



RFID 13.56 MHz Radio Test Report

FCC ID: WXASF650A

This report concerns (check one) : Original Grant Class II Change

Issued Date : Nov. 06, 2012
Project No. : 1208196
Equipment : Fingerprint Reader With RJ45 Connector
Ethernet Interface
Model Name : SF650A; SF650A-XX (XX: 0~9, A~Z for
marketing purpose)
Applicant : GIGA-TMS INC.
Address : 8F, No. 31, Lane 169, Kang-Ning St.,
Hsi-Chih, New Taipei City, Taiwan

Tested by: Neutron Engineering Inc. EMC Laboratory
Date of Receipt: Oct. 30, 2012
Date of Test: Oct. 30, 2012 ~ Nov. 02, 2012

Testing Engineer: Rush Kao
(Rush Kao)

Technical Manager: Jeff Yang
(Jeff Yang)

Authorized Signatory: Andy Chiu
(Andy Chiu)

Neutron Engineering Inc.
B1, No. 37, Lane 365, YangGuang St.,
NeiHu District 114, Taipei, Taiwan.
TEL: +886-2-2657-3299
FAX: +886-2-2657-3331





Declaration

Neutron represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

Neutron's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **Neutron** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **Neutron** issued reports.

Neutron's reports must not be used by the client to claim product endorsement by the authorities or any agency of the Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and **Neutron-self**, extracts from the test report shall not be reproduced except in full with **Neutron's** authorized written approval.

Neutron's laboratory quality assurance procedures are in compliance with the **ISO Guide 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.



Table of Contents

REPORT ISSUED HISTORY	4
1 CERTIFICATION	5
2 SUMMARY OF TEST RESULTS	6
2.1 TEST FACILITY	7
2.2 MEASUREMENT UNCERTAINTY	7
3 GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT	8
3.2 DESCRIPTION OF TEST MODES	9
3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	10
3.4 DESCRIPTION OF SUPPORT UNITS	11
4 RADIATED EMISSION	12
4.1 LIMITS	12
4.2 MEASUREMENT INSTRUMENTS LIST	13
4.3 TEST PROCEDURE	13
4.4 DEVIATION FROM TEST STANDARD	13
4.5 TEST SETUP	14
4.6 EUT OPERATING CONDITIONS	15
4.7 TEST RESULTS- FCC PART 15.209	16
4.8 TEST RESULTS- FCC PART 15.225	18
5 FREQUENCY STABILITY	20
5.1 LIMITS	20
5.2 MEASUREMENT INSTRUMENTS LIST	20
5.3 TEST PROCEDURE	20
5.4 DEVIATION FROM TEST STANDARD	20
5.5 EUT OPERATING CONDITIONS	20
5.6 TEST RESULTS	21
6 EUT TEST PHOTO	22



REPORT ISSUED HISTORY

Revised Version No.	Description	Issued Date
-	Initial Issue.	Nov. 06, 2012



1 CERTIFICATION

Equipment : Fingerprint Reader With RJ45 Connector Ethernet Interface
Brand Name : GIGATEK; PROMAG ; ProData
Model Name : SF650A; SF650A-XX (XX: 0~9, A~Z for marketing purpose)
Applicant : GIGA-TMS INC.
Date of Test : Oct. 30, 2012 ~ Nov. 02, 2012
Standards : FCC Part 15, Subpart C: 2010
ANSI C63.4: 2009

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-1-1208196) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP and TAF according to the ISO-17025 quality assessment standard and technical standard(s).



2 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part 15, Subpart C: 2010		
Standard Section	Test Item	Result
15.207	Conducted emission	N/A
15.35 / 15.205 / 15.209 / 15.225	Radiated emission	PASS
15.225(e)	Frequency Stability	PASS
15.203	Antenna Requirement	PASS

NOTE:

1. **N/A**: denotes test is not applicable in this Test Report
2. Portable device; SAR report is required.



2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

Radiated emission Test:

CB08: (VCCI RN: G-91; FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty is not specified by FCC/Industry Canada rules and for reference only.

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%**.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

B. Radiated emission test:

Test Site	Item	Measurement Frequency Range	Uncertainty	NOTE	
CB08	Radiated emission at 3m	Horizontal Polarization	30 - 200MHz	3.35 dB	
			200 - 1000MHz	3.11 dB	
			1 - 18GHz	3.97 dB	
			18 - 40GHz	4.01 dB	
		Vertical Polarization	30 - 200MHz	3.22 dB	
			200 - 1000MHz	3.24 dB	
			1 - 18GHz	4.05 dB	
			18 - 40GHz	4.04 dB	

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.

Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR} , as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz : 3.6 dB

Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz : 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR} .



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Fingerprint Reader With RJ45 Connector Ethernet Interface	
Brand Name	GIGATEK; PROMAG ; ProData	
Model Name	SF650A; SF650A-XX (XX: 0~9, A~Z for marketing purpose)	
OEM Brand/Model Name	GF1911; GF1912	
Model Difference	Models' differences between each other only the changes of brand name and model name which do not affect the EMI performance. Model SF650A was used for final testing and collecting test data included in this report.	
Product Description	The EUT is a Fingerprint Reader With RJ45 Connector Ethernet Interface.	
	Operation Frequency:	13.56 MHz
	Modulation Type:	ASK
	Number of Channel	1
	Antenna Designation:	LOOP Antenna
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.	
Power Source	DC Voltage supplied from DC Source.	
Power Rating	I/P: DC 9-12V	
Connecting I/O Port(s)	Please refer to the User's Manual	
Products Covered	N/A	
EUT Modification(s)	N/A	

Note:

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



3.2 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 Test Mode	Description
Mode 1	TX

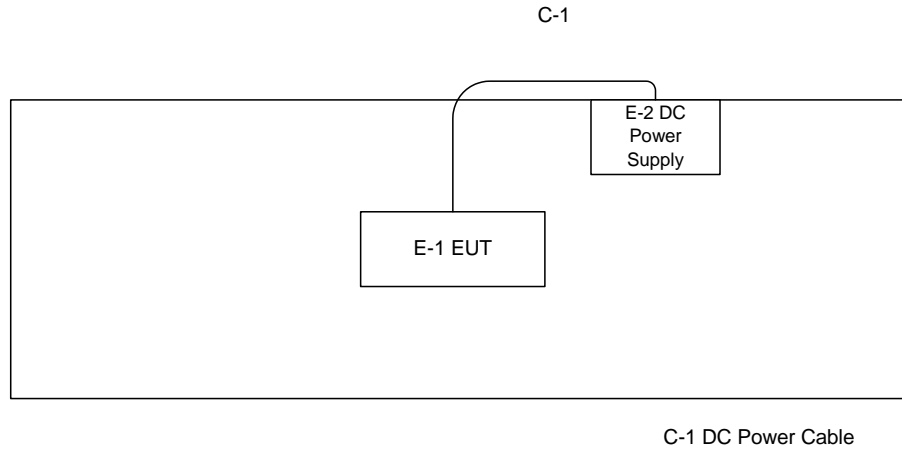
Radiated emission test	
Final Test Mode	Description
Mode 1	TX

Frequency Stability test	
Final Test Mode	Description
Mode 1	TX

Antenna Requirement test	
Final Test Mode	Description
Mode 1	TX



3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED





3.4 DESCRIPTION OF SUPPORT UNITS

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	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	Fingerprint Reader With RJ45 Connector Ethernet Interface	GIGATEK; PROMAG ; ProData	SF650A	WXASF650A	N/A	EUT
E-2	DC Power Supply	GOOD WILL	GPC-3030D	N/A	B710591	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	N/A	N/A	1.0M	Power cable

Note:

- (1) The support equipment was authorized by Declaration of Conformity (DOC).



4 RADIATED EMISSION

4.1 LIMITS

FCC Part 15.209				
Frequency (MHz)	Field Strength Limitation		Field Strength Limitation at 3m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
0.009 – 0.490	2400 / F(KHz)	300m	10000 * 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 – 1.705	24000 / F(KHz)	30m	100 * 24000/F(KHz)	20log 24000/F(KHz) + 40
1.705 – 30.00	30	30m	100* 30	20log 30 + 40
30.0 – 88.0	100	3m	100	20log 100
88.0 – 216.0	150	3m	150	20log 150
216.0 – 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500
FCC Part 15.225(a)/(b)/(c)				
Frequency (MHz)	Field Strength Limitation		Field Strength Limitation at 3m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
13.553 – 13.567	15,848	30 m	15,848*100	124
13.567 – 13.710	334	30 m	334*100	90.5
13.110 – 13.410	106	30 m	106*100	80.5
13.710 – 14.010				

NOTE:

- (1) The tighter limit shall apply at the boundary between two frequency range.
- (2) Limitation expressed in dBuV/m is calculated by 20log Emission Level (uV/m).
- (3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $L_{d1} = L_{d2} * (d_2/d_1)^2$.
 Example:
 F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 3m distance is adjusted as $L_{d1} = L_1 = 30uV/m * (10)^2 = 100 * 30 uV/m$
- (4) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
 Margin Level = Measurement Value – Limit Value



4.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 01, 2013
2	Microflex Cable	N/A	N/A	1m	Apr. 14, 2013
3	Test Cable	N/A	LMR-400	966_12m	May. 15, 2013
4	Test Cable	N/A	LMR-400	966_3m	May. 15, 2013
5	Pre-Amplifier	EMC	EMC-330	980088	Jul. 12, 2013
6	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 12, 2013
7	Loop Ant.	EMCO	6502	00042960	Jan. 12,2013

Remark: "N/A" denotes No Model Name, No Serial No. or No Calibration specified.

4.3 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m or 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. 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. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting radiated 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.
- e. 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.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

NOTE: (FCC PART 15.209)

- a. Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode with Detector BW=120 kHz.
- b. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.

NOTE: (FCC PART 15.225)

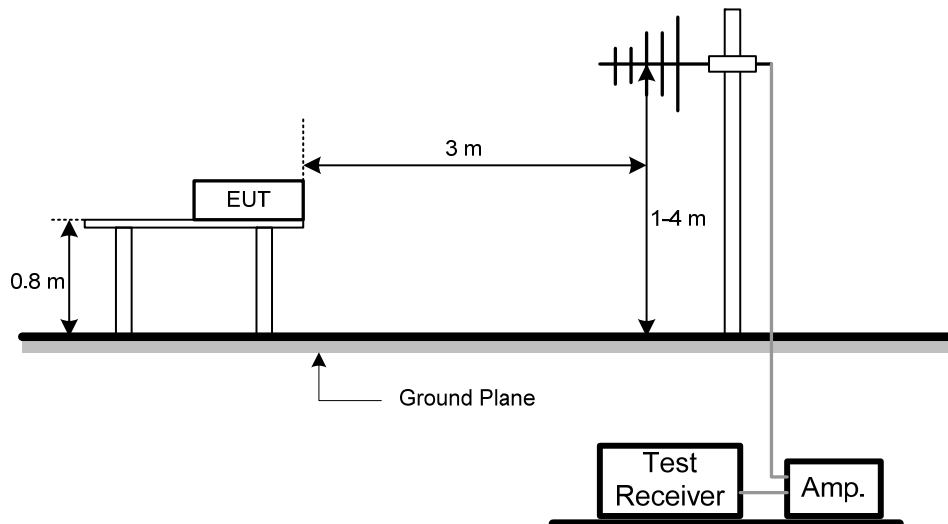
- a. Spectrum Setting:
 9 KHz – 150 KHz, RBW= 200Hz, VBW=200Hz, Sweep time = 200 ms.
 150 K Hz – 30 MHz, RBW= 10 KHz, VBW=10 KHz, Sweep time = 200 ms.
 30 MHz – 1000 MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
- b. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- c. The Log-Bicon Antenna will use to test frequency range from 30MHz to 1000MHz and the Loop Antenna will use to test frequency below 30MHz.

4.4 DEVIATION FROM TEST STANDARD

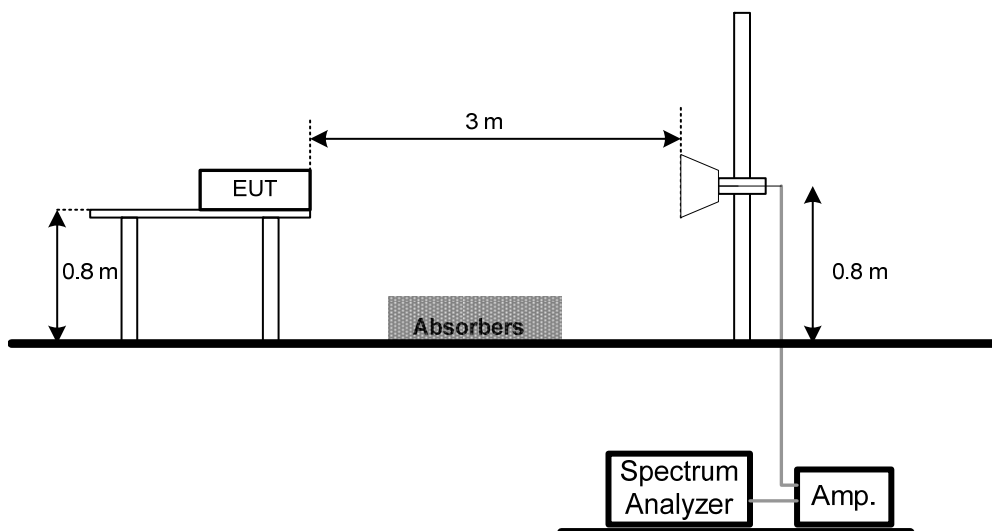
No deviation

4.5 TEST SETUP

Below 1 GHz



Above 1 GHz





4.6 EUT OPERATING CONDITIONS

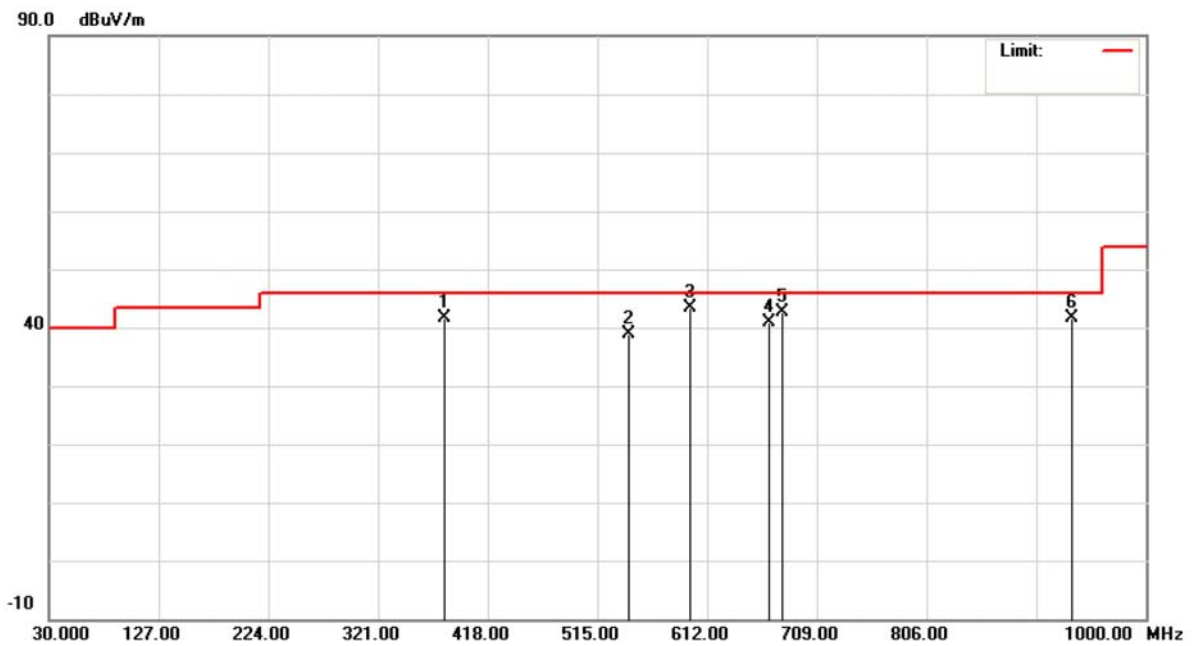
The EUT used during radiated emission measurement was designed to exercise in a manner similar to a typical use.



4.7 TEST RESULTS- FCC PART 15.209

E.U.T	Fingerprint Reader With RJ45 Connector Ethernet Interface	Model Name	SF650A
Temperature	26 °C	Relative Humidity	60%
Test Voltage	DC 12V(Supply from AC/DC Power Supply)		
Test Mode	TX		

Polarization: Vertical

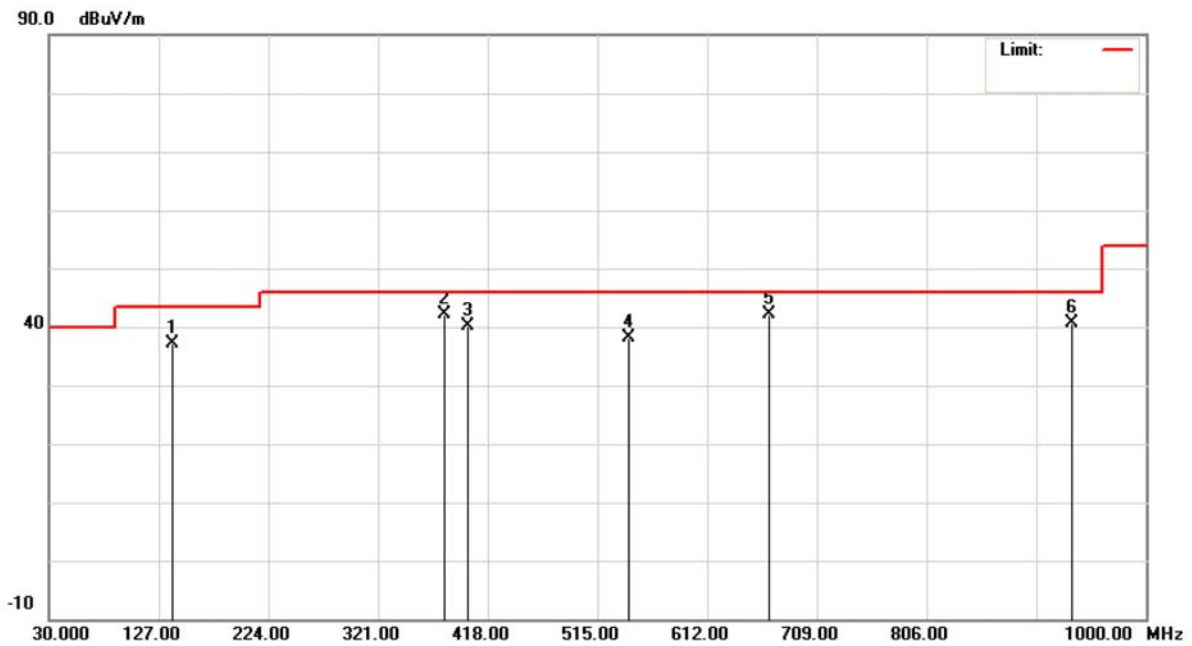


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		379.2000	57.69	-16.13	41.56	46.00	-4.44	peak	
2		542.1599	51.86	-12.86	39.00	46.00	-7.00	peak	
3	*	596.4800	54.32	-11.00	43.32	46.00	-2.68	peak	
4		666.3200	51.00	-10.05	40.95	46.00	-5.05	peak	
5		677.9600	52.66	-9.91	42.75	46.00	-3.25	peak	
6		934.0400	47.55	-5.82	41.73	46.00	-4.27	peak	



E.U.T	Fingerprint Reader With RJ45 Connector Ethernet Interface	Model Name	SF650A
Temperature	26 °C	Relative Humidity	60%
Test Voltage	DC 12V(Supply from AC/DC Power Supply)		
Test Mode	TX		

Polarization: Horizontal

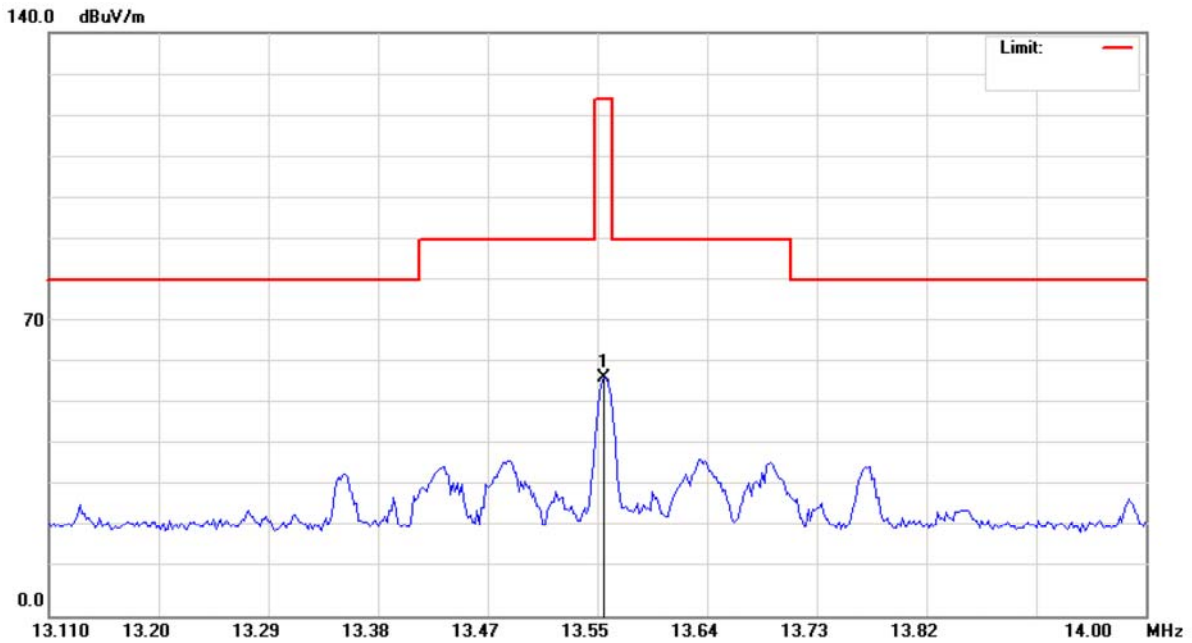


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		138.6400	55.99	-18.80	37.19	43.50	-6.31	peak	
2	*	379.2000	58.22	-16.13	42.09	46.00	-3.91	peak	
3		400.5400	55.64	-15.49	40.15	46.00	-5.85	peak	
4		542.1599	50.95	-12.86	38.09	46.00	-7.91	peak	
5		666.3200	52.13	-10.05	42.08	46.00	-3.92	peak	
6		934.0400	46.38	-5.82	40.56	46.00	-5.44	peak	



4.8 TEST RESULTS- FCC PART 15.225

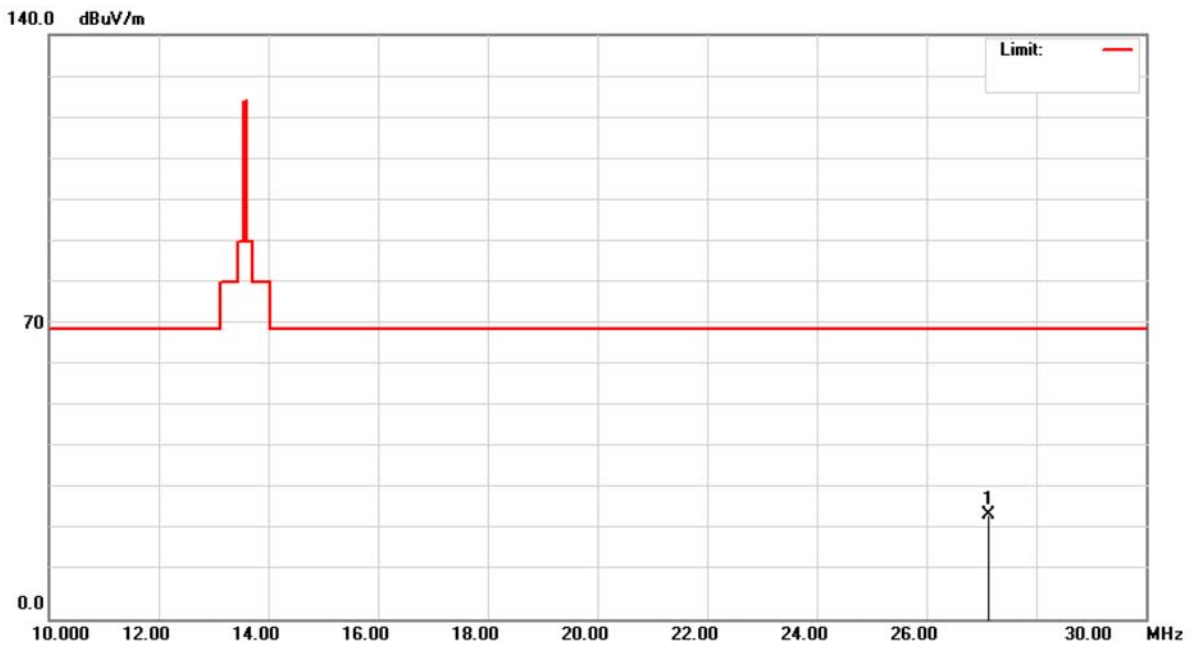
E.U.T	Fingerprint Reader With RJ45 Connector Ethernet Interface	Model Name	SF650A
Temperature	26 °C	Relative Humidity	60%
Test Voltage	DC 12V(Supply from AC/DC Power Supply)		
Test Mode	TX		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	*	13.5603	45.94	11.24	57.18	124.0	-66.82	peak	



E.U.T	Fingerprint Reader With RJ45 Connector Ethernet Interface	Model Name	SF650A
Temperature	26 °C	Relative Humidity	60%
Test Voltage	DC 12V(Supply from AC/DC Power Supply)		
Test Mode	TX		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	27.1200	14.98	9.92	24.90	69.54	-44.64	peak	



5 FREQUENCY STABILITY

5.1 LIMITS

FCC Part 15.225(e)

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.

5.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Aug. 29, 2013

Remark: "N/A" denotes No Model Name, No Serial No. or No Calibration specified.

5.3 TEST PROCEDURE

- a. The equipment under test was connected to an external AC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber.
After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.
- b. At room temperature ($25\pm 5^{\circ}\text{C}$), an external variable AC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

5.4 DEVIATION FROM TEST STANDARD

No deviation

5.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.6** Unless otherwise a special operating condition is specified in the follows during the testing.



5.6 TEST RESULTS

E.U.T	Fingerprint Reader With RJ45 Connector Ethernet Interface	Model Name	SF650A
Temperature	26 °C	Relative Humidity	60%
Test Voltage	DC 12V(Supply from AC/DC Power System)		
Test Mode	TX		

Frequency Stability Versus Environmental Temperature

	Temperature (°C)	Voltage (AC)	Frequency (MHz)	Frequency Error (kHz)	Limit (kHz)	Result
	20	120V	13.56036			
0 min	50	120V	13.56032	-0.040	+/- 1.356	PASS
	-20	120V	13.56044	0.080	+/- 1.356	PASS
2 min	50	120V	13.56032	-0.040	+/- 1.356	PASS
	-20	120V	13.56046	0.100	+/- 1.356	PASS
5 min	50	120V	13.56032	-0.040	+/- 1.356	PASS
	-20	120V	13.56044	0.080	+/- 1.356	PASS
10 min	50	120V	13.56032	-0.040	+/- 1.356	PASS
	-20	120V	13.56046	0.100	+/- 1.356	PASS

Frequency Stability Versus Input Voltage

Temperature (°C)	Voltage (AC)		Frequency (MHz)	Frequency Error (kHz)	Limit (kHz)	Result
20	V-nom	120	13.56036			
20	V-min	102	13.56036	0	+/- 1.356	PASS
20	V-max	138	13.56038	0.02	+/- 1.356	PASS