

Project No.: TM-2305000074P
Report No.: TMWK2305001407KR

FCC ID: P4Q-N635RN
IC: 2420C-N635RN

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Rev.: 00

RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

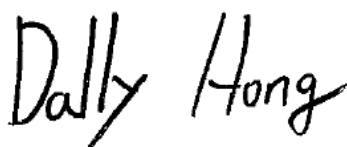
INDUSTRY CANADA RSS-247

Test Standard	FCC Part 15.247 IC RSS-247 issue 3 and IC RSS-GEN issue 5
Product name	Chrion Pro
Brand Name	Mio, MiTAC, Magellan, Teletrac Navman
Model No.	N635
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:



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。

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	January 4, 2024	Initial Issue	ALL	Allison Chen

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

FCC Applicant	Mitac Digital Technology Corporation 4F., No. 1, R&D Road 2, Hsinchu Science Park, Hsinchu 30076 Taiwan
IC Applicant	MiTAC Digital Technology Corporation 4F., No. 1, R&D Road 2, Hsinchu Science Park, Hsinchu 30076 Taiwan
Manufacturer	MITAC COMPUTER (KUNSHAN) CO., LTD. No. 269, 2nd Avenue, District A, Comprehensive Free Trade Zone, Kunshan, Jiangsu, P.R. China
Equipment	Chrion Pro
Trade Name	Mio, MiTAC, Magellan, Teletrac Navman
Model No.	N635
Model Discrepancy	Difference of the those trade names (list on this report) are just for marketing purpose only.
Received Date	May 25, 2023
Date of Test	October 12~26, 2023
Power Supply	1. Powered from AC Adapter. I/P: 100-240Vac, 50-60Hz, 0.3A; O/P: Vdc, 5V 2.0A 2. Powered from car charge. I/P: 12-24Vdc; O/P: 5Vdc, 2A (Max) 3. Powered from Rechargeable Li-ion Polymer Battery. Rating: 3.7VDC, 4000mAh, 14.8Wh
HW Version	R02
SW Version	R15
Serial number	HGM37E0001

Remark:

- For more details, please refer to the User's manual of the EUT.
- Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
- Disclaimer: The variant model numbers / trademarks are assessed as identical in hardware and software to each other, hence all variants are fully covered by the test results in this test report without further verification test.

1.2 EUT CHANNEL INFORMATION

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

Remark:

Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 and RSS-GEN Table 1 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 ☒ Chip
Antenna Gain	Antenna Gain: 1.31 dBi
Brand / Model	INPAQ / ACM3-5036-A1-CC-S
Antenna connector	i-pex

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 and RSS-Gen §6.8.

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.

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	Tony Chao	-
RF Conducted	David Li	-

Remark: The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC public 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 Due
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				

966A_Radiated Wi-Fi 2.4GHz					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Loop Antenna	COM-POWER	AL-130	121051	2023-05-23	2024-05-22
Preamplifier	EMEC	EM330	060609	2023-02-22	2024-02-21
Thermo-Hygro Meter	WISEWIND	1206	D07	2022-12-19	2023-12-18
Signal Analyzer	KEYSIGHT	N9010A	MY54200716	2023-10-13	2024-10-12
Preamplifier	HP	8449B	3008A00965	2022-12-23	2023-12-22
Bi-Log Antenna	Sunol Sciences	JB3	A030105	2023-08-08	2024-08-07
Cable	Huber+Suhner	104PEA	20995+21000+182330	2023-02-22	2024-02-21
Horn Antenna	ETC	MCTD 1209	DRH13M02003	2023-01-12	2024-01-11
High Pass Filters	Titan Microwave	T04H30001800070S01	22011402-4	2023-06-17	2024-06-16
Horn Antenna	SCHWARZBECK	BBHA9170	1047	2022-12-30	2023-12-29
Pre-Amplifier	EMCI	EMC184045SE	980860	2022-12-27	2023-12-26
Cable	EMCI	EMC101G	211010+211011+211012	2022-12-12	2023-12-11
Cable	EMCI	EMC101G	221213+221011+221012	2023-10-17	2024-10-16
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Software	e3 V9-210616c				

RF_Conduction(RF)					
Name of Equipment	Manufacturer	Model	Serial Number	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-WUKU)				

Remark:

- Each piece of equipment is scheduled for calibration once a year.
- N.C.R. = No Calibration Required.

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

Support Unit List					
N0	Kind	Brand	Model	Core	Length
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A
A	TypeA to TypeC	N/A	N/A	N/A	N/A

Conducted_Sup_Units					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
NB(E)	Lenovo	T460	N/A	N/A	N/A
Cable	SP	Type C Cable	N/A	N/A	N/A

RF_Conduction(RF)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
NB	Lenovo	IBM 7663	N/A	N.C.R	N.C.R

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 662911, KDB 558074, RSS-247 Issue 3 and RSS-GEN Issue 5.

2. TEST SUMMARY

FCC Standard Section	IC Standard Section	Report Section	Test Item	Result
15.203	RSS-GEN 6.8	1.3	Antenna Requirement	Pass
15.207(a)	RSS-GEN 8.8	4.1	AC Conducted Emission	Pass
15.247(a)(2)	RSS-247(5.2)(a)	4.2	6 dB Bandwidth	Pass
-	RSS-GEN 6.7	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(3)	RSS-247(5.4)(d)	4.3	Output Power Measurement	Pass
15.247(e)	RSS-247(5.2)(b)	4.4	Power Spectral Density	Pass
15.247(d)	RSS-247(5.5)	4.5	Conducted Band Edge	Pass
15.247(d)	RSS-247(5.5)	4.5	Conducted Spurious Emission	Pass
15.247(d) 15.205	RSS-GEN 8.9, 8.10	4.6	Radiation Band Edge	Pass
15.247(d) 15.205	RSS-GEN 8.9, 8.10	4.6	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

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

Remark:

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

Radiated Emission Measurement Above 1G	
Test Condition	Radiated Emission Above 1G
Power supply Mode	Mode 1: EUT power by Adapter without Cradle
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4
Worst Position	☐ Placed in fixed position. ☒ Placed in fixed position at X-Plane (E2-Plane) ☐ Placed in fixed position at Y-Plane (E1-Plane) ☐ Placed in fixed position at Z-Plane (H-Plane)

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1: EUT power by Adapter without Cradle Mode 2: EUT power by N635_V+CarCharger Mode 3: EUT power by N564_TN+CarCharger Mode 4: EUT power by N635_V+Adapter Mode 5: EUT power by N564_TN+Adapter
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Power supply Mode	Mode 1: EUT power by NB Mode 2: EUT power by Adapter
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.

3.3 EUT DUTY CYCLE

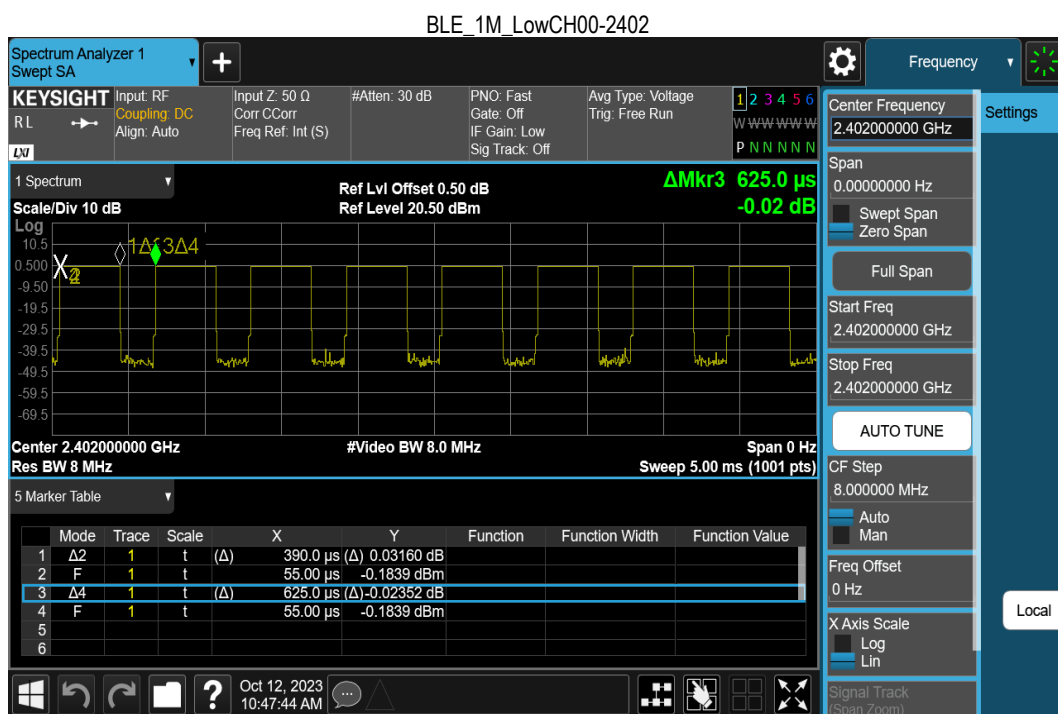
Temperature: 25.3°C

Test date: October 12, 2023

Humidity: 59% RH

Tested by: David Li

	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



4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a) and RSS-GEN section 8.8,

Frequency Range (MHz)	Limits(dBμV)	
	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

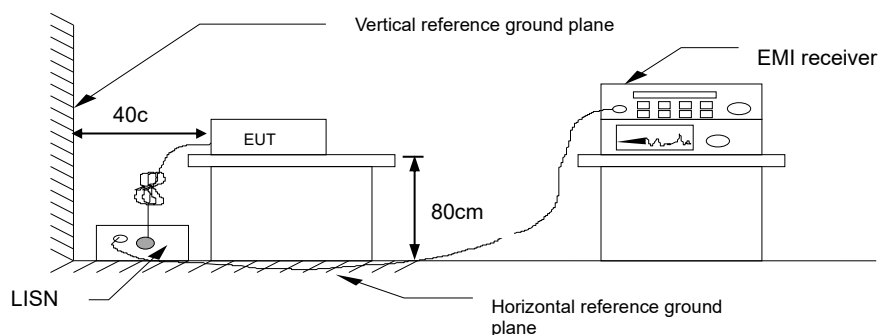
* Decreases with the logarithm of the frequency.

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



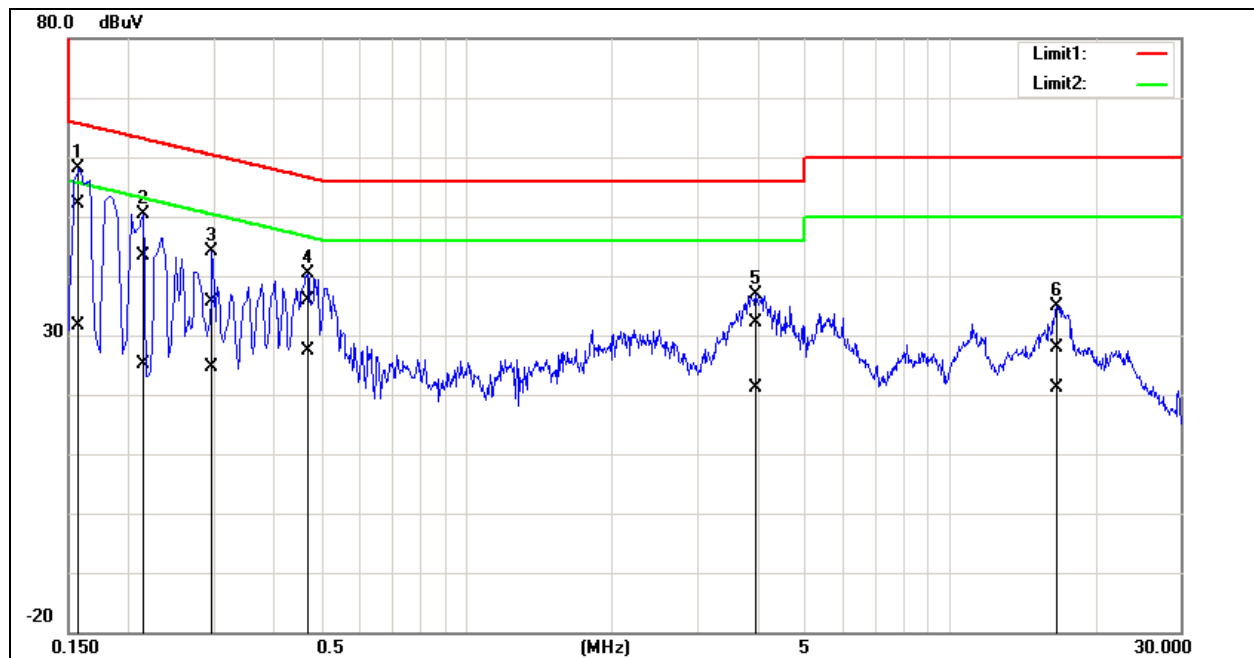
4.1.4 Test Result

Pass

Test Data

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

Porject No.:	TM-2305000074P	Date:	2023/10/26
Standard:	NCC/FCC/IC QP	Temp.(°C)/Hum.(%):	24.3(°C)/52%
Test item:	Conduction test	Test By:	Tony.Chao
Line:	L1	Test Voltage:	AC 120V/60Hz
Model:	Mode 1		
Description:			

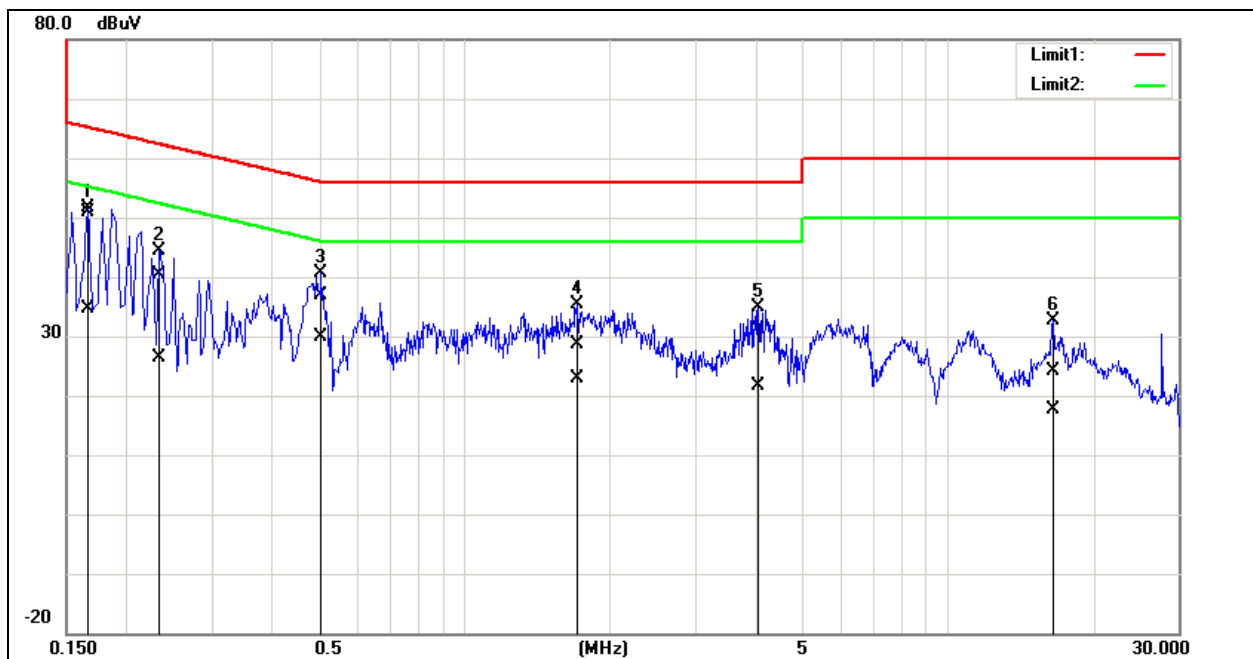


No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1*	0.1580	51.97	31.50	0.15	52.12	31.65	65.57	55.57	-13.45	-23.92	Pass
2	0.2140	43.35	24.99	0.15	43.50	25.14	63.05	53.05	-19.55	-27.91	Pass
3	0.2980	35.42	24.47	0.15	35.57	24.62	60.30	50.30	-24.73	-25.68	Pass
4	0.4700	35.71	27.28	0.15	35.86	27.43	56.51	46.51	-20.65	-19.08	Pass
5	3.9740	31.98	20.80	0.26	32.24	21.06	56.00	46.00	-23.76	-24.94	Pass
6	16.6300	27.49	20.77	0.46	27.95	21.23	60.00	50.00	-32.05	-28.77	Pass

Porject No.: TM-2305000074P
Standard: NCC/FCC/IC QP
Test item: Conduction test
Line: N
Model: Mode 1

Date: 2023/10/26
Temp.(°C)/Hum.(%): 24.3(°C)/52%
Test By: Tony.Chao
Test Voltage: AC 120V/60Hz

Description:

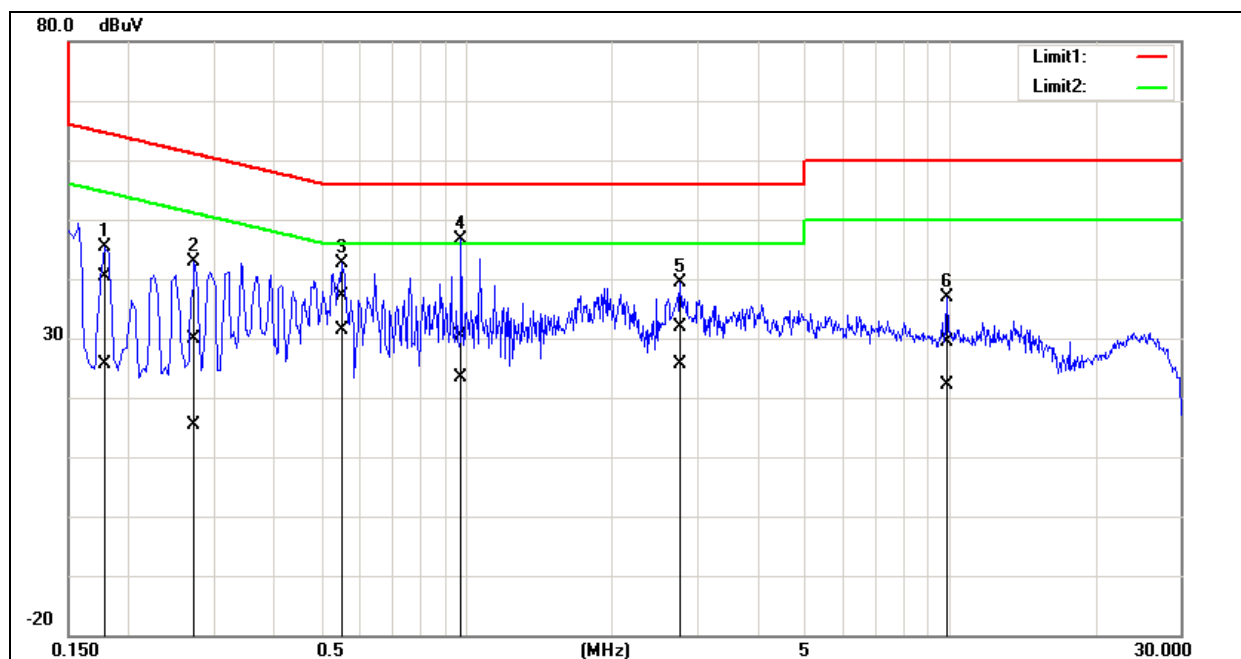


No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1*	0.1660	50.79	34.49	0.19	50.98	34.68	65.16	55.16	-14.18	-20.48	Pass
2	0.2340	40.23	26.25	0.19	40.42	26.44	62.31	52.31	-21.89	-25.87	Pass
3	0.5060	36.80	29.78	0.19	36.99	29.97	56.00	46.00	-19.01	-16.03	Pass
4	1.7140	28.42	22.73	0.25	28.67	22.98	56.00	46.00	-27.33	-23.02	Pass
5	4.0660	30.83	21.29	0.31	31.14	21.60	56.00	46.00	-24.86	-24.40	Pass
6	16.5460	23.70	17.10	0.47	24.17	17.57	60.00	50.00	-35.83	-32.43	Pass

Project No.: TM-2305000074P
Standard: NCC/FCC/IC QP
Test item: Conduction test
Line: L1
Model: Mode 2

Date: 2023/11/3
Temp.(°C)/Hum.(%): 24.3(°C)/52%
Test By: Tony.Chao
Test Voltage: AC 120V/60Hz

Description:

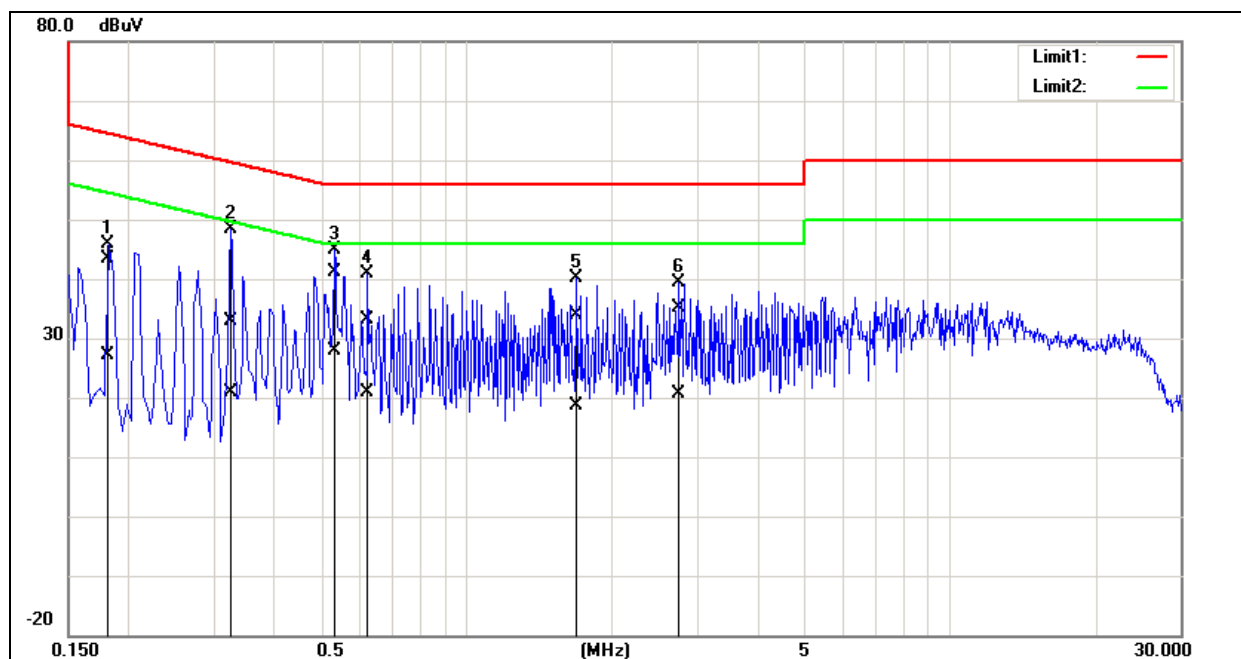


No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1780	40.23	25.46	0.15	40.38	25.61	64.58	54.58	-24.20	-28.97	Pass
2	0.2740	29.78	15.26	0.15	29.93	15.41	61.00	51.00	-31.07	-35.59	Pass
3*	0.5540	36.96	31.25	0.15	37.11	31.40	56.00	46.00	-18.89	-14.60	Pass
4	0.9740	30.19	23.12	0.16	30.35	23.28	56.00	46.00	-25.65	-22.72	Pass
5	2.7740	31.68	25.44	0.24	31.92	25.68	56.00	46.00	-24.08	-20.32	Pass
6	9.8860	28.97	21.71	0.36	29.33	22.07	60.00	50.00	-30.67	-27.93	Pass

Project No.: TM-2305000074P
Standard: NCC/FCC/IC QP
Test item: Conduction test
Line: N
Model: Mode 2

Date: 2023/11/3
Temp.(°C)/Hum.(%): 24.3(°C)/52%
Test By: Tony.Chao
Test Voltage: AC 120V/60Hz

Description:



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1820	43.20	26.98	0.20	43.40	27.18	64.39	54.39	-20.99	-27.21	Pass
2	0.3260	32.75	20.75	0.19	32.94	20.94	59.55	49.55	-26.61	-28.61	Pass
3*	0.5340	40.86	27.79	0.19	41.05	27.98	56.00	46.00	-14.95	-18.02	Pass
4	0.6260	32.97	20.63	0.19	33.16	20.82	56.00	46.00	-22.84	-25.18	Pass
5	1.6900	33.54	18.30	0.25	33.79	18.55	56.00	46.00	-22.21	-27.45	Pass
6	2.7580	34.84	20.37	0.28	35.12	20.65	56.00	46.00	-20.88	-25.35	Pass

4.2 6dB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

4.2.1 Test Limit

According to §15.247(a)(2) and RSS-247 section 5.2(a)

6 dB Bandwidth :

Limit	Shall be at least 500kHz
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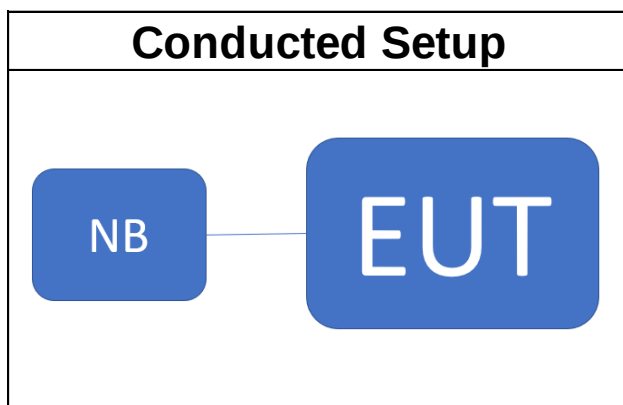
Occupied Bandwidth(99%) : For reporting purposes only.

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 6dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth.
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test

4.2.3 Test Setup



4.2.4 Test Result

Temperature: 25.3°C

Test date: October 12, 2023

Humidity: 59% RH

Tested by: David Li

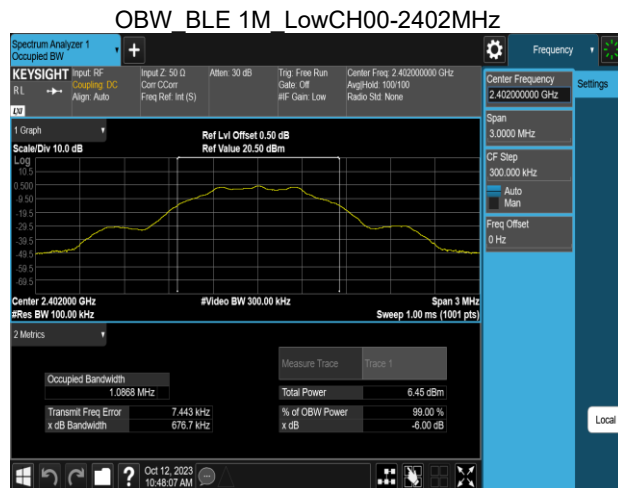
BLE 1M mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	0.6767	≥ 0.5	PASS
2442	0.6779	≥ 0.5	PASS
2480	0.68	≥ 0.5	PASS

BLE 1M mode

Frequency (MHz)	99%Bandwidth (MHz)	6dB Bandwidth (MHz)
2402	1.0581	0.6348
2442	1.0583	0.6318
2480	1.0586	0.6261

Test Data (6dB BANDWIDTH)



Test Data (BANDWIDTH 99%)

IC OBW BLE 1M LowCH00-2402MHz



IC OBW BLE 1M MidCH20-2442MHz



IC OBW BLE 1M HighCH39-2480MHz



4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.247(b)(3) and RSS-247 section 5.4(d)

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.

IC

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

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

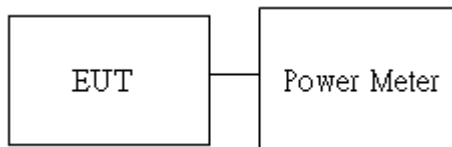
Average output power : For reporting purposes only.

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



4.3.4 Test Result

Temperature: 25.3°C

Test date: October 12, 2023

Humidity: 59% RH

Tested by: David Li

Peak & Average output power :

BLE 1M mode:

CH	Frequency (MHz)	Power set	Peak Output Power (dBm)	Required Limit (dBm)
Low	2402	default	0.26	30
Mid	2442	default	0.68	30
High	2480	default	0.01	30
CH	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Required Limit (dBm)
Low	2402	default	0.22	30
Mid	2442	default	0.65	30
High	2480	default	-0.06	30

***Note:**

1.Measured by power meter, cable loss 0.5 dB + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.



EIRP :

EIRP BLE 1M mode

CH	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit
Low	2402	default	0.22	1.31	1.53	4W= 36 dBm
Mid	2442	default	0.65	1.31	1.96	4W= 36 dBm
High	2480	default	-0.06	1.31	1.25	4W= 36 dBm

*** Note:** EIRP = Average Power + Gain

4.4 POWER SPECTRAL DENSITY

4.4.1 Test Limit

According to §15.247(e) and RSS-247 section 5.2(b)

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.

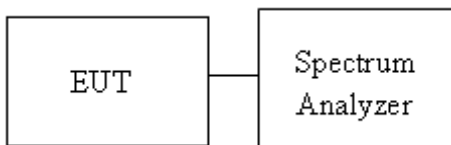
Limit	☒ Antenna not exceed 6 dBi : 8dBm ☐ Antenna with DG greater than 6 dBi [Limit = 8 – (DG – 6)] ☐ Point-to-point operation :
-------	---

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



4.4.4 Test Result

BLE 1M mode

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2402	-15.170	8	PASS
2442	-14.450	8	PASS
2480	-15.440	8	PASS

***Note:**

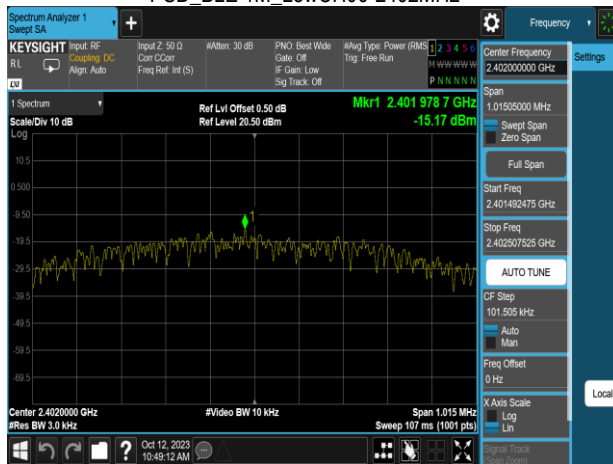
1.cable loss as 0.5dB that offsets in the spectrum

Test Data

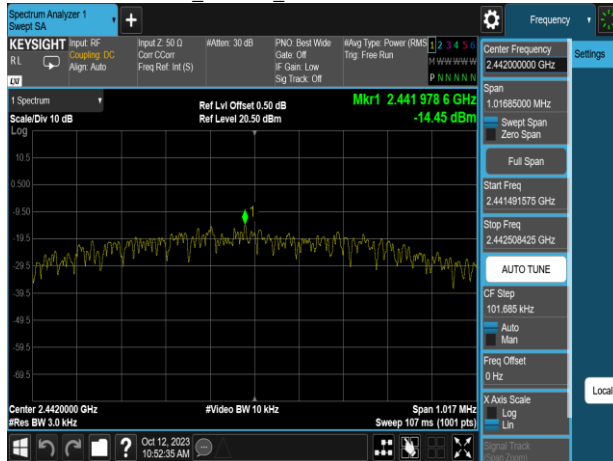
Temperature: 25.3°C
Humidity: 59% RH

Test date: October 12, 2023
Tested by: David Li

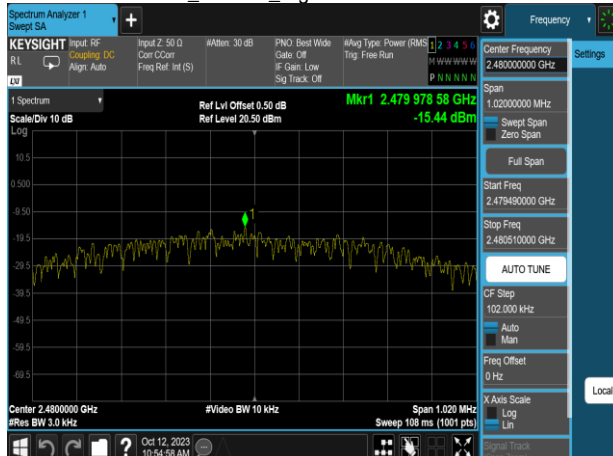
PSD_BLE 1M_LowCH00-2402MHz



PSD_BLE 1M_MidCH20-2442MHz



PSD_BLE 1M_HighCH39-2480MHz



4.5 CONDUCTED BAND EDGE AND SPURIOUS EMISSION

4.5.1 Test Limit

According to §15.247(d) and RSS-247 section 5.5

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).

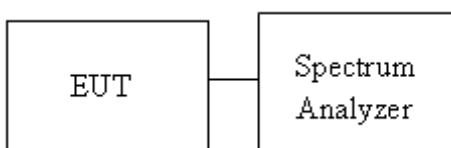
IC: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either 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(d), 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.

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



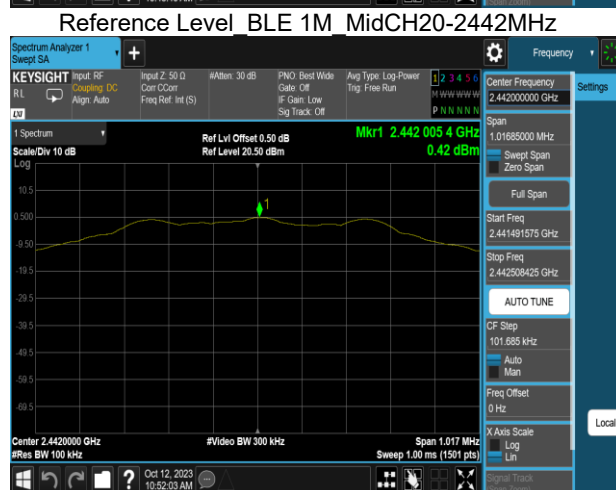
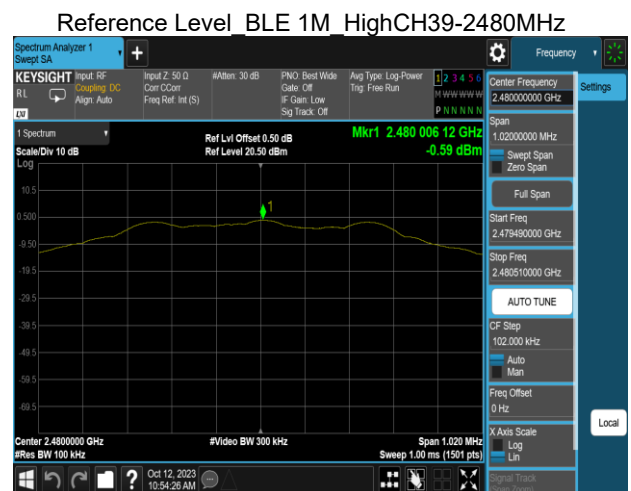
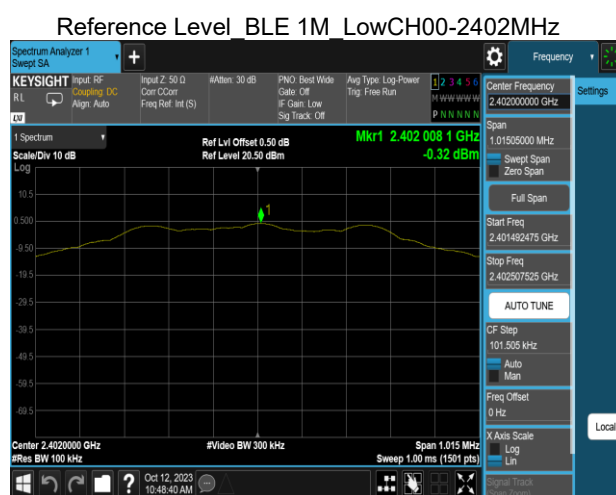
Report No.: TMWK2305001407KR

4.5.4 Test Result

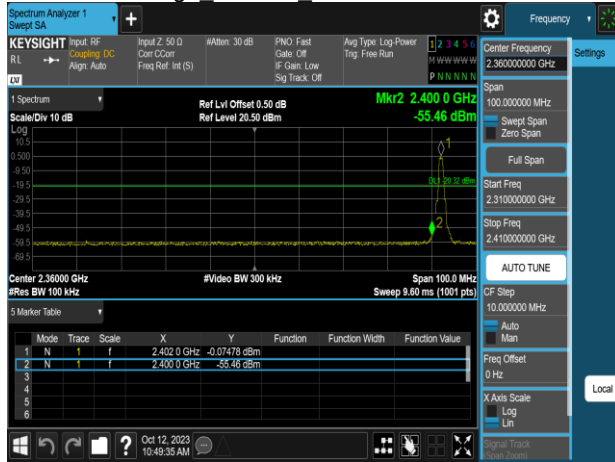
Temperature: 25.3°C
Humidity: 59% RH

Test date: October 12, 2023
Tested by: David Li

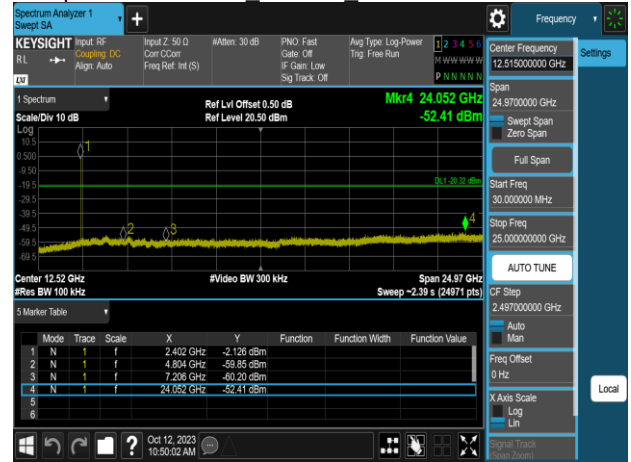
Test Data



Band Edge BLE 1M LowCH00-2402MHz



Spurious Emission BLE 1M LowCH00-2402MHz



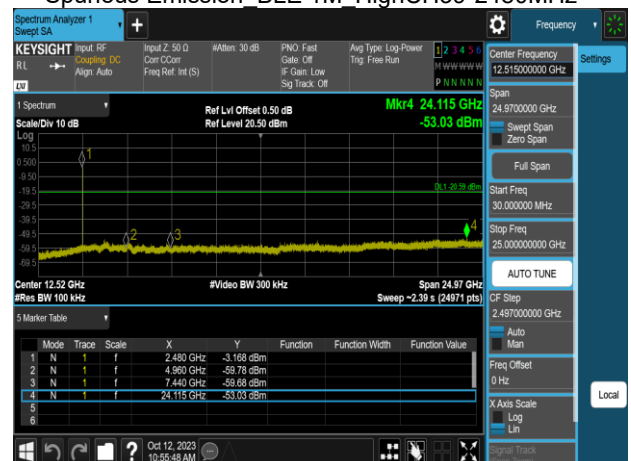
Band Edge BLE 1M HighCH39-2480MHz



Spurious Emission BLE 1M MidCH20-2442MHz



Spurious Emission BLE 1M HighCH39-2480MHz



4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

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

IC according to RSS-247 section 5.5, RSS-Gen, Section 8.9 and 8.10

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 (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	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 area 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.

RSS-Gen Table 3 and Table 5 – General Field Strength Limits for Transmitters and Receivers at Frequencies Above 30 MHz (Note)

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	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)

Note: Measurements for compliance with the limits in table 3 may be performed at distances other than 3 metres, in accordance with Section 6.6.

RSS-Gen Table 6: General Field Strength Limits for Transmitters at Frequencies Below 30 MHz (Transmit)

Frequency	Magnetic field strength (H-Field) ($\mu\text{A/m}$)	Measurement Distance (m)
9-490 kHz ^{Note}	6.37/F (F in kHz)	300
490-1,705 kHz	63.7/F (F in kHz)	30
1.705-30 MHz	0.08	30

Note: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

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:

1. 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.
2. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

3. The SA setting following :

(1) Below 1G : RBW = 100kHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak,
Trace = Max hold.

(2) Above 1G :

(2.1) For Peak measurement : RBW = 1MHz, VBW $\geq$ 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.

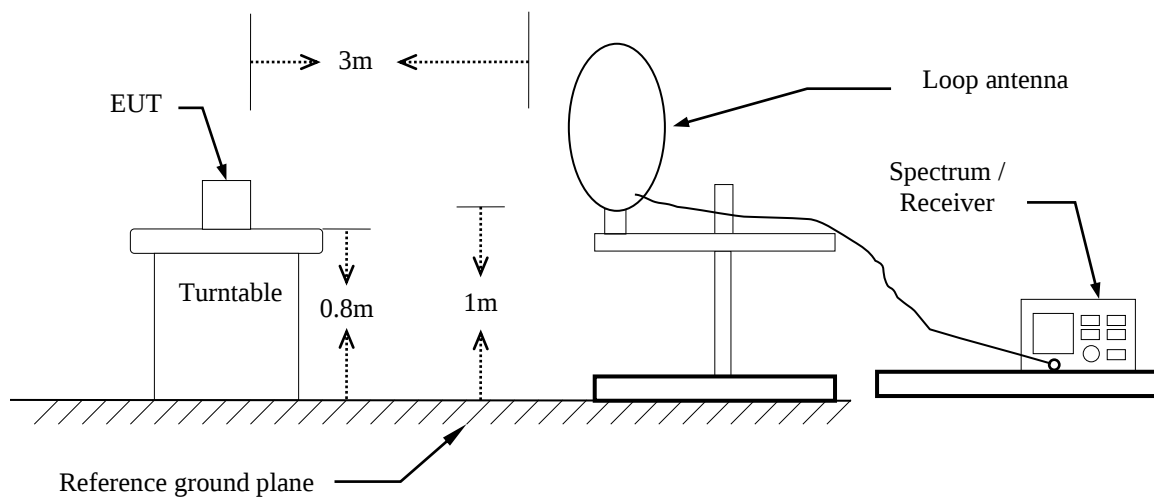
4. Data result

Actual FS=Spectrum Reading Level+Factor

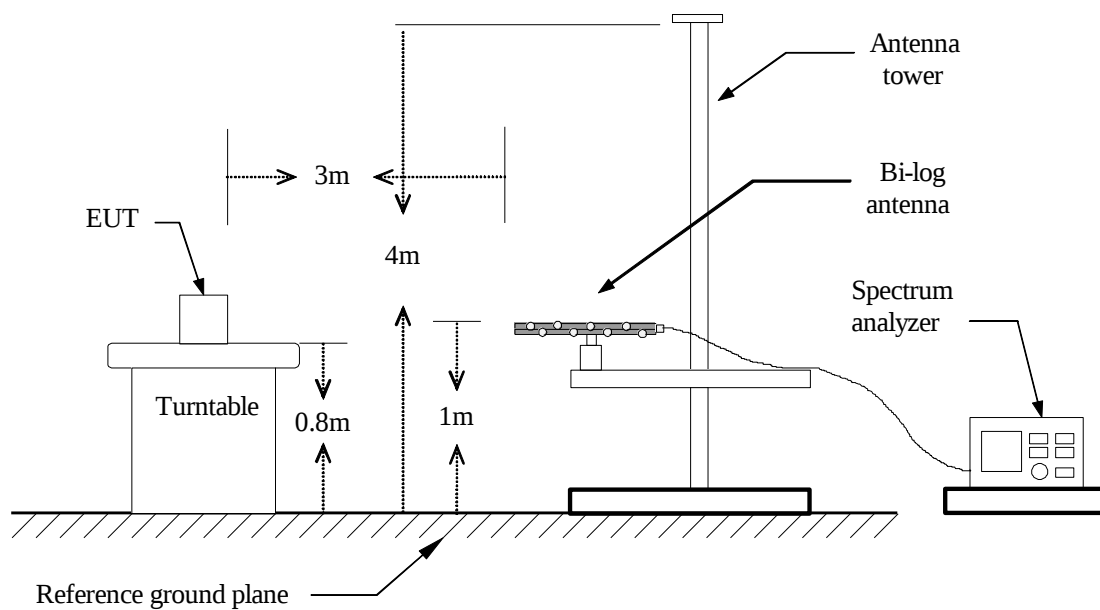
Margin=Actual FS- Limit

4.6.3 Test Setup

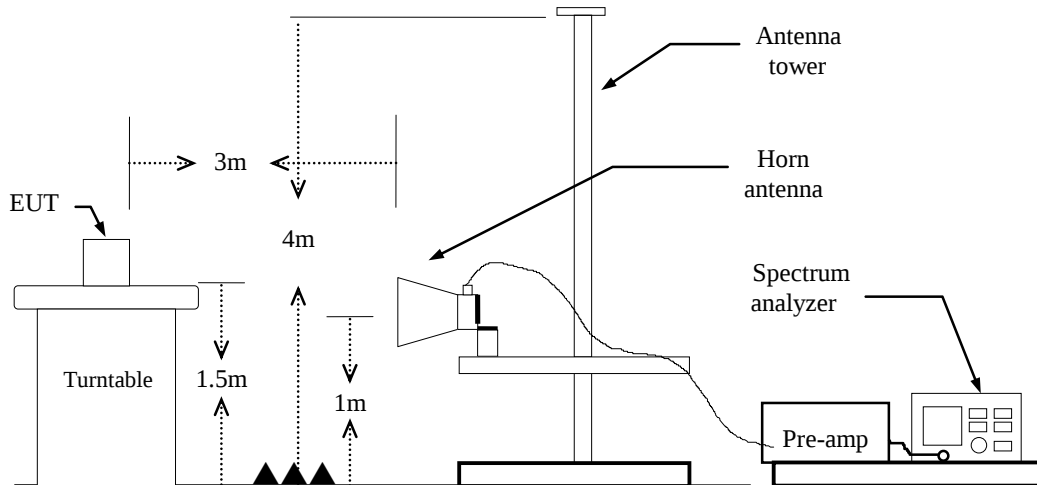
9kHz ~ 30MHz



30MHz ~ 1GHz



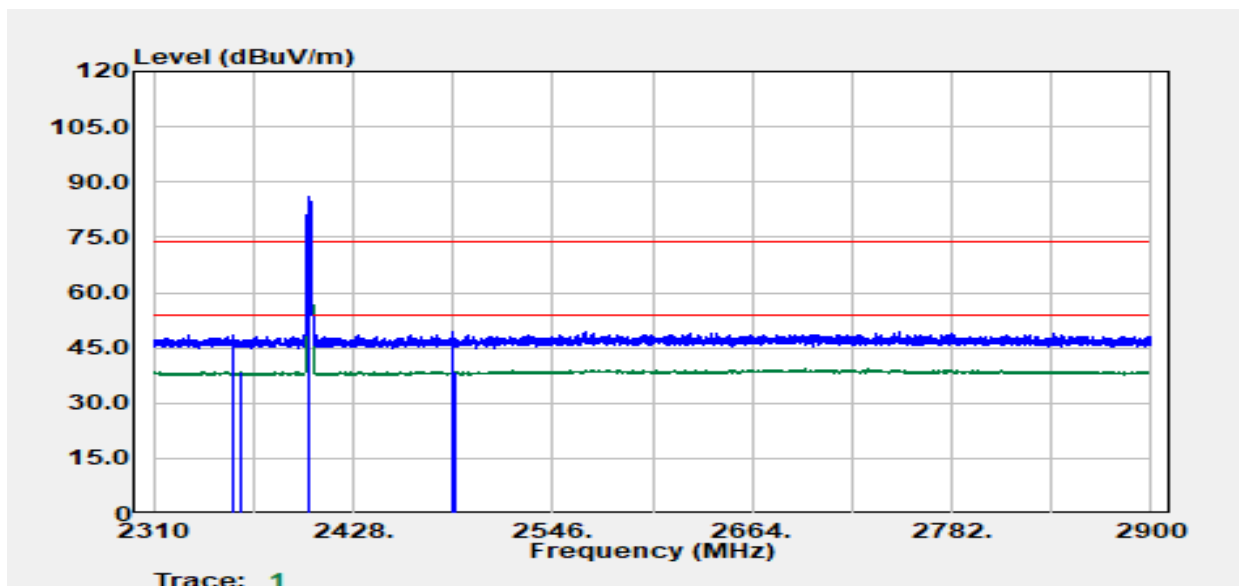
Above 1 GHz



4.6.4 Test Result

Band Edge Test Data

Project No	:TM-2305000074P	Test Date	:2023-10-21
Operation Band	:BLE 1M	Temp./Humi.	:24.6/58
Frequency	:2402 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Ray.Li
EUT Pol	:E2	Test Chamber	: 966A
Setting	:		

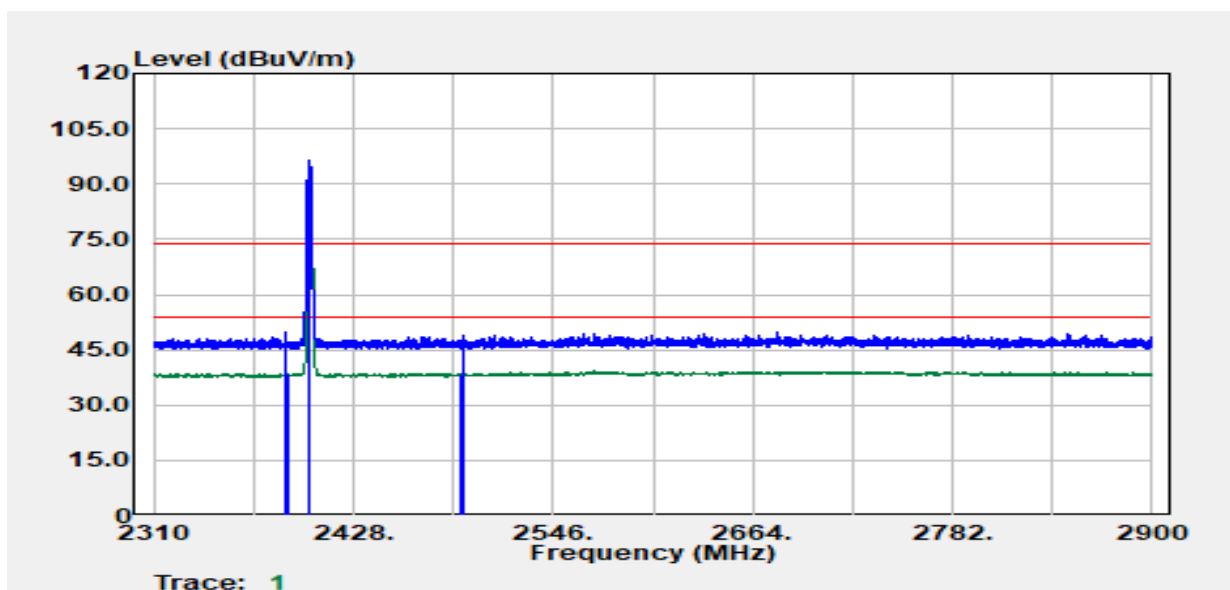


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2356.61	Peak	43.50	4.90	48.40	74.00	-25.60
2361.68	Average	33.68	4.85	38.53	54.00	-15.47
2402.00	Peak	81.36	4.79	86.15	--	--
2402.00	Average	81.07	4.79	85.85	--	--
2486.65	Peak	44.06	5.27	49.32	74.00	-24.68
2488.89	Average	33.34	5.27	38.61	54.00	-15.39

Report No.: TMWK2305001407KR

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2402 MHz
Operation Mode :Bandedge
EUT Pol :E2
Setting :

Test Date :2023-10-21
Temp./Humi. :24.6/58
Antenna Pol. :HORIZONTAL
Engineer :Ray.Li
Test Chamber : 966A

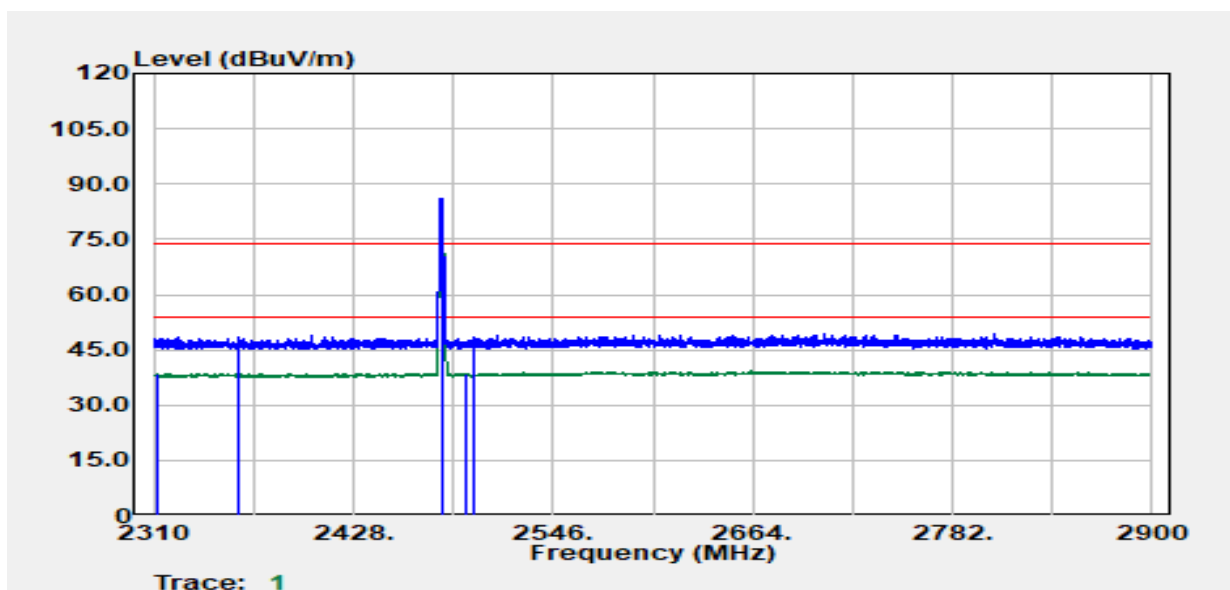


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2387.53	Peak	44.97	4.95	49.93	74.00	-24.07
2389.65	Average	33.52	4.97	38.50	54.00	-15.50
2402.00	Peak	91.49	4.79	96.27	--	--
2402.00	Average	91.19	4.79	95.97	--	--
2491.84	Average	33.15	5.27	38.42	54.00	-15.58
2493.49	Peak	43.42	5.27	48.69	74.00	-25.31

Report No.: TMWK2305001407KR

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2480 MHz
Operation Mode :Bandedge
EUT Pol :E2
Setting :

Test Date :2023-10-21
Temp./Humi. :24.6/58
Antenna Pol. :VERTICAL
Engineer :Ray.Li
Test Chamber : 966A

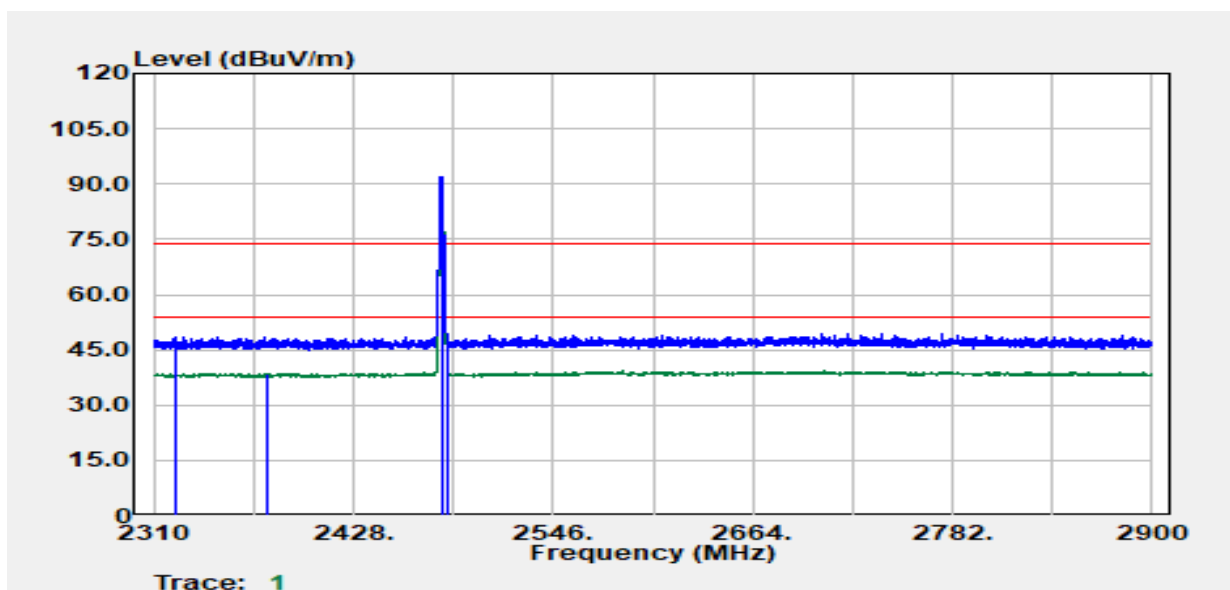


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2312.60	Average	33.64	4.86	38.50	54.00	-15.50
2360.50	Peak	43.59	4.86	48.45	74.00	-25.55
2480.00	Peak	80.70	5.26	85.96	--	--
2480.00	Average	80.28	5.26	85.54	--	--
2494.55	Average	33.25	5.27	38.52	54.00	-15.48
2499.86	Peak	43.18	5.28	48.46	74.00	-25.54

Report No.: TMWK2305001407KR

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2480 MHz
Operation Mode :Bandedge
EUT Pol :E2
Setting :

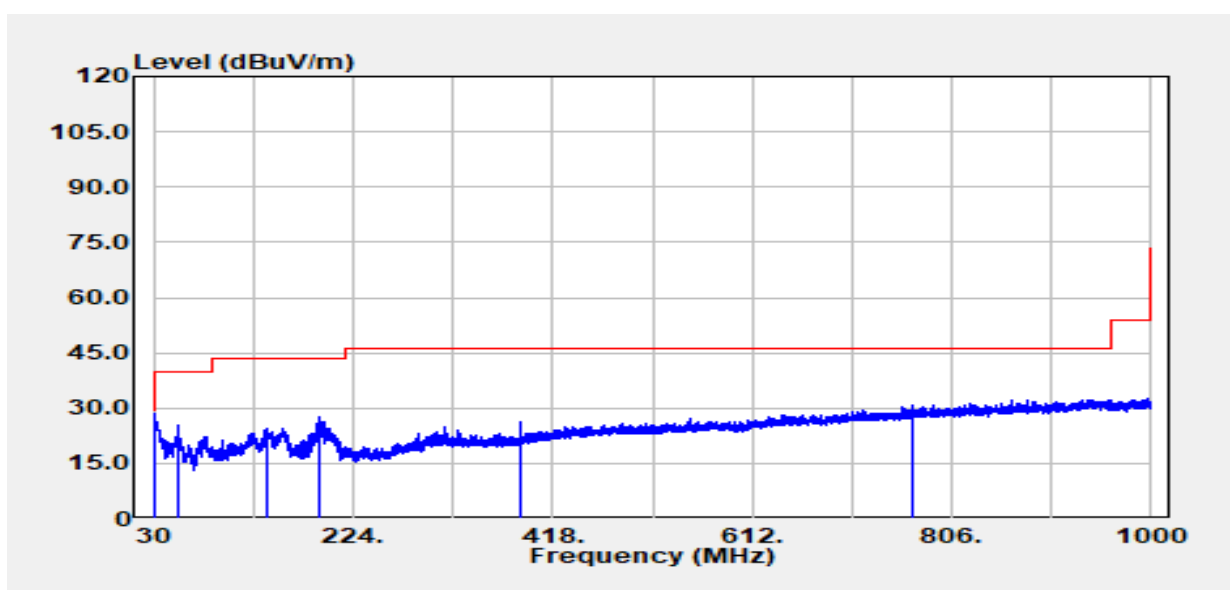
Test Date :2023-10-21
Temp./Humi. :24.6/58
Antenna Pol. :HORIZONTAL
Engineer :Ray.Li
Test Chamber : 966A



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2323.57	Peak	43.63	4.73	48.35	74.00	-25.65
2377.14	Average	33.74	4.84	38.58	54.00	-15.42
2480.00	Peak	86.71	5.26	91.97	--	--
2480.00	Average	86.33	5.26	91.59	--	--
2483.50	Average	34.48	5.26	39.74	54.00	-14.26
2483.93	Peak	42.85	5.26	48.12	74.00	-25.88

Tx

Project No	:TM-2305000074P	Test Date	:2023-10-24
Operation Band	:BLE 1M	Temp./Humi.	:24.6/57
Frequency	:2480 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:TX	Engineer	:Tony.Chao
EUT Pol	:E2	Test Chamber	: 966A
Setting	:		

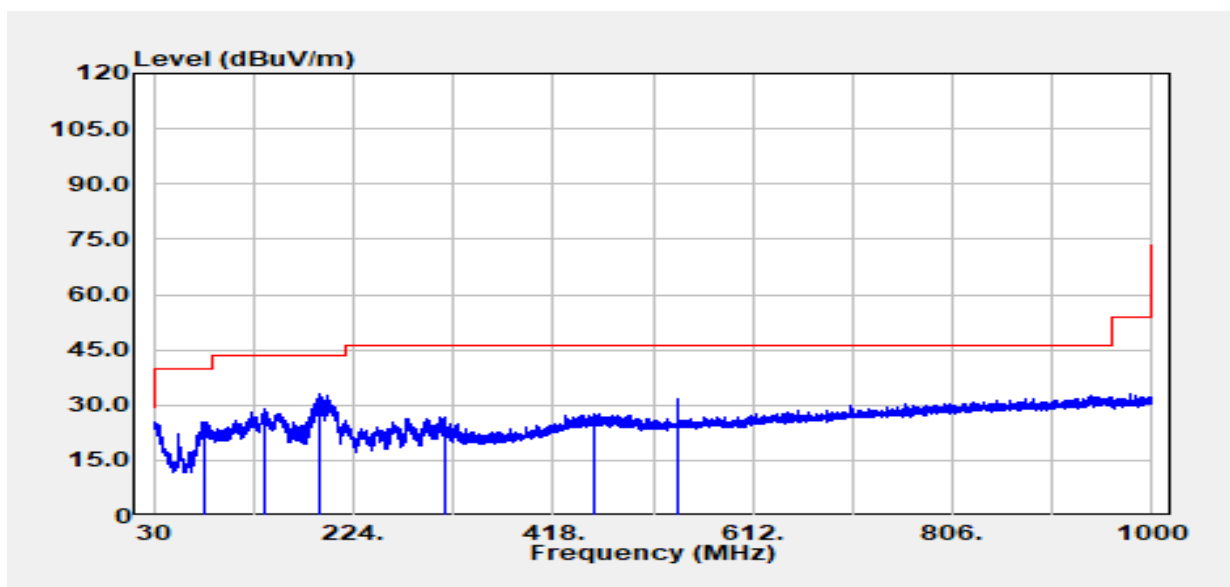


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
30.73	Peak	31.79	-3.09	28.70	40.00	-11.30
54.61	Peak	41.28	-16.03	25.25	40.00	-14.75
141.19	Peak	34.53	-10.02	24.51	43.50	-18.99
192.11	Peak	38.89	-11.26	27.63	43.50	-15.87
386.60	Peak	32.98	-6.56	26.42	46.00	-19.58
767.81	Peak	30.03	0.76	30.79	46.00	-15.21

Report No.: TMWK2305001407KR

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2480 MHz
Operation Mode :TX
EUT Pol :E2
Setting :

Test Date :2023-10-24
Temp./Humi. :24.6/57
Antenna Pol. :HORIZONTAL
Engineer :Tony.Chao
Test Chamber : 966A

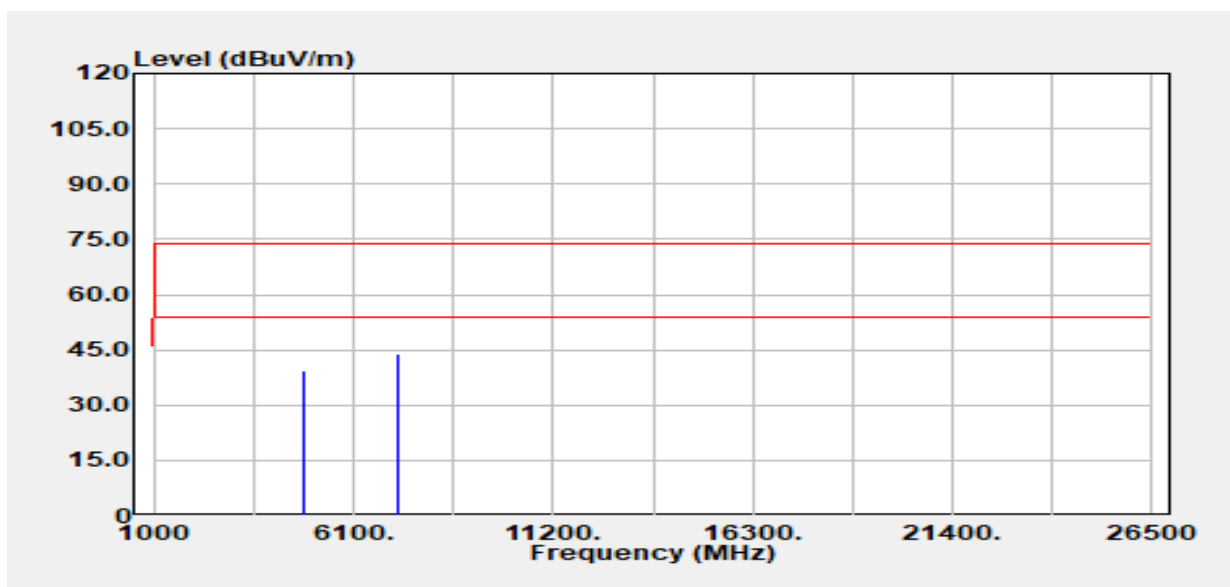


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
80.08	Peak	40.96	-15.50	25.46	40.00	-14.54
138.88	Peak	38.78	-9.76	29.03	43.50	-14.47
192.11	Peak	44.28	-11.26	33.02	43.50	-10.48
312.03	Peak	35.22	-8.35	26.88	46.00	-19.12
457.77	Peak	31.92	-4.29	27.62	46.00	-18.38
539.13	Peak	34.90	-3.06	31.84	46.00	-14.16

Report No.: TMWK2305001407KR

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2402 MHz
Operation Mode :TX
EUT Pol :E2
Setting :

Test Date :2023-10-23
Temp./Humi. :24.7/58
Antenna Pol. :VERTICAL
Engineer :Tony.Chao
Test Chamber : 966A



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	37.64	1.95	39.59	74.00	-34.41
4804.00	Average	30.33	1.95	32.28	54.00	-21.72
7206.00	Peak	34.98	8.72	43.70	74.00	-30.30
7206.00	Average	27.51	8.72	36.23	54.00	-17.77

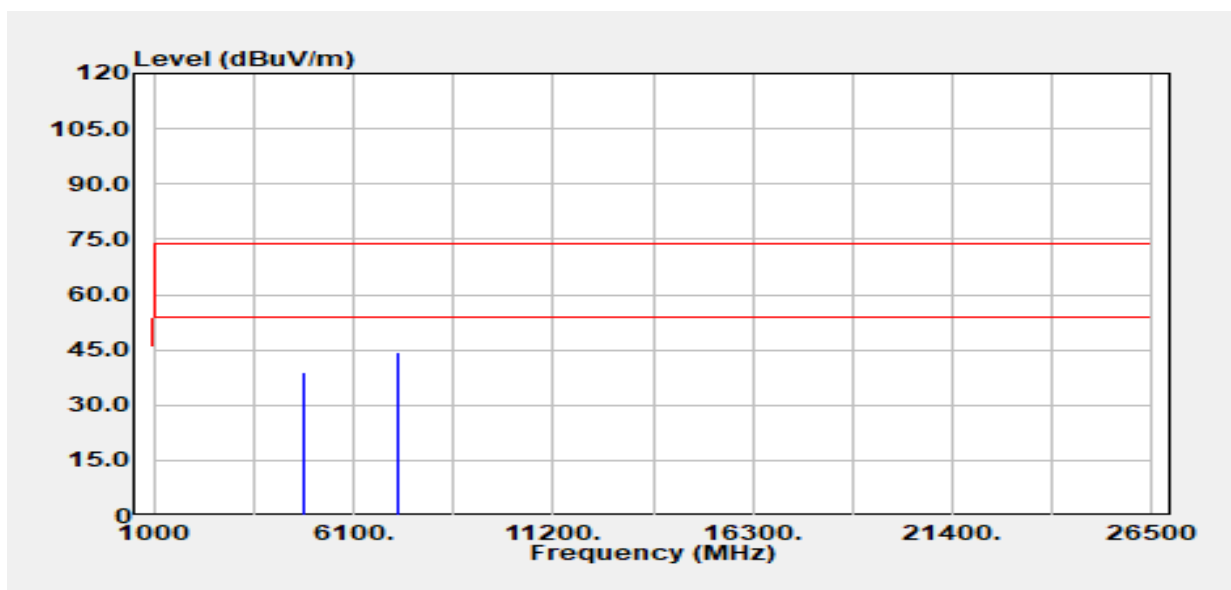
Report No.: TMWK2305001407KR

Page: 45 / 49

Rev.: 00

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2402 MHz
Operation Mode :TX
EUT Pol :E2
Setting :

Test Date :2023-10-23
Temp./Humi. :24.7/58
Antenna Pol. :HORIZONTAL
Engineer :Tony.Chao
Test Chamber : 966A

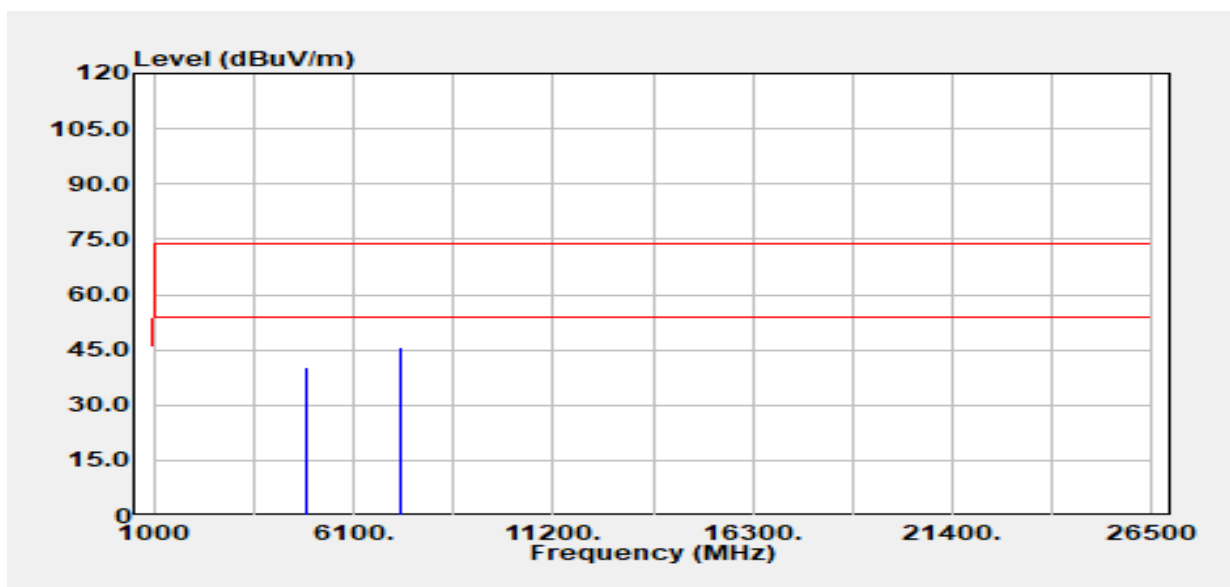


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4804.00	Peak	36.92	1.95	38.87	74.00	-35.13
4804.00	Average	29.19	1.95	31.14	54.00	-22.86
7206.00	Peak	35.80	8.72	44.51	74.00	-29.49
7206.00	Average	27.06	8.72	35.78	54.00	-18.22

Report No.: TMWK2305001407KR

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2442 MHz
Operation Mode :TX
EUT Pol :E2
Setting :

Test Date :2023-10-23
Temp./Humi. :24.7/58
Antenna Pol. :VERTICAL
Engineer :Tony.Chao
Test Chamber : 966A

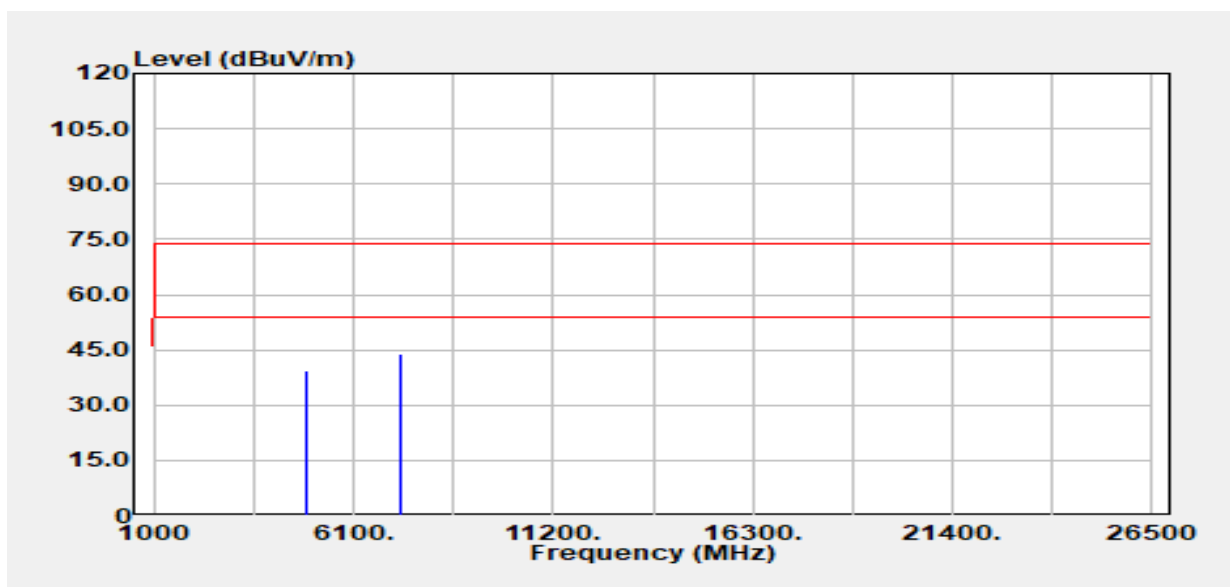


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4884.00	Peak	37.94	2.25	40.19	74.00	-33.81
4884.00	Average	29.72	2.25	31.97	54.00	-22.03
7326.00	Peak	36.94	8.60	45.55	74.00	-28.45
7326.00	Average	27.09	8.60	35.69	54.00	-18.31

Report No.: TMWK2305001407KR

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2442 MHz
Operation Mode :TX
EUT Pol :E2
Setting :

Test Date :2023-10-23
Temp./Humi. :24.7/58
Antenna Pol. :HORIZONTAL
Engineer :Tony.Chao
Test Chamber : 966A

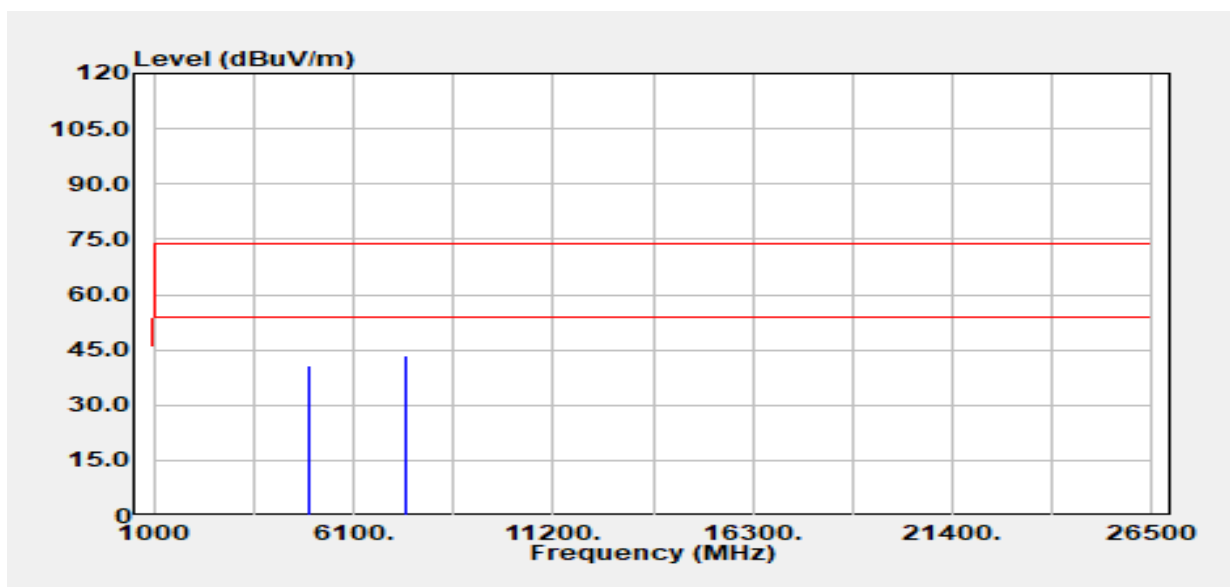


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4884.00	Peak	37.06	2.25	39.31	74.00	-34.69
4884.00	Average	28.56	2.25	30.81	54.00	-23.19
7326.00	Peak	35.26	8.60	43.86	74.00	-30.14
7326.00	Average	26.75	8.60	35.35	54.00	-18.65

Report No.: TMWK2305001407KR

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2480 MHz
Operation Mode :TX
EUT Pol :E2
Setting :

Test Date :2023-10-23
Temp./Humi. :24.7/58
Antenna Pol. :VERTICAL
Engineer :Tony.Chao
Test Chamber : 966A

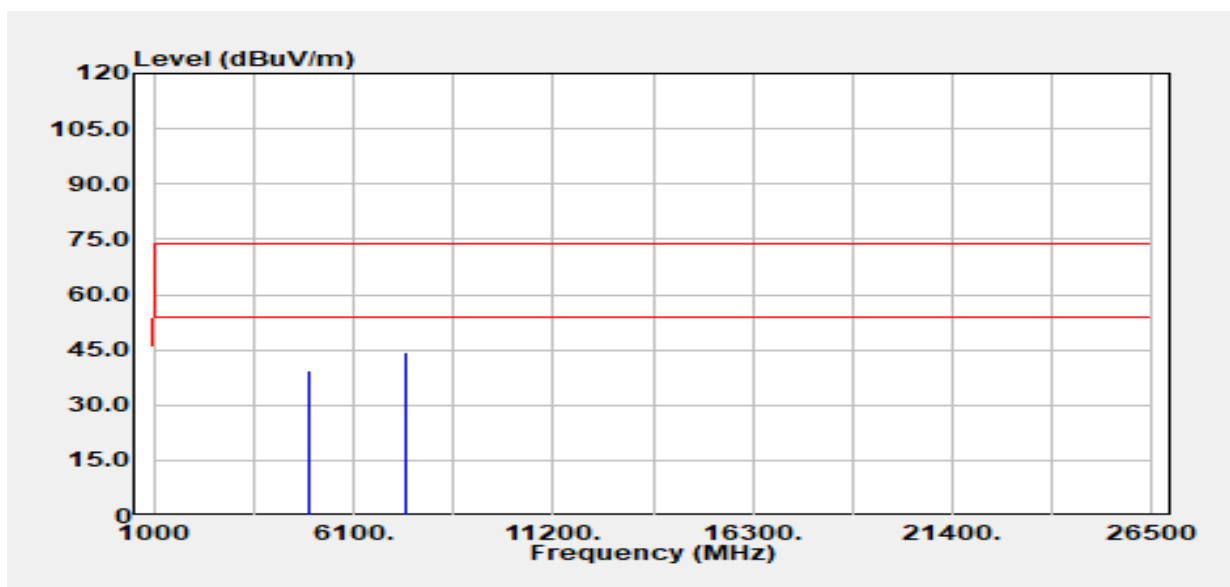


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.00	Peak	38.00	2.83	40.83	74.00	-33.17
4960.00	Average	29.82	2.83	32.65	54.00	-21.35
7440.00	Peak	34.90	8.60	43.50	74.00	-30.50
7440.00	Average	28.10	8.60	36.70	54.00	-17.30

Report No.: TMWK2305001407KR

Project No :TM-2305000074P
Operation Band :BLE 1M
Frequency :2480 MHz
Operation Mode :TX
EUT Pol :E2
Setting :

Test Date :2023-10-23
Temp./Humi. :24.7/58
Antenna Pol. :HORIZONTAL
Engineer :Tony.Chao
Test Chamber : 966A



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	36.50	2.83	39.34	74.00	-34.66
4960.00	Average	28.13	2.83	30.96	54.00	-23.04
7440.00	Peak	35.62	8.60	44.22	74.00	-29.78
7440.00	Average	26.96	8.60	35.56	54.00	-18.44