



ETL Testing Laboratories, Inc.
4317-A Park Drive, N.W.
Norcross, GA 30093
Telephone (770) 925-2444
Fax (770) 925-7294

Mitsubishi Wireless Communication

RADIATED SPURIOUS EMISSION MEASUREMENT REPORT In Support Of APPLICATION FOR CERTIFICATION

**MODEL: MT253
Digital 800**

**Sept. 20, 1999
Report Number: mit2452.rpb**

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LIST OF EXHIBITS

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1.0 General Description

1.1 Product Description

PCS 1900 GSM based hand held cellular phone.

1.2 Test Facility

The open area test site used to collect the radiated data is located at 4317-A Park Drive NW, Norcross, Georgia. This test facility has been fully described in a report dated Jan. 8, 1993 submitted to the FCC. Please reference the site filing number: 31040/SIT/1300B3, dated March 9, 1993. This facility is accredited by the NVLAP program.

2.0 System Test Configuration

2.1 Justification

The unit was operated in the standalone configuration, placed in the center of the turntable.

Channel of operation:	High	Channel 799 (849.0 MHZ)
	Mid	Channel 384 (836.5 MHZ)
	Low	Channel 491 (824.0 MHZ)

2.2 EUT Exercising Software

The EUT was configured to exercise in a manner similar to a typical use. For simplicity of testing, the unit was programmed to transmit continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Equipment Modification

Any modifications installed previous to testing by Mitsubishi Wireless Communication will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services NA, Inc.

3.0 Measurement Data

3.1 Field Strength of Spurious Radiation

(a). Field Strength Calculation and Measurement Procedure

The emission limitation specified in FCC Paragraph 24.238(a) is given as $43 + 10 * \log$ (mean output power in watts). This is given for any frequency outside the licensee's frequency block. For 1.00 watt, this equals 43 dB below the carrier for all emissions.

The transceiver was placed on a rotatable wooden test stand approximately 0.8 meter in height. The emission spectrum was examined up to 20 GHz using an HP8566B spectrum analyzer and EMCO 3115 double ridge horn guide. Measurements below 1.0 GHz were made using a Chase Design "Biconilog" antenna. At each frequency, the device was rotated through 360 degrees, and the antenna was raised and lowered between 1 - 4 meters. Measurements were made with both test antenna vertically and horizontally polarized. In each case, only the maximum radiation measured was recorded for this report. All emissions not reported were more than 20 dB below the specified limit. The noise floor of the measurement equipment, spectrum analyzer and accessories, was at least 60 dB below the level of the applicable limits.

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

where FS = Field Strength in dB V/m

RA = Receiver Amplitude in dBuV

CL = Cable Loss in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

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3.1 Field Strength of Spurious Radiation (Continued)

Assume a receiver reading of 33.5 dB V is obtained at 1763.0 MHz. The antenna factor of 25.6 dB and cable loss of 1.0 dB is added. No amplifier gain is subtracted, giving a field strength of 60.1 dB V/m. This value in dB V/m was converted to its corresponding level in V/m.

$$\begin{array}{ll} \text{RA} = 33.5 \text{ dB V/m} & \text{AF} = 25.6 \text{ dB} \\ \text{CL} = 1.0 \text{ dB} & \text{AG} = 0.0 \text{ dB} \end{array}$$

$$\text{FS} = 33.5 + 25.6 + 1.0 = 60.1 \text{ dBuV/m}$$

(b). Measurement Data

The results on the following page(s) were obtained when the device was tested in the condition described in Section 2.

The data below 1 GHz was taken at RBW=120kHz, above 1GHz the RBW was set to 1 MHz. The unit was set at the maximum output power, which was 1 W.

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Field Strength of Spurious Emissions Mid Channel Antenna Retracted

Company: Mitsubishi Wireless

Model: MT253

Job No.: J99022452

Date: 09/17/99

Standard: CFR 47 Part 22

Class: Group: None

Notes: TX 0.6W Mid Channel 836.5Mhz

Tested by: Mark A. Severson

Location: Norcross

Detector: HP 8566

Antenna: AHSYS571

PreAmp: CDI 10G

Cable(s): CABLE4 CABLE9

Distance: 3

Digital 800(D800)

Signature:

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Atten Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	
Antenna Fully retracted										
V	836.500	95.0	23.0	1.5	0.0	10.0	129.5	n/a	n/a	Pk
H	836.500	84.4	23.0	1.5	0.0	10.0	118.9	n/a	n/a	Pk
V	1673.000	40.6	27.3	1.6	0.0	10.0	79.6	84.4	-4.8	Pk
H	1673.000	36.7	27.3	1.6	0.0	10.0	75.7	84.4	-8.7	Pk
V	2509.500	36.9	31.2	2.2	0.0	0.0	70.3	84.4	-14.1	Pk
H	2509.500	37.9	31.2	2.2	0.0	0.0	71.3	84.4	-13.1	Pk
V	3346.000	36.2	31.9	2.2	23.2	0.0	47.1	84.4	-37.3	Pk nf
H	3346.000	36.2	31.9	2.2	23.2	0.0	47.1	84.4	-37.3	Pk nf
V	4182.500	36.3	33.4	2.3	23.7	0.0	48.3	84.4	-36.1	Pk nf
H	4182.500	36.8	33.4	2.3	23.7	0.0	48.8	84.4	-35.6	Pk nf
V	5019.000	36.9	35.8	2.7	24.2	0.0	51.2	84.4	-33.2	Pk nf
H	5019.000	36.8	35.8	2.7	24.2	0.0	51.1	84.4	-33.3	Pk nf
V	5855.000	43.1	36.4	2.9	24.3	0.0	58.1	84.4	-26.3	Pk nf
H	5855.000	42.0	36.4	2.9	24.3	0.0	57.0	84.4	-27.4	Pk nf
V	6692.000	43.2	37.7	3.1	24.6	0.0	59.5	84.4	-24.9	Pk nf
H	6692.000	44.0	37.7	3.1	24.6	0.0	60.3	84.4	-24.1	Pk nf
V	7528.500	43.0	37.7	3.6	25.0	0.0	59.4	84.4	-25.0	Pk nf
H	7528.500	42.4	37.7	3.6	25.0	0.0	58.8	84.4	-25.6	Pk nf
V	8365.000	40.9	38.3	3.9	25.4	0.0	57.7	84.4	-26.7	Pk nf
H	8365.000	41.4	38.3	3.9	25.4	0.0	58.2	84.4	-26.2	Pk nf

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Field Strength of Spurious Emissions High Channel Antenna Retracted

Company: Mitsubishi Wireless

Model: MT253

Job No.: J99022452

Date: 09/17/99

Standard: CFR 47 Part 22

Class: B

Group: None

Notes: TX 0.6W High channel 849Mhz

Digital 800(D800)

Tested by: Mark A. Severson

Location: Norcross

Detector: HP 8566

Antenna: AHSYS571

PreAmp: CDI 10G

Cable(s): CABLE4 CABLE9

Distance: 3

Signature:

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Atten Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	
Antenna Fully retracted										
V	849.000	93.6	23.2	1.5	0.0	10.0	128.3	n/a	n/a	Pk
H	849.000	80.7	23.2	1.5	0.0	10.0	115.4	n/a	n/a	Pk
V	1698.000	40.5	27.5	1.7	0.0	10.0	79.7	84.4	-4.7	Pk
H	1698.000	40.1	27.5	1.7	0.0	10.0	79.3	84.4	-5.1	Pk
V	2547.000	37.7	31.4	2.2	0.0	0.0	71.2	84.4	-13.2	Pk
H	2547.000	38.4	31.4	2.2	0.0	0.0	71.9	84.4	-12.5	Pk
V	3396.000	37.0	31.8	2.2	0.0	0.0	71.0	84.4	-13.4	Pk
H	3396.000	36.1	31.8	2.2	0.0	0.0	70.1	84.4	-14.3	Pk
V	4245.000	37.0	33.4	2.4	23.7	0.0	49.1	84.4	-35.3	Pk
H	4245.000	37.4	33.4	2.4	23.7	0.0	49.5	84.4	-34.9	Pk
V	5094.000	36.5	35.6	2.7	24.2	0.0	50.6	84.4	-33.8	Pk
H	5094.000	37.0	35.6	2.7	24.2	0.0	51.1	84.4	-33.3	Pk
V	5943.000	37.2	36.8	2.9	24.3	0.0	52.6	84.4	-31.8	Pk
H	5943.000	39.9	36.8	2.9	24.3	0.0	55.3	84.4	-29.1	Pk
V	6792.000	41.1	37.9	3.2	24.7	0.0	57.5	84.4	-26.9	Pk
H	6792.000	44.0	37.9	3.2	24.7	0.0	60.4	84.4	-24.0	Pk
V	7641.000	43.2	37.5	3.7	25.1	0.0	59.3	84.4	-25.1	Pk
H	7641.000	42.9	37.5	3.7	25.1	0.0	59.0	84.4	-25.4	Pk
V	8490.000	41.5	38.8	4.0	25.5	0.0	58.8	84.4	-25.6	Pk
H	8490.000	41.8	38.8	4.0	25.5	0.0	59.1	84.4	-25.3	Pk

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Field Strength of Spurious Emissions Low Channel Antenna Fully Extended

Company: Mitsubishi Wireless

Model: MT253

Job No.: J99022452

Date: 09/17/99

Standard: CFR 47 Part 22

Class:

Group: None

Notes: TX 0.6W Low Channel 824.0Mhz

Digital 800(D800)

Tested by: Mark A. Severson

Location: Norcross

Detector: HP 8566

Antenna: AHSYS571

PreAmp: CDI 10G

Cable(s): CABLE4 CABLE9

Distance: 3

Signature:

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Atten Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	
Antenna Fully Extended										
V	824.000	95.2	22.9	1.5	0.0	10.0	129.6	n/a	n/a	Pk
H	824.000	82.8	22.9	1.5	0.0	10.0	117.2	n/a	n/a	Pk
V	1648.000	42.3	27.1	1.6	0.0	10.0	81.0	84.4	-3.4	Pk
H	1648.000	35.4	27.1	1.6	0.0	10.0	74.1	84.4	-10.3	Pk
V	2472.000	36.0	31.1	2.1	0.0	10.0	79.2	84.4	-5.2	Pk
H	2472.000	37.9	31.1	2.1	0.0	0.0	71.1	84.4	-13.3	Pk
V	3296.000	36.6	32.0	2.2	23.2	0.0	47.6	84.4	-36.8	Pk
H	3296.000	36.3	32.0	2.2	23.2	0.0	47.3	84.4	-37.1	Pk
V	4120.000	36.2	33.4	2.3	23.7	0.0	48.2	84.4	-36.2	Pk
H	4120.000	36.8	33.4	2.3	23.7	0.0	48.8	84.4	-35.6	Pk
V	4944.000	36.6	35.5	2.7	24.1	0.0	50.7	84.4	-33.7	Pk
H	4944.000	36.4	35.5	2.7	24.1	0.0	50.5	84.4	-33.9	Pk
V	5768.000	37.0	36.0	2.9	24.3	0.0	51.6	84.4	-32.8	Pk
H	5768.000	37.5	36.0	2.9	24.3	0.0	52.1	84.4	-32.3	Pk
V	6592.000	41.9	37.6	3.1	24.6	0.0	57.9	84.4	-26.5	Pk
H	6592.000	42.2	37.6	3.1	24.6	0.0	58.2	84.4	-26.2	Pk
V	7416.000	41.1	37.9	3.5	25.0	0.0	57.5	84.4	-26.9	Pk
H	7416.000	41.1	37.9	3.5	25.0	0.0	57.5	84.4	-26.9	Pk
V	8240.000	41.6	37.8	3.9	25.3	0.0	58.0	84.4	-26.4	Pk
H	8240.000	41.6	37.8	3.9	25.3	0.0	58.0	84.4	-26.4	Pk

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Field Strength of Spurious Emissions Mid Channel Antenna Extended

Company: Mitsubishi Wireless

Model: MT253

Job No.: J99022452

Date: 09/20/99

Standard: CFR 47 Part 22

Class:

Group: None

Notes: Tx 0.6W Mid channel 836.5Mhz

Digital 800(D800)

Tested by: Mark A. Severson

Location: Norcross

Detector: HP 8566

Antenna: AHSYS571

PreAmp: CDI 10G

Cable(s): CABLE4 CABLE9

Distance: 3

Signature:

Ant. Pol. (V/H)	Frequency MHz	Reading dB(μV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Atten Factor dB	Net dB(μV/m)	Limit dB(μV/m)	Margin dB	
Antenna Fully extended										
V	836.500	96.0	23.0	1.5	0.0	10.0	130.5	n/a	n/a	Pk
H	836.500	84.3	23.0	1.5	0.0	10.0	118.8	n/a	n/a	Pk
V	1673.000	41.8	27.3	1.6	0.0	10.0	80.8	84.4	-3.6	Pk
H	1673.000	37.0	27.3	1.6	0.0	10.0	76.0	84.4	-8.4	Pk
V	2509.500	37.1	31.2	2.2	0.0	0.0	70.5	84.4	-13.9	Pk
H	2509.500	36.8	31.2	2.2	0.0	0.0	70.2	84.4	-14.2	Pk
V	3346.000	36.9	31.9	2.2	23.2	0.0	47.8	84.4	-36.6	Pk
H	3346.000	37.1	31.9	2.2	23.2	0.0	48.0	84.4	-36.4	Pk
V	4182.500	37.0	33.4	2.3	23.7	0.0	49.0	84.4	-35.4	Pk
H	4182.500	36.6	33.4	2.3	23.7	0.0	48.6	84.4	-35.8	Pk
V	5019.000	37.2	35.8	2.7	24.2	0.0	51.5	84.4	-32.9	Pk
H	5019.000	36.7	35.8	2.7	24.2	0.0	51.0	84.4	-33.4	Pk
V	5855.000	43.3	36.4	2.9	24.3	0.0	58.3	84.4	-26.1	Pk
H	5855.000	43.1	36.4	2.9	24.3	0.0	58.1	84.4	-26.3	Pk
V	6692.000	43.0	37.7	3.1	24.6	0.0	59.3	84.4	-25.1	Pk
H	6692.000	43.3	37.7	3.1	24.6	0.0	59.6	84.4	-24.8	Pk
V	7528.500	43.9	37.7	3.6	25.0	0.0	60.3	84.4	-24.1	Pk
H	7528.500	44.0	37.7	3.6	25.0	0.0	60.4	84.4	-24.0	Pk
V	8365.000	41.9	38.3	3.9	25.4	0.0	58.7	84.4	-25.7	Pk
H	8365.000	42.0	38.3	3.9	25.4	0.0	58.8	84.4	-25.6	Pk

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Field Strength of Spurious Emissions High Channel Antenna Extended

Company: Mitsubishi Wireless

Model: MT253

Job No.: J99022452

Date: 09/20/99

Standard: CFR 47 Part 22

Class: Group: None

Notes: Tx 0.6W High channel 849.0Mhz

Digital 800(D800)

Tested by: Mark A. Severson

Location: Norcross

Detector: HP 8566

Antenna: AHSYS571

PreAmp: CDI 10G

Cable(s): CABLE4 CABLE9

Distance: 3

Signature:

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Atten Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	
Antenna Fully extended										
V	849.000	94.1	23.2	1.5	0.0	10.0	128.8	n/a	n/a	Pk
H	849.000	83.8	23.2	1.5	0.0	10.0	118.5	n/a	n/a	Pk
V	1698.000	41.0	27.5	1.7	0.0	10.0	80.2	84.4	-4.2	Pk
H	1698.000	39.2	27.5	1.7	0.0	10.0	78.4	84.4	-6.0	Pk
V	2547.000	38.0	31.4	2.2	0.0	0.0	71.5	84.4	-12.9	Pk
H	2547.000	38.5	31.4	2.2	0.0	0.0	72.0	84.4	-12.4	Pk
V	3396.000	37.2	31.8	2.2	0.0	0.0	71.2	84.4	-13.2	Pk
H	3396.000	36.3	31.8	2.2	0.0	0.0	70.3	84.4	-14.1	Pk
V	4245.000	36.6	33.4	2.4	23.7	0.0	48.7	84.4	-35.7	Pk
H	4245.000	37.5	33.4	2.4	23.7	0.0	49.6	84.4	-34.8	Pk
V	5094.000	36.2	35.6	2.7	24.2	0.0	50.3	84.4	-34.1	Pk
H	5094.000	37.3	35.6	2.7	24.2	0.0	51.4	84.4	-33.0	Pk
V	5943.000	41.9	36.8	2.9	24.3	0.0	57.3	84.4	-27.1	Pk
H	5943.000	42.7	36.8	2.9	24.3	0.0	58.1	84.4	-26.3	Pk
V	6792.000	43.6	37.9	3.2	24.7	0.0	60.0	84.4	-24.4	Pk
H	6792.000	44.1	37.9	3.2	24.7	0.0	60.5	84.4	-23.9	Pk
V	7641.000	42.9	37.5	3.7	25.1	0.0	59.0	84.4	-25.4	Pk
H	7641.000	43.1	37.5	3.7	25.1	0.0	59.2	84.4	-25.2	Pk
V	8490.000	41.4	38.8	4.0	25.5	0.0	58.7	84.4	-25.7	Pk
H	8490.000	42.0	38.8	4.0	25.5	0.0	59.3	84.4	-25.1	Pk

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ERP Measurements

Company: Mitsubishi Wireless

Model: MT253

Job No.: J99017653

Date: 09/22/99

Standard: CFR 47 P22

Class: Group: None

Notes: EIRP Measurements

Digital 800(D800)

Tested by: Mark A. Severson

Location: Norcross

Detector: HP 8566

Antenna: AHSYS571

PreAmp: None

Cable(s): CABLE8 CABLE9

Distance: 3

Signature:

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Atten Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB
EUT, retractable antenna(fully Extended)									
V	824.000	95.2	22.9	1.5	0.0	10.0	129.6	n/a	n/a
V	836.500	96.0	23.0	1.5	0.0	10.0	130.5	n/a	n/a
V	849.000	94.1	23.2	1.5	0.0	10.0	128.8	n/a	n/a

Substitution Method

Ant. Pol. (V/H)	Frequency MHz	EUT Measured Reading dB(uV)	Sig Generator Level dBm	Pwr meter Reading dBm	Atten	Tx. Ant Gain dBi	Subs Meth Radiated Power dBm	Radiated Power in Watts	Calc. EUT Radiated Power	Delta EUT vs. Subs. dB
EUT, retractable antenna(fully Extended)										
V	824.000	129.6	-23.1	16.2	12.0	0.7	28.9	0.776		
V	836.500	130.5	-22.1	17.5	12.0	0.7	30.2	1.050		
V	849.000	128.8	-24.4	15.1	12.0	0.7	27.8	0.631		

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4.0 Configuration Photograph(s)

Front View



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4.0 Configuration Photograph(s) (continued)

Rear View



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5.0 Instruments and Accessories

Measurement equipment used for radiated emission compliance testing utilized some of the equipment on the following list:

Type	Manufacturer	Model Number	Serial Number	Cal Due (mm/dd/yy)
Spectrum Analyzer	Hewlett Packard	HP8566B	2135A0132	04/02/00
Preamplifier	CDI	P950	EMC-0001	11/05/99
Preamplifier	CDI	P1000	EMI-P10GHz	01/07/00
Horn Antenna	EMCO	3115	9208-3919	01/05/00
Horn Antenna	AH Systems	SAS200/571	246	12/11/98
Open Area Test Site	N/A	Norcross	N/A	08/01/99
Cable 1	N/A	N/A	N/A	08/01/99
Cable 2	N/A	N/A	N/A	08/01/99
Cable 3	N/A	N/A	N/A	08/01/99
Cable 4	N/A	N/A	N/A	08/01/99
Signal Generator	HP	83620B	3722A00537	01/26/99
TWT	Varian	VZL6941K1	5663	NCR
Power Meter	Boonton	4232A	25901	07/01/99
Power Sensor	Boonton	51013	23645	06/29/99
EMI Receiver	HP	95462A	3650A00362	07/15/99
RF Filter Selector	HP	85460A	3704A00331	07/15/99

6.0 Test Report Information

Company Name: Mitsubishi Wireless Communication

Attention: Mr. Steve Georgitsos

Model No.: MT253
Digital 800

Report Date: Sept. 20, 1999

Test Site Location: Intertek Testing Services Inc.
4317-A Park Dr., N.W.
Norcross, GA 30093

We attest to the accuracy of this report:

Mark A. Severson
EMC Associate Engineer

David J. Schramm
EMC Technical Supervisor