ZACTA Technology Corporation Yonezawa Testing Center
4149-7 Hachimanpara 5-chome Yonezawa-shi Yamagata 992-1128 Japan
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TEST REPORT

Report No.: Z01C-00319
Issue Date: September 28, 2000

The device, as described herewith, was tested pursuant to applicable test procedure indicated below and complies with the requirements of;

FCC Part15 Subpart B, Class B

The EUT complies with section 15.37 "Transition provision for compliance with the rules".
The test results are traceable to international or national standards.

Applicant	:	Kenwood Corporation Communication Equipment Division 1-16-2, Hakusan, Midori-ku Yokohama-shi, Kanagawa 226-8525 Phone: +81-45-939-6254 Fax.: +81-45-939-7096
Equipment under test (EUT)	:	Scanning Receiver (As PC peripheral)
FCC ID	:	K4431201110
Trade Name	:	KENWOOD
Model Number	:	TS-2000 / TS-2000X / TS-B2000
Serial Number	:	N/A
EUT Condition	:	Pre-production

Test procedure	:	ANSI C63.4-1992
Date of test	:	September 23, 2000
Test place	:	Site 2
Test results	:	Complied

Zacta Technology Corporation certifies that no party to the application is subject to a denial of federal benefits, that include FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21U.S.C. 853(a).

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.

Test performed by: Takuya Osato / EMC engineer

Authorized by: Kiyoshi Endo / Manager of Technical Division

NVLAP®
Lab code : 200306-0

Table of contents

1. Equipment description

1.1 EUT information

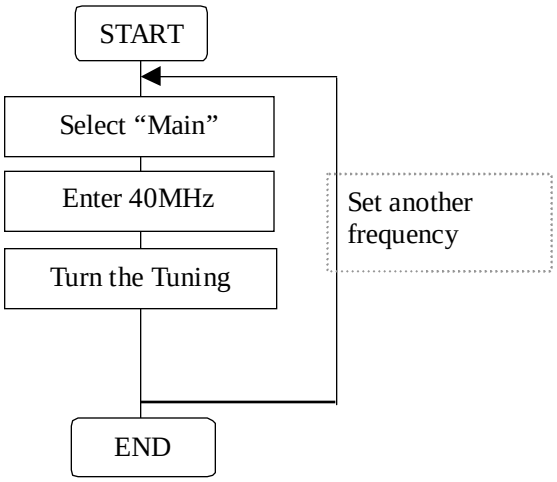
No.	EUT	Company	Model No.	Serial No.	FCC ID/DoC	Comment
1	Scanning receiver	KENWOOD	TS-2000X	N/A	K4431201110	-
2	Microphone	KENWOOD	MC-43S	N/A	N/A	Accessory
3	Separate remote panel	KENWOOD	RM-2000	N/A	N/A	Option
4	Speaker	KENWOOD	KES-3	N/A	N/A	Option
5	Speaker	KENWOOD	SP-50B	N/A	N/A	Option

Max. used frequency	1299.999999MHz
Frequency range	<Main> 30kHz to 60MHz 142MHz to 152MHz 420MHz to 450MHz 1240MHz to 1300MHz <Sub> 118MHz to 174MHz 220MHz to 512MHz
Power ratings	DC +13.8V [EUT is powered from DC power supply. Power supply for DC power supply in testing was AC 120V 60Hz.]
Port(s)	PHONES jack MIC connector ANT 1 and ANT 2 connectors GND post KEY and PADDLE jacks AT connector ANT 144 connector ANT 430 connector ANT 1.2G connector (TS-2000 Optional) DC 13.8V power input connector COM connector PANEL connector EXT.SP1 and EXT.SP2 jacks EXT.CONT connector ACC2 connector REMOTE connector HF RX ANT connector
Size	(W) 269.5 x (H) 95.5 x (D) 316.7 mm (TS-2000 / TS-2000X) (W) 269.5 x (H) 95.5 x (D) 317.1 mm (TS-B2000)
Variation of model(s)	TS-2000 (HF/VHF/UHF All-mode Multi-band Transceiver) TS-2000X (HF/VHF/UHF/1.2GHz All-mode Multi-band Transceiver) *Tested model TS-B2000 (HF/VHF/UHF All-mode Multi-band Transceiver)

1.2 Operating flow

<Frequency scans>

Ex.) Scan Main frequency range from 30kHz to 60MHz



2. Configuration information

2.1 Peripheral(s) information

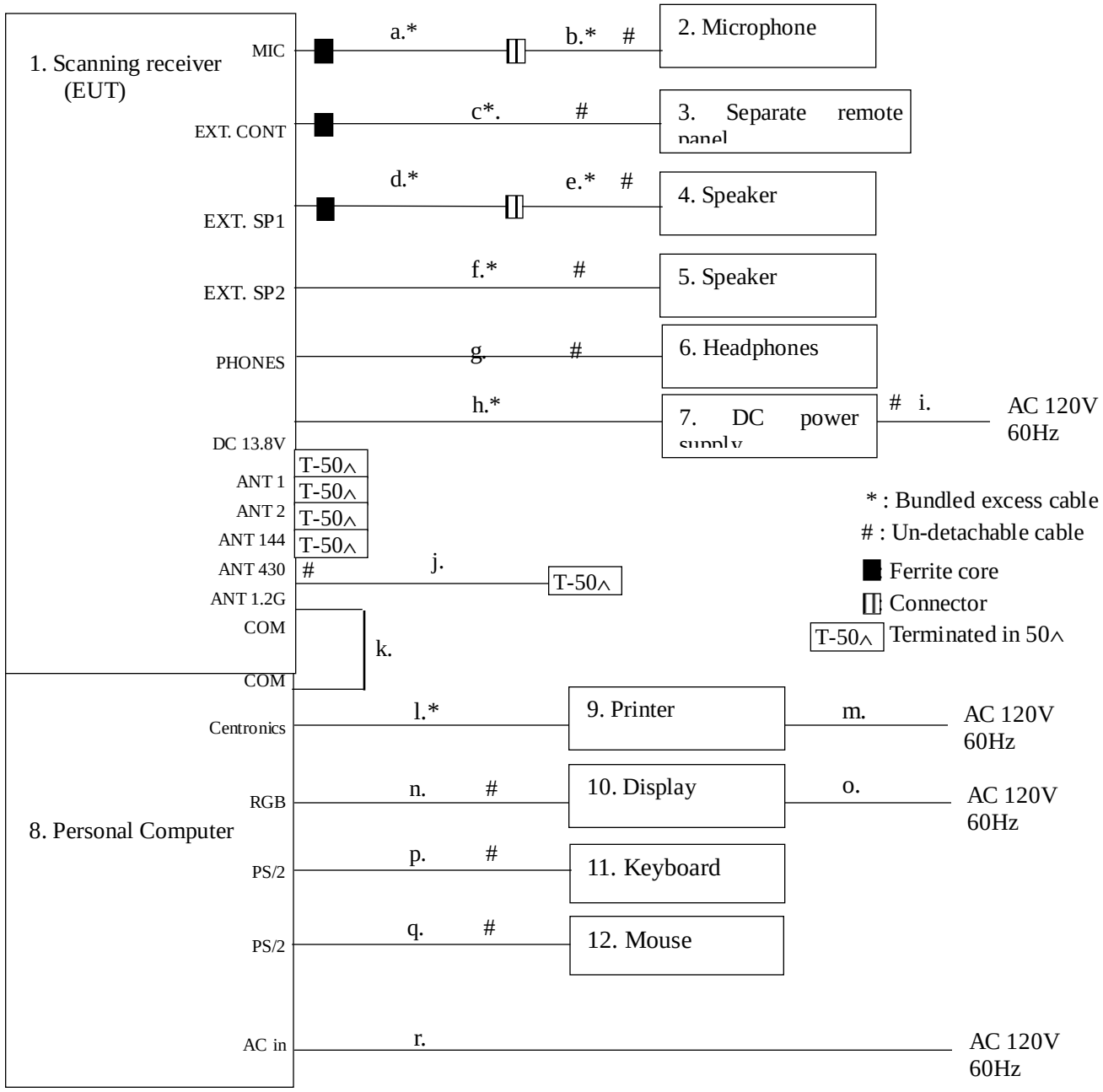
No.	Equipment	Company	Model No.	Serial No.	DoC / FCC ID	Comment
6	Headphones	KENWOOD	HS-5	N/A	N/A	-
7	DC power supply	KENWOOD	PS-52	70600045	N/A	-
8	Personal Computer	Hewlett Packard	Vectra 525	US70254071	B94VECTRAVEMT	-
9	Printer	Hewlett Packard	C4555A	US6BC212N	B94C4555X	-
10	Display	Goldstar	Studio Works 56i	15005G004966	BEJCS585	-
11	Keyboard	DELL	SK-1000REW	M961062608	BCG1100258	-
12	Mouse	Hewlett Packard	M-S34	LZB64901930	DZL211029	-

2.2 Cable(s) information

No.	Cable	Length [m]	Shield	Connector	From	To	Comment
a	Microphone cable	4.0	Shielded	Metal	EUT	Microphone cable No.b.	Bundled excess cable With one ferrite core
b	Microphone cable	0.4	Shielded	Metal	Microphone cable No.a.	Microphone	Coiled
c	Remote panel cable	5.0	Unshielded	Metal	EUT	Separate remote panel	Accessory
d	Speaker cable	5.0	Unshielded	Metal	EUT	Speaker cable No.e	Accessory With one ferrite core
e	Speaker cable	1.8	Unshielded	Metal	Speaker cable No.d	Speaker No.4	-
f	Speaker cable	1.8	Unshielded	Metal	EUT	Speaker No.5	-
g	Headphones cable	2.0	Unshielded	Metal	EUT	Headphones	-
h	DC cable	6.0	Unshielded	Plastic	EUT	DC power supply	Accessory
i	AC power cord for DC power supply	1.3	Unshielded	Plastic	DC power supply	AC outlet	-
j	1.2G ANT cable	0.2	Unshielded	Metal	EUT	Terminated in 50∧	-
k	RS-232C cable	1.5	Shielded	Metal	EUT	PC	-
l	Centronics cable	1.8	Shielded	Metal	Personal Computer	Printer	-
m	AC power cord for Printer	2.0	Unshielded	Plastic	Printer	AC outlet	-
n	RGB cable	1.8	Shielded	Metal	PC	Display	-
o	AC power cord for Display	2.0	Unshielded	Plastic	Display	AC outlet	-
p	Keyboard cable	1.7	Unshielded	Metal	PC	Keyboard	-

q	Mouse cable	2.0	Shielded	Metal	PC	Mouse	-
r	AC power cord for PC	2.5	Unshielded	Plastic	PC	AC outlet	-

2.3 System configuration



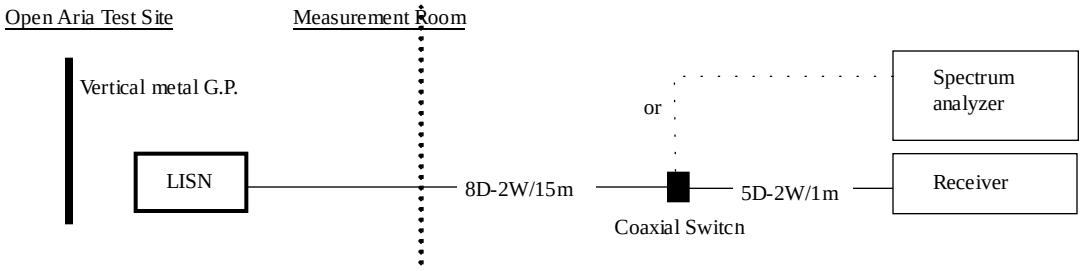
Note 1: Numbers assigned to equipment or cables on this diagram are corresponded to the list in "1.1 EUT information", "2.1 Peripheral(s) information" and "2.2 Cable(s) information".
Note 2: Microphone cable (No. a.) with one ferrite core is supplied with EUT.
Note 3: Remote panel cable (No. c.) with one ferrite core is supplied with EUT.
Note 4: Speaker cable (No. d.) with one ferrite core is supplied with EUT.

3. Test procedure

3.1 Description of Conducted Emission testing

Conducted emission testing is performed using test receiver. The detector function of the receiver is set to CISPR quasi-peak mode and the bandwidth is set to 9kHz. The frequency range from 450kHz to 30 MHz is scanned, and six highest emissions (Min.) are reported. The test results represent the worst-case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation.
EUT and support equipment is on a 1 meter x 2.3 meter surface, 0.8-meter height wooden table that is placed 40 cm away from the vertical metal ground plane.
Conducted emission of DC power supply was tested because EUT is powered from DC power supply. 50∧/50⌈H Line Impedance Stabilization Network (LISN) are 80cm away from the DC power supply and placed on the conducting ground plane. LISN for peripheral is terminated in 50∧.
Sufficient time for the EUT, support equipment and test equipment are allowed in order for them to warm up to their normal operating condition.

Cables for Conducted emission Test



3.2 Test equipment for Conducted emission

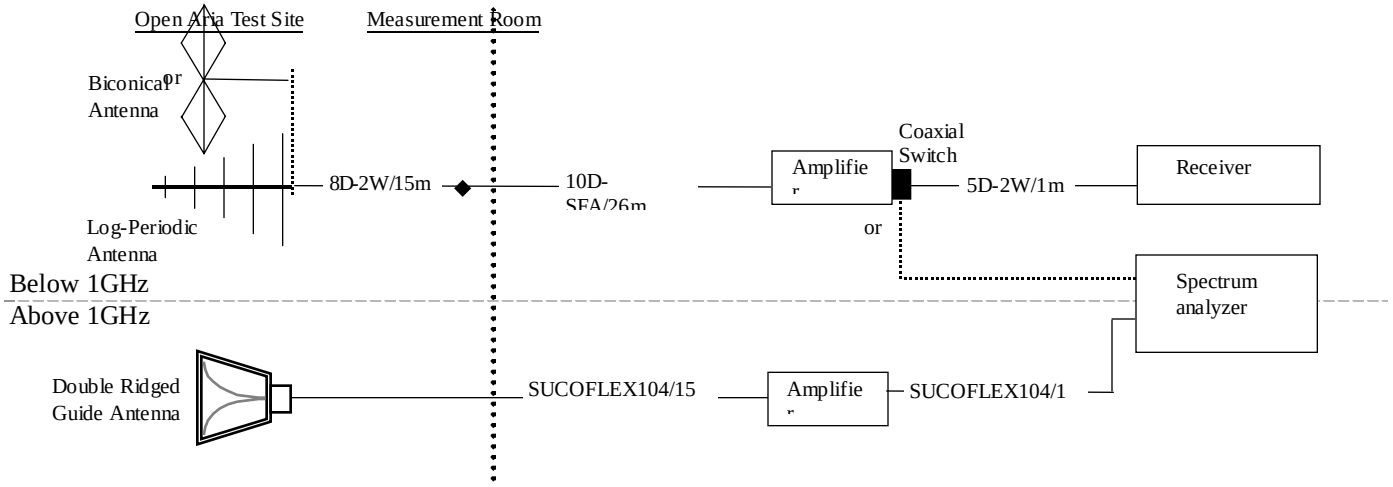
Equipment	Company	Model No.	Serial No.	Calibration date	Period
Spectrum analyzer	Agilent Technologies	8568B	2732A03847	Aug. 2000	1 year
Test Receiver	Rohode&Schwarz	ESHS10	842884/009	Oct. 1999	1 year
Line Impedance Stabilization Network for DC power supply	Compliance Design Inc.	8012-50-R-24-BNC	887121	Feb. 2000	1 year
Line Impedance Stabilization Network for Peripheral	Compliance Design Inc.	8012-50-R-24-BNC	887113	Mar. 2000	1 year
50∧ terminator	Agilent Technologies	11593A	N/A	Aug. 2000	1 year
Coaxial cable	FUJIKURA	8D-2W/15m 5D-2W/1m	H120601#3/C	Jun. 2000	1 year
Coaxial Switch	ANRITSU	MP59B	M26050	Jun. 2000	1 year

;The above equipment calibration is traceable to NIST or an equivalent standards reference organization.

3.3 Description of Radiated emission testing

Radiated emission testing is performed at 3m distance using broadband antenna (Biconical antenna, log-periodic antenna and double-ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1 to 4 meters and stopped at height producing the maximum emission. Frequency Range: 30MHz –1GHz is scanned and investigated using receiver, and above 1GHz, using spectrum analyzer. The detector function of the test receiver is set to CISPR Quasi-peak mode and the bandwidth is set to 120kHz. Peak and average detectors are used for measurements above 1GHz. The bandwidth of spectrum analyzer is set to 1MHz.
The EUT and support equipment are placed on a 1 meter x 2.3 meter surface, 0.8 meter height wooden table. The turntable is rotated by 360 degrees and stopped at azimuth of producing the maximum emission.
Interconnecting cables, which hanging closer than 40cm to the horizontal metal ground plane are bundled its excess in center. Six highest emissions (Min.) are reported. The test results represent the worst-case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation.
Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.
The highest frequency used in the EUT is 1299.999999MHz, therefore, the frequency range is investigated from 30MHz up to the frequency 7GHz, as specified in CFR section 15.33.

Cables for Radiated emission Test



3.4 Test equipment for Radiated emission

[Testing below 1GHz]

Equipment	Company	Model No.	Serial No.	Calibration date	Period
Spectrum analyzer	Agilent Technologies	8568B	2732A03847	Aug. 2000	1 year
RF Preamplifier	Anritsu	MH648A	M96157	Aug. 2000	1 year
Test Receiver	Kyoritsu Electrical Works, Ltd.	KNM-5002 KCV-6002	4N-187-10 4-257-1	Nov. 1999	1 year
Biconical Antenna	Schwarzbeck	BBA9106/VHA9103L E	02130879	Jun. 2000	1 year
Log Periodic Antenna	EMCO	3146	8901-2332	Jun. 1999	1 year
Coaxial cable	FUJIKURA	8D-2W/15m 10D-SFA/26m 5D-2W/1m	H120601#2/R3	Jun. 2000	1 year
Coaxial Switch	ANRITSU	MP59B	M26050	Jun. 2000	1 year
Site attenuation	ZACTA Technology Corp.	Site 2	N/A	Dec.1999	1 year

[Testing above 1GHz]

Equipment	Company	Model No.	Serial No.	Calibration date	Period
Spectrum Analyzer	ADVANTEST	R3271A	65050042	May. 2000	1 year
RF Preamplifier	Agilent Technologies	8449B	3008A00589	May. 2000	1 year
Double Ridged Guide Antenna	EMCO	3115	4327	Sep. 1999	1 year
Coaxial cable	SUHNER	SUCOFLEX 104/15m SUCOFLEX 104/1m	108014/4 108015/4	May. 2000	1 year

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

4. Laboratory description

4.1 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 and Type of Site:

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

Site type : Whether protected site

*3m/10m Radiated emission & Conducted emission testing can be performed on each site

3. Facility filing information:

1) FCC site filing: Pursuant to CFR47♣2.948

Site name	Final filing date
Site 1, Site 2 and Site 3	March 6, 2000

2) VCCI site filing: Pursuant to V–5/99.05 VCCI Regulations for Registration of measurement facilities

Site name	Radiated emission Registration No.	Conducted emission Registration No.	Duration of Registration
Site 1	R-136	C-132	September 30, 2003
Site 2	R-137	C-133	September 30, 2003
Site 3	R-138	C-134	September 30, 2003

3) NVLAP Accreditation:

NVLAP Lab. code: **200306-0**

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

4.2 Uncertainty

Total Uncertainty @95%min. Confidence probability

±1.78dB	For Conducted Emission
±2.66dB	For 3m Radiated Emission
±2.01dB	For 10m Radiated Emission

5. Results of the measurements

5.1 Results of the measurements

The minimum margins to the limits are as follows.

	Margin	Frequency	Detector	Operating mode	Data sheet
Conducted emission	29.7dB	1.265MHz	Quasi-peak	Scan mode	No. 1

	Margin	Frequency	Antenna Height	Antenna Polarity	Table degree	Operating mode	Data sheet
Radiated emission	2.6dB	2328.46MHz	2.0m	Vertical	190°	Scan mode	No. 2

5.2 Deviation from the standard

Not applicable.

5.3 Sample of field strength calculation

Conducted Emission [Sample Calculation] $dB\lceil V = 20\log_{10}(\lceil V)$

Class B
Limit @3.332MHz = 250⌈V = 48.0dB⌈V
Reading = 41.6dB⌈V Cable Loss + LISN Factor = 0.2 + 0.5 = 0.7dB Total = 41.6 + 0.7 = 42.3dB⌈V Margin = 48.0 - 42.3 = 5.7dB

Radiated Emission [Sample Calculation] $dB\lceil V/m = 20\log_{10}(\lceil V/m)$

Class B
Limit @147.6MHz = 150⌈V/m = 43.5dB⌈V/m
Reading = 42.8dB⌈V Ant. Factor + Cable Loss - Amp. Gain = 14.2 + 3.0 - 30.0 = -12.8dB Total = 42.8 - 12.8 = 30.0dB⌈V/m Margin = 43.5 - 30.0 = 13.5dB

6. Test Data

***** CONDUCTION MEASUREMENTS *****

STANDARD : FCC Part15 SubpartB SHEET NO. : 1
CLASS : B

DATE OF TEST : 2000/9/23
TEST SITE : 2
TEMP. [ ] : 25.0
HUMIDITY [%] 50.0
OPERATOR : T.Osato
COMPANY KENWOOD
EUT : Scanning receiver (HF/V/UHF TRANCEIVER)
MODEL NO. : TS-2000X
SERIAL NO. : N/A
TEST MODE : SCAN
NOTE : With PC

[QUASI-PEAK] FREQUENCY [MHz]	READING LINE A [dBµV]	READING LINE B [dBµV]	FACTOR [dB]	EMISSION LEVEL LINE A [dBµV]	EMISSION LEVEL LINE B [dBµV]	LIMIT [dBµV]	MARGIN [dB]		NOTE
1.195	14.7	14.5	0.2	14.9	14.7	48.0	33.1		
1.239	16.5	16.4	0.2	16.7	16.6	48.0	31.3		
1.265	18.1	17.8	0.2	18.3	18.0	48.0	29.7	*	
1.318	17.5	17.1	0.2	17.7	17.3	48.0	30.3		
1.505	16.3	16.0	0.2	16.5	16.2	48.0	31.5		
1.533	16.0	16.9	0.2	16.2	17.1	48.0	30.9		

*The Worst Emission. FACTOR LISN Factor + Cable Loss Ver.1.10 F2#005

***** RADIATION MEASUREMENTS *****

STANDARD : FCC Part15 SubpartB SHEET NO. : 2
CLASS : B
DISTANCE [m] : 3
DATE OF TEST : 2000/9/23
TEST SITE : 2
TEMP. [ ] : 25.0
HUMIDITY [%] : 50.0
OPERATOR : T.Osato
COMPANY : KENWOOD
EUT : Scanning receiver (HF/V/UHF TRANSCEIVER)
MODEL NO. : TS-2000X
SERIAL NO. : N/A
TEST MODE : SCAN
NOTE : With PC

ANTENNA POL. HOR/VER	HEIGHT [m]	TABLE RADIAN [Deg.]	READING FREQUENCY [MHz]	READING LEVEL [dBμV]	FACTOR [dBμV/m]	EMISSION LEVEL [dBμV/m]	LIMIT [dBμV/m]	MARGIN [dB]		NOTE
HOR	3.5	270	66.31	53.7	-20.9	32.8	40.0	7.2		PC
HOR	3.0	90	99.47	52.1	-17.9	34.2	43.5	9.3		PC
HOR	2.0	180	120.83	54.3	-14.6	39.7	43.5	3.8		
VER	1.0	295	157.50	48.5	-11.8	36.7	43.5	6.8		PC
HOR	2.5	190	165.78	50.4	-11.3	39.1	43.5	4.4		PC
HOR	1.0	265	426.75	33.0	-8.6	24.4	46.0	21.6		
VER	2.0	190	2328.46	53.0	-2.0	51.0	54.0	3.0		AVE
VER	2.0	190	2328.46	53.4	-2.0	51.4	54.0	2.6	*	PEAK
HOR	1.0	230	3483.45	39.2	2.9	42.1	54.0	11.9		AVE
HOR	1.0	230	3483.45	40.3	2.9	43.2	54.0	10.8		PEAK

* The Worst Emission. FACTOR Antenna Factor + Cable Loss - Amp Gain Ver.1.10 F2#005