

TOSHIBA

TOSHIBA HOKUTO ELECTRONICS CORPORATION
MAGNETRON ENGINEERING & QUALITY ASSURANCE GROUP, ELECTRON TUBES DIVISION
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Mr. R. Kanemitsu
Deputy General Manager
Research & Development Department
Crystal Electric Co., Ltd.
3-22-5, Higashinakamoto,
Higashinari-ku,
Osaka 537-0021, Japan

Report No. : 05-107
Issued date : September 20, 2005

Re : EMI test result in your model MFM-1NTPS MWO with Panasonic magnetron 2M211A-M2J

Dear R. Kanemitsu,

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
Group Manager
Magnetron Engineering & Quality Assurance Group
Electron Tubes Division

AZ/HR

cc :

EMI test report

1. Test site

Name : Toshiba Hokuto Electronics Corporation
 Magnetron Engineering & Quality Assurance Group, Electron Tubes 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 23, 2004)

2. Specification of EUT

Manufacturer : Crystal Electric Co., Ltd.
 Equipment : Microwave oven
 Model No. : MFM-1NTPS
 Line voltage : 120V/60Hz
 Rating output power : 600W (IEC 60705)
 Magnetron : PANASONIC 2M211A-M2J

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 : 468W, Input power : 998W
 Field strength limit @300m : 25μV/m Section 18.305
 Temperature, Humidity : 26°C, 72%
 Tested date : September 19, 2005
 Test engineer : S.Hirotani

4.2 Radiation hazard test

Test specification : FDA (U.S. Food and Drug Administration) 21CFR 1030.10
 Load : 275ml Water/Center
 Results : Radiation leakage : 0.6W/m² max.
 Temperature, Humidity : 24°C, 75%
 Tested date : September 19, 2005
 Test engineer : S.Hirotani

4.3 Frequency measurements

Test specification : FCC Part 18
 Load : 1000ml Water/Center
 Results : See Table below
 Temperature, Humidity : 24°C, 75%
 Tested date : September 19, 2005
 Test engineer : S.Hirotani

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

Load (ml)	1000	800	600	400	200
Frequency (MHz)	2470	2471	2471	2473	2474

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

Line voltage (V)	96	108	120	132	150
Frequency (MHz)	2471	2471	2470	2471	2469

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 : September 19, 2005
Test engineer : S.Hirotani
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 : September 19, 2005
Test engineer : S.Hirotani
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 10-11.

Radiated emission measurements (Above 900MHz)

Manufacturer	: Crystal Electric Co., Ltd.	Tested date	: September 19, 2005
Equipment	: Microwave oven	Temperature, Humidity	: 24°C, 75%
Model No.	: MFM-1NTPS	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	: S.Hirotani
Load condition	: FCC/OST MP-5 Section 4.1		
Line voltage	: 120V/60Hz		
Operation mode	: Cooking/600W(Max power)		
Magnetron	: PANASONIC 2M211A-M2J		

Radiated emission measurements

Detector type : Average, IFBW : 1MHz

H : Horizontal, V : Vertical

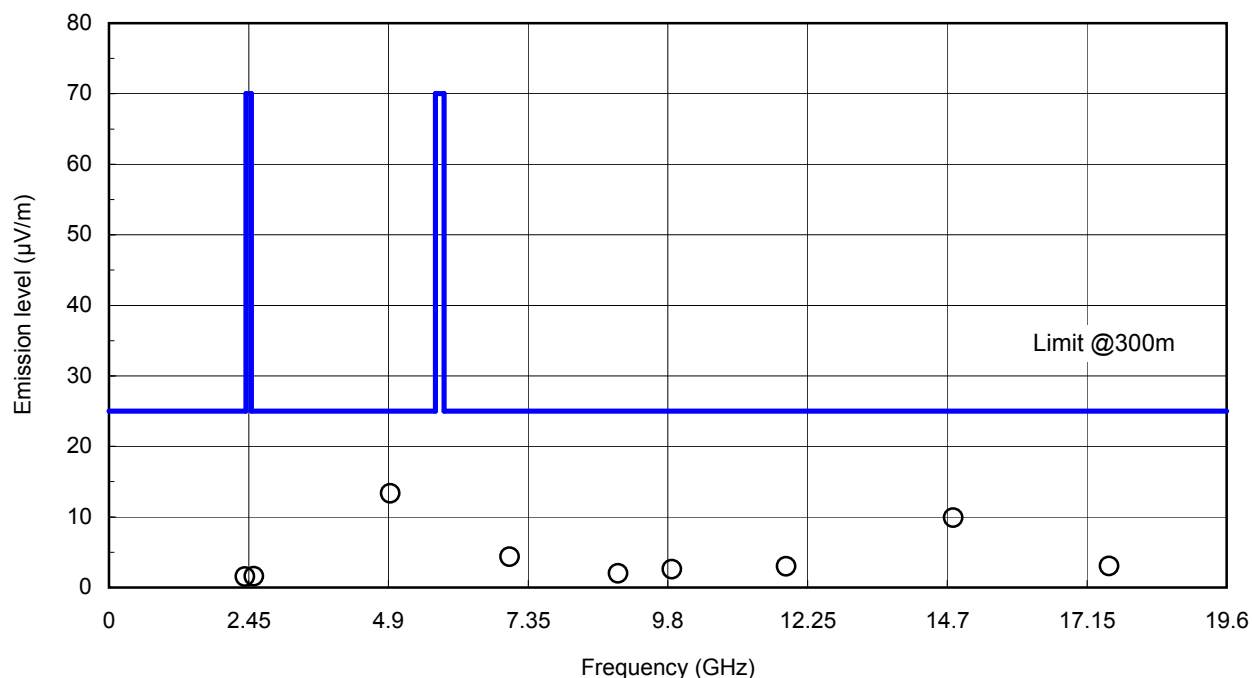
No.	Frequency (GHz)	Reading (dBμV)	Ant. polari- zation	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Gain (dB)	Conversion Factor 3m to 300m	Result @300m (μV/m)	Limit @300m (μV/m)	Margin (μV/m)	Load Water (ml)	Load Position
1	2.388	24.6	H	21.8	1.8	0.0	0.0061	1.6	25.0	23.4	700	Center
2	2.542	24.2	V	21.8	1.9	0.0	0.0065	1.6	25.0	23.4	700	Center
3	4.936	56.9	H	39.1	2.8	36.3	0.0100	13.3	25.0	11.7	300	Center
4	7.025	46.6	H	39.1	3.1	36.0	0.0100	4.4	25.0	20.6	300	Center
5	8.928	39.5	V	39.1	3.7	36.2	0.0100	2.0	25.0	23.0	700	Center
6	9.874	38.5	H	42.5	3.9	36.6	0.0100	2.6	25.0	22.4	700	Center
7	11.875	36.3	H	44.5	4.3	35.6	0.0100	3.0	25.0	22.0	700	Center
8	14.809	51.9	H	37.1	4.7	33.8	0.0100	9.9	25.0	15.1	700	Center
9	17.543	41.4	V	37.2	4.8	33.7	0.0100	3.1	25.0	21.9	700	Center

Result @3m (dBμV/m) = Reading(dBμV/m) + Ant. Factor(dB/m) + Cable Loss(dB) - Amp. Gain(dB)

Result @300m (μV/m) = Conversion Factor × 10 ^ (Result @3m/20)

*Lowest frequency : Lowest frequency generated in the device

Radiated emission measurements



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

Manufacturer	: Crystal Electric Co., Ltd.	Tested date	: September 20, 2005
Equipment	: Microwave oven	Temperature, Humidity	: 25°C, 53%
Model No.	: MFM-1NTPS	Test site	: Shielded room
Test specification	: FCC Part 18	Result	: Pass
Equipment classification	: Consumer ISM equipment	Test engineer	: S.Hirotani
Test procedure	: FCC/OST MP-5		
Load condition	: 700ml/Center (FCC/OST MP-5 Section 4.1)		
Line voltage	: 120V/60Hz		
Operation mode	: Cooking/600W(Max power)		
Magnetron	: PANASONIC 2M211A-M2J		

Conducted power line measurements

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

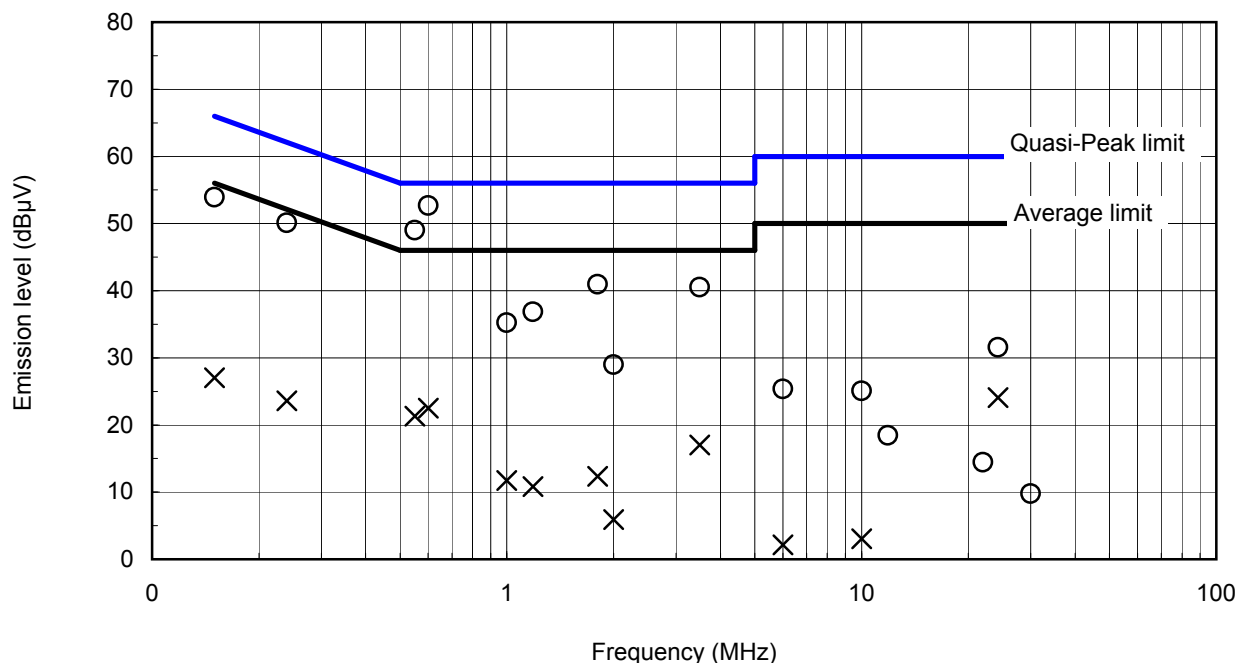
QP : Quasi-Peak, AV : Average

No.	Frequency (MHz)	Reading (dBμV)		LISN factor (dB)	Cable loss (dB)	Atten. (dB)	Result (dBμV)		Limit (dBμV)		Margin (dB)	
		QP	AV				QP	AV	QP	AV	QP	AV
1	0.150	53.7	26.8	0.1	0.1	0.0	53.9	27.0	66.0	56.0	12.1	29.0
2	0.240	49.9	23.4	0.1	0.1	0.0	50.1	23.6	63.4	53.4	13.3	29.8
3	0.550	48.8	21.1	0.1	0.1	0.0	49.0	21.3	56.0	46.0	7.0	24.7
4	0.601	52.5	22.3	0.1	0.1	0.0	52.7	22.5	56.0	46.0	3.3	23.5
5	1.000	35.0	11.5	0.1	0.1	0.0	35.2	11.7	56.0	46.0	20.8	34.3
6	1.185	36.6	10.6	0.1	0.1	0.0	36.8	10.8	56.0	46.0	19.2	35.2
7	1.802	40.7	12.1	0.1	0.1	0.0	40.9	12.3	56.0	46.0	15.1	33.7
8	2.000	28.7	5.6	0.1	0.2	0.0	29.0	5.9	56.0	46.0	27.0	40.1
9	3.500	40.1	16.6	0.2	0.2	0.0	40.5	17.0	56.0	46.0	15.5	29.0
10	6.000	24.7	1.5	0.3	0.4	0.0	25.3	2.1	60.0	50.0	34.7	47.9
11	10.000	24.1	2.1	0.4	0.6	0.0	25.1	3.1	60.0	50.0	34.9	46.9
12	11.864	17.4	-	0.4	0.6	0.0	18.4	-	60.0	-	41.6	-
13	22.000	12.7	-	0.6	1.1	0.0	14.5	-	60.0	-	45.5	-
14	24.228	29.7	22.2	0.7	1.2	0.0	31.6	24.1	60.0	50.0	28.4	25.9
15	30.000	7.5	-	0.8	1.5	0.0	9.7	-	60.0	-	50.3	-

Result(dBμV) = Reading(dBμV) + LISN factor(dB) + Cable loss(dB) + Atten.(dB)

Conducted power line measurements

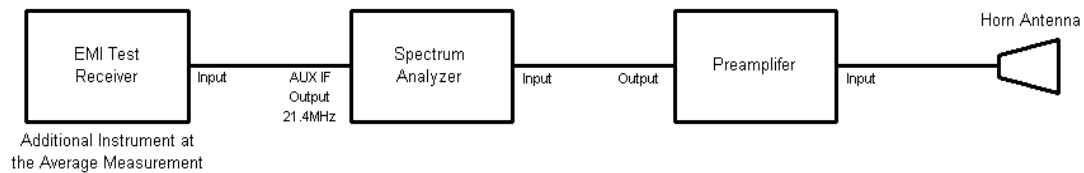
○ : Quasi-Peak, × : Average



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

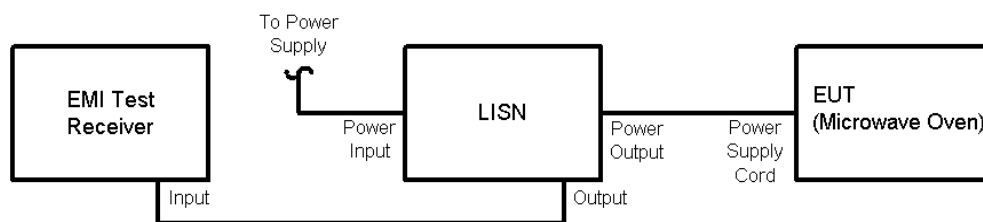
Result @3m(dBμV/m) = Reading(dBμV/m) + Ant. Factor(dB/m) + Cable Loss(dB) - Amp. Gain(dB)

Result @300m(μV/m) = $K \times 10^{(\text{Result @3m}/20)}$

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

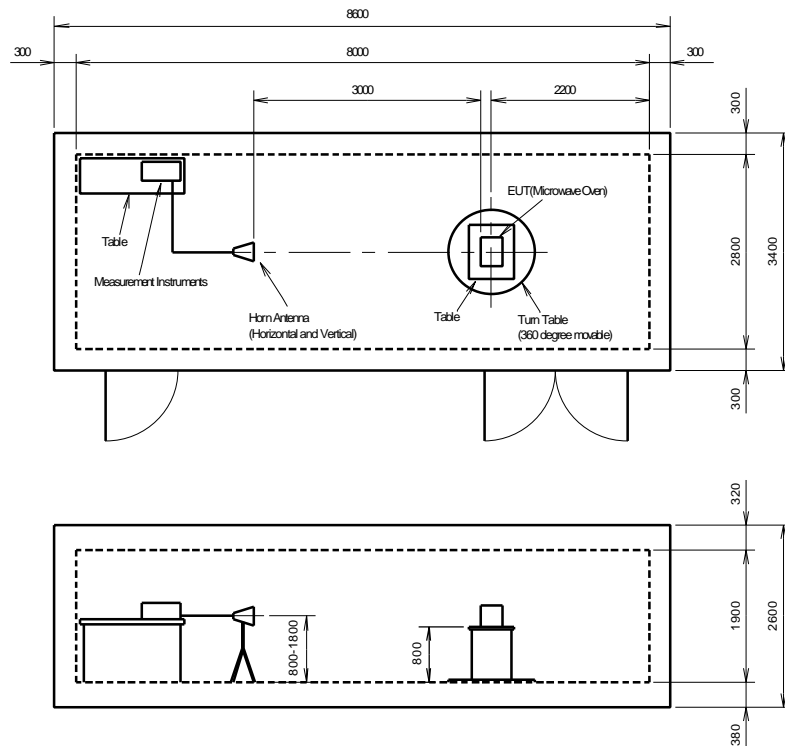
Result(dBμV) = Reading(dBμV) + LISN factor(dB) + Cable loss(dB)

List of measuring instruments

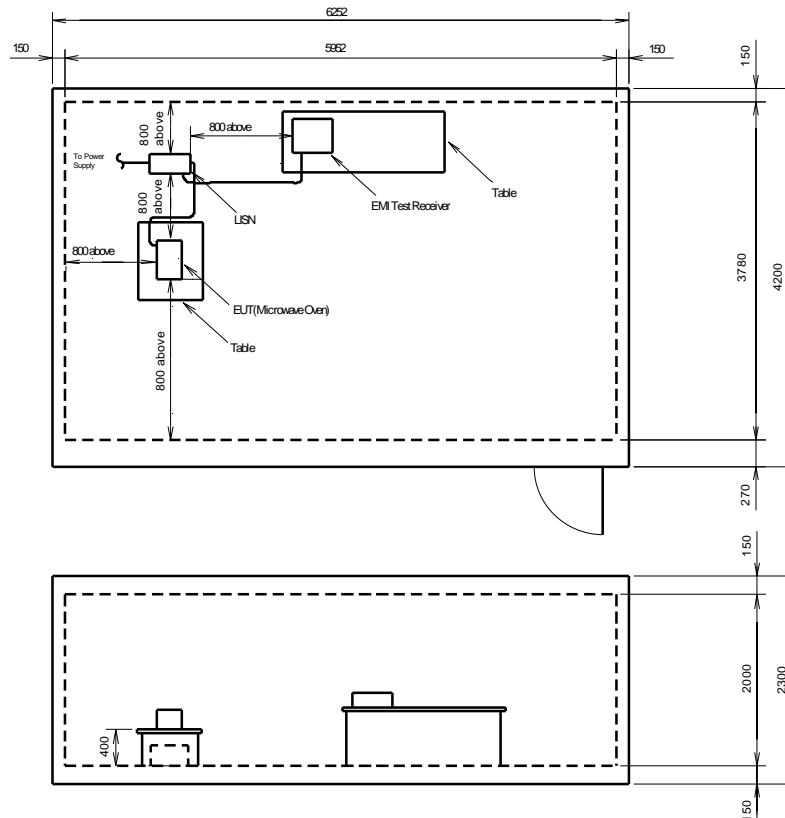
No.	Instrument	Model Name & Manufacturer	Specification	Test Item	Last Calibration Date/Interval	Calibration Interval
1	EMI Test Receiver	ESHS30 Ser : 828144/004 Rohde & Schwarz	9kHz to 30MHz	Conducted Power Line	March 2005	Annually
2	LISN	KNW-242 Ser : 8-607-6 Kyoritsu Electrical	50μH, 50ohm	Conducted Power Line	March 2005	Annually
3	Coaxial Cable	3D-2W Fujikura		Conducted Power Line	March 2005	Annually
4	Horn Antenna	CA-S Ser : 22-1 Polarad	2.1 to 4.34GHz	Radiated Emission	March 2005	Annually
5	Horn Antenna	CA-M Ser : 20-15 Polarad	4.19 to 7.74GHz	Radiated Emission	March 2005	Annually
6	Horn Antenna	CA-X Ser : 20-10 Polarad	7.36 to 10GHz	Radiated Emission	March 2005	Annually
7	Horn Antenna	5C401A Ser : B176126 SPC Electronics	10 to 15GHz	Radiated Emission	March 2005	Annually
8	Horn Antenna	Model 4609 Ser : 8906 Narda	12.4 to 18GHz	Radiated Emission	March 2005	Annually
9	Spectrum Analyzer	8592L Ser : 3624A00578 Hewlett Packard	9kHz to 22GHz	Radiated Emission	March 2005	Annually
10	EMI Test Receiver	ESCS30 Ser : 100349 Rohde & Schwarz	9kHz to 2750MHz	Radiated Emission	March 2005	Annually
11	Preamplifier	8449B 3008A01826 Agilent	1 to 26.5GHz	Radiated Emission	March 2005	Annually
12	Coaxial Cable	SUCOFLEX100-SF104 134223/4 Suhner		Radiated Emission	March 2005	Annually
13	Coaxial Cable	SUCOFLEX100-SF104 144786/4 Suhner		Radiated Emission	March 2005	Annually
14	Signal Generator	8671B Ser : 2545A00106 Hewlett Packard	2.0 to 18 GHz	-	March 2005	Annually
15	Frequency Counter	85340A Ser : 134A01280 Hewlett Packard		-	March 2005	Annually
16	Power Meter	435A Ser : 1312J00144 Hewlett Packard	0 to 1 mW	-	March 2005	Annually
17	Power Sensor	8481A Ser : 1234A871 Hewlett Packard		-	March 2005	Annually

Physical layout of anechoic chamber and shielded room

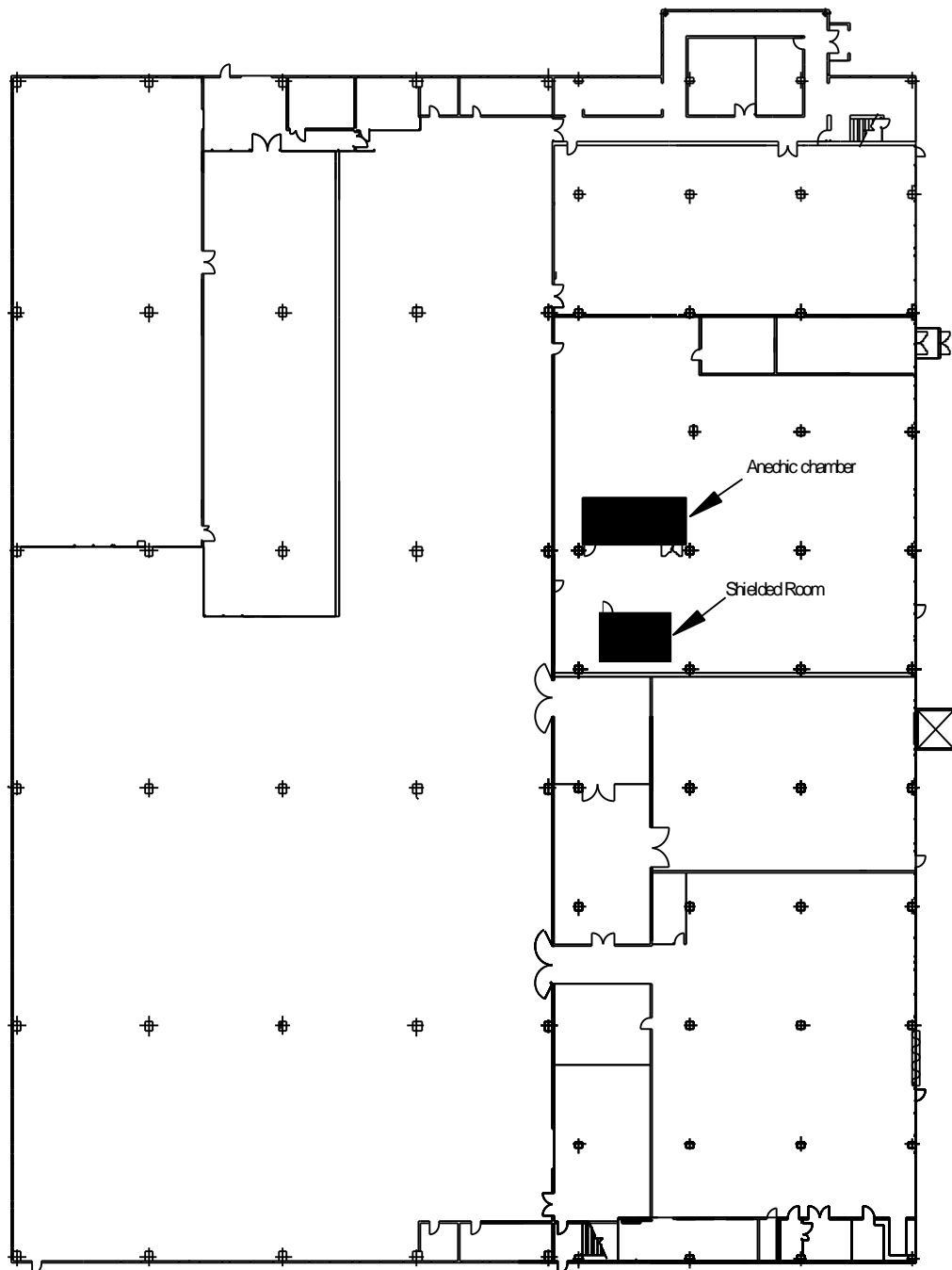
Anechoic chamber for radiated emission measurement



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

