

# **THRU Lab & Engineering.**

**RM1105,11FL, ACE TECHNO TOWER**

**197-22, GURO-DONG GURO-GU SEOUL KOREA**

**T81221095059F81221095056 email thrukang@kornet.net**



## **Test Report**

**Product Name: 26.96-27.28 MHz Wireless R/C Toy - TX**

**FCC ID: QW70202**

## **Applicant:**

**HOBBYENGINE MODEL INDUSTRIAL LTD.**

**ROOM 619, 6/F., PENINSULA CENTRE, 67 MODY ROAD,  
TSIMSHATSUI EAST  
KOWLOON  
HONG KONG**

**Date Receipt: 04/20/2004**

**Date Tested: 04/21/2004**

**APPLICANT: HOBBYENGINE MODEL INDUSTRIAL LTD.**

**FCC ID: QW70202**

**REPORT #: THRU-404006**

**COVER SHEET**

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**FCC ID:** QW70202

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### EXHIBITS CONTAINING:

BLOCK DIAGRAM  
SCHEMATIC  
PARTS LIST  
INSTRUCTION MANUAL  
SAMPLE OF FCC ID LABEL  
LOCATION OF FCC ID LABEL  
EXTERNAL PHOTO - FRONT SIDE  
EXTERNAL PHOTO - BACK SIDE  
INTERNAL PHOTO - COMPONENT SIDE  
INTERNAL PHOTO - COPPER SIDE  
CIRCUIT DESCRIPTION

APPLICANT: HOBBYENGINE MODEL INDUSTRIAL LTD.

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## Test Equipment List

| DEVICE               | MODEL        | MFGR            | SERNO          | DUE.CAL     |
|----------------------|--------------|-----------------|----------------|-------------|
| EMI Test Receiver    | ESVS 10      | Rohde & Schwarz | 830489/001     | 2005.04.07. |
| Spectrum Analyzer    | 8566B        | Hewlett Packard | 2311A02394     | 2005.04.07. |
| Spectrum Display     | 85662A       | Hewlett Packard | 2542A12429     | 2005.04.07. |
| Quasi-Peak Adapter   | 85650A       | Hewlett Packard | 2521A00887     | 2005.04.07. |
| RF Preselector       | 85685A       | Hewlett Packard | 2648A00504     | 2005.04.07. |
| Pre-Amplifier        | 8449B        | Hewlett Packard | 3008A00375     | 2005.04.07. |
| Pre-Amplifier        | 8447F        | Hewlett Packard | 3113A05367     | 2005.04.07. |
| Spectrum Monitor     | EZM          | Rohde & Schwarz | 862304/007     | 2005.04.07. |
| Bico-Antenna         | 94455-1      | Eaton           | 977            | 2005.03.17. |
| Log-Periodic Antenna | 3146         | EMCO            | 2051           | 2005.03.17. |
| Dipole Antenna       | TDA25/1/2    | Electro Metrics | 176/200/200    | 2005.03.17. |
| Horn Antenna         | SAS-571      | A.H Systems     | 414            | 2005.03.17. |
| Spectrum Analyzer    | R3261C       | Advantest       | 71720189       | 2005.04.07. |
| LISN                 | KNW-242      | Kyoritsu        | 8-923-2        | 2004.07.17. |
| LISN                 | 8012-50-R-24 | Solar           | 8379121        | 2004.07.17. |
| Loop Ant             | 6507         | EMCO            | 1435           | 2004.10.06. |
| Signal Generator     | SMS          | Rohde & Schwarz | 872165/100     | 2005.04.07. |
| Modulation Analyzer  | 8901B        | Hewlett Packard | 3438A05094     | 2005.04.07. |
| Frequency Counter    | CMC251       | Tektronic       | CMC-251TW52489 | 2005.04.07. |

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## TEST PROCEDURE

**GENERAL:** This report shall NOT be reproduced except in full without the written approval of Thrulab & Engineering.

**RADIATION INTERFERENCE:** The test procedure used was ANSI STANDARD C63.4-1992 using a HEWLETT PACKARD spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz. The ambient temperature of the UUT was 25°C with a humidity of 75%.

**FORMULA OF CONVERSION FACTORS:** The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

**Example:**

Freq (MHz) METER READING + ACF = FS  
33 20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

**ANSI STANDARD C63.4-1992 10.1.7 MEASUREMENT PROCEDURES:** The unit under test was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

The situation was similar for the conducted measurement except that the table did not rotate. The EUT was setup as described in ANSIC63.4-1992 with the EUT 40 cm from the vertical ground wall.

**Not Applicable, battery operated.**

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APPLICANT: HOBBYENGINE MODEL INDUSTRIAL LTD.

FCC ID: QW70202

NAME OF TEST: RADIATION INTERFERENCE

RULES PART NO.: 15.227(a)

REQUIREMENTS: CARRIER FREQUENCY SHALL NOT EXCEEDS 10,000 microvolts/meter AT 3M.

| Frequency (MHz) | Meter Reading dBuv/m PK | Meter Reading dBuv/m AV | Polar | Ant Height m | Antenna Factor dB | Cable Loss dB | Result dBuv PK | Result dBuv AV | Limit dBuv/m PK | Limit dBuv/m AV | Margin dBuv/m PK | Margin dBuv/m AV |
|-----------------|-------------------------|-------------------------|-------|--------------|-------------------|---------------|----------------|----------------|-----------------|-----------------|------------------|------------------|
| 27.095          | 35.3                    | 33.6                    | H     | 2.4          | 16.1              | 0.9           | 52.3           | 50.6           | 100             | 80              | -47.7            | -29.4            |
| 27.095          | 54.4                    | 51.6                    | V     | 2.20         | 16.1              | 0.9           | 71.4           | 68.6           | 100             | 80              | -28.6            | -11.4            |

SAMPLE CALCULATION: FSdBuV/m = MR (dBuV) + ACFdB.

**TEST PROCEDURE:** The procedure used was ANSI STANDARD C63.4-1992. The spectrum was scanned from 30 MHz to 1000 MHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The UUT was tested in 3 orthogonal planes.

**TEST RESULTS:** THE UNIT DOES MEET THE FCC REQUIREMENTS.

PERFORMED BY: K.M CHOI

DATE: 04/21/2004

APPLICANT: HOBBYENGINE MODEL INDUSTRIAL LTD.

FCC ID: QW70202

REPORT #: THRU-404006

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**APPLICANT:** HOBBYENGINE MODEL INDUSTRIAL LTD.

**FCC ID:** QW70202

**NAME OF TEST:** RADIATION INTERFERENCE

**RULES PART NO.:** 15.227(b)

**REQUIREMENTS:** OUT-OF-BAND EMISSIONS SHALL NOT EXCEED:

|               |                                  |
|---------------|----------------------------------|
| 30 - 88 MHz   | 40.0 dBuV/M MEASURED AT 3 METERS |
| 88 - 216 MHz  | 43.5 dBuV/M                      |
| 216 - 960 MHz | 46.0 dBuV/m                      |
| ABOVE 960 MHz | 54.0 dBuV/m                      |

## TEST DATA:

| No | Emission Frequency (MHz) | Meter Reading dBuV | Ant. Polaritry | Correction Factor dB | Cable Loss dB | Field Strength (dBuV/m) | Margin (dBuV) | Limit (dBuV/m) |
|----|--------------------------|--------------------|----------------|----------------------|---------------|-------------------------|---------------|----------------|
| 1  | 54.19                    | 4.2                | H              | 9.4                  | 1.1           | 14.7                    | -25.3         | 40.0           |
| 2  | 81.28                    | 14.4               | H              | 8.4                  | 1.4           | 24.1                    | -15.9         | 40.0           |
| 3  | 108.38                   | 11.0               | H              | 11.0                 | 1.7           | 23.7                    | -19.8         | 43.5           |
| 4  | 135.48                   | 11.4               | H              | 14.0                 | 2.0           | 27.4                    | -16.1         | 43.5           |
| 5  | 162.57                   | 7.2                | H              | 16.9                 | 2.2           | 26.3                    | -17.2         | 43.5           |
| 6  | 189.67                   | 7.6                | H              | 13.6                 | 2.4           | 23.6                    | -19.9         | 43.5           |
| 7  | 216.76                   | 8.3                | H              | 10.7                 | 2.7           | 21.7                    | -21.8         | 46.0           |
| 8  | 243.86                   | 15.0               | H              | 11.6                 | 3.1           | 29.6                    | -16.4         | 46.0           |
| 9  | 270.96                   | 4.6                | H              | 14.5                 | 3.2           | 22.3                    | -23.7         | 46.0           |
| 10 | 298.05                   | 8.5                | H              | 16.5                 | 3.4           | 28.4                    | -17.6         | 46.0           |
| 11 | 325.15                   | 13.7               | H              | 16.2                 | 3.6           | 33.5                    | -12.5         | 46.0           |
| 12 | 352.91                   | 4.8                | H              | 14.8                 | 3.8           | 23.5                    | -22.5         | 46.0           |
| 13 | 379.33                   | 7.9                | H              | 15.1                 | 4.0           | 27.0                    | -19.0         | 46.0           |
| 14 | 487.71                   | 4.1                | H              | 18.7                 | 4.8           | 27.6                    | -18.4         | 46.0           |

SAMPLE CALCULATION: FSdBuV/m = MR (dBuV) + ACFdB.

**TEST PROCEDURE:** The procedure used was ANSI STANDARD C63.4-1992. The spectrum was scanned from 30 MHz to 1000 MHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The UUT was tested in 3 orthogonal planes.

**TEST RESULTS:** THE UNIT DOES MEET THE FCC REQUIREMENTS.

**PERFORMED BY:** K.M CHOI

**DATE:** 04/21/2004

**APPLICANT:** HOBBYENGINE MODEL INDUSTRIAL LTD.

**FCC ID:** QW70202

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APPLICANT: HOBBYENGINE MODEL INDUSTRIAL LTD.

FCC ID: QW70202

NAME OF TEST: RADIATION INTERFERENCE

RULES PART NO.: 15.227(b)

REQUIREMENTS: OUT-OF-BAND EMISSIONS SHALL NOT EXCEED:  
30 - 88 MHz 40.0 dBuV/M MEASURED AT 3 METERS  
88 - 216 MHz 43.5 dBuV/M  
216 - 960 MHz 46.0 dBuV/m  
ABOVE 960 MHz 54.0 dBuV/m

## TEST DATA:

| No | Emission<br>Frequency<br>(MHz) | Meter<br>Reading<br>dBuV | Ant.<br>Polaritry | Correction<br>Factor<br>dB | Cable<br>Loss<br>dB | Field<br>Strength<br>(dBuV/m) | Margin<br>(dBuV) | Limit<br>(dBuV/m) |
|----|--------------------------------|--------------------------|-------------------|----------------------------|---------------------|-------------------------------|------------------|-------------------|
| 1  | 54.19                          | 12.4                     | V                 | 9.4                        | 1.1                 | 22.9                          | -17.1            | 40.0              |
| 2  | 81.28                          | 20.7                     | V                 | 8.4                        | 1.4                 | 30.4                          | -9.6             | 40.0              |
| 3  | 108.38                         | 8.6                      | V                 | 11.0                       | 1.7                 | 21.3                          | -22.2            | 43.5              |
| 4  | 135.48                         | 21.4                     | V                 | 14.0                       | 2.0                 | 37.4                          | -6.1             | 43.5              |
| 5  | 162.57                         | 13.9                     | V                 | 16.9                       | 2.2                 | 33.0                          | -10.5            | 43.5              |
| 6  | 189.67                         | 12.9                     | V                 | 13.6                       | 2.4                 | 28.9                          | -14.6            | 43.5              |
| 7  | 216.76                         | 5.8                      | V                 | 10.7                       | 2.7                 | 19.2                          | -24.3            | 43.5              |
| 8  | 243.86                         | 17.7                     | V                 | 11.6                       | 3.1                 | 32.3                          | -13.7            | 46.0              |
| 9  | 270.96                         | 7.5                      | V                 | 14.5                       | 3.2                 | 25.2                          | -20.8            | 46.0              |
| 10 | 298.05                         | 9.4                      | V                 | 16.5                       | 3.4                 | 29.3                          | -16.7            | 46.0              |
| 11 | 325.15                         | 23.8                     | V                 | 16.2                       | 3.6                 | 43.6                          | -2.4             | 46.0              |
| 12 | 352.23                         | 14.3                     | V                 | 14.8                       | 3.8                 | 33.0                          | -13.0            | 46.0              |
| 13 | 379.33                         | 20.7                     | V                 | 15.1                       | 4.0                 | 39.8                          | -6.2             | 46.0              |
| 14 | 406.43                         | 11.2                     | V                 | 15.5                       | 4.3                 | 31.0                          | -15.0            | 46.0              |
| 15 | 433.53                         | 3.7                      | V                 | 16.0                       | 4.5                 | 24.1                          | -21.9            | 46.0              |
| 16 | 460.62                         | 5.8                      | V                 | 18.2                       | 4.6                 | 28.7                          | -17.3            | 46.0              |
| 17 | 487.71                         | 10.4                     | V                 | 18.7                       | 4.8                 | 33.9                          | -12.1            | 46.0              |
| 18 | 541.91                         | 6.4                      | V                 | 18.1                       | 5.2                 | 29.6                          | -16.4            | 46.0              |
| 19 | 758.67                         | 5.0                      | V                 | 21.0                       | 6.5                 | 32.5                          | -13.5            | 46.0              |
| 20 | 812.84                         | 6.0                      | V                 | 22.0                       | 6.8                 | 34.8                          | -11.2            | 46.0              |

SAMPLE CALCULATION: FSdBuV/m = MR (dBuV) + ACFdB.

TEST PROCEDURE: The procedure used was ANSI STANDARD C63.4-1992. The spectrum was scanned from 30 MHz to 1000 MHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The UUT was tested in 3 orthogonal planes.

TEST RESULTS: THE UNIT DOES MEET THE FCC REQUIREMENTS.

PERFORMED BY: K.M CHOI

DATE: 04/21/2004

APPLICANT: HOBBYENGINE MODEL INDUSTRIAL LTD.

FCC ID: QW70202

REPORT #: THRU-404006

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**APPLICANT:** HOBBYENGINE MODEL INDUSTRIAL LTD

**FCC ID:** QW70202

**NAME OF TEST:** Occupied Bandwidth

**RULES PART NO.:** 15.227

**REQUIREMENTS:** The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated to the general limits of 15.209.

|               |                                   |
|---------------|-----------------------------------|
| 1.705-30 MHz  | 69.54 dBuV/M MEASURED AT 3 METERS |
| 30 - 88 MHz   | 40.0 dBuV/M                       |
| 88 - 216 MHz  | 43.5 dBuV/M                       |
| 216 - 960 MHz | 46.0 dBuV/m                       |
| ABOVE 960 MHz | 54.0 dBuV/m                       |

THE GRAPH ON THE NEXT PAGE REPRESENTS THE EMISSIONS TAKEN FOR THE DEVICE.

**METHOD OF MEASUREMENT:** A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was taken. The vertical scale is set to 10 dB per division.

**TEST RESULTS:** The unit DOES meet the FCC requirements.

**PERFORMED BY:** K.M CHOI

**DATE:** 04/21/2004

**APPLICANT:** HOBBYENGINE MODEL INDUSTRIAL LTD.

**FCC ID:** QW70202

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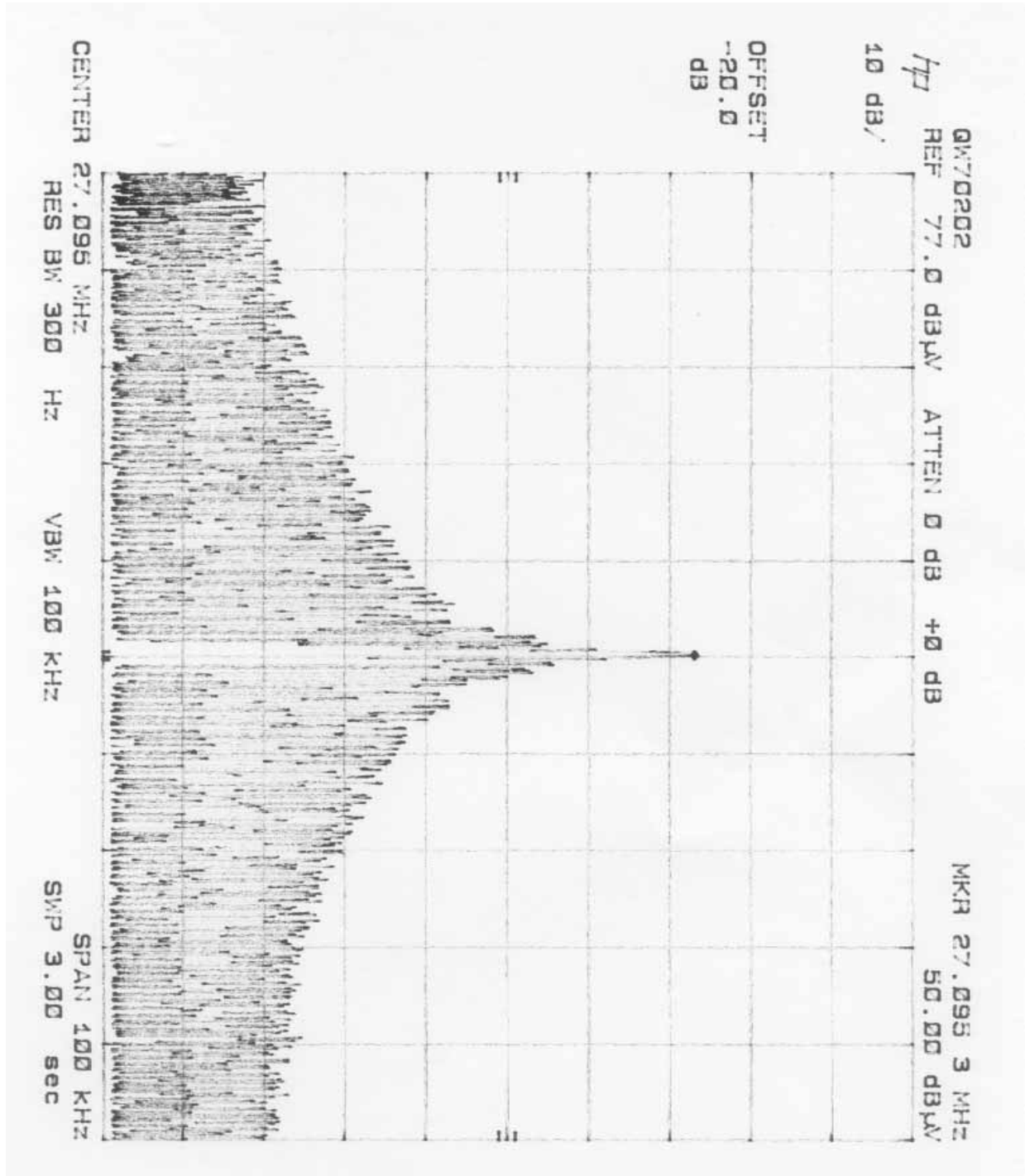
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## OCCUPIED BANDWIDTH PLOT



APPLICANT: HOBBYENGINE MODEL INDUSTRIAL LTD.

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REPORT #: THRU-404006