

Prüfbericht-Nr.: <i>Test report no.:</i>	CN2479N8 002	Auftrags-Nr.: <i>Order no.:</i>	168493211	Seite 1 von 23 Page 1 of 23
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2024-07-08	
Auftraggeber: <i>Client:</i>	Sensitech Inc. 800 Cummings Center Suite 258X, Beverly MA 01915-6197 USA			
Prüfgegenstand: <i>Test item:</i>	Quarterback Gateway			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	T11013310			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.247 CFR47 FCC Part 15: Subpart C Section 15.209 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 2: Section 2.1091 RSS-247-Issue 3 August 2023 RSS-Gen Issue 5 March 2019			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-07-10	Please refer to photo documents		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003791751-004/005			
Prüfzeitraum: <i>Testing period:</i>	2024-08-13 - 2024-09-27			
Ort der Prüfung: <i>Place of testing:</i>	Refer to Clause 2.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	 Andy Yan		genehmigt von: <i>authorized by:</i>	 Lin Lin
Datum: <i>Date:</i>	2024-12-05		Ausstellungsdatum: <i>Issue date:</i>	2024-12-06
Stellung / Position:	Sachverständige(r)/Expert		Stellung / Position:	Sachverständige(r)/Expert
Sonstiges / <i>Other:</i>	FCC ID: SRMT11013310 IC: 6654A-T11013310 HVIN: T11013310 This report is for 2.4GHz WiFi and Bluetooth transmitters.			
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:	P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet <i>* 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</i>			
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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Test report no.:

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Anmerkungen
Remarks

- | | |
|----------|--|
| 1 | <p>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.</p> <p>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><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></p> |
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| 3 | <p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.</p> <p>Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i></p> <p><i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p> |
| 4 | <p>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.</p> <p><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></p> |

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM CONDUCTED OUTPUT POWER

RESULT: Pass

5.1.3 CONDUCTED POWER SPECTRAL DENSITY

RESULT: Pass

5.1.4 6dB BANDWIDTH

RESULT: Pass

5.1.5 99% BANDWIDTH

RESULT: Pass

5.1.6 20dB BANDWIDTH

RESULT: Pass

5.1.7 CARRIER FREQUENCY SEPARATION

RESULT: Pass

5.1.8 NUMBER OF HOPPING FREQUENCY

RESULT: Pass

5.1.9 TIME OF OCCUPANCY

RESULT: Pass

5.1.10 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHz BANDWIDTH

RESULT: Pass

5.1.11 RADIATED SPURIOUS EMISSION

RESULT: Pass

5.1.12 CONDUCTED EMISSION ON AC MAINS

RESULT: Pass

6.1.1 ELECTROMAGNETIC FIELDS

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 of Radiated Spurious Emissions

2 Test Sites

2.1 Test Facilities

Shanghai ATBL Technology Co., Ltd.

5-6/F., Unit 1, No 8, Free Trade One Life Science and Sci-Tech Industrial Park, No.160, Basheng Road,
Pudong New District, Shanghai City, China

FCC Registration No.: 0031025281

ISED Company Number: 27371

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Shanghai ATBL Technology Co., Ltd.

Radio Conducted Test

Equipment Name	Manufacturer	Model	Serial No.	Equipment No.	Calibrated until
Power meter	Anritsu	ML2496A	1935001	SHATBL-W030	2025.07.17
Power sensor	Anritsu	MA2411B	1911006	SHATBL-W031	2025.07.17
Adjustable Attenuator	Agilent	8494B	MY42144015	SHATBL-W009	2025.07.17
Environmental Test Chamber	KSON	THS-B6C-150	9159K	SHATBL-W019	2025.03.27
Spectrum analyzer	R&S	FSV40-N	101761	SHATBL-W036	2025.07.17
Thermometer	DeLi	N/A	N/A	SHATBL-W012	2025.07.17
Test Software	FALA	LZ-RF	N/A	SHATBL-W020	2025.07.17

Radiated Spurious Emissions

Equipment Name	Manufacturer	Model	Serial No.	Equipment No.	Calibrated until
Signal analyzer	Agilent	N9020A	MY50200811	SHATBL-E017	2025.03.27
Amplifier	JPT	JPA0118-55-303A	1910001800055000	SHATBL-E006	2025.03.27
Amplifier	JPT	JPA-10M1G32	21010100035001	SHATBL-E005	2025.03.27
Antenna/Turn table Controller	Brilliant	N/A	N/A	SHATBL-E007	N/A
Loop Antenna(9kHz-30MHz)	Daze	ZN30900C	20077	SHATBL-E042	2025.05.16
Bilog Antenna	SCHWARZBECK	VULB 9168	01174	SHATBL-E008	2025.05.16
Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120D	02334	SHATBL-E009	2025.05.16
Horn Antenna	COM-POWER	AH-1840	10100008	SHATBL-E043	2025.07.18
Thermometer	DeLi	N/A	N/A	SHATBL-E015	2025.07.17
Test Software	FALA	EMC-RI(Ver.4A2)	N/A	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 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.

Parameter	Uncertainty
Conducted Output Power	1.266dB
Power spectral density	1.282dB
Conducted spurious emissions	1.73dB
Radiated Spurious Emission 9KHz-30MHz	2.35dB
Radiated Spurious Emission 30MHz-1GHz	3.60dB
Radiated Spurious Emission 1GHz-18GHz	5.40dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix 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 **Shanghai ATBL Technology Co., Ltd.** 5-6/F., Unit 1, No 8, Free Trade One Life Science and Sci-Tech Industrial Park, No.160, Basheng Road, Pudong New District, Shanghai City, 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 T11013310 is a LTE-M/NB-IoT/2G GSM Quad band tracking device, it also support Bluetooth, 2.4GHz WiFi and 915MHz wireless technologies.

This product including an approved WiFi/Bluetooth module with FCC ID: 2AC7Z-ESP32WROOM32E with report no.: RSHD200218007-00B (Bluetooth) and RSHD200218007-00A(2.4GHz WiFi and BLE) issued by Bay Area Compliance Laboratories Corp. (Kunshan).

This product including an approved WiFi/Bluetooth module with ISED Certification No.: 21098-ESPWROOM32E with report no.: RSHD200618005-08B (Bluetooth) and RSHD200618005-08A (2.4GHz WiFi and BLE) issued by Bay Area Compliance Laboratories Corp. (Kunshan).

Since the WiFi module has no any change from the original granted one, only recheck the output power and radiated spurious emission. All the other data can refer to report RSHD200218007-00B, RSHD200218007-00A and RSHD200618005-08B and RSHD200618005-08A.

This report is only for Wi-Fi operation.

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	Quarterback Gateway
Type Designation	T11013310
FCC ID	SRMT11013310
ISED Certification Number	6654A-T11013310
HVIN	T11013310
Operating Voltage	AC/DC Adapter Rechargeable Battery (4.2V)
Testing Voltage	AC/DC Adapter Rechargeable Battery (4.2V)
Antenna Type	Integral Antenna

Technical Specification of WiFi Module	
WiFi Module Number	ESP32-WROOM-32E
Frequency Range	2.4G Wi-Fi: 2412-2462 MHz with 5MHz Channel Spacing BLE: 2402-2480MHz with 2MHz Channel Spacing Bluetooth: 2402-2480MHz with 1MHz Channel Spacing
Type of Modulation	DSSS, OFDM, GFSK, $\pi/4$ -DQPSK, 8-DPSK
Antenna Gain	3.4dBi (Max)

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, Normal Operation (Radio Link)
- C. Off

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 |
| - Block Diagram | - Schematics |
| - Operation Description | |

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.

4.3 Special Accessories and Auxiliary Equipment

Table 3: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N	Rating
--	--	--	--	

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)

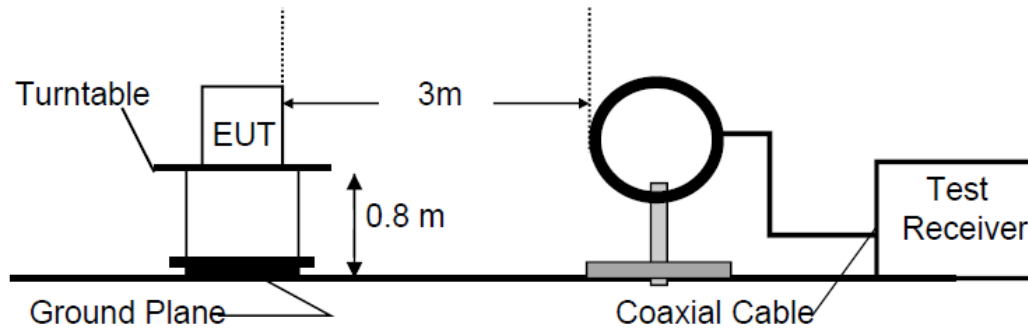


Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

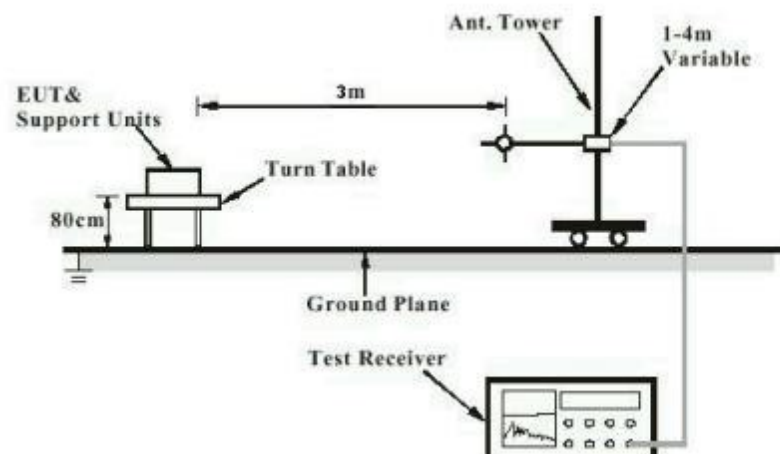


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

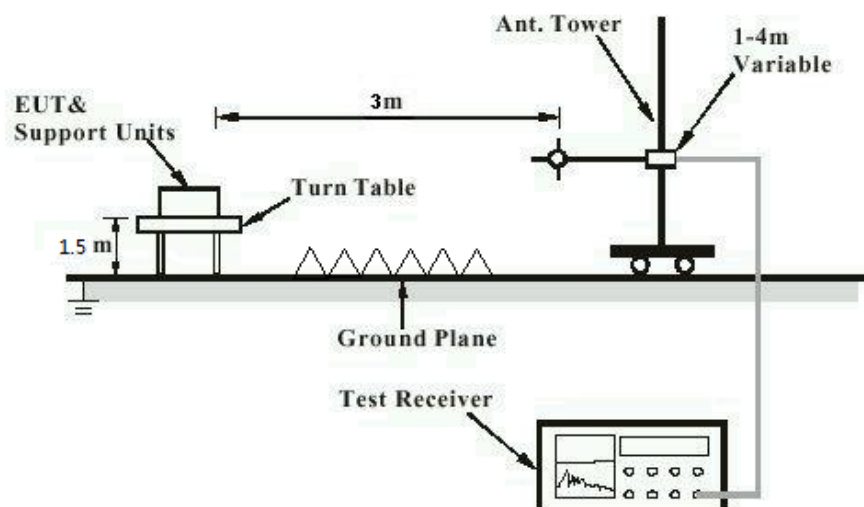


Diagram of Measurement Configuration for Mains Conduction Measurement

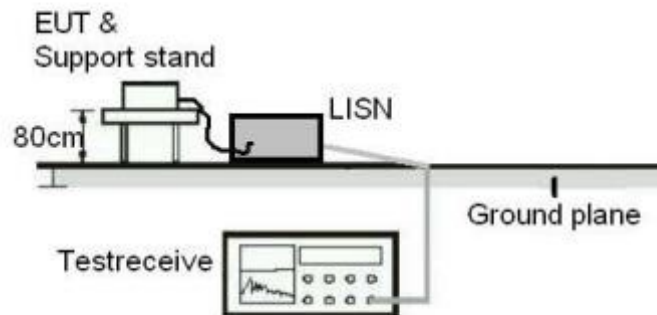
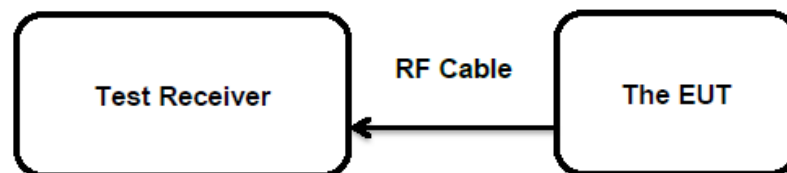


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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 6.8

According to the manufacturer declared, the EUT has an integral antenna, the directional gain of antenna is 3.4dBi, 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 Conducted Output Power

RESULT:

Pass

Test Specification

Test standard	:	FCC Part 15.247(b)(2)&(3) RSS-247 Clause 5.4(a)&(d)
Basic standard	:	ANSI C63.10: 2013 Not more than 1Watt(30dBm) for DTS in the band 902-928MHz and 2400-2483.5MHz
Limits	:	Not more than 1Watt(30dBm) for FHSS with at least 50 hopping channels in the band 902-928MHz
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2024-08-26
Input voltage	:	Fully charged battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 °C
Relative humidity	:	55 %
Atmospheric pressure	:	101 kPa

Table 4: Test Result of Maximum Output Power of 2.4GHz WiFi and BLE

Test Mode	Test Channel (MHz)	Measured Output Power		Limit (W)
		(dBm)	Max. (W)	
802.11b/1Mbps	2412	17.41	0.0824	< 1.0
	2437	17.45		
	2462	19.16		
802.11g/6Mbps	2412	16.27		
	2437	16.46		
	2462	18.07		
802.11n HT20/MCS0	2412	16.57		
	2437	16.67		
	2462	18.27		
802.11n HT40/MCS0	2422	16.57		
	2437	16.81		
	2452	18.31		
BLE Mode	2402	6.96		
	2440	7.05		
	2480	5.94		
Max. Measured Value		19.16	0.0824	

Note:

- 1) The cable loss is taken into account in results.
- 2) Max.E.I.R.P. = 19.16+3.4dBi = 22.56dBm = 0.18 < 4W

Table 5: Test Result of Maximum Output Power of Bluetooth

Test Mode	Test Channel (MHz)	Measured Output Power		Limit (W)
		(dBm)	Max. (W)	
BDR (GFSK)	2402	0.29	0.0024	< 0.125
	2441	0.17		
	2480	0.92		
EDR (π/4-DQPSK)	2402	0.92		
	2441	2.6		
	2480	3.29		
EDR (8DPSK)	2402	1.48		
	2441	3.13		
	2480	3.74		
Max. Measured Value		3.74	0.0024	

Note:

- 1) The cable loss is taken into account in results.
- 2) Max.E.I.R.P. = 3.74+3.4dBi = 7.14dBm = 0.05 < 4W

Output Power in Module Report.

WiFi&Bluetooth

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
802.11b Mode				
Low	2412	26.00	30	Pass
Middle	2437	25.88	30	Pass
High	2462	25.59	30	Pass
802.11g Mode				
Low	2412	25.42	30	Pass
Middle	2437	25.38	30	Pass
High	2462	25.11	30	Pass
802.11n-HT20 Mode				
Low	2412	25.48	30	Pass
Middle	2437	25.48	30	Pass
High	2462	25.23	30	Pass
802.11n-HT40 Mode				
Low	2422	24.97	30	Pass
Middle	2437	25.78	30	Pass
High	2452	23.79	30	Pass
BLE Mode				
Low	2402	7.56	30	Pass
Middle	2440	7.51	30	Pass
High	2480	7.13	30	Pass

Bluetooth:

Mode	Frequency (MHz)	Output Power		Limit (mW)
		(dBm)	(mW)	
BDR (GFSK)	2402	7.22	5.27	1000
	2441	7.33	5.41	1000
	2480	6.91	4.91	1000
EDR ($\pi/4$-DQPSK)	2402	9.48	8.87	125
	2441	9.61	9.14	125
	2480	9.21	8.34	125
EDR (8DPSK)	2402	9.93	9.84	125
	2441	9.99	9.98	125
	2480	9.61	9.14	125

5.1.3 Conducted Power Spectral Density

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

Test standard	: FCC Part 15.247(e) RSS-247 Clause 5.2(b)
Basic standard	: ANSI C63.10: 2013
Limits	: < 8 dBm / 3kHz
Kind of test site	: Shielded Room

For the measurement records, refer to reports RSHD200218007-00A and RSHD200618005-08A.

5.1.4 6dB Bandwidth

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

Test standard	: FCC Part 15.247(a)(2) RSS-247 Clause 5.2(a)
Basic standard	: ANSI C63.10: 2013
Limits	: At least 500kHz for bandwidth(DTS)
Kind of test site	: Shielded Room

For the measurement records, refer to reports RSHD200218007-00A and RSHD200618005-08A.

5.1.5 99% Bandwidth

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

Test standard	: FCC Part 15.247(a) RSS-Gen Clause 6.7
Basic standard	: ANSI C63.10: 2013
Kind of test site	: Shielded Room

For the measurement records, refer to report RSHD200218007-00A, RSHD200218007-00B, RSHD200618005-08A and RSHD200618005-08B.

5.1.6 20dB Bandwidth

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

Test standard	: FCC Part 15.247(a)(1) RSS-247 Clause 5.1(a)
Basic standard	: ANSI C63.10: 2013
Kind of test site	: Shielded Room

For the measurement records, refer to reports RSHD200218007-00B and RSHD200618005-08B.

5.1.7 Carrier Frequency Separation

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

Test standard	: FCC Part 15.247(a)(1) RSS-247 Clause 5.1(b)
Basic standard	: ANSI C63.10: 2013
Limits	: $\geq 25\text{kHz}$ or 2/3 of 20dB bandwidth, whichever is greater
Kind of test site	: Shielded Room

For the measurement records, refer to reports RSHD200218007-00B and RSHD200618005-08B.

5.1.8 Number of Hopping Frequency

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

Test standard	: FCC part 15.247(a)(1)(iii) RSS-247 Clause 5.1(d)
Basic standard	: ANSI C63.10: 2013
Limits	: ≥ 15 non-overlapping channels
Kind of test site	: Shielded Room

For the measurement records, refer to reports RSHD200218007-00B and RSHD200618005-08B.

5.1.9 Time of Occupancy

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

Test standard	: FCC part 15.247(a)(1)(iii) RSS-247 Clause 5.1(d)
Basic standard	: ANSI C63.10: 2013
Limits	: < 0.4s
Kind of test site	: Shielded Room

For the measurement records, refer to reports RSHD200218007-00B and RSHD200618005-08B.

5.1.10 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

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

Test standard	: FCC Part 15.247(d) RSS-247 Clause 5.5
Basic standard	: ANSI C63.10: 2013
Limits	: 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	: Shielded Room

For the measurement records, refer to report RSHD200218007-00A, RSHD200218007-00B, RSHD200618005-08A and RSHD200618005-08B.

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Page 20 of 23**5.1.11 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 : 2024-09-09

Input voltage : Fully charged battery, AC 120V/60Hz

Operation mode : A

Test channel : Low / Middle / High

Ambient temperature : 25 °C

Relative humidity : 55 %

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.

5.1.12 Conducted Emission on AC Mains**RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.207(a) & FCC Part 15.107(a)
Basic standard	: ANSI C63.10: 2013 & ANSI C63.4: 2014
Frequency range	: 0.15 – 30MHz
Limits	: FCC Part 15.207(a) & FCC Part 15.107(a)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-27
Input voltage	: Battery charged by AC/DC adapter with 120V/60Hz input
Operation mode	: B
Earthing	: Not connected
Ambient temperature	: 22 °C
Relative humidity	: 56 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix B.

6 Safety Human Exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

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

Test standard : CFR47 FCC Part 2: Section 2.1091
CFR47 FCC Part 1: Section 1.1310
FCC KDB Publication 447498 v06
FCC KDB Publication 865664 D02 v01r02

FCC requirement: Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20cm normally can be maintained between the user and the device.

MPE Calculation Method according to OET Bulletin 65

Power Density: $S_{(mW/cm^2)} = PG/4\pi R^2$ or $EIRP/4\pi R^2$

Where:

S = power density (mW/cm²)

P = power input to the antenna (mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (cm)

The nominal maximum conducted output power specified:

26.00 dBm

From the peak RF output power, the minimum mobile separation distance, d=20 cm, as well as the antenna gain (3.4 dBi), the RF power density can be calculated as below:

$$S_{(mW/cm^2)} = PG/4\pi R^2 = 0.17 \text{ mW/cm}^2$$

Limits for Maximum Permissible Exposure (MPE) according to FCC Part 1.1310: 1.0 mW/cm²

“RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons.”

7 Photographs of the Test Set-Up

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

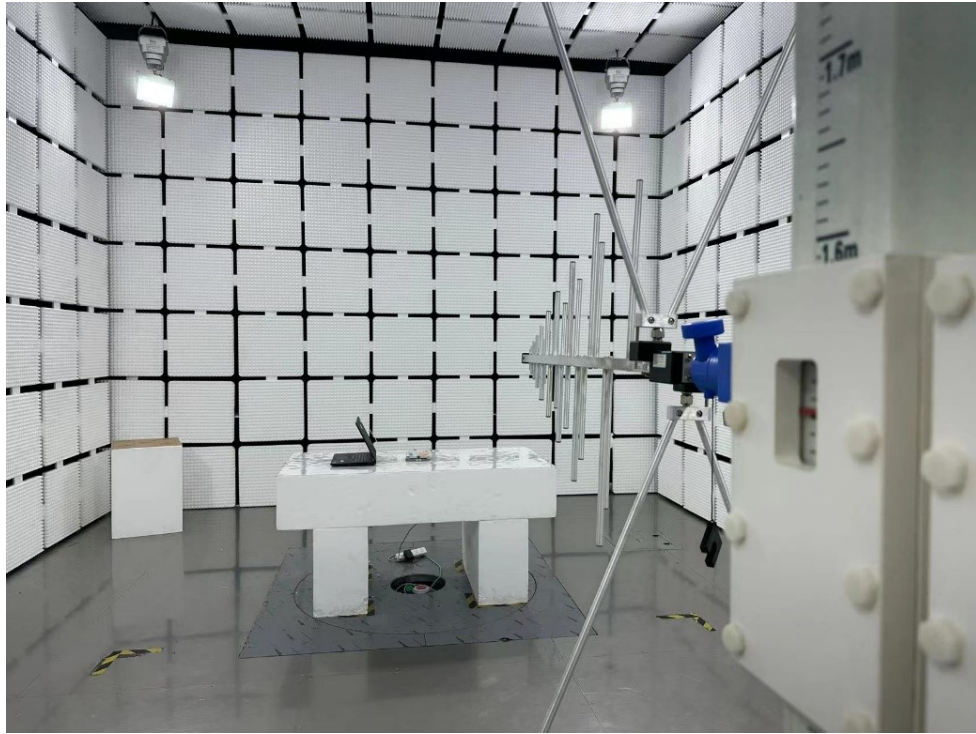
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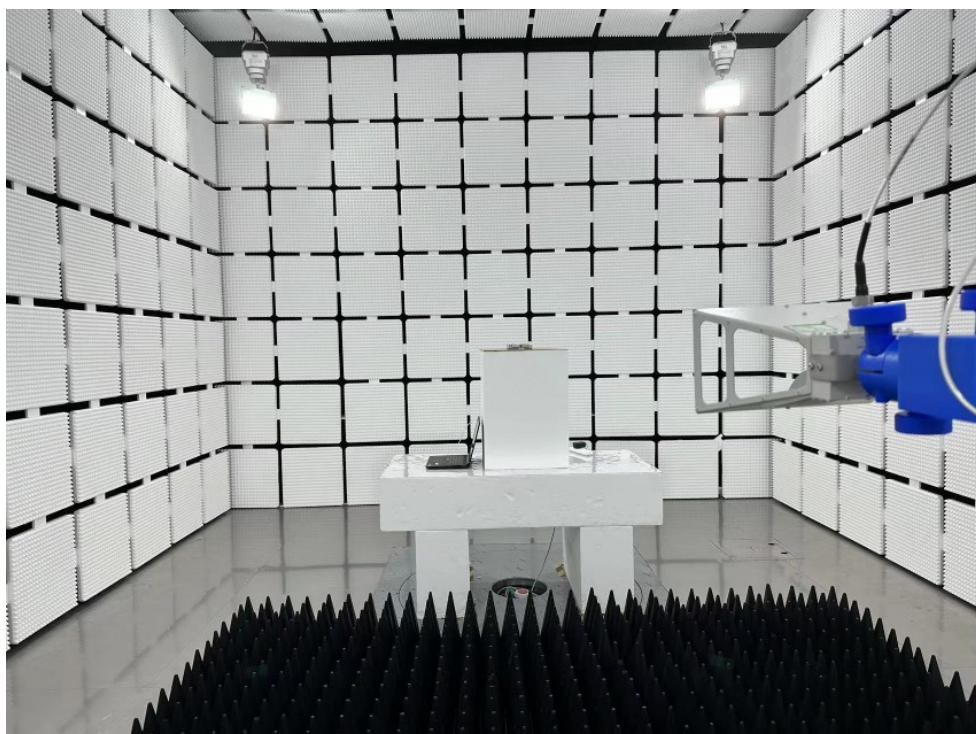
Appendix A: Photographs of the Test Set-Up

APPENDIX A: PHOTOGRAPHS OF THE TEST SET-UP.....	1
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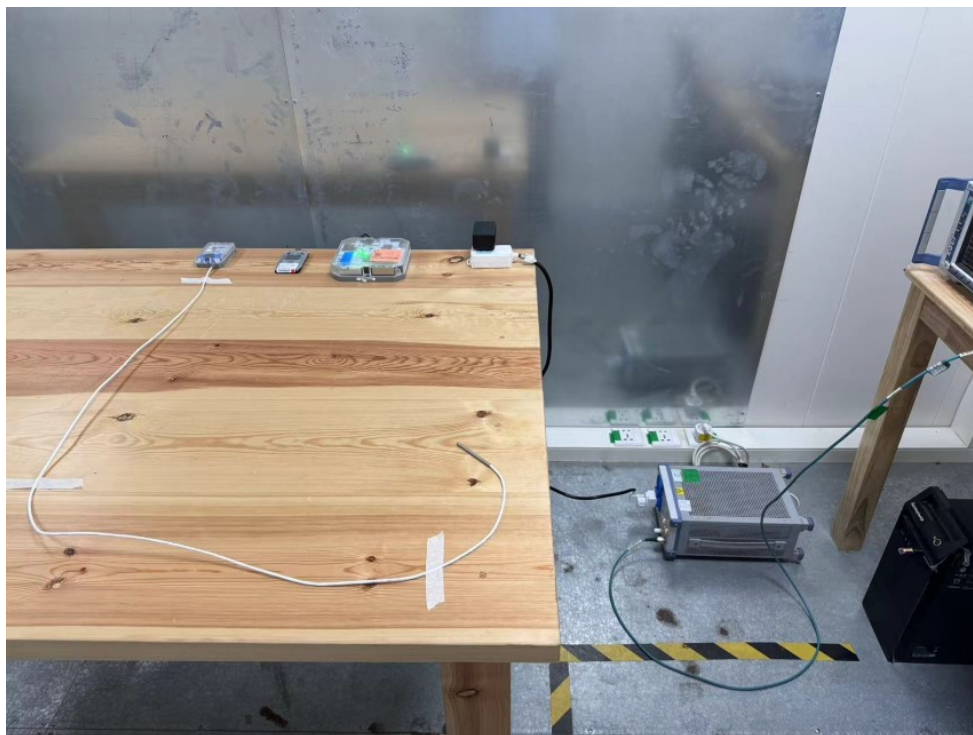
Photograph 1: Set-up for Radiated Spurious Emission, Below 1GHz



Photograph 2: Set-up for Radiated Spurious Emission, Above 1GHz



Photograph 3: Set-up for AC Conducted Emissions Test



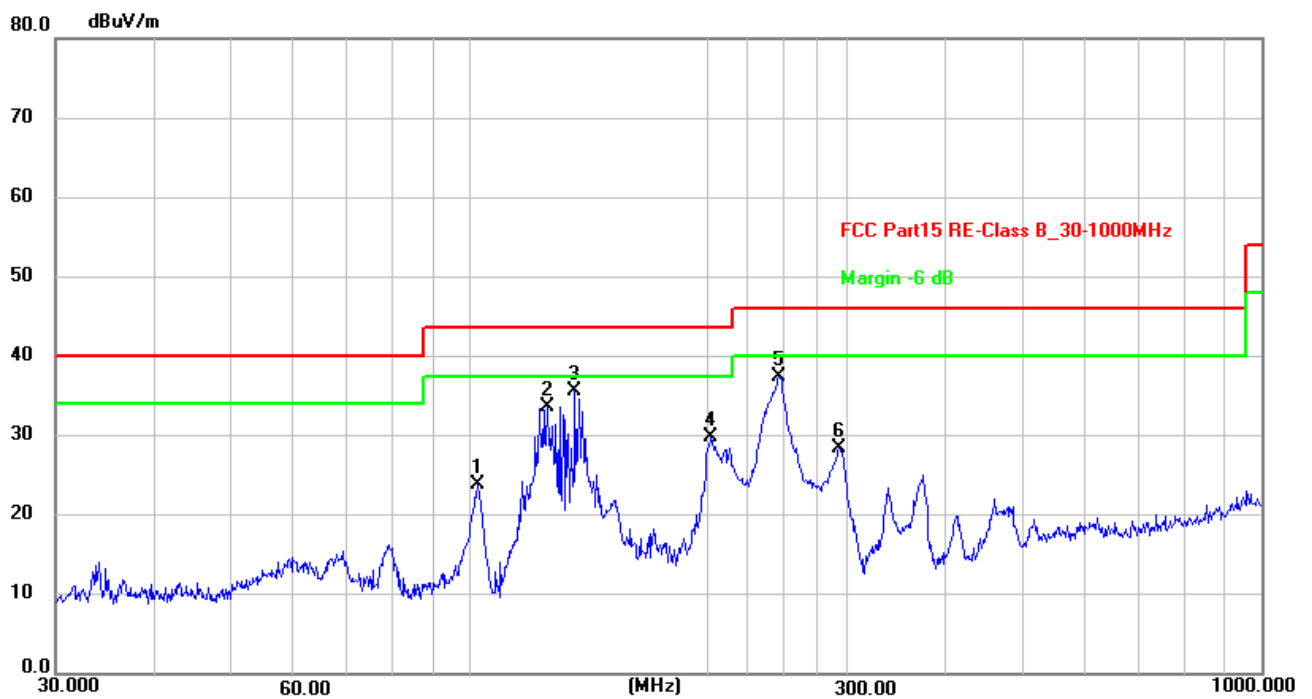
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Note 1: Testing was carried out within frequency range 9 kHz to the tenth harmonics. The measurement results below 30MHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 10GHz were reported. All test mode were tested and only the worst-case mode reported.

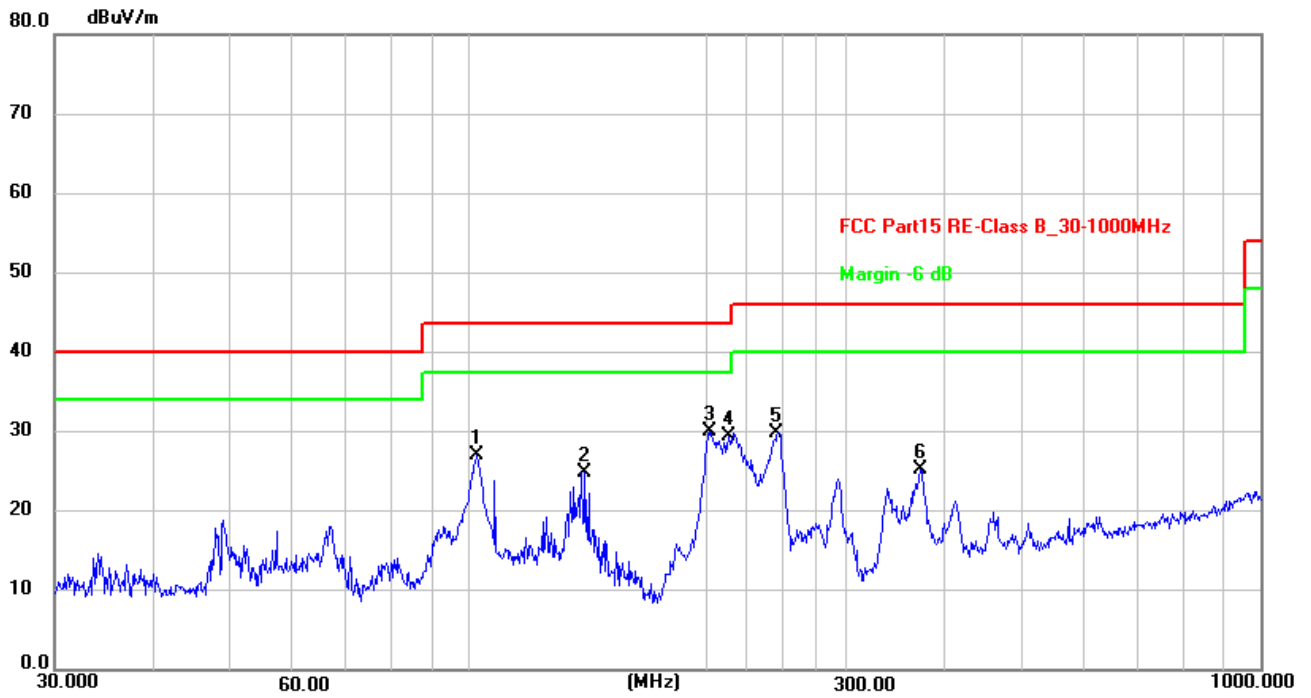
Appendix B.1: Test Results of Radiated Co-location Spurious Emissions

30MHz - 1GHz



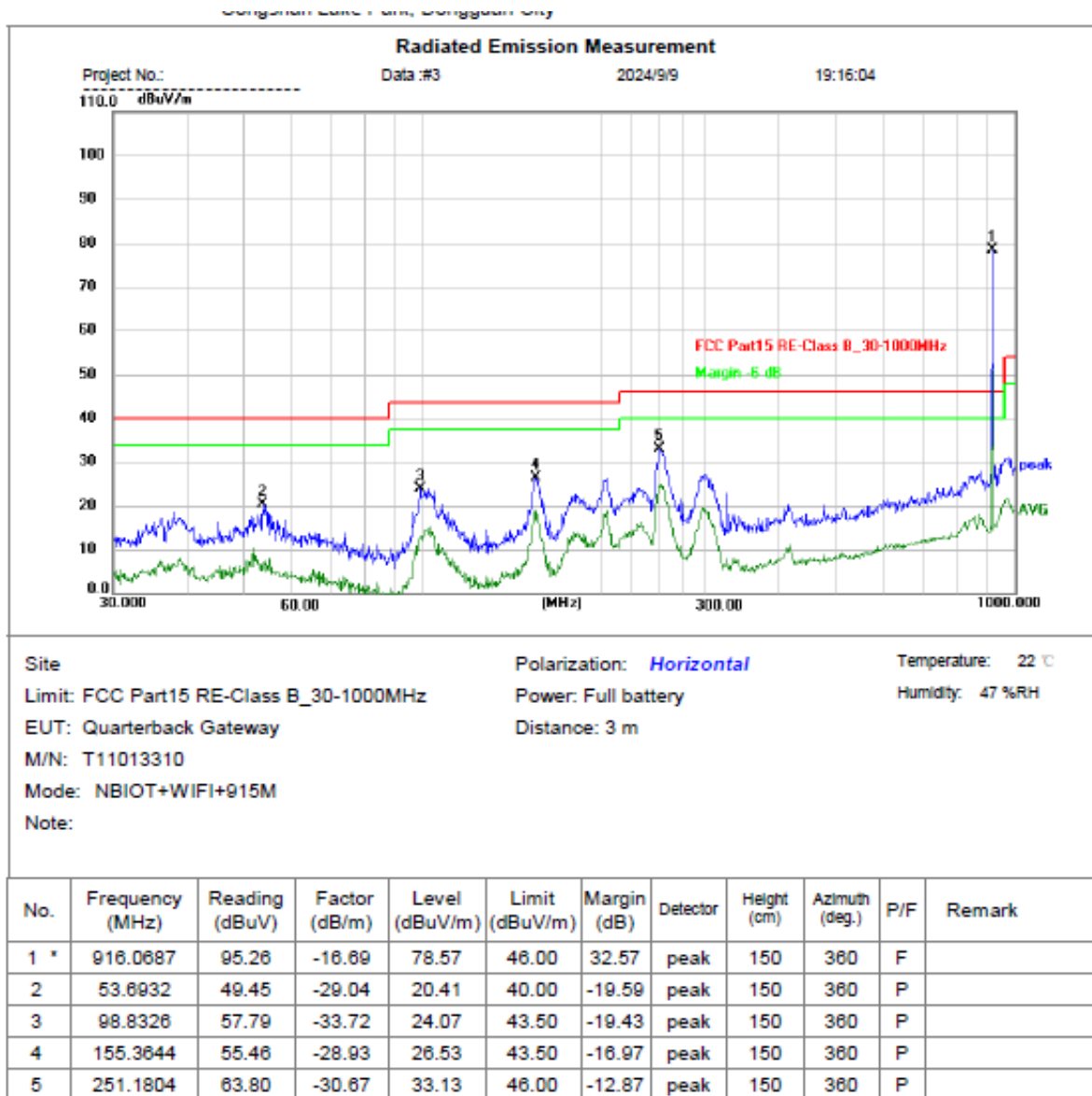
Site:	Antenna:Horizontal	Temperature(°C):23(°C)
Limit:	FCC Part15 RE-Class B_30-1000MHz	Humidity(%):53%
EUT:	Quarterback Gateway	Test Time:
M/N.:	Gateway	Power Rating:
Mode:	Bluetooth+4G+915MHz	Test Engineer:
Note:		Bosco

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1	102.3596	57.02	-33.27	23.75	43.50	-19.75	peak	200	172	
2	125.4457	65.13	-31.54	33.59	43.50	-9.91	peak	200	343	
3 *	135.9822	65.66	-30.08	35.58	43.50	-7.92	peak	200	0	
4	202.1005	62.32	-32.53	29.79	43.50	-13.71	peak	200	307	
5	246.8149	68.07	-30.57	37.50	46.00	-8.50	peak	200	316	
6	293.0842	57.10	-28.67	28.43	46.00	-17.57	peak	200	13	

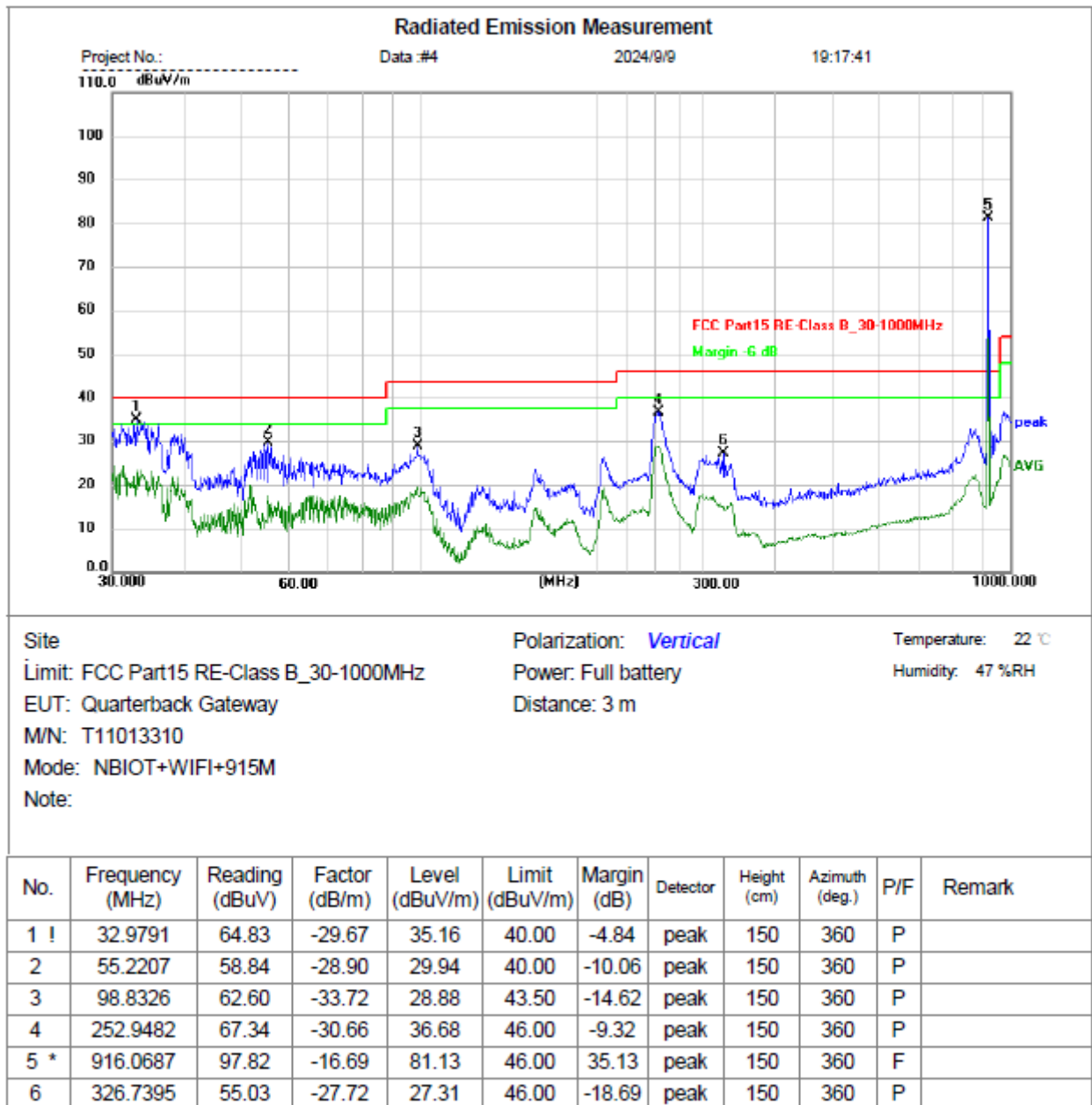


Site:	Antenna:Vertical	Temperature(°C):23(°C)
Limit:	FCC Part15 RE-Class B_30-1000MHz	Humidity(%):53%
EUT:	Quarterback Gateway	Test Time:
M/N.:	Gateway	Power Rating:
Mode:	Bluetooth+4G+915MHz	Test Engineer:
Note:		Bosco

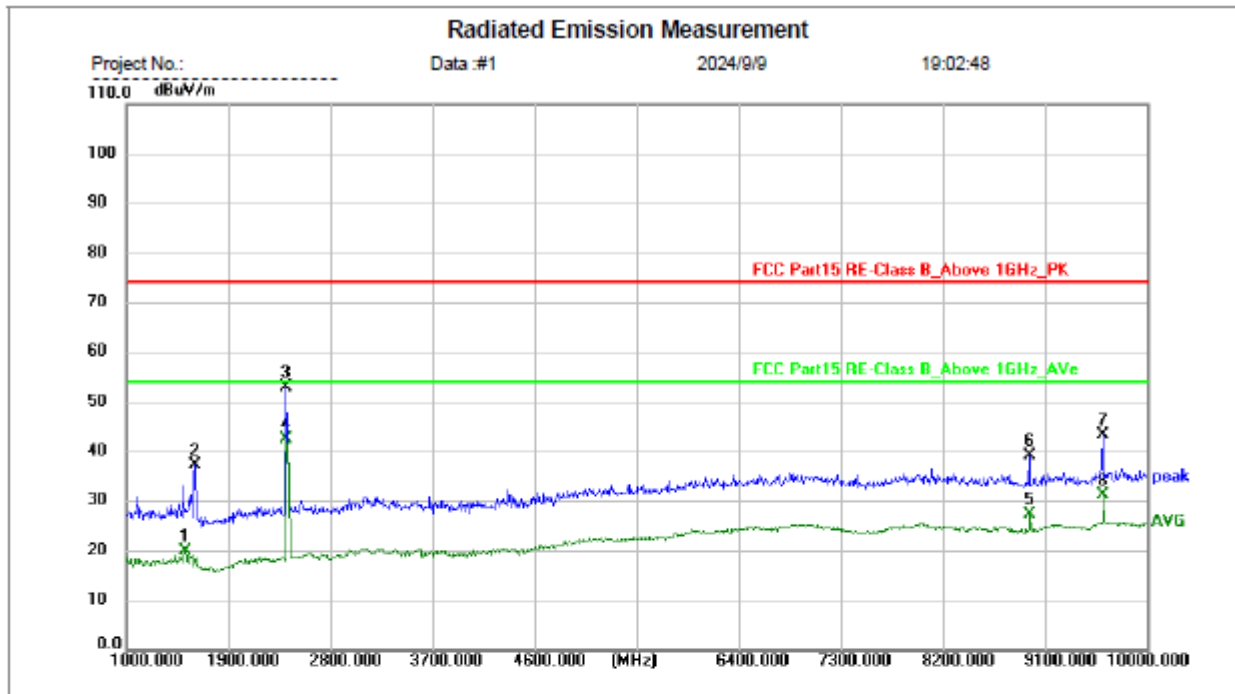
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1	102.3597	60.29	-33.27	27.02	43.50	-16.48	peak	100	351	
2	140.3421	54.58	-29.66	24.92	43.50	-18.58	peak	100	251	
3 *	202.1005	62.55	-32.53	30.02	43.50	-13.48	peak	100	106	
4	213.0151	62.26	-32.85	29.41	43.50	-14.09	peak	100	88	
5	245.9509	60.39	-30.54	29.85	46.00	-16.15	peak	100	337	
6	372.0045	52.14	-26.88	25.26	46.00	-20.74	peak	100	165	



Field strength exceeds the limit is fundamental emission.



Field strength exceeds the limit is fundamental emission.

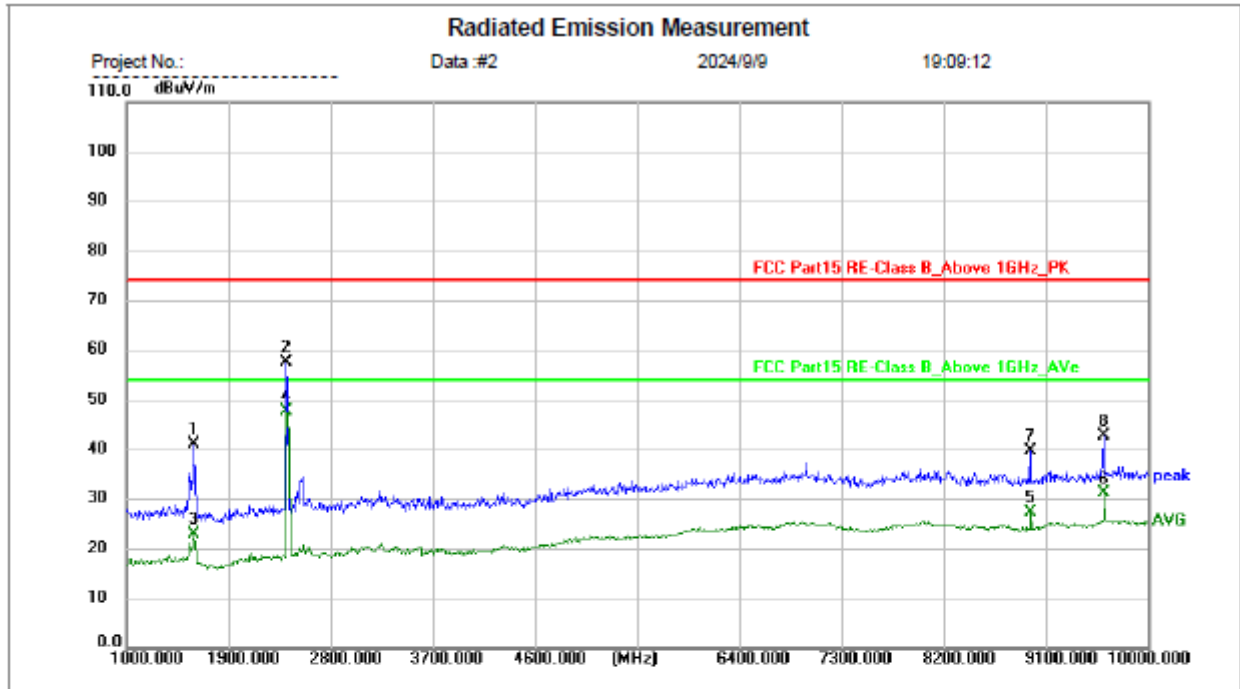


Site Limit: FCC Part15 RE-Class B_Above 1GHz_PK EUT: Quarterback Gateway M/N: T11013310 Mode: NBIOT+WIFI+915M Note:

Polarization: *Horizontal* Power: Full battery Distance: 3 m

Temperature: 22 °C Humidity: 47 %RH

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	1522.000	45.82	-25.80	20.02	54.00	-33.98	AVG	150	360	P	
2	1603.000	63.22	-26.00	37.22	74.00	-36.78	peak	150	360	P	
3	2404.000	76.46	-23.58	52.88	74.00	-21.12	peak	150	360	P	
4 *	2413.000	66.03	-23.54	42.49	54.00	-11.51	AVG	150	360	P	
5	8965.000	38.70	-11.25	27.45	54.00	-26.55	AVG	150	360	P	
6	8956.000	50.45	-11.27	39.18	74.00	-34.82	peak	150	360	P	
7	9604.000	54.23	-10.93	43.30	74.00	-30.70	peak	150	360	P	
8	9613.000	42.10	-10.93	31.17	54.00	-22.83	AVG	150	360	P	



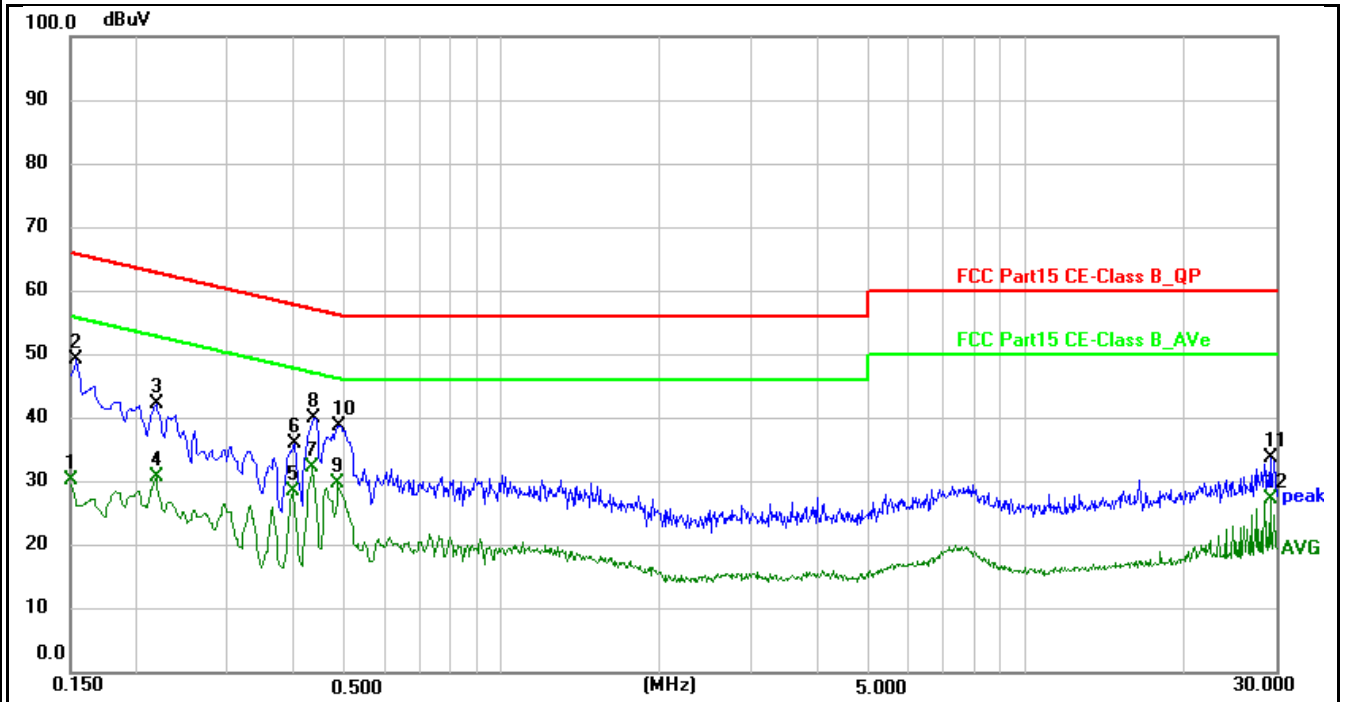
Site Limit: FCC Part15 RE-Class B_Above 1GHz_PK EUT: Quarterback Gateway M/N: T11013310 Mode: NBIOT+WIFI+915M Note:

Polarization: **Vertical** Power: Full battery Distance: 3 m

Temperature: 22 °C Humidity: 47 %RH

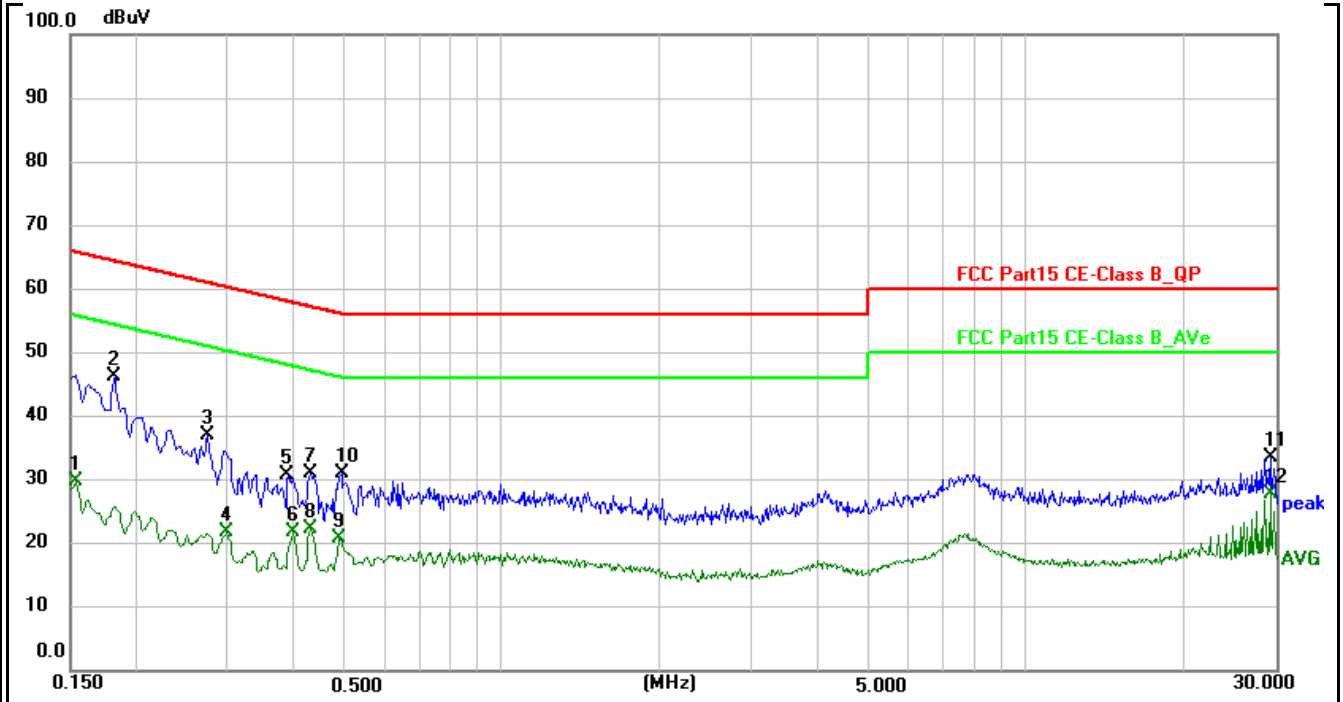
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	1594.000	66.98	-25.98	41.00	74.00	-33.00	peak	150	360	P	
2	2404.000	81.14	-23.58	57.56	74.00	-16.44	peak	150	360	P	
3	1594.000	48.88	-25.98	22.90	54.00	-31.10	AVG	150	360	P	
4 *	2413.000	71.20	-23.54	47.66	54.00	-6.34	AVG	150	360	P	
5	8965.000	38.49	-11.25	27.24	54.00	-26.76	AVG	150	360	P	
6	9613.000	42.12	-10.93	31.19	54.00	-22.81	AVG	150	360	P	
7	8956.000	50.93	-11.27	39.66	74.00	-34.34	peak	150	360	P	
8	9604.000	53.57	-10.93	42.64	74.00	-31.36	peak	150	360	P	

Appendix B.2: Test Results of Conducted Emission on AC Mains



Site:		Phase: L1	Temperature(C):22(C)
Limit:	FCC Part15 CE-Class B_QP		Humidity(%):56%
EUT:	Quarterback Gateway	Test Time:	2024/9/27 17:02:44
M/N.:	Gateway	Power Rating:	AC120V/60Hz
Mode:	BT+4G+915MHz	Test Engineer:	Bosco
Note:			

No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector	Comment
1	0.1500	10.84	19.42	30.26	56.00	-25.74	AVG	
2	0.1539	29.82	19.42	49.24	65.79	-16.55	peak	
3	0.2180	22.85	19.42	42.27	62.89	-20.62	peak	
4	0.2180	11.29	19.42	30.71	52.89	-22.18	AVG	
5	0.3980	9.02	19.47	28.49	47.90	-19.41	AVG	
6	0.4020	16.45	19.47	35.92	57.81	-21.89	peak	
7 *	0.4340	12.72	19.47	32.19	47.18	-14.99	AVG	
8	0.4380	20.52	19.47	39.99	57.10	-17.11	peak	
9	0.4860	10.30	19.47	29.77	46.24	-16.47	AVG	
10	0.4900	19.37	19.46	38.83	56.17	-17.34	peak	
11	29.2980	11.53	22.23	33.76	60.00	-26.24	peak	
12	29.2980	5.02	22.23	27.25	50.00	-22.75	AVG	



Site:		Phase: N	Temperature(C):22(C)
Limit:	FCC Part15 CE-Class B_QP		Humidity(%):56%
EUT:	Quarterback Gateway	Test Time:	2024/9/27 17:04:53
M/N.:	Gateway	Power Rating:	AC120V/60Hz
Mode:	BT+4G+915MHz	Test Engineer:	Bosco
Note:			

No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector	Comment
1	0.1539	10.30	19.44	29.74	55.79	-26.05	AVG	
2 *	0.1819	26.94	19.44	46.38	64.40	-18.02	peak	
3	0.2740	17.57	19.44	37.01	61.00	-23.99	peak	
4	0.2980	2.34	19.44	21.78	50.30	-28.52	AVG	
5	0.3899	11.34	19.48	30.82	58.07	-27.25	peak	
6	0.3980	2.24	19.48	21.72	47.90	-26.18	AVG	
7	0.4300	11.68	19.48	31.16	57.25	-26.09	peak	
8	0.4300	2.94	19.48	22.42	47.25	-24.83	AVG	
9	0.4900	1.42	19.47	20.89	46.17	-25.28	AVG	
10	0.4940	11.62	19.47	31.09	56.10	-25.01	peak	
11	29.3020	11.64	21.84	33.48	60.00	-26.52	peak	
12	29.3020	5.86	21.84	27.70	50.00	-22.30	AVG	