Prüfbericht-Nr.: *Test report no.:*	**CN231C12 004**	**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 Part15: Subpart E Section 15.407 CFR47 FCC Part15: Subpart C Section 15.207 CFR47 FCC Part15: 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 2023-03-15	
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 = mangelhaft
	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 specification(s)		*F(ail) = failed a.m. test specification(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 output power

RESULT: *Pass*

5.1.3 Power Spectral Density

RESULT: *Pass*

5.1.4 Frequency Stability

RESULT: *Pass*

5.1.5 26dB Bandwidth and 99% Bandwidth

RESULT: *Pass*

5.1.6 6dB Bandwidth

RESULT: *Pass*

5.1.7 Radiated Spurious Emission

RESULT: *Pass*

5.1.8 Dynamic Frequency Selection (DFS)

RESULT: *Pass*

5.1.9 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 appendixes:
Appendix A: Photographs of the Test Set-up
Appendix B: Test data of 5GHz bands Wi-Fi

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
Temperature Humidity Chamber	GZ-ESPEC	ER-10AGT	0005091-2	Jun. 10, 2023
EXTENDED RANGE DC POWER SUPPLY	TAKASAGO	ZX-400LA	N/A	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 basis using in house standards or comparisons.

2.5 Uncertainty of Measurement

The value of the measurement uncertainty of each parameter is listed as below:

Table 2: Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	±2.7 x 10^{-5}
RF Power (conducted)	±0.66 dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	±5.08 dB
Radiated Emission of Receiver, valid up to 26.5 GHz	±5.08 dB
Conducted Emission, (150kHz to 30MHz)	± 3.26 dB
Radiated Emission (3m SAC), 30MHz to 1000MHz	± 4.58 dB
Radiated Emission (3m SAC), above 1000MHz	± 5.10 dB
Temperature	±2 °C
Humidity	±5 %
Voltage (DC)	±5 %
Voltage (AC, <10kHz)	±5 %

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A and Appendix B 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 5G Wi-Fi 802.11a/n/ac mode only.

3.2 Ratings and System Details

Table 3: Technical Specification

Technical Specification	**Value**
Product Name	WiFi+BT USB2.0 Module
Model	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 Wi-Fi 802.11 a/n/ac	
Operating Frequency Range	5150-5350MHz, 5470-5725MHz, 5725-5850MHz
Operating Frequency / Channels / Protocol	5180-5320MHz, 14CHs, 802.11 a/n20/n40/ac20/ac40/ac80 5500-5700MHz, 21CHs, 802.11 a/n20/n40/ac20/ac40/ac80 5745-5825MHz, 8CHs, 802.11 a/n20/n40/ac20/ac40/ac80
Channel Spacing	5MHz, 20MHz, 40MHz, 80MHz
Modulation	DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16QAM, 64QAM,256QAM)
Type of Product	Adaptive equipment and does not support non-adaptive mode: LBT based Detect and Avoid (load-based equipment)
Type of Product	Client Device without Radar Detection
TX Power Control (TPC)	Not Supported
Antenna Number	2
Antenna Type	PIFA antenna
Antenna Gain	ANT1: 2.89 dBi ANT2: 2.83 dBi

Table 4: RF Channel and Frequency of Wi-Fi 802.11 a/n/ac

Channel List for 802.11a/n20/ac20							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	**5180**	**40**	**5200**	44	5220	**48**	**5240**
52	**5260**	56	5280	**60**	**5300**	**64**	**5320**
100	**5500**	104	5520	108	5540	112	5560
116	**5580**	120	5600	124	5620	128	5640
132	5660	136	5680	**140**	**5700**	**149**	**5745**
153	5765	**157**	**5785**	159	5795	**165**	**5825**

Channel List for 802.11n40/ac40							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	**5190**	**46**	**5230**	**54**	**5270**	**62**	**5310**
102	**5510**	**110**	**5550**	118	5590	126	5630
134	**5670**	**151**	**5755**	**159**	**5795**		

Channel List for 802.11ac80							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	**5210**	**58**	**5290**	**106**	**5530**	**122**	**5610**
155	**5775**						

Remark: 5600-5650 frequency band is not applicable for IC.

The channels in bold in the table are used for testing.

3.3 Independent Operation Modes

The basic operation modes are:

A. Tx, (5GHz Bands, 802.11a/n/ac)
   1. Lowest channel
   2. Middle channel
   3. Highest channel
B. WiFi on
C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Application Form
- Circuit Diagram
- Instruction Manual
- Photo Documents
- Technical Description
- Bill of Material
- 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.

4.2 Test Operation

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	S/N
Notebook	DELL	Vostro 3400	N/A
Router	SMART/RG	SE80ad	17600060F1

Note: The Router FCC ID: VW7-SE80AC; IC ID: 11130A-SE80AC.

4.4 Countermeasures to Achieve ERM 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)

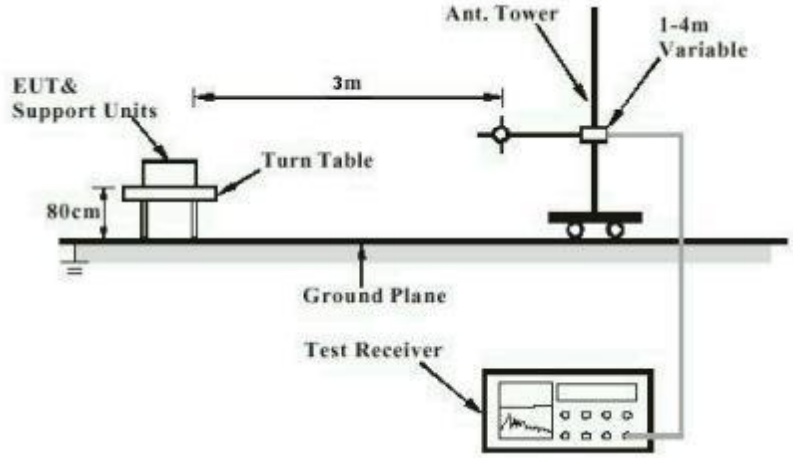


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

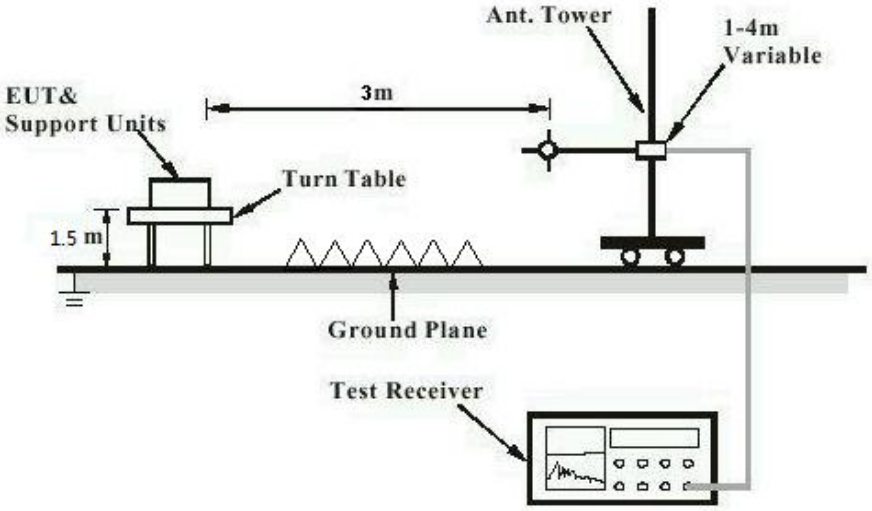


Diagram of Measurement Configuration for Mains Conduction Measurement

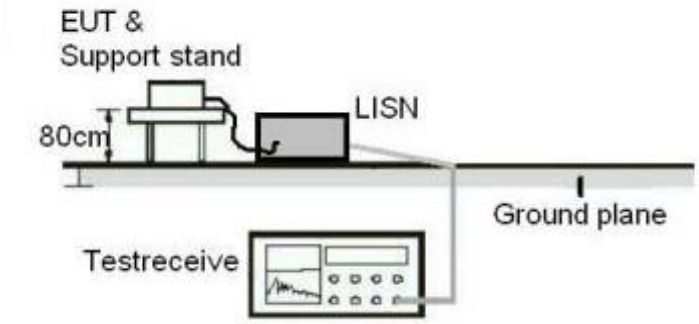


Diagram of Measurement Configuration for Conducted Transmitter Measurement

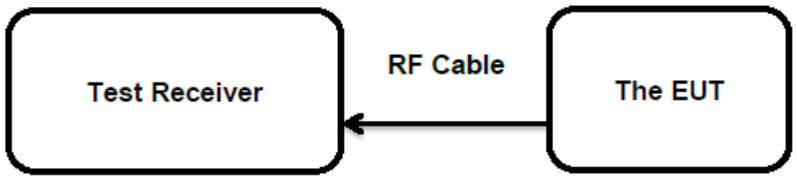
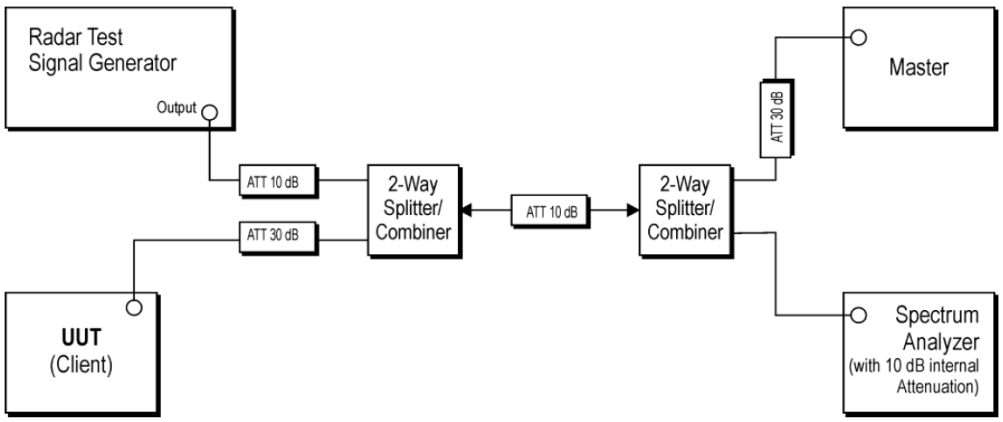


Diagram of Measurement Configuration for Dynamic Frequency Selection (DFS)



5. Test Results

5.1 Radio Test Requirement & Test Suites (5GHz Bands)

5.1.1 Antenna Requirement

RESULT: **Pass**

Test Specification
Test standard : FCC Part 15.203

The EUT has two PIFA antennas, the maximum gain of antenna is 2.89 dBi(ANT1) and 2.83 dBi(ANT2), 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.

Antennas 1 and 2 are uncorrelated, and MIMO antenna gain is the maximum of the two antennas.

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

Refer to EUT Photo for further details.

5.1.2 Maximum output power

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (a) RSS-247 clause 6.2
Basic standard	:	ANSI C63.10:2013
Limits	:	FCC: <250mW (24dBm) (5150-5250MHz) *<250mW (24dBm) (5250-5350MHz, 5470-5725MHz) *250 mW (24dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz, where is lesser. <1W (30dBm) (5725-5850MHz) IC: * Max e.i.r.p.<200mW (23dBm) (5150-5250MHz) *200 mW (23dBm) or 10 dBm + 10 logB, where B is the 99% emission bandwidth in MHz, where is lesser. *Max conducted output power < 250mW (24dBm) (5250-5350MHz) *250 mW (24dBm) or 11 dBm + 10 logB, where B is the 99% emission bandwidth in MHz, where is lesser. *Max e.i.r.p.<1W (30dBm) (5250-5350MHz) *1 W (30dBm) or 17 dBm + 10 log B, where B is the 99% emission bandwidth in MHz, where is lesser. Max conducted output power <1W (30dBm) (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-16
Input voltage	:	DC 3.3V
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Note: Per RSS-247 section 6.2.3, transmission on channels which overlap 5600-5650MHz is prohibited. This device operates under these frequencies only under the control of a certified master device and does not support active scanning on these channels. This device does not transmit any beacons or initiate any transmissions in 5250-5350MHz or 5470-5725MHz.
Antennas 1 and 2 are uncorrelated, and MIMO antenna gain is the maximum of the two antennas.

Refer to attached Appendix B for details of test data.

5.1.3 Power Spectral Density

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (a) RSS-247 clause 6.2
Basic standard	:	ANSI C63.10:2013
Limits	:	FCC: <11dBm/MHz (5150-5250MHz 5250-5350MHz, 5470-5725MHz) <30dBm/500KHz (5725-5850MHz) IC: e.i.r.p. spectral density <10dBm/MHz (5150-5250MHz) <11dBm/1MHz (5250-5350MHz) <30dBm/500KHz (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-16
Input voltage	:	DC 3.3V
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.4 Frequency Stability

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (g) RSS-Gen Clause 6.11
Basic standard	:	ANSI C63.10:2013
Limits	:	Within assigned bands
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-03-07
Input voltage	:	DC 3.3V
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.5 26dB Bandwidth and 99% Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 RSS-Gen Clause 6.6
Basic standard	:	ANSI C63.10:2013
Limits	:	N/A
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-03-08
Input voltage	:	DC 3.3V
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.6 6dB Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (e) RSS-247 clause 6.2.4.1
Basic standard	:	ANSI C63.10:2013
Limits	:	At least 500KHz (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-16
Input voltage	:	DC 3.3V
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.7 Radiated Spurious Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(b) & FCC Part 15.205 & FCC Part 15.209 RSS-247 clause 6.2 & RSS-GEN clause 8.9 and 8.10
Basic standard	:	ANSI C63.10:2013
Limits	:	• For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. • For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. • For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. Emissions outside the band 5470-5600 MHz and 5650-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p. • For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. • Restricted Bands meet the requirement of 15.209 limit and RSS-GEN
Kind of test site	:	3m Semi-Anechoic Chamber (below 1GHz) 3m Anechoic Chamber (above 1GHz)

Test Setup

Date of testing	:	2023-02-07 – 2023-03-15
Input voltage	:	DC 3.3V
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	23 ℃
Relative humidity	:	48 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.8 Dynamic Frequency Selection (DFS)

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(h) RSS-247 clause 6.3 5250-5350MHz, 5470-5725MHz Channel Move Time: Within 10 seconds.
Limits	:	Channel Closing Transmission Time: 200ms+aggregate of 60ms over remaining 10s period; Non-Occupancy Period: at least 30 minutes.
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-16
Input voltage	:	DC 3.3V
Operation mode	:	A
Test channel	:	CH58 and CH116
Ambient temperature	:	23 ℃
Relative humidity	:	48 %
Atmospheric pressure	:	101 kPa

Note: DFS is not applicable to 5600-5650 frequency band for IC.

Refer to attached Appendix B for details of test data.

5.1.9 Conducted Emission on AC Mains

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.207 RSS-GEN clause 8.8
Basic standard	:	ANSI C63.10:2013
Frequency range	:	0.15 - 30MHz
Limits	:	FCC Part 15.207
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-02-07 – 2023-02-21
Input voltage	:	AC 120V, 60Hz
Operation mode	:	B
Earthing	:	Not connected
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

6. Photographs of the Test Set-Up

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

7. List of Tables