MEASUREMENT REPORT

FCC PART 15C WLAN 802.11b/g/n

FCC ID:	2APLNCL3
APPLICANT:	Seura Inc
Application Type:	Certification
Product:	NTP Clock
Model No.:	CL.3
Brand Name:	Seura
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (Section 15.247)
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01v05r02
Test Date:	September 20 ~ 30, 2019

Reviewed By: Sunny Sun
(Sunny Sun)

Approved By: Robin Wu
(Robin Wu)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
1909RSU033-U1	Rev. 01	Initial Report	10-18-2019	Valid

CONTENTS

Description Page

§2.1033 General Information 5

1. INTRODUCTION 6

1.1. Scope 6
1.2. MRT Test Location 6

2. PRODUCT INFORMATION 7

2.1. Equipment Description 7
2.2. Product Specification Subjective to this Report 7
2.3. Working Frequencies for this report 8
2.4. Test Mode 8
2.5. Description of Test Software 8
2.6. Device Capabilities 9
2.7. Test Configuration 10
2.8. EMI Suppression Device(s)/Modifications 10
2.9. Labeling Requirements 10

3. DESCRIPTION of TEST 11

3.1. Evaluation Procedure 11
3.2. AC Line Conducted Emissions 11
3.3. Radiated Emissions 12

4. ANTENNA REQUIREMENTS 13

5. TEST EQUIPMENT CALIBRATION DATE 14

6. MEASUREMENT UNCERTAINTY 16

7. TEST RESULT 17

7.1. Summary 17
7.2. 6dB Bandwidth Measurement 18
7.2.1. Test Limit 18
7.2.2. Test Procedure used 18
7.2.3. Test Setting 18
7.2.4. Test Setup 18
7.2.5. Test Result 19
7.3. Output Power Measurement 22
7.3.1. Test Limit 22
7.3.2. Test Procedure Used 22
7.3.3. Test Setting 22

7.3.4. Test Setup 23
7.3.5. Test Result 24
7.4. Power Spectral Density Measurement 26
7.4.1. Test Limit 26
7.4.2. Test Procedure Used 26
7.4.3. Test Setting 26
7.4.4. Test Setup 26
7.4.5. Test Result 27
7.5. Conducted Band Edge and Out-of-Band Emissions 30
7.5.1. Test Limit 30
7.5.2. Test Procedure Used 30
7.5.3. Test Settitng 30
7.5.4. Test Setup 31
7.5.5. Test Result 32
7.6. Radiated Spurious Emission Measurement 41
7.6.1. Test Limit 41
7.6.2. Test Procedure Used 41
7.6.3. Test Setting 41
7.6.4. Test Setup 43
7.6.5. Test Result 44
7.7. Radiated Restricted Band Edge Measurement 58
7.7.1. Test Limit 58
7.7.2. Test Procedure Used 59
7.7.3. Test Setting 59
7.7.4. Test Setup 60
7.7.5. Test Result 61
7.8. AC Conducted Emissions Measurement 93
7.8.1. Test Limit 93
7.8.2. Test Setup 93
7.8.3. Test Result 94

8. CONCLUSION 96

Appendix A - Test Setup Photograph 97

Appendix B - EUT Photograph 98

§2.1033 General Information

Applicant:	Seura Inc
Applicant Address:	1230 Ontario Rd, Green Bay, WI 54311
Manufacturer:	Seura Inc
Manufacturer Address:	1230 Ontario Rd, Green Bay, WI 54311
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in ANSI C63.4-2014.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications, Radio and SAR testing.**


Accredited Laboratory

A2LA has accredited

MRT TECHNOLOGY (SUZHOU) CO., LTD.

Suzhou, Jiangsu, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Presented this 24th day of July 2018.

President and CEO
For the Accreditation Council
Certificate Number: 3628.01
Valid to: August 31, 2020

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

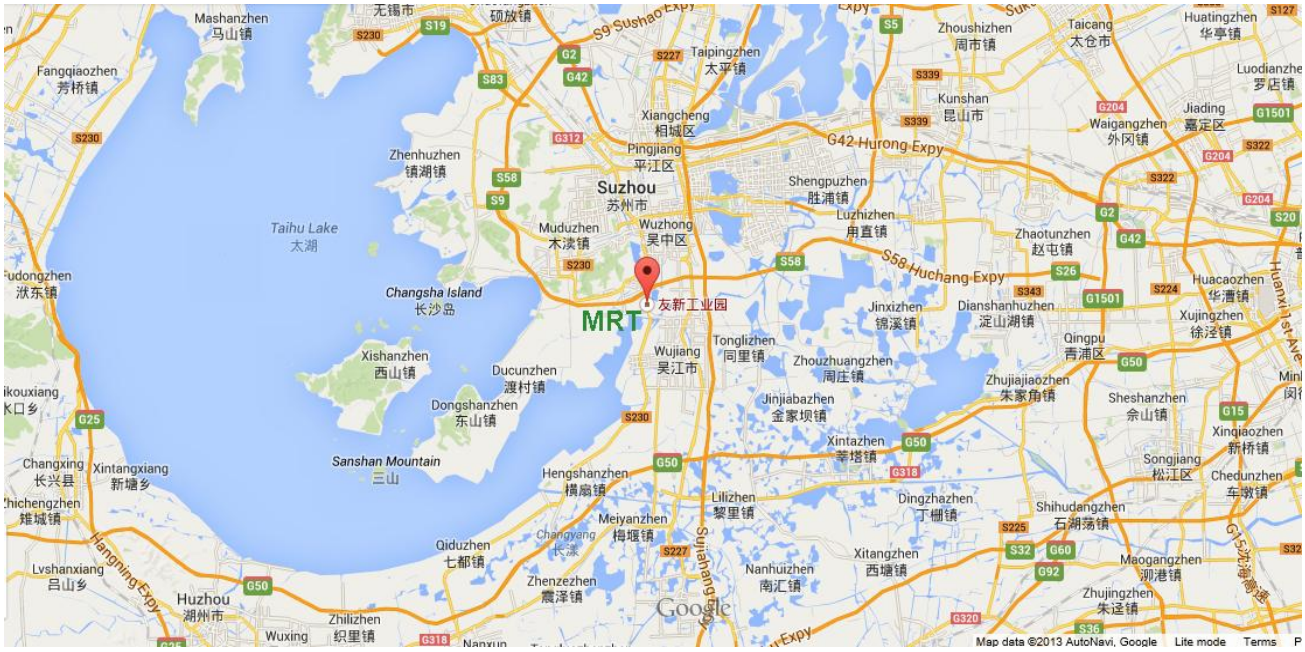
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada and Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The measurement facility compliant with the test site requirements specified in ANSI C63.4-2014.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	NTP Clock
Model No.:	CL.3
Brand Name:	Seura
Wi-Fi Specification:	802.11a/b/g/n

2.2. Product Specification Subjective to this Report

Frequency Range:	802.11b/g/n-HT20: 2412 ~ 2462 MHz 802.11n-HT40: 2422 ~ 2452 MHz
Channel Number:	802.11b/g/n-HT20: 11 802.11n-HT40: 7
Type of Modulation:	802.11b: DSSS 802.11g/n: OFDM
Data Rate:	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 150Mbps
Maximum Average Output Power:	802.11b: 13.37dBm 802.11g: 17.33dBm 802.11n-HT20: 16.19dBm 802.11n-HT40: 15.60dBm
Antenna Type:	PCB Antenna
Antenna Gain:	1.5dBi

Note: For other features of this EUT, test report will be issued separately.

2.3. Working Frequencies for this report

802.11b/g/n-HT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz	--	--

802.11n-HT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
03	2422 MHz	04	2427 MHz	05	2432 MHz
06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	--	--	--	--

2.4. Test Mode

Test Mode	Mode 1: Transmit by 802.11b (1Mbps)
	Mode 2: Transmit by 802.11g (6Mbps)
	Mode 3: Transmit by 802.11n-HT20 (MCS0)
	Mode 4: Transmit by 802.11n-HT40 (MCS0)

2.5. Description of Test Software

The test utility software used during testing was “MT7637 QA”, and the version was 0.0.1.60.

Power parameter value refers to operation description.

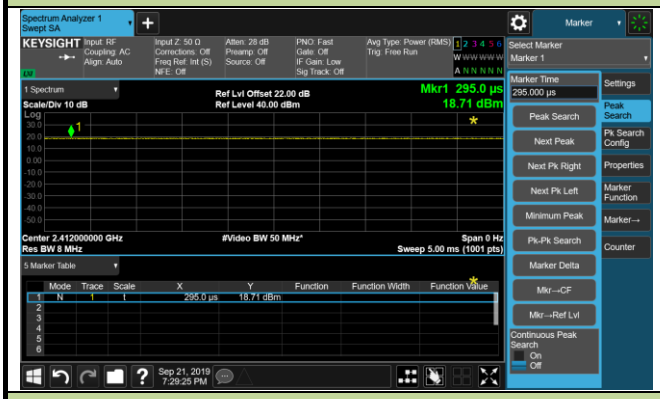
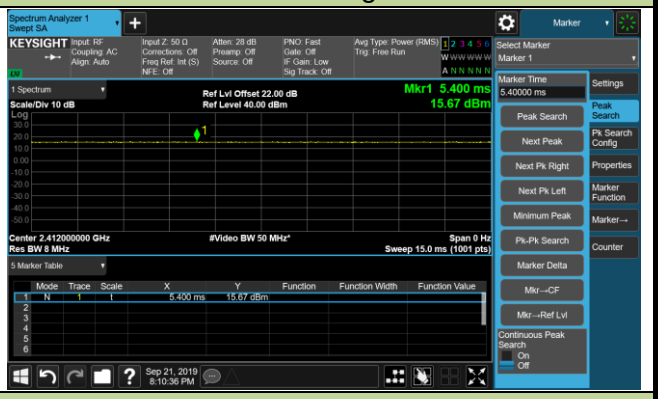
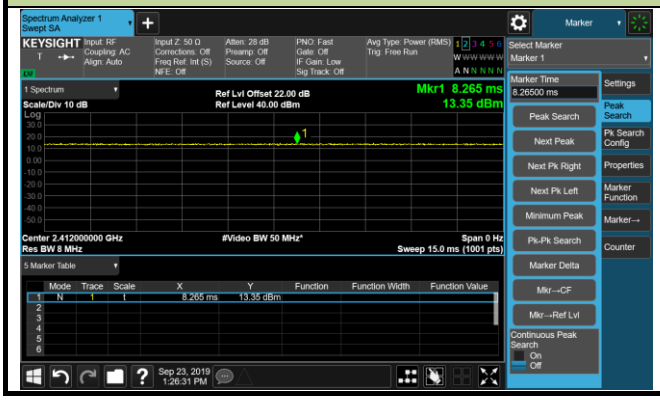
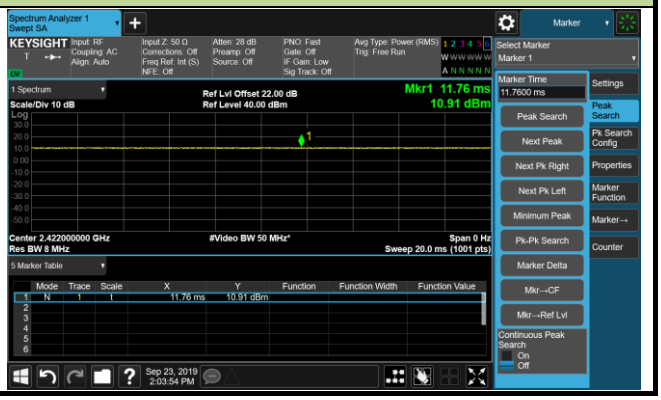
2.6. Device Capabilities

This device contains the following capabilities:

2.4GHz WLAN (DTS), 5GHz WLAN (NII)

Note: The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
802.11b	100%
802.11g	100%
802.11n-HT20	100%
802.11n-HT40	100%

Duty Cycle	
802.11b	802.11g
	
802.11n-HT20	802.11n-HT40
	

2.7. Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013, which is used as the reference of appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.8. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.9. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION of TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and were used in the measurement.

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment which determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.
For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.
Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, which produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antenna of this device is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2020/04/15
Two-Line V-Network	R&S	ENV 216	MRTSUE06002	1 year	2020/06/13
Two-Line V-Network	R&S	ENV 216	MRTSUE06003	1 year	2020/06/13
Thermohygrometer	Testo	608-H1	MRTSUE06404	1 year	2020/08/08
Shielding Room	MIX-BEP	Chamber-SR2	MRTSUE06215	N/A	N/A

Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2020/08/01
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2020/09/03
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2019/11/09
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2020/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2019/10/19
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2019/12/17
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2019/11/16
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2020/06/11
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2020/08/08
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2020/04/30

Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2020/08/01
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2019/11/09
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2019/10/19
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2019/11/09
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2019/12/17
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2019/11/16
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2020/06/11
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2019/12/13
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2020/04/30

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2020/04/15
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2020/07/11
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2020/04/15
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2019/11/16
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2020/06/30
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2020/06/30
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2020/06/13
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2020/06/13
Modulation Analyzer	HP	8901A	MRTSUE06098	1 year	2019/10/18
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2019/11/16
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2019/11/16
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2019/08/14

Software	**Version**	**Function**
EMI Software	V3	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz~150kHz: 3.84dB 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 30MHz~300MHz: 4.07dB 300MHz~1GHz: 3.63dB 1GHz~18GHz: 4.16dB Vertical: 30MHz~300MHz: 4.18dB 300MHz~1GHz: 3.60dB 1GHz~18GHz: 4.76dB
Radiated Emission Measurement - AC2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 30MHz~300MHz: 3.75dB 300MHz~1GHz: 3.53dB 1GHz~18GHz: 4.28dB Vertical: 30MHz~300MHz: 3.86dB 300MHz~1GHz: 3.53dB 1GHz~18GHz: 4.33dB

7. TEST RESULT

7.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	≤ 1Watt		Pass	Section 7.3
15.247(e)	Power Spectral Density	≤ 8dBm / 3kHz		Pass	Section 7.4
15.247(d)	Band Edge / Out-of-Band Emissions	≥ 20dBc (Peak)		Pass	Section 7.5
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.6 & 7.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.8

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.

7.2. 6dB Bandwidth Measurement

7.2.1.Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

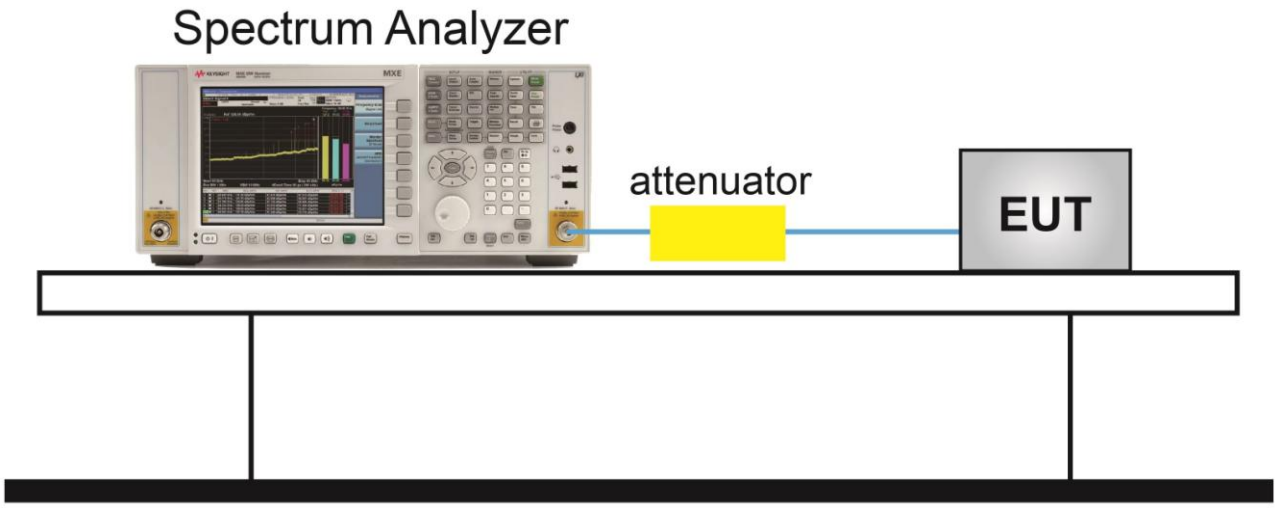
7.2.2.Test Procedure used

ANSI C63.10-2013 - Section 11.8

7.2.3.Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize

7.2.4.Test Setup



7.2.5.Test Result

Product	NTP Clock	Temperature	25°C
Test Engineer	Flay Yang	Relative Humidity	52%
Test Site	TR3	Test Date	2019/09/21 ~ 2019/09/26

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	1Mbps	01	2412	9.57	≥ 0.5	Pass
802.11b	1Mbps	06	2437	9.56	≥ 0.5	Pass
802.11b	1Mbps	11	2462	9.57	≥ 0.5	Pass
802.11g	6Mbps	01	2412	16.30	≥ 0.5	Pass
802.11g	6Mbps	06	2437	16.34	≥ 0.5	Pass
802.11g	6Mbps	11	2462	16.35	≥ 0.5	Pass
802.11n-HT20	MCS0	01	2412	17.36	≥ 0.5	Pass
802.11n-HT20	MCS0	06	2437	17.59	≥ 0.5	Pass
802.11n-HT20	MCS0	11	2462	17.53	≥ 0.5	Pass
802.11n-HT40	MCS0	03	2422	35.89	≥ 0.5	Pass
802.11n-HT40	MCS0	06	2437	35.90	≥ 0.5	Pass
802.11n-HT40	MCS0	09	2452	35.82	≥ 0.5	Pass

802.11b 6dB Bandwidth

Channel 01 (2412MHz)

Channel 06 (2437MHz)

Channel 11 (2462MHz)

802.11g 6dB Bandwidth

Channel 01 (2412MHz)

Channel 06 (2437MHz)

Channel 11 (2462MHz)

802.11n-HT20 6dB Bandwidth

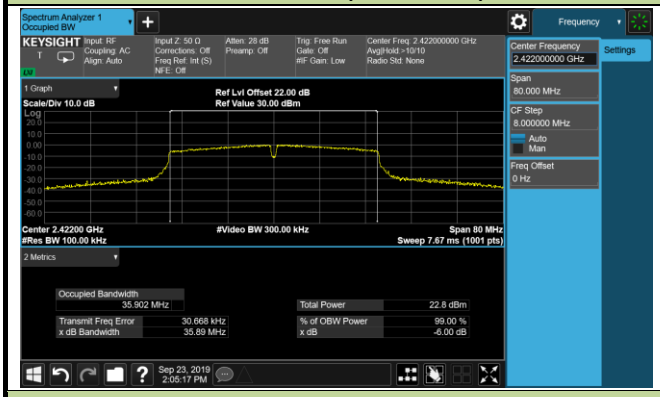
Channel 01 (2412MHz)

Channel 06 (2437MHz)

Channel 11 (2462MHz)

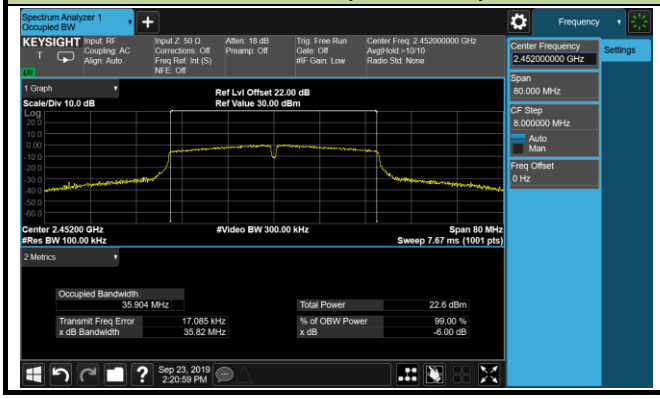
802.11n-HT40 6dB Bandwidth

Channel 03 (2422MHz)



Channel 06 (2437MHz)

Channel 09 (2452MHz)



7.3. Output Power Measurement

7.3.1.Test Limit

The maximum conducted output power shall be exceed 1 Watt (30dBm).

7.3.2.Test Procedure Used

ANSI C63.10 - Section 11.9.1.3

ANSI C63.10 - Section 11.9.2.3.2

7.3.3.Test Setting

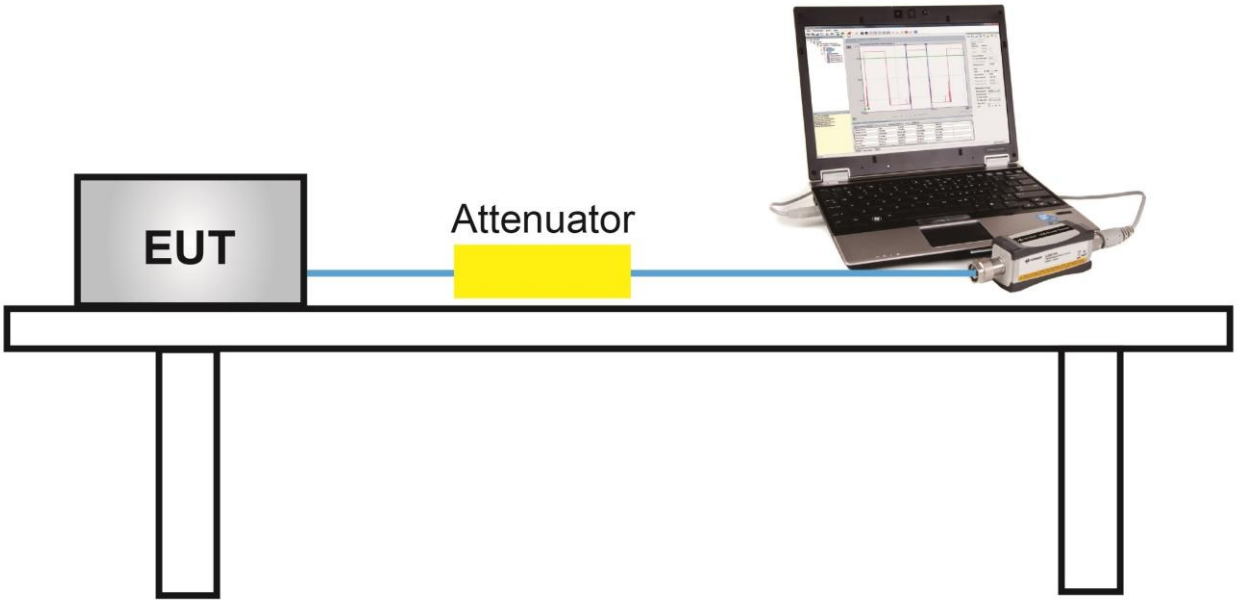
Method PKPM1 (Peak Power Measurement)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Method AVGPM-G (Measurement using a gated RF average-reading power meter)

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

7.3.4.Test Setup



7.3.5.Test Result

Output power test was verified over all data rates of each mode shown as below, and then choose the maximum output power (gray marker) for final test of each channel.

Test Mode	Bandwidth (MHz)	Channel No.	Frequency (MHz)	Data Rate / MCS	Average Power (dBm)
802.11b	20	6	2437	1Mbps	13.03
				5.5Mbps	12.72
				11Mbps	12.36
802.11g	20	6	2437	6Mbps	17.29
				24Mbps	16.89
				54Mbps	16.48
802.11n	20	6	2437	MCS0	16.04
				MCS3	15.71
				MCS7	15.26
802.11n	40	6	2437	MCS0	15.60
				MCS3	15.13
				MCS7	14.72

Product	NTP Clock	Temperature	25°C
Test Engineer	Flay Yang	Relative Humidity	52%
Test Site	TR3	Test Date	2019/09/20

Test Result of Peak Output Power

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
11b	1Mbps	01	2412	15.35	≤ 30.00	Pass
11b	1Mbps	06	2437	14.97	≤ 30.00	Pass
11b	1Mbps	11	2462	14.79	≤ 30.00	Pass
11g	6Mbps	01	2412	24.28	≤ 30.00	Pass
11g	6Mbps	06	2437	24.40	≤ 30.00	Pass
11g	6Mbps	11	2462	24.23	≤ 30.00	Pass
11n-HT20	MCS0	01	2412	23.68	≤ 30.00	Pass
11n-HT20	MCS0	06	2437	23.84	≤ 30.00	Pass
11n-HT20	MCS0	11	2462	23.58	≤ 30.00	Pass
11n-HT40	MCS0	03	2422	23.47	≤ 30.00	Pass
11n-HT40	MCS0	06	2437	23.90	≤ 30.00	Pass
11n-HT40	MCS0	09	2452	23.12	≤ 30.00	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
11b	1Mbps	01	2412	13.37	≤ 30.00	Pass
11b	1Mbps	06	2437	13.03	≤ 30.00	Pass
11b	1Mbps	11	2462	12.80	≤ 30.00	Pass
11g	6Mbps	01	2412	17.33	≤ 30.00	Pass
11g	6Mbps	06	2437	17.29	≤ 30.00	Pass
11g	6Mbps	11	2462	17.32	≤ 30.00	Pass
11n-HT20	MCS0	01	2412	15.75	≤ 30.00	Pass
11n-HT20	MCS0	06	2437	16.04	≤ 30.00	Pass
11n-HT20	MCS0	11	2462	16.19	≤ 30.00	Pass
11n-HT40	MCS0	03	2422	15.58	≤ 30.00	Pass
11n-HT40	MCS0	06	2437	15.60	≤ 30.00	Pass
11n-HT40	MCS0	09	2452	15.15	≤ 30.00	Pass

7.4. Power Spectral Density Measurement

7.4.1.Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

The same method of determining the conducted output power shall be used to determine the power spectral density.

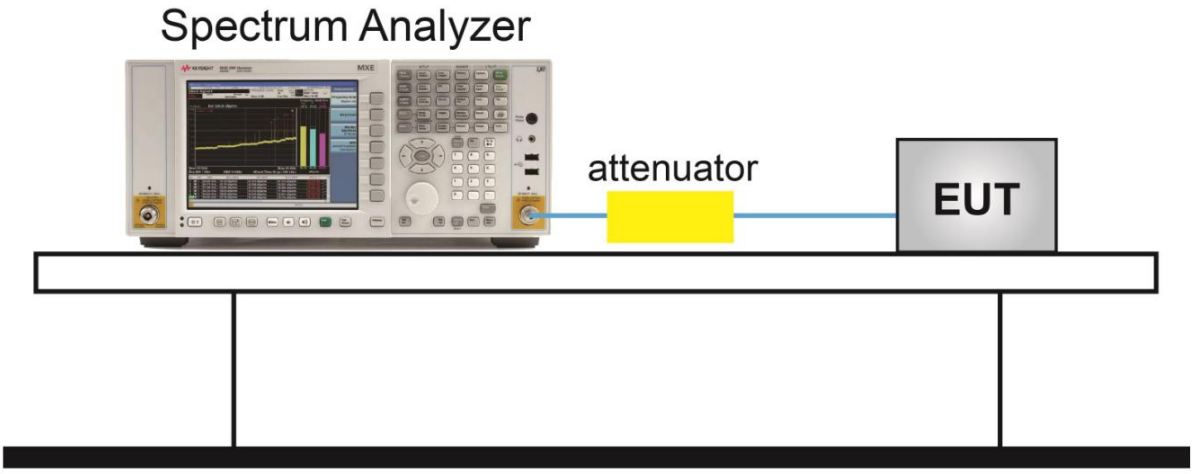
7.4.2.Test Procedure Used

ANSI C63.10 - Section 11.10.2

7.4.3.Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

7.4.4.Test Setup



7.4.5.Test Result

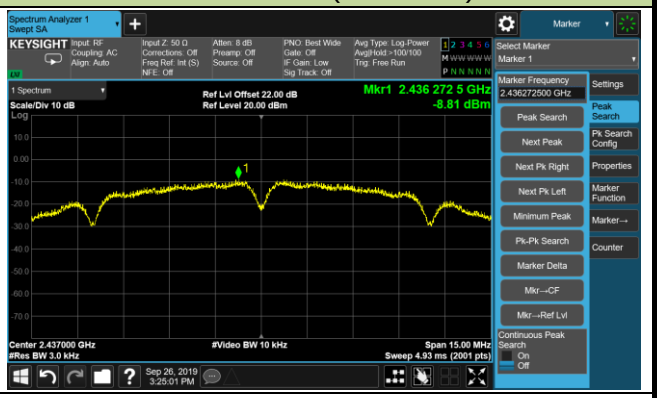
Product	NTP Clock	Temperature	25°C
Test Engineer	Flay Yang	Relative Humidity	52%
Test Site	TR3	Test Date	2019/09/21 ~ 2019/09/26

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	PK PSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
11b	1Mbps	01	2412	-8.08	≤ 8.00	Pass
11b	1Mbps	06	2437	-8.81	≤ 8.00	Pass
11b	1Mbps	11	2462	-8.78	≤ 8.00	Pass
11g	6Mbps	01	2412	-5.82	≤ 8.00	Pass
11g	6Mbps	06	2437	-6.05	≤ 8.00	Pass
11g	6Mbps	11	2462	-5.84	≤ 8.00	Pass
11n-HT20	MCS0	01	2412	-6.55	≤ 8.00	Pass
11n-HT20	MCS0	06	2437	-6.77	≤ 8.00	Pass
11n-HT20	MCS0	11	2462	-6.44	≤ 8.00	Pass
11n-HT40	MCS0	03	2422	-9.97	≤ 8.00	Pass
11n-HT40	MCS0	06	2437	-10.35	≤ 8.00	Pass
11n-HT40	MCS0	09	2452	-10.15	≤ 8.00	Pass

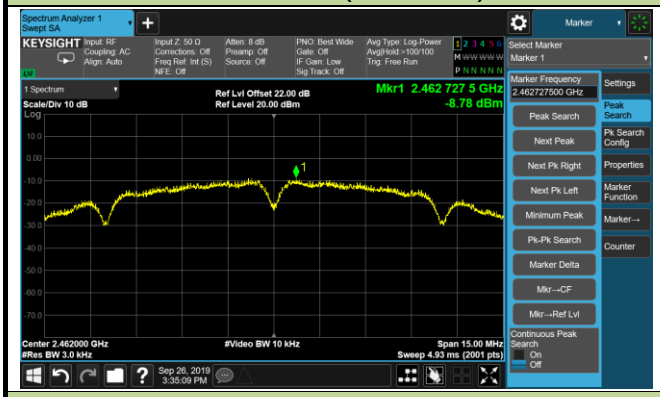
802.11b - PK PSD

Channel 01 (2412MHz)

Channel 06 (2437MHz)



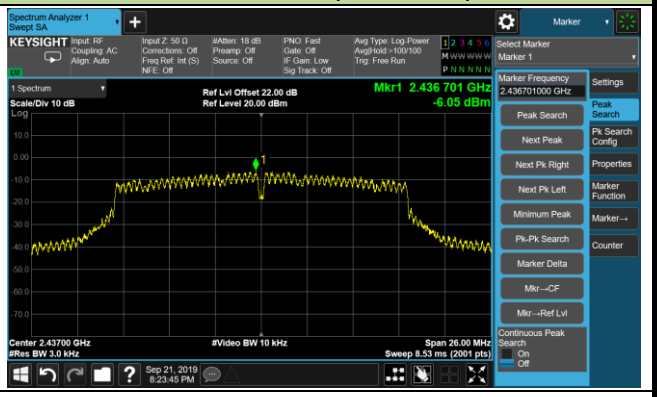
Channel 11 (2462MHz)



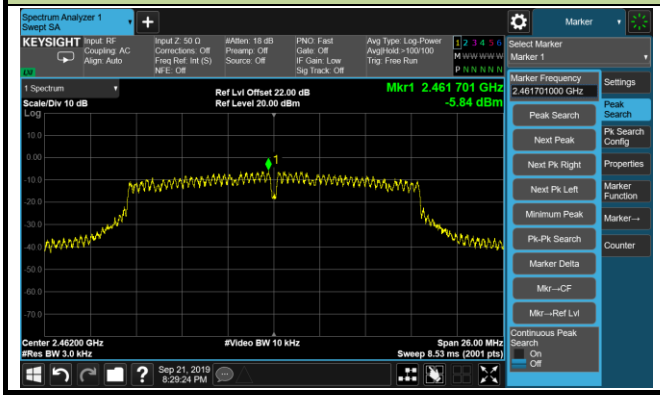
802.11g - PK PSD

Channel 01 (2412MHz)

Channel 06 (2437MHz)

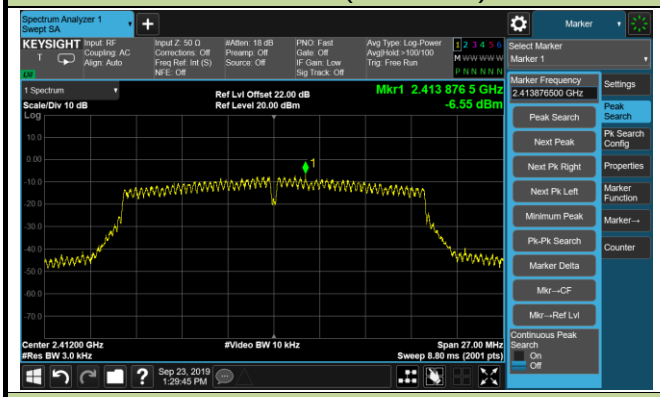


Channel 11 (2462MHz)

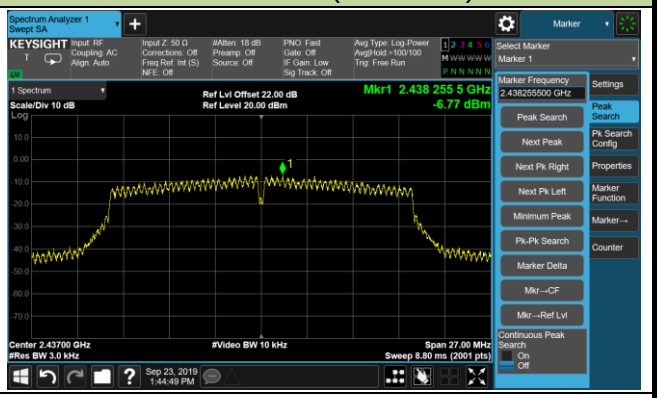


802.11n-HT20 - PK PSD

Channel 01 (2412MHz)



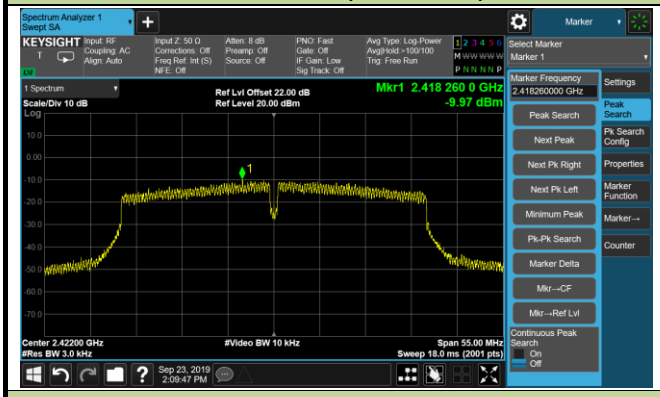
Channel 06 (2437MHz)



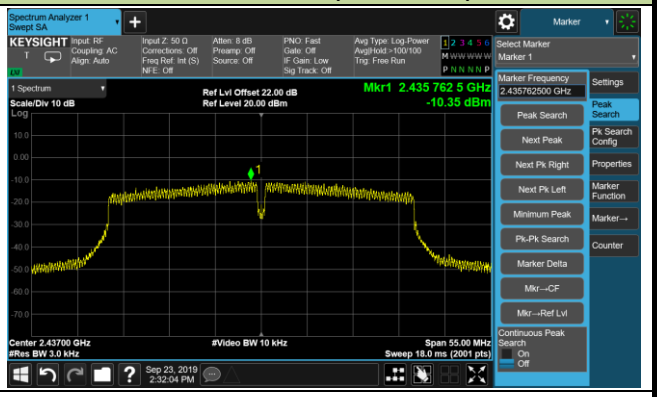
Channel 11 (2462MHz)

802.11n-HT40 - PK PSD

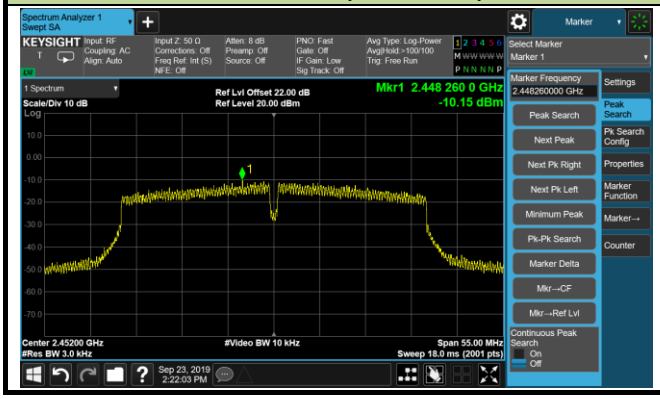
Channel 01 (2422MHz)



Channel 06 (2437MHz)



Channel 11 (2452MHz)



7.5. Conducted Band Edge and Out-of-Band Emissions

7.5.1.Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

7.5.2.Test Procedure Used

ANSI C63.10 - Section 11.11

7.5.3.Test Settitng

Reference level measurement

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 1.5 times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW ≥ 3 x RBW
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Allow trace to fully stabilize

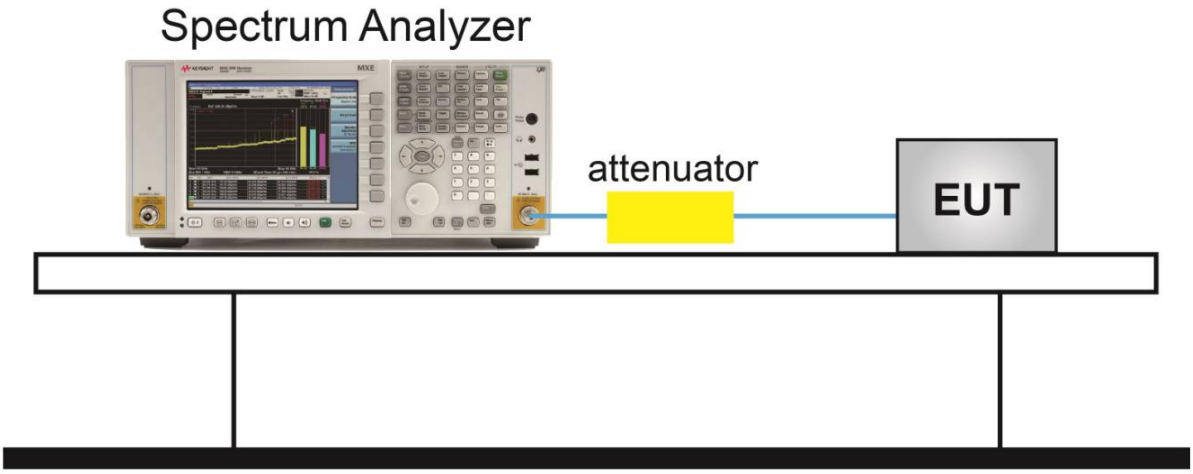
Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Notes

1. RBW was set to 1.3MHz rather than 100 kHz in order to increase the measurement speed; meanwhile, the VBW was set to 4MHz instead of 300 kHz.
2. The display line shown in the following plots denotes the limit at 20dB below the fundamental emission level measured in a 100 kHz bandwidth. However, since the traces in the following plots are measured with a 1.3 MHz RBW, the display line may not necessarily appear to be 20 dB below the level of the fundamental measured in a 1.3 MHz bandwidth.
3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

7.5.4.Test Setup



7.5.5.Test Result

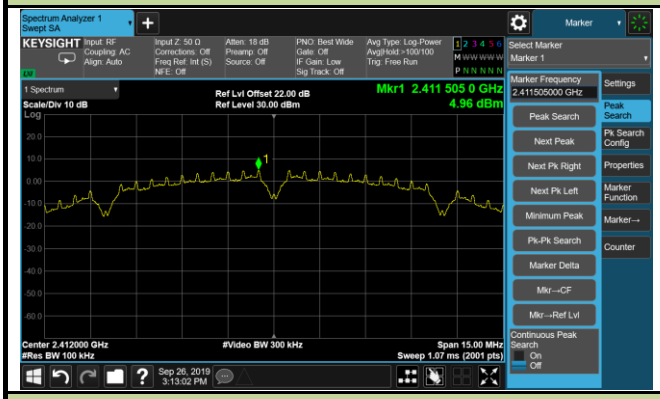
Product	NTP Clock	Temperature	25°C
Test Engineer	Flay Yang	Relative Humidity	52%
Test Site	TR3	Test Date	2019/09/21 ~ 2019/09/26

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Limit	Result
802.11b	1Mbps	01	2412	20dBc	Pass
802.11b	1Mbps	06	2437	20dBc	Pass
802.11b	1Mbps	11	2462	20dBc	Pass
802.11g	6Mbps	01	2412	20dBc	Pass
802.11g	6Mbps	06	2437	20dBc	Pass
802.11g	6Mbps	11	2462	20dBc	Pass
802.11n-HT20	MCS0	01	2412	20dBc	Pass
802.11n-HT20	MCS0	06	2437	20dBc	Pass
802.11n-HT20	MCS0	11	2462	20dBc	Pass
802.11n-HT40	MCS0	03	2422	20dBc	Pass
802.11n-HT40	MCS0	06	2437	20dBc	Pass
802.11n-HT40	MCS0	09	2452	20dBc	Pass

802.11b Out-of-Band Emissions

Channel 01 (2412MHz)

100kHz PSD Reference Level

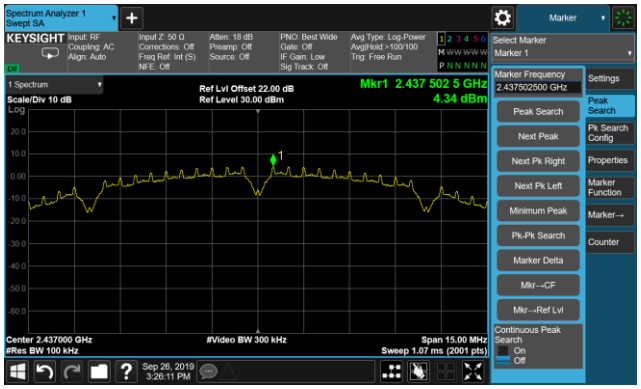


Low Band Edge

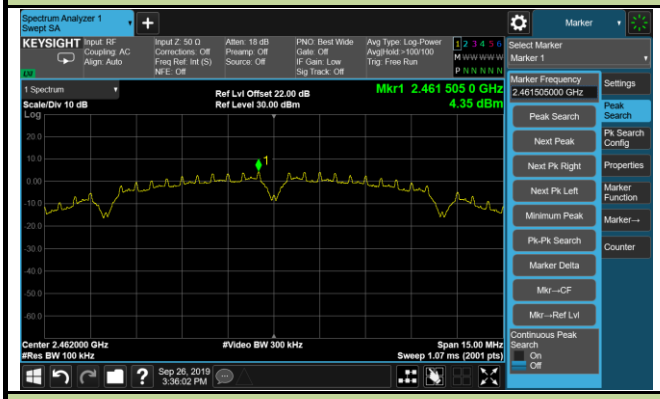
Spurious Emission

Channel 06 (2437MHz)

100kHz PSD Reference Level



Spurious Emission

802.11b Out-of-Band Emissions	
Channel 11 (2462MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	

802.11g Out-of-Band Emissions

Channel 01 (2412MHz)

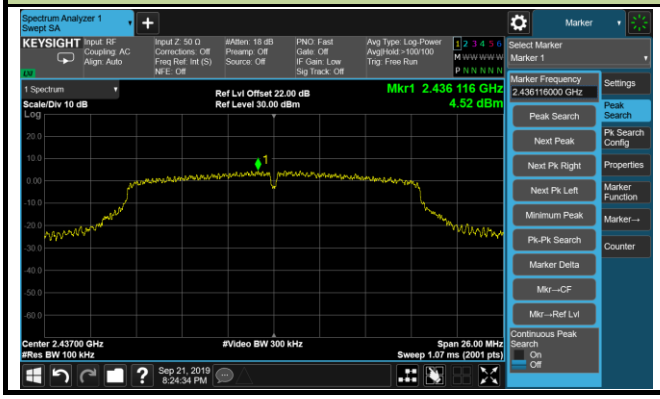
100kHz PSD Reference Level

Low Band Edge

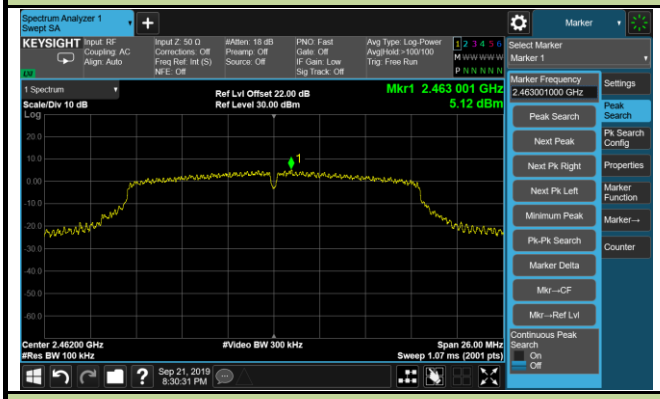
Spurious Emission

Channel 06 (2437MHz)

100kHz PSD Reference Level



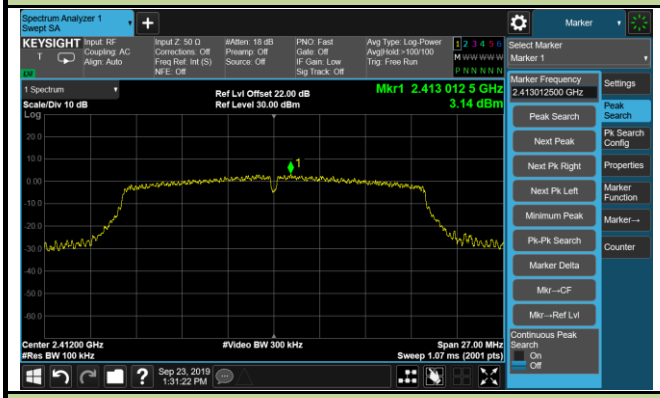
Spurious Emission

802.11g Out-of-Band Emissions	
Channel 11 (2462MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	

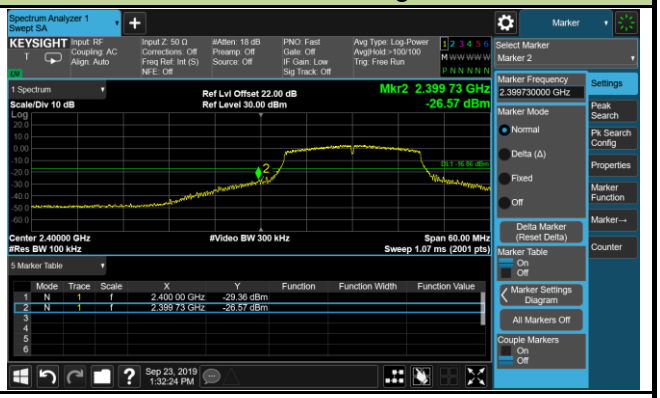
802.11n-HT20 Out-of-Band Emissions

Channel 01 (2412MHz)

100kHz PSD Reference Level



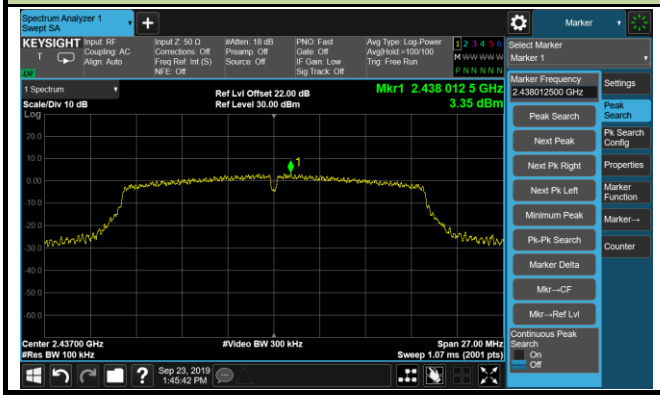
Low Band Edge



Spurious Emission

Channel 06 (2437MHz)

100kHz PSD Reference Level



Spurious Emission

802.11n-HT20 Out-of-Band Emissions	
Channel 11 (2462MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	

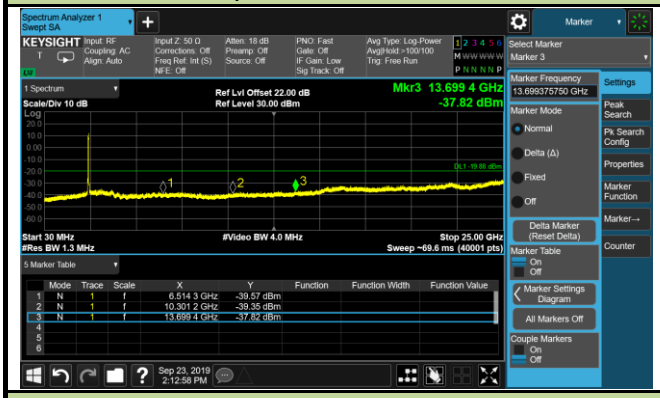
802.11n-HT40 Out-of-Band Emissions

Channel 03 (2422MHz)

100kHz PSD Reference Level

Low Band Edge

Spurious Emission



Channel 06 (2437MHz)

100kHz PSD Reference Level

Spurious Emission

802.11n-HT40 Out-of-Band Emissions	
Channel 09 (2452MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	

7.6. Radiated Spurious Emission Measurement

7.6.1.Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15.209 Limit		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.6.2.Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

7.6.3.Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

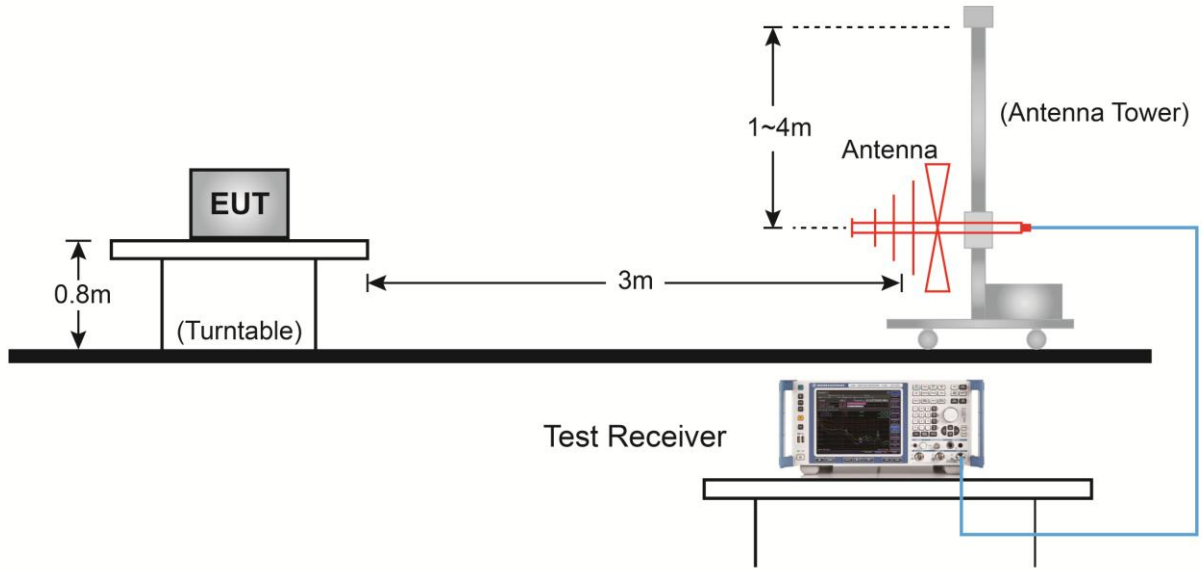
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10 Hz.

If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration.

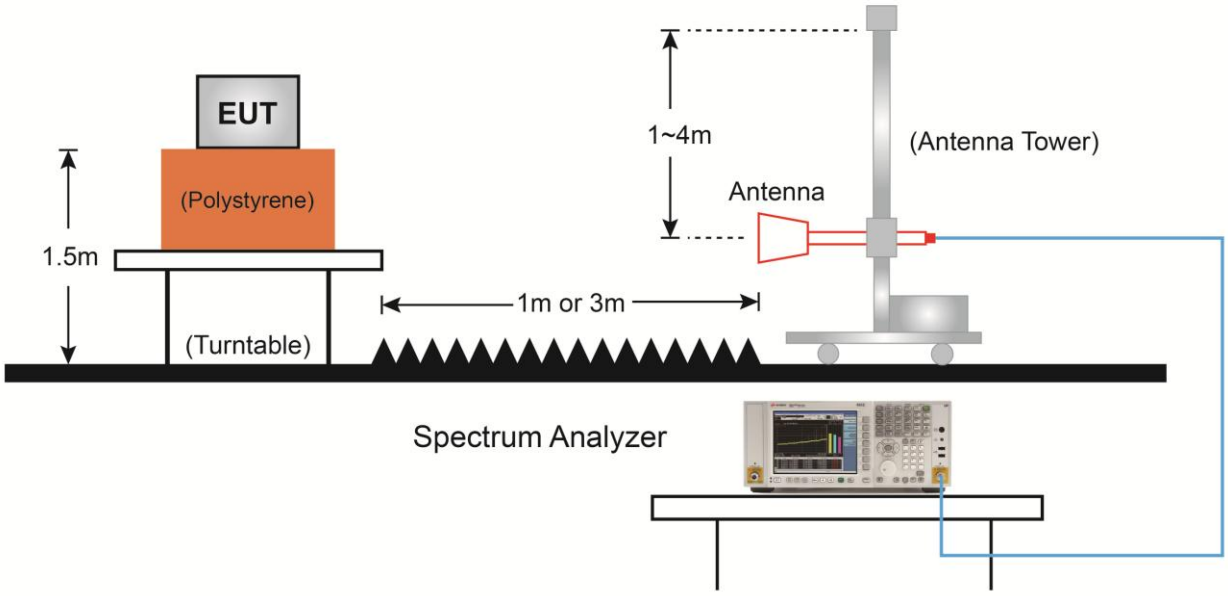
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

7.6.4.Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



7.6.5.Test Result

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11b	Test Channel:	01
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4825.0	51.2	1.9	53.1	74.0	-20.9	Peak	Horizontal
	7494.0	37.4	10.5	47.9	74.0	-26.1	Peak	Horizontal
*	8760.5	36.9	10.9	47.8	78.9	-31.1	Peak	Horizontal
*	9942.0	34.9	12.3	47.3	78.9	-31.6	Peak	Horizontal
	4825.0	51.6	1.9	53.5	74.0	-20.5	Peak	Vertical
	7587.5	36.8	10.3	47.1	74.0	-26.9	Peak	Vertical
*	8752.0	36.8	10.8	47.6	78.9	-31.3	Peak	Vertical
*	9857.0	35.5	11.6	47.1	78.9	-31.8	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (98.9dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11b	Test Channel:	06
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4876.0	52.8	1.6	54.4	74.0	-19.6	Peak	Horizontal
	4876.0	51.5	1.6	53.2	54.0	-0.8	Average	Horizontal
	7485.5	35.9	10.3	46.2	74.0	-27.8	Peak	Horizontal
*	7919.0	36.3	9.3	45.6	77.3	-31.7	Peak	Horizontal
*	8811.5	35.1	11.0	46.1	77.3	-31.2	Peak	Horizontal
	4876.0	45.9	1.6	47.5	74.0	-26.5	Peak	Vertical
	7570.5	37.1	9.6	46.7	74.0	-27.3	Peak	Vertical
*	8811.5	36.1	11.0	47.1	77.3	-30.2	Peak	Vertical
*	10222.5	36.4	13.2	49.5	77.3	-27.8	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (97.3dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11b	Test Channel:	11
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4927.0	53.4	1.2	54.7	74.0	-19.3	Peak	Horizontal
	4927.0	52.4	1.2	53.6	54.0	-0.4	Average	Horizontal
	7587.5	37.8	10.3	48.1	74.0	-25.9	Peak	Horizontal
*	8939.0	34.0	10.5	44.5	77.5	-33.0	Peak	Horizontal
*	9738.0	38.3	11.9	50.2	77.5	-27.3	Peak	Horizontal
	4927.0	48.6	1.2	49.8	74.0	-24.2	Peak	Vertical
	7596.0	37.9	10.7	48.6	74.0	-25.4	Peak	Vertical
*	8854.0	35.0	10.6	45.6	77.5	-31.9	Peak	Vertical
*	10384.0	37.0	15.1	52.0	77.5	-25.5	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (97.5dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11g	Test Channel:	01
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4825.0	58.8	1.9	60.7	74.0	-13.3	Peak	Horizontal
	4825.0	48.6	1.9	50.5	54.0	-3.5	Average	Horizontal
	7502.5	35.7	9.9	45.6	74.0	-28.4	Peak	Horizontal
*	8811.5	35.5	11.0	46.5	86.5	-40.0	Peak	Horizontal
*	10146.0	37.0	13.1	50.1	86.5	-36.4	Peak	Horizontal
	4825.0	50.5	1.9	52.5	74.0	-21.5	Peak	Vertical
	7587.5	37.0	10.3	47.2	74.0	-26.8	Peak	Vertical
*	8735.0	35.5	11.0	46.5	86.5	-40.0	Peak	Vertical
*	10018.5	38.0	12.1	50.1	86.5	-36.4	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (106.5dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11g	Test Channel:	06
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4876.0	61.6	1.6	63.3	74.0	-10.7	Peak	Horizontal
	4876.0	51.8	1.6	53.5	54.0	-0.5	Average	Horizontal
	7315.5	41.3	10.1	51.4	74.0	-22.6	Peak	Horizontal
*	8820.0	37.4	11.3	48.7	85.4	-36.7	Peak	Horizontal
*	10384.0	37.0	15.1	52.1	85.4	-33.3	Peak	Horizontal
	4867.5	56.9	1.6	58.4	74.0	-15.6	Peak	Vertical
	4872.4	43.5	1.6	45.1	54.0	-8.9	Average	Vertical
	7596.0	37.0	10.7	47.8	74.0	-26.2	Peak	Vertical
*	8811.5	36.7	11.0	47.7	85.4	-37.7	Peak	Vertical
*	10384.0	35.8	15.1	50.8	85.4	-34.6	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (105.4dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11g	Test Channel:	11
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4927.0	58.4	1.2	59.6	74.0	-14.4	Peak	Horizontal
	4927.0	50.2	1.2	51.4	54.0	-2.6	Average	Horizontal
	7579.0	37.3	9.8	47.1	74.0	-26.9	Peak	Horizontal
*	8641.5	36.2	10.7	46.9	84.8	-37.9	Peak	Horizontal
*	10367.0	36.4	14.5	50.9	84.8	-33.9	Peak	Horizontal
	4918.5	56.8	1.4	58.2	74.0	-15.8	Peak	Vertical
	4924.6	43.9	1.3	45.1	54.0	-8.9	Average	Vertical
	7468.5	38.3	9.6	48.0	74.0	-26.0	Peak	Vertical
*	8769.0	36.5	11.0	47.5	84.8	-37.3	Peak	Vertical
*	9950.5	37.4	12.8	50.2	84.8	-34.6	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (104.8dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11n-HT20	Test Channel:	01
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4825.0	56.2	1.9	58.1	74.0	-15.9	Peak	Horizontal
	4825.0	43.3	1.9	45.2	54.0	-8.8	Average	Horizontal
	7502.5	38.2	9.9	48.2	74.0	-25.8	Peak	Horizontal
*	8820.0	37.1	11.3	48.4	85.0	-36.6	Peak	Horizontal
*	9942.0	36.9	12.3	49.2	85.0	-35.8	Peak	Horizontal
	4825.0	57.0	1.9	58.9	74.0	-15.1	Peak	Vertical
	4825.6	41.8	1.9	43.7	54.0	-10.3	Average	Vertical
	7494.0	37.7	10.5	48.3	74.0	-25.7	Peak	Vertical
*	8752.0	37.5	10.8	48.3	85.0	-36.7	Peak	Vertical
*	10384.0	37.5	15.1	52.6	85.0	-32.4	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (105.0dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11n-HT20	Test Channel:	06
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4876.0	58.7	1.6	60.4	74.0	-13.6	Peak	Horizontal
	4876.0	48.0	1.6	49.6	54.0	-4.4	Average	Horizontal
	7596.0	37.3	10.7	48.0	74.0	-26.0	Peak	Horizontal
*	8811.5	36.8	11.0	47.8	84.8	-37.0	Peak	Horizontal
*	9899.5	35.4	12.1	47.5	84.8	-37.3	Peak	Horizontal
	4876.0	52.1	1.6	53.7	74.0	-20.3	Peak	Vertical
	7604.5	37.4	10.0	47.4	74.0	-26.6	Peak	Vertical
*	8718.0	36.4	10.9	47.3	84.8	-37.5	Peak	Vertical
*	10384.0	35.9	15.1	50.9	84.8	-33.9	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (104.8dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11n-HT20	Test Channel:	11
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4918.5	55.3	1.4	56.7	74.0	-17.3	Peak	Horizontal
	4918.5	44.0	1.4	45.4	54.0	-8.6	Average	Horizontal
	7596.0	35.8	10.7	46.6	74.0	-27.4	Peak	Horizontal
*	8743.5	36.5	10.9	47.4	84.5	-37.1	Peak	Horizontal
*	10375.5	36.7	14.8	51.5	84.5	-33.0	Peak	Horizontal
	4927.0	51.8	1.2	53.0	74.0	-21.0	Peak	Vertical
	7596.0	36.8	10.7	47.5	74.0	-26.5	Peak	Vertical
*	7944.5	37.8	9.6	47.3	84.5	-37.2	Peak	Vertical
*	10129.0	37.0	12.9	49.9	84.5	-34.6	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (104.5dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11n-HT40	Test Channel:	03
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4859.0	53.8	1.5	55.3	74.0	-18.7	Peak	Horizontal
	4859.0	42.1	1.5	43.6	54.0	-10.4	Average	Horizontal
	7587.5	36.5	10.3	46.8	74.0	-27.2	Peak	Horizontal
*	8718.0	36.3	10.9	47.2	81.8	-34.6	Peak	Horizontal
*	10358.5	35.3	14.2	49.5	81.8	-32.3	Peak	Horizontal
	4842.0	50.7	1.5	52.1	74.0	-21.9	Peak	Vertical
	7477.0	38.1	10.0	48.1	74.0	-25.9	Peak	Vertical
*	8735.0	36.5	11.0	47.5	81.8	-34.3	Peak	Vertical
*	10384.0	36.3	15.1	51.4	81.8	-30.4	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (101.8dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11n-HT40	Test Channel:	06
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4876.0	53.7	1.6	55.3	74.0	-18.7	Peak	Horizontal
	4876.0	43.2	1.6	44.8	54.0	-9.2	Average	Horizontal
	7596.0	36.7	10.7	47.4	74.0	-26.6	Peak	Horizontal
*	8752.0	36.0	10.8	46.8	81.5	-34.7	Peak	Horizontal
*	10078.0	37.2	12.7	49.9	81.5	-31.6	Peak	Horizontal
	4876.0	47.5	1.6	49.1	74.0	-24.9	Peak	Vertical
	7587.5	36.6	10.3	46.8	74.0	-27.2	Peak	Vertical
*	8709.5	36.2	10.8	47.0	81.5	-34.5	Peak	Vertical
*	10154.5	36.8	13.0	49.8	81.5	-31.7	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (101.5dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	NTP Clock	Temperature	25°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC1	Test Date	2019/09/26
Test Mode	802.11n-HT40	Test Channel:	09
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4901.5	53.2	1.5	54.7	74.0	-19.3	Peak	Horizontal
	4901.5	42.6	1.5	44.0	54.0	-10.0	Average	Horizontal
	7596.0	36.6	10.7	47.3	74.0	-26.7	Peak	Horizontal
*	8820.0	35.9	11.3	47.2	81.1	-33.9	Peak	Horizontal
*	10256.5	37.0	13.6	50.7	81.1	-30.4	Peak	Horizontal
	4901.5	48.4	1.5	49.9	74.0	-24.1	Peak	Vertical
	7604.5	38.1	10.0	48.1	74.0	-25.9	Peak	Vertical
*	8760.5	36.3	10.9	47.2	81.1	-33.9	Peak	Vertical
*	10095.0	37.3	12.8	50.1	81.1	-31.0	Peak	Vertical

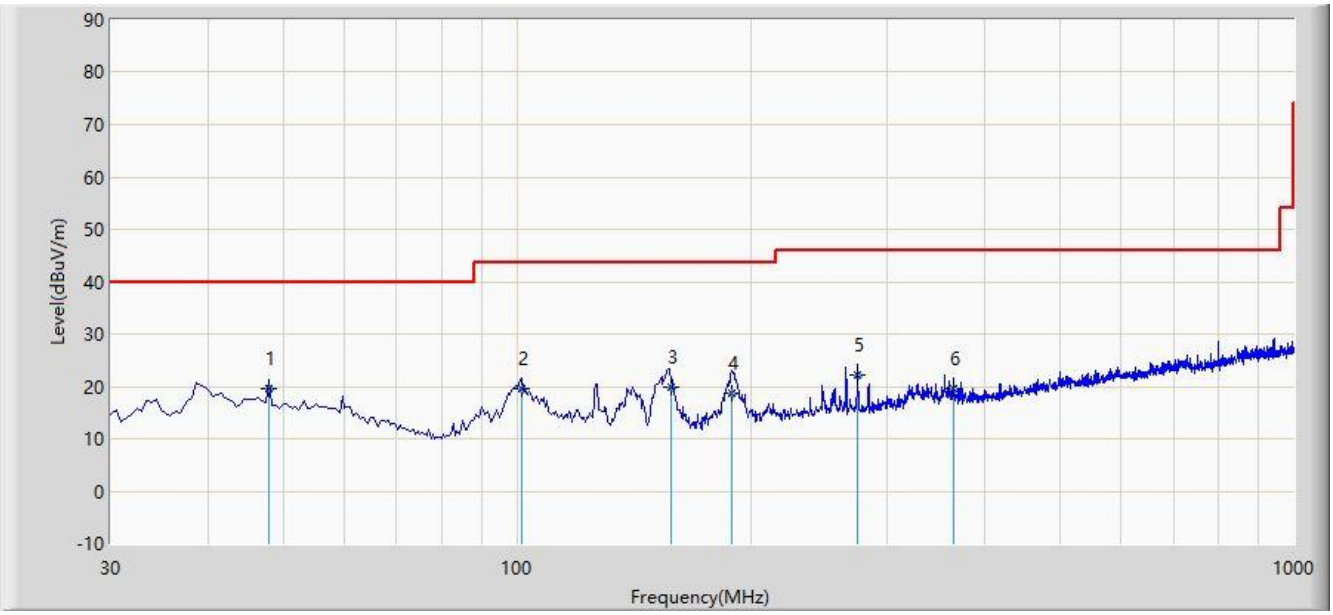
Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (101.1dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

The Worst Case of Radiated Emission below 1GHz:

Site: AC2	Time: 2019/09/26 - 14:03
Limit: FCC_Part15.209_RSE(3m)	Engineer: Bacon Dong
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: NTP Clock	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11b at Channel 2437MHz	



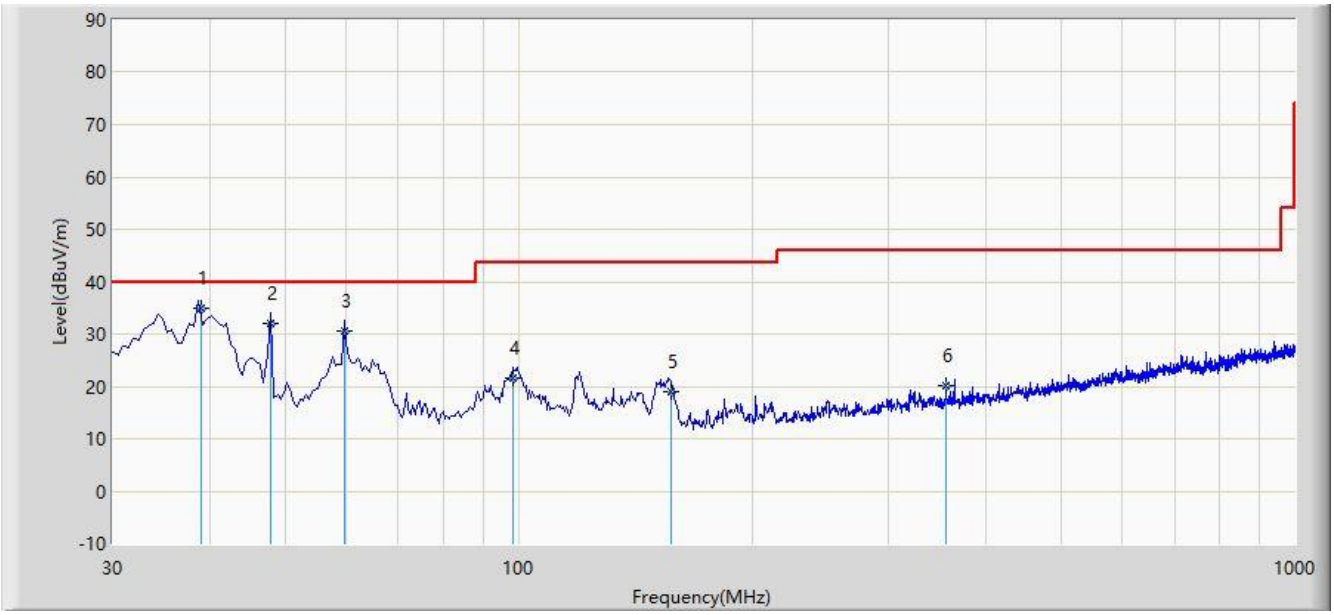
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	47.945	19.638	4.872	-20.362	40.000	14.767	QP
2		101.295	19.613	6.735	-23.887	43.500	12.879	QP
3		158.040	19.949	10.532	-23.551	43.500	9.416	QP
4		188.990	18.558	7.200	-24.942	43.500	11.358	QP
5		274.440	22.058	8.410	-23.942	46.000	13.648	QP
6		364.650	19.628	4.074	-26.372	46.000	15.554	QP

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

Site: AC2	Time: 2019/09/26 - 14:18
Limit: FCC_Part15.209_RSE(3m)	Engineer: Bacon Dong
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: NTP Clock	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11b at Channel 2437MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	38.984	34.893	21.400	-5.107	40.000	13.493	QP
2		47.945	32.005	17.239	-7.995	40.000	14.767	QP
3		59.585	30.718	16.985	-9.282	40.000	13.733	QP
4		98.385	21.678	9.185	-21.822	43.500	12.493	QP
5		157.555	19.073	9.675	-24.427	43.500	9.398	QP
6		355.435	20.093	4.668	-25.907	46.000	15.425	QP

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

7.7. Radiated Restricted Band Edge Measurement

7.7.1.Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1] 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15.209 Limits		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.7.2.Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

7.7.3.Test Setting

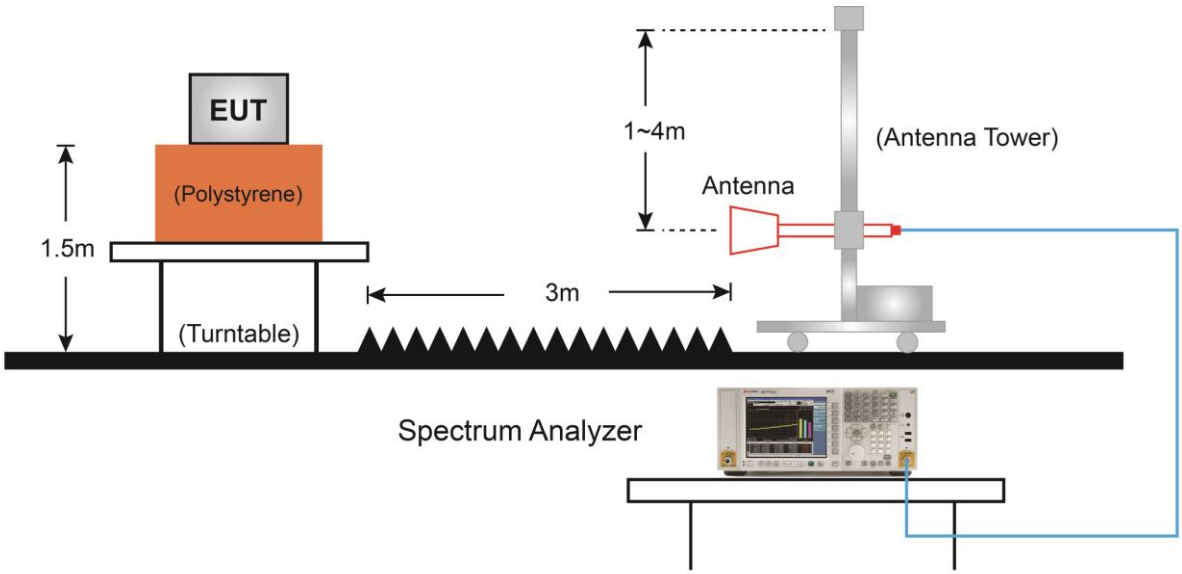
Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Field Strength Measurements

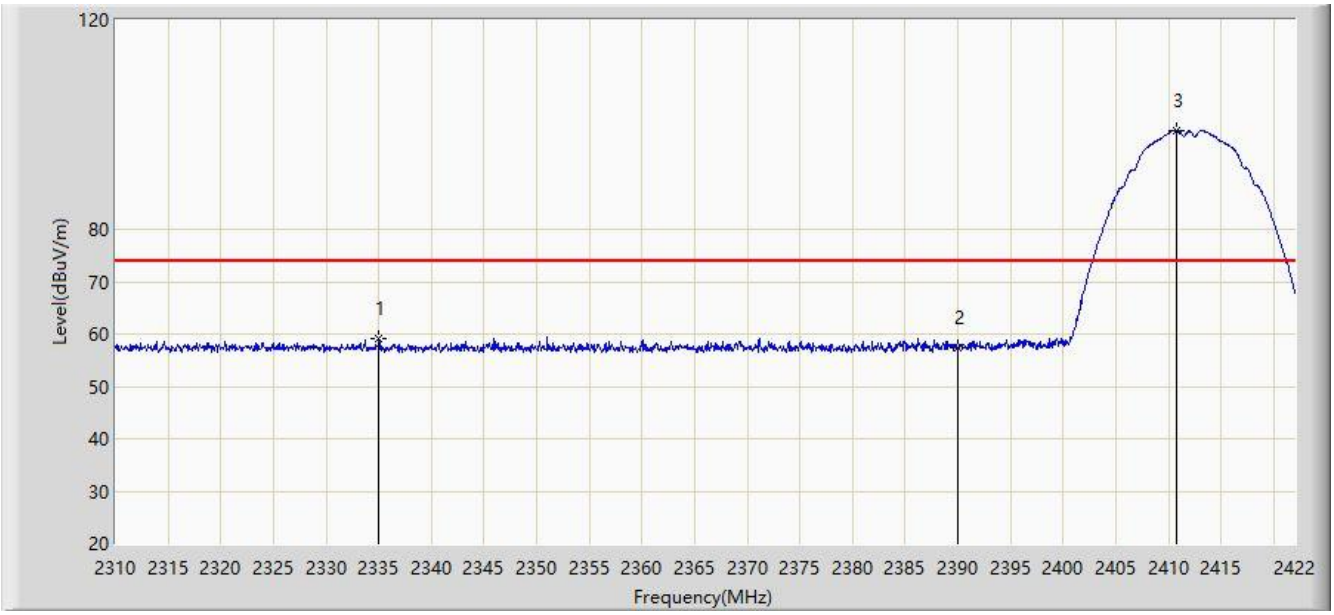
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW ≥ 1/T
4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to “Voltage” regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

7.7.4.Test Setup



7.7.5.Test Result

Site: AC2	Time: 2019/09/26 - 17:44
Limit: FCC Part 15.209_RE(3m)	Engineer: Flay Yang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: NTP Clock	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11b at channel 2412MHz	

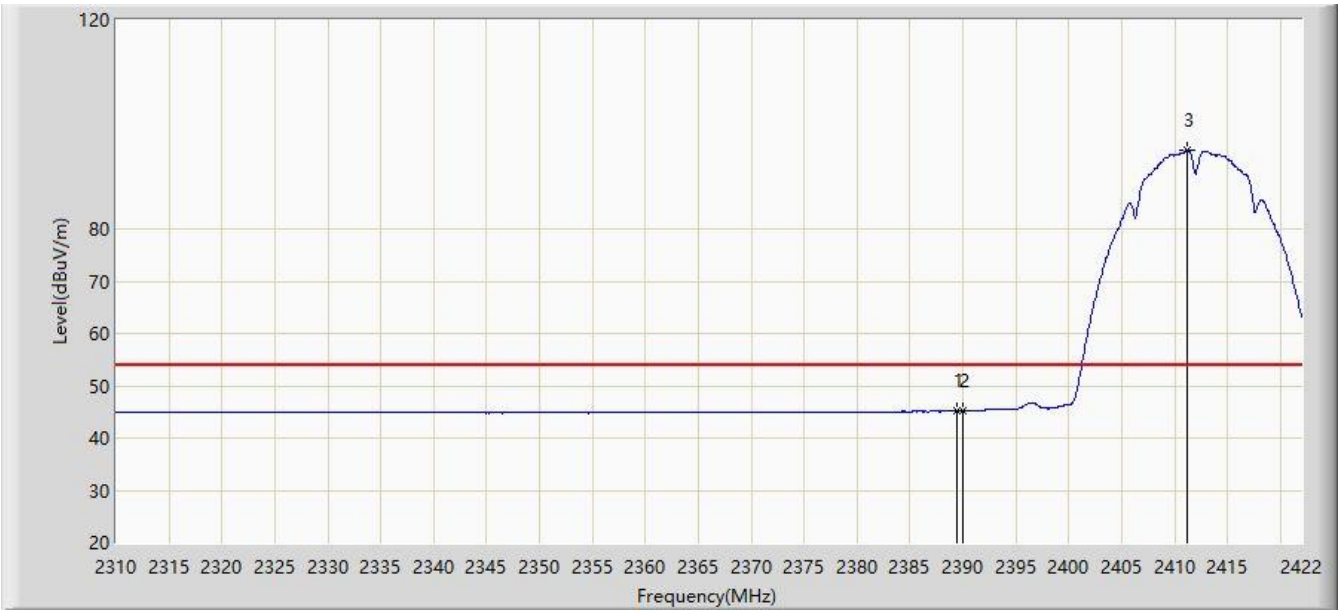


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2335.032	59.165	28.399	-14.835	74.000	30.766	PK
2			2390.000	57.347	26.753	-16.653	74.000	30.594	PK
3		*	2410.744	98.947	68.371	N/A	N/A	30.577	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2019/09/26 - 17:46
Limit: FCC Part 15.209_RE(3m)	Engineer: Flay Yang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: NTP Clock	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11b at channel 2412MHz	

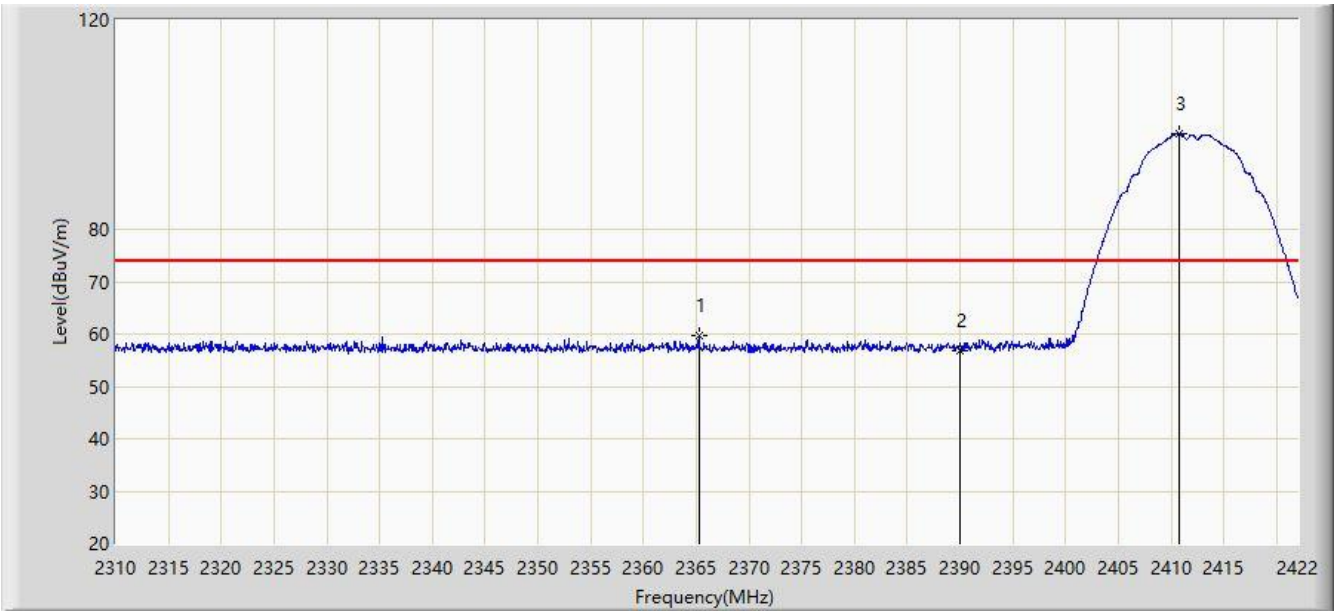


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2389.408	45.163	14.568	-8.837	54.000	30.595	AV
2			2390.000	45.128	14.534	-8.872	54.000	30.594	AV
3		*	2411.248	95.171	64.595	N/A	N/A	30.576	AV

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2019/09/26 - 17:48
Limit: FCC Part 15.209_RE(3m)	Engineer: Flay Yang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: NTP Clock	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11b at channel 2412MHz	

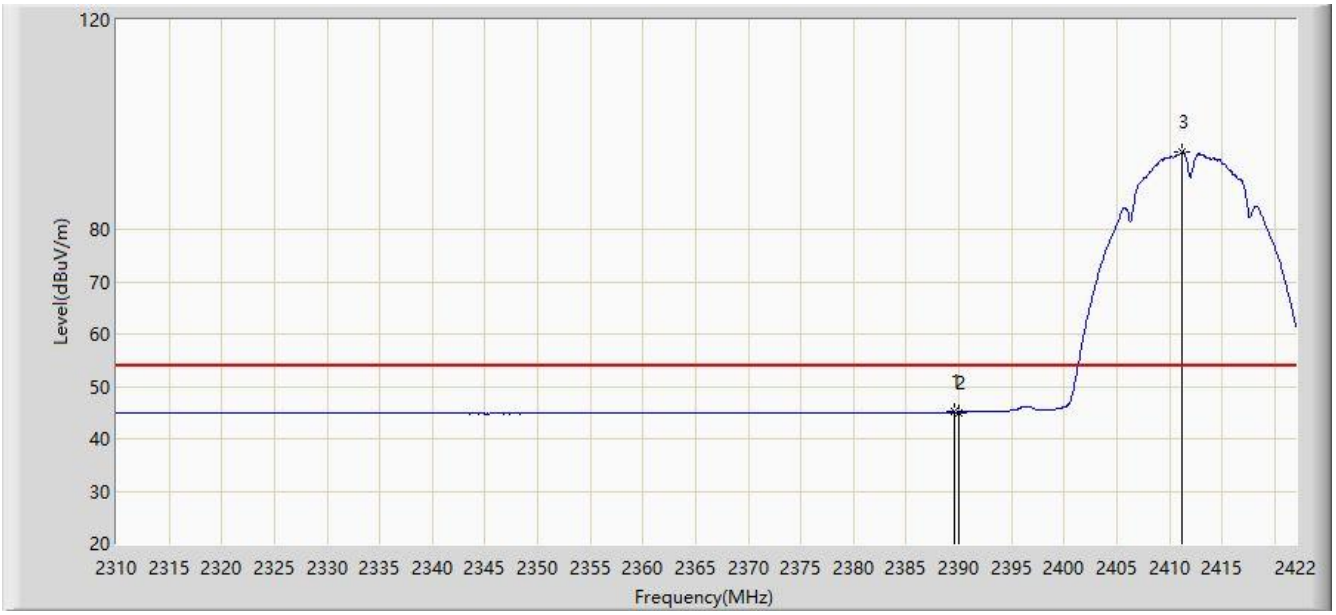


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2365.272	59.702	29.050	-14.298	74.000	30.652	PK
2			2390.000	56.859	26.265	-17.141	74.000	30.594	PK
3		*	2410.744	98.295	67.719	N/A	N/A	30.577	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2019/09/26 - 17:50
Limit: FCC Part 15.209_RE(3m)	Engineer: Flay Yang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: NTP Clock	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11b at channel 2412MHz	

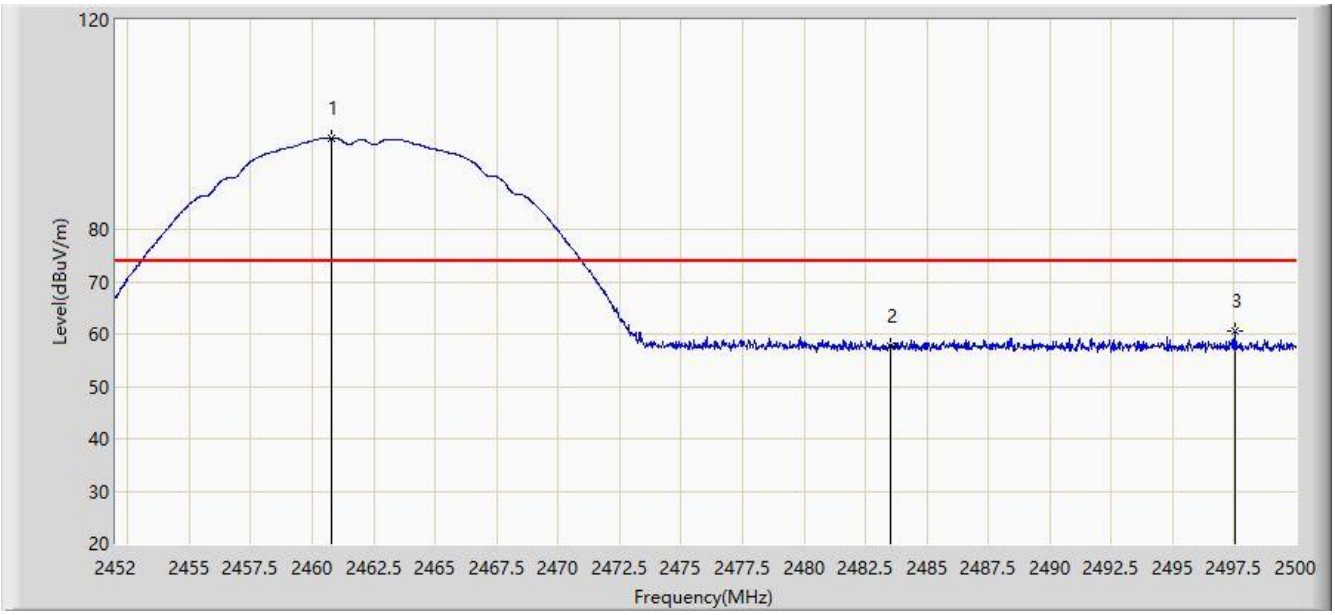


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2389.520	45.085	14.490	-8.915	54.000	30.595	AV
2			2390.000	45.055	14.461	-8.945	54.000	30.594	AV
3		*	2411.192	94.682	64.106	N/A	N/A	30.576	AV

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2019/09/26 - 17:52
Limit: FCC Part 15.209_RE(3m)	Engineer: Flay Yang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: NTP Clock	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11b at channel 2462MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2460.784	97.532	67.004	N/A	N/A	30.528	PK
2			2483.500	57.729	27.160	-16.271	74.000	30.569	PK
3			2497.528	60.455	29.828	-13.545	74.000	30.627	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2019/09/26 - 17:56
Limit: FCC Part 15.209_RE(3m)	Engineer: Flay Yang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: NTP Clock	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11b at channel 2462MHz	

No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2461.216	93.986	63.456	N/A	N/A	30.530	AV
2			2483.500	45.371	14.802	-8.629	54.000	30.569	AV
3			2483.512	45.374	14.805	-8.626	54.000	30.569	AV

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)