



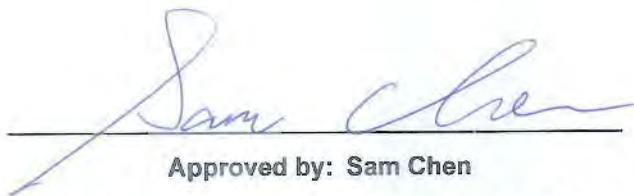
# FCC RADIO TEST REPORT

FCC ID : Q87-03418  
Equipment : LINKSYS E2500 N600 Dual-Band WIFI ROUTER,  
LINKSYS E5350 AC1000 Dual-Band WIFI ROUTER,  
LINKSYS E5400 AC1200 Dual-Band WIFI ROUTER,  
LINKSYS E5300 AC750 Dual-Band WIFI ROUTER  
Brand Name : LINKSYS  
Model Name : E2500 V4, E5350, E5400, E5300  
Applicant : Linksys LLC  
121 Theory, Irvine CA 92617, United States  
Standard : 47 CFR FCC Part 15.247

The product was received on Oct. 31, 2018, and testing was started from Oct. 31, 2018 and completed on Dec. 27, 2018. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

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

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



Approved by: Sam Chen

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**  
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



## Table of Contents

History of this test report.....	4
Summary of Test Result.....	5
<b>1 General Description .....</b>	<b>6</b>
1.1 Information.....	6
1.2 Testing Applied Standards .....	8
1.3 Testing Location Information.....	8
1.4 Measurement Uncertainty .....	8
<b>2 Test Configuration of EUT.....</b>	<b>9</b>
2.1 Test Channel Mode .....	9
2.2 The Worst Case Measurement Configuration.....	10
2.3 EUT Operation during Test .....	11
2.4 Accessories .....	12
2.5 Support Equipment.....	12
2.6 Test Setup Diagram .....	13
<b>3 Transmitter Test Result .....</b>	<b>16</b>
3.1 AC Power-line Conducted Emissions .....	16
3.2 DTS Bandwidth .....	18
3.3 Maximum Conducted Output Power .....	19
3.4 Power Spectral Density .....	22
3.5 Emissions in Non-restricted Frequency Bands .....	24
3.6 Emissions in Restricted Frequency Bands.....	25
<b>4 Test Equipment and Calibration Data .....</b>	<b>29</b>

**Appendix A. Test Results of AC Power-line Conducted Emissions****Appendix B. Test Results of DTS Bandwidth****Appendix C. Test Results of Maximum Conducted Output Power****Appendix D. Test Results of Power Spectral Density****Appendix E. Test Results of Emissions in Non-restricted Frequency Bands****Appendix F. Test Results of Emissions in Restricted Frequency Bands****Appendix G. Test Results of Radiated Emission Co-location****Appendix H. Test Photos**



**Photographs of EUT v01**



## History of this test report



## Summary of Test Result

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

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

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

Reviewed by: Sam Chen

Report Producer: Sandy Chuang



## 1 General Description

### 1.1 Information

#### 1.1.1 RF General Information

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

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	802.11b	20	2TX
2.4-2.4835GHz	802.11g	20	2TX
2.4-2.4835GHz	802.11n HT20	20	2TX
2.4-2.4835GHz	802.11n HT40	40	2TX

Note:

- 11b mode uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
- 11g, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- BWch is the nominal channel bandwidth.
- Nss-Min is the minimum number of spatial streams.
- Nant is the number of outputs. e.g., 2(2,3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.

#### 1.1.2 Antenna Information

Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)	
					2.4Gz	5GHz
1	FIT	4TS4009-A0001-JH	Dipole Antenna	I-PEX	2.52	3.37
2	FIT	4TS4009-A0002JH	Dipole Antenna	I-PEX	2.53	3.28

Note1: The above information was declared by manufacturer.

Note2: The EUT has two antennas.

**For WLAN 2.4GHz (2TX/2RX):**

Ant. 1 (Port 1) and Ant. 2 (Port 2) could transmit/receive simultaneously.

**For WLAN 5GHz (2TX/2RX):**

Ant. 1 (Port 1) and Ant. 2 (Port 2) could transmit/receive simultaneously.



### 1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11b	0.981	0.083	n/a (DC>=0.98)	n/a (DC>=0.98)
802.11g	0.941	0.264	1.397m	1k
802.11n HT20	0.923	0.348	1.309m	1k
802.11n HT40	0.85	0.706	650u	3k

### 1.1.4 EUT Operational Condition

EUT Power Type	From Power Adapter		
Beamforming Function	<input checked="" type="checkbox"/>	With beamforming for 802.11a/n/ac in 5GHz	<input type="checkbox"/> Without beamforming
Function	<input checked="" type="checkbox"/>	Point-to-multipoint	<input type="checkbox"/> Point-to-point
Test Software Version	QATool_0.0.1.85		

Note: The above information was declared by manufacturer.

### 1.1.5 Table for Multiple Listing

The EUT has four equipment names and model names which are identical to each other in all aspects except for the following table:

Item	Equipment Name				Model Name
1	LINKSYS E2500 N600 Dual-Band WIFI ROUTER				E2500 V4
2	LINKSYS E5350 AC1000 Dual-Band WIFI ROUTER				E5350
3	LINKSYS E5400 AC1200 Dual-Band WIFI ROUTER				E5400
4	LINKSYS E5300 AC750 Dual-Band WIFI ROUTER				E5300

Item	Radio Type					Description
	802.11b	802.11g	802.11n	802.11a	802.11ac	
1	V	V	V	V	X	The difference equipment and model name served as marketing strategy and supporting radio type.
2	V	V	V	V	V	
3	V	V	V	V	V	
4	V	V	V	V	V	

From the above models, model: E5400 is the highest speed of this series and include all functions and standard, so it was selected as representative model for the test and its data was recorded in this report.



## 1.2 Testing Applied Standards

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

- ◆ 47 CFR FCC Part 15
- ◆ ANSI C63.10-2013
- ◆ FCC KDB 558074 D01 v05
- ◆ FCC KDB 662911 D01 v02r01

## 1.3 Testing Location Information

Testing Location					
<input type="checkbox"/>	HWA YA	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)	TEL : 886-3-327-3456	FAX : 886-3-327-0973	
<input checked="" type="checkbox"/>	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.	TEL : 886-3-656-9065	FAX : 886-3-656-9085	

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date	Remark
RF Conducted	TH01-CB	Paul Chen	22°C / 64%	Nov. 23, 2018~ Dec. 04, 2018	-
Radiated	03CH01-CB (Below 1GHz)	Cola Fan	22°C / 54%	Dec. 01, 2018	-
	03CH01-CB (Above1GHz)	Stim Sung	22°C / 54%	Oct. 31, 2018~ Dec. 01, 2018	-
AC Conduction	CO01-CB	Peter Wu	23°C / 59%	Dec. 24, 2018	Adapter 1
				Dec. 27, 2018	Adapter 2

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

## 1.4 Measurement Uncertainty

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

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.0 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%
Output Power Measurement	1.33 dB	Confidence levels of 95%
Power Density Measurement	1.27 dB	Confidence levels of 95%
Bandwidth Measurement	9.74 x10 <sup>-8</sup>	Confidence levels of 95%



## 2 Test Configuration of EUT

### 2.1 Test Channel Mode

Mode	PowerSetting
802.11b_Nss1,(1Mbps)_2TX	-
2412MHz	21
2417MHz	24
2422MHz	24
2427MHz	25
2437MHz	25
2442MHz	25
2447MHz	24
2452MHz	24
2457MHz	23
2462MHz	23
802.11g_Nss1,(6Mbps)_2TX	-
2412MHz	1A
2417MHz	2F
2437MHz	2F
2452MHz	2F
2457MHz	22
2462MHz	1B
802.11n HT20_Nss1,(MCS0)_2TX	-
2412MHz	18
2417MHz	21
2422MHz	2F
2437MHz	2F
2447MHz	2F
2452MHz	22
2457MHz	1F
2462MHz	17
802.11n HT40_Nss1,(MCS0)_2TX	-
2422MHz	13
2427MHz	16
2432MHz	1A
2437MHz	1D
2442MHz	1A
2447MHz	17
2452MHz	14



## 2.2 The Worst Case Measurement Configuration

### The Worst Case Mode for Following Conformance Tests

<b>Tests Item</b>	AC power-line conducted emissions
<b>Condition</b>	AC power-line conducted measurement for line and neutral
<b>Operating Mode</b>	Normal Link
1	EUT with Adapter 1
2	EUT with Adapter 2

For operating mode 1 is the worst case and it was record in this test report.

### The Worst Case Mode for Following Conformance Tests

<b>Tests Item</b>	DTS Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in Non-restricted Frequency Bands
<b>Test Condition</b>	Conducted measurement at transmit chains

### The Worst Case Mode for Following Conformance Tests

<b>Tests Item</b>	Emissions in Restricted Frequency Bands
<b>Test Condition</b>	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
<b>Operating Mode &lt; 1GHz</b>	Normal Link
The EUT can be placed in Y-axis and Z-axis. After evaluating, "Z axis" generated the worst test result, So the measurement will follow this same test configuration.	
1	Place EUT in Z axis with Adapter 1
2	Place EUT in Z axis with Adapter 2

For operating mode 2 is the worst case and it was record in this test report.

### Operating Mode > 1GHz

CTX

The EUT can be placed in Y-axis and Z-axis. After evaluating, "Y axis" generated the worst test result, So the measurement will follow this same test configuration.

1	Place EUT in Y axis
---	---------------------



The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	Simultaneous Transmission Analysis - Radiated Emission Co-location
<b>Test Condition</b>	Radiated measurement
<b>Operating Mode</b>	Normal Link
The EUT can be placed in Y-axis and Z-axis. After evaluating, "Z axis" generated the worst test result, So the measurement will follow this same test configuration.	
1	Place EUT in Z axis with WLAN 2.4GHz+ WLAN 5GHz
Refer to Appendix G for Radiated Emission Co-location.	

The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation
<b>Operating Mode</b>	
1	WLAN 2.4GHz+ WLAN 5GHz
Refer to Sporton Test Report No.: FA8N1905 for Co-location RF Exposure Evaluation.	

## 2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.



## 2.4 Accessories

Accessories				
No.	Equipment Name	Brand Name	Model Name	Rating
1	Adapter	LEI	MU06AY120050-A1	INPUT: 100-240V~, 50/60Hz, 0.2A OUTPUT: 12V, 0.5A
2	Adapter	Ktec	KSAS0051200050VUD	INPUT: 100-240V~50/60Hz, 0.18A OUTPUT: 12V, 0.5A
Other				
RJ-45 cable*1, Non-shielded, 0.88m				

## 2.5 Support Equipment

For Test Site No: CO01-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	LAN NB	DELL	E6430	N/A
B	WAN NB	DELL	E6430	N/A
C	2.4G NB	DELL	E6430	N/A
D	5G NB	DELL	E6430	N/A

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

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	NB	DELL	E4300	N/A
B	NB	DELL	E4300	N/A
C	NB	DELL	E4300	N/A
D	NB	DELL	E4300	N/A

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

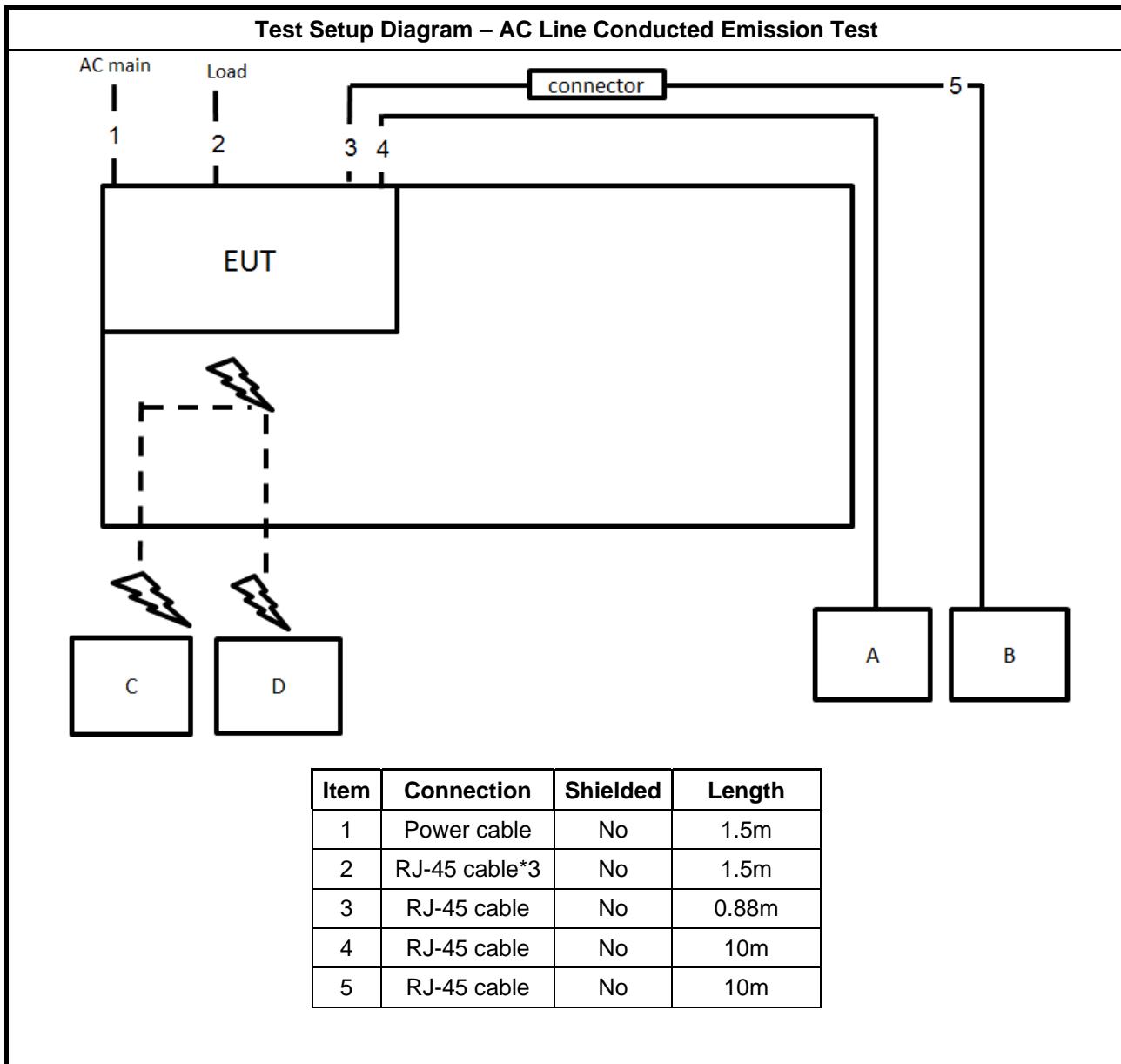
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	NB	DELL	E4300	N/A

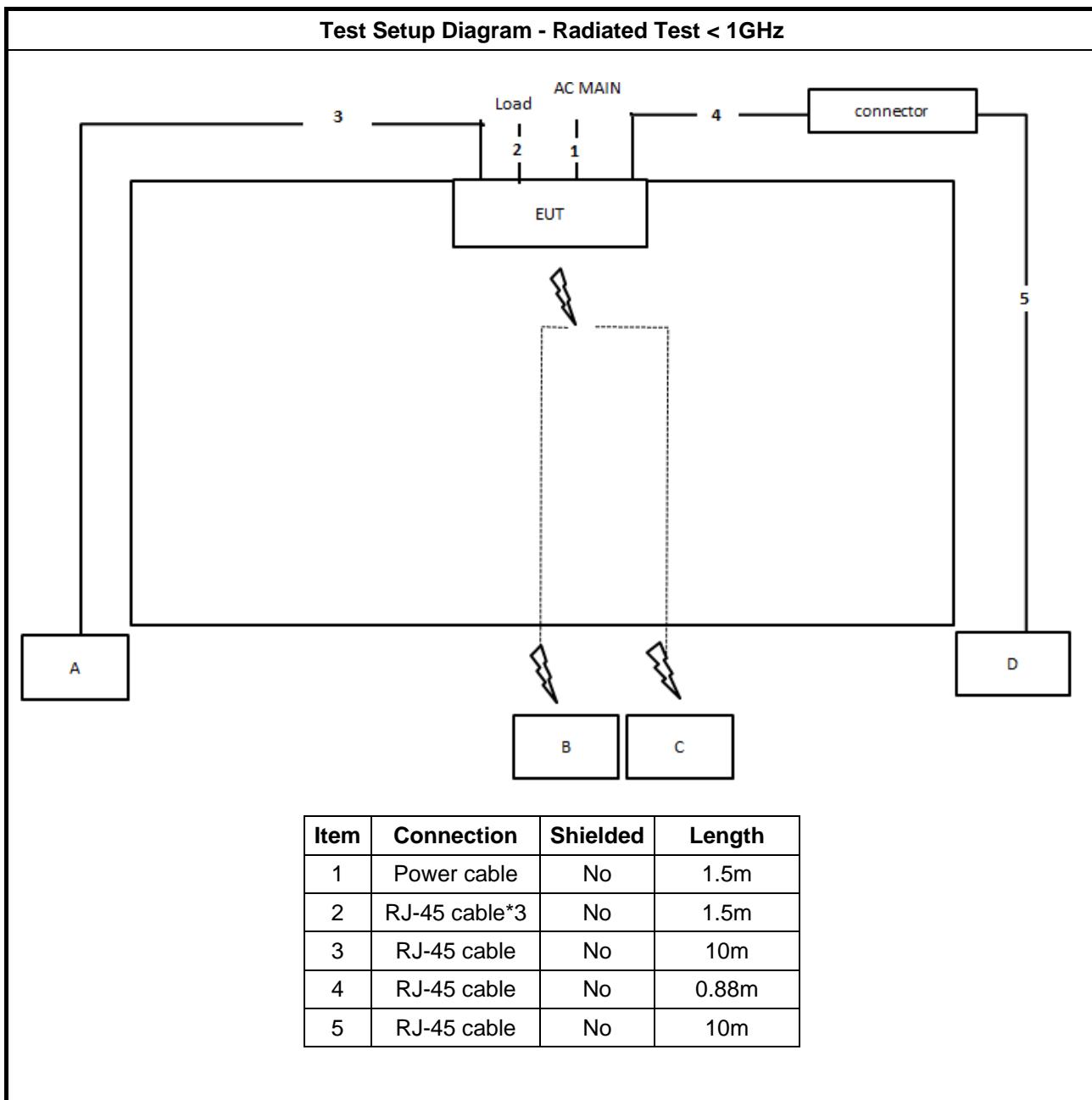
For Test Site No: TH01-CB

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



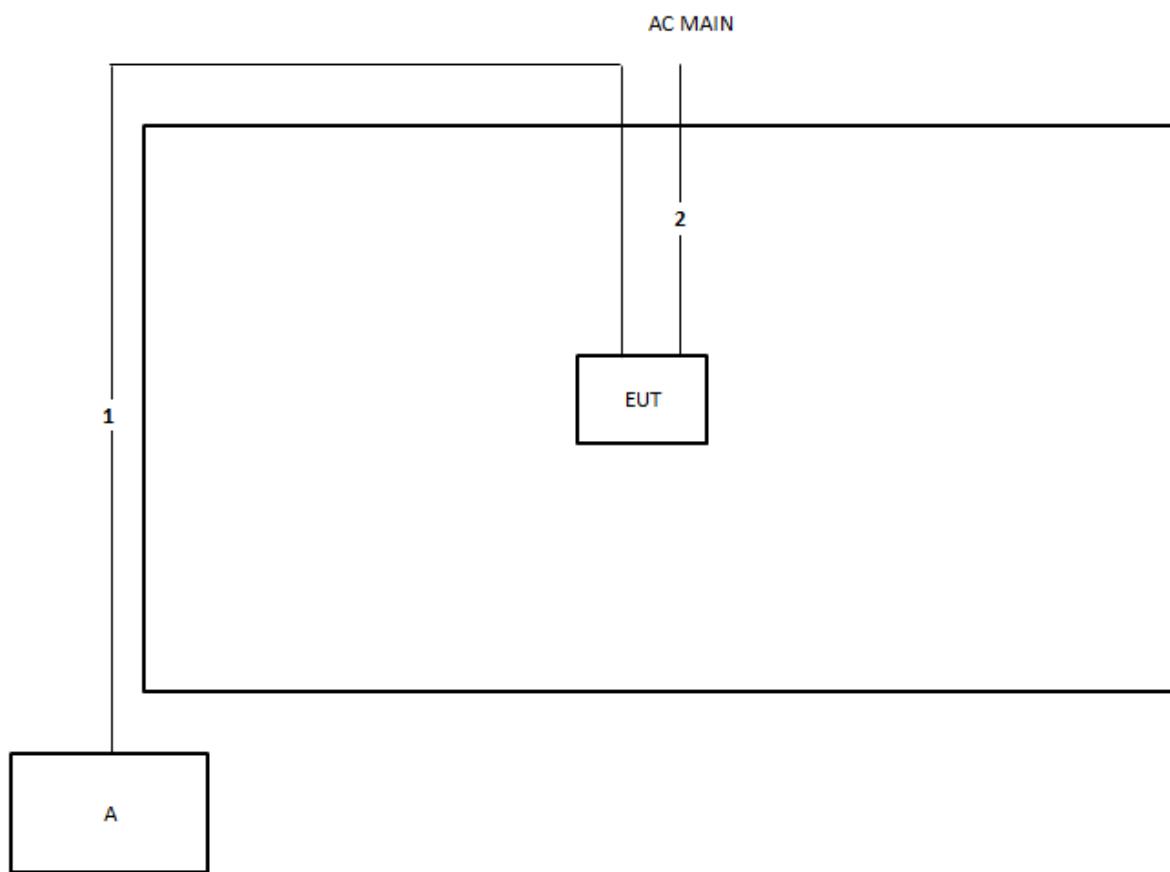
## 2.6 Test Setup Diagram







## Test Setup Diagram - Radiated Test &gt; 1GHz



Item	Connection	Shielded	Length
1	RJ-45 cable	No	10m
2	Power cable	No	1.5m



### 3 Transmitter Test Result

#### 3.1 AC Power-line Conducted Emissions

##### 3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: \* Decreases with the logarithm of the frequency.

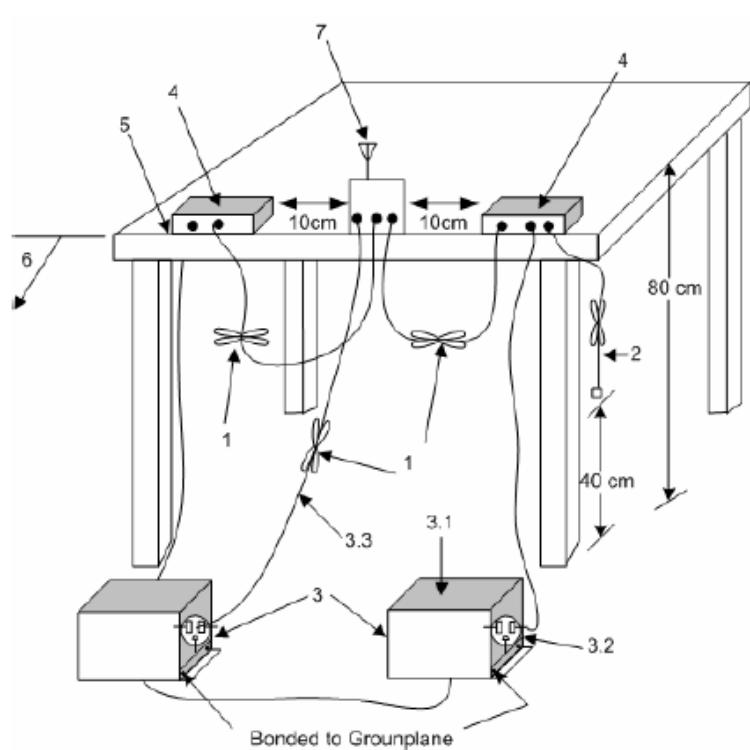
##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

### 3.1.4 Test Setup



- 1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
- 2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- 3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in  $50 \Omega$  loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
  - 3.1—All other equipment powered from additional LISN(s).
  - 3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
  - 3.3—LISN at least 80 cm from nearest part of EUT chassis.
- 4—Non-EUT components of EUT system being tested.
- 5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
- 6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
- 7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

### 3.1.5 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A



## 3.2 DTS Bandwidth

### 3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
<b>Systems using digital modulation techniques:</b>
▪ 6 dB bandwidth $\geq$ 500 kHz.

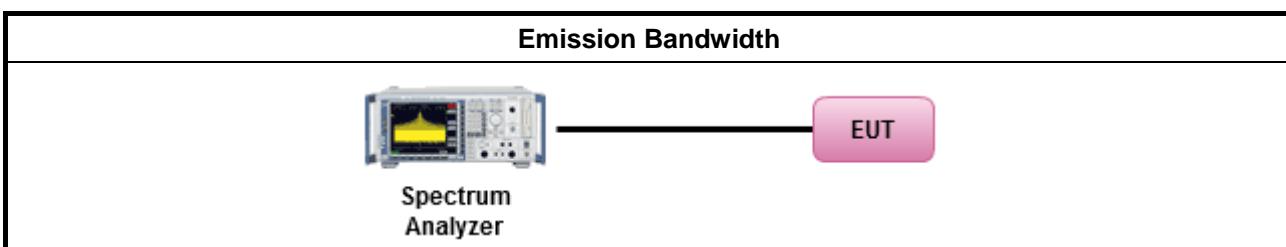
### 3.2.2 Measuring Instruments

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

### 3.2.3 Test Procedures

Test Method
▪ For the emission bandwidth shall be measured using one of the options below:
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.1 Option 1 for 6 dB bandwidth measurement.
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.2 Option 2 for 6 dB bandwidth measurement.
<input type="checkbox"/> Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B



### 3.3 Maximum Conducted Output Power

#### 3.3.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit	
	<ul style="list-style-type: none"><li>▪ If <math>G_{TX} \leq 6 \text{ dBi}</math>, then <math>P_{Out} \leq 30 \text{ dBm}</math> (1 W)</li></ul>
	<ul style="list-style-type: none"><li>▪ Point-to-multipoint systems (P2M): If <math>G_{TX} &gt; 6 \text{ dBi}</math>, then <math>P_{Out} = 30 - (G_{TX} - 6) \text{ dBm}</math></li></ul>
	<ul style="list-style-type: none"><li>▪ Point-to-point systems (P2P): If <math>G_{TX} &gt; 6 \text{ dBi}</math>, then <math>P_{Out} = 30 - (G_{TX} - 6)/3 \text{ dBm}</math></li></ul>
	<ul style="list-style-type: none"><li>▪ Smart antenna system (SAS):<ul style="list-style-type: none"><li>- Single beam: If <math>G_{TX} &gt; 6 \text{ dBi}</math>, then <math>P_{Out} = 30 - (G_{TX} - 6)/3 \text{ dBm}</math></li><li>- Overlap beam: If <math>G_{TX} &gt; 6 \text{ dBi}</math>, then <math>P_{Out} = 30 - (G_{TX} - 6)/3 \text{ dBm}</math></li><li>- Aggregate power on all beams: If <math>G_{TX} &gt; 6 \text{ dBi}</math>, then <math>P_{Out} = 30 - (G_{TX} - 6)/3 + 8\text{dB dBm}</math></li></ul></li></ul>

$P_{Out}$  = maximum peak conducted output power or maximum conducted output power in dBm,

$G_{TX}$  = the maximum transmitting antenna directional gain in dBi.

#### 3.3.2 Measuring Instruments

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



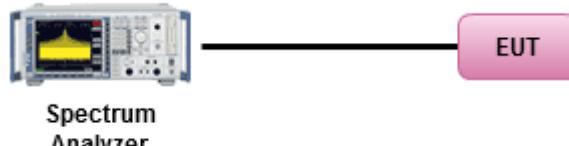
### 3.3.3 Test Procedures

Test Method	
▪ Maximum Peak Conducted Output Power	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.1.1 & C63.10 clause 11.9.1.1 (RBW $\geq$ EBW method). <input type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.1.3 & C63.10 clause 11.9.1.3 (peak power meter).
▪ Maximum Conducted Output Power	<p>[duty cycle <math>\geq</math> 98% or external video / power trigger]</p> <input type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.2 Method AVGSA-1. <input type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.3 Method AVGSA-1A. (alternative)
	duty cycle $<$ 98% and average over on/off periods with duty factor
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.4 Method AVGSA-2. <input type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.5 Method AVGSA-2A (alternative) <input type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.6 Method AVGSA-3 <input type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.7 Method AVGSA-3A (alternative)
	Measurement using a power meter (PM)
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.1 Method AVGPM (using an RF average power meter). <input type="checkbox"/> Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.2 Method AVGPM-G (using an gate RF average power meter).
▪ For conducted measurement.	<ul style="list-style-type: none"><li>If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.</li><li>If multiple transmit chains, EIRP calculation could be following as methods: <math>P_{total} = P_1 + P_2 + \dots + P_n</math> (calculated in linear unit [mW] and transfer to log unit [dBm]) <math>EIRP_{total} = P_{total} + DG</math></li></ul>



### 3.3.4 Test Setup

#### Maximum Conducted Output Power (Spectrum Analyzer)



### 3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C



## 3.4 Power Spectral Density

### 3.4.1 Power Spectral Density Limit

#### Power Spectral Density Limit

- Power Spectral Density (PSD)  $\leq 8 \text{ dBm/3kHz}$

### 3.4.2 Measuring Instruments

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

### 3.4.3 Test Procedures

#### Test Method

- Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).

Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.2 Method PKPSD.

[duty cycle  $\geq 98\%$  or external video / power trigger]

Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.3 Method AVGPSD-1.

Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.5 Method AVGPSD-2.

Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.7 Method AVGPSD-3.

duty cycle  $< 98\%$  and average over on/off periods with duty factor

Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.4 Method AVGPSD-1A.  
(alternative).

Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.6 Method AVGPSD-2A.  
(alternative)

Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.8 Method AVGPSD-3A.  
(alternative)

- For conducted measurement.

- If The EUT supports multiple transmit chains using options given below:

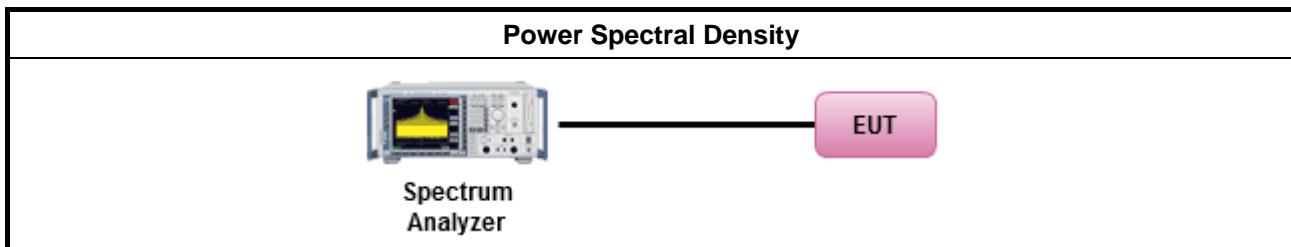
Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.

Option 2: Measure and sum spectral maxima across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,



Option 3: Measure and add  $10 \log(N)$  dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with  $10 \log(N)$ . Or each transmit chains shall be add  $10 \log(N)$  to compared with the limit.

### 3.4.4 Test Setup



### 3.4.5 Test Result of Power Spectral Density

Refer as Appendix D



### 3.5 Emissions in Non-restricted Frequency Bands

#### 3.5.1 Emissions in Non-restricted Frequency Bands Limit

Un-restricted Band Emissions Limit	
RF output power procedure	Limit (dB)
Peak output power procedure	20
Average output power procedure	30

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

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

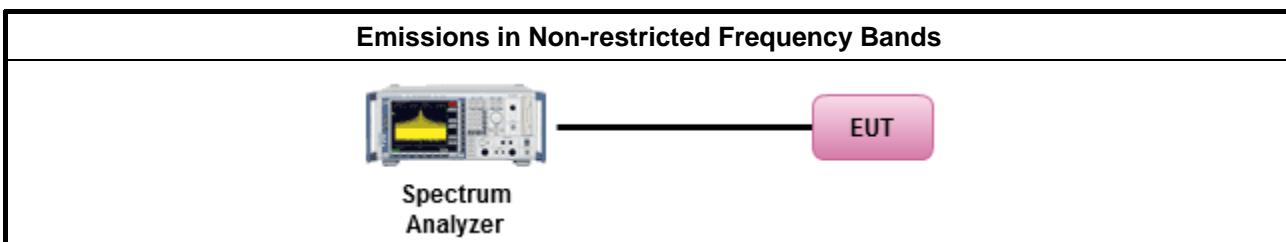
#### 3.5.2 Measuring Instruments

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

#### 3.5.3 Test Procedures

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

#### 3.5.4 Test Setup



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

Refer as Appendix E



## 3.6 Emissions in Restricted Frequency Bands

### 3.6.1 Emissions in Restricted Frequency Bands Limit

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

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

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

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

### 3.6.2 Measuring Instruments

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



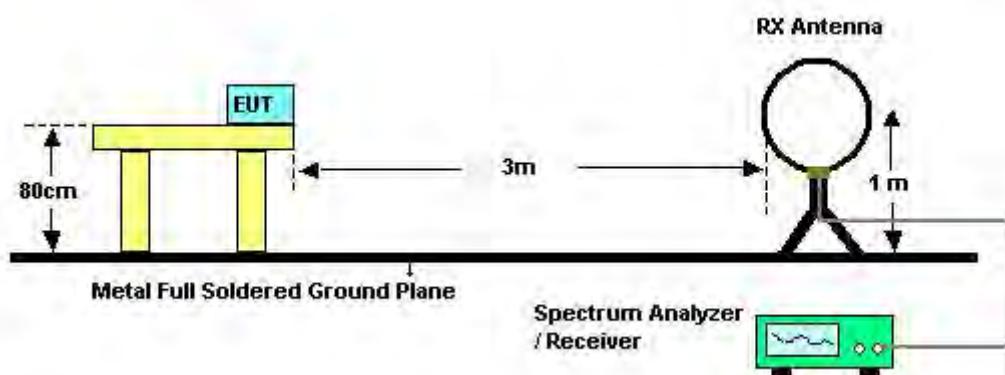
### 3.6.3 Test Procedures

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

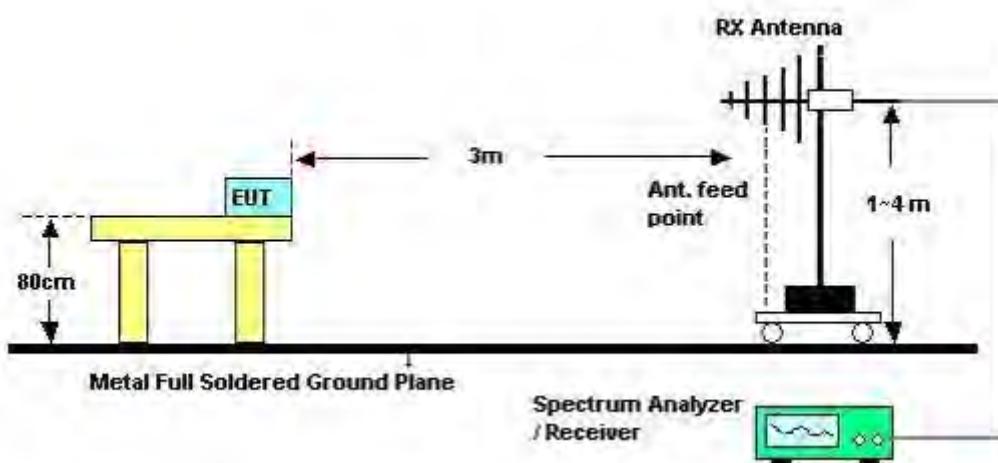
### 3.6.4 Test Setup

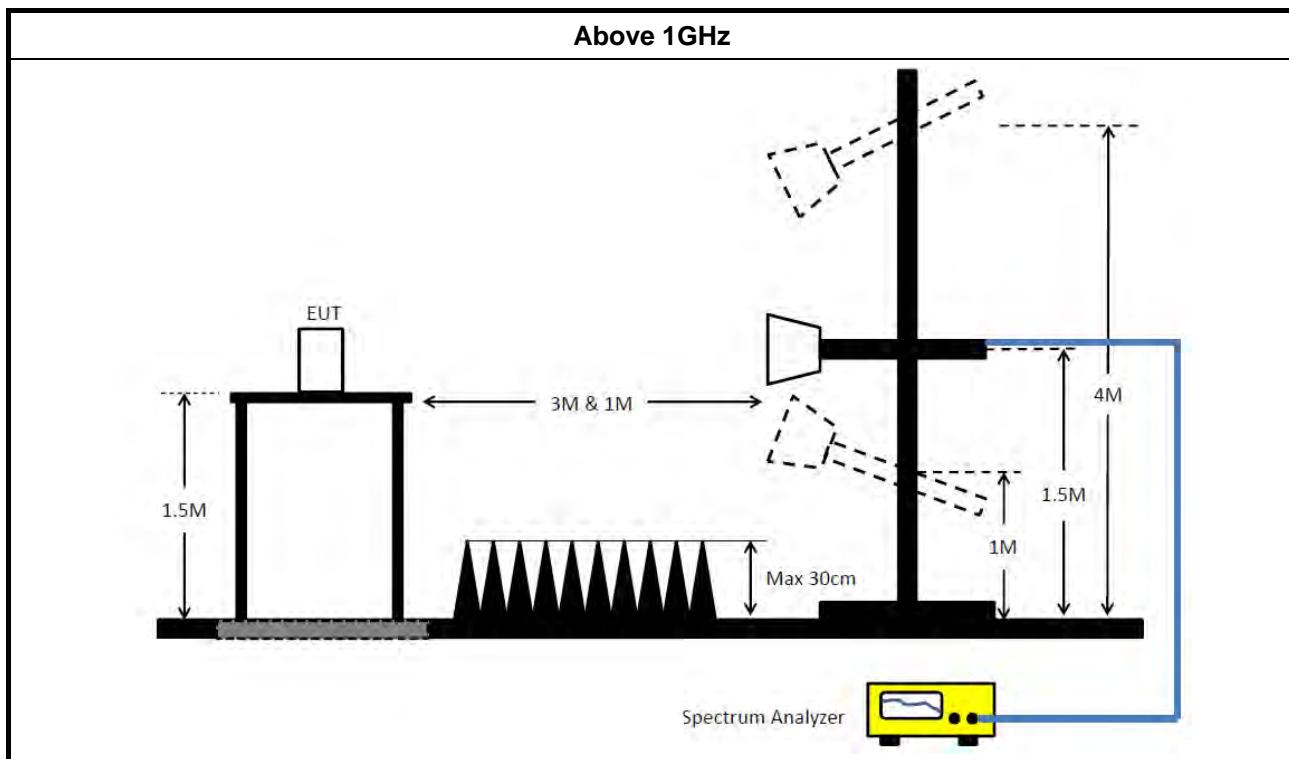
#### Radiated - Emissions in Restricted Frequency Bands

9kHz ~30MHz



30MHz~1GHz





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

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

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

### 3.6.6 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix F



## 4 Test Equipment and Calibration Data

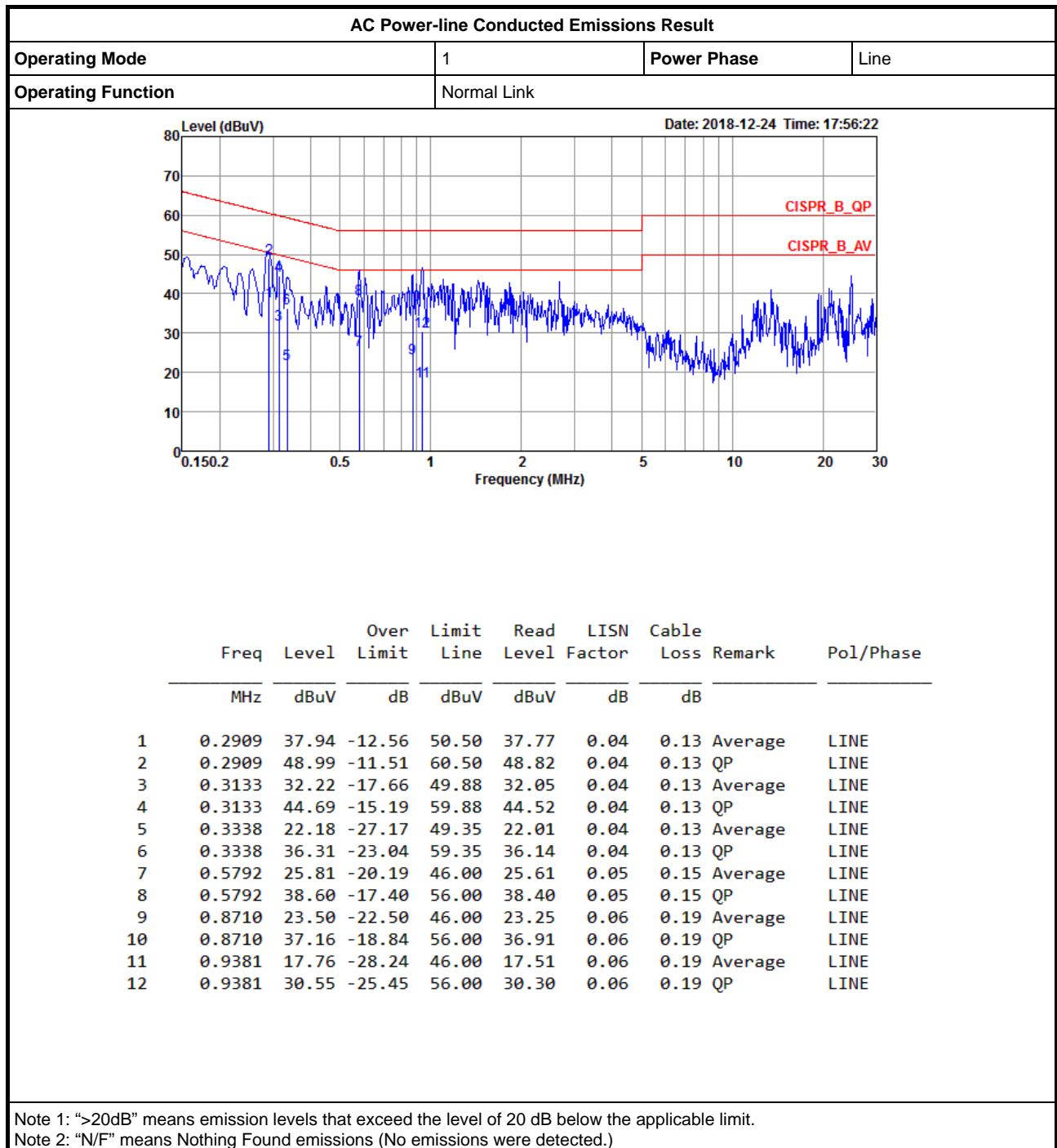
Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 31, 2018	Jan. 30, 2019	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 24, 2018	Dec. 23, 2019	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 05, 2018	Nov. 04, 2019	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	150kHz ~ 30MHz	May 22, 2018	May 21, 2019	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 27, 2018	Aug. 26, 2019	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	9610-4976	1GHz ~ 18GHz	Apr. 25, 2018	Apr. 24, 2019	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2018	May 01, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 09, 2018	Jan. 08, 2019	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100080	9kHz~40GHz	Oct. 03, 2018	Oct. 02, 2019	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS	100359	9kHz ~ 2.75GHz	Jul. 03, 2018	Jul. 02, 2019	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-I0-7	N/A	N/A	N/A	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 21, 2017	Dec. 20, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)

**FCC RADIO TEST REPORT****Report No. : FR8N1905AA**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-28	1 GHz –26.5 GHz	Nov. 19, 2018	Nov. 18, 2019	Conducted (TH01-CB)

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

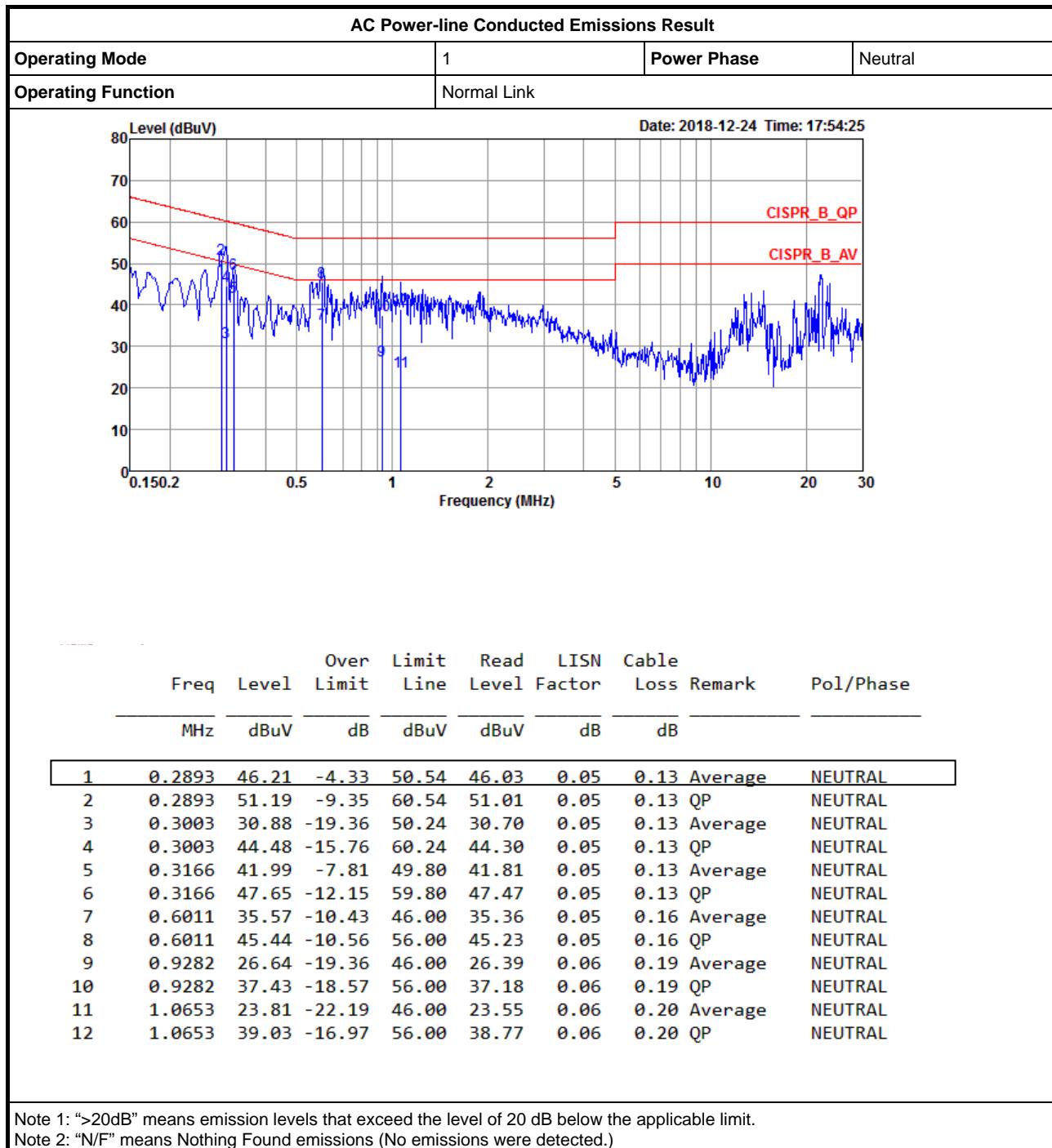
NCR means Non-Calibration required.





## AC Power-line Conducted Emissions Result

Appendix A



**Summary**

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
802.11b_Nss1,(1Mbps)_2TX	10.075M	16.717M	16M7G1D	10M	14.993M
802.11g_Nss1,(6Mbps)_2TX	15.1M	17.291M	17M3D1D	14.375M	16.342M
802.11n HT20_Nss1,(MCS0)_2TX	15.05M	18.166M	18M2D1D	14.4M	17.516M
802.11n HT40_Nss1,(MCS0)_2TX	35.05M	36.132M	36M1D1D	30.05M	35.732M

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

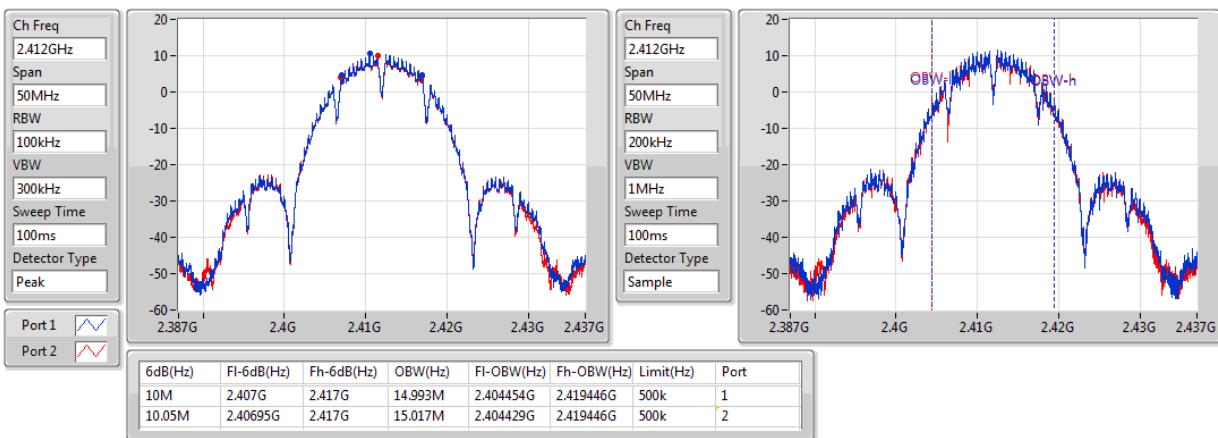
**Result**

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)	Port 2-N dB (Hz)	Port 2-OBW (Hz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	10M	14.993M	10.05M	15.017M
2437MHz	Pass	500k	10.075M	15.767M	10.075M	16.717M
2462MHz	Pass	500k	10.05M	15.467M	10.05M	15.367M
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	15.1M	16.342M	15.1M	16.442M
2437MHz	Pass	500k	15.05M	16.592M	15M	17.291M
2462MHz	Pass	500k	15.1M	16.392M	14.375M	16.417M
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	15.05M	17.516M	14.4M	17.516M
2437MHz	Pass	500k	15.05M	17.791M	14.975M	18.166M
2462MHz	Pass	500k	15.05M	17.516M	15M	17.516M
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	500k	35.05M	35.782M	35M	35.932M
2437MHz	Pass	500k	35M	35.732M	33.8M	36.132M
2452MHz	Pass	500k	33.8M	35.832M	30.05M	35.832M

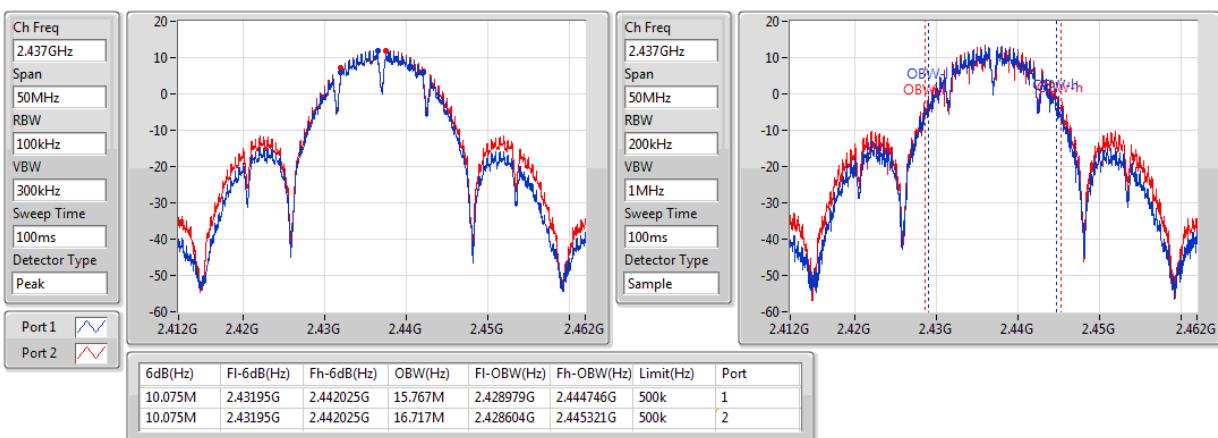
**Port X-N dB** = Port X 6dB down bandwidth; **Port X-OBW** = Port X 99% occupied bandwidth;

**802.11b\_Nss1,(1Mbps)\_2TX**
**EBW**
**2412MHz**

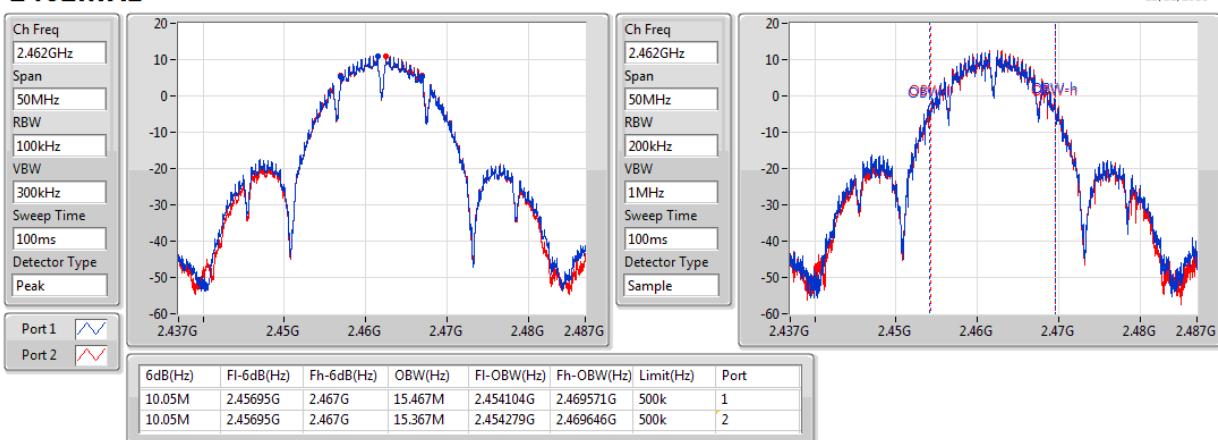
23/11/2018


**802.11b\_Nss1,(1Mbps)\_2TX**
**EBW**
**2437MHz**

23/11/2018

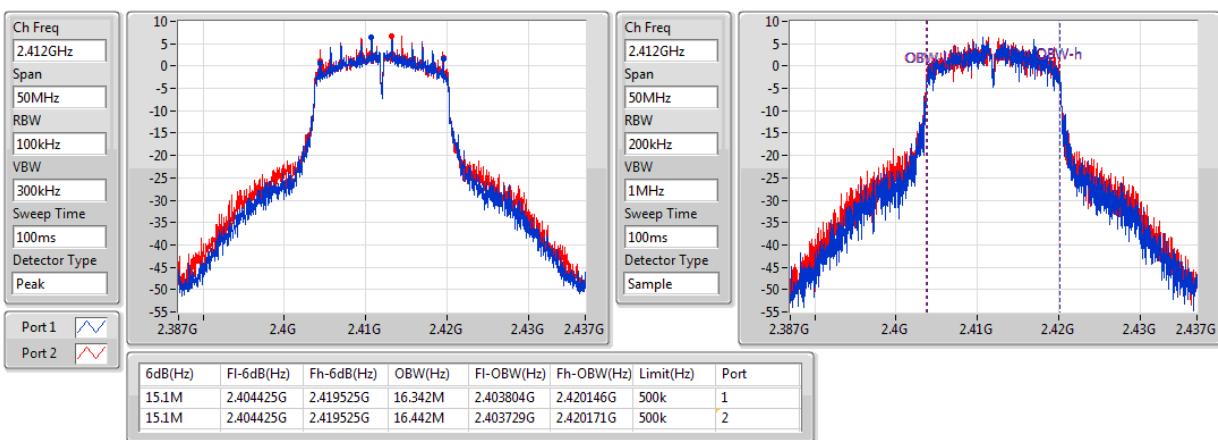

**802.11b\_Nss1,(1Mbps)\_2TX**
**EBW**
**2462MHz**

23/11/2018

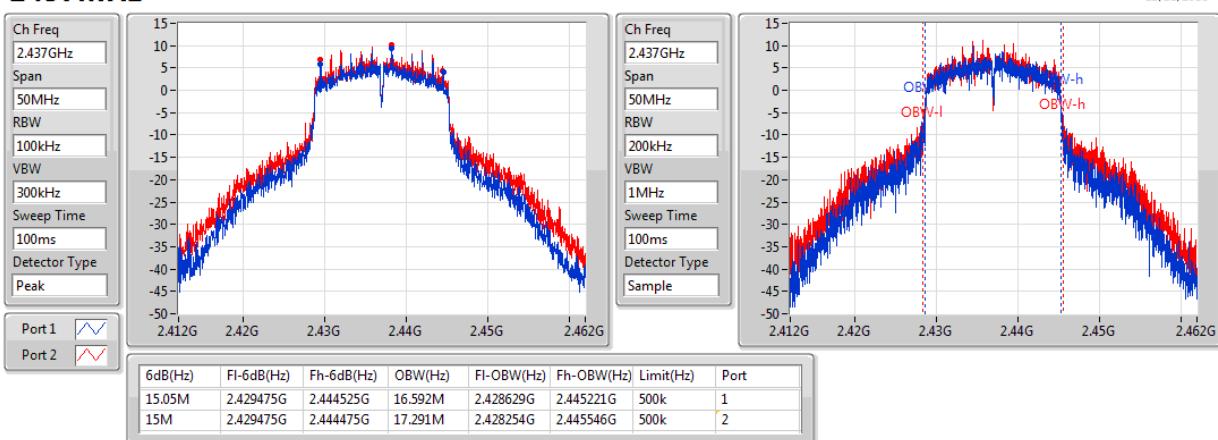


**802.11g\_Nss1,(6Mbps)\_2TX**
**EBW**
**2412MHz**

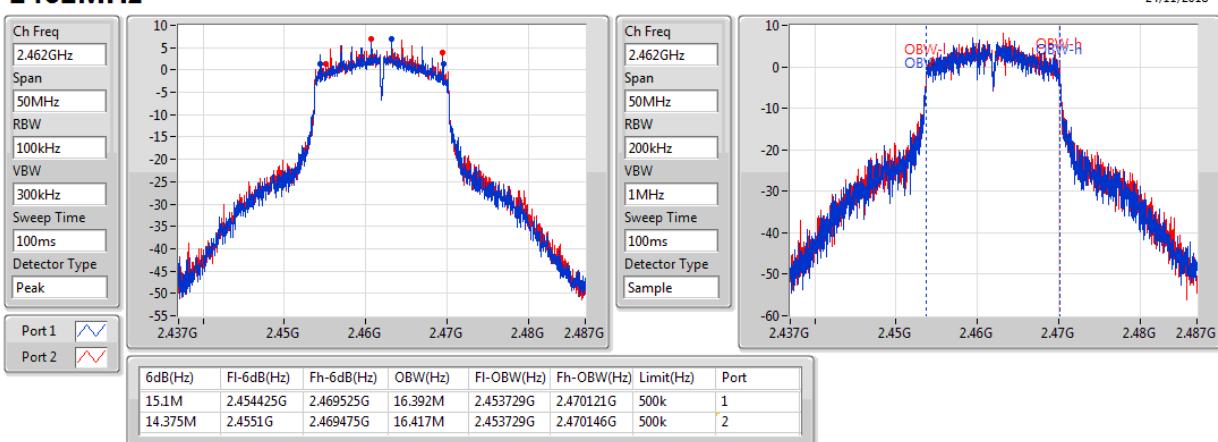
24/11/2018


**802.11g\_Nss1,(6Mbps)\_2TX**
**EBW**
**2437MHz**

23/11/2018

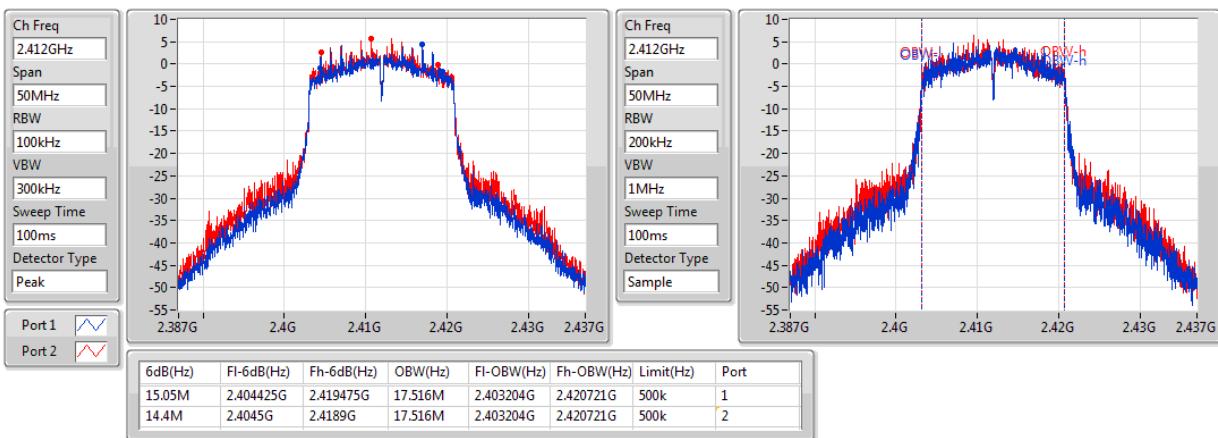

**802.11g\_Nss1,(6Mbps)\_2TX**
**EBW**
**2462MHz**

24/11/2018

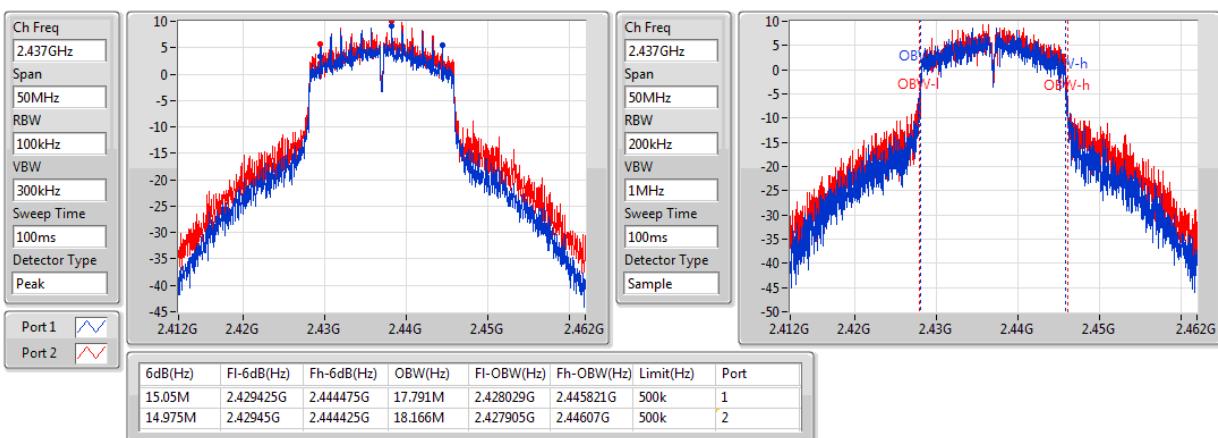


**802.11n HT20\_Nss1,(MCS0)\_2TX**
**EBW**
**2412MHz**

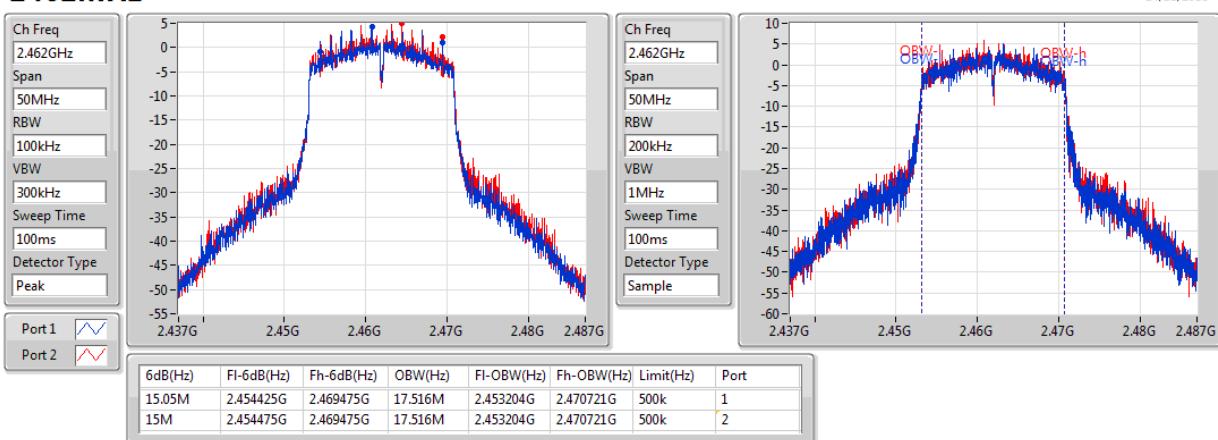
24/11/2018


**802.11n HT20\_Nss1,(MCS0)\_2TX**
**EBW**
**2437MHz**

24/11/2018

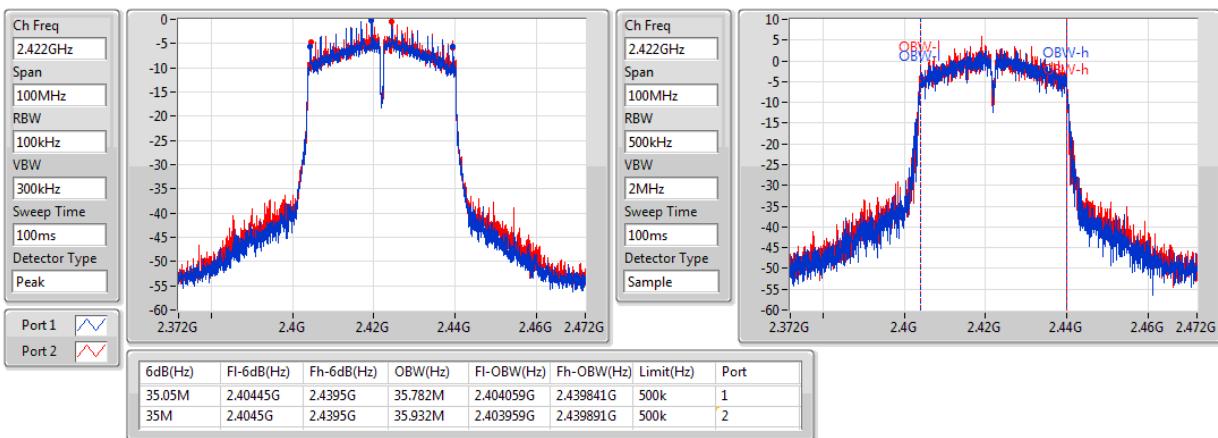

**802.11n HT20\_Nss1,(MCS0)\_2TX**
**EBW**
**2462MHz**

24/11/2018

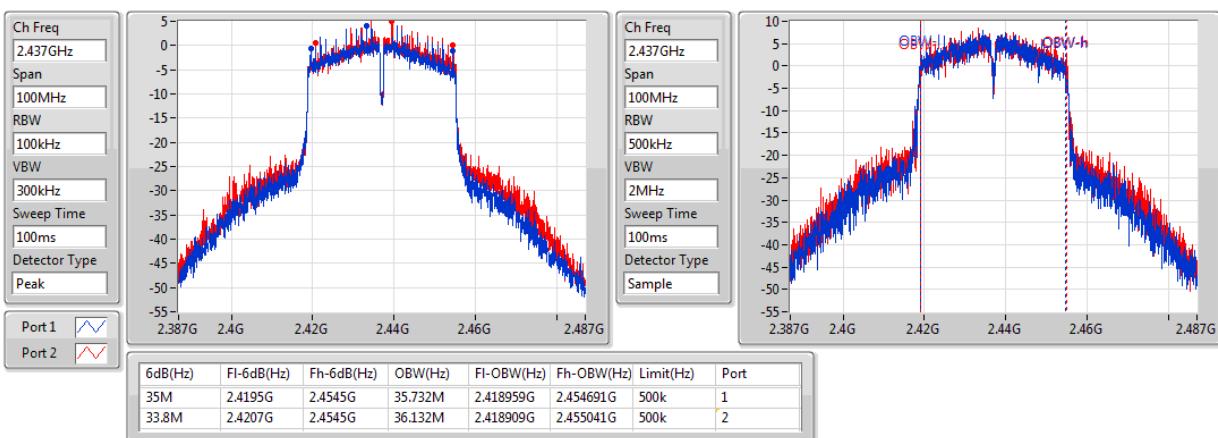


**802.11n HT40\_Nss1,(MCS0)\_2TX**
**EBW**
**2422MHz**

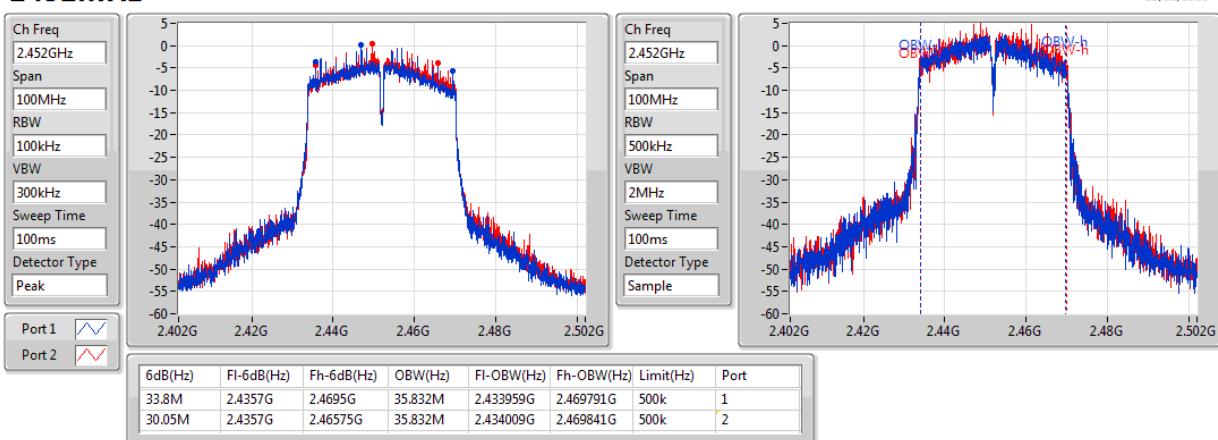
23/11/2018


**802.11n HT40\_Nss1,(MCS0)\_2TX**
**EBW**
**2437MHz**

23/11/2018


**802.11n HT40\_Nss1,(MCS0)\_2TX**
**EBW**
**2452MHz**

23/11/2018



**Summary**

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_2TX	25.84	0.38371
802.11g_Nss1,(6Mbps)_2TX	23.49	0.22336
802.11n HT20_Nss1,(MCS0)_2TX	23.38	0.21777
802.11n HT40_Nss1,(MCS0)_2TX	20.83	0.12106



## Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	2.53	20.49	20.79	23.65	30.00
2417MHz	Pass	2.53	21.91	21.90	24.92	30.00
2422MHz	Pass	2.53	21.94	21.73	24.85	30.00
2427MHz	Pass	2.53	22.25	22.46	25.37	30.00
2432MHz						
2437MHz	Pass	2.53	22.62	23.03	25.84	30.00
2442MHz	Pass	2.53	22.21	22.52	25.38	30.00
2447MHz	Pass	2.53	21.88	21.98	24.94	30.00
2452MHz	Pass	2.53	21.67	21.99	24.84	30.00
2457MHz	Pass	2.53	21.28	21.40	24.35	30.00
2462MHz	Pass	2.53	21.48	21.51	24.51	30.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	2.53	17.34	17.17	20.27	30.00
2417MHz	Pass	2.53	19.87	19.92	22.91	30.00
2437MHz	Pass	2.53	19.86	21.03	23.49	30.00
2452MHz	Pass	2.53	19.72	20.44	23.11	30.00
2457MHz	Pass	2.53	18.75	20.11	22.49	30.00
2462MHz	Pass	2.53	17.49	17.62	20.57	30.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	2.53	16.22	16.44	19.34	30.00
2417MHz	Pass	2.53	19.91	20.07	23.00	30.00
2422MHz	Pass	2.53	19.89	20.17	23.04	30.00
2437MHz	Pass	2.53	19.67	20.97	23.38	30.00
2447MHz	Pass	2.53	19.33	20.53	22.98	30.00
2452MHz	Pass	2.53	18.93	20.23	22.64	30.00
2457MHz	Pass	2.53	18.64	19.22	21.95	30.00
2462MHz	Pass	2.53	15.65	15.94	18.81	30.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	2.53	12.87	13.04	15.97	30.00
2427MHz	Pass	2.53	14.00	14.14	17.08	30.00
2432MHz	Pass	2.53	16.05	16.14	19.11	30.00
2437MHz	Pass	2.53	17.71	17.93	20.83	30.00
2442MHz	Pass	2.53	15.92	16.08	19.01	30.00
2447MHz	Pass	2.53	14.35	14.49	17.43	30.00
2452MHz	Pass	2.53	13.34	13.52	16.44	30.00

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

Note : Conducted average output power is for reference only

**Summary**

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
802.11b_Nss1,(1Mbps)_2TX	-6.86
802.11g_Nss1,(6Mbps)_2TX	-4.00
802.11n HT20_Nss1,(MCS0)_2TX	-4.71
802.11n HT40_Nss1,(MCS0)_2TX	-8.36

RBW=3kHz.

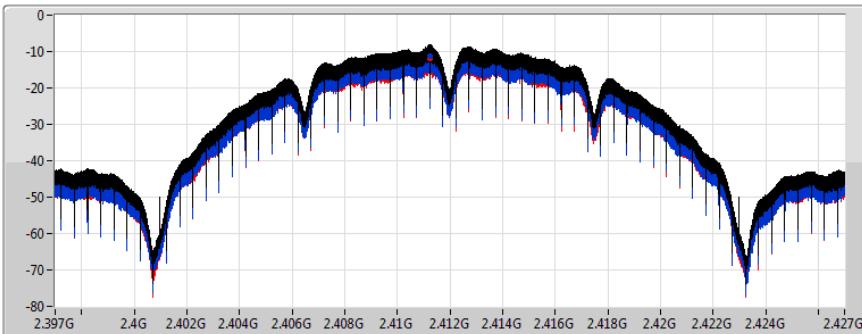
**Result**

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	Port 2 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	5.54	-11.20	-11.91	-8.62	8.00
2437MHz	Pass	5.54	-9.58	-9.71	-6.86	8.00
2462MHz	Pass	5.54	-10.52	-10.49	-7.49	8.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	5.54	-9.69	-8.59	-7.70	8.00
2437MHz	Pass	5.54	-7.32	-6.21	-4.00	8.00
2462MHz	Pass	5.54	-9.99	-8.88	-6.90	8.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	5.54	-11.45	-10.26	-8.64	8.00
2437MHz	Pass	5.54	-6.40	-6.63	-4.71	8.00
2462MHz	Pass	5.54	-11.57	-9.16	-7.51	8.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	5.54	-16.39	-16.40	-13.41	8.00
2437MHz	Pass	5.54	-11.77	-10.71	-8.36	8.00
2452MHz	Pass	5.54	-15.34	-14.25	-13.12	8.00

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

**802.11b\_Nss1,(1Mbps)\_2TX**
**2412MHz**

Ch Freq  
2.412GHz  
Span  
30MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
334ms  
Detector Type  
RMS

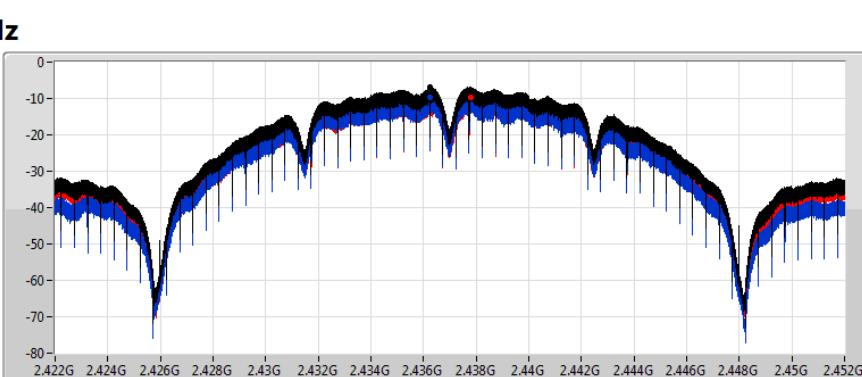

**PSD**

23/11/2018

Sum  
Port 1  
Port 2

**802.11b\_Nss1,(1Mbps)\_2TX**
**2437MHz**

Ch Freq  
2.437GHz  
Span  
30MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
334ms  
Detector Type  
RMS


**PSD**

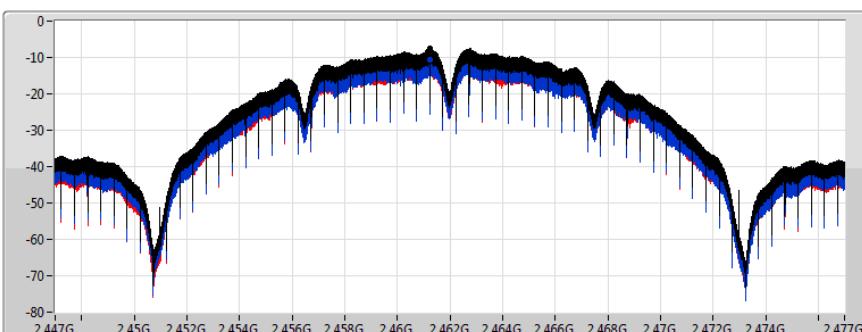
23/11/2018

Sum  
Port 1  
Port 2

Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-6.86	-6.86	-9.58	-9.71

**802.11b\_Nss1,(1Mbps)\_2TX**
**2462MHz**

Ch Freq  
2.462GHz  
Span  
30MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
334ms  
Detector Type  
RMS


**PSD**

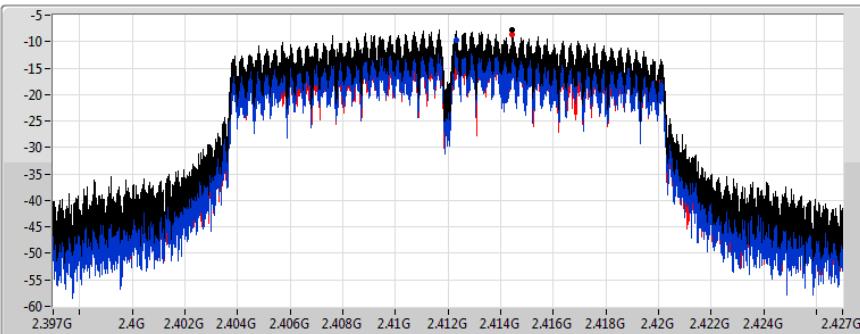
23/11/2018

Sum  
Port 1  
Port 2

Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-7.49	-7.49	-10.52	-10.49

**802.11g\_Nss1,(6Mbps)\_2TX**
**2412MHz**

Ch Freq  
2.412GHz  
Span  
30MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
334ms  
Detector Type  
Peak

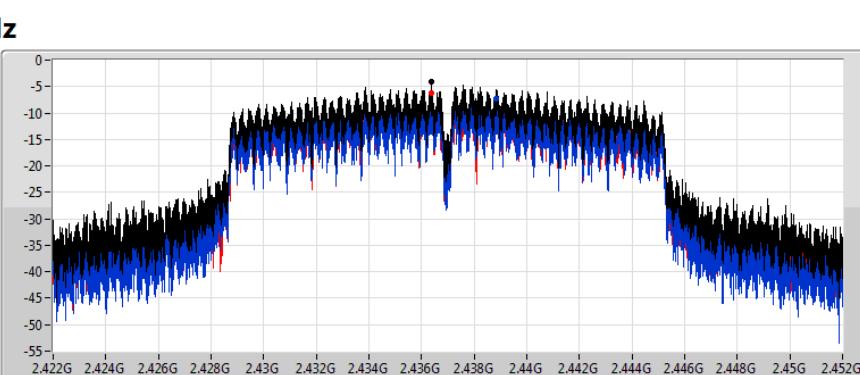

**PSD**

24/11/2018

Sum  
Port 1  
Port 2

**802.11g\_Nss1,(6Mbps)\_2TX**
**2437MHz**

Ch Freq  
2.437GHz  
Span  
30MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
334ms  
Detector Type  
Peak

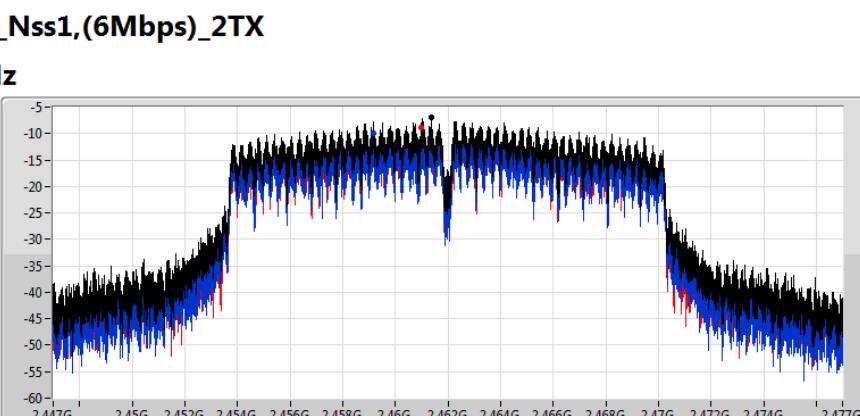

**PSD**

23/11/2018

Sum  
Port 1  
Port 2

**802.11g\_Nss1,(6Mbps)\_2TX**
**2462MHz**

Ch Freq  
2.462GHz  
Span  
30MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
334ms  
Detector Type  
Peak


**PSD**

24/11/2018

Sum  
Port 1  
Port 2

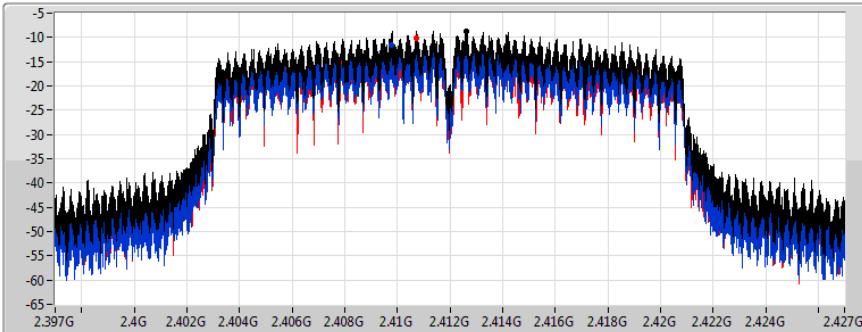
Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-7.70	-7.70	-9.69	-8.59

Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-4.00	-4.00	-7.32	-6.21

Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-6.90	-6.90	-9.99	-8.88

**802.11n HT20\_Nss1,(MCS0)\_2TX**
**2412MHz**

Ch Freq  
2.412GHz  
Span  
30MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
334ms  
Detector Type  
Peak

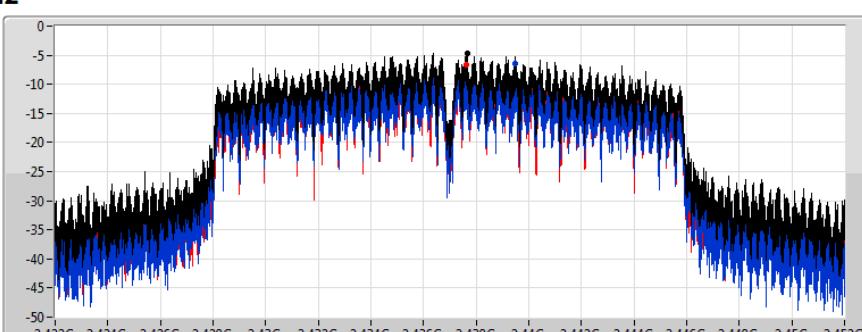

**PSD**

24/11/2018

Sum  
Port 1  
Port 2

**802.11n HT20\_Nss1,(MCS0)\_2TX**
**2437MHz**

Ch Freq  
2.437GHz  
Span  
30MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
334ms  
Detector Type  
Peak

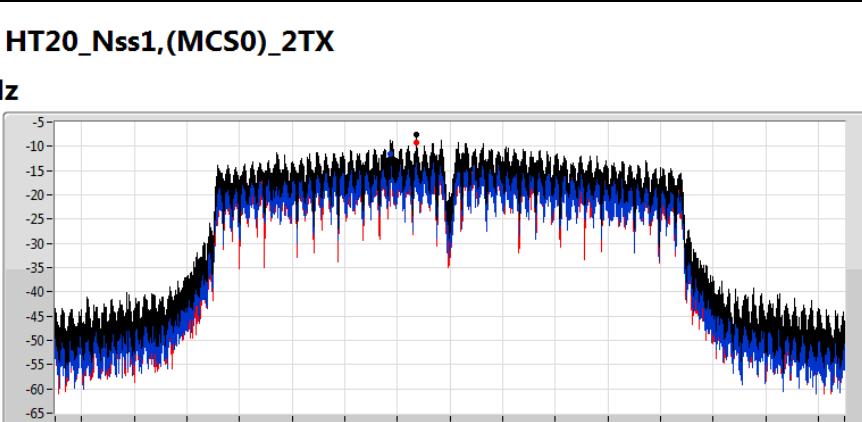

**PSD**

24/11/2018

Sum  
Port 1  
Port 2

**802.11n HT20\_Nss1,(MCS0)\_2TX**
**2462MHz**

Ch Freq  
2.462GHz  
Span  
30MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
334ms  
Detector Type  
Peak


**PSD**

24/11/2018

Sum  
Port 1  
Port 2

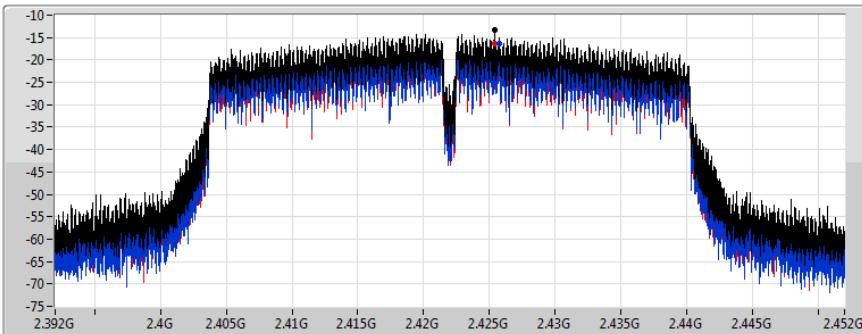
Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-8.64	-8.64	-11.45	-10.26

Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-4.71	-4.71	-6.40	-6.63

Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-7.51	-7.51	-11.57	-9.16

**802.11n HT40\_Nss1,(MCS0)\_2TX**
**2422MHz**

Ch Freq  
2.422GHz  
Span  
60MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
667ms  
Detector Type  
Peak

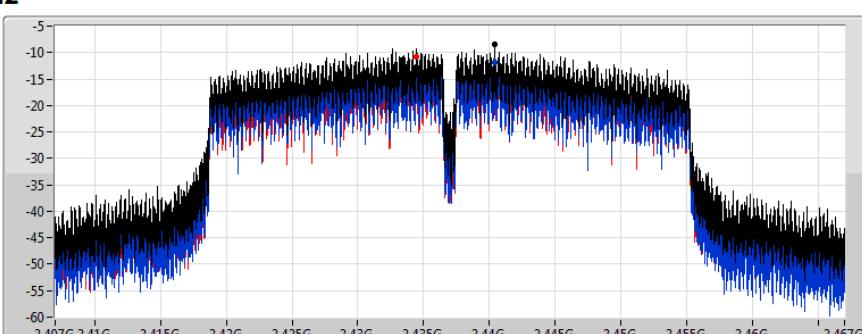

**PSD**

23/11/2018

Sum  
Port 1  
Port 2

**802.11n HT40\_Nss1,(MCS0)\_2TX**
**2437MHz**

Ch Freq  
2.437GHz  
Span  
60MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
667ms  
Detector Type  
Peak

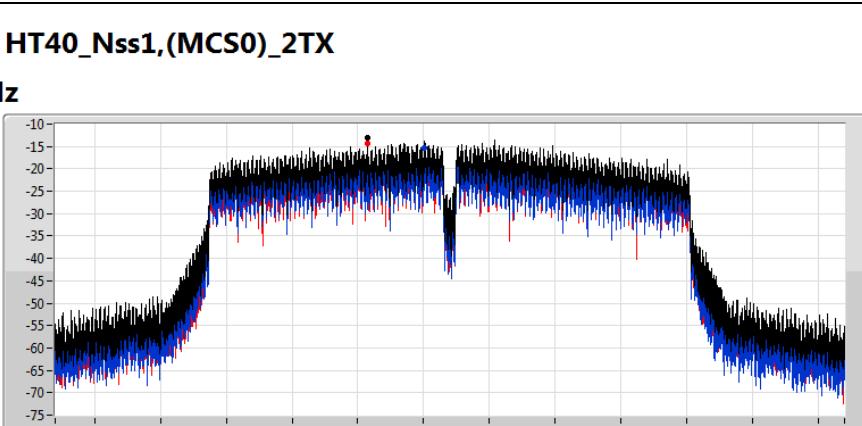

**PSD**

23/11/2018

Sum  
Port 1  
Port 2

**802.11n HT40\_Nss1,(MCS0)\_2TX**
**2452MHz**

Ch Freq  
2.452GHz  
Span  
60MHz  
RBW  
3kHz  
VBW  
10kHz  
Sweep Time  
667ms  
Detector Type  
Peak


**PSD**

23/11/2018

Sum  
Port 1  
Port 2

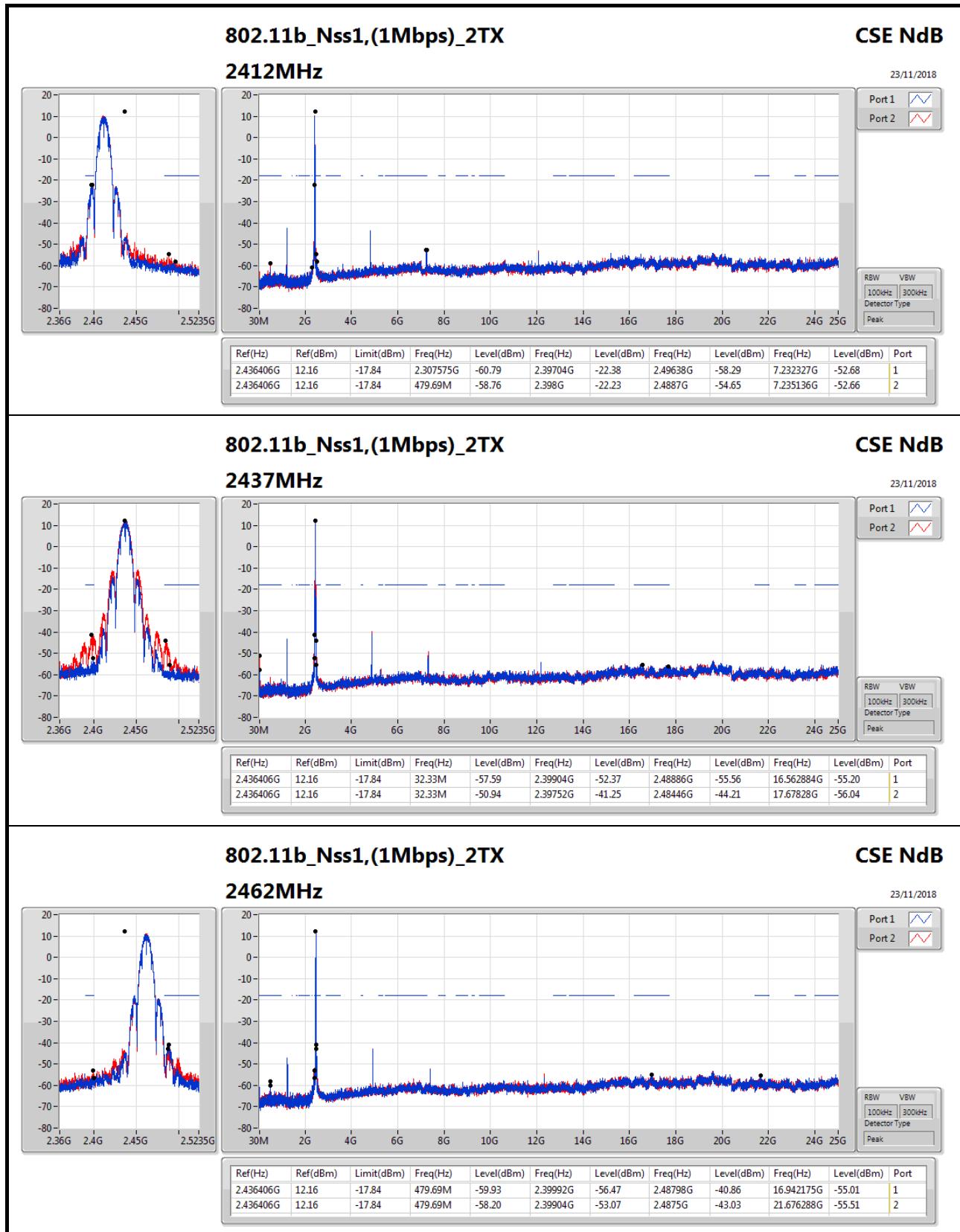
Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-13.12	-13.12	-15.34	-14.25

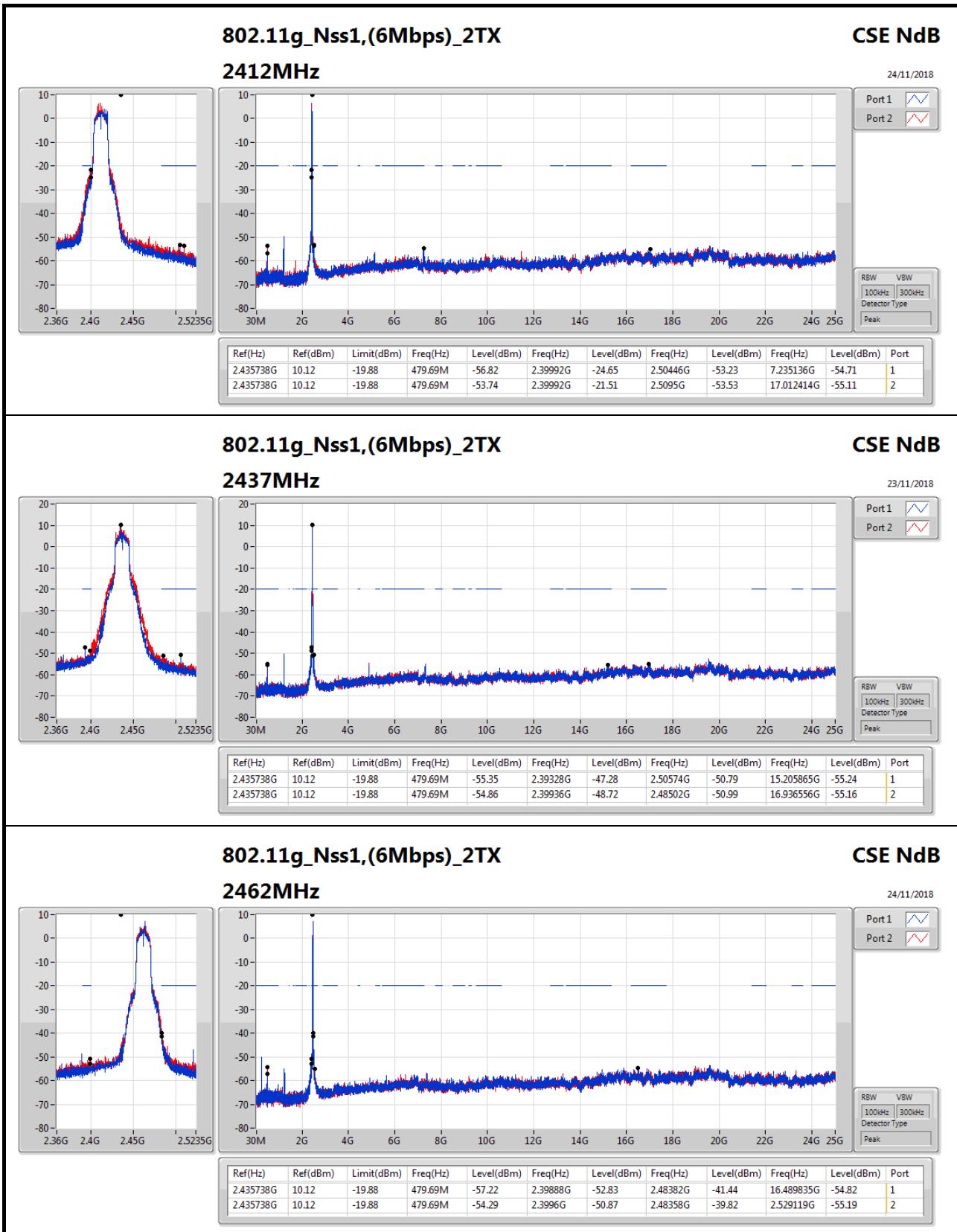
**Summary**

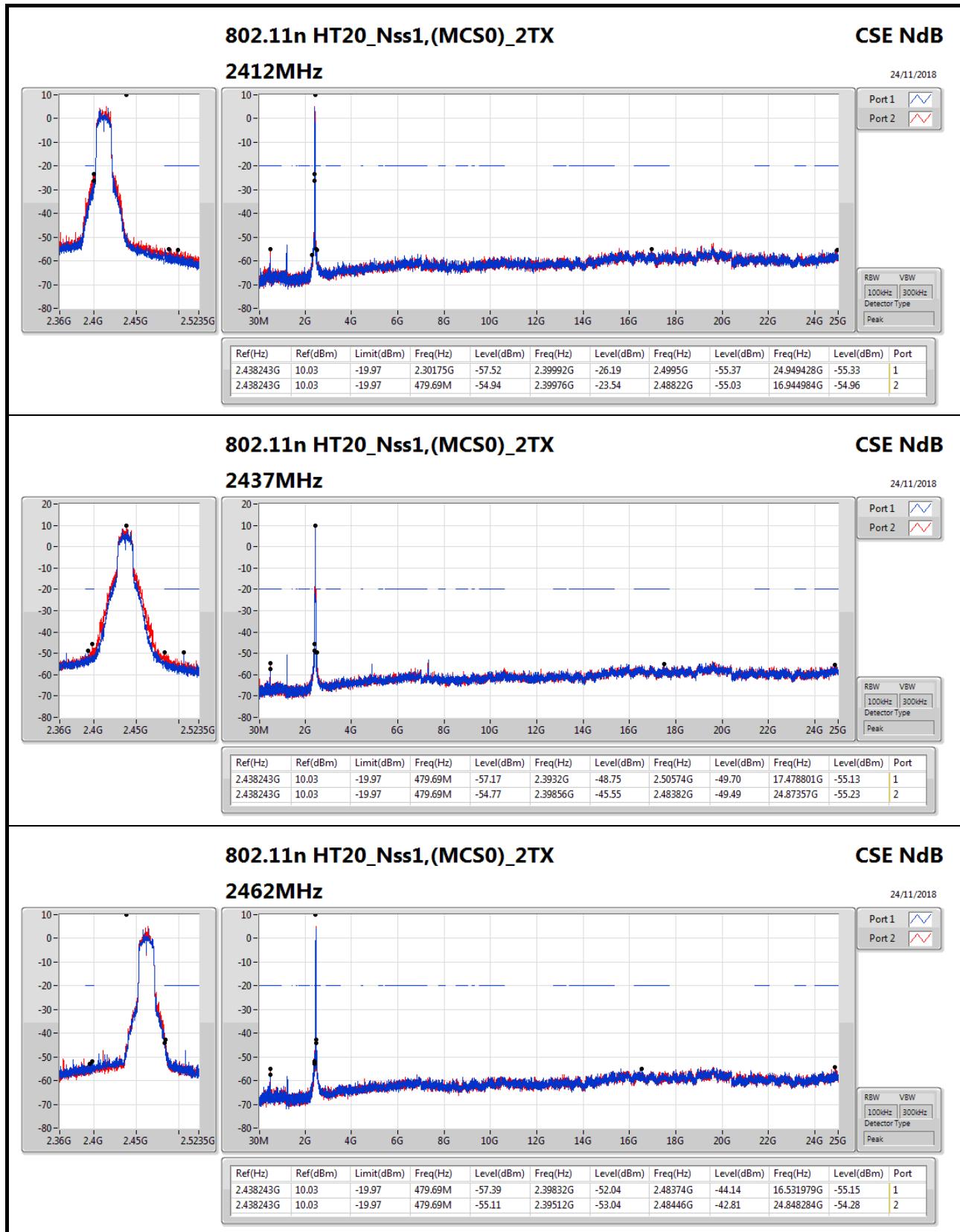
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
802.11b_Nss1,(1Mbps)_2TX	Pass	2.436406G	12.16	-17.84	479.69M	-58.76	2.398G	-22.23	2.4887G	-54.65	7.235136G	-52.66	2
802.11g_Nss1,(6Mbps)_2TX	Pass	2.435738G	10.12	-19.88	479.69M	-53.74	2.39992G	-21.51	2.5095G	-53.53	17.012414G	-55.11	2
802.11n HT20_Nss1,(MCS0)_2TX	Pass	2.438243G	10.03	-19.97	479.69M	-54.94	2.39976G	-23.54	2.48822G	-55.03	16.944984G	-54.96	2
802.11n HT40_Nss1,(MCS0)_2TX	Pass	2.434402G	5.49	-24.51	479.985M	-51.99	2.39952G	-25.99	2.48366G	-43.16	16.227329G	-54.05	2

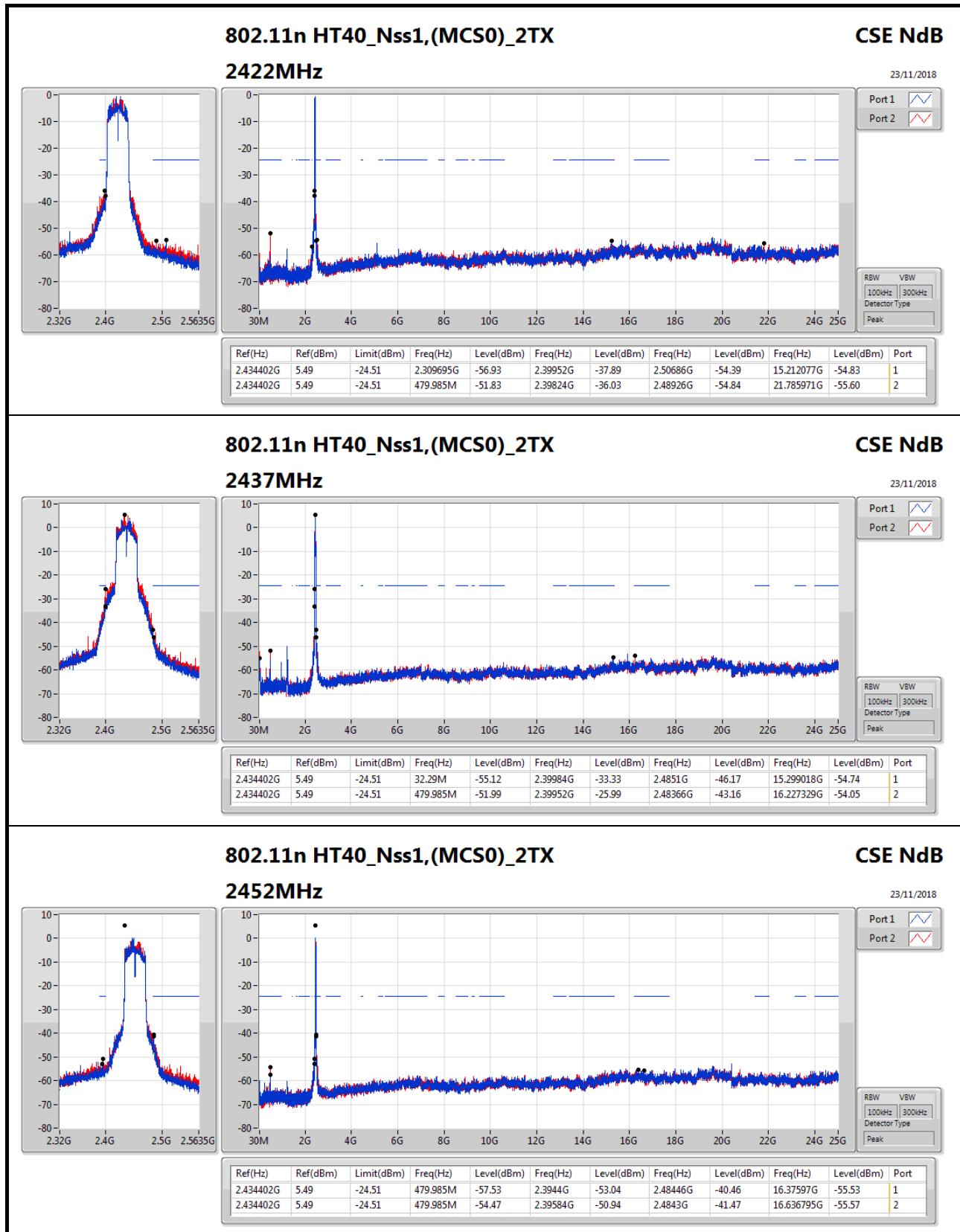
**Result**

Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.436406G	12.16	-17.84	2.307575G	-60.79	2.39704G	-22.38	2.49638G	-58.29	7.232327G	-52.68	1
2412MHz	Pass	2.436406G	12.16	-17.84	479.69M	-58.76	2.398G	-22.23	2.4887G	-54.65	7.235136G	-52.66	2
2437MHz	Pass	2.436406G	12.16	-17.84	32.33M	-57.59	2.39904G	-52.37	2.48886G	-55.56	16.562884G	-55.20	1
2437MHz	Pass	2.436406G	12.16	-17.84	32.33M	-50.94	2.39752G	-41.25	2.48446G	-44.21	17.67828G	-56.04	2
2462MHz	Pass	2.436406G	12.16	-17.84	479.69M	-59.93	2.39992G	-56.47	2.48798G	-40.86	16.942175G	-55.01	1
2462MHz	Pass	2.436406G	12.16	-17.84	479.69M	-58.20	2.39904G	-53.07	2.4875G	-43.03	21.676288G	-55.51	2
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.435738G	10.12	-19.88	479.69M	-56.82	2.39992G	-24.65	2.50446G	-53.23	7.235136G	-54.71	1
2412MHz	Pass	2.435738G	10.12	-19.88	479.69M	-53.74	2.39992G	-21.51	2.5095G	-53.53	17.012414G	-55.11	2
2437MHz	Pass	2.435738G	10.12	-19.88	479.69M	-55.35	2.39328G	-47.28	2.50574G	-50.79	15.205865G	-55.24	1
2437MHz	Pass	2.435738G	10.12	-19.88	479.69M	-54.86	2.39936G	-48.72	2.48502G	-50.99	16.936556G	-55.16	2
2462MHz	Pass	2.435738G	10.12	-19.88	479.69M	-57.22	2.39888G	-52.83	2.48382G	-41.44	16.489835G	-54.82	1
2462MHz	Pass	2.435738G	10.12	-19.88	479.69M	-54.29	2.3996G	-50.87	2.48358G	-39.82	2.529119G	-55.19	2
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.438243G	10.03	-19.97	2.30175G	-57.52	2.39992G	-26.19	2.4995G	-55.37	24.949428G	-55.33	1
2412MHz	Pass	2.438243G	10.03	-19.97	479.69M	-54.94	2.39976G	-23.54	2.48822G	-55.03	16.944984G	-54.96	2
2437MHz	Pass	2.438243G	10.03	-19.97	479.69M	-57.17	2.3932G	-48.75	2.50574G	-49.70	17.478801G	-55.13	1
2437MHz	Pass	2.438243G	10.03	-19.97	479.69M	-54.77	2.39856G	-45.55	2.48382G	-49.49	24.87357G	-55.23	2
2462MHz	Pass	2.438243G	10.03	-19.97	479.69M	-57.39	2.39832G	-52.04	2.48374G	-44.14	16.531979G	-55.15	1
2462MHz	Pass	2.438243G	10.03	-19.97	479.69M	-55.11	2.39512G	-53.04	2.48446G	-42.81	24.848284G	-54.28	2
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2422MHz	Pass	2.434402G	5.49	-24.51	2.309695G	-56.93	2.39952G	-37.89	2.50686G	-54.39	15.212077G	-54.83	1
2422MHz	Pass	2.434402G	5.49	-24.51	479.985M	-51.83	2.39824G	-36.03	2.48926G	-54.84	21.785971G	-55.60	2
2437MHz	Pass	2.434402G	5.49	-24.51	32.29M	-55.12	2.39984G	-33.33	2.4851G	-46.17	15.299018G	-54.74	1
2437MHz	Pass	2.434402G	5.49	-24.51	479.985M	-51.99	2.39952G	-25.99	2.48366G	-43.16	16.227329G	-54.05	2
2452MHz	Pass	2.434402G	5.49	-24.51	479.985M	-57.53	2.3944G	-53.04	2.48446G	-40.46	16.37597G	-55.53	1
2452MHz	Pass	2.434402G	5.49	-24.51	479.985M	-54.47	2.39584G	-50.94	2.4843G	-41.47	16.636795G	-55.57	2





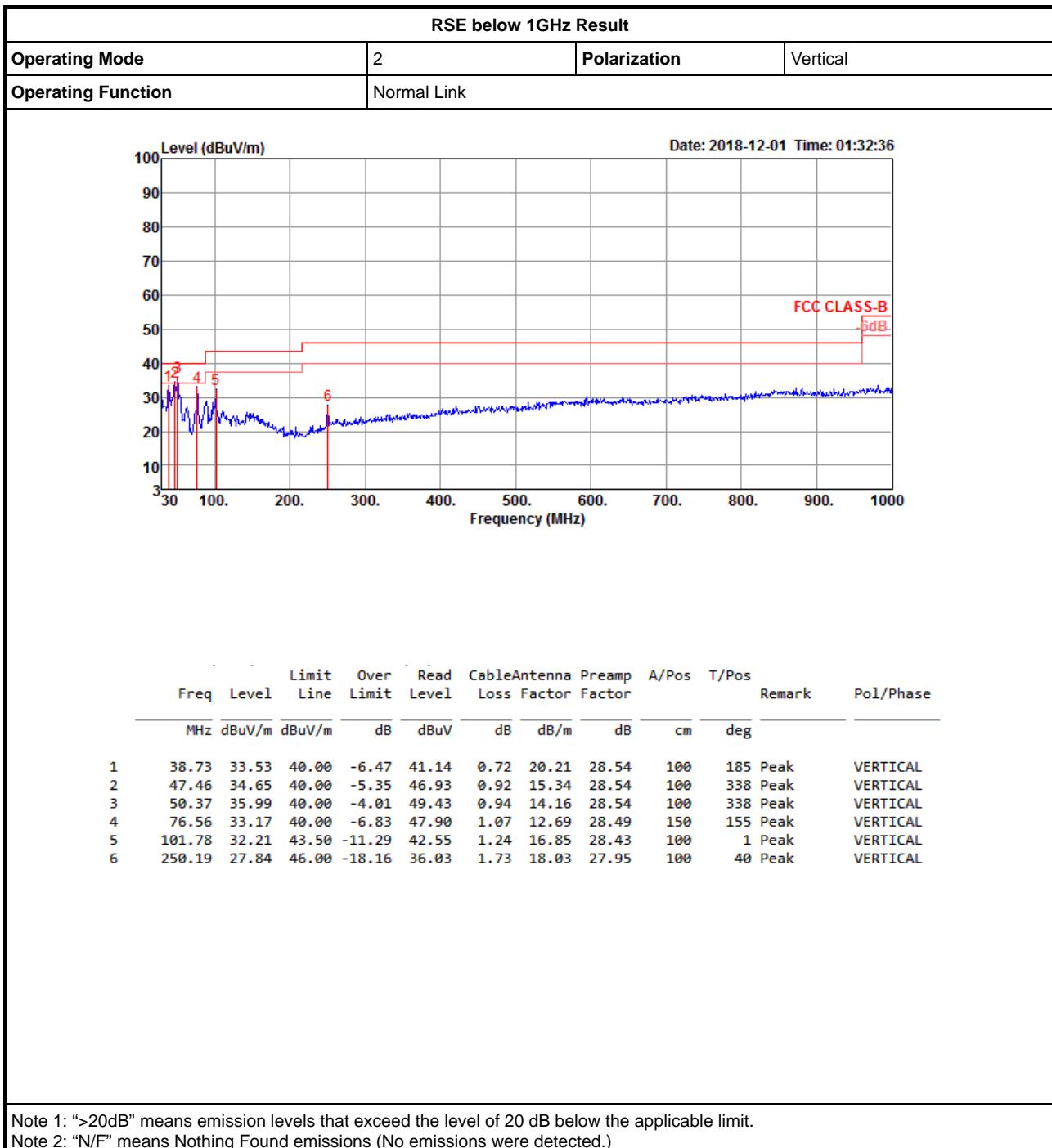






## RSE below 1GHz Result

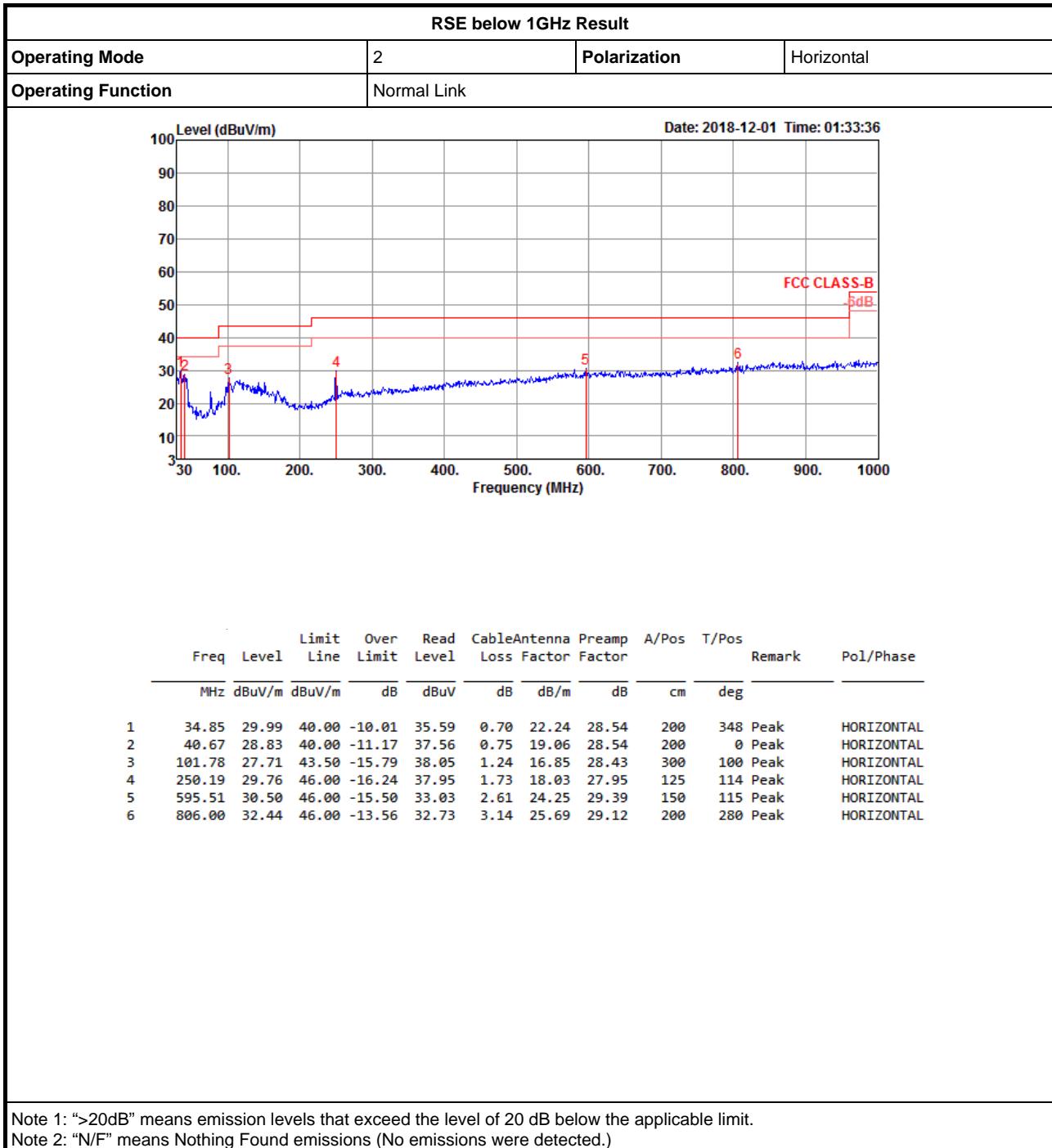
Appendix F.1





## RSE below 1GHz Result

## Appendix F.1

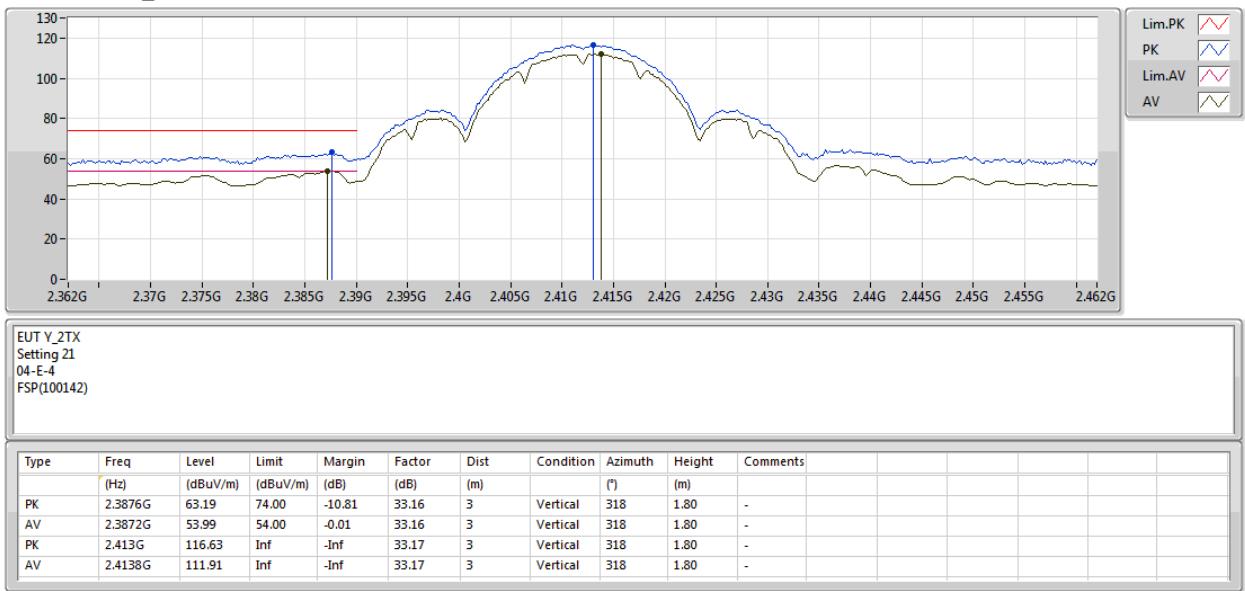


**Summary**

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
802.11b_Nss1,(1Mbps)_2TX	Pass	AV	2.3872G	53.99	54.00	-0.01	33.16	3	Vertical	318	1.80	-

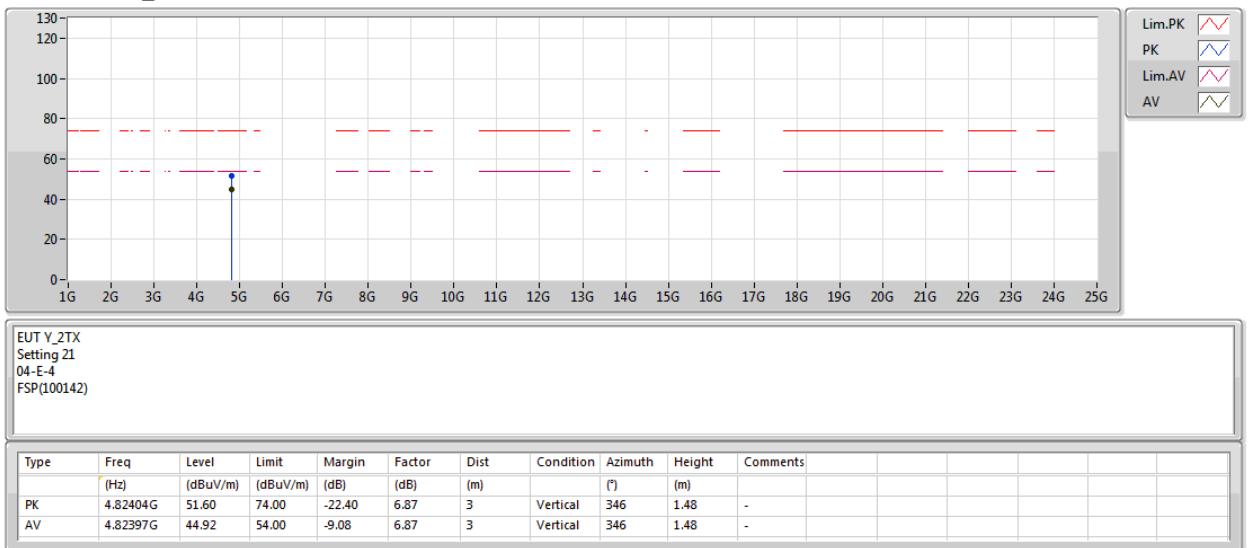
**802.11b\_Nss1,(1Mbps)\_2TX**

01/11/2018

**2412MHz\_TX**


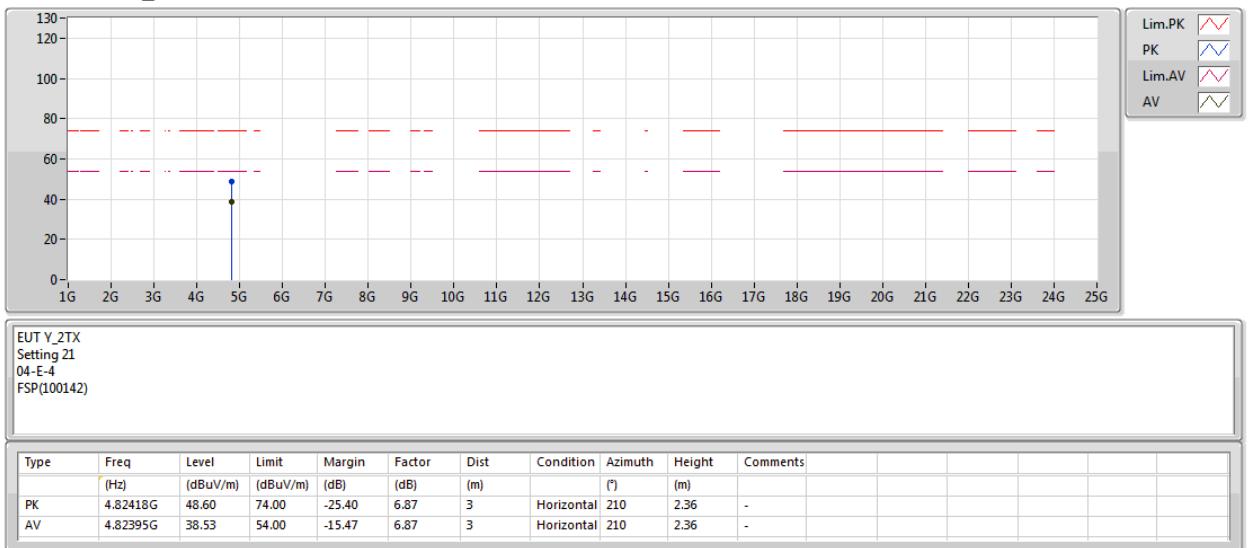
**802.11b\_Nss1,(1Mbps)\_2TX**

01/11/2018

**2412MHz\_TX**

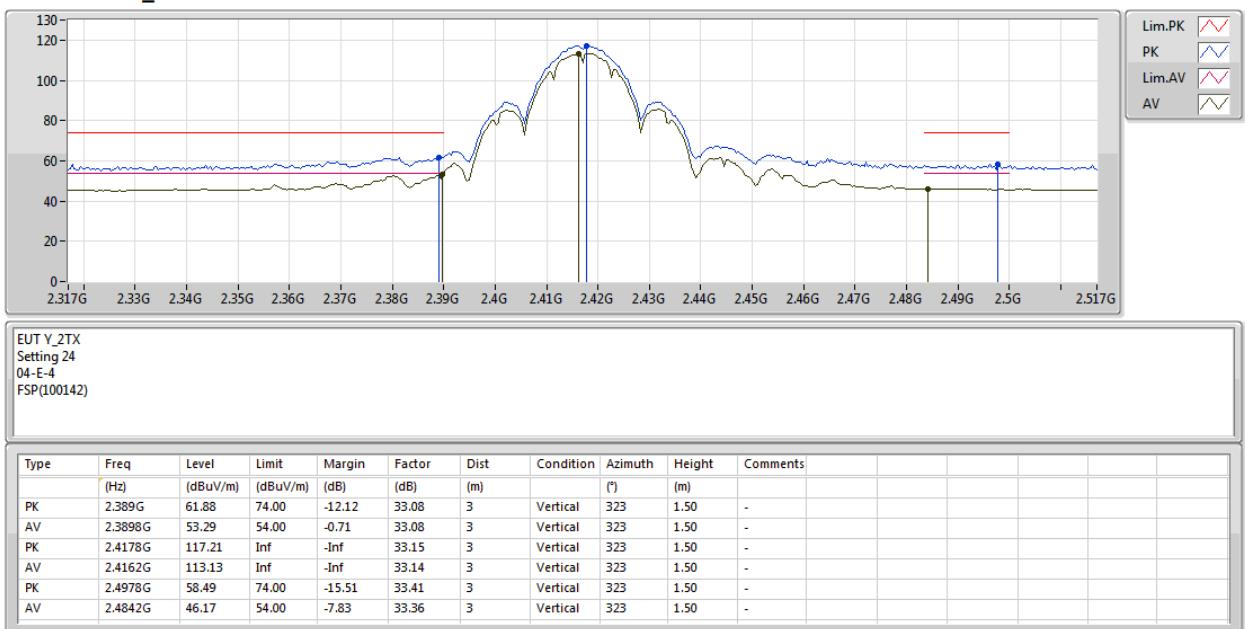
**802.11b\_Nss1,(1Mbps)\_2TX**

01/11/2018

**2412MHz\_TX**


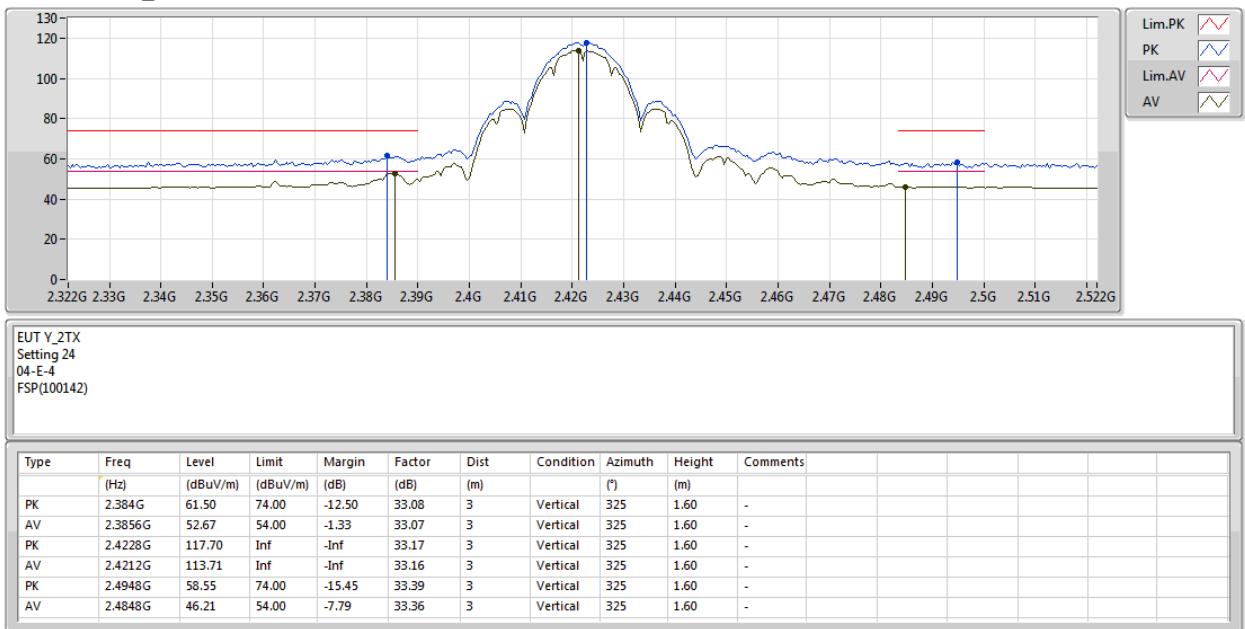
**802.11b\_Nss1,(1Mbps)\_2TX**

22/11/2018

**2417MHz\_TX**


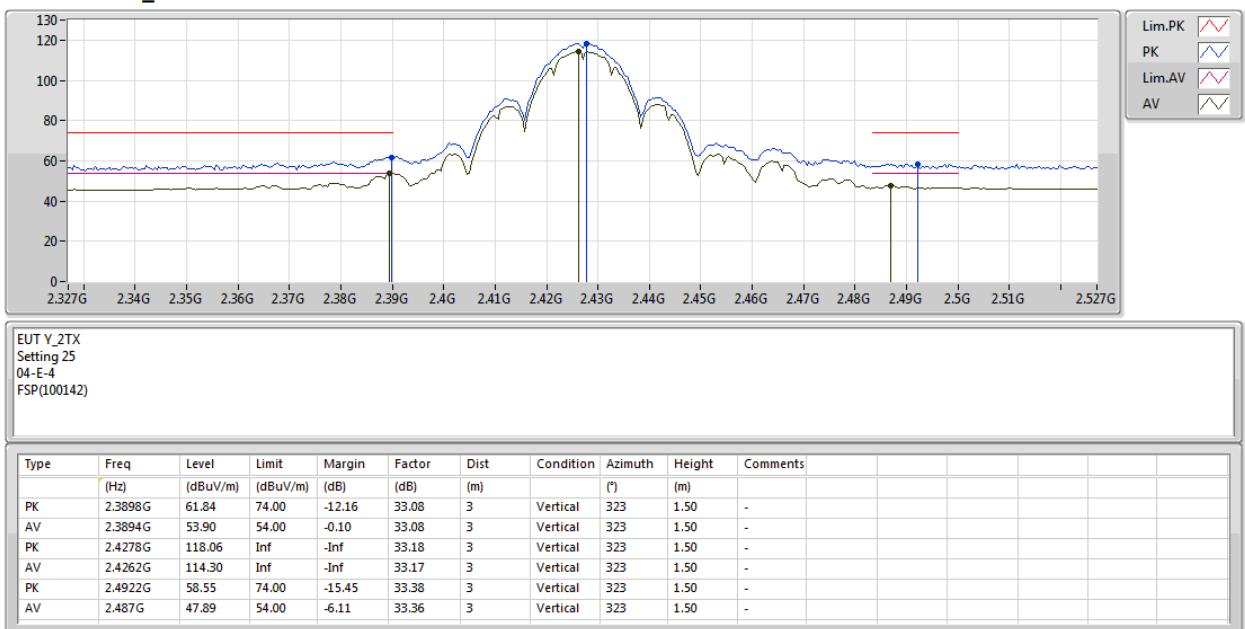
**802.11b\_Nss1,(1Mbps)\_2TX**

22/11/2018

**2422MHz\_TX**


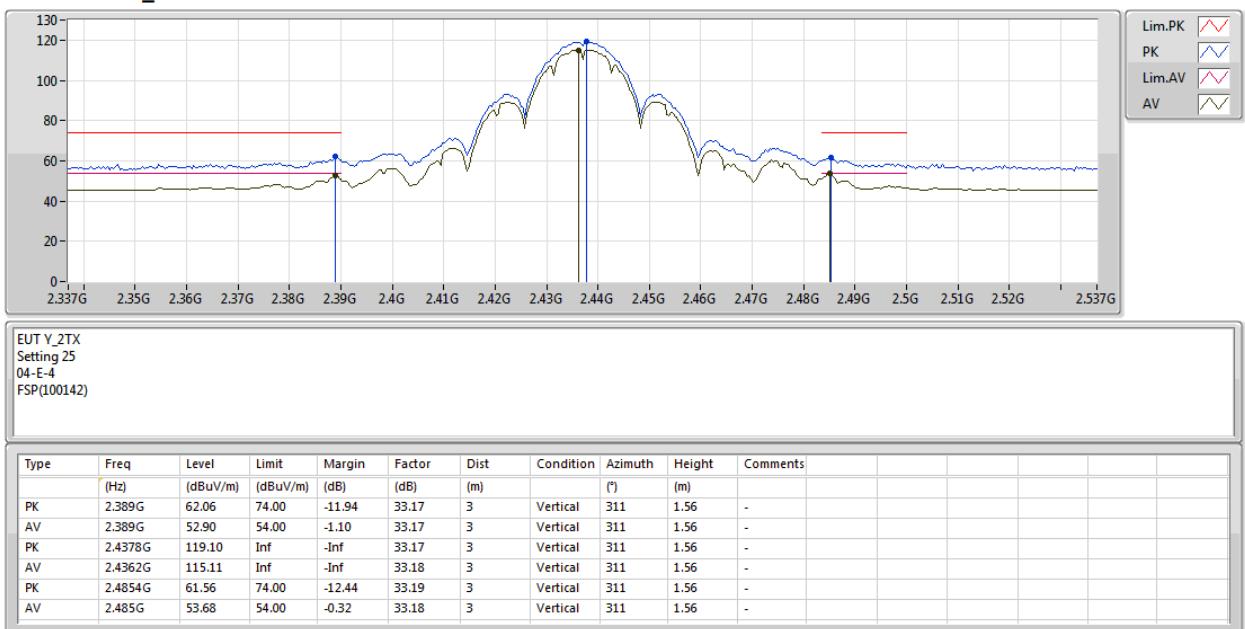
**802.11b\_Nss1,(1Mbps)\_2TX**

22/11/2018

**2427MHz\_TX**


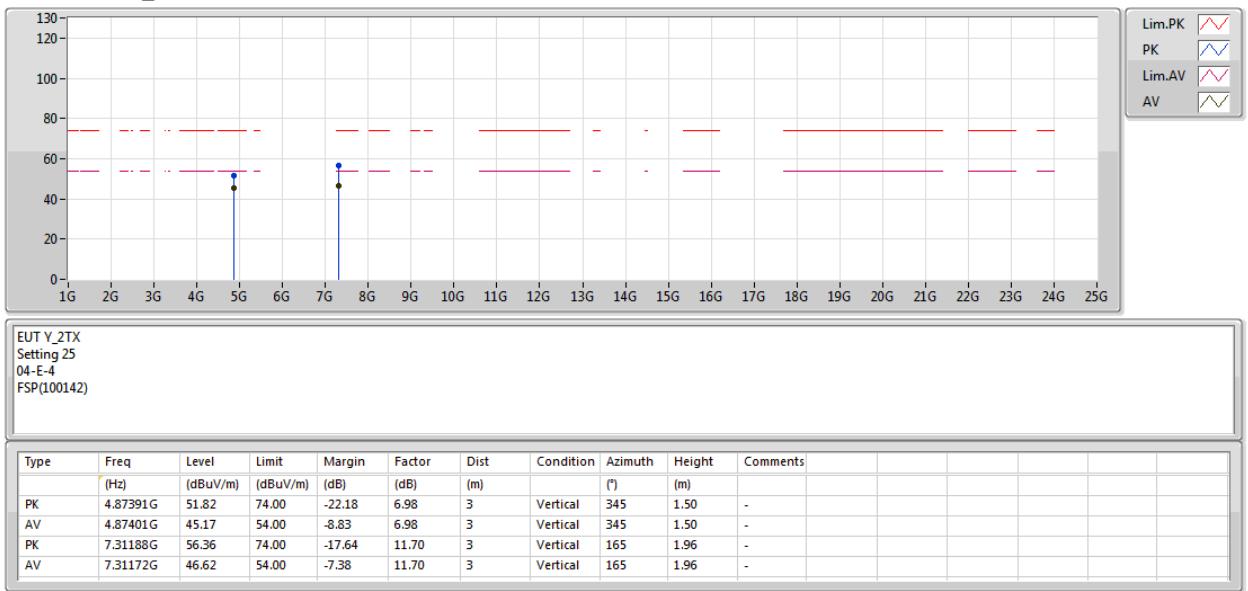
**802.11b\_Nss1,(1Mbps)\_2TX**

01/11/2018

**2437MHz\_TX**


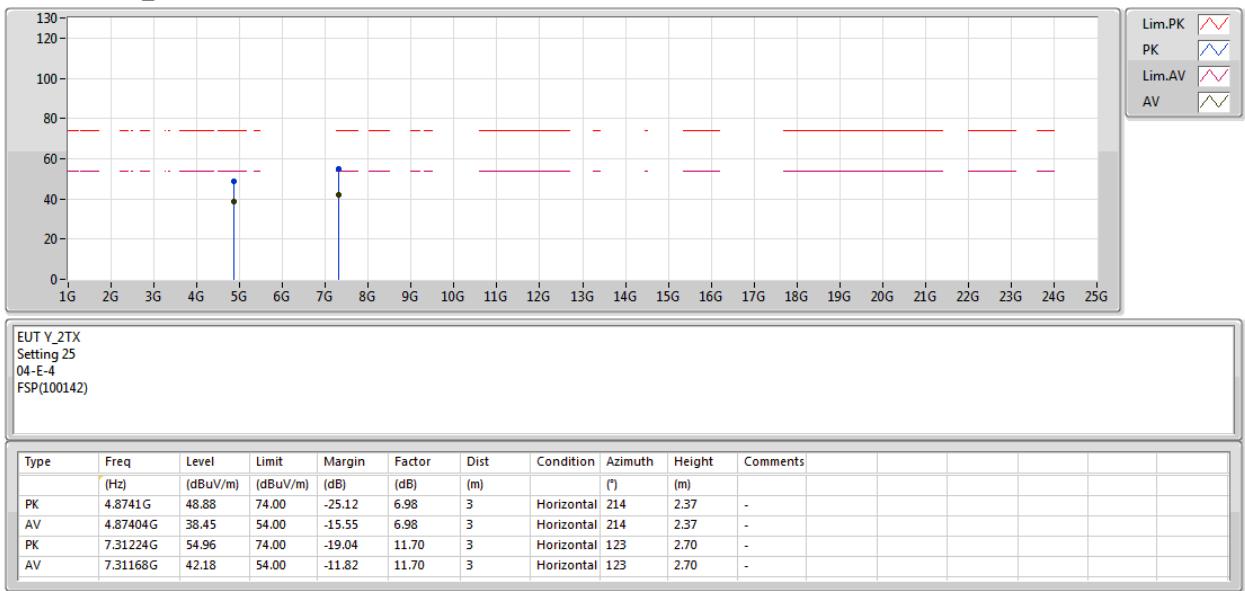
**802.11b\_Nss1,(1Mbps)\_2TX**

01/11/2018

**2437MHz\_TX**

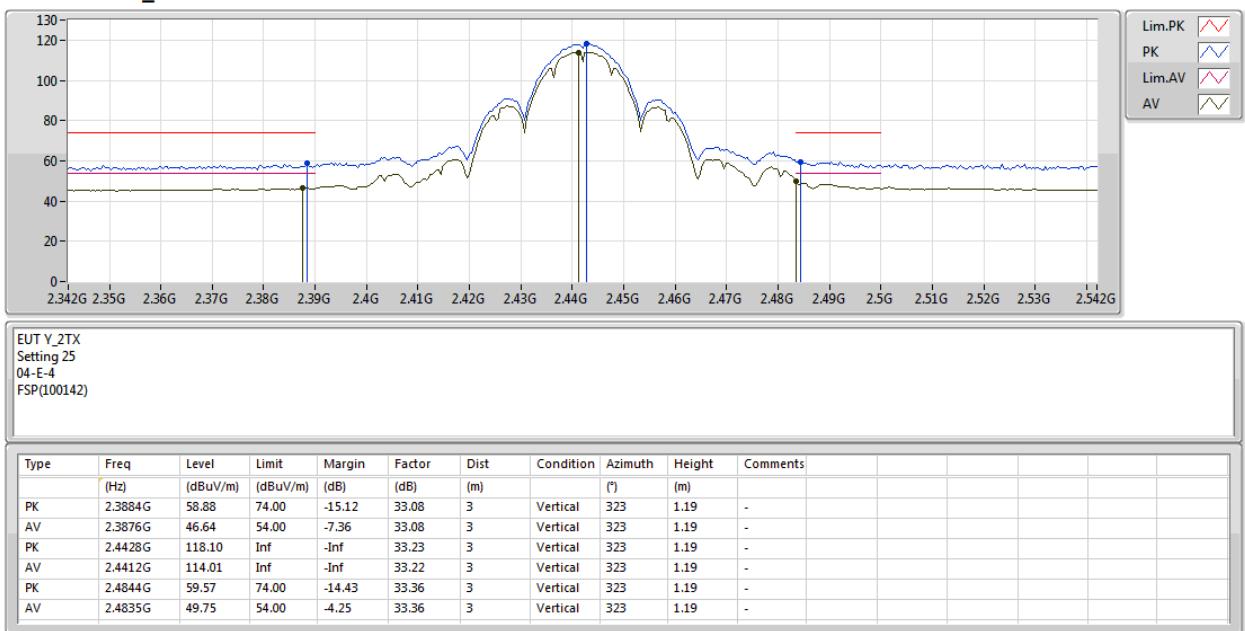
**802.11b\_Nss1,(1Mbps)\_2TX**

01/11/2018

**2437MHz\_TX**

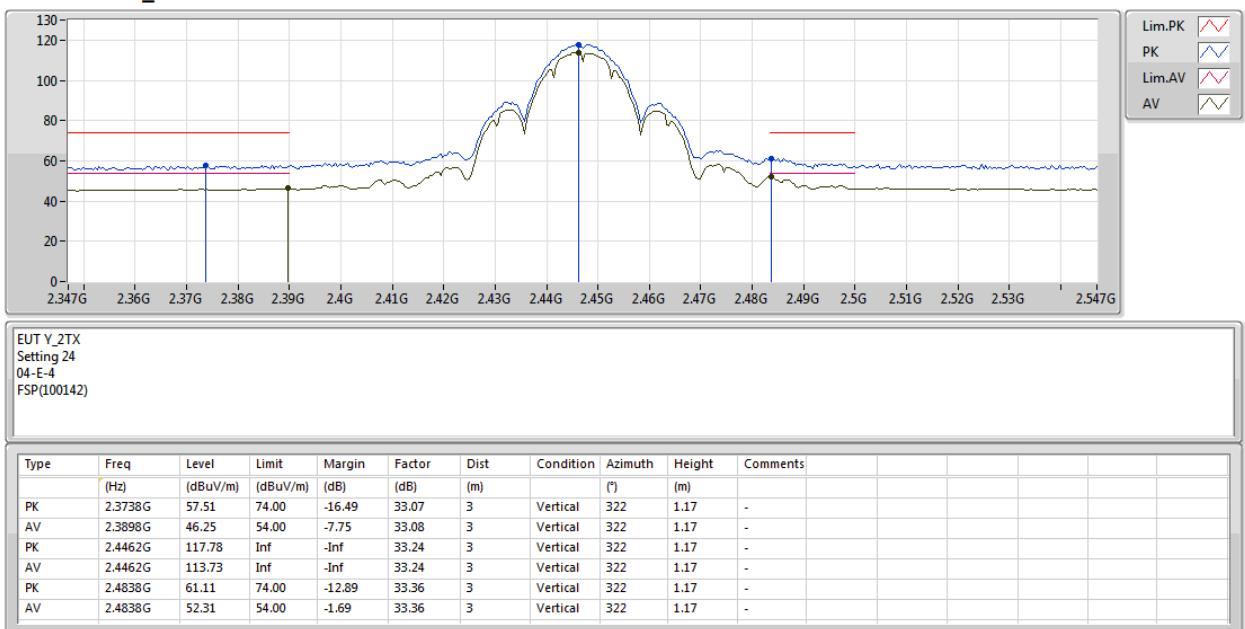
**802.11b\_Nss1,(1Mbps)\_2TX**

22/11/2018

**2442MHz\_TX**


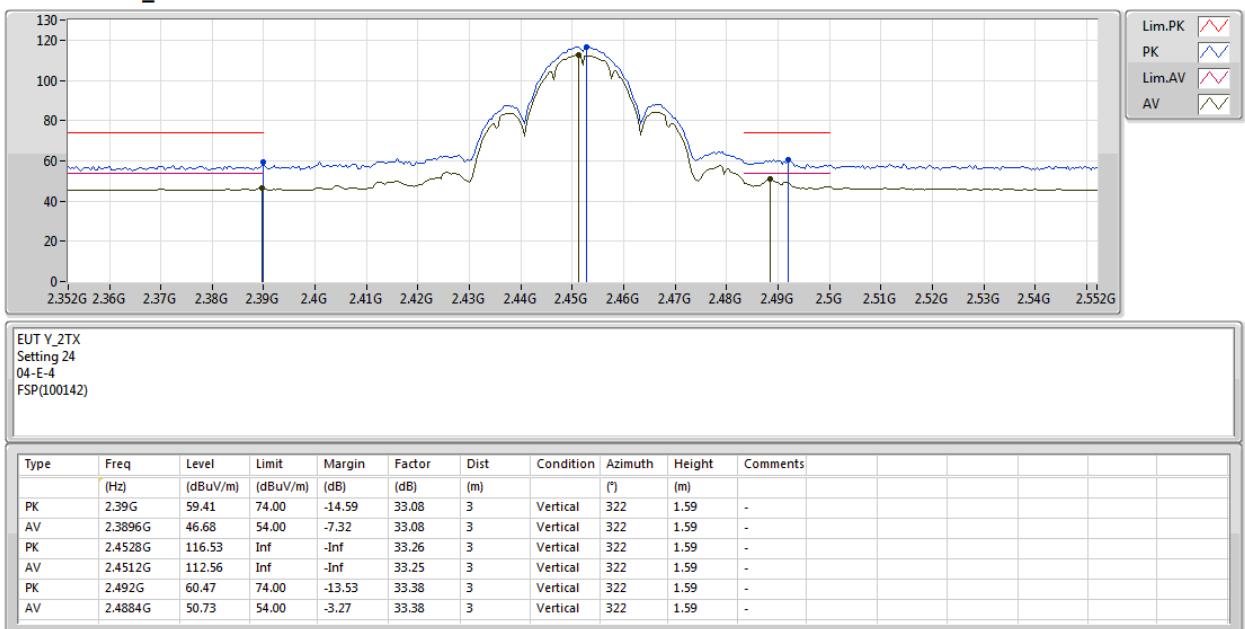
**802.11b\_Nss1,(1Mbps)\_2TX**

22/11/2018

**2447MHz\_TX**


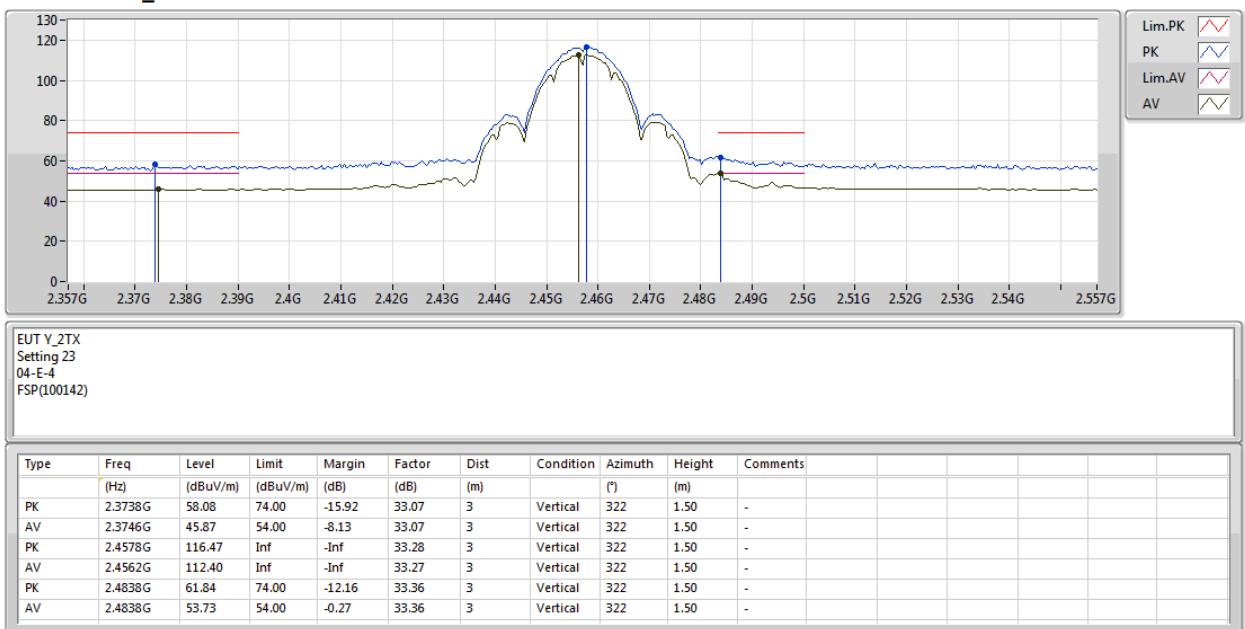
**802.11b\_Nss1,(1Mbps)\_2TX**

22/11/2018

**2452MHz\_TX**


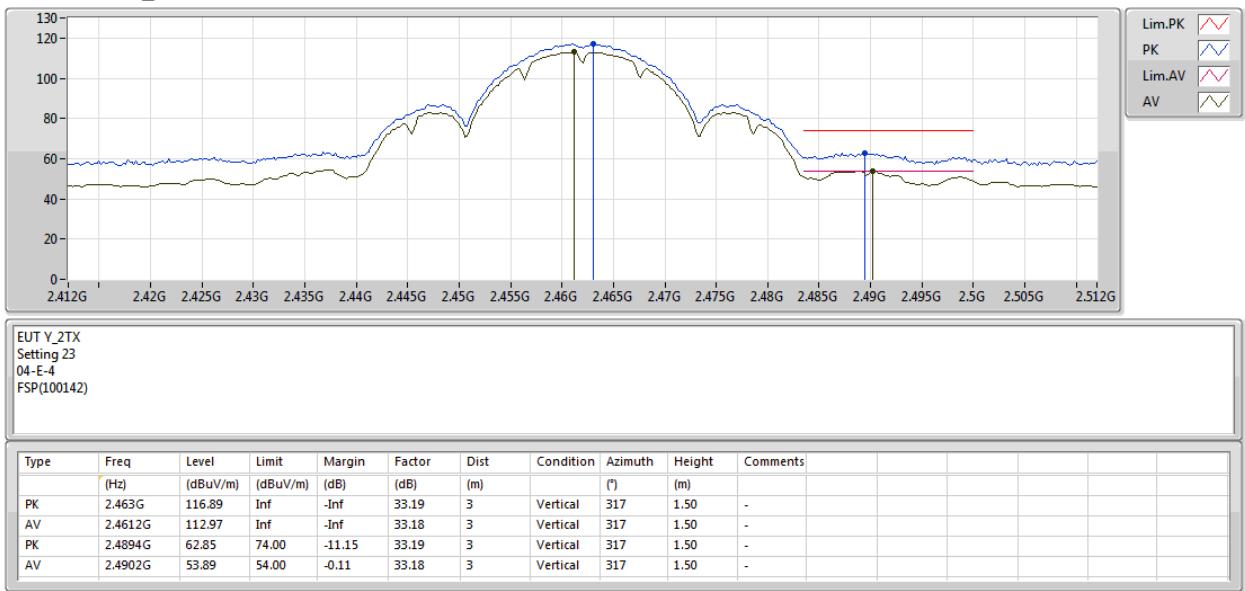
**802.11b\_Nss1,(1Mbps)\_2TX**

22/11/2018

**2457MHz\_TX**


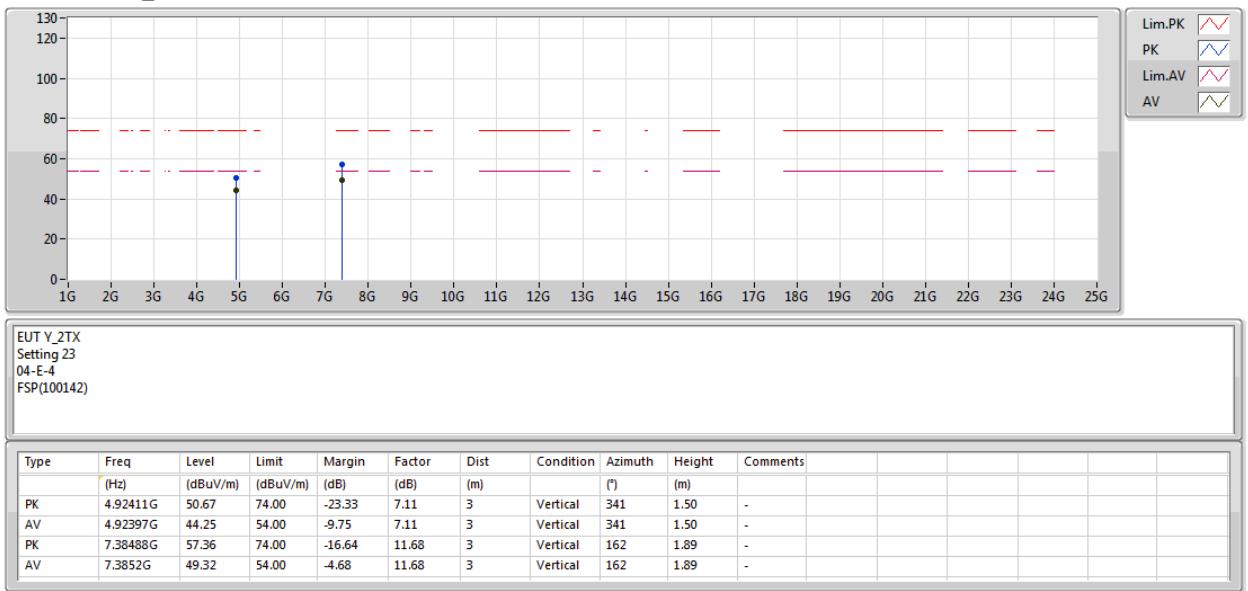
**802.11b\_Nss1,(1Mbps)\_2TX**

01/11/2018

**2462MHz\_TX**


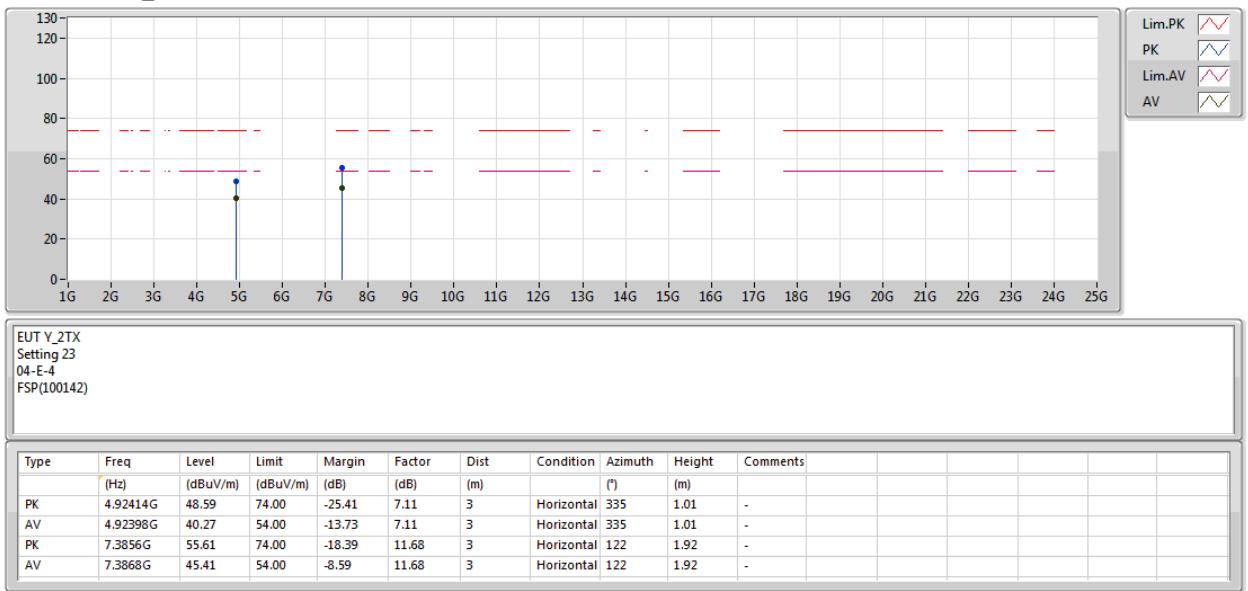
**802.11b\_Nss1,(1Mbps)\_2TX**

01/11/2018

**2462MHz\_TX**

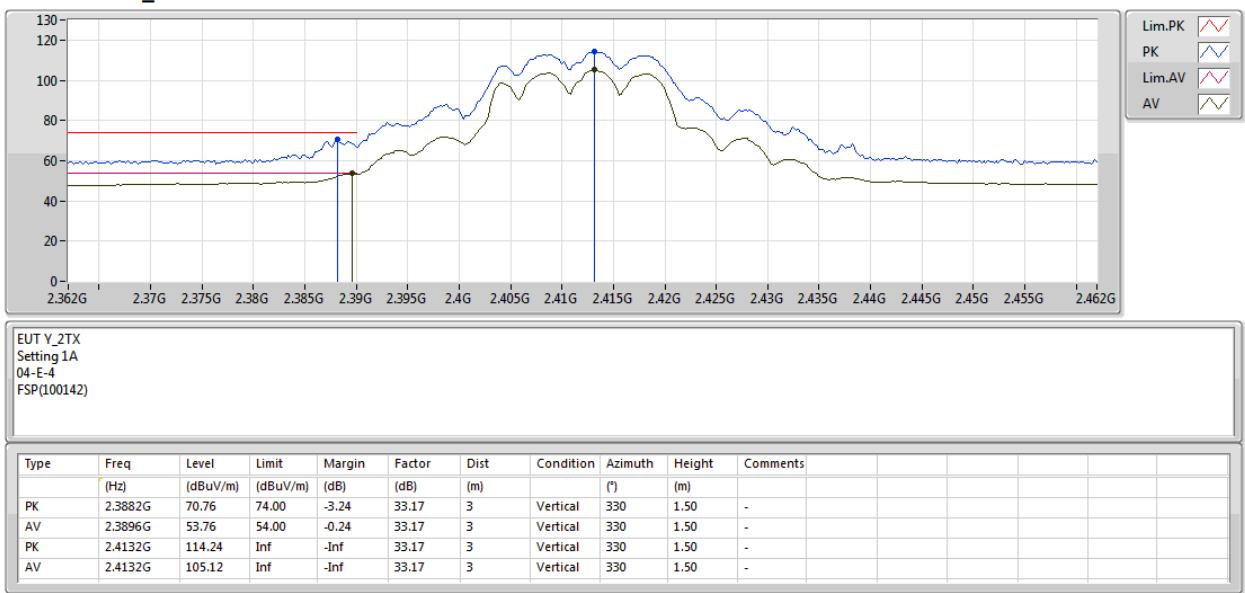
**802.11b\_Nss1,(1Mbps)\_2TX**

01/11/2018

**2462MHz\_TX**

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

01/11/2018

**2412MHz\_TX**


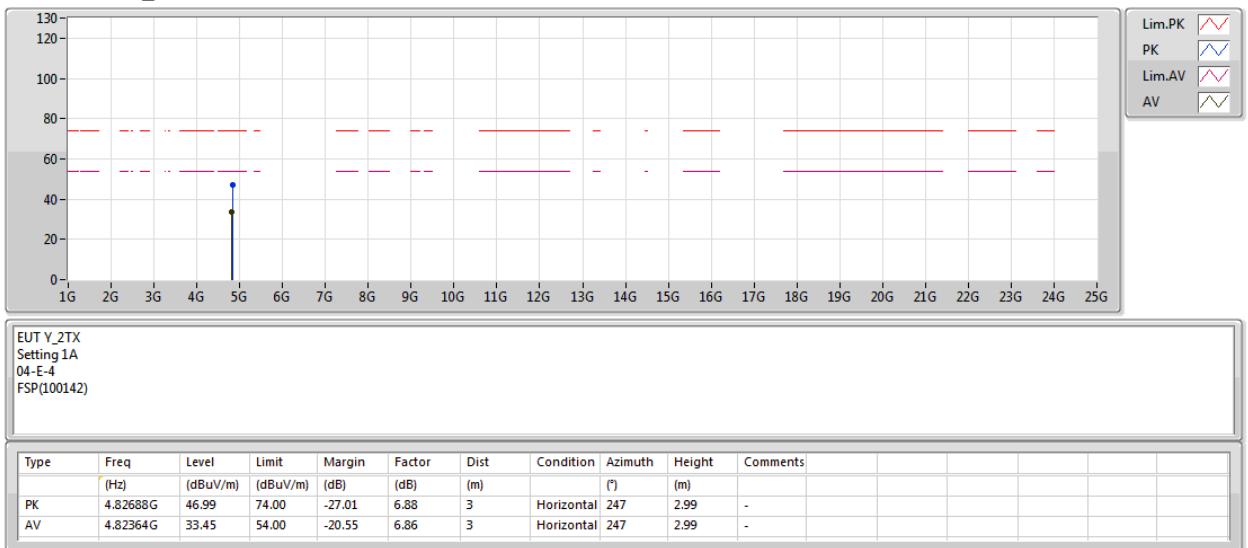
**802.11g\_Nss1,(6Mbps)\_2TX**

01/11/2018

**2412MHz\_TX**

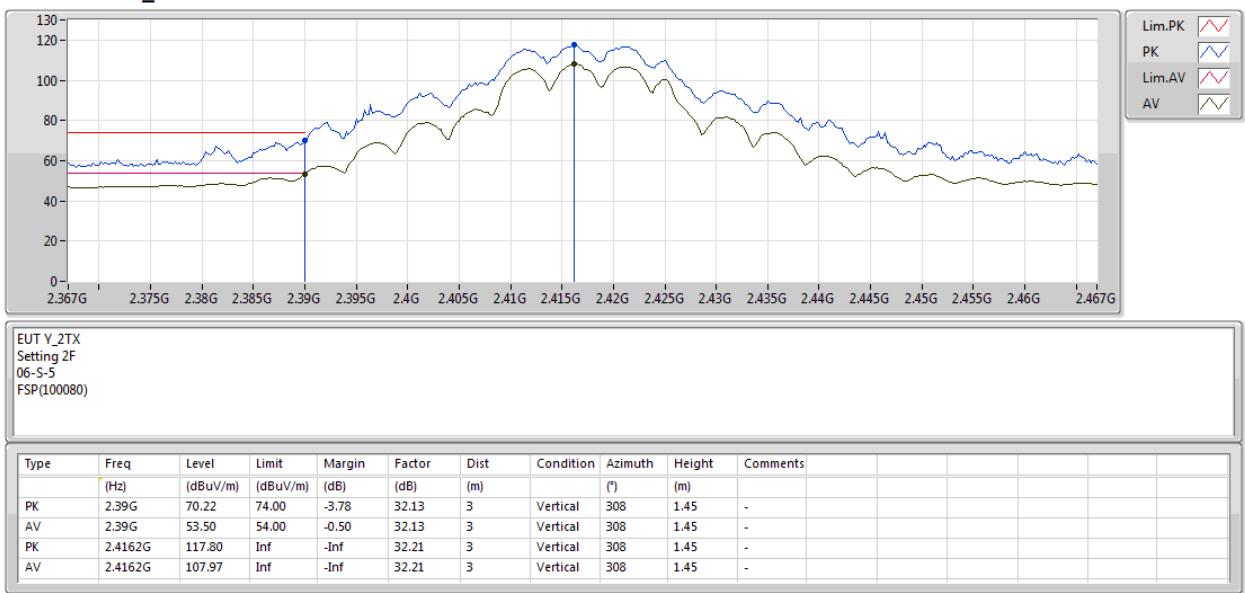

**802.11g\_Nss1,(6Mbps)\_2TX**

01/11/2018

**2412MHz\_TX**


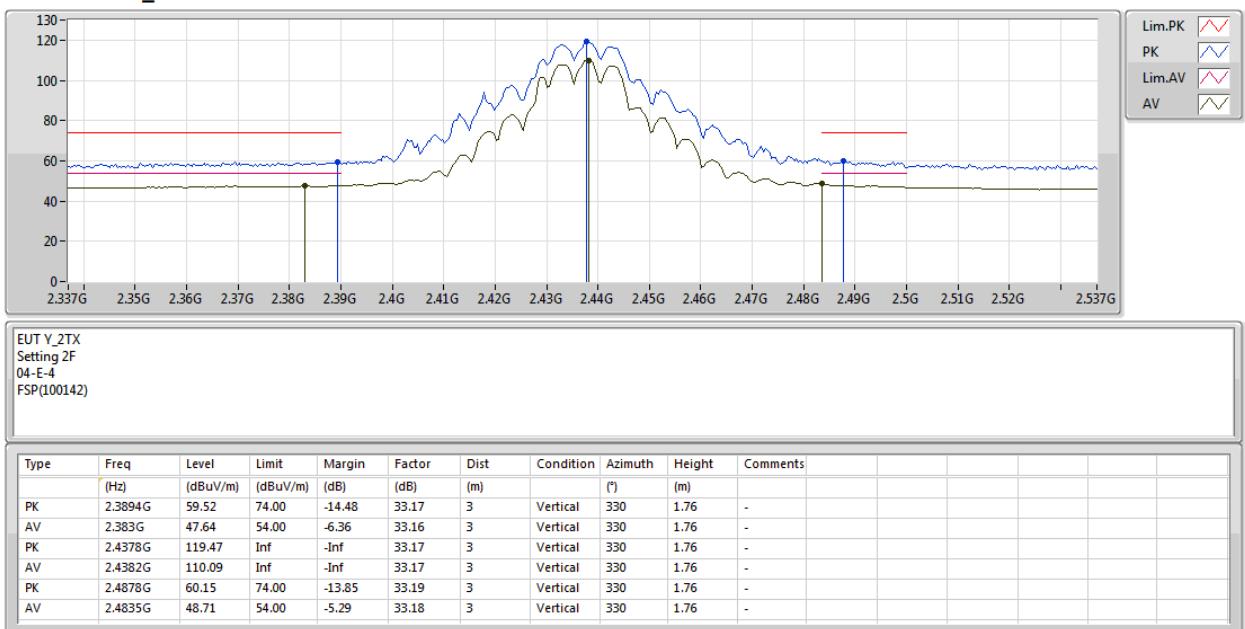
**802.11g\_Nss1,(6Mbps)\_2TX**

23/11/2018

**2417MHz\_TX**


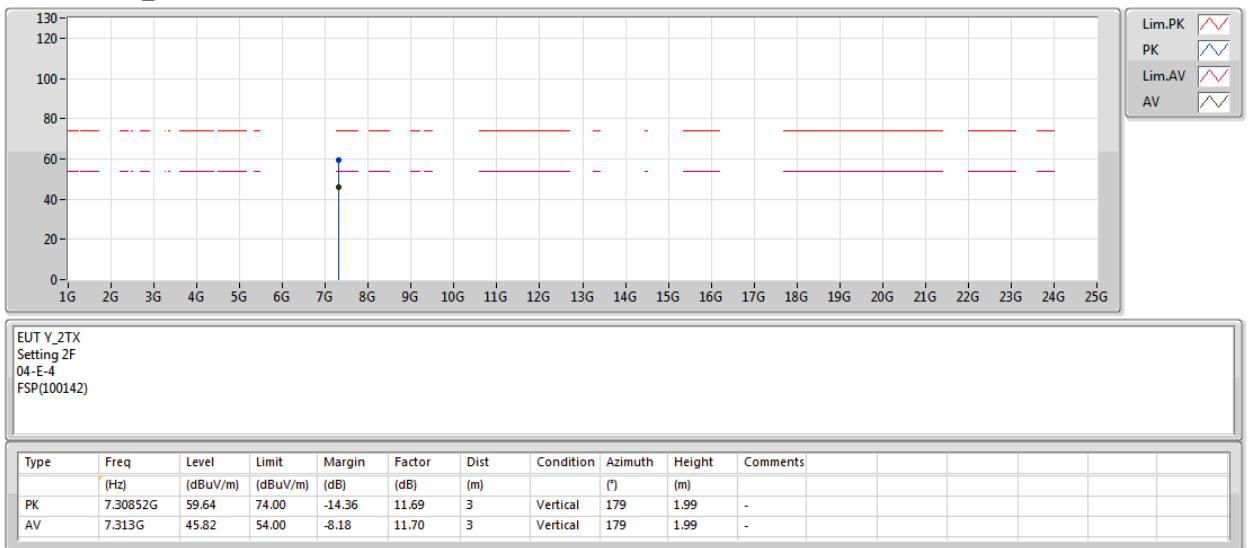
**802.11g\_Nss1,(6Mbps)\_2TX**

01/11/2018

**2437MHz\_TX**


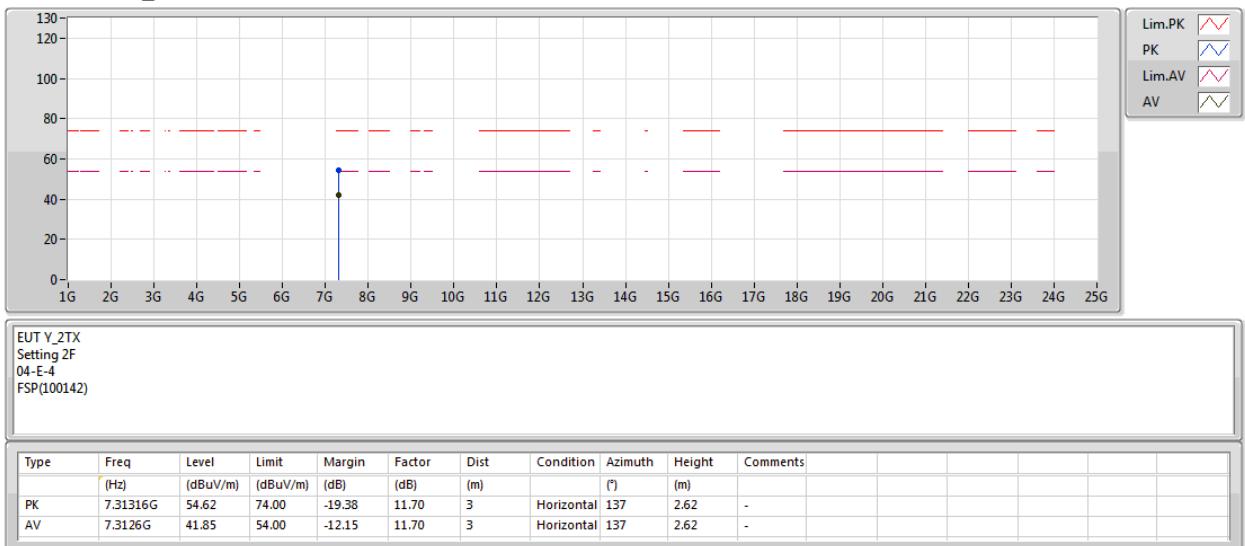
**802.11g\_Nss1,(6Mbps)\_2TX**

01/11/2018

**2437MHz\_TX**


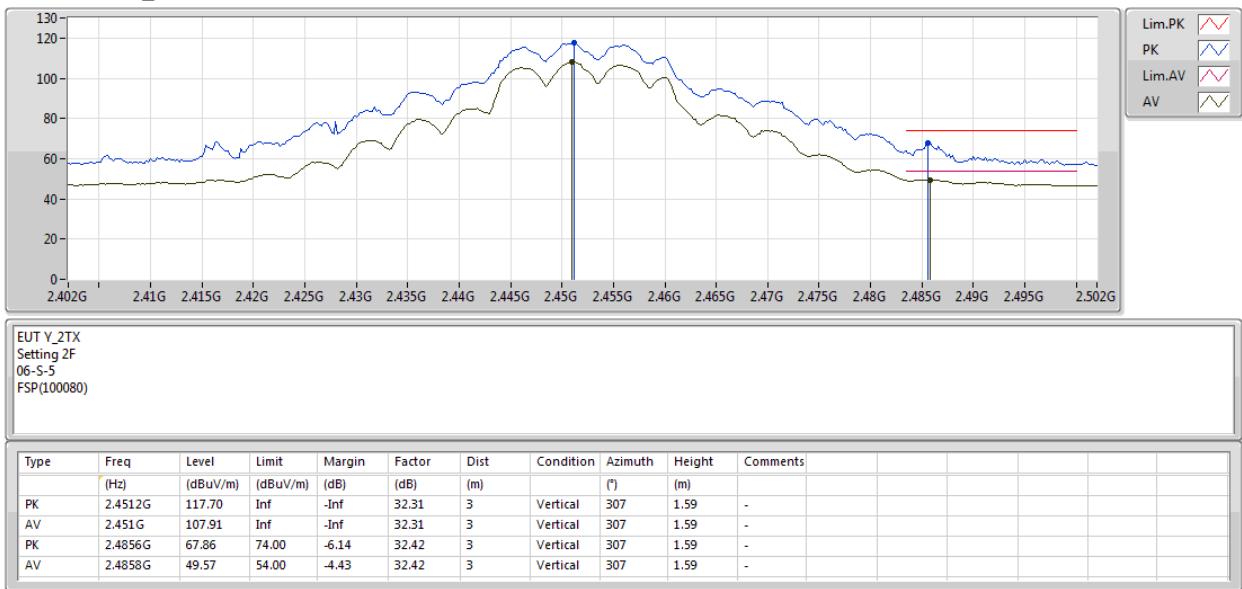
**802.11g\_Nss1,(6Mbps)\_2TX**

01/11/2018

**2437MHz\_TX**


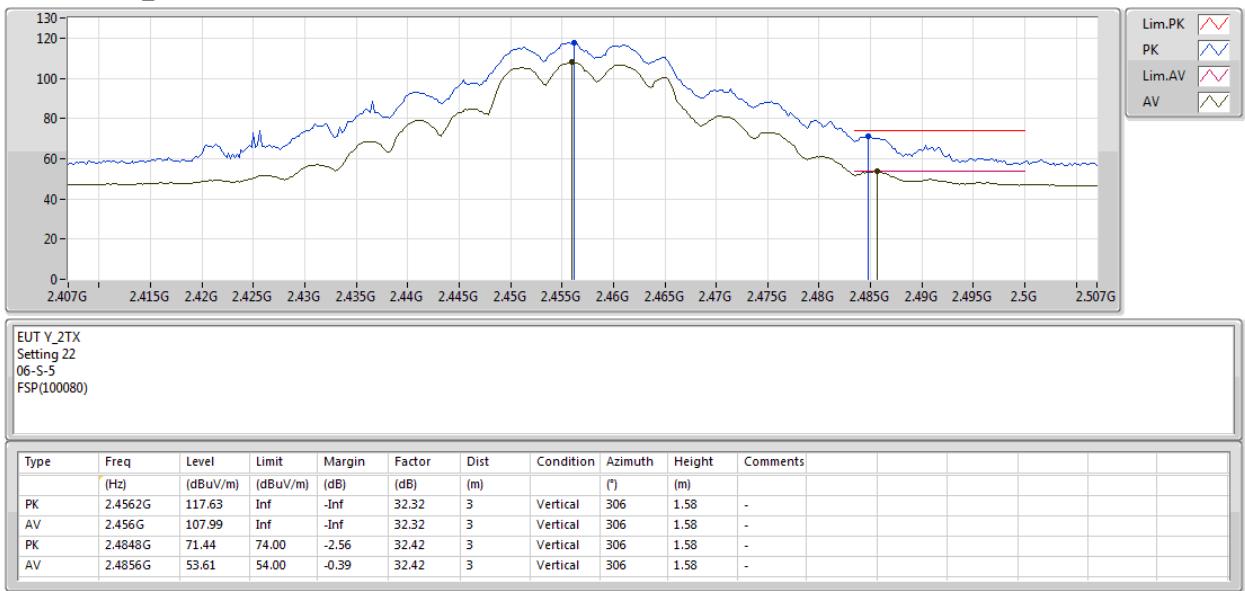
**802.11g\_Nss1,(6Mbps)\_2TX**

23/11/2018

**2452MHz\_TX**


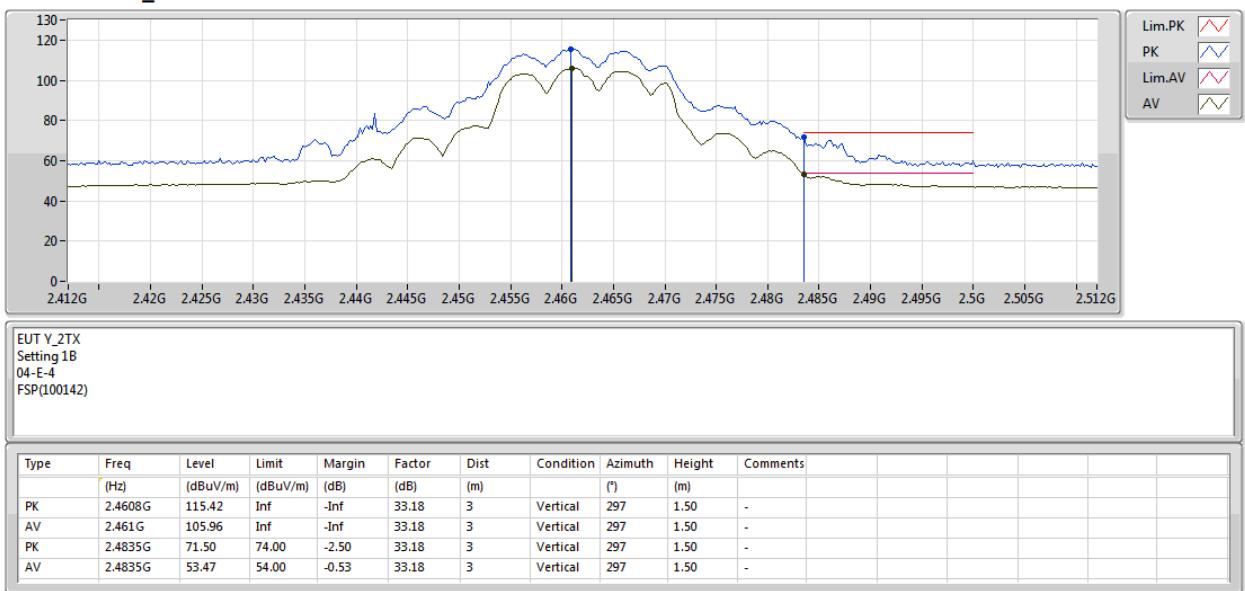
**802.11g\_Nss1,(6Mbps)\_2TX**

23/11/2018

**2457MHz\_TX**


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

01/11/2018

**2462MHz\_TX**


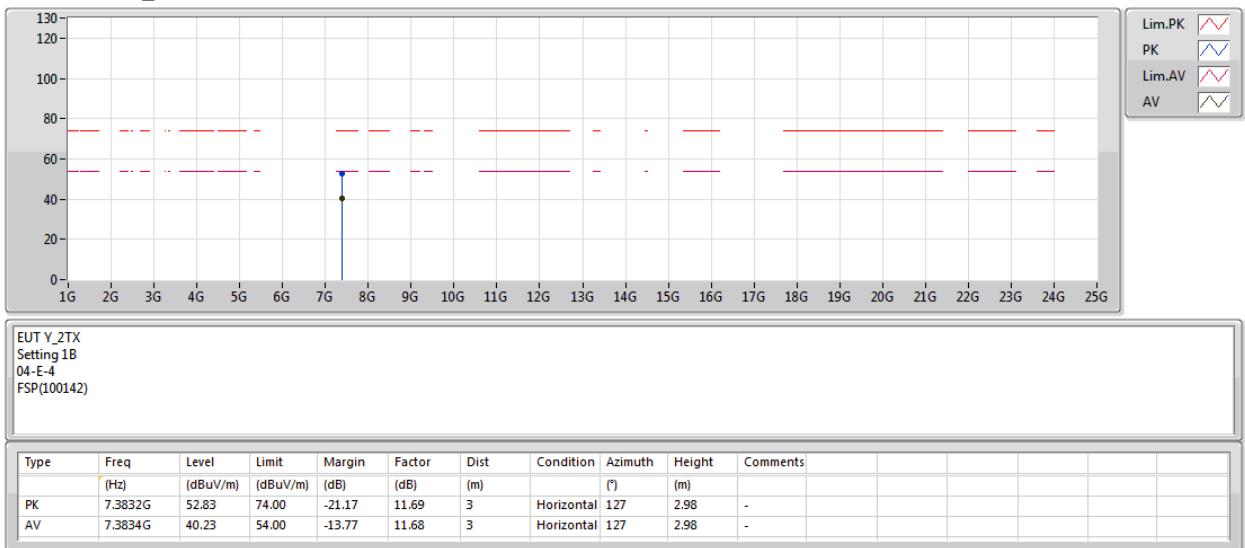
**802.11g\_Nss1,(6Mbps)\_2TX**

01/11/2018

**2462MHz\_TX**


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

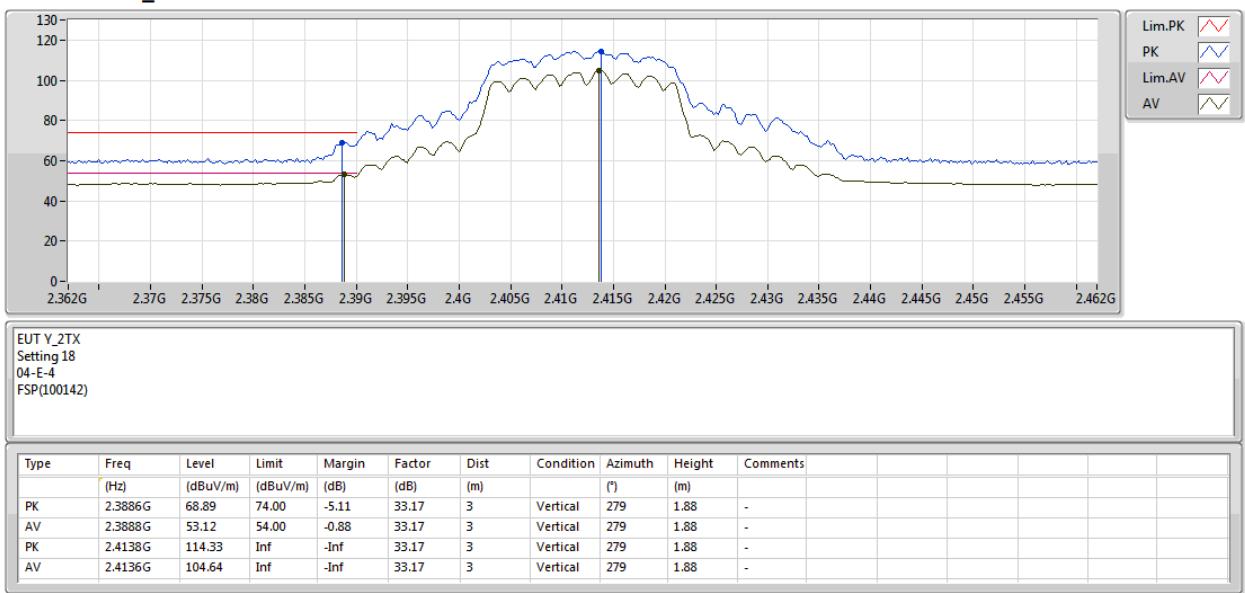
01/11/2018

**2462MHz\_TX**


## 802.11n HT20\_Nss1,(MCS0)\_2TX

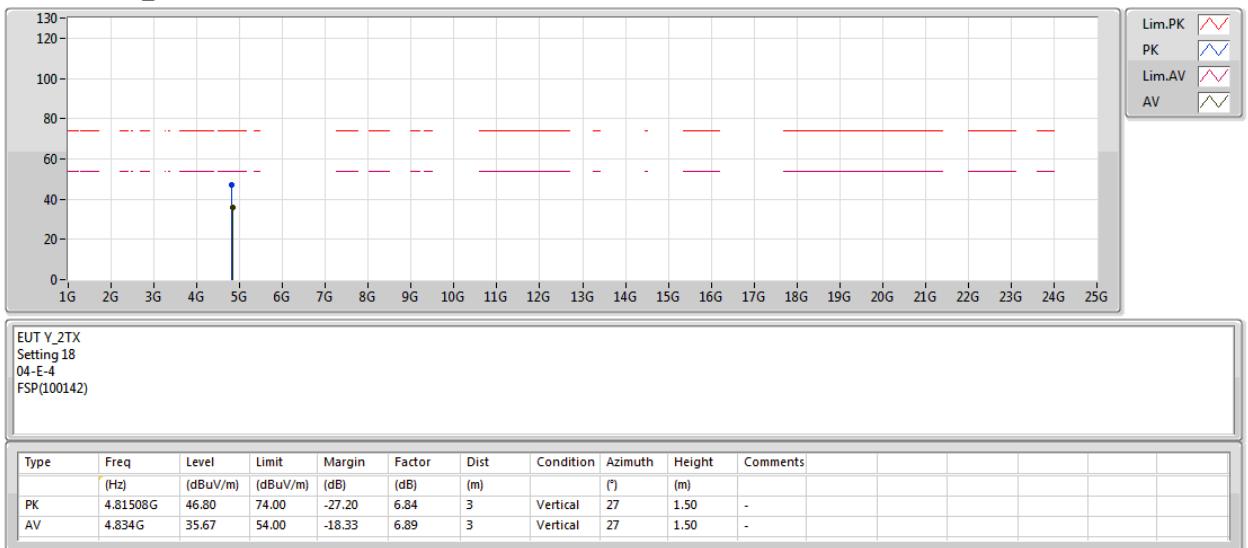
01/11/2018

## 2412MHz\_TX



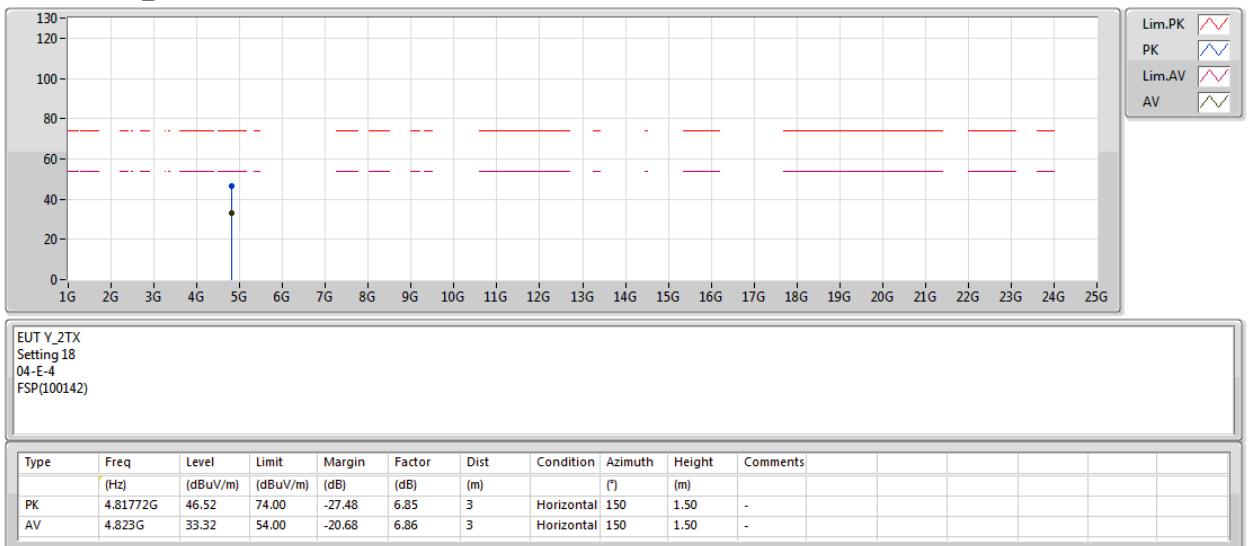
**802.11n HT20\_Nss1,(MCS0)\_2TX**

01/11/2018

**2412MHz\_TX**


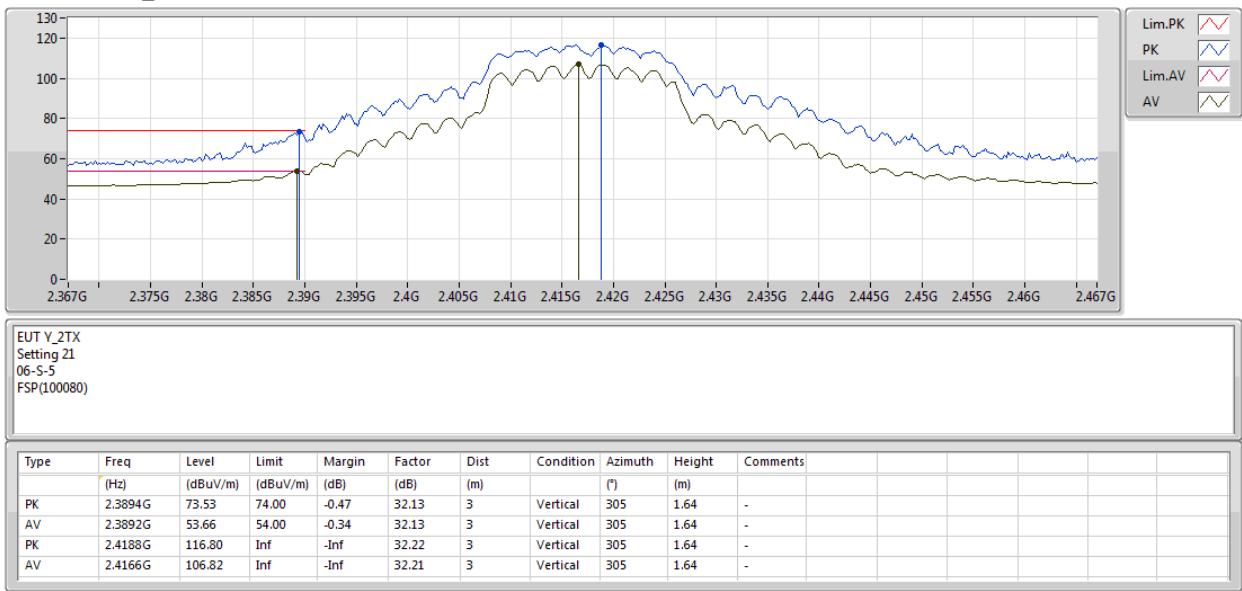
**802.11n HT20\_Nss1,(MCS0)\_2TX**

01/11/2018

**2412MHz\_TX**


**802.11n HT20\_Nss1,(MCS0)\_2TX**

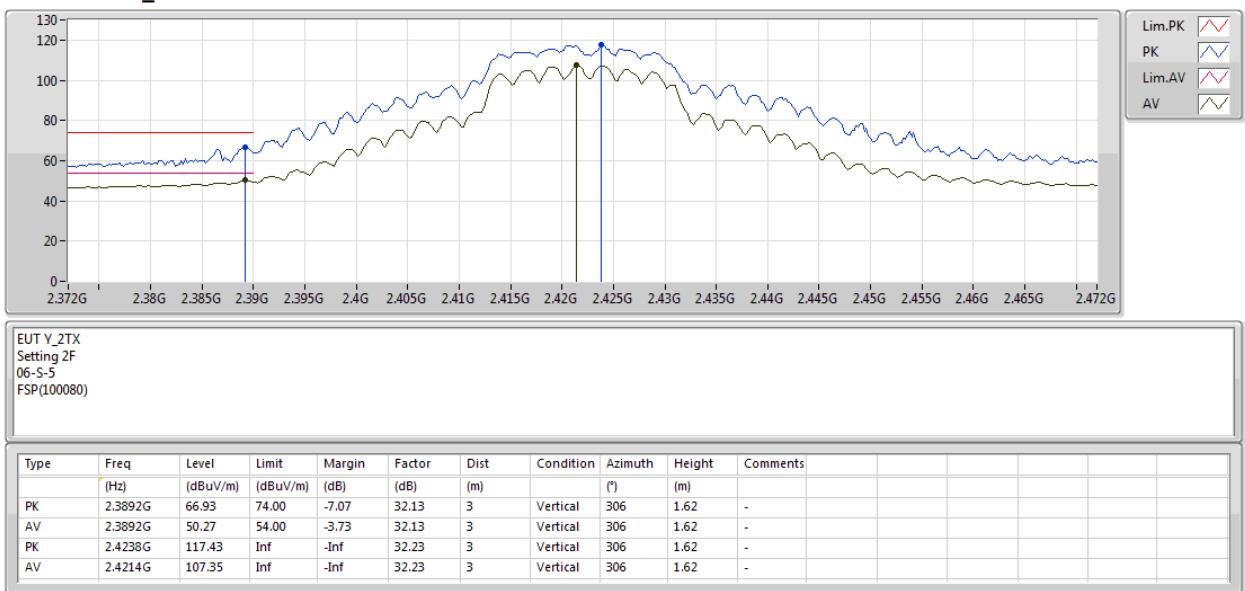
23/11/2018

**2417MHz\_TX**


## 802.11n HT20\_Nss1,(MCS0)\_2TX

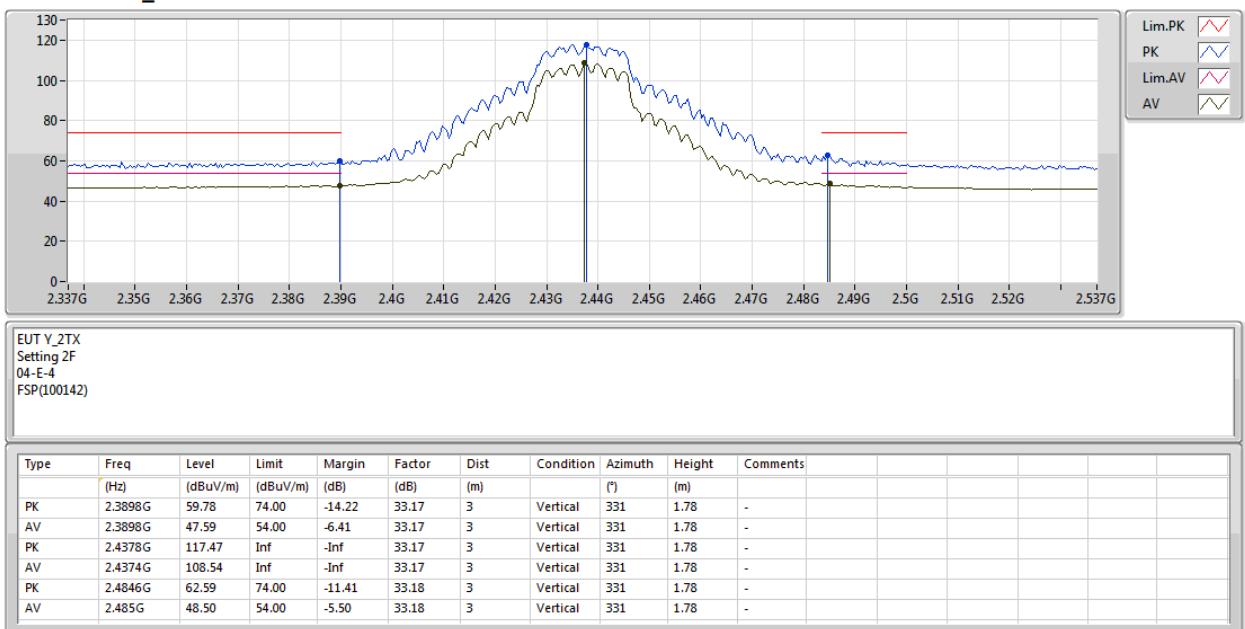
23/11/2018

## 2422MHz\_TX



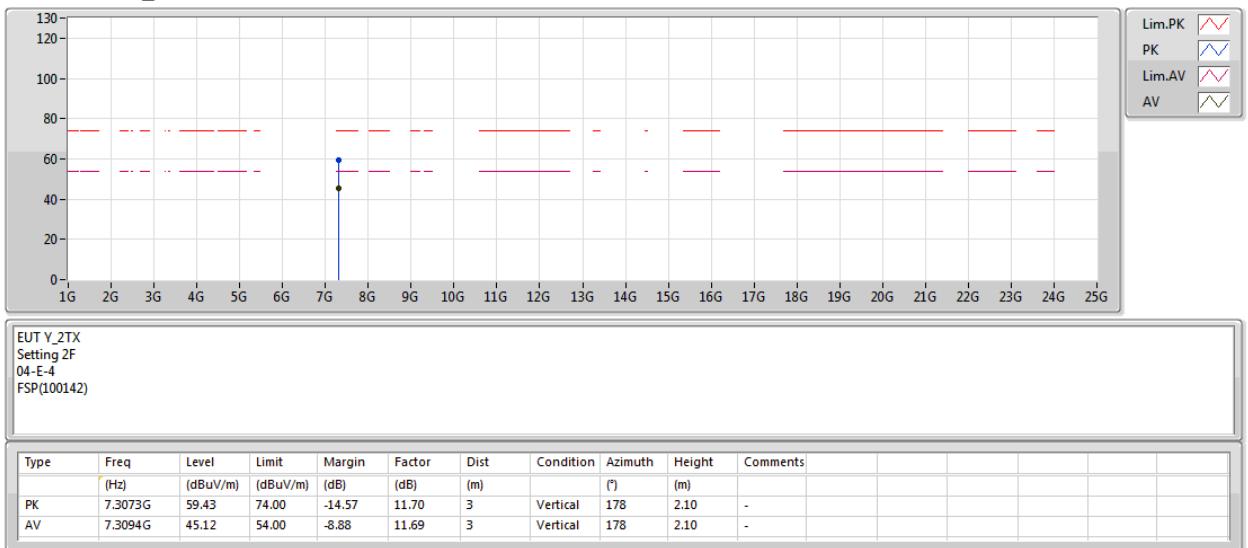
**802.11n HT20\_Nss1,(MCS0)\_2TX**

01/11/2018

**2437MHz\_TX**


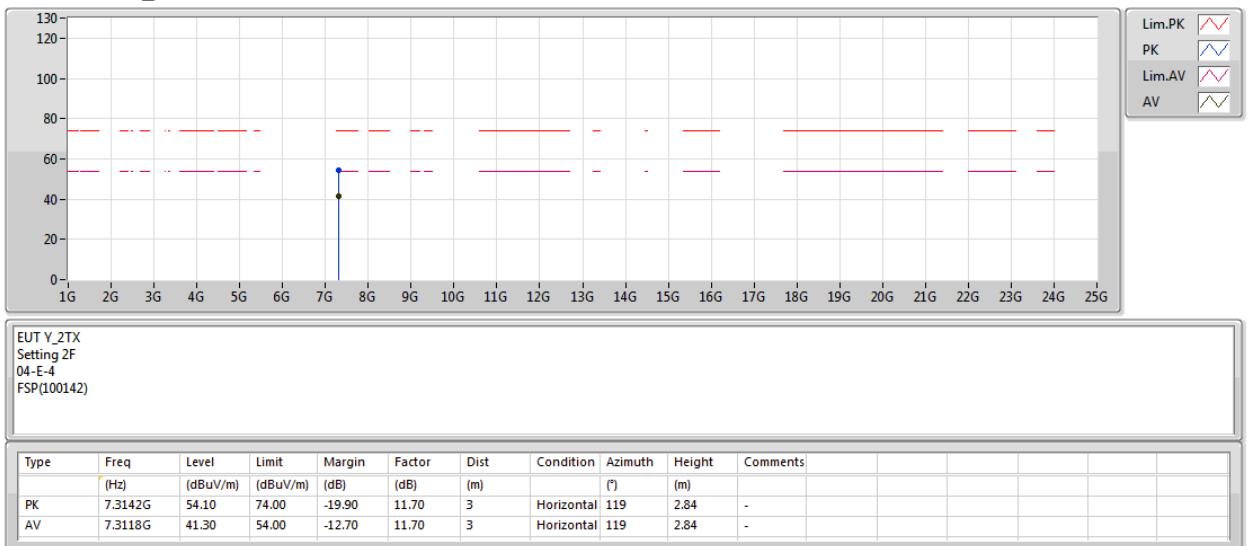
**802.11n HT20\_Nss1,(MCS0)\_2TX**

01/11/2018

**2437MHz\_TX**


**802.11n HT20\_Nss1,(MCS0)\_2TX**

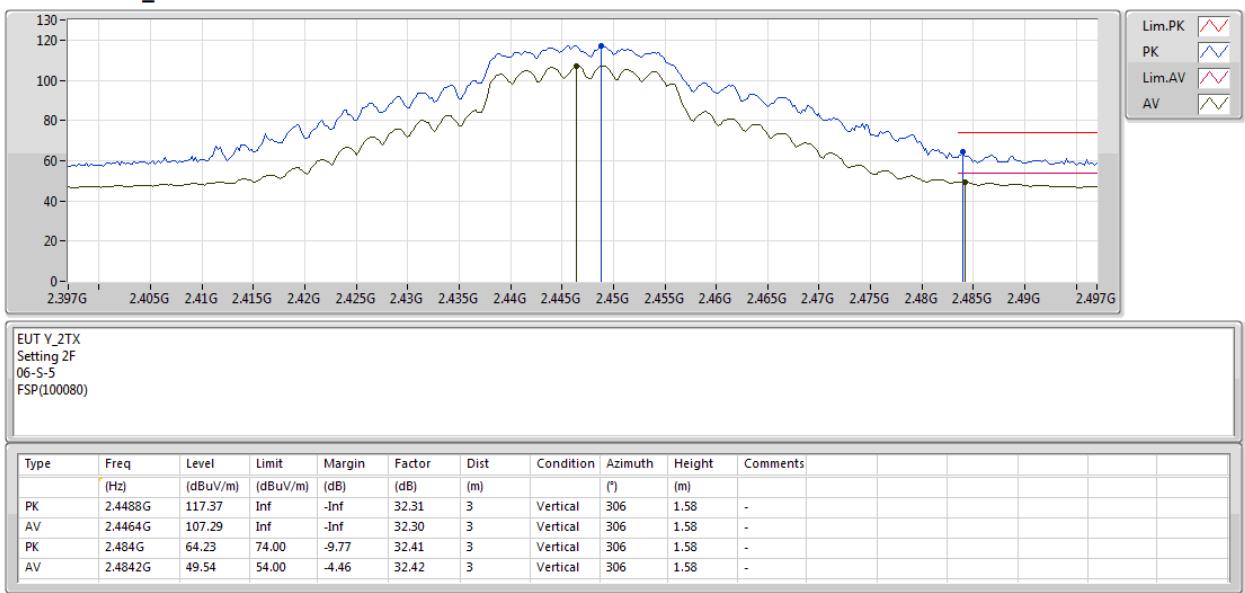
01/11/2018

**2437MHz\_TX**


## 802.11n HT20\_Nss1,(MCS0)\_2TX

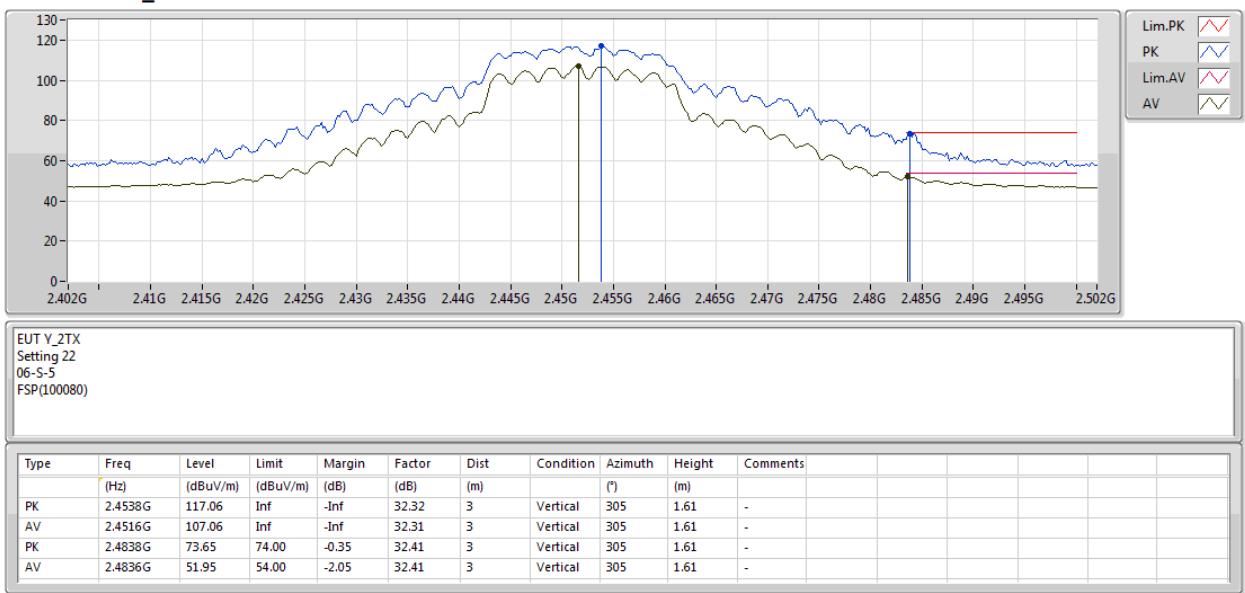
23/11/2018

## 2447MHz\_TX



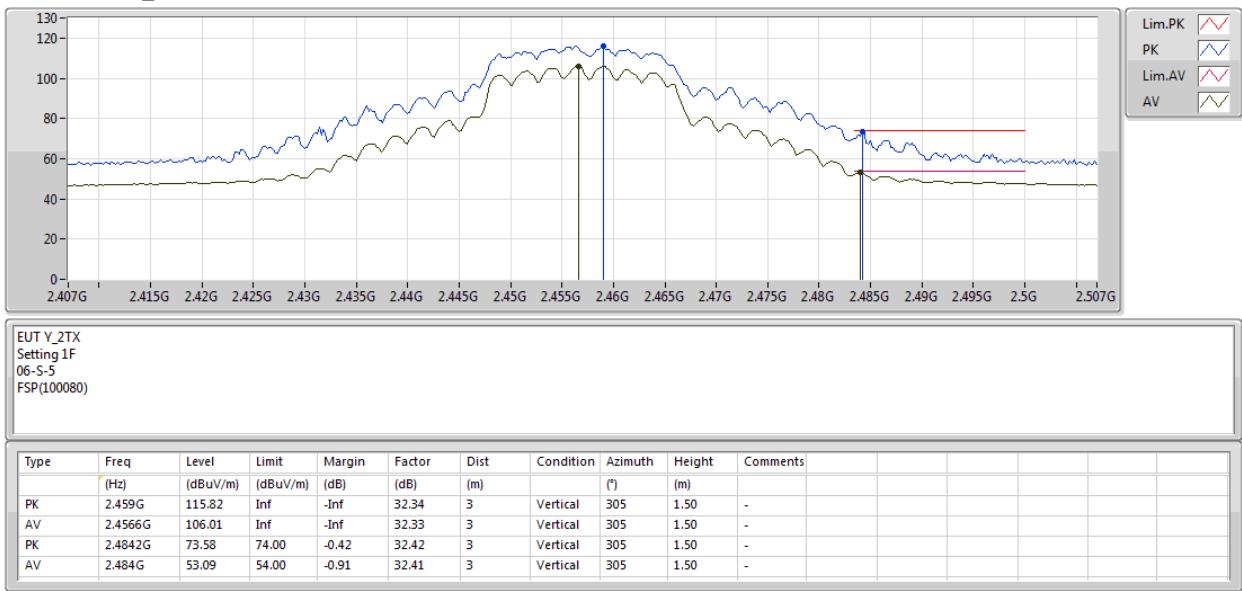
**802.11n HT20\_Nss1,(MCS0)\_2TX**

23/11/2018

**2452MHz\_TX**


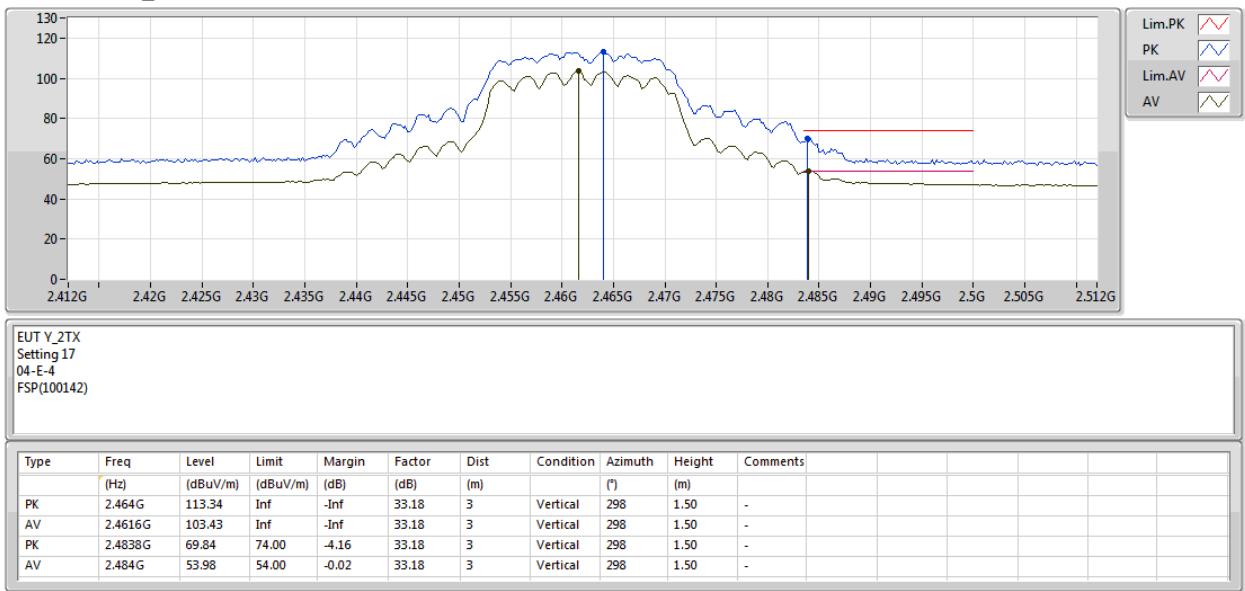
**802.11n HT20\_Nss1,(MCS0)\_2TX**

23/11/2018

**2457MHz\_TX**


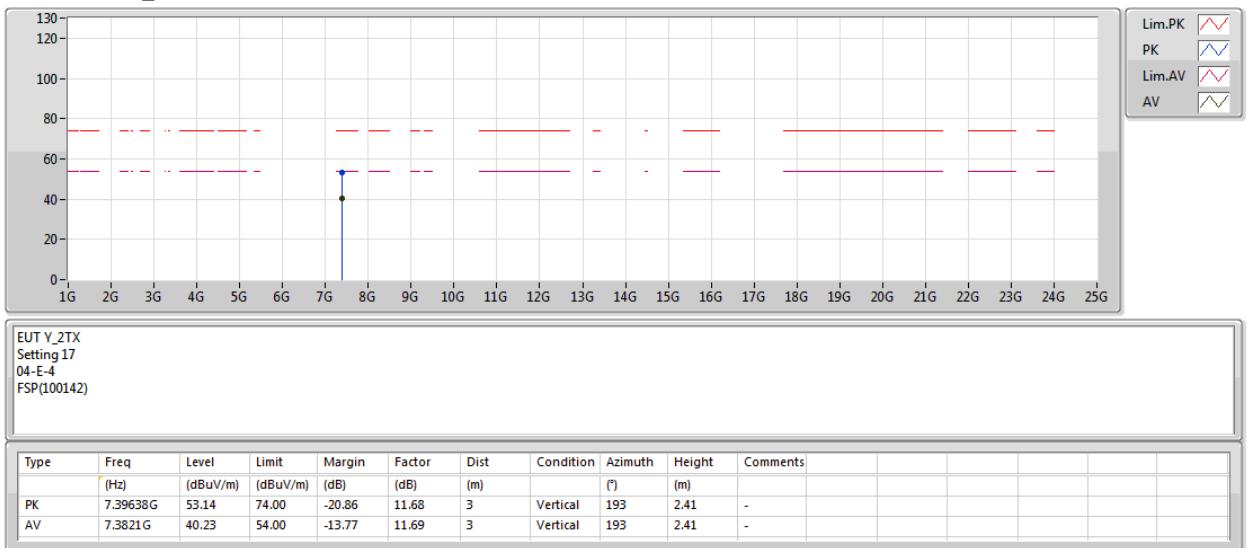
**802.11n HT20\_Nss1,(MCS0)\_2TX**

01/11/2018

**2462MHz\_TX**


**802.11n HT20\_Nss1,(MCS0)\_2TX**

01/11/2018

**2462MHz\_TX**


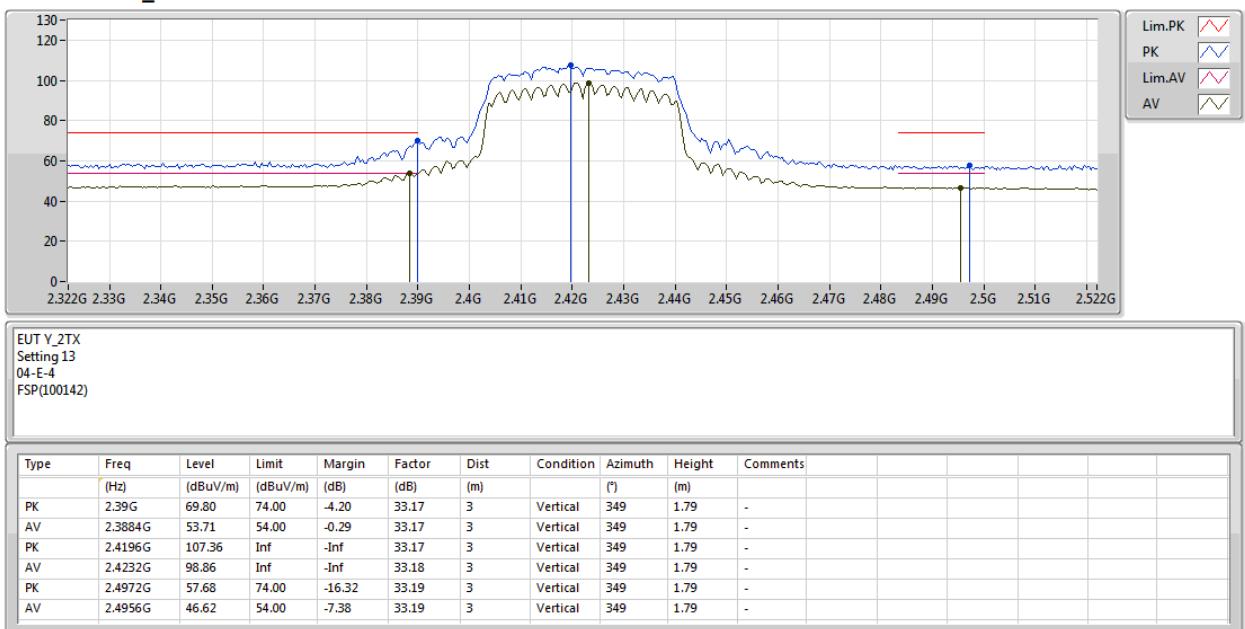
**802.11n HT20\_Nss1,(MCS0)\_2TX**

01/11/2018

**2462MHz\_TX**

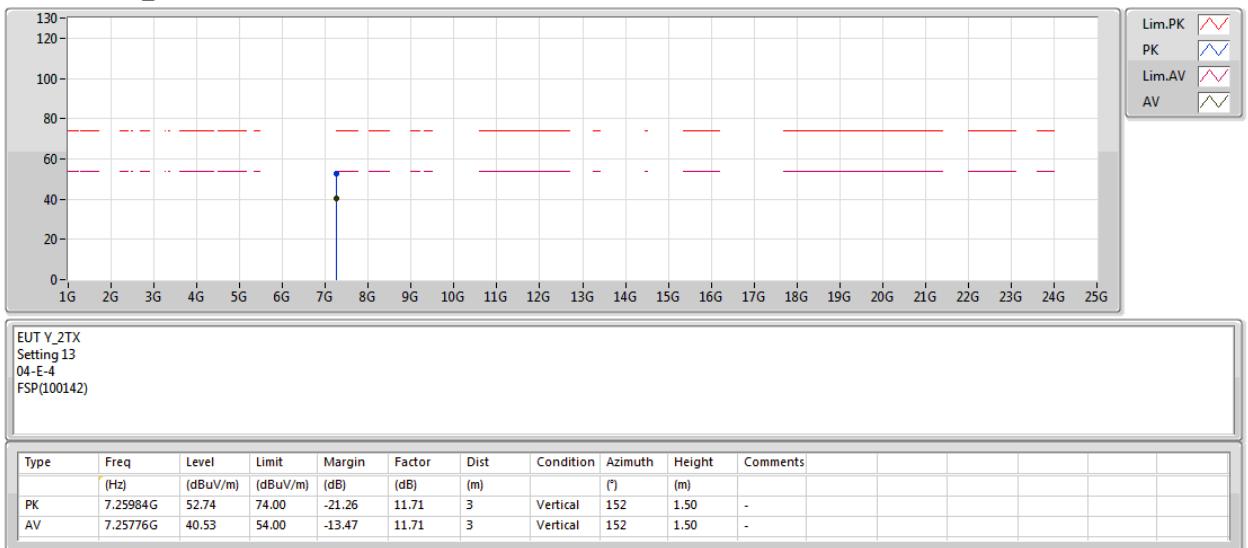

**802.11n HT40\_Nss1,(MCS0)\_2TX**

01/11/2018

**2422MHz\_TX**


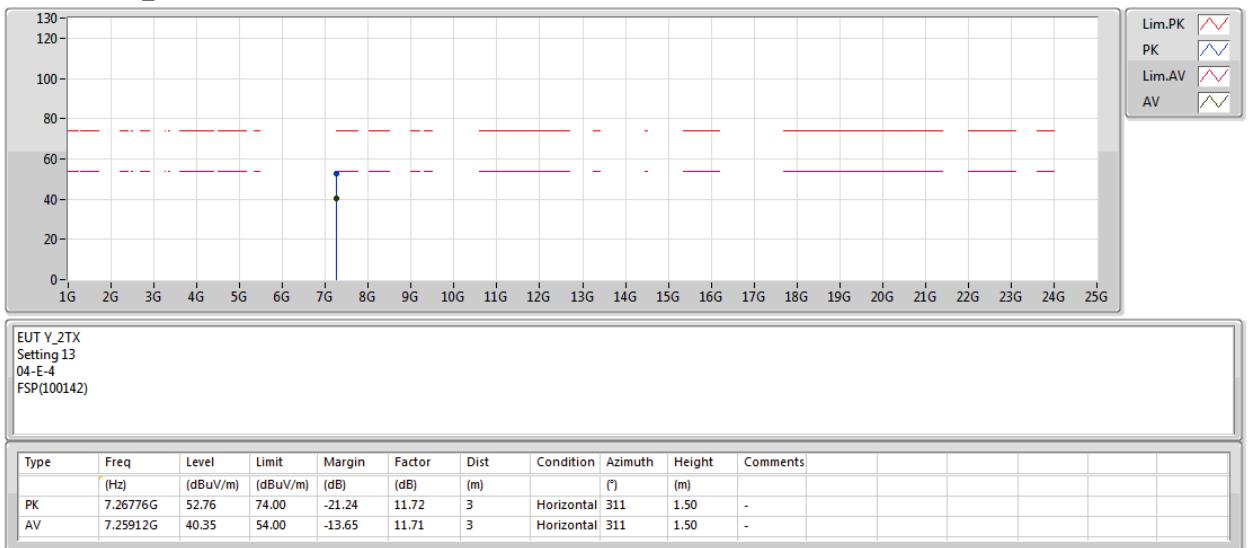
**802.11n HT40\_Nss1,(MCS0)\_2TX**

01/11/2018

**2422MHz\_TX**


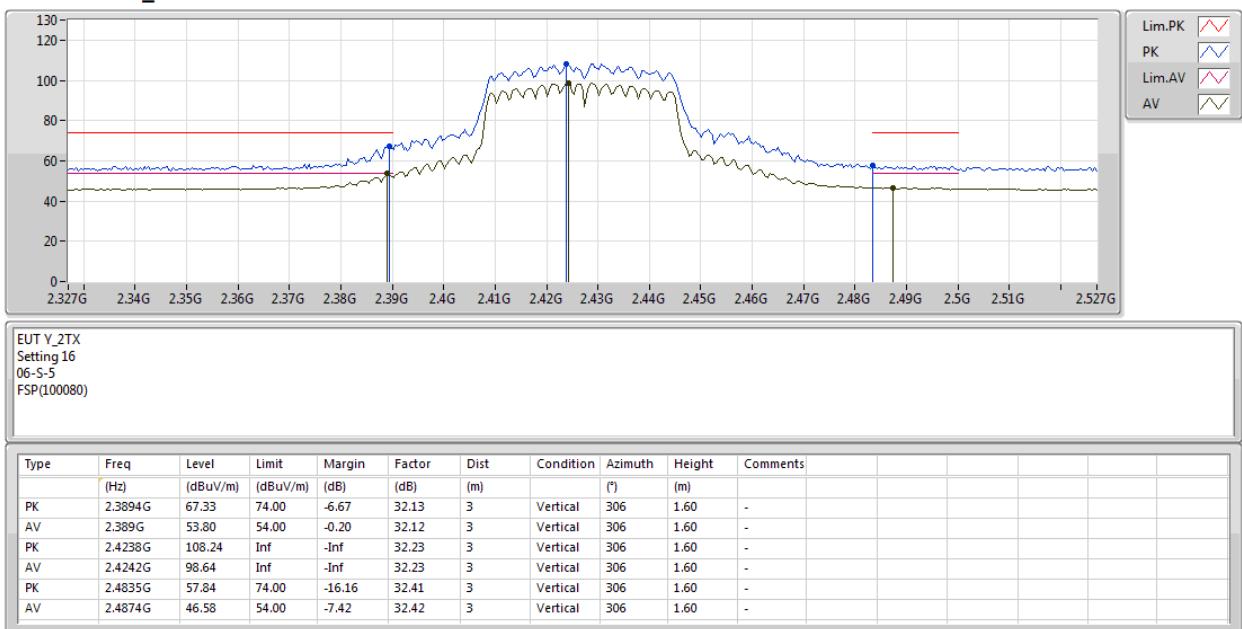
**802.11n HT40\_Nss1,(MCS0)\_2TX**

01/11/2018

**2422MHz\_TX**


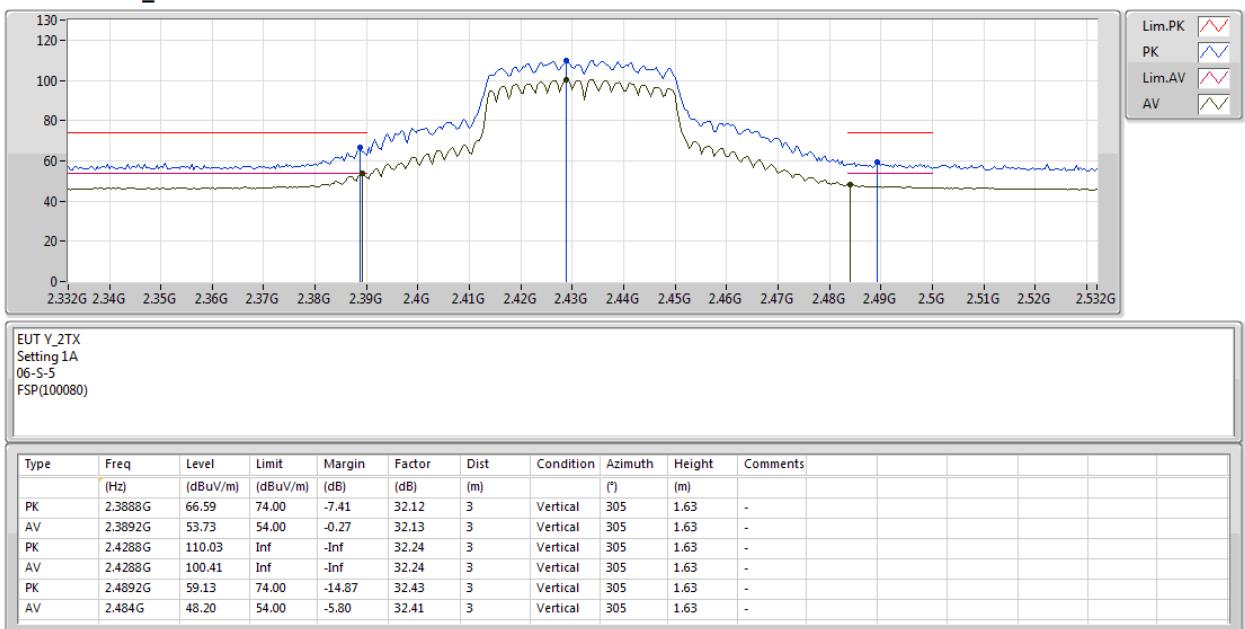
**802.11n HT40\_Nss1,(MCS0)\_2TX**

23/11/2018

**2427MHz\_TX**


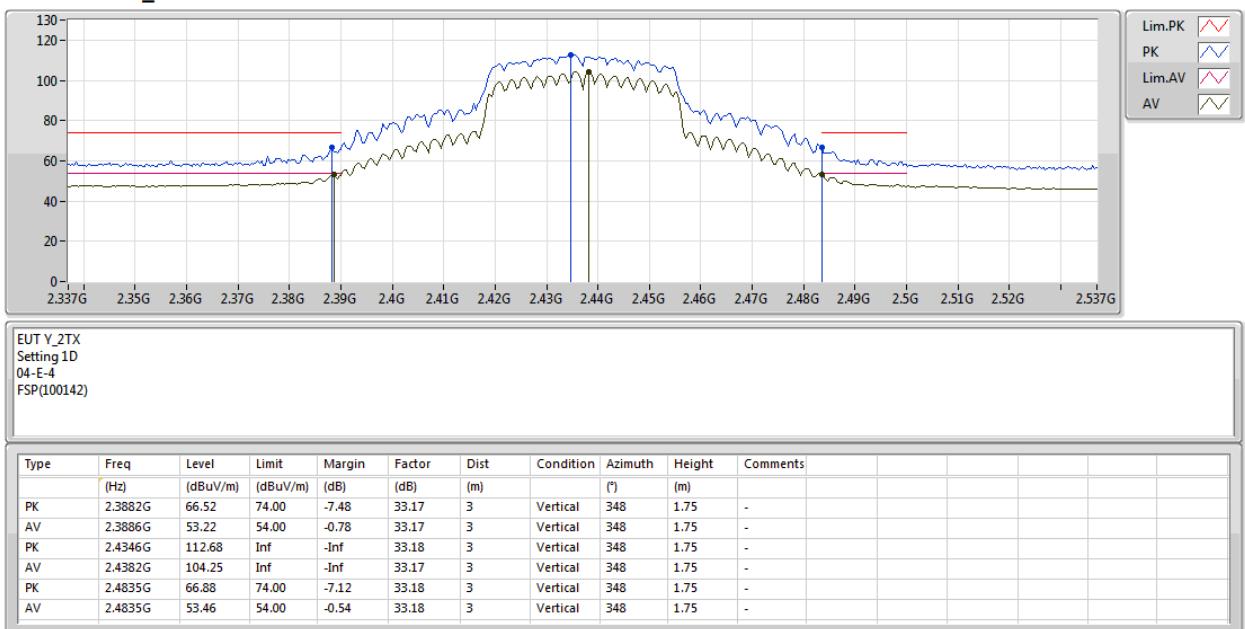
**802.11n HT40\_Nss1,(MCS0)\_2TX**

23/11/2018

**2432MHz\_TX**


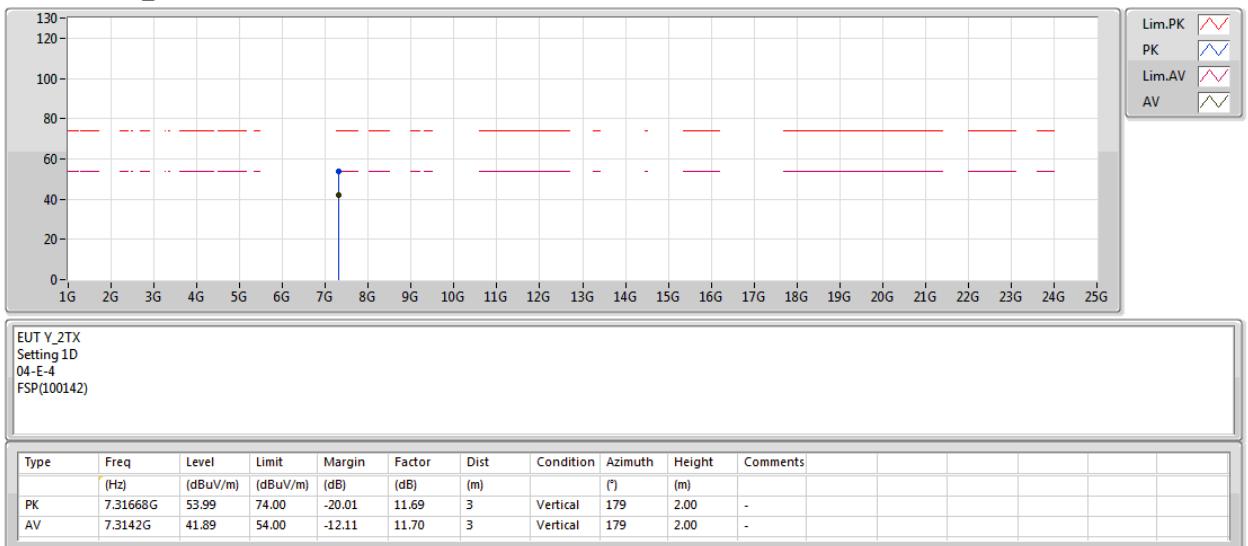
**802.11n HT40\_Nss1,(MCS0)\_2TX**

01/11/2018

**2437MHz\_TX**


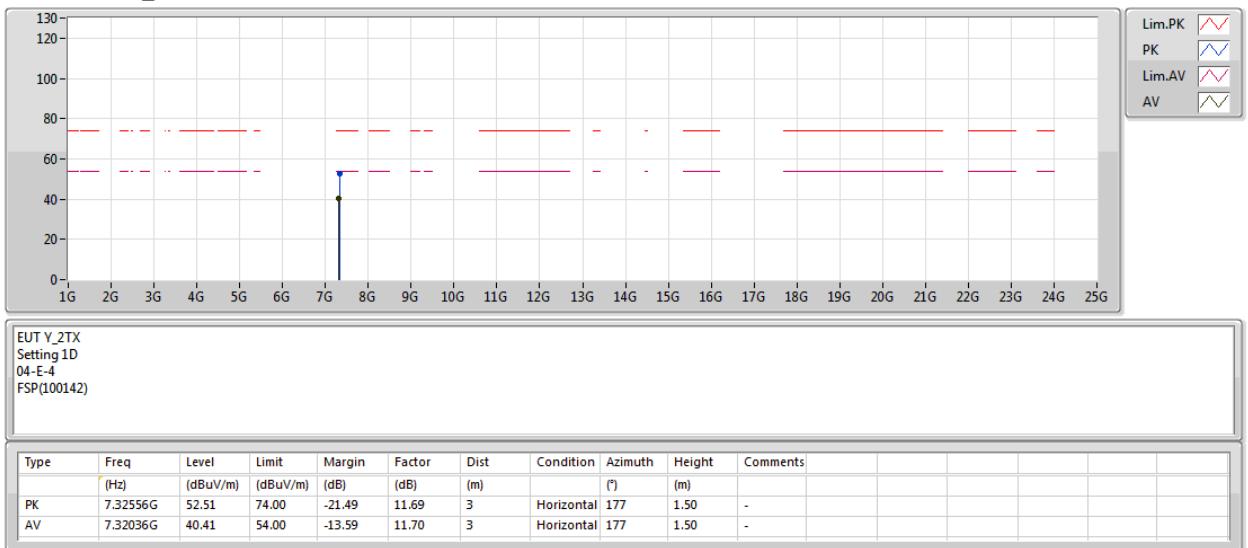
**802.11n HT40\_Nss1,(MCS0)\_2TX**

01/11/2018

**2437MHz\_TX**


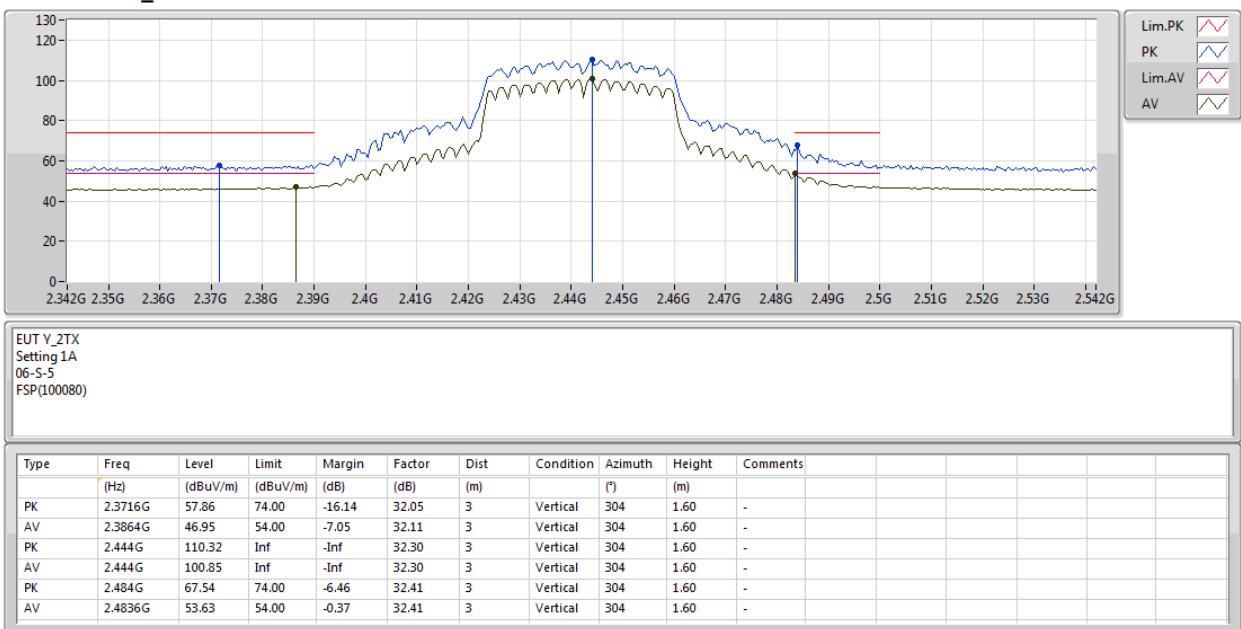
**802.11n HT40\_Nss1,(MCS0)\_2TX**

01/11/2018

**2437MHz\_TX**


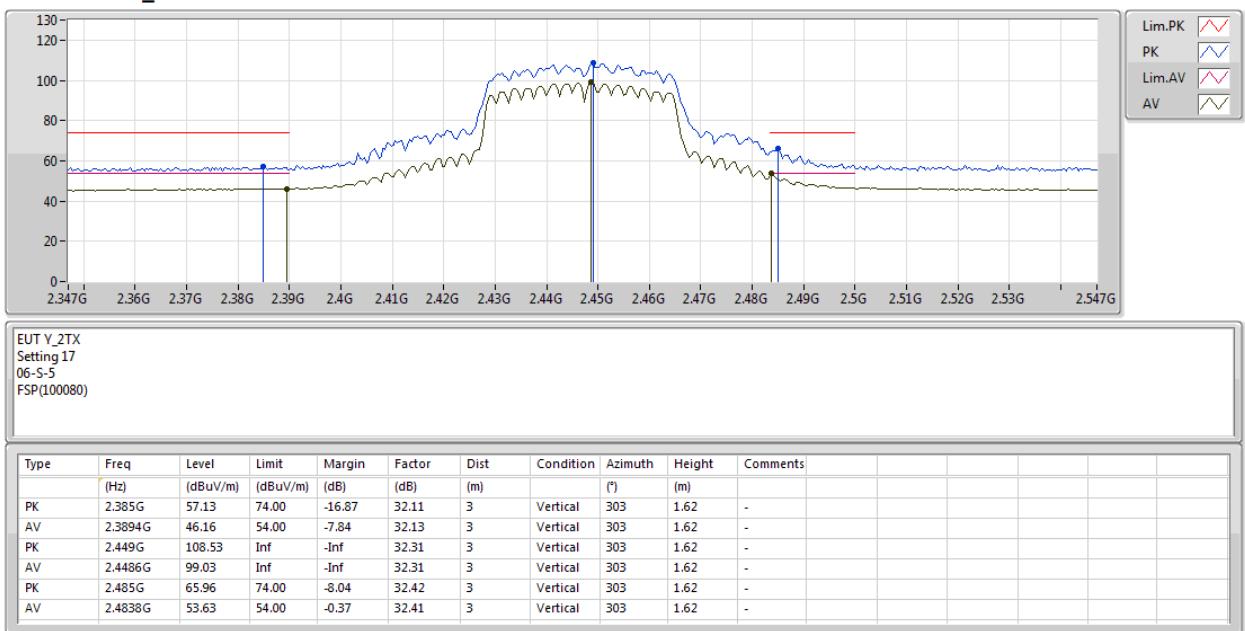
**802.11n HT40\_Nss1,(MCS0)\_2TX**

23/11/2018

**2442MHz\_TX**


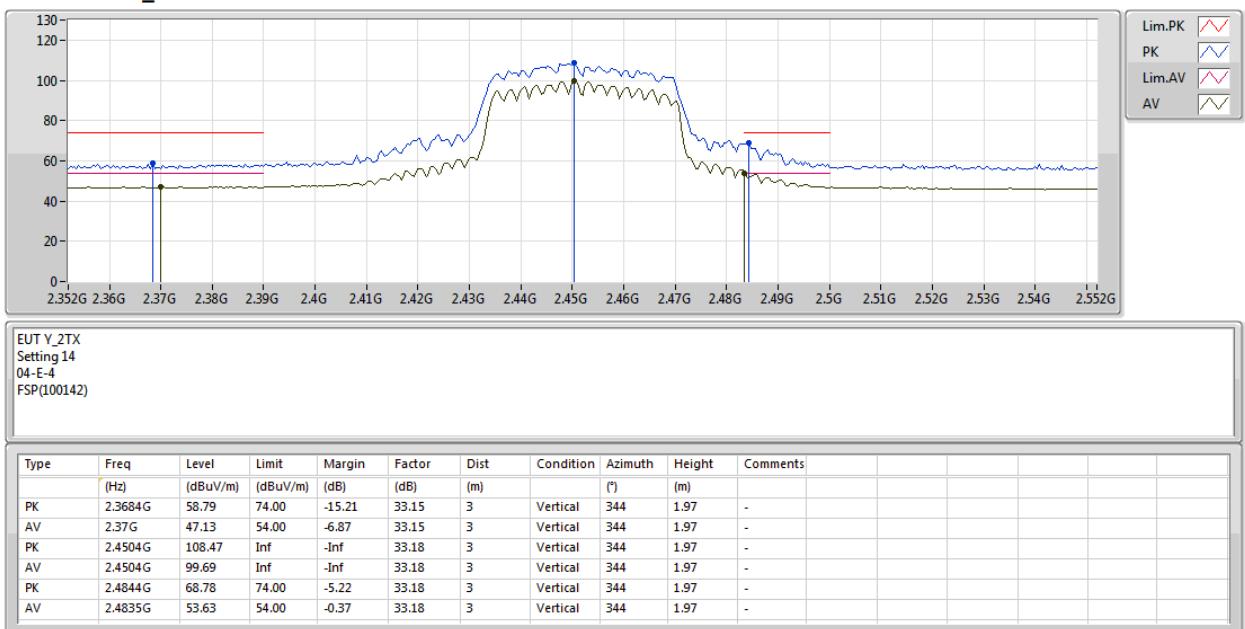
**802.11n HT40\_Nss1,(MCS0)\_2TX**

23/11/2018

**2447MHz\_TX**


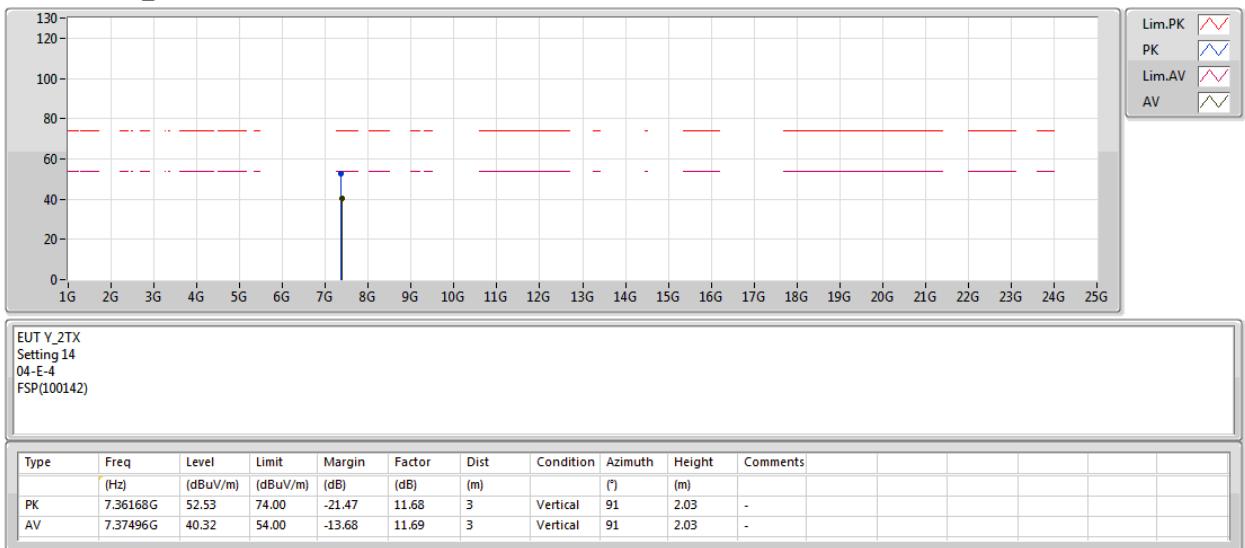
**802.11n HT40\_Nss1,(MCS0)\_2TX**

01/11/2018

**2452MHz\_TX**


**802.11n HT40\_Nss1,(MCS0)\_2TX**

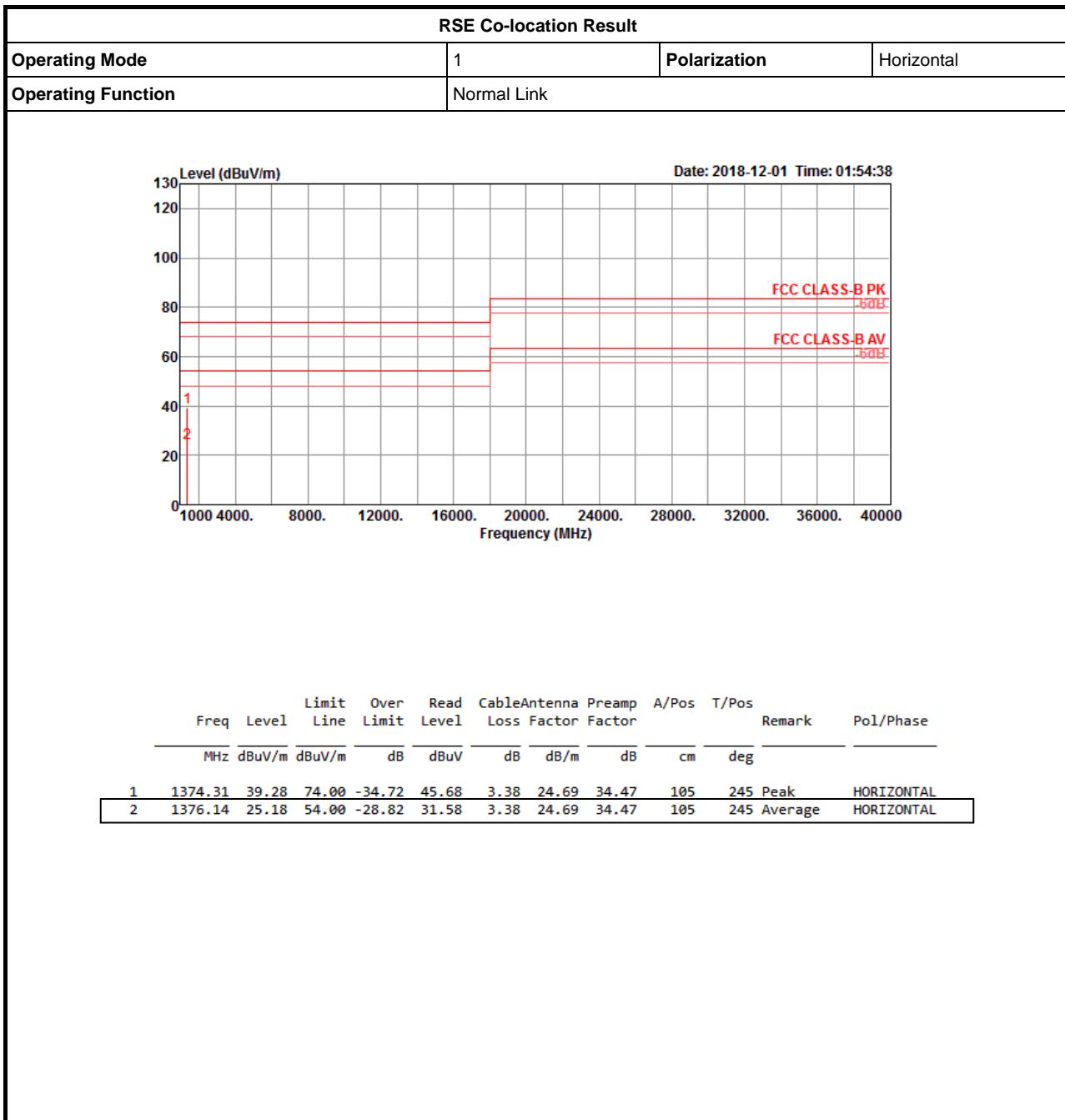
01/11/2018

**2452MHz\_TX**


**802.11n HT40\_Nss1,(MCS0)\_2TX**

01/11/2018

**2452MHz\_TX**



## RSE Co-location Result

Appendix G

