EMC
TEST REPORT

Report No.: **EME-070137**
Model No.: **MD20**
Issued Date: **Mar. 05, 2007**

Applicant: **CTC Union Technologies Co., Ltd.**
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Test By: **Intertek Testing Services Taiwan Ltd.**
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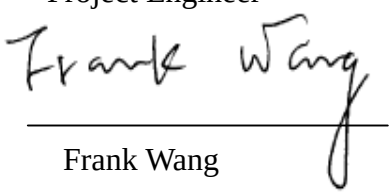
Project Engineer



Frank Wang

Reviewed By

Kevin Chen

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1. General Information

1.1 Identification of the EUT

Product:	Mini DSLAM
Model No.:	MD20
Applicant:	CTC Union Technologies Co., Ltd.
Rated Power:	DC 48V
Power Cord:	2C×2.0 meter unshielded cable
Data Cable:	1. RJ-45 UTP Cat.5 10meter ㄨ 2 2. RJ-45 STP Cat.5 3meter ㄨ 3 3. MDF cable IDC50F AWG26 50C 5meter ㄨ 10
Sample receiving date:	Nov. 24, 2005
Testing date:	May 11, 2006 ~ May 26, 2006

1.2 Additional information about the EUT

The EUT is a Mini DSLAM, and was defined as information technology equipment.

All the modules are listed below:

Card Type	P/N	DESCRIPTION
IM8AC	F2CU-IM8A-0001C	R3 8E1 IMA UNIT GTLP HE500
ST1AC	F2CU-ST1A-0001B	R3 STM1 UNIT GTLP HE500
GE1AC	F2CU-GE1A-0001C	R3 GBE UNIT GTLP WIN747
AL5EC	F2CU-AL5E-0001D	ADSL 24L ETSI 270 SPLTR ANX-A
AL5AC	F2CU-AL5A-0001D	ADSL 24L ANSI 600 SPLTR ANX-A
AL5BC	F2CU-AL5B-0001D	ADSL 24L ISDN SPLTR ANX-B
SL6AC	F2CU-SL6A-0001C	SHDSL 24L W/O WETTING CURRENT ANX-A/B
	F2CU-MA1A-0000C	R3 MECH ASSY UNIT 2U
	F2CU-FA1A-C200A	R3 FAN ASSY UNIT 2U
	F2CU-DP1A-0000D	R3 DC PWR UNIT 2U

For more detail features, please refer to user's Manual.

1.3 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.
Notebook PC	IBM	1860	L3WM776
Notebook PC	HP	HSTNN-I04C	CNU5240X14
CPE	XVAi Tech	X8121r	A811A4003373
CPE	Tailyn	GS-R250S	G32RG3-017290
CPE	ADC	MM701G2	047016982

2. Test Summary

Emission			
Standard	**Test Type**	**Result**	**Remarks**
EN 55022: 1998 +A1: 2000+A2: 2003 Class A	ISN Test	PASS	Pass by -0.67 dB at 0.840 MHz With GE1AC port GBE1 Port 1G
	Radiated Test	PASS	Pass by –0.90 dB at 200.000 MHz With antenna polarization Vertical

Immunity (EN 55024: 1998+A1: 2001+A2: 2003)				
Standard	**Test Type**	**Result**	**Performance Criteria**	**Test Judgment**
IEC 61000-4-2: 1995+A1: 1998+ A2: 2000	ESD test	PASS	Criterion B	Meets the requirements of Performance Criterion B
IEC 61000-4-3: 2002	RS test	PASS	Criterion A	Meets the requirements of Performance Criterion A
IEC 61000-4-4: 2004	EFT test	PASS	Criterion B	Meets the requirements of Performance Criterion B
IEC 61000-4-5: 2001	Surge test	PASS	Criterion B	Meets the requirements of Performance Criterion A
IEC 61000-4-6: 2003	CS test	PASS	Criterion A	Meets the requirements of Performance Criterion A

Remark:

The EUT has been tested/evaluated and pass the above standards without modification.

3. Test Specifications

3.1 Standards

EN 55022: 1998+A1: 2000+A2: 2003 Electromagnetic compatibility - requirements for radio disturbance characteristics of information technology equipment.

EN 61000-3-2: 2000 Electromagnetic compatibility — Part 3. Limits. Section 2. Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

EN 61000-3-3: 1995+A1: 2001 Electromagnetic compatibility — Part 3. Limits. Section 3. Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16 A

EN 55024: 1998+A1: 2001+A2: 2003 Information technology equipment — Immunity characteristics Limits and methods of measurement.

3.2 Mode of operation during the test

The EUT was supplied with DC 48V and was tested in normal operating mode.

EUT Operation Condition
1. Power on all equipment
2. Run testing program on two Notebook PCs
3. Traffic cable length: (1) RJ-45 UTP Cat.5 10meter × 2
(2) RJ-45 STP Cat.5 3meter × 3
(3) MDF cable IDC50F AWG26 50C 5meter × 10

There are three testing configurations listed below:

(1) Configuration 1: R3.1 W/ GE1AC
(2) Configuration 2: R3.0 W/ IM8AC
(3) Configuration 3: R3.0 W/ ST1AC

Intertek found configurations 1 was the worst case.

The following test items were exempted based on engineering judgments.

EN 55022 Conducted Emission
EN 61000-3-2 Harmonic test
EN 61000-3-3 Flicker test
IEC 61000-4-11 Dip test

Since the EUT is not connected to AC source, directly the tests are not applicable for it.

IEC 61000-4-8 Magnetic field immunity test:
The equipment does not contain components susceptible to magnetic fields, therefore, the test can be waived.

3.3 Classification of ITE

ITE is subdivided into two categories denoted class A ITE and class B ITE.

Class B ITE

Class B ITE is a category of apparatus which satisfies the class B ITE disturbance limits.

Class B ITE is intended primarily for use in the domestic environment and may include:

— equipment with no fixed place of use; for example, portable equipment powered by built-in batteries;

— telecommunication terminal equipment powered by a telecommunication network;

— personal computers and auxiliary connected equipment.

NOTE: The domestic environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10 m of the apparatus concerned.

Class A ITE

Class A ITE is a category of all other ITE which satisfies the class A ITE limits but not the class B ITE limits. Such equipment should not be restricted in its sale but the following warning shall be included in the instructions for use:

WARNING
This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

3.4 Performance criteria

The performance criteria listed below are based on those regulated in the standard, specified by the manufacturer or derived from the product specification.

Criteria A:
During the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below performance level specified by manufacturer.

Criteria B:
Loss of function is allowed, provided the function self-recoverable or restored by the operation of the controls by the user in accordance with manufacturers instructions or after the test the equipment shall continue to operate as intended. Degradation of performance or loss of function is allowed after the application of the phenomena below a performance level specified by the manufacturer. During the test, degradation of performance is allowed. However, no change of actual operating state or stored data is allowed.

Criteria C:
Temporary degradation or loss of function or performance that requires operator Intervention or system reset.

3.5 Performance verification

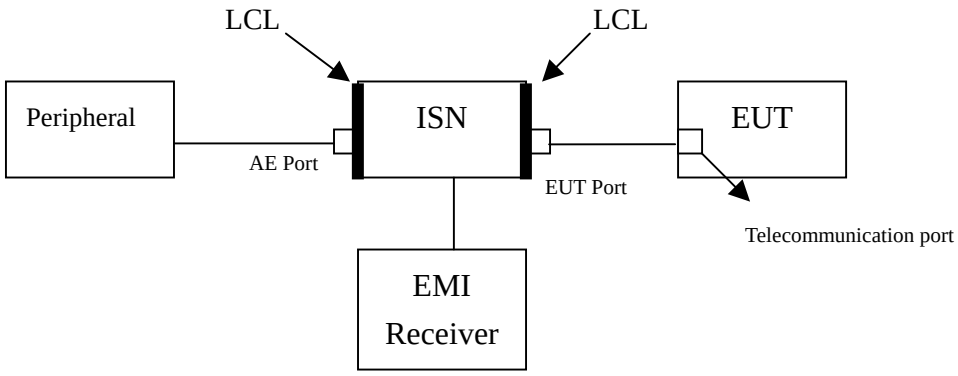
The EUT has been monitored based on manufacturer’s specification; the performance fulfilled the requirements of standard.

4.2 Telecommunication Port Emission Test

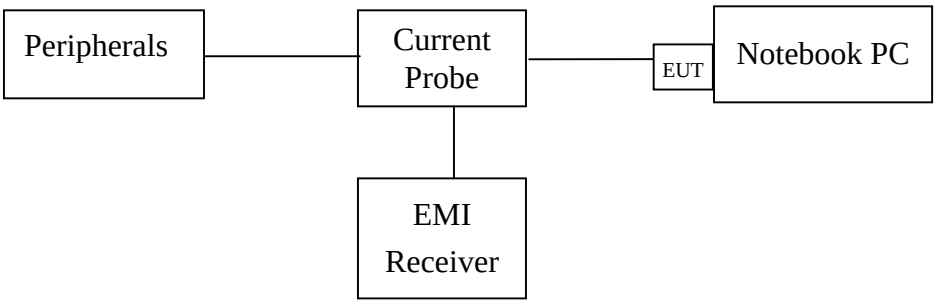
4.2.1 Operating Environment

Temperature:	23 ℃	Atmospheric Pressure:	1023 hPa
Relative Humidity:	53 %	Test Voltage:	DC 48V

4.2.2 Test Procedure



The EUT along with its peripherals were placed on a wooden table, 1.0m(W)×1.5m(L) and 0.8m in height and the EUT was adjusted to maintain a 0.4meter space from a vertical reference plane. Connect the telecommunication port of the EUT to ISN, and the AE port of ISN to the peripherals. The receiver shows the reading from ISN.



The EUT along with its peripherals were placed on a wooden table, 1.0m(W)×1.5m(L) and 0.8m in height and the EUT was adjusted to maintain a 0.4meter space from a vertical reference plane.

The distance between the EUT and Current Probe is 10cm, and RJ-45 UTP Cat.5 Cable has pass through the Current Probe and connect to EMI receiver to record the maximum emission.

4.2.3 Test Equipment

Equipment	Brand	Model No.	Intertek ID No.	Next Cal. Date
EMI Receiver	Rohde & Schwarz	ESCS 30	EC318	06/16/2006
AMN	Rohde & Schwarz	ESH3-Z5	EC320	01/09/2007
2x2 Wire ISN	Rohde & Schwarz	ENY22	EC340	04/26/2007
Four Wire ISN	Rohde & Schwarz	ENY41	EC341	04/26/2007
EMI Current Probe	SCHAFFNER	041038	EC401	05/17/2006

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

4.2.4 Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports

Freq. (MHz)	Voltage limits (dB μ V)			
	Class A (dB μ V)		Class B (dB μ V)	
	Q.P.	Avg.	Q.P.	Avg.
0.15~0.50	97 to 87	84 to 74	84 to 74	74 to 64
0.50~30.0	87	74	74	64

Freq. (MHz)	Current limits (dB μ A)			
	Class A (dB μ A)		Class B (dB μ A)	
	Q.P.	Avg.	Q.P.	Avg.
0.15~0.50	53 to 43	40 to 30	40 to 30	30 to 20
0.50~30.0	43	30	30	20

4.2.5 Uncertainty of Conducted Emission

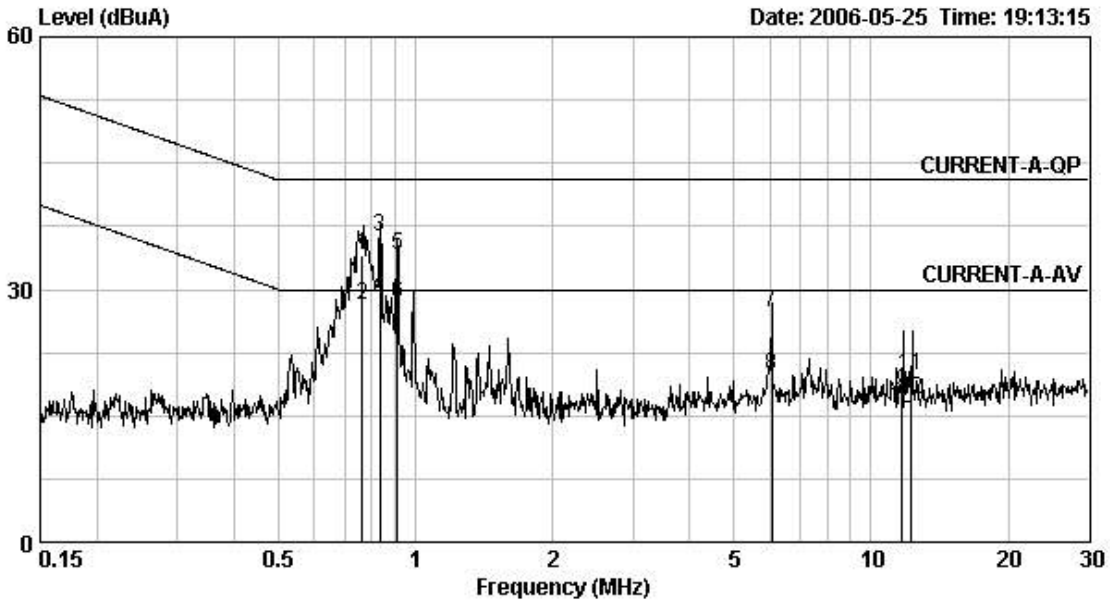
Expanded uncertainty (k=2) of conducted emission measurement is 2.6 dB.

4.2.6 Telecommunication Port Emission Data

Model No.: MD20
Test Mode: GE1AC/GBE1 port 1Gbps

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Remark
MHz		dB	dBuA	dBuA	dBuA	dB	
0.76		36.00	-1.92	34.08	43.00	-8.92	QP
0.76		36.00	-7.90	28.10	30.00	-1.90	AVERAGE
0.84		36.00	0.16	36.16	43.00	-6.84	QP
0.84		36.00	-6.67	29.33	30.00	-0.67	AVERAGE
0.91		36.00	-1.92	34.08	43.00	-8.92	QP
0.91		36.00	-7.66	28.34	30.00	-1.66	AVERAGE
6.04		36.04	-8.82	27.22	43.00	-15.78	QP
6.04		36.04	-16.24	19.80	30.00	-10.20	AVERAGE
11.71		36.06	-18.36	17.70	43.00	-25.30	QP
11.71		36.06	-20.33	15.73	30.00	-14.27	AVERAGE
12.29		36.06	-16.29	19.77	43.00	-23.23	QP
12.29		36.06	-19.14	16.92	30.00	-13.08	AVERAGE

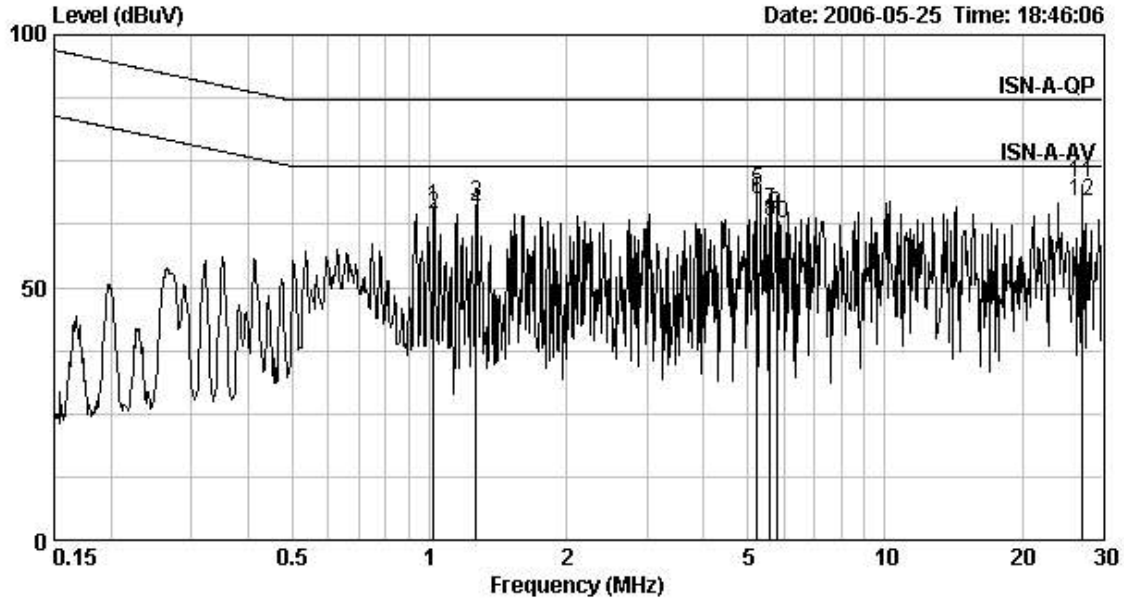
Remark:
1. Correction Factor (dB)= Probe Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuA) – Limit (dBuA)



Model No.: MD20
Test Mode: GE1AC/GBE1 port 100Mbps
LCL Type: Type II , 60dB

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Remark
MHz		dB	dBuV	dBuV	dBuV	dB	
1.02		10.20	55.70	65.90	87.00	-21.10	QP
1.02		10.20	54.42	64.62	74.00	-9.38	AVERAGE
1.27		10.20	56.42	66.62	87.00	-20.38	QP
1.27		10.20	54.98	65.18	74.00	-8.82	AVERAGE
5.23		10.14	59.10	69.24	87.00	-17.76	QP
5.23		10.14	57.34	67.48	74.00	-6.52	AVERAGE
5.60		10.15	54.90	65.05	87.00	-21.95	QP
5.60		10.15	52.89	63.04	74.00	-10.96	AVERAGE
5.78		10.15	54.46	64.61	87.00	-22.39	QP
5.78		10.15	52.45	62.60	74.00	-11.40	AVERAGE
27.16		10.42	60.15	70.57	87.00	-16.43	QP
27.16		10.42	56.53	66.95	74.00	-7.05	AVERAGE

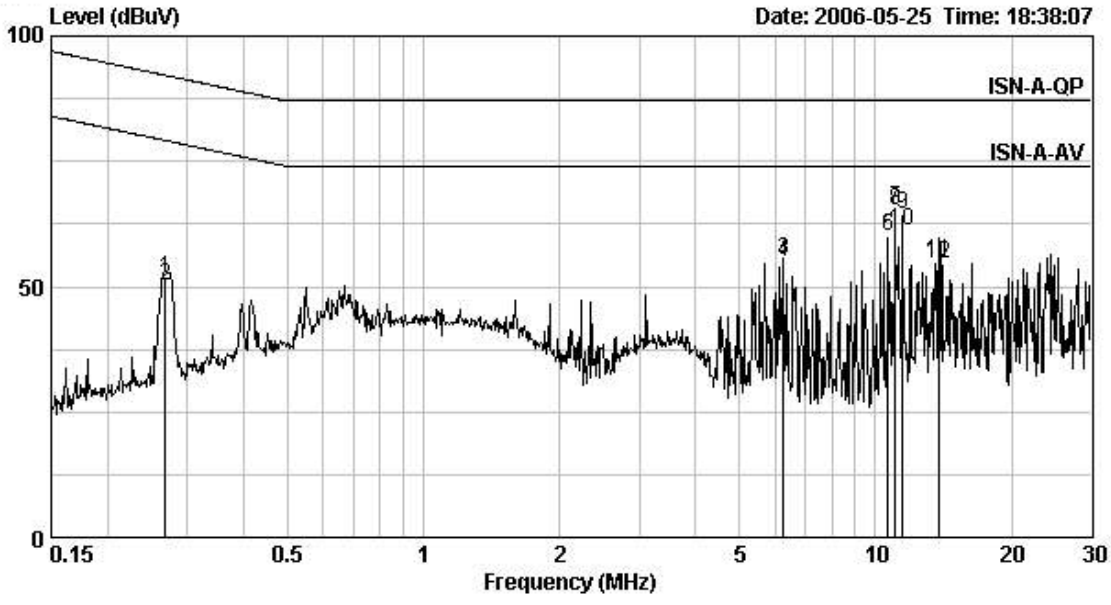
Remark:
1. Correction Factor (dB)= AMN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Model No.: MD20
Test Mode: GE1AC/GBE1 port 10Mbps
LCL Type: Type II, 60dB

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Remark
MHz		dB	dBuV	dBuV	dBuV	dB	
0.27		10.35	41.29	51.64	92.19	-40.55	QP
0.27		10.35	39.66	50.01	79.19	-29.18	AVERAGE
6.25		10.17	45.17	55.34	87.00	-31.66	QP
6.25		10.17	44.94	55.11	74.00	-18.89	AVERAGE
10.64		10.25	49.80	60.05	87.00	-26.95	QP
10.64		10.25	49.68	59.93	74.00	-14.07	AVERAGE
11.09		10.26	55.42	65.68	87.00	-21.32	QP
11.09		10.26	55.07	65.33	74.00	-8.67	AVERAGE
11.49		10.26	54.11	64.37	87.00	-22.63	QP
11.49		10.26	50.76	61.02	74.00	-12.98	AVERAGE
13.76		10.27	44.76	55.03	87.00	-31.97	QP
13.76		10.27	44.21	54.48	74.00	-19.52	AVERAGE

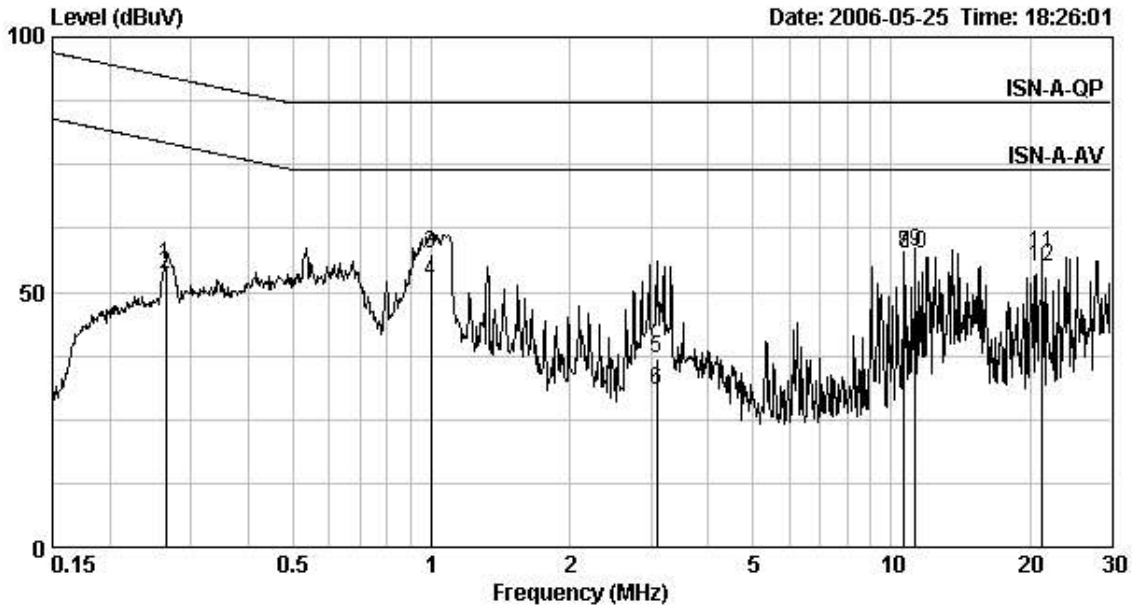
Remark:
1. Correction Factor (dB)= AMN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Model No.: MD20
Test Mode: AL5EB DSL port
LCL Type: Type V, 80dB

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Remark
MHz		dB	dBuV	dBuV	dBuV	dB	
0.27		10.35	44.98	55.33	92.27	-36.94	QP
0.27		10.35	43.28	53.63	79.27	-25.64	AVERAGE
1.00		10.20	47.16	57.36	87.00	-29.64	QP
1.00		10.20	41.98	52.18	74.00	-21.82	AVERAGE
3.08		10.17	26.76	36.93	87.00	-50.07	QP
3.08		10.17	20.67	30.84	74.00	-43.16	AVERAGE
10.64		10.25	47.37	57.62	87.00	-29.38	QP
10.64		10.25	47.27	57.52	74.00	-16.48	AVERAGE
11.26		10.26	47.67	57.93	87.00	-29.07	QP
11.26		10.26	47.23	57.49	74.00	-16.51	AVERAGE
21.24		10.31	47.35	57.66	87.00	-29.34	QP
21.24		10.31	44.45	54.76	74.00	-19.24	AVERAGE

Remark:
1. Correction Factor (dB)= AMN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

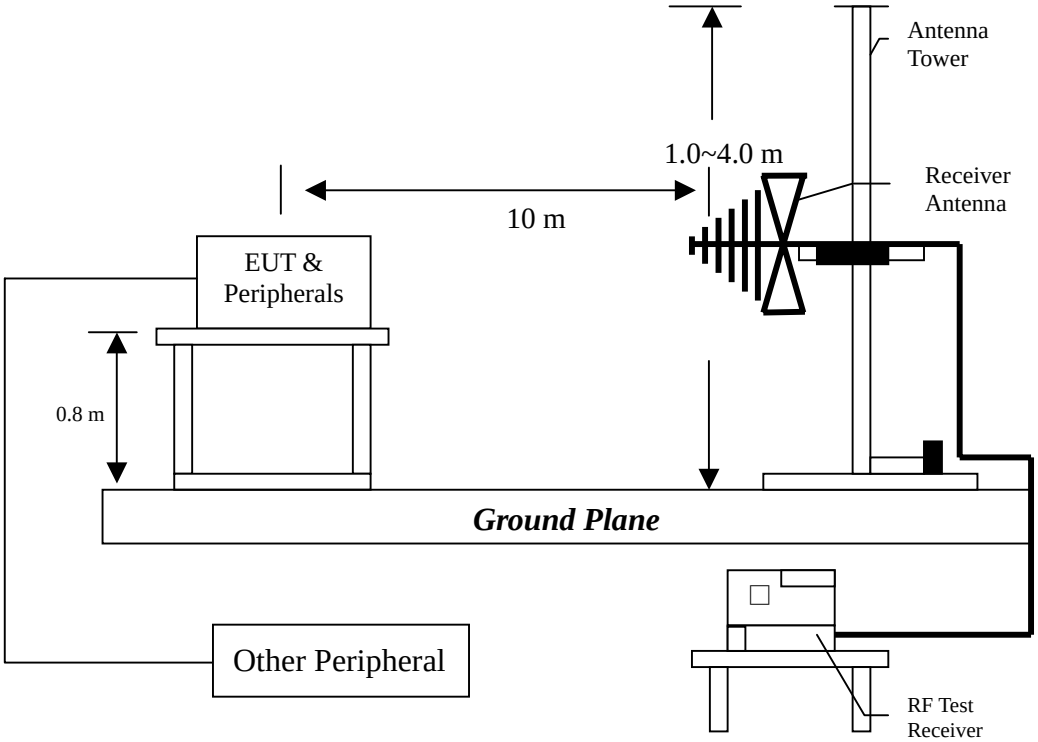


4. EN 55022 Radiated Emission Test

4.1 Operating Environment

Temperature:	25 ℃	Atmospheric Pressure:	1023 hPa
Relative Humidity:	50 %	Test Voltage:	DC 48V

4.2 Test Procedure



Radiated testing was performed at a 10 meters open area test site. The equipment under test were placed on a turntable top 0.8 m above ground. The table was 360 degrees to determine the position of the highest radiation. EUT is set 10 meters from the EMI receiving antenna, which is mounted on a variable height mast. The antenna height is varied between one meter and four meters above ground to find the maximum value of the field strength. Both horizontal polarization and vertical polarization of the antenna was set to conduct the measurement.
The bandwidth was set on the EMI meter 120 kHz.
The levels are quasi peak value readings. The frequency spectrum from 30 MHz to 1000 MHz was investigated.

4.3 Test Equipment

Equipment	Brand	Model No.	Intertek ID No.	Next Cat. Date
EMI Receiver	Rohde & Schwarz	ESCS 30	EC318	06/16/2006
EMI Spectrum	Rohde & Schwarz	ESMI	EC317	08/07/2006
Turn Table	Electro-Metrics	EM4710	EP306	N/A
Bilog Antenna	Schaffner	CBL611213	EC366	02/06/2007
Ferrite Clamp	Rohde & Schwarz	EZ-24	N/A	N/A

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

4.4 Radiated Emission Limit

Frequency (MHz)	Distance(m)	Class A(dB μ V/m)	Class B(dB μ V/m)
30~230	10	40	30
230~1000	10	47	37

Note:
1. The tighter limit shall apply at the edge between two frequency bands.
2. Distance refers to the distance in meters between the EUT to antenna.

4.5 Uncertainty of Radiated Emission

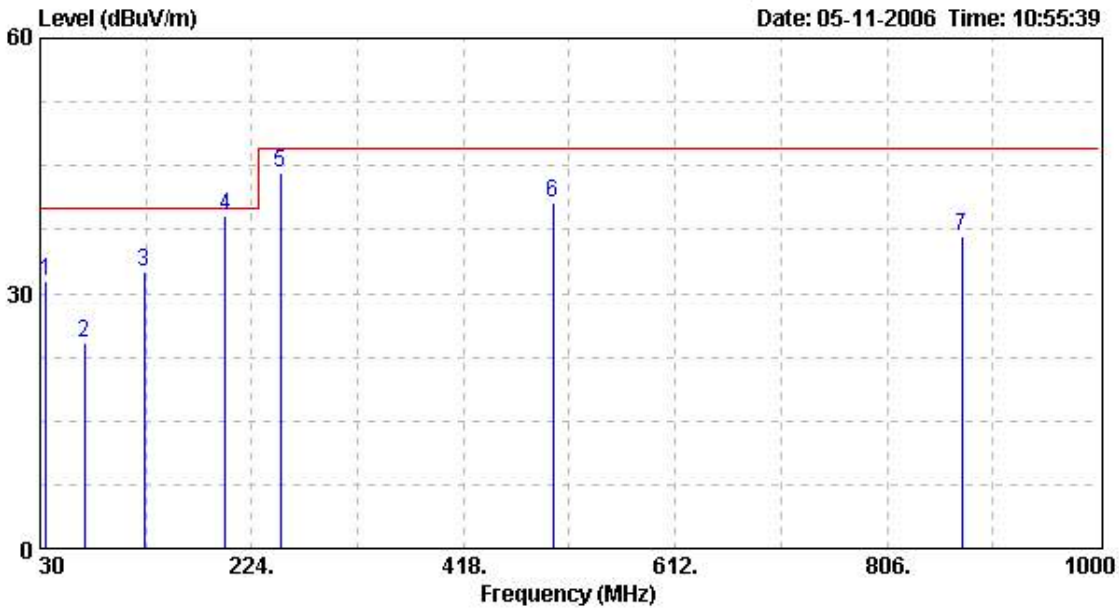
Expanded uncertainty (k=2) of radiated emission measurement is 3.58 dB.

4.6 Radiated Emission Test Data

Polarity: Vertical
Model No.: MD20
Worst Case: Configuration 1

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Ant Pos	Table Pos	Remark
MHz		dB	dBuV	dBuV/m	dBuV/m	dB	cm	deg	
35.3	VERTICAL	18.50	13.00	31.50	40.00	-8.50	100	360	QP
70.7	VERTICAL	8.12	16.00	24.12	40.00	-15.88	100	81	QP
125.0	VERTICAL	14.48	18.00	32.48	40.00	-7.52	100	360	QP
200.0	VERTICAL	12.10	27.00	39.10	40.00	-0.90	100	160	QP
250.0	VERTICAL	15.70	28.50	44.20	47.00	-2.80	100	266	QP
500.0	VERTICAL	22.15	18.40	40.55	47.00	-6.45	100	190	QP
875.0	VERTICAL	27.00	9.80	36.80	47.00	-10.20	201	256	QP

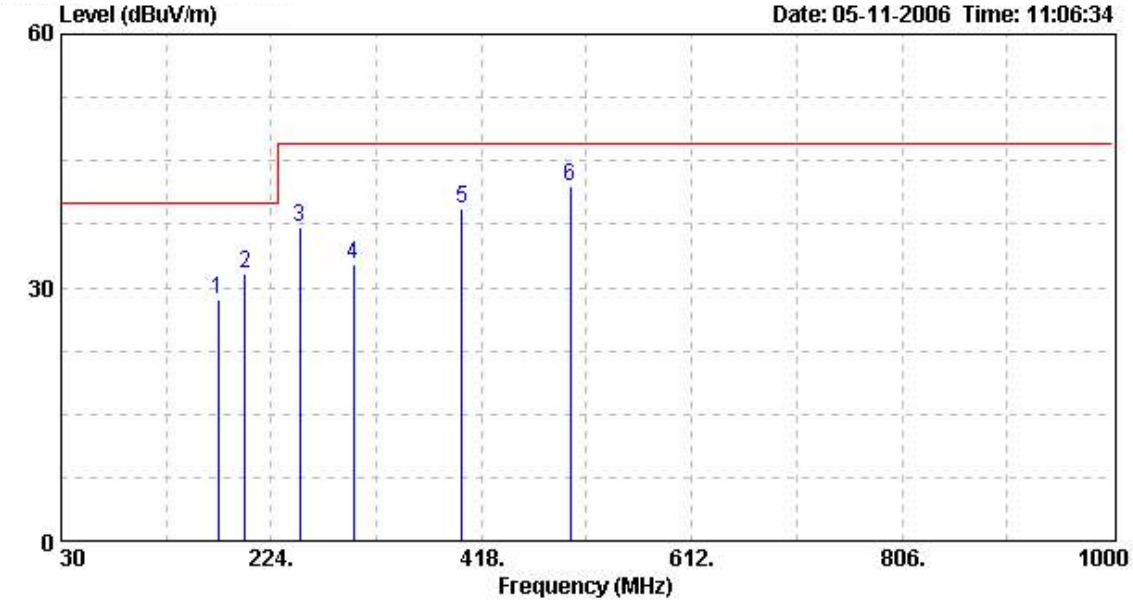
Remark:
1. Level (dB μ V/m)= Factor (dB/m)+ Read Level (dB μ V)
2. Factor = Antenna Factor (dB/m) + Cable Loss (dB)
3. Over Limit (Margin) (dB) = Level (dB μ V/m) – Limit Line(dB μ V/m)



Polarity: Horizontal
Model No.: MD20
Worst Case: Configuration 1

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Ant Pos	Table Pos	Remark
MHz		dB	dBuV	dBuV/m	dBuV/m	dB	cm	deg	
175.0	HORIZONTAL	12.13	16.50	28.63	40.00	-11.37	400	175	QP
200.0	HORIZONTAL	12.10	19.50	31.60	40.00	-8.40	400	48	QP
250.0	HORIZONTAL	15.70	21.40	37.10	47.00	-9.90	261	348	QP
300.0	HORIZONTAL	17.05	15.80	32.85	47.00	-14.15	344	146	QP
400.0	HORIZONTAL	19.93	19.50	39.43	47.00	-7.57	308	108	QP
500.0	HORIZONTAL	22.15	19.80	41.95	47.00	-5.05	215	60	QP

Remark:
1. Level (dB μ V/m)= Factor (dB/m)+ Read Level (dB μ V)
2. Factor = Antenna Factor (dB/m) + Cable Loss (dB)
3. Over Limit (Margin) (dB) = Level (dB μ V/m) – Limit Line(dB μ V/m)



5. IEC 61000-4-2 Electrostatic Discharge Immunity Test

5.1 Operating Environment

Temperature:	25 ℃	Atmospheric Pressure:	1023 hPa
Relative Humidity:	55 %	Test Voltage:	DC 48V

5.2 Purpose

The object of the test is to evaluate the ESD immunity performance of EUT.

5.3 Test Set-Up

A horizontal coupling plane (HCP) was placed on a non-metallic table 0.8 m above a reference ground plane (RGP) and connected to it with a cable with two 470 kΩ resistors. The EUT was placed on an insulation sheet on the HCP and was operated according to the specified operating mode.

A vertical coupling plane (VCP) was connected to the RGP with a cable with two 470 kΩ resistors.

5.4 Test Conditions

Test level: Contact discharge ------- +/- 4kV

Single discharge at 1 second interval positive discharge and negative discharge
The selected test points are listed in this table, the numbers refer to the figures attached.

5.5 Test Equipment

Equipment	Manufacturer	Model No.	Intertek ID No.	Next Cal. Date
Electrostatic Discharge System	NoiseKen	ESS-2002	EC362	06/28/2006

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

5.6 Test Result

Point of Discharge	Applied Voltage (kV)	Total No. of Discharge (Each Point)	Result	Criteria Level	Remark
(Contact) Point 1-23 Refer to figure attached 1-2	±2	10	P	A	-
	±4	10	P	B	-
(Air) Point -	±2	-	-	-	-
	±4	-	-	-	-
	±8	-	-	-	-
HCP (4 sides)	±2	10	P	A	-
	±4	10	P	B	-
VCP (4 sides)	±2	10	P	A	-
	±4	10	P	B	-

Note: 1. “P” means the EUT pass the test.
Note: 2. “-“ means not applicable

☐ Meet criterion A – operated as intended during and after the test

☒ Meet criterion B – operated as intended after the test

☐ Meet criterion C – loss/ error of function

Figure 1: ESD Discharge Points

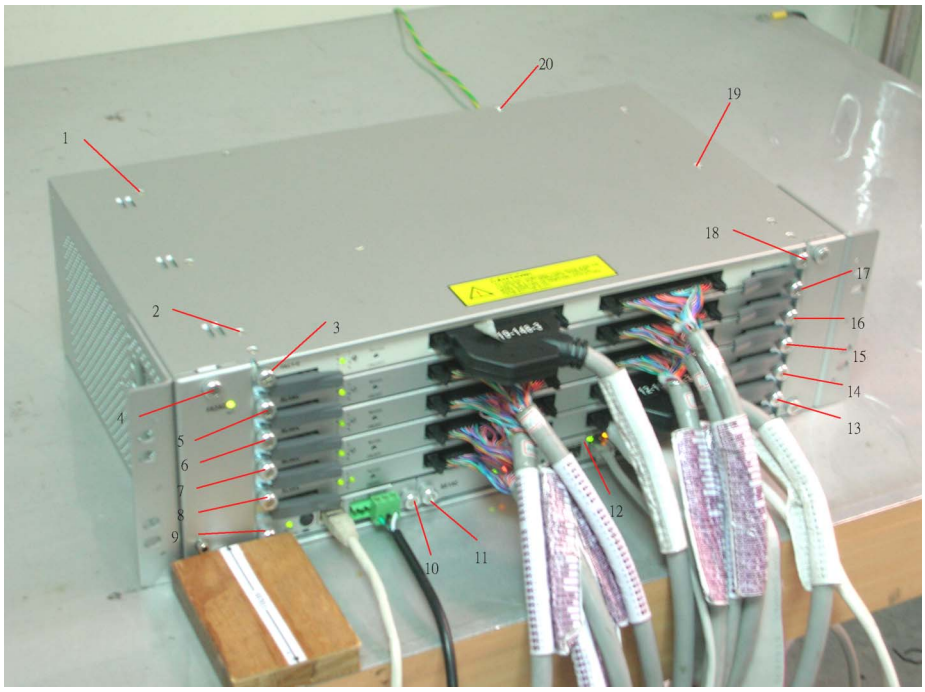


Figure 2: ESD Discharge Points

6. IEC 61000-4-3 Radiated, Radio-Frequency, Electromagnetic Field Immunity Test

6.1 Operating Environment

Temperature:	23	℃	Atmospheric Pressure:	1023	hPa
Relative Humidity:	53	%	Test Voltage:	DC 48V	

6.2 Purpose

This test method subjects the EUT to a power source of disturbance comprising electric and magnetic field, simulating those coming from intentional RF transmitters.

6.3 Test Set-Up

The EUT was placed on a non-metallic table 0.8 m above the reference ground plane (RGP) and was operated according to its specified operating mode.

Ferrite tiles/absorbers were placed on the RGP between the EUT and the antenna to reduce the reflections from the RGP. The EUT and its cables were exposed for the electromagnetic field for 1.5m vertically and 1.5m horizontally.

The distance between antenna and EUT is 3 meter.

6.4 Test Conditions

Test level	Test field strength V/m	Modulation
1	1	1 kHz 80% AM
2	3	1 kHz 80% AM
3	10	1 kHz 80% AM
X	Special	1 kHz 80% AM

The frequency steps : 1%, Log sweep
Dwell time : 3 sec
Frequency range : 80MHz~1GHz
Test ports : Enclosure port
Test field strength : 3V/m

6.5 Test Equipment

Equipment	Manufacture	Model No.	Intertek ID No.	Next Cal. Date
An-echoic chamber 7m×3m×3m	Comtest Instrumentation	9708093	EC328	03/10/2007
RF signal Generator	Marconi	2024	EC301	08/08/2006
Dual Band RF Power Amplifier	Kalmus	757LCB	EP314	N/A
High Power Microwave Amplifier Series	MILMEGA	AS0102-30	EP318	N/A
Bi-log Antenna	EMCO	3141	EC304	12/17/2006
RF Power Meter	Boonton	4230	EC302	08/08/2006
Field Probe	Holaday	HI-4422	EC307	07/08/2006

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

6.6 Generation of The Electromagnetic Field

The electromagnetic field is generated from a computer controlled signal generator. The output power is amplified and then radiated from broadband log periodic antennas. For each sweep a pre-recorded empty chamber calibration file is used to establish the required field strength. When using these files the field strength inside an area of 1.5/1.0 m x 1.5m is in accordance with the standard.

6.7 Test Results

Exposed Side: ☒ Front ☒ Left ☒ Rear ☒ Right

H: Horizontal V: Vertical

Frequency (MHz)	Horizontal/ Vertical	Result	Criteria Level	Remark
80MHz to 1GHz	H	P	A	-
80MHz to 1GHz	V	P	A	-

Note: 1. “P” means the EUT pass the test.
Note: 2. “-“ means not applicable

☒ Meet criterion A – operated as intended during and after the test

☐ Meet criterion B – operated as intended after the test

☐ Meet criterion C – loss/error of function

7. IEC 61000-4-4 Electrical Fast Transient/Burst Immunity Test

7.1 Operating Environment

Temperature:	21 ℃	Atmospheric Pressure:	1023 hPa
Relative Humidity:	57 %	Test Voltage:	DC 48V

7.2 Purpose

The purpose of this test is to evaluate the EUT performance during the repetitive transient bursts applied to power port and ports for I/O ports.

7.3 Test Set-Up

For I/O ports testing, the EUT was placed on a non-metallic support 0.1 m above a reference ground plane (RGP) and operated in the operating mode specified.

For power port testing, the EUT was placed on a non-metallic table 0.1 m above a reference ground plane (RGP) and was put into operation according to the specified operating mode.

7.4 Test Condition

Open-circuit output test voltage (±10%) and repetition rate of the impulses (±20%)				
Level	On power supply port, PE		On I/O (Input/Output) signal, Data and control ports	
	Voltage peak kV	Repetition rate kHz	Voltage peak kV	Repetition rate kHz
1	0.5	5 or 100	0.25	5 or 100
2	1	5 or 100	0.5	5 or 100
3	2	5 or 100	1	5 or 100
4	4	5 or 100	2	5 or 100
X(1)	Special	Special	Special	Special
NOTE 1 Use of 5 kHz repetition rates is traditional; however, 100 kHz is closer to reality. Product committees should determine which frequencies are relevant for specific products or product types. NOTE 2 With some products, there may be no clear distinction between power ports and I/O ports, in which case it is up to product committees to make this determination for test purposes.				
(1) "x" is an open level. The level has to be specified in the dedicated equipment specification				

7.5 Test Equipment

Equipment	Manufacture	Model No.	Intertek ID No.	Next Cal. Date
EFT/Burst Tester	Keytek	CE40	EC312	07/27/2006

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

7.6 Test Results

Level	Polarity	Power supply line and Protective earth terminal	Signal Line & Control Line	Criteria Level	Remark
0.25kV	+	P	-	A	DC Power
0.5kV	-	P	-	B	DC Power
0.25kV	+	-	P	A	GBE1 Port
0.5kV	-	-	P	B	GBE1 Port
0.25kV	+	-	P	A	AL5EB DSL Port
0.5kV	-	-	P	A	AL5EB DSL Port

Note: 1. “P” means the EUT pass the test.
Note: 2. “-“ means not applicable

☐ Meet criterion A - operated as intended during and after the test

☒ Meet criterion B - operated as intended after the test

☐ Meet criterion C - loss/error of function

8. IEC 61000-4-5 Surge Immunity Test

8.1 Operating Environment

Temperature:	25 ℃	Atmospheric Pressure:	1023 hPa
Relative Humidity:	55 %	Test Voltage:	DC 48V

8.2 Purpose

The object of this test is to establish a common reference to evaluate the performance of EUT when subjected to high-energy disturbances on the power and interconnection lines.

8.3 Test Set-Up

The EUT was placed on a non-metallic support 0.8 m above a reference ground plane and was put into operation according to the specified operating mode.

8.4 Test Conditions

For signal line:

Level	Open circuit test voltage kV +/- 10%	Remark
2	1.0	Line to Ground

Surge wave form: 1.2 x 50 μs, Repetition rate: 1 /min (max)

8.5 Test Equipment.

Equipment	Manufacture	Model No.	Intertek ID No.	Next Cal. Date
Surge Tester	Key Tek	EMC Pro	EC313	10/19/2006
External Coupler/Decoupler for Telecom Line	Key Tek	CM-TELCD	EP326-1	N/A

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

8.6 Test Results

Test times: 5 times / each condition

Type of Line: Telecom Line (Balance Line)

Test Volt.	Test Mode	Polarity	Test Result	Criteria	Remark
0.5kV	Line to Ground	+	-	-	-
		-	-	-	-
1kV	Line to Ground	+	P	A	AL5EB DSL Port
		-	P	A	AL5EB DSL Port

Note: 1. “P” means the EUT pass the test.
Note: 2. “-“ means not applicable

☒ Meet criterion A - operated as intended during and after the test

☐ Meet criterion B - operated as intended after the test

☐ Meet criterion C - loss/error of function

9. IEC 61000-4-6 Immunity to Conducted Disturbances, Inducted by Radio-Frequency Fields

9.1 Operating Environment

Temperature:	23	°C	Atmospheric Pressure:	1023	hPa
Relative Humidity:	53	%	Test Voltage:	DC 48V	

9.2 Purpose

The test method subjects the EUT to a power source of disturbance comprising electric and magnetic field, simulating those coming from intentional RF transmitters.
The measurement is for evaluating the performance of EUT when subjected to RF conducted disturbance.

9.3 Test Set-Up

The EUT was placed on a non-metallic support 0.1 m above a reference ground plane (RGP) with the coupling/decoupling network (CDN) placed 0.3 m from the EUT on the RGP. The injection clamp was placed 0.3 m from the EUT on the RGP.

9.4 Test Conditions

Test level	Voltage (Vrms)	Modulation
1	1	1 kHz 80% AM
2	3	1 kHz 80% AM
3	10	1 kHz 80% AM
X	Special	1 kHz 80% AM

The frequency steps : 1%, Log sweep
Dwell time : 3 sec
Frequency range : 150kHz to 80MHz
Test ports : DC port, Signal port
Test voltage : 3Vrms

9.5 Test Equipment

Equipment	Manufacture	Model No.	Intertek ID No.	Next Cal. Date
RF signal Generator	Marconi	2024	EC301	08/08/2006
Dual Band RF Power Amplifier	Kalmus	757LCB	EP314	N/A
Coupling network	Comtest instrument	4412-016	EC305	01/05/2007
Coupling network	Comtest instrument	4413-016	EC306	01/05/2007
RF Power Meter	Boonton	4230	EC302	08/08/2006
RF Injection Clamp	Luthi	EM101	EC308	01/05/2007
Coupling And Decoupling Network	Schaffner	CDN T400	EC385	03/09/2007

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

9.6 Generation And Calibration of The Disturbance Signal

The disturbance signal is generated from a computer controlled signal generator.
The output signal is amplified and injected to the CDN/injection clamp. The disturbance signal level was calibrated as specified in the standard. A power meter was connected to the EUT side of the CDN through a 150 -50Ω adapter. The auxiliary equipment (AE) side of the network was terminated with 150Ω to ground during the calibration. The generator settings obtained during the calibration procedure were later repeated in the tests.

9.7 Test Results

Frequency (MHz)	Test Port/Line	Result	Criteria Level	Remark
0.15MHz to 80MHz	Power Line	P	A	DC Power
0.15MHz to 80MHz	Signal Line	P	A	GE1AC/ GBE1 Port
0.15MHz to 80MHz	Signal Line	P	A	AL5EB DSL Port

Note: 1. “P” means the EUT pass the test.
Note: 2. “-“ means not applicable

☒ Meet criterion A – operated as intended during and after the test

☐ Meet criterion B – operated as intended after the test

☐ Meet criterion C – loss／error of function

Appendix A1: External photo of EUT

Configuration 1

Configuration 2

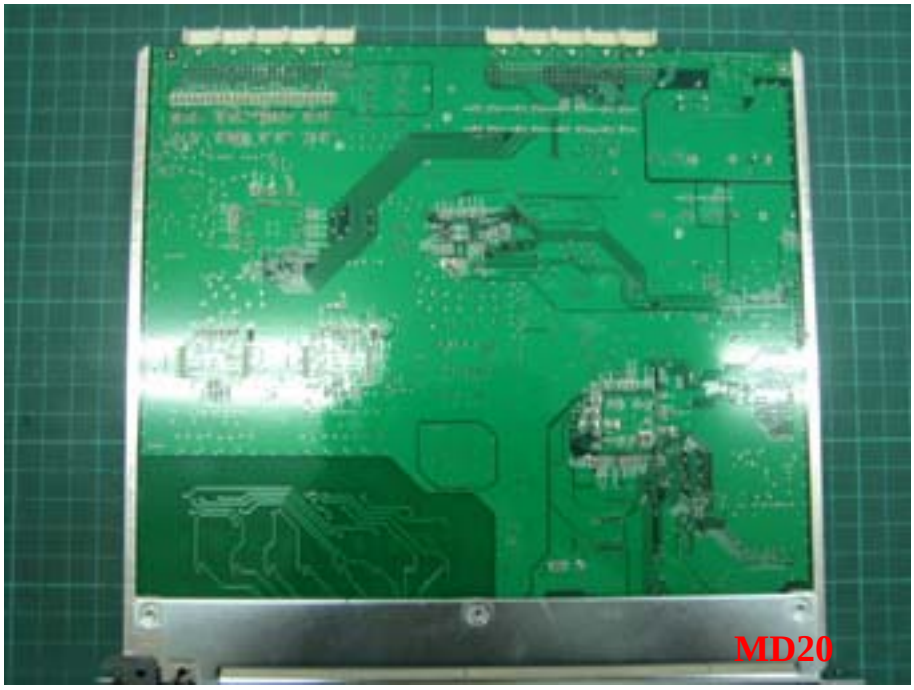
Configuration 3


VARTA
TADIRAN
MICRON
ELCO
HERG
KYOCERA
AMP
MD20

Appendix A2: Internal photo of EUT

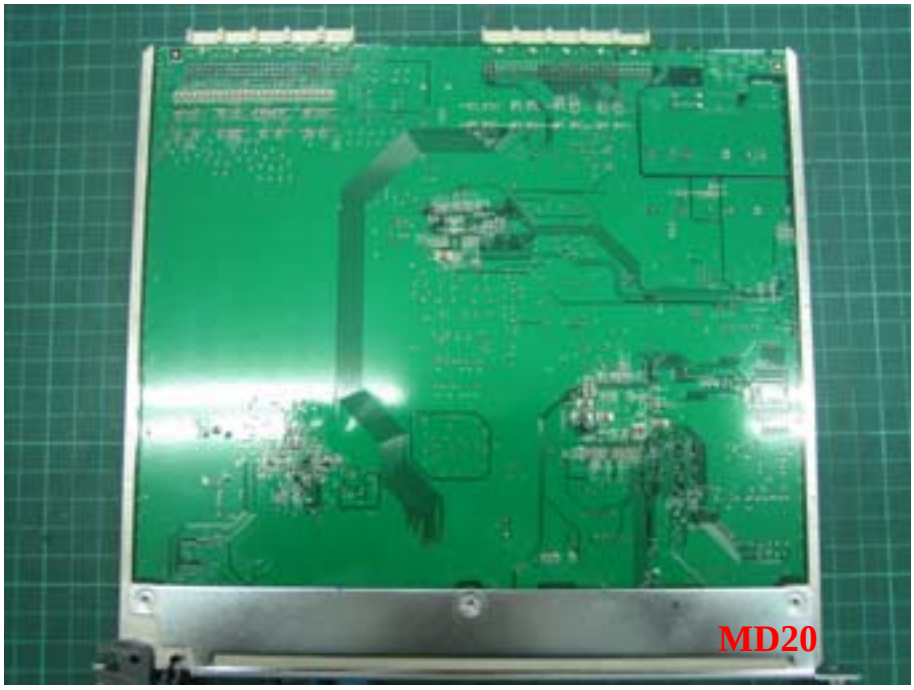
IM8AC

IM8AC

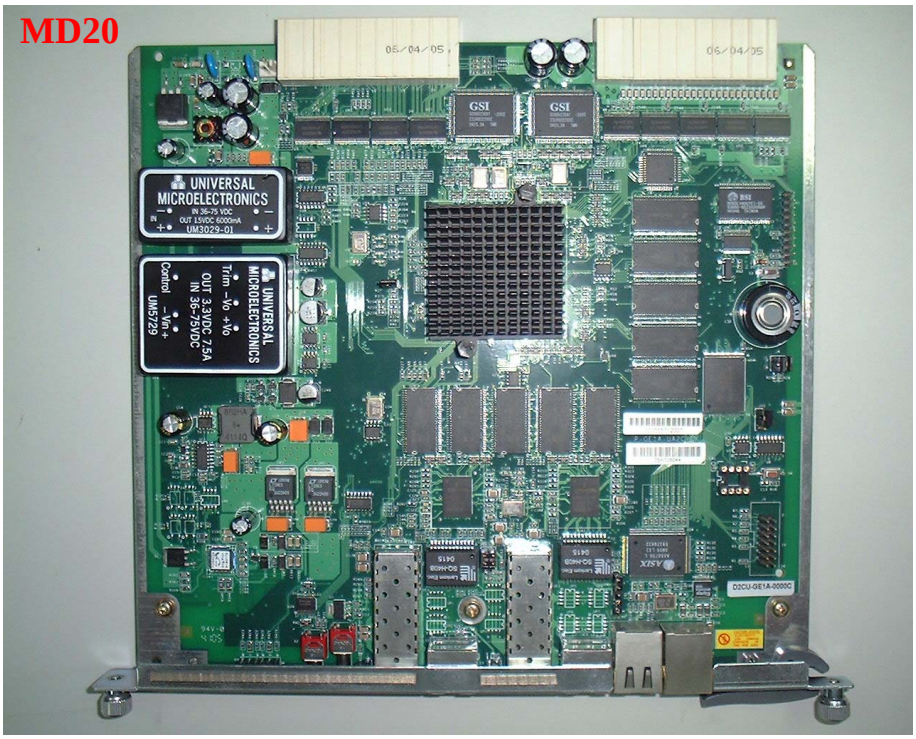


ST1AC

ST1AC



GE1AC



GE1AC

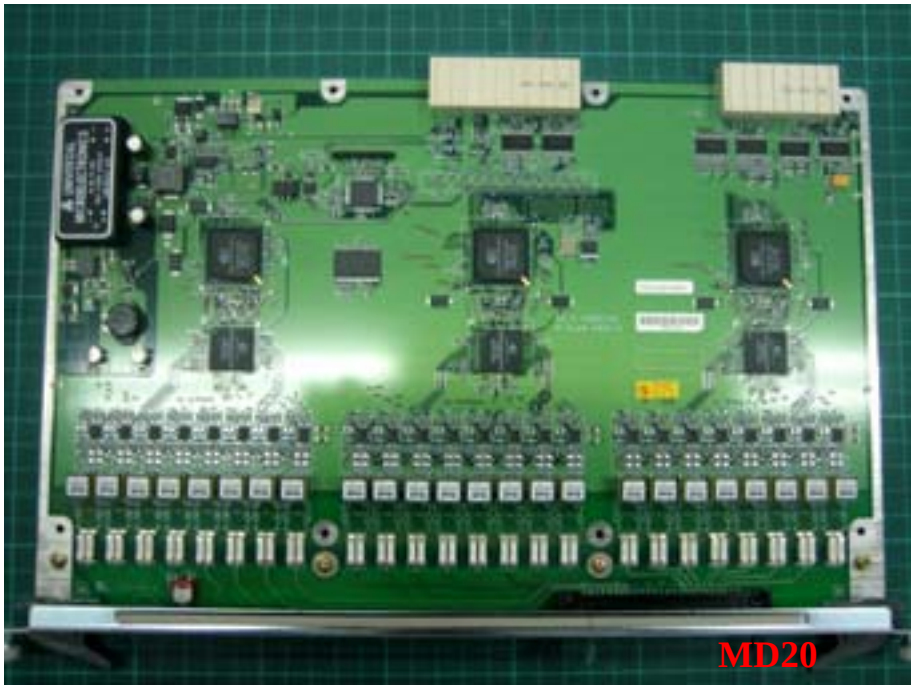
AL5EC

AL5EC

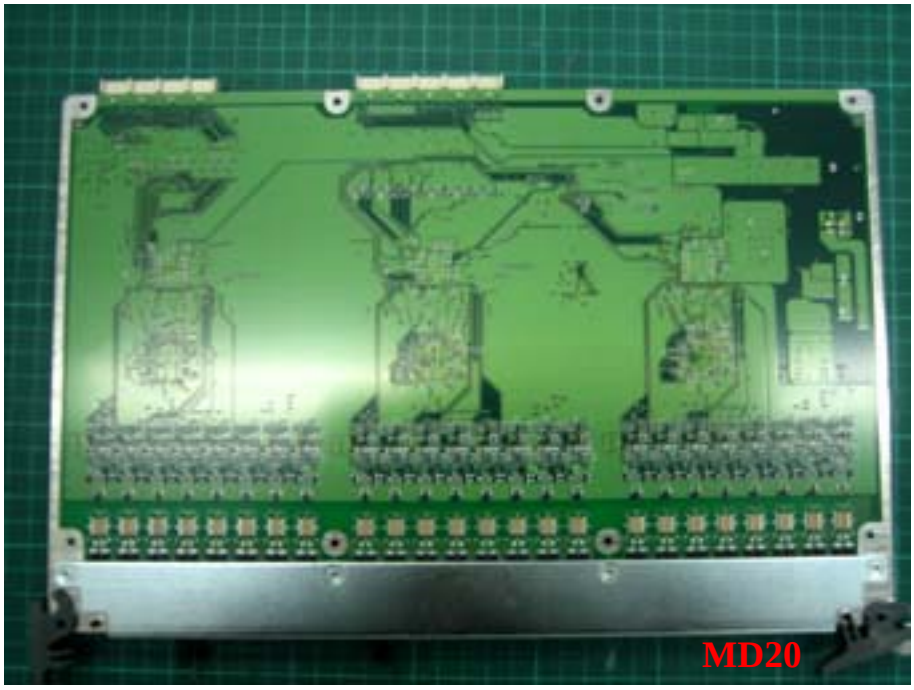
AL5BC

AL5BC

SL6AC



SL6AC



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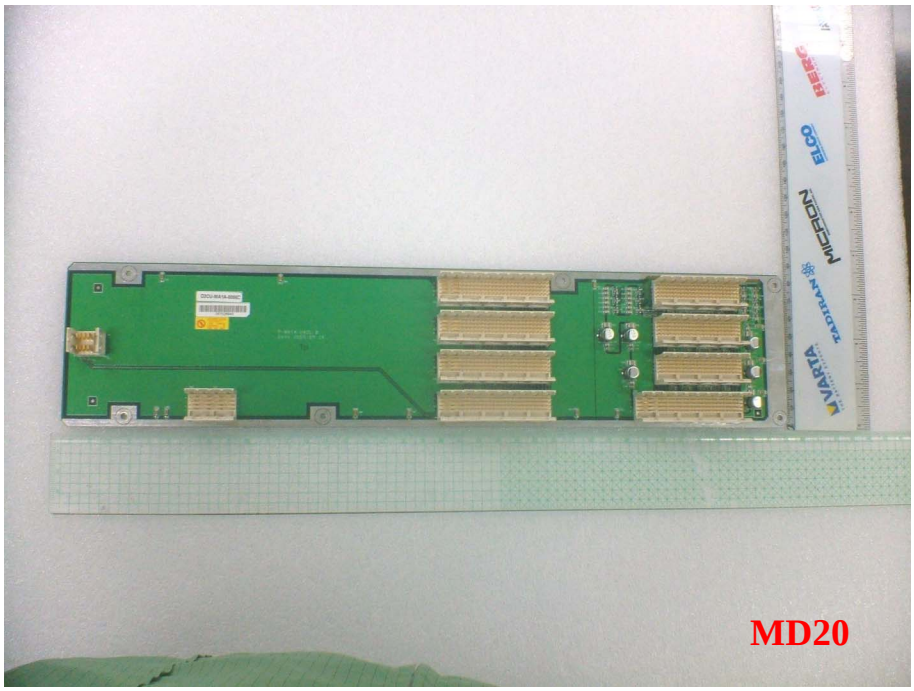

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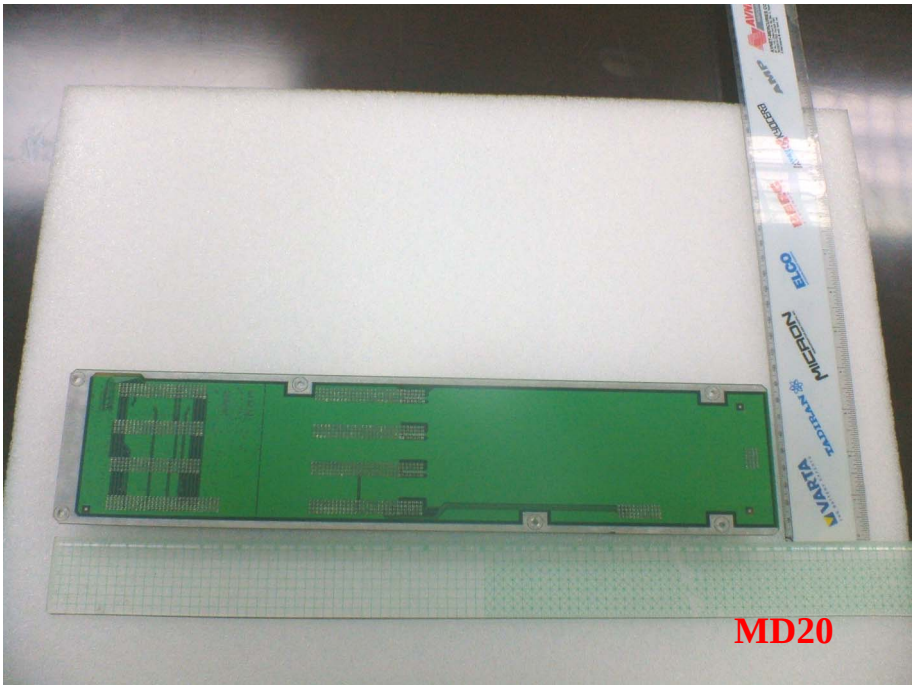
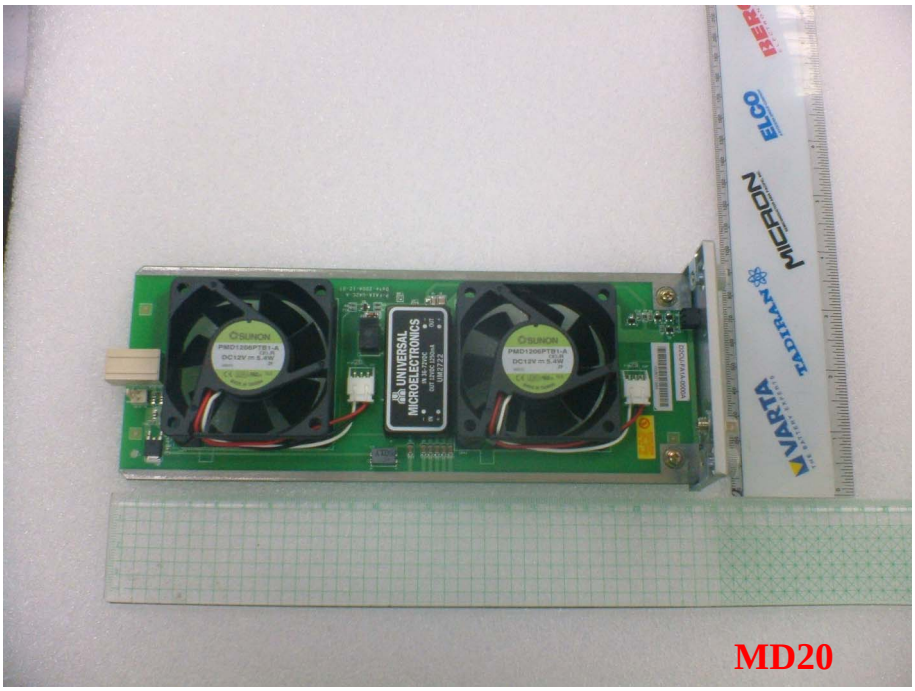


FA1A



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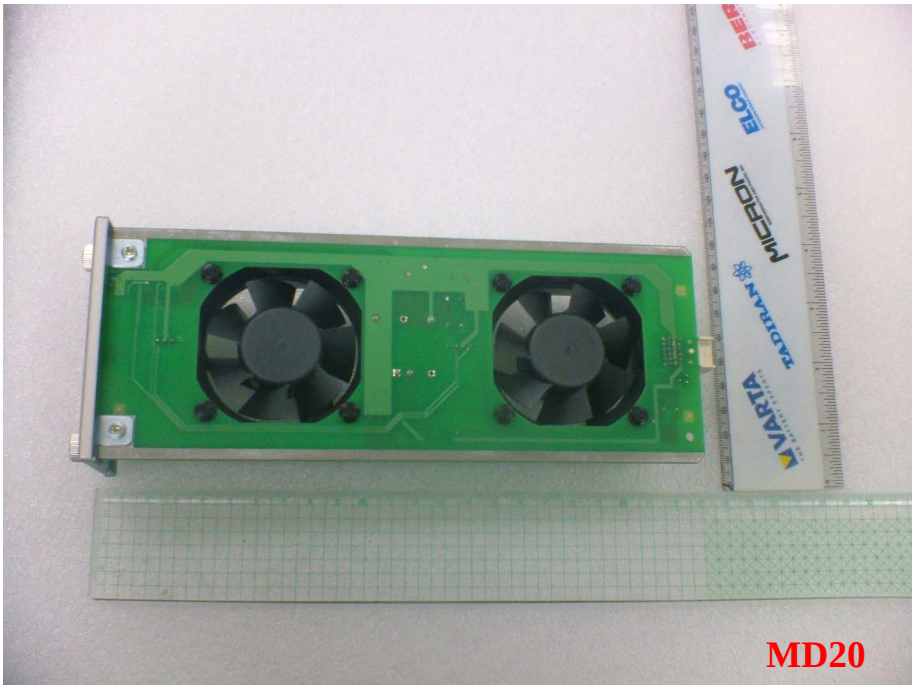
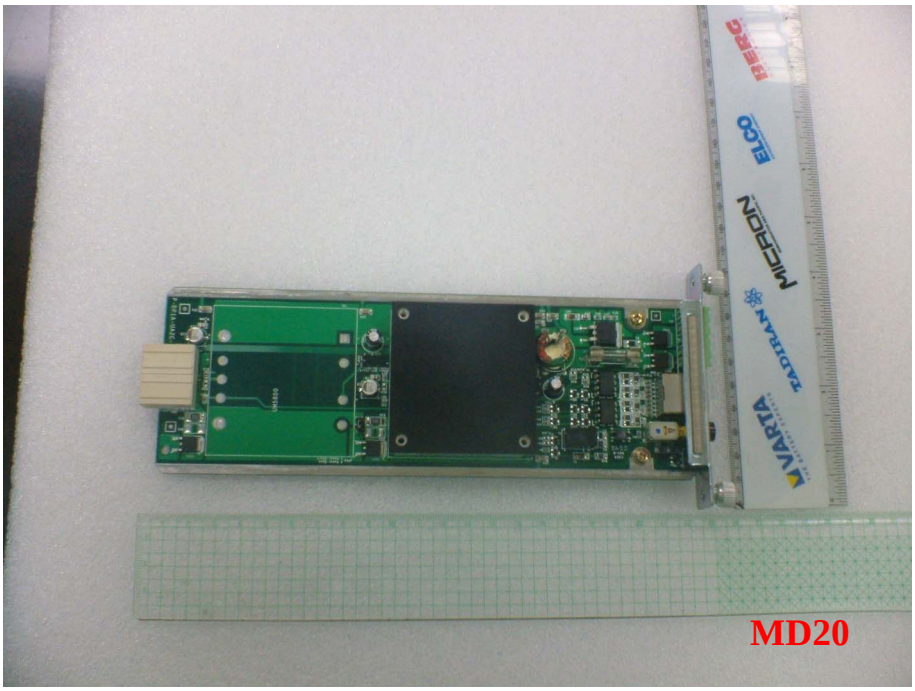
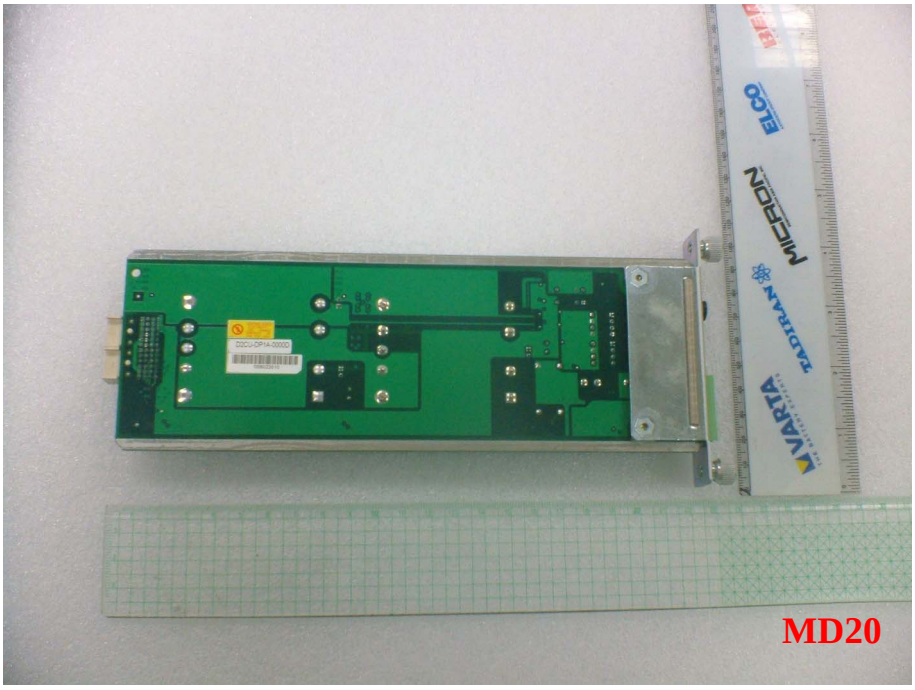
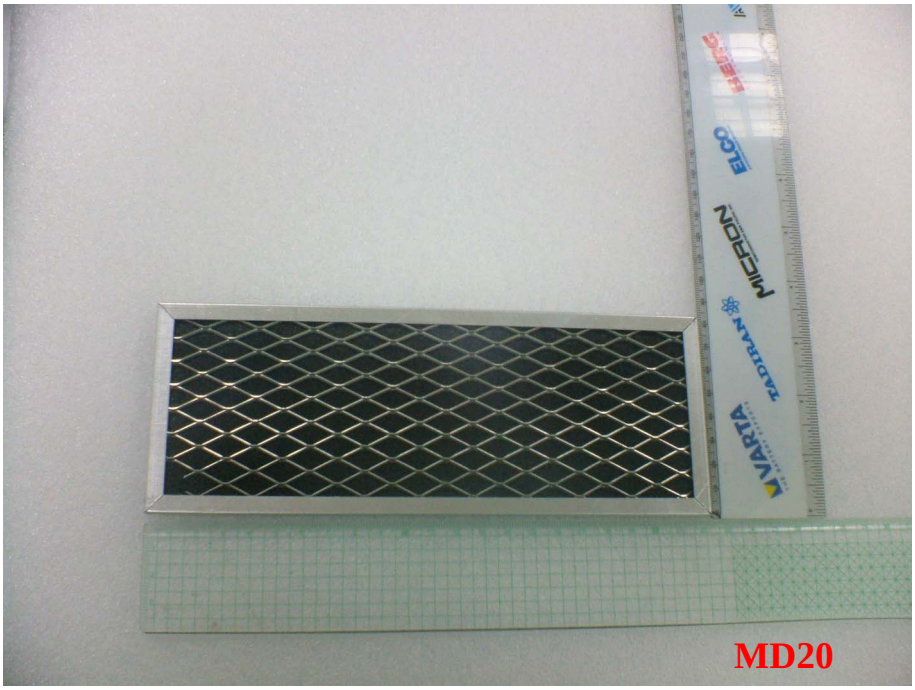


DP1A

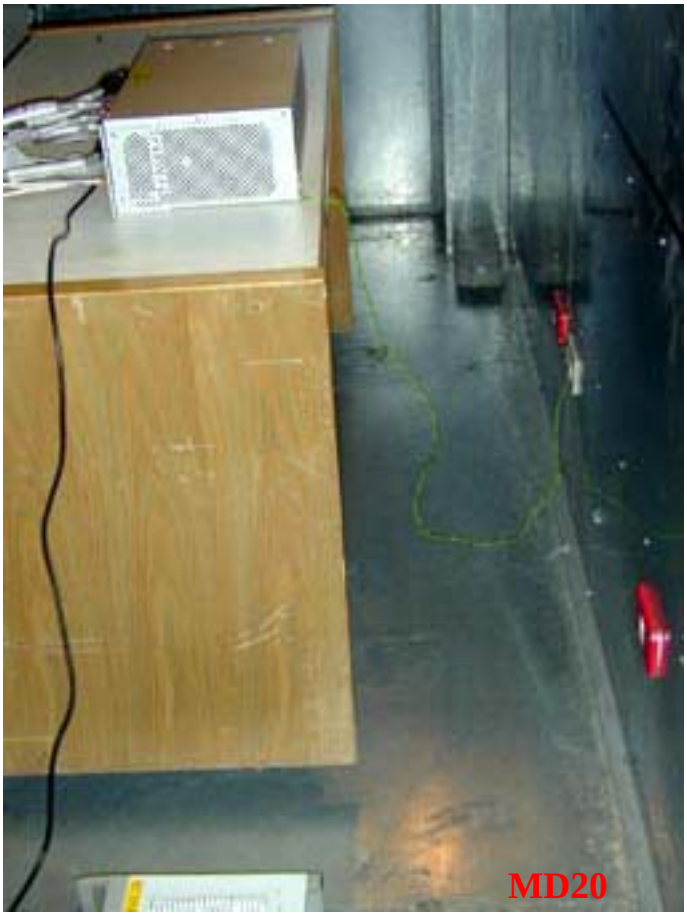


DP1A




MD20

Appendix B1: ISN Emission Test Set-up



Appendix B2: Radiated Emission Test Set-up