FCC Part 15, Subpart C (Intentional Radiator)
Product Name: IBM ThinkPad i Series 1300
1171-21A/2AU/71U

FCC ID: ANO12P701X

September 4, 2000

EMC Engineer

Takeshi Asano

Signature:

IBM Japan, Ltd.
EMC Engineering
LAB-S59
1623-14, Shimotsuruma,
Yamato-shi Kanagawa-ken 242, Japan
Phone: +81-46-215-4779
Fax: +81-46-273-7420
E-Mail: asano@jp.ibm.com

EMC Engineering manager / NVLAP signatory

Akihisa Sakurai

Signature:

IBM Japan, Ltd.
EMC Engineering
LAB-S59
1623-14, Shimotsuruma,
Yamato-shi Kanagawa-ken 242, Japan
Phone: +81-46-215-2613
Fax: +81-46-273-7420
E-Mail: akihisa@jp.ibm.com

Product Manager

Satoshi Tsutsui

Signature:

IBM Japan, Ltd.
Business & Technology Planning
LAB-R12
1623-14, Shimotsuruma,
Yamato-shi Kanagawa-ken 242, Japan
Phone: +81-46-215-2690

Portable Systems Director

Makoto Yashiro

Signature:

IBM Japan, Ltd.
Portable Systems
LAB-R11
1623-14, Shimotsuruma,
Yamato-shi Kanagawa-ken 242, Japan
Phone: +81-46-215-2230

MEASUREMENT/TECHNICAL REPORT – Part 15 Subpart C (Intentional Radiator)

IBM ThinkPad i Series 1300
(1171-21U/2AU/71U)

FCC ID : ANO12P701X

September 4, 2000

This report concerns: (check one)
Original Grant ✓
Class I change
Class II change

Equipment type: Wireless LAN device in Computer (computer, printer, modem, etc.)

This report shall not be reproduced except in full, without the written permission of this test lab.

The measurement results contained in this report relate only to the item which was tested.

Measurement procedure used is ANSI C63.4-1992 unless otherwise specified.
Other test procedure:

The FCC has issued provisional acceptance of this test laboratory for Declaration of Conformity testing per letter dated 1997.

APPLICANT ANTI-DRUG ABUSE CERTIFICATION:
By checking yes, the applicant certifies that, in the case of an individual applicant, he or she is not subject to a denial of federal benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse of 1988, 21 U.S.C. 853(a), or, in the case of a non-individual applicant (e.g. corporation, partnership or other unincorporated association), no party to the application is subject to a denial of federal benefits, that includes FCC benefits, pursuant to that section. For the definition of a "party" for these purposes, see 47 CFR 1.2002(b).

(Yes) or No

"Report shall not be reproduced except in full, without the written approval of the laboratory" "the report must not be used by the client to claim product endorsement by NVLAP or any agency of the US government"

Prepared by: Takeshi Asano
IBM Japan Corporation, Yamato EMC Enginnering
LAB-S59, 1623-14, Shimotsuruma, Yamato-shi Kanagawa-ken 242-8502, Japan
Tel: +81-46-215-4779 Fax: +81-46-273-7420

1. GENERAL INFORMATION

1.1 Objective

This is an IBM ThinkPad i Series 1300 (1171-21U/2AU/71U) FCC Part 15, Subpart C (Intentional Radiator) Certification Compliance Report.

1.2 Product Description

The ThinkPad i Series 1300 (model 1171-21U/2AU/71U) is a portable type notebook personal computer which has IEEE 802.11b Wireless LAN function inside (Lucent miniPCI IEEE802.11b Wireless LAN card and IBM original integrated 2 slot type antennas). These models feature as follows;

[Common features]

- Intel® Mobile Celeron® processor at 550 MHz with 128 KB of on-board cache.
- 64-bit SDRAM memory
- 2.5” 5GB Hard file
- 24X CD-ROM drive
- 56Kbps software modem
- PCMCIA slot (type-2 x 1 or type-3 x 1)
- CRT, USB(x2), KBD/MOUSE, Headphone, Mic-in, RJ-11, DC-in ports
- IEEE 802.11b Wireless-LAN function (figure in p.31)
  [Lucent MPCI3A-20 miniPCI card]
  - IEEE 802.11b Wireless-LAN (2.4GHz band)
  - divercity antenna switch circuit integrated on the card (2 antenna connectors)
  [IBM antennas]
  - 2 slot type antennas inside of LCD bezel
  - feeding with thin coax cables (40cm) from each connector on the card to each antenna directly

[model 21U/2AU]

- 12” HPA LCD (800x600)

[model 71U]

- 13” TFT LCD (1024x768)

Table 1: Models of ThinkPad i 1300

Model	CPU	LCD Panel	DRAM	HDD	CD-ROM	IEEE802.11b	AAL	O/S
1171-21U	Celeron 550	12” HPA	64MB	5GB	24 X	Yes	No	Win ME
1171-2AU	Celeron 550	12” HPA	64MB	5GB	24 X	Yes	Yes	Win ME
1171-71U	Celeron 550	13” TFT	64MB	5GB	24 X	Yes	No	Win ME

Note: AAL (Anytime Anywhere Learning) is a name of a pre-loaded application

1.3 Related Submittal(s)/Grant(s)/Notes

There are no related submitals and grants
The device without Wireless LAN function is classified as a digital device under Part 15 Subpart B and subject to DoC.

1.4 Compliance Summary

The IBM ThinkPad i 1300 (1171-21U/2AU/71U) does comply with the Part 15 Subpart C.
Tests were performed by IBM, Lucent and Senton (test house). The system tests (emission) were performed by IBM while the wireless card tests were performed by Lucent or Senton. (see Chapter 4 in detail)

1.5 Condition of EUT

The physical condition of the EUT tested:

_____ Prototype
___✓___ Preproduction
_____ Production

1.6 Dates of Receipt of EUT

The EUT was logged into Yamato EMC Engineering on August 18, 2000.

1.7 Dates of Measurements

Measurements were performed on August 28 through September 4, 2000.

1.8 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4-1992.
Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.9 Deviations from Test Methodology

There is no deviation from the test methodology.

1.10 Test Facility / NVLAP Accreditation

The semi-anechoic chamber #2 and conducted measurement facility used to correct the data are located in Yamato Laboratory, IBM Japan. These facilities have been fully described in a report dated September 1998, submitted to your office, and accepted in a letters, dated Nov. 2,1998(31040/SIT).
IBM Yamato EMC Engineering is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with Criteria established in Title 15, Part 285 Code of Federal Regulations.(NVLAP Lab code: 200198-0)

1.11 Test Facility, Radiated (above 1000 MHz)

The same test chamber described above was used to measure the radiated emissions between 1000 MHz and 25000 MHz.

1.12 Test System Details

Table 2 shows test system details.

Table 2 EUT and Peripheral Equipment List for Radiated and Conducted Emissions

Model Number &S/N	**FCC ID**	**Description**	**Cable Description**
1171-71U (EUT) (s/n AA-005B6)	ANO12P701X	IBM Notebook PC ThinkPad i Series 1300 CPU: Intel Celeron 550MHz	
P/N 02K6544	N/A	Universal AC adapter 56W	Unshielded power cord

2. PRODUCT LABELING

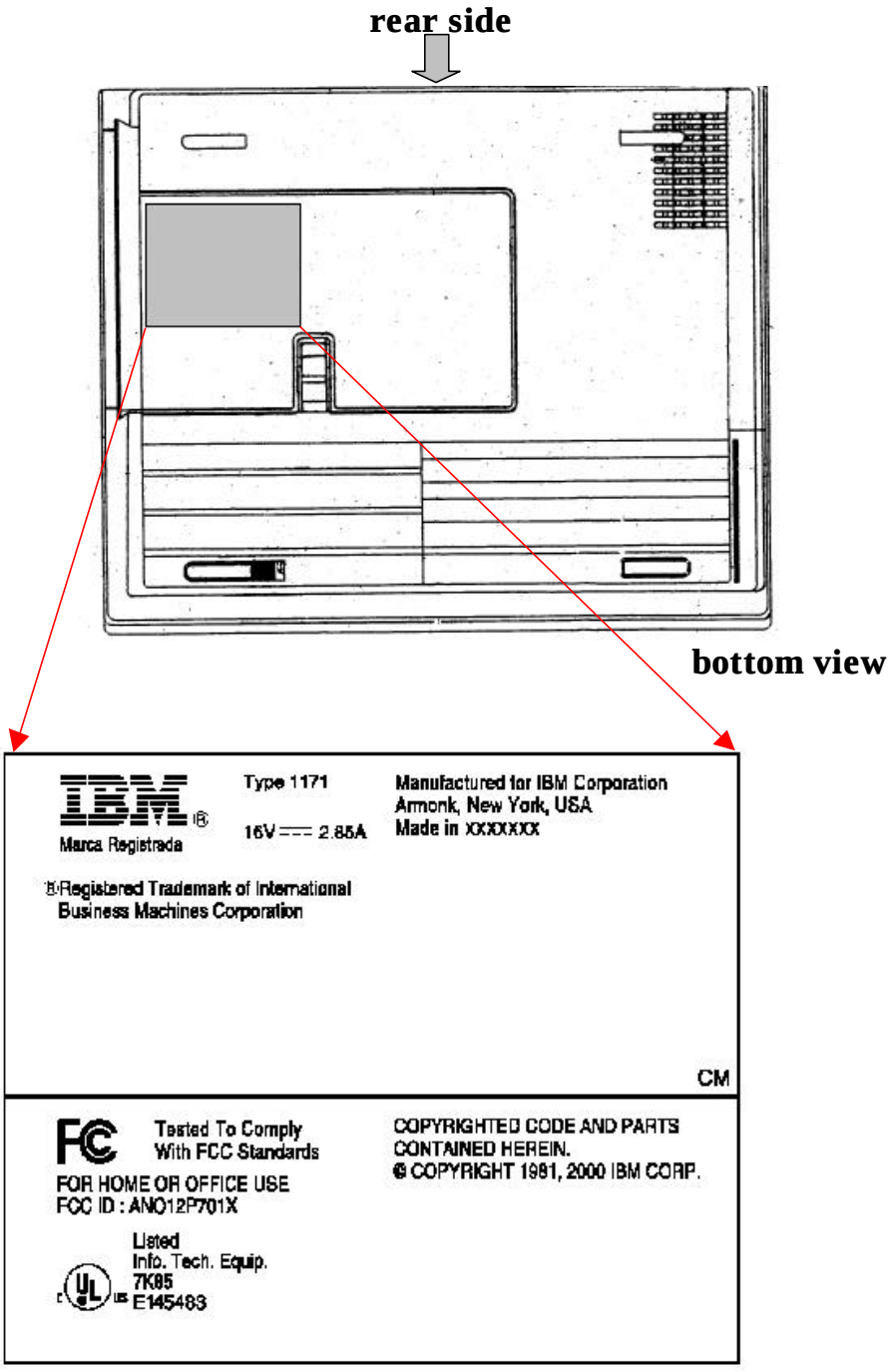


Fig.1 FCC label of ANO12P701X

3. BLOCK DIAGRAM

3.1 Block Diagram of the PC system unit

(IBM ThinkPad i Series 1300)

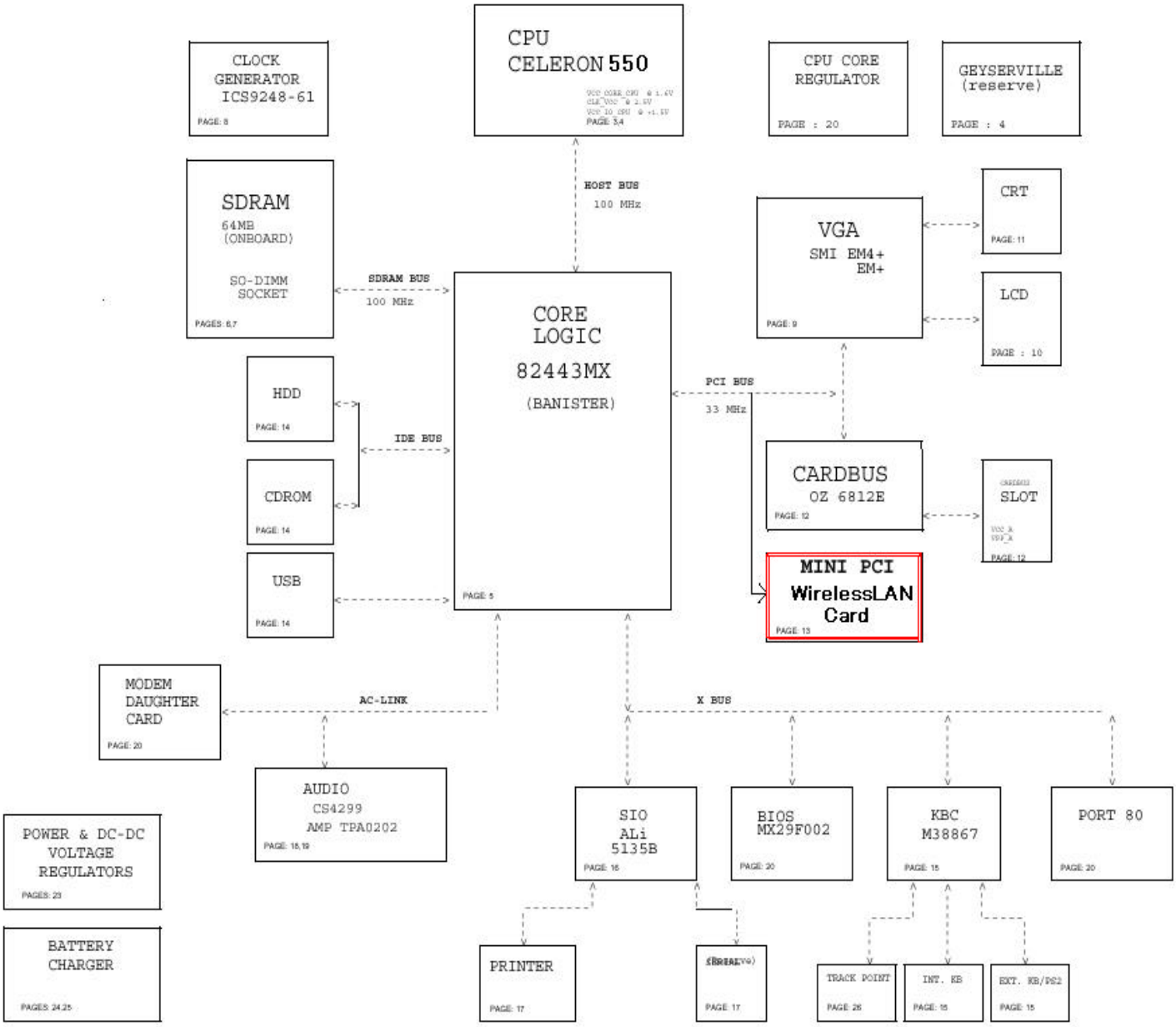
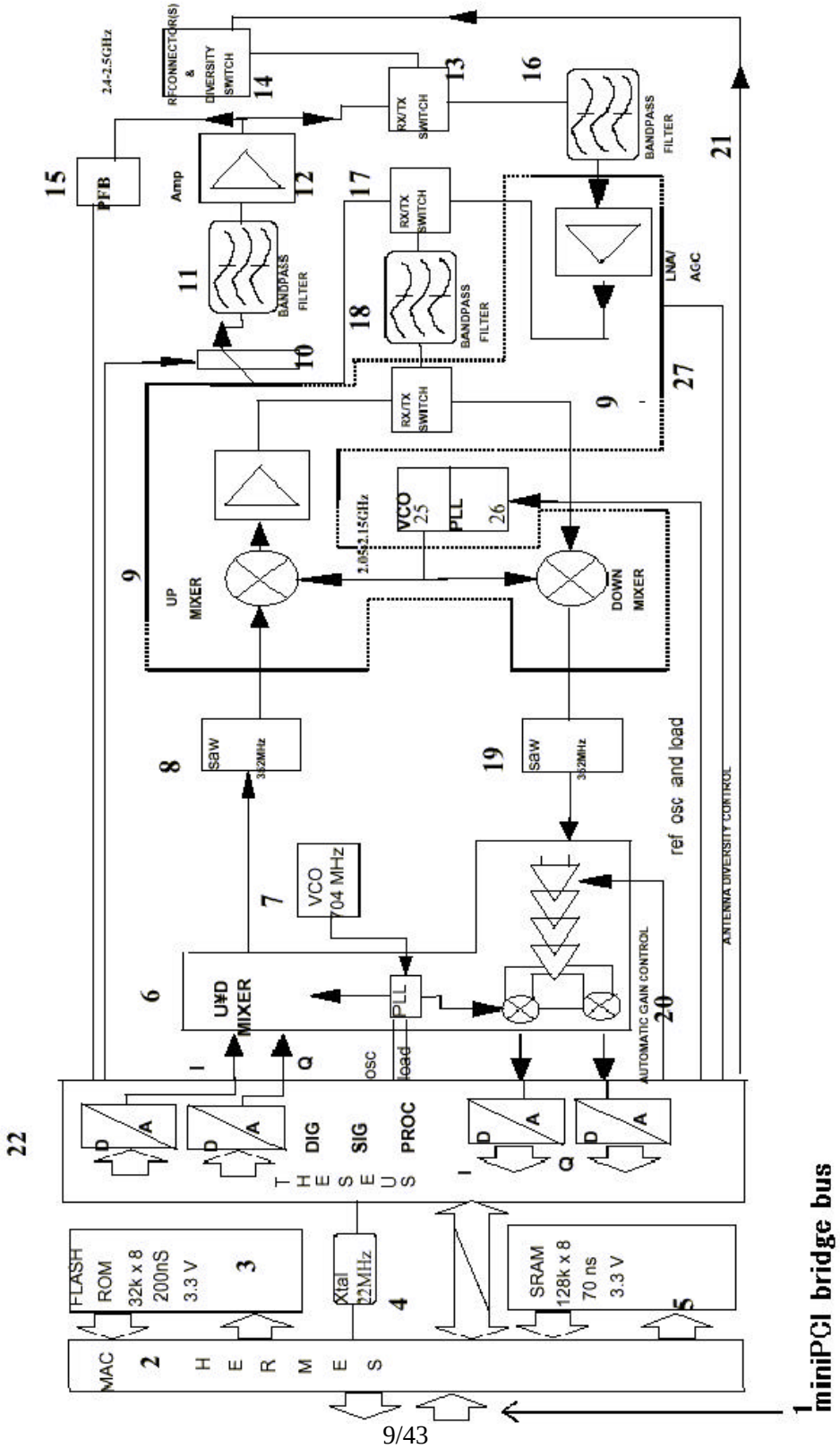


Fig. 2 Block diagram of ThinkPad i 1300

Prepared by T. Murota and T. Asano

3.2 Block Diagram of the Wireless-LAN mini-PCI card

Fig. 3 Block diagram of the Wireless-LAN mini-PCI card



3.3 Description of the Wireless-LAN mini-PCI card

The various parts of the Block diagram are numbered and an explanation is given of these blocks.

3.3.1 General RF specifications

			Specifications	Related regulation	Attached Refference
Peak output power			31.6mW (15dBm)	Part 15.247.b	Page 39(Senton-TP.pdf)
Frequency range	Lowest (Ch.1)	center	2.412GHz		Page 67(Senton-TP.pdf)
		6db BW	2.404GHz	Part 15.247.a2	Page 32(Senton-TP.pdf)
	Highest (CH.11)	center	2.462GHz		Page 75(Senton-TP.pdf)
		6db BW	2.470GHz	Part 15.247.a2	Page 38(Senton-TP.pdf)

3.3.2 Transmitter functions

A) Digital Signal Processor. (22)
Function : Generate spread signal with an Barker sequence of 11, the original raw data rate of two Megabits is transformed to a symbol rate of one MegaBaud and multiplied with eleven and modulated with a DQPSK (Differential Quadrature Phase Shift Keying) Modulation. The unfiltered data comes out of I and Q and goes to the up/down mixer (6)

B) The above signals are mixed in (6) in a so called quadrature modulator with the Intermediate Frequency (IF) of 352 MHz.

C) The upmixer is fed by the VCO of 704 MHz, which is divided by 2 to 352 MHz.
D) The SAW (8) filters all unwanted mixing products, such that only the 352 MHz band remains.
E) This signal goes into the RF upmixer (9) SA2420 were it is mixed with the RF VCO with a range of 2050 to 2150 MHz.
F) The Rx/Tx switch (17) brings the signal to the variable attenuator (10), where the output level is controlled.
G) The signal is fed through a 2.4- 2.5 GHz bandpass filter (11) to remove all unwanted mixer products, and thus to get a clean signal for further processing.
H) The signal is amplified in (12), with approx. 23 dB to an output level of approx. 15 dBm
I) This signal goes to the special connector.
J) The output power is controlled with a so called power feed back loop (15) in which the output power is compared with a DAC value from (10)

3.3.3 Receiver functions

K) The receive signal enters the antenna passes the RX/TX switch (14) and (13) this is set to RX mode.
L) The signal goes through the 2.4 GHz filter (16) to remove all unwanted spectral components in order to deliver a clean signal for the receiver.
M) A Low Noise Amplifiers (LNA) (in 9) is used to amplify the weak signal to a level fitted for down mixing.

Prepared by T. Murota and T. Asano

N) The AGC (27) can amplify or attenuate the signal according to the Digital signal processor required input with a step size of 26 dB.
O) Again the Rx/Tx switch in the Rx mode is passed and also the same filter as in transmit mode (18).
P) The down mixer (9) mixes the 2.4 GHz with the 2.1 GHz to the 352 MHz IF.
Q) The signal of 352 MHz is amplified again (9) and filtered by a SAW filter (19) to give a clean signal for the second mixer.
R) The Downmixer (6) mixes the 352 MHz signal down to the I and Q signals, also the auto gain control can increase the level to the required level via line 20.
S) The very low amplitude baseband I and Q signal is amplified in the AMPs (6) to a level fitted for the Analogue to Digital converters (22), which make it a proper signal for the digital signal processor.
T) The digital signal processor (22) removes the spreading as present on the signal with a so called autocorrelation function. The resulting output of the processor is a received data rate of 2 Megabits.

3.3.4 VCO, PLL and OSC

U) These three form one entity to generate a single tone signal for down mixing.
There are two of these blocks available, one for the IF LO (7 and 6) (352MHz) and one for the RF LO (25 and 26) of 2050 to 2150 MHz.
V) All the PLL's and the processor (2) have one reference Crystal of 22 MHz (4) with an accuracy of 25 ppm.

3.3.5 General circuits

W) Antenna Diversity.
Depending on the signal strength and signal quality the Digital processor (22) can select between two antenna's which gives the best signal. This is done initial during the training sequence in the received signal.

X) Automatic Gain control.
Depending on the signal strength and signal quality the Digital processor (22) can choose to increase or decrease the signal level at the digital input, this is done by reducing or increasing the gain in the receiver via the LNA-AGC (in 9).

Y) The Signal processor (22) can read via the MAC (2) the registers for programming all

Z) The MAC is used to do the handshaking with the miniPCI bridge chip bus (1) and handling the IEEE protocol. Also used to load the PLL frequencies and dividers, also used to interface to the EEPROM which contains all parameters for the PLL's and the Callcode

4. LIST OF MEASUREMENTS

Table 3 shows the list of the measurements for FCC Part 15 Subpart C.

Table 3 List of the measurements for FCC Part 15 Subpart C

Section(s)	Test	Page	Result
	Transmit mode (TX):		
15.247.a2	Minimum 6 dB bandwidth	---	Refer to SENTON Report No. 56305-00323-1 (Attached file Senton-TP.pdf)
15.247.b	Maximum peak output power	---	Refer to SENTON Report No. 56305-00323-1 (Attached file Senton-TP.pdf)
15.247.d	Peak power density	---	Refer to SENTON Report No. 56305-00323-1 (Attached file Senton-TP.pdf)
	Frequency range (conducted)	---	Refer to SENTON Report No. 56305-00323-1 (Attached file Senton-TP.pdf)
15.247.e	Processing gain	---	Refer to Lucent Report No. 015127, Rev. A (Attached file Lucent-TP.pdf)
15.207	Conducted emission test 450kHz – 30MHz	15	Passed (Refer to Chapter 7)
15.247.c 15.209 15.205.a, b	Radiated emission test 9kHz – 30MHz	---	Not applicable (acc. to Section 15.33)
15.247.c 15.209 15.205.a, b	Radiated emission test 30MHz – 1GHz	18	Passed (Refer to Chapter 8)
15.247.c 15.209 15.205.a, b	Radiated emission test 1GHz – 25GHz	23	Passed (Refer to Chapter 9)
	Receive mode (RX):		
15.207	Conducted emission test 450kHz – 30MHz	15	Passed (Refer to Chapter 7)
15.209	Radiated emission test 9kHz – 30MHz		Not applicable (acc. to Section 15.33)
15.209	Radiated emission test 30MHz – 1GHz	18	Passed (Refer to Chapter 8)
15.209	Radiated emission test 1GHz – 12.5GHz	23	Passed (Refer to Chapter 9)
15.247.b	Antenna gain measurement	28	Less than 6 dBi (Refer to Chapter 10)

Notes;

- Card dependant measurements were performed by Senton and Lucent.
- Antenna dependant measurements were performed by IBM.

5. SYSTEM TEST CONFIGURATION

5.1 Justification

The EUT was evaluated with the following configuration as user typical configurations. This report describes one configuration to check the radiated and conducted emission with IEEE 802.11b function active as an intentional radiator. No I/O was attached during the test for fear that it should affect the emission.

5.2 EUT Exerciser Software

The exerciser software "WaveLAN-II Engineering Test Program", Version v01.21 (Oct.11, 1999) was used during the radiated and conducted emission testing. Three kinds of modulation are used for transmission with appropriate bit rates:

Table 4 Transmit mode (TX)

Operation Frequency [GHz]	Rated output power (conducted) [dBm]			Test performed*
	Bit rate 2Mbps	Bit rate 5.5Mbps	Bit rate 11Mbps	
2.412 (Ch. 1)	+15	+15	+15	X
2.417 (Ch. 2)	+15	+15	+15	
2.422 (Ch. 3)	+15	+15	+15	
2.427 (Ch. 4)	+15	+15	+15	
2.432 (Ch. 5)	+15	+15	+15	
2.437 (Ch. 6)	+15	+15	+15	
2.442 (Ch. 7)	+15	+15	+15	X
2.447 (Ch. 8)	+15	+15	+15	
2.452 (Ch. 9)	+15	+15	+15	
2.457 (Ch. 10)	+15	+15	+15	
2.462 (Ch. 11)	+15	+15	+15	X

* Full testing with bit rate 11Mbps only

Table 5 Receive mode (RX)

Operation Frequency [GHz]	Test performed
2.412 (Ch. 1)	
2.417 (Ch. 2)	
2.422 (Ch. 3)	
2.427 (Ch. 4)	
2.432 (Ch. 5)	
2.437 (Ch. 6)	
2.442 (Ch. 7)	X
2.447 (Ch. 8)	
2.452 (Ch. 9)	
2.457 (Ch. 10)	
2.462 (Ch. 11)	

5.3 Special Accessories

No special accessories were used.

5.4 Equipment Modification

No modifications were made to the equipment tested.

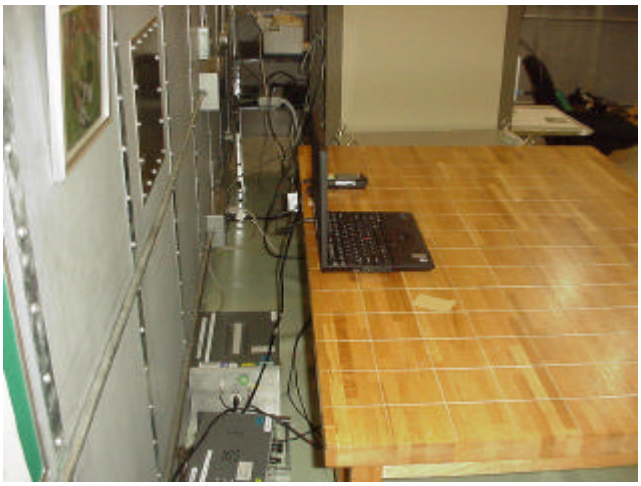
Prepared by T. Murota and T. Asano

6. CONDUCTED AND RADIATED MEASUREMENT PHOTOS

Radiated Emission - Front View
(EMI SEMIANECHOIC CHAMBER)

Radiated Emission – Rear View
(EMI SEMIANECHOIC CHAMBER)

Conducted EMI - Front View



Conducted EMI – Side View

7. CONDUCTED EMISSION MEASUREMENT (450kHz – 30MHz)

7.1 Test Procedure

The conducted emissions are measured in the IBM shielded room with a spectrum analyzer in peak hold. The system is operated with the EUT Exerciser software. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9KHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

Table 6. Conducted Emission Test Instrumentation

Description	**Model**	**Serial Number**	**Calibration Date**	**Calibration Interval**
Computer	IBM 6589-13J	97-15613	N/A	N/A
Spectrum Analyzer (100Hz-1.5GHz)	HP 8568B	3019A05156	03/27/00	1 year
Spectrum Analyzer Display	HP 8568B	3026A19366	03/27/00	1 year
Quasi-Peak Adapter	HP 85650A	2811A01433	03/27/00	1 year
Receiver (9kHz-30MHz)	R&S ESH3	891806/012	09/14/99	1 year
LISN (for EUT)	EMCO 3825/2	1426	09/10/99	1 year
LISN (for non-EUT)	Schwarzbeck NNLA-8120A	8120460A	09/10/99	1 year
Switch/control unit	HP 3488A	2719A17228	N/A	N/A
Plotter	HP 7550A	2631A33619	N/A	N/A
Coax cables: (See Figure 5.)	Length:			
- Lisn-L <=> SW/Con.unit (SW100)	4 m	- EMIC-L	04/14/00	1 year
- Lisn-N <=> SW/Con.unit (SW101)	4 m	- EMIC-N	04/14/00	1 year
- SW/Con.unit <=> RCVR (Input)	1 m	- EMIC-R	04/14/00	1 year
- SW/Con.unit<=> Spe Ana.(Signal In)	1 m	- EMIC-S	04/14/00	1 year

Notes:

- The above equipment calibration is traceable to National standards.
- HP: Hewlett Packard, R&S: Rohde & Schwarz

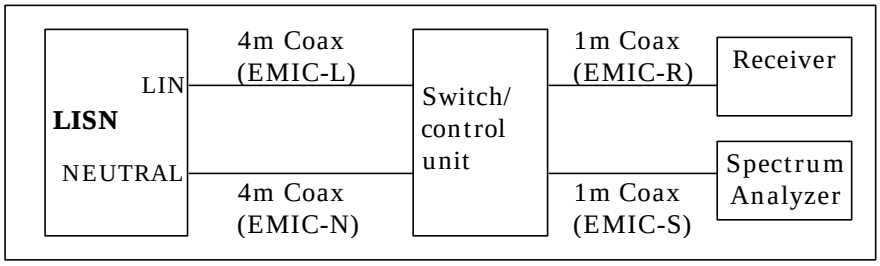


Figure 4. Cables for Conducted Emission Test

7.2 Conducted Emission Measured Data

The EUT was found to comply with the FCC Part15 Subpart C limits with a margin of 10.2 dB. A minimum of the 6 highest emissions relative to the limits are provided.

Table 7-1. EUT: M/T 1171-71U, s/n AA-005B6, Ch.1(2412MHz) TX mode 11Mbps

Frequency (MHz)	QP Voltage (dBμV)	QP Limit (dBμV)	QP Voltage (μV)	QP Limit (μV)	Phase
0.5627	29.3	48.0	29.2	250	Line
0.6287	30.1	48.0	32.0	250	Neutral
1.7552	28.4	48.0	26.3	250	Neutral
4.5059	35.1	48.0	56.9	250	Line
6.7208	37.7	48.0	76.7	250	Neutral
25.1273	23.7	48.0	15.3	250	Line

Table 7-2. EUT: M/T 1171-71U, s/n AA-005B6, Ch.7(2442MHz) TX mode 11Mbps

Frequency (MHz)	QP Voltage (dBμV)	QP Limit (dBμV)	QP Voltage (μV)	QP Limit (μV)	Phase
0.5659	30.2	48.0	32.4	250	Line
0.6313	30.8	48.0	34.7	250	Neutral
1.6423	28.1	48.0	25.4	250	Neutral
4.5529	35.8	48.0	61.7	250	Line
6.6189	37.1	48.0	71.6	250	Neutral
17.0968	23.3	48.0	14.6	250	Line

Table 7-3. EUT: M/T 1171-71U, s/n AA-005B6, Ch.11(2462MHz) TX mode 11Mbps

Frequency (MHz)	QP Voltage (dBμV)	QP Limit (dBμV)	QP Voltage (μV)	QP Limit (μV)	Phase
0.5690	29.9	48.0	31.3	250	Line
0.8162	25.3	48.0	18.4	250	Line
1.3895	29.2	48.0	28.8	250	Neutral
4.2272	35.3	48.0	58.2	250	Line
6.6233	37.8	48.0	77.6	250	Neutral
25.6777	22.8	48.0	13.8	250	Line

Table 7-4. EUT: M/T 1171-71U, s/n AA-005B6, Ch.7(2442MHz) RX mode

Frequency (MHz)	QP Voltage (dBμV)	QP Limit (dBμV)	QP Voltage (μV)	QP Limit (μV)	Phase
0.5646	29.8	48.0	30.9	250	Line
0.6957	27.1	48.0	22.6	250	Line
1.7637	28.6	48.0	26.9	250	Neutral
4.2274	35.5	48.0	59.6	250	Line
6.6224	37.6	48.0	75.9	250	Neutral
16.8293	22.5	48.0	13.3	250	Line

Test Personnel:

Tester Signature : T. Asano Date Sep. 4, 2000

Tester Name : Takeshi Asano

8. RADIATED EMISSION MEASUREMENT (30MHz – 1GHz)

8.1 Test Procedure

Preliminary radiated emissions are measured in the semi-anechoic chamber at a 3 meter distance on every azimuths in both horizontal and vertical polarity. The antennas are also scanned in height. The emissions are recorded with a spectrum analyzer in peak hold mode. The identified emissions are further maximized by a cable manipulation. The noise closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120kHz. The highest emissions relative to the limit are listed. The instrumentation used is listed Table 8.

Table 8 Radiated Emission Test Instrumentation

Description	**Model**	**Serial Number**	**Calibration Date**	**Calibration Interval**
Computer	IBM 5551-L	#4	N/A	N/A
Spectrum Analyzer (100Hz-1.5GHz) for 30-200MHz	HP 8568B	3019A05155	01/28/00	1 year
Spectrum Analyzer Display for 30-200MHz	HP 8568B	3026A19353	01/28/00	1 year
Quasi-Peak Adapter for 30-200MHz	HP 85650A	3033A01449	01/28/00	1 year
Spectrum Analyzer (100Hz-1.5GHz) for 200-1000MHz	HP 8568B	2732A03651	10/01/99	1 year
Spectrum Analyzer Display for 200-1000MHz	HP 8568B	2648A15255	10/01/99	1 year
Quasi-Peak Adapter for 200-1000MHz	HP 85650A	2521A00968	10/01/99	1 year
Amplifier (100KHz-1.3GHz)				
- for 30-200MHz	HP 8447F	3113A04622	04/14/00	1 year
- for 200-1000MHz	HP 8447F	3113A04620	04/14/00	1 year
Biconical Antenna (30-200MHz)	EMCO 3108	2536	10/12/99	1 year
Log-Periodic Antenna (200-1000MHz)	EMCO 3146	2849	09/09/99	1 year
Receiver (20MHz-1.3GHz)	R&S ESVP	892111/026	10/01/99	1 year
Switch/control unit	HP 3488A	2719A17229	N/A	N/A
Plotter	HP 7550A	3040A09092	N/A	N/A
N-Coax cables: (See Figure 6.)	Length:			
- Bi-coni Ant <=> 10m Cable	9 m	- EM203L01	04/14/00	1 year
- 10m Cable <=> Shield Panel	10 m	- EM203L02	04/14/00	1 year
- Shield Panel <=> RF Amp	7 m	- EM203L03	04/14/00	1 year
- RF Amp <=> Power Splitter	0.5m	- EM203L04	04/14/00	1 year
- Log-peri Ant <=> 10m Cable	9 m	- EM203H01	04/14/00	1 year
- 10m Cable <=> Shield Panel	10 m	- EM203H02	04/14/00	1 year
- Shield Panel <=> RF Amp	7 m	- EM203H03	04/14/00	1 year

- RF Amp <=> Power Splitter	0.5m	- EM203H04	04/14/00	1 year
Coax cables:				
- Power Splitter <=> SW/Con.unit (SW110)	1 m	- EM203L05	04/14/00	1 year
- Power Splitter <=> SW/Con.unit (SW300)	1 m	- EM203L06	04/14/00	1 year
- Power Splitter <=> SW/Con.unit (SW100)	1 m	- EM203H05	04/14/00	1 year
- Power Splitter <=> SW/Con.unit (SW301)	1 m	- EM203H06	04/14/00	1 year
- SW/Con.unit <=> Receiver (Input)	2 m	- EM2RCV	04/14/00	1 year
- SW/Con.unit <=> Spe Ana.(Signal In) for 30- 200MHz	2 m	- EM2SPL	04/14/00	1 year
- SW/Con.unit <=> Spe Ana.(Signal In) for 200-1000MHz	2 m	- EM2SPH	04/14/00	1 year

Notes:

- The above equipment calibration is traceable to National standards.
- HP: Hewlett Packard, R&S: Rohde & Schwarz

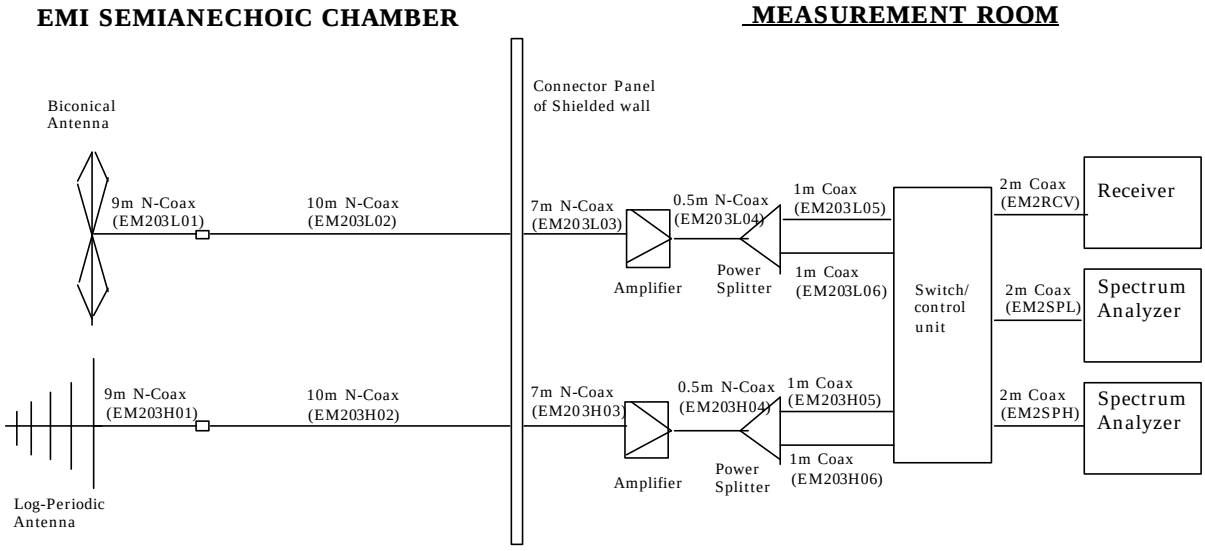


Figure 5 Cables for Radiated Emission Test

8.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver. All factors are included in the reported data.

FS = R + AF + CORR

where:

FS	=	Field Strength
R	=	Measured Receiver Input Amplitude
AF	=	Antenna Factor
CORR	=	Correction Factor = CL - AG
CL	=	Cable Loss
AG	=	Amplifier Gain

Given a Receiver input reading of 51.5dBμV; Antenna Factor of 8.5dB/m; Cable Loss of 1.3dB; and an Amplifier Gain of 26dB. The Field Strength of the measured emission is:

FS = 51.5+8.5+1.3-26.0 = 35.3dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level(dBμV/m) = 20 $\times$ Log(Level(μV/m))

40dBμV/m = 100μV/m
48μV = 250μV

8.3 Radiated Emission Measured Data

The EUT was found to comply with FCC Part15 Subpart C limits with a margin of 5.5dB. A minimum of the 6 highest emissions relative to the limits are provided.

Table 9-1. EUT: M/T 1171-71U, s/n AA-005B6, Ch.1(2412MHz) TX mode 11Mbps

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
73.731	V	39.9	7.8	-21.7	26.0	40	20.0	100
195.680	H	44.3	13.7	-20.3	37.7	43.5	76.7	150
199.934	H	33.1	13.8	-20.0	26.9	43.5	22.1	150
384.059	V	42.0	14.7	-16.7	40.0	46	100.0	200
391.358	V	38.2	14.9	-16.6	36.5	46	66.8	200
456.584	V	40.0	16.3	-16.8	39.5	46	94.4	200

Table 9-2. EUT: M/T 1171-71U, s/n AA-005B6, Ch.7(2442MHz) TX mode 11Mbps

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
73.731	V	39.8	7.8	-21.7	25.9	40	19.7	100
195.680	H	44.0	13.7	-20.3	37.4	43.5	74.1	150
372.268	H	36.5	14.4	-16.4	34.5	46	53.1	200
384.058	V	42.5	14.7	-16.7	40.5	46	105.9	200
400.904	H	38.2	15.2	-16.7	35.0	46	56.2	200
456.584	V	39.9	16.3	-16.8	39.4	46	93.3	200

Table 9-3. EUT: M/T 1171-71U, s/n AA-005B6, Ch.11(2462MHz) TX mode 11Mbps

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
195.679	H	44.1	13.7	-20.3	37.5	43.5	75.0	150
372.268	H	38.5	14.4	-16.4	36.5	46	66.8	200
384.059	V	42.5	14.7	-16.7	40.5	46	105.9	200
391.358	V	37.6	14.9	-16.6	35.9	46	62.3	200
400.904	H	36.1	15.2	-16.7	34.6	46	53.7	200
456.584	V	39.9	16.3	-16.8	39.4	46	93.3	200

Table 9-4. EUT: M/T 1171-71U, s/n AA-005B6, Ch.7(2442MHz) RX mode

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
73.732	V	40.2	7.8	-21.7	26.3	40	20.7	100
195.680	H	44.3	13.7	-20.3	37.7	43.5	76.7	150
372.267	H	39.3	14.4	-16.4	37.3	46	73.3	200
384.059	V	41.9	14.7	-16.7	39.9	46	98.9	200
391.358	V	38.1	14.9	-16.6	36.4	46	66.1	200
456.584	V	40.8	16.3	-16.8	40.3	46	103.5	200

Test Personnel:

Tester Signature : T. Asano Date Sep. 4, 2000

Tester Name : Takeshi Asano

9. RADIATED EMISSION MEASUREMENTS (1GHz – 25GHz)

9.1 Test Procedure

Radiated emissions were measured in the frequency range with 1 GHz to 25GHz in transmitting mode and 1 GHz to 12.5 GHz in receiving mode. All tests were performed in the semi-anechoic chamber at a 3-meter distance (except for the frequency range with 18 GHz to 25 GHz where test distance was reduced to 1 meter) on both horizontal and vertical polarities. The antenna was also scanned in height. The emissions are recorded with a spectrum analyzer in peak hold mode. The identified emissions are further maximized as a function of cable manipulation, azimuth, and antenna height. The emissions closest to the limits are measured in the peak mode with the tuned spectrum analyzer using a bandwidth of 1MHz and the average setting mode with the tuned spectrum analyzer using resolution bandwidth of 1MHz / video bandwidth of 100Hz. The highest emissions relative to the limit are listed.

Test instrumentation used is listed in Table 10.

Table 10 Radiated Emission Test Instrumentation (1GHz – 25GHz)

Description	**Model**	**Serial Number**	**Calibration Date**	**Calibration Interval**
Spectrum Analyzer EMI Test Receiver	R&S ESI26	836119/003	07/12/00	1 year
Amplifier (1-26.5GHz)	HP 8449B	3008A00580	06/02/00	1 year
Horn Antenna (1- 18GHz)	EMCO 3115	6121	04/17/00	1 year
Horn Antenna (18- 26.5GHz)	EMCO 3160-9	0004-1202		
SF106 cables: (See Figure 7.) - Horn Ant <=> RF Amp. - RF Amp.<=>Spectrum Analyzer	Length: 6 m 15 m	 - EM206SCO - EM215SCO	 08/10/00 08/10/00	 1 year 1 year

Notes.

- The above equipment calibration is traceable to National standards.
- HP: Hewlett Packard, R&S: Rohde & Schwarz

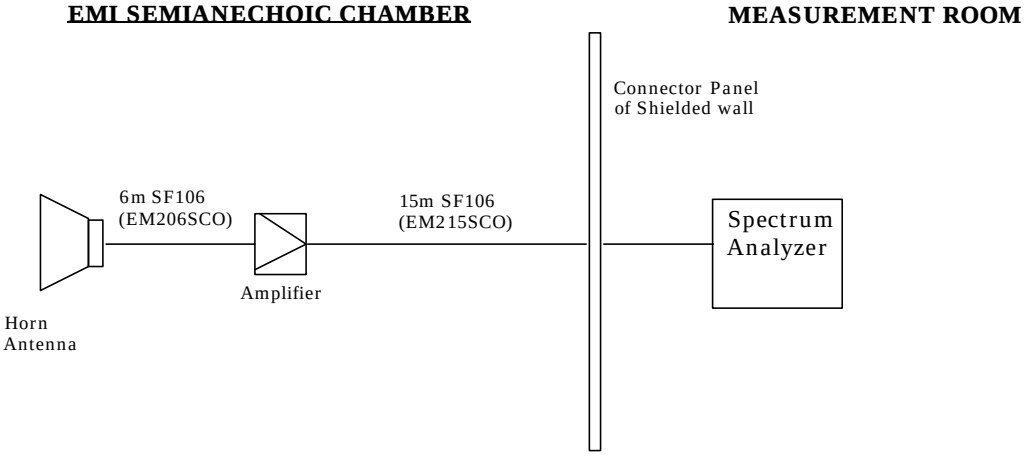


Figure 6 Cables for Radiated Emission Test

9.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where:

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL-AG
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor

Given a Spectrum Analyzer input reading of 51.5 dBμV; Antenna Factor of 8.5 dB/m; Cable Loss of 1.3 dB; Falloff Factor of 0 dB; and an Amplifier Gain of 26 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 – 26 – 0.0 = 35.6 dBμV/m

Conversions between dBμV/m (or dBμV) and μV/m (or μV) are done as :

Level(dBμV/m) = 20 X Log (Level(μV/m))

40 dBμV/m = 100 μV/m
48 dBμV = 250 μV

9.3 Radiated Emission Measured Data (1GHz – 25GHz)

The EUT was found to comply with FCC Part15 Subpart C limits above 1000 MHz with a margin of 4.2 dB. Note: The measurement was done for the frequency range of 1 GHz to 25 GHz in TX mode and 1 GHz to 12.5GHz in RX mode.

Table 11-1. EUT: M/T 1171-71U, s/n AA-005B6, Ch.1(2412MHz) TX mode 11Mbps

Frequency (GHz)	Polarity (H/V)	Measured (dBμV) ***(peak)***	Measured (dBμV) ***(average)***	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBμV/m) ***(peak)***	FCC Limit (dBμV/m) ***(peak)***	Field Strength (dBμV/m) ***(average)***	FCC Limit (dBμV/m) ***(average)***
1.097	V	53.4	-	25.1	-32.7	0.0	45.8	74.0	-	54.0
1.301	V	52.9	-	25.1	-32.0	0.0	46.0	74.0	-	54.0
2.385	H	52.1	-	28.6	-30.3	0.0	50.4	74.0	-	54.0
2.390	H	51.9	-	28.6	-30.3	0.0	50.2	74.0	-	54.0
2.493	H	50.8	-	28.9	-30.1	0.0	49.6	74.0	-	54.0
4.825	H	52.4	39.9	33.1	-27.9	0.0	57.6	74.0	45.1	54.0
7.236	H	48.9	38.4	36.6	-26.2	0.0	59.3	NRB*	48.8	NRB*

* NRB: Non Restricted Band

Table 11-2. EUT: M/T 1171-71U, s/n AA-005B6, Ch.7(2442MHz) TX mode 11Mbps

Frequency (GHz)	Polarity (H/V)	Measured (dBμV) ***(peak)***	Measured (dBμV) ***(average)***	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBμV/m) ***(peak)***	FCC Limit (dBμV/m) ***(peak)***	Field Strength (dBμV/m) ***(average)***	FCC Limit (dBμV/m) ***(average)***
1.097	V	50.6	-	25.1	-32.7	0.0	43.0	74.0	-	54.0
1.301	V	53.0	-	25.1	-32.0	0.0	46.1	74.0	-	54.0
2.372	H	52.3	-	28.6	-30.3	0.0	50.6	74.0	-	54.0
2.386	H	51.4	-	28.6	-30.3	0.0	49.7	74.0	-	54.0
2.488	H	51.3	-	28.8	-30.1	0.0	50.0	74.0	-	54.0
4.887	H	52.0	40.6	33.3	-27.9	0.0	57.4	74.0	46.0	54.0
7.326	H	51.2	39.1	36.8	-26.1	0.0	61.9	74.0	49.8	54.0

Table 11-3. EUT: M/T 1171-71U, s/n AA-005B6, Ch.11(2462MHz) TX mode 11Mbps

Frequency (GHz)	Polarity (H/V)	Measured (dBμV) ***(peak)***	Measured (dBμV) ***(average)***	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBμV/m) ***(peak)***	FCC Limit (dBμV/m) ***(peak)***	Field Strength (dBμV/m) ***(average)***	FCC Limit (dBμV/m) ***(average)***
1.097	V	56.3	-	25.1	-32.7	0.0	48.7	74.0	-	54.0
1.301	V	53.7	-	25.1	-32.0	0.0	46.8	74.0	-	54.0
2.389	H	50.5	-	28.6	-30.3	0.0	48.9	74.0	-	54.0
2.485	H	51.9	-	28.8	-30.1	0.0	50.6	74.0	-	54.0
2.488	H	51.3	-	28.8	-30.1	0.0	50.0	74.0	-	54.0
4.923	H	52.2	38.8	33.4	-27.9	0.0	57.7	74.0	44.3	54.0
7.387	H	48.5	37.8	36.9	-26.1	0.0	59.3	74.0	48.6	54.0

Table 11-4. EUT: M/T 1171-71U, s/n AA-005B6, Ch.7(2442MHz) RX mode

Frequency (GHz)	Polarity (H/V)	Measured (dBμV) *(peak)*	Measured (dBμV) *(average)*	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBμV/m) *(peak)*	FCC Limit (dBμV/m) *(peak)*	Field Strength (dBμV/m) *(average)*	FCC Limit (dBμV/m) *(average)*
1.097	V	53.9	-	25.1	-32.7	0.0	46.3	74.0	-	54.0
1.301	V	53.0	-	25.1	-32.0	0.0	46.1	74.0	-	54.0
No other peak was detected										

Test Personnel:

Tester Signature : T. Asano Date Sep. 4, 2000

Tester Name : Takeshi Asano

10. ANTENNA GAIN MEASUREMENT

Section 15.247.b states that the maximum antenna gain can be no greater than 6dBi if the transmitter power is 1 Watt.

10.1 Test Procedure

• Two EMCO 3115 horns with known gains were placed 3 meters apart and 1 meter above the ground plane. A signal was fed into one of the antennas using a 2.442 GHz signal source. The second horn was connected to the input of a spectrum analyzer.
• The following settings were made to the spectrum analyzer for all measurements:

• The resolution bandwidth and video bandwidth were both set to 1 MHz.
• Logarithmic amplifiers were selected for the detector function

• The horn to horn signal level, S_{HH} ,was measured in both horizontal and vertical polarities.
• The horn connected to the signal source was removed and replaced with the antenna of ThinkPad i 1300.
• The horn to ThinkPad antenna signal level, S_{HR} , was measured with the horn in both horizontal and vertical polarities.
• The gain of the ThinkPad antenna, GR , was calculated by adding S_{HR} - S_{HH} to the gain of the horn.

Table 12 Antenna Gain Measurement Instrumentation

Description	Model	Serial Number	Calibration Date	Calibration Interval
Spectrum Analyzer	R&S ESI26	836119/003	07/12/00	1 year
Amplifier (1-26.5GHz)	HP 8449B	3008A00580	06/02/00	1 year
Signal Generator	HP E4430B	US39342157	02/02/00	1 year
Horn Antenna (1- 18GHz)	EMCO 3115	6121	04/17/00	1 year
Horn Antenna (1- 18GHz)	EMCO 3115	5774		

10.2 Test Results

Table 13 Antenna Gain Measurement Result

Polarity	3115 to 3115 Signal Level (dBm)	3115 to ThinkPad Signal Level (dBm)	3115 Gain (dBi)	ThinkPad Antenna Gain (dBi)
Horizontal	-9.66	-13.54	9.1	5.2

Test Personnel:

Tester Signature : T. Asano Date Sep. 4, 2000

Tester Name : Takeshi Asano

11. PHOTOS OF TESTED EUT

Photo.1: Front View : IBM ThinkPad i Series 1300 (1171-21U/2AU, 12 inch LCD)

Photo.2: Front View : IBM ThinkPad i Series 1300 (1171-71U, 13 inch LCD)

Photo.3: Rear View : IBM ThinkPad i Series 1300 (all models)

Photo.4: Rear View : Connector terminals

Photo.5: Locations of IEEE802.11b Wireless-LAN mini-PCI card and Antenna

Photo.6: Exterior views of IEEE802.11b Wireless-LAN mini-PCI card

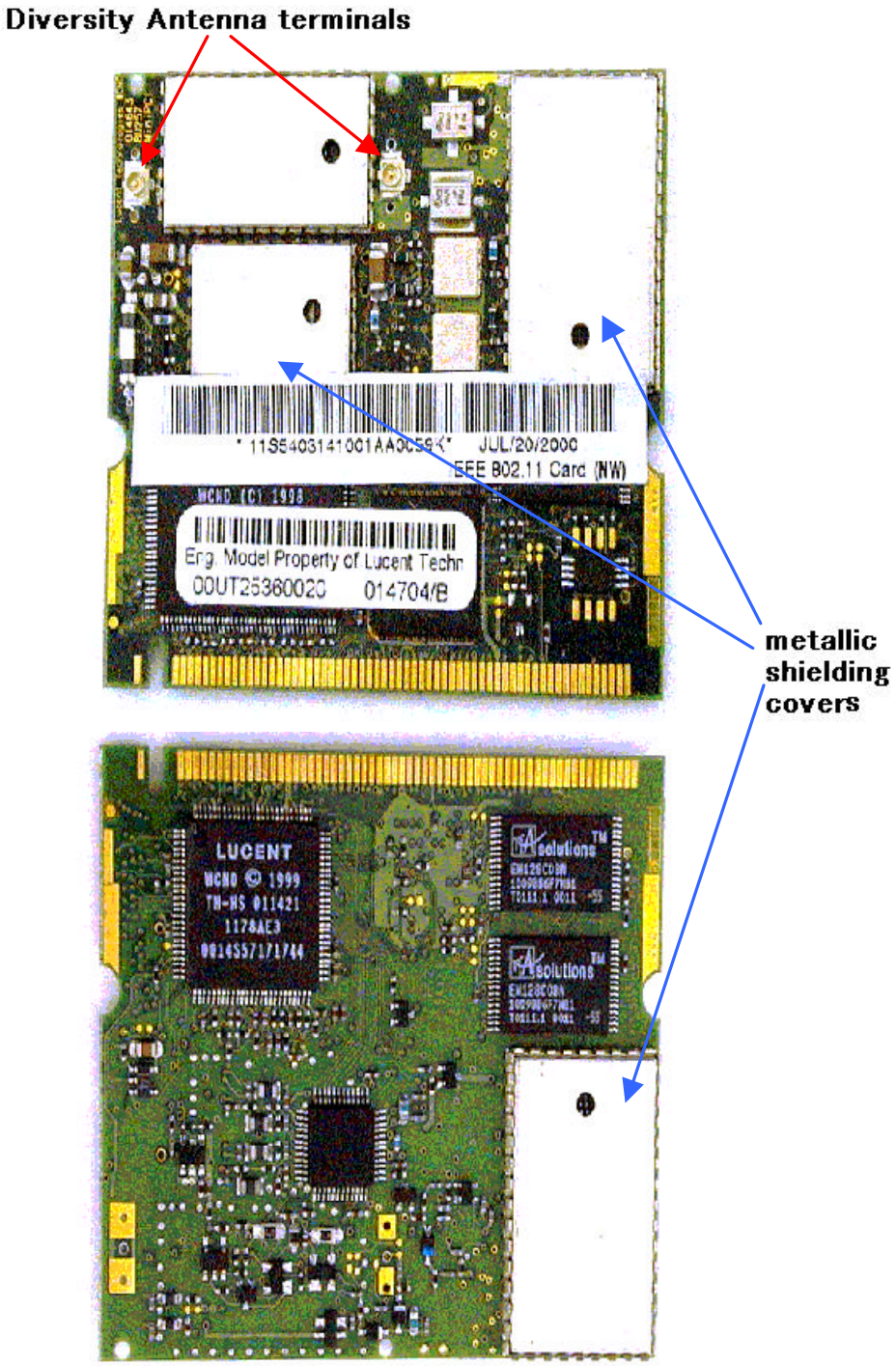
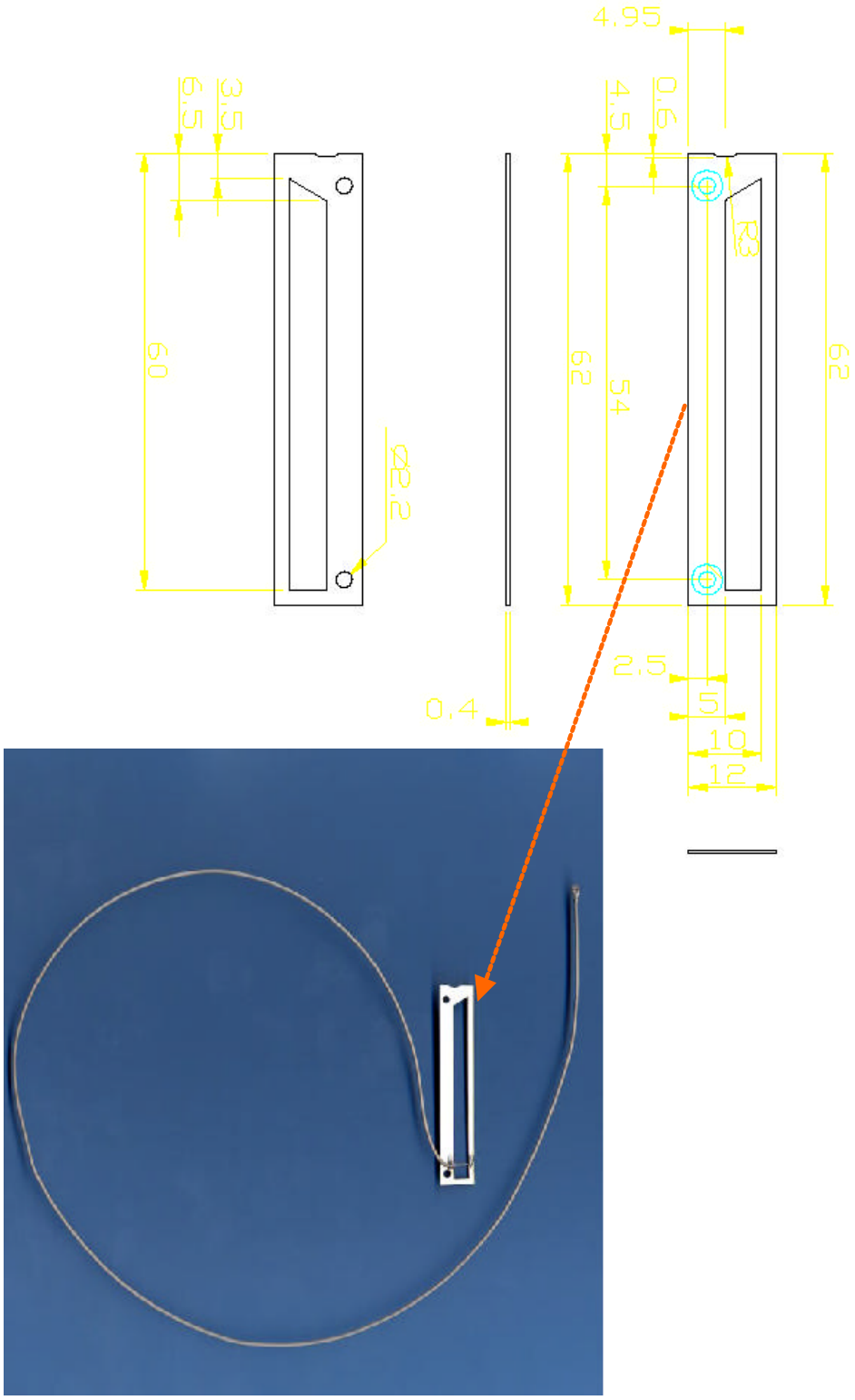


Photo.7: Diversity Antennas mounted in LCD
IBM ThinkPad i Series 1300 (1171-21U/2AU, 12 inch LCD)

Photo.8: Diversity Antennas mounted in LCD
IBM ThinkPad i Series 1300 (1171-71U, 13 inch LCD)

Photo.9: Exterior views of Antenna



12. SCHEMATIC DIAGRAMS

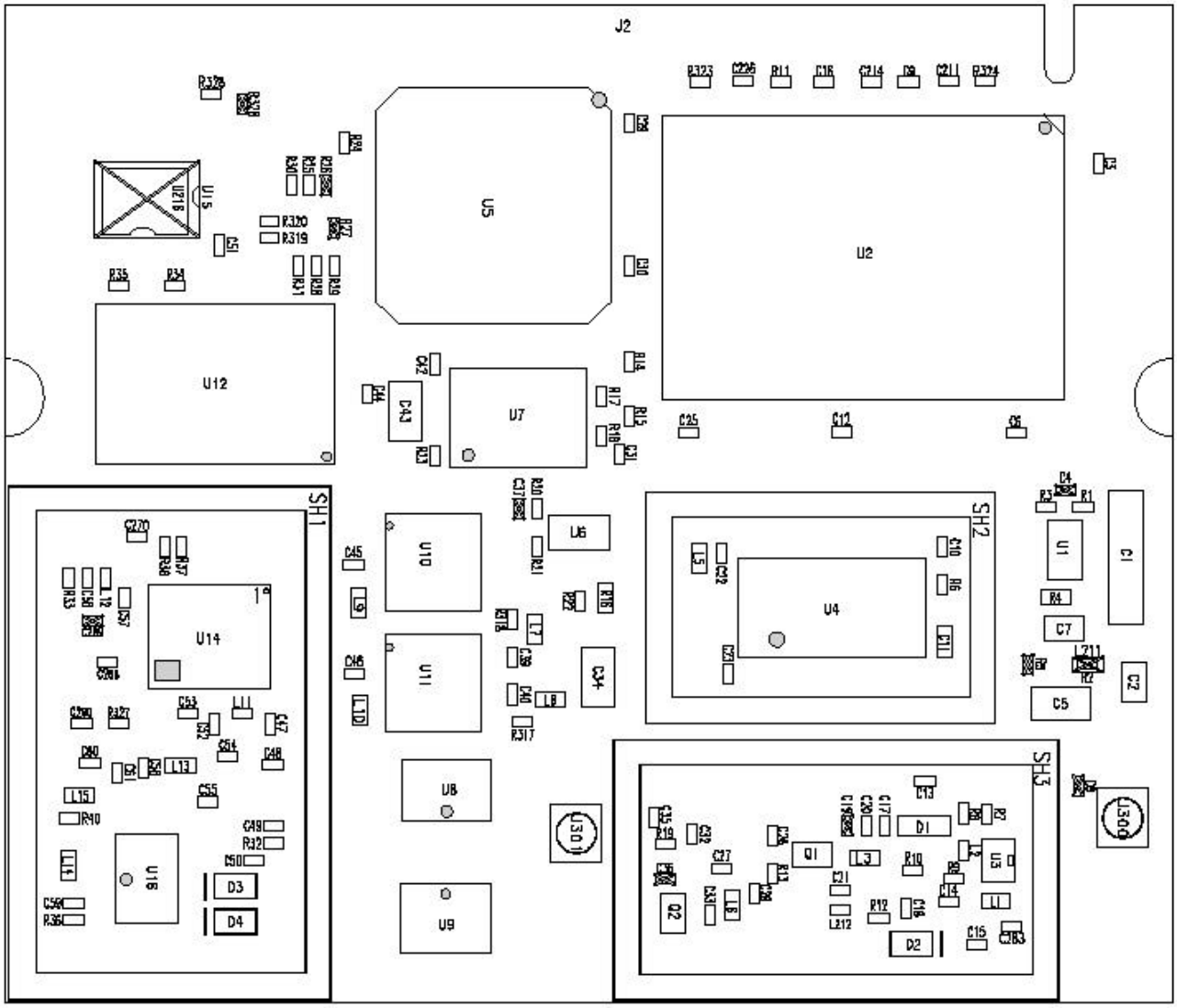
The schematic diagrams are the Confidential documents and should be held in confidence per 47 CFR section 0.459.
Therefore these documents are not disclosed in here, they will be sent to FCC directly.

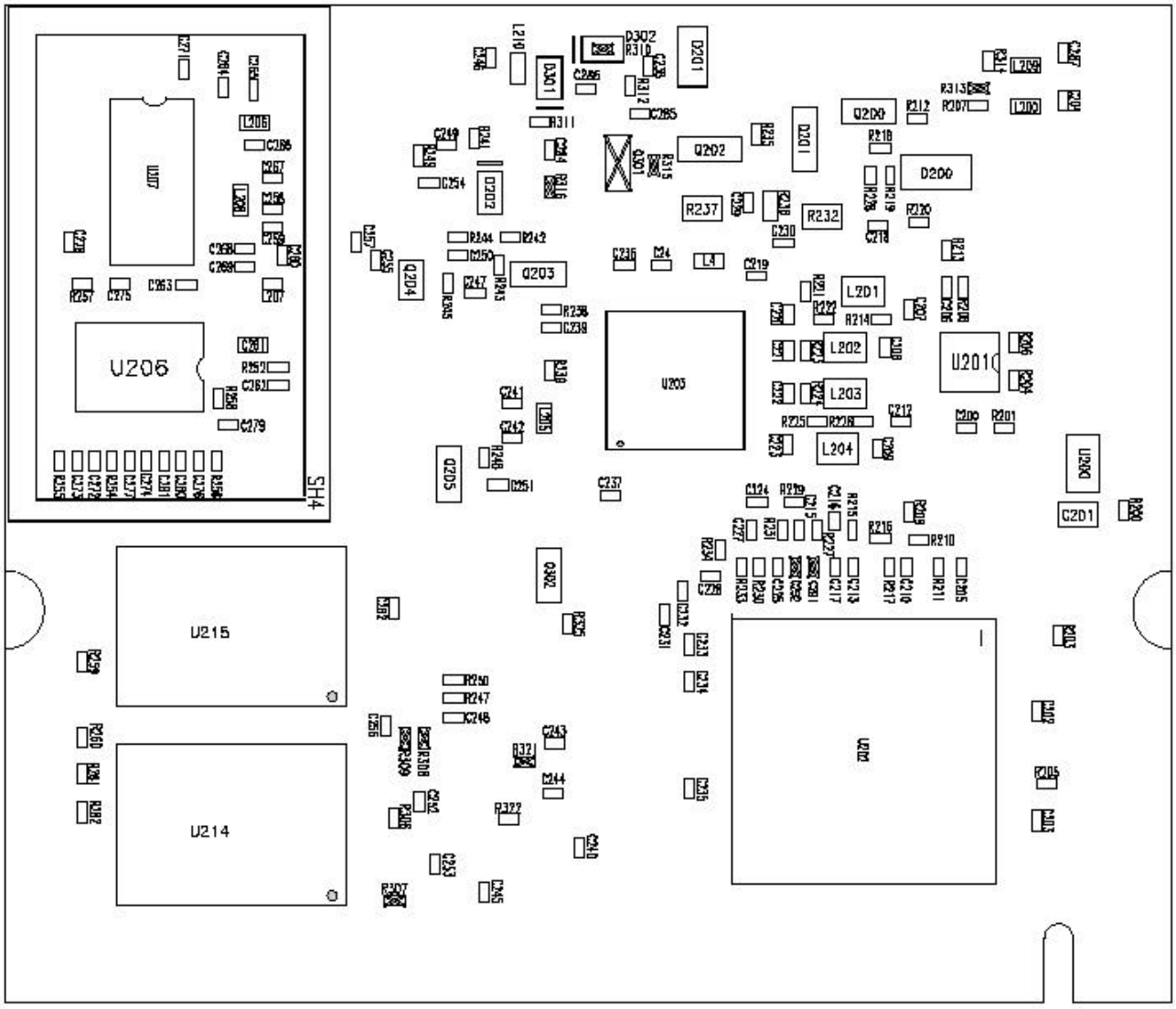
13. USER'S MANUAL

Please refer the following attached file.

"Manual1-TP1300.pdf" is described about PC(ThinkPad i Series 1300) system unit itself,
and
"Manual2-WLAN.pdf" is introducing the Wireless-LAN mini-PCI card.

14. PARTS LIST OF WIRELESS-LAN mini-PCI CARD




U206
U215
U214
U203
U201
U202
U200
L201
L202
L203
L204
Q201
Q202
Q203
Q204
Q205
Q302
D201
D202
D203
D207
D301
D302
SH4

ITEM	PART/DWG	REQ'D	MAME AND DESCRIPTION	NOTES
1	000845	3	CAP, 10uF, MURATA, GRM230Y5V106Z10	C5 C34 C43
2	001748	2	CAP, 1uF, MURATA, GRM40X5R105K10	C2 C201
3	001749	1	CAP, 2.2uF, MURATA, GRM40Y5V225Z10	C7
4	001906	4	IND, 10uH, MURATA, LQG21C100N00	L201 L202 L203 L204
5	002052	2	RES, 1.00, KOA, RK73H1JT1R00F	R4 R16
6	002236	1	RES, 82.5, KOA, RK73H1JT82R5F	R236
7	002737	2	CAP, 22nF, MURATA, GRM39X7R223K25	C11 C261
8	002851	2	IND, 1.8nH, COILCRAFT, 0603CS-1N8XKBC	L206 L208
9	002861	1	IND, 39nH, COILCRAFT, 0603CS-39NXJBC	L13
10	002882	3	IND, 12nH, TOKO, LL1608-FH12NJ	L3 L6 L210
11	002885	2	IND, 22nH, TOKO, LL1608-FH22NJ	L4 L9
12	002886	2	IND, 27nH, TOKO, LL1608-FH27NJ	L10 L15
13	002887	2	IND, 33nH, TOKO, LL1608-FH33NJ	L7 L8
14	002889	2	IND, 47nH, TOKO, LL1608-FH47NJ	L1 L14
15	002891	1	IND, 68nH, TOKO, LL1608-FH68NJ	L205
16	002893	1	IND, 100nH, TOKO, LL1608-FHR10J	L5
17	003244	3	RES, 100, KOA, RK73H1ETP1000F	R239 R244 R257
18	003283	1	RES, 255, KOA, RK73H1ETP2550F	R8
19	003290	4	RES, 301, KOA, RK73H1ETP3010F	R37 R38 R323 R324
20	003296	1	RES, 348, KOA, RK73H1ETP3480F	R10
21	003302	4	RES, 402, KOA, RK73H1ETP4020F	R222 R223 R224 R225
22	003311	3	RES, 499, KOA, RK73H1ETP4990F	R18 R207 R211
23	003334	2	RES, 866, KOA, RK73H1ETP8660F	R214 R226
24	003340	6	RES, 1.00k, KOA, RK73H1ETP1001F	R13 R14 R22 R40 R203 R208
25	003346	1	RES, 1.15k, KOA, RK73H1ETP1151F	R212
26	003357	3	RES, 1.50k, KOA, RK73H1ETP1501F	R12 R241 R242
27	003369	8	RES, 2.00k, KOA, RK73H1ETP2001F	R17 R19 R32 R227 R230 R249 R311 R312
28	003396	1	RES, 3.83k, KOA, RK73H1ETP3831F	R252
29	003402	1	RES, 4.42k, KOA, RK73H1ETP4421F	R6
30	003405	1	RES, 4.75k, KOA, RK73H1ETP4751F	R218
31	003431	1	RES, 8.87k, KOA, RK73H1ETP8871F	R254
32	003436	11	RES, 10.0k, KOA, RK73H1ETP1002F	R11 R15 R205 R206 R213 R228 R235 R246 R258 R325 R328
33	003453	1	RES, 15.0k, KOA, RK73H1ETP1502F	R245
34	003465	7	RES, 20.0k, KOA, RK73H1ETP2002F	R215 R229 R256 R259 R260 R261 R262
35	003485	6	RES, 32.4k, KOA, RK73H1ETP3242F	R1 R20 R204 R219 R231 R233
36	003493	1	RES, 39.2k, KOA, RK73H1ETP3922F	R238
37	003496	11	RES, 42.2k, KOA, RK73H1ETP4222F	R3 R21 R28 R29 R30 R31 R34 R35 R247 R250 R319

ITEM	PART/DWG	REQ'D	MAME AND DESCRIPTION	NOTES
38	003532	3	RES, 100k, KOA, RK73H1ETP1003F	R209 R210 R220
39	003653	7	CAP, 1.0pF, MURATA, GRM36COG1R0C50	C23 C24 C33 C45 C50 C255 C283
40	003655	1	CAP, 1.5pF, MURATA, GRM36COG1R5C50	C46
41	003658	4	CAP, 2.2pF, MURATA, GRM36COG2R2C50	C47 C48 C56 C247
42	003662	2	CAP, 3.9pF, MURATA, GRM36COG3R9C50	C58 C271
43	003668	2	CAP, 6.8pF, MURATA, GRM36COG6R8C50	C241 C242
44	003671	5	CAP, 8.2pF, MURATA, GRM36COG8R2C50	C14 C17 C28 C266 C286
45	003673	3	CAP, 10pF, MURATA, GRM36COG100C50	C52 C60 C61
46	003675	23	CAP, 12pF, MURATA, GRM36COG120J50	C13 C15 C18 C21 C26 C27 C32 C35 C49 C55 C221 C222 C238 C246 C249 C250 C254 C257 C259 C265 C284 C285 C290
47	003681	12	CAP, 22pF, MURATA, GRM36COG220J50	C53 C258 C263 C267 C269 C270 C275 C276 C278 C279 C280 C281
48	003683	2	CAP, 27pF, MURATA, GRM36COG270J50	C208 C209
49	003689	2	CAP, 47pF, MURATA, GRM36COG470J50	C204 C287
50	003699	7	CAP, 120pF, MURATA, GRM36COG121J50	C39 C54 C216 C264 C268 C272 C288
51	003714	13	CAP, 1nF, MURATA, GRM36X7R102K50	C20 C31 C59 C206 C210 C217 C219 C223 C224 C225 C227 C237 C239
52	003715	2	CAP, 1.2nF, MURATA, GRM36X7R122K50	C274 C277
53	003719	1	CAP, 2.7nF, MURATA, GRM36X7R272K50	C262
54	003721	1	CAP, 3.9nF, MURATA, GRM36X7R392K50	C10
55	003726	1	CAP, 10nF, MURATA, GRM36X7R103K16	C200
56	003727	3	CAP, 15nF, MURATA, GRM36Y5V153Z50	C215 C231 C232
57	003731	44	CAP, 100nF, MURATA, GRM36Y5V104Z16	C12 C9 C3 C6 C16 C22 C25 C29 C30 C40 C42 C44 C51 C57 C202 C203 C205 C207 C211 C212 C213 C214 C218 C220 C226 C228 C229 C230 C233 C234 C235 C236 C240 C243 C244 C245 C248 C251 C252 C253 C256 C260 C273 C282
58	003856	1	IND, 2.7nH, TOKO, LL1005-FH2N7S	L11
59	003859	1	IND, 4.7nH, TOKO, LL1005-FH4N7K	L2
60	003866	2	IND, 18nH, TOKO, LL1005-FH18NK	L12 L207

ITEM	PART/DWG	REQ'D	MAME AND DESCRIPTION	NOTES
61	005051	12	RES, 0, KOA, RM73Z1ETD	R2 R24 R25 R33 R234 R255 R306 R314 R317 R318 R320 R322
62	005076	5	RES, 10, KOA, RM73B1ETP10RJ	R9 R23 R36 R201 R221
63	005083	2	RES, 20, KOA, RM73B1ETP20RJ	R216 R217
64	005090	1	RES, 39, KOA, RM73B1ETP39RJ	R243
65	005093	1	RES, 51, KOA, RM73B1ETP51RJ	R7
66	005096	1	RES, 68, KOA, RM73B1ETP68RJ	R327
67	005107	1	RES, 200k, KOA, RM73B1ETP2003J	R200
68	005125	1	RES, 1.0, KOA, RK73H2A1R0F	R232
69	005139	1	RES, 3.9, KOA, RK73H2A3R9F	R237
70	010001	1	SA2420, AIC, PHILIPS, SA2420	U207
71	010003	2	BFP420, TRANSISTOR, SIEMENS, Q62702-F1591	Q2 Q204
72	010009	1	BFP450, TRANSISTOR, SIEMENS, Q62702-F1590	Q1
73	010004_	1	MA-LC22.000MHz, AIC, USI, MA-LC22.000MHz	U7
74	010011	3	BC847BW, TRANSISTOR, PHILIPS, BC847BW	Q200 Q203 Q302
75	010012	1	BC857BW, TRANSISTOR, PHILIPS, BC857BW	Q205
76	010016	2	BCV62, TRANSISTOR, PHILIPS, BCV62B	Q201 Q202
77	010017	1	TLV431ACDBV5, DIODE, TEXAS, TLV431ACDBV5	D200
78	010019	2	LFSN30N17C2450B, AIC, MURATA, LFSN30N17C2450B	U8 U16
79	010021	1	BAR64_03W, DIODE, SIEMENS, BAR64-03W	D202
80	010023	1	LFJ30_03B2450BA100, AIC, MURATA, LFJ30_03B2450BA100	U9
81	010066	1	LABEL_BOARD_LEVEL_8X32mm	
82	010202	1	emi_fil, CAP, NFM61R 4.7nF, MURATA, NFM61R30T472	C1
83	010203	1	BAR80, DIODE, SIEMENS, BAR80	D201
84	010204	5	BAR63_03W, DIODE, SIEMENS, BAR63-03W	D2 D3 D4 D301 D302
85	010206	2	MIC5205, AIC, MICREL, MIC5205BM5	U1 U6
86	010334	1	BU4S71, MISC, ROHM, BU4S71	U200
87	010464	1	HSMS2852, DIODE, HP, HSMS2852	D1
88	010827	1	HERMES, DIC, LUCENT, HERMES	U2
89	011213	1	SST29LE010, DIC, SST, SST29LE010-150-4C-WH	U12
90	011262	1	CP0805B2442, AIC, AVX, CP0805B2442BW	U3
91	011276	2	IND, BLM11B222, MURATA, BLM11B222	L200 L209
92	012008	1	MQE_911_704, AIC, MURATA, MQE_911-704	U4
93	012080	2	B3680, AIC, EPCOS, B39351-B3680-U310	U10 U11
94	012094	2	LP62S1024, DIC, ELITEMT, LP62S1024X-55LL	U214 U215
95	013003	2	CONN_coaxial, CONN, HRS, CL331-0471-0-01	J300 J301
96	013007	1	M24C02, DIC, ST, m24c02-w-dw	U216
97	013008	1	MQH_303_2096, AIC, MURATA, MQH-303-2096	U14
98	013009	1	PCI1410_144, DIC, TI, PCI1410GGU	U5
99	013013	1	SA8026, AIC, PHILIPS, SA8026DH	U206
100	013018	1	OPA337, AIC, BURR-BROWN, OPA337EA	U201
101	013024	1	SA1630BR, AIC, PHILIPS, SA1630BR	U203
102	014733	1	THESEUS_HS, DIC, LUCENT, 1198AE3	U202
103	014891	REF	SCHEMATIC	
104	014892	FILE	SOLDER_PASTE_A	
105	014893	FILE	SOLDER_PASTE_B	
106	014894	FILE	COMP_CENTER_LIST	

ITEM	PART/DWG	REQ'D	MAME AND DESCRIPTION		NOTES
107	014895	1	BOARD_PRINTED		
108	014968	1	SHIELD-TOP-LONG-HIGH		
109	014969	1	SHIELD-TOP-SHORT-HIGH		
110	014970	1	SHIELD-TOP-LONG-LOW		
111	014971	1	SHIELD-BOTTOM		
112	003854	1	IND, 1.8nH , TOKO , LL1005-FH1N8S	L212	