

TEST REPORT

Report No.: SHE24050068-01AE

Date: 2024-06-07

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Applicant : AiRISTA Flow, Inc.
Address of Applicant : 1966 Greenspring Drive, Suite 125
Timonium, Maryland 21093.

Product Name : BLE BEACONING GATEWAY + AOA
Brand Name : AiRISTA Flow
Model Name : BGU.AOA.C
Sample Acquisition Method : Sent by Client
Sample No. : E24050068-02#01
E24050068-02#02

FCC ID : TA7-BGU-AOA

Standards : FCC CFR47 Part 15, Subpart C

Date of Receipt : 2024-05-24
Date of Test : 2024-05-28~ 2024-06-07
Date of Issue : 2024-06-07

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Prepared by:



(Erik Yang)

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Approved by:



(Authorized signatory: Echo Mu)

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1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298, Pingan Road, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Applicant Company Name	AiRISTA Flow, Inc.
Address	1966 Greenspring Drive, Suite 125 Timonium, Maryland 21093.
Contact Person	Patrick Jenkins
Telephone	(443) 212-4251
Email	Patrick.Jenkins@Airista.com
Manufacturer Company Name	AiRISTA Flow, Inc.
Address	1966 Greenspring Drive, Suite 125 Timonium, Maryland 21093.
Factory Company Name	AiRISTA Flow, Inc.
Address	1966 Greenspring Drive, Suite 125 Timonium, Maryland 21093.

1.3 Details of EUT

Product Name	BLE BEACONING GATEWAY + AOA
Brand Name	AiRISTA Flow
Test Model Name	BGU.AOA.C
FCC ID	TA7-BGU-AOA
Mode of Operation	Bluetooth BLE Version 5.0
Frequency Range	2402MHz ~ 2480MHz
Number of Channels	40 (at intervals of 2 MHz)
Modulation Type	BLE ☒ GFSK 1Mbps ☒ GFSK 2Mbps
Max RF Output Power-Conducted	6.61dBm
Antenna Type	(CC2642R1F) BLE1: Internal Antenna (CC2642R1F) BLE2: AOA Antenna (RTL8720DN) BLE: PCB Antenna
Antenna Gain	(CC2642R1F) BLE1: 2.5dBi (CC2642R1F) BLE2: -1.18dBi (RTL8720DN) BLE: 0.43dBi
Extreme Temperature Range	0℃~ +55℃
Test Voltage	Input(POE): DC 37-57V Input(USB): DC 5V 1A
Hardware Version	1.0

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Software Version	1002.2338
RF power setting in TEST SW	SmartRF Studio 7 v2.28.0_Power level setting_3dBm RTLBTAPP Version:5.2.2.40_ Power level setting_Default

- Note:
- The above information was declared by the manufacture.
 - For more details, please refer to the User's manual of the EUT.

Channel List

Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2.402GHz	14	2.430GHz	28	2.458GHz
1	2.404GHz	15	2.432GHz	29	2.460GHz
2	2.406GHz	16	2.434GHz	30	2.462GHz
3	2.408GHz	17	2.436GHz	31	2.464GHz
4	2.410GHz	18	2.438GHz	32	2.466GHz
5	2.412GHz	19	2.440GHz	33	2.468GHz
6	2.414GHz	20	2.442GHz	34	2.470GHz
7	2.416GHz	21	2.444GHz	35	2.472GHz
8	2.418GHz	22	2.446GHz	36	2.474GHz
9	2.420GHz	23	2.448GHz	37	2.476GHz
10	2.422GHz	24	2.450GHz	38	2.478GHz
11	2.424GHz	25	2.452GHz	39	2.480GHz
12	2.426GHz	26	2.454GHz		
13	2.428GHz	27	2.456GHz		

1.4 Test Methodology

47 CFR Part 15, Subpart C	Telecommunication-Radio Frequency Devices-Intentional Radiators
KDB Publication 558074 D01 v05r02	15.247 Meas Guidance.
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

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1.5 Test Summary

Test Item	FCC Rules	Result
Antenna Requirement	FCC Part 15.247(b)(4), Part 15.203	PASS
Maximum peak conducted output power	FCC Part 15.247(b)(3)	PASS
6dB Bandwidth	FCC Part 15.247(a)(2)	PASS
Maximum conducted output power spectral density	FCC Part 15.247(e)	PASS
Conducted Spurious Emission & Authorized-band band-edge	FCC Part 15.247(d)	PASS
Radiated Emission	FCC Part 15.247(d), 15.205, 15.209	PASS
Band Edge (Restricted-band band-edge)	FCC Part 15.247(d), 15.205, 15.209	PASS
Conducted Emission on AC Mains	FCC Part 15.207(a)	PASS

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2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Keysight	N9020B	MY59260184	2023-07-27	2024-07-26
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2023-06-08	2024-06-07
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2024-06-04	2025-06-03
Signal Generator	Rohde & Schwarz	SMR27	100184	2023-07-27	2024-07-26
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2023-06-08	2024-06-07
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2024-06-05	2025-06-04
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2023-06-08	2024-06-07
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2024-06-04	2025-06-03
V-network	SCHWARZBECK	NSLK 8127	8127-902	2023-06-07	2024-06-06
V-network	SCHWARZBECK	NSLK 8127	8127-902	2024-06-05	2025-06-04
Attenuator	SCHWARZBECK	VTSD 9561-FN	/	2023-06-06	2024-06-05
Attenuator	SCHWARZBECK	VTSD 9561-FN	/	2024-06-05	2025-06-04
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2023-03-22	2025-03-21
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2023-06-13	2025-06-12
Loop Antenna	SCHWARZBECK	FMZB 1513	/	2023-06-09	2025-06-08
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2023-06-18	2025-06-17
Broadband Preamplifier	SCHWARZBECK	BBV 9718	346	2023-06-08	2024-06-07
Broadband Preamplifier	SCHWARZBECK	BBV 9718	346	2024-06-04	2025-06-03
EMC chamber 9*6*6(L*W*H)	CHANGNING	966	N/A	2023-06-09	2025-06-08
Shielded Enclosure 8*5*4(L*W*H)	CHANGNING	854	N/A	2023-06-09	2025-06-08
Test Software	BL	BL410_E	Version:2.1.1.436	N/A	N/A
Test Software	BL	BL410_R	Version:2.1.1.409	N/A	N/A

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2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI. The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95.45%.

Parameter		Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	9KHz – 30MHz	± 3.42 dB
	30 MHz – 1GHz	± 5.01 dB
	> 1GHz	± 5.21 dB
Conducted Emission on AC Mains	150kHz-30MHz	± 2.68 dB
Occupied Channel Bandwidth		± 5 %
Maximum Conducted Output Power		± 0.64 dB
Maximum Conducted Output Power Spectral Density		± 1.18 dB

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3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitting mode. Select test channel as below:

Channel	Frequency
The lowest channel(CH00)	2402MHz
The middle channel(CH19)	2440MHz
The highest channel(CH39)	2480MHz

The basic operation modes are:

- A. On
1. BLE mode

a. Transmitting

i. Low Channel

ii. Middle Channel

iii. High Channel

b. Receiving
2. Normal working with Bluetooth on

B. Standby

C. Off

3.2 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model Name	Serial No.
Laptop 1	Lenovo	TP00083A	PF-0PRDGN
Laptop 2	HP	HP ZHAN 66 PRO G1	5CD7438R1J
USB Cable	N/A	N/A	1.00m Unshielded
POE Switch	MERCURY	MSG05CP	1242079001044
Adapter	UGREEN	CD112	50714

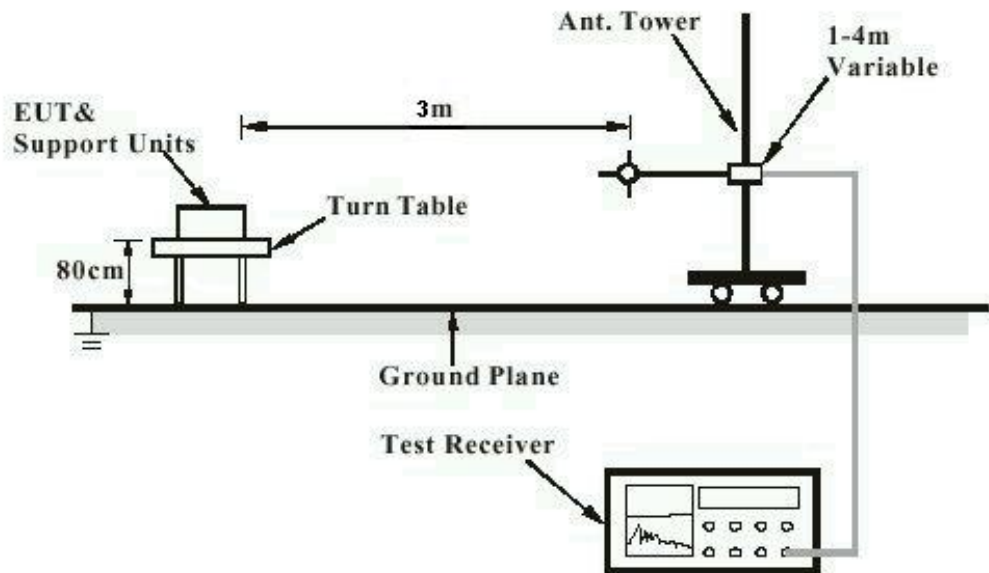
3.3 Support Software

Description	Manufacturer	Software Name
Software 1	N/A	SmartRF Studio 7 v2.28.0
Software 2	N/A	RTLBTAPP Version:5.2.2.40

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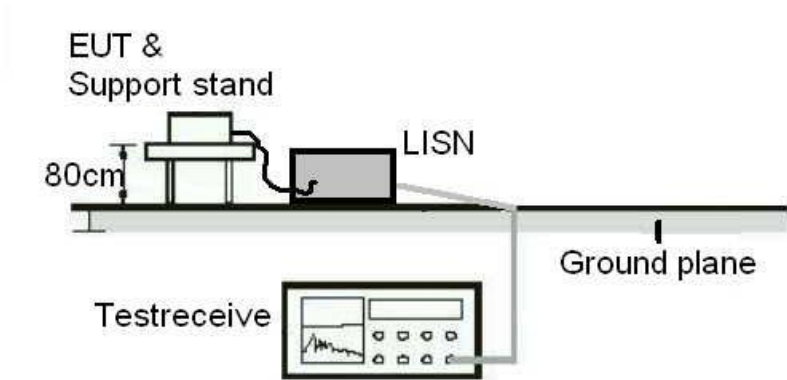
3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement



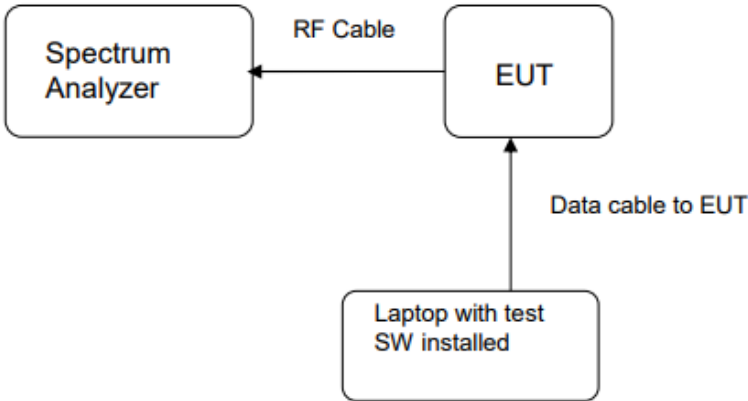
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Diagram of Measurement Equipment Configuration for Transmitter Test



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4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT:

PASS

Test standard	: FCC Part 15.247(b)(4), Part 15.203
Requirement	: 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. In addition, If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

According to the manufacturer declaration, The EUT has an antenna with a directional gain of 2.5dBi. The antenna is Internal antenna with no possibility of replacement with a non-approved antenna by the end-user.

The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Therefore, the EUT is considered to comply with this provision.

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4.1.2 Maximum peak conducted output power

RESULT:

PASS

Test standard : FCC Part 15.247(b)(3)

Requirement : ANSI C63.10-2013 clause 11.9.1.1,
KDB 558074 D01 v05r02, Clause 8.3.1

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 23.1°C

Relative humidity : 52%

Table 1: Maximum peak conducted output power_(CC2642R1F) BLE1

Test Mode	Test Channel (MHz)	Maximum peak conducted output power		Limit (W)
		(dBm)	(mW)	
BLE-1Mbps	2402	-1.20	0.76	< 1
	2440	-1.54	0.70	
	2480	-1.74	0.67	
BLE-2Mbps	2402	-1.27	0.75	< 1
	2440	-1.57	0.70	
	2480	-1.77	0.67	

Table 2: Maximum peak conducted output power_(CC2642R1F) BLE2

Test Mode	Test Channel (MHz)	Maximum peak conducted output power		Limit (W)
		(dBm)	(mW)	
BLE-1Mbps	2402	-0.94	0.81	< 1
	2440	-1.17	0.76	
	2480	-1.31	0.74	
BLE-2Mbps	2402	-0.96	0.80	< 1
	2440	-1.17	0.76	
	2480	-1.31	0.74	

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Table 3: Maximum peak conducted output power_ (RTL8720DN) BLE

Test Mode	Test Channel (MHz)	Maximum peak conducted output power		Limit (W)
		(dBm)	(mW)	
BLE-1Mbps	2402	6.15	4.12	< 1
	2440	6.51	4.48	
	2480	6.53	4.50	
BLE-2Mbps	2402	6.07	4.05	< 1
	2440	6.56	4.53	
	2480	6.61	4.58	

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(CC2642R1F) BLE1 Data plots

Figure 1: Peak Output Power, 2402MHz, BLE-1Mbps

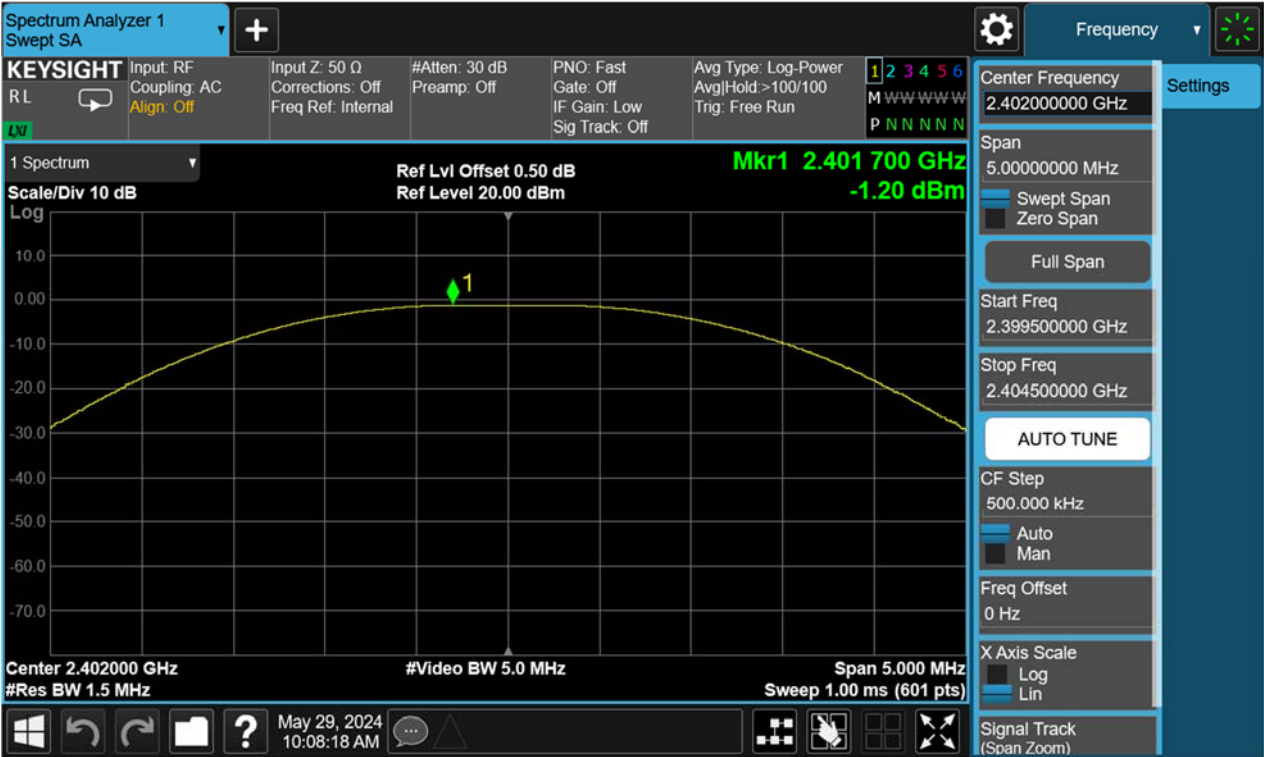


Figure 2: Peak Output Power, 2440MHz, BLE-1Mbps



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Figure 3: Peak Output Power, 2480MHz, BLE-1Mbps

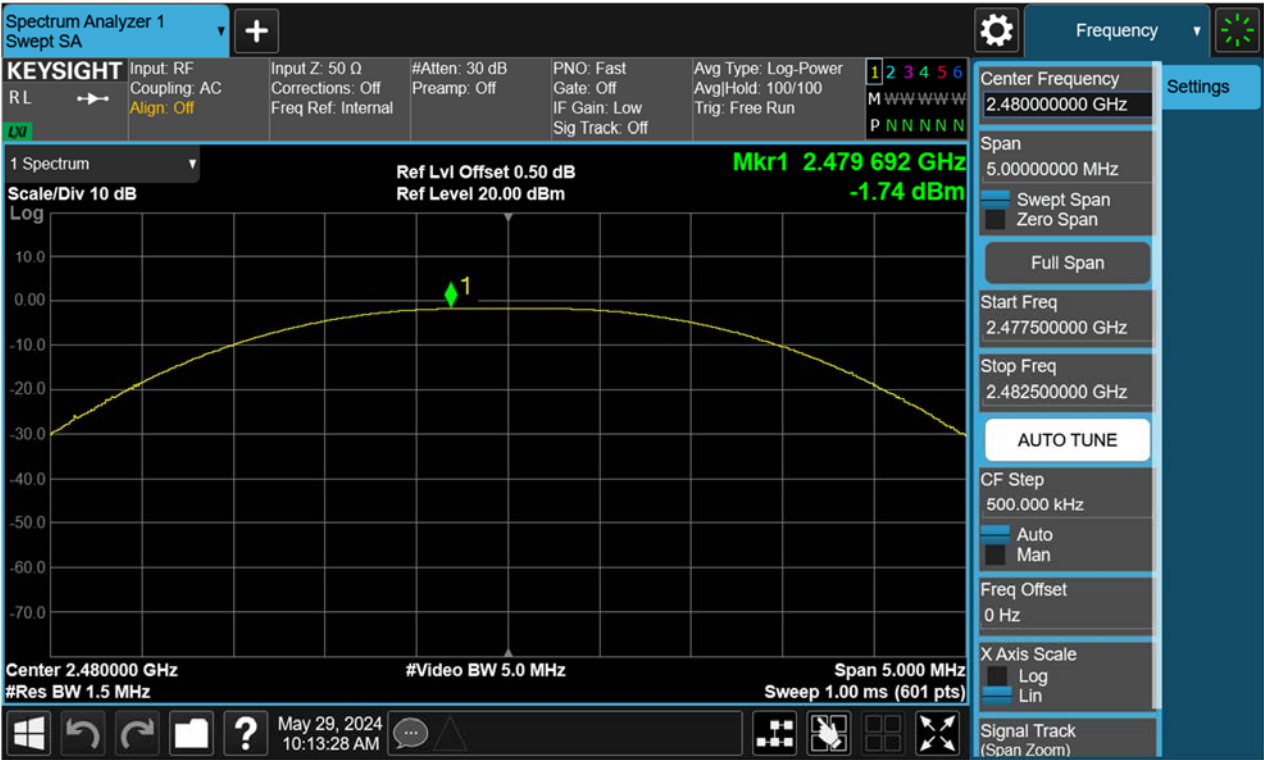


Figure 4: Peak Output Power, 2402MHz, BLE-2Mbps



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Figure 5: Peak Output Power, 2440MHz, BLE-2Mbps



Figure 6: Peak Output Power, 2480MHz, BLE-2Mbps



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(CC2642R1F) BLE2 Data plots

Figure 7: Peak Output Power, 2402MHz, BLE-1Mbps



Figure 8: Peak Output Power, 2440MHz, BLE-1Mbps



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Figure 9: Peak Output Power, 2480MHz, BLE-1Mbps

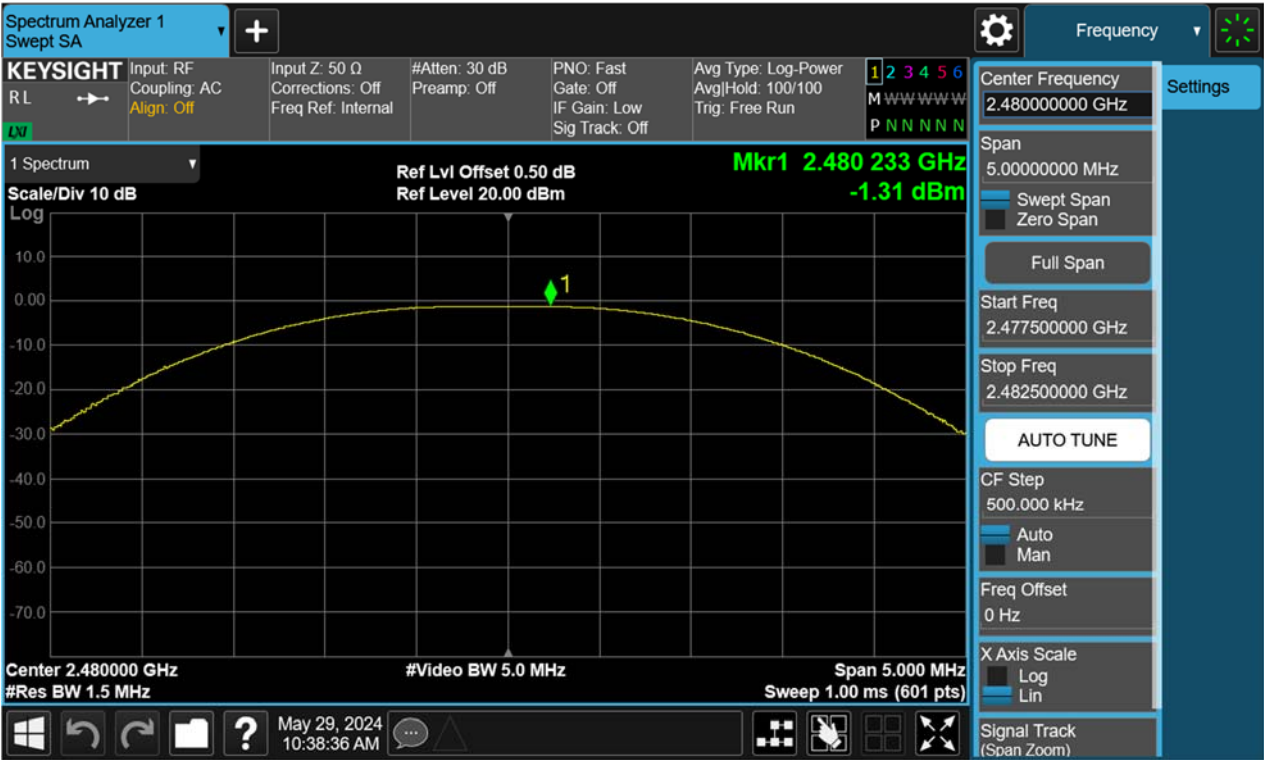


Figure 10: Peak Output Power, 2402MHz, BLE-2Mbps



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Figure 11: Peak Output Power, 2440MHz, BLE-2Mbps



Figure 12: Peak Output Power, 2480MHz, BLE-2Mbps



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(RTL8720DN) BLE Data plots

Figure 13: Peak Output Power, 2402MHz, BLE-1Mbps

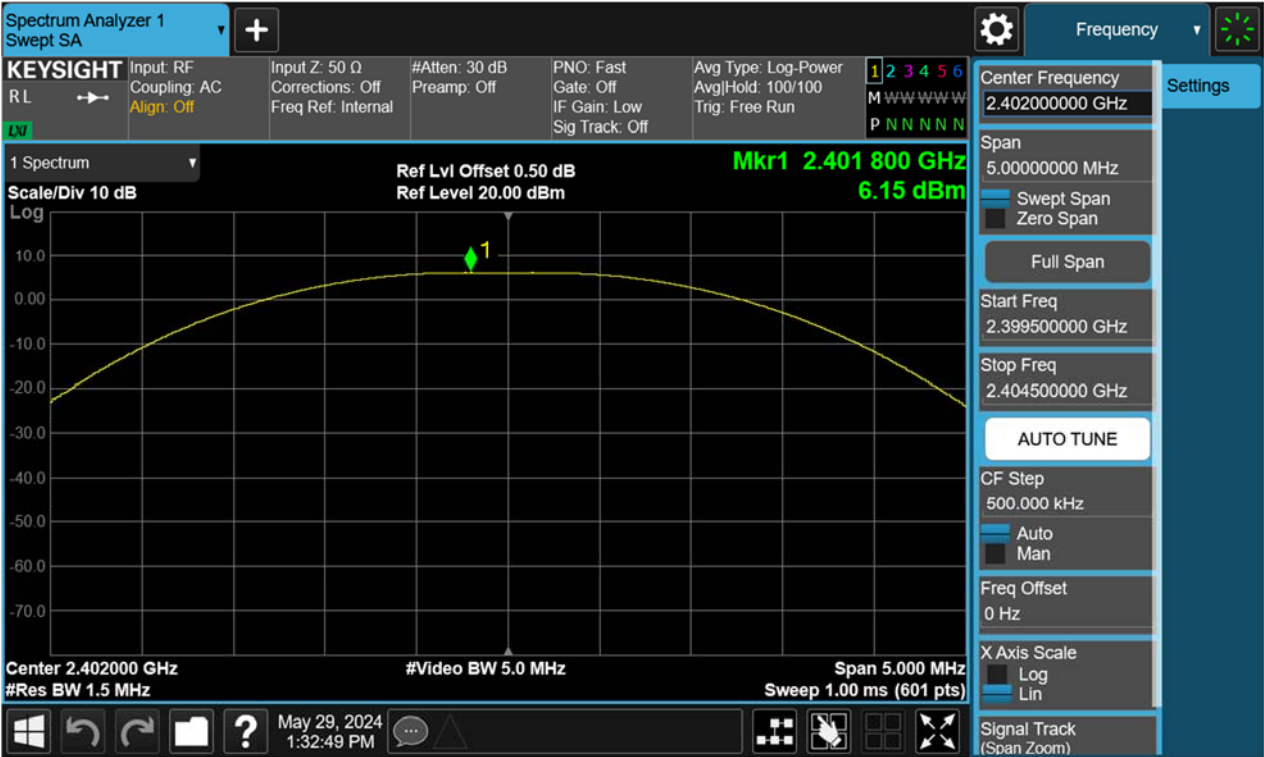


Figure 14: Peak Output Power, 2440MHz, BLE-1Mbps



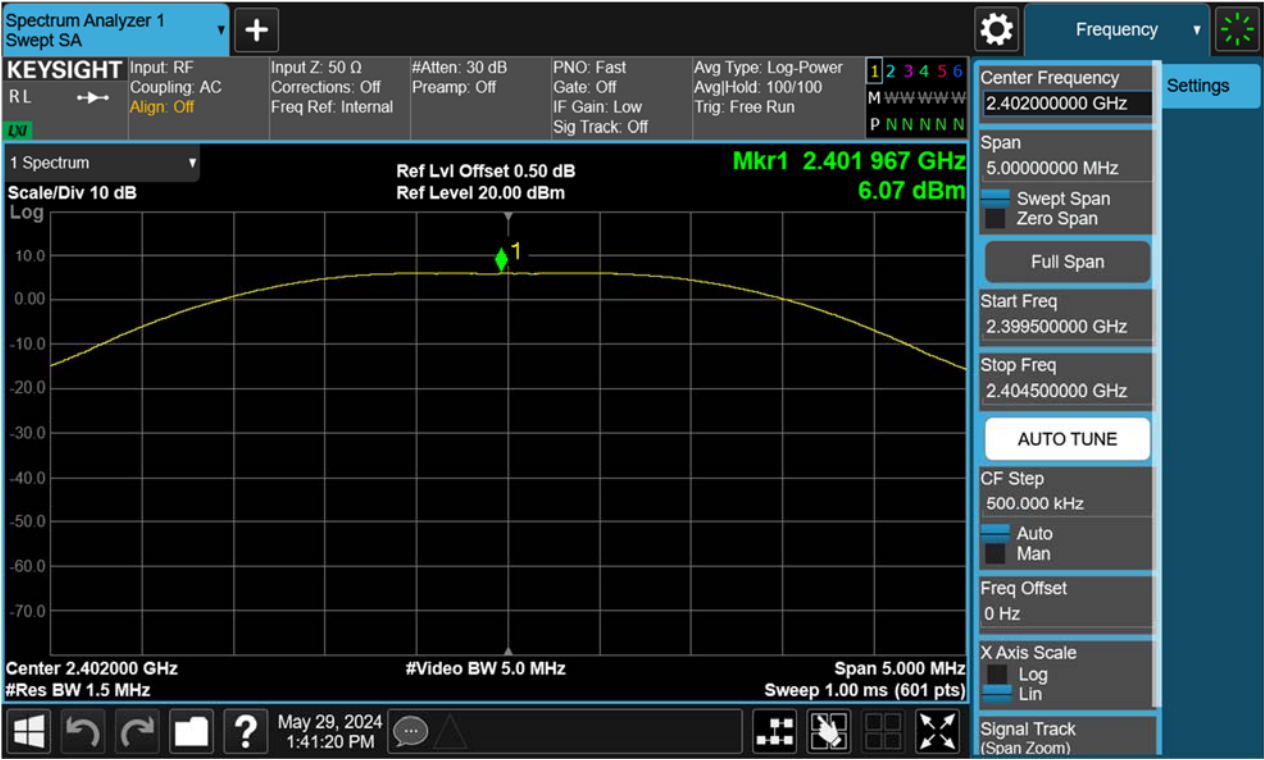
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Figure 15: Peak Output Power, 2480MHz, BLE-1Mbps



Figure 16: Peak Output Power, 2402MHz, BLE-2Mbps



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Figure 17: Peak Output Power, 2440MHz, BLE-2Mbps



Figure 18: Peak Output Power, 2480MHz, BLE-2Mbps



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4.1.3 6dB Bandwidth

RESULT:

PASS

Test standard : FCC Part 15.247(a)(2)

Requirement : ANSI C63.10-2013 clause 11.8.1,
KDB 558074 D01 v05r02, Clause 8.2

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 23.1°C

Relative humidity : 52%

Table 4: 6dB Bandwidth_(CC2642R1F) BLE1

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE-1Mbps	2402	0.7179	1.0515	>0.5 MHz
	2440	0.6810	1.0505	
	2480	0.6985	1.0713	
BLE-2Mbps	2402	1.5110	2.1228	
	2440	1.3690	2.0997	
	2480	1.4280	2.0753	

Table 5: 6dB Bandwidth_(CC2642R1F) BLE2

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE-1Mbps	2402	0.7014	1.0622	>0.5 MHz
	2440	0.6862	1.0444	
	2480	0.6667	1.0532	
BLE-2Mbps	2402	1.4110	2.0733	
	2440	1.3860	2.0654	
	2480	1.4180	2.0962	

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Table 6: 6dB Bandwidth_(RTL8720DN) BLE

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE-1Mbps	2402	0.6613	1.0346	>0.5 MHz
	2440	0.6506	1.0386	
	2480	0.6871	1.0351	
BLE-2Mbps	2402	1.2300	2.0591	
	2440	1.2680	2.0716	
	2480	1.0370	2.0858	

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(CC2642R1F) BLE1 Data plots

Figure 19: 6dB Bandwidth, 2402MHz, BLE-1Mbps



Figure 20: 6dB Bandwidth, 2440MHz, BLE-1Mbps



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Figure 21: 6dB Bandwidth, 2480MHz, BLE-1Mbps



Figure 22: 6dB Bandwidth, 2402MHz, BLE-2Mbps



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Figure 23: 6dB Bandwidth, 2440MHz, BLE-2Mbps



Figure 24: 6dB Bandwidth, 2480MHz, BLE-2Mbps



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(CC2642R1F) BLE2 Data plots

Figure 25: 6dB Bandwidth, 2402MHz, BLE-1Mbps



Figure 26: 6dB Bandwidth, 2440MHz, BLE-1Mbps



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Figure 27: 6dB Bandwidth, 2480MHz, BLE-1Mbps



Figure 28: 6dB Bandwidth, 2402MHz, BLE-2Mbps



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Figure 29: 6dB Bandwidth, 2440MHz, BLE-2Mbps



Figure 30: 6dB Bandwidth, 2480MHz, BLE-2Mbps



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(RTL8720DN) BLE Data plots

Figure 31: 6dB Bandwidth, 2402MHz, BLE-1Mbps



Figure 32: 6dB Bandwidth, 2440MHz, BLE-1Mbps



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Figure 33: 6dB Bandwidth, 2480MHz, BLE-1Mbps



Figure 34: 6dB Bandwidth, 2402MHz, BLE-2Mbps



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Figure 35: 6dB Bandwidth, 2440MHz, BLE-2Mbps



Figure 36: 6dB Bandwidth, 2480MHz, BLE-2Mbps



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4.1.4 Maximum conducted output power spectral density

RESULT:

PASS

Test standard : FCC Part 15.247(e)

Requirement : ANSI C63.10-2013 clause 11.10.2,
KDB 558074 D01 v05r02, Clause 8.4

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 23.1°C

Relative humidity : 52%

Table 7: Maximum conducted output power spectral density_(CC2642R1F) BLE1

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE-1Mbps	2402	-15.79	8
	2440	-13.00	
	2480	-14.77	
BLE-2Mbps	2402	-16.84	
	2440	-16.63	
	2480	-18.63	

Table 8: Maximum conducted output power spectral density_(CC2642R1F) BLE2

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE-1Mbps	2402	-14.13	8
	2440	-15.53	
	2480	-14.92	
BLE-2Mbps	2402	-17.82	
	2440	-17.22	
	2480	-17.39	

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Table 9: Maximum conducted output power spectral density_(RTL8720DN) BLE

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE-1Mbps	2402	-10.50	8
	2440	-10.02	
	2480	-10.34	
BLE-2Mbps	2402	-12.04	
	2440	-11.28	
	2480	-12.51	

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(CC2642R1F) BLE1 Data plots

Figure 37: Power Spectral Density, 2402MHz, BLE-1Mbps



Figure 38: Power Spectral Density, 2440MHz, BLE-1Mbps

