Pass	38	36.782
2422MHz_TnomVmin	Pass	38	36.822
2422MHz_TnomVmax	Pass	38	36.782
2442MHz_TnomVnom	Pass	38	36.782
2442MHz_TnomVmin	Pass	38	36.782
2442MHz_TnomVmax	Pass	38	36.782
2462MHz_TnomVnom	Pass	38	36.822
2462MHz_TnomVmin	Pass	38	36.822
2462MHz_TnomVmax	Pass	38	36.782

P1-OBW = Port 1 99% occupied bandwidth;



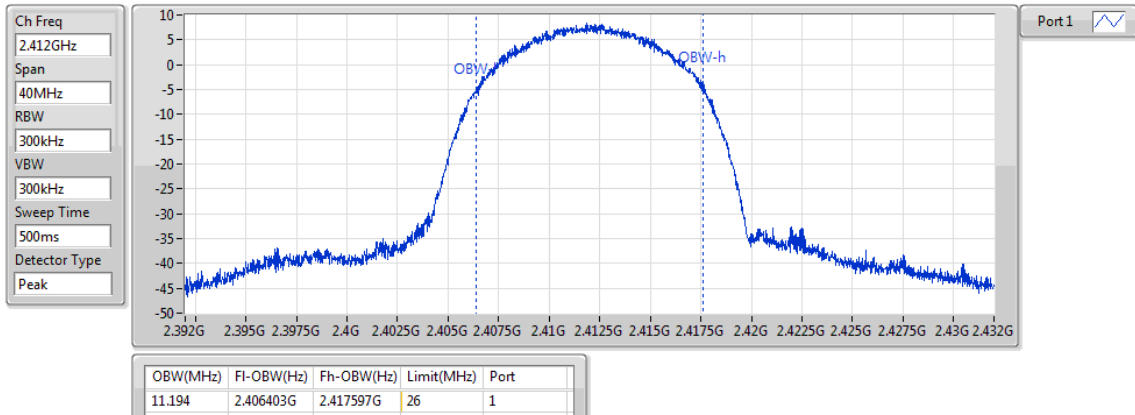
Occupied Bandwidth Result

Appendix C

802.11b_Nss1_1TX

OBW

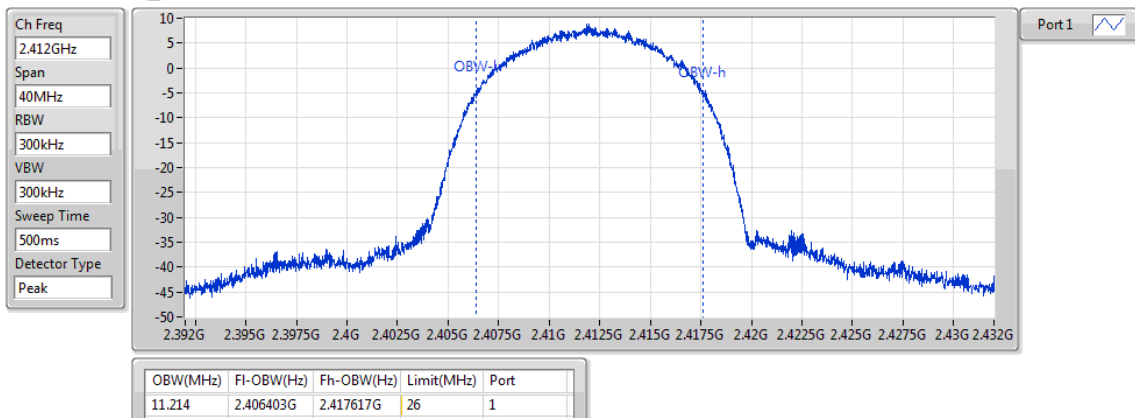
2412MHz_TnomVnom



802.11b_Nss1_1TX

OBW

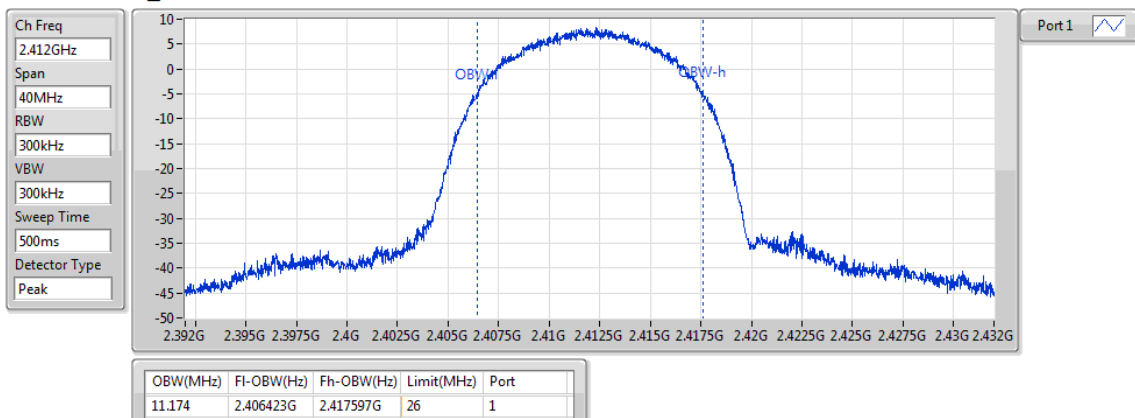
2412MHz_TnomVmin



802.11b_Nss1_1TX

OBW

2412MHz_TnomVmax





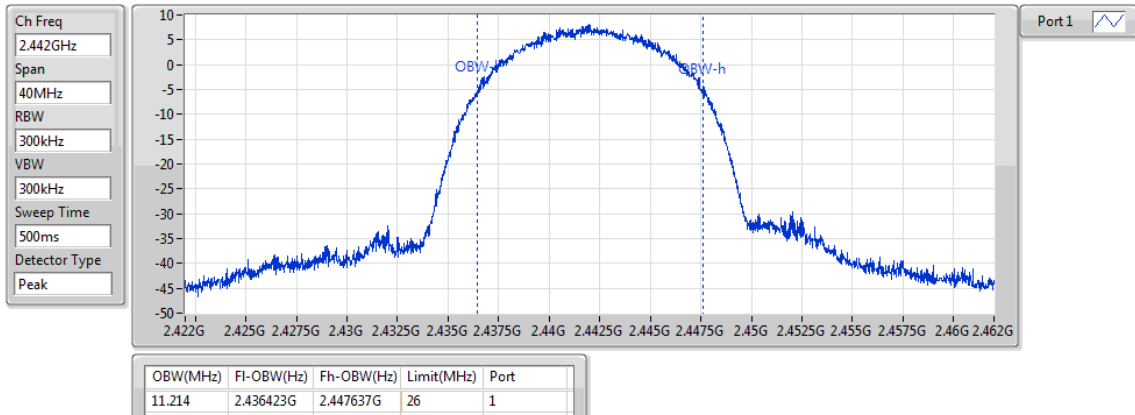
Occupied Bandwidth Result

Appendix C

802.11b_Nss1_1TX

OBW

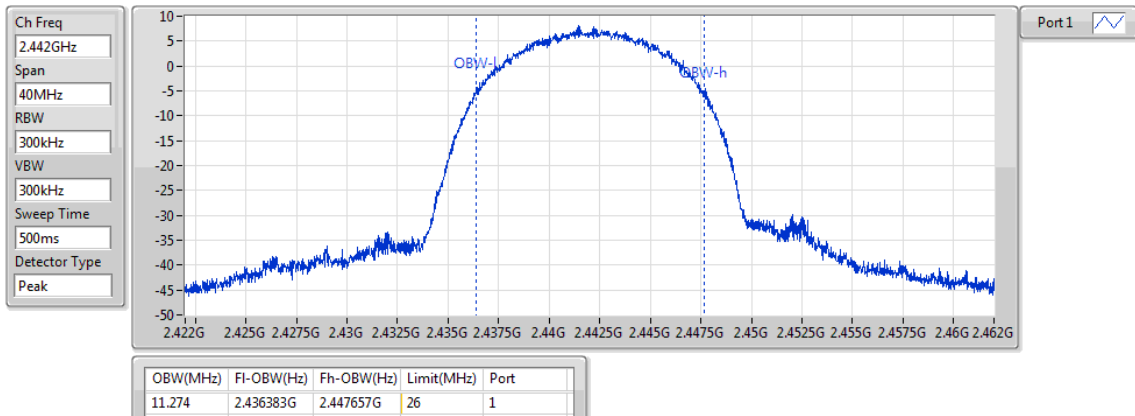
2442MHz_TnomVnom



802.11b_Nss1_1TX

OBW

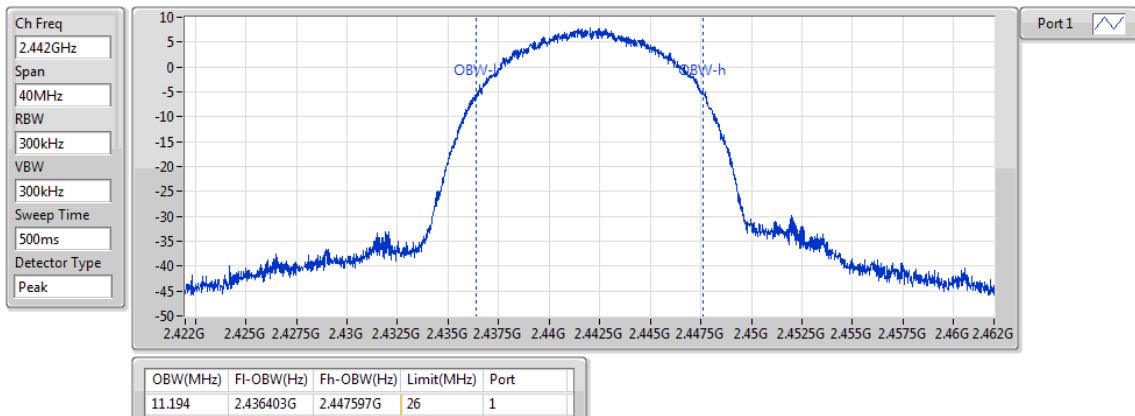
2442MHz_TnomVmin



802.11b_Nss1_1TX

OBW

2442MHz_TnomVmax





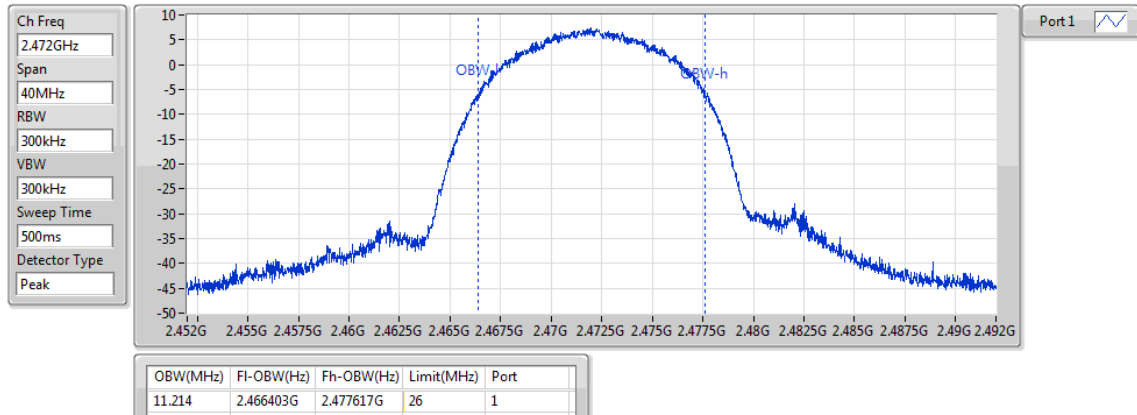
Occupied Bandwidth Result

Appendix C

802.11b_Nss1_1TX

OBW

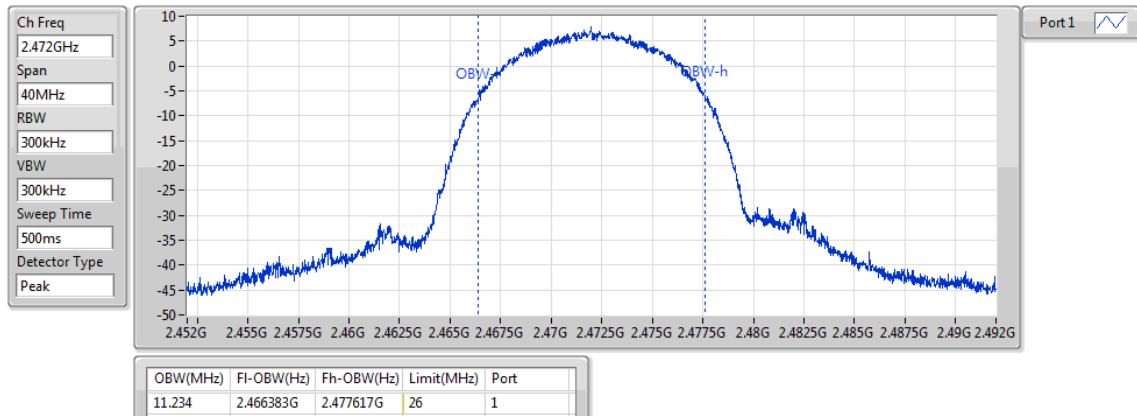
2472MHz_TnomVnom



802.11b_Nss1_1TX

OBW

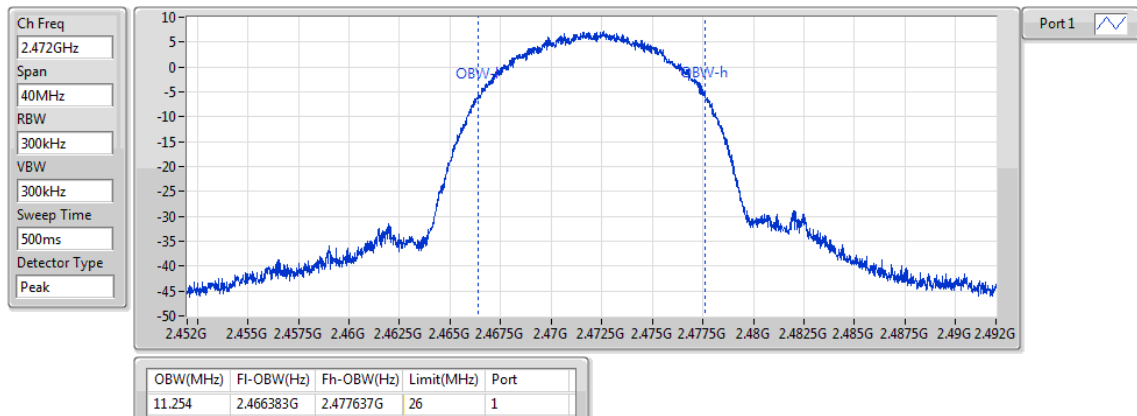
2472MHz_TnomVmin



802.11b_Nss1_1TX

OBW

2472MHz_TnomVmax





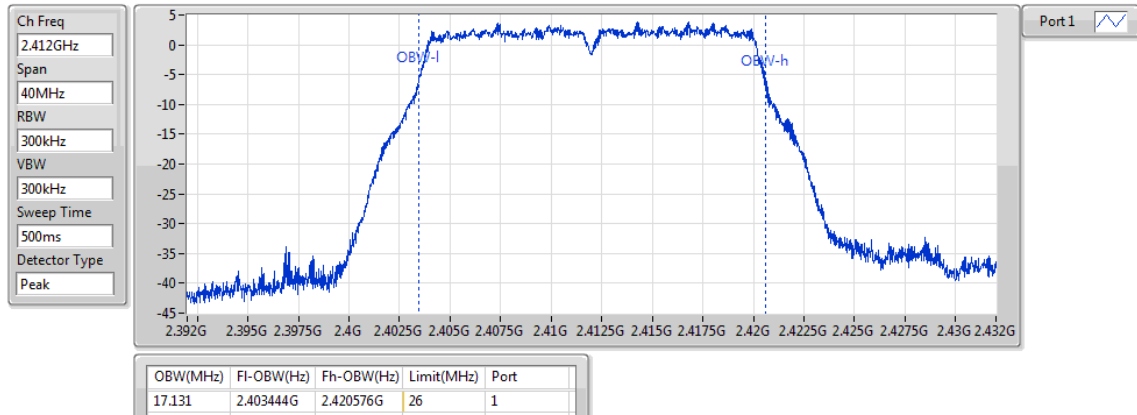
Occupied Bandwidth Result

Appendix C

802.11g_Nss1_1TX

OBW

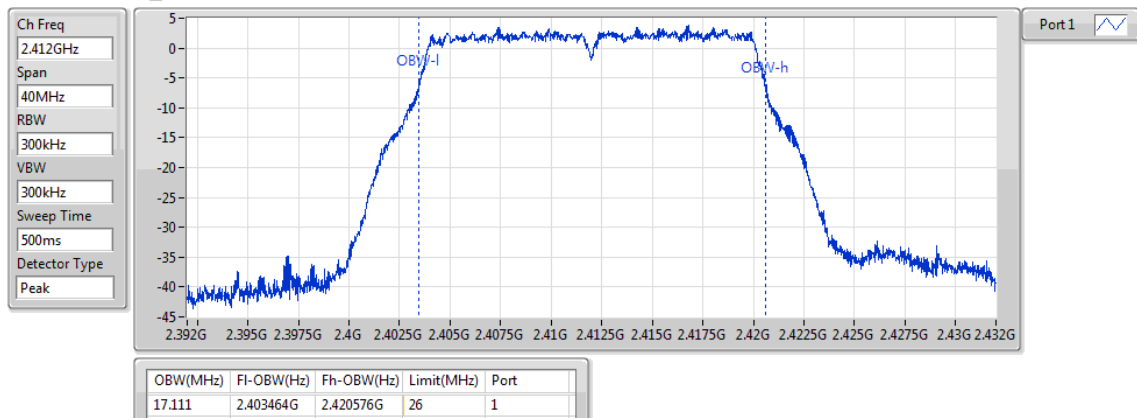
2412MHz_TnomVnom



802.11g_Nss1_1TX

OBW

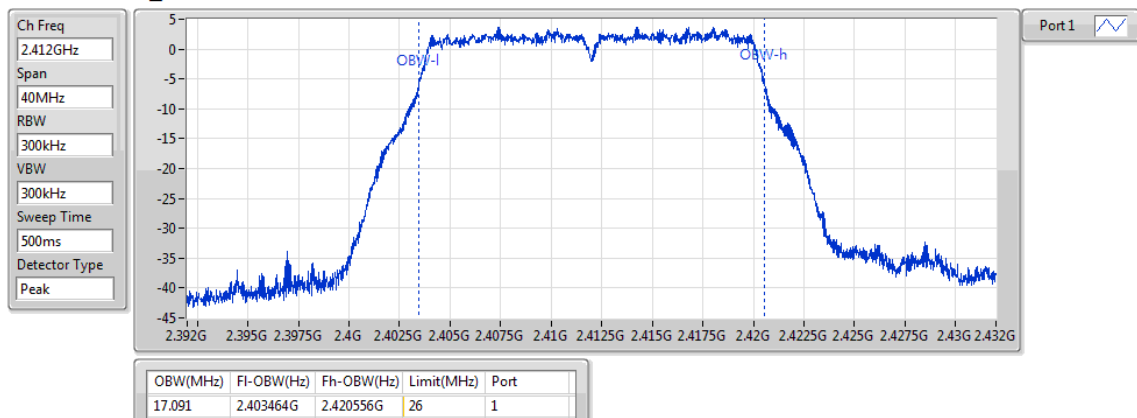
2412MHz_TnomVmin



802.11g_Nss1_1TX

OBW

2412MHz_TnomVmax





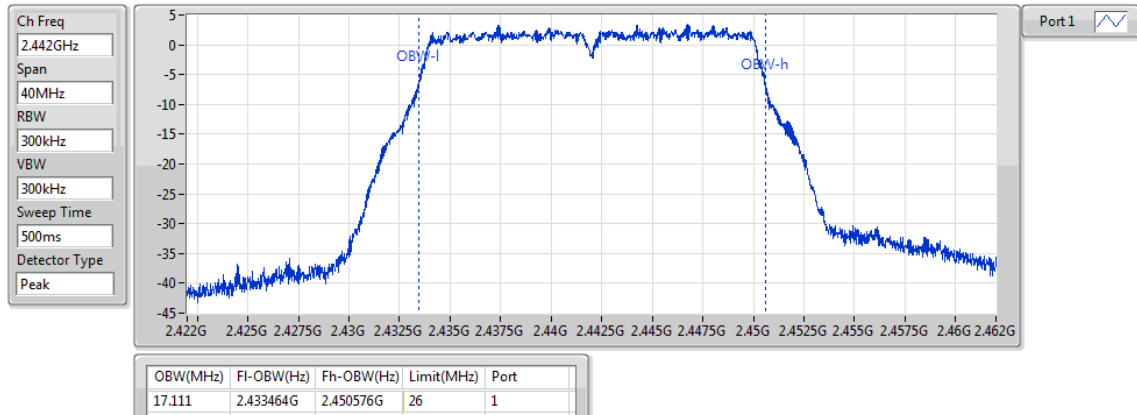
Occupied Bandwidth Result

Appendix C

802.11g_Nss1_1TX

OBW

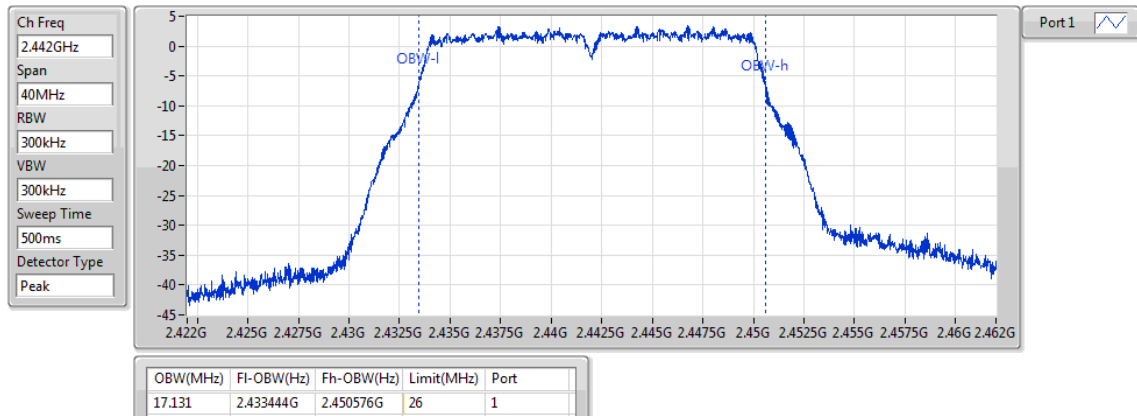
2442MHz_TnomVnom



802.11g_Nss1_1TX

OBW

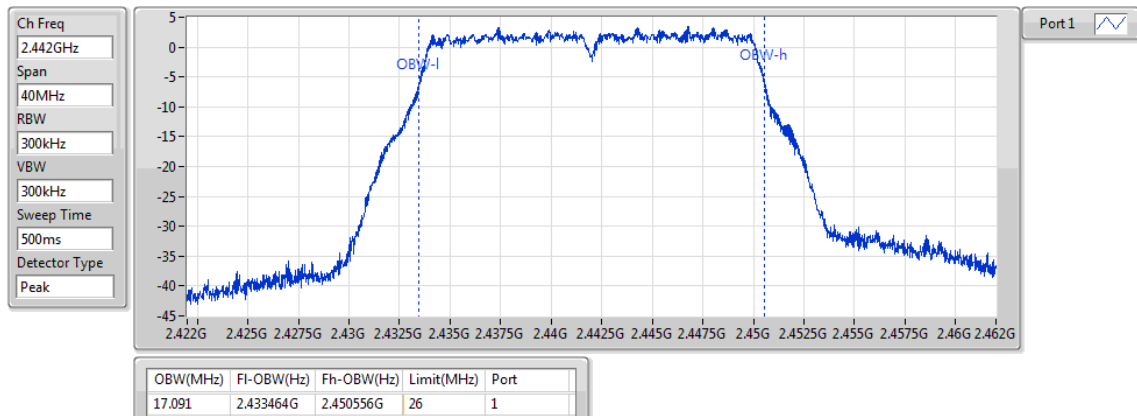
2442MHz_TnomVmin



802.11g_Nss1_1TX

OBW

2442MHz_TnomVmax





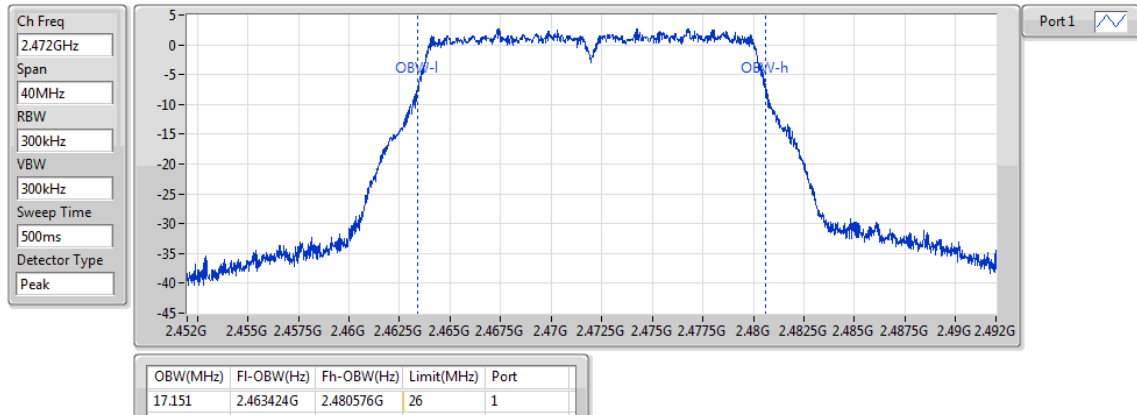
Occupied Bandwidth Result

Appendix C

802.11g_Nss1_1TX

OBW

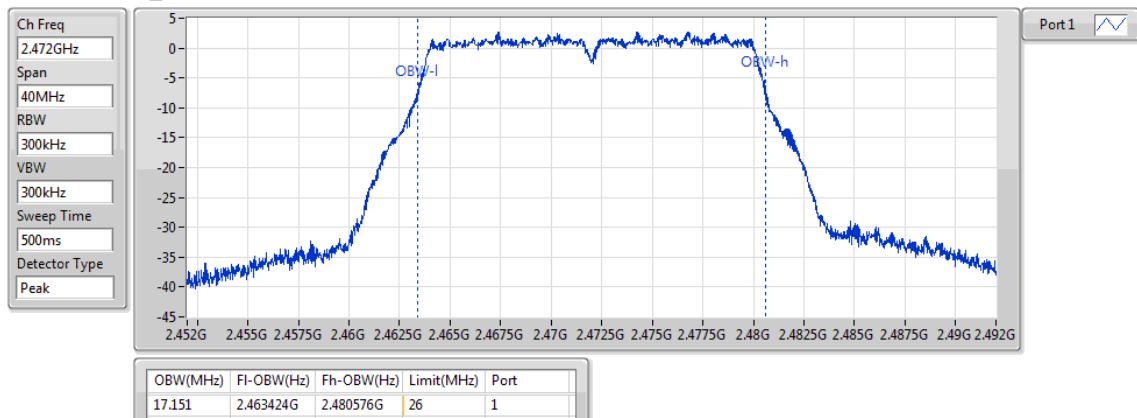
2472MHz_TnomVnom



802.11g_Nss1_1TX

OBW

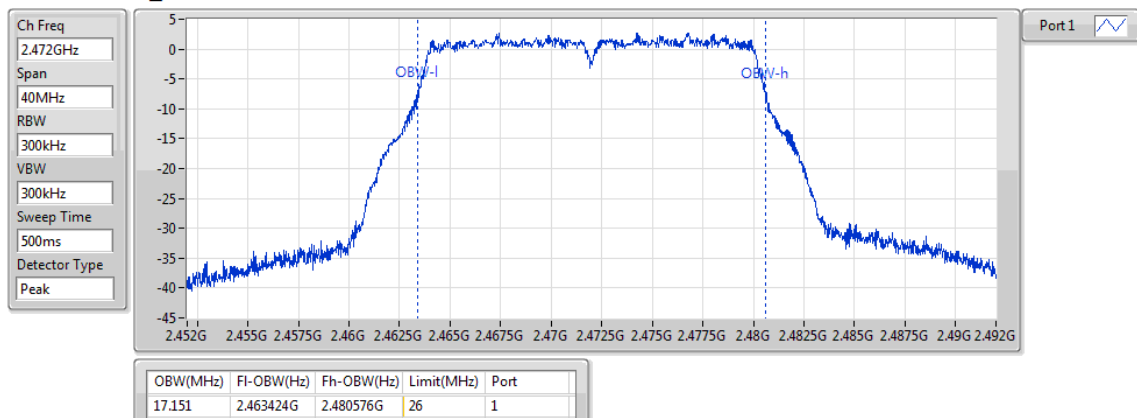
2472MHz_TnomVmin



802.11g_Nss1_1TX

OBW

2472MHz_TnomVmax





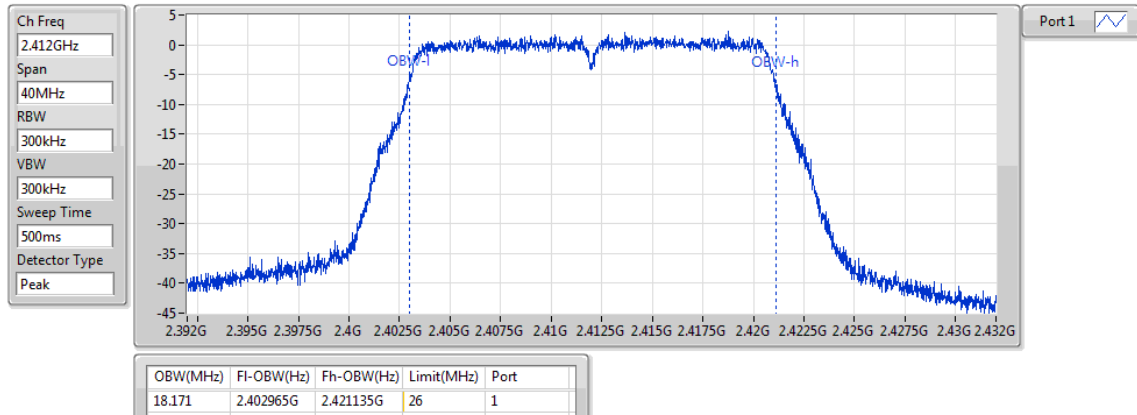
Occupied Bandwidth Result

Appendix C

802.11n HT20_Nss1,(MCS0)_1TX

OBW

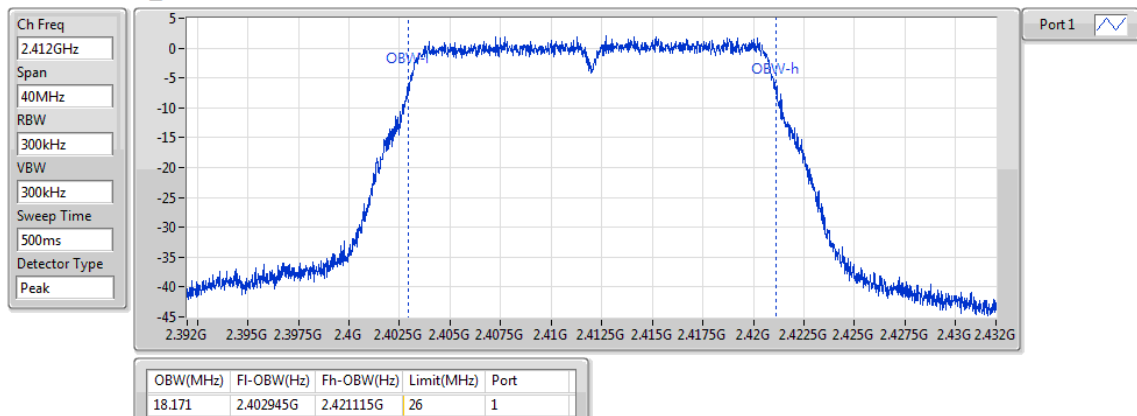
2412MHz_TnomVnom



802.11n HT20_Nss1,(MCS0)_1TX

OBW

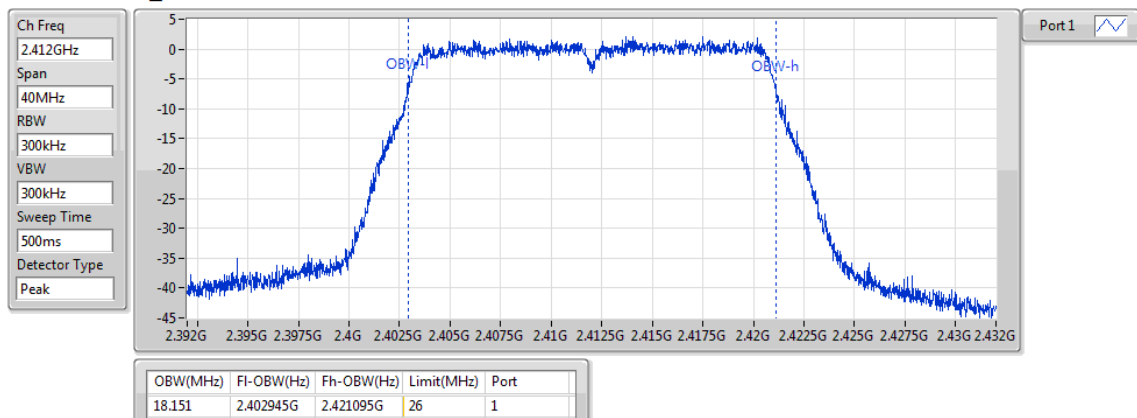
2412MHz_TnomVmin



802.11n HT20_Nss1,(MCS0)_1TX

OBW

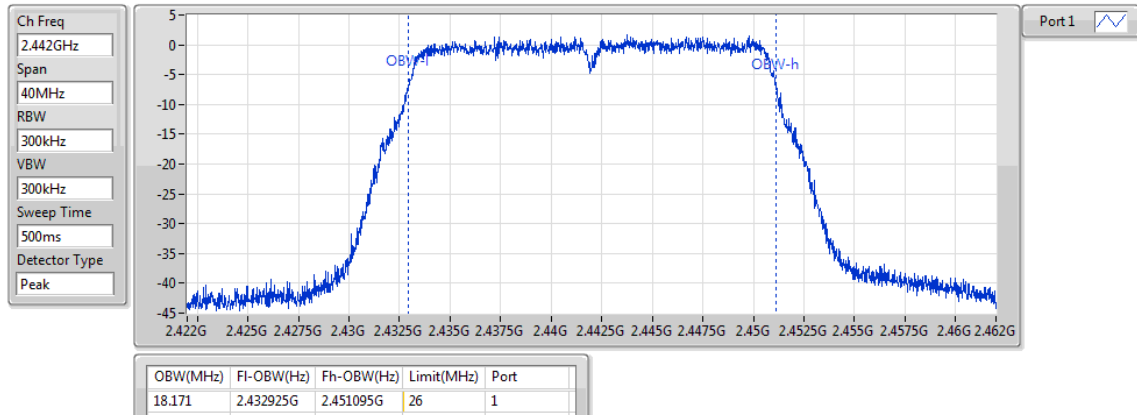
2412MHz_TnomVmax



802.11n HT20_Nss1,(MCS0)_1TX

OBW

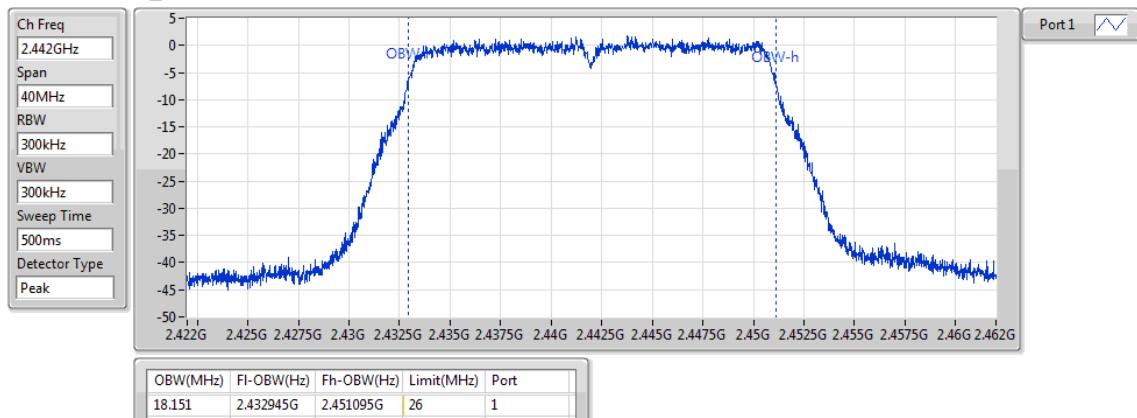
2442MHz_TnomVnom



802.11n HT20_Nss1,(MCS0)_1TX

OBW

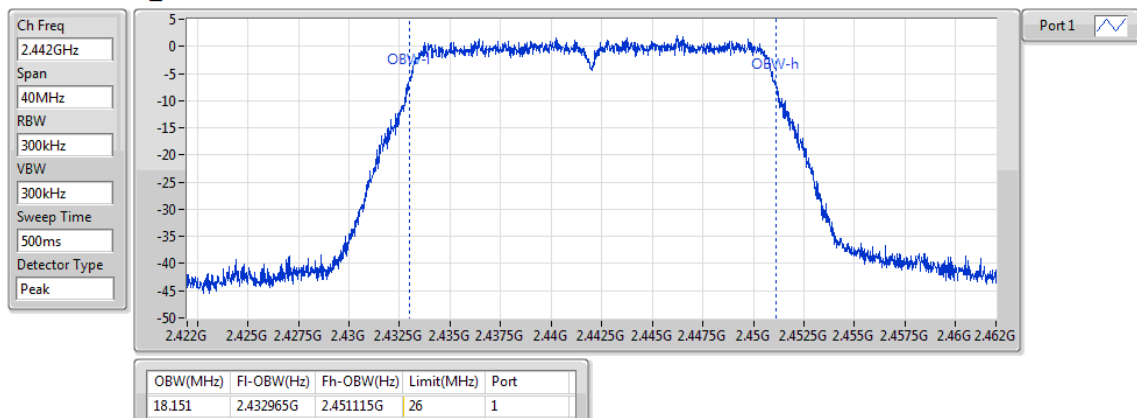
2442MHz_TnomVmin



802.11n HT20_Nss1,(MCS0)_1TX

OBW

2442MHz_TnomVmax





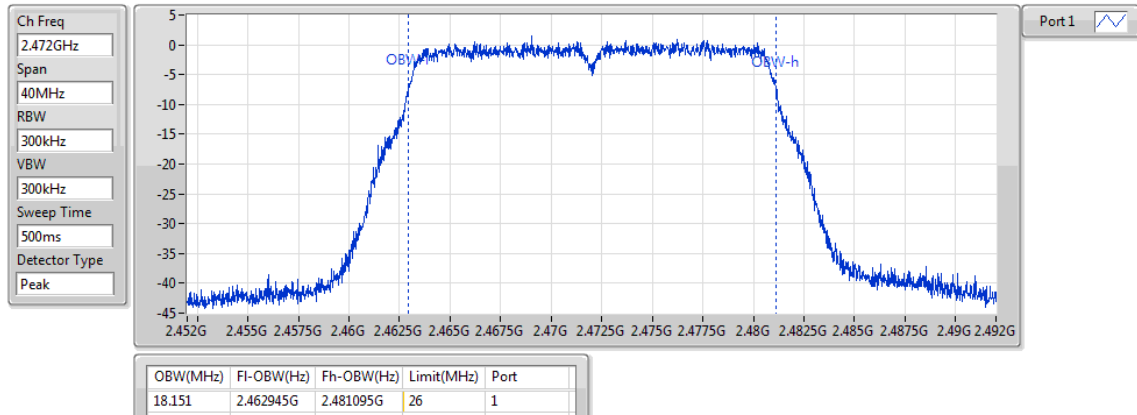
Occupied Bandwidth Result

Appendix C

802.11n HT20_Nss1,(MCS0)_1TX

OBW

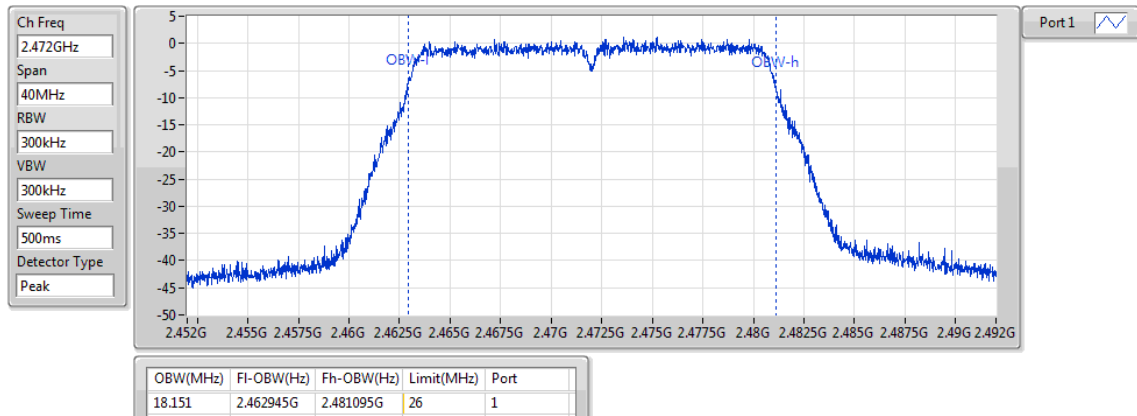
2472MHz_TnomVnom



802.11n HT20_Nss1,(MCS0)_1TX

OBW

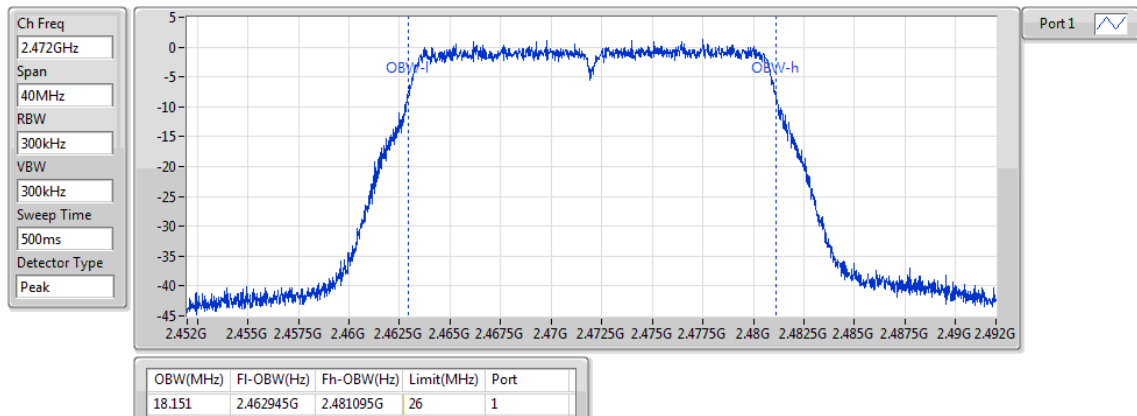
2472MHz_TnomVmin



802.11n HT20_Nss1,(MCS0)_1TX

OBW

2472MHz_TnomVmax





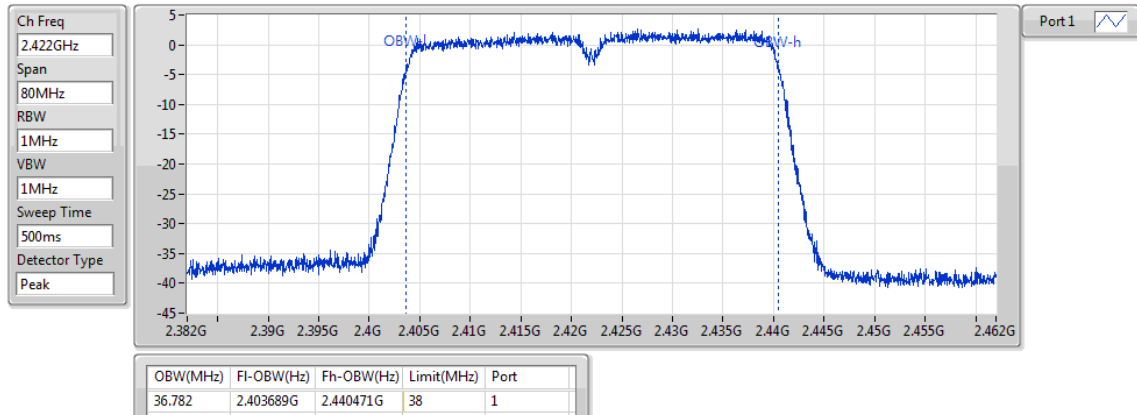
Occupied Bandwidth Result

Appendix C

802.11n HT40_Nss1,(MCS0)_1TX

OBW

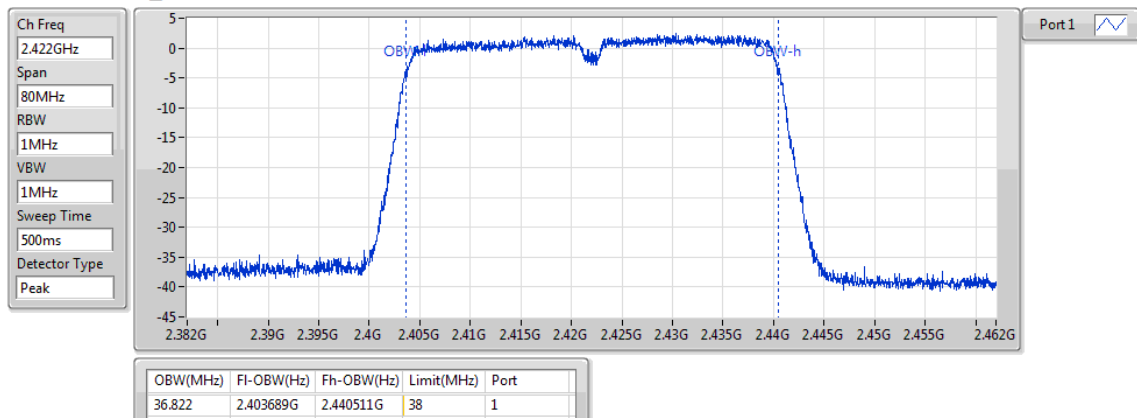
2422MHz_TnomVnom



802.11n HT40_Nss1,(MCS0)_1TX

OBW

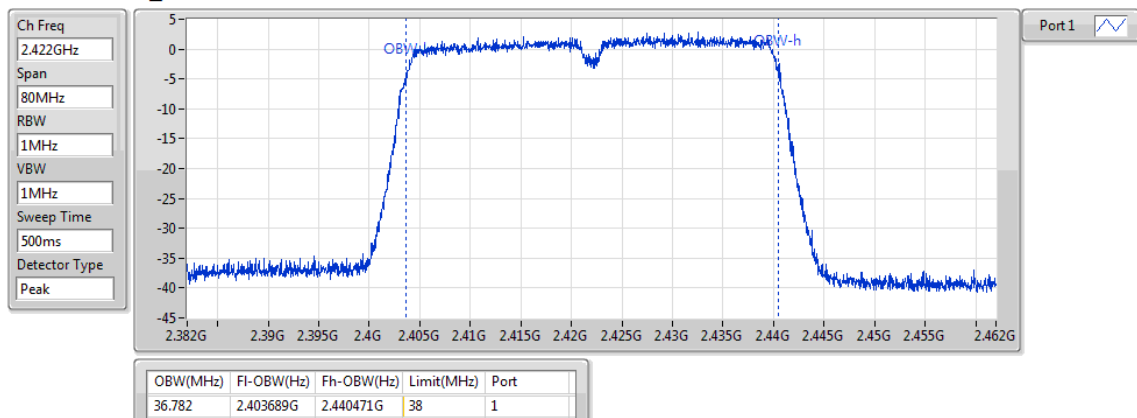
2422MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

OBW

2422MHz_TnomVmax





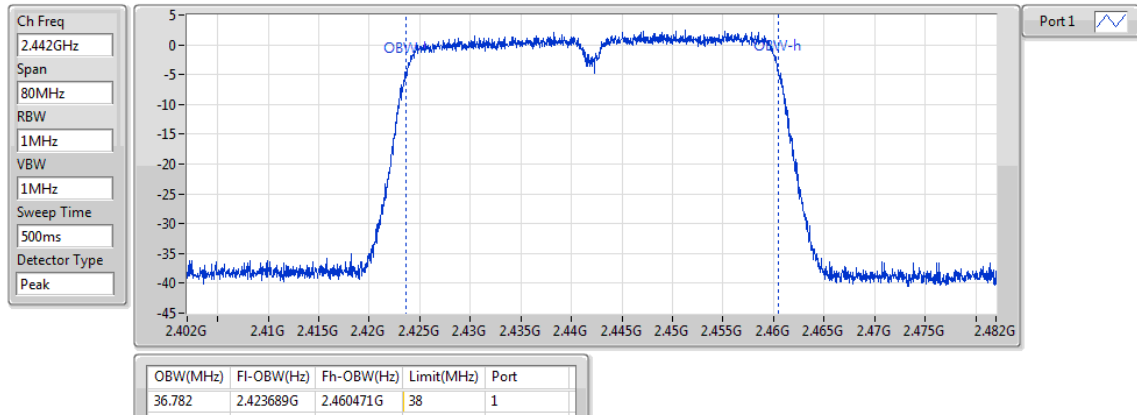
Occupied Bandwidth Result

Appendix C

802.11n HT40_Nss1,(MCS0)_1TX

OBW

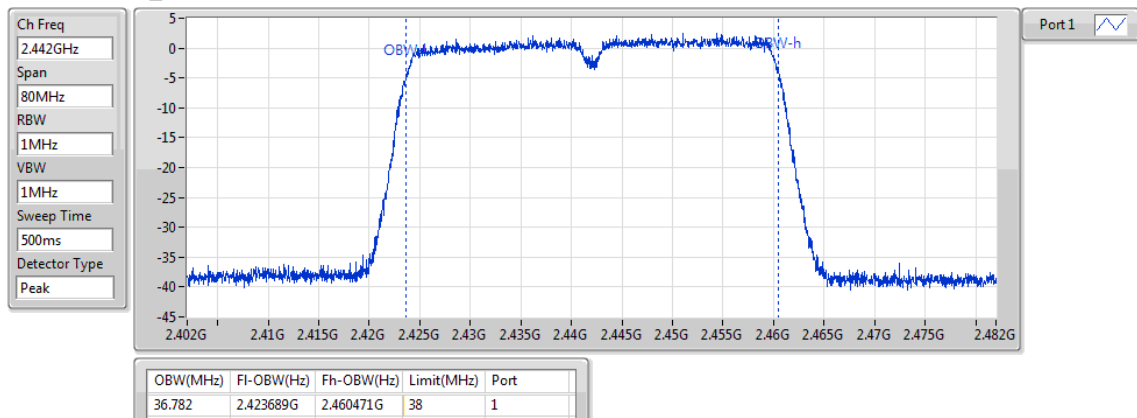
2442MHz_TnomVnom



802.11n HT40_Nss1,(MCS0)_1TX

OBW

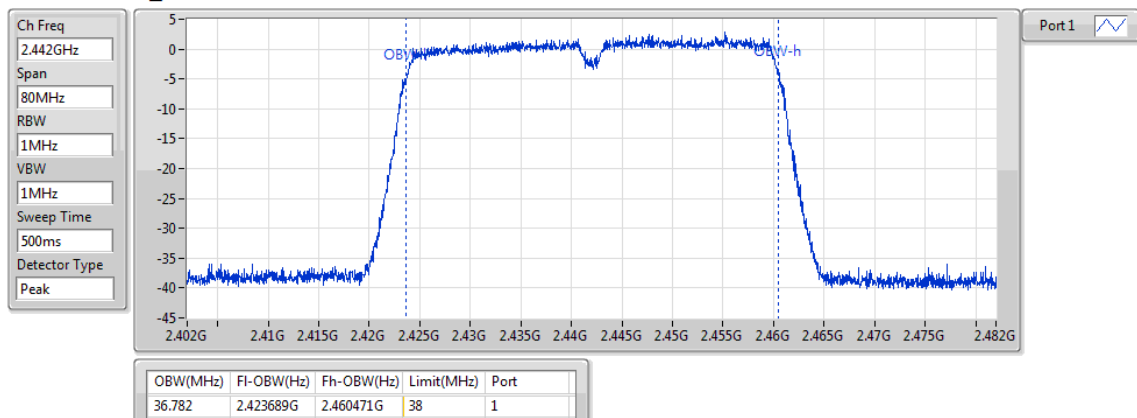
2442MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

OBW

2442MHz_TnomVmax





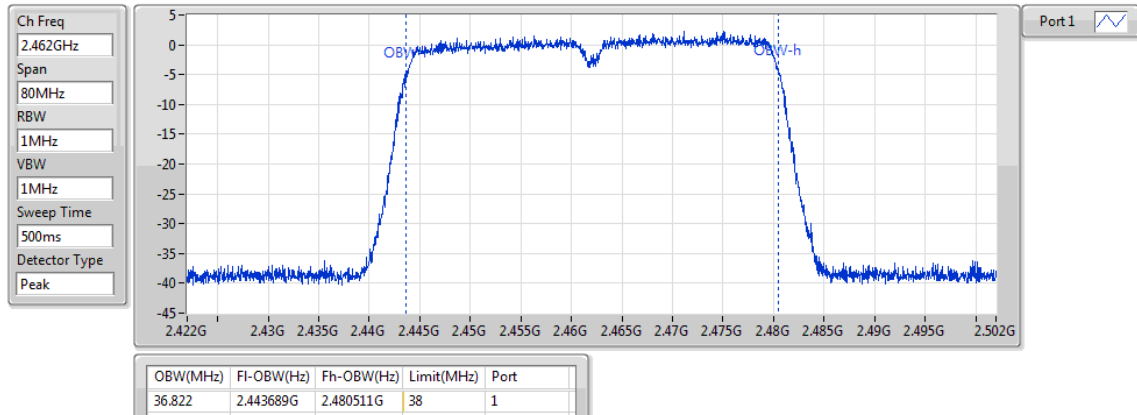
Occupied Bandwidth Result

Appendix C

802.11n HT40_Nss1,(MCS0)_1TX

OBW

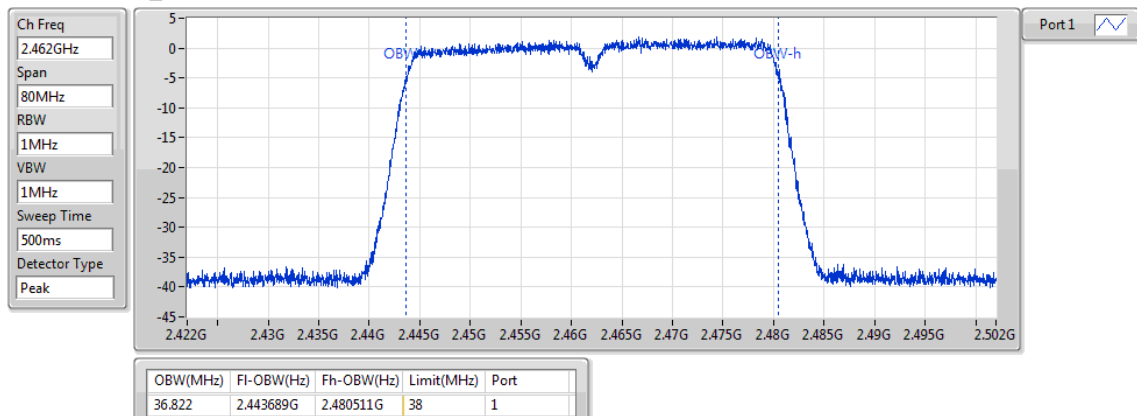
2462MHz_TnomVnom



802.11n HT40_Nss1,(MCS0)_1TX

OBW

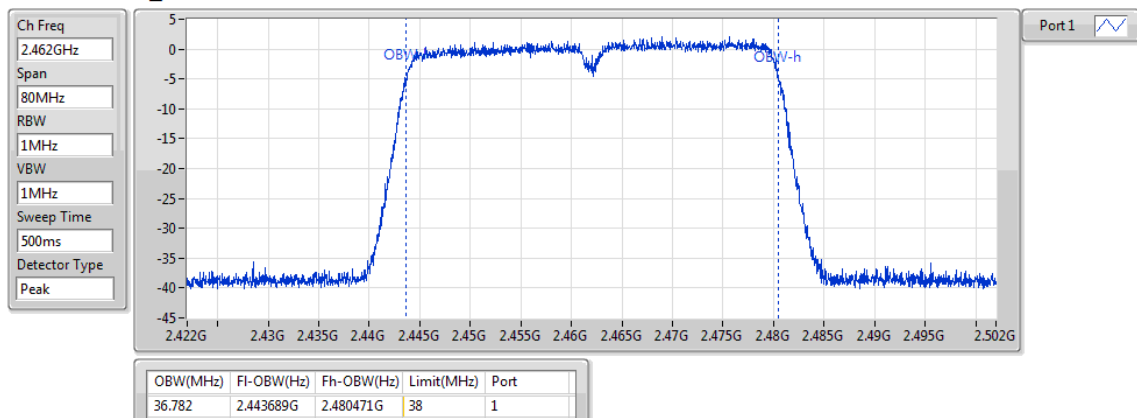
2462MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

OBW

2462MHz_TnomVmax





Spread Bandwidth Result

Appendix D

Summary

Mode	Max-SBW (MHz)	Min-SBW (MHz)	Max-SF	Min-SF
2.4-2.4835GHz	-	-	-	-
802.11b_Nss1_1TX	7.936	7.876	5.772	5.728

Max-SBW = Maximum spreading bandwidth; **Min-SBW** = Minimum spreading bandwidth;

Max-SF = Maximum spreading factor; **Min-SF** = Minimum spreading factor;



Spread Bandwidth Result

Appendix D

Result

Mode	Result	SBW Limit (MHz)	Symbol Rate (Msps)	SF Limit	P1-SBW (MHz)	P1-SF
802.11b_Nss1_1TX	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	0.5	1.375	5	7.936	5.772
2412MHz_TnomVmin	Pass	0.5	1.375	5	7.916	5.757
2412MHz_TnomVmax	Pass	0.5	1.375	5	7.916	5.757
2442MHz_TnomVnom	Pass	0.5	1.375	5	7.896	5.743
2442MHz_TnomVmin	Pass	0.5	1.375	5	7.916	5.757
2442MHz_TnomVmax	Pass	0.5	1.375	5	7.916	5.757
2472MHz_TnomVnom	Pass	0.5	1.375	5	7.876	5.728
2472MHz_TnomVmin	Pass	0.5	1.375	5	7.896	5.743
2472MHz_TnomVmax	Pass	0.5	1.375	5	7.936	5.772

P1-SBW = Port 1 spreading bandwidth;

P1-SF = Port 1 spreading factor;



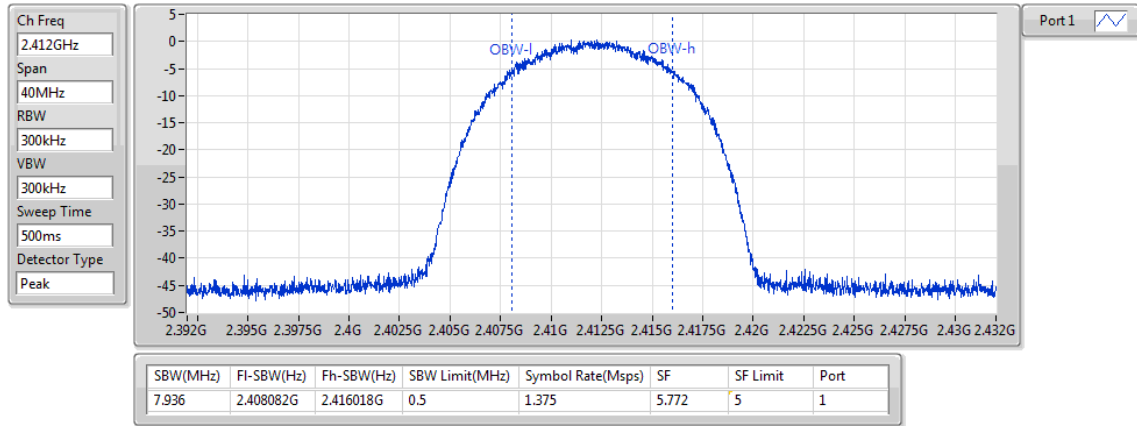
Spread Bandwidth Result

Appendix D

802.11b_Nss1_1TX

SBW

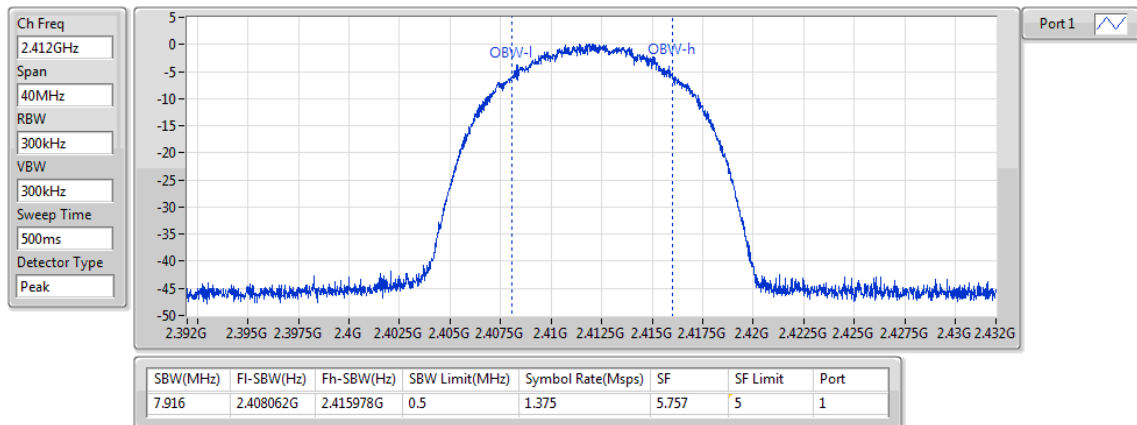
2412MHz_TnomVnom



802.11b_Nss1_1TX

SBW

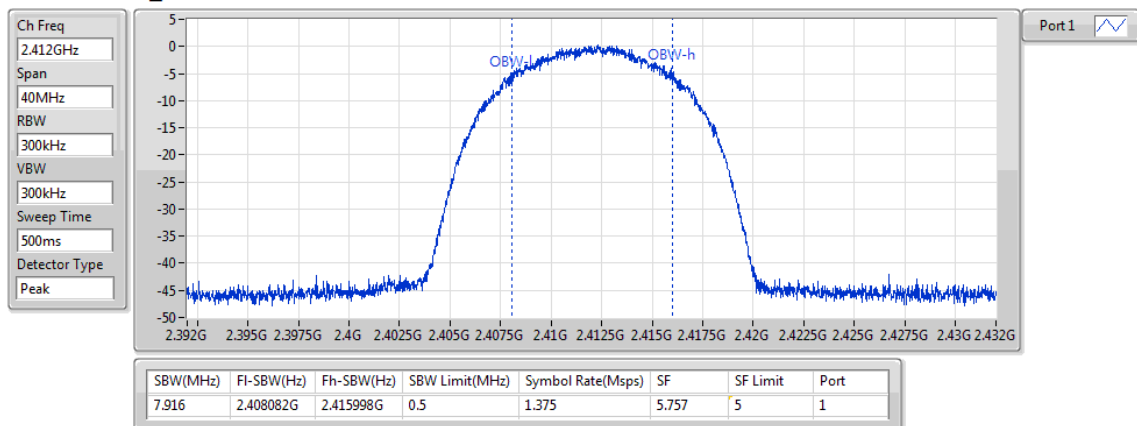
2412MHz_TnomVmin



802.11b_Nss1_1TX

SBW

2412MHz_TnomVmax





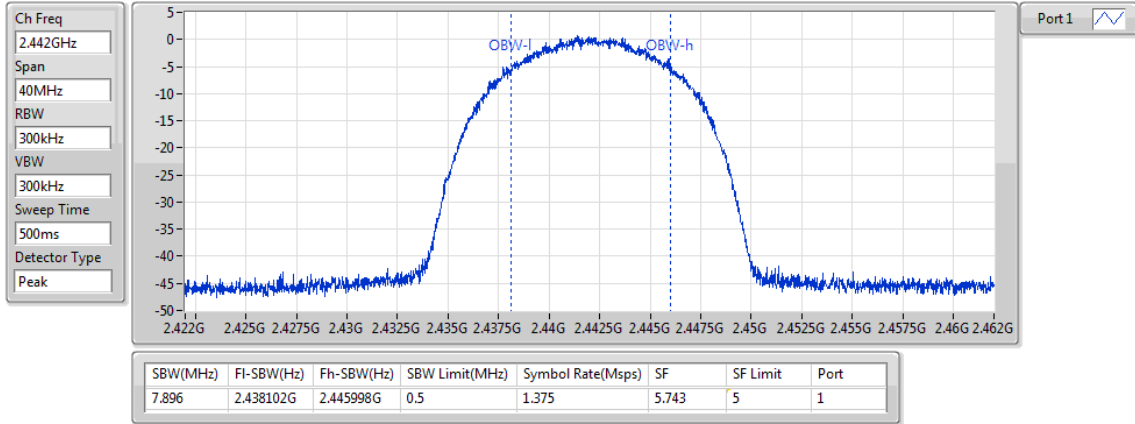
Spread Bandwidth Result

Appendix D

802.11b_Nss1_1TX

SBW

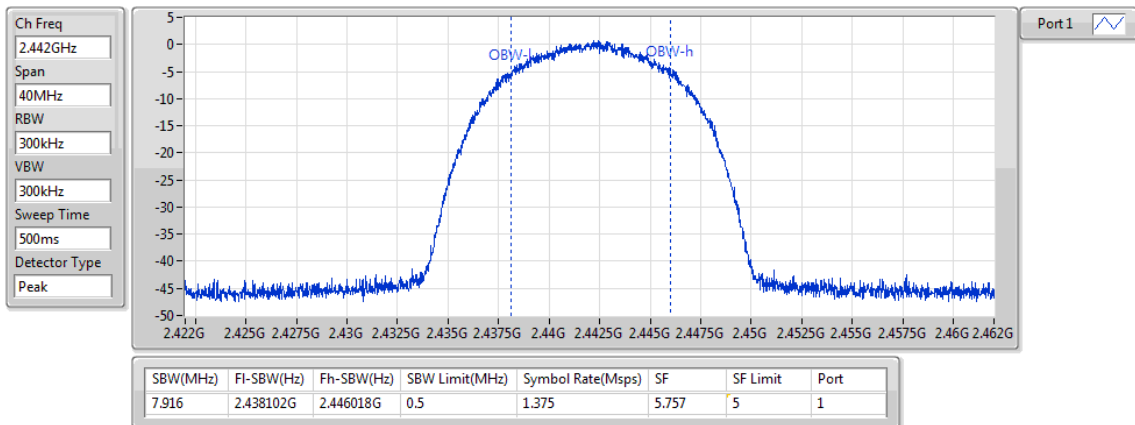
2442MHz_TnomVnom



802.11b_Nss1_1TX

SBW

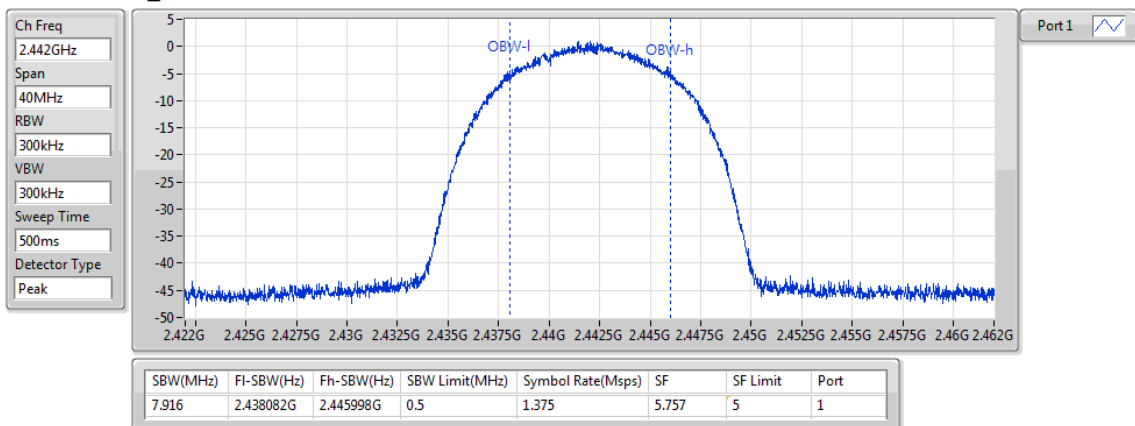
2442MHz_TnomVmin



802.11b_Nss1_1TX

SBW

2442MHz_TnomVmax





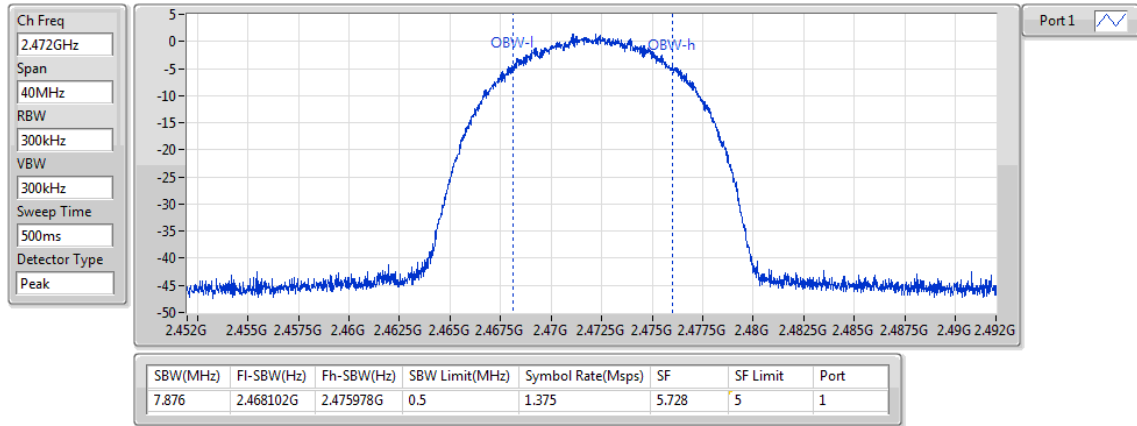
Spread Bandwidth Result

Appendix D

802.11b_Nss1_1TX

SBW

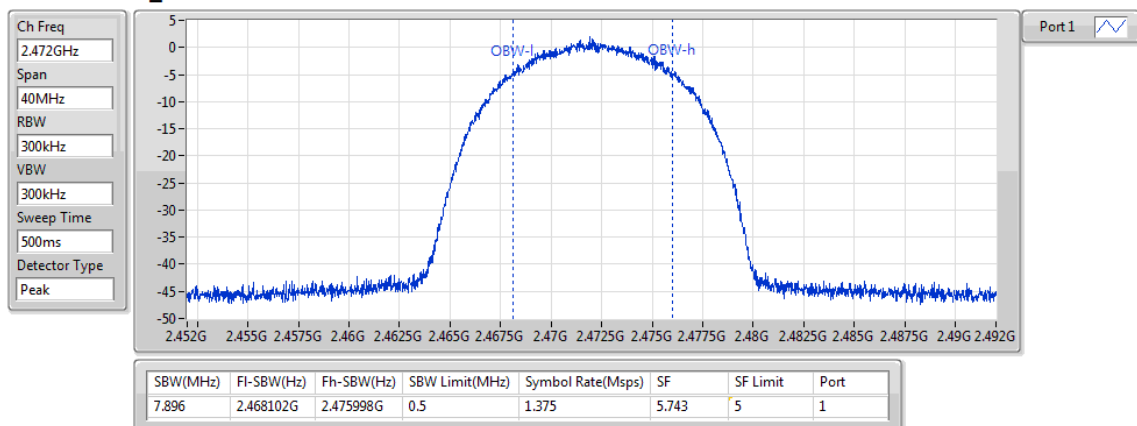
2472MHz_TnomVnom



802.11b_Nss1_1TX

SBW

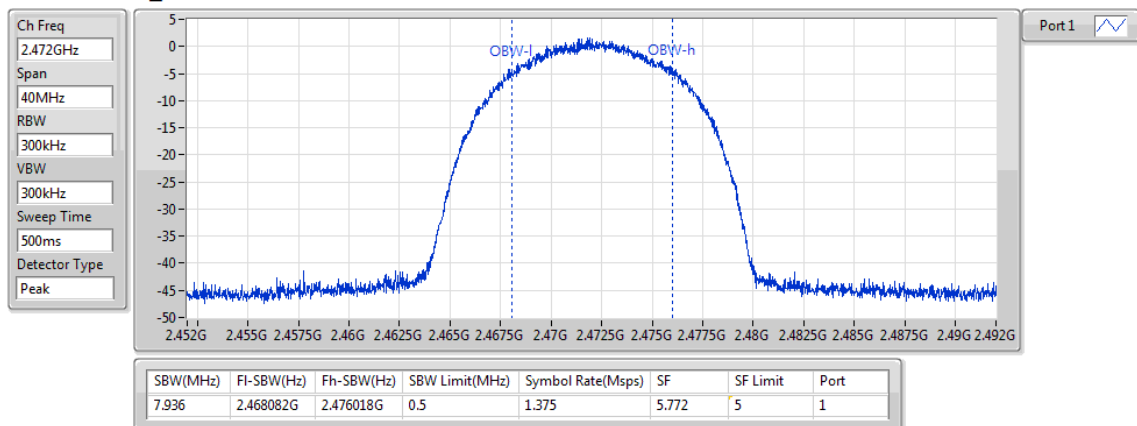
2472MHz_TnomVmin



802.11b_Nss1_1TX

SBW

2472MHz_TnomVmax





CSE-TXUnwanted Emission StrengthResult

Appendix E

Summary

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (uW/MHz)	Limit (dBm)	Limit (uW/MHz)	Margin (dB)	P1 (dBm)	P1 (uW/MHz)
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
802.11b_Nss1_1TX	Pass	2.4965G	12.5G	1M	12496.249	-43.24	0.04742	-26.02	2.5	-17.22	-43.24	0.04742
802.11g_Nss1_1TX	Pass	2.4835G	2.4965G	1M	2483.526	-30.20	0.95499	-16.02	25	-14.18	-30.20	0.95499
802.11n HT20_Nss1,(MCS0)_1TX	Pass	2.4835G	2.4965G	1M	2483.526	-31.34	0.73451	-16.02	25	-15.32	-31.34	0.73451
802.11n HT40_Nss1,(MCS0)_1TX	Pass	2.4965G	12.5G	1M	12488.746	-42.95	0.0507	-26.02	2.5	-16.93	-42.95	0.0507

**CSE-TXUnwanted Emission StrengthResult****Appendix E****Result**

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (uW/MHz)	Limit (dBm)	Limit (uW/MHz)	Margin (dB)	P1 (dBm)	P1 (uW/MHz)
802.11b_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	30M	2.387G	1M	2387	-50.67	0.00857	-26.02	2.5	-24.65	-50.67	0.00857
2412MHz_TnomVnom	Pass	2.387G	2.4G	1M	2398.882	-40.18	0.09594	-16.02	25	-24.16	-40.18	0.09594
2412MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2488.466	-51.10	0.00776	-16.02	25	-35.08	-51.10	0.00776
2412MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12484.995	-43.70	0.04266	-26.02	2.5	-17.68	-43.70	0.04266
2412MHz_TnomVmin	Pass	30M	2.387G	1M	2387	-50.67	0.00857	-26.02	2.5	-24.65	-50.67	0.00857
2412MHz_TnomVmin	Pass	2.387G	2.4G	1M	2398.882	-40.14	0.09683	-16.02	25	-24.12	-40.14	0.09683
2412MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2487.14	-51.10	0.00776	-16.02	25	-35.08	-51.10	0.00776
2412MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12497.499	-43.46	0.04508	-26.02	2.5	-17.44	-43.46	0.04508
2412MHz_TnomVmax	Pass	30M	2.387G	1M	2387	-49.64	0.01086	-26.02	2.5	-23.62	-49.64	0.01086
2412MHz_TnomVmax	Pass	2.387G	2.4G	1M	2398.7	-40.10	0.09772	-16.02	25	-24.08	-40.10	0.09772
2412MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2487.686	-51.04	0.00787	-16.02	25	-35.02	-51.04	0.00787
2412MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12486.245	-43.55	0.04416	-26.02	2.5	-17.53	-43.55	0.04416
2442MHz_TnomVnom	Pass	30M	2.387G	1M	2317.468	-52.22	0.006	-26.02	2.5	-26.20	-52.22	0.006
2442MHz_TnomVnom	Pass	2.387G	2.4G	1M	2399.974	-52.40	0.00575	-16.02	25	-36.38	-52.40	0.00575
2442MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2484.852	-51.46	0.00714	-16.02	25	-35.44	-51.46	0.00714
2442MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12494.998	-43.60	0.04365	-26.02	2.5	-17.58	-43.60	0.04365
2442MHz_TnomVmin	Pass	30M	2.387G	1M	2370.501	-52.05	0.00624	-26.02	2.5	-26.03	-52.05	0.00624
2442MHz_TnomVmin	Pass	2.387G	2.4G	1M	2395.138	-52.32	0.00586	-16.02	25	-36.30	-52.32	0.00586
2442MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2485.398	-51.42	0.00721	-16.02	25	-35.40	-51.42	0.00721
2442MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12496.249	-43.24	0.04742	-26.02	2.5	-17.22	-43.24	0.04742
2442MHz_TnomVmax	Pass	30M	2.387G	1M	2354.002	-52.16	0.00608	-26.02	2.5	-26.14	-52.16	0.00608
2442MHz_TnomVmax	Pass	2.387G	2.4G	1M	2398.232	-52.39	0.00577	-16.02	25	-36.37	-52.39	0.00577
2442MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2484.904	-51.53	0.00703	-16.02	25	-35.51	-51.53	0.00703
2442MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12481.243	-43.69	0.04276	-26.02	2.5	-17.67	-43.69	0.04276
2472MHz_TnomVnom	Pass	30M	2.387G	1M	2346.931	-52.27	0.00593	-26.02	2.5	-26.25	-52.27	0.00593
2472MHz_TnomVnom	Pass	2.387G	2.4G	1M	2396.828	-52.70	0.00537	-16.02	25	-36.68	-52.70	0.00537
2472MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2483.552	-36.88	0.20512	-16.02	25	-20.86	-36.88	0.20512
2472MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12482.494	-43.86	0.04111	-26.02	2.5	-17.84	-43.86	0.04111
2472MHz_TnomVmin	Pass	30M	2.387G	1M	2344.574	-52.26	0.00594	-26.02	2.5	-26.24	-52.26	0.00594
2472MHz_TnomVmin	Pass	2.387G	2.4G	1M	2397.322	-52.71	0.00536	-16.02	25	-36.69	-52.71	0.00536
2472MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2483.578	-37.25	0.18836	-16.02	25	-21.23	-37.25	0.18836
2472MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12493.748	-43.87	0.04102	-26.02	2.5	-17.85	-43.87	0.04102
2472MHz_TnomVmax	Pass	30M	2.387G	1M	2343.396	-52.27	0.00593	-26.02	2.5	-26.25	-52.27	0.00593
2472MHz_TnomVmax	Pass	2.387G	2.4G	1M	2397.53	-52.74	0.00532	-16.02	25	-36.72	-52.74	0.00532
2472MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2483.552	-36.91	0.2037	-16.02	25	-20.89	-36.91	0.2037
2472MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12494.998	-43.80	0.04169	-26.02	2.5	-17.78	-43.80	0.04169
802.11g_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	30M	2.387G	1M	2387	-46.74	0.02118	-26.02	2.5	-20.72	-46.74	0.02118
2412MHz_TnomVnom	Pass	2.387G	2.4G	1M	2399.974	-36.54	0.22182	-16.02	25	-20.52	-36.54	0.22182



CSE-TXUnwanted Emission StrengthResult

Appendix E

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (uW/MHz)	Limit (dBm)	Limit (uW/MHz)	Margin (dB)	P1 (dBm)	P1 (uW/MHz)
2412MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2484.982	-50.95	0.00804	-16.02	25	-34.93	-50.95	0.00804
2412MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12500	-43.80	0.04169	-26.02	2.5	-17.78	-43.80	0.04169
2412MHz_TnomVmin	Pass	30M	2.387G	1M	2387	-46.61	0.02183	-26.02	2.5	-20.59	-46.61	0.02183
2412MHz_TnomVmin	Pass	2.387G	2.4G	1M	2399.974	-36.50	0.22387	-16.02	25	-20.48	-36.50	0.22387
2412MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2487.244	-50.94	0.00805	-16.02	25	-34.92	-50.94	0.00805
2412MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12497.499	-43.61	0.04355	-26.02	2.5	-17.59	-43.61	0.04355
2412MHz_TnomVmax	Pass	30M	2.387G	1M	2385.822	-47.27	0.01875	-26.02	2.5	-21.25	-47.27	0.01875
2412MHz_TnomVmax	Pass	2.387G	2.4G	1M	2399.974	-36.08	0.2466	-16.02	25	-20.06	-36.08	0.2466
2412MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2484.67	-51.02	0.00791	-16.02	25	-35.00	-51.02	0.00791
2412MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12496.249	-43.47	0.04498	-26.02	2.5	-17.45	-43.47	0.04498
2442MHz_TnomVnom	Pass	30M	2.387G	1M	2383.465	-51.80	0.00661	-26.02	2.5	-25.78	-51.80	0.00661
2442MHz_TnomVnom	Pass	2.387G	2.4G	1M	2399.428	-50.39	0.00914	-16.02	25	-34.37	-50.39	0.00914
2442MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2484.514	-49.03	0.0125	-16.02	25	-33.01	-49.03	0.0125
2442MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12471.24	-43.82	0.0415	-26.02	2.5	-17.80	-43.82	0.0415
2442MHz_TnomVmin	Pass	30M	2.387G	1M	2387	-51.59	0.00693	-26.02	2.5	-25.57	-51.59	0.00693
2442MHz_TnomVmin	Pass	2.387G	2.4G	1M	2399.87	-50.30	0.00933	-16.02	25	-34.28	-50.30	0.00933
2442MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2485.008	-49.13	0.01222	-16.02	25	-33.11	-49.13	0.01222
2442MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12494.998	-43.86	0.04111	-26.02	2.5	-17.84	-43.86	0.04111
2442MHz_TnomVmax	Pass	30M	2.387G	1M	2382.286	-51.87	0.0065	-26.02	2.5	-25.85	-51.87	0.0065
2442MHz_TnomVmax	Pass	2.387G	2.4G	1M	2399.87	-50.42	0.00908	-16.02	25	-34.40	-50.42	0.00908
2442MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2484.176	-49.16	0.01213	-16.02	25	-33.14	-49.16	0.01213
2442MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12500	-43.62	0.04345	-26.02	2.5	-17.60	-43.62	0.04345
2472MHz_TnomVnom	Pass	30M	2.387G	1M	2366.965	-52.24	0.00597	-26.02	2.5	-26.22	-52.24	0.00597
2472MHz_TnomVnom	Pass	2.387G	2.4G	1M	2398.128	-52.68	0.0054	-16.02	25	-36.66	-52.68	0.0054
2472MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2483.526	-30.34	0.9247	-16.02	25	-14.32	-30.34	0.9247
2472MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12491.247	-43.61	0.04355	-26.02	2.5	-17.59	-43.61	0.04355
2472MHz_TnomVmin	Pass	30M	2.387G	1M	2317.468	-52.08	0.00619	-26.02	2.5	-26.06	-52.08	0.00619
2472MHz_TnomVmin	Pass	2.387G	2.4G	1M	2399.766	-52.64	0.00545	-16.02	25	-36.62	-52.64	0.00545
2472MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2483.526	-30.20	0.95499	-16.02	25	-14.18	-30.20	0.95499
2472MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12497.499	-43.73	0.04236	-26.02	2.5	-17.71	-43.73	0.04236
2472MHz_TnomVmax	Pass	30M	2.387G	1M	2315.111	-52.19	0.00604	-26.02	2.5	-26.17	-52.19	0.00604
2472MHz_TnomVmax	Pass	2.387G	2.4G	1M	2399.272	-52.73	0.00533	-16.02	25	-36.71	-52.73	0.00533
2472MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2483.526	-30.41	0.90991	-16.02	25	-14.39	-30.41	0.90991
2472MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12498.75	-43.51	0.04457	-26.02	2.5	-17.49	-43.51	0.04457
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	30M	2.387G	1M	2387	-48.31	0.01476	-26.02	2.5	-22.29	-48.31	0.01476
2412MHz_TnomVnom	Pass	2.387G	2.4G	1M	2399.974	-35.64	0.2729	-16.02	25	-19.62	-35.64	0.2729
2412MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2485.762	-51.30	0.00741	-16.02	25	-35.28	-51.30	0.00741
2412MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12489.996	-43.48	0.04487	-26.02	2.5	-17.46	-43.48	0.04487
2412MHz_TnomVmin	Pass	30M	2.387G	1M	2387	-48.98	0.01265	-26.02	2.5	-22.96	-48.98	0.01265



CSE-TXUnwanted Emission StrengthResult

Appendix E

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (uW/MHz)	Limit (dBm)	Limit (uW/MHz)	Margin (dB)	P1 (dBm)	P1 (uW/MHz)
2412MHz_TnomVmin	Pass	2.387G	2.4G	1M	2399.974	-35.20	0.302	-16.02	25	-19.18	-35.20	0.302
2412MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2487.634	-51.31	0.0074	-16.02	25	-35.29	-51.31	0.0074
2412MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12489.996	-43.86	0.04111	-26.02	2.5	-17.84	-43.86	0.04111
2412MHz_TnomVmax	Pass	30M	2.387G	1M	2387	-48.53	0.01403	-26.02	2.5	-22.51	-48.53	0.01403
2412MHz_TnomVmax	Pass	2.387G	2.4G	1M	2399.974	-35.43	0.28642	-16.02	25	-19.41	-35.43	0.28642
2412MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2484.28	-51.38	0.00728	-16.02	25	-35.36	-51.38	0.00728
2412MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12496.249	-43.64	0.04325	-26.02	2.5	-17.62	-43.64	0.04325
2442MHz_TnomVnom	Pass	30M	2.387G	1M	2341.039	-51.84	0.00655	-26.02	2.5	-25.82	-51.84	0.00655
2442MHz_TnomVnom	Pass	2.387G	2.4G	1M	2399.636	-51.68	0.00679	-16.02	25	-35.66	-51.68	0.00679
2442MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2485.138	-50.34	0.00925	-16.02	25	-34.32	-50.34	0.00925
2442MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12494.998	-43.69	0.04276	-26.02	2.5	-17.67	-43.69	0.04276
2442MHz_TnomVmin	Pass	30M	2.387G	1M	2382.286	-52.16	0.00608	-26.02	2.5	-26.14	-52.16	0.00608
2442MHz_TnomVmin	Pass	2.387G	2.4G	1M	2399.298	-51.53	0.00703	-16.02	25	-35.51	-51.53	0.00703
2442MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2486.152	-50.29	0.00935	-16.02	25	-34.27	-50.29	0.00935
2442MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12484.995	-43.89	0.04083	-26.02	2.5	-17.87	-43.89	0.04083
2442MHz_TnomVmax	Pass	30M	2.387G	1M	2383.465	-51.99	0.00632	-26.02	2.5	-25.97	-51.99	0.00632
2442MHz_TnomVmax	Pass	2.387G	2.4G	1M	2399.116	-51.65	0.00684	-16.02	25	-35.63	-51.65	0.00684
2442MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2483.656	-50.27	0.0094	-16.02	25	-34.25	-50.27	0.0094
2442MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12493.748	-43.87	0.04102	-26.02	2.5	-17.85	-43.87	0.04102
2472MHz_TnomVnom	Pass	30M	2.387G	1M	2350.466	-52.33	0.00585	-26.02	2.5	-26.31	-52.33	0.00585
2472MHz_TnomVnom	Pass	2.387G	2.4G	1M	2399.428	-52.84	0.0052	-16.02	25	-36.82	-52.84	0.0052
2472MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2483.526	-31.34	0.73451	-16.02	25	-15.32	-31.34	0.73451
2472MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12492.497	-43.71	0.04256	-26.02	2.5	-17.69	-43.71	0.04256
2472MHz_TnomVmin	Pass	30M	2.387G	1M	2330.432	-52.16	0.00608	-26.02	2.5	-26.14	-52.16	0.00608
2472MHz_TnomVmin	Pass	2.387G	2.4G	1M	2399.376	-52.81	0.00524	-16.02	25	-36.79	-52.81	0.00524
2472MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2483.526	-31.50	0.70795	-16.02	25	-15.48	-31.50	0.70795
2472MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12498.75	-43.35	0.04624	-26.02	2.5	-17.33	-43.35	0.04624
2472MHz_TnomVmax	Pass	30M	2.387G	1M	2312.755	-51.91	0.00644	-26.02	2.5	-25.89	-51.91	0.00644
2472MHz_TnomVmax	Pass	2.387G	2.4G	1M	2396.802	-52.77	0.00528	-16.02	25	-36.75	-52.77	0.00528
2472MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2483.526	-31.65	0.68391	-16.02	25	-15.63	-31.65	0.68391
2472MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12492.497	-43.64	0.04325	-26.02	2.5	-17.62	-43.64	0.04325
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2422MHz_TnomVnom	Pass	30M	2.387G	1M	2387	-45.88	0.02582	-26.02	2.5	-19.86	-45.88	0.02582
2422MHz_TnomVnom	Pass	2.387G	2.4G	1M	2399.974	-44.89	0.03243	-16.02	25	-28.87	-44.89	0.03243
2422MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2484.046	-51.33	0.00736	-16.02	25	-35.31	-51.33	0.00736
2422MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12491.247	-43.39	0.04581	-26.02	2.5	-17.37	-43.39	0.04581
2422MHz_TnomVmin	Pass	30M	2.387G	1M	2384.643	-46.42	0.0228	-26.02	2.5	-20.40	-46.42	0.0228
2422MHz_TnomVmin	Pass	2.387G	2.4G	1M	2399.974	-44.86	0.03266	-16.02	25	-28.84	-44.86	0.03266
2422MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2486.464	-51.39	0.00726	-16.02	25	-35.37	-51.39	0.00726
2422MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12488.746	-42.95	0.0507	-26.02	2.5	-16.93	-42.95	0.0507

**CSE-TXUnwanted Emission StrengthResult****Appendix E**

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (uW/MHz)	Limit (dBm)	Limit (uW/MHz)	Margin (dB)	P1 (dBm)	P1 (uW/MHz)
2422MHz_TnomVmax	Pass	30M	2.387G	1M	2387	-46.31	0.02339	-26.02	2.5	-20.29	-46.31	0.02339
2422MHz_TnomVmax	Pass	2.387G	2.4G	1M	2399.974	-43.94	0.04036	-16.02	25	-27.92	-43.94	0.04036
2422MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2484.098	-51.42	0.00721	-16.02	25	-35.40	-51.42	0.00721
2422MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12494.998	-43.72	0.04246	-26.02	2.5	-17.70	-43.72	0.04246
2442MHz_TnomVnom	Pass	30M	2.387G	1M	2382.286	-51.86	0.00652	-26.02	2.5	-25.84	-51.86	0.00652
2442MHz_TnomVnom	Pass	2.387G	2.4G	1M	2399.662	-49.02	0.01253	-16.02	25	-33.00	-49.02	0.01253
2442MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2484.332	-49.64	0.01086	-16.02	25	-33.62	-49.64	0.01086
2442MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12498.75	-43.58	0.04385	-26.02	2.5	-17.56	-43.58	0.04385
2442MHz_TnomVmin	Pass	30M	2.387G	1M	2383.465	-51.42	0.00721	-26.02	2.5	-25.40	-51.42	0.00721
2442MHz_TnomVmin	Pass	2.387G	2.4G	1M	2399.662	-49.04	0.01247	-16.02	25	-33.02	-49.04	0.01247
2442MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2484.956	-49.73	0.01064	-16.02	25	-33.71	-49.73	0.01064
2442MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12497.499	-43.28	0.04699	-26.02	2.5	-17.26	-43.28	0.04699
2442MHz_TnomVmax	Pass	30M	2.387G	1M	2317.468	-51.96	0.00637	-26.02	2.5	-25.94	-51.96	0.00637
2442MHz_TnomVmax	Pass	2.387G	2.4G	1M	2399.766	-49.02	0.01253	-16.02	25	-33.00	-49.02	0.01253
2442MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2484.67	-49.65	0.01084	-16.02	25	-33.63	-49.65	0.01084
2442MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12493.748	-43.46	0.04508	-26.02	2.5	-17.44	-43.46	0.04508
2462MHz_TnomVnom	Pass	30M	2.387G	1M	2304.505	-51.92	0.00643	-26.02	2.5	-25.90	-51.92	0.00643
2462MHz_TnomVnom	Pass	2.387G	2.4G	1M	2398.44	-52.38	0.00578	-16.02	25	-36.36	-52.38	0.00578
2462MHz_TnomVnom	Pass	2.4835G	2.4965G	1M	2483.552	-43.58	0.04385	-16.02	25	-27.56	-43.58	0.04385
2462MHz_TnomVnom	Pass	2.4965G	12.5G	1M	12492.497	-43.22	0.04764	-26.02	2.5	-17.20	-43.22	0.04764
2462MHz_TnomVmin	Pass	30M	2.387G	1M	2345.753	-51.86	0.00652	-26.02	2.5	-25.84	-51.86	0.00652
2462MHz_TnomVmin	Pass	2.387G	2.4G	1M	2399.298	-52.36	0.00581	-16.02	25	-36.34	-52.36	0.00581
2462MHz_TnomVmin	Pass	2.4835G	2.4965G	1M	2483.526	-43.62	0.04345	-16.02	25	-27.60	-43.62	0.04345
2462MHz_TnomVmin	Pass	2.4965G	12.5G	1M	12474.991	-43.52	0.04446	-26.02	2.5	-17.50	-43.52	0.04446
2462MHz_TnomVmax	Pass	30M	2.387G	1M	2300.97	-51.84	0.00655	-26.02	2.5	-25.82	-51.84	0.00655
2462MHz_TnomVmax	Pass	2.387G	2.4G	1M	2399.376	-52.37	0.00579	-16.02	25	-36.35	-52.37	0.00579
2462MHz_TnomVmax	Pass	2.4835G	2.4965G	1M	2483.526	-43.68	0.04285	-16.02	25	-27.66	-43.68	0.04285
2462MHz_TnomVmax	Pass	2.4965G	12.5G	1M	12500	-43.48	0.04487	-26.02	2.5	-17.46	-43.48	0.04487



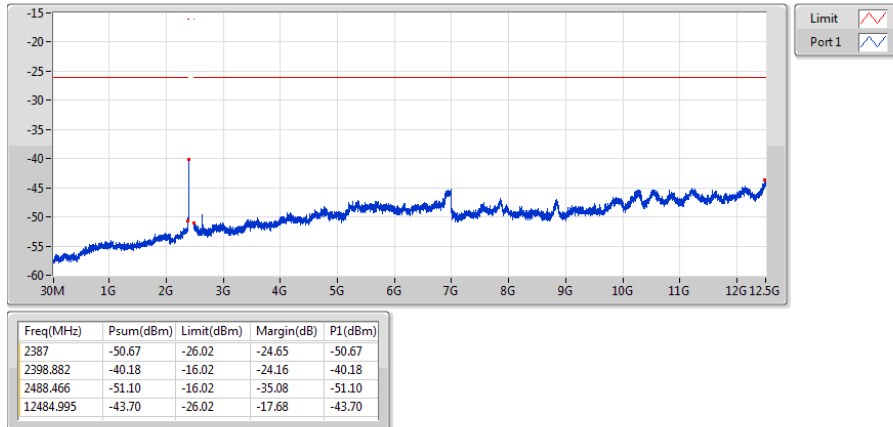
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11b_Nss1_1TX

CSE-TX

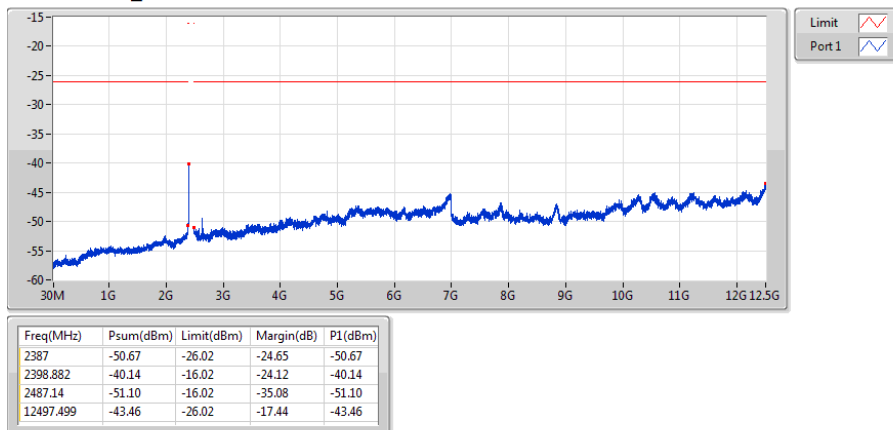
2412MHz_TnomVnom



802.11b_Nss1_1TX

CSE-TX

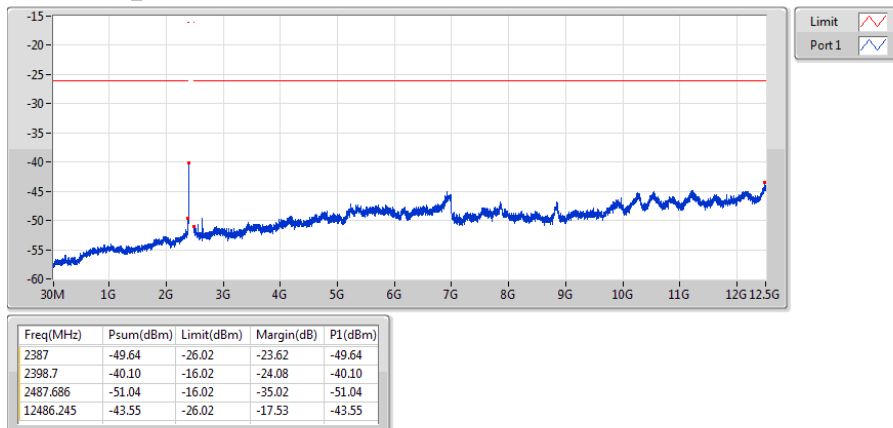
2412MHz_TnomVmin



802.11b_Nss1_1TX

CSE-TX

2412MHz_TnomVmax





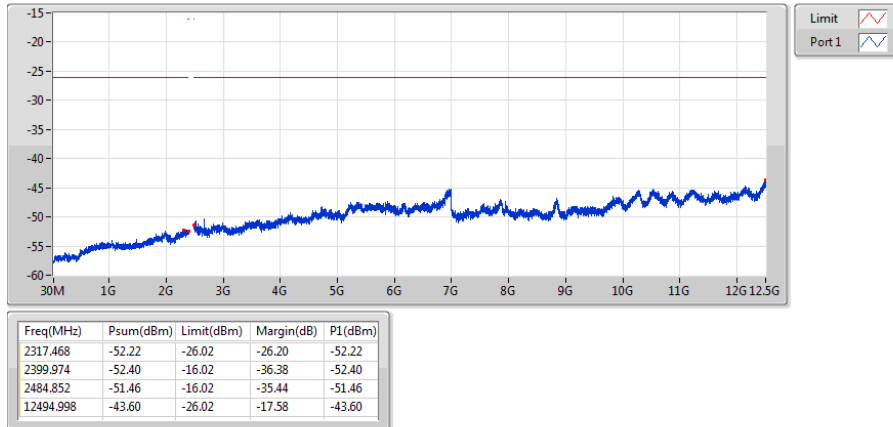
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11b_Nss1_1TX

CSE-TX

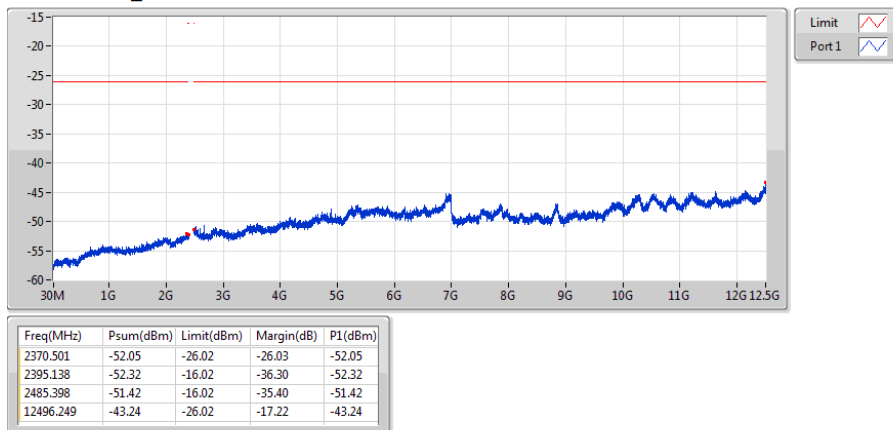
2442MHz_TnomVnom



802.11b_Nss1_1TX

CSE-TX

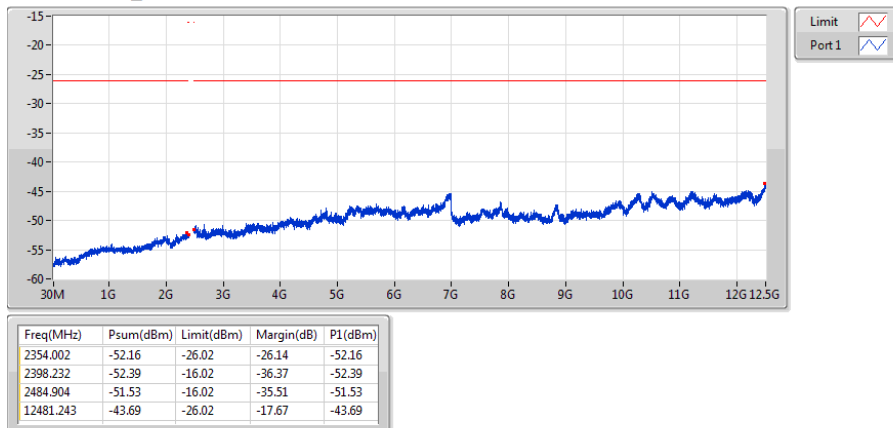
2442MHz_TnomVmin



802.11b_Nss1_1TX

CSE-TX

2442MHz_TnomVmax





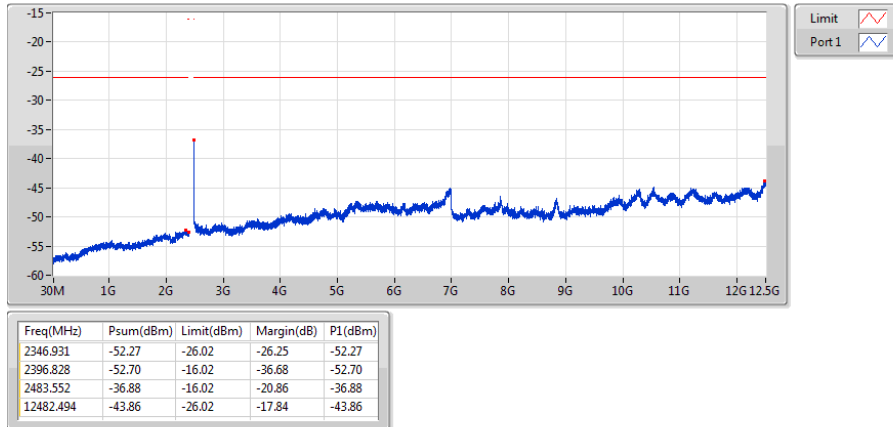
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11b_Nss1_1TX

CSE-TX

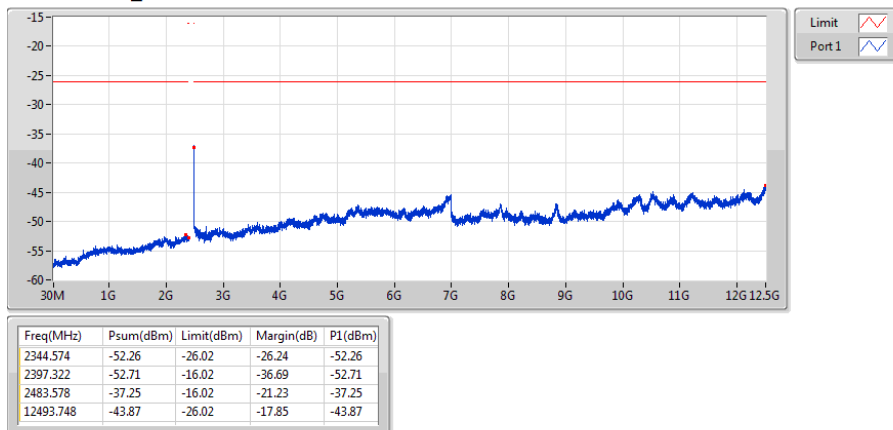
2472MHz_TnomVnom



802.11b_Nss1_1TX

CSE-TX

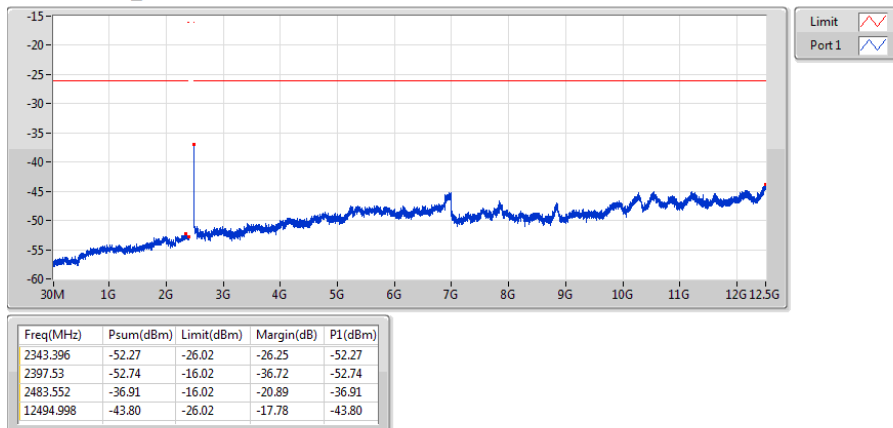
2472MHz_TnomVmin



802.11b_Nss1_1TX

CSE-TX

2472MHz_TnomVmax





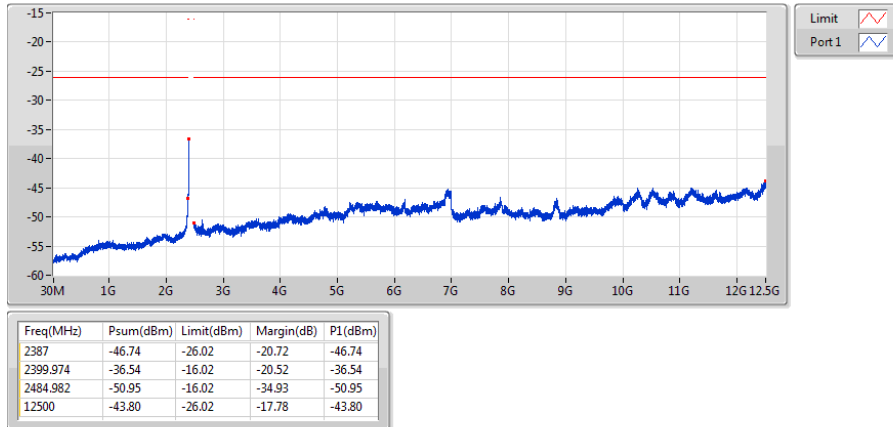
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11g_Nss1_1TX

CSE-TX

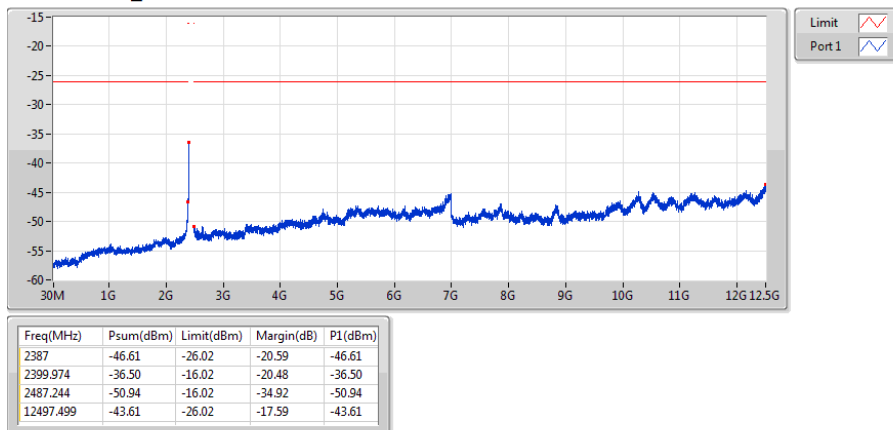
2412MHz_TnomVnom



802.11g_Nss1_1TX

CSE-TX

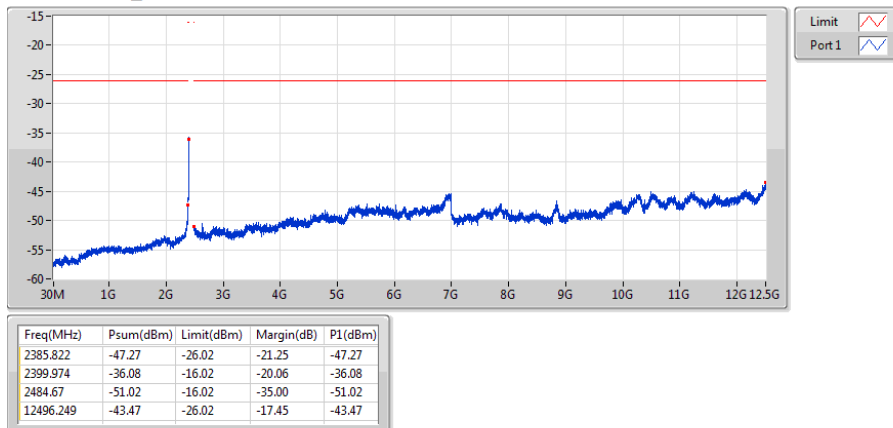
2412MHz_TnomVmin



802.11g_Nss1_1TX

CSE-TX

2412MHz_TnomVmax





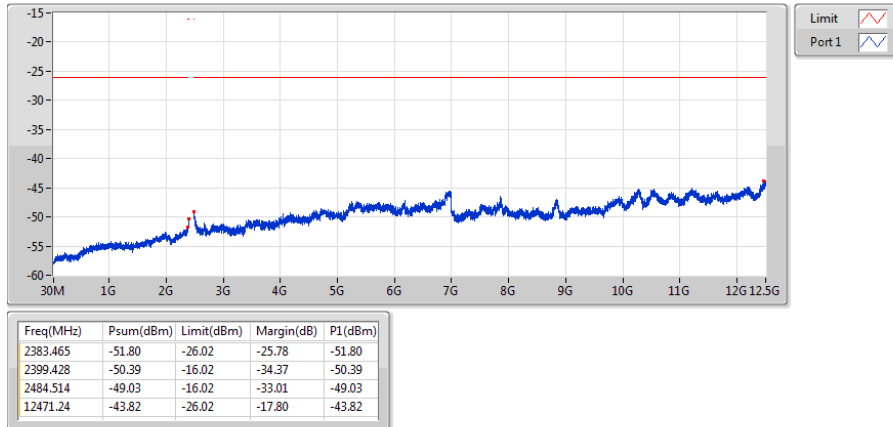
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11g_Nss1_1TX

CSE-TX

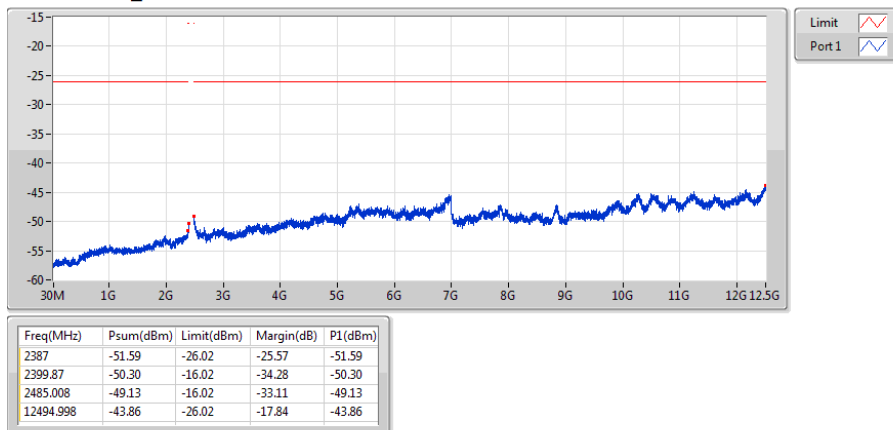
2442MHz_TnomVnom



802.11g_Nss1_1TX

CSE-TX

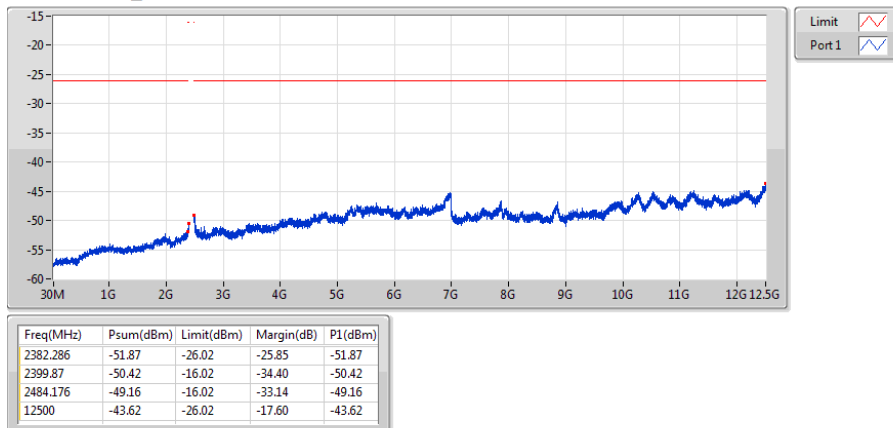
2442MHz_TnomVmin



802.11g_Nss1_1TX

CSE-TX

2442MHz_TnomVmax





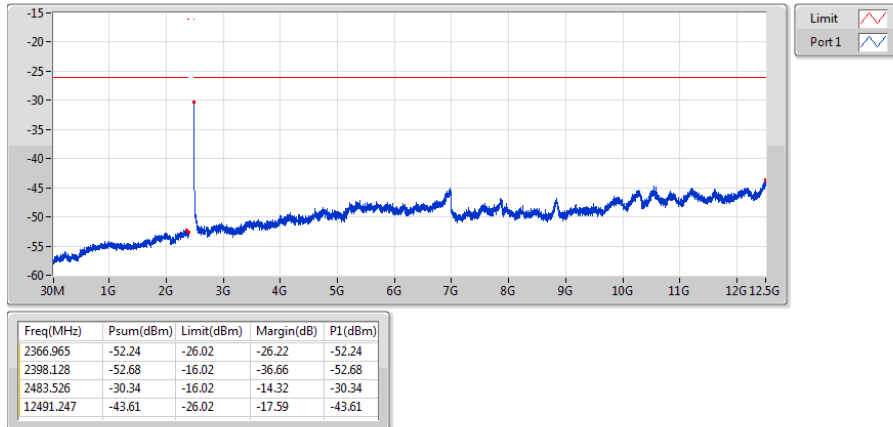
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11g_Nss1_1TX

CSE-TX

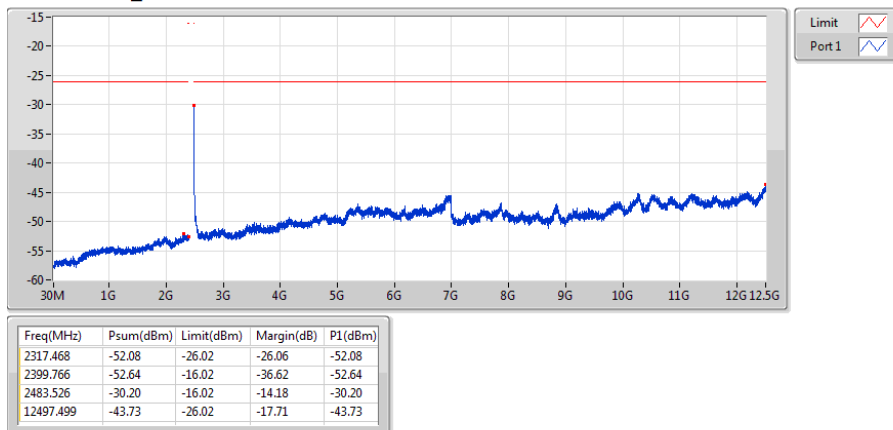
2472MHz_TnomVnom



802.11g_Nss1_1TX

CSE-TX

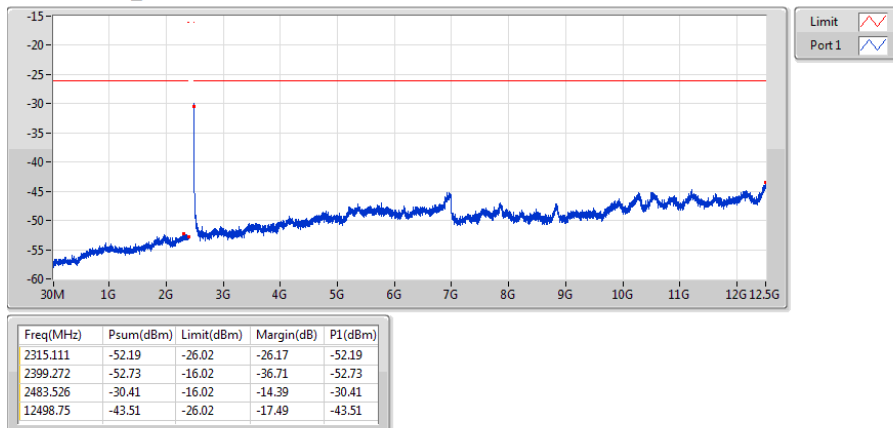
2472MHz_TnomVmin



802.11g_Nss1_1TX

CSE-TX

2472MHz_TnomVmax





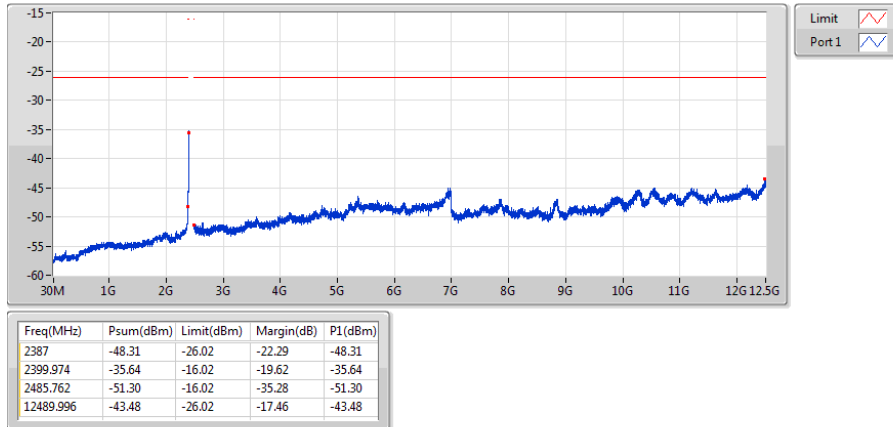
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11n HT20_Nss1,(MCS0)_1TX

CSE-TX

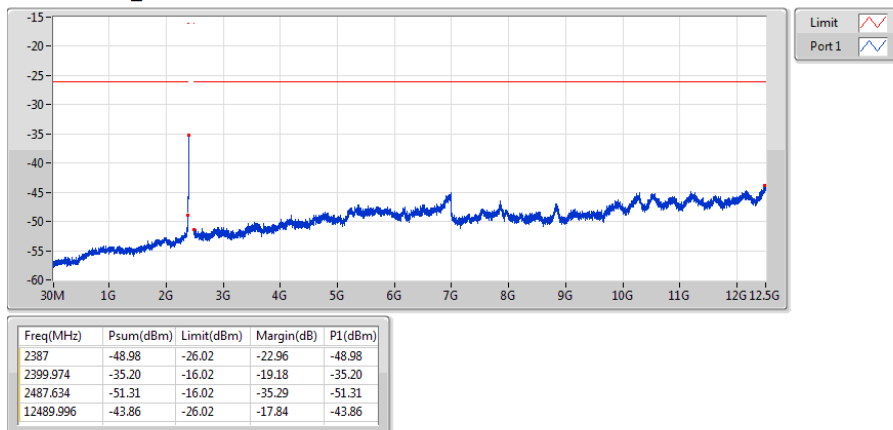
2412MHz_TnomVnom



802.11n HT20_Nss1,(MCS0)_1TX

CSE-TX

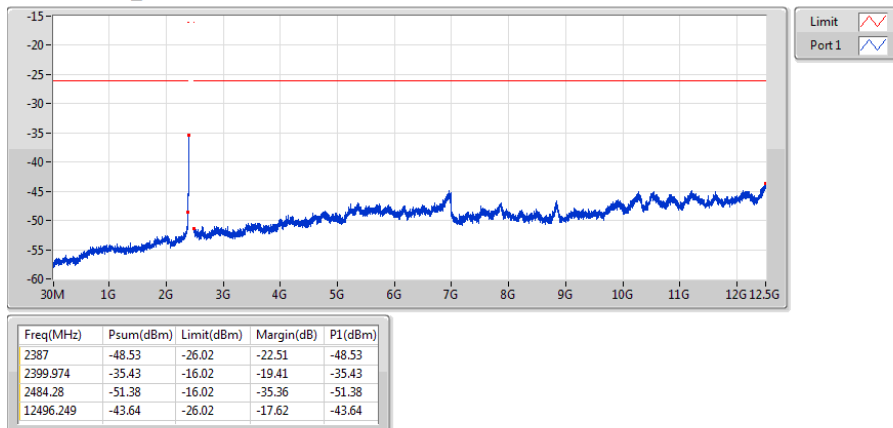
2412MHz_TnomVmin



802.11n HT20_Nss1,(MCS0)_1TX

CSE-TX

2412MHz_TnomVmax





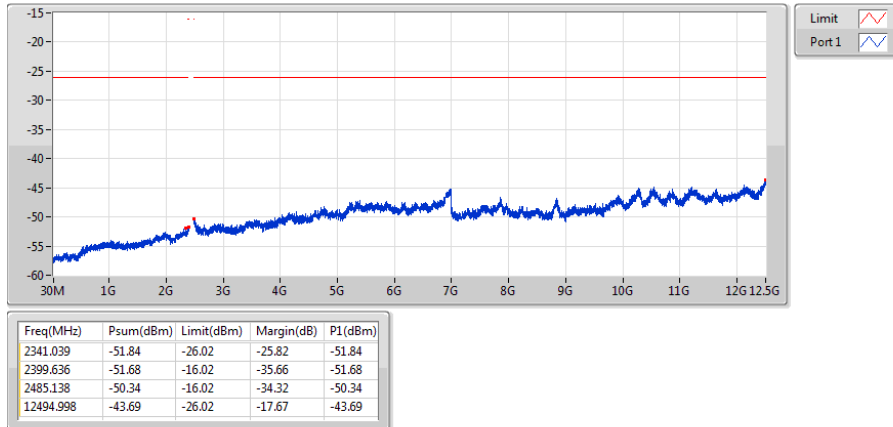
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11n HT20_Nss1,(MCS0)_1TX

CSE-TX

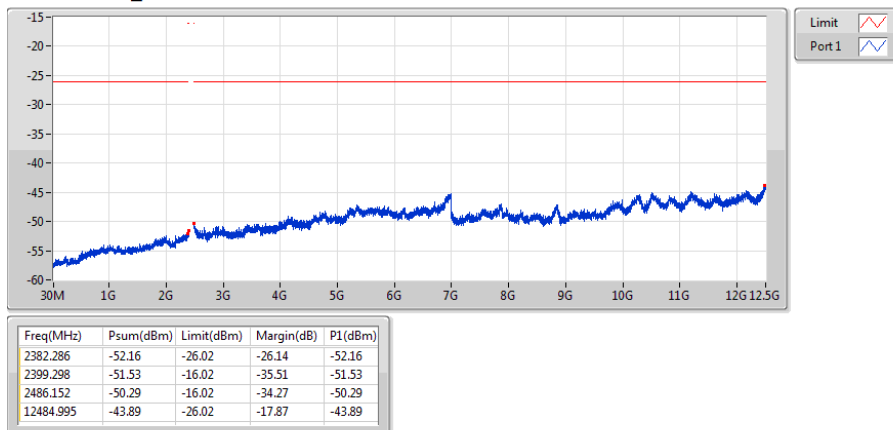
2442MHz_TnomVnom



802.11n HT20_Nss1,(MCS0)_1TX

CSE-TX

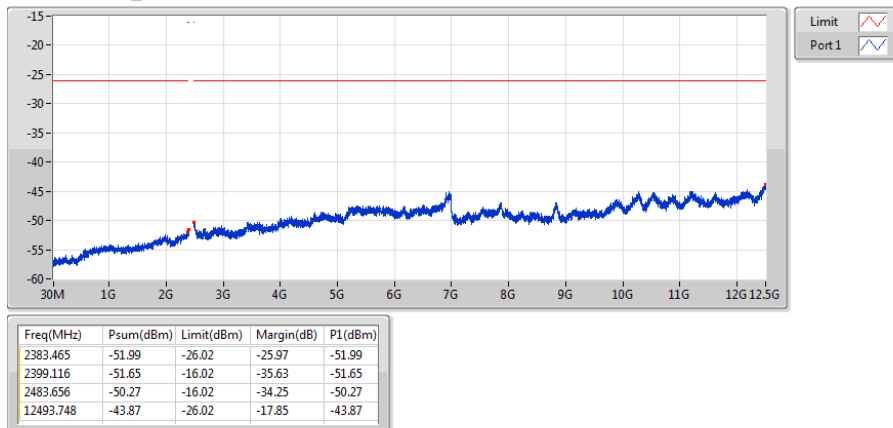
2442MHz_TnomVmin



802.11n HT20_Nss1,(MCS0)_1TX

CSE-TX

2442MHz_TnomVmax





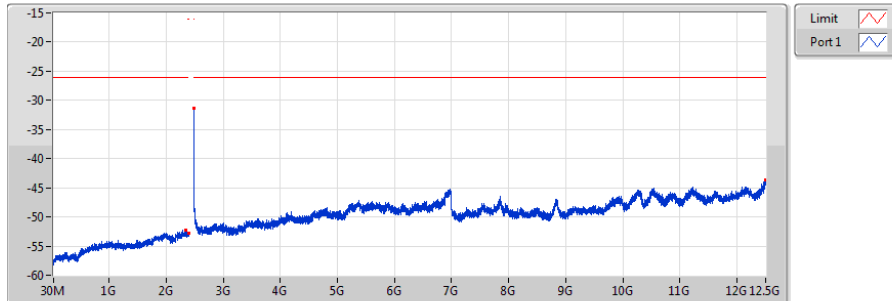
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11n HT20_Nss1,(MCS0)_1TX

CSE-TX

2472MHz_TnomVnom

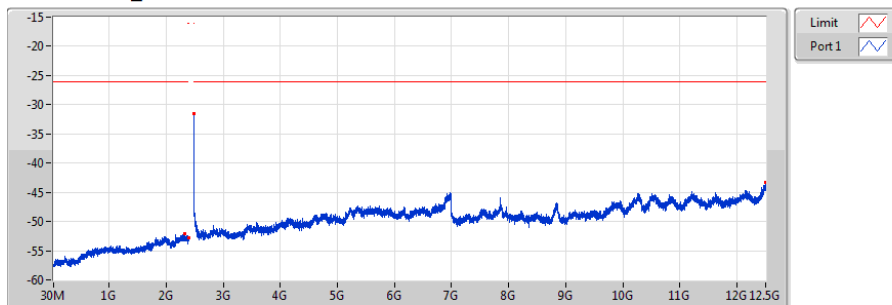


Freq(MHz)	Psum(dBm)	Limit(dBm)	Margin(dB)	P1(dBm)
2350.466	-52.33	-26.02	-26.31	-52.33
2399.428	-52.84	-16.02	-36.82	-52.84
2483.526	-31.34	-16.02	-15.32	-31.34
12492.497	-43.71	-26.02	-17.69	-43.71

802.11n HT20_Nss1,(MCS0)_1TX

CSE-TX

2472MHz_TnomVmin

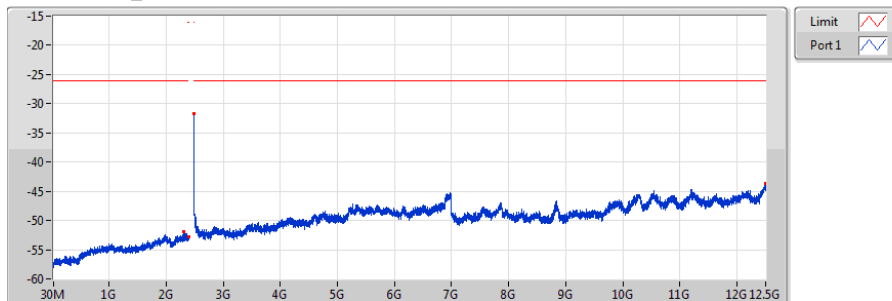


Freq(MHz)	Psum(dBm)	Limit(dBm)	Margin(dB)	P1(dBm)
2330.432	-52.16	-26.02	-26.14	-52.16
2399.376	-52.81	-16.02	-36.79	-52.81
2483.526	-31.50	-16.02	-15.48	-31.50
12498.75	-43.35	-26.02	-17.33	-43.35

802.11n HT20_Nss1,(MCS0)_1TX

CSE-TX

2472MHz_TnomVmax



Freq(MHz)	Psum(dBm)	Limit(dBm)	Margin(dB)	P1(dBm)
2312.755	-51.91	-26.02	-25.89	-51.91
2396.802	-52.77	-16.02	-36.75	-52.77
2483.526	-31.65	-16.02	-15.63	-31.65
12492.497	-43.64	-26.02	-17.62	-43.64



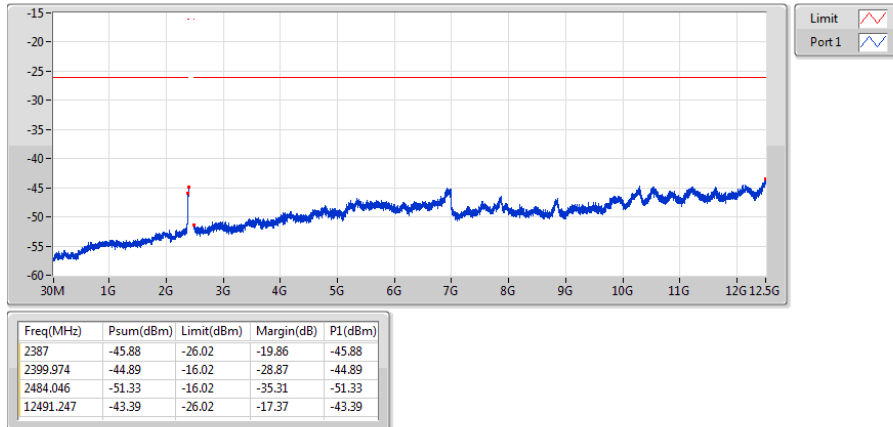
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11n HT40_Nss1,(MCS0)_1TX

CSE-TX

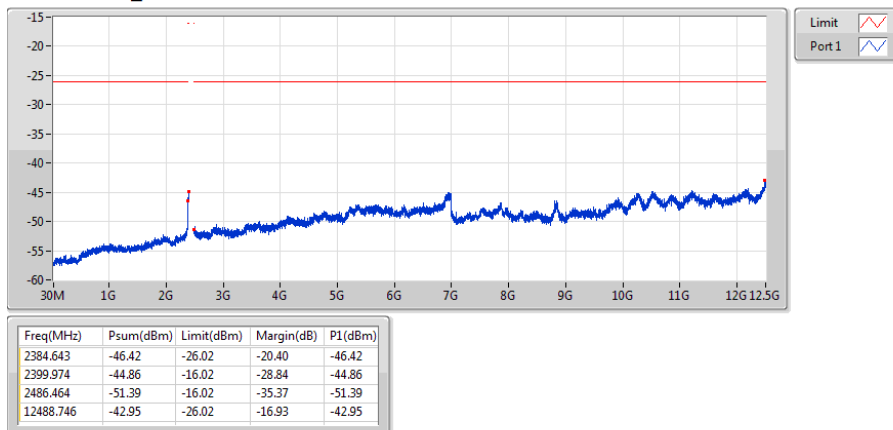
2422MHz_TnomVnom



802.11n HT40_Nss1,(MCS0)_1TX

CSE-TX

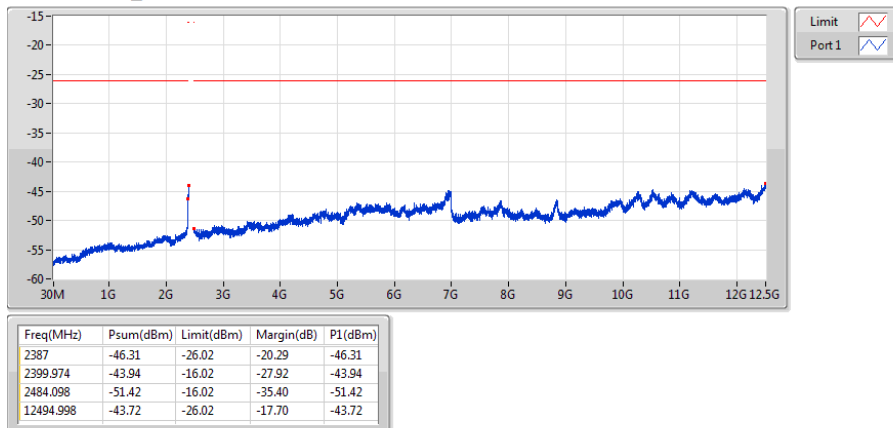
2422MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

CSE-TX

2422MHz_TnomVmax





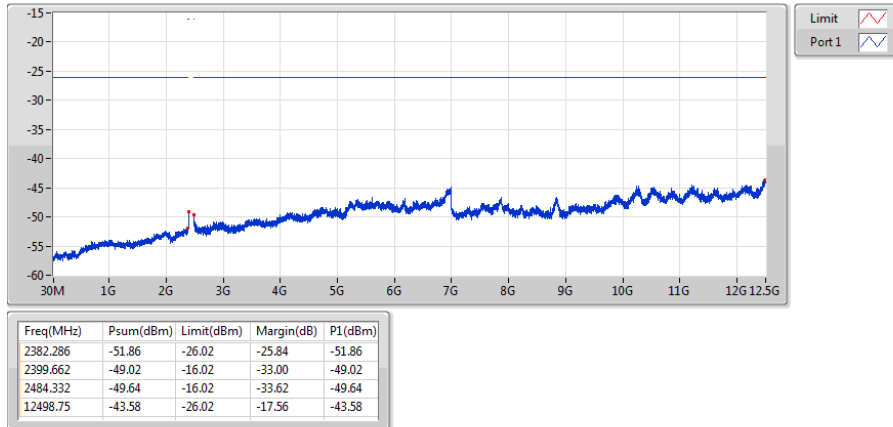
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11n HT40_Nss1,(MCS0)_1TX

CSE-TX

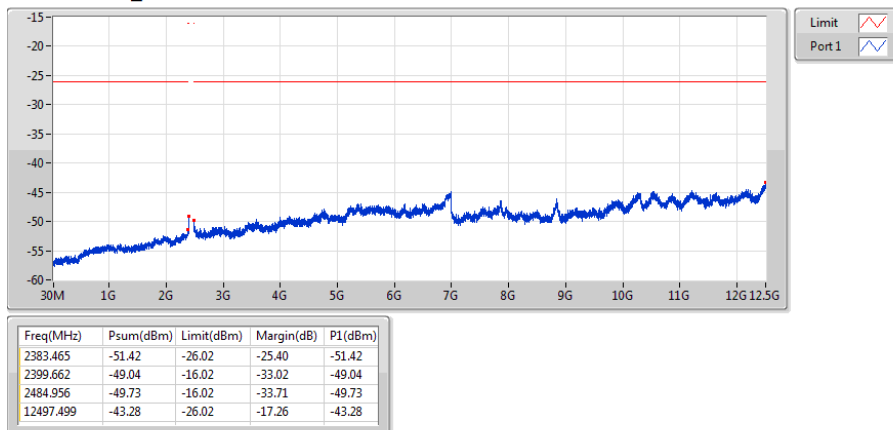
2442MHz_TnomVnom



802.11n HT40_Nss1,(MCS0)_1TX

CSE-TX

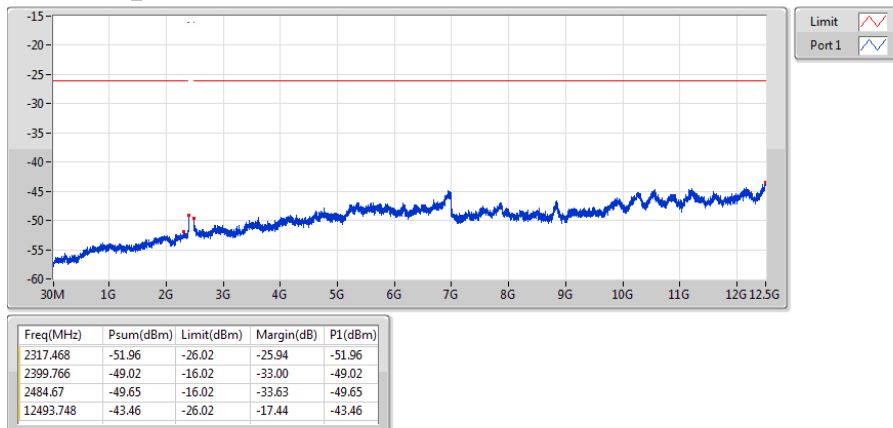
2442MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

CSE-TX

2442MHz_TnomVmax





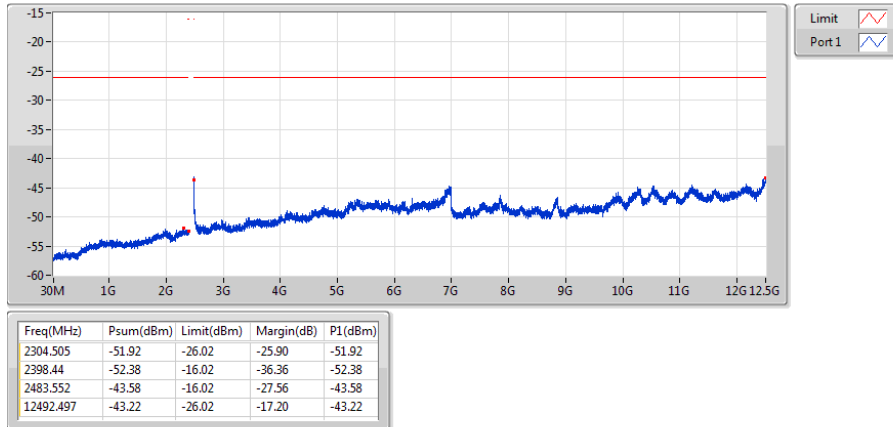
CSE-TXUnwanted Emission StrengthResult

Appendix E

802.11n HT40_Nss1,(MCS0)_1TX

CSE-TX

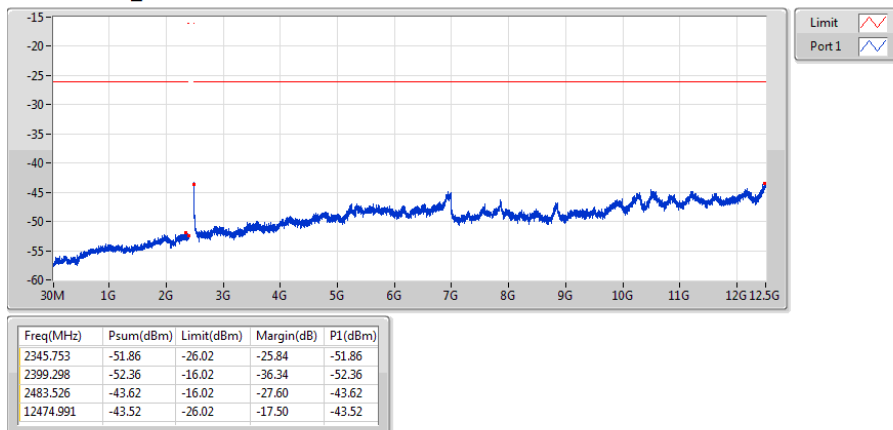
2462MHz_TnomVnom



802.11n HT40_Nss1,(MCS0)_1TX

CSE-TX

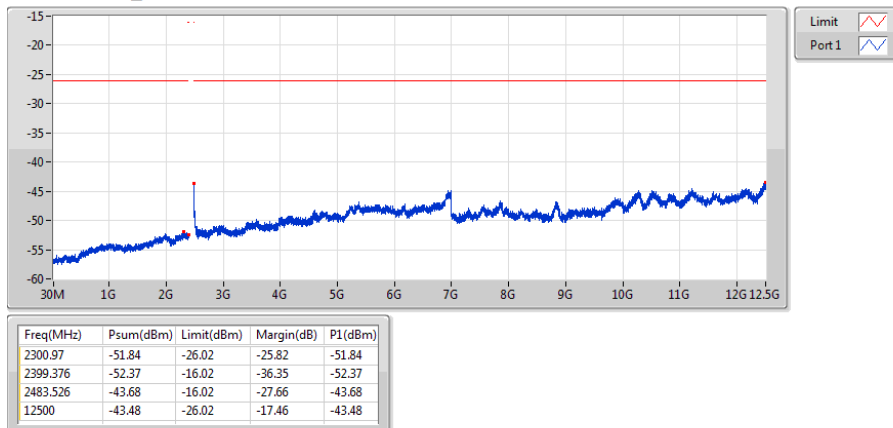
2462MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

CSE-TX

2462MHz_TnomVmax





Carrier Sensing Function Result

Appendix F

Summary

Mode	Result	Interference Pin (dBm)	Function
2.4-2.4835GHz	-	-	-
802.11b_Nss1_1TX	Pass	OBW<26MHz	w/o test
802.11g_Nss1_1TX	Pass	OBW<26MHz	w/o test
802.11n HT20_Nss1,(MCS0)_1TX	Pass	OBW<26MHz	w/o test
802.11n HT40_Nss1,(MCS0)_1TX	Pass	-44.04	Good



Carrier Sensing Function Result

Appendix F

Result

Mode	Result	Interference Pin (dBm)	Function
802.11b_Nss1_1TX	-	-	-
2412MHz_TnomVnom	Pass	OBW<26MHz	w/o test
2412MHz_TnomVmin	Pass	OBW<26MHz	w/o test
2412MHz_TnomVmax	Pass	OBW<26MHz	w/o test
2442MHz_TnomVnom	Pass	OBW<26MHz	w/o test
2442MHz_TnomVmin	Pass	OBW<26MHz	w/o test
2442MHz_TnomVmax	Pass	OBW<26MHz	w/o test
2472MHz_TnomVnom	Pass	OBW<26MHz	w/o test
2472MHz_TnomVmin	Pass	OBW<26MHz	w/o test
2472MHz_TnomVmax	Pass	OBW<26MHz	w/o test
802.11g_Nss1_1TX	-	-	-
2412MHz_TnomVnom	Pass	OBW<26MHz	w/o test
2412MHz_TnomVmin	Pass	OBW<26MHz	w/o test
2412MHz_TnomVmax	Pass	OBW<26MHz	w/o test
2442MHz_TnomVnom	Pass	OBW<26MHz	w/o test
2442MHz_TnomVmin	Pass	OBW<26MHz	w/o test
2442MHz_TnomVmax	Pass	OBW<26MHz	w/o test
2472MHz_TnomVnom	Pass	OBW<26MHz	w/o test
2472MHz_TnomVmin	Pass	OBW<26MHz	w/o test
2472MHz_TnomVmax	Pass	OBW<26MHz	w/o test
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-
2412MHz_TnomVnom	Pass	OBW<26MHz	w/o test
2412MHz_TnomVmin	Pass	OBW<26MHz	w/o test
2412MHz_TnomVmax	Pass	OBW<26MHz	w/o test
2442MHz_TnomVnom	Pass	OBW<26MHz	w/o test
2442MHz_TnomVmin	Pass	OBW<26MHz	w/o test
2442MHz_TnomVmax	Pass	OBW<26MHz	w/o test
2472MHz_TnomVnom	Pass	OBW<26MHz	w/o test
2472MHz_TnomVmin	Pass	OBW<26MHz	w/o test
2472MHz_TnomVmax	Pass	OBW<26MHz	w/o test
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-
2422MHz_TnomVnom	Pass	-43.89	Good
2422MHz_TnomVmin	Pass	-43.89	Good
2422MHz_TnomVmax	Pass	-43.89	Good
2442MHz_TnomVnom	Pass	-43.96	Good
2442MHz_TnomVmin	Pass	-43.96	Good
2442MHz_TnomVmax	Pass	-43.96	Good
2462MHz_TnomVnom	Pass	-44.04	Good
2462MHz_TnomVmin	Pass	-44.04	Good
2462MHz_TnomVmax	Pass	-44.04	Good



Interference Prevention Function Result

Appendix G

Summary

Mode	Result	ID Length	ID Limit	Function
2.4-2.4835GHz	-	-	-	-
802.11b_Nss1_1TX	Pass	F0:AB:54:1F:23:C9	48 bits	Good
802.11g_Nss1_1TX	Pass	F0:AB:54:1F:23:C9	48 bits	Good
802.11n HT20_Nss1,(MCS0)_1TX	Pass	F0:AB:54:1F:23:C9	48 bits	Good
802.11n HT40_Nss1,(MCS0)_1TX	Pass	F0:AB:54:1F:23:C9	48 bits	Good



Interference Prevention Function Result

Appendix G

Result

Mode	Result	ID Length	ID Limit	Function
802.11b_Nss1_1TX	-	-	-	-
2412MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2412MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2412MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2472MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2472MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2472MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
802.11g_Nss1_1TX	-	-	-	-
2412MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2412MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2412MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2472MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2472MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2472MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-
2412MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2412MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2412MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2472MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2472MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2472MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-
2422MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2422MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2422MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2442MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2462MHz_TnomVnom	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2462MHz_TnomVmin	Pass	F0:AB:54:1F:23:C9	48 bits	Good
2462MHz_TnomVmax	Pass	F0:AB:54:1F:23:C9	48 bits	Good



CSE-RXSecondary Radiated EmissionsResult

Appendix H

Summary

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (nW/MHz)	Limit (dBm)	Limit (nW/MHz)	Margin (dB)	P1 (dBm)	P1 (nW/MHz)
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
802.11b_Nss1_1TX	Pass	1G	12.5G	1M	10524.875	-68.78	0.13243	-46.99	20	-21.79	-68.78	0.13243
802.11g_Nss1_1TX	Pass	1G	12.5G	1M	10524.875	-68.04	0.15704	-46.99	20	-21.05	-68.04	0.15704
802.11n HT20_Nss1,(MCS0)_1TX	Pass	1G	12.5G	1M	10524.875	-68.17	0.15241	-46.99	20	-21.18	-68.17	0.15241
802.11n HT40_Nss1,(MCS0)_1TX	Pass	1G	12.5G	1M	10524.875	-68.44	0.14322	-46.99	20	-21.45	-68.44	0.14322



CSE-RXSecondary Radiated EmissionsResult

Appendix H

Result

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (nW/MHz)	Limit (dBm)	Limit (nW/MHz)	Margin (dB)	P1 (dBm)	P1 (nW/MHz)
802.11b_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	30M	1G	100k	953.925	-91.42	0.00072	-53.98	4	-37.44	-91.42	0.00072
2412MHz_TnomVnom	Pass	1G	12.5G	1M	3617.687	-69.87	0.10304	-46.99	20	-22.88	-69.87	0.10304
2412MHz_TnomVmin	Pass	30M	1G	100k	953.925	-91.46	0.00071	-53.98	4	-37.48	-91.46	0.00071
2412MHz_TnomVmin	Pass	1G	12.5G	1M	3617.687	-69.90	0.10233	-46.99	20	-22.91	-69.90	0.10233
2412MHz_TnomVmax	Pass	30M	1G	100k	773.02	-91.11	0.00077	-53.98	4	-37.13	-91.11	0.00077
2412MHz_TnomVmax	Pass	1G	12.5G	1M	3617.687	-69.94	0.10139	-46.99	20	-22.95	-69.94	0.10139
2442MHz_TnomVnom	Pass	30M	1G	100k	772.535	-89.60	0.0011	-53.98	4	-35.62	-89.60	0.0011
2442MHz_TnomVnom	Pass	1G	12.5G	1M	3662.25	-71.66	0.06823	-46.99	20	-24.67	-71.66	0.06823
2442MHz_TnomVmin	Pass	30M	1G	100k	953.925	-90.19	0.00096	-53.98	4	-36.21	-90.19	0.00096
2442MHz_TnomVmin	Pass	1G	12.5G	1M	3662.25	-71.37	0.07295	-46.99	20	-24.38	-71.37	0.07295
2442MHz_TnomVmax	Pass	30M	1G	100k	953.925	-90.22	0.00095	-53.98	4	-36.24	-90.22	0.00095
2442MHz_TnomVmax	Pass	1G	12.5G	1M	3662.25	-71.42	0.07211	-46.99	20	-24.43	-71.42	0.07211
2472MHz_TnomVnom	Pass	30M	1G	100k	957.805	-90.24	0.00095	-53.98	4	-36.26	-90.24	0.00095
2472MHz_TnomVnom	Pass	1G	12.5G	1M	3708.25	-71.97	0.06353	-46.99	20	-24.98	-71.97	0.06353
2472MHz_TnomVmin	Pass	30M	1G	100k	953.925	-90.78	0.00084	-53.98	4	-36.80	-90.78	0.00084
2472MHz_TnomVmin	Pass	1G	12.5G	1M	3708.25	-72.14	0.06109	-46.99	20	-25.15	-72.14	0.06109
2472MHz_TnomVmax	Pass	30M	1G	100k	957.32	-91.39	0.00073	-53.98	4	-37.41	-91.39	0.00073
2472MHz_TnomVmax	Pass	1G	12.5G	1M	10524.875	-68.78	0.13243	-46.99	20	-21.79	-68.78	0.13243
802.11g_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	30M	1G	100k	958.775	-89.96	0.00101	-53.98	4	-35.98	-89.96	0.00101
2412MHz_TnomVnom	Pass	1G	12.5G	1M	3617.687	-69.64	0.10864	-46.99	20	-22.65	-69.64	0.10864
2412MHz_TnomVmin	Pass	30M	1G	100k	772.05	-91.49	0.00071	-53.98	4	-37.51	-91.49	0.00071
2412MHz_TnomVmin	Pass	1G	12.5G	1M	3617.687	-69.77	0.10544	-46.99	20	-22.78	-69.77	0.10544
2412MHz_TnomVmax	Pass	30M	1G	100k	953.925	-90.79	0.00083	-53.98	4	-36.81	-90.79	0.00083
2412MHz_TnomVmax	Pass	1G	12.5G	1M	10524.875	-68.04	0.15704	-46.99	20	-21.05	-68.04	0.15704
2442MHz_TnomVnom	Pass	30M	1G	100k	953.925	-89.01	0.00126	-53.98	4	-35.03	-89.01	0.00126
2442MHz_TnomVnom	Pass	1G	12.5G	1M	2414.5	-69.95	0.10116	-46.99	20	-22.96	-69.95	0.10116
2442MHz_TnomVmin	Pass	30M	1G	100k	953.925	-89.03	0.00125	-53.98	4	-35.05	-89.03	0.00125
2442MHz_TnomVmin	Pass	1G	12.5G	1M	3662.25	-71.50	0.07079	-46.99	20	-24.51	-71.50	0.07079
2442MHz_TnomVmax	Pass	30M	1G	100k	953.925	-90.04	0.00099	-53.98	4	-36.06	-90.04	0.00099
2442MHz_TnomVmax	Pass	1G	12.5G	1M	10524.875	-70.27	0.09397	-46.99	20	-23.28	-70.27	0.09397
2472MHz_TnomVnom	Pass	30M	1G	100k	953.925	-91.27	0.00075	-53.98	4	-37.29	-91.27	0.00075
2472MHz_TnomVnom	Pass	1G	12.5G	1M	10523.437	-71.44	0.07178	-46.99	20	-24.45	-71.44	0.07178
2472MHz_TnomVmin	Pass	30M	1G	100k	957.805	-91.23	0.00075	-53.98	4	-37.25	-91.23	0.00075
2472MHz_TnomVmin	Pass	1G	12.5G	1M	3708.25	-72.37	0.05794	-46.99	20	-25.38	-72.37	0.05794
2472MHz_TnomVmax	Pass	30M	1G	100k	957.805	-90.56	0.00088	-53.98	4	-36.58	-90.56	0.00088
2472MHz_TnomVmax	Pass	1G	12.5G	1M	3708.25	-72.22	0.05998	-46.99	20	-25.23	-72.22	0.05998
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	30M	1G	100k	773.02	-91.11	0.00077	-53.98	4	-37.13	-91.11	0.00077



CSE-RXSecondary Radiated EmissionsResult

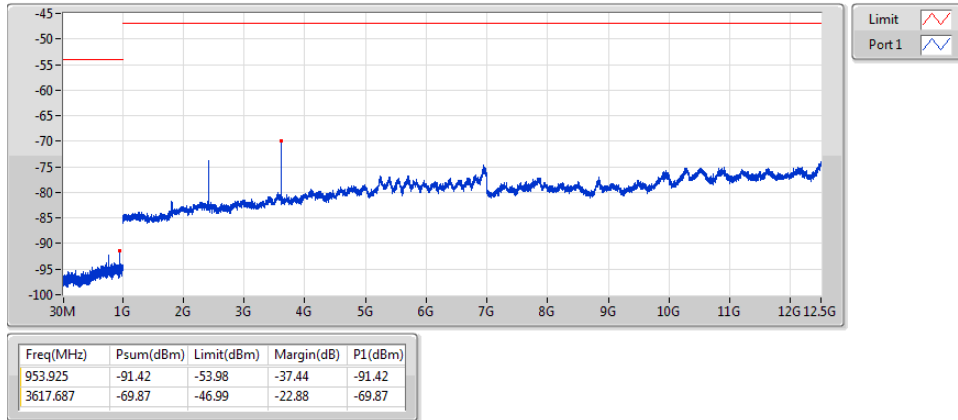
Appendix H

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (nW/MHz)	Limit (dBm)	Limit (nW/MHz)	Margin (dB)	P1 (dBm)	P1 (nW/MHz)
2412MHz_TnomVnom	Pass	1G	12.5G	1M	3617.687	-69.75	0.10593	-46.99	20	-22.76	-69.75	0.10593
2412MHz_TnomVmin	Pass	30M	1G	100k	958.775	-88.58	0.00139	-53.98	4	-34.60	-88.58	0.00139
2412MHz_TnomVmin	Pass	1G	12.5G	1M	10524.875	-68.49	0.14158	-46.99	20	-21.50	-68.49	0.14158
2412MHz_TnomVmax	Pass	30M	1G	100k	953.925	-90.91	0.00081	-53.98	4	-36.93	-90.91	0.00081
2412MHz_TnomVmax	Pass	1G	12.5G	1M	3617.687	-69.72	0.10666	-46.99	20	-22.73	-69.72	0.10666
2442MHz_TnomVnom	Pass	30M	1G	100k	953.925	-92.13	0.00061	-53.98	4	-38.15	-92.13	0.00061
2442MHz_TnomVnom	Pass	1G	12.5G	1M	10524.875	-68.17	0.15241	-46.99	20	-21.18	-68.17	0.15241
2442MHz_TnomVmin	Pass	30M	1G	100k	953.925	-89.82	0.00104	-53.98	4	-35.84	-89.82	0.00104
2442MHz_TnomVmin	Pass	1G	12.5G	1M	3662.25	-71.68	0.06792	-46.99	20	-24.69	-71.68	0.06792
2442MHz_TnomVmax	Pass	30M	1G	100k	957.32	-90.83	0.00083	-53.98	4	-36.85	-90.83	0.00083
2442MHz_TnomVmax	Pass	1G	12.5G	1M	10524.875	-70.32	0.0929	-46.99	20	-23.33	-70.32	0.0929
2472MHz_TnomVnom	Pass	30M	1G	100k	953.925	-89.09	0.00123	-53.98	4	-35.11	-89.09	0.00123
2472MHz_TnomVnom	Pass	1G	12.5G	1M	3708.25	-72.19	0.06039	-46.99	20	-25.20	-72.19	0.06039
2472MHz_TnomVmin	Pass	30M	1G	100k	953.925	-90.84	0.00082	-53.98	4	-36.86	-90.84	0.00082
2472MHz_TnomVmin	Pass	1G	12.5G	1M	3708.25	-72.17	0.06067	-46.99	20	-25.18	-72.17	0.06067
2472MHz_TnomVmax	Pass	30M	1G	100k	953.925	-89.72	0.00107	-53.98	4	-35.74	-89.72	0.00107
2472MHz_TnomVmax	Pass	1G	12.5G	1M	10524.875	-69.49	0.11246	-46.99	20	-22.50	-69.49	0.11246
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2422MHz_TnomVnom	Pass	30M	1G	100k	958.775	-90.23	0.00095	-53.98	4	-36.25	-90.23	0.00095
2422MHz_TnomVnom	Pass	1G	12.5G	1M	3632.062	-71.29	0.0743	-46.99	20	-24.30	-71.29	0.0743
2422MHz_TnomVmin	Pass	30M	1G	100k	730.825	-88.80	0.00132	-53.98	4	-34.82	-88.80	0.00132
2422MHz_TnomVmin	Pass	1G	12.5G	1M	3632.062	-71.59	0.06934	-46.99	20	-24.60	-71.59	0.06934
2422MHz_TnomVmax	Pass	30M	1G	100k	958.775	-89.57	0.0011	-53.98	4	-35.59	-89.57	0.0011
2422MHz_TnomVmax	Pass	1G	12.5G	1M	3632.062	-71.32	0.07379	-46.99	20	-24.33	-71.32	0.07379
2442MHz_TnomVnom	Pass	30M	1G	100k	730.34	-86.36	0.00231	-53.98	4	-32.38	-86.36	0.00231
2442MHz_TnomVnom	Pass	1G	12.5G	1M	3662.25	-71.66	0.06823	-46.99	20	-24.67	-71.66	0.06823
2442MHz_TnomVmin	Pass	30M	1G	100k	773.02	-91.44	0.00072	-53.98	4	-37.46	-91.44	0.00072
2442MHz_TnomVmin	Pass	1G	12.5G	1M	3662.25	-71.63	0.06871	-46.99	20	-24.64	-71.63	0.06871
2442MHz_TnomVmax	Pass	30M	1G	100k	958.775	-89.33	0.00117	-53.98	4	-35.35	-89.33	0.00117
2442MHz_TnomVmax	Pass	1G	12.5G	1M	3662.25	-71.56	0.06982	-46.99	20	-24.57	-71.56	0.06982
2462MHz_TnomVnom	Pass	30M	1G	100k	953.925	-91.27	0.00075	-53.98	4	-37.29	-91.27	0.00075
2462MHz_TnomVnom	Pass	1G	12.5G	1M	3692.437	-70.16	0.09638	-46.99	20	-23.17	-70.16	0.09638
2462MHz_TnomVmin	Pass	30M	1G	100k	953.925	-91.01	0.00079	-53.98	4	-37.03	-91.01	0.00079
2462MHz_TnomVmin	Pass	1G	12.5G	1M	10524.875	-68.44	0.14322	-46.99	20	-21.45	-68.44	0.14322
2462MHz_TnomVmax	Pass	30M	1G	100k	937.435	-91.83	0.00066	-53.98	4	-37.85	-91.83	0.00066
2462MHz_TnomVmax	Pass	1G	12.5G	1M	3692.437	-70.13	0.09705	-46.99	20	-23.14	-70.13	0.09705

802.11b_Nss1_1TX

CSE-RX

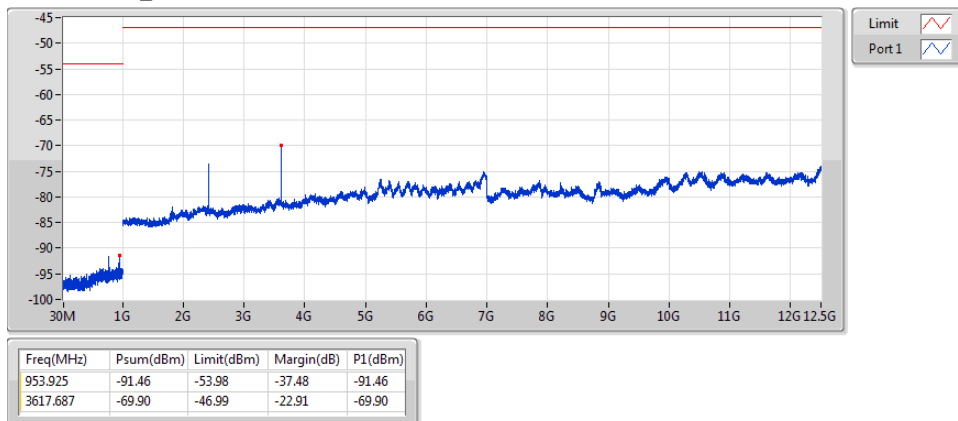
2412MHz_TnomVnom



802.11b_Nss1_1TX

CSE-RX

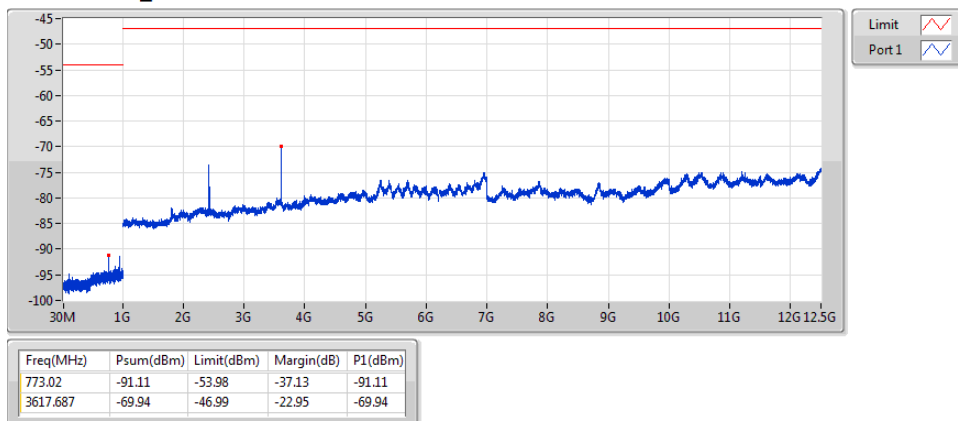
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802.11b_Nss1_1TX

CSE-RX

2412MHz_TnomVmax

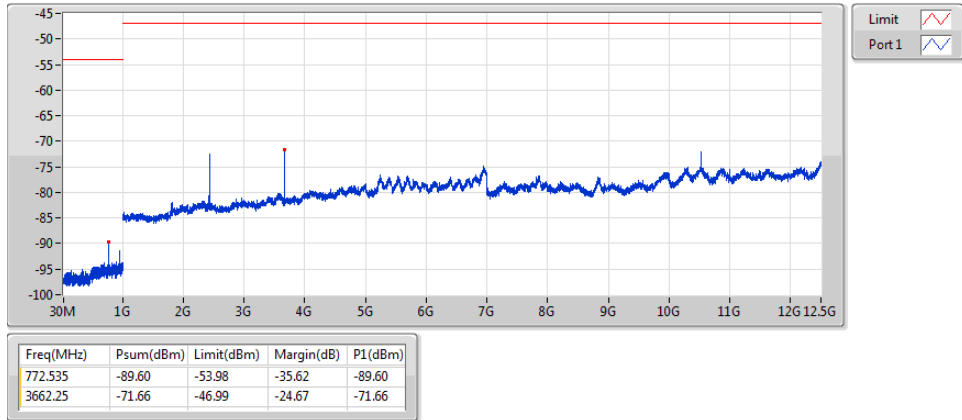




802.11b_Nss1_1TX

CSE-RX

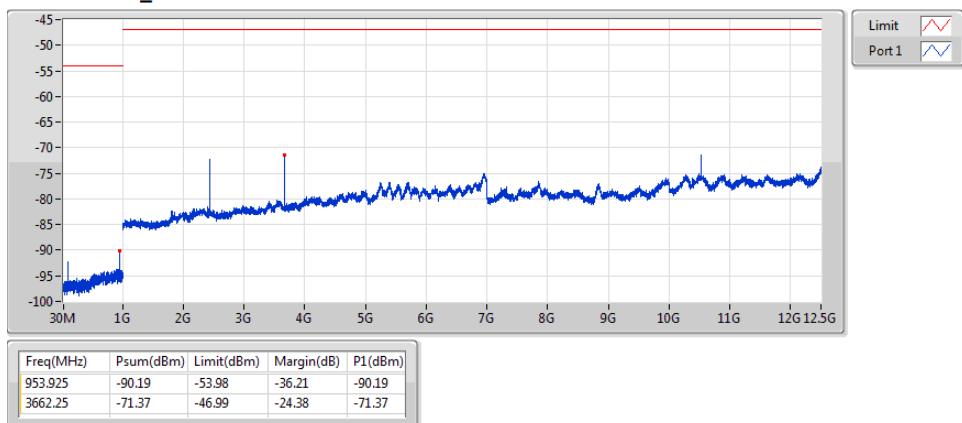
2442MHz_TnomVnom



802.11b_Nss1_1TX

CSE-RX

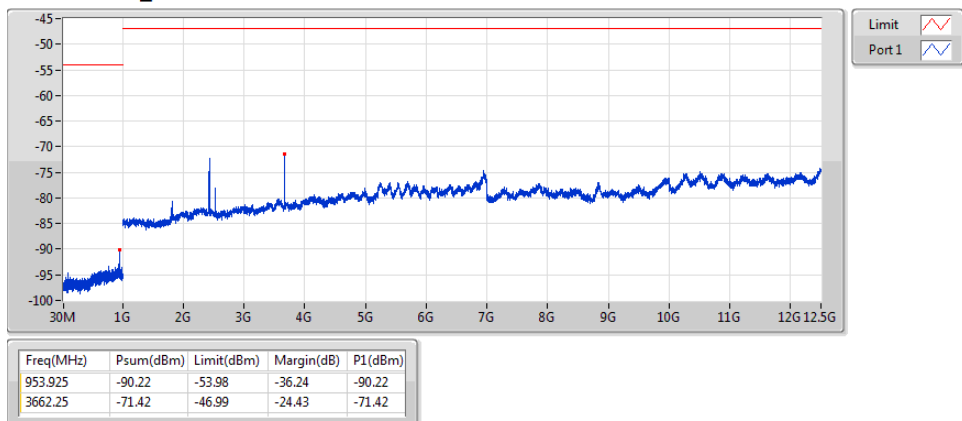
2442MHz_TnomVmin



802.11b_Nss1_1TX

CSE-RX

2442MHz_TnomVmax

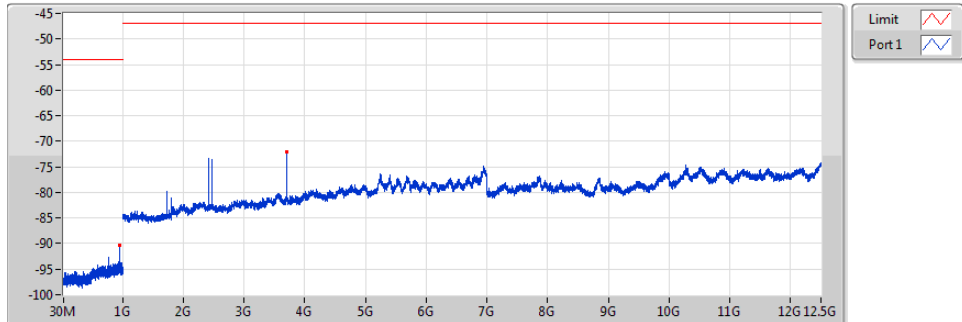




802.11b_Nss1_1TX

CSE-RX

2472MHz_TnomVnom

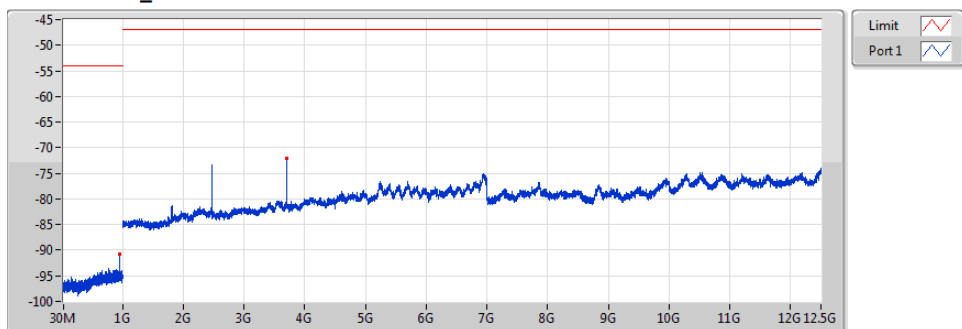


Freq(MHz)	Psum(dBm)	Limit(dBm)	Margin(dB)	P1(dBm)
957.805	-90.24	-53.98	-36.26	-90.24
3708.25	-71.97	-46.99	-24.98	-71.97

802.11b_Nss1_1TX

CSE-RX

2472MHz_TnomVmin

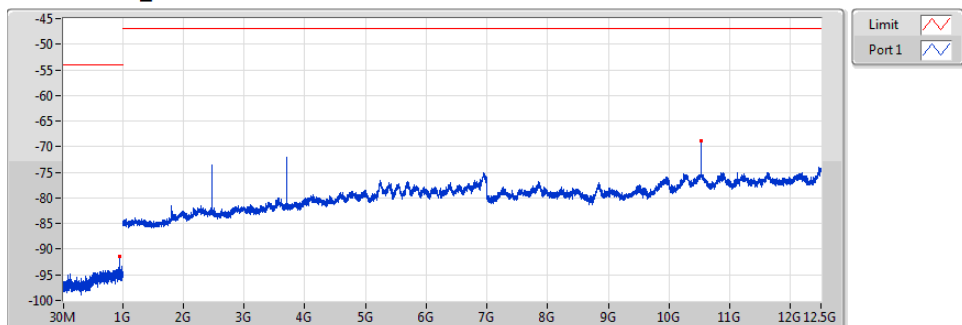


Freq(MHz)	Psum(dBm)	Limit(dBm)	Margin(dB)	P1(dBm)
953.925	-90.78	-53.98	-36.80	-90.78
3708.25	-72.14	-46.99	-25.15	-72.14

802.11b_Nss1_1TX

CSE-RX

2472MHz_TnomVmax



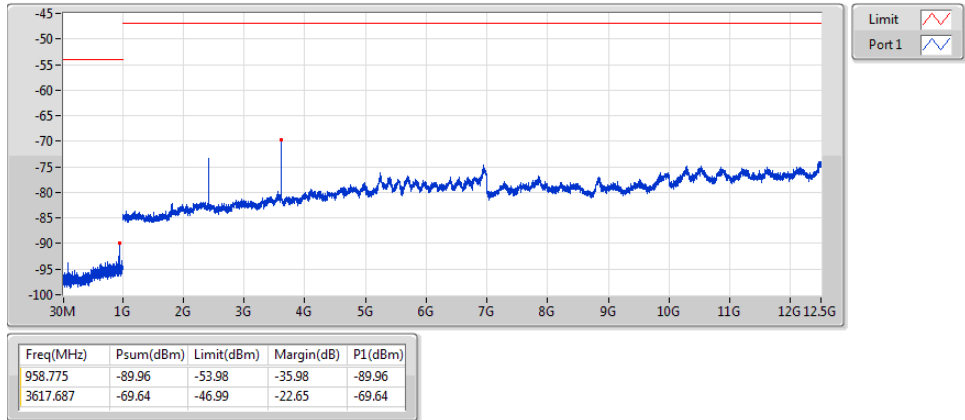
Freq(MHz)	Psum(dBm)	Limit(dBm)	Margin(dB)	P1(dBm)
957.32	-91.39	-53.98	-37.41	-91.39
10524.875	-68.78	-46.99	-21.79	-68.78



802.11g_Nss1_1TX

CSE-RX

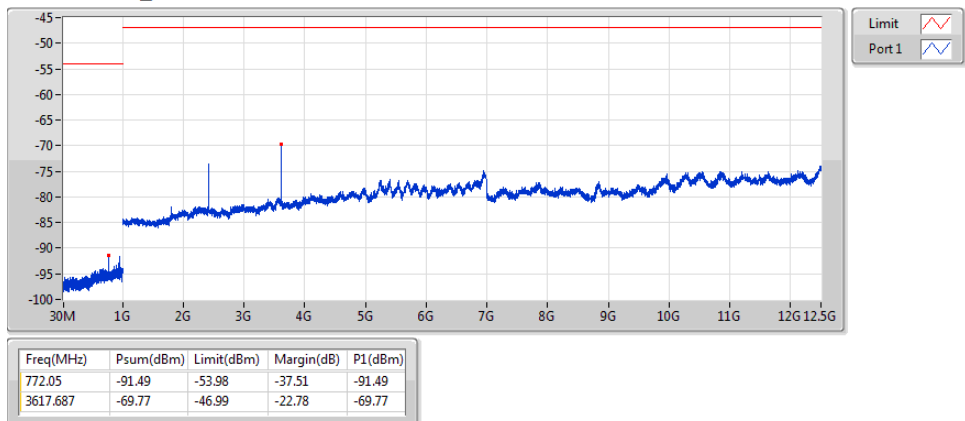
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802.11g_Nss1_1TX

CSE-RX

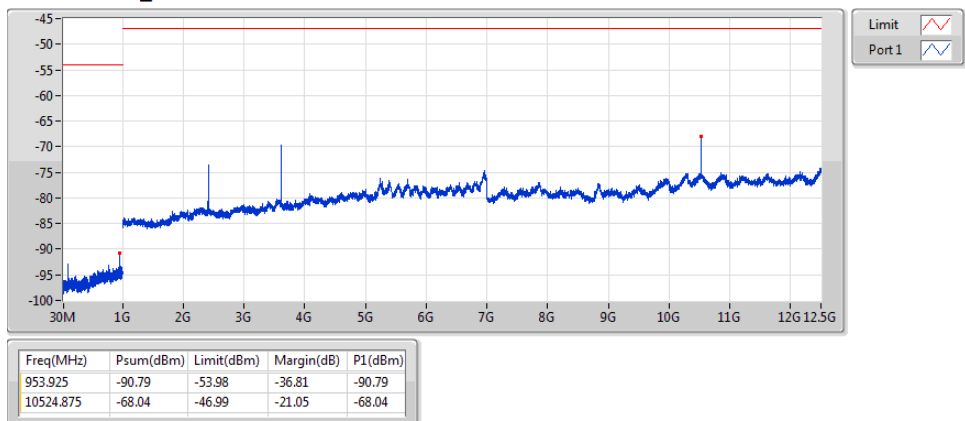
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802.11g_Nss1_1TX

CSE-RX

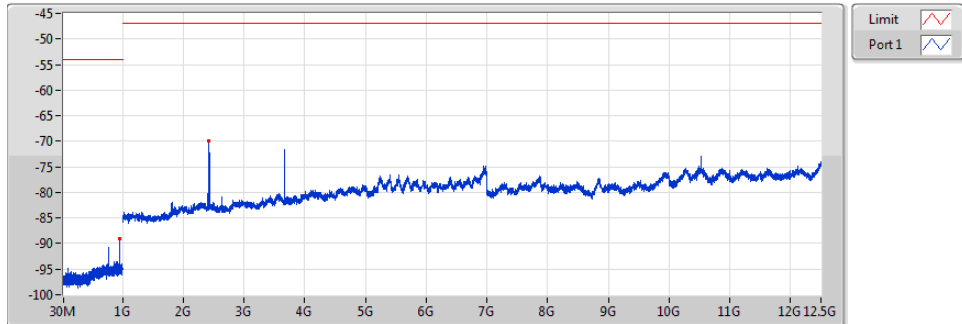
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802.11g_Nss1_1TX

CSE-RX

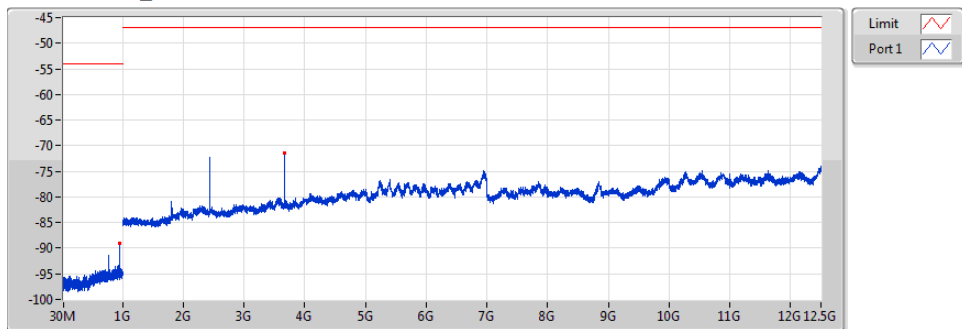
2442MHz_TnomVnom



802.11g_Nss1_1TX

CSE-RX

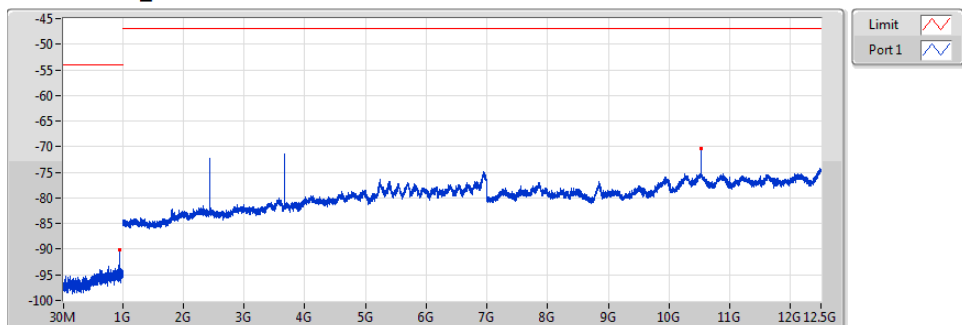
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802.11g_Nss1_1TX

CSE-RX

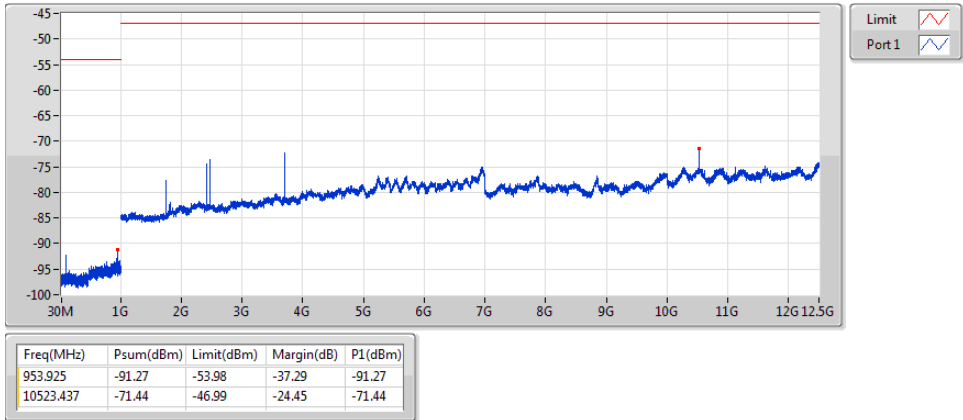
2442MHz_TnomVmax



802.11g_Nss1_1TX

CSE-RX

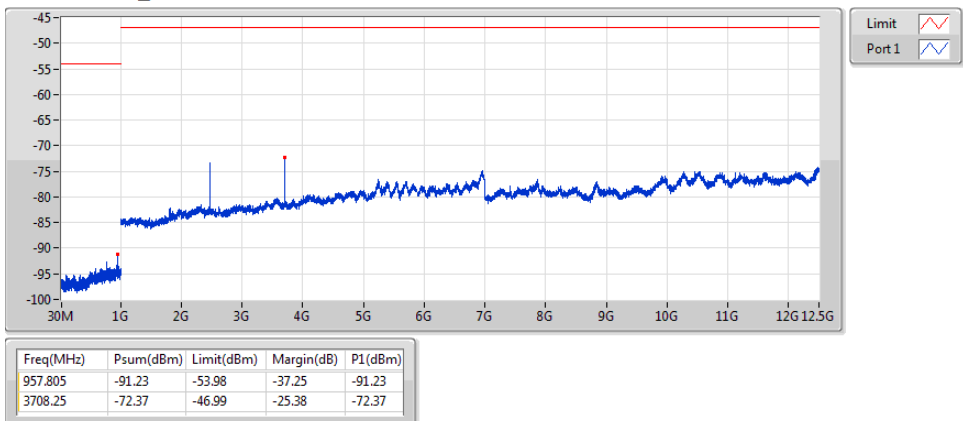
2472MHz_TnomVnom



802.11g_Nss1_1TX

CSE-RX

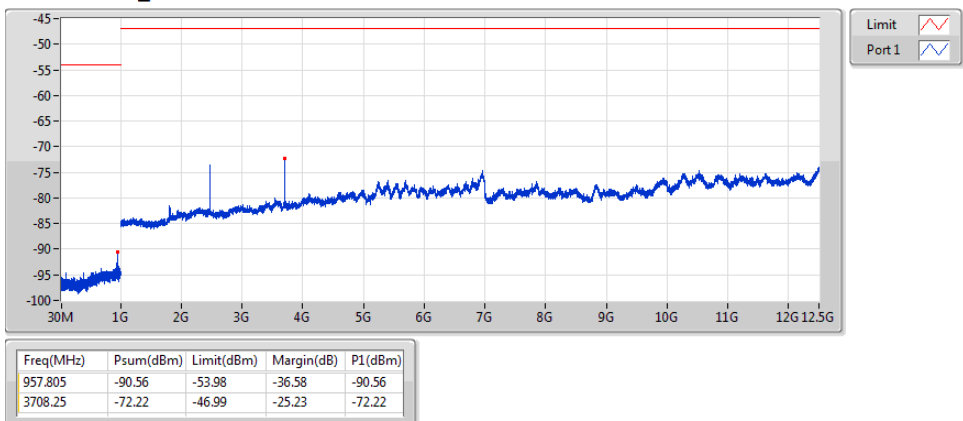
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802.11g_Nss1_1TX

CSE-RX

2472MHz_TnomVmax

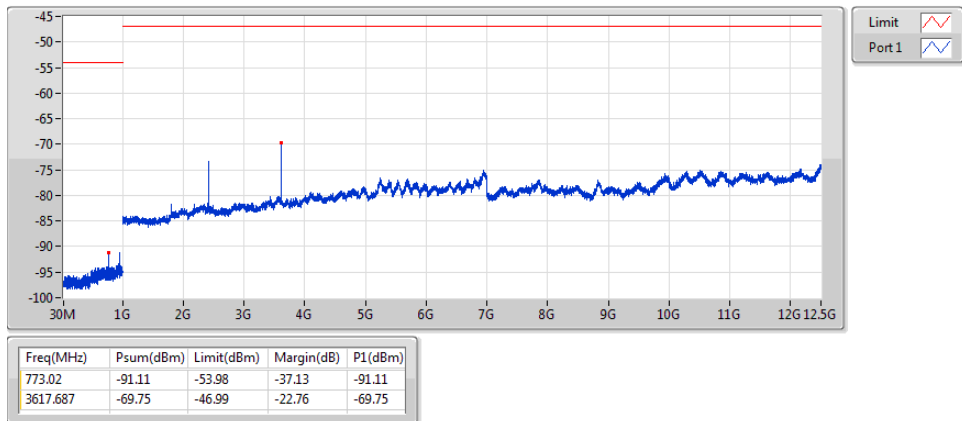




802.11n HT20_Nss1,(MCS0)_1TX

CSE-RX

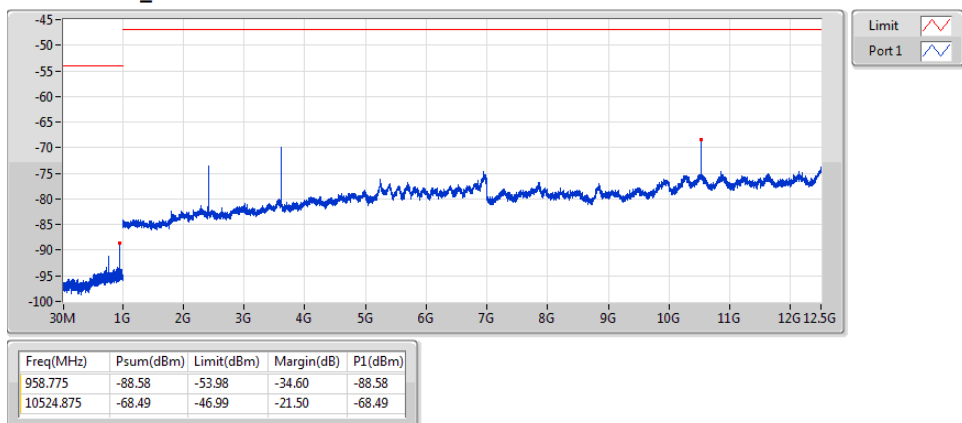
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802.11n HT20_Nss1,(MCS0)_1TX

CSE-RX

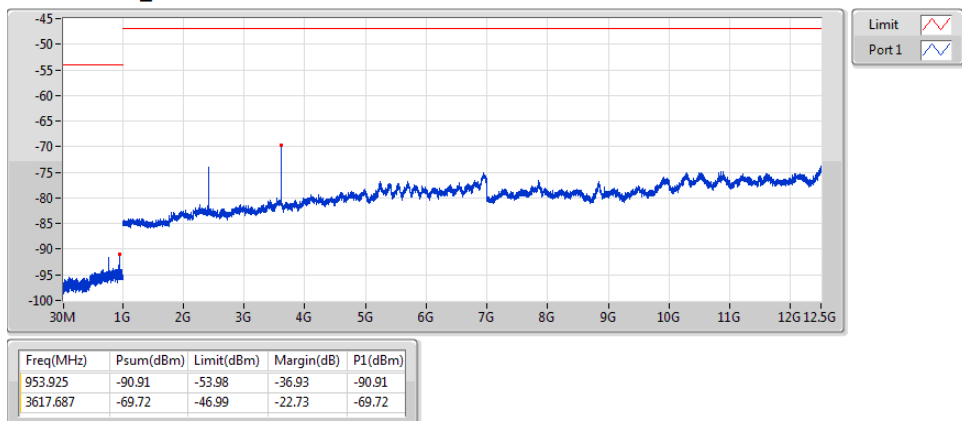
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802.11n HT20_Nss1,(MCS0)_1TX

CSE-RX

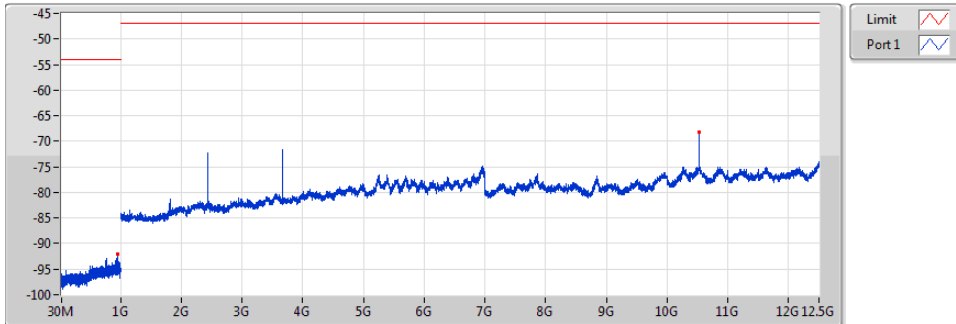
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802.11n HT20_Nss1,(MCS0)_1TX

CSE-RX

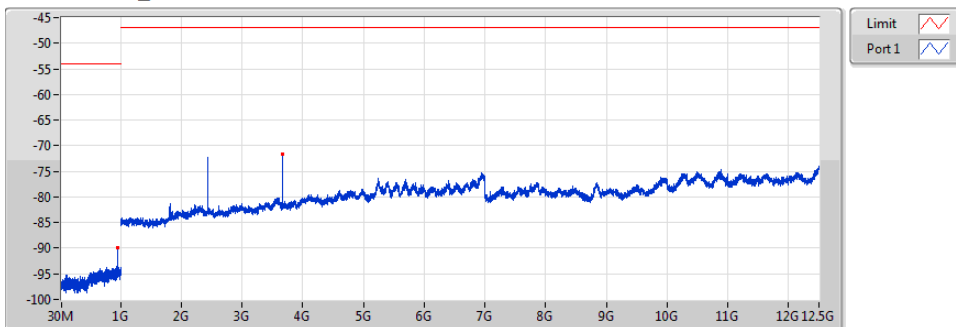
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802.11n HT20_Nss1,(MCS0)_1TX

CSE-RX

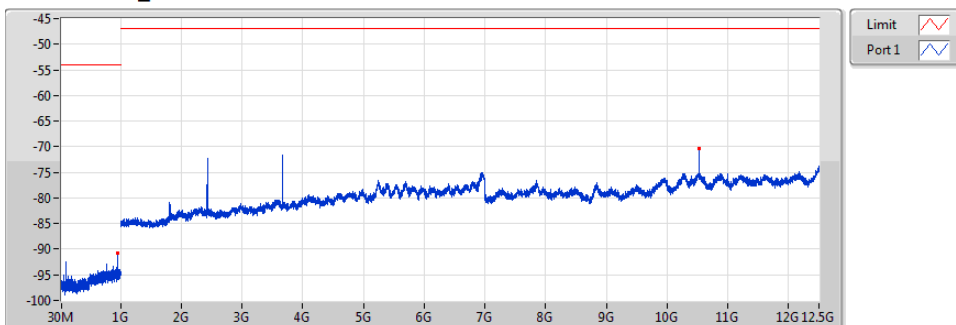
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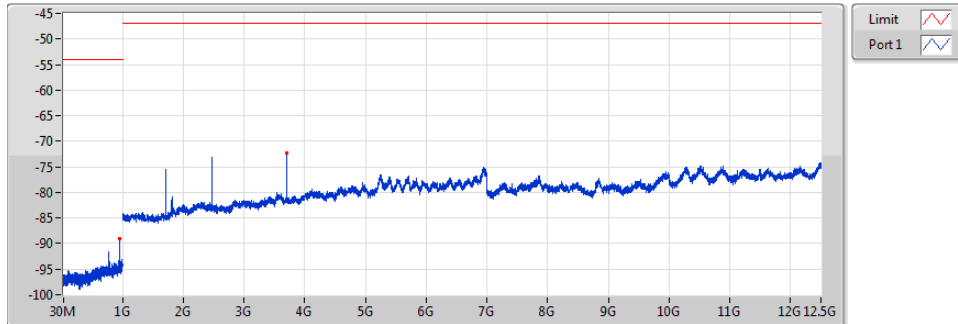
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802.11n HT20_Nss1,(MCS0)_1TX

CSE-RX

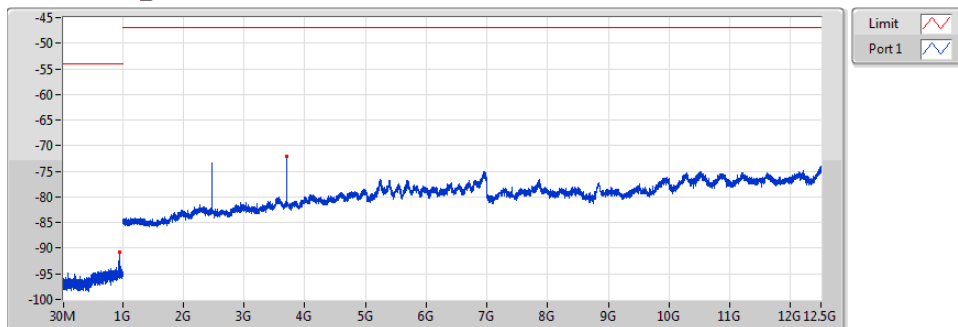
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802.11n HT20_Nss1,(MCS0)_1TX

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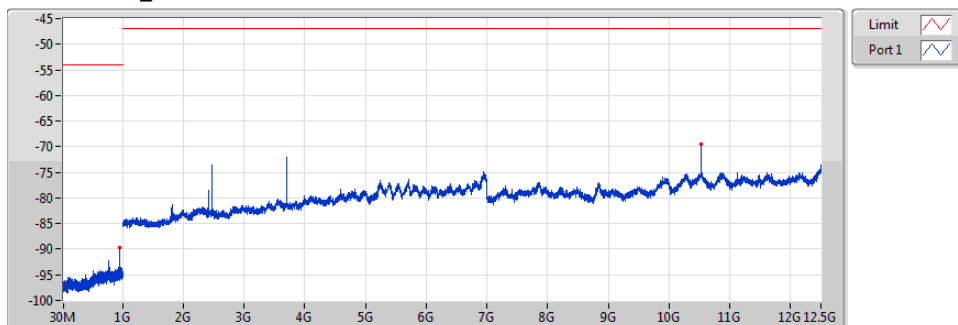
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802.11n HT20_Nss1,(MCS0)_1TX

CSE-RX

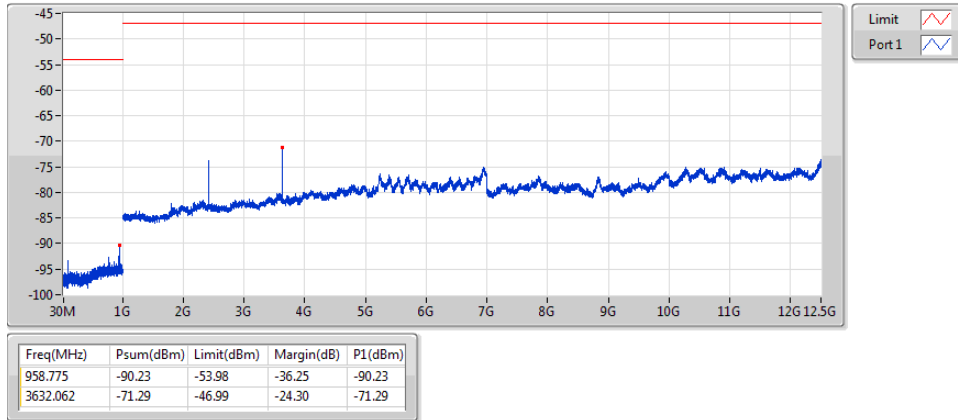
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802.11n HT40_Nss1,(MCS0)_1TX

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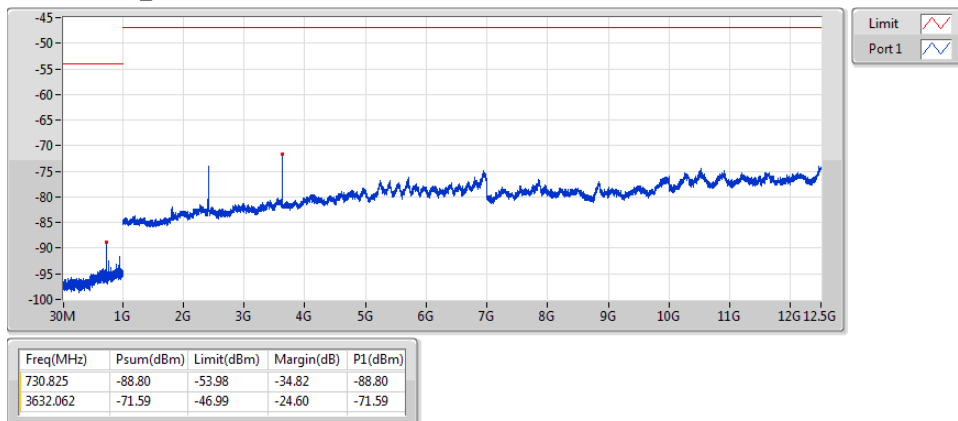
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802.11n HT40_Nss1,(MCS0)_1TX

CSE-RX

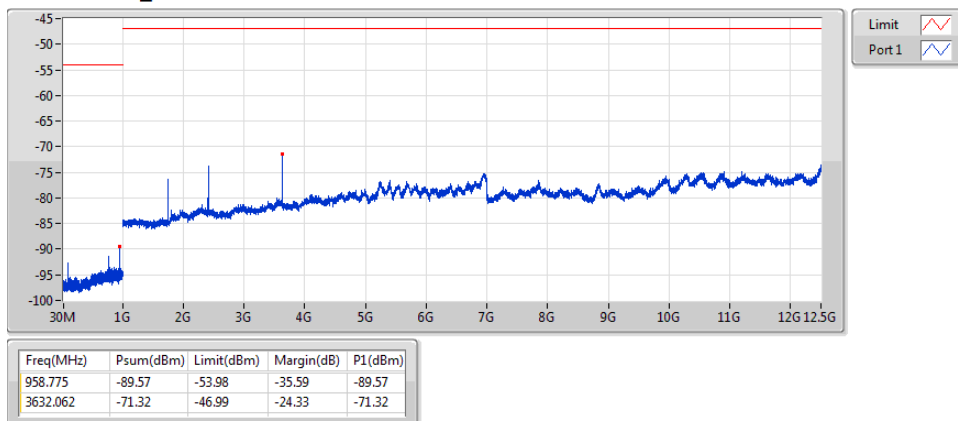
2422MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

CSE-RX

2422MHz_TnomVmax

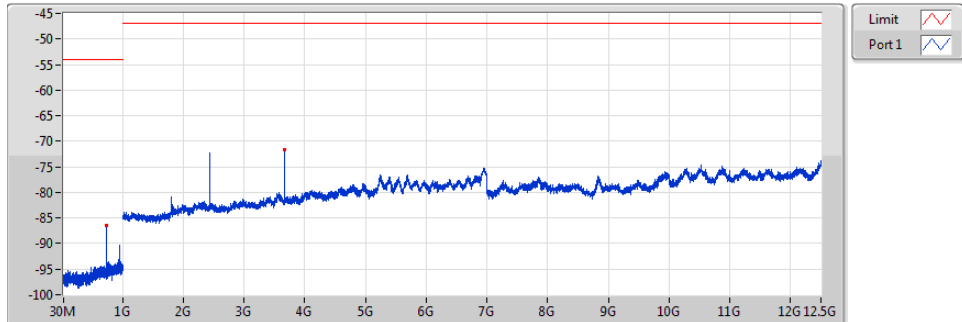




802.11n HT40_Nss1,(MCS0)_1TX

CSE-RX

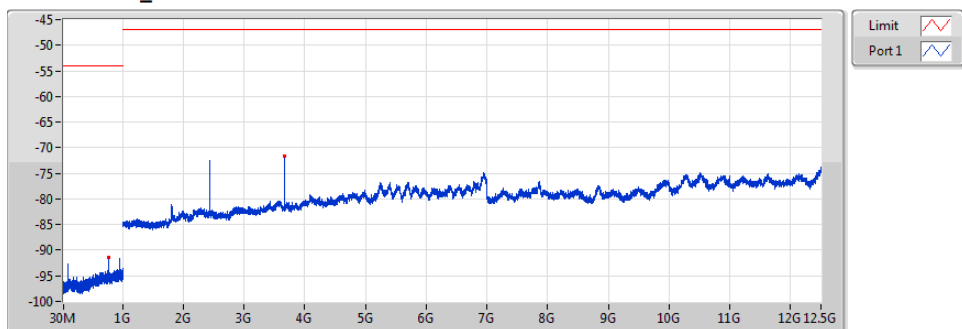
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802.11n HT40_Nss1,(MCS0)_1TX

CSE-RX

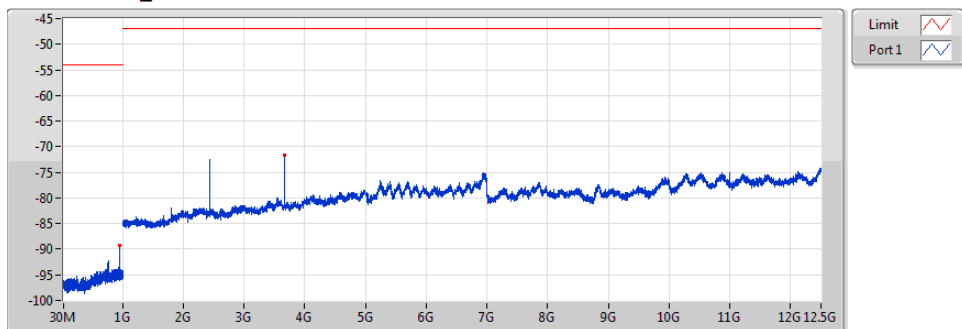
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802.11n HT40_Nss1,(MCS0)_1TX

CSE-RX

2442MHz_TnomVmax

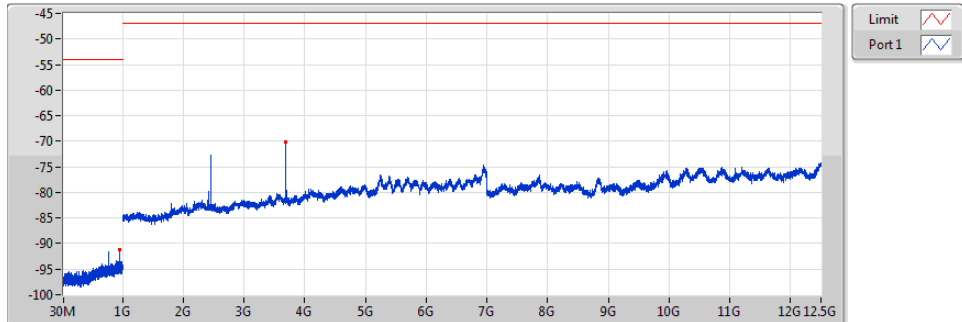




802.11n HT40_Nss1,(MCS0)_1TX

CSE-RX

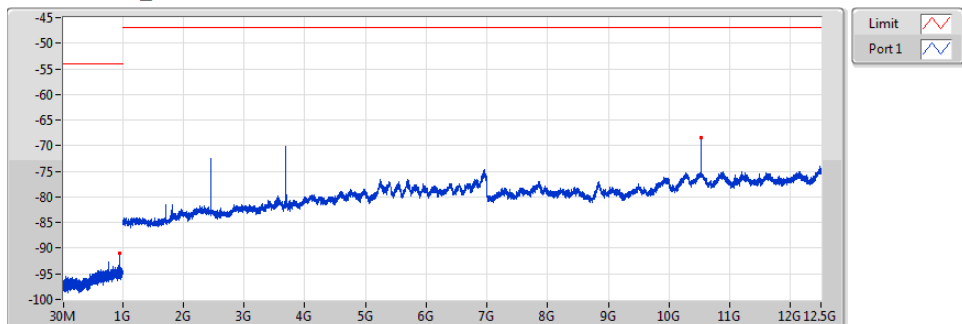
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802.11n HT40_Nss1,(MCS0)_1TX

CSE-RX

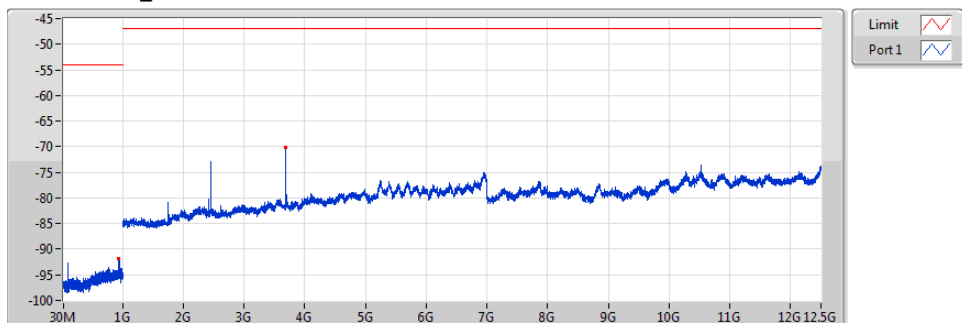
2462MHz_TnomVmin



802.11n HT40_Nss1,(MCS0)_1TX

CSE-RX

2462MHz_TnomVmax



Appendix I. Antenna Information

2.4 GHz / 5.5 GHz Dipole 2 dBi Antenna for Reverse Polarity SMA



ORDERING INFORMATION

Order Number	Description
001-0009	2.4/5.5GHz Dipole Antenna for Reverse Polarity SMA Connector.
080-0001	U.FL to Reverse Polarity SMA Cable, 105mm

Table 1 Orderable Part Numbers

SPECIFICATIONS

Specification	Value
2.4Ghz Band Peak Gain	+2 dBi
5 GHz Band Peak Gain	+2 dBi
Impedance	50 ohms, Nominal
Type	Dipole
Polarization	Linear Vertical
VSWR	≤2.0 : 1, Maximum
Frequency	2400-2500MHz, 5150-5850MHz
Weight	22g
Size	137 × 13 mm
Antenna Color	Black
Operating Temp	−20°C + 65°C
UL Rating	UL 94HB

Table 2 Specifications

PHYSICAL DIMENSIONS (MM)

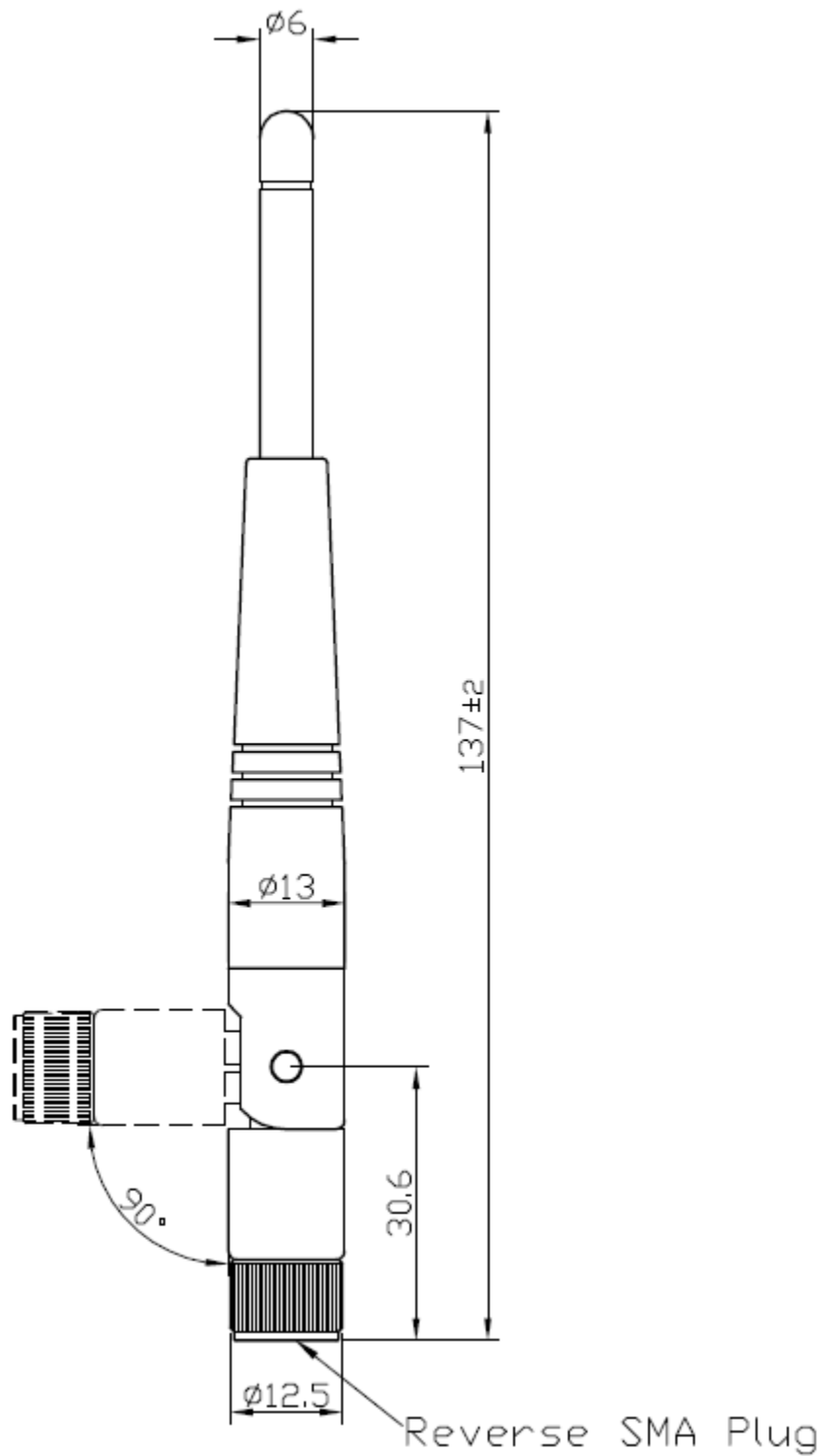


Figure 1 Physical Dimensions

TYPICAL ANTENNA REFLECTION PERFORMANCE

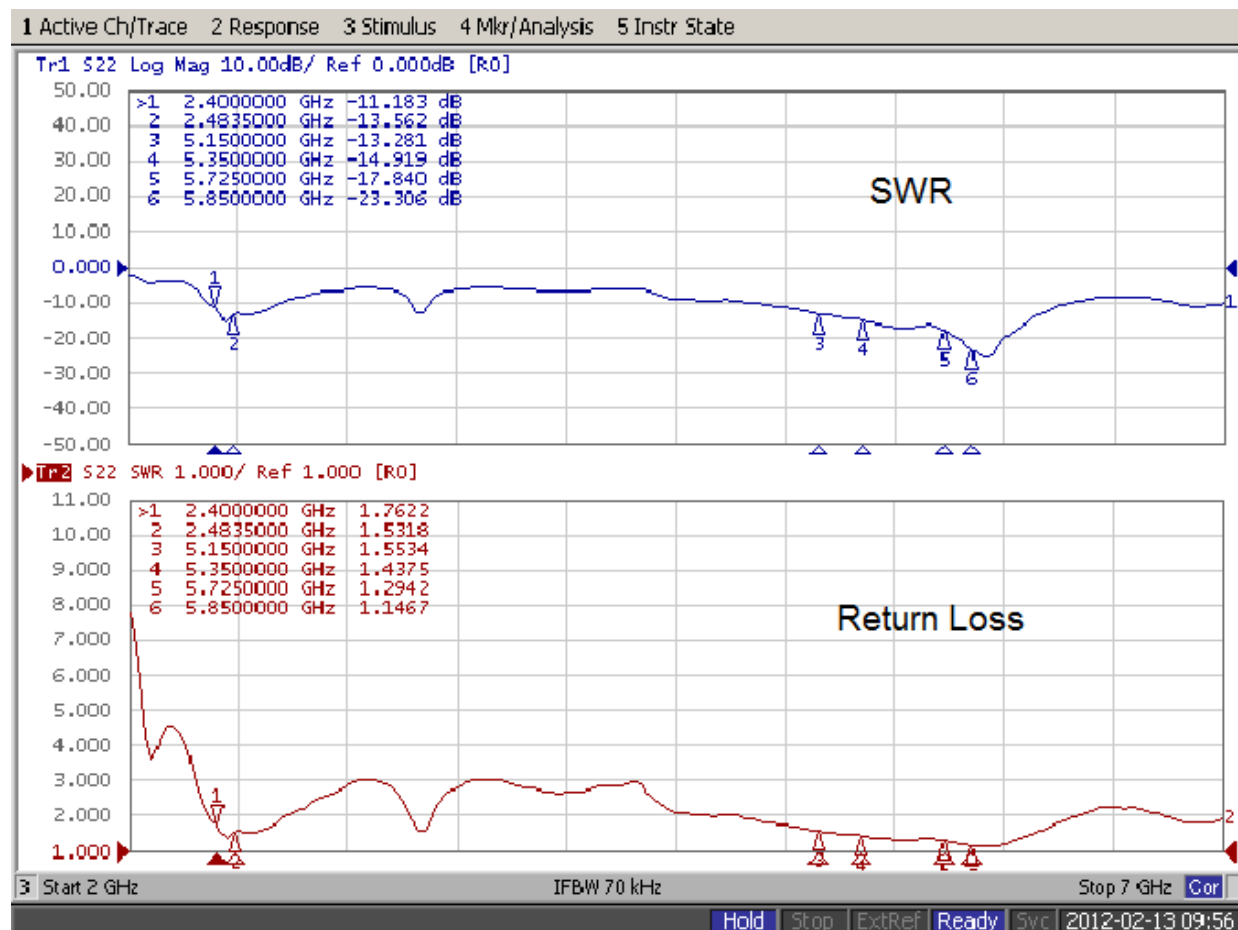


Figure 2 Typical Antenna Reflection Performance

TYPICAL ANTENNA RADIATION PERFORMANCE

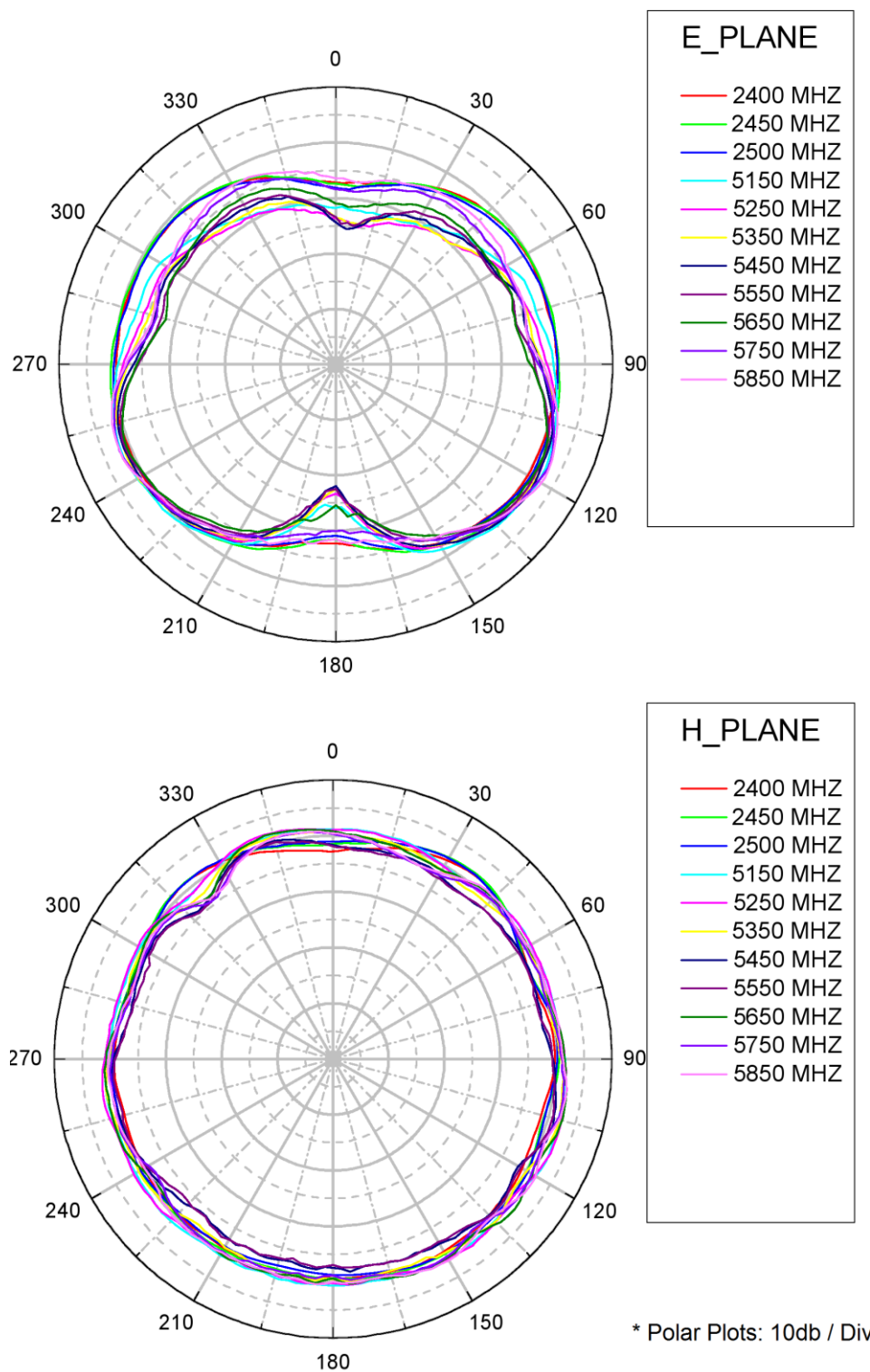


Figure 3 Typical Antenna Radiation Performance

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2.4 / 5.5 GHz FlexPIFA 3 dBi Antenna w/U.FL Cable, 100mm



ORDERING INFORMATION

Order Number	Description
001-0016	2.4 / 5.5 GHz FlexPIFA Antenna w/U.FL cable, 100mm
001-0021	2.4 / 5.5 GHz FlexPIFA Antenna w/MHF4L cable, 100mm

Table 1 Orderable Part Numbers

KEY FEATURES

- Can be installed on different non-conductive surfaces and thicknesses.
- Can be installed near metals or the human body.
- Dual Band Antenna: 2.4 GHz and 5 GHz
- Can be installed on flat or curved surfaces.
- Quick and easy Installation
- Adhesive holds to surface during humidity exposure and hot/cold cycles.
- RoHS Compliant

SPECIFICATIONS

Specification	Value
2.4 GHz Band Peak Gain	+2.5 dBi
5 GHz Band Peak Gain	+3 dBi
2.4 GHz Average Gain	> -1.9 dBi
5 GHz Average Gain	> -4.0 dBi
Impedance	50 ohms
Type	Flexible Planar Inverted F Antenna (FlexPIFA)
Polarization	Linear
VSWR	<3.0:1, 2400 – 2480 MHz
	<3.0:1, 4900 – 5900 MHz
Frequency	2400 - 2480 MHz, 4900 - 5900 MHz
Weight	1.13g
Size	38.6mm × 12.7mm × 2.5mm
Antenna Color	Clear Yellow
Adhesive	3M 100MP
Operating Temp	-40°C to +85°C
Connector Mating Height	U.FL: 2.5mm Max
	MHF4L: 1.4mm Max

Table 2 Specifications

PHYSICAL DIMENSIONS (MM)

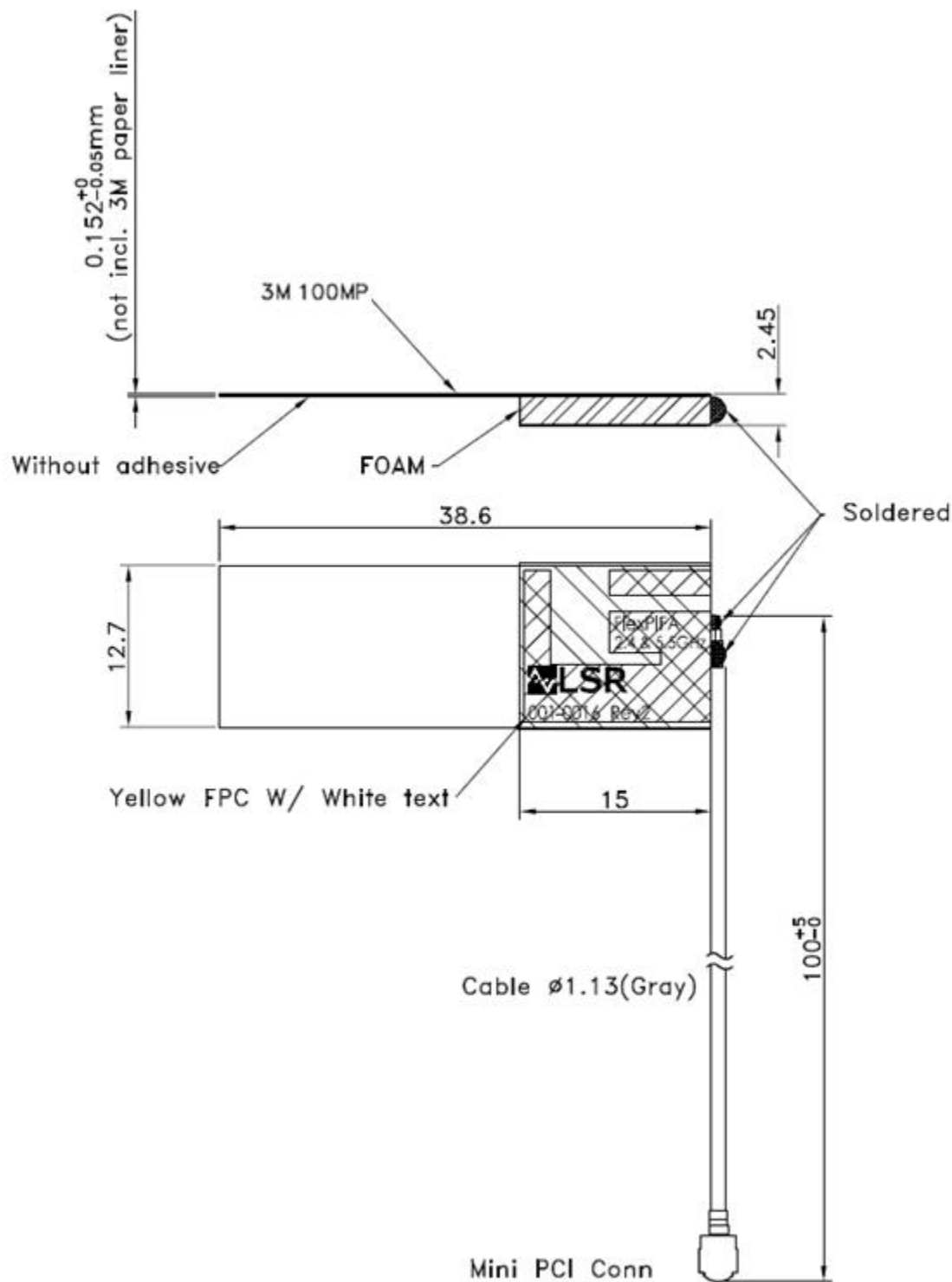


Figure 1 Physical Dimensions

TEST SETUP

Antenna measurements such as VSWR were measured with an Agilent E5071C Vector Network Analyzer. Radiation patterns were measured with an Agilent 5181A Signal Generator and Agilent E4445A Spectrum Analyzer in a 3 meter Anechoic Chamber.

Flat surface measurements were done with the antenna centered on a 1.5 mm thick plate of Polycarbonate. Curved surface measurements were taken by placing the antenna on the inside and outside of different diameter PVC tubing.

FLAT SURFACE ANTENNA MEASUREMENTS

VSWR

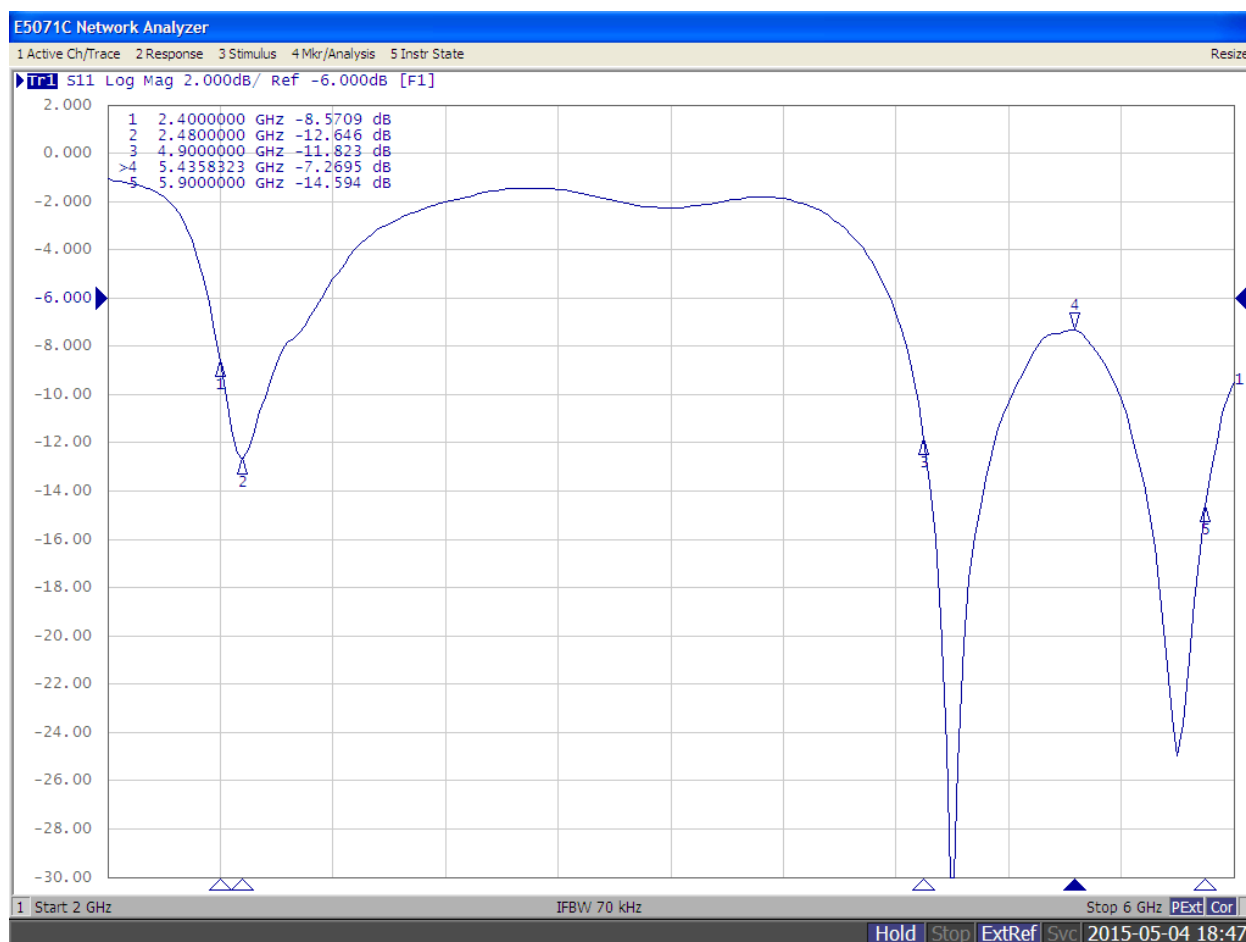


Figure 2 Antenna VSWR measured on a 1.5 mm thick plate of Polycarbonate

FLAT SURFACE ANTENNA RADIATION PERFORMANCE

FlexPIFA centered on a 1.5 mm thick plate of Polycarbonate

Antenna Measurement Set-Up:

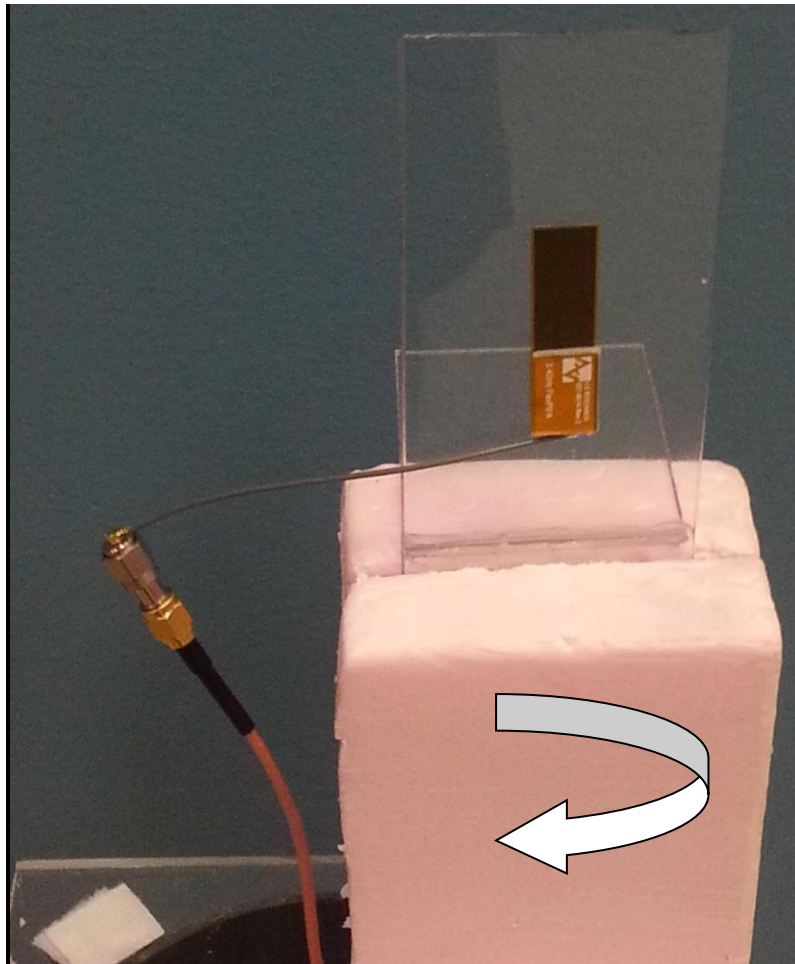


Figure 3 Vertical Orientation Set-Up

Vertical Orientation at 2440 MHz:

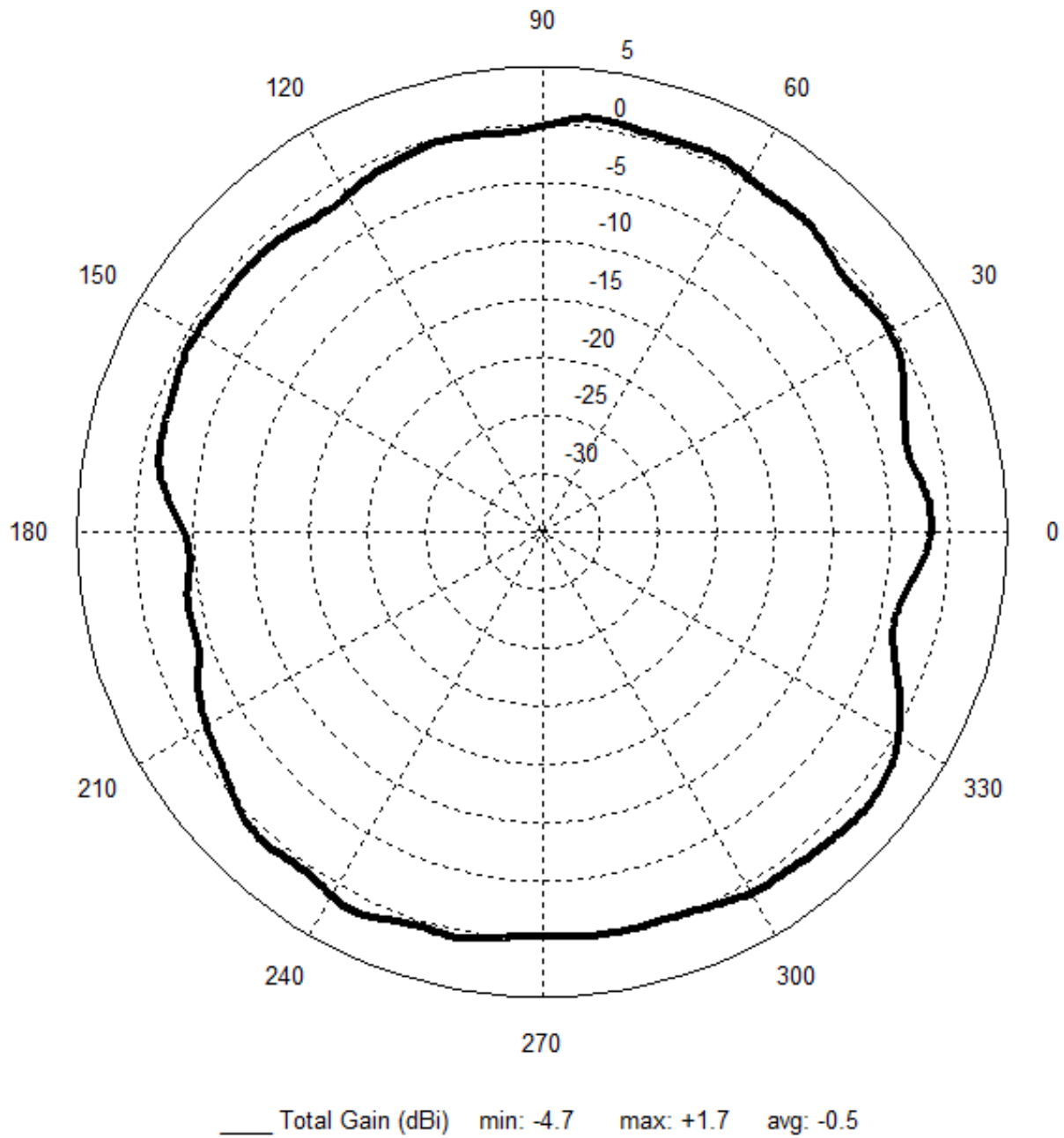


Figure 4 Vertical Orientation Pattern

Antenna Measurement Set-Up:

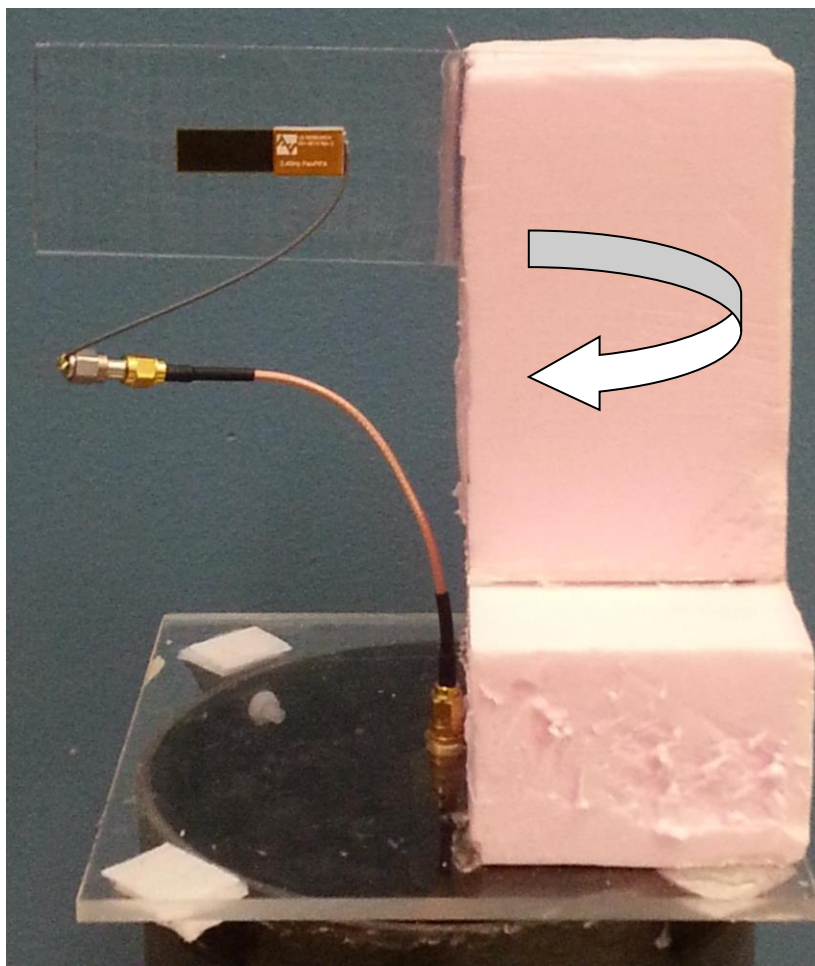


Figure 5 Horizontal Orientation Set-Up

Horizontal Orientation at 2440 MHz:

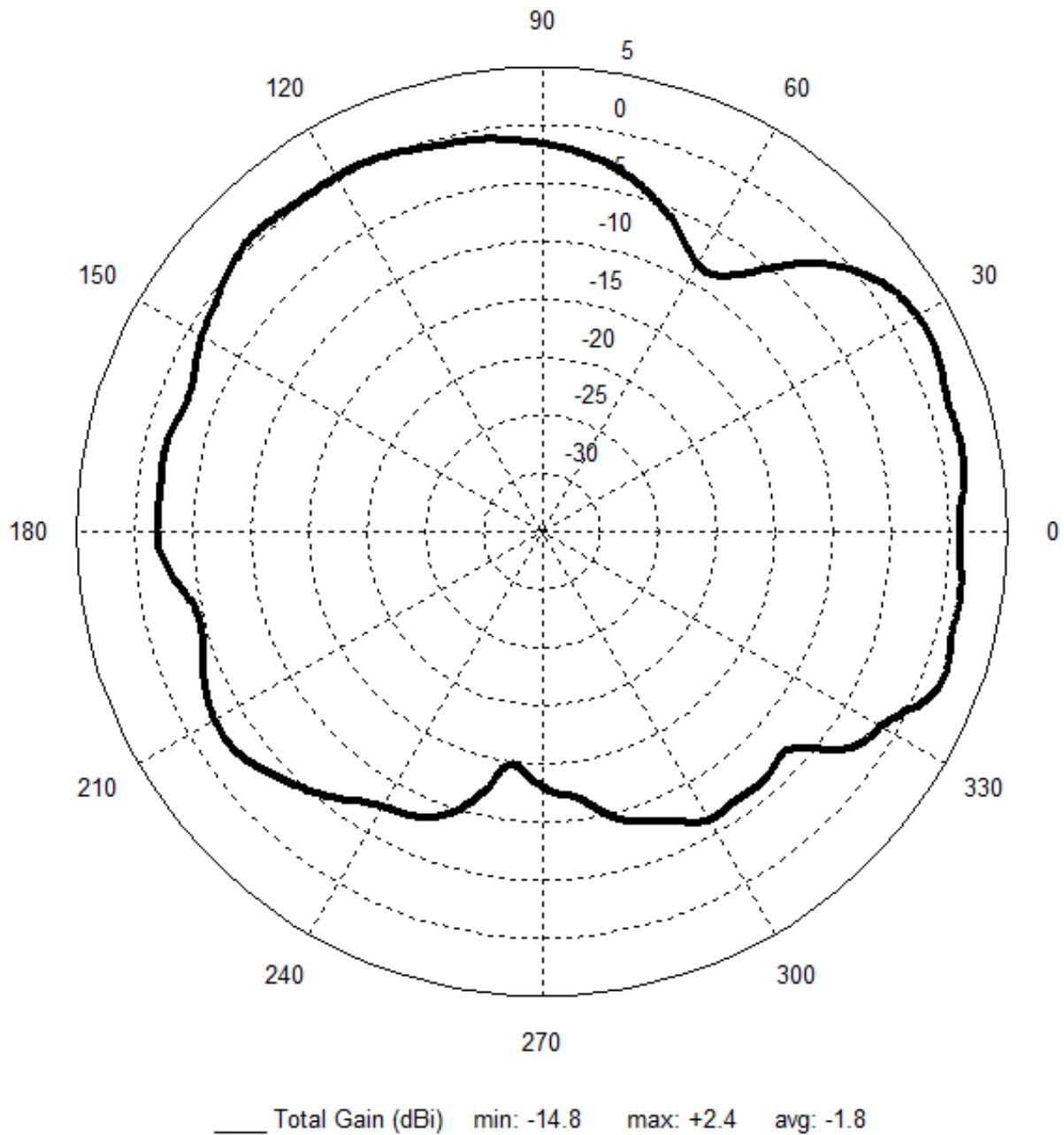


Figure 6 Horizontal Orientation Pattern

Antenna Measurement Set-Up:

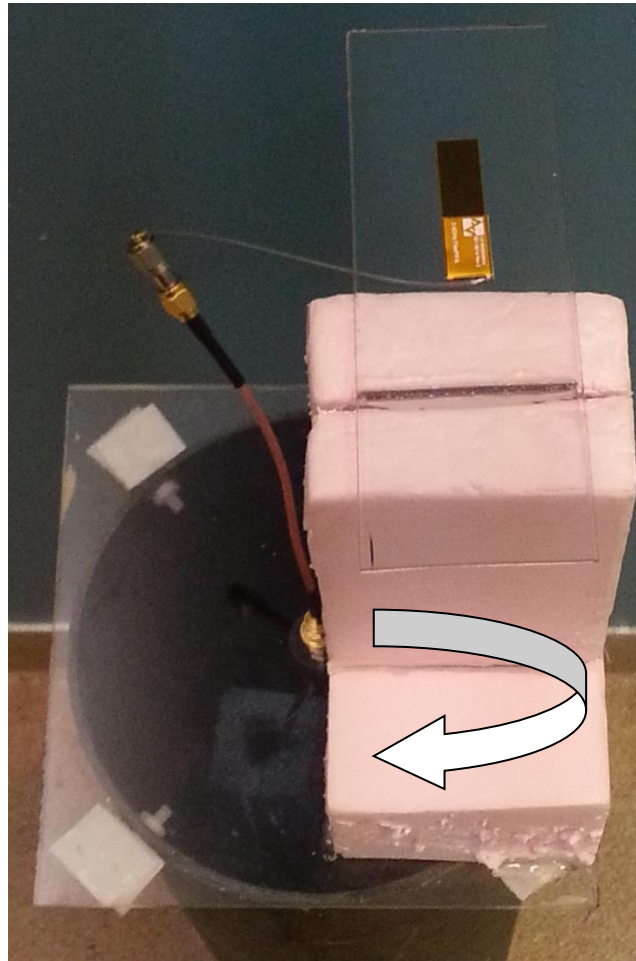


Figure 7 Flat Orientation Set-Up

Flat Orientation at 2440 MHz:

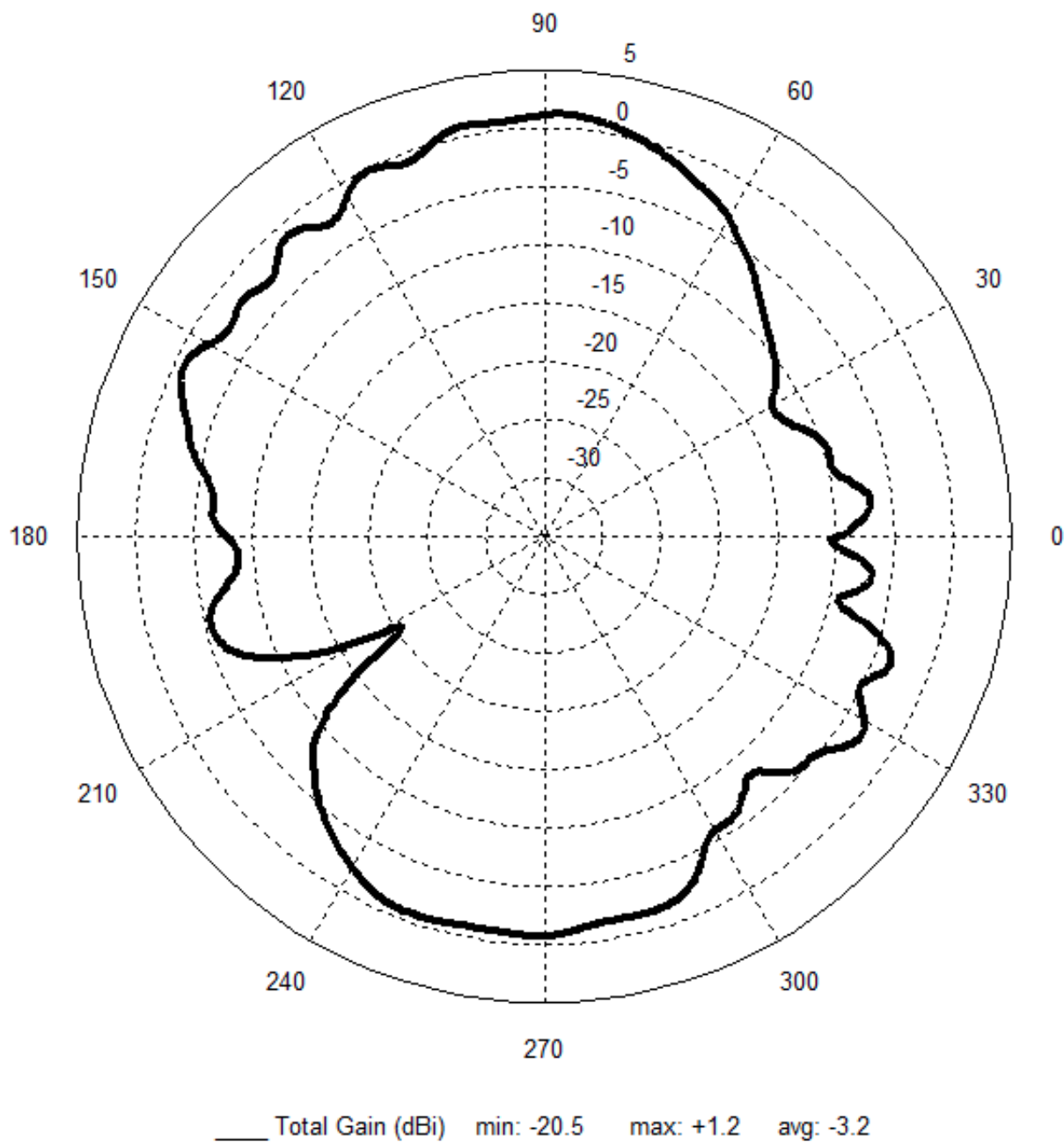


Figure 8 Flat Orientation Pattern

5 GHz Band

FlexPIFA centered on a 1.5 mm thick plate of Polycarbonate

Antenna Measurement Set-Up:

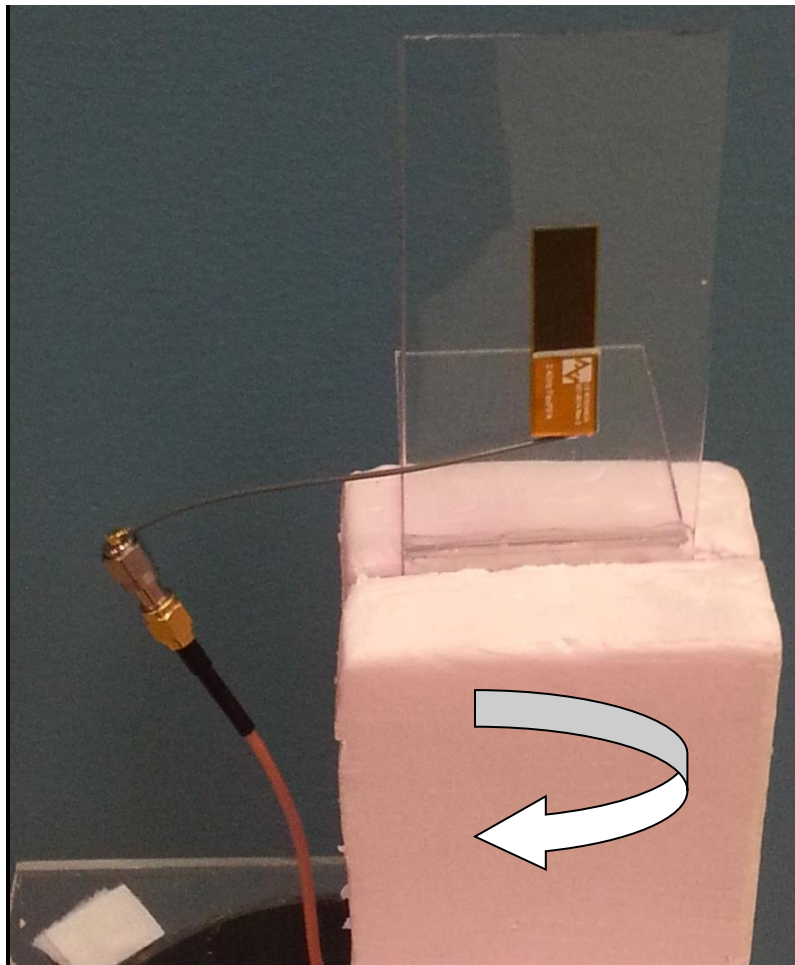


Figure 9 Vertical Orientation Set-Up

Vertical Orientation at 4900 MHz:

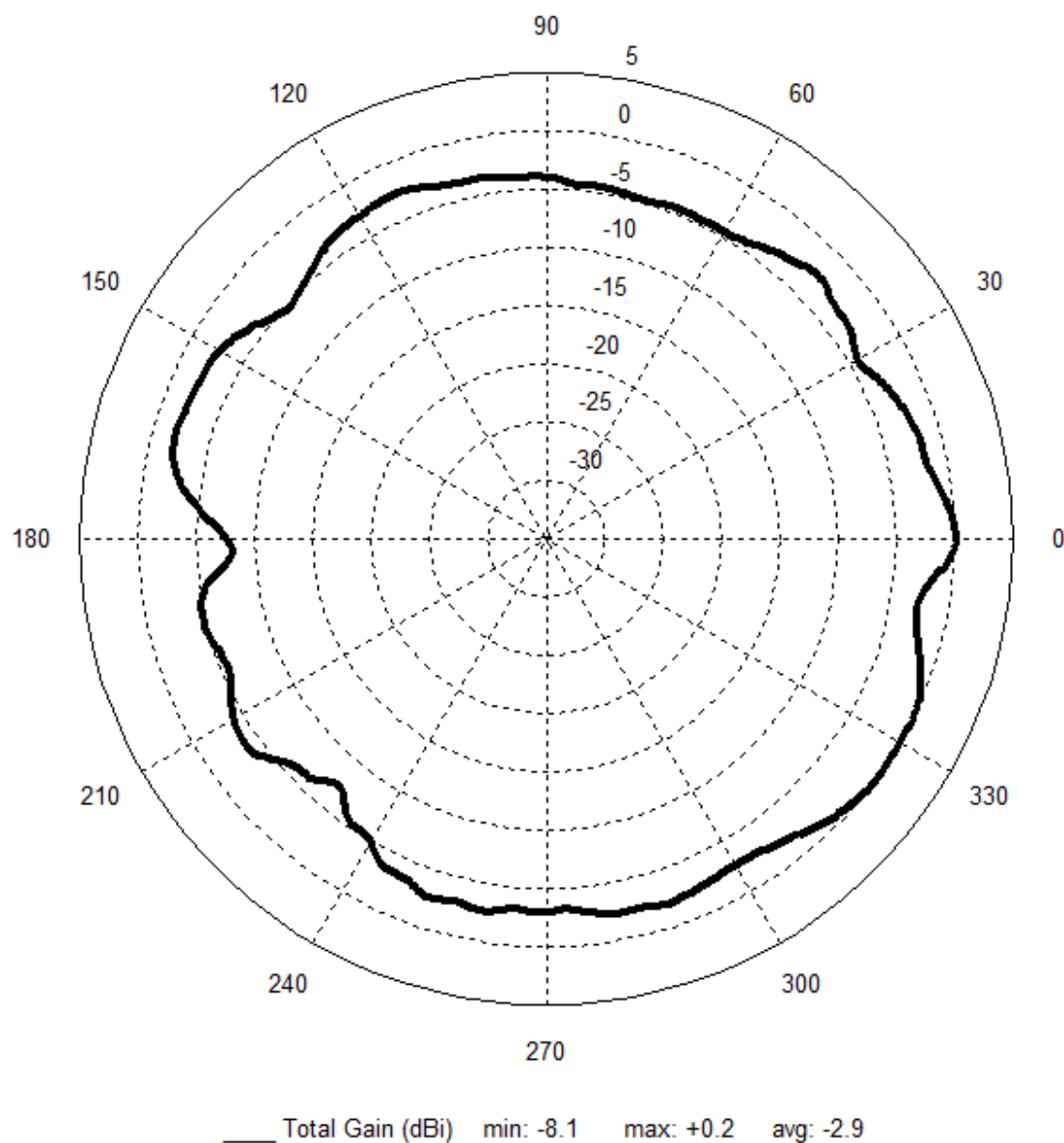


Figure 10 Vertical Orientation Pattern

Vertical Orientation at 5400 MHz:

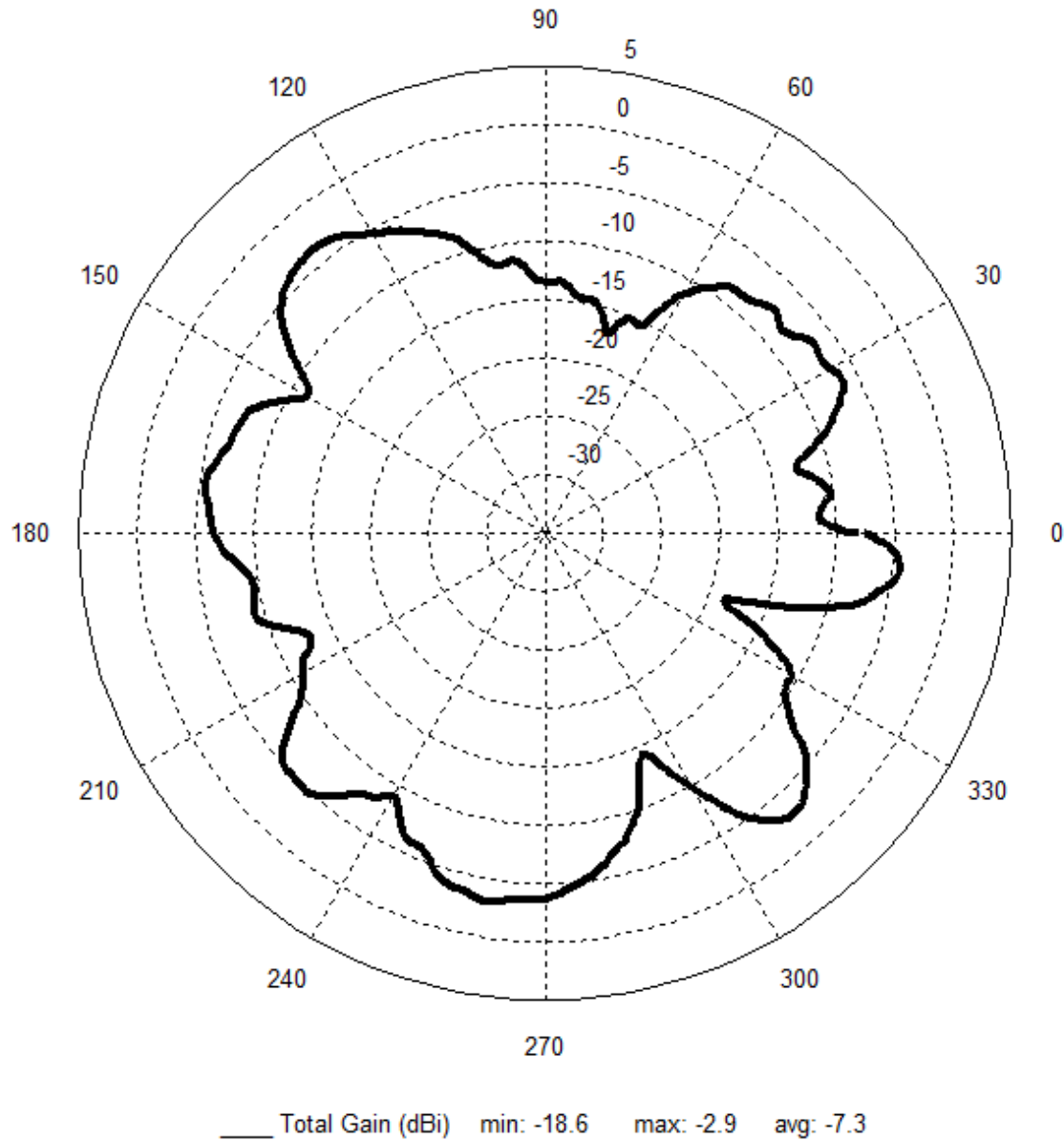


Figure 11 Vertical Orientation Pattern

Vertical Orientation at 5900 MHz:

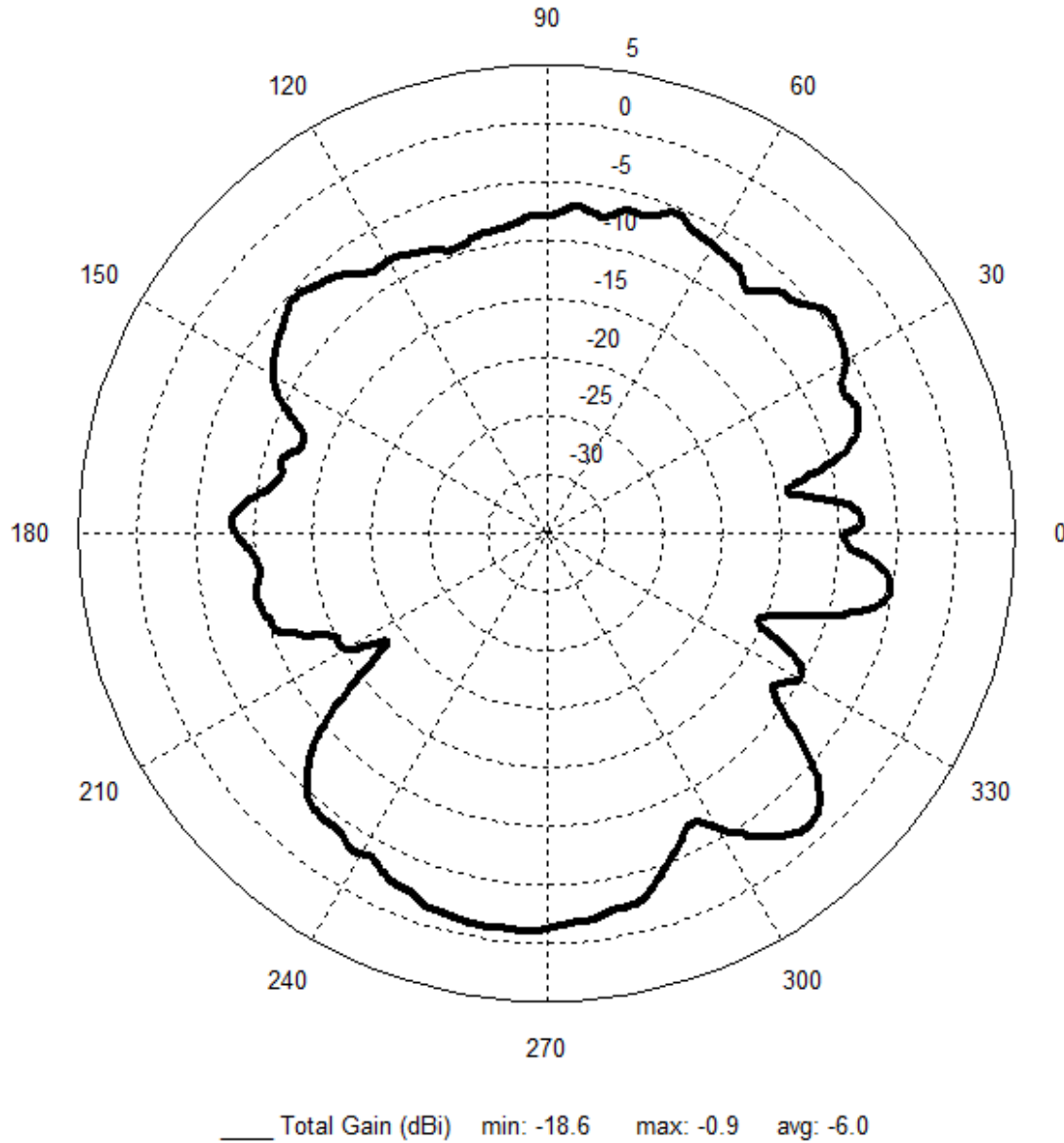


Figure 12 Vertical Orientation Pattern

Antenna Measurement Set-Up:

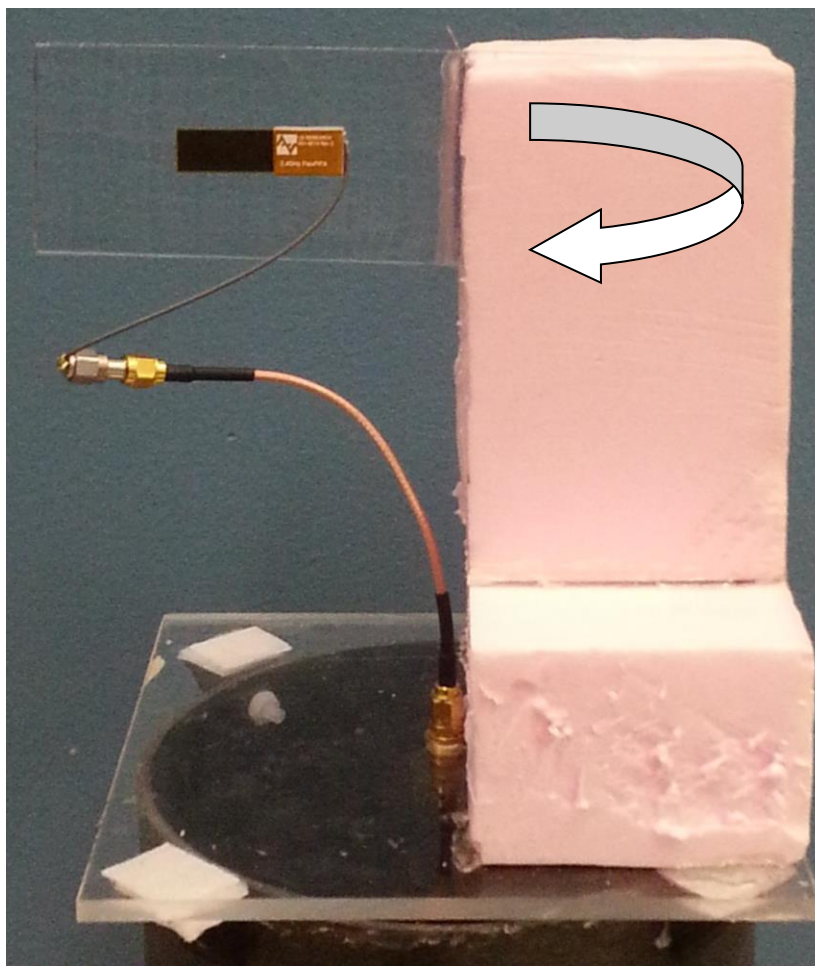


Figure 13 Horizontal Orientation Set-Up

Horizontal Orientation at 4900 MHz:

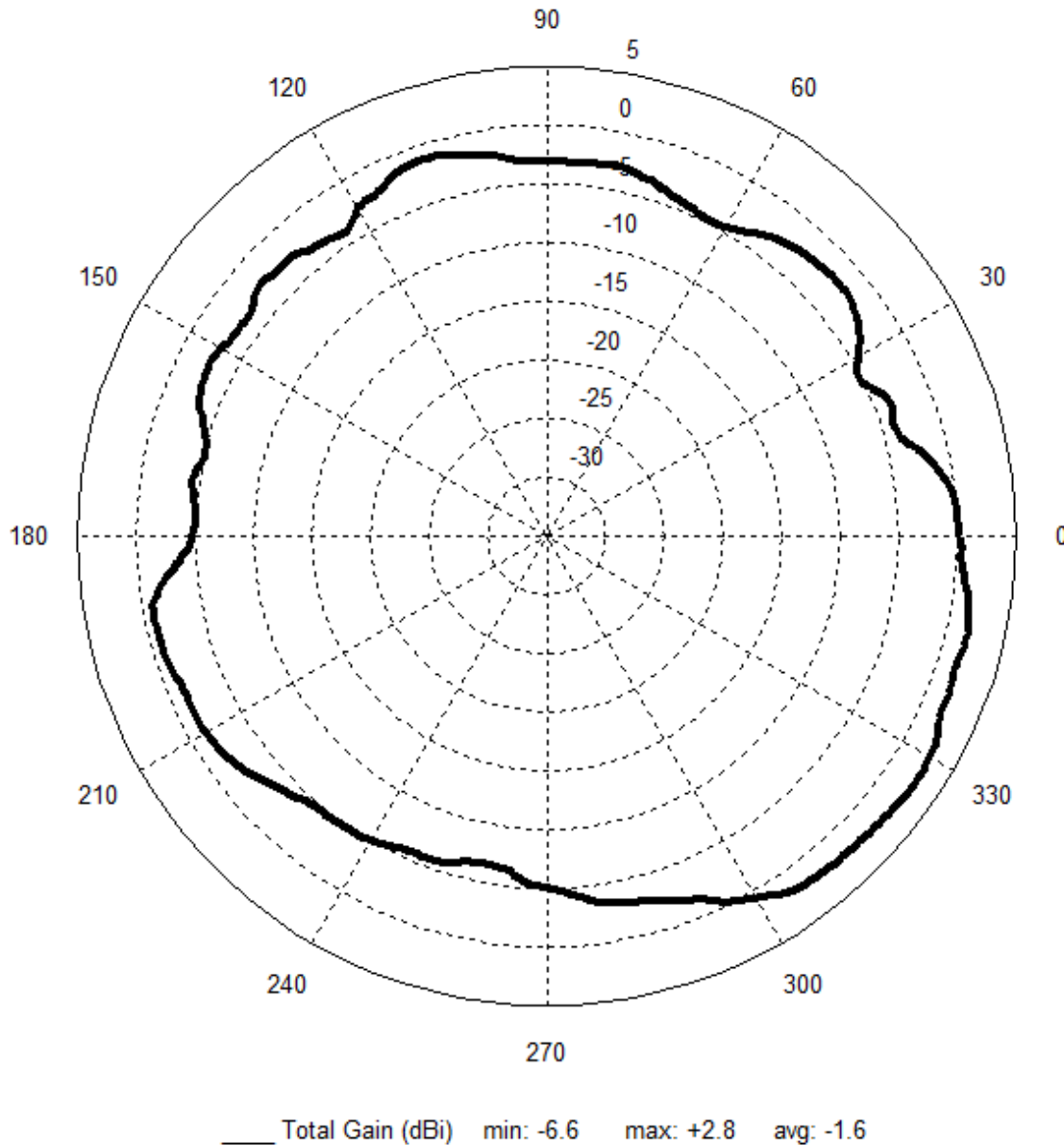


Figure 14 Horizontal Orientation Pattern

Horizontal Orientation at 5400 MHz:

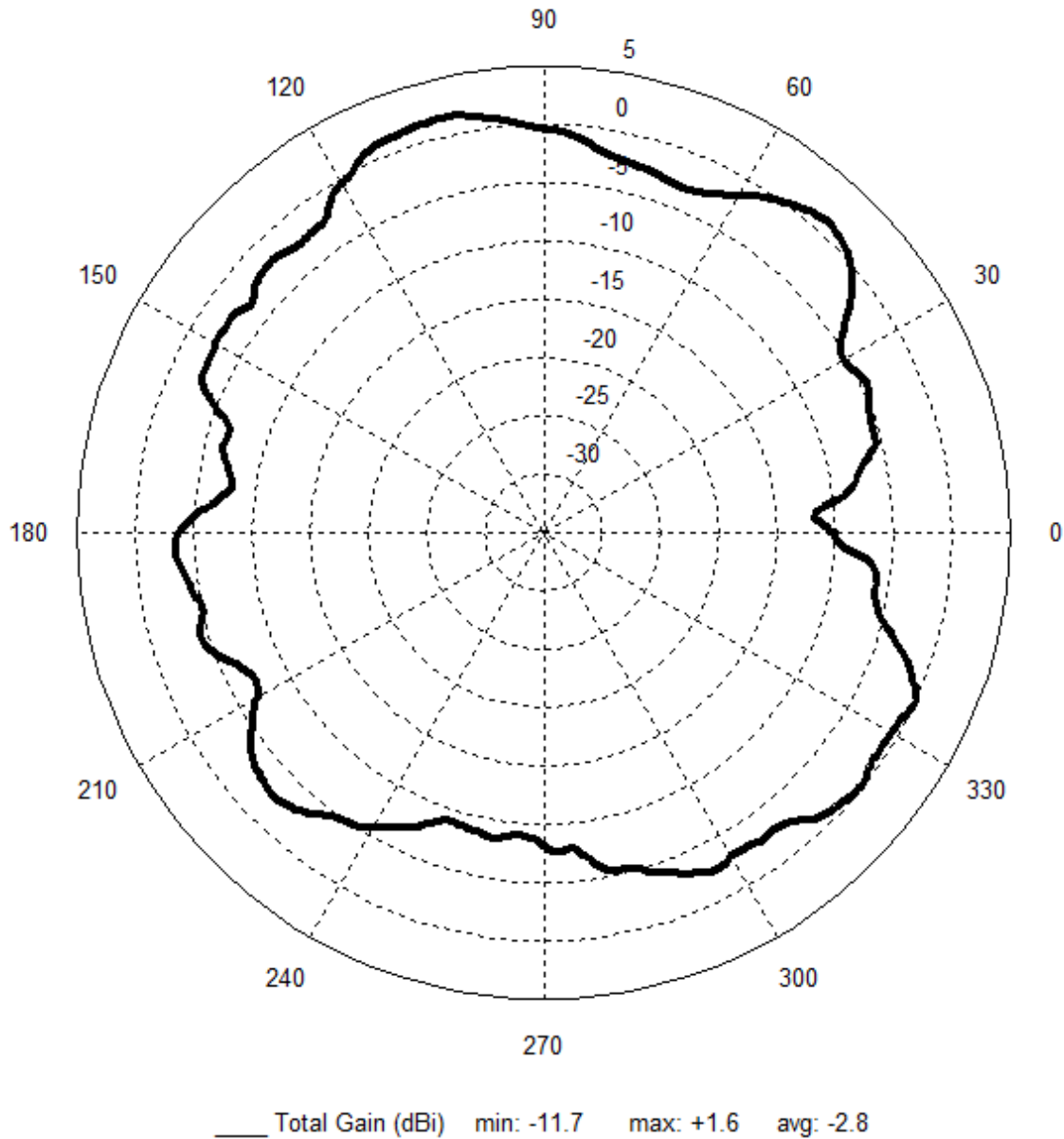


Figure 15 Horizontal Orientation Pattern

Horizontal Orientation at 5900 MHz:

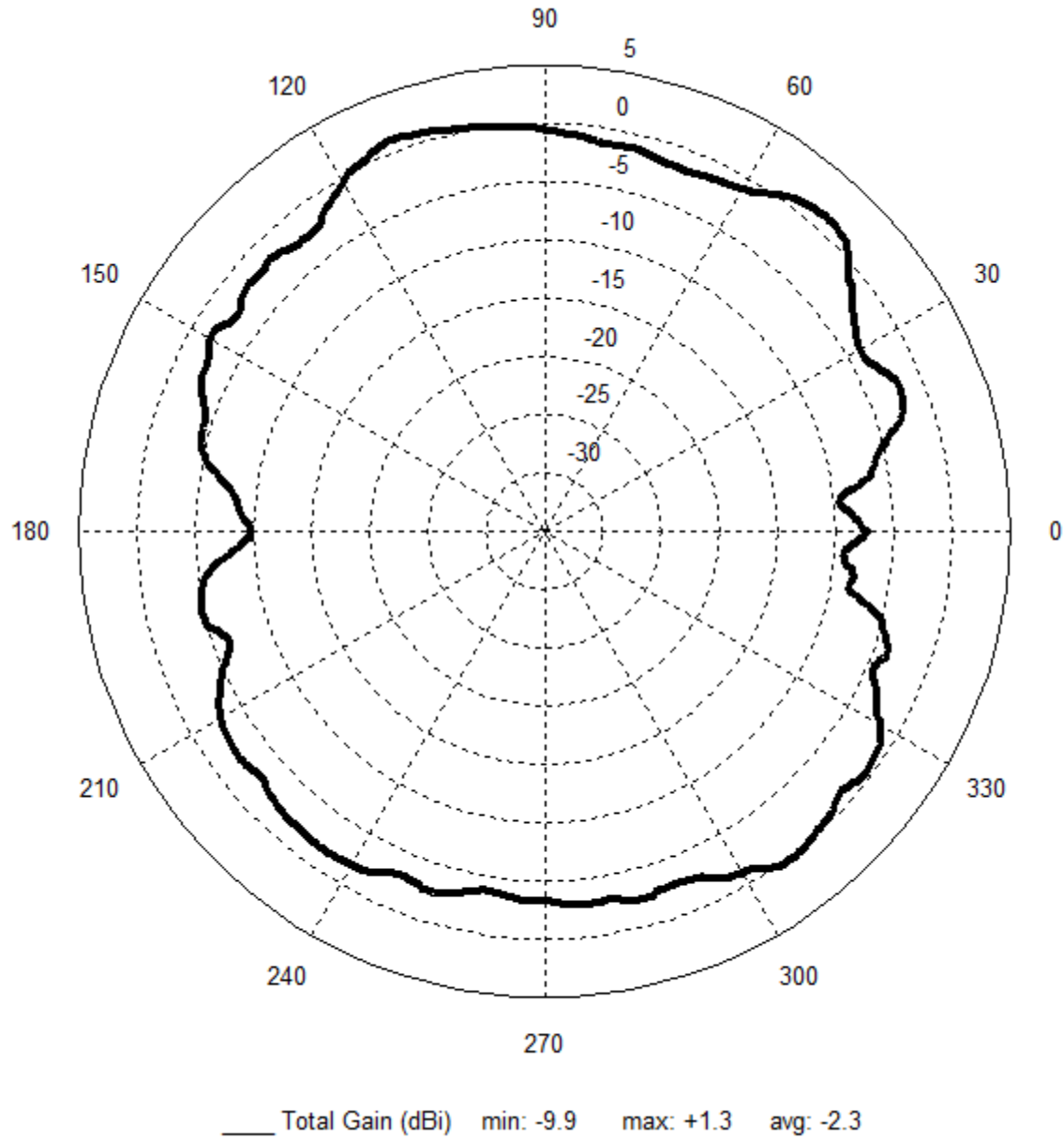


Figure 16 Horizontal Orientation Pattern

Antenna Measurement Set-Up:

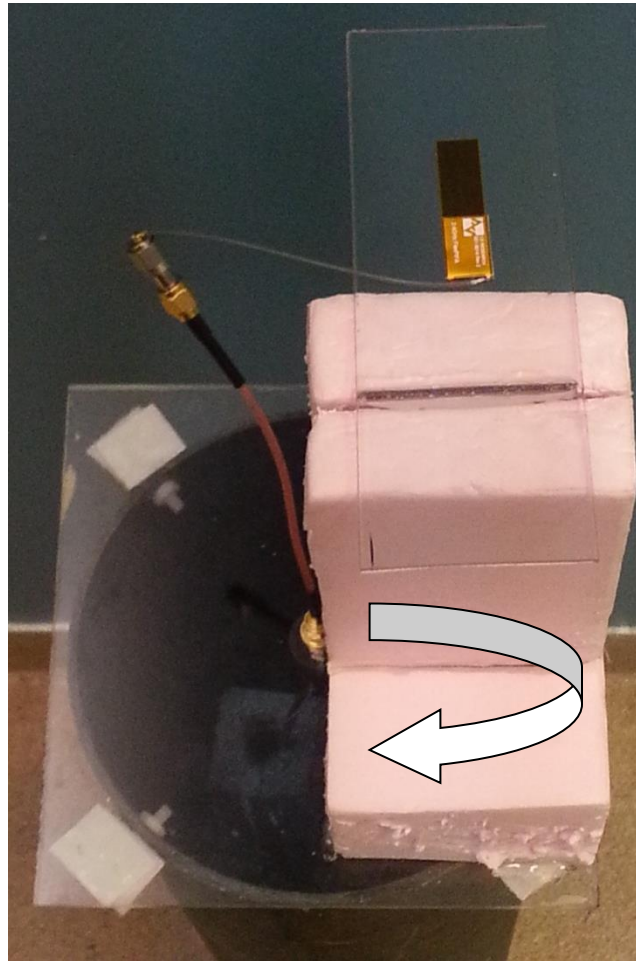


Figure 17 Flat Orientation Set-Up

Flat Orientation at 4900 MHz:

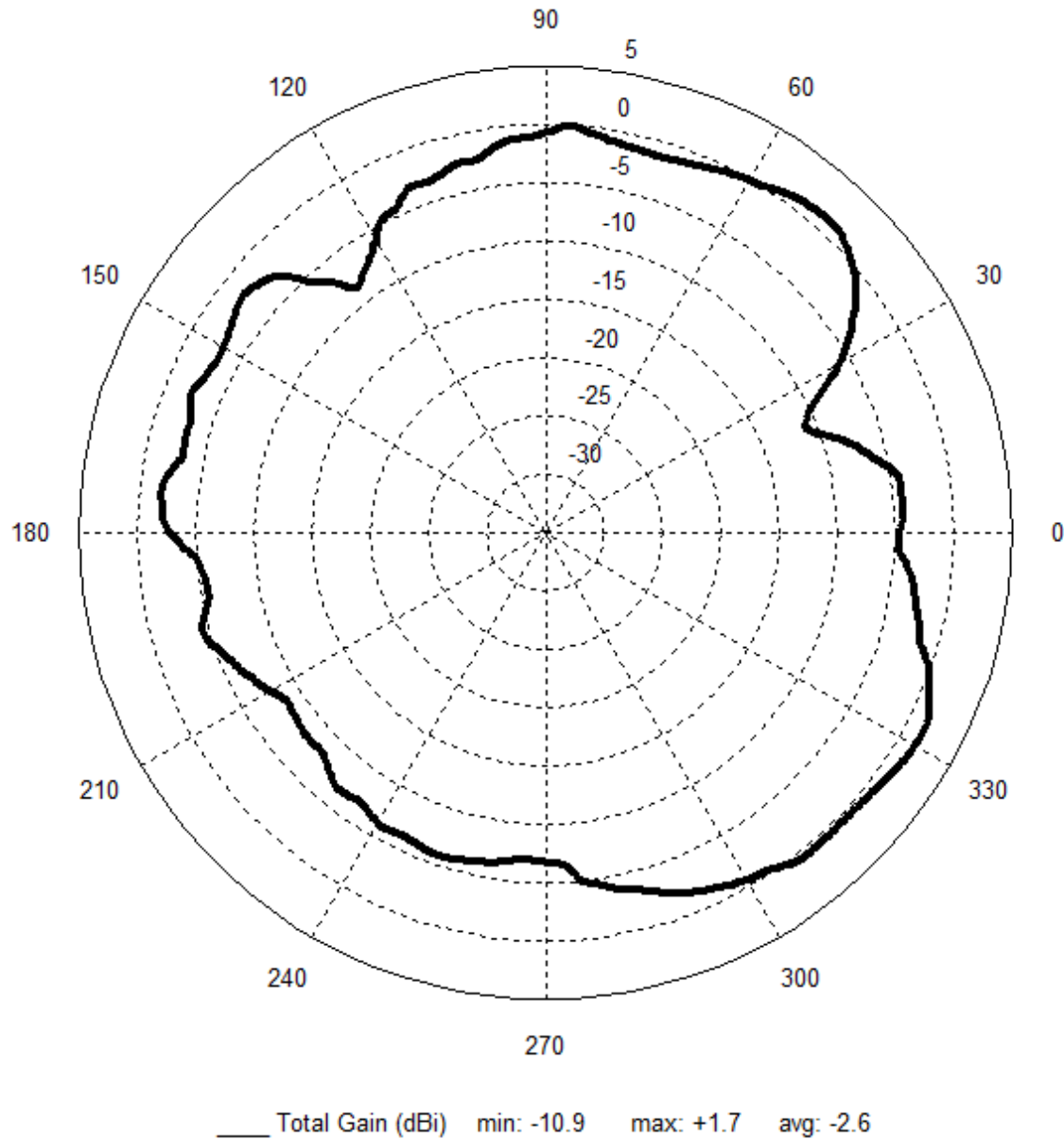


Figure 18 Flat Orientation Pattern

Flat Orientation at 5400 MHz:

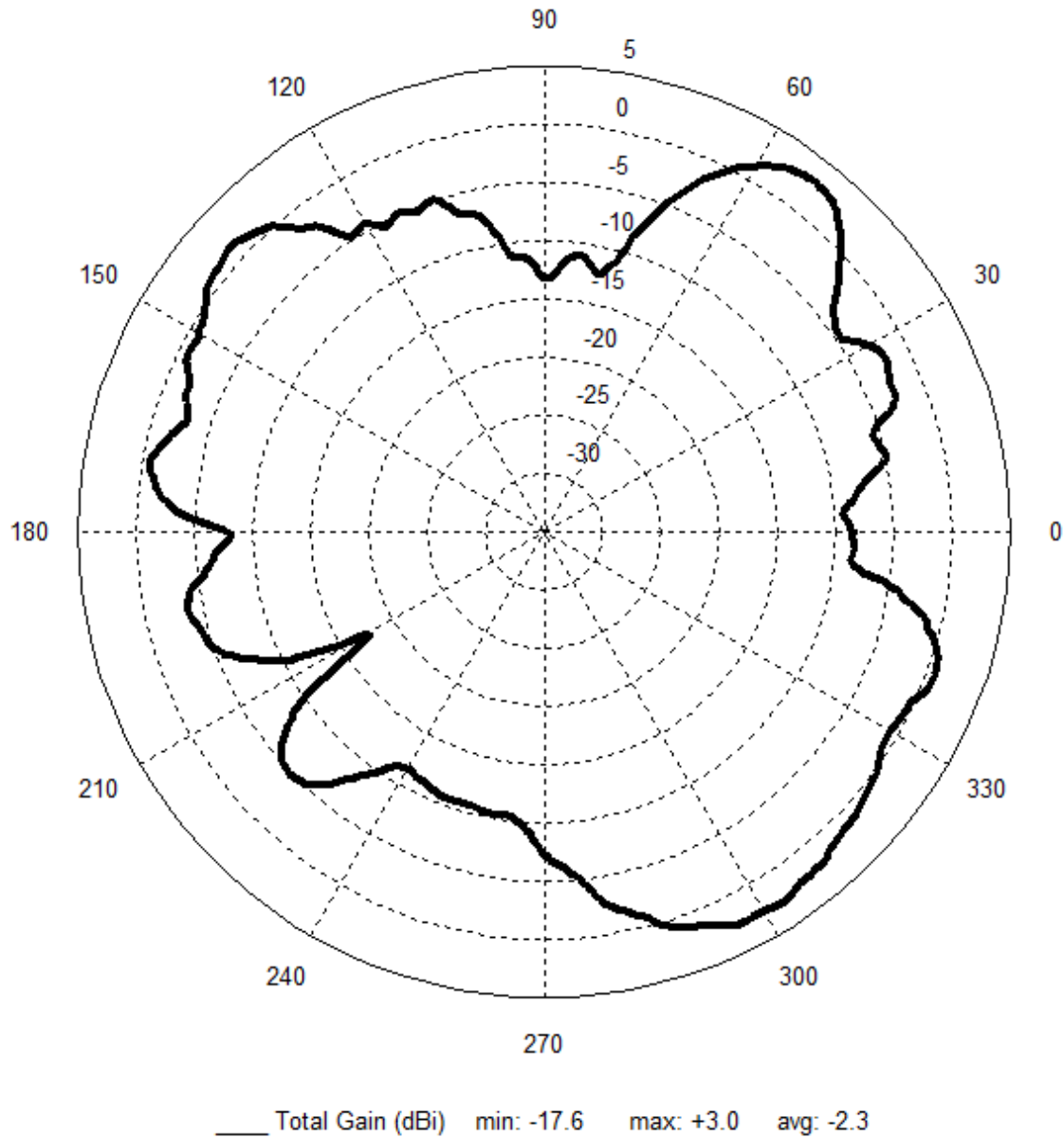


Figure 19 Flat Orientation Pattern

Flat Orientation at 5900 MHz:

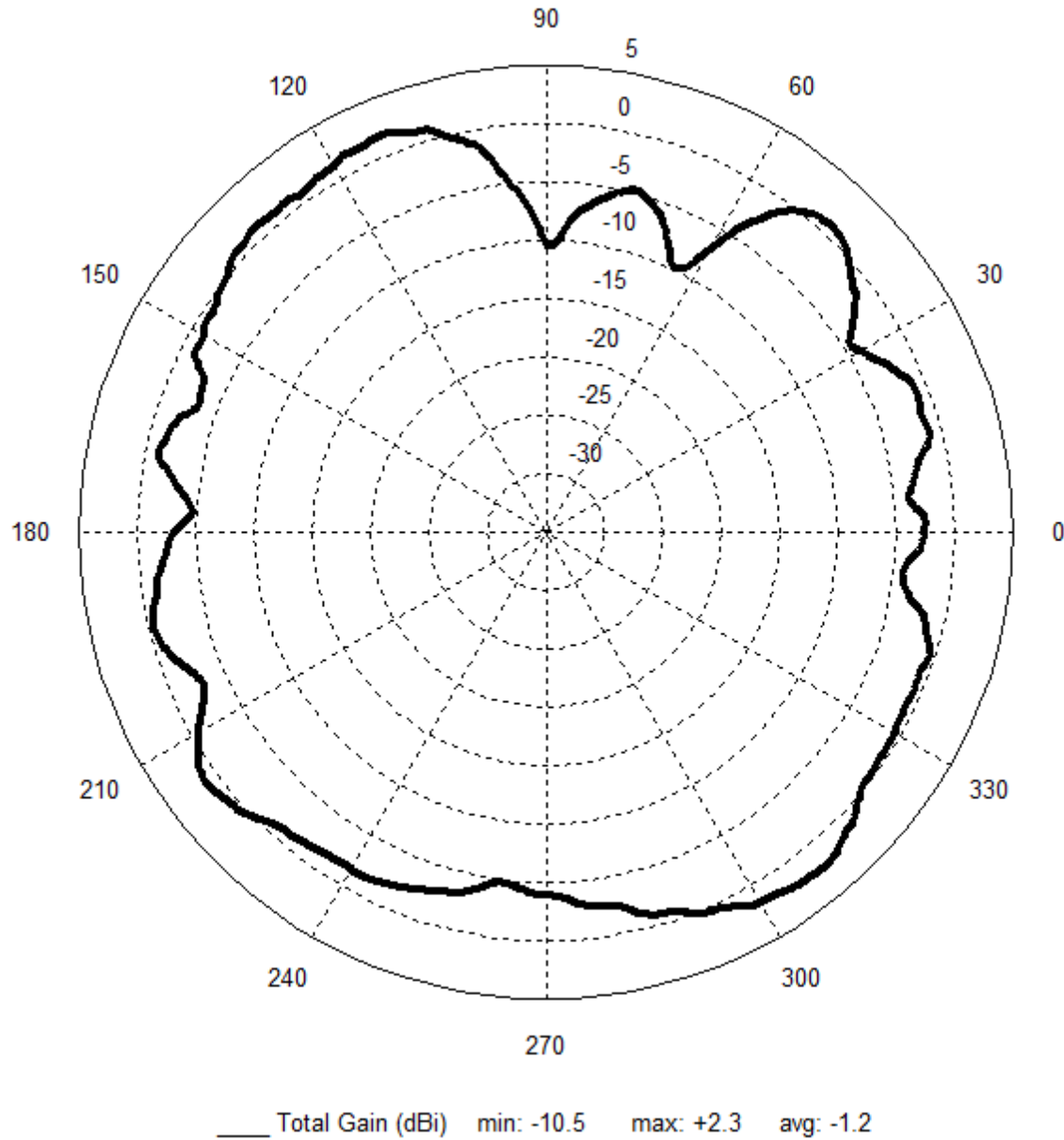


Figure 20 Secondary Elevation Pattern

OPTIMAL INSTALLATION GUIDE

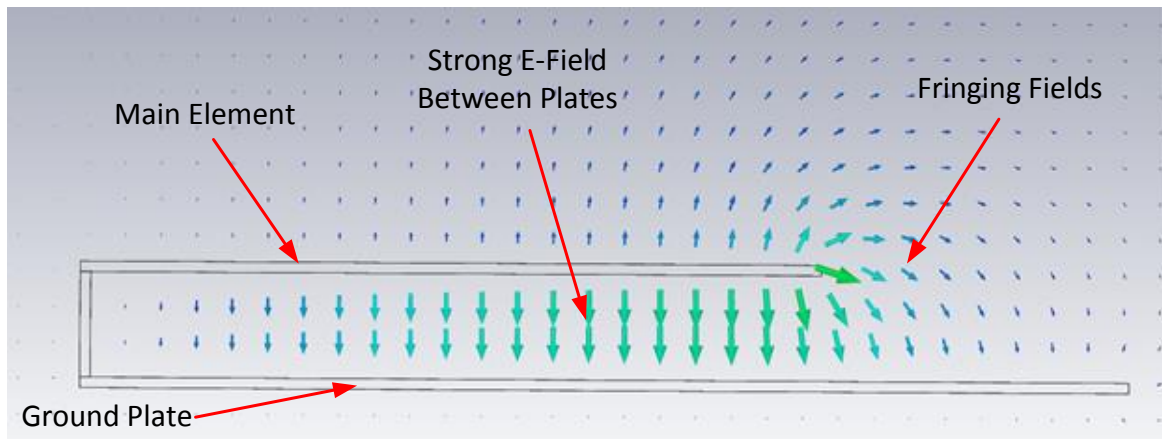


Figure 21 E-Field Radiation from FlexPIFA, Taken from CST Simulation

The main element should be kept clear of any non-metal objects (such as plastics) on top of it by at least 3 mm (see **Figure 22**). Similarly, the two long sides of the FlexPIFA should be kept clear of any non-metal object by at least 2 mm (See **Figure 23**). A 1 mm clearance should be observed from the ground wall to any non-metal object. Mounting the FlexPIFA in a situation that does not allow for these clearance recommendations may change the gain characteristics stated in the datasheet, which could impact overall range of the wireless system.

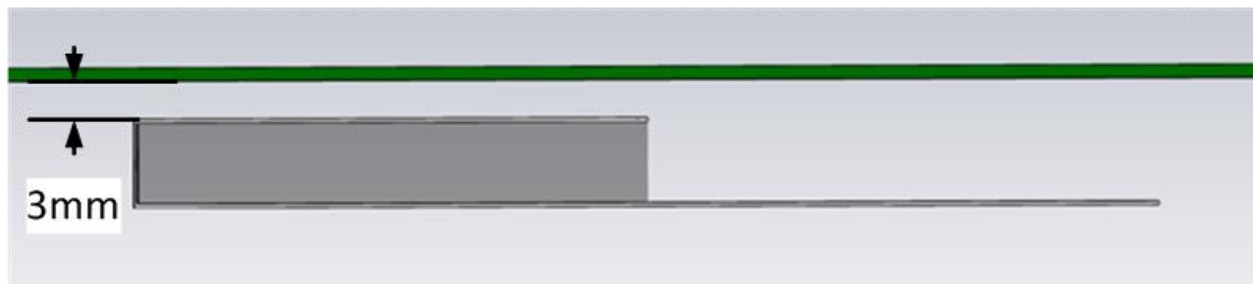


Figure 22 Top Clearance

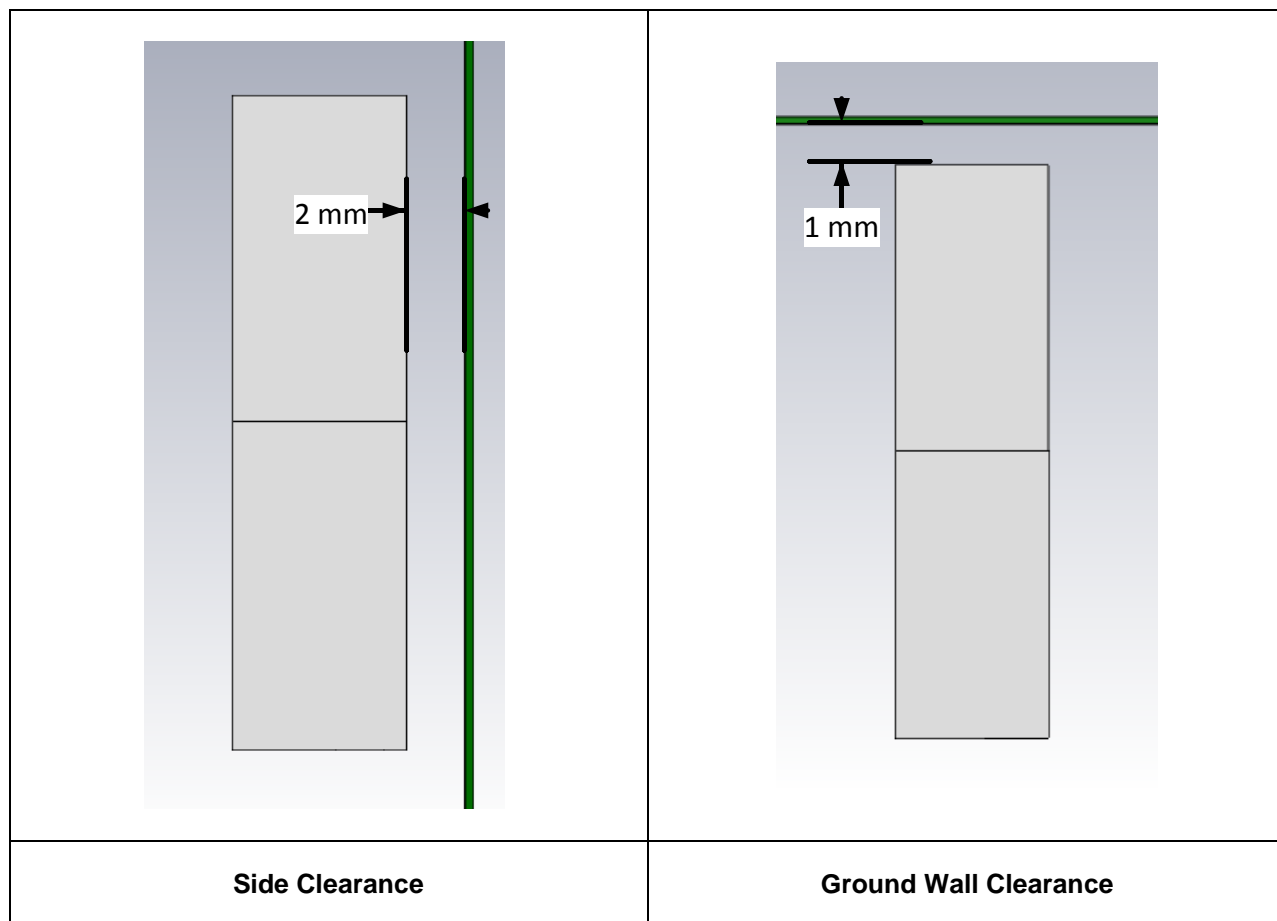


Figure 23 Side and Ground Wall Clearance

The ideal material for the FlexPIFA to be mounted on is 1.5 mm thick polycarbonate for maximum performance. However, as previously mentioned, the FlexPIFA can tolerate other non-metallic surfaces and thicknesses and still radiate effectively. Depending on the type of material, the FlexPIFA may be detuned.

The coaxial cable feeding the FlexPIFA should be routed away from the antenna. Do not run the coaxial cable over the top of the FlexPIFA or near the tip of the main element. The cable should be routed perpendicular to the side of the FlexPIFA (this is the way the cable comes assembled), underneath the ground plate, or away from the ground wall. All three of these options are shown in **Figure 24**.

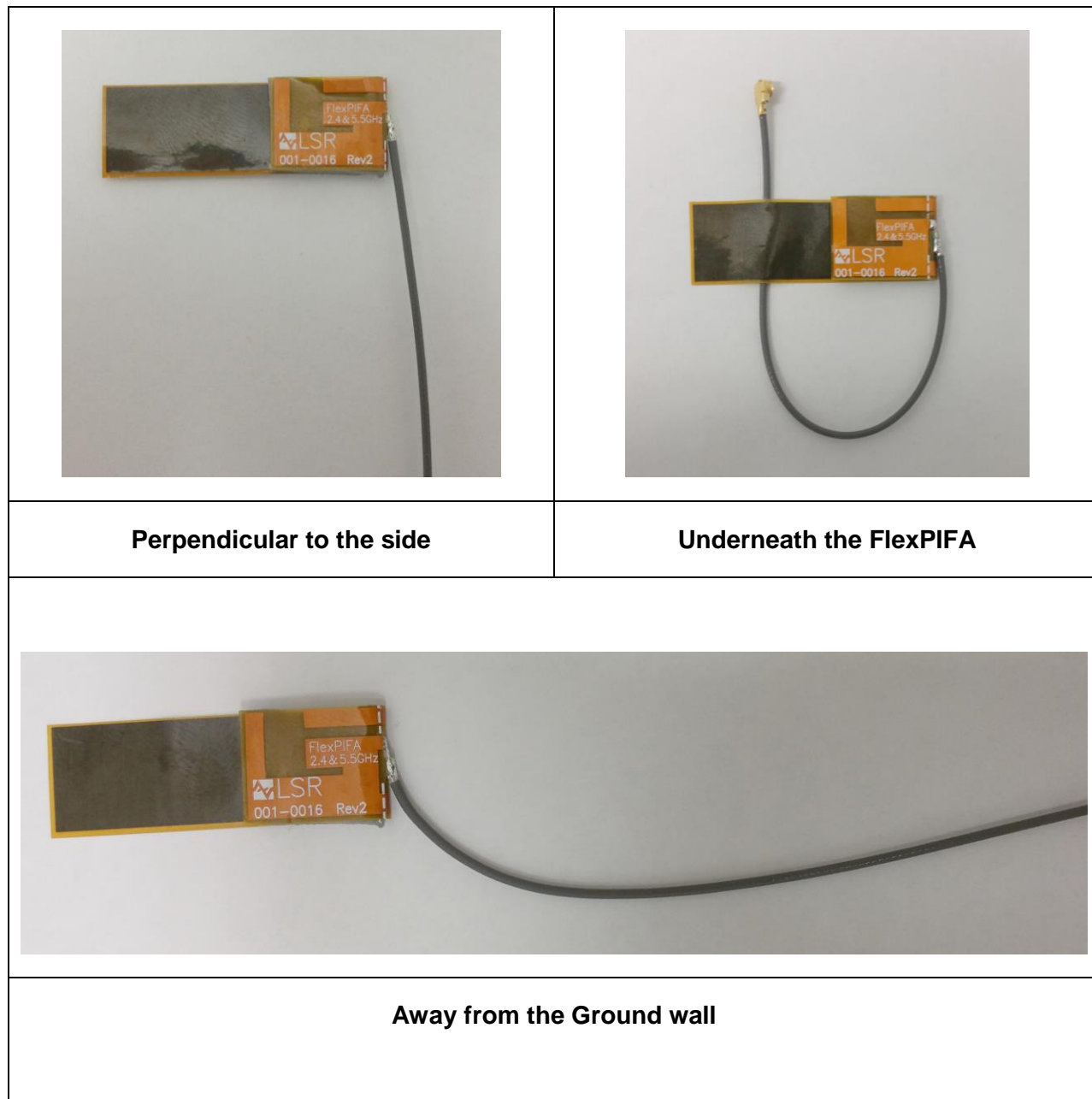


Figure 24 Recommended Cable Routing

As with any antenna, care should be taken not to place conductive materials or objects near the antenna (except as described in the next section). The radiated fields from the antenna will induce currents on the surface of the metal; as a result those currents then produce their own radiation. These re-radiating fields from the metal will interfere with the fields radiating from the FlexPIFA (this is true for any antenna). Other objects, such as an LCD display, placed in close proximity to the antenna may not affect its tuning but it can distort the radiation pattern. Materials that absorb electromagnetic fields should be kept away from the antenna to maximize performance. Common things to keep in mind when placing the antenna:

Wire Routing

Speakers – these generate magnetic fields

Metal Chassis and Frames

Battery Location

Proximity to Human Body

Display Screen – these will absorb radiation

Paint – do not use metallic coating or flakes

Flex Limits of the FlexPIFA

One of the unique features of the FlexPIFA is its ability to flex. However, due to the adhesive there are limits as to how much the antenna can be flexed and remain secured to the device. The FlexPIFA should not be flexed in a convex position with a radius less than 16mm. Going smaller than this may result in the antenna peeling off the surface over time. Should a tighter radius of curvature be required, it is recommended you contact LS Research for assistance.

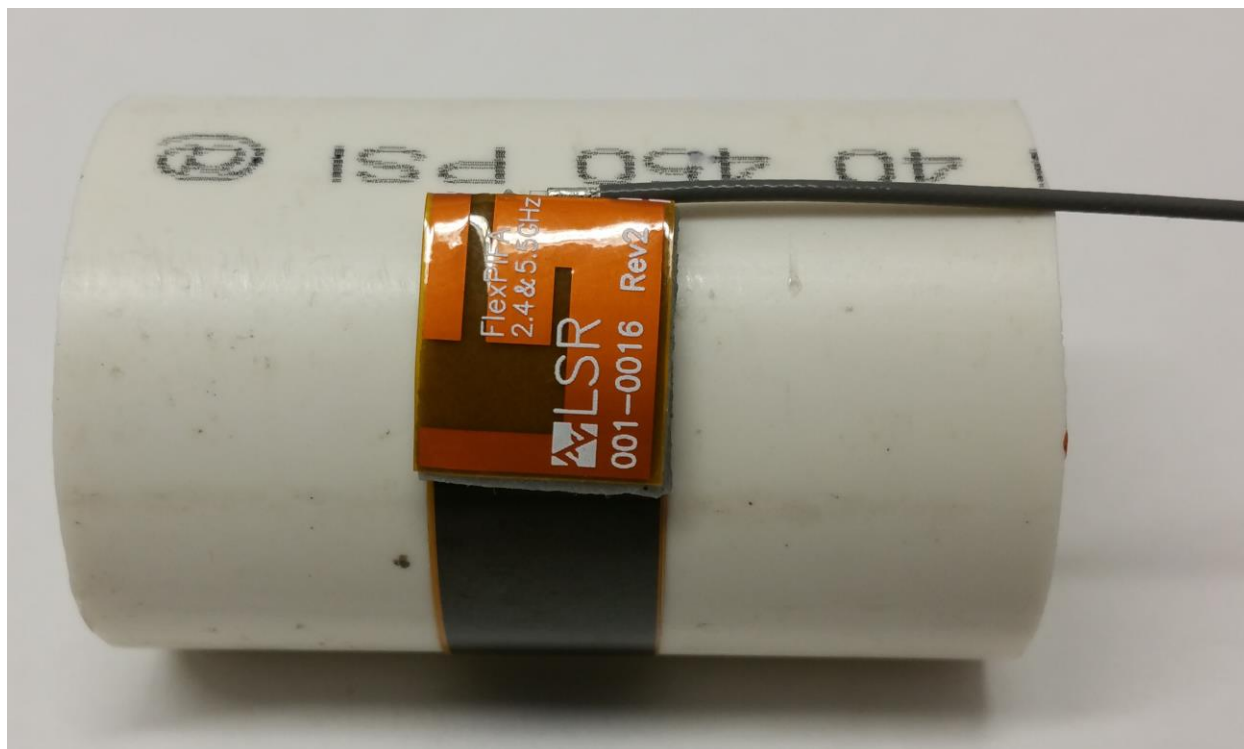


Figure 25 Convex Mounted

The FlexPIFA should not be flexed in a concave position with a radius less than 25mm. In this scenario, the limiting factor is performance. The ground plate of the antenna is pressed closer to the main element. As previously discussed in the introduction of this application note, the fringing fields developing off the end of the element are responsible for most of the radiation. In a concave position with a radius of curvature less than 25mm, the fringing fields are adversely affected and gain suffers. If a tighter radius of curvature is required, it is recommended you contact LS Research for assistance.

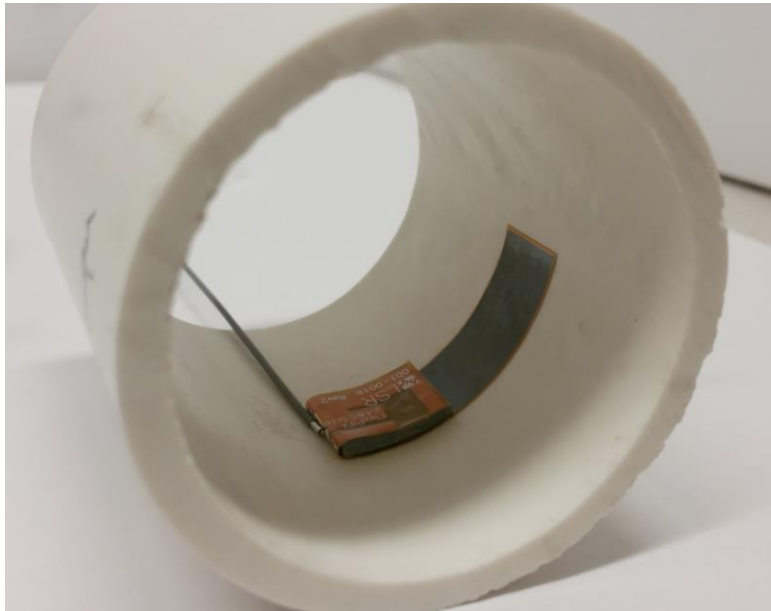


Figure 26 Concave Mounted

The FlexPIFA is not designed to be twisted or crumpled. The adhesive back should lay flush with the surface it is mounted on.

Mounting on Metal and Body Loaded Applications

The FlexPIFA can tolerate being mounted on conductive surfaces. There will be some detuning of the antenna, which translates into some gain reduction. Even though the FlexPIFA is optimized to work on non-metallic surfaces, it still radiates efficiently due to the fringing fields (Shown in **Figure 21**). The ground plate of the FlexPIFA carries the adhesive backing; placing the antenna onto a metal surface simply enlarges the size of the ground beneath the main element. Previously the fringing fields only interacted with the small ground of the FlexPIFA - however they are now interacting with the much larger ground. The fringing fields still develop and radiate, but the antenna will no longer tune as well to the 2.4 GHz frequency band. Consequently the VSWR increases and there is some loss in radiated power. If the FlexPIFA cannot meet your range requirements after being implemented on a metal surface, contact LSR Design Services for a custom antenna build to help meet your application needs.

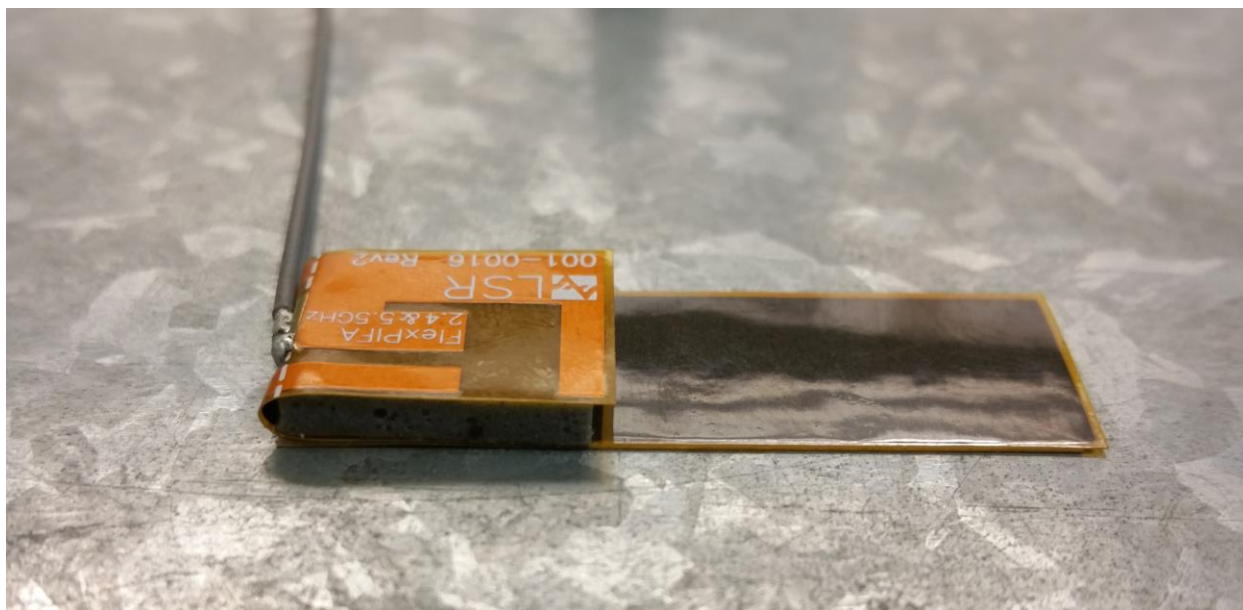


Figure 27 FlexPIFA Mounted on Metal

Do not mount the FlexPIFA where metal is within 10 mm above the main element (see **Figure 29**). Not only will this severely limit the radiation pattern (mainly due to the re-radiation problem previously described) it will detune the antenna inside of this range. Similarly, the two long sides of the FlexPIFA should be kept clear of any metal object by at least 5 mm. These keep out requirements pertain to **conductive** materials only, and are different from those listed in the previous sections which apply to **non-conductive** materials. In general, it is good practice to always keep metals as far away from the antenna as possible.

For the best performance, a spacer should be placed between the FlexPIFA and the conductive surface (see **Figure 28**). The spacer should be 1.5 mm thick polycarbonate. This will significantly improve performance and tuning of the FlexPIFA on a metal surface. Other non-conductive materials such as ABS plastic can be used; however polycarbonate will provide the best results.



Figure 28 FlexPIFA Mounted on Metal Surface with 1.5mm Thick Polycarbonate Spacer

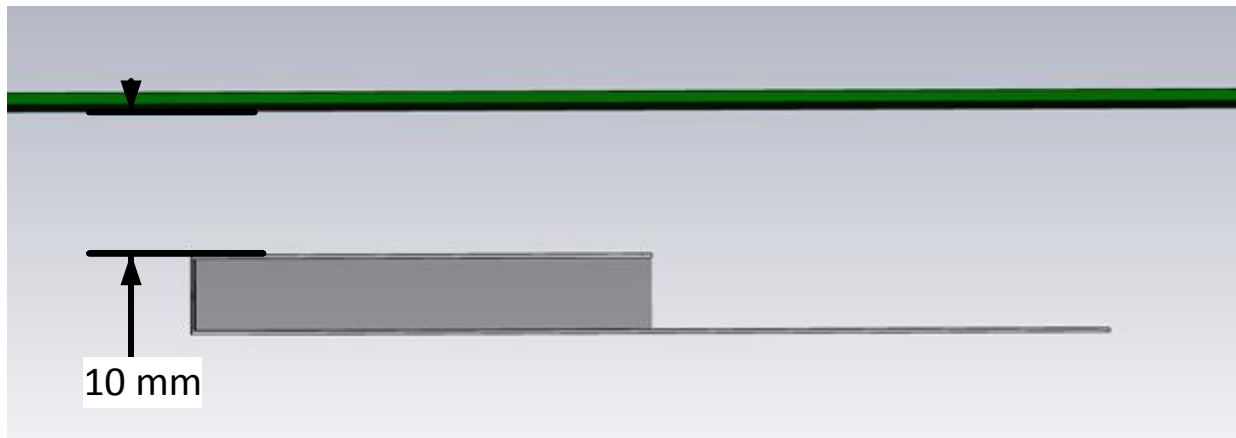


Figure 29 Metal near Main Element

For body worn applications, the FlexPIFA can tolerate the presence of the human body. It is not recommended that the antenna be mounted directly on body tissue, this will detune the FlexPIFA. Additionally the human body is an excellent absorber of 2.4GHz RF signals. As a result of this, expect a reduction in range due to the presence of a body. In a body worn application, the ground plate of the FlexPIFA should be closest to the body tissue. The main element should be pointed away from the body. Additionally, for handheld devices the FlexPIFA should be mounted in a location where it will not be covered by the hand. If the antenna is mounted in a location where the main element will be covered or near a human body, ensure that there is at least a 10mm separation distance between the main element and the body as shown in **Figure 29**.

Additionally, when the FlexPIFA is mounted very close to body tissue, use a spacer to create separation distance between the body tissue and ground plate. This will ensure maximum performance and prevent the antenna from detuning. As previously mentioned, the ideal spacer material is 1.5 mm thick polycarbonate.

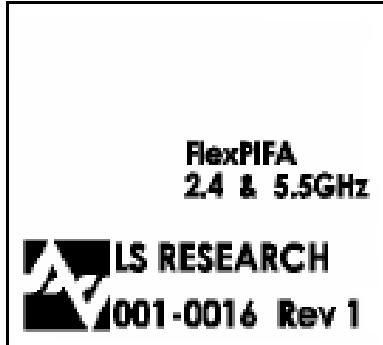
Quite often this separation distance between the body tissue and the FlexPIFA is already provided by the enclosure. **Figure 30** below is an example of a bracelet with the FlexPIFA integrated inside it. The enclosure provides enough spacing between the antenna and body tissue to prevent any major detuning. The enclosure is made of polycarbonate.



Figure 30 FlexPIFA Integrated into Bracelet

PRODUCT REVISION HISTORY

Rev 1: Initial Production Release



Rev 2:



Updated LSR Logo

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2.4 GHz / 5.5 GHz Waterproof Dipole 2 dBi Antenna, IP67



ORDERING INFORMATION

Order Number	Description
001-0012	2.4/5.5 GHz Waterproof Dipole Antenna for Reverse Polarity SMA Connector, IP67
080-0013	U.FL to Reverse Polarity SMA Cable, 105mm, O-Ring Seal
080-0014	U.FL to Reverse Polarity SMA Cable, 210mm, O-Ring Seal

Table 1 Orderable Part Numbers

SPECIFICATIONS

Specification	Value
2.4 Ghz Band Gain	+2 dBi
5 GHz Band Gain	+2 dBi
Impedance	50 ohms
Type	Dipole
Polarization	Linear Vertical
VSWR	≤2.5 : 1
Frequency	2400 - 2500MHz, 4910 - 5850MHz
Weight	18g
Size	114 mm × 13 mm
Antenna Color	Black
Operating Temp	-40°C to +85°C
UL Rating	UL 94HB

Table 2 Specifications

PHYSICAL DIMENSIONS (MM)

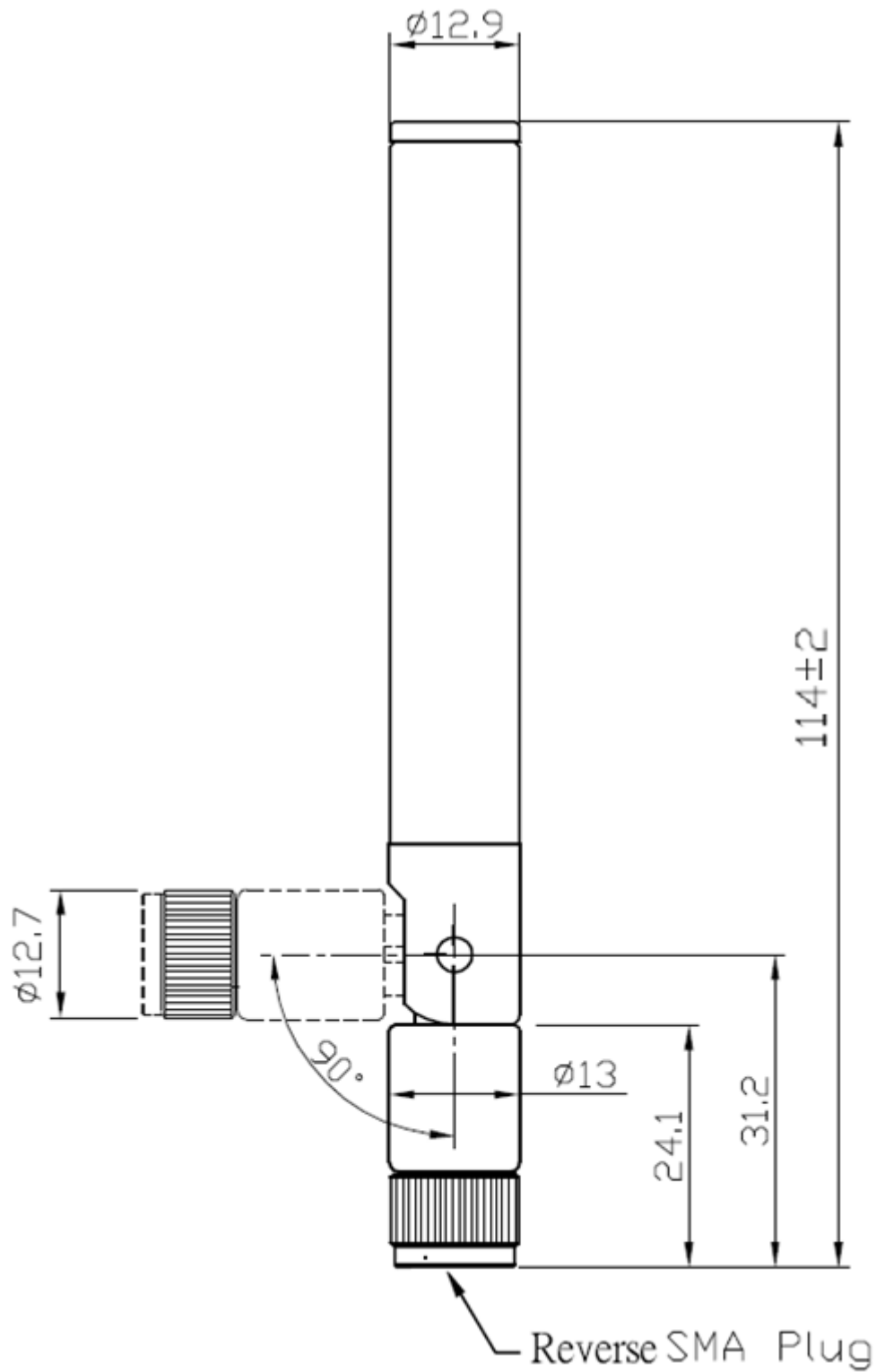


Figure 1 Physical Dimensions

TYPICAL ANTENNA REFLECTION PERFORMANCE

Straight Antenna Position

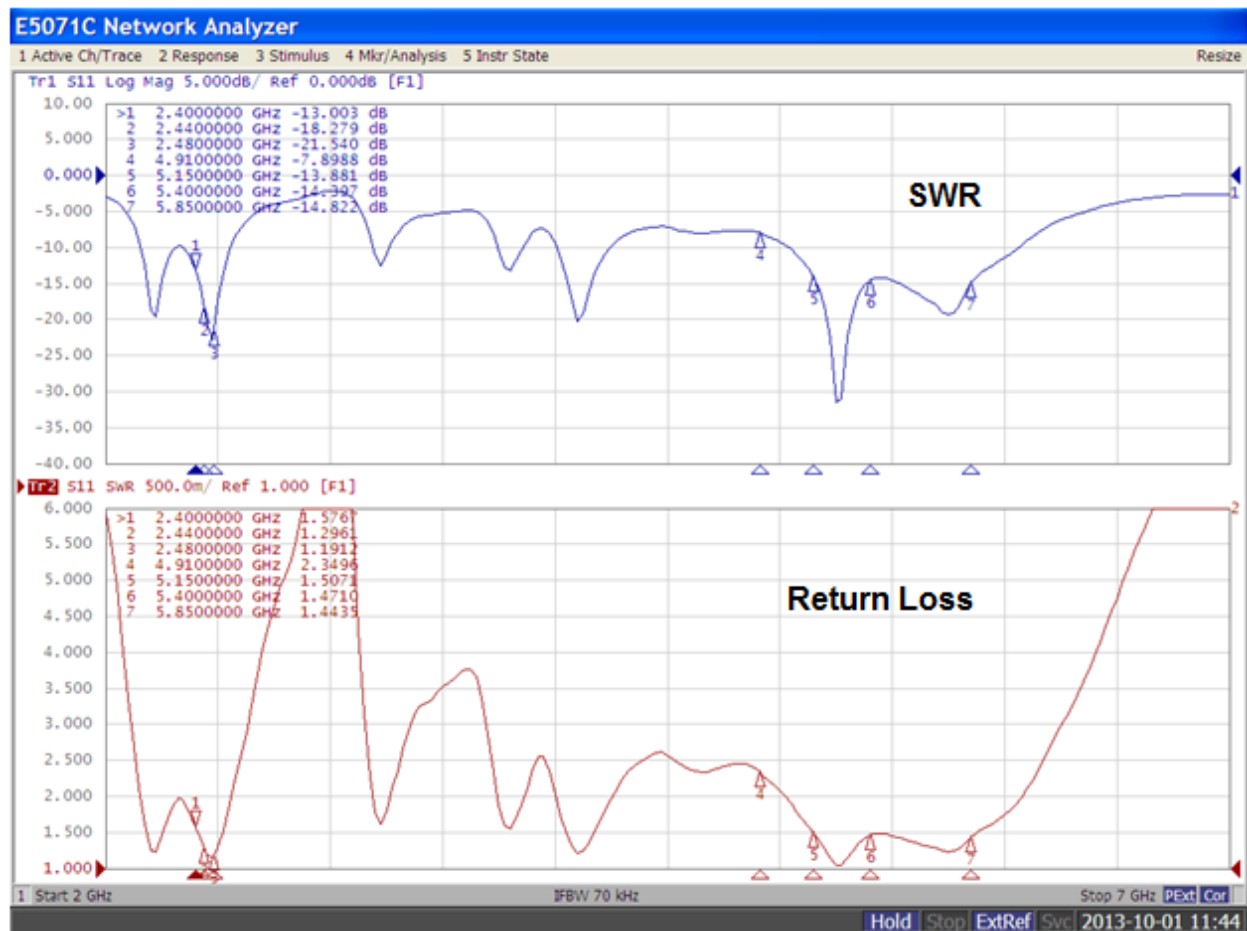


Figure 2 Typical Straight Position Reflection Performance

Bent Antenna Position

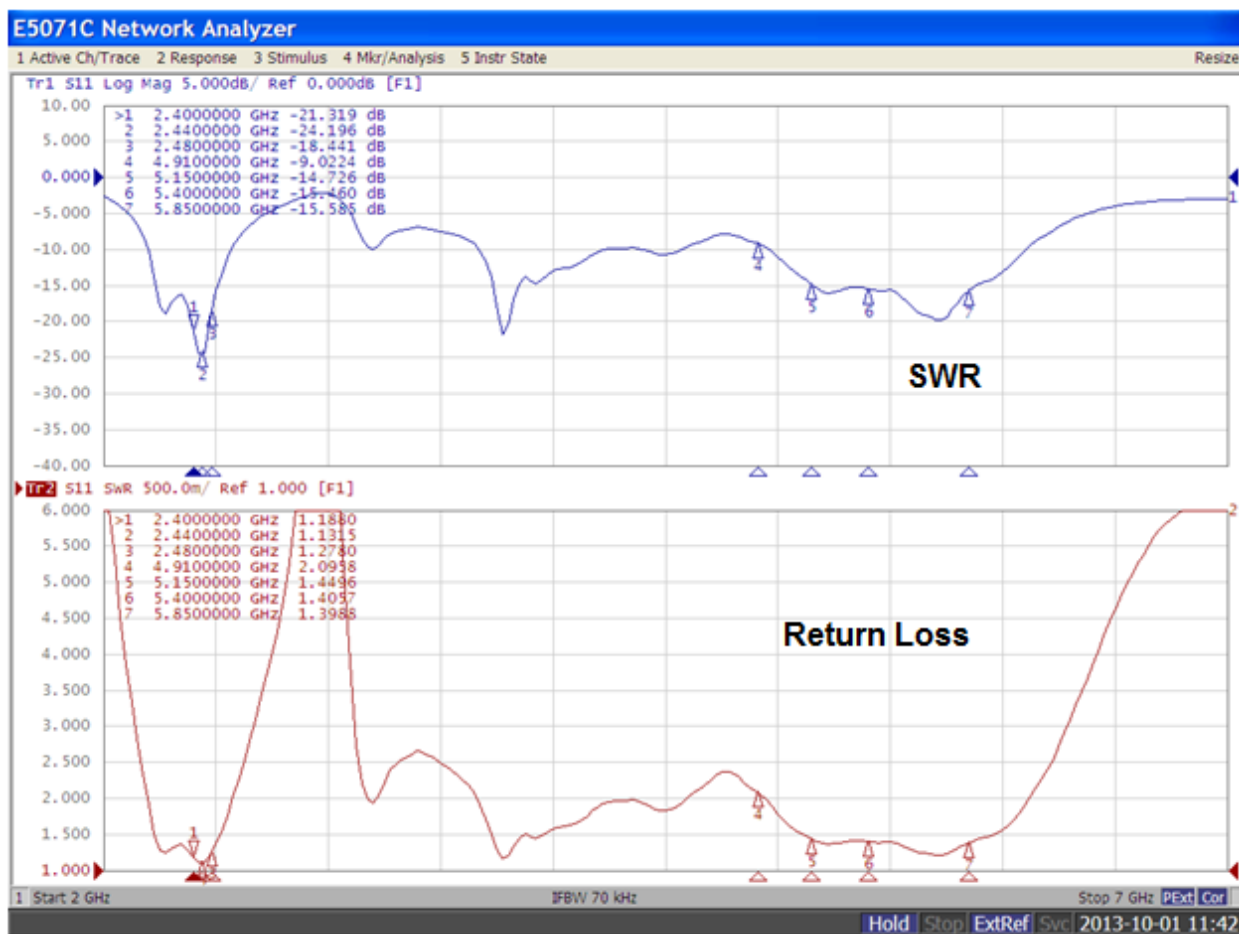


Figure 3 Typical Bent Position Reflection Performance

TYPICAL ANTENNA RADIATION PERFORMANCE

2.4 GHz Band

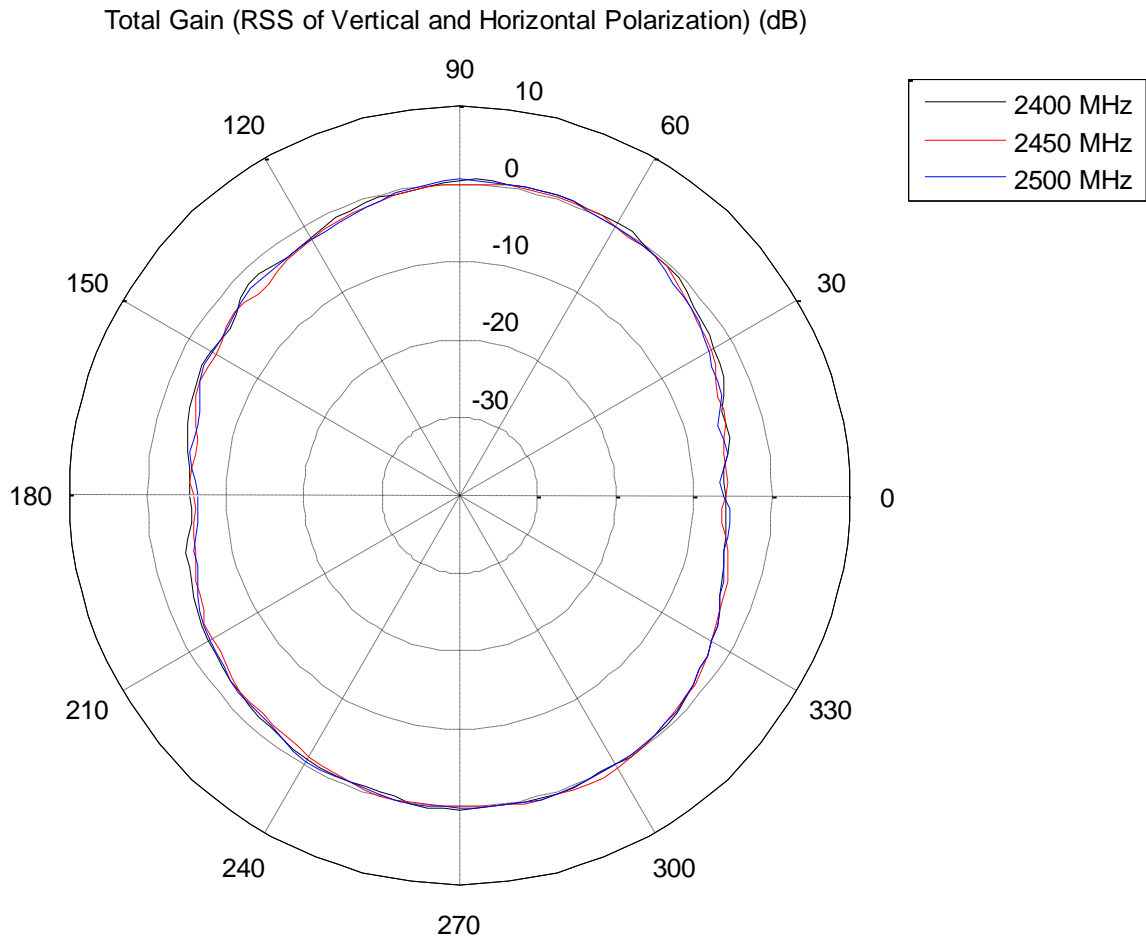


Figure 4 Typical E-Plane Performance

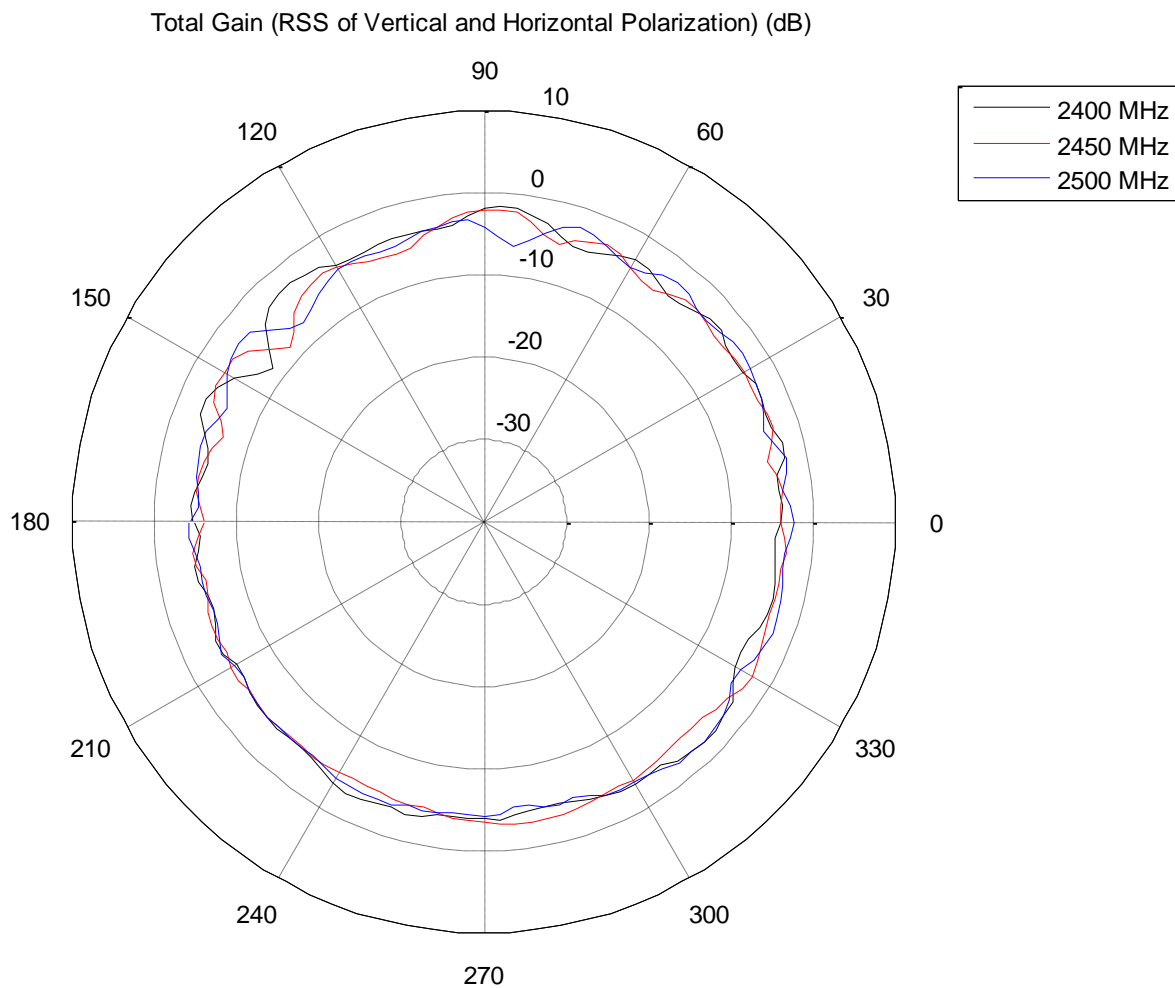


Figure 5 Typical H-Plane Performance

5 GHz Band

Total Gain (RSS of Vertical and Horizontal Polarization) (dB)

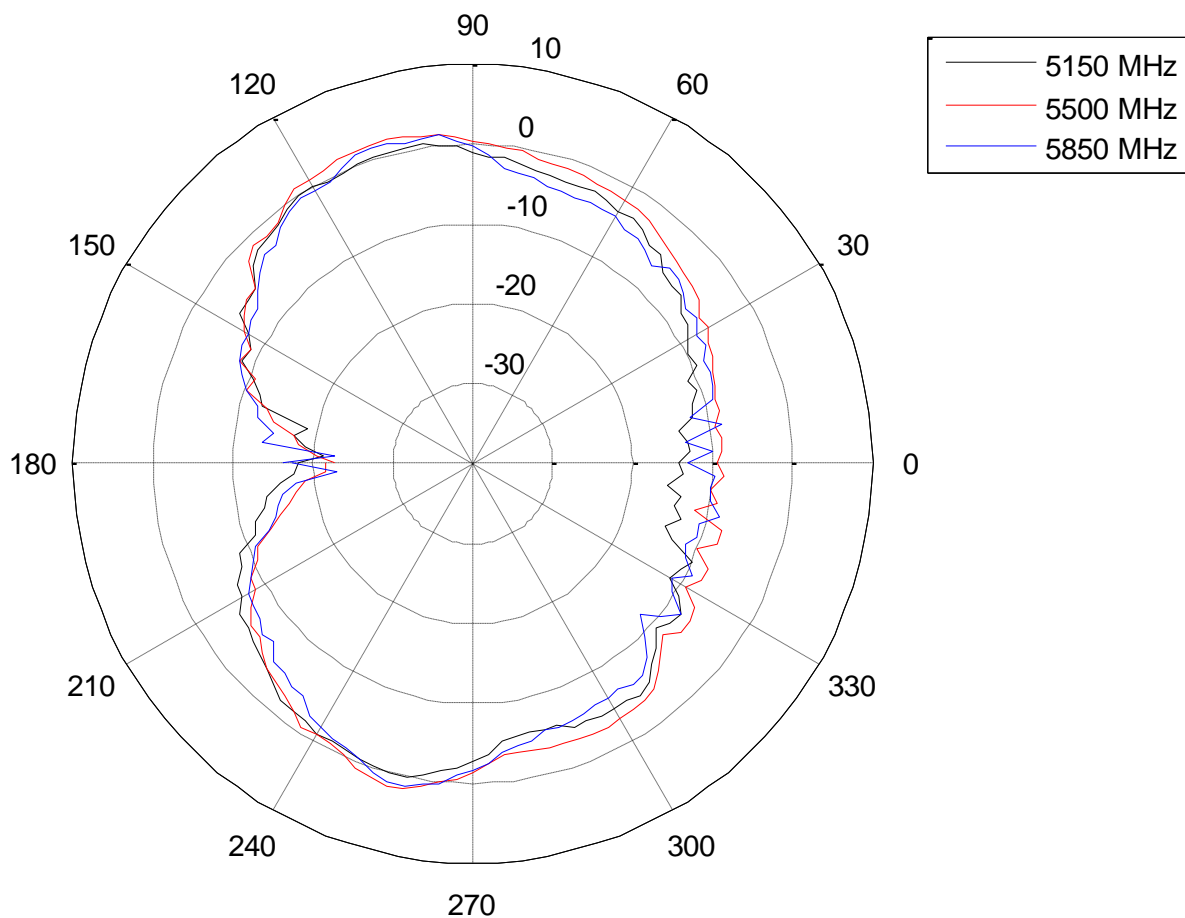


Figure 6 Typical E-Plane Performance

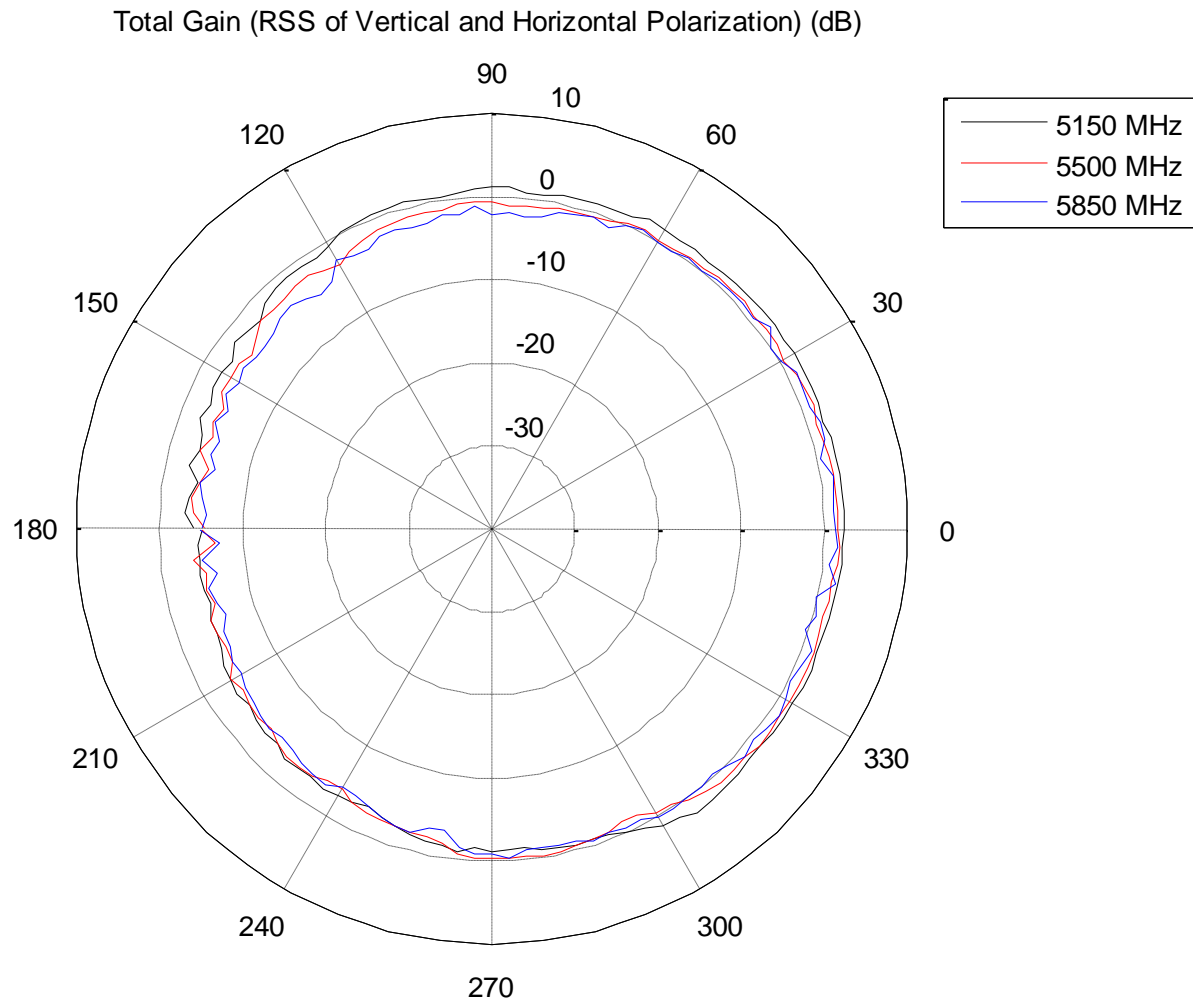


Figure 7 Typical H-Plane Performance

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"High Frequency Ceramic Solutions"

802.11 Dual Band 2.45/5 GHz Mini Chip Antenna. WiFi, Wireless LAN, I P/N 2450AD14A5500

Detail Specification: 10/26/2017

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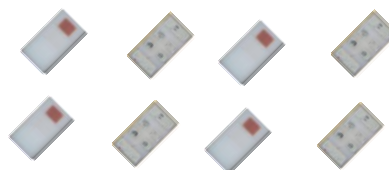
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General Specifications

Part Number	2450AD14A5500	
Frequency (MHz)	2400 - 2480	5150 - 5850
Ave. Rad Efficiency	60%	80%
Peak Gain (dBi typ.)	1.0 dBi typ. (XZ-Total)	4.0 dBi typ. (XZ-Total)
Average Gain (dBi typ.)	-3.5 dBi typ. (XZ-Total)	-2.5 dBi typ. (XZ-Total)
Return Loss (dB)	6 min.	6 min.
Impedance	50 Ω	
Input Power	2 Watts max. (CW)	

Let us help you with the antenna design, optimization, and tuning!

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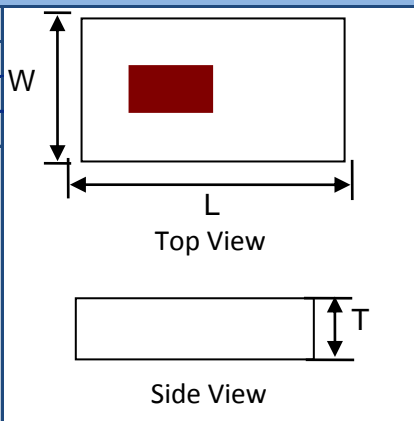
Storage Period	18 months max.
Storage Temperature	-40 to +85°C
Operating Temperature	-40 to +85°C
Reel Quantity	4000

Part Number Explanation

P/N Suffix	Packing Style	Bulk (loose)	Suffix = S	e.g. 2450AD14A5500S
		T & R	Suffix = T	e.g. 2450AD14A5500T
		100% Tin	Suffix = T or S	e.g. 2450AD14A5500(T or S)
	Evaluation Board	2450AD14A5500-EB1SMA & 2450AD14A5500-EB2SMA		

Mechanical Dimensions

	In	mm
L	0.063 \pm 0.004	1.60 \pm 0.10
W	0.031 \pm 0.004	0.80 \pm 0.10
T	0.016 max.	0.40 max.



Terminal Configuration

No.	Function
1	GND
2	FEED
3	NC
4	NC

Top View looking "through" the component

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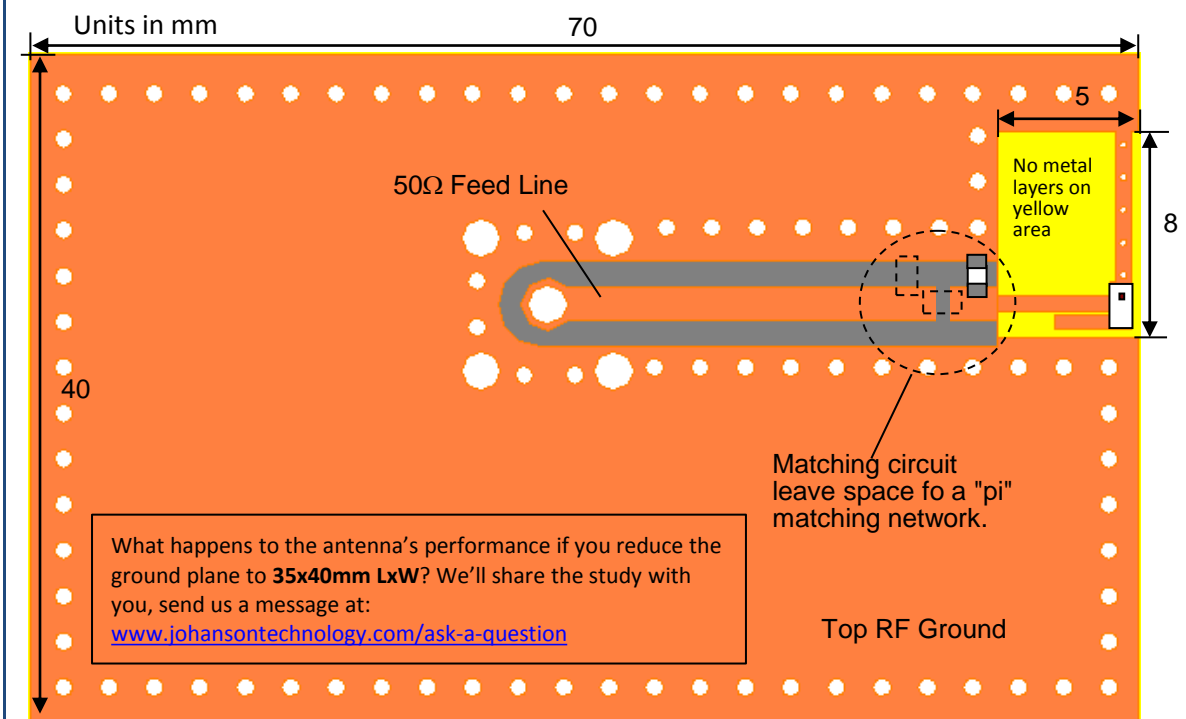
802.11 Dual Band 2.45/5 GHz Mini Chip Antenna. WiFi, Wireless LAN, IoT P/N 2450AD14A5500

Detail Specification: 10/26/2017

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Mounting Considerations 1: Evaluation Board, 65x70mm (Scenario 1 Terminal Configuration)



To order the ABOVE pre-tuned 50Ω EVB with a female SMA connector click here: www.johansontechnology.com/request-a-sample

Would you like the layout file of the above? Have antenna tuning issues?

Please contact us if you have any questions regarding the implementation of this antenna in your PCB's layout. We'll be happy to guide you to maximize the antenna's performance.

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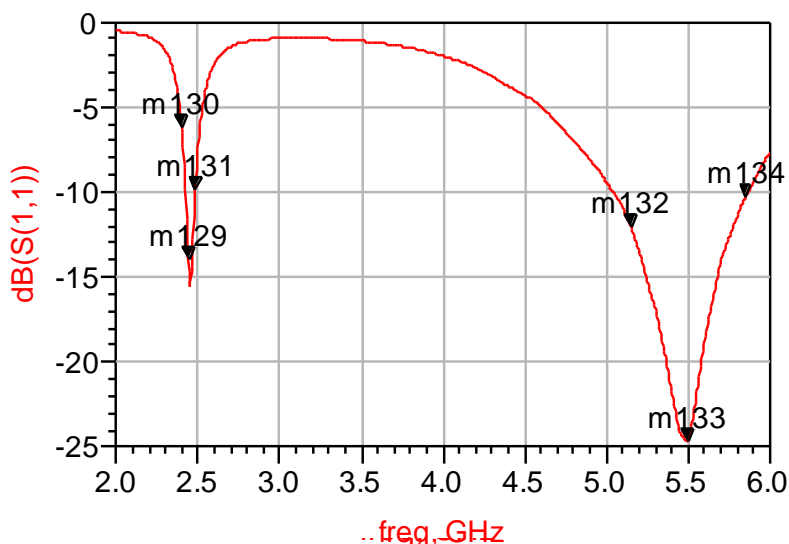
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Mounting Considerations 2: Typical Electrical Performance (T=25°C)



m130 freq=2.400GHz dB(S(1,1))=-6.202	m129 freq=2.442GHz dB(S(1,1))=-14.010	m131 freq=2.484GHz dB(S(1,1))=-9.880
m132 freq=5.150GHz dB(S(1,1))=-12.066	m133 freq=5.500GHz dB(S(1,1))=-24.657	m134 freq=5.850GHz dB(S(1,1))=-10.323

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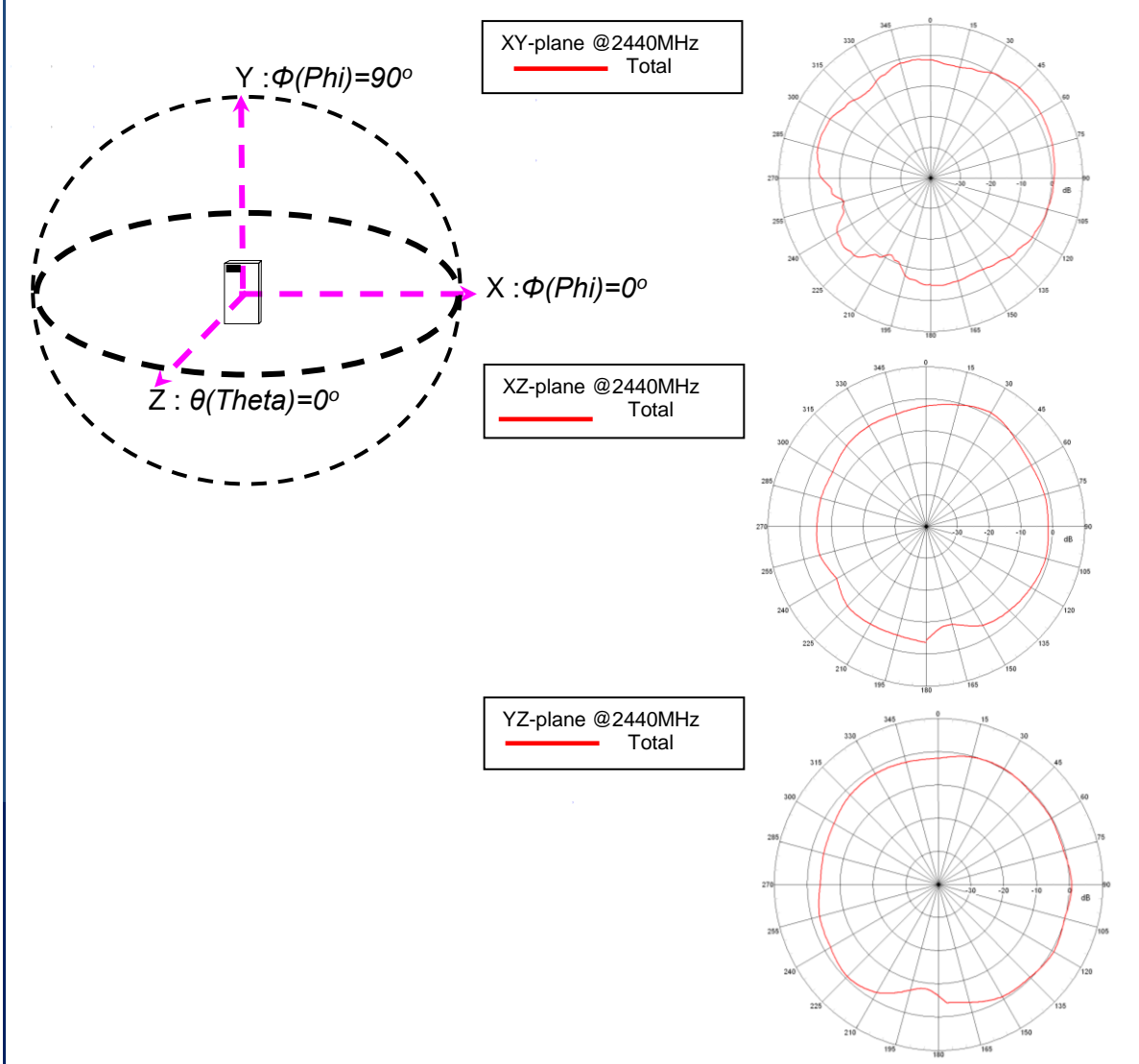
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Typical EM Radiation Performance @ 2.44GHz (T=25°C)



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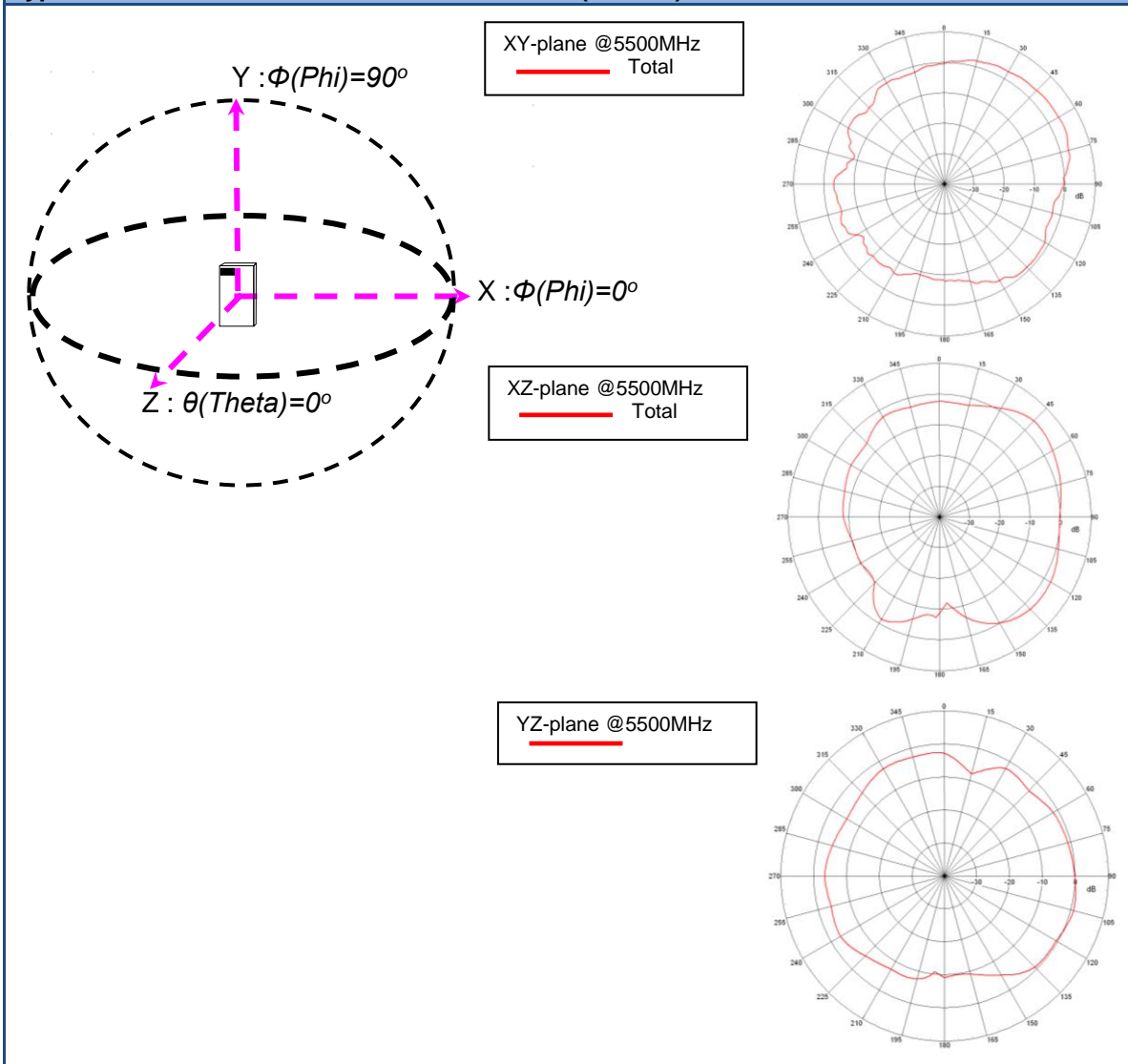
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Typical EM Radiation Performance @ 5.50 GHz (T=25°C)



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2 Free layout reviews and if you need us to tune and characterize the antenna on your product (inside anechoic chamber) we can do that too. Small lab fee may apply for the latter.

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