

EMI TEST REPORT
FCC PART 15 SUBPART B

RICOH COMPANY, LTD.

CD-R/RW Drive Unit

FCC ID: BBP104S

MODEL NAME: MC104S/RW104S

Report No.: Z02C-99345

Report Issue Date: December 22, 1999

ZACTA TECHNOLOGY CORPORATION
YONEZAWA TESTING CENTER

4149-7 Hachimanpara 5-chome
Yonezawa-shi Yamagata
992-1128 Japan

NVLAP[®]
Lab code : 200306-0

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1.CERTIFICATE OF COMPLIANCE

ZACTA TECHNOLOGY CORPORATION
 YONEZAWA TESTING CENTER
 4149-7 Hachimanpara 5-chome
 Yonezawa-shi Yamagata 992-1128 Japan

This device, as described herewith, was tested pursuant to test procedure ANSI C63.4-1992, by Zacta Technology Corporation. The test results are traceable to international or national standard.


COMPANY	: RICOH COMPANY, LTD. 3-2-3, Shin-yokohama, Kohoku-ku, Yokohama-shi, Kanagawa 222-8530 Japan Phone: +81-45-477-1663 Fax: +81-45-477-1649
EUT	: CD-R/RW Drive Unit
FCC ID	: BBP104S
MODEL NAME	: MC104S/RW104S
SERIAL NO.	: K-3

EUT CONDITION : Pre-production
EUT CLASS : B
DATE FOR TEST : December 15, 16, 1999
TEST SITE : Site 2
FCC RULE : FCC Part15 Subpart B, Class B Docket 87-389
REPORT NO. : Z02C-99345
REMARKS : Shielded cables are used in system
TEST RESULTS : Complied

Tested by:


 Takuya Osato / EMC Engineer

Authorized by:


 Kiyoshi Endo / Manager of Technical Division

The results in this report are applicable only to the samples tested.

This report shall not be re-produced except in full without the written approval of Zacta Technology Corporation.

2.EQUIPMENT DESCRIPTION

EUT	: CD-R/RW Drive Unit
FCC ID	: BBP104S
MODEL NAME	: MC104S/RW104S
MAX FREQUENCY	: 233MHz
POWER	: DC 5V, 12V
PORTS	: SCSI Headphone
EUT SIZE	: (D) 233 X (W) 146 X (H) 41.3 mm
OPERATING MODE	: Read mode Write mode

3.RESULT OF THE MEASUREMENTS

3.-1 RESULTS OF THE MEASUREMENTS

The minimum margin to the limits are as follows:

	Margin	FREQ.	POL.[H/V]	Ant. Height	Table deg.	Operating mode
Conduction	-11.7dB	20.010MHz	N/A	N/A	N/A	Write mode (Disk 1)
Radiation	-4.2dB	228.84MHz	H	1.5m	200°	Read mode (Disk 5)

3.-2 DEVIATION FROM THE STANDARD

Not applicable.

4. CONFIGURATION INFORMATION

4-1 DEVICE INFORMATION

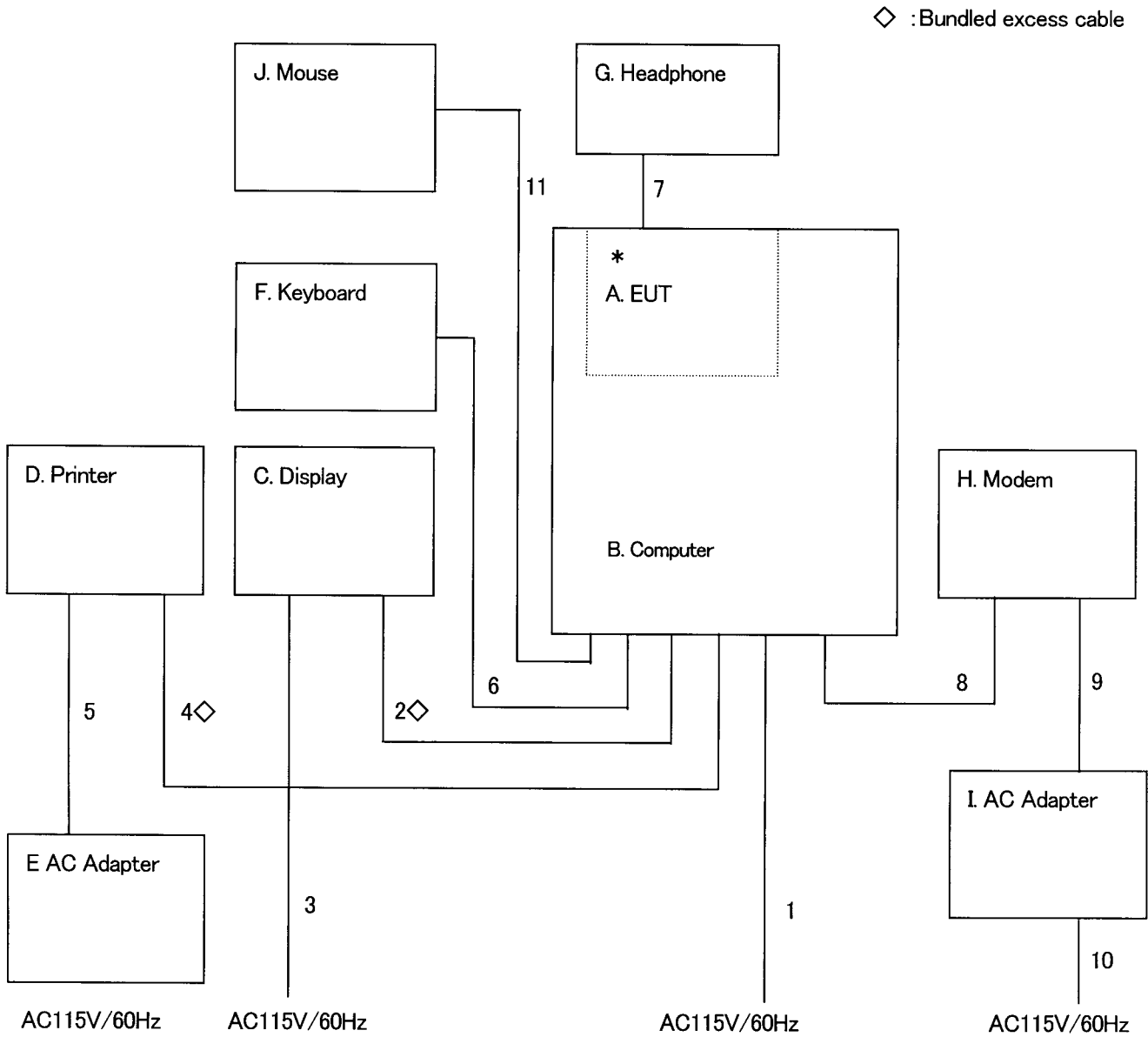
NO.	EQUIPMENT	COMPANY	MODEL NAME	SERIAL NO.	DoC / FCC ID	COMMENT
A	CD-R/RW Drive Unit	RICOH	MC104S/RW104S	K-3	BBP104S	EUT
B	Computer	COMPAQ	DESKPRO 5133	7617HXF30138	CNT75MDCZ5	
C	Display	IBM	8512-001	72-0736575	ANO7NF8512	
D	Printer	HP	2225C+	2950S64811	DSI6XU2225	
E	AC adapter	HP	82241AJ	N/A	N/A	For Printer
F	Keyboard	COMPAQ	RT6674TJP	22361433	AQ6-MTN4C15	
G	Headphone	SONY	MDR-Z900	N/A	N/A	
H	Modem	Hayes	5240AM	A0125240K346	BFJ5201AM	
I	AC adapter	Hayes	T41-090800-A01	N/A	N/A	For Modem
J	Mouse	COMPAQ	M-S34	N/A	DZL210472	

4-2 CABLES INFORMATION

NO.	CABLE	COMPANY	LENGTH [m]	SHIELD		Connected Situation		COMMENT
				Cable	Connector	From	To	
1	AC Power cord	Hanai	2.3	Unshielded	Plastic	PC	AC outlet	
2	CRT cable	N/A	1.5	Shielded	Metal	PC(VIDEO)	Display	*
3	AC Power cord	IBM	2.5	Unshielded	Plastic	Display	AC outlet	
4	Parallel cable	N/A	1.5	Shielded	Metal	PC(Parallel)	Printer	*
5	DC cable	HP	2.0	Unshielded	Plastic	Printer	AC Adapter	
6	Keyboard cable	N/A	1.9	Shielded	Metal	PC(Keyboard)	Keyboard	Coiled
7	Headphone cable	SONY	1.3	Shielded	Metal	EUT (Headphone)	Headphone	
8	Serial cable	N/A	1.5	Shielded	Metal	PC(Serial)	Modem	
9	DC cable	N/A	1.7	Unshielded	Plastic	Modem	AC adapter	
10	AC Power cord	N/A	0.8	Unshielded	Plastic	AC Adapter	AC outlet	
11	Mouse cable	N/A	1.7	Shielded	Metal	PC(Mouse)	Mouse	

* : Bundled excess cable

4-3 SYSTEM CONFIGURATION



Symbols or numbers assigned to equipment or cables on this diagram are corresponded to the symbols or numbers assigned to equipment or cables on tables in Configuration/Cable Information.

5. TEST SITE CONDITION & INSTRUMENTATION

5.-1 TEST SITE CONDITION

Test date	December 15, 16, 1999			
Site #	Site 2			
Weather	December 15: Weather: Cloudy	Temp.: 19°C	Humidity: 40%	
	December 16: Weather: Cloudy	Temp.: 18°C	Humidity: 42%	

5.-2 TEST EQUIPMENT FOR CONDUCTION

Equipment	Company	Model name / Serial No.	Calibration date	Period
Spectrum analyzer	Hewlett Packard	8568B / 2732A03847	Jul. 1999	1 year
Test Receiver	ROHDE&SHWARZ	ESHS10 / 842884/009	Jun. 1999	1 year
Line Impedance Stabilization Network	Kyoritsu Electrical Works, Ltd.	KNW-242C / 8-875-19 (for EUT)	Feb. 1999	1 year
Line Impedance Stabilization Network	Kyoritsu Electrical Works, Ltd.	KNW-242C / 8-1096-3 (for Peripheral)	Jan. 1999	1 year
Coaxial cable	FUJIKURA	8D-2W / H110601#2/15C	Jun. 1999	1 year

※Calibration is traceable to NIST or an equivalent standards reference organization.

SETTING INFORMATION

FREQUENCY RANGE	CLASS A	450kHz-30MHz
	CLASS B	
ARRANGEMENT OF EUT	TABLE TOP	Placed on Non-conductive turn table Height: 80cm Dimension: 1mx1.5m
	FLOOR-STANDING	Placed on the Electrical insulating material
TEST RECEIVER		IF Bandwidth : 10kHz Detector : QUASI PEAK, AVERAGE
VERTICAL METAL GROUND PLANE		Distance from Table end : 40cm Size : 2m x 2m
LINE IMPEDANCE STABILIZATION NETWORK		Specification : 50Ω / 50 μ H Distance from EUT : 80cm (Min.)

6.-3 TEST EQUIPMENT FOR RADIATION

Equipment	Company	Model name / Serial No.	Calibration date	Period
Spectrum analyzer	Hewlett Packard	8568B / 2732A03847	Jul. 1999	1 year
RF Preamplifier	Anritsu	MH648A / M96157	Jul. 1999	1 year
Test Receiver	Kyoritsu Electrical Works, Ltd.	KNM-5002 / 4N-187-10 KCV-6002 / 4-257-1	Jan. 1999	1 year
Biconical Antenna	Schwarzbeck	BBA9106/VHA9103LE / 02130879	Jun. 1999	1 year
Log Periodic Antenna	EMCO	3146 / 2332	Jun. 1999	1 year
Coaxial cable	FUJIKURA	8D-2W / H110601#2/15R	Jun. 1999	1 year
Coaxial cable	FUJIKURA	10D-SFA / H110601#2/10D-SFA	Jun. 1999	1 year
Site attenuation	Zacta Technology Corp.	Site 2	Dec. 1999	1 year

***** Measurement above 1GHz *****

Equipment	Company	Model name / Serial No.	Calibration date	Period
Spectrum Analyzer	ADVANTEST	R3271A / 65050042	May. 1999	1 year
RF Preamplifier	HEWLETT-PACKARD Co.	8449B / 3008A00589	May. 1999	2 year
Double Ridged Guide Antenna	EMCO	3115 / 4327	Sep. 1999	2 year
Coaxial cable	SUHNER	SUCOFLEX 104 108014/4 & 108015/4	May. 1999	2 year

※Calibration is traceable to NIST or an equivalent standards reference organization.

SETTING INFORMATION		
FREQUENCY RANGE	CLASS A	30MHz-2GHz
	CLASS B	
ARRANGEMENT OF EUT	TABLE TOP	Placed on Non-conductive turn table Height: 80cm Dimension: 1mx1.5m Azimuth: 0-360°
	FLOOR-STANDING	Placed on the Electrical insulting material Azimuth: 0-360°
TEST RECEIVER		IF Bandwidth : 120kHz Detector : QUASI PEAK
ANTENNA		Distance from EUT : 10m Height : 1m - 4m Polarization : Horizontal/Vertical

6.LABORATORY DESCRIPTION

6.-1 DESCRIPTION FOR TEST SITE

1. LOCATION:

ZACTA TECHNOLOGY CORPORATION YONEZAWA TESTING CENTER
4149-7 Hachimanpara 5-chome, Yonezawa-shi Yamagata 992-1128 Japan
Phone: +81-238-28-2880 Fax: +81-238-28-2888

2. THE NUMBER OF SITE:

Site name : Site 1, Site 2, Site 3 and Site 4 - Total 4 sites.

3. THE TYPE OF SITE:

Whether protected site

4. TEST TYPE:

All sites could perform as follows tests:

- 1) 3/10m Radiation test
- 2) Conduction test

5. FACILITY FILING INFORMATION

- 1) FCC FINAL SITE FILING: 2.948 Pursuant to ANSI C63.4-1992

Site name	Final filing date
Site 1, Site 2 and Site 3	January 29, 1997
Site 4	June 18, 1998

*3m/10m Radiation & Conduction testing could be performed on each site

- 2) VCCI FINAL SITE FILING: V-5/97.04 Pursuant to VCCI Regulations for Registration of measurement facilities

Site name	Radiation Registration No.	Conduction Registration No.	Final filing date
Site 1	R-136	C-132	April 1, 1997
Site 2	R-137	C-133	April 1, 1997
Site 3	R-138	C-134	April 1, 1997
Site 4	R-752	C-775	June 23, 1998

- 3) NVLAP ACCREDITATION:

NVLAP CODE: **200306-0**

NVLAP INFORMATION: NVLAP accreditation does not constitute any product endorsement by NVLAP or any agent of the U.S. Government

6.-2 DESCRIPTION OF CONDUCTED EMISSION TESTING

The line-conducted emissions testing facility is located inside of the site which used for radiated emissions testing. A 1 meter x 1.5 meter surface, 0.8 meter height from conducting ground plane wooden table is placed 40 cm away from the vertical conducting surface.

Two $50\ \Omega / 50\ \mu\text{H}$ Line Impedance Stabilization Network (LISN) are placed on the conducting ground plane.

The EUT was powered from the KYORITSU LISN and the support equipment were another KYORITSU LISN.

$50\ \Omega$ BNC connector of the KYORITSU LISN for support equipment is terminated in $50\ \Omega$.

An isolation transformer has 50A which is large enough to not affect the peak consumption current by the EUT.

All interconnecting cables more than 1 meter were bundled to 1 meter length.

Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition.

The frequency range was scanned from 450kHz to 30 MHz. The detector function of the test receiver was set to CISPR quasi-peak mode and the bandwidth was set to 10kHz.

The EUT, support equipment and interconnecting cables were arranged and manipulated to maximize worst emissions for each emission in this test report.

6.-3 DESCRIPTION OF RADIATED EMISSION TESTING

Measurements: were made at 3 meter using broadband antenna (Biconical Antenna and log-periodic antenna) & Test receiver. Frequency Range : 30MHz – 1GHz was scanned and investigated using receiver. Six highest emissions(Min.) was reported. The test results represents the worst case emissions for each emission with manipulating the EUT, support equipment and interconnecting cables maximize the worst emissions in this test report.

Condition:

The detector function of the test receiver was set to CISPR Quasi-peak mode and the bandwidth was set to 120kHz. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition.

The EUT and support equipment were placed on a top of a 0.8 meter height wooden table.

For Floor-Standing devices, the EUT and all cables were installed on electrical insulating material.

The antenna height was varied 1 to 4 meters and stopped at height producing the maximum emission. The turntable was rotated by 360 degrees and stopped at azimuth of producing the maximum emission.

Interconnecting cables, which are connected to a peripheral, was bundled in center, and its length was not exceeding 1 meter. Each emission was maximized by varying the mode of operation.

As specified in CFR section 15.33, in case of the highest frequency used in the device is from 108MHz to 500MHz, the frequency range was investigated from 30MHz up to the frequency 2GHz, when the highest frequency is from 500MHz to 1GHz, up to 5GHz.

For measurements above 1GHz, double-ridged guide antenna was used as specified in ANSI C63.4-1992 section 4.1.5.4. Pursuant to CFR section 15.35(b) and ANSI C63.4-1992 section 4.2., peak and average detectors were used for measurements above 1GHz. The bandwidth of spectrum analyzer was set to 1MHz.

When measuring emissions above 1GHz, the frequencies of maximum emissions were determined by manually positioning the antenna close to the EUT and by moving the antenna over all sides of the EUT while observing a spectral display. The beam width of the antenna at that time was larger than EUT.

6.-4 UNCERTAINTY

CONDUCTION

Total Uncertainty @95%min.Confidence probability	$\pm 1.78\text{dB}$
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RADIATION

Total Uncertainty @95%min.Confidence probability	3m	10m
	$\pm 2.66\text{dB}$	$\pm 2.01\text{dB}$

6.-5 SAMPLE OF FIELD STRENGTH CALCULATION

$$\text{dB } \mu\text{V} = 20\log_{10} (\mu\text{V})$$

$$\text{dB } \mu\text{V/m} = 20\log_{10} (\mu\text{V/m})$$

[Sample Calculation]

***CONDUCTION**

@ 3.332MHz : Class B limit = $250 \mu\text{V} = 48.0\text{dB } \mu\text{V}$

Reading = $41.6\text{dB } \mu\text{V}$

Cable Loss + LISN Factor = $0.2 + 0.5 = 0.7\text{dB}$

Total = $41.6 + 0.7 = 42.3\text{dB } \mu\text{V}$

Margin = $42.3 - 48.0 = -5.7\text{dB}$

5.7 dB below the limit

***RADIATION**

@ 147.6MHz : Class B limit = $150 \mu\text{V/m} = 43.5\text{dB } \mu\text{V/m}$

Reading = $42.8\text{dB } \mu\text{V}$

Ant. Factor + Cable Loss - Amp. Gain = $14.2 + 3.0 - 30.0 = -12.8\text{dB}$

Total = $42.8 - 12.8 = 30.0\text{dB } \mu\text{V/m}$

Margin = $30.0 - 43.5 = -13.5\text{dB}$

13.5 dB below the limit

DATE OF TESTS: 99/12/15 SITE:2 CHART NO: SHEET NO: 1
 COMPANY NAME: RICOH MODEL:RW104S MODE: READ
 COMMENT: DISK 1

POL	ANT	TABLE	FREQ.	READ.	FACTOR	NET	LIMITS	MARGIN	COMMENT
H/V	[m]	[deg]	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
V	1.0	25	100.23	44.9	-18.0	26.9	43.5	-16.6	
V	1.0	330	167.05	45.5	-11.6	33.9	43.5	-9.6	
V	1.0	200	200.47	44.7	-10.2	34.5	43.5	-9.0	
H	1.3	355	228.17	50.7	-9.7	41.0	46.0	-5.0	*
V	1.0	65	228.37	40.5	-9.7	30.8	46.0	-15.2	
H	1.3	225	250.00	50.1	-9.4	40.7	46.0	-5.3	
H	1.0	215	275.68	44.3	-8.2	36.1	46.0	-9.9	
H	1.0	55	350.89	45.7	-10.9	34.8	46.0	-11.2	
H	2.5	150	400.95	47.5	-10.2	37.3	46.0	-8.7	
H	2.8	70	459.28	43.1	-8.5	34.6	46.0	-11.4	
H	1.0	250	959.98	35.8	3.4	39.2	46.0	-6.8	

DATE OF TESTS: 99/12/15 SITE:2 CHART NO: SHEET NO: 2
 COMPANY NAME: RICOH MODEL:RW104S MODE: WRITE
 COMMENT: WRITE MODE

DISC 1

S/N:K-3

POL	ANT	TABLE	FREQ.	READ.	FACTOR	NET	LIMITS	MARGIN	COMMENT
H/V	[m]	[deg]	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
V	1.0	220	71.19	50.5	-20.7	29.8	40.0	-10.2	
V	1.0	110	100.22	54.0	-18.0	36.0	43.5	-7.5	
H	1.2	0	138.14	41.5	-13.4	28.1	43.5	-15.4	
H	1.8	80	186.14	40.9	-10.8	30.1	43.5	-13.4	
H	2.0	30	200.44	46.7	-10.2	36.5	43.5	-7.0	
V	1.0	190	200.44	46.6	-10.2	36.4	43.5	-7.1	
H	2.0	150	225.57	43.9	-9.7	34.2	46.0	-11.8	
H	1.2	215	250.64	46.2	-9.4	36.8	46.0	-9.2	
V	2.5	25	400.92	44.3	-10.2	34.1	46.0	-11.9	
H	1.3	190	651.64	42.4	-3.3	39.1	46.0	-6.9	*

DATE OF TESTS: 99/12/15 SITE: 2 CHART NO: SHEET NO: 3
 COMPANY NAME: RICOH MODEL: RW104S MODE: READ
 COMMENT: DISK 5

S/N: K-3

POL	ANT	TABLE	FREQ.	READ.	FACTOR	NET	LIMITS	MARGIN	COMMENT
H/V	[m]	[deg]	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
V	1.0	60	100.23	46.0	-18.0	28.0	43.5	-15.5	
H	1.3	250	200.47	47.0	-10.2	36.8	43.5	-6.7	
V	1.0	285	200.47	41.1	-10.2	30.9	43.5	-12.6	
H	1.3	245	225.57	45.3	-9.7	35.6	46.0	-10.4	
H	1.5	200	228.84	51.5	-9.7	41.8	46.0	-4.2	*
V	1.5	80	228.84	44.2	-9.7	34.5	46.0	-11.5	
H	1.4	280	250.63	48.9	-9.4	39.5	46.0	-6.5	
V	1.0	285	250.63	46.8	-9.4	37.4	46.0	-8.6	
H	1.0	180	380.00	50.0	-10.7	39.3	46.0	-6.7	
V	1.0	310	668.53	33.0	-3.1	29.9	46.0	-16.1	
V	1.0	250	959.87	36.7	3.4	40.1	46.0	-5.9	
H	1.0	210	959.88	31.5	3.4	34.9	46.0	-11.1	

DATE OF TESTS: 99/12/15 SITE:2 CHART NO: SHEET NO: 4
 COMPANY NAME: RICOH MODEL:RW104S MODE: WRITE
 COMMENT: WRITE MODE

DISC 5

S/N:K-3

POL	ANT	TABLE	FREQ.	READ.	FACTOR	NET	LIMITS	MARGIN	COMMENT
H/V	[m]	[deg]	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
V	1.0	45	100.22	54.3	-18.0	36.3	43.5	-7.2	
H	1.0	305	186.14	38.7	-10.8	27.9	43.5	-15.6	
H	1.8	200	200.44	44.7	-10.2	34.5	43.5	-9.0	
V	1.0	310	200.44	46.9	-10.2	36.7	43.5	-6.8	*
H	1.4	155	225.57	45.4	-9.7	35.7	46.0	-10.3	
H	1.2	280	250.64	47.4	-9.4	38.0	46.0	-8.0	
H	1.1	270	275.68	35.5	-8.2	27.3	46.0	-18.7	
H	1.0	225	651.64	38.3	-3.3	35.0	46.0	-11.0	

DATE OF TESTS : 99/12/16 SITE: 2 CHART NO. SHEET NO. 5
 COMPANY NAME : RICOH MODEL: RW104S MODE: READ
 COMMENT: READ MODE

DISC 1

S/N:K-3

FREQ. [MHz]	READ.A [dBuV]	READ.B [dBuV]	FACTOR [dB]	NET A [dBuV]	NET B [dBuV]	LIMITS [dBuV]	MARGIN [dB]	COMMENT
2.277	27.5	27.3	0.2	27.7	27.5	48.0	-20.3	
4.910	34.6	27.7	0.3	34.9	28.0	48.0	-13.1	*
13.768	27.5	24.5	0.6	28.1	25.1	48.0	-19.9	
16.750	24.4	22.3	0.6	25.0	22.9	48.0	-23.0	
21.868	33.6	33.0	0.8	34.4	33.8	48.0	-13.6	
29.860	31.3	30.6	1.2	32.5	31.8	48.0	-15.5	

DATE OF TESTS : 99/12/16 SITE: 2 CHART NO. SHEET NO. 6
 COMPANY NAME : RICOH MODEL: RW104S MODE: WRITE
 COMMENT: WRITE MODE

DISC 1

S/N:K-3

FREQ. [MHz]	READ.A [dBuV]	READ.B [dBuV]	FACTOR [dB]	NET A [dBuV]	NET B [dBuV]	LIMITS [dBuV]	MARGIN [dB]	COMMENT
2.278	27.5	27.0	0.2	27.7	27.2	48.0	-20.3	
5.061	34.5	28.9	0.3	34.8	29.2	48.0	-13.2	
14.218	27.8	25.5	0.6	28.4	26.1	48.0	-19.6	
16.093	25.5	23.4	0.6	26.1	24.0	48.0	-21.9	
20.010	35.5	25.6	0.8	36.3	26.4	48.0	-11.7	*
28.566	34.0	30.5	1.2	35.2	31.7	48.0	-12.8	

DATE OF TESTS : 99/12/16 SITE: 2 CHART NO. SHEET NO. 7
 COMPANY NAME : RICOH MODEL: RW104S MODE: READ
 COMMENT: READ MODE

DISC 5

S/N:K-3

FREQ. [MHz]	READ.A [dBuV]	READ.B [dBuV]	FACTOR [dB]	NET A [dBuV]	NET B [dBuV]	LIMITS [dBuV]	MARGIN [dB]	COMMENT
2.278	26.5	27.5	0.2	26.7	27.7	48.0	-20.3	
4.801	28.8	34.0	0.3	29.1	34.3	48.0	-13.7	
10.930	24.0	25.1	0.5	24.5	25.6	48.0	-22.4	
14.476	25.8	27.1	0.6	26.4	27.7	48.0	-20.3	
21.867	35.1	35.3	0.8	35.9	36.1	48.0	-11.9	*
29.961	32.6	31.7	1.2	33.8	32.9	48.0	-14.2	

DATE OF TESTS : 99/12/16 SITE: 2 CHART NO. SHEET NO. 8
 COMPANY NAME : RICOH MODEL: RW104S MODE: WRITE
 COMMENT: WRITE MODE

DISC 5

S/N:K-3

FREQ. [MHz]	READ.A [dBuV]	READ.B [dBuV]	FACTOR [dB]	NET A [dBuV]	NET B [dBuV]	LIMITS [dBuV]	MARGIN [dB]	COMMENT
2.227	27.1	27.2	0.2	27.3	27.4	48.0	-20.6	
4.707	34.3	28.6	0.3	34.6	28.9	48.0	-13.4	*
11.133	19.3	24.5	0.5	19.8	25.0	48.0	-23.0	
14.425	27.3	25.6	0.6	27.9	26.2	48.0	-20.1	
21.887	30.0	30.6	0.8	30.8	31.4	48.0	-16.6	
29.352	27.6	27.3	1.2	28.8	28.5	48.0	-19.2	