Prüfbericht-Nr.: *Test report no.:*	**CN231C12 001**	**Auftrags-Nr.:** *Order no.:*	**168416342**	Seite 1 von 23 *Page 1 of 23*
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	2023-02-07	
Auftraggeber: *Client:*	**Shenzhen Chuangwei-RGB Electronics Co., Ltd** 13F-16F, Unit A, Skyworth Building, Shennan Road,Nanshan District, Shenzhen, Guangdong, P.R.China			
Prüfgegenstand: *Test item:*	WiFi+BT USB2.0 Module			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	NTUD-T12			
Auftrags-Inhalt: *Order content:*	Test Report			
Prüfgrundlage: *Test specification:*	CFR47 FCC Part 15: Subpart C Section 15.247 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 15: Subpart C Section 15.209		RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 February 2021	
Wareneingangsdatum: *Date of sample receipt:*	2023-02-07	Refer to Photo Documentation		
Prüfmuster-Nr.: *Test sample no.:*	T230207021-Y01/01			
Prüfzeitraum: *Testing period:*	2023-02-07 to 2023-03-07			
Ort der Prüfung: *Place of testing:*	Shenzhen Central Standard International Center Co., Ltd.			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von: *tested by:*	X Hardy Suo	**genehmigt von:** *authorized by:*	X Lin Lin
Datum: *Date:* 2023-03-16		**Ausstellungsdatum:** *Issue date:* 2023-03-16	
Stellung / Position	Engineer	**Stellung** / Position	Reviewer

Sonstiges / *Other:* FCC ID: 2ANM3NTUDT12
IC: 23165-NTUDT12
HVIN: NTUD-T12

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	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhalt
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specifications(s)		*F(ail) = failed a.m. test specifications(s)*	*N/A = not applicable*	*N/T = not tested*

TÜV Rheinland (Shenzhen) Co., Ltd. 1601 R&D Room, 1602-1604, 17-18F, Building 7 Site C, Vanke Cloud City Phase I, Xingke First Street, Xili Street, Xili Community, Nanshan District, Shenzhen 518052, P.R. China
Mail: service@de.tuv.com · Web: www.tuv.com

Test Summary

5.1.1 ANTENNA REQUIREMENT
RESULT: *Pass*

5.1.2 MAXIMUM CONDUCTED OUTPUT POWER
RESULT: *Pass*

5.1.3 99% BANDWIDTH
RESULT: *Pass*

5.1.4 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH
RESULT: *Pass*

5.1.5 RADIATED SPURIOUS EMISSION
RESULT: *Pass*

5.1.6 20DB BANDWIDTH
RESULT: *Pass*

5.1.7 CARRIER FREQUENCY SEPARATION
RESULT: *Pass*

5.1.8 NUMBER OF HOPPING FREQUENCY
RESULT: *Pass*

5.1.9 TIME OF OCCUPANCY
RESULT: *Pass*

5.1.10 CONDUCTED EMISSION ON AC MAINS
RESULT: *Pass*

Contents

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 Test Data

2 Test Sites

2.1 Test Facilities

Shenzhen Central Standard International Center Co., Ltd.
Room 201, Building 1, Mogen Fashion Industrial Park, No. 10, Shilongzai Road, Xinshi Community, Dalang Street, Longhua District, Shenzhen.
CNAS No.: L11671
A2LA No.: 6426.01
FCC Registration No.: 0031378433
IC CAB identifier No.: CN0051

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

Radio Spectrum Testing				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
Spectrum Analyzer	Agilent	N9020A	MY50200391	Jun. 13, 2023
Power sensor	KEYSIGHT	U2021XA	MY55080015	Jun. 13, 2023
Power sensor	KEYSIGHT	U2021XA	MY54250016	Jun. 13, 2023
Power sensor	KEYSIGHT	U2021XA	MY54250020	Jun. 13, 2023
Power sensor	KEYSIGHT	U2021XA	MY54210030	Jun. 13, 2023
Vector Signal Generator	Agilent	N5182A	MY50140130	Jun. 13, 2023
Signal generator	Agilent	SML03	100925	Jun. 13, 2023
Power sensor Box	MWRFtest	N/A	N/A	N/A
RF Switch Box	MWRFtest	MW100-RFCB	N/A	N/A
MTS 8310	MWRFtest	V 2.0.0.0		
Unwanted Emission Testing				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
Spectrum Analyzer	Agilent	N9020A	MY50200391	Jun. 13, 2023
Bilog Antenna	Schwarzbeck	VULB9168	VULB9168-250	Jul. 25, 2025
Horn Antenna	AARONIAAG	Powerlog 70180	3980	Jul. 04, 2025
Horn Antenna	A-INFOMW	LB-180400-KF	J211020657	Sep. 26, 2023
Loop Antenna	Schwarzbeck	FMZB1519B	00023	Nov. 15, 2023
Amplifier	HP	8447F	2634A02050	Jun. 13, 2023
Amplifier	Agilent	8449B	4035A00116	Jun. 13, 2023
3M Chamber	Maor	9*6*6	--	Jul. 26, 2023
Conducted Emission				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
EMI Test Receiver	R&S	ESRP3	101936	Jun. 13, 2023
LISN	R&S	ENV216	100002	Jun. 13, 2023
Shelding Room	Maor	8*4*3	--	May. 03, 2023
EZ-EMC	Fara	V 3.1		

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 basics 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

Table 2: Measurement Uncertainty

Item		**Extended Uncertainty**
Conducted Emission		± 3.26 dB
Radiated Emission (30-1000MHz)	Field strength (dBμV/m)	4.58dB
Radiated Emission (above 1000MHz)	Field strength (dBμV/m)	5.10dB
Radio Spectrum		± 1.5 dB

2.6 Location of Original Data

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

2.7 Status of Facility Used for Testing

Shenzhen Central Standard International Center Co., Ltd.

Room 201, Building 1, Mogen Fashion Industrial Park, No. 10, Shilongzai Road, Xinshi Community, Dalang Street, Longhua District, Shenzhen

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a RF Module which supports Bluetooth, 2.4G Wi-Fi 802.11 b/g/n, 5G Wi-Fi 802.11a/n/ac wireless technology.

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

Note: This report is for Classic Bluetooth mode only.

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	**Value**
Kind of Equipment	WiFi+BT USB2.0 Module
Type Designation	NTUD-T12
Trade Mark	/
FCC ID	2ANM3NTUDT12
IC	23165-NTUDT12
HVIN	NTUD-T12
FVIN	T12_3ANT_Golden_WiFi_20221028
Operating Voltage	DC 3.3V
Technical Specification of Bluetooth	
Technical Specification	**Value**
Operating Frequency	2402 - 2480 MHz
Type of Modulation	GFSK, π/4DQPSK, 8DPSK
Channel Number	BDR & EDR mode:79 channels
Channel Separation	BDR & EDR mode:1MHz
Wireless Technology	Bluetooth 5.0
Antenna Type	PIFA Antenna[i]
Max. Antenna Gain	2.85 dBi

Table 4: RF Channel and Frequency of Bluetooth

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
00	**2402.00**	20	2422.00	40	2442.00	60	2462.00
01	2403.00	21	2423.00	41	2443.00	61	2463.00
02	2404.00	22	2424.00	42	2444.00	62	2464.00
03	2405.00	23	2425.00	43	2445.00	63	2465.00
04	2406.00	24	2426.00	44	2446.00	64	2466.00
05	2407.00	25	2427.00	45	2447.00	65	2467.00
06	2408.00	26	2428.00	46	2448.00	66	2468.00
07	2409.00	27	2429.00	47	2449.00	67	2469.00
08	2410.00	28	2430.00	48	2450.00	68	2470.00
09	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	--	--

3.3 Independent Operation Modes

The basic operation modes are:

A. On
   1. Bluetooth transmitting mode (BDR & EDR mode)
      a) Low Channel
      b) Middle Channel
      c) High Channel

B. On, Transmitting on Hopping channel

C. On, Bluetooth connecting mode

D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- Block Diagram
- Schematics
- Technical Description
- FCC/IC Label and Location Info
- Photo Document
- User Manual

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 testing were performed according to the procedures in ANSI C63.10: 2013.

4.3 Special Accessories and Auxiliary Equipment

Table 5: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	Rating
Notebook	DELL	Vostro 3400	N/A

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 30MHz)

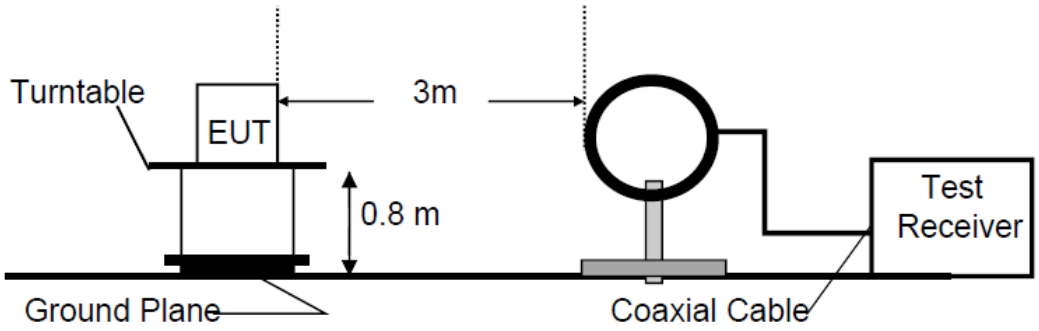


Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

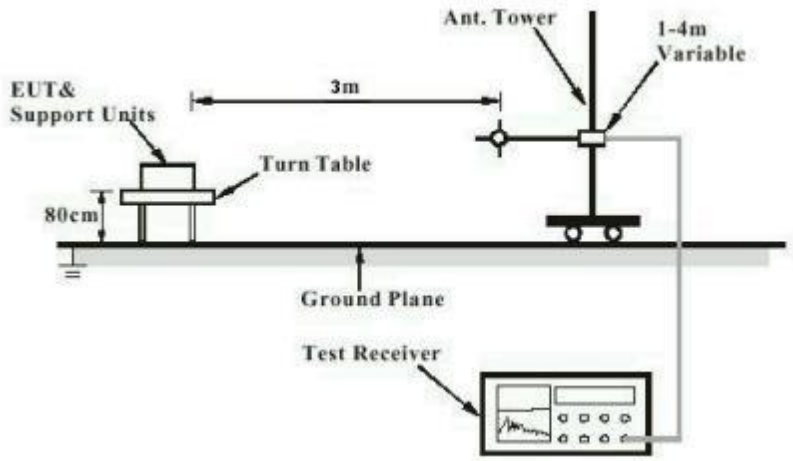


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

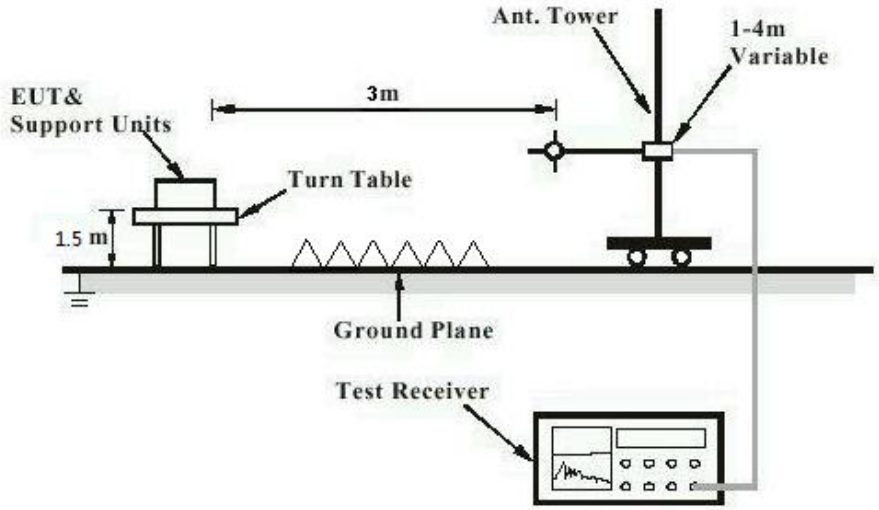


Diagram of Measurement Configuration for Mains Conduction Measurement

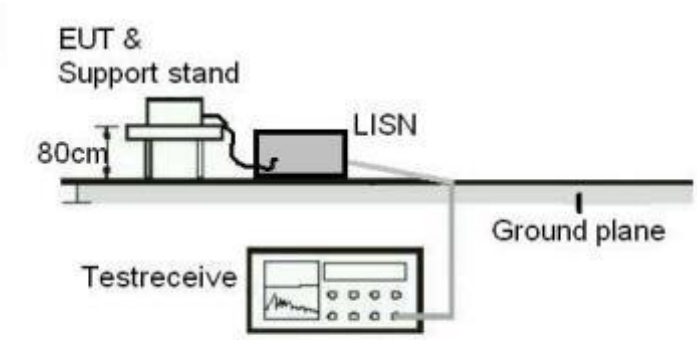
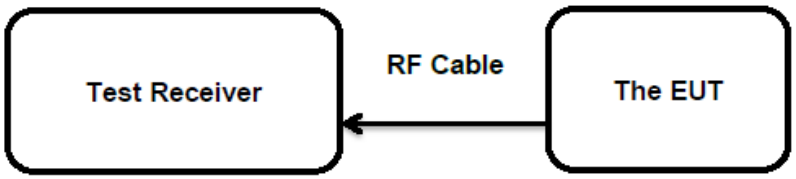


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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 8.3

According to the manufacturer declared, the EUT has an PIFA antenna, the directional gain of antenna is 2.85 dBi, which that use of a non-standard antenna connector and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Maximum Conducted Output Power

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(b)(1) RSS-247 Clause 5.4(b)
Basic standard	:	ANSI C63.10: 2013
Limits	:	FHSS<0.125W(Maximum peak conducted output power) < 4 W (e.i.r.p.)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-22
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	53 %
Atmospheric pressure	:	101 kPa

Table 6: Test Result of Maximum Conducted Output Power

Test Mode	Channel Frequency (MHz)	Measured Average Output Power		Limit (W)
		(dBm)	(W)	
BDR	2402	9.27	0.0085	< 0.125
	2441	9.68	0.0093	
	2480	10.45	0.0111	
EDR	2402	11.94	0.0156	< 0.125
	2441	12.17	0.0165	
	2480	12.24	0.0167	

Note: The cable loss is taken into account in results and the maximum e.i.r.p. is 12.24 dBm + 2.85 dBi = 15.09dBm which is less than 4W(36dBm).

5.1.3 99% Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	RSS-Gen Clause 6.7
Basic standard	:	ANSI C63.10: 2013
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-22
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	53 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B

5.1.4 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(d) RSS-247 Clause 5.5
Basic standard	:	ANSI C63.10: 2013
Limits	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power);
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-03-07
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	53 %
Atmospheric pressure	:	101 kPa

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to following test plot, and compliance is achieved as well.

For the measurement records, refer to the appendix B.

5.1.5 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 Table 6 & Table 7
Kind of test site	:	3m Semi-anechoic Chamber

Test Setup

Date of testing	:	2023-02-07 – 2023-02-21
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	23 ℃
Relative humidity	:	55 %
Atmospheric pressure	:	101 kPa

Remark:
During the pretest the EUT was rotated through three orthogonal axes to determine the attitude that maximizes the emissions. After that the EUT was manually handled to find the orientation that has the maximum emission, which is the orientation shown in the test set-up photos.

Testing was carried out within frequency range 9kHz to the tenth harmonics.

For the measurement records, refer to the appendix B.

5.1.6 20dB Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(a)(1) RSS-247 Clause 5.1(a)
Basic standard	:	ANSI C63.10: 2013
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-22
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	53 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B.

5.1.7 Carrier Frequency Separation

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(a)(1) RSS-247 Clause 5.1(b)
Basic standard	:	ANSI C63.10: 2013
Limits	:	≥ 25kHz or 2/3 of 20dB bandwidth, whichever is greater
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-22
Input voltage	:	DC 3.3V
Operation mode	:	B
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	53 %
Atmospheric pressure	:	101 kPa

Note:

The limit is maximum 2/3 of the 20 dB bandwidth: 868.000 kHz.

For the measurement records, refer to the appendix B.

5.1.8 Number of Hopping Frequency

RESULT: **Pass**

Test Specification

Test standard	:	FCC part 15.247(a)(1)(iii) RSS-247 Clause 5.1(d)
Basic standard	:	ANSI C63.10: 2013
Limits	:	≥ 15 non-overlapping channels
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-22
Input voltage	:	DC 3.3V
Operation mode	:	B
Ambient temperature	:	25 ℃
Relative humidity	:	53 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B.

5.1.9 Time of Occupancy

RESULT: **Pass**

Test Specification

Test standard	:	FCC part 15.247(a)(1)(iii) RSS-247 Clause 5.1(d)
Basic standard	:	ANSI C63.10: 2013
Limits	:	< 0.4s
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-03-07
Input voltage	:	DC 3.3V
Operation mode	:	B
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	53 %
Atmospheric pressure	:	101 kPa

Note:

Dwell time = Pulse width x (Hopping rate / Number of channels) x Period

Period = 0.4 x 79 (channel) = 31.6 seconds

For the measurement records, refer to the appendix B.

5.1.10 Conducted Emission on AC Mains

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.207(a) RSS-Gen Clause 8.8
Basic standard	:	ANSI C63.10: 2013
Frequency range	:	0.15 – 30MHz
Limits	:	FCC Part 15.207(a) RSS-Gen Table 4
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-21
Input voltage	:	AC 120V, 60Hz
Operation mode	:	C
Earthing	:	Not connected
Ambient temperature	:	23.4
Relative humidity	:	60
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B.

6 Photographs of the Test Set-Up

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

7 List of Tables