



FCC RADIO TEST REPORT

FCC ID:XLY-5000

Product : ELECTRONIC RFID & KEYPAD LOCKS

Trade Mark : ZEPHYR LOCK

Model Name : 5000

Serial Model : 5254, 5255, 5154, 5155, 5270, 5271, 5170, 5171

Report No. : NTEK-2017NT06073802F

Prepared for

Zephyrlock, LLC

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Prepared by

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TEST RESULT CERTIFICATION**Applicant's name**: Zephyrlock, LLC

Address: 14 Finance Drive Danbury Connecticut United States 06810

Manufacturer's Name: Unionwest Limited

Address: 905 Tower 1, Silvercord, 30 Canton Road, T.S.T, Kowloon, Hong Kong

Product description

Product name.....: ELECTRONIC RFID & KEYPAD LOCKS

Model and/or type reference .: 5000

Serial Model : 5254, 5255, 5154, 5155, 5270, 5271, 5170, 5171

Standards.....: FCC Part15.225:01 Oct. 2016

Test procedure ANSI C63.10-2013

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test.....:

Date (s) of performance of tests.....: 07Jun. 2017 ~ 27 Jun. 2017

Date of Issue.....: 27 Jun. 2017

Test Result.....: **Pass**

Testing Engineer : Lebron Wang
(Lebron Wang)

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(Jason Chen)

Authorized Signatory : Sam. Chen
(Sam Chen)

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15, Subpart C (15.231)			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	The EUT is powered by battery.
15.205(a) 15.209 15.225	Radiated Spurious Emission	Pass	
15.225	20dB Bandwidth	Pass	
15.225	Frequency Tolerance	Pass	
15.203	Antenna Requirement	Pass	

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report.

1.1 TEST FACILITY

Shenzhen NTEK Testing Technology Co., Ltd

Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.

FCC Registration No.:238937; IC Registration No.:9270A-1

CNAS Registration No.:L5516

1.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	ELECTRONIC RFID & KEYPAD LOCKS	
Trade Mark	ZEPHYR LOCK	
Model Name	5000	
Serial Model	5254, 5255, 5154, 5155, 5270, 5271, 5170, 5171	
Model Difference	All the model are the same circuit and RF module, except the model No..	
Product Description	The EUT is a ELECTRONIC RFID & KEYPAD LOCKS	
	Operation Frequency:	13.56MHz
	Modulation Type:	ASK
	Number Of Channel	1CH.
	Antenna Designation:	Loop Antenna
	Antenna Gain(Peak)	1.0 dBi
Adapter	N/A	
Battery	DC 6V/1A	
HW Version	V1.3	
SW Version	V1.0	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

Table for Filed Antenna

Ant .	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	Loop Antenna	N/A	1.0	Antenna

2.2 DESCRIPTION OF TEST MODES

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 above was evaluated respectively.

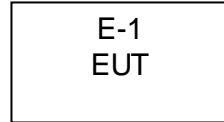
Pretest Mode	Description
Mode 1	TX

For Conducted Emission	
Final Test Mode	Description
Mode 1	TX

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
E-1	ELECTRONIC RFID & KEYPAD LOCKS	ZEPHYR LOCK	5000	N/A	EUT

Item	Cable Type	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2016.07.06	2017.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2017.06.07	2018.06.06	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2016.07.06	2017.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2017.06.07	2018.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2017.06.07	2018.06.06	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2016.07.06	2017.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2016.07.06	2017.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2016.12.22	2017.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2017.06.08	2018.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2016.07.06	2017.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2016.07.06	2017.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2017.06.06	2018.06.05	1 year
2	LISN	R&S	ENV216	101313	2016.08.24	2017.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2016.08.24	2017.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2017.06.07	2018.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2017.06.07	2018.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2017.06.08	2018.06.07	1 year

3. ANTENNA REQUIREMENT

3.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 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.

3.2 EUT ANTENNA

The EUT antenna is permanent attached Loop antenna(Gain:1dBi). It comply with the standard requirement.

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5			66 - 56 *	56 - 46 *	CISPR
0.50 -5.0			56.00	46.00	CISPR
5.0 -30.0			60.00	50.00	CISPR

0.15 -0.5			66 - 56 *	56 - 46 *	LP002.
0.50 -5.0			56.00	46.00	LP002.
5.0 -30.0			60.00	50.00	LP002.

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

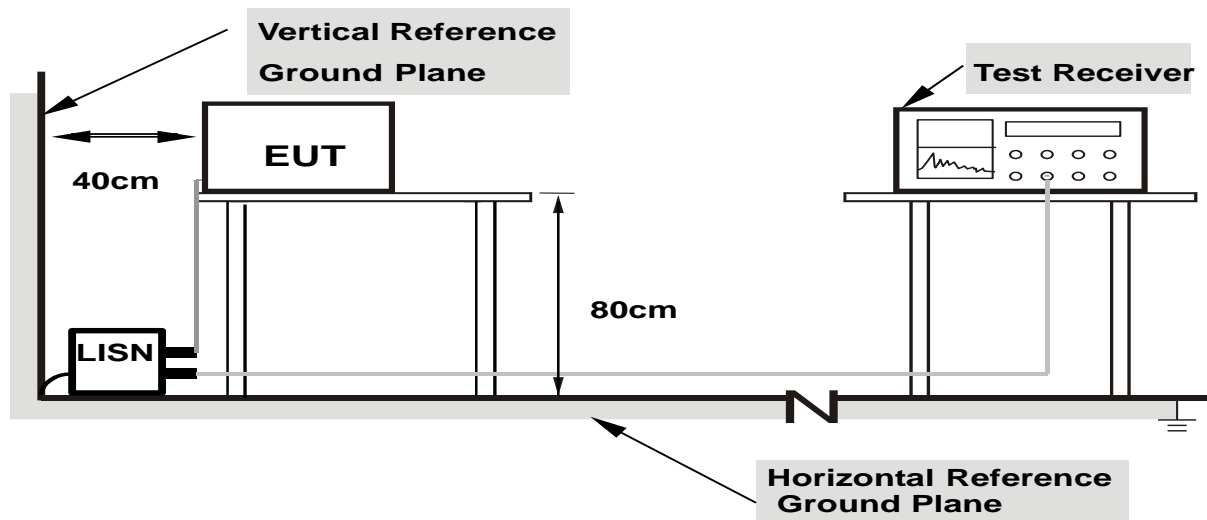
4.1.2 TEST PROCEDURE

- 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.
- 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.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

4.1.5 TEST RESULT

EUT :	ELECTRONIC RFID & KEYPAD LOCKS	Model Name :	5000
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	N/A
Test Voltage :	N/A	Test Mode :	N/A

Note: The EUT is powered by battery, so not application.

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 Radiated Emission Limits (FCC 15.209)

Frequencies (MHz)	Field Strength (micorvolts/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

Note:

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

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC 15.225)

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters, equal to 124dBuV/m at 3 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters, equal to 90.5dBuV/m at 3 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters, equal to 80.5dBuV/m at 3 meters..
- (d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.2.2 TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz And above 1GHz,
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m meter test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m.
- 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.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

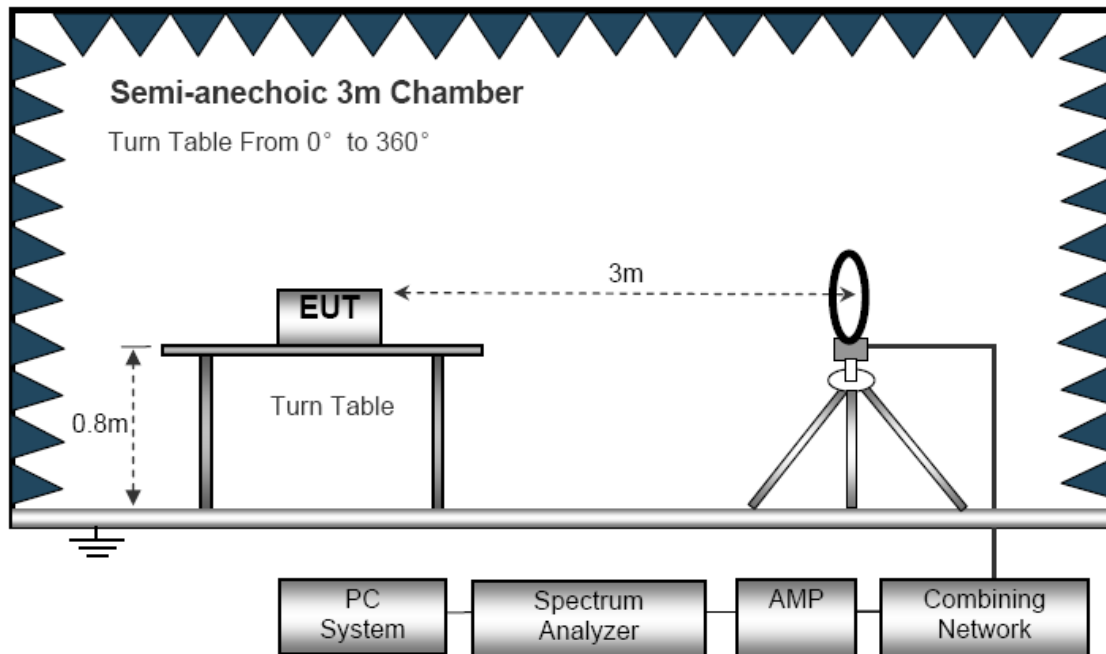
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

4.2.3 DEVIATION FROM TEST STANDARD

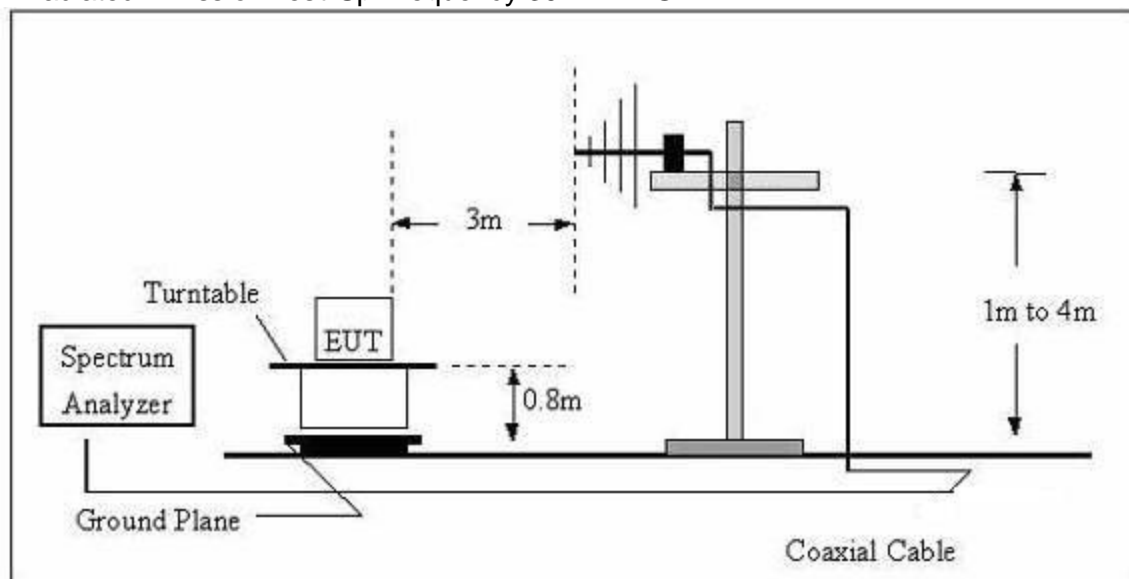
No deviation

4.2.4 TEST SETUP

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



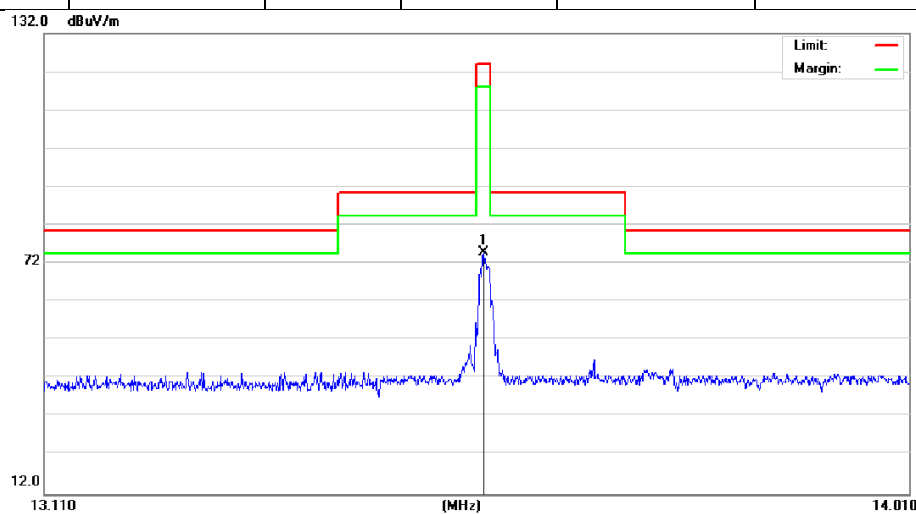
(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



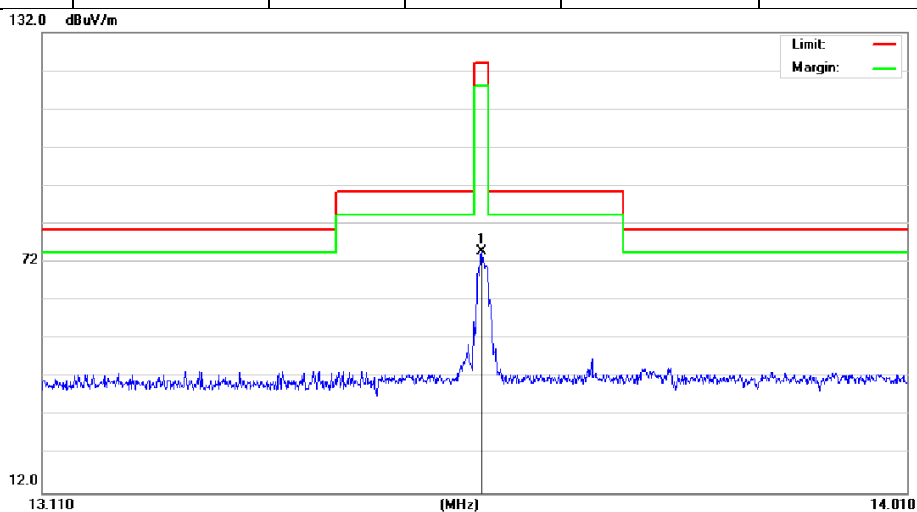
4.2.5 TEST RESULTS (BELOW 30MHz)

EUT :	ELECTRONIC RFID & KEYPAD LOCKS	Model Name. :	5000
Temperature :	20 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	DC 6V
Test Mode :	TX		

Freq.	Reading	Factor	Emission Level	Limit	Margin	Polar
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/@3m)	(dB)	
13.56	60.54	13.03	73.57	124	-50.43	H



Freq.	Reading	Factor	Emission Level	Limit	Margin	Polar
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/@3m)	(dB)	
13.56	59.12	13.03	72.15	124	-51.85	V



Freq.	Reading	Factor	Emission Level	Extrapolation factor	Measurement results (calculated)	Limits	Margin
(MHz)	dB μ V@3m	(dB)	(dB μ V/m)	(dB)	dB μ V/m @30m	dB μ V/m @30m	(dB)
27.05	14.95	13.17	28.12	40	-11.88	30	-41.88

Frequency Range	Frequency	Reading	Factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
(MHz)	(MHz)	dB μ V @3m	(dB)	(dB)	dB μ V/m &30m	dB μ V/m @30m	(dB)
13.110~13.41	13.375	28.48	21.55	40	10.03	40.5	-30.47
13.410~13.553	13.517	35.85	21.55	40	17.40	50.5	-33.10
13.553~13.567	13.559	60.10	21.55	40	41.65	84.0	-42.35
13.567~13.71	13.568	36.54	21.55	40	18.09	50.5	-32.41
13.710~14.01	13.818	33.65	21.55	40	15.20	40.5	-25.3

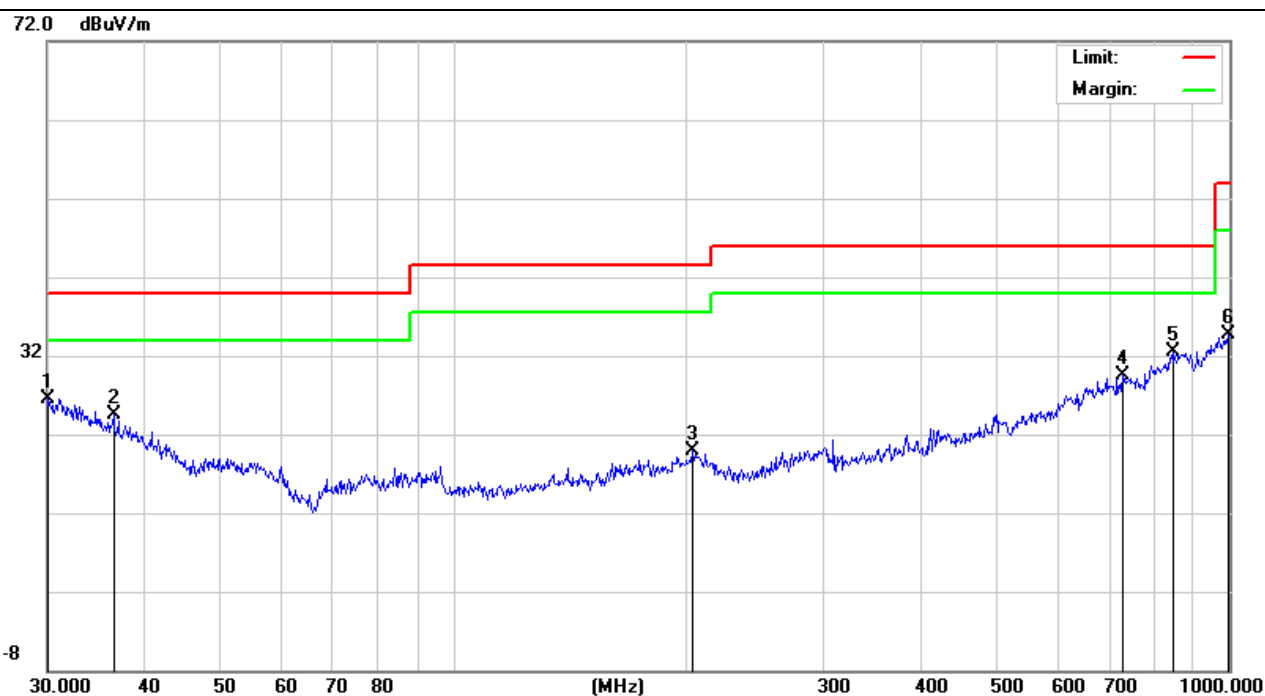
4.2.6 TEST RESULTS (30 – 1000 MHz)

EUT :	ELECTRONIC RFID & KEYPAD LOCKS	Model Name :	5000
Temperature :	20 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	DC 6V
Test Mode :	TX	Polarization :	Horizontal

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
H	30.1054	5.42	21.15	26.57	40.00	-13.43	QP
H	36.5091	6.22	18.22	24.44	40.00	-15.56	QP
H	203.5228	5.98	13.85	19.83	43.50	-23.67	QP
H	729.3582	7.15	22.26	29.41	46.00	-16.59	QP
H	848.0562	6.81	25.68	32.49	46.00	-13.51	QP
H	996.4996	6.53	28.08	34.61	54.00	-19.39	QP

Remark:

Factor = Antenna Factor + Cable Loss - Amplifier.

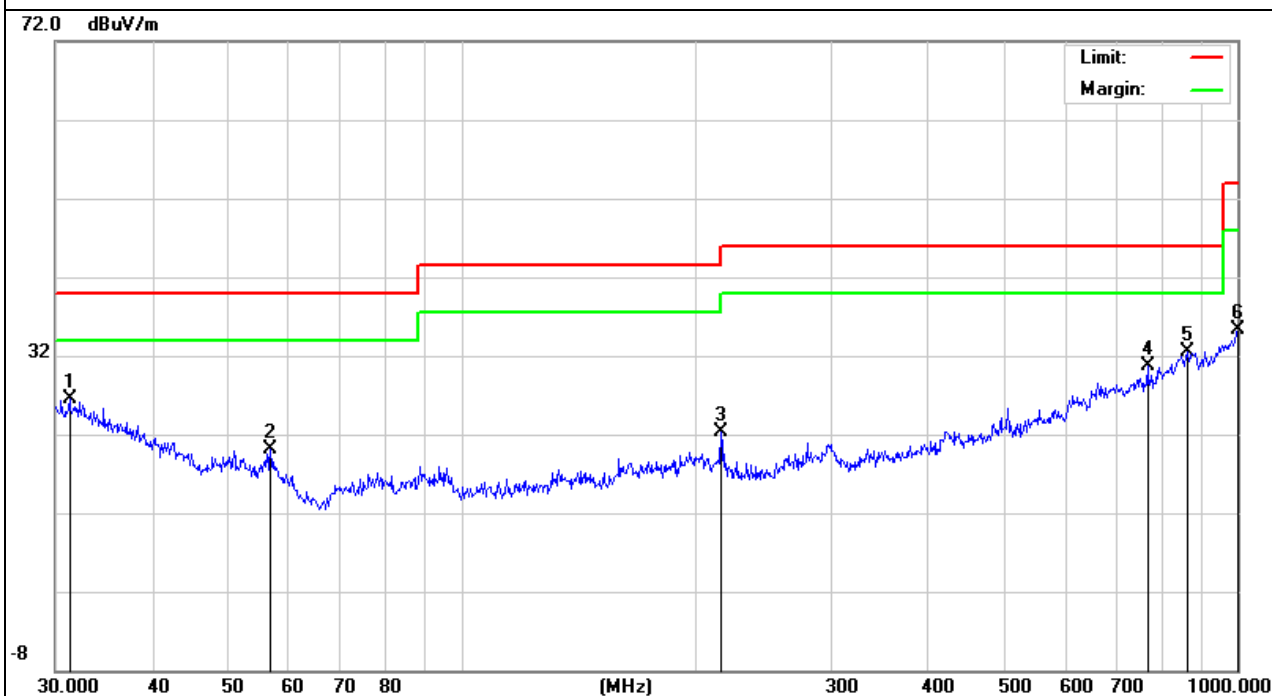


EUT :	ELECTRONIC RFID & KEYPAD LOCKS	Model Name :	5000
Temperature :	20 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	DC 6V
Test Mode :	TX	Polarization :	Vertical

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	31.2893	5.89	20.65	26.54	40.00	-13.46	QP
V	56.7916	8.10	11.99	20.09	40.00	-19.91	QP
V	216.0240	9.12	13.09	22.21	46.00	-23.79	QP
V	766.0571	8.42	22.35	30.77	46.00	-15.23	QP
V	863.0561	6.57	25.93	32.50	46.00	-13.50	QP
V	1000.0000	6.98	28.25	35.23	54.00	-18.77	QP

Remark:

Factor = Antenna Factor + Cable Loss - Amplifier.



5. BANDWIDTH TEST

5.1 TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak mode.
2. 20dB Bandwidth the resolution bandwidth of 1 kHz and the video bandwidth of 1 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

5.2 DEVIATION FROM STANDARD

FCC Part15.225

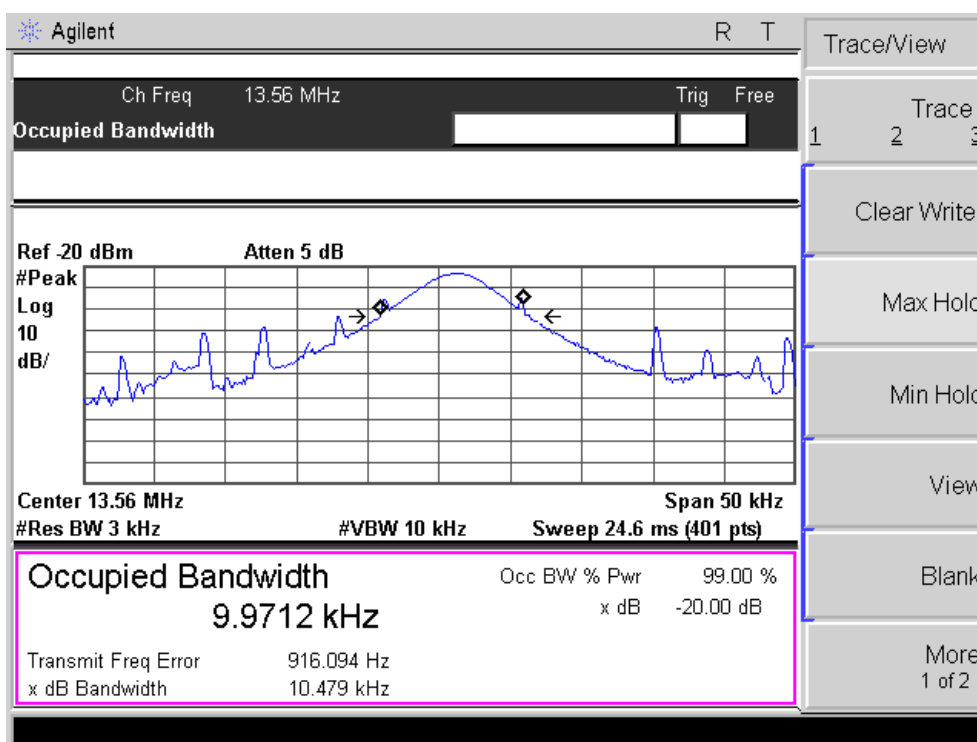
5.3 TEST SETUP



5.4 TEST RESULTS

EUT :	ELECTRONIC RFID & KEYPAD LOCKS	Model Name :	5000
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1020 hPa	Test Power :	DC 6V
Test Mode :	TX CH 1		

Test Channel	Frequency (MHz)	20 dBc Bandwidth (kHz)
CH01	13.56	10.479



6. FREQUENCY TOLERANCE

6.1 Requirement:

Test Requirement: FCC Part15.225

Test Method: ANSI C63.4:2003

Requirement: The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

6.2 Test Procedure

- 1.The EUT was placed on a turn table which is 0.8m above ground plane.
- 2.Set EUT as normal operation
- 3.Set SPA Center Frequency = fundamental frequency, RBW, VBW= 10kHz, Span =100kHz.
- 4.Set SPA Max hold. Mark peak.

Test Result

Power Supply	Temperature (°C)	Measured Frequency (MHz)	Frequency Error (MHz)	Result %	Part 15.225 Limit
DC 6.0V	-20	13.560150	0.000150	0.00111	+/- 0.01%
	20	13.560155	0.000155	0.00114	+/- 0.01%
	50	13.560153	0.000153	0.00113	+/- 0.01%
DC 5.4V	-20	13.560154	0.000154	0.00114	+/- 0.01%
	20	13.560152	0.000152	0.00112	+/- 0.01%
	50	13.560153	0.000153	0.00113	+/- 0.01%
DC 6.6V	-20	13.560148	0.000148	0.00109	+/- 0.01%
	20	13.560152	0.000152	0.00112	+/- 0.01%
	50	13.560147	0.000147	0.00108	+/- 0.01%