

Prüfbericht-Nr.: Test report no.:	CN24IPWU 002	Auftrags-Nr.: Order no.:	168477868	Seite 1 von 24 Page 1 of 24
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2024-01-05	
Auftraggeber: Client:	Xiamen Intretech Inc. No. 100, Dongfu West Road, Haicang District, Xiamen, Fujian, China			
Prüfgegenstand: Test item:	M4GM			
Bezeichnung / Typ-Nr.: Identification / Type no.:	M4GM-GL-01 (Trademark: )			
Auftrags-Inhalt: Order content:	Test Report			
Prüfgrundlage: Test specification:	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 27 47 CFR FCC Part 2			
Wareneingangsdatum: Date of sample receipt:	2024-04-02	Please refer to Photo Document		
Prüfmuster-Nr.: Test sample no.:	A003680014-001~014			
Prüfzeitraum: Testing period:	2024-04-10 - 2024-05-13			
Ort der Prüfung: Place of testing:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:	 Jonathan Li		genehmigt von: authorized by:	 Bell Hu
Datum: Date:	2024-06-10		Ausstellungsdatum: Issue date:	2024-06-10
Stellung / Position:	Sachverständige(r)/Expert		Stellung / Position:	Sachverständige(r)/Expert
Sonstiges / Other:	FCC ID: S96M4GMG			
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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V05

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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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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>

Test Summary

5.1.1. RF POWER OUTPUT

RESULT: Pass

5.1.2. MODULATION CHARACTERISTICS

RESULT: Pass

5.1.3. OCCUPIED BANDWIDTH AND 26dB BANDWIDTH

RESULT: Pass

5.1.4. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

RESULT: Pass

5.1.5. SPURIOUS EMISSIONS AT ANTENNA TERMINALS – BAND EDGE

RESULT: Pass

5.1.6. FIELD STRENGTH OF SPURIOUS RADIATION

RESULT: Pass

5.1.7. FREQUENCY STABILITY

RESULT: Pass

5.1.8. PEAK TO AVERAGE RATIO

RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

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

Appendix A: Test Results for WCDMA operation Band II

Appendix B: Test Results for WCDMA operation Band IV

Appendix C: Test Results for WCDMA operation Band V

Appendix D Test Results of Field Strength of Spurious Radiation

1.2 Test Standard(s)

Applied Rules:	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 27 47 CFR FCC Part 2
Test Method:	KDB 971168 D01 ANSI C63.26

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China.

FCC Accreditation Designation No.: CN1260

ISED Wireless Device Testing Laboratory: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio Spectrum Testing (CTE6000)					
Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. until
Shielding Room 6#	Albatross	SR6	APC17151-SR6	2021-06-22	2024-06-22
Wideband Radio Communication Tester	R&S	CMW500	166305	2023-07-25	2024-07-25
Signal Analyzer	R&S	FSV 40	101475	2023-07-25	2024-07-25
Vector Signal Generator	R&S	SMBV100A	263466	2023-09-21	2024-09-21
Signal Generator	R&S	SMB100A	181041	2023-11-06	2024-11-05
High Speed Power Supply	KEITHLEY	2303	4080052	2023-11-06	2024-11-05
RF Control Unit	Tonscend	JS0806-1	19H8060192	N/A	N/A
Band Reject Filter Group	Tonscend	JS0806-F	19I8060194	2023-11-14	2025-11-13
Radio Spectrum Testing (LRD2)					
Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. until
Shielding Room 6#	Albatross	SR6	APC17151-SR6	2021-06-22	2024-06-22
Signal Analyzer	R&S	FSV 40	101475	2023-07-25	2024-07-25
Signal and spectrum analyzer	Rohde & Schwarz	FSV3030	101576	2023-11-06	2024-11-05
Vector signal generator	Rohde & Schwarz	SMBV100B	102642	2023-11-06	2024-11-05
Vector signal generator	Rohde & Schwarz	SMB100A	182690	2023-11-06	2024-11-05
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	170345	2023-11-06	2024-11-05
1 channel power supply	Rohde & Schwarz	HMC8041	101712	2023-11-06	2024-11-05
Band Reject Filter	Tonscend	JS0806-F	21I8060483	2023-11-14	2025-11-13

Group					
RF Control Unit	Tonscend	JS0806-1	21H8060472	N/A	N/A
Test Software	Tonscend	JS1120	N/A	N/A	N/A
Control PC	Lenovo	TianYi510S-07IMB	2018AP3073	N/A	N/A
Unwanted Emission Testing (TS8996)					
Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. until
EMI Test Receiver	R&S	ESR 7	102021	2023-07-26	2024-07-25
Signal Analyzer	R&S	FSV 40	101439	2023-07-26	2024-07-25
System Controller Interface	R&S	SCI-100	S10010038	N/A	N/A
Filterbank	R&S	Wlan	100759	2023-07-26	2024-07-25
OSP	R&S	OSP 120	102040	N/A	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2023-07-26	2024-07-25
Amplifier	R&S	SCU-18F	180070	2023-07-26	2024-07-25
Amplifier	R&S	SCU40A	100475	2023-07-26	2024-07-25
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2022-08-07	2024-08-06
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2022-08-07	2024-08-06
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	2022-08-28	2024-08-27
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2022-08-07	2024-08-06
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	2021-06-22	2024-06-22

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.

Table 2: Measurement Uncertainty

Parameter	Uncertainty (k=2)
RF output power, conducted	± 0.99 dB
Occupied Channel Bandwidth	± 2.08 %
RF power density, conducted	± 0.99 dB
Unwanted Emissions, conducted	± 0.89 dB
All emissions, radiated	±4.17 dB

2.6 Location of Original Data

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

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China. is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a 4G module, which support GPRS/EDGE, WCDMA and LTE wireless technologies.

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

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	Value
Product Name:	M4GM
Test Model No.:	M4GM-GL-01
Trademark:	
FCC ID:	S96M4GMG
Operating Voltage:	DC 8V~30V
Testing Voltage:	DC 24V
Operation Temperature:	0°C to +60°C
Technical Specification of WCDMA	
Operational Frequency:	Band 2, Band 4, Band 5
Type of Modulation:	QPSK, 16QAM
Antenna Type:	External Antenna
Antenna Number:	1
Max Antenna Gain:	3.4 dBi for WCDMA Band 2 2.8 dBi for WCDMA Band 4 5.4 dBi for WCDMA Band 5 (Provided by the Client)

Prüfbericht - Nr.: CN24IPWU 002
*Test Report No.:*Seite 10 von 24
Page 10 of 24**Table 4: Operating Frequency Range of EUT**

Frequency Band(s)	Frequency Range		Channel Bandwidth (MHz)
	Transmitting f_{UL} (MHz)	Receiving f_{DL} (MHz)	
Band 2	1850 ~ 1910	1930 ~ 1990	5
Band 4	1710 ~ 1755	2110 ~ 2155	5
Band 5	824 ~ 849	869 ~ 894	5

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, communication link established, Transmitting
 - 1) WCDMA operating
 - i. Low channel
 - ii. Middle channel
 - iii. High channel
- B. On, communication link established, Receiving
 - 1) WCDMA, operating
- C. Idle
- D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- | | |
|------------------------------|-------------------------|
| - Application Form | - Operation Description |
| - ID Label and Location Info | - Block Diagram |
| - Schematics | - PCB Layout |

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 KDB 971168 D01 and ANSI C63.26.

According to clause 3.1, all tests were performed on model M4GM-GL-01 in this report.

Table 5: List of Frequencies under Test

Support Band	Support Standard	Channel Frequency (MHz)	Channel Number
WCDMA Band 2	WCDMA/HSDPA/HSUPA	1852.4	9262
		1880.0	9400
		1907.6	9538
WCDMA Band 4	WCDMA/HSDPA/HSUPA	1712.4	1312
		1732.6	1413
		1752.6	1513
WCDMA Band 5	WCDMA/HSDPA/HSUPA	826.4	4132
		836.4	4182
		846.6	4233

Table 6: Test Environments

Environment Parameter	Values During Tests			
	Temperature	Voltage (Radio Module)	Voltage (EUT)	Relative Humidity
NTNV	25°C±2°C	3.3Vdc	24Vdc	Ambient
LTLV	0 °C	3.0Vdc	---	---
LTHV	0 °C	3.6Vdc	---	---
HTLV	+60 °C	3.0Vdc	---	---
HTHV	+60 °C	3.6Vdc	---	---

Table 7: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Adapter	N/A	IVP0330-2000	N/A	DC 3.3V, 2.0A
Adapter	N/A	IVP2400-2000	N/A	DC 24V, 2.0A

4.3 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.

4.4 Test Setup Diagram

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

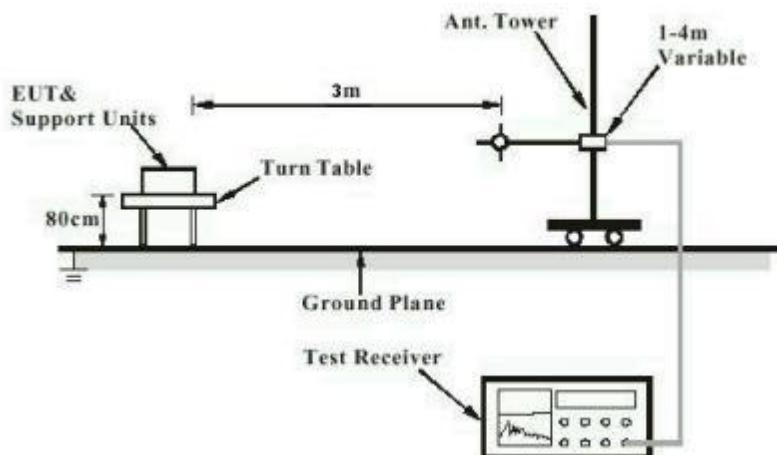


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

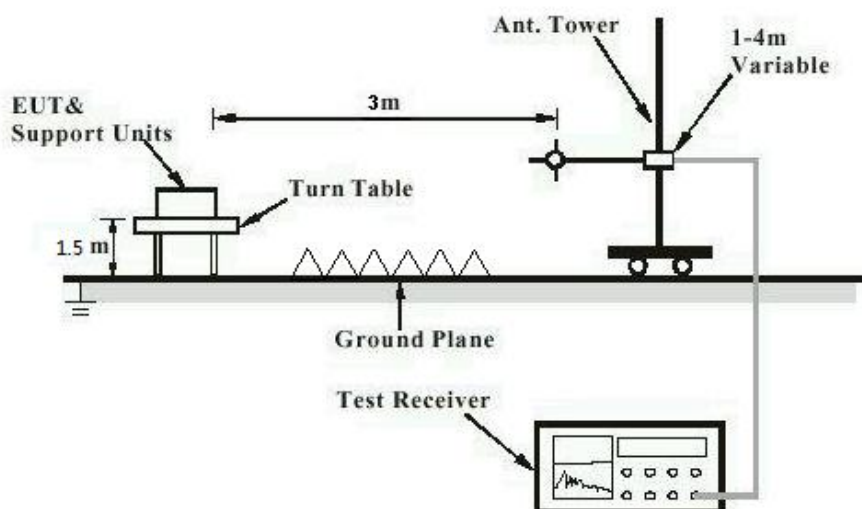
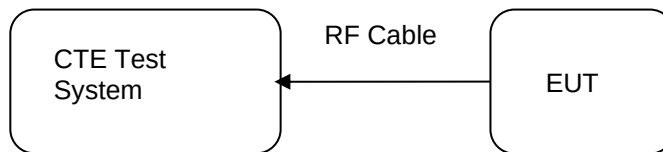


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5. TEST RESULTS

5.1. ESSENTIAL REQUIREMENTS OF STANDARD

5.1.1. RF POWER OUTPUT

RESULT:

Pass

Test standard	:	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 27 47 CFR FCC Part 2
Limits	:	Operating band FCC Limit Band 2 EIRP 2 watts Band 4 EIRP 1 watts Band 5 ERP 7 watts
Test procedure	:	Clause 5.2.4.2 of ANSI C63.26
Kind of test site	:	Shielding Room

Test Setup

Date of testing	:	2024-04-10 - 2024-05-13
Input voltage	:	DC 3.3V
Test environment	:	☒ Normal test conditions ☐ Extreme test conditions
Operation mode	:	A.1
Ambient temperature	:	23 °C
Relative humidity	:	50%
Atmospheric pressure	:	101.0 kPa

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_{\text{T}}$$

where

ERP or EIRP: effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas} , e.g. dBm)

P_{Meas} : measured transmitter output power, in dBm

G_{T} : gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

Refer to attached Appendix A to Appendix C for details of test results.

5.1.2. MODULATION CHARACTERISTICS**RESULT:****Pass**

Test standard	:	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 27 47 CFR FCC Part 2
Limits	:	"Other types of equipment", the use of higher order modulations such as OFDM or LTE or other modulation are acceptable for use
Test procedure	:	Clause 5.2.3 of ANSI C63.26
Kind of test site	:	Shielding Room
2024-04-10 - 2024-05-13		
DC 3.3V		

Note:

The device implement digital modulation such as BPSK and QPSK, hence the EUT is deemed to comply with this requirement without additional testing.

5.1.3. OCCUPIED BANDWIDTH AND 26dB BANDWIDTH**RESULT:****Pass**

Test standard : 47 CFR FCC Part 22
47 CFR FCC Part 24
47 CFR FCC Part 27
47 CFR FCC Part 2

Test requirement : Section 2.1049 of 47 CFR FCC Part 2

Limits : No limit

Test procedure : Section 5.4.3 of ANSI C63.26
☒ Conducted measurements
☐ Radiated measurements

Kind of test site : Shielding Room

Test Setup

Date of testing : 2024-04-10 - 2024-05-13

Input voltage : DC 3.3V

Test environment : ☒ Normal test conditions
☐ Extreme test conditions

Operation mode : A.1

Ambient temperature : 24 °C

Relative humidity : 50%

Atmospheric pressure : 101.0 kPa

Refer to attached Appendix A to Appendix C for details of test results.

5.1.4. SPURIOUS EMISSIONS AT ANTENNA TERMINALS**RESULT:****Pass**

Test standard	:	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 27 47 CFR FCC Part 2
Limits	:	Operating band FCC Limit Band 2 < - 13 dBm /1MHz Band 4 < - 13 dBm /1MHz < - 13 dBm /100kHz Band 5 @ < 1GHz < - 13 dBm /1MHz @ > 1GHz
Test procedure	:	Clause 5.7.4 of ANSI C63.26
Kind of test site	:	Shielding Room

Test Setup

Date of testing	:	2024-04-10 - 2024-05-13
Input voltage	:	DC 3.3V
Test environment	:	☒ Normal test conditions ☐ Extreme test conditions
Operation mode	:	A.1
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

The limit calculation:

$$\text{Limit} = P_{\text{Meas}} (\text{dBm}) - [43 + 10 \log(P_{\text{Meas}})] = -13 \text{ dBm}$$

Refer to attached Appendix A to Appendix C for details of test results.

**5.1.5. SPURIOUS EMISSIONS AT ANTENNA TERMINALS – BAND
EDGE****RESULT:****Pass**

Test standard	:	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 27 47 CFR FCC Part 2
Limits	:	Operating band FCC Limit Band 2 < - 13 dBm /1%EBW Band 4 < - 13 dBm /1%EBW Band 5 < - 13 dBm /1%EBW
Test procedure	:	Clause 5.7.3 of ANSI C63.26
Kind of test site	:	Shielding Room

Test Setup

Date of testing	:	2024-04-10 - 2024-05-13
Input voltage	:	DC 3.3V
Test environment	:	☒ Normal test conditions ☐ Extreme test conditions
Operation mode	:	A.1
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

The limit calculation:

$$\text{Limit} = P_{\text{Meas}} (\text{dBm}) - [43 + 10 \log(P_{\text{Meas}})] = -13 \text{ dBm}$$

Refer to attached Appendix A to Appendix C for details of test results.

5.1.6. FIELD STRENGTH OF SPURIOUS RADIATION**RESULT:****Pass**

Test standard	:	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 27 47 CFR FCC Part 2
Limits	:	Operating band FCC Limit Band 2 < - 13 dBm /1MHz Band 4 < - 13 dBm /1MHz Band 5 < - 13 dBm /100kHz @ < 1GHz < - 13 dBm /1MHz @ > 1GHz
Test procedure	:	Clause 5.5 of ANSI C63.26
Kind of test site	:	3m Semi Anechoic Room

Test Setup

Date of testing	:	2024-04-10 - 2024-05-13
Input voltage	:	DC 3.3V
Test environment	:	☒ Normal test conditions ☐ Extreme test conditions
Operation mode	:	A.1
Ambient temperature	:	23 °C
Relative humidity	:	47%
Atmospheric pressure	:	101.0 kPa

The limit calculation:

$$\text{Limit} = P_{\text{Meas}} \text{ (dBm)} - [43 + 10 \log(P_{\text{Meas}})] = -13 \text{ dBm}$$

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in this report. The measurement is performed for all operational modes and both antenna polarization, only the data of the worst mode is recorded in this report.

Refer to attached Appendix D for details of test results.

5.1.7. FREQUENCY STABILITY**RESULT:****Pass**

Test standard	:	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 27 47 CFR FCC Part 2
Limits	:	Operating band FCC Limit Band 2 Within authorized bands Band 4 Within authorized bands Band 5 2.5 ppm
Test procedure	:	Clause 5.6.3 of ANSI C63.26
Kind of test site	:	Shielding Room

Test Setup

Date of testing	:	2024-04-10 - 2024-05-13
Input voltage	:	DC 3.3V
Test environment	:	☒ Normal test conditions ☒ Extreme test conditions
Operation mode	:	A.1
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

Refer to attached Appendix A to Appendix C for details of test results.

5.1.8. PEAK TO AVERAGE RATIO**RESULT:****Pass**

Test standard	:	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 27 47 CFR FCC Part 2
Limits	:	Operating band FCC Limit Band 2 PAR ≤ 13 dB Band 4 PAR ≤ 13 dB Band 5 PAR ≤ 13 dB
Test procedure	:	Clause 5.2.6 of ANSI C63.26
Kind of test site	:	Shielding Room

Test Setup

Date of testing	:	2024-04-10 - 2024-05-13
Input voltage	:	DC 3.3V
Test environment	:	☒ Normal test conditions ☐ Extreme test conditions
Operation mode	:	A.1
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

Refer to attached Appendix A to Appendix C for details of test results.

6. SYSTEM MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Table 8: System Measurement Uncertainty

Parameter	Uncertainty (k=2)
RF output power, conducted	± 0.99 dB
Occupied Channel Bandwidth	± 2.08 %
RF power density, conducted	± 0.99 dB
Unwanted Emissions, conducted	± 0.89 dB
All emissions, radiated	± 4.17 dB

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