



## TEST REPORT

**Product Name** : Industrial Radio Remote Controller  
**Model Number** : F24  
**Data Applies to** : F24-10D ; F24-10S ; F24-8D ; F24-8S  
**Brand Name** : TELECRANE  
**FCC ID** : LWN9309F24

**Applicant** : LEE' S HI-TECH ENTERPRISE CO., LTD  
**Address** : 8F-1, NO.288-2, Hsin-Ya Rd, Chien-Chen  
Zone(806), Kaohsiung, Taiwan, R.O.C.

**Received Date** : September 23, 2004  
**Tested Date** : September 23 ~ October 13, 2004

Notes :

1. This report will be invalid if duplicated or photocopied in part.
2. This report refers only to the specimen(s) submitted to testing, and be invalid as separately used.
3. This report is invalid without examination stamp and signature of this institute.
4. The tested specimen(s) will be preserved for thirty days from the data issued.
5. The report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.





**Ecom Sertech Corp.**

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Rd., ChuTugn Chen, Hsinchu, Taiwan 310, R.O.C  
TEL: 886-3-5918012 FAX: 886-3-5825720

FCC ID : LWN9309F24

Report No. : ER04-09-68FRF

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## Test Report Certification

**Product Name** : Industrial Radio Remote Controller  
**Model Number** : F24  
**Data Applies to** : F24-10D ; F24-10S ; F24-8D ; F24-8S  
**Brand Name** : TELECRANE  
**FCC ID** : LWN9309F24  
**Applicant** : LEE' S HI-TECH ENTERPRISE CO., LTD

### Measurement Standard :

47 CFR Part 15 Subpart B and C(Section 15.231)  
ANSI C63.4-2003

**Tested By** : Stan Peng, **Date** : October 19, 2004  
(Stan Peng)  
**Approved By** : Chieh-De Tsai, **Date** : October 19, 2004  
(Chieh-De Tsai, Manager)



WE HEREBY CERTIFY THAT: The measurements shown in the attachment were made in accordance with the procedures indicated, and the energy emitted by the equipment was found to be within the limits applicable. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.



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Rm. 258, Bldg. 17, NO.195, Sec.4 Chung Hsing Rd., ChuTugn Chen, Hsinchu, Taiwan 310, R.O.C  
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# 1. GENERAL INFORMATION

## 1.1 General Statement

MEASUREMENT DEVIATION : Comply with standard in full

TRACEABILITY : This test result is traceable to national or international std.

## 1.2 General Description of EUT & Power

|                           |                                                                                                                                                                                                                                                |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product Name</b>       | Industrial Radio Remote Controller                                                                                                                                                                                                             |
| <b>Model Number</b>       | F24                                                                                                                                                                                                                                            |
| <b>Data Applies To</b>    | F24-10D ; F24-10S ; F24-8D ; F24-8S                                                                                                                                                                                                            |
| <b>Frequency Range</b>    | 310MHz ~ 320MHz                                                                                                                                                                                                                                |
| <b>Operated Selection</b> | manual                                                                                                                                                                                                                                         |
| <b>Type of Modulation</b> | FSK                                                                                                                                                                                                                                            |
| <b>EUT Description</b>    | The EUT, was the transmitter of a industrial remote control system. The EUT is for transmission of a control signal used with remote switch. It does not activate automatically and transmit periodically at a regular predetermined interval. |
| <b>Antenna Type</b>       | Helix Antenna, Antenna Gain : 1.5dBi.                                                                                                                                                                                                          |
| <b>Power Source</b>       | 3VDC (For Transmitter device) from two AA battery                                                                                                                                                                                              |

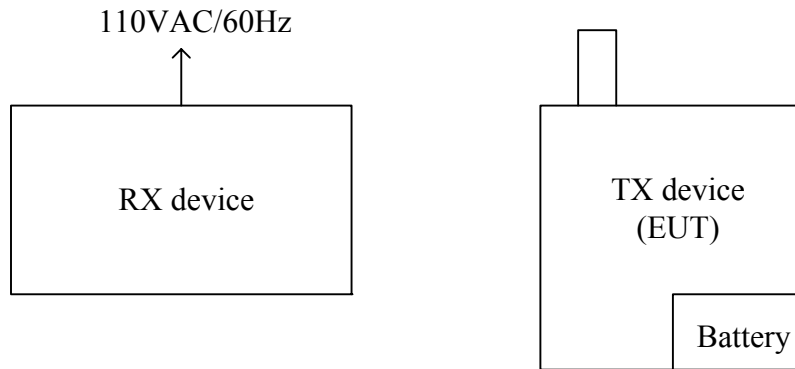
Note :

The difference of the series model

| Different Item                  | Brand | TELECRANE                                                     |         |                                                               |                                                               |                                                               |
|---------------------------------|-------|---------------------------------------------------------------|---------|---------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
|                                 | Model | F24                                                           | F24-10D | F24-10S                                                       | F24-8D                                                        | F24-8S                                                        |
| Transmitter PCB                 |       | same                                                          | same    | same                                                          | same                                                          | same                                                          |
| Transmitter Power Supply        |       | same                                                          | same    | same                                                          | same                                                          | same                                                          |
| Transmitter RF Circuits Design  |       | same                                                          | same    | same                                                          | same                                                          | same                                                          |
| Transmitter Key Numbers & Spec. |       | Ten units of double-speed push-button+ One unit of Start key. | same    | Ten units of double-speed push-button+ One unit of Start key. | Ten units of double-speed push-button+ One unit of Start key. | Ten units of double-speed push-button+ One unit of Start key. |

To add a series model for business necessary. (Double-Speed push-button : 3003.0451 ; Single-Speed push-button : B3w-4050) The products between these for models are all the same except for Transmitter Key Numbers & Spec. Receiver Relay Setup.

### 1.3 EUT & Peripherals Setup Diagram



### 1.4 EUT Operating Condition

- (1) Set up the EUT as described in set up diagram.
- (2) Switch on the operation button.
- (3) Start test.

### 1.5 Description of Test Site

#### SITE DESCRIPTION

|                               |                  |
|-------------------------------|------------------|
| FCC Certificate NO.           | : 90585          |
| BSMI Certificate NO.          | : SL2-IN-E-0002  |
| NVLAP Lab Code                | : 200118-0       |
| CNLA Certificate NO.          | : CNLA-ZL97018   |
| VCCI Certificate NO.          | : R-1189, C-1250 |
| TÜV Rheinland Certificate NO. | : 10008375       |

|               |                                                                                                    |
|---------------|----------------------------------------------------------------------------------------------------|
| NAME OF SITE  | : Ecom Sertech Corp. Hsin-Chu Lab.<br>(Spin-off from ITRI / ERSO on Apr. 01, 2003)                 |
| SITE LOCATION | : Rm.258, Bldg.17, NO.195 , Sec. 4, Chung Hsing Rd.,<br>Chu-Tung Chen. Hsin-Chu, Taiwan 310 R.O.C. |

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Rm. 258, Bldg. 17, NO.195, Sec.4 Chung Hsing Rd., ChuTugn Chen, Hsinchu, Taiwan 310, R.O.C  
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## 1.6 Summary of Test Results

The EUT has been tested according to the following specifications :

| APPLIED STANDARD : 47 CFR Part 15, Subpart B and Subpart C |                                                            |        |                               |
|------------------------------------------------------------|------------------------------------------------------------|--------|-------------------------------|
| Standard Section                                           | Test Type and Limit                                        | Result | REMARK                        |
| 15.231(b)                                                  | Field strength of Fundamental                              | PASS   | Meet the requirement of limit |
| 15.231(b)                                                  | Field strength of Harmonics                                | PASS   | Meet the requirement of limit |
| 15.231(b)(3)                                               | Transmitter<br>Radiated Emissions<br>Limit : 15.231(b)     | PASS   | Meet the requirement of limit |
| 15.231(a)(1)                                               | Deactivate transmission within 5 seconds of being released | PASS   | Manually operated only        |
| 15.231(a)(2)                                               | Cease transmission within 5 seconds after activation       | N/A    | Manually operated only        |
| 15.231(a)(3)                                               | Transmit periodically at a regular predetermined interval. | N/A    | Manually operated only        |
| 15.231(c)                                                  | Bandwidth<br>Limit: Center frequency $\times$ 0.25%        | PASS   | Meet the requirement of limit |



## 2. TRANSMITTER AUTO-OFF AND DUTY CYCLE

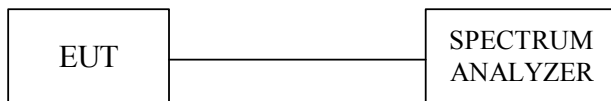
### 2.1 Test Equipments

The following test equipments are utilized in making the measurements contained in this report.

| Description & Manufacturer | Model No. | Serial No. | Date Of Calibration |
|----------------------------|-----------|------------|---------------------|
| R/S SPECTRUM ANALYZER      | FSEK30    | 835253/002 | June 17, 2004       |

### 2.2 Test Setup

The diagram below shows the test setup that is utilized to perform the measurements for duty cycle and power off duration.



### 2.3 Test Procedures

1. The tests were performed with the equipment under test (EUT) connected to the spectrum directly.
2. The spectrum was turned to the center frequency of the emission and set to the zero span with proper sweep time.
3. The duration of transmission of ON/OFF was determined by the spectrum with the function of marker and cursor line.
4. The spectrum was used to check whether the EUT stop transmission or not within 5 seconds after the EUT was powered off.

### 2.4 Uncertainty of Radiated Emission

The uncertainty of time domain measurement is  $\pm 1\mu\text{s}$ .



## 2.5 Test Result

### 1. For the fundamental frequency (310.25MHz)

The EUT in manual mode complies with the requirement of FCC 15.231(a). After exploratory tests, two types of pattern were discovered and recorded.

For Pattern one :

| Parameter            | Results        | Remark      |
|----------------------|----------------|-------------|
| Manual on time       | 230.46 $\mu$ s | Manual mode |
| Manual duration time | 479.94 $\mu$ s | Manual mode |
| Duty Cycle           | 48.01 %        | Manual mode |

For Pattern two :

| Parameter            | Results        | Remark      |
|----------------------|----------------|-------------|
| Manual on time       | 110.22 $\mu$ s | Manual mode |
| Manual duration time | 236.47 $\mu$ s | Manual mode |
| Duty Cycle           | 46.61 %        | Manual mode |

The transmitter ceases transmission immediately after being released and complied with the requirement in section 15.231(a)(1).

**2. For the fundamental frequency (318.80MHz)**

The EUT in manual mode complies with the requirement of FCC 15.231(a). After exploratory tests, two types of pattern were discovered and recorded.

For Pattern one :

| Parameter            | Results        | Remark      |
|----------------------|----------------|-------------|
| Manual on time       | 227.45 $\mu$ s | Manual mode |
| Manual duration time | 471.94 $\mu$ s | Manual mode |
| Duty Cycle           | 48.19 %        | Manual mode |

For Pattern two :

| Parameter            | Results        | Remark      |
|----------------------|----------------|-------------|
| Manual on time       | 110.18 $\mu$ s | Manual mode |
| Manual duration time | 236.59 $\mu$ s | Manual mode |
| Duty Cycle           | 46.57 %        | Manual mode |

The transmitter ceases transmission immediately after being released and complied with the requirement in section 15.231(a)(1).



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Rm. 258, Bldg. 17, NO.195, Sec.4 Chung Hsing Rd., ChuTugn Chen, Hsinchu, Taiwan 310, R.O.C  
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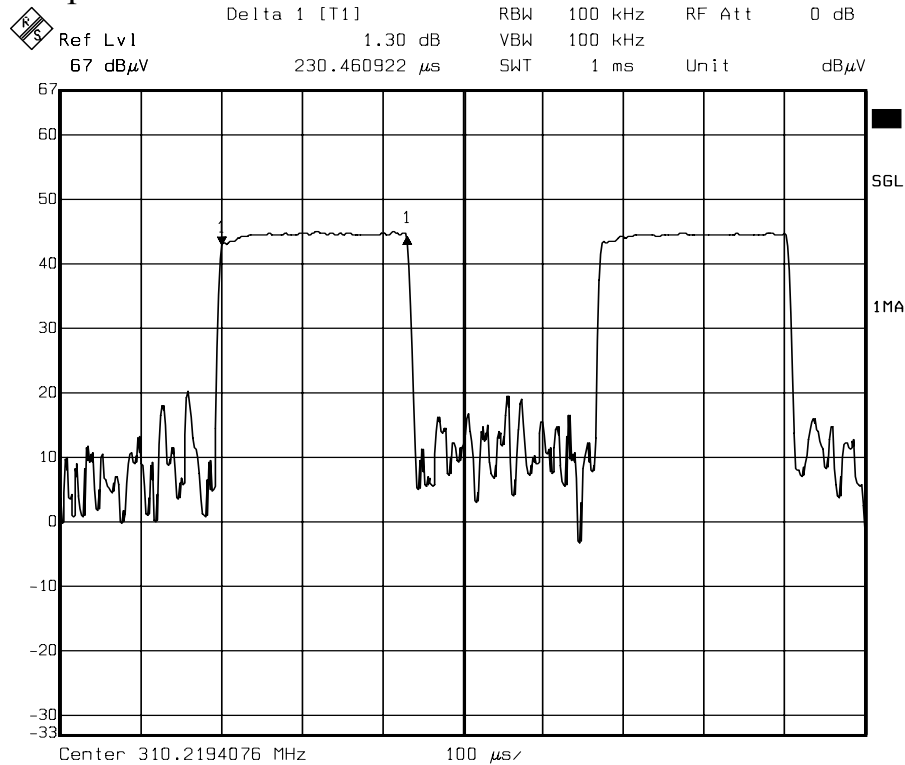
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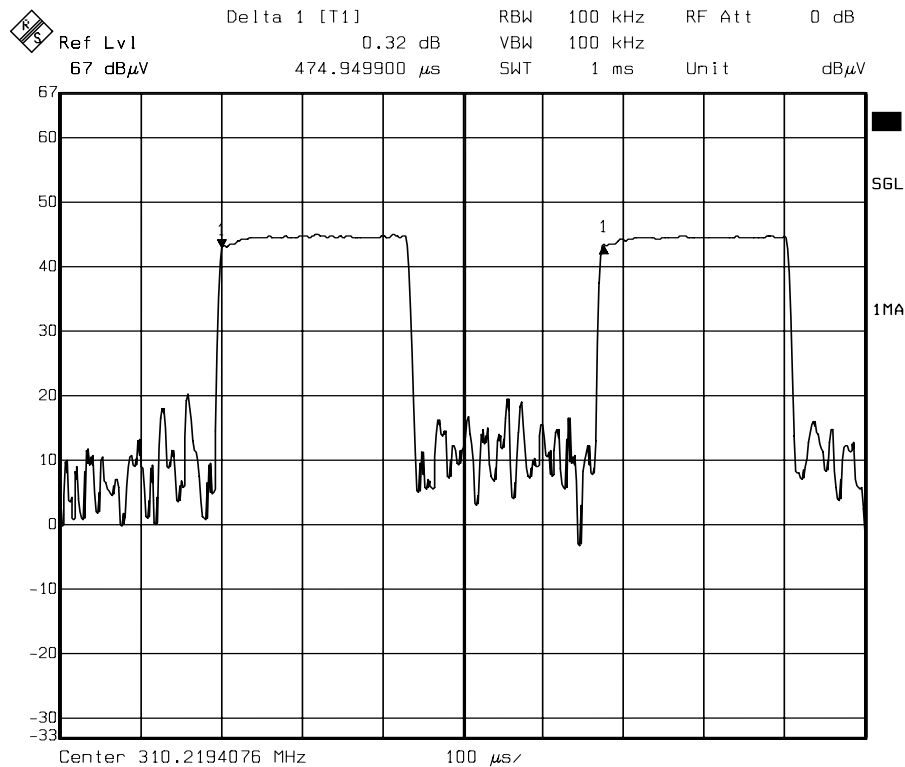
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### 1. For the fundamental frequency (310.25MHz)

For pattern one :



Date: 22.OCT.2004 22:52:44



Date: 22.OCT.2004 22:51:42



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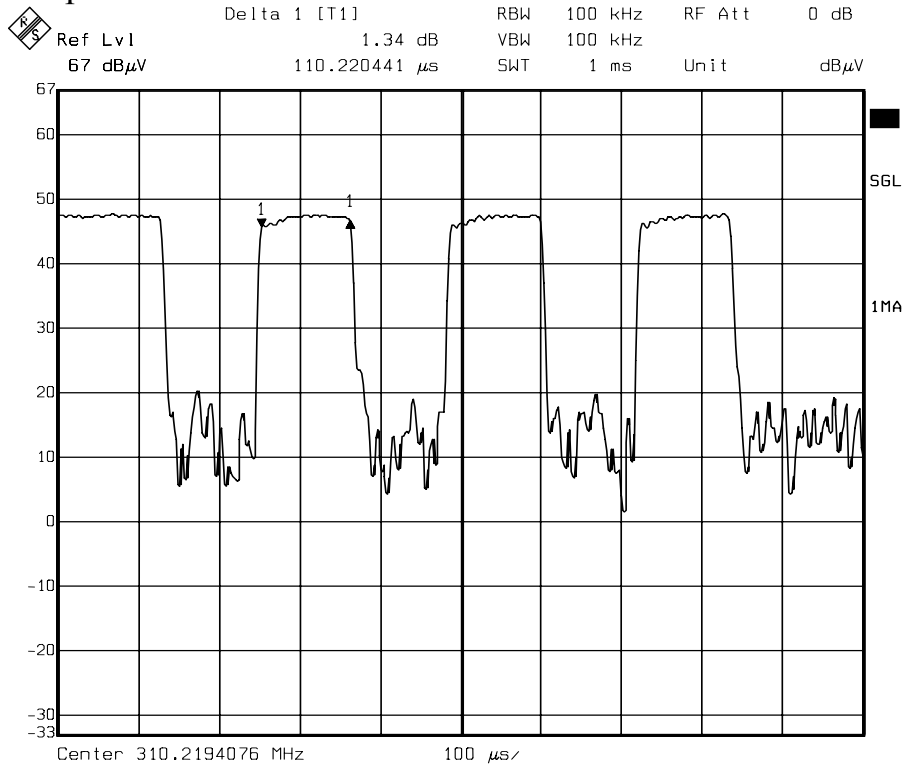
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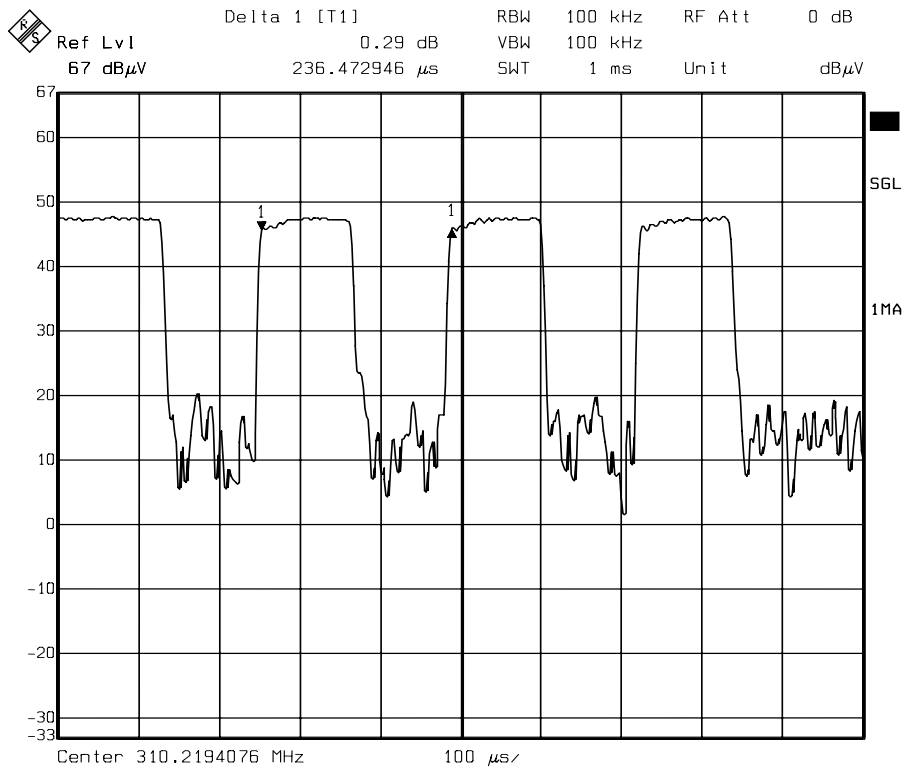
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For pattern two :



Date: 22.OCT.2004 22:54:36



Date: 22.OCT.2004 22:54:15



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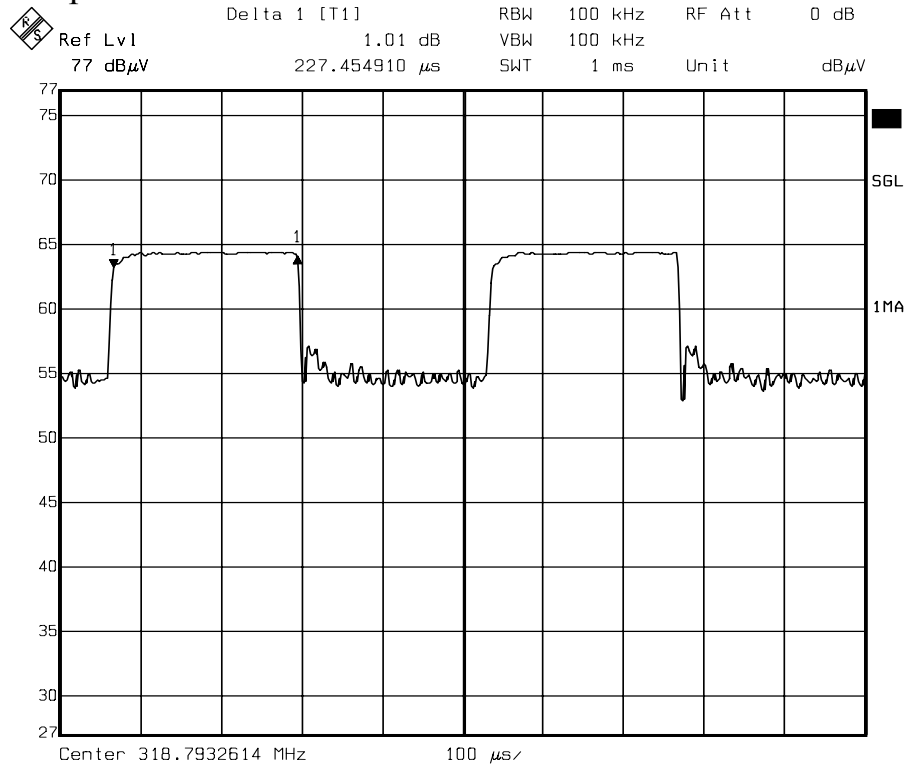
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Report No. : ER04-09-68FRF

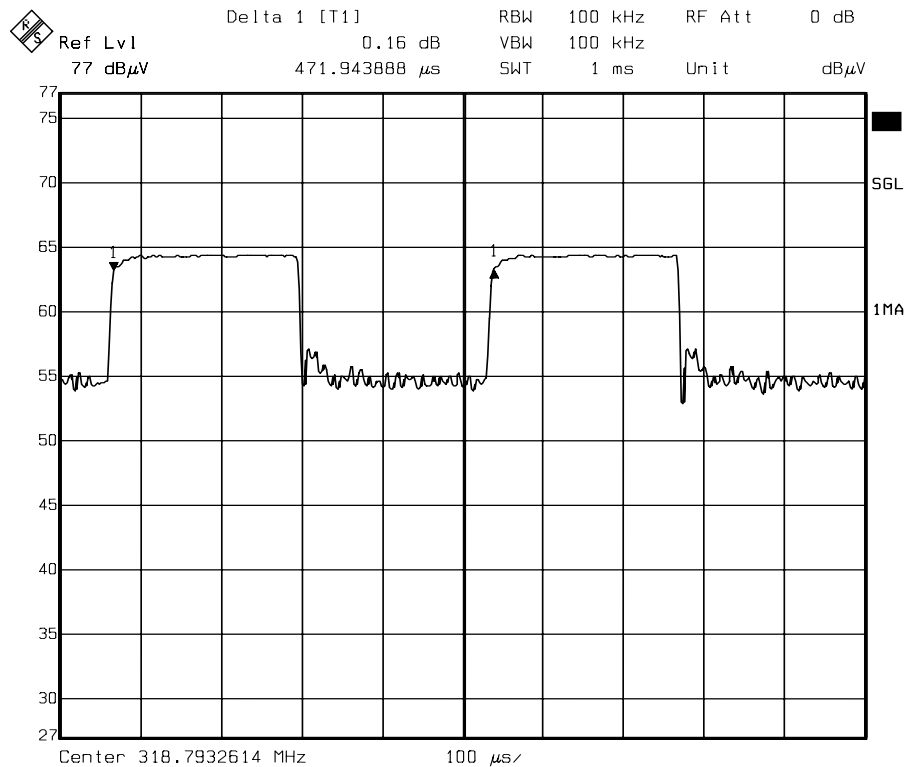
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### 2. For the fundamental frequency (318.80MHz)

For pattern one :



Date: 22.OCT.2004 23:18:03



Date: 22.OCT.2004 23:17:33



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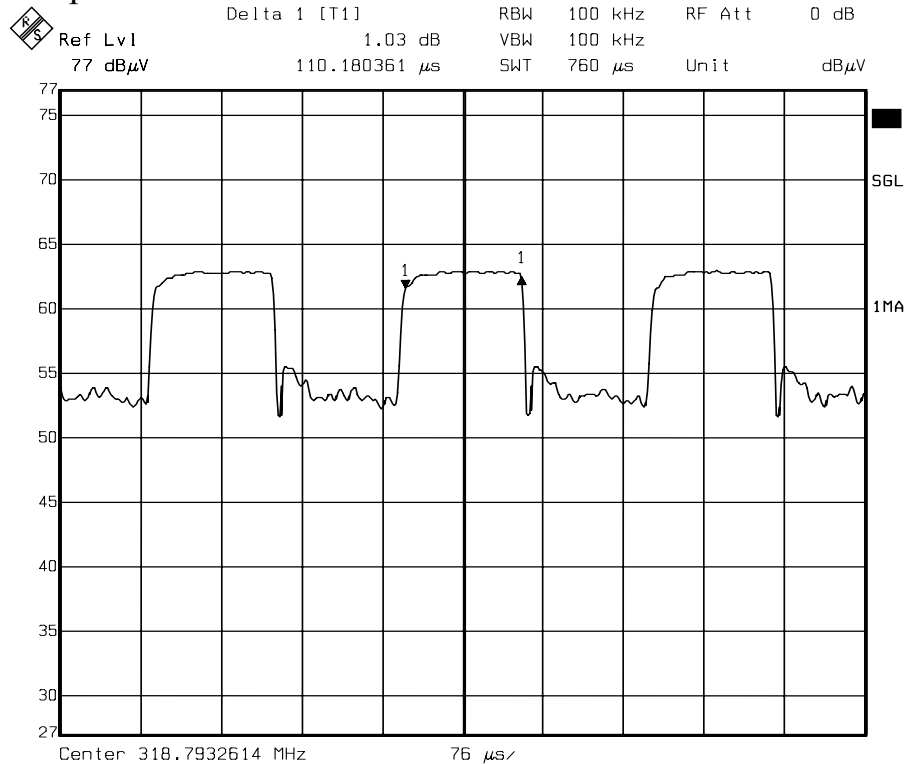
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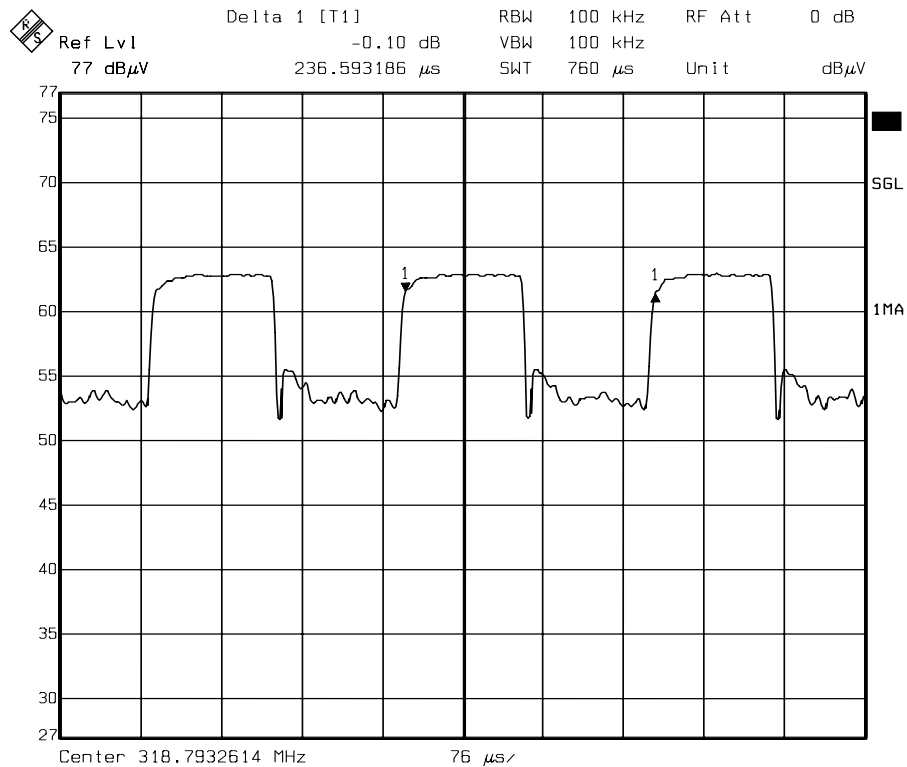
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For pattern two :



Date: 22.OCT.2004 23:20:42



Date: 22.OCT.2004 23:20:08

### 3. RADIATED EMISSION TEST

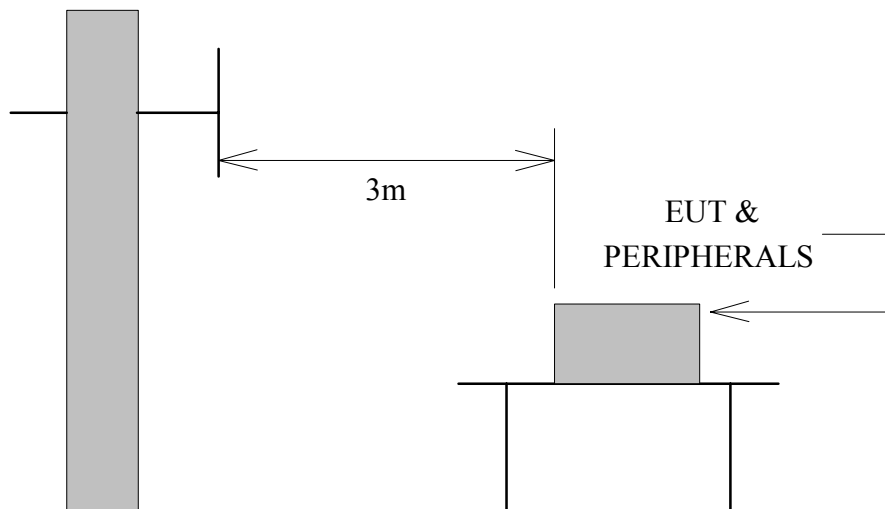
#### 3.1 Test Equipments

The following test equipments are utilized in making the measurements contained in this report.

| Manufacturer or Type  | Model No    | Serial No  | Date of Calibration | Calibration Period | Remark |
|-----------------------|-------------|------------|---------------------|--------------------|--------|
| CHASE BI-LOG ANTENNA  | CBL6112B    | 2421       | May 07, 2004        | 1 Year             | FINAL  |
| R/S SPECTRUM ANALYZER | FSEK30      | 835253/002 | June 17, 2004       | 1 Year             | FINAL  |
| OPEN SITE             | -----       | No.2       | May 07, 2004        | 1 Year             | FINAL  |
| N TYPE COAXIAL CABLE  | CHA9525     | 4          | July 13, 2004       | 1 Year             | FINAL  |
| Horn Antenna          | AH-118      | 10089      | February 25, 2004   | 1 Year             | FINAL  |
| HP Pre-amplifier      | 8449B       | 3008A01471 | November 11, 2004   | 1 Year             | FINAL  |
| HP High pass filter   | 84300/80038 | 011        | CAL. ON USE         | 1 Year             | FINAL  |
| Horn Antenna          | AH-840      | 03077      | February 25, 2004   | 1 Year             | FINAL  |

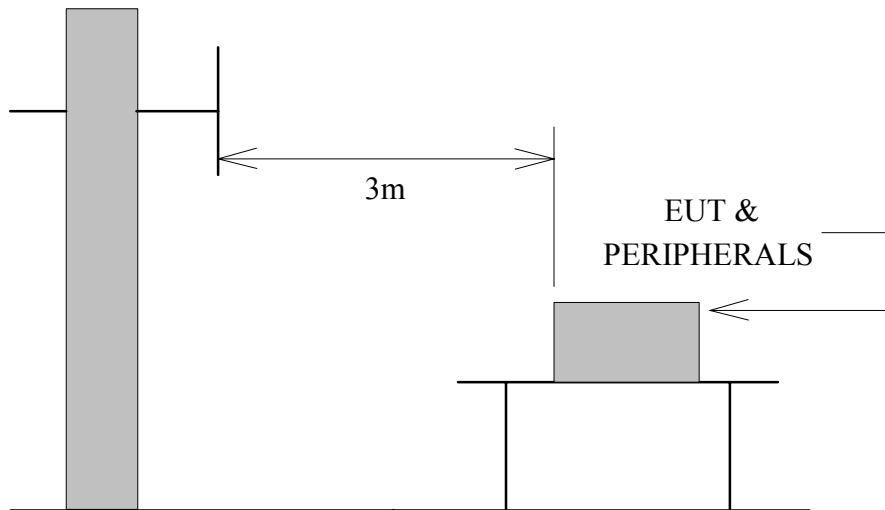
#### 3.2 Test Setup

1. The diagram below shows the test setup that is utilized to make the measurements for emission from 30 to 1GHz.(For Transmitter device)



Antenna Elevation Variable

2. The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.(For Transmitter device)



Antenna Elevation Variable

### 3.3 Radiation Limit

For intentional device, according to § 15.231(b), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following table.

| Fundamental Frequency (MHz) | Distance (Meters) | Field Strength of Fundamental ( $\mu\text{V/M}$ ) | Field Strength of Spurious Emission ( $\mu\text{V/M}$ ) |
|-----------------------------|-------------------|---------------------------------------------------|---------------------------------------------------------|
| 40.66-40.70                 | 3                 | 2250                                              | 225                                                     |
| 70-130                      | 3                 | 1250                                              | 125                                                     |
| 130-174                     | 3                 | 1250 to 3750                                      | 125 to 375                                              |
| 174-260                     | 3                 | 3750                                              | 375                                                     |
| 260-470                     | 3                 | 3750 to 12500                                     | 375 to 1250                                             |
| Above 470                   | 3                 | 12500                                             | 1250                                                    |

### 3.4 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. During performing radiated emission below 1GHz, the EUT (Transmitter device) was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1GHz, the EUT (Transmitter device) was set 3 meters away from the interference-receiving antenna.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

### 3.5 Uncertainty of Radiated Emission

The uncertainty of radiated emission is  $\pm 2.72\text{dB}$ .



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### 3.6 Radiated RF Noise Measurement Results

The frequency spectrum from 30 MHz to 4000 MHz for Transmitter was investigated. All emissions not reported are much lower than the prescribed limits.

|              |                                    |                 |            |
|--------------|------------------------------------|-----------------|------------|
| Company      | LEE' S HI-TECH ENTERPRISE CO., LTD | Test Date       | 2004/10/05 |
| Product Name | Industrial Radio Remote Controller | Test By         | Stan Peng  |
| Model Name   | F24                                | TEMP & Humidity | 23°C, 78%  |

| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading at 3m(dBμV) |          | Limits (dBμV/m) | Emission Level at 3m(dBμV/m) |          |
|-----------------|-----------------------|-----------------|---------------------------|----------|-----------------|------------------------------|----------|
|                 |                       |                 | Horizontal                | Vertical |                 | Horizontal                   | Vertical |
| 30.00           | 17.01                 | 0.97            | *                         | *        | 40.00           | *                            | *        |
| ▲310.25         | 14.01                 | 4.36            | 37.30                     | 39.80    | 75.33(QP)       | 55.67                        | 58.17    |
| 620.50          | 18.84                 | 5.78            | 1.60                      | 4.80     | 46.00(QP)       | 26.22                        | 29.42    |
| 930.75          | 21.52                 | 7.37            | -1.10                     | -1.10    | 46.00(QP)       | 27.79                        | 27.79    |
| 1241.00         | 23.41                 | 8.92            | 12.00                     | 12.90    | 75.33(PK)       | 44.33                        | 45.23    |
| 1241.00         | 23.41                 | 8.92            | 1.90                      | 2.00     | 55.33(AVG)      | 34.23                        | 34.33    |
| ※1551.25        | 25.07                 | 10.14           | 11.60                     | 11.90    | 74.00(PK)       | 46.81                        | 47.11    |
| ※1551.25        | 25.07                 | 10.14           | 1.10                      | 1.00     | 54.00(AVG)      | 36.31                        | 36.21    |
| 1861.50         | 26.87                 | 11.39           | 12.10                     | 12.60    | 75.33(PK)       | 50.36                        | 50.86    |
| 1861.50         | 26.87                 | 11.39           | 1.50                      | 1.50     | 55.33(AVG)      | 39.76                        | 39.76    |
| 3102.50         | ---                   | ---             | ---                       | ---      | 75.33(PK)       | ---                          | ---      |
| 3102.50         | ---                   | ---             | ---                       | ---      | 55.33(AVG)      | ---                          | ---      |

#### REMARKS :

1. \* Undetectable
2. Emission level (dBμV/m) = Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).
3. Remark "▲" means fundamental frequency for Transmitter device.
4. The emission value below 1GHz is quasi-peak value and the emission value above 1GHz is both peak and average value.  
PK : Peak value; AVG : Average value; QP : Quasi-peak value.
5. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
6. Remark "※" means the Restricted band.
7. For the fundamental frequency (310.25MHz), X-axis direction, detailed in setup photo.

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The frequency spectrum from 30 MHz to 4000 MHz for Transmitter was investigated. All emissions not reported are much lower than the prescribed limits.

|                     |                                    |                            |            |
|---------------------|------------------------------------|----------------------------|------------|
| <b>Company</b>      | LEE' S HI-TECH ENTERPRISE CO., LTD | <b>Test Date</b>           | 2004/10/05 |
| <b>Product Name</b> | Industrial Radio Remote Controller | <b>Test By</b>             | Stan Peng  |
| <b>Model Name</b>   | F24                                | <b>TEMP &amp; Humidity</b> | 23°C, 78%  |

| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading at 3m(dBμV) |          | Limits (dBμV/m) | Emission Level at 3m(dBμV/m) |          |
|-----------------|-----------------------|-----------------|---------------------------|----------|-----------------|------------------------------|----------|
|                 |                       |                 | Horizontal                | Vertical |                 | Horizontal                   | Vertical |
| 30.00           | 17.01                 | 0.97            | *                         | *        | 40.00           | *                            | *        |
| ▲310.25         | 14.01                 | 4.36            | 43.70                     | 36.00    | 75.33(QP)       | 62.07                        | 54.37    |
| 620.50          | 18.84                 | 5.78            | 5.70                      | 3.60     | 46.00(QP)       | 30.32                        | 28.22    |
| 930.75          | 21.52                 | 7.37            | -1.10                     | -1.20    | 46.00(QP)       | 27.79                        | 27.69    |
| 1241.00         | 23.41                 | 8.92            | 12.30                     | 12.10    | 75.33(PK)       | 44.63                        | 44.43    |
| 1241.00         | 23.41                 | 8.92            | 2.00                      | 2.00     | 55.33(AVG)      | 34.33                        | 34.33    |
| ※1551.25        | 25.07                 | 10.14           | 11.60                     | 11.40    | 74.00(PK)       | 46.81                        | 46.61    |
| ※1551.25        | 25.07                 | 10.14           | 1.10                      | 1.00     | 54.00(AVG)      | 36.31                        | 36.21    |
| 1861.50         | 26.87                 | 11.39           | 11.70                     | 11.40    | 75.33(PK)       | 49.96                        | 49.66    |
| 1861.50         | 26.87                 | 11.39           | 1.60                      | 1.50     | 55.33(AVG)      | 39.86                        | 39.76    |
| 3102.50         | ---                   | ---             | ---                       | ---      | 75.33(PK)       | ---                          | ---      |
| 3102.50         | ---                   | ---             | ---                       | ---      | 55.33(AVG)      | ---                          | ---      |

**REMARKS :**

1. \* Undetectable
2. Emission level (dBμV/m) = Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).
3. Remark "▲" means fundamental frequency for Transmitter device.
4. The emission value below 1GHz is quasi-peak value and the emission value above 1GHz is both peak and average value.  
PK : Peak value; AVG : Average value; QP : Quasi-peak value.
5. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
6. Remark "※" means the Restricted band.
7. For the fundamental frequency (310.25MHz), Y-axis direction, detailed in setup photo.

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TEL: 886-3-5918012 FAX: 886-3-5825720

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The frequency spectrum from 30 MHz to 4000 MHz for Transmitter was investigated. All emissions not reported are much lower than the prescribed limits.

|                     |                                    |                            |            |
|---------------------|------------------------------------|----------------------------|------------|
| <b>Company</b>      | LEE' S HI-TECH ENTERPRISE CO., LTD | <b>Test Date</b>           | 2004/10/05 |
| <b>Product Name</b> | Industrial Radio Remote Controller | <b>Test By</b>             | Stan Peng  |
| <b>Model Name</b>   | F24                                | <b>TEMP &amp; Humidity</b> | 23°C, 78%  |

| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading at 3m(dBμV) |          | Limits (dBμV/m) | Emission Level at 3m(dBμV/m) |          |
|-----------------|-----------------------|-----------------|---------------------------|----------|-----------------|------------------------------|----------|
|                 |                       |                 | Horizontal                | Vertical |                 | Horizontal                   | Vertical |
| 30.00           | 17.01                 | 0.97            | *                         | *        | 40.00           | *                            | *        |
| ▲310.25         | 14.01                 | 4.36            | 44.10                     | 34.70    | 75.33(QP)       | 62.47                        | 53.07    |
| 620.50          | 18.84                 | 5.78            | 3.10                      | 3.00     | 46.00(QP)       | 27.72                        | 27.62    |
| 930.75          | 21.52                 | 7.37            | -1.20                     | -1.10    | 46.00(QP)       | 27.69                        | 27.79    |
| 1241.08         | 23.41                 | 8.92            | 11.80                     | 12.10    | 75.33(PK)       | 44.13                        | 44.43    |
| 1241.08         | 23.41                 | 8.92            | 1.90                      | 2.00     | 55.33(AVG)      | 34.23                        | 34.33    |
| ※1551.25        | 25.07                 | 10.14           | 11.50                     | 11.60    | 74.00(PK)       | 46.71                        | 46.81    |
| ※1551.25        | 25.07                 | 10.14           | 1.00                      | 1.10     | 54.00(AVG)      | 36.21                        | 36.31    |
| 1861.50         | 26.87                 | 11.39           | 12.80                     | 12.90    | 75.33(PK)       | 51.06                        | 51.16    |
| 1861.50         | 26.87                 | 11.39           | 1.50                      | 1.50     | 55.33(AVG)      | 39.76                        | 39.76    |
| 3102.50         | ---                   | ---             | ---                       | ---      | 75.33(PK)       | ---                          | ---      |
| 3102.50         | ---                   | ---             | ---                       | ---      | 55.33(AVG)      | ---                          | ---      |

**REMARKS :**

1. \* Undetectable
2. Emission level (dBμV/m) = Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).
3. Remark "▲" means fundamental frequency for Transmitter Device.
4. The emission value below 1GHz is quasi-peak value and the emission value above 1GHz is both peak and average value.  
PK : Peak value; AVG : Average value; QP : Quasi-peak value.
5. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
6. Remark "※" means the Restricted band.
7. For the fundamental frequency (310.25MHz), Z-axis direction, detailed in setup photo.

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Rm. 258, Bldg. 17, NO.195, Sec.4 Chung Hsing Rd., ChuTugn Chen, Hsinchu, Taiwan 310, R.O.C  
TEL: 886-3-5918012 FAX: 886-3-5825720

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The frequency spectrum from 30 MHz to 4000 MHz for Transmitter was investigated. All emissions not reported are much lower than the prescribed limits.

|                     |                                    |                            |             |
|---------------------|------------------------------------|----------------------------|-------------|
| <b>Company</b>      | LEE' S HI-TECH ENTERPRISE CO., LTD | <b>Test Date</b>           | 2004/10/08  |
| <b>Product Name</b> | Industrial Radio Remote Controller | <b>Test By</b>             | Stan Peng   |
| <b>Model Name</b>   | F24                                | <b>TEMP &amp; Humidity</b> | 21.5°C, 78% |

| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading at 3m(dBμV) |          | Limits (dBμV/m) | Emission Level at 3m(dBμV/m) |          |
|-----------------|-----------------------|-----------------|---------------------------|----------|-----------------|------------------------------|----------|
|                 |                       |                 | Horizontal                | Vertical |                 | Horizontal                   | Vertical |
| 30.00           | 17.01                 | 0.97            | *                         | *        | 40.00           | *                            | *        |
| ▲318.80         | 14.43                 | 4.40            | 25.10                     | 28.40    | 75.84(QP)       | 43.93                        | 47.23    |
| 637.60          | 18.98                 | 5.88            | 0.60                      | 0.20     | 46.00(QP)       | 25.46                        | 25.06    |
| 1275.20         | 23.55                 | 8.97            | 12.40                     | 12.20    | 75.84(PK)       | 44.93                        | 44.73    |
| 1275.20         | 23.55                 | 8.97            | 1.90                      | 1.80     | 55.84(AVG)      | 34.43                        | 34.33    |
| ※1594.00        | 25.41                 | 10.31           | 11.50                     | 11.60    | 74.00(PK)       | 47.22                        | 47.32    |
| ※1594.00        | 25.41                 | 10.31           | 1.00                      | 1.00     | 54.00(AVG)      | 36.72                        | 36.72    |
| 1912.80         | 27.03                 | 11.57           | 12.50                     | 12.80    | 75.84(PK)       | 51.10                        | 51.40    |
| 1912.80         | 27.03                 | 11.57           | 1.80                      | 1.90     | 55.84(AVG)      | 40.40                        | 40.50    |
| 3188.10         | ---                   | ---             | ---                       | ---      | 75.80(PK)       | ---                          | ---      |
| 3188.10         | ---                   | ---             | ---                       | ---      | 55.80(AVG)      | ---                          | ---      |

**REMARKS :**

1. \* Undetectable
2. Emission level (dBμV/m) = Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).
3. Remark "▲" means fundamental frequency for Transmitter device.
4. The emission value below 1GHz is quasi-peak value and the emission value above 1GHz is both peak and average value.  
PK : Peak value; AVG : Average value; QP : Quasi-peak value.
5. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
6. Remark "※" means the Restricted band.
7. For the fundamental frequency (318.80MHz), X-axis direction, detailed in setup photo.

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The frequency spectrum from 30 MHz to 4000 MHz for Transmitter was investigated. All emissions not reported are much lower than the prescribed limits.

|                     |                                    |                            |             |
|---------------------|------------------------------------|----------------------------|-------------|
| <b>Company</b>      | LEE' S HI-TECH ENTERPRISE CO., LTD | <b>Test Date</b>           | 2004/10/08  |
| <b>Product Name</b> | Industrial Radio Remote Controller | <b>Test By</b>             | Stan Peng   |
| <b>Model Name</b>   | F24                                | <b>TEMP &amp; Humidity</b> | 21.5°C, 78% |

| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading at 3m(dBμV) |          | Limits (dBμV/m) | Emission Level at 3m(dBμV/m) |          |
|-----------------|-----------------------|-----------------|---------------------------|----------|-----------------|------------------------------|----------|
|                 |                       |                 | Horizontal                | Vertical |                 | Horizontal                   | Vertical |
| 30.00           | 17.01                 | 0.97            | *                         | *        | 40.00           | *                            | *        |
| ▲318.80         | 14.43                 | 4.40            | 29.90                     | 19.90    | 75.84(QP)       | 48.73                        | 38.73    |
| 637.60          | 18.98                 | 5.88            | 1.10                      | 0.30     | 46.00(QP)       | 25.96                        | 25.16    |
| 1275.20         | 23.55                 | 8.97            | 12.80                     | 12.40    | 75.84(PK)       | 45.33                        | 44.93    |
| 1275.20         | 23.55                 | 8.97            | 1.80                      | 1.80     | 55.84(AVG)      | 34.33                        | 34.33    |
| ※1594.00        | 25.41                 | 10.31           | 11.60                     | 11.50    | 74.00(PK)       | 47.32                        | 47.22    |
| ※1594.00        | 25.41                 | 10.31           | 1.10                      | 1.00     | 54.00(AVG)      | 36.82                        | 36.72    |
| 1912.80         | 27.03                 | 11.57           | 12.80                     | 12.60    | 75.84(PK)       | 51.40                        | 51.20    |
| 1912.80         | 27.03                 | 11.57           | 2.00                      | 1.90     | 55.84(AVG)      | 40.60                        | 40.50    |
| 3188.10         | ---                   | ---             | ---                       | ---      | 75.80(PK)       | ---                          | ---      |
| 3188.10         | ---                   | ---             | ---                       | ---      | 55.80(AVG)      | ---                          | ---      |

**REMARKS :**

1. \* Undetectable
2. Emission level (dBμV/m) = Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).
3. Remark "▲" means fundamental frequency for Transmitter device.
4. The emission value below 1GHz is quasi-peak value and the emission value above 1GHz is both peak and average value.  
PK : Peak value; AVG : Average value; QP : Quasi-peak value.
5. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
6. Remark "※" means the Restricted band.
7. For the fundamental frequency (318.80MHz), Y-axis direction, detailed in setup photo.

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TEL: 886-3-5918012 FAX: 886-3-5825720

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The frequency spectrum from 30 MHz to 4000 MHz for Transmitter was investigated. All emissions not reported are much lower than the prescribed limits.

|                     |                                    |                            |             |
|---------------------|------------------------------------|----------------------------|-------------|
| <b>Company</b>      | LEE' S HI-TECH ENTERPRISE CO., LTD | <b>Test Date</b>           | 2004/10/08  |
| <b>Product Name</b> | Industrial Radio Remote Controller | <b>Test By</b>             | Stan Peng   |
| <b>Model Name</b>   | F24                                | <b>TEMP &amp; Humidity</b> | 21.5°C, 78% |

| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading at 3m(dBμV) |          | Limits (dBμV/m) | Emission Level at 3m(dBμV/m) |          |
|-----------------|-----------------------|-----------------|---------------------------|----------|-----------------|------------------------------|----------|
|                 |                       |                 | Horizontal                | Vertical |                 | Horizontal                   | Vertical |
| 30.00           | 17.01                 | 0.97            | *                         | *        | 40.00           | *                            | *        |
| ▲318.80         | 14.43                 | 4.40            | 32.70                     | 24.90    | 75.84(QP)       | 51.53                        | 43.73    |
| 637.60          | 18.98                 | 5.88            | 0.20                      | 0.10     | 46.00(QP)       | 25.06                        | 24.96    |
| 1275.20         | 23.55                 | 8.97            | 12.60                     | 12.50    | 75.84(PK)       | 45.13                        | 45.03    |
| 1275.20         | 23.55                 | 8.97            | 1.80                      | 1.80     | 55.84(AVG)      | 34.33                        | 34.33    |
| ※1594.00        | 25.41                 | 10.31           | 11.50                     | 11.30    | 74.00(PK)       | 47.22                        | 47.02    |
| ※1594.00        | 25.41                 | 10.31           | 1.00                      | 0.90     | 54.00(AVG)      | 36.72                        | 36.62    |
| 1912.80         | 27.03                 | 11.57           | 12.80                     | 12.70    | 75.84(PK)       | 51.40                        | 51.30    |
| 1912.80         | 27.03                 | 11.57           | 1.90                      | 1.90     | 55.84(AVG)      | 40.50                        | 40.50    |
| 3188.10         | ---                   | ---             | ---                       | ---      | 75.80(PK)       | ---                          | ---      |
| 3188.10         | ---                   | ---             | ---                       | ---      | 55.80(AVG)      | ---                          | ---      |

**REMARKS :**

1. \* Undetectable
2. Emission level (dBμV/m) = Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).
3. Remark "▲" means fundamental frequency for Transmitter Device.
4. The emission value below 1GHz is quasi-peak value and the emission value above 1GHz is both peak and average value.  
PK : Peak value; AVG : Average value; QP : Quasi-peak value.
5. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
6. Remark "※" means the Restricted band.
7. For the fundamental frequency (318.80MHz), Z-axis direction, detailed in setup photo.

### 3.7 Photos of Radiated Test

TX mode :

(1) X-axis





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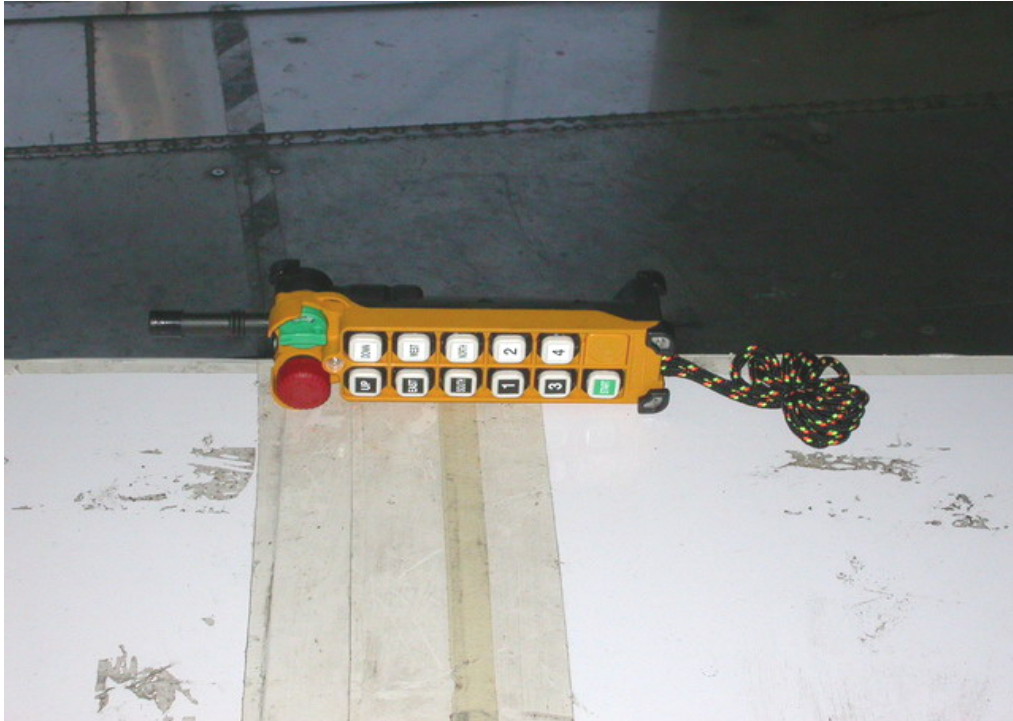
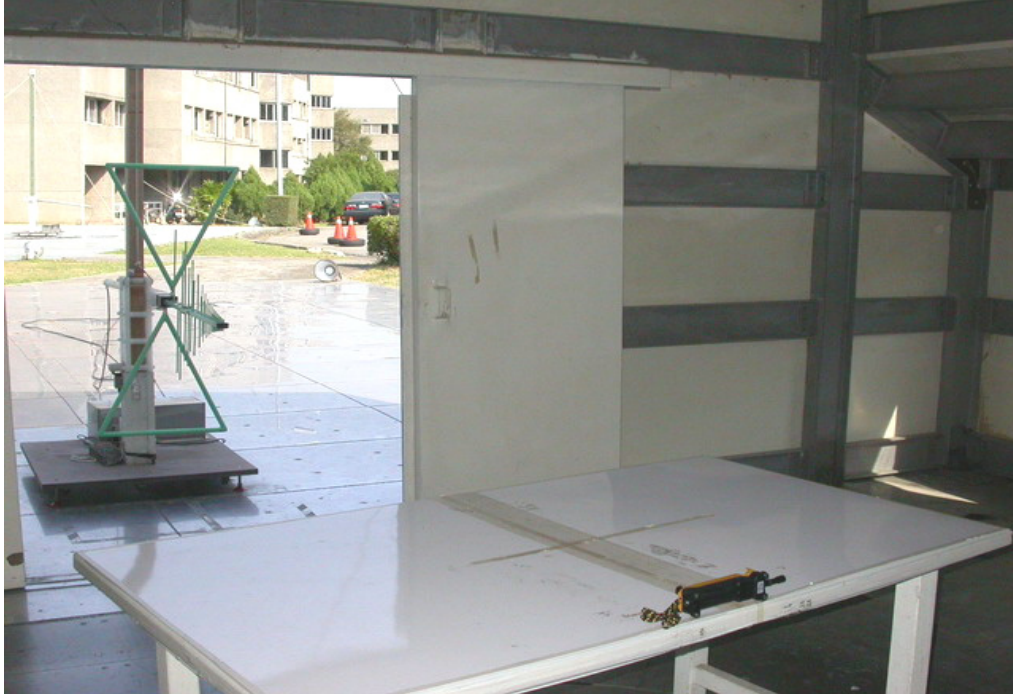
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(2) Y-axis





(3) Z-axis





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## 4. BANDWIDTH MEASUREMENT

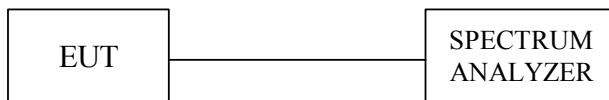
### 4.1 Test Equipments

| Description & Manufacturer           | Model No. | Serial No. | Date Of Calibration |
|--------------------------------------|-----------|------------|---------------------|
| ROHDE & SCHWARZ<br>SPECTRUM ANALYZER | FSEK30    | 835253/002 | June 17, 2004       |

Note :

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.2 Test Setup



### 4.3 Limits of Bandwidth Measurement

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

### 4.4 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 1MHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

### 4.5 Uncertainty of Conducted Emission

The uncertainty of conducted emission is  $\pm 200\text{KHz}$ .

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#### 4.6 Test Results

|                             |                                             |                                 |               |
|-----------------------------|---------------------------------------------|---------------------------------|---------------|
| <b>Input Power (System)</b> | 3VDC (For TX device)<br>from two AA battery | <b>Environmental Conditions</b> | 26.2°C, 62%RH |
| <b>Tested By</b>            | Stan Peng                                   |                                 |               |

1. For the fundamental frequency (310.25MHz)

| <b>Center Frequency (MHz)</b> | <b>Bandwidth (kHz)</b> | <b>Minimum Limit (kHz)</b> | <b>Pass / Fail</b> |
|-------------------------------|------------------------|----------------------------|--------------------|
| 310.25                        | 115.23                 | 775.6                      | PASS               |

Note : The fundamental frequency of EUT is 310.25MHz. The minimum bandwidth limit will be the 0.25% of the center frequency that is  $310.25\text{MHz} \times 0.25\% = 775.6 \text{ kHz}$ .

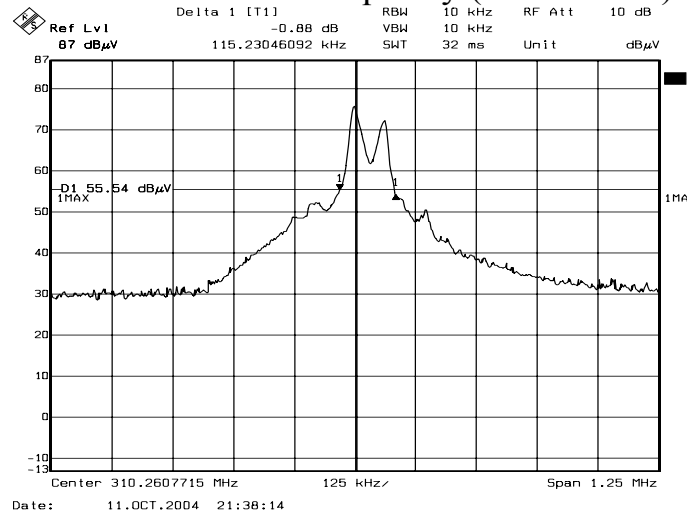
2. For the fundamental frequency (318.80MHz)

| <b>Center Frequency (MHz)</b> | <b>Bandwidth (kHz)</b> | <b>Minimum Limit (kHz)</b> | <b>Pass / Fail</b> |
|-------------------------------|------------------------|----------------------------|--------------------|
| 318.80                        | 120.24                 | 797                        | PASS               |

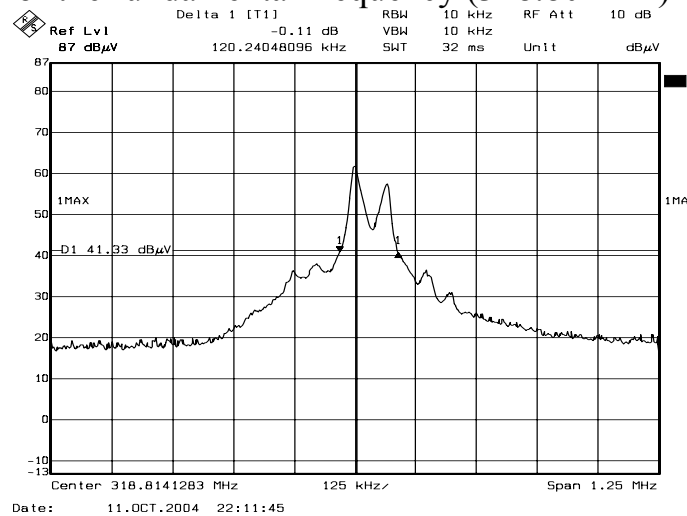
Note : The fundamental frequency of EUT is 318MHz. The minimum bandwidth limit will be the 0.25% of the center frequency that is  $318.80\text{MHz} \times 0.25\% = 797 \text{ kHz}$ .

## 4.7 Photo of Bandwidth Measurement

### 1. For the fundamental frequency (310.25MHz)



### 2. For the fundamental frequency (318.80MHz)





## **5. ANTENNA REQUIREMENT**

### **5.1 Standard Applicable**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### **5.2 Antenna Connected Construction**

The antenna used in this product is Helix antenna. And the maximum Gain of the antenna is only 1.5dBi.