

REPORT NUMBER 1621

December 2000

## RADIO PERFORMANCE MEASUREMENTS

On the T2020-543-F04 Mobile Transceiver

**FCC ID: CASTEL0054**

SN: 17045026

In accordance with

FCC 47 CFR Parts 22 and 90

PREPARED BY: Garry Pringle

\_\_\_\_\_  
Test Technician

CHECKED & APPROVED BY: SA Crompton

\_\_\_\_\_  
Laboratory Manager

### TELTEST LABORATORIES

Tait Electronics Ltd  
PO Box 1645  
558 Wairakei Road  
Christchurch 8005  
New Zealand

Phone: +64-3-3583399

Fax: +64-3-3580432

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NAME OF TEST: TRANSMITTER OUTPUT POWER (CONDUCTED)

TEST CONDITIONS: Ambient Temperature 20°C  
 Relative Humidity 50%  
 Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1046

GUIDE: TIA/EIA-603 2.2.1

MEASUREMENT PROCEDURE:

1. The Equipment Under Test (EUT) was set up as shown on the following diagram.
2. The coaxial attenuator has an impedance of 50 Ohms.
3. The unmodulated output power was measured with an RF Power meter.

MEASUREMENT RESULTS:

Manufacturer's Rated Output Power: Switchable: 5 W and 25 W Nominal

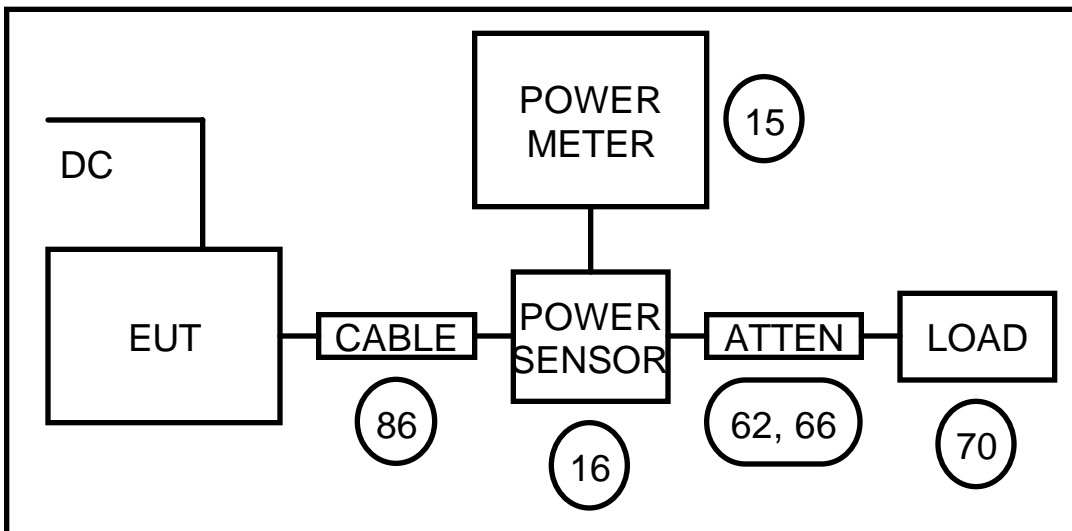
| 451.1 MHz                    | 5 W nominal    | 25 W nominal |
|------------------------------|----------------|--------------|
| POWER (W)                    | 4.96           | 27.35        |
| Variation from Nominal (%)   | -0.8           | +9.4         |
| Measurement Uncertainty (dB) | +0.63<br>-0.68 |              |

LIMIT CLAUSE: FCC 47 CFR 90.205

Radio Type: Mobile  
 Frequency Band: 400 MHz ~ 470 MHz

(n) The output power shall not exceed by more than 20% the manufacturer's rated output power for the particular transmitter.

TEST SETUP: See page 41 for Test Equipment information.



NAME OF TEST: AUDIO FREQUENCY FILTER RESPONSE

TEST CONDITIONS: Ambient Temperature °C  
Relative Humidity %  
Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1047

GUIDE: TIA/EIA-603 2.2.15

MEASUREMENT PROCEDURE:

This test was not carried out as the EUT meets the emission limits specified in §90.210.

MEASUREMENT RESULTS:

See Occupied Bandwidth tests on page 14.

LIMIT CLAUSE: FCC 47 CFR 90.211 (a)

(a) Transmitters utilizing analog emissions that are equipped with an audio low-pass filter must meet the emission limitations specified in §90.210....

TEST SETUP: See page 14 – Occupied Bandwidth

NAME OF TEST: TRANSMITTER AUDIO FREQUENCY RESPONSE  
PRE-EMPHASIS

TEST CONDITIONS: Ambient Temperature 20°C  
Relative Humidity 50%  
Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603 2.2.6

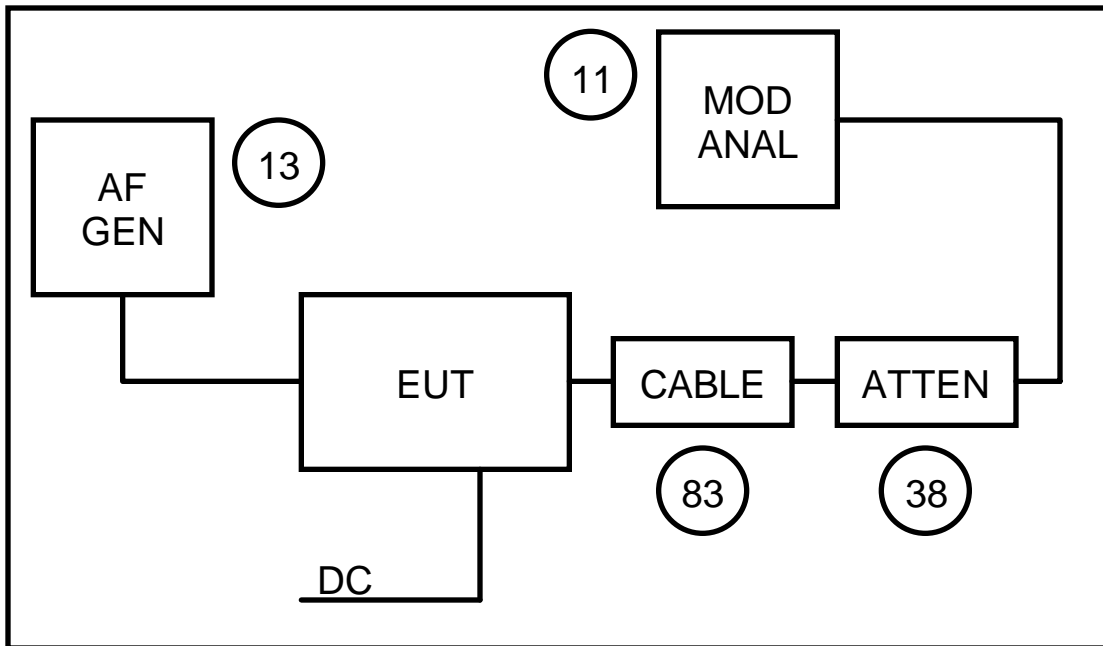
MEASUREMENT PROCEDURE:

1. The Equipment Under Test (EUT) was set up as shown on the following diagram.
2. An audio input tone of 1000Hz was applied with the level set to obtain 20% of maximum deviation. This was used as the 0dB reference point.
3. The AF was varied while the audio level was held constant.
4. The response in dB relative to 1000Hz was measured.

MEASUREMENT RESULTS: See the plot on the following page.

LIMIT CLAUSE: TIA/EIA-603 2.2.6

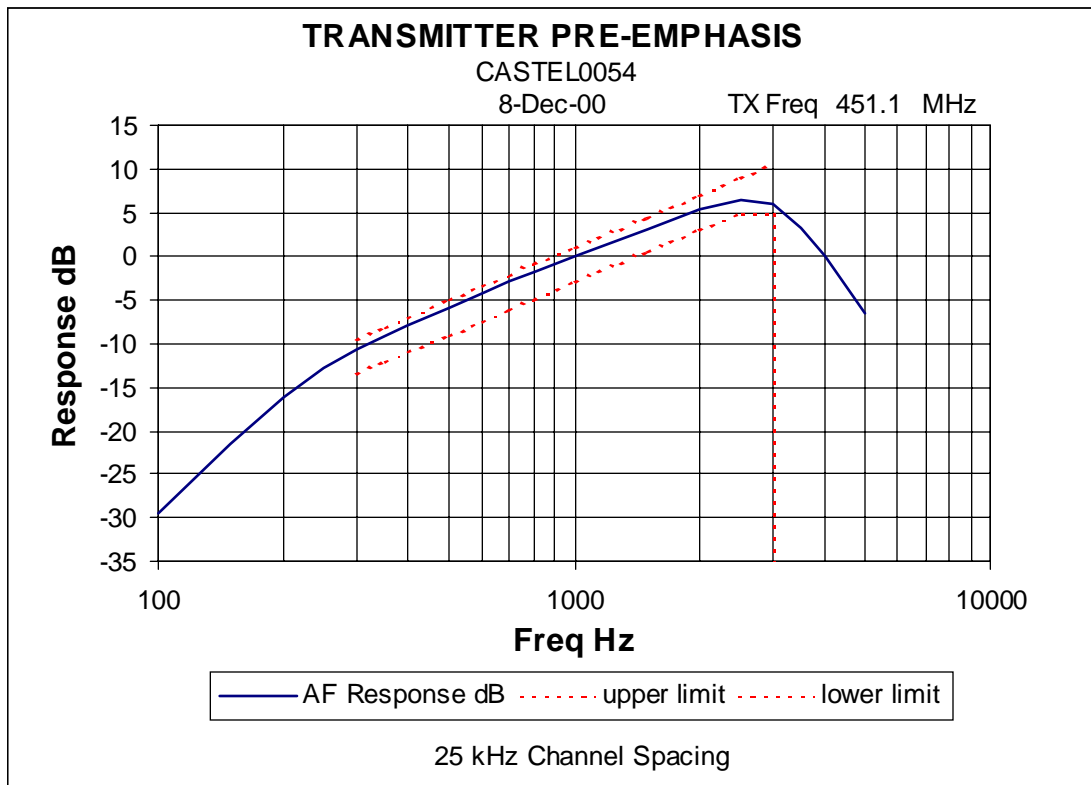
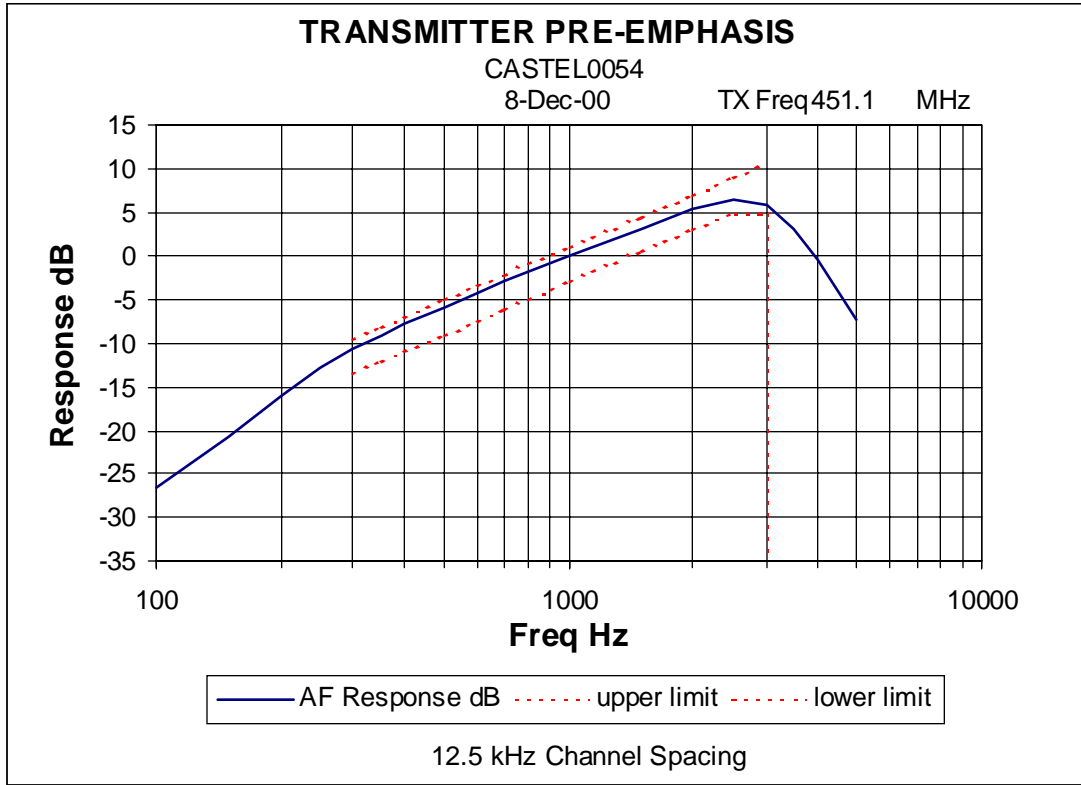
TEST SETUP: See page 41 for Test Equipment information.



NAME OF TEST: TRANSMITTER AUDIO FREQUENCY RESPONSE  
PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 451.1 MHz



NAME OF TEST: TRANSMITTER MODULATION LIMITING

TEST CONDITIONS: Ambient Temperature 20°C  
 Relative Humidity 50%  
 Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1047 (b)

GUIDE: TIA/EIA-603 2.2.3

MEASUREMENT PROCEDURE:

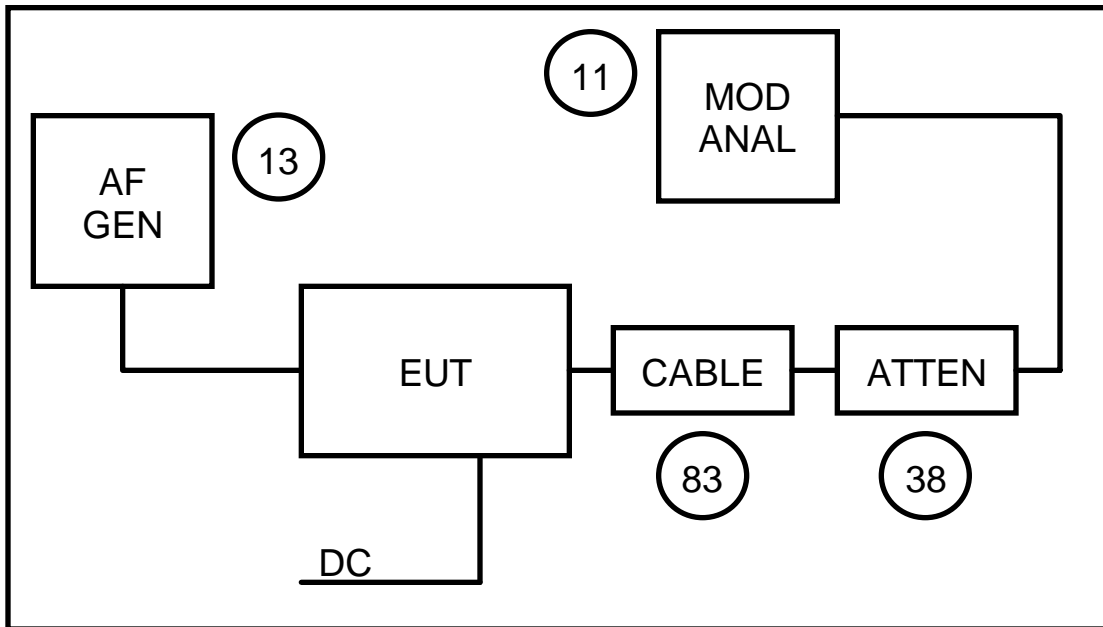
1. The EUT was set up as shown on the following diagram.
2. The modulation response was measured at three audio frequencies while varying the input level.
3. Measurements were made for both Positive and Negative Deviation.

MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz and 25.0 kHz channel spacing..

LIMIT CLAUSE: FCC 47 CFR 90.211 (a)

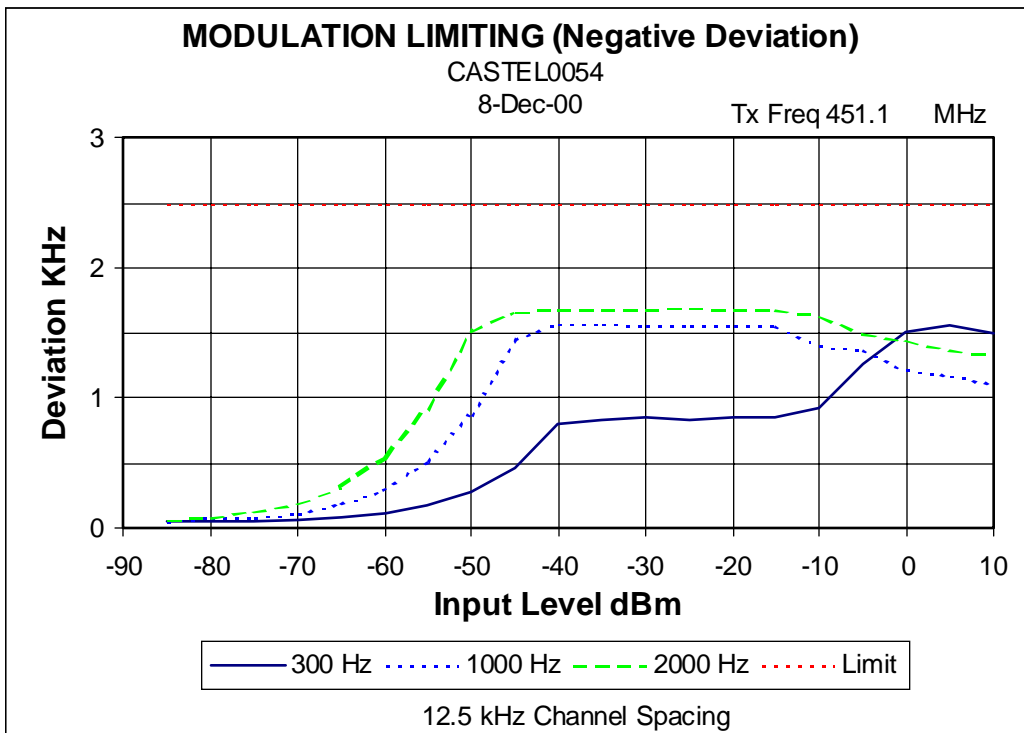
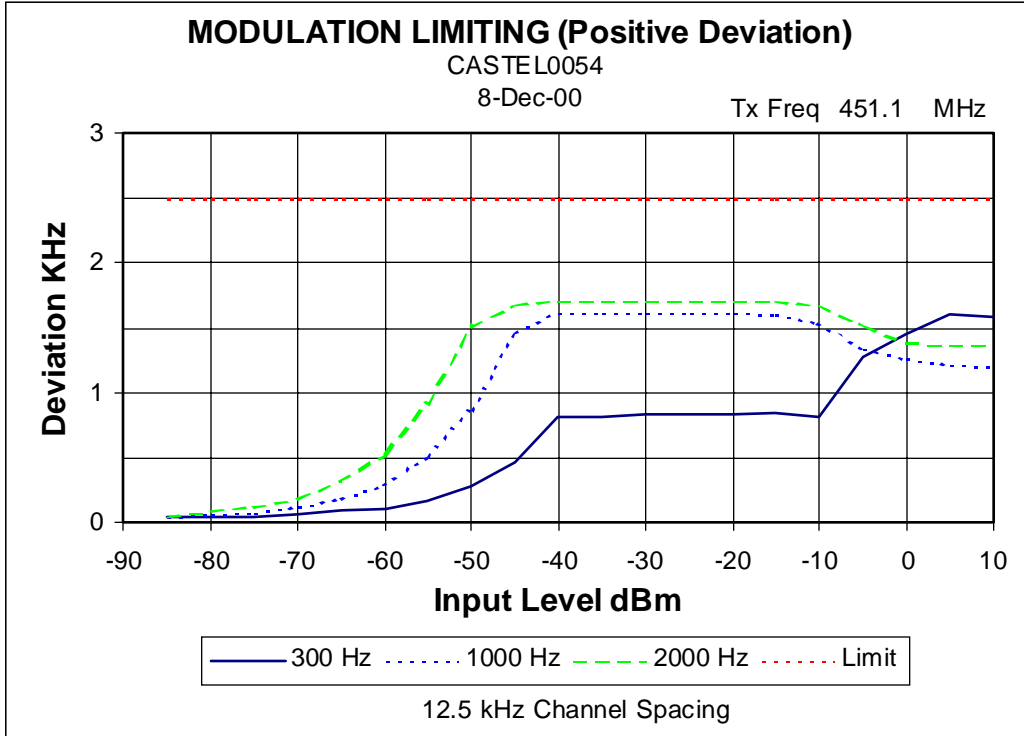
TEST SETUP: See page 41 for Test Equipment information.



NAME OF TEST: TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 451.1 MHz

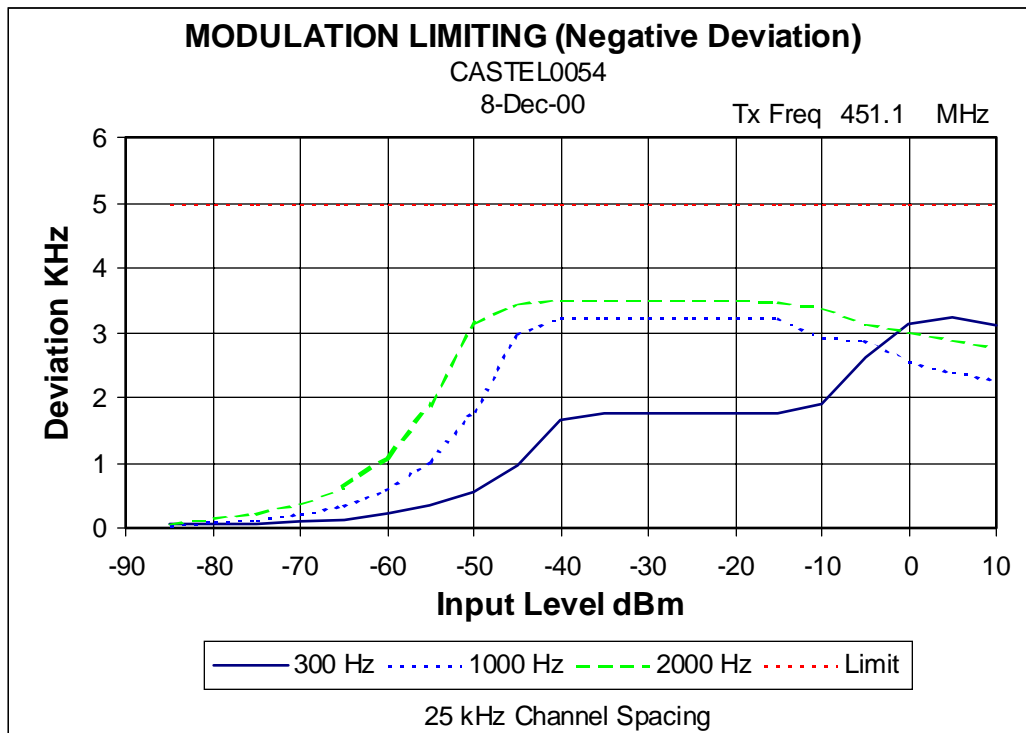
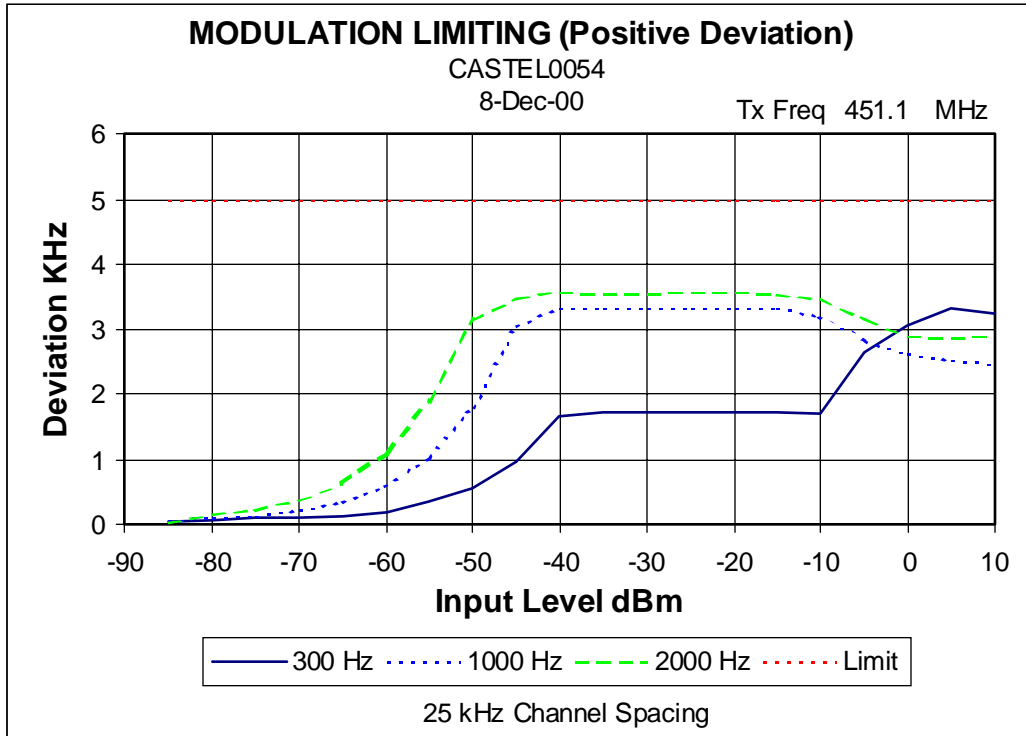




NAME OF TEST: TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 451.1 MHz



NAME OF TEST: TRANSMITTER MODULATION LIMITING  
STEADY STATE

TEST CONDITIONS: Ambient Temperature 20°C  
Relative Humidity 50%  
Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1047 (b)

GUIDE: TIA/EIA-603 2.2.3

MEASUREMENT PROCEDURE:

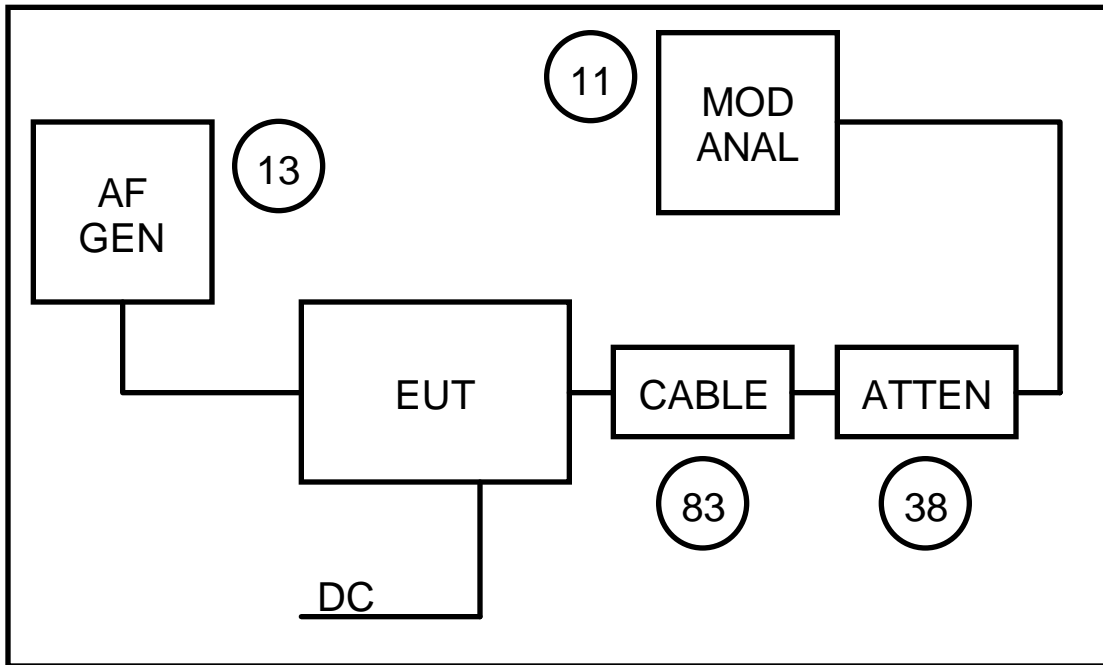
1. The Equipment Under Test was set up as shown in the following diagram.
2. The modulation response was measured with a level stepped 20 dB above the level required to obtain 60% deviation at 1000Hz AF.
3. Measurements were made for both Positive and Negative deviation.

MEASUREMENT RESULTS:

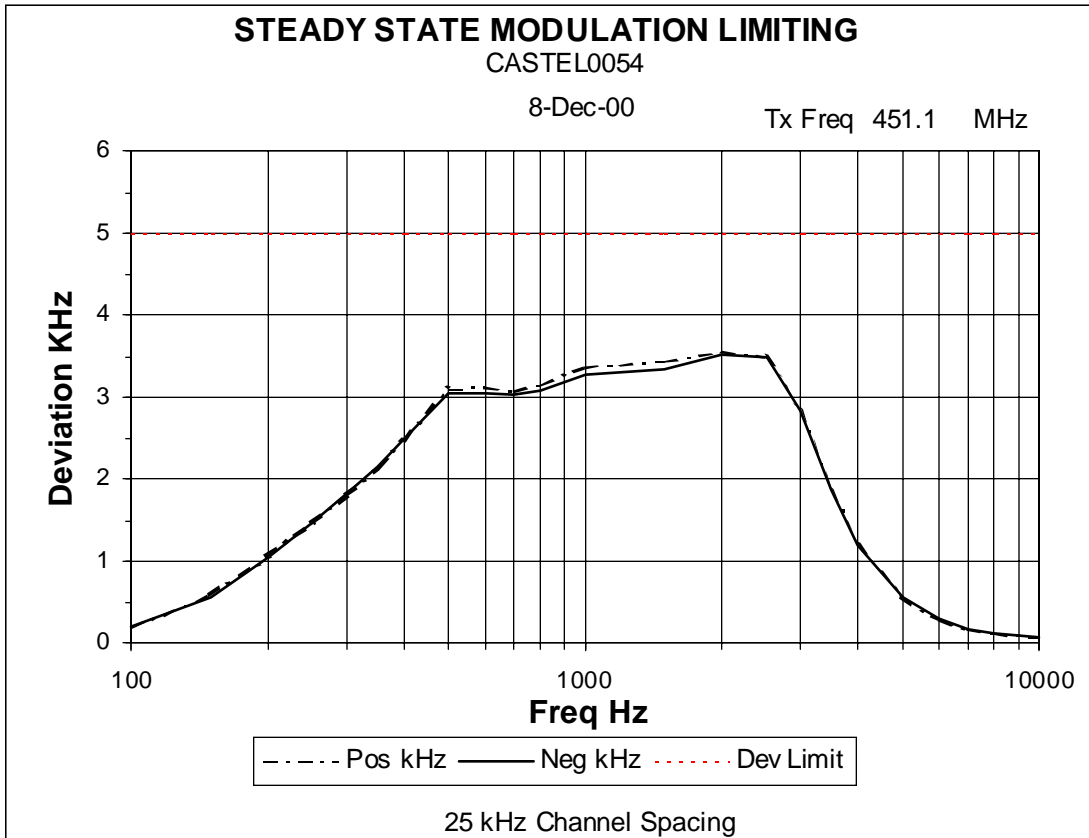
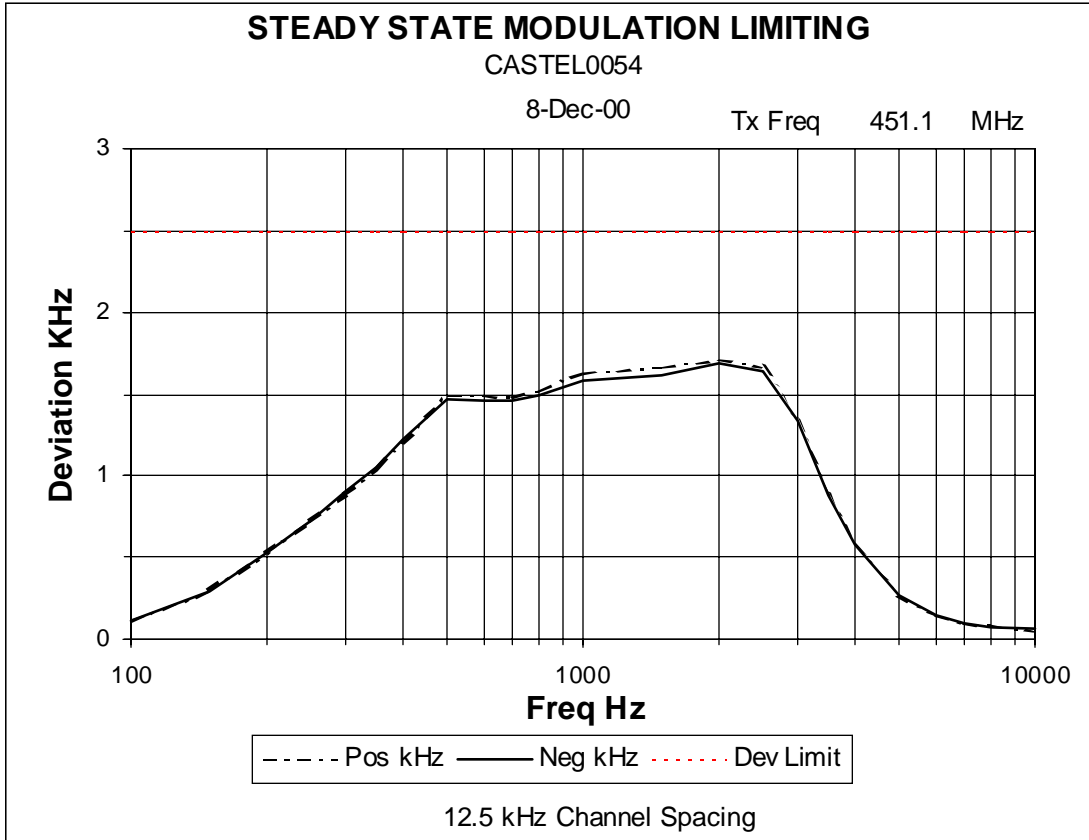
See the plots on the following pages for 12.5 kHz and 25.0 kHz channel spacing..

LIMIT CLAUSE: FCC 47 CFR 90.211 (a) 2.1047 (b)

TEST SETUP: See page 41 for Test Equipment information.



NAME OF TEST: TRANSMITTER MODULATION LIMITING  
STEADY STATE  
SPECIFICATION: FCC CFR 2.1047 (b)  
Tx FREQUENCY: 451.1 MHz



NAME OF TEST: TRANSMITTER MODULATION LIMITING INSTANTANEOUS

TEST CONDITIONS: Ambient Temperature 20°C  
 Relative Humidity 50%  
 Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1047 (b)

GUIDE: TIA/EIA-603 2.2.3

MEASUREMENT PROCEDURE:

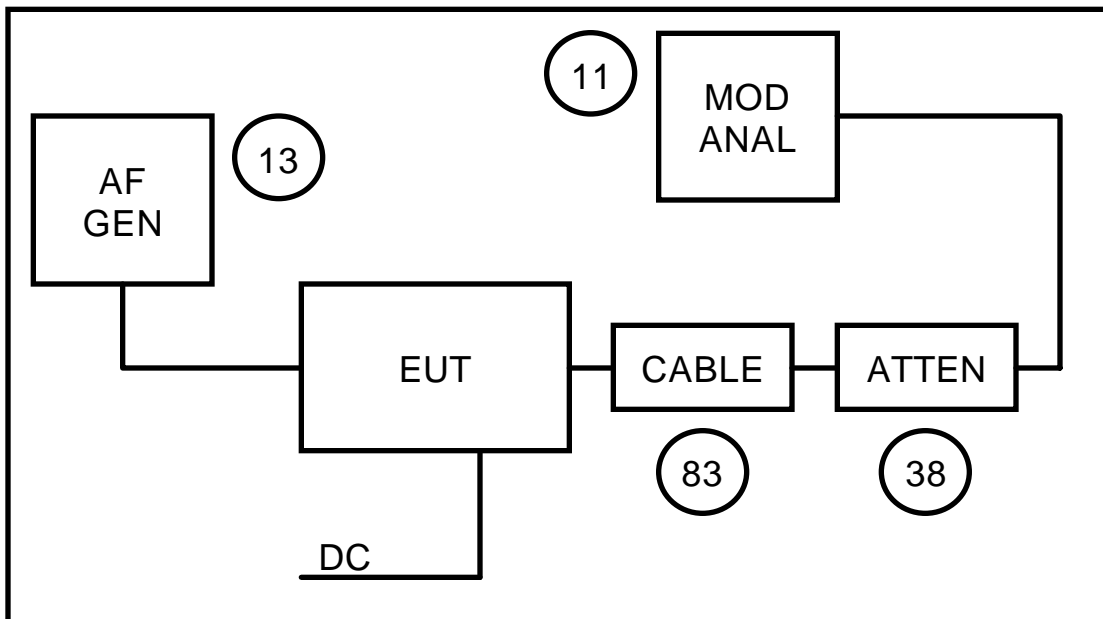
1. The Equipment Under Test was set up as shown in the following diagram.
2. The modulation response was measured with a level stepped 20 dB above the level required to obtain 60% deviation at 1000Hz AF.
3. Measurements were made for both Positive and Negative deviation.

MEASUREMENT RESULTS:

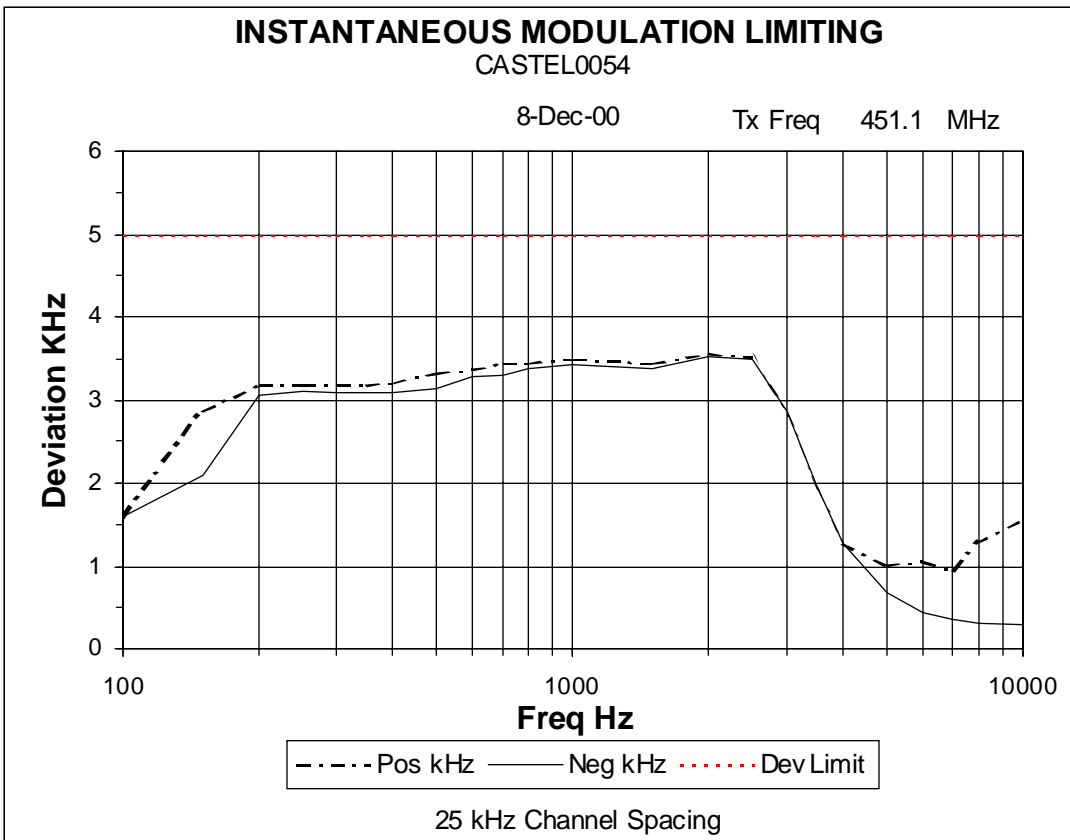
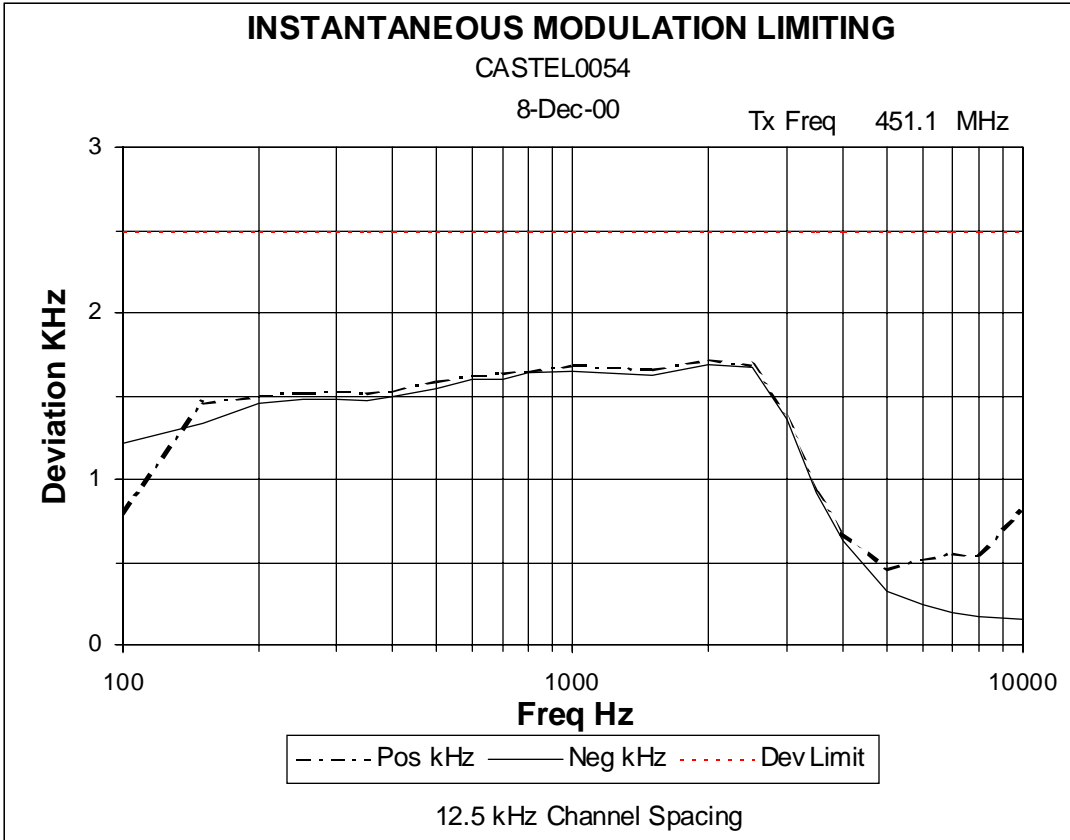
See the plot on the following pages for 12.5 kHz and 25.0 kHz channel spacing..

LIMIT CLAUSE: FCC 47 CFR 90.211 (a) 2.1047 (b)

TEST SETUP: See page 41 for Test Equipment information.



NAME OF TEST: TRANSMITTER MODULATION LIMITING  
INSTANTANEOUS  
SPECIFICATION: FCC CFR 2.1047 (b)  
Tx FREQUENCY: 451.1 MHz



NAME OF TEST: OCCUPIED BANDWIDTH

TEST CONDITIONS: Ambient Temperature 21°C  
 Relative Humidity 65%  
 Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA/EIA-603 2.2.11

MEASUREMENT PROCEDURE:

1. The Equipment Under Test was set up as shown in the following diagram.
2. The EUT was modulated by a 2500Hz tone at an input level 16dB above a level that produced 50% deviation. The input level was established at the frequency of maximum response of the audio modulating circuit.
3. The Occupied Bandwidth was measured on the Spectrum Analyser with the controls set as shown on the following plots.

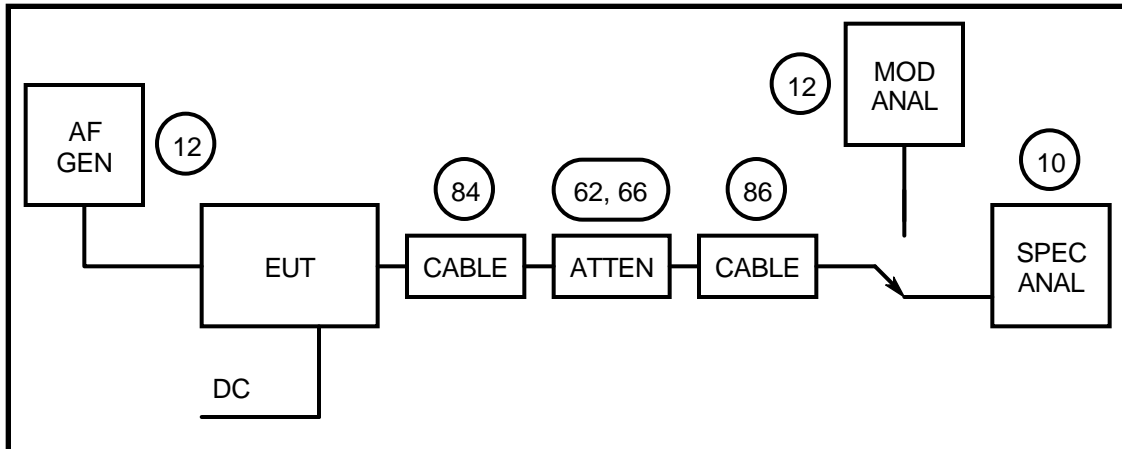
MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz and 25.0 kHz channel spacing..

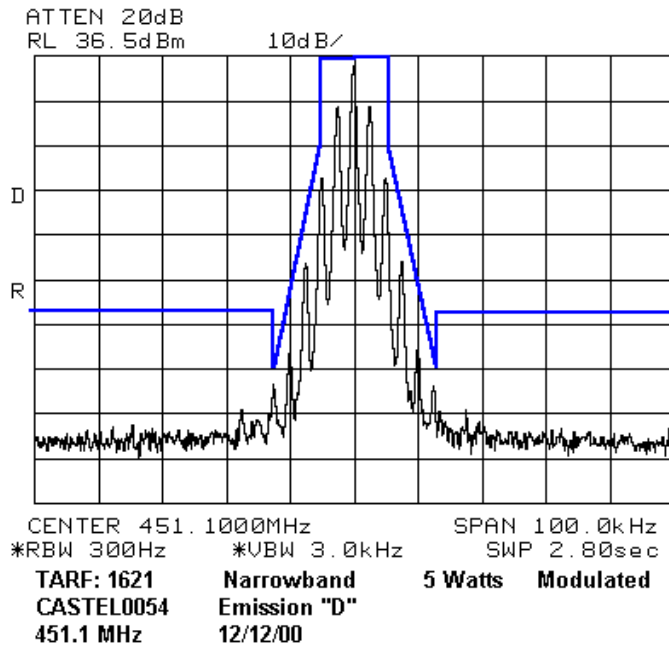
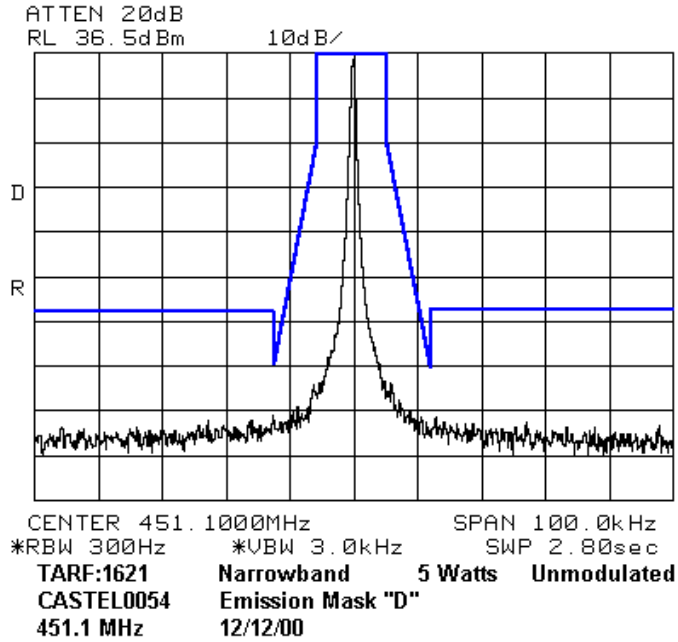
LIMIT CLAUSE: FCC 47 CFR 90.210

TEST SETUP: See page 41 for Test Equipment information.

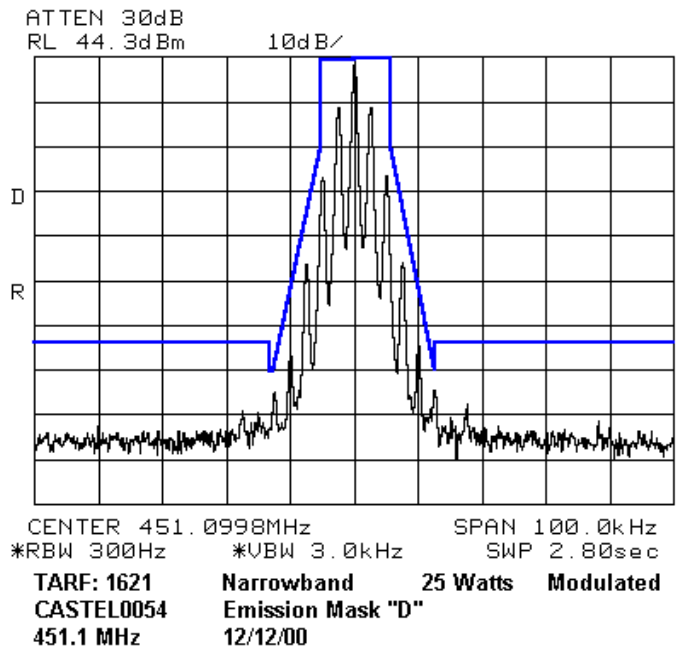
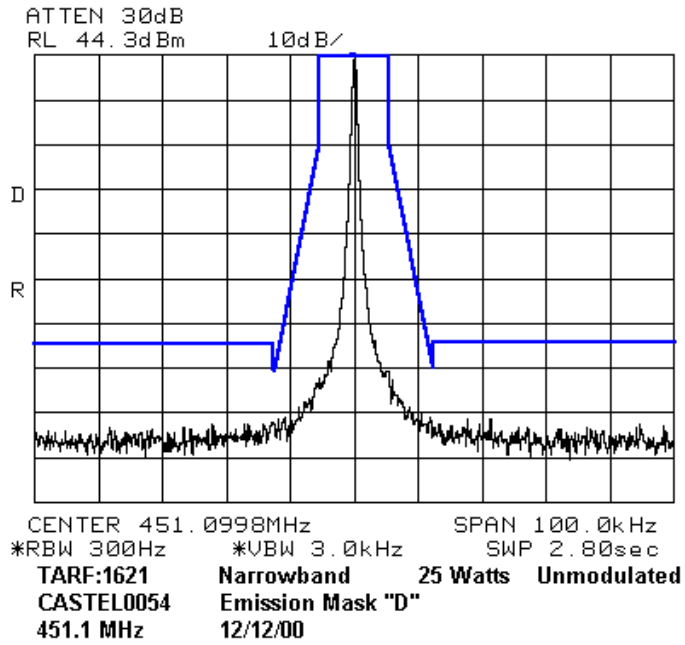
Emission Mask D 12.5 kHz Channel Spacing  
 Emission Mask B 25.0 kHz Channel Spacing



NAME OF TEST: OCCUPIED BANDWIDTH  
 SPECIFICATION: FCC CFR 2.1049 (c)  
 Tx FREQUENCY: 451.1 MHz

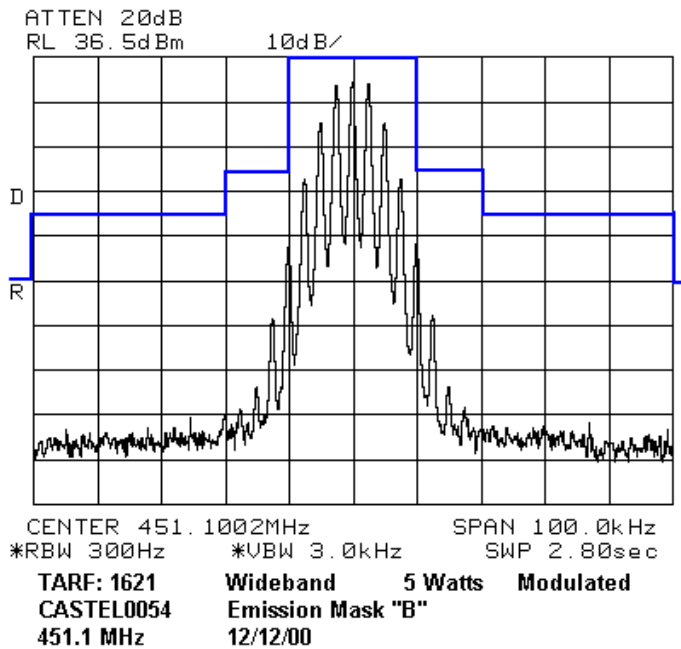
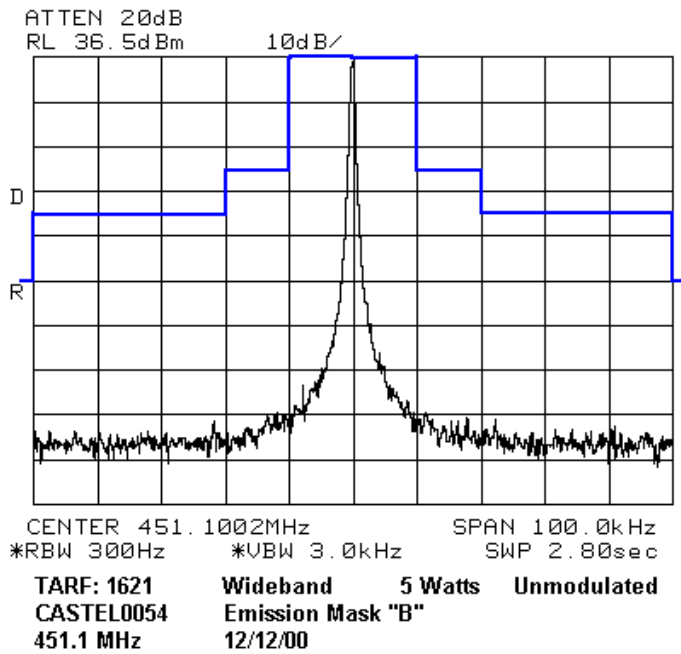


NAME OF TEST: OCCUPIED BANDWIDTH  
 SPECIFICATION: FCC CFR 2.1049 (c)  
 Tx FREQUENCY: 451.1 MHz

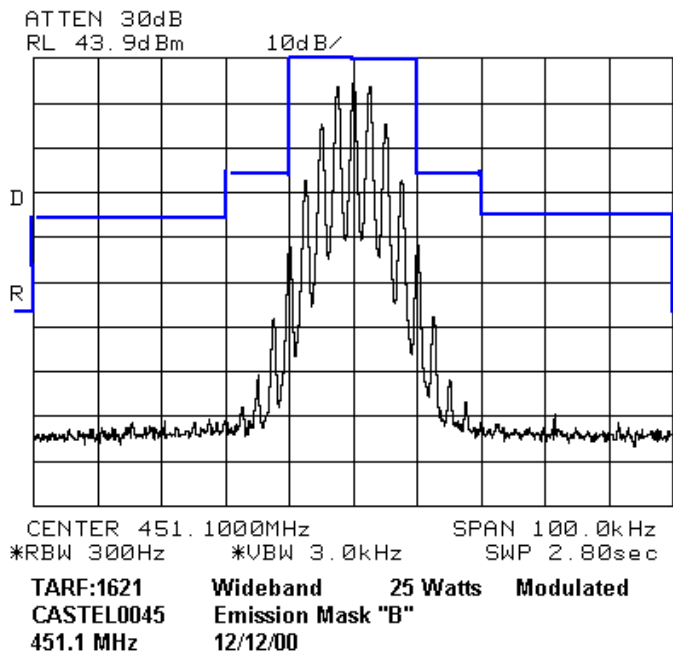
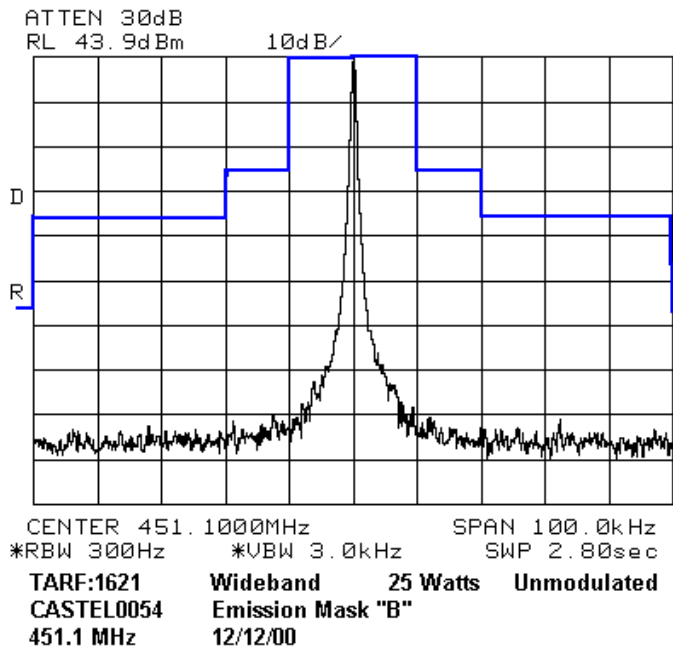




NAME OF TEST: OCCUPIED BANDWIDTH  
 SPECIFICATION: FCC CFR 2.1049 (c)  
 Tx FREQUENCY: 451.1 MHz



NAME OF TEST: OCCUPIED BANDWIDTH  
 SPECIFICATION: FCC CFR 2.1049 (c)  
 Tx FREQUENCY: 451.1 MHz



NAME OF TEST: SPURIOUS EMISSIONS (CONDUCTED)

TEST CONDITIONS: Ambient Temperature 21°C  
 Relative Humidity 65%  
 Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1051

GUIDE: TIA/EIA-603 2.2.13

MEASUREMENT PROCEDURE:

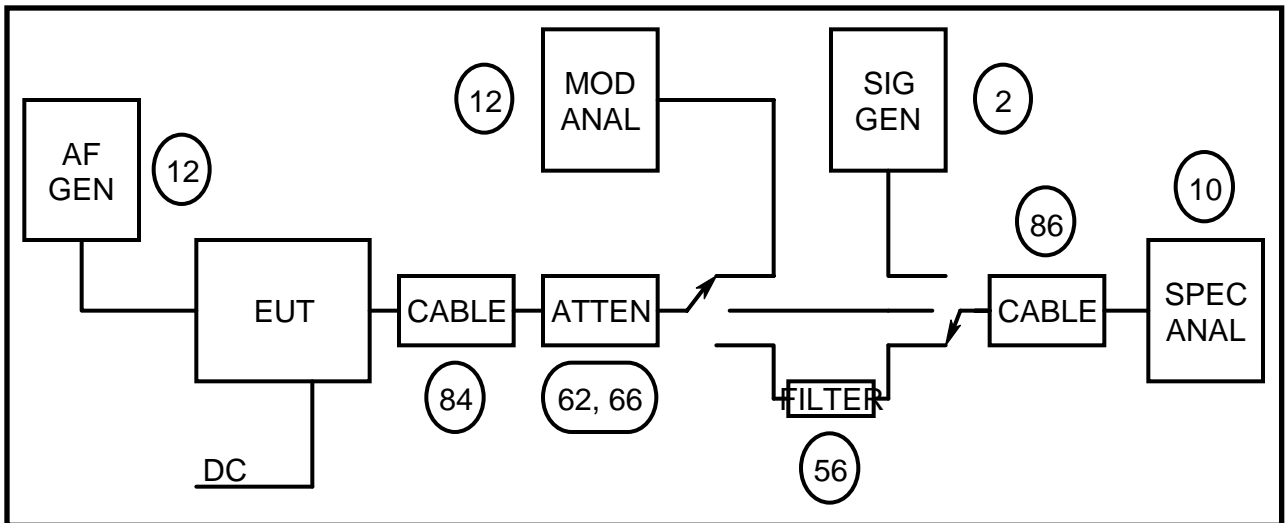
1. The Equipment Under Test was set up as shown in the following diagram.
2. The frequency range examined was from the lowest frequency generated within the EUT, to a frequency higher than the 10<sup>th</sup> Harmonic: 100kHz to Fc-BW  
 Fc+BW to 4.7GHz
3. Spurious emissions which were attenuated more than 20dB below the limit were not recorded.

MEASUREMENT RESULTS:

See the tables on the following pages for 12.5 kHz and 25.0 kHz channel spacing..

LIMIT CLAUSE: FCC 47 CFR 90.210

TEST SETUP: See page 41 for Test Equipment information.



NAME OF TEST: SPURIOUS EMISSIONS (CONDUCTED)  
 SPECIFICATION: FCC CFR 2.1051  
 Tx FREQUENCY: 451.1 MHz

| 12.5 kHz Channel Spacing  |             | 451.1 MHz @ 5 W | Emission Mask D |
|---|-------------|-----------------|-----------------|
| Emission Frequency (MHz)  | Level (dBm) | Level (dBc)     |                 |
| 356.3435  | -39.17      | 76.17           |                 |
| 362.3920  | -37.67      | 74.67           |                 |
| 428.9232  | -34.82      | 71.82           |                 |
|   |             |                 |                 |
|   |             |                 |                 |
|   |             |                 |                 |
|   |             |                 |                 |
|   |             |                 |                 |
|   |             |                 |                 |
|   |             |                 |                 |
|   |             |                 |                 |
|   |             |                 |                 |
|   |             |                 |                 |
| No other emissions were detected at a level greater than 20 dB below the limit. |             |                 |                 |

LIMITS:

| Carrier Output Power<br>Watts | Emission Mask D<br>12.5 kHz Channel Spacing<br>$50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ |        |
|-------------------------------|--|--------|
| 25 W                          | -20 dBm  | 64 dBc |
| 5 W                           | -20 dBm  | 57 dBc |

NAME OF TEST: SPURIOUS EMISSIONS (CONDUCTED)  
 SPECIFICATION: FCC CFR 2.1051  
 Tx FREQUENCY: 451.1 MHz

| 12.5 kHz Channel Spacing  |             | 451.1 MHz @ 25 W | Emission Mask D |
|---|-------------|------------------|-----------------|
| Emission Frequency (MHz)  | Level (dBm) | Level (dBc)      |                 |
| 356.3435  | -37.83      | 81.83            |                 |
| 428.9228  | -38.50      | 82.50            |                 |
| 358.3597  | -39.83      | 83.83            |                 |
|   |             |                  |                 |
|   |             |                  |                 |
|   |             |                  |                 |
|   |             |                  |                 |
|   |             |                  |                 |
|   |             |                  |                 |
|   |             |                  |                 |
|   |             |                  |                 |
|   |             |                  |                 |
|   |             |                  |                 |
|   |             |                  |                 |
| No other emissions were detected at a level greater than 20 dB below the limit. |             |                  |                 |

LIMITS:

| Carrier Output Power<br>Watts | Emission Mask D<br>12.5 kHz Channel Spacing<br>$50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ |        |
|-------------------------------|--|--------|
| 25 W                          | -20 dBm  | 64 dBc |
| 5 W                           | -20 dBm  | 57 dBc |





NAME OF TEST: SPURIOUS EMISSIONS (RADIATED)

TEST CONDITIONS: Ambient Temperature 20°C  
 Relative Humidity 65%  
 Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603 2.2.12

MEASUREMENT PROCEDURE:

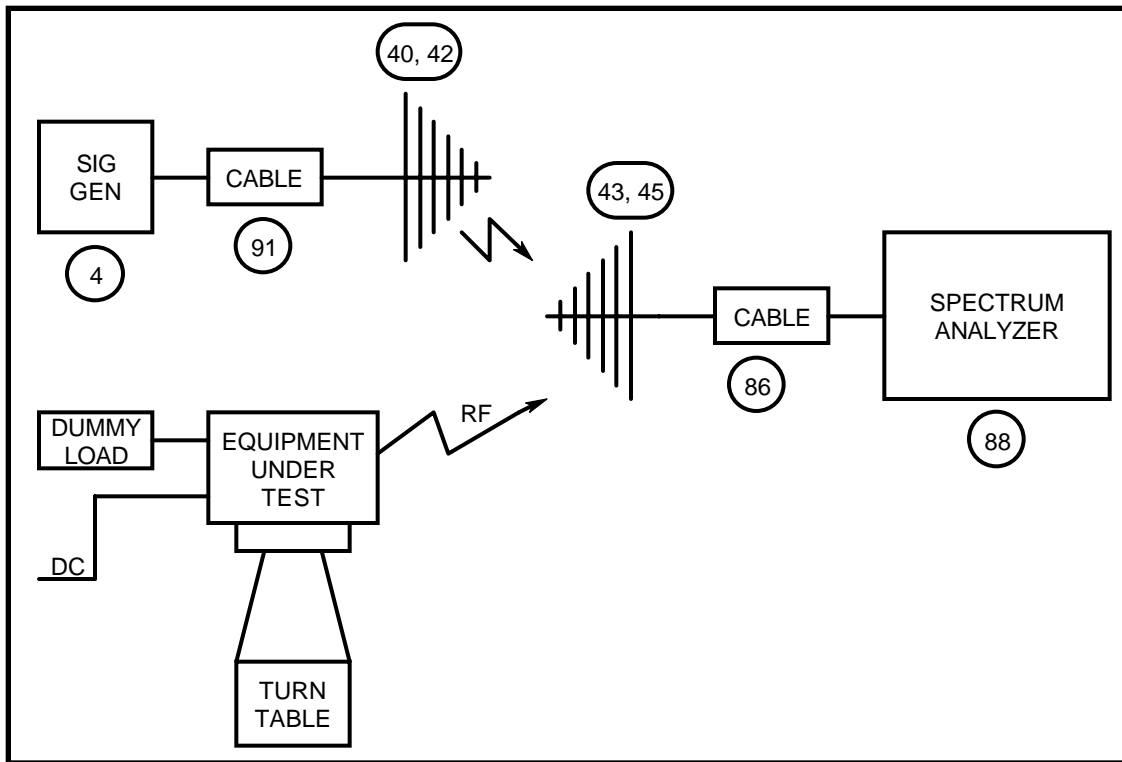
1. The Equipment Under Test was set up as shown in the following diagram.
2. The EUT was placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal was connected to an RF dummy load.
3. The turntable was rotated through 360° to obtain the maximum response of each spurious emission. Valid emissions were determined by switching the EUT on and off.
4. The EUT was replaced by a signal generator and substitution antenna to make measurements by the substitution method.

MEASUREMENT RESULTS:

See the tables on the following pages for 12.5 kHz and 25.0 kHz channel spacing..

LIMIT CLAUSE: FCC 47 CFR 90.210

TEST SETUP: See page 41 for Test Equipment information.













NAME OF TEST: TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

TEST CONDITIONS: Ambient Temperature 20°C  
 Relative Humidity 50%  
 Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

GUIDE: TIA/EIA-603 2.2.2

- MEASUREMENT PROCEDURE:
1. The Equipment Under Test was set up as shown in the following diagram.
  2. The EUT was tested for frequency error from -30°C to +50°C in 10°C increments
  3. The frequency error was recorded in parts per million (ppm).

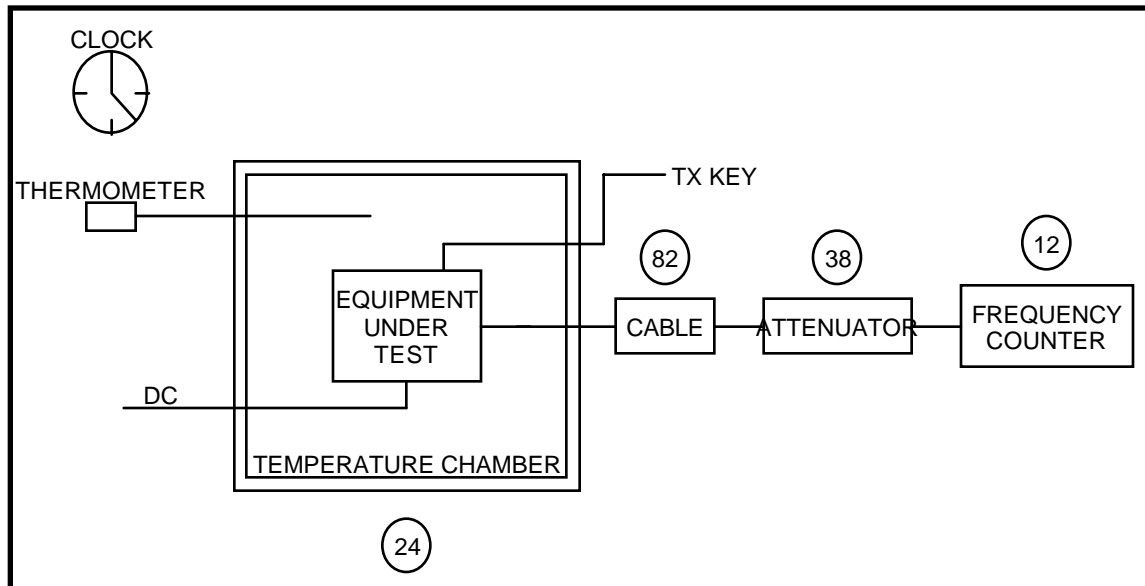
MEASUREMENT RESULTS: See the plot on the following page.

LIMIT CLAUSE: FCC 47 CFR 90.213

TEST SETUP: See page 41 for Test Equipment information.

Frequency Range: 400 MHz to 470 MHz

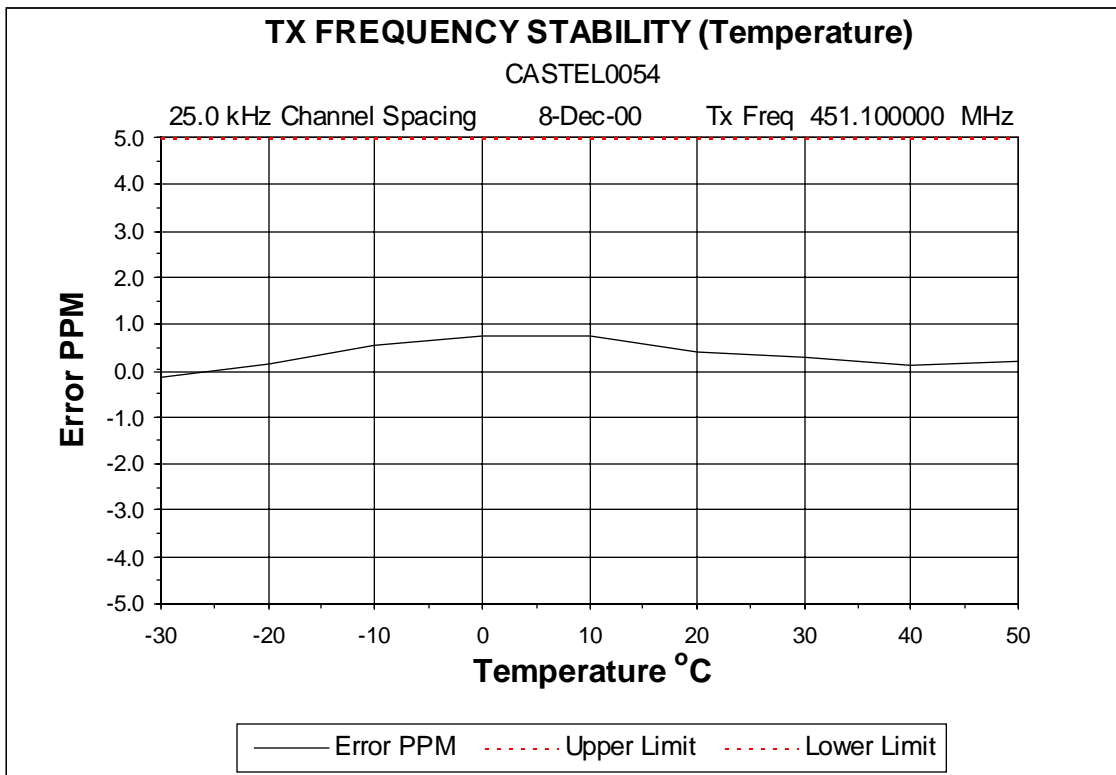
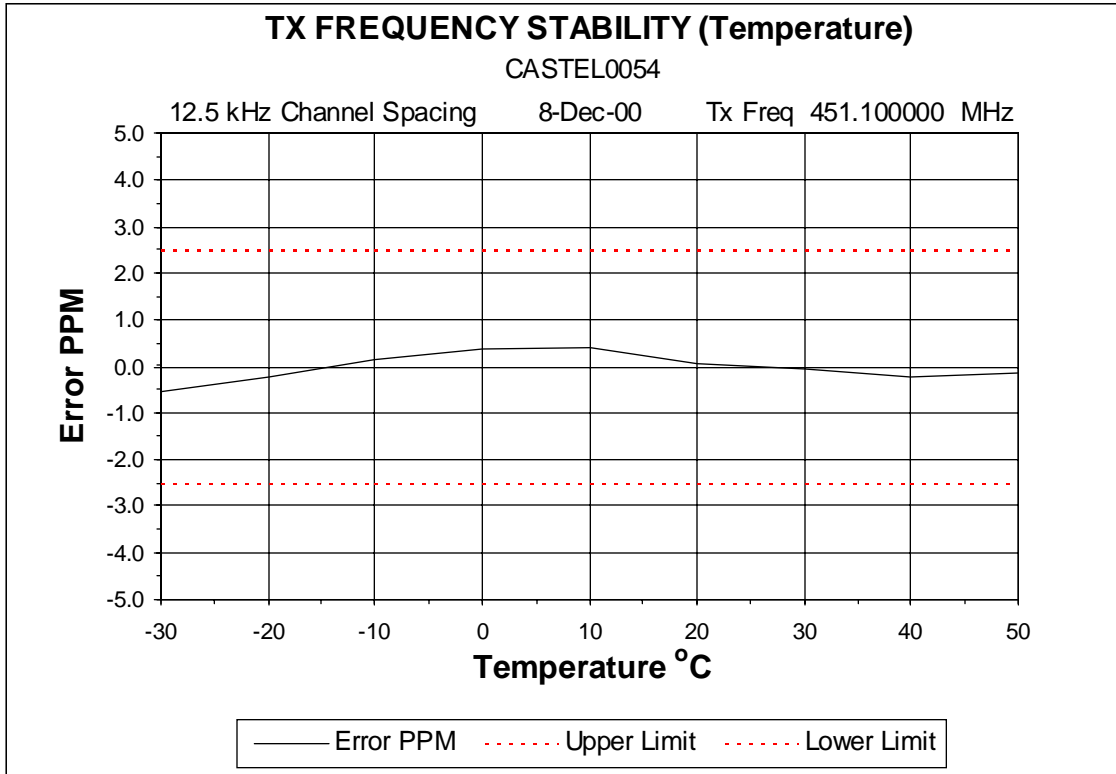
| Channel Spacing (kHz) | Frequency Error (ppm) |
|-----------------------|-----------------------|
| 12.5                  | 2.5                   |
| 25.0                  | 5.0                   |



NAME OF TEST: TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

Tx FREQUENCY: 451.1 MHz



NAME OF TEST: TRANSMITTER FREQUENCY STABILITY (VOLTAGE)

TEST CONDITIONS: Ambient Temperature 20°C  
 Relative Humidity 50%  
 Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 2.1055 (d) (1)

GUIDE: TIA/EIA-603 2.2.2

MEASUREMENT PROCEDURE:

1. The Equipment Under Test was set up as shown in the following diagram.
2. The EUT was tested for frequency error at an input voltage to the radio of 85% to 115%.
3. The frequency error was recorded in parts per million (ppm).

TEST SETUP: See page 41 for Test Equipment information.

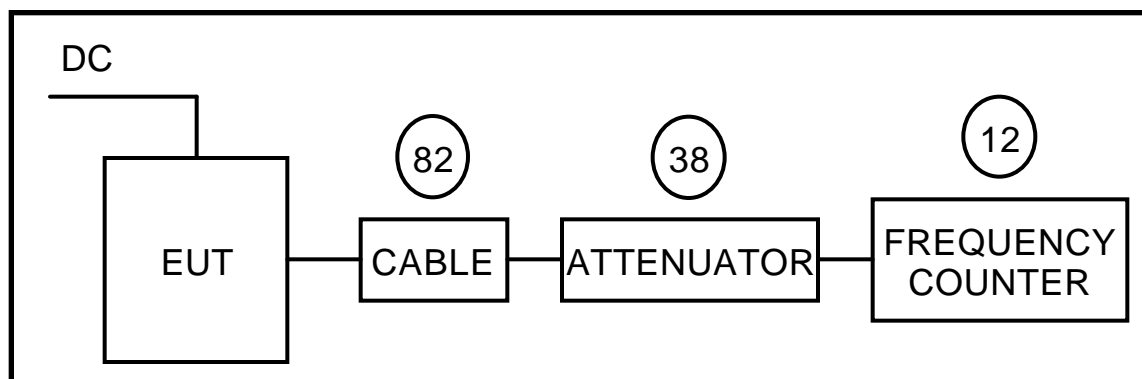
MEASUREMENT RESULTS:

Frequency Range: 400 MHz to 470 MHz

| Channel Spacing (kHz) | FREQUENCY ERROR (ppm) @ 451.1 MHz |           |          |
|-----------------------|-----------------------------------|-----------|----------|
|                       | 11.7V DC                          | 13.8 V DC | 15.9V DC |
| 12.5                  | 0.12                              | 0.14      | 0.11     |
| 25.0                  | 0.49                              | 0.51      | 0.45     |

LIMIT CLAUSE: FCC 47 CFR 90.213

| Channel Spacing (kHz) | Frequency Error (ppm) |
|-----------------------|-----------------------|
| 12.5                  | 2.5                   |
| 25.0                  | 5.0                   |



NAME OF TEST: TRANSIENT FREQUENCY BEHAVIOR

TEST CONDITIONS: Ambient Temperature 21°C  
 Relative Humidity 65%  
 Standard Voltage 13.8 V DC

SPECIFICATION: FCC 47 CFR 90.214

GUIDE: TIA/EIA-603 2.2.19

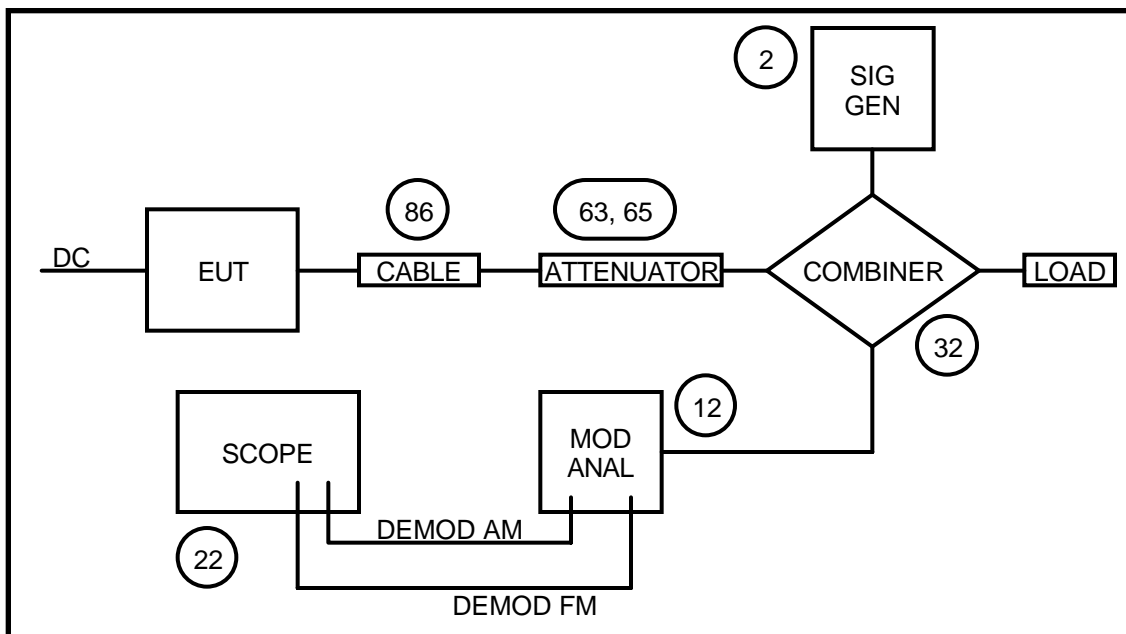
MEASUREMENT PROCEDURE:

1. The Equipment Under Test was set up as shown in the following diagram.
2. Measurements and plots were made following the TIA/EIA procedure.

MEASUREMENT RESULTS: See the tables and plots on the following pages

LIMIT CLAUSE: FCC 47 CFR 90.214

TEST SETUP: See page 41 for Test Equipment information.





NAME OF TEST: TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 451.1 MHz

12.5 kHz Channel Spacing

| FREQUENCY                                | 451.1 MHz @ 5 W Tx                 |               |
|--|------------------------------------|---------------|
| TRANSIENT RESPONSE PERIOD                | CARRIER PEAK VARIATION FROM NORMAL |               |
|  | Key ON (kHz)                       | Key OFF (kHz) |
| t1                                       | 4.77                               | N/A           |
| t2                                       | 0.57                               | N/A           |
| t3                                       | N/A                                | 1.15          |
| t2 → t3                                  | 0.57                               |               |
| ERROR LIMIT (t2 → t3)<br>@ 2.5 ppm (kHz) | 1.175                              |               |

|   |     |    |
|---|-----|----|
| Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation. | YES | NO |
|   | Y   |    |
| Confirm that during the period t2 the frequency difference does not exceed half a channel separation.               | YES | NO |
|   | Y   |    |
| Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.         | YES | NO |
|   | Y   |    |

LIMIT: 12.5 kHz CHANNEL SPACING

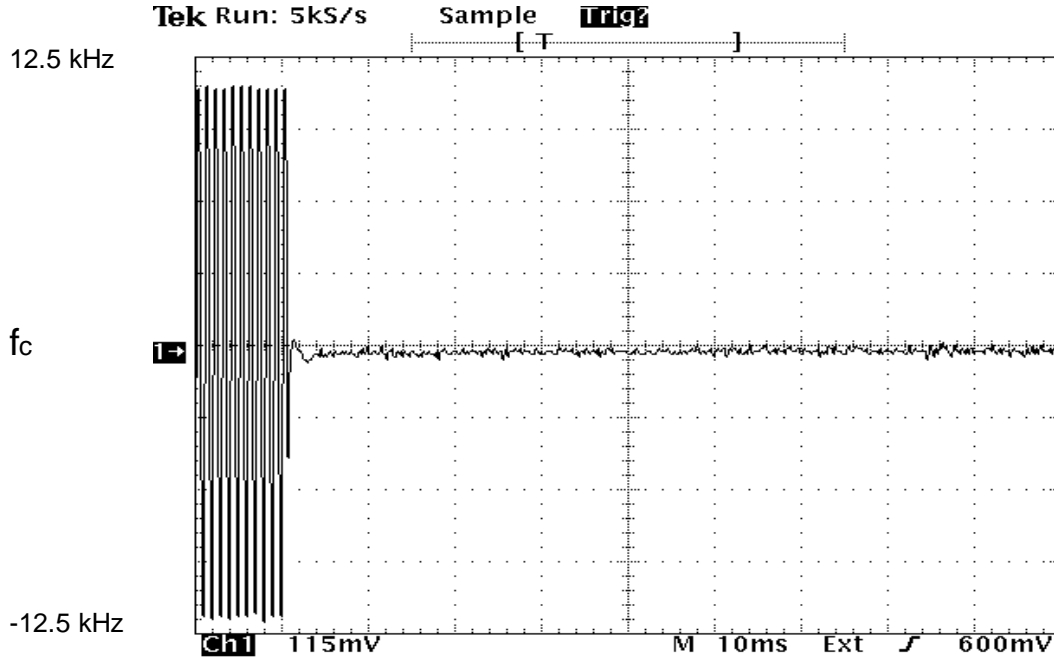
| TRANSIENT PERIODS | MAXIMUM FREQUENCY DIFFERENCE (kHz) | FREQUENCY RANGE<br>400 – 470 MHz |
|-------------------|------------------------------------|----------------------------------|
| t1 (mS)           | 12.5                               | 10 mS                            |
| t2 (mS)           | 6.25                               | 25 mS                            |
| t3 (mS)           | 12.5                               | 10 mS                            |

NAME OF TEST: TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 451.1 MHz  
12.5kHz Channel Spacing 5 W

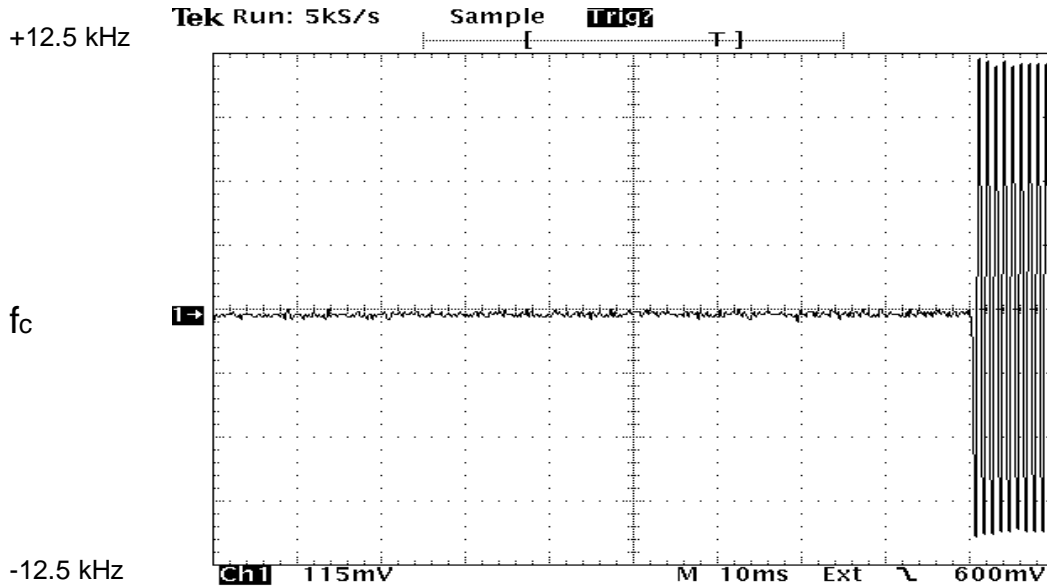
Key ON



10 mS / Division

12.5 kHz Channel Spacing 5 W

Key OFF



10 mS / Division

NAME OF TEST: TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 451.1 MHz

12.5 kHz Channel Spacing

|  |                                    |               |
|--|------------------------------------|---------------|
| FREQUENCY                                | 451.1 MHz @ 25 W Tx                |               |
| TRANSIENT RESPONSE PERIOD                | CARRIER PEAK VARIATION FROM NORMAL |               |
|  | Key ON (kHz)                       | Key OFF (kHz) |
| t1                                       | 2.34                               | N/A           |
| t2                                       | 0.95                               | N/A           |
| t3                                       | N/A                                | 5.98          |
| t2 → t3                                  | 0.95                               |               |
| ERROR LIMIT (t2 → t3)<br>@ 2.5 ppm (kHz) | 1.175                              |               |

|   |     |    |
|---|-----|----|
| Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation. | YES | NO |
|   | Y   |    |
| Confirm that during the period t2 the frequency difference does not exceed half a channel separation.               | YES | NO |
|   | Y   |    |
| Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.         | YES | NO |
|   | Y   |    |

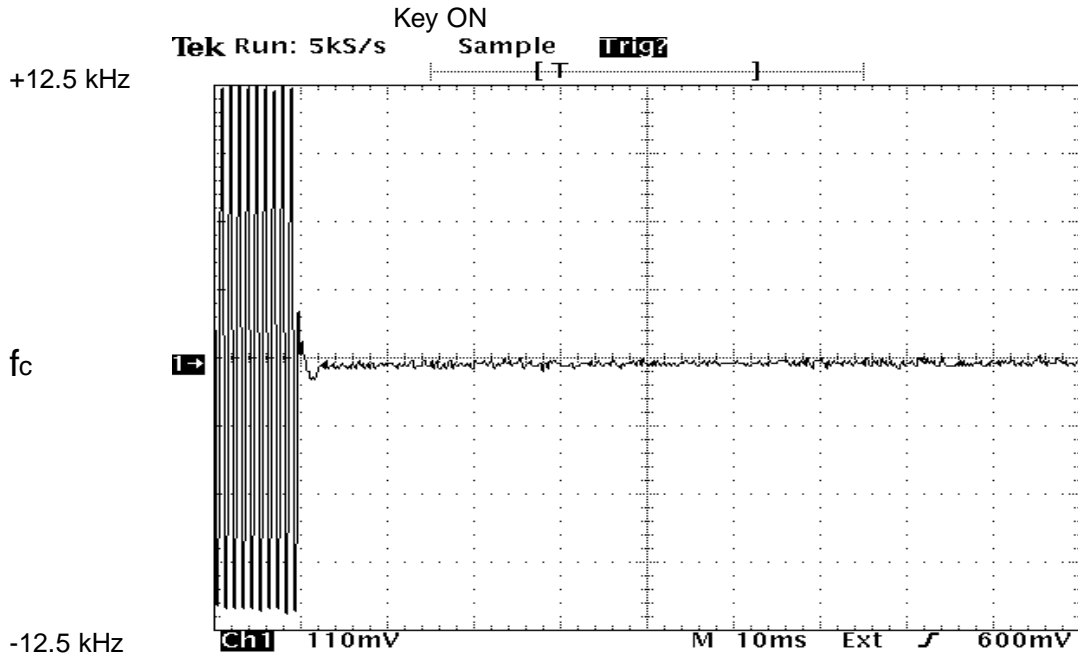
LIMIT: 12.5 kHz CHANNEL SPACING

| TRANSIENT PERIODS | MAXIMUM FREQUENCY DIFFERENCE (kHz) | FREQUENCY RANGE<br>400 – 470 MHz |
|-------------------|------------------------------------|----------------------------------|
| t1 (mS)           | 12.5                               | 10 mS                            |
| t2 (mS)           | 6.25                               | 25 mS                            |
| t3 (mS)           | 12.5                               | 10 mS                            |

NAME OF TEST: TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

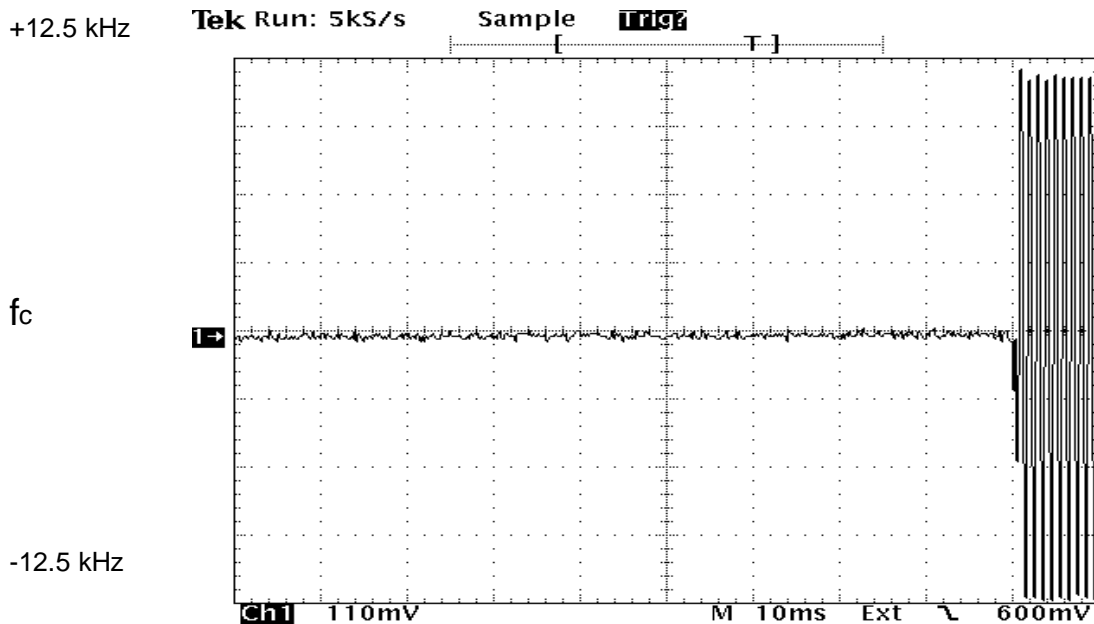
Tx FREQUENCY: 451.1 MHz  
12.5kHz Channel Spacing 25 W



10 mS / Division

12.5 kHz Channel Spacing 25 W

Key OFF



10 mS / Division

NAME OF TEST: TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 451.1 MHz

25.0 kHz Channel Spacing

| FREQUENCY                                | 451.1 MHz @ 5 W Tx                 |               |
|--|------------------------------------|---------------|
| TRANSIENT RESPONSE PERIOD                | CARRIER PEAK VARIATION FROM NORMAL |               |
|  | Key ON (kHz)                       | Key OFF (kHz) |
| t1                                       | 4.38                               | N/A           |
| t2                                       | 1.10                               | N/A           |
| t3                                       | N/A                                | 7.82          |
| t2 → t3                                  | 1.10                               |               |
| ERROR LIMIT (t2 → t3)<br>@ 5.0 ppm (kHz) | 2.35                               |               |

|   |     |    |
|---|-----|----|
| Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation. | YES | NO |
|   | Y   |    |
| Confirm that during the period t2 the frequency difference does not exceed half a channel separation.               | YES | NO |
|   | Y   |    |
| Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.         | YES | NO |
|   | Y   |    |

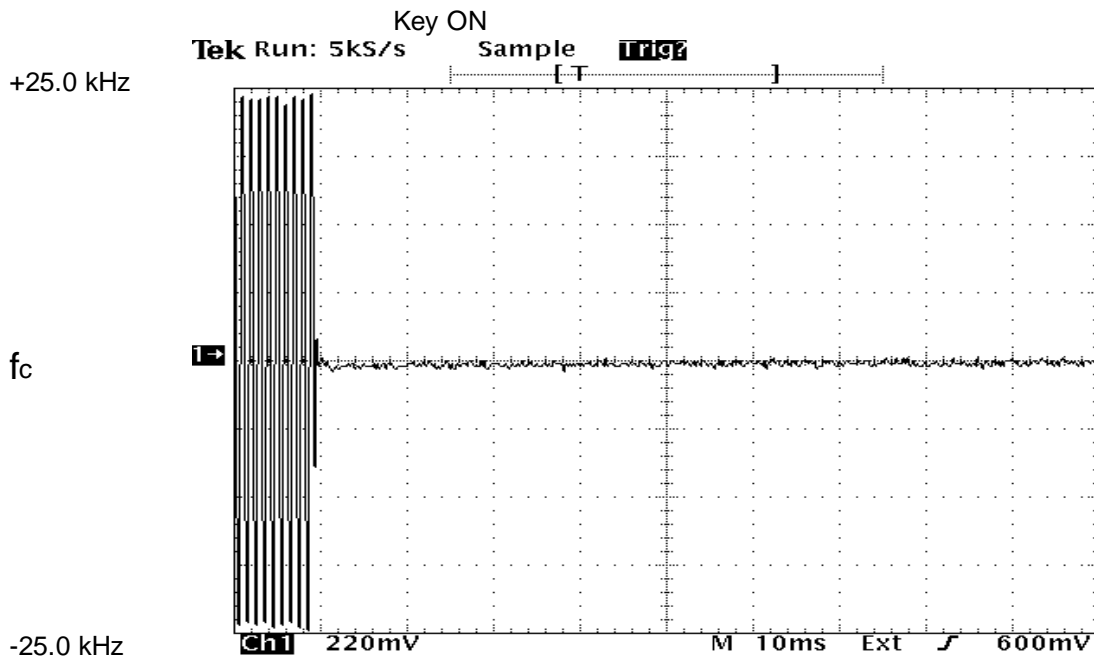
LIMIT: 25.0 kHz CHANNEL SPACING

| TRANSIENT PERIODS | MAXIMUM FREQUENCY DIFFERENCE (kHz) | FREQUENCY RANGE<br>400 – 470 MHz |
|-------------------|------------------------------------|----------------------------------|
| t1 (mS)           | 25.0                               | 10 mS                            |
| t2 (mS)           | 12.5                               | 25 mS                            |
| t3 (mS)           | 25.0                               | 10 mS                            |

NAME OF TEST: TRANSIENT FREQUENCY BEHAVIOUR

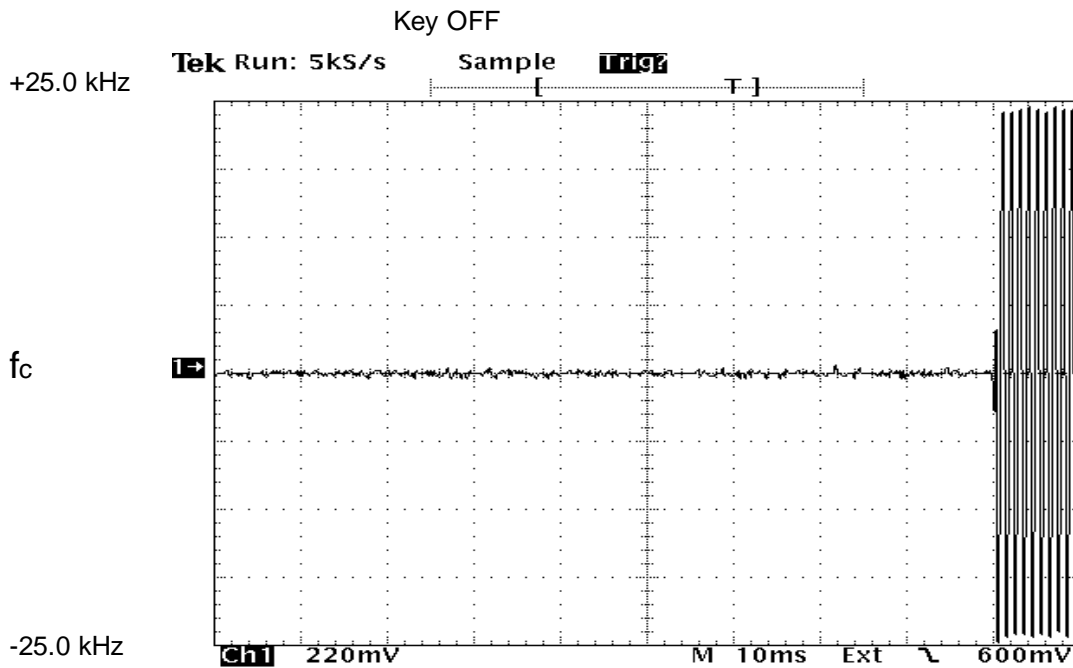
SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 451.1 MHz  
25.0 kHz Channel Spacing 5 W



10 mS / Division

25.0 kHz Channel Spacing 5 W



10 mS / Division

NAME OF TEST: TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 451.1 MHz

25.0 kHz Channel Spacing

|  |                                    |               |
|--|------------------------------------|---------------|
| FREQUENCY                                | 451.1 MHz @ 25 W Tx                |               |
| TRANSIENT RESPONSE PERIOD                | CARRIER PEAK VARIATION FROM NORMAL |               |
|  | Key ON (kHz)                       | Key OFF (kHz) |
| t1                                       | 9.52                               | N/A           |
| t2                                       | 1.14                               | N/A           |
| t3                                       | N/A                                | 3.92          |
| t2 → t3                                  | 1.14                               |               |
| ERROR LIMIT (t2 → t3)<br>@ 5.0 ppm (kHz) | 2.35                               |               |

|   |     |    |
|---|-----|----|
| Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation. | YES | NO |
|   | Y   |    |
| Confirm that during the period t2 the frequency difference does not exceed half a channel separation.               | YES | NO |
|   | Y   |    |
| Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.         | YES | NO |
|   | Y   |    |

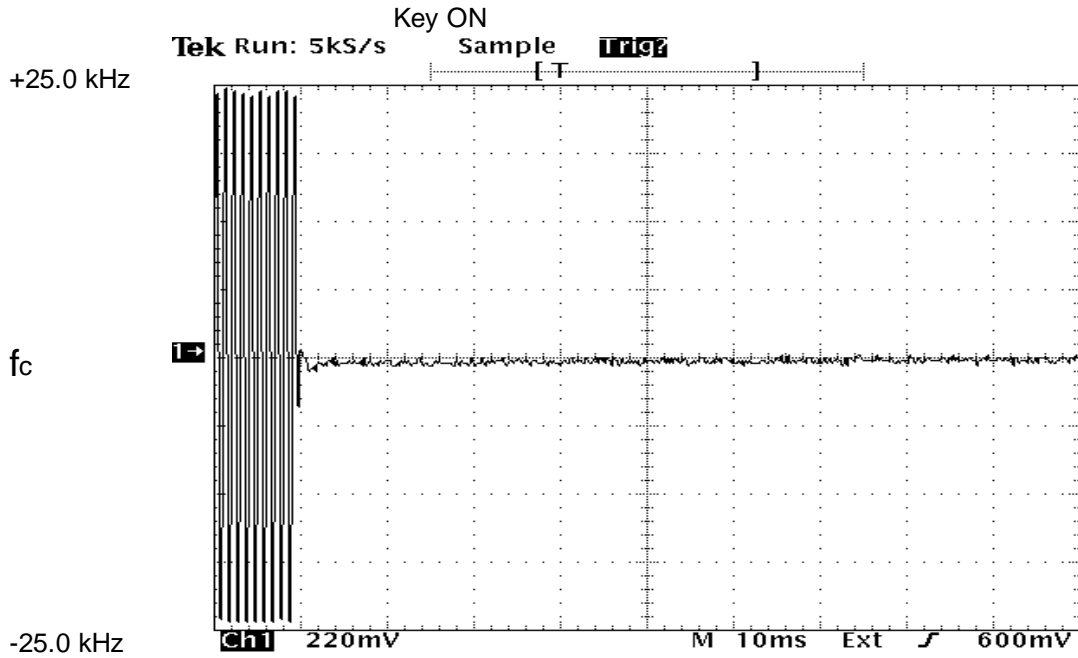
LIMIT: 25.0 kHz CHANNEL SPACING

| TRANSIENT PERIODS | MAXIMUM FREQUENCY DIFFERENCE (kHz) | FREQUENCY RANGE<br>400 – 470 MHz |
|-------------------|------------------------------------|----------------------------------|
| t1 (mS)           | 25.0                               | 10 mS                            |
| t2 (mS)           | 12.5                               | 25 mS                            |
| t3 (mS)           | 25.0                               | 10 mS                            |

NAME OF TEST: TRANSIENT FREQUENCY BEHAVIOUR

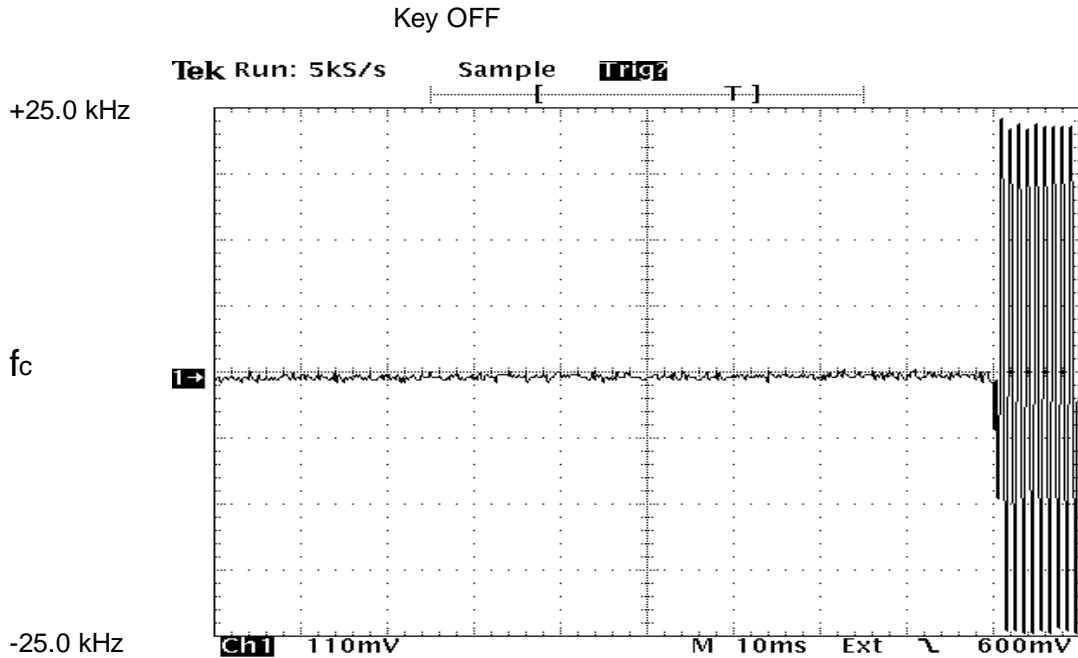
SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 451.1 MHz  
25.0 kHz Channel Spacing 25 W



10 mS / Division

25.0 kHz Channel Spacing 25 W



10 mS / Division



## TEST EQUIPMENT LIST

To facilitate inclusion on each page, the test equipment used is identified (numbered) and listed against the related test in the report.

| No | Equipment Type           | Model number                | Serial Number | Tait ID: |
|----|--------------------------|-----------------------------|---------------|----------|
| 01 | Signal Generator         | HP 8642B (Opt 001)          | 2512A00176    | E3064    |
| 02 | Signal Generator         | HP8648A                     | 3430U00344    | E3579    |
| 03 | Signal Generator         | HP8656A                     | 2142A02103    | E3063    |
| 04 | Signal Generator         | HP8648C                     | 3443U00543    | E3558    |
| 05 | Signal Generator         | SMY01 1062.5502.11          | 841736/019    | E3553    |
| 10 | Spectrum Analyser        | HP8596E (Opt 140)           | 3346A00213    | E3427    |
| 11 | Modulation Analyser      | HP8901B (Opt 002)           | 2441A00393    | E3073    |
| 12 | Modulation Analyser      | FMA 0852.8500.52            | 842541/001    | E3554    |
| 13 | Audio Analyser           | HP8903A                     | 2308A02597    | E3074    |
| 14 | Power Head               | HP11722A                    | 2320A00688    | E3307    |
| 15 | Power Meter              | NRVS 1020.1809.02           | 841954/005    | E3555    |
| 16 | Power Sensor             | URV5-Z4 395.1619.55         | 841.498/003   | E3557    |
| 20 | Power Supply             | HP6032A                     | 2441A-0041    | E3075    |
| 21 | Power Supply             | NGSM32/10<br>192.0810.31    | Fnr 434       | E3556    |
| 22 | Oscilloscope             | Tektronics TDS 340          | B013611       | E3585    |
| 23 | Universal Counter        | Goldstar FC-2015U           | 600801        | E3550    |
| 24 | Environmental Chamber    | Contherm Spatial Cal        | E3397         | E3397    |
| 24 | Environmental Chamber    | Contherm Temp Control       | E3397         | E3397    |
| 25 | Portable Hygrometer (AC) | Rotronic A1                 | 2070300/38    | N/A      |
| 25 | Whirling Hygrometer      | Casella 3156 / 82           | TA004         | TA004    |
| 30 | Directional Coupler      | HP778D-012                  | 1144 07392    | E3292    |
| 31 | 4 Port Combiner (CAST)   | DVU4, W<br>201.4018.03      | 300729/47     | E3623    |
| 32 | 4 Port Combiner          | DVU4, W<br>201.4018.03      | 300971/28     | E3572    |
| 33 | 3 Port Combiner          | Weinschel 1506A, 1W         | LD858         | E3672    |
| 34 | Mixer Spurious Emission  | Tait (3.2G ≤ Rfx ≤<br>4.0G) | E3661         | E3661    |
| 35 | Mixer Transient ACP      | Minicircuits ZAD-11         | 77031         | E3394    |

## TEST EQUIPMENT LIST (Cont.)

| No | Equipment Type         | Model number        | Serial Number | Tait ID: |   |
|----|------------------------|---------------------|---------------|----------|---|
| 36 | Voltmeter              | HP3478A             | 2545A25838    | E1559    |   |
| 37 | Variac                 | Yamabishi S-260-5   | TX-533        | E1737    |   |
| 38 | RX and TX, RF Paths    | Tait CAST Interface | E3067         | E3067    |   |
| 40 | Reference Dipoles      | Emco 3121C-DB1      | 9510-1164     | E3559    |   |
| 41 | Antenna                | Biconical           | 9307-1680     | E3033    |   |
| 42 | Reference Horn Antenna | Emco DRG 3115       | 9512-4638     | E3560    |   |
| 43 | Horn Antenna           | Emco DRG 3115       | 2084          | E3076    |   |
| 44 | Corner 175-420 MHz     | Ailtech DM 105A-T2  | J1417-103     | E3031    |   |
| 45 | Corner 400-1000 MHz    | Ailtech DM 105A-T3  | J1418-108     | E3036    |   |
| 46 | S-LINE TEM CELL        | 1089.9296.02        | 338232/003    | E3636    |   |
| 50 | Amplifier AR 1M-1000M  | 25W1000A            | 20444         | E3637    |   |
| 51 | Amplifier AR 10K-250M  | 25A250              | 16373         | E3570    |   |
| 52 | Amplifier +21.7 dB     | Tait ZFL-1000LN     | E3660         | E3360    |   |
| 53 | RF Filter 21.4M (CAST) | Tait NDK 21G-6DT    | E3069         | E3069    |   |
| 54 | RF Filter 21.4M (ACP)  | Tait NDK 21G-6DT    | RA-7'         | E3249    |   |
| 55 | Filter Notch           | Tait                | N/A           | ?        |   |
| 56 | Filter High Pass       | Tait                | Mhz           | N/A      | ? |
| 57 | Filter Low Pass        | Tait                | Mhz           | N/A      | ? |
| 60 | RF Attenuator 250W     | Weinschel 45-30-34  | JW663         | E3386    |   |
| 61 | RF Attenuator 150W     | Weinschel 40-20-33  | CJ404         | E3387    |   |
| 62 | RF Attenuator 150W     | Weinschel 57-10-34  | LB590         | E3674    |   |
| 63 | RF Attenuator 150W     | Weinschel 40-06-34  | KV457         | E3561    |   |
| 64 | RF Attenuator 50W      | Weinschel 24-10-34  | AL0401        | E3388    |   |
| 65 | RF Attenuator 50W      | Weinschel 24-20-44  | AW1266        | E3562    |   |

## TEST EQUIPMENT LIST (Cont.)

| No | Equipment Type           | Model number         | Serial Number | Tait ID: |
|----|--------------------------|----------------------|---------------|----------|
| 66 | RF Attenuator 25W        | Weinschel 33-20-33   | BD5871        | E3673    |
| 67 | RF Attenuator 150W(CAST) | Weinschel 40-20-33   | CJ405         | 3366/82  |
| 70 | RF Load 150W             | Byrd 8166            | 524           | E3625    |
| 71 | RF Load 50 W             | Weinschel F1426      | BF0487        | E3675    |
| 72 | RF Load 50 W             | Weinschel F1426      | AE2490        | E3624    |
| 73 | RF Termination 20W       | Deltec               | 118.001       | E3626    |
| 74 | RF Termination W         | MCL NTRM-50          | 951215        | E3574    |
| 75 | RF Termination W         | MCL NTRM-50          | 954214        | E3575    |
| 76 | RF Termination W         | MCL NTRM-50          | 954214        | E3576    |
| 80 | 20 M Coax Cable          | RG214/U 50 (Ext Cal) | CBL01         | E3659    |
| 81 | 2 M Coax Cable           | RG213/U 50 (Ext Cal) | CBL02         | E3658    |
| 82 | 3 M Coax Cable (BLUE)    | Suhner Sucoflex 104A | 25033 / 4A    | E3694    |
| 83 | 1 M Coax Cable (BLUE)    | Suhner Sucoflex 104A | 25006 / 4A    | E3693    |
| 84 | 1 M Coax Cable (BLUE)    | Suhner Sucoflex 104A | 25005 / 4A    | E3692    |
| 85 | 1 M Coax Cable (BLUE)    | Suhner Sucoflex 104A | 25004 / 4A    | E3691    |
| 86 | 1 M Coax Cable (BLUE)    | Suhner Sucoflex 104A | 25003 / 4A    | E3690    |
| 87 | Audio Analyser           | HP8903B              | 2818A04275    | E3710    |
| 88 | Spectrum Analyser        | HP8562E              | 3821A00799    | E3715    |
| 89 | Field Strength Meter     | Holiday HI-422       | 95661         | E3630    |
| 90 | Power Supply             | HP6012B              | 2524A00616    | E3712    |
| 91 | 20 M Coax Cable          | RG214/U 50 (Ext Cal) | 3404          | 24/08/99 |
| 92 | LISN                     | EMCO 3825/2          | 9204-1961     | E3040    |
| 93 | Oscilloscope             | Tektronics TDS 380   | B017095       | E3782    |
|    |                          |                      |               |          |