FCC RF Exposure Exemption report

for

Notebook Computer

Model No.: RK15

FCC ID: IR5RK15

of

Applicant: MilDef Crete Inc.
Address: 7F, No. 250, Sec.3, Pei Shen Rd., Shen Keng District, New Taipei City Taiwan R.O.C.

Tested and Prepared

by

Worldwide Testing Services (Taiwan) Co., Ltd.

FCC Registration No.: TW1477, TW1072

Industry Canada filed test laboratory Reg. No.: 20037, 5107A

Report No.: W6M22307-22823-EE

6F, NO. 58, LANE 188, RUEY-KUANG RD., NEIHU TAIPEI 114, TAIWAN, R.O.C.
TEL: 886-2-66068877 FAX: 886-2-66068879 E-mail: wts@wts-lab.com

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1 General Information

1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.
The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.
Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.
Neither is there any guarantee that such a test sample will interwork with other genuinely open systems.
The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that is performance generally conforms to representative cases of communications equipment.

Laboratory disclaimer-
1. The test results of this test report relate exclusively to the item tested as specified in 1.5.
2. The test report may only be reproduced or published in full.
3. Reproduction or publication of extracts from the report requires the prior written approval of the Worldwide Testing Services(Taiwan) Co., Ltd.
4. Antenna gain is provided by applicant and laboratory issue relevant data and results.

Tester:

Date	WTS-Lab.	Name	Signature
September 13, 2023		Sora Kuo	Sora

Technical responsibility for area of testing:

Date	WTS	Name	Signature
September 13, 2023		Kevin Wang	Kevin Wang

1.2 Testing laboratory

1.2.1 Location

10m OATS
No.5-1, Lishui, Shuang Sing Village, Wanli Dist.,
New Taipei City 207, Taiwan (R.O.C.)

3 meter semi-anechoic chamber
No.35, Aly. 21, Ln. 228, Ankang Rd., Neihu Dist.,
Taipei City 114, Taiwan (R.O.C.)
Tel: 886-2-6613-0228

Worldwide Testing Services (Taiwan) Co., Ltd.
6F., No. 58, Ln. 188, Ruiguang Rd., Neihu Dist.,
Taipei City 114 , Taiwan (R.O.C.)
Tel: 886-2-6606-8877

1.2.2 Details of accreditation status

Accredited testing laboratory
FCC filed test laboratory Reg. No.: TW1477, TW1072
Industry Canada filed test laboratory Reg. No.: 20037, 5107A

Test location, where different from Worldwide Testing Services (Taiwan) Co., Ltd. :

Name:	./.
Accredited no.:	./.
Street:	./.
Town:	./.
Country:	./.

1.3 Application details

Approval holder

Name:	MilDef Crete Inc.
Street:	7F, No. 250, Sec.3, Pei Shen Rd., Shen Keng District,
Town:	New Taipei City
Country:	Taiwan R.O.C.

Manufacturer: (if applicable)

Name:	./.
Street:	./.
Town:	./.
Country:	./.

Date of receipt of test item:	July 11, 2023
Date of test:	from July 12, 2023 to September 13, 2023

1.4 General information of Test item

Type of test item:	Notebook Computer
Model no.:	RK15
Multi-listing model no.:	./.
Brand name:	MilDef Crete
Power supply:	Adapter (I/P: 100-240V~50-60Hz, 1.2A MAX. O/P: 19.0V⎓4.74A, 90.06W) Battery 10.8Vd.c.⎓7500mAh/81Wh
Type of antenna:	PIFA antenna
Antenna gain:	WLAN 2.4G MAIN antenna: -1.97dBi AUX antenna: -0.72dBi WLAN 5G MAIN antenna: Band 1: -4.23dBi Band 4: -6.02dBi AUX antenna: Band 1: -1.91dBi Band 4: -6.02dBi
Directional gain:	WLAN 2.4G: 1.69dBi WLAN 5G Band 1: 0.02dBi Band 4: -3.01dBi

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Technical data:

WLAN 2.4G		
Mode	Channel	Conducted Power (dBm)
802.11b	Ch 1 : 2412 MHz	13.09
	Ch 6 : 2437 MHz	13.33
	Ch 11 : 2462 MHz	13.02
802.11g	Ch 1 : 2412 MHz	12.54
	Ch 6 : 2437 MHz	12.83
	Ch 11 : 2462 MHz	12.52
802.11ax20MHz	Ch 1 : 2412 MHz	15.74
	Ch 6 : 2437 MHz	15.17
	Ch 11 : 2462 MHz	15.18
802.11ax40MHz	Ch 1 : 2412 MHz	15.29
	Ch 4 : 2437 MHz	15.33
	Ch 7 : 2452 MHz	15.45

WLAN 5G			
Band	Mode	Channel	Conducted Power (dBm)
NII-1	802.11a	Ch 36 : 5180 MHz	9.73
		Ch 44 : 5220 MHz	9.85
		Ch 48 : 5240 MHz	9.59
	802.11ax 20M	Ch 36 : 5180 MHz	11.14
		Ch 44 : 5220 MHz	11.36
		Ch 48 : 5240 MHz	11.24
	802.11ax 40M	Ch 38 : 5190 MHz	11.45
		Ch 46 : 5230 MHz	11.47
	802.11ax 80M	Ch 42 : 5210 MHz	11.75
NII-3	802.11a	Ch 149 : 5745 MHz	9.53
		Ch 157 : 5785 MHz	9.84
		Ch 165 : 5825 MHz	9.91
	802.11ax 20M	Ch 149 : 5745 MHz	11.87
		Ch 157 : 5785 MHz	11.87
		Ch 165 : 5825 MHz	12.14
	802.11ax 40M	Ch 151 : 5755 MHz	12.04
		Ch 159 : 5795 MHz	12.17
	802.11ax 80M	Ch 155 : 5775 MHz	11.84

Bluetooth		
Mode	Channel	Conducted Power (dBm)
Normal	Ch 0 : 2402 MHz	7.90
	Ch 39 : 2441 MHz	8.23
	Ch 78 : 2480 MHz	7.73
EDR	Ch 0 : 2402 MHz	5.95
	Ch 39 : 2441 MHz	6.29
	Ch 78 : 2480 MHz	5.82

Bluetooth		
Mode	Channel	Conducted Power (dBm)
BLE 1M	Ch 0 : 2402 MHz	4.29
	Ch 19 : 2440 MHz	3.83
	Ch 39 : 2480 MHz	3.24
BLE 2M	Ch 0 : 2402 MHz	4.36
	Ch 19 : 2440 MHz	3.91
	Ch 39 : 2480 MHz	3.29

Operation modes: Duplex

Modulation type: WLAN 2.4G: DSSS/OFDM

WLAN 5G: DSSS/OFDM

Bluetooth: GFSK、π/4DQPSK、8DPSK

Sample no.: #01

Special statement: ./.

Classification:

Fixed Device	☐
Mobile Device (Human Body distance ＞ 20cm)	☒
Portable Device (Human Body distance ＜ 20cm)	☐

1.5 Duty cycle and factor

The duty factor is computed as [10 log (1 / D)], where D is the duty cycle.

WLAN 2.4G

Mode	T_{on} (ms)	$T_{on}+T_{off}$ (ms)	Duty cycle (%)	Duty Factor (dB)	1/T - VBW (kHz)
802.11b	8.397	8.413	99.81%	0.01	0.12
802.11g	0.204	0.244	83.61%	0.78	4.90
802.11ax 20MHz	0.296	0.352	84.09%	0.75	3.38
802.11ax 40MHz	0.532	0.588	90.48%	0.43	1.88

WLAN 5G

Mode	T_{on} (ms)	$T_{on}+T_{off}$ (ms)	Duty cycle (%)	Duty Factor (dB)	1/T - VBW (kHz)
802.11a	0.198	0.240	82.50%	0.84	5.05
802.11ax 20MHz	0.293	0.336	87.20%	0.59	3.41
802.11ax 40MHz	0.376	0.421	89.31%	0.49	2.66
802.11ax 80MHz	0.729	0.770	94.68%	0.24	1.37

BLE

Mode	T_{on} (ms)	$T_{on}+T_{off}$ (ms)	Duty cycle (%)	1/T - VBW (kHz)
BLE 1M	0.404	0.629	64.23%	2.48
BLE 2M	0.216	0.625	34.56%	4.63

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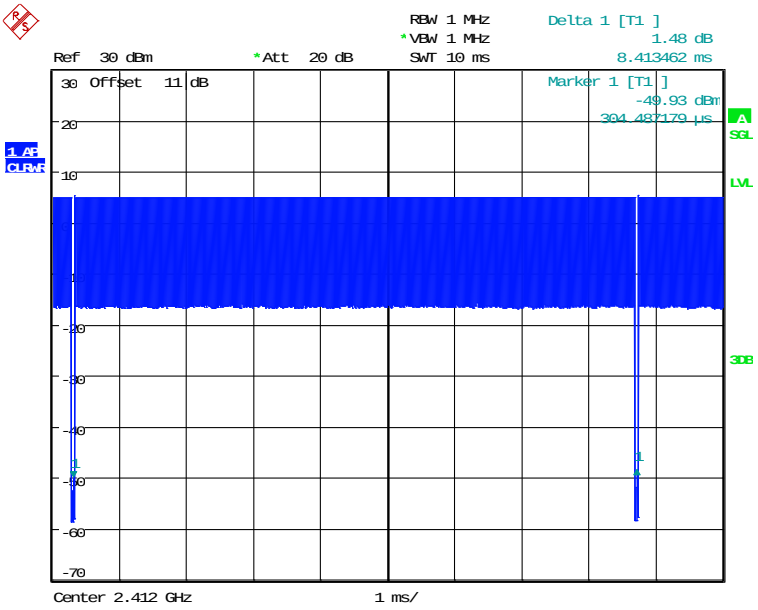
Duty cycle plot
WLAN 2.4G



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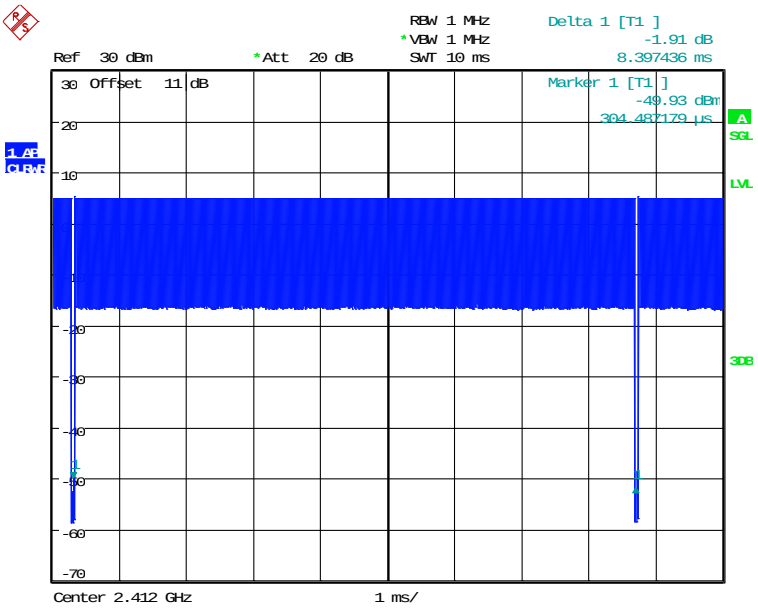

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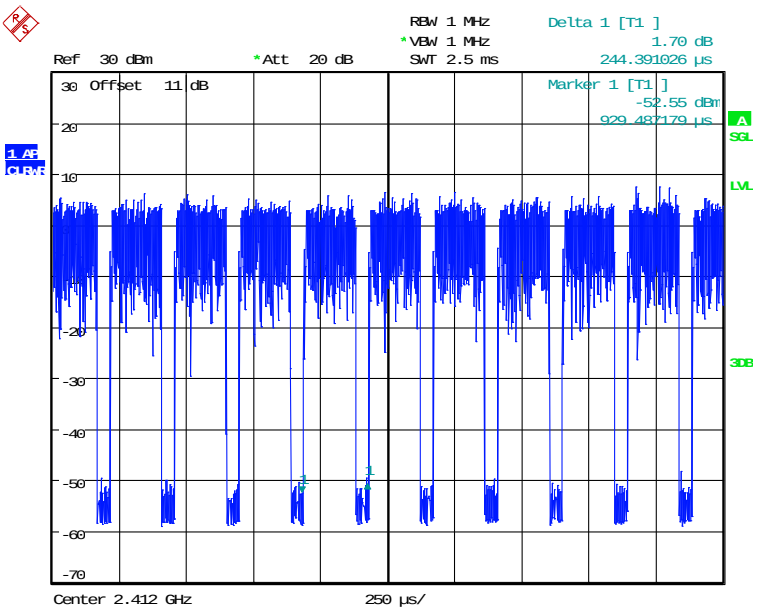

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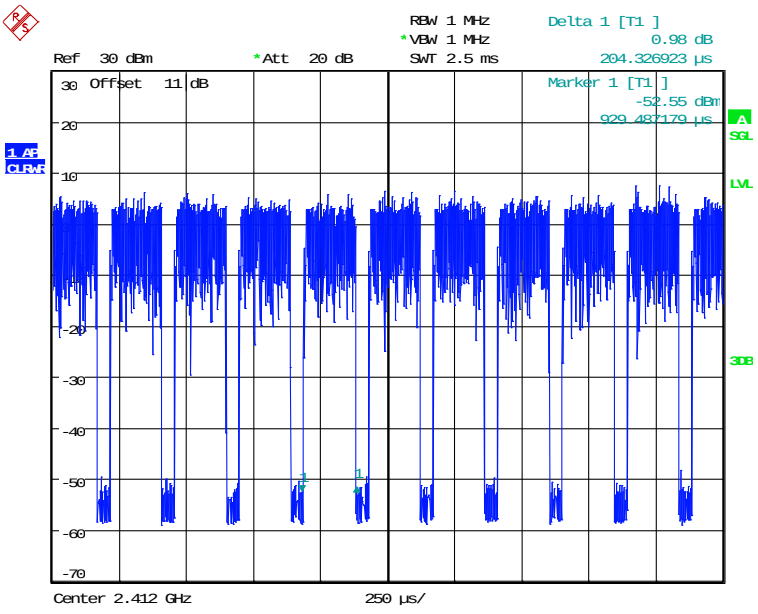

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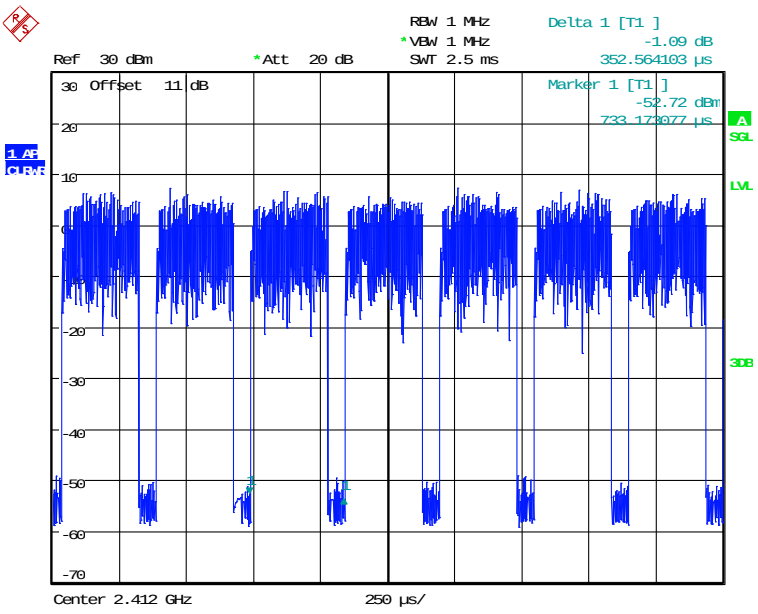

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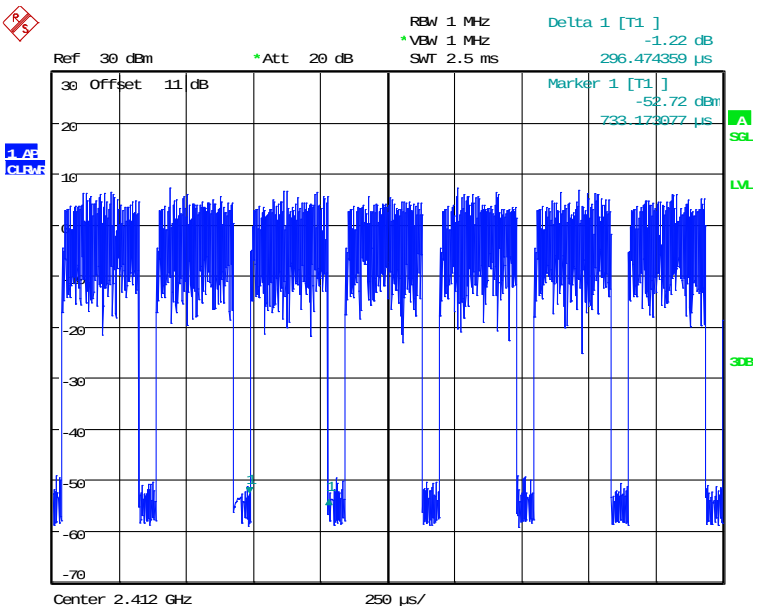

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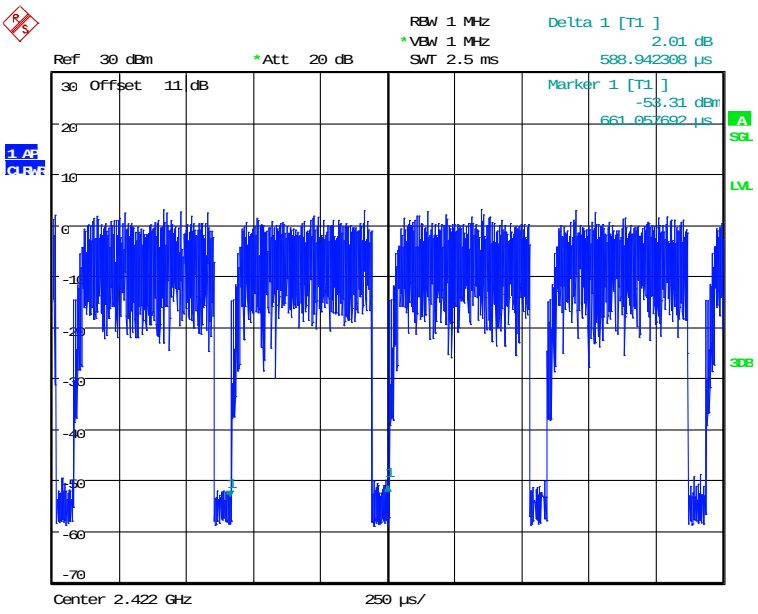

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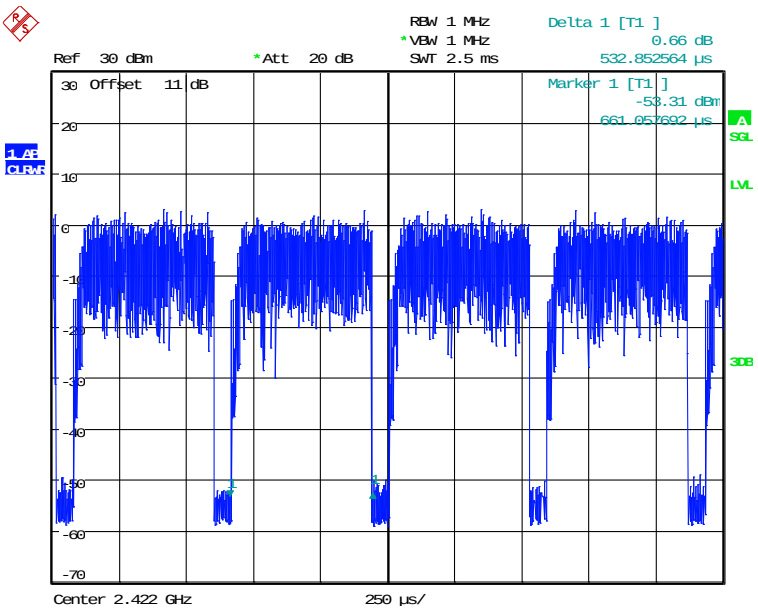

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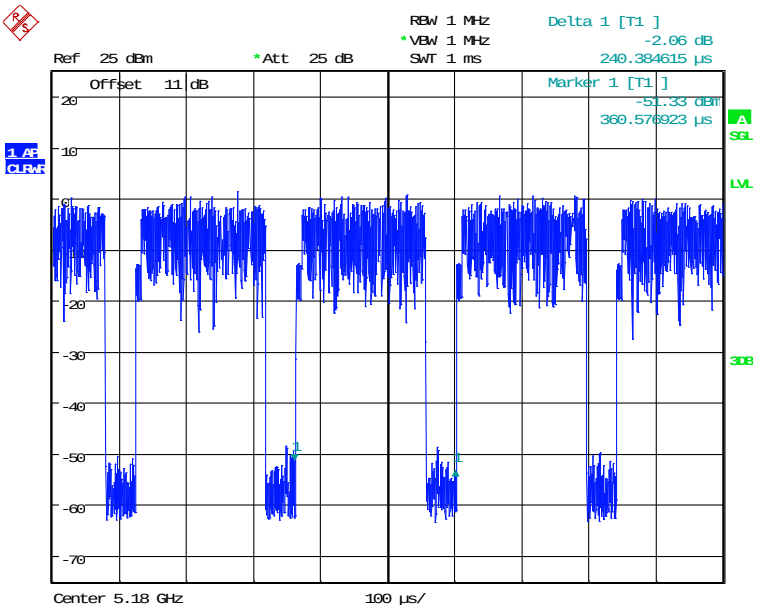
FCC ID: IR5RK15
WLAN 5G



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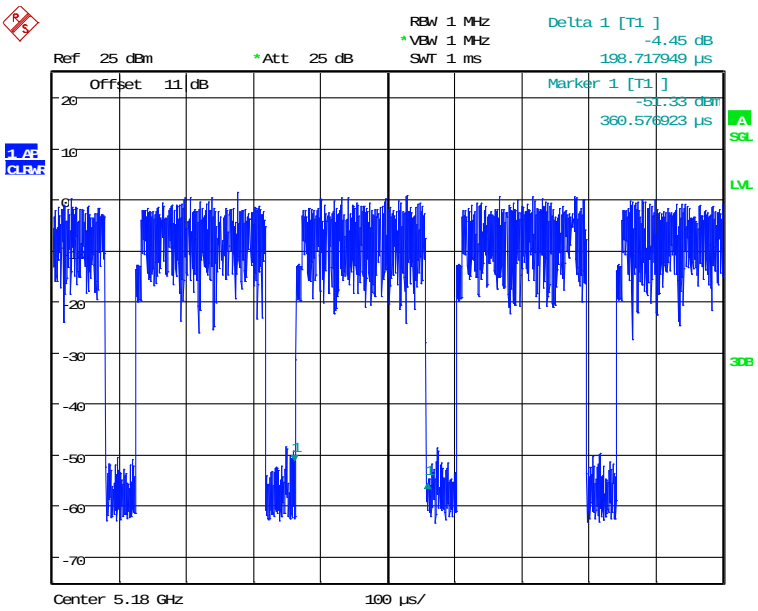

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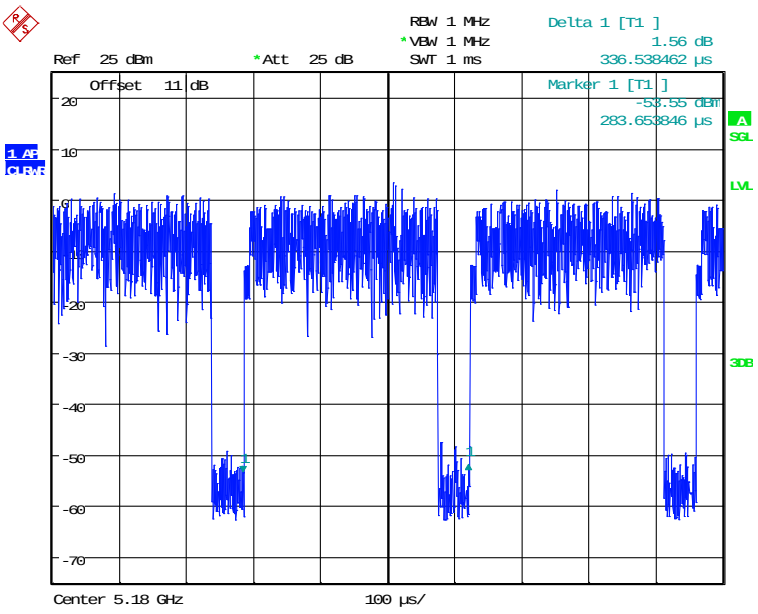
FCC ID: IR5RK15



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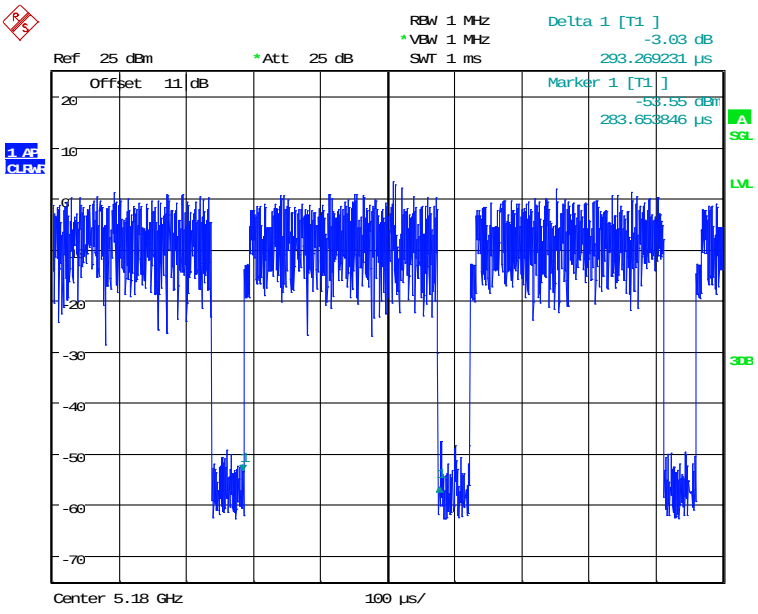

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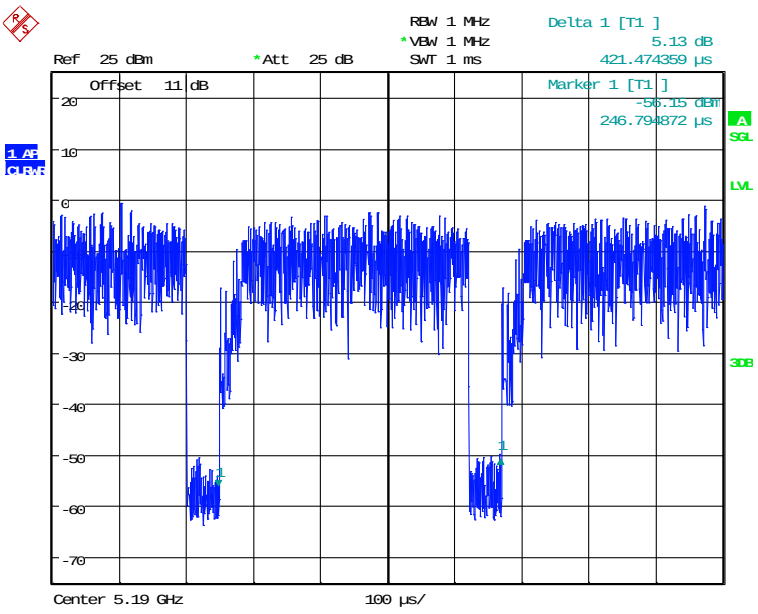

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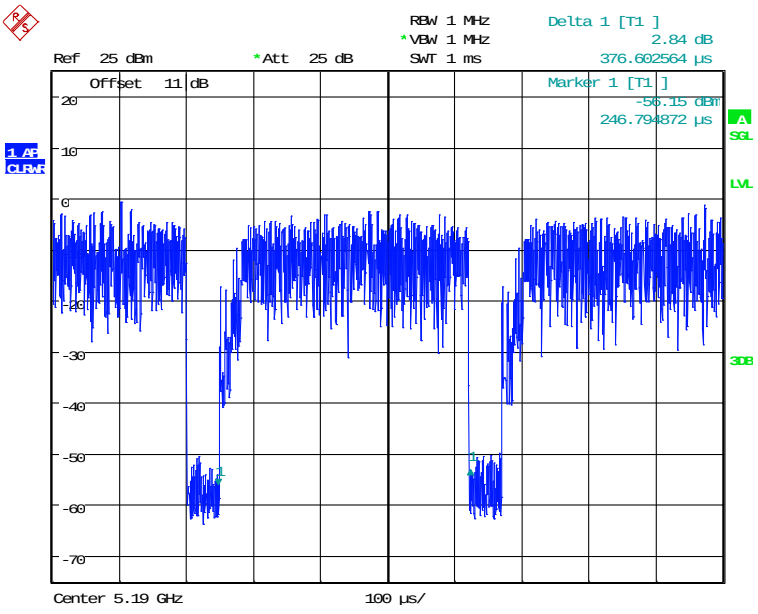

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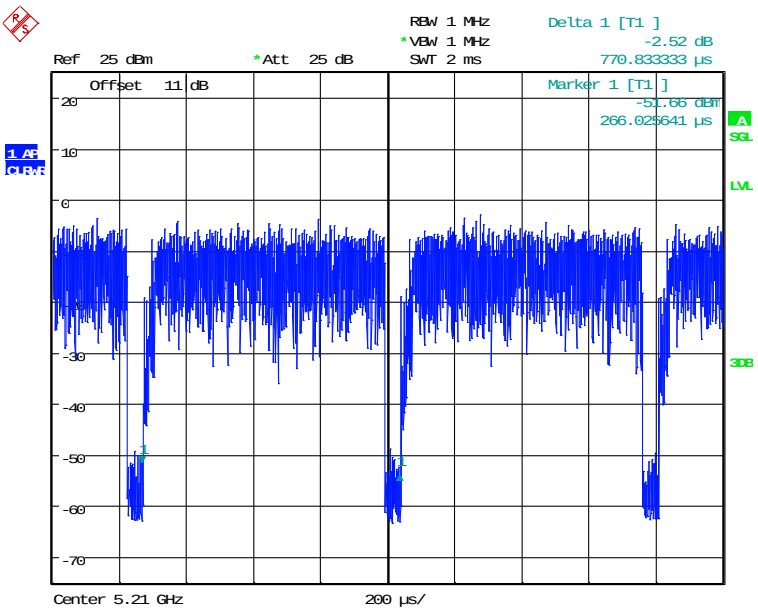

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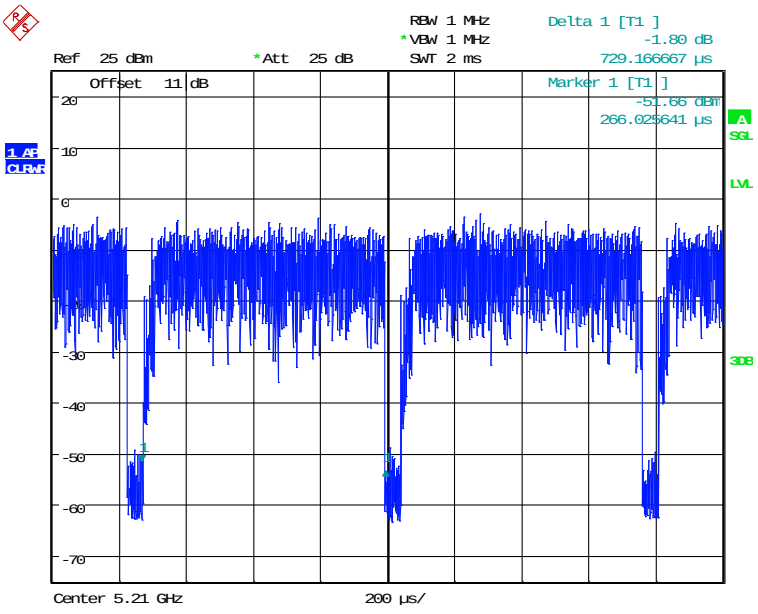

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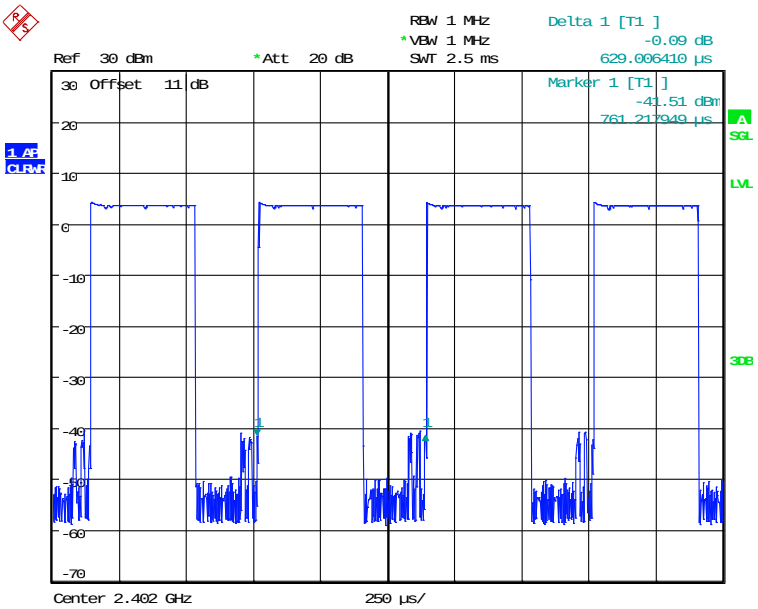
BLE 1M



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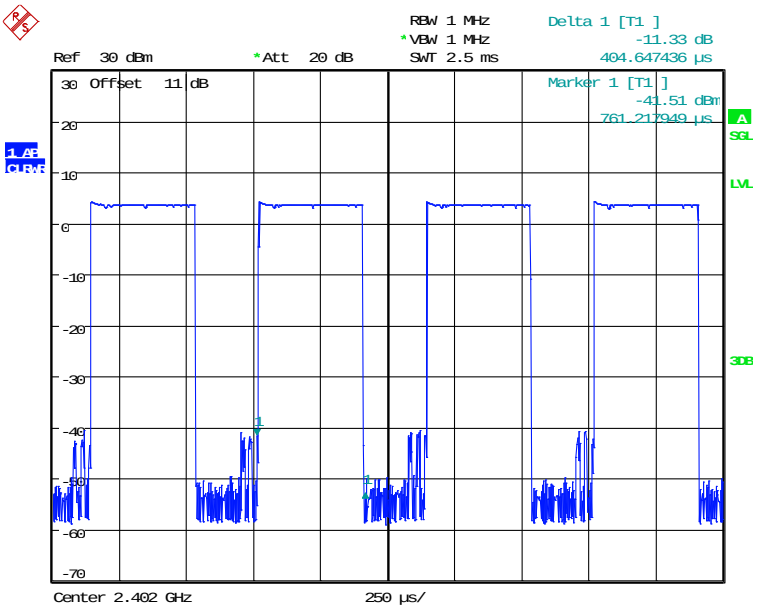

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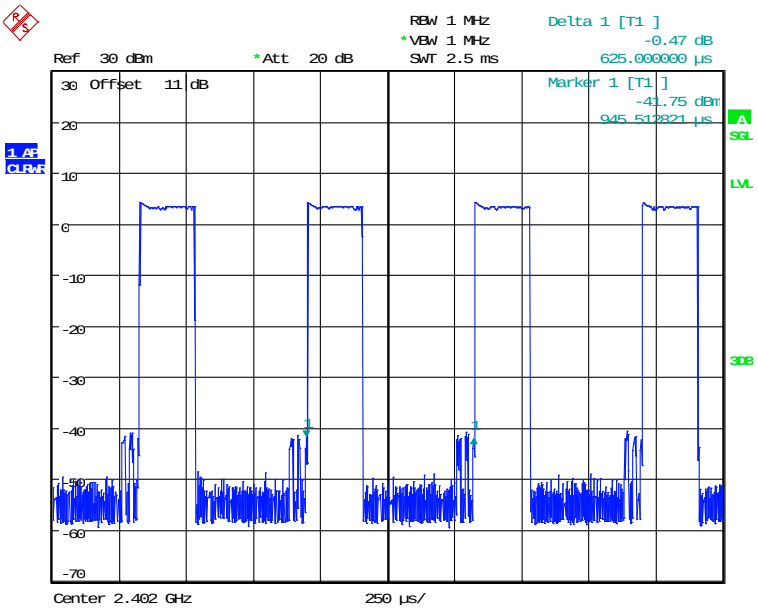
Registration number: W6M22307-22823-EE
FCC ID: IR5RK15
2M



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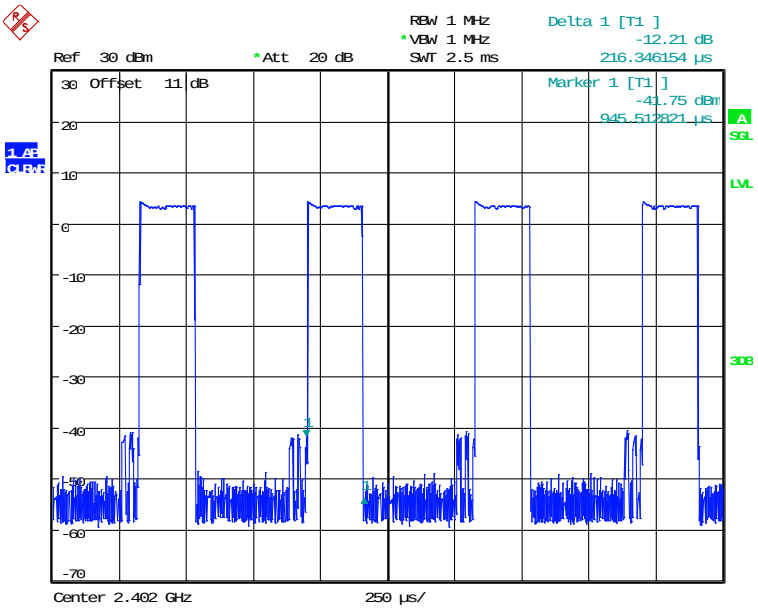

DUTY BLE 2M
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1.7 Test standards

47 CFR FCC Part 2.1093
447498 D04 Interim General RF Exposure Guidance v01

2 Test configuration

2.1 Test environment

Relative humidity content: 20 ... 75 %

Air pressure: 86 ... 103 kPa

Extreme conditions parameters: ./.

2.2 Measurement uncertainty

Test item Name	Uncertainty
Estimation Result of Uncertainty of Conducted Output Power Measurement (Peak Output Power (transmitter))	Expanded Uncertainty：1.48 dB

The decision rule is: Measurement uncertainty is not included in the calculation of test results.

2.3 Test Equipment List

RF Conducted

No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2023/7/24	2024/7/23
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2023/2/17	2024/2/16
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2023/2/17	2024/2/16
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2023/2/17	2024/2/16
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2023/3/22	2024/3/21
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2023/2/17	2024/2/16
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2023/2/17	2024/2/16
ETSTW-RE 112	AC POWER SOURCE	TFC-1005	T-0A023536	T-Power	Function test	
ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2023/2/17	2024/2/16
ETSTW-RE 153	Signal Analyzer	FSV40	101929	R&S	2022/10/3	2023/10/2
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2023/8/28	2024/8/27
ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2023/4/27	2024/4/26
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104 （S_Cable 9） （S_Cable 9）	279067	HUBER+SUHNER	2023/02/17	2024/2/16
ETSTW-Cable 045	Microwave Cable	SUCOFLEX 104	325536	HUBER+SUHNER	2022/10/21	2023/10/20
ETSTW-Cable 058	Microwave Cable	SUCOFLEX 104	none	HUBER+SUHNER	2023/5/26	2024/5/25
WTSTW-SW 008	Signal studio	Agilent	None	AUDIX	Version 2.0.0.1	

3 Equivalent Isotropic Radiated Power (EIRP)

3.1 Exemption Limits for Routine Evaluation according to 47 CFR FCC Part 2 Subpart J, section 2.1091

FCC OET Bulletin 65 Edition 97.01 determines the equations for predicting RF fields and applicable limits.
The prediction for power density in the far-field but will over-predict power density in the near field, where it could be used for walking a “worst case” or conservative prediction.
Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20 cm normally can be maintained between the user and the device.

MPE Calculation Method

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

E = Electric field (V/m) P = output power (W) G = EUT Antenna numeric gain (numeric)
d = Separation distance between radiator and human body (m)
The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

mW/cm^2.

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WLAN 2.4G

Mode	Channel/Frequency (MHz)	Conducted Power (dBm)	Antenna 1 Gain (dBi)	Antenna 2 Gain (dBi)	Directional gain (dBi)	Power density (mW/cm^2)	Limit (mW/cm^2)	Ratio
802.11b	Ch 1 : 2412 MHz	13.09	-1.97	--	--	0.0026	1	0.0026
	Ch 6 : 2437 MHz	13.33	-1.97	--	--	0.0027	1	0.0027
	Ch 11 : 2462 MHz	13.02	-1.97	--	--	0.0025	1	0.0025
802.11g	Ch 1 : 2412 MHz	12.54	-1.97	--	--	0.0023	1	0.0023
	Ch 6 : 2437 MHz	12.83	-1.97	--	--	0.0024	1	0.0024
	Ch 11 : 2462 MHz	12.52	-1.97	--	--	0.0023	1	0.0023
802.11 ax20MHz	Ch 1 : 2412 MHz	15.74	--	--	1.69	0.011	1	**0.011**
	Ch 6 : 2437 MHz	15.17	--	--	1.69	0.0097	1	0.0097
	Ch 11 : 2462 MHz	15.18	--	--	1.69	0.0097	1	0.0097
802.11 ax40MHz	Ch 1 : 2422 MHz	15.29	--	--	1.69	0.0099	1	0.0099
	Ch 4 : 2437 MHz	15.33	--	--	1.69	0.01	1	0.01
	Ch 7 : 2452 MHz	15.45	--	--	1.69	0.0103	1	0.0103

WLAN 5G

Band 1

Mode	Channel/Frequency (MHz)	Conducted Power (dBm)	Antenna 1 Gain (dBi)	Antenna 2 Gain (dBi)	Directional gain (dBi)	Power density (mW/cm^2)	Limit (mW/cm^2)	Ratio
802.11a	Ch 36 : 5180 MHz	9.73	-4.23	--	--	0.0007	1	0.0007
	Ch 44 : 5220 MHz	9.85	-4.23	--	--	0.0007	1	0.0007
	Ch 48 : 5240 MHz	9.59	-4.23	--	--	0.0007	1	0.0007
802.11 ax20MHz	Ch 36 : 5180 MHz	11.14	--	--	0.02	0.0026	1	0.0026
	Ch 44 : 5220 MHz	11.36	--	--	0.02	0.0027	1	0.0027
	Ch 48 : 5240 MHz	11.24	--	--	0.02	0.0027	1	0.0027
802.11 ax40MHz	Ch 38 : 5190 MHz	11.45	--	--	0.02	0.0028	1	0.0028
	Ch 46 : 5230 MHz	11.47	--	--	0.02	0.0028	1	0.0028
802.11 ax80MHz	Ch 42 : 5210 MHz	11.75	--	--	0.02	0.003	1	**0.003**

Registration number: W6M22307-22823-EE
FCC ID: IR5RK15

Band 4

Mode	Channel/Frequency (MHz)	Conducted Power (dBm)	Antenna 1 Gain (dBi)	Antenna 2 Gain (dBi)	Directional gain (dBi)	Power density (mW/cm^2)	Limit (mW/cm^2)	Ratio
802.11a	Ch 149 : 5745 MHz	9.53	-6.02	--	--	0.0004	1	0.0004
	Ch 157 : 5785 MHz	9.84	-6.02	--	--	0.0005	1	0.0005
	Ch 165 : 5825 MHz	9.91	-6.02	--	--	0.0005	1	0.0005
802.11 ax20MHz	Ch 149 : 5745 MHz	11.87	--	--	-3.01	0.0015	1	0.0015
	Ch 157 : 5785 MHz	11.87	--	--	-3.01	0.0015	1	0.0015
	Ch 165 : 5825 MHz	12.14	--	--	-3.01	0.0016	1	**0.0016**
802.11 ax40MHz	Ch 151 : 5755 MHz	12.04	--	--	-3.01	0.0016	1	**0.0016**
	Ch 159 : 5795 MHz	12.17	--	--	-3.01	0.0016	1	**0.0016**
802.11 ax80MHz	Ch 155 : 5775 MHz	11.84	--	--	-3.01	0.0015	1	0.0015

Normal & EDR

Mode	Channel/Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Power density (mW/cm^2)	Limit (mW/cm^2)	Ratio
BR	Ch 0 : 2402 MHz	7.90	-1.97	0.0008	1	**0.0008**
	Ch 39 : 2441 MHz	8.23	-1.97	0.0008	1	**0.0008**
	Ch 78 : 2480 MHz	7.73	-1.97	0.0007	1	0.0007
EDR	Ch 0 : 2402 MHz	5.95	-1.97	0.0005	1	0.0005
	Ch 39 : 2441 MHz	6.29	-1.97	0.0005	1	0.0005
	Ch 78 : 2480 MHz	5.82	-1.97	0.0005	1	0.0005

BLE 1M & 2M

Mode	Channel/Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Power density (mW/cm^2)	Limit (mW/cm^2)	Ratio
BR	Ch 0 : 2402 MHz	4.29	-1.97	0.0003	1	**0.0003**
	Ch 19 : 2440 MHz	3.83	-1.97	0.0003	1	**0.0003**
	Ch 39 : 2480 MHz	3.24	-1.97	0.0003	1	**0.0003**
EDR	Ch 0 : 2402 MHz	4.36	-1.97	0.0003	1	**0.0003**
	Ch 19 : 2440 MHz	3.91	-1.97	0.0003	1	**0.0003**
	Ch 39 : 2480 MHz	3.29	-1.97	0.0003	1	**0.0003**

From the peak EUT RF output power, the minimum mobile separation distance, d = 20 cm, as well as the gain of the used antenna, the RF power density can be obtained.

Simultaneous evaluation-
0.011 (WLAN 2.4G) + 0.0008 (BT) = 0.0118<1

Simultaneous evaluation-
0.003 (WLAN 5G) + 0.0008 (BT) = 0.0038<1