

# ELECTROMAGNETIC EMISSIONS **COMPLIANCE REPORT**



Applicant:	Darfon Electronics Corp. 167, Shanying Road, Gueishan, Taoyuan 333, Taiwan		
Manufacturer:	HP Inc. 1501 Page Mill Road, Palo Alto, CA 94304, USA		
Product Name:	Wireless Keyboard		
Brand Name:	HP		
Model No.:	TPA-D003K		
Model Difference:	N/A		
Report Number:	TERF2308001966E2		
FCC ID	O62-TPAD003K		
Date of EUT Received:	August 11, 2023		
Date of Test:	August 11, 2023 $\sim$ December 29, 2023		
Issue Date:	December 29, 2023		
Approved B	ALNO HSieh		
Approved By Arno Hsieh			

### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT comply with FCC rule part §15.249.

The results of this report relate only to the sample identified in this report.

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Revision History						
Report Number	Revision	Description	Issue Date	Revised By	Remark	
TERF2308001966E2	00	Original	December 1, 2023	Celery Wei		
TERF2308001966E2	01	Modify comments	December 26, 2023	Celery Wei	*	
TERF2308001966E2	02	Modify comments	December 29, 2023	Celery Wei	*	

Note:

1 . The remark "\*" indicates modification of the report upon requests from certification body.

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#### **GENERAL INFORMATION** 1

#### 1.1 **Product Description**

Product Name:	Wireless Keyboard
Brand Name:	HP
Model No.:	TPA-D003K
Model Difference:	N/A
Hardware Version:	N/A
Firmware Version:	N/A
EUT Series No.:	9CH3010001
Power Supply:	3Vdc from AAA Battery
Test Software (Name/Version)	default(push button)

#### 1.2 **RF** Specification

Radio Technology:	2.4GHz Short Range Radio		
Frequency Range:	2405 – 2476MHz		
Channel number:	12 channels		
Modulation type:	GFSK		
Transmit Power:	95.84dBµV/m		

### 1.3 Antenna Designation

Antenna	Supplier	Antenna	Freq.	Peak Antenna
Type		Part No.	(MHz)	Gain (dBi)
Chip	Unictron Technologies Corp.	AA055U	2400-2500	1.8

Note: Antenna information is provided by the applicant.

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#### 1.4 **Test Methodology of Applied Standards**

FCC Part 15, Subpart C §15.249

ANSI C63.10:2013

#### 1.5 **Test Facility**

Laboratory	Test Site Address	Test Site Name	FCC Designa- tion number	IC CAB identifier
		SAC 1		
		SAC 2		
		SAC 3		
	No. 124 We Kung Dood New Tringi	Conduction 1		
	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New	Conducted 1	TW0027	
	Taipei City, Taiwan.	Conducted 2	100027	
	Taiper City, Taiwan.	Conducted 3		TW3702
		Conducted 4		
		Conducted 5		
SGS Taiwan Ltd.		Conducted 6		
Central RF Lab.		Conduction C		
(TAF code 3702)		SAC C		
		SAC D		
		SAC G		
	No 2 Kaji 1at Pd. Cujahan District	Conducted A		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conducted B	TW0028	
	Tabyuan City, Taiwan 555	Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		
	ame is remarked on the equipmen measurements occurred in specif		•	s an indica-

#### 1.6 **Special Accessories**

There are no special accessories used while test was conducted.

#### **Equipment Modifications** 1.7

There was no modification incorporated into the EUT.

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#### SYSTEM TEST CONFIGURATION 2

#### 2.1 **EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

#### 2.2 **EUT Exercise**

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

#### 2.3 **Test Procedure**

#### 2.3.1 **Conducted Emissions**

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

#### 2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

#### 2.3.3 **Radiated Emissions**

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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#### 2.4 Measurement Results Explanation Example

### 2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

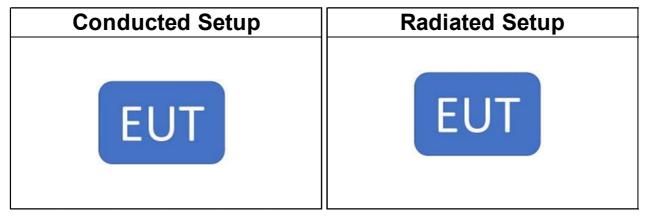
Radiated emission below 30MHz is measured in a 9m\*6m\*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### 2.4.2 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

#### 2.5 **Test Configuration**



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# **3 SUMMARY OF TEST RESULTS**

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emis- sion	Compliant
§15.205 §15.249(a)(e) §15.209	Radiated Emission	Compliant
§15.215(c)	Emission Bandwidth	Compliant
§15.203	Antenna Requirement	Compliant

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#### DESCRIPTION OF TEST MODES 4

#### 4.1 **Operating Frequencies**

Channel	Frequency
0	2405
1	2407
2	2408
3	2442
4	2423
5	2427
6	2447
7	2451
8	2452
9	2473
10	2474
11	2476

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#### THE WORST TEST MODES AND CHANNEL DETAILS 5

- 1. The EUT has been tested under operating condition.
- 2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

### **RADIATED EMISSION TEST:**

TRANSMIT RADIATED EMISSION TEST (BELOW 1 GHz)					
MODEAVAILABLE CHANNELTESTED CHANNELMODULATIONDATA RATE (Mbps)ANTENNA PORT					
2.4G	0 to 11	6	GFSK	1	1TX

TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	0 to 11	0,6,11	GFSK	1	1TX

Note: The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.

### ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	
2.4G	0 to 11	0,6,11	GFSK	1	

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#### **MEASUREMENT UNCERTAINTY** 6

Test Items	U	ncertaint	:y
AC Power Line Conducted Emission	+/-	2.32	dB
Emission Bandwidth	+/-	1.53	Hz
Undesignable radiated emission measurement	+/-	1.68	dB
Temperature	+/-	0.7	°C
Humidity	+/-	3	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty					
Polarization: Vertical	+/-	2.8	dB	9kHz~30MHz	
	+/-	4.82	dB	30MHz - 1000MHz	
	+/-	4.37	dB	1GHz - 18GHz	
	+/-	4.21	dB	18GHz - 40GHz	
	+/-	2.8	dB	9kHz~30MHz	
Polarization: Horizontal	+/-	4.54	dB	30MHz - 1000MHz	
Polarization: Horizontal	+/-	4.37	dB	1GHz - 18GHz	
	+/-	4.21	dB	18GHz - 40GHz	

### Note:

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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#### MEASUREMENT EQUIPMENT USED 7

#### 7.1 **Conducted Measurement**

Conducted Emission Test Site: Conducted D						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	05/23/2023	05/22/2024	
Power Meter	Anritsu	ML2496A	2138002	08/31/2023	08/30/2024	
Power Sensor	Anritsu	MA2411B	1911390	08/31/2023	08/30/2024	
Power Sensor	Anritsu	MA2411B	1911398	08/31/2023	08/30/2024	
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R	
Attenuator	Woken	WATT-218FS-10	RF18	11/16/2022	11/15/2023	
Attenuator	Woken	WATT-218FS-10	RF19	11/16/2022	11/15/2023	
DC Block	PASTERNACK	PE8210	RF155	11/16/2022	11/15/2023	
Attenuator	Woken	WATT-218FS-10	RF18	11/15/2023	11/14/2024	
Attenuator	Woken	WATT-218FS-10	RF19	11/15/2023	11/14/2024	
DC Block	PASTERNACK	PE8210	RF155	11/15/2023	11/14/2024	

#### 7.2 **Radiated Measurement**

Radiated Emission Test Site: SAC C						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-300	11/11/2022	11/10/2023	
Horn Antenna	Schwarzbeck	BBHA9170	184	12/30/2022	12/29/2023	
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/12/2023	01/11/2024	
Loop Antenna	ETS.LINDGREN	6502	148045	10/05/2022	10/04/2023	
3m Site NSA	SGS	966 chamber C	N/A	03/02/2023	03/01/2024	
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/29/2023	03/28/2024	
Test Software	audix	e3	E3 20923 SGS Ver.9 ( C )	N.C.R	N.C.R	
Pre-Amplifier	<b>EMC Instruments</b>	EMC330	980096	11/16/2022	11/15/2023	
Pre-Amplifier	<b>EMC Instruments</b>	EMC118A45SE	980789	11/16/2022	11/15/2023	
Pre-Amplifier	<b>EMC Instruments</b>	EMC18405SEE	980881	10/25/2022	10/24/2023	
Attenuator	Woken	WATT-218FS-10	RF16	11/16/2022	11/15/2023	
Coaxial Cable	Huber Suhner	EMC106-SM-SM- 9100	150704	11/16/2022	11/15/2023	
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	11/16/2022	11/15/2023	
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/16/2022	11/15/2023	

### NOTE: N.C.R refers to Not Calibrated Required.

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#### CONDUCTED EMISSION TEST 8

#### 8.1 **Applicable Standard:**

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range		imits BuV)
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
Note		

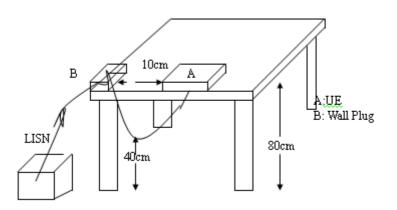
1. The lower limit shall apply at the transition frequencies

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

#### 8.2 EUT Setup:

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

#### 8.3 **Test Setup**



#### 8.4 **Measurement Procedure:**

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all phases of power being supplied by given UE are completed

#### 8.5 **Measurement Result:**

N/A; Powered from AAA battery.

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#### **RADIATED EMISSION TEST** 9

#### 9.1 **Applicable Standard**

- 1. Only spurious emissions are permitted in any of the frequency bands listed in §15.205.
- 2. The field strength of fundamental and harmonic emissions, measured at 3 m, shall not exceed 50 mV/m and 0.5 mV/m respectively.
- 3. Emissions radiated outside of the specified frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in §15.209, whichever is less stringent.

#### 9.2 **Measurement Procedure**

#### 9.2.1 **Duty Cycle**

- Place the EUT on the table and set it in transmitting mode. 1.
- Set span = Zero
- RBW = 8MHz, VBW = 8MHz, 3.
- Detector = Peak 4.

#### 9.2.2 Radiated

- The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1. 1GHz above ground plane.
- 2. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
- 3. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
- Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Meas-4. urements at frequency above 1 GHz.
- 5. Set the spectrum analyzer as RBW=1 MHz, VBW  $\geq$  1/T (Duty cycle < 98%) for Average Emission Measurements at frequency above 1 GHz.
- 6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 7. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 8. Repeat above procedures until all frequency measured were complete.

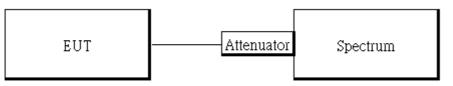
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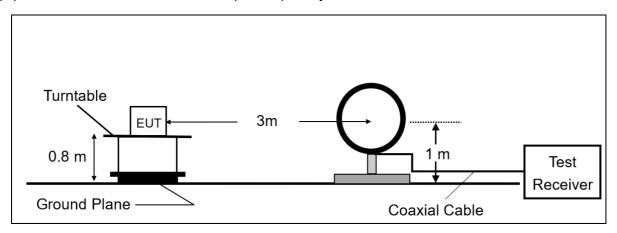
#### **Test Setup** 9.3

#### 9.3.1 **Duty Cycle**

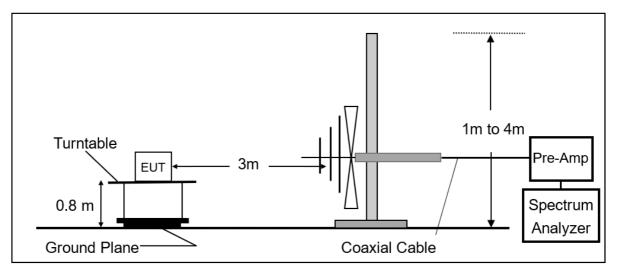


#### 9.3.1 Radiated

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



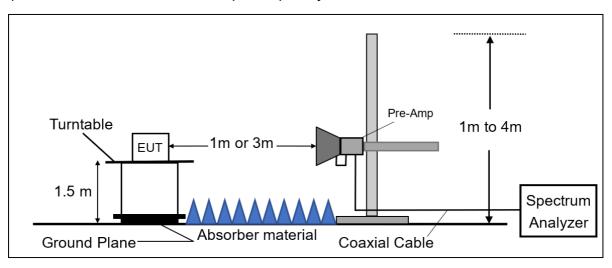
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### (C) Radiated Emission Test Set-Up, Frequency Above 1GHz.



#### 9.4 **Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

### FS = RA + AF + CL - AG

5	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB) Factor(dB) = Antenna Factor(dBµV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

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**Duty Factor** 

	Duty Cycle (%) = Ton / (Ton+Toff)	1/T (kHz)	VBW setting (kHz)
2.4G	62.75	2.60	3.00



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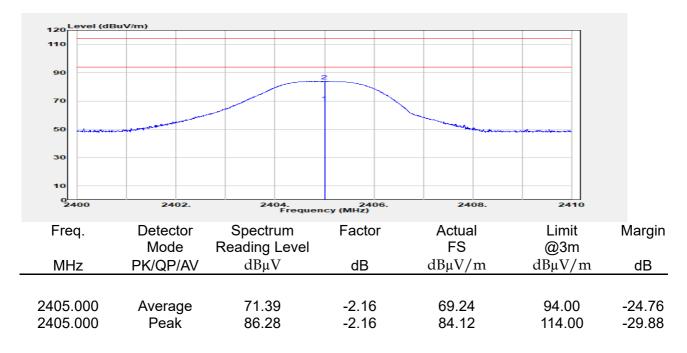
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#### 9.5 **Measurement Result**

### 9.5.1 Field Strength of the Fundamental Signal

Report Number	:TERF2308001966E2	Test Site	:SAC C
Operation Mode	:2.4GHz	Test Date	:2023-10-02
Test Frequency	:2405 MHz	Temp./Humi.	:24.2°C/42%
Test Mode	:Main	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Andy Wang



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Report Number Operation Mod Test Frequence Test Mode EUT Pol	de :2.4GHz		Te Te Ar	st Date :20 mp./Humi. :24 itenna Pol. :He		
120 Level (dBu 110 90 70 50 30 10 0 2400	IV/m)	2404.	2406. cy (MHz)	2408.		
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2405.000 2405.000	Average Peak	80.74 95.56	-2.16 -2.16	78.58 93.40	94.00 114.00	-15.42 -20.60

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Report Number :TERF2308001966E2			Те	est Site :SA	AC C	
Operation Mo	Operation Mode :2.4GHz			est Date :20	23-10-02	
Test Frequency :2447 MHz			Те	mp./Humi. :24	.2°C/42%	
Test Mode	:Main		Ar	ntenna Pol. :Ve	ertical	
EUT Pol	:E2 Plane		Er	ngineer :Ar	ndy Wang	
120 Level (dBu	iV/m)		1			
110						
90			2			
70						
50	Warner and				man and an and and and and and and and an	
30						
10 0 2442	2444.	2446.	2448.	2450.	2452	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
ricq.		Reading Level		FS	@3m	margin
MHz	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
0447.000	A	70.00	0.04	74 50	04.00	00.44
2447.000 2447.000	Average Peak	73.63 88.56	-2.04 -2.04	71.59 86.52	94.00 114.00	-22.41 -27.48
2117.000	1 Can	00.00	2.01	00.0L		27.40

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Report Number :TERF2308001966E2			Те	st Site :S/	AC C		
Operation Mo	Operation Mode :2.4GHz			Test Date :2023-10-02			
Test Frequence	cy :2447 MH	Z	Те	mp./Humi. :24	<b>.2°</b> C/ <b>42%</b>		
Test Mode	:Main		Ar	ntenna Pol. :He	orizontal		
EUT Pol	:E2 Plane		Er	ngineer :Ar	ndy Wang		
120 Level (dBu	ıV/m)						
110							
90							
70							
50					and a state of the second		
30							
10							
0	2444.	2446. Frequen	2448. cy (MHz)	2450.	2452		
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB	
1011 12		αυμν	uD	ασμν/ π	αυμ γ Π	UD	
2447.000	Average	82.52	-2.04	80.48	94.00	-13.52	
2447.000	Peak	97.36	-2.04	95.32	114.00	-18.68	

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Report Numbe Operation Moe Test Frequenc Test Mode EUT Pol	de :2.4GHz		Te: Tei An	st Date :20 mp./Humi. :24 tenna Pol. :Ve		
120 Level (dBu 110 90 70 50 Januard 30 10 2471	2473.	2475. Frequen	2477. cy (MHz)	2479.		
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2476.000 2476.000	Average Peak	81.08 93.12	-2.05 -2.05	79.03 91.07	94.00 114.00	-14.97 -22.93

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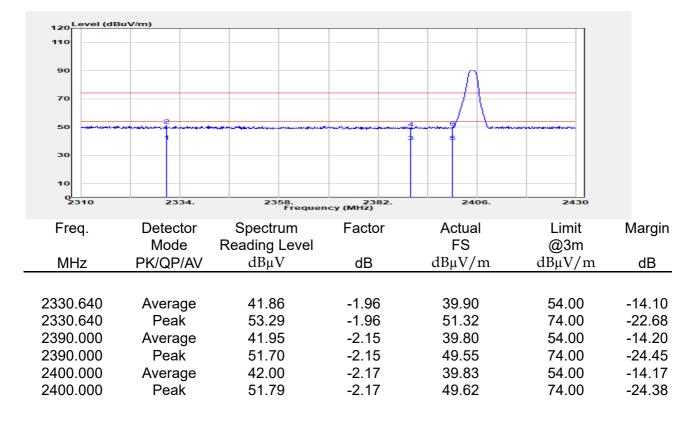
Report Numbe	er :TERF230	08001966E2	Те	st Site :S/	AC C	
Operation Mo	de :2.4GHz		Te	st Date :20	)23-10-02	
Test Frequence	cy :2476 MH	Z	Те	mp./Humi. :24	<b>.2°</b> C/ <b>42%</b>	
Test Mode	:Main		An	itenna Pol. :He	orizontal	
EUT Pol	:E2 Plane	1	En	igineer :Ar	ndy Wang	
120 Level (dBu	uV/m)					
90						
70						
50 harrenter					warman water a war	
30						
10 0 2471	2473.	2475.	2477.	2479.	2481	
Freq.	Detector	2475. Frequen	Factor	Actual	Limit	Margin
Fieq.	Mode	Reading Level	Facior	FS	@3m	Margin
MHz	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
2476.000	Average	83.02	-2.05	80.97	94.00	-13.03
2476.000	Peak	97.89	-2.05	95.84	114.00	-18.16

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#### 9.5.1 Restricted bands around fundamental frequency

Report Number	:TERF2308001966E2	Test Site	:SAC C
Operation Mode	:2.4GHz	Test Date	:2023-10-02
Test Frequency	:2405 MHz	Temp./Humi.	:24.2°C/42%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Andy Wang



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Report Numbe	er :TERF23	08001966E2	Te	est Site :SA	VC C	
Operation Mo	de :2.4GHz		Te	est Date :20	23-10-02	
Test Frequence	cy :2405 MH	lz	Te	emp./Humi. :24	.2℃/42%	
Test Mode	:Bandedg	le	A	ntenna Pol. :Ho	orizontal	
EUT Pol	:E2 Plane	9	E	ngineer :Ar	ldy Wang	
120 Level (dBu	JV/m)					
110						
90				- A		
70						
50				finned have		
30				3 5		
10						
0 2310	2334.	2358. Frequen	2382. cy (MHz)	2406.	2430	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2352.840	Average	41.99	-2.09	39.90	54.00	-14.10
2352.840	Peak	53.51	-2.09	51.43	74.00	-22.57
2390.000	Average	42.07	-2.15	39.91	54.00	-14.09
2390.000	Peak	51.53	-2.15	49.38	74.00	-24.62
2400.000	Average	42.15	-2.17	39.98	54.00	-14.02
2400.000	Peak	52.05	-2.17	49.88	74.00	-24.12

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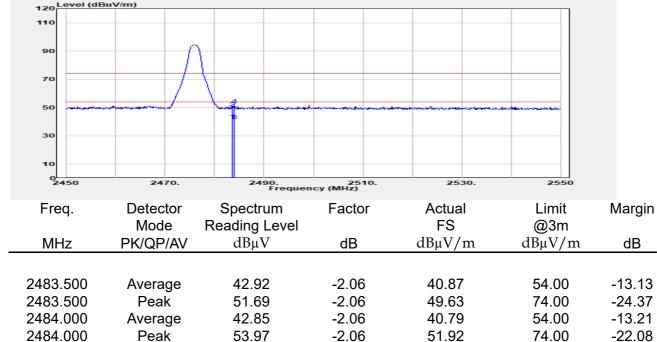
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Report Number	:TERF2308001966E2	Т
Operation Mode	:2.4GHz	Т
Test Frequency	:2476 MHz	Т
Test Mode	:Bandedge	A
EUT Pol	:E2 Plane	E
120 Level (dBuV/r	n)	
110		

Test Site	:SAC C
Test Date	:2023-10-02
Temp./Humi.	:24.2℃/42%
Antenna Pol.	:Vertical
Engineer	:Andy Wang



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Report Numbe Operation Moe Test Frequenc Test Mode EUT Pol	de :2.4GHz	lz je		Test Date :20 Temp./Humi. :24 Antenna Pol. :Ho		
120 Level (dBu 110 90 70 50 30 10						
0 2450	2470.	2490. Frequen	2510. cy (MHz)	2530.	2550	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.500 2483.500 2483.800 2483.800	Average Peak Average Peak	43.52 52.55 43.81 53.74	-2.06 -2.06 -2.06 -2.06	41.47 50.49 41.75 51.69	54.00 74.00 54.00 74.00	-12.53 -23.51 -12.25 -22.31

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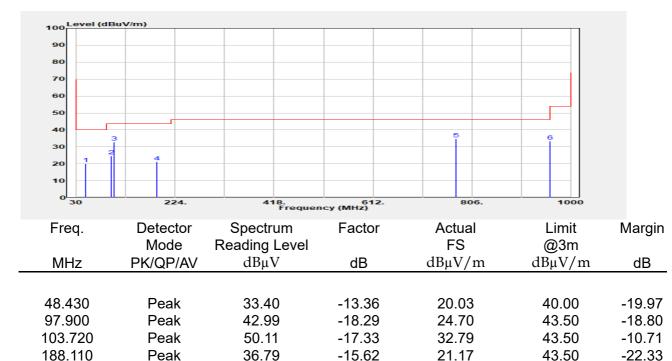
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### Report No.: TERF2308001966E2 Page: 28 of 39



#### 9.5.2 **Radiated Spurious Emission Measurement Result**

Report Number	:TERF2308001966E2	Test Site	:SAC C
Operation Mode	:2.4G	Test Date	:2023-10-03
Test Frequency	:2447 MHz	Temp./Humi.	:20.6℃/52%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Andy Wang



-1.33

1.43

34.82

33.24

46.00

46.00

-11.18

-12.76

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.

36.15

31.81

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774.960

959.260

Peak

Peak



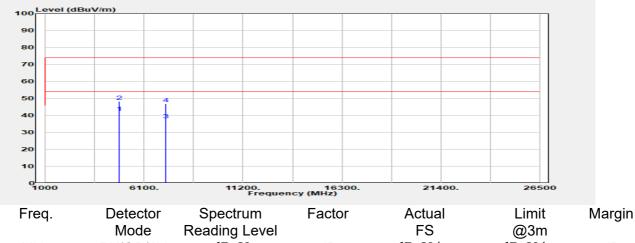
Report Numbe Operation Mo Test Frequence Test Mode EUT Pol	de :2.4G	z	- - /	Test Date :2 Temp./Humi. :2 Antenna Pol. :H		
100 Level (dBr 90 80 70 60 50 40 30 20 10 0 30	224.	418. Frequen	612. ccy (MH2)	5		
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
36.790 101.780 189.080 262.800 771.080 952.470	Peak Peak Peak Peak Peak Peak	34.64 41.62 45.81 36.78 35.43 32.34	-14.70 -17.65 -15.79 -14.01 -1.13 1.18	19.94 23.97 30.02 22.77 34.31 33.52	40.00 43.50 43.50 46.00 46.00 46.00	-20.06 -19.53 -13.48 -23.23 -11.69 -12.48

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Report Number	:TERF2308001966E2
Operation Mode	:2.4G
Test Frequency	:2405 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC C
Test Date	:2023-10-02
Temp./Humi.	:24.2°C/42%
Antenna Pol.	:Vertical
Engineer	:Andy Wang



	wode	Reading Level		F5	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4810.000	Average	38.45	3.32	41.77	54.00	-12.23
4810.000	Peak	44.90	3.32	48.22	74.00	-25.78
7215.000	Average	27.91	9.50	37.41	54.00	-16.59
7215.000	Peak	37.27	9.50	46.77	74.00	-27.23

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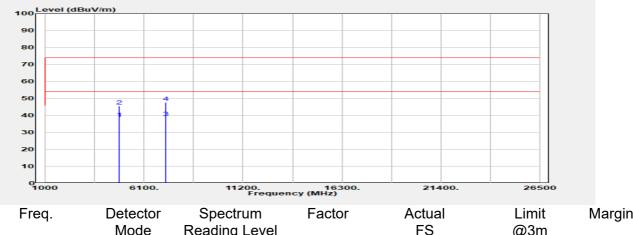
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Report Number	:TERF2308001966E2
Operation Mode	:2.4G
Test Frequency	:2405 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC C
Test Date	:2023-10-02
Temp./Humi.	:24.2°C/42%
Antenna Pol.	:Horizontal
Engineer	:Andy Wang



Fleq.	Mode	Reading Level	Factor	FS	@3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4810.000	Average	34.97	3.32	38.29	54.00	-15.71
4810.000	Peak	42.21	3.32	45.53	74.00	-28.47
7215.000	Average	29.22	9.50	38.72	54.00	-15.28
7215.000	Peak	38.19	9.50	47.69	74.00	-26.31

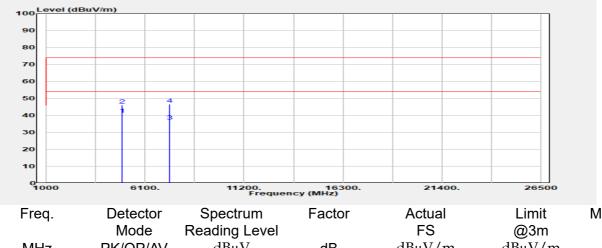
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Report Number	:TERF2308001966E2
Operation Mode	:2.4G
Test Frequency	:2447 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC C
Test Date	:2023-10-03
Temp./Humi.	:20.6°C/52%
Antenna Pol.	:Vertical
Engineer	:Andy Wang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4894.000	Average	37.37	3.22	40.60	54.00	-13.40
4894.000	Peak	42.79	3.22	46.01	74.00	-27.99
7341.000	Average	26.21	10.49	36.71	54.00	-17.29
7341.000	Peak	36.19	10.49	46.68	74.00	-27.32

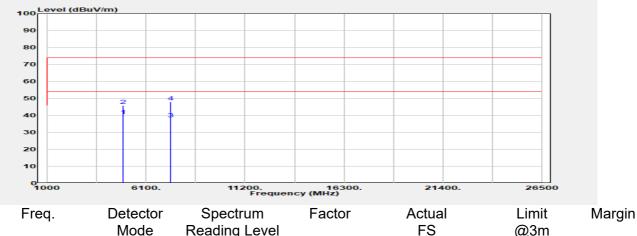
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Report Number	:TERF2308001966E2
Operation Mode	:2.4G
Test Frequency	:2447 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC C
Test Date	:2023-10-03
Temp./Humi.	:20.6°C/52%
Antenna Pol.	:Horizontal
Engineer	:Andy Wang



	Mode	Reading Level		FS	@3m	<b>.</b>
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4894.000	Average	36.75	3.22	39.97	54.00	-14.03
4894.000	Peak	42.52	3.22	45.74	74.00	-28.26
7341.000	Average	27.51	10.49	38.01	54.00	-15.99
7341.000	Peak	37.40	10.49	47.89	74.00	-26.11

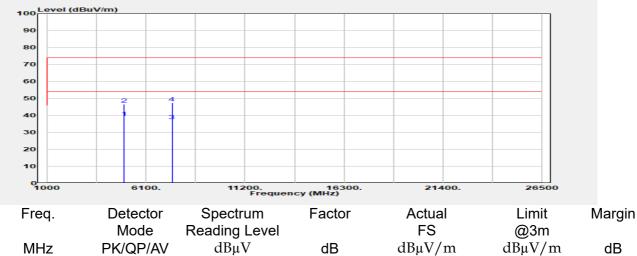
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Report Number	:TERF2308001966E2
Operation Mode	:2.4G
Test Frequency	:2476 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC C
Test Date	:2023-10-02
Temp./Humi.	:24.2°C/42%
Antenna Pol.	:Vertical
Engineer	:Andy Wang



MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4952.000	Average	35.40	3.32	38.72	54.00	-15.28
4952.000	Peak	43.29	3.32	46.61	74.00	-27.39
7428.000	Average	26.59	10.32	36.91	54.00	-17.09
7428.000	Peak	37.11	10.32	47.43	74.00	-26.57

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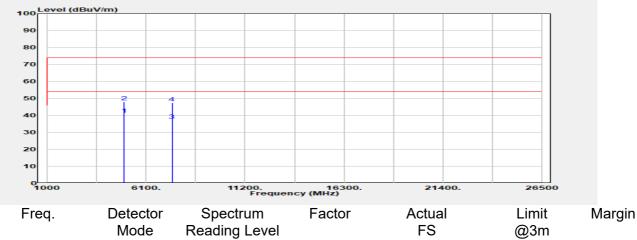
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Report Number	:TERF2308001966E2
Operation Mode	:2.4G
Test Frequency	:2476 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC C
Test Date	:2023-10-02
Temp./Humi.	:24.2°C/42%
Antenna Pol.	:Horizontal
Engineer	:Andy Wang



	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4952.000	Average	37.36	3.32	40.68	54.00	-13.32
4952.000	Peak	44.62	3.32	47.94	74.00	-26.06
7428.000	Average	26.94	10.32	37.26	54.00	-16.74
7428.000	Peak	37.04	10.32	47.36	74.00	-26.64

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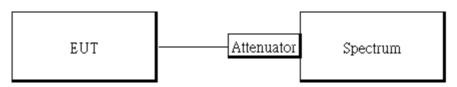
# **10 EMISSION BANDWIDTH**

#### **Applicable Standard** 10.1

§2.1049 (h) & 15.215(c)

Intentional radiators operating under the alternative provisions to the general emis-(c) sion limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

#### 10.1 Test Setup



#### **Measurement Procedure** 10.2

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW=1% to 5%, VBW = 3 times RBW. Span= 2 to 5 times of the OBW. Sweep=auto Detector = Peak, and Max hold
- 4. Turn on the -20 dB Bandwidth function, max reading.

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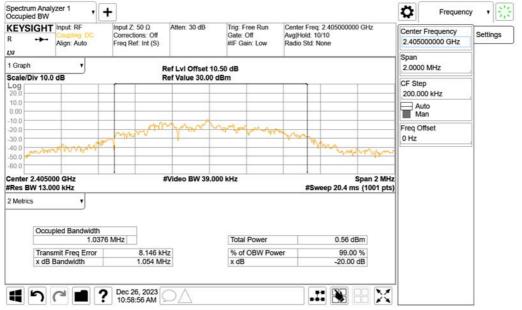


#### 10.3 Measurement Results:

### Measurement Result:

Frequency (MHz)	20dB BW (MHz)	99% Bandwidth (MHz)
2405	1.054	1.0376
2447	1.053	1.0267
2476	1.056	1.0206

### **CH** Low



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### **CH Mid**



## **CH High**



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# 8 ANTENNA REQUIREMENT

### 8.1 Standard Applicable:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

### 10.4 Antenna Connected Construction:

The antenna complies with this requirement and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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