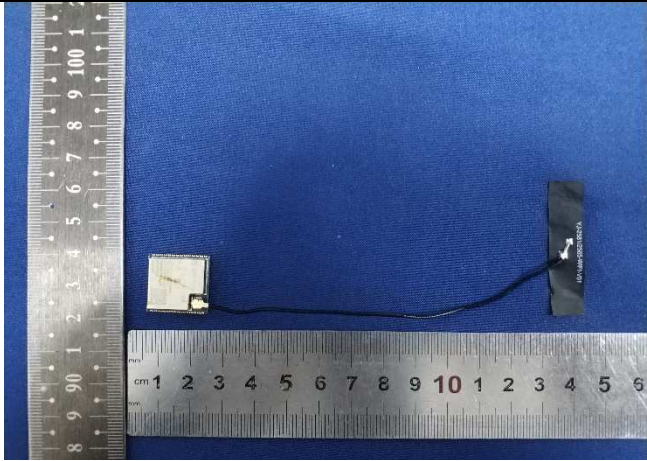


Prüfbericht-Nr.: Test report no.:	CN212120 002	Auftrags-Nr.: Order no.:	168342725	Seite 1 von 16 Page 1 of 16
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2021-11-08	
Auftraggeber: Client:	ESPRESSIF SYSTEMS (SHANGHAI) CO., LTD Suite 204, Block 2, 690 Bibo Road, Zhang Jiang Hi-Tech Park, Shanghai, 201203 China			
Prüfgegenstand: Test item:	Wi-Fi & Bluetooth Internet of Things Module			
Bezeichnung / Typ-Nr.: Identification / Type no.:	ESP32-WROOM-32UE			
Auftrags-Inhalt: Order content:	Test Report			
Prüfgrundlage: Test specification:	CFR47 FCC Part 15: Subpart C Section 15.247 RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 Feb. 2021			
Wareneingangsdatum: Date of sample receipt:	2021-12-10			
Prüfmuster-Nr.: Test sample no.:	A003158701-011			
Prüfzeitraum: Testing period:	2021-12-10 - 2021-12-16			
Ort der Prüfung: Place of testing:	Dongguan Dongdian Testing Service Co., Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:	 Signed by: Tim Zhang		genehmigt von: authorized by:	 Signed by: Lin Lin
Datum: Date:	2021-12-24		Ausstellungsdatum: Issue date:	2021-12-24
Stellung / Position:	Project Manager		Stellung / Position:	Reviewer
Sonstiges / Other:	This test report is based on BACL's report RSHD200323002-00A, 00B for change the antenna of module. Due to change, re-test Conducted Power, Radiated Spurious Emissions and Radiated Emissions in Restricted Bands for BT/BLE/Wi-Fi mode, other test data refer to original report. FCC ID: 2AC7Z-ESPWROOM32UE IC: 21098-ESPWROOMUE			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

V05

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Test Report No.:

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Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM CONDUCTED OUTPUT POWER

RESULT: Pass

5.1.3 RADIATED SPURIOUS EMISSION

RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up

Appendix B: Test Results of Bluetooth BDR/EDR

Appendix C: Test Results of Bluetooth BLE

Appendix D: Test Results of 2.4G WIFI

2 Test Sites

2.1 Test Facilities

Dongguan Dongdian Testing Service Co., Ltd.

No. 17, Zongbu Road 2, Songshan Lake, Sci&Tech Industry Park, Dongguan City, Guangdong Province, 523808, P.R. China

CNAS accreditation certification number: L6451

A2LA accreditation certification number: 3870.01

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

☒RF Connected Test (Tonscend RF Measurement System 2#)					
Spectrum analyzer	R&S	FSU26	101472	Jun. 01, 2021	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	Jun. 01, 2021	1 Year
Vector Signal Generator	Agilent	N5182A	MY19060405	Jun. 01, 2021	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180912	Jun. 01, 2021	1 Year
RF Control Unit	Tonsend	JS0806-2	DDT-ZC01449	Jun. 01, 2021	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Jun. 01, 2021	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.7	N/A	N/A
☒Radiation 3#chamber					
EMI Test Receiver	R&S	ESU	100472	Jun. 01, 2021	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Sep. 19, 2021	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	01429	Aug. 07, 2021	1 Year
Double Ridged Horn Antenna	Schwarzbeck	BBHA9120	02108	Jul. 17, 2021	1 Year
Pre-amplifier	COM-POWER	PAM-118A	18040084	Sep. 02, 2021	1 Year
RF Cable	N/A	14+1.5m	06270619	Sep. 02, 2021	1 Year
Test software	Audix	E3	V 9	N/A	N/A

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Test Item	Uncertainty
Peak Output Power (Conducted) (Spectrum Analyzer)	0.86 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	1.38 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Uncertainty for Radio Frequency (RBW < 20 kHz)	3×10^{-8}
Temperature	0.4 °C
Humidity	2 %
Uncertainty for Radiation Emission Test (30 MHz - 1 GHz)	4.70 dB (Antenna Polarize: V)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission Test (1 GHz - 40 GHz)	4.10 dB (1 - 6 GHz)
	4.40 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power Line Conduction Emission Test	3.32 dB (150 kHz - 30 MHz)

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B & C & D of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The Dongguan Dongdian Testing Service Co., Ltd. Test facility located at No. 17, Zongbu Road 2, Songshan Lake, Sci&Tech Industry Park, Dongguan City, Guangdong Province, 523808, P.R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a Wi-Fi & Bluetooth Internet of Things Module. It supports Bluetooth(dual mode) and Wi-Fi 802.11 b/g/n wireless technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment:	Wi-Fi & Bluetooth Internet of Things Module
Type Designation:	ESP32-WROOM-32UE
Trademark:	n.a
FCC ID:	2AC7Z-ESPWROOM32UE
IC:	21098-ESPWROOMUE
HVIN:	ESP32-WROOM-32UE
Operating Voltage:	DC 3.3V
Testing Voltage:	DC 3.3V
Antenna Type:	PIFA Antenna
Antenna Gain:	4.0 dBi for Bluetooth & 2.4G Wi-Fi
Technical Specification of Bluetooth (dual mode)	
Operating Frequency:	2402 MHz to 2480 MHz
Type of Modulation:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Channel Number:	BDR & EDR mode:79 channels, Low Energy mode:40 channels
Channel Separation:	BDR & EDR mode: 1MHz, Low Energy mode: 2MHz
Data Rate:	BDR & EDR mode: 1Mbps, 3Mbps Low Energy mode: 1Mbps
Technical Specification of Wi-Fi 802.11 b/g/n	
Operating Frequency:	2412 - 2462 MHz for 802.11b/g/n(HT20) 2422 - 2452 MHz for 802.11n(HT40)
Type of Modulation:	DSSS(DBPSK/DQPSK/CCK) OFDM(BPSK/QPSK/16QAM/64QAM)
Data Rate:	1/2/5.5/11 Mbps for 802.11b 6/9/12/18/24/36/48/54 Mbps for 802.11g MCS0 ~ MCS7 Mbps for 802.11n(HT20) MCS0 ~ MCS7 Mbps for 802.11n(HT40)
Channel Number:	11 channels for 802.11b/g/n(HT20) 7 channels for 802.11n(HT40)
Channel Separation:	5 MHz

Table 3: RF Channel and Frequency of Bluetooth BDR/EDR

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402.00	20	2422.00	40	2442.00	60	2462.00
1	2403.00	21	2423.00	41	2443.00	61	2463.00
2	2404.00	22	2424.00	42	2444.00	62	2464.00
3	2405.00	23	2425.00	43	2445.00	63	2465.00
4	2406.00	24	2426.00	44	2446.00	64	2466.00
5	2407.00	25	2427.00	45	2447.00	65	2467.00
6	2408.00	26	2428.00	46	2448.00	66	2468.00
7	2409.00	27	2429.00	47	2449.00	67	2469.00
8	2410.00	28	2430.00	48	2450.00	68	2470.00
9	2411.00	29	2431.00	49	2451.00	69	2471.00
10	2412.00	30	2432.00	50	2452.00	70	2472.00
11	2413.00	31	2433.00	51	2453.00	71	2473.00
12	2414.00	32	2434.00	52	2454.00	72	2474.00
13	2415.00	33	2435.00	53	2455.00	73	2475.00
14	2416.00	34	2436.00	54	2456.00	74	2476.00
15	2417.00	35	2437.00	55	2457.00	75	2477.00
16	2418.00	36	2438.00	56	2458.00	76	2478.00
17	2419.00	37	2439.00	57	2459.00	77	2479.00
18	2420.00	38	2440.00	58	2460.00	78	2480.00
19	2421.00	39	2441.00	59	2461.00		

Test frequencies are lowest channel: 2402 MHz, middle channel: 2441 MHz and highest channel: 2480 MHz for BDR/EDR

Table 4: RF Channel and Frequency of BLE

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Test frequencies are lowest channel: 2402 MHz, middle channel: 2440 MHz and highest channel: 2480 MHz for BLE

Table 5: RF Channel and Frequency of Wi-Fi 802.11 b/g/n

RF Channel	802.11 b/g/n(HT20)	802.11 n(HT40)
	Frequency (MHz)	Frequency (MHz)
01	2412	/
02	2417	/
03	2422	2422
04	2427	2427
05	2432	2432
06	2437	2437
07	2442	2442
08	2447	2447
09	2452	2452
10	2457	/
11	2462	/

Test frequencies are lowest channel: 2412 MHz, middle channel: 2437 MHz and highest channel: 2462 MHz for 802.11b/g/n(HT20)

Test frequencies are lowest channel: 2422 MHz, middle channel: 2437 MHz and highest channel: 2452 MHz for 802.11n(HT40)

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Bluetooth transmitting mode (BDR & EDR mode)
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- B. On, Bluetooth transmitting mode (BLE mode)
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- C. On, Wi-Fi 802.11b/g/n wireless transmitting mode
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- D. On, Transmitting on Hopping channel
- E. On, Bluetooth connecting mode
- F. On, Wi-Fi 802.11 b/g/n connecting mode
- G. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- | | |
|-------------------------|----------------|
| - Application Form | - User Manual |
| - Operation Description | - Rating Label |

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model ESP32-WROOM-32UE in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 6: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N
Notebook	Lenovo	ThinkPad	TP00015A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

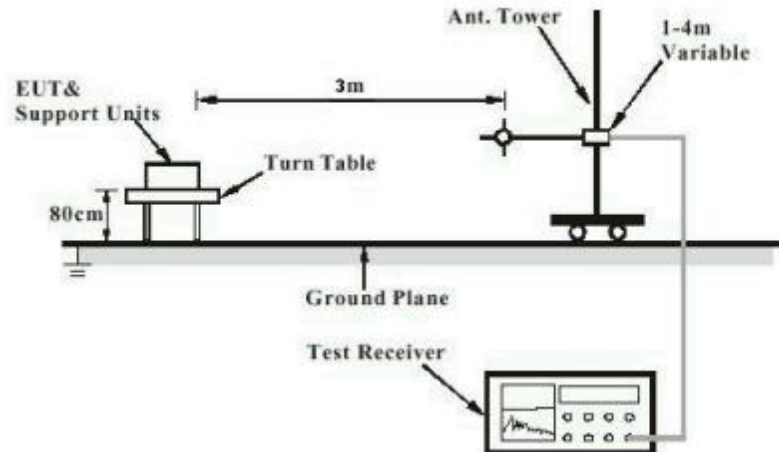
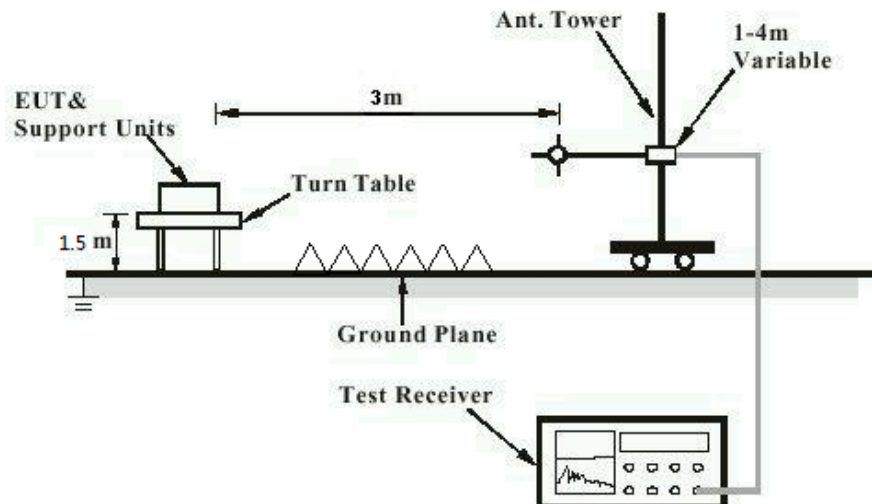


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:

Pass

Test Specification

Test standard : FCC Part 15.247(b)(4) and Part 15.203
RSS-Gen Clause 6.8

According to the manufacturer declared, the EUT has a PIFA antenna, the directional gain of antenna is 4.0 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

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5.1.2 Maximum Conducted Output Power

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.247(b)(1)&(3) RSS-247 Clause 5.4(b)&(d)
Basic standard	: ANSI C63.10: 2013 FHSS < 0.125 Watts(20.97dBm)
Limits	: DSSS < 1.0 Watts(30dBm) e.i.r.p < 4.0 Watts(36dBm)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2021-12-14
Input voltage	: DC 3.3V
Operation mode	: A, B, C
Test channel	: Low / Middle / High
Ambient temperature	: 24.8 °C
Relative humidity	: 55 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix B & C & D.

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5.1.3 Radiated Spurious Emission

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(d) & FCC Part 15.205 RSS-247 Clause 3.3
Basic standard	: ANSI C63.10: 2013
Limits	: Refer to 15.209(a) of FCC part 15.247(d) RSS-Gen Section 8.9 & 8.10
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: 2021-12-14 to 2021-12-16
Input voltage	: DC 3.3V
Operation mode	: A, B, C
Test channel	: Low / Middle / High
Ambient temperature	: Refer to test result
Relative humidity	: Refer to test result
Atmospheric pressure	: Refer to test result

Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix B & C & D.

6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

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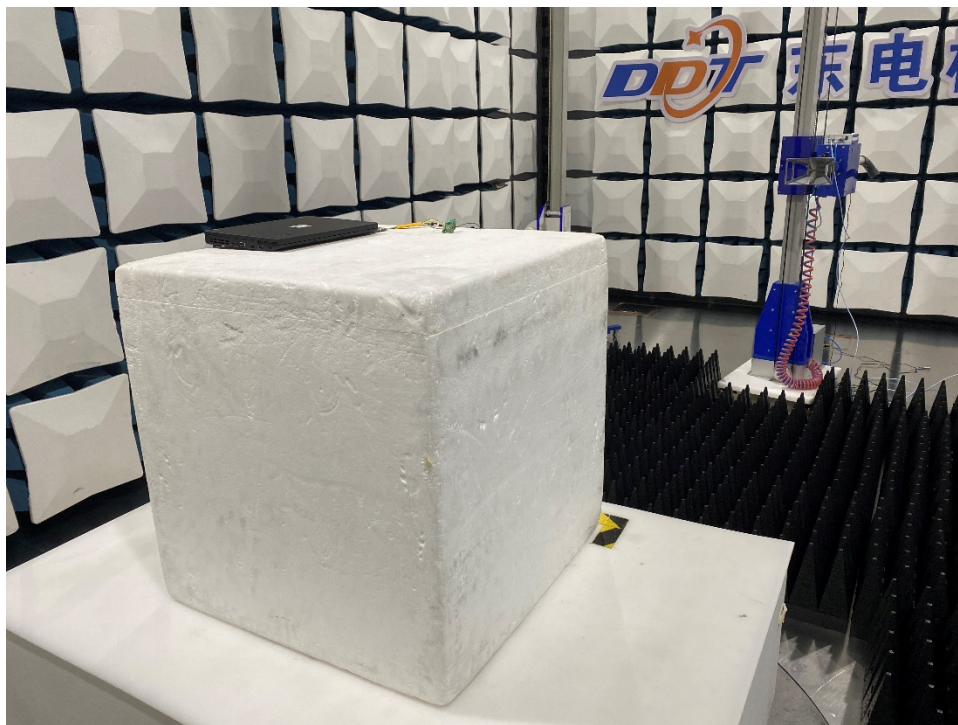
Appendix A: Photographs of the Test Set-Up

APPENDIX A: PHOTOGRAPHS OF THE TEST SET-UP	1
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PHOTOGRAPH 2: SET-UP PHOTO FOR RADIATED SPURIOUS EMISSION, 1GHz - 18GHz	2

Photograph 1: Set-up photo for Radiated Spurious Emission, 30MHz - 1GHz



Photograph 2: Set-up photo for Radiated Spurious Emission, 1GHz - 18GHz



Appendix B: Test Results of Bluetooth BDR/EDR

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Appendix B.1: Test Results of Maximum Peak Conducted Output Power and EIRP

Test Mode	Antenna	Channel	Conducted Peak Power[dBm]	Conducted Limit[dBm]	EIRP[dBm]	EIRP Limit[dBm]	Verdict
DH5	Ant1	2402	3.02	≤20.97	7.02	≤36	PASS
		2441	3.78	≤20.97	7.78	≤36	PASS
		2480	4.69	≤20.97	8.69	≤36	PASS
2DH5	Ant1	2402	5.22	≤20.97	9.22	≤36	PASS
		2441	6.16	≤20.97	10.16	≤36	PASS
		2480	7.18	≤20.97	11.18	≤36	PASS
3DH5	Ant1	2402	5.65	≤20.97	9.65	≤36	PASS
		2441	6.54	≤20.97	10.54	≤36	PASS
		2480	7.59	≤20.97	11.59	≤36	PASS

Note: Testing was carried out within frequency range 9kHz to the tenth harmonics. The measurement results below 30MHz and 18GHz - 26.5GHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 18GHz were reported.

Appendix B.2: Test Results of Radiated Spurious Emissions

Note: This testing was carried out on different modulations, but only the worst case was presented in this report.

30MHz - 1GHz

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3# **D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC BELOW 1G\FCC BELOW 1G_00001.EMI**

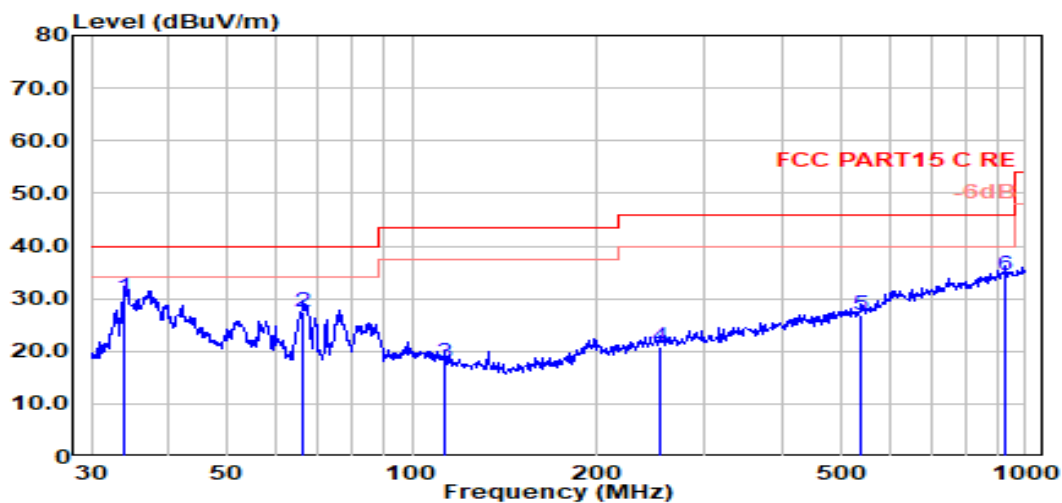
Test Date : 2021-12-15 **Tested By** : James

EUT : Wi-Fi & Bluetooth Internet of Things Module **Model Number** : ESP32-WROOM-32UE

Power Supply : DC 3.3V **Test Mode** : TX MODE

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa **Antenna/Distance** : VLUB 9163 3#/3m/Vertical

Memo : BT



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	33.92	17.84	8.81	3.51	30.16	40.00	-9.84	QP	Vertical
2	66.50	14.43	9.25	3.77	27.45	40.00	-12.55	QP	Vertical
3	112.92	3.89	10.02	4.04	17.95	43.50	-25.55	QP	Vertical
4	254.73	3.63	12.69	4.65	20.97	46.00	-25.03	QP	Vertical
5	539.48	3.89	17.40	5.56	26.85	46.00	-19.15	QP	Vertical
6	929.01	5.37	22.40	6.53	34.31	46.00	-11.69	QP	Vertical

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

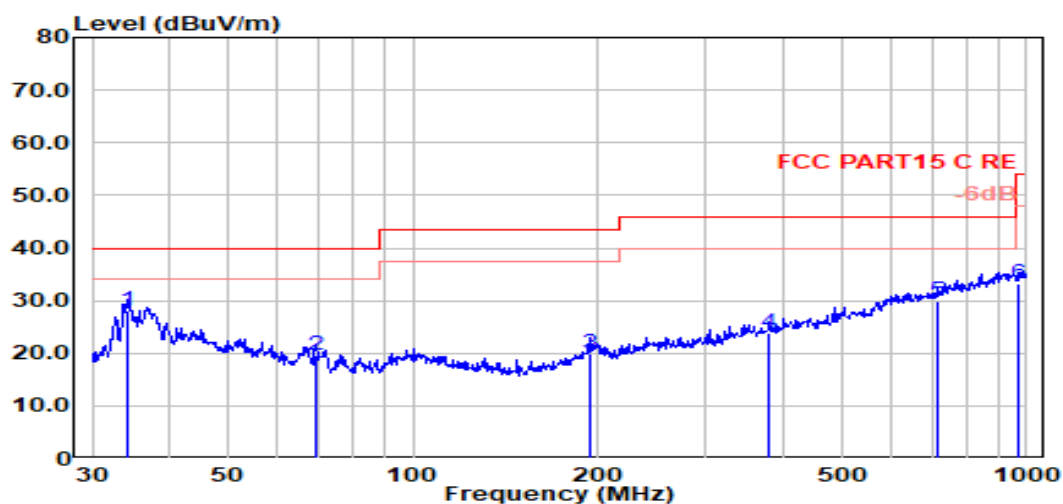
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-15
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BT

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC BELOW 1G\FCC BELOW 1G_00002.EMI
Tested By : James
Model Number : ESP32-WROOM-32UE
Test Mode : TX MODE
Antenna/Distance : VLUB 9163 3#/3m/HORIZONTAL



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	34.16	15.73	8.80	3.52	28.04	40.00	-11.96	QP	HORIZONTAL
2	69.36	6.73	9.00	3.79	19.52	40.00	-20.48	QP	HORIZONTAL
3	193.77	3.94	11.45	4.42	19.82	43.50	-23.68	QP	HORIZONTAL
4	381.25	3.92	14.95	5.09	23.95	46.00	-22.05	QP	HORIZONTAL
5	714.17	4.25	19.70	6.02	29.97	46.00	-16.03	QP	HORIZONTAL
6	968.93	4.44	22.18	6.67	33.29	54.00	-20.71	QP	HORIZONTAL

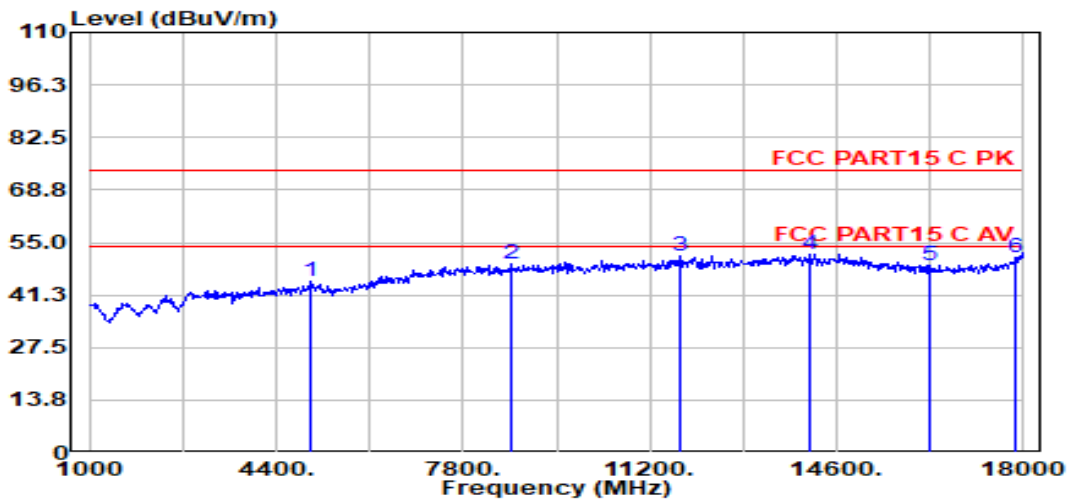
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

1GHz - 18GHz

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00015.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



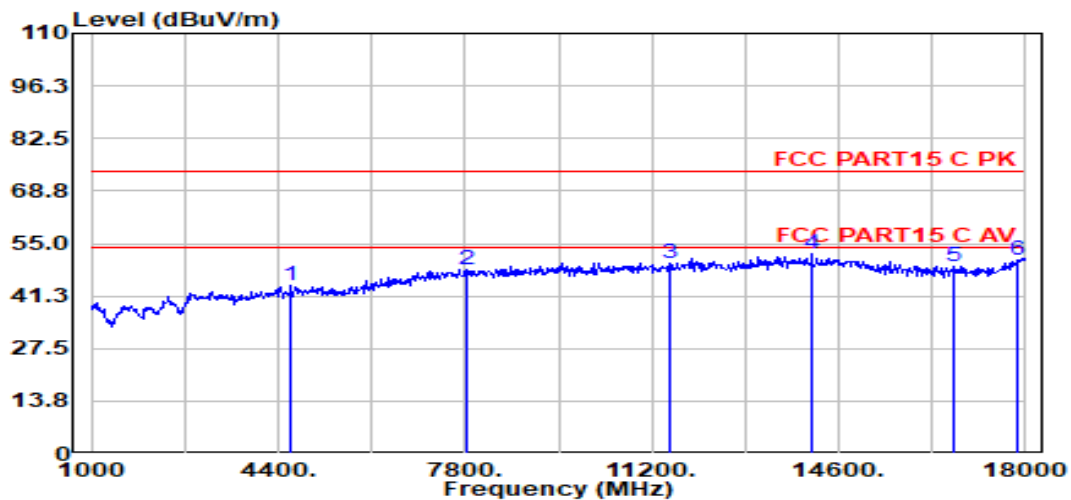
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	5029.00	46.52	33.08	5.50	40.40	44.70	74.00	-29.30	Peak	HORIZONTAL
2	8684.00	44.17	37.98	7.09	39.87	49.37	74.00	-24.63	Peak	HORIZONTAL
3	11744.00	44.25	39.10	8.07	40.13	51.29	74.00	-22.71	Peak	HORIZONTAL
4	14090.00	42.68	39.90	9.02	39.69	51.91	74.00	-22.09	Peak	HORIZONTAL
5	16283.00	41.71	37.90	9.45	39.96	49.10	74.00	-24.90	Peak	HORIZONTAL
6	17864.00	40.02	41.66	9.96	40.62	51.01	74.00	-22.99	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00016.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



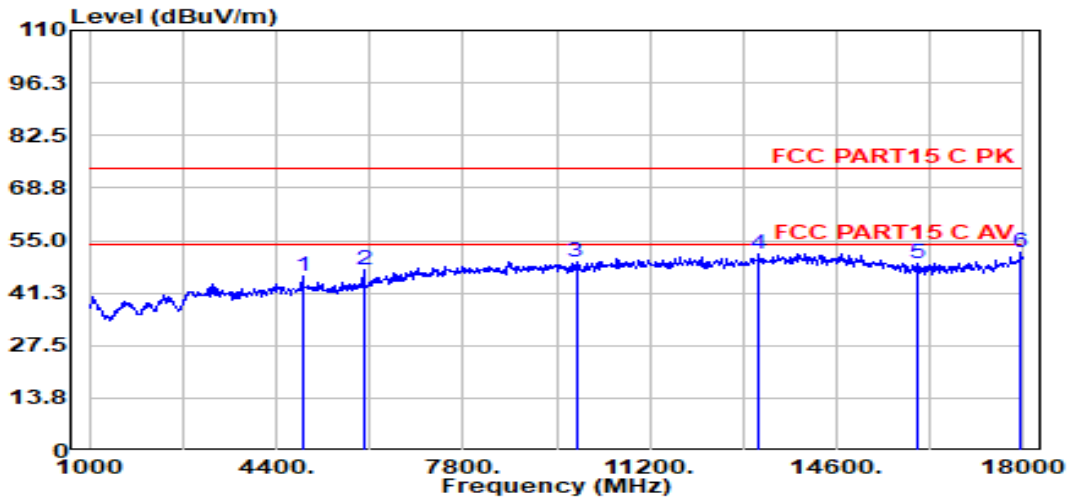
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4621.00	47.20	31.89	5.25	40.32	44.01	74.00	-29.99	Peak	VERTICAL
2	7834.00	44.54	36.80	6.75	39.78	48.31	74.00	-25.69	Peak	VERTICAL
3	11540.00	43.16	39.02	7.98	40.15	50.01	74.00	-23.99	Peak	VERTICAL
4	14107.00	43.25	39.90	9.02	39.69	52.48	74.00	-21.52	Peak	VERTICAL
5	16708.00	41.29	38.15	9.59	40.04	48.99	74.00	-25.01	Peak	VERTICAL
6	17847.00	39.74	41.55	9.95	40.61	50.64	74.00	-23.36	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2441

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00017.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



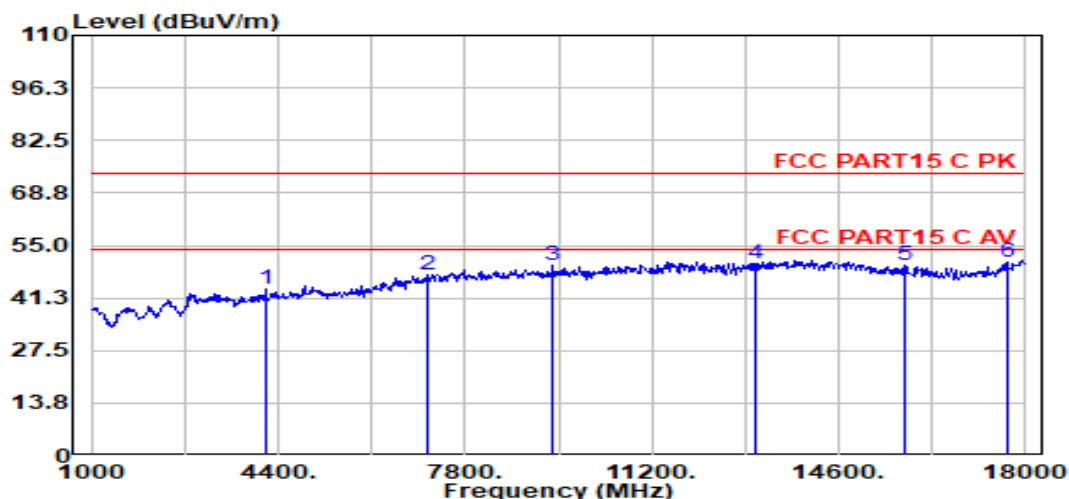
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4876.00	47.79	32.70	5.41	40.38	45.53	74.00	-28.47	Peak	VERTICAL
2	5998.00	47.79	34.00	5.95	40.50	47.24	74.00	-26.76	Peak	VERTICAL
3	9857.00	43.80	38.49	7.45	40.50	49.24	74.00	-24.76	Peak	VERTICAL
4	13189.00	43.44	39.75	8.65	40.27	51.57	74.00	-22.43	Peak	VERTICAL
5	16079.00	41.53	37.90	9.39	39.92	48.90	74.00	-25.10	Peak	VERTICAL
6	17949.00	40.39	42.18	9.98	40.67	51.89	74.00	-22.11	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2441

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00018.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



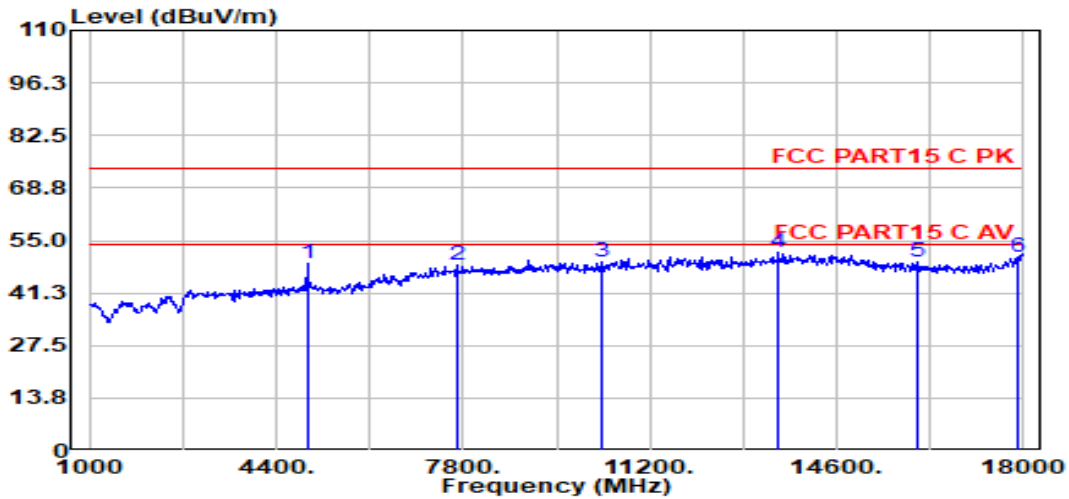
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4162.00	47.64	31.23	4.95	40.23	43.59	74.00	-30.41	Peak	HORIZONTAL
2	7137.00	44.65	36.11	6.43	39.71	47.48	74.00	-26.52	Peak	HORIZONTAL
3	9398.00	44.03	38.62	7.32	40.18	49.79	74.00	-24.21	Peak	HORIZONTAL
4	13104.00	42.37	39.68	8.61	40.33	50.34	74.00	-23.66	Peak	HORIZONTAL
5	15790.00	42.27	38.28	9.30	39.84	50.02	74.00	-23.98	Peak	HORIZONTAL
6	17660.00	40.70	40.39	9.89	40.50	50.49	74.00	-23.51	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00019.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



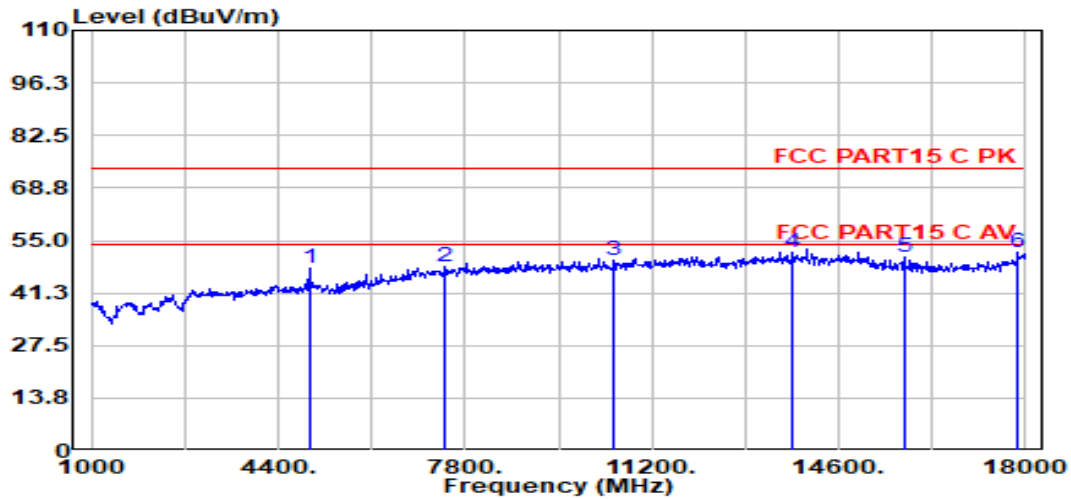
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4960.00	51.10	32.97	5.46	40.39	49.15	74.00	-24.85	Peak	HORIZONTAL
2	7698.00	45.05	36.64	6.69	39.77	48.61	74.00	-25.39	Peak	HORIZONTAL
3	10333.00	43.39	38.80	7.58	40.47	49.31	74.00	-24.69	Peak	HORIZONTAL
4	13546.00	43.12	39.99	8.81	40.02	51.90	74.00	-22.10	Peak	HORIZONTAL
5	16062.00	41.83	37.90	9.38	39.91	49.20	74.00	-24.80	Peak	HORIZONTAL
6	17881.00	39.58	41.76	9.96	40.63	50.68	74.00	-23.32	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00020.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4961.00	49.61	32.98	5.47	40.39	47.66	74.00	-26.34	Peak	VERTICAL
2	7443.00	44.81	36.35	6.57	39.74	48.00	74.00	-26.00	Peak	VERTICAL
3	10503.00	43.61	39.00	7.63	40.40	49.84	74.00	-24.16	Peak	VERTICAL
4	13750.00	42.93	39.95	8.90	39.88	51.90	74.00	-22.10	Peak	VERTICAL
5	15790.00	43.00	38.28	9.30	39.84	50.74	74.00	-23.26	Peak	VERTICAL
6	17864.00	41.04	41.66	9.96	40.62	52.04	74.00	-21.96	Peak	VERTICAL

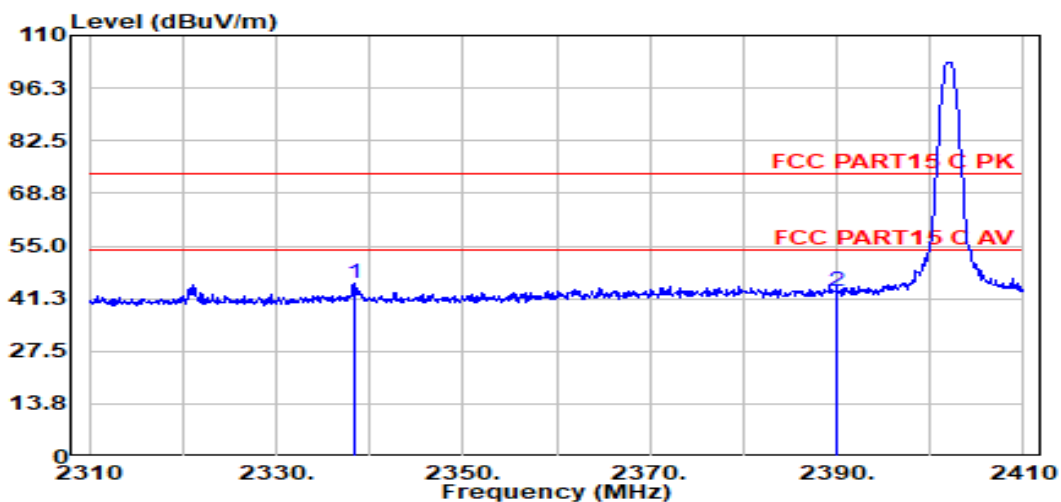
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Appendix B.3: Test Results of Radiated Emissions in Restricted Bands

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : DH5 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00003.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



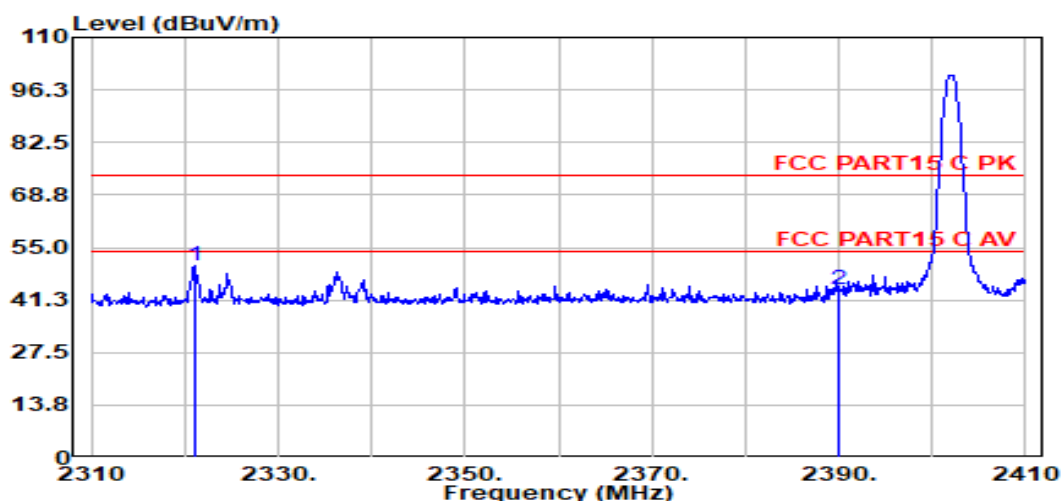
Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2338.30	53.86	27.31	3.68	39.57	45.29	74.00	-28.71	Peak	HORIZONTAL
2	2390.00	51.71	27.40	3.73	39.60	43.25	74.00	-30.75	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : DH5 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00004.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



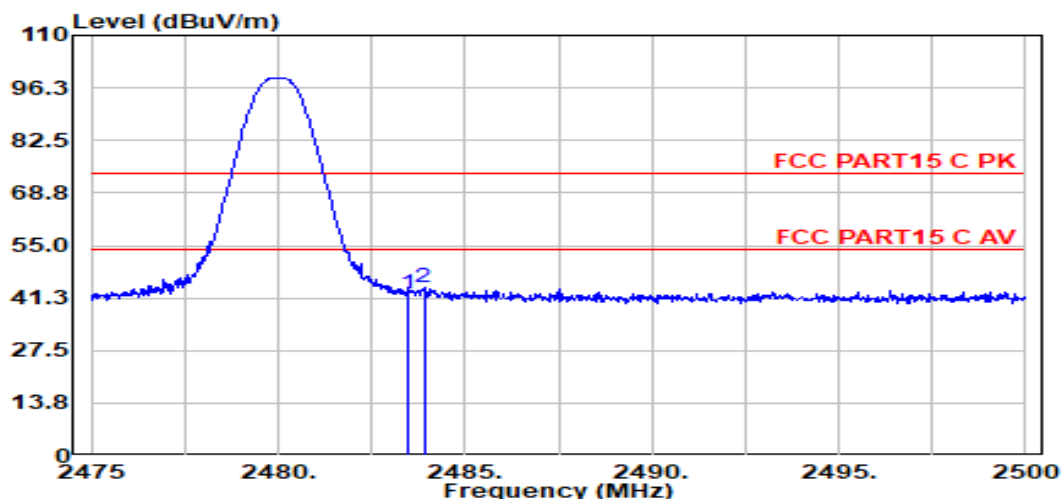
Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2321.10	58.73	27.28	3.67	39.56	50.11	74.00	-23.89	Peak	VERTICAL
2	2390.00	52.52	27.40	3.73	39.60	44.05	74.00	-29.95	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : DH5 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00005.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



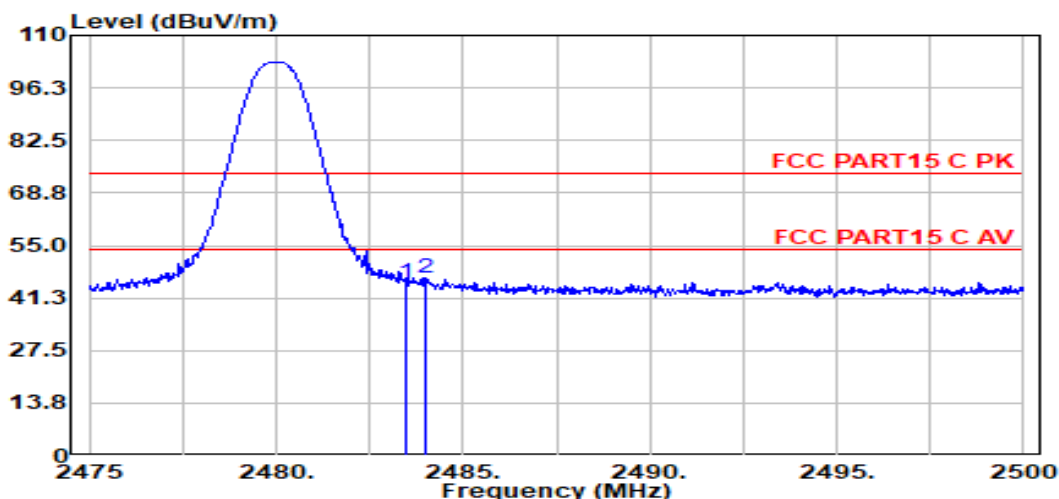
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	50.69	27.57	3.81	39.64	42.42	74.00	-31.58	Peak	VERTICAL
2	2483.90	52.42	27.57	3.81	39.64	44.16	74.00	-29.84	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : DH5 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00006.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



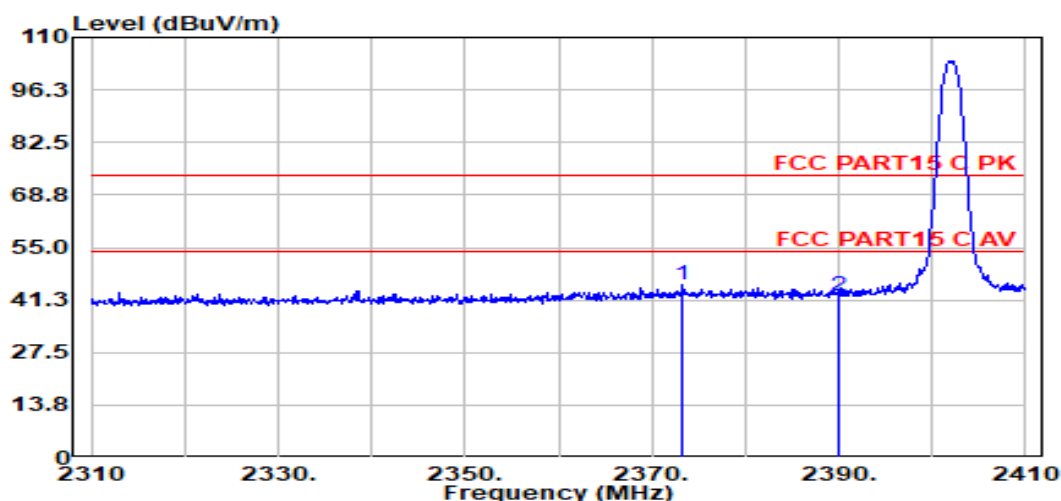
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	53.39	27.57	3.81	39.64	45.13	74.00	-28.87	Peak	HORIZONTAL
2	2483.98	54.92	27.57	3.81	39.64	46.65	74.00	-27.35	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 2DH5 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00007.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



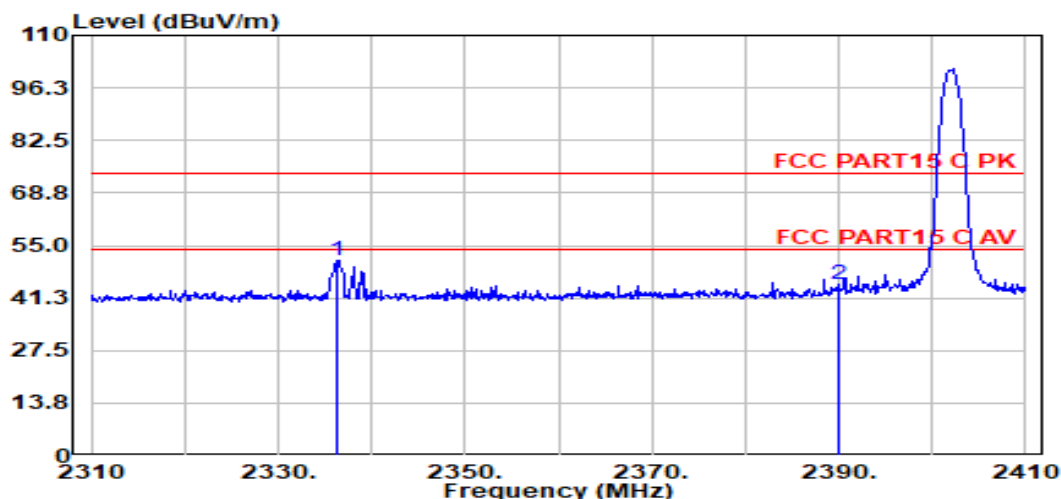
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2373.20	53.81	27.37	3.71	39.59	45.31	74.00	-28.69	Peak	HORIZONTAL
2	2390.00	50.94	27.40	3.73	39.60	42.47	74.00	-31.53	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 2DH5 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00008.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



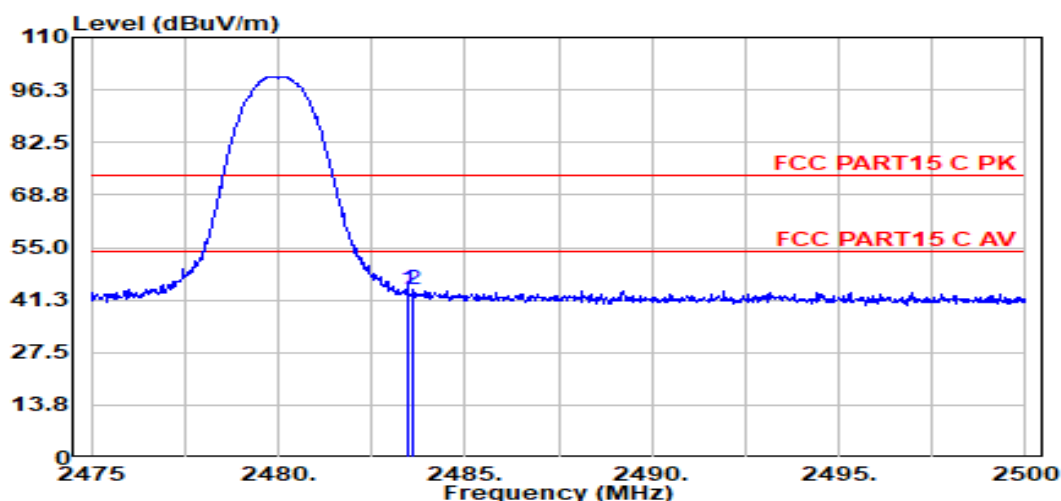
Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2336.30	59.76	27.31	3.68	39.57	51.18	74.00	-22.82	Peak	VERTICAL
2	2390.00	53.40	27.40	3.73	39.60	44.93	74.00	-29.07	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 2DH5 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00009.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



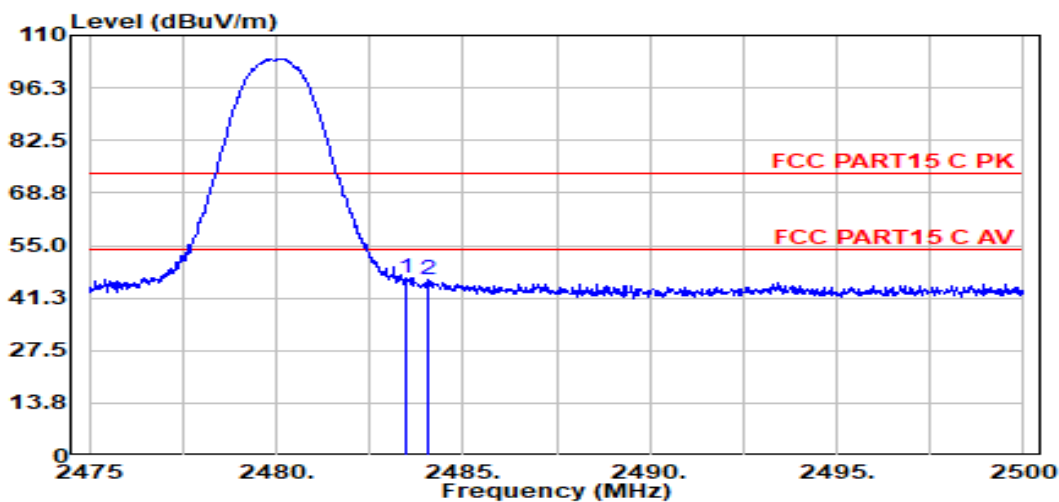
Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	52.45	27.57	3.81	39.64	44.19	74.00	-29.81	Peak	VERTICAL
2	2483.60	52.33	27.57	3.81	39.64	44.06	74.00	-29.94	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 2DH5 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00010.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



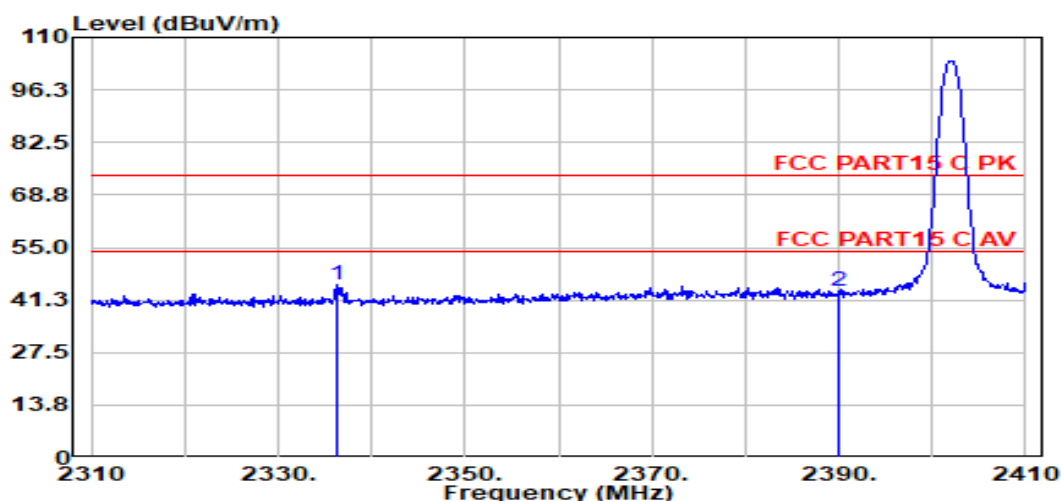
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	54.77	27.57	3.81	39.64	46.50	74.00	-27.50	Peak	HORIZONTAL
2	2484.05	54.26	27.57	3.81	39.64	46.00	74.00	-28.00	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00011.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

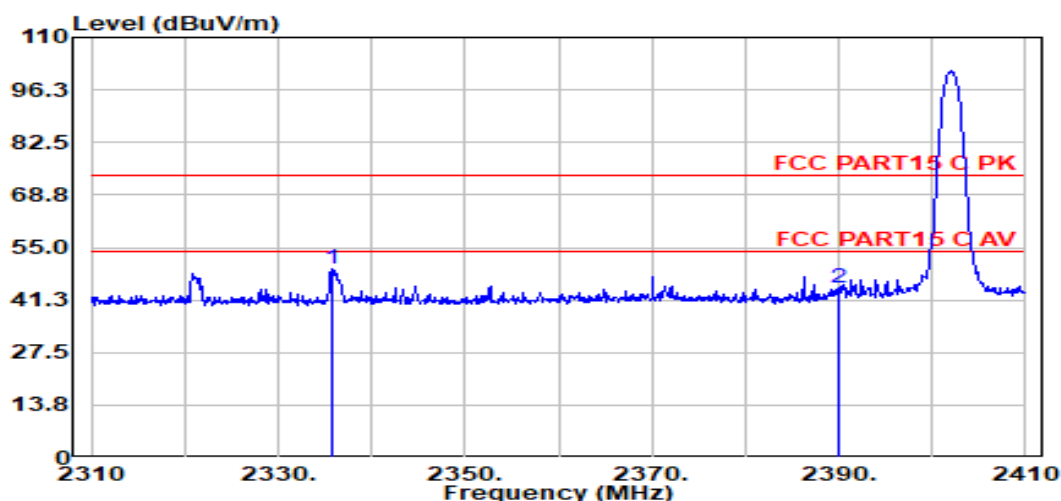


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2336.30	53.62	27.31	3.68	39.57	45.04	74.00	-28.96	Peak	HORIZONTAL
2	2390.00	52.21	27.40	3.73	39.60	43.75	74.00	-30.25	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2402
D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00012.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



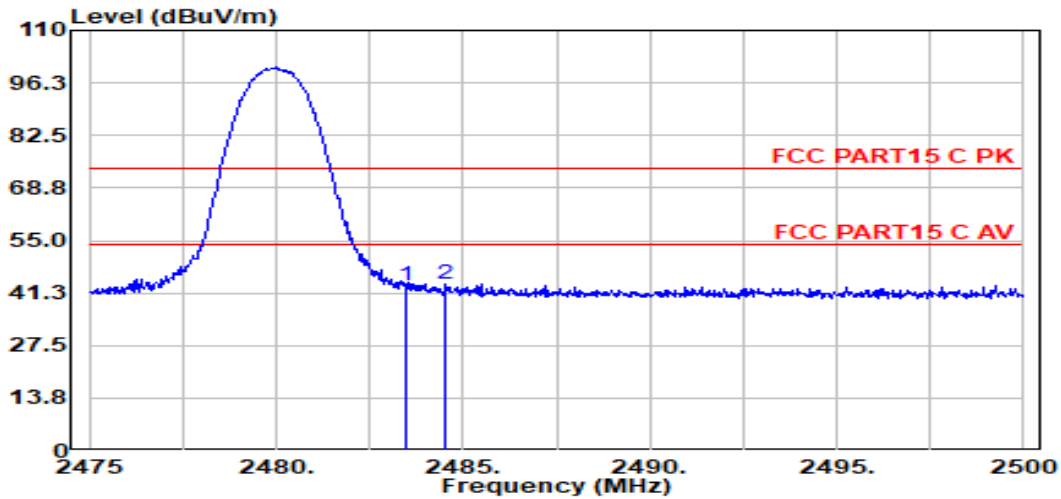
Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2335.80	57.92	27.30	3.68	39.57	49.34	74.00	-24.66	Peak	VERTICAL
2	2390.00	52.92	27.40	3.73	39.60	44.46	74.00	-29.54	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00013.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



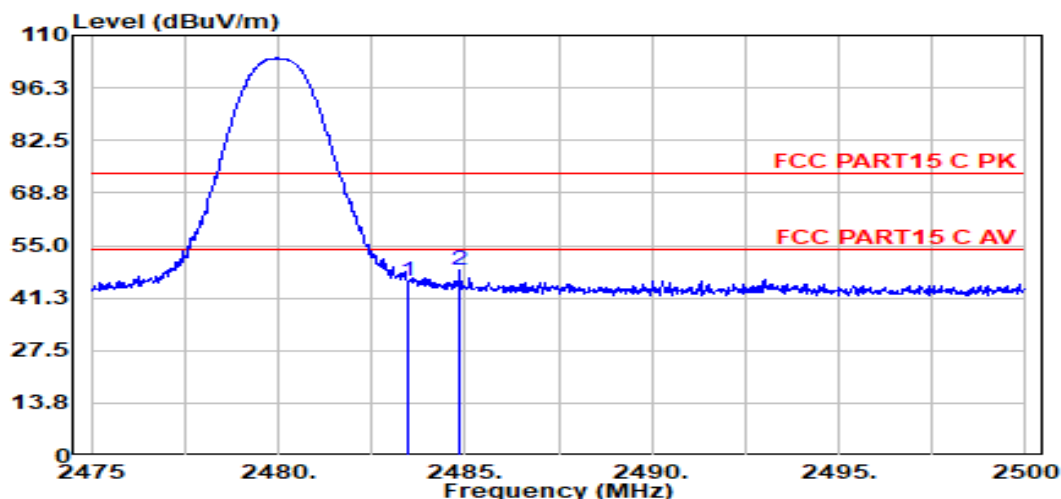
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	51.28	27.57	3.81	39.64	43.01	74.00	-30.99	Peak	VERTICAL
2	2484.55	51.84	27.57	3.81	39.64	43.58	74.00	-30.42	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00014.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



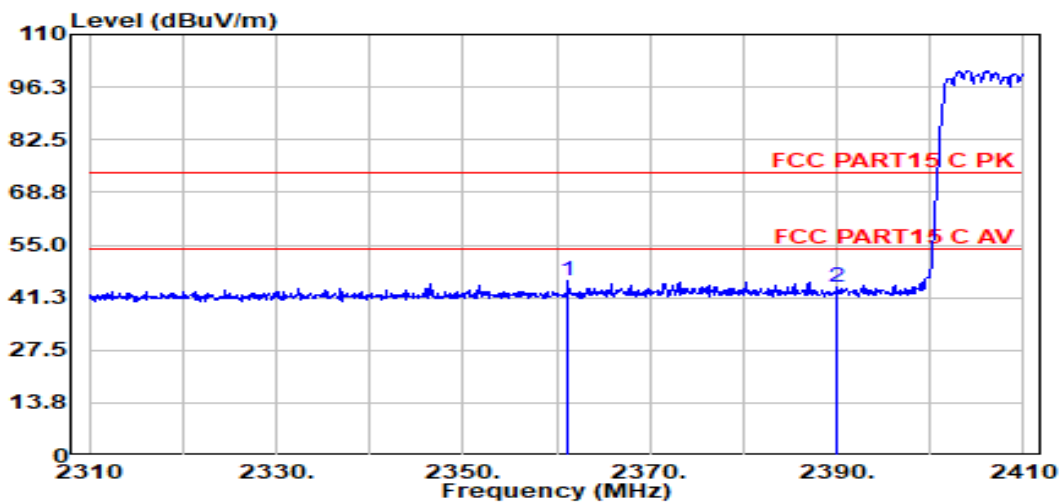
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	53.86	27.57	3.81	39.64	45.60	74.00	-28.40	Peak	HORIZONTAL
2	2484.88	56.64	27.57	3.81	39.64	48.38	74.00	-25.62	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : DH5 2402 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00033.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



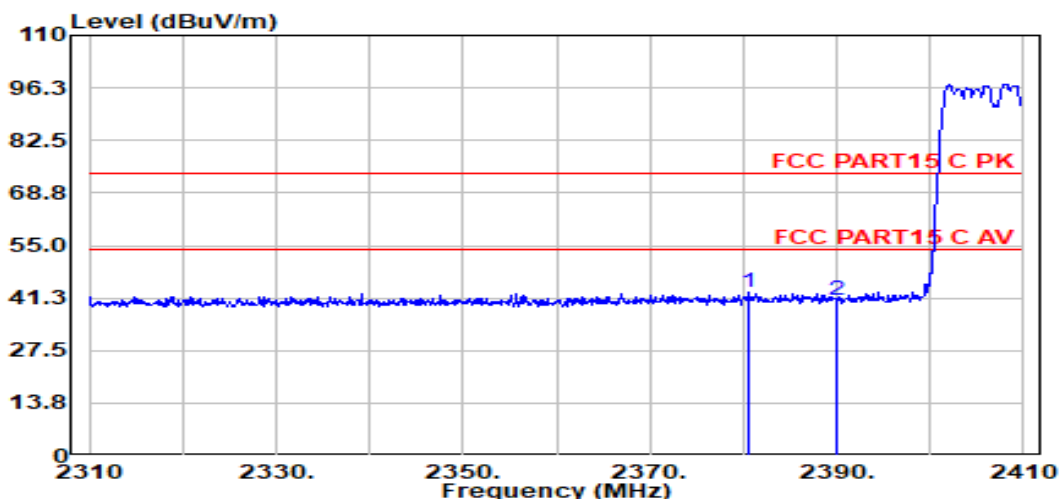
Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2361.30	54.09	27.35	3.70	39.58	45.57	74.00	-28.43	Peak	VERTICAL
2	2390.00	52.56	27.40	3.73	39.60	44.10	74.00	-29.90	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : DH5 2402 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00034.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



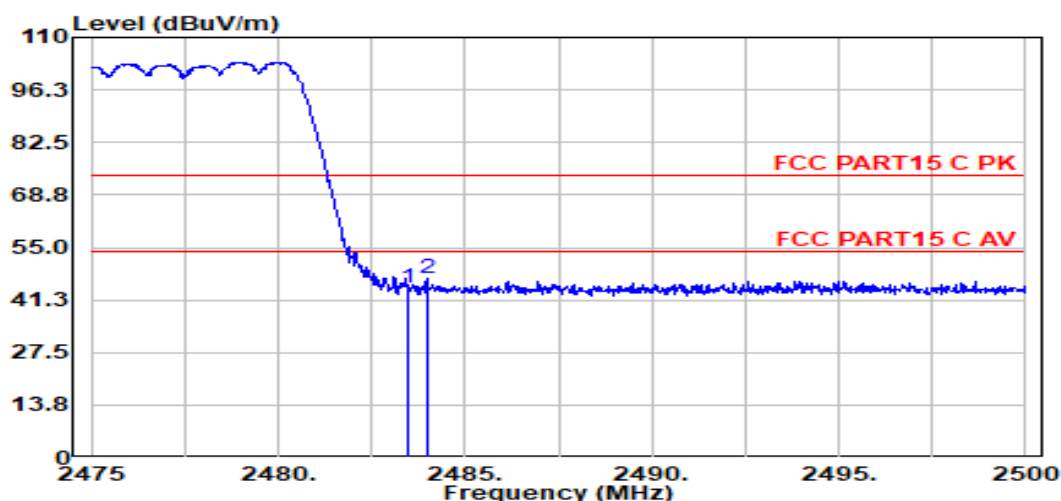
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2380.60	51.05	27.39	3.72	39.59	42.57	74.00	-31.43	Peak	HORIZONTAL
2	2390.00	49.14	27.40	3.73	39.60	40.67	74.00	-33.33	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : DH5 2480 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00035.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



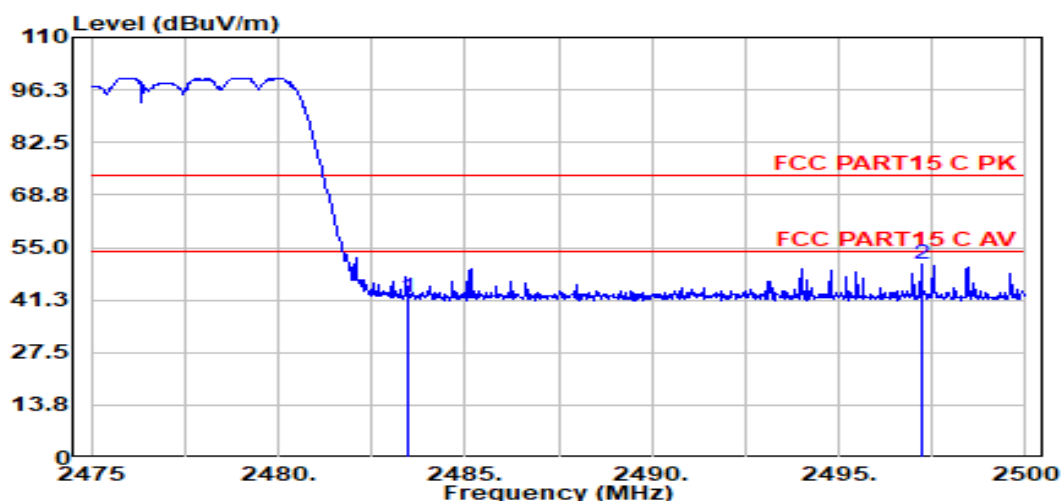
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	52.81	27.57	3.81	39.64	44.54	74.00	-29.46	Peak	HORIZONTAL
2	2484.00	54.99	27.57	3.81	39.64	46.73	74.00	-27.27	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : DH5 2480 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00036.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



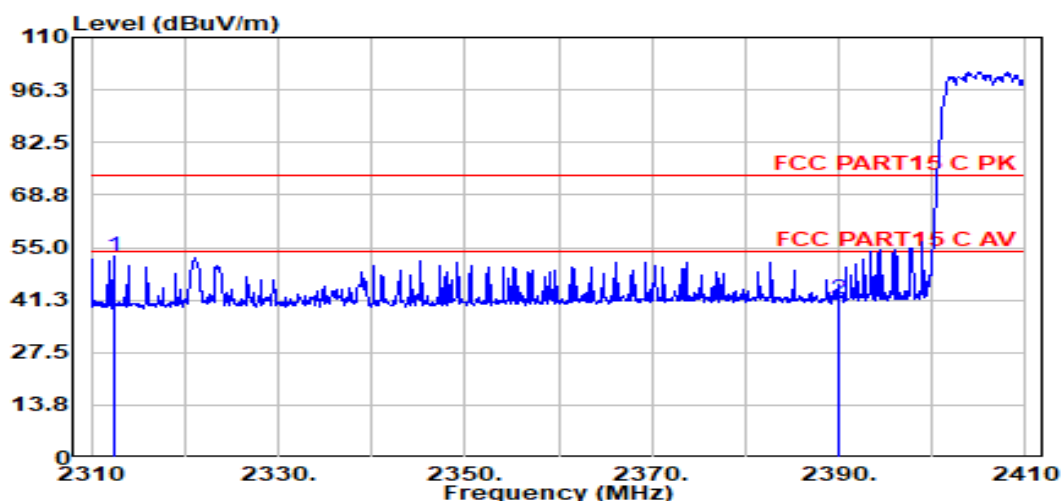
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	50.26	27.57	3.81	39.64	41.99	74.00	-32.01	Peak	VERTICAL
2	2497.20	59.04	27.59	3.82	39.65	50.81	74.00	-23.19	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 2DH5 2402 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00037.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2312.40	61.42	27.26	3.66	39.56	52.78	74.00	-21.22	Peak	VERTICAL
2	2390.00	50.06	27.40	3.73	39.60	41.60	74.00	-32.40	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00038.EMI

Test Date : 2021-12-16

Tested By : Kennys Zhang

EUT : Wi-Fi & Bluetooth Internet of Things Module

Model Number : ESP32-WROOM-32UE

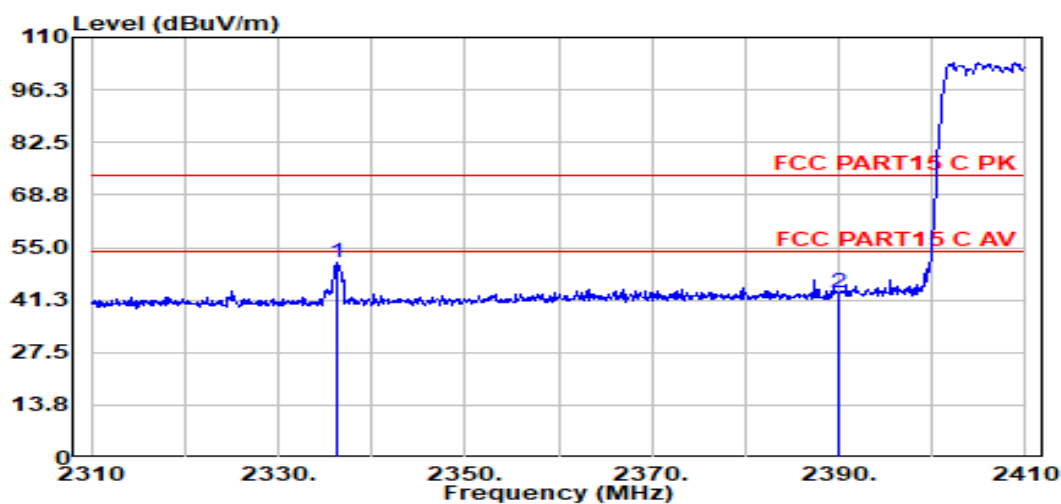
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa

Antenna/Distance : 2021 BBHA 9120D 3#
NEW/3m/HORIZONTAL

Memo : 2DH5 2402 Hopping



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2336.40	59.54	27.31	3.68	39.57	50.96	74.00	-23.04	Peak	HORIZONTAL
2	2390.00	51.66	27.40	3.73	39.60	43.20	74.00	-30.80	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

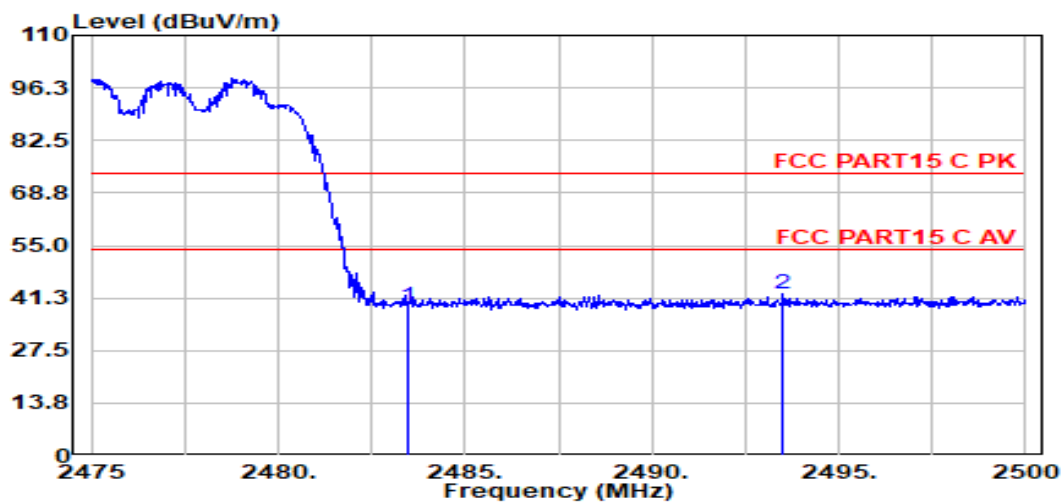
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 2DH5 2480 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00039.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



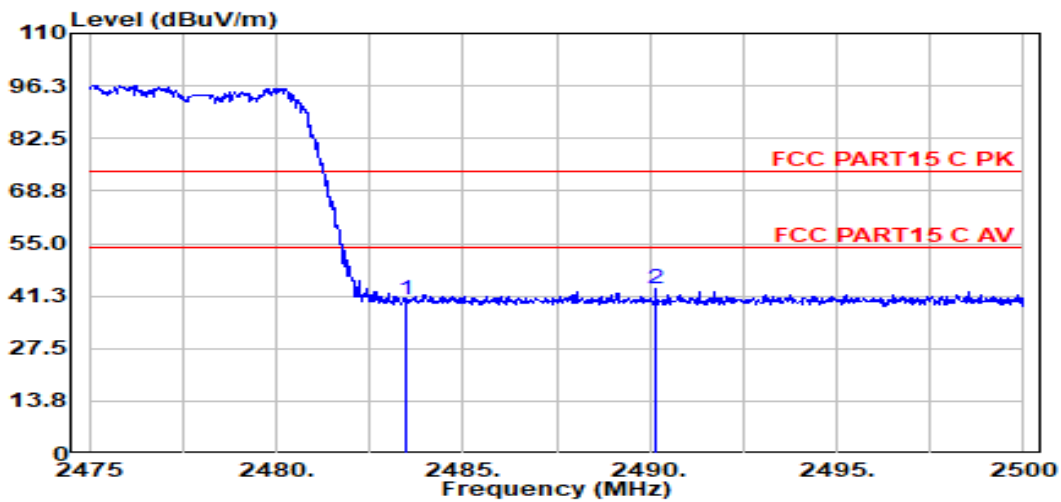
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	47.40	27.57	3.81	39.64	39.14	74.00	-34.86	Peak	HORIZONTAL
2	2493.53	50.56	27.59	3.81	39.65	42.31	74.00	-31.69	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 2DH5 2480 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00040.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



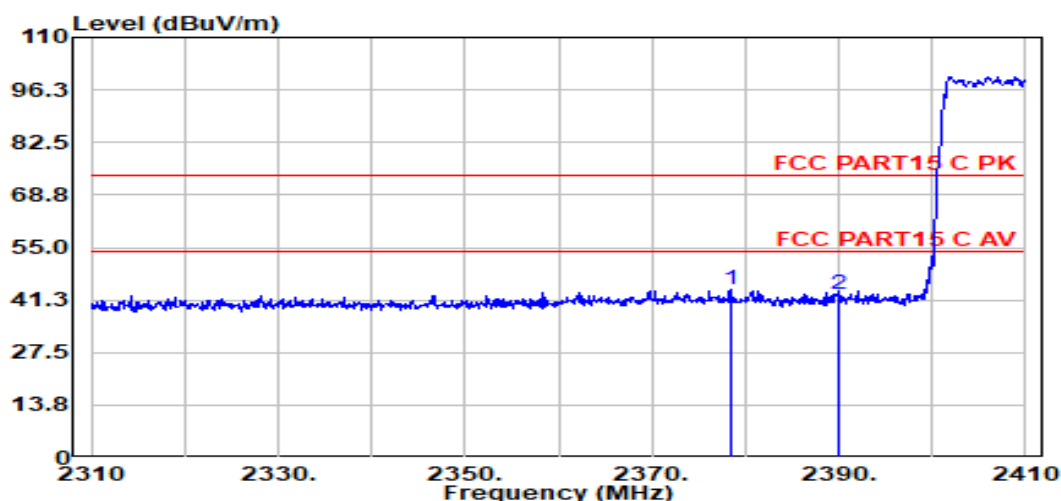
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	48.48	27.57	3.81	39.64	40.21	74.00	-33.79	Peak	VERTICAL
2	2490.15	51.27	27.58	3.81	39.65	43.02	74.00	-30.98	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2402 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00041.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



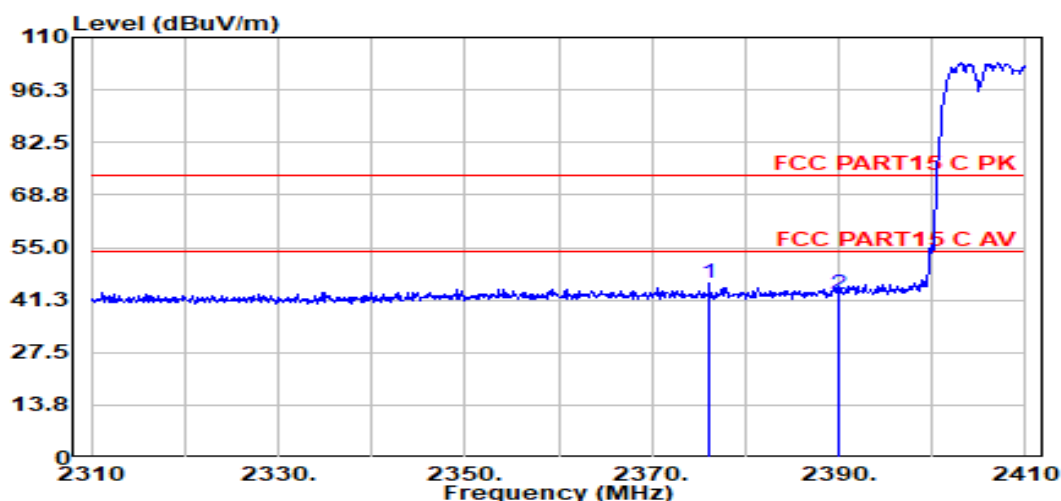
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2378.40	52.28	27.38	3.72	39.59	43.79	74.00	-30.21	Peak	VERTICAL
2	2390.00	51.32	27.40	3.73	39.60	42.86	74.00	-31.14	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2402 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00042.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2376.10	54.07	27.38	3.72	39.59	45.58	74.00	-28.42	Peak	HORIZONTAL
2	2390.00	51.08	27.40	3.73	39.60	42.62	74.00	-31.38	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00043.EMI

Test Date : 2021-12-16

Tested By : Kennys Zhang

EUT : Wi-Fi & Bluetooth Internet of Things Module

Model Number : ESP32-WROOM-32UE

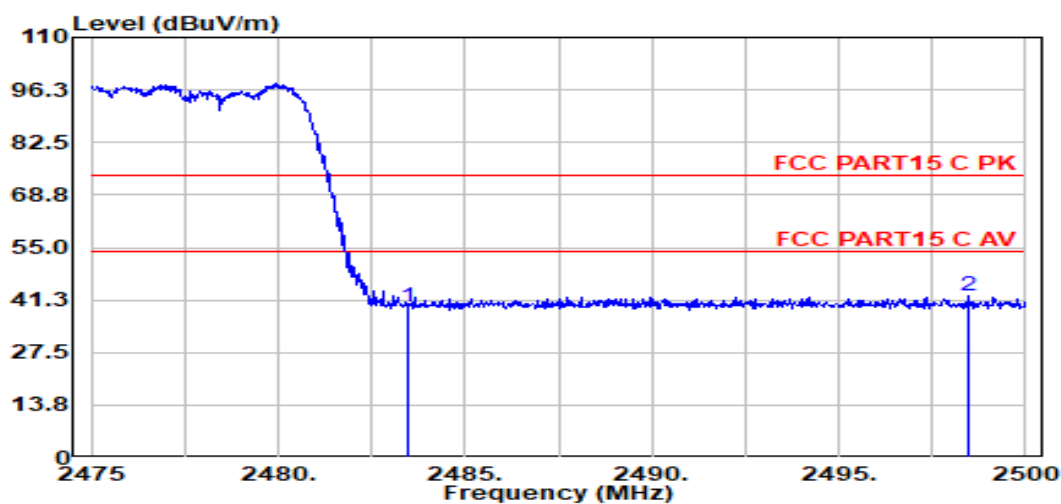
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa

Antenna/Distance : 2021 BBHA 9120D 3#
NEW/3m/HORIZONTAL

Memo : 3DH5 2480 Hopping



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	47.66	27.57	3.81	39.64	39.39	74.00	-34.61	Peak	HORIZONTAL
2	2498.45	50.54	27.60	3.82	39.65	42.31	74.00	-31.69	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

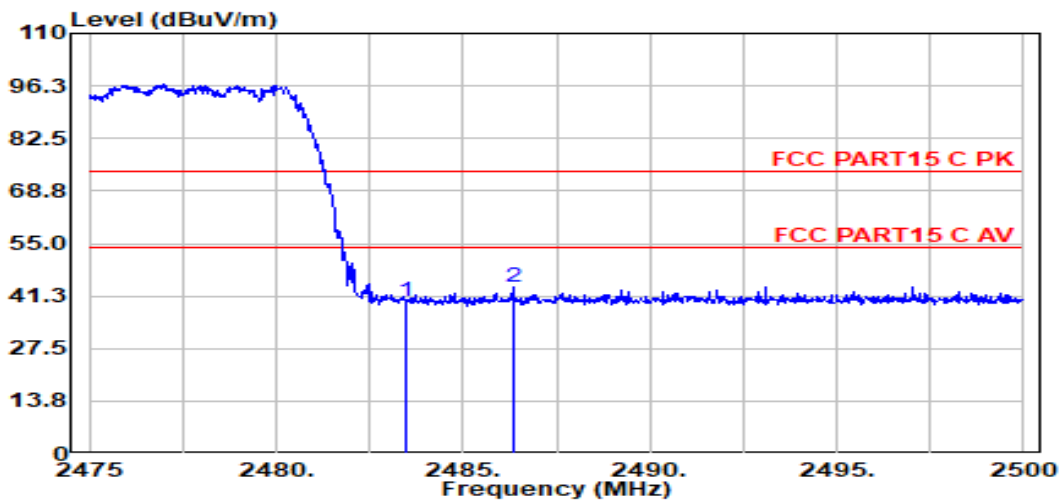
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 3DH5 2480 Hopping

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00044.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	48.15	27.57	3.81	39.64	39.88	74.00	-34.12	Peak	VERTICAL
2	2486.33	51.93	27.58	3.81	39.64	43.67	74.00	-30.33	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Appendix C: Test Results of Bluetooth Low Energy

APPENDIX C: TEST RESULTS OF BLUETOOTH LOW ENERGY	1
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Appendix C.1: Test Results of Maximum Peak Conducted Output Power and EIRP

TestMode	Antenna	Channel	Conducted Peak Power[dBm]	Conducted Limit[dBm]	EIRP[dBm]	EIRP Limit[dBm]	Verdict
BLE	Ant1	2402	3.17	≤30	7.17	≤36	PASS
		2440	3.82	≤30	7.82	≤36	PASS
		2480	4.81	≤30	8.91	≤36	PASS

Appendix C.2: Test Results of Radiated Spurious Emissions

Note:

- 1) This testing was carried out on different modulations, but only the worst case was presented in this report.
- 2) Testing was carried out within frequency range 9kHz to the tenth harmonics. The measurement results below 30MHz and 18GHz - 26.5GHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 18GHz were reported.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3# **D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC BELOW 1G\FCC BELOW 1G_00003.EMI**

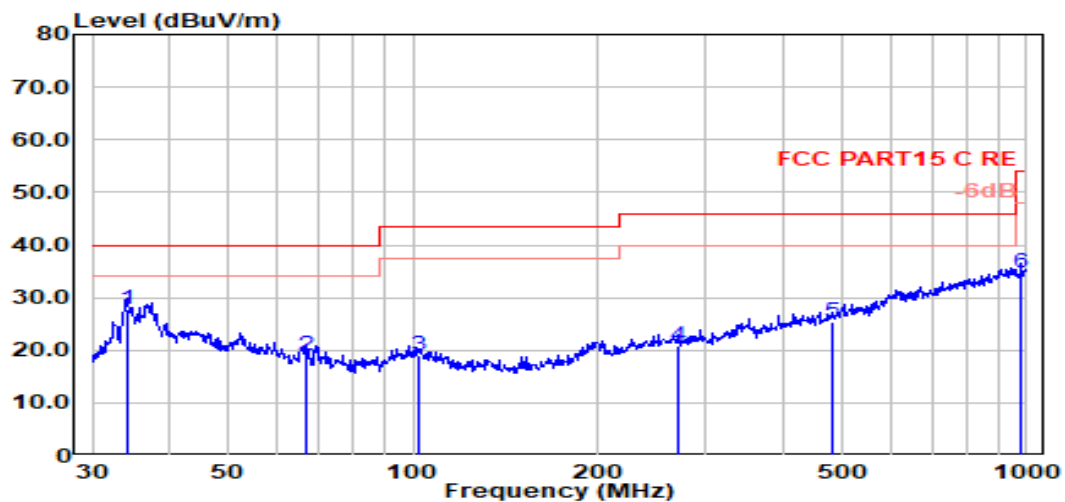
Test Date : 2021-12-15 **Tested By** : James

EUT : Wi-Fi & Bluetooth Internet of Things Module **Model Number** : ESP32-WROOM-32UE

Power Supply : DC 3.3V **Test Mode** : TX MODE

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa **Antenna/Distance** : VLUB 9163 3#/3m/HORIZONTAL

Memo : BLE



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	34.16	15.47	8.80	3.52	27.78	40.00	-12.22	QP	HORIZONTAL
2	66.73	5.90	9.23	3.77	18.90	40.00	-21.10	QP	HORIZONTAL
3	102.00	3.32	11.60	3.99	18.91	43.50	-24.59	QP	HORIZONTAL
4	269.43	3.61	12.60	4.71	20.92	46.00	-25.08	QP	HORIZONTAL
5	480.53	3.47	16.41	5.42	25.29	46.00	-20.71	QP	HORIZONTAL
6	979.18	5.57	22.30	6.73	34.60	54.00	-19.40	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

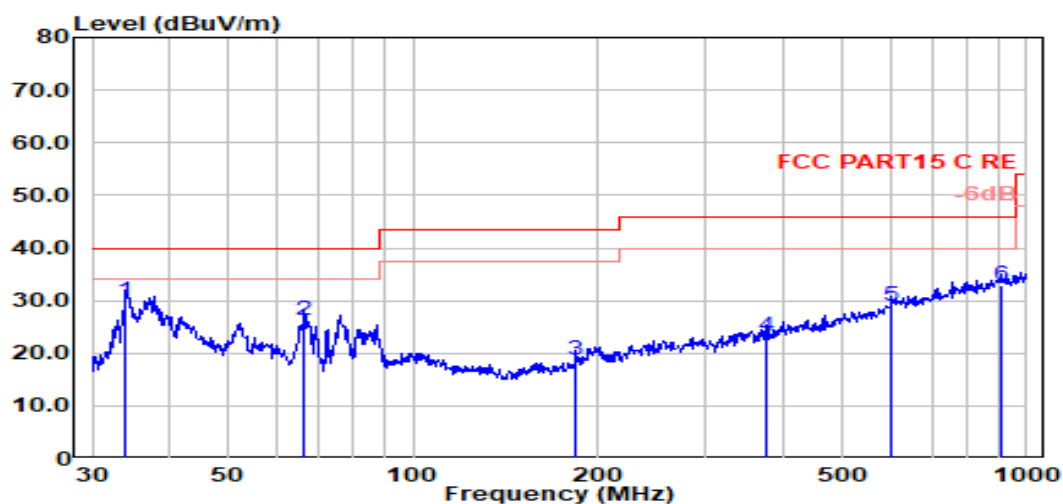
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-15
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC BELOW 1G\FCC BELOW 1G_00004.EMI
Tested By : James
Model Number : ESP32-WROOM-32UE
Test Mode : TX MODE
Antenna/Distance : VLUB 9163 3#/3m/Vertical



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	34.04	17.70	8.80	3.51	30.01	40.00	-9.99	QP	Vertical
2	66.50	13.37	9.25	3.77	26.40	40.00	-13.60	QP	Vertical
3	183.84	4.47	9.78	4.37	18.63	43.50	-24.87	QP	Vertical
4	377.26	3.42	14.85	5.07	23.34	46.00	-22.66	QP	Vertical
5	603.54	3.96	19.17	5.75	28.88	46.00	-17.12	QP	Vertical
6	906.48	4.29	22.23	6.49	33.01	46.00	-12.99	QP	Vertical

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

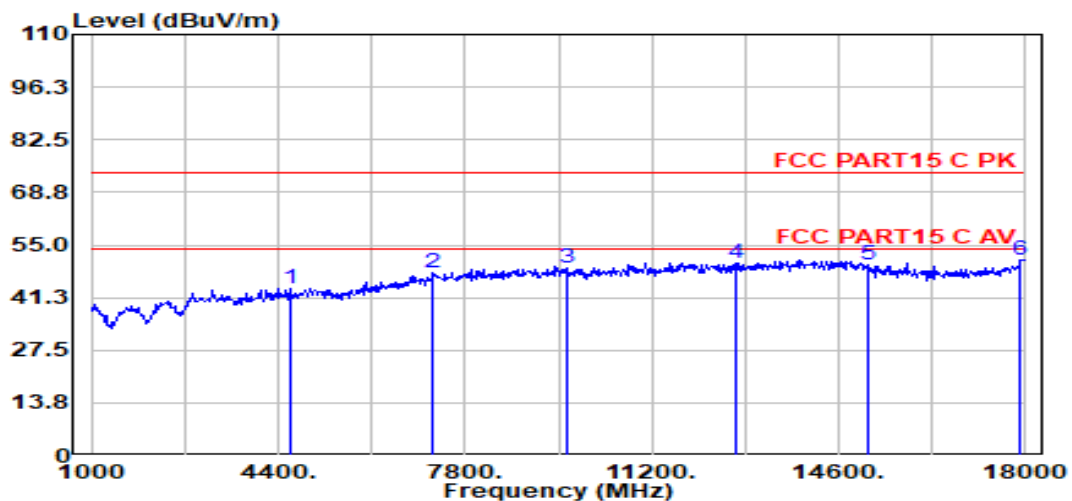
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

1GHz-18GHz

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	Tested By	: Kennys Zhang
Test Date	: 2021-12-14	Model Number	: ESP32-WROOM-32UE
EUT	: Wi-Fi & Bluetooth Internet of Things Module	Test Mode	: Tx Mode
Power Supply	: DC 3.3V	Antenna/Distance	: 2021 BBHA 9120D 3# NEW/3m/VERTICAL
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa		
Memo	: BLE 2402		



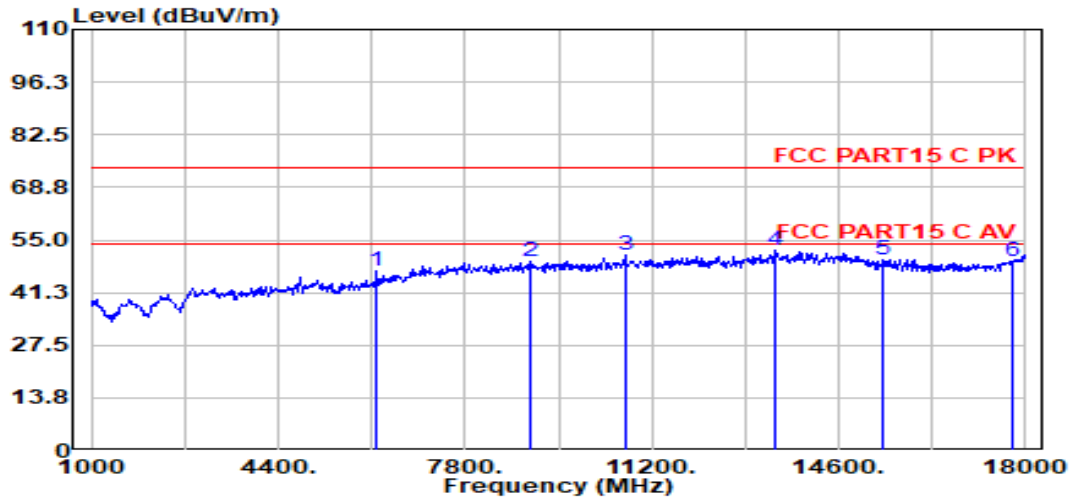
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4638.00	46.60	31.94	5.26	40.33	43.47	74.00	-30.53	Peak	VERTICAL
2	7222.00	44.87	36.18	6.47	39.72	47.80	74.00	-26.20	Peak	VERTICAL
3	9670.00	43.43	38.60	7.40	40.37	49.05	74.00	-24.95	Peak	VERTICAL
4	12747.00	42.87	39.30	8.46	40.32	50.30	74.00	-23.70	Peak	VERTICAL
5	15144.00	40.97	39.30	9.12	39.64	49.74	74.00	-24.26	Peak	VERTICAL
6	17915.00	39.78	41.97	9.97	40.65	51.08	74.00	-22.92	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00028.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



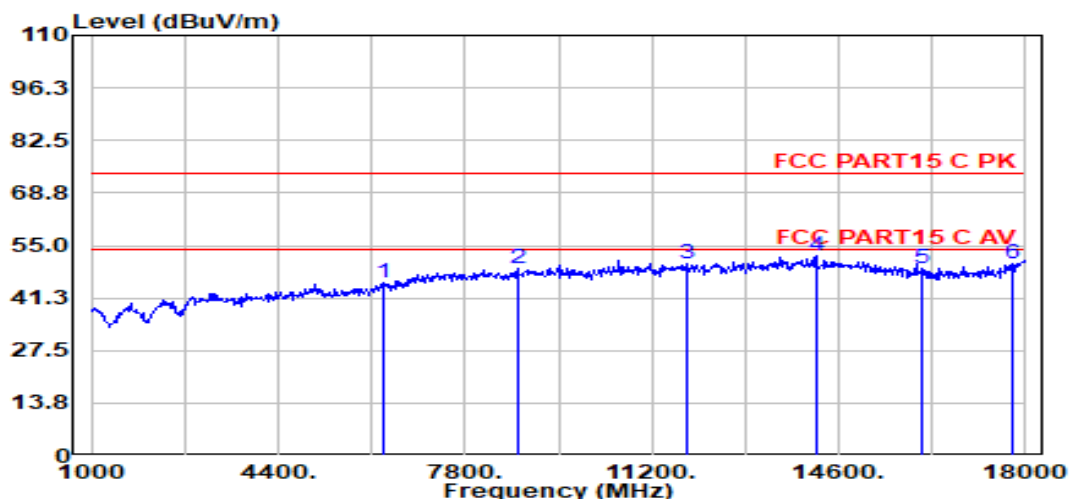
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	6202.00	46.75	34.48	6.03	40.34	46.94	74.00	-27.06	Peak	HORIZONTAL
2	9007.00	43.65	38.31	7.21	39.90	49.27	74.00	-24.73	Peak	HORIZONTAL
3	10707.00	44.50	39.12	7.68	40.32	50.99	74.00	-23.01	Peak	HORIZONTAL
4	13461.00	43.47	39.97	8.77	40.08	52.13	74.00	-21.87	Peak	HORIZONTAL
5	15416.00	41.53	38.92	9.20	39.72	49.92	74.00	-24.08	Peak	HORIZONTAL
6	17762.00	39.12	41.02	9.93	40.56	49.51	74.00	-24.49	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE 2440

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00029.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



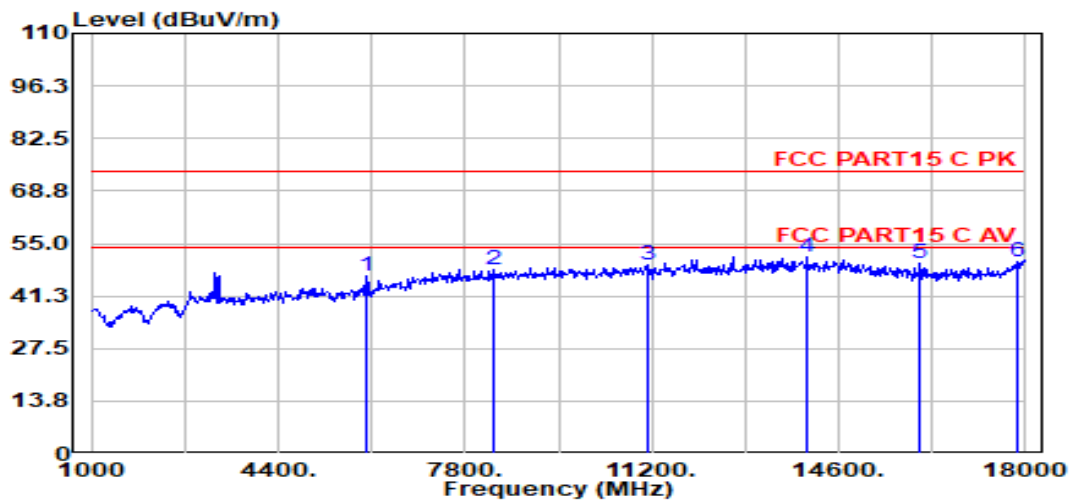
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	6304.00	44.79	34.73	6.08	40.26	45.34	74.00	-28.66	Peak	HORIZONTAL
2	8752.00	43.55	38.05	7.12	39.88	48.84	74.00	-25.16	Peak	HORIZONTAL
3	11846.00	43.27	39.14	8.11	40.12	50.40	74.00	-23.60	Peak	HORIZONTAL
4	14192.00	43.02	39.90	9.02	39.68	52.26	74.00	-21.74	Peak	HORIZONTAL
5	16096.00	41.76	37.90	9.39	39.92	49.13	74.00	-24.87	Peak	HORIZONTAL
6	17762.00	40.01	41.02	9.93	40.56	50.40	74.00	-23.60	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE 2440

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00030.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



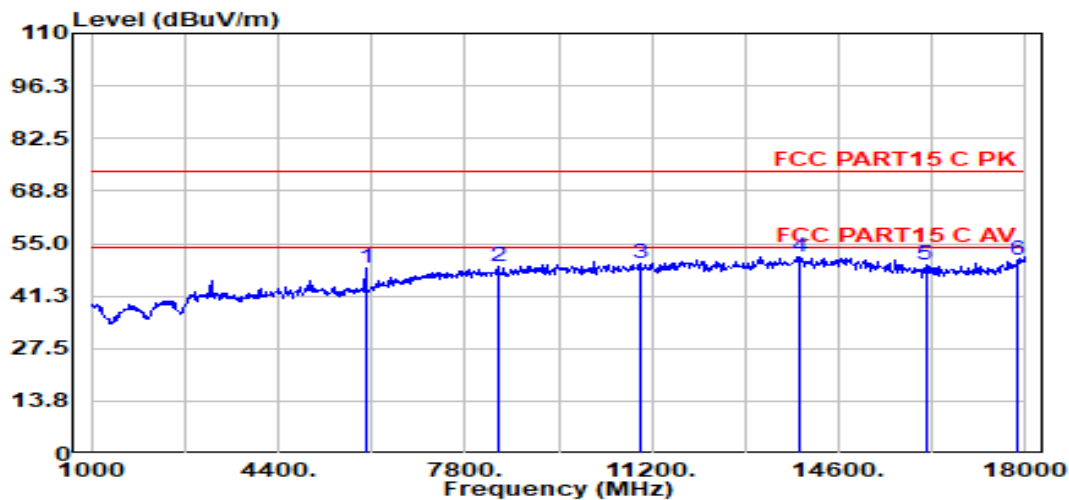
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	5998.00	47.08	34.00	5.95	40.50	46.52	74.00	-27.48	Peak	VERTICAL
2	8327.00	43.65	37.52	6.95	39.83	48.30	74.00	-25.70	Peak	VERTICAL
3	11132.00	42.60	39.22	7.81	40.19	49.45	74.00	-24.55	Peak	VERTICAL
4	14022.00	42.45	39.90	9.01	39.70	51.66	74.00	-22.34	Peak	VERTICAL
5	16079.00	42.31	37.90	9.39	39.92	49.68	74.00	-24.32	Peak	VERTICAL
6	17864.00	39.17	41.66	9.96	40.62	50.17	74.00	-23.83	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00031.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



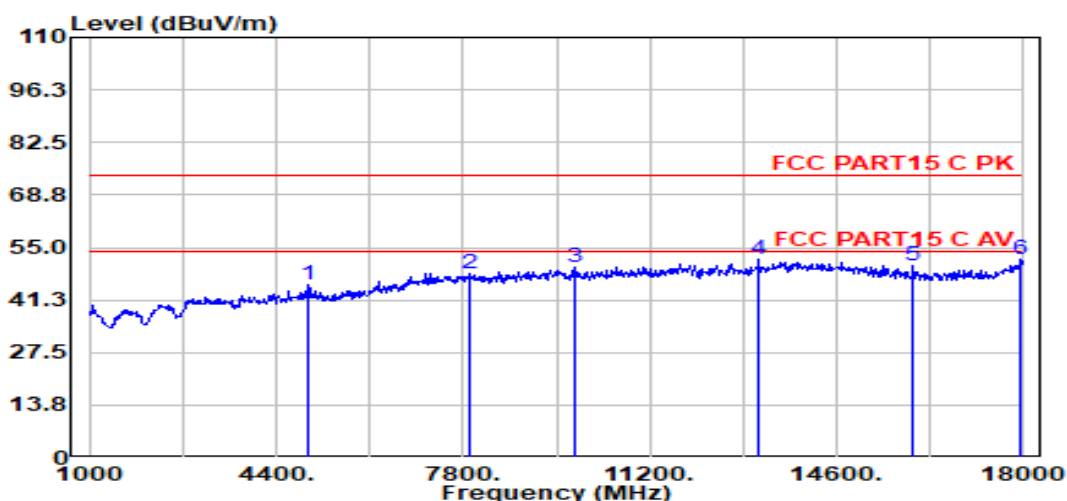
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	5998.00	49.27	34.00	5.95	40.50	48.72	74.00	-25.28	Peak	VERTICAL
2	8412.00	44.00	37.66	6.99	39.84	48.80	74.00	-25.20	Peak	VERTICAL
3	10996.00	42.96	39.30	7.76	40.20	49.82	74.00	-24.18	Peak	VERTICAL
4	13886.00	42.54	39.92	8.96	39.78	51.64	74.00	-22.36	Peak	VERTICAL
5	16181.00	42.00	37.90	9.42	39.94	49.38	74.00	-24.62	Peak	VERTICAL
6	17864.00	39.77	41.66	9.96	40.62	50.77	74.00	-23.23	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00032.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4961.00	47.10	32.98	5.47	40.39	45.15	74.00	-28.85	Peak	HORIZONTAL
2	7936.00	44.01	36.92	6.80	39.79	47.94	74.00	-26.06	Peak	HORIZONTAL
3	9823.00	44.35	38.51	7.44	40.48	49.82	74.00	-24.18	Peak	HORIZONTAL
4	13189.00	43.74	39.75	8.65	40.27	51.87	74.00	-22.13	Peak	HORIZONTAL
5	15977.00	42.68	37.94	9.35	39.89	50.08	74.00	-23.92	Peak	HORIZONTAL
6	17949.00	40.39	42.18	9.98	40.67	51.89	74.00	-22.11	Peak	HORIZONTAL

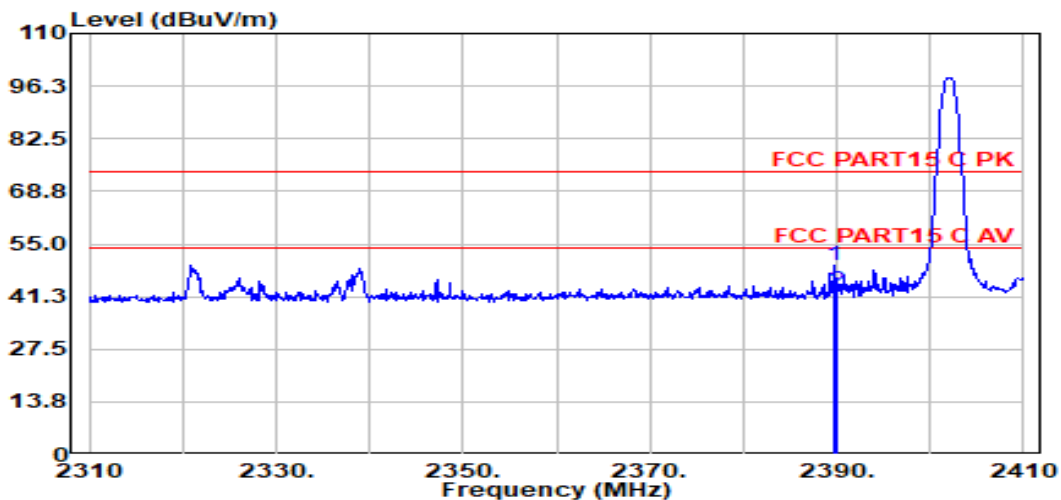
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Appendix C.3: Test Results of Radiated Emissions in Restricted Bands

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00023.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



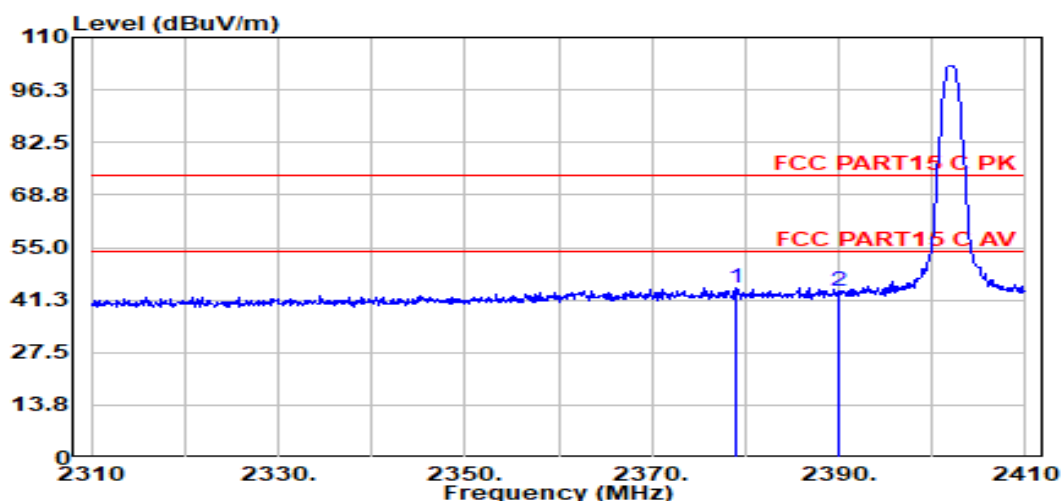
Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2389.80	57.76	27.40	3.73	39.59	49.30	74.00	-24.70	Peak	VERTICAL
2	2390.00	51.15	27.40	3.73	39.60	42.68	74.00	-31.32	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE 2402

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00024.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



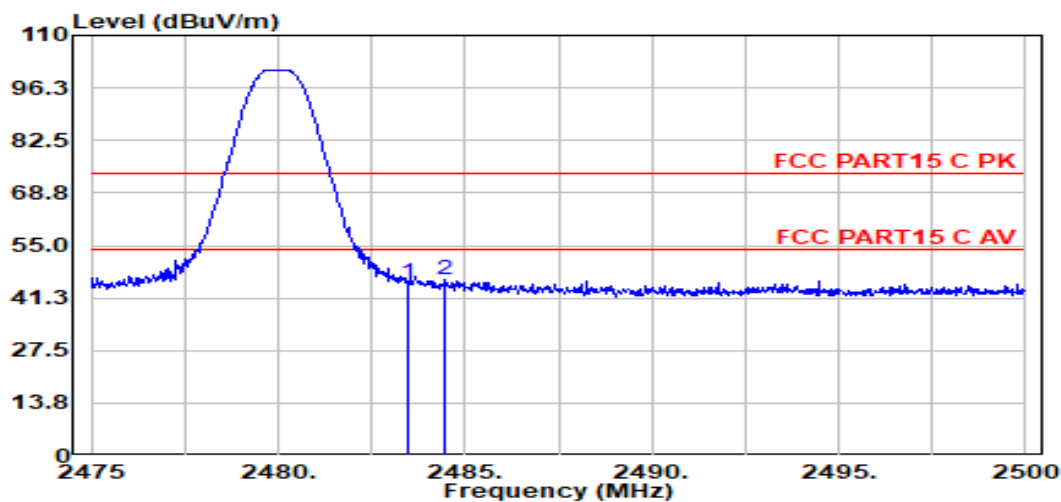
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2378.90	53.08	27.38	3.72	39.59	44.59	74.00	-29.41	Peak	HORIZONTAL
2	2390.00	51.97	27.40	3.73	39.60	43.51	74.00	-30.49	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00025.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



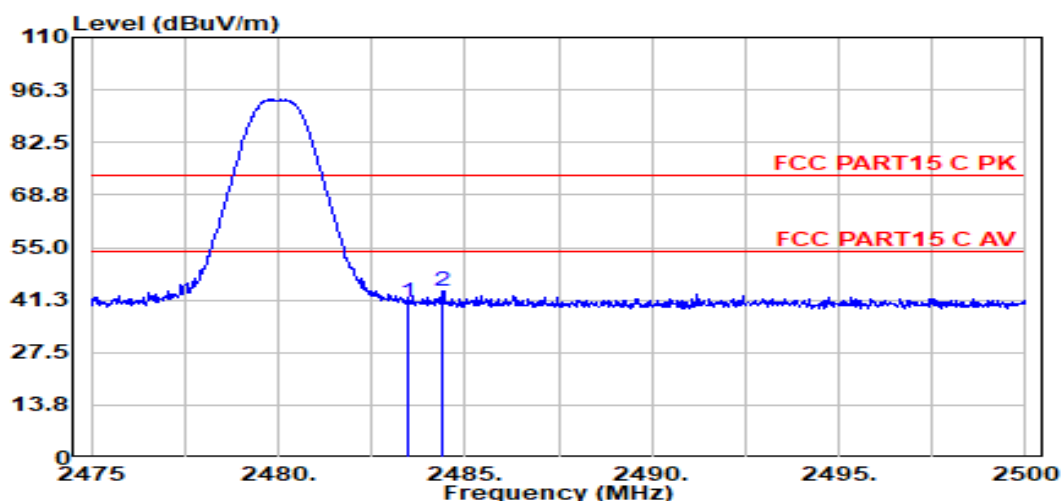
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	53.45	27.57	3.81	39.64	45.19	74.00	-28.81	Peak	HORIZONTAL
2	2484.45	54.16	27.57	3.81	39.64	45.90	74.00	-28.10	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-14
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : BLE 2480

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\BT&BLE\FCC ABOVE 1G_00026.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	49.14	27.57	3.81	39.64	40.88	74.00	-33.12	Peak	VERTICAL
2	2484.38	51.89	27.57	3.81	39.64	43.62	74.00	-30.38	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Appendix D: Test Results of Wi-Fi 802.11 b/g/n

APPENDIX D: TEST RESULTS OF WI-FI 802.11 B/G/N.....	1
APPENDIX D.1: TEST RESULTS OF MAXIMUM CONDUCTED OUTPUT POWER AND EIRP	2
APPENDIX D.2: TEST RESULTS OF RADIATED SPURIOUS EMISSIONS.....	3
30MHz - 1GHz (Worst case)	3
1GHz - 18GHz	5
APPENDIX D.3: TEST RESULTS OF RADIATED EMISSIONS IN RESTRICTED BANDS	29

Appendix D.1: Test Results of Maximum Conducted Output Power and EIRP

TestMode	Antenna	Channel	Set Power	Maximum Conducted Output Power[dBm]	Conducted Limit[dBm]	EIRP [dBm]	EIRP Limit[dBm]	Verdict
11B	Ant1	2412	---	15.92	≤30	19.92	≤36	PASS
		2437	---	15.40	≤30	19.40	≤36	PASS
		2462	---	15.07	≤30	19.07	≤36	PASS
11G	Ant1	2412	---	12.31	≤30	16.31	≤36	PASS
		2437	---	12.20	≤30	16.20	≤36	PASS
		2462	---	11.99	≤30	15.99	≤36	PASS
11N20SISO	Ant1	2412	---	12.23	≤30	16.23	≤36	PASS
		2437	---	12.03	≤30	16.03	≤36	PASS
		2462	---	11.81	≤30	15.81	≤36	PASS
11N40SISO	Ant1	2422	---	7.81	≤30	11.81	≤36	PASS
		2437	---	7.04	≤30	11.04	≤36	PASS
		2452	---	8.95	≤30	12.95	≤36	PASS

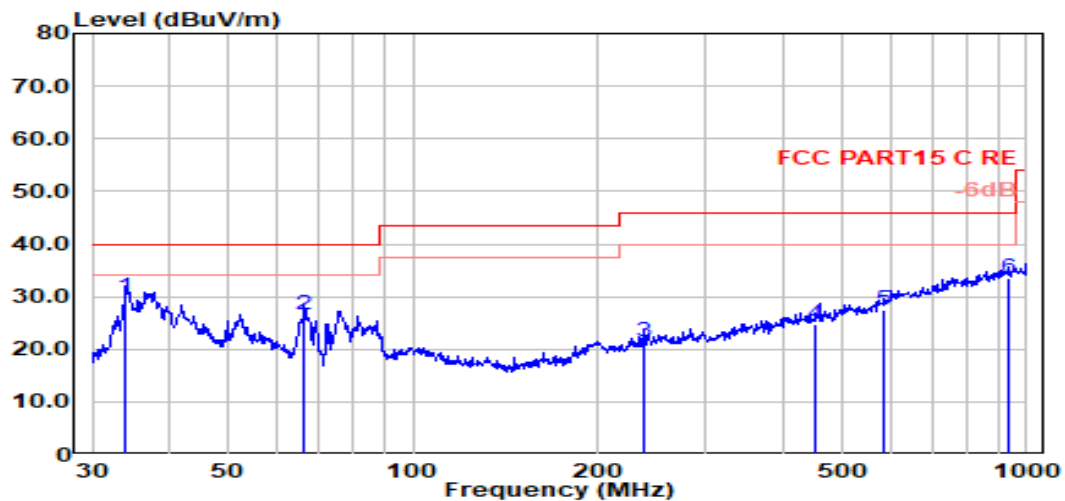
Note: Testing was carried out within frequency range 9kHz to the tenth harmonics. The measurement results below 30MHz and 18GHz - 26.5GHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 18GHz were reported.

Appendix D.2: Test Results of Radiated Spurious Emissions

30MHz - 1GHz (Worst case)

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-15
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 2.4G WIFI

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC BELOW 1G\FCC BELOW 1G_00005.EMI
Tested By : James
Model Number : ESP32-WROOM-32UE
Test Mode : TX MODE
Antenna/Distance : VLUB 9163 3#/3m/Vertical



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	34.04	17.70	8.80	3.51	30.01	40.00	-9.99	QP	Vertical
2	66.50	13.51	9.25	3.77	26.53	40.00	-13.47	QP	Vertical
3	237.48	4.53	12.40	4.59	21.52	46.00	-24.48	QP	Vertical
4	452.72	3.73	15.80	5.32	24.85	46.00	-21.15	QP	Vertical
5	586.84	3.11	18.65	5.70	27.45	46.00	-18.55	QP	Vertical
6	935.55	4.78	22.29	6.54	33.61	46.00	-12.39	QP	Vertical

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

Test Site : DDT 3m Chamber 3# **D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC BELOW 1G\FCC BELOW 1G_00006.EMI**

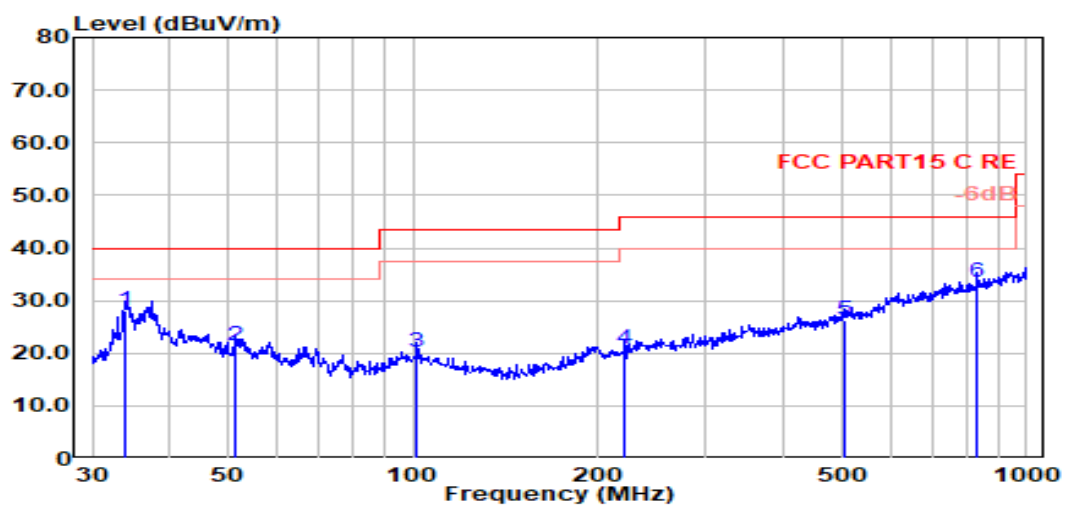
Test Date : 2021-12-15 **Tested By** : James

EUT : Wi-Fi & Bluetooth Internet of Things **Model Number** : ESP32-WROOM-32UE
Module

Power Supply : DC 3.3V **Test Mode** : TX MODE

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa **Antenna/Distance** : VLUB 9163 3#/3m/HORIZONTAL

Memo : 2.4GWIFI



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	33.80	15.64	8.82	3.51	27.98	40.00	-12.02	QP	HORIZONTAL
2	51.48	5.22	12.40	3.68	21.30	40.00	-18.70	QP	HORIZONTAL
3	101.64	4.53	11.60	3.99	20.12	43.50	-23.38	QP	HORIZONTAL
4	221.39	4.73	11.51	4.53	20.78	46.00	-25.22	QP	HORIZONTAL
5	502.94	3.71	17.16	5.49	26.35	46.00	-19.65	QP	HORIZONTAL
6	830.40	6.11	21.00	6.29	33.41	46.00	-12.59	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

1GHz - 18GHz

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00029.EMI

Test Date : 2021-12-16

Tested By : Kennys Zhang

EUT : Wi-Fi & Bluetooth Internet of Things Module

Model Number : ESP32-WROOM-32UE

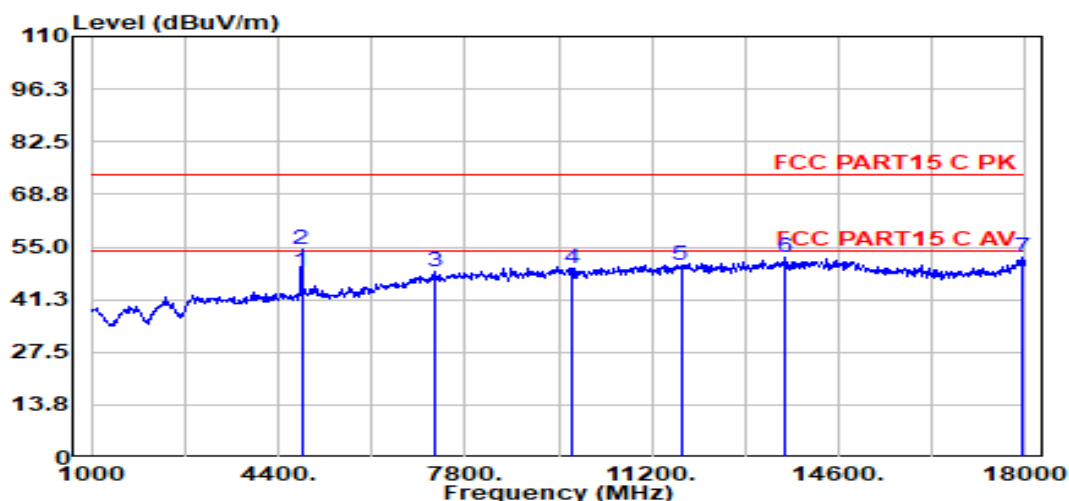
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa

Antenna/Distance : 2021 BBHA 9120D 3#
NEW/3m/HORIZONTAL

Memo : 11b 2412



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4825.00	50.86	32.54	5.38	40.37	48.41	54.00	-5.59	Average	HORIZONTAL
2	4825.00	56.65	32.54	5.38	40.37	54.20	74.00	-19.80	Peak	HORIZONTAL
3	7239.00	45.65	36.19	6.48	39.72	48.60	74.00	-25.40	Peak	HORIZONTAL
4	9755.00	43.93	38.55	7.42	40.43	49.47	74.00	-24.53	Peak	HORIZONTAL
5	11727.00	43.30	39.09	8.06	40.13	50.32	74.00	-23.68	Peak	HORIZONTAL
6	13631.00	43.53	39.97	8.84	39.96	52.39	74.00	-21.61	Peak	HORIZONTAL
7	17949.00	40.63	42.18	9.98	40.67	52.13	74.00	-21.87	Peak	HORIZONTAL

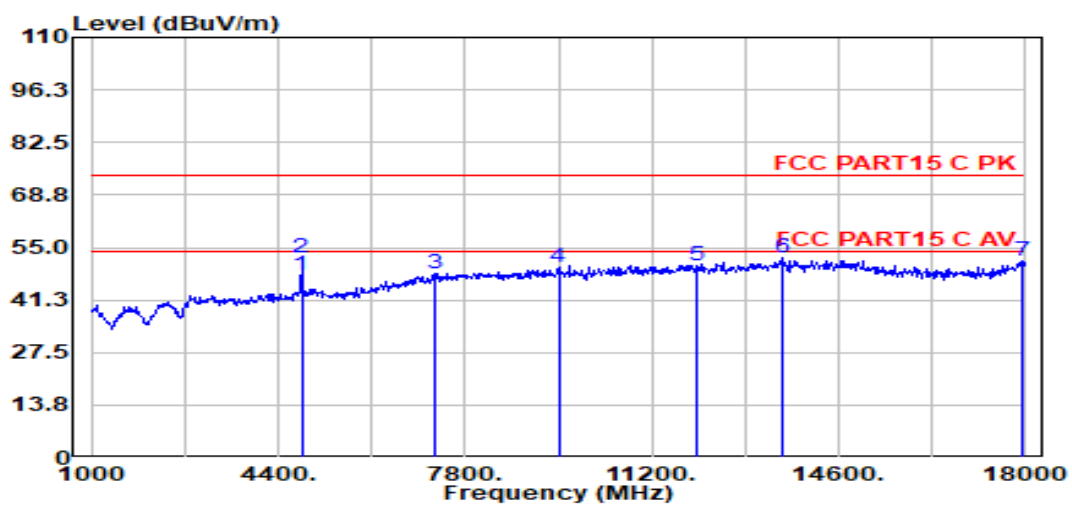
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11b 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00030.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

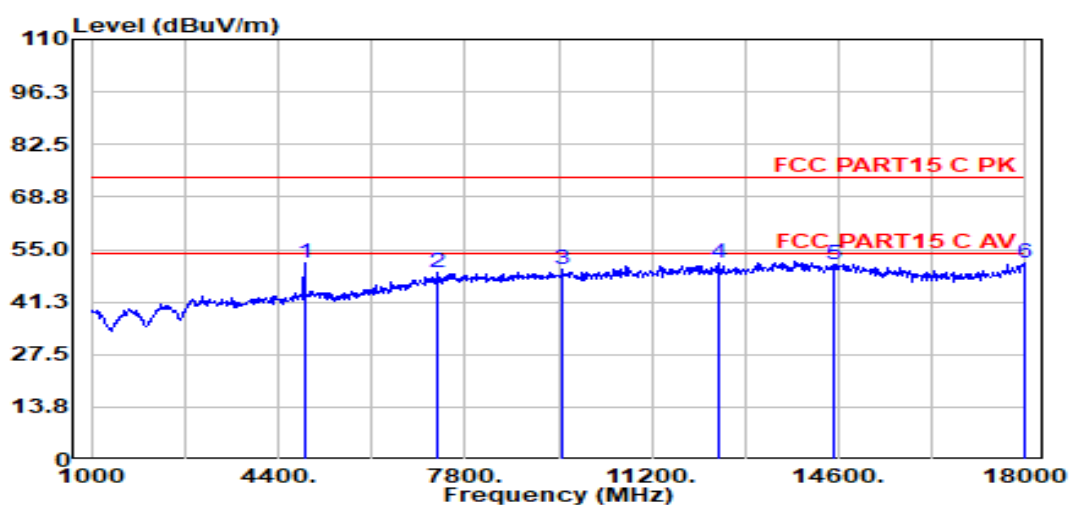


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4825.00	50.26	32.54	5.38	40.37	47.81	54.00	-6.19	Average	VERTICAL
2	4825.00	54.83	32.54	5.38	40.37	52.38	74.00	-21.62	Peak	VERTICAL
3	7239.00	45.23	36.19	6.48	39.72	48.18	74.00	-25.82	Peak	VERTICAL
4	9500.00	44.10	38.70	7.35	40.25	49.90	74.00	-24.10	Peak	VERTICAL
5	12016.00	43.07	39.19	8.18	40.10	50.33	74.00	-23.67	Peak	VERTICAL
6	13563.00	43.71	39.99	8.81	40.01	52.51	74.00	-21.49	Peak	VERTICAL
7	17949.00	39.80	42.18	9.98	40.67	51.30	74.00	-22.70	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11b 2437

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00031.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

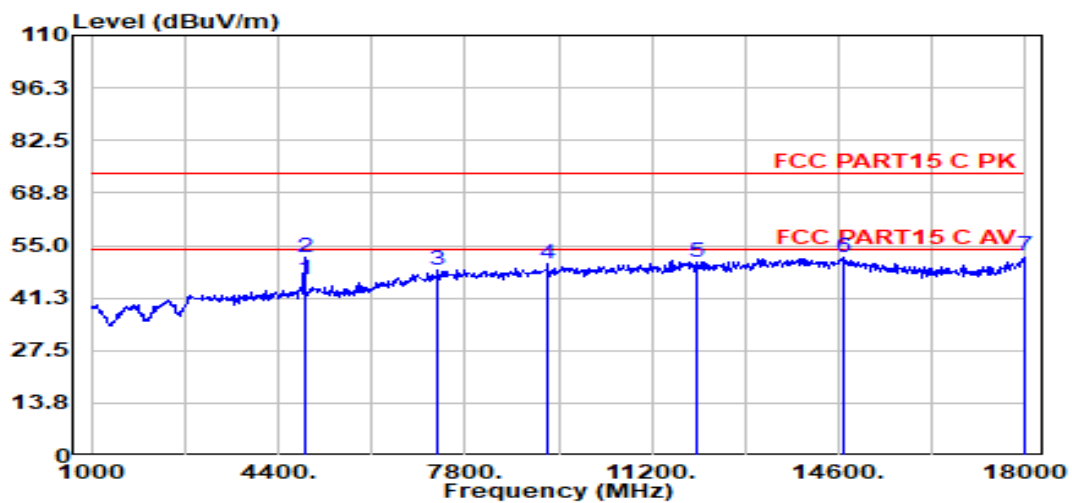


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4876.00	53.61	32.70	5.41	40.38	51.35	74.00	-22.65	Peak	HORIZONTAL
2	7307.00	45.95	36.25	6.51	39.73	48.97	74.00	-25.03	Peak	HORIZONTAL
3	9568.00	43.88	38.66	7.37	40.30	49.61	74.00	-24.39	Peak	HORIZONTAL
4	12407.00	44.28	39.04	8.33	40.22	51.42	74.00	-22.58	Peak	HORIZONTAL
5	14515.00	41.73	39.89	9.05	39.65	51.02	74.00	-22.98	Peak	HORIZONTAL
6	17983.00	39.68	42.39	9.99	40.69	51.38	74.00	-22.62	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11b 2437

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00032.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

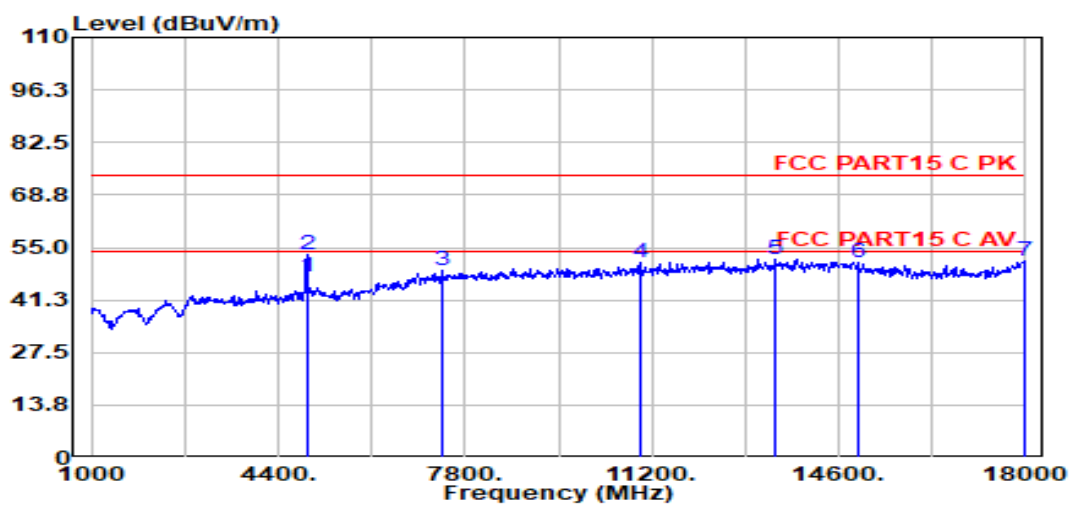


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4876.00	48.52	32.70	5.41	40.38	46.26	54.00	-7.74	Average	VERTICAL
2	4876.00	54.08	32.70	5.41	40.38	51.82	74.00	-22.18	Peak	VERTICAL
3	7307.00	45.62	36.25	6.51	39.73	48.64	74.00	-25.36	Peak	VERTICAL
4	9296.00	44.38	38.54	7.29	40.11	50.10	74.00	-23.90	Peak	VERTICAL
5	12016.00	43.58	39.19	8.18	40.10	50.85	74.00	-23.15	Peak	VERTICAL
6	14668.00	42.56	39.77	9.06	39.63	51.75	74.00	-22.25	Peak	VERTICAL
7	18000.00	40.61	42.50	10.00	40.70	52.41	74.00	-21.59	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11b 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00033.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

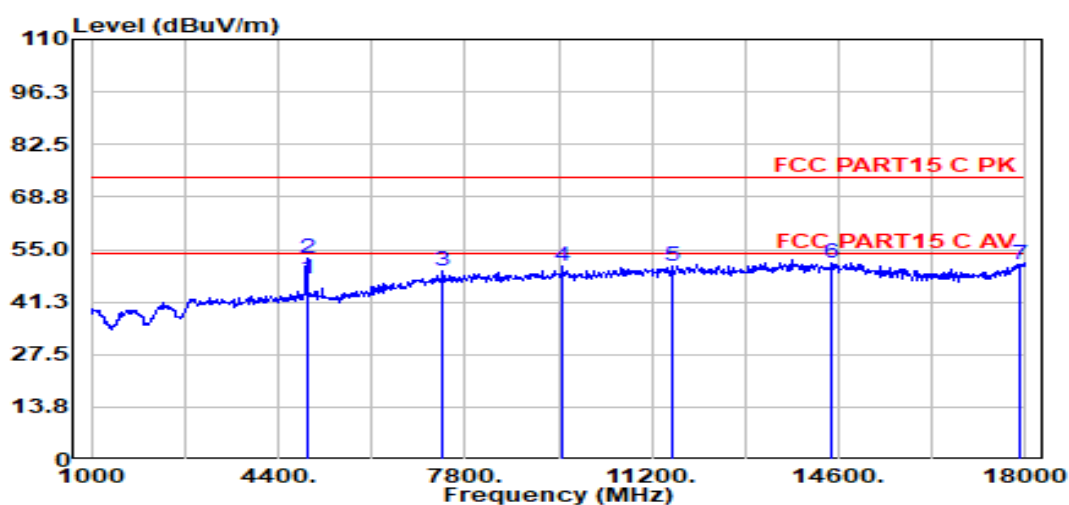


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4927.00	49.28	32.87	5.44	40.39	47.20	54.00	-6.80	Average	HORIZONTAL
2	4927.00	55.08	32.87	5.44	40.39	53.01	74.00	-20.99	Peak	HORIZONTAL
3	7375.00	45.86	36.30	6.54	39.74	48.96	74.00	-25.04	Peak	HORIZONTAL
4	10979.00	44.38	39.29	7.75	40.21	51.21	74.00	-22.79	Peak	HORIZONTAL
5	13444.00	43.20	39.96	8.76	40.09	51.83	74.00	-22.17	Peak	HORIZONTAL
6	14957.00	42.02	39.53	9.08	39.60	51.03	74.00	-22.97	Peak	HORIZONTAL
7	17983.00	39.59	42.39	9.99	40.69	51.29	74.00	-22.71	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11b 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00034.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

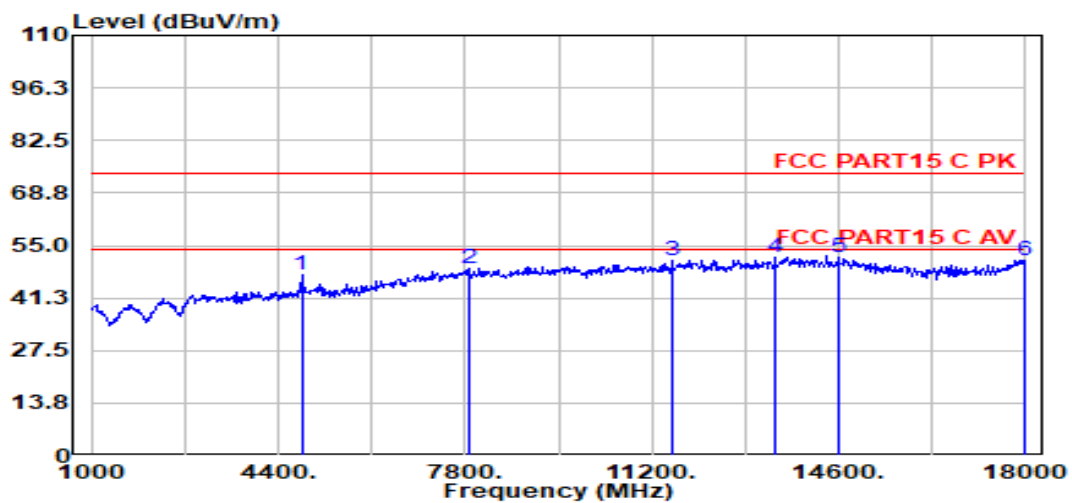


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4927.00	49.28	32.87	5.44	40.39	47.20	54.00	-6.80	Average	VERTICAL
2	4927.00	54.79	32.87	5.44	40.39	52.72	74.00	-21.28	Peak	VERTICAL
3	7392.00	46.39	36.31	6.55	39.74	49.51	74.00	-24.49	Peak	VERTICAL
4	9585.00	44.93	38.65	7.37	40.31	50.64	74.00	-23.36	Peak	VERTICAL
5	11591.00	43.63	39.04	8.00	40.14	50.53	74.00	-23.47	Peak	VERTICAL
6	14464.00	42.25	39.90	9.04	39.65	51.54	74.00	-22.46	Peak	VERTICAL
7	17915.00	39.88	41.97	9.97	40.65	51.18	74.00	-22.82	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00035.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

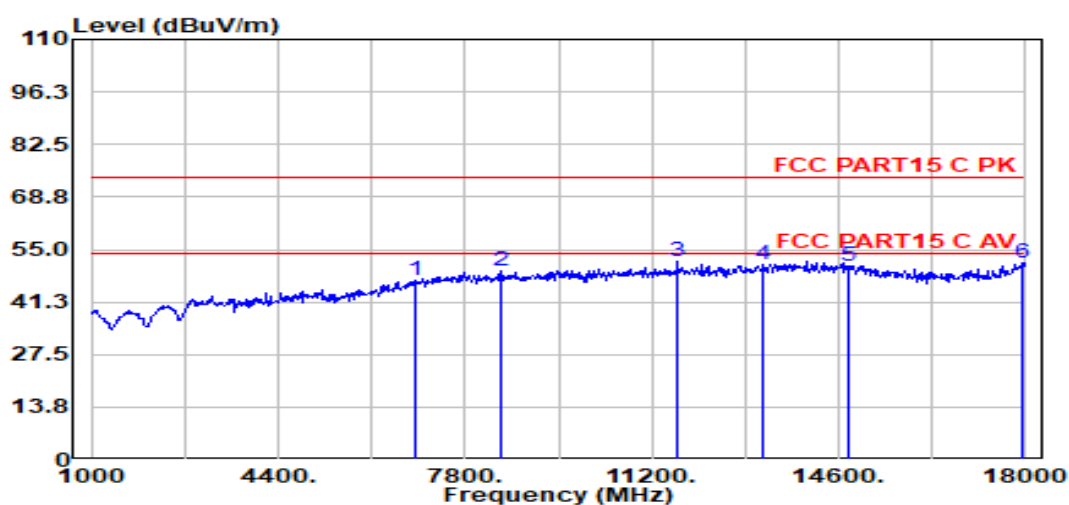


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4825.00	49.71	32.54	5.38	40.37	47.26	74.00	-26.74	Peak	HORIZONTAL
2	7868.00	45.20	36.84	6.77	39.79	49.03	74.00	-24.97	Peak	HORIZONTAL
3	11574.00	44.34	39.03	8.00	40.14	51.22	74.00	-22.78	Peak	HORIZONTAL
4	13444.00	43.38	39.96	8.76	40.09	52.00	74.00	-22.00	Peak	HORIZONTAL
5	14600.00	42.55	39.82	9.05	39.64	51.78	74.00	-22.22	Peak	HORIZONTAL
6	17966.00	39.61	42.29	9.99	40.68	51.21	74.00	-22.79	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00036.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

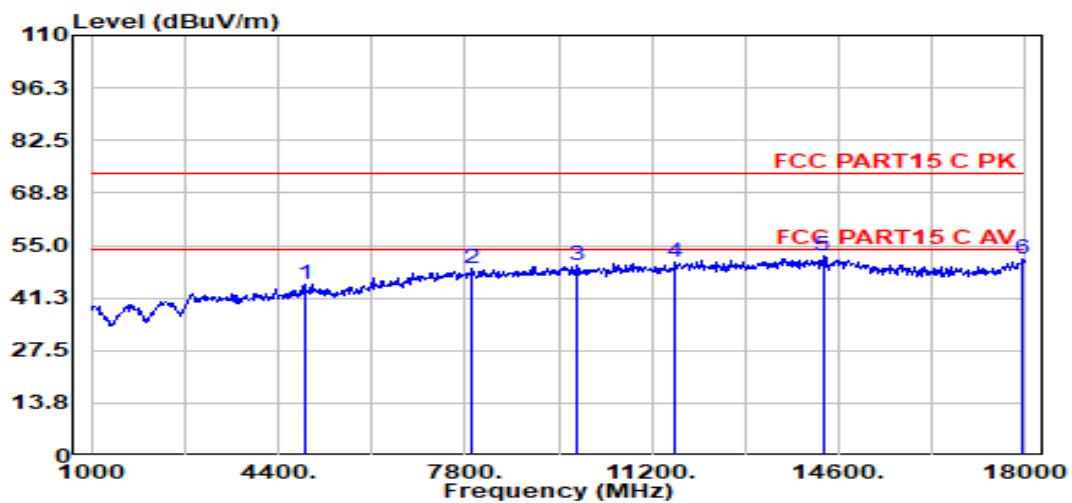


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	6882.00	44.68	35.81	6.32	39.79	47.02	74.00	-26.98	Peak	VERTICAL
2	8446.00	44.66	37.71	7.00	39.84	49.52	74.00	-24.48	Peak	VERTICAL
3	11659.00	44.80	39.06	8.03	40.13	51.76	74.00	-22.24	Peak	VERTICAL
4	13240.00	43.01	39.79	8.67	40.23	51.24	74.00	-22.76	Peak	VERTICAL
5	14787.00	41.69	39.67	9.07	39.62	50.80	74.00	-23.20	Peak	VERTICAL
6	17949.00	40.02	42.18	9.98	40.67	51.52	74.00	-22.48	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2437

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00037.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

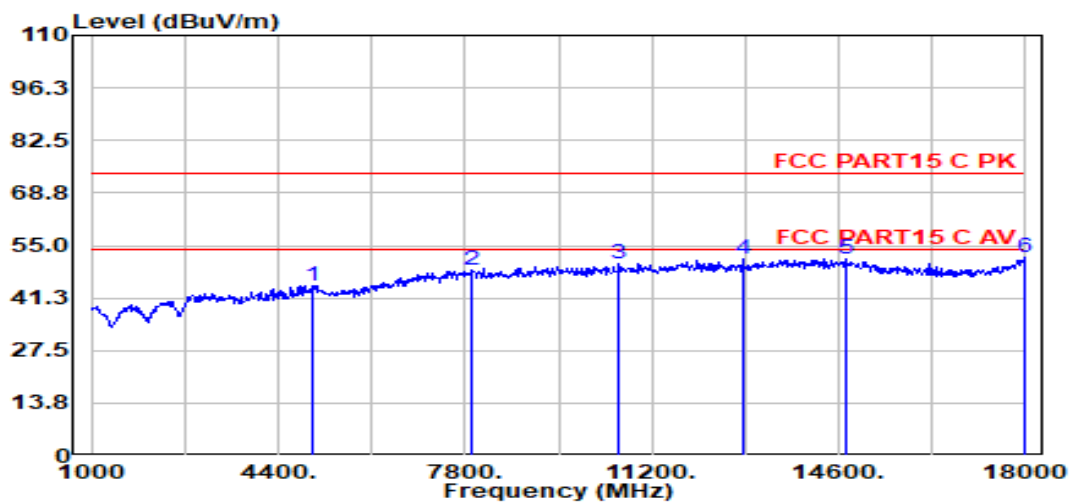


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4876.00	47.26	32.70	5.41	40.38	45.00	74.00	-29.00	Peak	HORIZONTAL
2	7936.00	45.05	36.92	6.80	39.79	48.98	74.00	-25.02	Peak	HORIZONTAL
3	9840.00	44.51	38.50	7.45	40.49	49.96	74.00	-24.04	Peak	HORIZONTAL
4	11625.00	43.59	39.05	8.02	40.14	50.51	74.00	-23.49	Peak	HORIZONTAL
5	14311.00	42.90	39.90	9.03	39.67	52.16	74.00	-21.84	Peak	HORIZONTAL
6	17949.00	40.06	42.18	9.98	40.67	51.56	74.00	-22.44	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2437

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00038.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

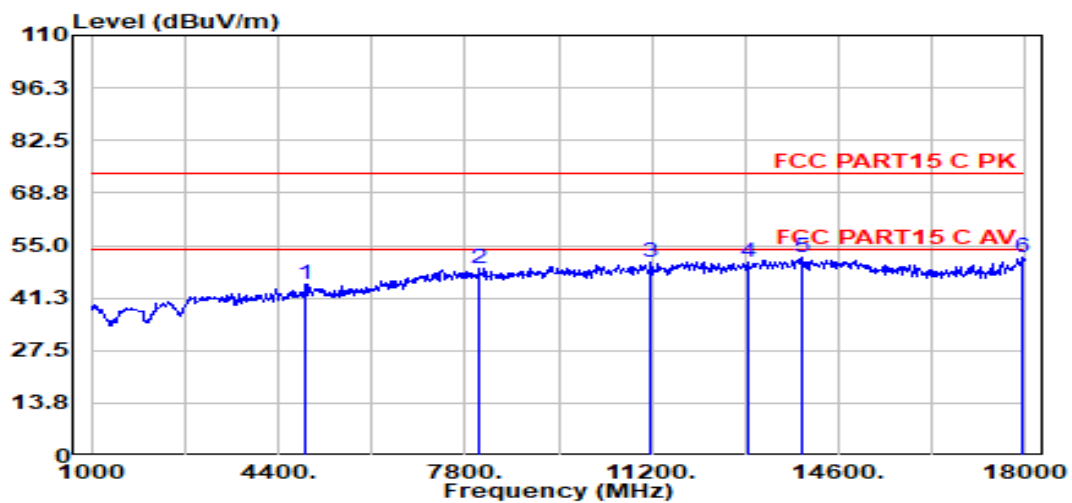


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	5012.00	46.42	33.09	5.50	40.40	44.61	74.00	-29.39	Peak	VERTICAL
2	7902.00	44.51	36.88	6.78	39.79	48.38	74.00	-25.62	Peak	VERTICAL
3	10605.00	44.06	39.06	7.65	40.36	50.42	74.00	-23.58	Peak	VERTICAL
4	12849.00	43.73	39.42	8.50	40.35	51.29	74.00	-22.71	Peak	VERTICAL
5	14736.00	42.53	39.71	9.06	39.63	51.67	74.00	-22.33	Peak	VERTICAL
6	17966.00	40.41	42.29	9.99	40.68	52.01	74.00	-21.99	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00039.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

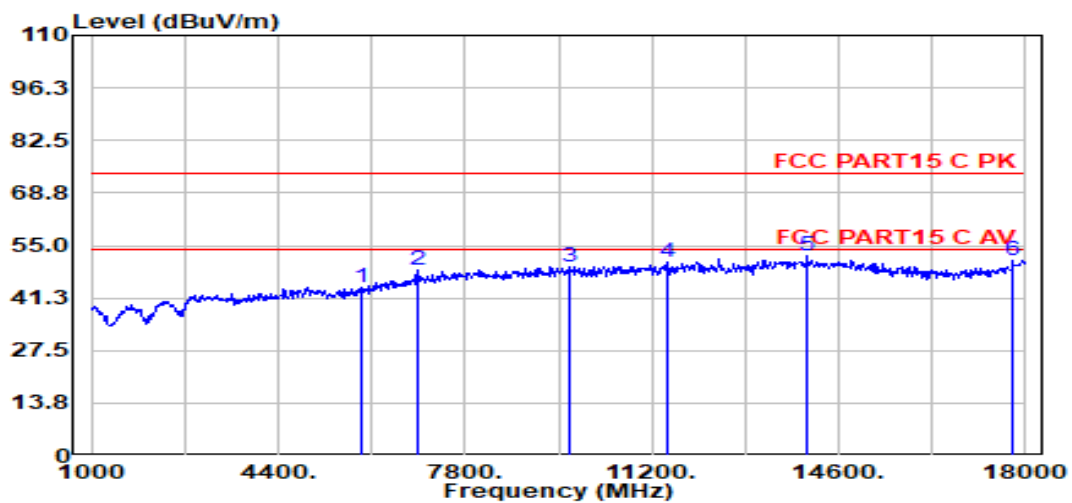


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4910.00	46.96	32.81	5.43	40.38	44.82	74.00	-29.18	Peak	HORIZONTAL
2	8055.00	44.88	37.09	6.85	39.81	49.01	74.00	-24.99	Peak	HORIZONTAL
3	11183.00	43.88	39.19	7.84	40.18	50.72	74.00	-23.28	Peak	HORIZONTAL
4	12934.00	43.14	39.52	8.53	40.38	50.81	74.00	-23.19	Peak	HORIZONTAL
5	13937.00	42.87	39.91	8.98	39.74	52.02	74.00	-21.98	Peak	HORIZONTAL
6	17949.00	40.23	42.18	9.98	40.67	51.73	74.00	-22.27	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00040.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

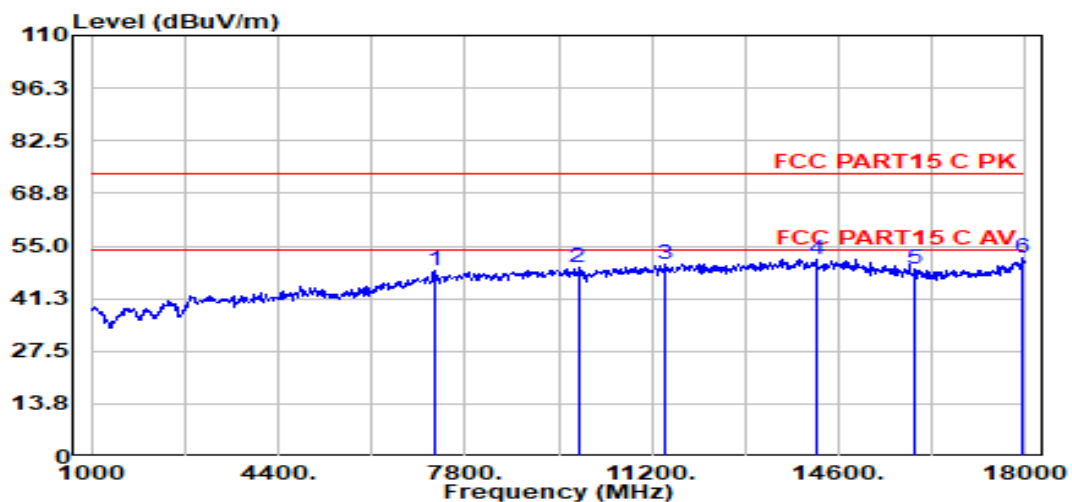


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	5930.00	44.90	33.83	5.92	40.49	44.16	74.00	-29.84	Peak	VERTICAL
2	6933.00	45.99	35.89	6.34	39.75	48.47	74.00	-25.53	Peak	VERTICAL
3	9687.00	43.94	38.59	7.40	40.38	49.55	74.00	-24.45	Peak	VERTICAL
4	11472.00	43.84	39.02	7.95	40.15	50.65	74.00	-23.35	Peak	VERTICAL
5	14022.00	43.06	39.90	9.01	39.70	52.27	74.00	-21.73	Peak	VERTICAL
6	17762.00	40.86	41.02	9.93	40.56	51.25	74.00	-22.75	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00023.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

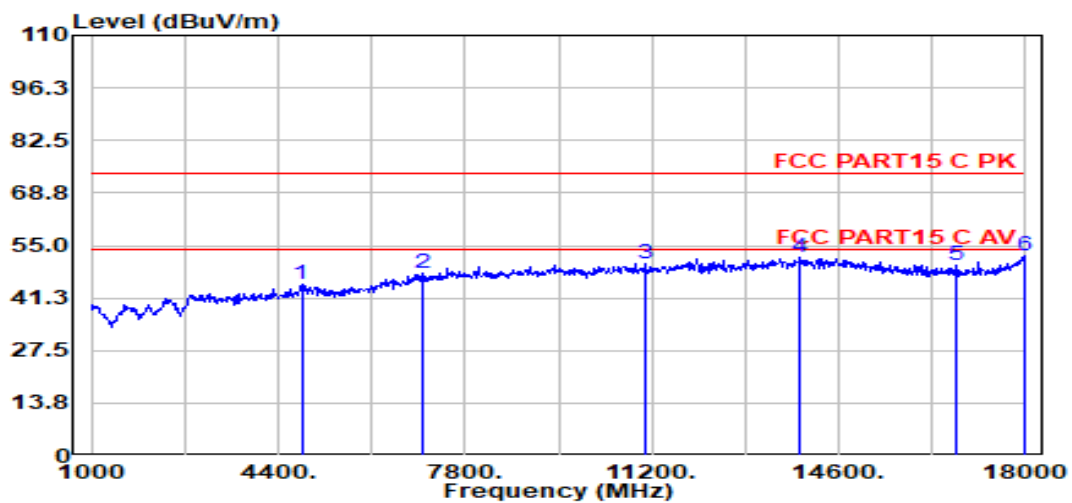


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	7239.00	45.49	36.19	6.48	39.72	48.44	74.00	-25.56	Peak	HORIZONTAL
2	9857.00	43.91	38.49	7.45	40.50	49.34	74.00	-24.66	Peak	HORIZONTAL
3	11455.00	43.36	39.03	7.95	40.15	50.18	74.00	-23.82	Peak	HORIZONTAL
4	14192.00	42.37	39.90	9.02	39.68	51.62	74.00	-22.38	Peak	HORIZONTAL
5	15994.00	41.65	37.91	9.36	39.90	49.02	74.00	-24.98	Peak	HORIZONTAL
6	17949.00	40.51	42.18	9.98	40.67	52.01	74.00	-21.99	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00024.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

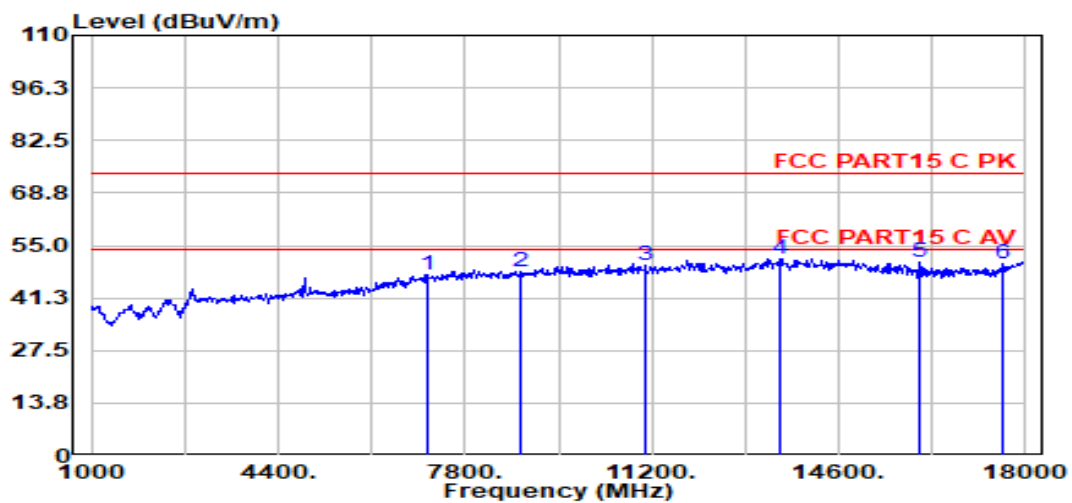


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4825.00	47.12	32.54	5.38	40.37	44.67	74.00	-29.33	Peak	VERTICAL
2	7018.00	45.14	36.01	6.38	39.70	47.83	74.00	-26.17	Peak	VERTICAL
3	11081.00	43.53	39.25	7.79	40.19	50.39	74.00	-23.61	Peak	VERTICAL
4	13886.00	42.66	39.92	8.96	39.78	51.76	74.00	-22.24	Peak	VERTICAL
5	16725.00	42.27	38.17	9.60	40.05	50.00	74.00	-24.00	Peak	VERTICAL
6	17966.00	40.72	42.29	9.99	40.68	52.31	74.00	-21.69	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2437

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00025.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

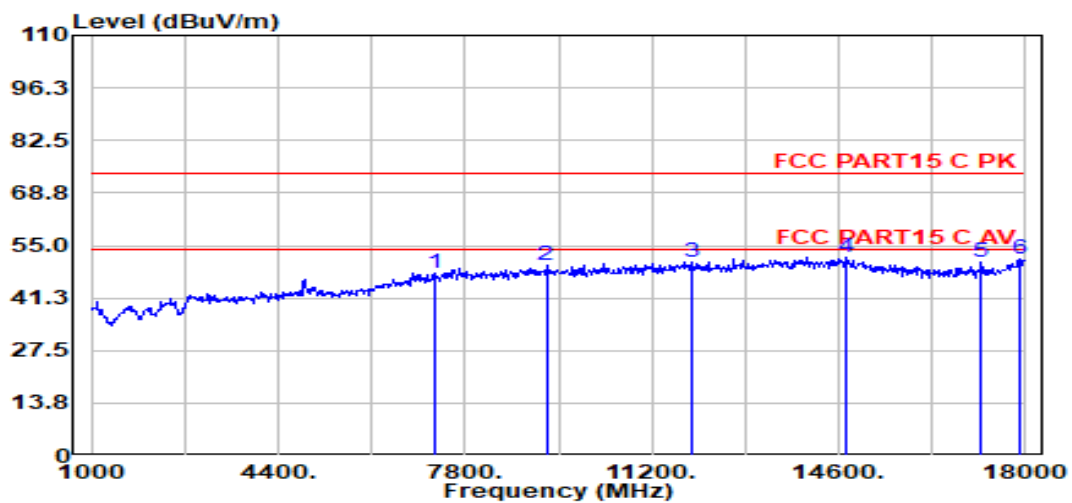


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	7137.00	44.46	36.11	6.43	39.71	47.29	74.00	-26.71	Peak	VERTICAL
2	8820.00	42.67	38.12	7.14	39.88	48.05	74.00	-25.95	Peak	VERTICAL
3	11081.00	42.77	39.25	7.79	40.19	49.62	74.00	-24.38	Peak	VERTICAL
4	13512.00	42.74	40.00	8.79	40.04	51.49	74.00	-22.51	Peak	VERTICAL
5	16079.00	43.32	37.90	9.39	39.92	50.69	74.00	-23.31	Peak	VERTICAL
6	17592.00	40.70	39.97	9.87	40.46	50.09	74.00	-23.91	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2437

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00026.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

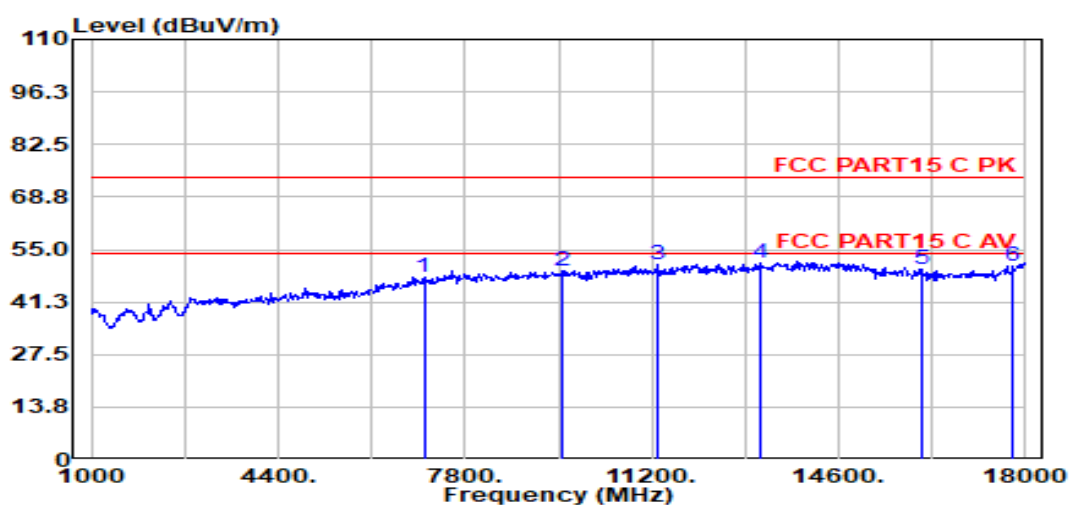


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	7239.00	44.90	36.19	6.48	39.72	47.85	74.00	-26.15	Peak	HORIZONTAL
2	9279.00	44.05	38.52	7.29	40.10	49.77	74.00	-24.23	Peak	HORIZONTAL
3	11948.00	43.45	39.18	8.15	40.11	50.68	74.00	-23.32	Peak	HORIZONTAL
4	14736.00	42.61	39.71	9.06	39.63	51.76	74.00	-22.24	Peak	HORIZONTAL
5	17201.00	42.14	38.86	9.75	40.22	50.53	74.00	-23.47	Peak	HORIZONTAL
6	17915.00	40.24	41.97	9.97	40.65	51.53	74.00	-22.47	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00027.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

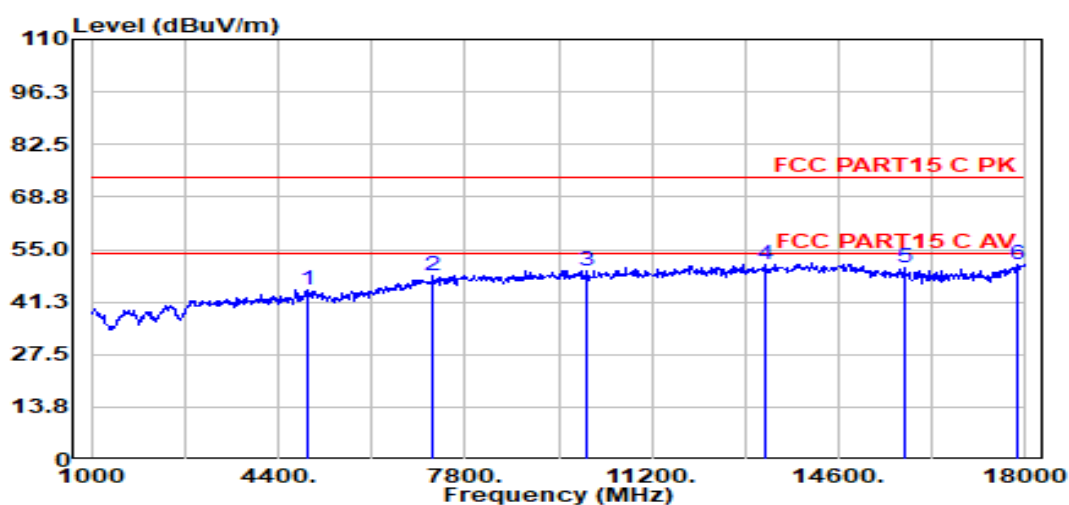


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	7052.00	45.06	36.04	6.39	39.71	47.79	74.00	-26.21	Peak	HORIZONTAL
2	9585.00	43.82	38.65	7.37	40.31	49.53	74.00	-24.47	Peak	HORIZONTAL
3	11285.00	44.38	39.13	7.88	40.17	51.21	74.00	-22.79	Peak	HORIZONTAL
4	13172.00	43.57	39.74	8.64	40.28	51.67	74.00	-22.33	Peak	HORIZONTAL
5	16096.00	42.36	37.90	9.39	39.92	49.73	74.00	-24.27	Peak	HORIZONTAL
6	17779.00	39.97	41.13	9.93	40.57	50.46	74.00	-23.54	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00028.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

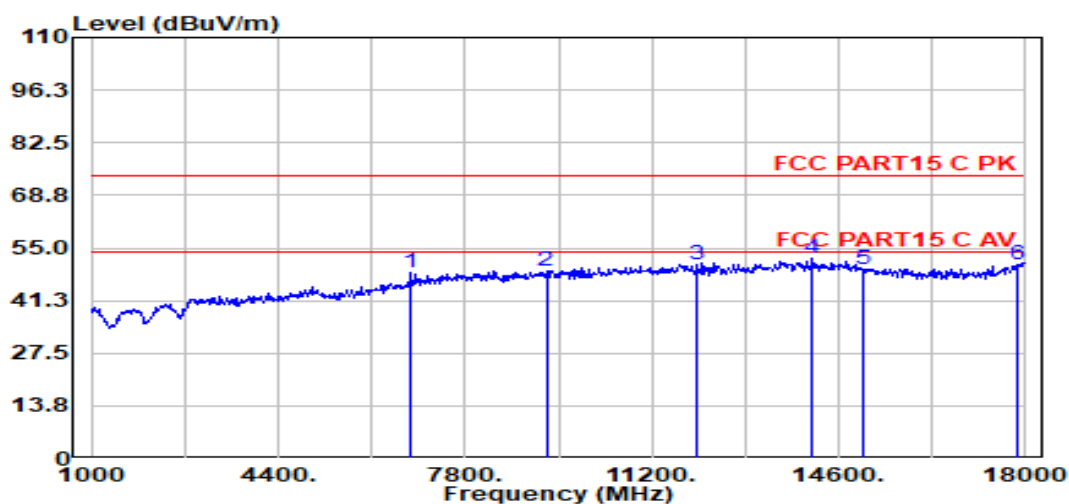


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4927.00	46.48	32.87	5.44	40.39	44.41	74.00	-29.59	Peak	VERTICAL
2	7222.00	45.27	36.18	6.47	39.72	48.20	74.00	-25.80	Peak	VERTICAL
3	10010.00	44.01	38.41	7.49	40.60	49.32	74.00	-24.68	Peak	VERTICAL
4	13257.00	42.84	39.81	8.68	40.22	51.10	74.00	-22.90	Peak	VERTICAL
5	15790.00	42.31	38.28	9.30	39.84	50.05	74.00	-23.95	Peak	VERTICAL
6	17864.00	39.98	41.66	9.96	40.62	50.97	74.00	-23.03	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2422

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00045.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

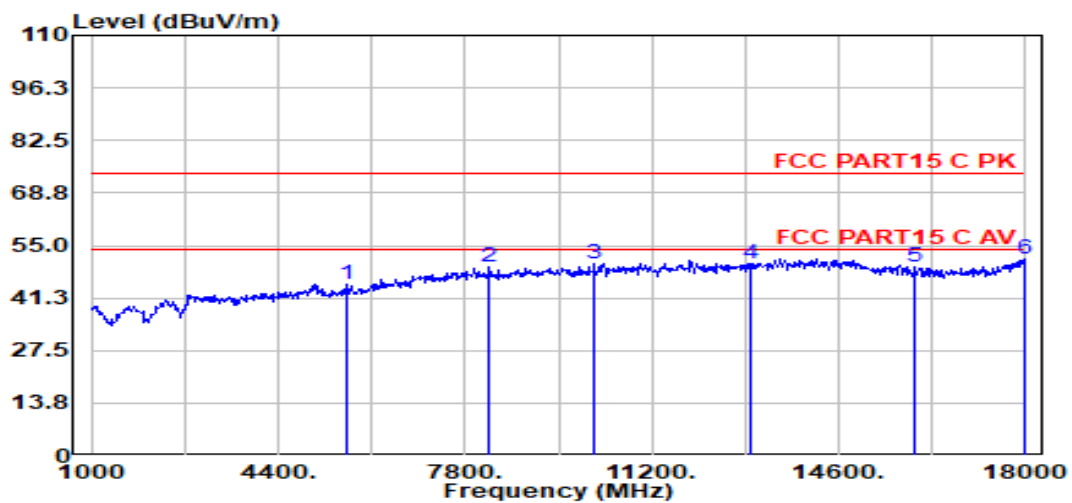


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	6814.00	46.48	35.70	6.29	39.85	48.62	74.00	-25.38	Peak	HORIZONTAL
2	9279.00	43.45	38.52	7.29	40.10	49.16	74.00	-24.84	Peak	HORIZONTAL
3	12016.00	43.29	39.19	8.18	40.10	50.55	74.00	-23.45	Peak	HORIZONTAL
4	14124.00	43.01	39.90	9.02	39.69	52.24	74.00	-21.76	Peak	HORIZONTAL
5	15059.00	40.67	39.42	9.10	39.62	49.57	74.00	-24.43	Peak	HORIZONTAL
6	17830.00	39.66	41.45	9.95	40.60	50.46	74.00	-23.54	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2422

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00046.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

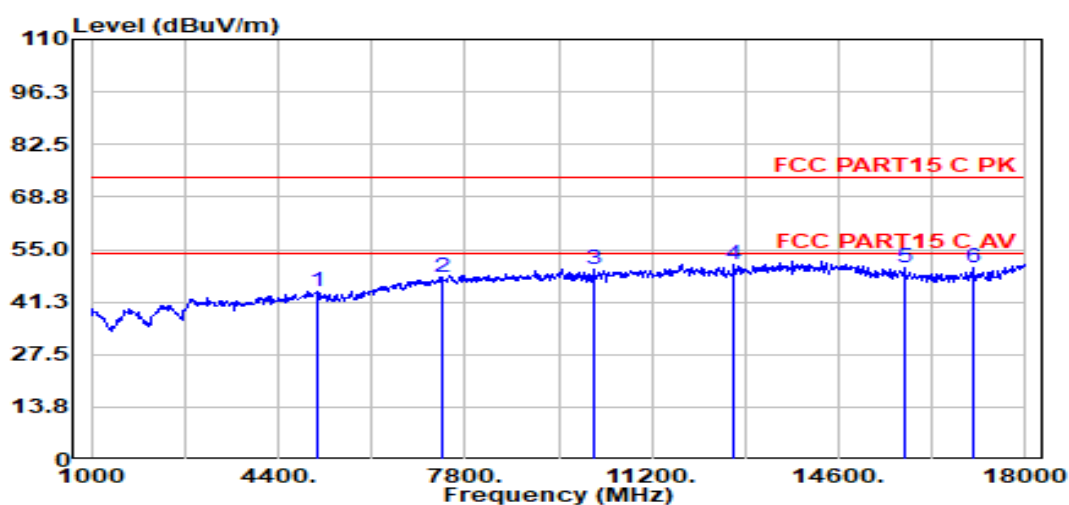


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	5641.00	46.39	33.14	5.78	40.46	44.85	74.00	-29.15	Peak	VERTICAL
2	8242.00	44.85	37.39	6.92	39.82	49.34	74.00	-24.66	Peak	VERTICAL
3	10146.00	44.69	38.58	7.53	40.54	50.26	74.00	-23.74	Peak	VERTICAL
4	12985.00	42.65	39.58	8.55	40.40	50.39	74.00	-23.61	Peak	VERTICAL
5	15994.00	41.83	37.91	9.36	39.90	49.20	74.00	-24.80	Peak	VERTICAL
6	17966.00	39.70	42.29	9.99	40.68	51.30	74.00	-22.70	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2437

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00047.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

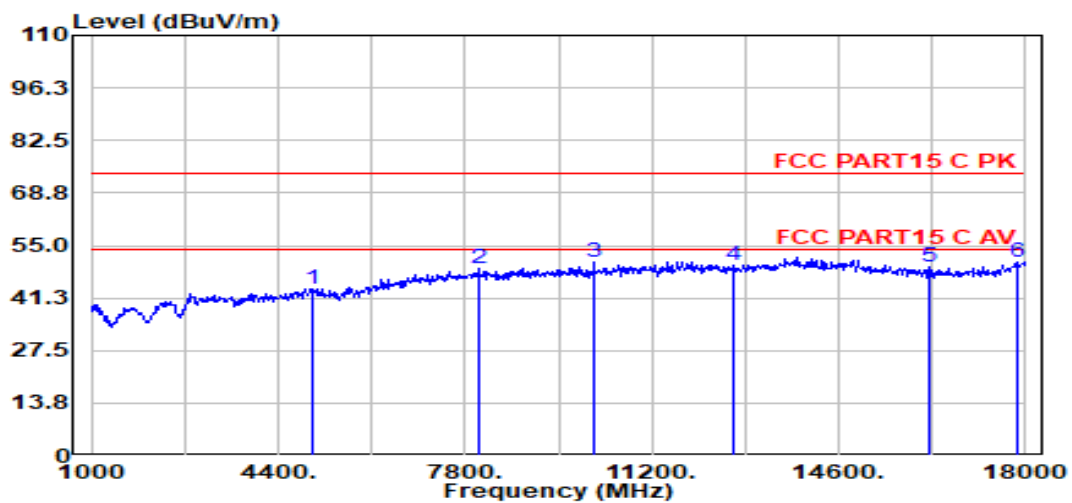


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	5097.00	45.86	33.04	5.53	40.41	44.02	74.00	-29.98	Peak	VERTICAL
2	7392.00	44.62	36.31	6.55	39.74	47.75	74.00	-26.25	Peak	VERTICAL
3	10146.00	44.37	38.58	7.53	40.54	49.93	74.00	-24.07	Peak	VERTICAL
4	12679.00	43.67	39.21	8.43	40.30	51.02	74.00	-22.98	Peak	VERTICAL
5	15790.00	42.60	38.28	9.30	39.84	50.34	74.00	-23.66	Peak	VERTICAL
6	17031.00	42.03	38.56	9.70	40.12	50.17	74.00	-23.83	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2437

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00048.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

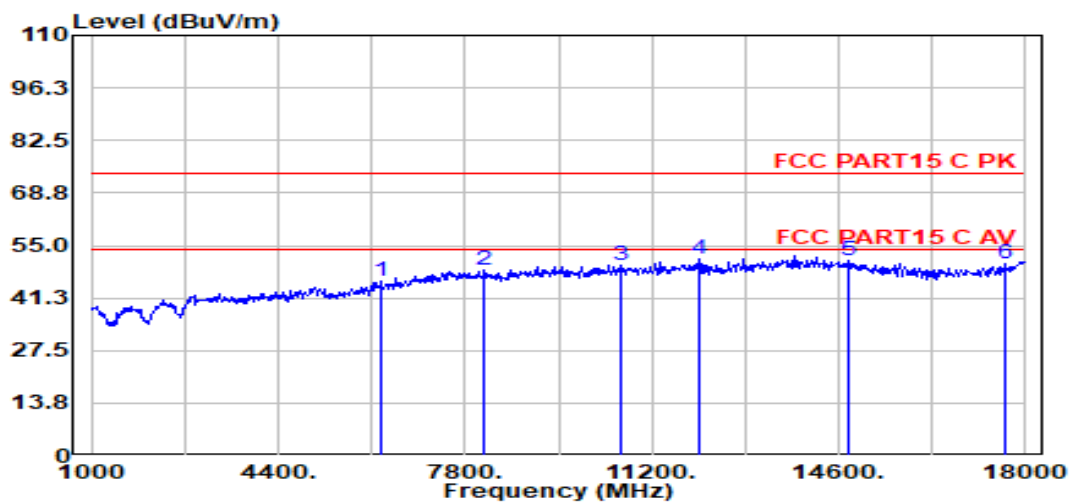


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	5046.00	45.55	33.07	5.51	40.40	43.73	74.00	-30.27	Peak	HORIZONTAL
2	8038.00	44.97	37.06	6.84	39.80	49.08	74.00	-24.92	Peak	HORIZONTAL
3	10146.00	45.09	38.58	7.53	40.54	50.66	74.00	-23.34	Peak	HORIZONTAL
4	12679.00	42.66	39.21	8.43	40.30	50.01	74.00	-23.99	Peak	HORIZONTAL
5	16266.00	42.20	37.90	9.45	39.95	49.60	74.00	-24.40	Peak	HORIZONTAL
6	17864.00	39.55	41.66	9.96	40.62	50.54	74.00	-23.46	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2452

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00049.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

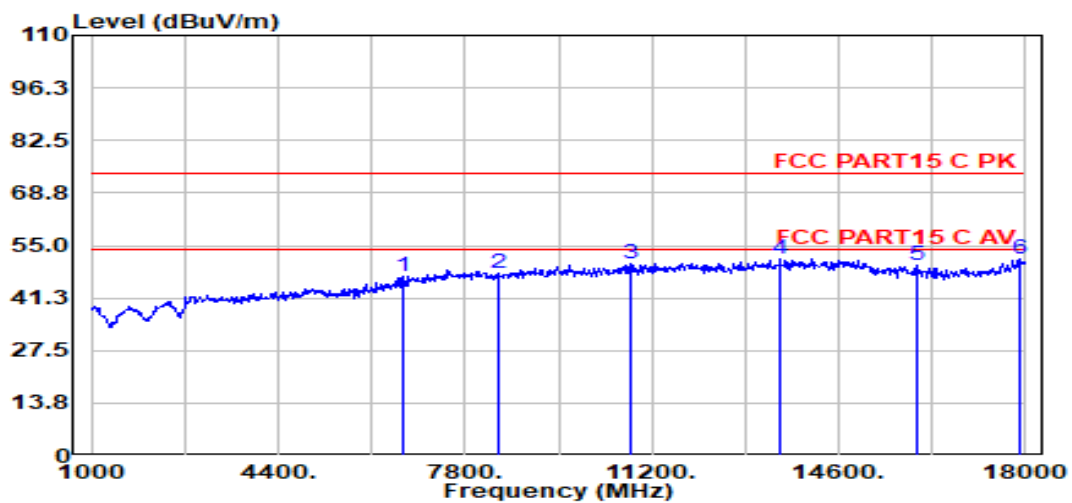


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	6270.00	45.38	34.65	6.06	40.28	45.80	74.00	-28.20	Peak	HORIZONTAL
2	8140.00	44.24	37.22	6.88	39.81	48.53	74.00	-25.47	Peak	HORIZONTAL
3	10622.00	43.63	39.07	7.66	40.35	50.01	74.00	-23.99	Peak	HORIZONTAL
4	12050.00	44.41	39.18	8.19	40.12	51.66	74.00	-22.34	Peak	HORIZONTAL
5	14770.00	41.85	39.68	9.06	39.62	50.97	74.00	-23.03	Peak	HORIZONTAL
6	17643.00	40.51	40.29	9.89	40.49	50.21	74.00	-23.79	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2452

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00050.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL



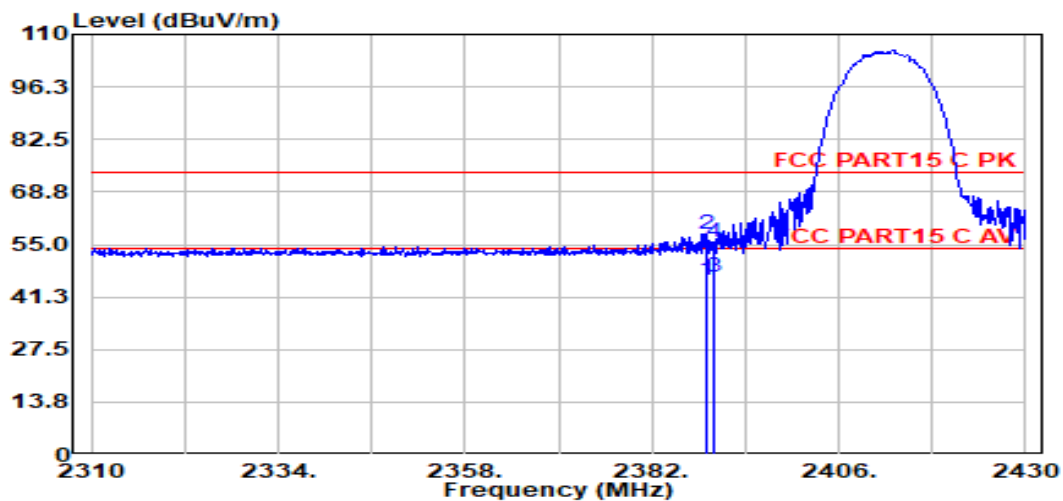
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	6661.00	45.11	35.46	6.23	39.97	46.83	74.00	-27.17	Peak	VERTICAL
2	8412.00	43.08	37.66	6.99	39.84	47.88	74.00	-26.12	Peak	VERTICAL
3	10809.00	43.43	39.19	7.71	40.28	50.04	74.00	-23.96	Peak	VERTICAL
4	13529.00	42.51	39.99	8.80	40.03	51.27	74.00	-22.73	Peak	VERTICAL
5	16045.00	42.32	37.90	9.37	39.91	49.69	74.00	-24.31	Peak	VERTICAL
6	17881.00	40.42	41.76	9.96	40.63	51.52	74.00	-22.48	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Appendix D.3: Test Results of Radiated Emissions in Restricted Bands

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11b 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00003.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

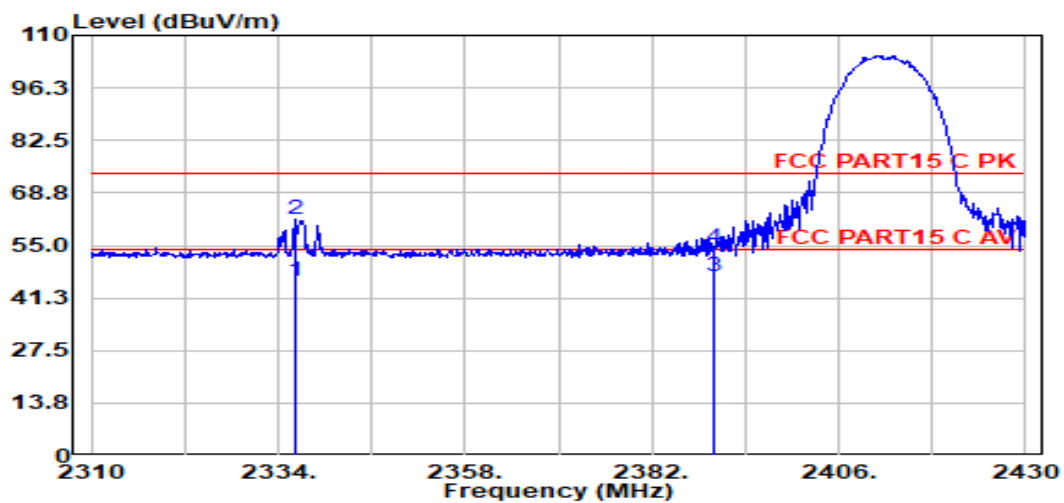


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2389.08	14.56	27.40	3.73	0.00	45.69	54.00	-8.31	Average	HORIZONTAL
2	2389.08	26.78	27.40	3.73	0.00	57.90	74.00	-16.10	Peak	HORIZONTAL
3	2390.04	15.36	27.40	3.73	0.00	46.49	54.00	-7.51	Average	HORIZONTAL
4	2390.04	24.38	27.40	3.73	0.00	55.51	74.00	-18.49	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11b 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00004.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

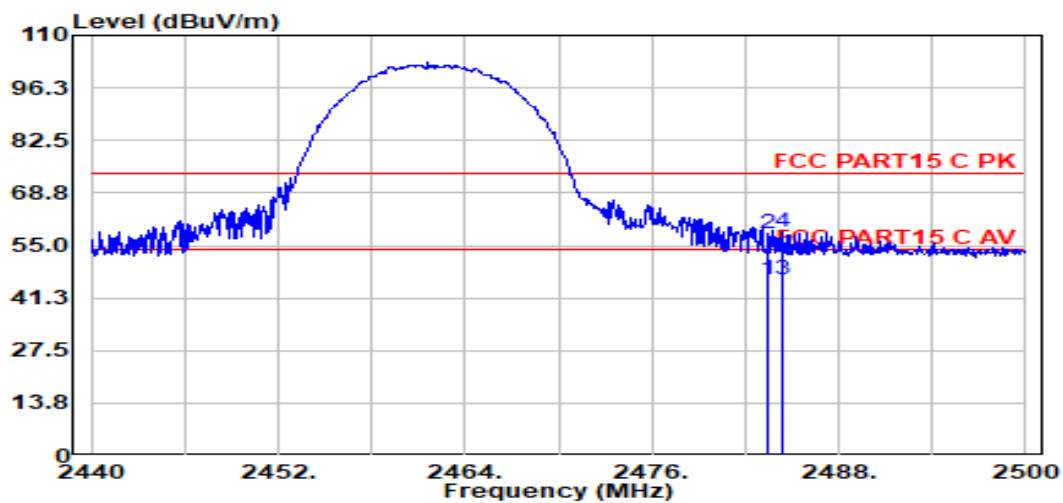


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2336.16	14.58	27.31	3.68	0.00	45.57	54.00	-8.43	Average	VERTICAL
2	2336.16	30.91	27.31	3.68	0.00	61.90	74.00	-12.10	Peak	VERTICAL
3	2390.04	15.64	27.40	3.73	0.00	46.77	54.00	-7.23	Average	VERTICAL
4	2390.04	23.27	27.40	3.73	0.00	54.40	74.00	-19.60	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11b 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00005.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

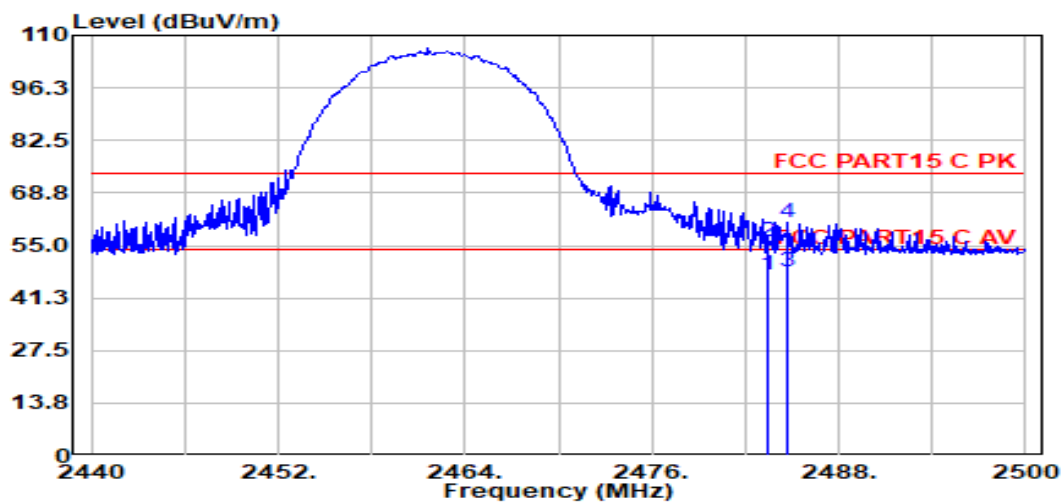


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	14.58	27.57	3.81	0.00	45.96	54.00	-8.04	Average	VERTICAL
2	2483.50	26.76	27.57	3.81	0.00	58.14	74.00	-15.86	Peak	VERTICAL
3	2484.46	14.78	27.57	3.81	0.00	46.16	54.00	-7.84	Average	VERTICAL
4	2484.46	27.19	27.57	3.81	0.00	58.57	74.00	-15.43	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11b 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00006.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

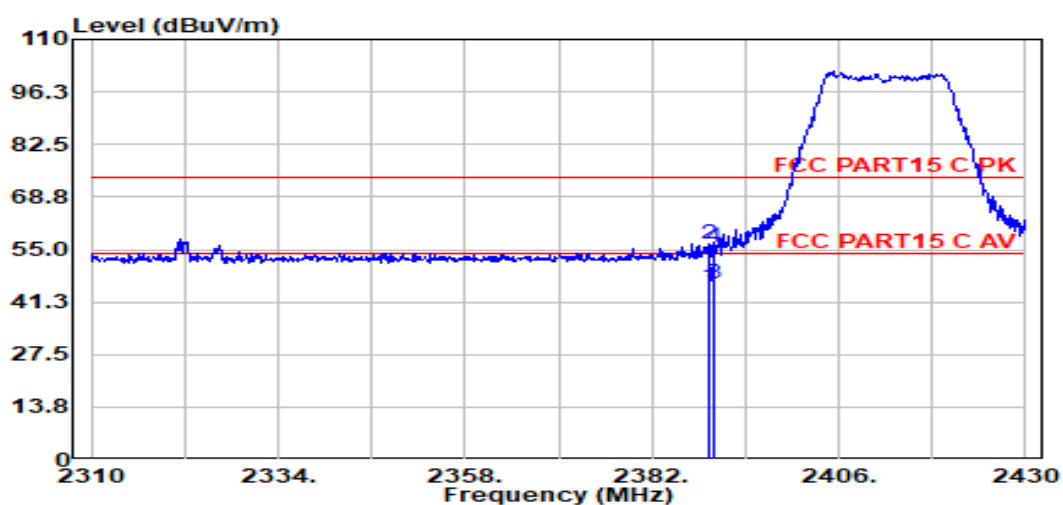


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	15.84	27.57	3.81	0.00	47.22	54.00	-6.78	Average	HORIZONTAL
2	2483.50	24.58	27.57	3.81	0.00	55.96	74.00	-18.04	Peak	HORIZONTAL
3	2484.76	16.58	27.57	3.81	0.00	47.96	54.00	-6.04	Average	HORIZONTAL
4	2484.76	29.74	27.57	3.81	0.00	61.12	74.00	-12.88	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00015.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

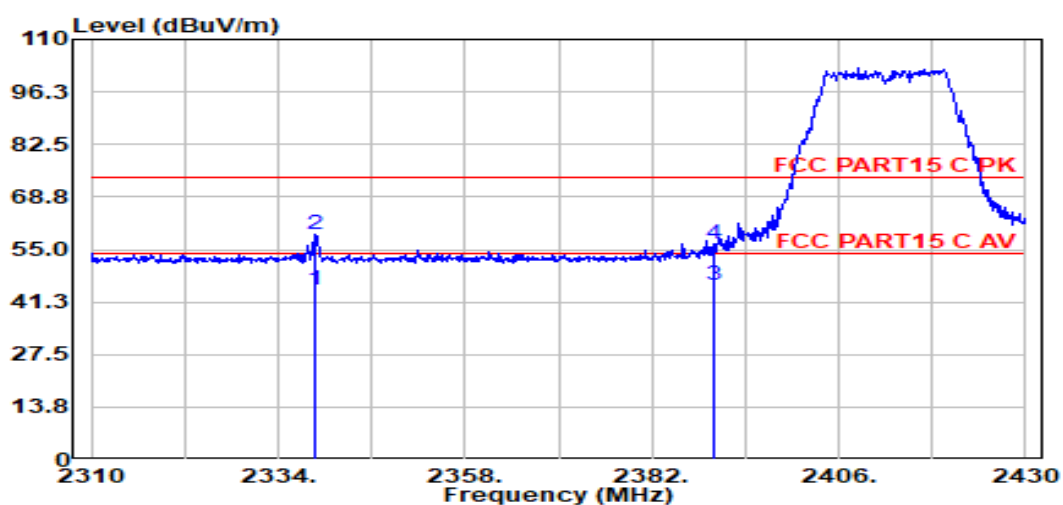


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2389.32	14.22	27.40	3.73	0.00	45.35	54.00	-8.65	Average	HORIZONTAL
2	2389.32	25.49	27.40	3.73	0.00	56.62	74.00	-17.38	Peak	HORIZONTAL
3	2390.04	14.89	27.40	3.73	0.00	46.02	54.00	-7.98	Average	HORIZONTAL
4	2390.04	24.70	27.40	3.73	0.00	55.83	74.00	-18.17	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00016.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

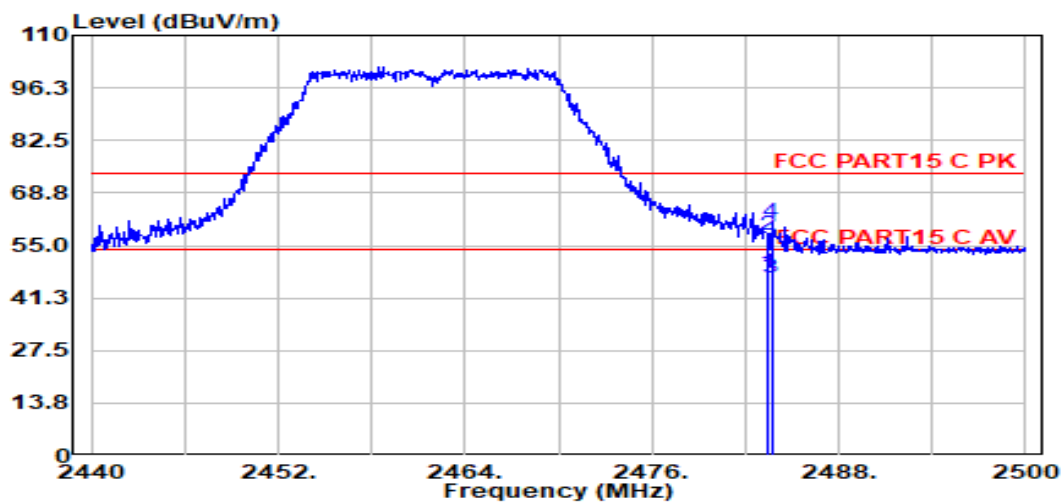


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2338.68	13.54	27.31	3.68	0.00	44.53	54.00	-9.47	Average	VERTICAL
2	2338.68	27.84	27.31	3.68	0.00	58.83	74.00	-15.17	Peak	VERTICAL
3	2390.04	14.56	27.40	3.73	0.00	45.69	54.00	-8.31	Average	VERTICAL
4	2390.04	25.38	27.40	3.73	0.00	56.51	74.00	-17.49	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00017.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

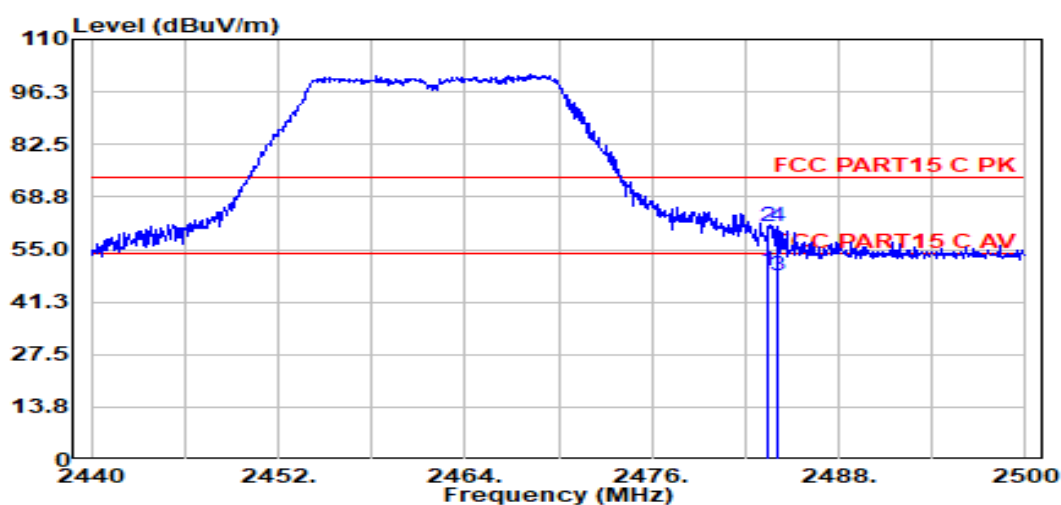


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	16.28	27.57	3.81	0.00	47.66	54.00	-6.34	Average	VERTICAL
2	2483.50	26.51	27.57	3.81	0.00	57.88	74.00	-16.12	Peak	VERTICAL
3	2483.68	15.17	27.57	3.81	0.00	46.55	54.00	-7.45	Average	VERTICAL
4	2483.68	29.66	27.57	3.81	0.00	61.04	74.00	-12.96	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11g 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00018.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



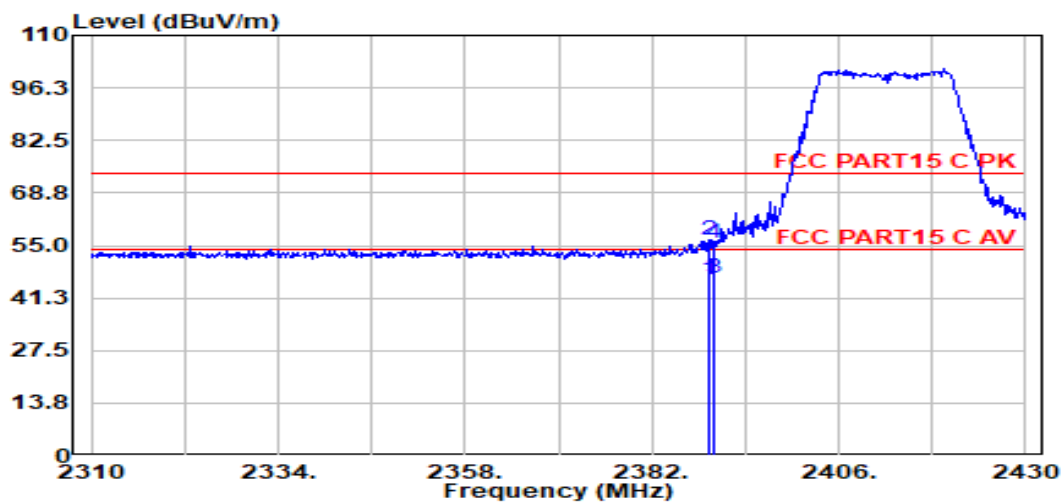
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	17.82	27.57	3.81	0.00	49.20	54.00	-4.80	Average	HORIZONTAL
2	2483.50	29.49	27.57	3.81	0.00	60.87	74.00	-13.13	Peak	HORIZONTAL
3	2484.10	16.87	27.57	3.81	0.00	48.25	54.00	-5.75	Average	HORIZONTAL
4	2484.10	29.75	27.57	3.81	0.00	61.12	74.00	-12.88	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Prüfbericht - Produkte
Test Report - Products

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00019.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

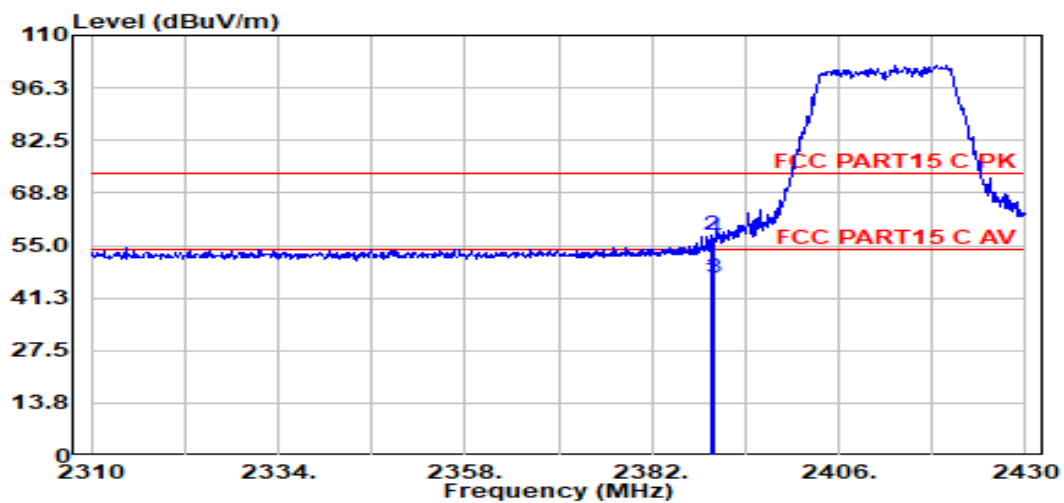


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2389.20	15.12	27.40	3.73	0.00	46.25	54.00	-7.75	Average	HORIZONTAL
2	2389.20	25.15	27.40	3.73	0.00	56.27	74.00	-17.73	Peak	HORIZONTAL
3	2390.04	15.47	27.40	3.73	0.00	46.60	54.00	-7.40	Average	HORIZONTAL
4	2390.04	24.36	27.40	3.73	0.00	55.49	74.00	-18.51	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2412

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00020.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

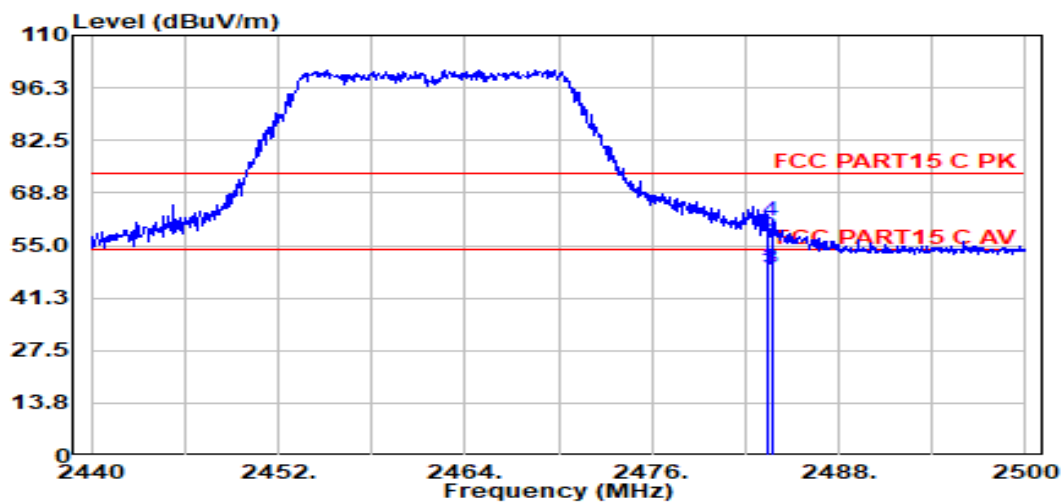


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2389.56	15.14	27.40	3.73	0.00	46.27	54.00	-7.73	Average	VERTICAL
2	2389.56	26.36	27.40	3.73	0.00	57.49	74.00	-16.51	Peak	VERTICAL
3	2390.04	15.28	27.40	3.73	0.00	46.41	54.00	-7.59	Average	VERTICAL
4	2390.04	25.79	27.40	3.73	0.00	56.92	74.00	-17.08	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00021.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

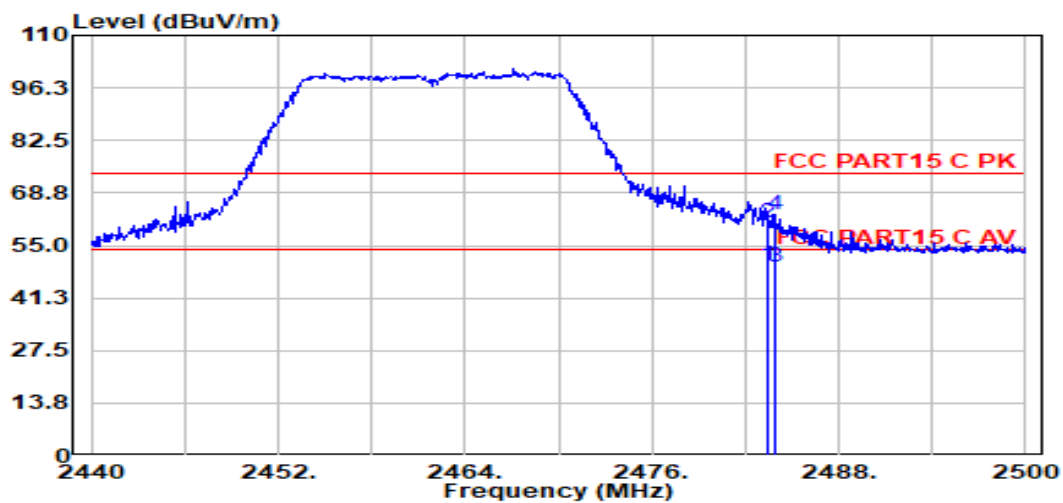


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	17.26	27.57	3.81	0.00	48.64	54.00	-5.36	Average	VERTICAL
2	2483.50	26.02	27.57	3.81	0.00	57.39	74.00	-16.61	Peak	VERTICAL
3	2483.68	17.70	27.57	3.81	0.00	49.08	54.00	-4.92	Average	VERTICAL
4	2483.68	30.06	27.57	3.81	0.00	61.43	74.00	-12.57	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-13
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11n20 2462

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00022.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

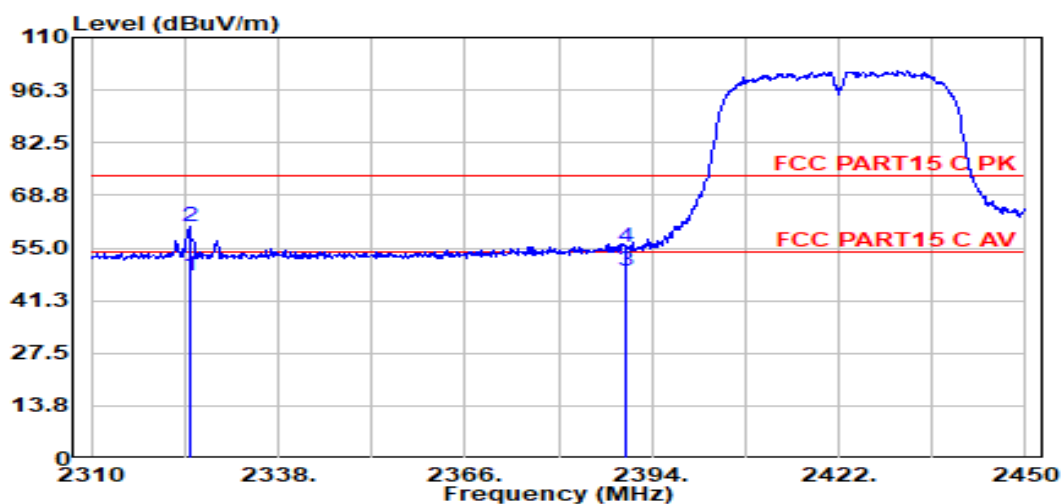


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	18.24	27.57	3.81	0.00	49.62	54.00	-4.38	Average	HORIZONTAL
2	2483.50	29.56	27.57	3.81	0.00	60.94	74.00	-13.06	Peak	HORIZONTAL
3	2483.86	18.22	27.57	3.81	0.00	49.60	54.00	-4.40	Average	HORIZONTAL
4	2483.86	31.81	27.57	3.81	0.00	63.19	74.00	-10.81	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2422

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00041.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL

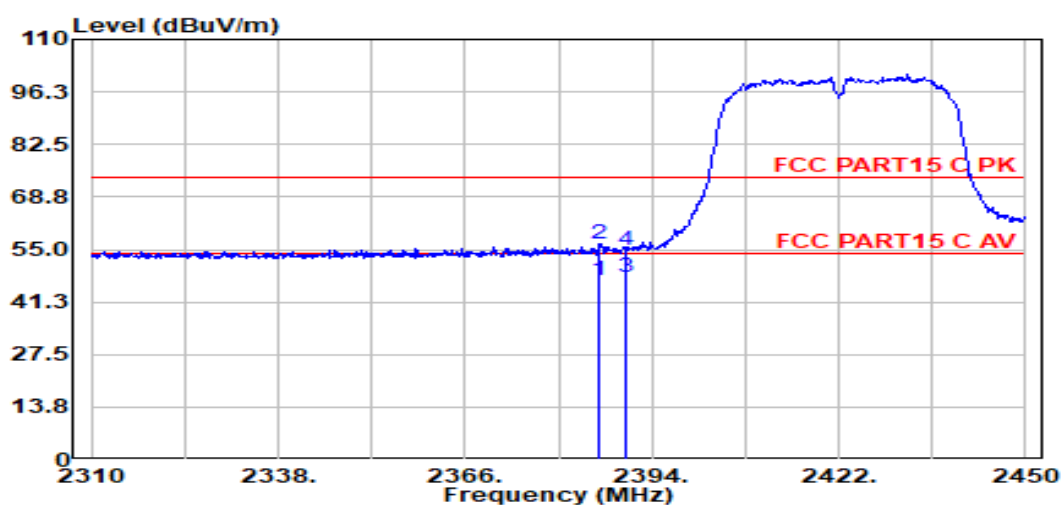


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2324.70	16.58	27.28	3.67	0.00	47.54	54.00	-6.46	Average	HORIZONTAL
2	2324.70	29.60	27.28	3.67	0.00	60.55	74.00	-13.45	Peak	HORIZONTAL
3	2389.94	17.68	27.40	3.73	0.00	48.81	54.00	-5.19	Average	HORIZONTAL
4	2389.94	23.93	27.40	3.73	0.00	55.06	74.00	-18.94	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2422

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00042.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

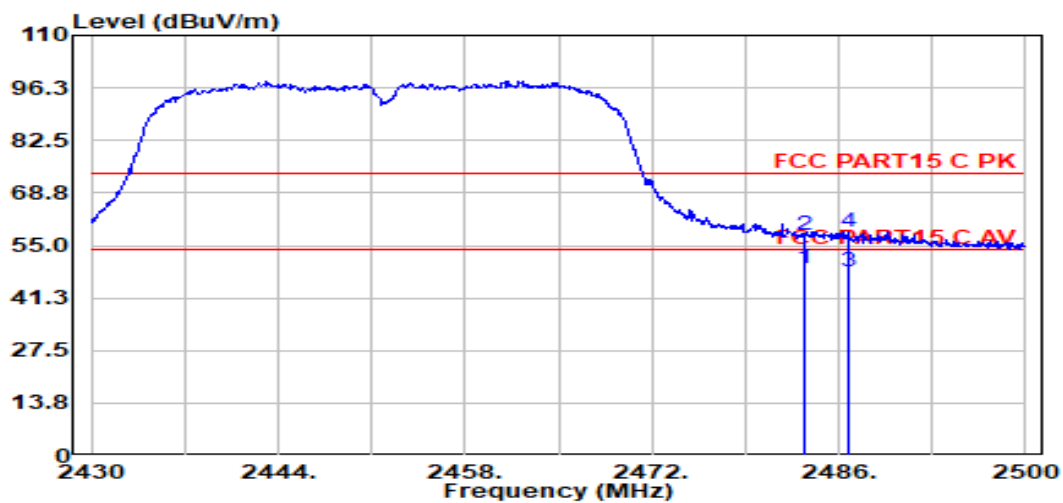


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2386.16	15.74	27.40	3.72	0.00	46.86	54.00	-7.14	Average	VERTICAL
2	2386.16	25.44	27.40	3.72	0.00	56.55	74.00	-17.45	Peak	VERTICAL
3	2389.94	16.58	27.40	3.73	0.00	47.71	54.00	-6.29	Average	VERTICAL
4	2389.94	23.78	27.40	3.73	0.00	54.91	74.00	-19.09	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2452

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00043.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/VERTICAL

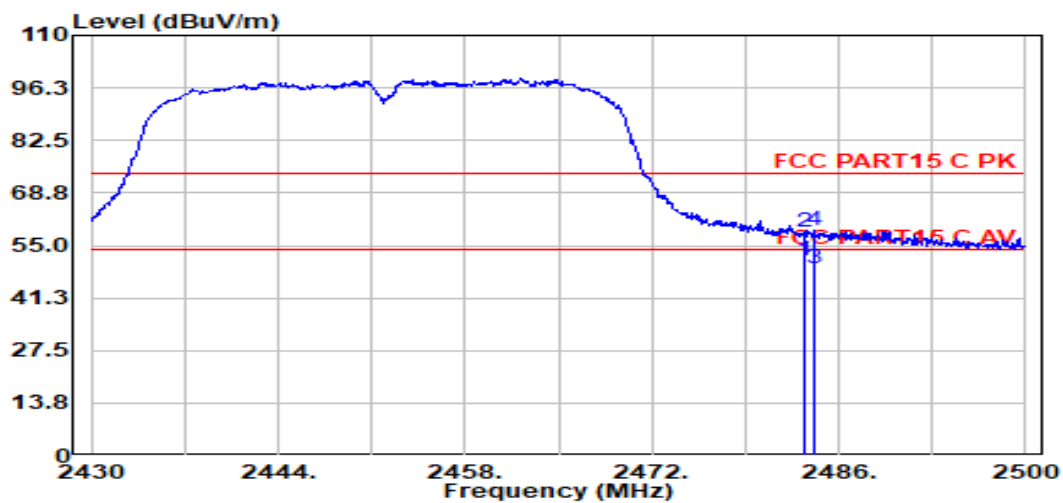


Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.48	17.73	27.57	3.81	0.00	49.11	54.00	-4.89	Average	VERTICAL
2	2483.48	26.19	27.57	3.81	0.00	57.57	74.00	-16.43	Peak	VERTICAL
3	2486.70	16.84	27.58	3.81	0.00	48.22	54.00	-5.78	Average	VERTICAL
4	2486.70	27.28	27.58	3.81	0.00	58.66	74.00	-15.34	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

Test Site : DDT 3m Chamber 3#
Test Date : 2021-12-16
EUT : Wi-Fi & Bluetooth Internet of Things Module
Power Supply : DC 3.3V
Condition : Temp:24.5°,Humi:55%,Press:100.1kPa
Memo : 11N40 2452

D:\2021 report data\Q21120910-1E ESP32-WROOM-32UE\FCC ABOVE 1G\2.4G\FCC ABOVE 1G_00044.EMI
Tested By : Kennys Zhang
Model Number : ESP32-WROOM-32UE
Test Mode : Tx Mode
Antenna/Distance : 2021 BBHA 9120D 3# NEW/3m/HORIZONTAL



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2483.48	19.48	27.57	3.81	0.00	50.86	54.00	-3.14	Average	HORIZONTAL
2	2483.48	26.98	27.57	3.81	0.00	58.35	74.00	-15.65	Peak	HORIZONTAL
3	2484.11	17.58	27.57	3.81	0.00	48.96	54.00	-5.04	Average	HORIZONTAL
4	2484.11	27.43	27.57	3.81	0.00	58.81	74.00	-15.19	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.