

ENGINEERING TEST REPORT



REMOTE CONTROL TRANSMITTER MODEL NO.: CHAR

FCC ID: OZV-CHAR

In Accordance With

**FEDERAL COMMUNICATIONS COMMISSION (FCC)
PART 15, SUBPART C, SEC. 15.231
PERIODIC OPERATION AT 313 MHz**

UltraTech's FILE NO.: DEU-007-F231

Tested for:

YATZ ELECTRONICS INDUSTRY

Blk 50 Kallang Bahru #04-17/18
Kallang Basin Industrial Estate,
Singapore, 339334

Tested by:

UltraTech - Group of Labs

3000 Bristol Circle
Oakville, Ontario
Canada L6H 6G4

Report Prepared by: Hannah Truong

DATE: April 25, 2000

UltraTech

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EXHIBIT 1. SUBMITTAL CHECK LIST

Exhibit No.	Exhibit Type	Description of Contents	Quality Check (OK)
1 through 6	Test Report	<ul style="list-style-type: none"> Exhibit 1: Submittal check lists Exhibit 2: Summary of Test Results & General Statement of Certification Exhibit 3: General Information Exhibit 4: System Test Configuration Exhibit 5: Test Data Exhibit 6: General Test Procedures 	OK
7	Test Report - Plots of Measurement Data	Plots # 1 to 3	OK
8	Test Setup Photos	Photos #: 1 and 2	OK
9	External Photos of EUT	Photos #: 1 and 2	OK
10	Internal Photos of EUT	Photos #: 1 to 4	OK
11	Cover Letters	<ul style="list-style-type: none"> Letter from Ultratech for Certification Request Letter from the Applicant to appoint Ultratech to act as an agent Letter from the Applicant to request for Confidentiality Filing 	OK
12	Attestation Statements	<ul style="list-style-type: none"> Manufacturer's Declaration for Equipment Specifications, Installation (if it is professionally installed) and Production Quality Production Assurance. Manufacturer's Declaration of Conformity (FCC DoC) for compliance with FCC Part 15, Sub. B, Class B - Computing Devices - if required 	None
13	Application Forms	<ul style="list-style-type: none"> Form 731 Form 159 Confirmation of Exhibits sent to FCC Status of Exhibits sent to FCC 	OK
14	ID Label/Location Info	<ul style="list-style-type: none"> ID Label Location of ID Label 	OK
15	Block Diagrams	<ul style="list-style-type: none"> Block diagrams #: 1 	OK
16	Schematic Diagrams	<ul style="list-style-type: none"> Schematic diagrams #: 1 	OK
17	Parts List/Tune Up Info		None
18	Operational Description		OK
19	RF Exposure Info		None
20	Users Manual		OK

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EXHIBIT 2. SUMMARY OF TEST RESULTS & GENERAL STATEMENT OF CERTIFICATION

FCC PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
15.203	Antenna Requirement	Yes
15.231(a)	Provisions of FCC 15.231	Yes
15.231(a) & (b)	Transmitter Radiated Emissions - Fundamental, Harmonic and Spurious	Yes
1.1310	RF Exposure Limits	Yes
15.231(c)	20 dB Bandwidth	Yes
15.107, 15.109	AC Power Conducted Emissions & Radiated Emissions for Receiver and Digital Circuit Portions	Not applicable for battery operated device.

TESTIMONIAL AND STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY:

- 1) *THAT the application was prepared either by, or under the direct supervision of the undersigned.*
- 2) *THAT the measurement data supplied with the application was taken under my direction and supervision.*
- 3) *THAT the data was obtained on representative production units, randomly selected.*
- 4) *THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.*

Certified by:

*Tri Minh Luu, P. Eng.
V.P., Engineering*

DATE: April 25, 2000

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EXHIBIT 3. GENERAL INFORMATION

3.1 APPLICANT

YATZ ELECTRONICS INDUSTRY
Blk 50 Kallang Bahru #04-17/18
Kallang Basin Industrial Estate,
Singapore, 339334

Applicant's Representative: Mr. Philip Neo

3.2 MANUFACTURER

YATZ ELECTRONICS INDUSTRY
Blk 50 Kallang Bahru #04-17/18
Kallang Basin Industrial Estate,
Singapore, 339334

3.3 DESCRIPTION OF EQUIPMENT UNDER TEST

PRODUCT NAME:	REMOTE CONTROL TRANSMITTER
MODEL NO.:	CHAR
SERIAL NUMBER:	N/A
TYPE OF EQUIPMENT:	Periodic Low Power Transmitters
OPERATING FREQ.:	313 MHz
BANDWIDTH (20 dB OBW):	10.09 KHz
POWER RATING:	0.0023 mWatts EIRP
EMISSION DESIGNATION @ 15.201:	10K1P1N
DUTY CYCLE:	81%
INPUT SUPPLY:	Alkaline 12V battery (GP23A type)
ASSOCIATED DEVICES:	The transmitter is to be used with the receiver that bears the FCC ID: MEYTCCKOA-X00R
INTERFACE PORTS:	N/A

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3.4 RELATED SUBMITTAL(S)/GRANT

Not applicable.

3.5 TEST METHODOLOGY

These tests were conducted on a sample of the equipment for the purpose of certification compliance with Code of Federal Regulations (CFR47-1991), Part 15, Subpart C, Para. 15.231, Periodic Low Power Transmitters

Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4-1992 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz.

3.6 TEST FACILITY

AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).

Radiated Emissions were performed at the UltraTech's 3-10 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: Sep. 20, 1999.

The above test site is also filed with Interference Technology International Ltd (ITI - An EC Directive on EMC).

3.7 UNITS OF MEASUREMENTS

Measurements of conducted emissions are reported in units of dB referenced to one microvolt [dB(uV)].

Measurements of radiated emissions are reported in units of dB referenced to one microvolt per meter [dB(uV)/m] at the distance specified in the report, wherever it is applicable.

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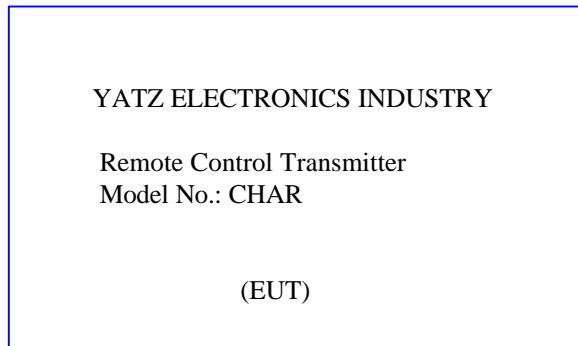
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EXHIBIT 4. SYSTEM TEST CONFIGURATION

4.1 BLOCK DIAGRAMS FOR RADIATED EMISSION MEASUREMENTS



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4.2 PHOTOGRAPH FOR RF EMISSION MEASUREMENTS

Tests were performed at the Open Field test Site located in Oakville, Ontario, Canada.
Please refer to Exhibit 8 for the test setup photographs.

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4.3 JUSTIFICATION

The transmitter was set to transmit continuously for testing purpose only

4.4 EUT OPERATING CONDITION

The transmitter was set to operate continuously for testing.

4.5 SPECIAL ACCESSORIES

No special accessories were required.

4.6 EQUIPMENT MODIFICATIONS

Not required

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EXHIBIT 5. TEST DATA

5.1 ANTENNA REQUIREMENTS @ FCC CFR 47, PARA 15.203

PRODUCT NAME: REMOTE CONTROL TRANSMITTER, Model No.: CHAR

FCC REQUIREMENTS:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Notes: This requirement does not apply to carrier current devices operated under the provisions of @ 15.211, 15.213, 15.217, 17.219 or 15.221.

ENGINEERING ANALYSIS:

Internal integral antenna component mounted on the printed circuit board.

5.2 PROVISIONS OF FCC 15.231(A) FOR PERIODIC TRANSMITTERS

PRODUCT NAME: REMOTE CONTROL TRANSMITTER, Model No.: CHAR

ENGINEERING ANALYSIS

FCC PROVISIONS	ANALYSIS ON COMPLIANCE
Permitted Type of Devices (alarm systems, door opener, remote switches etc ...)	Remote switches
Prohibited Type of Devices (radio control of toys)	Not radio control toys
Prohibited Transmission Type (voice, video or data continuous transmission)	Recognition codes to identify other particular component as part of the system
A Manually Operated Transmitter (shall employ with the switch that automatically deactivate the transmitter within 5 seconds of being released)	The transmitter is automatically deactivated within less than 1 seconds of being released.
Periodic Transmissions: at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitter used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for the transmitter	N/A
Internal Radiators which are not employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.	

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5.3 TRANSMITTER RADIATED EMISSIONS @ 3 METERS, FCC CFR 47, PARA. 15.231(B), 15.209 & 15.205

PRODUCT NAME: REMOTE CONTROL TRANSMITTER, Model No.: CHAR

FCC REQUIREMENTS:

The RF radiated emissions measured at 3 meters distance shall not exceed the field strength below:

Fundamental Frequency (MHz)	Average Field Strength Limits (μ V)	
	Fundamental	Harmonic/Spurious
260 - 470 MHz	3750 - 12,500	375 - 1250

All other emissions inside restricted bands specified in @ 15.205(a) shall not exceed the general radiated emission limits specified in @ 15.209(a)

Remarks:

- Applies to harmonics/spurious emissions that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209.
- @ FCC CFR 47, Para. 15.237(c) - The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in @15.35 for limiting peak emissions apply.

FCC CFR 47, Part 15, Subpart C, Para. 15.205(a) - Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	162.0125 - 167.17	2310 - 2390	9.3 - 9.5
0.49 - 0.51	167.72 - 173.2	2483.5 - 2500	10.6 - 12.7
2.1735 - 2.1905	240 - 285	2655 - 2900	13.25 - 13.4
8.362 - 8.366	322 - 335.4	3260 - 3267	14.47 - 14.5
13.36 - 13.41	399.9 - 410	3332 - 3339	14.35 - 16.2
25.5 - 25.67	608 - 614	3345.8 - 3358	17.7 - 21.4
37.5 - 38.25	960 - 1240	3600 - 4400	22.01 - 23.12
73 - 75.4	1300 - 1427	4500 - 5250	23.6 - 24.0
108 - 121.94	1435 - 1626.5	5350 - 5460	31.2 - 31.8
123 - 138	1660 - 1710	7250 - 7750	36.43 - 36.5
149.9 - 150.05	1718.8 - 1722.2	8025 - 8500	Above 38.6
156.7 - 156.9	2200 - 2300	9000 - 9200	

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FCC CFR 47, Part 15, Subpart C, Para. 15.209(a)
-- Field Strength Limits within Restricted Frequency Bands --

FREQUENCY (MHz)	FIELD STRENGTH LIMITS (microvolts/m)	DISTANCE (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23+3 °C
- Relative humidity: 50+5 %
- Atmospheric Pressure: 100+5 kPa

POWER INPUT:

Alkaline 12V battery (GP23A type)

TEST EQUIPMENT:

- **Spectrum Analyzer**, Advantest, Model R3271, S/N: 15050203, 100 Hz to 32 GHz)
- **Microwave Amplifier**, HP, Model 83017A, Frequency Range 1 to 26.5 GHz, 34-38 dBdB gain nominal.
- **Active Loop Antenna**, Emco, Model 6507, SN 8906-1167, Frequency Range 1 KHz - 30 MHz, @ 50 Ohms
- **Log Periodic/Bow-Tie Antenna**, Emco, Model 3143, SN 1029, 20 - 1000 MHz, @ 50 ohms.
- **Horn Antenna**, Emco, Model 3115, SN 9701-5061, Frequency Range: 1 - 18 GHz, @ 50 Ohms.

METHOD OF MEASUREMENTS:

Refer to **ANSI 63.4-1992, Para. 8** for detailed radiated emissions measurement procedures.

Applies to harmonics/spurious that fall in the restricted bands listed in Section 15.205. the maximum permitted average field strength is listed in Section 15.209. A Pre-Amp and highpass filter are used for this measurement.

- For measurements from 9 KHz to 150 KHz, set RBW = 200 Hz, VBW \geq RBW, SWEEP=AUTO.
- For measurements from 150 KHz to 30 MHz, set RBW = 10 KHz, VBW \geq RBW, SWEEP=AUTO.
- For measurements from 30 MHz to 1 GHz, set RBW = 100 KHz, VBW \geq RBW, SWEEP=AUTO.
- For measurement above 1 GHz, set RBW = 1 MHz, VBW = 1 MHz, SWEEP=AUTO.

If the emission is pulsed, modified the unit for continuous operation, then use the settings above for measurements, then correct the reading by subtracting the peak-average correction factor derived from the appropriate duty cycle calculation. See Section 15.35(b) and (c).

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FCC CFR 47, Para. 2.997 - Frequency spectrum to be investigated

The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10th harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC CFR 47, Para. 2.993 - Field Strength Spurious Emissions

(a) Measurements was made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.989(c) as appropriate. For equipment operating on frequencies below 1 GHz, an Open Field Test is normally required, with the measuring instrument antenna located in the far field at all test frequencies. In event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

(b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
- (2) All equipment operating on frequencies higher than 25 MHz
- (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4) Other types of equipment as required, when deemed necessary by the Commission.

TEST RESULTS: Conforms.

TEST PERSONNEL: Mr. Hien Luu, EMC Technician

DATE: April 5, 2000

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MEASUREMENT DATA

RADIATED EMISSIONS MEASUREMENTS @ 3 METERS

TEST CONFIGURATION

- For measurements from 9 KHz to 150 KHz, set RBW = 200 Hz, VBW \geq RBW, SWEEP=AUTO.
- For measurements from 150 KHz to 30 MHz, set RBW = 10 KHz, VBW \geq RBW, SWEEP=AUTO.
- For measurements from 30 MHz to 1 GHz, set RBW = 100 KHz, VBW \geq RBW, SWEEP=AUTO.
- For measurement above 1 GHz, set RBW = 1 MHz, VBW = 1 MHz, SWEEP=AUTO.
- The following measurements were the worst cases when the radiating antenna was placed in both horizontal and vertical polarization.*
- The following AVERAGE rf levels were obtained from either Peak readings added by the duty cycle correction factor. DUTY CYCLE FACTOR = $20\log_{10}(0.8) = -1.83 \text{ dB}$*

The radiated emissions tests were repeated with the EUT placed in three different orthogonal positions (back down, stand up and side up), and the worst case of measurements were recorded as follows:

FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.231(b) FUNDAMENTAL (dBuV/m)	LIMIT 15.231(b) SPURIOUS (dBuV/m)	MARGIN (dB)	PASS/FAIL
313.00	63.6	61.8	V	46.0	75.5	55.5	-13.7	PASS
313.00	68.9	67.1	H	46.0	75.5	55.5	-8.4	PASS
626.00	43.8	42.0	V	46.0	75.6	55.6	-13.6	PASS
626.00	41.1	39.3	H	46.0	75.6	55.6	-16.3	PASS
939.00	35.4	33.6	V	46.0	75.6	55.6	-22.0	PASS
939.00	47.5	45.7	H	46.0	75.6	55.6	-9.9	PASS
1252.00	42.8	41.0	V	54.0	75.6	55.6	-14.6	PASS
1252.00	41.1	39.3	H	54.0	75.6	55.6	-16.3	PASS

No other significant emissions were found in the frequency range from 10 MHz to 10th harmonic of the carrier frequency (3130 MHz).

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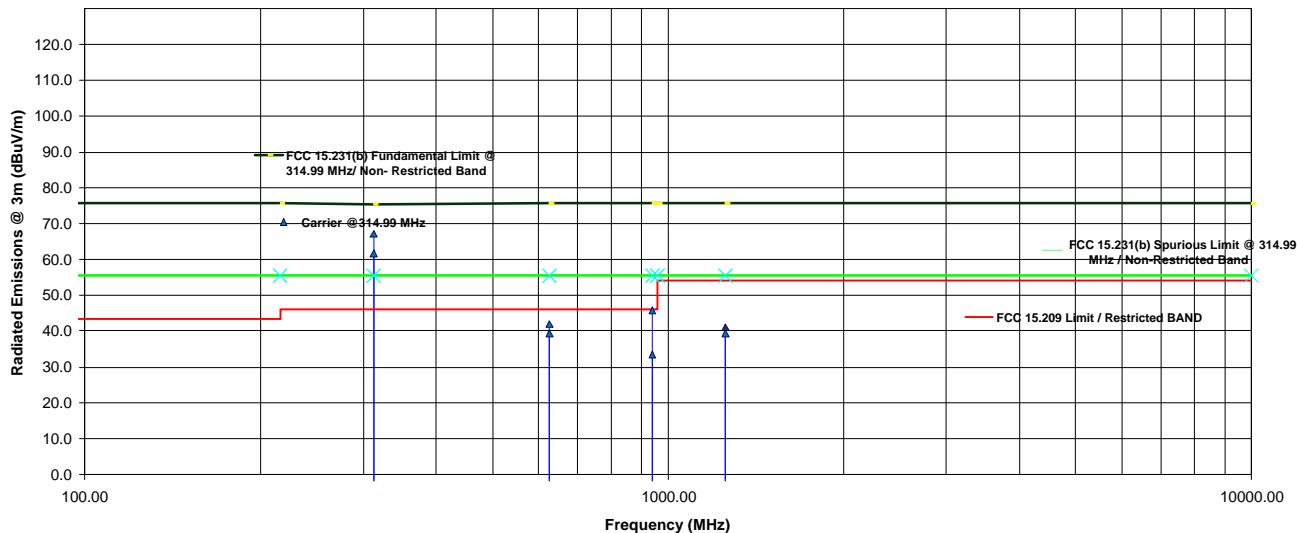
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All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Transmitter Radiated Emissions Measurements at 3 Meters OFTS
Yatz Electronics Industry
Remote Control Transmitter, M/N: CHAR
Transmitter@ 313 MHz



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5.4 20 DB BANDWIDTH @ FCC CFR 47, PARA. 15.209(C)

PRODUCT NAME: REMOTE CONTROL TRANSMITTER, Model No.: CHAR

FCC REQUIREMENTS:

The 20dB bandwidth of the emission shall be no more than 0.25% of the center frequency for devices operating above 70MHz.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23+3 oC
- Relative humidity: 50+5 %
- Atmospheric Pressure: 100+5 kPa

POWER INPUT:

Alkaline 12V battery (GP23A type)

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203

TEST RESULTS:

Conforms.

Frequency	Measured 20 dB BW	Limit (0.25% Fc)
MHz	kHz	kHz
313	10.09	78.25

Please refer to plot #1 and #2 in Exhibit 7 for details of measurement data

TEST PERSONNEL: Mr. Hung Trinh, EMC Technician

DATE: April 25, 2000

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5.5 RF EXPOSURE LIMIT FCC 1.1310

PRODUCT NAME: REMOTE CONTROL TRANSMITTER, Model No.: CHAR

FCC REQUIREMENTS:

FCC 1.1310:- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
30-300	61.4	0.163	1.0	6
300-1500	F/300	6
(B) Limits for General Population/Uncontrolled Exposure				
30-300	27.5	0.073	0.2	30
300-1500	F/1500	30

F = Frequency in MHz

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23+3 °C
- Relative humidity: 50+5 %
- Atmospheric Pressure: 100+5 kPa

POWER INPUT:

Alkaline 12V battery (GP23A type)

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METHOD OF MEASUREMENTS:

METHOD OF MEASUREMENTS:

FCC @ 1.1310 & OST Bulletin No. 65-October 1985

$$S = PG/4\pi r^2 = EIRP/4\pi r^2$$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm²
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$$r = \sqrt{PG/4\pi S}$$

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

TEST RESULTS: Conforms.

TEST PERSONNEL: Mr. Hien Luu, EMC Technician

DATE: April 5, 2000

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MEASUREMENT DATA:

**EFFECTIVE ISOTROPIC RADIATED POWER (EIRP) MEASURED AT 3 METER DISTANCE
(Substitution Method)**

FUNDAMENTAL FREQUENCY (MHz)	Max. Average Field Strength Level @ 100 kHz At 3 m (dBuV/m)	Antenna Polarization (V/H)	Average EIRP Power (mW)	(1) MINIMUM ALLOWABLE DISTANCE (r) FROM SKIN (cm)
313	61.8	V	0.00045	0.013
313	67.1	H	0.00154	0.024

Since the power density of 0.21 mW/cm^2 is at a very short distance from the radiating antenna, the RF exposure limit warning or SAR tests are not necessary.

Remarks:

(1) RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\pi S)^{1/2} = (EIRP/4\pi S)^{1/2}$
 $S = 313/1500 = 0.21 \text{ mW/cm}^2$

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5.6 AC POWERLINE CONDUCTED EMISSIONS, FCC CFR 47, PARA. 15.107(A)

PRODUCT NAME: REMOTE CONTROL TRANSMITTER, Model No.: CHAR

NAME OF TEST: AC Powerline Conducted Emissions.

FCC LIMIT:

The RF voltage conducted back onto the public utility lines shall not exceed 250 μ V or 48.0 dB μ V measured from 450 kHz to 30 MHz.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23+3 °C
- Relative humidity: 50+5 %
- Atmospheric Pressure: 100+5 kPa

POWER INPUT:

Alkaline 12V battery (GP23A type)

TEST EQUIPMENT:

- Advantest R3271 Spectrum Analyzer, Frequency Range: 100Hz-26.5GHz, with built-in Peak, Quasi-Peak and Average Detectors.
- HP 11947A Transient Limiter, HP, Model 11947A, Frequency Range: 9KHz-200MHz, Attenuation: 10dB HP.
- HP 7475 Plotter
- EMCO 3825/2 LISN, Frequency Range: 9KHz-200MHz
- RF Shielded Enclosure (12x16x12 feet)

METHOD OF MEASUREMENTS:

Refer to ANSI C63.4-1992.

MEASUREMENT DATA

Not applicable for DC operated devices.

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EXHIBIT 6. GENERAL TEST PROCEDURES

6.1 AC POWERLINE CONDUCTED EMISSIONS MEASUREMENTS - GENERAL TEST METHOD

- AC Powerline Conducted Emissions were performed in the shielded room, 16'(L) by 12'(W) by 12'(H).
- Conducted power-line measurements were made over the frequency range from 450 KHz to 30 MHz to determine the line-to-ground radio noise voltage which was conducted from the EUT power-input terminals that were directly (or directly via separate transformers, power supplies) connected to a public power network.
- The EUT normally received power from another device that connects to the public utility ac power lines, measurements would be made on that device with the EUT in operation to ensure that the device continues to comply with the appropriate limits while providing the EUT with power.
- The EUT was operated only from internal or dedicated batteries, with no provisions for connection to the public utility ac power lines, ac power-line conducted measurements were not required.
- Table-top devices were placed on a platform of nominal size 1 m by 1.5m raised 80 cm above the conducting ground plane.
- The EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the power source. All unused 50-Ohm connectors of the LISN was terminated in 50-ohm when not connected to the measuring instruments.
- The line cord of the EUT connected to one LISN which was connected to the measuring instrument. Those power cords for the units of devices not under measurement were connected to a separate multiple ac outlets. Drawings and photographs of typically conducted emission test setups were shown in the Test Report. Each current-carrying conductor of the EUT shall be individually tested.
- The EUT was normally operated with a ground (safety) connection, the EUT was connected to the ground at the LISN through a conductor provided in the lead from the ac power mains to the LISN.
- The excess length of the power cord was folded back and forth in an 8-shape on a wooden strip with a vertical prong located on the top of the LISN case.
- The EUT was set-up in its typical configuration and operated in its various modes as described in this test report.
- A preliminary scan was made by using spectrum analyzer system with the detector function set to PEAK mode (10 KHz RBW, VBW \geq RBW), frequency span 450KHz-30MHz.
- The maximum conducted emission for a given mode of operation was found by using the following step-by-step procedure:
 - Step1. Monitor the frequency range of interest at a fixed EUT azimuth.
 - Step2. Manipulate the system cables and peripheral devices to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.
 - Step3. The effects of various modes of operation is examined. This is done by varying equipment operation modes as step 2 is being performed.

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Step4. After completing step 1 through 3, record EUT and peripheral device configuration, mode of operation, cable configuration, signal levels and frequencies for final test.

- Each highest signal level at the maximized test configuration was zoomed in a small frequency span on the spectrum analyzer's display (the manipulation of cables and peripheral devices and EUT operation modes might have to be repeated to obtain the highest signal level with the spectrum analyzer set to PEAK detector mode 10 KHz RBW and $VBW \geq RBW$). The spectrum analyzer was then set to CISPR QUASI-PEAK detector mode (9 KHz RBW, 1 MHz RBW) and the final highest RF signal level and frequency was record.
- Broad-band ac powerline conducted emissions:-** If the EUT exhibits ac powerline conducted emissions that exceed the limit with the instrument set to the quasi-peak mode, then measurements should be made in the average mode. If the amplitude measured in the quasi-peak mode is at least 6 dB higher than the amplitude measured in the average mode, the level measured in quasi peak mode may be reduced by 13 dB before comparing it to the limit.

6.2 ELECTRICAL FIELD RADIATED EMISSIONS MEASUREMENTS - GENERAL TEST METHOD

- The radiated emission measurements were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario. The Attenuation Characteristics of OFTS have been filed to FCC.
- Radiated emissions measurements were made using the following test instruments:
 - Calibrated EMCO active loop antenna in the frequency range from 10 KHz to 1 MHz
 - Calibrated EMCO biconilog antenna in the frequency range from 30 MHz to 2000 MHz.
 - Calibrated A.H. Systems log periodic antenna in the frequency range above 1000 MHz (1GHz - 18 GHz).
 - Calibrated Advantest spectrum analyzer and pre-selector. In general, the spectrum analyzer would be used as follows:
 - The rf electric field levels were measured with the spectrum analyzer set to PEAK detector (1 KHz RBW and $VBW \geq RBW$ for frequency below 30 MHz, 100 KHz RBW and $VBW \geq RBW$ for Frequency below 1 GHz and 1 MHz RBW and 1 MHz VBW for frequency greater than 1 GHz).
 - If any rf emission was observed to be a broadband noise, the spectrum analyzer's CISPR QUASI-PEAK detector (120 KHz RBW and 1MHz VBW) was then set to measure the signal level.
 - If the signal being measured was narrowband and the ambient field was broadband, the bandwidth of the spectrum analyzer was reduced.

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- The EUT was set-up in its typical configuration and operated in its various modes as described in this test report.
- The frequencies of emissions was first detected. Then the amplitude of the emissions was measured at the specified measurement distance using required antenna height, polarization, and detector characteristics.
- During this process, cables and peripheral devices were manipulated within the range of likely configuration.
- For each mode of operation required to be tested, the frequency spectrum was monitored. Variations in antenna heights (from 1 meter to 4 meters above the ground plane), antenna polarization (horizontal plane and vertical plane), cable placement and peripheral placement (each variable within bounds specified elsewhere) were explored to produce the highest amplitude signal relative to the limit.

The maximum radiated emission for a given mode of operation was found by using the following step-by-step procedure:

- Step1: Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.
- Step2: Manipulate the system cables to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.
- Step3: Rotate the EUT 360 degrees to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat Step 2. Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.
- Step4: Move the antenna over its full allowed range of travel (1 to 4 meters) to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to Step 2 with the highest amplitude observation and proceed.
- Step5: Change the polarity of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarity. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.
- Step6: The effects of various modes of operation is examined. This is done by varying the equipment modes as steps 2 through 5 are being performed.
- Step7: After completing steps 1 through 6, record the final highest emission level, frequency, antenna polarization and detector mode of the measuring instrument.

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Calculation of Field Strength:

The field strength is calculated by adding the calibrated antenna factor and cable factor, and subtracting the Amplifier gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$\boxed{FS = RA + AF + CF - AG}$$

Where FS = Field Strength
RA = Receiver/Analyzer Reading
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Example: If a receiver reading of 60.0 dBuV is obtained, the antenna factor of 7.0 dB and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:.

$$\begin{aligned} \text{Level in dBuV/m} &= 60 + 7.0 + 1.0 - 30. \\ &= 38.0 \text{ dBuV/m.} \end{aligned}$$

$$\text{Level in uV/m} = 10^{(38/20)} = 79.43 \text{ uV/m.}$$

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EXHIBIT 7. PLOTS OF MEASUREMENT DATA

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EXHIBIT 8. TEST SETUP PHOTOS OF EUT

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EXHIBIT 9. EXTERNAL PHOTOGRAPHS OF EUT

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EXHIBIT 10. INTERNAL PHOTOGRAPHS OF EUT

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EXHIBIT 11. COVER LETTERS

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EXHIBIT 12. ATTESTATION STATEMENTS

None

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EXHIBIT 13. APPLICATION FORMS

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EXHIBIT 14. ID LABEL/LOCATION INFORMATION

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EXHIBIT 15. BLOCK DIAGRAMS

ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vhk.ultratech@sympatico.ca, Website: <http://www.ultratech-labs.com>

File #: DEU-007-F231
April 25, 2000

- Assessed by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia)
- Accredited by Industry Canada (Canada) under ACC-LAB (Europe/Canada MRA)
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EXHIBIT 16. SCHEMATIC DIAGRAMS

ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vhk.ultratech@sympatico.ca, Website: <http://www.ultratech-labs.com>

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EXHIBIT 17. PARTS LIST / TUNE UP INFORMATION

None

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EXHIBIT 18. OPERATIONAL DESCRIPTION

None

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EXHIBIT 19. RF EXPOSURE INFORMATION

None

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EXHIBIT 20. USERS MANUAL

ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

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