

APPLICATION CERTIFICATION FCC Part 15C On Behalf of Hobbico Inc

TTX850 8-Channel 2.4GHz Transmitter Model No.: TACJ2850

FCC ID: IYFTTX850

Prepared for Address Prepared by Address	•	Hobbico Inc 2904 Research Road Champaign, IL USA 61821 ACCURATE TECHNOLOGY CO., LTD F1, Bldg. A, Chan Yuan New Material Port, Keyuan Rd. Science & Industry Park, Nan Shan, Shenzhen, Guangdong P.R. China
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Date of Report	:	Mar 30, 2014



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Test Report Certification

Applicant& address Manufacturer&	:	Hobbico Inc 2904 Research Road Champaign, IL USA 61821 Shanghai Nine Eagles Electronic Technology Co.,Ltd			
address		No.818, FengRao Road, Maiu town, Jiading District, Shanghai, China			
Product	:	TTX850 8-Channel 2.4GHz Transmitter			
Model No.	:	TACJ2850			
Trade name	:	TACTIC			

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247 ANSI C63.4: 2009

The device described above is tested by ACCURATE TECHNOLOGY CO. LTD to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and ACCURATE TECHNOLOGY CO. LTD is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of ACCURATE TECHNOLOGY CO. LTD.

Date of Test :

Prepared by :

Mar 13, 2014- Mar 30, 2014

7im Zhane

(Tim.zhang, Engineer)

Approved & Authorized Signer :

(Sean Liu, Manager)



1. GENERAL INFORMATION

1.1. Description of Device (EUT)

The submitted sample is a TTX850 8-Channel 2.4GHz Transmitter. The sample is powered by DC 6.0V (Powered by battery).

		TTX850 8-Channel 2.4GHz Transmitter
Frequency Range	:	2.403-2.479GHz
Channel Spacing	:	1MHz
Number of Channels	:	77
Modulation Type	:	GFSK
Type of Antenna	:	Integral Antenna
Max antenna gain	:	2.0dBi
Power Supply	:	DC 6.0V(Powered by battery)

1.2. Special Accessory and Auxiliary Equipment

N/A

1.3. Description of Test Facility

EMC Lab	:	Accredited by TUV Rheinland Shenzhen
		Listed by FCC The Registration Number is 752051
		Listed by Industry Canada The Registration Number is 5077A-2
		Accredited by China National Accreditation Committee for Laboratories The Certificate Registration Number is L3193
Name of Firm Site Location	:	ACCURATE TECHNOLOGY CO. LTD F1, Bldg. A, Changyuan New Material Port, Keyuan Rd. Science & Industry Park, Nanshan, Shenzhen, Guangdong P.R. China



1.4. Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	=	4.06dB, k=2



2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Туре	S/N	Calibrated dates	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 11, 2014	Jan. 10, 2015
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 11, 2014	Jan. 10, 2015
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 11, 2014	Jan. 10, 2015
Pre-Amplifier	Rohde&Schwarz	CBLU118354 0-01	3791	Jan. 11, 2014	Jan. 10, 2015
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 15, 2014	Jan. 14, 2015
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 15, 2014	Jan. 14, 2015
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 15, 2014	Jan. 14, 2015
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 15, 2014	Jan. 14, 2015
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 11, 2014	Jan. 10, 2015
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 11, 2014	Jan. 10, 2015
Highpass Filter	Wainwright	WHKX3.6/18	N/A	Jan. 11, 2014	Jan. 10, 2015
	Instruments	G-1022	NT (A	T 11 2011	I 10 0015
Band Reject Filter	Wainwright	WRCG2400/2	N/A	Jan. 11, 2014	Jan. 10, 2015
	Instruments	485-2375/2510			
		-60/11SS			



3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: **Transmitting mode** Low Channel: 2403MHz

Middle Channel: 2442MHz High Channel: 2479MHz

3.2. Configuration and peripherals

EUT	
Figure 1 Setup: Transmitting mode	



4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.207	Power Line Conducted Emission	N/A
Section 15.247(a)(1)	20dB Bandwidth Test	Compliant
Section 15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
Section 15.247(a)(1)	Channel Separation Test	Compliant
Section 15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
Section 15.247(b)(1)	Maximum Peak Output Power Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.247(d) Section 15.205 Section 15.209	Radiated Spurious Emission Test	Compliant
Section 15.247(d)	Conducted Spurious Emission Test	Compliant
Section 15.203	Antenna Requirement	Compliant

Remark: "N/A" means "Not applicable".



5. POWER LINE CONDUCTED MEASUREMENT

Frequency	Limit dB(μV)				
(MHz)	Quasi-peak Level	Average Level			
0.15 - 0.50	66.0 - 56.0 *	56.0 - 46.0 *			
0.50 - 5.00	56.0	46.0			
5.00 - 30.00	60.0	50.0			
NOTE1: The lower limit shall apply at the transition frequencies.					
NOTE2: The limit decreases linearly with the logarithm of the frequency in the					
range 0.15MHz to 0.50MHz.					

5.1. Power Line Conducted Emission Measurement Limits

5.2. Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

5.3.Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4: 2009 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

5.4. Power Line Conducted Emission Measurement Results

Not applicable



6. 20DB BANDWIDTH MEASUREMENT

6.1.Block Diagram of Test Setup



6.2. The Requirement For Section 15.247(a)(1)

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

6.3.EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4. Operating Condition of EUT

6.4.1.Setup the EUT and simulator as shown as Section 6.1.

6.4.2.Turn on the power of all equipment.

6.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz,2479MHz TX frequency to transmit.

6.5.Test Procedure

- 1. Set resolution bandwidth (RBW) = 30 kHz.
- 2. Set the video bandwidth (VBW) = 100 kHz.
- 3. Detector = Peak.
- 4. Trace mode = max hold.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.
- 7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.



6.6.Test Result

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	2403	0.560
40	2442	0.572
77	2479	0.556

The spectrum analyzer plots are attached as below.



Low Channel

Date: 25.MAR.2014 10:00:24



Middle Channel



Date: 25.MAR.2014 09:59:04



High Channel

Date: 25.MAR.2014 10:02:17



7. MAXIMUM PEAK OUTPUT POWER

7.1.Block Diagram of Test Setup



7.2. The Requirement For Section 15.247(a)(1)

Section 15.247(a)(1):) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

7.3.EUT Configuration on Measurement

The equipment is installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4. Operating Condition of EUT

- 7.4.1.Setup the EUT and simulator as shown as Section 7.1.
- 7.4.2.Turn on the power of all equipment.
- 7.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, 2479MHz TX frequency to transmit.

7.5.Test Procedure

- 7.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.
- 7.5.2.Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz.
- 7.5.3.Measurement the maximum peak output power.



7.6.Test Result

Test mode: Transmitting										
Channel	Frequency (MHz)	Peak Output Power (dBm)	Peak Output Power (W)	Limits dBm / W						
Low	2403	1.23	0.00133	30 dBm / 1 W						
Middle	2442	-0.51	0.00089	30 dBm / 1 W						
High	2479	-0.21	0.00095	30 dBm / 1 W						

The spectrum analyzer plots are attached as below.



Low Channel

Date: 25.MAR.2014 08:37:31



Middle Channel



Date: 25.MAR.2014 08:16:49



High Channel

Date: 25.MAR.2014 08:13:07



8. TIME OF OCCUPANCY (DWELL TIME)

8.1.Block Diagram of Test Setup



8.2. The Requirement For Section 15.247

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

8.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4. Operating Condition of EUT

- 8.4.1.Setup the EUT and simulator as shown as Section 8.1.
- 8.4.2.Turn on the power of all equipment.
- 8.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, 2479MHz TX frequency to transmit.

8.5.Test Procedure

- 8.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.
- 8.5.2.The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 * channel no. (s), the quantity of pulse was get from single sweep.

Dwell Time= time slot length * hope rate/ number of hopping channels * 30.8s



8.6.Test Result

Mode	Channel	Pulse Width (ms)	s) Dwell Time (S) Limit		Result						
	Low	2.94	0.0659	0.4	Pass						
	Middle	2.94	0.0659	0.4	Pass						
	High	0.4	Pass								
	400ms*77 hopping channels=30.8sec(Time of Occupancy Limit)										
TX	EUT transmi	itter has a channel h	opping rate of 56h	ops/s/slot							
	56hops/s/77=56/77=0.727hops/sec										
	0.727*30.8=22.4										
	0.98 *3=2.94										
Dwell Time=22.4*2.94=65.856ms											

The spectrum analyzer plots are attached as below.



Low Channel



Date: 25.MAR.2014 08:41:29



Date: 28.MAR.2014 16:22:45





Middle Channel

Date: 28.MAR.2014 16:21:22



Date: 28.MAR.2014 16:20:17





Date: 25.MAR.2014 08:43:28



Date: 28.MAR.2014 16:19:17



9. Channel Separation Test

9.1.Block Diagram of Test Setup



9.2. The Requirement For Section 15.247(a)1

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

9.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.4. Operating Condition of EUT

- 9.4.1.Setup the EUT and simulator as shown as Section 9.1.
- 9.4.2.Turn on the power of all equipment.
- 9.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, and 2479MHz TX frequency to transmit.

9.5.Test Procedure

- 9.5.1.Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.
- 9.5.2.Set the adjacent channel of the EUT maxhold another trace
- 9.5.3.Measure the channel separation.



9.6.Test Result

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result	
Low Channel	2403	1.004	0 560	Pass	
Adjacent Channel	2404	1.004	0.500		
Mid Channel	2442	1.002	0.572	Dece	
Adjacent Channel	2443	1.002	0.372	rass	
High Channel	2479	1.002	0.556	Daga	
Adjacent Channel	2478	1.002	0.556	Pass	

The spectrum analyzer plots are attached as below.



Low Channel







10.QUANTITY OF HOPPING CHANNEL TEST

10.1.Block Diagram of Test Setup



10.2. The Requirement For Section 15.247

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

10.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.4. Operating Condition of EUT

- 10.4.1.Setup the EUT and simulator as shown as Section 10.1.
- 10.4.2.Turn on the power of all equipment.
- 10.4.3.Let the EUT work in Hopping modes measure it. The transmit frequency are 2403-2479 MHz.

10.5.Test Procedure

- 10.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.
- 10.5.2.Set the EUT in hopping mode from first channel to last.
- 10.5.3.By using the Max-Hold function record the Quantity of the channel.



10.6.Test Result

Frequency Range (MHz)	Number of Hopping Channel	Limit		
2400-2483.5	77	≥ 15		

The spectrum analyzer plots are attached as below.



Date: 19.Mar.2014 18:35:44



11.BAND EDGE COMPLIANCE TEST

11.1.Block Diagram of Test Setup



11.2. The Requirement For Section 15.247

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

11.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

11.4.Operating Condition of EUT

- 11.4.1.Setup the EUT and simulator as shown as Section 11.1.
- 11.4.2.Turn on the power of all equipment.
- 11.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2479MHz TX frequency to transmit.

11.5.Test Procedure

Conducted Band Edge:

11.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.



11.5.2.Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.

Radiate Band Edge:

- 11.5.3.The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
- 11.5.4.The turntable was rotated for 360 degrees to determine the position of maximum emission level.
- 11.5.5.EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
- 11.5.6.Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

11.5.7.RBW=1MHz, VBW=1MHz

11.5.8.The band edges was measured and recorded.

11.6.Test Result

Frequency	Result of Band Edge	Limit of Band Edge
(MHz)	(dBc)	(dBc)
2403	40.53	> 20dBc
2479	40.61	> 20dBc



Low Channel



Date: 25.MAR.2014 08:36:41



High Channel

Date: 25.MAR.2014 08:07:53



Radiated Band Edge Result

Note:

- 1. Emissions attenuated more than 20 dB below the permissible value are not reported.
- 2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

3. Display the measurement of peak values.











ATC®

ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China

							·					
Job N	lo.: alen #377	1				F	Polarizati	ion: H	lorizonta	al		
Stand	ndard: FCC PK							Power Source: DC 6V				
Test i	t item: Radiation Test							Date: 2014/03/24				
Temp	emp.(C)/Hum.(%) 25 C / 55 %							:26:32				
EUT:	TTX850 8-Channel 2 4GHz Transmitter							Signat	ure:			
Mode	: TX 2403M	IHz				0) Distance:	3m				
Model: TACJ2850												
Manufacturer: Nine Eagles												
Nata	Demart Nav		26									
Note:	Report No./	AIE2014028	90									
10)0.0 dBu∀/m											
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30)											
20)											
11	10											
	2310.000									2430.0 MHz		
		Deel	E. I	D- 11	15.20	N.4						
No.	⊢req. (MHz)	(dBuV/m)	Factor (dB)	(dBuV/m)	(dBuV/m)	(dB)	Detector	Height (cm)	Degree (deg.)	Remark		
1	2393.160	55.75	-6.77	48.98	74.00	-25.02	peak					
2	2393.160	46.89	-6.77	40.12	54.00	-13.88	AVG					
3	2399.880	66.69	-6.76	59.93	74.00	-14.07	peak					
4	2399.880	57.78	-6.76	51.02	54.00	-2.98	AVG					
	1	1	1	1	1	1		1		1		



ATC ATC[®]

ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park, Nanshan Shenzhen, P.R. China

Site: 1# Chamber Tel:+86-0755-26503290 Fax:+86-0755-26503396

				-							
Job N	Job No.: alen #3770 Polarization: Vertical										
Standard: FCC PK Power Source: DC 6V											
Test i	Test item: Radiation Test Date: 2014/03/24										
Temp	Temp.(C)/Hum.(%) 25 C / 55 % Time: 11:21:33										
EUT:	UT: TTX850 8-Channel 2.4GHz Transmitter Engineer Signature:										
Mode	Mode: TX 2403MHz Distance: 3m										
Mode	I: TACJ2850)									
Manu	facturer: Nine	Eagles									
Note:	Report No:/	ATE2014029	96								
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30											
20	(.										
10	2310.000									2430.0 MHz	
	2310.000							-		2100.0 14112	
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark	
1	2397.600	62.63	-6.76	55.87	74.00	-18.13	peak				
2	2397.600	52.54	-6.76	45.78	54.00	-8.22	AVG				
3	2399.880	69.23	-6.76	62.47	74.00	-11.53	peak				

52.23

54.00

-1.77

AVG

-6.76

4

2399.880

58.99





Test mode: hopping mode

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Site: 1# Chamber

		50	ence & Inc	ustry Park,r	vansnan Sr	ienznen,	P.R.Chi	na	T QA		20000000
Job N	b No.: alen #3301 Polarization: Horizontal									al	
Stand	ard: FCC PK					F	ower So	ource:	DC 6.0	V	
Test if	em: Radiatio	on Test				C	Date: 14/03/21/				
Temp	.(C)/Hum.(%) 25 C/5	5 %			Т	Time: 10/57/00				
EUT:	TTX850 8-0	Channel 2.4G	Hz Transm	itter		Engineer Signature:					
Mode	TX(Hoppir	ng mode))istance:	3m			
Model	: TACJ2850)									
Manufacturer: Nine Eagles											
Note:	Report No:A	ATE2014029	96								
11	7.0 dBuV/m								limit		
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	2310.000									2500.0	MHZ
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark	
1	2399.300	69.91	-6.76	63.15	74.00	-10.85	peak				
2	2399.300	58.65	-6.76	51.89	54.00	-2.11	AVG				
3	2483.660	69.35	-6.54	62.81	74.00	-11.19	peak				
4	2483.660	58.21	-6.54	51.67	54.00	-2.33	AVG				





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Job N	lo.: alen #330	F	Polarization: Vertical									
Stand	Standard: FCC PK							Power Source: DC 6.0V				
Test i	Test item: Radiation Test							Date: 14/03/21/				
Temp	Temp.(C)/Hum.(%) 25 C / 55 %							Time: 10/50/35				
EUT:	EUT: TTX850 8-Channel 2.4GHz Transmitter							Signati	ure:			
Mode	Mode: TX(Hopping mode) Distance: 3m											
Model: TACJ2850												
Manufacturer: Nine Eagles												
Note: Report No:ATE20140296												
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17	.0											
-	2310.000									2500.0	MHz	
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark		
1	2398.920	69.09	-6.76	62.33	74.00	-11.67	peak					
2	2398.920	58.12	-6.76	51.36	54.00	-2.64	AVG					
3	2483.660	67.32	-6.54	60.78	74.00	-13.22	peak					
4	2483.660	56.35	-6.54	49.81	54.00	-4.19	AVG					



12. RADIATED SPURIOUS EMISSION TEST

12.1.Block Diagram of Test Setup

12.1.1.Block diagram of connection between the EUT and peripherals



12.1.2.Semi-Anechoic Chamber Test Setup Diagram



GROUND PLANE

12.2.The Limit For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the



transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

12.3.Restricted bands of operation

12.3.1.FCC Part 15.205 Restricted bands of operation

perm	itted in any of the freque	ncy bands listed below:	
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
$^{1}0.495$ -0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 ²Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

12.4.Configuration of EUT on Measurement

The equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.



12.5.Operating Condition of EUT

12.5.1.Setup the EUT and simulator as shown as Section 12.1.

- 12.5.2.Turn on the power of all equipment.
- 12.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, and 2479MHz TX frequency to transmit.

12.6.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2009 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The frequency range from 9kHz to 25GHz is checked.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector. The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading. The basic equation calculation is as follows: Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

12.7.The Field Strength of Radiation Emission Measurement Results

Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.

2. *: Denotes restricted band of operation.

3. The EUT is tested radiation emission at each test channel in three axes. The worst emissions are reported in all test mode and channels.

4. The radiation emissions from 18-25GHz are not reported, because the test values lower than the limits of 20dB.



Below 1G

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Job N	Job No.: alen #3731						Polarization: Vertical			
Standard: FCC Class B 3M Radiated						F	Power Source: DC 6V			
Test item: Radiation Test					[Date: 201	14/03/14	4		
Temp	.(C)/Hum.(%) 25 C/5	5 %			-	Time: 15:	:54:51		
EUT:	TTX850	8-Channel 2	.4GHz Tra	ansmitter		E	Engineer	Signat	ure:	
Mode	TX 2442M	Hz				[Distance:	3m		
Model	: TACJ2850)								
Manut	facturer: Nine	Eagles								
Note:	Report No:/	ATE2014029	96							
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No	Freq.	Reading	Factor	Result	Limit	Margin	Detector	Height	Degree	Remark
4	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)		(cm)	(deg.)	
1	256.5210	52.25	-19.36	32.89	46.00	-13.11				
2	318.8170	47.52	-17.43	30.09	46.00	-15.91				
3	357.9286	46.38	-15.98	30.40	46.00	-15.60	QP			





F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China

Job N	o.: alen #373	3				F	Polarization:	Horizont	al				
Stand	ard: FCC Clas	s B 3M Rad	Power Source: DC 6V										
Test if	tem: Radiatio	on Test	Date: 2014/03/14										
Temp	.(C)/Hum.(%) 25 C/5	Time: 15:56:2	21									
EUT:	TTX850	8-Channel 2	.4GHz Tra	E	Engineer Sigr	nature:							
Mode	: TX 2479M	IHz				0	Distance: 3	m					
Mode	: TACJ2850												
Manut	facturer: Nine	Eagles											
Note:	Report No:	ATE2014029	96										
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	30.000 40	50 60 70	0 80		1	30	00 400	500 600 7	700 1000.0 MHz				
	Freq	Reading	Factor	Result	Limit	Margin	Hoir	tht Degree					
No.	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Detector (cn	n) (deg.)	Remark				
1	256.5210	56.25	-19.36	36.89	46.00	-9.11	QP						
2	317.7010	53.20	-17.45	35.75	46.00	-10.25	QP						
3	360.4476	47.87	-15.92	31.95	46.00	-14.05	QP						





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Job No	o.: alen #373	2				F	Polarization: Vertical					
Standa	ard: FCC Clas	s B 3M Rad	Power Source: DC 6V									
Test it	em: Radiatio	n Test	Date: 2014/03/14									
Temp.	(C)/Hum.(%) 25 C/5	Time: 15:55:30									
EUT:	TTX850	8-Channel 2	Engineer Signature:									
Mode:	TX 2479M	Hz				[Distance: 3m					
Model: TACJ2850												
Manuf	acturer: Nine	Eagles										
Note: Report No:ATE20140296												
70.0 dBu∀/m												
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	30.000 40	50 60 70	80			30	00 400 500 600 700 1000.0 MHz					
	Freq	Reading	Factor	Result	Limit	Margin	Height Degree					
No.	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Detector (cm) (deg.) Remark					
1	256.5210	51.69	-19.36	32.33	46.00	-13.67	QP QP					
2	360.4476	46.75	-15.92	30.83	46.00	-15.17	QP QP					
3	467.2348	44.51	-14.30	30.21	46.00	-15.79	QP					



Above 1G

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All and a second second	Science & Industry Park,Nanshan Shenzhen,P.R.China Fax:+86-0755-26503396											
Job No.: alen #3768 Polarization: Horizontal												
Stand	ard: FCC Clas	s B 3M Rad	iated			F	ower Sc	ource:	DC 6V			
Test if	em: Radiatio	n Test				C	Date: 2014/03/24					
Temp	.(C)/Hum.(%) 25 C/5	5 %			т	ime: 11:	17:59				
EUT:	TTX850	8-Channel 2	.4GHz Tra	nsmitter		E	Ingineer	Signat	ure:			
Mode	TX 2403M	Hz				C) istance:	3m				
Model: TACJ2850												
Manuf	acturer: Nine	Eagles										
Note:	Report No:4	TE2014020	96									
Note.	Report No.7	12014028										
10	0.0 dBuV/m											
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No.	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Detector	(cm)	(deg.)	Remark		
1	2400.753	97.27	-6.76	90.51	,	· - /	peak	10				
2	2400.753	90.01	-6.76	83.25			AVG	50 				
3	4804.110	51.14	-1.59	49.55	74.00	-24.45	peak					
4	11701.375	43.49	6.23	49.72	74.00	-24.28	peak					





F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China

Job N	No.: alen #3769 Polarization: Vertical											
Stand	ard: FCC Clas	s B 3M Rad	liated			F	Power Source: DC 6V					
Test if	tem: Radiatio	n Test				[Date: 201	14/03/24	4			
Temp	.(C)/Hum.(%) 25 C/5	5 %			٦	Time: 11	19:28				
EUT:	TTX850	8-Channel 2	.4GHz Tra	nsmitter		E	Engineer	Signat	ure:			
Mode	: TX 2403M	Hz					Distance:	3m				
Model	idel: TACJ2850											
Manufacturer: Nine Eagles												
Note.	Note: Report No:ATE20140296											
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	1000.000	20	000	3000	5000	6000	7000 8000	9000		18000.0 MHz		
	Freq.	Reading	Factor	Result	Limit	Margin		Height	Dearee			
No.	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Detector	(cm)	(deg.)	Remark		
1	2400.753	97.52	-6.76	90.76			peak					
2	2400.753	90.12	-6.76	83.36			AVG					
3	4804.110	51.90	-1.59	50.31	74.00	-23.69	peak					
4	12798.243	41.71	7.60	49.31	74.00	-24.69	peak					





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Job N	No.: alen #3764 Polarization: Horizontal												
Stand	ard: FCC Clas	s B 3M Rad	liated			F	Power So	ource:	DC 6V				
Test it	em: Radiatio	n Test				0	Date: 201	14/03/24	4				
Temp	.(C)/Hum.(%) 25 C/5	5 %			1	Time: 11	:10:08					
EUT:	TTX850	8-Channel 2	.4GHz Tra	nsmitter		E	Engineer	Signate	ure:				
Mode:	TX 2442M	Hz				[Distance:	3m					
Model	Nodel: TACJ2850												
Manuf	acturer: Nine I	Eagles											
Note:	Report No:A	TE2014029	96										
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	1000.000	20	000	3000	5000	6000	7000 8000	9000		18000.0 MHz			
No	Freq.	Reading	Factor	Result	Limit	Margin	Detector	Height	Degree	Domark			
INO.	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Defector	(cm)	(deg.)	Remark			
1	2442.751	96.77	-6.64	90.13			peak						
2	2442.751	89.39	-6.64	82.75			AVG						
3	4888.151	49.82	-1.33	48.49	74.00	-25.51	peak						
4	11140.310	44.27	5.65	49.92	74.00	-24.08	peak						





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Job N	Job No.: alen #3765 Polarization: Vertical												
Standard: FCC Class B 3M Radiated Power Source: DC 6V													
Test if	em: Radiatio	n Test				[Date: 201	14/03/24	4				
Temp	.(C)/Hum.(%) 25 C/5	5 %			-	Time: 11	11:36					
EUT:	EUT: TTX850 8-Channel 2.4GHz Transmitter Engineer Signature:												
Mode: TX 2442MHz Distance: 3m													
Model: TACJ2850													
Manuf	acturer: Nine	Eagles											
Note:	Report No:/	ATE2014029	96										
10	0.0 dBuV/m												
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No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark			
1	2442.751	97.08	-6.64	90.44			peak						
2	2442.751	89.89	-6.64	83.25			AVG						
3	4888.151	50.67	-1.33	49.34	74.00	-24.66	e peak						
4	13288.284	40.51	8.56	49.07	74.00	-24.93	9 peak						





F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China

Job N	o.: alen #376	7		F	Polarization: Horizontal								
Stand	ard: FCC Clas	s B 3M Rad	liated	Power Source: DC 6V									
Test if	em: Radiatio	n Test				0	Date: 2014/03/24						
Temp	.(C)/Hum.(%) 25 C/5	Fime: 11:	15:23									
EUT:	TTX850	8-Channel 2	.4GHz Tra	nsmitter		E	Engineer	Signat	ure:				
Mode	Mode: TX 2479MHz Distance: 3m												
Model	Model: TACJ2850												
Manuf	acturer: Nine I	Eagles											
Note:	Report No:A	ATE2014029	96										
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No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark			
1	2478.310	96.39	-6.56	89.83			peak						
2	2478.310	89.21	-6.56	82.65			AVG						
3	4959.307	52.05	-1.12	50.93	74.00	-23.07	peak						
4	12541.903	42.16	7.22	49.38	74.00	-24.62	peak						





F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China

Job N	o.: alen #376	6		F	Polarization: Vertical							
Stand	ard: FCC Clas	s B 3M Rad	liated			F	Power Sc	ource:	DC 6V			
Test if	em: Radiatio	n Test				[Date: 2014/03/24					
Temp	.(C)/Hum.(%) 25 C/5	5 %			٦	Time: 11:	13:37				
EUT:	TTX850	8-Channel 2	.4GHz Tra	E	Engineer	Signat	ure:					
Mode	TX 2479M	Hz		Distance:	3m							
Model: TACJ2850												
Manufacturer: Nine Eagles												
Note:	Report No:A	ATE2014029	96									
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No	Freq.	Reading	Factor	Result	Limit	Margin	Detector	Height	Degree	Remark		
INO.	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Detector	(cm)	(deg.)			
1	2478.310	99.34	-6.56	92.78			peak					
2	2478.310	92.12	-6.56	85.56		510 million and	AVG					
3	4959.307	50.93	-1.12	49.81	74.00	-24.19	peak					
4	11204.896	44.51	5.72	50.23	74.00	-23.77	peak					



13.CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

13.1.Block Diagram of Test Setup



13.2. The Requirement For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

13.3.EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

13.4.Operating Condition of EUT

- 13.4.1.Setup the EUT and simulator as shown as Section 13.1.
- 13.4.2.Turn on the power of all equipment.
- 13.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, and 2479MHz TX frequency to transmit.



13.5.Test Procedure

- 13.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.
- 13.5.2.Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz (From 30MHz to 25GHz).
- 13.5.3.The Conducted Spurious Emission was measured and recorded.

13.6.Test Result

Pass.

The spectrum analyzer plots are attached as below.

Spectrum									
Ref Level	20.00 dBm	Offset	1.00 dB 👄 F	RBW 100 kH	z				
🗕 Att	30 dB	SWT	250 ms 😑 \	/BW 300 kH	z Mode /	Auto Sweep			
●1Pk Max									
					M	2[1]		-	50.94 dBm
10 d8m					M	1[1]		20	0.83 dBm
TO UBIII						1[1]		:	2.3970 GHz
U dBm									
-10 dBm									
-20 dBm									
-30 dBm									
-40 dBm									
-50 dBm							N	2	
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-604dBm	whow when	province sig	where we want	man water	Annald a s			00000	
Male and									
-70 dBm									
, o ubiii									
Start 30.0	MHz			691	pts			Stop	25.0 GHz
					Mea	suring		- 444	25.03.2014 10:22:24

Low Channel

Date: 25.MAR.2014 10:22:24



Middle Channel



Date: 25.MAR.2014 10:23:22

High Channel



Date: 25.MAR.2014 09:39:51



14.ANTENNA REQUIREMENT

14.1.The Requirement

According to Section 15.203, 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.

14.2. Antenna Construction

Device is equipped with Integral antenna, which isn't displaced by other antenna. Therefore, the equipment complies with the antenna requirement of Section 15.203.

