

Designated by Ministry of International Trade and Industry

KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER

HEAD OFFICE

6-8-7 NISHITENMA

KITA-KU OSAKA 530-0047 JAPAN



Corporate Juridical Person

IKOMA TESTING LABORATORY

12128 TAKAYAMA-CHO

IKOMA-CITY NARA 630-0101 JAPAN

TEST REPORTReport No.A-019-02-C

Date: 18 November 2002

This test report is to certify that the tested device properly complies with the requirements of:

FCC Rules and Regulations Part 22 Subpart H ; Public Mobile Service

All the tests necessary to show compliance to the requirements were performed and these results met the specifications of requirement. The results of this report should not be construed to imply compliance of equipment other than that, which was tested. Unless the laboratory permission, this report should not be copied in part.

1. Applicant

Company Name : Shintom Co., Ltd.

Mailing Address : 1-19-20, Shin-Yokohama, Kohoku-ku, Yokohama 222-0033 Japan

2. Identification of Tested Device

Kind of Equipment Authorization : DoC Certification Verification

FCC ID : BFYT3017

Device Name : Cellular Mobile Telephone

Trade Name : AUDIOVOX

Model Number : TR93

Serial Number : 1740000825 Prototype Pre-production Production

Date of Manufacture : October 1999

3. Test Items and Procedure

: Measurement of Field Strength of Spurious Radiation

: Measurement of RF Power Output (Substitution Method)

Above all tests were performed under: FCC Part 2 Section 2.1046 and Section 2.1053

: without deviation, : with deviation (details are found inside of this report)

4. Date of Test

Receipt of Test Sample : 5 November 2002

Test Completed on : 15 November 2002

Yasuhiro Yamada
Chief Manager / Ikoma Testing Laboratory

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1. GENERAL INFORMATION

1.1. Product Description

The AUDIOVOX Model No. TR93 (referred to as the EUT in this report) is a Cellular Mobile Telephone.

- (1) Transmitting Frequency Range : 824.04 - 848.97 MHz
- (2) Receiving Frequency Range : 869.04 - 893.97 MHz
- (3) Emission Designator : F3E
- (4) Type of Circuit : Superheterodyne
 - 1st IF : 83.16 MHz
 - 2nd IF : 60 kHz
- (5) Type of Antenna : External Antenna (50Ω, unbalanced)
- (6) Rated Power Supply : DC 13.7 V
- (7) Contained Oscillator
 - 1) SYSTEM CLOCK : 14.4 MHz
 - 2) 2nd LOCAL OSC : 83.1 MHz
 - 3) RX VCO : 952.2 - 977.13 MHz
 - 4) TX VCO : 824.04 - 848.97 MHz

1.2. Description for Equipment Authorization

(1) Reference Rule and Specification	: FCC Rule Part 22 Subpart H ; a Public Mobile Service
(2) Kind of Equipment Authorization	: <input type="checkbox"/> DoC <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Verification
(3) Procedure of Application	: <input type="checkbox"/> Original Equipment <input checked="" type="checkbox"/> Modification

1.3. Test Facility

All tests described in this report were performed by:

Name: KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER (KEC)
IKOMA TESTING LABORATORY

Open Area Test Site No.1 No.3 No.4
Anechoic Chamber No.1 No.3
Shielded Room No.1 No.2 No.4 No.5

Address: 12128, Takayama-cho Ikoma-city, Nara, 630-0101 Japan

These test facilities have been filed with the FCC under the criteria of ANSI C63.4-1992. The KEC has been accredited by the NVLAP (Lab. Code: 200207-0) based on ISO17025. Also the laboratory has been authorized by TUV Product Service (GER) and TUV Rheinland (GER) based on their criteria for testing laboratory (EN45001).

2. TESTED SYSTEM

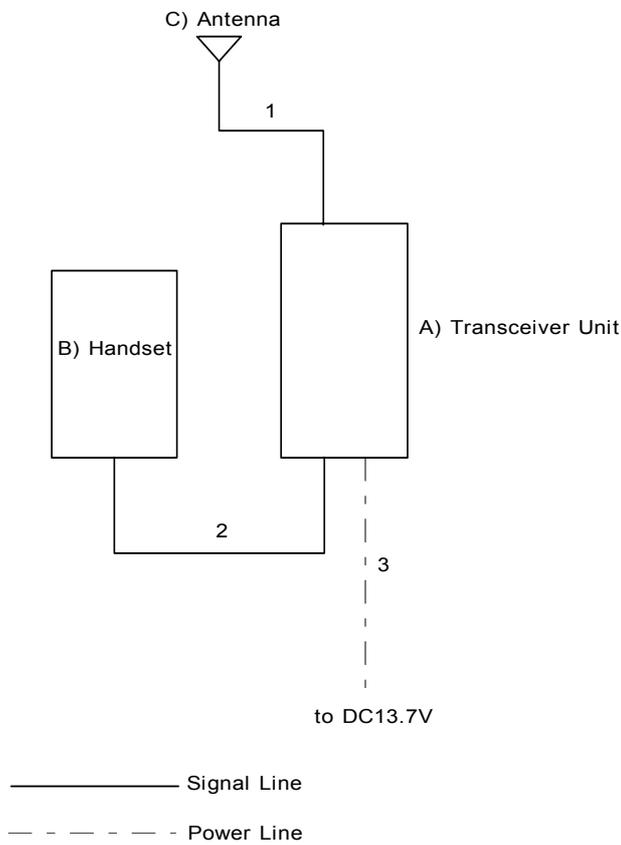
2.1. Test Mode

Carrier wave is continuously transmitted at Max power Level.

2.2. Characterization and condition of EUT System

: normal, : not normal (that is)

2.3. Block Diagram of EUT System



[Note] See 2.4 List of EUT System and 2.5 List of Cables.

2.4. List of EUT System

No	Device Name (Interface)	Model Number (Serial Number)	FCC ID (Trade Name)	Note	Remark
A	Cellular Mobile Telephone	TR93 (17400000825)	BFYT3017 (AUDIOVOX)	EUT	(1)
B	Handset	TH93 (-)	N/A		(1)
C	Antenna	1/4 λ Monopole (-)	N/A	Length : 23 cm	(2)

N/A: Not Applicable

[Remark]

(1) : EUT

(2) : Accessory of EUT

2.5. List of Cables

No	Cable Name	Shielded (Y/N)	Length (m)	Note	Remark
1	Antenna Cable	Y	2.43	Mini UHF 50 Ω Coaxial Cable	(1)
2	Curly Cord	N	0.4	Attached to Handset	(1)
3	Power Cable	N	1.8	DC 13.7V	(1)

[Remark]

(1): Accessory cable of EUT

3. RF OUTPUT POWER AND RADIATED EMISSIONS

3.1. Reference Rule and Specification

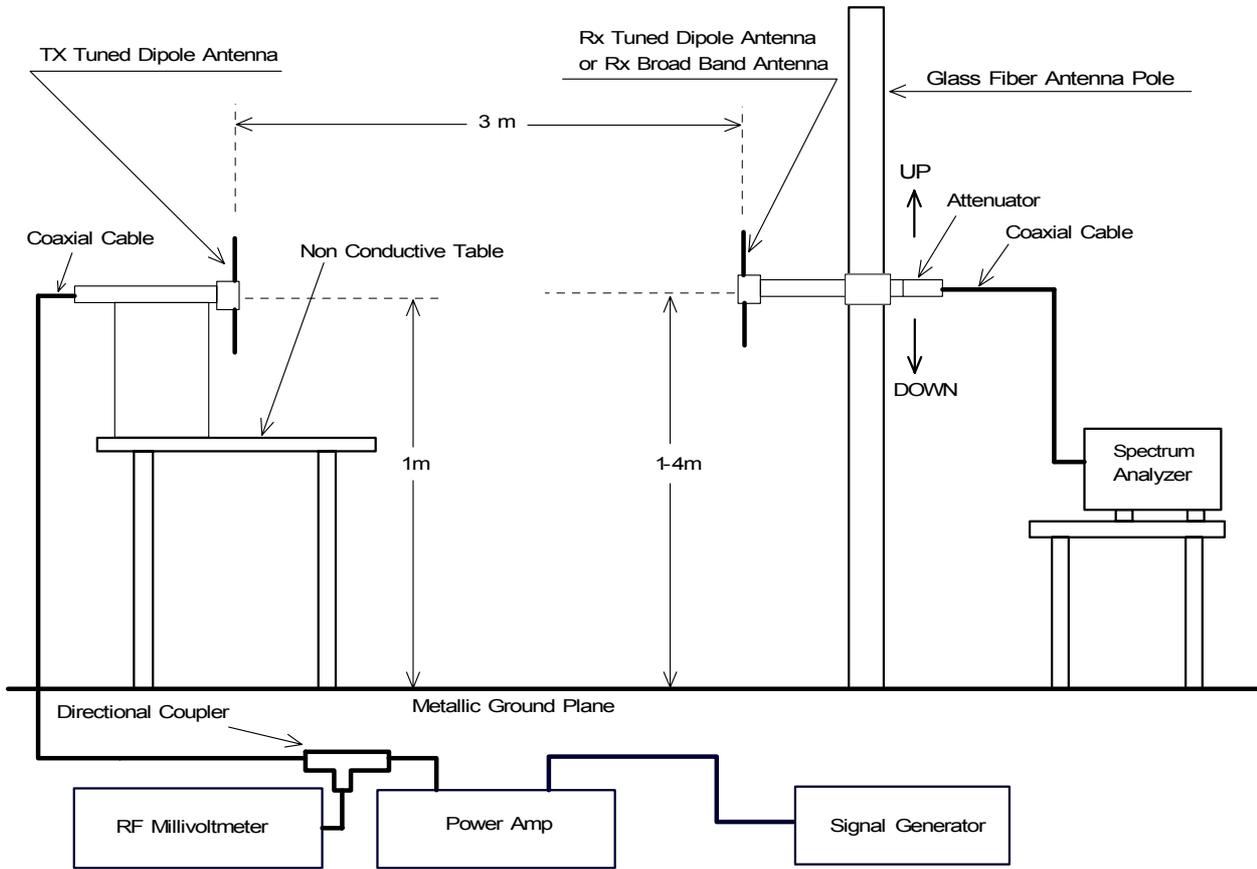
FCC Rule Part 22 Subpart H [§22.917] and Part 2 Subpart J [§2.1053]

3.2. Test Procedure

- (1) Place the transmitter to be tested (EUT) on the turntable.
- (2) Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier.
- (3) For each spurious frequency, raise and lower the test antenna from 1m to 4m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
- (4) Repeat step (3) for each spurious frequency with the test antenna polarized vertically.
- (5) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3m above the ground.
- (6) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
- (7) Repeat step (6) with both antennas vertically polarized for each spurious frequency.
- (8) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps (6) and (7) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.
- (9) The levels record in step (8) are the absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

$$\text{Radiated spurious emissions (dB)} = 10 \log_{10} \left[\frac{\text{TX power in watts}}{0.001} \right] - \text{the levels in step (8)}$$

Note : It is permissible to use other antennas provided they can be referenced to a dipole.



3.4. Test Results

(1) (991 ch.)

Carrier Emission Frequency	Spectrum Analyzer Reading		RF Meter Reading		Cable Loss	ERP	RF Output Power	Limit
	Horizontal	Vertical	Horizontal	Vertical				
(MHz)	(dBuV)	(dBuV)	(dBm)	(dBm)	(dB)	(dBm)	(mW)	(W)
824.04	92.2	96.4	30.2	35.2	2.0	33.2	2065.38	7.0

Spurious Emission Frequency	Spectrum Analyzer Reading		RF Meter Reading		Antenna Gain	Cable Loss	ERP	ERP	Limit of ERP	Margin
	Horizontal	Vertical	Horizontal	Vertical						
(MHz)	(dBuV)	(dBuV)	(dBm)	(dBm)	(dBi)	(dB)	(dBm)	(dBc)	(dBc)	(dB)
1648.08	41.6	52.2	-38.3	-27.8	13.7	2.9	-19.2	-52.3	-46.2	6.1
2472.12	27.7	35.2	-53.8	-46.6	16.8	3.5	-35.5	-68.6	-46.2	22.5
3296.16	25.0	25.0	-48.3	-48.4	18.6	4.1	-36.0	-69.1	-46.2	23.0
4120.20	20.0	20.0	-52.0	-51.6	19.4	4.7	-39.1	-72.2	-46.2	26.1
4944.24	15.0	15.0	-54.5	-54.2	19.5	5.3	-42.2	-75.3	-46.2	29.2
5768.28	40.5	35.5	-58.7	-63.0	19.4	5.7	-47.2	-80.3	-46.2	34.2
6592.32	30.0	30.2	-71.2	-71.0	22.3	6.2	-57.1	-90.2	-46.2	44.1
7416.36	33.1	37.6	-68.2	-63.6	22.7	6.6	-49.7	-82.8	-46.2	36.7
8240.40	30.3	33.1	-67.7	-66.3	22.3	7.1	-53.3	-86.4	-46.2	40.3

[Note]

The spectrum was scanned from 25MHz to the ten harmonic of the carrier, and all emissions not reported were very low.

[Calculation method]

ERP of Carrier (dBm) = Maximum RF Meter Reading (dBm) – Cable Loss (dB)

ERP of Spurious (dBc) = Maximum RF Meter Reading (dBm) + Antenna Gain (dBi) –
Dipole Antenna Gain [2.15dBi] – Cable Loss (dB) – ERP of Carrier (dBm)

[Environment]

Temperature: 24 °C

Humidity: 31 %

[Tested Date/ Tester]

15 November 2002

Signature

Yasunari Kawai

(2) (383 ch.)

Carrier Emission Frequency	Spectrum Analyzer Reading		RF Meter Reading		Cable Loss	ERP	RF Output Power	Limit
	Horizontal	Vertical	Horizontal	Vertical				
(MHz)	(dBuV)	(dBuV)	(dBm)	(dBm)	(dB)	(dBm)	(mW)	(W)
836.49	95.0	98.1	32.5	36.9	2.0	34.9	3054.92	7.0

Spurious Emission Frequency	Spectrum Analyzer Reading		RF Meter Reading		Antenna Gain	Cable Loss	ERP	ERP	Limit of ERP	Margin
	Horizontal	Vertical	Horizontal	Vertical						
(MHz)	(dBuV)	(dBuV)	(dBm)	(dBm)	(dBi)	(dB)	(dBm)	(dBc)	(dBc)	(dB)
1672.98	52.1	55.3	-28.5	-25.0	13.7	2.9	-16.4	-51.2	-47.9	3.3
2509.47	31.2	36.9	-49.5	-44.1	16.9	3.5	-32.9	-67.7	-47.9	19.9
3345.96	25.0	25.0	-47.7	-47.5	18.7	4.1	-35.1	-69.9	-47.9	22.1
4182.45	25.0	25.0	-47.2	-46.8	19.4	4.8	-34.4	-69.2	-47.9	21.4
5018.94	30.1	38.1	-69.8	-61.8	19.3	5.3	-50.0	-84.8	-47.9	37.0
5855.43	35.6	41.1	-66.1	-60.7	19.5	5.8	-49.2	-84.0	-47.9	36.2
6691.92	31.7	40.4	-68.9	-60.0	22.4	6.3	-46.1	-80.9	-47.9	33.1
7528.41	34.5	39.6	-67.1	-61.8	22.7	6.7	-48.0	-82.8	-47.9	35.0
8364.90	33.1	36.2	-62.8	-61.1	21.5	7.1	-48.9	-83.7	-47.9	35.9

[Note]

The spectrum was scanned from 25MHz to the ten harmonic of the carrier, and all emissions not reported were very low.

[Calculation method]

ERP of Carrier (dBm) = Maximum RF Meter Reading (dBm) – Cable Loss (dB)

ERP of Spurious (dBc) = Maximum RF Meter Reading (dBm) + Antenna Gain (dBi) –
Dipole Antenna Gain [2.15dBi] – Cable Loss (dB) – ERP of Carrier (dBm)

[Environment]

Temperature: 24 °C

Humidity: 31 %

[Tested Date/ Tester]

15 November 2002

Signature

Yasunari Kawai

(3) (799 ch.)

Carrier Emission Frequency	Spectrum Analyzer Reading		RF Meter Reading		Cable Loss	ERP	RF Output Power	Limit
	Horizontal	Vertical	Horizontal	Vertical				
(MHz)	(dBuV)	(dBuV)	(dBm)	(dBm)	(dB)	(dBm)	(mW)	(W)
848.97	91.7	96.8	29.4	35.6	2.1	33.5	2213.09	7.0

Spurious Emission Frequency	Spectrum Analyzer Reading		RF Meter Reading		Antenna Gain	Cable Loss	ERP	ERP	Limit of ERP	Margin
	Horizontal	Vertical	Horizontal	Vertical						
(MHz)	(dBuV)	(dBuV)	(dBm)	(dBm)	(dBi)	(dB)	(dBm)	(dBc)	(dBc)	(dB)
1697.94	39.5	45.7	-40.5	-34.3	13.7	2.9	-25.7	-59.1	-46.5	12.7
2546.91	27.4	31.0	-53.6	-50.2	17.1	3.5	-38.8	-72.2	-46.5	25.8
3395.88	25.0	25.0	-48.4	-48.4	18.7	4.2	-36.1	-69.5	-46.5	23.1
4244.85	25.0	25.0	-47.1	-46.6	19.4	4.8	-34.2	-67.6	-46.5	21.2
5093.82	28.6	34.6	-71.8	-65.9	18.7	5.3	-54.7	-88.1	-46.5	41.7
5942.79	37.6	42.8	-66.1	-60.2	21.8	5.8	-46.4	-79.8	-46.5	33.4
6791.76	30.0	32.1	-69.5	-67.4	22.4	6.3	-53.5	-86.9	-46.5	40.5
7640.73	37.2	41.4	-63.3	-59.2	22.8	6.8	-45.4	-78.8	-46.5	32.4
8489.70	30.0	30.0	-66.8	-68.3	21.6	7.2	-54.6	-88.0	-46.5	41.6

[Note]

The spectrum was scanned from 25MHz to the ten harmonic of the carrier, and all emissions not reported were very low.

[Calculation method]

ERP of Carrier (dBm) = Maximum RF Meter Reading (dBm) – Cable Loss (dB)

ERP of Spurious (dBc) = Maximum RF Meter Reading (dBm) + Antenna Gain (dBi) –
Dipole Antenna Gain [2.15dBi] – Cable Loss (dB) – ERP of Carrier (dBm)

[Environment]

Temperature: 24 °C

Humidity: 31 %

[Tested Date/ Tester]

15 November 2002

Signature

Yasunari Kawai

3.5. Photographs of EUT System Configuration



4. USED TEST EQUIPMENTS AND CALIBRATION STATUS

Equipment	Manufacturer	Model No	Specifications	KEC Control No.	If used, checked By "x".	Last Cal.	Next Cal.
Spectrum Analyzer	Hewlett Packard	HP8564E	Frequency Range 9 kHz to 40 GHz	SA-39	<input checked="" type="checkbox"/>	2002/2	2003/2
Tuned Dipole Antenna	Kyoritsu	KBA-611S	Frequency Range 500 MHz - 1 GHz	AN-136	<input checked="" type="checkbox"/>	2002/2	2003/2
Tuned Dipole Antenna	Kyoritsu	KBA-611S	Frequency Range 500 MHz - 1 GHz	AN-115	<input checked="" type="checkbox"/>	2002/2	2003/2
Signal Generator	Wiltron	6769B	Frequency Range 10 MHz - 40 GHz	SG-42	<input checked="" type="checkbox"/>	2002/10	2003/10
Power Amp.	Amplifier Research	100W1000M1	Frequency Range 70 MHz - 1 GHz	AM-55	<input checked="" type="checkbox"/>	2002/6	2003/6
RF Millivolt-Meter	Rohde & Schwarz	URV5	Frequency Range 9 kHz - 2 GHz	VV-29	<input checked="" type="checkbox"/>	2002/3	2003/3
Coaxial Cable	Suhner	SUCOFLEX 104	Length : 1m [SMA(p)-SMA(p)]	CL-42	<input checked="" type="checkbox"/>	2002/2	2003/2
			Length : 10m [SMA(p)-SMA(p)]	CL-45	<input checked="" type="checkbox"/>	2002/2	2003/2
				CL-46	<input checked="" type="checkbox"/>	2002/2	2003/2
Horn Antenna	Raven	91888-2	Frequency Range 1 GHz - 2 GHz	AN-116	<input checked="" type="checkbox"/>	2001/8	2003/8
		91888-2	Frequency Range 1 GHz - 2 GHz	AN-211	<input checked="" type="checkbox"/>	2001/8	2003/8
		91889-2	Frequency Range 2 GHz - 5 GHz	AN-117	<input checked="" type="checkbox"/>	2001/8	2003/8
		91889-2	Frequency Range 2 GHz - 5 GHz	AN-212	<input checked="" type="checkbox"/>	2001/11	2002/11
	Scientific Atlanta	12-3.9	Frequency Range 3.95GHz - 5.85 GHz	AN-103	<input checked="" type="checkbox"/>	2001/8	2003/8
		12-3.9	Frequency Range 3.95GHz - 5.85 GHz	AN-142	<input checked="" type="checkbox"/>	2001/8	2003/8
		12-5.8	Frequency Range 5.85 GHz - 8.2 GHz	AN-62	<input checked="" type="checkbox"/>	2001/8	2003/8
		12-5.8	Frequency Range 5.85 GHz - 8.2 GHz	AN-104	<input checked="" type="checkbox"/>	2001/8	2003/8
		12-8.2	Frequency Range 8.2 GHz - 12.4 GHz	AN-63	<input checked="" type="checkbox"/>	2001/8	2003/8
		12-8.2	Frequency Range 8.2 GHz - 12.4 GHz	AN-210	<input checked="" type="checkbox"/>	2001/8	2003/8
Terminator	Anritsu	MP752A	50 Ω	AX-503	<input checked="" type="checkbox"/>	2002/2	2003/2
100V Insertion Unit	Rohde & Schwarz	URV5-Z4	Frequency Range 100 kHz - 2 GHz	VV-24-2	<input checked="" type="checkbox"/>	2002/3	2003/3
Directional Bridge	Hewlett Packard	86205A	Frequency Range 300 kHz - 6 GHz	AX-55	<input checked="" type="checkbox"/>	2002/8	2003/8