

Shenzhen Toby Technology Co., Ltd.

Report No.: TB-FCC146135

1 of 44 Page:

FCC Radio Test Report FCC ID: 2AG2A-TON9108

Original Grant

Report No. TB-FCC146135

Shenzhen Fast Precision Technologies Co. Ltd. **Applicant**

Equipment Under Test (EUT)

EUT Name IonBeacon

Model No. TON9108

Series No. N/A

Brand Name IOTTON

Receipt Date 2015-12-01

2015-12-01 to 2015-12-22 **Test Date**

Issue Date 2015-12-23

FCC Part 15, Subpart C (15.247:2015) **Standards**

Test Method ANSI C63.10: 2013

Conclusions PASS

In the configuration tested, the EUT complied with the standards specified above,

The EUT technically complies with the FCC and IC requirements

Test/Witness

Engineer

Approved&

Authorized

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TB-RF-074-1.0

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1. General Information about EUT

1.1 Client Information

Applicant: Shenzhen Fast Precision Technologies Co. Ltd.

Address : Room 703, Zhengtailai Business Building, Xixiang Road, Baoan

District, Shenzhen, China

Manufacturer : Shenzhen Fast Precision Technologies Co. Ltd.

Address : Room 703, Zhengtailai Business Building, Xixiang Road, Baoan

District, Shenzhen, China

1.2 General Description of EUT (Equipment Under Test)

EUT Name	1	IonBeacon	IonBeacon		
Models No.	7	TON9108	TON9108		
Model Difference	= {	N/A			
A Direction	e e	Operation Frequency: Bluetooth(BLE):2402~2480MHz			
Due desail	13	Number of Channel:	Bluetooth(BLE): 40 channels see Note 3		
Product Description		RF Output Power:	0.898dBm		
	OBY TO	Antenna Gain:	3 dBi PCB Antenna		
		Modulation Type:	GFSK		
CHO.		Bit Rate of Transmitter:	1Mbps(GFSK)		
Power Supply	:	DC power by Lithium Ba	attery.		
Power Rating	:	DC 3.0V Lithium Battery.			
Connecting I/O Port(S)	:	Please refer to the User's Manual			

Note:

- (1) This Test Report is FCC Part 15.247 for Bluetooth BLE, the test procedure follows the FCC KDB 558074 D01 DTS Meas Guidance v03r03.
- (2) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- (3) Antenna information provided by the applicant.



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(4) Channel List:

	BLE Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	
00	2402	14	2430	28	2458	
01	2404	15	2432	29	2460	
02	2406	16	2434	30	2462	
03	2408	17	2436	31	2464	
04	2410	18	2438	32	2466	
05	2412	19	2440	33	2468	
06	2414	20	2442	34	2470	
07	2416	21	2444	35	2472	
80	2418	22	2446	36	2474	
09	2420	23	2448	37	2476	
10	2422	24	2450	38	2478	
11	2424	25	2452	39	2480	
12	2426	26	2454	1		
13	2428	27	2456		M. B. Carrier	

1.3 Block Diagram Showing the Configuration of System Tested

TX Mode

EUT

1.4 Description of Support Units

The EUT has been test as a indenpdent unit.





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1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

For Conducted Test				
Final Test Mode Description				
N/A	N/A			

For Radiated Test				
Final Test Mode	Description			
Mode 2	TX Mode			
Mode 3	TX Mode (Channel 00/20/39)			

Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

Bluetooth BLE Mode: GFSK Modulation Transmitting mode.

- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a mobile unit; in normal use it was positioned on X-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

1.6 Description of Test Software Setting

During testing channel& Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF setting.

Test Software Version	Connection Manager v3		
Channel	CH 00	CH 20	CH 39
BLE Mode	DEF	DEF	DEF



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1.7 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

Test Item	Parameters	Expanded Uncertainty (U _{Lab})
	Level Accuracy:	
Conducted Emission	9kHz~150kHz	±3.42 dB
	150kHz to 30MHz	±3.42 dB
Dadiated Emission	Level Accuracy:	. 4 CO dD
Radiated Emission	9kHz to 30 MHz	±4.60 dB
Dadiated Emission	Level Accuracy:	. 4 40 dD
Radiated Emission	30MHz to 1000 MHz	±4.40 dB
Padiated Emission	Level Accuracy:	.4.20 dB
Radiated Emission	Above 1000MHz	±4.20 dB

1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

FCC List No.: (811562)

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.



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2. Test Summary

FCC Part 15 Subpart C(15.247)/RSS 247 Issue 1 Standard Section					
FCC	IC	Test Item	Judgment	Remark	
15.203	1	Antenna Requirement	PASS	N/A	
15.207	RSS-GEN 7.2.4	Conducted Emission	N/A	N/A	
15.205	RSS-GEN 7.2.2	Restricted Bands	PASS	N/A	
15.247(a)(2)	RSS 247 5.2 (1)	6dB Bandwidth	PASS	N/A	
15.247(b)	RSS 247 5.4 (4)	Peak Output Power	PASS	N/A	
15.247(e)	RSS 247 5.2 (2)	Power Spectral Density	PASS	N/A	
15.247(d)	RSS 247 5.5	Transmitter Radiated Spurious Emission	PASS	N/A	

Note: "/" for no requirement for this test item.

N/A is an abbreviation for Not Applicable.



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3. Test Equipment

Conducted Emission Test						
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date	
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Aug. 07, 2015	Aug. 06, 2016	
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Aug. 07, 2015	Aug. 06, 2016	
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Aug. 07, 2015	Aug. 06, 2016	
LISN	Rohde & Schwarz	ENV216	101131	Aug. 07, 2015	Aug. 06, 2016	
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date	
Radiation	Emission Tes	t			T	
Spectrum Analyzer	Agilent	E4407B	MY45106456	Aug. 29, 2015	Aug. 28, 2016	
EMI Test Receiver	Rohde & Schwarz	ESCI	100010/007	Aug. 07, 2015	Aug. 06, 2016	
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 28, 2015	Mar. 27, 2016	
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar. 28, 2015	Mar. 27, 2016	
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 28, 2015	Mar. 27, 2016	
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar. 28, 2015	Mar. 27, 2016	
Pre-amplifier	Sonoma	310N	185903	Mar. 28, 2015	Mar. 27, 2016	
Pre-amplifier	HP	8447B	3008A00849	Mar. 28, 2015	Mar. 27, 2016	
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 28, 2015	Mar. 27, 2016	
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A	



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4. Conducted Emission Test

4.1 Test Standard and Limit

4.1.1Test Standard FCC Part 15.207

4.1.2 Test Limit

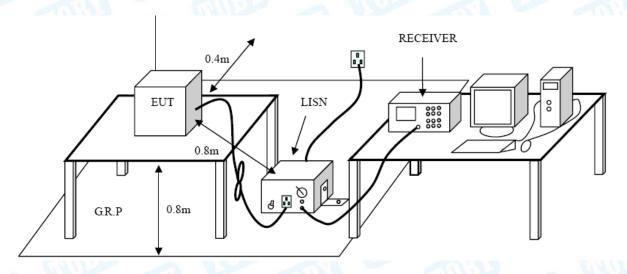
Conducted Emission Test Limit

THE FRANCE OF THE PARTY OF THE	Maximum RF Line	e Voltage (dBμV)
Frequency	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Notes:

- (1) *Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2 Test Setup



4.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.



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I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN at least 80 cm from nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

4.4 EUT Operating Mode

Please refer to the description of test mode.

4.5 Test Data

The EUT is powered by Lithium Battery, no requirement for this test item.



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5. Radiated Emission Test

5.1 Test Standard and Limit

5.1.1 Test Standard FCC Part 15.209

5.1.2 Test Limit

Radiated Emission Limits (9kHz~1000MHz)

Frequency (MHz	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Radiated Emission Limit (Above 1000MHz)

Frequency	Class A (dBuV	/m)(at 3 M)	Class B (dBuV/m)(at 3 M)			
(MHz)	Peak	Average	Peak	Average		
Above 1000	80	60	74	54		

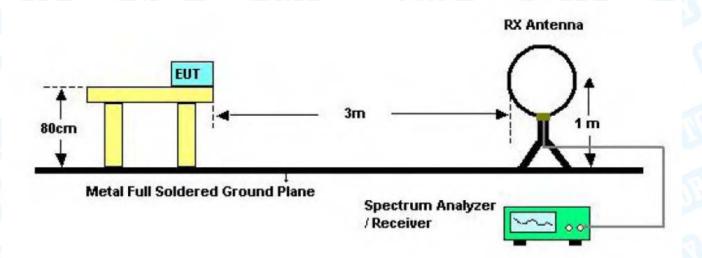
Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level(dBuV/m)=20log Emission Level(uV/m)

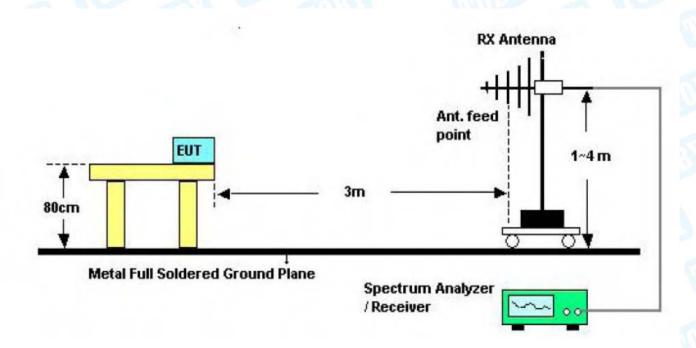


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5.2 Test Setup



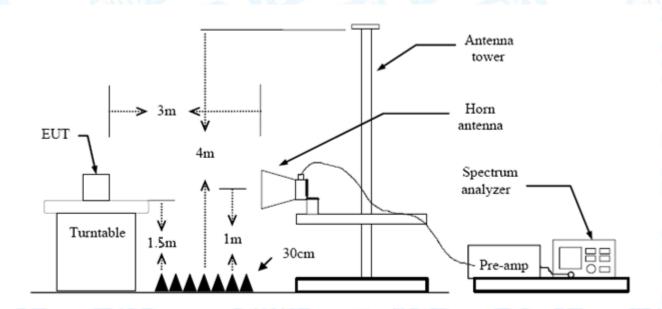
Below 30MHz Test Setup



Below 1000MHz Test Setup



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Above 1GHz Test Setup

5.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.



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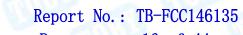
5.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

5.5 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=1 kHz with Peak Detector for Average Values.

Test data please refer the following pages.





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EUT:		IonBe	eacon		Model:		TON91	80	
empera	ature:	25 ℃		10	Relative F	lumidity:	55%		
est Vol	tage:	DC 3	V	100	11	(III)	13.9		
nt. Pol		Horiz	ontal	Alle		100		MI.	
est Mo	de:	BLE	TX 2402 Mc	de	MILE		1 111	A STATE OF THE PARTY OF THE PAR	
Remark:		Only	worse case	is reported		CITIES !	3		
80.0 dBuV	//m								
						(RF)FCC 150	3M Radiation		
							Margin -6	dB	
30								6	
						5 X	Contraction of the contraction o	nt.lum	
1 X		2	3		a purchase of the same	mandality liveled to low man	Marie		
Mary Diago	hame and	ريد لياكس رييس	an want of soll or who have from	المعياد بالمعادية المعادية المعادية	a remain to the remaining the first of				
	-	We the second							
20 30.000	40 50	0 60 70	80	(MHz)	300	400 500	600 700	1000.00	
			Dandina		N.1				
No. N	Лk. I	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detecto	
1		.8823	28.46	-16.98	11.48				
·						40.00	-28.52	peak	
2		.8031	31.94	-23.99	7.95	40.00	-32.05	peak	
3	112	2.5242	28.65	-22.03	6.62	43.50	-36.88	peal	
4	290	0.0172	28.59	-17.28	11.31	46.00	-34.69	peal	
5	459	9.1143	31.43	-12.15	19.28	46.00	-26.72	peak	
6 *		3.3170	29.40	-6.42	22.98	46.00	-23.02	peak	
		2.0170	20.70	V.72	22.00	10.00	20.02	pour	
*-84	1-4		Transport 1	-					
*:Maximur	n data	x:Over limit	!:over margin						



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4.1		-	
М	4 🙈	1	
	A W		
			7

EUT:	IonBeacon	a WW	Model:	TON9108		
Temperature:	25 ℃	13	Relative Humidity:	55%		
Test Voltage:	DC 3V			339		
Ant. Pol.	Vertical	Alte	1			
Test Mode:	BLE TX 2402 Mod	de		ABUL		
Remark:	Only worse case	is reported				
80.0 dBuV/m						
			(RF)FCC 15C	3M Radiation		
				Margin -6 dB		
30						
			6			
1.			5 5 5 5 5 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8	the property of the same of th		
Marchan Marchander	2	3 4	in the Control Market State of the Control of the C			
Market Comm	may the work who to the property the same of the same	Ar Fr				
-20						
30.000 40 50	60 70 80	(MHz)	300 400 500	600 700 1000.000		
	Reading	Correct	Measure-			
No. Mk. Fre	eq. Level	Factor	ment Limit	O∨er		
MH	Hz dBu∨	dB/m	dBuV/m dBuV/m	dB Detecto		
1 34.88	823 28.09	-16.98	11.11 40.00	-28.89 peal		
2 62.87	708 27.89	-24.26	3.63 40.00	-36.37 peal		
3 132.2	2205 29.64	-22.13	7.51 43.50	-35.99 peal		
4 192.4	185 28.29	-20.78	7.51 43.50	-35.99 peal		
5 359.1	859 28.43	-14.55	13.88 46.00	-32.12 peal		
6 * 524.5	5540 29.36	-10.17	19.19 46.00	-26.81 peal		
				•		



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No. Mk. Freq. Reading Correct Measure—Factor ment Limit Over MHz dBuV dBuV dBuV/m dBuV/m dB December			
Ant. Pol.	55%		
BLE TX 2442 Mode			
Remark: Only worse case is reported 0.0 dBuV/m			
80.0 dBiwV/m (REFECT 15C 3M Radiation Margin 6 dB 200 000 400 500 600 700 11 No. Mk. Freq. Reading Level Factor Measure—Factor ment Limit Over MHz dBuV dB/m dBuV/m dBuV/m dB 000 000 000 000 000 000 000 000 000			
No. Mk. Freq. Reading Correct Measure Factor ment Limit Over			
No. Mk. Freq. Reading Level Factor Measure— Factor Measure— MHz dBuV dB/m dBuV/m dBuV/m dB De 1 34.8823 28.46 -16.98 11.48 40.00 -28.52 p 2 65.8031 31.94 -23.99 7.95 40.00 -32.05 p 3 131.2965 29.14 -22.15 6.99 43.50 -36.51 p 4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p 6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p			
No. Mk. Freq. Reading Level Factor Measure— Factor Measure— MHz dBuV dB/m dBuV/m dBuV/m dB De 1 34.8823 28.46 -16.98 11.48 40.00 -28.52 p 2 65.8031 31.94 -23.99 7.95 40.00 -32.05 p 3 131.2965 29.14 -22.15 6.99 43.50 -36.51 p 4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p 6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p			
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No. Mk. Freq. Level Factor Measure— No. Mk. Freq. Level Factor Measure— Limit Over	4		
No. Mk. Freq. Level Factor Measure—	1		
No. Mk. Freq. Level Factor Measure—			
No. Mk. Freq. Reading Level Factor Measurement Limit Over MHz dBuV dBm dBuVm dBuVm dB De	i Innu		
No. Mk. Freq. Reading Level Factor Measure— Factor ment Limit Over MHz			
No. Mk. Freq. Reading Level Correct Factor Measure Factor Limit Over 1 34.8823 28.46 -16.98 11.48 40.00 -32.05 p 2 65.8031 31.94 -23.99 7.95 40.00 -32.05 p 3 131.2965 29.14 -22.15 6.99 43.50 -36.51 p 4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p *:Maximum data x:Over limit !:over margin !:over margin !:over margin	+		
No. Mk. Freq. Reading Level Correct Factor Measure Factor Limit Over 1 34.8823 28.46 -16.98 11.48 40.00 -32.05 p 2 65.8031 31.94 -23.99 7.95 40.00 -32.05 p 3 131.2965 29.14 -22.15 6.99 43.50 -36.51 p 4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p *:Maximum data x:Over limit !:over margin !:over margin !:over margin	\perp		
No. Mk. Freq. Reading Level Correct Factor Measure Factor Limit Over 1 34.8823 28.46 -16.98 11.48 40.00 -32.05 p 2 65.8031 31.94 -23.99 7.95 40.00 -32.05 p 3 131.2965 29.14 -22.15 6.99 43.50 -36.51 p 4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p 6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p *:Maximum data x:Over limit !:over margin			
No. Mk. Freq. Reading Level Correct Factor ment Measure ment Limit Over 1 34.8823 28.46 -16.98 11.48 40.00 -28.52 p 2 65.8031 31.94 -23.99 7.95 40.00 -32.05 p 3 131.2965 29.14 -22.15 6.99 43.50 -36.51 p 4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p 6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p *:Maximum data x:Over limit !:over margin	1000.00		
No. Mk. Freq. Level Factor ment Limit Over MHz dBuV dBuV dBuV/m d	1000.00		
1 34.8823 28.46 -16.98 11.48 40.00 -28.52 p 2 65.8031 31.94 -23.99 7.95 40.00 -32.05 p 3 131.2965 29.14 -22.15 6.99 43.50 -36.51 p 4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p 6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p *:Maximum data x:Over limit !:over margin			
2 65.8031 31.94 -23.99 7.95 40.00 -32.05 p 3 131.2965 29.14 -22.15 6.99 43.50 -36.51 p 4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p 6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p *:Maximum data x:Over limit !:over margin	etecto		
3 131.2965 29.14 -22.15 6.99 43.50 -36.51 p 4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p 6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p *:Maximum data x:Over limit !:over margin	peak		
4 249.4250 28.42 -18.15 10.27 46.00 -35.73 p 5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p 6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p *:Maximum data x:Over limit !:over margin	peak		
5 449.5557 31.45 -12.47 18.98 46.00 -27.02 p 6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p *:Maximum data x:Over limit !:over margin	peak		
6 * 872.1832 30.04 -6.10 23.94 46.00 -22.06 p	peak		
*:Maximum data x:Over limit !:over margin	peak		
	peak		
Emission Lavel- Paad Lavelt Correct Factor			
inission Level- Nead Level+ Correct I actor			



19 of 44 Page:



EUT:			IonB	eacon			Model:		TON91	80
Tempe	ratur	e:	25 °C	0		33	Relative	Humidity:	55%	The same
Test Vo	ltag	e:	DC 3	V	300	100	11	TIE	13.9	
Ant. Po	ol.		Vertic	cal		BROK				
Test Mo	ode:		BLE	TX 24	42 Mc	ode	THE		* A7	1 Lane
Remark	k:		Only	worse	case	is reported			9	
80.0 dBu	uV/m									
								(RF)FCC 150	3M Radiation	
									Margin -6	dB
				_						
30										
								5 , ,	6	and makes
Marrie also					2	3	4 X	sourtail to a sugar the good	-VMV/r-	
Anti-rite	^{ho} leyhyyyylley	Well white decree	- X	i de brilligher digitalis	all through the	3 malificipaliste Statements	AND AND STREET AND STREET STREET			
20										
30.000	40	50	60 70	80		(MHz)	300	400 500	600 700	1000.00
				Read	dina	Correct	Measure-			
No.	Mk.	Fr	eq.	Lev	_	Factor	ment	Limit	O∨er	
		MH	⊣z	dBu	ıV	dB/m	dBuV/m	dBuV/m	dB	Detecto
1		63.9	827	29.	10	-24.16	4.94	40.00	-35.06	peak
2		100.2	2286	29.	01	-21.82	7.19	43.50	-36.31	peak
3		164.9	9071	28.	59	-20.84	7.75	43.50	-35.75	peak
4		283.9	9791	28.	35	-17.40	10.95	46.00	-35.05	peak
•		396.2	2412	28.	31	-13.05	15.26	46.00	-30.74	peak
5			3052	- 20	57	-7.13	21.44	46.00	-24.56	peak
				- 20	57	-7 13	21 44	46 00	-24 56	ne



TOBY

UT:	IonBe	eacon	Model:		TON9108			
Temperature:	25 ℃	CIN'		Relative H	55%			
Test Voltage:	DC 3	V	100	18	(III)	339		
Ant. Pol.	Horiz	ontal	ART		1 62		21	
Test Mode:	BLE	TX 2480 Mc	de	THE PARTY OF		1 111	1 leader	
Remark:	Only	worse case	is reported		CITE OF	3		
80.0 dBuV/m								
					(RF)FCC 15C	3M Radiation		
						Margin -6 (
30								
					5 	6	Marine	
Manufally 1		2	3 X	a complete for the second of the formation	i Grafishallandalffillanan	1		
The state of the s	Mary Mary Mary Mary Mary Mary Mary Mary	A CONTRACTOR AND A CONT	hadamilkahand	Winds				
20								
30.000 40	50 60 70	80	(MHz)	300	400 500	600 700	1000.00	
		Reading	Correct	Measure-				
No. Mk.	Freq.	Level	Factor	ment	Limit	O∨er		
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detecto	
1 4	3.0504	27.61	-21.45	6.16	40.00	-33.84	peal	
2 1	12.5241	28.65	-22.03	6.62	43.50	-36.88	peal	
	59.7844	29.39	-20.52	8.87	43.50	-34.63	peal	
	44.3854	28.12	-14.96	13.16	46.00	-32.84	peal	
	40.1963	31.14	-12.64	18.50	46.00	-27.50		
							peal	
	31.9202	28.44	-7.12	21.32	46.00	-24.68	peal	
6 * 73								



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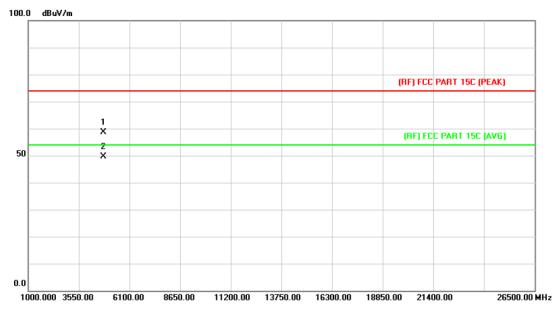
ММ	JRA	
	JDI	

EUT:			lor	nBe	aco	n		9	11/4	Mc	odel:					TOI	N 91	80	
Гетре	ratur	e:	25	°C		FT		13		Re	Relative Humidity:				55%				
Test Vo	oltag	e:	DC	C 3V	/								6						A
Ant. Po	ol.		Ve	ertica	al			N	HIL								A		
Test M	ode:		BL	E T	X 2	2480	0 Mo	de		- 5					A			طر	
Remar	k:		Or	าly v	vors	se c	case	is re	ported										- 1
80.0 dB	uV/m																		_
													(RF)	FCC 1	15C 3		liation gin -6		$\overline{}$
					T.											Mai	Jin -6	ав	Ħ
										_									4
30					H	H													+
				_										5 X	اسماد	الماميماليل	₩.~ 6	والمالية	No.
Wast of			1			Ш	2		3		4 X	الميامين البراقية	Moderal	piggalbha)	pptrophy				
Anti-Anti-	Manya Mayarile	Makenhalan	Amaria Aria	mbride	or high the	g despert	Mondow	motherisadele	- Xymyd	Harristan Arriva									
						П													
20						П													
30.000	40	50	60	70	80				(MHz)		30	00	400	5	500	600	700	100	00.000
					Re	-adi	ing	Co	rrect	Mea	asure								
No.	Mk.	F	req.			eve	_		actor		ent		Lim	it	1	0ve	er		
		M	1Hz		С	dBu\	V	dE	3/m	dE	Bu∀/m		dBu	V/m		dB		Det	ecto
1		63.9	9827	,	2	9.1	0	-24	4.16	4	1.94		40	.00	-	35.	06	р	eak
2		104.	903	3	2	8.3	2	-2′	1.84	6	3.48		43	.50	-	37.	02	р	eak
3		164.	907	1	2	8.5	9	-20	0.84	7	7.75		43	.50	-	35.	75	р	eak
		283.	979	1	2	8.3	5	-17	7.40	1	0.95		46	.00	-	35.	05	р	eak
4				<u> </u>	2	9.3	4	-11	1.70	1	7.64		46	.00	-	28.	36	р	eak
5		472.	1/5	9															



Report No.: TB-FCC146135
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EUT:	IonBeacon	Model:	TON9108						
Temperature:	25 °C Relative Humidity: 55%								
Test Voltage:	DC 3V								
Ant. Pol.	Horizontal								
Test Mode:	BLE Mode TX 2402 MHz	BLE Mode TX 2402 MHz							
Remark:	No report for the emission v	which more than 10 dB be	low the						
	prescribed limit.	- 13 W							



No	. Mk	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.802	45.25	13.44	58.69	74.00	-15.31	peak
2	*	4803.958	36.23	13.44	49.67	54.00	-4.33	AVG



23 of 44 Page:

EUT:	IonBeacon Model: TON9108							
Temperature:	25 ℃	Relative Humidity:	55%					
Test Voltage:	DC 3V							
Ant. Pol.	Vertical							
Test Mode:	BLE Mode TX 2402 MHz							
Remark:	No report for the emission which more than 10 dB below the prescribed limit.							

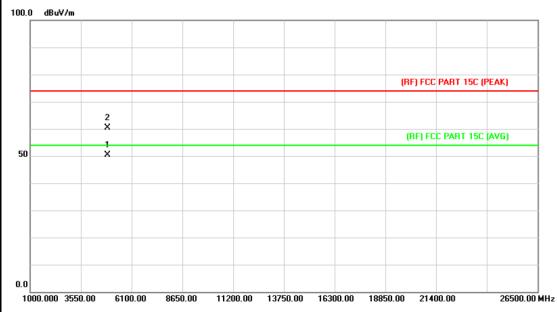


No	o. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.354	45.96	13.44	59.40	74.00	-14.60	peak
2	*	4803.647	35.73	13.44	49.17	54.00	-4.83	AVG



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EUT:	IonBeacon	Model:	TON9108				
Temperature:	25 ℃	Relative Humidity:	55%				
Test Voltage:	DC 3V	The state of	339				
Ant. Pol.	Horizontal	Horizontal					
Test Mode:	BLE Mode TX 2442 MHz		HILL				
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

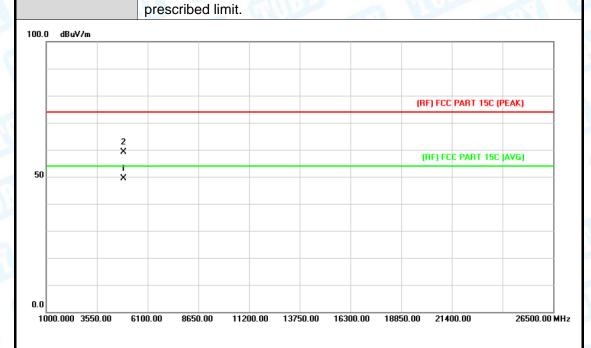


No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4883.931	36.42	13.92	50.34	54.00	-3.66	AVG
2		4884.024	46.39	13.92	60.31	74.00	-13.69	peak



25 of 44 Page:

		1:00	
EUT:	IonBeacon	Model:	TON9108
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3V	TIES EN	339
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2442 MHz		HILL
Remark:	No report for the emission w	hich more than 10 dB be	elow the

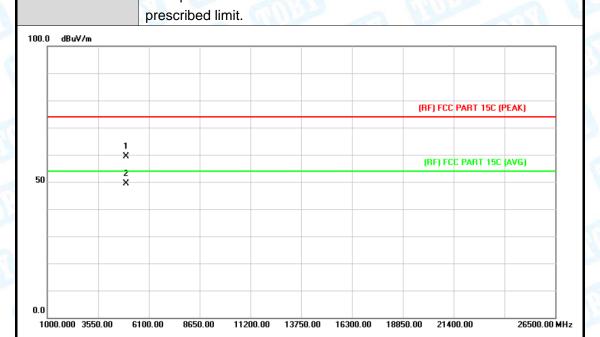


No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4883.664	35.43	13.92	49.35	54.00	-4.65	AVG
2		4884.312	45.29	13.92	59.21	74.00	-14.79	peak



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EUT:	IonBeacon	Model:	TON9108					
Temperature:	25 ℃	Relative Humidity:	55%					
Test Voltage:	DC 3V	ma -						
Ant. Pol.	Horizontal							
Test Mode:	BLE Mode TX 2480 MHz	BLE Mode TX 2480 MHz						
Remark:	No report for the emission when	No report for the emission which more than 10 dB below the						

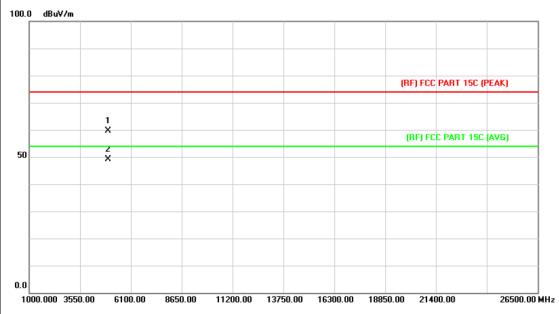


No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.400	44.93	14.36	59.29	74.00	-14.71	peak
2	*	4959.592	34.90	14.36	49.26	54.00	-4.74	AVG



Report No.: TB-FCC146135
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EUT:	IonBeacon	Model:	TON9108			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	DC 3V	The same	339			
Ant. Pol.	Vertical					
Test Mode:	BLE Mode TX 2480 MHz		HILL			
Remark:	No report for the emission which more than 10 dB below the					
	prescribed limit.	- W				



No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.357	45.28	14.36	59.64	74.00	-14.36	peak
2	*	4959.674	34.88	14.36	49.24	54.00	-4.76	AVG



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6. Restricted Bands Requirement

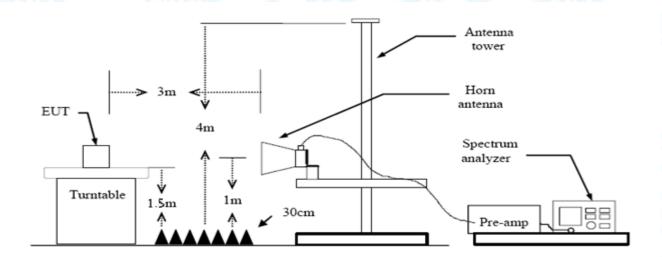
6.1 Test Standard and Limit

6.1.1 Test Standard FCC Part 15.209 FCC Part 15.205

6.1.2 Test Limit

Restricted Frequency	Class B (dB	suV/m)(at 3 M)
Band (MHz)	Peak	Average
2310 ~2390	74	54
2483.5 ~2500	74	54

6.2 Test Setup



6.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked



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and then Quasi Peak detector mode re-measured.

- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 KHz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.

6.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

6.5 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=1kHz with Peak Detector for Average Values.

Test data please refer the following pages.

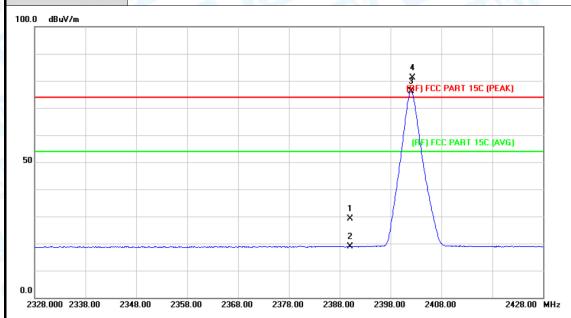




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(1) Radiation Test

EUT:	IonBeacon	Model:	TON9108				
Temperature:	25 ℃	Relative Humidity:	55%				
Test Voltage:	DC 3V	DC 3V					
Ant. Pol.	Horizontal		MAIL				
Test Mode:	BLE Mode TX 2402 MHz	BLE Mode TX 2402 MHz					
Remark:	N/A						

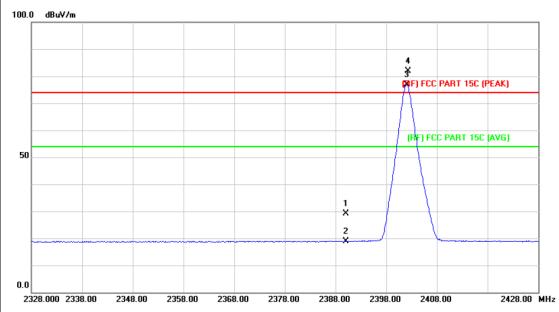


No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	28.45	0.77	29.22	74.00	-44.78	peak
2		2390.000	18.20	0.77	18.97	54.00	-35.03	AVG
3	*	2402.000	75.30	0.82	76.12	Fundamental Frequency		AVG
4	Χ	2402.300	80.27	0.82	81.09	Fundamental	Frequency	peak



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EUT:	IonBeacon	Model:	TON9108	
Temperature:	25 ℃	Relative Humidity:	55%	
Test Voltage:	DC 3V		33	
Ant. Pol.	Vertical			
Test Mode:	BLE Mode TX 2402 MHz			
Remark:	N/A			



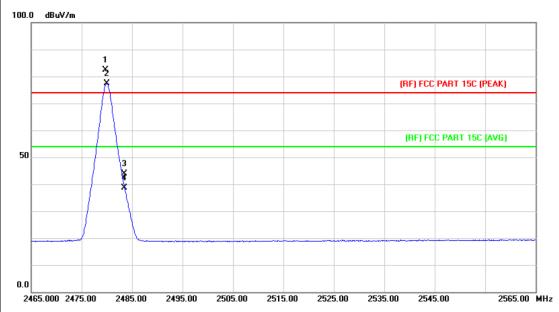
No.	Mk.	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	28.34	0.77	29.11	74.00	-44.89	peak
2		2390.000	18.18	0.77	18.95	54.00	-35.05	AVG
3	*	2402.000	76.07	0.82	76.89	Fundamental	Frequency	AVG
4	Х	2402.300	81.07	0.82	81.89	Fundamental	Frequency	peak



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EUT:	IonBeacon Model: TON9108				
Temperature:	25 ℃	Relative Humidity:	55%		
Test Voltage:	DC 3V				
Ant. Pol.	Horizontal				
Test Mode:	BLE Mode TX 2480 MHz				
Remark:	N/A				



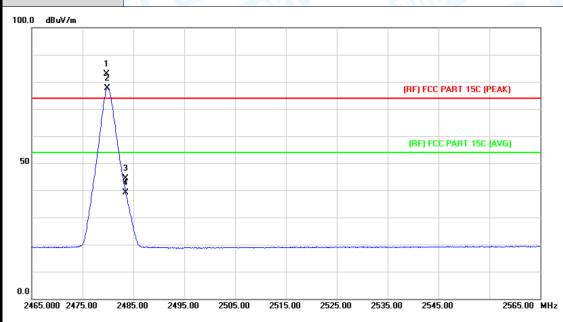
No.	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Χ	2479.700	81.21	1.15	82.36	Fundamental F	requency	peak
2	*	2480.000	76.26	1.15	77.41	Fundamental F	requency	AVG
3		2483.500	42.74	1.17	43.91	74.00	-30.09	peak
4		2483.500	37.49	1.17	38.66	54.00	-15.34	AVG



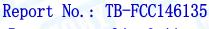
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The Course			1:33
EUT:	IonBeacon	Model:	TON9108
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3V		39
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2480 MHz		A B C

Remark: N/A



No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	2479.700	81.61	1.15	82.76	Fundamental F	requency	peak
2	*	2479.900	76.57	1.15	77.72	Fundamental F	requency	AVG
3		2483.500	43.09	1.17	44.26	74.00	-29.74	peak
4		2483.500	37.92	1.17	39.09	54.00	-14.91	AVG

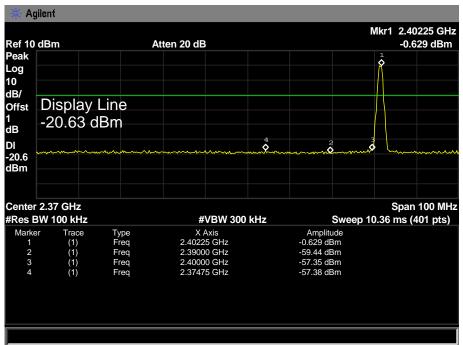


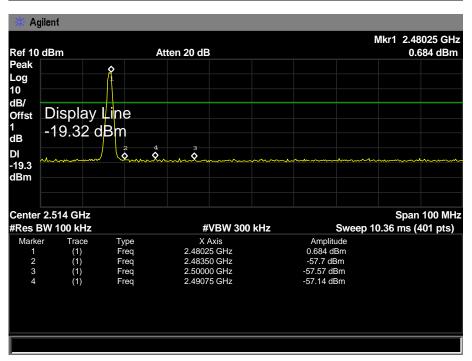


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(2) Conducted Test

EUT:	IonBeacon Model: TON9108			
Temperature:	25 °C Relative Humidity: 55%			
Test Voltage:	DC 3V			
Test Mode:	BLE Mode TX 2402MHz / BLE Mode TX 2480MHz			
Remark:	The EUT is programed in con	tinuously transmitting mod	le	







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7. Bandwidth Test

7.1 Test Standard and Limit

7.1.1 Test Standard FCC Part 15.247 (a)(2)

7.1.2 Test Limit

FCC Part 15 Subpart C(15.247)/RSS-247				
Test Item	Limit	Frequency Range(MHz)		
Bandwidth	>=500 KHz (6dB bandwidth)	2400~2483.5		

7.2 Test Setup



7.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) The bandwidth is measured at an amplitude level reduced 6dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.
- (3)Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:100 kHz, and Video Bandwidth:300 kHz, Detector: Peak, Sweep Time set auto.

7.4 EUT Operating Condition

The EUT was set to continuously transmitting in each mode and low, middle and high channel for the test.





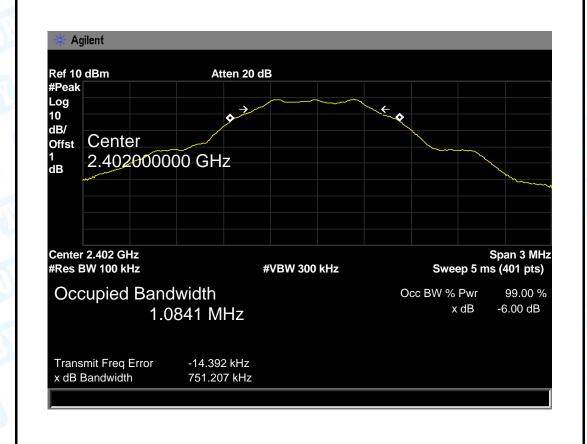
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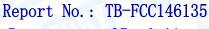
7.5 Test Data

EUT:	IonBeacon		Model:	TON9108
Temperature:	25 ℃		Relative Humidity:	55%
Test Voltage:	DC 3V			A STORES
Test Mode:	BLE TX Mode			
Channel frequency		6dB Bandwidth	99% Bandwidth	Limit
(MHz)		(kHz)	(kHz)	(kHz)
2402		751.207	1084.10	
2442		748.874	1083.90	>=500
2480		751.753	1083.20	
		PLE Mod	0	•

BLE Mode

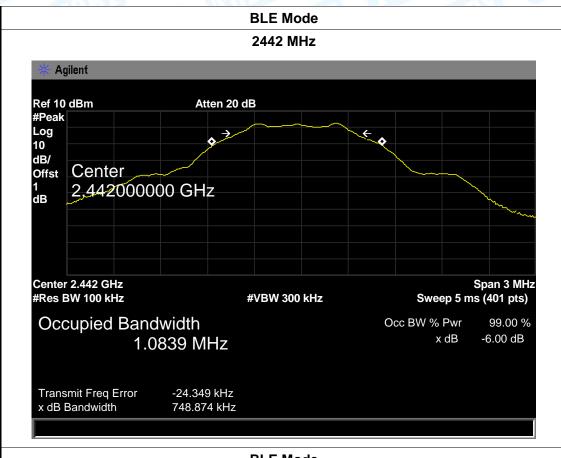
2402 MHz

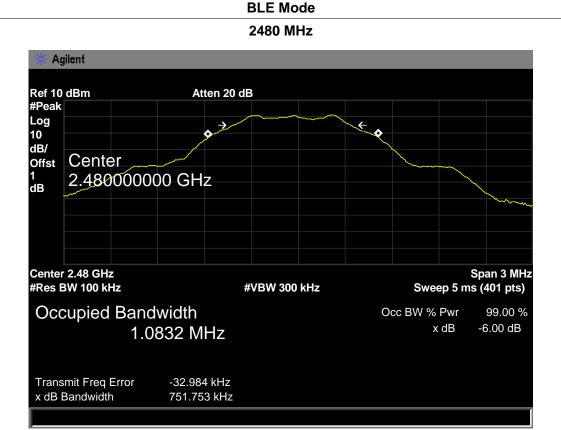






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8. Peak Output Power Test

8.1 Test Standard and Limit

8.1.1 Test Standard FCC Part 15.247 (b)

8.1.2 Test Limit

FCC Part 15 Subpart C(15.247)/RSS-247				
Test Item	Limit	Frequency Range(MHz)		
Peak Output Power	1 Watt or 30 dBm	2400~2483.5		

8.2 Test Setup



8.3 Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement is according to section 9.1.1 of KDB 558074 D01 DTS Meas Guidance v03r03.

- (1) Set the RBW≥DTS Bandwidth
- (2) Set VBW≥3*RBW
- (3) Set Span≥3*RBW
- (4) Sweep time=auto
- (5) Detector= peak
- (6) Trace mode= maxhold.
- (7) Allow trace to fully stabilize, and then use peak marker function to determine the peak amplitude level.

8.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.



ı dB

M1 S2 S3 FC AA

Center 2.402 GHz #Res BW 1 MHz

Marker

0.159 dBm

2.402195000 GHz

Report No.: TB-FCC146135

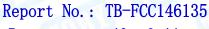
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8.5 Test Data

Temperature: 25 °C Relative Humidity: 55% Test Voltage: DC 3V Test Mode: Channel frequency (MHz) Test Result (dBm) Limit (dBm) 2402 0.159 30 2442 -0.327 30 2480 0.898 BLE Mode 2402 MHz	EUT:	IonBeacor		Model:		TON9108
Test Mode: BLE TX Mode Channel frequency (MHz) Test Result (dBm) Limit (dBm) 2402 0.159 2442 -0.327 30 2480 0.898 BLE Mode	Temperature:	25 ℃		Relative H	lumidity:	55%
Channel frequency (MHz) Test Result (dBm) Limit (dBm) 2402 0.159 30 2442 -0.327 30 2480 0.898 BLE Mode	Test Voltage:	DC 3V	11:33	Miller		A PROPERTY.
2402 0.159 2442 -0.327 2480 0.898 BLE Mode	Test Mode:	BLE TX M	ode		CITE)
2442 -0.327 30 2480 0.898 BLE Mode	Channel freque	ncy (MHz)	Test Resul	t (dBm)	Lim	nit (dBm)
2480 0.898 BLE Mode	2402		0.15	9		
BLE Mode	2442		-0.327		30	
	2480		0.898			
2402 MHz		·	RIEM	ode		
			DEE IVI	oue		
* Agilent	Agilent					
Mkr1 2.4021950 GHz			2402 N		Mkr1	
# Agilent Mkr1 2.4021950 GHz Ref 10 dBm	Ref 10 dBm		2402 N	1Hz	Mkr1	

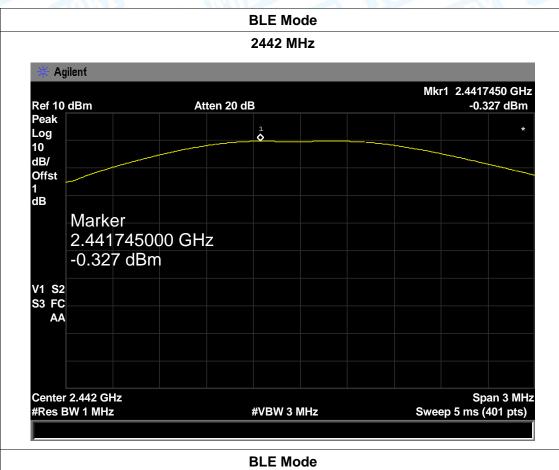
#VBW 3 MHz

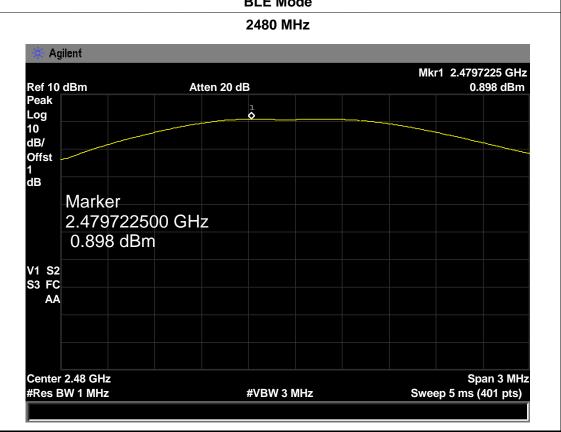
Span 3 MHz Sweep 5 ms (401 pts)





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9. Power Spectral Density Test

9.1 Test Standard and Limit

9.1.1 Test Standard FCC Part 15.247 (e)

9.1.2 Test Limit

FCC Part 15 Subpart C(15.247)					
Test Item	Limit	Frequency Range(MHz)			
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5			

9.2 Test Setup



9.3 Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v03r03.

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Set analyser center frequency to DTS channel center frequenyc.
- (3) Set the span to 1.5 times the DTS bandwidth.
- (4) Set the RBW to: 3 kHz(5) Set the VBW to: 10 kHz
- (6) Detector: peak(7) Sweep time: auto
- (8) Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

9.4 EUT Operating Condition

The EUT was set to continuously transmitting in each mode and low, Midle and high channel for the test.

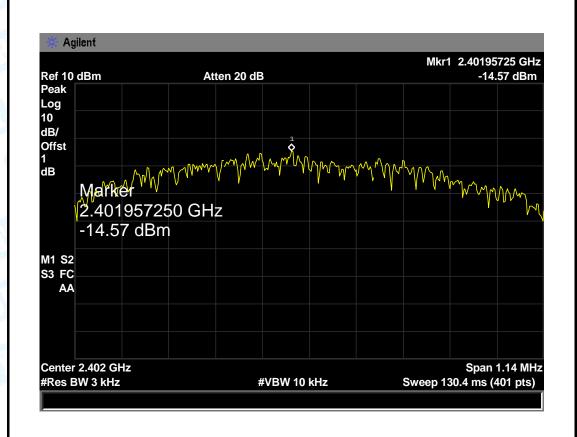


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8.5 Test Data

EUT:	IonBeacon		Model:	TON9108	
Temperature:	25 ℃		Relative Humidity:	55%	
Test Voltage:	DC 3V				
Test Mode:	BLE TX Mode			A Charles	
Channel Frequency		Power Dens	sity	Limit	
(MHz)		(3 kHz/dBı	m)	(dBm)	
2402		-14.57			
2442		-11.84		8	
2480		-13.22			
		BI F Mod	<u> </u>		

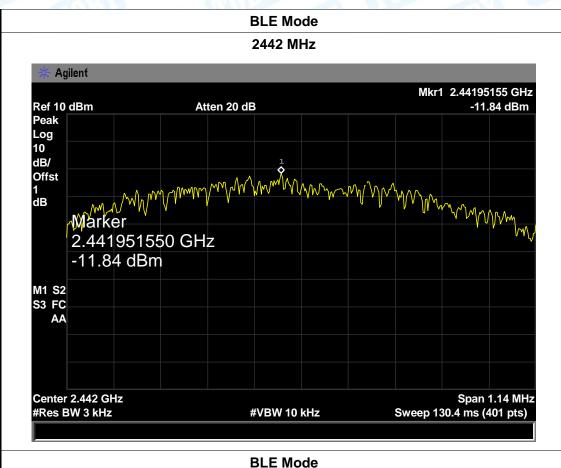
2402 MHz

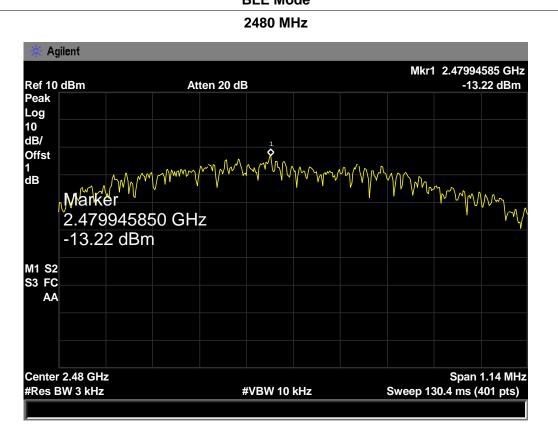






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10. Antenna Requirement

10.1 Standard Requirement

10.1.1 Standard FCC Part 15.203

10.1.2 Requirement

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.

10.2 Antenna Connected Construction

The directional gains of the antenna used for transmitting is 3 dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

10.3 Result

The EUT antenna is a PCB Antenna. It complies with the standard requirement.

Antenna Type		
	▼ Permanent attached antenna	
Miller	□ Unique connector antenna	
on BB	□ Professional installation antenna	