

Prüfbericht-Nr.: Test report no.:	CN2554HU 003	Auftrags-Nr.: Order no.:	168512050	Seite 1 von 20 Page 1 of 20
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2024-11-12	
Auftraggeber: Client:	Shining 3D Tech Co., Ltd. No. 1398, Xiangbin Road, Wenyan, Xiaoshan, Hangzhou, Zhejiang, P.R. China			
Prüfgegenstand: Test item:	3D Printer, Dental Appliances Manufacturing Device			
Bezeichnung / Typ-Nr.: Identification / Type no.:	AccuFab-F1, Dcraft-4			
Auftrags-Inhalt: Order content:	Test Report			
Prüfgrundlage: Test specification:	CFR47 FCC Part 15: Subpart E Section 15.407 RSS-247 Issue 3 August 2023 RSS-Gen Issue 5 February 2021			
Wareneingangsdatum: Date of sample receipt:	2024-12-03	Refer to Photos document		
Prüfmuster-Nr.: Test sample no.:	A003853025-001			
Prüfzeitraum: Testing period:	2024-12-25 - 2025-05-07			
Ort der Prüfung: Place of testing:	Refer to section 2.1			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:	<u>X Bell Hu</u>		genehmigt von: authorized by:	<u>X Jonathan Li</u>
Datum: Date:	2025-06-27	Ausstellungsdatum: Issue date:		2025-06-27
Signed by: Bell Hu		Signed by: Jonathan Li		
Stellung / Position:	Sachverständige(r)/Expert		Stellung / Position:	Sachverständige(r)/Expert
Sonstiges / Other:	FCC ID: 2AMG4-F1, IC: 24652-F1, HVIN: AccuFab-F1, Dcraft-4, PMN: 3D Printer, Dental Appliances Manufacturing Device This device contains certificated Wi-Fi module (Mode: FCU741R, FCC ID: XMR2023FCU741R , IC:10224A-2023FCU741R). It's under a new Certification application and the test data for conducted antenna port in this report is cited from the originally granted module, according to KDB 996369 D02 (b).			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
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Prüfbericht-Nr.: CN2554HU 003
Test report no.:

Seite 2 von 20
Page 2 of 20

Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>

Prüfbericht - Nr.: CN2554HU 003
Test Report No.:

Seite 3 von 20
Page 3 of 20

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM OUTPUT POWER

RESULT: Pass

5.1.3 CONDUCTED POWER SPECTRAL DENSITY

RESULT: Pass

5.1.4 RADIATED SPURIOUS EMISSION

RESULT: Pass

5.1.5 AC CONDUCTED EMISSION

RESULT: Pass

Contents

1	GENERAL REMARKS	5
1.1	COMPLEMENTARY MATERIALS	5
2	TEST SITES	5
2.1	TEST FACILITIES	5
2.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	6
2.3	TRACEABILITY	7
2.4	CALIBRATION	7
2.5	MEASUREMENT UNCERTAINTY.....	7
2.6	LOCATION OF ORIGINAL DATA.....	7
2.7	STATUS OF FACILITY USED FOR TESTING.....	7
3	GENERAL PRODUCT INFORMATION	8
3.1	PRODUCT FUNCTION AND INTENDED USE.....	8
3.2	RATINGS AND SYSTEM DETAILS	9
3.3	INDEPENDENT OPERATION MODES	10
3.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS.....	10
3.5	SUBMITTED DOCUMENTS.....	10
4	TEST SET-UP AND OPERATION MODES	11
4.1	PRINCIPLE OF CONFIGURATION SELECTION	11
4.2	TEST OPERATION AND TEST SOFTWARE.....	11
4.3	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	12
4.4	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE	12
4.5	TEST SETUP DIAGRAM	13
5	TEST RESULTS	14
5.1	TRANSMITTER REQUIREMENT & TEST SUITES	14
5.1.1	<i>Antenna Requirement</i>	<i>14</i>
5.1.2	<i>Maximum Output Power.....</i>	<i>15</i>
5.1.3	<i>Conducted Power Spectral Density</i>	<i>17</i>
5.1.4	<i>Radiated Spurious Emission</i>	<i>18</i>
5.1.5	<i>AC Conducted Emission</i>	<i>19</i>
6	PHOTOGRAPHS OF THE TEST SET-UP	20
7	LIST OF TABLES.....	20

Prüfbericht - Nr.: CN2554HU 003
Test Report No.:

Seite 5 von 20
Page 5 of 20

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 Test Set-up

Appendix B: Test Results of Wi-Fi

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

2-3F, 101 & 102, No.2, Nuclear Power Industrial Park, Fuming Community, Fucheng Street,
Longhua District, Shenzhen 518000, People's Republic of China
A2LA Cert. No.: 5162.01

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio Spectrum Testing (SRD-Tonscend)				
Equipment	Manufacturer	Model	Serial No.	Cal. until
EXA Signal Analyzer, Multi-touch	Keysight	N9010B	MY60241175	25.09.2025
MXG X-Series RF Vector Signal Generator	Keysight	N5182B	MY61250137	25.09.2025
EXG X-Series Microwave Analog Signal Generator	Keysight	N5173B	MY61250141	25.09.2025
DC Power Supply	Keysight	E3642A	MY61276100	25.09.2025
Wireless Connectivity Tester	R&S	CMW270	102505	25.09.2025
Power Control Unit	Tonscend	JS0806-4ADC	N/A	25.09.2025
Automation Control Unit	Tonscend	JS0806-2	21C8060396	25.09.2025
Test Software	Tonscend	JS1120-3	N/A	N/A
Control PC	Lenovo	TianYi510S-071MB	Y LX23JMF	N/A
Unwanted Emission Testing (TS8996)				
Equipment	Manufacturer	Model	Serial No.	Cal. until
Signal Generator	R&S	SMB100A	180840	28.09.2025
Wideband Radio Communication Tester	R&S	CMW500	165339	28.09.2025
Signal Analyzer	R&S	FSV 40	101440	28.09.2025
System Controller Interface	R&S	SCI-100	S10010036	N/A
Filterbank	R&S	GSM	100811	28.09.2025
OSP	R&S	OSP 150	101385	13.11.2024
Pre-amplifier	R&S	SCU08F1	08320030	28.09.2025
Amplifier	R&S	SCU-18F	180079	28.09.2025
Amplifier	R&S	SCU40A	100450	28.09.2025
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	192	06.10.2026
Double-Ridged Antenna (1 - 18 GHz)	ETS-LINDGREN	3117	00218719	06.10.2026
Wideband Ridged Horn Antenna (12-18 GHz)	Steatite	QMS-00208	18312	06.10.2026
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19066	06.10.2026
Biconical Broadband Antenna (30 MHz - 1 GHz)	Schwarzbeck	VUBA 9117	357	06.10.2026
Double Ridged Broadband Horn Antenna (1 – 18 GHz)	Schwarzbeck	BBHA 9120 D	01760	06.10.2026
Broadband Horn Antenna (15 – 40 GHz)	Schwarzbeck	BBHA 9170	00862	06.10.2026
Test software	R&S	EMC32 (V10.50.40)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NW9P2	N/A
3m Fully Anechoic Chamber	Albatross	FAC-3m	APC17151-FAC	13.09.2027

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.

Parameter	Uncertainty (k=2)
RF output power, conducted	± 0.41dB
Occupied Channel Bandwidth	± 2.08 %
RF power density, conducted	± 0.39 dB
Unwanted Emissions, conducted	± 0.59 dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	± 4.82 dB
Radiated Emission of Receiver, valid up to 26.5 GHz	± 4.82 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B 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 TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at 2-3F, 101 & 102, No.2, Nuclear Power Industrial Park, Fuming Community, Fucheng Street, Longhua District, Shenzhen 518000, People's Republic of 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 product is a 3D Printer, it supports NFC, 5GHz Wi-Fi and 2.4GHz Wi-Fi.
 This report is for 5GHz Wi-Fi operation only.

This device contains certificated Wi-Fi module (Mode: FCU741R, FCC ID: XMR2023FCU741R, IC:10224A-2023FCU741R). It's under a new Certification application and the test data for conducted antenna port in this report is cited from the originally granted module (Test report:, IC test Report: CR362717BTX), according to KDB 996369 D02 (b).

The antenna changed to accommodate the module into the product, details as below

Items	Antenna information	Remark
Wi-Fi Module (FCU741R)	Antenna: (Refer to the module reports) 2400 MHz ~ 2483.5 MHz: 0.73 dBi 5150 MHz ~ 5250 MHz: 1.14 dBi 5725 MHz ~ 5850 MHz: 1.14 dBi	1. It verified that there are no evident variations on RF conducted signals for 2.4GHz Wi-Fi and 5.8GHz Wi-Fi, the conducted power kept in matching with original module. 2. Comparing with the module antennas, the maximum gains for all the antennas get higher. The final Maximum EIRP* for 2.4/5.8GHz Wi-Fi still less than the limit (36dBm) provided in RSS-247.
3D Printer (The current product)	Antenna: (provided by the client) 2400 MHz ~ 2483.5 MHz: 5.05 dBi 5150 MHz ~ 5250 MHz: 4.49 dBi 5725 MHz ~ 5850 MHz: 4.49 dBi	2.4GHz Wi-Fi: Maximum EIRP=P(Conducted)+G (Maximum Antenna Gain=27.63+5.05=32.68dBm). 5.8GHz Wi-Fi: Maximum EIRP=P(Conducted)+G (Maximum Antenna Gain=19.17+4.49=23.66dBm). 3. Comparing with the module antennas, the maximum gains for all the antennas get higher, thus the conducted power for 5.1GHz Wi-Fi was decreased to accommodate the higher antenna gain. 4. To guarantee the compliance, the below items were re-tested and reported for 5GHz Wi-Fi. As for other test items, please refer the module reports: a) The RSE re-tested for 5.1 and 5.8GHz Wi-Fi b) Power and PSD were re-tested for 5.1GHz Wi-Fi 5. The U-NII-2A and U-NII-2C were blocked and not open to public when integrated into the host.

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

Test Summary	
Items	Remark
Antenna Requirement	Refer to section 5.1.1
Maximum Conducted Output Power	Refer to section 5.1.2
Conducted Power Spectral Density	Refer to section 5.1.3
26dB Bandwidth and 99% Bandwidth	Refer to the original module report FR362717B, CR362717BTX
6% Bandwidth	
DYNAMIC FREQUENCY SELECTION (DFS)	N/A, this device has no DFS band
Radiated Spurious Emission	Refer to section 5.1.4
AC Conducted Emission	Refer to section 5.1.5

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment:	3D Printer, Dental Appliances Manufacturing Device
Type Designation:	AccuFab-F1,Dcraft-4
Operating Voltage:	100-240V AC; 50/60Hz;
Testing Voltage:	120V AC/50Hz;
FCC ID:	2AMG4-F1
IC ID:	24652-F1
PMN:	3D Printer, Dental Appliances Manufacturing Device (They are electrically identical, only named differently for marketing purpose)
HVIN:	AccuFab-F1,Dcraft-4 (They are electrically identical, only named differently for marketing purpose)
Antenna Type:	Integral Antenna
Antenna Gain:	Antenna: (provided by the client) 2400 MHz ~ 2483.5 MHz: 5.05 dBi 5150 MHz ~ 5250 MHz: 4.49 dBi 5725 MHz ~ 5850 MHz: 4.49 dBi
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, OFDMA(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~MCS 7 for 802.11n(HT20/40) (All data rates considered, only the Worst-cases reported)
Channel Number:	11 channels for 802.11b/g/n(HT20) 7 channels for 802.11n(HT40)
Antenna Type:	Integral Antennas
Number of Antenna:	1Tx1Rx
Antenna Gain:	Antenna: 5.05dBi (Provided by the Client)
Technical Specification of Wi-Fi 802.11 a/n	
Operating Frequency:	5180-5240MHz, 5745-5825MHz* *(The DFS bands 5250-5350MHz and 5470-5725MHz were blocked when it integrated into the host 3D Printer)
Type of Modulation:	OFDM
Protocol:	802.11 a/n20/n40
Data Rate:	6/9/12/18/24/36/48/54 Mbps for 802.11a MCS0~MCS 7 for 802.11n (All data rates considered, only the Worst-cases reported)
Antenna Type:	Integral Antenna
Number of Antenna:	1TX1RX
Antenna Gain:	Antenna: 4.49dBi (Provided by the Client)

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Wi-Fi 802.11 a/n wireless transmitting mode
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- B. On, Wi-Fi 802.11 a/n connecting mode

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- | | |
|--------------------|-------------------------|
| - Application Form | - User Manual |
| - Block Diagram | - Operation Description |

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 in this report.

Table 3: Test environments

Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
NTNV	24.6°C	Normal	Ambient

Table 4: Test channel and frequency

U-NII-1			
20MHz Bandwidth		40MHz Bandwidth	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190
40	5200	46	5230
44	5220		
48	5240		

U-NII-3			
20MHz Bandwidth		40MHz Bandwidth	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755
153	5765	159	5795
157	5785		
161	5805		
165	5825		

Prüfbericht - Nr.: CN2554HU 003
Test Report No.:Seite 12 von 20
Page 12 of 20

4.3 Special Accessories and Auxiliary Equipment

Table 5: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N	Rating
Laptop	Lenovo	T480	PF-16A6N8	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 1GHz)

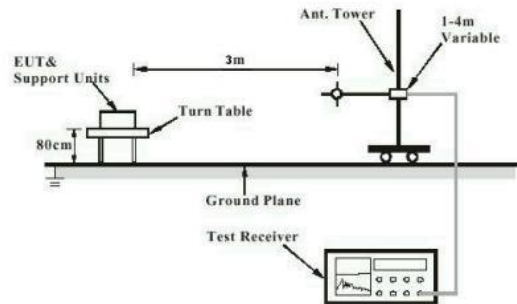


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

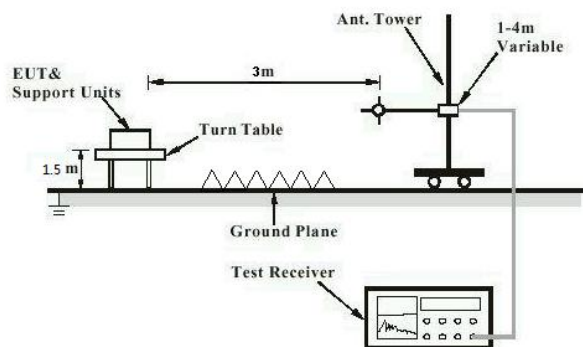


Diagram of Measurement Configuration for Conducted Transmitter Measurement

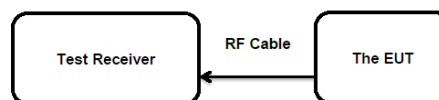
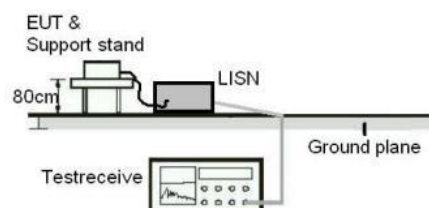


Diagram of Measurement Configuration for Mains Conduction Measurement



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 6.8

The EUT has an integral antenna with a unique connector, which is designed with permanent attachment and no consideration of replacement. The maximum antenna gain is 4.49 dBi.

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

Refer to EUT Photo for further details.

Prüfbericht - Nr.: **CN2554HU 003**
Test Report No.:Seite 15 von 20
Page 15 of 20

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 FCC: <250mW (23.98dBm) (5150-5250MHz)
Limits	: IC: * Max e.i.r.p.<200mW (5150-5250MHz) *200 mW (23dBm) or 10 dBm + 10 logB, where B is the 99% emission bandwidth in MHz, where is lesser.
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2025-02-05 to 2025-05-05
Input voltage	: AC 120V
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 25.2 °C
Relative humidity	: 37 %
Atmospheric pressure	: 101 kPa

For details refer to the following test result.

The Maximum antenna Gain is 4.49dBi for U-NII-1 band

Prüfbericht - Nr.: CN2554HU 003
Test Report No.:Seite 17 von 20
Page 17 of 20

5.1.3 Conducted 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 FCC:
Limits	:	<11dBm/MHz (5150-5250MHz) IC: e.i.r.p. spectral density <10dBm/MHz (5150-5250MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2025-02-05 to 2025-05-05
Input voltage	:	AC 120V
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25.2 °C
Relative humidity	:	37 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix A

5.1.4 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

KDB 789033 D02 v01r03

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

Test Setup

Date of testing

: 2025-02-05 to 2025-05-05

Input voltage

: AC 120V

Operation mode

: A

Test channel

: Low / Middle / High

Ambient temperature

: Refer to test result

Relative humidity

: Refer to test result

Atmospheric pressure

: 101 kPa

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 A

Prüfbericht - Nr.: **CN2554HU 003**
Test Report No.:Seite 19 von 20
Page 19 of 20

5.1.5 AC Conducted Emission

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.207(a)
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	: 2025-02-05 to 2025-05-05
Input voltage	: AC 120V
Operation mode	: B
Test channel	: Low / Middle / High
Ambient temperature	: Refer to test result
Relative humidity	: Refer to test result
Atmospheric pressure	: 101 kPa

6 Photographs of the Test Set-Up

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

7 List of Tables

Table 1: List of Test and Measurement Equipment.....	6
Table 2: Technical Specification of EUT	9
Table 3: Test environments	11
Table 4: Test channel and frequency.....	11
Table 5: Auxiliary Equipment Used during Test	12
Table 6: Test Result of Maximum Conducted Output Power, 5.1GHz Wi-Fi	16