



FCC TEST REPORT (PART 27)

REPORT NO.: RF961108H05

MODEL NO.: MAX-200HW2

RECEIVED: Nov. 09, 2007

TESTED: Nov. 21 to Dec. 12, 2007

ISSUED: Dec. 12, 2007

APPLICANT: ZyXEL Communications Corporation

ADDRESS: No. 6, Innovation Road II, Science-Park, Hsin-Chu,
300, Taiwan

ISSUED BY : Advance Data Technology Corporation

LAB LOCATION : No. 81-1, Lu Liao Keng, 9 Ling, Wu Lung Tsuen,
Chiung Lin Hsiang, Hsin Chu Hsien, Taiwan.

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TABLE OF CONTENTS

1	CERTIFICATION	3
2	SUMMARY OF TEST RESULTS	4
2.1	MEASUREMENT UNCERTAINTY	4
3	GENERAL INFORMATION.....	5
3.1	GENERAL DESCRIPTION OF EUT.....	5
3.1.1	TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL.....	6
3.2	GENERAL DESCRIPTION OF APPLIED STANDARDS.....	7
3.3	DESCRIPTION OF SUPPORT UNITS	7
3.3.1	CONFIGURATION OF SYSTEM UNDER TEST	8
4	TEST TYPES AND RESULTS	9
4.1	RADIATED EMISSION MEASUREMENT (BELOW 1GHz)	9
4.1.1	LIMITS OF RADIATED EMISSION MEASUREMENT	9
4.1.2	TEST INSTRUMENTS	10
4.1.3	TEST PROCEDURES.....	11
4.1.4	DEVIATION FROM TEST STANDARD	11
4.1.5	TEST SETUP.....	12
4.1.6	EUT OPERATING CONDITIONS.....	12
4.1.7	TEST RESULTS.....	13
4.2	RADIATED EMISSION MEASUREMENT (ABOVE 1GHz).....	14
4.2.1	LIMITS OF RADIATED EMISSION MEASUREMENT	14
4.2.2	TEST INSTRUMENTS	15
4.2.3	TEST PROCEDURES.....	16
4.2.4	DEVIATION FROM TEST STANDARD	16
4.2.5	TEST SETUP.....	17
4.2.6	EUT OPERATING CONDITIONS.....	17
4.2.7	TEST RESULTS.....	18
5	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	19
6	INFORMATION ON THE TESTING LABORATORIES	20



1 CERTIFICATION

PRODUCT: Wimax Router

MODEL: MAX-200HW2

APPLICANT: ZyXEL Communications Corporation

TESTED: Nov. 21 to Dec. 12, 2007

TEST SAMPLE: R&D SAMPLE

TEST STANDARDS: FCC Part 27, Subpart C & M

ANSI C63.4-2003

The above equipment (Model no.: MAX-200HW2) has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Claire Kuan , **DATE:** Dec. 12, 2007
(Claire Kuan, Specialist)

TECHNICAL ACCEPTANCE : Hank Chung , **DATE:** Dec. 12, 2007
Responsible for RF (Hank Chung, Deputy Manager)

APPROVED BY : May Chen , **DATE:** Dec. 12, 2007
(May Chen, Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 27 & Part 2			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
2.1053 27.53(l)(4)(6)	Radiated Spurious Emissions	PASS	Meet the requirement of limit.

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Measurement	Value
Radiated emissions (30MHz-1GHz)	3.94 dB
Radiated emissions (1GHz -18GHz)	2.33 dB
Radiated emissions (18GHz -40GHz)	2.55 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wimax Router
MODEL NO.	MAX-200HW2
FCC ID	I88MAX200HW2
POWER SUPPLY	DC 18V from host equipment
MODULATION TECHNOLOGY	OFDMA
FREQUENCY RANGE	2496MHz ~ 2690MHz
CHANNEL BANDWIDTH	5MHz
NUMBER OF CHANNEL	39
MAX. EIRP POWER	32.12dBm
DATA CABLE	NA
I/O PORTS	LINE port *2 ETHERNET port *4
ASSOCIATED DEVICES	NA

NOTE:

1. This product is co-located with following certified 11g device:

Product Name	Brand	Model No.	FCC ID
802.11g wireless MiniPCI card	ZyXEL	ZyXEL G-620	I88G-620

2. For the EUT with modulation type and coding rate:

		DL	UL
Modulation		QPSK, 16QAM, 64QAM	QPSK, 16QAM
Code Rate	CC	1/2, 3/4, 2/3, 5/6	1/2, 3/4
	CTC	1/2, 3/4, 2/3, 5/6	1/2, 3/4
	Repetition	X2, x4, x6	X2, x4, x6

3. The EUT was tested with following one WLAN card individually; therefore emission tests are added for simultaneously transmit between WIMAX and WLAN function. The emission tests have been performed at the worst channel of both WIMAX and WLAN, and recorded in the report.
4. The above EUT information was declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or User's Manual.

3.1.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGUR E MODE	APPLICABLE TO		DESCRIPTION
	RE<1G	RE≥1G	
-	√	√	Co-located

Where RE<1G RE: Radiated Emission below 1GHz
RE≥1G: Radiated Emission above 1GHz

RADIATED EMISSION MEASUREMENT (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type
802.11g + WiMAX	1 to 11	11	OFDM	BPSK
	1 to 39	39	OFDMA	QPSK-1/2

RADIATED EMISSION MEASUREMENT (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type
802.11g + WiMAX	1 to 11	11	OFDM	BPSK
	1 to 39	39	OFDMA	QPSK-1/2



3.2 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 27

ANSI C63.4-2003

ANSI/TIA/EIA-603-A

NOTE: All test items have been performed and recorded as per the above standards.

3.3 DESCRIPTION OF SUPPORT UNITS

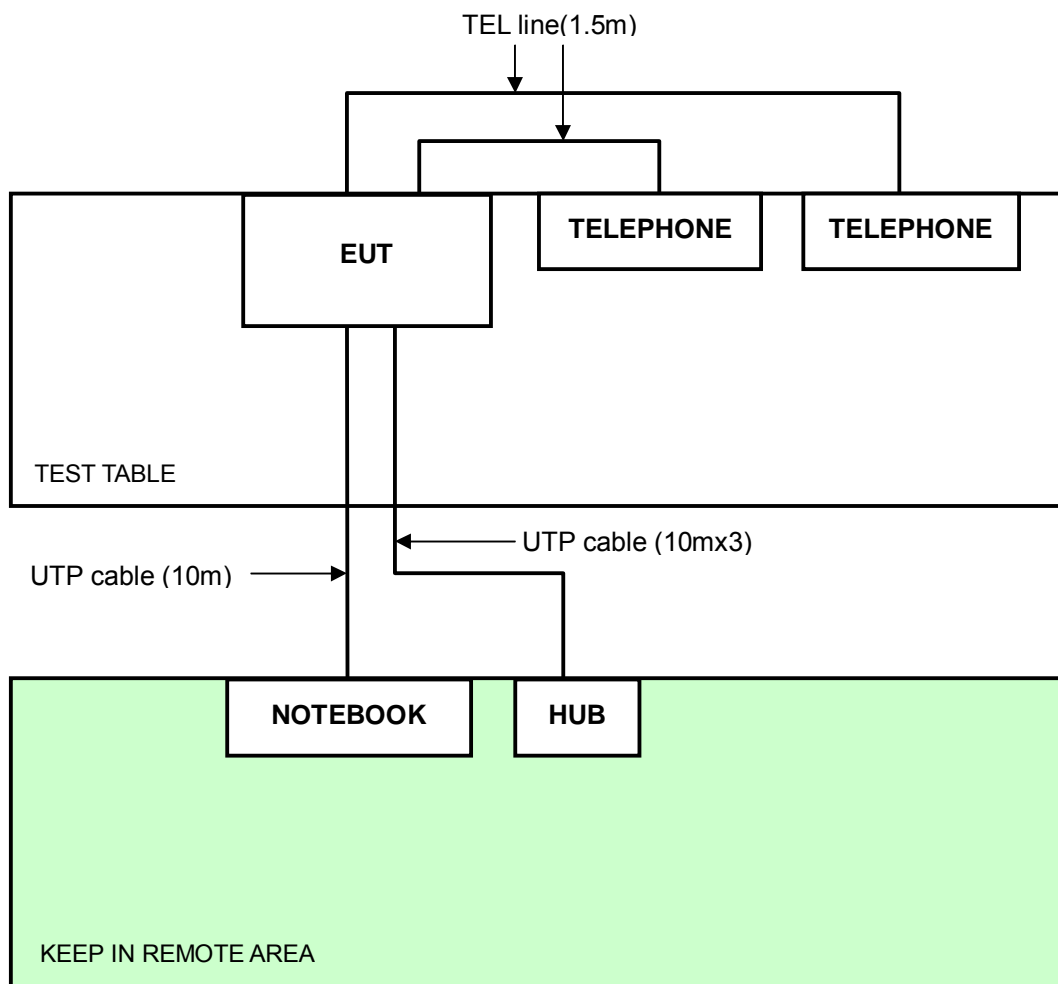
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	PP18L	6976685584	FCC Doc
2	HUB	AVSYS	110H8	01-20E-000002	DoC
3	TELEPHONE	ROMEO	TE-812	97285638	N/A
4	TELEPHONE	DAISHO	DS-03	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA
3	1.8 m Non shielded cable, RJ11 connector, w/o core.
4	1.8 m Non shielded cable, RJ11 connector, w/o core.

NOTE: All power cords of the above support units are non shielded (1.8m).

3.3.1 CONFIGURATION OF SYSTEM UNDER TEST



4 TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT (BELOW 1GHz)

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

In the FCC 27.53(l) (4), On any frequency outside a licensee's frequency block the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB. The specified minimum attenuation becomes 43dB and the limit of emission equal to -13 dBm.



4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ADVANTEST Spectrum Analyzer	R3271A	85060311	July 15, 2008
HP Pre_Amplifier	8449B	3008A01922	Oct. 04, 2008
ROHDE & SCHWARZ Test Receiver	ESCS30	100375	Mar. 26, 2008
CHASE Broadband Antenna	VULB 9168	138	July 26, 2008
Schwarzbeck Horn_Antenna	BBHA9120	D124	Jan. 01, 2008
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 25, 2008
TRILOG Broad Band Antenna	VULB 9168	138	July 26, 2008
RF Switches (ARNITSU)	CS-201	1565157	Aug. 13, 2008
RF CABLE (Chaintek)	SF102	22054-2	Nov. 14, 2008
RF Cable(RICHTEC)	9913-30M N-N Cable	STCCAB-30M-1 GHz	Aug. 13, 2008
Software	ADT_Radiated_V 7.6.15.7	NA	NA
CHANCE MOST Antenna Tower	AT-100	0203	NA
CHANCE MOST Turn Table	TT-100	0203	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: R3271A) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in ADT Open Site No. C.
4. The FCC Site Registration No. is 656396.
5. The VCCI Site Registration No. is R-1626.
6. The CANADA Site Registration No. is IC 4824A-3.

4.1.3 TEST PROCEDURES

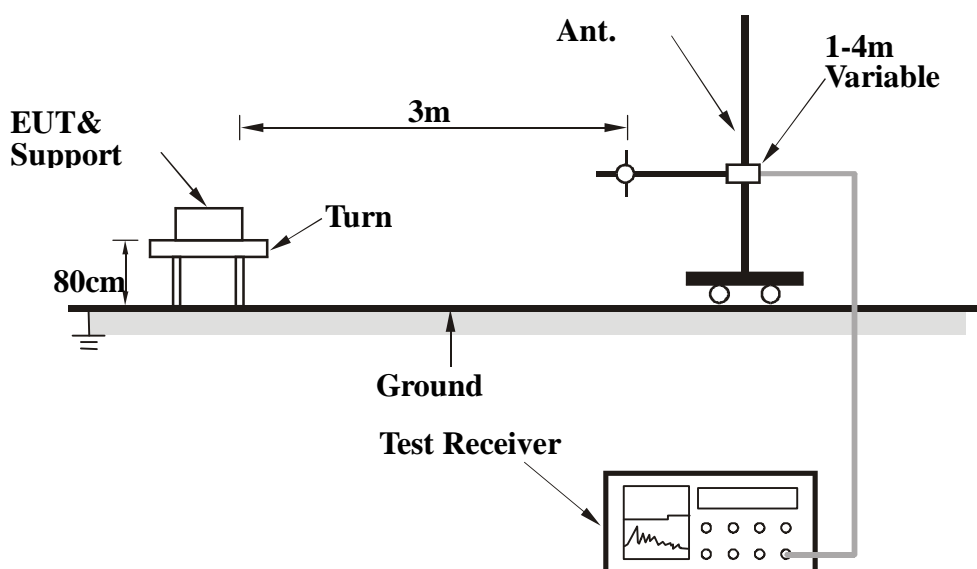
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 m above the ground.
- c. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading and recorded the value.
- d. The EUT is replaced by a horn antenna connected to a signal generator tuned to the frequency of emission.
- e. The signal generator level has to be adjusted to have the same emission nature.
- f. The radiated power can be calculated via the factor and antenna gain.
- g. Repeat step a ~ f for horizontal polarization.

NOTE: The resolution bandwidth of spectrum analyzer is 1MHz and the video bandwidth is 3MHz.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITIONS

- a. The notebook controlled EUT to export rated output power under transmission mode and specific channel frequency.

4.1.7 TEST RESULTS

FREQUENCY RANGE	Below 1000MHz	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	22 deg. C, 68 %RH, 963hPa	TESTED BY	Sky Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Power level (dBm)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Emission Level (dBuV/m)
1	133.32	-58.08	-13.00	-58.714	0.634	37.22
2	299.99	-59.02	-13.00	-64.661	5.641	36.38
3	400.01	-54.40	-13.00	-44.885	-9.515	41.3
4	499.98	-57.47	-13.00	-47.936	-9.534	37.93
5	800.01	-57.47	-13.00	-47.826	-9.644	37.73
6	933.32	-57.25	-13.00	-47.414	-9.836	38.55

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Power level (dBm)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Emission Level (dBuV/m)
1	50.13	-57.37	-13.00	-57.601	0.231	39.03
2	399.90	-57.48	-13.00	-47.965	-9.515	37.72
3	440.01	-59.49	-13.00	-49.968	-9.522	36.01
4	600.02	-61.08	-13.00	-51.6	-9.48	34.12
5	700.00	-63.07	-13.00	-53.445	-9.625	33.03
6	800.00	-55.08	-13.00	-45.436	-9.644	40.32

REMARKS: 1. Power Value(dBm)=S.G Power Value (dBm) + Correction Factor(dB)



4.2 RADIATED EMISSION MEASUREMENT (ABOVE 1GHz)

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

In the FCC 27.53(l) (4), On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB. The specified minimum attenuation becomes 43dB and the limit of emission equal to -13 dBm.



4.2.2 TEST INSTRUMENTS

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RF Cable(RICHTEC)	9913-30M N-N Cable	STCCAB-30M-1 GHz	Aug. 13, 2008
Software	ADT_Radiated_V 7.6.15.7	NA	NA
CHANCE Antenna Tower	MOST AT-100	0203	NA
CHANCE MOST Turn Table	TT-100	0203	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: R3271A) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in ADT Open Site No. C.
4. The FCC Site Registration No. is 656396.
5. The VCCI Site Registration No. is R-1626.
6. The CANADA Site Registration No. is IC 4824A-3.

4.2.3 TEST PROCEDURES

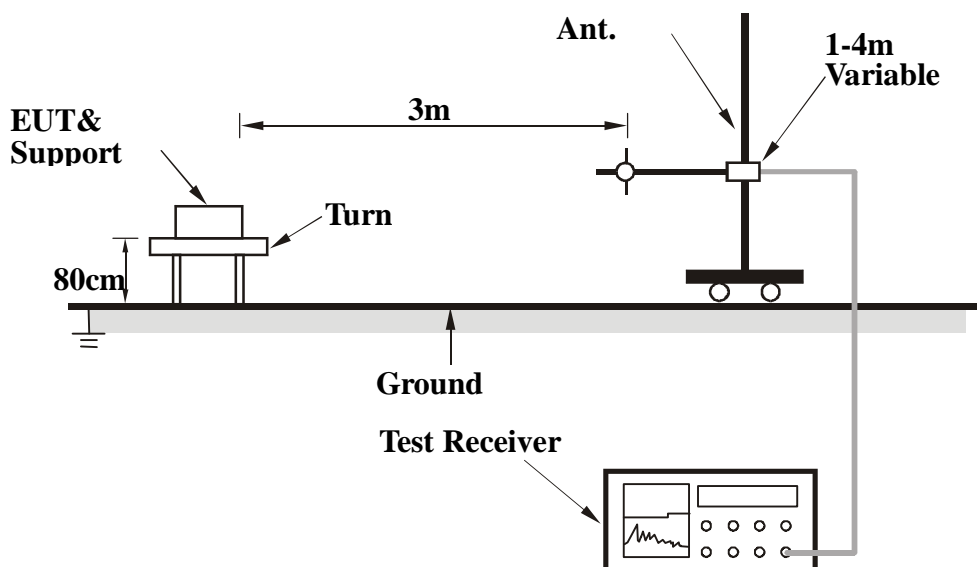
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 m above the ground.
- c. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading and recorded the value.
- d. The EUT is replaced by a horn antenna connected to a signal generator tuned to the frequency of emission.
- e. The signal generator level has to be adjusted to have the same emission nature.
- f. The radiated power can be calculated via the factor and antenna gain.
- g. Repeat step a ~ f for horizontal polarization.

NOTE: The resolution bandwidth of spectrum analyzer is 1MHz and the video bandwidth is 3MHz.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

- a. The notebook controlled EUT to export rated output power under transmission mode and specific channel frequency.

4.2.7 TEST RESULTS

FREQUENCY RANGE	Above 1000MHz	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	18 deg. C, 71 %RH, 963hPa	TESTED BY	Wen Yu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Power level (dBm)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Emission Level (dBuV/m)
1	4924.00	-28.93	-13.00	-54.94	26.01	67.37
2	5375.00	-20.67	-13.00	-47.54	26.87	75.53
3	7386.00	-32.83	-13.00	-63.07	30.24	63.37
4	8062.50	-38.98	-13.00	-71.5	32.52	56.32
5	10750.00	-44.37	-13.00	-72.5	28.13	50.83

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Power level (dBm)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Emission Level (dBuV/m)
1	4924.00	-35.17	-13.00	-61.18	26.01	61.13
2	5375.00	-24.04	-13.00	-50.91	26.87	72.16
3	7386.00	-32.28	-13.00	-62.52	30.24	63.92
4	8062.50	-37.09	-13.00	-69.61	32.52	58.21
5	10750.00	-42.89	-13.00	-71.02	28.13	52.31

REMARKS: 1. The other emission levels were very low against the limit.



5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



6 INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC, UL, A2LA
GERMANY	TUV Rheinland
JAPAN	VCCI
NORWAY	NEMKO
CANADA	INDUSTRY CANADA , CSA
R.O.C.	TAF, BSMI, NCC
NETHERLANDS	Telefication
SINGAPORE	GOST-ASIA (MOU)
RUSSIA	CERTIS (MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:

www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab: Web Site: www.adt.com.tw

Tel: 886-3-3183232

Fax: 886-3-3185050

The address and road map of all our labs can be found in our web site also.