

# ENGINEERING TEST REPORT



**TDMA Activator  
MODEL NO.: GSPS-ACT-02**

**FCC ID: N60GSPS-ACT-02**

**FCC PART 15, SUBPART C, PARA. 15.249  
LOW POWER TRANSMITTERS  
OPERATING AT 916.5 MHz**

**UltraTech's FILE NO.: GCI6-FTX**

**TESTED FOR:**

GEMSTAR COMMUNICATIONS INC.  
760 Pacific Road, Unit 7  
Oakville, Ontario  
Canada, L6L 6M5

**TESTED BY:**

**UltraTech Engineering Labs Inc.**  
3000 Brsitol Circle  
Oakville, Ontario  
Canada L6H 6G4

**PREPARED BY:** Dan Huynh

**DATE:** May 4, 2000

**UltraTech**

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## 1. **EXHIBIT 1 - SUMMARY OF TEST RESULTS & GENERAL STATEMENT OF CERTIFICATION**

FCC PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
15.249(a), 15.209, 15.205 & 1.1310	Transmitter Radiated Emissions, Harmonic Emissions and RF Exposure Limit	Yes
15.107(a)	AC Power Conducted Emissions	Yes

**Note 1:** The digital circuits of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices and Radio Receivers. The engineering test report can be provided upon FCC requests.

### **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, representative.*
- 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: May 4, 2000

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## 2. **EXHIBIT 2 - GENERAL INFORMATION**

### 2.1. ***Applicant***

GEMSTAR COMMUNICATIONS INC.  
760 Pacific Road, Unit 7  
Oakville, Ontario  
Canada, L6L 6M5

Applicant's Representative: Mr. Richard Bonham

### 2.2. ***Manufacturer***

GEMSTAR COMMUNICATIONS INC.  
760 Pacific Road, Unit 7  
Oakville, Ontario  
Canada, L6L 6M5

### 2.3. ***Description of Equipment under Test***

<b>PRODUCT NAME:</b>	TDMA Activator
<b>SERIAL NUMBER:</b>	Pre-production
<b>TYPE OF EQUIPMENT:</b>	Low Power Transmitters
<b>OPERATING FREQ.:</b>	916.5 MHz
<b>BANDWIDTH (26 dB OBW):</b>	96.0 kHz
<b>POWER RATING:</b>	0.45 mW EIRP
<b>EMISSION DESIGNATION:</b>	96K0K1D
<b>DUTY CYCLE:</b>	37.9%
<b>CPU SPEED:</b>	4.00 MHz
<b>INPUT SUPPLY:</b>	9 Vdc via AC Adaptor
<b>ASSOCIATED DEVICES:</b>	Gemstar Lettermail Tag, Model GSPS-LMT-02 FCC ID: N6OGSPS-LMT-02 (concurrently submitted to FCC)
<b>INTERFACE PORTS:</b>	TNC Interface F Type Interface DC Jack Interface

## 2.4. ***Related Submittal(s)/Grant***

Not applicable.

## 2.5. ***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. 15.249, Low Power Transmitters operating in the Frequency Band 902-928 MHz.

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.

## 2.6. ***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-to-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 C63.4-1992, 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). 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).

## 2.7. ***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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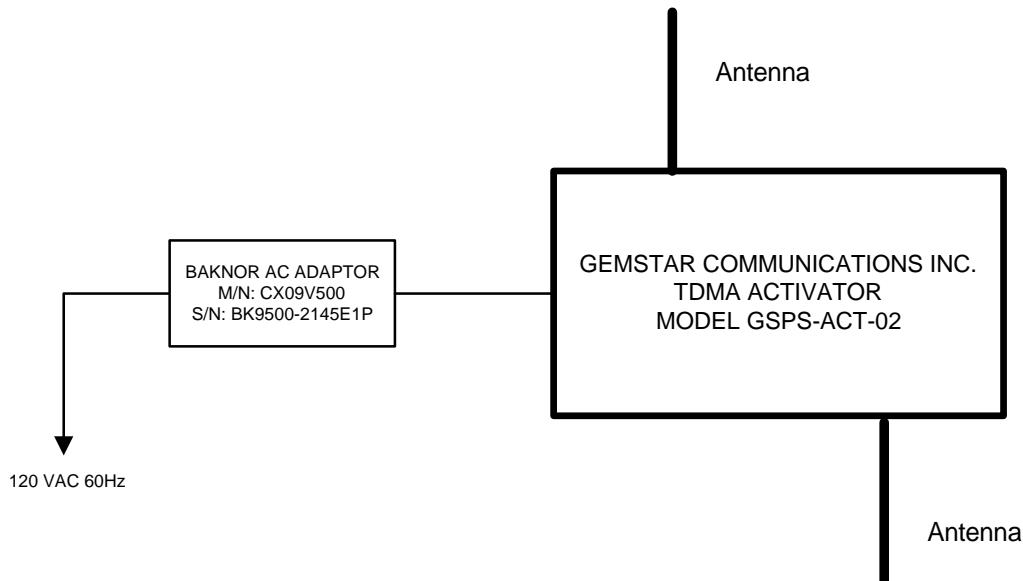
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### 3. **EXHIBIT 3 - SYSTEM TEST CONFIGURATION**

#### 3.1. ***Block Diagrams for Conducted & Radiated Emission Measurements***



### 3.2. *Photograph for RF Emission Measurements*

#### 3.2.1. TEST SETUP FOR AC POWER LINE CONDUCTED EMISSIONS MEASUREMENTS

Tests were performed in the screen room



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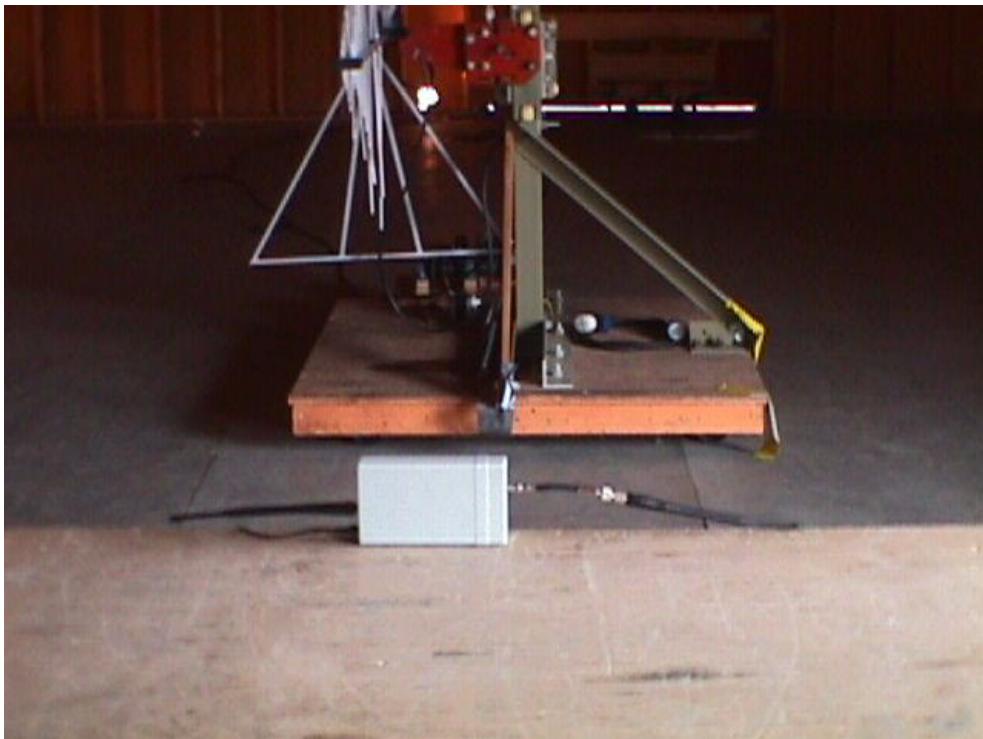
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### 3.2.2. TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS

Tests were performed at the Open Field test Site located in Oakville, Ontario, Canada



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### **3.3. *Justification***

The transmitter was set to transmit continuously for testing purpose only. This is not normal operating condition.

### **3.4. *EUT Operating Condition***

The EUT was set to transmit continuously during testing.

### **3.5. *Special Accessories***

No special accessories were required.

### **3.6. *Equipment Modifications***

To achieve compliance, the following change(s) were made by UltraTech's test house during compliance testing:

None.

## 4. EXHIBIT 4 - TEST DATA

### 4.1. **Transmitter Fundamental & Harmonic Radiated Emissions @ FCC CFR 47, Para 15.249(a)**

**PRODUCT NAME:** TDMA Activator, Model No.: GSPS-ACT-02

#### FCC REQUIREMENTS:

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

FUNDAMENTAL FREQUENCY	Field Strength of Fundamental @ 3m (dBuV/m)	Field Strength of Harmonics @ 3m (dBuV/m)
902 - 928 MHz	94.0	54.0
2400 - 2483.5 MHz	94.0	54.0
5725 - 5875 MHz	94.0	54.0
24.0 - 24.25 GHz	108.0	68.0

#### 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 °C
- Relative humidity: 51%

**TEST EQUIPMENT:**

- **Spectrum Analyzer**, Advantest, Model R3271, S/N: 15050203, 100 Hz to 32 GHz
- **Spectrum Analyzer**, Advantest, Model 3261A, SN 91720151, Input +25dBm max., 9KHz-2.6GHz, 50 Ohms, built-in Quasi-Peak Detector.
- **RF Preselector**, Advantest Model R3551, SN 92970002, 9KHz-1GHz, 50 Ohms input/output, input +25 dBm max, 30 dB gain.
- **Microwave Amplifier**, HP, Model 83017, Frequency Range 0.5 to 26.5 GHz, 30dB 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.
- **Log Periodic Antenna**, A.H. Systems, Model SAS-200/518, SN 343, Frequency Range: 1 - 18 GHz, @ 50 Ohms.
- **Horn Antenna**, Emco, Model 3160-09, 18-26.5GHz

**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 measurement below 1 GHz, set RBW = 100 KHz, VBW  $\geq$  100 KHz, SWEEP=AUTO.

For measurement above 1 GHz, set RBW = 1 MHz, VBW = 1 MHz (Peak) & VBW = 10 Hz (Average), 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 10<sup>th</sup> 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. Hung Trinh, RFI/EMI Technician

**DATE:** May 5, 2000

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**MEASUREMENT DATA****RADIATED EMISSIONS MEASUREMENTS @ 3 METERS****TEST CONFIGURATION**

- This lowest, middle and highest channels were established at its full rated output power. The emissions were investigated from the lowest frequency generated by the transmitter up to the 10th harmonic of the fundamental emissions in each case. the measured level of the carrier was recorded and compared to the level of the emissions as required in Parts 15.249(c) or 15.209(a) whichever was applicable.
- For measuring radiated emissions at frequencies below 1 GHz, the Spectrum Analyzer was set as 100 KHz RBW, VBW  $\geq$  RBW, SWEEP TIME: AUTO, PEAK DETECTOR.
- For measuring radiated emissions at frequencies above 1 GHz, the Spectrum Analyzer was set as 1 MHz RBW, 1 MHz VBW, SWEEP TIME: AUTO for PEAK measurements and 1 MHz RBW, 10 Hz VBW, SWEEP TIME: AUTO for AVERAGE measurements.
- 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 or Average readings added by the duty cycle correction factor. **DUTY CYCLE FACTOR =  $20\log_{10}(0.379) = -8.42 \text{ dB}$**

Note: The EUT was mounted in the manner that the transmitter antenna was positioned in both horizontal and vertical polarization.

CHANNEL FREQUENCY TESTED: 916.5 MHz							
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (a) (dBuV/m)	LIMIT 15.249 (a) (dBuV/m)	MARGIN (dB)	PASS/FAIL
916.5	90.96	82.54	V	46.0	54.0	-11.5	PASS
916.5	91.74	83.32	H	46.0	54.0	-10.7	PASS
1833.0	55.16	46.74	V	54.0	54.0	-7.3	PASS
1833.0	51.25	42.83	H	54.0	54.0	-11.2	PASS
2749.5	48.76	40.34	V	54.0	54.0	-13.7	PASS*
2749.5	43.98	35.56	H	54.0	54.0	-18.4	PASS*
3666.0	54.15	45.73	V	54.0	54.0	-8.3	PASS*
3666.0	51.37	42.95	H	54.0	54.0	-11.1	PASS*
4582.5	61.51	53.09	V	54.0	54.0	-0.9	PASS*
4582.5	55.49	47.07	H	54.0	54.0	-6.9	PASS*
5499.0	58.13	49.71	V	54.0	54.0	-4.3	PASS
5499.0	51.79	43.37	H	54.0	54.0	-10.6	PASS
6415.5	56.74	48.32	V	54.0	54.0	-5.7	PASS
6415.5	48.00	39.58	H	54.0	54.0	-14.4	PASS

No other significant emissions were found in the frequency range from 10 MHz to 10 GHz. Refer to attached plots for details

\* Emission within the restricted band specified @ 15.205(a)

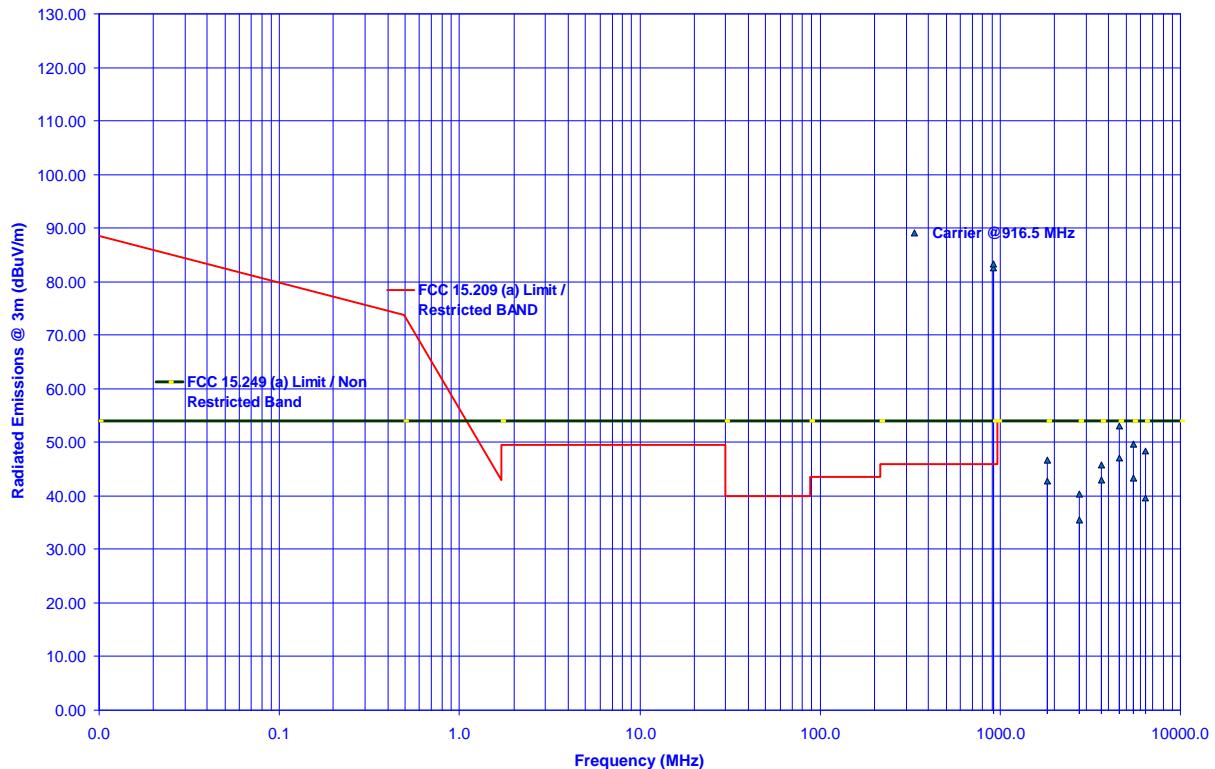
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**Transmitter Radiated Emissions Measurements at 3 Meter OFTS**  
**Gemstar Communications Inc.**  
**TDMA Activator, Model GSPS-ACT-02**  
**TRANSMIT Freq.: 916.5 MHz**

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## 4.2. RF Exposure Limit FCC 1.1310

**PRODUCT NAME:** TDMA Activator, Model No.: GSPS-ACT-02

### **FCC REQUIREMENTS:**

**FCC 1.1310:-** The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radiofrequency (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 <sup>2</sup> )	Average Time (minutes)
<b>(A) Limits for Occupational/Control Exposures</b>				
30-300	61.4	0.163	1.0	6
300-1500	...	...	F/300	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
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+2 kPa

### **POWER INPUT:**

120 VAC 60Hz.

### **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/cm<sup>2</sup>  
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

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

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File #: GCI6-FTX  
May 4, 2000

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**TEST RESULTS:** Conforms.

**TEST PERSONNEL:** Mr. Hung Trinh, RFI/EMI Technician

**DATE:** May 5, 2000

**MEASUREMENT DATA:**

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

TX CHANNEL OUTPUT	FUNDAMENTAL FREQUENCY (MHz)	Tx Antenna Gain (Numeric)	Max. Field Strength Level @ 100 KHz BW At 3 m (dBuV/m)	Max. EIRP POWER In a 100 KHz BW (mW)	POWER LIMIT (mW)
Single channel output	916.5	1	91.74	0.45	N/A

**RF EXPOSURE DISTANCE LIMITS:  $r = (EIRP/4\pi S)^{1/2}$**   
G= 1 numeric, S = f/1500 = 916.5/1500 = 0.61 mW/cm<sup>2</sup> (f in MHz)

TRANSMITTER CHANNEL OUTPUT	FUNDAMENTAL FREQUENCY (MHz)	MEASURED EIRP FULL POWER (mWatts)	MINIMUM ALLOWABLE DISTANCE (r) FROM SKIN (Centi-Meter)
Single channel output	916.5	0.45	0.24

Since the power density of 0.61 mW/cm<sup>2</sup> is at a very short distance from the radiating antenna and due to very low operating RF power required, the RF exposure limit warning or SAR tests are not necessary.

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#### **4.3. AC Powerline Conducted Emissions, FCC CFR 47, Para. 15.107(a)**

**PRODUCT NAME:** TDMA Activator, Model No.: GSPS-ACT-02

**NAME OF TEST:** AC Powerline Conducted Emissions.

**FCC LIMIT:**

The RF voltage conducted back onto the public utility lines shall not exceed 250 uV or 48.0 dBuV measured from 450 KHz to 30 MHz.

**CLIMATE CONDITION:**

Standard Temperature and Humidity:

- Ambient temperature: 23 °C
- Relative humidity: 51%

**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 7475 Plotter
- EMCO 3825/2 LISN, Frequency Range: 9KHz-200MHz
- RF Shielded Enclosure (12x16x12 feet)

**METHOD OF MEASUREMENTS:**

Refer to ANSI C63.4-1992.

**TEST RESULTS:** Conforms.

**TEST PERSONNEL:** Mr. Hung Trinh, RFI/EMI Technician

**DATE:** June 21, 1999

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**MEASUREMENT DATA**

**AC POWER-LINE CONDUCTED EMISSIONS**

**REMARKS**

- *All rf emissions from 450 KHz to 30 MHz were scanned, and eight highest emission levels were recorded. See attached plots.*
- *P: Peak Detector, 10 KHz RBW, VBW  $\geq$  RBW*
- *Q: CISPR QUASI-PEAK, 9 KHz RBW, VBW  $\geq$  RBW*
- *QP/BB: for broadband emission (QP level - AVG level > 6 dB); the recorded level was QP level less 13 dB.*

There were no significant RF emissions found in the frequency range of 450 kHz to 30 MHz.

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## 5. **EXHIBIT 5 - GENERAL TEST PROCEDURES**

### 5.1. ***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 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.
- If the EUT was operates only from internal or dedicated batteries, with no provisions for connection to the public utility ac power lines, ac power-line conducted measurements are 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 3.2 of the 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 VBW) 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.

## 5.2. 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:
  - 1) Calibrated EMCO active loop antenna in the frequency range from 10 KHz to 1 MHz
  - 2) Calibrated EMCO biconilog antenna in the frequency range from 30 MHz to 2000 MHz.
  - 3) Calibrated A.H. Systems log periodic antenna in the frequency range above 1000 MHz (1GHz - 18 GHz).
  - 4) Horn Antennas:
    - a) Horn Antenna, Emco, Model 3160-09, 18-26.5GHz
    - b) Horn Antenna, Emco, Model 3160-10, 26.5-40GHz
    - c) Mixer, Tektronix, P/N 118-0098-00, 18-26.5GHz
    - d) Mixer, Tektronix, P/N 119-0098-00, 26.5-40GHz
    - e) Mixer, HP, P/N R3434A, 12.4-18GHz
    - f) Mixer, HP, P/N R3434B, 18-26.5GHz
    - g) Mixer, HP, P/N R3434C, 26.5-40GHz
  - 5) Calibrated Advantest spectrum analyzer and pre-selector/pre-amplifier. 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 1 KHz VBW 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 3.2 of the 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 polarization of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarization. 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/m and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:.

Field Level in dBuV/m =  $60 + 7.0 + 1.0 - 30 = 38.0$  dBuV/m.

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

**Notes:** The frequency and amplitude of at least six highest conducted emissions relative to the limit are recorded unless such emissions are more than 20 dB below the limit. If less than six emissions are within 20dB of the limit, the background or receiver noise level shall be reported at representative frequencies.

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## 6. **EXHIBIT 6 - INFORMATION RELATED TO EQUIPMENT UNDER TESTS**

### 6.1. ***FCC ID Labeling and Sketch of FCC Label Location***

Refer to the attached FCC ID Label

### 6.2. ***Photographs of Equipment under Test***

Refer to the attached photographs

### 6.3. ***System Block Diagram(s)***

Refer to the attached block diagrams

### 6.4. ***Schematic Diagrams***

Refer to the attached schematic diagrams

### 6.5. ***User's Manual with “FCC Information to User Statements”***

Refer to the attached Users' manual

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