



Neutron Engineering Inc.

FCC Radio Test Report

FCC ID: 2AAVCARMSTRONG-LOCK

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

Issued Date : Apr. 30, 2013
Project No. : 1304020
Equipment : SMART DIGITAL CABINET LOCK
Model Name : SDWC-001W; SDWC-507K;
SDWC-666; SDWS-001
Applicant : Bai Fu Co., Ltd
Address : 3F., No.77, Zhouzi St., Neihu Dist.,
Taipei City 114, Taiwan (R.O.C.)

Tested by: Neutron Engineering Inc. EMC Laboratory

Date of Receipt: Apr. 08, 2013

Date of Test: Apr. 08, 2013 ~ Apr. 29, 2013

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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.

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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.



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1. CERTIFICATION

Equipment : SMART DIGITAL CABINET LOCK
Brand Name : ARMSTRONG
Model Name. : SDWC-001W; SDWC-507K; SDWC-666; SDWS-001
Applicant : Bai Fu Co., Ltd
Factory : BESTFULL INVESTMENTS LTD
Address : Buliding B Huaqiang Road Shangsha Village, Chang An Town, Dong Guan
City Guang Dong Province, China
Date of Test : Apr. 08, 2013 ~ Apr. 29, 2013
Test Item : ENGINEERING SAMPLE
Standard(s) : FCC Part15, Subpart C(15.209)/ 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-1-1304020) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).



2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.209)			
Standard(s) Section	Test Item	Judgment	Remark
FCC			
15.207	Conducted Emission	N/A Note (1)	Note (2)
15.209	Radiated Emission	PASS	

NOTE:

- (1) "N/A" denotes test is not applicable in this test report.
- (2) The EUT used new battery.



2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **DG-CB03** at the location of No.3, Jinshagang 1st Road, ShiXia, Dalang Town, Dong Guan, China.523792
Neutron's test firm number for FCC 319330

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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 %**.

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U , (dB)	NOTE
DG-C02	CISPR	150 KHz ~ 30MHz	1.94	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U , (dB)	NOTE
DG-CB03	CISPR	9KHz~30MHz	V	3.79	
		9KHz~30MHz	H	3.57	
		30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	H	3.60	
		200MHz ~ 1,000MHz	V	3.86	
		200MHz ~ 1,000MHz	H	3.94	
		1GHz~18GHz	V	3.12	
		1GHz~18GHz	H	3.68	
		18GHz~40GHz	V	4.15	
		18GHz~40GHz	H	4.14	



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	SMART DIGITAL CABINET LOCK
Brand Name	ARMSTRONG
Model Name.	SDWC-001W; SDWC-507K; SDWC-666; SDWS-001
Model Difference	Only difference is the appearance.
Product Description	More details of EUT technical specification, please refer to the User's Manual.
Power Source	DC voltage supplied from 3*AAA size battery.
Power Rating	DC 4.5V
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. The maximum operating frequency is 125KHz.



3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based 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	WIRELESS

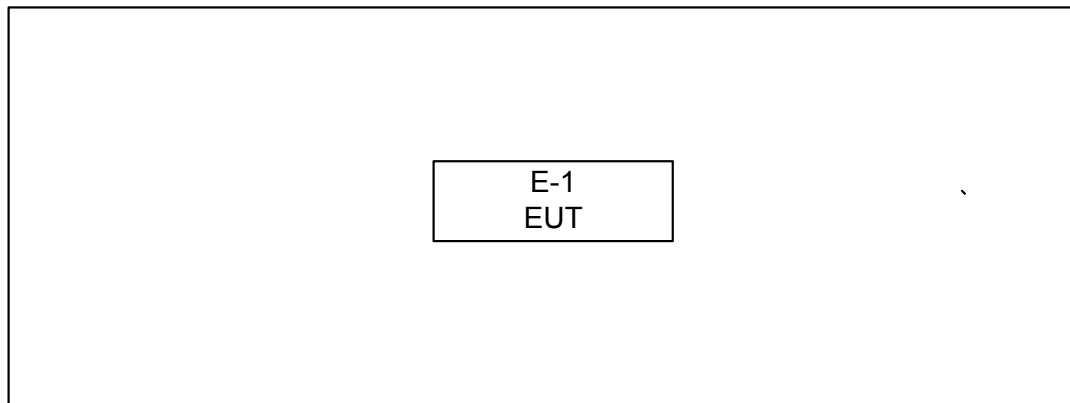
For Conducted Test	
Final Test Mode	Description
N/A	" N/A " denotes test is not applicable in this test report.

For Radiated Test	
Final Test Mode	Description
Mode 1	WIRELESS



3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated:





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	SMART DIGITAL CABINET LOCK	ARMSTRONG	SDWC-001W	2AAVCARMSTRONG-LOCK	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note
N/A	-	-	-	

Note:

- (1) For detachable type I/O cable should be specified the length in m in 『Length』 column.

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	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

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.

4.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	EMCO	3816/2	00052765	Apr. 25, 2014
2	LISN	R&S	ENV216	100087	Nov. 16, 2013
3	Test Cable	N/A	C_17	N/A	Mar. 15, 2014
4	EMI TEST RECEIVER	R&S	ESCS30	826547/022	Apr. 25, 2014
5	50Ω Terminator	SHX	TF2-3G-A	08122902	Apr. 25, 2014

Remark: "N/A" denotes no model no., serial no. or no calibration specified.

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

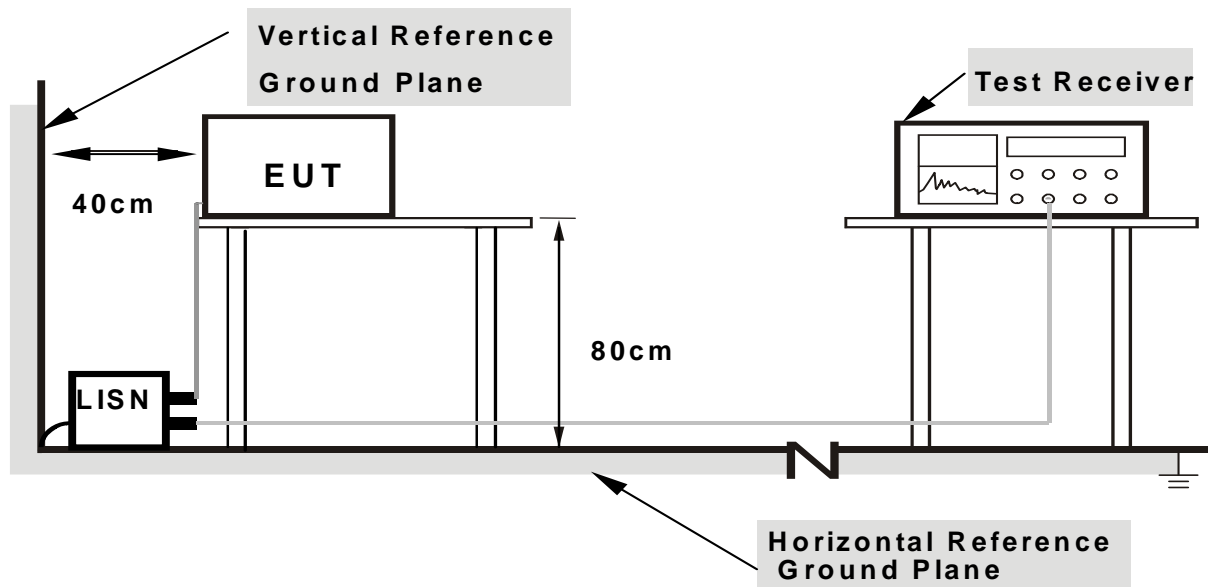
4.1.3 TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- 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.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 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

4.1.6 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmitting/receiving during test.



4.1.7 TEST RESULTS

EUT:	SMART DIGITAL CABINET LOCK	Model Name:	SDWC-001W
Temperature:	-	Relative Humidity:	-
Test Voltage:	-	Phase:	-
Test Mode:	" N/A " denotes test is not applicable in this test report.		

Remark

- (1) All readings are QP Mode value unless otherwise stated AVG in column of『Note 』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform. In this case, a " * " marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150KHz to 30MHz.



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

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

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 15.209)

FREQUENCY (MHz)	(dBuV/m) (at 3m)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC Part 15.249)

FCC Part15 (15.249) , Subpart C	
Limit	Frequency Range (MHz)
Field strength of fundamental 50000 μ V/m (94 dB μ V/m) @ 3 m	2400-2483.5
Field strength of harmonics 500 μ V/m (54 dB μ V/m) @ 3 m	Above 2483.5



4.2.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Apr. 25, 2014
2	Amplifier	HP	8447D	2944A09673	Apr. 25, 2014
3	Test Receiver	R&S	ESCI	100382	Apr. 25, 2014
4	Test Cable	N/A	C-01_CB03	N/A	Jul. 02, 2014
5	Antenna	ETS	3115	00075789	Apr. 25, 2014
6	Amplifier	Agilent	8449B	3008A02274	Apr. 25, 2014
7	Spectrum	Agilent	E4408B	US39240143	Nov. 16, 2013
8	Test Cable	HUBER+SUHNER	C-45	N/A	Apr. 30, 2014
9	Controller	CT	SC100	N/A	N/A
10	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Apr. 25, 2014
11	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Oct.12, 2013
12	Horn Antenna	EMCO	3115	9605-4803	Apr. 25, 2014

Remark: "N/A" denotes no model no., serial no. or no calibration specified.

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

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz for PK/AVG detector
Start ~ Stop Frequency	90kHz~110kHz for QP detector
Start ~ Stop Frequency	110kHz~490kHz for PK/AVG detector
Start ~ Stop Frequency	490kHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector



4.2.3 TEST PROCEDURE

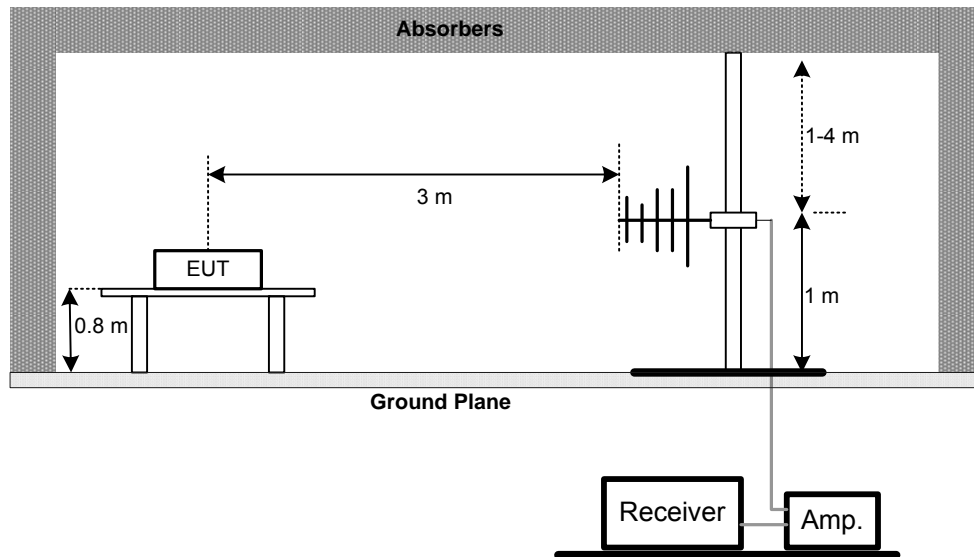
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- 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 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.
- 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.

4.2.4 DEVIATION FROM TEST STANDARD

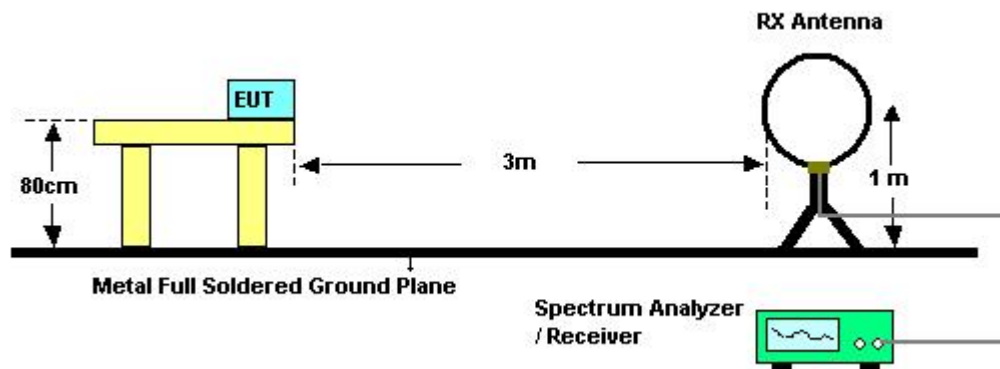
No deviation

4.2.5 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(B) For radiated emissions below 30MHz



4.2.6 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.



4.2.7 TEST RESULTS (BELOW 30MHz)

EUT:	SMART DIGITAL CABINET LOCK	Model No. :	SDWC-001W
Temperature:	25°C	Relative Humidity:	58 %
Test Voltage:	DC 4.5V		
Test Mode:	WIRELESS		

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
0.0094	0°	17.15	24.30	41.45	128.19	-86.74	AV
0.0094	0°	19.45	24.30	43.75	148.19	-104.44	PK
0.0138	0°	18.02	24.30	42.32	124.81	-82.49	AV
0.0138	0°	20.27	24.30	44.57	144.81	-100.24	PK
0.0265	0°	17.38	23.89	41.27	119.14	-77.87	AV
0.0265	0°	20.07	23.89	43.96	139.14	-95.18	PK
0.1250	0°	46.25	21.00	67.25	105.67	-38.42	AV
0.1250	0°	49.02	21.00	70.02	125.67	-55.65	PK
0.2460	0°	19.72	20.41	40.13	99.79	-59.66	AVG
0.2460	0°	22.41	20.41	42.82	119.79	-76.97	PK
1.5270	0°	18.45	19.55	38.00	63.93	-25.93	QP

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
0.0093	90°	18.32	24.30	42.62	128.28	-85.66	AVG
0.0093	90°	20.56	24.30	44.86	148.28	-103.42	PK
0.0237	90°	17.47	24.07	41.54	120.11	-78.57	AVG
0.0237	90°	20.57	24.07	44.64	140.11	-95.47	PK
0.0318	90°	18.47	23.55	42.02	117.56	-75.53	AVG
0.0318	90°	20.77	23.55	44.32	137.56	-93.23	PK
0.1250	90°	45.25	21.00	66.25	105.67	-39.42	AVG
0.1250	90°	49.25	21.00	70.25	125.67	-55.42	PK
0.2460	90°	18.36	20.41	38.77	99.79	-61.02	AVG
0.2460	90°	20.72	20.41	41.13	119.79	-78.66	PK
1.6450	90°	18.47	19.54	38.01	63.28	-25.28	QP

Remark :

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported ◦
- (2) Distance extrapolation factor = 40 log (specific distance / test distance) (dB); ◦
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor. ◦



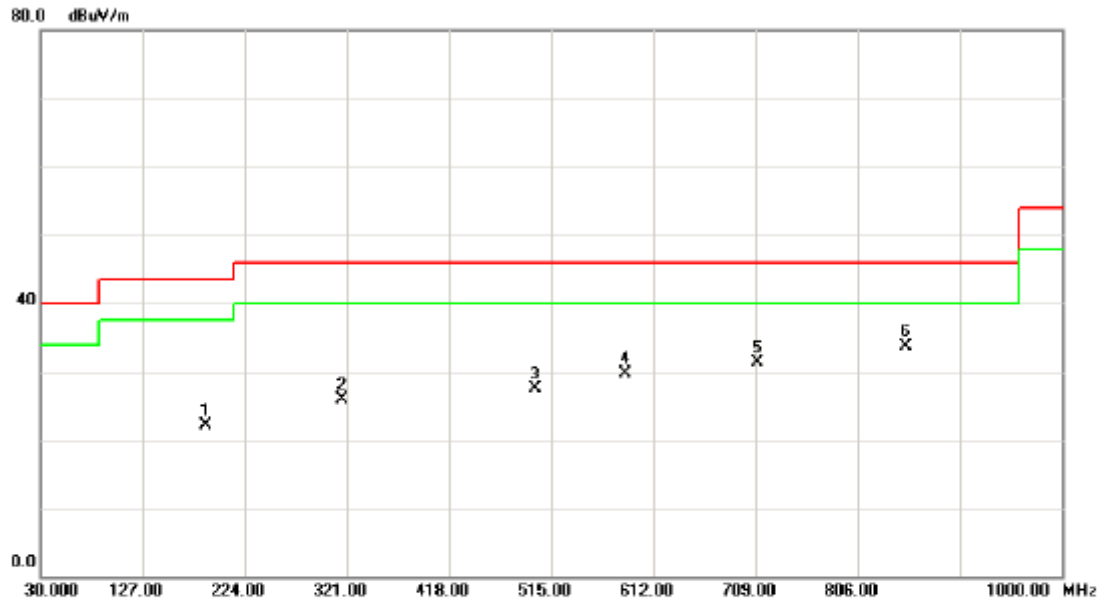
4.2.8 TEST RESULTS (BETWEEN 30 – 1000 MHz)

Remark :

- (1) 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 ◦
- (2) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency ◦ “F” denotes fundamental frequency; “ H” denotes spurious frequency. “E” denotes band edge frequency.
- (3) Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode or QP detector mode of the emission ◦
- (4) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.



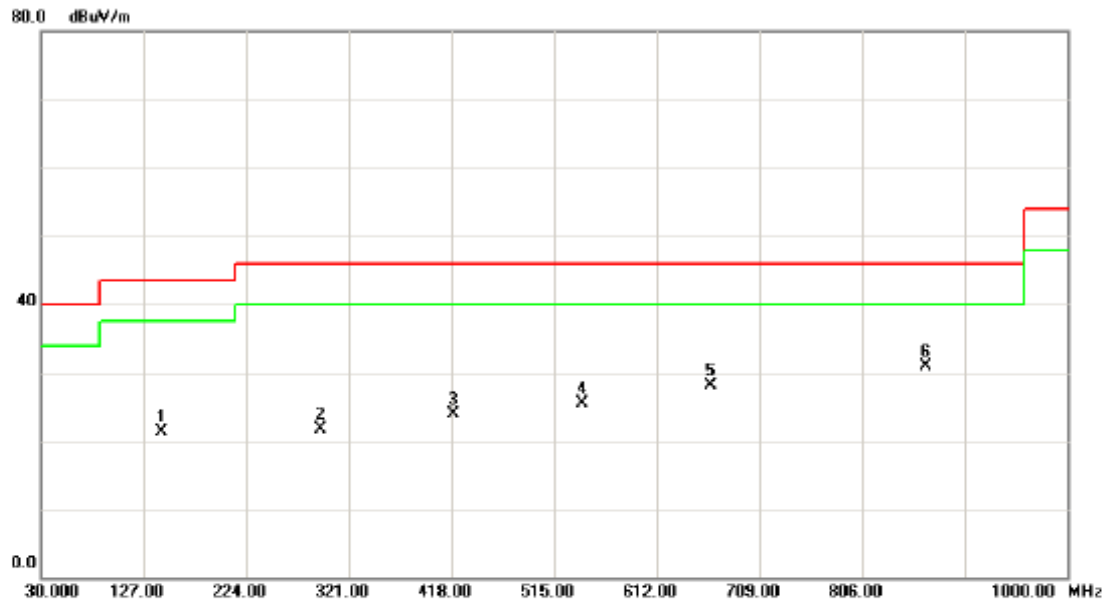
EUT:	SMART DIGITAL CABINET LOCK	Model Name:	SDWC-001W
Temperature:	25 °C	Relative Humidity:	55 %
Test Voltage:	DC 4.5V	Phase:	Vertical
Test Mode:	WIRELESS		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		187.6250	38.82	-16.76	22.06	43.50	-21.44	peak	
2		316.1500	37.61	-11.68	25.93	46.00	-20.07	peak	
3		500.4500	34.82	-7.34	27.48	46.00	-18.52	peak	
4		585.3250	34.35	-4.62	29.73	46.00	-16.27	peak	
5		711.4250	34.42	-3.04	31.38	46.00	-14.62	peak	
6	*	852.0750	34.61	-0.85	33.76	46.00	-12.24	peak	



EUT:	SMART DIGITAL CABINET LOCK	Model Name:	SDWC-001W
Temperature:	25 °C	Relative Humidity:	55 %
Test Voltage:	DC 4.5V	Phase:	Horizontal
Test Mode:	WIRELESS		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		143.9750	38.93	-17.66	21.27	43.50	-22.23	peak	
2		294.3250	33.83	-12.06	21.77	46.00	-24.23	peak	
3		420.4250	32.57	-8.65	23.92	46.00	-22.08	peak	
4		541.6750	31.27	-5.80	25.47	46.00	-20.53	peak	
5		662.9250	31.37	-3.29	28.08	46.00	-17.92	peak	
6	*	866.6250	31.47	-0.61	30.86	46.00	-15.14	peak	