

REPORT OF MEASUREMENTS
FOR
DTC COMMUNICATIONS, INC.
AUDIO SURVEILLANCE TRANSMITTER
MODEL: H25T2070
FCC ID: H25T2070

CERTIFICATION INFORMATION

Applicant/Manufacturer: **DTC Communications, Inc.
486 Amherst Street
Nashua, NH 03062**

Equipment under Test (EUT): **The EUT is an Audio Surveillance Transmitter used in Law Enforcement Applications**

Model: **H25T2070**

FCC ID Number: **FCC ID: H25T2070**

Applicable Test Standard: **FCC Parts 2 & 90**

EUT Frequency Range: **150 To174MHz**

Emission Designator: **11K0F3E**

Measured Power Output **.100 Watts**

Channel Spacing **12.5kHz**

Transmit Modes: **Wideband and Narrowband Deviation**

Antenna Connector Type: **MMCX Female**

Antenna Type: **Wire Whip**

Input Power: **4.5VDC (3AA Batteries)**

RF Exposure: **See Attached Installation/Users Manual and MPE Evaluation. Unit is categorically exempt.**

Measurements Required by FCC: **See Report Section 1 (Summary of Test Program) and the following Test Report Data Attachments:**

- RF Power Output**
- Modulation Characteristics**
- Occupied Bandwidth**
- Spurious Emissions at Antenna Terminals**
- Effective Radiated Power of Spurious Radiation**
- Frequency Stability**
- Transient Frequency Response**

SECTION 1
SUMMARY OF TEST PROGRAM

RF POWER OUTPUT

Measurement Procedure:

The RF output connector of the test sample was connected through external attenuators to a spectrum analyzer. The test sample was configured to output an unmodulated CW signal. Testing was performed at 1 frequency within the operational band. The level of the maximized output power level was recorded and shown below.

| Frequency (MHz) | Output (dBm) | Output (Watts) |
|-----------------|--------------|----------------|
| 170.0 | 20.01 | .100 |

For complete test data, see electronic Test Report Attachment, **RF Power Output Data**.

TRANSIENT FREQUENCY BEHAVIOR 90.214

Measurement Procedure:

The difference between the actual transmitter frequency to the assigned transmitter frequency was measured, as a function of time, when the transmitter RF output was switched on or off. Using the method of measurement described in TIA/EIA-603, 2.2.19 the transient frequency behavior was measured and compared to the limit specified in 90.214 for equipment operating in the 150 to 174MHz band designed to operate on 12.5kHz channels.

For complete test data, see electronic Test Report Attachment, **Transient Frequency Behavior**

MODULATION CHARACTERISTICS 2.1047/90.211 (a)

2.1047 (a) Frequency Response of Audio Modulating Circuit (100 to 500Hz) (Attached)

2.1047 (a) Frequency Response of Audio Low Pass Filter (Attached)

2.1047 (b) Modulation Limiting showing frequency deviation versus modulation input voltage (Attached)

90.211 (a) Equipment that is equipped with an audio low pass filter must meet the emission limitations specified in 90.210.

For complete test data, See Electronic Test Report Attachment, **Modulation Characteristics Data and Occupied Bandwidth Data.**

OCCUPIED BANDWIDTH 2.1049/90.210 (d)

Measurement Procedure:

The test sample's RF output was connected through proper attenuation to a spectrum analyzer.

The test sample was modulated with a 2500Hz signal at a level 16dB above that required to produce 50% modulation. The input level was established at the frequency of maximum response of the audio modulating circuit. FCC Part 90.210 (d) states that for transmitters designed to operate with a 12.5kHz 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 removed from the center of the authorized bandwidth f_0 to 5.625kHz removed from f_0 : zero dB
2. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625kHz but no more than 12.5kHz: 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 12.5kHz: At least $50 + 10\log (P)$ dB or 70dB whichever is lesser attenuation.

For complete test data, see electronic Test Report Attachment, **Occupied Bandwidth Data.**

ANTENNA PORT SPURIOUS EMISSIONS 2.1051/TIA/EIA-603

Measurement Procedure:

A spectrum analyzer was connected to the RF output port of the test sample. The test sample was modulated with a 2500Hz signal at an input level 16dB greater than that necessary to produce 50% of rated system deviation. The input level was established at the frequency of maximum response of the audio modulating circuit. Testing was performed in both wideband and narrowband deviation modes. The level of any spurious emission was recorded. Testing was performed in the frequency range of 30MHz to 1.74GHz. The spurious emissions limit is -20Bm as specified in FCC Part 90.210 (d)

For complete test data, including harmonic and spurious emissions measured at antenna terminal, see electronic Test Report Attachment, **Antenna Conducted Data**.

EFFECTIVE RADIATED POWER OF SPURIOUS RADIATION 2.1053/TIA/EIA-603

Measurement Procedure:

The test sample was placed on a 80cm high wooden test stand which was located 3 meters from the test antenna on an FCC listed test site. A shielded load of proper impedance was connected to the RF output connector of the test sample. The test sample was operated in both wideband and narrowband deviation modes. The effective radiated power of each out of band spurious emission was measured using the substitution method specified in TIA/EIA-603. The frequency range of the test was 30MHz – 1.74GHz. The limit for out of band spurious emissions is -20dBm as specified in Part 90.210 (d)

For complete test data, see electronic Test Report Attachment, **Radiated Emissions Data**.

FREQUENCY STABILITY MEASUREMENTS 2.1055/90.213

Measurement Procedure (Frequency vs. Voltage & Temperature):

Testing was performed at frequency versus input voltage and temperature. The test sample was placed in a temperature chamber with the RF output of the test sample connected to a spectrum analyzer. FCC Part 2.1055 states that the primary supply voltage for battery operated equipment be reduced to the battery operating end point as specified by the manufacturer. The manufacturer specifies that the operating end point is 3.5VDC. The temperature was varied from -30 degrees c to +50 degrees c in 10 degree increments. The output frequency from the test sample was measured and recorded and compared to the limit specified in 90.213 (5.0ppm) .0005%.

For complete test data, see electronic Test Report Attachment, **Frequency Stability Data**.

SECTION 2
EQUIPMENT LISTS

RF Power Output

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due Date |
|-----------|-------------------|---------------------|--------------------|------------------|-----------------|-----------------|
| 4895 | Spectrum Analyzer | Hewlett Packard | 9kHz - 22GHz | 8593EM | 2/13/02 | 2/13/03 |
| 4962 | Attenuator | Narda | DC - 18 GHz | 757C-20dB | 11/6/02 | 11/6/03 |

Occupied Bandwidth

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due Date |
|-----------|-------------------|---------------------|--------------------|------------------|-----------------|-----------------|
| 4962 | Attenuator | Narda | DC - 18 GHz | 757C-20dB | 11/6/02 | 11/6/03 |
| 5010 | Graphics Plotter | Hewlett Packard | N/A | 7470A | 4/18/02 | 4/18/03 |
| R411 | Spectrum Analyzer | Hewlett Packard | 30 Hz - 2.9 GHz | AT-8560E | 1/8/03 | 1/8/05 |

Spurious Emissions at Antenna Terminals

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due Date |
|-----------|-------------------|---------------------|--------------------|------------------|-----------------|-----------------|
| 3128 | 20 dB Attenuator | Lucas Weinscher | DC - 18 GHz | 2 | 1/8/03 | 1/8/04 |
| 4895 | Spectrum Analyzer | Hewlett Packard | 9kHz - 22GHz | 8593EM | 2/13/02 | 2/13/03 |
| 4962 | Attenuator | Narda | DC - 18 GHz | 757C-20dB | 11/6/02 | 11/6/03 |

Spurious Radiated Emissions

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due Date |
|-----------|-----------------------|---------------------|--------------------|------------------|-----------------|-----------------|
| 3258 | Double Ridge Guide | EMCO | 1 - 18 GHz | 3115 | 5/6/02 | 5/6/03 |
| 4029 | Test Site Attenuation | Retlif | 3 / 10 Meters | RNH | 11/27/02 | 11/27/03 |
| 4202 | Biconilog | EMCO | 26 MHz - 2 GHz | 3142 | 7/25/02 | 7/25/03 |
| 4895 | Spectrum Analyzer | Hewlett Packard | 9kHz - 22GHz | 8593EM | 2/13/02 | 2/13/03 |
| 4921 | Graphics Plotter | Hewlett Packard | N/A | 7550A | 9/20/02 | 9/20/03 |

EQUIPMENT LISTS

Frequency Stability

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due Date |
|------|---------------------|-----------------|-----------------|-----------|----------|----------|
| 3117 | Power Supply | B&K Precision | 0-30 Vdc, 3.0 A | 1630 | 2/25/02 | 2/25/03 |
| 4962 | Attenuator | Narda | DC - 18 GHz | 757C-20dB | 11/6/02 | 11/6/03 |
| 4997 | Digital Thermometer | Omega | N/A | | 12/19/02 | 12/19/03 |
| 520N | Digital Multimeter | Wavetek | N/A | 25XT | 11/26/02 | 5/26/03 |
| 557 | Temperature Chamber | Associated Env. | -73 C - +177 C | SK 3105 | 6/11/02 | 6/11/03 |
| R411 | Spectrum Analyzer | Hewlett Packard | 30 Hz - 2.9 GHz | AT-8560E | 1/8/03 | 1/8/05 |

Transient Frequency Behavior

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due Date |
|------|-------------------------|---------------------|--------------------|-----------|----------|----------|
| 073 | Interference Analyzer | Electro-Metrics | 10 kHz - 1 GHz | EMC-25 | 1/27/03 | 1/27/04 |
| 3118 | Broadband Pre-Amplifier | Electro-Metrics | 10 KHz - 1 GHz | BPA-1000 | 1/31/03 | 1/31/04 |
| 3233 | Graphics Plotter | Hewlett Packard | N/A | 7470A | 4/16/02 | 4/16/03 |
| 3448 | 0-11 DB Stepattenuator | Midwest Microwave | DC - 18 GHz | 1092 | 2/25/02 | 2/25/03 |
| 4001 | Oscilloscope | Tektronix | N/A | TDS 520A | 4/11/02 | 4/11/03 |
| 4961 | Attenuator | Narda | DC - 18 GHz | 757C-30dB | 11/6/02 | 11/6/03 |
| 4999 | 50 ohm Adapter | Boonton Electronics | .01 - 1200 MHz | 952002 | 12/10/02 | 12/10/03 |
| 5006 | RF Millivoltmeter | Boonton Electronics | 10 kHz - 1.2 GHz | 9200 | 11/8/02 | 11/8/03 |
| 5017 | RF Probe | Boonton Electronics | 10 kHz to 1200 MHz | 91-12F | 12/10/02 | 12/10/03 |
| 5020 | RF Detector | Pasternack | 100 KHz - 1 GHz | PE8000-50 | 1/27/03 | 1/27/04 |
| 532 | High Power Dir Coupler | Werlatone Inc. | .01 - 1000 MHz | C2630 | 1/3/03 | 1/3/04 |

EQUIPMENT LIST

Modulation Limiting

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due Date |
|------|------------------|---------------------|----------------|-----------------|----------|----------|
| 419 | Modulation Meter | Boonton Electronics | .01 - 1.2 GHz | 82AD | 7/8/02 | 7/8/03 |
| 4990 | Audio Oscillator | Rohde & Schwarz | 1 Hz - 1.3 MHz | SPN 336.3019.32 | 6/10/02 | 6/10/03 |