

# TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: [sid@timcoengr.com](mailto:sid@timcoengr.com)



## Test Report

Product Name: VHF RF MODEM

FCC ID: H78KPBSR100D

Applicant:

**KP ELECTRONIC SYSTEMS LTD.  
P.O. Box 42  
TEFEN INDUSTRIAL PARK  
TEFEN, 24959  
ISREAL**

**Date Receipt: FEBRUARY 24, 2004**

**Date Tested: APRIL 1, 2004**

APPLICANT: KP ELECTRONICS SYSTEMS LTD.

FCC ID: H78KPBSR100D

REPORT #: K\KP\226AIT4\226AIT4TestReport.doc

COVER SHEET

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### EXHIBITS CONTAINING:

CONFIDENTIALITY LETTER  
BLOCK DIAGRAM  
SCHEMATIC  
PARTS LIST  
USERS MANUAL  
LABEL SAMPLE & LOCATION  
EXTERNAL PHOTOGRAPHS  
INTERNAL PHOTOGRAPHS  
TUNING PROCEDURE  
OPERATIONAL DESCRIPTION  
TEST SET UP PHOTOGRAPH

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## GENERAL INFORMATION REQUIRED FOR TYPE ACCEPTANCE

2.1033(c)(1)(2) KP ELECTRONIC SYSTEMS LTD. will manufacture the  
FCCID: H78KPBSR100D VHF TRANSCEIVER in quantity,  
for use under FCC RULES PART 90.

KP ELECTRONIC SYSTEMS LTD.  
P.O. BOX 42  
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TEFEN, 24959  
ISREAL

## 2.1033(c) TECHNICAL DESCRIPTION

2.1033(c)(3) Instruction book. A draft copy of the instruction  
manual is included in the exhibits.

2.1033(c)(4) Type of Emission: 11K25F1D  
90.209

$B_n = 2M + 2DK$   
 $M = 9600$   
 $D = 825$   
 $B_n = 2(9600/2) + 2(825) = 11.25k$

90.217 (b) Authorized Bandwidth 12.5 kHz

2.1033(c)(5) Frequency Range: 136 - 174 MHz  
90.209

2.1033(c)(6)(7) Power Output shall not exceed 59 Watts into a 50 ohm  
90.205 resistive load. There are no user power controls.

2.1033(c)(8) DC Voltages and Current into Final Amplifier:

### FINAL AMPLIFIER ONLY

$V_{ce} = 12.5$   
 $I_{ce} = 1.93$

$P_{in} = 24.13$

2.1033(c)(9) Tune-up procedure. The tune-up procedure is included  
in the exhibits.

2.1033(c)(10) Complete Circuit Diagrams: The circuit diagram and  
block diagram are included in the exhibits.

(11) Function of each electron tube or semiconductor  
device or other active circuit device see the  
exhibits.

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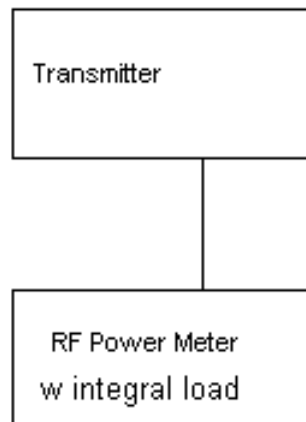
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- (12) Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description in the instruction manual.
- 2.1033(c)(13) A photograph or drawing of the equipment identification label is shown in the exhibits.
- 2.1033(c)(14) Photographs of the equipment of sufficient clarity to reveal equipment construction and layout and label location are shown in the exhibits.
- 2.1033(c)(15) For equipment employing digital modulation, a detail description of the modulation technique. This UUT uses FSK to modulate the transmitter.
- 2.1033(c)(16) The data required for 2.1046 through 2.1057 is submitted below.
- 2.1046(a) **RF POWER OUTPUT**  
RF power is measured by connecting a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage of 12.5 VDC, and the transmitter properly adjusted the RF output measures:

**OUTPUT POWER:** 10 Watts



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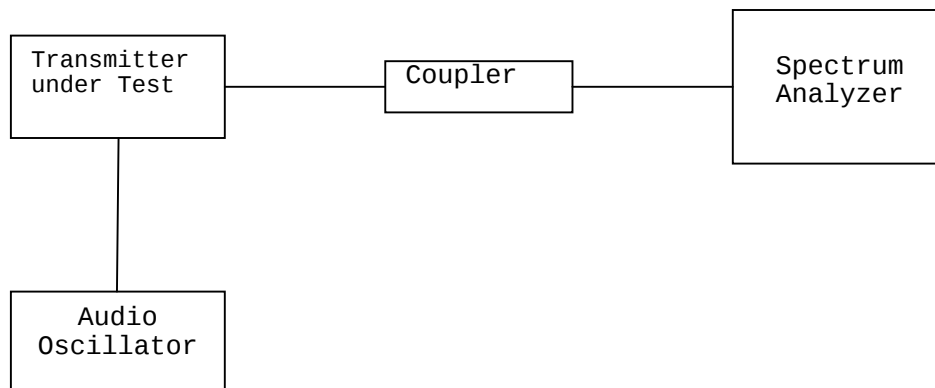
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- 2.1049      Occupied bandwidth:  
90.210(d)   Emission Mask D - 12.5 kHz channel bandwidth equipment.  
For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:
- (1) On any frequency from the center of the authorized bandwidth  $f_0$  to 5.625 kHz removed from  $f_0$ : Zero dB.
  - (2) On any frequency from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least  $7.27 (f_d - 2.88 \text{ kHz})$  dB.
  - (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz: At least  $50 + 10\log(P)$  dB or 70 dB, whichever is the lesser attenuation.

Test procedure: TIA/EIA-603 para 2.2.11, with the exception that various tones were used.

Test procedure diagram

## OCCUPIED BANDWIDTH MEASUREMENT



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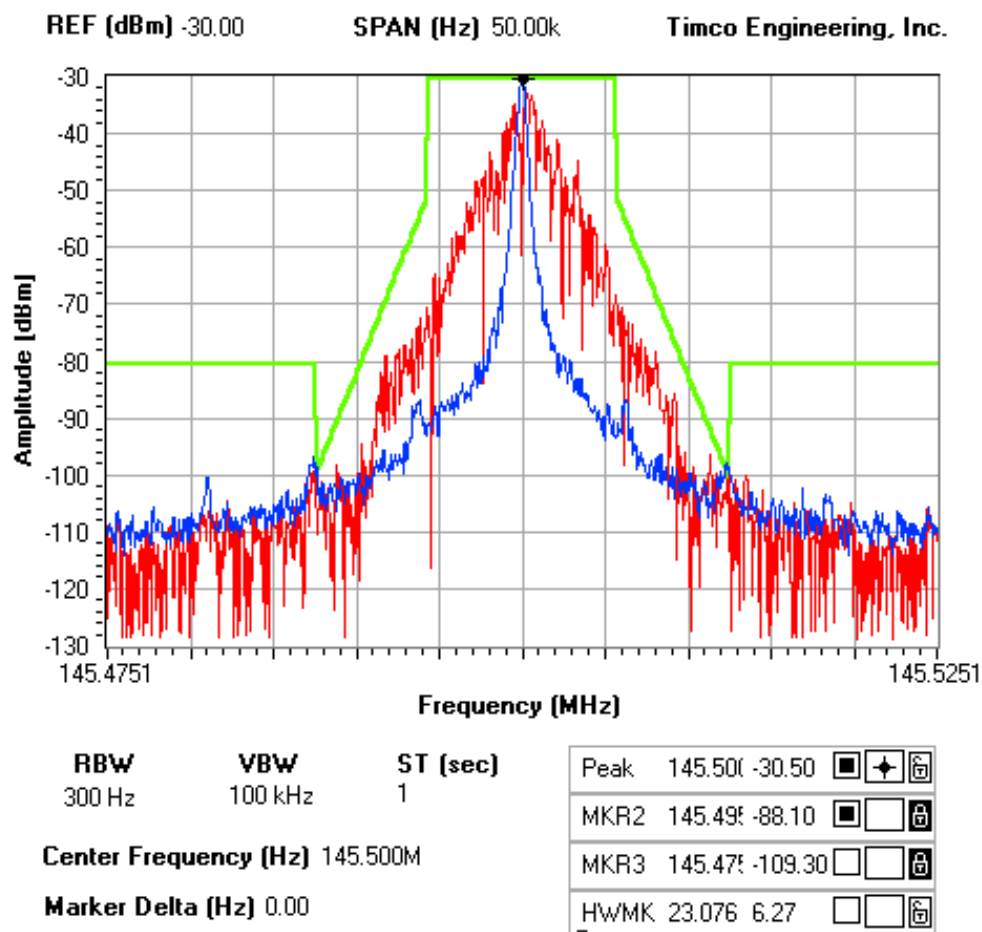
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## OCCUPIED BANDWIDTH PLOT

### NOTES:

KP ELECTRONIC SYSTEMS LTD. - FCC ID: H78BSR100-D  
OCCUPIED BANDWIDTH PLOT

### FCC 90.210 Mask D



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## 2.1051

### Spurious emissions at antenna terminals (conducted):

Data below shows the level of conducted spurious responses. The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

#### REQUIREMENTS:

Emissions must be  $50 + 10\log(P_o)$  dB below the mean power output of the transmitter.

| FREQ. (MHz) | dBm   | FREQ. (MHz) | dBm   | FREQ. (MHz) | dBm   |
|-------------|-------|-------------|-------|-------------|-------|
| 136         | 40    | 145.50      | 40    | 154.90      | 40    |
| 272         | < -25 | 291.00      | < -30 | 309.80      | < -30 |
| 408         | < -25 | 436.50      | < -30 | 467.70      | < -30 |
| 544         | < -25 | 582.00      | < -30 | 619.60      | < -30 |
| 680         | < -25 | 727.50      | < -30 | 774.50      | < -30 |
| 816         | < -25 | 873.00      | < -30 | 929.40      | < -30 |
| 952         | < -25 | 1018.50     | < -30 | 1084.30     | < -30 |
| 1088        | < -25 | 1164.00     | < -30 | 1239.20     | < -30 |
| 1244        | < -25 | 1309.50     | < -30 | 1394.10     | < -30 |
| 1360        | < -25 | 1455.00     | < -30 | 1549.00     | < -30 |

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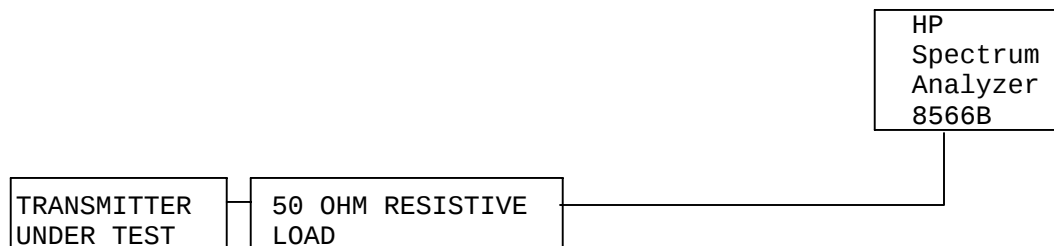
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## Method of Measuring Conducted Spurious Emissions



**METHOD OF MEASUREMENT:** The procedure used was TIA/EIA-603 STANDARD without any exceptions. An audio generator was connected to the UUT through a dummy microphone circuit and the output of the transmitter connected to a standard load and from the standard load through a pre-selector filter of the spectrum analyzer. The spectrum was scanned from 400 kHz to at least the tenth harmonic of the fundamental using a HP model 8566B spectrum analyzer. The measurements were made using the shielded room located at TIMCO ENGINEERING INC. 849 N.W. State Road 45, Newberry, Florida 32669.

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**2.1053**

**Field strength of spurious emissions:**

**NAME OF TEST:**

RADIATED SPURIOUS EMISSIONS (136MHz)

**REQUIREMENTS:**

Emissions must be  $50 + 10\log(P_o)$  dB below the mean power output of the transmitter.

$$50 + 10\log(10) = 60.00 \text{ dB}$$

**TEST DATA:**

| Emission Frequency MHz | Ant. Polarity | Corrected EUT Signal Reading | Coax Loss (dB) | Substitution Antenna (dBd) | dB Below Carrier (dBc) |
|------------------------|---------------|------------------------------|----------------|----------------------------|------------------------|
| 136.00                 | H             | 40.00                        | 0              | 0                          | 0                      |
| 272.00                 | H             | -61.50                       | 0.00           | -1.15                      | 102.65                 |
| 408.00                 | H             | -55.80                       | 0.00           | -0.38                      | 96.18                  |
| 544.00                 | H             | -37.40                       | 0.00           | -0.55                      | 77.95                  |
| 680.00                 | V             | -32.70                       | 0.00           | 0.07                       | 72.63                  |
| 816.00                 | H             | -15.20                       | 0.00           | -1.22                      | 56.42                  |
| 952.00                 | H             | -32.20                       | 0.00           | -1.17                      | 73.37                  |
| 1088.00                | H             | -39.40                       | 1.02           | 3.30                       | 77.12                  |
| 1224.00                | H             | -38.70                       | 1.02           | 3.85                       | 75.87                  |
| 1360.00                | H             | -48.40                       | 1.07           | 4.39                       | 85.08                  |

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**2.1053**

**Field strength of spurious emissions:**

**NAME OF TEST:** RADIATED SPURIOUS EMISSIONS (145.50 MHz)

**REQUIREMENTS:** Emissions must be  $50 + 10\log(P_o)$  dB below the mean power output of the transmitter.

$$50 + 10\log(10) = 60.00 \text{ dB}$$

**TEST DATA:**

| Emission Frequency MHz | Ant. Polarity | Corrected EUT Signal Reading | Coax Loss (dB) | Substitution Antenna (dBd) | dB Below Carrier (dBc) |
|------------------------|---------------|------------------------------|----------------|----------------------------|------------------------|
| 145.50                 | H             | 40.00                        | 0              | 0                          | 0                      |
| 291.00                 | H             | -56.50                       | 0.00           | -1.26                      | 97.76                  |
| 436.50                 | V             | -58.00                       | 0.00           | -0.45                      | 98.45                  |
| 582.00                 | H             | -34.60                       | 0.00           | -0.45                      | 75.05                  |
| 727.50                 | H             | -24.60                       | 0.00           | -0.19                      | 64.79                  |
| 873.00                 | H             | -18.40                       | 0.00           | -0.77                      | 59.17                  |
| 1018.50                | H             | -33.40                       | 1.00           | 3.02                       | 71.38                  |
| 1164.00                | H             | -39.60                       | 1.03           | 3.61                       | 77.02                  |
| 1309.50                | H             | -42.50                       | 1.06           | 4.19                       | 79.37                  |
| 1455.00                | H             | -37.10                       | 1.09           | 4.77                       | 73.42                  |

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**2.1053**

**Field strength of spurious emissions:**

**NAME OF TEST:**

RADIATED SPURIOUS EMISSIONS (154.90 MHz)

**REQUIREMENTS:**

Emissions must be  $50 + 10\log(P_o)$  dB below the mean power output of the transmitter.

$$50 + 10\log(10) = 60.00 \text{ dB}$$

**TEST DATA:**

| Emission Frequency MHz | Ant. Polarity | Corrected EUT Signal Reading | Coax Loss (dB) | Substitution Antenna (dBd) | dB Below Carrier (dBc) |
|------------------------|---------------|------------------------------|----------------|----------------------------|------------------------|
| 154.90                 | H             | 40.00                        | 0              | 0                          | 0                      |
| 309.80                 | H             | -52.00                       | 0.00           | -1.25                      | 93.25                  |
| 464.70                 | H             | -41.60                       | 0.00           | -0.51                      | 82.11                  |
| 619.60                 | H             | -39.40                       | 0.00           | -0.29                      | 79.69                  |
| 774.50                 | H             | -23.70                       | 0.00           | -0.94                      | 64.64                  |
| 929.40                 | H             | -28.70                       | 0.00           | -0.90                      | 69.60                  |
| 1084.30                | H             | -48.40                       | 1.02           | 3.29                       | 86.13                  |
| 1239.20                | H             | -37.80                       | 1.05           | 3.91                       | 74.94                  |
| 1394.10                | H             | -40.00                       | 1.08           | 4.53                       | 76.55                  |
| 1549.00                | V             | -46.50                       | 1.11           | 4.98                       | 82.63                  |

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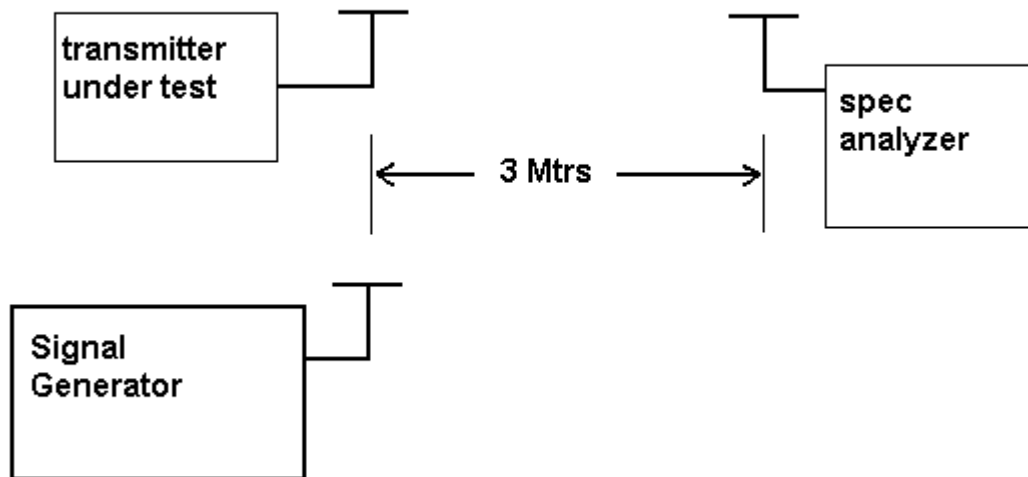
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## Method of Measuring Radiated Spurious Emissions



**METHOD OF MEASUREMENTS:** The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

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2.1055 Frequency stability:  
90.213(a)(1)

Temperature and voltage tests were performed to verify that the frequency remains within the .00025%, 2.5 ppm specification limit, 12.5 kHz spacing. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25° C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30° C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst-case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to + 50° C.

Readings were also taken at minus 15% of the battery voltage of 12.5 VDC, which we estimate to be the battery endpoint.

## MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 145.499 975 MHz

| <u>TEMPERATURE °C</u> | <u>FREQUENCY_MHz</u> | <u>PPM</u> |
|-----------------------|----------------------|------------|
| REFERENCE_____        | 145.499 975          | 00.0       |
| -30_____              | 145.500 135          | + 1.10     |
| -20_____              | 145.500 193          | + 1.50     |
| -10_____              | 145.500 173          | + 1.36     |
| 0_____                | 145.500 124          | + 1.02     |
| +10_____              | 145.500 056          | + 0.56     |
| +20_____              | 145.499 996          | + 0.14     |
| +30_____              | 145.499 921          | - 0.37     |
| +40_____              | 145.499 901          | - 0.51     |
| +50_____              | 145.499 932          | - 0.30     |

| <u>BATT</u> | <u>%BATT. DATA</u> | <u>VOLTS</u> | <u>BATT. PPM</u> |
|-------------|--------------------|--------------|------------------|
| -15%        | 145.499 993        | 10.63        | + 0.12           |

**RESULTS OF MEASUREMENTS:** The test results indicates that the EUT meets the requirements.

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2.1055(a)(1) Frequency stability:  
90.214 Transient Frequency Behavior

**REQUIREMENTS:** Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum transient frequencies within the maximum frequency difference limits during the time intervals indicated:

| Time Intervals | Maximum frequency difference | All Equipment |             |
|----------------|------------------------------|---------------|-------------|
|                |                              | 150-174 MHz   | 421-512 MHz |

## Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels

|         |                |         |         |
|---------|----------------|---------|---------|
| $t_1^4$ | $\pm 25.0$ kHz | 5.0 mS  | 10.0 mS |
| $t_2$   | $\pm 12.5$ kHz | 20.0 mS | 25.0 mS |
| $t_3^4$ | $\pm 25.0$ kHz | 5.0 mS  | 10.0 mS |

## Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels

|         |                |         |         |
|---------|----------------|---------|---------|
| $t_1^4$ | $\pm 12.5$ kHz | 5.0 mS  | 10.0 mS |
| $t_2$   | $\pm 6.25$ kHz | 20.0 mS | 25.0 mS |
| $t_3^4$ | $\pm 12.5$ kHz | 5.0 mS  | 10.0 mS |

## Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels

|         |                 |         |         |
|---------|-----------------|---------|---------|
| $t_1^4$ | $\pm 6.25$ kHz  | 5.0 mS  | 10.0 mS |
| $t_2$   | $\pm 3.125$ kHz | 20.0 mS | 25.0 mS |
| $t_3^4$ | $\pm 6.25$ kHz  | 5.0 mS  | 10.0 mS |

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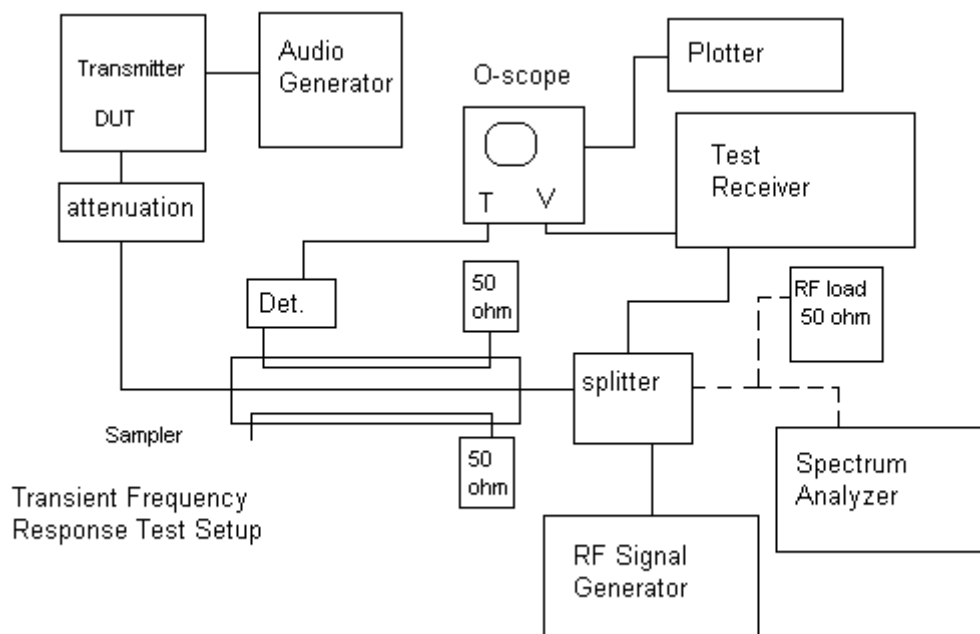
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**TEST PROCEEDURE:** TIA/EIA TS603 PARA 2.2.19, the levels were set as follows;

1. Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, then the transmitter was turned off.
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
3. Reduce the attenuation between the transmitter and the RF detector by 30 dB.
4. With the levels set as above the transient frequency behavior was observed & recorded.



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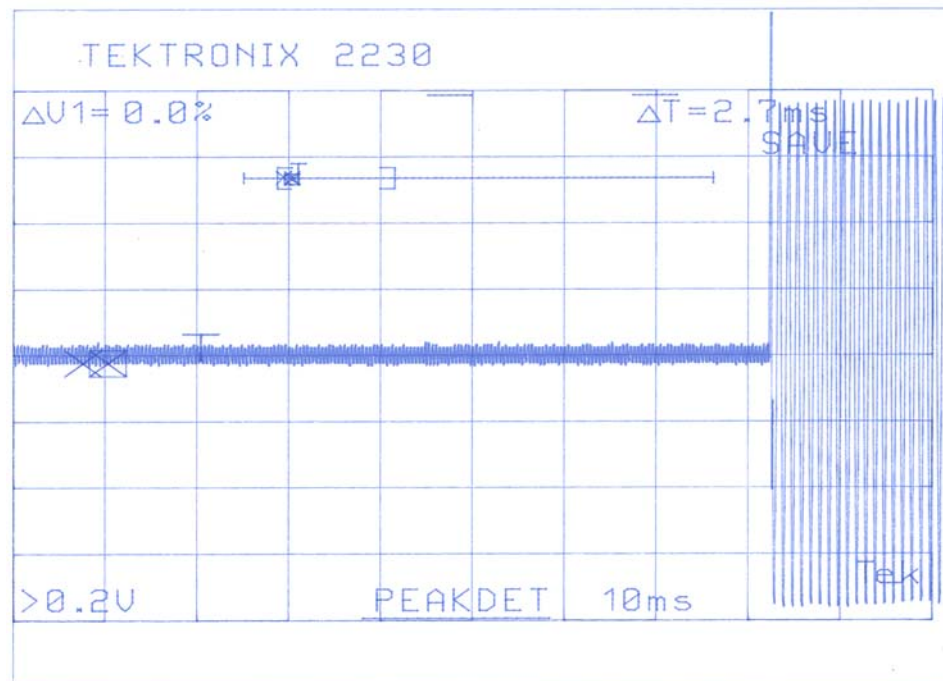
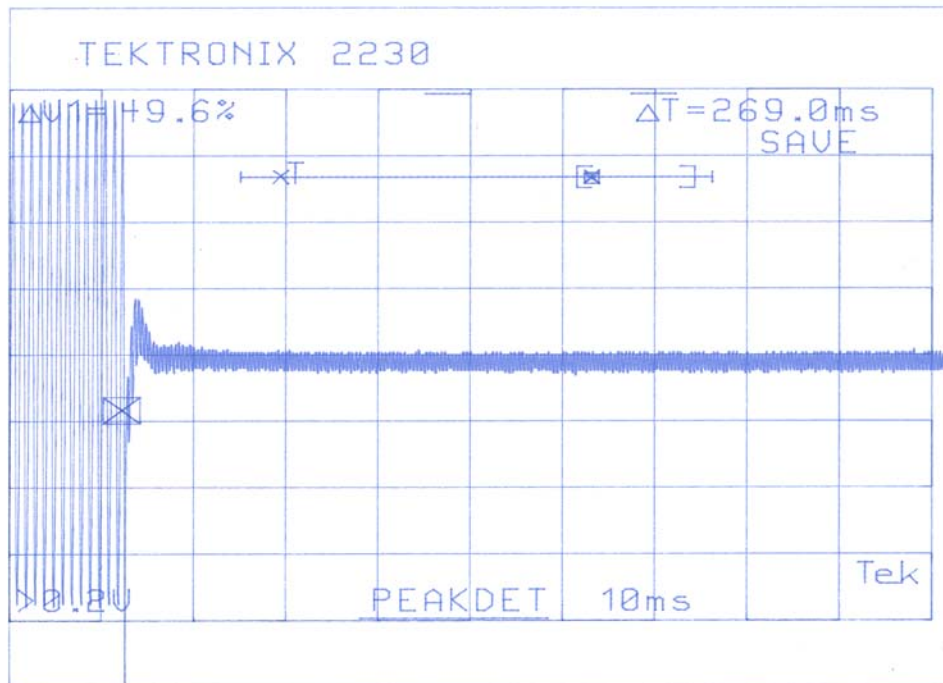
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## TRANSIENT FREQUENCY RESPONSE 12.5 kHz



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## EMC Equipment List

|   | DEVICE                                           | MFGR            | MODEL         | SERNO                    | CAL/CHAR<br>DATE  | DUE DATE<br>or STATUS |
|---|--------------------------------------------------|-----------------|---------------|--------------------------|-------------------|-----------------------|
| X | 3-Meter<br>OATS                                  | TEI             | N/A           | N/A                      | Listed<br>1/13/03 | 1/13/06               |
|   | 3/10-Meter<br>OATS                               | TEI             | N/A           | N/A                      | Listed<br>3/26/01 | 3/26/04               |
|   | Receiver, Beige Tower<br>Spectrum Analyzer       | HP              | 8566B Opt 462 | 3138A07786<br>3144A20661 | CAL<br>8/31/01    | 8/31/03               |
|   | RF Preselector                                   | HP              | 85685A        | 3221A01400               | CAL<br>8/31/01    | 8/31/03               |
|   | Quasi-Peak Adapter                               | HP              | 85650A        | 3303A01690               | CAL<br>8/31/01    | 8/31/03               |
| X | Receiver, Blue Tower<br>Spectrum Analyzer        | HP              | 8568B         | 2928A04729               | CAL               | 4/15/05               |
| X |                                                  |                 |               | 2848A18049               | 4/15/03           |                       |
| X | RF Preselector                                   | HP              | 85685A        | 2926A00983               | CAL<br>4/15/03    | 4/15/05               |
| X | Quasi-Peak Adapter                               | HP              | 85650A        | 2811A01279               | CAL<br>4/15/03    | 4/15/05               |
|   | Receiver, Silver/Grey Tower<br>Spectrum Analyzer | HP              | 8566B Opt 462 | 3552A22064<br>3638A08608 | CAL<br>10/14/02   | 10/14/04              |
|   | RF Preselector                                   | HP              | 85685A        | 2620A00294               | CAL<br>10/14/02   | 10/14/04              |
|   | Quasi-Peak Adapter                               | HP              | 85650A        | 3303A01844               | CAL<br>10/14/02   | 10/14/04              |
|   | Preamplifier                                     | HP              | 8449B         | 3008A01075               | CHAR<br>1/28/02   | 1/28/04               |
| X | Biconnical Antenna                               | Electro-Metrics | BIA-25        | 1171                     | CAL<br>4/26/01    | 4/26/03               |
|   | Biconnical Antenna                               | Eaton           | 94455-1       | 1096                     | CAL<br>10/1/01    | 10/1/03               |
|   | Biconnical Antenna                               | Eaton           | 94455-1       | 1057                     | CAL<br>3/18/03    | 3/18/05               |
|   | BiconiLog Antenna                                | EMCO            | 3143          | 9409-1043                |                   |                       |
| X | Log-Periodic<br>Antenna                          | Electro-Metrics | LPA-25        | 1122                     | CAL<br>10/2/01    | 10/2/03               |
|   | Log-Periodic<br>Antenna                          | Electro-Metrics | EM-6950       | 632                      | CHAR<br>10/15/01  | 10/15/03              |
|   | Log-Periodic<br>Antenna                          | Electro-Metrics | LPA-30        | 409                      | CAL<br>3/4/03     | 3/4/05                |

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|   | DEVICE                                | MFGR                           | MODEL      | SERNO      | CAL/CHAR<br>DATE   | DUE DATE<br>or STATUS |
|---|---------------------------------------|--------------------------------|------------|------------|--------------------|-----------------------|
|   | Dipole Antenna<br>Kit                 | Electro-Metrics                | TDA-30/1-4 | 152        | CAL<br>3/21/01     | 3/21/04               |
|   | Dipole Antenna<br>Kit                 | Electro-Metrics                | TDA-30/1-4 | 153        | CAL<br>9/26/02     | 9/26/05               |
|   | Double-Ridged Horn<br>Antenna         | Electro-Metrics                | RGA-180    | 2319       | CAL<br>2/17/03     | 2/17/05               |
|   | Horn Antenna                          | Electro-Metrics                | EM-6961    | 6246       | CAL<br>3/31/03     | 3/31/05               |
|   | Horn Antenna                          | ATM                            | 19-443-6R  | None       | No Cal<br>Required |                       |
|   | Passive Loop Antenna                  | EMC Test Systems               | EMCO 6512  | 9706-1211  | CHAR<br>7/10/01    | 7/10/03               |
|   | Line Impedance<br>Stabilization . . . | Electro-Metrics                | ANS-25/2   | 2604       | CAL<br>10/9/01     | 10/9/03               |
|   | Line Impedance Stabilization<br>. . . | Electro-Metrics                | EM-7820    | 2682       | CAL<br>3/12/03     | 3/12/05               |
|   | Termaline Wattmeter                   | Bird Electronic<br>Corporation | 611        | 16405      | CAL<br>5/25/99     | 5/25/01               |
|   | Termaline Wattmeter                   | Bird Electronic<br>Corporation | 6104       | 1926       | CHAR<br>12/12/01   | 12/12/03              |
|   | Oscilloscope                          | Tektronix                      | 2230       | 300572     | CHAR<br>2/1/01     | 2/1/03                |
|   | System One                            | Audio Precision                | System One | SYS1-45868 | CHAR<br>4/25/02    | 4/25/04               |
|   | Temperature Chamber                   | Tenney<br>Engineering          | TTRC       | 11717-7    | CHAR<br>1/22/02    | 1/22/04               |
|   | AC Voltmeter                          | HP                             | 400FL      | 2213A14499 | CAL<br>10/9/01     | 10/9/03               |
|   | AC Voltmeter                          | HP                             | 400FL      | 2213A14261 | CHAR<br>10/15/01   | 10/15/03              |
|   | AC Voltmeter                          | HP                             | 400FL      | 2213A14728 | CHAR<br>10/15/01   | 10/15/03              |
| X | Digital Multimeter                    | Fluke                          | 77         | 35053830   | CHAR<br>1/8/02     | 1/8/04                |
|   | Digital Multimeter                    | Fluke                          | 77         | 43850817   | CHAR<br>1/8/02     | 1/8/04                |
|   | Digital Multimeter                    | HP                             | E2377A     | 2927J05849 | CHAR<br>1/8/02     | 1/8/04                |
|   | Multimeter                            | Fluke                          | FLUKE-77-3 | 79510405   | CHAR<br>9/26/01    | 9/26/03               |
|   | Peak Power Meter                      | HP                             | 8900C      | 2131A00545 | CHAR<br>1/26/01    | 1/26/03               |
|   | Power Meter                           | HP                             | 432A       | 1141A07655 | CAL<br>4/15/03     | 4/15/05               |

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|   | DEVICE                    | MFGR                    | MODEL                | SERNO        | CAL/CHAR<br>DATE | DUE DATE<br>or STATUS |
|---|---------------------------|-------------------------|----------------------|--------------|------------------|-----------------------|
|   | Power Meter<br>And Sensor | Bird                    | 4421-107<br>4022     | 0166<br>0218 | CAL<br>4/16/03   | 4/16/05               |
|   | Power Sensor              | HP                      | 478A                 | 72129        | CAL<br>4/15/03   | 4/15/05               |
|   | Digital Thermometer       | Fluke                   | 2166A                | 42032        | CAL<br>1/16/02   | 1/16/04               |
|   | Thermometer               | Traulsen                | SK-128               |              | CHAR<br>1/22/02  | 1/22/04               |
|   | Thermometer               | Extech                  | 4028                 | 14871-2      | CAL<br>3/7/03    | 3/7/05                |
| X | Hygro-Thermometer         | Extech                  | 445703               | 0602         | CAL<br>10/4/02   | 10/4/04               |
|   | Frequency Counter         | HP                      | 5352B                | 2632A00165   | CAL<br>11/28/01  | 11/28/03              |
|   | Frequency Counter         | HP                      | 5385A                | 2730A03025   | CAL<br>3/7/03    | 3/7/05                |
|   | Power Sensor              | Agilent<br>Technologies | 84811A               | 2551A02705   | CHAR<br>1/26/01  | 1/26/03               |
|   | Service Monitor           | IFR                     | FM/AM 500A           | 5182         | CAL<br>11/22/00  | 11/22/02              |
|   | Comm. Serv. Monitor       | IFR                     | FM/AM 1200S          | 6593         | CAL<br>5/12/02   | 5/12/04               |
|   | Signal Generator          | HP                      | 8640B                | 2308A21464   | CAL<br>2/15/02   | 2/15/04               |
|   | Sweep Generator           | Wiltron                 | 6648                 | 101009       | CAL<br>4/15/03   | 4/15/05               |
|   | Sweep Generator           | Wiltron                 | 6669M                | 007005       | CAL<br>3/3/03    | 3/3/05                |
|   | Modulation Analyzer       | HP                      | 8901A                | 3435A06868   | CAL<br>9/5/01    | 9/5/03                |
|   | Modulation Meter          | Boonton                 | 8220                 | 10901AB      | CAL<br>4/15/03   | 4/15/05               |
|   | Near Field Probe          | HP                      | HP11940A             | 2650A02748   | CHAR<br>2/1/01   | 2/1/03                |
|   | BandReject Filter         | Lorch Microwave         | 5BR4-2400/<br>60-N   | Z1           | CHAR<br>3/2/01   | 3/2/03                |
|   | BandReject Filter         | Lorch<br>Microwave      | 6BR6-2442/<br>300-N  | Z1           | CHAR<br>3/2/01   | 3/2/03                |
|   | BandReject Filter         | Lorch<br>Microwave      | 5BR4-10525/<br>900-S | Z1           | CHAR<br>3/2/01   | 3/2/03                |
|   | High Pass Filter          | Microlab                | HA-10N               |              | CHAR<br>10/4/01  | 10/4/03               |
|   | High Pass Filter          | Microlab                | HA-20N               |              | CHAR<br>2/7/03   | 2/7/05                |

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|  | DEVICE               | MFGR                | MODEL         | SERNO      | CAL/CHAR<br>DATE | DUE DATE<br>or STATUS |
|--|----------------------|---------------------|---------------|------------|------------------|-----------------------|
|  | Audio Oscillator     | HP                  | 653A          | 832-00260  | CHAR<br>3/1/01   | 3/1/03                |
|  | Frequency Counter    | HP                  | 5382A         | 1620A03535 | CHAR<br>3/2/01   | 3/2/03                |
|  | Frequency Counter    | HP                  | 5385A         | 3242A07460 | CAL<br>3/7/03    | 3/7/05                |
|  | Preamplifier         | HP                  | 8449B-H02     | 3008A00372 | CHAR<br>3/4/01   | 3/4/03                |
|  | Amplifier            | HP                  | 11975A        | 2738A01969 | CHAR<br>3/1/01   | 3/1/03                |
|  | Egg Timer            | Unk                 |               |            | CHAR<br>8/31/01  | 8/31/03               |
|  | Measuring Tape, 20M  | Kraftixx            | 0631-20       |            | CHAR<br>2/1/02   | 2/1/04                |
|  | Measuring Tape, 7.5M | Kraftixx            | 7.5M PROFI    |            | 2/1/02           | 2/1/04                |
|  | Coaxial Cable #51    | Insulated Wire Inc. | NPS 2251-2880 | Timco #51  | CHAR<br>1/23/02  | 1/23/04               |
|  | Coaxial Cable #64    | Semflex Inc.        | 60637         | Timco #64  | CHAR<br>1/24/02  | 1/24/04               |
|  | Coaxial Cable #65    | General Cable Co.   | E9917 RG233/U | Timco #65  | CHAR<br>1/23/02  | 1/23/04               |
|  | Coaxial Cable #106   | Unknown             | Unknown       | Timco #106 | CHAR<br>1/23/02  | 1/23/04               |

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## MAXIMUM PERMISSIBLE EXPOSURE CALCULATIONS

### Calculation Results

|                                  |                           |
|----------------------------------|---------------------------|
| Average Power at the Antenna     | 10.000 watts              |
| Antenna Gain in dBi              | 6.00 dBi                  |
| Distance to the Area of Interest | 4.20 feet                 |
| Frequency of Operation           | 150.000 MHz               |
| Estimated RF Power Density       | 0.1934 mw/cm <sup>2</sup> |

|                                                       | Controlled Environment  | Uncontrolled Environment |
|-------------------------------------------------------|-------------------------|--------------------------|
| Maximum Permissible Exposure (MPE)                    | 1.00 mw/cm <sup>2</sup> | 0.21 mw/cm <sup>2</sup>  |
| Distance to Compliance From Center of Antenna         | 1.90 feet               | 4.18 feet                |
| Does the Area of Interest Appear to be in Compliance? | yes                     | yes                      |

### Calculation Results

|                                  |                           |
|----------------------------------|---------------------------|
| Average Power at the Antenna     | 10.000 watts              |
| Antenna Gain in dBi              | 2.00 dBi                  |
| Distance to the Area of Interest | 2.70 feet                 |
| Frequency of Operation           | 150.000 MHz               |
| Estimated RF Power Density       | 0.1863 mw/cm <sup>2</sup> |

|                                                       | Controlled Environment  | Uncontrolled Environment |
|-------------------------------------------------------|-------------------------|--------------------------|
| Maximum Permissible Exposure (MPE)                    | 1.00 mw/cm <sup>2</sup> | 0.21 mw/cm <sup>2</sup>  |
| Distance to Compliance From Center of Antenna         | 1.22 feet               | 2.66 feet                |
| Does the Area of Interest Appear to be in Compliance? | yes                     | yes                      |

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