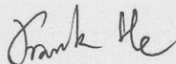
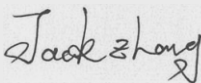


Test report No:
20B0013R-RF-US-P06V01

FCC & ISED TEST REPORT

Product Name	Digital Device
Trademark	PHILIPS
Model and /or type reference	9290024696
FCC ID	2AGBW9290024696X
IC	20812-24696X
Applicant's name / address	Signify (China) Investment Co., Ltd Building 9, Lane 888, Tian Lin Road, Min Hang District, Shanghai, P. R. C
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C Section 15.247 ANSI C63.10: 2013 KD558074 D01 15.247 Meas Guidance v05r02 RSS-Gen Issue 5 RSS-247 Issue 2
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Kitty Li/Project Assistant 
Reviewed by (name / position & signature)	Frank He/ Technical Supervisor 
Approved by (name / position & signature)	Jack Zhang/ Supervisor 
Date of issue	2021-02-05
Report template No	Template_FCC 15.247-RF-V1.0

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Nov. 02, 2020
Date (start test)	Nov. 03, 2020
Date (finish test)	Feb. 03, 2021

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
T_x	: Transmitter
R_x	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
20B0013R-RF-US-P06V01	V1.0	Initial issue of report.	2020-12-01
20B0013R-RF-US-P06V01	V1.1	P20-21, added the test data of AC Power Line Conducted Emission. P34, modified the test data of Emissions in non-restricted frequency band.	2021-02-03
20B0013R-RF-US-P06V01	V1.2	P13, modified the information of Auxiliary equipment / Test software for the EUT.	2021-02-05

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with Part 15 Subpart C Paragraph 15.247, RSS-Gen Issue 5, RSS-247 Issue 2.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Information;
 - Chapter 1.3 Channel List.

USED EQUIPMENT

AC Power Line Conducted Emission / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMI Test Receiver	R&S	ESCI	100906	2020.04.18	2021.04.17
Two-Line V-Network	R&S	ENV216	101190	2021.01.27	2022.01.26
Two-Line V-Network	R&S	ENV216	101044	2020.04.18	2021.04.17
50ohm Termination	SHX	TF2	7081402	2020.09.23	2021.09.22
50ohm Termination	SHX	TF2	7081403	2020.09.23	2021.09.22
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A	N/A
Temperature/Humidity Meter	RTS	RTS-8S	TR1-TH	2020.08.23	2021.08.22
Dekra test software	Dekra	-	-	-	-

Emissions in non-restricted frequency bands/ Occupied Bandwidth/ Fundamental emission output power/ Power Spectral Density / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.08.15	2021.08.14
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2020.04.17	2021.04.16
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2020.08.15	2021.08.14
4TX MIMO Power Sensor	Keysight	X8750A	MY59400102	2020.02.11	2021.02.10
Coaxial Cable	Woken	SFL402	F02-150410-044	2021.01.01	2021.12.31
Temperature/Humidity Meter	RTS	RTS-8S	RF08	2020.08.13	2021.08.12

Radiated Emission(30MHz-1GHz) / AC2

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMI Test Receiver	R&S	ESCI	100573	2020.12.06	2021.12.05
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2020.09.22	2021.09.21
Coaxial Cable	Huber+Suhner	RG 214	AC2-C	2020.04.05	2021.04.04
Temperature/Humidity Meter	RTS	RTS-8S	AC2-TH	2020.08.13	2021.08.12
Dekra test software	Dekra	-	-	-	-

Radiated Emission(1GHz-40GHz) / AC5

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2020.04.17	2021.04.16
Amplifier	Keleto	LNPA	SK20190225	2020.09.25	2021.09.24
Preamplifier	EMCI	EMC184045SE	980263	2020.05.24	2021.05.23
DRG Horn Antenna	ETS-Lindgren	3117	00167055	2020.08.06	2021.08.05
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2019.03.23	2021.03.22
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2020.04.05	2021.04.04
Coaxial Cable	ROSENBERGER	LA1-C011- 2000/3000	AC5-40G	2020.04.18	2021.04.17
Temperature/Humidity Meter	RTS	RTS-8S	AC5-TH	2020.08.13	2021.08.12
Dekra test software	Dekra	-	-	-	-

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%. The Uncertainties comply with standard required as below.

Test item	Uncertainty
AC Power Line Conducted Emission	9kHz~150kHz: 2.80 dB 150kHz~30MHz: 2.40 dB
Peak Power Output	± 1.27 dB
Radiated Emission(30MHz~1GHz)	Horizontal: 30MHz~200MHz: 3.50 dB 300MHz~1GHz: 3.60 dB Vertical: 30MHz~200MHz: 3.60 dB 300MHz~1GHz: 3.50 dB
Radiated Emission(1GHz~26.5GHz)	Horizontal: 1GHz~18GHz: 5.00 dB Vertical: 1GHz~18GHz: 4.80 dB
RF antenna conducted test	± 1.27 dB
Radiated Emission Band Edge	± 3.9 dB
DTS Bandwidth	± 150 Hz
Occupied Bandwidth	± 1 kHz
Power Density	± 1.27 dB

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name	Digital Device
Model No.	9290024696
FCC ID	2AGBW9290024696X
IC	20812-24696X
Manufacturer	Signify (China) Investment Co., Ltd
Manufacturer Address	Building 9, Lane 888, Tian Lin Road, Min Hang District, Shanghai, P. R. C

Wireless specification	Zigbee
Operating frequency range(s)	2400~2483.5MHz
Type of Modulation	DSSS-OQPSK
Number of channel	16
Date Rate	250kbps max

Rated power supply	Voltage and Frequency	
	☐	AC: 220 – 240 V, 50/60 Hz
	☐	AC: 100 – 240 V, 50/60 Hz
	☒	DC: 24 Vdc
	☐	Battery:
Mounting position	☐	Table top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Head-mounted equipment
	☒	Other: RF module

1.2 Antenna Information

Antenna model / type number	N/A			
Antenna serial number	N/A			
Antenna Delivery	☒	1TX + 1RX		
	☐	2TX + 2RX		
Antenna technology	☒	SISO		
	☐	MIMO	☐	CDD
			☐	Beam-forming
Antenna Type	☐	External	☐	Dipole
			☐	Sectorized
	☒	Internal	☐	PIFA
			☒	PCB
			☐	Metal Monopole Antenna
			☐	Others.....
Antenna Gain	4.26 dBi			

1.3 Channel List

Working Frequency of Each Channel: For Zigbee							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
11	2405 MHz	12	2410 MHz	13	2415 MHz	14	2420 MHz
15	2425 MHz	16	2430 MHz	17	2435 MHz	18	2440 MHz
19	2445 MHz	20	2450 MHz	21	2455 MHz	22	2460 MHz
23	2465 MHz	24	2470 MHz	25	2475 MHz	26	2480 MHz

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

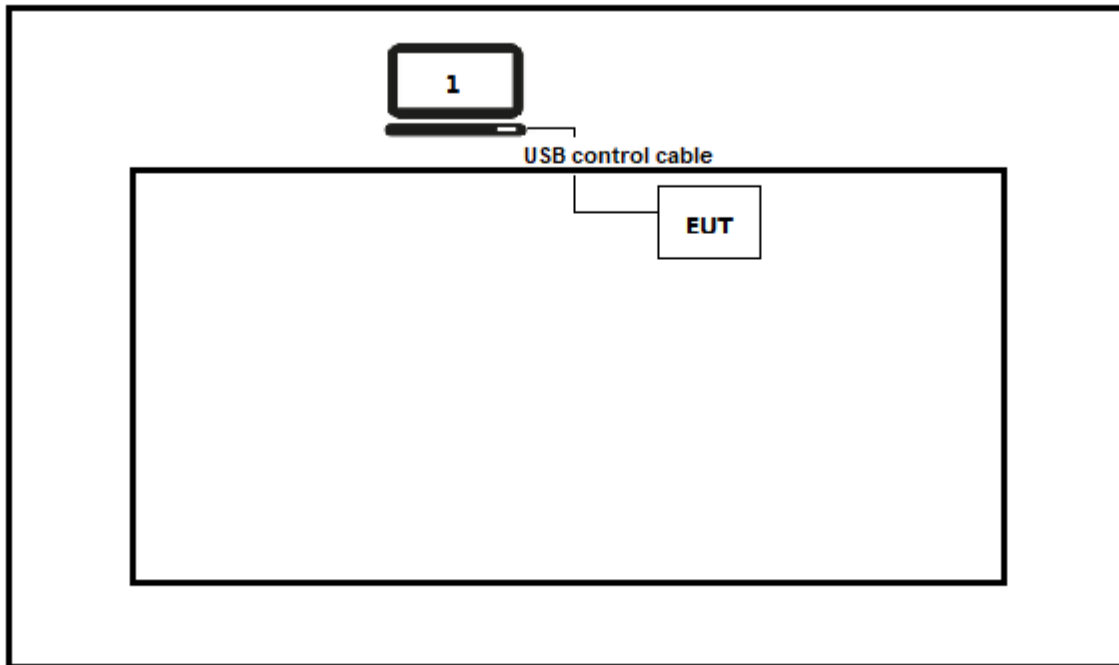
Test Mode For Zigbee	Mode1: Transmit by Zigbee
----------------------	---------------------------

2.2 Auxiliary equipment / Test software for the EUT

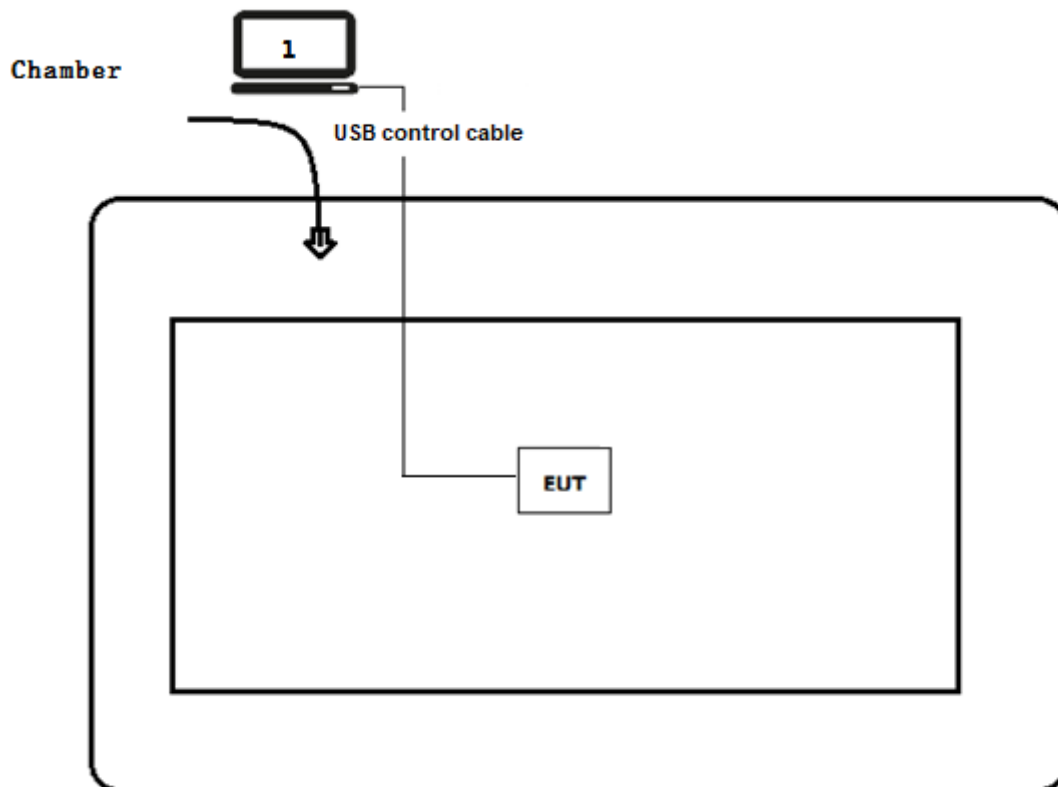
Auxiliary equipment	Type / Version	Manufacturer	Supplied by
Notebook	Think pad x220	Lenovo	Adapter
Debug board	N/A	N/A	N/A
Software	Type / Version	Manufacturer	Supplied by
ApprobationTool	N/A	N/A	N/A

2.3 Test Configuration / Block diagram used for tests

Test setup Diagram- AC Line Conducted Emission Test



Test setup Diagram- Radiated Emission



2.4 Testing process

1	Setup the EUT as shown in Section 2.3.
2	Execute test software “ApprobationTool” on the notebook.
3	Configure the test mode, the test channel, and the data rate.
4	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC CFR Title 47 Part 15 Subpart C Section 15.247	2021	Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 558074 D01 v05r02	2019	Guidance for performing compliance measurements on Digital Transmission System (DTS) operating under section 15.247
RSS-Gen Issue 5 Amendment 1	2019	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 2	2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

The following deviation(s) was / were made from the published requirements of the listed standards: N/A.

(Please define the deviations from the standard(s) if applicable)

3.3 Overview of results

For FCC

Requirement – Test case	Basic standard(s)	Verdict	Remark
AC Power Line Conducted Emission	FCC 15.207	PASS	---
Emissions in restricted frequency bands	FCC 15.247(b)(3)	PASS	---
Duty cycle	ANSI C63.10:2013	PASS	---
Emissions in non-restricted frequency bands	FCC 15.247(d), FCC 15.209	PASS	---
Radiated Emission Band Edge	FCC 15.247(d)	PASS	---
Fundamental emission output power	FCC 15.247(d), FCC 15.209	PASS	---
DTS Bandwidth	FCC 15.247(a)(2)	PASS	---
Power Spectral Density	FCC 15.247(e)	PASS	---
Antenna Requirement	FCC 15.203	PASS	---

For ISED

Requirement – Test case	Basic standard(s)	Verdict	Remark
AC Power Line Conducted Emission	RSS-Gen Issue 5 Section 8.8	PASS	---
Emissions in restricted frequency bands	RSS-Gen Issue 5 Section 8.9	PASS	---
Duty cycle	ANSI C63.10:2013	PASS	---
Emissions in non-restricted frequency bands	RSS-247 Issue 2 Section 5.5	PASS	---
Radiated Emission Band Edge	RSS-Gen Issue 5 Section 8.10	PASS	---
Fundamental emission output power	RSS-247 Issue 2 Section 5.4(d)	PASS	---
DTS Bandwidth	RSS-Gen Issue 5 Section 6.7	PASS	---
Power Spectral Density	RSS-247 Issue 2 Section 5.2(b)	PASS	---
Antenna Requirement	RSS-Gen Issue 5 Section 6.8	PASS	---

3.4 Test Facility

USA	:	FCC Designation Number: CN1199
CA	:	ISED CAB identifier: CN0040

4 TEST RESULTS

4.1 AC Power Line Conducted Emission

VERDICT: PASS

4.1.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.207	
Frequency range [MHz]	Limit: QP [dB(μV) ¹⁾]	Limit: AV [dB(μV) ¹⁾]
0,15 - 0,50	66 - 56 ²⁾	56 - 46 ²⁾
0,50 - 5,0	56	46
5,0 - 30	60	50

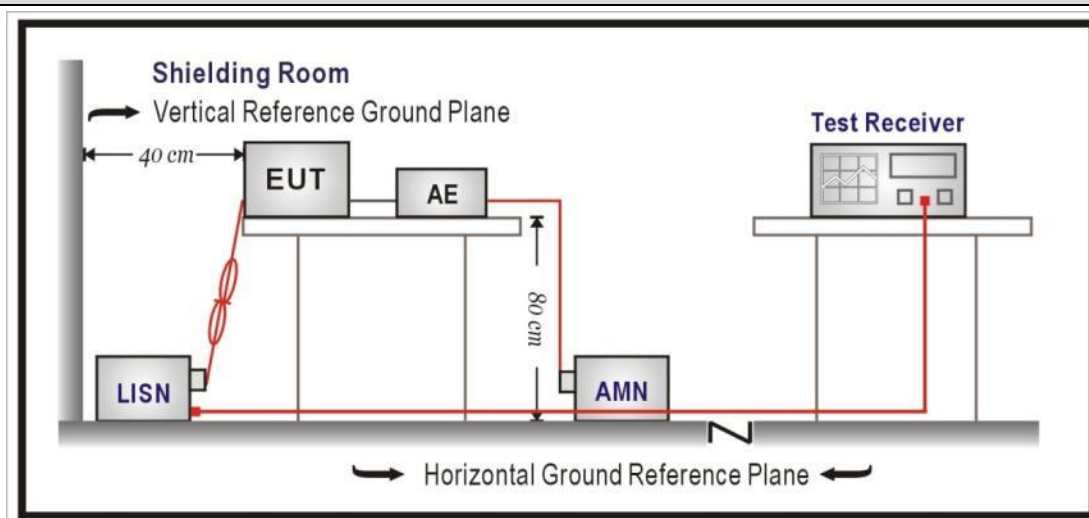
¹⁾ At the transition frequency, the lower limit applies.

²⁾ The limit decreases linearly with the logarithm of the frequency.

NOTE 1: The exclusion band for transmitters shall be considered for transmitters operating at frequencies below 30 MHz.

NOTE 2: Where the AC output port is directly connected (or via a circuit breaker) to the AC power input port of the EUT the AC power output port need not to be tested.

4.1.2 Test Setup

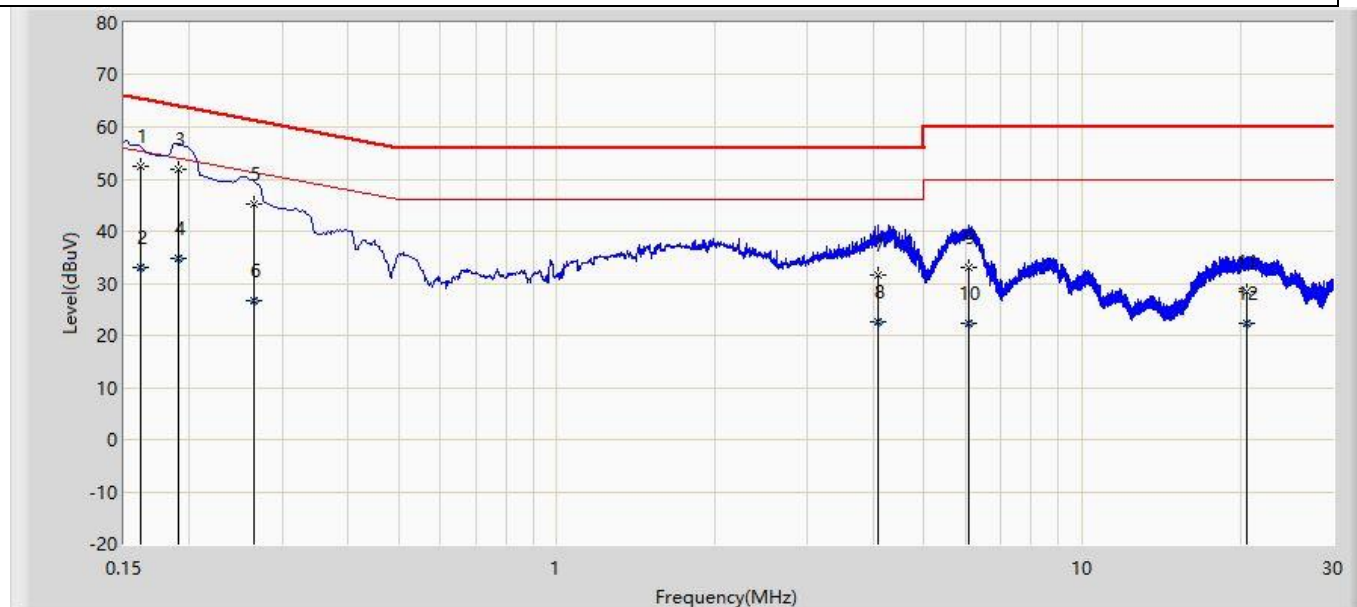


4.1.3 Test Procedure

	References Rule	Chapter	Item
☒	ANSI C63.10-2013	6.2	Standard test method for ac power-line conducted emissions from unlicensed wireless devices

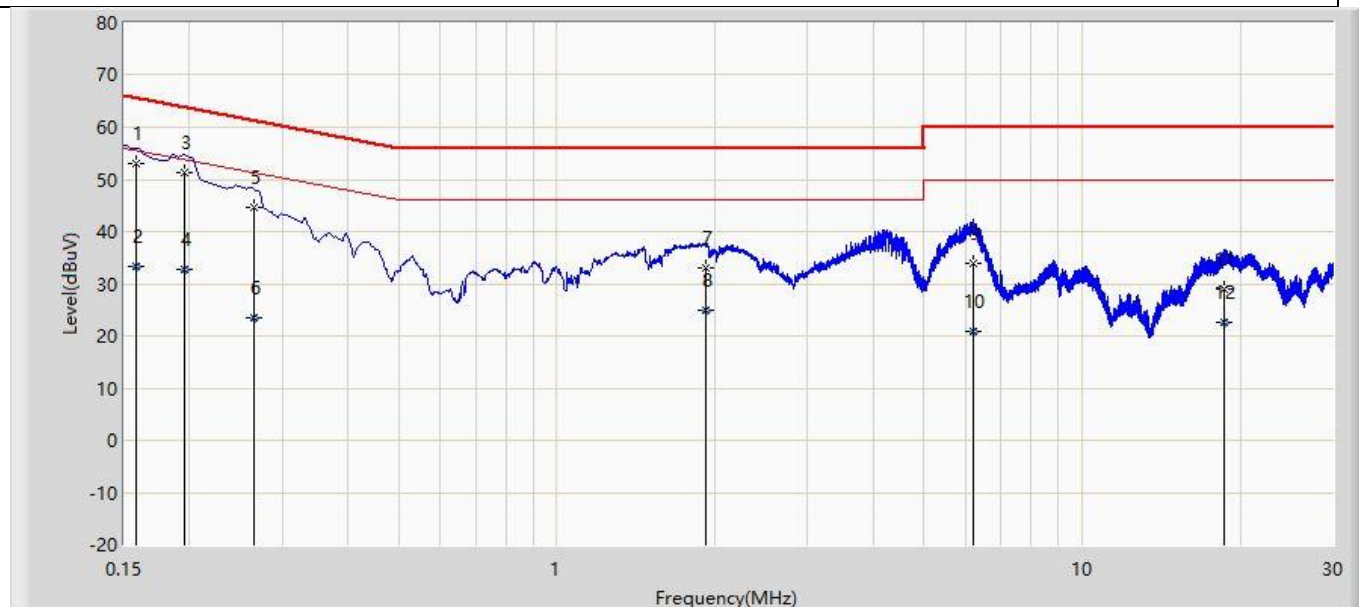
4.1.4 Test Data

Profile: 20B0013R	Page No.: 1
Engineer: YULIU	
Site: TR1	Time: 2021/02/03 - 13:10
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101044_(0.009-30MHz)	Polarity: Line
EUT: Digital Device	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.161	52.410	42.742	-12.990	65.399	9.667	QP
2		0.161	33.056	23.389	-22.343	55.399	9.667	AV
3	*	0.191	51.980	42.304	-12.023	64.003	9.675	QP
4		0.191	34.815	25.140	-19.188	54.003	9.675	AV
5		0.265	45.177	35.486	-16.104	61.281	9.691	QP
6		0.265	26.544	16.853	-24.737	51.281	9.691	AV
7		4.094	31.636	21.743	-24.364	56.000	9.893	QP
8		4.094	22.709	12.816	-23.291	46.000	9.893	AV
9		6.077	33.014	23.029	-26.986	60.000	9.984	QP
10		6.077	22.251	12.266	-27.749	50.000	9.984	AV
11		20.593	28.526	18.093	-31.474	60.000	10.433	QP
12		20.593	22.211	11.778	-27.789	50.000	10.433	AV

Profile: 20B0013R	Page No.: 2
Engineer: YULIU	
Site: TR1	Time: 2021/02/03 - 13:15
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101044_(0.009-30MHz)	Polarity: Neutral
EUT: Digital Device	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.158	53.005	43.341	-12.582	65.587	9.663	QP
2		0.158	33.377	23.714	-22.210	55.587	9.663	AV
3	*	0.195	51.296	41.597	-12.525	63.821	9.699	QP
4		0.195	32.756	23.057	-21.065	53.821	9.699	AV
5		0.265	44.557	34.844	-16.724	61.281	9.714	QP
6		0.265	23.461	13.748	-27.820	51.281	9.714	AV
7		1.925	32.903	23.120	-23.097	56.000	9.783	QP
8		1.925	24.829	15.046	-21.171	46.000	9.783	AV
9		6.218	33.917	23.915	-26.083	60.000	10.002	QP
10		6.218	20.937	10.935	-29.063	50.000	10.002	AV
11		18.587	29.026	18.637	-30.974	60.000	10.389	QP
12		18.587	22.655	12.266	-27.345	50.000	10.389	AV

4.2 Emissions in restricted frequency bands**VERDICT: PASS****4.2.1 Limit****Standard** FCC Part 15 Subpart C Paragraph 15.209**Restricted Bands of operation**

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.81425 – 8.81475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	
13.36 – 13.41			

Restricted Bands of operation for IC

0.090 - 0.110	13.36 - 13.41	960 - 1427	9.0 - 9.2
0.495 - 0.505	16.42 - 16.423	1435 - 1626.5	9.3 - 9.5
2.1735 - 2.1905	16.69475 - 16.69525	1645.5 - 1646.5	10.6 - 12.7
3.020 - 3.026	16.80425 - 16.80475	1660 - 1710	13.25 - 13.4
4.125 - 4.128	25.5 - 25.67	1718.8 - 1722.2	14.47 - 14.5
4.17725 - 4.17775	37.5 - 38.25	2200 - 2300	15.35 - 16.2
4.20725 - 4.20775	73 - 74.6	2310 - 2390	17.7 - 21.4
5.677 - 5.683	74.8 - 75.2	2483.5 - 2500	22.01 - 23.12
6.215 - 6.218	108 - 138	2655 - 2900	23.6 - 24.0
6.26775 - 6.26825	149.9 - 150.05	3260 - 3267	31.2 - 31.8
6.31175 - 6.31225	156.52475 - 156.52525	3332 - 3339	36.43 - 36.5
8.291 - 8.294	156.7 - 156.9	3345.8 - 3358	Above 38.6
8.362 - 8.366	162.0125 - 167.17	3500 - 4400	
8.37625 - 8.38675	167.72 - 173.2	4500 - 5150	
8.81425 - 8.81475	240 - 285	5350 - 5460	
12.29 - 12.293	322 - 335.4	7250 - 7750	
12.51975 - 12.52025	399.9 - 410	8025 - 8500	
12.57675 - 12.57725	608 - 614	--	

Restricted Band Emissions Limit

Frequency (MHz)	Field strength (μ V/m)	Field strength (dB μ V/m)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300 _(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30 _(Note 1)
1.705 - 30	30	29.5	30 _(Note 1)
30 - 88	100	40	3 _(Note 2)
88 - 216	150	43.5	3 _(Note 2)
216 - 960	200	46	3 _(Note 2)
Above 960	500	54	3 _(Note 2)

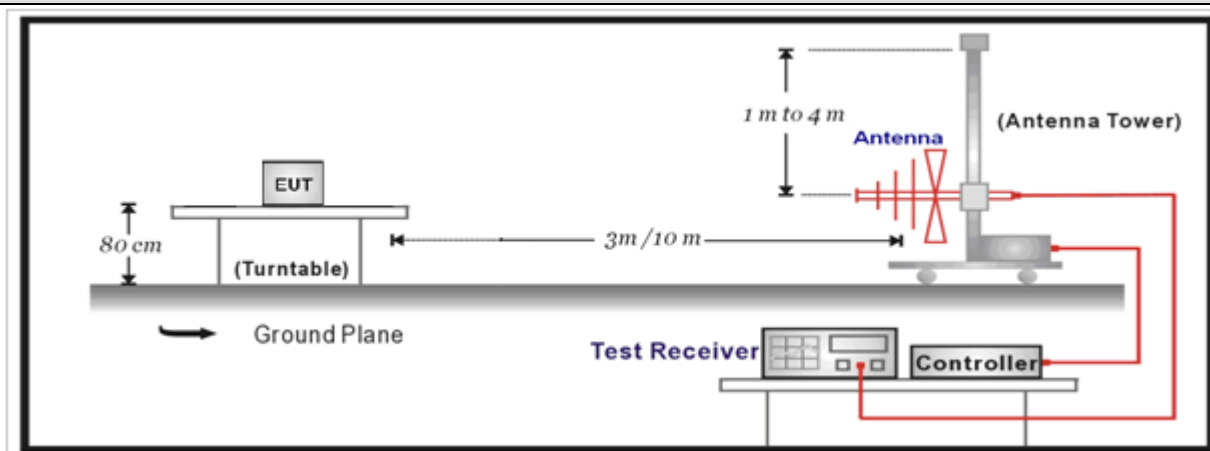
Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment.

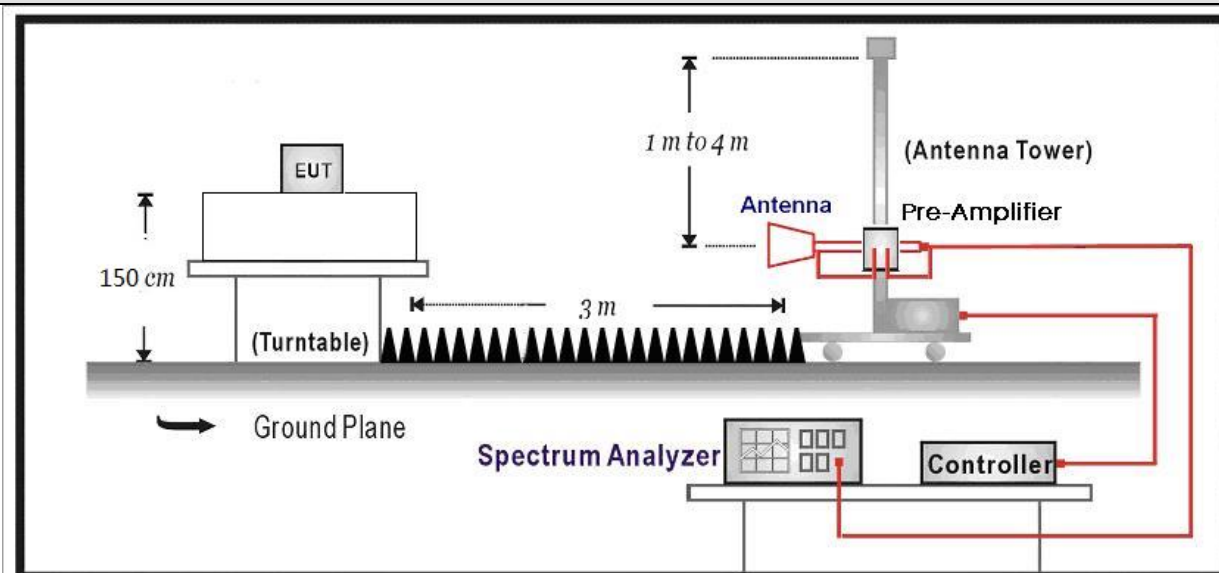
Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.2.2 Test Setup

30MHz-1GHz Test Setup:



Above 1GHz Test Setup:

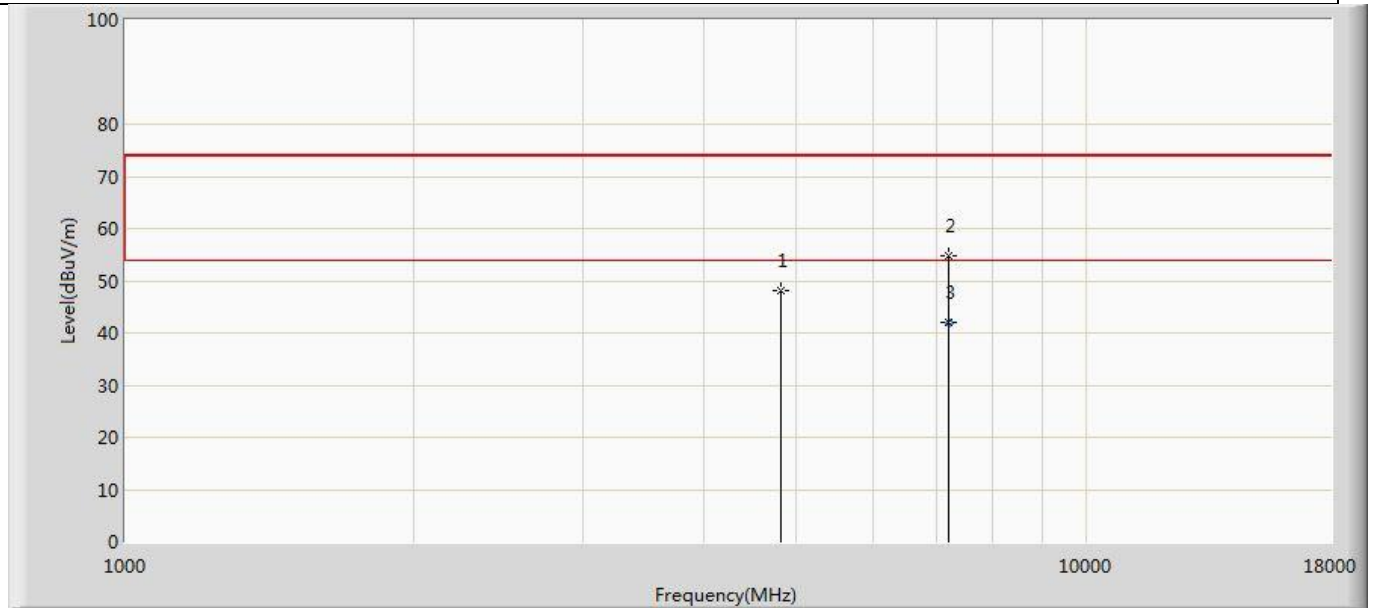


4.2.3 Test Procedure

	References Rule		Chapter	Description
☒	ANSI C63.10		11.12	Emissions in restricted frequency bands
	☒	ANSI C63.10	11.12.1	Radiated emission measurements
	☒	ANSI C63.10	11.12.2.7	Radiated spurious emission test
	☒	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
	☒	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
	☒	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

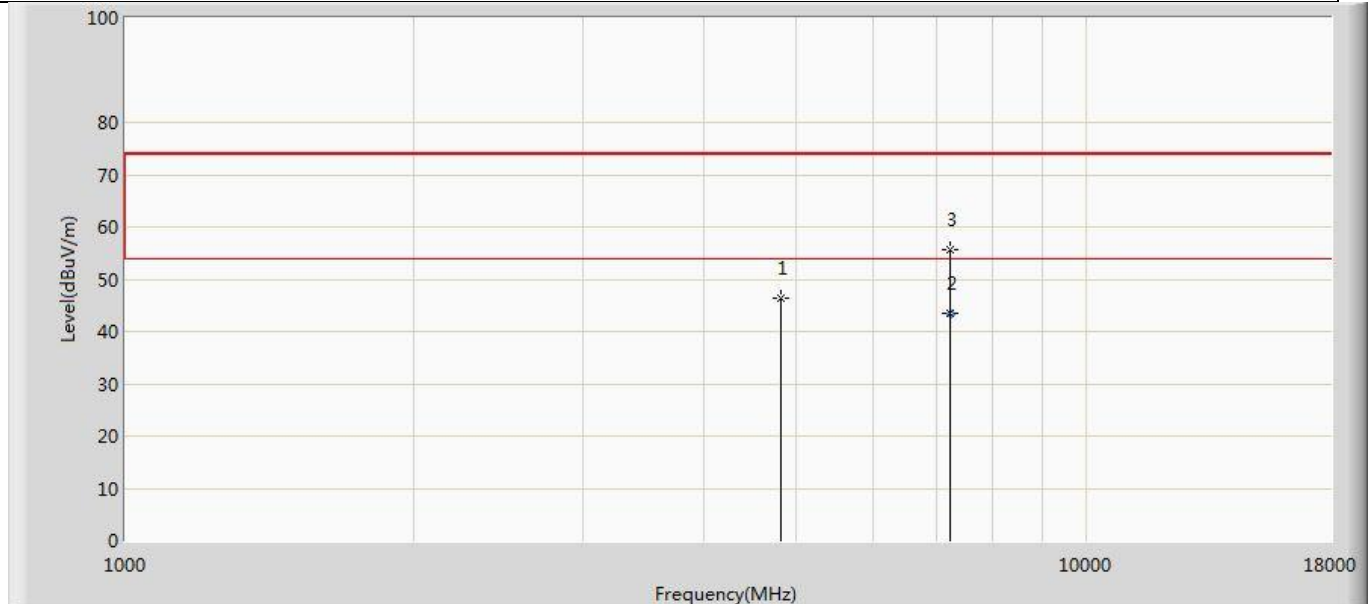
4.2.4 Test Data

Profile: RSE	Page No.: 31
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 23:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2405MHz	



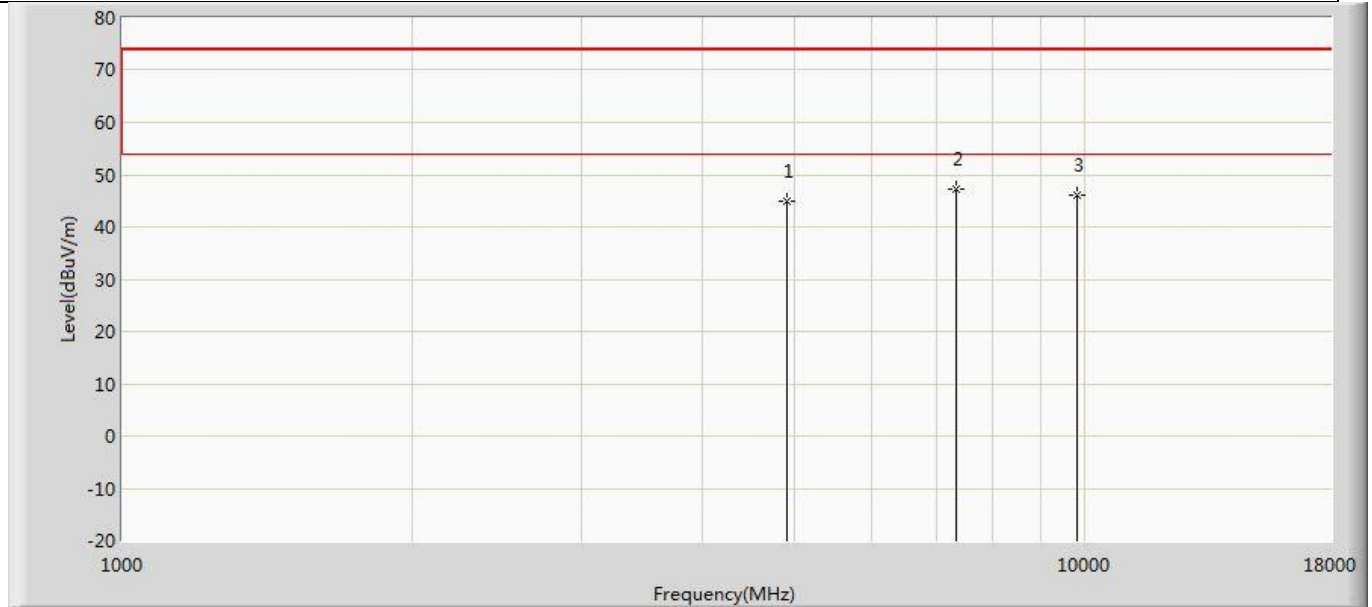
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4808.000	48.129	52.765	-25.871	74.000	-4.636	PK
2		7205.000	54.801	56.963	-19.199	74.000	-2.162	PK
3	*	7205.000	42.012	44.174	-11.988	54.000	-2.162	AV

Profile: RSE	Page No.: 32
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 23:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2405MHz	



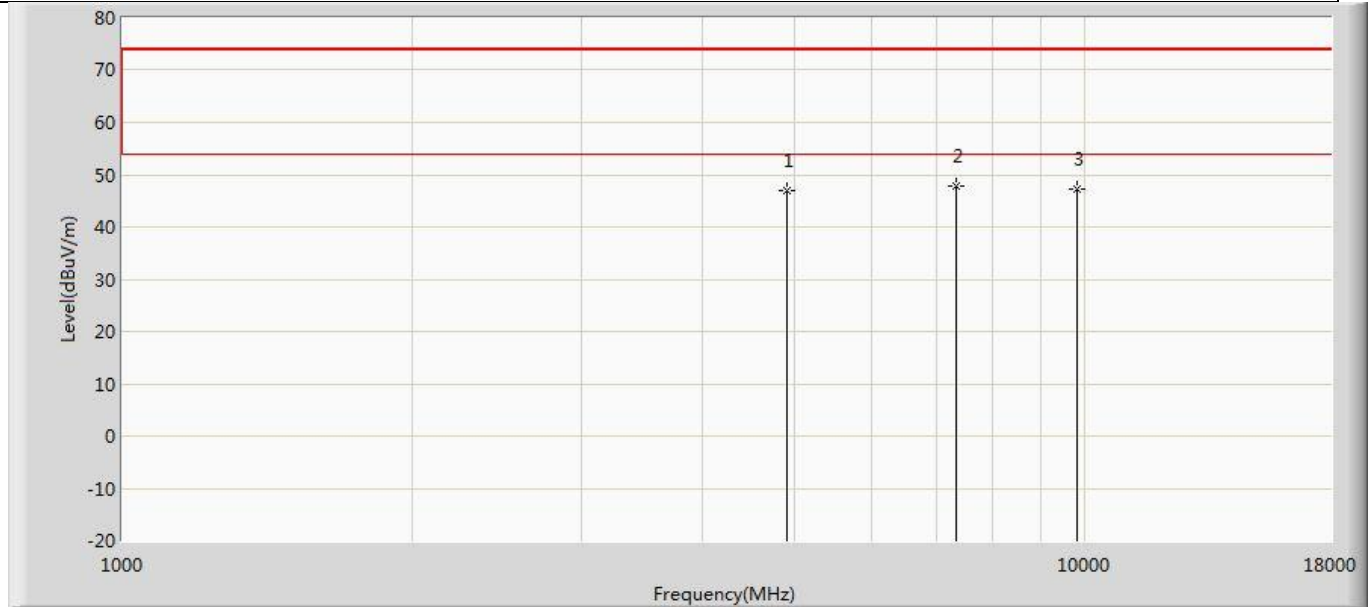
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4808.000	46.431	51.067	-27.569	74.000	-4.636	PK
2	*	7215.000	43.341	45.361	-10.659	54.000	-2.020	AV
3		7222.000	55.758	57.679	-18.242	74.000	-1.921	PK

Profile: RSE	Page No.: 3
Engineer: Pawn	
Site: AC5	Time: 2020/11/30 - 10:51
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Digital Device	Power: DC 24V
Note: Mode1:Transmit at 2450MHz	



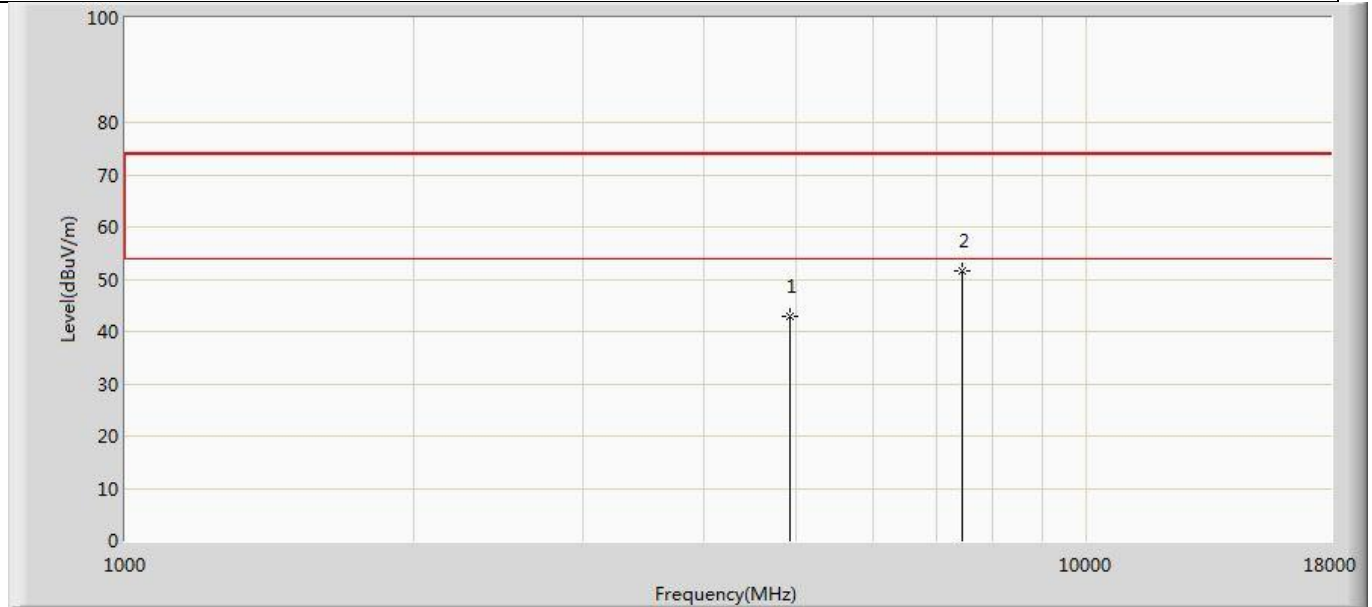
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4900.000	44.928	49.902	-29.072	74.000	-4.974	PK
2	*	7350.000	47.349	49.451	-26.651	74.000	-2.102	PK
3		9800.000	46.193	46.415	-27.807	74.000	-0.223	PK

Profile: RSE	Page No.: 4
Engineer: Pawn	
Site: AC5	Time: 2020/11/30 - 10:55
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Digital Device	Power: DC 24V
Note: Mode1:Transmit at 2450MHz	



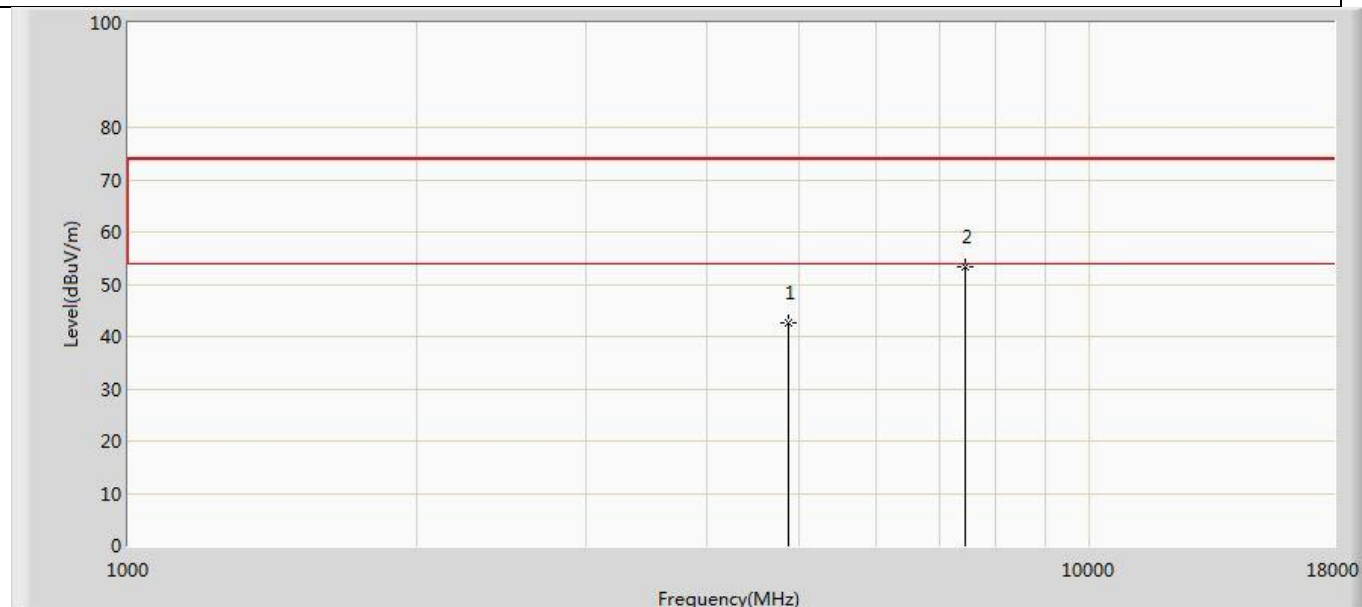
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4900.000	46.982	51.956	-27.018	74.000	-4.974	PK
2	*	7350.000	47.891	49.993	-26.109	74.000	-2.102	PK
3		9800.000	47.113	47.335	-26.887	74.000	-0.223	PK

Profile: RSE	Page No.: 35
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 23:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4927.000	42.905	47.471	-31.095	74.000	-4.566	PK
2	*	7443.000	51.726	53.688	-22.274	74.000	-1.962	PK

Profile: RSE	Page No.: 36
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 23:05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4876.000	42.607	47.576	-31.393	74.000	-4.969	PK
2	*	7443.000	53.191	55.153	-20.809	74.000	-1.962	PK

Note:

1. Measured Level = Reading Level + Factor.
2. The test frequency range, 9kHz~30MHz, 18GHz~26GHz, both of the worst case are at least 20dB below the limits, therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.
4. As the radiated emission was performed, so conducted emission was not tested.

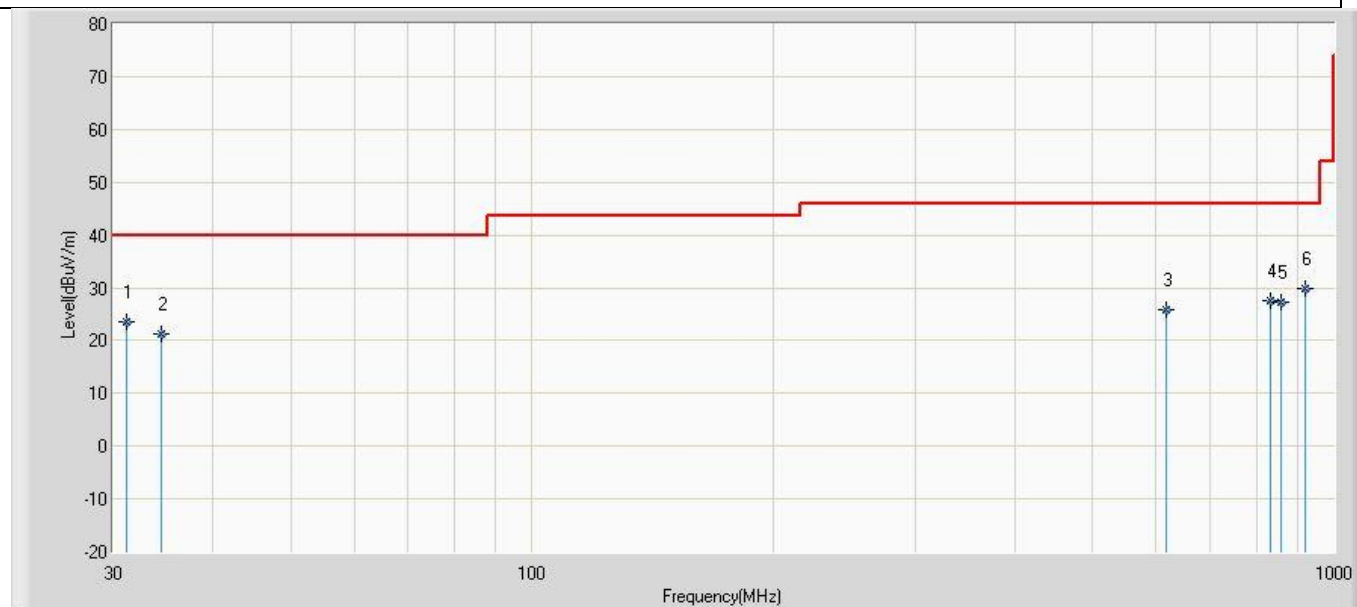
The worst case of Radiated Emission below 1GHz:

Engineer: Neil	
Site: AC3	Time: 2020/12/01 - 17:42
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC3_3m (30-1000MHz)	Polarity: Vertical
EUT: Digital Device	Power: DC 24V
Note: Mode1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		30.364	20.167	-3.700	-19.833	40.000	23.867	QP
2		33.760	18.471	-4.300	-21.529	40.000	22.772	QP
3		208.359	20.389	-2.800	-23.111	43.500	23.189	QP
4		772.292	29.246	-3.000	-16.754	46.000	32.246	QP
5		893.421	30.763	-2.300	-15.237	46.000	33.063	QP
6	*	947.378	31.327	-3.400	-14.673	46.000	34.727	QP

Engineer: Neil	
Site: AC3	Time: 2020/12/01 - 17:42
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC3_3m (30-1000MHz)	Polarity: Horizontal
EUT: Digital Device	Power: DC 24V
Note: Mode1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		31.212	23.633	-3.500	-16.367	40.000	27.133	QP
2		34.486	21.369	-4.200	-18.631	40.000	25.569	QP
3		618.790	25.769	-3.500	-20.231	46.000	29.269	QP
4		835.100	27.624	-2.900	-18.376	46.000	30.524	QP
5		860.300	27.167	-4.200	-18.833	46.000	31.367	QP
6	*	922.360	29.773	-2.400	-16.227	46.000	32.173	QP

4.3 Emissions in non-restricted frequency band

VERDICT: PASS

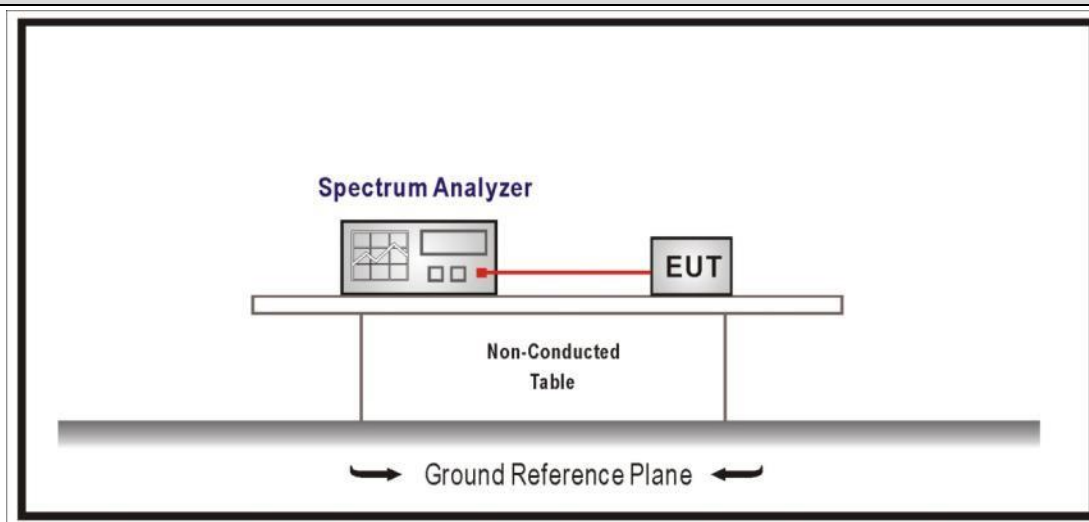
4.3.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.247(d)
RF Output power (Detection methods)	Limit(dB)
RF Output power(Average detector)	30dBc(Note1)
RF Output power(PK detector)	20dBc(Note2)

Note 1: If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).

Note 2: If the maximum peak conducted output power procedure was used, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

4.3.2 Test Setup



4.3.3 Test Procedure

References Rule		Chapter	Description
☒	ANSI C63.10	11.11	Emissions in non-restricted frequency bands
☒	ANSI C63.10	11.11.1	General
☒	ANSI C63.10	11.11.2	Reference level measurement
☒	ANSI C63.10	11.11.3	Emission level measurement

4.3.4 Test Data

Mode1/CH11/2405MHz

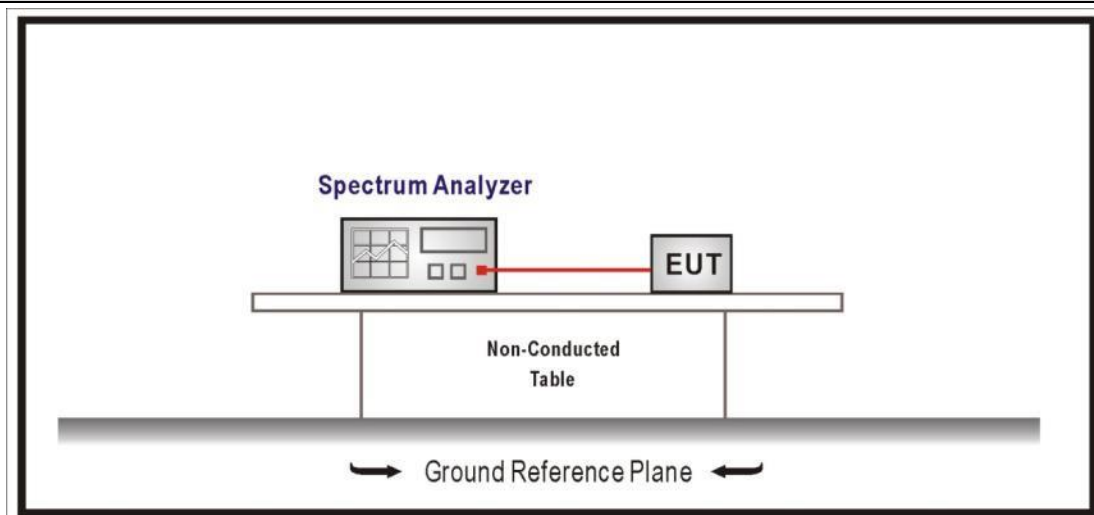


Mode1/CH26/2480MHz



4.4 Duty cycle**VERDICT: PASS****4.4.1 Limit**

N/A

4.4.2 Test Setup**4.4.3 Test Procedure**

References Rule		Chapter	Description
☒	ANSI C63.10	11.6	Duty cycle (D), transmission duration (T), and maximum power control level

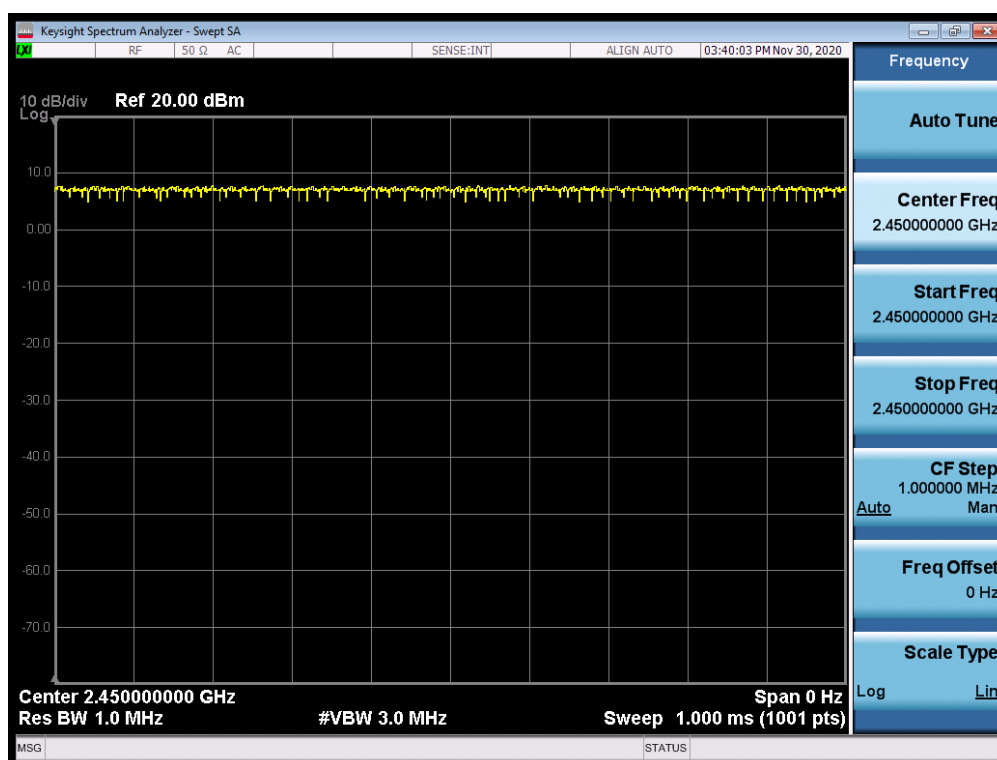
4.4.4 Test Data

Test Mode	Tx On (us)	Tx Off (us)	VBW (kHz)	Tx On + Tx Off (us)	Duty Cycle (%)
Mode 1	--	--	--	--	100

Note 1: T means the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Note 2: According to KDB 558074, when test for Radiated Emission Band Edge and Radiated Emission, for average detector set: $VBW \geq 1/T$ will be used.

Mode 1 CH20 2450MHz



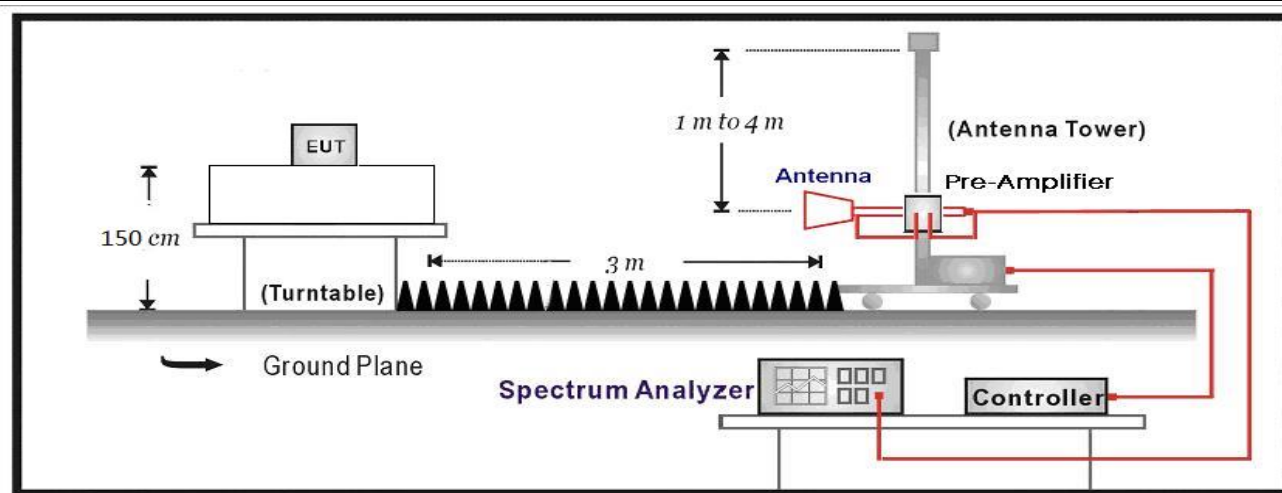
4.5 Radiated Emission Band Edge**VERDICT: PASS****4.5.1 Limit**

Standard		FCC Part 15 Subpart C Paragraph 15.247(d) , 15.209		
Frequency bands (MHz)	Detector	Limit (dB μ V/m)	RBW (MHz)	Distance (m)
2310-2390	PK	74	1	3
2483.5-2500	AV	54	1	3

Note: The field strength of emissions appearing within these frequency bands shall not exceed the limits.

4.5.2 Test Setup

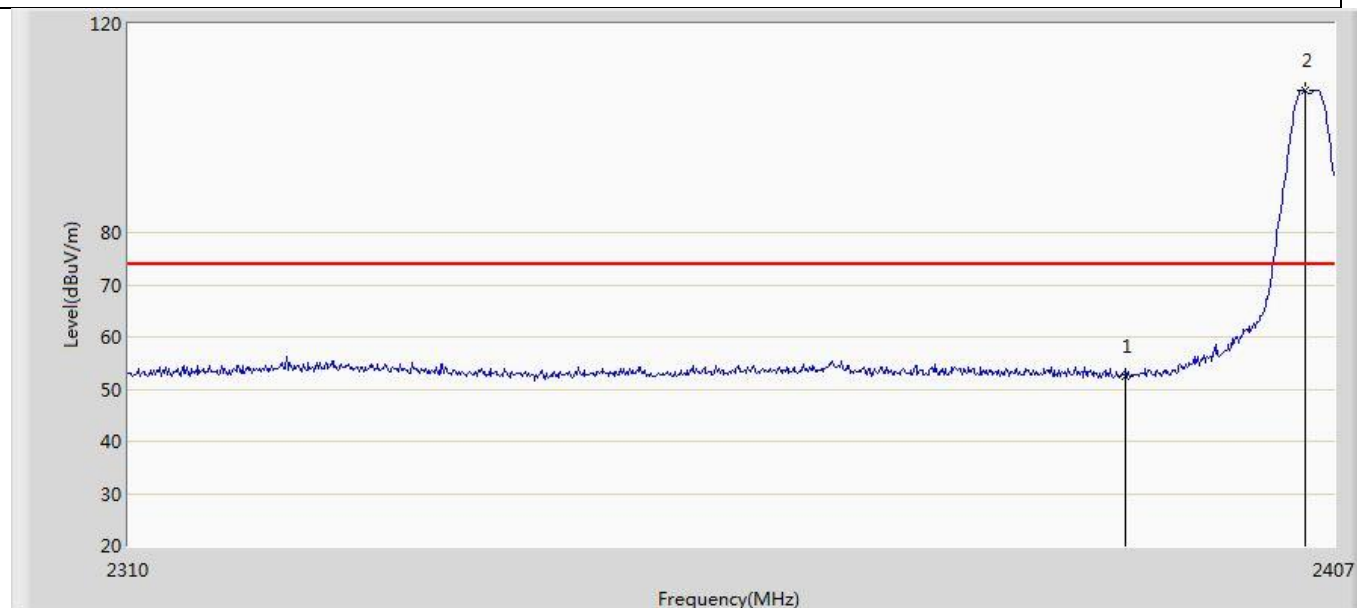
Above 1GHz Test Setup:

**4.5.3 Test Procedure**

	References Rule	Chapter	Description
☒	ANSI C63.10	6.10	Band-edge testing
☒	☒ ANSI C63.10	6.10.5	Restricted-band band-edge measurements
☐	☐ ANSI C63.10	6.10.6	Marker-delta method
☒	ANSI C63.10	11.12	Emissions in restricted frequency bands
☒	☒ ANSI C63.10	11.12.1	Radiated emission measurements
☒	☒ ANSI C63.10	11.12.2.7	Radiated spurious emission test
☐	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
☐	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
☒	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

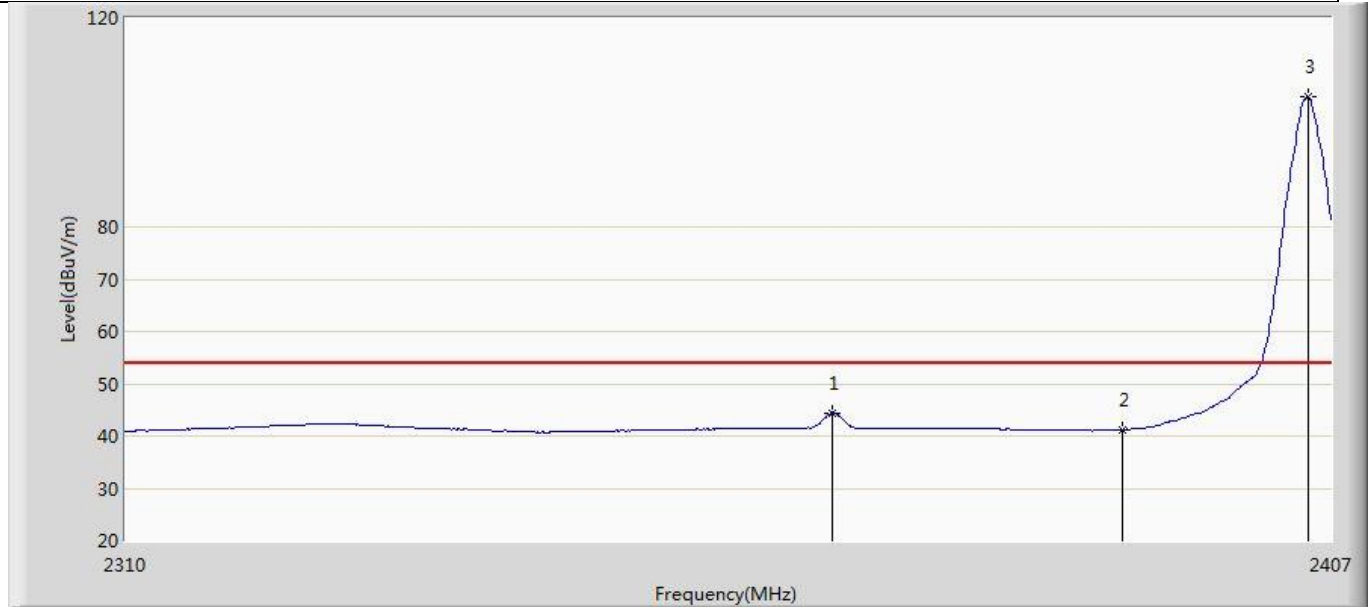
4.5.4 Test Data

Profile: 20B0013R	Page No.: 33
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 21:47
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2405MHz	



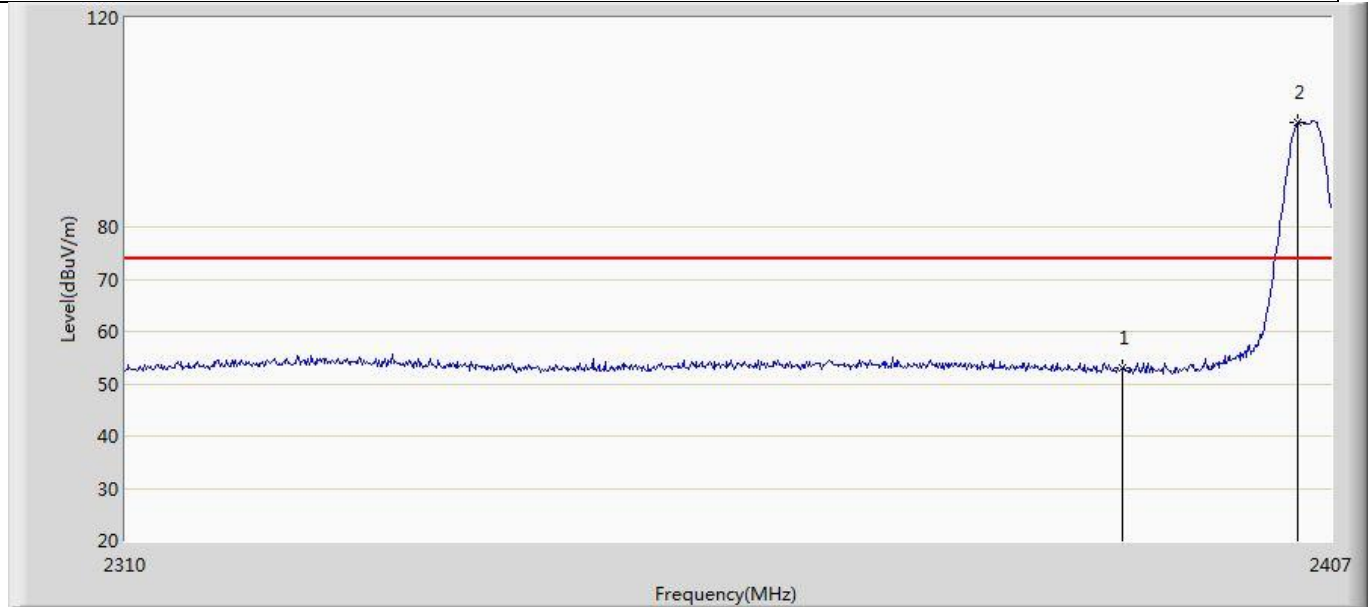
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	52.394	16.650	-21.606	74.000	35.745	PK
2	*	2404.672	107.159	70.894	33.159	74.000	36.265	PK

Profile: 20B0013R	Page No.: 34
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 21:54
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2405MHz	



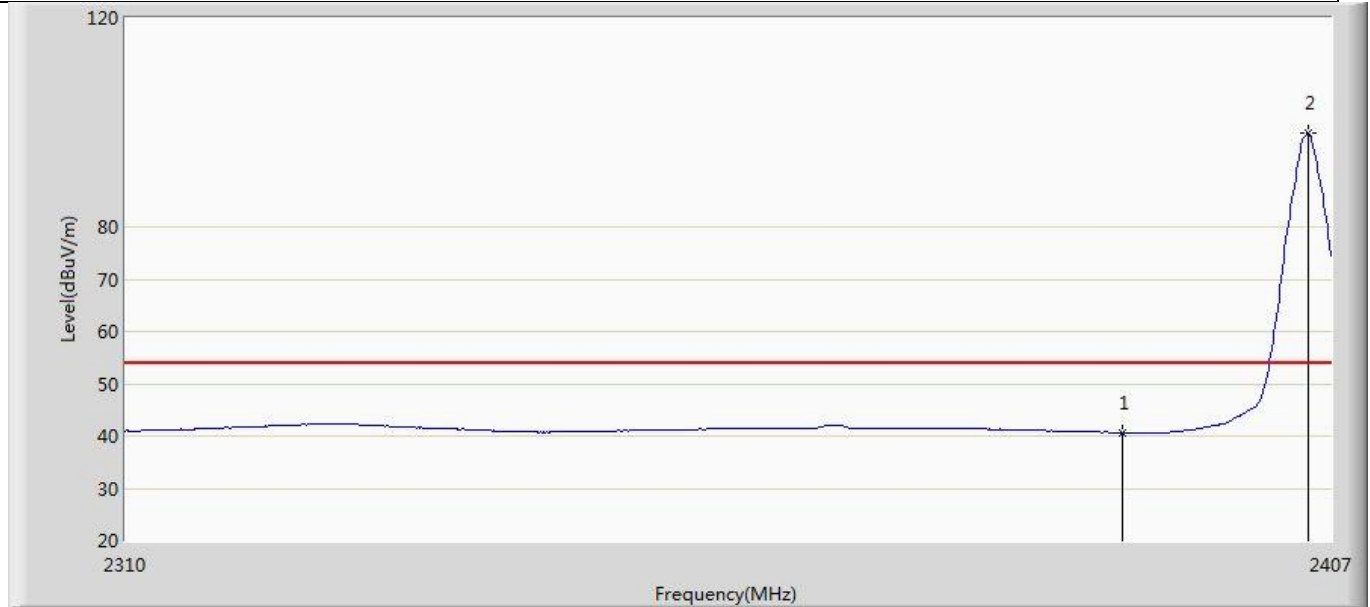
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2366.357	44.416	7.770	-9.584	54.000	36.646	AV
2		2390.000	41.156	5.412	-12.844	54.000	35.745	AV
3	*	2405.157	104.805	68.504	50.805	54.000	36.301	AV

Profile: 20B0013R	Page No.: 35
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 21:55
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2405MHz	



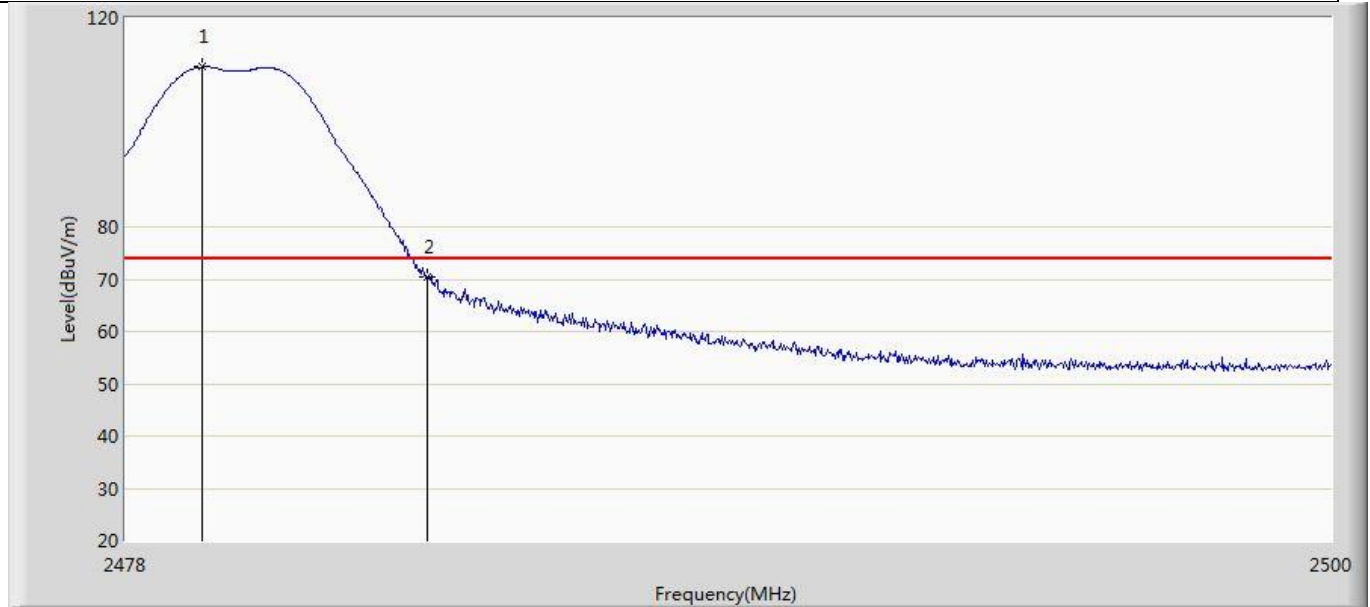
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	53.171	17.427	-20.829	74.000	35.745	PK
2	*	2404.284	100.000	63.764	26.000	74.000	36.236	PK

Profile: 20B0013R	Page No.: 36
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 21:56
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2405MHz	



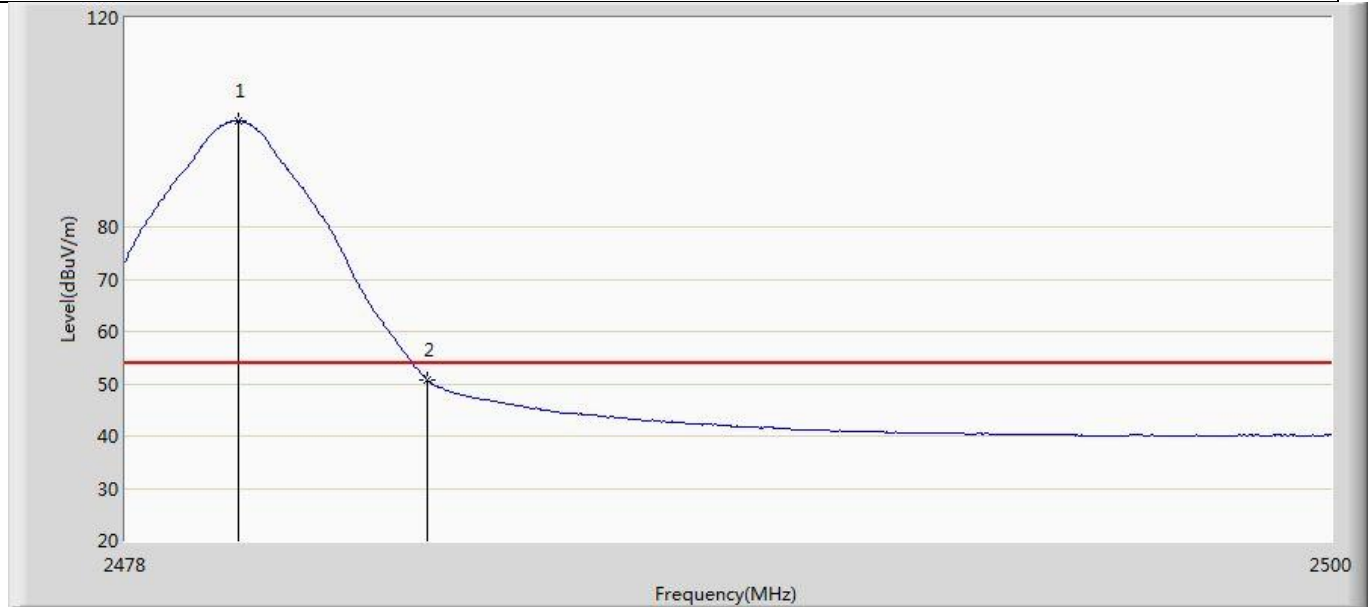
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	40.607	4.863	-13.393	54.000	35.745	AV
2	*	2405.157	97.867	61.566	43.867	54.000	36.301	AV

Profile: 20B0013R	Page No.: 37
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 21:59
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2480MHz	



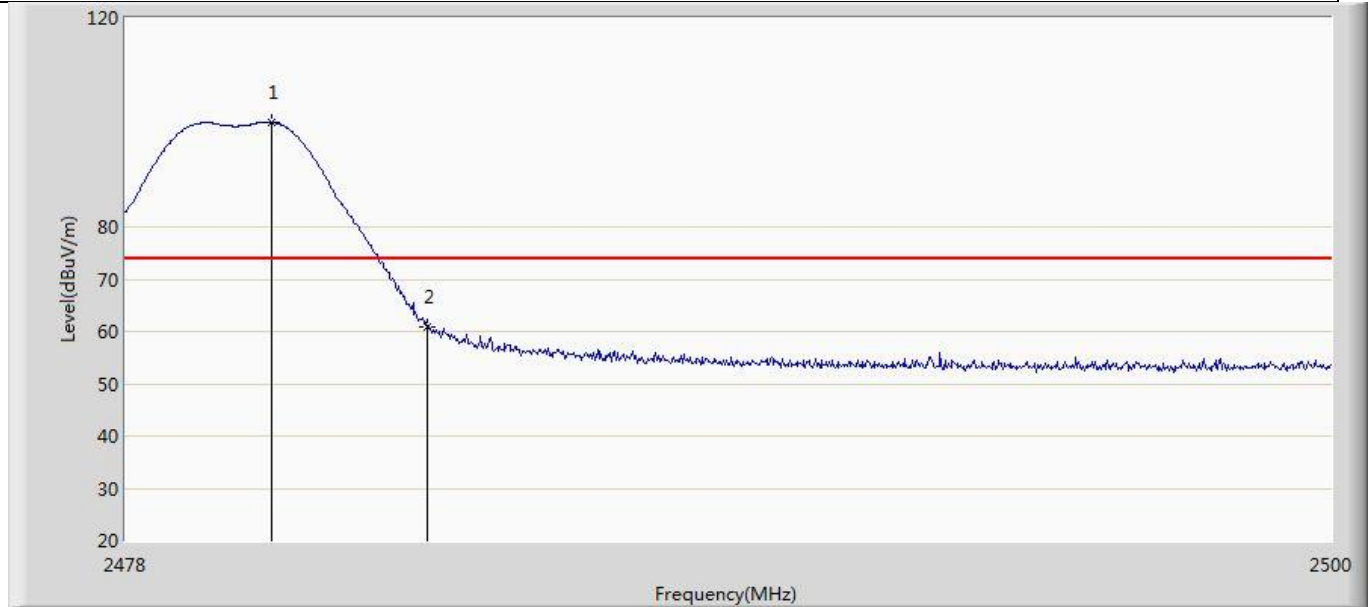
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.408	110.582	73.730	36.582	74.000	36.852	PK
2		2483.500	70.453	33.754	-3.547	74.000	36.699	PK

Profile: 20B0013R	Page No.: 38
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 22:02
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2480MHz	



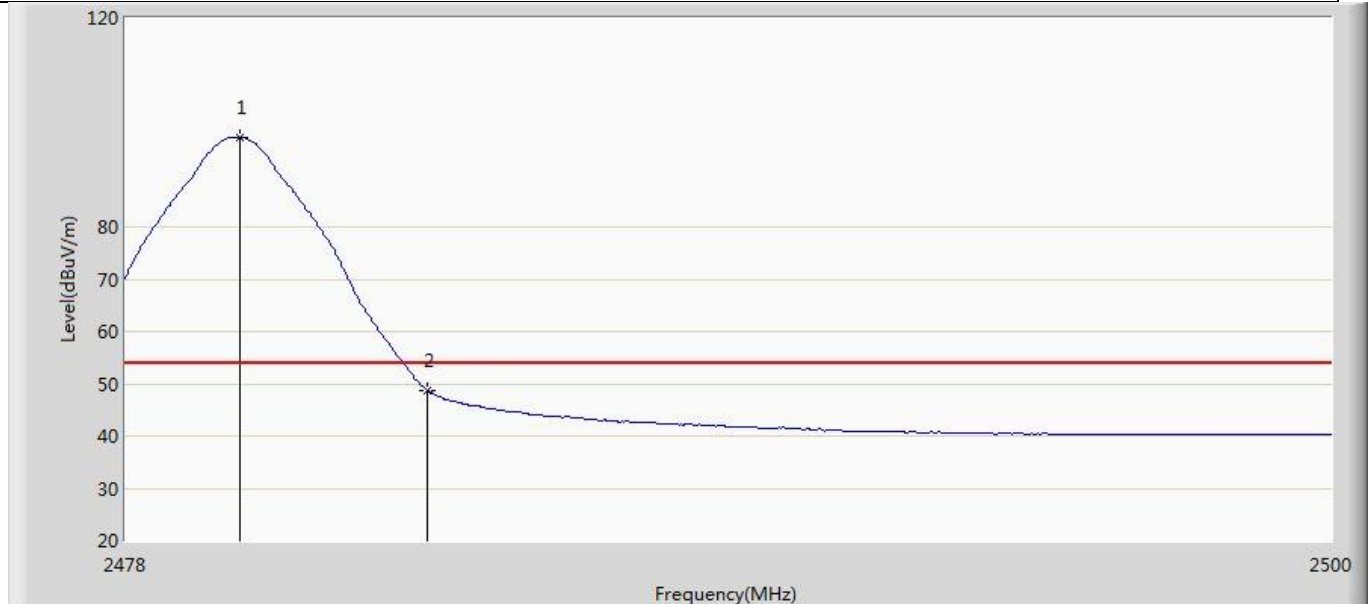
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.046	100.248	63.420	46.248	54.000	36.828	AV
2		2483.500	50.838	14.139	-3.162	54.000	36.699	AV

Profile: 20B0013R	Page No.: 39
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 22:03
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.662	99.984	63.179	25.984	74.000	36.805	PK
2		2483.500	60.923	24.224	-13.077	74.000	36.699	PK

Profile: 20B0013R	Page No.: 40
Engineer: Neil	
Site: AC5	Time: 2020/11/19 - 22:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Digital Device	Power: 24 Vdc
Note: Mode 1:Transmit at 2480MHz	

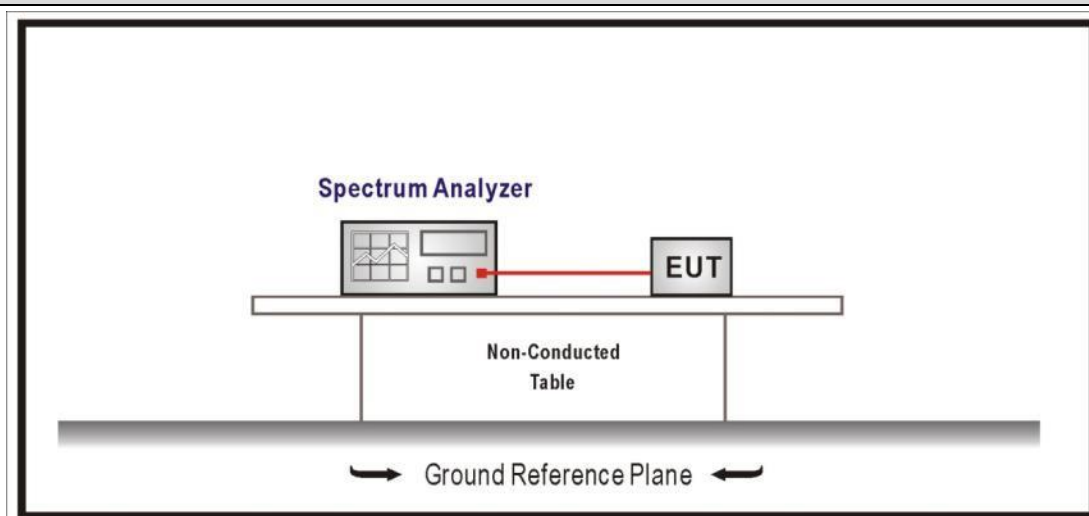


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.090	97.202	60.376	43.202	54.000	36.827	AV
2		2483.500	48.747	12.048	-5.253	54.000	36.699	AV

4.6 DTS Bandwidth**VERDICT: PASS****4.6.1 Limit**

Standard	FCC Part 15 Subpart C Paragraph 15.247 (a)(2)
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Systems using digital modulation techniques operate in the 2400-2483.5 MHz. The minimum 6 dB bandwidth shall be at least 500 kHz

4.6.2 Test Setup**4.6.3 Test Procedure**

	Reference Rule	Chapter	Description
☒	ANSI C63.10	11.8	DTS bandwidth
☐	ANSI C63.10	11.8.1	Option 1
☒	ANSI C63.10	11.8.2	Option 2

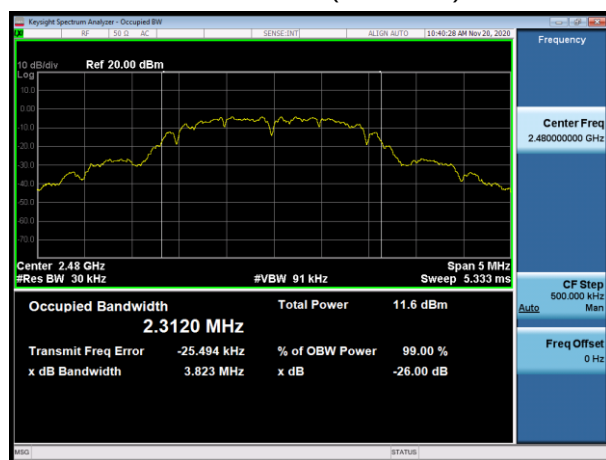
4.6.4 Test Data

Mode	CH.	Test Freq. (MHz)	99% Occupied Bandwidth (MHz)	Limit	6dB Occupied Bandwidth (MHz)	Limit (kHz)	Result
1	11	2405	2.3042	Within frequency band	1.828	>500	Pass
	20	2450	2.3094	Within frequency band	1.824	>500	Pass
	26	2480	2.3120	Within frequency band	1.730	>500	Pass

Note : The worst case of Occupied Bandwidth as below:

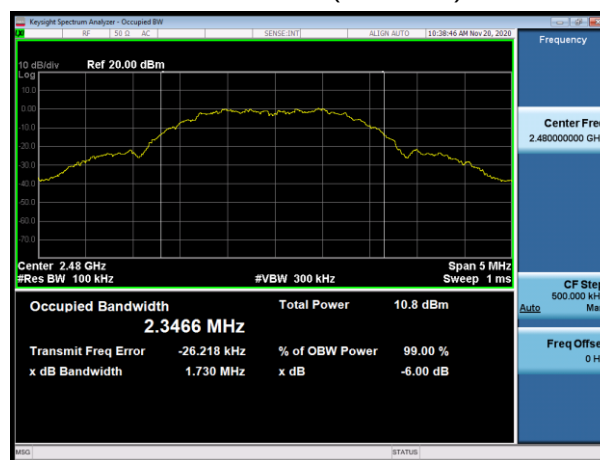
99% Occupied Bandwidth

Mode 1 CH26 (2480MHz)



6dB Occupied Bandwidth

Mode 1 CH26 (2480MHz)



4.7 Fundamental emission output power

VERDICT: PASS

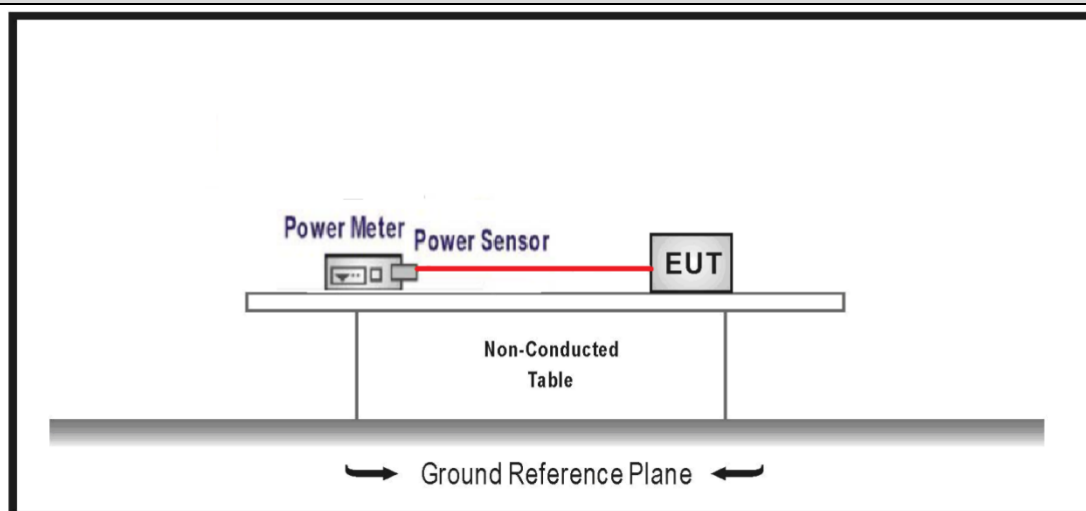
4.7.1 Limit

Standard		FCC Part 15 Subpart C Paragraph 15.247 (b)(3)
☒	GTX < 6dBi	$P_{out} \leq 30 \text{ dBm}$
☐	GTX > 6dBi	
☐	Non-Fix point-point	$P_{out} \leq 30 - (GTX - 6)$
☐	Fix point-point	$P_{out} \leq 30 - [(GTX - 6)]/3$
☐	Point-to-multipoint	$P_{out} \leq 30 - (GTX - 6)$
☐	Overlap Beams	$P_{out} \leq 30 - [(GTX - 6)]/3$
☐	Aggregate power transmitted simultaneously on all beams	$P_{out} \leq 30 - [(GTX - 6)]/3$
☐	single directional beam	$P_{out} \leq 30 - [(GTX - 6)]/3 + 8 \text{ dB}$

Note 1 : GTX directional gain of transmitting antennas.

Note 2 : Pout is maximum peak conducted output power .

4.7.2 Test Setup



4.7.3 Test Procedure

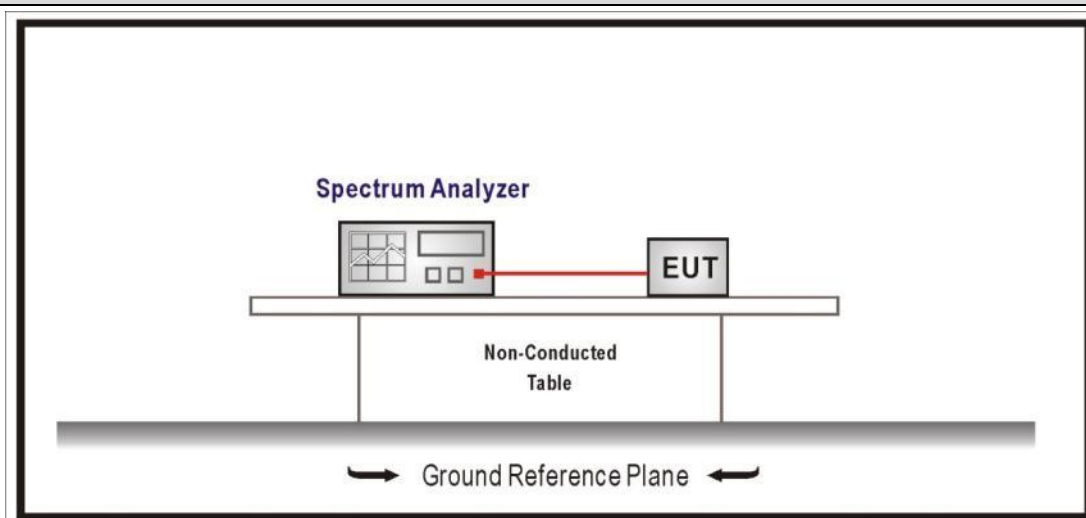
	References Rule			Chapter	Description		
☒	ANSI C63.10			11.9	Fundamental emission output power		
	☒	ANSI C63.10			11.9.1	Maximum peak conducted output power	
		☐	ANSI C63.10	11.9.1.1	RBW ≥ DTS bandwidth		
		☐	ANSI C63.10	11.9.1.2	Integrated band power method		
		☒	ANSI C63.10	11.9.1.3	PKPM1 Peak power meter method		
	☐	ANSI C63.10			11.9.2	Maximum conducted (average) output power	
		☐	ANSI C63.10			11.9.2.2	Measurement using a spectrum analyzer (SA)
			☐	ANSI C63.10	11.9.2.2.2	Method AVGSA-1(Duty cycle≥98%)	
			☐	ANSI C63.10	11.9.2.2.3	Method AVGSA-1A(Duty cycle≥98%)	
			☐	ANSI C63.10	11.9.2.2.4	Method AVGSA-2(Duty cycle≤98%)	
			☐	ANSI C63.10	11.9.2.2.5	Method AVGSA-2A(Duty cycle≤98%)	
			☐	ANSI C63.10	11.9.2.2.4	Method AVGSA-3	
			☐	ANSI C63.10	11.9.2.2.5	Method AVGSA-3A	
		☐	ANSI C63.10			11.9.2.3	Measurement using a power meter (PM)
			☐	ANSI C63.10	11.9.2.3.1	Method AVGPM	
			☐	ANSI C63.10	11.9.2.3.2	Method AVGPM-G	

4.7.4 Test Data

Mode	Channel	Test Frequency (MHz)	Conducted Power (dBm)	EIRP (dBm)	Conducted Power Limit (dBm)	EIRP Limit (dBm)	Result
Mode 1	11	2405	7.39	11.65	≤30	≤36	Pass
	20	2450	7.42	11.68	≤30	≤36	Pass
	26	2480	7.40	11.66	≤30	≤36	Pass

4.8 Power Density**VERDICT: PASS****4.8.1 Limit:**

Standard	FCC Part 15 Subpart C Paragraph 15.247 (b)(3)
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Power Spectral Density $\leq 8\text{dBm}/3\text{kHz}$ **4.8.2 Test Setup****4.8.3 Test Procedure**

	References Rule		Chapter	Description
☒	ANSI C63.10		11.10	Maximum power spectral density level in the fundamental emission
	☒	ANSI C63.10	11.10.2	Method PKPSD (peak PSD)
	☐	ANSI C63.10	11.10.3	Method AVGPSD-1(Duty cycle $\geq 98\%$)
	☐	ANSI C63.10	11.10.4	Method AVGPSD-1A(Duty cycle $\geq 98\%$)
	☐	ANSI C63.10	11.10.5	Method AVGPSD-2(Duty cycle $< 98\%$)
	☐	ANSI C63.10	11.10.6	Method AVGPSD-2A(Duty cycle $< 98\%$)
	☐	ANSI C63.10	11.10.7	Method AVGPSD-3
	☐	ANSI C63.10	11.10.8	Method AVGPSD-3A

4.8.4 Test Data

Mode	Channel	Test Frequency (MHz)	Measurement PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Mode 1	11	2405	-10.448	≤8	Pass
	20	2450	-10.718	≤8	Pass
	26	2480	-10.557	≤8	Pass

Note : The worst case of PSD as below:

Mode 1 CH11(2405MHz)



4.9 Antenna Requirement**VERDICT: PASS****4.9.1 Limit:**

Standard	FCC Part 15 Subpart C Paragraph 15.203
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An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

4.9.2 Antenna Connector Construction:

- | | |
|-------------------------------------|--|
| ☒ | The use of a permanently attached antenna |
| ☐ | The antenna use of a unique coupling to the intentional radiator |
| ☐ | The use of a nonstandard antenna jack or electrical connector |

Please refer to the attached document "Internal Photograph" to show the antenna connector.

5 TEST SETUP PHOTO AND EUT PHOTO

Remark: The test setup photo and EUT Photo please see appendix.

_____ The End _____