

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : CORDLESS DOORBELL & CLOCK
Model No. : BC-01M
FCC ID : XXXBC-01M
Filing Type : Certification
Applicant : **POWER ELECTRONIC CO., LTD**
NO. 573, CHUNG CHENG RD., HSIN-TIEN, TAIPEI,
TAIWAN, R.O.C.

- The test result refers exclusively to the test presented test model / sample.
- Without the written authorization of the test lab., the Test Report may not be copied.
- **Certificate or Test Report must not be used by the applicant to claim the product in this test report endorsement by NVLAP or any agency of U.S. government.**

SPORTON International Inc.

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

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CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment : CORDLESS DOORBELL & CLOCK
Model No. : BC-01M
FCC ID : XXXBC-01M
Applicant : **POWER ELECTRONIC CO., LTD**
NO. 573, CHUNG CHENG RD., HSIN-TIEN, TAIPEI,
TAIWAN, R.O.C.

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 1992** and the energy emitted by this equipment was **passed** both radiated and conducted emission limits. Testing was carried out on Jul. 20, 2001 at **SPORTON International Inc.** LAB. in Lin Kou.


K. J. Lin
Manager

SPORTON International Inc.

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

1. General Description of Equipment under Test

1.1. Applicant

POWER ELECTRONIC CO., LTD
NO. 573, CHUNG CHENG RD., HSIN-TIEN, TAIPEI, TAIWAN, R.O.C.

1.2. Manufacturer

Same as 1.1.

1.3. Basic Description of Equipment under Test

Equipment	: CORDLESS DOORBELL & CLOCK
Model No.	: BC-01M
FCC ID	: XXXBC-01M
Trade Name	: POWER ELECTRONIC
Power Supply Type	: From Battery (6V)
Power Cord	: N/A

1.4. Feature of Equipment under Test

- Operating Frequency: 313.85MHz
- Operating Range Up to 100 FT
- For Use With Transmitter button: AAA (UM4) x 4

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. The EUT has been associated with peripherals pursuant to ANSI C63.4-1992 and configuration operated in a manner which tended to maximize its emission characteristics in a typical application.
- b. Frequency range investigated: radiation 30 MHz to 3139MHz.
- c. The radiated emissions testing was made by rotating three orthogonal axes.(Normal mode, Horizontal mode, Vertical mode).
- d. The EUT employs a switch that will automatically deactivate the transmitter within no more than 5 seconds of being released.
- e. Pursuant to 15.231(c) of Part 15. Subpart C, the bandwidth of the emission at the 20dB point shall be no wider than 0.25% of the center frequency for EUT.

The carrier frequency of EUT is 313.85MHz

$313.85\text{MHz} * 0.25\% = 784.6\text{KHz}$

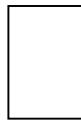
For 313.85MHz, the bandwidth is 530KHz (as shown in section 2.4 of this test report), which is less than 784.6KHz.

The EUT meet the 20dB point bandwidth requirement.

2.2. Description of Test System

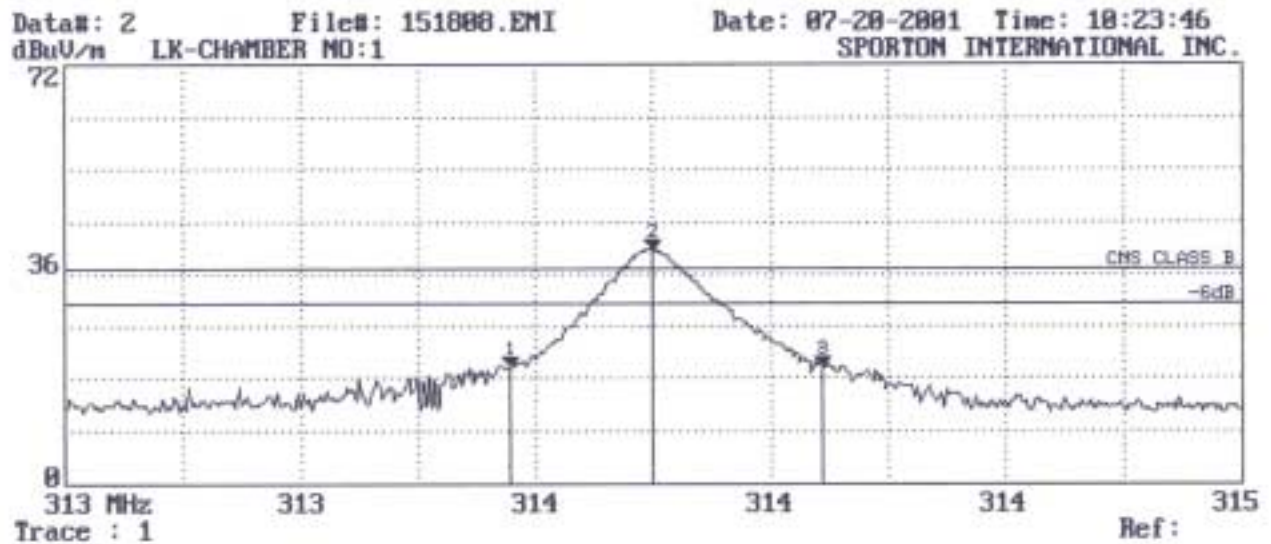
The EUT was tested alone. No support devices is needed for testing.

2.3. Connection Diagram of Test System



EUT

2.4. A plot shows the EUT meet the requirement of 15.231(c)



the bandwidth of the emission at the 20dB point is 530Hz

3. Test Software

No test software was used during testing.

4. General Information of Test

4.1. Test Facility

This test was carried out by SPORTON International Inc.

Test Site Location : No. 30-2, Lin 6, Diing-Fwu Tsuen, Lin-Kou-Hsiang,
Taipei Hsien, Taiwan, R.O.C.

TEL : 886-2-2601-1640

FAX : 886-2-2601-1695

4.2. Standard for Methods of Measurement

ANSI C63.4-1992

4.3. Test in Compliance with

FCC Part 15, Subpart C

4.4. Frequency Range Investigated

- a. Conduction: from 450 kHz to 30 MHz
- b. Radiation : from 30 MHz to 3139 MHz

4.5. Test Distance

The test distance of radiated emission from antenna to EUT is 3 M.

5. Test of Conducted Powerline

The power supply of the EUT is from battery.

So Conducted Powerline test is not applicable to this equipment.

6. Test of Radiated Emission

Radiated emissions from 30 MHz to 3139 MHz were measured with a bandwidth of 120 kHz according to the methods defines in ANSI C63.4-1992. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in section 6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

6.1. Major Measuring Instruments

6.1.1. from 30MHz to 1GHz

- Amplifier (HP 87405A)
 - Attenuation 0 dB
 - RF Gain 20 dB
 - Signal Input 10 MHz to 3 GHz

- Spectrum Analyzer (HP 8560E)
 - Attenuation 0 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1000 MHz
 - Resolution Bandwidth 1 MHz
 - Video Bandwidth 1 MHz
 - Signal Input 30 Hz to 2.9 GHz

- Test Receiver (R&S ESEC30)
 - Resolution Bandwidth 120 KHz
 - Frequency Band 9 KHz to 2.75 GHz
 - Quasi-Peak Detector ON for Quasi-Peak Mode
OFF for Peak Mode

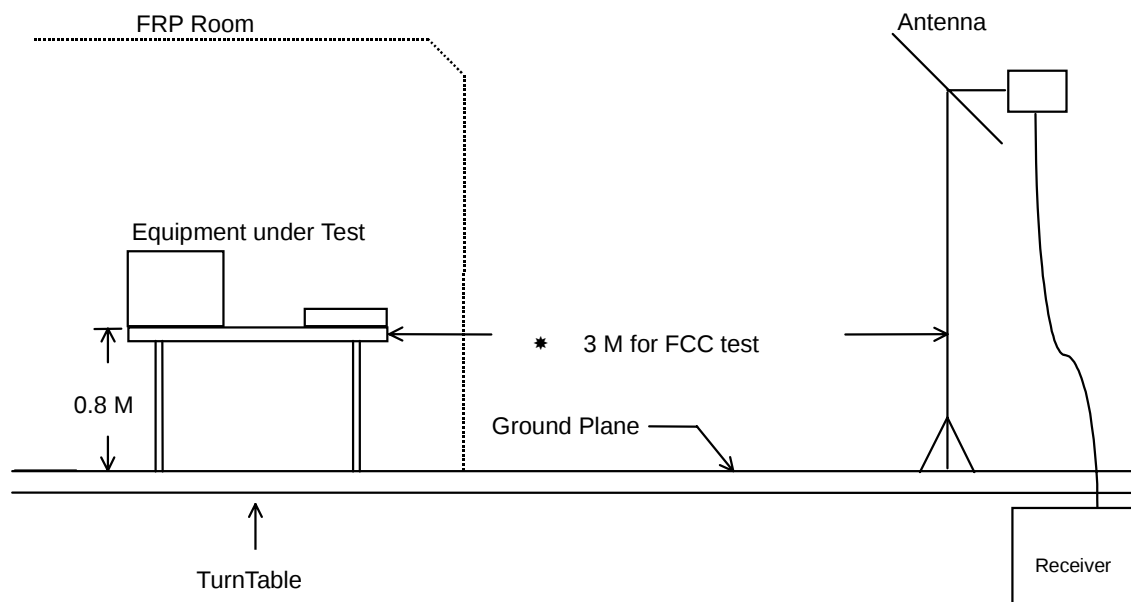
6.1.2. from 1GHz to 3.139GHz

- Receiver (HP 8546A)
 - Attenuation 0 dB
 - Start Frequency 1000 MHz
 - Stop Frequency 3139MHz
 - Resolution Bandwidth 1 MHz
 - Video Bandwidth 1 MHz
 - Signal Input 9 KHz to 6.5 GHz

6.2. Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 6 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 6 dB margin will be repeated one by one using the quasi-peak method and reported.

6.3. Typical Test Setup Layout of Radiated Emission



6.4. Test Result of Radiated Emission

6.4.1. Test mode : NORMAL MODE

- Test Distance : 3 M
- Temperature : 28°C
- Relative Humidity : 60 %
- Test Date : Jul. 19, 2001
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin

313.800 MHz / 61.36 dBuV (HORIZONTAL) Antenna Height 1.1 Meter, Turntable Degree 70 °.

- Test Distance : for 30MHz ~ 1GHz

Frequency (MHz)	Antenna Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m) (uV/m)	Emission (dBuV/m) (uV/m)	Level (dB)	Margin (dB)	Detect Mode
156.800	H	9.80	1.94	3.44	43.50 149.62	15.18	5.74	-28.32	Peak
156.800	V	9.80	1.94	5.10	43.50 149.62	16.84	6.95	-26.66	Peak

Fundamental Frequency and Spurious Emissions :

Frequency (MHz)	Antenna Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m) (uV/m)	Emission (dBuV/m) (uV/m)	Level (dB)	Margin (dB)	Detect Mode
313.800	H	13.20	2.57	45.59	75.55 5991.01	61.36 1169.50	-14.19	Q.P.	
627.500	H	18.65	3.91	6.84	55.55 599.10	29.40 29.51	-26.15	Q.P.	
941.200	H	20.70	5.03	2.13	55.55 599.10	27.86 24.72	-27.69	Q.P.	
313.800	V	13.20	2.57	26.26	75.55 5991.01	42.03 126.33	-33.52	Q.P.	
627.500	V	18.65	3.91	2.50	55.55 599.10	25.06 17.91	-30.49	Q.P.	
941.200	V	20.70	5.03	-0.05	55.55 599.10	25.68 19.23	-29.87	Q.P.	

- Test Distance : for 1GHz ~ 3.139GHz

Remark: Frequency from 1000MHz to 3139MHz, the emission emitted by the EUT is too low to be measured

Test Engineer : Benny
Benny Lee

6.4.2. Test mode : HORIZONTAL MODE

- Test Distance : 3 M
- Temperature : 28°C
- Relative Humidity : 60 %
- Test Date : Jul. 19, 2001
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin

313.800 MHz / 50.53 dBuV (VERTICAL) Antenna Height 1 Meter, Turntable Degree 30 °.

- Test Distance : for 30MHz ~ 1GHz

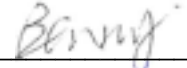
Frequency (MHz)	Antenna Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
156.800	H	9.80	1.94	2.60	43.50	149.62	14.34	5.21	-29.16	Peak
156.800	V	9.80	1.94	1.27	43.50	149.62	13.01	4.47	-30.49	Peak

Fundamental Frequency and Spurious Emissions :

Frequency (MHz)	Antenna Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
313.800	H	13.20	2.57	28.93	75.55	5991.01	44.70	171.79	-30.85	Q.P.
627.500	H	18.65	3.91	7.17	55.55	599.10	29.73	30.65	-25.82	Q.P.
941.200	H	20.70	5.03	0.22	55.55	599.10	25.95	19.84	-29.60	Q.P.
313.800	V	13.20	2.57	34.76	75.55	5991.01	50.53	336.12	-25.02	Q.P.
627.500	V	18.65	3.91	6.34	55.55	599.10	28.90	27.86	-26.65	Q.P.
941.200	V	20.70	5.03	0.89	55.55	599.10	26.62	21.43	-28.93	Q.P.

- Test Distance : for 1GHz ~ 3.139GHz

Remark: Frequency from 1000MHz to 3139MHz, the emission emitted by the EUT is too low to be measured

Test Engineer : 

Benny Lee

6.4.3. Test mode : VERTICAL MODE

- Test Distance : 3 M
- Temperature : 28°C
- Relative Humidity : 60 %
- Test Date : Jul. 19, 2001
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin

627.500 MHz / 32.73 dBuV (VERTICAL) Antenna Height 1 Meter, Turntable Degree 10 °.

- Test Distance : for 30MHz ~ 1GHz

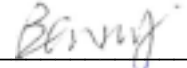
Frequency (MHz)	Antenna Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
156.800	H	9.80	1.94	2.60	43.50	149.62	14.34	5.21	-29.16	Peak
156.800	V	9.80	1.94	3.44	43.50	149.62	15.18	5.74	-28.32	Peak

Fundamental Frequency and Spurious Emissions :

Frequency (MHz)	Antenna Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
313.800	H	13.20	2.57	36.09	75.55	5991.01	51.86	391.74	-23.69	Q.P.
627.500	H	18.65	3.91	2.00	55.55	599.10	24.56	16.90	-30.99	Q.P.
941.200	H	20.70	5.03	-1.45	55.55	599.10	24.28	16.37	-31.27	Q.P.
313.800	V	13.20	2.57	36.76	75.55	5991.01	52.53	423.16	-23.02	Q.P.
627.500	V	18.65	3.91	10.17	55.55	599.10	32.73	43.30	-22.82	Q.P.
941.200	V	20.70	5.03	3.22	55.55	599.10	28.95	28.02	-26.60	Q.P.

- Test Distance : for 1GHz ~ 3.139GHz

Remark: Frequency from 1000MHz to 3139MHz, the emission emitted by the EUT is too low to be measured

Test Engineer : 

Benny Lee

6.5. Photographs of Radiated Emission Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW



REAR VIEW



7. Antenna Factor & Cable Loss

Frequency (Mhz)	Antenna Factor (dB)	Cable Loss (dB)
30	18.6	0.8
35	14.9	0.9
40	15.5	1.0
45	10.1	1.1
50	8.1	1.2
55	6.9	1.2
60	5.7	1.2
65	6.5	1.3
70	7.3	1.3
75	7.1	1.3
80	6.9	1.3
85	7.8	1.4
90	8.7	1.5
95	9.6	1.5
100	10.6	1.5
110	11.1	1.5
120	11.5	1.5
130	11.2	1.6
140	10.7	1.7
150	10.2	1.8
160	9.6	2.0
170	8.9	2.1
180	8.4	2.2
190	8.3	2.2
200	8.3	2.2
220	9.5	2.2
240	10.8	2.2
260	11.7	2.3
280	12.3	2.3
300	12.8	2.5
320	13.4	2.6
340	14.0	2.6
360	14.6	2.7
380	15.0	2.8
400	15.5	2.8
450	16.3	3.3
500	17.3	3.3
550	18.7	3.7
600	18.7	3.8
650	18.6	4.0
700	18.7	4.2
750	20.0	4.3
800	19.9	4.5
850	20.2	4.7
900	20.5	5.2
950	20.7	5.0
1000	21.2	5.2
1000	24.0	4.1
2000	28.4	5.8
3000	30.0	7.2
4000	32.6	8.6
5000	33.3	10.0

8. EMI Suppression Component List

No EMI Suppression Component

9. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer (Site 6)	HP	8560E	3728A03186	30KHz – 2.9GHz	Sep. 15, 2000	Radiation
Receiver (Site 6)	R&S	ESCS30	8477931/003	9 K – 2.75 GHz	Dec. 27, 2000	Radiation
Amplifier (Site 6)	HP	87405A	3207A01437	100K - 3GHz	Aug. 03, 2000	Radiation
Bilog Antenna (Site 6)	CHASE	CBL6112A	2442	30MHz -2GHz	Jun. 23, 2001	Radiation
Half-wave dipole antenna (Site 6)	EMCO	3121C	9705-1285	28 M - 1GHz	May 16, 2001	Radiation
Turn Table (site 6)	EMCO	2080	9711-2021	0 ~ 360 degree	N/A	Radiation
Antenna Mast (site 6)	EMCO	2075	9711-2115	1 m- 4 m	N/A	Radiation
Receiver	HP	8546A	3325A00108	9KHz~6.5GHz	Dec.15, 2000	Radiation
Horn Antenna	EMCO	3115	4976	1GHz~18GHz	Jun. 20, 2001	Radiation

- Calibration Interval of instruments listed above is one year.

10. Uncertainty of Test Site

Uncertainty of Conducted Emission Measurement

Contribution	Probability Distribution	150KHz – 30MHz
Cable and I/P attenuator calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2.5
LISN coupling specification	rectangular	±1.5
Transducer factor frequency interpolation	rectangular	±0.2
Mismatch Receiver VSWR $\Gamma_1=0.09$ LISN VSWR $\Gamma_2=0.33$ Uncertainty= $20\log(1-\Gamma_1*\Gamma_2)$	U-shaped	0.2
combined standard uncertainty Ue(y)	normal	±1.7
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±3.4

$$U = \sqrt{(0.3/2)^2 + (2.5^2 + 1.5^2 + 0.2^2)/3 + (0.2)^2/2} = 1.7$$

Uncertainty of Radiated Emission Measurement

Contribution	Probability Distribution	3m	10m
Antenna factor calibration	normal(k=2)	±1.6	±1.6
cable loss calibration	normal(k=2)	±0.3	±0.3
RCV/SPA specification	rectangular	±2.5	±2.5
Antenna Directivity	rectangular	±3	±0.5
Antenna Factor V.S. Height	rectangular	±2	±2
Antenna Factor Interpolation for Frequency	rectangular	±0.25	±0.25
site imperfection	rectangular	±2	±2
Mismatch Receiver VSWR $\Gamma_1=0.09$ Antenna VSWR $\Gamma_2=0.67$ Uncertainty= $20\log(1-\Gamma_1*\Gamma_2)$	U-shaped	±0.54	±0.54
combined standard uncertainty Ue(y)	normal	±2.9	±2.4
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±5.8	±4.8

$$U = \sqrt{(1.6/2)^2 + (0.3/2)^2 + (3^2 + 0.5^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2} = 2.4 \quad \text{for 10m test distance}$$

$$U = \sqrt{(1.6/2)^2 + (0.3/2)^2 + (3^2 + 3^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2} = 2.9 \quad \text{for 3m test distance}$$