# **FCC RF Test Report**

APPLICANT : Quectel Wireless Solutions Co., Ltd.

**EQUIPMENT**: Smart Module

BRAND NAME : Quectel

MODEL NAME : SG560D-WF

FCC ID : XMR2023SG560DWF

STANDARD : FCC Part 15 Subpart C §15.247

CLASSIFICATION : (DTS) Digital Transmission System

TEST DATE(S) : Sep. 07, 2024 ~ Sep. 30, 2024

We, Sporton International Inc. (Shenzhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

This report contains data that were produced under subcontract by Sporton International Inc. (Kunshan)

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.

JasonJia

Approved by: Jason Jia





Report No.: FR482209B

## Sporton International Inc. (ShenZhen)

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People's Republic of China

Sporton International Inc. (ShenZhen)

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# **REVISION HISTORY**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR482209B	Rev. 01	Initial issue of report	Oct. 23, 2024

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## SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(b)(3)	Peak Output Power	≤ 30dBm	Pass	-
3.2	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 4.16 dB at 288.02 MHz
3.3	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

**Remark**: This is a variant report, the change note could be referred to the Class II Permissive Change letter which is exhibit separately. According to the differences, only the related test cases were verified from original test report (Report Number PD20230213RF02).

#### **Conformity Assessment Condition:**

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or
  in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of
  non-compliance that may potentially occur if measurement uncertainty is taken into account.
- 2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty"

#### Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

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# 1 General Description

## 1.1 Applicant

#### **Quectel Wireless Solutions Co., Ltd.**

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

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## 1.2 Manufacturer

#### **Quectel Wireless Solutions Co., Ltd.**

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

## 1.3 Product Feature of Equipment Under Test

	Product Feature				
Equipment	Equipment Smart Module				
Brand Name	Quectel				
Model Name	SG560D-WF				
FCC ID	XMR2023SG560DWF				
SN Code	Conducted: D1C24CG10000191 Radiation: 6d896798				
HW Version	R2.0				
SW Version	SG560DWFPBR03A01				
EUT Stage	Identical Prototype				

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

# 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification				
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz			
Number of Channels	40			
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)			
Maximum Output Power to Antenna	BLE 1Mbps: -0.91 dBm (0.000811 W)			
Maximum Output Power to Antenna	BLE 2Mbps: -0.88 dBm (0.000817 W)			
Antenna Type / Gain	Dipole Antenna type with gain 0.2 dBi			
Type of Modulation	Bluetooth LE : GFSK			

## 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

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## 1.6 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

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Test Firm	Sporton International Inc. (Kunshan)					
	No. 1098, Pengxi North	n Road, Kunshan Econom	ic Development Zone			
Test Site Location	Jiangsu Province 215300 People's Republic of China					
	TEL: +86-512-57900158					
	Sporton Site No.	FCC Designation No.	FCC Test Firm			
Test Site No.	Sporton Site No.	rec besignation No.	Registration No.			
	TH01-KS	CN1257	314309			

Note: Test data subcontracted: conducted test case in section 3.1 of this report

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International Inc. (ShenZhen)						
Test Site Location		uilding 1, No. 2, Tengfeng et, Baoan District, Shenzhe s Republic of China					
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.				
	03CH04-SZ	CN1256	421272				

## 1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	TH01-KS	Tonscend	JS1120-3 test system China_210602	3.3.10
2.	03CH04-SZ	AUDIX	E3	6.2009-8-24

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## 1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ANSI C63.10-2013

#### Remark:

- All test items were verified and recorded according to the standards and without any deviation during the test.
- 2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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# 2 Test Configuration of Equipment Under Test

# 2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
2400-2483.5 MHz	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

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## 2.2 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

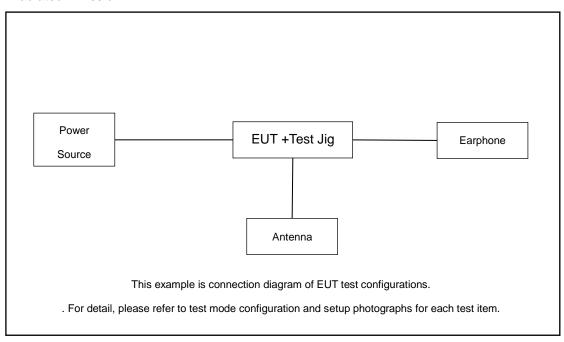
	Summary table of Test Cases			
Took Itom	Data Rate / Modulation			
Test Item	Bluetooth – LE / GFSK			
	Mode 1: Bluetooth Tx CH00_2402 MHz_BLE 1Mbps			
	Mode 2: Bluetooth Tx CH19_2440 MHz_BLE 1Mbps			
Conducted	Mode 3: Bluetooth Tx CH39_2480 MHz_BLE 1Mbps			
TCs	Mode 4: Bluetooth Tx CH00_2402 MHz_BLE 2Mbps			
	Mode 5: Bluetooth Tx CH19_2440 MHz_BLE 2Mbps			
	Mode 6: Bluetooth Tx CH39_2480 MHz_BLE 2Mbps			
Radiated	Mode 1: Plueteeth Ty CH20, 2490 MHz, PLE 2Mbps			
TCs	Mode 1: Bluetooth Tx CH39_2480 MHz_BLE 2Mbps			
Remark: For	Radiated Test Cases, The tests were performance with Adapter and Test Jig.			

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# 2.3 Connection Diagram of Test System

#### Radiated Emission:



## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	IPod	Apple	MC525 ZP/A	Fcc DoC	N/A	Shielded, 1.0m
2.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2m DC O/P: Shielded, 1.8m
3.	WLAN AP	Dlink	DIR-820L	KA2IR820LA1	N/A	Unshielded,1.8m
4.	BT Earphone	N/A	N/A	N/A	N/A	N/A
5.	Test Jig	N/A	N/A	N/A	N/A	N/A
6.	Antenna	N/A	N/A	N/A	N/A	N/A
7.	Earphone	N/A	N/A	N/A	N/A	N/A

# 2.5 EUT Operation Test Setup

For BLE function, the engineering test program was provided and enabled to make EUT continuous transmit.

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## 3 Test Result

## 3.1 Output Power Measurement

#### 3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

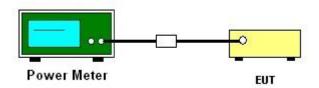
## 3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

#### 3.1.3 Test Procedures

- The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1
   Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM method.
- 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Measure the conducted output power and record the results in the test report.

#### 3.1.4 Test Setup



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## 3.1.5 Test Result of Peak Output Power

Test Mode	Antenna	CH.	Peak Conducted Power (dBm)	Conducted Power Limit	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit	Pass/Fail
		0	-0.91	30.00	0.2	-0.71	36.00	Pass
BLE1M	Ant1	19	-0.95	30.00	0.2	-0.75	36.00	Pass
		39	-1.68	30.00	0.2	-1.48	36.00	Pass
		0	-0.88	30.00	0.2	-0.68	36.00	Pass
BLE2M	Ant1	19	-0.95	30.00	0.2	-0.75	36.00	Pass
		39	-1.62	30.00	0.2	-1.42	36.00	Pass

# 3.1.6 Test Result of Average Output Power (Reporting Only)

Test Mode	Antenna	CH.	Duty Factor (dB)	Average Conducted Power (dBm)
		0	2.07	-1.36
BLE1M	Ant1	19	2.07	-1.39
		39	2.07	-1.77
		0	4.89	-1.00
BLE2M	Ant1	19	4.89	-1.04
		39	4.89	-1.98

Note: Power setting is the default.

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## 3.2 Radiated Band Edges and Spurious Emission Measurement

## 3.2.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

## 3.2.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

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#### 3.2.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
- 2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
- 3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- 4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 5. Corrected Reading: Antenna Factor + Cable Loss + Read Level Preamp Factor = Level
- 6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
- 7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- 8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \ge 1$  GHz for peak measurement. For average measurement:
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

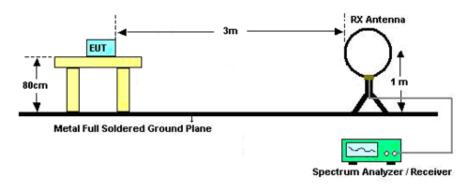
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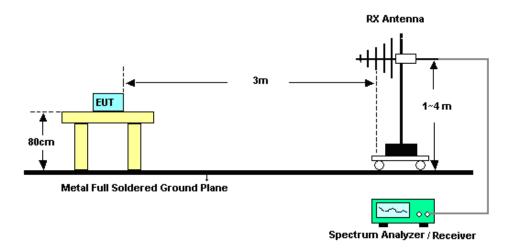
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## 3.2.4 Test Setup

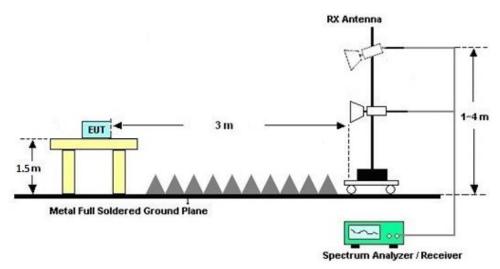
#### For radiated emissions below 30MHz



#### For radiated emissions from 30MHz to 1GHz



#### For radiated emissions above 1GHz



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## 3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

## 3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

## 3.2.7 Duty Cycle

Please refer to Appendix B.

# 3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix A.

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## 3.3 Antenna Requirements

## 3.3.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

## 3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

#### 3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

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# 4 List of Measuring Equipment

Instrument	Manufacturer Model No.		Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 11, 2023	Sep. 07, 2024	Oct. 10, 2024	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GH z	Jan. 02, 2024	Sep. 07, 2024	Jan. 01, 2025	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 02, 2024	Sep. 07, 2024	Jan. 01, 2025	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 18, 2023	Sep. 12, 2024~ Sep. 30, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 13	10Hz~44GHz	Jul. 03, 2024	Sep. 12, 2024~ Sep. 30, 2024	Jul. 02, 2025	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2E	101141	9kHz~30MHz	Dec. 29, 2023	Sep. 12, 2024~ Sep. 30, 2024	Dec. 28, 2024	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	May 09, 2024	Sep. 12, 2024~ Sep. 30, 2024	May 08, 2025	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBE CK	BBHA9120D	9120D-147 4	1GHz~18GHz	Jul. 07, 2023	Sep. 12, 2024~ Sep. 30, 2024	Jul. 06, 2025	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBE CK	BBHA9170	9170#679	15GHz~40GHz	Jul. 04, 2024	Sep. 12, 2024~ Sep. 30, 2024	Jul. 03, 2025	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 18, 2023	Sep. 12, 2024~ Sep. 30, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P- R	1943528	1GHz~18GHz	Oct. 18, 2023	Sep. 12, 2024~ Sep. 30, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35- HG	1871923	18GHz~40GHz	Jul. 03, 2024	Sep. 12, 2024~ Sep. 30, 2024	Jul. 02, 2025	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY572801 36	500MHz~26.5G Hz	Jul. 03, 2024	Sep. 12, 2024~ Sep. 30, 2024	Jul. 02, 2025	Radiation (03CH04-SZ)
AC Power Source	APC	AFV-S-600B	F11905001 9	N/A	Oct. 18, 2023	Sep. 12, 2024~ Sep. 30, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Sep. 12, 2024~ Sep. 30, 2024	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Sep. 12, 2024~ Sep. 30, 2024	NCR	Radiation (03CH04-SZ)

NCR: No Calibration Required

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# 5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

## **Uncertainty of Conducted Measurement**

#### Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence	5.1 dB
of 95% (U = 2Uc(y))	3.1 uB

#### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence	5.1 dB
of 95% (U = 2Uc(y))	3.1 ub

#### Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Manager and the sector of the formal sector of Open Cileman	
Measuring Uncertainty for a Level of Confidence	4.8 dB
of 95% (U = 2Uc(y))	4.0 UB

#### **Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)**

Measuring Uncertainty for a Level of Confidence	5.1 dB
of 95% (U = 2Uc(y))	3.1 dB

----- THE END -----

Sporton International Inc. (ShenZhen)

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Report Issued Date : Oct. 23, 2024
Report Version : Rev. 01

Report No.: FR482209B

# Appendix A. Radiated Spurious Emission Test Data

Test Engineer :	Wenbo Xiao	Relative Humidity :	48~49%
	Wellbo Alao	Temperature :	24℃~25℃

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## **Radiated Spurious Emission Test Modes**

Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	2400-2483.5	1	Bluetooth-LE_GSFK	39	2480	2Mbps	-	-
Mode 2	2400-2483.5	1	Bluetooth-LE_GSFK	39	2480	2Mbps	-	LF

## Summary of each worse mode

Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Bluetooth-LE_GSFK	39	2489.62	35.82	54.00	-18.18	V	AVERAGE	Pass	Band Edge
1	Bluetooth-LE_GSFK	39	7440.00	45.04	74.00	-28.96	V	Peak	Pass	Harmonic
2	Bluetooth-LE_GSFK-LF	00	288.02	41.84	46.00	-4.16	Н	PEAK	PASS	LF

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1 Mode **Band Edge** 2400-2483.5\_Bluetooth-LE\_GSFK\_CH39\_2480MHz **ANT** Pol. Horizontal **Fundamental** Date: 2024-09-12 140 Level (dBuV/m) Date: 2024-09-12 140 Level (dBuV/m) 122.5 122.5 105.0 105.0 87.5 87.5 PEAK\_BE\_7 70.0 70.0 52.5 52.5 **Peak** 35.0 35.0 17.5 17.5 2480 Frequency (MHz) ru. 2200. Frequency (MHz) 1000 2484. 2500 3000 Limit Margin Read Ant Cable Preamp APos TPos Limit Margin Read Ant Cable Preamp APos TPos Freq Level Line (dB) Level Factor Loss Factor Freq Level Line (dB) Level Factor Loss Factor MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2487.56 43.87 74.00 -30.13 41.30 30.70 5.46 33.59 173 45 PEAK 1 2480.00 81.36 ----- 78.79 30.70 5.46 33.59 173 45 PEAK Date: 2024-09-12 Date: 2024-09-12 140 Level (dBuV/m) 140 Level (dBuV/m) 122.5 122.5 105.0 105.0 87.5 87.5 70.0 70.0 AVG BE 54 AVG 54 52.5 52.5 Avg 35.0 35.0 17.5 17.5 1000 Frequency (MHz) Frequency (MHz) Limit Margin Read Ant Cable Preamp APos TPos Limit Margin Read Ant Cable Preamp APos TPos Freq Level Line (dB) Level Factor Loss Factor Freq Level Line (dB) Level Factor Loss Factor MHz dBuV/m dBuV/m dBuV dB/m dB dB deg MHz dBuV/m dBuV/m dBuV dB/m dB dB cm cm deg 1 2480.00 79.26 ----- 76.69 30.70 5.46 33.59 173 45 AVERAGE 1 2493.10 35.80 54.00 -18.20 33.23 30.70 5.47 33.60 173 45 AVERAGE

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1 Mode **Band Edge** 2400-2483.5\_Bluetooth-LE\_GSFK\_CH39\_2480MHz **ANT** Pol. Vertical **Fundamental** Date: 2024-09-12 140 Level (dBuV/m) Date: 2024-09-12 140 Level (dBuV/m) 122.5 122.5 105.0 105.0 87.5 87.5 PEAK\_BE\_7 70.0 70.0 52.5 52.5 **Peak** 35.0 35.0 17.5 17.5 2480 Z492. Frequency (MHz) ru. 2200. Frequency (MHz) 1000 2484. 2500 3000 Limit Margin Read Ant Cable Preamp APos TPos Limit Margin Read Ant Cable Preamp APos TPos Freq Level Line (dB) Level Factor Loss Factor Freq Level Line (dB) Level Factor Loss Factor MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2497.00 44.44 74.00 -29.56 41.87 30.70 5.47 33.60 171 273 PEAK 1 2480.00 90.47 ----- 87.90 30.70 5.46 33.59 171 273 PEAK Date: 2024-09-12 Date: 2024-09-12 140 Level (dBuV/m) 140 Level (dBuV/m) 122.5 122.5 105.0 105.0 87.5 87.5 70.0 70.0 AVG\_54 AVG BE 54 52.5 52.5 Avg 35.0 35.0 17.5 17.5 1000 Frequency (MHz) Frequency (MHz) Limit Margin Read Ant Cable Preamp APos TPos Limit Margin Read Ant Cable Preamp APos TPos Freq Level Line (dB) Level Factor Loss Factor Freq Level Line (dB) Level Factor Loss Factor deg MHz dBuV/m dBuV/m dBuV dB/m dB dB MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg CM 1 2480.00 88.52 ----- 85.95 30.70 5.46 33.59 171 273 AVERAGE 1 2489.62 35.82 54.00 -18.18 33.24 30.70 5.47 33.59 171 273 AVERAGE

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1 Mode **Harmonic** 2400-2483.5\_Bluetooth-LE\_GSFK\_CH39\_2480MHz **ANT** Pol. Horizontal Vertical 140\_Level (dBuV/m) 140 Level (dBuV/m) Date: 2024-09-30 Date: 2024-09-30 122.5 122.5 105.0 105.0 87.5 87.5 PEAK\_74 PEAK 74 70.0 70.0 Peak 35.0 35.0 Avg 17.5 17.5 3000 3000 12200. 16800. Frequency (MHz) 12200. 16800. Frequency (MHz) 7600. 21400. 26000 7600. 21400. 26000 Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Freq Level Line Margin Level Factor Loss Factor deg deg --- Peak MHz dBuV/m dBuV/m dB dBuV dB/m dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm CM 1 4960.00 43.34 74.00 -30.66 63.68 36.10 8.46 64.90 1 4960.00 44.22 74.00 -29.78 64.56 36.10 8.46 64.90 --- Peak

--- Peak

2 7440.00 42.30 74.00 -31.70 60.17 36.82 10.17 64.86

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--- Peak

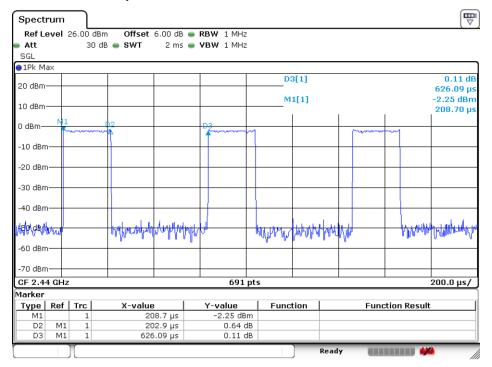
2 LF Mode 2400-2483.5\_Bluetooth-LE\_GSFK-LF\_CH00\_2402MHz **ANT** Pol. Horizontal Vertical Date: 2024-09-14 Date: 2024-09-14 80 Level (dBuV/m) 80 Level (dBuV/m) 70.0 70.0 60.0 60.0 FCC CLASS-E FCC CLASS-E 50.0 50.0 40.0 40.0 30.0 30.0 QP/ 20.0 **Peak** 224. 418. 612. Frequency (MHz) 806. 224. . 612. Frequency (MHz) 806. Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Freq Level Line Margin Level Factor MHz dBuV/m dBuV/m dB dBuV dB/m deg --- Peak MHz dBuV/m dBuV/m dB dBuV dB/m deg --- Peak CM dB dB CM 30.00 24.98 40.00 -15.02 30.85 25.20 0.53 31.60 37.76 31.18 40.00 -8.82 41.35 21.00 0.59 31.76 290.93 32.54 46.00 -13.46 43.17 19.12 349.13 34.79 46.00 -11.21 43.75 20.46 110.51 26.34 43.50 -17.16 40.13 17.00 183.26 29.36 43.50 -14.14 44.71 14.90 --- Peak --- Peak --- Peak --- Peak 1.07 31.86 1.77 31.52 1.38 31.63 1.98 31.40 --- Peak --- Peak --- Peak 288.02 41.84 46.00 -4.16 52.58 19.02 1.76 31.52 --- Peak 375.32 30.15 46.00 -15.85 38.56 21.00 2.04 31.45 348.16 40.65 46.00 -5.35 49.66 20.42 1.97 31.40 649.83 28.01 46.00 -17.99 30.06 26.50 2.65 31.20 579.99 28.29 46.00 -17.71 30.91 26.00 2.52 31.14 870.99 32.24 46.00 -13.76 30.96 29.20 3.10 31.02

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# **Appendix B. Duty Cycle Plots**

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth LE 2Mbps	32.41	0.203	4.929	10KHZ

#### **Bluetooth LE 2Mbps**



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