

Prüfbericht-Nr.: Test report no.:	CN23V36A 001	Auftrags-Nr.: Order no.:	168436396	Seite 1 von 17 Page 1 of 17	
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2023-07-24		
Auftraggeber: Client:	Xiamen R&T Plumbing Technology Co., Ltd. No.18, HouXiang Road, HaiCang District, Xiamen, 361028, China				
Prüfgegenstand: Test item:	Microwave sensor				
Bezeichnung / Typ-Nr.: Identification / Type no.:	HLR22-RVS-B1-35-D(I) (Trademark: R&T)				
Auftrags-Inhalt: Order content:	Test Report				
Prüfgrundlage: Test specification:	FCC CFR Title 47, Part 15, Subpart C, Section 15.249 RSS-210 Issue 10 December 2019 RSS-Gen Issue 5 March 2019				
Wareneingangsdatum: Date of sample receipt:	2023-07-25	Please refer to Photo Document			
Prüfmuster-Nr.: Test sample no.:	001-003				
Prüfzeitraum: Testing period:	2023-08-02 - 2023-08-04				
Ort der Prüfung: Place of testing:	MRT Technology (Suzhou) Co., Ltd.				
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.				
Prüfergebnis*: Test result*:	Pass				
geprüft von: tested by:			genehmigt von: authorized by:		
Datum: Date:	2023-09-12	Signed by: Chris Chen		Ausstellungsdatum: Issue date:	2023-09-12
Stellung / Position:		Department Manager	Stellung / Position:		Reviewer
Sonstiges / Other:	FCC ID:2AW23-L22G00 IC: 31226-L22G00, HVIN: HLR22-RVS-B1-35-D(I)				
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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Anmerkungen
Remarks

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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>

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Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 FIELD STRENGTH OF FUNDAMENTAL AND HARMONICS

RESULT: Pass

5.1.3 20dB AND 99% BANDWIDTH

RESULT: Pass

5.1.4 BAND EDGE

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

Appendix B: Photographs of the Test Set-up

2 Test Sites

2.1 Test Facilities

MRT Technology (Suzhou) Co., Ltd.

D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

A2LA accreditation certification number: 3628.01

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

Instrument Name	Manufacturer	Model No.	Asset No.	Cali. Interval	Cal. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2023-12-28
Anechoic Chamber	RIKEN	SIP-AC1	MRTSUE06554	1 year	2023-12-22
Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2024-05-23
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06599	1 year	2023-10-13
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2023-10-10
Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2024-07-14
Thermohygrometer	testo	608-H1	MRTSUE06616	1 year	2023-11-01
Thermohygrometer	testo	608-H1	MRTSUE06619	1 year	2023-11-01
Thermohygrometer	testo	608-H1	MRTSUE06620	1 year	2023-11-27
Thermohygrometer	testo	608-H1	MRTSUE06622	1 year	2023-11-27
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2024-01-12
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06645	1 year	2024-07-13
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2023-12-22
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2024-02-26
mmWave Antenna	MI-WWAVE	261U-25/383	MRTSUE06273	N/A	N/A
mmWave Antenna	A-INFO	LB-15-25-A	MRTSUE06409	N/A	N/A
mmWave Antenna	A-INFO	LB-10-25-A	MRTSUE06410	N/A	N/A
Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2024-06-29
Waveguide Harmonic Mixer	Keysight	M1970V	MRTSUE06271	3 years	2025-09-22
Waveguide Harmonic Mixer	Keysight	M1970W	MRTSUE06272	3 years	2025-09-29
Oscilloscope	Agilent	DSO-X 6002A	MRTSUE06107	1 year	2024-02-29

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 measurements as below table.

Table 2: Measurement Uncertainty

Parameter	Uncertainty
Radio frequency	$\pm 1 \times 10^{-7}$
RF power (conducted)	$\pm 2,5$ dB
Radiated emission of transmitter, valid to 26,5 GHz	± 6 dB
Radiated emission of transmitter, valid between 26,5 GHz and 100 GHz	± 8 dB
Radiated emission of receiver, valid to 26,5 GHz	± 6 dB
Radiated emission of receiver, valid between 26,5 GHz and 100 GHz	± 8 dB
Temperature	± 1 °C
Humidity	± 5 %
Voltage (dc)	± 1 %
Voltage (ac, < 10 kHz)	± 2 %
NOTE: For radiated emissions above 26,5 GHz it may not be possible to achieve measurement uncertainties complying with the levels specified in this table. In these cases alone it is acceptable to employ the alternative interpretation procedure specified in clause 5.9.1.	

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 MRT Technology (Suzhou) Co., Ltd. Test facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, 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 **Microwave sensor**, which supports 24GHz wireless technology.

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
Kind of Equipment:	Microwave sensor
Type Designation:	HLR22-RVS-B1-35-D(I)
Trademark:	R&T
FCC ID:	2AW23-L22G00
IC:	31226-L22G00
HVIN:	HLR22-RVS-B1-35-D(I)
Operating Voltage:	DC 5V
Testing Voltage:	DC 5V from DC source
Technical Specification of Microwave module	
Frequency Range:	24.05 - 24.25 GHz
Type of Modulation:	FMCW
Operate Frequency Range:	200MHz
Antenna Type:	PCB Layout Antenna
Antenna Gain:	12.00 dBi(Provided by the Client)

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, 24GHz transmitting mode (Microwave module)
- B. On, 24GHz connecting mode
- C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

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

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.

Table 4: Test Environments

Environment Parameter	Values During Tests		
	Temperature	Voltage	Relative Humidity
NTNV	25°C±2°C	5Vdc	Ambient

Table 5: Test Channel and Frequency

Mode	Test Channels (GHz)	Remark
Transmitting	24.05 to 24.25 GHz	--

4.3 Special Accessories and Auxiliary Equipment

Table 6: Auxiliary Equipment Used During Test

Description	Manufacturer	Model	S/N
DC Source	Guwei	AS58	--

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)

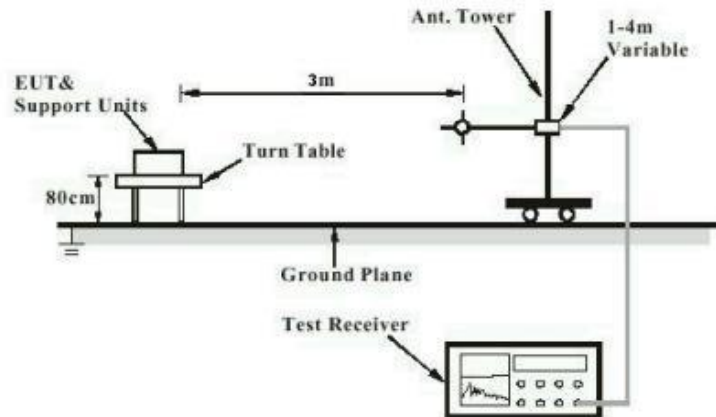


Diagram of Measurement Configuration for Radiation Test (1-40GHz)

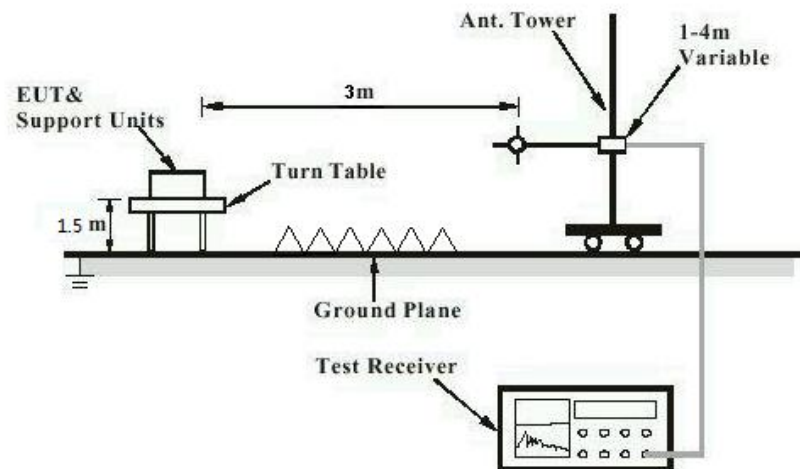


Diagram of Measurement Configuration for Radiation Test (40-100GHz)

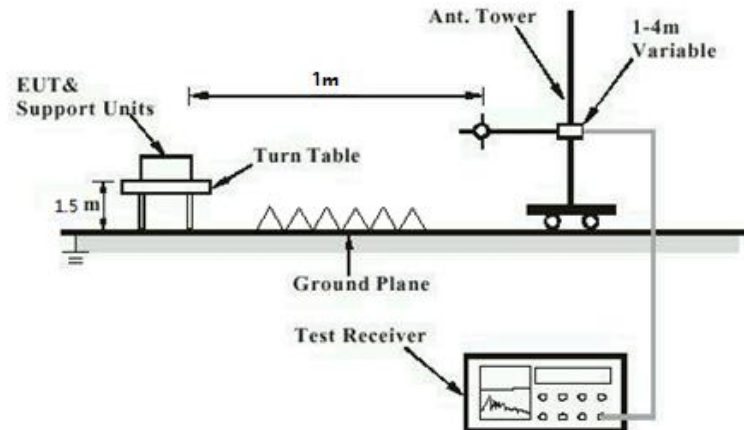
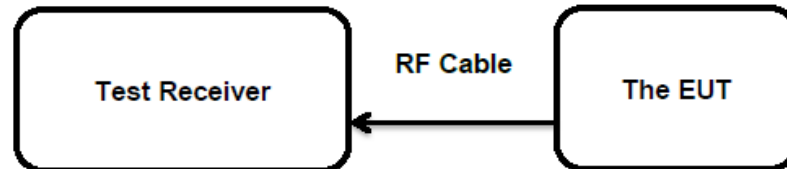


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:

Pass

Test Specification

Test standard : FCC Part 15.203
RSS-Gen Section 6.8

According to the manufacturer declared, the EUT has a PCB Layout antenna, the gain of antenna is 12.00 dBi, which that permanent attachment and no consideration of replacement.

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

Refer to EUT Photo for further details.

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5.1.2 Field strength of fundamental and harmonics

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.249(a) (d) (e) RSS-210 Section B.10
Basic standard	: ANSI C63.10: 2013
Limits	: FCC Part 15.249(a) (d) (e) & 15.209(a) RSS-210 Section B.10 (a) & (b) RSS-Gen Section 8.9
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: 2023-08-02 to 2023-08-04
Input voltage	: DC 5V
Operation mode	: A
Ambient temperature	: 23.2 °C
Relative humidity	: 55 %
Atmospheric pressure	: 101.1 kPa

Note: 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.

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5.1.3 20dB and 99% Bandwidth

RESULT:

Pass

Test Specification

Test standard	:	FCC Part 15.215 RSS-Gen Section 6.7
Basic standard	:	ANSI C63.10: 2013
Limits	:	Within assigned band
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2023-08-02
Input voltage	:	DC 5V
Operation mode	:	A
Ambient temperature	:	23.2 °C
Relative humidity	:	55 %
Atmospheric pressure	:	101.1 kPa

For the measurement records, refer to the appendix A.

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5.1.4 Band Edge

RESULT:**Pass****Test Specification**

Test standard : FCC Part 15.249(a) (d) (e) & 15.209 & 15.205
RSS-210 Section B.10 (a) & (b)
RSS-Gen Section 8.9 & 8.10

Basic standard : ANSI C63.10: 2013

Limits : FCC Part 15.249(a) (d) (e) & 15.209 & 15.205
RSS-Gen Table 5 & 7

Kind of test site : 3m Semi-anechoic Chamber

Test Setup

Date of testing : 2023-08-02 to 2023-08-04

Input voltage : DC 5V

Operation mode : A

Ambient temperature : 23.2 °C

Relative humidity : 55 %

Atmospheric pressure : 101.1 kPa

For the measurement records, refer to the appendix A.

6 Photographs of the Test Set-Up

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

7 List of Tables

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