

# Laboratory Test Report

## RADIO PERFORMANCE MEASUREMENTS

for the

TMBB1B Mobile Transceiver

Tested in accordance with:

CFR Title 47 Parts 22, 74 and 90

RSS-119 Issue 11  
RSS-Gen Issue 3

Report Revision: 1

Issue Date: 20-September-2012

PREPARED BY: Linda White \_\_\_\_\_  
Test Technician

CHECKED BY: Robin Kidson \_\_\_\_\_  
Signatory

APPROVED BY: Mike James \_\_\_\_\_  
Laboratory Engineer



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This document must not be reproduced except in full, without the written permission of the Compliance Laboratory Manager.

TELTEST Laboratories (A Division of Tait Communications)  
PO Box 1645, 558 Wairakei Road, Christchurch, New Zealand.

Telephone: 64 3 358 3399  
FAX: 64 3 359 4632

## TABLE OF CONTENTS

|                                                                         |     |
|-------------------------------------------------------------------------|-----|
| SUMMARY .....                                                           | 3   |
| REVISION.....                                                           | 4   |
| INTRODUCTION .....                                                      | 5   |
| DECLARATION OF CONFORMITY .....                                         | 6   |
| MODULATION TYPES, NECESSARY BANDWIDTH, and EMISSION<br>DESIGNATORS..... | 7   |
| TEST RESULTS .....                                                      | 9   |
| TRANSMITTER OUTPUT POWER (CONDUCTED).....                               | 9   |
| TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS.....                | 10  |
| TRANSMITTER MODULATION LIMITING .....                                   | 13  |
| OCCUPIED BANDWIDTH AND SPECTRUM MASKS .....                             | 19  |
| SPURIOUS EMISSIONS (Tx CONDUCTED) .....                                 | 70  |
| SPURIOUS EMISSIONS (Tx RADIATED).....                                   | 87  |
| TRANSIENT FREQUENCY BEHAVIOR.....                                       | 91  |
| TRANSMITTER FREQUENCY STABILITY - TEMPERATURE.....                      | 102 |
| TRANSMITTER FREQUENCY STABILITY - VOLTAGE .....                         | 107 |
| SPURIOUS EMISSIONS – Rx CONDUCTED .....                                 | 108 |
| TEST EQUIPMENT LIST .....                                               | 110 |
| ANNEX A – TEST SETUP DETAILS .....                                      | 111 |

**SUMMARY**

| <b>USA CFR 47</b>  |                                                     |                           |                     |
|--------------------|-----------------------------------------------------|---------------------------|---------------------|
| <b>Requirement</b> |                                                     | <b>Test Specification</b> | <b>Test Result:</b> |
| <b>No</b>          | <b>Description</b>                                  | <b>Part</b>               |                     |
| <b>1</b>           | Transmitter Output Power (Conducted)                | 2.1046                    | P                   |
| <b>2</b>           | Transmitter Audio Frequency Response - Pre-emphasis | 2.1047 (a)                | P                   |
| <b>3</b>           | Transmitter Modulation Limiting                     | 2.1047 (b)                | P                   |
| <b>4</b>           | Occupied Bandwidth and Spectrum Masks               | 2.1049 (c)                | P                   |
| <b>5</b>           | Spurious Emissions (Tx Conducted)                   | 2.1051                    | P                   |
| <b>6</b>           | Spurious Emissions (Tx Radiated)                    | 2.1053                    | P                   |
| <b>7</b>           | Transient Frequency Behaviour                       | 90.214                    | P                   |
| <b>8</b>           | Transmitter Frequency Stability - Temperature       | 2.1055 (a) (1)            | P                   |
| <b>9</b>           | Transmitter Frequency Stability - Voltage           | 2.1055 (d) (1)            | P                   |

| Industry Canada RSS |                                               |                    |            |              |
|---------------------|-----------------------------------------------|--------------------|------------|--------------|
| Requirement         |                                               | Test Specification |            | Test Result: |
| No                  | Description                                   | 119 Clause         | Gen Clause |              |
| 1                   | Transmitter Output Power (Conducted)          | 5.4                | 4.8        | P            |
| 2                   | Occupied Bandwidth and Spectrum Masks         | 5.5                | -          | P            |
| 3                   | Spurious Emissions (Tx Conducted)             | 5.8                | 4.9        | P            |
| 4                   | Transient Frequency Behaviour                 | 5.9                | -          | P            |
| 5                   | Transmitter Frequency Stability - Temperature | 5.3                | 4.7 (a)    | P            |
| 6                   | Transmitter Frequency Stability - Voltage     | 5.3                | 4.7 (b)    | P            |
| 7                   | Spurious Emissions - Rx Conducted             | 5.11               | 4.10       | P            |

| <b>Test Case Result Definitions</b>    |                  |
|----------------------------------------|------------------|
| No test Performed                      | -                |
| Test does not apply to the test object | N/A              |
| Test object meets requirements         | P (Pass)         |
| Test object does not meet requirements | F (Fail)         |
| Test object is not conclusive          | I (Inconclusive) |

REVISION

| Date              | Revision | Comments            |
|-------------------|----------|---------------------|
| 20-September-2012 | 1        | Initial test report |
|                   |          |                     |

# TELTEST Laboratories

Tait Communications

Report Number 3414

## INTRODUCTION

### REASON FOR REPORT

This report demonstrates that the TMBB1B mobile transceiver complies with CFR 47 Parts 22, 74 & 90, and RSS-119 Issue 11 & RSS-Gen Issue 3. This radio supports analog, P25 phase-1, digital FFSK, and Digital Mobile Radio modulations.

|               |                 |                                             |
|---------------|-----------------|---------------------------------------------|
| Type Approval | Testing of the  | T02-00012-PBAA (DMR) & T02-00014-PBAA (P25) |
|               | Serial number   | 20025394                                    |
|               | Frequency range | 136 → 174 MHz                               |

in accordance with:

CFR 47 Parts 22, 74 and 90  
RSS-119 Issue 11 & RSS-Gen Issue 3

### REPORT PREPARED FOR

Tait Communications  
PO Box 1645  
558 Wairakei Road  
Christchurch  
New Zealand

### DESCRIPTION OF SAMPLE

|                   |                                             |
|-------------------|---------------------------------------------|
| Manufacturer      | Tait Limited                                |
| Equipment:        | Mobile Transceiver                          |
| Type:             | TMBB1B                                      |
| Product Code:     | T02-00012-PBAA (DMR) & T02-00014-PBAA (P25) |
| Serial Number(s): | 20025394                                    |
| Quantity:         | 1                                           |

### HARDWARE & SOFTWARE

|                   | DMR Code and Version     | P25 Code and Version     |
|-------------------|--------------------------|--------------------------|
| Hardware ID       | TMBC12-0100_0006         | TMBC12-0100_0006         |
| Boot Code         | QCB1B_S00_2.16.00.0001   | QCB1B_S00_2.16.00.0001   |
| Radio Application | QCB1F_S00ML_0.12.00.0037 | QCB1F_S00ML_0.12.00.0070 |
| FPGA Image        | QCB1G_D02_0.54.00.0004   | QCB1G_D02_0.54.00.0004   |
| Hardware ID       | TMBB14-B100_0006         | TMBB14-B100_0006         |
| Boot Code         | QMB1B_S00_2.16.00.0001   | QMB1B_S00_2.16.00.0001   |
| DSP               | QMB1A_E01ML_0.12.00.0037 | QMB1A_A01ML_0.07.00.0070 |
| Radio Application | QMB1F_E00ML_0.12.00.0037 | QMB1F_A00ML_0.07.00.0070 |
| FPGA Image        | QMB1G_D08_0.54.00.0004   | QMB1G_D08_0.54.00.0004   |

### TEST CONDITIONS

All testing was performed between 3 September → 18 September 2012, and under the following conditions:

|                       |                      |
|-----------------------|----------------------|
| Ambient temperature:  | 15°C → 30°C          |
| Relative Humidity:    | 20% → 75%            |
| Standard Test Voltage | 13.8 V <sub>DC</sub> |

**DECLARATION OF CONFORMITY**

We, TELTEST LABORATORIES of 558 Wairakei Road, Christchurch New Zealand, declare under our sole responsibility that the product:

Equipment: Mobile Transceiver  
Type: TMBB1B  
Product Code: T02-00012-PBAA (DMR) & T02-00014-PBAA (P25)  
Serial Number(s): 20025394  
Quantity: 1

to which this declaration relates, is in conformity with the following standards:

CFR 47 Parts 22, 74 and 90

RSS-119 Issue 11 & RSS-Gen Issue 3

**Signature :** \_\_\_\_\_

M. James  
Compliance Laboratory Engineer

**Date :** \_\_\_\_\_

## TELTEST Laboratories

Tait Communications

Report Number 3414

---

### MODULATION TYPES, NECESSARY BANDWIDTH, and EMISSION DESIGNATORS

#### MODULATION TYPES:

|     |                                                            |          |          |
|-----|------------------------------------------------------------|----------|----------|
| F1E | Digital voice                                              |          |          |
| F3E | Analog FM                                                  |          |          |
| F7E | Two or more channels containing quantized or digital voice |          |          |
| F1D | Digital data                                               |          |          |
| F2D | FFSK                                                       | 1200 bps | 2400 bps |
| F7D | Two or more channels containing quantized or digital data  |          |          |
| FXD | Digital                                                    | TDMA     | 9600 bps |
| FXW | Digital Voice / Data                                       | TDMA     | 9600 bps |

CHANNEL SPACINGS: 12.5 kHz

#### EMISSION DESIGNATORS:

|                   |         |         |         |         |
|-------------------|---------|---------|---------|---------|
| Analog FM         | 11K0F3E |         |         |         |
| FFSK Data 1200bps | 6K60F2D |         |         |         |
| FFSK Data 2400bps | 7K80F2D |         |         |         |
| P25 C4FM          | 8K10F1E | 8K10F7E | 8K10F7D | 8K10F1D |
| DMR               | 7K60FXW | 7K60FXD |         |         |

#### CALCULATIONS

Equation:  $B_n = 2M + 2Dk$

(M is highest modulating frequency; D is peak allowable deviation; k is a constant of 1 for FM)

##### Analogue Voice

Necessary bandwidth

M = 3.0 kHz

D = 2.5 kHz

$$\begin{aligned} B_n &= (2 \times 3.0) + (2 \times 2.5) \times 1 \\ &= 11.0 \text{ kHz} \end{aligned}$$

12.5 kHz Channel Spacing

Emission Designator

**11K0F3E**

F3E represents an FM voice transmission

##### Fast Frequency Shift Keying (FFSK – 1200 bps)

Necessary bandwidth

M = 1.8 kHz

D = 1.5 kHz (60% of peak deviation)

$$\begin{aligned} B_n &= (2 \times 1.8) + (2 \times 1.5) \times 1 \\ &= 6.6 \text{ kHz} \end{aligned}$$

12.5 kHz Channel Spacing

Emission Designator

**6K60F2D**

F2D represents a FM data transmission with the use of a modulating sub carrier

##### Fast Frequency Shift Keying (FFSK – 2400 bps)

Necessary bandwidth

M = 2.4 kHz

D = 1.5 kHz (60% of peak deviation)

$$\begin{aligned} B_n &= (2 \times 2.4) + (2 \times 1.5) \times 1 \\ &= 7.8 \text{ kHz} \end{aligned}$$

12.5 kHz Channel Spacing

Emission Designator

**7K80F2D**

F2D represents a FM data transmission with the use of a modulating sub carrier

## TELTEST Laboratories

Tait Communications

Report Number 3414

---

### Emission Designators - Continued

Digital Voice / Data    APCO Phase 1 P25    12.5 kHz Channel Spacing

C4FM                    4800 symbols/sec                    9600 bps

Digital Voice/data transmissions use a 4 level frequency shift keying modulation scheme.

The necessary bandwidth has been measured using the 99% energy rule.

Digital Voice                    P25    12.5 kHz Channel Spacing

99% bandwidth

= 8.1 kHz

Emission Designator

**8K10F1E**

F1E represents a digital FM voice transmission

**8K10F7E**

F7E represents two or more channels containing quantized or digital voice information

Digital Data                    P25    12.5 kHz Channel Spacing

99% bandwidth

= 8.1 kHz

Emission Designator

**8K10F1D**

F1D represents an digital FM data transmission

**8K10F7D**

F7D represents two or more channels containing quantized or digital information

Digital Voice / Data    DMR    12.5 kHz Channel Spacing

4 Level FSK (as per ETSI TS 102 361-1)                    4800 symbols/sec                    9600 bps

The necessary bandwidth has been measured using the 99% energy rule.

Digital Voice/Data                    DMR    12.5 kHz Channel Spacing

99% bandwidth

= 7.6 kHz

Emission Designator

**7K60FXW**

FXW represents a FM Time Division Multiple Access (TDMA) combination of data and telephony

Digital Data                    DMR    12.5 kHz Channel Spacing

99% bandwidth

= 7.6 kHz

Emission Designator

**7K60FXD**

FXW represents FM Time Division Multiple Access (TDMA) data only

**TEST RESULTS****TRANSMITTER OUTPUT POWER (CONDUCTED)**

SPECIFICATION: CFR 47 2.1046  
RSS-119 5.4

GUIDE: TIA/EIA-603D 2.2.1

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for Equipment set up.
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: 50 W and 10 W

|                                     |           |           |           |           |           |
|-------------------------------------|-----------|-----------|-----------|-----------|-----------|
| Nominal 50 W                        | 138.1 MHz | 152.1 MHz | 153.1 MHz | 158.1 MHz | 173.1 MHz |
| Measured                            | 50.1      | 51.6      | 52.7      | 51.9      | 53.2      |
| Variation (%)                       | 0.29      | 3.22      | 5.39      | 3.74      | 6.34      |
| Variation (dB)                      | 0.01      | 0.14      | 0.23      | 0.16      | 0.27      |
|                                     |           |           |           |           |           |
| Nominal 10 W                        | 138.1 MHz | 152.1 MHz | 153.1 MHz | 158.1 MHz | 173.1 MHz |
| Measured                            | 9.9       | 10.1      | 10.3      | 10.1      | 10.1      |
| Variation (%)                       | -1.03     | 0.52      | 3.28      | 1.23      | 1.45      |
| Variation (dB)                      | -0.05     | 0.02      | 0.14      | 0.05      | 0.06      |
| Measurement Uncertainty<br>± 0.6 dB |           |           |           |           |           |

**LIMIT CLAUSES:****CFR 47 90.205 (s)**

The output power shall not exceed by more than 20%... the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

**RSS-119 5.4**

The output power shall be within ±1.0 dB of the manufacturer's rated power.

## TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: CFR 47 2.1047 (a)

GUIDE: TIA/EIA-603D 2.2.6

### MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
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.

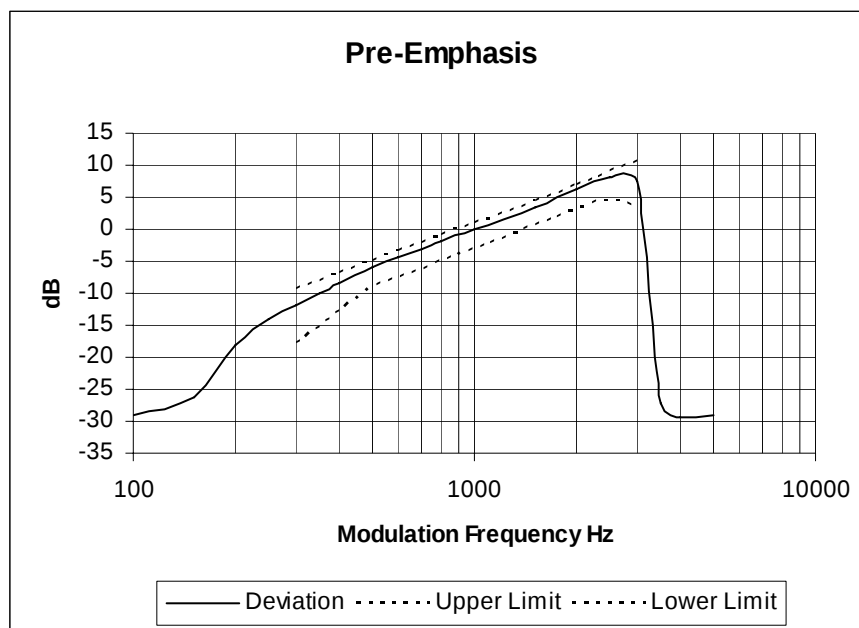
### MEASUREMENT RESULTS:

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

LIMIT CLAUSE: TIA/EIA-603C 3.2.6

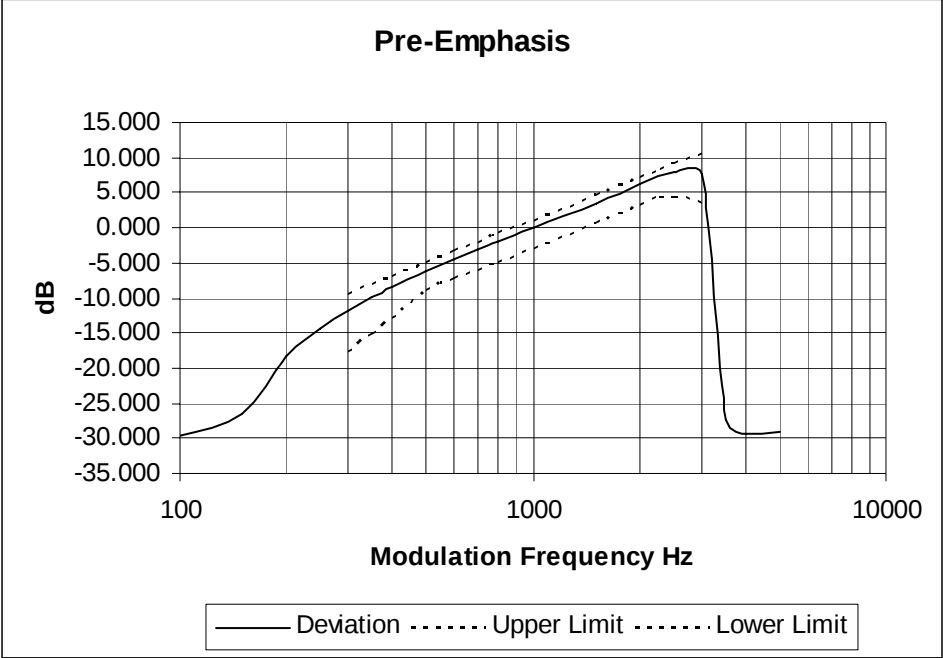
SPECIFICATION: CFR 47 2.1047 (a)

Tx FREQUENCY: 138.1 MHz 12.5 kHz Channel Spacing

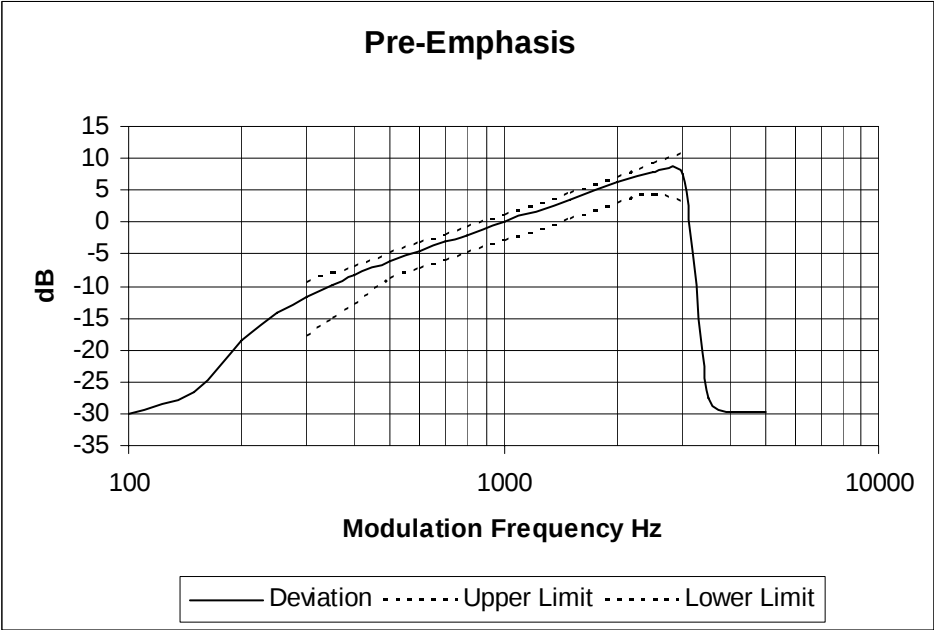


Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: CFR 47 2.1047 (a)  
Tx FREQUENCY: 152.1 MHz 12.5 kHz Channel Spacing



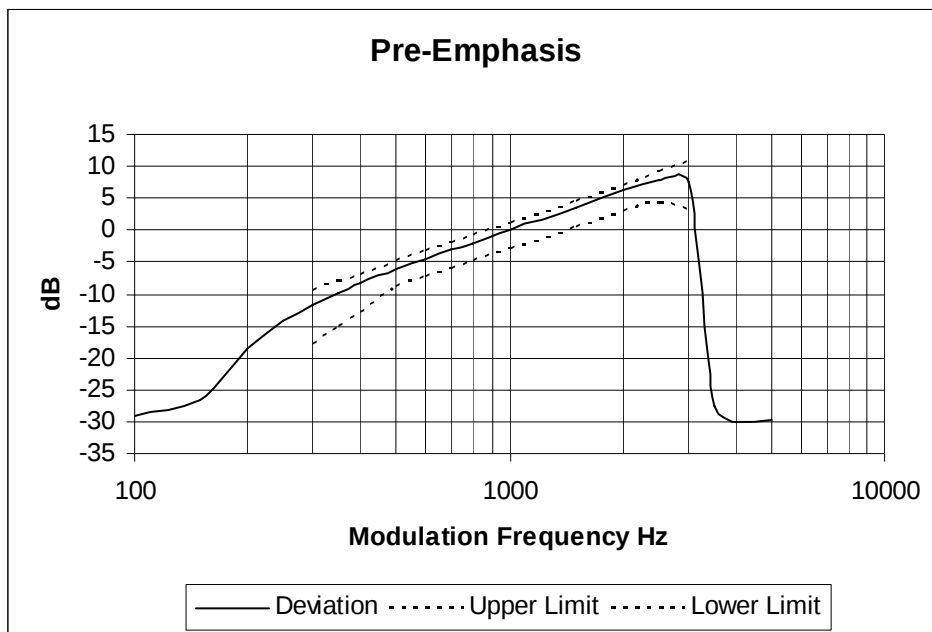
SPECIFICATION: CFR 47 2.1047 (a)  
Tx FREQUENCY: 153.1 MHz 12.5 kHz Channel Spacing



**Transmitter Audio Frequency Response – Pre-emphasis**

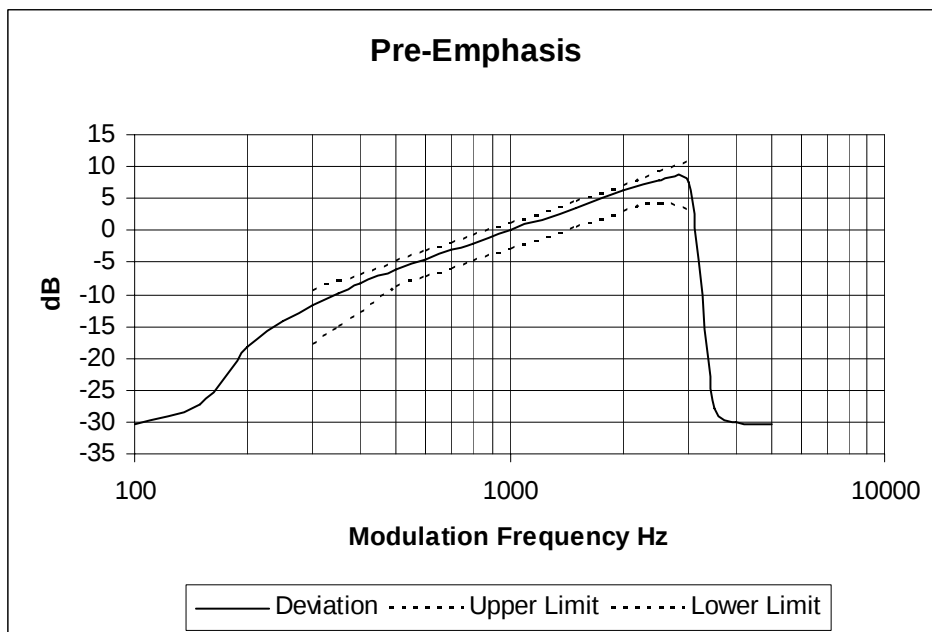
SPECIFICATION: CFR 47 2.1047 (a)

Tx FREQUENCY: 158.1 MHz 12.5 kHz Channel Spacing



SPECIFICATION: CFR 47 2.1047 (a)

Tx FREQUENCY: 173.1 MHz 12.5 kHz Channel Spacing



## TRANSMITTER MODULATION LIMITING

SPECIFICATION: CFR 47 2.1047 (b)

GUIDE: TIA/EIA-603D 2.2.3

### MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
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.

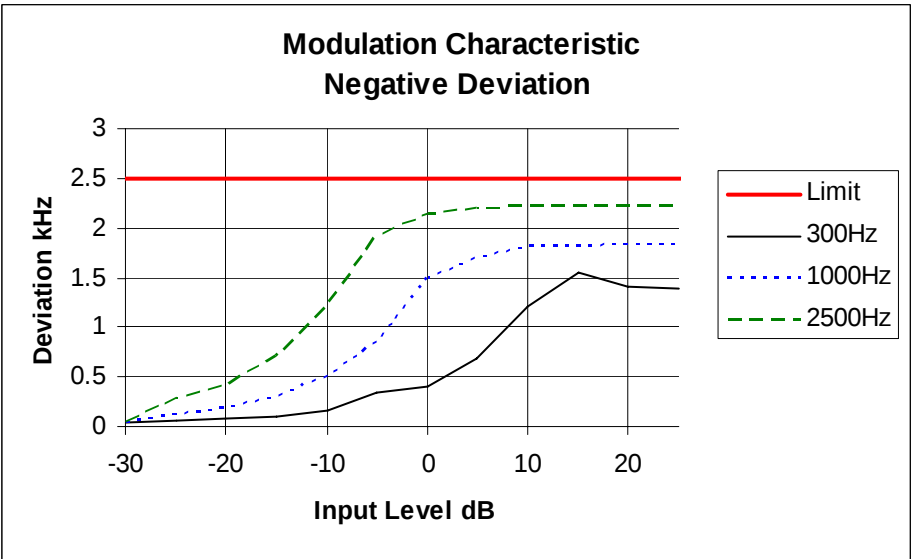
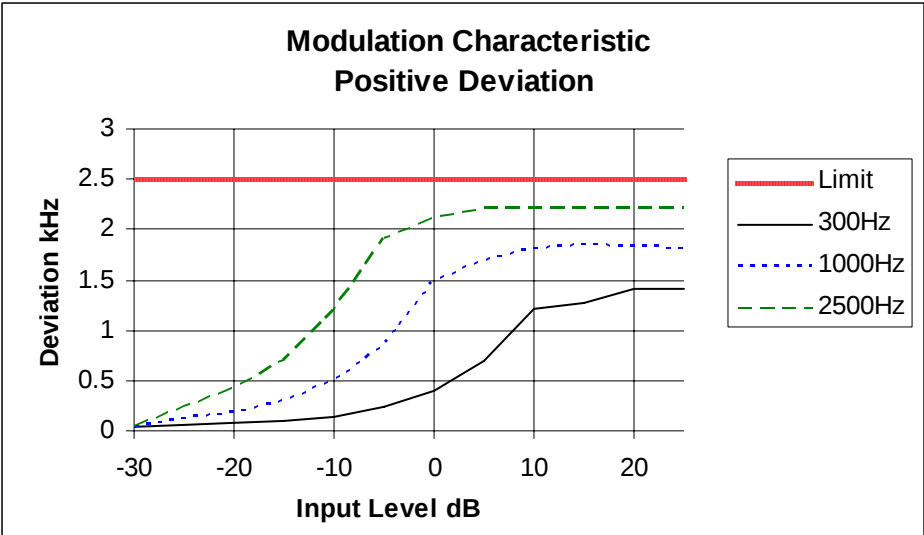
### MEASUREMENT RESULTS:

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

LIMIT CLAUSE: TIA/EIA-603D 1.3.4.4

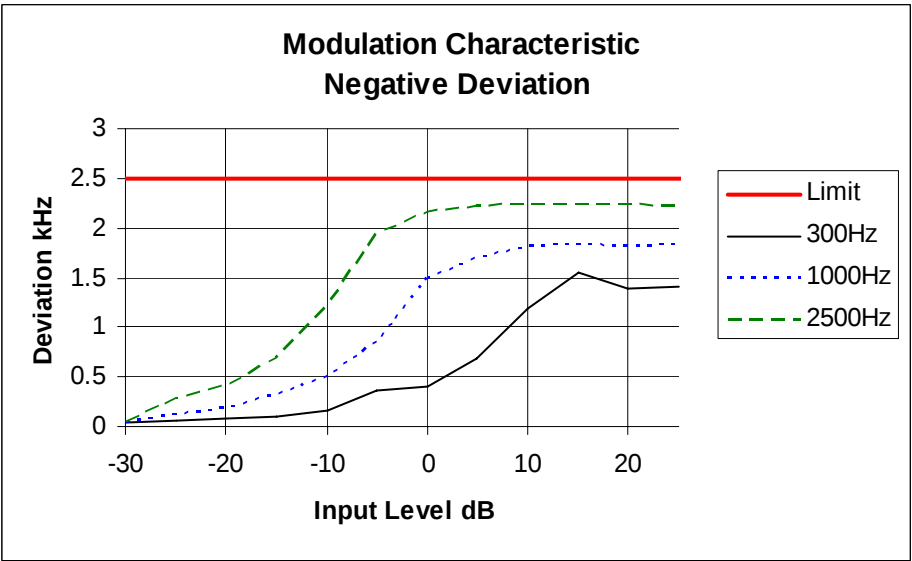
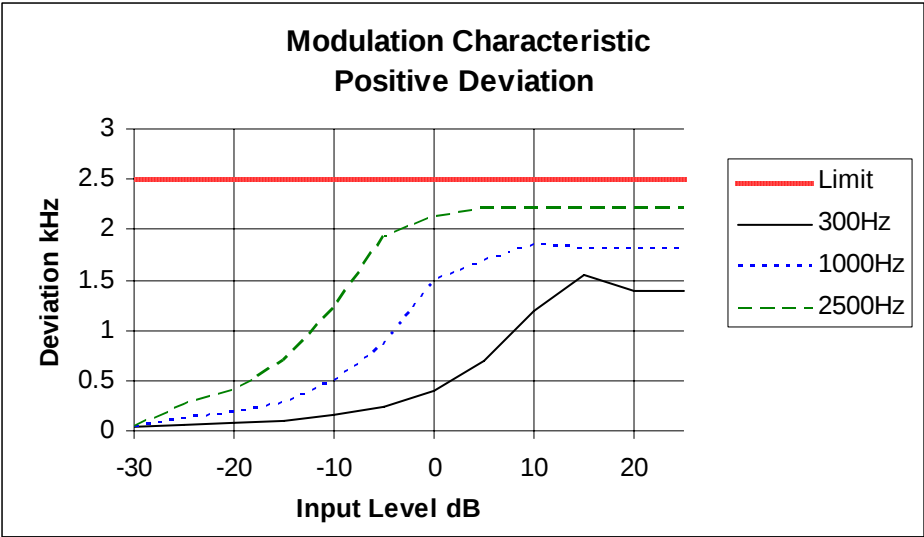
Transmitter Modulation Limiting

SPECIFICATION: CFR 47 2.1047 (b)  
Tx FREQUENCY: 138.1 MHz 12.5 kHz Channel Spacing



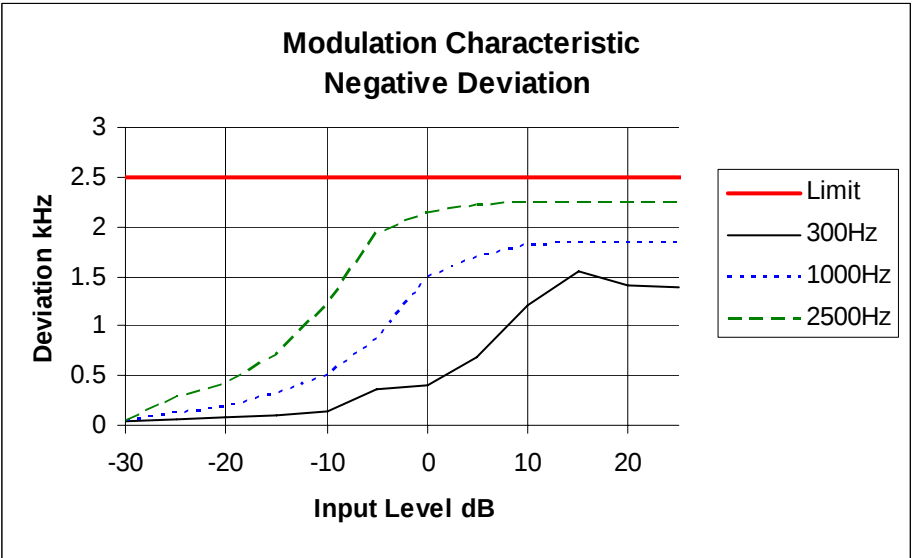
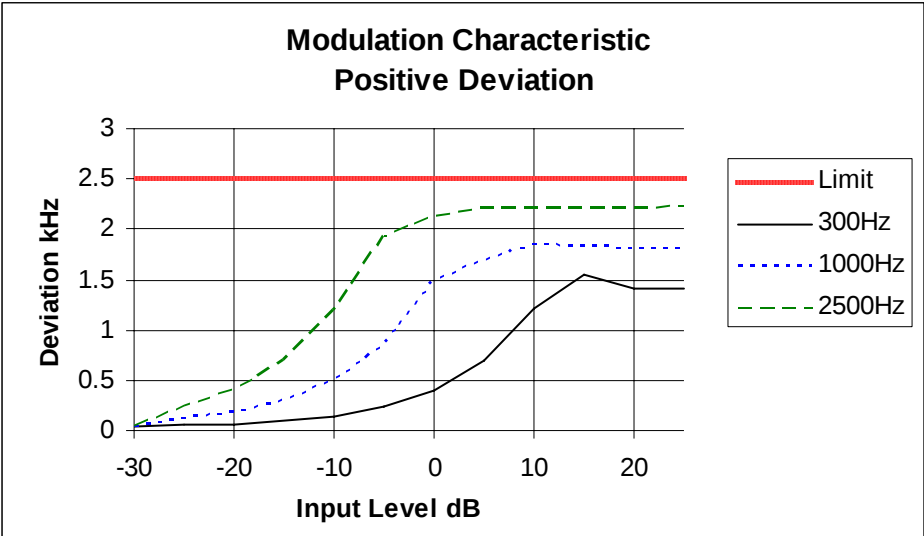
Transmitter Modulation Limiting

SPECIFICATION: CFR 47 2.1047 (b)  
Tx FREQUENCY: 152.1 MHz 12.5 kHz Channel Spacing



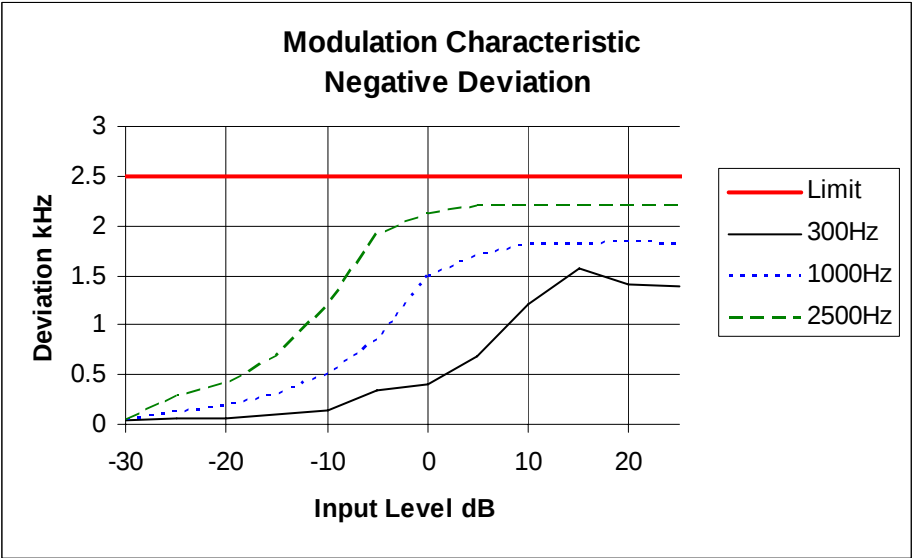
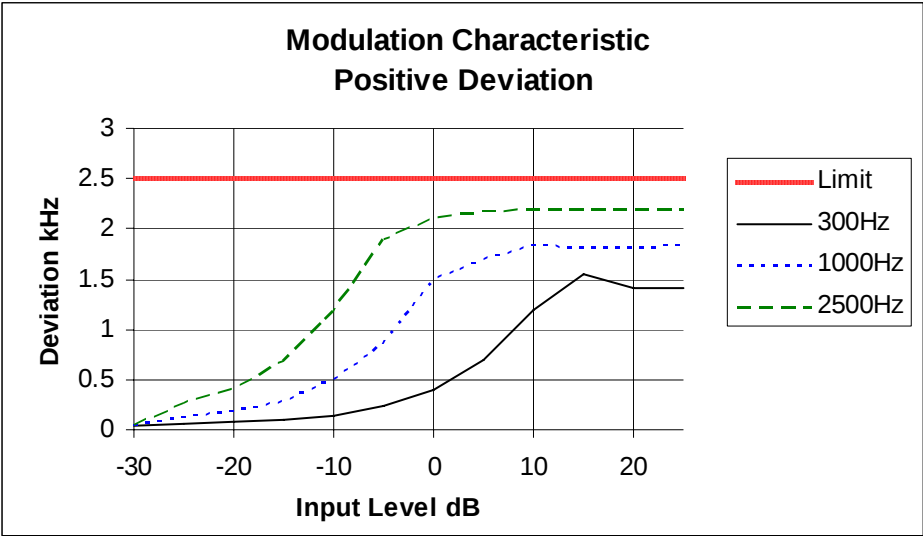
Transmitter Modulation Limiting

SPECIFICATION: CFR 47 2.1047 (b)  
Tx FREQUENCY: 153.1 MHz 12.5 kHz Channel Spacing



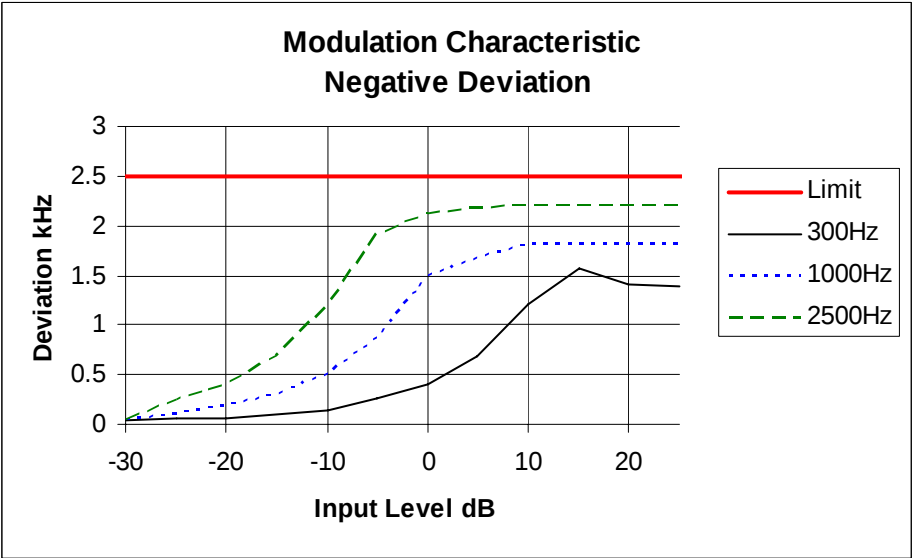
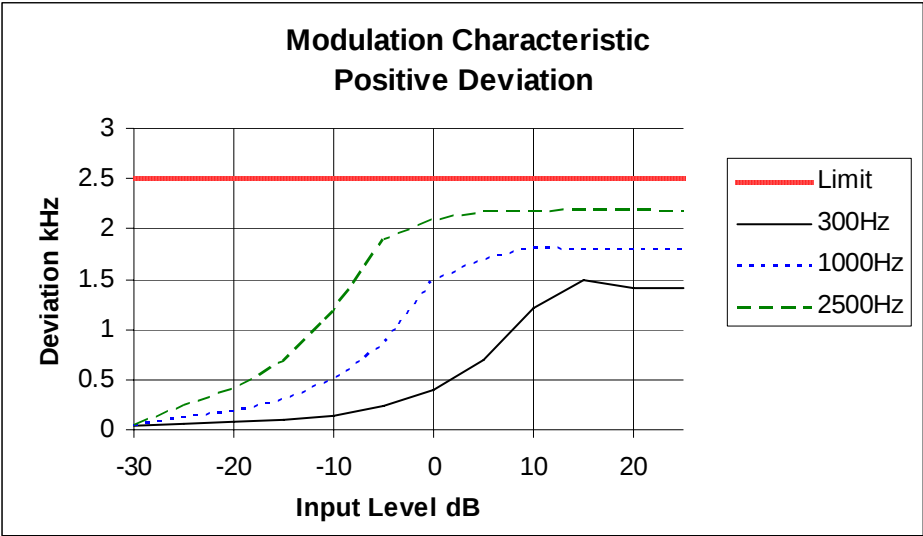
Transmitter Modulation Limiting

SPECIFICATION: CFR 47 2.1047 (b)  
Tx FREQUENCY: 158.1 MHz 12.5 kHz Channel Spacing



Transmitter Modulation Limiting

SPECIFICATION: CFR 47 2.1047 (b)  
Tx FREQUENCY: 173.1 MHz 12.5 kHz Channel Spacing



**OCCUPIED BANDWIDTH AND SPECTRUM MASKS**

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

GUIDE: TIA/EIA-603D 2.2.11

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for Equipment Set up.
2. For analog measurements: 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.  
For Data measurements: The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as follows.

Emission Mask D – Resolution Bandwidth = 100Hz, Video Bandwidth = 1 kHz

**MEASUREMENT RESULTS:**

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

LIMIT CLAUSE: CFR 47 90.210 RSS-119 5.5

**EMISSION MASKS**

|                 |                          |                                     |
|-----------------|--------------------------|-------------------------------------|
| Emission Mask D | 12.5 kHz Channel Spacing | Analog; FFSK;<br>Digital Voice/Data |
|-----------------|--------------------------|-------------------------------------|

**DATA SPEED**

|                    |                          |                     |
|--------------------|--------------------------|---------------------|
| Digital Voice/Data | 12.5 kHz Channel Spacing | 9600 bps            |
| FFSK               | 12.5 kHz Channel Spacing | 1200 bps & 2400 bps |

# TELTEST Laboratories

Tait Communications

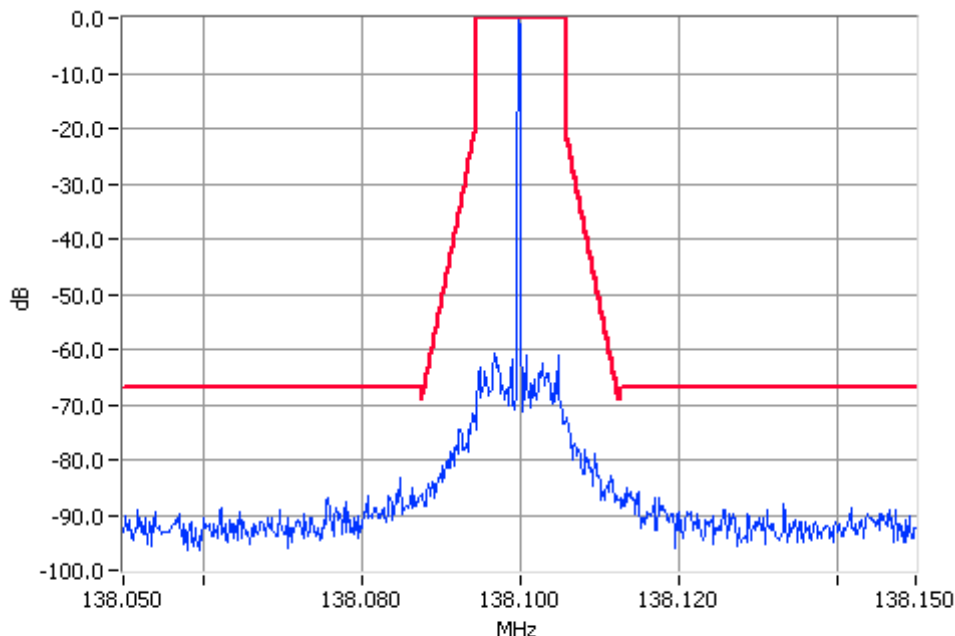
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

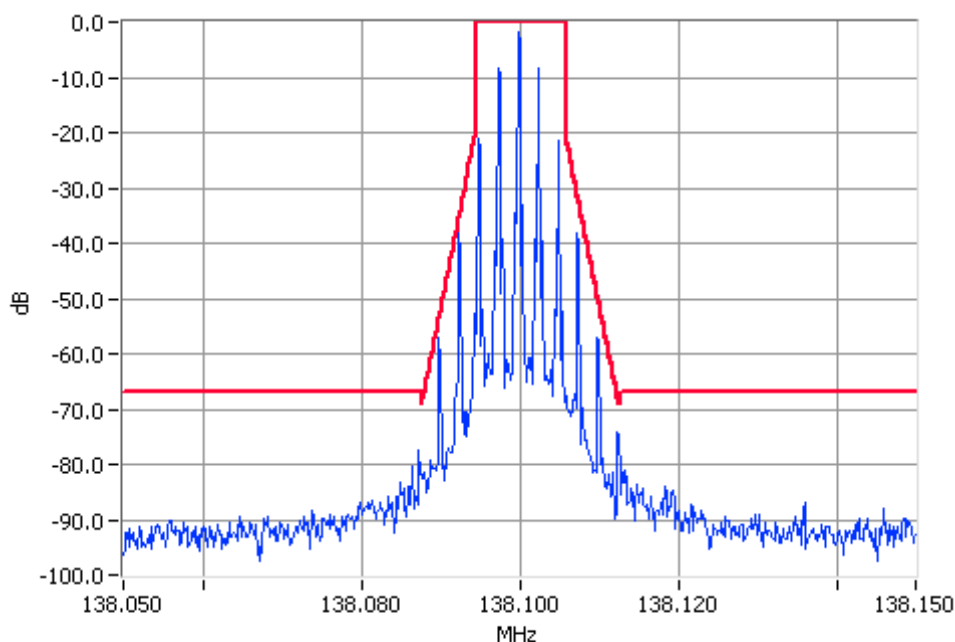
ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 138.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



**Analogue Modulation 138.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

# TELTEST Laboratories

Tait Communications

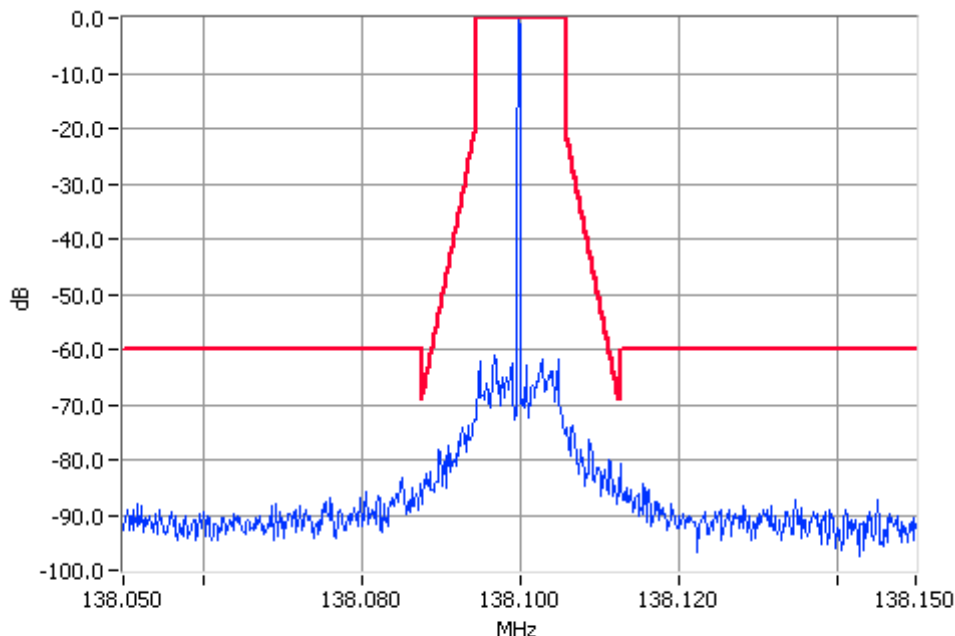
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

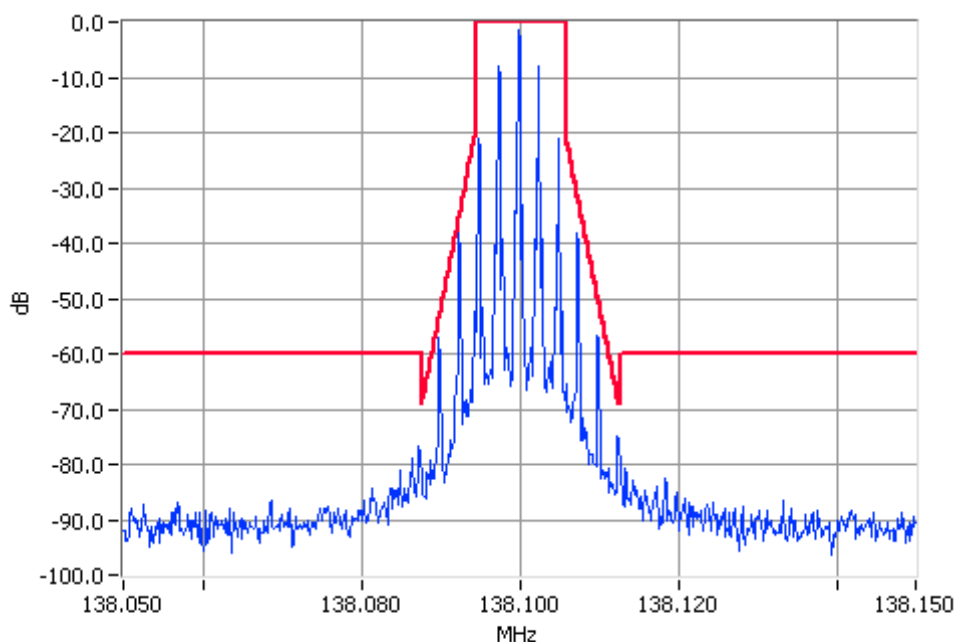
ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 10 W 12.5 kHz Channel Spacing



**Unmodulated 138.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



**Analogue Modulation 138.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

# TELTEST Laboratories

Tait Communications

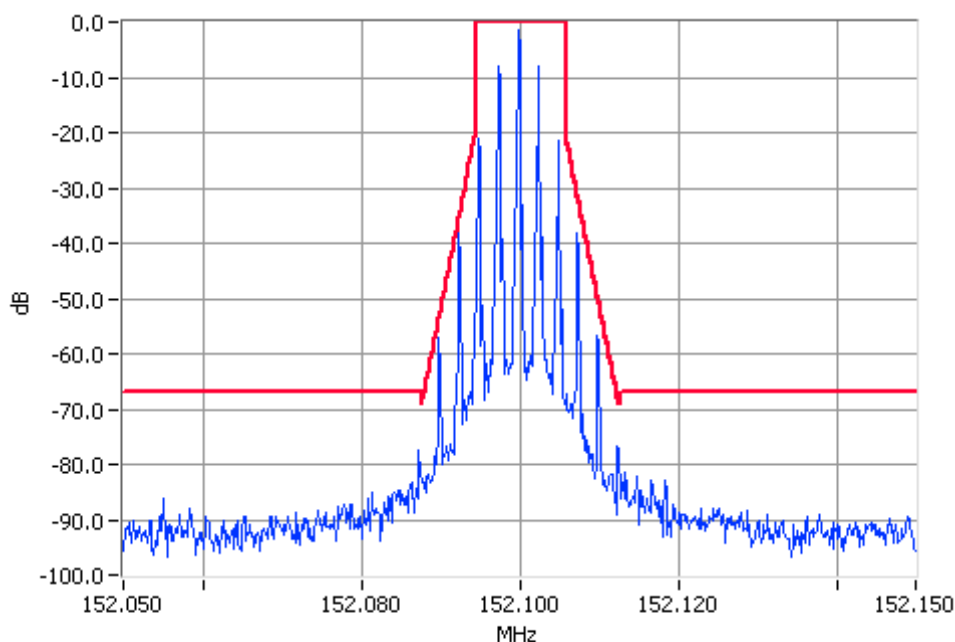
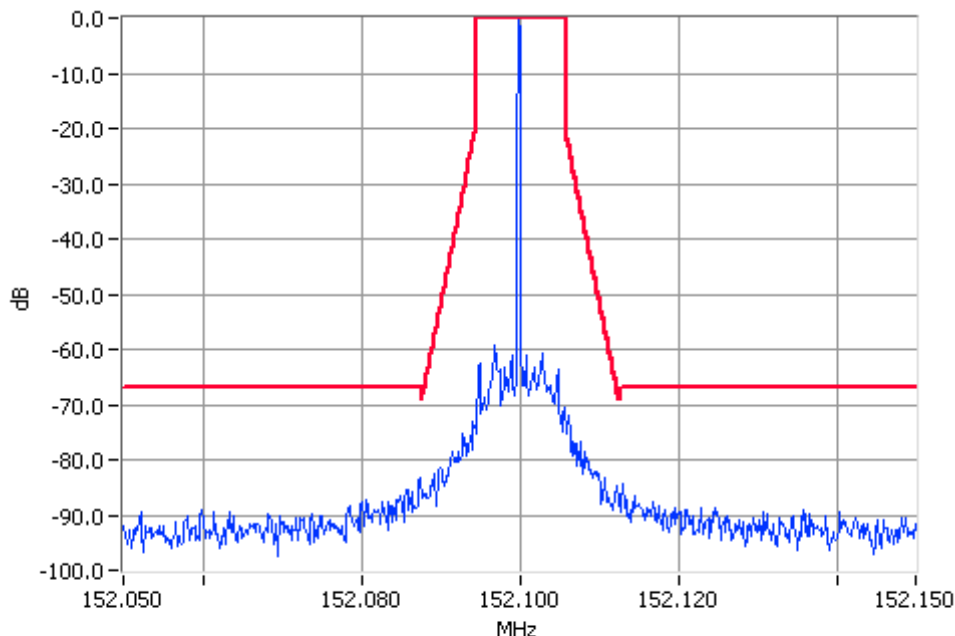
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 50 W 12.5 kHz Channel Spacing



# TELTEST Laboratories

Tait Communications

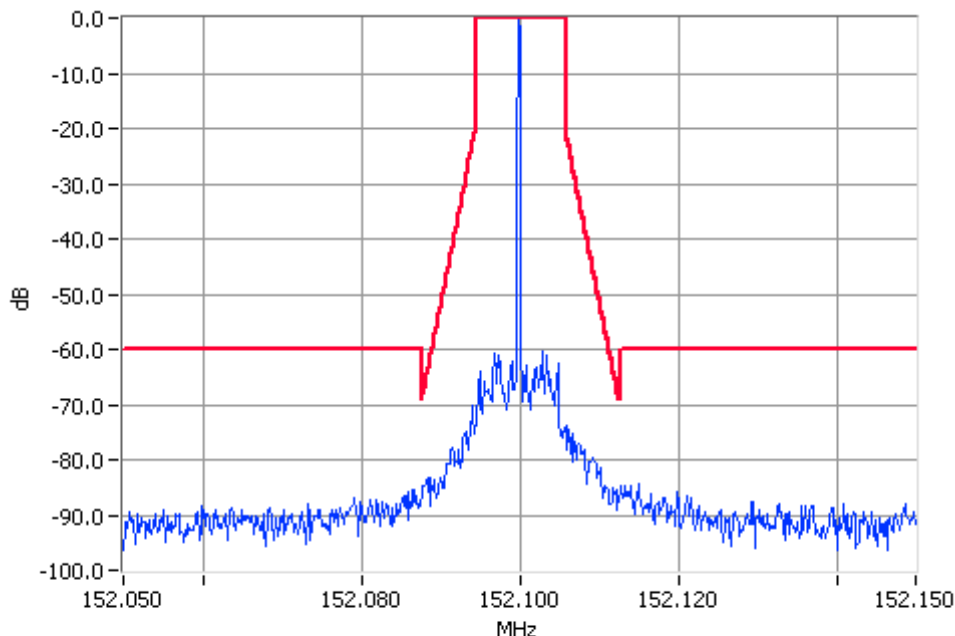
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

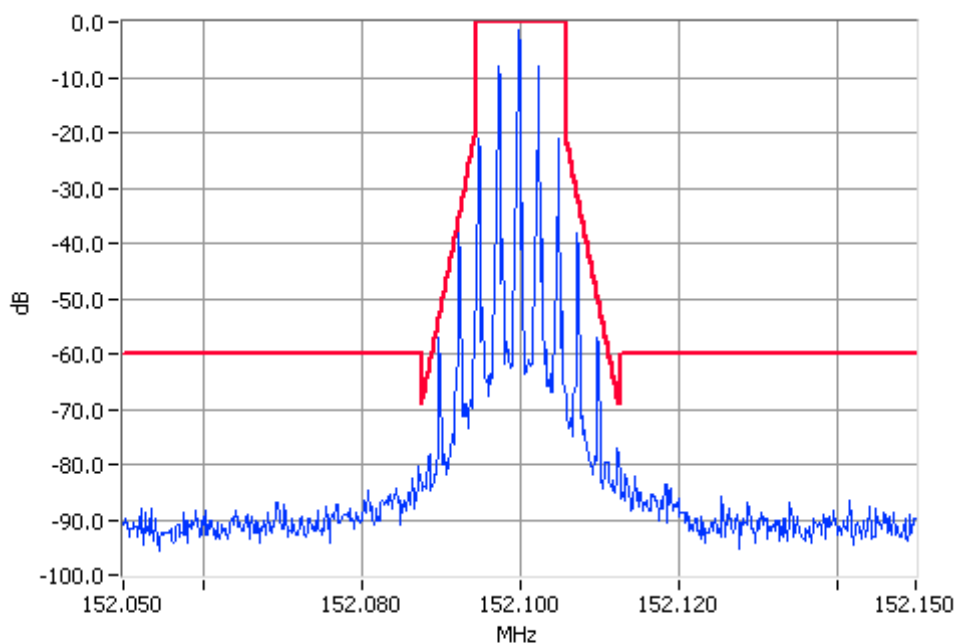
ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 10 W 12.5 kHz Channel Spacing



**Unmodulated 152.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



**Analogue Modulation 152.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

# TELTEST Laboratories

Tait Communications

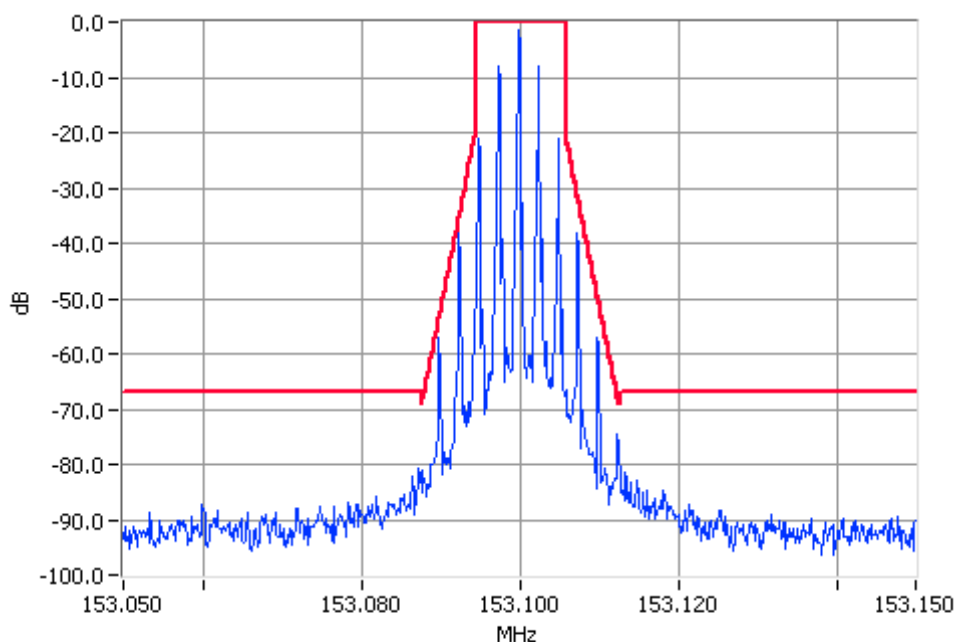
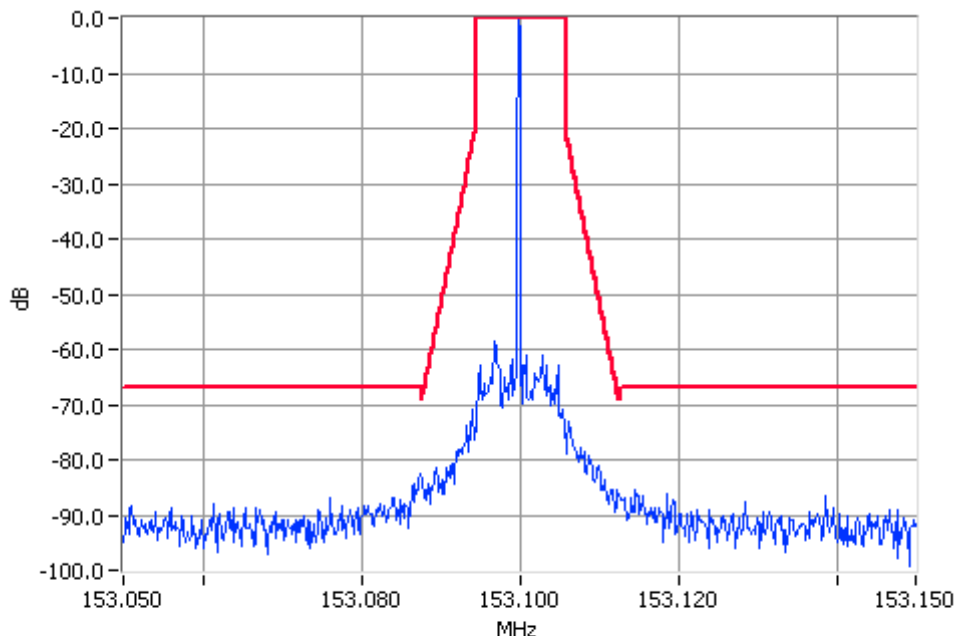
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 50 W 12.5 kHz Channel Spacing



# TELTEST Laboratories

Tait Communications

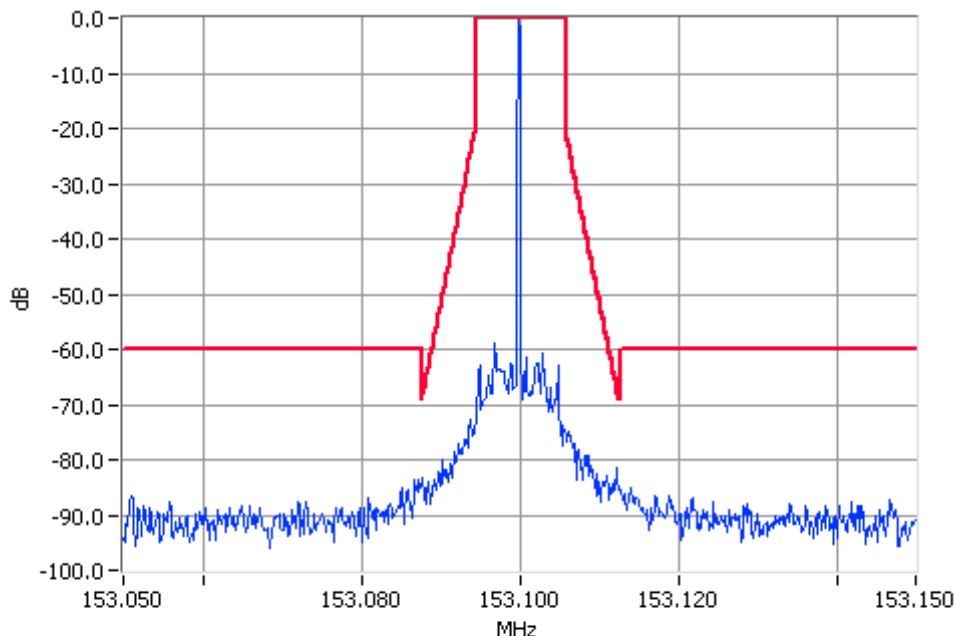
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

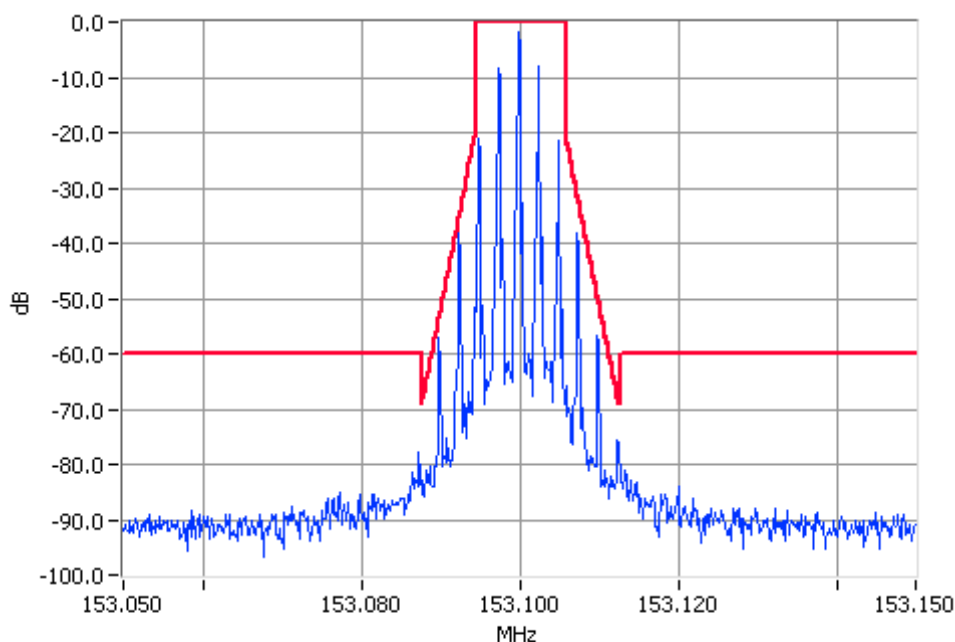
ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 10 W 12.5 kHz Channel Spacing



**Unmodulated 153.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



**Analogue Modulation 153.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

# TELTEST Laboratories

Tait Communications

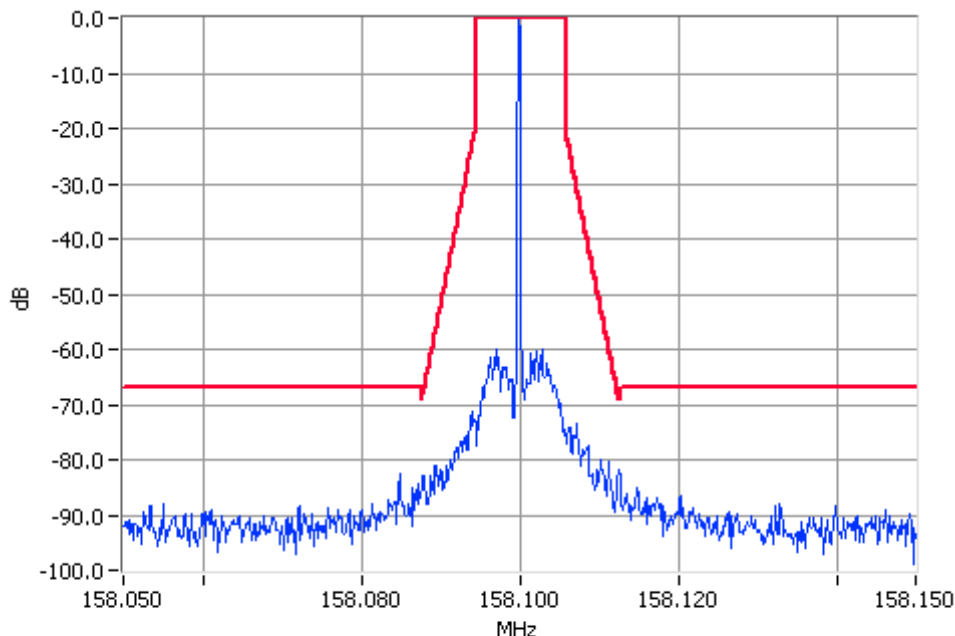
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

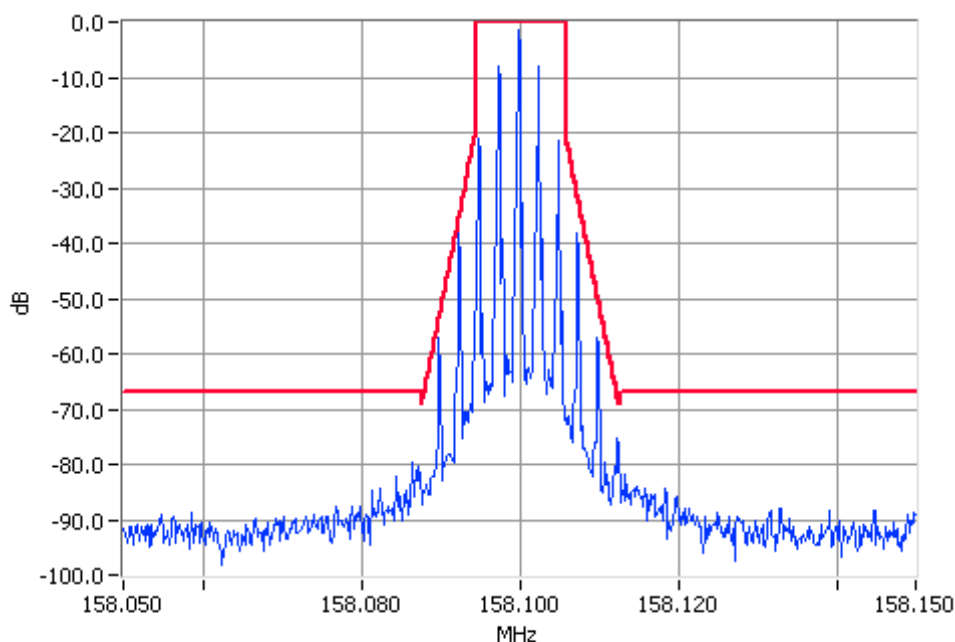
ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 158.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



**Analogue Modulation 158.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

# TELTEST Laboratories

Tait Communications

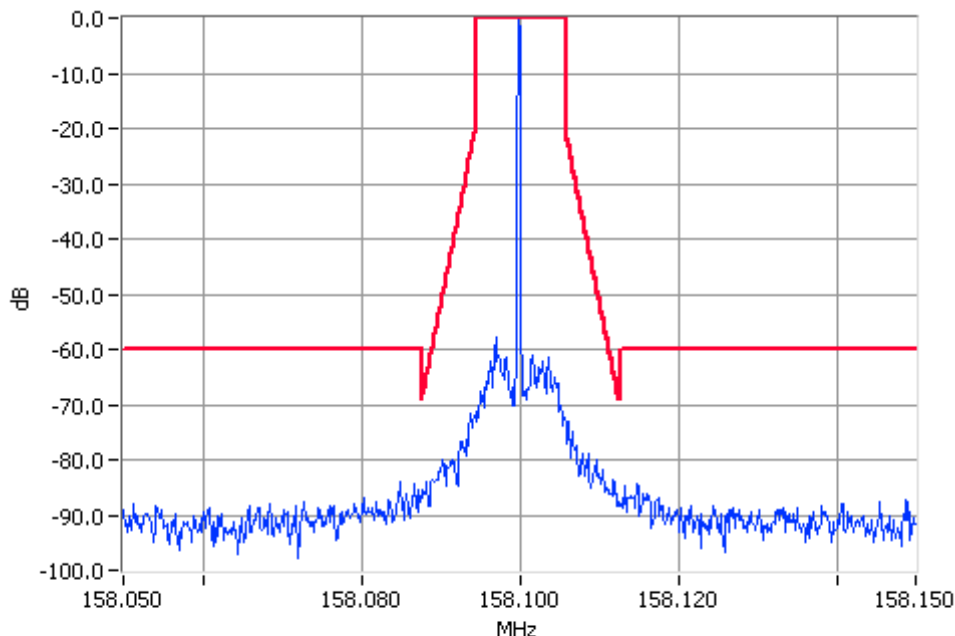
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

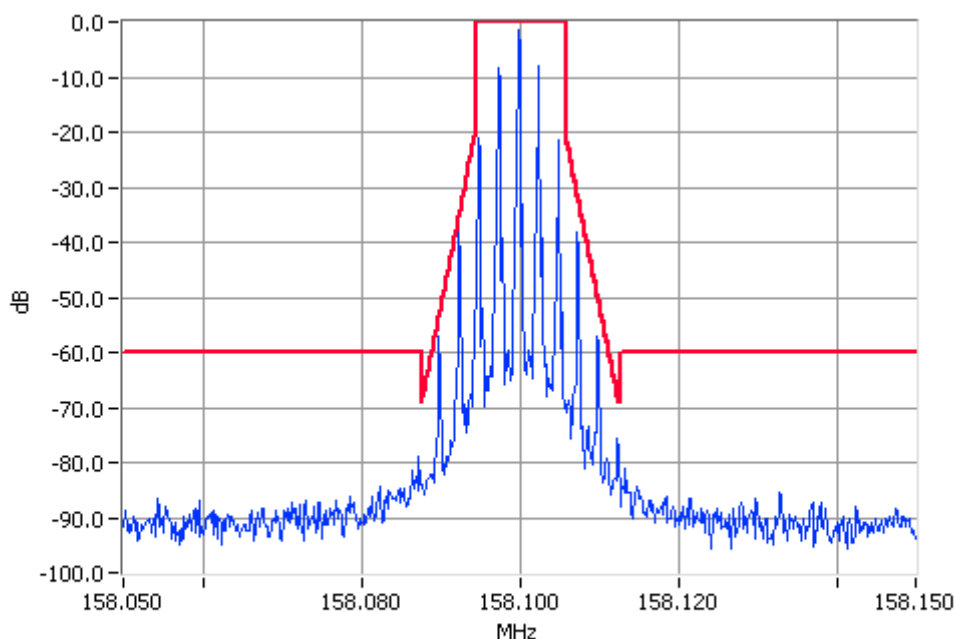
ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 10 W 12.5 kHz Channel Spacing



**Unmodulated 158.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



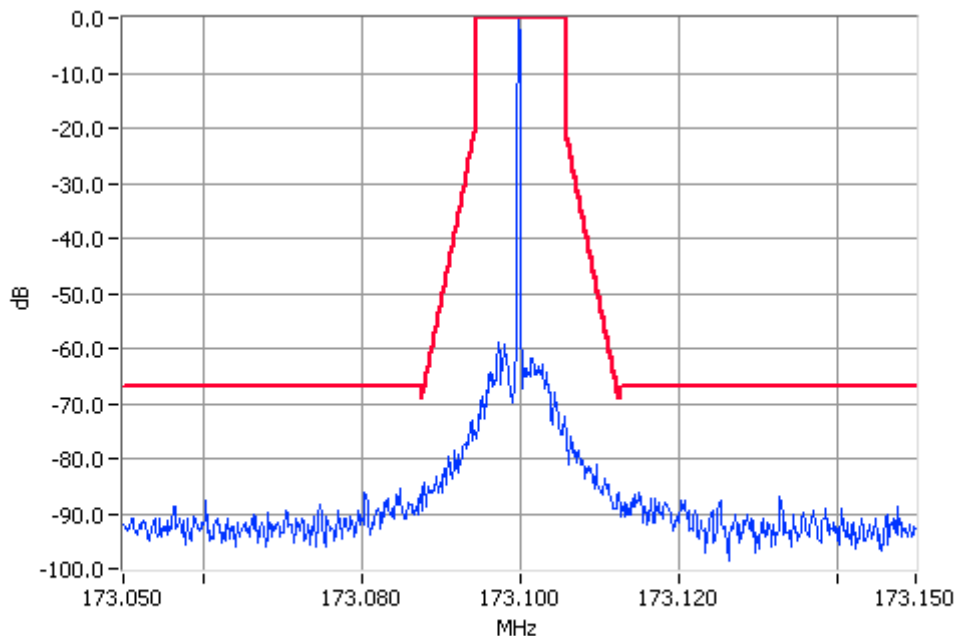
**Analogue Modulation 158.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Occupied Bandwidth and Spectrum Masks

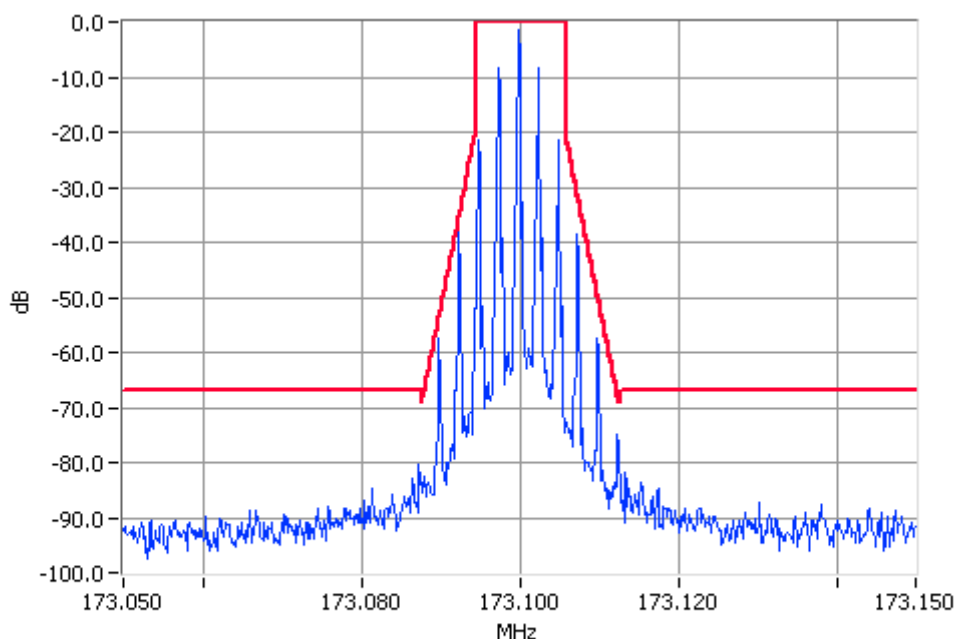
ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 173.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



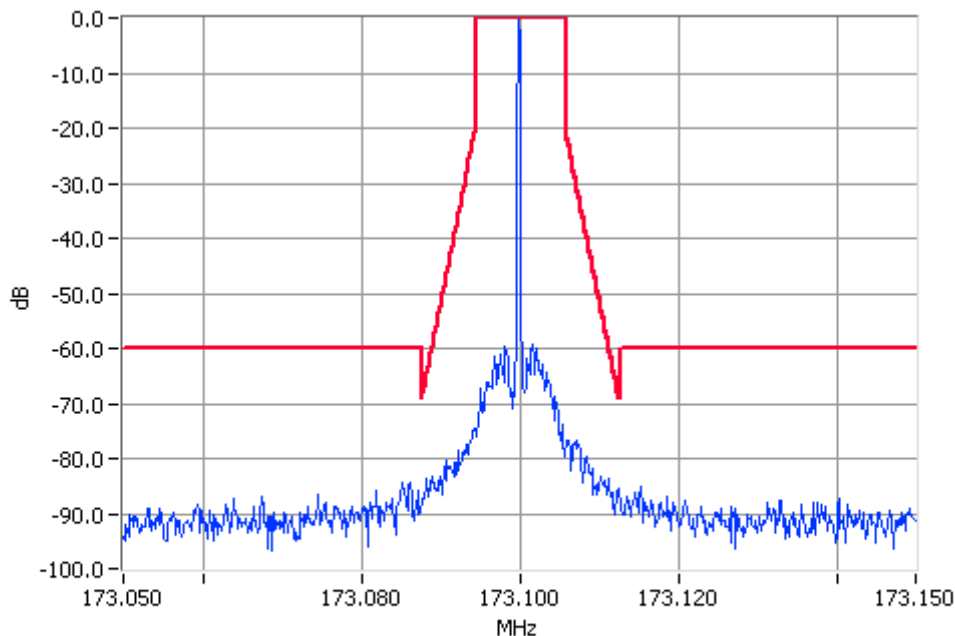
Analogue Modulation 173.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

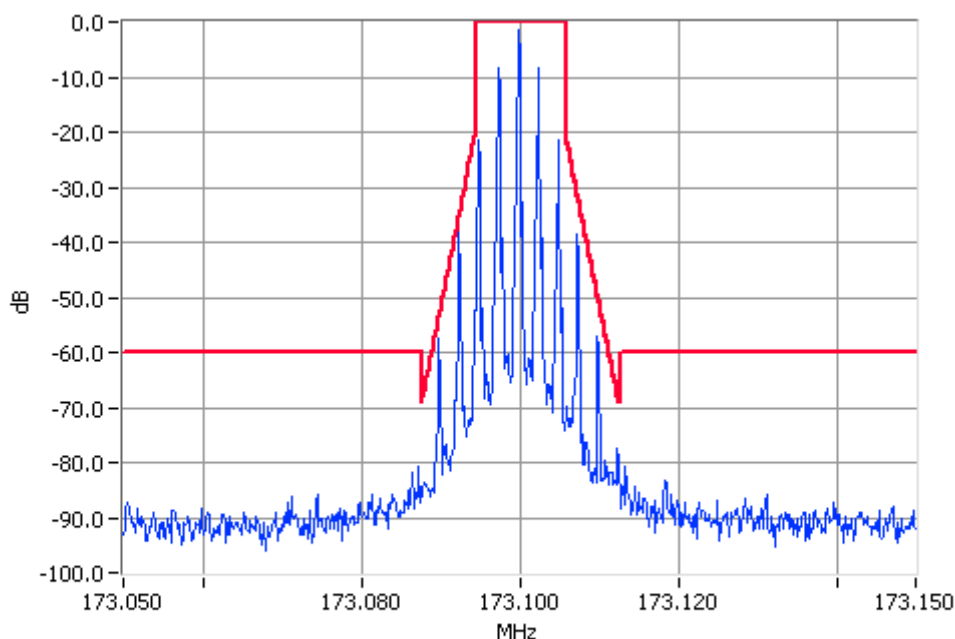
ANALOG VOICE

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 173.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



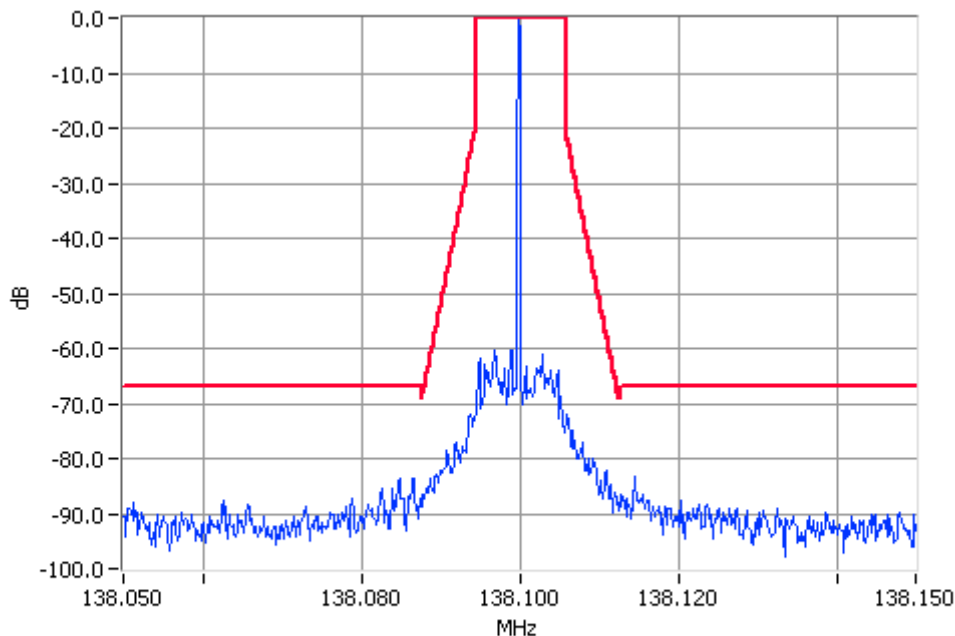
Analogue Modulation 173.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

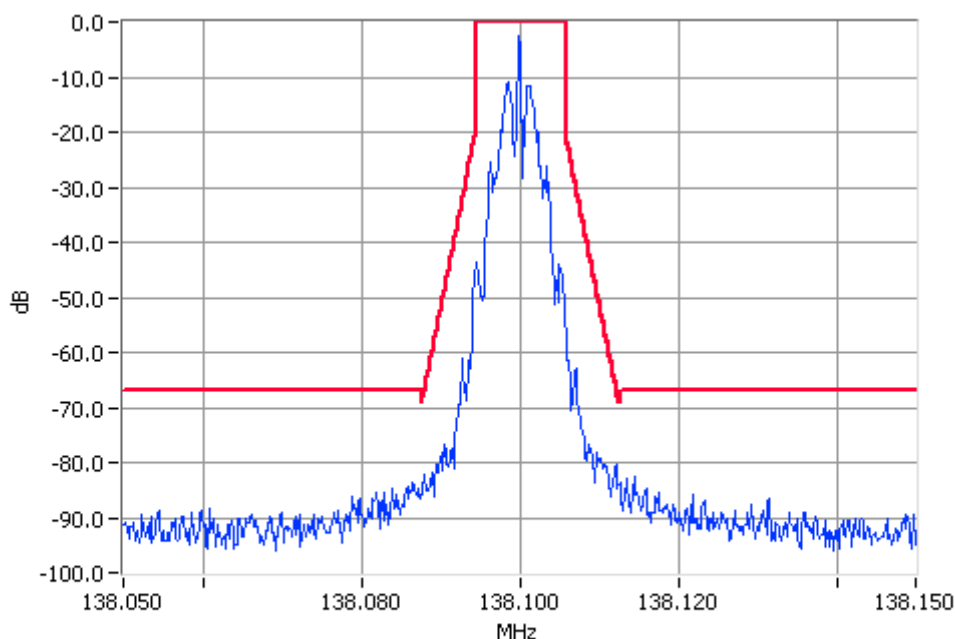
FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 138.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



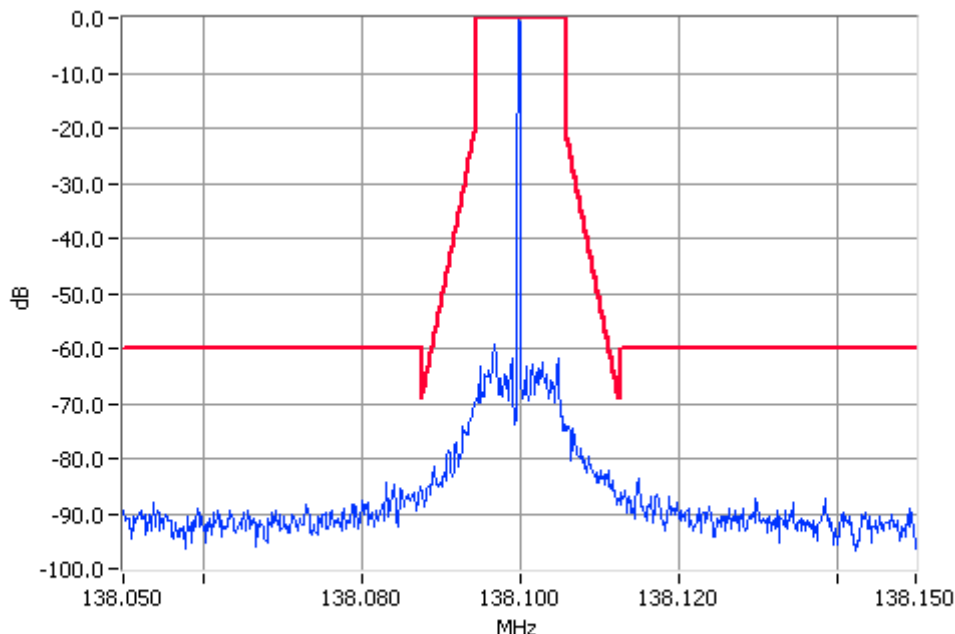
FFSK 1200 138.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

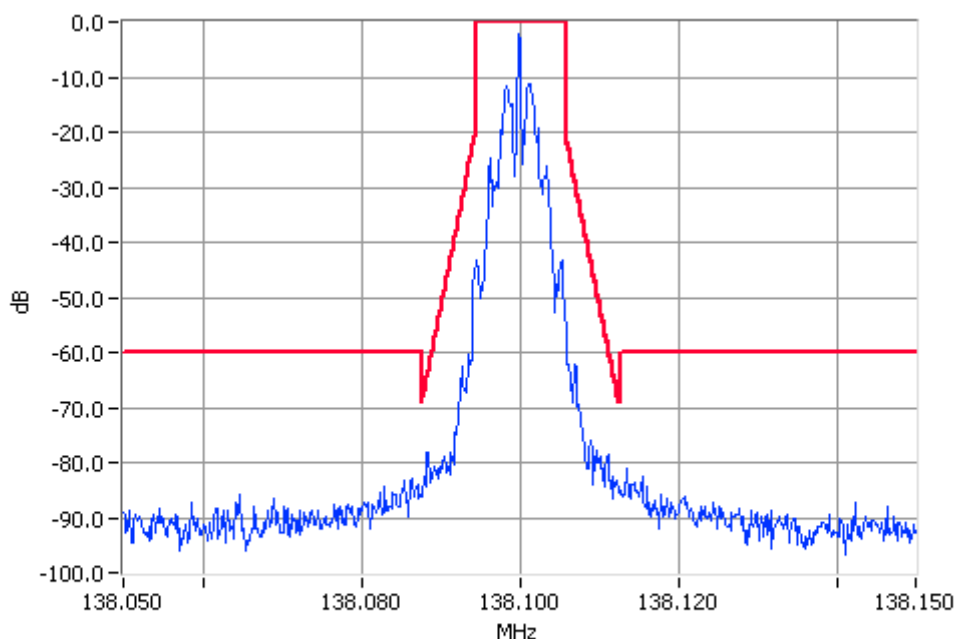
FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 138.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



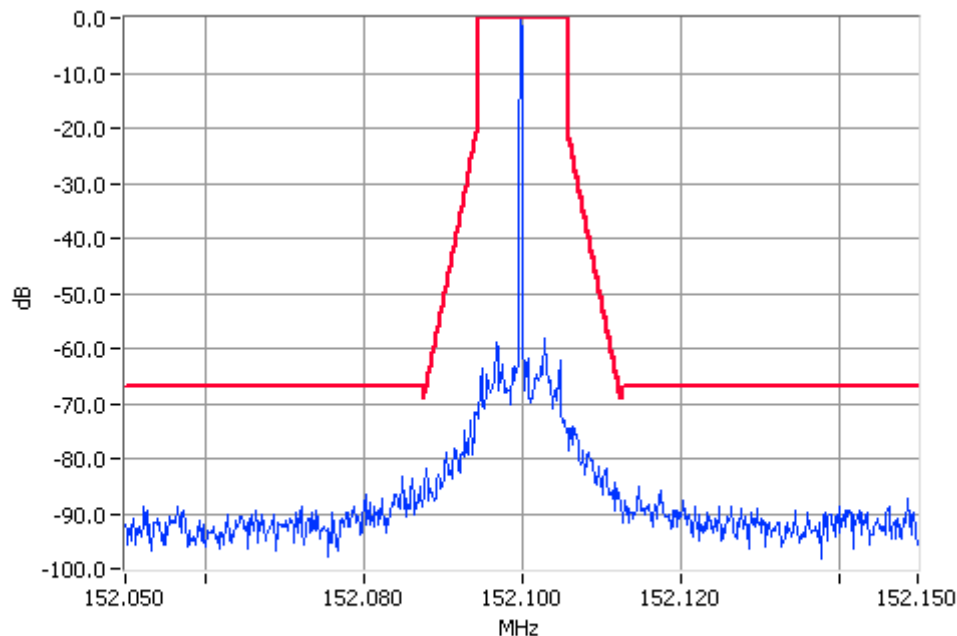
FFSK 1200 138.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

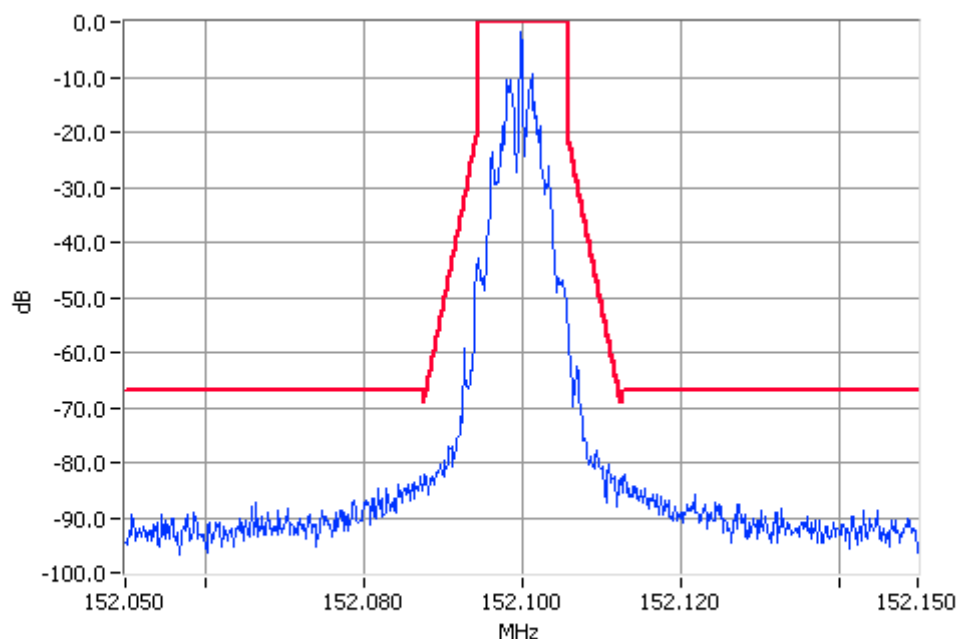
FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 152.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



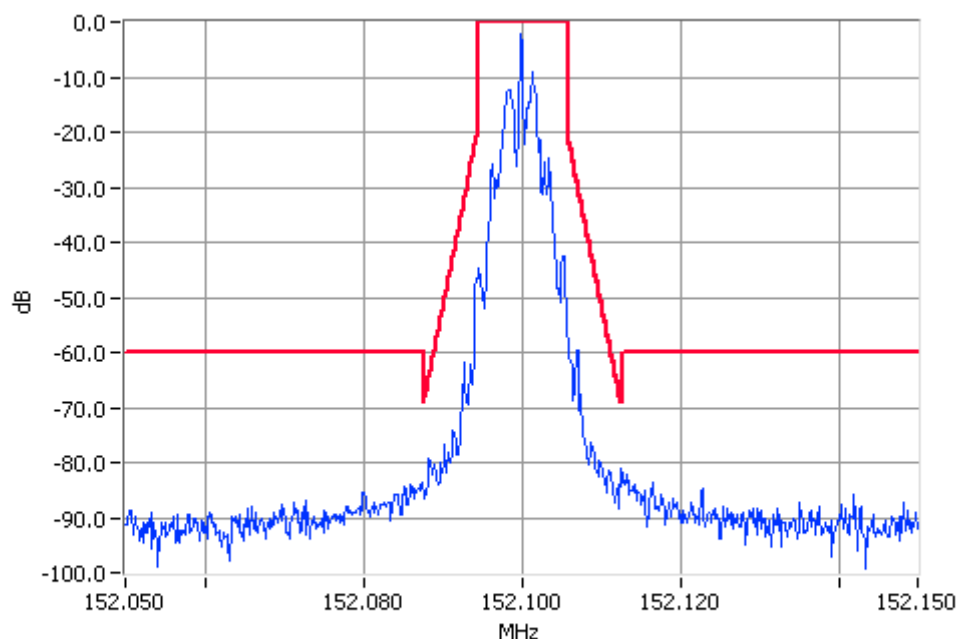
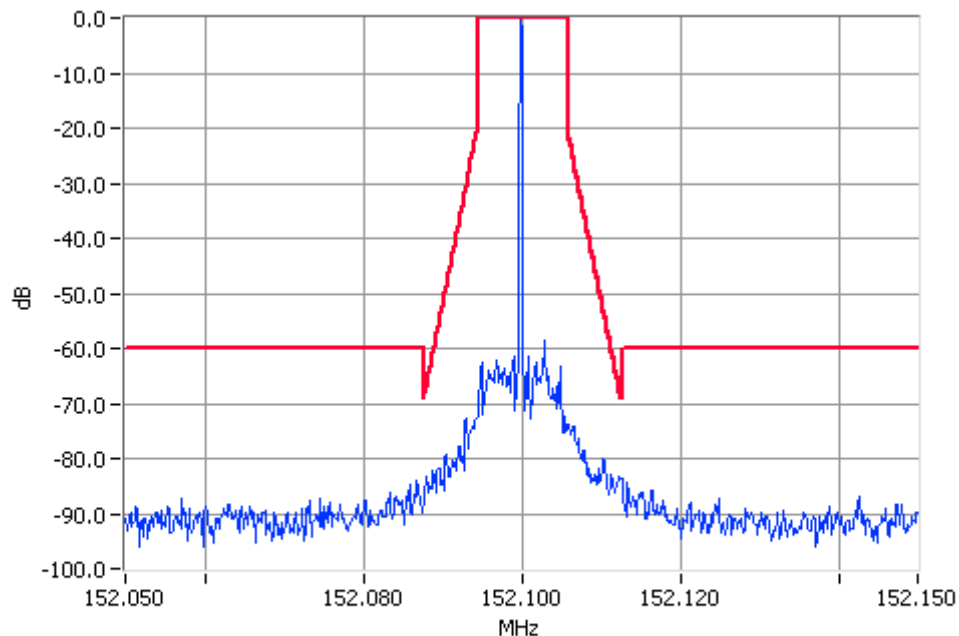
FFSK 1200 152.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 10 W 12.5 kHz Channel Spacing

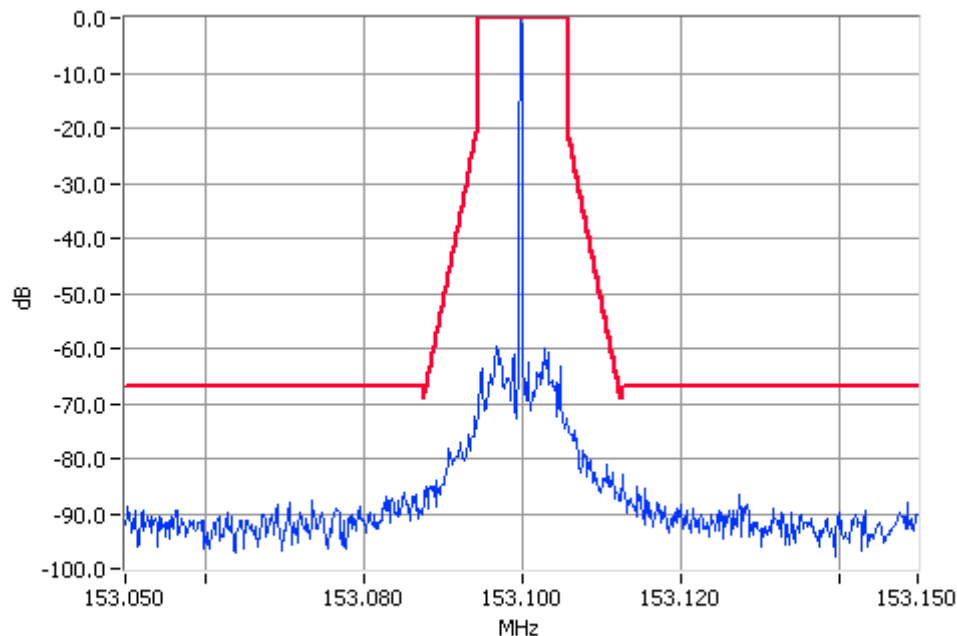


Occupied Bandwidth and Spectrum Masks

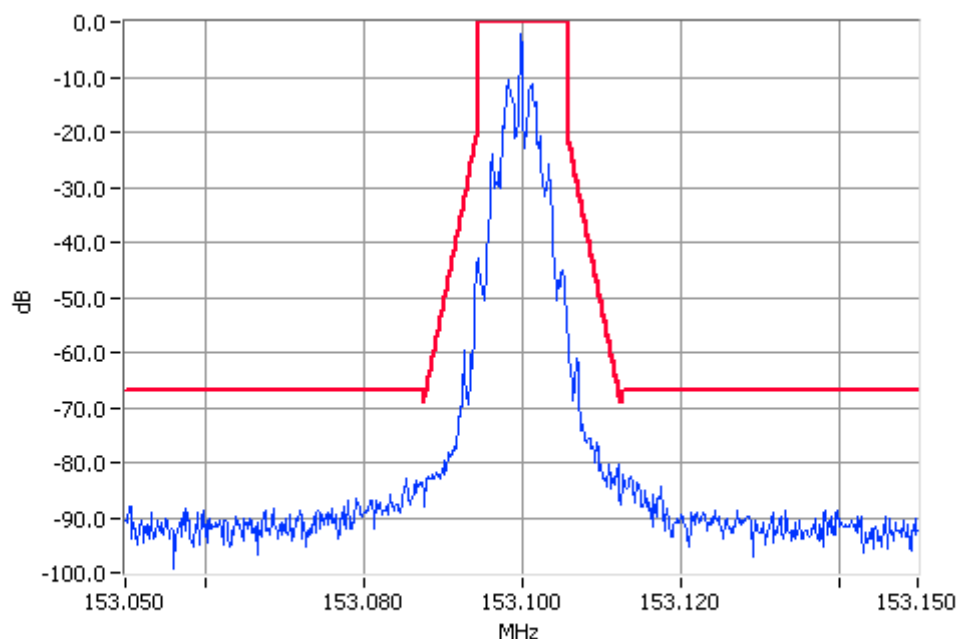
FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 153.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



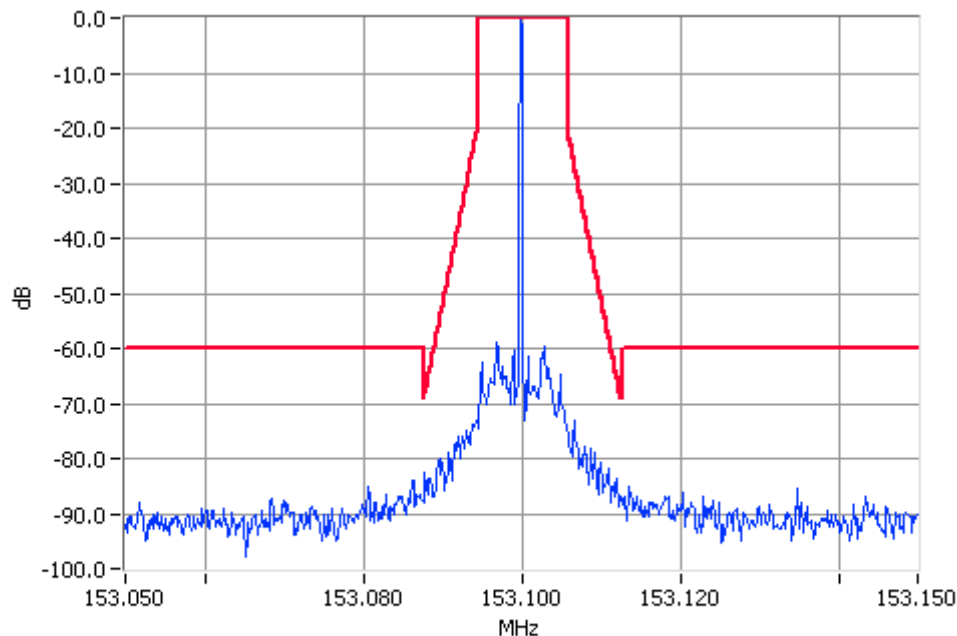
FFSK 1200 153.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

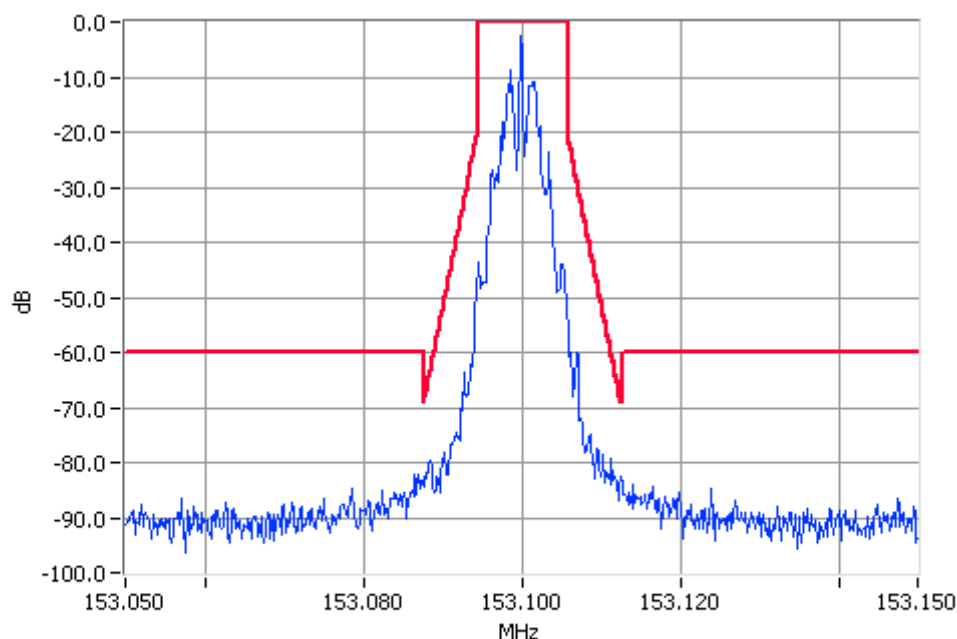
FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 153.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



FFSK 1200 153.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

# TELTEST Laboratories

Tait Communications

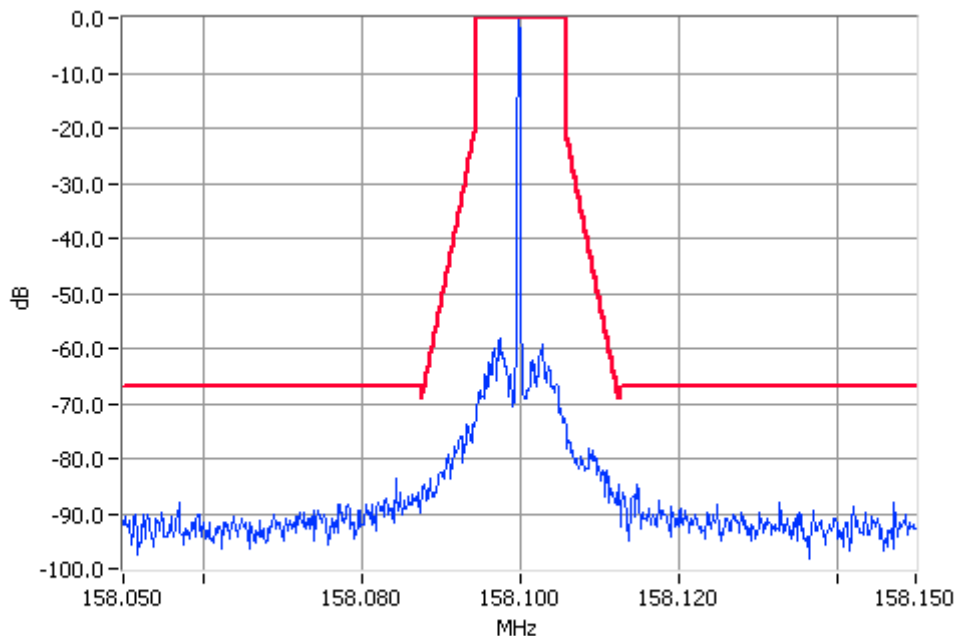
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

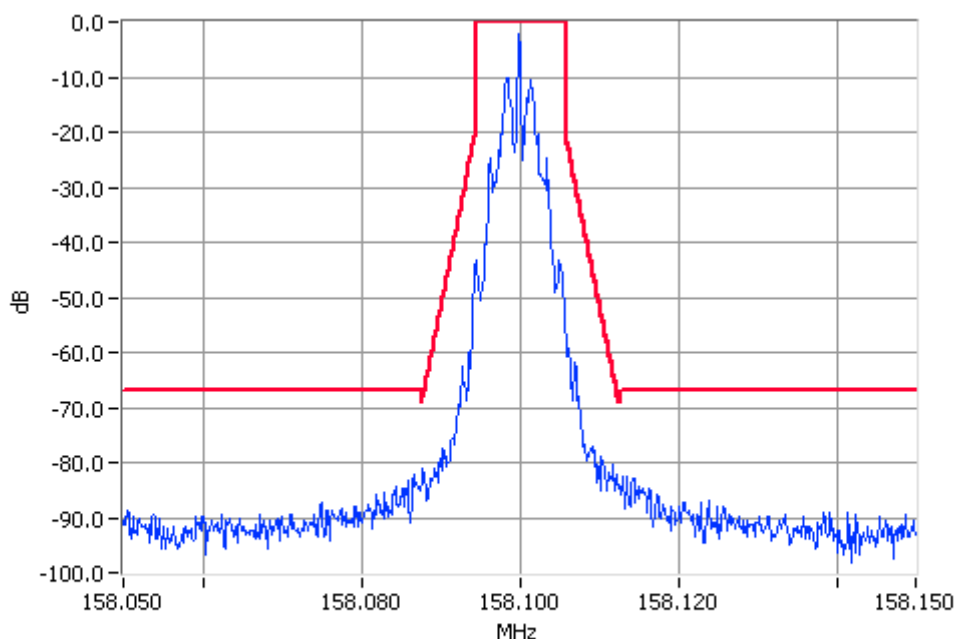
FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 158.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



**FFSK 1200 158.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

# TELTEST Laboratories

Tait Communications

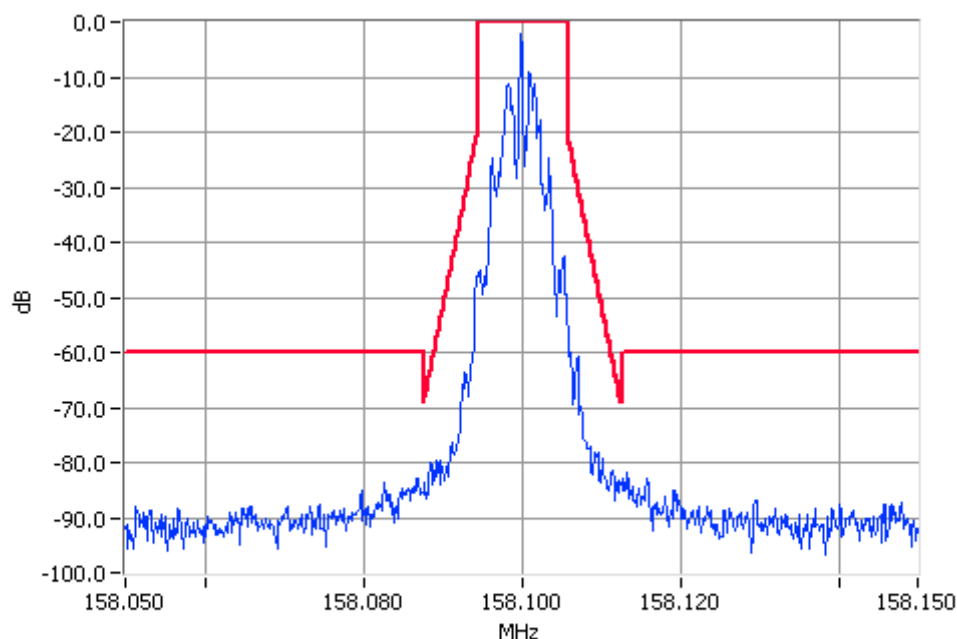
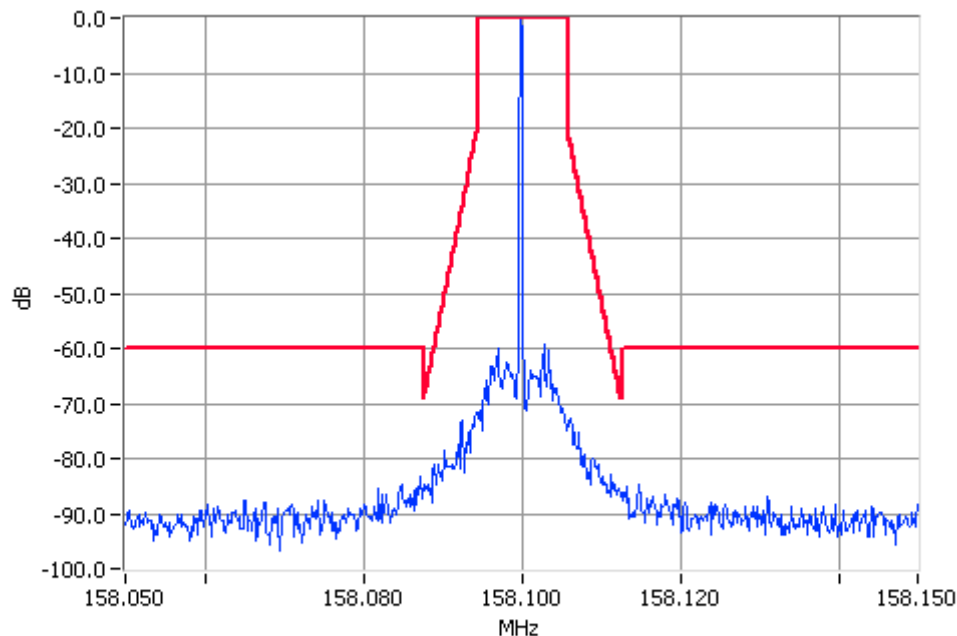
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 10 W 12.5 kHz Channel Spacing



# TELTEST Laboratories

Tait Communications

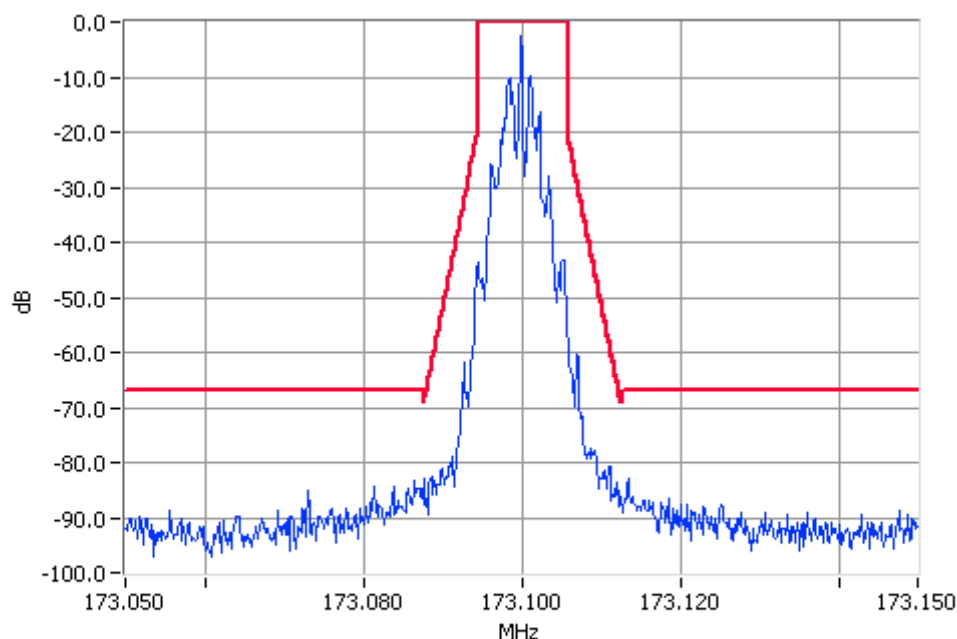
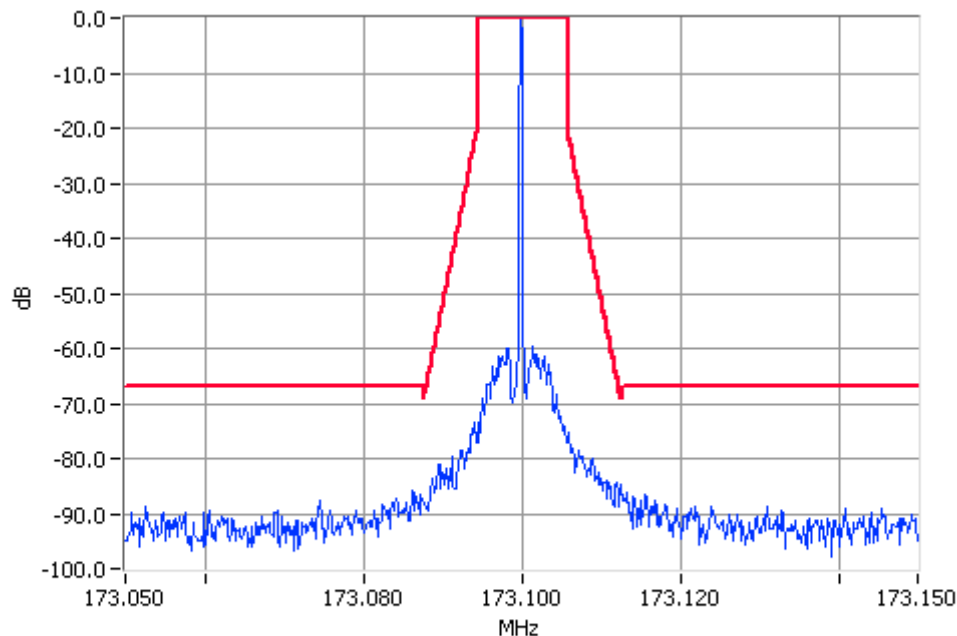
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 50 W 12.5 kHz Channel Spacing

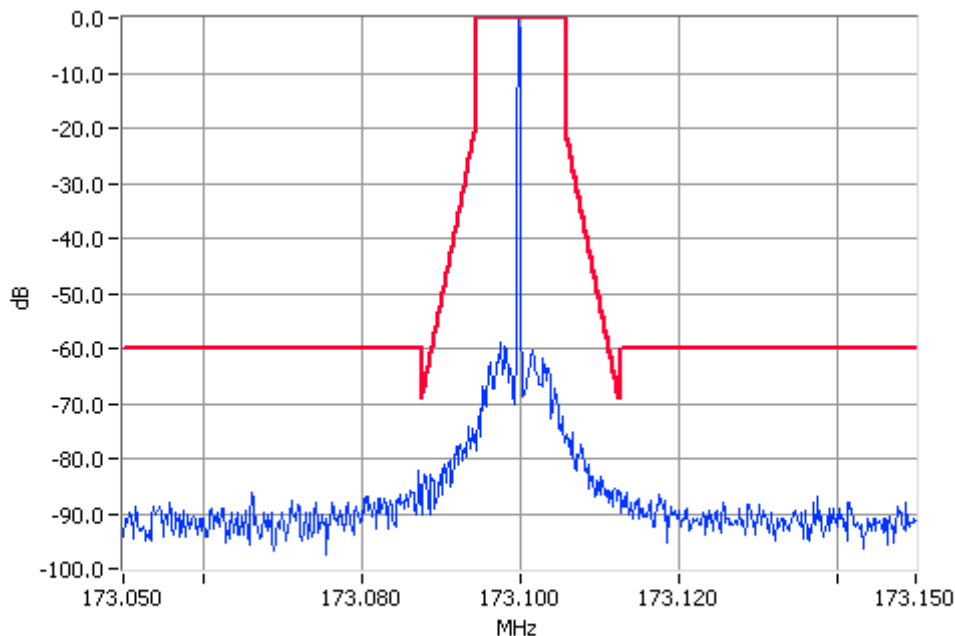


Occupied Bandwidth and Spectrum Masks

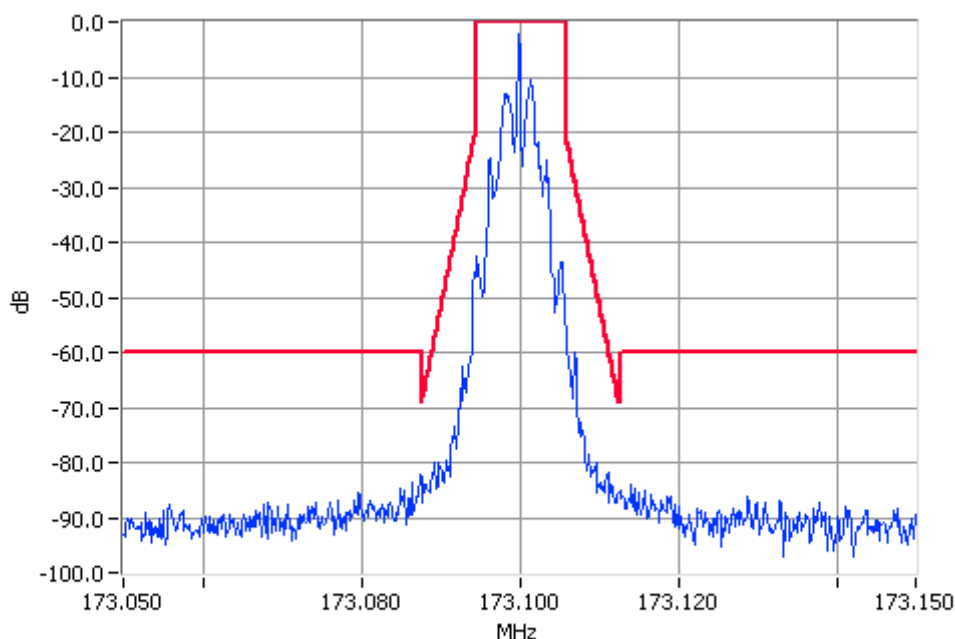
FFSK – 1200 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 173.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



FFSK 1200 173.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

# TELTEST Laboratories

Tait Communications

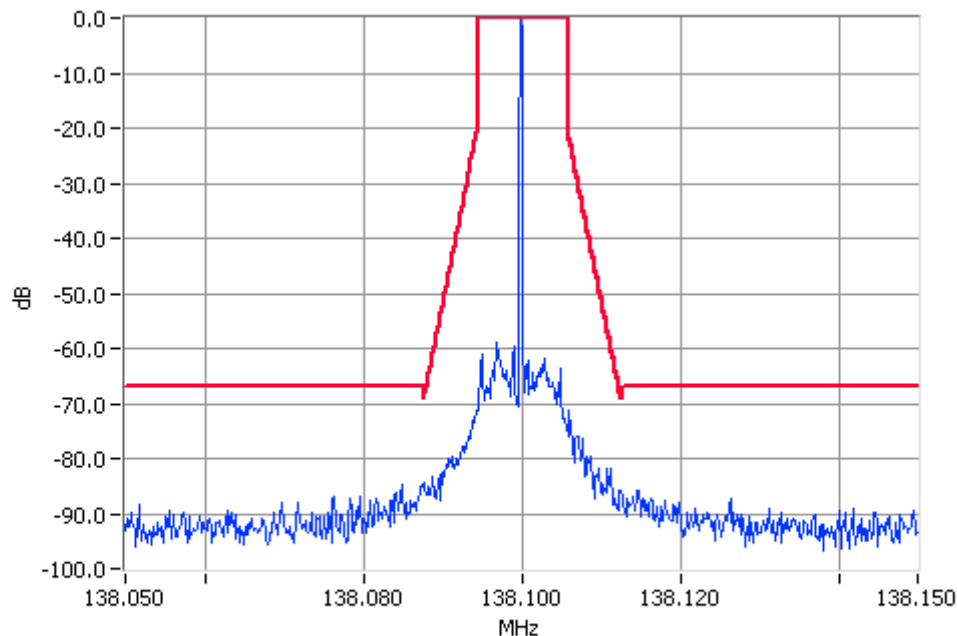
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

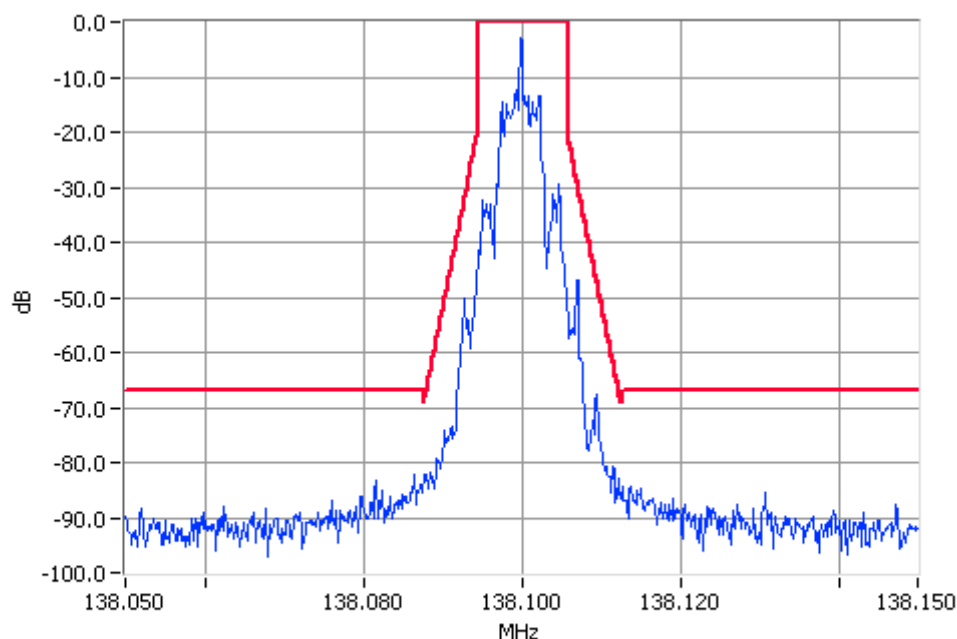
FFSK – 2400 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 138.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



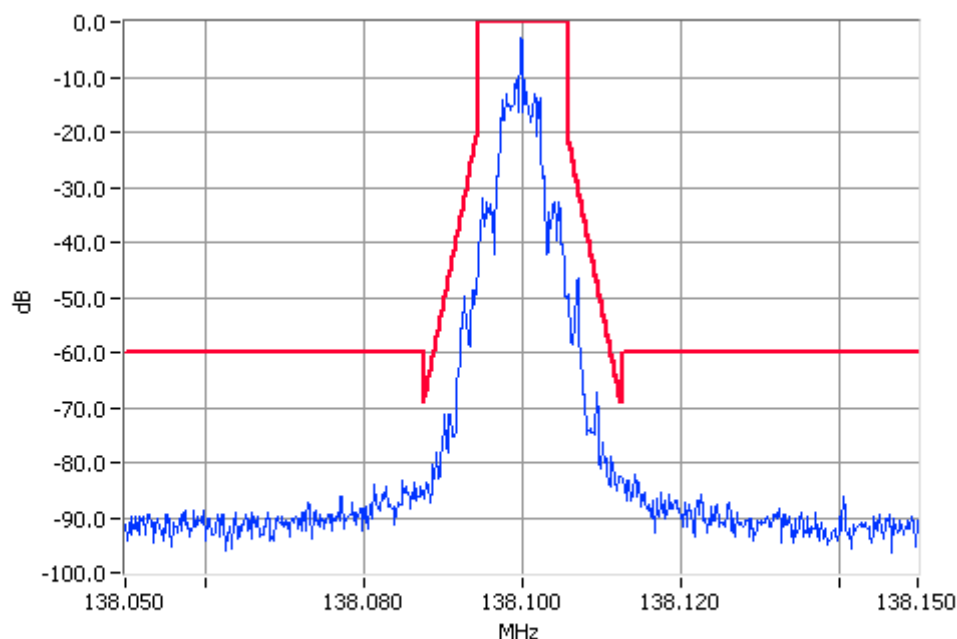
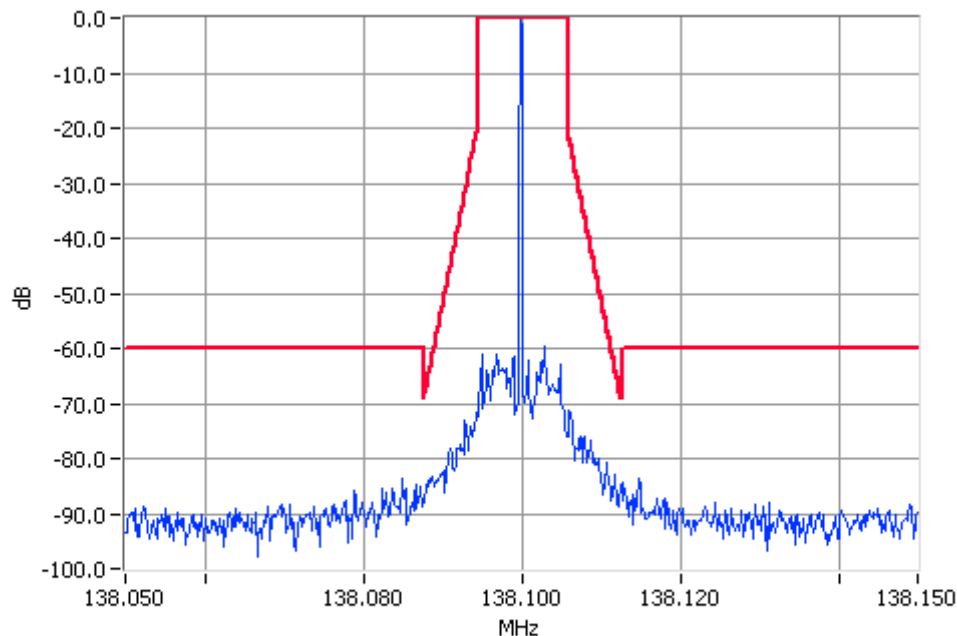
**FFSK 2400 138.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

SPECIFICATION: CFR 47CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 10 W 12.5 kHz Channel Spacing



# TELTEST Laboratories

Tait Communications

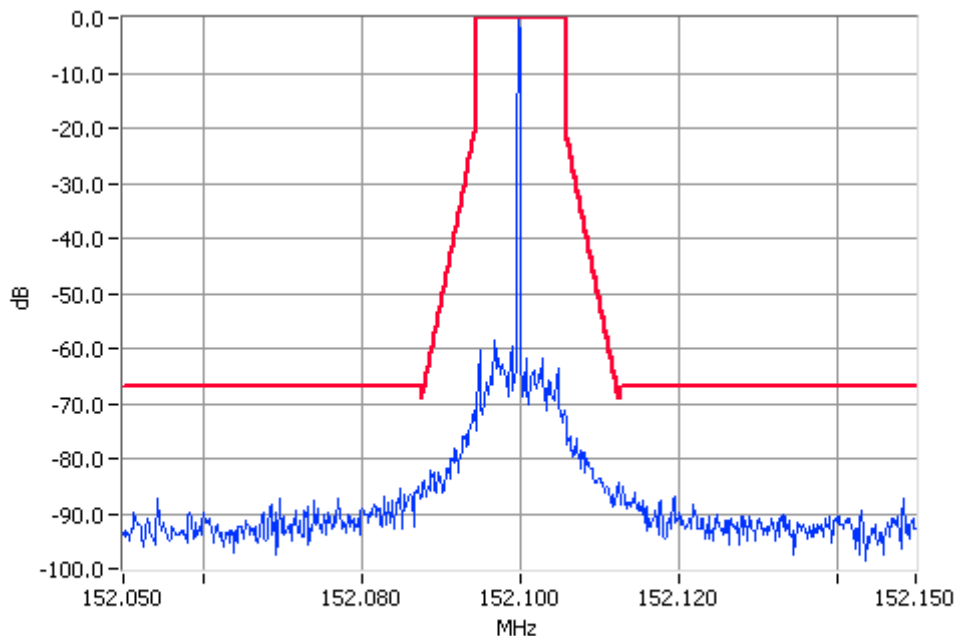
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

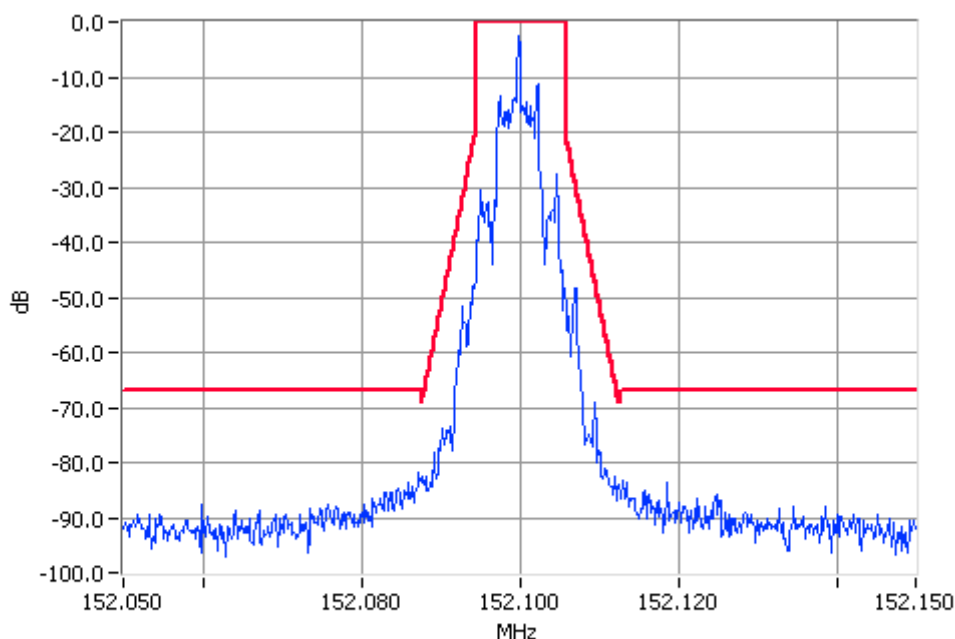
FFSK – 2400 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 152.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



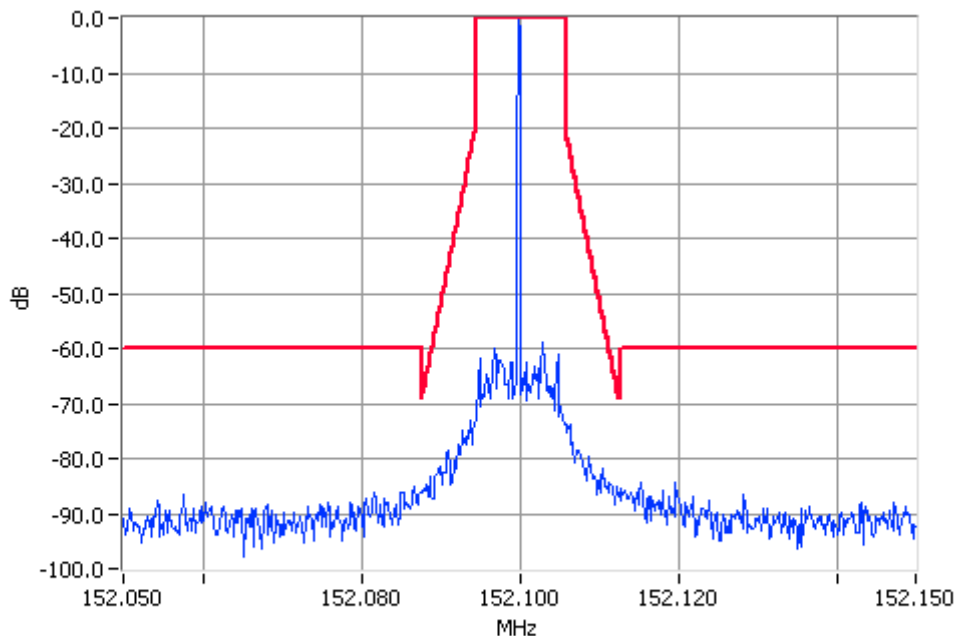
**FFSK 2400 152.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Occupied Bandwidth and Spectrum Masks

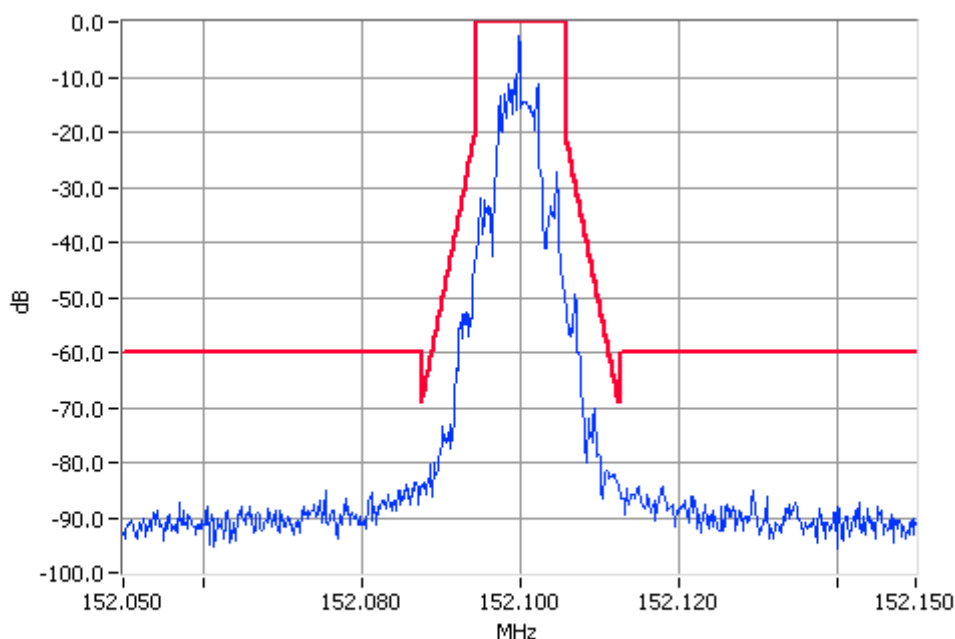
FFSK – 2400 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 152.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



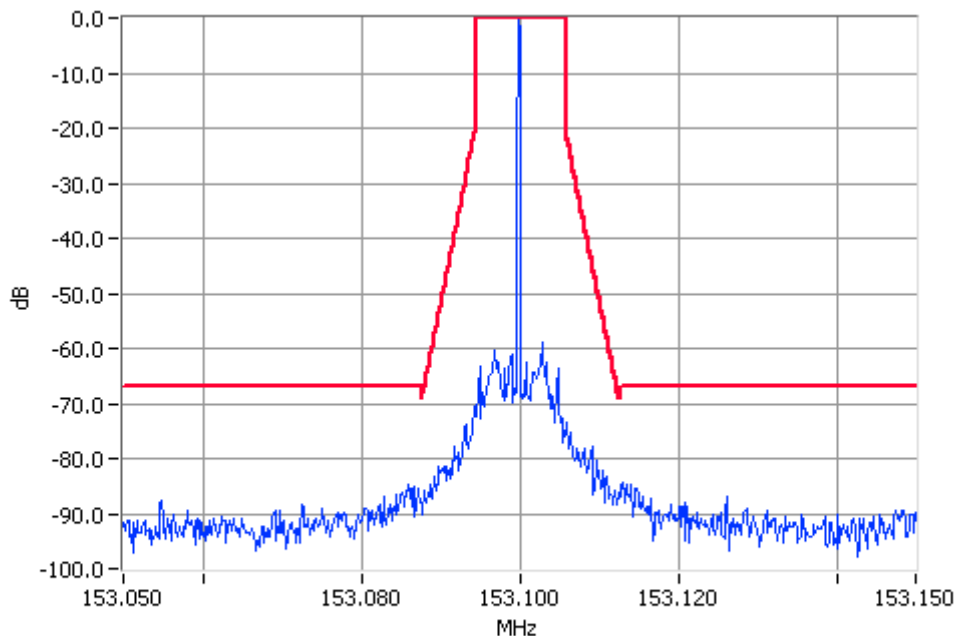
FFSK 2400 152.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

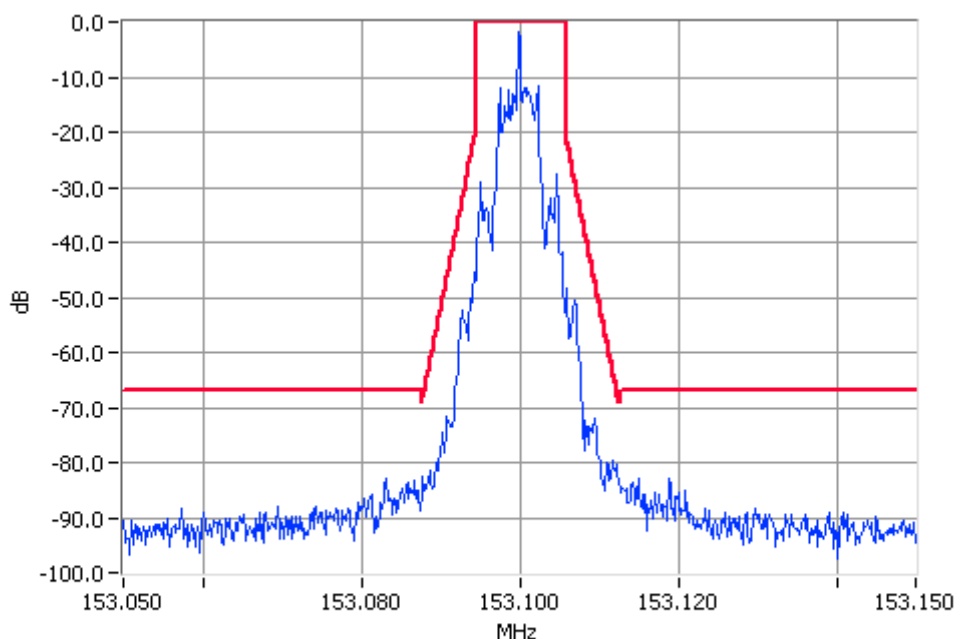
FFSK – 2400 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 153.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



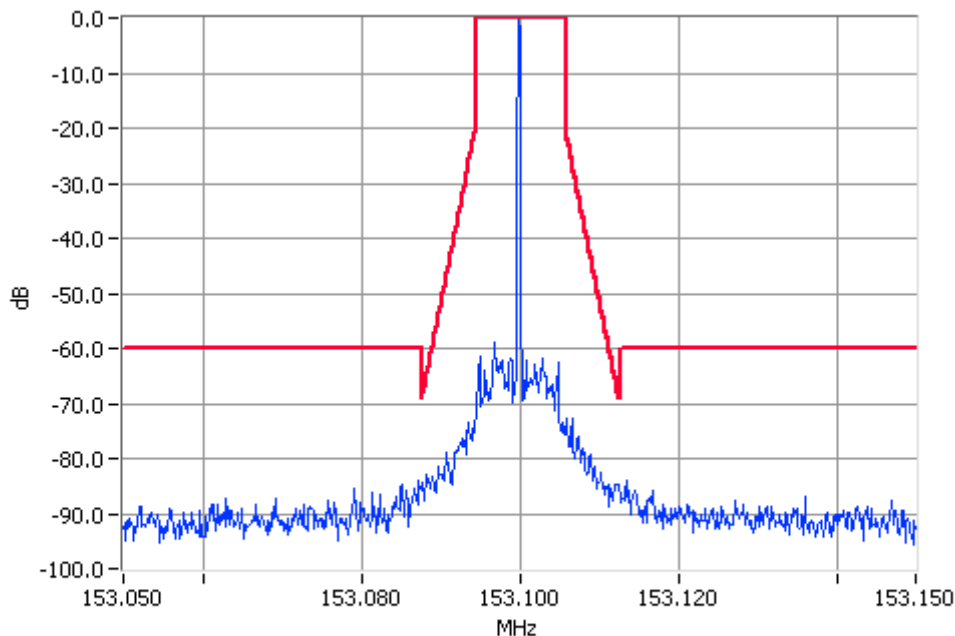
FFSK 2400 153.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

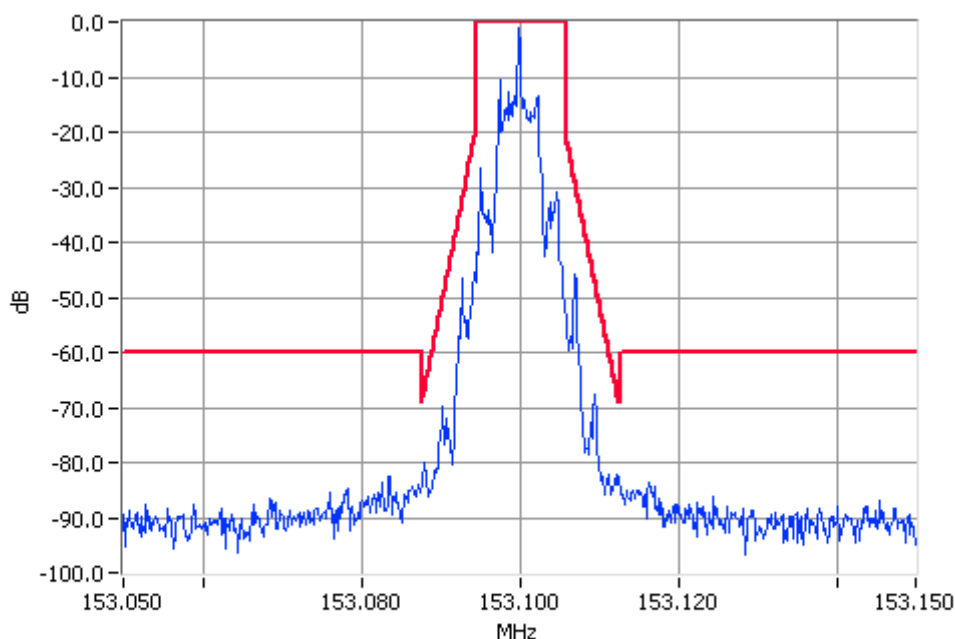
FFSK – 2400 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 153.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



FFSK 2400 153.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

# TELTEST Laboratories

Tait Communications

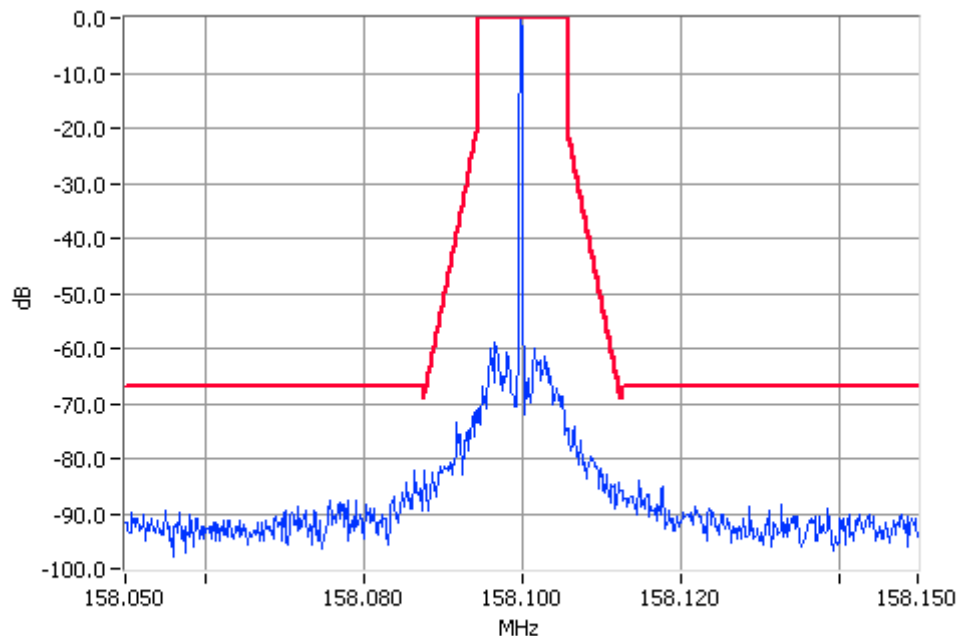
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

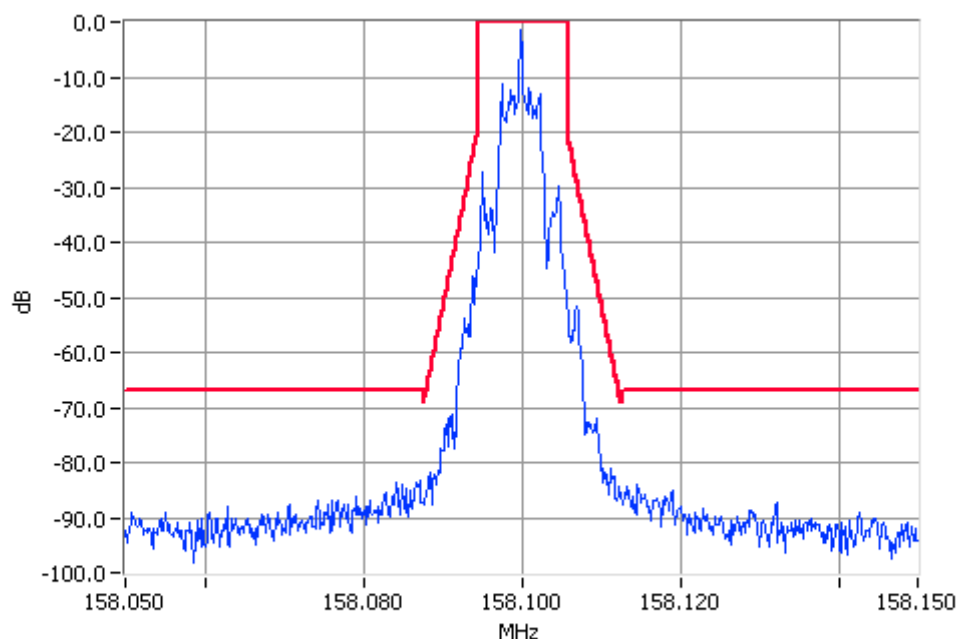
FFSK – 2400 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 158.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



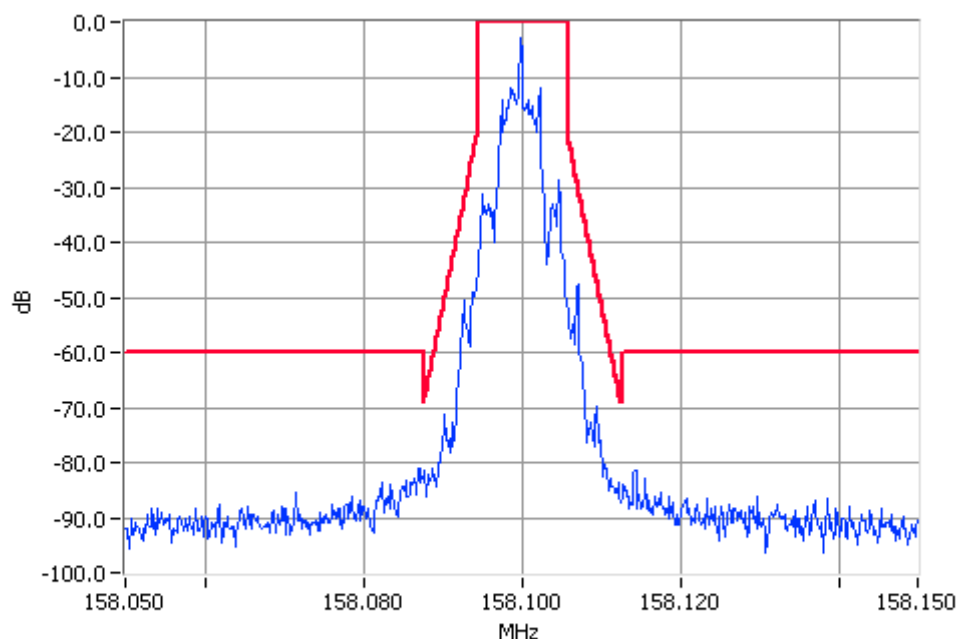
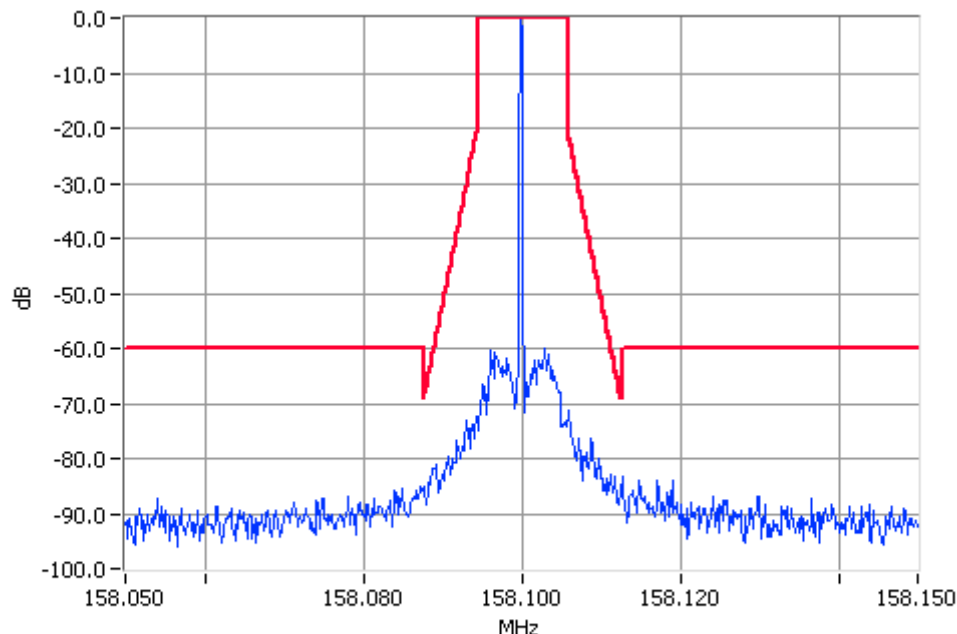
**FFSK 2400 158.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 10 W 12.5 kHz Channel Spacing



# TELTEST Laboratories

Tait Communications

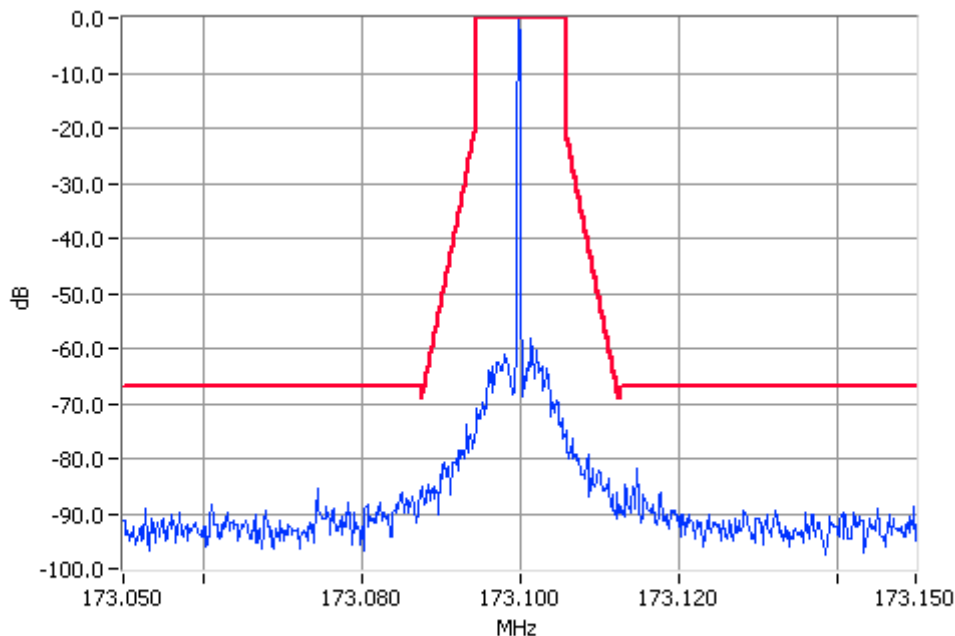
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

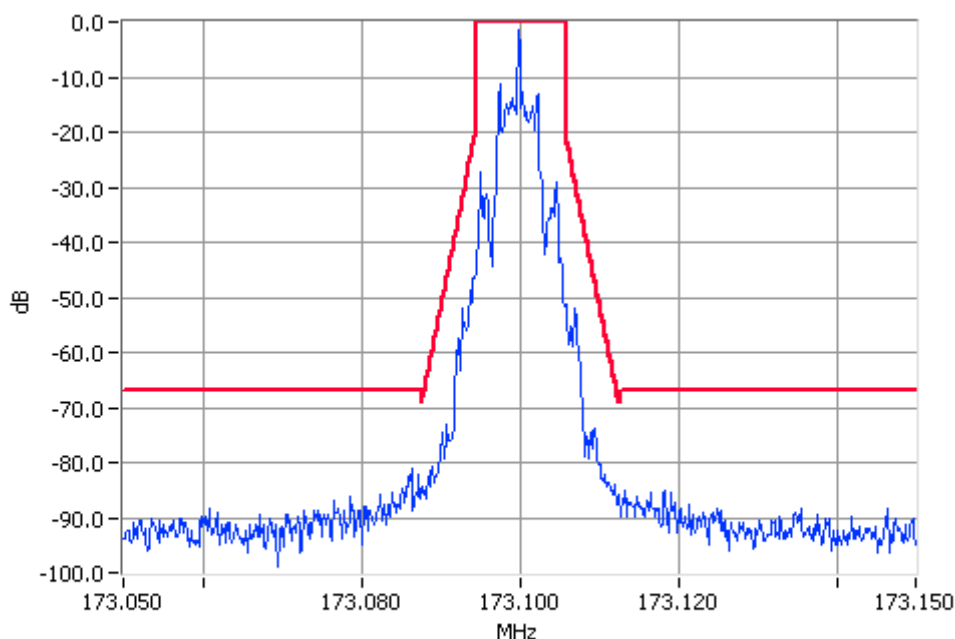
FFSK – 2400 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 173.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



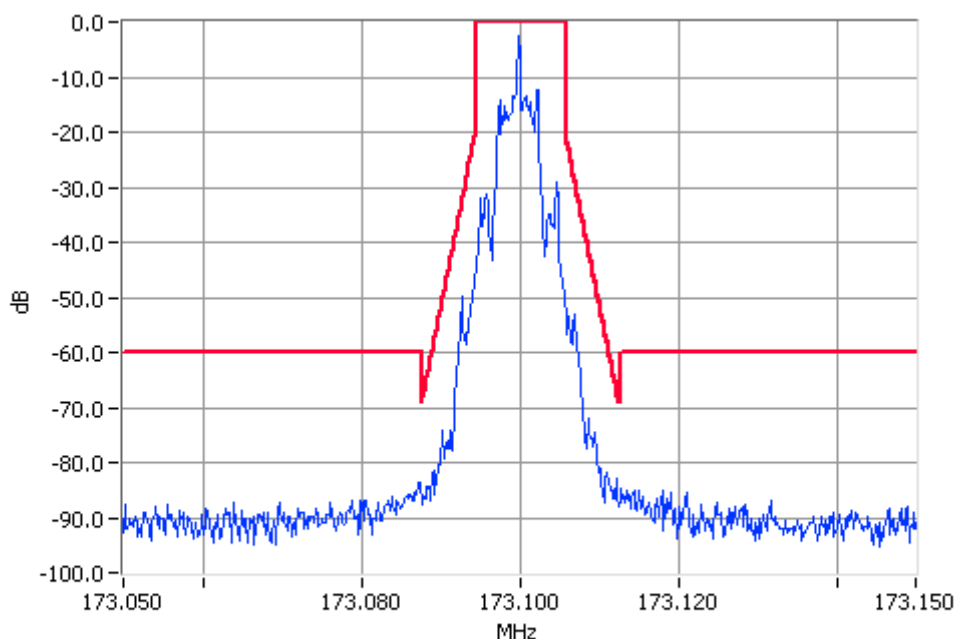
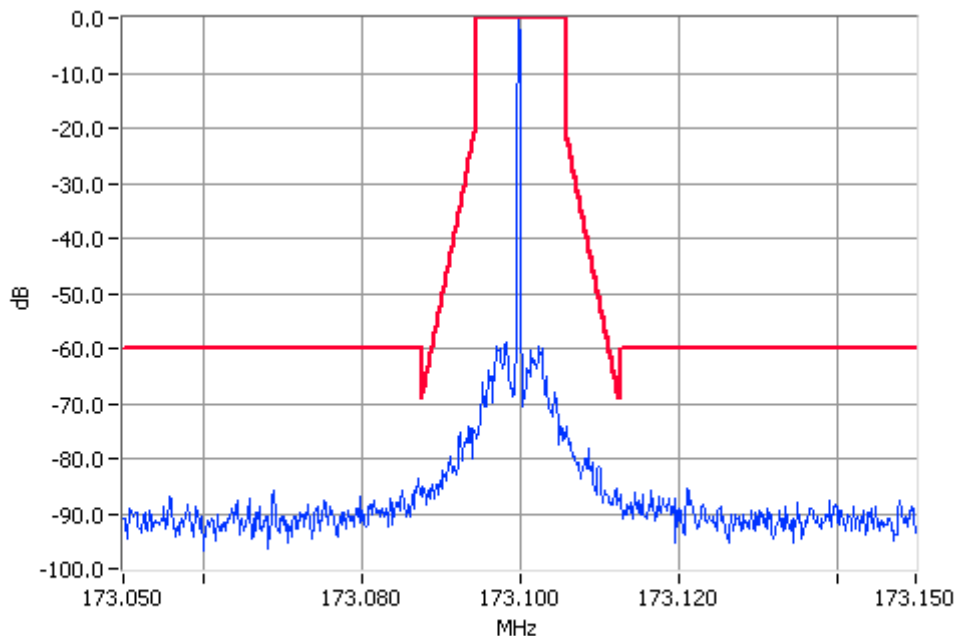
**FFSK 2400 173.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 10 W 12.5 kHz Channel Spacing



# TELTEST Laboratories

Tait Communications

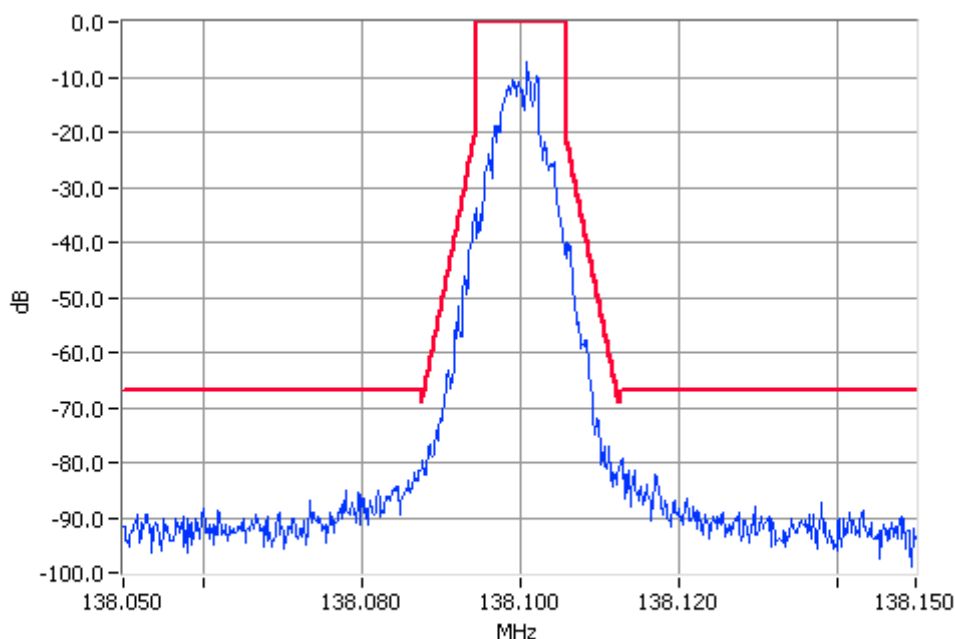
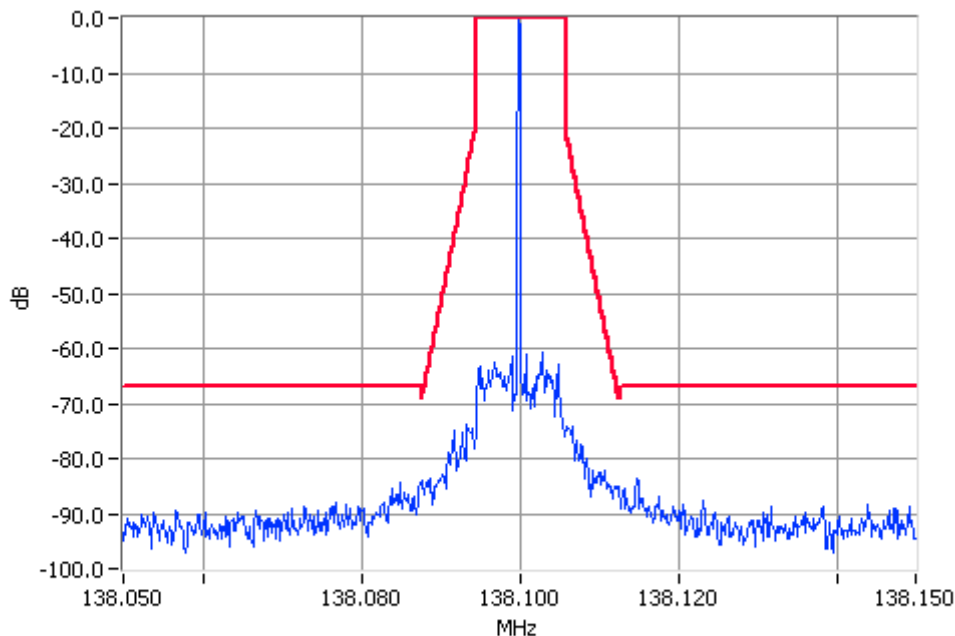
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 50 W 12.5 kHz Channel Spacing

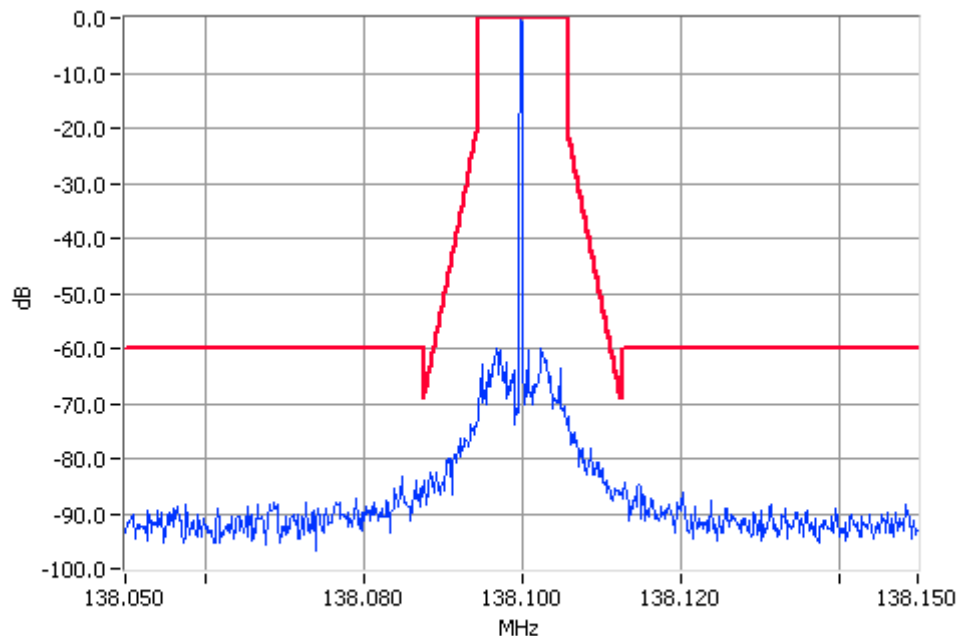


Occupied Bandwidth and Spectrum Masks

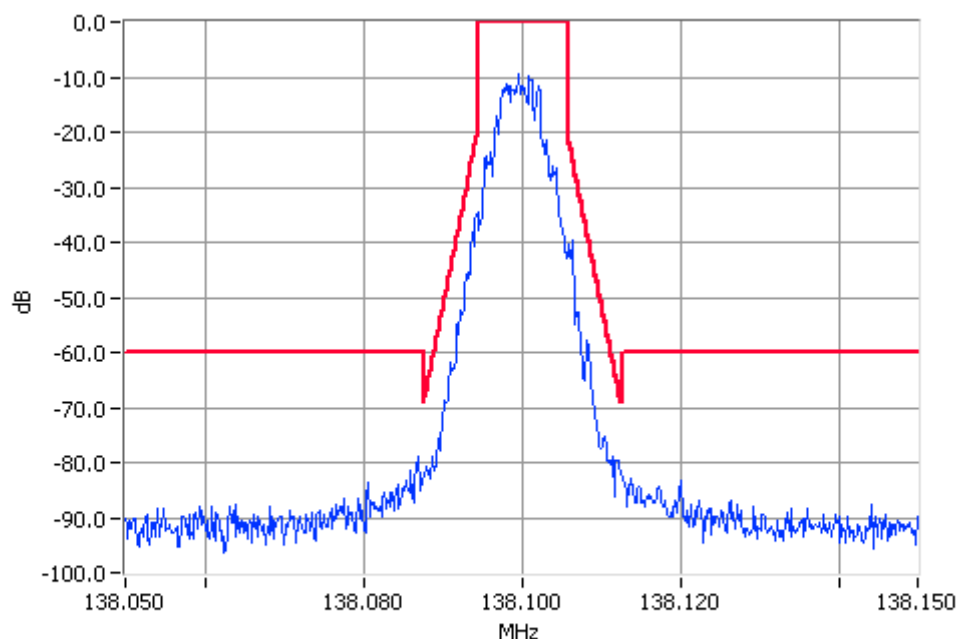
DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 138.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



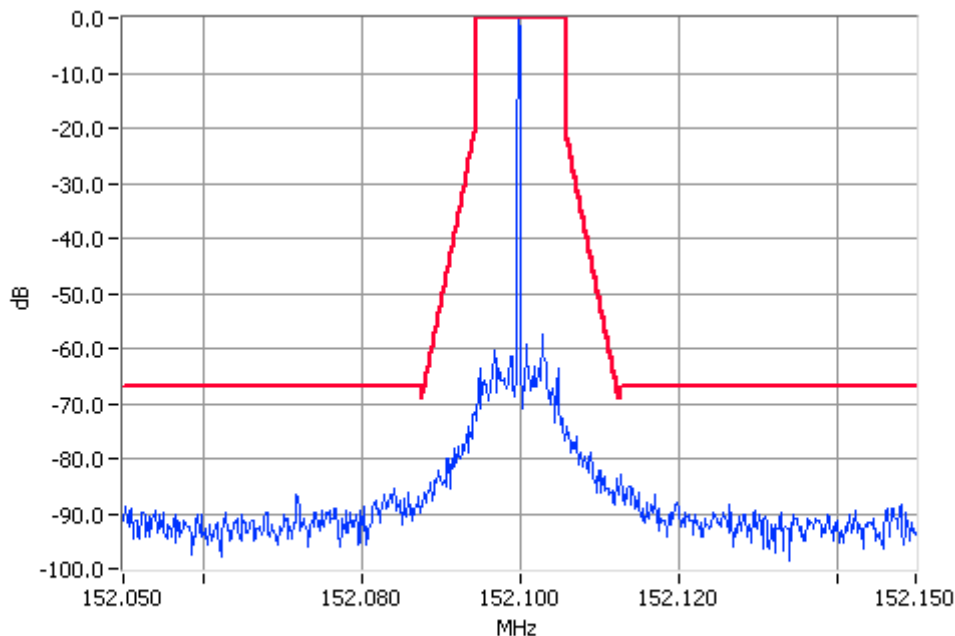
DMR 138.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

**Occupied Bandwidth and Spectrum Masks**

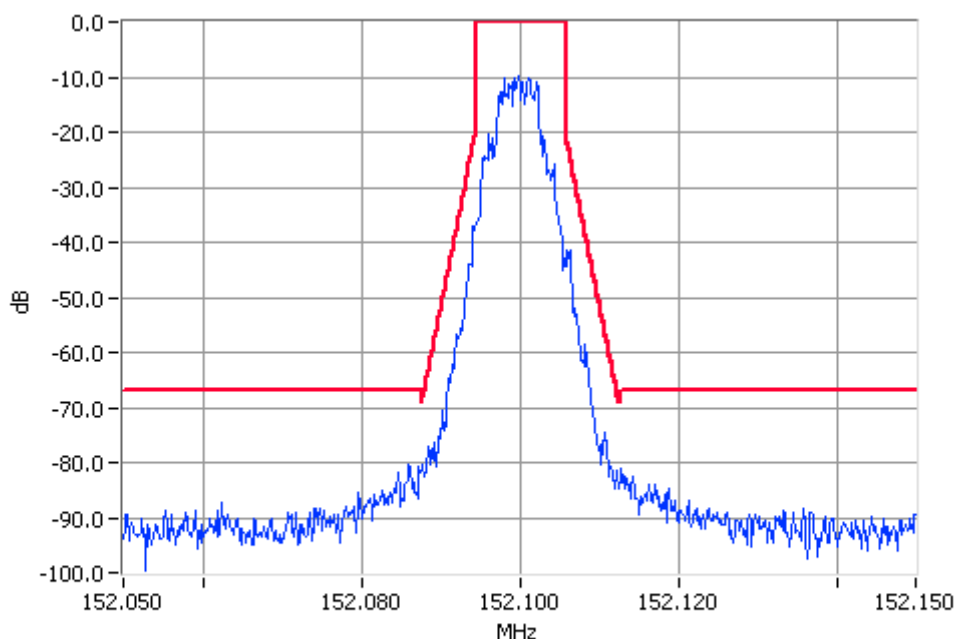
DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 152.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



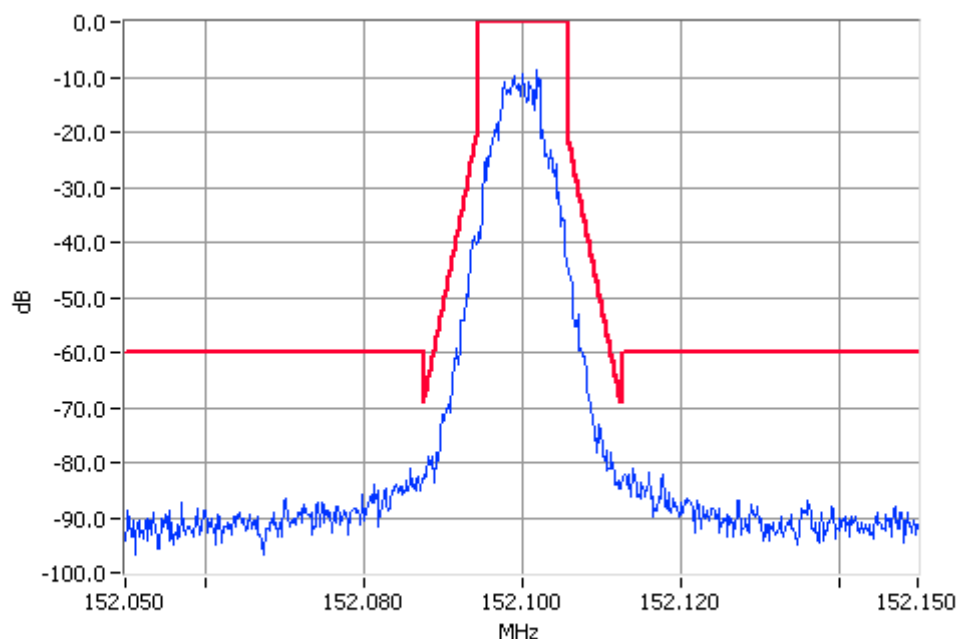
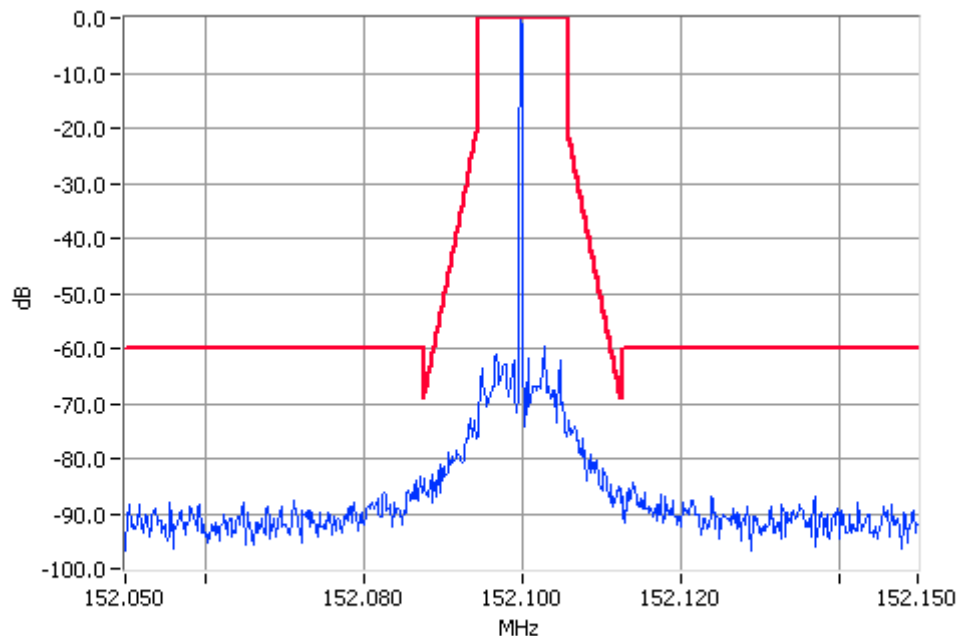
**DMR 152.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 10 W 12.5 kHz Channel Spacing



# TELTEST Laboratories

Tait Communications

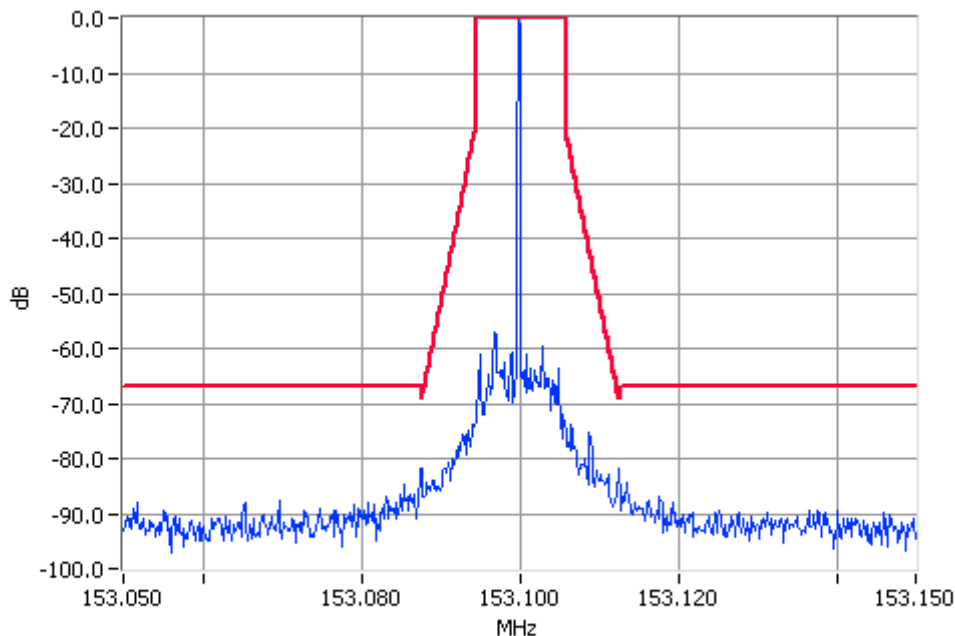
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

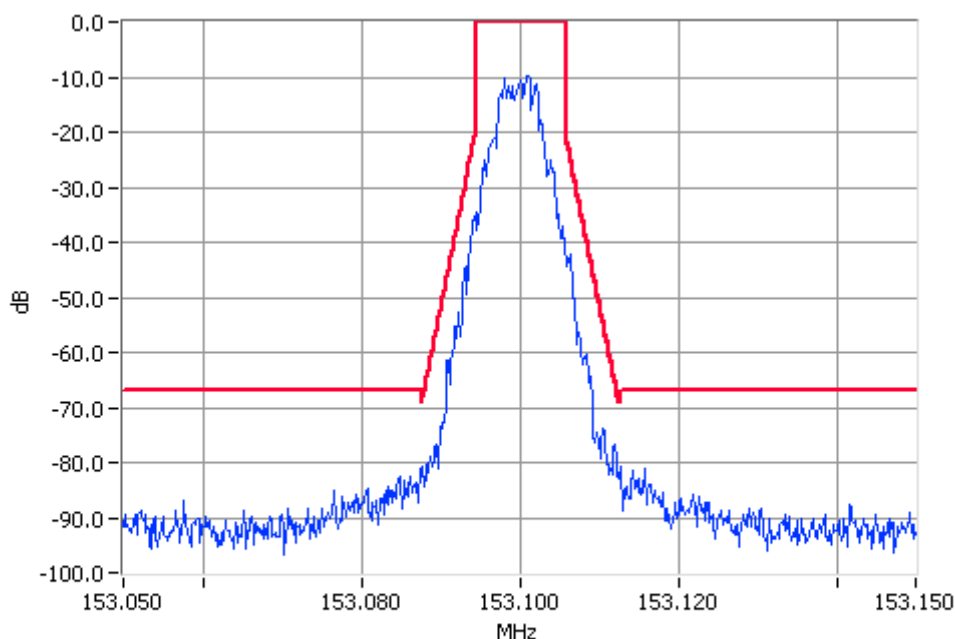
DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 153.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



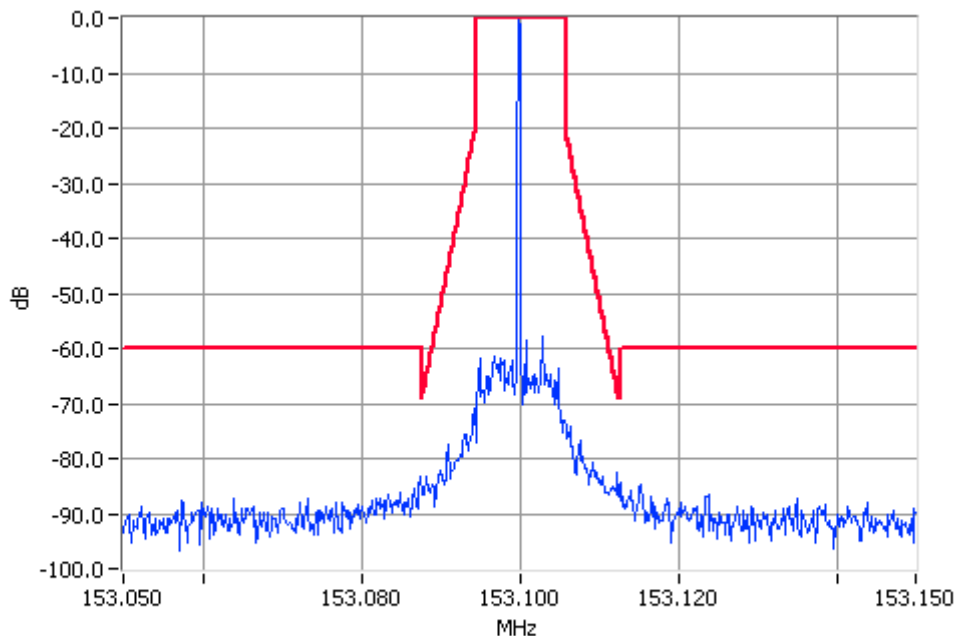
**DMR 153.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

# Occupied Bandwidth and Spectrum Masks

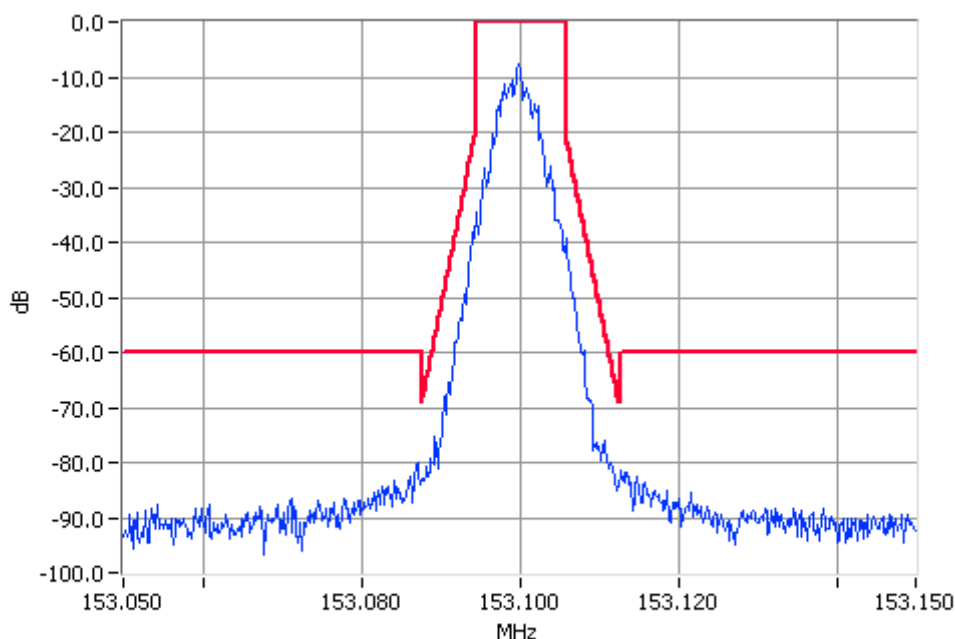
DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 10 W 12.5 kHz Channel Spacing



**Unmodulated 153.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



**DMR 153.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

# TELTEST Laboratories

Tait Communications

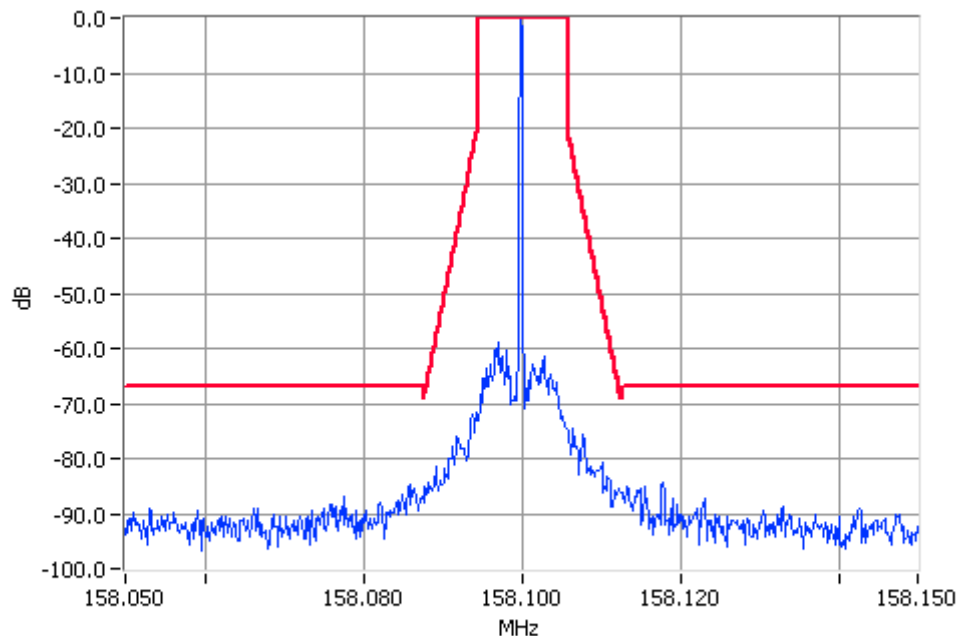
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

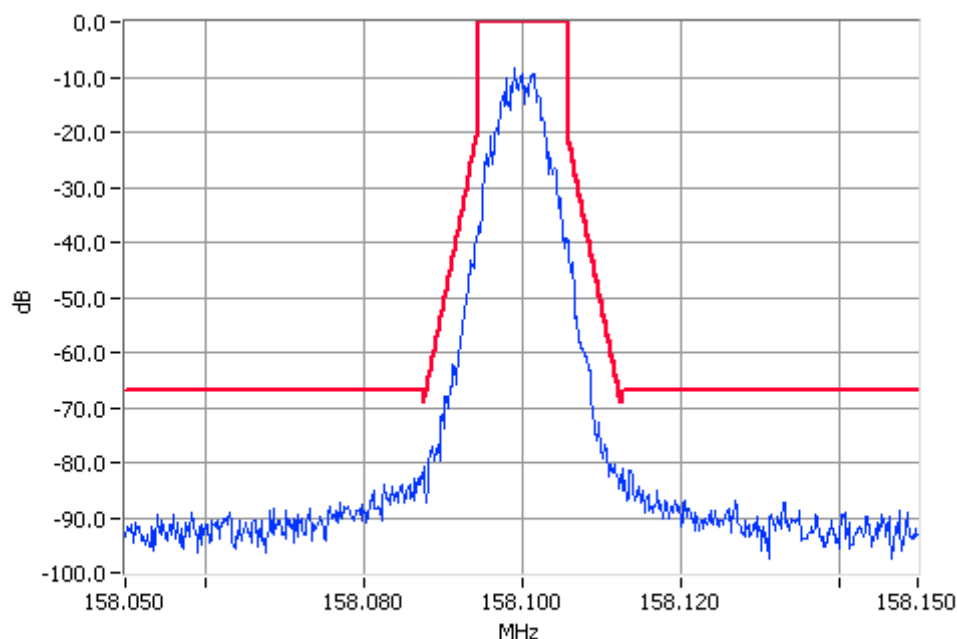
DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 158.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



**DMR 158.1000MHz Mask D 50W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

# TELTEST Laboratories

Tait Communications

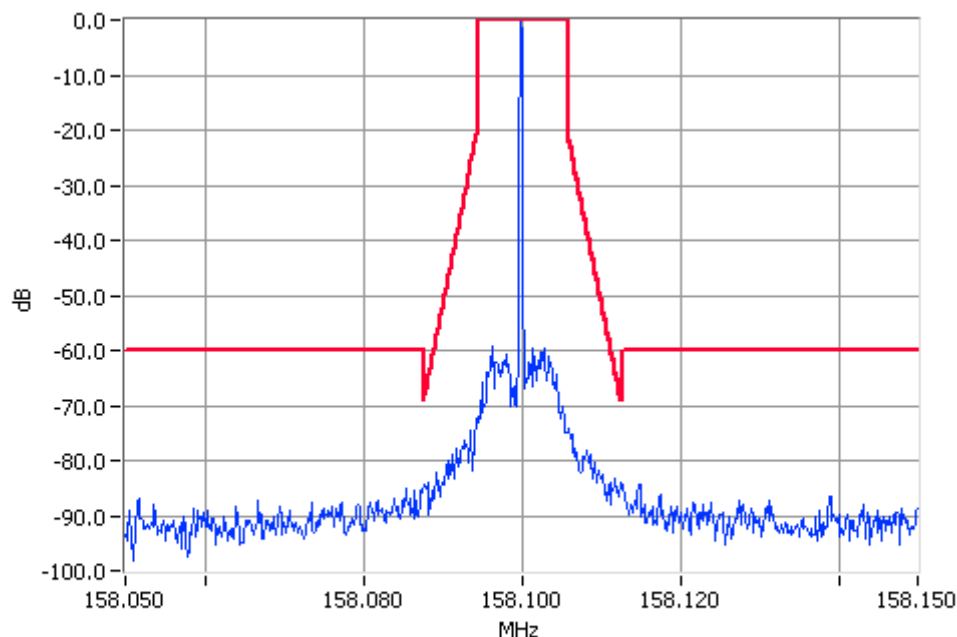
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

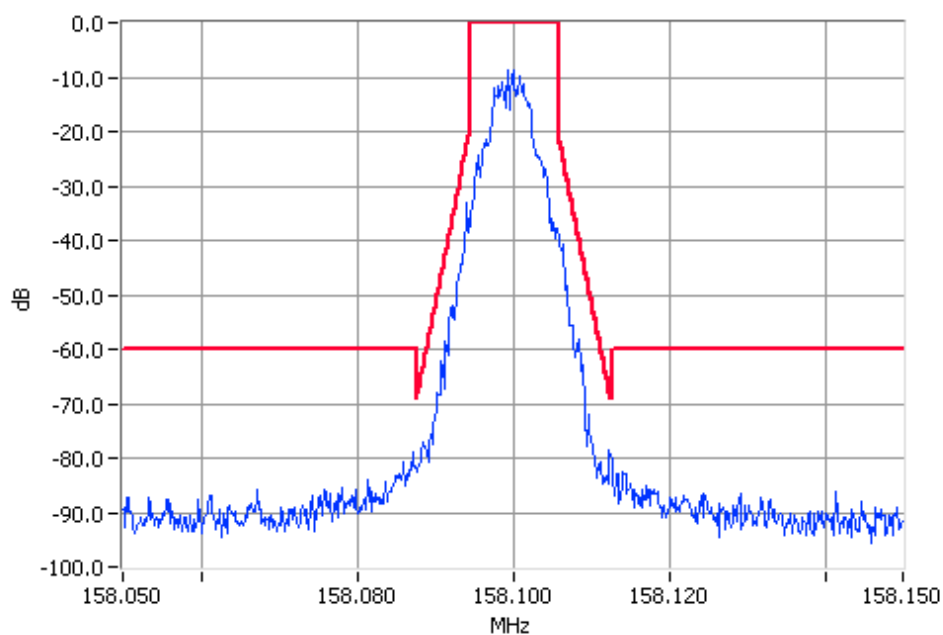
DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 10 W 12.5 kHz Channel Spacing



**Unmodulated 158.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



**DMR 158.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

# TELTEST Laboratories

Tait Communications

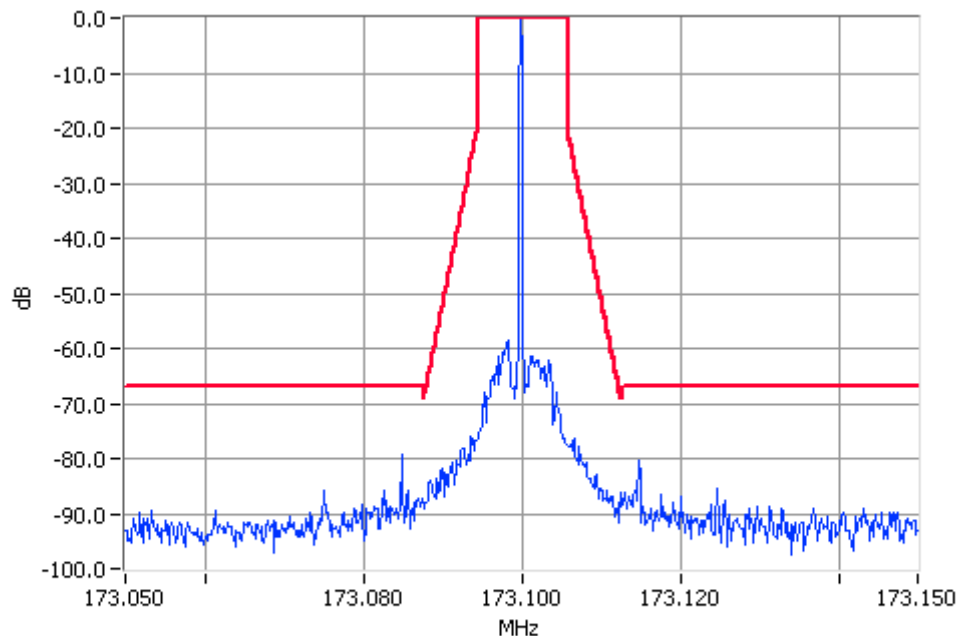
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

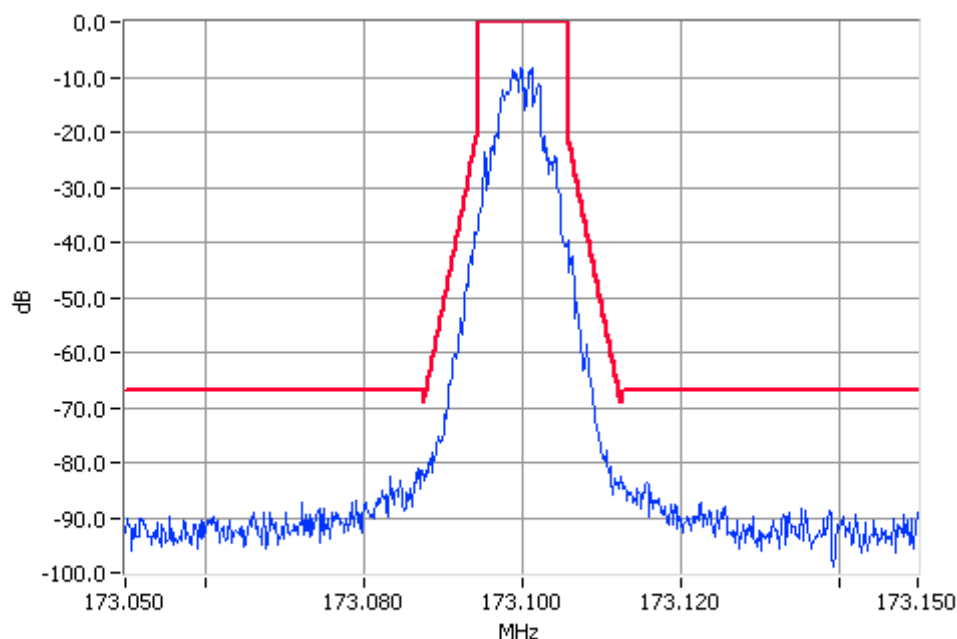
DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 173.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



**DMR 173.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

# TELTEST Laboratories

Tait Communications

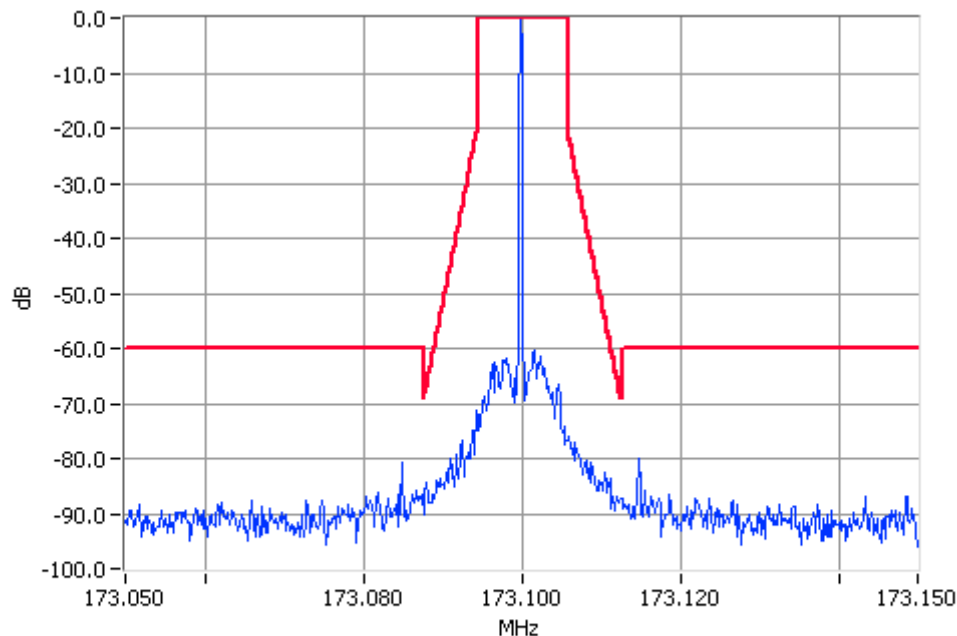
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

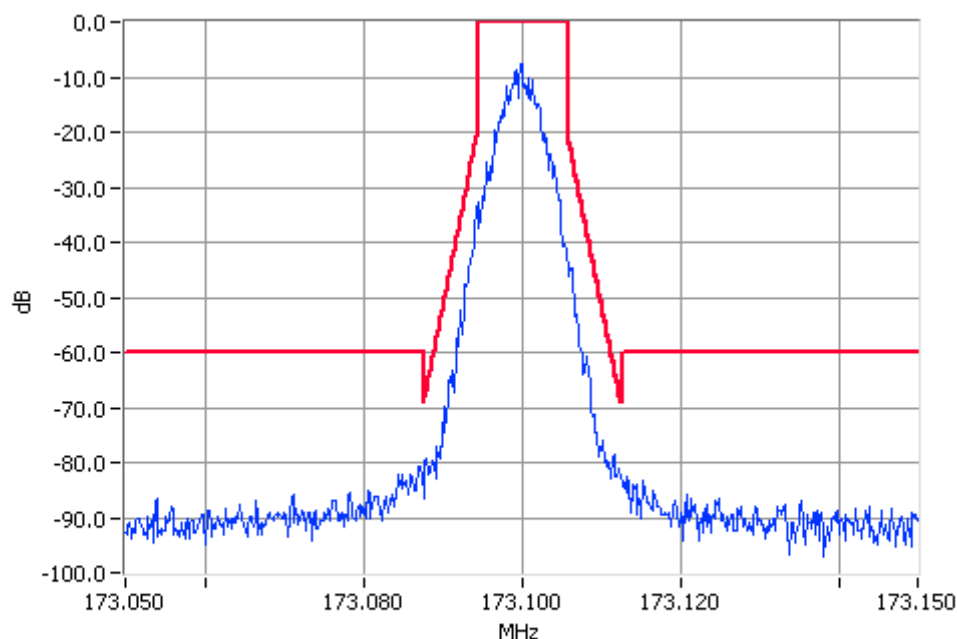
DMR

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 10 W 12.5 kHz Channel Spacing



**Unmodulated 173.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**



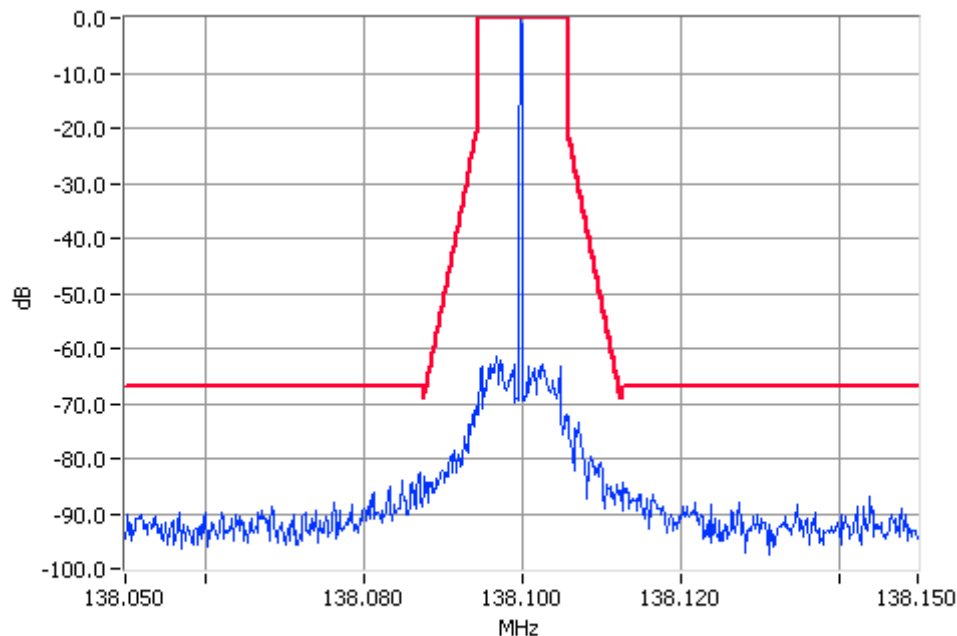
**DMR 173.1000MHz Mask D 10W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Occupied Bandwidth and Spectrum Masks

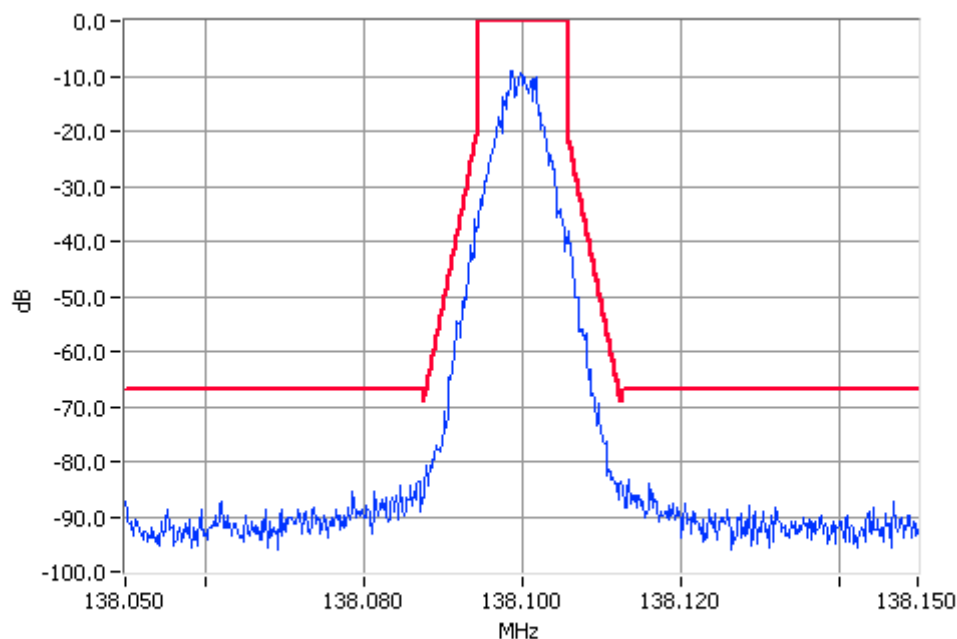
P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 138.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



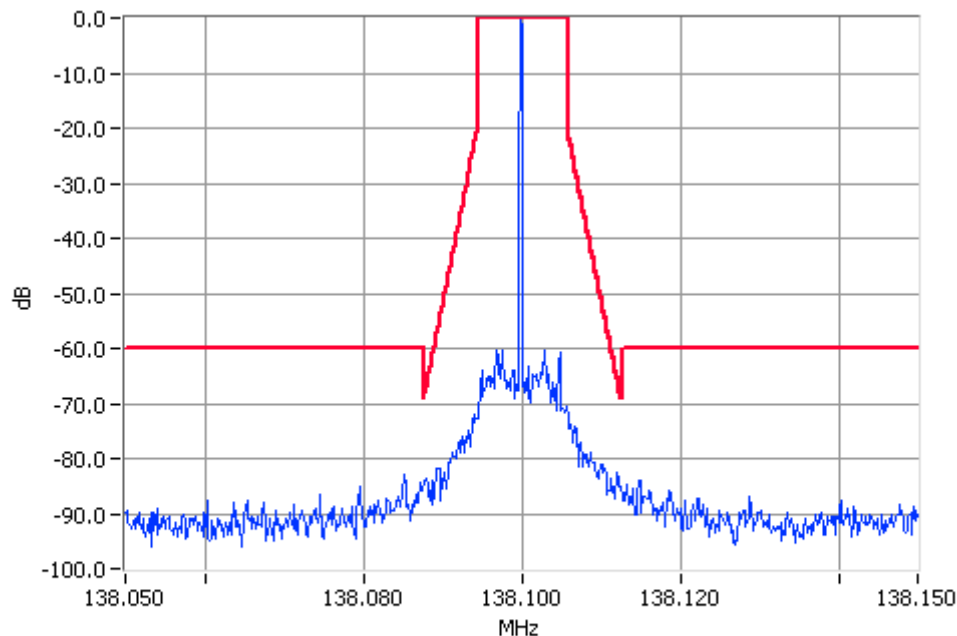
P25 APCO C4FM 138.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

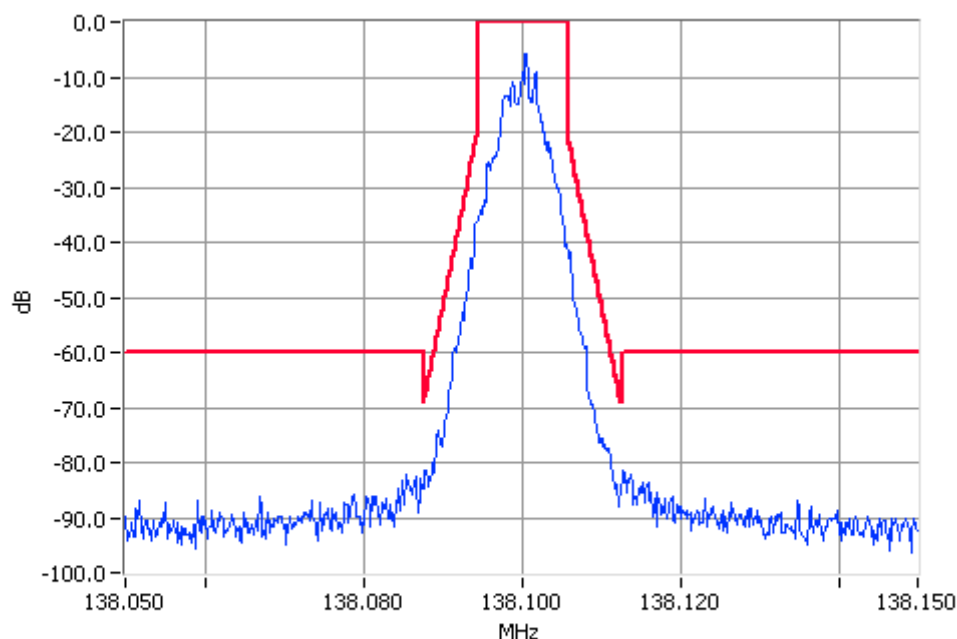
P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 138.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 138.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



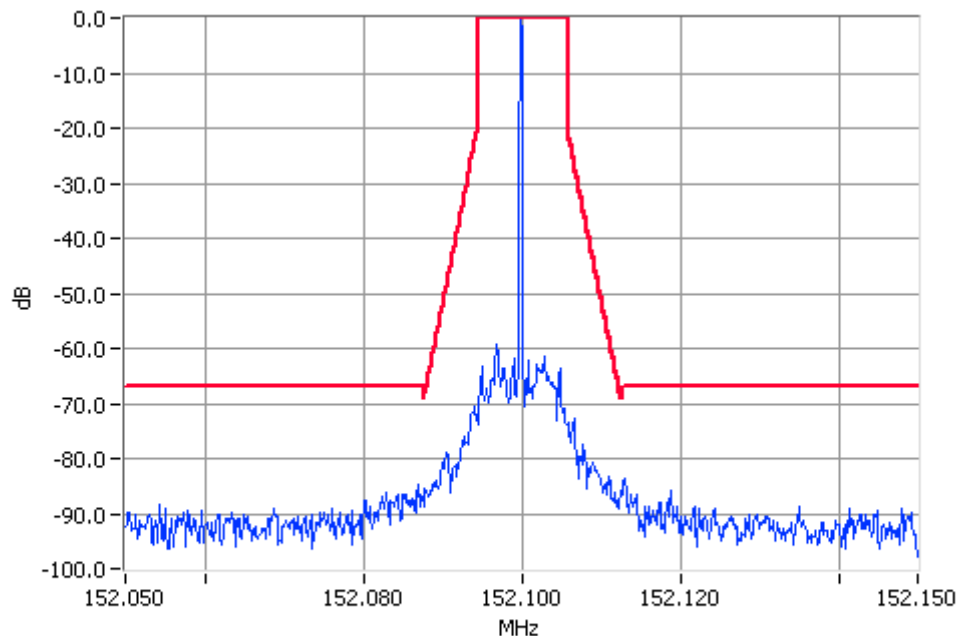
P25 APCO C4FM 138.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

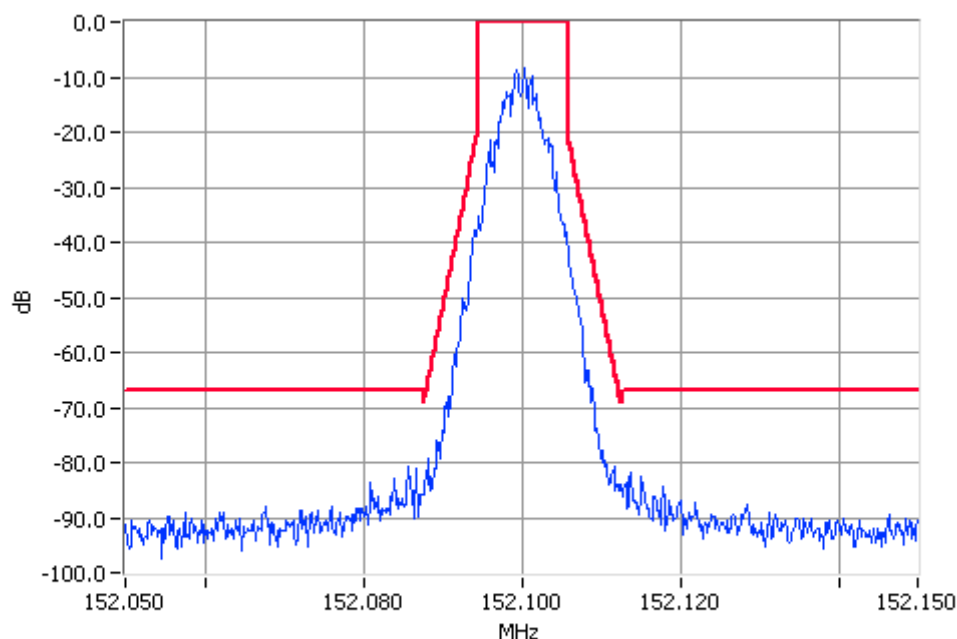
P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 152.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



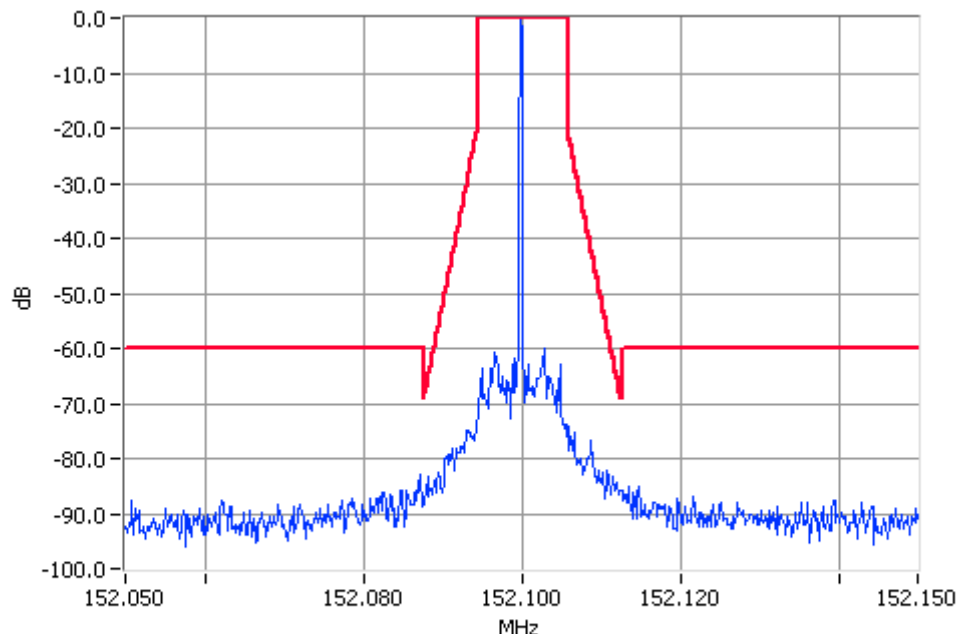
P25 APCO C4FM 152.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

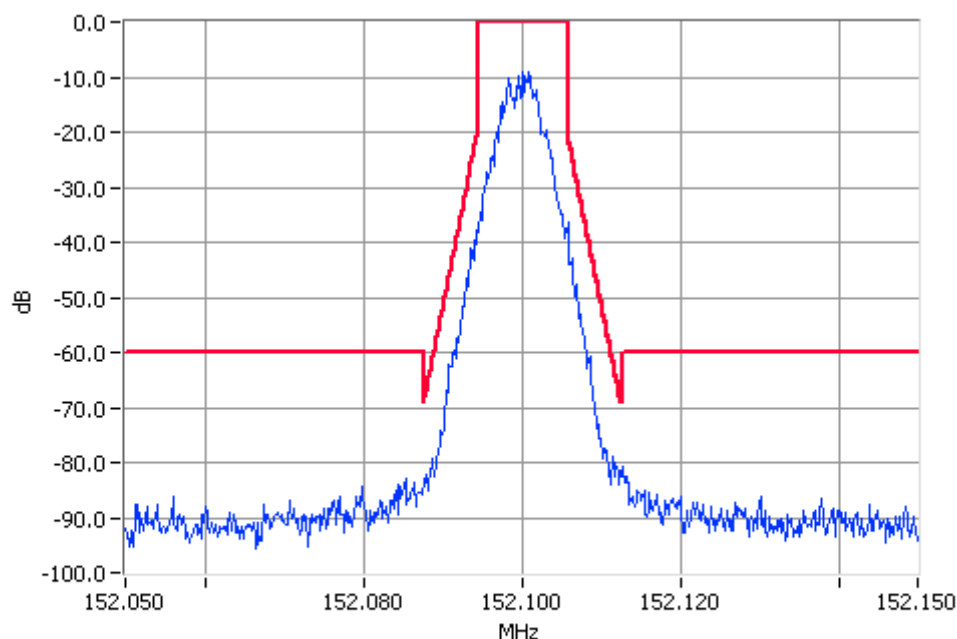
P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 152.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 152.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



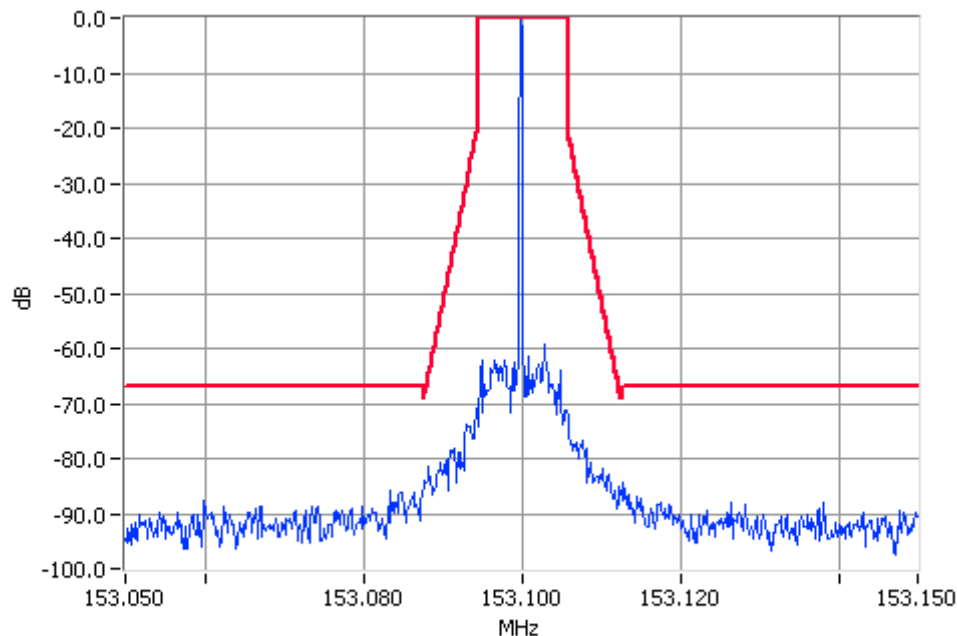
P25 APCO C4FM 152.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

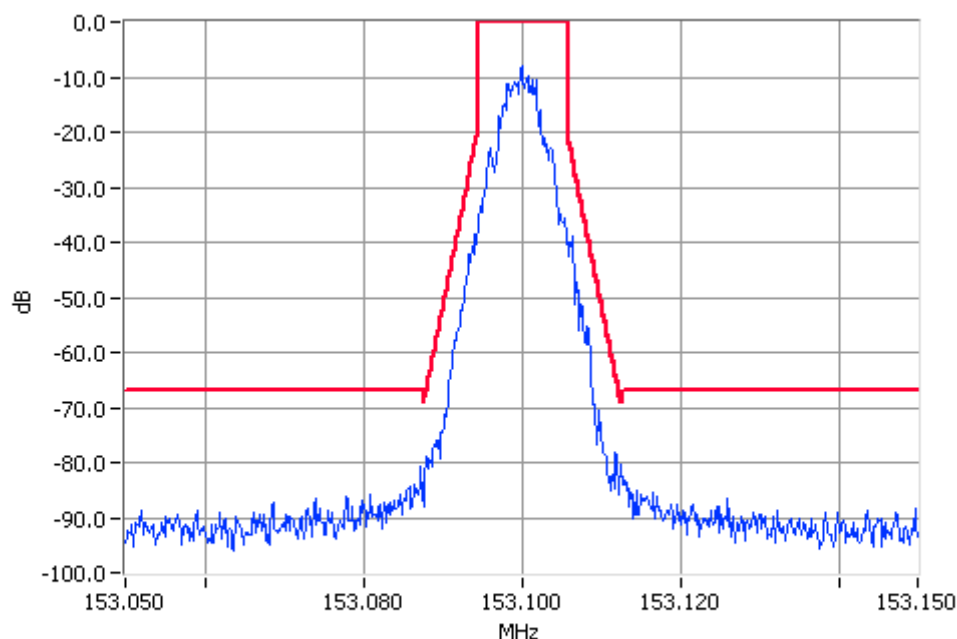
P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 153.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



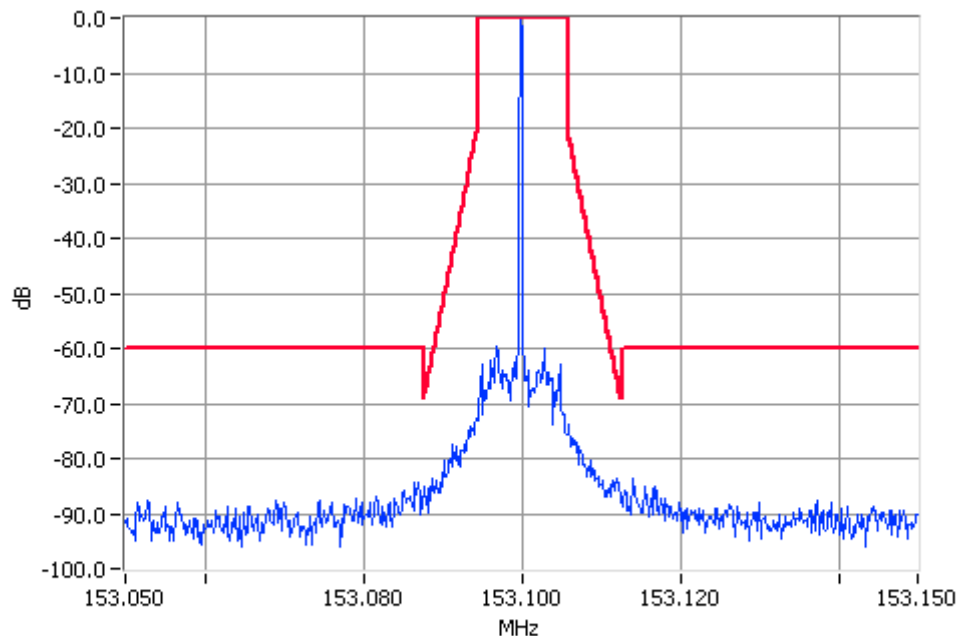
P25 APCO C4FM 153.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

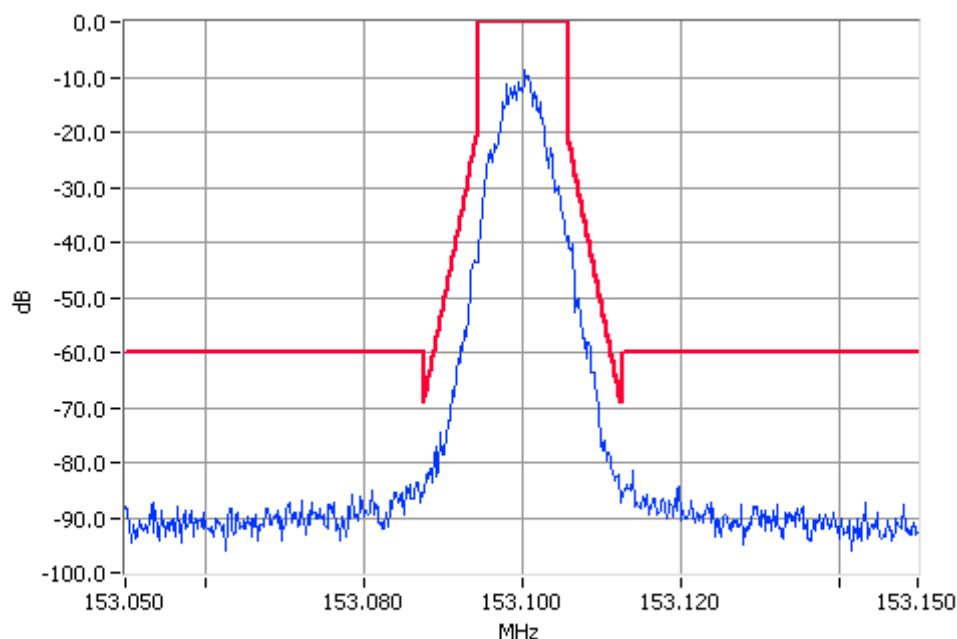
P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 153.1 MHz 10 W 12.5 kHz Channel Spacing



Unmodulated 153.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



P25 APCO C4FM 153.1000MHz Mask D 10W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

# TELTEST Laboratories

Tait Communications

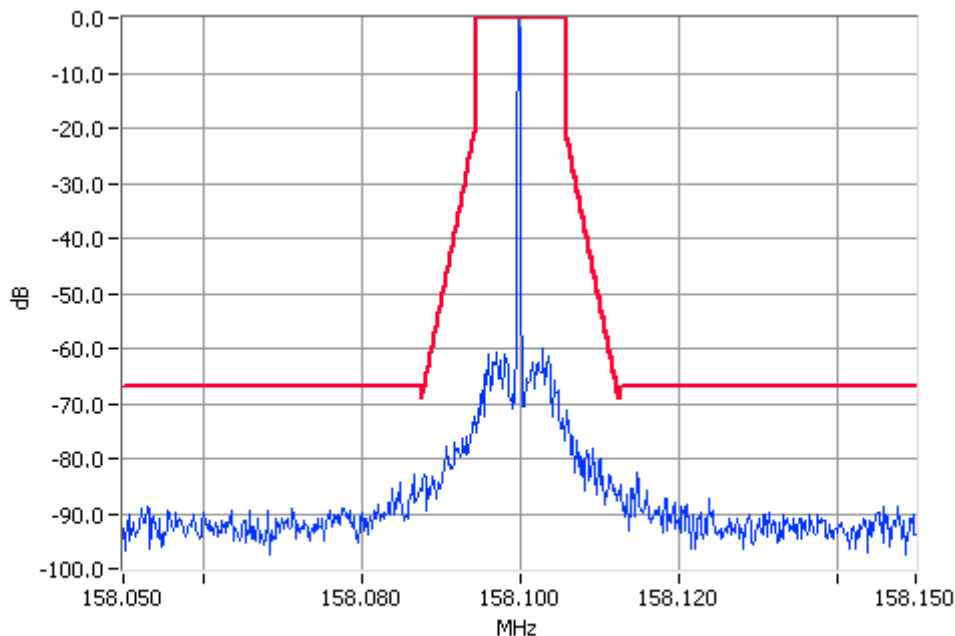
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

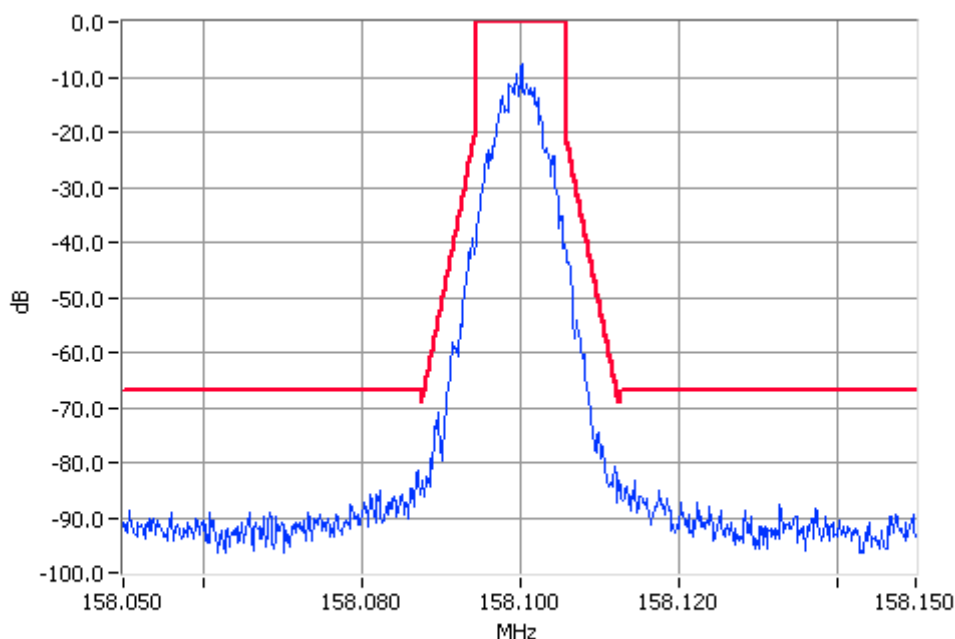
P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 50 W 12.5 kHz Channel Spacing



**Unmodulated 158.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



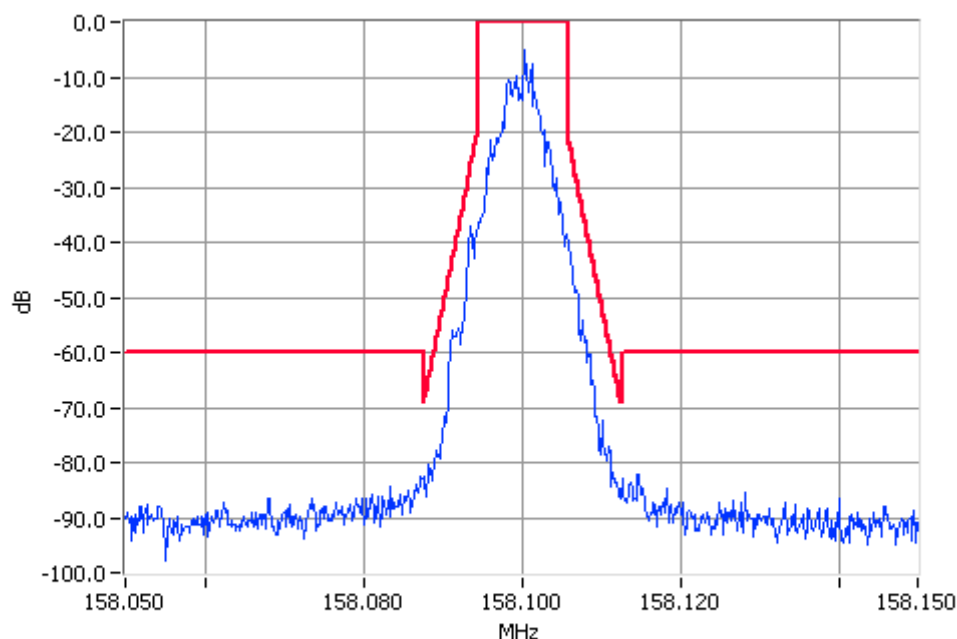
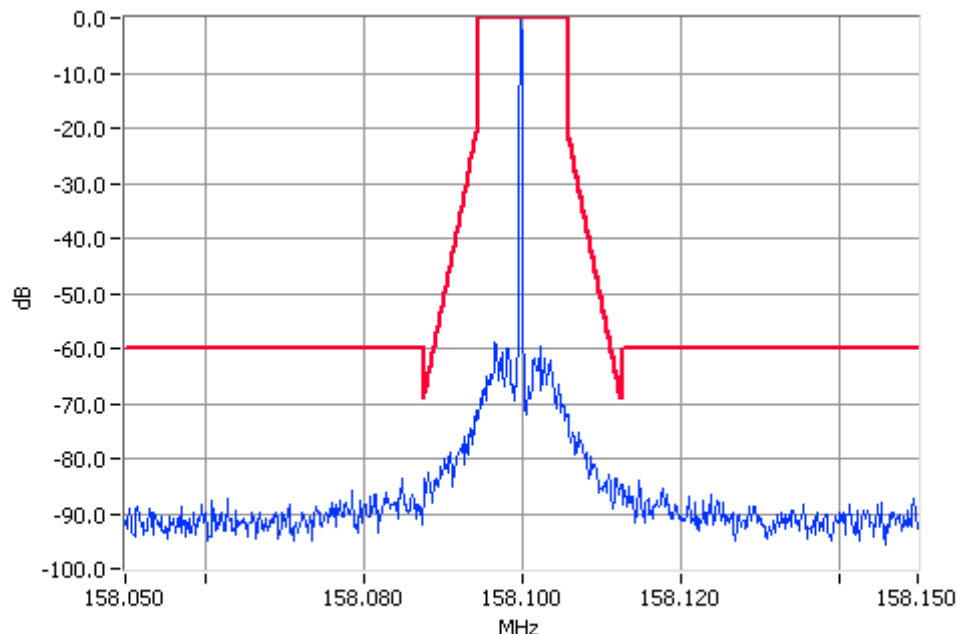
**P25 APCO C4FM 158.1000MHz Mask D 50W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

Occupied Bandwidth and Spectrum Masks

P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 10 W 12.5 kHz Channel Spacing



# TELTEST Laboratories

Tait Communications

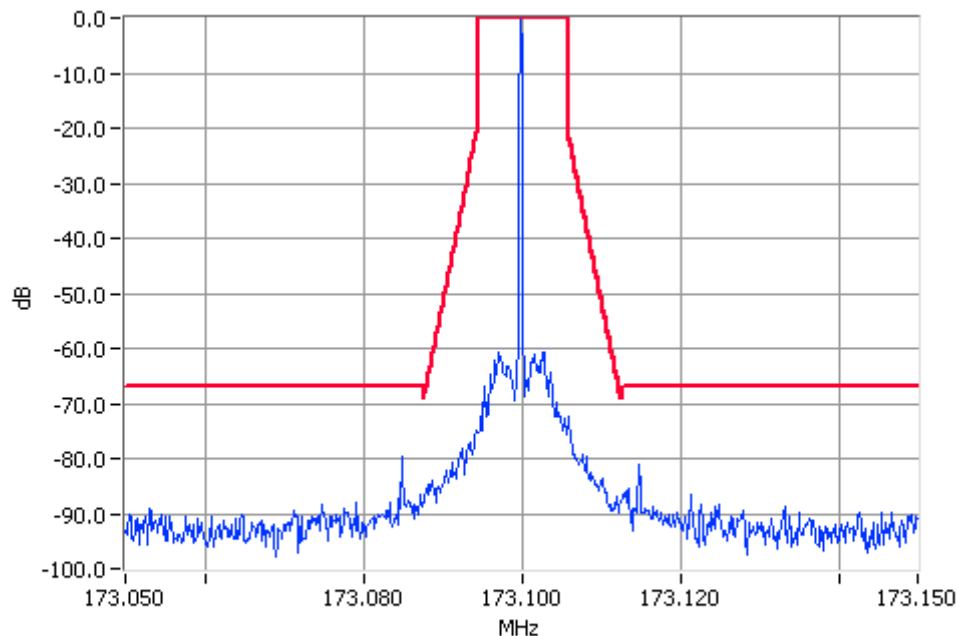
Report Number 3414

## Occupied Bandwidth and Spectrum Masks

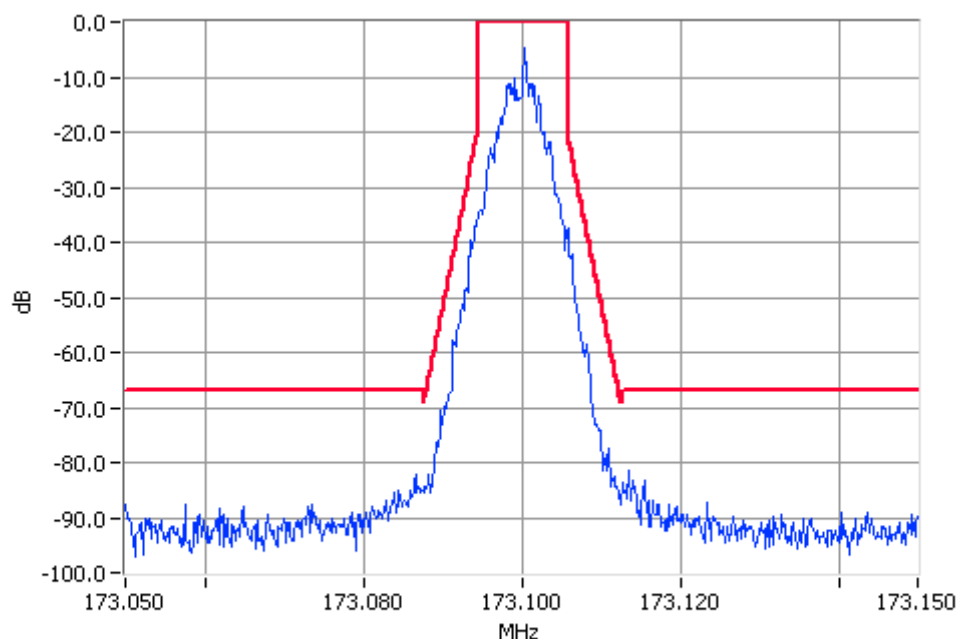
P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 173.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



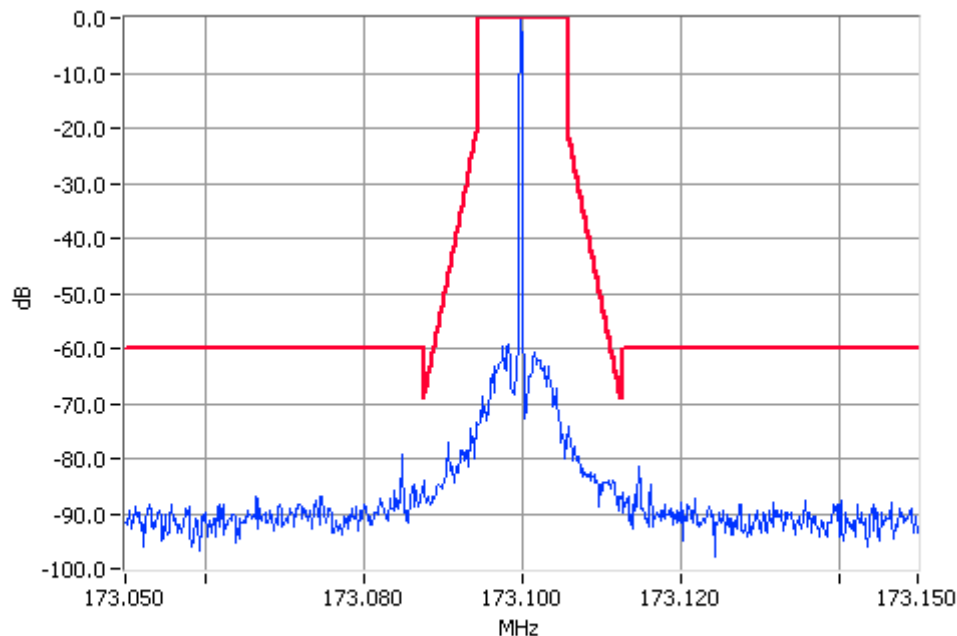
P25 APCO C4FM 173.1000MHz Mask D 50W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

**Occupied Bandwidth and Spectrum Masks**

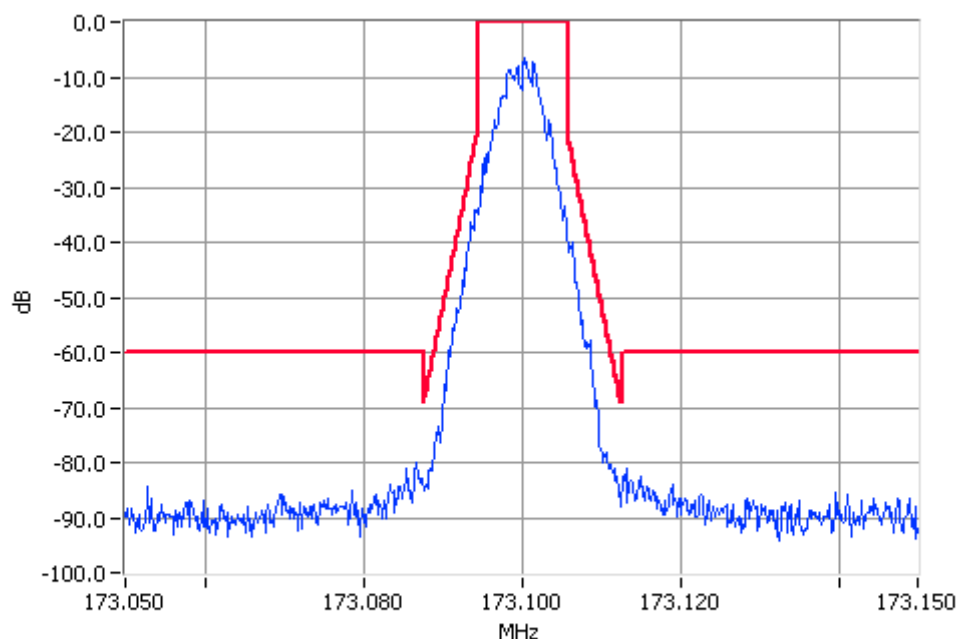
P25

SPECIFICATION: CFR 47 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 10 W 12.5 kHz Channel Spacing



**Unmodulated 173.1000MHz Mask D 10W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



**P25 APCO C4FM 173.1000MHz Mask D 10W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

## SPURIOUS EMISSIONS (Tx CONDUCTED)

SPECIFICATIONS: CFR 47 2.1051 RSS-119 5.8

GUIDE: TIA/EIA-603D 2.2.13

### MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
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, in this case 100 kHz to over the 10<sup>th</sup> harmonic excluding the carrier and it's channel spacing.

Spurious emissions which were attenuated by more than 20 dB below the limit were not recorded.

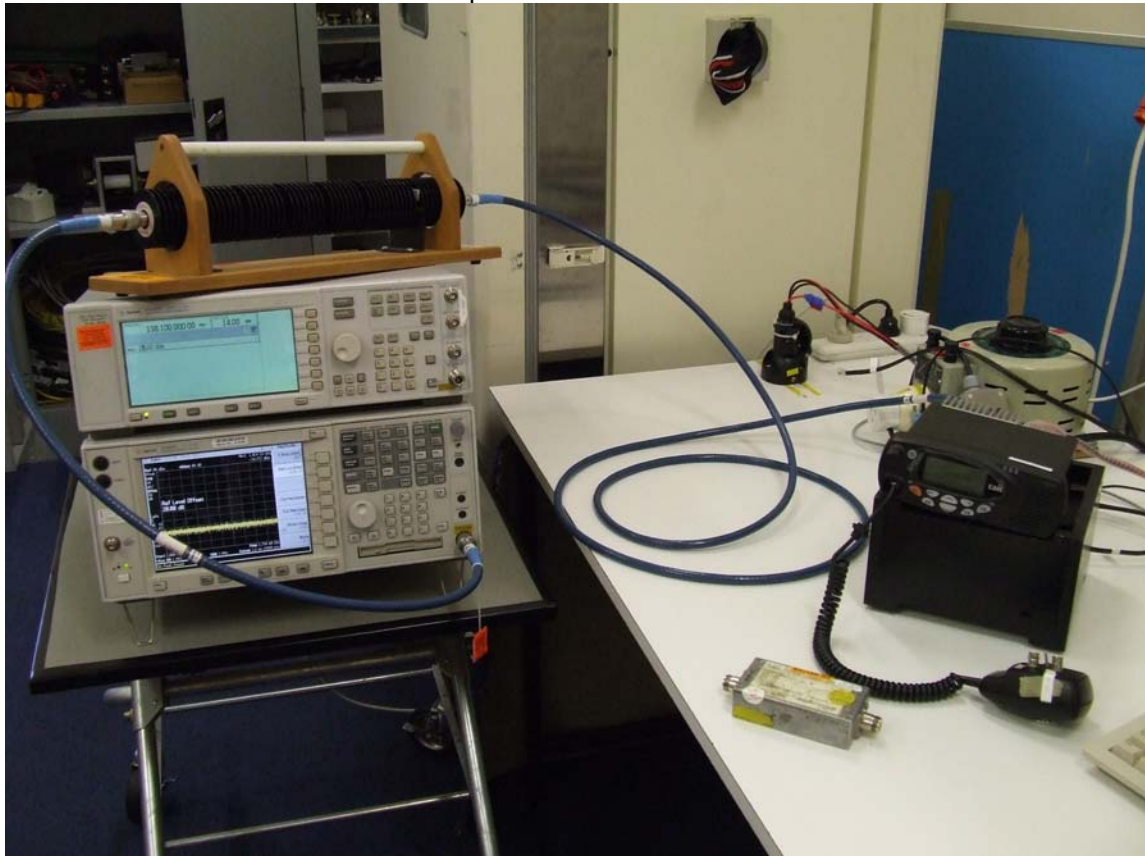
### MEASUREMENT RESULTS:

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

A photograph of the test set-up is included below.

LIMIT CLAUSES: CFR 47 90.210 RSS-119 5.8

Photo: Conducted Emissions Test Setup



**TELTEST Laboratories**

Tait Communications

Report Number 3414

---

**Tx Conducted Emissions - Continued**

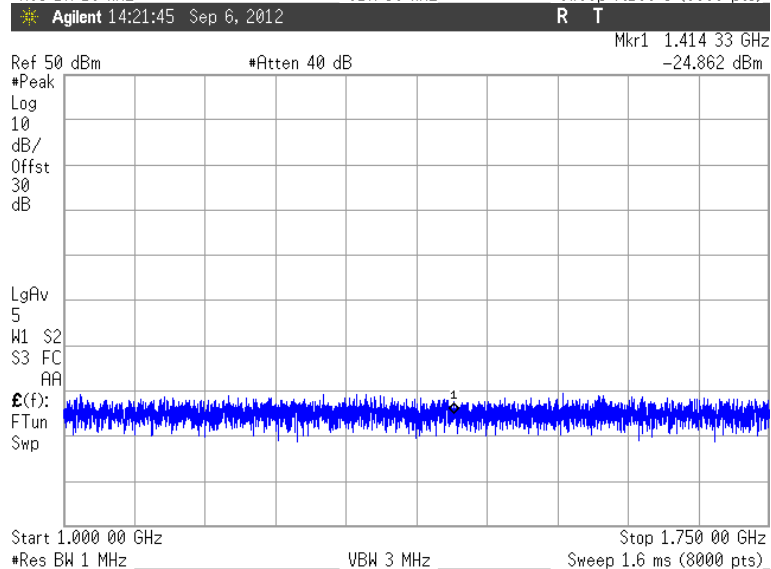
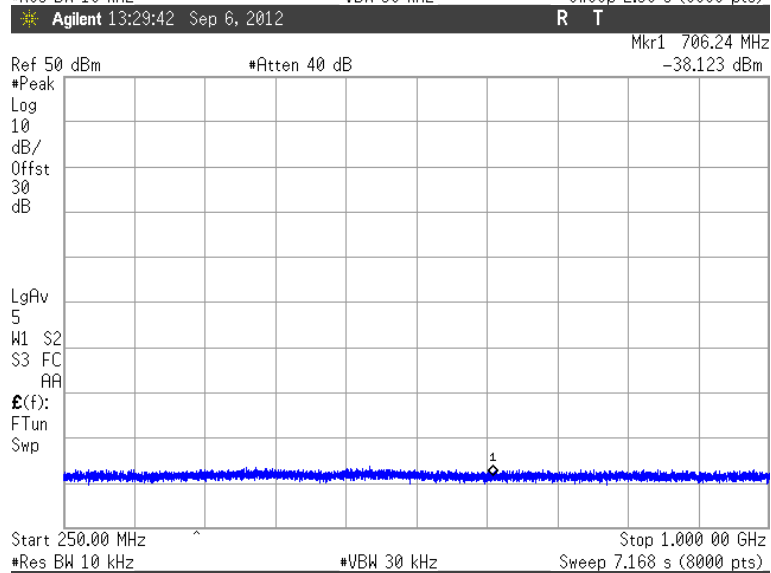
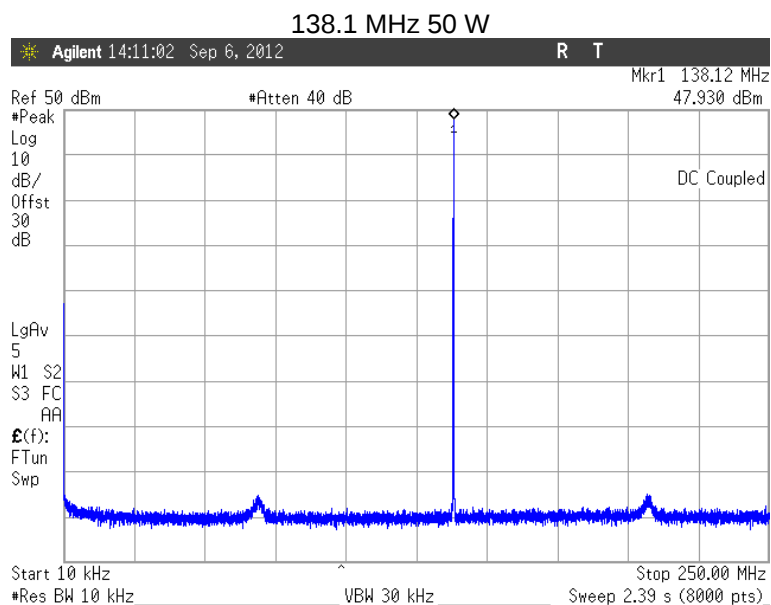
SPECIFICATION:

CFR 47 2.1051 RSS-119

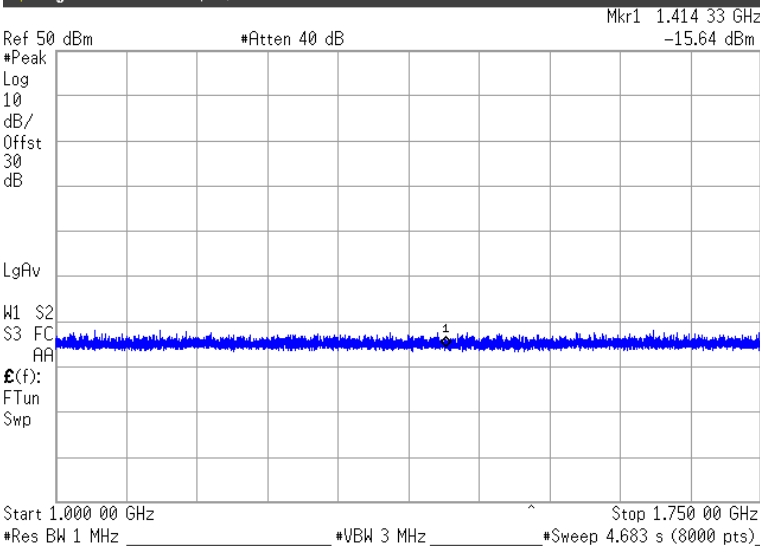
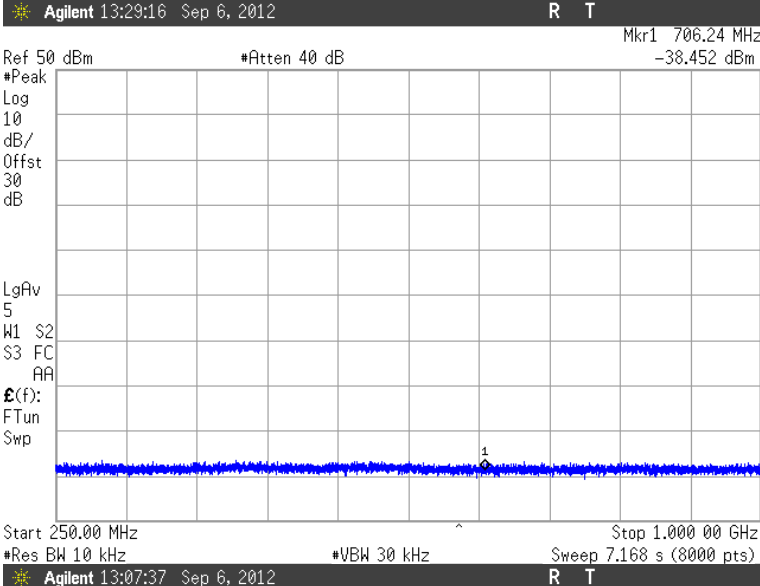
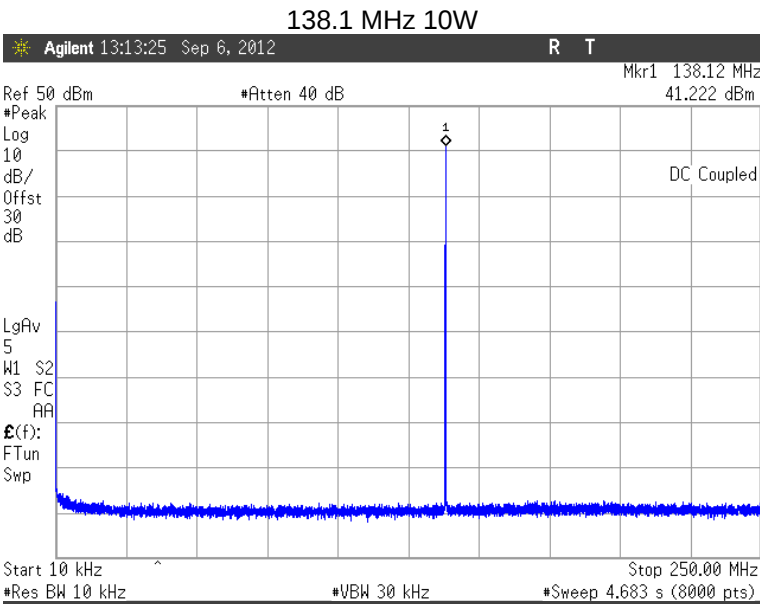
5.8

|                                                                           |             |                  |                 |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| 12.5 kHz Channel Spacing                                                  |             | 138.1 MHz @ 50 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| 12.5 kHz Channel Spacing                                                  |             | 138.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| No emissions were detected at a level greater than 20 dB below the limit. |             |                  |                 |

TELTEST Laboratories  
Tait Communications  
Report Number 3414



TELTEST Laboratories  
Tait Communications  
Report Number 3414



**TELTEST Laboratories**

Tait Communications

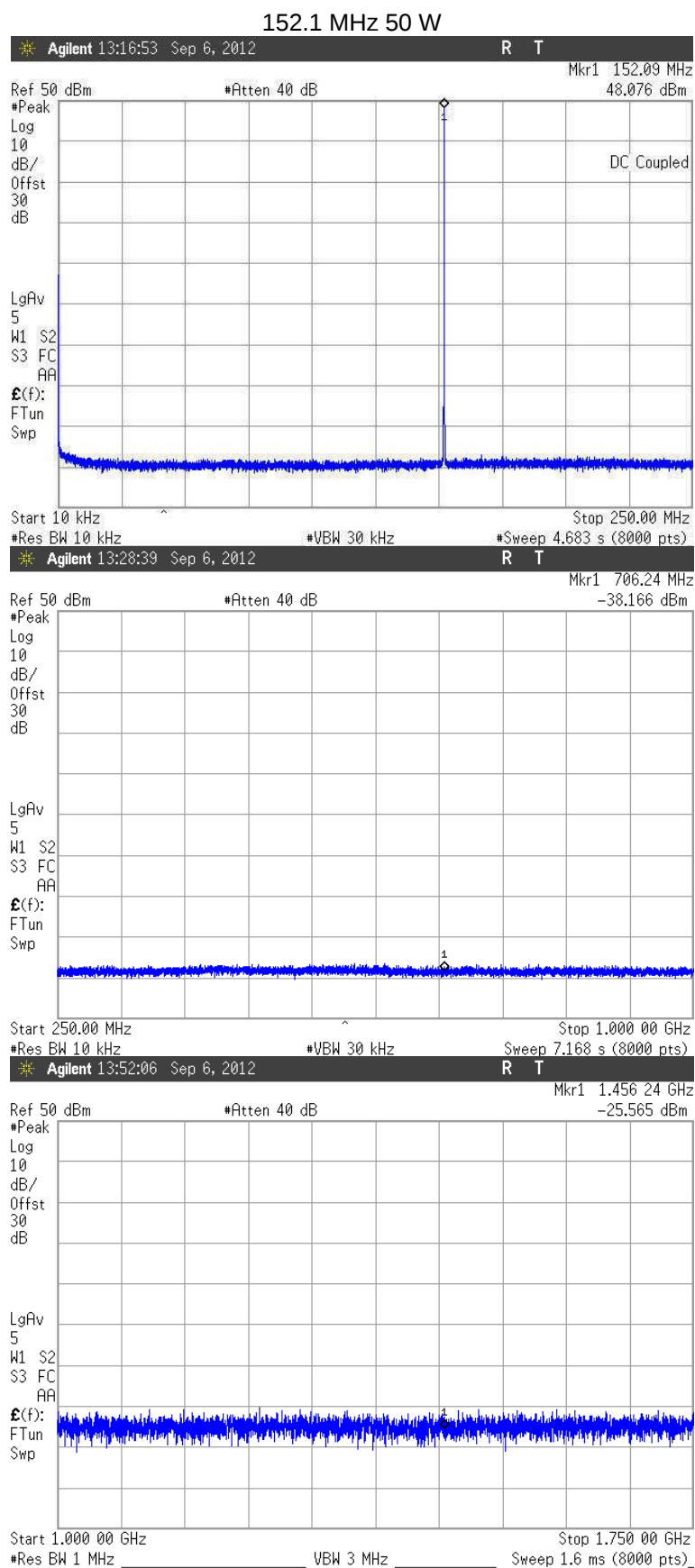
Report Number 3414

---

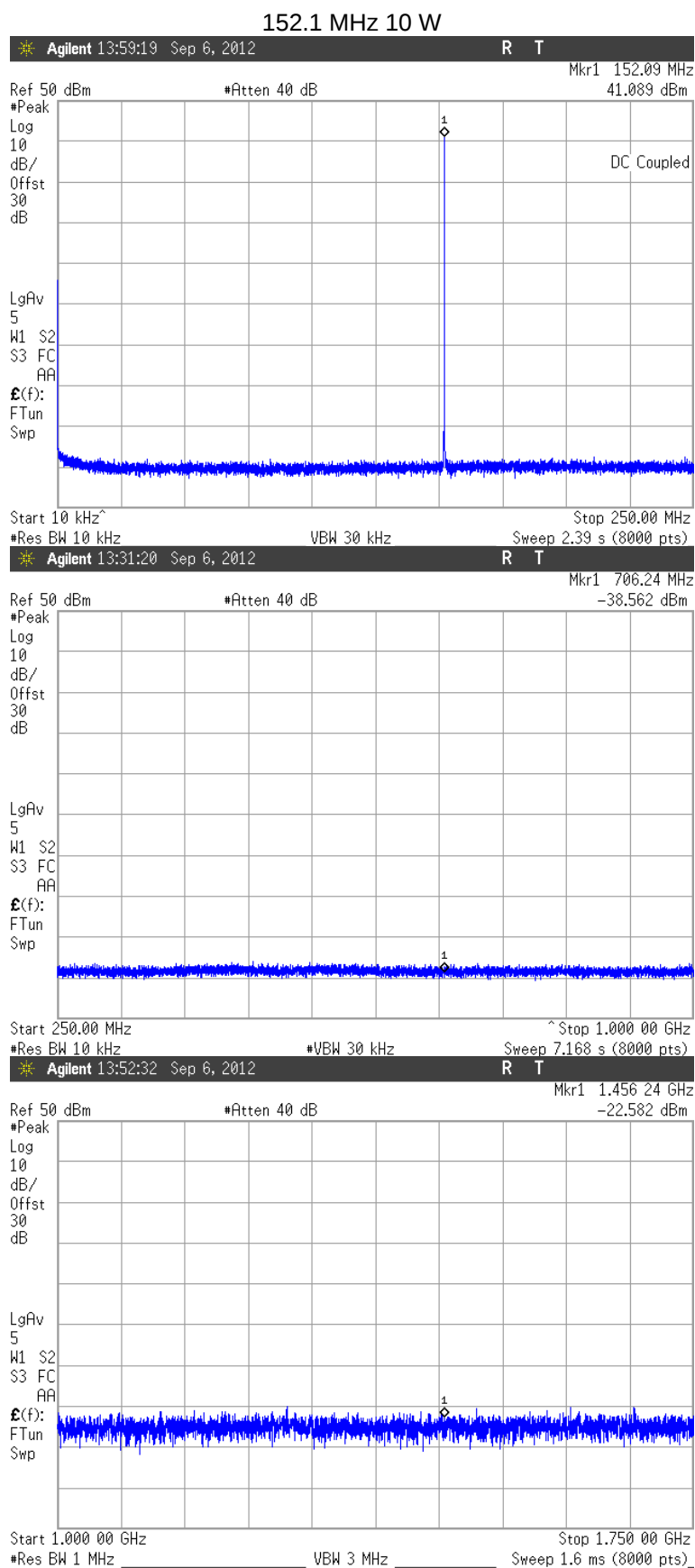
**Tx Conducted Emissions - Continued**

|                                                                           |             |                  |                 |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| 12.5 kHz Channel Spacing                                                  |             | 152.1 MHz @ 50 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| 12.5 kHz Channel Spacing                                                  |             | 152.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| No emissions were detected at a level greater than 20 dB below the limit. |             |                  |                 |

TELTEST Laboratories  
Tait Communications  
Report Number 3414



TELTEST Laboratories  
Tait Communications  
Report Number 3414



**TELTEST Laboratories**

Tait Communications

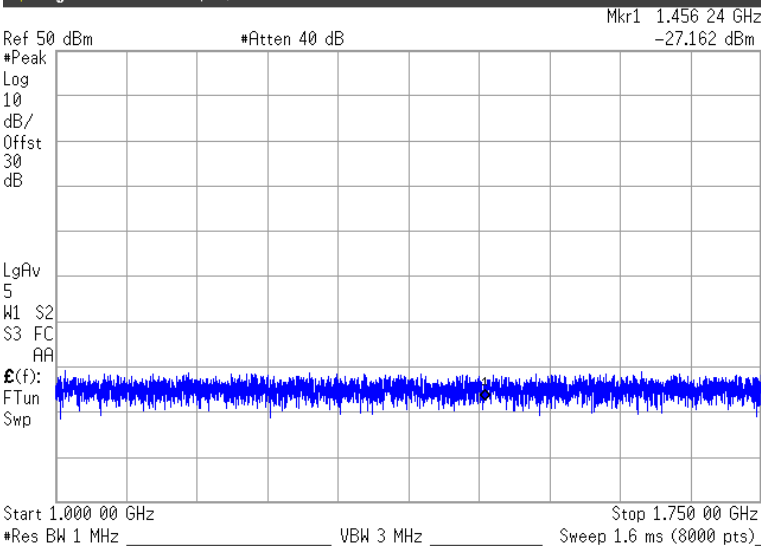
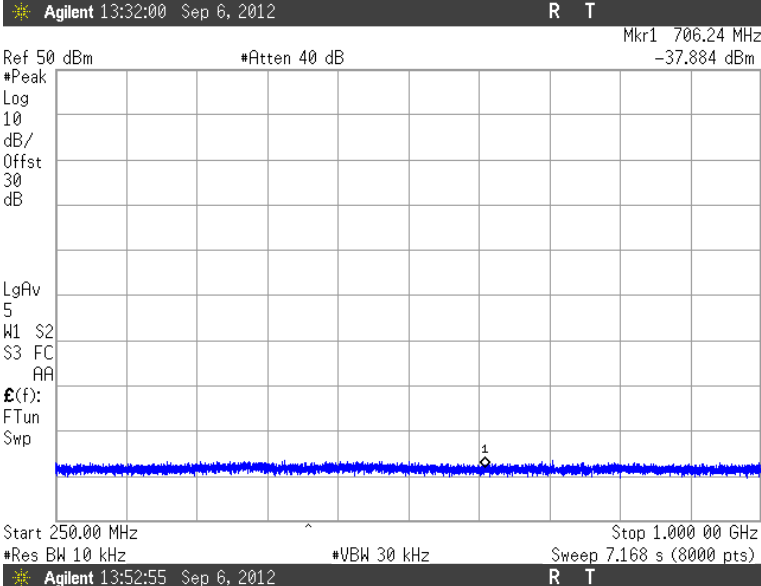
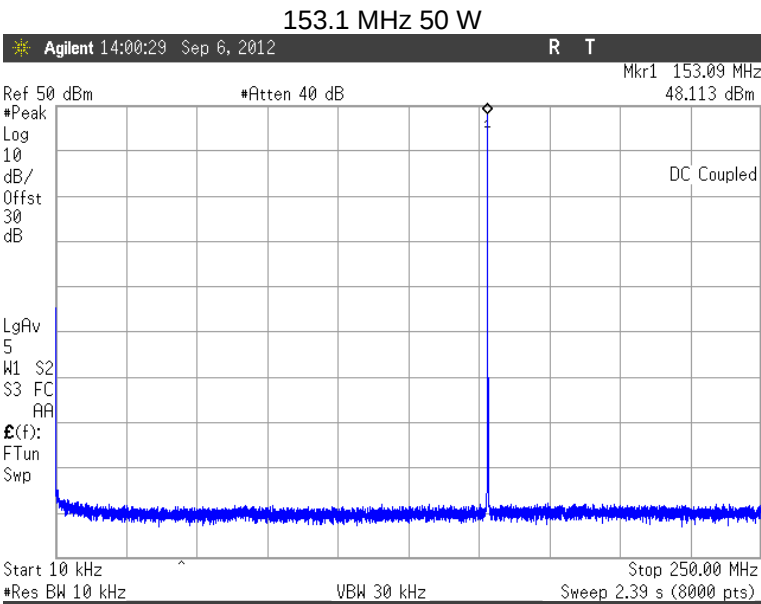
Report Number 3414

---

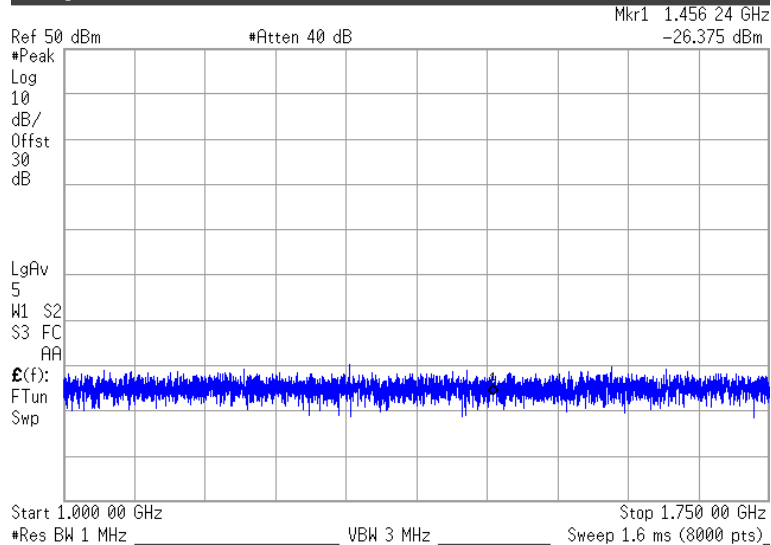
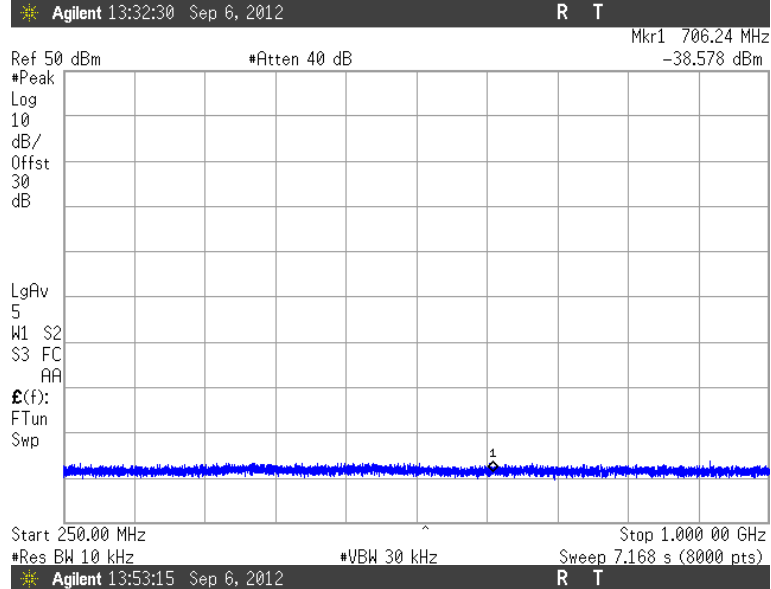
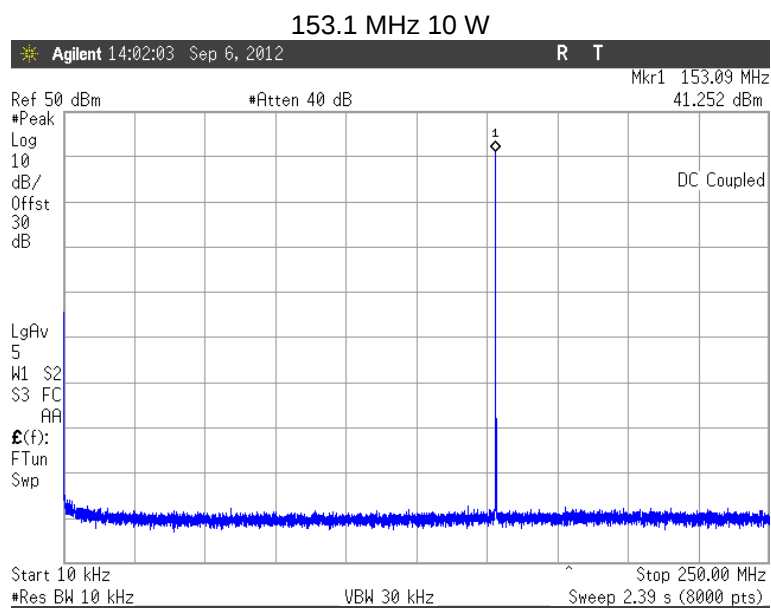
**Tx Conducted Emissions - Continued**

|                                                                           |             |                  |                 |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| 12.5 kHz Channel Spacing                                                  |             | 153.1 MHz @ 50 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| 12.5 kHz Channel Spacing                                                  |             | 153.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| No emissions were detected at a level greater than 20 dB below the limit. |             |                  |                 |

TELTEST Laboratories  
Tait Communications  
Report Number 3414



TELTEST Laboratories  
Tait Communications  
Report Number 3414



**TELTEST Laboratories**

Tait Communications

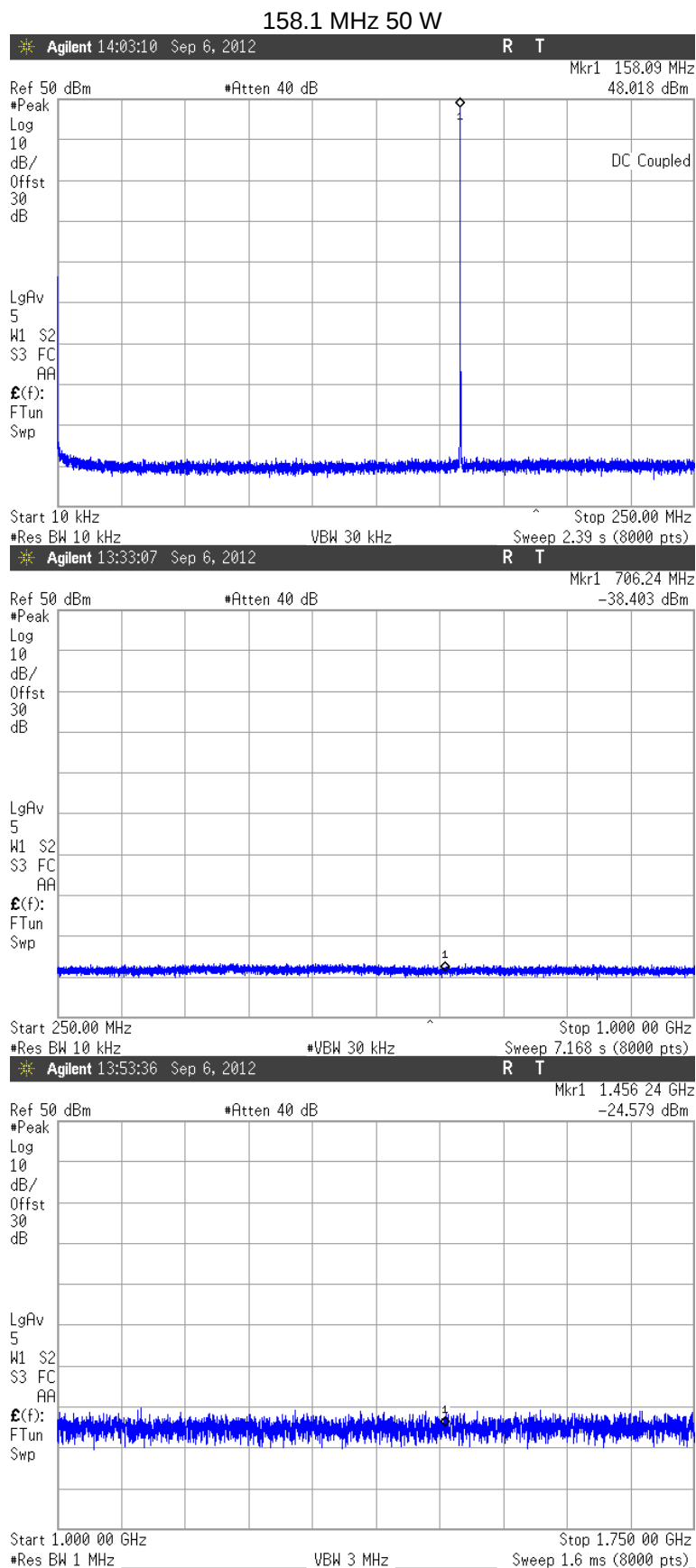
Report Number 3414

---

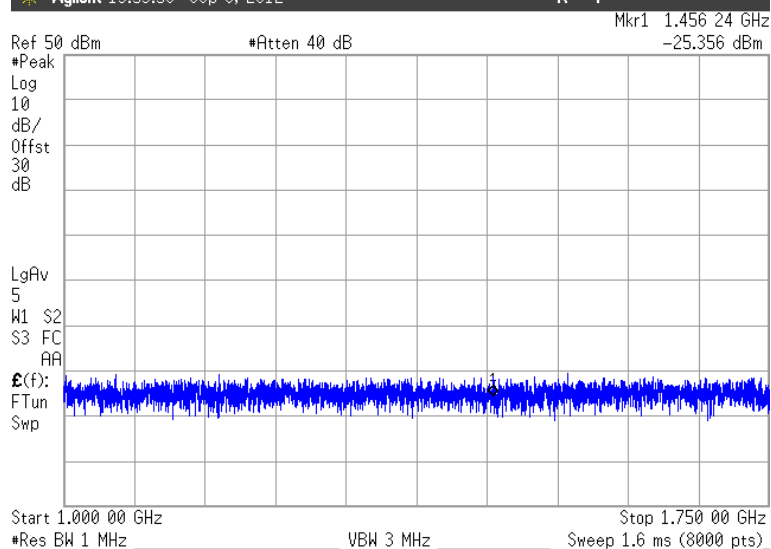
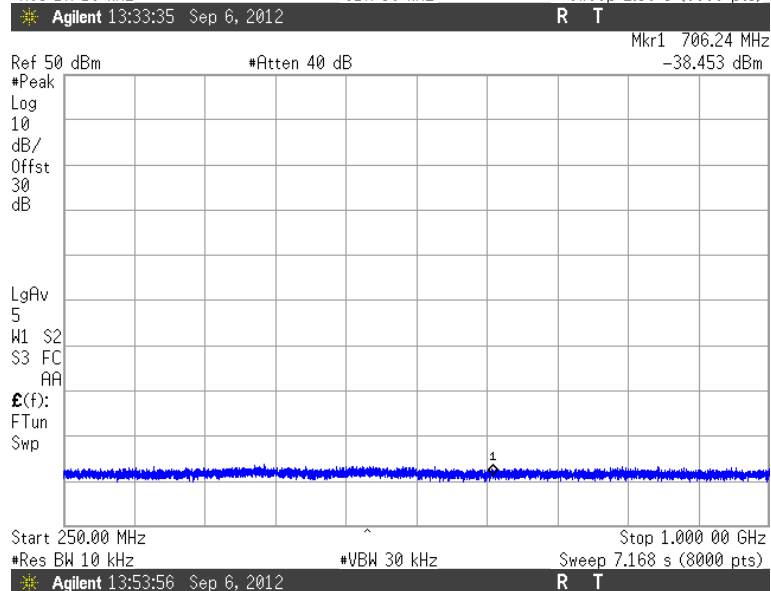
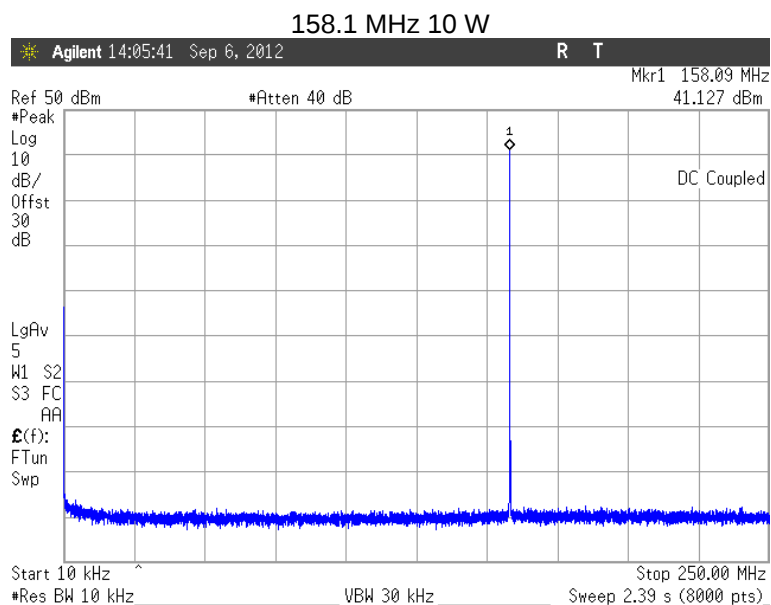
**Tx Conducted Emissions - Continued**

|                                                                           |             |                  |                 |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| 12.5 kHz Channel Spacing                                                  |             | 158.1 MHz @ 50 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| 12.5 kHz Channel Spacing                                                  |             | 158.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| No emissions were detected at a level greater than 20 dB below the limit. |             |                  |                 |

TELTEST Laboratories  
Tait Communications  
Report Number 3414



TELTEST Laboratories  
Tait Communications  
Report Number 3414



**TELTEST Laboratories**

Tait Communications

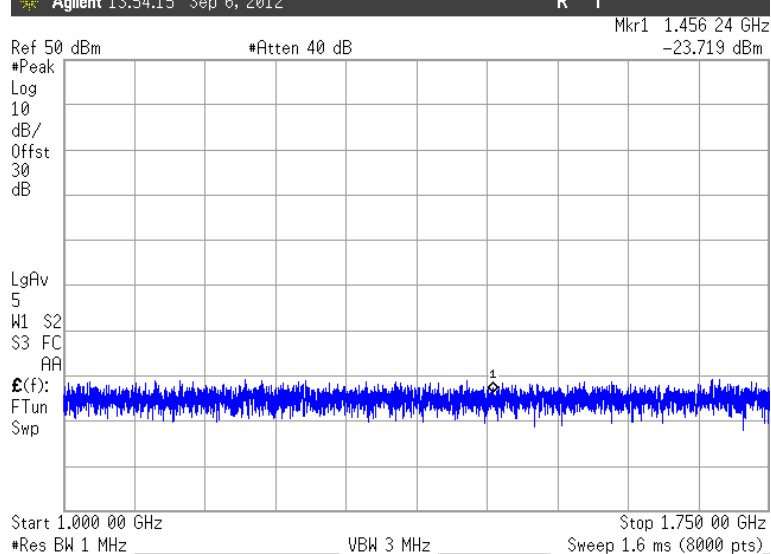
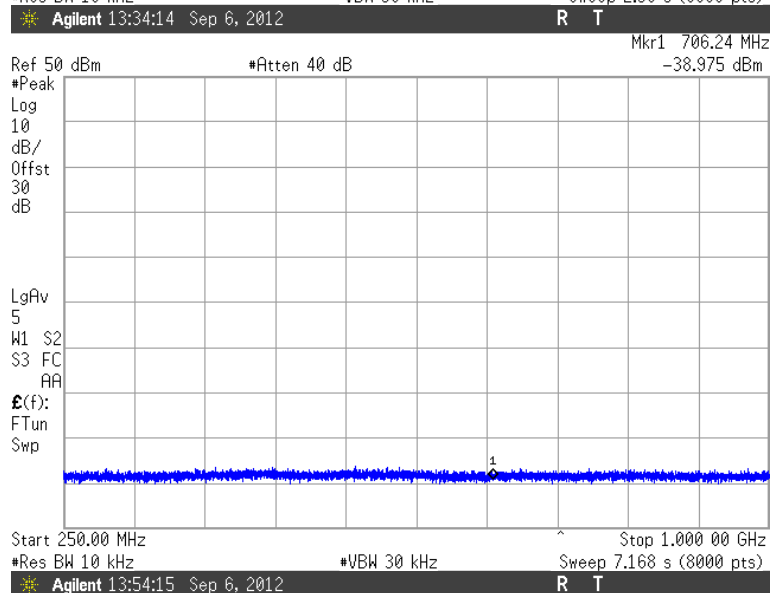
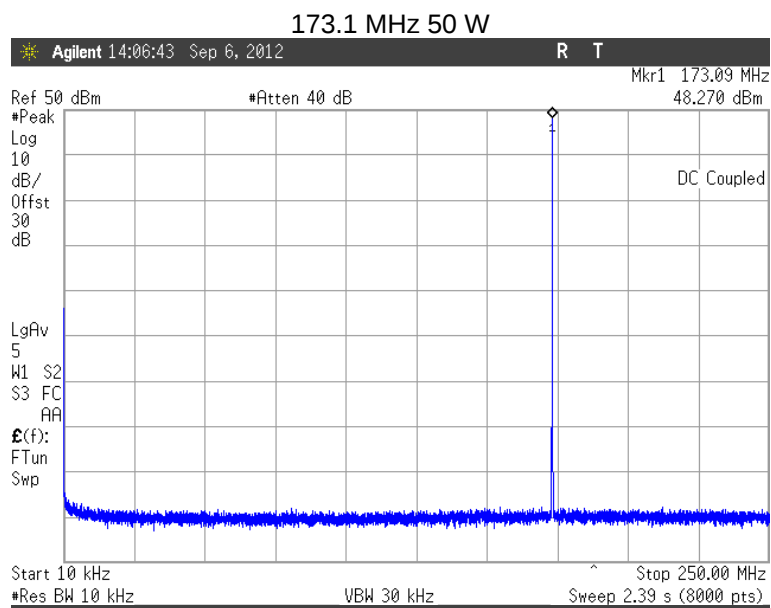
Report Number 3414

---

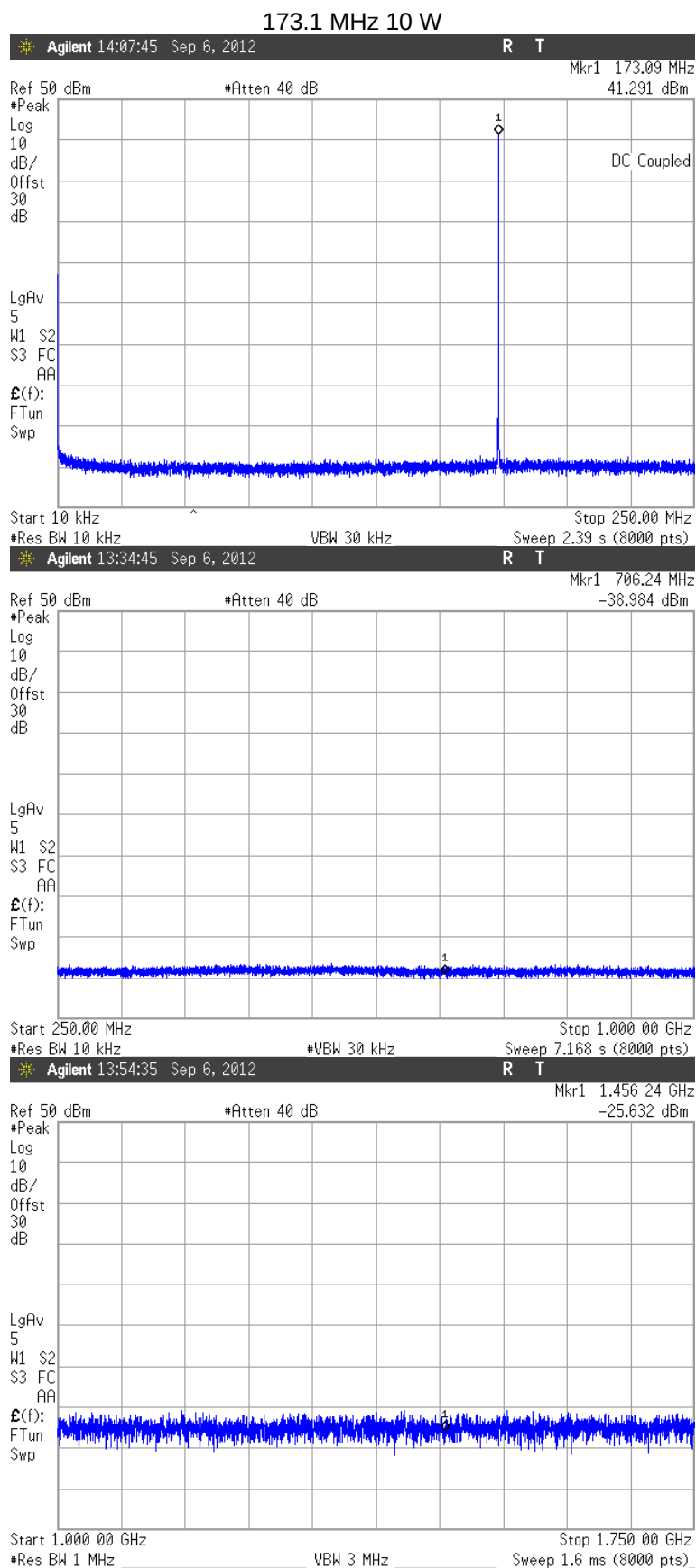
**Tx Conducted Emissions - Continued**

|                                                                           |             |                  |                 |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| 12.5 kHz Channel Spacing                                                  |             | 173.1 MHz @ 50 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| 12.5 kHz Channel Spacing                                                  |             | 173.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
| No emissions were detected at a level greater than 20 dB below the limit. |             |                  |                 |

TELTEST Laboratories  
Tait Communications  
Report Number 3414



TELTEST Laboratories  
Tait Communications  
Report Number 3414



**TELTEST Laboratories**

Tait Communications

Report Number 3414

---

LIMITS: CFR 47 90.210 RSS-119 5.8

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

**SPURIOUS EMISSIONS (Tx RADIATED)**

SPECIFICATION: CFR 47 2.1053

GUIDE: TIA/EIA-603D 2.2.12

**MEASUREMENT PROCEDURE:**

**Initial Scan:**

1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30MHz to 1000MHz. Any emission within 10dB of the limit is then re-tested on the OATS along with measurements from 1000MHz to the 10<sup>th</sup> harmonic of the fundamental frequency.
2. The EUT is then placed on a wooden turntable at a distance of 0.5 metres from the test antenna and emissions are measured from 1000MHz to the upper frequency required. Any emission within 10 dB of the limit is then re-tested on the OATS.
3. The harmonic emissions up to the 6<sup>th</sup> harmonic of the fundamental frequency are measured on the OATS

**OATS Measurement:**

1. The EUT is placed on a wooden turntable at a distance of three meters from the test antenna. The output terminal is connected to an RF dummy load.
2. The test antenna is raised from 1m to 4m to obtain a maximum reading; the turntable is then rotated through 360° to obtain the maximum response of each spurious emission. Valid emissions are determined by switching the EUT on and off.
3. The EUT is then replaced by a signal generator and substitution antenna to make measurements by the substitution method.

**MEASUREMENT RESULTS:**

See the tables on the following pages.

LIMIT CLAUSE: CFR 47 90.210

**TELTEST Laboratories**

Tait Communications

Report Number 3414

**Tx Radiated Emissions - Continued**

| 12.5 kHz Channel Spacing                                                  |             | 138.1 MHz @ 50 W | Emission Mask D |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| 12.5 kHz Channel Spacing                                                  |             | 138.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| No emissions were detected at a level greater than 10 dB below the limit. |             |                  |                 |

| 12.5 kHz Channel Spacing                                                  |             | 152.1 MHz @ 50 W | Emission Mask D |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| 12.5 kHz Channel Spacing                                                  |             | 152.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| No emissions were detected at a level greater than 10 dB below the limit. |             |                  |                 |

| 12.5 kHz Channel Spacing                                                  |             | 153.1 MHz @ 50 W | Emission Mask D |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| 12.5 kHz Channel Spacing                                                  |             | 153.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| No emissions were detected at a level greater than 10 dB below the limit. |             |                  |                 |

**TELTEST Laboratories**

Tait Communications

Report Number 3414

**Tx Radiated Emissions - Continued**

| 12.5 kHz Channel Spacing                                                  |             | 158.1 MHz @ 50 W | Emission Mask D |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| 12.5 kHz Channel Spacing                                                  |             | 158.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| No emissions were detected at a level greater than 10 dB below the limit. |             |                  |                 |

|                                                                           |             |                  |                 |
|---------------------------------------------------------------------------|-------------|------------------|-----------------|
| 12.5 kHz Channel Spacing                                                  |             | 173.1 MHz @ 50 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| 12.5 kHz Channel Spacing                                                  |             | 173.1 MHz @ 10 W | Emission Mask D |
| Emission Frequency (MHz)                                                  | Level (dBm) |                  | Level (dBc)     |
| ~                                                                         | ~           |                  | ~               |
|                                                                           |             |                  |                 |
| No emissions were detected at a level greater than 10 dB below the limit. |             |                  |                 |

**LIMITS: CFR 47 2.1053**

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

**TELTEST Laboratories**

Tait Communications

Report Number 3414

**Tx Radiated Emissions - Continued**

| Open Area Test Site Results           |                  |                 |
|---------------------------------------|------------------|-----------------|
| 12.5 kHz Channel Spacing              | 158.1 MHz @ 50 W | Emission Mask D |
| Harmonics<br>Emission Frequency (MHz) | Level (dBm)      | Level (dBc)     |
| 316.2                                 | -36.71           | -83.71          |
| 474.3                                 | -47.66           | -94.66          |
| 632.4                                 | -48.94           | -95.94          |
| 790.5                                 | -52.98           | -99.98          |
| 948.6                                 | -52.73           | -99.73          |
| 1106.7                                | -79.65           | -126.65         |

| 12.5 kHz Channel Spacing              | 173.1 MHz @ 50 W | Emission Mask D |
|---------------------------------------|------------------|-----------------|
| Harmonics<br>Emission Frequency (MHz) | Level (dBm)      | Level (dBc)     |
| 346.2                                 | -46.53           | -93.53          |
| 519.3                                 | -46.67           | -93.67          |
| 692.4                                 | -32.74           | -79.74          |
| 865.5                                 | -37.32           | -84.32          |



Photo: OATS Setup

**TRANSIENT FREQUENCY BEHAVIOR**

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

GUIDE: TIA/EIA-603D 2.2.19

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for equipment set up.
2. Measurements and plots were made following the TIA/EIA procedure.

**MEASUREMENT RESULTS:**

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

LIMIT CLAUSES: CFR 47 90.214 RSS-119 5.9

**TELTEST Laboratories**

Tait Communications

Report Number 3414

**Transient Frequency Behavior**

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

Tx FREQUENCY: 138.1 MHz 50 W 12.5 kHz Channel Spacing

| FREQUENCY                 | 138.1 MHz @ 50 W Tx                |               |
|---------------------------|------------------------------------|---------------|
| TRANSIENT RESPONSE PERIOD | CARRIER PEAK VARIATION FROM NORMAL |               |
|                           | Key ON (kHz)                       | Key OFF (kHz) |
| t1                        | -0.5                               | N/A           |
| t2                        | -0.5                               | N/A           |
| t3                        | N/A                                | -0.2          |
| t2 → t3 ppm               | 3.9                                |               |
| ERROR LIMIT (t2 → t3) ppm | 5.0                                |               |

|                                                                                                                     |     |    |
|---------------------------------------------------------------------------------------------------------------------|-----|----|
| 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: CFR 47 90.214

| TRANSIENT PERIODS | FREQUENCY RANGE<br>150 – 174 MHz | FREQUENCY RANGE<br>421 – 512 MHz |
|-------------------|----------------------------------|----------------------------------|
| t1 (ms)           | 5 ms                             | 10 ms                            |
| t2 (ms)           | 20 ms                            | 25 ms                            |
| t3 (ms)           | 5 ms                             | 10 ms                            |

LIMIT: RSS-119 5.9

| Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels |                              |                 |                 |
|--------------------------------------------------------------------------------------|------------------------------|-----------------|-----------------|
| TRANSIENT PERIODS                                                                    | Maximum Frequency Difference | FREQUENCY RANGE |                 |
|                                                                                      |                              | 138 – 174 MHz   | 406.1 – 470 MHz |
| t1 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |
| t2 (ms)                                                                              | ± 6.25 kHz                   | 20 ms           | 25 ms           |
| t3 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

# TELTEST Laboratories

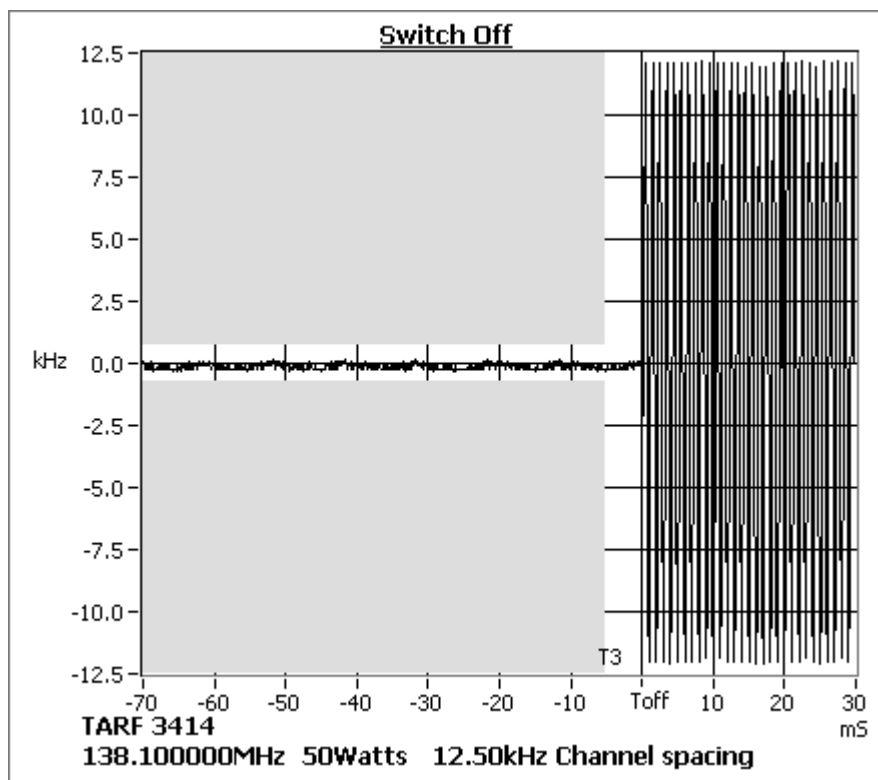
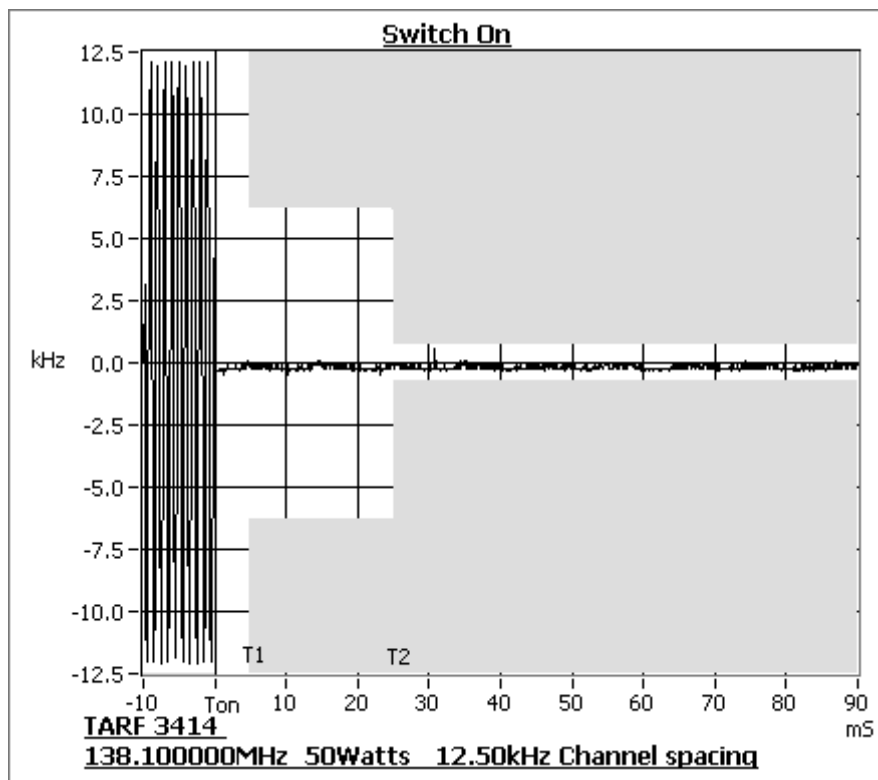
Tait Communications

Report Number 3414

## Transient Frequency Behavior

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

Tx FREQUENCY: 138.1 MHz 50 W 12.5 kHz Channel Spacing



**TELTEST Laboratories**

Tait Communications

Report Number 3414

**Transient Frequency Behavior**

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

Tx FREQUENCY: 152.1 MHz 50 W 12.5 kHz Channel Spacing

| FREQUENCY                 | 152.1 MHz @ 50 W Tx                |               |
|---------------------------|------------------------------------|---------------|
| TRANSIENT RESPONSE PERIOD | CARRIER PEAK VARIATION FROM NORMAL |               |
|                           | Key ON (kHz)                       | Key OFF (kHz) |
| t1                        | -0.6                               | N/A           |
| t2                        | -0.5                               | N/A           |
| t3                        | N/A                                | -0.4          |
| t2 → t3 ppm               | -3.3                               |               |
| ERROR LIMIT (t2 → t3) ppm | 5.0                                |               |

|                                                                                                                     |     |    |
|---------------------------------------------------------------------------------------------------------------------|-----|----|
| 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: CFR 47 90.214

| TRANSIENT PERIODS | FREQUENCY RANGE<br>150 – 174 MHz | FREQUENCY RANGE<br>421 – 512 MHz |
|-------------------|----------------------------------|----------------------------------|
| t1 (ms)           | 5 ms                             | 10 ms                            |
| t2 (ms)           | 20 ms                            | 25 ms                            |
| t3 (ms)           | 5 ms                             | 10 ms                            |

LIMIT: RSS-119 5.9

| Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels |                              |                 |                 |
|--------------------------------------------------------------------------------------|------------------------------|-----------------|-----------------|
| TRANSIENT PERIODS                                                                    | Maximum Frequency Difference | FREQUENCY RANGE |                 |
|                                                                                      |                              | 138 – 174 MHz   | 406.1 – 470 MHz |
| t1 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |
| t2 (ms)                                                                              | ± 6.25 kHz                   | 20 ms           | 25 ms           |
| t3 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

# TELTEST Laboratories

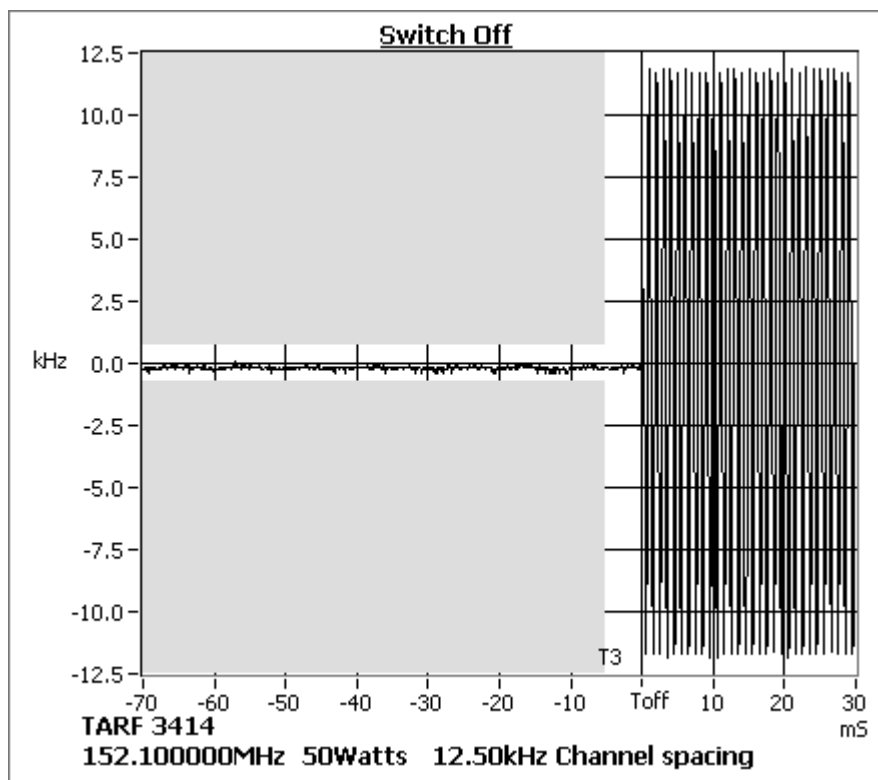
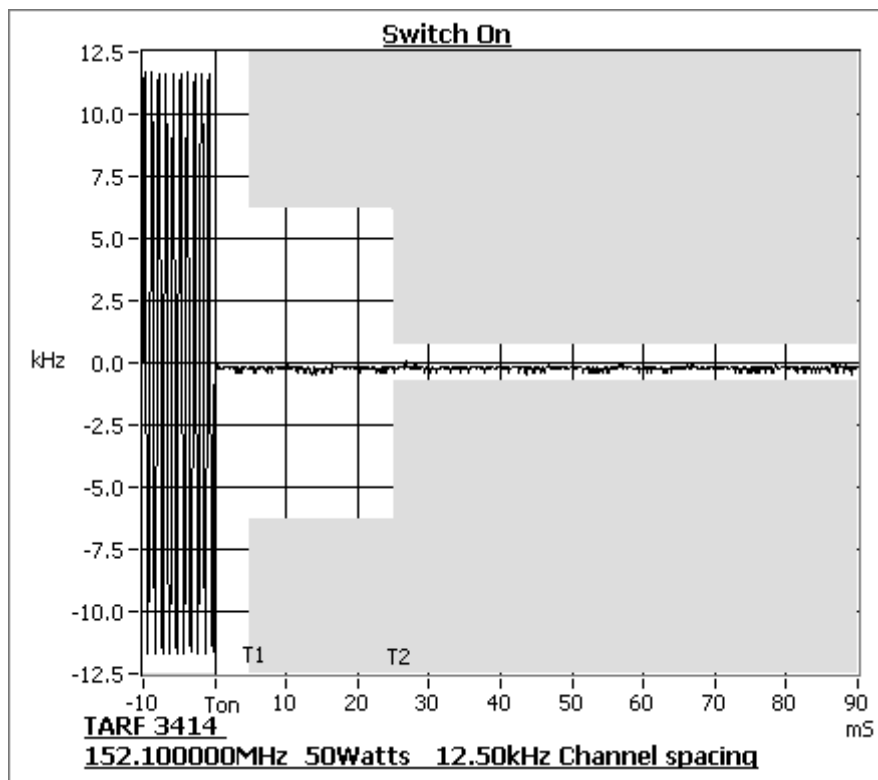
Tait Communications

Report Number 3414

## Transient Frequency Behavior

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

Tx FREQUENCY: 152.1 MHz 50 W 12.5 kHz Channel Spacing



**TELTEST Laboratories**  
Tait Communications  
Report Number 3414

**Transient Frequency Behavior**

SPECIFICATION: CFR 47 90.214 RSS-119 5.9  
Tx FREQUENCY: 153.1 MHz 50 W 12.5 kHz Channel Spacing

| FREQUENCY                 | 153.1 MHz @ 50 W Tx                |               |
|---------------------------|------------------------------------|---------------|
| TRANSIENT RESPONSE PERIOD | CARRIER PEAK VARIATION FROM NORMAL |               |
|                           | Key ON (kHz)                       | Key OFF (kHz) |
| t1                        | -0.3                               | N/A           |
| t2                        | -0.3                               | N/A           |
| t3                        | N/A                                | -0.6          |
| t2 → t3 ppm               | -3.0                               |               |
| ERROR LIMIT (t2 → t3) ppm | 5.0                                |               |

|                                                                                                                     |     |    |
|---------------------------------------------------------------------------------------------------------------------|-----|----|
| 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: CFR 47 90.214

| TRANSIENT PERIODS | FREQUENCY RANGE<br>150 – 174 MHz | FREQUENCY RANGE<br>421 – 512 MHz |
|-------------------|----------------------------------|----------------------------------|
| t1 (ms)           | 5 ms                             | 10 ms                            |
| t2 (ms)           | 20 ms                            | 25 ms                            |
| t3 (ms)           | 5 ms                             | 10 ms                            |

LIMIT: RSS-119 5.9

| Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels |                              |                 |                 |
|--------------------------------------------------------------------------------------|------------------------------|-----------------|-----------------|
| TRANSIENT PERIODS                                                                    | Maximum Frequency Difference | FREQUENCY RANGE |                 |
|                                                                                      |                              | 138 – 174 MHz   | 406.1 – 470 MHz |
| t1 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |
| t2 (ms)                                                                              | ± 6.25 kHz                   | 20 ms           | 25 ms           |
| t3 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

# TELTEST Laboratories

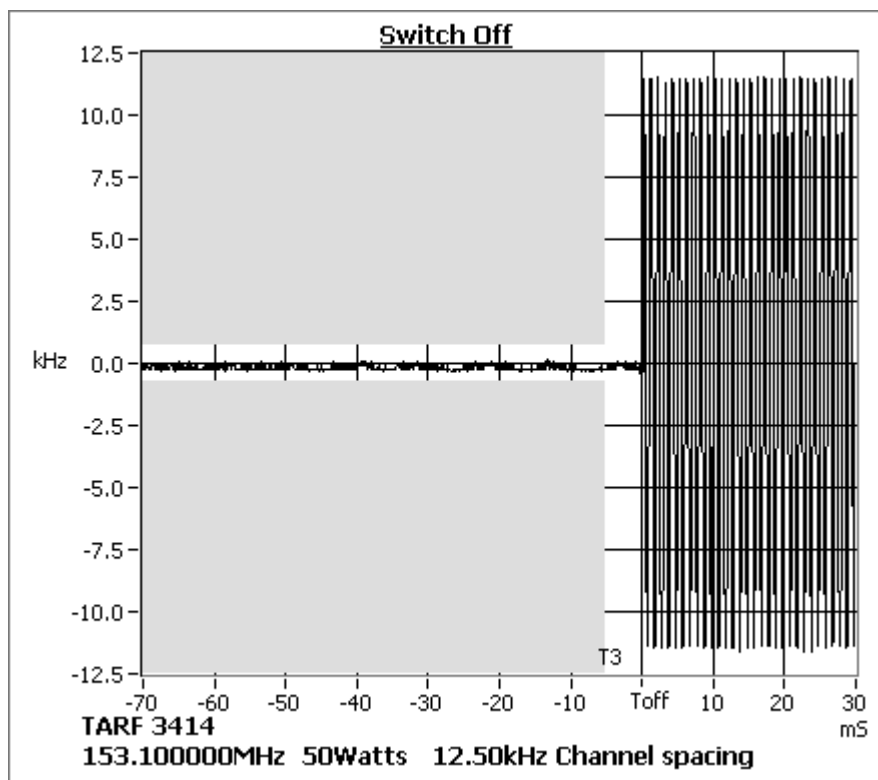
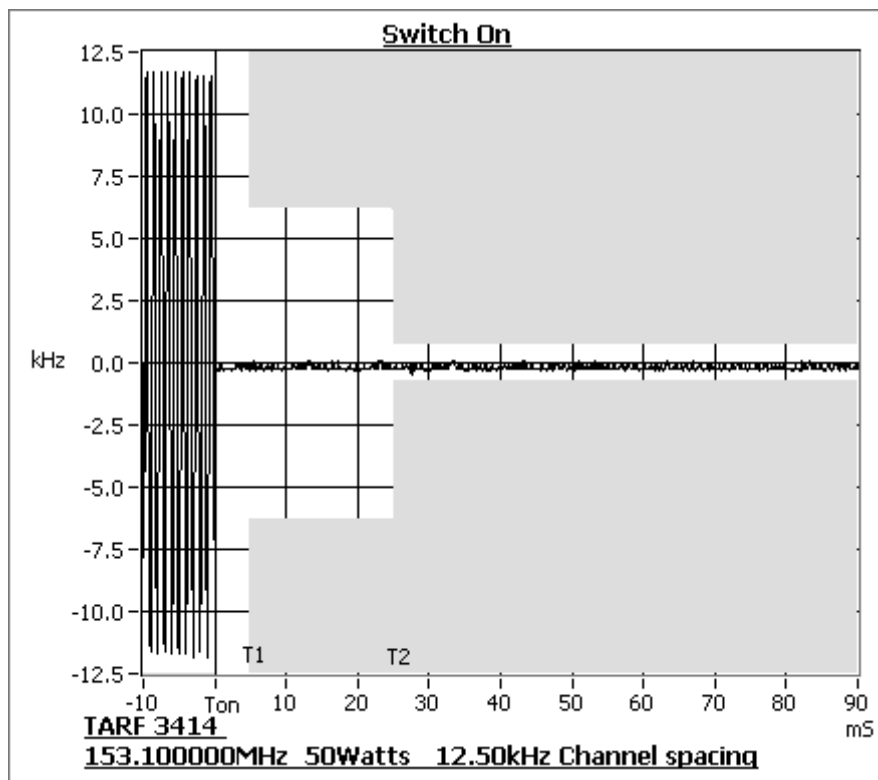
Tait Communications

Report Number 3414

## Transient Frequency Behavior

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

Tx FREQUENCY: 153.1 MHz 50 W 12.5 kHz Channel Spacing



**TELTEST Laboratories**

Tait Communications

Report Number 3414

**Transient Frequency Behavior**

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

Tx FREQUENCY: 158.1 MHz 50 W 12.5 kHz Channel Spacing

| FREQUENCY                 | 158.1 MHz @ 50 W Tx                |               |
|---------------------------|------------------------------------|---------------|
| TRANSIENT RESPONSE PERIOD | CARRIER PEAK VARIATION FROM NORMAL |               |
|                           | Key ON (kHz)                       | Key OFF (kHz) |
| t1                        | -0.4                               | N/A           |
| t2                        | -0.4                               | N/A           |
| t3                        | N/A                                | -0.4          |
| t2 → t3 ppm               | -2.3                               |               |
| ERROR LIMIT (t2 → t3) ppm | 5.0                                |               |

|                                                                                                                     |     |    |
|---------------------------------------------------------------------------------------------------------------------|-----|----|
| 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: CFR 47 90.214

| TRANSIENT PERIODS | FREQUENCY RANGE<br>150 – 174 MHz | FREQUENCY RANGE<br>421 – 512 MHz |
|-------------------|----------------------------------|----------------------------------|
| t1 (ms)           | 5 ms                             | 10 ms                            |
| t2 (ms)           | 20 ms                            | 25 ms                            |
| t3 (ms)           | 5 ms                             | 10 ms                            |

LIMIT: RSS-119 5.9

| Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels |                              |                 |                 |
|--------------------------------------------------------------------------------------|------------------------------|-----------------|-----------------|
| TRANSIENT PERIODS                                                                    | Maximum Frequency Difference | FREQUENCY RANGE |                 |
|                                                                                      |                              | 138 – 174 MHz   | 406.1 – 470 MHz |
| t1 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |
| t2 (ms)                                                                              | ± 6.25 kHz                   | 20 ms           | 25 ms           |
| t3 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

# TELTEST Laboratories

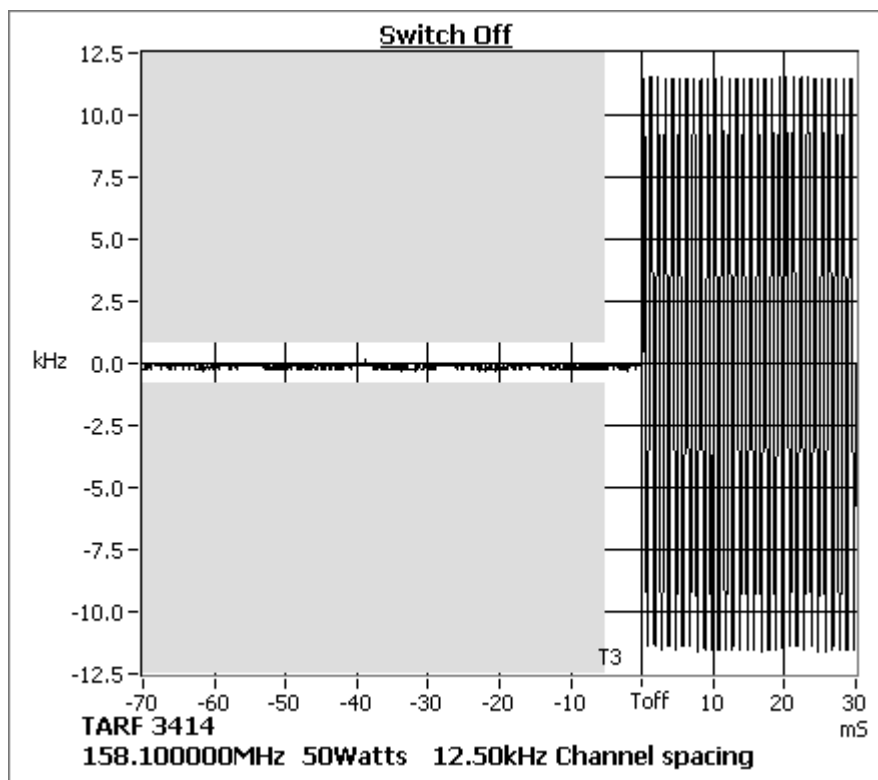
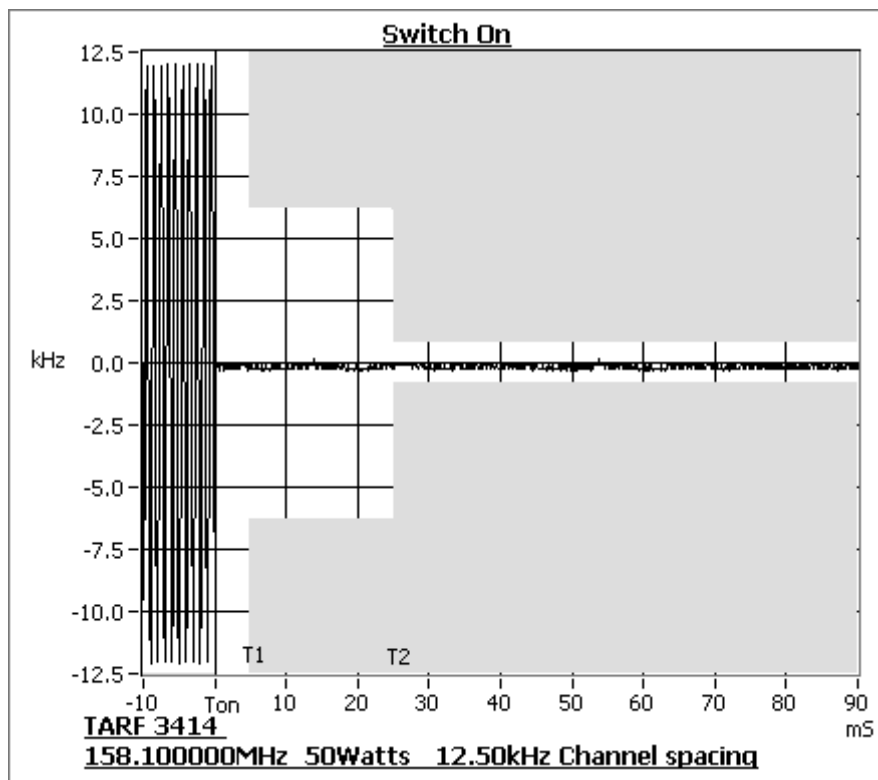
Tait Communications

Report Number 3414

## Transient Frequency Behavior

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

Tx FREQUENCY: 158.1 MHz 50 W 12.5 kHz Channel Spacing



**TELTEST Laboratories**

Tait Communications

Report Number 3414

**Transient Frequency Behavior**

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

Tx FREQUENCY: 173.1 MHz 50 W 12.5 kHz Channel Spacing

| FREQUENCY                 | 173.1 MHz @ 50 W Tx                |               |
|---------------------------|------------------------------------|---------------|
| TRANSIENT RESPONSE PERIOD | CARRIER PEAK VARIATION FROM NORMAL |               |
|                           | Key ON (kHz)                       | Key OFF (kHz) |
| t1                        | -0.3                               | N/A           |
| t2                        | -0.3                               | N/A           |
| t3                        | N/A                                | -0.4          |
| t2 → t3 ppm               | -2.5                               |               |
| ERROR LIMIT (t2 → t3) ppm | 5.0                                |               |

|                                                                                                                     |     |    |
|---------------------------------------------------------------------------------------------------------------------|-----|----|
| 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: CFR 47 90.214

| TRANSIENT PERIODS | FREQUENCY RANGE<br>150 – 174 MHz | FREQUENCY RANGE<br>421 – 512 MHz |
|-------------------|----------------------------------|----------------------------------|
| t1 (ms)           | 5 ms                             | 10 ms                            |
| t2 (ms)           | 20 ms                            | 25 ms                            |
| t3 (ms)           | 5 ms                             | 10 ms                            |

LIMIT: RSS-119 5.9

| Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels |                              |                 |                 |
|--------------------------------------------------------------------------------------|------------------------------|-----------------|-----------------|
| TRANSIENT PERIODS                                                                    | Maximum Frequency Difference | FREQUENCY RANGE |                 |
|                                                                                      |                              | 138 – 174 MHz   | 406.1 – 470 MHz |
| t1 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |
| t2 (ms)                                                                              | ± 6.25 kHz                   | 20 ms           | 25 ms           |
| t3 (ms)                                                                              | ± 12.5 kHz                   | 5 ms            | 10 ms           |

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

# TELTEST Laboratories

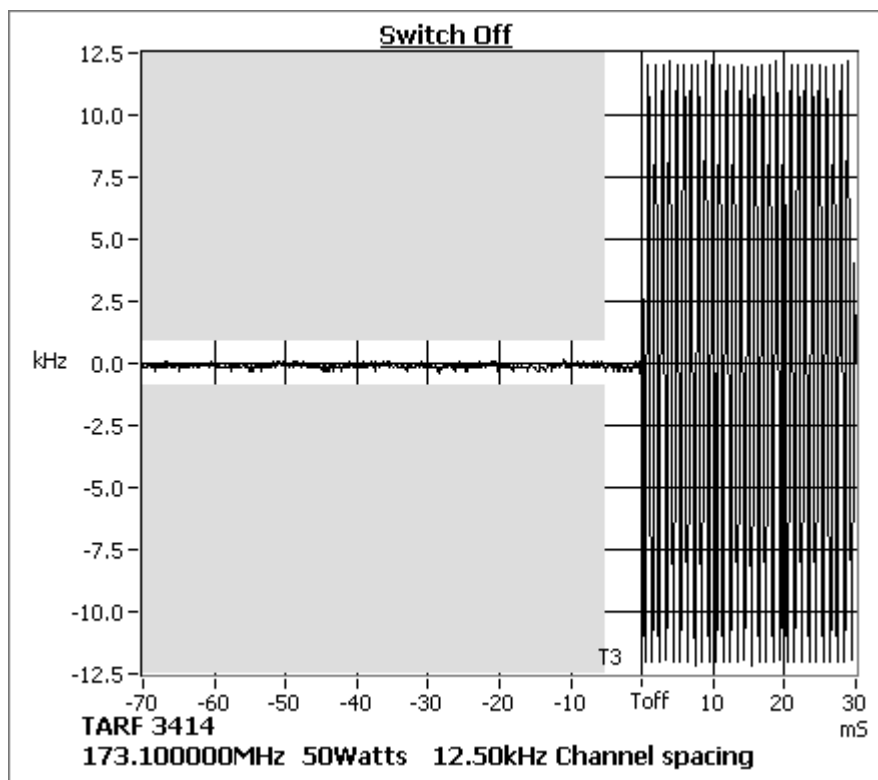
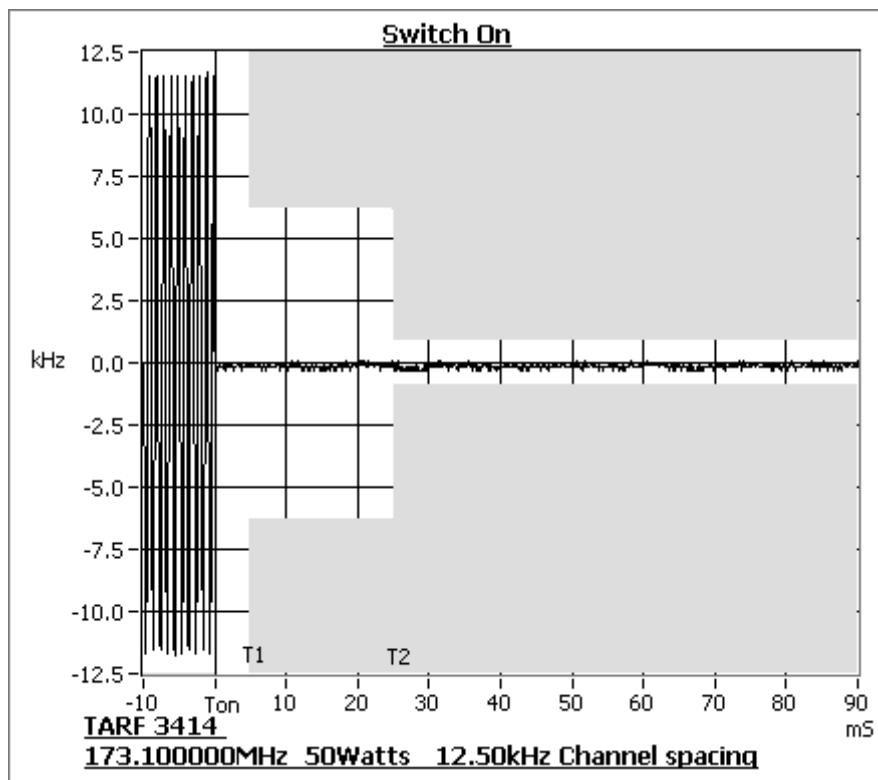
Tait Communications

Report Number 3414

## Transient Frequency Behavior

SPECIFICATION: CFR 47 90.214 RSS-119 5.9

Tx FREQUENCY: 173.1 MHz 50 W 12.5 kHz Channel Spacing



## TRANSMITTER FREQUENCY STABILITY - TEMPERATURE

SPECIFICATION: CFR 47 2.1055 (a) (1) RSS-119 5.3

GUIDE: TIA/EIA-603D 2.2.2

### MEASUREMENT PROCEDURE:

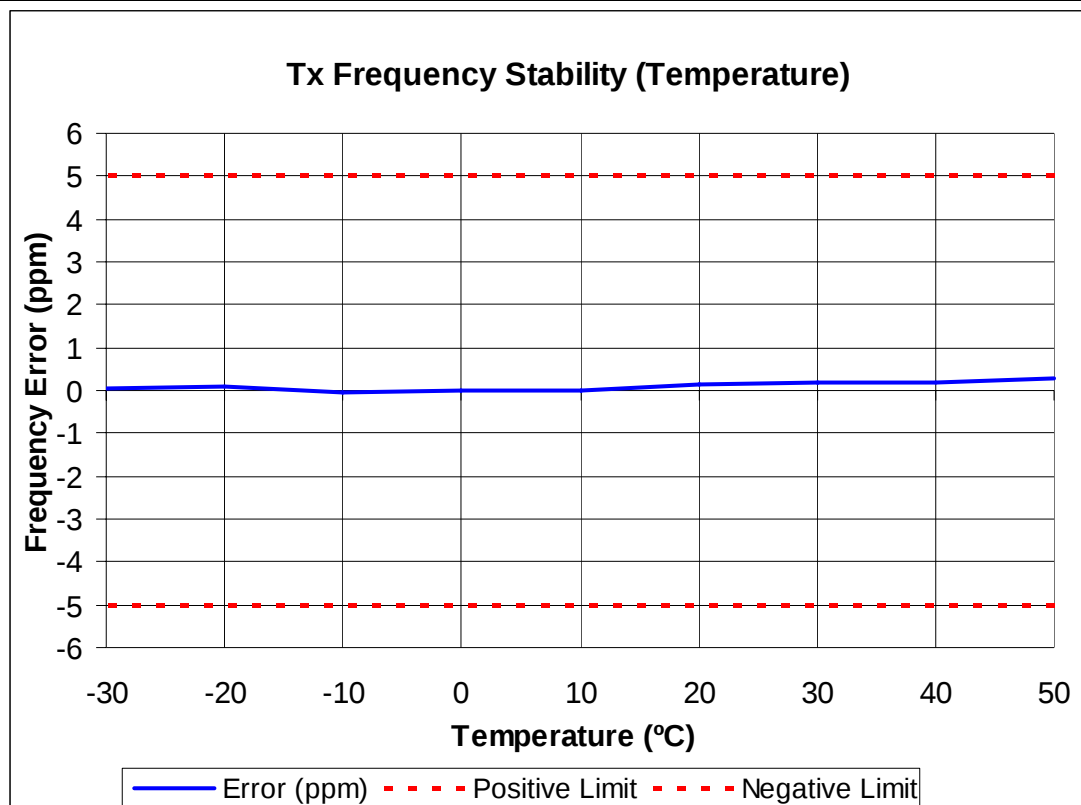
1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  in  $10^{\circ}\text{C}$  increments
3. The frequency error was recorded in parts per million (ppm).

### MEASUREMENT RESULTS:

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

138.1 MHz 50 W

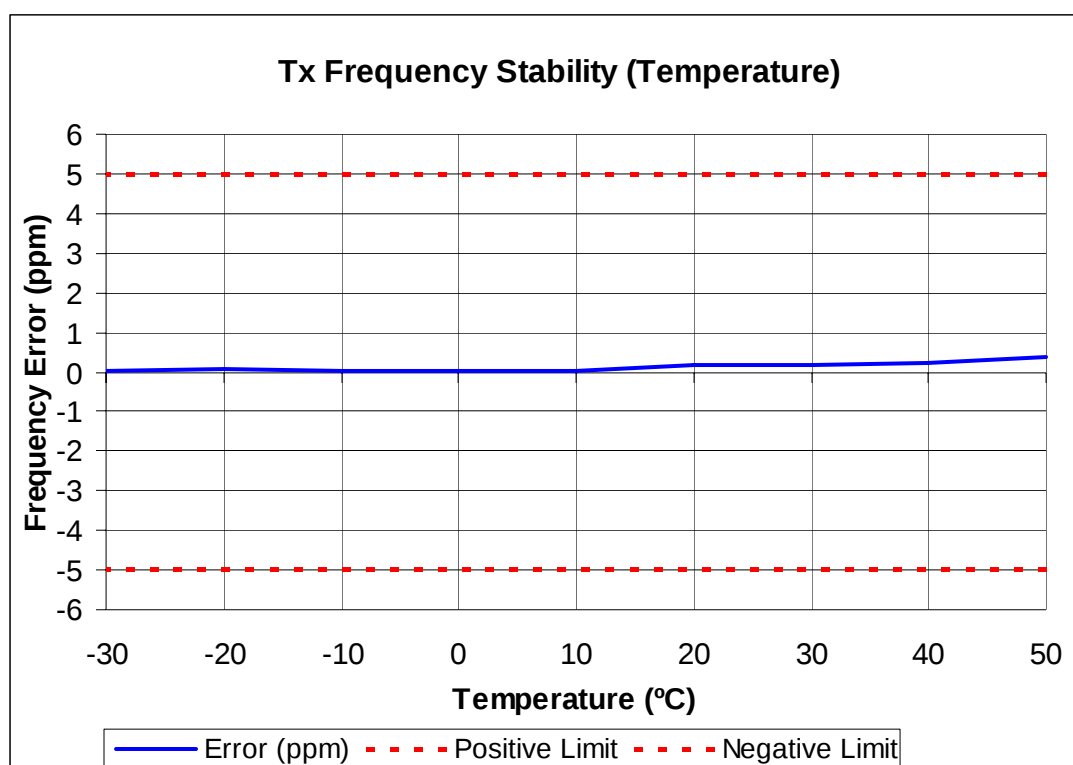
| Temperature ( $^{\circ}\text{C}$ ) | Frequency (MHz) | Error (ppm) |
|------------------------------------|-----------------|-------------|
| 50                                 | 138.100041      | 0.30        |
| 40                                 | 138.100027      | 0.20        |
| 30                                 | 138.100025      | 0.18        |
| 20                                 | 138.100020      | 0.14        |
| 10                                 | 138.100002      | 0.01        |
| 0                                  | 138.100003      | 0.02        |
| -10                                | 138.099994      | -0.04       |
| -20                                | 138.100010      | 0.07        |
| -30                                | 138.100006      | 0.04        |



Transmitter Frequency Stability - Temperature

152.1 MHz      50 W

| Temperature (°C) | Frequency (MHz) | Error (ppm) |
|------------------|-----------------|-------------|
| 50               | 152.100054      | 0.36        |
| 40               | 152.100034      | 0.22        |
| 30               | 152.100029      | 0.19        |
| 20               | 152.100025      | 0.16        |
| 10               | 152.100006      | 0.04        |
| 0                | 152.100004      | 0.03        |
| -10              | 152.100002      | 0.01        |
| -20              | 152.100008      | 0.05        |
| -30              | 152.100004      | 0.03        |



**TELTEST Laboratories**

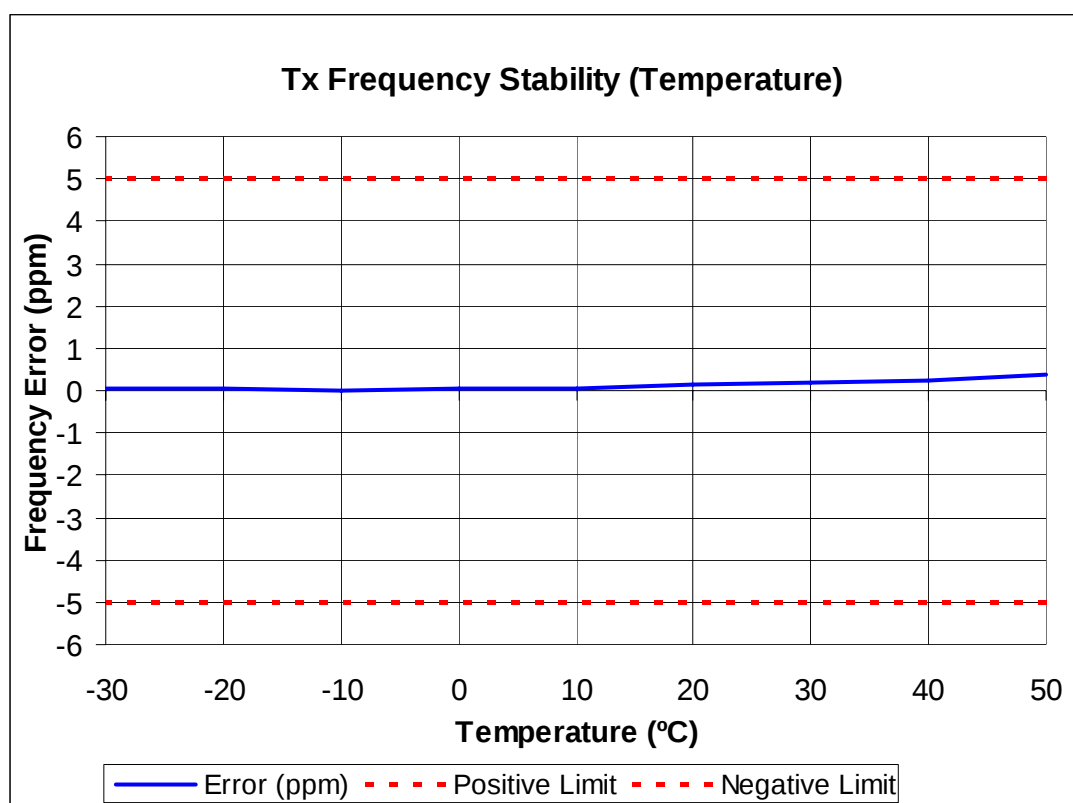
Tait Communications

Report Number 3414

**Transmitter Frequency Stability - Temperature**

153.1 MHz      50 W

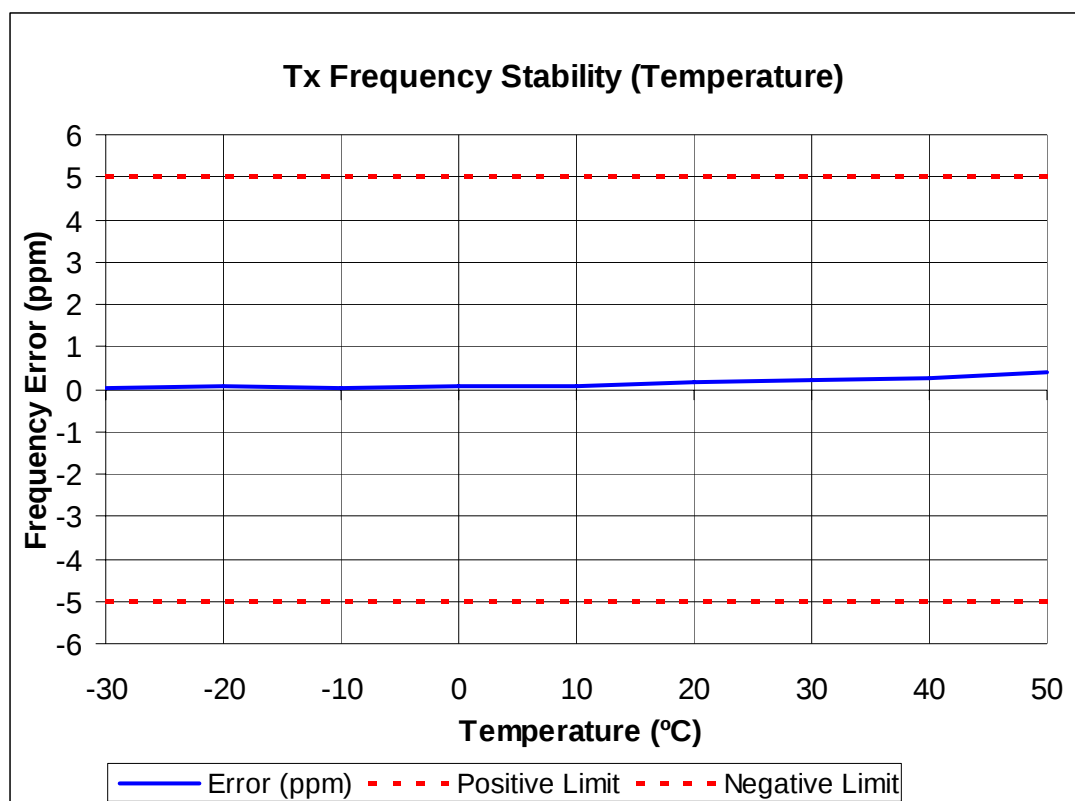
| Temperature (°C) | Frequency (MHz) | Error (ppm) |
|------------------|-----------------|-------------|
| 50               | 153.100059      | 0.39        |
| 40               | 153.100037      | 0.24        |
| 30               | 153.100029      | 0.19        |
| 20               | 153.100025      | 0.16        |
| 10               | 153.100008      | 0.05        |
| 0                | 153.100008      | 0.05        |
| -10              | 153.100002      | 0.01        |
| -20              | 153.100008      | 0.05        |
| -30              | 153.100005      | 0.03        |



Transmitter Frequency Stability - Temperature

158.1 MHz      50 W

| Temperature (°C) | Frequency (MHz) | Error (ppm) |
|------------------|-----------------|-------------|
| 50               | 158.100064      | 0.40        |
| 40               | 158.100043      | 0.27        |
| 30               | 158.100030      | 0.19        |
| 20               | 158.100029      | 0.18        |
| 10               | 158.100008      | 0.05        |
| 0                | 158.100009      | 0.06        |
| -10              | 158.100002      | 0.01        |
| -20              | 158.100009      | 0.06        |
| -30              | 158.100005      | 0.03        |



**TELTEST Laboratories**

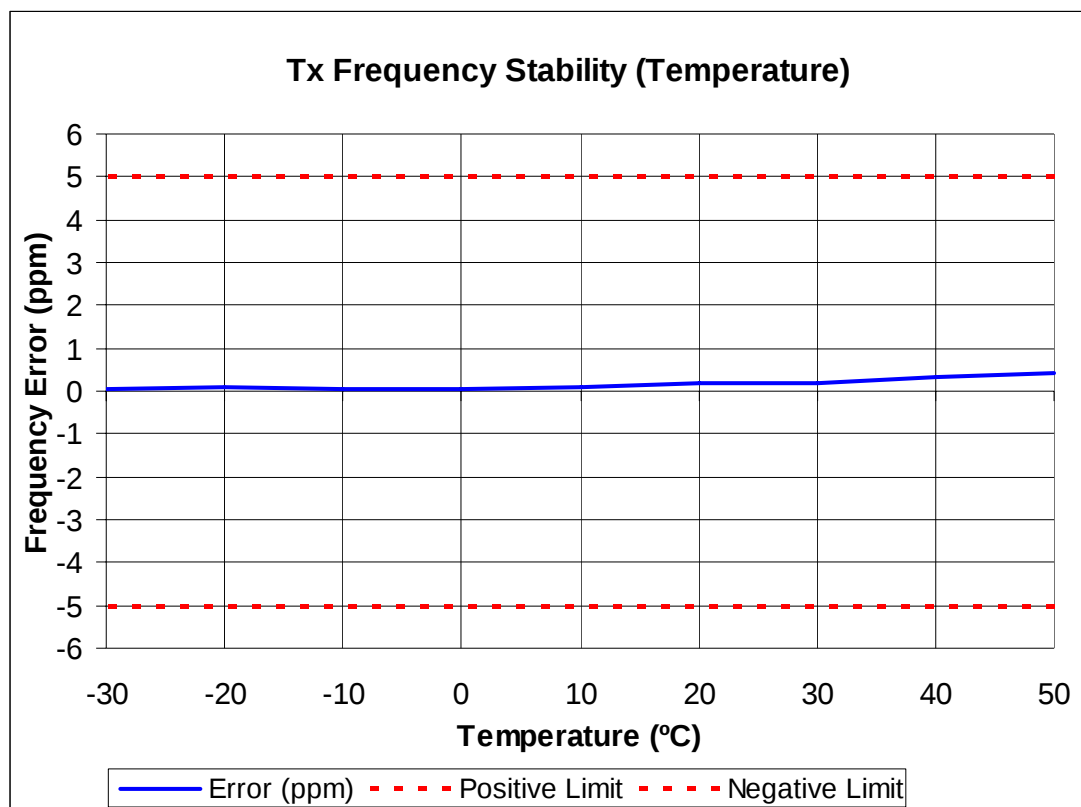
Tait Communications

Report Number 3414

**Transmitter Frequency Stability - Temperature**

173.1 MHz      50 W

| Temperature (°C) | Frequency (MHz) | Error (ppm) |
|------------------|-----------------|-------------|
| 50               | 173.100072      | 0.42        |
| 40               | 173.100053      | 0.31        |
| 30               | 173.100033      | 0.19        |
| 20               | 173.100032      | 0.18        |
| 10               | 173.100015      | 0.09        |
| 0                | 173.100012      | 0.07        |
| -10              | 173.100005      | 0.03        |
| -20              | 173.100013      | 0.08        |
| -30              | 173.100008      | 0.05        |



LIMIT: CFR 47 90.213

RSS-119      5.3

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

**TELTEST Laboratories**

Tait Communications

Report Number 3414

---

**TRANSMITTER FREQUENCY STABILITY - VOLTAGE**

SPECIFICATION: CFR 47 2.1055 (d) (1) RSS-119 5.3

GUIDE: TIA/EIA-603D 2.2.2

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for equipment set up.
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).

**MEASUREMENT RESULTS:**

Tx Power 50 W

| Voltage               | FREQUENCY ERROR (ppm) |           |           |           |           |
|-----------------------|-----------------------|-----------|-----------|-----------|-----------|
|                       | 138.1 MHz             | 152.1 MHz | 153.1 MHz | 158.1 MHz | 173.1 MHz |
| 13.80V <sub>DC</sub>  | 0.07                  | 0.09      | 0.11      | 0.11      | 0.12      |
| 11.73 V <sub>DC</sub> | 0.09                  | 0.11      | 0.11      | 0.11      | 0.12      |
| 15.87 V <sub>DC</sub> | 0.09                  | 0.10      | 0.10      | 0.11      | 0.12      |

LIMIT CLAUSES: CFR 47 90.213

RSS-119 5.3

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

**TELTEST Laboratories**

Tait Communications

Report Number 3414

---

**SPURIOUS EMISSIONS – Rx CONDUCTED**

SPECIFICATION: RSS-119 5.11

GUIDE: TIA/EIA-603D 2.1.2

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for Equipment set up diagram.
2. The frequency range examined was from 30 MHz to 3 times highest tunable frequency.
3. Spurious emissions which were attenuated more than 20dB below the limit were not recorded.

| 138.1 MHz Receive                                 |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
|                                                   |            |             |
| No emissions were detected within 20 dB of Limit. |            |             |

| 152.1 MHz Receive                                 |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
|                                                   |            |             |
| No emissions were detected within 20 dB of Limit. |            |             |

| 153.1 MHz Receive                                 |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
|                                                   |            |             |
| No emissions were detected within 20 dB of Limit. |            |             |

| 156.1 MHz Receive                                 |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
|                                                   |            |             |
| No emissions were detected within 20 dB of Limit. |            |             |

**TELTEST Laboratories**

Tait Communications

Report Number 3414

---

**Spurious Emissions – Rx Conducted**

| 158.1 MHz Receive                                 |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
|                                                   |            |             |
| No emissions were detected within 20 dB of Limit. |            |             |

| 173.1 MHz Receive                                 |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
|                                                   |            |             |
| No emissions were detected within 20 dB of Limit. |            |             |

**LIMIT CLAUSE:**

RSS-Gen

6(b)

|       |               |      |          |
|-------|---------------|------|----------|
| LIMIT | 30 → 1000 MHz | 2 nW | - 57 dBm |
|       | > 1000 MHz    | 5 nW | - 53 dBm |

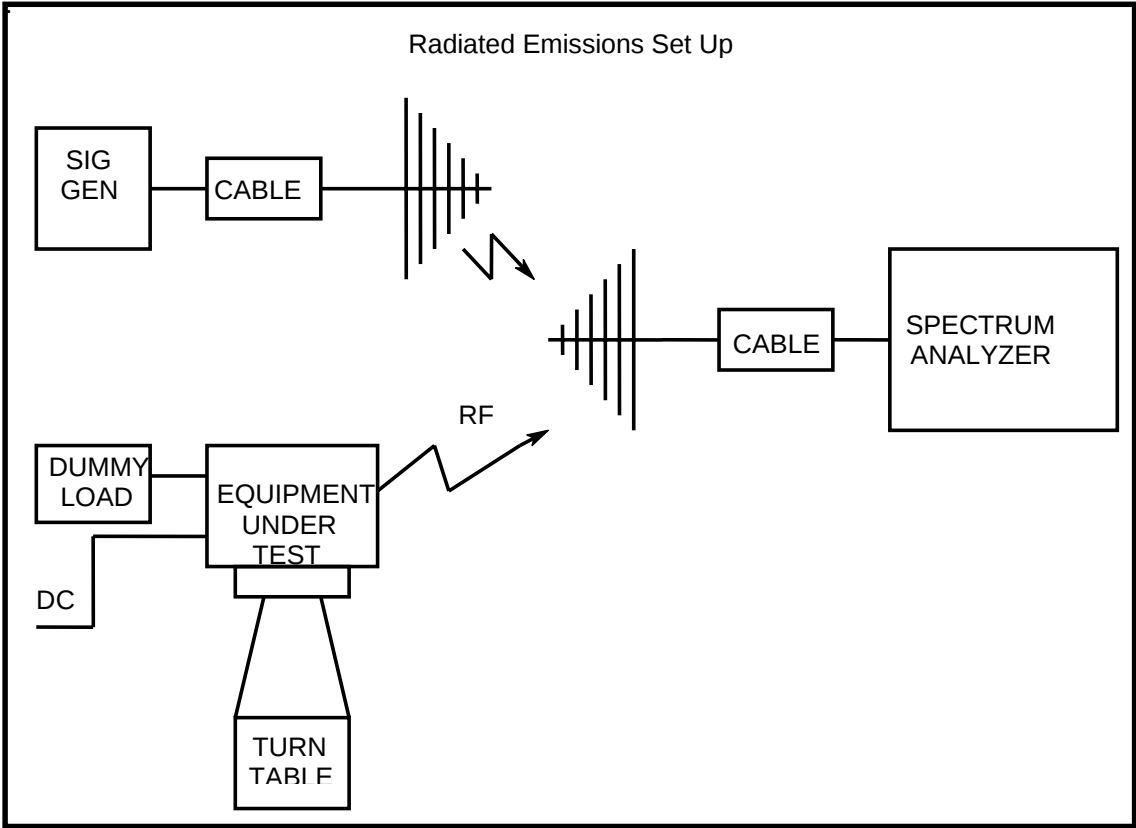
**TELTEST Laboratories**  
Tait Communications  
Report Number 3414

---

**TEST EQUIPMENT LIST**

| <b>Equipment</b>     | <b>Manufacturer</b> | <b>Model No</b>      | <b>Serial No#</b> | <b>Tait ID</b> | <b>Cal Due</b> |
|----------------------|---------------------|----------------------|-------------------|----------------|----------------|
| 1m Coax (Blue)       | Suhner              | Sucoflex 104A        | 44610/4A          | E4619          | 8-Oct-12       |
| 2m Coax (Black2)     | Suhner              | RG214HF/Nm/Nm/2000   | Black2            | E4623          | 8-Oct-12       |
| 2m Coax (Black3)     | Suhner              | RG214HF/Nm/Nm/2000   | Black3            | E4624          | 8-Oct-12       |
| 2m Coax (Black4)     | Suhner              | RG214HF/Nm/Nm/2000   | Black4            | E4653          | 8-Oct-12       |
| 3m Coax (Blue)       | Suhner              | Sucoflex 104A        | 44611/4A          | E4620          | 8-Oct-12       |
| Amplifier +21.7 dB   | Tait                | ZFL-1000LN           | E3660             | E3360          | 2-Dec-12       |
| Audio Analyser       | Hewlett Packard     | HP8903A              | 2308A02597        | E3074          | 14-Oct-12      |
| Environ. Chamber     | Contherm            | 5400 RHSLT.M         | 1416              | E4051          | 2-Aug-15       |
| Horn Antenna         | Emco                | DRG3115              | 9512-4638         | E3560          | 6-Jan-13       |
| Log Periodic Antenna | Schwarzbeck         | VUSLP                | 9111-219          | E4617          | -              |
| Modulation Analyser  | Hewlett Packard     | HP8901B (Opt 002)    | 2441A00393        | E3073          | 14-Oct-12      |
| Multimeter           | Fluke               | 77                   | 35069359          | E3237          | 10-Oct-12      |
| OATS Antenna Tower   | Electrometrics      | EM-4720-2            | 112               | E4447          | -              |
| OATS Controller      | Electrometrics      | EM-4700              | 119               | E4445          | -              |
| OATS Tower Cable     | Intelcom            | RG214                | OATS1             | E4621          | 12-Oct-12      |
| OATS Turntable       | Electrometrics      | EM-4704A             | 105               | E4446          | -              |
| OATS Turntable Cable | Intelcom            | RG215                | OATS2             | E4622          | 12-Oct-12      |
| Oscilloscope         | Tektronics          | TDS340               | B013611           | E3585          | 10-Oct-12      |
| Power Sensor         | Rohde & Schwarz     | URV5- Z4 395.1619.55 | 841498/003        | E3557          | 4-Oct-13       |
| Power Supply         | Hewlett Packard     | HP6032A              | 2441A00412        | E3075          | 13-Oct-12      |
| Reference Dipoles    | Emco                | 3121C DB1            | 9510-1164         | E3559          | 10-Dec-12      |
| RF Attenuator 350W   | Weinschel           | 67-30-33             | BR0531            | E4280          | 10-Oct-12      |
| RF Attenuator 150W   | Weinschel           | 40-20-33             | CJ405             | E3733          | 13-Oct-12      |
| RF Attenuator 50W    | Weinschel           | 24-10-34             | AZ0401            | E3388          | 17-Oct-12      |
| RF Attenuator 50W    | Weinschel           | 24-20-44             | AW1266            | E3562          | 11-Oct-12      |
| RF Load 150W         | Bird                | 8166                 | 524               | E3625          | 8-Oct-12       |
| RF Splitter Combiner | Minicircuits        | ZFSC-4-1             | -                 | E4083          | -              |
| Signal Generator     | Agilent             | E4422B               | GB40050320        | E3788          | 10-Oct-12      |
| Signal Generator     | Agilent             | E8663D               | MY50420224        | E4908          | 14-Oct-12      |
| S-Line TEM Cell      | Rohde & Schwarz     | 1089.9296.02         | 338232/003        | E3636          | 31-Aug-15      |
| Spectrum Analyser    | Agilent             | PXA N9030A           | MY49432161        | E4907          | 30-Mar-14      |
| Spectrum Analyser    | Hewlett Packard     | HP8562E              | 3821A00779        | E3715          | 11-Oct-12      |
| Spectrum Analyser    | Agilent             | PSA E4445A           | MY42510072        | E4139          | 22-Oct-12      |

ANNEX A – TEST SETUP DETAILS



All other testing is performed using the Teltest Radio **EVAL**uation system (TREVA), which is configured as shown below. The Spectrum Analyser is connected to the EUT via the attenuator network for Conducted Emissions testing, and Occupied Bandwidth.

