Prüfbericht-Nr.: *Test report no.:*	**CN24HZON 001**	**Auftrags-Nr.:** *Order no.:*	**168502657**	Seite 1 von 11 *Page 1 of 11*
Kunden-Referenz-Nr.: *Client reference no.:*	**N/A**	**Auftragsdatum:** *Order date:*	2024-09-03	
Auftraggeber: *Client:*	**WiseConn IP GmbH** Schochenmühlestrasse 4 6340, Baar, Switzerland			
Prüfgegenstand: *Test item:*	LoRa communication expansion module			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	MOD-C1-LORA-900 (Trademark: WiseConn)			
Auftrags-Inhalt: *Order content:*	Test Report			
Prüfgrundlage: *Test specification:*	CFR Title 47 FCC, Part 15, Subpart B ICES-003 Issue 7 October 2020			

Wareneingangsdatum: *Date of sample receipt:*	2024-10-17
Prüfmuster-Nr.: *Test sample no:*	A003836239-001
Prüfzeitraum: *Testing period:*	2024-10-17 - 2024-12-10
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:* ***Datum:*** *Date:* 2025-02-10	X Hardy Suo	**genehmigt von:** *authorized by:* **Ausstellungsdatum:** *Issue date:* 2025-02-10	X Lin Lin
Stellung / Position	Sachverständige(r)/Expert	**Stellung** / Position	Sachverständige(r)/Expert

Sonstiges /
Other:

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*

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. *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.*
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. *As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.*
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. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen 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 bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. 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.

Test Summary

5.1 Radiated emissions
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: Test Result.
Appendix B: Test Setup Photos.

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

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

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radiated Emission (3m chamber)				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
3m SAC	ETS-Lindgren	SAC3	CT001632-Q1362	2025-07-22
EMI Test Receiver	R&S	ESR7	102111	2025-08-18
Horn Antenna	R&S	HF907	102706	2025-09-01
Preamplifier (1-18GHz)	R&S	SCU-18F	180076	2025-10-11
Active magnetic loop antenna	SCHWARZBECK	FMZB1519B	00080	2025-09-01
Trilog-Broadband antenna	SCHWARZBECK	VULB9168	0945	2025-07-17
EMC32 test software	R&S	EMC32(Ver.10.60.20)	N/A	N/A

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

Parameter	Uncertainty
Mains Harmonic	± 4.60 %
Voltage Fluctuations & Flicker	± 0.64 %
Radiated Emission (3m SAC), 30MHz to 1000MHz	± 4.52 dB
Radiated Emission (3m SAC), above 1000MHz	± 4.37 dB
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	± 3.70 dB / ± 3.30 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were at 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

The TÜV Rheinland (Shenzhen) Co., Ltd. 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 LoRa communication expansion module which supports Lora wireless technology.

The MOD-C1-LORA is an expansion module for the product RF-C1 which is designed for the local control tasks of a pump station, and MOD-C1-LORA is powered by RF-C1.

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

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment:	LoRa communication expansion module
Type Designation:	MOD-C1-LORA-900
Operating Voltage:	DC 5V
Testing Voltage:	DC 5V
Operating Temperature Range:	-10 °C ~ +55 °C

3.3 Independent Operation Modes

The basic operation modes are:

A. On, Normal operation

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Block Diagram
- Schematics
- Photo Document
- User Manual

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

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 C63.4: 2014.

According to clause 3.1, all test were applied on model MOD-C1-LORA-900.

4.3 Special Accessories and Auxiliary Equipment

Table 3: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
PC	Lenovo	T14	/
USB-CAN adapter	NiRen	USB-CAN-V2	/

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)

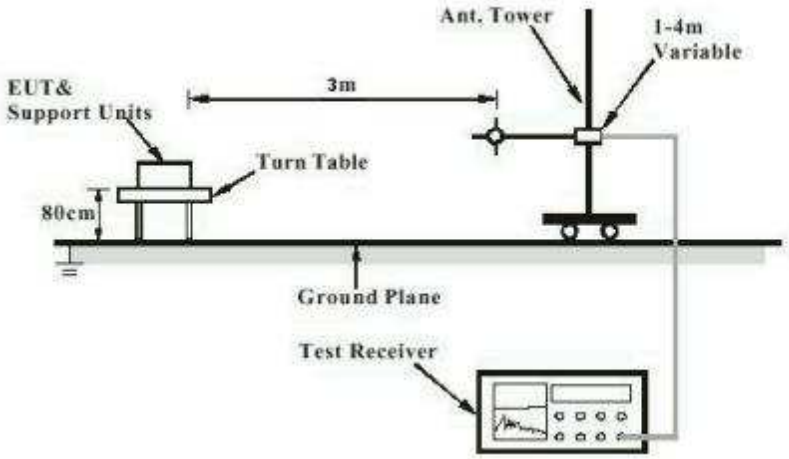
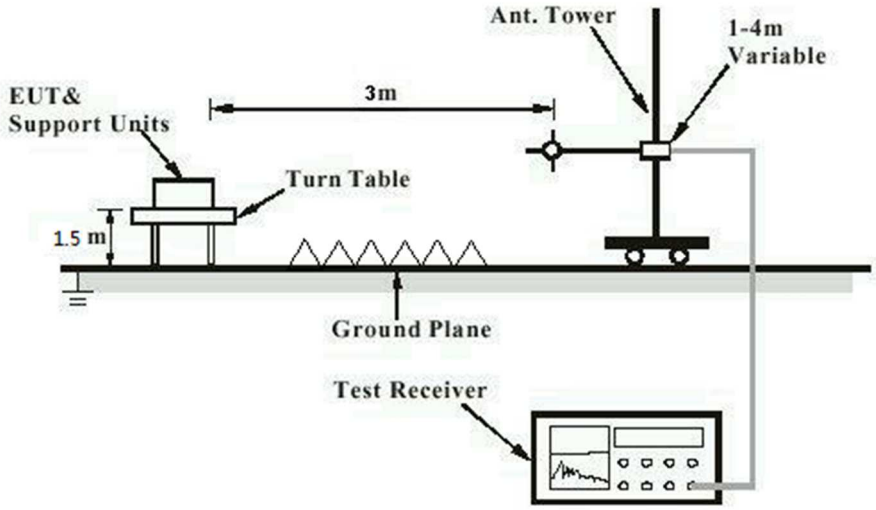


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)



5 Test Results

5.1 Radiated Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.109(a) ICES-003 Issue 7, Clause 3.2.2
Basic standard	:	ANSI C63.4: 2014
Frequency range	:	30MHz to 5th highest fundamental frequency
Classification	:	Class B
Limit	:	FCC Part 15.109(a) ICES-003 Table 2 & Table 4
Kind of test site	:	3m Semi-anechoic Chamber & 3m Full-anechoic Chamber

Test Setup

Date of testing	:	2024-10-17 - 2024-12-10
Input voltage	:	DC 5V
Operation mode	:	A
Earthing	:	Not Connected
Ambient temperature	:	Refer to test data
Relative humidity	:	Refer to test data
Atmospheric pressure	:	Refer to test data

For the measurement records, refer to appendix A.

Remark 1: The limit of below radiated emission test data is from FCC part 15.109, it also meet the limit of ICES-003 issue 7.

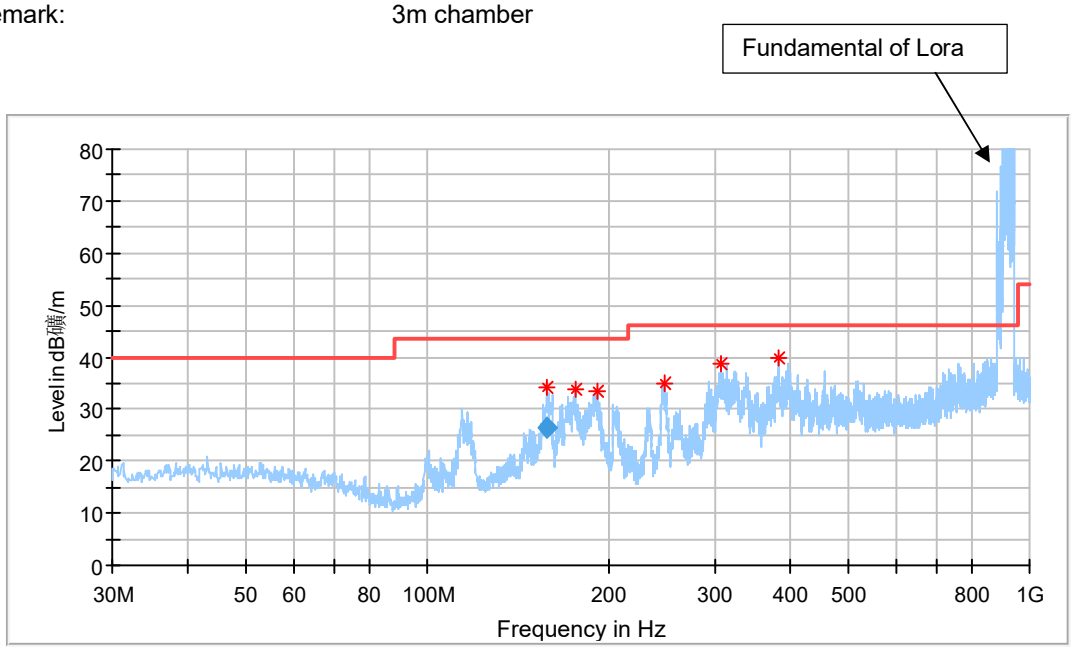
6 List of Tables

Appendix A: Test Results of EMC Requirements

Appendix A.1: Test Plots of Radiated Emissions, below 1GHz

EUT Information

EUT Name:	LoRa communication expansion module
Order Number:	168502657(P01591027)
Model:	MOD-C1-LORA-900
Test Mode:	On, Normal operation
Test Voltage:	DC 5V
Test Standard:	FCC Part 15B
Test By:/Review By:	Junhua/ Shower Dai
Tem./Hum./Pressure:	24.1°C/52.3%/101kPa
Remark:	3m chamber



Critical_Freqs

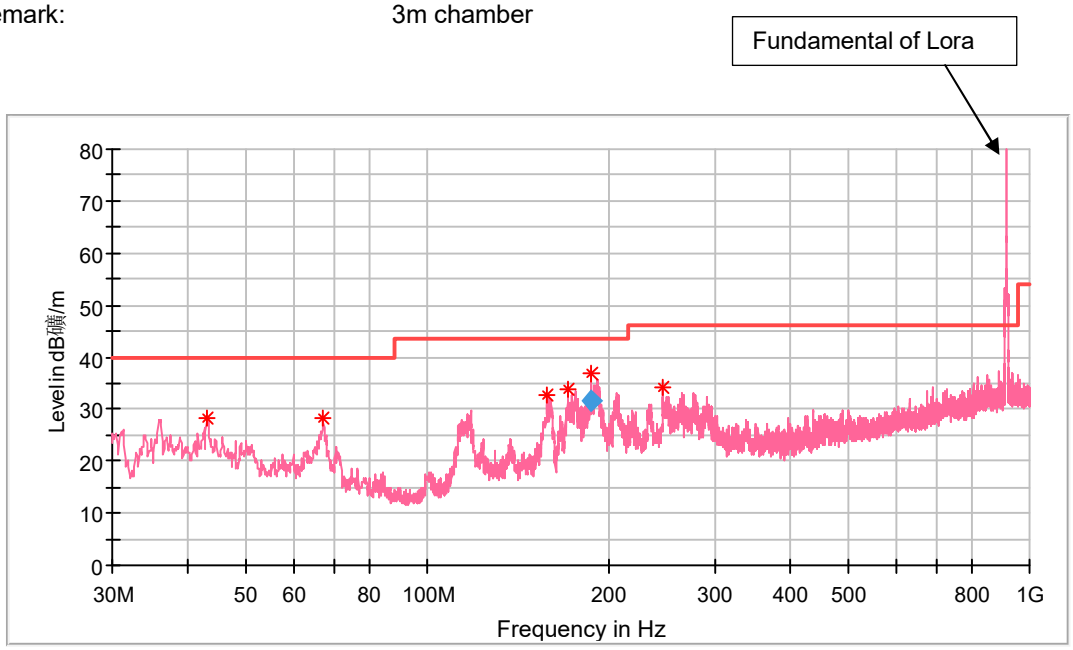
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
158.155000	34.27	43.50	9.23	200.0	H	274.0	20.6
175.888000	33.95	43.50	9.55	200.0	H	284.0	19.6
191.505000	33.47	43.50	10.03	200.0	H	260.0	17.7
247.571000	35.00	46.00	11.00	100.0	H	261.0	19.2
306.741000	38.56	46.00	7.44	100.0	H	105.0	21.3
382.207000	39.88	46.00	6.12	100.0	H	121.0	23.2

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
158.155000	26.51	43.50	16.99	1000.0	120.000	200.0	H	274.0	20.6

EUT Information

EUT Name:	LoRa communication expansion module
Order Number:	168502657(P01591027)
Model:	MOD-C1-LORA-900
Test Mode:	On, Normal operation
Test Voltage:	DC 5V
Test Standard:	FCC Part 15B
Test By:/Review By:	Junhua/ Shower Dai
Tem./Hum./Pressure:	24.1°C/52.3%/101kPa
Remark:	3m chamber



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
43.095000	28.33	40.00	11.67	100.0	V	106.0	20.4
67.151000	28.38	40.00	11.62	100.0	V	96.0	18.8
158.234000	32.76	43.50	10.74	100.0	V	199.0	20.6
171.523000	33.73	43.50	9.77	100.0	V	228.0	20.0
187.431000	36.79	43.50	6.71	100.0	V	228.0	18.1
246.601000	34.14	46.00	11.86	100.0	V	222.0	19.2

Final_Result

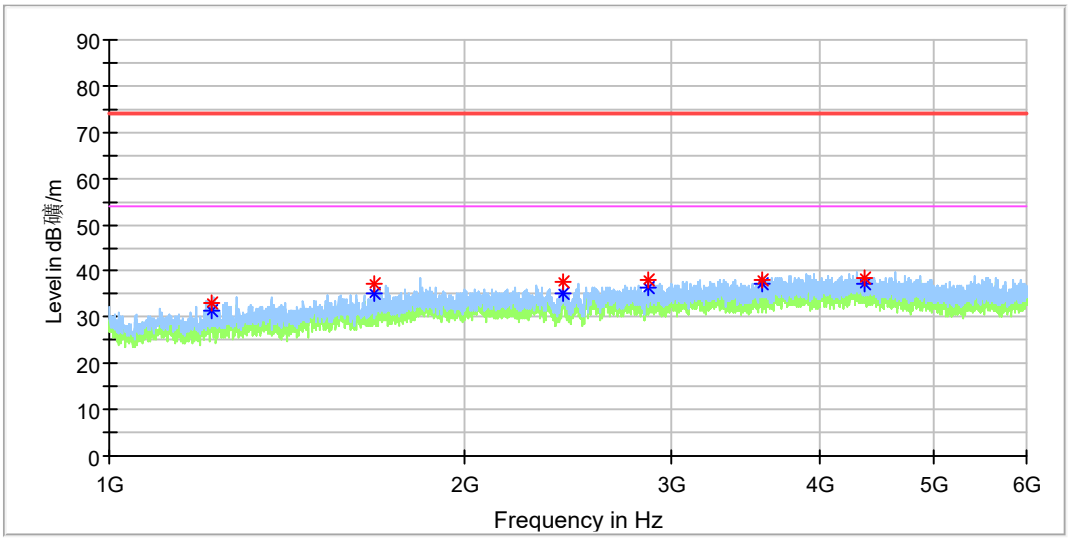
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
187.431000	31.55	43.50	11.95	1000.0	120.000	100.0	V	228.0	18.1

Appendix A.2: Test Plots of Radiated Emissions, above 1GHz

Note: Testing was carried out within frequency range 30MHz to the 5th harmonics. The measurement results above 18GHz were greater than 20dB below the limit, so only record the test result within the 30MHz to 18GHz.

EUT Information

EUT Name:	LoRa communication expansion module
Order Number:	168502657(P01591027)
Model:	MOD-C1-LORA-900
Test Mode:	On, Normal operation
Test Voltage:	DC 5V
Test Standard:	FCC Part 15B
Test By:/Review By:	Junhua/ Shower Dai
Tem./Hum./Pressure:	24.1°C/52.3%/101kPa
Remark:	3m chamber



Critical_Freqs

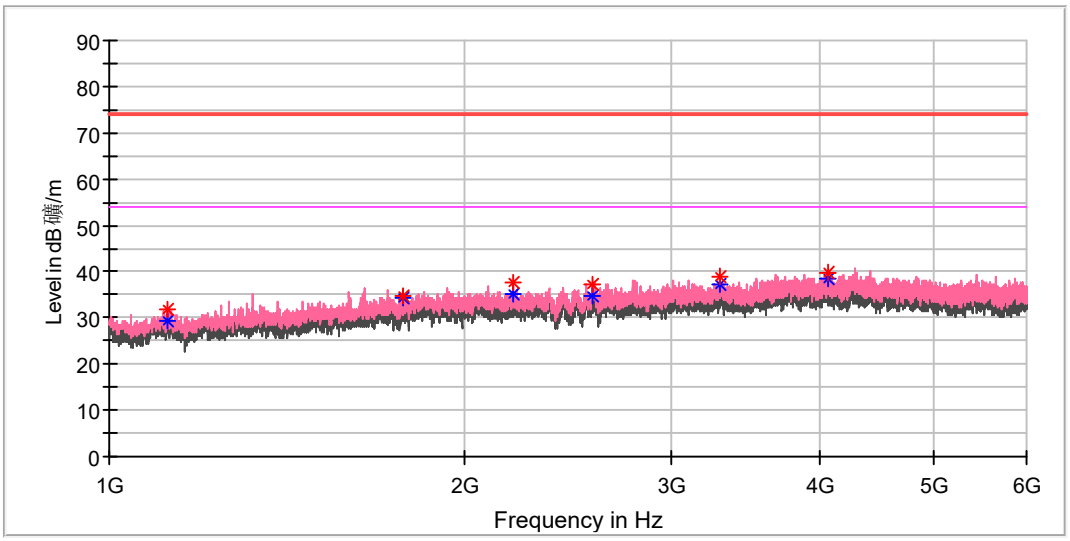
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1222.000000	---	54.00	22.72	100.0	H	232.0	-10.3
1222.000000	33.18	74.00	40.82	100.0	H	232.0	-10.3
1677.000000	---	54.00	18.73	100.0	H	46.0	-7.8
1677.000000	37.34	74.00	36.66	100.0	H	46.0	-7.8
2424.000000	---	54.00	18.98	100.0	H	308.0	-4.8
2424.000000	37.51	74.00	36.49	100.0	H	308.0	-4.8
2865.500000	---	54.00	17.68	100.0	H	0.0	-3.5
2866.000000	38.01	74.00	35.99	100.0	H	0.0	-3.5
3582.500000	---	54.00	16.61	100.0	H	11.0	-1.4
3582.500000	37.97	74.00	36.03	100.0	H	11.0	-1.4
4367.000000	38.52	74.00	35.48	100.0	H	353.0	0.6
4367.500000	---	54.00	16.70	100.0	H	353.0	0.5

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---		---	---

EUT Information

EUT Name:	LoRa communication expansion module
Order Number:	168502657(P01591027)
Model:	MOD-C1-LORA-900
Test Mode:	On, Normal operation
Test Voltage:	DC 5V
Test Standard:	FCC Part 15B
Test By:/Review By:	Junhua/ Shower Dai
Tem./Hum./Pressure:	24.1°C/52.3%/101kPa
Remark:	3m chamber



Critical_Freqs

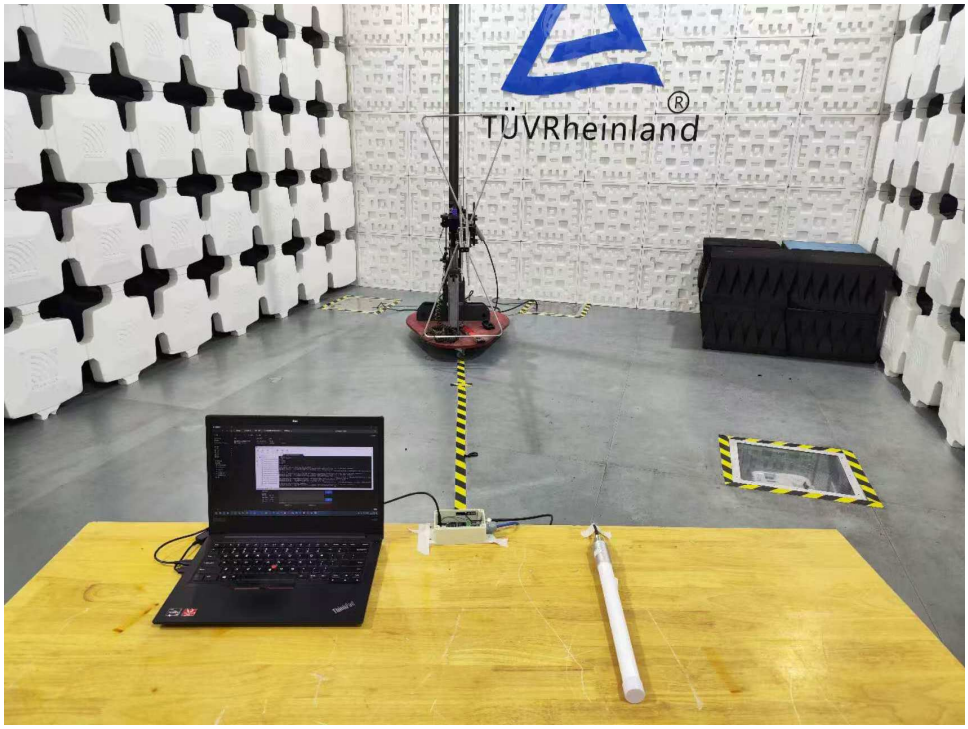
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1118.500000	---	54.00	24.63	100.0	V	277.0	-9.9
1118.500000	31.71	74.00	42.29	100.0	V	277.0	-9.9
1773.000000	---	54.00	19.83	100.0	V	272.0	-7.4
1773.000000	34.75	74.00	39.25	100.0	V	272.0	-7.4
2201.000000	---	54.00	18.67	100.0	V	46.0	-5.7
2201.000000	37.50	74.00	36.50	100.0	V	46.0	-5.7
2566.500000	37.19	74.00	36.81	100.0	V	110.0	-4.3
2566.500000	---	54.00	19.11	100.0	V	110.0	-4.3
3297.500000	---	54.00	16.59	100.0	V	212.0	-1.8
3297.500000	38.73	74.00	35.27	100.0	V	212.0	-1.8
4072.000000	39.58	74.00	34.42	100.0	V	196.0	-0.2
4072.000000	---	54.00	15.63	100.0	V	196.0	-0.2

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---		---	---

Appendix B: Photographs of the Test Set-Up Photos

Photograph 1: Set-up for Radiated Emissions, below 1GHz



Photograph 2: Set-up for Radiated Emissions, above 1GHz