FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment	:	X'mas RF Remote Controller
Model No.	:	HXTC-3001
FCC ID	:	QKUHXTC-3001
Filing Type	:	Certification
Applicant	:	**HUGEWIN ELECTRONICS CO., LTD.** No. 293, Hwa-Shing Street, Chu-Pei City, Hsin-Chu Hsien, 302 Taiwan, R.O.C.

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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: Jul. 15, 2002

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

Certificate No. : F262502

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment : X'mas RF Remote Controller

Model No. : HXTC-3001

FCC ID : QKUHXTC-3001

Applicant : **HUGEWIN ELECTRONICS CO., LTD.**
No. 293, Hwa-Shing Street, Chu-Pei City, Hsin-Chu Hsien,
302 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. 11, 2002 at **SPORTON International Inc.** LAB.

K. J. Lin July 16, 2002

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

HUGEWIN ELECTRONICS CO., LTD.
No. 293, Hwa-Shing Street, Chu-Pei City, Hsin-Chu Hsien, 302 Taiwan, R.O.C.

1.2. Manufacturer

Same as 1.1.

1.3. Basic Description of Equipment under Test

Equipment	: X' mas RF Remote Controller
Model No.	: HXTC-3001
FCC ID	: QKUHXTC-3001
Trade Name	: HWIN
Power Supply Type	: From Battery (12V)
Power Cord	: N/A

1.4. Feature of Equipment under Test

- Frequency: 315MHz
- Battery: DC12V
- Power: -10~-15dBm

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: conduction 450 KHz to 30 MHz, radiation 30 MHz to 3150MHz.
c. The radiated emissions testing was made by rotating three orthogonal axes.
d. The EUT employs a switch that will automatically deactivate the transmitter within no more than 5 seconds of being relased.
e. The EUT has no periodic transmission at regular predetermined interval.
f. 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 314.96MHz
314.96MHz * 0.25% = 787.4KHz.

The test result is 400KHz (as shown in section 2.4 of this test report), which is less than 787.4KHz.
The EUT meet the 20dB point bandwidth requirement.

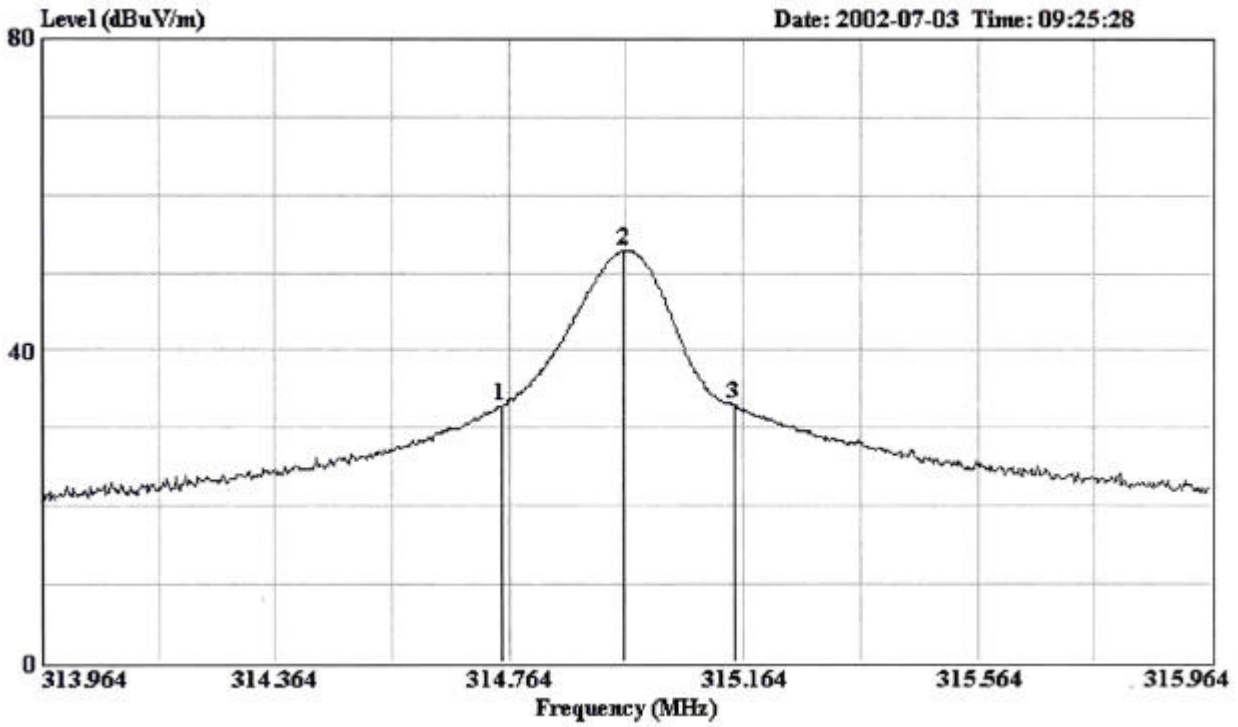
2.2. Description of Test System

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)



Mark 1: 314.75MHz
Mark 3: 315.15MHz
20dB bandwidth=315.15-314.75=0.4MHz

3. Test Software

No test software was used during testing.

4. General Information of Test

4.1. Test Facility

Test Site Location	:	No. 52, Hwa Ya 1St Road, Hwa Ya Technology Park, Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C. TEL : 886-3-3273456 FAX : 886-3-3180055
Test Site No.	:	SH03

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 3150 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 3150 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	(ADVANTEST BB525C)
Attenuation	10 dB
RF Gain	30 dB
Signal Input	9KHz – 3GHz

Spectrum Analyzer	(RAHDE&SCHEARZ & FSP7)
Attenuation	10 dB
Start Frequency	30 MHz
Stop Frequency	1000 MHz
Resolution Bandwidth	120 kHz
Signal Input	9KHz – 7GHz

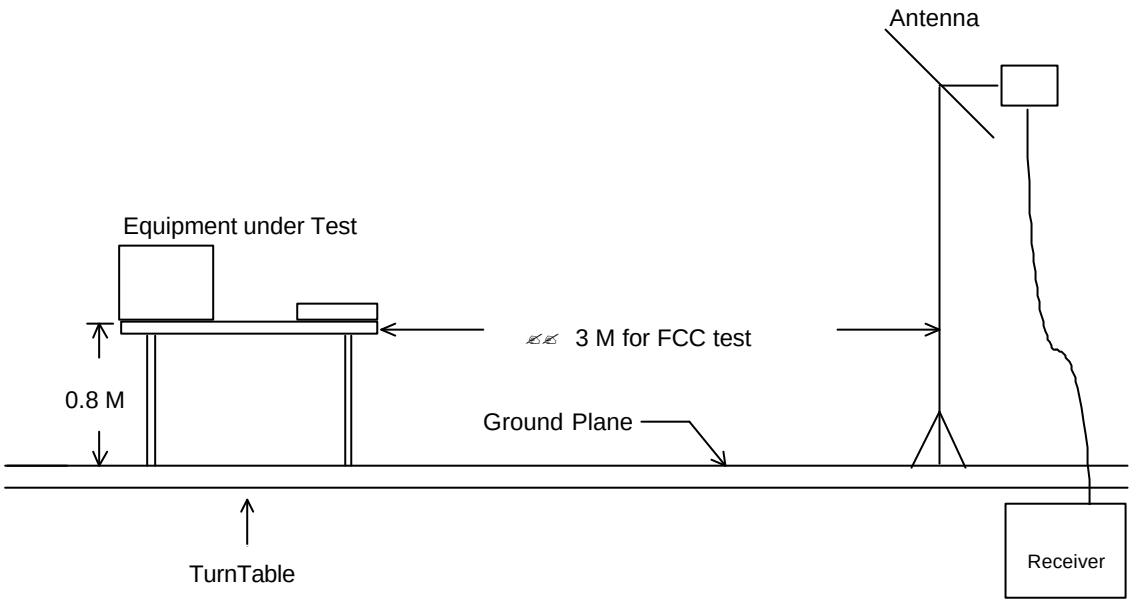
6.1.2. from 1GHz to 3.15GHz

Horn Antenna	(COM-POWER AH-118)
Attenuation	10 dB
Start Frequency	1000 MHz
Stop Frequency	3150 MHz
Resolution Bandwidth	1 MHz
Video Bandwidth	1 MHz
Signal Input	1GHz to 18GHz

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 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.
h. For testing above 1GHz, the emission level of the EUT in peak mode was more 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

6.3. Typical Test Setup Layout of Radiated Emission



6.4. Test Result of Radiated Emission

6.4.1. Orthogonal axes: X

- Frequency range: 30 ~ 3150MHz
- Test Distance : 3 M
- Temperature : 32?C
- Relative Humidity : 68 %
- Test Date : Jul. 11, 2002
- 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

315.180 MHz / 67.36 dBuV (HORIZONTAL) Antenna Height 1.1 Meter, Turntable Degree 360 ^{o}.

- **Spurious Emission**

  Remark: The emission emitted by the EUT is too low to be measured

✍ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission Level (dBuV/m)	Emission Level (uV/m)	Margin (dB)	Detect Mode
315.180	H	13.39	3.17	50.80	75.62	6039.49	67.36	2333.46	-8.26	Peak
629.460	H	18.90	4.59	21.60	55.62	603.95	45.09	179.68	-10.53	Peak
944.710	H	20.43	5.51	10.90	55.62	603.95	36.84	69.50	-18.78	Peak
1260.000	H	26.35	3.68	14.32	54.00	501.19	44.35	165.01	-9.65	A.V.
315.180	V	13.39	3.17	39.84	75.62	6039.49	56.40	660.69	-19.22	Peak
629.460	V	18.90	4.59	13.53	55.62	603.95	37.02	70.96	-18.60	Peak
944.710	V	20.43	5.51	13.19	55.62	603.95	39.13	90.47	-16.49	Peak
1259.840	V						-			Peak, A.V.
1574.800	H/V						-			Peak, A.V.
1889.760	H/V						-			Peak, A.V.
2204.720	H/V						-			Peak, A.V.
2519.680	H/V						-			Peak, A.V.
2834.640	H/V						-			Peak, A.V.
3149.600	H/V						-			Peak, A.V.

Remark " - ": The emission emitted by the EUT is too low to be measured except the emission listed above,

Test Engineer : Wayne

Wayue Hsu

6.4.2. Orthogonal axes: Y

- Frequency range: 30 ~ 3150MHz
- Test Distance : 3 M
- Temperature : 32?C
- Relative Humidity : 68 %
- Test Date : Jul. 3, 2002
- 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

629.46 MHz / 42.00 dBuV (VERTICAL) Antenna Height 1.1 Meter, Turntable Degree 360 ^{o}

- **Spurious Emission**

Remark: The emission emitted by the EUT is too low to be measured

✍ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission Level (dBuV/m)	Emission Level (uV/m)	Margin (dB)	Detect Mode
315.180	H	13.39	3.17	52.10	75.62	6039.49	68.66	2710.19	-6.96	Peak
629.460	H	18.90	4.59	24.06	55.62	603.95	47.55	238.51	-8.07	Peak
944.710	H	20.43	5.51	17.97	55.62	603.95	43.91	156.86	-11.71	Peak
1259.000	H	26.35	3.68	10.23	54.00	501.19	40.26	103.04	-13.74	A.V.
1586.000	H	27.08	4.15	8.11	54.00	501.19	39.34	92.68	-14.66	A.V.
315.180	V	13.39	3.17	42.79	75.62	6039.49	59.35	927.90	-16.27	Peak
629.460	V	18.90	4.59	18.51	46.00	199.53	42.00	125.89	-4.00	Peak
944.710	V	20.43	5.51	8.81	46.00	199.53	34.75	54.64	-11.25	Peak
1259.000	V	26.35	3.68	8.22	54.00	501.19	38.25	81.75	-15.75	A.V.
1575.000	V	27.09	4.13	8.67	54.00	501.19	39.89	98.74	-14.11	A.V.
1889.760	H/V						-			Peak, A.V.
2204.720	H/V						-			Peak, A.V.
2519.680	H/V						-			Peak, A.V.
2834.640	H/V						-			Peak, A.V.
3149.600	H/V						-			Peak, A.V.

Remark " - ": The emission emitted by the EUT is too low to be measured except the emission listed above,

Test Engineer : Wayne

Wayne Hsu

6.4.3. Orthogonal axes: Z

- Frequency range: 30 ~ 3150MHz
- Test Distance : 3 M
- Temperature : 32?C
- Relative Humidity : 68 %
- Test Date : Jul. 3, 2002
- 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
629.460 MHz / 52.41 dBuV (VERTICAL) Antenna Height 1.1 Meter, Turntable Degree 360 ^{o}

- **Spurious Emission**

Remark: The emission emitted by the EUT is too low to be measured

✍ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission Level (dBuV/m)	Emission Level (uV/m)	Margin (dB)	Detect Mode
315.180	H	13.39	3.17	43.20	75.62	6039.49	59.76	972.75	-15.86	Peak
629.460	H	18.90	4.59	19.44	55.62	603.95	42.93	140.12	-12.69	Peak
944.710	H	20.43	5.51	9.41	55.62	603.95	35.35	58.55	-20.27	Peak
1259.000	H						-			Peak, A.V.
1586.000	H						-			Peak, A.V.
315.180	V	13.39	3.17	51.09	75.62	6039.49	67.65	2412.68	-7.97	Peak
629.460	V	18.90	4.59	28.92	55.62	603.95	52.41	417.35	-3.21	Peak
944.710	V	20.43	5.51	13.35	55.62	603.95	39.29	92.15	-16.33	Peak
1259.000	V	26.35	3.68	10.02	54.00	501.19	40.05	100.58	-13.95	Peak
1575.000	V	27.09	4.13	9.98	54.00	501.19	41.20	114.82	-12.80	Peak
1886.700	H/V						-			Peak, A.V.
2201.150	H/V						-			Peak, A.V.
2515.600	H/V						-			Peak, A.V.
2830.050	H/V						-			Peak, A.V.
3144.500	H/V						-			Peak, A.V.

Remark " - ": The emission emitted by the EUT is too low to be measured except the emission listed above,

Test Engineer : Wayne

Wayue Hsu

7. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	18.10	0.99
35	16.00	1.07
40	13.29	1.13
45	10.75	1.20
50	8.10	1.26
55	6.40	1.32
60	5.36	1.40
65	4.94	1.41
70	5.19	1.51
75	6.05	1.57
80	6.96	1.60
85	8.04	1.70
90	8.76	1.70
95	9.70	1.75
100	10.30	1.79
110	11.17	1.93
120	11.60	1.95
130	11.23	2.01
140	10.61	2.12
150	10.10	2.20
160	9.20	2.26
170	9.01	2.33
180	8.71	2.40
190	8.80	2.52
200	8.24	2.55
220	8.80	2.64
240	10.72	2.78
260	13.20	2.89
280	12.50	2.98
300	12.96	3.11
320	13.50	3.20
340	13.93	3.25
360	14.39	3.44
380	14.70	3.63
400	15.76	3.50
450	16.35	3.82
500	17.29	4.01
550	18.50	4.16
600	18.43	4.39
650	18.85	4.72
700	18.93	4.71
750	19.75	4.83
800	19.92	5.27
850	20.24	5.22
900	20.30	5.22
950	20.46	5.54
1000	20.80	5.81
1000	25.10	3.06
2000	31.00	4.53
3000	30.30	5.19
4000	31.40	7.11
5000	34.10	7.62

8. EMI Suppression Component List

No EMI suppression components.

9. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	RAHDE & SCHEARZ	FSP7	838858/039	9KHz – 7GHz	Jan. 07, 2002	Radiation (SH03)
Amplifier	ADVANTEST	BB525C	CH300001	9KHz – 3GHz	Nov. 15, 2001	Radiation (SH03)
Bilog Antenna	SCHAFFNER	CBL61128	2681	30MHz –2GHz	Dec. 23, 2001	Radiation (SH03)
Turn Table	HD	DS 420	420/649/00	0 ? 360 degree	N/A	Radiation (SH03)
Antenna Mast	HD	MA 240	240/559/00	1 m - 4 m	N/A	Radiation (SH03)
Half-wave dipole antenna	Schwarzbeck	UHAP VHAP	995+99 1024+1024	30MHz - 1GHz	Sep. 27, 2001	Radiation (SH03)
Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 09, 2002	Radiation (SH03)

Calibration Interval of instruments listed above is one year.

10. 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 ?1=0.09 Antenna VSWR ?2=0.67 Uncertainty=20log(1-?1*?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 ?1=0.09 LISN VSWR ?2=0.33 Uncertainty=20log(1-?1*?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

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