

Prüfbericht-Nr.: <i>Test report no.:</i>	CN21UVL1 002	Auftrags-Nr.: <i>Order no.:</i>	168478710	Seite 1 von 16 <i>Page 1 of 16</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2024-04-12	
Auftraggeber: <i>Client:</i>	Shenzhen Rakwireless Technology Co., Ltd. Room 506, Bldg B, New Compark, Pingshan First Road, Taoyuan Street, XiLi town Nanshan District, Shenzhen, Guangdong, P.R. China			
Prüfgegenstand: <i>Test item:</i>	WisDuo			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	RAK3400, RAK3401			
Auftrags-Inhalt: <i>Order content:</i>	FCC and IC CIIPC test report			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.247 RSS-247 Issue 3 August 2023 RSS-Gen Issue 5 March 2019			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-04-16	Please refer to photo documents		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003697710-001			
Prüfzeitraum: <i>Testing period:</i>	2024-04-16 to 2024-04-24			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>			genehmigt von: <i>authorized by:</i>	
Datum: <i>Date:</i>	2024-04-24		Ausstellungsdatum: <i>Issue date:</i>	2024-04-24
Stellung / Position	Sachverständige(r)/Expert		Stellung / Position	Sachverständige(r)/Expert
Sonstiges / Other:	FCC ID: 2AF6B-RAK3400 IC: 25908-RAK3400, HVIN: RAK3400, RAK3401 This report based on previous test report CN21UVL1 001 issued by (TÜV Rheinland (Shenzhen) Co., Ltd.) for adding an alternative 3.4dBi PIFA antenna, spot check test on output power and spurious emissions were performed, other test data refer to previous test report CN21UVL1 001.			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged:</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
Legend:	1 = very good P(ass) = passed a.m. test specifications(s)	2 = good F(ail) = failed a.m. test specifications(s)	3 = satisfactory F(ail) = failed a.m. test specifications(s)	4 = sufficient N/A = not applicable
5 = mangelhalt N/T = nicht getestet 5 = poor N/T = not tested				
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V05

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Test report no.:

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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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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>

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

RESULT: Pass

5.1.3 RADIATED SPURIOUS EMISSION

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: Photographs of the Test Set-up

Appendix B: Test Results

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China

FCC Registration No.: 694916

IC Registration No.: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio Spectrum Testing						
Equip. No.	Description	Manufacturer	Model	Serial No.	Cali. Date	Cali. until
G1825795	Signal Analyzer	R&S	FSV 40	101441	26.07.2023	25.07.2024
G1825796	Vector Signal Generator	R&S	SMBV100A	263301	26.07.2023	25.07.2024
G1825797	Signal Generator	R&S	SMB100A	115186	26.07.2023	25.07.2024
G1825798	OSP	R&S	OSP 150	101017	14.11.2023	13.11.2024
G1825799	Control PC	DELL	OptiPlex 7050	FTJZ9P2	N/A	N/A
G1825800	Test Software	R&S	WMS32 (V11.00.00)	N/A	N/A	N/A
G1825801	Power Meter	R&S	NRP2	107105	14.11.2023	13.11.2024
G1829620	Power Sensor	R&S	NRP-Z81	105677	26.07.2023	25.07.2024
G1826483	Humid & Temp Programmable Tester	BOST	NTH090-60	19040801	01.03.2024	28.02.2025
G1826431	Shielding Room 8#	Albatross	SR8	APC17151-SR8	22.06.2021	22.06.2024
Unwanted Emission Testing						
Equip. No.	Description	Manufacturer	Model	Serial No.	Cali. Date	Cali. until
G1826021	EMI Test Receiver	R&S	ESR 7	102021	26.07.2023	25.07.2024
G1826023	Signal Analyzer	R&S	FSV 40	101439	26.07.2023	25.07.2024
G1826024	System Controller Interface	R&S	SCI-100	S10010038	N/A	N/A
G1826025	Filterbank	R&S	Wlan	100759	26.07.2023	25.07.2024
G1826026	OSP	R&S	OSP 120	102040	N/A	N/A
G1826028	Pre-amplifier	R&S	SCU08F1	08320031	26.07.2023	25.07.2024
G1826029	Amplifier	R&S	SCU-18F	180070	26.07.2023	25.07.2024
G1826030	Amplifier	R&S	SCU40A	100475	26.07.2023	25.07.2024
G1826031	Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	07.08.2022	06.08.2024
G1826032	Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	07.08.2022	06.08.2024
G1826033	Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	28.08.2022	27.08.2024
G1826034	Active Loop Antenna	Schwarzbeck	FMZB 1513	302	07.08.2022	06.08.2024
G1826036	Test software	R&S	EMC32 (V10.60.10)	N/A	N/A	N/A
G1826037	Control PC	Dell	OptiPlex 7050	36NV9P2	N/A	N/A
G1826433	3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	22.06.2021	22.06.2024

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.

Item		Extended Uncertainty
Conducted Emission		± 2.74 dB
Radiated Emission (30-1000MHz)	Field strength (dBμV/m)	4.27dB
Radiated Emission (above 1000MHz)	Field strength (dBμV/m)	4.46dB
Radio Spectrum		± 1.5 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) 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, Shenzhen 518110, 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 WisDuo, it supports Bluetooth Low Energy wireless technology.

Model RAK3400 is identical with model RAK3401 except the model RAK3401 is the extend of RAK3400, The RAK3401 is a breakout module designed to work with a baseboard. Essentially, it is a RAK3400 stamp module with an expansion PCB and connectors compatible with the baseboard. It allows an easy way to access to the pins of the RAK3400 module in order to simplify development and testing processes.

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
Type Designation	RAK3400, RAK3401
FCC ID	2AF6B-RAK3400
IC	25908-RAK3400
HVIN	RAK3400, RAK3401
Operating Voltage	DC 5V via USB interface
Testing Voltage	DC 5V
Technical Specification of Bluetooth Low Energy	
Operating Frequency	2402 – 2480 MHz
Bluetooth Core Version	Bluetooth 5.0, single mode
Data rate	1Mbps, 2Mbps
Channel Number	40 channels
Channel separation	2MHz
Modulation	GFSK
Antenna Type	IPEX Antenna
Smart Antenna Systems:	Not Applicable
Number of Antenna	1
Antenna Gain	1.68 dBi (declared by client)
Alternative Antenna Gain	3.4dBi (declared by client)

Table 3: RF Channel and Frequency of Bluetooth Low Energy

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
00	2402.00	10	2422.00	20	2442.00	30	2462.00
01	2404.00	11	2424.00	21	2444.00	31	2464.00
02	2406.00	12	2426.00	22	2446.00	32	2466.00
03	2408.00	13	2428.00	23	2448.00	33	2468.00
04	2410.00	14	2430.00	24	2450.00	34	2470.00
05	2412.00	15	2432.00	25	2452.00	35	2472.00
06	2414.00	16	2434.00	26	2454.00	36	2474.00
07	2416.00	17	2436.00	27	2456.00	37	2476.00
08	2418.00	18	2438.00	28	2458.00	38	2478.00
09	2420.00	19	2440.00	29	2460.00	39	2480.00

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, transmitting mode
 - 1. Low channel
 - 2. Middle channel
 - 3. High channel
- B. On, Operating
- C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- Block Diagram
- FCC/IC Label and Location Info
- Operation Description
- Photo Document
- Schematics
- 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 testing were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all test items were applied on model RAK3401.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Notebook	Lenovo	ThinkPad T480	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 30MHz)

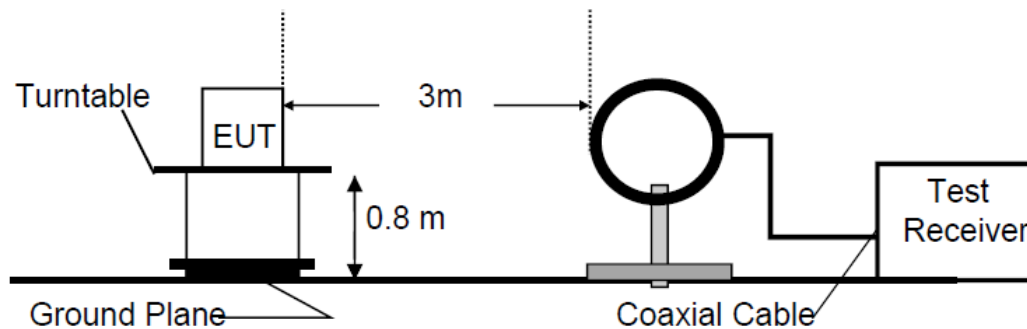


Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

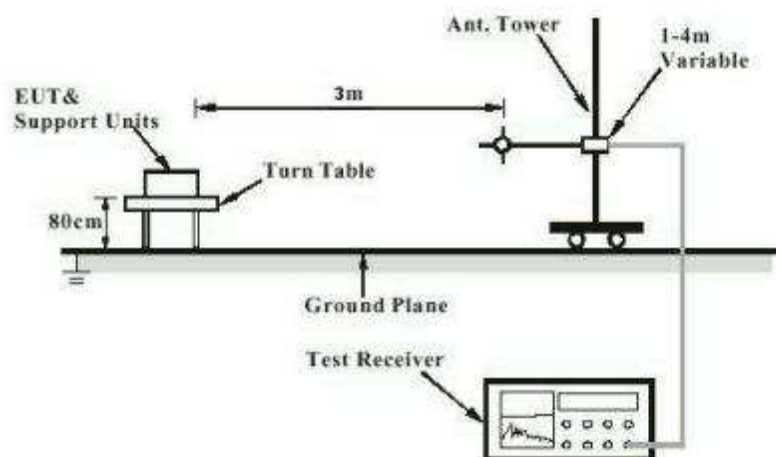


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

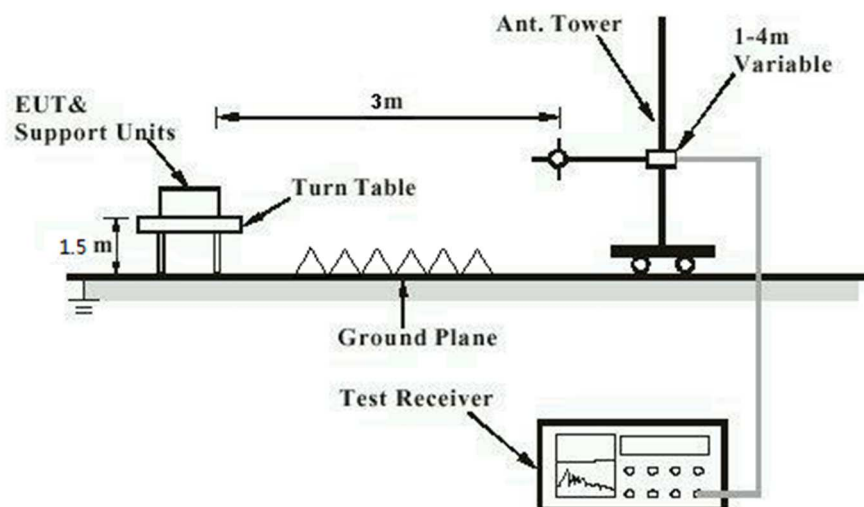


Diagram of Measurement Configuration for Mains Conduction Measurement

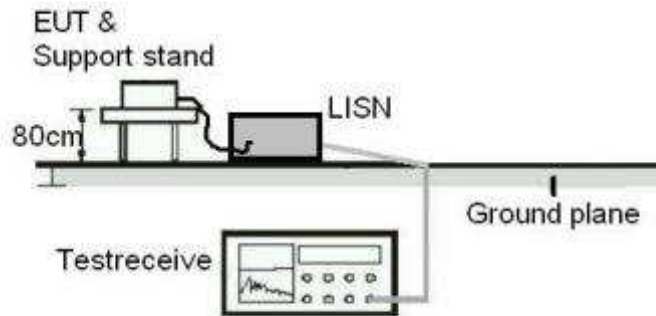
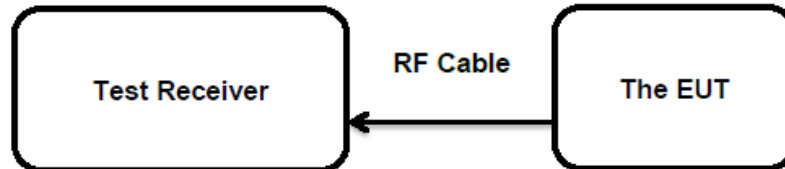


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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 6.7
Limit	:	the use of antennas with directional gains that do not exceed 6 dBi

According to the manufacturer declared, the EUT has an IPEX antenna, the directional gain of antenna is 1.68 dBi for original antenna and 3.4 dBi for alternative antenna, 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 Maximum Peak Conducted Output Power

RESULT:
Pass

Test Specification

Test standard	:	FCC Part 15.247(b)(3)
	:	RSS-247 Clause 5.4(d)
Basic standard	:	ANSI C63.10: 2013
Limits	:	< 1 Watt (Maximum Conducted Peak Power)
	:	e.i.r.p. <4W
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2024-04-16
Input voltage	:	DC 5V
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	23.5 °C
Relative humidity	:	60.5 %
Atmospheric pressure	:	101 kPa

For details refer to following test result.

Table 5: Test Result of Maximum Peak Conducted Output Power, 1Mbps

Channel	Channel Frequency (MHz)	Peak Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2402	3.4	0.00219	1
Middle Channel	2440	3.3	0.00214	1
High Channel	2480	2.5	0.00178	1

Table 6: Test Result of Maximum Peak Conducted Output Power, 2Mbps

Channel	Channel Frequency (MHz)	Peak Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2402	3.4	0.00219	1
Middle Channel	2440	3.3	0.00214	1
High Channel	2480	2.6	0.00182	1

Note: The cable loss is taken into account in results and the e.i.r.p. is 6.7 dBm less than 4W (36 dBm).

5.1.3 Radiated Spurious Emission

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

Test standard	: FCC Part 15.247(d) & FCC Part 15.205 RSS-247 Clause 3.3 & 5.5
Basic standard	: ANSI C63.10: 2013
Limits	: Refer to 15.209(a) of FCC part 15.247(d) RSS-Gen Table 4 & Table 5
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: 2024-04-24
Input voltage	: DC 5V
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: Refer to test data
Relative humidity	: Refer to test data
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 B.

6 Photographs of the Test Set-Up

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

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Appendix B: Test Results

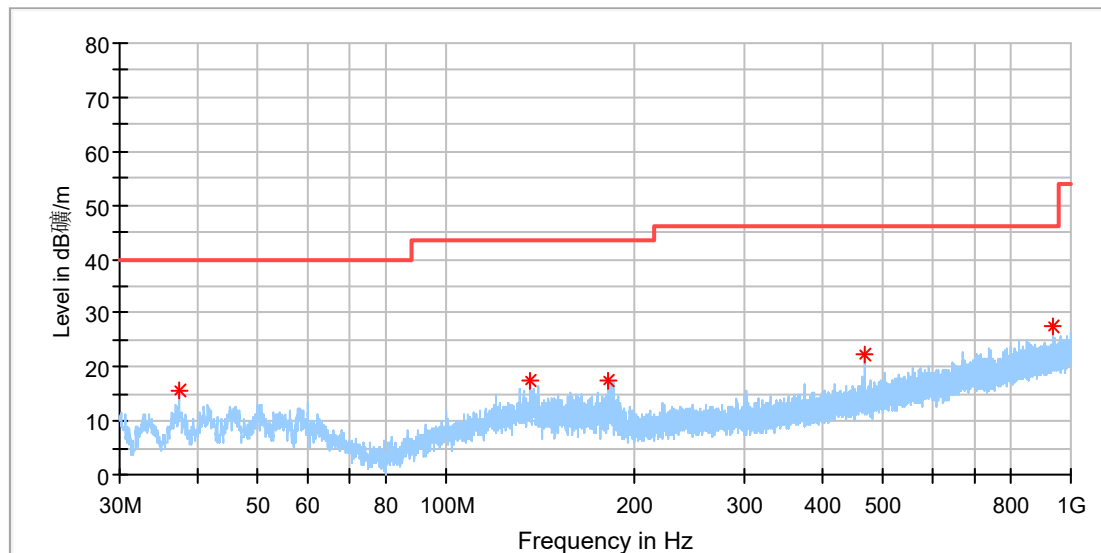
APPENDIX B: TEST RESULTS	1
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APPENDIX B.2: TEST RESULTS OF RADIATED EMISSIONS IN RESTRICTED BANDS	16

Appendix B.1: Test Results of Radiated Spurious Emissions

Note: 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.

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Mid channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical Freqs

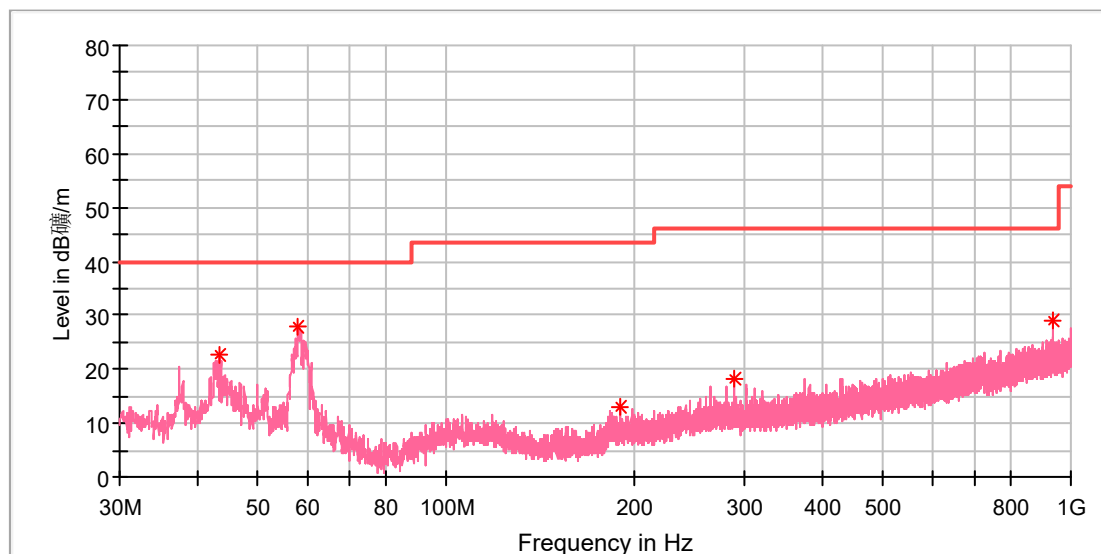
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.498846	15.55	40.00	24.45	100.0	H	326.0	-21.2
136.476154	17.45	43.50	26.05	100.0	H	335.0	-22.4
182.364615	17.42	43.50	26.08	100.0	H	178.0	-20.6
465.865769	22.50	46.00	23.50	100.0	H	155.0	-12.9
937.546923	27.54	46.00	18.46	100.0	H	317.0	-5.0

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
Model:	RAK3401
Test Mode:	BLE 1M_Mid channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

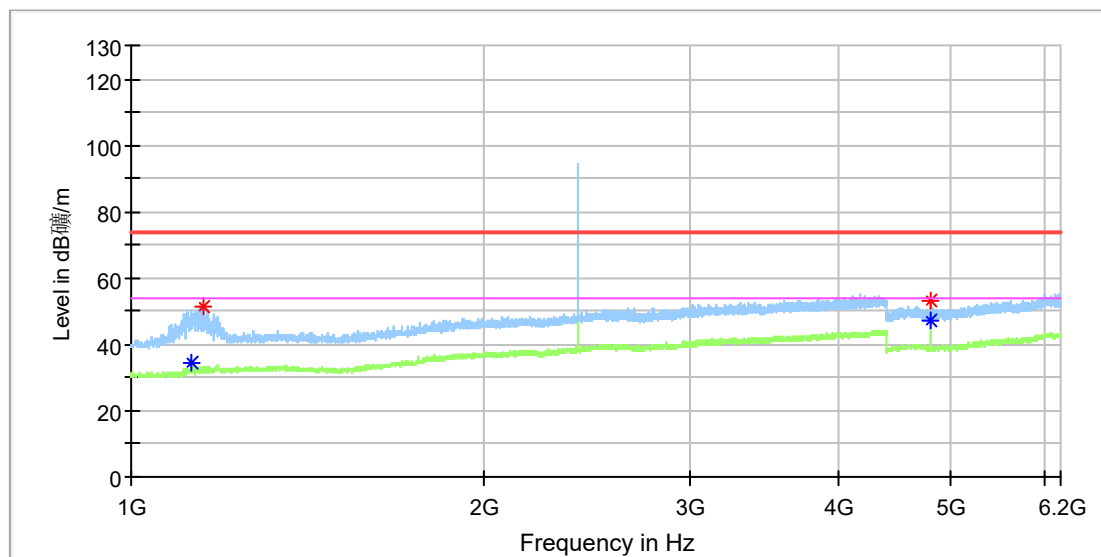
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
43.356154	22.82	40.00	17.18	100.0	V	298.0	-19.5
57.980769	27.86	40.00	12.14	100.0	V	200.0	-19.1
190.273846	12.89	43.50	30.61	100.0	V	0.0	-19.9
289.437692	18.16	46.00	27.84	100.0	V	191.0	-16.9
937.546923	29.07	46.00	16.93	100.0	V	249.0	-5.0

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Low channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

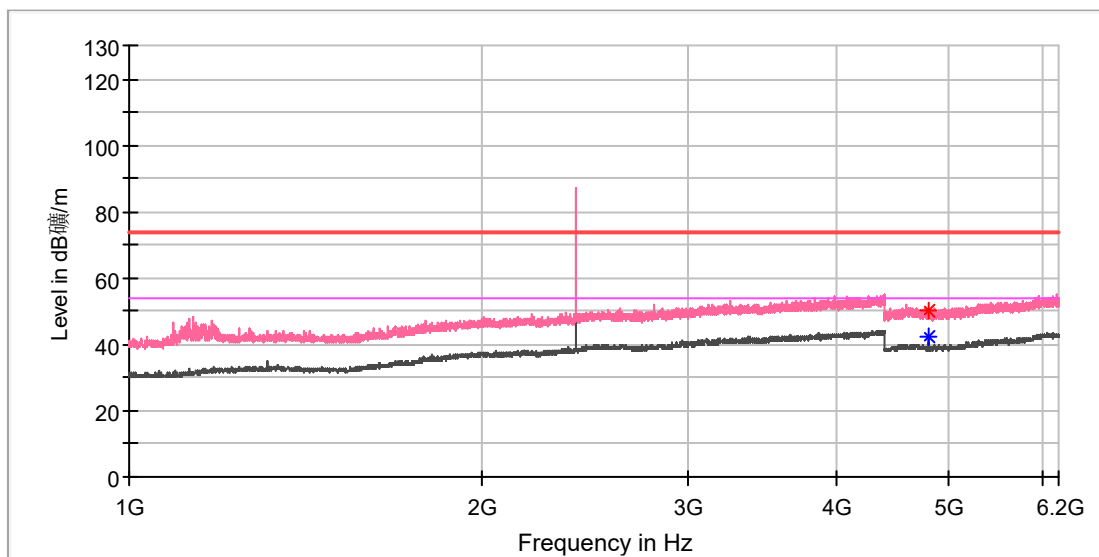
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1125.000000	---	34.32	54.00	19.68	150.0	H	0.0	0.3
1152.500000	51.30	---	74.00	22.70	150.0	H	287.0	0.8
4803.500000	---	47.36	54.00	6.64	150.0	H	81.0	11.8
4804.000000	52.96	---	74.00	21.04	150.0	H	81.0	11.8

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Low channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

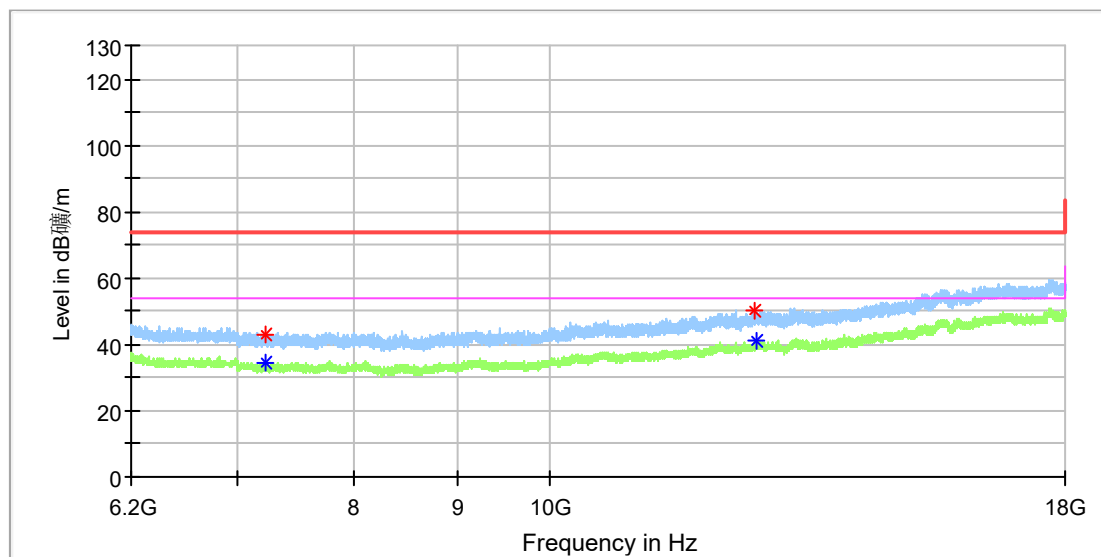
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4803.000000	50.40	---	74.00	23.60	150.0	V	233.0	11.8
4804.000000	---	42.37	54.00	11.63	150.0	V	233.0	11.8

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Low channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

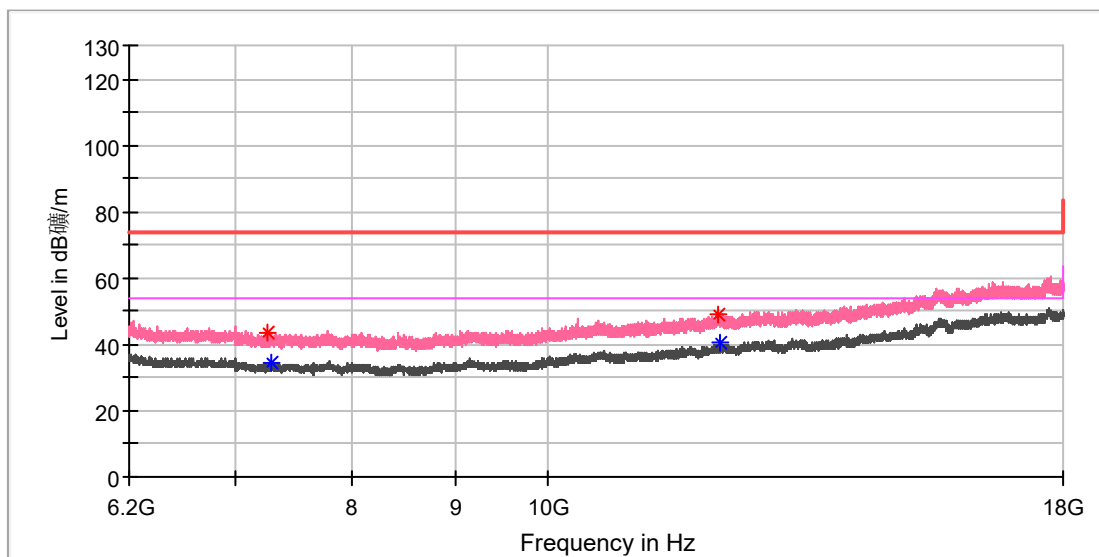
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7228.075000	---	34.59	54.00	19.41	150.0	H	148.0	8.7
7229.058333	42.89	---	74.00	31.11	150.0	H	195.0	8.6
12636.900000	50.44	---	74.00	23.56	150.0	H	219.0	15.0
12668.366667	---	40.96	54.00	13.04	150.0	H	7.0	15.1

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Low channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

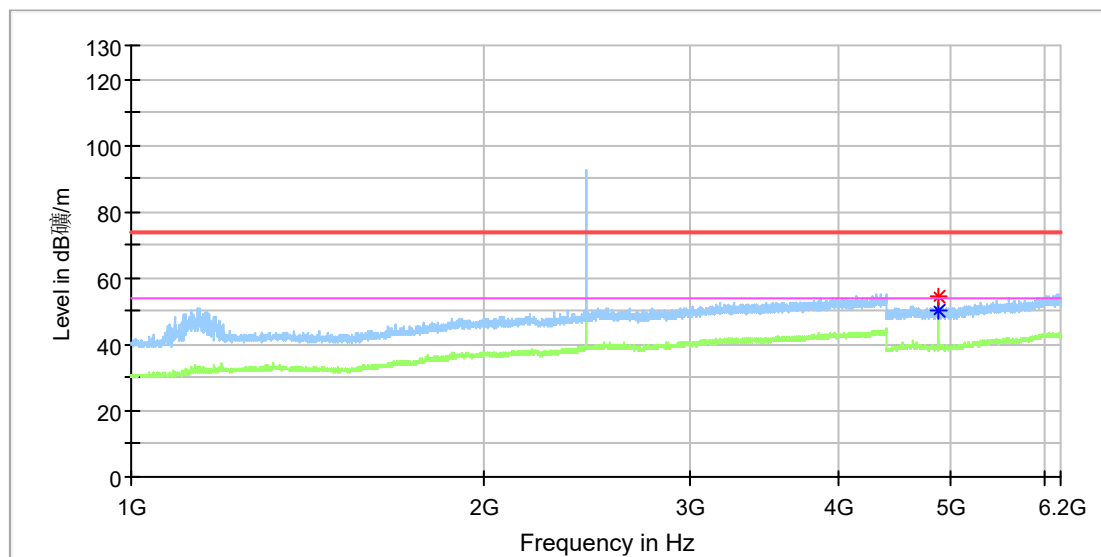
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7254.625000	43.79	---	74.00	30.21	150.0	V	228.0	8.5
7287.075000	---	34.53	54.00	19.47	150.0	V	228.0	8.4
12152.608333	48.98	---	74.00	25.02	150.0	V	253.0	14.4
12182.600000	---	40.30	54.00	13.70	150.0	V	253.0	14.6

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Mid channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

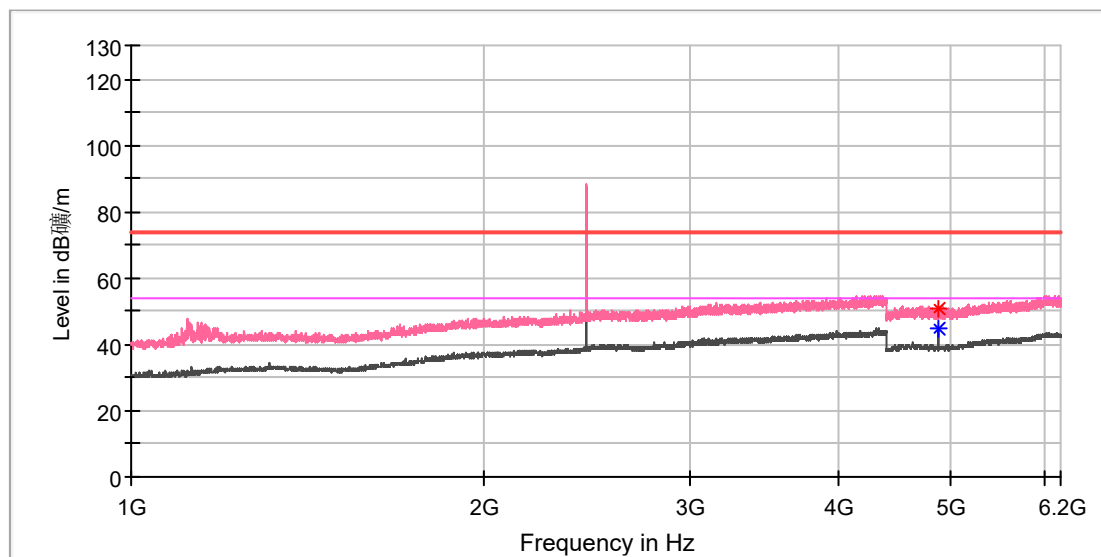
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4880.000000	54.39	---	74.00	19.61	150.0	H	90.0	11.8
4880.000000	---	50.23	54.00	3.77	150.0	H	90.0	11.8

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Mid channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

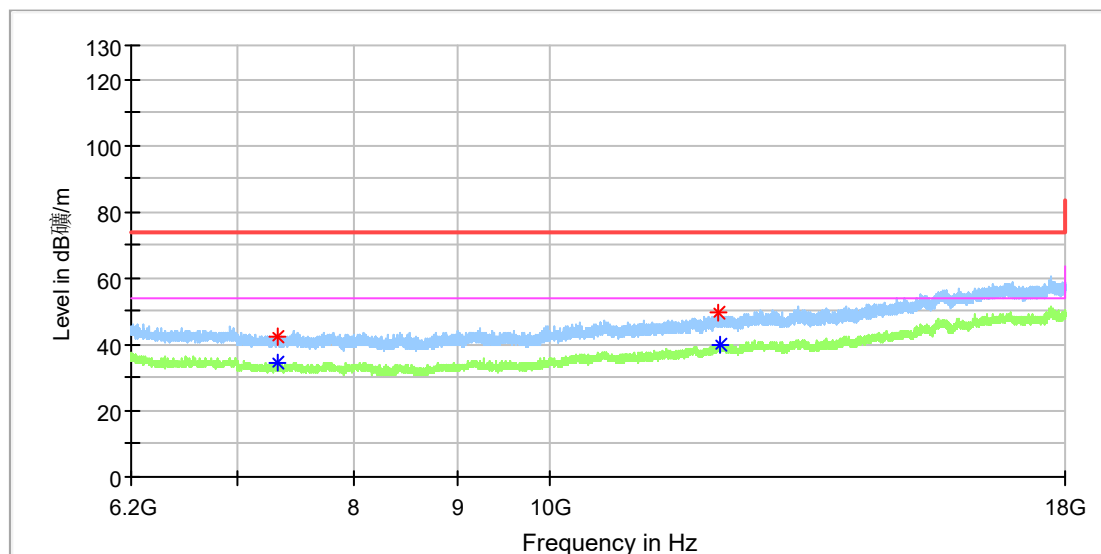
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4878.000000	51.04	---	74.00	22.96	150.0	V	110.0	11.8
4880.000000	---	44.63	54.00	9.37	150.0	V	268.0	11.8

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Mid channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

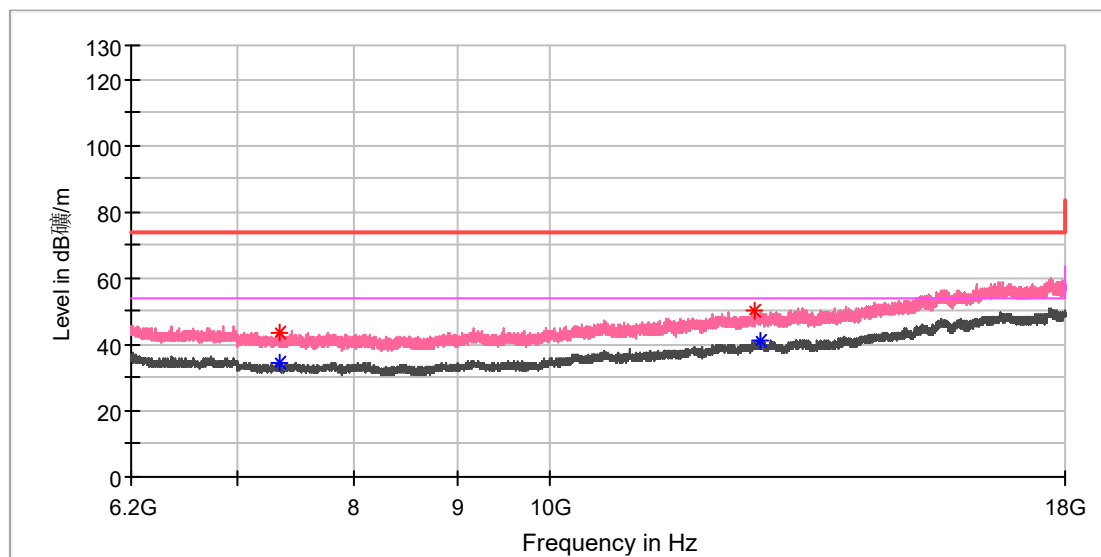
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7319.033333	42.62	---	74.00	31.38	150.0	H	103.0	8.2
7320.016667	---	34.54	54.00	19.46	150.0	H	45.0	8.2
12126.058333	49.39	---	74.00	24.61	150.0	H	22.0	14.3
12141.300000	---	39.72	54.00	14.28	150.0	H	299.0	14.4

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Mid channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

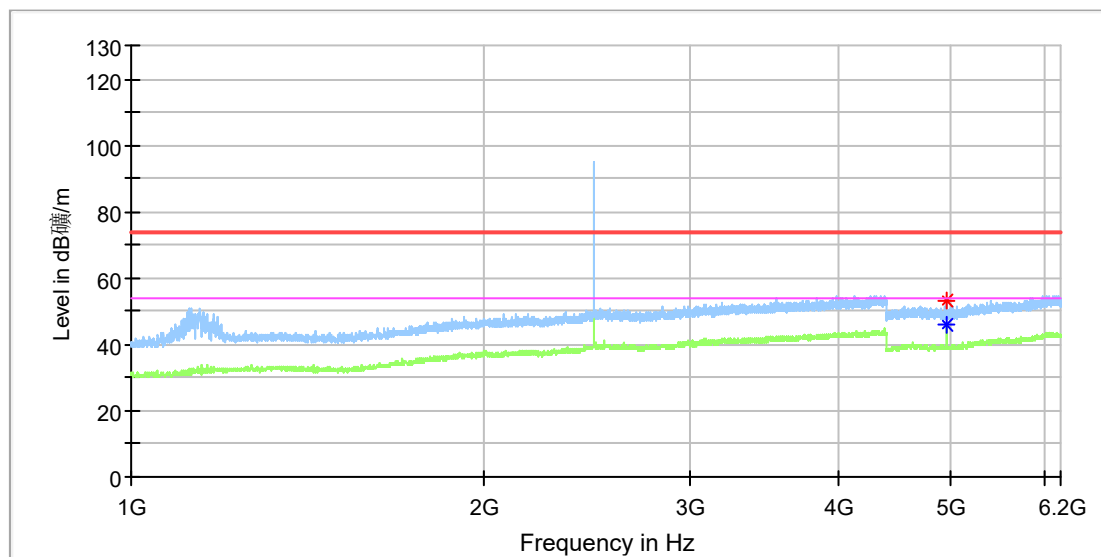
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7335.750000	---	34.21	54.00	19.79	150.0	V	316.0	8.1
7343.125000	43.62	---	74.00	30.38	150.0	V	218.0	8.1
12640.833333	49.96	---	74.00	24.04	150.0	V	316.0	15.0
12712.125000	---	41.23	54.00	12.77	150.0	V	97.0	15.1

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_High channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

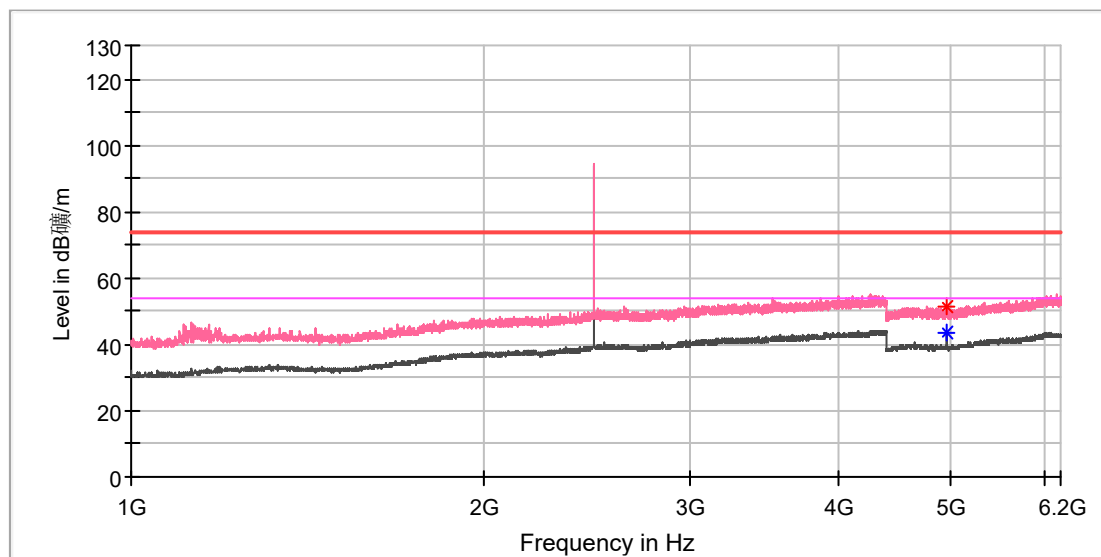
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4959.500000	52.98	---	74.00	21.02	150.0	H	76.0	11.8
4960.000000	---	46.10	54.00	7.90	150.0	H	100.0	11.8

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_High channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

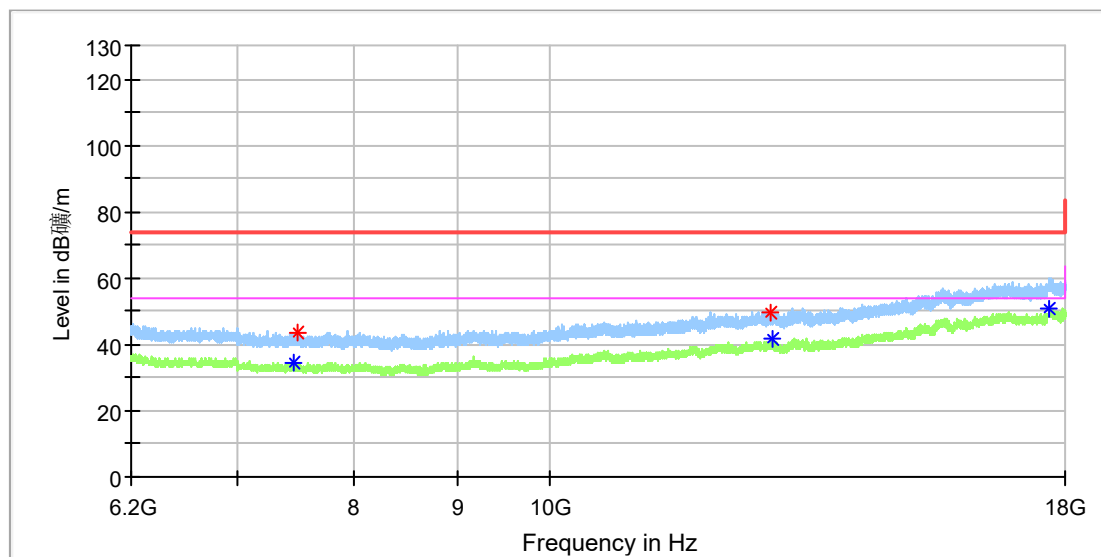
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4959.500000	51.33	---	74.00	22.67	150.0	V	24.0	11.8
4959.500000	---	43.52	54.00	10.48	150.0	V	24.0	11.8

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_High channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

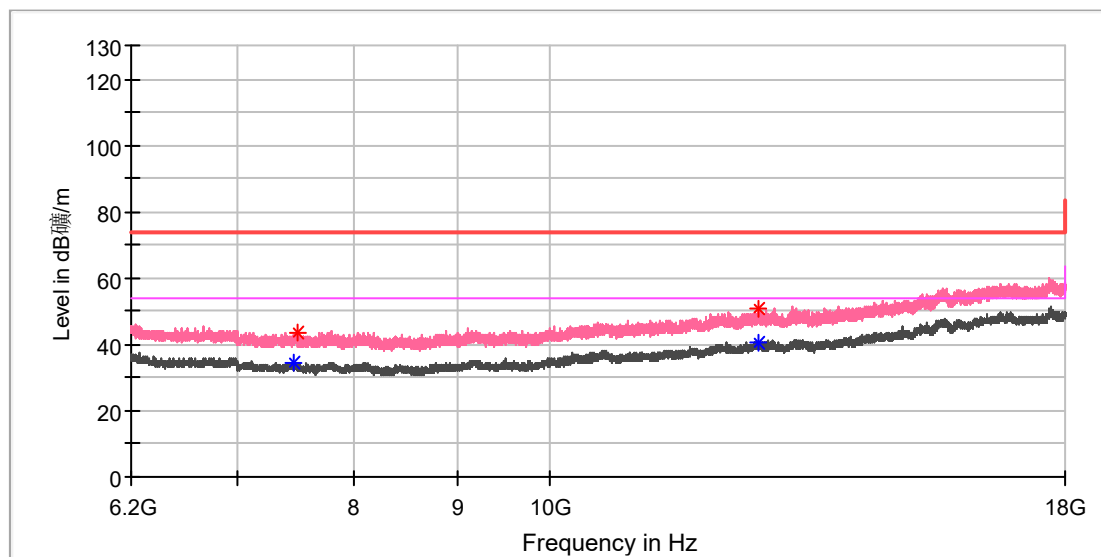
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7457.683333	---	34.66	54.00	19.34	150.0	H	262.0	8.5
7492.591667	43.41	---	74.00	30.59	150.0	H	201.0	8.7
12872.408333	49.64	---	74.00	24.36	150.0	H	225.0	15.4
12882.733333	---	41.52	54.00	12.48	150.0	H	347.0	15.4
17691.725000	---	50.73	54.00	3.27	150.0	H	273.0	22.9

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_High channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
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)
7458.175000	---	34.44	54.00	19.56	150.0	V	117.0	8.5
7488.166667	43.41	---	74.00	30.59	150.0	V	251.0	8.7
12672.791667	---	40.58	54.00	13.42	150.0	V	298.0	15.1
12685.575000	50.69	---	74.00	23.31	150.0	V	274.0	15.1

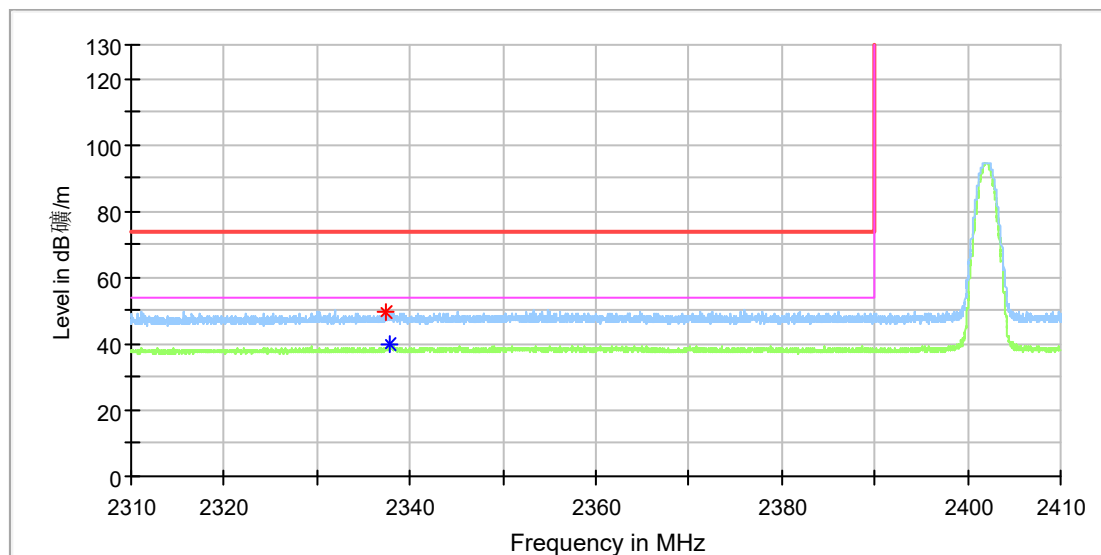
Final_Result

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

Appendix B.2: Test Results of Radiated Emissions in Restricted Bands

EUT Information

EUT Name: WisDuo
 Model: RAK3401
 Test Mode: BLE 1M_Low channel
 Order No/Sample No: 168478710/A003697710-002
 Test Voltage:: DC 5V From USB
 Remark: Temp 23 Humi:58%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin



Critical Freqs

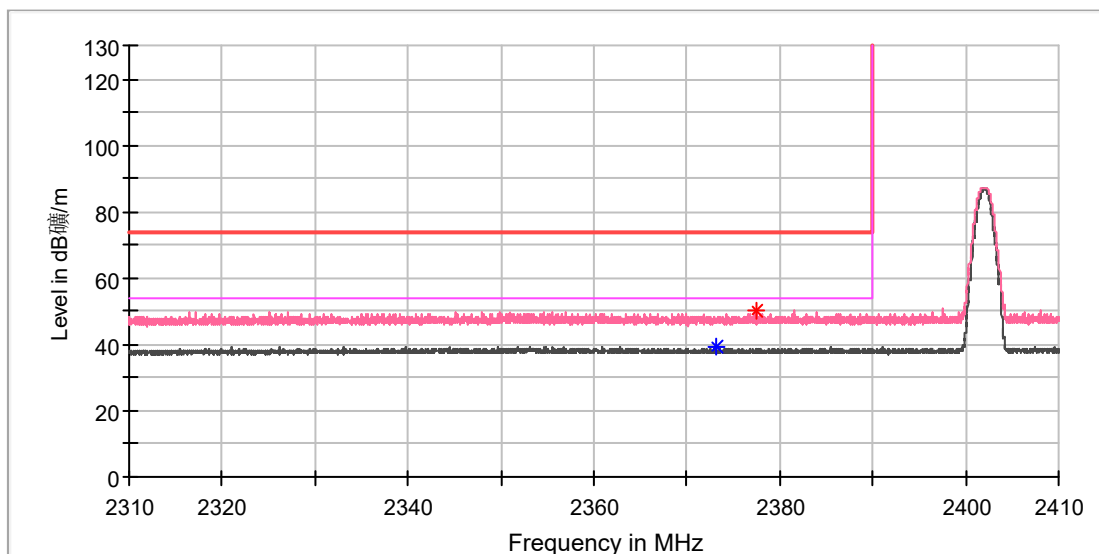
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2337.308824	49.70	---	74.00	24.30	150.0	H	58.0	6.8
2337.794118	---	39.95	54.00	14.05	150.0	H	29.0	6.8

Final Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_Low channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

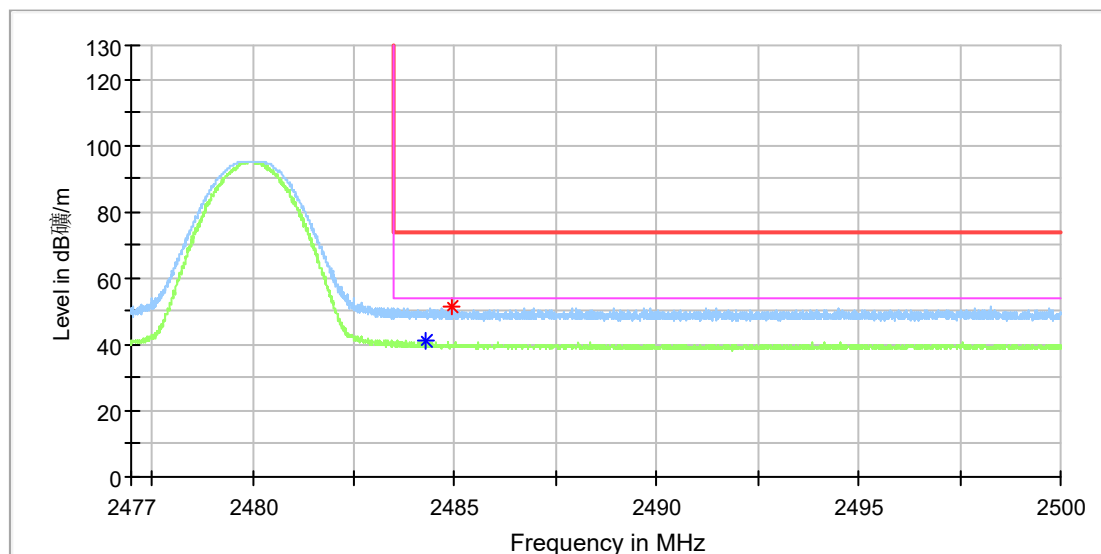
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2373.044118	---	39.19	54.00	14.81	150.0	V	137.0	6.9
2377.426471	50.35	---	74.00	23.65	150.0	V	252.0	6.9

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_High channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

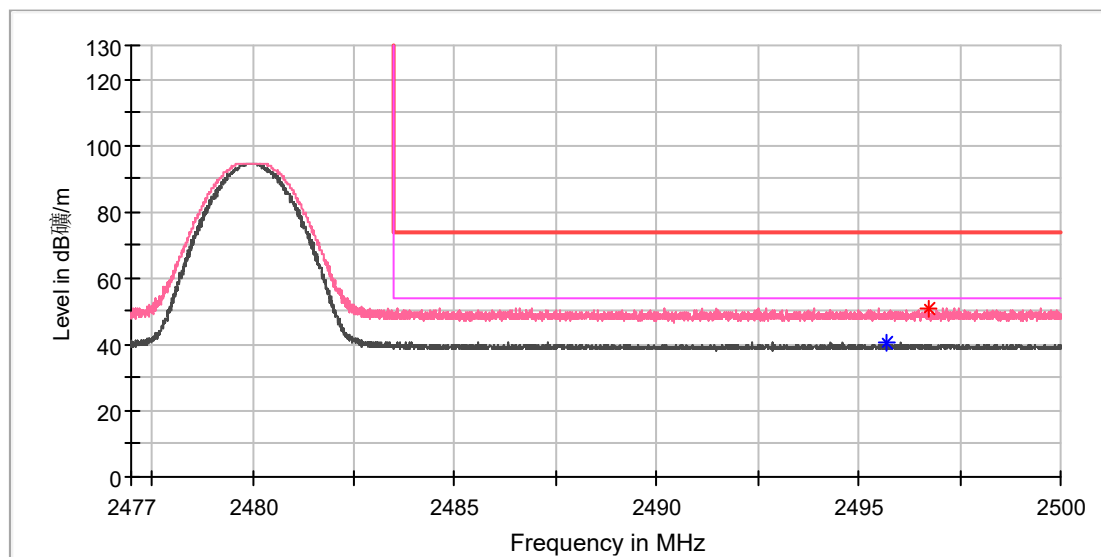
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.276471	---	41.28	54.00	12.72	150.0	H	13.0	7.4
2484.942647	51.41	---	74.00	22.59	150.0	H	280.0	7.4

Final_Result

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

EUT Information

EUT Name:	WisDuo
Model:	RAK3401
Test Mode:	BLE 1M_High channel
Order No/Sample No:	168478710/A003697710-002
Test Voltage::	DC 5V From USB
Remark:	Temp 23 Humi:58%
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)
2495.663235	---	40.29	54.00	13.71	150.0	V	225.0	7.4
2496.704412	50.91	---	74.00	23.09	150.0	V	218.0	7.4

Final_Result

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