

MEASUREMENT REPORT

FCC PART 15.247 WLAN 802.11b/g/n/ax

Report No.: S20230316528501E06

Issue Date: 05-07-2023

Applicant: Xi'an NovaStar Tech Co., Ltd.

Address: 101 Block D-F, 01 Square, Xi'an Software Park, No.72,
2nd Keji Road, Xi'an, Shaanxi, China

FCC ID: 2AG8JTU20P

Product: LED Playback Control Processor

Model No.: TU20 Pro, TU15 Pro

FCC Classification: Digital Transmission System (DTS)

FCC Rule Part(s): Part 15 Subpart C (15.247)

Test Procedure(s): ANSI C63.10-2013, KDB 558074 D01v05r02

Result: Pass

Receipt date: Mar 16, 2023

Test Date: Mar 17 ~ May 06, 2023

Compiled By

(Amos Xia)
Senior Test Engineer

Approved By

(Line Chen)
Engineer Manager

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 KDB 558074 D01. 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 Fanguang Inspection & Testing Co., Ltd. Wuxi Branch

The test report must not be used by the client to claim product certifications, approval, or endorsement by NVLAP, NIST or any agency of U.S. Government.

Revision History

Report No.	Version	Description	Issue Date
S20230316528501E06	Rev. 01	/	05-07-2023

CONTENTS

Description	Page
§2.1033 General Information	5
1. INTRODUCTION	6
1.1. Scope	6
1.2. Fangguang Test Location	6
2. PRODUCT INFORMATION	7
2.1. Equipment Description	7
2.2. Product Specification Subjective to this Report	7
2.3. Operation Frequency / Channel List	7
2.4. Description of Available Antennas	8
2.5. Device Capabilities	9
2.6. Description of Test Software	10
2.7. Test Mode	11
2.8. Test Configuration	11
2.9. EMI Suppression Device(s)/Modifications	11
2.10. Labeling Requirements	11
3. DESCRIPTION OF TEST	12
3.1. Evaluation Procedure	12
3.2. AC Line Conducted Emissions	12
3.3. Radiated Emissions	13
4. ANTENNA REQUIREMENTS	14
5. TEST EQUIPMENT CALIBRATION DATE	15
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	21
7.3.1. Test Limit	21

7.3.2. Test Procedure Used	21
7.3.3. Test Setting	21
7.3.4. Test Setup	22
7.3.5. Test Result of Output Power	23
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	27
7.4.5. Test Result	28
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 Setting	30
7.5.4. Test Setup	30
7.5.5. Test Result	31
7.6. Radiated Spurious Emission Measurement	36
7.6.1. Test Limit	36
7.6.2. Test Procedure Used	36
7.6.3. Test Setting	36
7.6.4. Test Setup	38
7.6.5. Test Result	40
7.7. Radiated Restricted Band Edge Measurement	45
7.7.1. Test Limit	45
7.7.2. Test Procedure Used	46
7.7.3. Test Setting	46
7.7.4. Test Setup	47
7.7.5. Test Result	48
7.8. AC Conducted Emissions Measurement	64
7.8.1. Test Limit	64
7.8.2. Test Setup	64
7.8.3. Test Result	65
8. CONCLUSION	71

§2.1033 General Information

Applicant:	Xi'an NovaStar Tech Co., Ltd.
Applicant Address:	101 Block D-F, 01 Square, Xi'an Software Park, No.72, 2nd Keji Road, Xi'an, Shaanxi, China
Manufacturer:	Xi'an NovaStar Tech Co., Ltd.
Manufacturer Address:	101 Block D-F, 01 Square, Xi'an Software Park, No.72, 2nd Keji Road, Xi'an, Shaanxi, China
Test Site:	Fangguang Inspection & Testing Co., Ltd.
LAB ID:	CN5037
Test Site Address:	G9 Building, China Sensor Network International Innovation Park No.200, Linghu Avenue Wuxi, Jiangsu 214000 China
FCC Rule Part(s):	Part 15 Subpart C (15.247)
FCC ID:	2AG8JTU20P
Test Device Serial No.:	S/N.: 2KKA02B12N0A10000059 ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Digital Transmission System (DTS)

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.

1.2. Fangguang Test Location

These measurement tests were performed at the Fangguang Inspection and testing Co.,LTD located at 200 Linghu Avenue, Xinwu District, Wuxi City. The detailed description of the measurement facility was found to be in compliance with the requirements of ANSI C63.4-2014.

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	LED Playback Control Processor								
Model Name:	TU20 Pro								
Additional Model:	TU15 Pro								
Model Description:	TU20 Pro and TU15 Pro are the same on the board, Schematic, Hardware version, Software version and internal photos are same, only port structure and the model name are different. <table><tr><th>Model</th><th>TU15 Pro</th><th>TU20 Pro</th></tr><tr><td>Number of RJ45 ports equipped</td><td>4</td><td>6</td></tr></table>			Model	TU15 Pro	TU20 Pro	Number of RJ45 ports equipped	4	6
Model	TU15 Pro	TU20 Pro							
Number of RJ45 ports equipped	4	6							
Trade Mark:									
Input Voltage Range:	DC 12V, 3A								
Wi-Fi Specification:	802.11b/g/n20/ax20/n40(The sample has two WiFi Modules, one for WIFI-STA function and that supports b/g/n20/n40, and the other for WiFi -AP function that support b/g/n20/ax20)								

2.2. Product Specification Subjective to this Report

Frequency Range:	802.11b/g/n20/ax20: 2412 ~ 2462MHz 802.11n40:2422 ~ 2452MHz
Channel Number:	802.11b/g/n20/ax20: 11 802.11n40:7
Type of Modulation:	802.11b: DSSS 802.11g/n/ax: OFDM
Data Rate:	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n/ax: MCS0~MCS7
Antenna Type:	Dipole Antenna
Antenna Gain:	WIFI-STA-Ant 0:2.27dBi WIFI-AP-Ant1:2.27dBi, Ant2:2.27dBi

2.3. Operation Frequency / Channel List

802.11b/g/n20/ax20

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	--	--

802.11n40

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. Description of Available Antennas

Antenna	Frequency Band (GHz)	Product Number	Tx Paths	Antenna
Dipole Antenna	2.4&5	WIFI-STA	1	Ant 0
Dipole Antenna	2.4&5	WIFI-AP	2	Ant 1+Ant 2

Antenna	Frequency Band (MHz)	Tx Paths	Per Chain Max Antenna Gain (dBi)		Beam Forming Directional Gain (dBi)	CDD Directional Gain (dBi)
			Ant 1	Ant 2		
WIFI-AP Ant 1+Ant 2	2412 ~2462	2	2.27	2.27	Nonsupport	5.28
	5150 ~ 5250 5725 ~ 5850	2	2.83	2.83	Nonsupport	5.84

Note:

Unequal Antenna gains, with equal transmit powers. For Antenna gains given by $G_1, G_2, \dots, G_N$ dBi transmit signals are correlated, then

- Directional gain = $10 \cdot \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}]$ dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]
- Directional Gain(2.4G) = $10 \cdot \log[(10^{2.27/20} + 10^{2.27/20})^2 / 2] = 5.28$ dBi

- Directional Gain(5G) = $10 \cdot \log[(10^{2.83/20} + 10^{2.83/20})^2/2] = 5.84 \text{ dBi}$

2.5. Device Capabilities

This device contains the following capabilities:

2.4GHz WLAN (DTS)

Note: 2.4GHz WLAN (DTS) operation is possible in 20MHz channel bandwidths. The maximum achievable duty cycle was 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:

Test Mode	Antenna	Frequency[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	Ant0	2412	8.43	8.52	98.94
		2437	8.41	8.51	98.82
		2462	8.41	8.50	98.94
11G	Ant0	2412	1.40	1.50	93.33
		2437	1.39	1.49	93.29
		2462	1.40	1.49	93.96
11N20SISO	Ant0	2412	1.31	1.41	92.91
		2437	1.31	1.41	92.91
		2462	1.31	1.41	92.91
11N40SISO	Ant0	2422	0.65	0.68	95.59
		2437	0.64	0.68	94.12
		2452	0.65	0.68	95.59

Test Mode	Antenna	Frequency[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	Ant1	2412	8.42	8.51	98.94
	Ant2	2412	8.41	8.51	98.82
	Ant1	2437	8.41	8.50	98.94
	Ant2	2437	8.42	8.51	98.94
	Ant1	2462	8.42	8.52	98.83
	Ant2	2462	8.42	8.51	98.94
11G	Ant1	2412	1.39	1.49	93.29
	Ant2	2412	1.39	1.49	93.29
	Ant1	2437	1.40	1.50	93.33

	Ant2	2437	1.40	1.50	93.33
	Ant1	2462	1.40	1.50	93.33
	Ant2	2462	1.40	1.50	93.33
11N20SISO	Ant1	2412	1.31	1.41	92.91
	Ant2	2412	1.30	1.40	92.86
	Ant1	2437	1.30	1.41	92.20
	Ant2	2437	1.31	1.41	92.91
	Ant1	2462	1.31	1.41	92.91
	Ant2	2462	1.31	1.40	93.57
11AX20SISO	Ant1	2412	1.02	1.12	91.07
	Ant2	2412	1.02	1.12	91.07
	Ant1	2437	1.02	1.13	90.27
	Ant2	2437	1.02	1.12	91.07
	Ant1	2462	1.02	1.12	91.07
	Ant2	2462	1.02	1.12	91.07
11N20MIMO	Ant1	2412	1.31	1.41	92.91
	Ant2	2412	1.31	1.41	92.91
	Ant1	2437	1.31	1.41	92.91
	Ant2	2437	1.30	1.40	92.86
	Ant1	2462	1.31	1.41	92.91
	Ant2	2462	1.31	1.41	92.91
11AX20MIMO	Ant1	2412	1.02	1.12	91.07
	Ant2	2412	1.02	1.13	90.27
	Ant1	2437	1.02	1.12	91.07
	Ant2	2437	1.02	1.12	91.07
	Ant1	2462	1.02	1.12	91.07
	Ant2	2462	1.02	1.12	91.07

Test Graphs see Appendix E.

2.6. Description of Test Software

The test utility software used during testing was “wl tool”, Power Parameter Value:

Test Mode	ANT0	ANT1	ANT2	CDD
B	15	15	15	15
G	15	15	15	15
N20	15	15	15	15
N40	15	--	--	--

AX20	--	15	15	14
------	----	----	----	----

2.7. Test Mode

Test Mode	Mode 1: Transmit by 802.11b Ant 0
	Mode 2: Transmit by 802.11g Ant 0
	Mode 3: Transmit by 802.11n20 Ant 0
	Mode 4: Transmit by 802.11n40 Ant 0
	Mode 5: Transmit by 802.11b Ant 1
	Mode 6: Transmit by 802.11g Ant 1
	Mode 7: Transmit by 802.11n20 Ant 1
	Mode 8: Transmit by 802.11ax20 Ant 1
	Mode 9: Transmit by 802.11b Ant 2
	Mode 10: Transmit by 802.11g Ant 2
	Mode 11: Transmit by 802.11n20 Ant 2
	Mode 12: Transmit by 802.11ax20 Ant 2
	Mode 13: Transmit by 802.11n-CDD
	Mode 14: Transmit by 802.11ax-CDD

2.8. Test Configuration

The EUT was tested per the guidance of KDB 558074 D01 v05r02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.9. EMI Suppression Device(s)/Modifications

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

2.10. 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 the guidance provided in KDB 558074 D01 v05r02 were used in the measurement of the EUT.

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 whichever 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. The 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 1-25GHz 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, whichever 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.”

- Use a unique coupling to the intentional radiator.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	FWXGJC-2016-181	1 year	2024/03/14
Two-Line V-Network	R&S	ENV 216	FWXGJC-2016-182	1 year	2023/06/01
Thermohygrometer	Yuhuaze	HTC-1	FWXDA-2016-385	1 year	2024/03/21

Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Loop Antenna	Schwarzbeck	FMZB 1519B	FWXGJC-2018-015	3 year	2024/08/13
Bi-Log Antenna	R&S	HL562E	FWXGJC-2016-267-06	3 year	2024/03/10
Broadband Horn Antenna	R&S	HF907	FWXGJC-2016-267-07	1 year	2024/03/02
Broadband Horn Antenna	Schwarzbeck	BBHA9170	FWXGJC-2018-016	3 year	2024/06/04
EMI Receiver	R&S	ESR26	FWXGJC-2016-267-01	1 year	2023/11/08
Pre-Amplifier	R&S	SCU-18D	FWXGJC-2016-267-05	1 year	2023/11/17
Pre-Amplifier	R&S	EMC184055 SE	FWXGJC-2018-018	3 year	2025/04/13
Thermohygrometer	Yuhuaze	HTC-1	FWXDA-2016-386	1 year	2023/11/21
Anechoic Chamber	Aimuke	EMCCT-3	FWXGJC-2016-270	1 year	2025/06/07

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Keysight	N9010B	FWXGJC-2018-010	1 year	2024/03/13
RF Control Unit	Toncend	JS0806-2	FWXGJC-2018-013	1 year	2023/06/30
Thermohygrometer	Yuhuaze	HTC-1	FWXDA-2016-385	1 year	2023/11/21

Test Software	Manufacturer	Version	Asset No.	Function
EMI Test Software	tonscend	/	/	/

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
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 2.05dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 30MHz-1GHz: 3.06dB 1GHz-12.75GHz: 4.13dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 30MHz-1GHz: 1.00 dB 1GHz-26.5GHz: 1.30 dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.60dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.80dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.20MHz

7. TEST RESULT

7.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.203	Antenna Requirement	/	/	Pass	Section 4
15.247(a)(2)	6dB Bandwidth	$\geq 500\text{kHz}$	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	$\leq 30\text{dBm}$		Pass	Section 7.3
15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$		Pass	Section 7.4
15.247(d)	Band Edge	$\geq 20\text{dBc}$		Pass	Section 7.5
15.247(d)	Out-of-Band Emissions	$\geq 20\text{dBc}$		Pass	Section 7.6
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 7.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	AC Line Conducted	Pass	Section 7.8

Notes:

- 1) 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.
- 2) 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.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

7.2. 6dB Bandwidth Measurement

7.2.1. Test Limit

The minimum permissible 6dB bandwidth is 500 kHz.

7.2.2. Test Procedure used

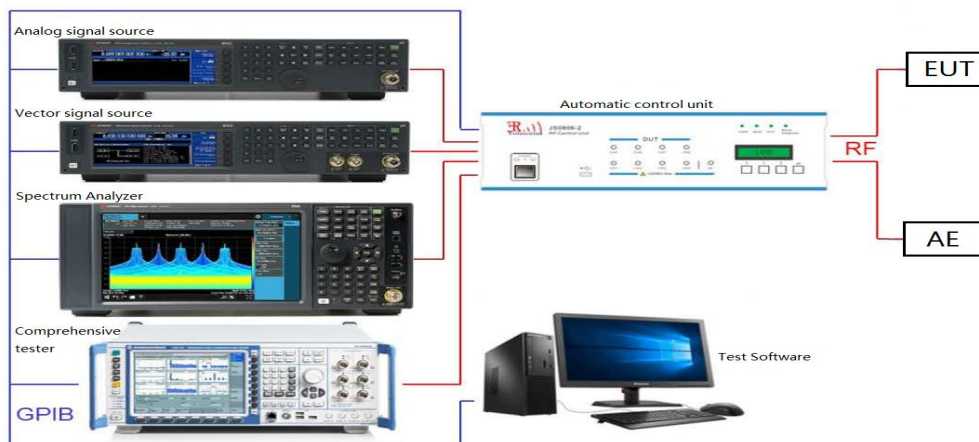
ANSI C63.10-2013 Section 11.8.2 Option 1

KDB 558074 D01 v05r02 – Section 8.2

7.2.3. Test Setting

1. Set RBW = 100 kHz
2. VBW $\geq 3 \times$ RBW
3. Detector = peak
4. Trace mode = max hold
5. Sweep = auto couple
6. Allow the trace was allowed to stabilize
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.2.4. Test Setup



7.2.5. Test Result

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	99%BW	Verdict
11B	Ant0	2412	7.560	2408.000	2415.560	0.5	12.011	PASS
		2437	8.520	2433.040	2441.560	0.5	11.946	PASS
		2462	7.560	2458.480	2466.040	0.5	12.023	PASS
11G	Ant0	2412	16.360	2403.840	2420.200	0.5	17.193	PASS
		2437	16.360	2428.880	2445.240	0.5	17.164	PASS
		2462	16.360	2453.840	2470.200	0.5	17.132	PASS
11N20SISO	Ant0	2412	17.400	2403.240	2420.640	0.5	18.239	PASS
		2437	16.360	2429.480	2445.840	0.5	18.125	PASS
		2462	17.560	2453.240	2470.800	0.5	18.266	PASS
11N40SISO	Ant0	2422	35.040	2404.480	2439.520	0.5	35.823	PASS
		2437	35.120	2419.480	2454.600	0.5	36.067	PASS
		2452	35.440	2434.480	2469.920	0.5	36.415	PASS

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	99%BW	Verdict
11B	Ant1	2412	7.560	2408.000	2415.560	0.5	12.004	PASS
	Ant2	2412	7.080	2408.480	2415.560	0.5	12.028	PASS
	Ant1	2437	7.120	2433.480	2440.600	0.5	11.943	PASS
	Ant2	2437	6.560	2433.960	2440.520	0.5	11.981	PASS
	Ant1	2462	8.040	2458.000	2466.040	0.5	12.011	PASS
	Ant2	2462	8.040	2458.000	2466.040	0.5	12.054	PASS
11G	Ant1	2412	16.360	2403.840	2420.200	0.5	17.170	PASS
	Ant2	2412	16.360	2403.840	2420.200	0.5	17.170	PASS
	Ant1	2437	16.320	2428.880	2445.200	0.5	17.140	PASS
	Ant2	2437	16.080	2429.120	2445.200	0.5	17.111	PASS
	Ant1	2462	16.320	2453.880	2470.200	0.5	17.179	PASS
	Ant2	2462	16.320	2453.840	2470.160	0.5	17.197	PASS
11N20SISO	Ant1	2412	17.560	2403.240	2420.800	0.5	18.246	PASS
	Ant2	2412	17.560	2403.240	2420.800	0.5	18.221	PASS
	Ant1	2437	16.400	2429.440	2445.840	0.5	18.212	PASS
	Ant2	2437	17.640	2428.240	2445.880	0.5	18.186	PASS
	Ant1	2462	17.560	2453.240	2470.800	0.5	18.178	PASS
	Ant2	2462	17.560	2453.240	2470.800	0.5	18.280	PASS

11AX20SI SO	Ant1	2412	18.840	2402.560	2421.400	0.5	18.951	PASS
	Ant2	2412	17.880	2403.320	2421.200	0.5	18.946	PASS
	Ant1	2437	17.880	2428.640	2446.520	0.5	18.983	PASS
	Ant2	2437	17.880	2428.480	2446.360	0.5	18.885	PASS
	Ant1	2462	18.240	2453.000	2471.240	0.5	19.026	PASS
	Ant2	2462	18.480	2452.520	2471.000	0.5	19.010	PASS
11N20MIM O	Ant1	2412	17.560	2403.240	2420.800	0.5	18.190	PASS
	Ant2	2412	17.560	2403.240	2420.800	0.5	18.231	PASS
	Ant1	2437	16.720	2429.120	2445.840	0.5	18.215	PASS
	Ant2	2437	16.280	2429.520	2445.800	0.5	18.082	PASS
	Ant1	2462	17.560	2453.240	2470.800	0.5	18.198	PASS
	Ant2	2462	17.560	2453.240	2470.800	0.5	18.224	PASS
11AX20MI MO	Ant1	2412	17.920	2402.600	2420.520	0.5	19.049	PASS
	Ant2	2412	18.280	2403.120	2421.400	0.5	18.950	PASS
	Ant1	2437	17.960	2428.600	2446.560	0.5	18.938	PASS
	Ant2	2437	17.120	2428.800	2445.920	0.5	19.015	PASS
	Ant1	2462	18.360	2453.120	2471.480	0.5	18.991	PASS
	Ant2	2462	18.760	2452.560	2471.320	0.5	19.162	PASS

Test Graphs see Appendix A.

7.3. Output Power Measurement

7.3.1. Test Limit

The maximum conducted output power is 1 Watt. And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.3.2. Test Procedure Used

ANSI C63.10-2013 – Section 11.9.2.2.4

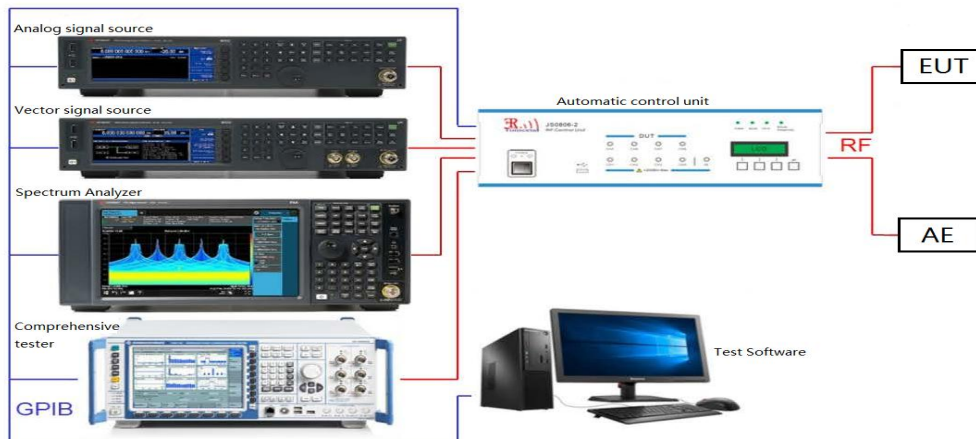
KDB 558074 D01 v05r02 – Section 8.3.2.2

7.3.3. Test Setting

1. Set span to at least 1.5 times the OBW..
2. Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
3. Set VBW $\geq [3 \times \text{RBW}]$.
4. Number of points in sweep $\geq [2 \times \text{span} / \text{RBW}]$. (This gives bin-to-bin spacing $\text{RBW} / 2$, so that narrowband signals are not lost between frequency bins.)
5. Sweep time = auto.
6. Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
7. Do not use sweep triggering. Allow the sweep to “free run.”
8. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the ON and OFF periods of the transmitter.
9. Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum. 10. Add $[10 \log (1 / D)]$, where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both

the ON and OFF times of the transmission). For example, add $[10 \log (1/0.25)] = 6 \text{ dB}$ if the duty cycle is 25%.

7.3.4. Test Setup



7.3.5. Test Result of Output Power

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

N _{TX}	Data Rate (Mbps)	
	802.11b	802.11g
1	1	6
1	2	9
1	5.5	12
1	11	18
1	--	24
1	--	36
1	--	48
1	--	54

N _{TX}	MCS Index for 802.11n	Data Rate (Mbps)			
		20MHz Bandwidth		40MHz Bandwidth	
		800ns GI	400ns GI	800ns GI	400ns GI
1	0	6.5	7.2	13.5	15.0
1	1	13.0	14.4	27.0	30.0
1	2	19.5	21.7	40.5	45.0
1	3	26.0	28.9	54.0	60.0
1	4	39.0	43.3	81.0	90.0
1	5	52.0	57.8	108.0	120.0
1	6	58.5	65.0	121.5	135.0
1	7	65.0	72.2	135.0	150.0

Note: Power output test was verified over all data rates of each mode shown as above, and then choose the maximum power output (yellow marker) for final test of each channel.

Test Result of Maximum conducted output power

Test Mode	Antenna	Frequency[MHz]	Average power [dBm]	DC Factor [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant0	2412	12.71	0.05	12.76	≤30.00	PASS
		2437	12.89	0.05	12.94	≤30.00	PASS
		2462	12.59	0.05	12.64	≤30.00	PASS
11G	Ant0	2412	13.04	0.30	13.34	≤30.00	PASS
		2437	13.52	0.30	13.82	≤30.00	PASS
		2462	13.04	0.27	13.31	≤30.00	PASS
11N20SISO	Ant0	2412	13.02	0.32	13.34	≤30.00	PASS
		2437	13.43	0.32	13.75	≤30.00	PASS
		2462	13.22	0.32	13.54	≤30.00	PASS
11N40SISO	Ant0	2422	10.65	0.20	10.85	≤30.00	PASS
		2437	10.57	0.26	10.83	≤30.00	PASS
		2452	10.36	0.20	10.56	≤30.00	PASS

Test Mode	Antenna	Frequency[MHz]	Average power [dBm]	DC Factor [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	12.93	0.05	12.98	≤30.00	PASS
	Ant2	2412	13.56	0.05	13.61	≤30.00	PASS
	Ant1	2437	13.26	0.05	13.31	≤30.00	PASS
	Ant2	2437	13.47	0.05	13.52	≤30.00	PASS
	Ant1	2462	12.93	0.05	12.98	≤30.00	PASS
	Ant2	2462	12.62	0.05	12.67	≤30.00	PASS
11G	Ant1	2412	13.22	0.30	13.52	≤30.00	PASS
	Ant2	2412	13.97	0.30	14.27	≤30.00	PASS
	Ant1	2437	13.89	0.30	14.19	≤30.00	PASS
	Ant2	2437	13.83	0.30	14.13	≤30.00	PASS
	Ant1	2462	13.59	0.30	13.89	≤30.00	PASS
	Ant2	2462	13.11	0.30	13.41	≤30.00	PASS
11N20SISO	Ant1	2412	13.17	0.32	13.49	≤30.00	PASS
	Ant2	2412	13.94	0.32	14.26	≤30.00	PASS
	Ant1	2437	13.59	0.35	13.94	≤30.00	PASS
	Ant2	2437	13.86	0.32	14.18	≤30.00	PASS
	Ant1	2462	13.41	0.32	13.73	≤30.00	PASS

	Ant2	2462	13.08	0.29	13.37	≤30.00	PASS
11AX20SIS O	Ant1	2412	13.39	0.41	13.80	≤30.00	PASS
	Ant2	2412	13.97	0.41	14.38	≤30.00	PASS
	Ant1	2437	13.85	0.44	14.29	≤30.00	PASS
	Ant2	2437	13.86	0.41	14.27	≤30.00	PASS
	Ant1	2462	13.59	0.41	14.00	≤30.00	PASS
	Ant2	2462	13.29	0.41	13.70	≤30.00	PASS
11N20MIM O	Ant1	2412	13.18	0.32	13.50	≤30.00	PASS
	Ant2	2412	13.01	0.32	13.33	≤30.00	PASS
	total	2412	---	---	16.43	≤30.00	PASS
	Ant1	2437	13.69	0.32	14.01	≤30.00	PASS
	Ant2	2437	13.55	0.32	13.87	≤30.00	PASS
	total	2437	---	---	16.95	≤30.00	PASS
	Ant1	2462	13.39	0.32	13.71	≤30.00	PASS
	Ant2	2462	13.37	0.32	13.69	≤30.00	PASS
	total	2462	---	---	16.71	≤30.00	PASS
11AX20MI MO	Ant1	2412	13.60	0.41	14.01	≤30.00	PASS
	Ant2	2412	14.24	0.44	14.68	≤30.00	PASS
	total	2412	---	---	17.37	≤30.00	PASS
	Ant1	2437	14.02	0.41	14.43	≤30.00	PASS
	Ant2	2437	13.62	0.41	14.03	≤30.00	PASS
	total	2437	---	---	17.24	≤30.00	PASS
	Ant1	2462	13.69	0.41	14.10	≤30.00	PASS
	Ant2	2462	13.86	0.41	14.27	≤30.00	PASS
	total	2462	---	---	17.20	≤30.00	PASS

The Duty Cycle Factor is compensated in the Offset of graph.

Test Graphs see Appendix B.

7.4. Power Spectral Density Measurement

7.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band. And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.4.2. Test Procedure Used

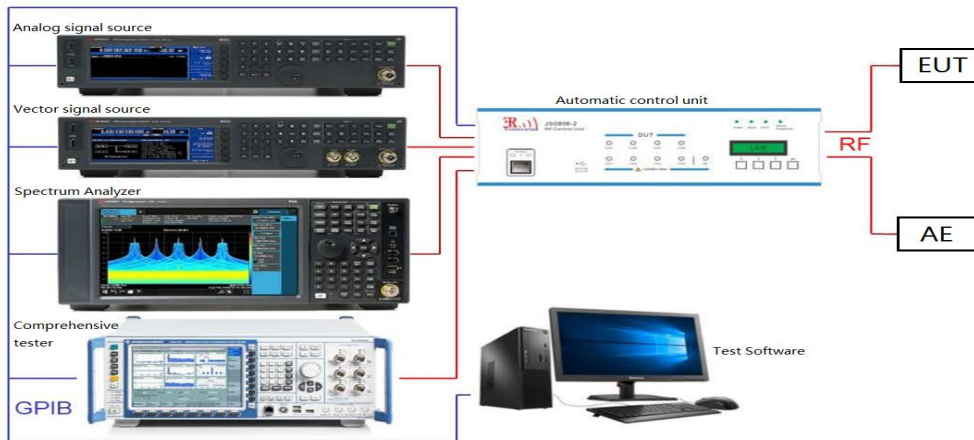
KDB 558074 D01 v05r02 - Section 8.4

ANSI C63.10 – Section 11.10.5

7.4.3. Test Setting

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the OBW.
3. Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq [3 \times \text{RBW}]$.
5. Detector = power averaging (rms) or sample detector (when rms not available).
6. Ensure that the number of measurement points in the sweep $\geq [2 \times \text{span} / \text{RBW}]$.
7. Sweep time = auto couple.
8. Do not use sweep triggering; allow sweep to “free run.”
9. Employ trace averaging (rms) mode over a minimum of 100 traces.
10. Use the peak marker function to determine the maximum amplitude level.
11. Add $[10 \log (1 / D)]$, where D is the duty cycle measured in step a), to the measured PSD to
12. If measured value exceeds requirement specified by regulatory agency, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced)..

7.4.4. Test Setup



7.4.5. Test Result

TestMode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant0	2412	-17.82	≤8.00	PASS
		2437	-17.49	≤8.00	PASS
		2462	-18.02	≤8.00	PASS
11G	Ant0	2412	-16.72	≤8.00	PASS
		2437	-16.45	≤8.00	PASS
		2462	-16.67	≤8.00	PASS
11N20SISO	Ant0	2412	-19.74	≤8.00	PASS
		2437	-19.20	≤8.00	PASS
		2462	-19.62	≤8.00	PASS
11N40SISO	Ant0	2422	-22.05	≤8.00	PASS
		2437	-21.91	≤8.00	PASS
		2452	-23.99	≤8.00	PASS

Test Mode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-17.65	≤8.00	PASS
	Ant2	2412	-16.88	≤8.00	PASS
	Ant1	2437	-17.38	≤8.00	PASS
	Ant2	2437	-17.30	≤8.00	PASS
	Ant1	2462	-17.52	≤8.00	PASS
	Ant2	2462	-18.26	≤8.00	PASS
11G	Ant1	2412	-16.55	≤8.00	PASS
	Ant2	2412	-15.35	≤8.00	PASS
	Ant1	2437	-16.22	≤8.00	PASS
	Ant2	2437	-16.06	≤8.00	PASS
	Ant1	2462	-16.00	≤8.00	PASS
	Ant2	2462	-16.56	≤8.00	PASS
11N20SISO	Ant1	2412	-19.49	≤8.00	PASS
	Ant2	2412	-18.62	≤8.00	PASS
	Ant1	2437	-18.97	≤8.00	PASS
	Ant2	2437	-18.46	≤8.00	PASS
	Ant1	2462	-18.98	≤8.00	PASS
	Ant2	2462	-19.68	≤8.00	PASS
11AX20SISO	Ant1	2412	-17.22	≤8.00	PASS
	Ant2	2412	-17.22	≤8.00	PASS

	Ant1	2437	-17.71	≤ 8.00	PASS
	Ant2	2437	-18.05	≤ 8.00	PASS
	Ant1	2462	-18.47	≤ 8.00	PASS
	Ant2	2462	-18.08	≤ 8.00	PASS
11N20MIMO	Ant1	2412	-17.44	≤ 8.00	PASS
	Ant2	2412	-17.97	≤ 8.00	PASS
	total	2412	-14.69	≤ 8.00	PASS
	Ant1	2437	-16.93	≤ 8.00	PASS
	Ant2	2437	-16.88	≤ 8.00	PASS
	total	2437	-13.89	≤ 8.00	PASS
	Ant1	2462	-18.06	≤ 8.00	PASS
	Ant2	2462	-17.33	≤ 8.00	PASS
	total	2462	-14.67	≤ 8.00	PASS
11AX20MIMO	Ant1	2412	-17.34	≤ 8.00	PASS
	Ant2	2412	-17.90	≤ 8.00	PASS
	total	2412	-14.60	≤ 8.00	PASS
	Ant1	2437	-18.23	≤ 8.00	PASS
	Ant2	2437	-18.24	≤ 8.00	PASS
	total	2437	-15.22	≤ 8.00	PASS
	Ant1	2462	-18.46	≤ 8.00	PASS
	Ant2	2462	-17.82	≤ 8.00	PASS
	total	2462	-15.12	≤ 8.00	PASS

The Duty Cycle Factor is compensated in the Offset of graph.

Test Graphs see Appendix C.

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 30dB 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

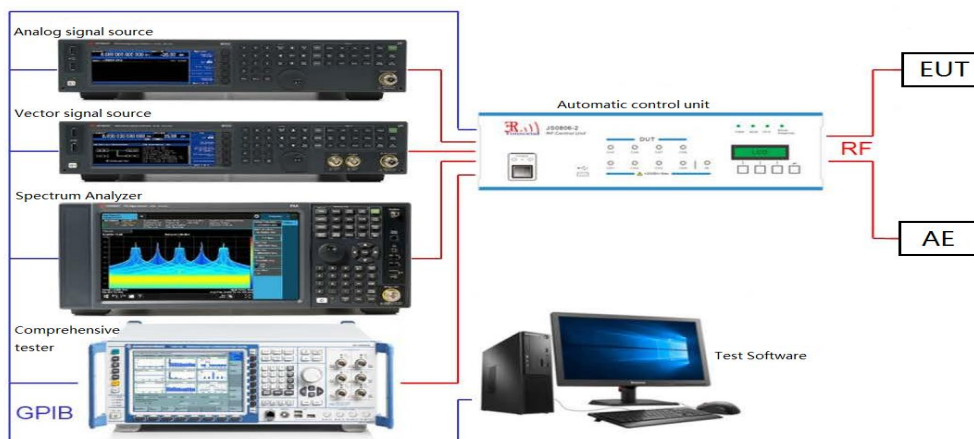
KDB 558074 D01 v05r02 - Section 8.5 & Section 8.6

ANSI C63.10 – Section 11.11&11.12

7.5.3. Test Settintng

- (a) Set the center frequency and span to encompass frequency range to be measured
- (b) RBW = 100kHz
- (c) VBW = 300kHz
- (d) Detector = RMS
- (e) Trace mode = max hold
- (f) Sweep time = auto couple
- (g) The trace was allowed to stabilize

7.5.4. Test Setup



7.5.5. Test Result

TestMode	Antenna	Frequency[MHz]	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant0	2412	Reference	5.20	5.20	---	PASS
			30~1000	5.20	-61.65	≤-14.8	PASS
			1000~26500	5.20	-52.44	≤-14.8	PASS
		2437	Reference	5.71	5.71	---	PASS
			30~1000	5.71	-61.84	≤-14.29	PASS
			1000~26500	5.71	-52.68	≤-14.29	PASS
		2462	Reference	5.42	5.42	---	PASS
			30~1000	5.42	-61.67	≤-14.58	PASS
			1000~26500	5.42	-52.45	≤-14.58	PASS
11G	Ant0	2412	Reference	0.30	0.30	---	PASS
			30~1000	0.30	-61.44	≤-19.7	PASS
			1000~26500	0.30	-52.7	≤-19.7	PASS
		2437	Reference	-1.67	-1.67	---	PASS
			30~1000	-1.67	-60.33	≤-21.67	PASS
			1000~26500	-1.67	-52.44	≤-21.67	PASS
		2462	Reference	0.02	0.02	---	PASS
			30~1000	0.02	-44.38	≤-19.98	PASS
			1000~26500	0.02	-52.51	≤-19.98	PASS
11N20SISO	Ant0	2412	Reference	1.04	1.04	---	PASS
			30~1000	1.04	-61.58	≤-18.96	PASS
			1000~26500	1.04	-53.24	≤-18.96	PASS
		2437	Reference	1.11	1.11	---	PASS
			30~1000	1.11	-61.3	≤-18.89	PASS
			1000~26500	1.11	-52.66	≤-18.89	PASS
		2462	Reference	1.25	1.25	---	PASS
			30~1000	1.25	-36.41	≤-18.75	PASS
			1000~26500	1.25	-52.93	≤-18.75	PASS
11N40SISO	Ant0	2422	Reference	-1.28	-1.28	---	PASS
			30~1000	-1.28	-61.15	≤-21.28	PASS
			1000~26500	-1.28	-35.13	≤-21.28	PASS
		2437	Reference	-2.00	-2.00	---	PASS
			30~1000	-2.00	-60.88	≤-22	PASS
			1000~26500	-2.00	-33.71	≤-22	PASS

		2452	Reference	-2.32	-2.32	---	PASS
			30~1000	-2.32	-45.93	≤-22.32	PASS
			1000~26500	-2.32	-52.35	≤-22.32	PASS

TestMode	Antenna	Frequency[MHz]	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	5.58	5.58	---	PASS
			30~1000	5.58	-61.67	≤-14.42	PASS
			1000~26500	5.58	-51.63	≤-14.42	PASS
	Ant2	2412	Reference	3.93	3.93	---	PASS
			30~1000	3.93	-61.15	≤-16.07	PASS
			1000~26500	3.93	-48.75	≤-16.07	PASS
	Ant1	2437	Reference	6.03	6.03	---	PASS
			30~1000	6.03	-61.7	≤-13.97	PASS
			1000~26500	6.03	-52.05	≤-13.97	PASS
	Ant2	2437	Reference	4.04	4.04	---	PASS
			30~1000	4.04	-61.98	≤-15.96	PASS
			1000~26500	4.04	-53.29	≤-15.96	PASS
	Ant1	2462	Reference	5.05	5.05	---	PASS
			30~1000	5.05	-61.48	≤-14.95	PASS
			1000~26500	5.05	-52.82	≤-14.95	PASS
	Ant2	2462	Reference	3.42	3.42	---	PASS
			30~1000	3.42	-61.43	≤-16.58	PASS
			1000~26500	3.42	-53.32	≤-16.58	PASS
11G	Ant1	2412	Reference	2.03	2.03	---	PASS
			30~1000	2.03	-60.91	≤-17.97	PASS
			1000~26500	2.03	-52.5	≤-17.97	PASS
	Ant2	2412	Reference	0.54	0.54	---	PASS
			30~1000	0.54	-61.38	≤-19.46	PASS
			1000~26500	0.54	-52.78	≤-19.46	PASS
	Ant1	2437	Reference	2.81	2.81	---	PASS
			30~1000	2.81	-61.92	≤-17.19	PASS
			1000~26500	2.81	-53.02	≤-17.19	PASS
	Ant2	2437	Reference	0.55	0.55	---	PASS
			30~1000	0.55	-61.42	≤-19.45	PASS
			1000~26500	0.55	-53.1	≤-19.45	PASS
	Ant1	2462	Reference	1.72	1.72	---	PASS

			30~1000	1.72	-61.47	≤ -18.28	PASS
			1000~26500	1.72	-52.53	≤ -18.28	PASS
	Ant2	2462	Reference	-0.16	-0.16	---	PASS
			30~1000	-0.16	-61.38	≤ -20.16	PASS
			1000~26500	-0.16	-52.33	≤ -20.16	PASS
11N20SISO	Ant1	2412	Reference	2.10	2.10	---	PASS
			30~1000	2.10	-61.88	≤ -17.9	PASS
			1000~26500	2.10	-52.43	≤ -17.9	PASS
	Ant2	2412	Reference	1.53	1.53	---	PASS
			30~1000	1.53	-61.42	≤ -18.47	PASS
			1000~26500	1.53	-52.88	≤ -18.47	PASS
	Ant1	2437	Reference	2.54	2.54	---	PASS
			30~1000	2.54	-61.44	≤ -17.46	PASS
			1000~26500	2.54	-52.44	≤ -17.46	PASS
	Ant2	2437	Reference	1.32	1.32	---	PASS
			30~1000	1.32	-61.71	≤ -18.68	PASS
			1000~26500	1.32	-53.16	≤ -18.68	PASS
	Ant1	2462	Reference	1.86	1.86	---	PASS
			30~1000	1.86	-61.52	≤ -18.14	PASS
	Ant2	2462	Reference	0.48	0.48	---	PASS
			30~1000	0.48	-61.34	≤ -19.52	PASS
			1000~26500	0.48	-52.69	≤ -19.52	PASS
11AX20SISO	Ant1	2412	Reference	1.93	1.93	---	PASS
			30~1000	1.93	-61.65	≤ -18.07	PASS
			1000~26500	1.93	-51.67	≤ -18.07	PASS
	Ant2	2412	Reference	3.03	3.03	---	PASS
			30~1000	3.03	-61.75	≤ -16.97	PASS
			1000~26500	3.03	-46.59	≤ -16.97	PASS
	Ant1	2437	Reference	2.68	2.68	---	PASS
			30~1000	2.68	-61.75	≤ -17.32	PASS
			1000~26500	2.68	-53.05	≤ -17.32	PASS
	Ant2	2437	Reference	2.74	2.74	---	PASS
			30~1000	2.74	-61.08	≤ -17.26	PASS
			1000~26500	2.74	-52.85	≤ -17.26	PASS
	Ant1	2462	Reference	1.99	1.99	---	PASS
			30~1000	1.99	-61.05	≤ -18.01	PASS
			1000~26500	1.99	-53.03	≤ -18.01	PASS

	Ant2	2462	Reference	1.89	1.89	---	PASS
			30~1000	1.89	-61.4	≤ -18.11	PASS
			1000~26500	1.89	-53.24	≤ -18.11	PASS
11N20MIMO	Ant1	2412	Reference	1.96	1.96	---	PASS
			30~1000	1.96	-61.8	≤ -18.04	PASS
			1000~26500	1.96	-52.04	≤ -18.04	PASS
	Ant2	2412	Reference	1.65	1.65	---	PASS
			30~1000	1.65	-61.9	≤ -18.35	PASS
			1000~26500	1.65	-52.74	≤ -18.35	PASS
	Ant1	2437	Reference	2.59	2.59	---	PASS
			30~1000	2.59	-60.52	≤ -17.41	PASS
			1000~26500	2.59	-53.18	≤ -17.41	PASS
	Ant2	2437	Reference	2.46	2.46	---	PASS
			30~1000	2.46	-61.04	≤ -17.54	PASS
			1000~26500	2.46	-52.92	≤ -17.54	PASS
	Ant1	2462	Reference	1.94	1.94	---	PASS
			30~1000	1.94	-61.7	≤ -18.06	PASS
			1000~26500	1.94	-52.93	≤ -18.06	
	Ant2	2462	Reference	1.89	1.89	---	PASS
			30~1000	1.89	-61.32	≤ -18.11	PASS
			1000~26500	1.89	-52.69	≤ -18.11	PASS
11AX20MIMO	Ant1	2412	Reference	2.04	2.04	---	PASS
			30~1000	2.04	-61.6	≤ -17.96	PASS
			1000~26500	2.04	-52.98	≤ -17.96	PASS
	Ant2	2412	Reference	2.44	2.44	---	PASS
			30~1000	2.44	-61.7	≤ -17.56	PASS
			1000~26500	2.44	-53	≤ -17.56	PASS
	Ant1	2437	Reference	2.67	2.67	---	PASS
			30~1000	2.67	-61.7	≤ -17.33	PASS
			1000~26500	2.67	-52.34	≤ -17.33	PASS
	Ant2	2437	Reference	2.64	2.64	---	PASS
			30~1000	2.64	-60.46	≤ -17.36	PASS
			1000~26500	2.64	-52.84	≤ -17.36	PASS
	Ant1	2462	Reference	2.28	2.28	---	PASS
			30~1000	2.28	-61.76	≤ -17.72	PASS
			1000~26500	2.28	-52.9	≤ -17.72	PASS
	Ant2	2462	Reference	2.32	2.32	---	PASS

			30~1000	2.32	-61.76	≤-17.68	PASS
			1000~26500	2.32	-52.43	≤-17.68	PASS

Test Graphs see Appendix D.

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 Subpart C Paragraph 15.209		
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 C63.10-2013 – Section 6.6.4.3

7.6.3. Test Setting

Peak Field Strength Measurements

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

- Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

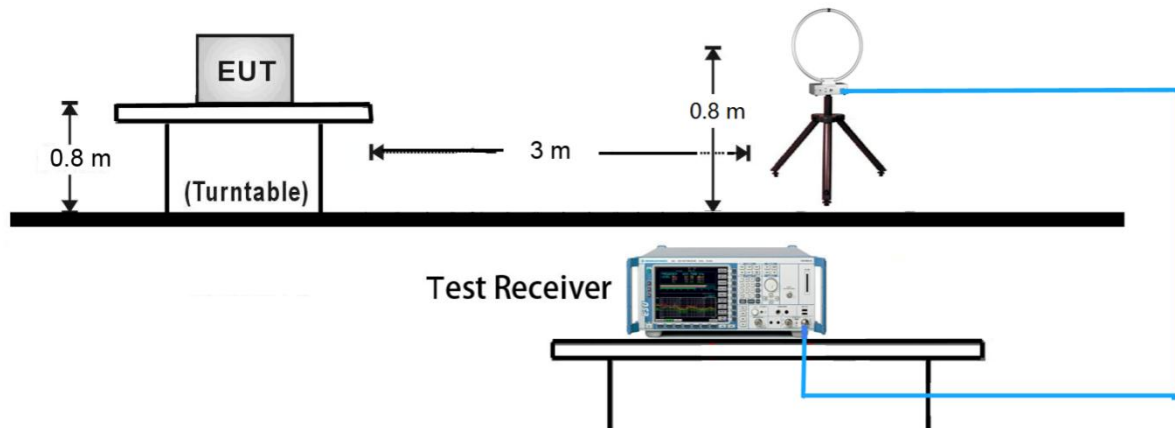
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

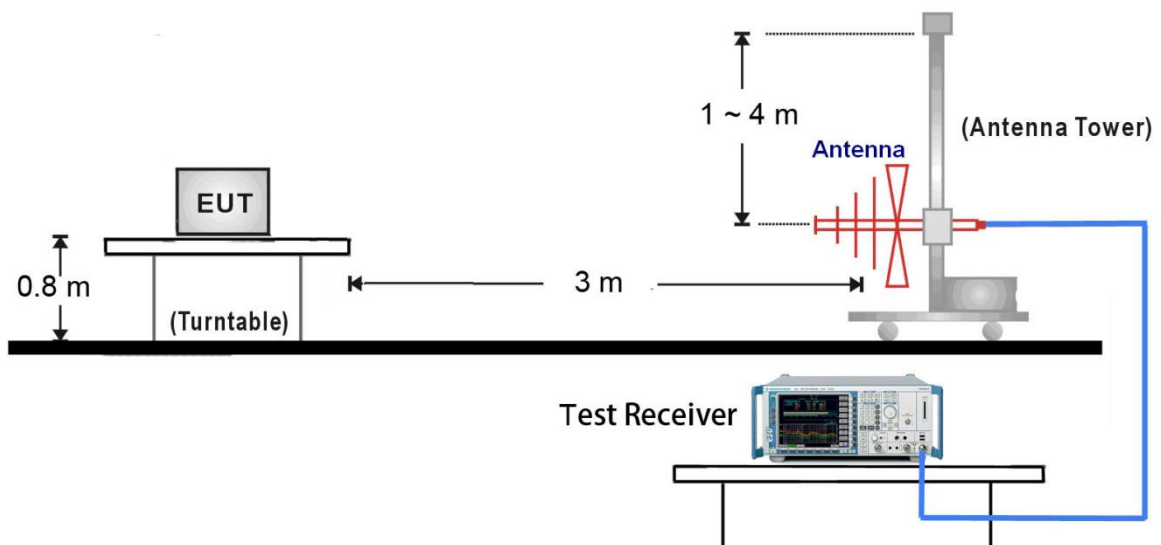
- Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- RBW = 1MHz
- VBW = 3MHz
- Detector = Power Average (RMS)
- Number of sweep point = 2001 (Number of sweep points must be $\geq 2 \times \text{span} / \text{RBW}$)
- Sweep time = auto
- Trace (RMS) averaging was performed over at least 100 traces.

7.6.4. Test Setup

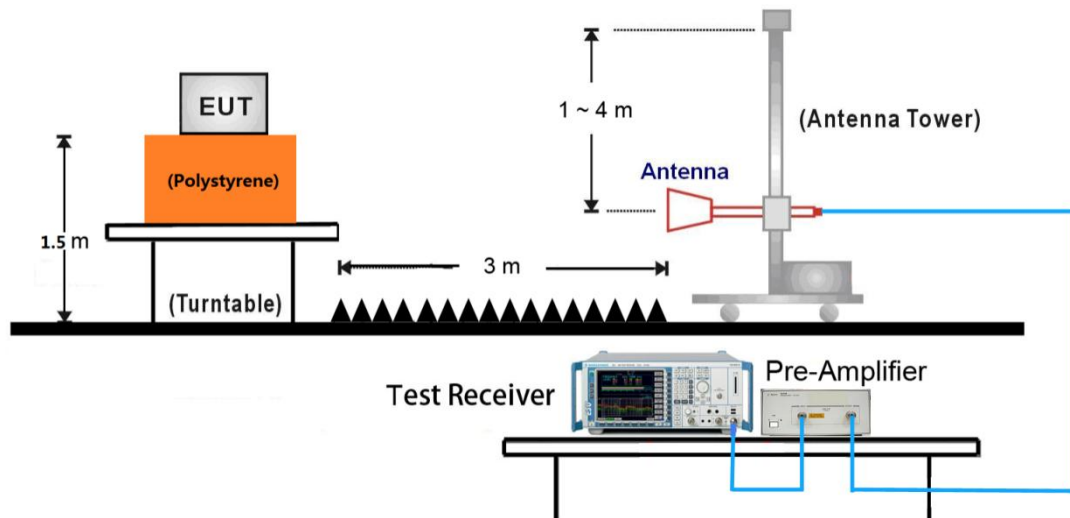
9kHz ~ 30MHz Test Setup:



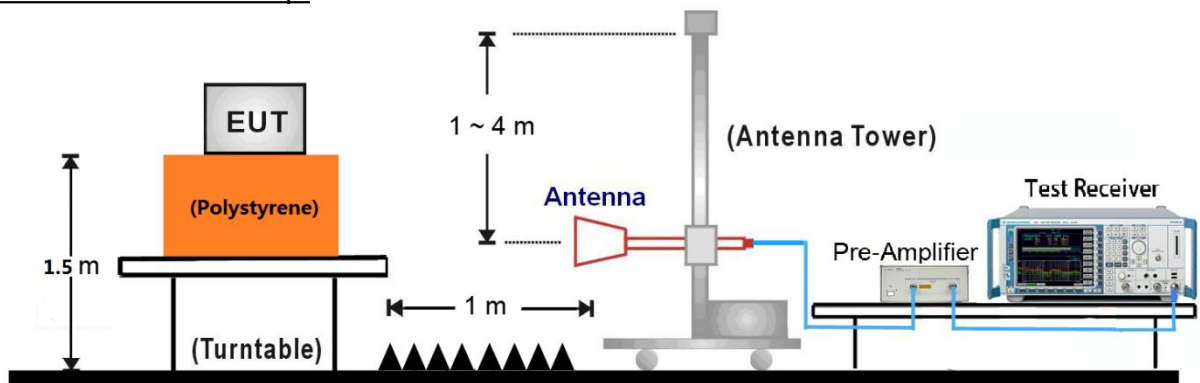
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



18GHz ~ 25GHz Test Setup:



7.6.5. Test Result

Test Mode:	802.11ax20 - CDD	Test Date:	2023-05-03
Test Channel:	01	Test Engineer:	Amos Xia
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. 3. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dBμV)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
3925.0000	40.15	4.81	74.00	33.85	Peak	Horizontal
5010.0000	43.77	7.64	74.00	30.23	Peak	Horizontal
6670.0000	46.71	13.08	74.00	27.29	Peak	Horizontal
8960.0000	53.06	15.74	74.00	20.94	Peak	Horizontal
3875.0000	40.69	4.70	74.00	33.31	Peak	Vertical
4835.0000	42.72	7.09	74.00	31.28	Peak	Vertical
6685.0000	46.99	13.08	74.00	27.01	Peak	Vertical
8780.0000	51.79	15.97	74.00	22.21	Peak	Vertical

Test Mode:	802.11ax20 - CDD	Test Date:	2023-05-03
Test Channel:	06	Test Engineer:	Amos Xia
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. 3. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dBμV)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
3845.0000	40.61	4.65	74.00	33.39	Peak	Horizontal
4675.0000	42.88	6.92	74.00	31.12	Peak	Horizontal
6580.0000	46.69	12.73	74.00	27.31	Peak	Horizontal
8805.0000	51.65	16.10	74.00	22.35	Peak	Horizontal
3935.0000	40.85	4.85	74.00	33.15	Peak	Vertical
4895.0000	42.77	7.30	74.00	31.23	Peak	Vertical
6590.0000	47.74	12.78	74.00	26.26	Peak	Vertical
7965.0000	51.50	15.54	74.00	22.50	Peak	Vertical

Test Mode:	802.11ax20 - CDD	Test Date:	2023-05-03
Test Channel:	11	Test Engineer:	Amos Xia
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. 3. This is the worst case of Radiated Emission for 1-18GHz.		

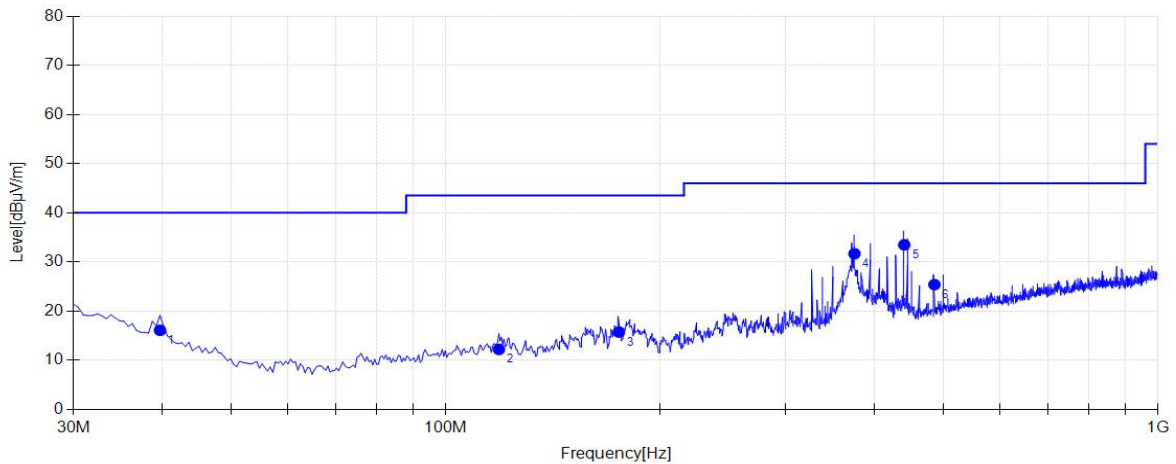
Frequency (MHz)	Level (dBμV)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
3610.0000	40.01	4.03	74.00	33.99	Peak	Horizontal
4800.0000	43.46	7.11	74.00	30.54	Peak	Horizontal
6090.0000	46.76	11.02	74.00	27.24	Peak	Horizontal
7975.0000	51.03	15.46	74.00	22.97	Peak	Horizontal
3935.0000	40.75	4.85	74.00	33.25	Peak	Vertical
5070.0000	43.30	7.64	74.00	30.70	Peak	Vertical
6455.0000	47.17	12.16	74.00	26.83	Peak	Vertical
8180.0000	51.81	15.19	74.00	22.19	Peak	Vertical

The worst case of Radiated Emission below 1GHz:

30MHz – 1GHz Test Data

EUT:	LED Playback Control Processor	Polarity:	Horizontal
Model:	TU20 Pro	S/N:	/
Mode:	Transmit by 802.11n20-CDD at Channel 2412MHz	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia

Test Graph



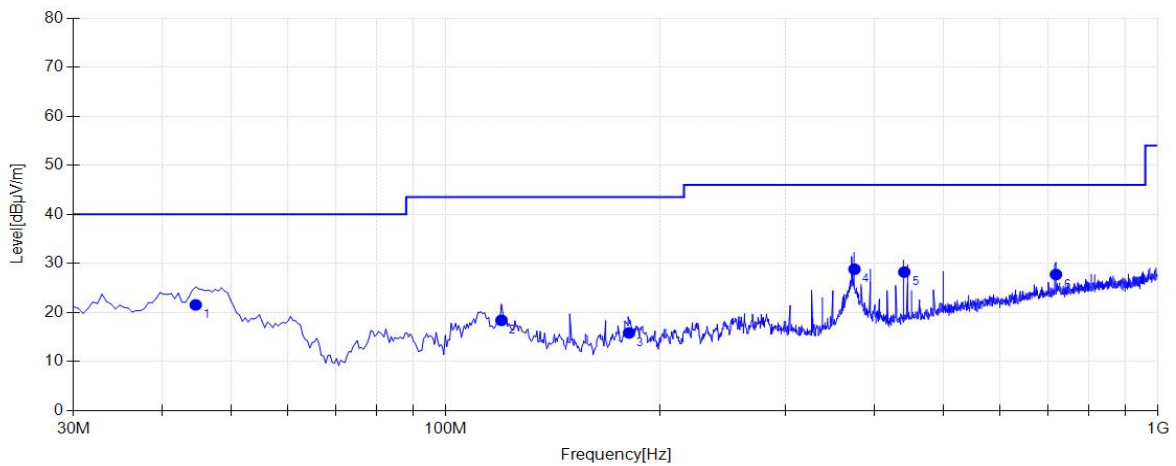
Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.7000	14.78	16.11	40.00	23.89	100	206	Horizontal
2	118.7550	11.63	12.22	43.50	31.28	200	318	Horizontal
3	175.0150	10.62	15.75	43.50	27.75	200	99	Horizontal
4	374.8350	15.33	31.68	46.00	14.32	100	356	Horizontal
5	440.3100	17.24	33.49	46.00	12.51	100	343	Horizontal
6	485.4150	18.54	25.40	46.00	20.60	200	284	Horizontal

Note 1: 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.

EUT:	LED Playback Control Processor	Polarity:	Vertical
Model:	TU20 Pro	S/N:	/
Mode:	Transmit by 802.11n20-CDD at Channel 2412MHz	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia

Test Graph



Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	44.5500	12.31	21.56	40.00	18.44	100	210	Vertical
2	119.7250	11.64	18.41	43.50	25.09	100	345	Vertical
3	180.8350	10.68	15.84	43.50	27.66	100	271	Vertical
4	374.8350	15.33	28.82	46.00	17.18	200	261	Vertical
5	440.3100	17.24	28.25	46.00	17.75	200	200	Vertical
6	719.1850	22.12	27.75	46.00	18.25	200	242	Vertical

Note 1: 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	8.25 - 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 - 156.525	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 Subpart C Paragraph 15.209		
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

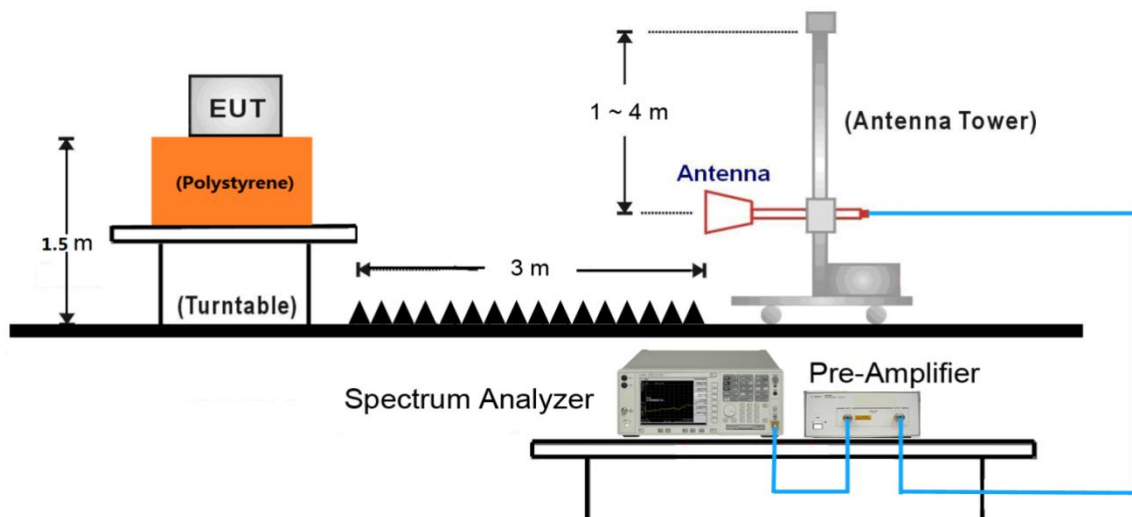
Peak Field Strength Measurements

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 = 3MHz
4. Detector = Power Average (RMS)
5. Number of sweep point = 2001 (Number of sweep points must be $\geq 2 \times \text{span} / \text{RBW}$)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

7.7.4. Test Setup



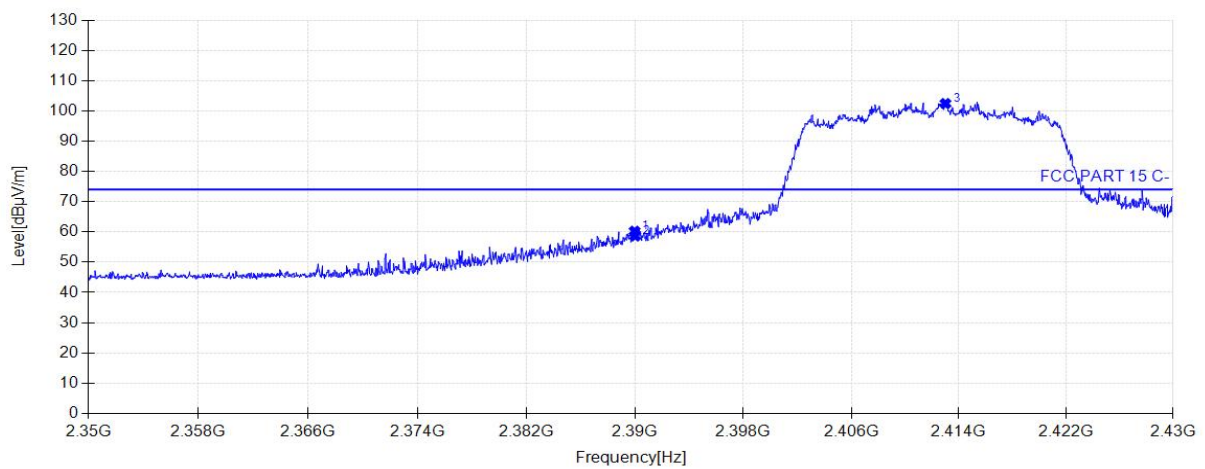
Note: This item was performed with the WIFI antenna connected.

7.7.5. Test Result

The worst case of Radiated Restricted Band Edge

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2412MHz		

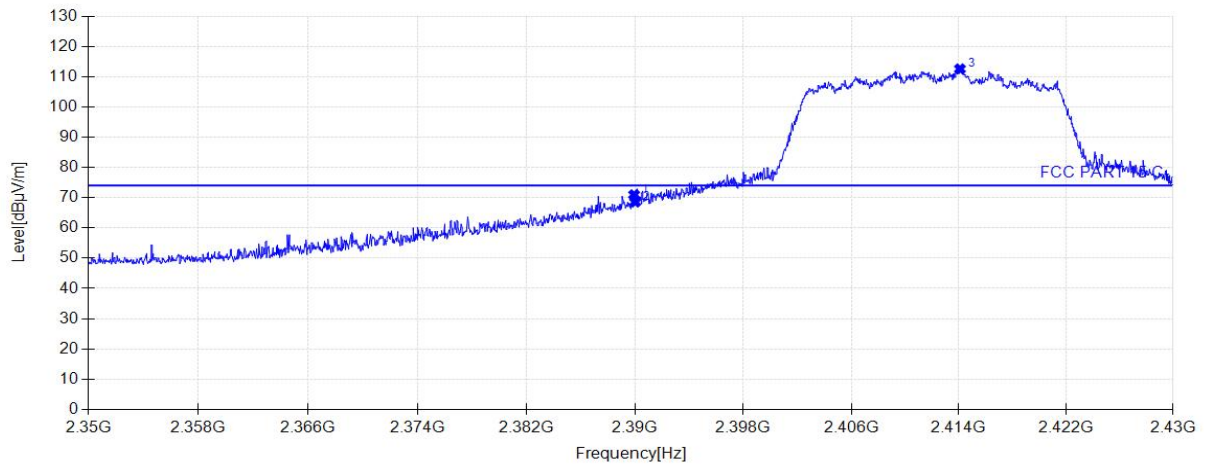
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2389.96	60.25	32.74	74.00	13.75	160	37	Horizontal
2	2390.00	58.65	32.74	74.00	15.35	160	44	Horizontal
3	2413.00	102.44	32.86	N/A	N/A	160	30	Horizontal

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2412MHz		

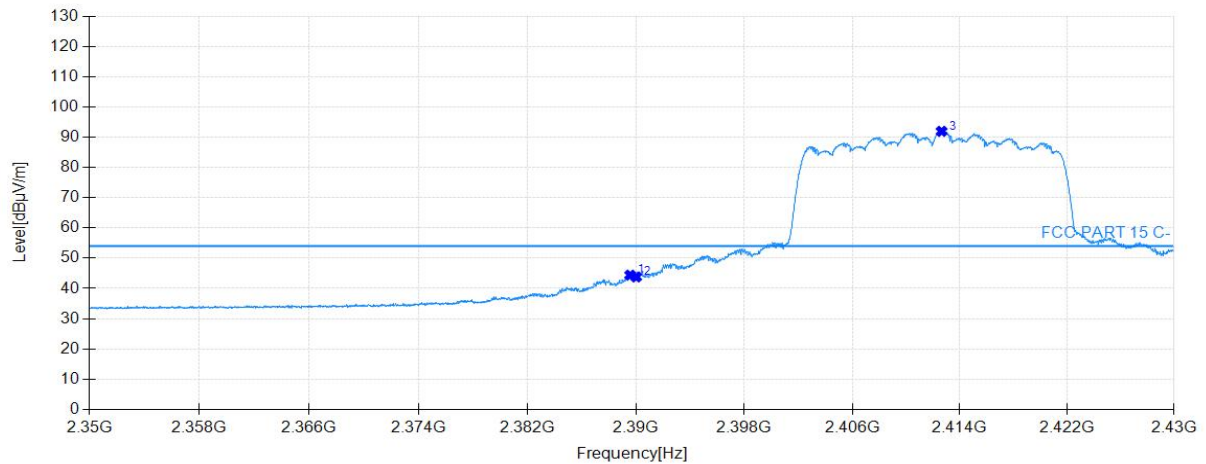
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2389.92	70.95	32.74	74.00	3.05	160	68	Vertical
2	2390.00	68.56	32.74	74.00	5.44	160	68	Vertical
3	2414.08	112.55	32.87	N/A	N/A	160	282	Vertical

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2412MHz		

Test Graph

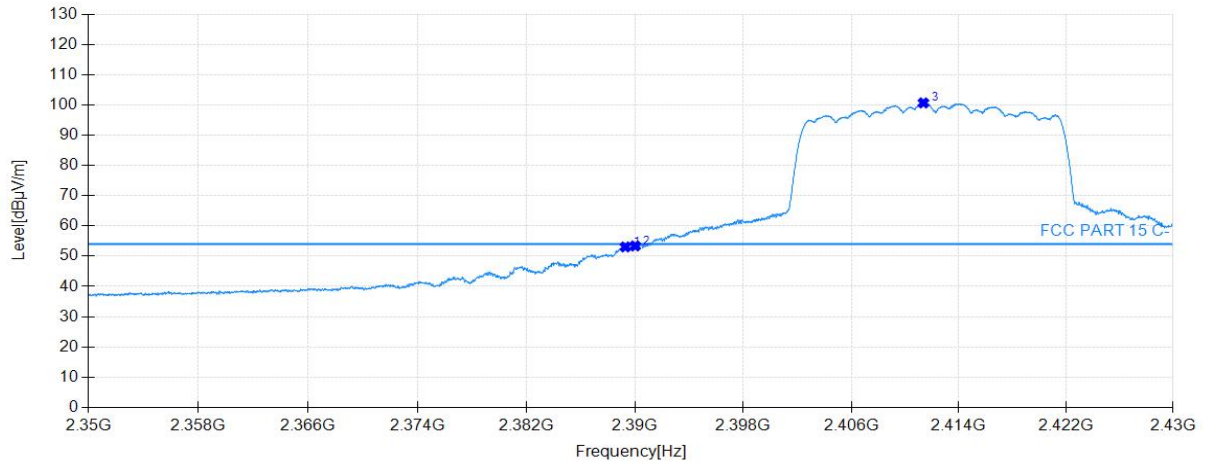


Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2389.56	44.40	32.74	54.00	9.60	160	37	Horizontal
2	2390.00	43.80	32.74	54.00	10.20	160	44	Horizontal
3	2412.64	91.93	32.86	N/A	N/A	160	44	Horizontal

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2412MHz		

Start of Test:2023-05-03 14:41:45

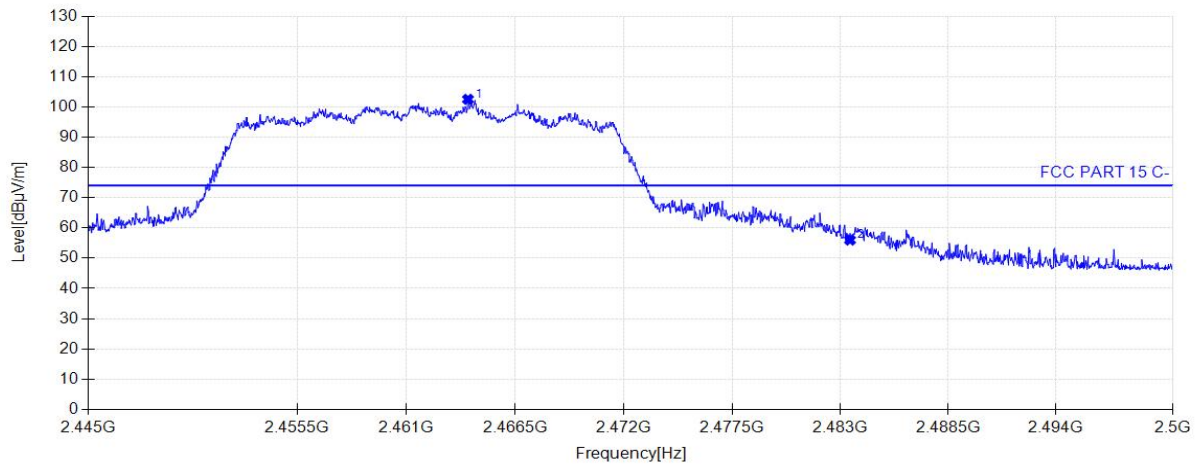
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2389.28	53.05	32.74	54.00	0.95	160	275	Vertical
2	2390.00	53.37	32.74	54.00	0.63	160	41	Vertical
3	2411.36	100.65	32.85	N/A	N/A	160	329	Vertical

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2462MHz		

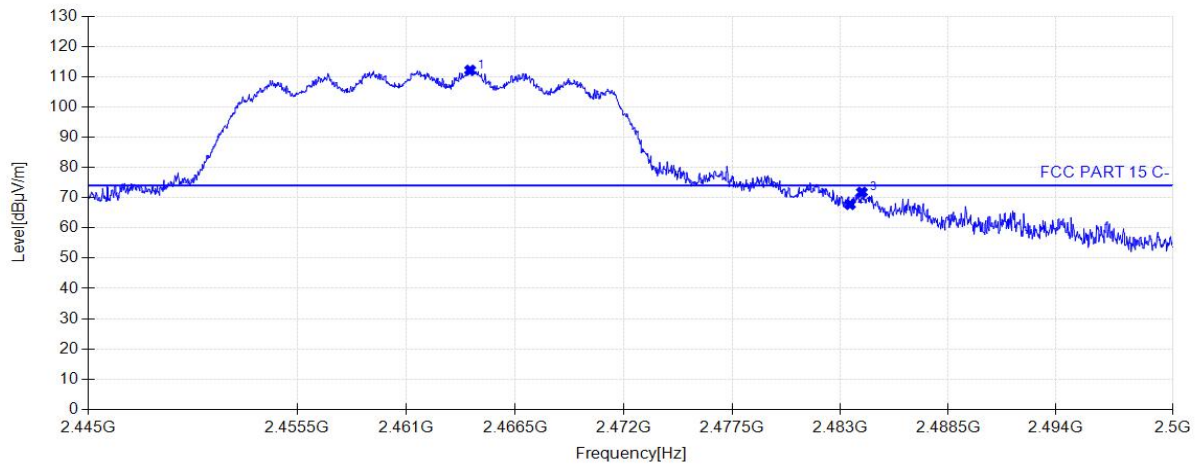
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2464.11	102.51	33.13	N/A	N/A	160	230	Horizontal
2	2483.50	55.99	33.23	74.00	18.01	160	4	Horizontal

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2462MHz		

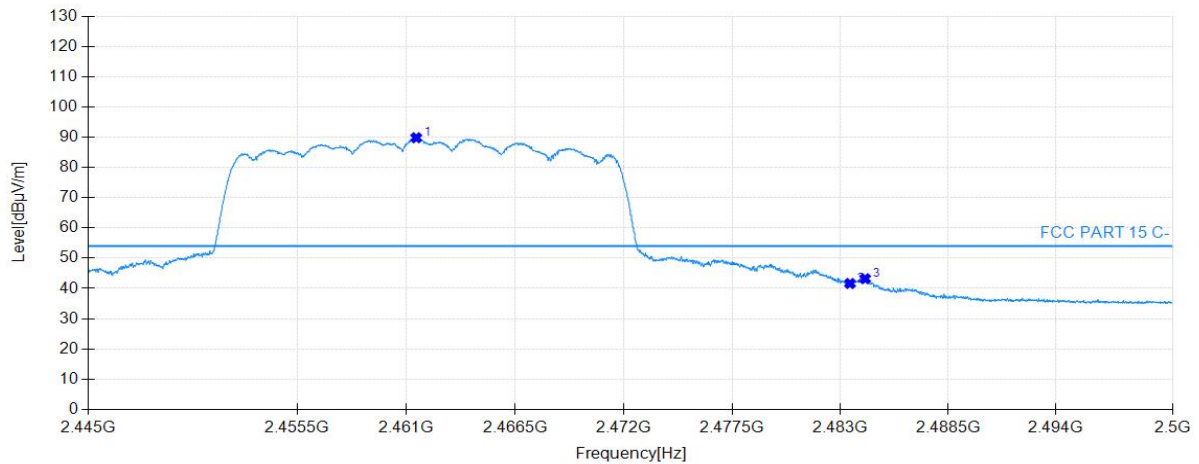
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2464.22	112.14	33.13	N/A	N/A	160	302	Vertical
2	2483.50	67.74	33.23	74.00	6.26	160	323	Vertical
3	2484.10	71.81	33.24	74.00	2.19	160	302	Vertical

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2462MHz		

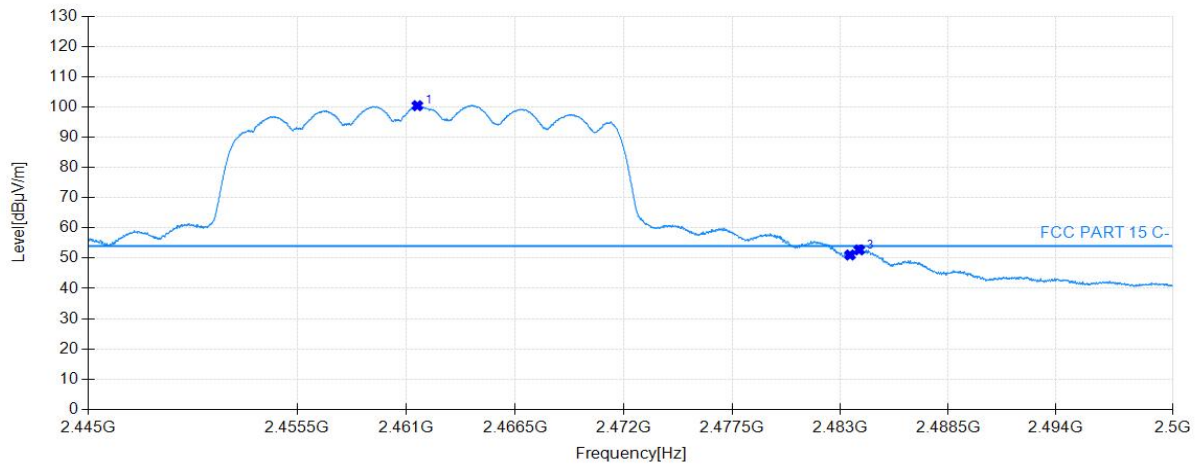
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2461.50	89.80	33.12	N/A	N/A	160	236	Horizontal
2	2483.50	41.63	33.23	54.00	12.37	160	230	Horizontal
3	2484.27	43.21	33.24	54.00	10.79	160	230	Horizontal

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2462MHz		

Test Graph

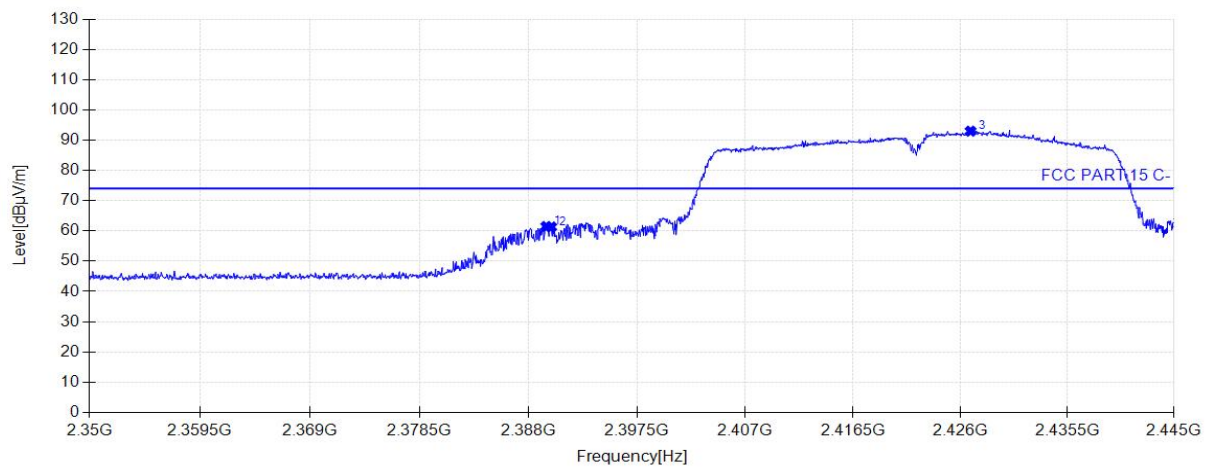


Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2461.55	100.39	33.12	N/A	N/A	160	282	Vertical
2	2483.50	51.06	33.23	54.00	2.94	160	303	Vertical
3	2483.96	52.73	33.24	54.00	1.27	160	318	Vertical

The Maximum bandwidth of Radiated Restricted Band Edge

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11n40 at Channel 2422MHz		

Test Graph

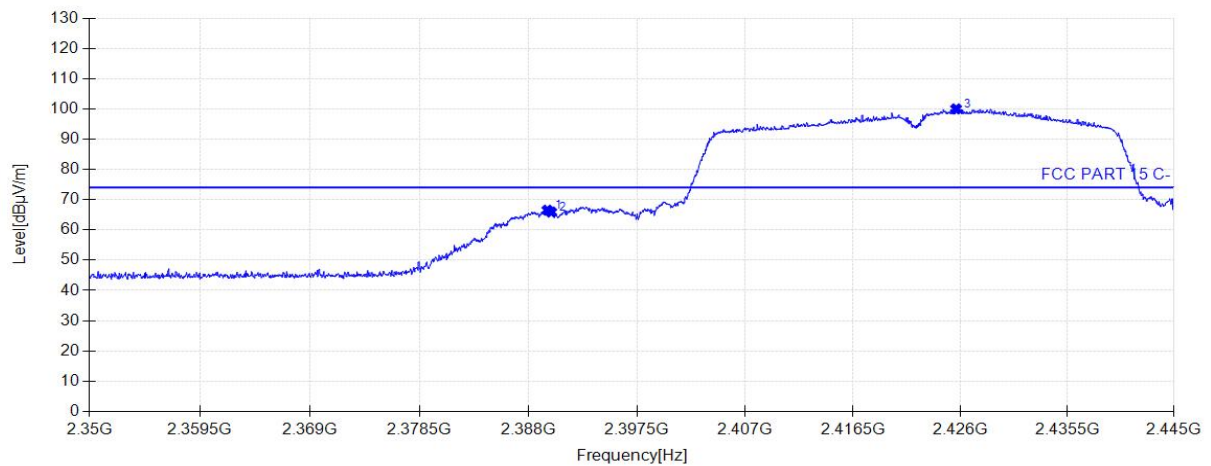


Suspected Data List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2389.56	61.47	32.74	74.00	12.53	160	134	Horizontal
2	2390.00	61.31	32.74	74.00	12.69	160	134	Horizontal
3	2426.90	92.97	32.94	N/A	N/A	160	126	Horizontal

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11n40 at Channel 2422MHz		

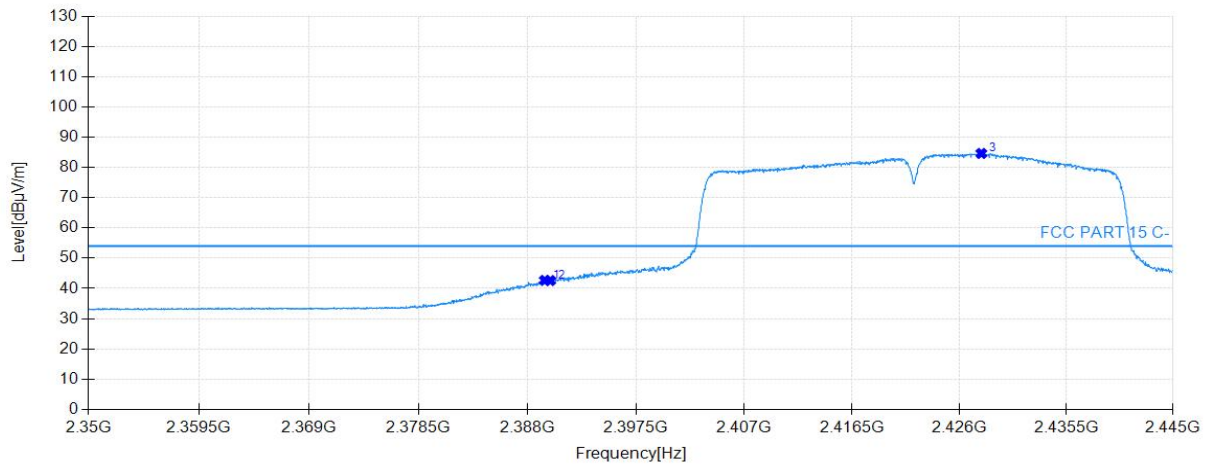
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2389.66	66.54	32.74	74.00	7.46	160	285	Vertical
2	2390.00	65.90	32.74	74.00	8.10	160	285	Vertical
3	2425.62	100.00	32.93	N/A	N/A	160	262	Vertical

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11n40 at Channel 2422MHz		

Test Graph

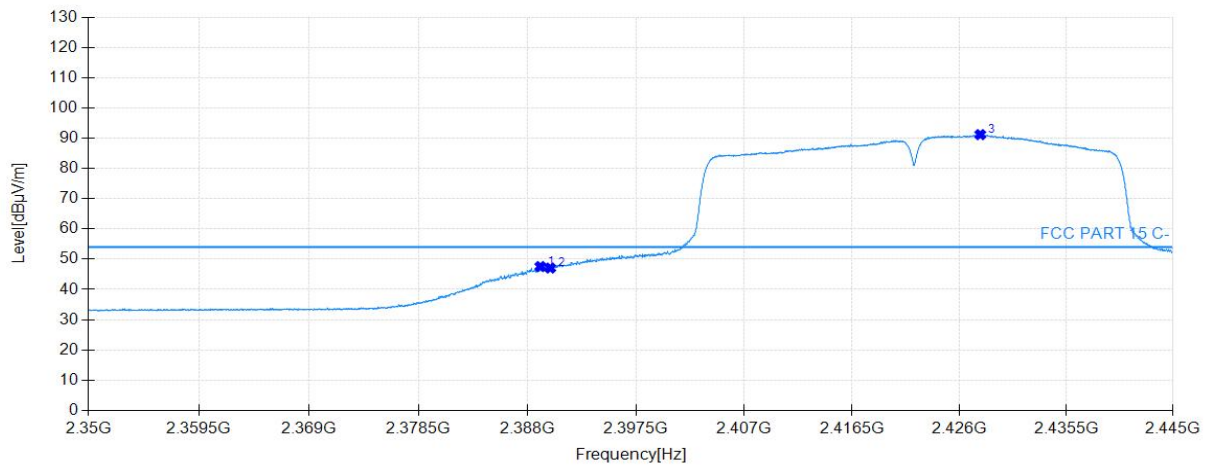


Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2389.52	42.67	32.74	54.00	11.33	160	130	Horizontal
2	2390.00	42.61	32.74	54.00	11.39	160	130	Horizontal
3	2427.94	84.61	32.94	N/A	N/A	160	130	Horizontal

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11n40 at Channel 2422MHz		

Start of Test:2023-05-03 14:41:45

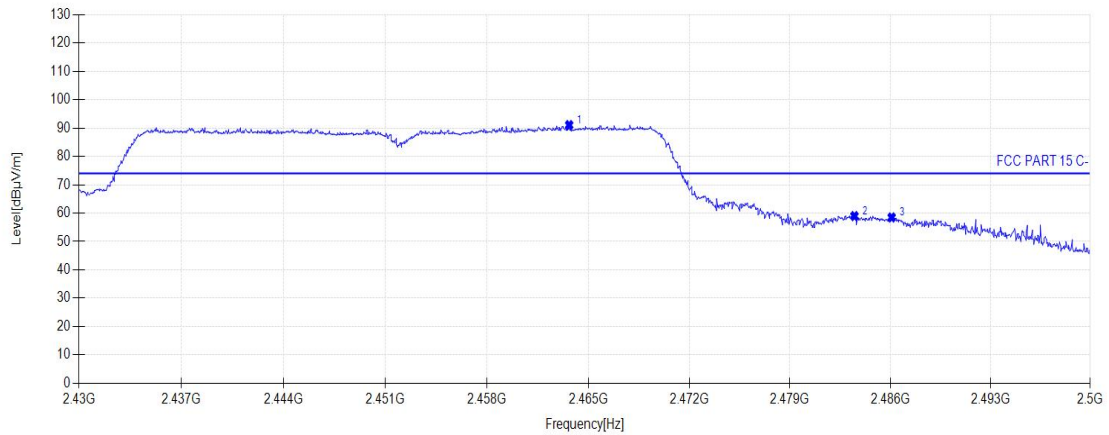
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2389.14	47.56	32.74	54.00	6.44	160	293	Vertical
2	2390.00	47.07	32.74	54.00	6.93	160	272	Vertical
3	2427.85	91.16	32.94	N/A	N/A	160	243	Vertical

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11n40 at Channel 2452MHz		

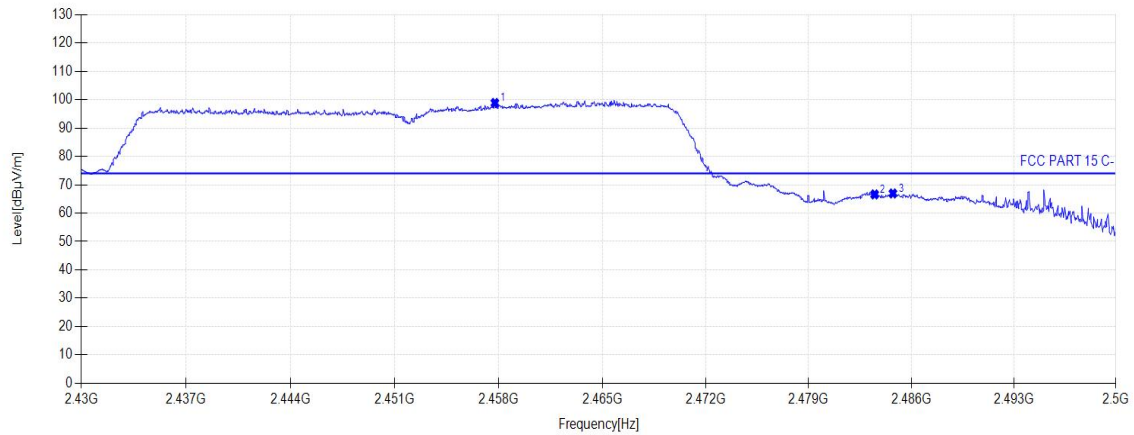
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2463.68	91.09	33.13	N/A	N/A	160	122	Horizontal
2	2483.50	58.97	33.23	74.00	15.03	160	137	Horizontal
3	2486.09	58.49	33.25	74.00	15.51	160	33	Horizontal

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11n40 at Channel 2452MHz		

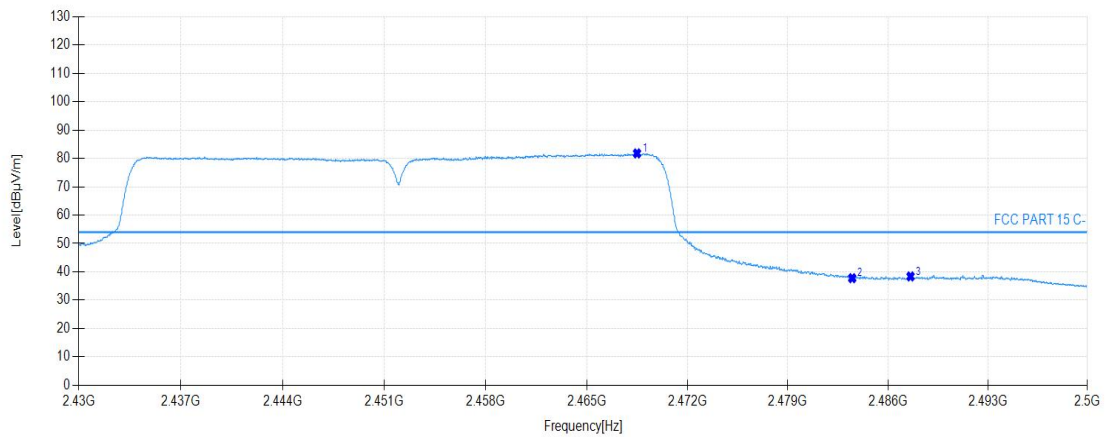
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2457.74	98.90	33.10	N/A	N/A	160	300	Vertical
2	2483.50	66.62	33.23	74.00	7.38	160	307	Vertical
3	2484.74	66.95	33.24	74.00	7.05	160	307	Vertical

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11n40 at Channel 2452MHz		

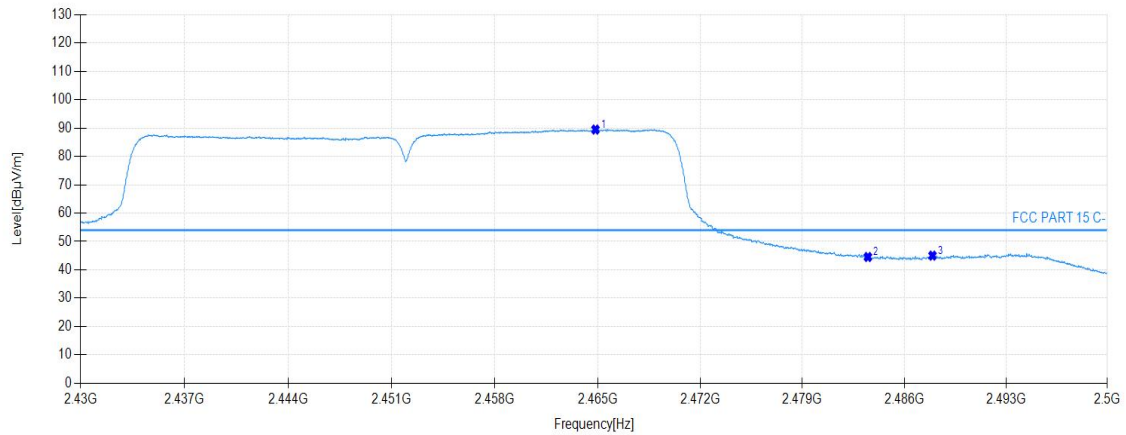
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2468.50	81.81	33.15	N/A	N/A	160	130	Horizontal
2	2483.50	37.76	33.23	54.00	16.24	160	145	Horizontal
3	2487.58	38.37	33.25	54.00	15.63	160	19	Horizontal

Project Information			
EUT:	LED Playback Control Processor	Model:	TU20 Pro
S/N:	/	Voltage:	AC 120V/60Hz
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11n40 at Channel 2452MHz		

Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2464.85	89.50	33.14	N/A	N/A	160	227	Vertical
2	2483.50	44.53	33.23	54.00	9.47	160	308	Vertical
3	2487.94	45.01	33.26	54.00	8.99	160	315	Vertical

7.8. AC Conducted Emissions Measurement

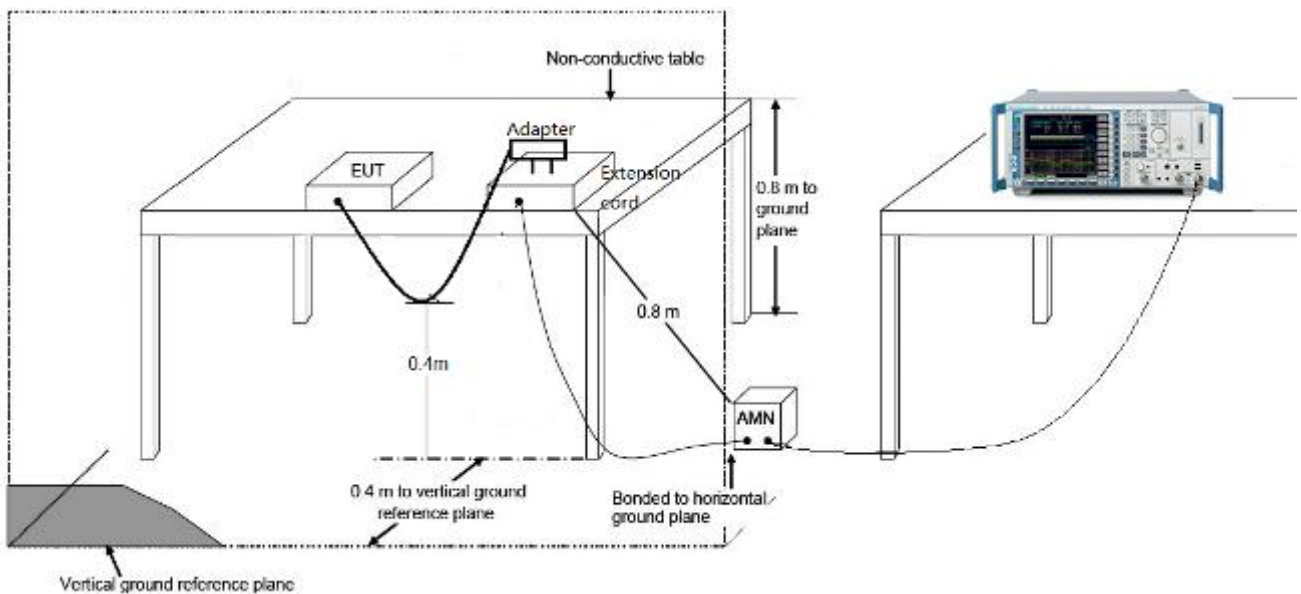
7.8.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

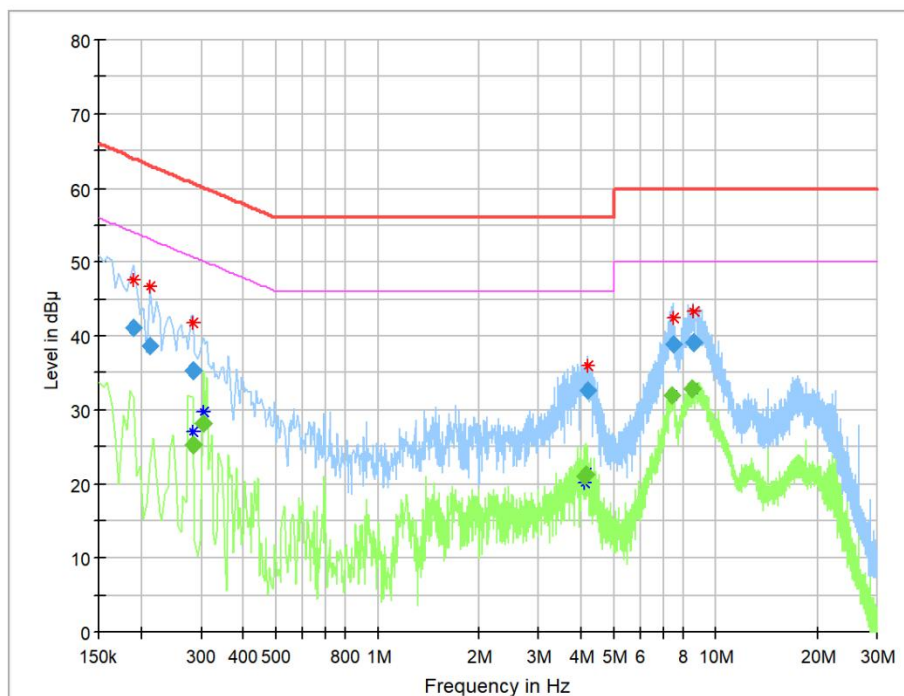
7.8.2. Test Setup



7.8.3. Test Result

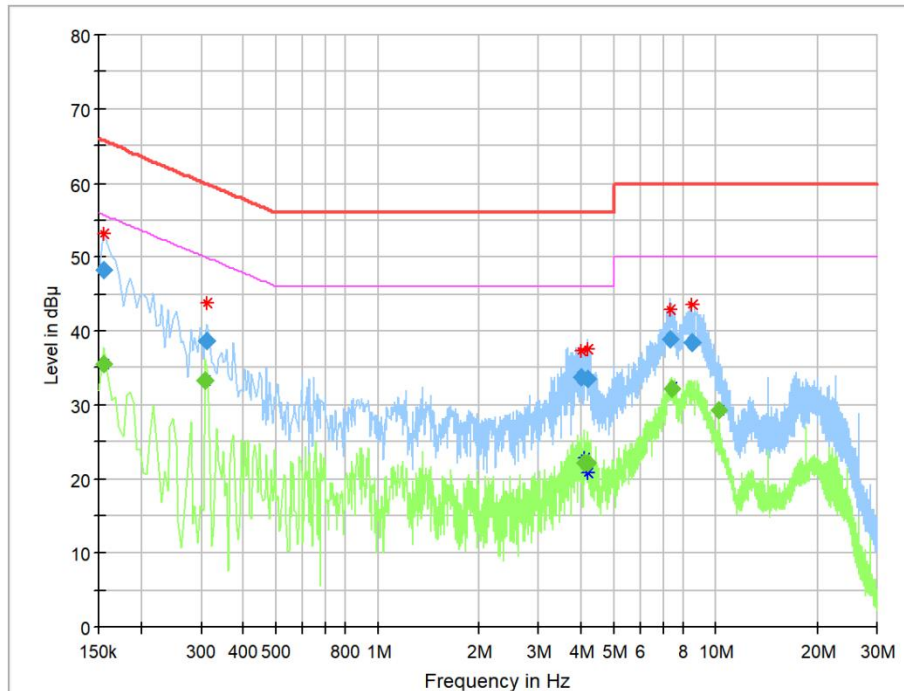
The worst case of Conducted Emissions:

EUT:	LED Playback Control Processor	Polarity:	LINE
Model:	TU20 Pro	Power Supply:	ADS-36MG-12
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 24°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2412MHz		



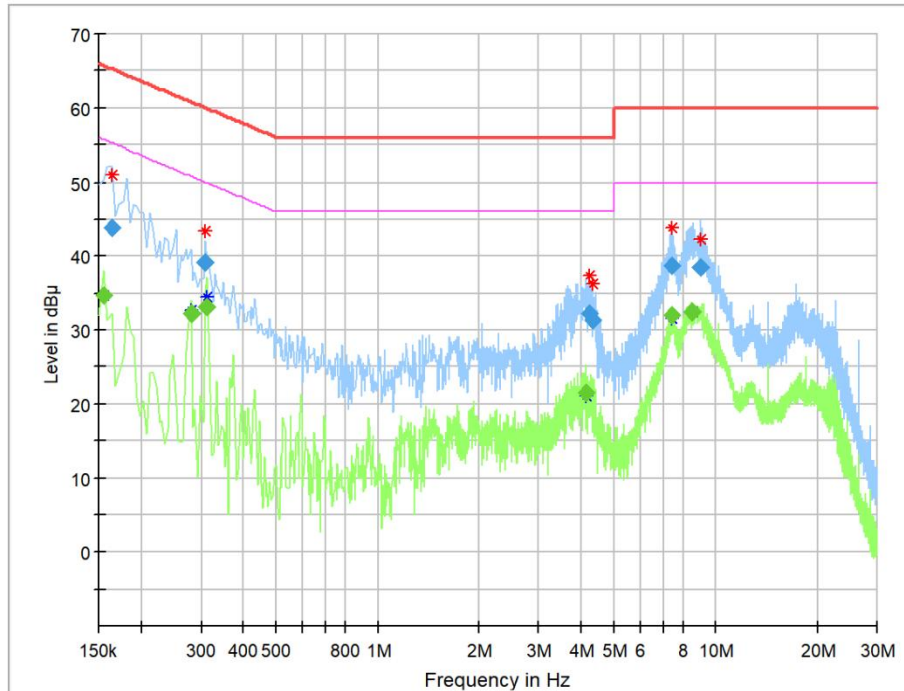
Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.190500	41.01	---	64.02	23.01	100.0	9.000	L1	ON	9.6
0.213000	38.65	---	63.09	24.44	100.0	9.000	L1	ON	9.6
0.285000	---	25.36	50.67	25.31	100.0	9.000	L1	ON	9.6
0.285000	35.35	---	60.67	25.32	100.0	9.000	L1	ON	9.6
0.303000	---	28.20	50.16	21.96	100.0	9.000	L1	ON	9.6
4.096500	---	21.01	46.00	24.99	100.0	9.000	L1	ON	9.7
4.146000	---	21.23	46.00	24.77	100.0	9.000	L1	ON	9.7
4.186500	32.66	---	56.00	23.34	100.0	9.000	L1	ON	9.7
7.453500	---	31.88	50.00	18.12	100.0	9.000	L1	ON	9.7
7.480500	38.92	---	60.00	21.08	100.0	9.000	L1	ON	9.7
8.511000	---	32.77	50.00	17.23	100.0	9.000	L1	ON	9.7
8.560500	39.03	---	60.00	20.97	100.0	9.000	L1	ON	9.7

EUT:	LED Playback Control Processor	Polarity:	NEUTRAL
Model:	TU20 Pro	Power Supply:	ADS-36MG-12
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 24°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2412MHz		



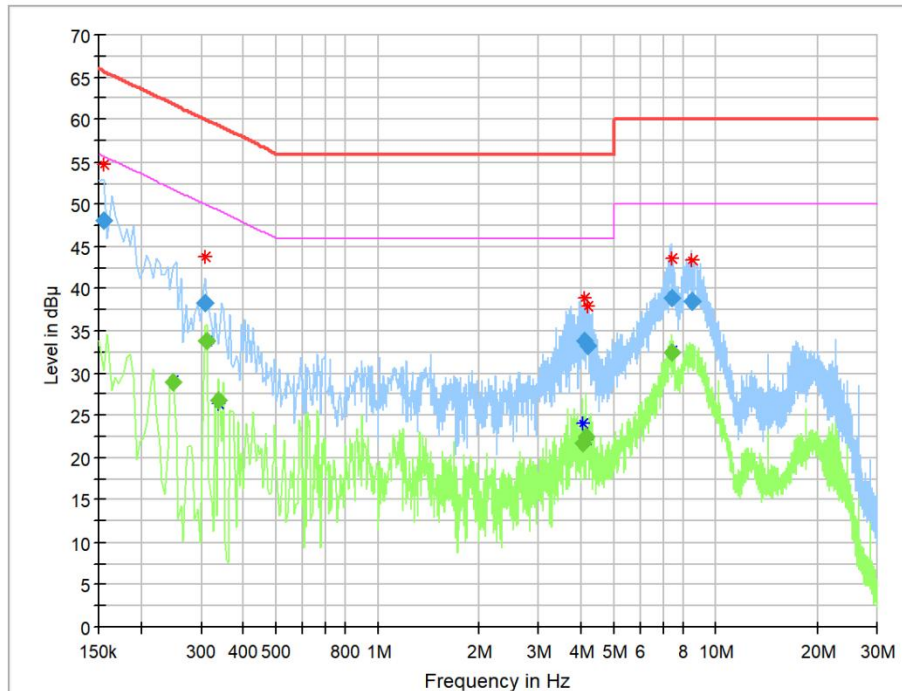
Frequency (MHz)	QuasiPeak (dBUV)	Average (dBUV)	Limit (dBUV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	---	35.50	55.75	20.26	100.0	9.000	N	ON	9.6
0.154500	48.34	---	65.75	17.42	100.0	9.000	N	ON	9.6
0.307500	---	33.21	50.04	16.83	100.0	9.000	N	ON	9.6
0.312000	38.61	---	59.92	21.31	100.0	9.000	N	ON	9.6
3.993000	33.79	---	56.00	22.21	100.0	9.000	N	ON	9.6
4.114500	---	22.11	46.00	23.89	100.0	9.000	N	ON	9.7
4.191000	33.56	---	56.00	22.44	100.0	9.000	N	ON	9.7
4.191000	---	22.06	46.00	23.94	100.0	9.000	N	ON	9.7
7.350000	38.86	---	60.00	21.14	100.0	9.000	N	ON	9.7
7.449000	---	32.28	50.00	17.72	100.0	9.000	N	ON	9.7
8.497500	38.45	---	60.00	21.55	100.0	9.000	N	ON	9.7
10.239000	---	29.21	50.00	20.79	100.0	9.000	N	ON	9.7

EUT:	LED Playback Control Processor	Polarity:	LINE
Model:	TU20 Pro	Power Supply:	ADS-36MG-12
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 24°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2437MHz		



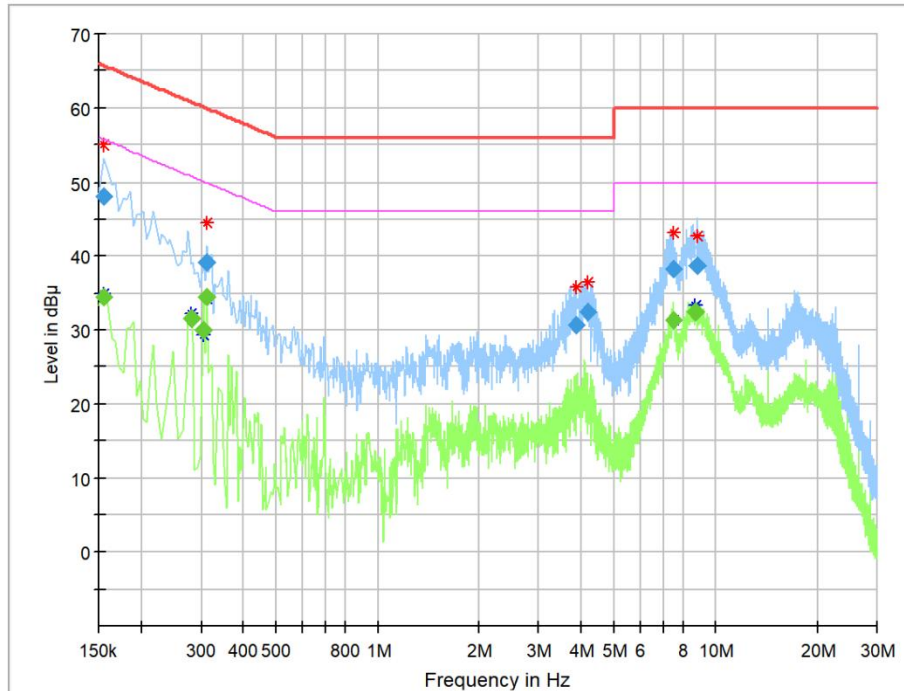
Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	---	34.58	55.75	21.17	100.0	9.000	L1	ON	9.6
0.163500	43.88	---	65.28	21.40	100.0	9.000	L1	ON	9.6
0.280500	---	32.28	50.80	18.52	100.0	9.000	L1	ON	9.6
0.307500	39.24	---	60.04	20.80	100.0	9.000	L1	ON	9.6
0.312000	---	33.10	49.92	16.81	100.0	9.000	L1	ON	9.6
4.128000	---	21.58	46.00	24.42	100.0	9.000	L1	ON	9.7
4.249500	32.32	---	56.00	23.68	100.0	9.000	L1	ON	9.7
4.321500	31.34	---	56.00	24.66	100.0	9.000	L1	ON	9.7
7.476000	38.75	---	60.00	21.25	100.0	9.000	L1	ON	9.7
7.476000	---	31.95	50.00	18.05	100.0	9.000	L1	ON	9.7
8.524500	---	32.54	50.00	17.46	100.0	9.000	L1	ON	9.7
8.965500	38.46	---	60.00	21.54	100.0	9.000	L1	ON	9.7

EUT:	LED Playback Control Processor	Polarity:	NEUTRAL
Model:	TU20 Pro	Power Supply:	ADS-36MG-12
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 24°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2437MHz		



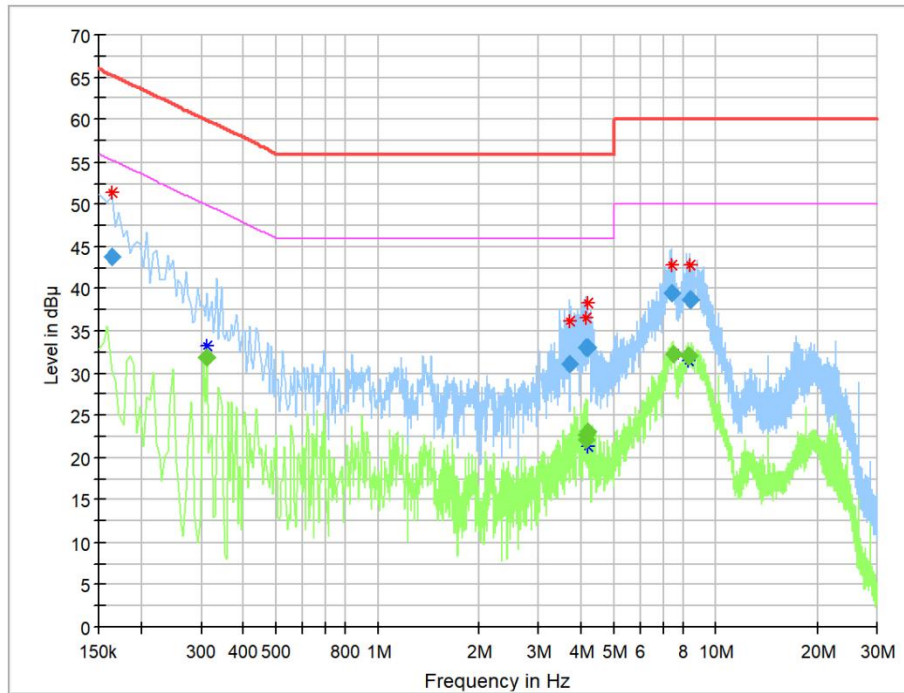
Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	48.17	---	65.75	17.58	100.0	9.000	N	ON	9.6
0.249000	---	28.94	51.79	22.85	100.0	9.000	N	ON	9.6
0.307500	38.37	---	60.04	21.67	100.0	9.000	N	ON	9.6
0.312000	---	33.84	49.92	16.08	100.0	9.000	N	ON	9.6
0.339000	---	26.80	49.23	22.43	100.0	9.000	N	ON	9.6
4.056000	---	21.61	46.00	24.39	100.0	9.000	N	ON	9.7
4.087500	33.76	---	56.00	22.24	100.0	9.000	N	ON	9.7
4.137000	---	22.49	46.00	23.51	100.0	9.000	N	ON	9.7
4.177500	33.31	---	56.00	22.69	100.0	9.000	N	ON	9.7
7.404000	38.95	---	60.00	21.05	100.0	9.000	N	ON	9.7
7.471500	---	32.54	50.00	17.46	100.0	9.000	N	ON	9.7
8.488500	38.58	---	60.00	21.42	100.0	9.000	N	ON	9.7

EUT:	LED Playback Control Processor	Polarity:	LINE
Model:	TU20 Pro	Power Supply:	ADS-36MG-12
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 24°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2462MHz		



Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	---	34.47	55.75	21.28	100.0	9.000	L1	ON	9.6
0.154500	48.12	---	65.75	17.64	100.0	9.000	L1	ON	9.6
0.280500	---	31.65	50.80	19.15	100.0	9.000	L1	ON	9.6
0.303000	---	30.01	50.16	20.15	100.0	9.000	L1	ON	9.6
0.312000	39.09	---	59.92	20.83	100.0	9.000	L1	ON	9.6
0.312000	---	34.36	49.92	15.56	100.0	9.000	L1	ON	9.6
3.880500	30.64	---	56.00	25.36	100.0	9.000	L1	ON	9.6
4.173000	32.36	---	56.00	23.64	100.0	9.000	L1	ON	9.7
7.521000	38.17	---	60.00	21.83	100.0	9.000	L1	ON	9.7
7.521000	---	31.43	50.00	18.57	100.0	9.000	L1	ON	9.7
8.727000	---	32.45	50.00	17.55	100.0	9.000	L1	ON	9.7
8.835000	38.69	---	60.00	21.31	100.0	9.000	L1	ON	9.7

EUT:	LED Playback Control Processor	Polarity:	NEUTRAL
Model:	TU20 Pro	Power Supply:	ADS-36MG-12
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 24°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by 802.11ax20 - CDD at Channel 2462MHz		



Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.163500	43.75	---	65.28	21.53	100.0	9.000	N	ON	9.6
0.312000	---	31.96	49.92	17.96	100.0	9.000	N	ON	9.6
3.700500	31.12	---	56.00	24.88	100.0	9.000	N	ON	9.6
4.146000	---	22.67	46.00	23.33	100.0	9.000	N	ON	9.7
4.164000	---	22.10	46.00	23.90	100.0	9.000	N	ON	9.7
4.164000	33.06	---	56.00	22.94	100.0	9.000	N	ON	9.7
4.186500	33.05	---	56.00	22.95	100.0	9.000	N	ON	9.7
4.186500	---	23.07	46.00	22.93	100.0	9.000	N	ON	9.7
7.440000	39.51	---	60.00	20.49	100.0	9.000	N	ON	9.7
7.530000	---	32.36	50.00	17.64	100.0	9.000	N	ON	9.7
8.277000	---	31.99	50.00	18.01	100.0	9.000	N	ON	9.7
8.385000	38.80	---	60.00	21.20	100.0	9.000	N	ON	9.7

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **LED Playback Control Processor** is in compliance with Part 15C of the FCC Rules.

_____ The End _____