# FCC Part 15C Measurement and Test Report

# For

# Shenzhen Daiku technology Co., LTD

# FCC ID: 2BCKX-S4ULTRA

FCC Rule(s):	FCC Part 15.247		
Product Description:	Smart Watch		
Tested Model:	<u>S4ultra</u>		
Report No.:	BSL240904175001RF		
Tested Date:	<u>Sep.03-25,2024</u>		
Issued Date:	<u>Sep.25,2024</u>		
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# **1. GENERAL INFORMATION**

# **1.1 Product Description for Equipment Under Test (EUT)**

Client Information	
Applicant:	Shenzhen Daiku technology Co., LTD
Address of applicant:	605-606, Building E, Longjing Science Park, 339 Bulong Road,
	Longgang District, Shenzhen
Manufacturer:	Shenzhen Daiku technology Co., LTD
Address of manufacturer:	605-606, Building E, Longjing Science Park, 339 Bulong Road,
	Longgang District, Shenzhen

General Description of EUT		
Product Name:	Smart Watch	
Brand Name:	N/A	
Models No.:	S4ultra	
Rated Voltage:	DC 3.7V by battery	
Note: The test data is gathered from a production sample provided by the manufacturer.		

Technical Characteristics of EUT		
Bluetooth Version:	V5.0	
Frequency Range:	2402-2480MHz	
Modulation:	GFSK	
Quantity of Channels:	40	
Channel Separation:	2MHz	
Type of Antenna:	Cable Antenna	
Antenna Gain:	1.49dBi	

### 1.2 Test Standards

The following report is prepared on behalf of the Shenzhen Daiku technology Co., LTD in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

#### **1.3 Test Methodology**

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 v05r02 for digital transmission systems shall be performed also.

#### 1.4 Test Facility

BSL Testing Co.,LTD.

1/F, Building B, Xinshidai GR Park, Shiyan Street, Bao'an District, Shenzhen, ShiyanStreet, Bao'an District, Shenzhen, Guangdong, 518052, People's Republic of China

FCC Test Firm Registration Number: 562200 Designation Number: CN1338

Tel: 400-882-9628 Fax: 86-755-26508703

# **1.5 EUT Setup and Test Mode**

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List			
Test Mode	Description	Remark	
TM1	GFSK(BLE)	2402MHz, 2440MHz, 2480MHz	

EUT Cable List and Details				
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite	
/	/	/	/	

Special Cable List and Details				
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite	
/	/	/	/	

Auxiliary Equipment List and Details				
Description	Manufacturer	Model	Serial Number	

# **1.6 Measurement Uncertainty**

Measurement uncertainty				
Parameter	Conditions	Uncertainty		
RF Output Power	Conducted	$\pm 0.42$ dB		
Occupied Bandwidth	Conducted	$\pm 1.5\%$		
Power Spectral Density	Conducted	$\pm 1.8$ dB		
Conducted Spurious Emission	Conducted	±2.17dB		
Conducted Emissions	Conducted	$\pm 2.88$ dB		
Transmitter Spurious Emissions	Radiated	$\pm 5.1$ dB		

Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
Communication Tester	Rohde & Schwarz	CMW500	100358	2023-10-27	2024-10-26
Spectrum Analyzer	R&S	FSP40	100550	2023-10-27	2024-10-26
Test Receiver	R&S	ESCI7	US47140102	2023-10-27	2024-10-26
Signal Generator	HP	83630B	3844A01028	2023-10-27	2024-10-26
Test Receiver	R&S	ESPI-3	100180	2023-10-27	2024-10-26
Amplifier	Agilent	8449B	4035A00116	2023-10-27	2024-10-26
Amplifier	HP	8447E	2945A02770	2023-10-27	2024-10-26
Signal Generator	IFR	2023A	202307/242	2023-10-27	2024-10-26
Broadband Antenna	SCHAFFNER	2774	2774	2023-10-27	2024-10-26
Biconical and log	ELECTRO-METRI	EM-6917B-1	171	2023-10-27	2024-10-26
periodic antennas	CS	EM-091/B-1	1/1	2025-10-27	2024-10-26
Horn Antenna	R&S	HF906	100253	2023-10-27	2024-10-26
Horn Antenna	EM	EM-6961	6462	2023-10-27	2024-10-26
LISN	R&S	ESH3-Z5	100196	2023-10-27	2024-10-26
LISN	COM-POWER	LI-115	02027	2023-10-27	2024-10-26
3m Semi-Anechoic	Chengyu Electron	9 (L)*6 (W)*	BSL086	2023-10-27	2024-10-26
Chamber		6 (H)	DSL080	2025-10-27	2024-10-20
Horn Antenna	A-INFOMW	LB-180400KF	BSL088	2023-10-27	2024-10-26
20dB Attenuator	ICPROBING	IATS1	BSL1003	2023-10-27	2024-10-26
POWER DIVIDER	Mini-circuits	PD-2SF-0010	N/A	2023-10-27	2024-10-26
Power Meter	DARE	RPR3006W	15I00041SN	2023-10-27	2024 10 26
			O03	2023-10-27	2024-10-26
Loop Antenna	Schwarz beck	FMZB 1516	9773	2023-10-27	2024-10-26
Antenna Tower	SKET	BK-4AT-BS	N/A	N/A	N/A

# **1.7 Test Equipment List and Details**

# 2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 2.1093	RF Exposure	PASS
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	PASS
§15.205	Restricted Band of Operation	PASS
§ 15.207(a)	Conducted Emission	N/A
§ 15.247(e)	Power Spectral Density	PASS
§ 15.247(a)(2)	6 dB Bandwidth	PASS
§ 15.247(b)(3)	RF Output Power	PASS
§ 15.209(a)	Radiated Emission	PASS
§ 15.247(d)	Band Edge (Out of Band Emissions)	PASS

Note: PASS: applicable, N/A: not applicable.

# 3. RF Exposure

# **3.1 Standard Applicable**

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

### **3.2 Test Result**

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

# 4. Antenna Requirement

### 4.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section.

### **4.2 Evaluation Information**

This product has a Chip antenna(1.49dBi), fulfill the requirement of this section.

# **5.** Power Spectral Density

# **5.1 Standard Applicable**

According to 15.247(a)(1)(iii), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

# **5.2 Test Procedure**

According to the KDB 558074 D01 v05r02, the test method of power spectral density as below:

a) Set analyzer center frequency to DTS channel center frequency.

- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq$  3  $\times$  RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### **5.3 Environmental Conditions**

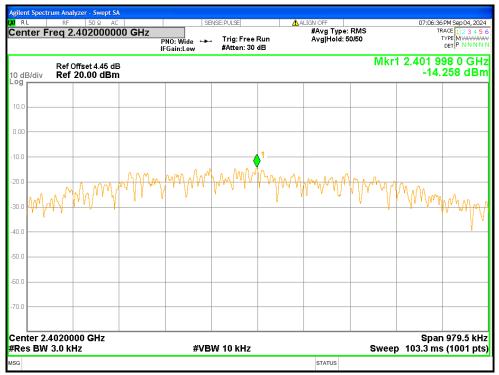
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

### **5.4 Summary of Test Results/Plots**

Test Mede	Test Channel	Power Spectral Density	Limit
Test Mode	MHz	dBm/3kHz	dBm/3kHz
	2402	-14.26	8
GFSK(BLE)	2440	-14.66	8
	2480	-15.68	8

Please refer to the following test plots:

#### Low Channel



Middle Channel



# High Channel

RL RF	7zer - Swept SA 50 Ω AC	SI	ENSE:PULSE	ALIGN OFF	07:10:33 PM Sep 04, 202
nter Freq 2.	480000000 GI	Hz PNO: Wide IFGain:Low	.↓ Trig: Free Run #Atten: 30 dB	#Avg Type: RMS Avg Hold: 300/300	TRACE 1 2 3 4 5 TYPE M WWWW DET P N N N N
	ffset 4.44 dB 20.00 dBm				Mkr1 2.479 998 0 GH -15.678 dBr
.0					
10					
			<b>_</b> 1		
0		mm non Ar	1. mp	n Alban Mar A J	
MANA INA	Mm 1	A. A. A.	Y Y Y	M. M. M. M. A. A.	M/ MMMMMMMM
0					
0					
nter 2.48000 es BW 3.0 kH			3W 10 kHz		Span 981.0 kH weep 103.5 ms (1001 pt

# 6. 6dB Bandwidth

### 6.1 Standard Applicable

According to 15.247(a)(2). Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 6.2 Test Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq$  3  $\times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

# **6.3 Environmental Conditions**

Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

#### 6.4 Summary of Test Results/Plots

Test Mode	Test Channel MHz	6 dB Bandwidth kHz	Limit kHz
GFSK(BLE)	2402	653	≥500
	2440	650	≥500
	2480	654	≥500

Please refer to the following test plots:

#### For BLE

Low Channel:

Agilent Spectrum Analyzer - Occupied BV		ENSE:PULSE		07-04-00 04-00
Center Freq 2.402000000		Center Freq: 2.402000		07:06:23 PM Sep 04, 2024 Radio Std: None
	#IFGain:Low	. Trig: Free Run #Atten: 30 dB	Avg Hold: 300/300	Radio Device: BTS
Ref Offset 4.45 dE 10 dB/div Ref 24.45 dBm				Mkr3 2.402327 GHz -5.2866 dBm
Log 14.5				
4.45	^2	↓1	3	
-5.55				
-15.6				~~~
-25.6				
-35.6				Mannen
-45.6				
-55.6				
-65.6				
Center 2.402 GHz #Res BW 100 kHz		#VBW 300 k	Hz	Span 2 MHz Sweep 1.333 ms
Occupied Bandwidtl	า	Total Power	7.55 dBm	
	0156 MHz			
Transmit Freq Error	656 Hz	OBW Power	99.00 %	
x dB Bandwidth	652.8 kHz	x dB	-6.00 dB	
MSG			STATUS	

Middle Channel:



High Channel:

x dB Ba	andwidth	654.2 kHz	x dB	-6.00 dB		
Transm	iit Freq Error	2.345 kHz	OBW Power	99.00 %		
Occup	ied Bandwidth 1.0	159 MHz	Total Power	5.85 dBm		
enter 2.4 Res BW	100 kHz		#VBW 300 ki			Span 2 MH Sweep 1.333 m
5.6						
5.6						
5.6	. musicher and a second se					
.6	- Alexand				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Marine Marine
.6				1 million and a second	-	
56		Em		- marks		
44		~2	1	- 2		
dB/div	Ref 24.44 dBm					-7.1364 dBr
	Ref Offset 4.44 dB	an Galiteow				2.480329 GH
	<u> </u>	#IEGain:Low	'	Avg Hold: 100/100	Rac	lio Device: BTS
RL	RF 50 Ω AC eq 2.480000000 G		ENSE:PULSE 4800000 Center Freg: 2.4800000	ALIGN OFF	Rac	07:09:49 PM Sep 04, 202 lio Std: None

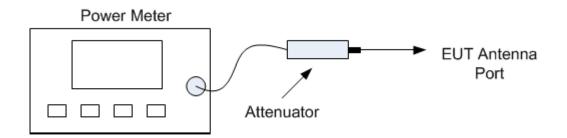
# 7. RF Output Power

# 7.1 Standard Applicable

According to 15.247(b)(3). For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

### 7.2 Test Procedure

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.



### **7.3 Environmental Conditions**

Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

# 7.4 Summary of Test Results/Plots

Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
GFSK(BLE)	2402	1.49	1.41	1000
	2440	1.03	1.27	1000
	2480	0.01	1.00	1000

Note: the antenna gain of 1.49 dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.

# 8. Field Strength of Spurious Emissions

# 8.1 Standard Applicable

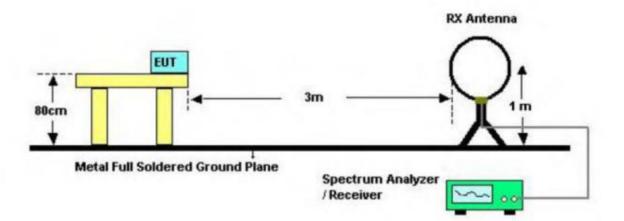
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

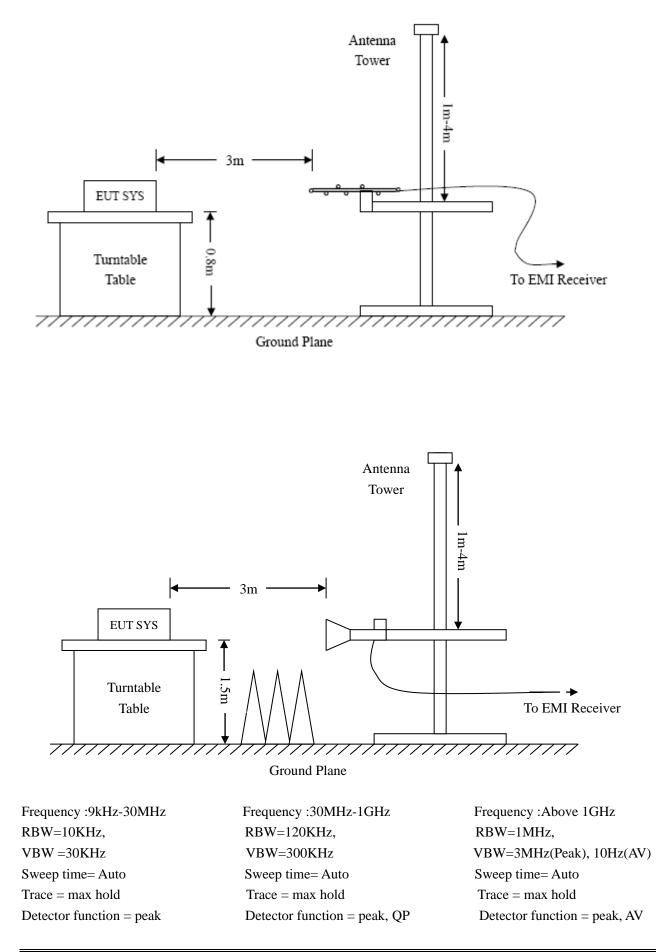
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

#### 8.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.





### 8.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of  $-6dB\mu V$  means the emission is  $6dB\mu V$  below the maximum limit. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15 Limit

#### **8.4 Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

#### 8.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

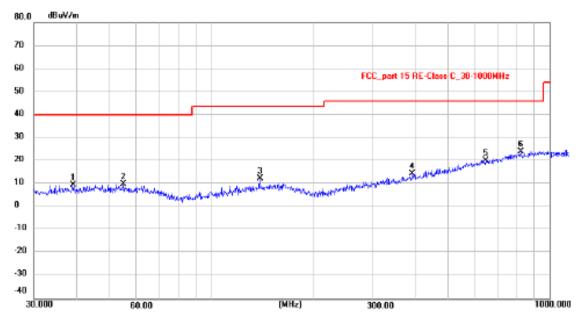
Note:

- 1. Worst-case radiated emission below 1GHz is GFSK (CH High) mode.
- 2. Worst-case radiated emission above 1GHz is GFSK (CH Low, Middle, High) mode.

The Worst Test Data Below 1GHz GFSK (CH High) mode:

# Plot of Radiated Emissions

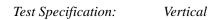
Test Specification: Horizontal

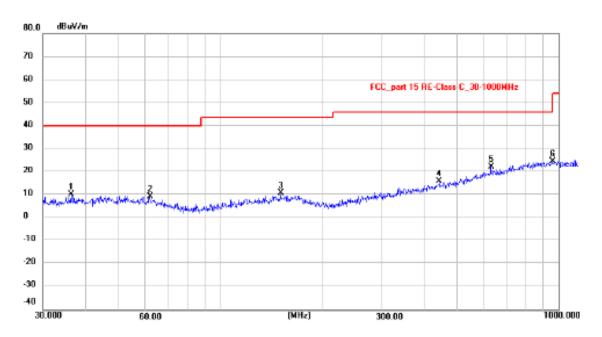


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	39.0245	26.15	-16.43	9.72	40.00	-30.28	peak
2	55.2207	26.93	-16.85	10.08	40.00	-29.92	peak
3	139.3613	29.20	-16.80	12.40	43.50	-31.10	peak
4	393.4723	27.58	-13.26	14.32	46.00	-31.68	peak
5	647.3856	27.27	-7.10	20.17	46.00	-25.83	peak
6 *	821.7103	28.63	-4.43	24.20	46.00	-21.80	peak

\*:Maximum data x:Over limit !:over margin

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No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	36.3814	27.20	-16.86	10.34	40.00	-29.66	peak
2	61.9951	26.67	-17.35	9.32	40.00	-30.68	peak
3	151.0666	26.88	-15.93	10.95	43.50	-32.55	peak
4	444.8514	27.71	-11.79	15.92	46.00	-30.08	peak
5	631.6884	29.56	-7.35	22.21	46.00	-23.79	peak
6 *	958.7943	27.80	-3.06	24.74	46.00	-21.26	peak

\*:Maximum data x:Over limit !:over margin

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Test channel:

The Worst Spurious Emissions Above 1GHz

Transmitting: BLE mode:

Lowest

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2402	87.53	-	-	Vertical
4804	40.27	74.00	-33.73	Vertical
7206	38.43	74.00	-35.57	Vertical
9608	31.72	74.00	-42.28	Vertical
2402	86.94	-	-	Horizontal
4804	40.28	74.00	-33.72	Horizontal
7206	37.83	74.00	-36.17	Horizontal
9608	31.53	74.00	-42.47	Horizontal

#### Average value:

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization		
2402	86.34	-	Vertic			
4804	38.16	54.00	-15.84	Vertical		
7206	36.57	54.00	-17.43	Vertical		
9608	30.51	54.00	-23.49	Vertical		
2402	86.18	-	-	Horizontal		
4804	38.27	54.00	-15.73	Horizontal		
7206	36.39	54.00	-17.61	Horizontal		
9608	30.59	54.00	-23.41	Horizontal		

#### Remark:

- 1. Final Level =Receiver Read level + Antenna Factor + Cable Loss Preamplifier Factor
- 2. "\*", means this data is the too weak instrument of signal is unable to test.
- 3. The emission from 9 kHz to 30MHz was pre tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.
- 4. In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.

Test	cha	nnel:	

Middle

Peak value:

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2442	86.57	-	-	Vertical
4882	40.59	74.00	-33.41	Vertical
7323	38.47	74.00	-35.53	Vertical
9764	31.68	74.00	-42.32	Vertical
2442	86.37	-	-	Horizontal
4882	39.57	74.00	-34.43	Horizontal
7323	37.83	74.00	-36.17	Horizontal
9764	31.67	74.00	-42.33	Horizontal

#### Average value:

Frequency (MHz)	Level (dBuV/m)			Polarization
2442	85.94	-	-	Vertical
4882	38.54	54.00	-15.46	Vertical
7323	37.46	54.00	-16.54	Vertical
9764	30.24	54.00	-23.76	Vertical
2442	85.83	-	-	Horizontal
4882	38.47	54.00	-15.53	Horizontal
7323	36.51	54.00	-17.49	Horizontal
9764	30.57	54.00	-23.43	Horizontal

Remark:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

2. "\*", means this data is the too weak instrument of signal is unable to test.

- 3. The emission from 9 kHz to 30MHz was pre tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.
- 4. In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.

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	Test channel:	Highest
- 1		5

Peak value:

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2480	85.37	-	-	Vertical
4960	39.61	74.00	-34.39	Vertical
7440	38.54	74.00	-35.46	Vertical
9920	31.64	74.00	-42.36	Vertical
2480	85.16	-	-	Horizontal
4960	39.47	74.00	-34.53	Horizontal
7440	37.43	74.00	-36.57	Horizontal
9920	31.49	74.00	-42.51	Horizontal

#### Average value:

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
2480	85.37	-	-	Vertical	
4960	38.43	54.00	-15.57	Vertical	
7440	36.27	54.00	-17.73	Vertical	
9920	30.47	54.00 -23.53		Vertical	
2480	85.27	-	-	Horizontal	
4960	37.16	54.00	-16.84	Horizontal	
7440	35.44	54.00	-18.56	Horizontal	
9920	30.27	54.00	-23.73	Horizontal	

Remark:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

2. "\*", means this data is the too weak instrument of signal is unable to test.

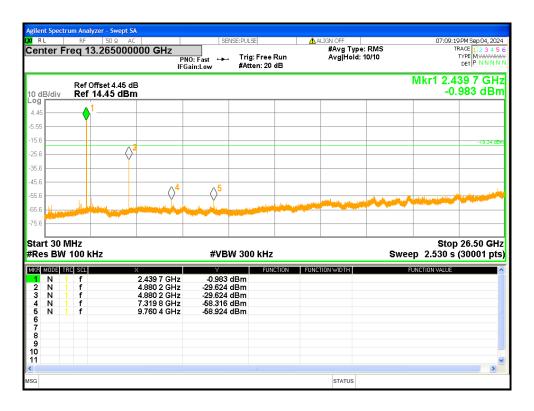
3. The emission from 9 kHz to 30MHz was pre tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.

4. In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.

### Spurious Emission(Conducted) For BLE Low channel:

RL		50 Ω AC		SEN	NSE:PULSE	<u> </u>	ALIGN OFF			7 PM Sep 04, 20
enter F	req 13.2	65000000	PNO	0:Fast ↔→ ain:Low	Trig: Free R #Atten: 20 d		#Avg Type Avg Hold:		1	TYPE MWMM DET P N N N
dB/div	Ref Offse Ref 14.4								Mkr1 2.4 -1.	01 7 GH .042 dB
45	<mark>1</mark>									
55										
.6										-18.90
i.6		~~								
.6										
.6			- 4	۸5						
.6				$-\diamond$		والقلول المريح وقريم	and hereiting hereitige	a state of the state of the		<b>Second</b>
.6						and the second second second				
.6										
art 30 ľ les BW	VIHz 100 kHz			#VB\	N 300 kHz			Swee	Stop 2.530 s	) 26.50 GI (30001 p
R MODE T		×	01 7 GHz	۲ -1.042	FUNCT	ION FUNC	TION WIDTH	F	UNCTION VALUE	
N 1	f f	4.80	04 3 GHz	-29.248	dBm					
N <sup>′</sup>	f f		04 3 GHz 06 9 GHz	-29.248						
N 1	f	9.60	05 1 GHz	-61.848	dBm					
N 1										
N <sup>′</sup>										
N <sup>(</sup>										

Middle channel:



High channel:

RL	RF	50 Ω AC		SE	NSE:PULSE		ALIGN OFF		07:11:	24 PM Sep 04, 20
nter F	req 13.2	65000000	PNC	): Fast 🗰	Trig: Fre #Atten: 2		#Avg Ty Avg Hol			TRACE 1 2 3 4 TYPE MWWW DET P N N N
dB/div		et 4.44 dB 44 dBm								480 2 GH .972 dB
4	<mark>1</mark>									
s						_				
										-20.35 c
		3								-20.35 0
		Y								
; 			4	∧ <mark>5</mark>						السياني الم
	العطيعة الت		Y.	Y			and the state of the	الريانيين المريس		
and the second second										
nt 30 M es BW	VIHz 100 kHz			#VB	W 300 KH	z		Swee		p 26.50 GH s (30001 pt
MODE TR		×		Y		INCTION	FUNCTION WIDTH	F	UNCTION VALUE	
N 1	f		30 2 GHz 59 6 GHz	-1.972 -30.881						
N 1	f	4.9	59 6 GHz 39 8 GHz	-30.881 -61.077	dBm					
N 1	f		201 GHz	-59.931						
										>

Note: Not recorded emission from 9 KHz to 30 MHz as emission level at least 20dBc lower than emission limit.

Bandedge (Conducted)

Lowest Channel:

Agiler	nt Spe	ctru	n Ana	lyzer - Swept SA								
<mark>IXI</mark> R Cen	l	Fre	RF	50 Ω AC	GHZ	SE	NSE:PULSE		ALIGN OFF #Avg T	ype: RMS		02 PM Sep 04, 2024 TRACE 1 2 3 4 5 6
001			· • ·		Р	NO: Fast ↔ Gain:Low	Trig: Fr #Atten:	ree Run ∶30 dB	AvgļHo	id: 1000/1000		
10 d	Bídis			Offset 4.45 dB 20.00 dBm							Mkr1 2.4 1	02 0 GHz .324 dBm
Log			1101									
10.0	$\vdash$											1
0.00	$\vdash$											<mark></mark>
-10.0	⊢											+
-20.0	⊨											-19.03 dBm
-30.0												<u>_</u>
-40.0												
-50.0												
-60.0	m	h an h	(***~ <b>*</b> /)	anteren and	en Mundormal	handstrand	Myshawryper	man	ward the second wards	www.www.www.www.	hard many manager	man of the h
-70.0												
10.0												
Star #Re						#VB	W 300 k	Hz		Sw	Stop 2 eep 9.600 m	.40600 GHz s (1001 pts)
MKR	MODE	TRC	SCL	×		Y		FUNCTION	FUNCTION WIDTH		FUNCTION VALUE	~
1	N N		f f		.402 0 GHz .400 0 GHz	1.324 -45.337						
2 3	Ν		f	2	.400 0 GHz	-45.337	dBm					
2 3 4 5 6 7 8 9 10	Ν		f	2	.400 0 GHz	-45.337	dBm					
6												
7												
9												
10 11												~
<												
MSG									STATUS	3		

# High Channel:

	rum Analyzer - Swej	ot SA						
X/RL	RF 50 Ω	AC	SEN	SE:PULSE	ALIGN OFF			PM Sep 04, 2024
Center F	req 2.52600		PNO: Fast ↔ •Gain:Low	Trig: Free Run #Atten: 30 dB	#Avg Ty Avg Hol	pe: RMS d: 100/100		TYPE MWWWWW DET P NNNN
10 dB/div	Ref Offset 4.4 Ref 20.00 d						Mkr1 2.4 -0.	30 0 GHz 107 dBm
10.0	1							
-10.0	·							
20.0								-20.32 dBm
30.0	1							
40.0 50.0	$\sqrt{2}$ $\sqrt{4}$	3						
50.0 <b>- 10</b>	Kunnelagurred	monoralitentimen	genter and the main	hypown-level where	setti anner i cradita i ann	- Inthe mandel	lenger marghtland	washrownah
70.0								
	'600 GHz 100 kHz		#VBV	V 300 kHz		Swee	Stop 2. p 9.600 ms	57600 GH: (1001 pts
ikr mode ti 1 n 1	RC SCL	× 2.480 0 GHz	-0.107 c	FUNCTION	FUNCTION WIDTH	F	UNCTION VALUE	
2 N 3 N	f f	2.480 0 GHz 2.483 5 GHz 2.500 0 GHz	-55.537 (	Bm				
	f	2.487 2 GHz	-53.459 c	lBm				
4 N 1 5 6 7 8 9								
10								
1								

# 9. Out of Band Emissions

# 9.1 Standard Applicable

According to \$15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in \$15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in \$15.205(a), must also comply with the radiated emission limits specified in \$15.209(a).

### 9.2 Test Procedure

According to the KDB 558074 D01 v05r02, the Marker-delta method as follows:

for Antenna-port conducted measurement.

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

1). Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2). Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to an EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.

3). Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=1/B for AV detector.

4). Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

5). Repeat above procedures until all measured frequencies were complete.

6). Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

7). Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)

8). Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies  $\leq$  30 MHz,

4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

9). For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).

10). Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

E = EIRP - 20log D + 104.77 = EIRP + 95.23

Where:

 $E = electric field strength in dB\mu V/m$ ,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

11). Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

12). Compare the resultant electric field strength level to the applicable regulatory limit.

13). Perform radiated spurious emission test duress until all measured frequencies were complete.

### **9.3 Environmental Conditions**

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

### 9.4 Summary of Test Results/Plots

Bandedge (Radiated)

#### GFSK(BLE)

Channel	Freq.(MHz)	Power(dBm)	Gain(dBi)	Level(dBuV)	Limit(dBuV)	Margin(dB)	Detector
LOW (2402MHz)	2396.0	-46.56	2.00	50.67	74.00	-23.33	Peak
HIGH	2483.5	-45.37	2.00	51.86	74.00	-22.14	Peak
(2480MHz)	2500.0	-45.68	2.00	51.55	74.00	-22.45	Peak

Remark: 1. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

2. Maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater.

# Bandedge (Conducted)

# Lowest Channel:

	trum Analyzer - S	swept SA					
X/RL	RF 50		SENSE:PULS	e l	ALIGN OFF		06:58:07 PM Sep 04, 2024
Senter F	req 2.3560			: Free Run en: 30 dB	#Avg Type: R Avg Hold: 100		TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N
10 dB/div	Ref Offset 4 Ref 20.00					Mkr1	1 2.402 2 GHz 1.366 dBm
10.0							1-
0.00							X
10.0							-18.60 dBm
20.0				_			
40.0							1
	an and a star and the star	Mark mary mary mary	undertementationation	Mannan	and management	mulalinamore	and made and
60.0							
70.0							
	0600 GHz V 1.0 MHz		#VBW 3.0	MHz			top 2.40600 GH: 00 ms (1001 pts
MKR MODE T	1 f	× 2.402 2 GHz	Y 1.366 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE
2 N 3 N 4 N	1 f 1 f 1 f	2.396 0 GHz 2.396 0 GHz 2.396 0 GHz	-46.567 dBm -46.567 dBm -46.567 dBm				
5 6							
5 6 7 8 9							
10							
11 <							
ISG					STATUS		

# High Channel:

RL	RF 50 Ω AC		SENSE:PULSE		ALIGN OFF		06:57:38	PM Sep 04, 202
enter Free	q 2.526000000 C	SHZ PNO: Fas IFGain:Lo			#Avg Type: Avg Hold: 1		T	ACE 1 2 3 4 5 YPE M WARAW DET P N N N N
	Ref Offset 4.44 dB Ref 20.00 dBm					1	/kr1 2.48 -0.0	10 2 GH )99 dBi
	<u> </u>	e					2	
0								-20.04 d
		0 <sup>3</sup>						
	a the hand war and have	handlinand	which the most of the second	mandentan	Winnersharm	and margin marging	raddes war an a state of the st	handbornel
0								
art 2.4760							Stop 2.5	7600 GI
es BW 1.	0 MHz		#VBW 3.0 MH			-	1.000 ms	(1001 pi
MODE TRC N 1 N 1	f 2.48		Y FL 0.099 dBm 5.376 dBm	INCTION FL	INCTION WIDTH	FU	NCTION VALUE	
	f 2.50	00 GHz -4	5.683 dBm 5.376 dBm					
N 1 N 1	1 2.40							
N 1	1 2.40							
N 1	1 2.40							
N 1	1 2.40							

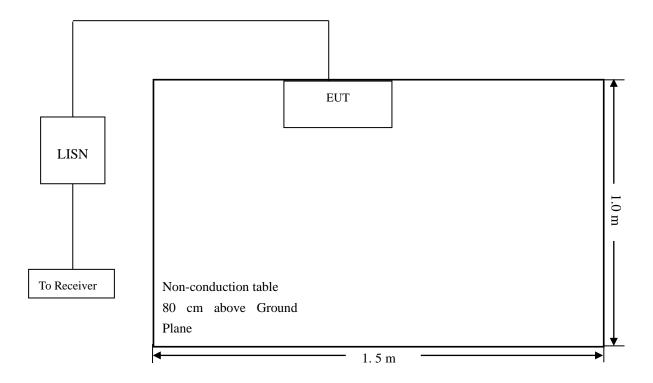
# **10. Conducted Emissions**

### **10.1 Test Procedure**

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

### 10.2 Basic Test Setup Block Diagram



### **10.3 Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

# **10.4 Test Receiver Setup**

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency	150 kHz
Stop Frequency	30 MHz
Sweep Speed	Auto
IF Bandwidth	10 kHz
Quasi-Peak Adapter Bandwidth	9 kHz
Quasi-Peak Adapter Mode	Normal

### **10.5 Summary of Test Results/Plots**

According to the data in section 10.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device

### **10.6 Conducted Emissions Test Data**

The equipment is battery powered, so do not test this item

\*\*\*\*\* END OF REPORT \*\*\*\*\*