

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : Belkin RF Wireless Keyboard

Model No. : F8E832-KYBD, F8E832-BNDL, F8E832deBNDL,
F8E832auBNDL, F8E832fcBNDL,
F8E832msBNDL, F8E832ukBNDL, F8E832xBNDL

FCC ID : K7SF8E832KYBD

Filing Type : Certification

Applicant : **Belkin Corporation**
501 West Walnut Street Compton. CA. 90220-5221. U.S.A.

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SPORTON International Inc.

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

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History of this test report

Original Report Issue Date: May 29, 2003

☒ No additional attachment.

☐ Additional attachment were issued as following record :

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment : Belkin RF Wireless Keyboard

Model No. : F8E832-KYBD, F8E832-BNDL, F8E832deBNDL,
F8E832auBNDL, F8E832fcBNDL, F8E832msBNDL,
F8E832ukBNDL, F8E832xBNDL

FCC ID : K7SF8E832KYBD

Applicant : **Belkin Corporation**
501 West Walnut Street Compton. CA. 90220-5221. U.S.A.

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 Jan. 25, 2003 at **SPORTON International Inc.** LAB.


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

Belkin Corporation
501 West Walnut Street Compton. CA. 90220-5221. U.S.A.

1.2. Manufacturer

WEI FU MOLD PLASTIC & METAL FACTORY
Da-Ning Industrial Zone, Humen, Dongguan, Guangdong, CHINA

1.3. Basic Description of Equipment under Test

Equipment	: Belkin RF Wireless Keyboard
Model No.	: F8E832-KYBD, F8E832-BNDL, F8E832deBNDL, F8E832auBNDL, F8E832fcBNDL, F8E832msBNDL, F8E832ukBNDL, F8E832xBNDL
FCC ID	: K7SF8E832KYBD
Trade Name	: Belkin
Power Supply Type	: From Battery
Power Cord	: N/A

1.4. Feature of Equipment under Test

- 1 Channel (With Multi Task, Paten's Patent)
- Security ID: 256 Sets
- Cordless Technology: Radio Frequency (TDMA technology)
- Carry Frequency: 27.045MHZ
- Modulation Mode: FSK (Frequency Shift Key)
- Transfer Rate: 10 kbps
- Input Power: 3VDC (2*AAA)
- Power Consumption: 10 mA
- RF Power: 500uv/m at 3m
- Switch Activation Mechanism: Membrane
- Indicator LED: 1 LED (Red, Blinking)
- Operation Switch: 1 Link Switch (Tact switch)
- Effective Distance: 2 M
- Battery Life: 6 Months

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. The EUT has been configured and operated pursuant to ANSI C63.4-1992 in a manner which tended to maximize its emission characteristics in a typical application.
- b. The complete test system included HP PC, HP Printer, ACEEX Modem, VIEWSONIC Monitor, Belkin RF Mouse, Belkin Receiver and EUT for EMI test.
- c. Frequency range investigated: radiation 30 MHz to 1000MHz.

2.2. Description of Test System

Support Unit 1. -- Personal Computer (HP)

FCC ID	: N/A
Model No.	: VECTRA VL420 DT
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0039
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- Monitor (VIEWSONIC)

FCC ID	: N/A
Model No.	: VCDTS21553-3P
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0023
Data Cable	: Shielded, 360 degree via metal backshells, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- Printer (HP)

FCC ID	: B94C2642X
Model No.	: DJ 400
Power Supply Type	: Linear
Power Cord	: Non-Shielded
Serial No.	: SP0048
Data Cable	: Shielded, 360 degree via metal backshells, 1.35m

Support Unit 4. -- Modem (ACEEX)

FCC ID : IFAXDM1414
Model No. : DM1414
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0015
Data Cable : Shielded, 360 degree via metal backshells, 1.15m

Support Unit 5. -- Receiver (Belkin)

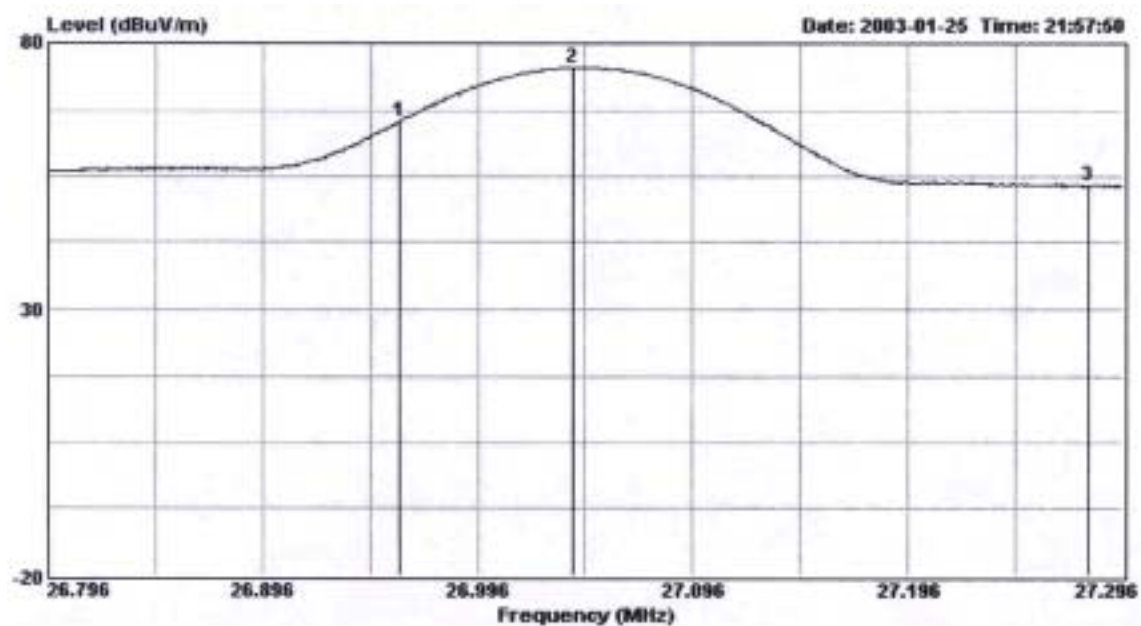
FCC ID : N/A
Model No. : F8E832-REX
Serial No. : SP0089

Support Unit 6. -- RF Mouse (Belkin)

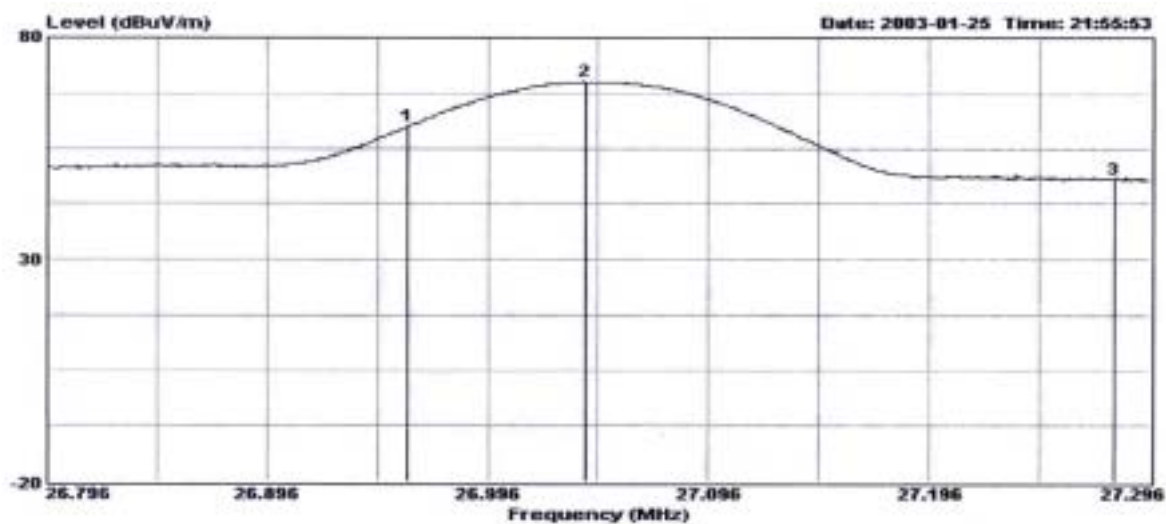
FCC ID : K7SF8E832MSE
Model No. : F8E832-MSE
Serial No. : SP0088

2.3. Band edge compliance plot per 15.227(b).

Horizontal



Vertical



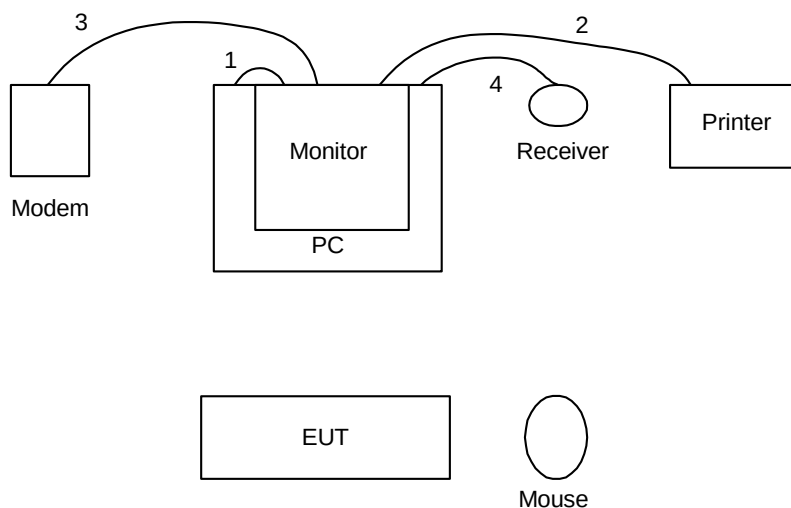
Mark 1 : 26.96MHz

Mark 3 : 27.28MHz

RBW:120KHz,VBW:300KHz

Conformation of the fundamental frequency

2.4. Connection Diagram of Test System



1. The I/O cable is connected from PC to the support unit 2.
2. The I/O cable is connected from PC to the support unit 3
3. The I/O cable is connected from PC to the support unit 4.
4. The I/O cable is connected from PC to the support unit 5.

3. General Information of Test

3.1. Test Facility

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,
Kwei-Shan Hsiag, Tao Yuan Hsien, Taiwan, R.O.C.
TEL : 886-3-327-3456
FAX : 886-3-318-0055

Test Site No : 03CH03-HY

3.2. Test Voltage

115V/ 60Hz

3.3. Standard for Methods of Measurement

ANSI C63.4-1992

3.4. Test in Compliance with

FCC Part 15, Subpart C

3.5. Frequency Range Investigated

a. Radiation : from 30 MHz to 1 GHz

3.6. Test Distance

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

4. Test of Conducted Powerline

The power supply of the EUT is from battery.

So the conducted powerline test is not applicable to the EUT.

5. Test of Radiated Emission

Radiated emissions from 30 MHz to 1 GHz 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 5.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

5.1. Major Measuring Instruments

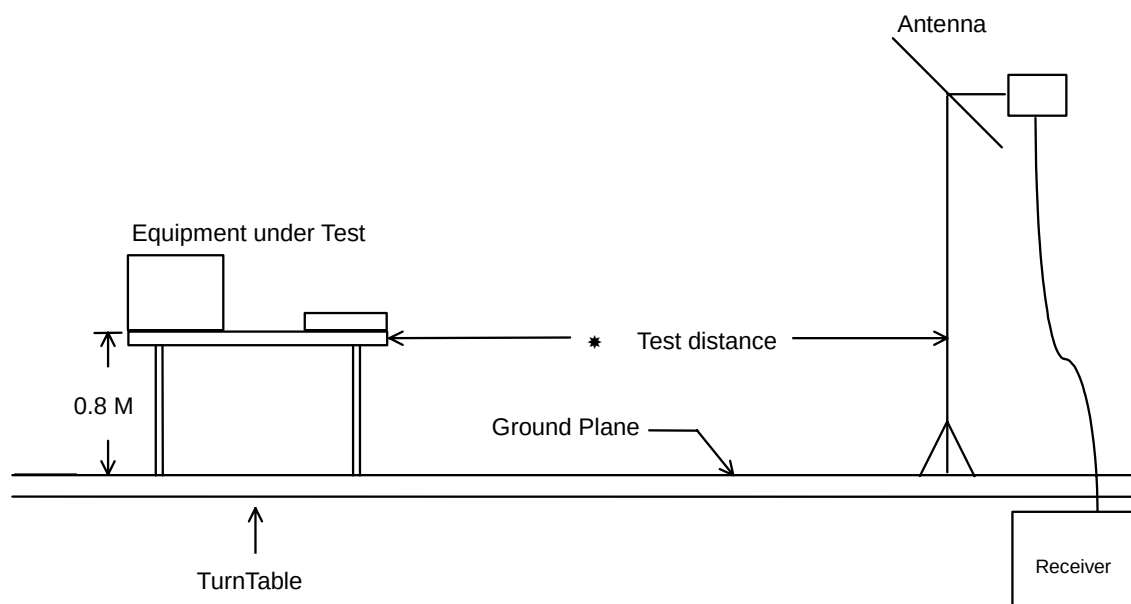
- Amplifier (HP 8447D)
 - RF Gain 30 dB
 - Signal Input 100 KHz to 1.3 GHz

- Spectrum Analyzer (R&S FSP)
 - Attenuation 10 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1000 MHz
 - Resolution Bandwidth 120 KHz
 - Signal Input 9 KHz to 7 GHz

5.2. 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 adjust 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 3 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 3 dB margin will be repeated one by one using the quasi-peak method and reported.

5.3. Typical Test Setup Layout of Radiated Emission



5.4. Test Result of Radiated Emission

- Test Distance : 3 M
- Temperature : 21°C
- Relative Humidity : 57 %
- Test Date : Jan. 25, 2003
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

■ The test was passed at the minimum margin that marked under gray area in the following table, and its antenna height is 2 m, turn table degree is 260°

- Spurious Emissions:

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Level (dBuV/m)	Margin (dB)
53.490	H	6.02	1.36	22.14	40.00	29.52	-10.48
108.300	H	9.62	1.99	26.75	43.50	38.36	-5.14
135.300	H	10.39	2.20	24.18	43.50	36.77	-6.73
162.300	H	7.91	2.45	19.90	43.50	30.26	-13.24
216.300	H	8.80	2.91	17.28	46.00	28.99	-17.01
297.570	H	11.38	3.50	20.23	46.00	35.11	-10.89
53.490	V	6.02	1.36	16.16	40.00	23.54	-16.46
80.490	V	6.00	1.75	12.49	40.00	20.24	-19.76
108.300	V	9.62	1.99	22.12	43.50	33.73	-9.77
135.300	V	10.39	2.20	17.01	43.50	29.60	-13.90
162.300	V	7.91	2.45	12.71	43.50	23.07	-20.43
216.300	V	8.80	2.91	13.16	46.00	24.87	-21.13

- Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Level (dBuV/m)	Margin (dB)	Detect Mode
27.040	H	15.40	0.93	45.12	80.00	61.45	-18.55	Peak
27.040	V	15.40	0.93	39.80	80.00	56.13	-23.87	Peak

Test Engineer :

Jay Zhong

6. EMI Suppression Component List

⇒No EMI suppression components.

7. Antenna Factor & Cable Loss

Frequency (Mhz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	1.00
35	13.63	1.08
40	11.11	1.18
45	10.59	1.24
50	6.47	1.30
55	5.83	1.38
60	5.18	1.44
65	4.81	1.52
70	4.43	1.59
75	5.10	1.68
80	5.91	1.75
85	7.33	1.77
90	8.74	1.83
95	9.05	1.85
100	9.36	1.90
110	9.65	2.01
120	9.97	2.06
130	10.51	2.16
140	10.32	2.24
150	9.42	2.34
160	8.09	2.42
170	7.43	2.56
180	7.60	2.62
190	7.43	2.67
200	7.26	2.76
220	9.11	2.92
240	10.88	3.09
260	11.75	3.23
280	11.55	3.38
300	11.36	3.51
320	12.03	3.63
340	12.69	3.73
360	13.33	4.03
380	14.00	4.00
400	14.63	4.09
450	15.33	4.31
500	16.03	4.64
550	16.65	5.09
600	17.29	5.49
650	17.64	5.82
700	18.00	5.94
750	18.39	6.16
800	18.79	6.58
850	19.10	6.72
900	19.42	6.81
950	19.58	7.10
1000	19.75	7.41

8. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum analyzer	R&S	FSP40	100004/040	9KHZ~40GHZ	Aug. 07, 2002	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A09072	100KHz – 1.3GHz	Oct. 21, 2002	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2687	30MHz –2GHz	Dec. 21, 2002	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
Half-wave dipole antenna	R&S	HZ12 HZ13	83924403 83924503	30MHz - 1GHz	Sep. 23, 2002	Radiation (03CH03-HY)

※ Calibration Interval of instruments listed above is one year.

9. Uncertainty of Test Site

Uncertainty of Radiated Emission Measurement

Contribution	Probability Distribution	3m
Antenna factor calibration	normal(k=2)	±1
cable loss calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
Antenna Directivity	rectangular	±3
Antenna Factor V.S. Height	rectangular	±2
Antenna Factor Interpolation for Frequency	rectangular	±0.25
site imperfection	rectangular	±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
combined standard uncertainty Ue(y)	normal	±2.7
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±5.4

$U = \sqrt{\{(1/2)^2 + (0.3/2)^2 + (2^2 + 0.5^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2\}} = 2.2$ for 10m test distance

$U = \sqrt{\{(1/2)^2 + (0.3/2)^2 + (2^2 + 3^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2\}} = 2.7$ for 3m test distance

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
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	±1.66
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±3.32

$U = \sqrt{\{(0.3/2)^2 + (2^2 + 1.5^2 + 0.2^2)/3 + (0.2)^2/2\}} = 1.66$