

# CFR 47 FCC Part 15.231

## TEST REPORT

Product : **Transmitter**

Trade Name : EXCALI BUR; Crime Guard

Model Number : #147-03; #147-03B; #149-05; #149-05B

FCC ID : ELV147

Prepared for

### **Nutek Corporation**

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Prepared by

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# Statement of Compliance

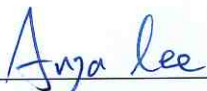
**Applicant:** Nutek Corporation  
**Manufacturer:** Nutek Corporation  
**Product:** Transmitter  
**Model No.:** #147-03; #147-03B; #149-05; #149-05B  
**Tested Power Supply:** 6Vdc Battery  
**Date of Final Test:** Sep. 01, 2008

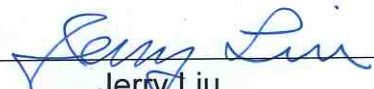
**Configuration of Measurements and Standards Used :**

FCC Rules and Regulations Part 15 Subpart C

1. The result of the testing report relate only to the item tested.
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Report Issued: 2008/10/07

Project Engineer:   
Anya Lee

Approved:   
Jerry Liu

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## 1 Summary of Measurement

| <b>Report Clause</b> | <b>Test Parameter</b> | <b>Reference Document<br/>CFR47 Part15</b> | <b>Results</b> |
|----------------------|-----------------------|--|----------------|
| 4                    | Radiated Emission     | §15.231(b), 15.209                         | Pass           |
| 5                    | Emission bandwidth    | §15.231(c)                                 | Pass           |

## 2 General Information

### 2.1 Description of Equipment Under Test

- Product** : Transmitter
- Model Number** : #147-03; #147-03B; #149-05; #149-05B
- Applicant** : **Nutek Corporation**  
 NO.167, Lane 235, Bauchiau Rd., Shindian City, Taipei Country  
 23145, Taiwan.
- Manufacturer** : **Nutek Corporation**  
 NO.167, Lane 235, Bauchiau Rd., Shindian City, Taipei Country  
 23145, Taiwan.
- Power Supply** : 6Vdc Battery
- Operating Frequency** : 433.92MHz
- Channel Number** : 1 channel
- Type of Modulation** : ASK
- Antenna description** : This device uses Monopole antenna.
- |                |   |       |
|----------------|---|-------|
| Antenna Gain   | : | 0 dBi |
| Connector type | : | N/A   |
- Sample Receive date** : Aug. 26, 2008
- Date of Test** : Aug. 26 ~ Sep. 01, 2008
- Additional Description** : 1) The EUT is **Transmitter**.  
 2) The Model Number “#147-03” is representative selected in the test and included in this report.  
 3) For all the series only the Face plate and shape of logo are different. The difference please see detail as follows:

| Model No. | LOGO        | Face plate  |
|-----------|-------------|-------------|
| #147-03   | EXCALIBUR   | Chrome      |
| #147-03B  | EXCALI BUR  | Dark Chrome |
| #149-05   | Crime Guard | Chrome      |
| #149-05B  | Crime Guard | Dark Chrome |

## **2.2 Details of tested peripheral equipment**

N/A

## 2.3 Test Facility

- Site Description** : ☑OATS 2
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Site 1, 2 Location** : No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang,  
Taipei County, Taiwan, R.O.C.
- Site 3, 4 Location** : No. 12, Ruei-Shu Valley, Ruei-Ping Tsun, Lin-Kou Hsiang,  
Taipei County, Taiwan, R.O.C.
- Site Filing** :
- Federal Communication Commissions – USA  
Registration No.: 96399 (OATS 1 & 2)  
Registration No.: 518958 (OATS 3 & 4)
  - Voluntary Control Council for Interference by Information  
Technology Equipment (VCCI) – Japan  
Registration No. (Conducted Room): C-1094  
Registration No. (Conducted Room): T-271  
Registration No. (OATS 1): R-1040  
Registration No. (OATS 2): R-1041
  - Industry Canada (IC)  
Submission: 113543
  - Japan Electrical Safety & Environment Technology Laboratories (JET)  
Registration No.: 04S03-01
- Site Accreditation** :
- Bureau of Standards and Metrology and Inspection (BSMI) –  
Taiwan, R.O.C.  
Accreditation No.:  
SL2-IN-E-0026 for CNS13438 / CISPR22  
SL2-R1-E-0026 for CNS13439 / CISPR13  
SL2-R2-E-0026 for CNS13439 / CISPR13  
SL2-A1-E-0026 for CNS13783-1 / CISPR14-1
  - Taiwan Accreditation Foundation (TAF)  
Accreditation No.: 1113
  - TÜV NORD  
Certificate No: TNTW0801R



### 3 Test specifications

#### 3.1 Test standard

The EUT was performed according to FCC Part 15 Subpart C Section 15.231 procedure and setup followed by ANSI C63.4, 2003 requirements.

#### 3.2 Operation mode

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report

The EUT was operated in continuous transmission mode during all of the tests.



**X axis mode**



**Y axis mode**



**Z axis mode**



### 3.3 Test Equipment

| Instrument              | Manufacturer | Model           | Serial No.  | Next Cal. Date |
|-------------------------|--------------|-----------------|-------------|----------------|
| Spectrum Analyzer       | R&S          | FSP30           | 100002      | 2008/12/14     |
| Spectrum Analyzer       | Agilent      | 8564EC          | 4046A00331  | 2009/04/11     |
| Preamplifier            | Agilent      | 8449B           | 3008A01434  | 2009/03/31     |
| Preamplifier            | SCHAFFNER    | CA30100         | 2           | 2008/10/21     |
| Horn Antenna            | COM-POWER    | AH-118          | 10081       | 2010/05/12     |
| Horn Antenna            | Schwarzbeck  | BBHA 9120       | 9120D-583   | 2008/12/17     |
| Horn Antenna            | Schwarzbeck  | BBHA 9170       | 213         | 2010/06/08     |
| Wide Bandwidth Sensor   | Anritsu      | MA2491A         | 728133      | 2008/10/18     |
| Power Meter             | Anritsu      | ML2495A         | 736010      | 2008/10/28     |
| Temp & Humidity chamber | GIAN FORCE   | GTH-150-40-2P-U | MAA0305-012 | 2009/05/14     |
| Signal Generator        | Agilent      | E8254A          | US41140164  | 2009/05/21     |

Note: The above equipments are within the valid calibration period.

## 4 Radiated emission test

### 4.1 Limits

According to FCC 15.231(b) requirement:

In addition to the provisions of §15.205, the field strength of emissions from intentional radiator operated under this section shall not exceed the following:

#### Fundamental and harmonics emission limits

| Frequency<br>(MHz) | Field Strength of Fundamental |                   | Field Strength of Harmonics |                   |
|--------------------|-------------------------------|-------------------|-----------------------------|-------------------|
|                    | ( $\mu$ V/m@3m)               | (dB $\mu$ V/m@3m) | ( $\mu$ V/m@3m)             | (dB $\mu$ V/m@3m) |
| 433.92             | 10996                         | 80.8              | 1099.6                      | 60.8              |

#### General Radiated emission Limit

Spurious Emission tested through until 10<sup>th</sup> harmonic. Radiated emissions, which fall in the restricted bands, as defined in §15.205 (a), comply with the radiated emission limits specified in §15.209 (a).

| Frequency<br>(MHz) | 15.209 Limits   |                   |
|--------------------|-----------------|-------------------|
|                    | ( $\mu$ V/m@3m) | (dB $\mu$ V/m@3m) |
| 30-88              | 100             | 40                |
| 88-216             | 150             | 43.5              |
| 216-960            | 200             | 46                |
| Above 960          | 500             | 54                |

Remark :

1. The table above tighter limit applies at the band edges.
2. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.

## 4.2 Calculation of Average Factor

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

Averaging factor in dB =  $20 \log (\text{duty cycle})$

The duty cycle is simply the on-time divided by 100ms

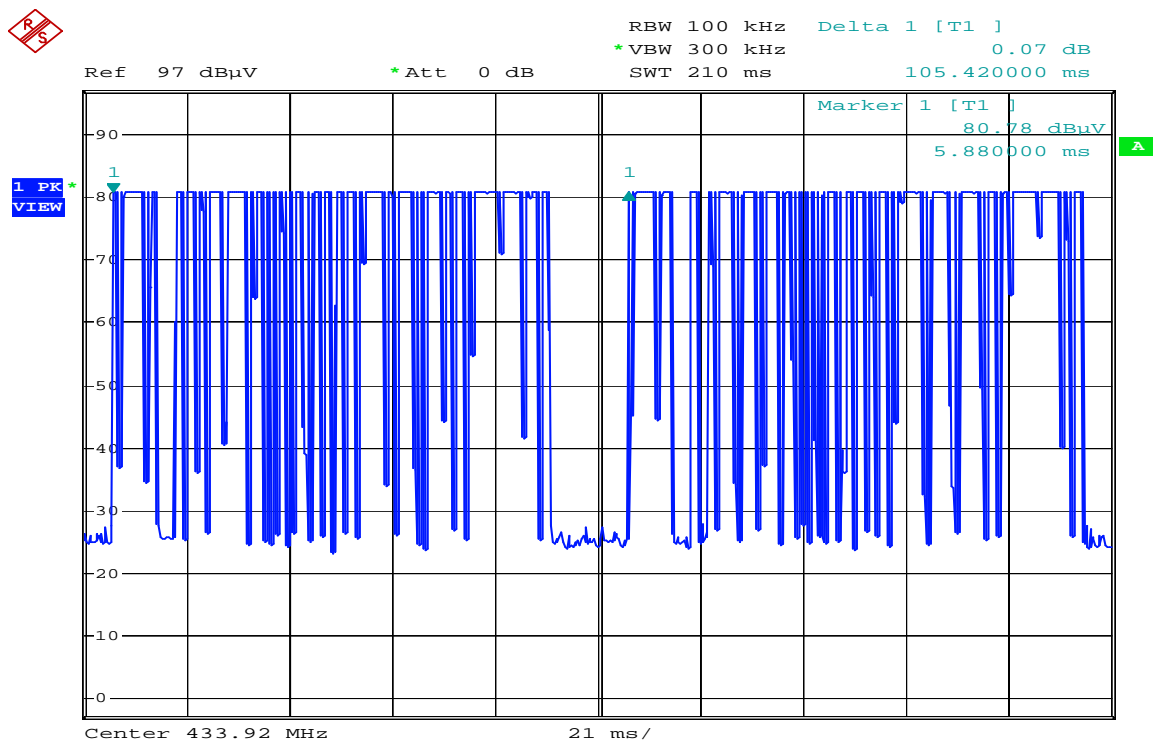
The duration of one cycle = 105.42ms

Duty Cycle =  $(0.720\text{ms} \times 44 + 0.324\text{ms} \times 32) / 100\text{ms} = 0.42$

Therefore, the averaging factor is found by  $20 \log 0.42 = -7.53\text{dB}$

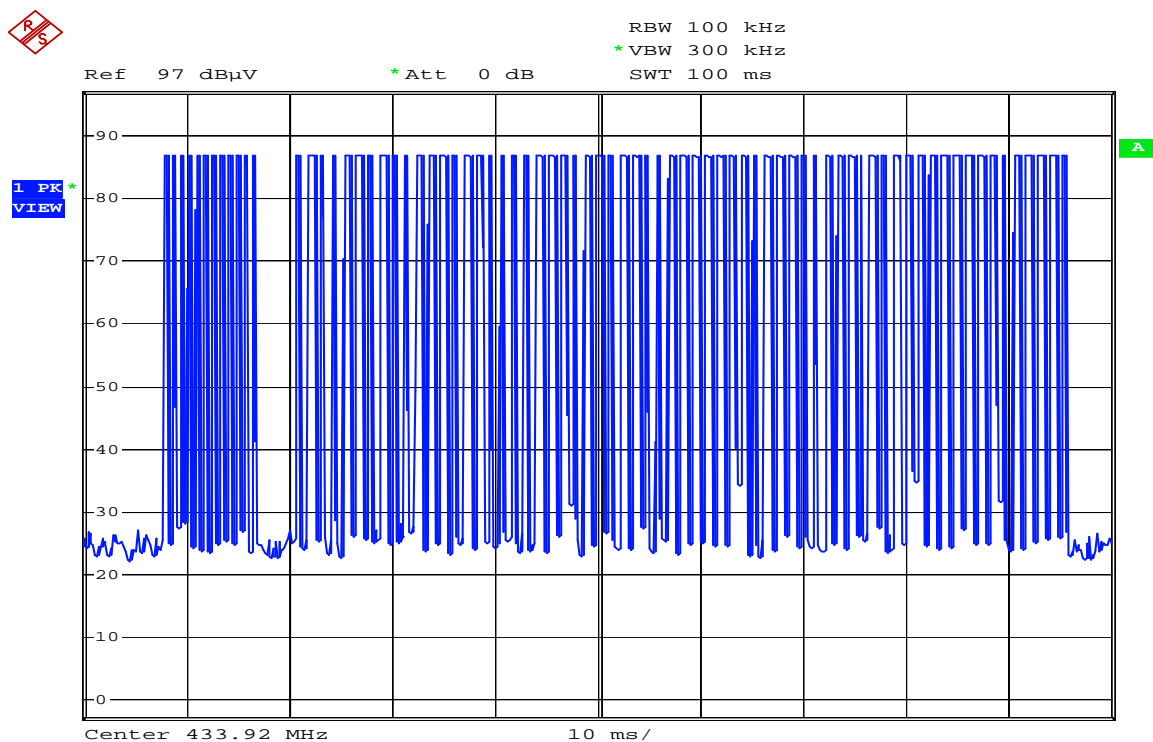
Please see the diagrams below.

# Duty Cycle



Comment: Duty Cycle  
Date: 27.AUG.2008 16:42:59

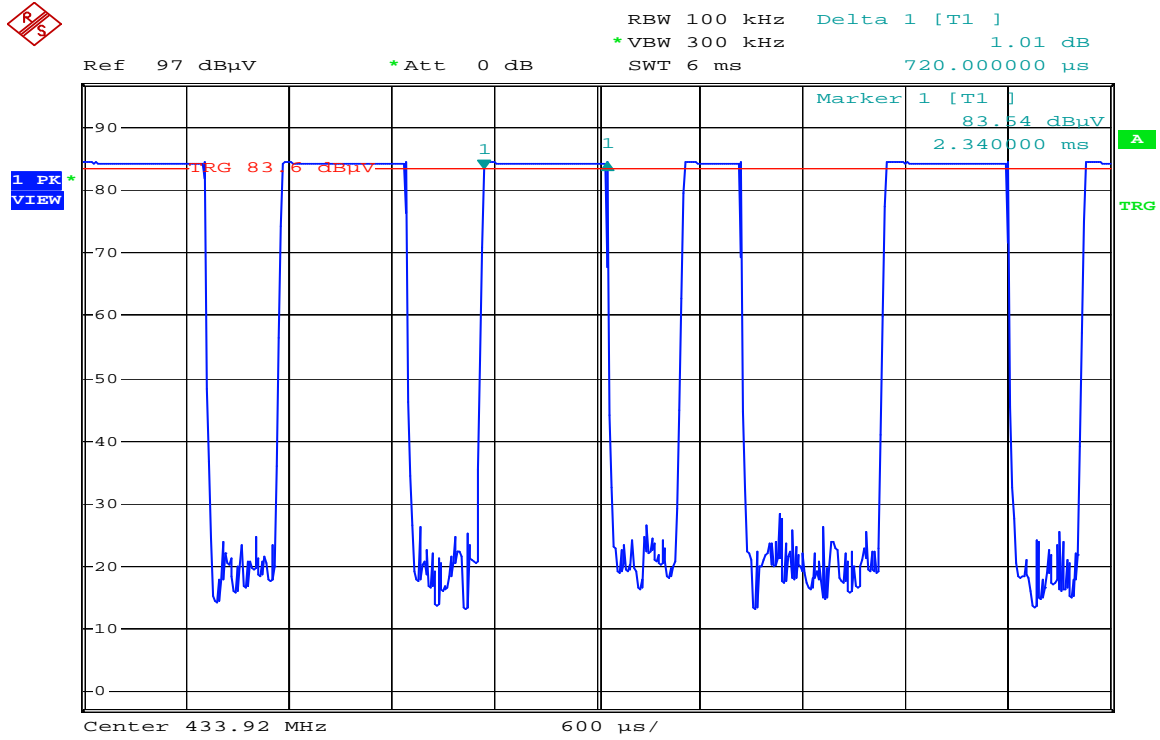
## Duty cycle 1



Comment: Duty Cycle  
Date: 27.AUG.2008 16:37:09

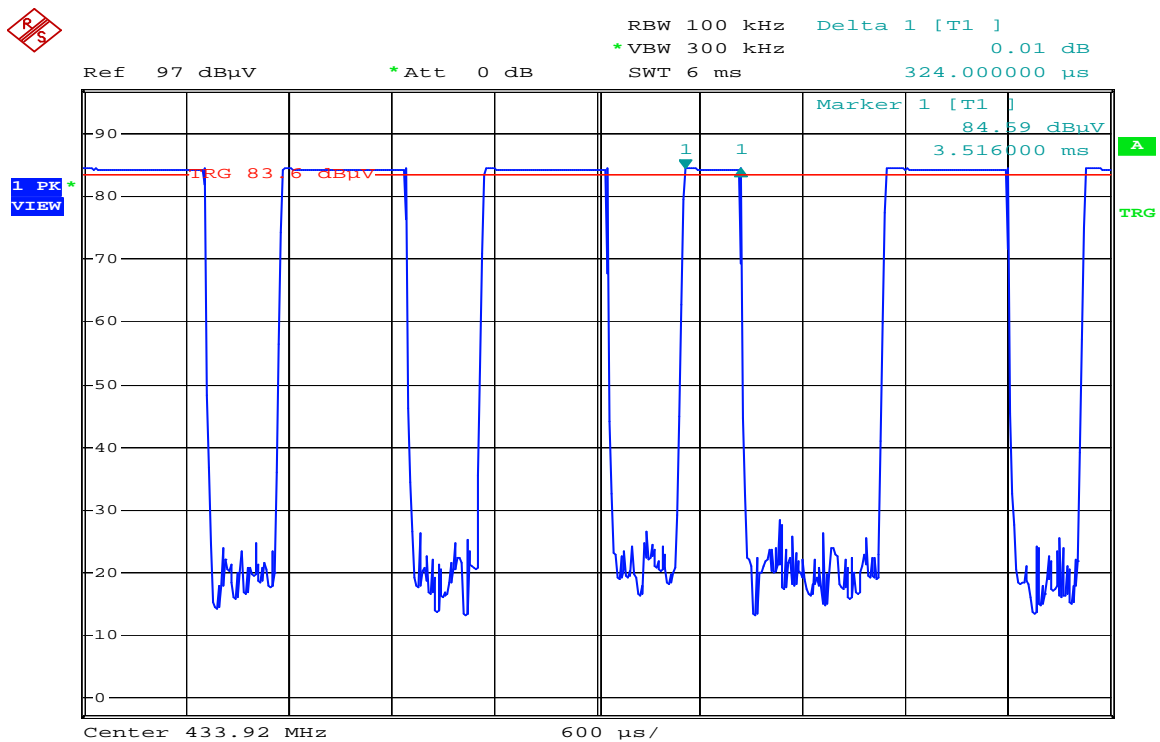
## Duty cycle 2

### Time Slot



Comment: Time Slot  
Date: 27.AUG.2008 16:54:24

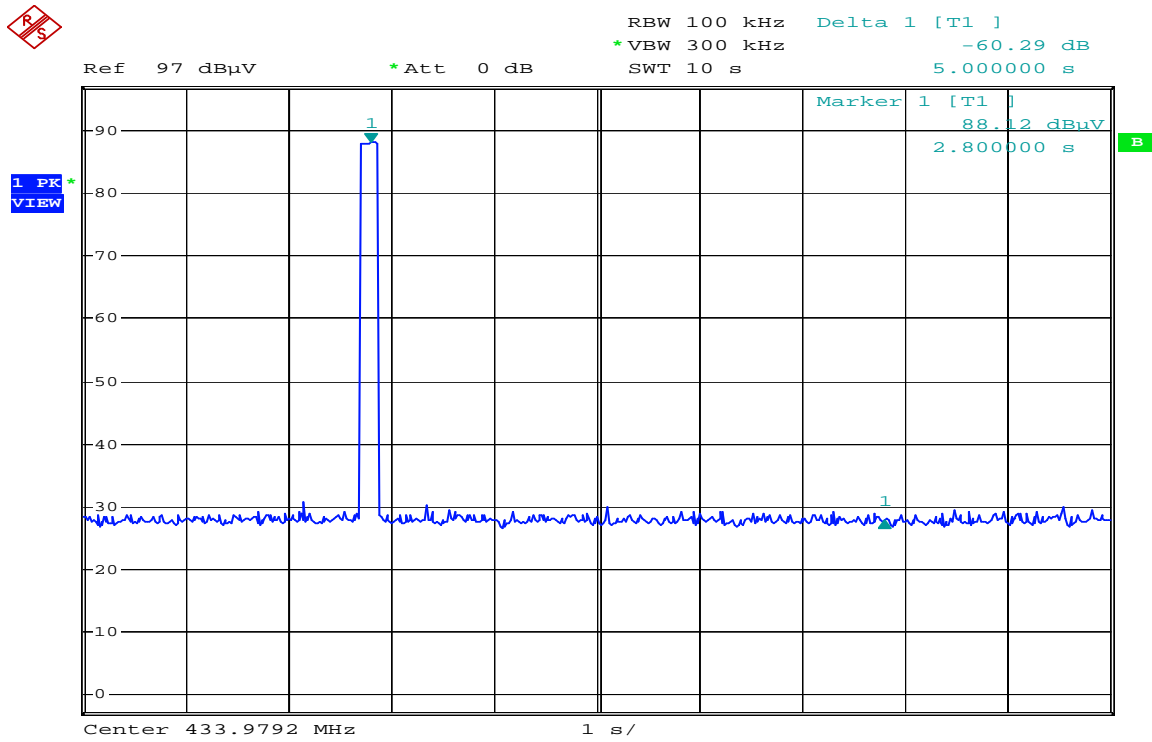
### Time Slot 1



Comment: Time Slot  
Date: 27.AUG.2008 16:54:49

### Time Slot 2

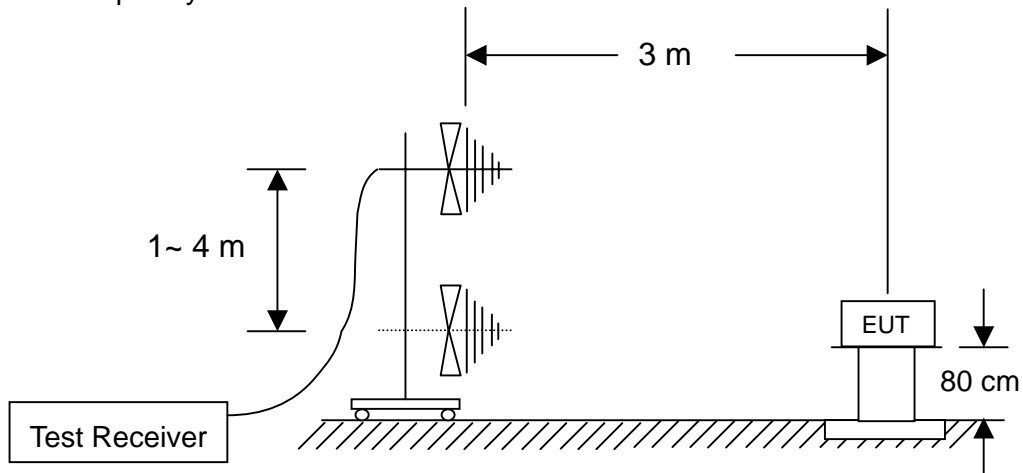
The EUT was complied with the requirement of FCC 15.231 (a)(1), which employed a switch that will automatically deactivate the transmitter within less than 5 seconds of being released.



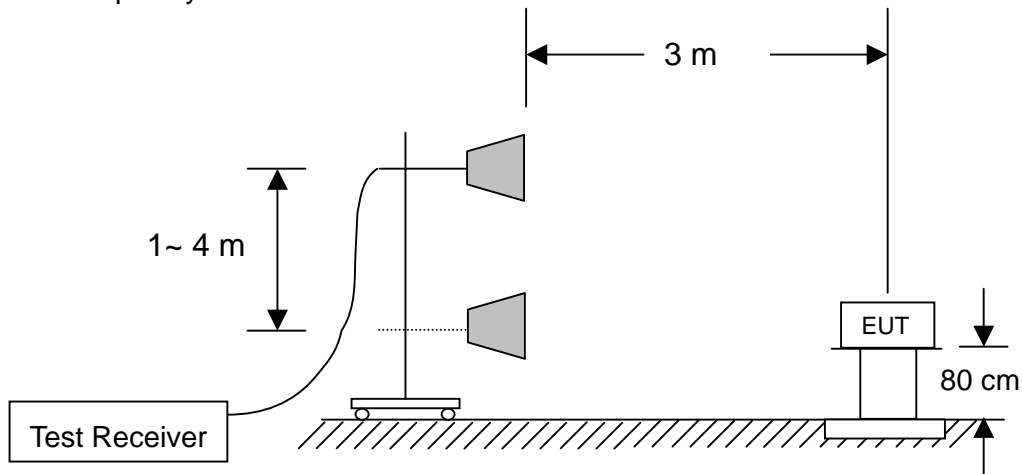
Comment: Deactivation  
Date: 27.AUG.2008 15:32:23

### 4.3 Configuration of Measurement

Measurement Frequency under 1GHz



Measurement Frequency above 1GHz



### 4.4 Test Procedure

Radiated emission measurements frequency range were performed from 30MHz to 5GHz. Spectrum Analyzer Resolution Bandwidth set to 100kHz or greater for frequencies from 30MHz to 1GHz, and set 1MHz Resolution Bandwidth for frequencies above 1GHz.

The EUT is place on non-conductive turntable for the test. If peripheral devices apply to the EUT, the peripheral devices will be connected to EUT and whole system. During the emission test, the signal is maximized through rotation and all cables were present worst-case emissions. The height of antenna and polarization is constantly changed for exploring maximum signal reading. The height of antenna can be up form reference ground to 4 meter and down to 1 meter.

### 4.5 Test Result

**PASS.**

The final test emission data is shown on as following tables.

### Radiated Emission below 1GHz

| Frequency (MHz) | Antenna Polarization | Reading (dB $\mu$ V) | Preamp (dB) | Correction Factor (dB/m) | Corrected Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Det. Mode |
|-----------------|----------------------|----------------------|-------------|--------------------------|--------------------------------|-----------------------|-------------|-----------|
| 231.275         | H                    | 37.49                | 31.28       | 12.56                    | 18.77                          | 46.00                 | -27.23      | QP        |
| 323.425         | H                    | 32.04                | 31.26       | 20.53                    | 21.31                          | 46.00                 | -24.69      | QP        |
| 638.675         | H                    | 32.84                | 31.09       | 30.68                    | 32.43                          | 46.00                 | -13.57      | QP        |
| 786.600         | H                    | 32.39                | 31.03       | 31.28                    | 32.64                          | 46.00                 | -13.36      | QP        |
| 158.525         | V                    | 32.62                | 31.29       | 21.66                    | 22.99                          | 46.00                 | -23.01      | QP        |
| 323.425         | V                    | 33.01                | 31.26       | 21.66                    | 23.41                          | 46.00                 | -22.59      | QP        |
| 709.000         | V                    | 39.99                | 31.02       | 27.56                    | 36.53                          | 46.00                 | -9.47       | QP        |
| 912.430         | V                    | 36.89                | 30.97       | 25.09                    | 31.01                          | 46.00                 | -14.99      | QP        |

Remark : Corrected Level = Reading – Preamp + Correction Factor  
 Correction Factor = Antenna Factor + Cable Loss



## Fundamental and harmonics emissions

| Freq. (MHz) | Antenna Polarization | Reading (dB $\mu$ V) | Preamp (dB) | Correction Factor (dB/m) | Average Factor (dB) | Corrected Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Det. Mode |
|-------------|----------------------|----------------------|-------------|--------------------------|---------------------|--------------------------------|-----------------------|-------------|-----------|
| 433.98      | H                    | 78.80                | 36.40       | 26.08                    | --                  | 68.48                          | 80.8                  | -12.32      | PK        |
| 867.93      | H                    | 42.26                | 36.40       | 26.78                    | --                  | 32.64                          | 60.8                  | -28.16      | PK        |
| 1301.93     | H                    | 38.97                | 36.34       | 27.84                    | --                  | 30.47                          | 54.0                  | -23.53      | PK        |
| 433.98      | V                    | 81.48                | 36.40       | 26.08                    | --                  | 71.16                          | 80.8                  | -9.64       | PK        |
| 867.96      | V                    | 41.96                | 36.40       | 26.78                    | --                  | 32.34                          | 60.8                  | -28.46      | PK        |
| 1301.93     | V                    | 41.66                | 36.34       | 27.84                    | --                  | 33.16                          | 54.0                  | -20.84      | PK        |

Remark :

1. Corrected Level = Reading – Preamp + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss
3. The present spurious points only shows that above noise level and the frequency range test from 30MHz to 10<sup>th</sup> harmonic of frequency.

## **5 Emission bandwidth**

### **5.1 Limits**

According to FCC 15.231(c) requirement:

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

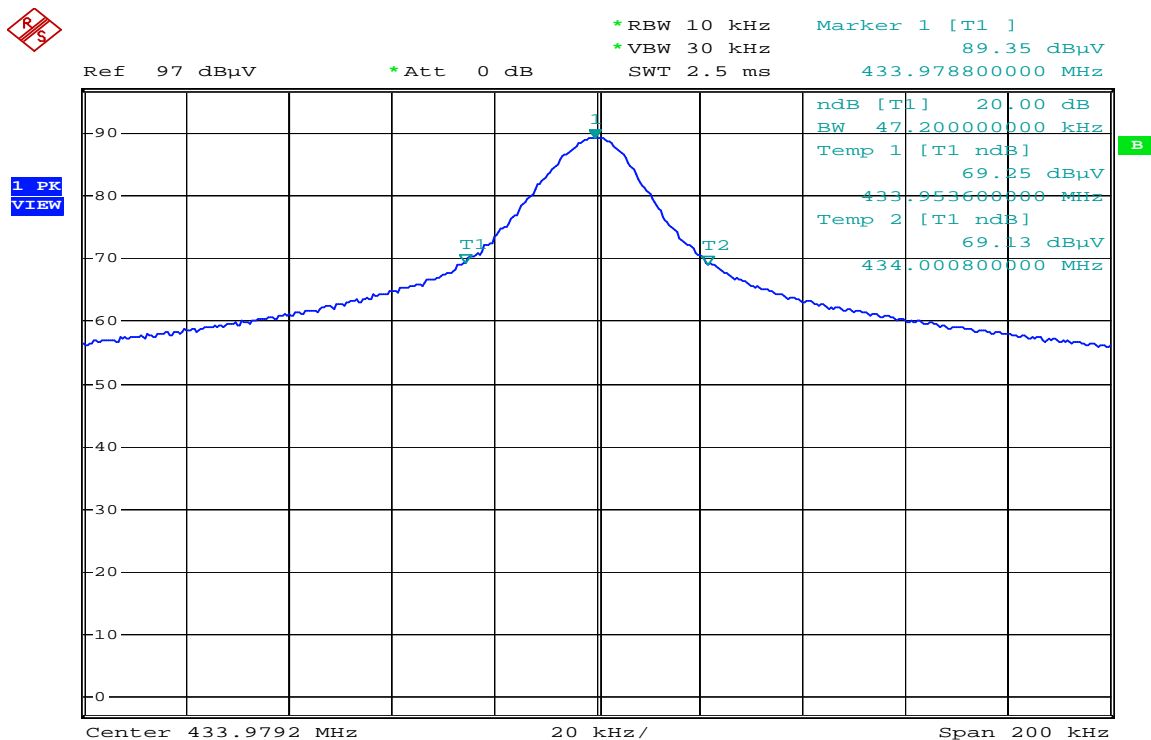
B.W (20dBc) Limit = 0.25% \* f(MHz) = 0.25% \* 433.98MHz = 1084.95kHz

### **5.2 Test Result**

**PASS.**

The final test data is shown on as following.

| Channel Frequency (MHz) | Measured 20dB Bandwidth (kHz) | Limit (kHz) |
|-------------------------|-------------------------------|-------------|
| 433.98                  | 47.2                          | 1084.95     |



Comment: 20dB Bandwidth  
 Date: 27.AUG.2008 15:26:33