

# TOSHIBA

**TOSHIBA HOKUTO ELECTRONICS CORPORATION**

MAGNETRON ENGINEERING GROUP, MAGNETRON DIVISION  
1975, 23-CHOME MINAMI 5-JODORI, ASAHIKAWA, HOKKAIDO 078-8335, JAPAN  
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Crystal Electric Co., Ltd.  
3-22-5, Higashinakamoto,  
Higashinari-ku,  
Osaka 537-0021, Japan

Report No. : 08-047  
Issued date : July 23, 2008

Re : EMI test result in your model MFM-7TP MWO with Toshiba magnetron 2M231H(IF)-C

Dear Sirs,

We are enclosing the above mentioned EMI test results based on FCC Part 18 in our measuring facility.  
Please feel free to contact us, if you have any question or request.

Sincerely yours,



Toshiki Azuma  
Manager  
Magnetron Engineering Group

AZ/sw

CC :

## EMI test report

### 1. Test site

Name : Toshiba Hokuto Electronics Corporation  
Magnetron Engineering Group, Magnetron Division  
Laboratory for EMI measurements  
Address : 1975-Banchi, 23-Chome, Minami 5-Jodori, Asahikawa 078-8335  
Japan  
FCC registration number : 741626 (Date of listing: August 10, 2007)

### 2. Specification of EUT

Manufacturer : Crystal Electric Co., Ltd.  
Equipment : Microwave oven  
Model No. : MFM-7TP  
Line voltage : 120V/60Hz  
Rating output power : 700W (IEC 60705)  
Magnetron : TOSHIBA 2M231H(IF)-C

### 3. Test specification

Test specification : FCC Part 18  
Equipment classification : Consumer ISM equipment  
Test procedure : FCC/OST MP-5

### 4. Test result

#### 4.1 Output power measurement

Test specification : IEC 60705  
Load : 1000ml Water/Center  
Results : Output power : 490W, Input power : 1090W  
Field strength limit @300m : 25μV/m FALSE Section 18.305  
Temperature, Humidity : 24°C, 55%  
Tested date : July 22, 2008  
Test engineer : Y.Sawada

#### 4.2 Radiation hazard test

Test specification : FDA (U.S. Food and Drug Administration) 21CFR 1030.10  
Load : 275ml Water / Center  
Results : Radiation leakage : 0.5W/ m<sup>2</sup> max.  
Temperature, Humidity : 24°C, 55%  
Tested date : July 22, 2008  
Test engineer : Y.Sawada

#### 4.3 Frequency measurements

Test specification : FCC Part 18  
Load : 1000ml Water/Center  
Results : See Table below  
Temperature, Humidity : 24°C, 55%  
Tested date : July 22, 2008  
Test engineer : Y.Sawada

The variation of frequency with time (Line voltage : 120V/60Hz)

| Load (ml)       | 1000 | 800  | 600  | 400  | 200  |
|-----------------|------|------|------|------|------|
| Frequency (MHz) | 2455 | 2456 | 2453 | 2469 | 2465 |

The variation of frequency for line voltage (Load : 1000ml Water/Center)

| Line voltage (V) | 96   | 108  | 120  | 132  | 150  |
|------------------|------|------|------|------|------|
| Frequency (MHz)  | 2451 | 2453 | 2452 | 2453 | 2456 |

#### 4.4 Radiated emission measurements

Test specification : FCC Part 18  
Frequency range : Above 900MHz  
Field strength limit @300m : 25µV/m, Section 18.305  
Result : Pass  
Tested date : July 22, 2008  
Test engineer : Y.Sawada  
Data of measurement results : Refer to Page 4

#### 4.5 Conducted power line measurements

Test specification : FCC Part 18  
Frequency range : 0.15MHz to 30MHz  
Conducted limit : Section 18.307  
Result : Pass  
Tested date : July 22, 2008  
Test engineer : Y.Sawada  
Data of test results : Refer to Page 5

#### 5. Description of radiated emission and conducted power line measurements

See attached "Description of radiated emission and conducted power line measurements" Page 6.

#### 6. Measuring instruments

See attached "List of measuring instruments" Page 7.

#### 7. Physical layout of anechoic chamber and shielded room

See attached "Description of radiated emission and conducted power line measurements" Page 8.

#### 8. Environmental condition of test site

See attached "Description of radiated emission and conducted power line measurements" Page 9.

#### 9. EUT arrangements

See attached "Description of radiated emission and conducted power line measurements" Page 10 and Page 11.

### Radiated emission measurements (Above 900MHz)

|                          |                              |                       |                    |
|--------------------------|------------------------------|-----------------------|--------------------|
| Manufacturer             | : Crystal Electric Co., Ltd. | Tested date           | : July 22, 2008    |
| Equipment                | : Microwave oven             | Temperature, Humidity | : 24°C, 55%        |
| Model No.                | : MFM-7TP                    | Test site             | : Anechoic chamber |
| Test specification       | : FCC Part 18                | Measurement distance  | : 3m               |
| Equipment classification | : Consumer ISM equipment     | Result                | : Pass             |
| Test procedure           | : FCC/OST MP-5               | Test engineer         | : Y.Sawada         |
| Load condition           | : FCC/OST MP-5 Section 4.1   |                       |                    |
| Line voltage             | : 120V/60Hz                  |                       |                    |
| Operation mode           | : Cooking / 700W             |                       |                    |
| Magnetron                | : TOSHIBA 2M231H(IF)-C       |                       |                    |

## Radiated emission measurements

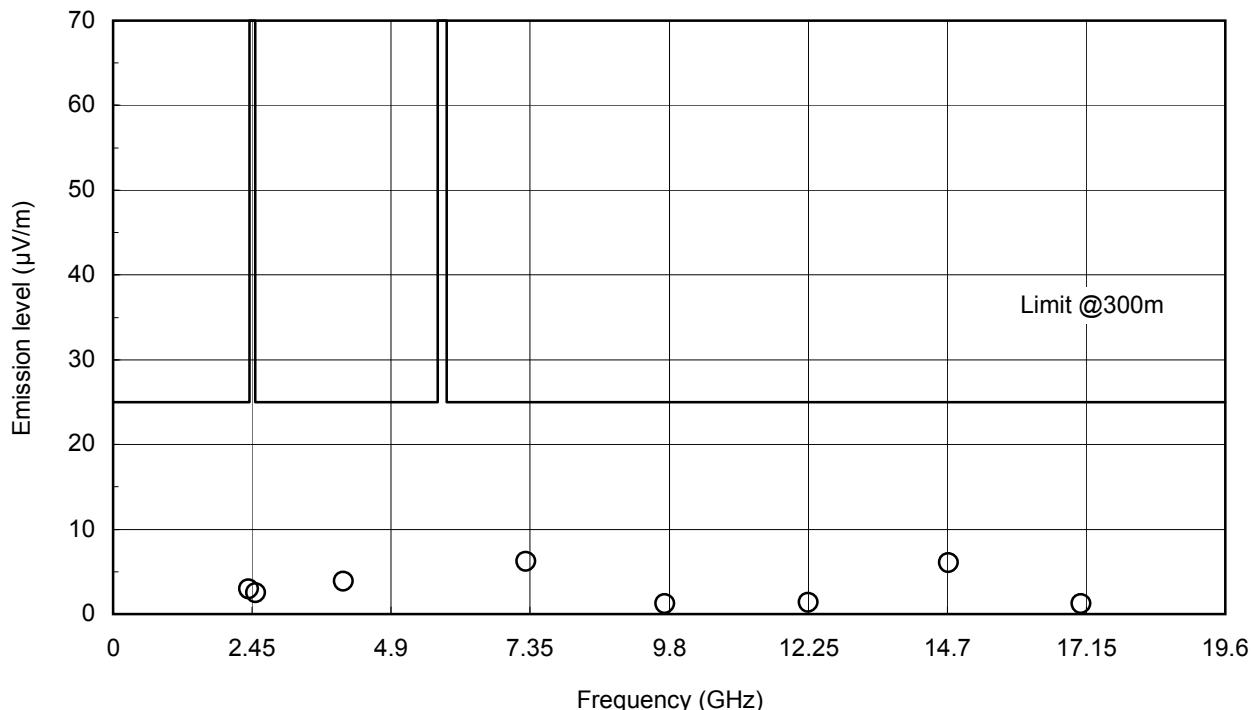
Detector type : Average, IFBW : 1MHz

H : Horizontal, V : Vertical

Result @3m (dB $\mu$ V/m) = Reading(dB $\mu$ V/m) + Ant. Factor(dB/m) + Cable Loss(dB) - Amp. Gain(dB)

Result @300m ( $\mu$ V/m) = Conversion Factor  $\times$  10  $^{\wedge}$  (Result @3m/20)

## Radiated emission measurements



### Conducted power line measurements (Frequency range : 0.15MHz to 30MHz)

|                          |  |                       |                 |
|--------------------------|--|-----------------------|-----------------|
| Manufacturer             | : Crystal Electric Co., Ltd.                 | Tested date           | : July 22, 2008 |
| Equipment                | : Microwave oven                             | Temperature, Humidity | : 25°C, 54%     |
| Model No.                | : MFM-7TP                                    | Test site             | : Shielded room |
| Test specification       | : FCC Part 18                                | Result                | : Pass          |
| Equipment classification | : Consumer ISM equipment                     | Test engineer         | : Y.Sawada      |
| Test procedure           | : FCC/OST MP-5                               |                       |                 |
| Load condition           | : 700ml/Center<br>(FCC/OST MP-5 Section 4.1) |                       |                 |
| Line voltage             | : 120V/60Hz                                  |                       |                 |
| Operation mode           | : Cooking / 700W                             |                       |                 |
| Magnetron                | : TOSHIBA 2M231H(IF)-C                       |                       |                 |

### Conducted power line measurements

Detector type : Quasi-Peak and Average, IF Bandwidth : 10kHz

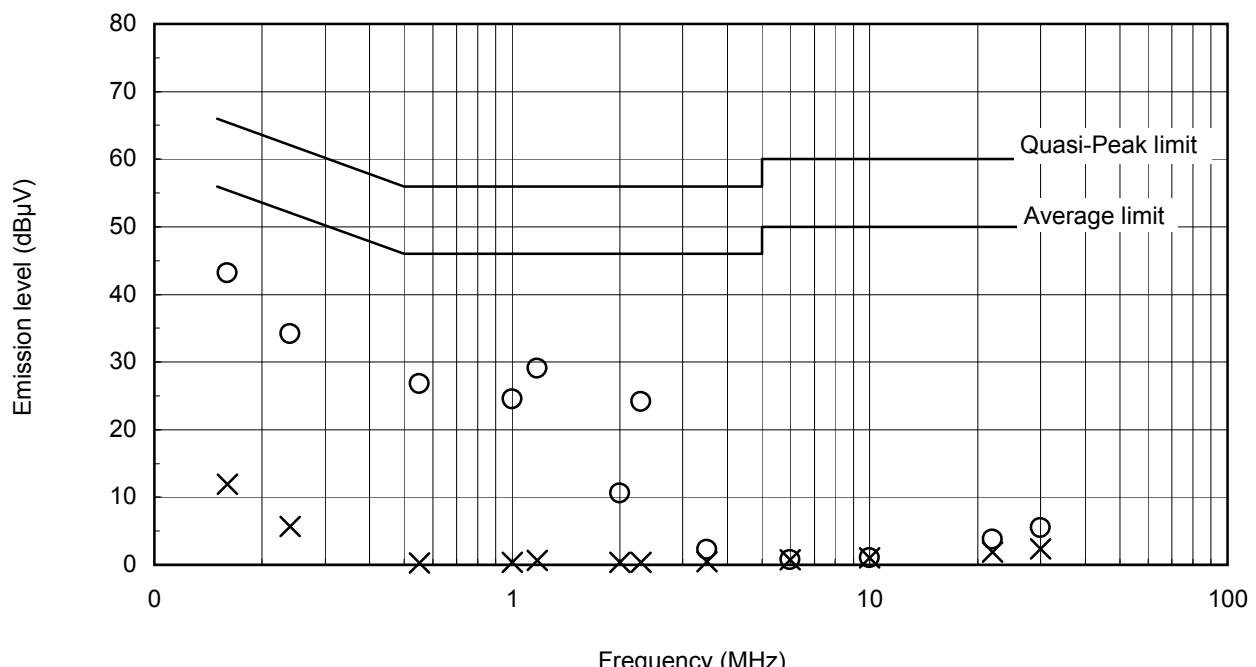
QP : Quasi-Peak, AV : Average

| No. | Frequency<br>(MHz) | Reading<br>(dB $\mu$ V) |      | LISN<br>factor<br>(dB) | Cable<br>loss<br>(dB) | Atten.<br>(dB) | Result<br>(dB $\mu$ V) |      | Limit<br>(dB $\mu$ V) |      | Margin<br>(dB) |      |
|-----|--------------------|-------------------------|------|------------------------|-----------------------|----------------|------------------------|------|-----------------------|------|----------------|------|
|     |                    | QP                      | AV   |                        |                       |                | QP                     | AV   | QP                    | AV   | QP             | AV   |
| 1   | 0.160              | 42.9                    | 11.7 | 0.1                    | 0.1                   | 0.0            | 43.1                   | 11.9 | 65.7                  | 55.7 | 22.6           | 43.8 |
| 2   | 0.240              | 34.0                    | 5.5  | 0.1                    | 0.1                   | 0.0            | 34.2                   | 5.7  | 63.4                  | 53.4 | 29.2           | 47.7 |
| 3   | 0.550              | 26.6                    | 0.1  | 0.1                    | 0.1                   | 0.0            | 26.8                   | 0.3  | 56.0                  | 46.0 | 29.2           | 45.7 |
| 4   | 1.000              | 24.3                    | 0.1  | 0.1                    | 0.1                   | 0.0            | 24.5                   | 0.3  | 56.0                  | 46.0 | 31.5           | 45.7 |
| 5   | 1.176              | 28.8                    | 0.4  | 0.1                    | 0.1                   | 0.0            | 29.0                   | 0.6  | 56.0                  | 46.0 | 27.0           | 45.4 |
| 6   | 2.000              | 10.3                    | 0.1  | 0.1                    | 0.2                   | 0.0            | 10.6                   | 0.4  | 56.0                  | 46.0 | 45.4           | 45.6 |
| 7   | 2.291              | 23.8                    | 0.1  | 0.1                    | 0.2                   | 0.0            | 24.1                   | 0.4  | 56.0                  | 46.0 | 31.9           | 45.6 |
| 8   | 3.500              | 1.9                     | 0.1  | 0.2                    | 0.2                   | 0.0            | 2.3                    | 0.5  | 56.0                  | 46.0 | 53.7           | 45.5 |
| 9   | 6.000              | 0.1                     | 0.1  | 0.3                    | 0.4                   | 0.0            | 0.7                    | 0.7  | 60.0                  | 50.0 | 59.3           | 49.3 |
| 10  | 10.000             | 0.1                     | 0.1  | 0.4                    | 0.6                   | 0.0            | 1.1                    | 1.1  | 60.0                  | 50.0 | 58.9           | 48.9 |
| 11  | 22.000             | 2.0                     | 0.1  | 0.6                    | 1.1                   | 0.0            | 3.8                    | 1.9  | 60.0                  | 50.0 | 56.2           | 48.1 |
| 12  | 30.000             | 3.2                     | 0.1  | 0.8                    | 1.5                   | 0.0            | 5.4                    | 2.3  | 60.0                  | 50.0 | 54.6           | 47.7 |
|     |                    |                         |      |                        |                       |                |                        |      |                       |      |                |      |
|     |                    |                         |      |                        |                       |                |                        |      |                       |      |                |      |
|     |                    |                         |      |                        |                       |                |                        |      |                       |      |                |      |

Result(dB $\mu$ V) = Reading(dB $\mu$ V) + LISN factor(dB) + Cable loss(dB) + Atten.(dB)

### Conducted power line measurements

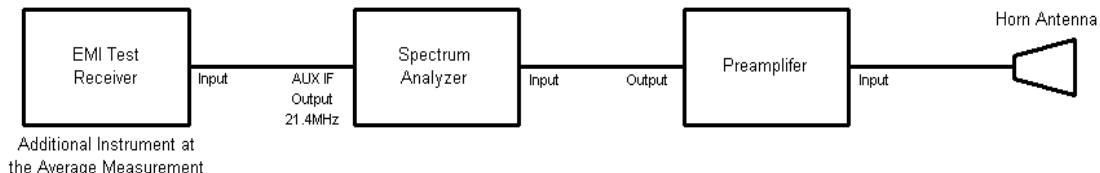
○ : Quasi-Peak, × : Average



## Description of radiated emission and conducted power line measurements

### 1 Radiated emission measurements

#### 1.1 Measurement system for radiated emission



#### 1.2 Measurement Instruments Setting

| Spectrum Analyzer | EMI Test Receiver  |
|-------------------|--------------------|
| RES BW : 3MHz     | Detector : Average |
| Video BW : 3MHz   | SCALE : Linear     |
| SPAN : 0Hz        | IF BW : 1MHz       |

#### 1.3 Calculation formula

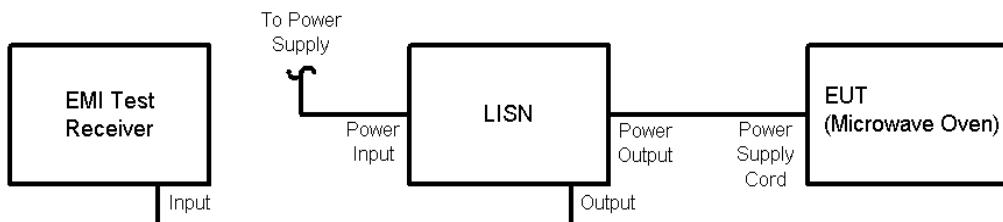
Result @3m(dB $\mu$ V/m) = Reading(dB $\mu$ V/m) + Ant. Factor(dB/m) + Cable Loss(dB) - Amp. Gain(dB)

Result @300m( $\mu$ V/m) = K × 10<sup>(Result @3m/20)</sup>

K : Conversion factor for 3m to 300m

### 2 Conducted power line measurements

#### 2.1 Measurement system for conducted power line



#### 2.2 Measurement Instruments Setting

EMI Test Receiver Setting:

| Average measurement | QP measurement        |
|---------------------|-----------------------|
| Detector : Average  | Detector : Quasi-Peak |
| SCALE : Linear      | SCALE : Linear        |
| IF BW : 10kHz       | IF BW : 10kHz         |

#### 2.3 Calculation formula

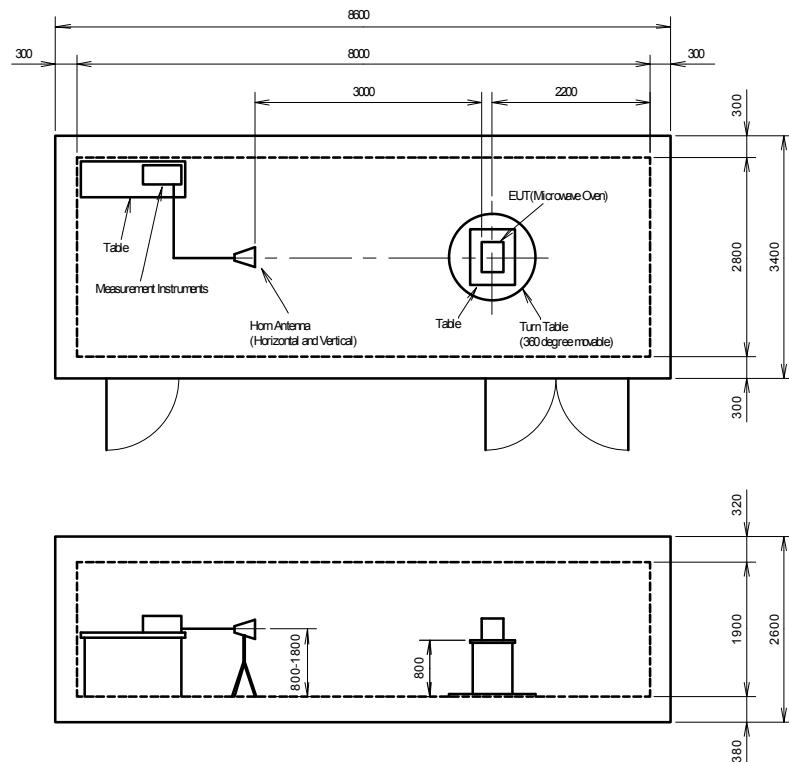
Result(dB $\mu$ V) = Reading(dB $\mu$ V) + LISN factor(dB) + Cable loss(dB)

## List of measuring instruments

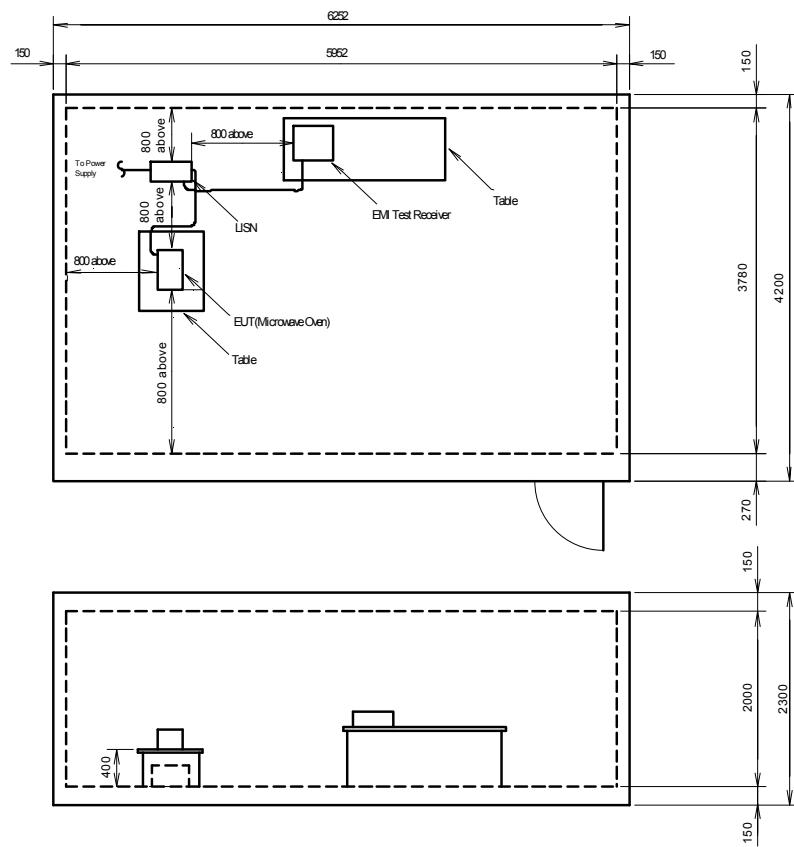
| No. | Instrument        | Model Name & Manufacturer                       | Specification   | Test Item            | Last Calibration Date/Interval | Calibration Interval |
|-----|-------------------|---|-----------------|----------------------|--------------------------------|----------------------|
| 1   | EMI Test Receiver | ESHS30<br>Ser : 828144/004<br>Rohde & Schwarz   | 9kHz to 30MHz   | Conducted Power Line | March 2008                     | Annually             |
| 2   | LISN              | KNW-242<br>Ser : 8-607-6<br>Kyoritsu Electrical | 50μH, 50ohm     | Conducted Power Line | March 2008                     | Annually             |
| 3   | Coaxial Cable     | 3D-2W<br>Fujikura                               |                 | Conducted Power Line | March 2008                     | Annually             |
| 4   | Horn Antenna      | CA-S<br>Ser : 22-1<br>Polarad                   | 2.1 to 4.34GHz  | Radiated Emission    | March 2008                     | Annually             |
| 5   | Horn Antenna      | CA-M<br>Ser : 20-15<br>Polarad                  | 4.19 to 7.74GHz | Radiated Emission    | March 2008                     | Annually             |
| 6   | Horn Antenna      | CA-X<br>Ser : 20-10<br>Polarad                  | 7.36 to 10GHz   | Radiated Emission    | March 2008                     | Annually             |
| 7   | Horn Antenna      | 5C401A<br>Ser : B176126<br>SPC Electronics      | 10 to 15GHz     | Radiated Emission    | March 2008                     | Annually             |
| 8   | Horn Antenna      | Model 4609<br>Ser : 8906<br>Narda               | 12.4 to 18GHz   | Radiated Emission    | March 2008                     | Annually             |
| 9   | Spectrum Analyzer | 8592L<br>Ser : 3624A00578<br>Hewlett Packard    | 9kHz to 22GHz   | Radiated Emission    | March 2008                     | Annually             |
| 10  | EMI Test Receiver | ESCS30<br>Ser : 100349<br>Rohde & Schwarz       | 9kHz to 2750MHz | Radiated Emission    | March 2008                     | Annually             |
| 11  | Preamplifier      | 8449B<br>3008A01826<br>Agilent                  | 1 to 26.5GHz    | Radiated Emission    | March 2008                     | Annually             |
| 12  | Coaxial Cable     | SUCOFLEX100-SF104<br>134223/4<br>Suhner         |                 | Radiated Emission    | March 2008                     | Annually             |
| 13  | Coaxial Cable     | SUCOFLEX100-SF104<br>144786/4<br>Suhner         |                 | Radiated Emission    | March 2008                     | Annually             |
| 14  | Signal Generator  | 8671B<br>Ser : 2545A00106<br>Hewlett Packard    | 2.0 to 18 GHz   | -                    | March 2008                     | Annually             |
| 15  | Frequency Counter | 85340A<br>Ser : 134A01280<br>Hewlett Packard    |                 | -                    | March 2008                     | Annually             |
| 16  | Power Meter       | 435A<br>Ser : 1312J00144<br>Hewlett Packard     | 0 to 1 mW       | -                    | March 2008                     | Annually             |
| 17  | Power Sensor      | 8481A<br>Ser : 1234A871<br>Hewlett Packard      |                 | -                    | March 2008                     | Annually             |

### Physical layout of anechoic chamber and shielded room

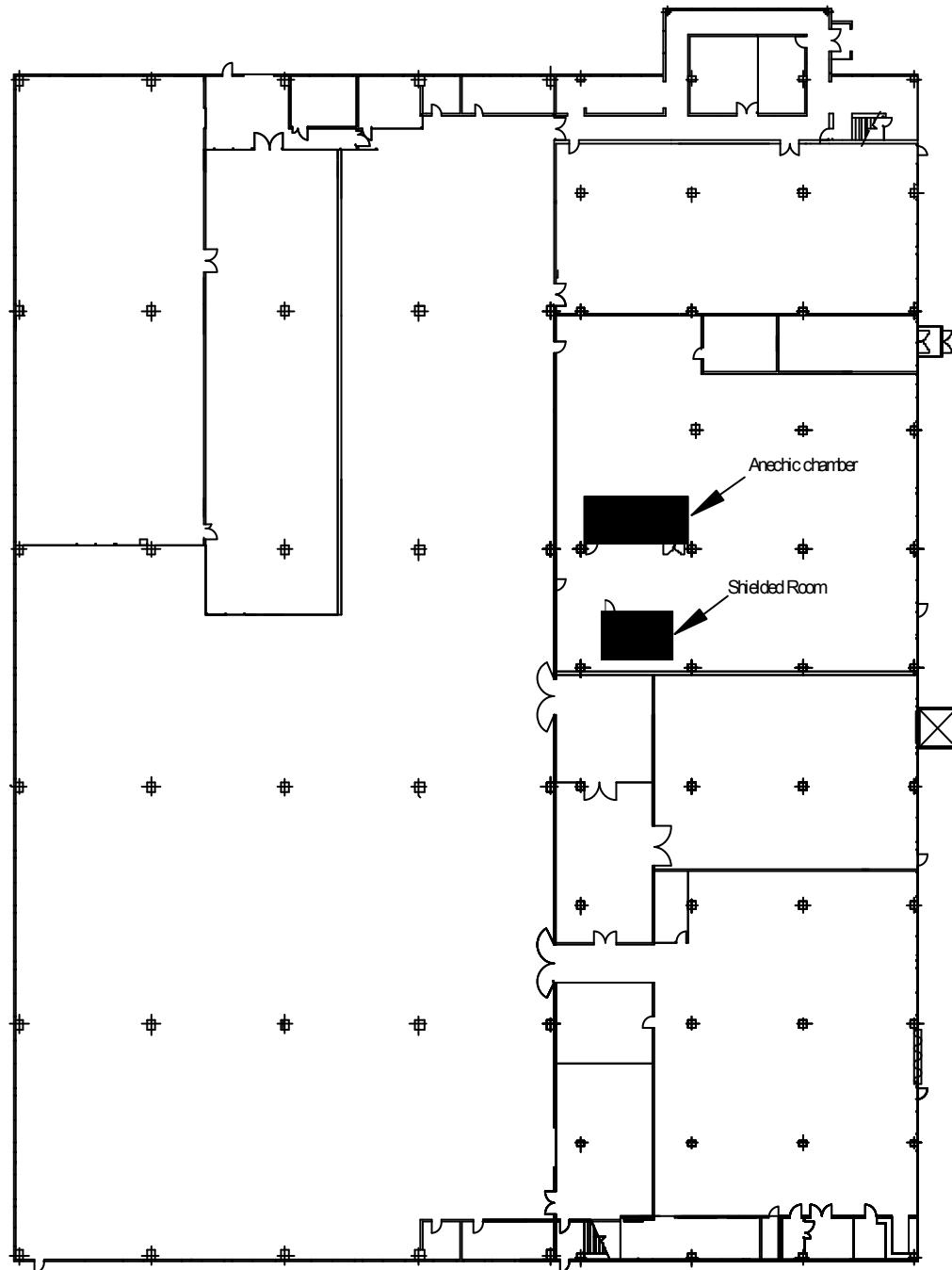
#### Anechoic chamber for radiated emission measurement



#### Shielded room for conducted power line measurement



Environmental condition of test site



EUT arrangements

Radiated emission - Front View



Radiated emission - Rear View



EUT arrangements

Conducted Emission - Front View



Conducted Emission - Side View

