CE Test Report

Equipment	:	**Sterling-LWB5+ WiFi 5 + Bluetooth 5.2 USB Adapter**
Model No.	:	**Sterling LWB5+**
Brand Name	:	**Laird Connectivity**
Applicant	:	**Laird Connectivity, LLC.**
Address	:	**W66N220 Commerce Court, Cedarburg, Wisconsin 53012, USA**
Standard	:	**EN 300 328 V2.2.2 (2019-07)**
Received Date	:	**Aug. 03, 2020**
Tested Date	:	**Aug. 20, 2020 ~ Jun. 25, 2021**

We, International Certification Corporation, 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: **Approved by:**

James Fan / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
ER061103-02AC	Rev. 01	Initial issue	Aug. 17, 2021

Summary of Test Results

Ref. Std. Clause	Test Items	Measured	Result
4.3.2.2	RF Output Power	17.75 dBm.	Pass
4.3.2.3	Power Spectral Density	Meet the requirement of limit.	Pass
4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	Only for non-adaptive equipment.	N/A
4.3.2.5	Medium Utilisation (MU) factor	Only for non-adaptive equipment.	N/A
4.3.2.6	Adaptivity	Meet the requirement of limit.	Pass
4.3.2.7	Occupied Channel Bandwidth	Meet the requirement of limit.	Pass
4.3.2.8	Transmitter unwanted emissions in the out of band domain	Meet the requirement of limit.	Pass
4.3.2.9	Transmitter unwanted emissions in the spurious domain	Meet the requirement of limit.	Pass
4.3.2.10	Receiver spurious emissions	Meet the requirement of limit.	Pass
4.3.2.11	Receiver Blocking	Meet the requirement of limit.	Pass
4.3.2.12	Geo-location Capability	The device has no this capability.	N/A

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.

1 General Description

1.1 Information

Test results of RF Conducted measurement is referred to International Certification Corp. Report No. ER061103AC.

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
Frequency Range (MHz)	**IEEE Std. 802.11**	**Ch. Freq. (MHz)**	**Channel Number**	**Transmit Chains (N_{TX})**	**Data Rate / MCS**
2400-2483.5	b	2412-2472	1-13 [13]	1	1-11 Mbps
2400-2483.5	g	2412-2472	1-13 [13]	1	6-54 Mbps
2400-2483.5	n (HT20)	2412-2472	1-13 [13]	1	MCS 0-7
2400-2483.5	n (HT40)	2422-2462	3-11 [9]	1	MCS 0-7
Note 1: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation. Note 2: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.					

1.1.2 Antenna Details

Ant. No.	Manufacturer	Model	Laird Part Number	Type	Connector	Antenna Gain (dBi)
1	ACX	AD1608-A2455 AAT/LF	NA	Chip Antenna	N/A	1.0

1.1.3 EUT Operational Condition

Power Type	5 Vdc		
SW Version	N/A		
Operational Climatic	☒ Tnom (20°C)	☒ Tmax (85°C)	☒ Tmin (-40°C)

1.1.4 Accessories

N/A

1.1.5 Adaptive Equipment

Adaptive Equipment		
☐	non-Adaptive Equipment:	
	The maximum RF Output Power (e.i.r.p.): dBm	
	The maximum (corresponding) Duty Cycle: %	
☒	Adaptive Equipment without the possibility to switch to a non-adaptive mode:	
	☒	The equipment has implemented an LBT based DAA mechanism:
		☐ The equipment is Frame Based equipment
		☒ The equipment is Load Based equipment
		☐ The equipment can switch dynamically between Frame Based and Load Based equipment
	☐	The equipment has implemented an non-LBT based DAA mechanism
	☐	The equipment can operate in more than one adaptive mode
	☐	Adaptive Frequency Hopping using other forms of DAA (non-LBT based)/without Short Control Signaling Transmissions
☐	Adaptive Equipment which can also operate in a non-adaptive mode	

1.1.6 Channel List

Frequency band (MHz)		2400~2483.5	
802.11 b / g / n HT20		802.11n HT40	
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	---	---

1.1.7 Test Tool and Duty Cycle

Test Tool	TeraTerm, Version: 4.103	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
b	99.75%	0.01
g	99.00%	0.04
n (HT20)	98.90%	0.05
n (HT40)	97.80%	0.10

1.1.8 Power Index of Test Tool

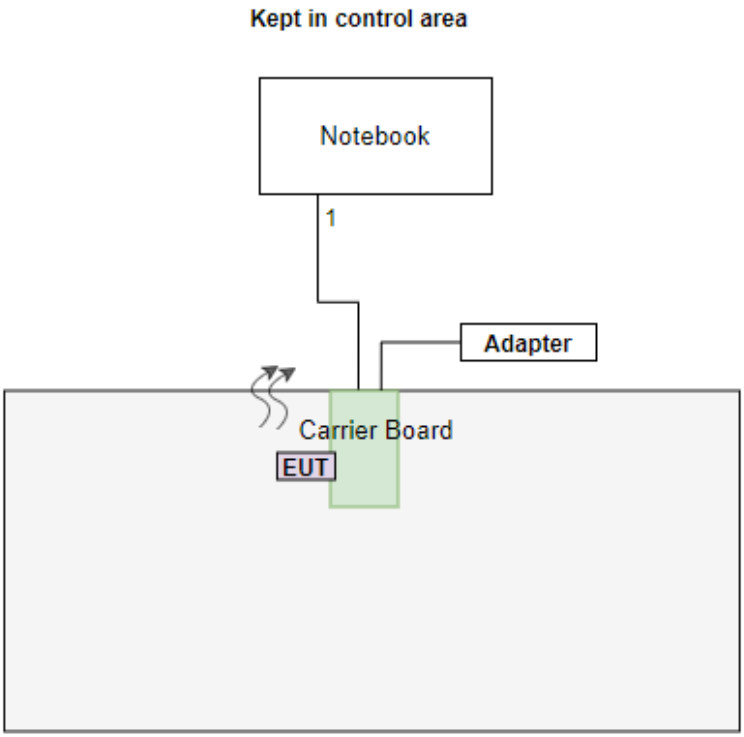
Modulation Mode	Test Frequency (MHz)					
	b / g / n (HT20)			n (HT40)		
	2412	2442	2472	2422	2442	2462
b	62	62	62	---	---	---
g	66	66	66	---	---	---
n (HT20)	66	66	66	---	---	---
n (HT40)	---	---	---	66	66	66

1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**S/N**	**Remarks**
1	Notebook	DELL	Latitude 5400	CXYCM33	---
2	Carrier Board	Laird	DVK-LWB5+	---	Provided by applicant.

1.3 Test Setup Chart

Test Setup Diagram



No.	Signal cable / Length (m)
1	USB, 0.5m shielded.

1.4 Test Equipment List and Calibration Data

Test Item	Radiated Emissions				
Test Site	Fully-anechoic chamber 1 / (05CH01-WS)				
Test Date	Jun. 15, 2021				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
5m Fully-anechoic chamber	TDK	0	05CH01-WS	NA	NA
Spectrum Analyzer	Agilent	N9010A	MY54200247	Oct. 16, 2020	Oct. 15, 2021
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-524	Nov. 11, 2020	Nov. 10, 2021
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1094	Nov. 03, 2020	Nov. 02, 2021
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Dec. 31, 2020	Dec. 30, 2021
Preamplifier	Agilent	83017A	MY39501310	Nov. 30, 2020	Nov. 29, 2021
Preamplifier	EMC	EMC02325	980146	Nov. 16, 2020	Nov. 15, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY22626/4	Oct. 13, 2020	Oct. 12, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16609/4	Oct. 13, 2020	Oct. 12, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY15686/4	Oct. 13, 2020	Oct. 12, 2021
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-005	Oct. 13, 2020	Oct. 12, 2021
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-006	Oct. 13, 2020	Oct. 12, 2021
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Test Date	Aug. 20, 2020				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101486	Feb. 10, 2020	Feb. 09, 2021
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Dec. 12, 2019	Dec. 11, 2020
Power Sensor	Agilent	U2021XA	MY53480019	Feb. 10, 2020	Feb. 09, 2021
Power Sensor	Agilent	U2021XA	MY53510003	Feb. 10, 2020	Feb. 09, 2021
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 02, 2019	Dec. 01, 2020
Combiner(1X2)	WOKEN	0120A02201801O	DOM2AEW1A23	Oct. 17, 2019	Oct. 16, 2020
Combiner(1X4)	WOKEN	4WAYDIV	0120A042011010	Oct. 16, 2019	Oct. 15, 2020
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Measurement Software	Agilent	EN RF test	V2.151229	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Adaptivity				
Test Site	(TH01-WS)				
Test Date	Jun. 25, 2021				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum	R&S	FSV7	100607	Jan. 06, 2021	Jan. 05, 2022
RF cable-4M	HUBER+SUHNER	SUCOFLEX_104	MY15686/4	Oct. 13, 2020	Oct. 12, 2021
RF cable-0.5M	HUBER+SUHNER	SUCOFLEX_104	296081/4	Oct. 15, 2020	Oct. 14, 2021
RF cable-0.2M	HUBER+SUHNER	SUCOFLEX_104	329023/4	Oct. 15, 2020	Oct. 14, 2021
RF cable-0.2M	HUBER+SUHNER	SUCOFLEX_104	329021/4	Oct. 15, 2020	Oct. 14, 2021
MXG-B RF Vector Signal Generator	Agilent	N5182B	MY53050081	May 16, 2021	May 15, 2022
Signal Generator	R&S	SMB100A	175727	Jan. 07, 2021	Jan. 06, 2022
Preamplifier	EMC	EMC02325	980188	Nov. 09, 2020	Nov. 08, 2021
Oscilloscope	National Instruments	USB-5133	F651FF	Jul. 15, 2020	Jul. 14, 2021
Combiner(1X2)	Woken	2WAYDIV-1	0120A02056002D	Oct. 15, 2020	Oct. 14, 2021
Combiner(1X2)	Woken	2WAYDIV-2	0120A02056002D	Oct. 15, 2020	Oct. 14, 2021
Combiner(1X4)	Woken	4WAYDIV	0120A042011010	Oct. 15, 2020	Oct. 14, 2021
Direction Coupler	Marvelous Microwave	MVE4514-20	20	Oct. 15, 2020	Oct. 14, 2021
Attenuator	Warison	WATT-6SR1211	01	Oct. 15, 2020	Oct. 14, 2021
Measurement Software	Sporton	Sporton_3	1.0.0.22	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Receiver Blocking				
Test Site	(05CH01-WS)				
Test Date	Jun. 18, 2021				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Wireless connectivity tester	R&S	CMW270	100856	Nov. 02, 2020	Nov. 01, 2021
Signal Generator	R&S	SMB100A	175727	Jan. 07, 2021	Jan. 06, 2022
RF cable-0.5M	HUBER+SUHNER	SUCOFLEX_104	500202/4	Oct. 15, 2020	Oct. 14, 2021
RF cable-0.5M	HUBER+SUHNER	SUCOFLEX_104	296088/4	Oct. 15, 2020	Oct. 14, 2021
RF cable-0.2M	HUBER+SUHNER	SUCOFLEX_104	329023/4	Oct. 15, 2020	Oct. 14, 2021
Combiner(1X2)	WOKEN	2WAYDIV	12101200003	Oct. 15, 2020	Oct. 14, 2021
Note: Calibration Interval of instruments listed above is one year.					

1.5 Testing Applied Standards

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

EN 300 328 V2.2.2 (2019-07)

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty		
Parameters	**Uncertainty**	**Limit**
Occupied Channel Bandwidth	±0.0034 %	±5 %
RF output power, conducted	±0.592 dB	±1.5 dB
Power Spectral Density, conducted	±0.583 dB	±3 dB
Unwanted Emissions, conducted	±2.715 dB	±3 dB
All emissions, radiated	±3.14 dB	±6 dB
Temperature	±0.4 ºC	±3 °C
Supply voltages	±0.15 %	±3 %
Time	±0.1 %	±5 %

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	TH01-WS, 05CH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Test Configuration
RF Output Power Power Spectral Density Transmitter unwanted emissions in the out of band domain	11b 11g HT20 HT40	2412 / 2442 / 2472 2412 / 2442 / 2472 2412 / 2442 / 2472 2422 / 2442 / 2462	1 Mbps 6 Mbps MCS 0 MCS 0	---
Occupied Channel Bandwidth Adaptivity	11b 11g HT20 HT40	2412 / 2472 2412 / 2472 2412 / 2472 2422 / 2462	1 Mbps 6 Mbps MCS 0 MCS 0	---
Transmitter Radiated Spurious Emissions≤1GHz Receiver Radiated Spurious Emissions≤1GHz	11g HT40	2412 / 2472 2422 / 2462	6 Mbps MCS 0	---
Transmitter Radiated Spurious Emissions>1GHz	11b 11g HT20 HT40	2412 / 2472 2412 / 2472 2412 / 2472 2422 / 2462	1 Mbps 6 Mbps MCS 0 MCS 0	---
Receiver Radiated Spurious Emissions>1GHz	11g HT40	2412 / 2472 2422 / 2462	6 Mbps MCS 0	---
Receiver Blocking	11b	2412 / 2472	1 Mbps	---

NOTE:
1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Z-plane** result was found as the worst case and was shown in this report.

3 Transmitter Test Results

3.1 RF Output Power

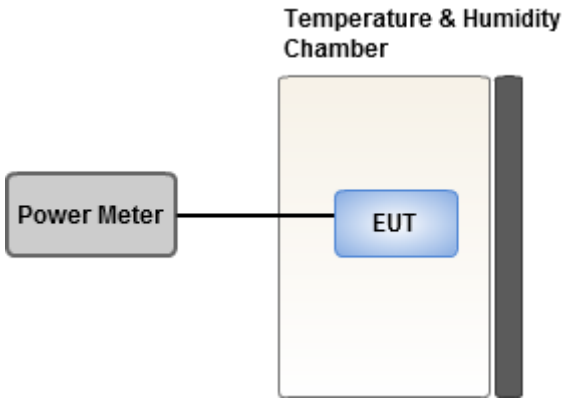
3.1.1 Limit of RF Output Power

The maximum RF output power shall be 20 dBm.

3.1.2 Test Procedures

Reference to clause 5.4.2.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.1.3 Test Setup



3.1.4 Test Result of RF Output Power

Ambient Condition	25°C / 65%	Tested By	Nai Xu

RF Output Power (dBm)				
Modulation Mode	11b/1Mbps			
Condition	**Freq. (MHz)**	**EIRP Power(dBm)**	**Limit (dBm)**	**Results**
$T_{nom}V_{nom}$	2412	16.41	20	Pass
$T_{min}V_{nom}$	2412	16.62	20	Pass
$T_{max}V_{nom}$	2412	15.94	20	Pass
$T_{nom}V_{nom}$	2442	16.34	20	Pass
$T_{min}V_{nom}$	2442	16.61	20	Pass
$T_{max}V_{nom}$	2442	15.93	20	Pass
$T_{nom}V_{nom}$	2472	16.11	20	Pass
$T_{min}V_{nom}$	2472	16.38	20	Pass
$T_{max}V_{nom}$	2472	15.65	20	Pass

Note: EIRP = Measured conducted power + Antenna gain

RF Output Power (dBm)				
Modulation Mode	11g/6Mbps			
Condition	**Freq. (MHz)**	**EIRP Power(dBm)**	**Limit (dBm)**	**Results**
$T_{nom}V_{nom}$	2412	17.22	20	Pass
$T_{min}V_{nom}$	2412	17.41	20	Pass
$T_{max}V_{nom}$	2412	16.87	20	Pass
$T_{nom}V_{nom}$	2442	17.55	20	Pass
$T_{min}V_{nom}$	2442	17.74	20	Pass
$T_{max}V_{nom}$	2442	17.22	20	Pass
$T_{nom}V_{nom}$	2472	17.30	20	Pass
$T_{min}V_{nom}$	2472	17.52	20	Pass
$T_{max}V_{nom}$	2472	16.95	20	Pass

Note: EIRP = Measured conducted power + Antenna gain

RF Output Power (dBm)				
Modulation Mode	HT20/MCS 0			
Condition	**Freq. (MHz)**	**EIRP Power(dBm)**	**Limit (dBm)**	**Results**
$T_{nom}V_{nom}$	2412	17.54	20	Pass
$T_{min}V_{nom}$	2412	17.75	20	Pass
$T_{max}V_{nom}$	2412	17.15	20	Pass
$T_{nom}V_{nom}$	2442	17.45	20	Pass
$T_{min}V_{nom}$	2442	17.69	20	Pass
$T_{max}V_{nom}$	2442	17.08	20	Pass
$T_{nom}V_{nom}$	2472	17.32	20	Pass
$T_{min}V_{nom}$	2472	17.54	20	Pass
$T_{max}V_{nom}$	2472	16.97	20	Pass

Note: EIRP = Measured conducted power + Antenna gain

RF Output Power (dBm)				
Modulation Mode	HT40/MCS 0			
Condition	**Freq. (MHz)**	**EIRP Power(dBm)**	**Limit (dBm)**	**Results**
$T_{nom}V_{nom}$	2422	17.32	20	Pass
$T_{min}V_{nom}$	2422	17.60	20	Pass
$T_{max}V_{nom}$	2422	16.98	20	Pass
$T_{nom}V_{nom}$	2442	17.28	20	Pass
$T_{min}V_{nom}$	2442	17.50	20	Pass
$T_{max}V_{nom}$	2442	16.85	20	Pass
$T_{nom}V_{nom}$	2462	17.24	20	Pass
$T_{min}V_{nom}$	2462	17.48	20	Pass
$T_{max}V_{nom}$	2462	16.86	20	Pass

Note: EIRP = Measured conducted power + Antenna gain

3.2 Power Spectral Density

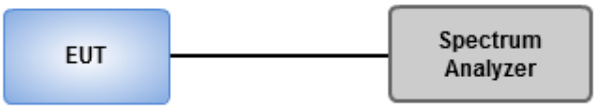
3.2.1 Limit of Power Spectral Density

The maximum Power Spectral Density is limited to 10 dBm per MHz.

3.2.2 Test Procedures

Reference to clause 5.4.3.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.2.3 Test Setup



3.2.4 Test Result of Power Spectral Density

Ambient Condition	25°C / 65%	**Tested By**	Nai Xu

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
11b/1Mbps	2412	8.04	10	Pass
11b/1Mbps	2442	7.84	10	Pass
11b/1Mbps	2472	7.94	10	Pass
11g/6Mbps	2412	5.86	10	Pass
11g/6Mbps	2442	5.93	10	Pass
11g/6Mbps	2472	5.55	10	Pass
HT20/MCS 0	2412	5.86	10	Pass
HT20/MCS 0	2442	5.98	10	Pass
HT20/MCS 0	2472	5.89	10	Pass
HT40/MCS 0	2422	2.69	10	Pass
HT40/MCS 0	2442	2.69	10	Pass
HT40/MCS 0	2462	2.47	10	Pass

Note: Power Density = Measured conducted power density+ Antenna gain

3.3 Occupied Channel Bandwidth

3.3.1 Limit of Occupied Channel Bandwidth

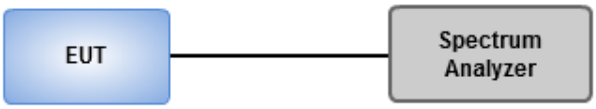
The Occupied Channel Bandwidth shall fall completely within 2.4~2.4835 GHz.

In addition, for non-adaptive equipment using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

3.3.2 Test Procedures

Reference to clause 5.4.7.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.3.3 Test Setup



3.3.4 Test Result of Occupied Channel Bandwidth

Ambient Condition	25°C / 65%	Tested By	Nai Xu

Summary

Mode	OBW (Hz)	ITU-Code
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_1TX	12.216M	12M2G1D
802.11g_Nss1,(6Mbps)_1TX	16.744M	16M7D1D
802.11n HT20_Nss1,(MCS0)_1TX	17.923M	17M9D1D
802.11n HT40_Nss1,(MCS0)_1TX	36.62M	36M6D1D

OBW = 99% occupied bandwidth;

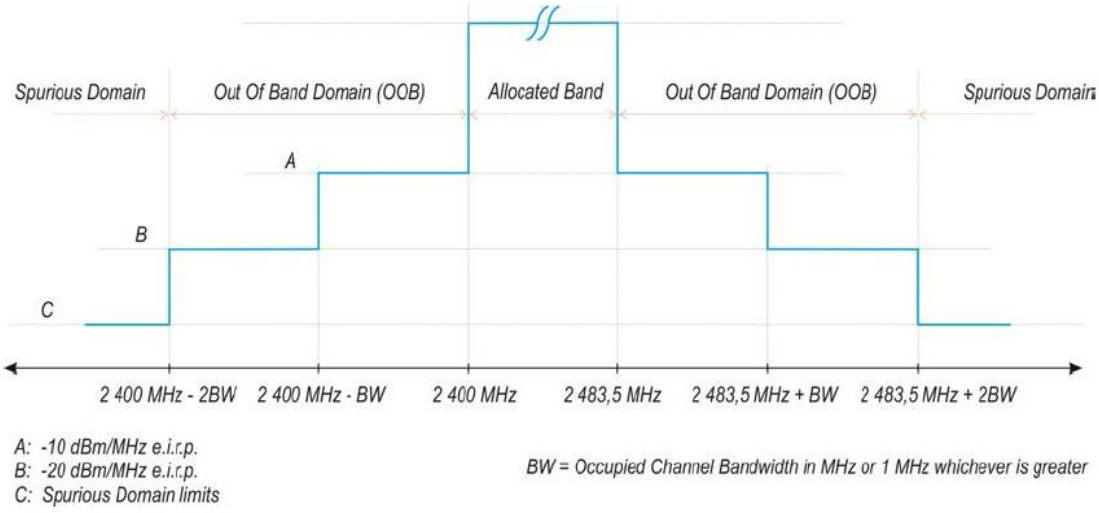
Result

Mode	Result	Limit (Hz)	fl-OBW (Hz)	fh-OBW (Hz)	OBW (Hz)	N dB (Hz)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.4-2.4835G	2.405865G	2.418072G	12.207M	9.44M
2472MHz_TnomVnom	Pass	2.4-2.4835G	2.465847G	2.478063G	12.216M	9.42M
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.4-2.4835G	2.403589G	2.420332G	16.744M	16.8M
2472MHz_TnomVnom	Pass	2.4-2.4835G	2.463598G	2.480331G	16.733M	16.82M
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.4-2.4835G	2.402997G	2.42092G	17.923M	18.04M
2472MHz_TnomVnom	Pass	2.4-2.4835G	2.462996G	2.480917G	17.921M	18.04M
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-	-
2422MHz_TnomVnom	Pass	2.4-2.4835G	2.403636G	2.440239G	36.603M	36.92M
2462MHz_TnomVnom	Pass	2.4-2.4835G	2.443628G	2.480248G	36.62M	36.96M

fl-OBW = fl lower edge 99% occupied bandwidth; **fh-OBW** = fh higher edge 99% occupied bandwidth; **OBW** = 99% occupied bandwidth;
N dB = 6dB down bandwidth;

3.4 Transmitter Unwanted Emissions in the Out-Of-Band Domain

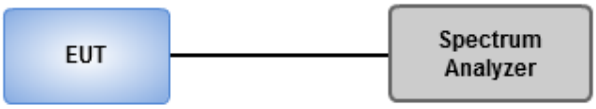
3.4.1 Limit of Transmitter Unwanted Emissions in the Out-Of-Band Domain



3.4.2 Test Procedures

Reference to clause 5.4.8.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.4.3 Test Setup



3.4.4 Test Result of Transmitter Unwanted Emissions in the Out-Of-Band Domain

Ambient Condition	25°C / 65%	Tested By	Nai Xu

Summary

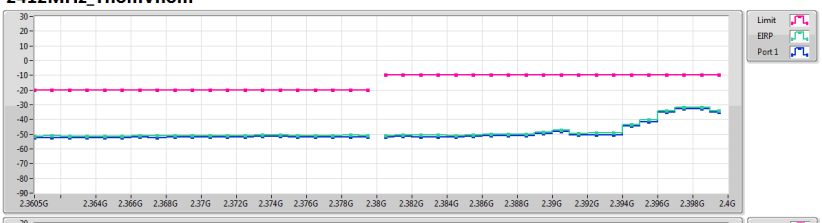
Mode	EIRP-A (dBm)	Limit-A (dBm)	EIRP-B (dBm)	Limit-B (dBm)
2.4-2.4835GHz	-	-	-	-
802.11b_Nss1,(1Mbps)_1TX	-31.15	-10	-50.57	-20
802.11g_Nss1,(6Mbps)_1TX	-27.65	-10	-46.14	-20
802.11n HT20_Nss1,(MCS0)_1TX	-27.41	-10	-44.68	-20
802.11n HT40_Nss1,(MCS0)_1TX	-27.09	-10	-43.44	-20

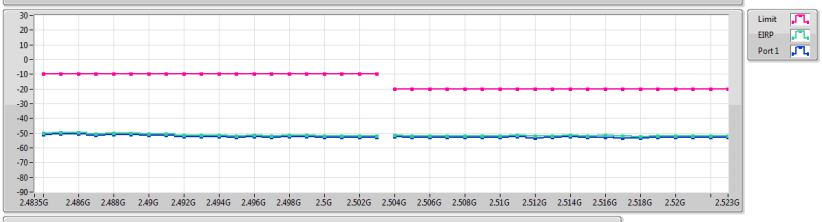
Result

Mode	Result	Freq (Hz)	EIRP (dBm)	Limit (dBm)	Freq (Hz)	EIRP (dBm)	Limit (dBm)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.3735G	-50.68	-20	2.3975G	-31.93	-10
2412MHz_TnomVnom	Pass	2.504G	-51.51	-20	2.486G	-49.54	-10
2472MHz_TnomVnom	Pass	2.3795G	-52.33	-20	2.3985G	-50.49	-10
2472MHz_TnomVnom	Pass	2.507G	-50.57	-20	2.486G	-31.15	-10
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.3795G	-46.14	-20	2.3995G	-27.65	-10
2412MHz_TnomVnom	Pass	2.513G	-51.35	-20	2.49G	-50.09	-10
2472MHz_TnomVnom	Pass	2.3765G	-52.14	-20	2.3985G	-50.58	-10
2472MHz_TnomVnom	Pass	2.504G	-46.99	-20	2.484G	-31.61	-10
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2412MHz_TnomVnom	Pass	2.3785G	-44.68	-20	2.3995G	-27.41	-10
2412MHz_TnomVnom	Pass	2.508G	-51.39	-20	2.489G	-50.10	-10
2472MHz_TnomVnom	Pass	2.3725G	-51.92	-20	2.3955G	-50.76	-10
2472MHz_TnomVnom	Pass	2.505G	-46.95	-20	2.484G	-30.78	-10
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2422MHz_TnomVnom	Pass	2.3595G	-43.44	-20	2.3995G	-27.09	-10
2422MHz_TnomVnom	Pass	2.524G	-51.24	-20	2.485G	-47.60	-10
2462MHz_TnomVnom	Pass	2.3595G	-50.85	-20	2.3995G	-43.03	-10
2462MHz_TnomVnom	Pass	2.524G	-47.09	-20	2.489G	-30.32	-10

802.11b_Nss1,(1Mbps)_1TX **Mask**

2412MHz_TnomVnom

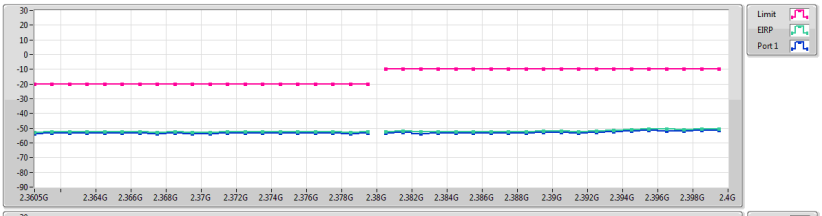


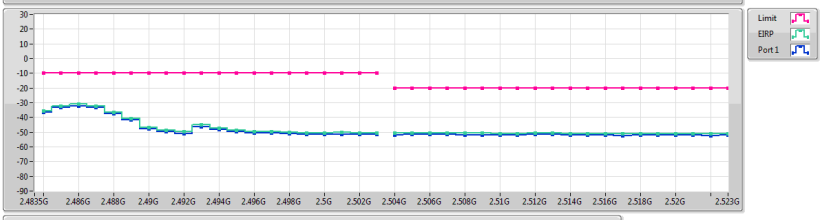


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3735G	-50.68	-20	2.3975G	-31.93	-10	2.486G	-49.54	-10	2.504G	-51.51	-20

802.11b_Nss1,(1Mbps)_1TX **Mask**

2472MHz_TnomVnom

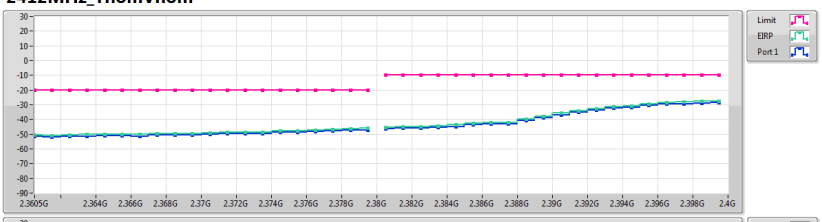


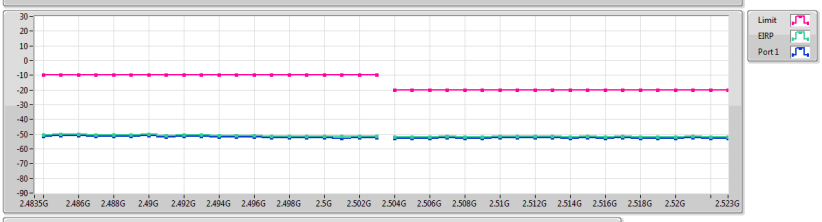


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3795G	-52.33	-20	2.3985G	-50.49	-10	2.486G	-31.15	-10	2.507G	-50.57	-20

802.11g_Nss1,(6Mbps)_1TX **Mask**

2412MHz_TnomVnom

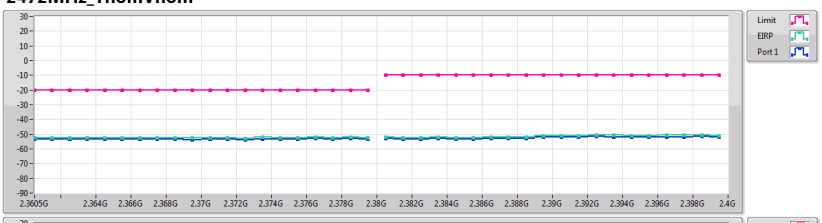


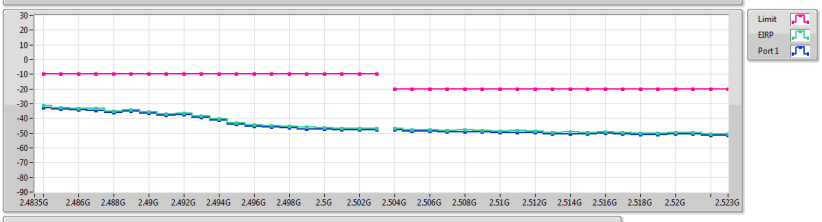


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3795G	-46.14	-20	2.3995G	-27.65	-10	2.49G	-50.09	-10	2.513G	-51.35	-20

802.11g_Nss1,(6Mbps)_1TX **Mask**

2472MHz_TnomVnom

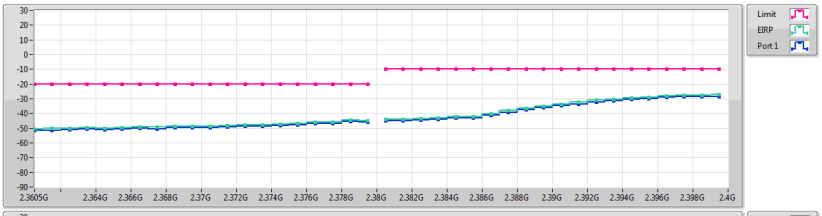


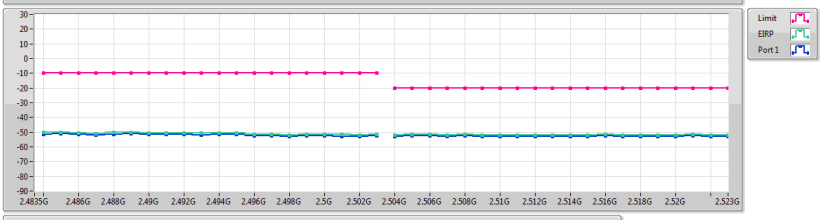


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3765G	-52.14	-20	2.3985G	-50.58	-10	2.484G	-31.61	-10	2.504G	-46.99	-20

802.11n HT20_Nss1,(MCS0)_1TX **Mask**

2412MHz_TnomVnom

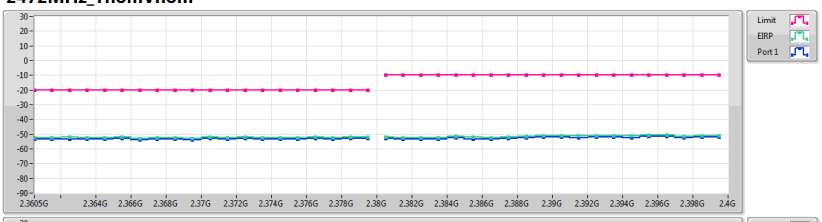


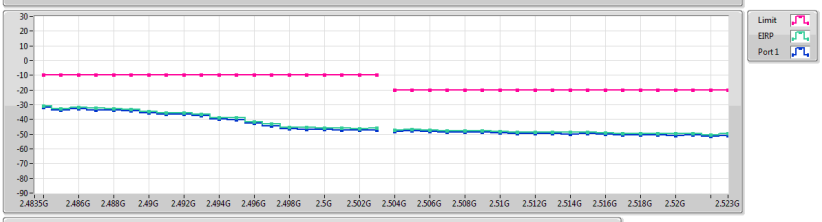


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3785G	-44.68	-20	2.3995G	-27.41	-10	2.489G	-50.10	-10	2.508G	-51.39	-20

802.11n HT20_Nss1,(MCS0)_1TX **Mask**

2472MHz_TnomVnom

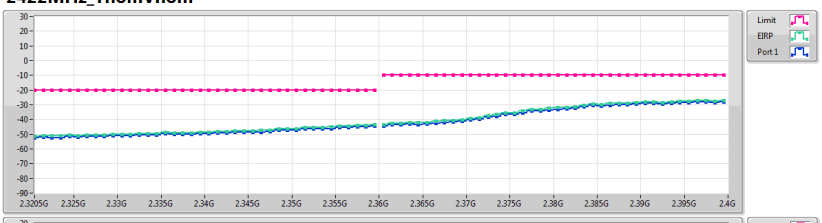


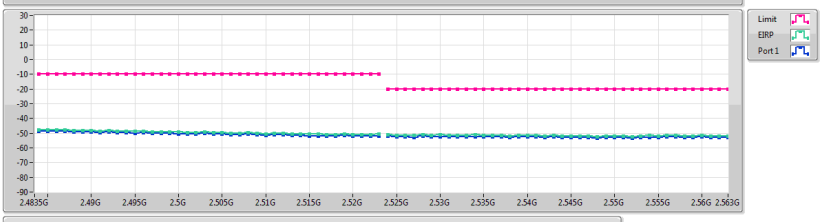


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3725G	-51.92	-20	2.3955G	-50.76	-10	2.484G	-30.78	-10	2.505G	-46.95	-20

802.11n HT40_Nss1,(MCS0)_1TX **Mask**

2422MHz_TnomVnom

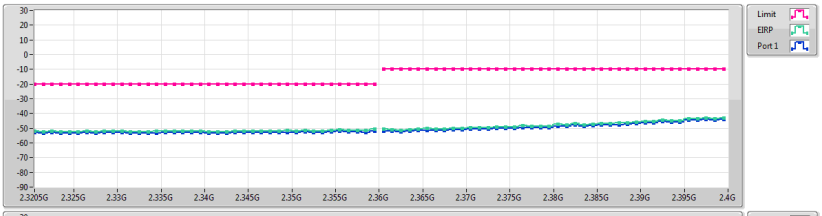


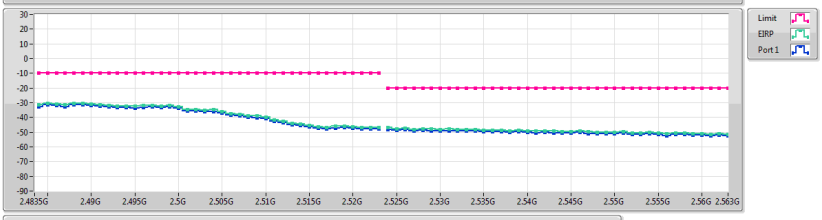


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3595G	-43.44	-20	2.3995G	-27.09	-10	2.485G	-47.60	-10	2.524G	-51.24	-20

802.11n HT40_Nss1,(MCS0)_1TX **Mask**

2462MHz_TnomVnom





Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3595G	-50.85	-20	2.3995G	-43.03	-10	2.489G	-30.32	-10	2.524G	-47.09	-20

3.5 Transmitter Unwanted Emissions in the Spurious Domain

3.5.1 Limit of Transmitter Unwanted Emissions in the Spurious Domain

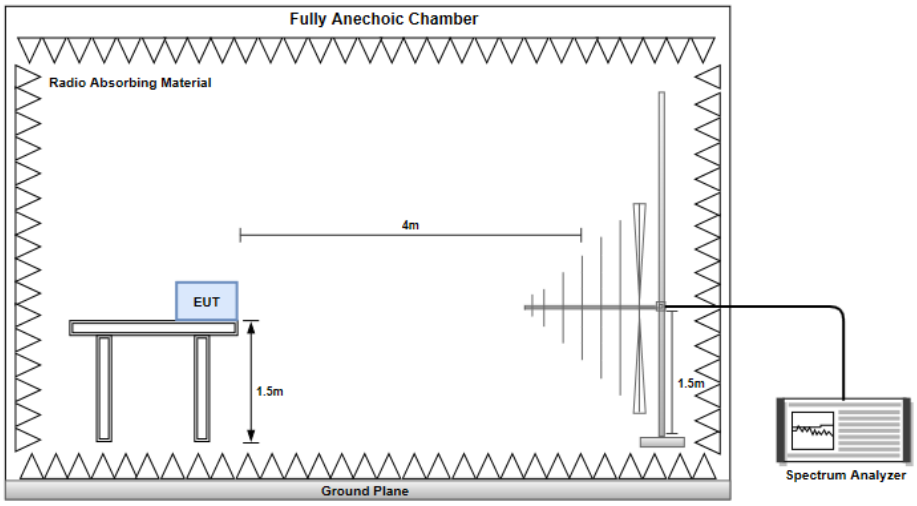
Frequency Range (MHz)	Maximum power (dBm)	Bandwidth (kHz)
30 to 47	-36	100
47 to 74	-54	100
74 to 87,5	-36	100
87,5 to 118	-54	100
118 to 174	-36	100
174 to 230	-54	100
230 to 470	-36	100
470 to 694	-54	100
694 to 1000	-36	100
1000 to 12750	-30	1000

3.5.2 Test Procedures

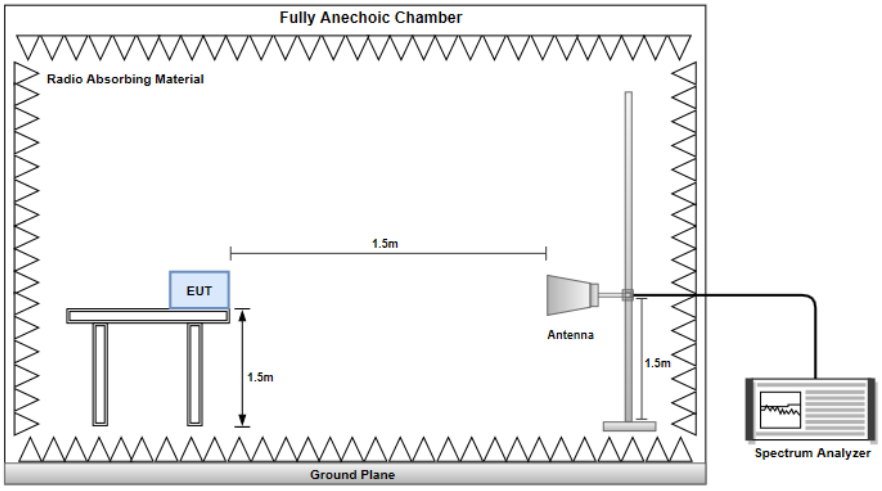
Reference to clause 5.4.9.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.5.3 Test Setup

Below 1GHz



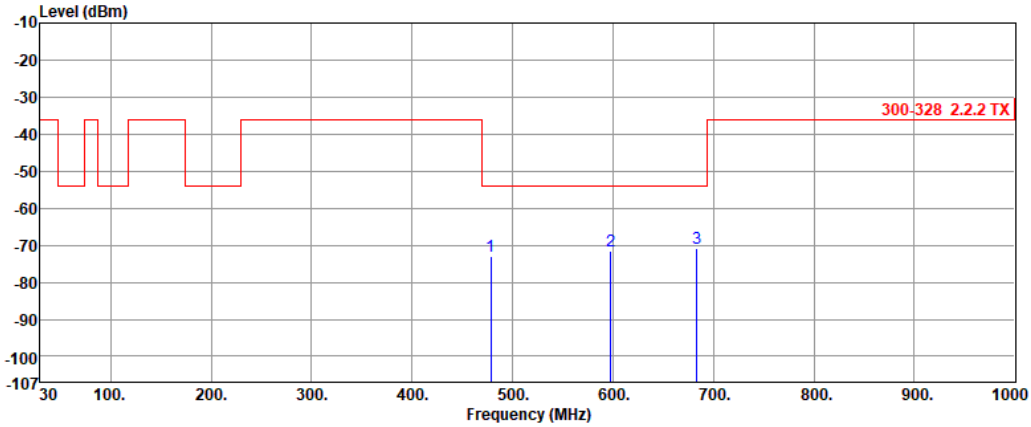
Above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	11g	**Test Freq. (MHz)**	2412
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

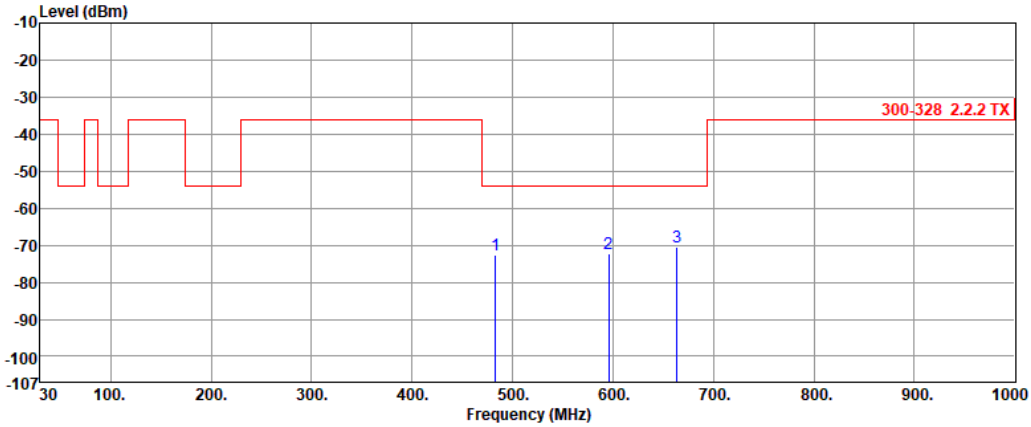


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	478.14	-73.14	-54.00	-19.14	1.83	-74.97
2	597.45	-71.63	-54.00	-17.63	4.81	-76.44
3	683.78	-70.69	-54.00	-16.69	5.43	-76.12

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

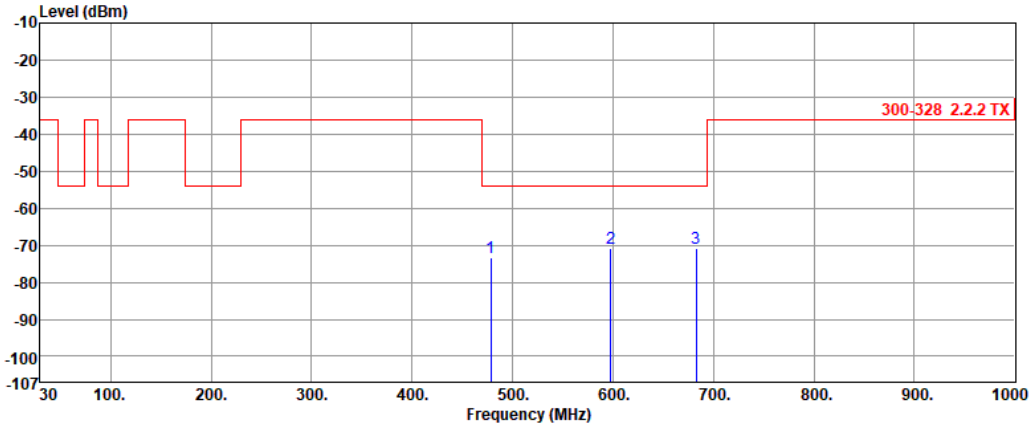


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	482.99	-72.52	-54.00	-18.52	2.02	-74.54
2	595.51	-72.22	-54.00	-18.22	4.77	-76.99
3	663.41	-70.40	-54.00	-16.40	5.20	-75.60

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2472
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

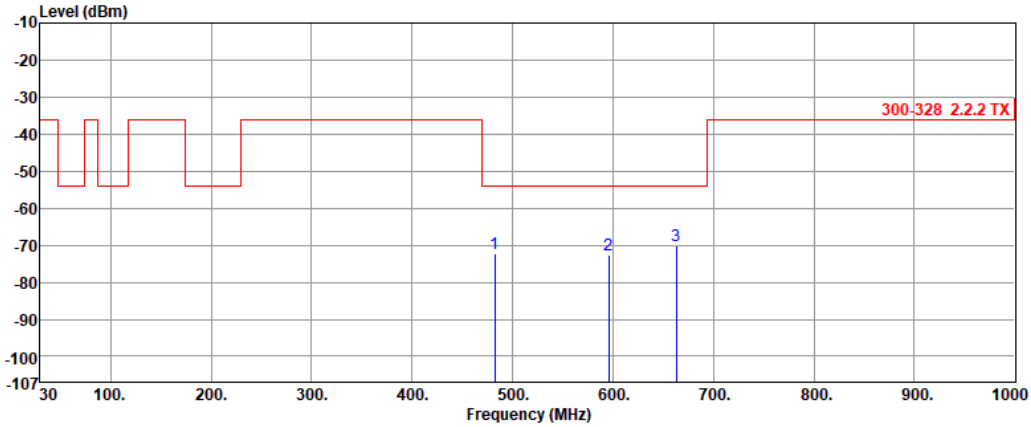


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	478.57	-73.24	-54.00	-19.24	1.84	-75.08
2	597.66	-71.00	-54.00	-17.00	4.82	-75.82
3	683.14	-70.93	-54.00	-16.93	5.44	-76.37

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2472
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

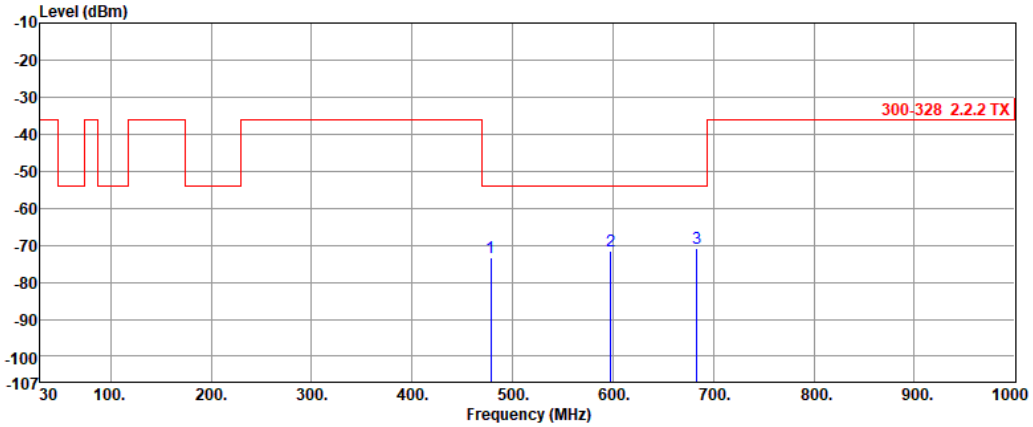


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	482.54	-72.37	-54.00	-18.37	2.01	-74.38
2	595.66	-72.75	-54.00	-18.75	4.78	-77.53
3	663.33	-70.06	-54.00	-16.06	5.20	-75.26

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

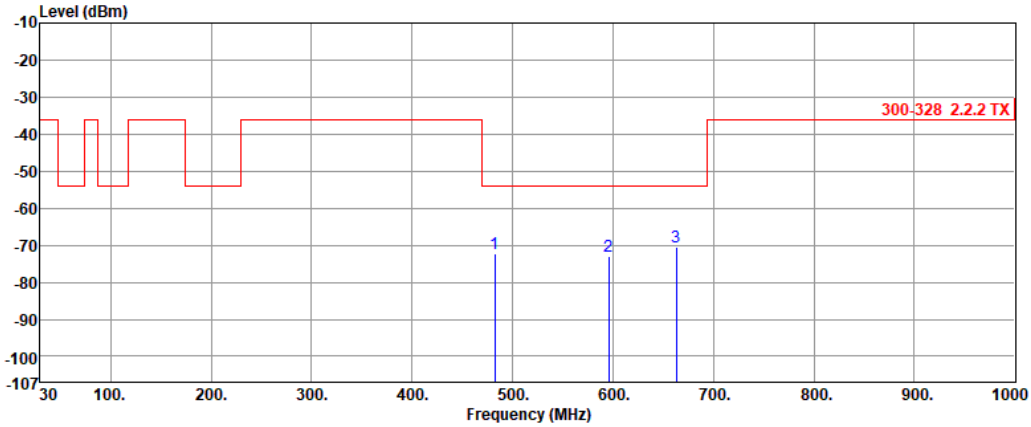


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	478.22	-73.49	-54.00	-19.49	1.83	-75.32
2	597.69	-71.53	-54.00	-17.53	4.83	-76.36
3	683.18	-70.82	-54.00	-16.82	5.43	-76.25

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

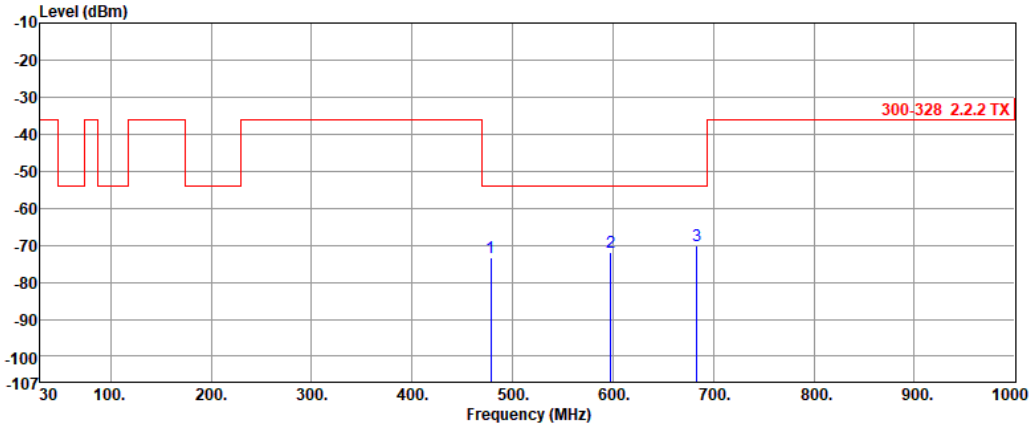


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	482.37	-72.18	-54.00	-18.18	2.00	-74.18
2	595.98	-72.86	-54.00	-18.86	4.80	-77.66
3	663.03	-70.51	-54.00	-16.51	5.20	-75.71

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

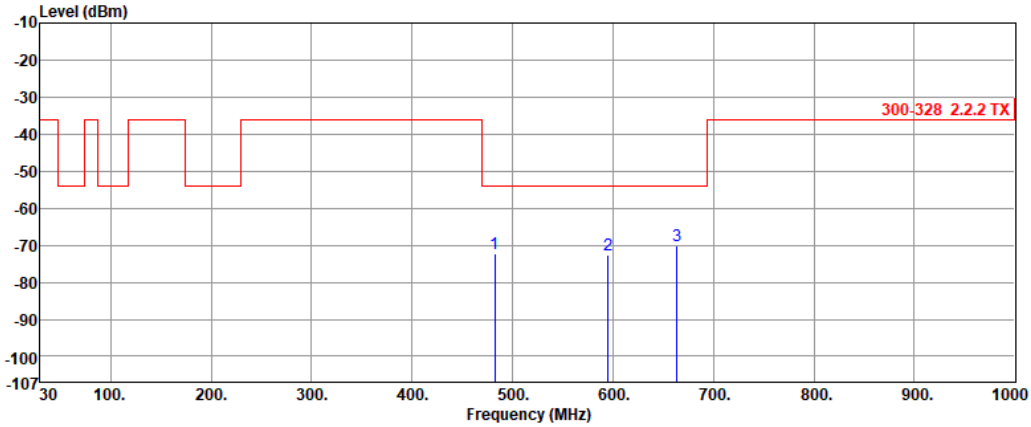


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	478.21	-73.49	-54.00	-19.49	1.83	-75.32
2	597.82	-71.93	-54.00	-17.93	4.83	-76.76
3	683.43	-70.10	-54.00	-16.10	5.43	-75.53

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65



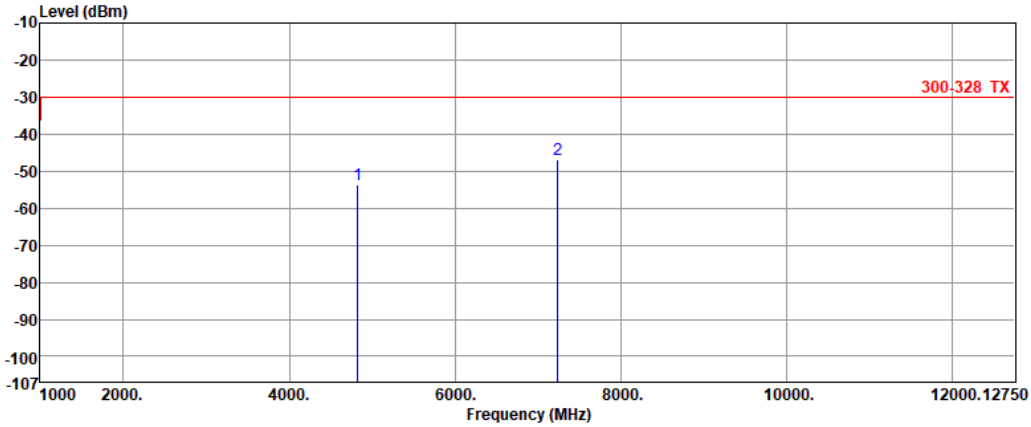
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	482.63	-72.29	-54.00	-18.29	2.01	-74.30
2	595.38	-72.46	-54.00	-18.46	4.77	-77.23
3	663.86	-70.12	-54.00	-16.12	5.21	-75.33

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 802.11b

Modulation	11b	Test Freq. (MHz)	2412
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

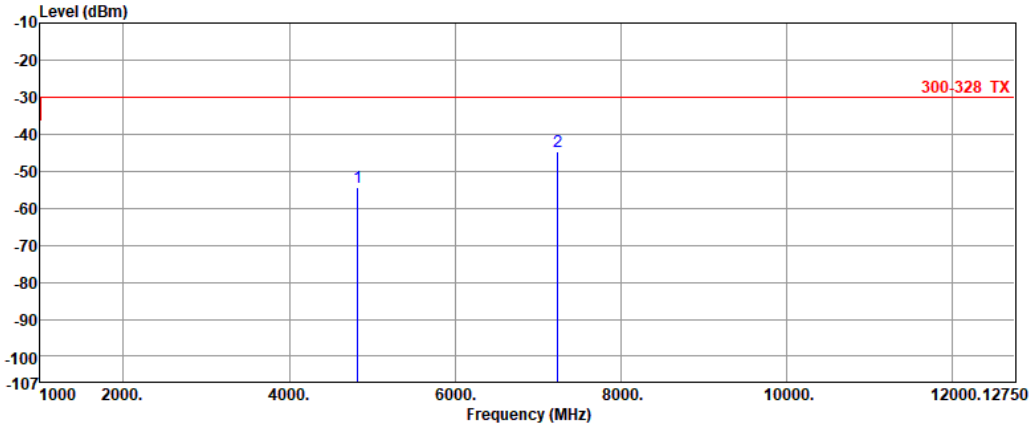


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4824.17	-53.55	-30.00	-23.55	7.85	-61.40
2	7235.86	-46.91	-30.00	-16.91	15.50	-62.41

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

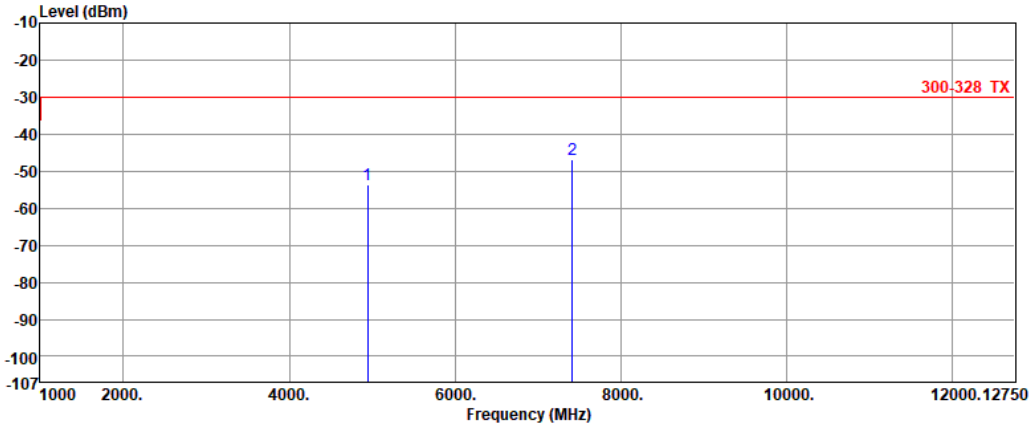


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4824.12	-54.26	-30.00	-24.26	7.73	-61.99
2	7236.29	-44.87	-30.00	-14.87	14.92	-59.79

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11b	Test Freq. (MHz)	2472
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

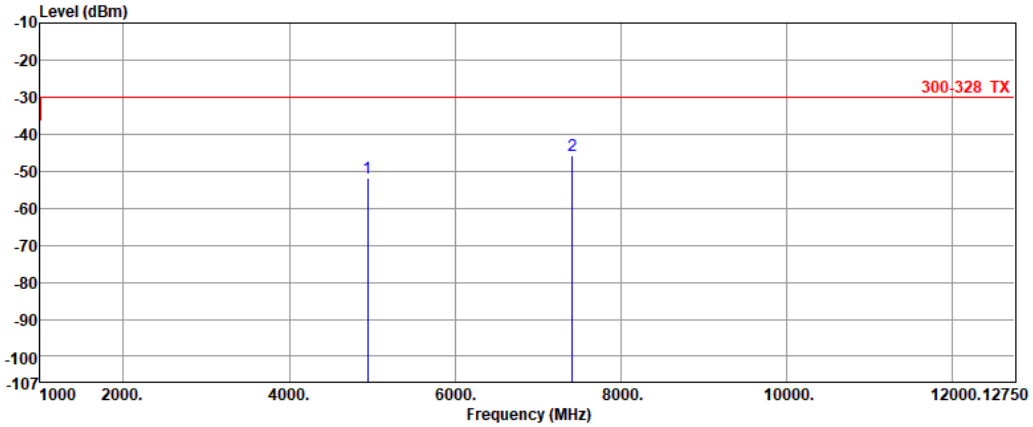


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4943.80	-53.49	-30.00	-23.49	9.07	-62.56
2	7416.41	-46.92	-30.00	-16.92	15.47	-62.39

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11b	Test Freq. (MHz)	2472
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65



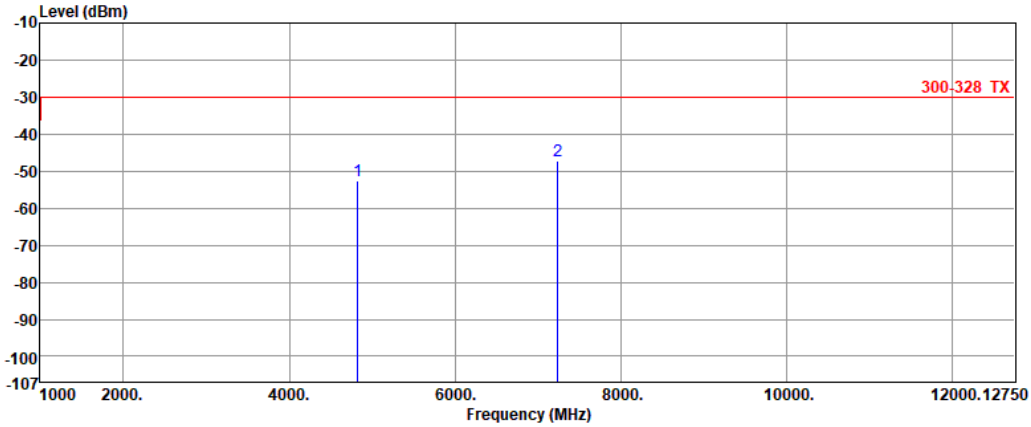
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4943.79	-52.01	-30.00	-22.01	9.01	-61.02
2	7416.08	-45.87	-30.00	-15.87	15.18	-61.05

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

3.5.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 802.11g

Modulation	11g	**Test Freq. (MHz)**	2412
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

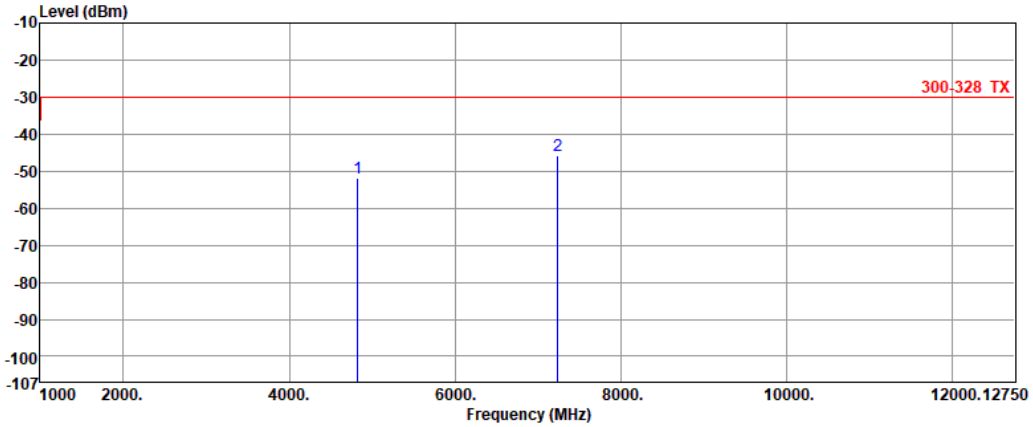


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4824.15	-52.48	-30.00	-22.48	7.85	-60.33
2	7236.08	-47.33	-30.00	-17.33	15.50	-62.83

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

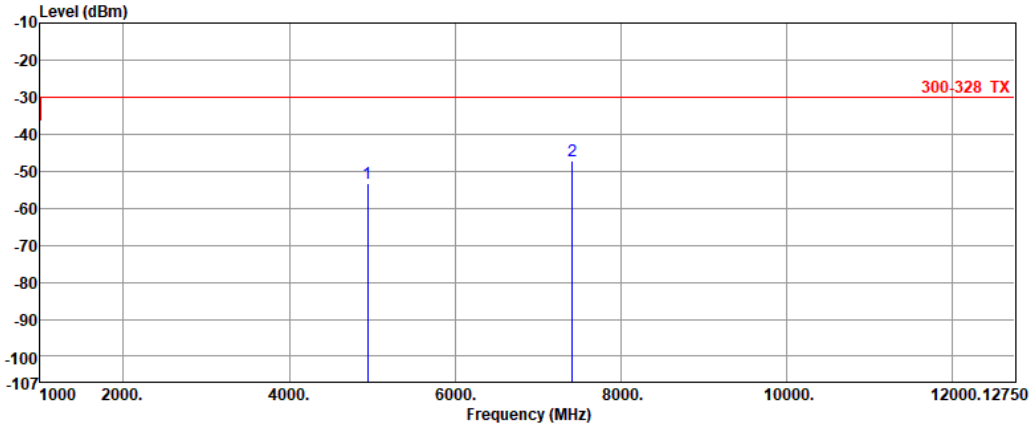


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4824.49	-51.84	-30.00	-21.84	7.73	-59.57
2	7235.61	-45.96	-30.00	-15.96	14.92	-60.88

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2472
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

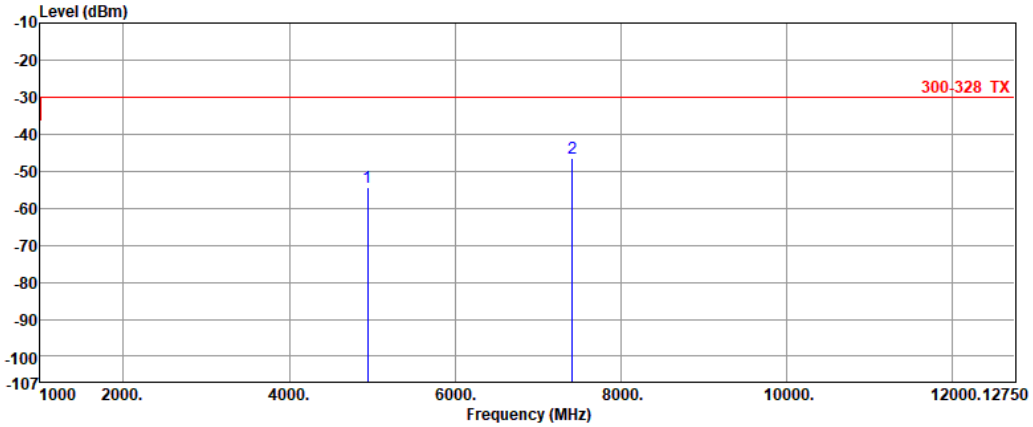


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4943.73	-53.45	-30.00	-23.45	9.07	-62.52
2	7416.36	-47.27	-30.00	-17.27	15.47	-62.74

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2472
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65



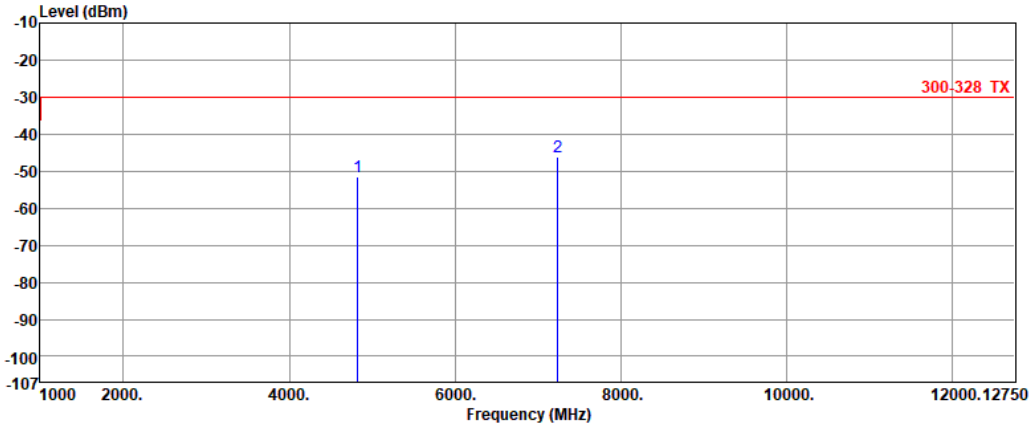
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4943.81	-54.24	-30.00	-24.24	9.01	-63.25
2	7415.65	-46.66	-30.00	-16.66	15.18	-61.84

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 802.11n HT20

Modulation	HT20	**Test Freq. (MHz)**	2412
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

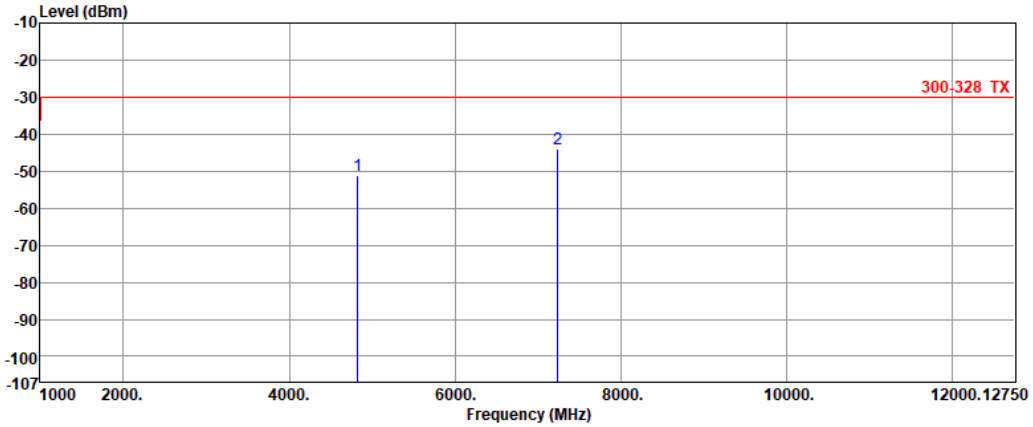


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4824.06	-51.60	-30.00	-21.60	7.85	-59.45
2	7236.19	-46.31	-30.00	-16.31	15.50	-61.81

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

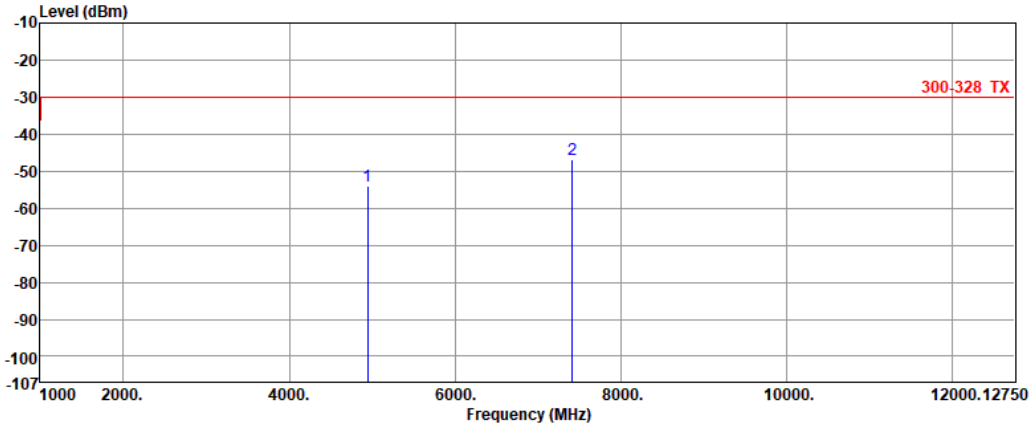


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4823.85	-51.27	-30.00	-21.27	7.72	-58.99
2	7236.06	-43.86	-30.00	-13.86	14.92	-58.78

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT20	Test Freq. (MHz)	2472
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

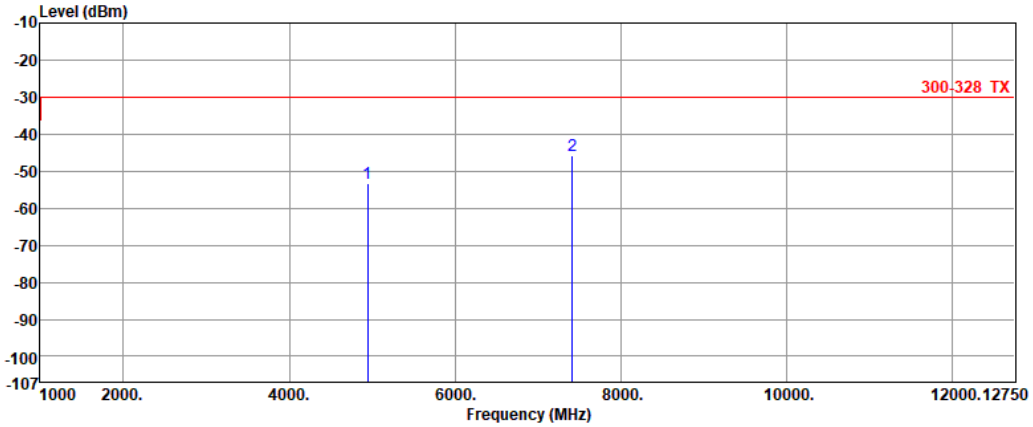


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4943.60	-54.15	-30.00	-24.15	9.07	-63.22
2	7415.94	-46.84	-30.00	-16.84	15.47	-62.31

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT20	Test Freq. (MHz)	2472
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65



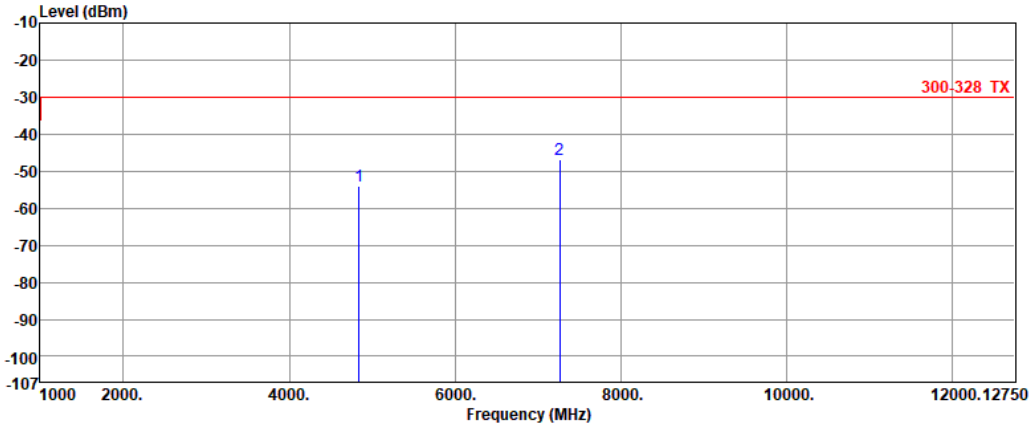
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4944.11	-53.18	-30.00	-23.18	9.02	-62.20
2	7416.00	-45.96	-30.00	-15.96	15.18	-61.14

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

3.5.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 802.11n HT40

Modulation	HT40	**Test Freq. (MHz)**	2422
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

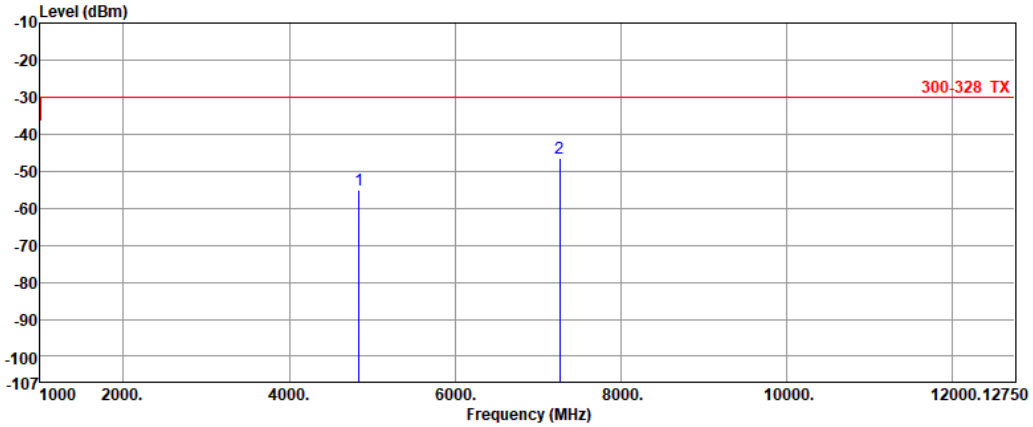


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4843.73	-54.16	-30.00	-24.16	8.15	-62.31
2	7265.86	-46.78	-30.00	-16.78	15.62	-62.40

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

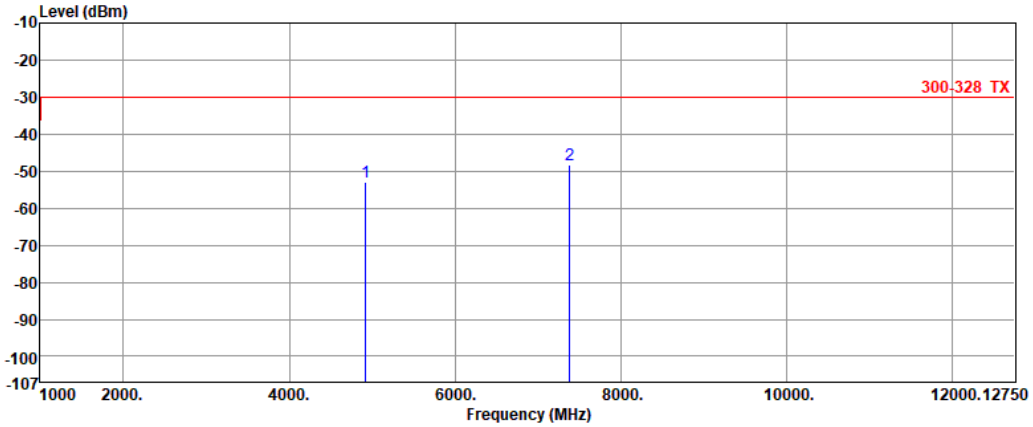


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4844.26	-55.13	-30.00	-25.13	8.00	-63.13
2	7266.04	-46.58	-30.00	-16.58	15.18	-61.76

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

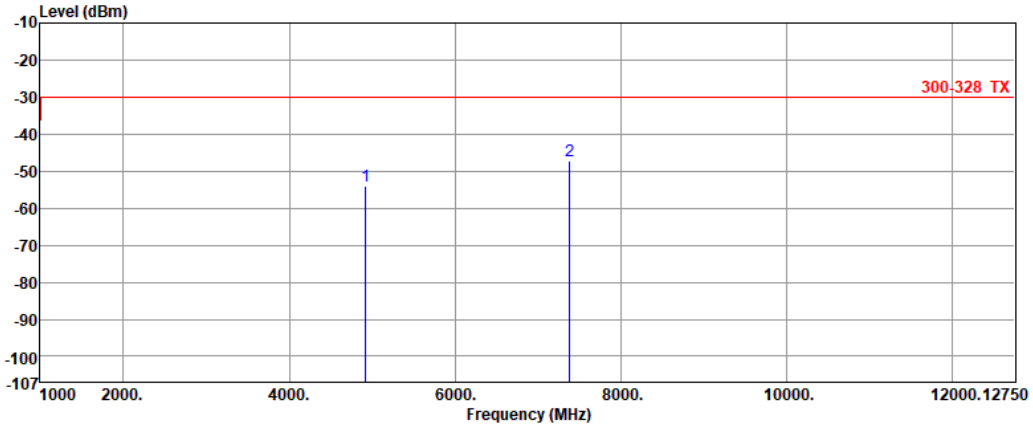


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4923.58	-53.01	-30.00	-23.01	9.03	-62.04
2	7386.03	-48.13	-30.00	-18.13	15.57	-63.70

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4923.81	-54.20	-30.00	-24.20	8.89	-63.09
2	7386.18	-47.30	-30.00	-17.30	15.25	-62.55

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

4 Receiver Test Results

4.1 Receiver Spurious Emissions

4.1.1 Limit of Receiver Spurious Emissions

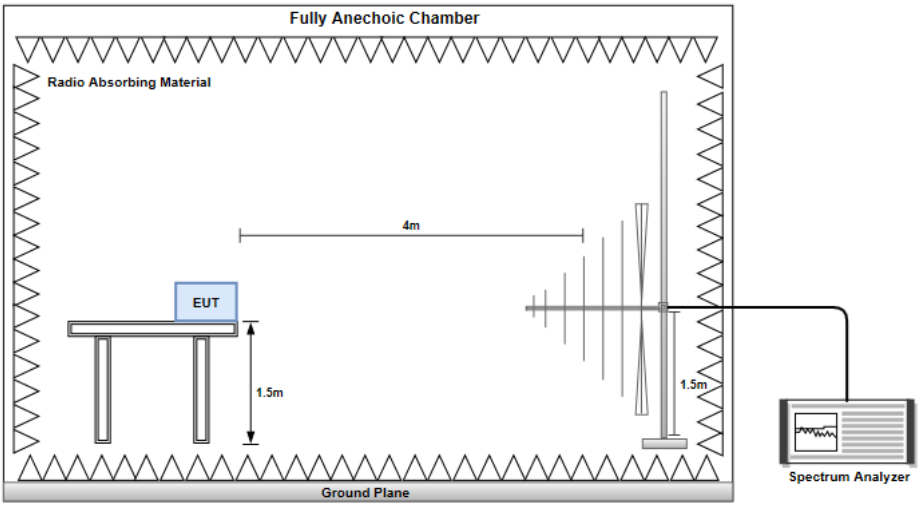
Frequency Range	Maximum power (dBm)	Measurement bandwidth (kHz)
30 MHz to 1 GHz	-57	100
Above 1 GHz to 12,75 GHz	-47	1000

4.1.2 Test Procedures

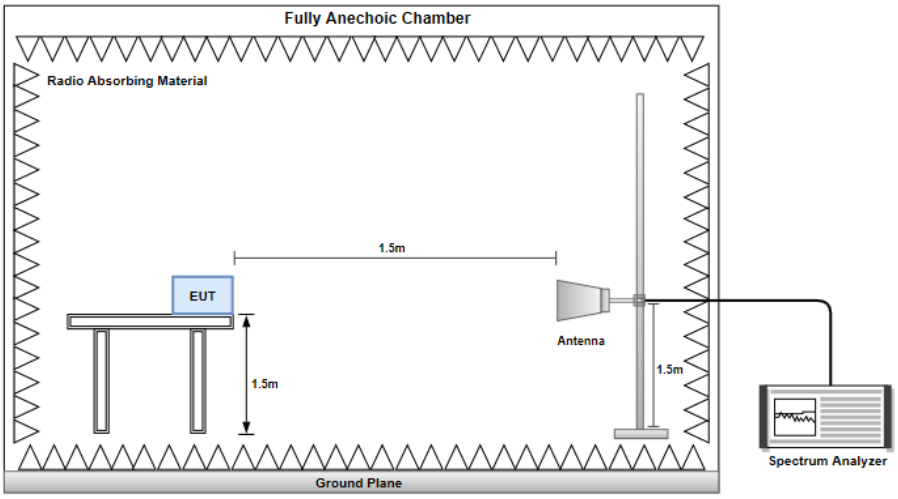
Reference to clause 5.4.10.2 of ETSI EN 300 328 V2.2.2 (2019-07).

4.1.3 Test Setup

Below 1GHz



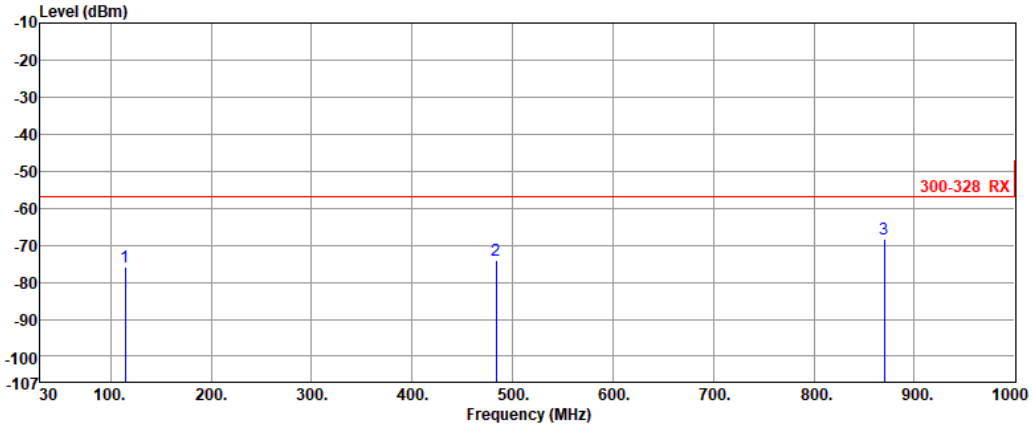
Above 1 GHz



4.1.4 Receiver Radiated Unwanted Emissions (Below 1GHz)

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

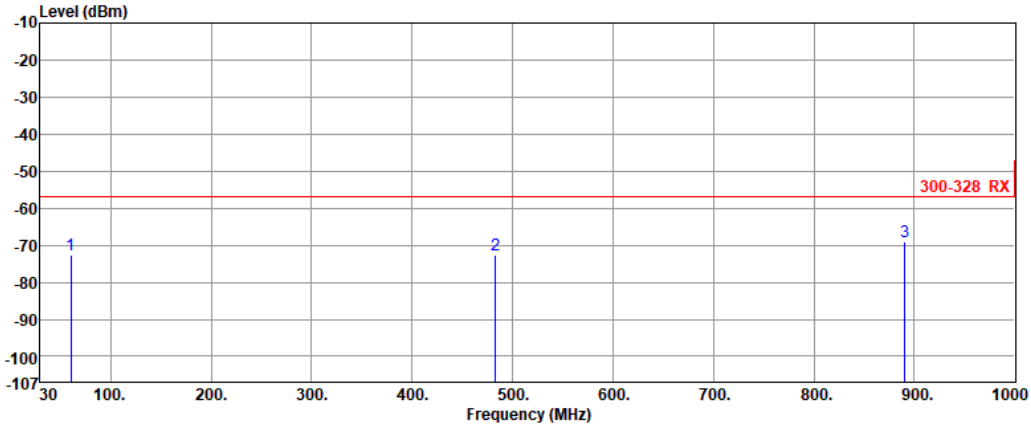


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	114.39	-75.85	-57.00	-18.85	-5.57	-70.28
2	483.96	-74.04	-57.00	-17.04	2.01	-76.05
3	870.02	-68.46	-57.00	-11.46	8.40	-76.86

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

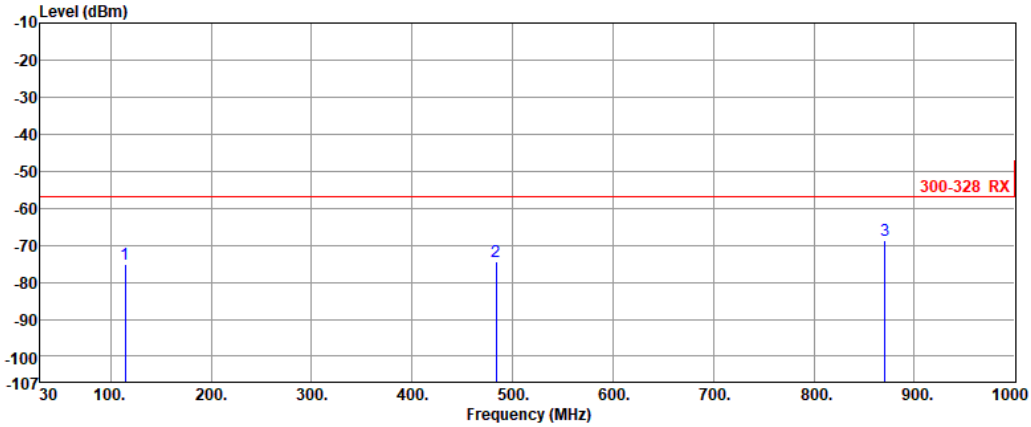


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	60.07	-72.60	-57.00	-15.60	-3.38	-69.22
2	482.99	-72.65	-57.00	-15.65	2.02	-74.67
3	890.39	-69.10	-57.00	-12.10	8.81	-77.91

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2472
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

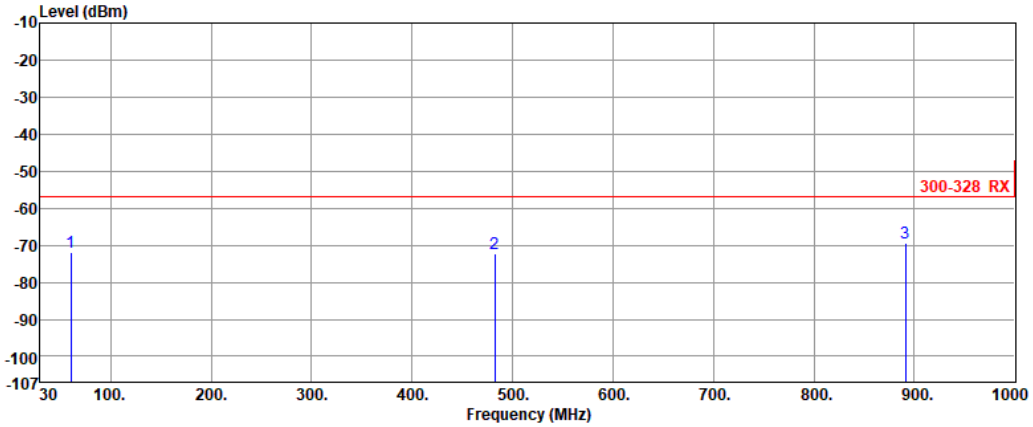


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	114.51	-75.24	-57.00	-18.24	-5.56	-69.68
2	483.76	-74.36	-57.00	-17.36	2.00	-76.36
3	870.48	-68.87	-57.00	-11.87	8.43	-77.30

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2472
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

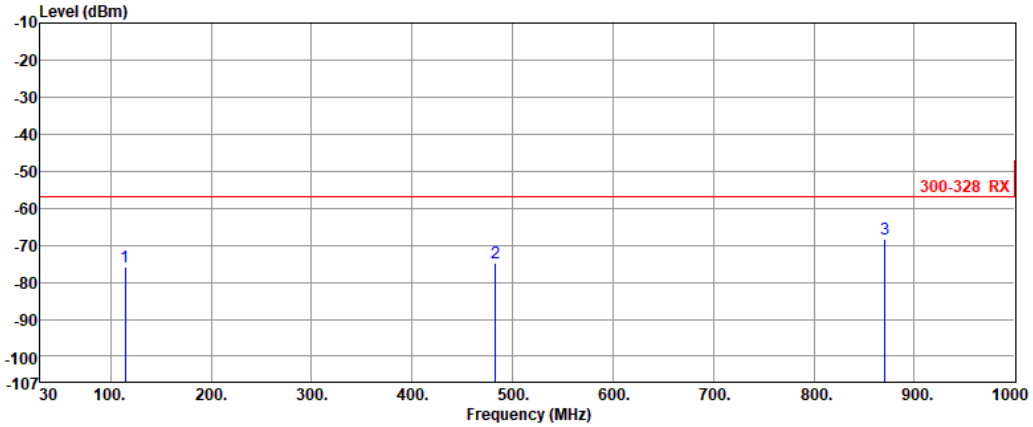


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	60.13	-72.09	-57.00	-15.09	-3.40	-68.69
2	482.68	-72.28	-57.00	-15.28	2.01	-74.29
3	890.89	-69.42	-57.00	-12.42	8.82	-78.24

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

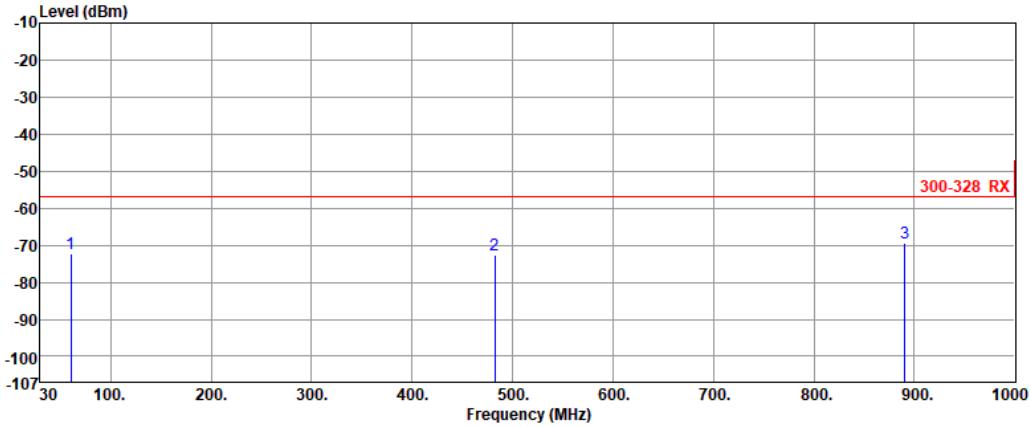


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	114.48	-75.98	-57.00	-18.98	-5.56	-70.42
2	483.18	-74.84	-57.00	-17.84	1.98	-76.82
3	870.83	-68.23	-57.00	-11.23	8.45	-76.68

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

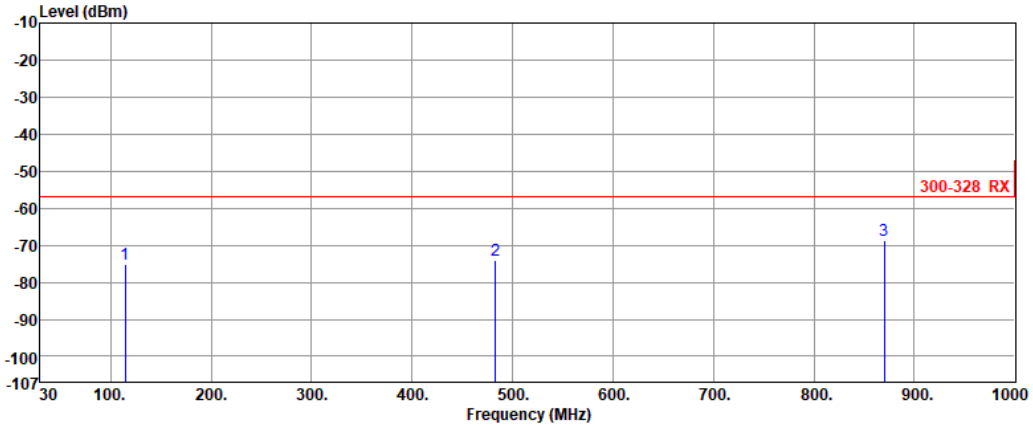


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	60.17	-72.21	-57.00	-15.21	-3.41	-68.80
2	482.35	-72.78	-57.00	-15.78	2.00	-74.78
3	890.43	-69.39	-57.00	-12.39	8.81	-78.20

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

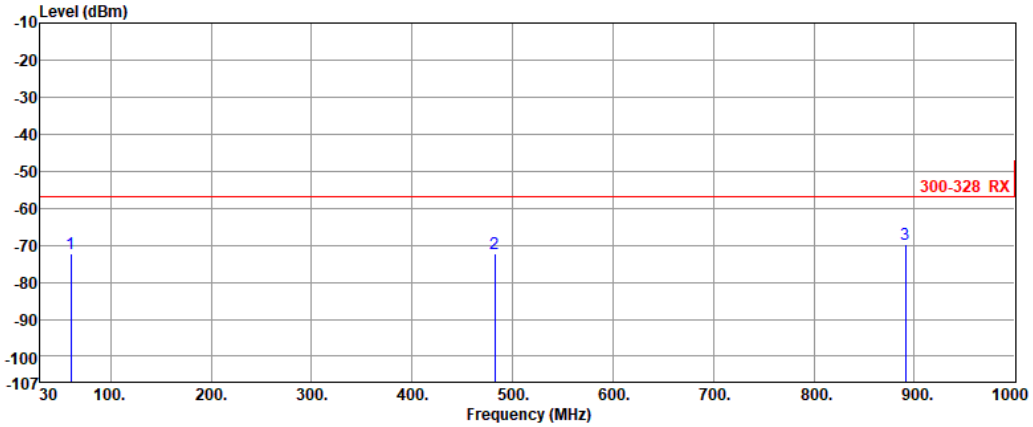


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	114.58	-75.26	-57.00	-18.26	-5.55	-69.71
2	483.29	-74.03	-57.00	-17.03	1.98	-76.01
3	870.30	-68.68	-57.00	-11.68	8.42	-77.10

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65



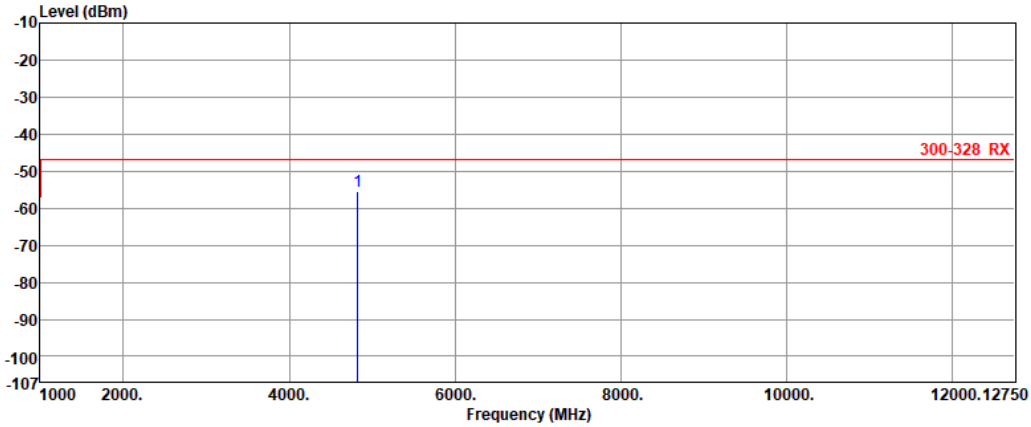
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	60.53	-72.26	-57.00	-15.26	-3.51	-68.75
2	482.08	-72.14	-57.00	-15.14	1.99	-74.13
3	890.90	-69.71	-57.00	-12.71	8.82	-78.53

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

4.1.5 Receiver Radiated Unwanted Emissions (Above 1GHz)

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

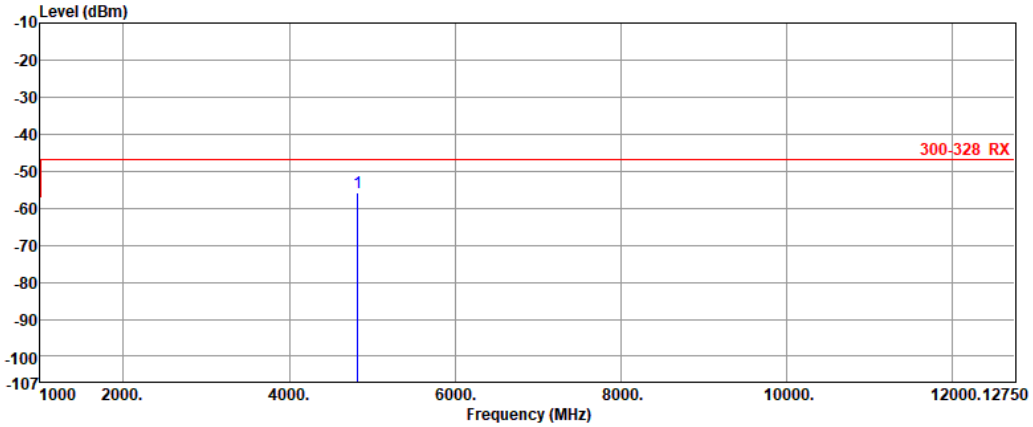


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4824.37	-55.41	-47.00	-8.41	7.85	-63.26

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

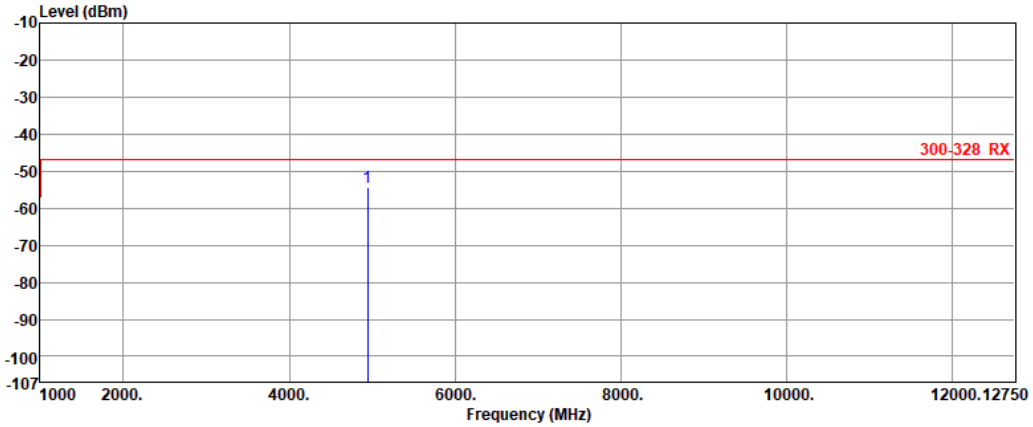


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4824.42	-55.71	-47.00	-8.71	7.73	-63.44

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2472
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

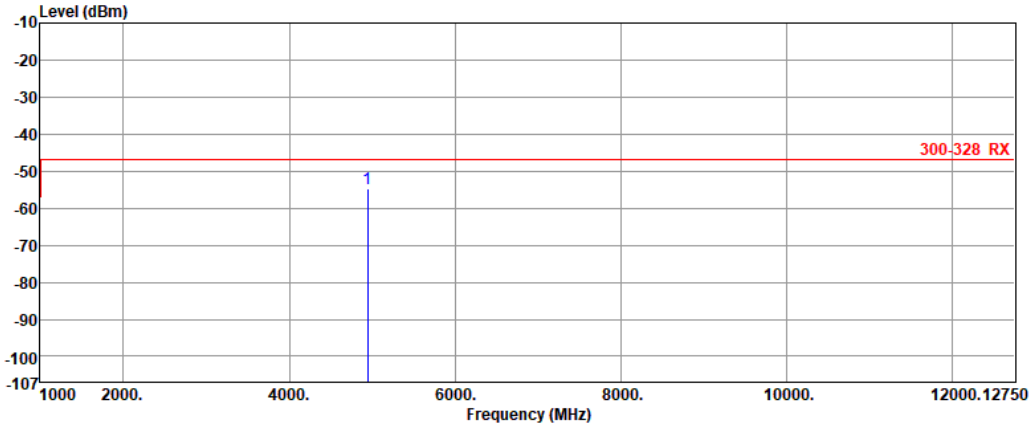


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4943.98	-54.21	-47.00	-7.21	9.07	-63.28

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11g	Test Freq. (MHz)	2472
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

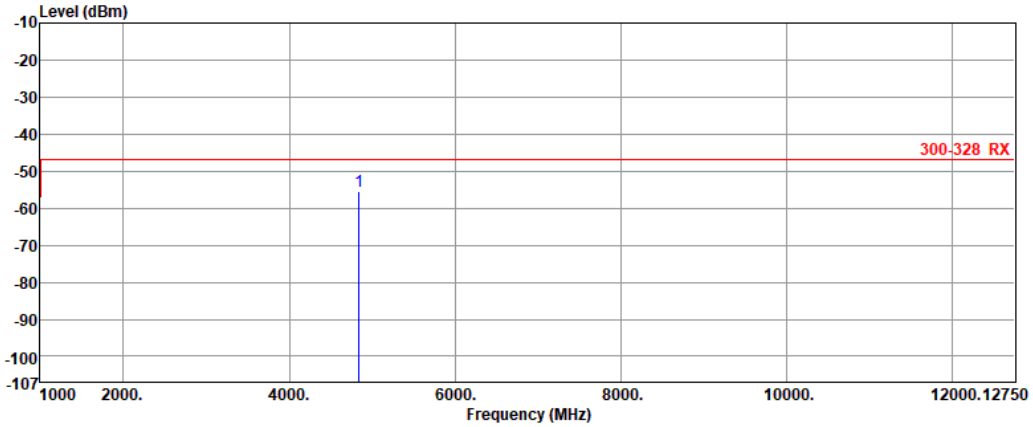


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4944.47	-54.60	-47.00	-7.60	9.02	-63.62

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

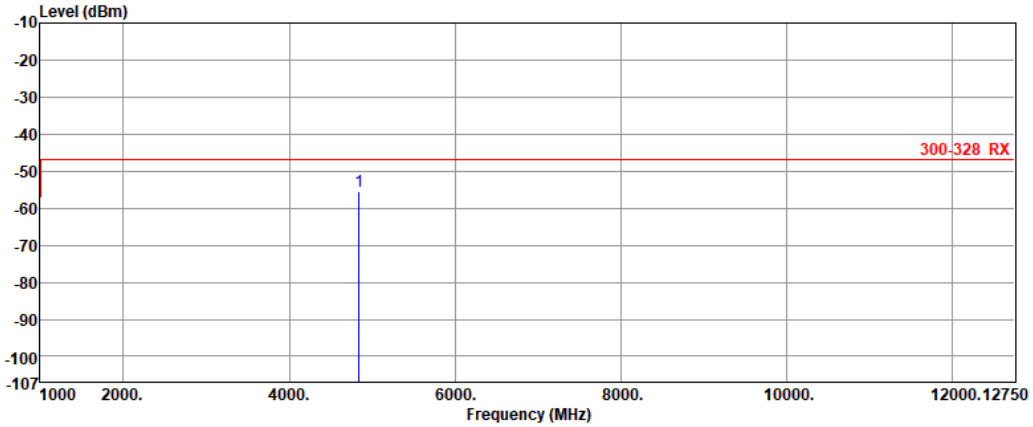


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4844.07	-55.63	-47.00	-8.63	8.16	-63.79

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65

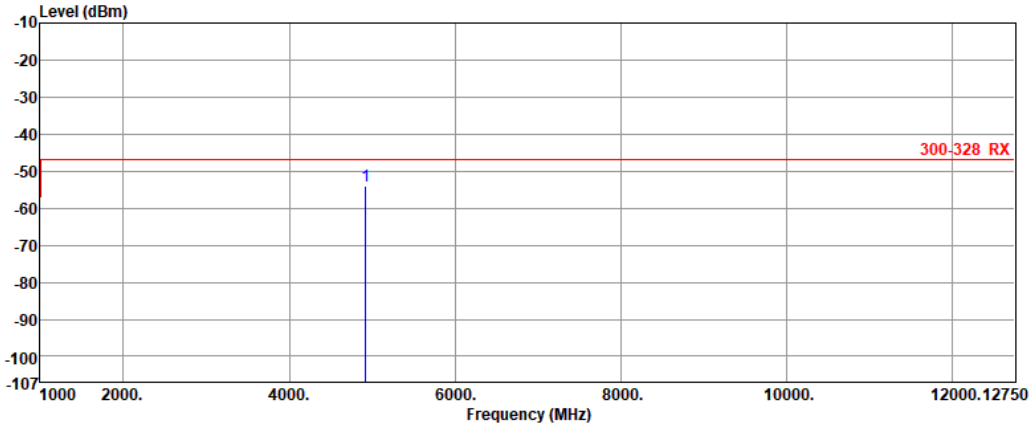


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4844.33	-55.45	-47.00	-8.45	8.00	-63.45

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Horizontal		

Test By :Alan Tang Temperature:24 Humidity(%):65

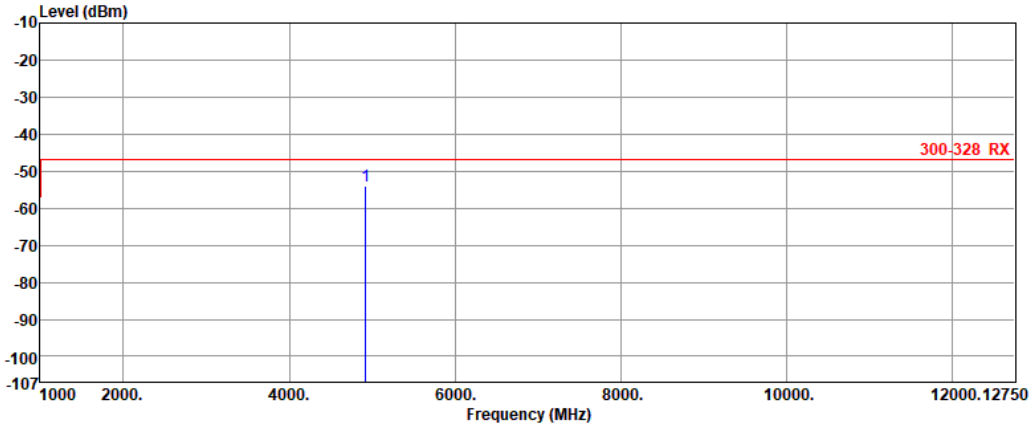


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4924.19	-53.89	-47.00	-6.89	9.03	-62.92

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By :Alan Tang Temperature:24 Humidity(%):65



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4924.51	-53.94	-47.00	-6.94	8.89	-62.83

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

5 Adaptivity Test Results

5.1 Adaptivity and Unwanted Signal Parameters

5.1.1 Limit of Adaptivity and Unwanted Signal Parameters

Adaptivity and Unwanted Signal Limit	
☒	Only for adaptive systems and RF Output Power > 10 dBm
☐	Non-LBT based Detect and Avoid: ◆ minimum remain unavailable = 1sec; ◆ minimum Idle Period time = 100us; ◆ maximum Channel Occupancy Time (COT) = 40ms ◆ detection threshold level = -70 dBm/MHz + 10 x $\log_{10}$(100mW / Pout) (Pout in mW e.i.r.p);
☐	LBT based Detect and Avoid (Frame Based Equipment): ◆ minimum Clear Channel Assessment (CCA) time = 18 us; ◆ COT = 1 ms to 10 ms ◆ Idle Period = 5% of COT ◆ detection threshold level = -70 dBm/MHz + 10 x $\log_{10}$(100mW / Pout) (Pout in mW e.i.r.p);
☒	LBT based Detect and Avoid (Load Based Equipment with spectrum sharing mechanism IEEE Std.): ◆ LBT based spectrum sharing mechanism may implement IEEE 802.11™-2012 [i.3] clause 9, clause 10, clause 16,clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8 ◆ detection threshold level = -70 dBm/MHz + 10 x $\log_{10}$(100mW / Pout) (Pout in mW e.i.r.p);
☒	Short Control Signalling Transmissions: ◆ Short Control Signalling Transmissions shall have a maximum duty cycle of 10 % within an observation period of 50 ms.

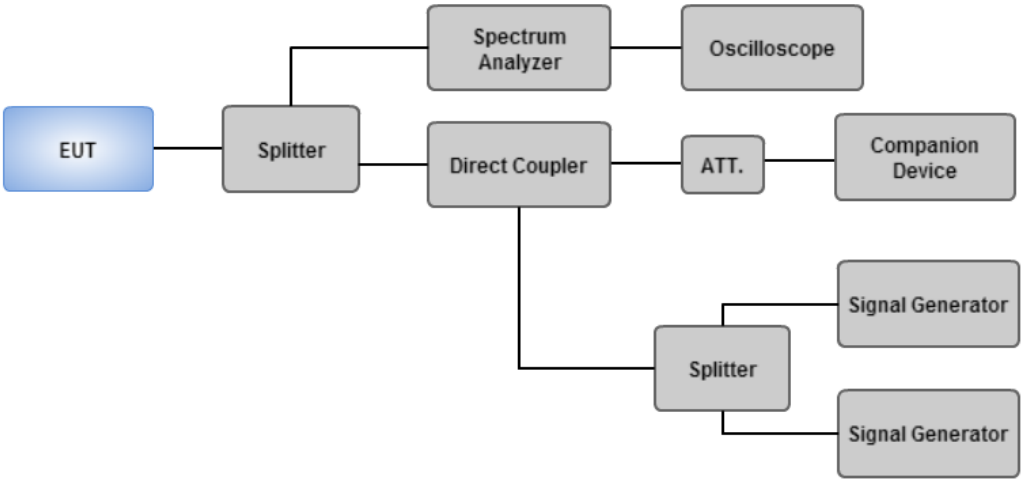
Unwanted Signal Parameters			
Equipment Type	**Wanted Signal Mean Power from Companion Device**	**Unwanted signal frequency (MHz)**	**Unwanted CW signal power (dBm)**
non-FHSS using LBT	sufficient to maintain the link (see note 3)	2395 or 2488,5 (see note 1)	-35 (see note 2)
non-FHSS using DAA	-30 dBm(see note 2)		

Note 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442MHz, while the lowest frequency shall be used fortesting operating channels within the range 2 442 MHz to 2 483,5 MHz.
Note 2: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density in front of the UUT antenna
Note 3: A typical conducted value which can be used in most cases is -50 dBm/MHz

5.1.2 Test Procedures

Reference to clause 5.4.6.2 of ETSI EN 300 328 V2.2.2 (2019-07).

5.1.3 Test Setup



5.1.4 Test Result of Adaptivity、Unwanted Signal and Short Control Signalling Transmissions

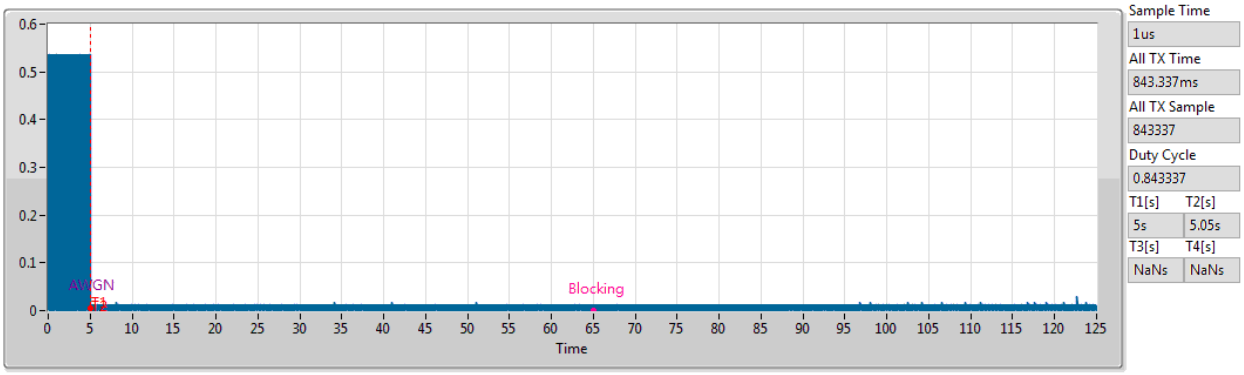
Ambient Condition	25°C / 64%	**Tested By**	Jack Li

Adaptivity and Unwanted Signal Result						
Adaptivity Detection Threshold Level (dBm)			-66.75			
Unwanted Signal Level (dBm)			-34			
Modulation Mode	**Freq. (MHz)**	**Short Control Signalling Transmissions (ms)**	**Channel Occupancy Time (ms)**	**Idle Period Time (μs)**	**Adaptivity**	**Unwanted Signal Test Status**
802.11b	2412	4.614	12.482	44	Pass	Pass
802.11b	2472	1.25	12.482	44		
802.11g	2412	3.486	0.357	70		
802.11g	2472	4.36	0.357	68		
802.11n (HT20)	2412	3.674	5.085	61		
802.11n (HT20)	2472	3.4	3.402	60		
802.11n (HT40)	2422	2.782	5.149	60		
802.11n (HT40)	2462	4.994	5.149	68		
Limit		< 5 ms	< 13 ms	>18μs		
Result		**Complied**				

5.1.5 Test Result of Adaptivity and Unwanted Signal Plots

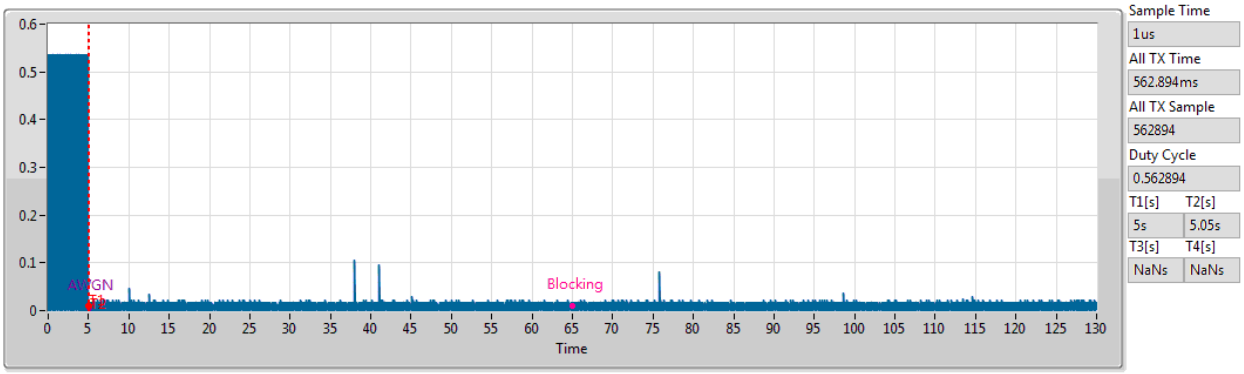
Adaptivity & Unwanted Signal Result Plots
Unwanted signal: 2488.5 MHz
802.11b - 2412MHz

Time Analysis



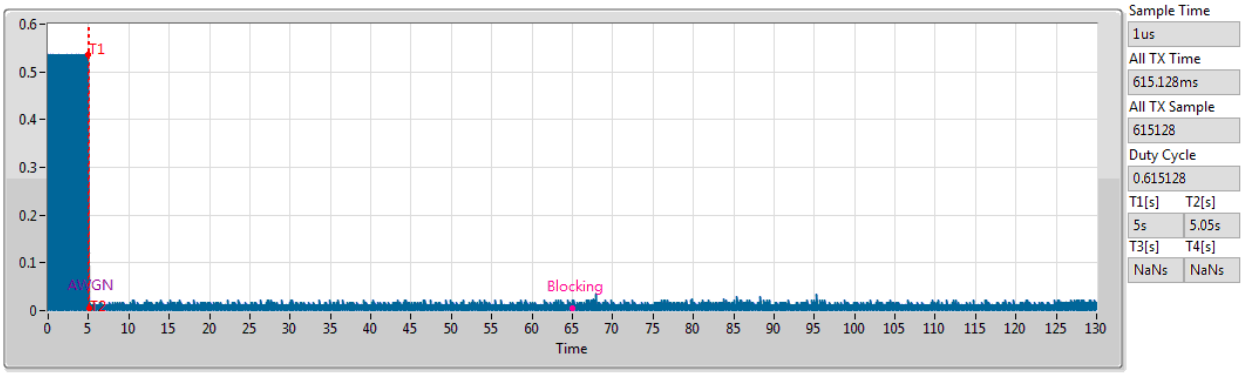
Unwanted signal: 2395 MHz
802.11b - 2472MHz

Time Analysis



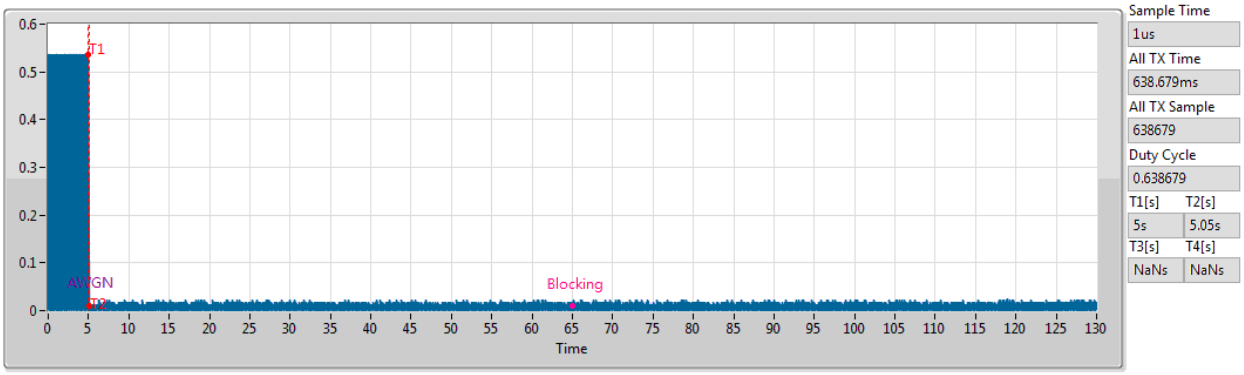
Adaptivity & Unwanted Signal Result Plots
Unwanted signal: 2488.5 MHz
802.11g - 2412MHz

Time Analysis



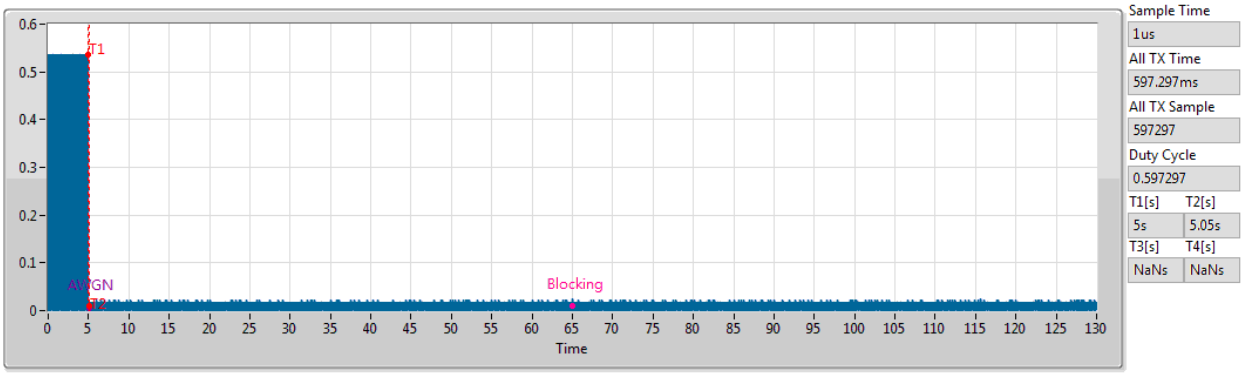
Unwanted signal: 2395 MHz
802.11g - 2472MHz

Time Analysis



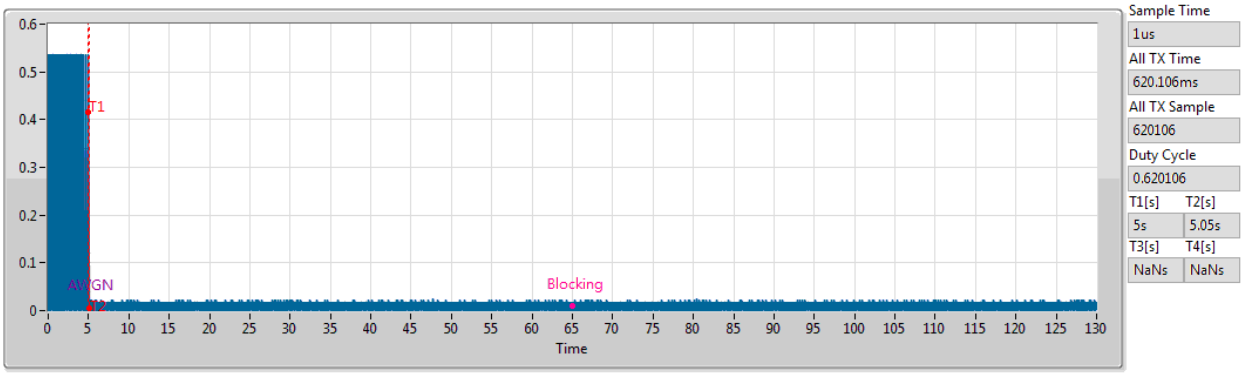
Adaptivity & Unwanted Signal Result Plots
Unwanted signal: 2488.5 MHz
802.11n (HT20) - 2412MHz

Time Analysis



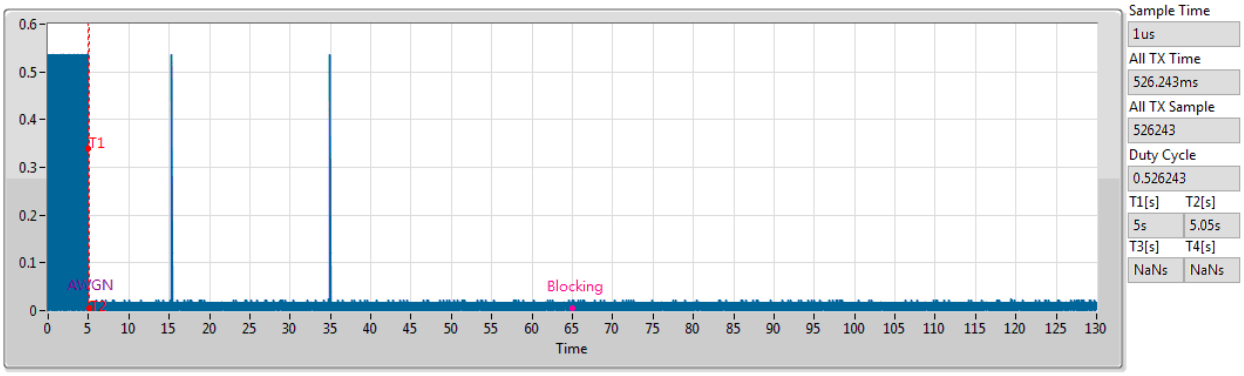
Unwanted signal: 2395 MHz
802.11n (HT20) - 2472MHz

Time Analysis



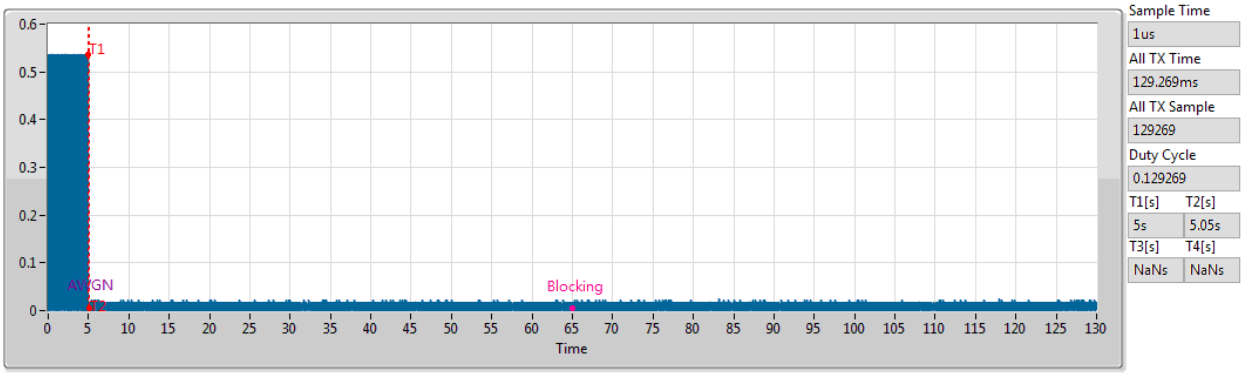
Adaptivity & Unwanted Signal Result Plots
Unwanted signal: 2488.5 MHz
802.11n (HT40) - 2422MHz

Time Analysis

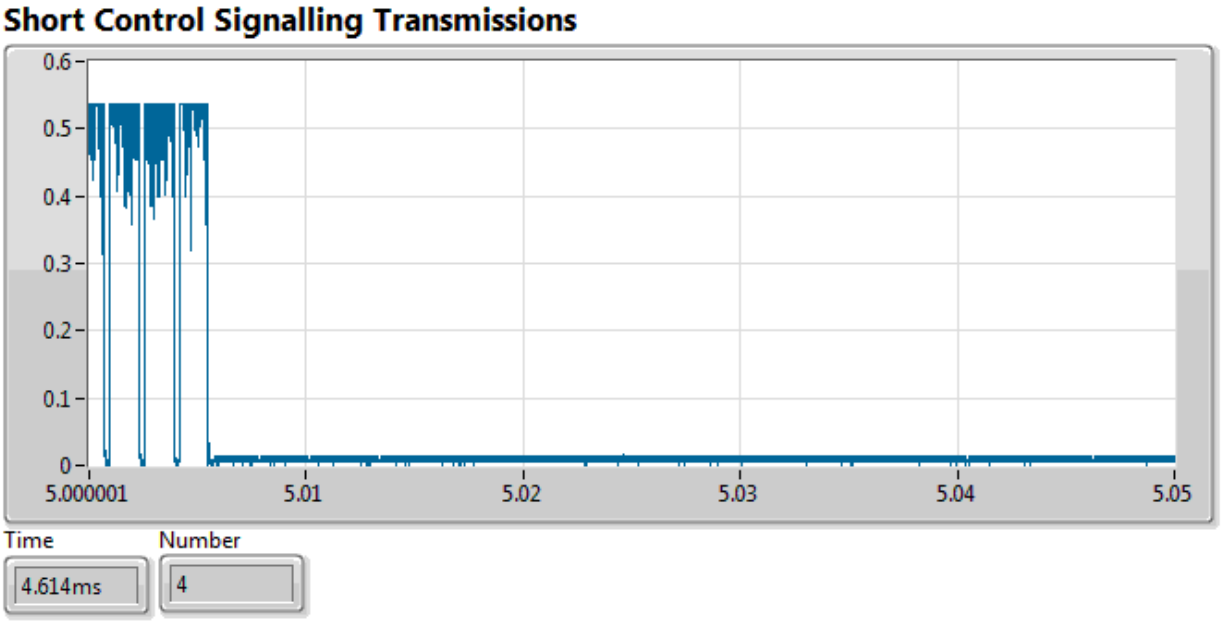
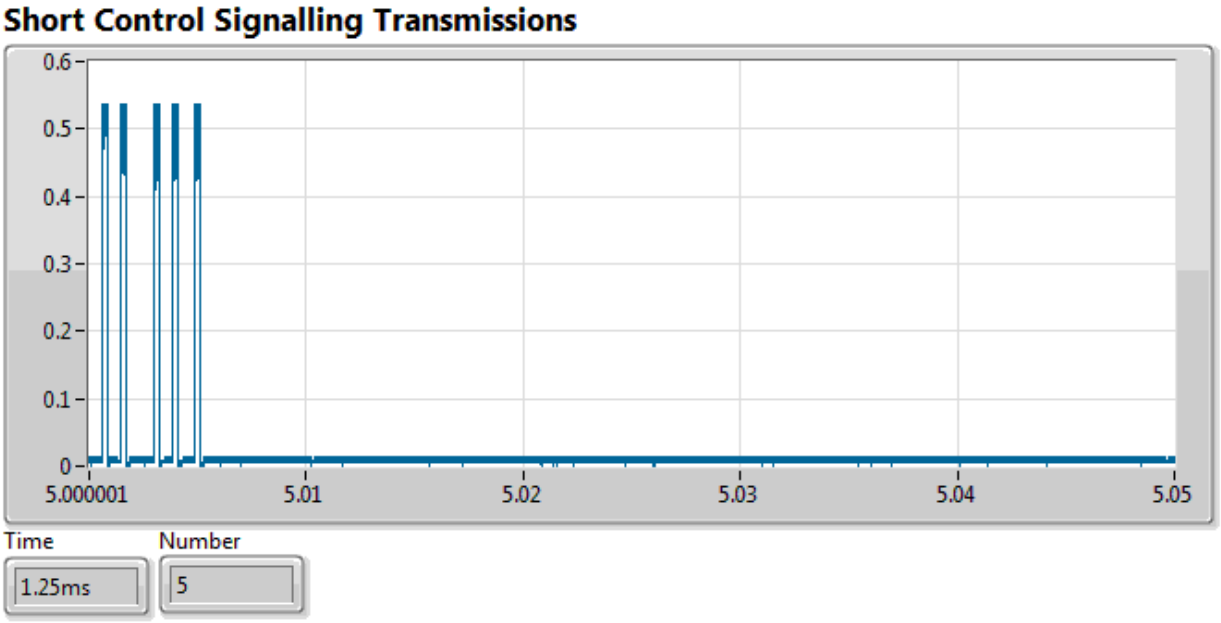


Unwanted signal: 2395 MHz
802.11n (HT40) – 2462MHz

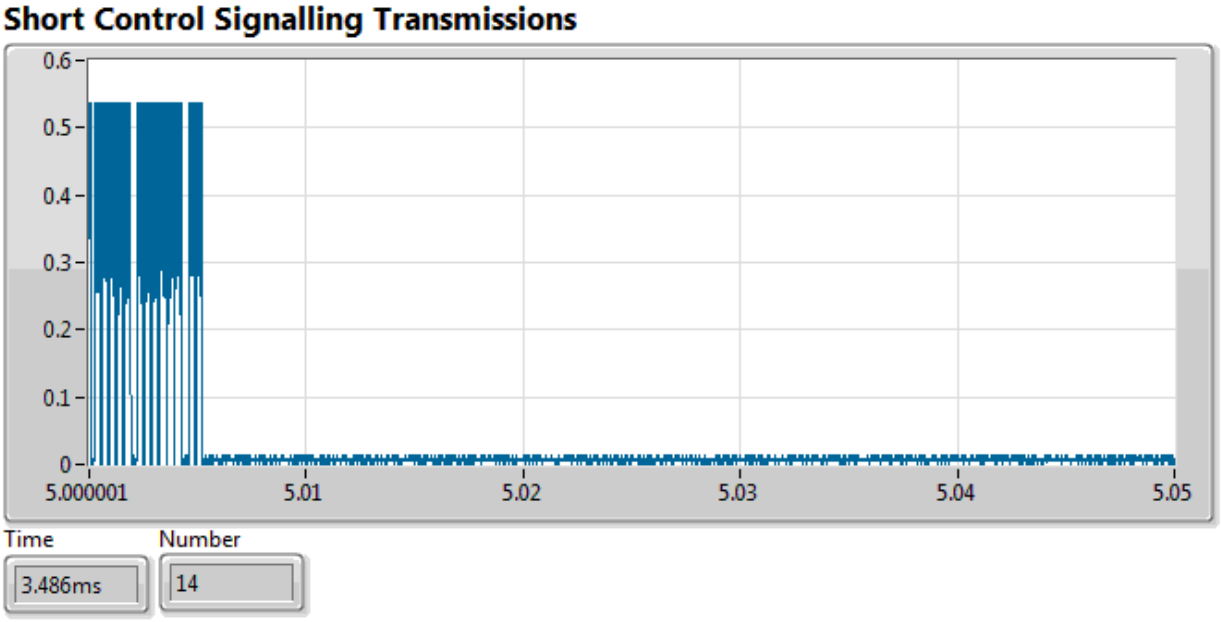
Time Analysis



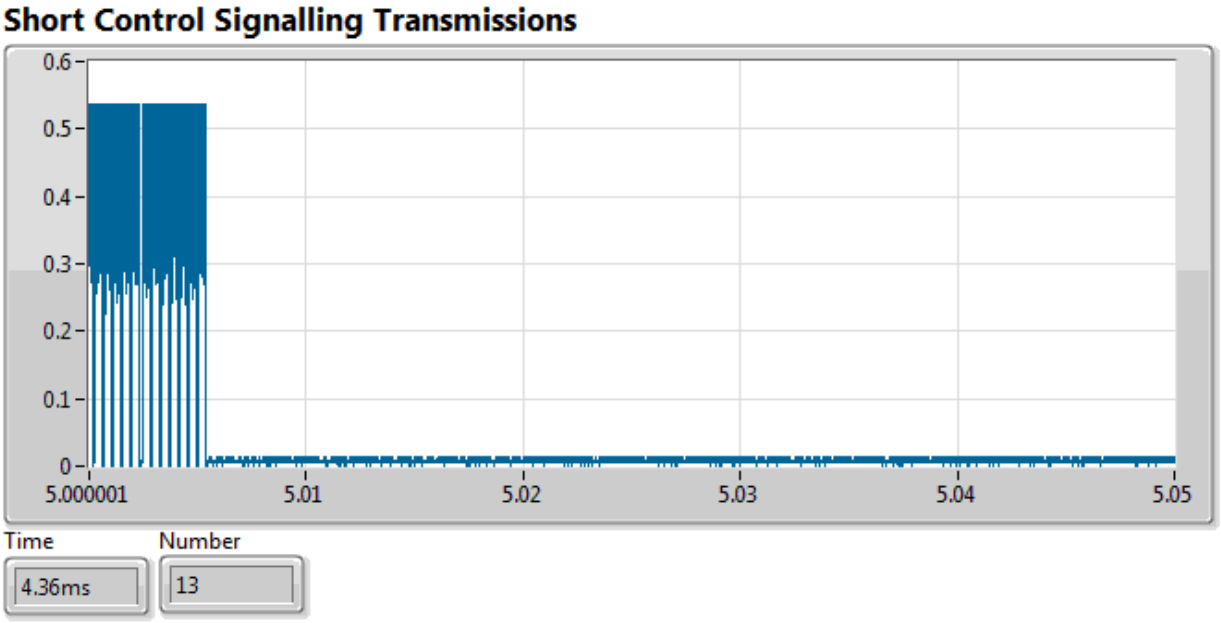
5.1.6 Test Result of Short Control Signalling Transmissions Plots

Short Control Signalling Transmissions Plots
802.11b - 2412MHz

802.11b - 2472MHz


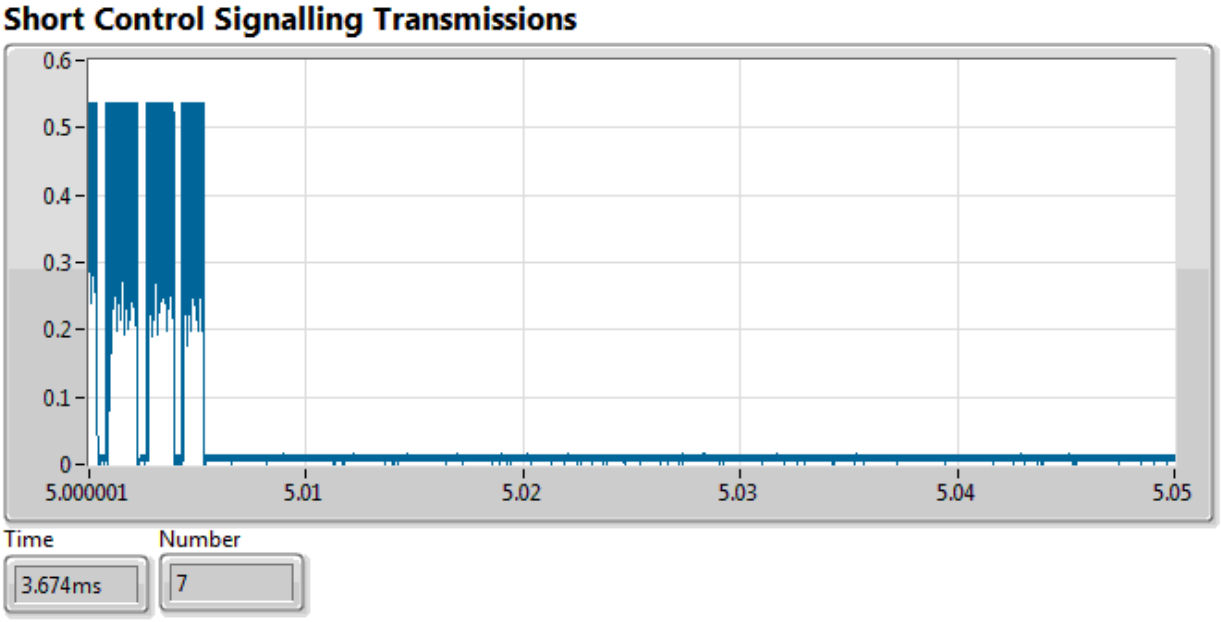
Short Control Signalling Transmissions Plots
802.11g - 2412MHz



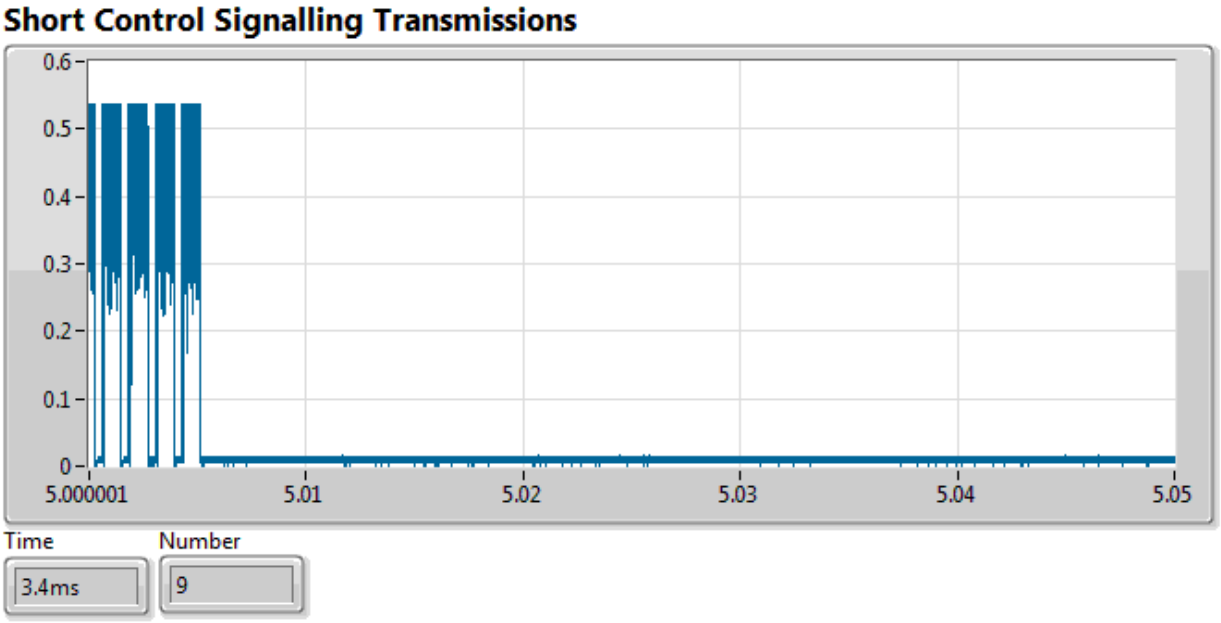
802.11g - 2472MHz



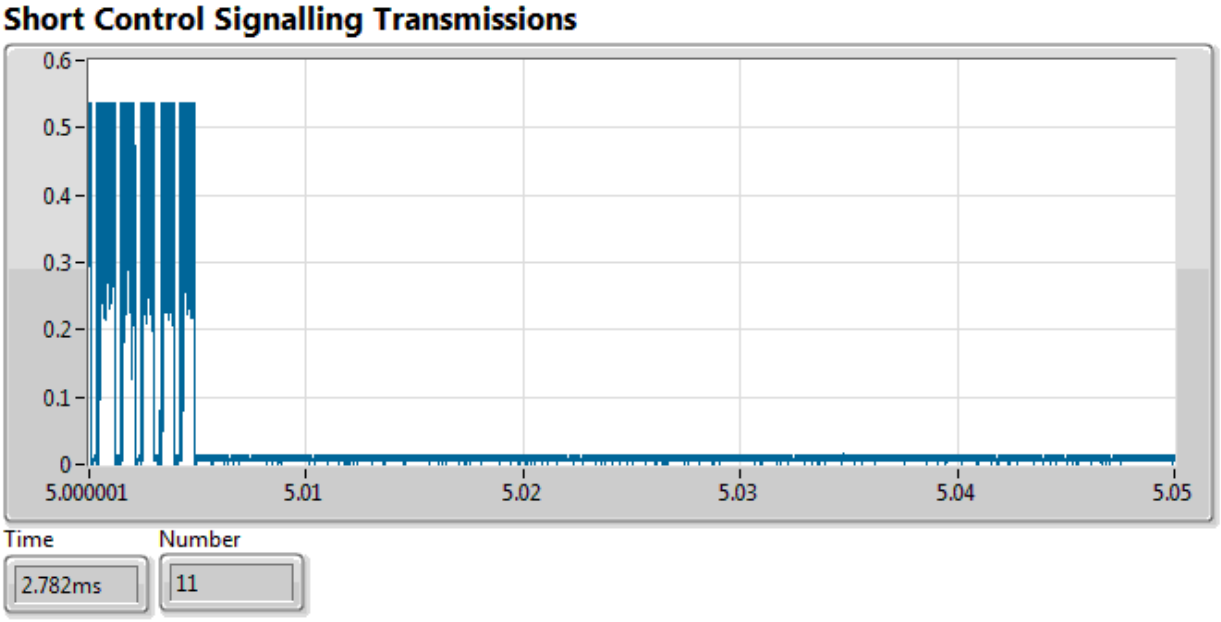
Short Control Signalling Transmissions Plots
802.11n (HT20) - 2412MHz



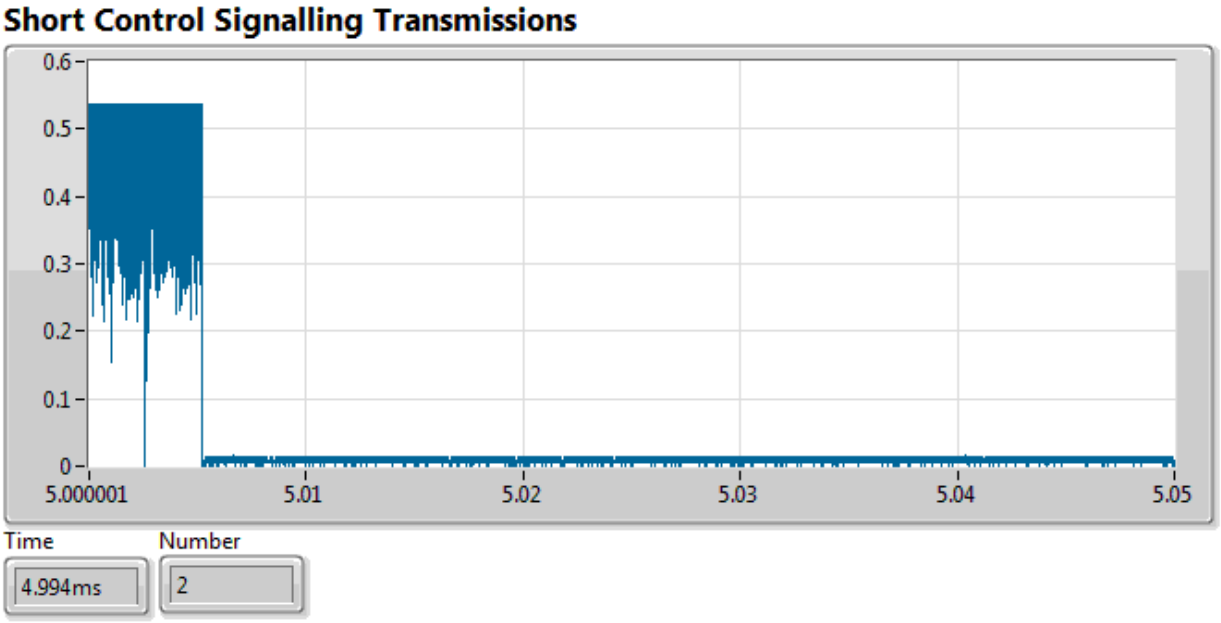
802.11n (HT20) - 2472MHz



Short Control Signalling Transmissions Plots
802.11n (HT40) - 2422MHz

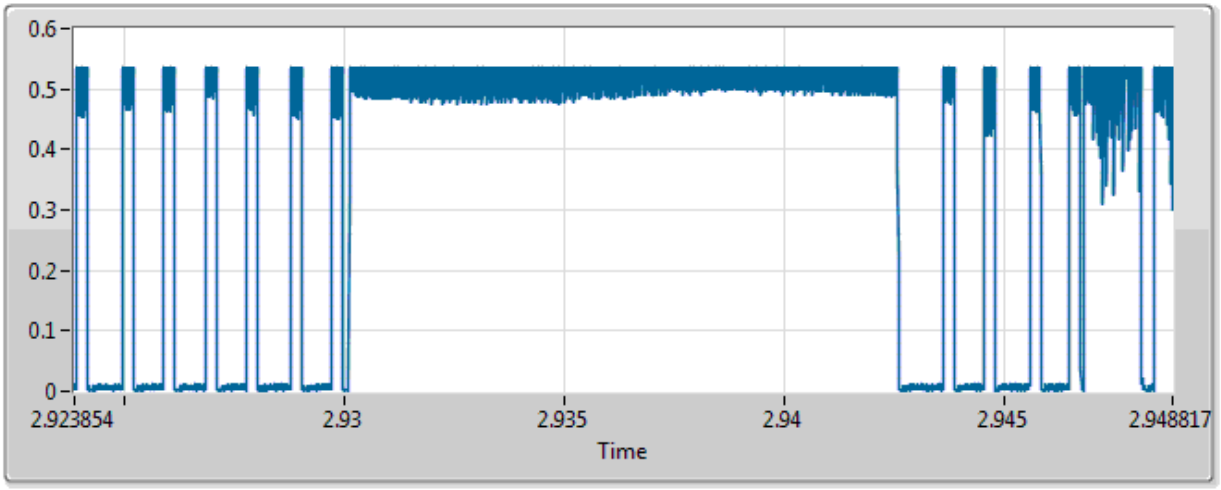


802.11n (HT40) – 2462MHz



Channel Occupancy Time
802.11b - 2412MHz

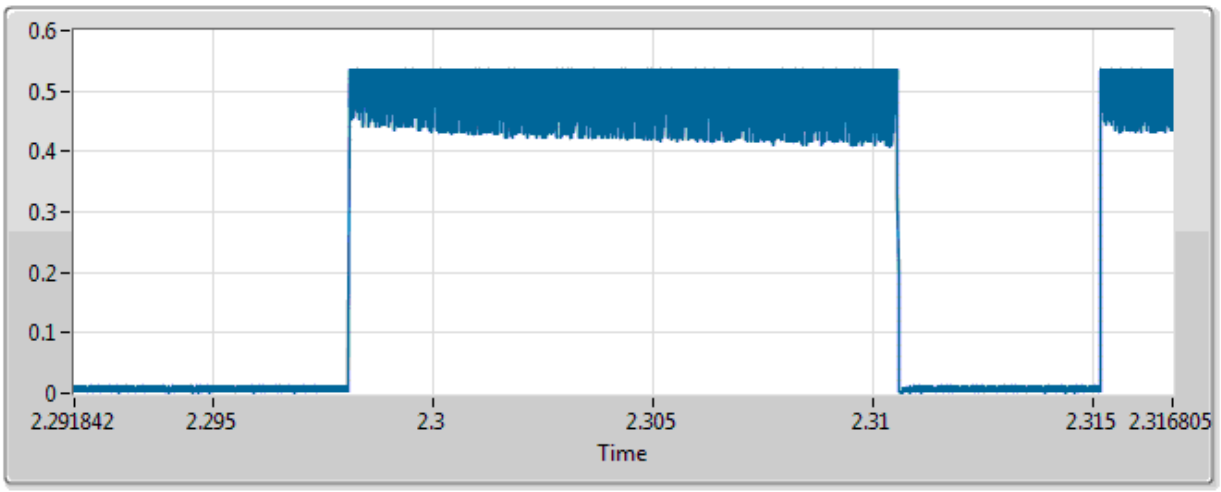
Max On Time



12.482ms

802.11b - 2472MHz

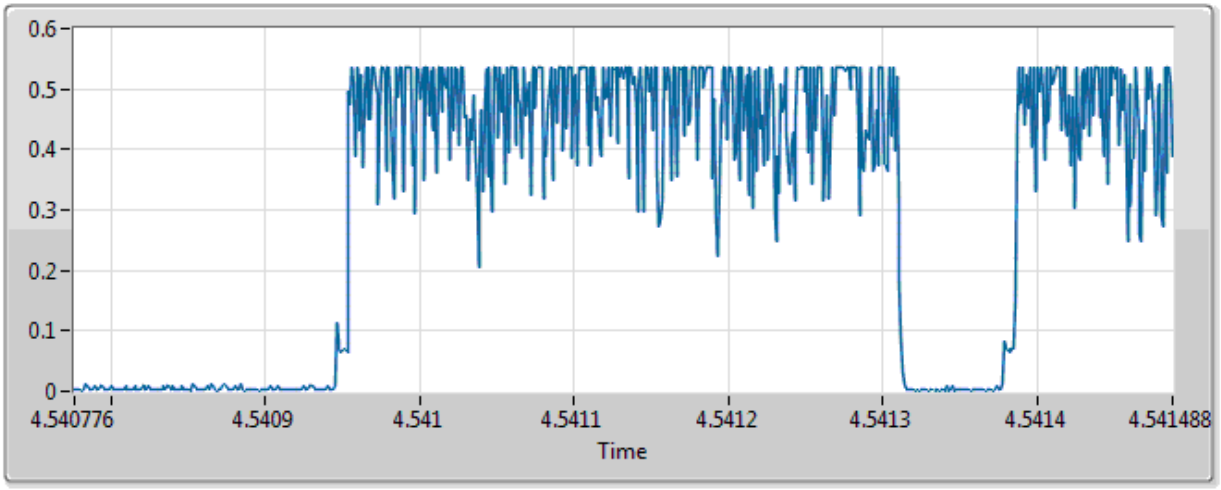
Max On Time



12.482ms

Channel Occupancy Time
802.11g - 2412MHz

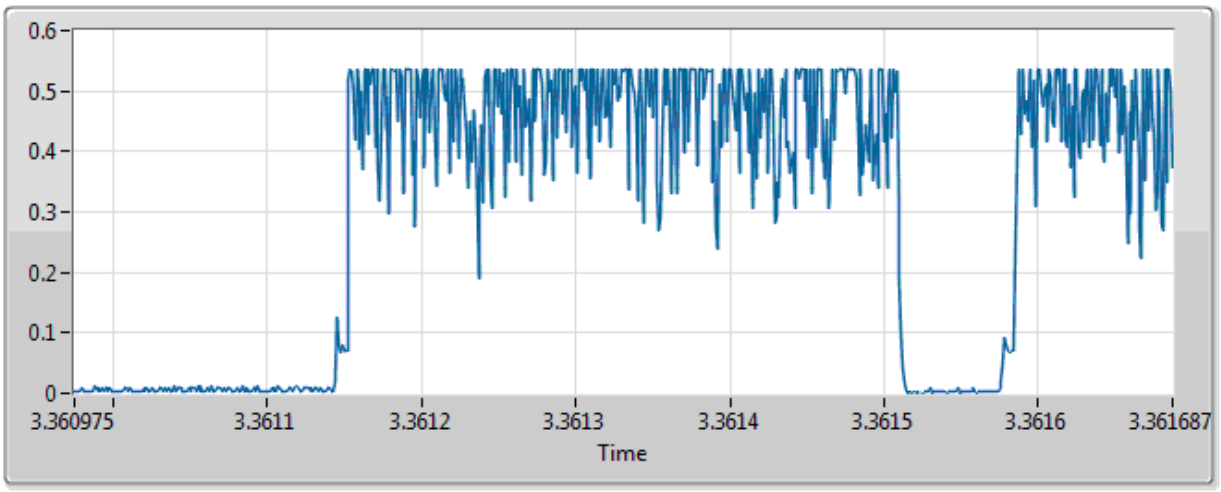
Max On Time



357us

802.11g - 2472MHz

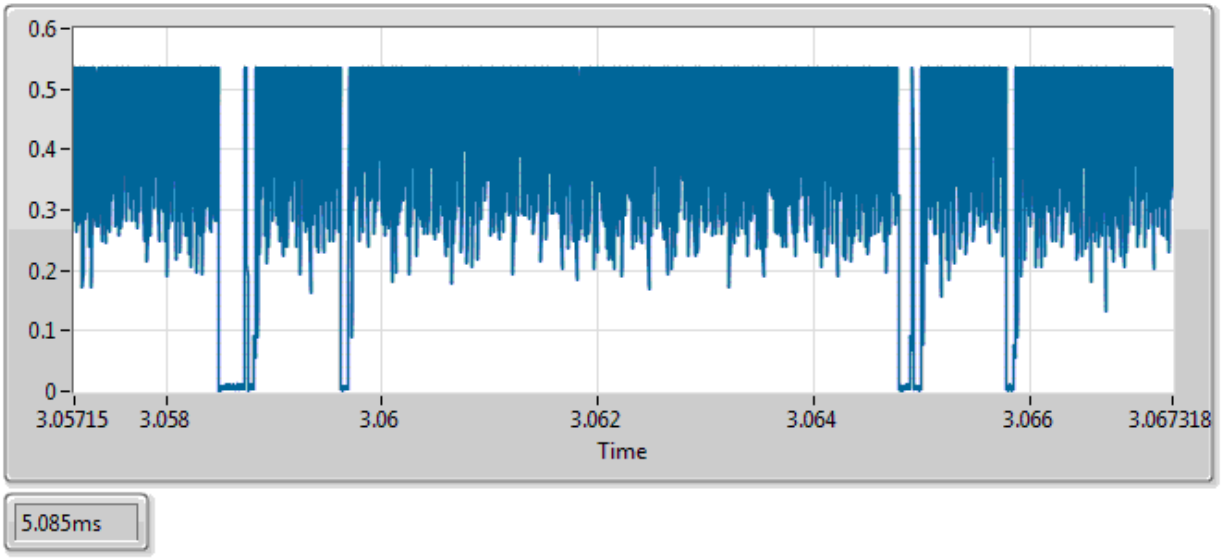
Max On Time



357us

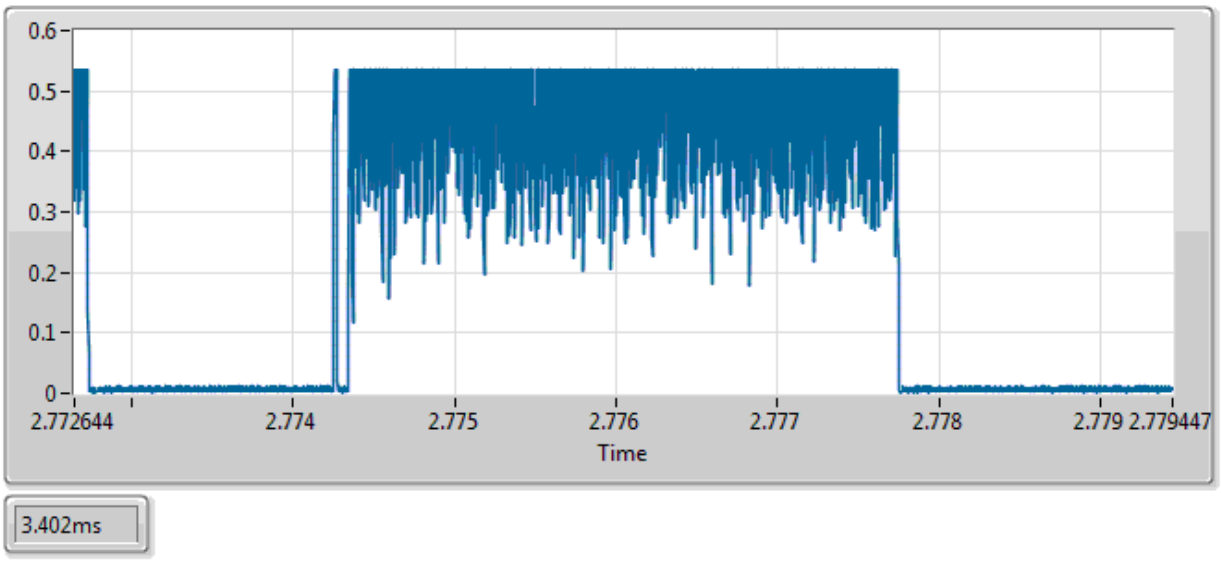
Channel Occupancy Time
802.11n (HT20) - 2412MHz

Max On Time



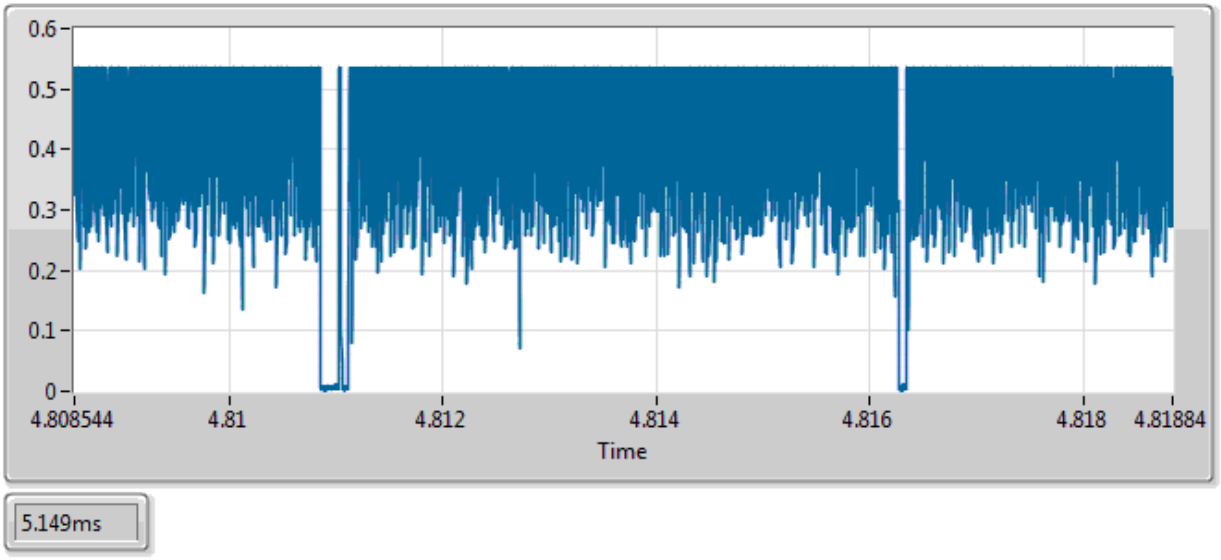
802.11n (HT20) - 2472MHz

Max On Time



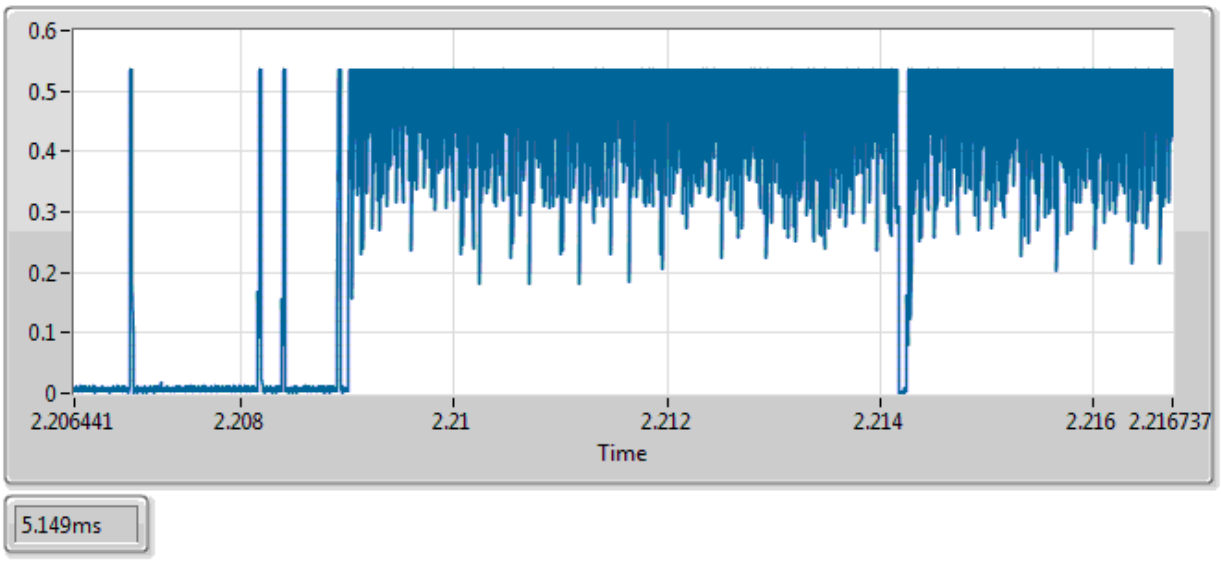
Channel Occupancy Time
802.11n (HT40) - 2422MHz

Max On Time

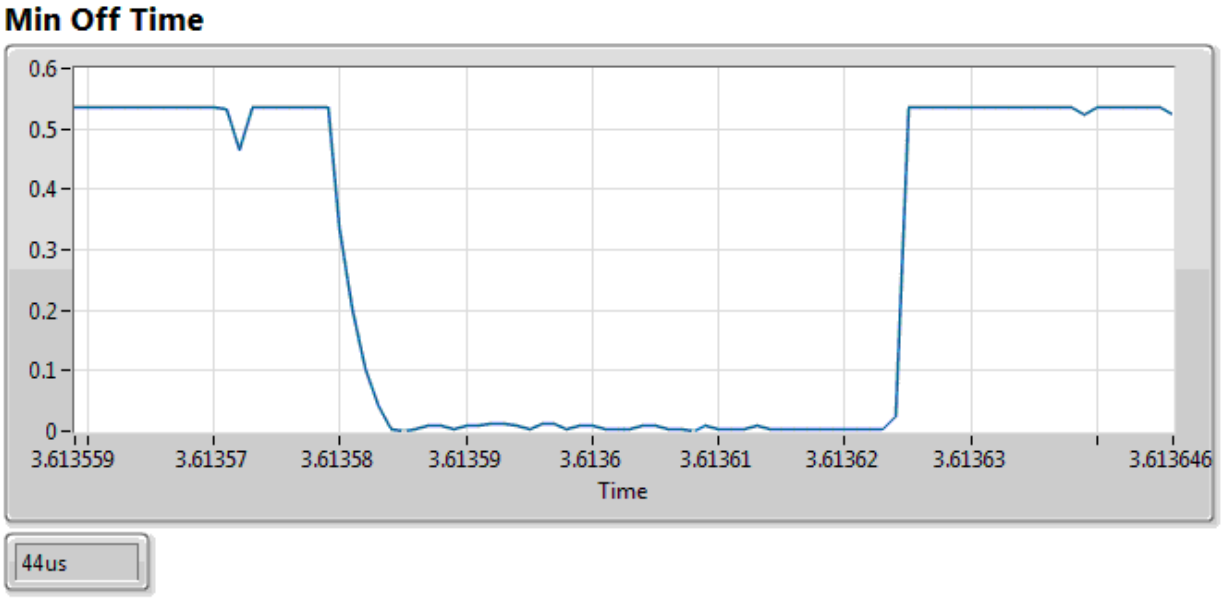


802.11n (HT40) – 2462MHz

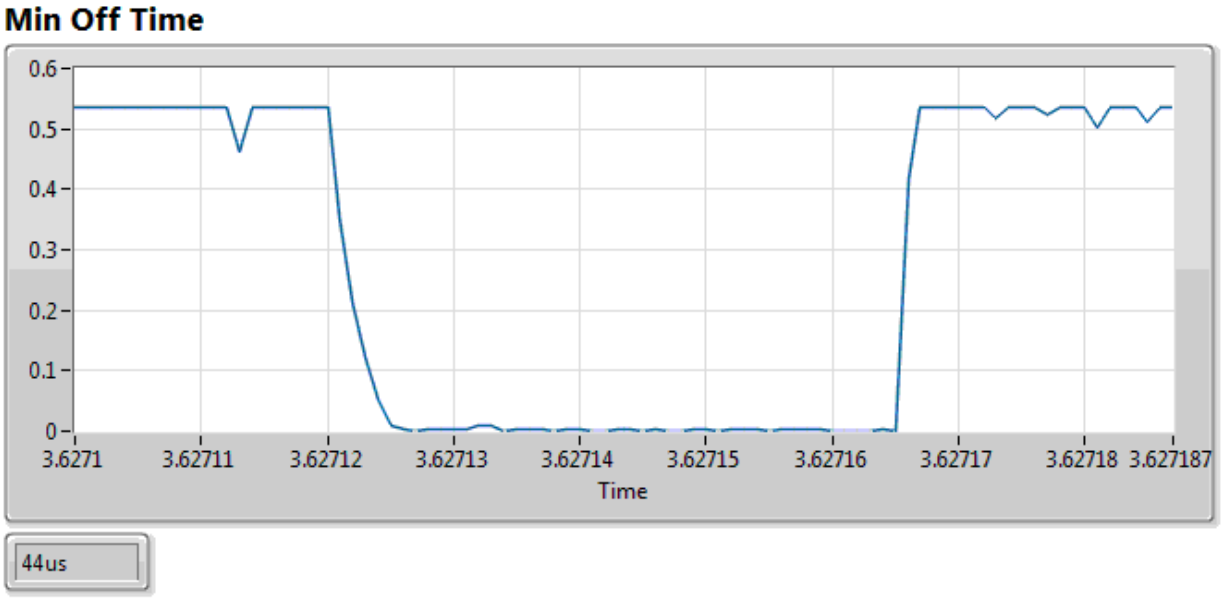
Max On Time



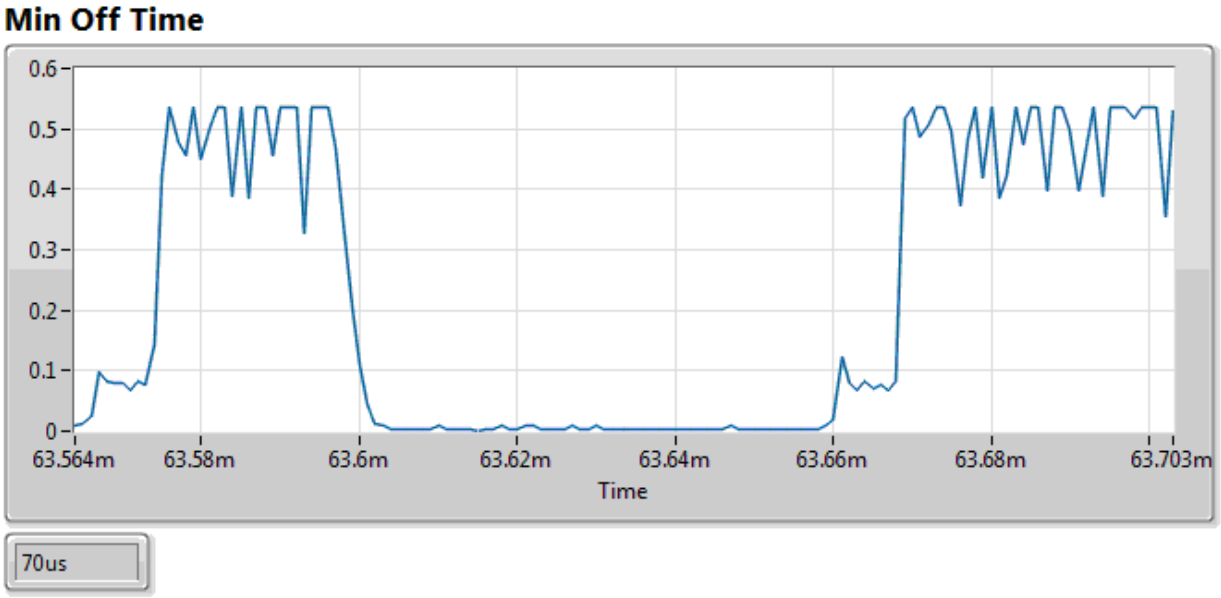
Idle Period Time
802.11b - 2412MHz



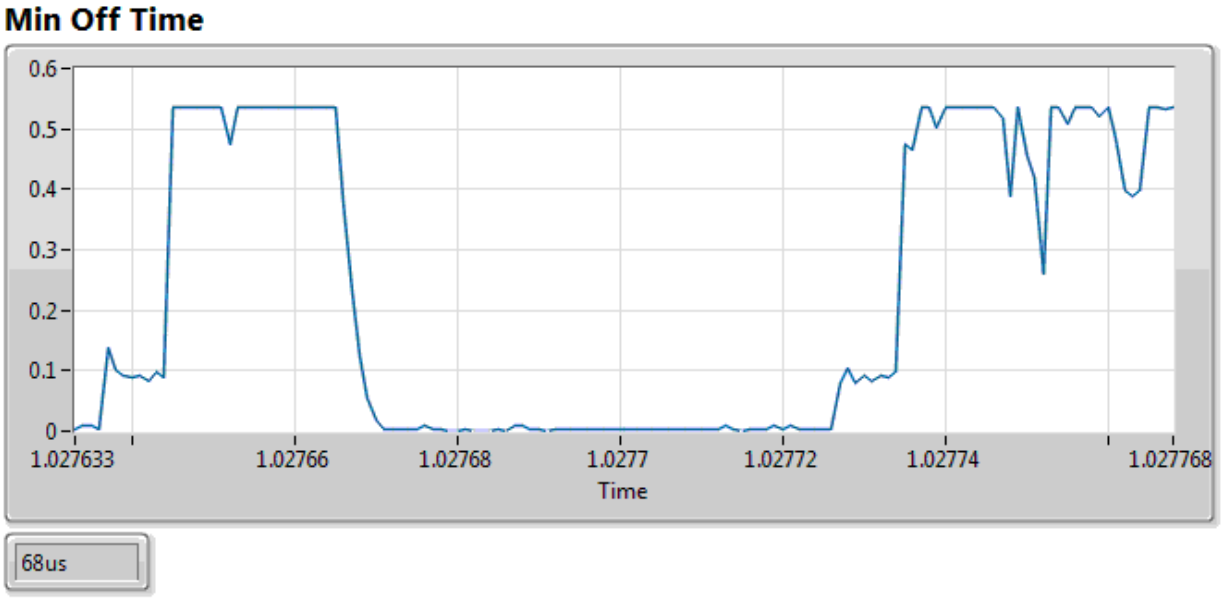
802.11b - 2472MHz



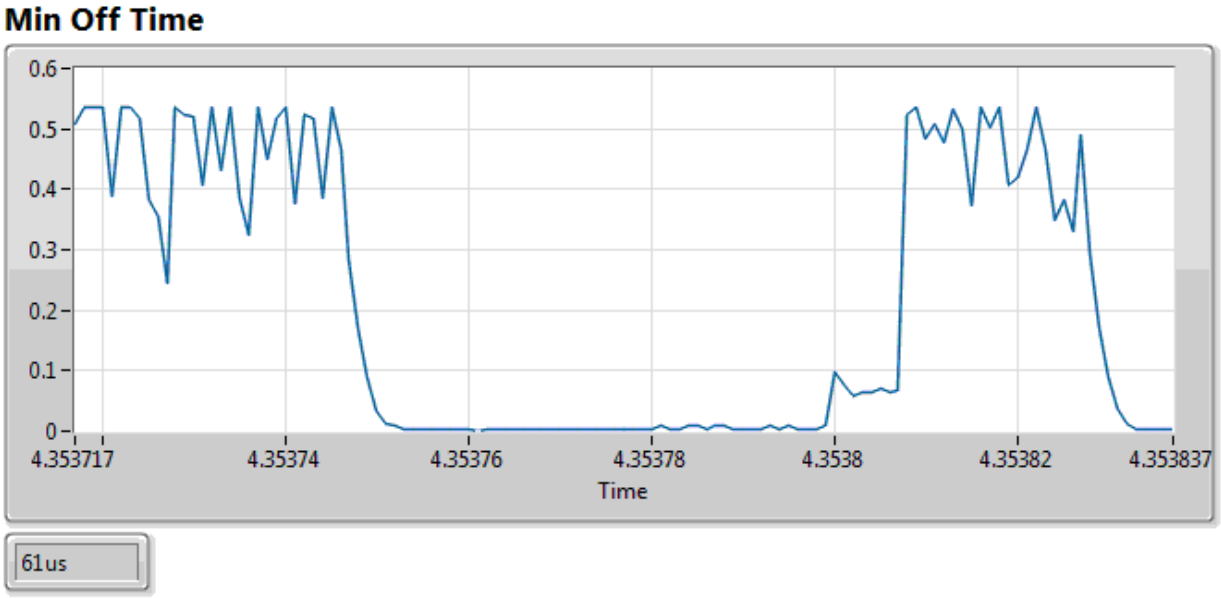
Idle Period Time
802.11g - 2412MHz



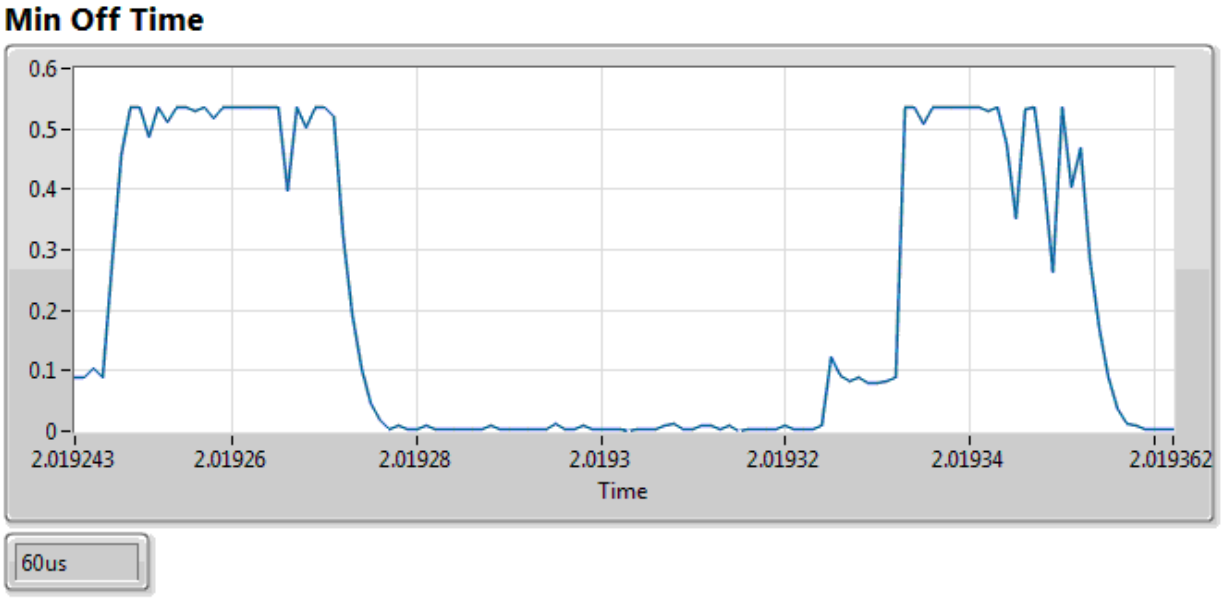
802.11g - 2472MHz



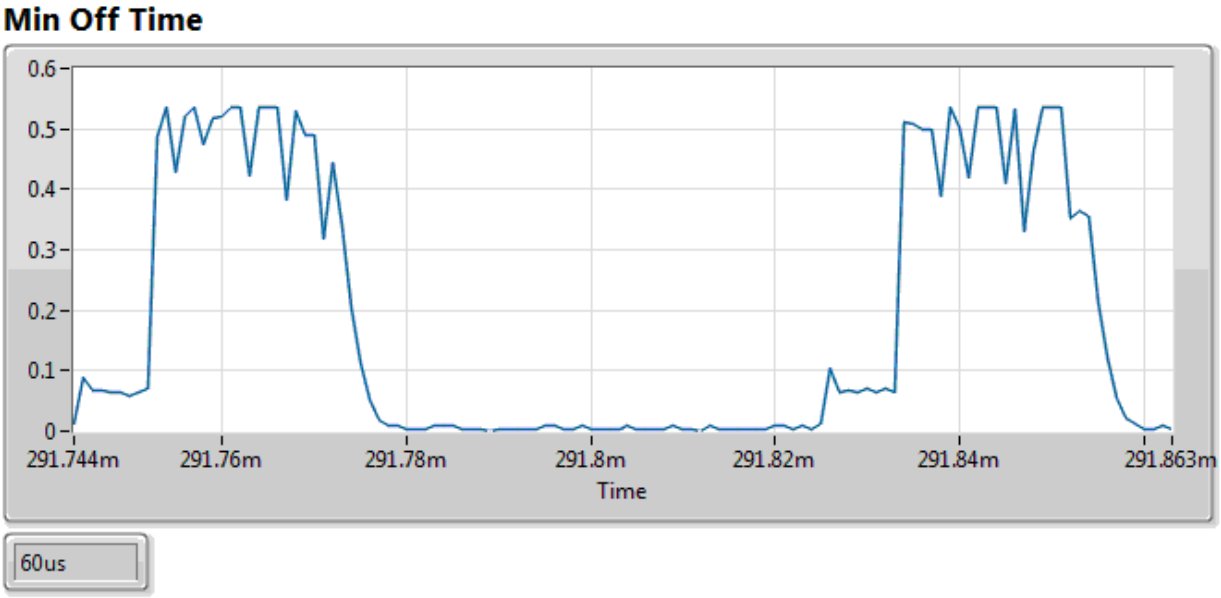
Idle Period Time
802.11n (HT20)) - 2412MHz



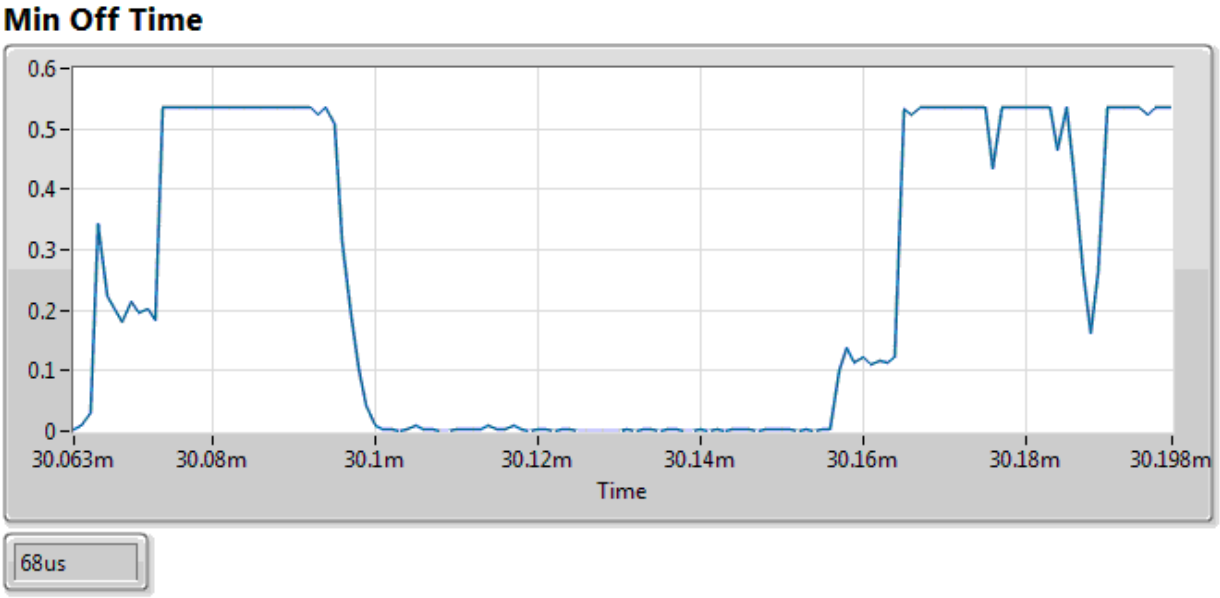
802.11n (HT20) - 2472MHz



Idle Period Time
802.11n (HT40) - 2422MHz



802.11n (HT40) - 2462MHz



6 Receiver Blocking Test Results

6.1 Receiver Blocking

6.1.1 Limit of Receiver Blocking

Receiver Blocking Parameters for Receiver Category 1 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm) (see notes 1 and 4)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (see note 4)**	**Type of Blocking Signal**
(-133 dBm + 10 × log10(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × log10(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

Note 1: OCBW is in Hz.
Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
Note 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 20 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
Note 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned.

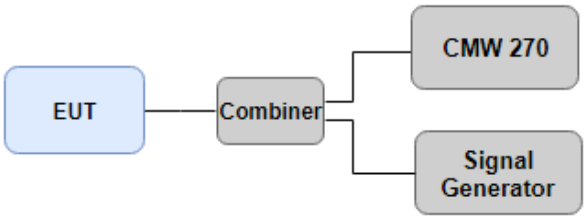
Receiver Blocking Parameters for Receiver Category 2 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm) (see notes 1 and 3)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (see note 3)**	**Type of Blocking Signal**
(-139 dBm + 10 × log10(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
Note 1: OCBW is in Hz. Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. Note 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned.			

Receiver Blocking Parameters for Receiver Category 3 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm) (see notes 1 and 3)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (see note 3)**	**Type of Blocking Signal**
(-139 dBm + 10 × log10(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less	2 380 2 504 2 300 2 584	-34	CW
Note 1: OCBW is in Hz. Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative the test may be performed using a wanted signal up to P_{min} + 30 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal Note 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned.			

6.1.2 Test Procedures

Reference to clause 5.4.11.2 of ETSI EN 300 328 V2.2.2 (2019-07).

6.1.3 Test Setup

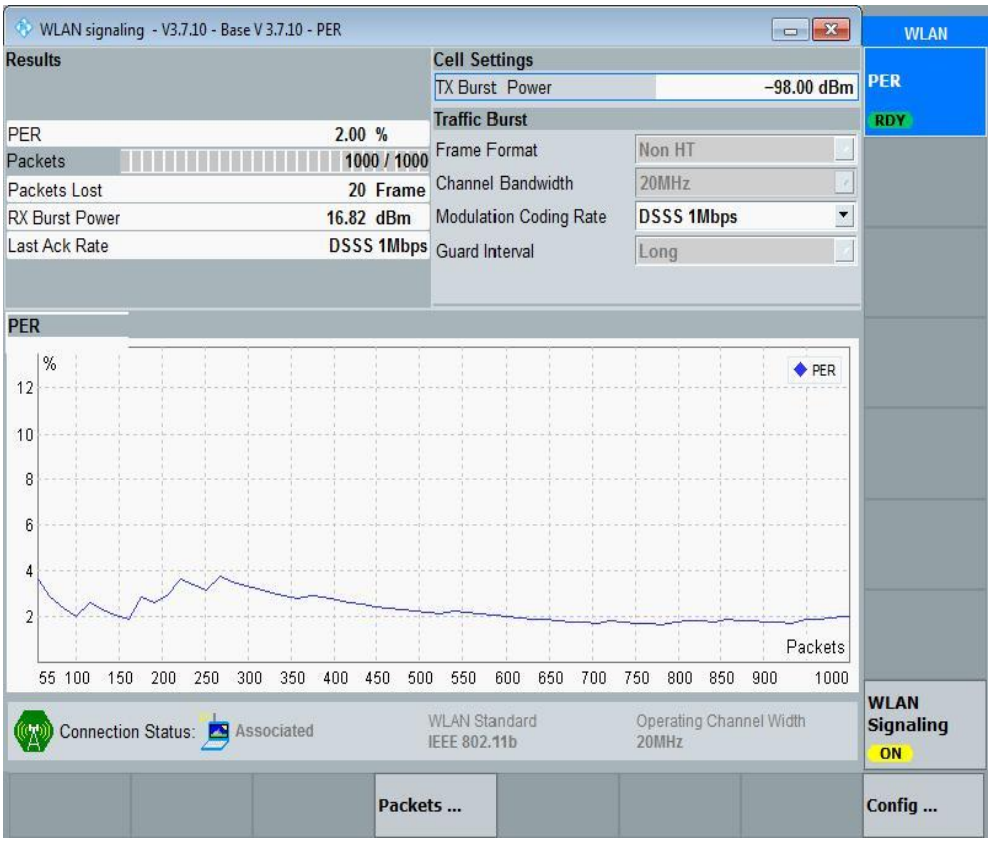


6.1.4 Test Result of Receiver Blocking

Ambient Condition	25°C / 65%	Tested By	Alan Tang

11b / 2412 MHz

Without Interference Signal Sensitivity Level



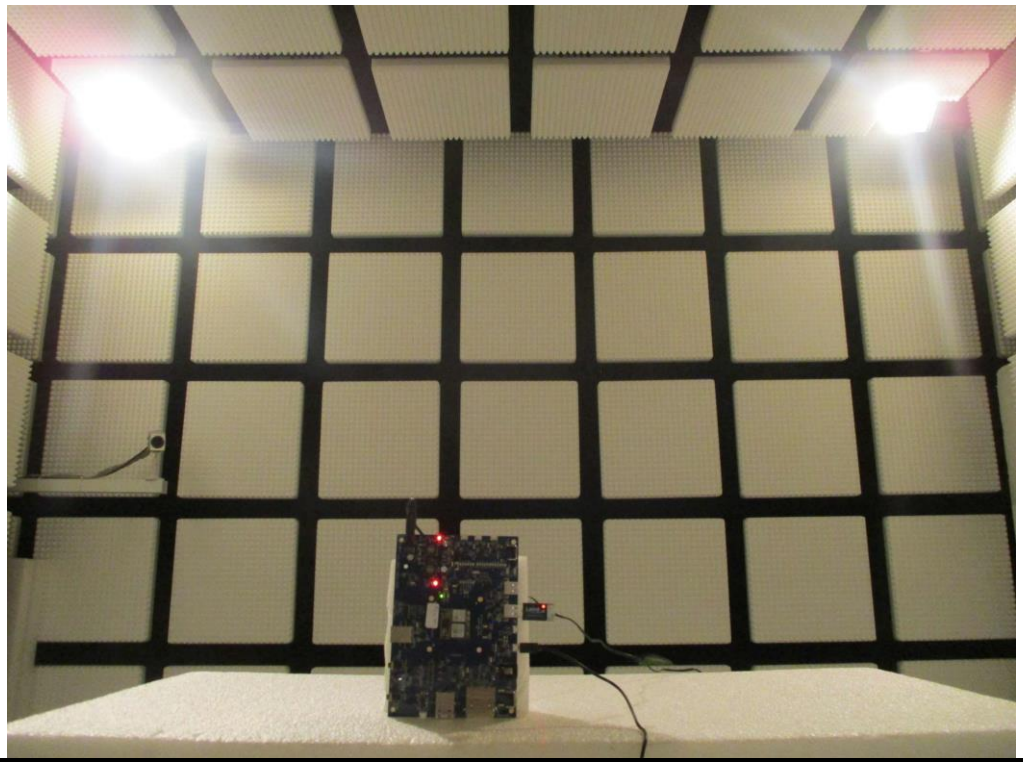
Receiver Category	1		
Performance Criteria Limit	PER ≤ 10 %		
Wanted Signal Mean Power from Companion Device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm)**	**Test Result**
-67	2380	-33	Pass
-73	2300	-33	Pass
-73	2330	-33	Pass
-73	2360	-33	Pass

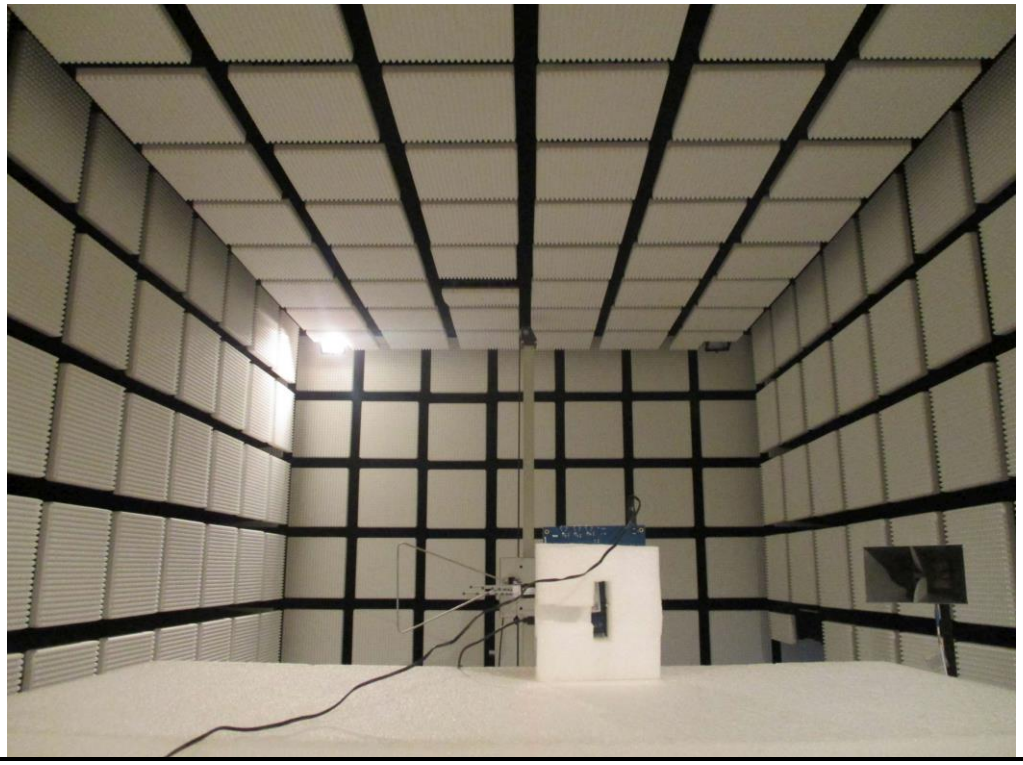
11b / 2472 MHz
Without Interference Signal Sensitivity Level

Receiver Category	1		
Performance Criteria Limit	PER ≤ 10 %		
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-67	2504	-33	Pass
-73	2524	-33	Pass
-73	2584	-33	Pass
-73	2674	-33	Pass

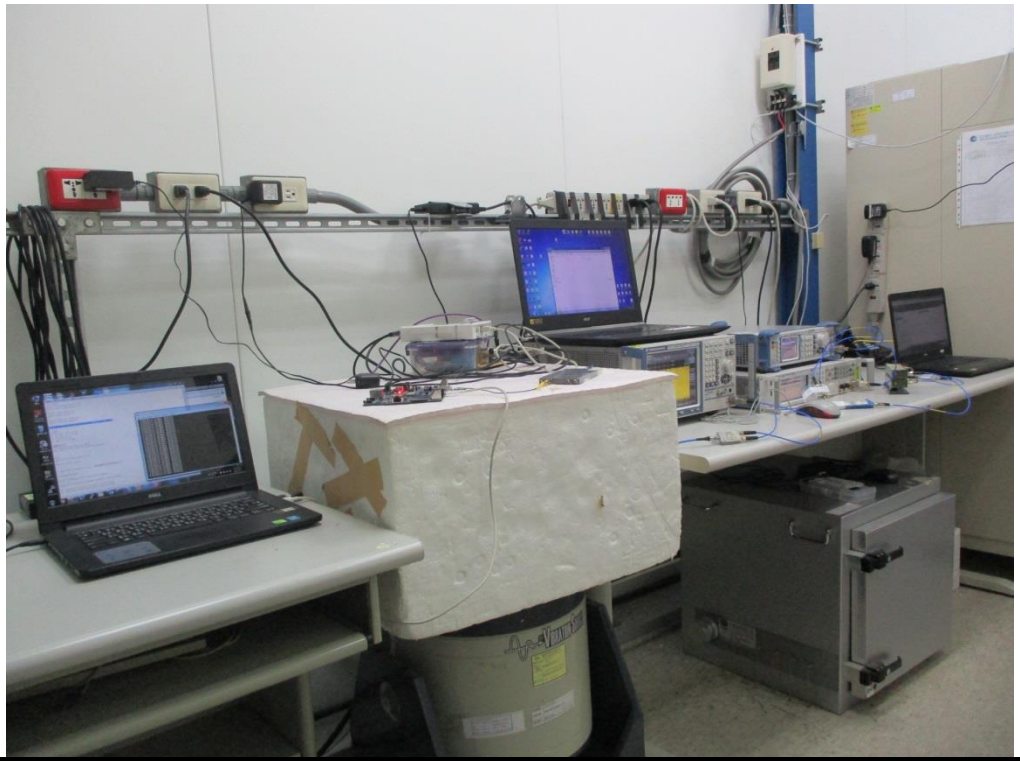
7 Photographs of the Test Configuration

Spurious Emission Test

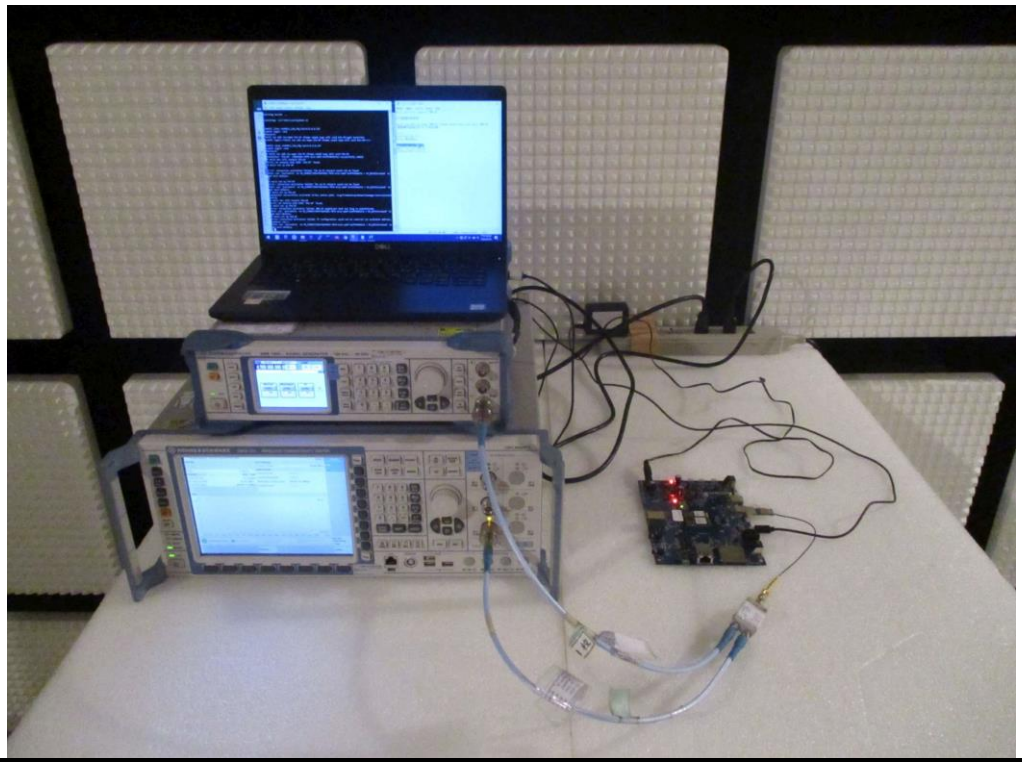




Adaptivity, Unwanted Signal and Short Control Signalling Transmissions Test



Receiver Blocking Test



8 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 Corporation (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.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No.30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan (R.O.C.)	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.) No.2-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)	No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.)

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

Tel: 886-3-271-8666
Fax: 886-3-318-0345
Email: ICC_Service@icertifi.com.tw

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