



Project No: Report No.: TM-2307000391P TMWK2307002436KR FCC ID: BJI-CL8852BU

Page: 1 / 58 Rev.: 00

# RADIO TEST REPORT FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
Product name	WLAN/BT USB Dongle
Brand Name	Toshiba Tec Corporation
Model No.	CL-8852BU
Test Result	Pass
Statements of Conformity	Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)

Approved by:

Hong

Dally Hong Sr. Engineer

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan /新北市五股區五工六路 11 號 t:(886-2) 2299-9720 f:(886-2) 2299-9721 www.sqs.com.tw

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <a href="http://www.sgs.com.tw/Terms-and-Conditions">http://www.sgs.com.tw/Terms-and-Conditions</a> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <a href="http://www.sgs.com.tw/Terms-and-Conditions">http://www.sgs.com.tw/Terms-and-Conditions</a> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <a href="http://www.sgs.com.tw/Terms-and-Conditions">http://www.sgs.com.tw/Terms-and-Conditions</a> and, for electronic format documents, subject to Terms and Conditions for Electronic Document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of client's instruction, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced, except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.



Page: 2 / 58 Rev.: 00

# **Revision History**

Rev.	Issue Date	Revisions	Revised By
00	November 1, 2023	Initial Issue	Doris Chu



Report No.:

Page: 3 / 58 Rev.: 00

## Table of contents

TMWK2307002436KR

1.	GENERAL INFORMATION 4
1.1	EUT INFORMATION4
1.2	EUT CHANNEL INFORMATION
1.3	ANTENNA INFORMATION
1.4	MEASUREMENT UNCERTAINTY6
1.5	FACILITIES AND TEST LOCATION7
1.6	INSTRUMENT CALIBRATION 8
1.7	SUPPORT AND EUT ACCESSORIES EQUIPMENT9
1.8	TEST METHODOLOGY AND APPLIED STANDARDS9
2.	TEST SUMMERY 10
3.	DESCRIPTION OF TEST MODES 11
3.1	THE WORST MODE OF OPERATING CONDITION 11
3.2	THE WORST MODE OF MEASUREMENT 12
3.3	EUT DUTY CYCLE
4.	TEST RESULT 15
4.1	AC POWER LINE CONDUCTED EMISSION 15
4.2	6DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%) 18
4.3	OUTPUT POWER MEASUREMENT 23
4.4	POWER SPECTRAL DENSITY
4.5	CONDUCTED BAND EDGE AND SPURIOUS EMISSION
4.6	RADIATION BANDEDGE AND SPURIOUS EMISSION
APPE	NDIX 1 - PHOTOGRAPHS OF EUTA-1



## 1. GENERAL INFORMATION

## **1.1 EUT INFORMATION**

Applicant	Toshiba Tec Corporation 6-78, Minami-Cho, Mishima-Shi, Shizuoka-ken 411-8520 Japan
Manufacturer	CC&C Technologies Inc. 8F, 150, Jian Yi Road, Zhonghe District, New Taipei City, Taiwan 235, R. O. C.
Factory	Kunshan CC&C Technologies, Co., Ltd No.9 building,3rd Main Street, Kunshan Free Trade Zone, Jiangsu Province, P. R. China
Equipment	WLAN/BT USB Dongle
Model No.	CL-8852BU
Model Discrepancy	N/A
Trade Name	Toshiba Tec Corporation
Received Date	July 21, 2023
Date of Test	July 26 ~ August 30, 2023
Power Operation	Power from host device.
HW Version	ОВ
SW Version	01

Remark:

1. For more details, please refer to the User's manual of the EUT.

2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.



Page: 5 / 58 Rev.: 00

## **1.2 EUT CHANNEL INFORMATION**

Frequency Range	2402MHz-2480MHz		
Modulation Type	GFSK for BLE 1 Mbps GFSK for BLE 2 Mbps		
Number of channel	40 Channels		

#### Remark:

Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 for test channels

## Number of frequencies to be tested

Frequency range in which device operates	Number of frequencies	Location in frequency range of operation	
1 MHz or less	1	Middle	
1 MHz to 10 MHz	2	1 near top and 1 near bottom	
More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom	

## **1.3 ANTENNA INFORMATION**

Antenna Type	PIFA  PCB  Dipole  Coils		
Antenna Gain	Gain: -13.33 dBi		
Antenna Connector	N/A		

Notes:

1. The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203.



Page: 6 / 58 Rev.: 00

## **1.4 MEASUREMENT UNCERTAINTY**

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.213 dB
Channel Bandwidth	± 2.7 %
RF output power (Power Meter + Power sensor)	± 0.243 dB
Power Spectral density	± 2.739 dB
Conducted Bandedge	± 2.739 dB
Conducted Spurious Emission	± 2.742 dB
Radiated Emission_9kHz-30MHz	± 3.115 dB
Radiated Emission_30MHz-200MHz	± 4.071 dB
Radiated Emission_200MHz-1GHz	± 4.419 dB
Radiated Emission_1GHz-6GHz	± 5.023 dB
Radiated Emission_6GHz-18GHz	± 5.068 dB
Radiated Emission_18GHz-26GHz	± 3.349 dB
Radiated Emission_26GHz-40GHz	± 3.229 dB

#### Remark:

.

1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.



Page: 7 / 58 Rev.: 00

## **1.5 FACILITIES AND TEST LOCATION**

All measurement facilities used to collect the measurement data are located at

AC Powerline Conducted Emission and Conducted:

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

Radiated emission 9kHz to 40GHz:

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan 24803

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Tony Chao	-
Radiation	Czerny Lin	-
RF Conducted	Allen Shen	-

**Remark:** The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309



## **1.6 INSTRUMENT CALIBRATION**

Conducted_FCC/IC/NCC (All)						
Name of Equipment	Manufacturer Model Serial Number Calibration Date Calibration Du					
Power Sensor	Anritsu	MA2411B	1911386	2023-07-25	2024-07-24	
Power Sensor	Anritsu	MA2411B	1911387	2023-07-25	2024-07-24	
Power Meter	Anritsu	ML2496A	2136002	2022-11-24	2023-11-23	
EXA Signal Analyzer	Keysight	N9010B	MY60242460	2023-02-02	2024-02-01	
Software	Radio Test Software Ver. 21					

Radiated Emission Test Site: 966 D						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due	
Antenna	SHWARZBECK	VULB 9168	1277	2023-01-13	2024-01-12	
Pre-Amplifier	EMCI	EMC118A45SE	980820	2022-12-23	2023-12-22	
Pre-Amplifier	EMCI	EMC330N	980853	2022-12-23	2023-12-22	
Coaxial Cable	EMC	EMC101G-KM-KM- 9000	220407+211228+ 230205	2023-03-21	2024-03-20	
EXA Signal Analyzer	Agilent	N9010A	MY52220817	2023-03-09	2024-03-08	
Coaxial Cable	EMC	EMCCFD400	211212+211222+ 211020	2023-03-21	2024-03-20	
High Pass Filter	TITAN	T04H3000180007 0S01	211215-7-1	2023-02-02	2024-02-01	
Thermo-Hygro Meter	EDSDS	EDS-A49	966D1	2023-05-11	2024-05-10	
Pre-Amplifier	EMCI	EMC184045SE	980872	2023-01-03	2024-01-02	
Horn Antenna	RF SPIN	DRH18-E	210301A18ES	2023-02-03	2024-02-02	
Horn Antenna	SHWARZBECK	BBHA 9170	1134	2022-12-30	2023-12-29	
Loop Antenna	SCHWARZBECK	FMZB 1513-60	1513-60-028	2022-12-27	2023-12-26	
Software	e3 V9-210616c					

RF_Conduction(RF)						
Name of Equipment	Manufacturer	Model	Calibration Date	Calibration Due		
EMI Test Receiver	R&S	ESCI	100064	2023-06-07	2024-06-06	
LISN	TESEQ	LN2-16N	22012	2023-03-08	2024-03-07	
Cable	EMCI	CFD300-NL	CERF	2023-06-27	2024-06-26	
Software	EZ-EMC(CCS-3A1-CE-WUGU)					

#### Remark:

1. Each piece of equipment is scheduled for calibration once a year.

2. N.C.R. = No Calibration Required.



Page: 9 / 58 Rev.: 00

## **1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT**

Support Unit List							
Name of Equipment	Manufacturer Model Serial Number Calibration Date Calibration Due						
NB(E)	Lenovo	IBM 7663	N/A	N/A	N/A		

## **1.8 TEST METHODOLOGY AND APPLIED STANDARDS**

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, KDB 558074 D01.



Page: 10 / 58 Rev.: 00

## 2. TEST SUMMERY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	Pass
15.247(a)(2)	4.2	6 dB Bandwidth	Pass
-	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(3)	4.3	Output Power Measurement	Pass
15.247(e)	4.4	Power Spectral Density	Pass
15.247(d)	4.5	Conducted Band Edge	Pass
15.247(d)	4.5	Conducted Spurious Emission	Pass
15.247(d)	4.6	Radiation Band Edge	Pass
15.247(d)	4.6	Radiation Spurious Emission	Pass



Page: 11 / 58 Rev.: 00

## 3. DESCRIPTION OF TEST MODES

### **3.1 THE WORST MODE OF OPERATING CONDITION**

Operation mode	BLE Mode (1Mbps) BLE Mode (2Mbps)	
Test Channel Frequencies	1.Lowest Channel : 2402MHz 2.Middle Channel : 2442MHz 3.Highest Channel : 2480MHz	

Remark:

Г

1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.



## **3.2 THE WORST MODE OF MEASUREMENT**

AC Power Line Conducted Emission				
Test Condition AC Power line conducted emission for line and neutral				
Power supply Mode Mode 1: EUT Power by System				
Worst Mode   Mode 1 Mode 2 Mode 3 Mode 4				

Radiated Emission Measurement Above 1G					
Test Condition	Test Condition Radiated Emission Above 1G				
Power supply Mode	Mode 1: EUT Power by System				
Worst Mode	Mode 1				
Worst Position	<ul> <li>Placed in fixed position.</li> <li>Placed in fixed position at X-Plane (E2-Plane)</li> <li>Placed in fixed position at Y-Plane (E1-Plane)</li> <li>Placed in fixed position at Z-Plane (H-Plane)</li> </ul>				

Radiated Emission Measurement Below 1G				
Test Condition Radiated Emission Below 1G				
Power supply Mode	Mode 1: EUT Power by System			
Worst Mode	🛛 🖂 Mode 1 🗌 Mode 2 🗌 Mode 3 📄 Mode 4			

Remark:

1. The worst mode was record in this test report.

2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report

3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.



Page: 13 / 58 Rev.: 00

Report No.: TMWK2307002436KR

## **3.3 EUT DUTY CYCLE**

Temperature:	<b>26.2</b> ℃	Test date:	July 26, 2023
Humidity:	55% RH	Tested by:	Allen Shen

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
BLE 1M	62.40	2.05	2.56	3.00
BLE 2M	33.60	4.74	4.76	5.00





Page: 14 / 58 Rev.: 00



BLE 1M LowCH00-2402



Page: 15 / 58 Rev.: 00

## 4. TEST RESULT

## **4.1 AC POWER LINE CONDUCTED EMISSION**

### 4.1.1 Test Limit

According to §15.207(a),

Frequency Range	Limits(dBµV)			
(MHz)	Quasi-peak	Average		
0.15 to 0.50	66 to 56*	56 to 46*		
0.50 to 5	56	46		
5 to 30	60	50		

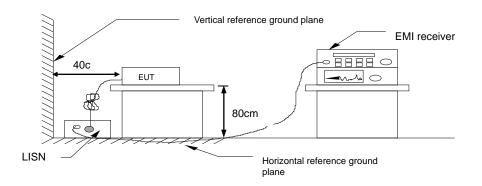
\* Decreases with the logarithm of the frequency.

### 4.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

- 1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
- 2. EUT connected to the line impedance stabilization network (LISN)
- 3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. Recorded Line for Neutral and Line.

### 4.1.3 Test Setup



## 4.1.4 Test Result

Pass



## Test Data

Job No.: Company: Standard: Test item: Line: Model:	TMWK2307002436KR Toshiba Tec Corporation NCC/FCC/IC QP Conduction test L1	n	Date: Time: Temp.(°C)/Hum.(%): Test By: Test Voltage:	2023/8/24 PM 06:12:17 25.5(℃)/53% Tony Chao AC 120V/60Hz
Description:				
80.0 dBuV			Limit1:	
			Limit2:	
¥ 2 3 × × 3		5		
30	Why Mpry Marin Marin and	YMATHIN HANNA HANN	Man Star Market and Market and Market	mmy M
*			* 1/2" ** "	
20				
0.150	0.5	(MHz)	5	30.000

No ·	Frequen cy	QuasiPe ak reading	Avera ge readin g	Correcti on factor	QuasiPe ak result	Avera ge result	QuasiPe ak limit	Avera ge limit	QuasiPe ak margin	Avera ge margi n	Rema rk
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.1860	51.66	33.85	0.15	51.81	34.00	64.21	54.21	-12.40	-20.21	Pass
2	0.2100	43.31	20.02	0.15	43.46	20.17	63.21	53.21	-19.75	-33.04	Pass
3	0.2580	40.16	23.30	0.15	40.31	23.45	61.50	51.50	-21.19	-28.05	Pass
4	0.8940	35.28	25.97	0.16	35.44	26.13	56.00	46.00	-20.56	-19.87	Pass
5	1.9220	41.61	31.21	0.22	41.83	31.43	56.00	46.00	-14.17	-14.57	Pass
6	5.8300	29.08	22.40	0.29	29.37	22.69	60.00	50.00	-30.63	-27.31	Pass

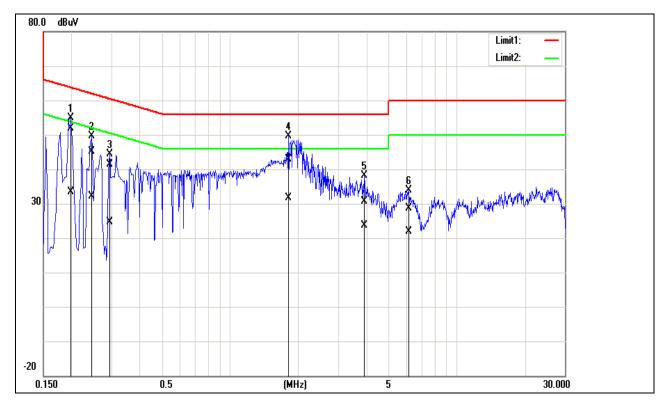
Note: 1. Correction factor = LISN loss + Cable loss.



Report No.:	TMWK2307002436KR

Page: 17 / 58 Rev.: 00

Job No.: Company: Standard: Test item: Line: Model:	TMWK2307002436KR Toshiba Tec Corporation NCC/FCC/IC QP Conduction test N	Date: Time: Temp.(℃)/Hum.(%): Test By: Test Voltage:	2023/8/24 PM 06:04:51 25.5(℃)/53% Tony Chao AC 120V/60Hz
Description:			



No	Frequen cy	QuasiPe ak reading	Avera ge readin g	Correcti on factor	QuasiPe ak result	Avera ge result	QuasiPe ak limit	Avera ge limit	QuasiPe ak margin	Avera ge margi n	Rema rk
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.1980	51.81	33.22	0.19	52.00	33.41	63.69	53.69	-11.69	-20.28	Pass
2	0.2460	44.98	31.91	0.19	45.17	32.10	61.89	51.89	-16.72	-19.79	Pass
3	0.2940	41.11	24.52	0.19	41.30	24.71	60.41	50.41	-19.11	-25.70	Pass
4	1.8140	42.59	31.34	0.25	42.84	31.59	56.00	46.00	-13.16	-14.41	Pass
5	3.9020	30.26	23.32	0.31	30.57	23.63	56.00	46.00	-25.43	-22.37	Pass
6	6.1860	28.24	21.57	0.34	28.58	21.91	60.00	50.00	-31.42	-28.09	Pass

Note: 1. Correction factor = LISN loss + Cable loss.



Page: 18 / 58 Rev.: 00

## 4.26dB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

### 4.2.1 Test Limit

According to §15.247(a)(2)

#### 6 dB Bandwidth :

Limit

Shall be at least 500kHz

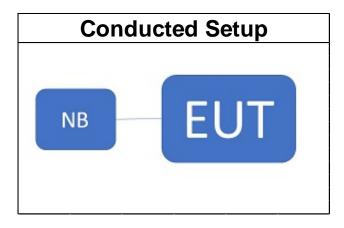
**Occupied Bandwidth(99%)** : For reporting purposes only.

### 4.2.2 Test Procedure

Test method Refer as KDB 558074 D01 and ANSI C63.10: 2013 clause 6.9.2.

- 1. The EUT RF output connected to the spectrum analyzer by RF cable.
- 2. Setting maximum power transmit of EUT
- 3. SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth and 99% Bandwidth.
- 4. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

### 4.2.3 Test Setup





Page: 19 / 58 Rev.: 00

## 4.2.4 Test Result

Temperature:	<b>26.2</b> ℃	Test date:	July 26, 2023
Humidity:	55% RH	Tested by:	Allen Shen

#### BLE 1M mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	0.6537	$\ge$ 0.5	PASS
2442	0.6632	<b>≧ 0.5</b>	PASS
2480	0.6542	≧ 0.5	PASS

#### BLE 2M mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	0.9987	$\ge$ 0.5	PASS
2442	1.125	≧ 0.5	PASS
2480	1.128	<b>≧ 0.5</b>	PASS



Report No.:

TMWK2307002436KR

Page: 20 / 58 Rev.: 00

#### BLE 1M mode

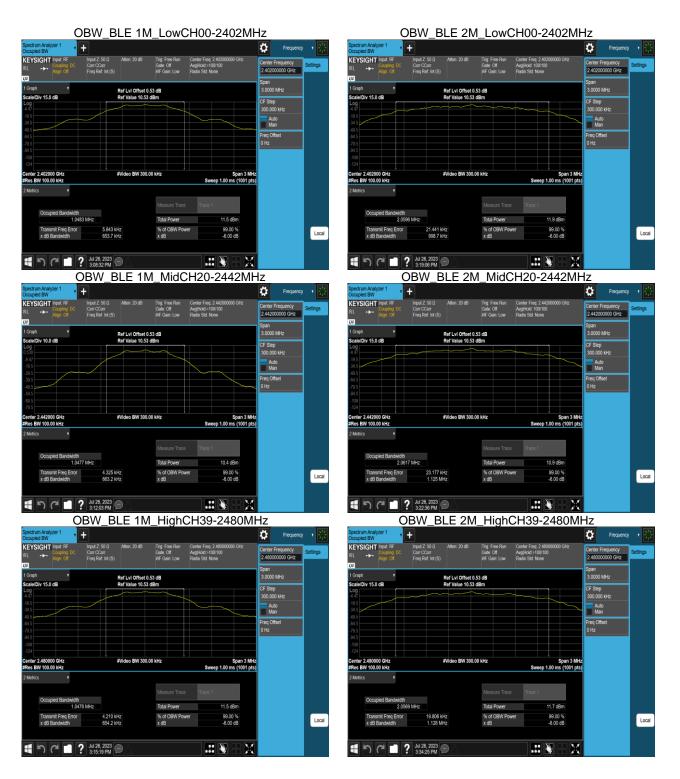
Frequency (MHz)	99%Bandwidth (MHz)
2402	1.0325
2442	1.0222
2480	1.0330

#### BLE 2M mode

Frequency (MHz)	99%Bandwidth (MHz)
2402	2.0408
2442	2.0353
2480	2.0285



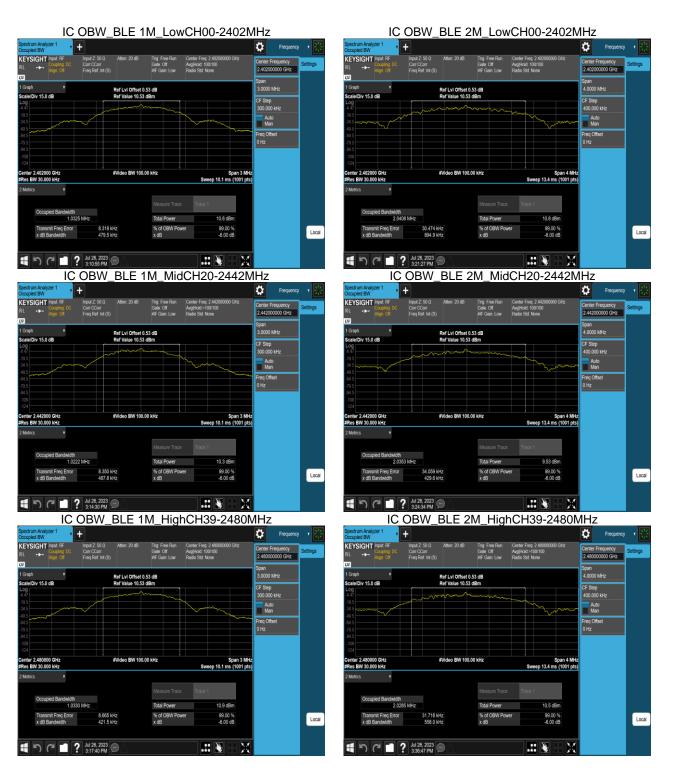
## Test Data (6dB BANDWIDTH)



Page: 21 / 58 Rev.: 00



### Test Data (BANDWIDTH 99%)





Page: 23 / 58 Rev.: 00

## 4.3 OUTPUT POWER MEASUREMENT

### 4.3.1 Test Limit

According to §15.247(b)(3)

Peak output power :

#### FCC

Alternatively, frequency hopping systems operating in the 2400-2483.5 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.

Limit	Antenna not exceed 6 dBi : $30dBm$ Antenna with DG greater than 6 dBi [Limit = $30 - (DG - 6)$ ] Point-to-point operation

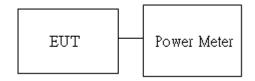
Average output power : For reporting purposes only.

### 4.3.2 Test Procedure

Test method Refer as KDB 558074 D01

- 1. The EUT RF output connected to the power meter by RF cable.
- 2. Setting maximum power transmit of EUT.
- 3. The path loss was compensated to the results for each measurement.
- 4. Measure and record the result of Peak output power and Average output power. in the test report.

#### 4.3.3 Test Setup





Page: 24 / 58 Rev.: 00

Report No.:	TMWK2307002436KR
-------------	------------------

#### 4.3.4 Test Result

Temperature:	<b>26.2</b> °C	Test date:	July 26, 2023
Humidity:	55% RH	Tested by:	Allen Shen

#### Peak & Average output power :

#### BLE 1M mode:

Frequency (MHz)	Power set	Peak Output Power (dBm)	Required Limit (dBm)		
2402	default	4.91	30		
2442	default	3.78	30		
2480	default	4.71	30		
Frequency (MHz)	Power set	Avg. Output Power (dBm)	Required Limit (dBm)		
2402	default	4.78	30		
2442	default	3.72	30		
2480	default	4.66	30		
	(MHz) 2402 2442 2480 Frequency (MHz) 2402 2442	(MHz)set2402default2442default2442default2480defaultFrequency (MHz)Power set2402default2442default	(MHz)set(dBm)2402default4.912442default3.782480default4.71Frequency (MHz)Power setAvg. Output Power (dBm)2402default4.782442default3.72		

\*Note:

1.Measured by power meter, cable loss 0.53 dB + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.



Page: 25 / 58 Rev.: 00

#### BLE 2M mode:

СН	Frequency (MHz)	Power set	Peak Output Power (dBm)	Required Limit (dBm)
Low	2402	default	5.01	30
Mid	2442	default	3.87	30
High	2480	default	4.86	30
СН	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Required Limit (dBm)
Low	2402	default	4.99	30
Mid	2442	default	3.83	30
			4.77	30

\*Note:

1.Measured by power meter, cable loss 0.53 dB + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.



Page: 26 / 58 Rev.: 00

## 4.4 POWER SPECTRAL DENSITY

## 4.4.1 Test Limit

According to §15.247(e)

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

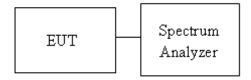
Limit	<ul> <li>Antenna not exceed 6 dBi : 8dBm</li> <li>Antenna with DG greater than 6 dBi</li> <li>[Limit = 8 - (DG - 6)]</li> <li>Point-to-point operation :</li> </ul>
-------	---

### 4.4.2 Test Procedure

Test method Refer as KDB 558074 D01

- 1. The EUT RF output connected to the spectrum analyzer by RF cable.
- 2. Setting maximum power transmit of EUT
- 3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
- 4. The path loss was compensated to the results for each measurement by SA.
- 5. Mark the maximum level.
- 6. Measure and record the result of power spectral density. in the test report.

### 4.4.3 Test Setup





Page: 27 / 58 Rev.: 00

### 4.4.4 Test Result

Temperature:	<b>26.2</b> ℃	Test date:	July 26, 2023
Humidity:	55% RH	Tested by:	Allen Shen

#### BLE 1M mode

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2402	-9.18	8	PASS
2442	-11.30	8	PASS
2480	-9.24	8	PASS

\*Note:

1.cable loss as 0.53dB that offsets in the spectrum

#### BLE 2M mode

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2402	-11.60	8	PASS
2442	-13.70	8	PASS
2480	-12.47	8	PASS

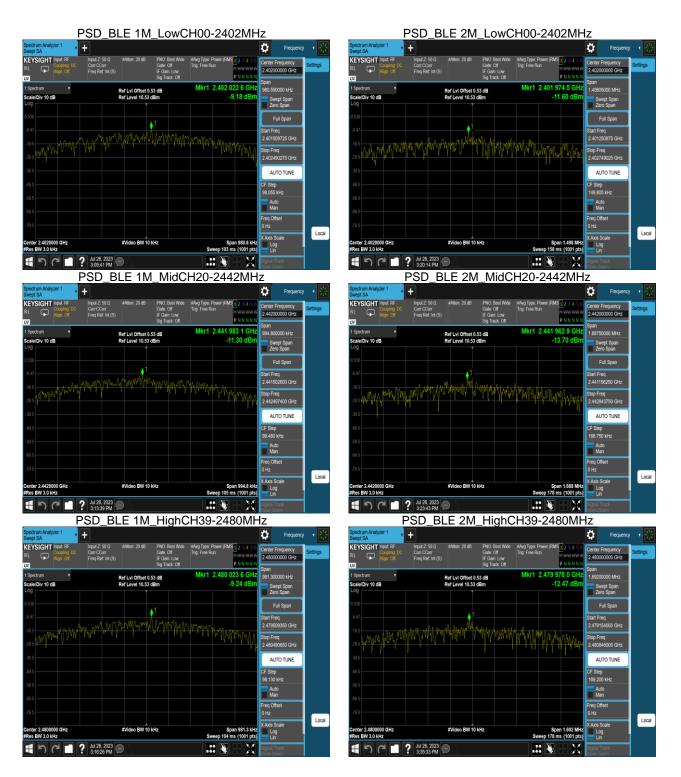
\*Note:

1.cable loss as 0.53dB that offsets in the spectrum



Report No.: TMWK230

## Test Data





Page: 29 / 58 Rev.: 00

## 4.5 CONDUCTED BAND EDGE AND SPURIOUS EMISSION

## 4.5.1 Test Limit

According to §15.247(d)

FCC: In any 100 kHz bandwidth outside the authorized frequency band,

Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

### 4.5.2 Test Procedure

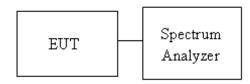
Test method Refer as KDB 558074 D01

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### 4.5.3 Test Setup



### 4.5.4 Test Result

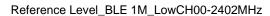
Temperature:	<b>26.2</b> ℃	Test date:	July 26, 2023
Humidity:	55% RH	Tested by:	Allen Shen



Report No.:

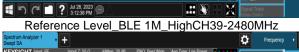
TMWK2307002436KR

## Test Data

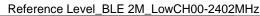


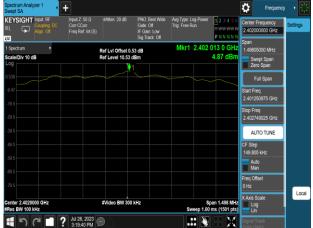


Spectrum Analyzer 1					Frequenc	, , 崇
Coupling DC	nput Z: 50 Ω #Atten: 20 dB Corr CCorr Freq Ref: Int (S)		vg Type: Log-Power ig: Free Run	123456 MWWWWW PNNNNN	Center Frequency 2.442000000 GHz Span	Settings
1 Spectrum	Ref LvI Offset 0.5 Ref Level 10.53 d	3 UB	Mkr1 2.442 0	02 7 GHz 1.00 dBm	994.800000 kHz	
Log 0.530	1				Zero Span Full Span	
					Start Freq 2.441502600 GHz	
					Stop Freq 2.442497400 GHz	
					AUTO TUNE	
					CF Step 99.480 kHz	
					Auto Man Freg Offset	
-79.5					0 Hz X Axis Scale	Local
Center 2.4420000 GHz #Res BW 100 kHz	#Video BW 300 F	(Hz	Sweep 1.00 n		Log Lin	
1	Jul 26, 2023 👝 🔿		+ N.		Signal Track	1









Reference Level\_BLE 2M\_MidCH20-2442MHz



Reference Level\_BLE 2M\_HighCH39-2480MHz



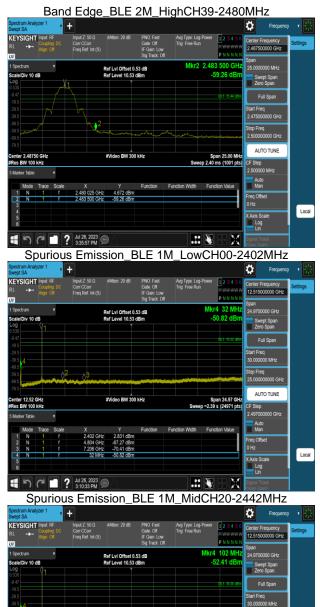
#### Page: 31 / 58 Rev.: 00

Band Edge\_BLE 1M\_LowCH00-2402MHz **Ö** + Frequency *(EYSIGHT* Corr CCorr Eren Ref: Int /9 Ref LvI Offset 0.53 dB Ref Level 10.53 dBm AUTO TUNE #Video BW 300 kH Step Local xis Sc Log Lin って I ? Jul 26, 2023 🗩 .:: 📎 X Band Edge\_BLE 1M\_HighCH39-2480MHz

Spectrum A Swept SA	nalyzer 1	- 1	+					C Frequenc	y y 🕄
KEYSIGI RL →			Input Z: 50 Ω Corr CCorr Freq Ref: Int (S)	#Atten: 20 dB	PNO: Fast Gate: Off IF Gain: Low Sig Track: O			2.467500000 GHZ	Settings
1 Spectrum Scale/Div 1 Log 0 530	0 dB	• 		Ref LvI Offset 0. Ref Level 10.53		Mkr3	2.489 150 GHz -59.60 dBm		
-9.47		-/					0L1 -15 03 dBm	Full Span	
-29.5 -39.5								Start Freq 2.475000000 GHz	1
	and the second		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	and the state of the	Stop Freq 2.50000000 GHz	1
-79.5 Center 2.48 #Res BW 1				#Video BW 300	kHz	Swa	Span 25.00 MHz ap 2.40 ms (1001 pts)		
5 Marker Tab		•					59 2.10 ms (1001 pts)	2.500000 MHz	
Mod	e Trace	Scale	x	Y	Function	Function Width	Function Value	Auto Man	
1 N	1	f	2.480 000 GHz	5.053 dBm				Freq Offset	
2 N	1	f	2.483 500 GHz	-61.48 dBm				0 Hz	
3 N	1		2.489 150 GHz	-59.60 dBm				0 HZ	Loca
4 5 6								X Axis Scale Log Lin	LOCA
<b>۱</b>	6		Jul 26, 2023 3:16:50 PM	ÐA				Signal Track (Span Zoom)	1

Band Edge\_BLE 2M\_LowCH00-2402MHz

Spectrum Anal Swept SA		•						Frequency	· • 🛞
KEYSIGHT RL +→• ™	Input: RF Coupling: Align: Off		Input Z: 50 Ω Corr CCorr Freq Ref: Int (S)	#Atten: 20 dB	PNO: Fast Gate: Off IF Gain: Low Sig Track: Of			Center Frequency 2.36000000 GHz Span	Settings
1 Spectrum	,			Ref LvI Offset 0.		Mki	r2 2.400 0 GHz -27.93 dBm	5pan 100.000000 MHz	
Scale/Div 10 c	B			Ref Level 10.53	1Bm		-27.93 dBm	Swept Span Zero Span	
-9.47							0 1 -15.13 dBm	Full Span	
-29.5								Start Freq 2.310000000 GHz	
-49.5 -59.5 -69.5	raa, hoogaa		***		والمدادة ومرسوها و	Superman	new lan	Stop Freq 2.410000000 GHz	
-79.5 Center 2.3600				#Video BW 300	kHz		Span 100.0 MHz	AUTO TUNE	
#Res BW 100 5 Marker Table	kHz ,					Swee	p 9.60 ms (1001 pts)	CF Step 10.000000 MHz	
Mode	Trace S	icale	x	Y	Function	Function Width	Function Value	Auto Man	
1 N 2 N	1	f f	2.402 0 GHz 2.400 0 GHz	4.966 dBm -27.93 dBm				Freq Offset	
3 4 5								0 Hz X Axis Scale Log	Local
6			Jul 26, 2023 🧹					Lin	
<b>ا</b> ر <b>ا</b>	(*		3:20:37 PM					Signal Track (Span Zoom)	



-69.5 -79.5	12.52	CH7			Video BW 300			Span 24.97 GHz	25.000000000 GHz AUTO TUNE
#Res	BW 100	kHz			WIGED BW 300	K112	Swee	p ~2.39 s (24971 pts)	
	Mode	Trace	Scale	x	Y	Function	Function Width	Function Value	Auto Man
1 2	N N N		f	2.442 GHz 4.884 GHz	2.305 dBm -67.01 dBm -70.79 dBm				Freq Offset 0 Hz
3 4 5 6	N	1	f	7.326 GHz 102 MHz	-70.79 dBm -52.41 dBm				X Axis Scale Log Lin



Spurious Emission\_BLE 1M\_HighCH39-2480MHz

Specti Swept	um Ana SA	lyzer 1	•	+						0	Frequency	•
KEY RL	SIGH1 +→-	Coupli Align: (		Input Z: 50 Ω Corr CCorr Freq Ref: Int (S)	#Atten: 20 dB	PNO: Fast Gate: Off IF Gain: Lov Sig Track: C		MA	2 3 4 5 6 ///////////////////////////////////	12.51	Frequency 5000000 GHz	Settings
1 Spe	trum:		•		Ref Lvl Offset 0.	53 dB		Mkr4 3		Span 24.97	00000 GHz	
icale .og	Div 10	dB (1			Ref Level 10.53	dBm		-51.9	2 dBm		wept Span ero Span	
.530 9.47 19.5								QL:	-15:03 dBm	Γ	Full Span	
29.5 39.5	4									Start F 30.00	'req 0000 MHz	
49.5 59.5 69.5		-		2 Last 0 <sup>3</sup>						Stop F 25.00	req 0000000 GHz	
79.5 ente	12.52	GH7			#Video BW 300	kHz		Span	4.97 GHz	A	UTO TUNE	
Res	BW 100 er Table		,		WIGED BIT 300	K112	Swee	opan 2 p ~2.39 s (2		CF Ste 2.497	p 000000 GHz	
	Mode	Trace	Scale	х	Y	Function	Function Width	Function	Value		uto lan	
1	N	1	f	2.480 GHz	2.389 dBm					5 C		
	Ν			4.960 GHz						Freq C	mset	
3	N	1	f	7.440 GHz						0 Hz		
4 5 6	N	1	f	32 MHz	: -51.92 dBm					X Axis Li Li	pg	La
1	5	2		Jul 26, 2023				N. I	M	Signal	Track	

Spurious Emission\_BLE 2M\_LowCH00-2402MHz

Swept				+ Input Ζ: 50 Ω	#Atten: 20 dB	PNO: Fast	Avg Type: Lo	a Denser	\$	Frequency	•
REY: RL	SIGH1	Coupli Align: (		Corr CCorr Freq Ref: Int (S)	WAllen: 20 GB	Gate: Off IF Gain: Low Sig Track: O	Trig: Free Ru		12.91900	equency 10000 GHz	Settings
	trum Div 10 (	dB	•		Ref Lvi Offset 0.5 Ref Level 10.53 d			Mkr4 102 MHz -51.43 dBm	Swep	ot Span	
Log 0.530 -9.47 -19.5		¥1						ØL1 -15.13 dBr		Spàn I Span	
-29.5 -39.5 -49.5	4								Start Free 30.00000		
-49.5 -59.5 -69.5 -79.5	-	-	<b>~</b> _0 <sup>2</sup>	**********	,				Stop Freq 25.00000	0000 GHz	
ente	r 12.52 BW 100				#Video BW 300	kHz		Span 24.97 GH		D TUNE	
	er Table	KMZ	•				286	ep ~2.39 s (24971 pts		000 GHz	
1	Mode N	Trace	Scale f	X 2.402 GHz 4.804 GHz		Function	Function Width	Function Value	Man Freq Offs	et	
2 3 4 5	N N	1	f	7.206 GHz 102 MHz	-66.24 dBm				0 Hz X Axis Sc Log	ale	Loc
6									Lin		

Spurious Emission\_BLE 2M\_MidCH20-2442MHz

Spectrum Ana Swept SA	lyzer 1	•	+						₽	Frequency	影
KEYSIGH RL +++	Couplin Couplin Align: C		Input Z: 50 Ω Corr CCorr Freq Ref: Int (S)	#Atten: 20 dB	PNO: Fast Gate: Off IF Gain: Low Sig Track: Of			www NNN		requency 000000 GHz	Settings
1 Spectrum				Ref LvI Offset 0.	53 dB		Mkr4 102	MHz		000 GHz	
Scale/Div 10	dB			Ref Level 10.53			-51.62 (	iBm		ept Span	
Log 0.530	Ø1									o Span	
-9.47							DL1 -16	13 dBm	F	ull Span	
-29.5 -39.5 -49.5									Start Fre 30.000	eq 100 MHz	
-59.5	-	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~							Stop Fre 25.000	9 100000 GHz	
Center 12.52 Res BW 100				#Video BW 300	) kHz	Swee	Span 24.9 p ~2.39 s (2497		AU CF Step	TO TUNE	
5 Marker Table										0000 GHz	
Mode	Trace	Scale	х	Y	Function	Function Width	Function Valu		Aut Ma		
1 N	1	f	2.442 GHz	-0.1468 dBm		- unocon most					
2 N			4.884 GHz						Freq Off	set	
3 N	1	f	7.326 GHz								
4 N 5 6	1	f	102 MHz	-51.62 dBm					X Axis S Loç Lin		Local
<b>۲</b>	2		Jul 26, 2023 3:24:12 PM	$\Delta$		.:		X	Signal T (Span Zo		

Page: 32 / 58 Rev.: 00

Spurious Emission\_BLE 2M\_HighCH39-2480MHz





Page: 33 / 58 Rev.: 00

## 4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

### 4.6.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

#### Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

#### Above 30 MHz

Frequency	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)		
(MHz)	Transmitters	Receivers	
30-88	100 (3 nW)	100 (3 nW)	
88-216	150 (6.8 nW)	150 (6.8 nW)	
216-960	200 (12 nW)	200 (12 nW)	
Above 960	500 (75 nW)	500 (75 nW)	

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test 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.



Page: 34 / 58 Rev.: 00

### 4.6.2 Test Procedure

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10: 2013, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 9KHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

Remark:

 Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test 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.
 No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

- 3. The SA setting following :
  - (1) Below 1G : RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
  - (2) Above 1G :
    - (2.1) For Peak measurement : RBW = 1MHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
    - (2.2) For Average measurement : RBW = 1MHz, VBW

If Duty Cycle  $\geq$  98%, VBW=10Hz.

'If Duty Cycle < 98%, VBW=1/T.

4. Data result

Actual FS=Spectrum Reading Level+Factor

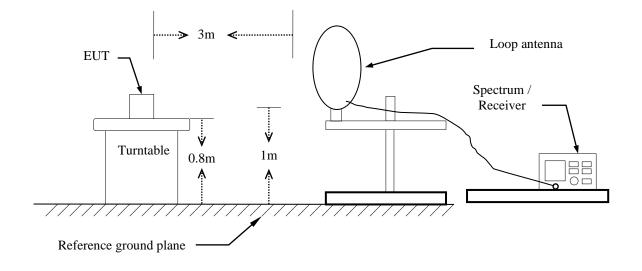
Margin=Actual FS- Limit



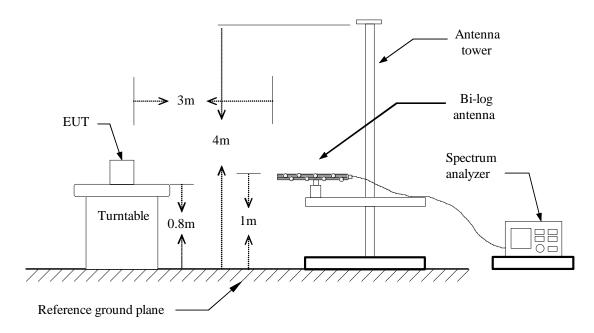
Page: 35 / 58 Rev.: 00

Report No.: TMWK2307002436KR

4.6.3 Test Setup <u>9kHz ~ 30MHz</u>



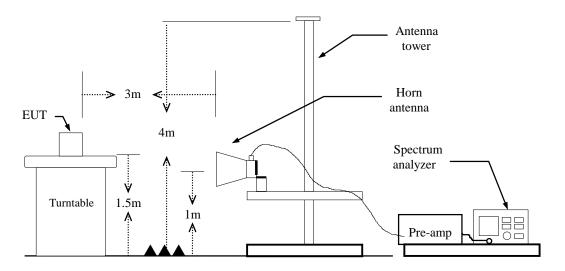
#### <u>30MHz ~ 1GHz</u>





Page: 36 / 58 Rev.: 00

### Above 1 GHz





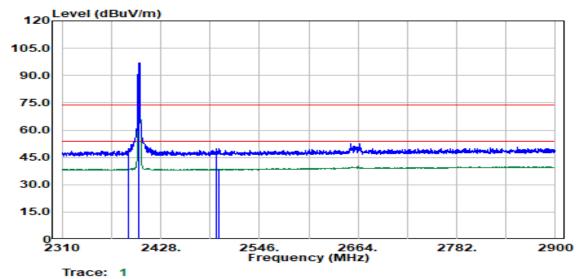
Report No.: TMWK2307002436KR

Page: 37 / 58 Rev.: 00

## 4.6.4 Test Result

## Band Edge Test Data

Report Number	:TMWK2307002436KR	Test Date	:2023-08-30
Operation Band	:BLE 1M	Temp./Humi.	:25.3/56
Frequency	:2402 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Czerny Lin
EUT Pol Setting	:E2 :	Test Chamber	: 966D



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2389.78	Average	33.83	4.80	38.63	54.00	-15.37
2390.00	Peak	45.03	4.80	49.84	74.00	-24.16
2402.00	Peak	92.59	4.51	97.10		
2402.00	Average	91.99	4.51	96.50		
2494.58	Peak	45.18	4.59	49.77	74.00	-24.23
2497.33	Average	33.98	4.62	38.61	54.00	-15.39



Report No.:	TMWK230700	2436KR			Rev.:	00
Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:2402 MHz	002436KR	Test Date Temp./Hur Antenna P Engineer Test Chan	ol.	:2023-08-30 :25.3/56 :HORIZON <sup>-</sup> :Czerny Lin : 966D	
120 Level (d	IBuV/m)					
105.0						
90.0						
75.0						
60.0						
45.0					<u> </u>	
30.0						
15.0						
0∟ 2310 Trace:	2428. : 1	2546. Frequenc	2664. cy <mark>(MHz)</mark>	2782.	2900	
	Dotoctor	Spootrum	۸	etual		

Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2387.03	Peak	47.21	4.80	52.01	74.00	-21.99
2387.53	Average	34.73	4.80	39.53	54.00	-14.47
2402.00	Peak	92.47	4.51	96.98		
2402.00	Average	91.04	4.51	95.55		
2486.08	Average	34.41	4.59	39.00	54.00	-15.00
2489.08	Peak	44.21	4.56	48.76	74.00	-25.24

Page: 38 / 58 Rev.: 00



Report No.:	TMWK2307	002436KR				Rev.: 00
Report Numbe Operation Bar Frequency Operation Mod EUT Pol Setting	nd :BLE 1M :2480 MHz		Test Da Temp./ Antenn Engine Test Cl	Humi. na Pol.	:2023-( :25.3/5 :VERT :Czern : 966D	i6 ICAL y Lin
120 Level	(dBuV/m)					
105.0						_
90.0						_
75.0						_
60.0						
45.0						<u></u>
30.0						
15.0						_
0 2310	2428.	2546. Freque	2664. ncy (MHz)	278	2.	2900
Irac	ce: 1					
Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin

	Freq.	Mode	Read Level	Factor	FS	Limit	Margin	
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
	2376.78	Peak	44.54	4.76	49.30	74.00	-24.70	
	2376.78	Average	34.58	4.76	39.34	54.00	-14.66	
	2480.00	Peak	93.21	4.65	97.86			
	2480.00	Average	92.90	4.65	97.55			
	2483.82	Peak	58.00	4.61	62.61	74.00	-11.39	
	2483.82	Average	40.94	4.61	45.55	54.00	-8.45	



2357.27

2374.03

2480.00

2480.00

2483.57

2483.57

Peak

Average

Peak

Average

Peak

Average

44.04

34.90

92.91

92.36

50.13

38.67

Report No.:	TMWK2307	002436KR				ev.: 00
Report Number Operation Band Frequency Operation Mode EUT Pol Setting	l :BLE 1M :2480 MHz		Antei Engir	o./Humi. nna Pol.	:2023-0 :25.3/56 :HORIZ :Czerny : 966D	3 ONTAL
120 Level (	dBuV/m)					
105.0						_
90.0		<b> </b>				_
75.0						_
60.0						
45.0	·····					
30.0						
15.0						_
0 2310	2428.	2546. Frequer	2664 1cy (MHz)	. 278	2. 2	2900
Trace	: 1					
Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB

4.81

4.73

4.65

4.65

4.61

4.61

48.85

39.63

97.56

97.00

54.74

43.28

74.00

54.00

--

---

74.00

54.00

-25.15

-14.37

---

--

-19.26

-10.72

Page: 40 / 58 Rev.: 00



45.0

30.0

15.0

0 2310

Trace: 1

2428.

Report No.:	TMWK2307002436KR		Page: 41 / 58 Rev.: 00	
Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:TMWK2307002436KR :BLE 2M :2402 MHz :Bandedge :E2 :	Test Date Temp./Humi. Antenna Pol. Engineer Test Chamber	:2023-08-30 :25.3/56 :VERTICAL :Czerny Lin : 966D	
120 Level (dl	BuV/m)			
105.0				
90.0				
75.0				
60.0				

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
2382.53 2389.53	Average Peak	34.88 44.91	4.80 4.80	39.67 49.71	54.00 74.00	-14.33 -24.29
2402.00	Peak	92.96	4.51	97.47		
2402.00	Average	91.48	4.51	95.99		
2494.58	Peak	44.62	4.59	49.21	74.00	-24.79
2497.33	Average	35.92	4.62	40.55	54.00	-13.45

2546. 2664. Frequency (MHz) 2782.

2900



Report No.:	TMWK2307002436KR		Rev.: 00
Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:2402 MHz	Test Date Temp./Humi. Antenna Pol. Engineer Test Chamber	:2023-08-30 :25.3/56 :HORIZONTAL :Czerny Lin : 966D
120 Level (d	IBuV/m)		
105.0			
90.0			
75.0			
60.0			
45.0			
30.0			
15.0			
0 2310		2664. 2782 ency (MHz)	. 2900
Trace:	: 1		

Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2389.53	Average	36.19	4.80	40.99	54.00	-13.01
2389.78	Peak	47.68	4.80	52.49	74.00	-21.51
2402.00	Peak	92.74	4.51	97.25		
2402.00	Average	90.26	4.51	94.77		
2498.58	Average	34.81	4.64	39.45	54.00	-14.55
2499.33	Peak	43.62	4.64	48.26	74.00	-25.74



Report No.:	TMWK2307	002436KR			Rev.:	43 7 30
Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:BLE 2M :2480 MHz :Bandedge :E2 :		Test Da Temp./ Antenn Engine Test C	Humi. na Pol.	:2023-08-30 :25.3/56 :VERTICAL :Czerny Lin : 966D	
120 Level (d	BuV/m)					
105.0						
90.0						
75.0						
60.0						
45.0	and a second	Manufacture and the second				
30.0						
15.0						
0 2310	2428.	2546. Frequer	2664. ncy (MHz)	2782	2900	)
Trace:	1					
Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit Ma	argin

	Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin	
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
	2320.50	Average	35.33	4.66	39.98	54.00	-14.02	
	2331.01	Peak	44.58	4.67	49.26	74.00	-24.74	
	2480.00	Peak	93.42	4.65	98.06			
	2480.00	Average	92.22	4.65	96.87			
	2483.57	Peak	58.87	4.61	63.48	74.00	-10.52	
	2483.82	Average	42.62	4.61	47.23	54.00	-6.77	

Page: 43 / 58 Rev.: 00



Average

Peak

Peak

Average

Peak

Average

34.95

44.30

93.12

91.57

50.31

41.56

4.66

4.71

4.65

4.65

4.61

4.61

39.61

49.02

97.77

96.21

54.93

46.17

54.00

74.00

--

---

74.00

54.00

-14.39

-24.98

---

--

-19.07

-7.83

2323.51

2371.78

2480.00

2480.00

2483.57

2483.57

Report No.:	TMWK23070	02436KR				ev.: 00
Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:TMWK230 :BLE 2M :2480 MHz :Bandedge :E2 :	7002436KR	Test Da Temp./ Antenr Engine Test C	Humi. na Pol.	:2023-0 :25.3/56 :HORIZ :Czerny : 966D	) ONTAL
120 Level (d	BuV/m)					
105.0						_
90.0						_
75.0						_
60.0						
45.0	1994 - Anna 1994 - Anna 1996 -	• • • • • • • • • • • • • • • • • • •				
30.0						_
15.0						
0 2310 Trace:	2428.	2546. Frequen	2664. cy (MHz)	278	2. 2	900
		-				
Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz F	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB

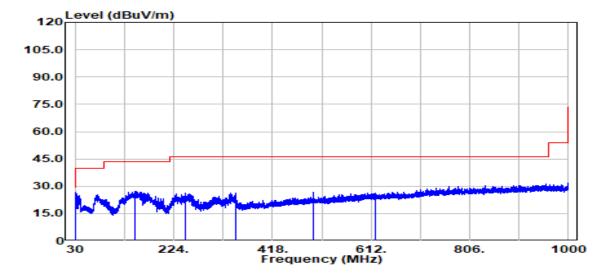
44 / 58 Page:



Page:	45 / 58
Rev.:	00

Report No.: TMWK2307002436KR

Report Number :TMWK2307002436KR Test Date :2023-08-30 Operation Band :BLE 2M Temp./Humi. :25.3/56 Frequency :2480 MHz Antenna Pol. :VERTICAL Operation Mode :TX Engineer :Czerny Lin EUT Pol Test Chamber :E2 :966D Setting :



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
31.84	Peak	40.61	-14.11	26.50	40.00	-13.50
148.34	Peak	40.23	-13.06	27.17	43.50	-16.33
245.73	Peak	40.06	-14.01	26.05	46.00	-19.95
345.64	Peak	37.42	-11.18	26.24	46.00	-19.76
498.41	Peak	34.23	-7.56	26.67	46.00	-19.33
619.37	Peak	31.03	-4.63	26.40	46.00	-19.60



Report No.:	TMWK2307002436KR		Rev.: 00
Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:2480 MHz	Test Date Temp./Humi. Antenna Pol. Engineer Test Chamber	:2023-08-30 :25.3/56 :HORIZONTAL :Czerny Lin : 966D
120 Level (d	iBuV/m)		
105.0			
90.0			
75.0			
60.0			
45.0			
30.0	Maria and Maria		
15.0			
0 <sup>L_</sup> 30	224. 418. Frequ	612. 806 ency (MHz)	. 1000

Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
160.66	Peak	38.20	-12.90	25.30	43.50	-18.20
262.61	Peak	38.22	-13.56	24.66	46.00	-21.34
337.01	Peak	39.93	-11.22	28.72	46.00	-17.28
408.01	Peak	35.95	-9.59	26.37	46.00	-19.63
499.77	Peak	33.36	-7.53	25.83	46.00	-20.17
602.20	Peak	31.00	-4.97	26.04	46.00	-19.96

Page: 46 / 58 Rev.: 00



Report No.:	TMWK2307	002436KR			Rev.: 00
Report Number :TMWK2307002436k Operation Band :BLE 1M Frequency :2402 MHz Operation Mode :TX EUT Pol :E2 Setting :			Test Date Temp./Hu Antenna I Engineer Test Cha	ımi. Pol.	:2023-08-30 :25.3/56 :VERTICAL :Czerny Lin : 966D
120 Level (	dBuV/m)				
105.0					
90.0					
75.0					
60.0					
45.0					
30.0					
15.0					
1000	6100.	11200. Frequenc	16300. y (MHz)	21400.	26500
	Detector	Spectrum		Actual	

Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin	
PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
Peak	43.45	0.38	43.84	74.00	-30.16	
Average	34.64	0.38	35.03	54.00	-18.98	
Peak	41.84	5.33	47.17	74.00	-26.83	
Average	33.41	5.33	38.74	54.00	-15.26	
	Mode PK/QP/AV Peak Average Peak	Mode PK/QP/AVRead Level dBµVPeak43.45Average34.64Peak41.84	ModeRead LevelFactorPK/QP/AVdBµVdBPeak43.450.38Average34.640.38Peak41.845.33	Mode         Read Level         Factor         FS           PK/QP/AV         dBµV         dB         dBµV/m           Peak         43.45         0.38         43.84           Average         34.64         0.38         35.03           Peak         41.84         5.33         47.17	Mode         Read Level         Factor         FS         Limit           PK/QP/AV         dBµV         dB         dBµV/m         dBµV/m           Peak         43.45         0.38         43.84         74.00           Average         34.64         0.38         35.03         54.00           Peak         41.84         5.33         47.17         74.00	Mode         Read Level         Factor         FS         Limit         Margin           PK/QP/AV         dBµV         dB         dBµV/m         dBµV/m         dB           Peak         43.45         0.38         43.84         74.00         -30.16           Average         34.64         0.38         35.03         54.00         -18.98           Peak         41.84         5.33         47.17         74.00         -26.83



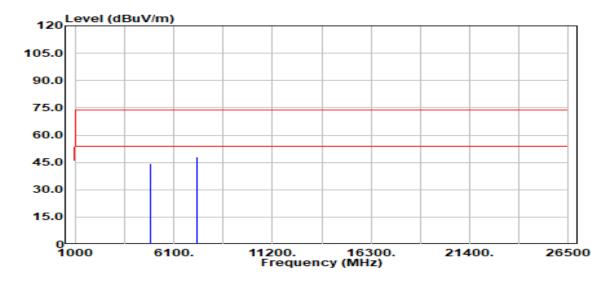
10	00	61	00.	112	00. equen	163		214	00.	2650	00
15.0											
30.0											
45.0	l										
60.0											
75.0											
90.0											
105.0											
120	evel (d	BuV/m	)								
Deration requency Deration UT Pol Setting	у	:BLE :2402 :TX :E2 :	1M 2 MHz			An En	mp./Hu tenna F gineer st Char	Pol.	:⊢ :C	5.3/56 IORIZON Czerny Lii 966D	
Report Nu				7002430	6KR		st Date			023-08-3	80
Report No	).: 	IIVIVV	23070	)02436K	ĸ					Rev.:	00

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
4804.00	Peak	41.73	0.38	42.11	74.00	-31.89
4804.00	Average	33.62	0.38	34.01	54.00	-20.00
7206.00	Peak	42.15	5.33	47.48	74.00	-26.52
7206.00	Average	33.43	5.33	38.76	54.00	-15.24



	Page: Rev.:	49 / 58 00
:2023	3-08-30	)

Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:TMWK2307002436KR :BLE 1M :2442 MHz :TX :E2 :	Test Date Temp./Humi. Antenna Pol. Engineer Test Chamber	:2023-08-30 :25.3/56 :VERTICAL :Czerny Lin : 966D
Setting	:		



	req. 1Hz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
488 732	34.00 34.00 26.00 26.00	Peak Average Peak Average	43.99 33.78 42.38 33.37	0.49 0.49 5.48 5.48	44.48 34.27 47.86 38.84	74.00 54.00 74.00 54.00	-29.52 -19.73 -26.14 -15.16



<b>1</b> 000	6100.	11200. Frequent	16300.	21400	. 26500
15.0					
30.0					
45.0					
60.0					
75.0					
90.0					
105.0					
120 Level (	dBuV/m)				
Operation Band Trequency Operation Mode OT Pol Setting	:BLE 1M :2442 MHz		Temp./Hu Antenna Engineer Test Cha	Pol.	:25.3/56 :HORIZONTAL :Czerny Lin : 966D
Report Number	:TMWK230	7002436KR	Test Date	)	:2023-08-30
Report No.:	TMWK23070	02436KR		Rev.: 00	

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
4884.00	Peak	43.25	0.49	43.74	74.00	-30.26
4884.00	Average	33.74	0.49	34.23	54.00	-19.77
7326.00	Peak	42.04	5.48	47.52	74.00	-26.48
7326.00	Average	33.22	5.48	38.69	54.00	-15.31

Page: 50 / 58 Rev.: 00



TMWK2307002436KR

Report No.:

Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:TMWK2307 :BLE 1M :2480 MHz :TX :E2 :	002436KR	Test Date Temp./Hu Antenna I Engineer Test Cha	ımi. Pol.	:2023-08-30 :25.3/56 :VERTICAL :Czerny Lin : 966D
120 Level (de	BuV/m)				
105.0					
90.0					
75.0					
60.0					
45.0					
30.0					
15.0					
0 1000	6100.	11200. Frequenc	16300. y (MHz)	21400.	26500

Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Peak	43.65	0.65	44.29	74.00	-29.71
4960.00	Average	33.77	0.65	34.41	54.00	-19.59
7440.00	Peak	43.68	5.56	49.24	74.00	-24.76
7440.00	Average	32.76	5.56	38.32	54.00	-15.68

Page: 51 / 58 Rev.: 00



<b>1</b> 000	6100.	11200. Frequen	16300. cy (MHz)	21400.	26500	
15.0						
30.0						
45.0						
60.0						
75.0						
90.0						
105.0						
120 Leve	el (dBuV/m)					
peration Mo UT Pol etting	ode :TX :E2 :		Engineer Test Cha	mber	:Czerny Lin : 966D	
Report Numb Operation Ba Frequency	nd :BLE 1M :2480 MHz	07002436KR	Test Date Temp./Hu Antenna I	ımi.	:2023-08-30 :25.3/56 :HORIZONT/	
Report No.:	TMWK2307	002436KR				

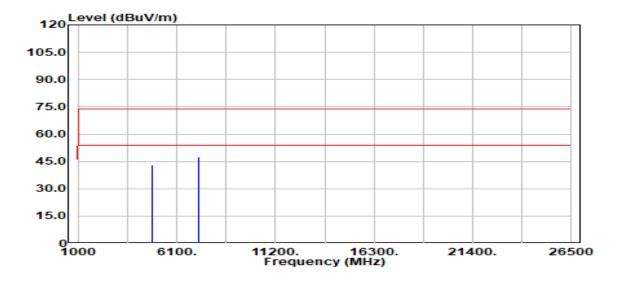
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
4960.00	Peak	43.97	0.65	44.62	74.00	-29.38
4960.00	Average	33.68	0.65	34.33	54.00	-19.67
7440.00	Peak	42.70	5.56	48.26	74.00	-25.74
7440.00	Average	32.75	5.56	38.31	54.00	-15.69

Page: 52 / 58 Rev.: 00



	Page: Rev.:	53 / 58 00
:202	3-08-30	)

Report Number	:TMWK2307002436KR	Test Date	:2023-08-30
Operation Band	:BLE 2M	Temp./Humi.	:25.3/56
Frequency	:2402 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:TX	Engineer	:Czerny Lin
EUT Pol	:E2	Test Chamber	: 966D
Setting	:		
C			



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
4804.00	Peak	42.70	0.38	43.08	74.00	-30.92
4804.00	Average	34.85	0.38	35.23	54.00	-18.77
7206.00	Peak	42.34	5.33	47.67	74.00	-26.33
7206.00	Average	33.48	5.33	38.80	54.00	-15.20



10	00	61	00.	112 Fr	00. equeno		00. Z)	214	00.	265	00
15.0 0											
30.0											
45.0											
60.0											
75.0											
90.0											
105.0											
120	evel (d	BuV/m)									1
Deration UT Pol etting	Mode	:TX :E2 :					gineer st Char	nber		Zerny Li 966D	n
Report Number :TMWK2307 Dperation Band :BLE 2M Frequency :2402 MHz Dperation Mode :TX			7002436	SKR	Tei An	st Date np./Hu tenna F		:2 :⊦	:023-08-3 5.3/56 IORIZOI		
Report No	.:	TMWK2307002436KR								Rev.	: 0

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
4804.00	Peak	43.67	0.38	44.05	74.00	-29.95
4804.00	Average	34.70	0.38	35.08	54.00	-18.92
7206.00	Peak	42.34	5.33	47.67	74.00	-26.33
7206.00	Average	33.59	5.33	38.92	54.00	-15.08

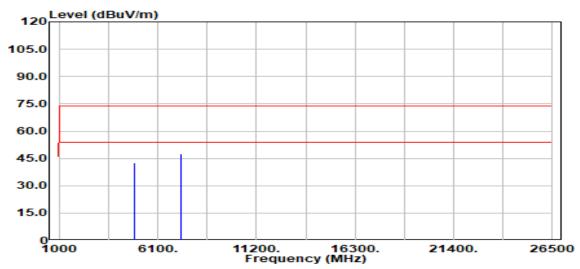
Page: 54 / 58 Rev.: 00



Rev.: 00	
:2023-08-30	
:25.3/56	
_	

Page: 55 / 58

Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:TMWK2307002436KR :BLE 2M :2442 MHz :TX :E2 :	Test Date Temp./Humi. Antenna Pol. Engineer Test Chamber	:2023-08-30 :25.3/56 :VERTICAL :Czerny Lin : 966D
--	--	--	---



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
4884.00	Peak	42.23	0.49	42.72	74.00	-31.28
4884.00	Average	34.69	0.49	35.18	54.00	-18.82
7326.00	Peak	42.19	5.48	47.67	74.00	-26.33
7326.00	Average	33.52	5.48	39.00	54.00	-15.00



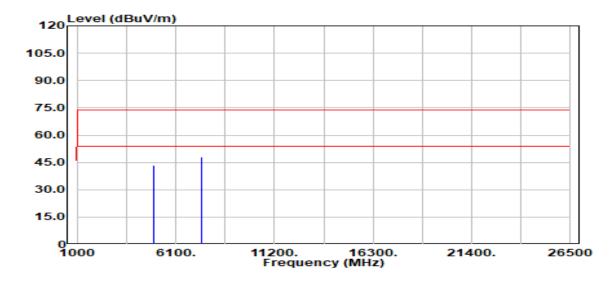
1000	6100.	11200. Frequenc	16300. cy (MHz)	21400.	26500		
15.0							
30.0							
45.0							
60.0							
75.0							
90.0							
105.0							
120 Level (d	BuV/m)						
requency Operation Mode UT Pol Setting	:2442 MHz		Antenna Engineer Test Cha	Pol.	:HORIZONTA :Czerny Lin : 966D		
Report Number Operation Band	:TMWK2307002436KR :BLE 2M		Test Date Temp./Hu		:2023-08-30 :25.3/56		
Report No.:	TMWK23070	Rev.: 00					

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
		dDpv	u D	dBp V/III	dBpt/iii	<u> </u>
4884.00	Peak	42.15	0.49	42.65	74.00	-31.35
4884.00	Average	34.61	0.49	35.10	54.00	-18.90
7326.00	Peak	42.59	5.48	48.07	74.00	-25.93
7326.00	Average	33.36	5.48	38.84	54.00	-15.16



Page: Rev.:	57 / 58 00

Report Number Operation Band Frequency Operation Mode EUT Pol Setting	:TMWK2307002436KR :BLE 2M :2480 MHz :TX :E2 :	Test Date Temp./Humi. Antenna Pol. Engineer Test Chamber	:2023-08-30 :25.3/56 :VERTICAL :Czerny Lin : 966D
--	--	--	---



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
4960.00	Peak	42.67	0.65	43.31	74.00	-30.69
4960.00	Average	34.56	0.65	35.21	54.00	-18.79
7440.00	Peak	42.23	5.56	47.80	74.00	-26.20
7440.00	Average	33.85	5.56	39.42	54.00	-14.58



100	00	610	00.		00. requen	163 cy (MH		214	00.	2650	0
15.0											
30.0											
45.0											
60.0											
75.0											
90.0											
105.0											
120	evel (di	BuV/m)									
Setting		:									
Dperation	Mode	:TX :E2					gineer st Chai	mber		zerny Lir 966D	ר
Dperation requency		:2480	LE 2M 480 MHz			An	mp./Hu tenna I		:H	5.3/56 ORIZON	
eport Nur	mber	:TMW	′K230	700243	6KR	Tes	st Date		:2	023-08-3	0
Report No.	•		20070	)02436k						Rev.:	00

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
4960.00	Peak	42.56	0.65	43.20	74.00	-30.80
4960.00	Average	34.62	0.65	35.27	54.00	-18.73
7440.00	Peak	43.74	5.56	49.30	74.00	-24.70
7440.00	Average	33.51	5.56	39.07	54.00	-14.93

- End of Test Report -