

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPARTC REQUIREMENT**

OF

Time Attendance Terminal

MODEL No.: TM-818, TM-828

FCC ID: 2AOFS-818828

Trademark: N/A

REPORT NO: ES171115970W02

ISSUE DATE: December 12, 2017

Prepared for
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VERIFICATION OF COMPLIANCE

Applicant:	SAFESCAN B.V. Aluminiumstraat 65, 2718 RB Zoetermeer, The Netherlands
Manufacturer:	ZKTECO CO., LTD. No.26, Pingshan 188 Industry zone, Tangxia Town, Dongguan City, Guangdong Province, China
Product Name:	Time Attendance Terminal
Model Number:	TM-818, TM-828 (Note: These models are identical in circuitry and electrical, mechanical and physical construction; the only differences are appearance and model. for trading purpose. We prepare TM-828 for test.)
Serial Number:	N/A
File Number:	ES171115970W02

We hereby certify that:

The above equipment was tested by EMTEK(SHENZHEN) CO., LTD.. 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 tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.207&15.209.

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

Date of Test :

November 15, 2017 to December 11, 2017

Prepared by :

Doris Su.

Doris Su/Editor

Reviewer :

Yaping Shen

Yaping Shen /Supervisor



Approve & Authorized Signer :

Lisa Wang

Lisa Wang/Manager

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1. GENERAL INFORMATION

1.1 Product Description

A major technical descriptions of EUT is described as following:

Supply power: DC 12V

RFID Frequency: 125KHz

Modulation: ASK

Operating temperature: -20°C ~ 55°C

Antenna type: Coil Antenna

Antenna gain: 0 dBi

Adapter:

Model: FJ-SW1201500N

Input: AC100-240V, 50-60Hz, 0.6A max

Output: 12V, 1.5A

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AOFS-818828 filing to comply with Section 15.207&15.209 of the FCC Part 15 Subpart C Rules.

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013) and Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Special Accessories

Not available for this EUT intended for grant.

1.5 Equipment Modifications

Not available for this EUT intended for grant.

1.6 Test Facility

Site Description

EMC Lab.

- : Accredited by CNAS, 2016.10.24
The certificate is valid until 2022.10.28
The Laboratory has been assessed and proved to be in compliance with CNAS-CL01: 2006(identical to ISO/IEC17025: 2005)
The Certificate Registration Number is L2291
- : Accredited by TUV Rheinland Shenzhen, 2016.5.19
The Laboratory has been assessed according to the requirements ISO/IEC 17025.
- : Accredited by FCC, August 03, 2017
Designation Number: CN1204
Test Firm Registration Number: 882943
- : Accredited by Industry Canada, November 24, 2015
The Certificate Registration Number is 4480A

2. System Test Configuration

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

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Radiated Emissions

The EUT is placed on as turn table which is 0.8 m above ground plane. 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 hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013.

2.4 Limitation

(1) Radiated Emission

FCC Part 15, Subpart C Section 15.209 limit of radiated emission for frequency below 1000GHz. The emissions from an intentional radiator shall not exceed the field strength level specified in the following table:

Frequency (MHz)	Field strength μV/m	Distance(m)	Field strength at 3m dBμV/m
0.009~0.490	2400/F(KHz)	300	See the remark
0.490~1.705	2400/F(KHz)	30	
1.705~30.0	30	30	
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Remark: 1. Emission level in dB_BuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dB_BuV) + distance extrapolation factor.

3. Summary of Test Results

FCC Rule	Description Of Test	Result
15.207	AC Power Conducted Emission	Pass
15.209	Radiated Emission	Pass

4. CONDUCTED EMISSION TEST

4.1 Applicable Standard

According to FCC Part 15.207(a)

4.2 Conformance Limit

Conducted Emission Limit

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies

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

4.3 Test Configuration

Test according to clause 7.3 conducted emission test setup

4.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.

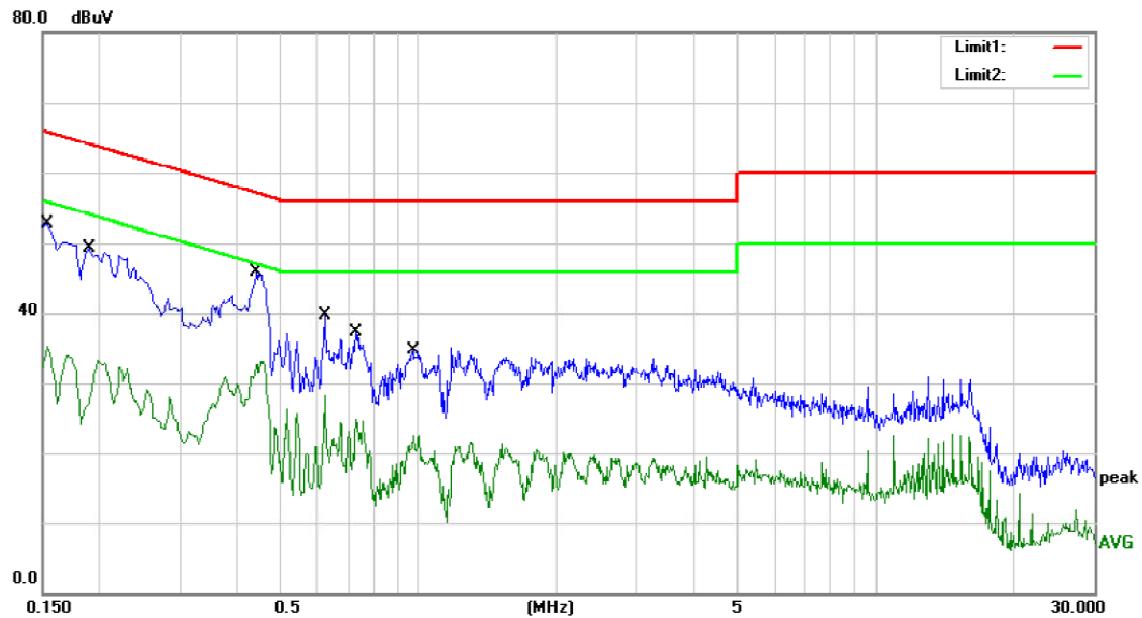
Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Repeat above procedures until all frequency measured were complete.

4.5 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	Due. CAL
Test Receiver	Rohde & Schwarz	ESCI	26115-010-0027	May 20, 2017	May 19, 2018
L.I.S.N.	Rohde & Schwarz	ENV216	101161	May 20, 2017	May 19, 2018
50Ω Coaxial Switch	Anritsu	MP59B	6100175589	May 21, 2017	May 20, 2018

4.6 Test Result



Site Conduction #2

Phase: **L1**

Temperature: 24.9

Limit: (CE)FCC PART 15 C

Power: AC 120V/60Hz

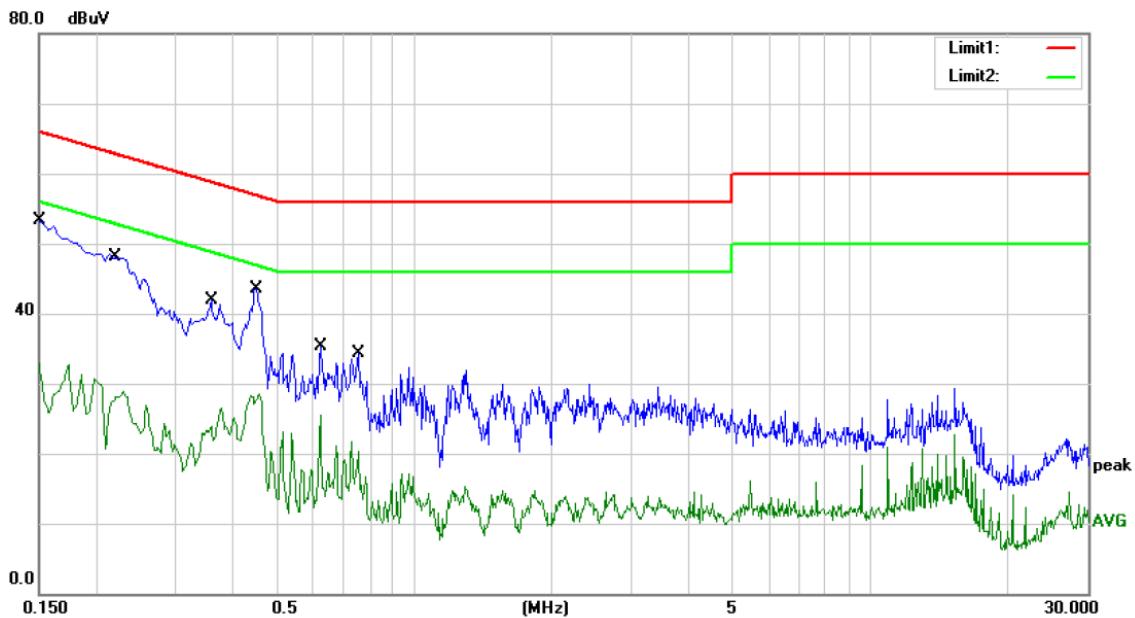
Humidity: 54 %

Mode: WIFI + 125kHz ON

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV	dB			
1		0.1540	42.90	9.89	52.79	65.78	-12.99	QP	
2		0.1540	25.48	9.89	35.37	55.78	-20.41	AVG	
3		0.1900	39.45	9.89	49.34	64.04	-14.70	QP	
4		0.1900	23.76	9.89	33.65	54.04	-20.39	AVG	
5	*	0.4420	35.99	9.91	45.90	57.02	-11.12	QP	
6		0.4420	23.20	9.91	33.11	47.02	-13.91	AVG	
7		0.6220	29.84	9.93	39.77	56.00	-16.23	QP	
8		0.6220	18.36	9.93	28.29	46.00	-17.71	AVG	
9		0.7300	27.36	9.94	37.30	56.00	-18.70	QP	
10		0.7300	14.94	9.94	24.88	46.00	-21.12	AVG	
11		0.9700	24.79	9.96	34.75	56.00	-21.25	QP	
12		0.9700	12.59	9.96	22.55	46.00	-23.45	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: KK



Site Conduction #2

Phase: **N**

Temperature: 24.9

Limit: (CE)FCC PART 15 C

Power: AC 120V/60Hz

Humidity: 54 %

Mode: WIFI +125kHz ON

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1500	43.38	9.89	53.27	66.00	-12.73	QP	
2		0.1500	23.03	9.89	32.92	56.00	-23.08	AVG	
3		0.2220	38.11	9.90	48.01	62.74	-14.73	QP	
4		0.2220	18.96	9.90	28.86	52.74	-23.88	AVG	
5		0.3580	31.91	9.91	41.82	58.77	-16.95	QP	
6		0.3580	16.62	9.91	26.53	48.77	-22.24	AVG	
7		0.4500	33.66	9.92	43.58	56.88	-13.30	QP	
8		0.4500	18.54	9.92	28.46	46.88	-18.42	AVG	
9		0.6220	25.46	9.93	35.39	56.00	-20.61	QP	
10		0.6220	15.63	9.93	25.56	46.00	-20.44	AVG	
11		0.7580	24.45	9.94	34.39	56.00	-21.61	QP	
12		0.7580	11.86	9.94	21.80	46.00	-24.20	AVG	

*:Maximum data

x:Over limit

!:over margin

Comment: Factor build in receiver.

Operator: KK

5. Radiated Emission Test

5.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured was complete.

When spectrum scanned from 9KHz to 150KHz setting resolution bandwidth 200Hz and video bandwidth 1kHz.

EMI Test Receiver	Setting
Attenuation	Auto
RB	200Hz
VB	1kHz
Detector	QP
Trace	Max hold

When spectrum scanned from 150KHz to 30MHz setting resolution bandwidth 9 kHz and video bandwidth 30kHz.

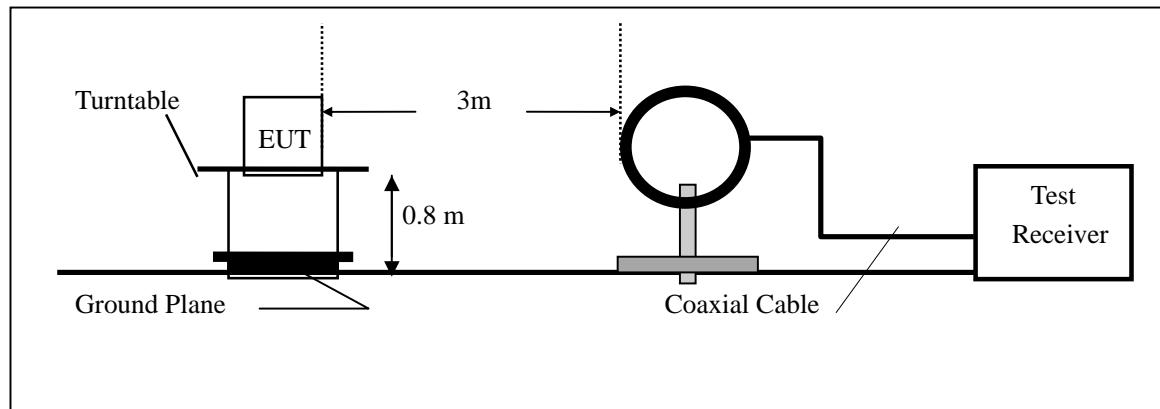
EMI Test Receiver	Setting
Attenuation	Auto
RB	9kHz
VB	30kHz
Detector	QP
Trace	Max hold

When spectrum scanned from 30 MHz to 1GHz setting resolution bandwidth 120 kHz and video bandwidth 300kHz.

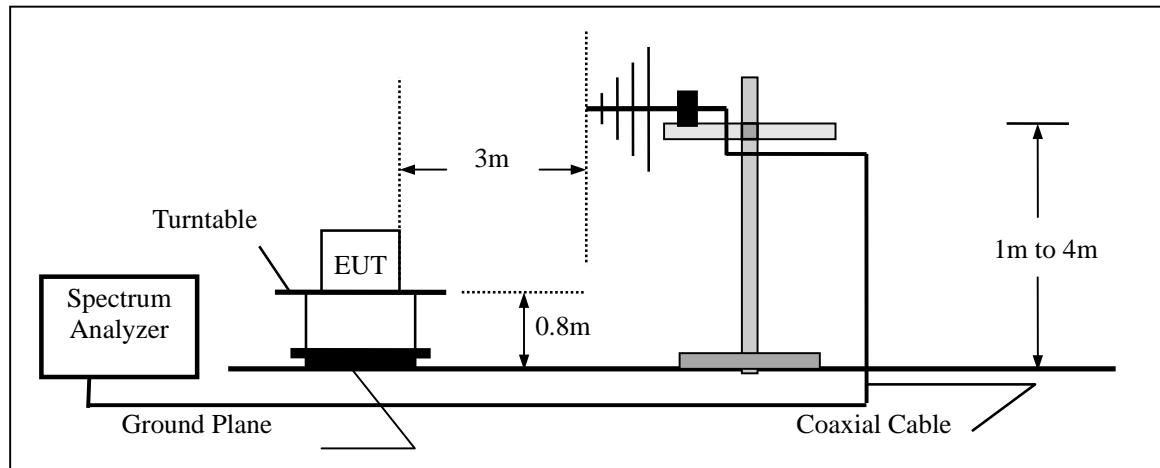
EMI Test Receiver	Setting
Attenuation	Auto
RB	120kHz
VB	300kHz
Detector	QP
Trace	Max hold

5.2 Test SET-UP (Block Diagram of Configuration)

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



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



5.3 Measurement Equipment Used:

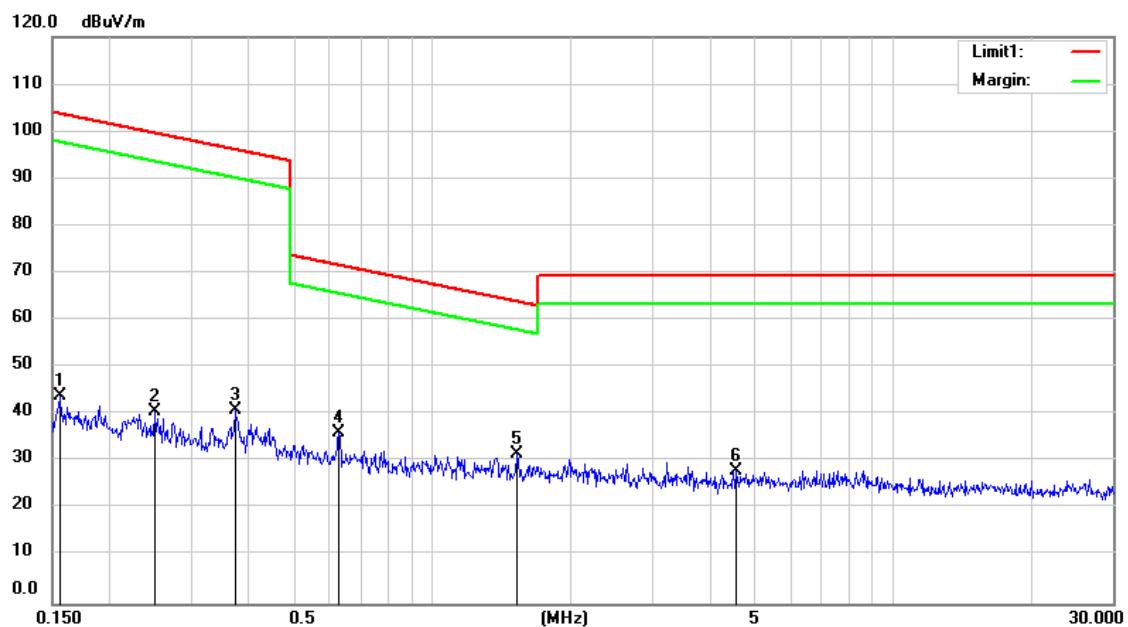
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 21, 2017	May 20, 2017
Loop Antenna	Schwarzbeck	FMZB 1519	1519-012	May 20, 2017	May 19, 2017
Pre-Amplifier	HP	8447F	2944A07999	May 20, 2017	May 19, 2017
Bilog Antenna	Schwarzbeck	VULB9163	142	May 20, 2017	May 19, 2017
Cable	Schwarzbeck	AK9513	ACRX1	May 21, 2017	May 20, 2017
Cable	Rosenberger	N/A	FP2RX2	May 21, 2017	May 20, 2017
Cable	Schwarzbeck	AK9513	CRPX1	May 21, 2017	May 20, 2017
Cable	Schwarzbeck	AK9513	CRRX2	May 21, 2017	May 20, 2017

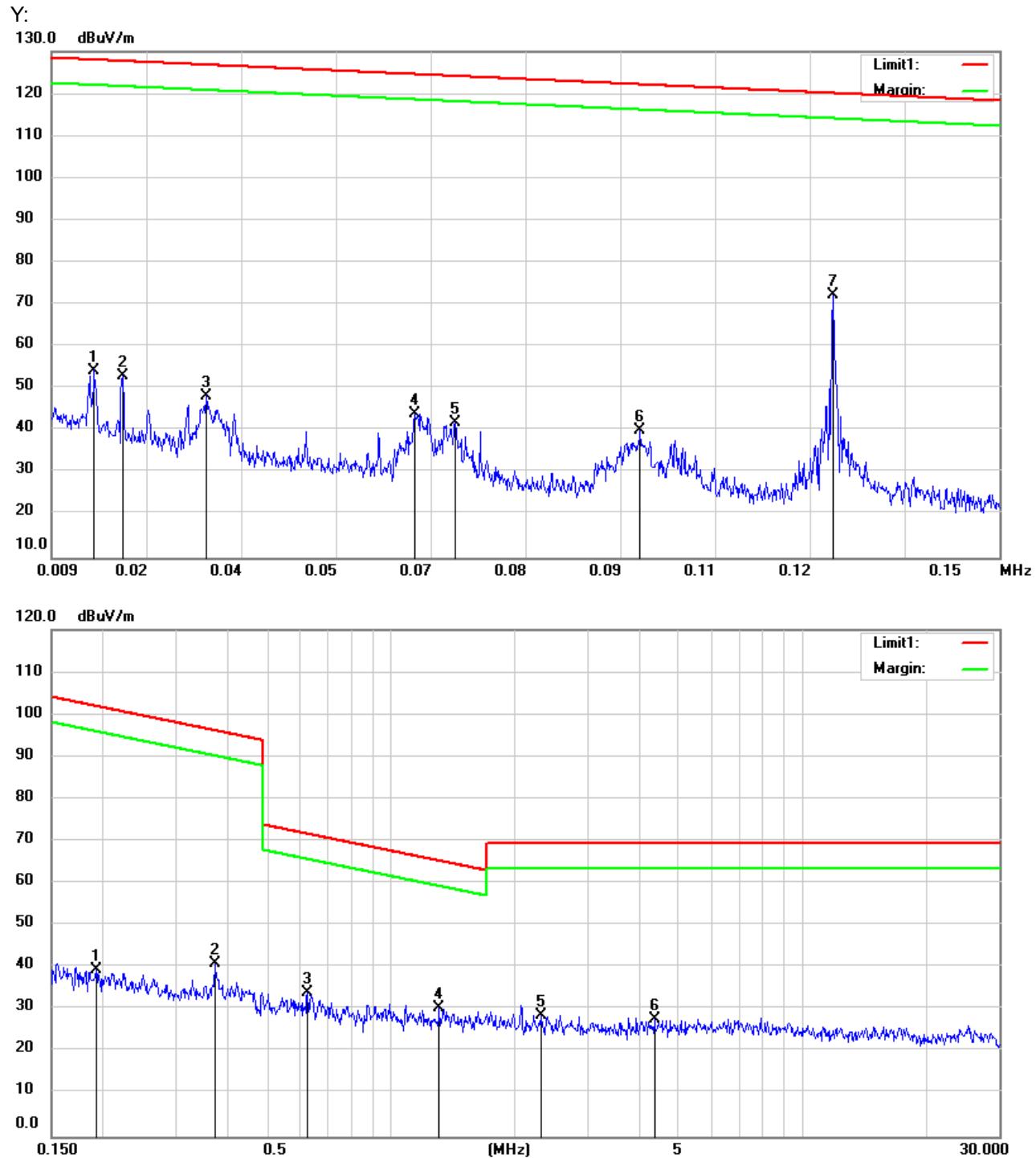
5.4 Measurement Result

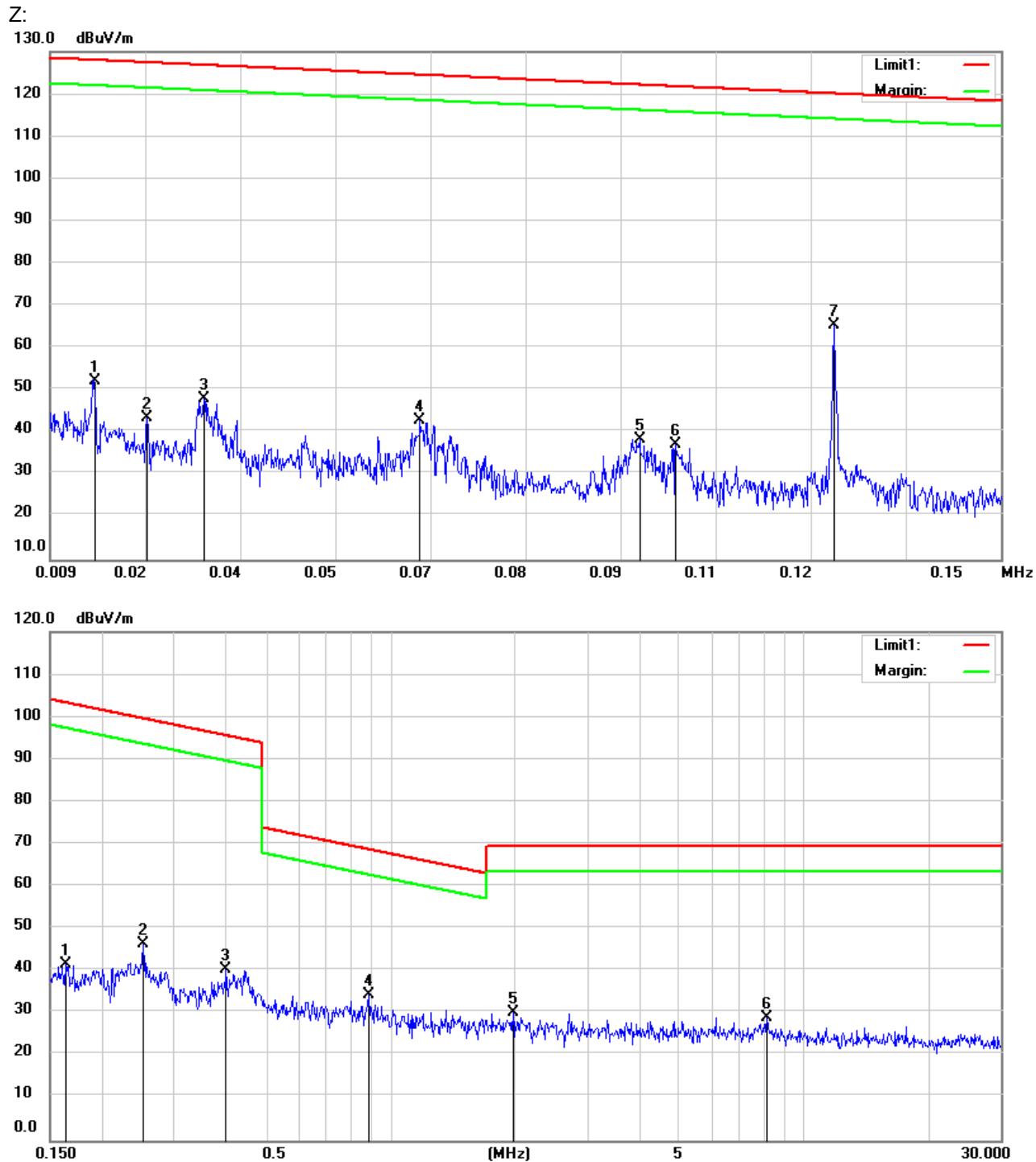
Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible Limit.

Operation Mode:	125kHz TX	Test Date :	November 30, 2017
Frequency Range:	9KHz~30MHz	Temperature :	24°C
Test Result:	PASS	Humidity :	53 %
Measured Distance:	3m	Test By:	KK

X:

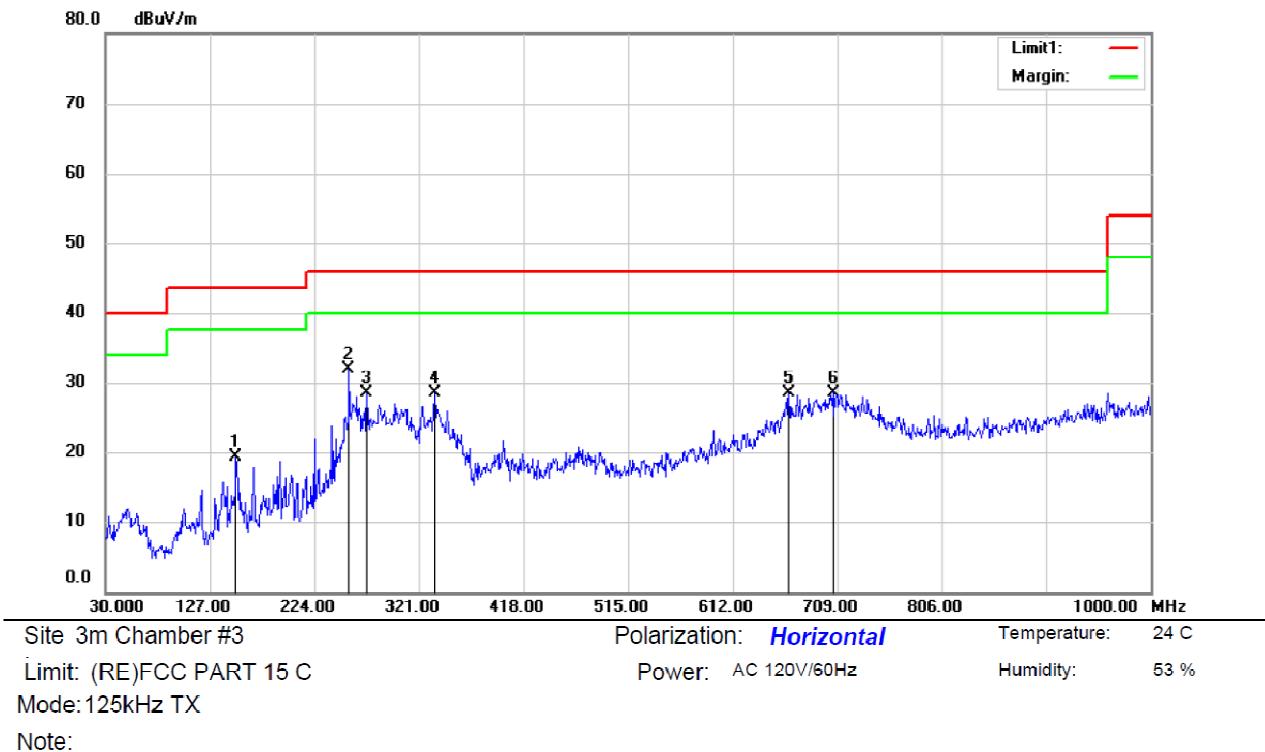






Operation Mode: 125kHz TX
 Frequency Range: 30~1000MHz
 Test Result: PASS
 Measured Distance: 3m

Test Date : November 30, 2017
 Temperature : 24°C
 Humidity : 53 %
 Test By: KK



No.	Mk.	Freq. MHz	Reading Level	Correct Factor	Measure- ment	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
			dBuV	dB	dBuV/m					
1		151.2500	38.40	-19.08	19.32	43.50	-24.18	QP		
2	*	256.0100	45.47	-13.51	31.96	46.00	-14.04	QP		
3		272.5000	41.77	-13.18	28.59	46.00	-17.41	QP		
4		335.5500	39.62	-11.05	28.57	46.00	-17.43	QP		
5		664.3800	32.85	-4.35	28.50	46.00	-17.50	QP		
6		705.1200	32.11	-3.51	28.60	46.00	-17.40	QP		

*:Maximum data x:Over limit !:Over margin

Operator: LQZ



Site 3m Chamber #3

Polarization: **Vertical**

Temperature: 24 C

Limit: (RE)FCC PART 15 C

Power: AC 120V/60Hz

Humidity: 53 %

Mode: 125kHz TX

Note:

No.	Mk.	Freq. MHz	Reading	Correct	Measure-	Limit	Over	Antenna Height cm	Table Degree	Comment
			Level dBuV	Factor dB	ment dBuV/m					
1		126.0300	42.28	-18.50	23.78	43.50	-19.72	QP		
2		184.2300	41.43	-16.75	24.68	43.50	-18.82	QP		
3		306.4500	40.01	-12.30	27.71	46.00	-18.29	QP		
4		473.2900	37.42	-8.22	29.20	46.00	-16.80	QP		
5	*	602.3000	34.41	-4.97	29.44	46.00	-16.56	QP		
6		960.2300	32.14	0.71	32.85	54.00	-21.15	QP		

*:Maximum data x:Over limit l:over margin

Operator: LQZ

6. Antenna Application

Antenna Requirement

Standard	Requirement
FCC CRF Part 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. 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, or §15.221. 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.

For intentional device, according to FCC 47 CFR 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. If transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Result

The EUT'S antenna is coil antenna, The antenna's gain is 0dBi and meets the requirement and the antenna can't be replaced by the user, which in accordance to section 15.203.