

TEST REPORT

Eurofins KCTL Co..Ltd.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (1) of (48)



1. Client

Name

: EVERINT Co., Ltd.

Address

: 129, Chungjusandan 1-ro, Chungju-si, Chungcheongbuk-do,

Republic of Korea

Date of Receipt : 2025-05-21

2. Use of Report

: Certification

3. Name of Product / Model

: Wi-Fi and Bluetooth Combo Module / WBT-MSO

4. Manufacturer / Country of Origin: EVERINT Co., Ltd. / Korea

5. FCC ID

: 2AKMF-WBT-MSO

6. IC Certificate No. : 22266-WBTMSO

7. Date of Test

: 2025-06-04 to 2025-07-01

8. Location of Test : ■ Permanent Testing Lab

□ On Site Testing

(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

9. Test method used: FCC Part 15 Subpart C, 15.247

RSS-247 Issue 3 August 2023

RSS-Gen Issue 5 February 2021

10. Test Result

: Refer to the test result in the test report

Tested by

Technical Manager

Affirmation

Name: Minki Kim

Name: Harim Lee

2025-07-23

Eurofins KCTL Co.,Ltd.

As a test result of the sample which was submitted from the client, this report does not guara ntee the whole product quality. This test report should not be used and copied without a written agreement by Eurofins KCTL Co., Ltd.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (2) of (48)



REPORT REVISION HISTORY

Date	Revision	Page No
2025-07-23	Originally issued	-

This report shall not be reproduced except in full, without the written approval of Eurofins KCTL Co.,Ltd. This document may be altered or revised by Eurofins KCTL Co.,Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by Eurofins KCTL Co.,Ltd. will constitute fraud and shall nullify the document. This test report is a general report that does not use the KOLAS accreditation mark and is not related to KS Q ISO/IEC 17025 and KOLAS accreditation.

G

eneral remarks for test reports
Statement concerning the uncertainty of the measurement systems used for the tests
(may be required by the product standard or client)
Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:
Procedure number, issue date and title: Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.
☑ Statement not required by the standard or client used for type testing

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311 www.kctl.co.kr Report No.: KR25-SRF0129 Page (3) of (48)



CONTENTS

1. (Jeneral Information	4
2. [Device information	4
2.1.	Frequency/channel operations	5
2.2.	RF power setting in TEST SW	6
3. <i>A</i>	Antenna requirement	
4. 5	Summary of tests	
5. N	Measurement uncertainty	g
6. N	Measurement results explanation example	10
7 1	Test results	11
7.1.	Maximum peak output power	11
7.2.	Carrier frequency separation	13
7.3.	20 dB channel bandwidth & 99% bandwidth	15
7.4.	Number of hopping channels	19
7.5.	Time of occupancy(Dwell time)	21
7.6.	Radiated spurious emissions & band edge	25
7.7.	Conducted Spurious Emission	43
7.8.	AC Conducted emission	46
8. N	Measurement equipment	48

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (4) of (48)



General information

EVERINT Co., Ltd. Client

Address 129, Chungjusandan 1-ro, Chungju-si, Chungcheongbuk-do, Republic of Korea

Manufacturer EVERINT Co., Ltd.

Address 129, Chungjusandan 1-ro, Chungju-si, Chungcheongbuk-do, Republic of Korea

Laboratory Eurofins KCTL Co..Ltd.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea Address FCC Site Designation No: KR0040, FCC Site Registration No: 687132 Accreditations

VCCI Registration No.: R-20080, G-20078, C-20059, T-20056

CAB Identifier: KR0040, ISED Number: 8035A

KOLAS No.: KT231

Device information

Equipment under test Wi-Fi and Bluetooth Combo Module

Model WBT-MSO

Bluetooth(BDR/EDR) GFSK, π/4DQPSK, 8DPSK Modulation technique

Bluetooth(BLE) GFSK

WLAN(802.11b/g/n/a/ac) DSSS, OFDM, OFDMA

BT/LE Number of channels 79 ch(BDR/EDR), 40 ch(BLE)

> 2.4 GHz band 11 ch (20 Mb), 9 ch (40 Mb)

5 GHz band

UNII-1 4 ch (20 Mb), 2 ch (40 Mb), 1 ch (80 Mb) 4 ch (20 Mb), 2 ch (40 Mb), 1 ch (80 Mb) UNII-2A UNII-2C 12 ch (20 Mb), 6 ch (40 Mb), 3 ch (80 Mb) 5 ch (20 Mz), 2 ch (40 Mz), 1 ch (80 Mz) UNII-3

Power source : DC 3.3 V

Antenna type BT/LE: Ceramic chip Antenna

WLAN: Chip Antenna

Antenna gain BT/LE 0.01 dBi

> Antenna 1 Antenna 2 2.4 GHz band **0.27** dBi 0.27 dBi

5 GHz band

UNII-1 0.38 dBi 0.38 dBi UNII-2A 0.27 dBi **0.27** dBi UNII-2C 0.82 dBi 0.82 dBi UNII-3 1.34 dBi 1.34 dBi

Frequency range 2.4 GHz band 2 402 MHz ~ 2 480 MHz (Bluetooth/BLE)

> 2 412 MHz ~ 2 462 MHz (802.11b/g/n_HT20) 2 422 MHz ~ 2 452 MHz (802.11n_HT40)

5 GHz band

UNII-1 5 180 MHz ~ 5 240 MHz (802.11a/n/ac HT20/VHT20)

> 5 190 MHz ~ 5 230 MHz (802.11n/ac HT40/VHT40)

(802.11ac VHT80)

UNII-2A 5 260 MHz ~ 5 320 MHz (802.11a/n/ac HT20/VHT20)

> 5 270 MHz ~ 5 310 MHz (802.11n/ac HT40/VHT40)

5 290 Mb (802.11ac_VHT80)

UNII-2C 5 500 MHz ~ 5 720 MHz (802.11a/n/ac HT20/VHT20)

 $5\,510~\text{Mz}~\sim5\,710~\text{Mz}$ (802.11n/ac_HT40/VHT40) 5 530 Mb ~ 5 690 Mb

(802.11ac _VHT80)

5 745 MHz \sim 5 825 MHz UNII-3 (802.11a/n/ac_HT20/VHT20)

5 755 Mb ~ 5 795 Mb (802.11n/ac HT40/VHT40) 5 775 Mb (802.11ac_VHT80)

Software version V001

Hardware version V001

Test device serial No. : WBTMSO00001 Operation temperature : 0 ℃ ~70 ℃

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (5) of (48)



2.1. Frequency/channel operations

This device contains the following capabilities: Bluetooth(BDR, EDR)

Ch.	Frequency (쌘)
00	2 402
39	2 441
78	2 480

Table 2.1.1. Bluetooth(BDR/EDR)

15.247 Requirements for Bluetooth transmitter:

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:
 - 1) This system is hopping pseudo-randomly.
 - 2) Each frequency is used equally on the average by each transmitter.
 - 3) The receiver input bandwidths that match the hopping channel bandwidths of their corresponding transmitters
 - 4) The receiver shifts frequencies in synchronization with the transmitted signals.
- 15.247(g): The system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this Section 15.247 should the transmitter be presented with a continuous data (or information) stream.
- 15.247(h): The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Eurofins KCTL Co.,Ltd.
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-70-4904-0113 FAX: 82-505-299-8311

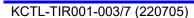
www.kctl.co.kr

Report No.: KR25-SRF0129 Page (6) of (48)



2.2. RF power setting in TEST SW

Operation mode	Test Program	Test mode	Power Setting
		DH1	0x35
		DH3	0x35
		DH5	0x35
	Tama Tama 44 04	2DH1	0x3b
Bluetooth	Tera Term v4.91 (DUT mode)	1 /DH3 1	0x3b
	(DOT IIIode)	2DH5	0x3b
		3DH1	0x3b
		3DH3	0x3b
		3DH5	0x3b



65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (7) of (48)



3. Antenna requirement

Requirement of FCC part section 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.

Requirement of RSS-Gen Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

- The transmitter has permanently attached Ceramic chip Antenna (Internal antenna) on board.
- The EUT Complies with the requirement of §15.203, §15.247.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (8) of (48)



4. Summary of tests

FCC Part ss section(s)	IC Rule reference	Parameter	Test Condition	Test results
15.247(b)(1),(4)	RSS-247, (5.4)(b)	Maximum peak output power		Pass
15.247(a)(1)	RSS-247, (5.1)(b)	Carrier frequency separation		Pass
15.247(a)(1)	RSS-247, (5.1)(b)	20 dB channel bandwidth		Pass
-	RSS-Gen(6.7)	Occupied bandwidth	Conducted	Pass
15.247(a)(iii) 15.247(b)(1)	RSS-247, (5.1)(d)	Number of hopping channel	Comadoted	Pass
15.247(a)(iii)	RSS-247, (5.1)(d)	Time of occupancy(dwell time)		Pass
15.207(a)	RSS-Gen(8.8)	AC Conduc <mark>ted Emissio</mark> ns		Pass
15.247(d)	RSS-247(5.5)	Conducted Sp <mark>urious Emis</mark> sions		Pass
15.205(a),	RSS-Gen	Spurious emission	Radiated	Pass
15.209(a)	(8.9), (8.10)	Band-edge, restricted ba <mark>nd</mark>	Naulaleu	Pass

Notes:

- 1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2. According to exploratory test no any obvious emission were detected from 9 \(\text{Mz}\) to 30 \(\text{Mz}\). Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
- 3. EUT was investigated in three orthogonal orientations X, Y and Z. it was determined that Y orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Y orientation.
- 4. The worst-case data rate were: BDR Packet type DH-1
 EDR Packet type 3DH-1
- 5. The test procedure(s) in this report were performed in accordance as following.
 - ANSI C63.10-2013
 - KDB 558074 D01 v05r02
- 6. This product does not support simultaneous operation under all conditions.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (9) of (48)



Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expande	d uncertainty (±)	
Maximum Peak Output Power	0.	9 dB	
6 dB Channel Bandwidth	0	.1 %	
Occupied Bandwidth	0	.1 %	
Number of hopping channel	0	.1 %	
Time of occupancy(dwell time)	0.	1 ms	
Conducted spurious emission	2.	.0 dB	
	Below 30 Mb	2.3 dB	
Radiated spurious Emissions	30 Mbz to 1 000 Mbz	2.6 dB	
(Bandedge, restricted band)	1 000 MHz to 18 000 MHz	4.8 dB	
	Above 18 000 Mbz	4.8 dB	
AC Conducted Emissions	150 kHz to 30 MHz	2.9 dB	

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (10) of (48)



6. Measurement results explanation example

The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.

With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Frequency (MHz)	Factor(dB)	Frequency (MHz)	Factor(dB)
30	16.86	9 000	21.38
50	17.62	10 000	20.96
100	17.31	11 000	21.10
200	18.21	12 000	21.58
300	18.05	13 000	21.32
400	18.29	14 000	21.44
500	18.54	15 000	21.03
600	18.63	16 000	20.91
700	18.67	17 000	20.92
800	18.88	18 000	20.38
900	19.05	19 000	20.66
1 000	18.89	20 000	21.17
2 000	19.78	21 000	21.76
3 000	20.37	22 000	22.10
4 000	20.18	23 000	22.45
5 000	22.31	24 000	21.42
6 000	22.35	25 000	22.33
7 000	21.45	26 000	22.20
8 000	20.62	26 5 00	23.16

Notes:

Offset(dB) = RF cable loss(dB) + Coupler(dB)

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

KR25-SRF0129 Page (11) of (48) www.kctl.co.kr

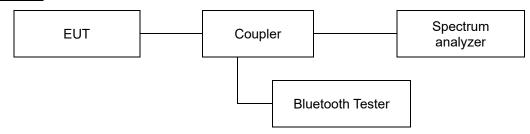
Report No.:



Test results

Maximum peak output power

Test setup



Limit FCC

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 klz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2 400-2 483.5 Mb band may have hopping channel carrier frequencies that are separated by 25 klb or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

According to §15.247(b)(1), for frequency hopping systems operating in the 2 400-2 483.5 Mb band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5 725-5 850 Mb band: 1 watt. For all other frequency hopping systems in the 2 400-2 483.5 Mb band: 0.125 watts.

According to §15.247(b)(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC

According to RSS-247(5.4)(b), for FHSs operating in the band 2400-2483.5 Mb, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels.

The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

Test procedure

ANSI C63.10-2013 - Section 7.8.5

Test settings

The test follows ANSI C63.10-2013 – Section 7.8.5. Using the power sensor instead of a spectrum analyzer.

Notes:

A peak responding power sensor is used, where the power sensor system video bandwidth is greater than the occupied bandwidth of the EUT.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (12) of (48)



Test results

			N	leasured	doutput	power(dBm	1)	
Frequency(酏)	Data rate (Mbps)	ро	ed output wer Bm)	Limit (dBm)	Ant Gain		e.i.r.p. 8m)	Max e.i.r.p. Limit
		Peak	Average	,	(dBi)	Peak	Average	(dB m)
2 402	1	8.13	7.52			8.14	7.53	
2 441	1	7.70	7.01			7.71	7.02	
2 480	1	7.27	6.48			7.28	6.49	
2 402	2	9.05	6.52			9.06	6.53	
2 441	2	8.61	6.07	20.97	0.01	8.62	6.08	36.02
2 480	2	8.17	5.61			8.18	5.62	
2 402	3	9.74	6.57			9.75	6.58	
2 441	3	9.32	6.07			9.33	6.08	
2 480	3	8.86	5.60			8.87	5.61	

Notes:

1. e.i.r.p. Calculation: e.i.r.p. (dB m) = Conducted output power (dB m) + Antenna gain (dB i)

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

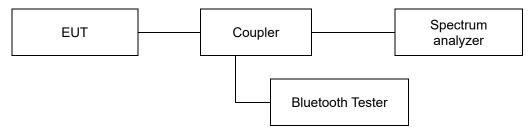
www.kctl.co.kr

Report No.: KR25-SRF0129 Page (13) of (48)



7.2. Carrier frequency separation

Test setup



Limit

According to §15.247(a)(1) and RSS-247(5.1)(b), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2 400-2 483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test procedure

ANSI C63.10-2013 - Section 7.8.2

Test settings

- a) Span: Wide enough to capture the peaks of two adjacent channels.
- b) RBW: Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- c) Video (or average) bandwidth (VBW) ≥ RBW.
- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.
- g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

Test results

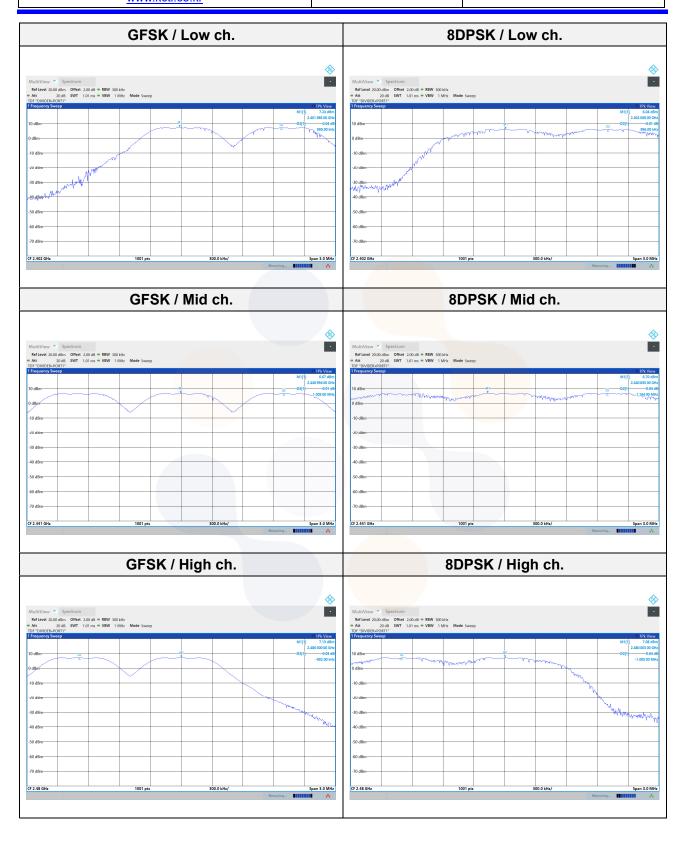
10011000110			
Frequency(M b)	Data rate(Mbps)	Carrier frequency separation(眦)	Limit(脈)
2 402	1	0.990	0.560
2 441	1	1.005	0.582
2 480	1	0.992	0.562
2 402	3	0.996	0.818
2 441	3	1.164	0.818
2 480	3	1.005	0.820

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (14) of (48)





65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

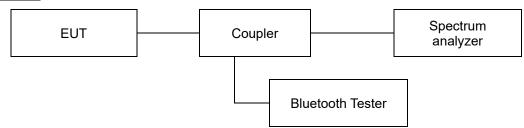
www.kctl.co.kr

Report No.: KR25-SRF0129 Page (15) of (48)



7.3. 20 dB channel bandwidth & 99% bandwidth

Test setup



Limit

According to §15.247(a)(1) and RSS-247(5.1)(b), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2 400-2 483.5 kHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test procedure

ANSI C63.10-2013 - Section 6.9.2

Test settings

20 dB channel bandwidth and Occupied bandwidth

The occupied bandwidth is measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced from a reference value by a specified ratio (or in decibels, a specified number of dB down from the reference value). Typical ratios, expressed in dB, are -6 dB, -20 dB, and -26 dB, corresponding to 6 dB BW, 20 dB BW, and 26 dB BW, respectively. In this subclause, the ratio is designated by "-xx dB." The reference value is either the level of the unmodulated carrier or the highest level of the spectral envelope of the modulated signal, as stated by the applicable requirement. Some requirements might specify a specific maximum or minimum value for the "-xx dB" bandwidth; other requirements might specify that the "-xx dB" bandwidth be entirely contained within the authorized or designated frequency band.

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.
- b) Span: Two times and five times the OBW.
- c) RBW = 1 % to 5 % of the OBW and VBW \geq 3 x RBW
- d) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation.
- e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "-xx dB down" requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
- f) Detector: peak
- g) Trace mode: max hold.
- h) Allow the trace to stabilize.
- i) Determine the "-xx dB down amplitude" using ((reference value) xx). Alternatively, this calculation may be made by using the marker-delta function of the instrument.
- j) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (16) of (48)



new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).

k) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "-xx dB down amplitude" determined in step h). If a marker is below this "-xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "-xx dB down amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

Test results

103t 103till3			
Frequency(脈)	Data rate (Mbps)	20 dB Bandwidth (Mb)	99% Bandwidth (脈)
2 402	1	0.840	0.837
2 441	1	0.873	0.837
2 480	1	0.843	0.840
2 402	3	1.227	1.125
2 441	3	1.227	1.124
2 480	3	1.230	1.124

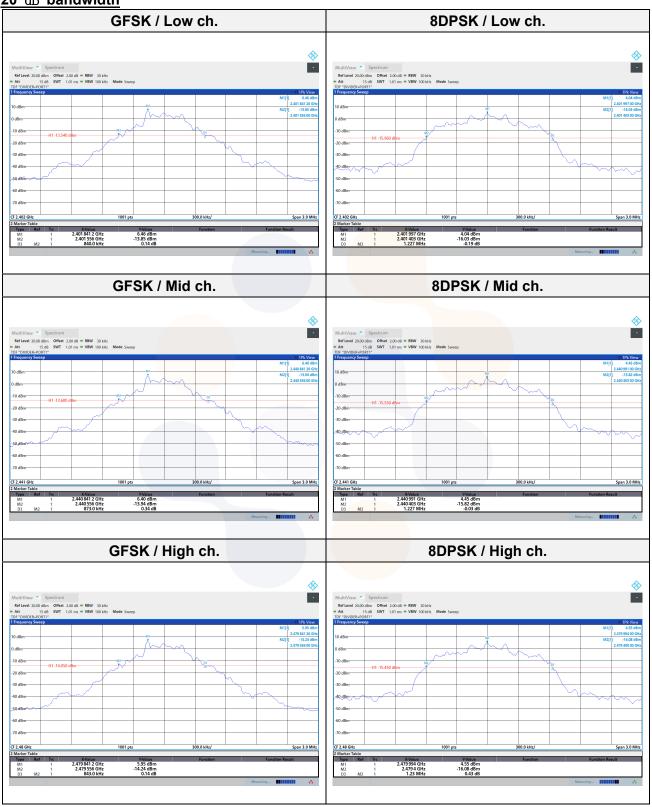
65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (17) of (48)



20 dB bandwidth



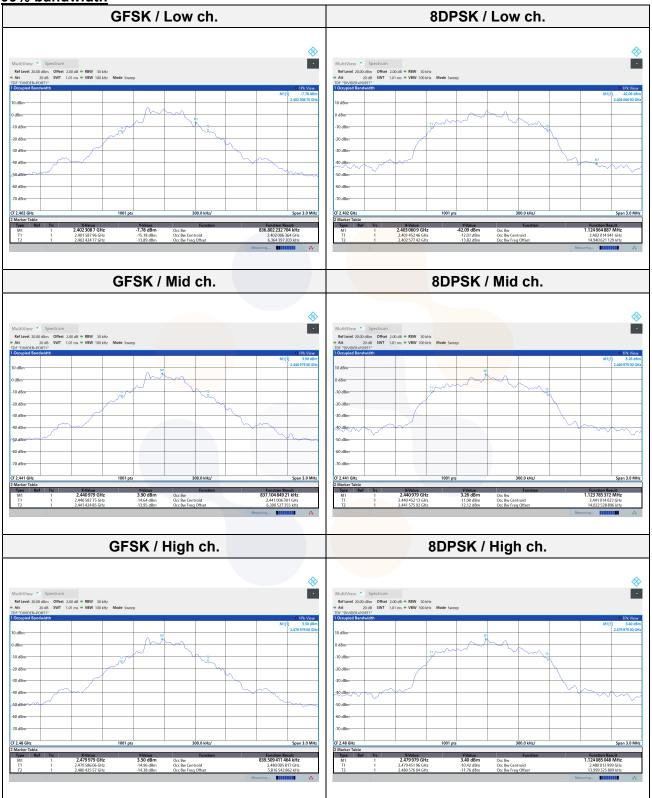
65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (18) of (48)



99% bandwidth



65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

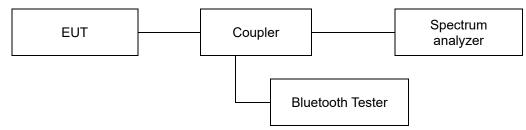
www.kctl.co.kr

Report No.: KR25-SRF0129 Page (19) of (48)



7.4. Number of hopping channels

Test setup



Limit

According to §15.247(a)(1)(iii) and RSS-247(5.1)(d), frequency hopping systems in the 2 400-2 483.5 band shall use at least 15 channels.

<u>Test procedure</u>

ANSI C63.10-2013 - Section 7.8.3

Test settings

- a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
- b)RBW: To identify clearly the individual channels, set the RBW to less than 30 % of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- c) VBW ≥ RBW.
- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.
- g) Allow the trace to stabilize.

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (20) of (48)



Test results

Mode	Number of hopping channel	Limit
GFSK	79	≥15
π /4DQPSK	79	≥15
8DPSK	79	≥15

Notes:

1. In case of AFH mode, minimum number of hopping channels is 20.



65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

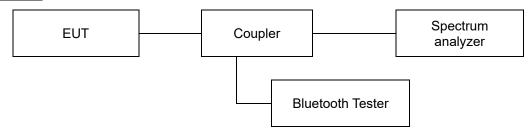
www.kctl.co.kr

Report No.: KR25-SRF0129 Page (21) of (48)



7.5. Time of occupancy(Dwell time)

Test setup



Limit

According to §15.247(a)(1)(iii) and RSS-247(5.1)(d), frequency hopping systems in the 2 400-2 483.5 Mb band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test procedure

ANSI C63.10-2013 - Section 7.8.4

Test settings

- a) Span: Zero span, centered on a hopping channel.
- b) RBW ≤ channel spacing and >> 1 / T, where T is the expected dwell time per channel.
- c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
- d) Detector function: Peak.
- e) Trace: Max hold.
- f) Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (22) of (48)



Test results

Non-AFH									
Modulation	Frequency (Mb)	Pulse Width (ms)	Hopping rate (hop/s)	Number of Channels	Result (s)	Limit (s)			
DH1		0.383	800.000		0.122				
DH3		1.640	400.000		0.262				
DH5		2.888	266.667		0.308				
2-DH1		0.391	800.000		0.125				
2-DH3	2 441	1.645	400.000	79	0.263	0.400			
2-DH5		2.895	266.667		0.309				
3-DH1		0.391	800.000		0.125				
3-DH3		1.642	400.000		0.263				
3-DH5		2.895	266.667		0.309				

AFH									
Modulation	Frequency (Mb)	Pulse Width (ms)	Hopping rate (hop/s)	Number of Channels	Result (s)	Limit (s)			
DH1		0.383	400.000		0.061				
DH3		1.640	200.000		0.131				
DH5		2.888	133.333		0.154				
2-DH1		0.391	400.000		0.063				
2-DH3	2 441	1.645	200.000	20	0.132	0.400			
2-DH5		2.895	133.333		0.154				
3-DH1		0.391	400.000		0.063				
3-DH3		1.644	200. <mark>000</mark>		0.131				
3-DH5		2.895	133.3 <mark>33</mark>		0.154				

Notes:

- 1. Non-AFH
- Period Time: 0.4 sec x 79 channels = 31.6 sec
- Result (s)= (Hopping rate (hop/s/slot) / 79 channels) x 31.6 sec x Pulse width (ms)
- 2. AFH
- Period Time: 0.4 sec x 20 channels = 8 sec
- Result (s)= (Hopping rate (hop/s/slot) / 20 channels) x 8 sec x Pulse width (ms)

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-4904-0113 FAX: 82-505-299-8311

www.kctl.co.kr

Report No.: KR25-SRF0129 Page (23) of (48)



In order to simplify the report, the attached plot is the Non-AFH in Test mode.

