Prüfbericht-Nr.: *Test report no.:*	**CN24HZON 002**	**Auftrags-Nr.:** *Order no.:*	**168502657**
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	2024-09-03
Auftraggeber: *Client:*	**Shenzhen RAKwireless Technology Co.,Ltd.** Room 506, Building B, New Compark, Pingshan First Road, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China		
Prüfgegenstand: *Test item:*	WisDuo LPWAN+BLE Module		
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	RAK11720 (Trademark: RAK)		
Auftrags-Inhalt: *Order content:*	FCC CIIPC and IC C4PC		
Prüfgrundlage: *Test specification:*	CFR47 FCC Part 15: Subpart C Section 15.247 RSS-247 Issue 3 August 2023 RSS-Gen Issue 5 February 2021		
Wareneingangsdatum: *Date of sample receipt:*	2024-10-17	Please refer to photo documents	
Prüfmuster-Nr.: *Test sample no.:*	A003836239-006		
Prüfzeitraum: *Testing period:*	2024-10-17 – 2024-11-21		
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:*	X Hardy Suo	**genehmigt von:** *authorized by:*	X Lin Lin
Datum: *Date:* 2025-02-13		**Ausstellungsdatum:** *Issue date:* 2025-02-13	
Stellung / Position	Sachverständige(r)/Expert	**Stellung** / Position	Sachverständige(r)/Expert

Sonstiges / *Other:*

FCC ID: 2AF6B-RAK11720

IC: 25908-RAK11720, HVIN: RAK11720, FVIN: RUI_3.5.2+user_final.hex, HMN: MOD-C1-LORA-900

This report is for FCC CIIPC and ISED C4PC as changed transmit antennas and will be installed into HOST LoRa communication expansion module (M/N: MOD-C1-LORA-900), radiated spurious emissions was re-performed.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *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.*
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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. *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

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 RADIATED SPURIOUS EMISSION
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 Results.

Appendix B: Photographs of the Test Set-up.

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 Certificate Number: 5162.01

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Unwanted Emission Testing (TS9975)					
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. Date**	**Cal. until**
EMI Test Receiver	R&S	ESR 7	102021	2024-09-29	2025-09-28
Signal Analyzer	R&S	FSV 40	101439	2024-09-29	2025-09-28
System Controller Interface	R&S	SCI-100	S10010038	N/A	N/A
Filterbank	R&S	Wlan	100759	2024-09-29	2025-09-28
OSP	R&S	OSP 120	102040	N/A	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2024-09-29	2025-09-28
Amplifier	R&S	SCU-18F	180070	2024-09-29	2025-09-28
Amplifier	R&S	SCU40A	100475	2024-09-29	2025-09-28
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2024-09-28	2025-09-27
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2024-09-28	2025-09-27
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	2024-09-28	2025-09-27
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2024-09-28	2025-09-27
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	2024-09-14	2027-09-13

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 (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
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 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 EUT is a WisBlock LPWAN Module which supports Lora and Bluetooth Low Energy technologies.

Previous Antenna information:

For LoRa:

Antenna #	Model	Antenna Gain	Antenna Type	Connector Type
1#	RAKARJ14	2.3 dBi	Dipole Antenna	RP-SMA connector
2#	RAKARJ16	2.3 dBi	Dipole Antenna	RP-SMA connector

Note:
1. When connecting to the module, all antennas listed above need to transfer to an IPEX connector.
2. Antennas 1# and 2# have the same type and similar in-band and out-of-band characteristics and only the color of enclosure different, they are considered as equivalent antennas. Thus, the antenna 1# was selected to be tested.

For BLE:

Antenna #	Model	Antenna Gain	Antenna Type	Connector Type
1#	R S2B1BH2A1B01000	3.12 dBi	PCB Layout Antenna	IPEX connector

Current Antenna information:
LoRa: a new dipole fiberglass antenna with 3dBi
BLE: N/A.

This report is for FCC CIIPC and ISED C4PC as changed transmit antennas and will be installed into HOST LoRa communication expansion module (M/N: MOD-C1-LORA-900) and disabled BLE function via software, radiated spurious emissions for LoRa re-performed.

Configuration 1:

Data Rate	SF (Spreading factor)	Operating Frequency
0	LoRa Modulation: SF10 / Bandwidth 125 kHz	915.1 – 927.7 MHz
1	LoRa Modulation: SF9 / Bandwidth 125 kHz	
2	LoRa Modulation: SF8 / Bandwidth 125 kHz	
3	LoRa Modulation: SF7 / Bandwidth 125 kHz	
4	LoRa Modulation: SF8 / Bandwidth 500 kHz	915.8 – 927.0 MHz

Configuration 2:

Data Rate	SF (Spreading factor)	Operating Frequency
0	LoRa Modulation: SF12 / Bandwidth 500 kHz	902.5 – 927.1 MHz
1	LoRa Modulation: SF11 / Bandwidth 500 kHz	
2	LoRa Modulation: SF10 / Bandwidth 500 kHz	
3	LoRa Modulation: SF9 / Bandwidth 500 kHz	
4	LoRa Modulation: SF8 / Bandwidth 500 kHz	
6	LoRa Modulation: SF7 / Bandwidth 500 kH5	

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	WisDuo LPWAN+BLE Module
Type Designation	RAK11720
FCC ID	2AF6B-RAK11720
IC	25908-RAK11720
HVIN	RAK11720
FVIN	RUI_3.5.2+user_final.hex
HMN	MOD-C1-LORA-900
Operating Voltage	DC 5V
Technical Specification of Lora DTS	
Operating Frequency	915.8 – 927.0 MHz 902.5 – 927.1 MHz
Type of Modulation	Lora
Data Rate	SF8 / DR4 for 903 – 914.2 MHz and 915.8 – 927.0 MHz SF7-SF12 / DR0 to DR5 for 902.5 – 927.1 MHz
Channel Number	8 channels for 915.8 – 927.0 MHz 43 channels for 902.5 – 927.1 MHz
Channel Separation	1.6 MHz
Occupied Bandwidth	500 kHz
Antenna Number:	1
Antenna Gain and Type:	Dipole fiberglass antenna with 3dBi
Technical Specification of Lora FHSS	
Frequency Range	915.1 – 927.7 MHz
Type of Modulation	Lora
Data Rate	SF7 to SF10 / DR0 to DR3
Channel Number	64 channels (Upstream)
Channel Separation	200 KHz
Occupied Bandwidth	125 KHz
Antenna Number:	1
Antenna Gain and Type:	Dipole fiberglass antenna with 3dBi

Table 3: RF Channel and Frequency of Lora DTS (915.8 – 927.0 MHz)

RF Channel	Center Frequency (MHz)	Occupied Bandwidth (KHz)	Channel Separation(KHz)	Modulation
0	915.80	500(SF8)	1600	LoRa:CSS
1	917.40	500(SF8)	1600	LoRa:CSS
2	919.00	500(SF8)	1600	LoRa:CSS
3	920.60	500(SF8)	1600	LoRa:CSS
4	922.20	500(SF8)	1600	LoRa:CSS
5	923.80	500(SF8)	1600	LoRa:CSS
6	925.40	500(SF8)	1600	LoRa:CSS
7	927.00	500(SF8)	1600	LoRa:CSS

Table 4: RF Channel and Frequency of Lora DTS (902.5 – 927.1 MHz)

RF Channel	Center Frequency (MHz)	Occupied Bandwidth (KHz)	Channel Separation(KHz)	Modulation
0	902.50	500	600	LoRa:CSS
1	903.10	500	600	LoRa:CSS
2	903.70	500	600	LoRa:CSS
3	904.30	500	600	LoRa:CSS
4	904.90	500	600	LoRa:CSS
5	905.50	500	600	LoRa:CSS
6	906.10	500	600	LoRa:CSS
7	906.70	500	600	LoRa:CSS
8	907.30	500	600	LoRa:CSS
9	907.90	500	600	LoRa:CSS
10	908.50	500	600	LoRa:CSS
11	909.10	500	600	LoRa:CSS
12	909.70	500	600	LoRa:CSS
13	910.30	500	600	LoRa:CSS
14	910.90	500	600	LoRa:CSS
15	911.50	500	600	LoRa:CSS
16	912.10	500	600	LoRa:CSS
17	912.70	500	600	LoRa:CSS
18	913.30	500	600	LoRa:CSS
19	913.90	500	600	LoRa:CSS
20	914.50	500	600	LoRa:CSS
21	915.10	500	600	LoRa:CSS
22	915.70	500	600	LoRa:CSS
23	916.30	500	600	LoRa:CSS
24	916.90	500	600	LoRa:CSS
25	917.50	500	600	LoRa:CSS
26	918.10	500	600	LoRa:CSS
27	918.70	500	600	LoRa:CSS
28	919.30	500	600	LoRa:CSS
29	919.90	500	600	LoRa:CSS
30	920.50	500	600	LoRa:CSS
31	921.10	500	600	LoRa:CSS
32	921.70	500	600	LoRa:CSS
33	922.30	500	600	LoRa:CSS
34	922.90	500	600	LoRa:CSS
35	923.50	500	600	LoRa:CSS
36	924.10	500	600	LoRa:CSS
37	924.70	500	600	LoRa:CSS
38	925.30	500	600	LoRa:CSS
39	925.90	500	600	LoRa:CSS
40	926.50	500	600	LoRa:CSS
41	927.10	500	600	LoRa:CSS
42	927.70	500	600	LoRa:CSS

Table 5: RF Channel and Frequency of Lora FHSS

RF Channel	Center Frequency (MHz)	Occupied Bandwidth (KHz)	Channel Separation(KHz)	Modulation
0	915.10	125(SF7~SF10)	200	LoRa:CSS
1	915.30	125(SF7~SF10)	200	LoRa:CSS

2	915.50	125(SF7~SF10)	200	LoRa:CSS
3	915.70	125(SF7~SF10)	200	LoRa:CSS
4	915.90	125(SF7~SF10)	200	LoRa:CSS
5	916.10	125(SF7~SF10)	200	LoRa:CSS
6	916.30	125(SF7~SF10)	200	LoRa:CSS
7	916.50	125(SF7~SF10)	200	LoRa:CSS
8	916.70	125(SF7~SF10)	200	LoRa:CSS
9	916.90	125(SF7~SF10)	200	LoRa:CSS
10	917.10	125(SF7~SF10)	200	LoRa:CSS
11	917.30	125(SF7~SF10)	200	LoRa:CSS
12	917.50	125(SF7~SF10)	200	LoRa:CSS
13	917.70	125(SF7~SF10)	200	LoRa:CSS
14	917.90	125(SF7~SF10)	200	LoRa:CSS
15	918.10	125(SF7~SF10)	200	LoRa:CSS
16	918.30	125(SF7~SF10)	200	LoRa:CSS
17	918.50	125(SF7~SF10)	200	LoRa:CSS
18	918.70	125(SF7~SF10)	200	LoRa:CSS
19	918.90	125(SF7~SF10)	200	LoRa:CSS
20	919.10	125(SF7~SF10)	200	LoRa:CSS
21	919.30	125(SF7~SF10)	200	LoRa:CSS
22	919.50	125(SF7~SF10)	200	LoRa:CSS
23	919.70	125(SF7~SF10)	200	LoRa:CSS
24	919.90	125(SF7~SF10)	200	LoRa:CSS
25	920.10	125(SF7~SF10)	200	LoRa:CSS
26	920.30	125(SF7~SF10)	200	LoRa:CSS
27	920.50	125(SF7~SF10)	200	LoRa:CSS
28	920.70	125(SF7~SF10)	200	LoRa:CSS
29	920.90	125(SF7~SF10)	200	LoRa:CSS
30	921.10	125(SF7~SF10)	200	LoRa:CSS
31	921.30	125(SF7~SF10)	200	LoRa:CSS
32	921.50	125(SF7~SF10)	200	LoRa:CSS
33	921.70	125(SF7~SF10)	200	LoRa:CSS
34	921.90	125(SF7~SF10)	200	LoRa:CSS
35	922.10	125(SF7~SF10)	200	LoRa:CSS
36	922.30	125(SF7~SF10)	200	LoRa:CSS
37	922.50	125(SF7~SF10)	200	LoRa:CSS
38	922.70	125(SF7~SF10)	200	LoRa:CSS
39	922.90	125(SF7~SF10)	200	LoRa:CSS
40	923.10	125(SF7~SF10)	200	LoRa:CSS
41	923.30	125(SF7~SF10)	200	LoRa:CSS
42	923.50	125(SF7~SF10)	200	LoRa:CSS
43	923.70	125(SF7~SF10)	200	LoRa:CSS
44	923.90	125(SF7~SF10)	200	LoRa:CSS
45	924.10	125(SF7~SF10)	200	LoRa:CSS
46	924.30	125(SF7~SF10)	200	LoRa:CSS
47	924.50	125(SF7~SF10)	200	LoRa:CSS
48	924.70	125(SF7~SF10)	200	LoRa:CSS
49	924.90	125(SF7~SF10)	200	LoRa:CSS
50	925.10	125(SF7~SF10)	200	LoRa:CSS
51	925.30	125(SF7~SF10)	200	LoRa:CSS
52	925.50	125(SF7~SF10)	200	LoRa:CSS

53	925.70	125(SF7~SF10)	200	LoRa:CSS
54	925.90	125(SF7~SF10)	200	LoRa:CSS
55	926.10	125(SF7~SF10)	200	LoRa:CSS
56	926.30	125(SF7~SF10)	200	LoRa:CSS
57	926.50	125(SF7~SF10)	200	LoRa:CSS
58	926.70	125(SF7~SF10)	200	LoRa:CSS
59	926.90	125(SF7~SF10)	200	LoRa:CSS
60	927.10	125(SF7~SF10)	200	LoRa:CSS
61	927.30	125(SF7~SF10)	200	LoRa:CSS
62	927.50	125(SF7~SF10)	200	LoRa:CSS
63	927.70	125(SF7~SF10)	200	LoRa:CSS

3.3 Independent Operation Modes

The basic operation modes are:

A. On, Lora transmitting mode (DTS)

B. On, Lora transmitting mode (FHSS)

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- ID Label and Location Info
- User Manual

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 and ANSI C63.4: 2014.
According to clause 3.1, all tests were performed on WisDuo LPWAN+BLE Module RAK11720 installed into HOST LoRa communication expansion module (M/N: MOD-C1-LORA-900) in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 6: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N
PC	Lenovo	T14	/

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 30MHz)

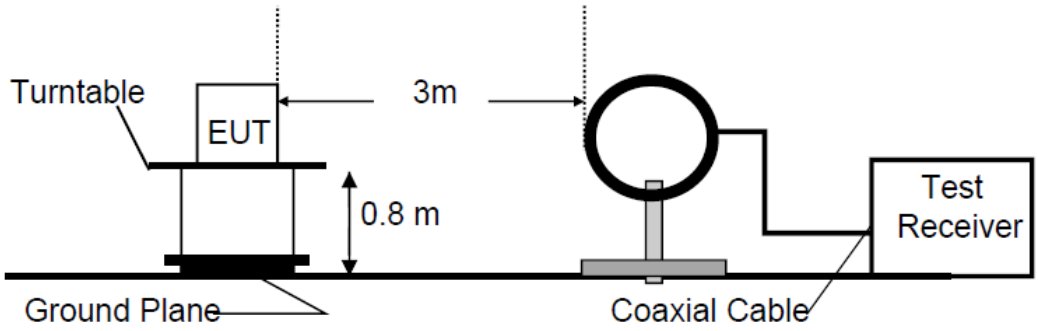


Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

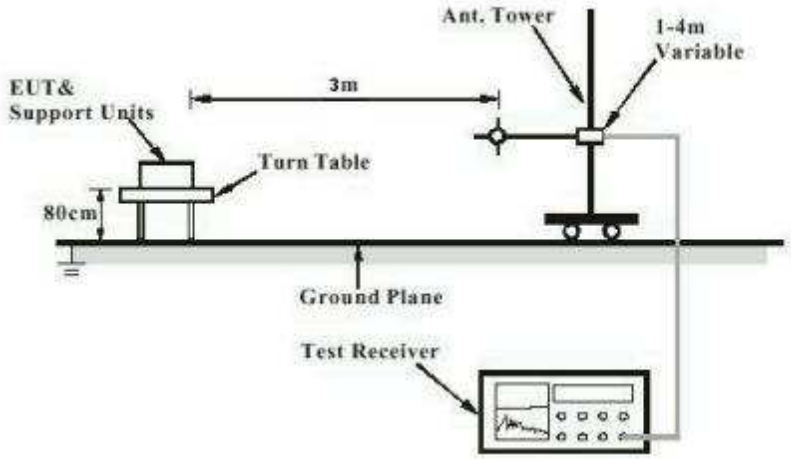


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

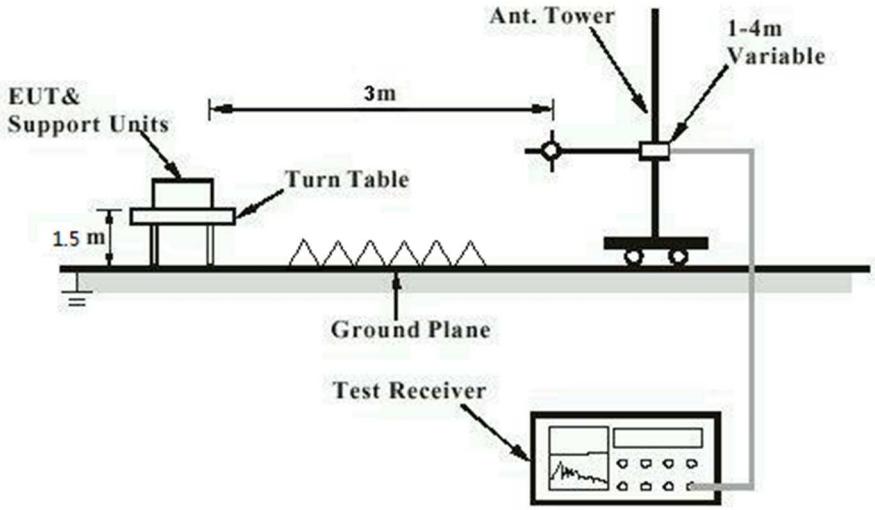
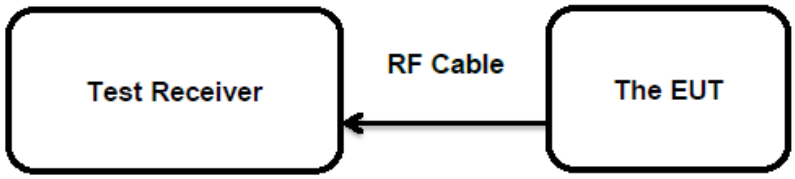


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 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

According to the manufacturer declared, the EUT has an external antenna, the maximum directional gain of antenna is 3dBi, and the antenna connector is designed with 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.

5.1.2 Radiated Spurious Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(d) & FCC Part 15.205 RSS-247 Clause 3.3
Basic standard	:	ANSI C63.10: 2013
Limits	:	Refer to 15.209(a) of FCC part 15.247(d)
Kind of test site	:	3m Semi-anechoic Chamber

Test Setup

Date of testing	:	2024-10-17 – 2024-11-21
Input voltage	:	DC 5V
Operation mode	:	A, B
Test channel	:	Low / Mid / 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.

6 Photographs of the Test Set-Up

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

7 List of Tables

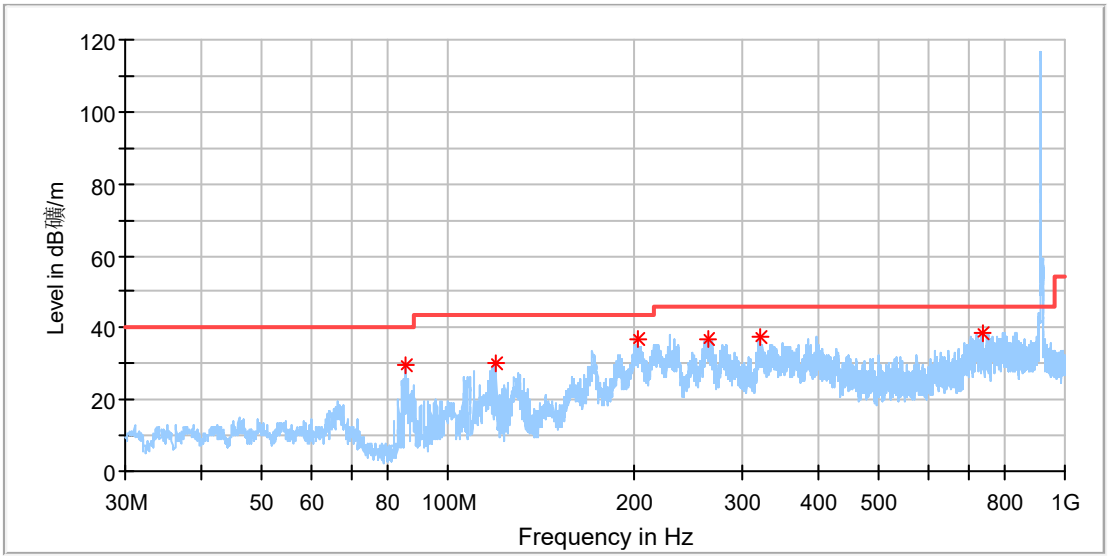
Appendix A: Test Results

Note 1: Testing was carried out within frequency range 9 kHz to the tenth harmonics. The measurement results below 30MHz and above 18GHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 18GHz were reported.

Appendix A.1: Test Results of Radiated Spurious Emissions

EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_915.8MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
85.401923	29.33	40.00	10.67	100.0	H	104.0	-22.4
119.463846	30.15	43.50	13.35	100.0	H	46.0	-20.8
203.630000	36.62	43.50	6.88	100.0	H	327.0	-19.0
263.770000	37.01	46.00	8.99	100.0	H	46.0	-17.1
321.820769	37.16	46.00	8.84	100.0	H	89.0	-15.6
734.742308	38.70	46.00	7.30	100.0	H	272.0	-7.3

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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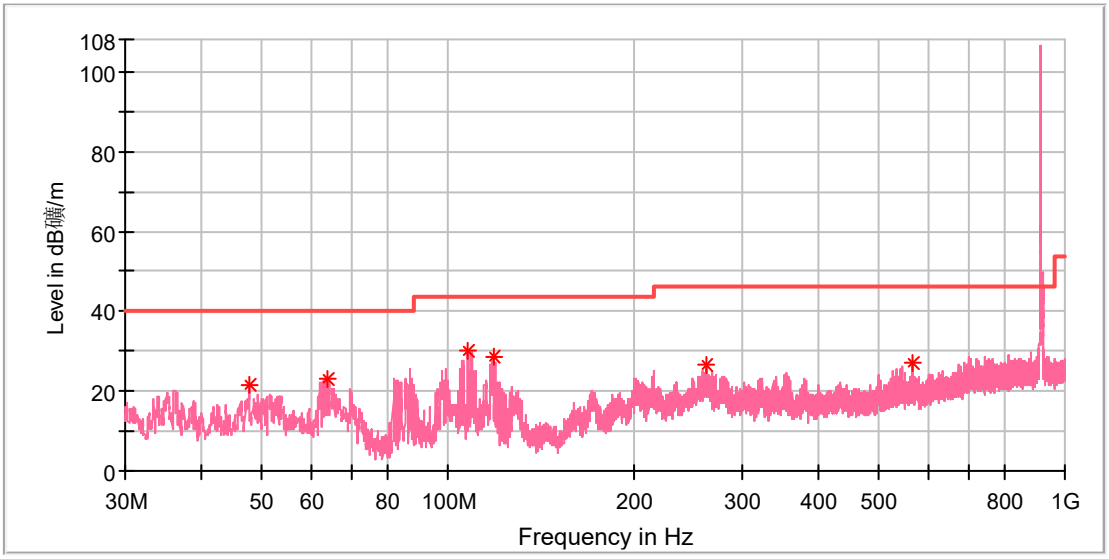
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_915.8MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
47.646539	21.53	40.00	18.47	100.0	V	41.0	-18.5
63.838077	23.23	40.00	16.77	100.0	V	213.0	-20.0
107.711923	29.95	43.50	13.55	100.0	V	170.0	-19.1
118.381923	28.72	43.50	14.78	100.0	V	145.0	-20.5
261.643462	26.48	46.00	19.52	100.0	V	120.0	-17.1
564.693846	27.35	46.00	18.65	100.0	V	34.0	-10.5

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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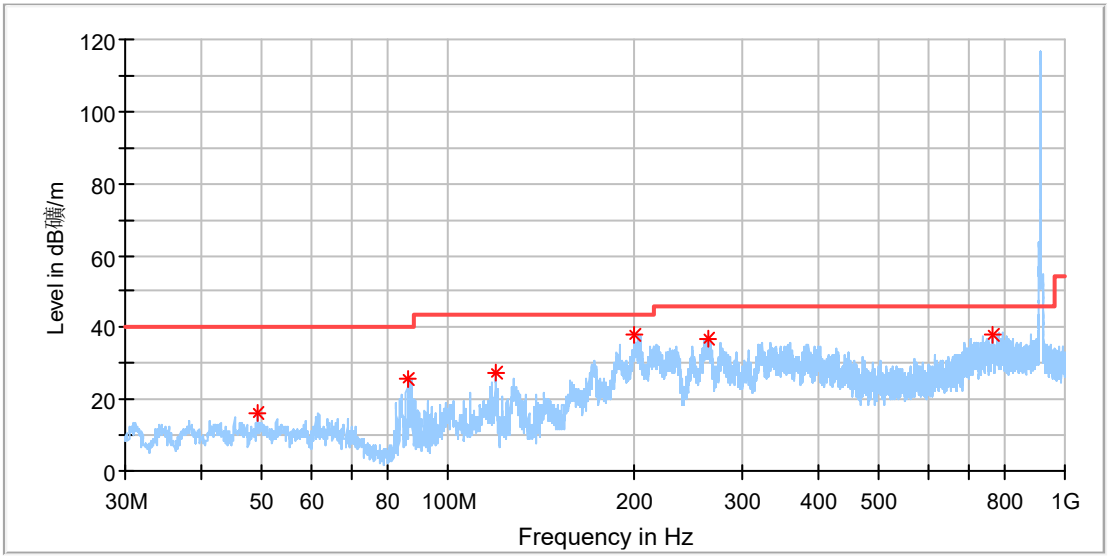
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_SF7_914.5MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
49.064231	16.16	40.00	23.84	100.0	H	316.0	-18.4
86.409231	25.82	40.00	14.18	100.0	H	282.0	-22.1
119.501154	27.61	43.50	15.89	100.0	H	44.0	-20.8
200.309615	37.70	43.50	5.80	100.0	H	210.0	-19.1
263.695385	37.05	46.00	8.95	100.0	H	53.0	-17.1
763.730385	37.94	46.00	8.06	100.0	H	236.0	-6.8

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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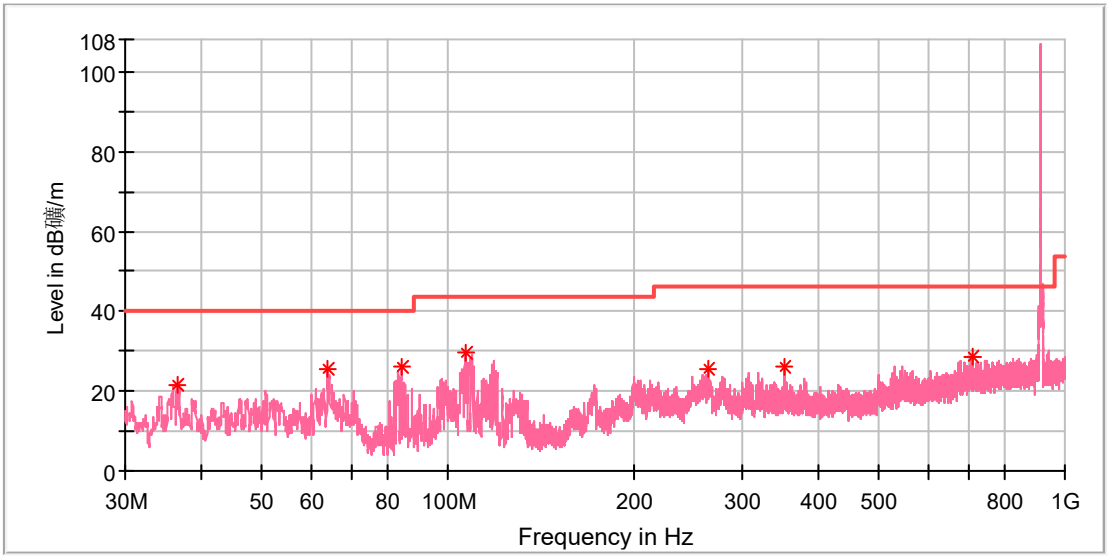
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_SF7_914.5MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
36.305000	21.73	40.00	18.27	100.0	V	58.0	-21.5
63.838077	25.40	40.00	14.60	100.0	V	318.0	-20.0
83.984231	25.91	40.00	14.09	100.0	V	335.0	-22.7
106.630000	29.58	43.50	13.92	100.0	V	150.0	-19.0
265.113077	25.72	46.00	20.28	100.0	V	150.0	-17.0
352.114615	26.03	46.00	19.97	100.0	V	115.0	-14.8
708.291154	28.57	46.00	17.43	100.0	V	197.0	-7.8

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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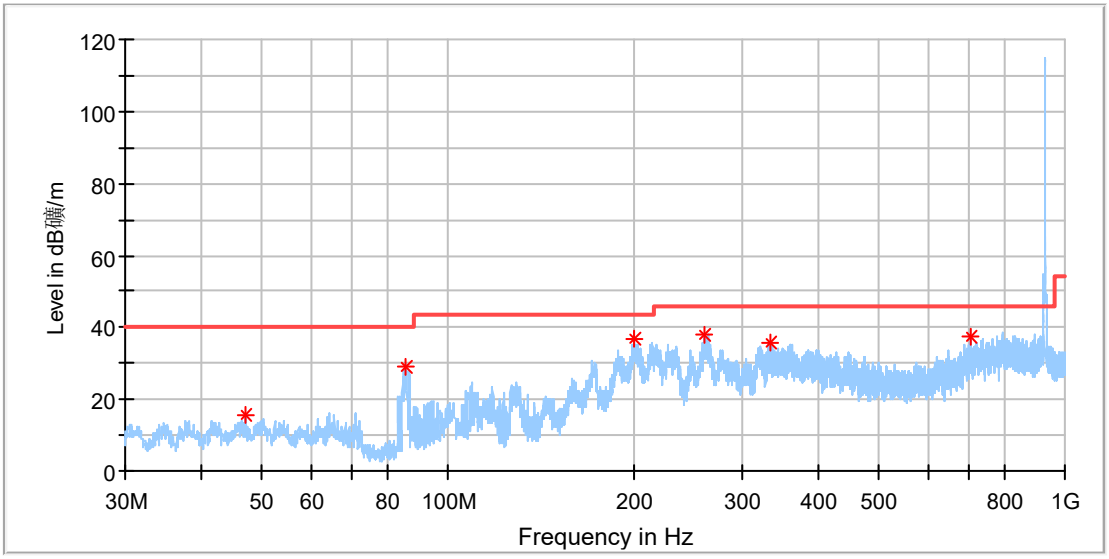
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora FHSS SF7_927.7MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
46.975000	15.52	40.00	24.48	100.0	H	330.0	-18.6
85.551154	29.28	40.00	10.72	100.0	H	114.0	-22.3
200.906539	36.90	43.50	6.60	100.0	H	210.0	-19.1
261.046539	37.70	46.00	8.30	100.0	H	233.0	-17.1
333.721923	35.93	46.00	10.07	100.0	H	76.0	-15.2
705.045385	37.36	46.00	8.64	100.0	H	241.0	-7.8

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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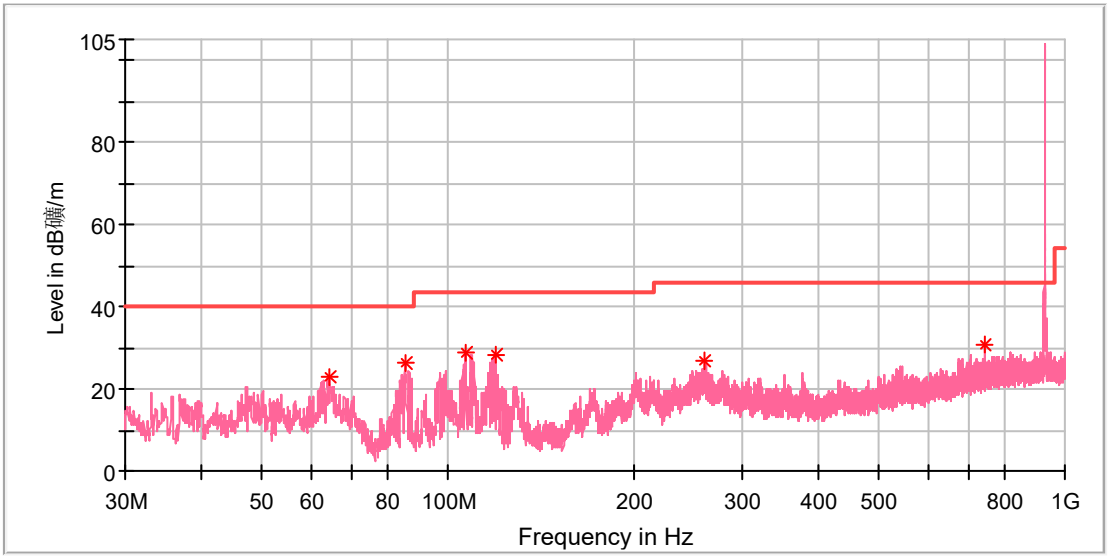
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora FHSS SF7_927.7MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
64.173846	23.06	40.00	16.94	100.0	V	209.0	-20.0
85.178077	26.23	40.00	13.77	100.0	V	160.0	-22.5
107.115000	28.84	43.50	14.66	100.0	V	274.0	-19.0
119.202692	28.39	43.50	15.11	100.0	V	153.0	-20.7
261.270385	26.77	46.00	19.23	100.0	V	112.0	-17.1
742.502308	30.75	46.00	15.25	100.0	V	29.0	-7.2

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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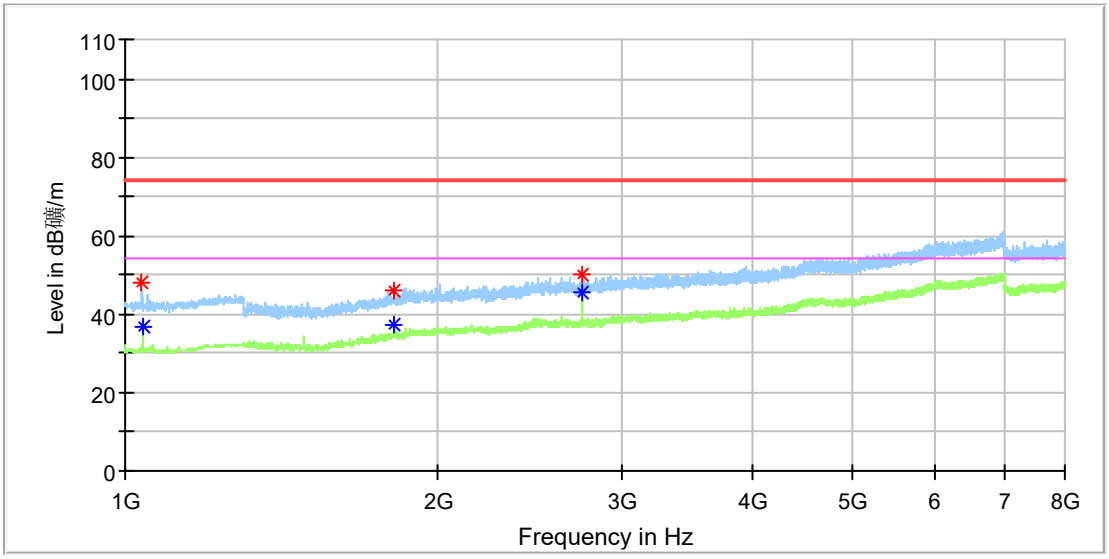
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_915.8MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1038.000000	48.25	---	74.00	25.75	150.0	H	94.0	0.5
1039.000000	---	36.64	54.00	17.36	150.0	H	256.0	0.5
1811.991667	45.97	---	74.00	28.03	150.0	H	152.0	6.3
1812.550000	---	37.31	54.00	16.69	150.0	H	116.0	6.3
2747.200000	50.22	---	74.00	23.78	150.0	H	0.0	9.3
2747.200000	---	45.35	54.00	8.65	150.0	H	0.0	9.3

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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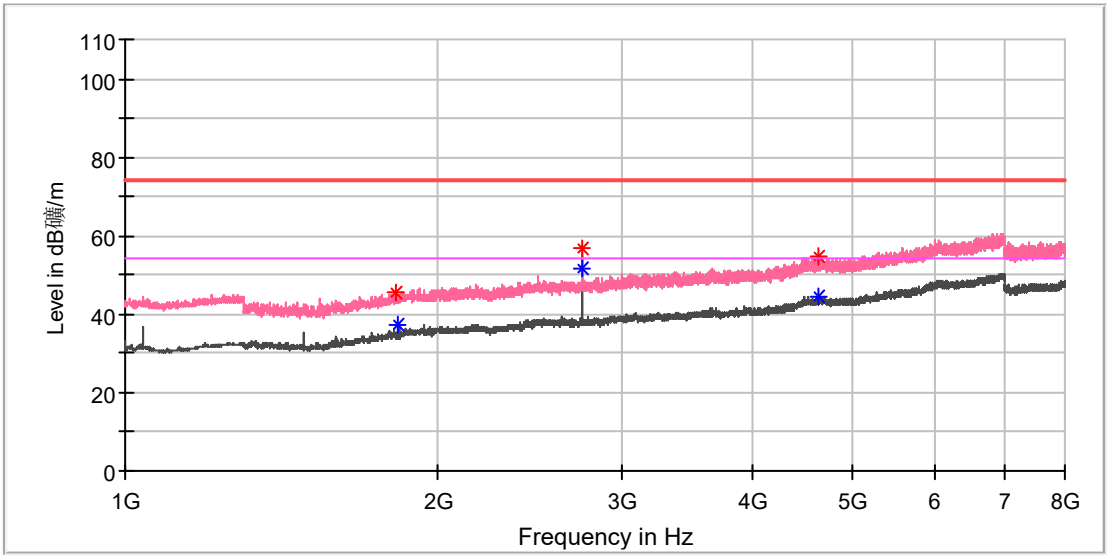
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_915.8MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1818.133333	45.65	---	74.00	28.35	150.0	V	184.0	6.3
1831.533333	---	37.30	54.00	16.70	150.0	V	314.0	6.4
2747.200000	---	51.92	54.00	2.08	150.0	V	224.0	9.3
2747.200000	56.56	---	74.00	17.44	150.0	V	224.0	9.3
4628.783333	---	44.43	54.00	9.57	150.0	V	103.0	13.5
4647.208333	54.54	---	74.00	19.46	150.0	V	314.0	13.5

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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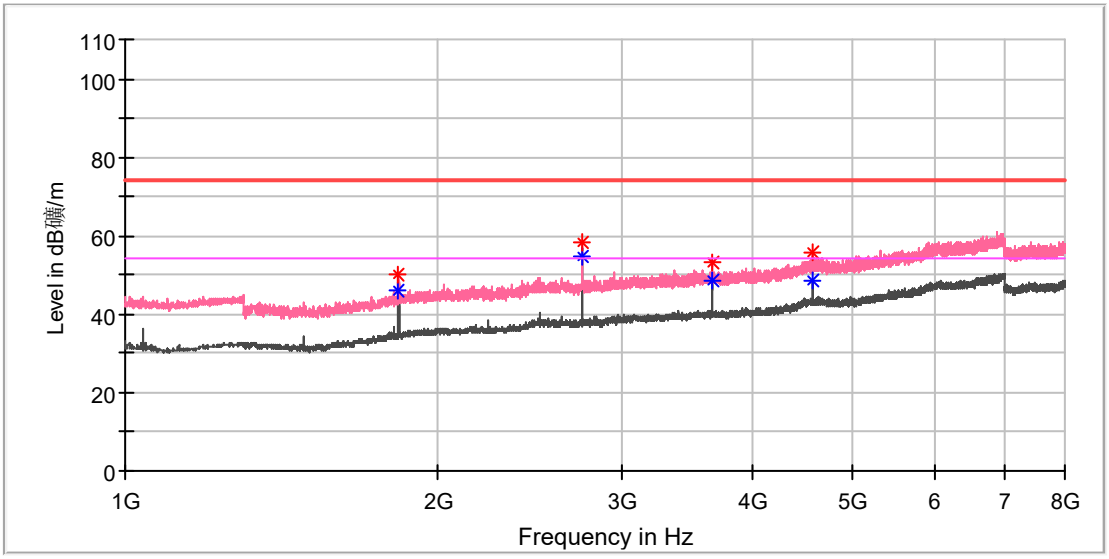
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_915.8MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1830.975000	50.22	---	74.00	23.78	150.0	V	127.0	6.4
1830.975000	---	46.06	54.00	7.94	150.0	V	127.0	6.4
2746.641667	---	54.72	54.00	-0.72	150.0	V	39.0	9.3
2747.200000	58.07	---	74.00	15.93	150.0	V	39.0	9.3
3661.750000	53.43	---	74.00	20.57	150.0	V	56.0	11.0
3662.308333	---	48.81	54.00	5.19	150.0	V	56.0	11.0
4578.533333	55.85	---	74.00	18.15	150.0	V	4.0	13.5
4579.650000	---	48.63	54.00	5.37	150.0	V	31.0	13.5

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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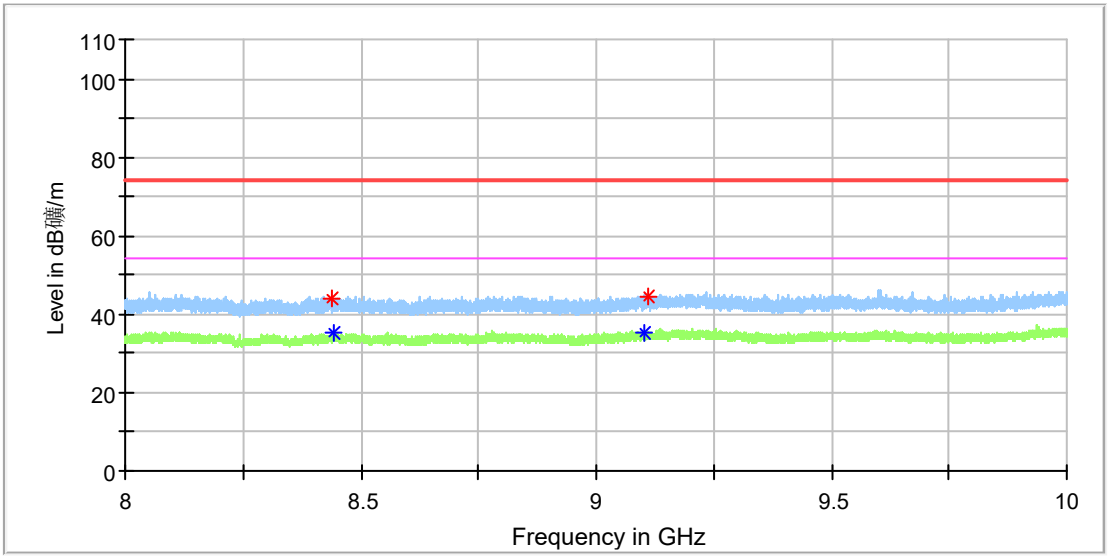
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_915.8MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8437.600000	44.15	---	74.00	29.85	150.0	H	0.0	9.3
8442.300000	---	35.12	54.00	18.88	150.0	H	225.0	9.2
9104.100000	---	35.41	54.00	18.59	150.0	H	168.0	10.0
9112.000000	44.63	---	74.00	29.37	150.0	H	282.0	10.1

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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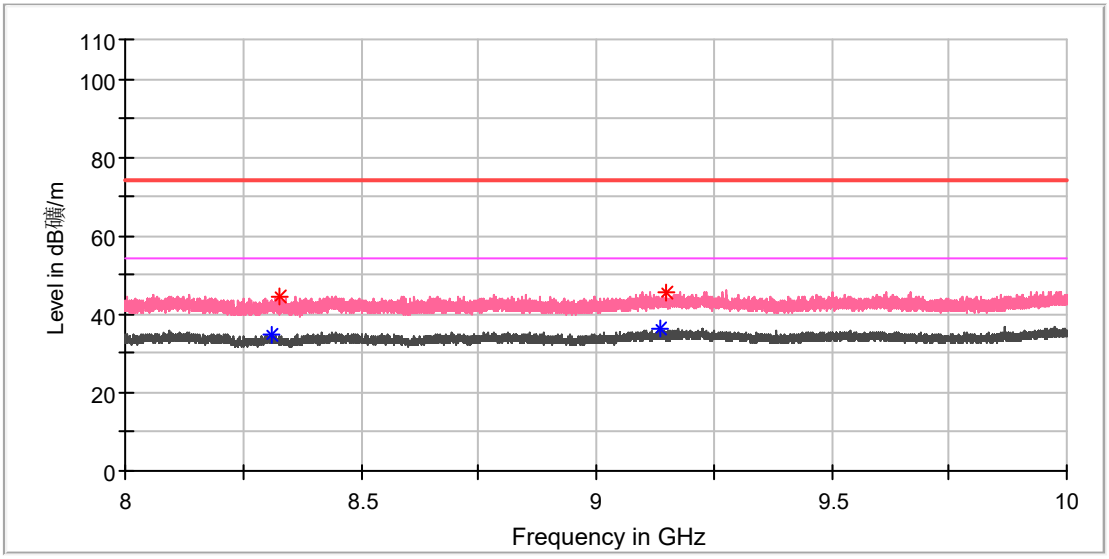
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_915.8MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8309.600000	---	34.90	54.00	19.10	150.0	V	186.0	8.8
8328.500000	44.75	---	74.00	29.25	150.0	V	121.0	8.8
9137.200000	---	36.13	54.00	17.87	150.0	V	168.0	10.3
9150.700000	45.44	---	74.00	28.56	150.0	V	237.0	10.4

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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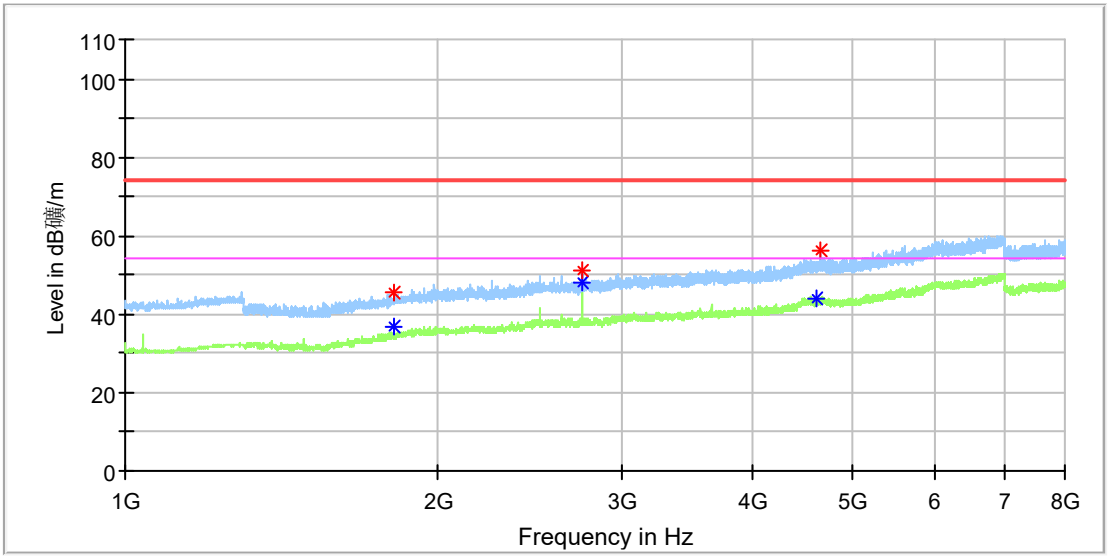
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_SF7_914.5MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1812.550000	45.29	---	74.00	28.71	150.0	H	332.0	6.3
1812.550000	---	37.02	54.00	16.98	150.0	H	332.0	6.3
2743.850000	---	47.87	54.00	6.13	150.0	H	18.0	9.3
2744.408333	50.91	---	74.00	23.09	150.0	H	18.0	9.3
4618.175000	---	44.06	54.00	9.94	150.0	H	244.0	13.5
4667.308333	56.11	---	74.00	17.89	150.0	H	234.0	13.5

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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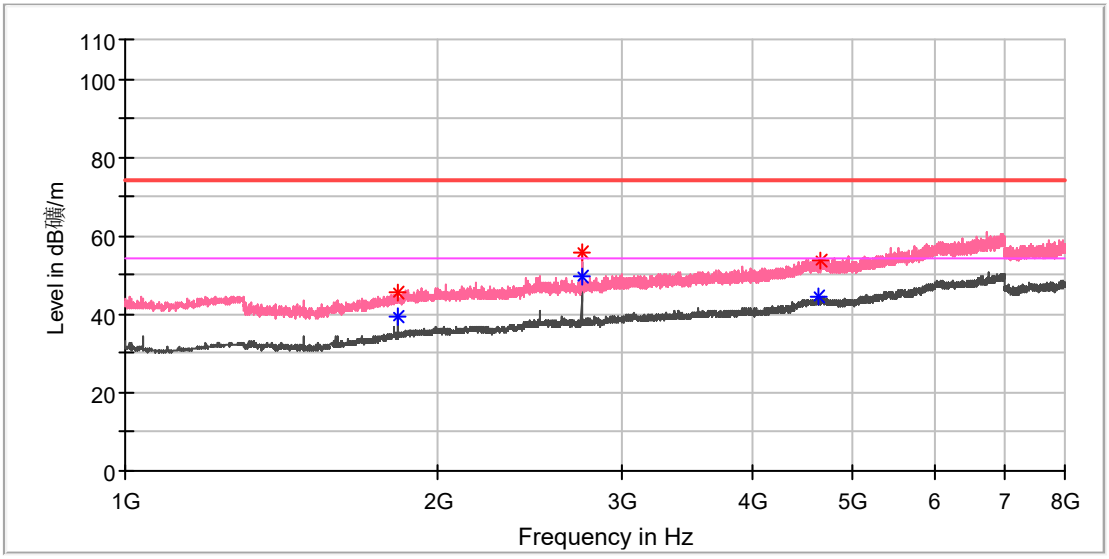
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_SF7_914.5MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1828.741667	45.37	---	74.00	28.63	150.0	V	39.0	6.4
1828.741667	---	39.26	54.00	14.74	150.0	V	39.0	6.4
2742.733333	---	49.51	54.00	4.49	150.0	V	29.0	9.3
2743.850000	55.84	---	74.00	18.16	150.0	V	6.0	9.3
4639.391667	---	44.28	54.00	9.72	150.0	V	351.0	13.5
4658.933333	53.73	---	74.00	20.27	150.0	V	203.0	13.5

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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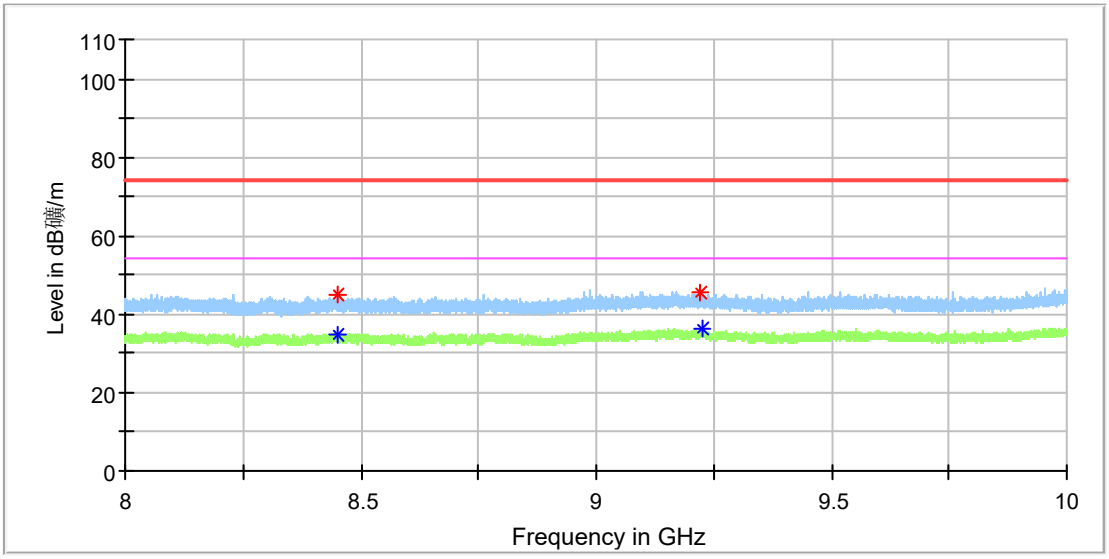
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_SF7_914.5MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8451.500000	---	34.94	54.00	19.06	150.0	H	212.0	9.2
8451.900000	44.86	---	74.00	29.14	150.0	H	1.0	9.2
9222.800000	45.38	---	74.00	28.62	150.0	H	45.0	10.7
9226.600000	---	36.17	54.00	17.83	150.0	H	193.0	10.7

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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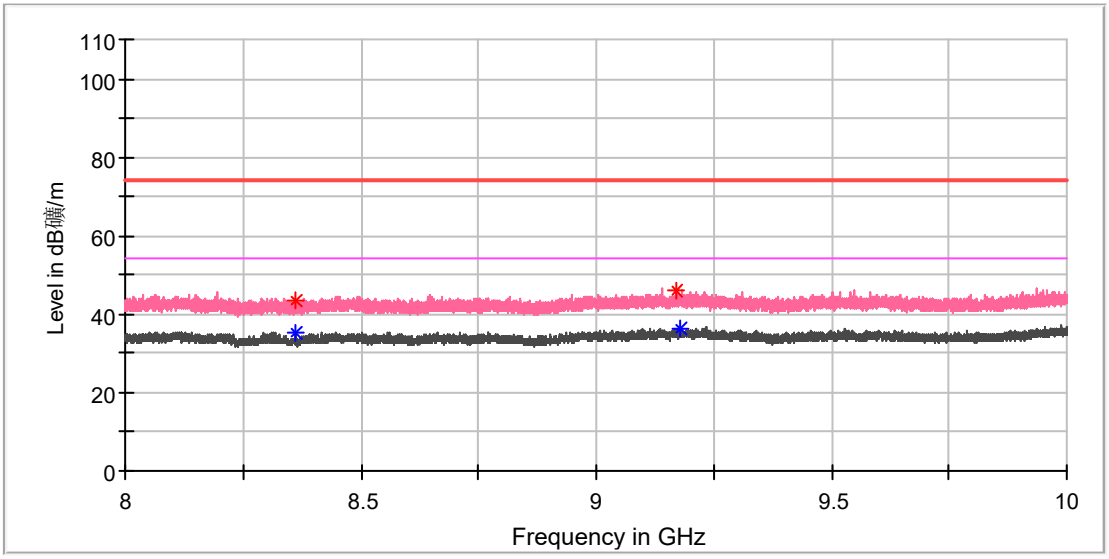
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora DTS_SF7_914.5MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8361.900000	43.54	---	74.00	30.46	150.0	V	271.0	8.9
8362.900000	---	35.25	54.00	18.75	150.0	V	192.0	8.9
9169.500000	46.11	---	74.00	27.89	150.0	V	297.0	10.5
9176.900000	---	36.47	54.00	17.53	150.0	V	348.0	10.5

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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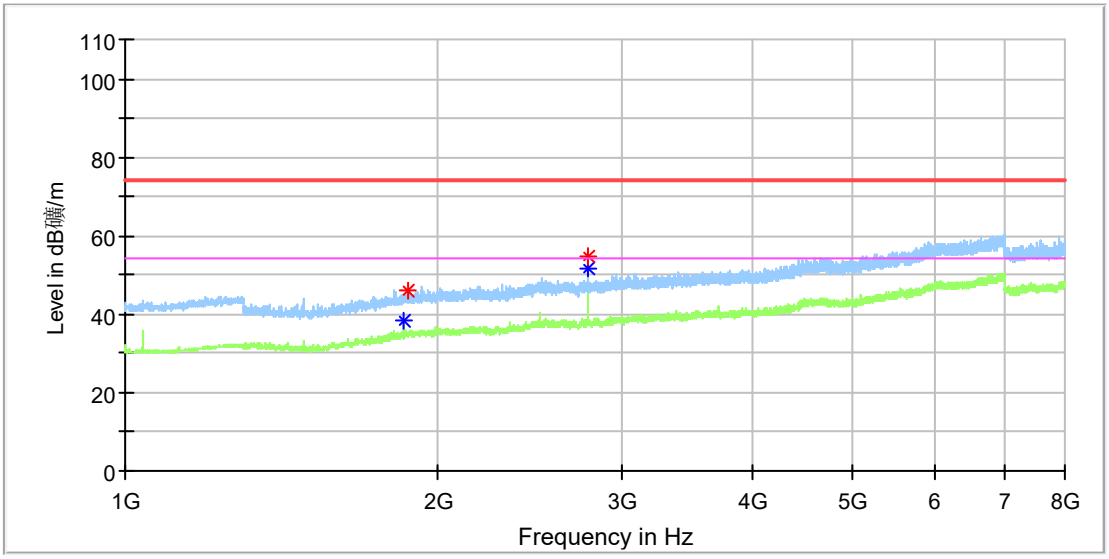
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora FHSS SF7_927.7MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1854.983333	---	38.33	54.00	15.67	150.0	H	109.0	6.5
1868.941667	46.27	---	74.00	27.73	150.0	H	119.0	6.7
2782.933333	---	51.89	54.00	2.11	150.0	H	305.0	9.4
2782.933333	54.89	---	74.00	19.11	150.0	H	305.0	9.4

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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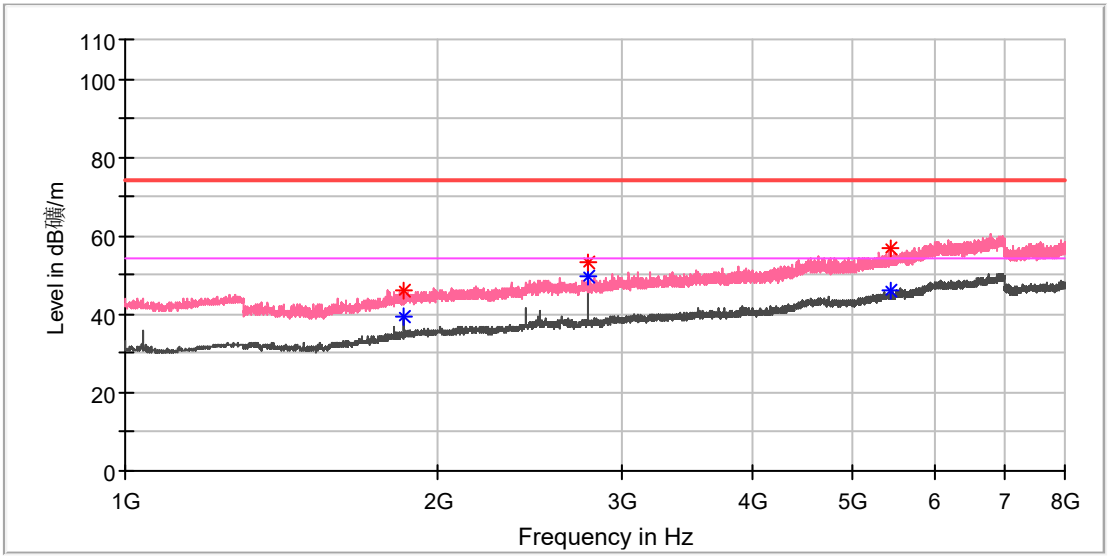
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora FHSS SF7_927.7MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1854.983333	46.09	---	74.00	27.91	150.0	V	291.0	6.5
1854.983333	---	39.36	54.00	14.64	150.0	V	291.0	6.5
2782.375000	52.96	---	74.00	21.04	150.0	V	65.0	9.4
2782.933333	---	49.62	54.00	4.38	150.0	V	184.0	9.4
5429.991667	56.63	---	74.00	17.37	150.0	V	336.0	15.0
5429.991667	---	46.14	54.00	7.86	150.0	V	336.0	15.0

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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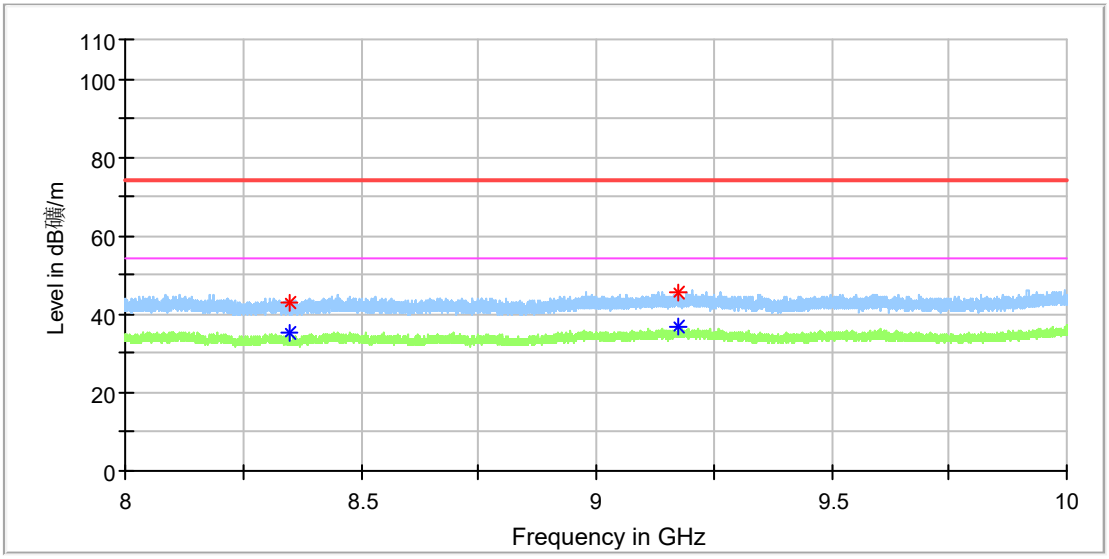
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora FHSS SF7_927.7MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8349.400000	42.93	---	74.00	31.07	150.0	H	358.0	8.9
8349.500000	---	35.23	54.00	18.77	150.0	H	358.0	8.9
9173.400000	---	36.62	54.00	17.38	150.0	H	177.0	10.5
9175.200000	45.31	---	74.00	28.69	150.0	H	286.0	10.5

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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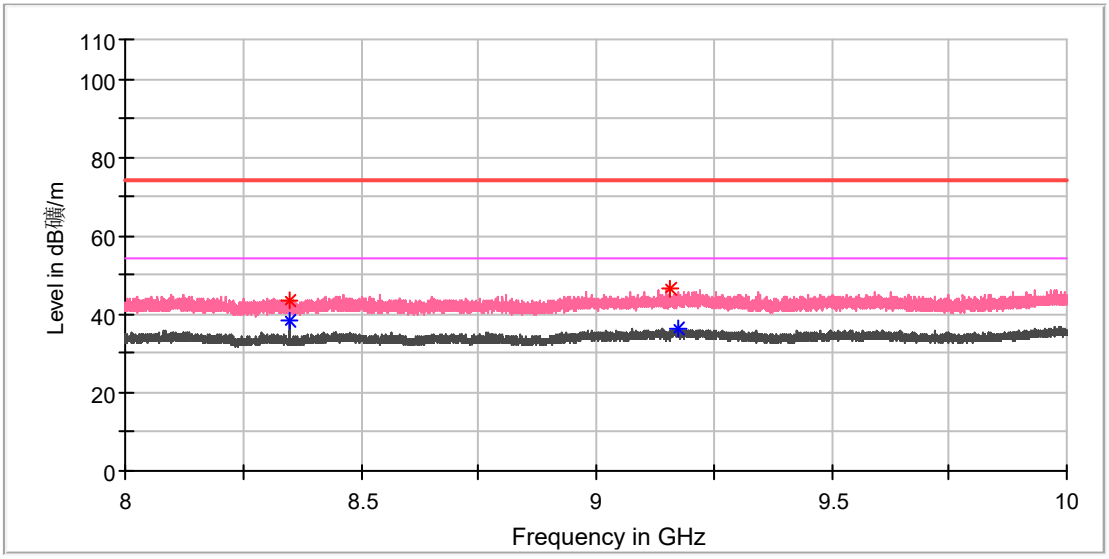
EUT Information

EUT Name:	WisDuo LPWAN+BLE Module
Model:	RAK11720
Test Mode:	Lora FHSS SF7_927.7MHz
Order No/Sample No:	168502657/A003836239-006
Test Voltage::	DC 5V
Remark:	Temp 23 Humi:53%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8349.000000	---	38.32	54.00	15.68	150.0	V	61.0	8.9
8349.000000	43.74	---	74.00	30.26	150.0	V	61.0	8.9
9159.100000	46.78	---	74.00	27.22	150.0	V	222.0	10.5
9172.600000	---	36.57	54.00	17.43	150.0	V	116.0	10.5

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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