# TEST REPORT



**CTK Co., Ltd.** (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501

Report No.: CTK-2024-00851 Page (1) / (49) Pages

# 1. Applicant

- $_{\circ}$  Name : SOLUM CO.,LTD.
- Address: 4,5,6th F, 357, Guseong-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea (Zip 16914)
- Date of Receipt : 2023-12-26

# 2. Manufacturer

- Name : SOLUM CO.,LTD.
- Address: 4,5,6th F, 357, Guseong-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea (Zip 16914)

# 3. Factory

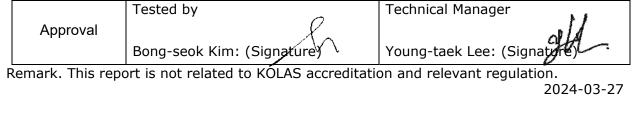
- ${}^{\circ}$  Name : DONGGUAN SOLUM ELECTRONICS CO., LTD.
- Address : Building 2/4/6, No.35, Tongzhen Road, Tongsha, Dongcheng District,

Dongguan City, Guangdong Province, 523127 People's Republic of China

- 4. Use of Report : For FCC Conformance
- 5. Test Sample / Model : Signage / WC37FAPBDU0/SM
- 6. Date of Test : 2024-02-27 to 2024-03-27
- 7. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.247
- **8. Testing Environment:** Temp.: (23 ± 1) °C, Humidity: (36 ± 3) % R.H.
- 9. Test Results : Compliance

**10. Location of Test :** Permanent Testing Lab On Site Testing (Address : 5, Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This report cannot be reproduced or copied without the written consent of CTK



CTK Co., Ltd.



Report No.: CTK-2024-00851 Page (2) / (49) Pages

# **REPORT REVISION HISTORY**

Date	Revision	Page No
2024-03-27	Issued (CTK-2024-00851)	all

This report shall not be reproduced except in full, without the written approval of CTK Co., Ltd. This document may be altered or revised by CTK Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by CTK Co., Ltd. will constitute fraud and shall nullify the document.



Report No.: CTK-2024-00851 Page (3) / (49) Pages

# **CONTENTS**

1. General Product Description
1.1 Applicant Information4
1.2 Product Information4
1.3 Peripheral Devices4
1.4 Model Differences4
2. Accreditations
2.1 Laboratory Accreditations and Listings5
2.2 Calibration Details of Equipment Used for Measurement
3. Test Specifications
3.1 Standards6
3.2 Mode of operation during the test7
3.3 Device Modifications7
3.4 Maximum Measurement Uncertainty7
3.5 Test Software7
4. Technical Characteristic Test
4.1 6dB Bandwidth8
4.2 Maximum peak Conducted Output Power14
4.3 Transmitter Power Spectral Density 20
4.4 Conducted Spurious emission26
4.5 Radiated Emission
4.6 AC Conducted Emissions
APPENDIX A – Test Equipment Used For Tests



Report No.: CTK-2024-00851 Page (4) / (49) Pages

# **1. General Product Description**

# **1.1 Applicant Information**

Company	SOLUM CO.,LTD.
Contact Point	4,5,6th F, 357, Guseong-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea (Zip 16914)
Contact Person	Name : Ki Dong Lee E-mail : kdlee007@solu-m.com Tel : +82-31-8006-7677 Fax : -

# 1.2 Product Information

FCC ID	2AFWN-WC37FAPBDW0	
Product Description	Signage	
Model name	WC37FAPBDU0/SM	
Variant Model name	-	
Operating Frequency	2 402 MHz - 2 480 MHz	
RF Output Power	BLE_PHY 1M : 1.090 dBm (1.285 mW) BLE_PHY 2M : 1.204 dBm (1.319 mW) BLE_PHY Coded(S=2) : 1.235 dBm (1.329 mW) BLE_PHY Coded(S=8) : 1.124 dBm (1.295 mW)	
Antenna Specification	Antenna type : PCB Antenna Peak Gain : 3.59 dBi	
Number of channels	40	
Channel Spacing	2 MHz	
Type of Modulation	GFSK	
Power Source	DC 19 V	
RF Power setting in Test SW	Initial value	

# **1.3 Peripheral Devices**

Device	Manufacturer	Model No.	Serial No.
Notebook	HP Inc.	HP Probook 455 G7	5CD0234DWM
AC Adapter	HP Inc.	PPP012D-S	677777-003

# **1.4 Model Differences**

Not applicable



Report No.: CTK-2024-00851 Page (5) / (49) Pages

# 2. Accreditations

# 2.1 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	CN : 8737A CAB ID : KR0025
KOREA	NRRA	KR0025

# 2.2 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.



# 3. Test Specifications

# 3.1 Standards

FCC Part Section(s)	Requirement(s)	Status (Note 1)	Test Condition
15.247(a)	6 dB Bandwidth	С	
15.247(b)	Maximum Output Power	С	
15.247(d)	Conducted Spurious emission	С	Conducted
15.247(d)	Unwanted Emission(Conducted)	С	
15.247(e)	Transmitter Power Spectral Density	С	
15.209	Radiated Emissions	С	Radiated
15.207	AC Conducted Emissions	С	Line Conducted
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable			
Note 2: The data in this test report are traceable to the national or international standards.			
<u>Note 3</u> : The sample was tested according to the following specification: FCC Part 15.247 <u>Note 4</u> : The tests were performed according to the method of measurements prescribed in KDB No.558074, ANSI C63.10-2013			



Report No.: CTK-2024-00851 Page (7) / (49) Pages

# 3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments. During at testing, system components were manipulated within the confines of typical usage to maximize each emission. All modulation modes were tests. The results are only attached worst cases.

#### Test Frequency

Lowest channel	Middle channel	Highest channel
2 402 MHz	2 440 MHz	2 480 MHz

#### Test mode

Mode	Duty Cycle	Duty Cycle Factor
BLE_PHY 1M	85.47	0.68
BLE_PHY 2M	57.60	2.40
BLE_PHY Coded(S=2)	57.12	2.43
BLE_PHY Coded(S=8)	82.80	0.82

# 3.3 Device Modifications

The following modifications were necessary for compliance:

Not applicable

# 3.4 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter. Coverage factor k = 2, Confidence levels of 95 %

Description	Uncertainty
Conducted RF Output Power	1.5 dB (C.L.: Approx. 95 %, k = 2)
Power Spectral Density	1.5 dB (C.L.: Approx. 95 %, k = 2)
Occupied Bandwidth	0.1 MHz (C.L.: Approx. 95 %, k = 2)
Unwanted Emission(conducted)	3.0 dB (C.L.: Approx. 95 %, k = 2)
Radiated Emissions (f $\leq$ 1 GHz)	3.88 dB (C.L.: Approx. 95 %, <i>k</i> = 2)
Radiated Emissions (f > 1 GHz)	4.50 dB (C.L.: Approx. 95 %, k = 2)
Line Conducted Emission	2.08 dB (C.L.: Approx. 95 %, k = 2)

# 3.5 Test Software

Conducted Test	Ics Pro Ver. 6.0.3	
Radiated Test	EP5RE Ver. 6.0.1.0, ES10 Ver. 10.001	
Line Conducted Test	EMC32 Ver. 10.50.0	



# 4. Technical Characteristic Test

# 4.1 6dB Bandwidth

# **Test Procedures**

KDB 558074 - Section 8.2 ANSI C63.10-2013 - Section 11.8.2

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.

# **Test Procedures**

ANSI C63.10-2013 - Section 6.9

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz
- c) Detector = peak

b) VBW  $\geq$  3 x RBW

- d) Trace mode = Max hold
- e) Sweep = auto couple
- f) Allow trace to fully 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.

# Minimum Standard :

6 dB Bandwidth > 500kHz



# Test Data :

Test mode: BLE\_PHY 1M

Frequency (MHz)	6dB Bandwidth (MHz)	Result
2 402	0.669	Complies
2 440	0.666	Complies
2 480	0.664	Complies

# Test mode: BLE\_PHY 2M

Frequency (MHz)	6dB Bandwidth (MHz)	Result
2 402	1.146	Complies
2 440	1.157	Complies
2 480	1.166	Complies

### Test mode: BLE\_PHY Coded(S=2)

Frequency (MHz)	6dB Bandwidth (MHz)	Result
2 402	0.653	Complies
2 440	0.659	Complies
2 480	0.659	Complies

## Test mode: BLE\_PHY Coded(S=8)

Frequency (MHz)	6dB Bandwidth (MHz)	Result
2 402	0.600	Complies
2 440	0.601	Complies
2 480	0.599	Complies

See next pages for actual measured spectrum plots.

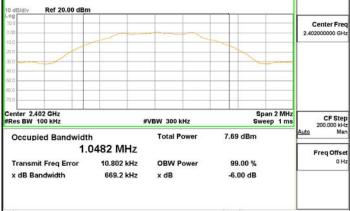


Report No.: CTK-2024-00851 Page (10) / (49) Pages

#### Test mode: BLE\_PHY 1M

RL Center F

	Lc	w	est Fr	e	quer	ncy	(240)	)2 MHz)	
tram Analyz							•		
RF	53.9	AC			SENSE INT		ALIGNAUTO	09:19:10 PM Mar 16, 2024	
Freq 2.4	0200	0000	GHz		er Freq: 2.40			Radio Std: None	Freq
]			#IFGain:Low		Free Run n: 12 dB		fold: 10/10 ain: -0.60 dB	Radio Device: BTS	
-									
Def	20.00	dDe	25						



#### Middle Frequency (2 440 MHz)

Center Fre	eq 2.44000000	0 GHz	SENSE DIT Center Freq: 2,440 rig: Free Run Atten: 10 dB		010 60 dB	Radio Sto Radio De		Fre	equency
10 dB/div	Ref 20.00 dB	m		_					
10.0 0.00									enter Fred
20.0	/				-	1			
40.0						_			
60.0 70.0									
Center 2.4 #Res BW			#VBW 300	kHz			oan 2 MHz eep 1 ms	-	CF Ster 200.000 kH
Occup	ied Bandwid			Power	6.59	dBm		Auto	Mar
	NACES OF TAXABLE PARTY.	.0476 MHz	5) 					F	req Offset
	hit Freq Error Andwidth	10.443 kH 665.5 kH		Power		.00 % 00 dB			0 H:





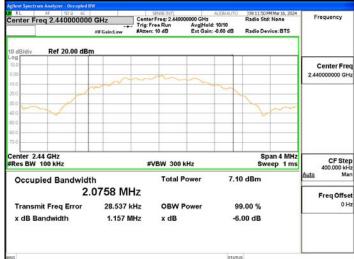
Report No.: CTK-2024-00851 Page (11) / (49) Pages

#### Test mode: BLE\_PHY 2M

Lowest Frequency (2 402 MHz)	



#### Middle Frequency (2 440 MHz)







# Test mode: BLE\_PHY Coded(S=2)

Lowest Frequency (2 402 MHz)

Center Freq 2.40200000	#IFGain:Low	SBAE INT Center Freq: 2.40200 Trig: Free Run #Atten: 12 dB	AUGNAUTO 0000 GHz Avg Held: 10/10 Ext Gain: -0.60 dB	10-30:08 PM Mar 16, 2024 Radio Std: None Radio Device: BTS	Frequency
10 dB/div Ref 20.00 dBm 100 0.00 100					Center Fred 2.402000000 GHz
20.0					
50.0 60.0 70.0					
Center 2.402 GHz #Res BW 100 kHz		#VBW 300 k	Hz	Span 2 MHz Sweep 1 ms	CF Step 200.000 kH
Occupied Bandwidt		Total P	ower 7.6	3 dBm	<u>Auto</u> Man
1.0	0349 MH	z			Freq Offset
Transmit Freq Error x dB Bandwidth	11.068 kl 652.8 kl		0.995 (C)	9.00 % .00 dB	0 Hz
eo			STATU	6	1

# Middle Frequency (2 440 MHz)

Center Fre	eq 2.44000000	0 GHz	Center Freq: 2.440 Trig: Free Run #Atten: 10 dB	Avg Hold: 10/10	Radio Std: N	None	Frequency
		#IFGain:Low	#Atten: 10 dB	Ext Gain: -0.60	dB Radio Devic	e: BTS	
10 dB/div	Ref 20.00 dB	m			• • • •		
0.00				-			Center Fre 2.440000000 GH
-10.0	/				2		
30.0					-		
40.0							
50.0							
-50.0							
Center 2.4 #Res BW			#VBW 300	kHz	Spa Swee	n 2 MHz ep 1 ms	CF Ste 200.000 kH
Occup	ied Bandwid	th	Total	Power	6.51 dBm		<u>Auto</u> Ma
	1	.0452 MH	z				Freq Offs
Transm	nit Freq Error	10.890 kł	z obw	Power	99.00 %		01
x dB Ba	andwidth	659.4 kł	łz x dB		-6.00 dB		
100					STATUS		



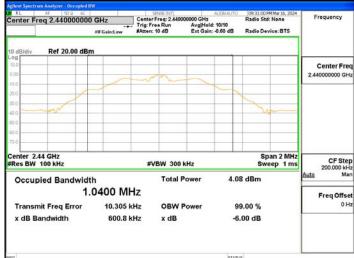


# Test mode: BLE\_PHY Coded(S=8)

Lowest Frequency (2 402 MHz)



#### Middle Frequency (2 440 MHz)







Report No.: CTK-2024-00851 Page (14) / (49) Pages

# 4.2 Maximum peak Conducted Output Power

## **Test Procedures**

KDB 558074 - Section 8.3.1.1 ANSI C63.10-2013 - Section 11.9.1.1

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

#### Test Settings:

Center frequency = the highest, middle and the lowest channels

a) RBW  $\geq$  DTS bandwidth

c) span  $\geq$  3 x RBW

e) Detector = peak

g) Allow trace to fully stabilize

b) VBW  $\geq$  3 x RBW

- d) Sweep time = auto couple
- f) Trace mode= max hold
- h) Use peak marker function to determine the peak amplitude level.

#### Limit :

Maximum Output Power < 1 W (30 dBm)



Report No.: CTK-2024-00851 Page (15) / (49) Pages

# Test Data :

#### Test mode: BLE\_PHY 1M

Frequency	-	ak Conducted Power	Result
(MHz)	(dBm)	(mW)	
2 402	1.090	1.285	Complies
2 440	0.049	1.011	Complies
2 480	-0.146	0.967	Complies

#### Test mode: BLE\_PHY 2M

Frequency			Result
(MHz)	(dBm)	(mW)	
2 402	1.204	1.319	Complies
2 440	0.140	1.033	Complies
2 480	-0.061	0.986	Complies

## Test mode: BLE\_PHY Coded(S=2)

Frequency	-	ak Conducted Power	Result
(MHz)	(dBm)	(mW)	
2 402	1.235	1.329	Complies
2 440	0.169	1.040	Complies
2 480	-0.073	0.983	Complies

# Test mode: BLE\_PHY Coded(S=8)

Frequency	Maximum pea Output		Result
(MHz)	(dBm)	(mW)	
2 402	1.124	1.295	Complies
2 440	0.263	1.062	Complies
2 480	-0.160	0.964	Complies

See next pages for actual measured spectrum plots.



Report No.: CTK-2024-00851 Page (16) / (49) Pages

#### Test mode: BLE\_PHY 1M

Lowest Frequency (2 402 MHz)



Middle Frequency (2 440 MHz)









Report No.: CTK-2024-00851 Page (17) / (49) Pages

#### Test mode: BLE\_PHY 2M

Lowest Frequency (2 402 MHz)



Middle Frequency (2 440 MHz)









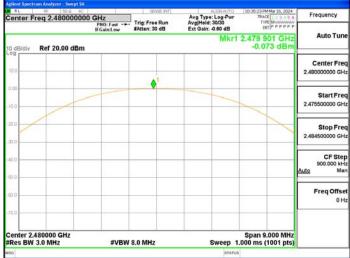
Report No.: CTK-2024-00851 Page (18) / (49) Pages

# Test mode: BLE\_PHY Coded(S=2)

Lowest Frequency (2 402 MHz) BEDE FORMER AND AC I At A F SO AC I Center Freq 2.402000000 GHz FRG. Fast → FGaint ow RAtten: 30 dB Avg Type: Log-Pw Avg[Hold: 30/30 Ext Gain: -0.60 dB Frequency DET P P P P P Auto Tur Mkr1 2.401 784 GH: 1.235 dBm Ref 20.00 dBm Center Fre 2.402000000 GH ٥ Start Fre 2.397500000 GH Stop Free 2.406500000 GH CF Step 900.000 kHz Man Freq Offse 0 H Center 2.402000 GHz #Res BW 3.0 MHz Span 9.000 MHz Sweep 1.000 ms (1001 pts) #VBW 8.0 MHz

#### Middle Frequency (2 440 MHz)







Report No.: CTK-2024-00851 Page (19) / (49) Pages

# Test mode: BLE\_PHY Coded(S=8)

Lowest Frequency (2 402 MHz) enter Freq 2.40200000 GHz PN0: Fest + IFGainLew Atten: 30 dB Avg Type: Log-Pw Avg[Hold: 30/30 Ext Gain: -0.60 dB Frequency DET P P P P P Auto Tur Mkr1 2.401 757 GHz 1.124 dBm Ref 20.00 dBm Center Fre 2.402000000 GH ٠ Start Fre 2.397500000 GH Stop Free 2.406500000 GH CF Step 900.000 kHz Man Freq Offse 0 H Center 2.402000 GHz #Res BW 3.0 MHz Span 9.000 MHz Sweep 1.000 ms (1001 pts) #VBW 8.0 MHz

Middle Frequency (2 440 MHz)



Highest Frequency (2 480 MHz)





Report No.: CTK-2024-00851 Page (20) / (49) Pages

# 4.3 Transmitter Power Spectral Density

# **Test Procedures**

KDB 558074 - Section 8.4 ANSI C63.10-2013 - Section 11.10.2

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance.

#### Test Settings:

Center frequency = the highest, middle and the lowest channels

a) RBW : 3 kHz  $\leq$  RBW  $\leq$  100 kHz

c) span  $\geq$  1.5 x DTS bandwidth

e) Detector = peak

g) Allow trace to fully stabilize

b) VBW  $\geq$  3 x RBW

- d) Sweep time = auto couple
- f) Trace mode= max hold

h) Use the peak marker function to determine the maximum amplitude level within the RBW.

#### Limit :

Power Spectral Density < 8dBm @ 3 kHz BW



Report No.: CTK-2024-00851 Page (21) / (49) Pages

## Test Data:

Test	mode:	<b>BIF</b>	PHY	1M
1031	mouc.	DLL_		1 1 1 1

Frequency	Power Spectral Density	Result
(MHz)	(dBm)	Result
2 402	-14.901	Complies
2 440	-15.771	Complies
2 480	-16.562	Complies

#### Test mode: BLE\_PHY 2M

Frequency	Power Spectral Density	Result
(MHz)	(dBm)	Result
2 402	-16.013	Complies
2 440	-17.820	Complies
2 480	-18.434	Complies

#### Test mode: BLE\_PHY Coded(S=2)

Frequency	Power Spectral Density	Result
(MHz)	(dBm)	Result
2 402	-6.013	Complies
2 440	-6.140	Complies
2 480	-6.541	Complies

## Test mode: BLE\_PHY Coded(S=8)

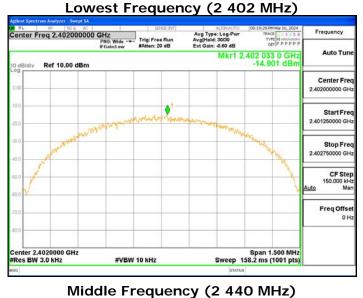
Frequency	Power Spectral Density	Result
(MHz)	(dBm)	Result
2 402	-5.286	Complies
2 440	-6.127	Complies
2 480	-6.464	Complies

See next pages for actual measured spectrum plots.



Report No.: CTK-2024-00851 Page (22) / (49) Pages

#### Test mode: BLE\_PHY 1M



enter Freq 2.440000000 GHz PNO: Wide ----If Galact.ov #Atten: 20 dB Frequency Avg Type: Log-Pwr Avg|Hold: 30/30 Ext Gain: -0.60 dB TRACE 1 2 3 4 5 TVPE MUMMMM DET P P P P P Auto Tun Mkr1 2.440 030 0 GHz -15.772 dBm Ref 10.00 dBm Center Free 2.440000000 GH ٥1 Start Free 2.439250000 GH Stop Free 2.440750000 GH CF Step 150.000 kHz Man sto Freq Offset 0 Hz Center 2.4400000 GHz #Res BW 3.0 kHz Span 1.500 MHz Sweep 158.2 ms (1001 pts) #VBW 10 kHz

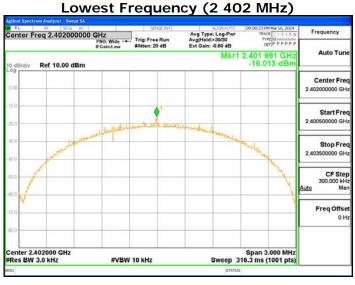






Report No.: CTK-2024-00851 Page (23) / (49) Pages

#### Test mode: BLE\_PHY 2M



Middle Frequency (2 440 MHz)

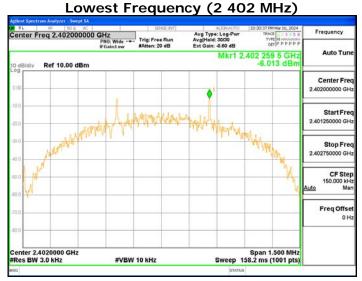








# Test mode: BLE\_PHY Coded(S=2)



Middle Frequency (2 440 MHz)









Report No.: CTK-2024-00851 Page (25) / (49) Pages

# Test mode: BLE\_PHY Coded(S=8)

Lowest Frequency (2 402 MHz) Stand Sector There are a solo a C in the solo and the so Frequency Avg Type: Log-Pw Avg[Hold: 30/30 Ext Gain: -0.60 dB DET P P P P P Auto Tur Mkr1 2.401 760 0 GH: -5.286 dBm Ref 10.00 dBm Center Fre 2.402000000 GH 0 Start Fre 2.401250000 GH North MAL Manual Stop Fre 2.402750000 GH CF Step 150.000 kHz Man Freq Offse 0 H Center 2.4020000 GHz #Res BW 3.0 kHz Span 1.500 MHz Sweep 158.2 ms (1001 pts) #VBW 10 kHz

Middle Frequency (2 440 MHz)









Report No.: CTK-2024-00851 Page (26) / (49) Pages

# 4.4 Conducted Spurious emission

#### **Test Procedures**

KDB 558074 - Section 8.5 ANSI C63.10-2013 - Section 11.11.3

The Unwanted emission from the EUT were measured according to the dictates PKPSD measurement procedure in section 11.11 of ANSI C63.10-2013.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Settings:

Center frequency = the highest, middle and the lowest channels

a) RBW = 100 kHz

b) VBW  $\geq$  3 x RBW

c) Detector = peak

d) Sweep time = auto couple

e) Trace mode= max holdf) Allow trace to fully stabilize

g) Use the peak marker function to determine the maximum amplitude level.

# Limit :

Emission level < 20 dBc

# **Test results: Complies**

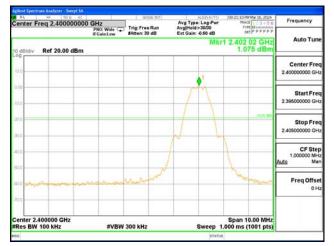
- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest in-band spectral density. Therefore the applying equipment meets the requirement.

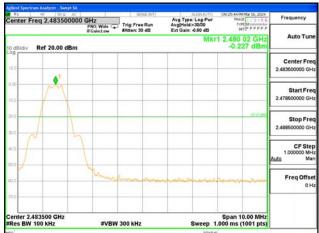
# See next pages for actual measured spectrum plots.

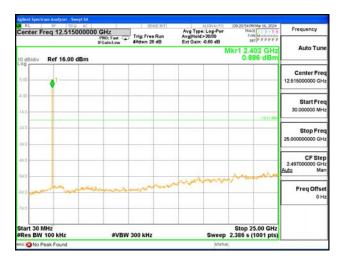


Report No.: CTK-2024-00851 Page (27) / (49) Pages

#### Test Data: Test Mode: BLE\_PHY 1M









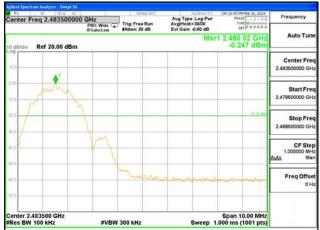
RL RF 50.0	AC	SENSE:INT	LA	IGNAUTO	09:25:28 PM Mar 16, 2024	
enter Freq 12.51500		Trig: Free Run #Atten: 26 dB	Avg Type:   Avg Hold>3 Ext Gain: -0	30/30	TRACE 1 2 3 4 5 6 TYPE MUMUUUU DET P P P P P P	Frequency
dB/div Ref 16.00 dB	m			N	1.446 dBm 1.446 dBm	Auto Tu
1						Center Fr 12.515000000 G
0						Start Fr 30.000000 M
					_21.45 dbn	Stop F 25.000000000 0
0						CF St 2.497000000 ( Auto
· alamaterile	ann an air		a Markanon Mak	der ver		Freq Off
art 30 MHz	#VRW	300 kHz		Sween	Stop 25.00 GHz 2.386 s (1001 pts)	

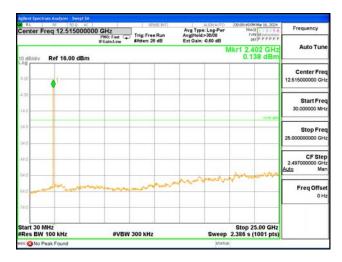


Report No.: CTK-2024-00851 Page (28) / (49) Pages

## Test Mode: BLE\_PHY 2M







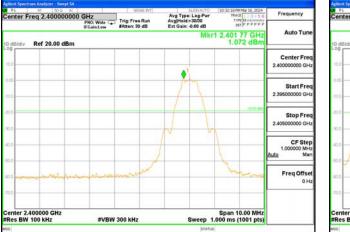


RL	RF 50 Q		SENSE:INT	ALIGNAUTO		E
enter	Freq 12.51500	PNO: Fast IFGain:Low	Trig: Free Run #Atten: 26 dB	Avg Type: Log-Pw Avg Hold>30/30 Ext Gain: -0.60 dB	TRACE 1 2 3 4 5 6 TYPE MUMUMUM DET P P P P P	Frequency
0 dB/div	Ref 16.00 dB	im			Mkr1 2.477 GHz -2.493 dBm	Auto Tur
5.00	1					Center Fr 12.515000000 G
4.0						Start Fr 30.000000 M
4.0					-22.40 dBn	Stop Fr 25.00000000 G
4.0						CF St 2.497000000 G Auto N
4.0	montally becarbe	and and a stand of the second	يسمن سول مسجع المسريوس	Ku warana ang		Freq Off: 0
itart 30	MUN				Stop 25.00 GHz	
	WHZ V 100 kHz	#VBW	300 kHz	Swee	p 2.386 s (1001 pts)	
	Peak Found			STAT	115	

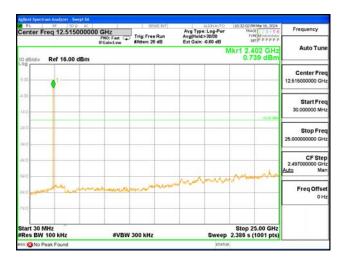


Report No.: CTK-2024-00851 Page (29) / (49) Pages

# Test Mode: BLE\_PHY Coded(S=2)









Center Pred 12.515000000 Bit 2000         Trig: Free Run Preside 1000         Augitidity 3000         Trig: Free Run Ret en: 26 dB         Augitidity 3000         Trig: Free Run Ret Gain: 4.60 dB         Augitidity 3000         Trig: Free Run Ruter: 26 dB         Augitidity 3000         Augitidity 30000 <th>RL</th> <th>RF 50.0 AI</th> <th></th> <th>SENSE:INT</th> <th></th> <th>ALIGNAUTO</th> <th>10:37:02 PM Mar 16, 2024</th> <th>E</th>	RL	RF 50.0 AI		SENSE:INT		ALIGNAUTO	10:37:02 PM Mar 16, 2024	E
In the log of the log	Center F	req 12.515000	PNO: Fast 😱	Trig: Free Run #Atten: 26 dB	Avg Hold:	>30/30	TRACE 1 2 3 4 5 6 TYPE MULLIUM DET P P P P P	
600         12.515000           100         30.000		Ref 16.00 dBn	n			N		Auto Tu
10         30,000           10		•1						Center Fi 12.515000000 G
								Start F 30.000000 M
2297000 10 10 10 10 10 10 10 10 10								Stop F 25.000000000
							- And a state	CF S 2.497000000 0 Auto
		and the local day	manulan landaria	می استرما <sup>ر</sup> (امحرم مردد)	بالمبلريميالي	mandar		Freq Off
	4.0							
tart 30 MHz Stop 25.00 GHz Res BW 100 kHz #VBW 300 kHz Sweep 2.386 s (1001 pts)			#VBW	300 kHz		Sweep		



Report No.: CTK-2024-00851 Page (30) / (49) Pages

# Test Mode: BLE\_PHY Coded(S=8)









RL RF 50.9 A		SENSE:INT		NAUTO	09:35:05 PM Mar 16, 2024	E
enter Freq 12.515000	DHO: Fast C	rig: Free Run Atten: 26 dB	Avg Type: Lo Avg[Hold:>30 Ext Gain: -0.6	130	TRACE 1 2 3 4 5 6 TVPL MULLINU DET P P P P P P	Frequency
dB/div Ref 16.00 dB	m			м	kr1 2.477 GHz -3.568 dBm	Auto Tun
1						Center Fre 12.515000000 GH
4.0						Start Fre 30.000000 M
4.0					-23.57 dije	Stop Fr 25.00000000 G
4.0						CF St 2.497000000 G Auto M
4.0 with the many set	d-anti-materia	unnana	Mada Jana Magari	UN PROPARY	, and a second	Freq Offs 0
4.0 tart 30 MHz					Stop 25.00 GHz	
Res BW 100 kHz	#VBW 30	0 kHz	S	weep 2	2.386 s (1001 pts)	



Report No.: CTK-2024-00851 Page (31) / (49) Pages

# 4.5 Radiated Emission

## **Test Location**

 $\boxtimes$  10 m SAC (test distance :  $\square$  10 m,  $\boxtimes$  3 m)  $\boxtimes$  3 m SAC (test distance : 3 m)

# **Test Procedures**

KDB 558074 - Section 8.5, 8.6 ANSI C63.10-2013 - Section 11.11, 11.12

- In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency rage above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

```
Test Settings:
Frequency Range = 9 kHz ~ 1 GHz
a) RBW = 100 kHz for f < 1 GHz, 9 kHz for f < 30 MHz
b) VBW \geq RBW
c) Detector = CISPR Quasi-peak
                                               d) Sweep time = auto couple
- Peak
Frequency Range = 1 GHz ~ 25 GHz (2.4 GHz 10<sup>th</sup> harmonic)
a) RBW = 1 MHz
b) VBW \geq 3 x RBW
                                               c) Detector = Peak
d) Sweep time = auto
                                               e) Trace mode = max hold
- Average (duty cycle \geq 98%)
Frequency Range = 1 GHz \sim 25 GHz (2.4 GHz 10<sup>th</sup> harmonic)
a) RBW = 1 MHz
b) VBW \geq 3 x RBW
                                               c) Detector = RMS
d) Sweep time = auto
                                               e) Averaging type = power (i.e., RMS)
f) Trace mode = average (at least 100 traces)
```



- Average (duty cycle < 98%, duty cycle variations are less than  $\pm 2\%$ )

Frequency Range = 1 GHz ~ 25 GHz (2.4 GHz 10<sup>th</sup> harmonic)

- a) RBW = 1 MHz
- b) VBW  $\geq$  3 x RBW

d) Sweep time = auto

c) Detector = RMS

e) Averaging type = power (i.e., RMS)

f) Trace mode = average (at least 100 traces)

A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.

If power averaging (RMS) mode, then the applicable correction factor is  $10 \log(1/x)$ , where x is the duty cycle.

Mode	Duty Cycle	Duty Cycle Factor
BLE_PHY 1M	85.47	0.68
BLE_PHY 2M	57.60	2.40
BLE_PHY Coded(S=2)	57.12	2.43
BLE_PHY Coded(S=8)	82.80	0.82

#### Limit :

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only

spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
<sup>1</sup> 0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475- 156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	<sup>2</sup> Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



FCC Part 15 § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 2 Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

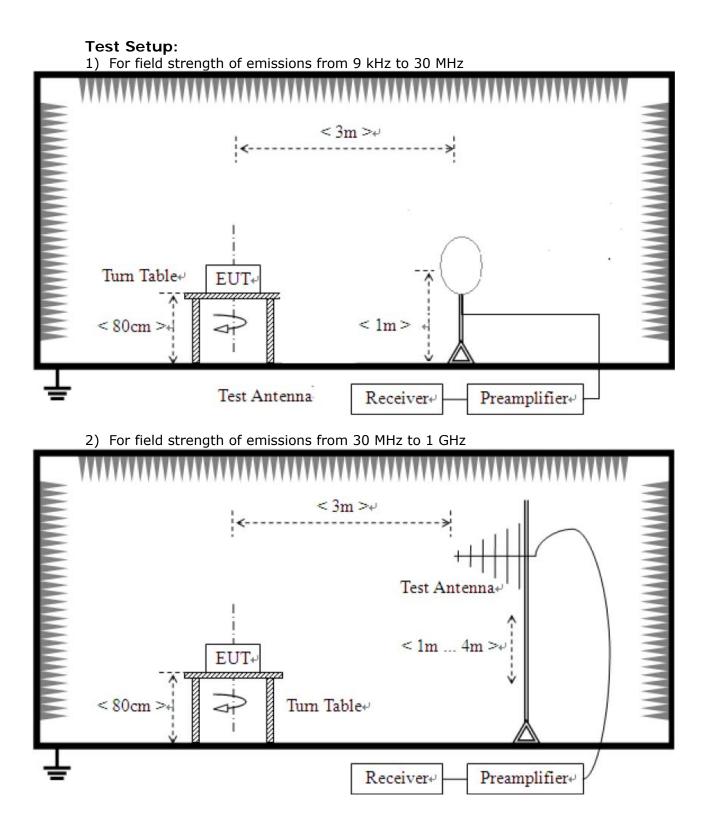
\*\* Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note :

- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)

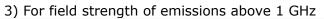


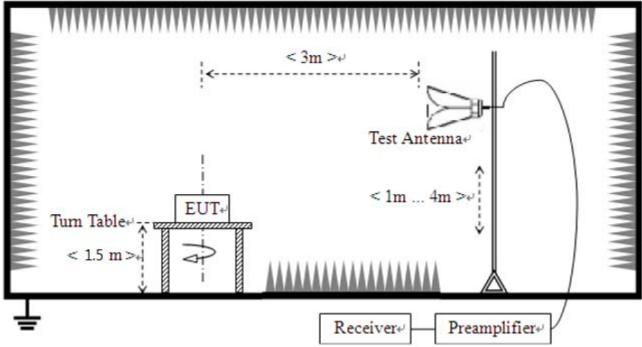
Report No.: CTK-2024-00851 Page (34) / (49) Pages





Report No.: CTK-2024-00851 Page (35) / (49) Pages







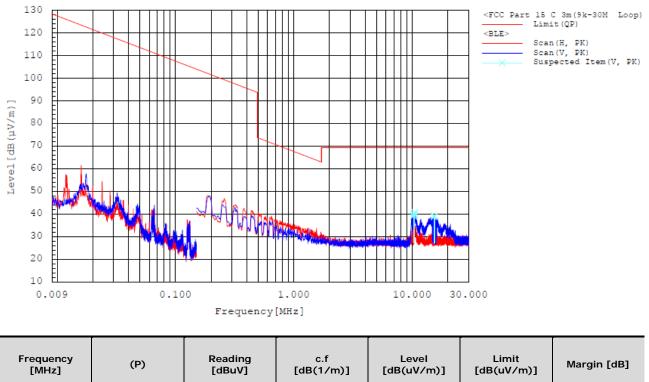
Report No.: CTK-2024-00851 Page (36) / (49) Pages

# Test results

# 1) 9 kHz to 30 MHz

Test mode : BLE\_PHY Coded(S=8)\_Lowest channel(Worst Case)

The requirements are:  $\square$  Complies



# Test Data

The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.

#### Remark :

- The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- 2. Result = Reading + c.f(Correction factor)
- 3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
- 4. This data is the Peak(PK) value.



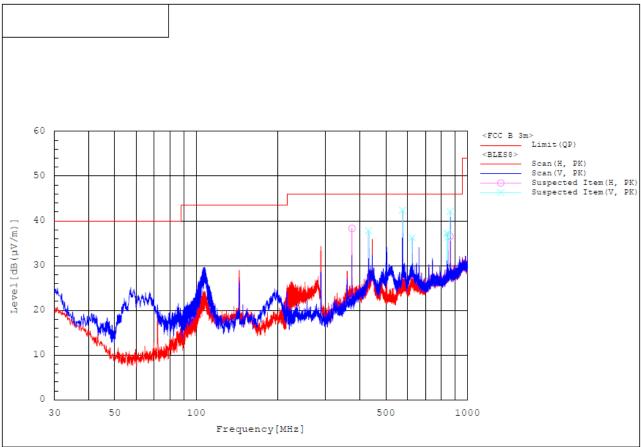
Report No.: CTK-2024-00851 Page (37) / (49) Pages

## 2) 30 MHz to 1 GHz

## Test mode : BLE\_PHY Coded(S=8)\_Lowest channel(Worst Case)

The requirements are:  $\square$  Complies

## Test Data



Spectrum Selection

No.	Frequency	Pol	Reading PK	c.f	Result PK	Limit QP	Margin QP-PK	Height	Angle	Remark
	[MHs]		[dB(µV)]	[dB(1/m)]	[dB(µV/m)]	[dB(µV/m)]	[dB]	[cm]	[deg]	
1	375.029	н	46.3	-8.0	38.3	46.0	7.7	99.	9 117.0	
2	431.483	v	43.7	-5.9	37.8	46.0	8.2	99.	9 359.6	
3	575.625	v	44.6	-2.2	42.4	46.0	3.6	99.	9 31.9	
4	624.998	v	38.3	-2.1	36.2	46.0	9.8	99.	9 357.1	
5	840.338	v	35.1	2.1	37.2	46.0	8.8	99.	9 357.9	
6	842.957	v	34.9	2.3	37.2	46.0	8.8	99.	9 359.6	
7	846.934	v	33.7	2.6	36.3	46.0	9.7	99.	9 211.5	
8	862.551	н	33.5	3.0	36.5	46.0	9.5	399.	9 93.2	
9	862.842	v	39.1	3.0	42.1	46.0	3.9	99.	9 357.2	

#### Remark :

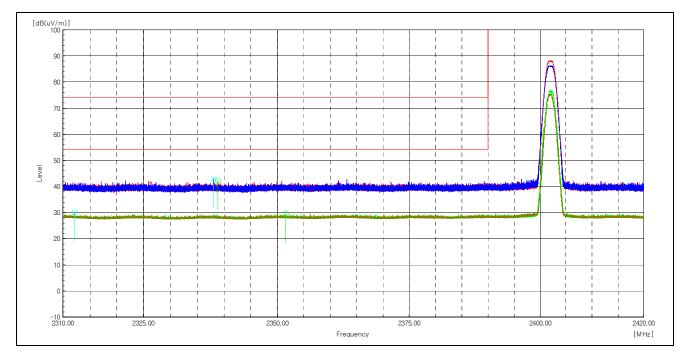
- 1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- 2. Result = Reading + c.f(Correction factor)
- 3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator Amp Gain



## 3) 2 310 MHz to 2 390 MHz

The requirements are:  $\square$  Complies

## Test DATA : BLE\_PHY 1M Lowest channel



## Test mode : BLE\_PHY 1M Lowest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	
	The emissi	ons 2 310 MHz to	2 390 MHz were	20 dB lower that	n the limit.		

## Test mode : BLE\_PHY 2M Lowest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	
	The emissi	ons 2 310 MHz to	2 390 MHz were	20 dB lower that	n the limit.		

## Test mode : BLE\_PHY Coded(S=2) Lowest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	
	The emissi	ons 2 310 MHz to	2 390 MHz were	20 dB lower that	n the limit.		



## Test mode : BLE\_PHY Coded(S=8) Lowest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
	The emissi	ons 2 310 MHz to	o 2 390 MHz were	20 dB lower that	n the limit.	

#### Remarks

1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.

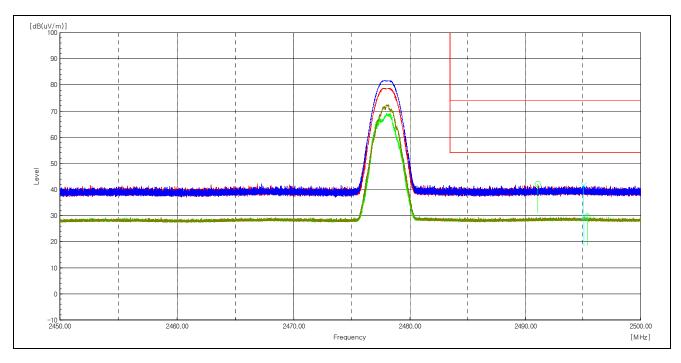
- 2. Result = Reading + c.f(correction factor)
- 3. Correction factor = Antenna factor + Cable loss Amp Gain
- 4. Tested at 100% duty cycle.



## 4) 2 483.5 MHz – 2 500 MHz

The requirements are:  $\square$  Complies

## Test DATA : BLE\_PHY 1M Highest channel



#### Test mode : BLE\_PHY 1M Highest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]		
The emissions 2 483.5 MHz to 2 500 MHz were 20 dB lower than the limit.								

#### Test mode : BLE\_PHY 2M Highest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
	The emission	ons 2 483.5 MHz t	to 2 500 MHz wer	e 20 dB lower tha	an the limit.	

## Test mode : BLE\_PHY Coded(S=2) Highest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
	The emission	ons 2 483.5 MHz t	to 2 500 MHz wer	e 20 dB lower tha	an the limit.	



## Test mode : BLE\_PHY Coded(S=8) Highest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
	The emission	ons 2 483.5 MHz t	to 2 500 MHz wer	e 20 dB lower tha	an the limit.	

#### Remarks

- 1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- 2. Result = Reading + c.f(correction factor)
- 3. Correction factor = Antenna factor + Cable loss Amp Gain
- 4. Tested at 100% duty cycle.

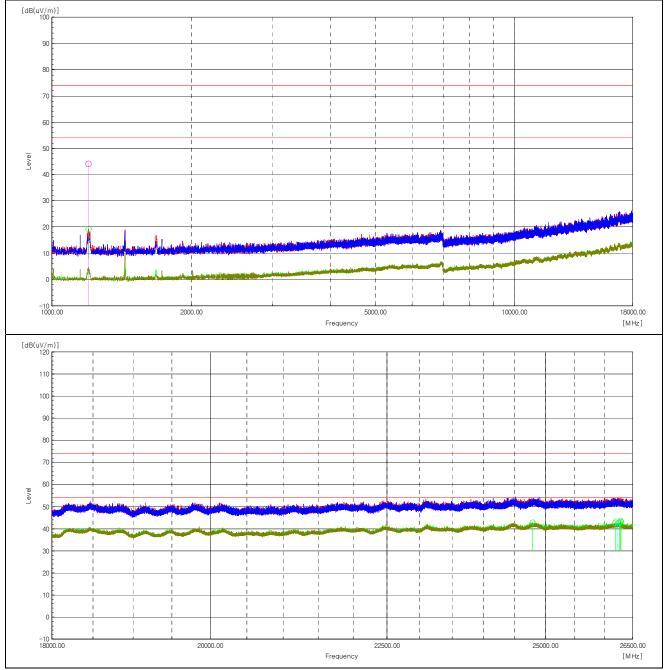


Report No.: CTK-2024-00851 Page (42) / (49) Pages

## 5) 1 GHz to 26.5 GHz

The requirements are:  $\square$  Complies

## Test DATA : BLE\_PHY 1M





## Test mode : BLE\_PHY 1M

#### Lowest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note
1 200.6	Н	55.1	-11.0	44.1	74.0	29.9	Peak

#### Middle channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note
1 440.0	v	54.4	-9.9	44.5	74.0	29.5	Peak

#### Highest channel

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note
1 440.0	Н	56.8	-9.9	46.9	74.0	27.1	Peak

#### Remarks

- 1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- 2. Result = Reading + c.f(correction factor)
- 3. Correction factor = Antenna factor + Cable loss Amp Gain
- 4. The 18 GHz end had no signal detected. As can be seen from the conducted spurious emission test, no signal was detected in the section.



Report No.: CTK-2024-00851 Page (44) / (49) Pages

## Test mode : BLE\_PHY 2M

Lowest channel

Frequency [MHz]	requency [MHz] (P) Reading c.f [dBuV] [dB(1/m)]		Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note	
1 440.7	v	54.4	-9.9	44.5	74.0	29.5	Peak

Middle channel

Frequency [MHz]	Hz] (P) Reading c.f [dBuV] [dB(1/m)]		Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note	
1 199.9	v	53.8	-11.0	42.8	74.0	31.2	Peak

Highest channel

Frequency [MHz]	quency MHz] (P) Reading c.f [dBuV] [dBuV]		Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note	
1 440.0	V	54.1	-9.9	44.2	74.0	29.8	Peak

#### Remarks

- 1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- 2. Result = Reading + c.f(correction factor)
- 3. Correction factor = Antenna factor + Cable loss Amp Gain
- 4. The 18 GHz end had no signal detected. As can be seen from the conducted spurious emission test, no signal was detected in the section.



## Test mode : BLE\_PHY Coded(S=2)

#### Lowest channel

Frequency [MHz]	equency (P) Reading c.f [MHz] (P) [dBuV] [dB(1/m)]		Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note	
1 440.0	V	54.0	-9.9	44.1	74.0	29.9	Peak

Middle channel

Frequency [MHz]	equency [MHz] (P) Reading c.f [dBuV] [dB(1/m)]		Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note	
1 440.0	V	53.9	-9.9	44.0	74.0	30.0	Peak

#### Highest channel

Frequency [MHz]	quency MHz] (P) Reading c.f [dBuV] [dBuV]		Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note	
1 440.0	V	53.5	-9.9	43.6	74.0	30.4	Peak

#### Remarks

- 1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- 2. Result = Reading + c.f(correction factor)
- 3. Correction factor = Antenna factor + Cable loss Amp Gain
- 4. The 18 GHz end had no signal detected. As can be seen from the conducted spurious emission test, no signal was detected in the section.



## Test mode : BLE\_PHY Coded(S=8)

#### Lowest channel

Frequency [MHz]	equency [MHz] (P) Reading c.f [dBuV] [dB(1/m)]		Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note	
1 439.3	V	53.5	-9.9	43.6	74.0	30.4	Peak

Middle channel

Frequency [MHz]	equency [MHz] (P) Reading c.f [dBuV] [dB(1/m)]		Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note	
1 199.9	V	53.6	-11.0	42.6	74.0	31.4	Peak

#### Highest channel

Frequency [MHz]	equency [MHz] (P) Reading c.f [dBuV] [dB(1/m)]		Level PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin PK [dB]	Note	
1 440.0	V	53.1	-9.9	43.2	74.0	30.8	Peak

#### Remarks

- 1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- 2. Result = Reading + c.f(correction factor)
- 3. Correction factor = Antenna factor + Cable loss Amp Gain
- 4. The 18 GHz end had no signal detected. As can be seen from the conducted spurious emission test, no signal was detected in the section.



## 4.6 AC Conducted Emissions

## Frequency Range of Measurement

150 kHz to 30 MHz

#### **Instrument Settings**

IF Band Width: 9 kHz

## **Test Procedures**

ANSI C63.10-2013 - Section 6.2

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.

Amplitude measurements were performed with a quasi-peak detector and an average detector.

## Limit

- 15.207(a)

Frequency (MHz)	Conducted Limit (dBuV)				
Frequency (MHz)	Quasi-peak	Average**			
0.15 ~ 0.5	66 to 56*	56 to 46*			
0.5 ~ 5	56	46			
5 ~ 30	60	50			

\* The level decreases linearly with the logarithm of the frequency. \*\* A linear average detector is required.

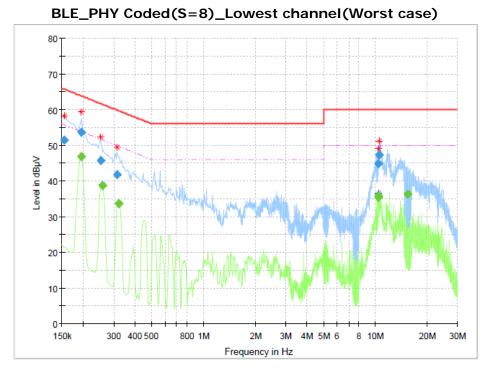
## **Test Results**

The requirements are:  $\square$  Complies



Report No.: CTK-2024-00851 Page (48) / (49) Pages

## **Test Data**



## Final Result

Frequency	QuasiPeak	CAverage	Limit	Margin	Meas. Time	Bandwidth	Line	Filter	Corr.
(MHz)	(dBµV)	(dBµV)	(dBµV)	(dB)	(ms)	(kHz)			(dB)
0.154500	51.37		65.75	14.38	15000.0	9.000	Ν	ON	9.8
0.195000		46.75	53.82	7.07	15000.0	9.000	Ν	ON	9.8
0.195000	53.60		63.82	10.22	15000.0	9.000	Ν	ON	9.8
0.253500	45.74		61.64	15.90	15000.0	9.000	Ν	ON	9.6
0.258000		38.70	51.50	12.79	15000.0	9.000	Ν	ON	9.6
0.316500	41.85		59.80	17.95	15000.0	9.000	Ν	ON	9.8
0.321000		33.57	49.68	16.11	15000.0	9.000	Ν	ON	9.8
10.365000		35.80	50.00	14.20	15000.0	9.000	Ν	ON	9.9
10.383000	44.92		60.00	15.08	15000.0	9.000	L1	ON	9.8
10.428000		35.44	50.00	14.56	15000.0	9.000	Ν	ON	9.9
10.540500	47.29		60.00	12.71	15000.0	9.000	Ν	ON	9.9
15.355500		36.23	50.00	13.77	15000.0	9.000	N	ON	10.0



Report No.: CTK-2024-00851 Page (49) / (49) Pages

# **APPENDIX A – Test Equipment Used For Tests**

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Signal Analyzer	Agilent	N9020A	MY50510324	2023-12-05	2024-12-05
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2023-03-22 2024-03-21	2024-03-22 2025-03-21
3	EMI TEST RECEIVER	Rohde & Schwarz	ESW44	102039	2023-05-03	2024-05-03
4	BILOG ANTENNA	TESEQ	CBL6111D	60654	2023-08-21	2025-08-21
5	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2023-04-15	2025-04-15
6	6dB Attenuator	PASTERNACK	PE7AP006-06	L20210504000023	2023-08-04	2024-08-04
7	AMPLIFIER	SONOMA INSTRUMENT	310N	411011	2023-08-04	2024-08-04
8	Spectrum Analyzer	R&S	FSV40	101574	2024-01-15	2025-01-15
9	PRE AMPLIFIER	HP	8449B	3008A00620	2023-04-21	2024-04-21
10	Double Ridged Guide Antenna	ETS-Lindgren	3115	00078895	2023-04-13	2024-04-13
11	HORN ANTENNA	SCHWARZBECK	BBHA9170	1153	2023-10-19	2024-10-19
12	LOW NOISE AMPLIFIER	TESTEK	TK-PA1840H	210124-L	2023-10-23	2024-10-23
13	Band Reject Filter	Micro Tronics	BRM50702	G233	2023-12-04	2024-12-04
14	EMI Test Receiver	R&S	ESR3	102826	2023-05-03	2024-05-03
15	LISN	R&S	ENV216	102698	2023-05-03	2024-05-03
16	6dB Attenuator	NONE	6dB	190557	2023-09-25	2024-09-25

No.	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (Conducted)	Junkosha Inc.	MWX221	1512S151	2023-08-21
2	RF Cable (Conducted)	Junkosha Inc.	MWX221	1512S148	2023-08-21
3	RF Cable (Line Conducted)	Canare Corporation	L-5D2W	N/A	2024-03-06
4	RF Cable (9kHz-30MHz Radiated)	Canare Corporation	L-5D2W	N/A	2024-03-06
5	RF Cable (9kHz-1GHz Radiated)	Canare Corporation	L-5D2W	N/A	2023-08-23
6	RF Cable (9kHz-1GHz Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2023-08-23
7	RF Cable (1GHz-18GHz Radiated)	Junkosha Inc.	MWX221	2008S246	2023-06-28
8	RF Cable (1GHz-18GHz Radiated)	Rosenberger	NONE	1520.9927.00	2023-06-28
9	RF Cable (1GHz-18GHz Radiated)	Sensorview Co., LTD	9S18	TPC2204060007	2023-06-28
10	RF Cable (18 GHz - 40 GHz Radiated)	Sensorview Co., LTD	9S40	TPC2204060009	2023-06-28
11	RF Cable (18 GHz - 40 GHz Radiated)	Sensorview Co., LTD	9A40	TP210713-001	2023-06-28

#### -END-