# Electromagnetic Compatibility Test Report

**Model: 5290**
**(Analog STL Transmitter)**

**EMCE Test Report Number: ER050412-1**

**Dated: 4/12/05**

**Prepared for:**
**TFT, Inc.**
**1330 Concourse Drive**
**San Jose, CA 95131**

**Prepared by:**
**EMCE Engineering**
**44366 South Grimmer Blvd**
**Fremont, Ca 94538**

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## 1.0 PURPOSE

Measurements were performed on the TFT, Inc. Analog STL Transmitter Model 5290 (hereinafter referred to as the "EUT") to determine the electromagnetic emissions as they relate to Part 74 of CFR 47. Measurements were performed at the test facilities of:

EMCE Engineering
44366 S. Grimmer Blvd
Fremont, Ca 94538

See appendix D for list of laboratory accreditations.

## 2.0 DESCRIPTION OF TEST SAMPLE

Testing was conducted to determine the individual EMC characteristics of the Analog STL Transmitter (Model 5290, no S/N).

The TFT 5290 Analog STL Transmitter transmits on one RF channel between 944.0 MHz and 952.0 MHz per CFR 47, 74.502(b).

## 3.0 DISPOSITION OF TEST SPECIMEN

Upon completion of the specified EMC tests the EUT was returned to TFT, Inc. in San Jose, CA, by TFT personnel.

## 4.0 NARRATIVE ABSTRACT

### 4.1 Conclusions

After completion of all EMC measurements, all measured data was reviewed and compared with the applicable sections from CFR 47, Part 74 (i.e., Applicable sections of 47CFR 74: 74.1 and Subpart E which consists of: 74.501, 74.502, 74.503, 74.531, 74.532, 74.533, 74.534, 74.535, 74.536, 74.537, 74.550, 74.551, 74.561, 74.562, 74.564, and 74.582), and test methods described in CFR 47, Parts 2 and 74. Individual test results will be presented in this section of the report. Table 1 summarizes the test results.

**TABLE 1: SUMMARY OF TEST RESULTS**

| CFR Section | Title | Comments | Results |
|---|---|---|---|
| 2.1046, 74.534 | RF Power Output | | PASSED |
| 2.1047, 74.535 | Modulation Characteristics | | PASSED |
| 2.1049, 74.535 | Occupied Bandwidth | | PASSED |
| 2.1051 | Spurious Emissions | | PASSED |
| 2.1055, 74.561 | Frequency Stability | | PASSED |
| 2.1057 | Investigation of Frequency Spectrum | | PASSED |

## 4.2 EMC Testing Summary

### 4.2.1 *RF Power Output (CFR 2.1046, 74.534)*

Test results may be found in Appendix A.

### *4.2.2 Modulation Characteristics (CFR 2.1047, 74.535)*

Test results may be found in Appendix A

### *4.2.3 Occupied Bandwidth (CFR 2.1049, 74.535)*

Test results may be found in Appendix A.

### *4.2.4 Spurious Emissions (CFR 2.1051)*

Test results may be found in Appendix A.

### *4.2.5 Frequency Stability (CFR 2.1055, 74.561)*

Test results may be found in Appendix A

### *4.2.6 Radiated Spurious Emissions / Investigation of Frequency Spectrum (CFR 2.1053, 2.1057)*

Test results may be found in Appendix A

# APPENDIX A

# Test Data
# For
# Analog STL Transmitter
# M/N: 5290

# RF Power Output (CFR 2.1046, 74.534), Occupied Bandwidth (CFR 2.1049, 74.535)

## Operating Mode: MONO

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT, Inc.**
Specification: **TFT 460 Analog Mask**
Work Order #: **2413** Date: 4/27/2005
Test Type: **Antenna Conducted Emissions** Time: 2:49:44 PM
Equipment: **Analog STL Transmitter** Sequence#: 2
Manufacturer: TFT, Inc. Tested By: Bob Cole
Model: 5290 120V 60Hz
S/N: N/A

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|
| HP 8566B S/A | 3014A06947 | 12/04 | 12/05 | 328 |

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Attenuator | MCE/Weinshel | 40-30-33 | N/A |

***Test Conditions / Notes:***

Mono

Spectrum analyzer Settings:

| Freq Range (MHz) | RBW | VBW | Sweep Time | QP Setting |
|---|---|---|---|---|
| 30-1000 | 100 kHz | 1 MHz | Auto | Bypass |
| 1000-10000 | 1 MHz | 1 MHz | Auto | Bypass |

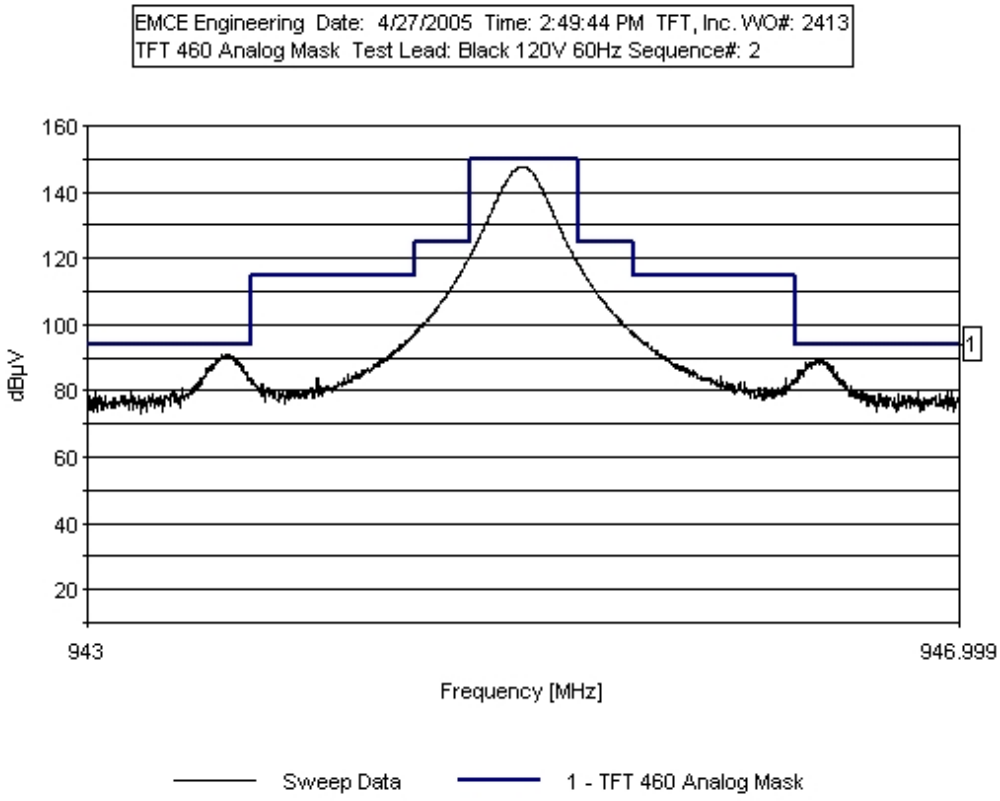
***Transducer Legend:***

T1=30 dB Attenuator

***Measurement Data:*** Reading listed by margin. Test Lead: Black

| # | Freq MHz | Rdng dBµV | T1 dB | dB | dB | dB | Dist Table | Corr dBµV | Spec dBµV | Margin dB | Polar Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 945.005M | 117.7 | +30.0 | | | | +0.0 | 147.7 | 150.0 | -2.3 | None |
| 2 | 943.640M | 61.0 | +30.0 | | | | +0.0 | 91.0 | 94.0 | -3.0 | None |
| 3 | 946.341M | 59.7 | +30.0 | | | | +0.0 | 89.7 | 94.0 | -4.3 | None |
| 4 | 943.434M | 51.0 | +30.0 | | | | +0.0 | 81.0 | 94.0 | -13.0 | None |
| 5 | 943.386M | 50.4 | +30.0 | | | | +0.0 | 80.4 | 94.0 | -13.6 | None |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | 946.964M | 50.3 | +30.0 | +0.0 | 80.3 | 94.0 | -13.7 | None |
| 7 | 943.037M | 49.7 | +30.0 | +0.0 | 79.7 | 94.0 | -14.3 | None |
| 8 | 943.197M | 49.5 | +30.0 | +0.0 | 79.5 | 94.0 | -14.5 | None |
| 9 | 946.604M | 48.7 | +30.0 | +0.0 | 78.7 | 94.0 | -15.3 | None |
| 10 | 943.053M | 48.6 | +30.0 | +0.0 | 78.6 | 94.0 | -15.4 | None |



# Operating Mode: FM

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT, Inc.**
Specification: **TFT 460 Analog Mask**
Work Order #: **2413** Date: 4/27/2005
Test Type: **Antenna Conducted Emissions** Time: 2:27:26 PM
Equipment: **Analog STL Transmitter** Sequence#: 6
Manufacturer: TFT, Inc. Tested By: Bob Cole
Model: 5290 120V 60Hz
S/N: N/A

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|
| HP 8566B S/A | 3014A06947 | 12/04 | 12/05 | 328 |

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Attenuator | MCE/Weinshel | 40-30-33 | N/A |

***Test Conditions / Notes:***

FM

Spectrum analyzer Settings:

| Freq Range (MHz) | RBW | VBW | Sweep Time | QP Setting |
|---|---|---|---|---|
| 30-1000 | 100 kHz | 1 MHz | Auto | Bypass |
| 1000-10000 | 1 MHz | 1 MHz | Auto | Bypass |

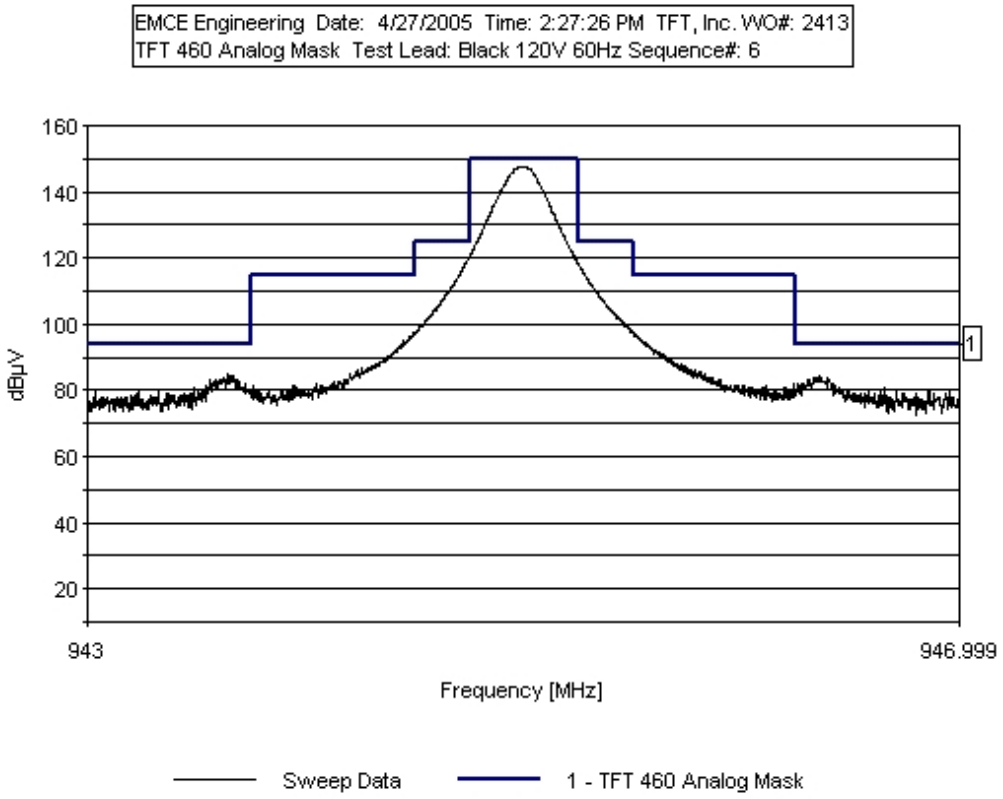
***Transducer Legend:***

T1=30 dB Attenuator

***Measurement Data:*** Reading listed by margin. Test Lead: Black

| # | Freq MHz | Rdng dBµV | T1 dB | dB | dB | dB | Dist Table | Corr dBµV | Spec dBµV | Margin dB | Polar Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 944.986M | 117.7 | +30.0 | | | | +0.0 | 147.7 | 150.0 | -2.3 | None |
| 2 | 943.639M | 54.9 | +30.0 | | | | +0.0 | 84.9 | 94.0 | -9.1 | None |
| 3 | 946.360M | 54.3 | +30.0 | | | | +0.0 | 84.3 | 94.0 | -9.7 | None |
| 4 | 943.559M | 53.4 | +30.0 | | | | +0.0 | 83.4 | 94.0 | -10.6 | None |
| 5 | 946.257M | 52.0 | +30.0 | | | | +0.0 | 82.0 | 94.0 | -12.0 | None |
| 6 | 946.423M | 51.5 | +30.0 | | | | +0.0 | 81.5 | 94.0 | -12.5 | None |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 943.487M | 50.9 | +30.0 | | +0.0 | 80.9 | 94.0 | -13.1 | None |
| 8 | 946.657M | 50.9 | +30.0 | | +0.0 | 80.9 | 94.0 | -13.1 | None |
| 9 | 943.506M | 50.3 | +30.0 | | +0.0 | 80.3 | 94.0 | -13.7 | None |
| 10 | 946.850M | 50.0 | +30.0 | | +0.0 | 80.0 | 94.0 | -14.0 | None |



# Operating Mode: FM with 152 kHz MUX

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT, Inc.**
Specification: **TFT 460 Analog Mask**
Work Order #: **2413** Date: 4/27/2005
Test Type: **Antenna Conducted Emissions** Time: 2:31:10 PM
Equipment: **Analog STL Transmitter** Sequence#: 7
Manufacturer: TFT, Inc. Tested By: Bob Cole
Model: 5290 120V 60Hz
S/N: N/A

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|
| HP 8566B S/A | 3014A06947 | 12/04 | 12/05 | 328 |

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Attenuator | MCE/Weinshel | 40-30-33 | N/A |

***Test Conditions / Notes:***

FM with 152 kHx MUX

Spectrum analyzer Settings:

| Freq Range (MHz) | RBW | VBW | Sweep Time | QP Setting |
|---|---|---|---|---|
| 30-1000 | 100 kHz | 1 MHz | Auto | Bypass |
| 1000-10000 | 1 MHz | 1 MHz | Auto | Bypass |

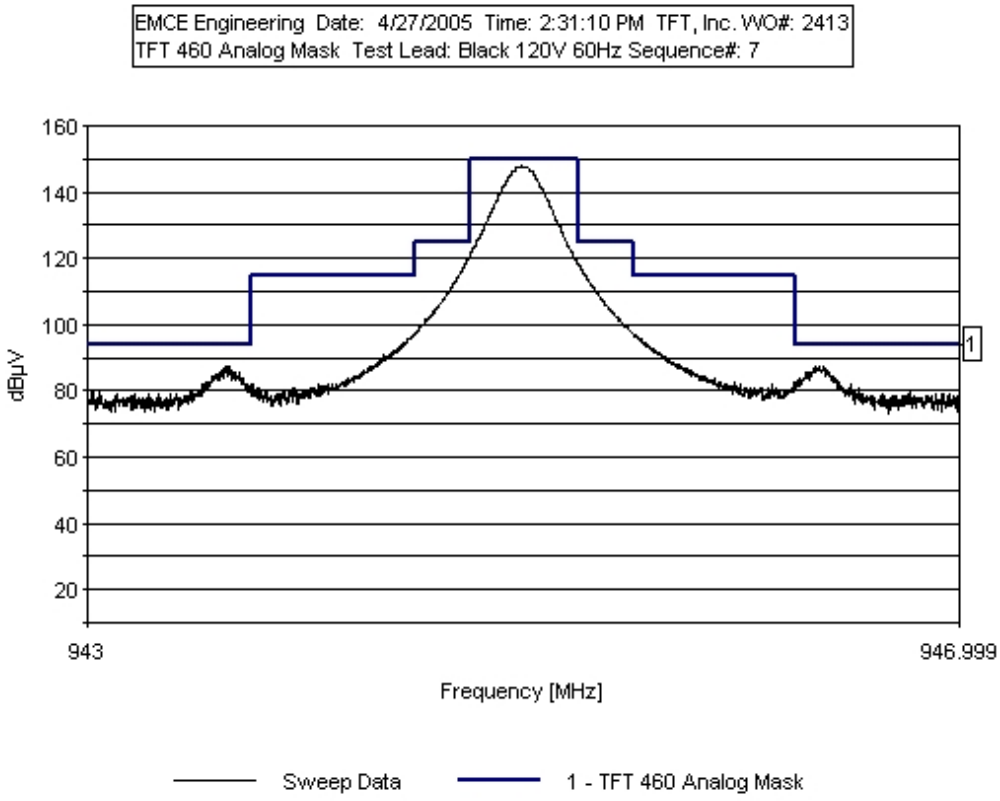
***Transducer Legend:***

T1=30 dB Attenuator

***Measurement Data:*** Reading listed by margin. Test Lead: Black

| # | Freq MHz | Rdng dBµV | T1 dB | dB | dB | dB | Dist Table | Corr dBµV | Spec dBµV | Margin dB | Polar Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 944.993M | 117.8 | +30.0 | | | | +0.0 | 147.8 | 150.0 | -2.2 | None |
| 2 | 943.652M | 57.6 | +30.0 | | | | +0.0 | 87.6 | 94.0 | -6.4 | None |
| 3 | 946.339M | 57.4 | +30.0 | | | | +0.0 | 87.4 | 94.0 | -6.6 | None |
| 4 | 946.537M | 50.8 | +30.0 | | | | +0.0 | 80.8 | 94.0 | -13.2 | None |
| 5 | 946.775M | 50.4 | +30.0 | | | | +0.0 | 80.4 | 94.0 | -13.6 | None |
| 6 | 943.474M | 49.6 | +30.0 | | | | +0.0 | 79.6 | 94.0 | -14.4 | None |
| 7 | 943.021M | 49.5 | +30.0 | | | | +0.0 | 79.5 | 94.0 | -14.5 | None |
| 8 | 943.051M | 49.5 | +30.0 | | | | +0.0 | 79.5 | 94.0 | -14.5 | None |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9 | 946.951M | 49.3 | +30.0 | +0.0 | 79.3 | 94.0 | -14.7 | None |
| 10 | 946.916M | 48.9 | +30.0 | +0.0 | 78.9 | 94.0 | -15.1 | None |



# Modulation Characteristics (CFR 2.1047, 74.535)

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT. Inc.**
Specification: **TFT 5290 Analog Mask - 1 kHz**
Work Order #:
Test Type: **Antenna Conducted Emissions**
Equipment: **Analog STL Transmitter**
Manufacturer: TFT, Inc.
Model: 5290
S/N: N/A

Date: 5/6/2005
Time: 1:39:42 PM
Sequence#: 6
Tested By: Test Engineer
120V 60Hz

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Attenuator | MCE/Weinshel | 40-30-33 | N/A |

***Test Conditions / Notes:***

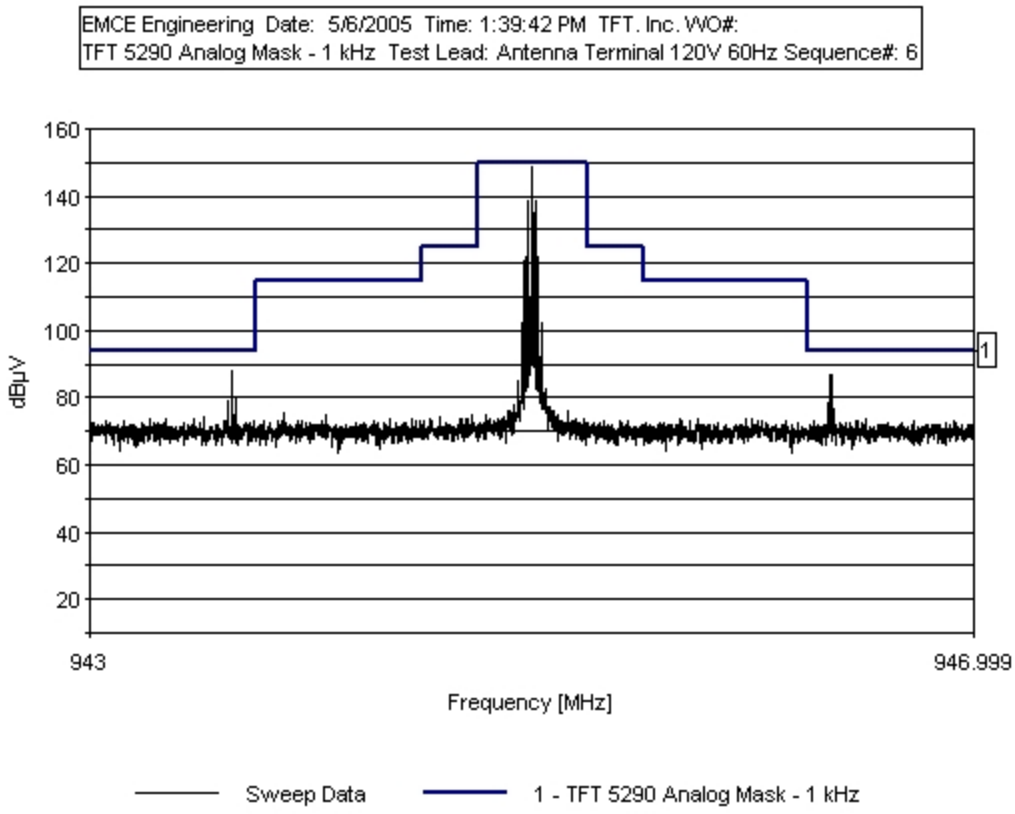
Mono with 15 kHz modulation, 24 kHz deviation 1.35 Vpp input level
1 kHz

***Transducer Legend:***

| | |
|---|---|
| T1=30 dB Attenuator | T2=Chamber Receive Cable to 1 GHz |

***Measurement Data:*** Reading listed by margin. Test Lead: Antenna Terminal

| # | Freq MHz | Rdng dBµV | T1 dB | T2 dB | dB | dB | Dist Table | Corr dBµV | Spec dBµV | Margin dB | Polar Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 944.996M | 115.2 | +30.0 | +3.2 | | | +0.0 | 148.4 | 150.0 | -1.6 | Anten |
| 2 | 943.641M | 54.9 | +30.0 | +3.2 | | | +0.0 | 88.1 | 94.0 | -5.9 | Anten |
| 3 | 946.352M | 53.8 | +30.0 | +3.2 | | | +0.0 | 87.0 | 94.0 | -7.0 | Anten |
| 4 | 944.981M | 105.2 | +30.0 | +3.2 | | | +0.0 | 138.4 | 150.0 | -11.6 | Anten |
| 5 | 945.011M | 105.2 | +30.0 | +3.2 | | | +0.0 | 138.4 | 150.0 | -11.6 | Anten |
| 6 | 943.656M | 46.4 | +30.0 | +3.2 | | | +0.0 | 79.6 | 94.0 | -14.4 | Anten |
| 7 | 943.626M | 45.7 | +30.0 | +3.2 | | | +0.0 | 78.9 | 94.0 | -15.1 | Anten |
| 8 | 946.336M | 45.3 | +30.0 | +3.2 | | | +0.0 | 78.5 | 94.0 | -15.5 | Anten |
| 9 | 946.367M | 43.3 | +30.0 | +3.2 | | | +0.0 | 76.5 | 94.0 | -17.5 | Anten |
| 10 | 943.512M | 40.8 | +30.0 | +3.2 | | | +0.0 | 74.0 | 94.0 | -20.0 | Anten |




Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT. Inc.**
Specification: **TFT 5290 Analog Mask - 3 kHz**
Work Order #:
Test Type: **Antenna Conducted Emissions**
Equipment: **Analog STL Transmitter**
Manufacturer: TFT, Inc.
Model: 5290
S/N: N/A

Date: 5/6/2005
Time: 1:43:02 PM
Sequence#: 8
Tested By: Test Engineer
120V 60Hz

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Attenuator | MCE/Weinshel | 40-30-33 | N/A |

***Test Conditions / Notes:***

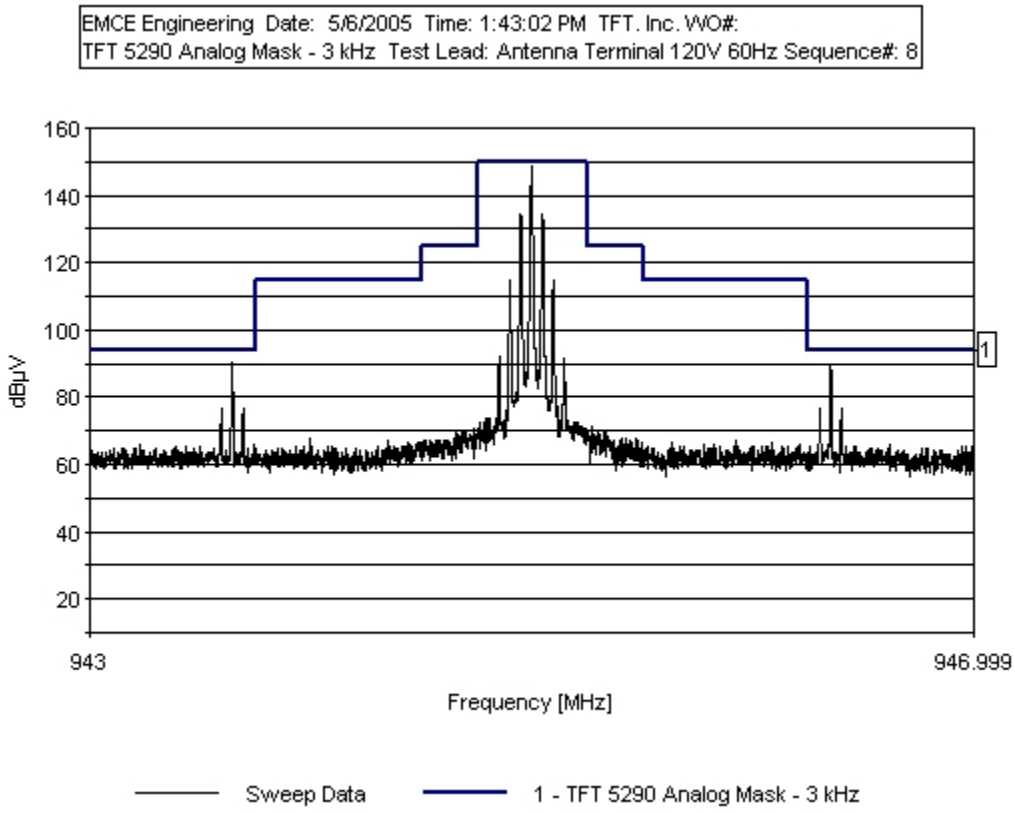
Composite with 50 kHz modulation, 50 kHz deviation 1.35 Vpp input level
3 kHz RBW

***Transducer Legend:***

| T1=30 dB Attenuator | T2=Chamber Receive Cable to 1 GHz |
|---|---|

***Measurement Data:*** Reading listed by margin. Test Lead: Antenna Terminal

| # | Freq MHz | Rdng dBµV | T1 dB | T2 dB | dB | dB | Dist Table | Corr dBµV | Spec dBµV | Margin dB | Polar Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 944.997M | 115.6 | +30.0 | +3.2 | | | +0.0 | 148.8 | 150.0 | -1.2 | Anten |
| 2 | 943.643M | 57.0 | +30.0 | +3.2 | | | +0.0 | 90.2 | 94.0 | -3.8 | Anten |
| 3 | 946.349M | 56.4 | +30.0 | +3.2 | | | +0.0 | 89.6 | 94.0 | -4.4 | Anten |
| 4 | 944.947M | 101.5 | +30.0 | +3.2 | | | +0.0 | 134.7 | 150.0 | -15.3 | Anten |
| 5 | 945.045M | 101.5 | +30.0 | +3.2 | | | +0.0 | 134.7 | 150.0 | -15.3 | Anten |
| 6 | 946.301M | 43.6 | +30.0 | +3.2 | | | +0.0 | 76.8 | 94.0 | -17.2 | Anten |
| 7 | 943.594M | 43.5 | +30.0 | +3.2 | | | +0.0 | 76.7 | 94.0 | -17.3 | Anten |
| 8 | 943.692M | 43.5 | +30.0 | +3.2 | | | +0.0 | 76.7 | 94.0 | -17.3 | Anten |
| 9 | 946.399M | 43.4 | +30.0 | +3.2 | | | +0.0 | 76.6 | 94.0 | -17.4 | Anten |
| 10 | 943.225M | 32.6 | +30.0 | +3.2 | | | +0.0 | 65.8 | 94.0 | -28.2 | Anten |



Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT. Inc.**
Specification: **TFT 5290 Analog Mask - 10 kHz**
Work Order #: Date: 5/6/2005
Test Type: **Antenna Conducted Emissions** Time: 1:49:52 PM
Equipment: **Analog STL Transmitter** Sequence#: 9
Manufacturer: TFT, Inc. Tested By: Test Engineer
Model: 5290 120V 60Hz
S/N: N/A

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Attenuator | MCE/Weinshel | 40-30-33 | N/A |

***Test Conditions / Notes:***

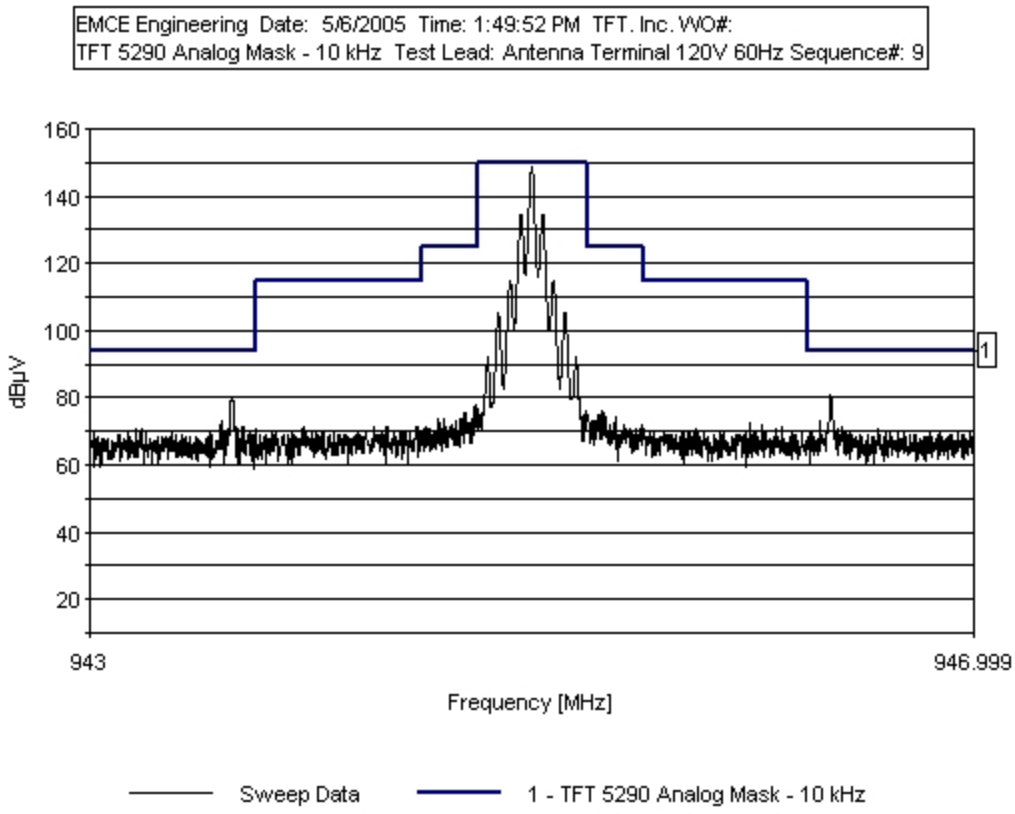
Composite with 50 kHz modulation, 1.35 Vpp input level, 50 kHz deviation MUX modulation 152 kHz , 1.35 Vpp input level - 12 kHz deviation
10 kHz RBW

***Transducer Legend:***

| | |
|---|---|
| T1=30 dB Attenuator | T2=Chamber Receive Cable to 1 GHz |

***Measurement Data:*** Reading listed by margin. Test Lead: Antenna Terminal

| # | Freq MHz | Rdng dBµV | T1 dB | T2 dB | dB | dB | Dist Table | Corr dBµV | Spec dBµV | Margin dB | Polar Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 944.997M | 115.5 | +30.0 | +3.2 | | | +0.0 | 148.7 | 150.0 | -1.3 | Anten |
| 2 | 946.351M | 47.4 | +30.0 | +3.2 | | | +0.0 | 80.6 | 94.0 | -13.4 | Anten |
| 3 | 943.644M | 47.1 | +30.0 | +3.2 | | | +0.0 | 80.3 | 94.0 | -13.7 | Anten |
| 4 | 944.947M | 101.5 | +30.0 | +3.2 | | | +0.0 | 134.7 | 150.0 | -15.3 | Anten |
| 5 | 945.045M | 101.5 | +30.0 | +3.2 | | | +0.0 | 134.7 | 150.0 | -15.3 | Anten |
| 6 | 946.303M | 39.7 | +30.0 | +3.2 | | | +0.0 | 72.9 | 94.0 | -21.1 | Anten |
| 7 | 943.597M | 39.6 | +30.0 | +3.2 | | | +0.0 | 72.8 | 94.0 | -21.2 | Anten |
| 8 | 943.691M | 38.0 | +30.0 | +3.2 | | | +0.0 | 71.2 | 94.0 | -22.8 | Anten |
| 9 | 946.401M | 37.9 | +30.0 | +3.2 | | | +0.0 | 71.1 | 94.0 | -22.9 | Anten |
| 10 | 943.746M | 37.6 | +30.0 | +3.2 | | | +0.0 | 70.8 | 94.0 | -23.2 | Anten |


EMCE Engineering Date: 5/6/2005 Time: 1:49:52 PM TFT. Inc. WO#:
TFT 5290 Analog Mask - 10 kHz Test Lead: Antenna Terminal 120V 60Hz Sequence#: 9
160
140
120
100
80
60
40
20
dBµV
1
943
946.999
Frequency [MHz]
Sweep Data
1 - TFT 5290 Analog Mask - 10 kHz

## Spurious Emissions (CFR 2.1051, 74.535)

## Operating Mode: MONO

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT, Inc.**
Specification: **TFT 5290 Spurious Conducted**
Work Order #: **2413** Date: 4/27/2005
Test Type: **Antenna Conducted Emissions** Time: 2:53:36 PM
Equipment: **Analog STL Transmitter** Sequence#: 11
Manufacturer: TFT, Inc. Tested By: Bob Cole
Model: 5290 120V 60Hz
S/N: N/A

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|
| HP 8566B S/A | 3014A06947 | 12/04 | 12/05 | 328 |

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Attenuator | MCE/Weinshel | 40-30-33 | N/A |

***Test Conditions / Notes:***

Mono - Harmonics

Spectrum analyzer Settings:

| Freq Range (MHz) | RBW | VBW | Sweep Time | QP Setting |
|---|---|---|---|---|
| 30-1000 | 100 kHz | 1 MHz | Auto | Bypass |
| 1000-10000 | 1 MHz | 1 MHz | Auto | Bypass |

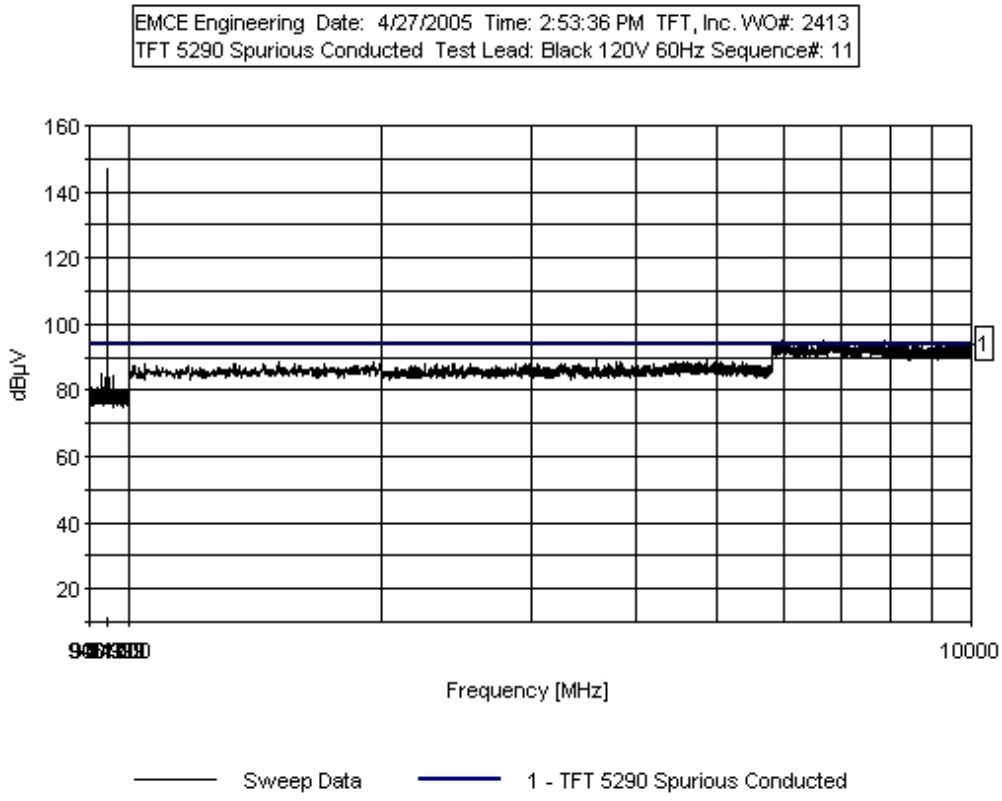
***Transducer Legend:***

T1=30 dB Attenuator

***Measurement Data:*** Reading listed by margin. Test Lead: Black

| # | Freq MHz | Rdng dBµV | T1 dB | dB | dB | dB | Dist Table | Corr dBµV | Spec dBµV | Margin dB | Polar Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 944.900M | 117.0 | +30.0 | | | | +0.0 | 147.0 | 94.0 | +53.0 | Fundamental Freq. |
| 2 | 4855.852M | 59.4 | +30.0 | | | | +0.0 | 89.4 | 94.0 | -4.6 | None |
| 3 | 3588.586M | 59.3 | +30.0 | | | | +0.0 | 89.3 | 94.0 | -4.7 | None |
| 4 | 5342.338M | 58.8 | +30.0 | | | | +0.0 | 88.8 | 94.0 | -5.2 | None |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | 4455.452M | 58.7 | +30.0 | +0.0 | 88.7 | 94.0 | -5.3 | None |
| 6 | 1950.950M | 58.6 | +30.0 | +0.0 | 88.6 | 94.0 | -5.4 | None |
| 7 | 3824.822M | 58.6 | +30.0 | +0.0 | 88.6 | 94.0 | -5.4 | None |
| 8 | 5052.048M | 58.6 | +30.0 | +0.0 | 88.6 | 94.0 | -5.4 | None |
| 9 | 5210.206M | 58.4 | +30.0 | +0.0 | 88.4 | 94.0 | -5.6 | None |
| 10 | 1508.508M | 58.3 | +30.0 | +0.0 | 88.3 | 94.0 | -5.7 | None |



# Operating Mode: FM

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT, Inc.**
Specification: **TFT 5290 Spurious Conducted**
Work Order #: **2413** Date: 4/27/2005
Test Type: **Antenna Conducted Emissions** Time: 2:55:36 PM
Equipment: **Analog STL Transmitter** Sequence#: 12
Manufacturer: TFT, Inc. Tested By: Bob Cole
Model: 5290 120V 60Hz
S/N: N/A

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|
| HP 8566B S/A | 3014A06947 | 12/04 | 12/05 | 328 |

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Attenuator | MCE/Weinshel | 40-30-33 | N/A |

***Test Conditions / Notes:***

FM – Harmonics

Spectrum analyzer Settings:

| Freq Range (MHz) | RBW | VBW | Sweep Time | QP Setting |
|---|---|---|---|---|
| 30-1000 | 100 kHz | 1 MHz | Auto | Bypass |
| 1000-10000 | 1 MHz | 1 MHz | Auto | Bypass |

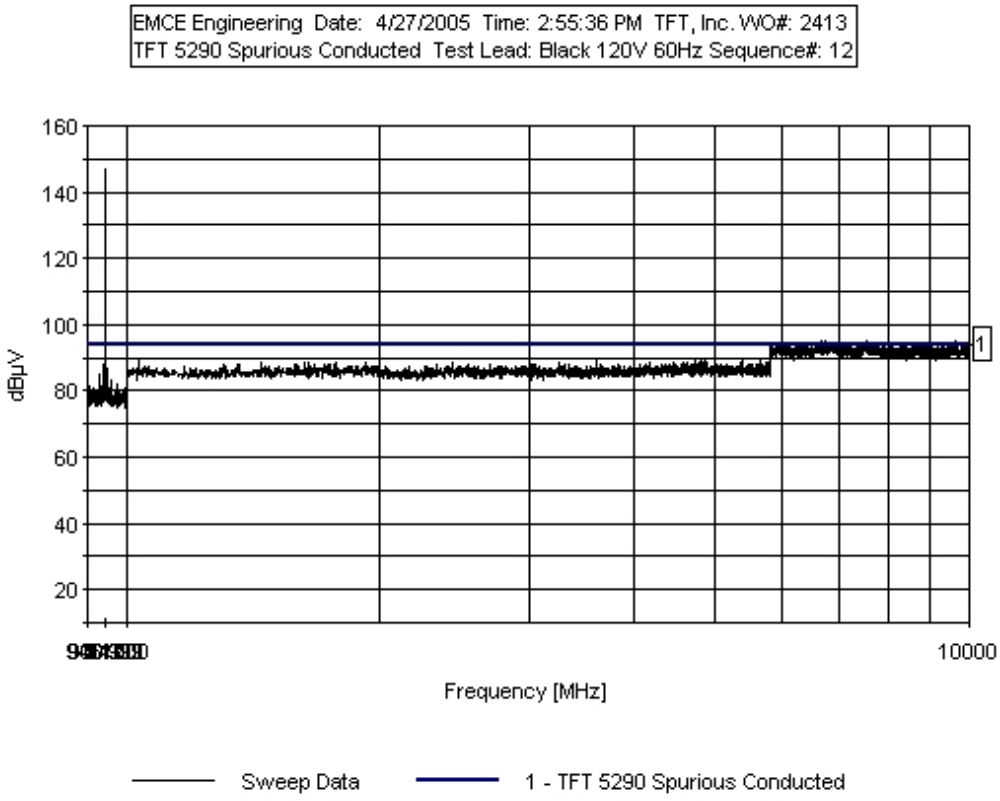
***Transducer Legend:***

T1=30 dB Attenuator

***Measurement Data:*** Reading listed by margin. Test Lead: Black

| # | Freq MHz | Rdng dBµV | T1 dB | dB | dB | dB | Dist Table | Corr dBµV | Spec dBµV | Margin dB | Polar Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 944.900M | 117.2 | +30.0 | | | | +0.0 | 147.2 | 94.0 | +53.2 | Fundamental Freq |
| | | | | | | | | | | | |
| 2 | 4723.720M | 59.7 | +30.0 | | | | +0.0 | 89.7 | 94.0 | -4.3 | None |
| 3 | 1036.036M | 59.0 | +30.0 | | | | +0.0 | 89.0 | 94.0 | -5.0 | None |
| 4 | 1998.998M | 58.9 | +30.0 | | | | +0.0 | 88.9 | 94.0 | -5.1 | None |
| 5 | 3616.614M | 58.9 | +30.0 | | | | +0.0 | 88.9 | 94.0 | -5.1 | None |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | 4445.442M | 58.7 | +30.0 | +0.0 | 88.7 | 94.0 | -5.3 | None |
| 7 | 1770.770M | 58.5 | +30.0 | +0.0 | 88.5 | 94.0 | -5.5 | None |
| 8 | 4173.170M | 58.5 | +30.0 | +0.0 | 88.5 | 94.0 | -5.5 | None |
| 9 | 2439.438M | 58.4 | +30.0 | +0.0 | 88.4 | 94.0 | -5.6 | None |
| 10 | 1442.442M | 58.3 | +30.0 | +0.0 | 88.3 | 94.0 | -5.7 | None |



# Operating Mode: FM with 152 kHz MUX

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT, Inc.**
Specification: **TFT 5290 Spurious Conducted**
Work Order #: **2413** Date: 4/27/2005
Test Type: **Antenna Conducted Emissions** Time: 2:57:13 PM
Equipment: **Analog STL Transmitter** Sequence#: 13
Manufacturer: TFT, Inc. Tested By: Bob Cole
Model: 5290 120V 60Hz
S/N: N/A

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|
| HP 8566B S/A | 3014A06947 | 12/04 | 12/05 | 328 |

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Attenuator | MCE/Weinshel | 40-30-33 | N/A |

***Test Conditions / Notes:***

FM - Harmonics 152 kHz MUX - Harmonics

Spectrum analyzer Settings:

| Freq Range (MHz) | RBW | VBW | Sweep Time | QP Setting |
|---|---|---|---|---|
| 30-1000 | 100 kHz | 1 MHz | Auto | Bypass |
| 1000-10000 | 1 MHz | 1 MHz | Auto | Bypass |

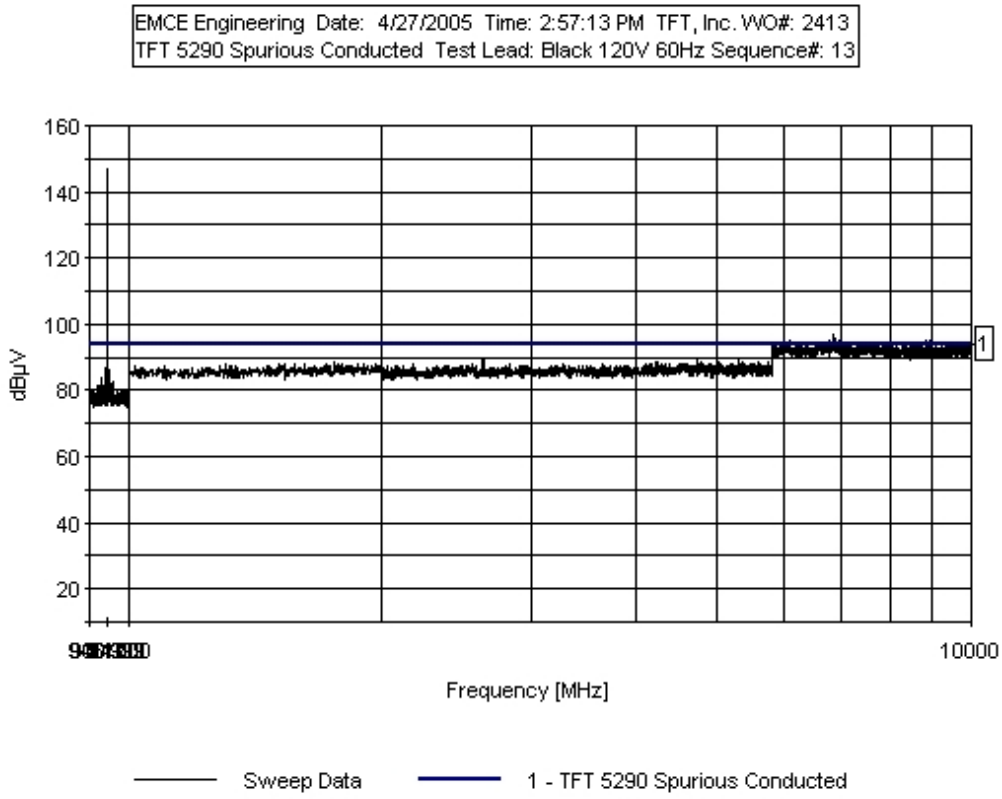
***Transducer Legend:***

T1=30 dB Attenuator

***Measurement Data:*** Reading listed by margin. Test Lead: Black

| # | Freq MHz | Rdng dBµV | T1 dB | dB | dB | dB | Dist Table | Corr dBµV | Spec dBµV | Margin dB | Polar Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 944.900M | 117.1 | +30.0 | | | | +0.0 | 147.1 | 94.0 | +53.1 | Fundamental Xmit Freq |
| 2 | 5286.282M | 59.7 | +30.0 | | | | +0.0 | 89.7 | 94.0 | -4.3 | None |
| 3 | 4723.720M | 59.3 | +30.0 | | | | +0.0 | 89.3 | 94.0 | -4.7 | None |
| 4 | 2635.634M | 58.9 | +30.0 | | | | +0.0 | 88.9 | 94.0 | -5.1 | None |
| 5 | 4221.218M | 58.6 | +30.0 | | | | +0.0 | 88.6 | 94.0 | -5.4 | None |
| 6 | 1758.758M | 58.3 | +30.0 | | | | +0.0 | 88.3 | 94.0 | -5.7 | None |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7 | 1512.512M | 58.2 | +30.0 | +0.0 | 88.2 | 94.0 | -5.8 | None |
| 8 | 1578.578M | 58.1 | +30.0 | +0.0 | 88.1 | 94.0 | -5.9 | None |
| 9 | 3276.274M | 58.1 | +30.0 | +0.0 | 88.1 | 94.0 | -5.9 | None |
| 10 | 1870.870M | 58.0 | +30.0 | +0.0 | 88.0 | 94.0 | -6.0 | None |



## Radiated Spurious Emissions (CFR 74,535)
## Operating Mode: Mono (Worst Case)

Note: Substitution Method
The following Radiated Spurious Emissions readings were determined by first identifying the frequencies using the test methods from ANSI 63.4. The signal amplitudes were then verified using the "substitution method" detailed in TIA 603-2004, section 2.2.12.2, and the results included here.

Test Procedure:

1. Radiated Spurious emissions were measured and maximized in both horizontal and vertical polarizations from 1 – 10 GHz to cover the tenth harmonic of the fundamental transmit frequency of 950 MHz.
2. EUT was replaced on the test bench with a signal generator connected to a Horn Antenna.
3. The worst case frequencies and amplitudes were then duplicated and maximized.
4. The signal generator output was then measured.
5. Power radiated from the substitute antenna was calculated as follows:

$$P_a(dBm) = P_g(dBm) - \text{cable loss}(dB) + \text{antenna gain}(dB)$$

Where: $P_a$ = Substitute antenna equivalent power
$P_g$ = Power from Signal Generator

$$\text{Radiated Spurious Emission (dB)} = 10 \log_{10} \left( \frac{20W}{.0001} \right) - P_a$$

$$= 53 - P_a$$

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **TFT, Inc.**
Specification: **FCC Class A 1 GHz-18 GHz**
Work Order #: **2413** Date: 4/5/2005
Test Type: **Radiated Scan** Time: 3:46:06 PM
Equipment: **Analog STL Transmitter** Sequence#: 11
Manufacturer: TFT, Inc. Tested By: Bob Cole
Model: 5290
S/N: N/A

***Test Equipment*:**

| Function | S/N | Calibration Date | Cal Due Date | Asset # |
|---|---|---|---|---|
| HP 84125B EMI Measurement System | | 3/05 | 3/06 | 396 |
| AH Systems DR Horn Antenna (Xmit) | 1291 | 08/02/2004 | 08/02/2006 | 389 |
| Signal Generator | Hewlett Packard | 8350A | | 32095A119 |

***Equipment Under Test* (* = EUT):**

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| Analog STL Transmitter* | TFT, Inc. | 5290 | N/A |

***Support Devices:***

| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| | | | |

***Test Conditions / Notes:***

Mono

***Measurement Data:*** Readings listed by margin. Test Distance: 3 Meter

| # | Freq | Rdng | $P_g$ | Cable Loss | Antenna Gain | $P_a$ | EIRP | Limit | Polar |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBm | dBm | dB | dB | dBm | dB | (dBm) | Ant |
| 1 | 2851.617M | -37.1 | -78.4 | 4.3 | -30.4 | -113.4 | -60.4 | -13 | Vert |
| 2 | 1901.248M | -45.3 | -75.2 | 3.4 | -28.1 | -104.7 | -51.7 | -13 | Vert |

## Frequency Stability (CFR 2.1055)

**FCC ID: BIO5290**

## Frequency Stability (CFR 2.1055)

### Frequency vs Temperature

| Temperature (Celcius) | Voltage | Frequency (MHz) | PASS/FAIL |
|---|---|---|---|
| 50 | 115 | 950.014 | **PASS** |
| 40 | 115 | 950.014 | **PASS** |
| 30 | 115 | 950.003 | **PASS** |
| 20 | 115 | 950.022 | **PASS** |
| 10 | 115 | 950.018 | **PASS** |
| 0 | 115 | 950.014 | **PASS** |
| -10 | 115 | 950.003 | **PASS** |
| -20 | 115 | N/A | **Non-Op** |
| -30 | 115 | N/A | **Non-Op** |

### Frequency vs Voltage

| Temperature (Celcius) | Voltage | Frequency (MHz) | PASS/FAIL |
|---|---|---|---|
| 20 | 97 | 950.005 | **PASS** |
| 20 | 115 | 950.022 | **PASS** |
| 20 | 128 | 950.016 | **PASS** |

Note:

# Appendix B

# EMCE Laboratory Accreditations

National Institute of Standards and Technology **NVLAP®** National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999
ISO 9002:1994

# Scope of Accreditation



**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

**NVLAP LAB CODE 200092-0**

**UNIVERSAL COMPLIANCE LABS DBA EMCE ENGINEERING**
44366 South Grimmer Boulevard
Fremont, CA 94538-6385
Mr. Bob Cole
Phone: 510-490-4307 Fax: 510-490-3441
E-Mail: bob@universalcompliance.com
URL: http://www.universalcompliance.com

| *NVLAP Code* | *Designation / Description* |
|---|---|
| **Emissions Test Methods:** | |
| 12/CIS22 | IEC/CISPR 22 (1997) & EN 55022 (1998) + A1(2000): Limits and methods of measurement of radio disturbance characteristics of information technology equipment |
| 12/CIS22a | IEC/CISPR 22 (1993) and EN 55022 (1994): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996) |
| 12/CIS22b | CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment |
| 12/FCC15b1 | ANSI C63.4 (2003) with FCC Method 47 CFR Part 15, Subpart B: Unintentional Radiators |
| 12/T51 | AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment |

December 31, 2005
*Effective through*

*For the National Institute of Standards and Technology*

NVLAP-01S (06-01)

National Institute of Standards and Technology — NVLAP® — National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999
ISO 9002:1994

# Scope of Accreditation



**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

**NVLAP LAB CODE 200092-0**

**UNIVERSAL COMPLIANCE LABS DBA EMCE ENGINEERING**

| *NVLAP Code* | *Designation / Description* |
|---|---|
| **Immunity Test Methods:** | |
| 12/I01 | IEC 61000-4-2, Ed. 2.1 (2001), A1, A2; EN 61000-4-2: Electrostatic Discharge Immunity Test |
| 12/I03 | IEC 61000-4-4(1995), A1(2000), A2(2001); EN 61000-4-4: Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical Fast Transient/Burst Immunity Test |
| 12/I04 | IEC 61000-4-5, Ed. 1.1 (2001-04); EN 61000-4-5: Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test |
| 12/I05 | IEC 61000-4-6, Ed. 2.0 (2003-05); EN 61000-4-6: Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields |
| 12/I06 | IEC 61000-4-8, Ed. 1.1 (2001); EN 61000-4-8: Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test |
| 12/I07 | IEC 61000-4-11, Ed. 1.1 (2001-03); EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests |

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United States Department of Commerce
National Institute of Standards and Technology

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ISO/IEC 17025:1999
ISO 9002:1994

# Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

## UNIVERSAL COMPLIANCE LABS DBA EMCE ENGINEERING

FREMONT, CA

*is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:*

## ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

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