

# LABORATORY TEST REPORT

## RADIO PERFORMANCE MEASUREMENTS

for the

TBDHHF Transportable Transceiver

Tested in accordance with:

FCC 47 CFR Parts 22 and 90

RSS-119 Issue 12  
RSS-Gen Issue 5

Report Revision: 2  
Issue Date: 03 May 2024

PREPARED BY: J. J. Aro

  
Test Technician

CHECKED & APPROVED BY: M. C. James

  
Laboratory Technical Manager



FCC Registration: 838288  
ISED Registration: 737A

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.

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

Telephone: 64 3 358 3399

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## REVISION HISTORY

| Date          | Revision | Comments                                                  |
|---------------|----------|-----------------------------------------------------------|
| 04 April 2024 | 1        | Initial test report                                       |
| 03 May 2024   | 2        | Added harmonics measurement results and test setup photos |
|               |          |                                                           |

## INTRODUCTION

Type approval testing of the TBDHHF, 15W, Transportable transceiver in order to demonstrate compliance with FCC 47 Parts 22 & 90, and RSS-119 Issue 12 & RSS-Gen Issue 5.

### REPORT PREPARED FOR

Tait International Ltd  
245 Wooldridge Road  
Harewood  
Christchurch 8051  
New Zealand

### DESCRIPTION OF SAMPLE

Manufacturer: Tait International Limited  
Equipment: Transportable Transceiver  
Type: TBDHHF  
Product Code: TB7306-HHL0  
Serial Number(s): 18411988  
Frequency range: 378 → 420 MHz  
Transmit Power: 15 W

### HARDWARE & SOFTWARE

Quantity: 1

| Module          | Product Code   | Serial Number | Firmware Version | Hardware Version |
|-----------------|----------------|---------------|------------------|------------------|
| Reciter         | T01-01403-JBAA | 18412105      | p25-3.55.00.0009 | 06.03            |
| Power Amplifier | T01-01405-JCAA | 18412352      | NA               | 00.01            |

### TEST CONDITIONS

All testing was performed between 21 March 2024 → 02 May 2024, and under the following conditions:

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

## TEST REQUIREMENTS AND RESULT SUMMARY

Specification Versions: RSS-119 issue 12, RSS Gen issue 5, ANSI C63.26-2015, TIA-603-E

| ISED Specification  | FCC Specification                            | Test Name                                           | Test Methods                             | Result |
|---------------------|----------------------------------------------|-----------------------------------------------------|------------------------------------------|--------|
| RSS-119 5.4         | FCC 47 CFR 2.1046                            | Transmitter Output Power (Conducted)                | ANSI C63.26 5.2.4.2                      | P      |
| No specification    | FCC 47 CFR 2.1047 (a)                        | Transmitter Audio Frequency Response – Pre-emphasis | ANSI C63.26 5.3.3.2                      | P      |
| No specification    | FCC 47 CFR 2.1047 (b)                        | Transmitter Modulation Limiting                     | ANSI C63.26 5.3.2                        | P      |
| RSS-119 5.5         | FCC 47 CFR 2.1049 (c)                        | Transmitter Occupied (99%) Bandwidth                | ANSI C63.26 5.4.4                        | P      |
| RSS-119 5.5         | FCC 47 CFR 90.210                            | Transmitter Spectrum Masks                          | ANSI C63.26.5.7.3                        | P      |
| RSS-119 5.8.9       | FCC 47 CFR 90.543                            | Adjacent Channel Power Ratio                        | TIA-603-E 2.2.14<br>TIA-102.CAAA-E 2.2.8 | N/A 2  |
| RSS-119 5.8         | FCC 47 CFR 2.1051                            | Transmitter Spurious Emissions (Conducted)          | ANSI C63.26 5.7                          | P      |
| RSS-119 5.8         | FCC 47 CFR 2.1053                            | Transmitter Spurious Emissions (Radiated)           | TIA-603-E 2.2.12                         | P      |
| No specification    | FCC CFR 90.543                               | Transmitter Radiated Emissions in the GNSS Band     | TIA-603-E 2.2.12                         | N/A 2  |
| RSS-119 5.8.9.2 rad | No specification                             | Transmitter Conducted Emissions in the GNSS Band    | ANSI C63.26 6.5.2.7.4                    | N/A 2  |
| RSS-119 5.9         | FCC 47 CFR 90.214                            | Transient Frequency Behaviour                       | ANSI C63.26 6.5.2.2                      | P      |
| RSS-119 5.3         | FCC 47 CFR 2.1055, FCC 47 CFR 90.213         | Transmitter Frequency Stability - Temperature       | ANSI C63.26 5.6.4                        | P      |
| RSS-119 5.3         | FCC 47 CFR 2.1055 (d) (1), FCC 47 CFR 90.213 | Transmitter Frequency Stability - Voltage           | ANSI C63.26 5.6.5                        | P      |
| RSS-Gen 7.4         | FCC 47 CFR 15.111                            | Receiver Spurious Emissions (Conducted)             | TIA-603-E 2.1.2                          | P      |

| Test Case Result Definitions           |                  |
|----------------------------------------|------------------|
| No test Performed                      | N                |
| 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) |

| Comments:                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------|
| N/A 1: Only required where the EUT is capable of Analogue modulation                                                          |
| N/A 2: Only required where the EUT transmits in the 768-776 or 798-806 MHz band (ISED), or 769-775 or 799-805 MHz band (FCC). |
| N/A 3: Only required where the EUT transmits in the 138-174 or 406.1-512 MHz band                                             |

## STATEMENT OF COMPLIANCE

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

Equipment: Transportable Transceiver  
Type: TBDHHF  
Product Code: TB7306-HHL0  
Serial Number(s): 18411988  
Quantity: 1

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

FCC 47 CFR Parts 22 and 90

RSS-119 Issue 12 & RSS-Gen Issue 5

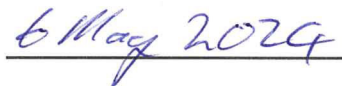
for the parameters tested in this report.

**Signature:**



M. C. James  
Laboratory Technical Manager

**Date:**



The results obtained in this test report pertain only to the item(s) tested. Teltest does not make any claims of compliance for samples or variants that were not tested.

95% measurement uncertainties are stated in this report but are not applied in the assessment of results.

## CHANNEL TABLE

| Label | Channel Number | Receive Frequency (MHz) | Transmit Frequency (MHz) | Amplifier Power (W) | Output Power (W) | Channel Spacing (kHz) |
|-------|----------------|-------------------------|--------------------------|---------------------|------------------|-----------------------|
| CH1 H | 1              | 406.150                 | 406.125                  | 20                  | 15               | 12.5                  |
| CH1 L | 2              | 406.150                 | 406.125                  | 3                   | 2                | 12.5                  |
| CH2 H | 3              | 413.050                 | 413.025                  | 20                  | 15               | 12.5                  |
| CH2 L | 4              | 413.050                 | 413.025                  | 3                   | 2                | 12.5                  |
| CH3 H | 5              | 419.950                 | 419.975                  | 20                  | 15               | 12.5                  |
| CH3 L | 6              | 419.950                 | 419.975                  | 3                   | 2                | 12.5                  |
| CH4 H | 7              | 388.750                 | 378.250                  | 21                  | 15               | 12.5                  |
| CH4 L | 8              | 388.750                 | 378.250                  | 3                   | 2                | 12.5                  |
|       |                |                         |                          |                     |                  |                       |

Note: To achieve the rated 15W transmission power at the output port, the internal power amplifier was adjusted to a higher power level, as indicated in the above table.

## MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

### MODULATION TYPES:

|     |                                    |          |
|-----|------------------------------------|----------|
| F3E | Analogue Frequency Modulation (FM) |          |
| F1E | P25 phase 1 Digital Voice          | 9600 bps |
| F1D | P25 phase 1 Digital Data           | 9600 bps |

CHANNEL SPACINGS: 12.5 kHz

### EMISSION DESIGNATORS:

|                           |          |
|---------------------------|----------|
|                           | 12.5 kHz |
| Analogue FM               | 11K0F3E  |
| Digital Voice P25 phase 1 | 8K10F1E  |
| Digital Data P25 phase 1  | 8K10F1D  |
|                           |          |

### 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: 12.5 kHz Bandwidth

Necessary bandwidth

M = 3.0 kHz

D = 2.5 kHz

$$B_n = (2 \times 3.0) + (2 \times 2.5) \times 1$$

$$= 11.0 \text{ kHz}$$

Emission Designator

**11K0F3E**

F3E represents an FM voice transmission

APCO P25 Phase 1: Digital Voice 12.5 kHz Channel Spacing

99% bandwidth

= 8.1 kHz

Emission Designator

**8K10F1E**

F1E represents a digital FM voice transmission

APCO P25 Phase 1: Digital Data 12.5 kHz Channel Spacing

99% bandwidth

= 8.1 kHz

Emission Designator

**8K10F1D**

F1D represents a digital FM data transmission

## TEST RESULTS

### TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046

RSS-119 5.4

GUIDE: ANSI C63.26 5.2.4.2

#### 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.

#### EXAMPLE CALCULATION:

##### Example calculation

$$\begin{aligned}\text{Power in dBm} &= \text{Measured power (dBm)} + \text{attenuator and cable loss (dB)} \\ \text{Chan 1 power (dBm)} &= 10.89 \text{ dBm} + 30.79 \text{ dB} \\ &= 41.68 \text{ dBm} \\ \text{Power in Watts} &= (10^{(41.68 \text{ dBm})/10})/1000 \\ &= 14.7 \text{ W}\end{aligned}$$

MEASUREMENT UNCERTAINTY:  $\pm 0.6 \text{ dB}$

#### MEASUREMENT RESULTS:

Manufacturer's Rated Output Power:

Switchable: 15 W and 2 W

| Nominal<br>15 W | 406.125 MHz | 413.025 MHz | 419.975 MHz | 378.250 MHz |
|-----------------|-------------|-------------|-------------|-------------|
| Measured        | 14.7        | 15.7        | 14.9        | 15.1        |
| Variation (%)   | -1.7        | 4.5         | -0.6        | 1.0         |
| Variation (dB)  | -0.1        | 0.2         | 0.0         | 0.0         |

| Nominal<br>2 W | 406.125 MHz | 413.025 MHz | 419.975 MHz | 378.250 MHz |
|----------------|-------------|-------------|-------------|-------------|
| Measured       | 2.2         | 2.2         | 2.2         | 2.2         |
| Variation (%)  | 8.8         | 12.5        | 11.3        | 11.2        |
| Variation (dB) | 0.4         | 0.5         | 0.5         | 0.5         |

#### LIMIT CLAUSES:

##### FCC 47 CFR 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  $\pm 1.0 \text{ dB}$  of the manufacturer's rated power.

## TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: ANSI C63.26 5.3.3.2

### MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
2. An audio input tone of 1000 Hz was applied with the level set to obtain 20% of maximum deviation. This was used as the 0 dB reference point.
3. The AF was varied while the audio level was held constant.
4. The response in dB relative to 1000 Hz was measured.

### MEASUREMENT RESULTS:

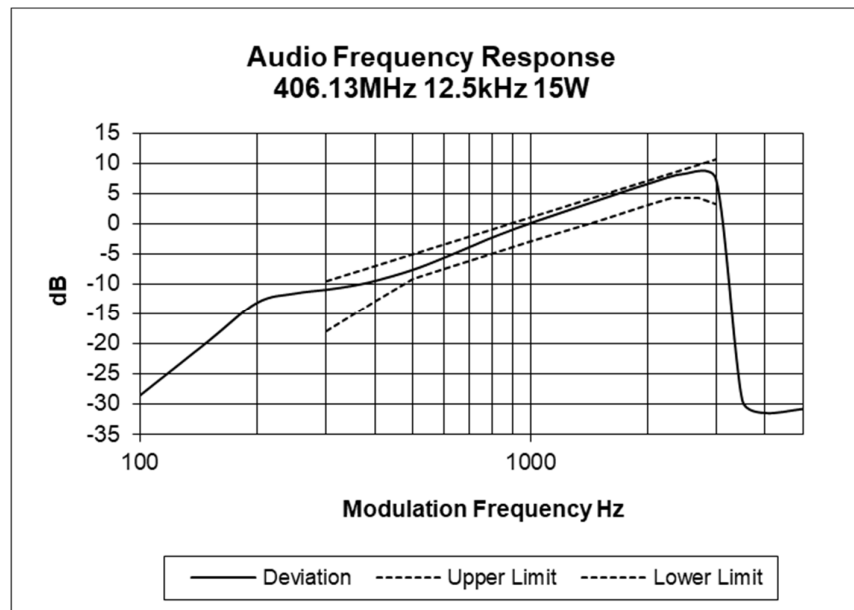
See the plots on the following pages for 12.5 kHz channel spacings tested at 15 W transmit power.

MEASUREMENT UNCERTAINTY:  $\pm 1.5 \%$

## Transmitter Audio Frequency Response – Pre-emphasis

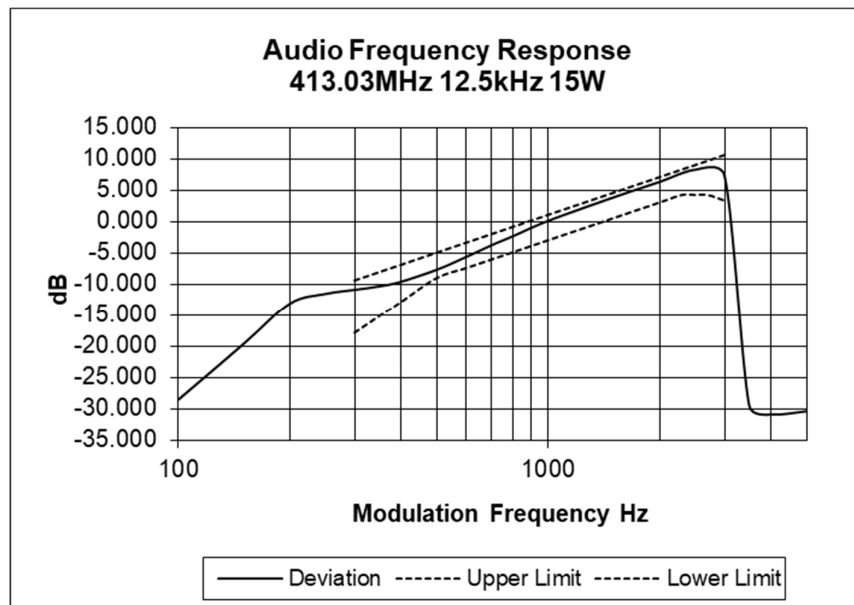
Tx FREQUENCY: 406.125 MHz

12.5 kHz Channel Spacing



Tx FREQUENCY: 413.025 MHz

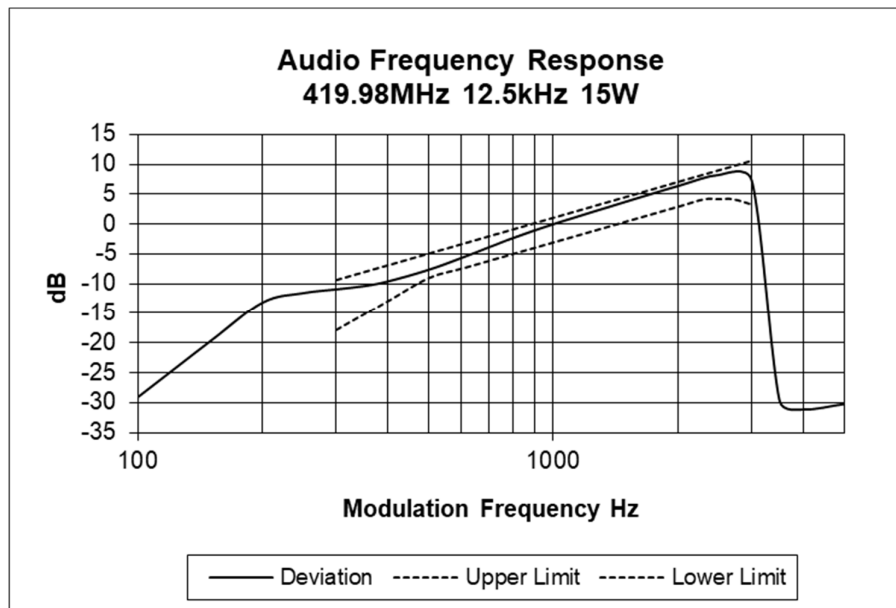
12.5 kHz Channel Spacing



## Transmitter Audio Frequency Response – Pre-emphasis

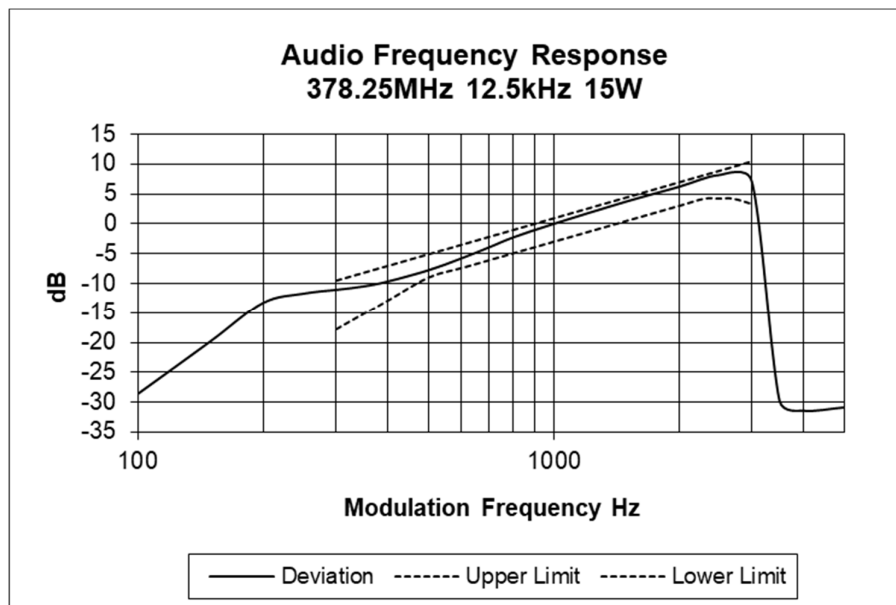
Tx FREQUENCY: 419.975 MHz

12.5 kHz Channel Spacing



Tx FREQUENCY: 378.250 MHz

12.5 kHz Channel Spacing



## TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

GUIDE: ANSI C63.26 5.3.2

### 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:

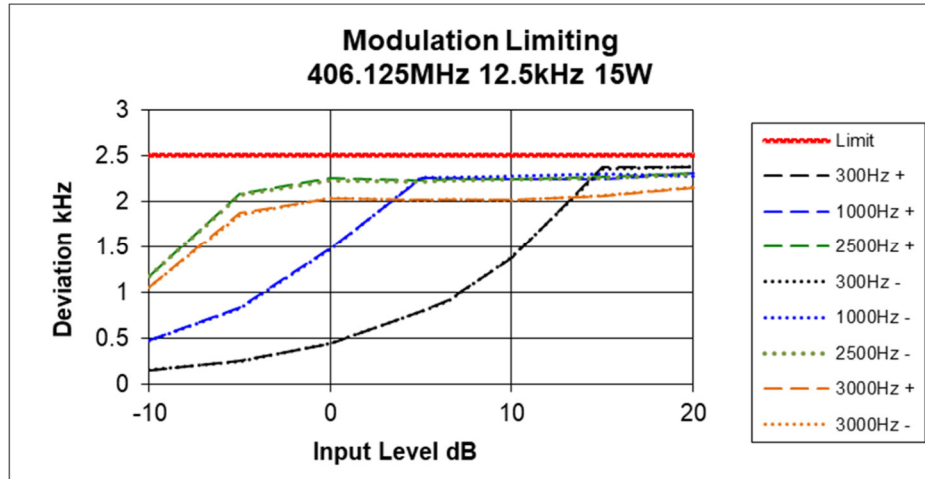
See the plots on the following pages for 12.5 kHz channel spacings.

MEASUREMENT UNCERTAINTY:  $\pm 1.5 \%$

## Transmitter Modulation Limiting

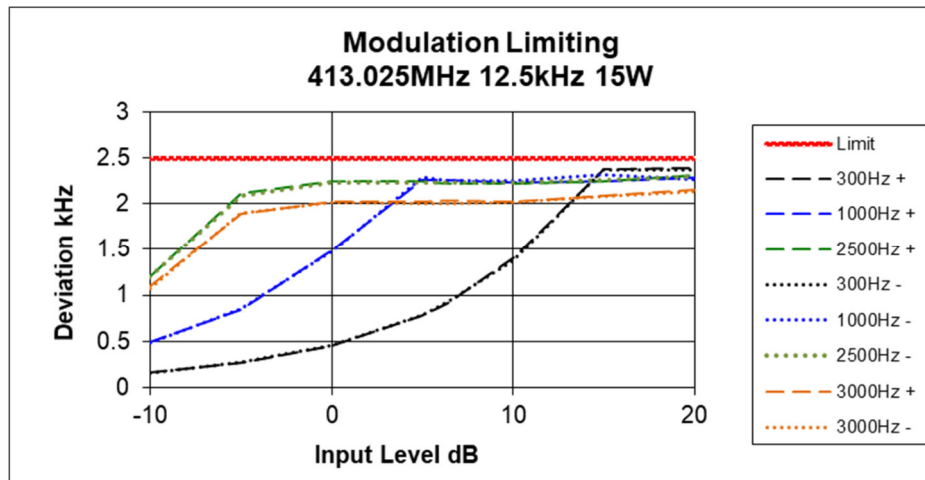
Tx FREQUENCY: 406.125 MHz

12.5 kHz Channel Spacing



Tx FREQUENCY: 413.025 MHz

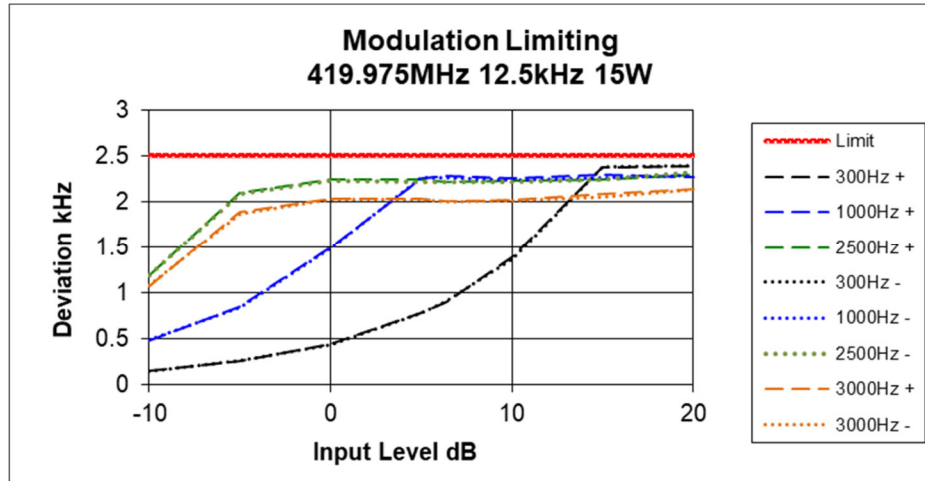
12.5 kHz Channel Spacing



## Transmitter Modulation Limiting

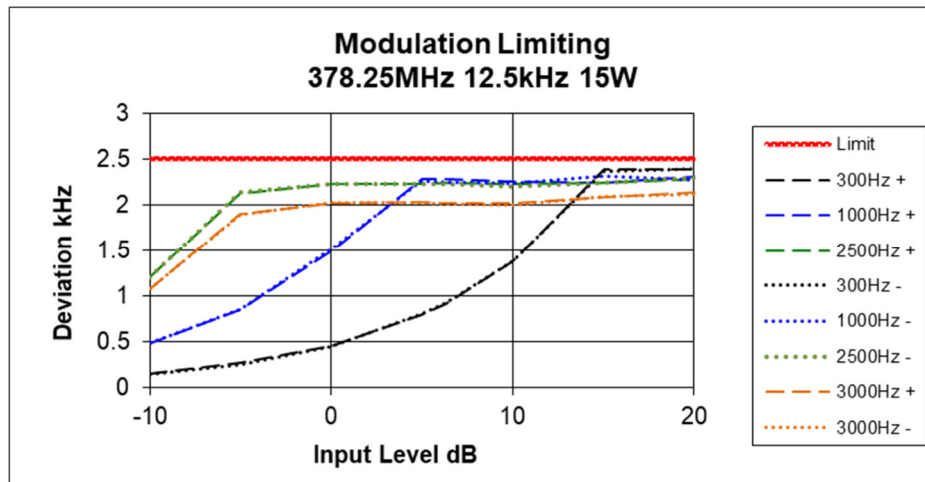
Tx FREQUENCY: 419.975 MHz

12.5 kHz Channel Spacing



Tx FREQUENCY: 378.250 MHz

12.5 kHz Channel Spacing



## TRANSMITTER OCCUPIED (99%) BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1046  
RSS-119 5.5

GUIDE: ANSI C63.26 5.4.4

### MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.
2. For analogue measurements: The EUT was modulated by a 2500 Hz tone at an input level 16 dB 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.  
Resolution Bandwidth = 100 Hz, Video Bandwidth = 300 Hz

### MEASUREMENT RESULTS:

|                                                                      |                       | Bandwidths (kHz) |                  |
|----------------------------------------------------------------------|-----------------------|------------------|------------------|
| Channel Frequency (MHz)                                              | Channel Spacing (kHz) | Analogue         | APCO P25 Phase I |
| 406.125 MHz                                                          | 12.5                  | 9.93             | 7.80             |
| 413.025 MHz                                                          | 12.5                  | 9.93             | 7.93             |
| 419.975 MHz                                                          | 12.5                  | 9.93             | 8.00             |
| 378.250 MHz                                                          | 12.5                  | 9.93             | 7.87             |
| <u>Limit</u><br>Authorized Bandwidth<br>47 CFR 90.209<br>RSS 119 5.5 |                       | 11.25            | 11.25            |
| Necessary BW used in emission designator                             |                       | 11.0             | 8.1              |
| Result                                                               |                       | Pass             | Pass             |

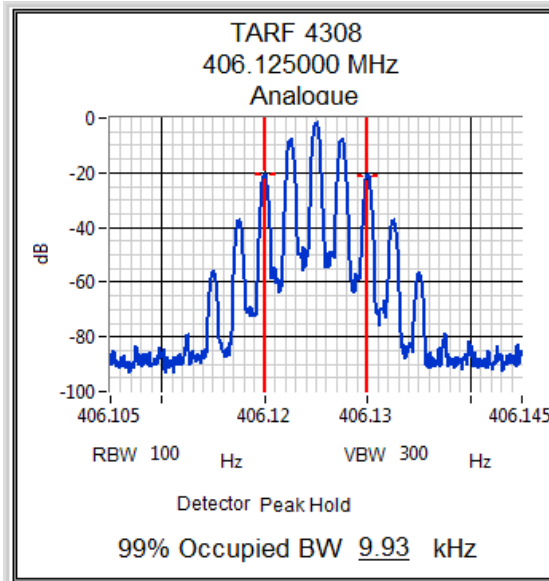
## Transmitter Occupied (99%) Bandwidth - Analogue

Channel 1 – 4

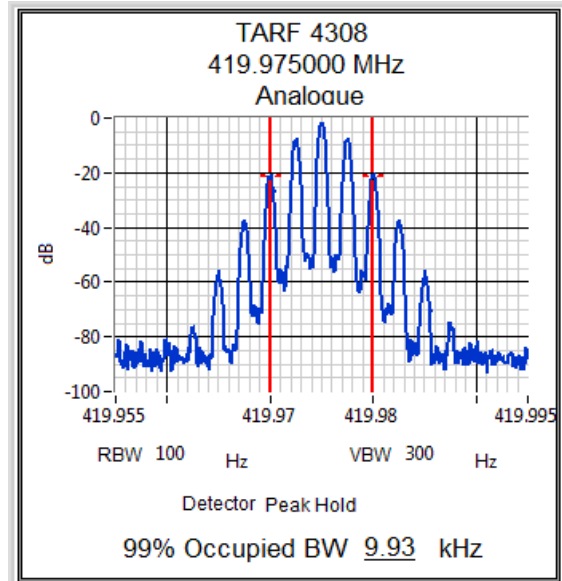
15 W Tx Power

12.5 kHz Channel Spacing

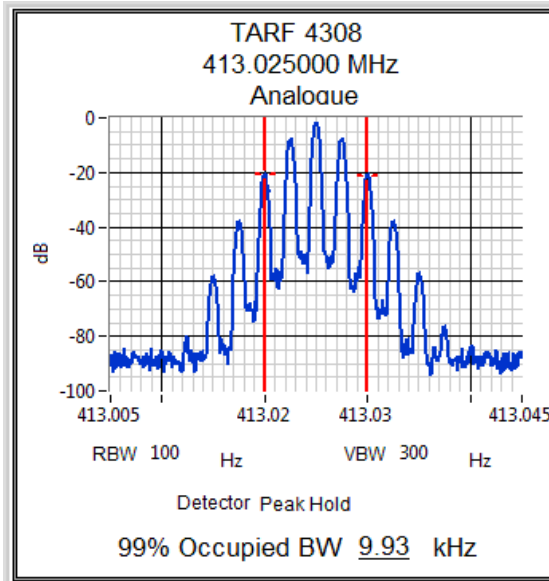
Tx Frequency: 406.125 MHz



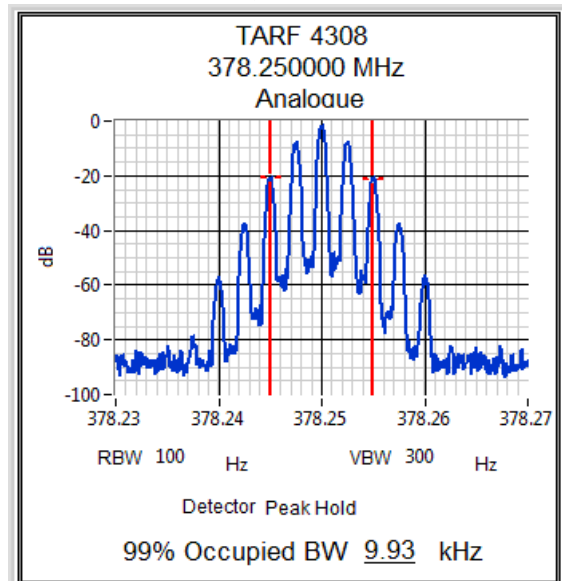
Tx Frequency: 419.975 MHz



Tx Frequency: 413.025 MHz



Tx Frequency: 378.250 MHz



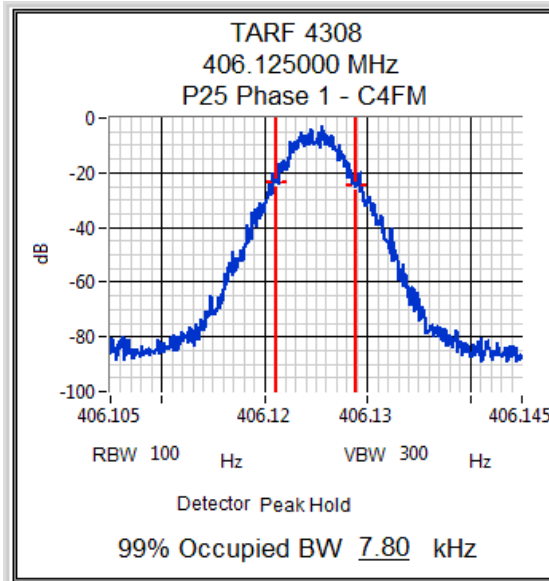
Transmitter Occupied (99%) Bandwidth – P25 Phase 1 C4FM

Channel 1 – 4

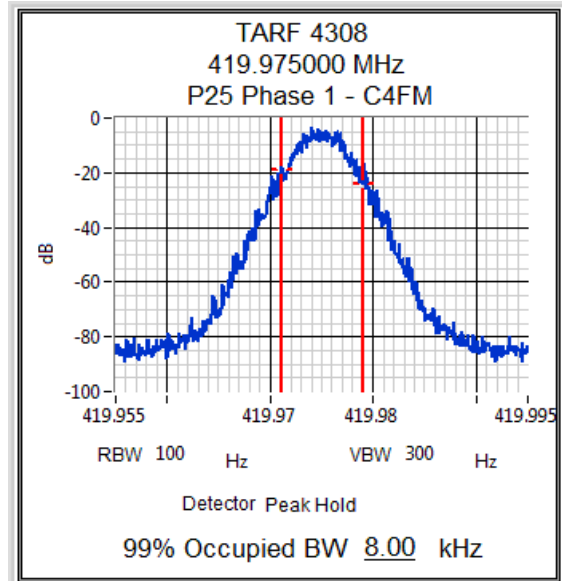
15 W Tx Power

12.5 kHz Channel Spacing

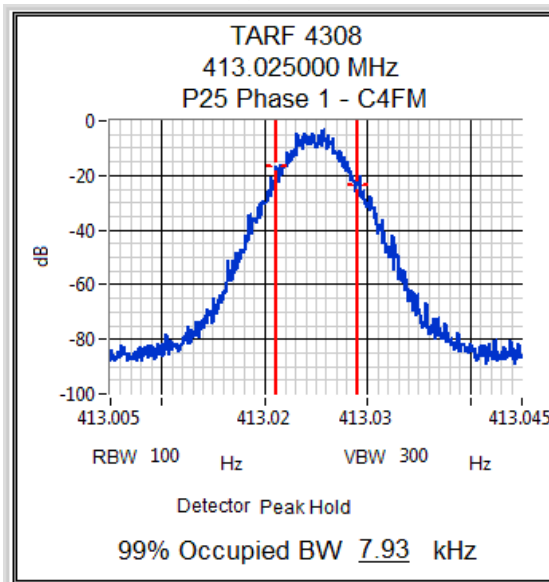
Tx Frequency: 406.125 MHz



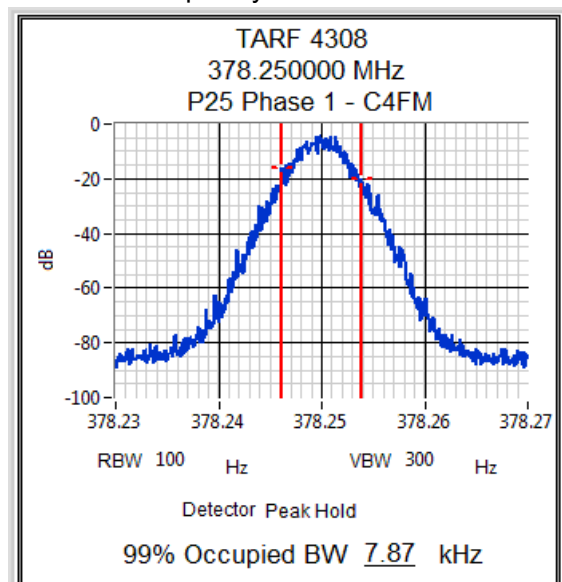
Tx Frequency: 419.975 MHz



Tx Frequency: 413.025 MHz



Tx Frequency: 378.250 MHz



## TRANSMITTER SPECTRUM MASKS

SPECIFICATION: FCC 47 CFR 2.1049 (c)

RSS-119 5.5

GUIDE: ANSI C63.26.5.7.3

### MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.
2. For analogue measurements: The EUT was modulated by a 2500 Hz tone at an input level 16 dB 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 = 100 Hz, Video Bandwidth = 1 kHz

### MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz channel spacings at 15W and 2W transmit power.

MEASUREMENT UNCERTAINTY:  $\pm 0.65\text{dB}$

### EMISSION MASKS

|                 |                          |                                 |
|-----------------|--------------------------|---------------------------------|
| Emission Mask D | 12.5 kHz Channel Spacing | Analogue and Digital Voice/Data |
|-----------------|--------------------------|---------------------------------|

### DATA SPEED

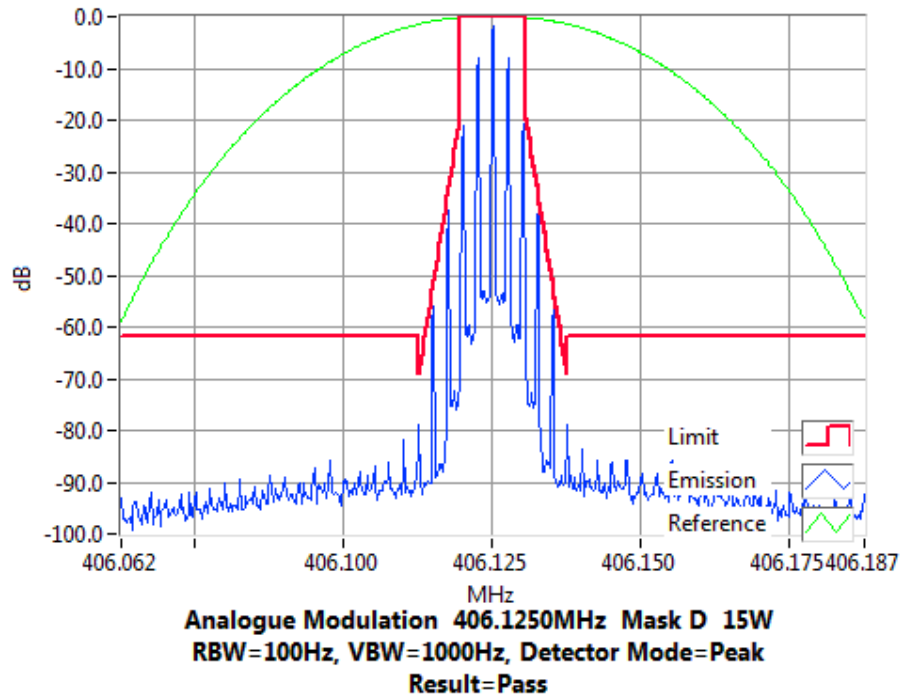
|                    |                          |          |
|--------------------|--------------------------|----------|
| Digital Voice/Data | 12.5 kHz Channel Spacing | 9600 bps |
|--------------------|--------------------------|----------|

## Transmitter Spectrum Masks - Analogue

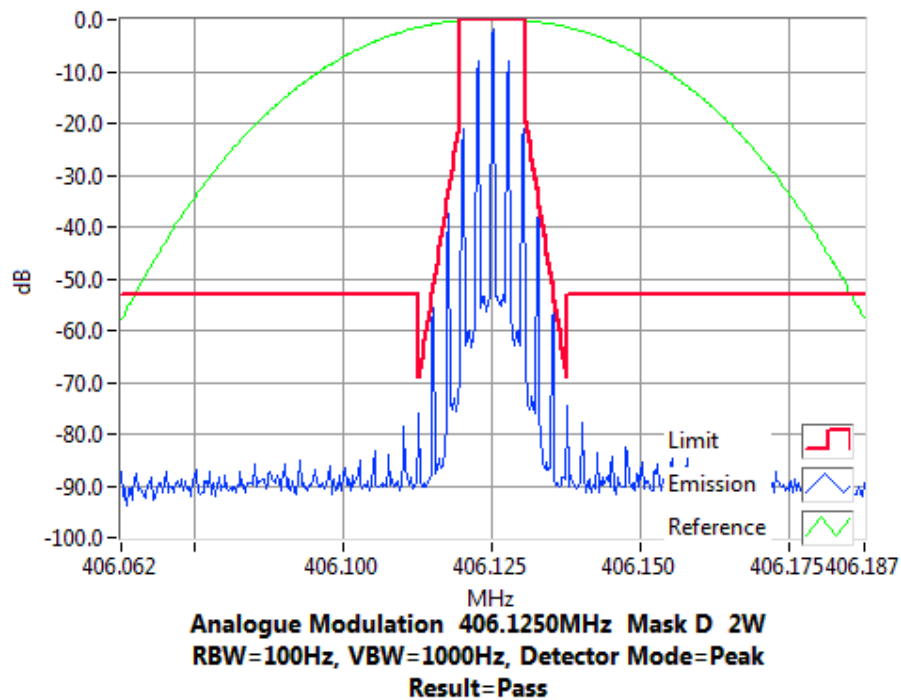
SPECIFICATION: FCC 47 CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 406.125 MHz 15 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 406.125 MHz 2 W 12.5 kHz Channel Spacing

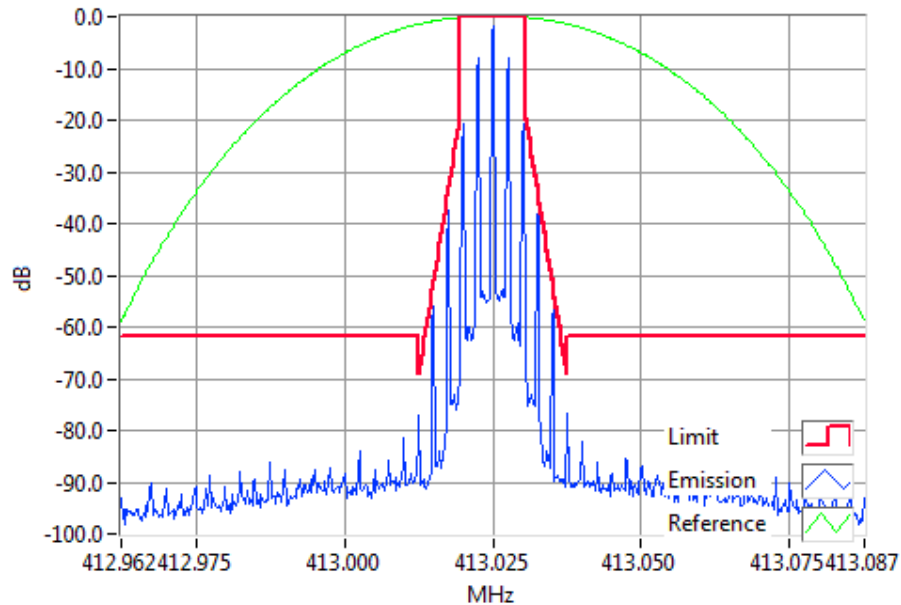


## Transmitter Spectrum Masks - Analogue

SPECIFICATION: FCC 47 CFR 2.1049 (c)

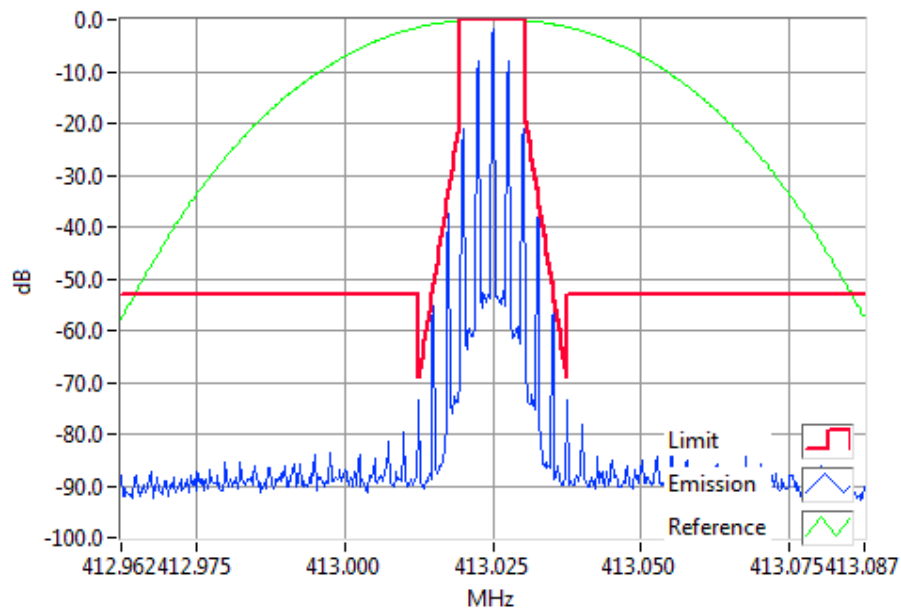
RSS-119 5.5

Tx FREQUENCY: 413.025 MHz 15 W 12.5 kHz Channel Spacing



**Analogue Modulation 413.0250MHz Mask D 15W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 413.025 MHz 2 W 12.5 kHz Channel Spacing



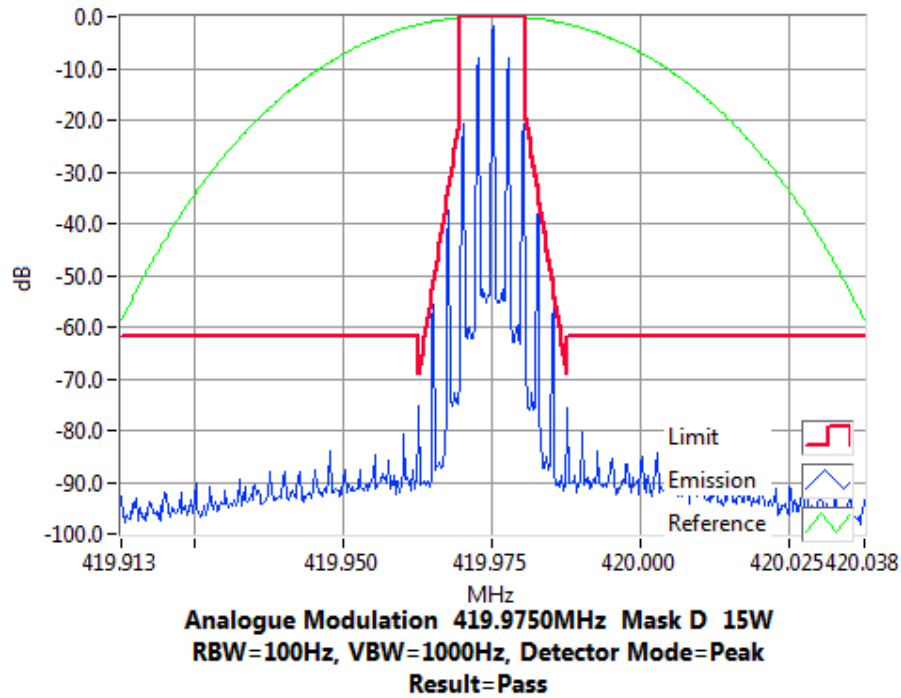
**Analogue Modulation 413.0250MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

## Transmitter Spectrum Masks - Analogue

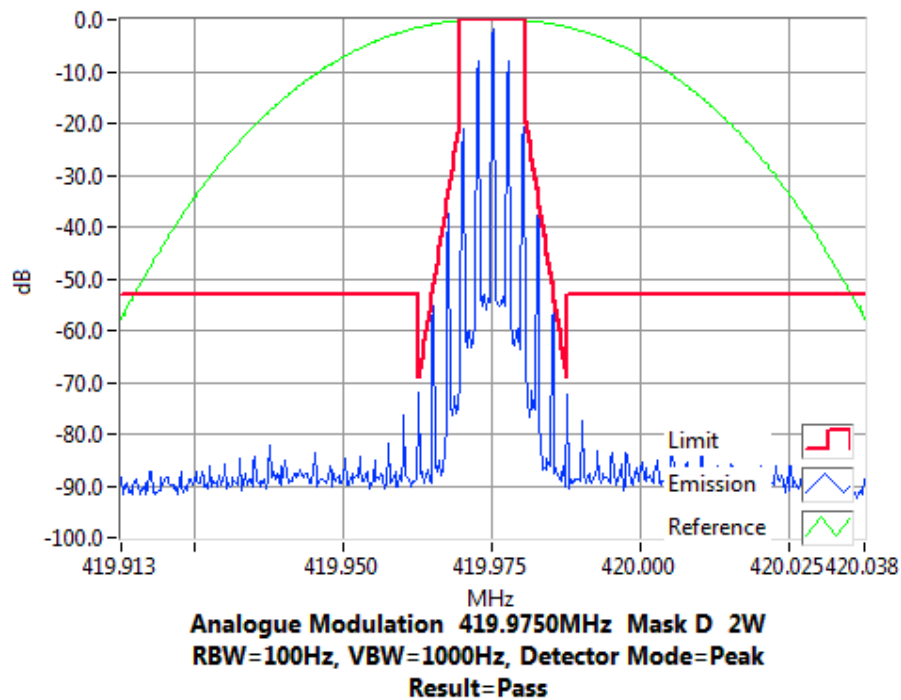
SPECIFICATION: FCC 47 CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 419.975 MHz 15 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 419.975 MHz 2 W 12.5 kHz Channel Spacing

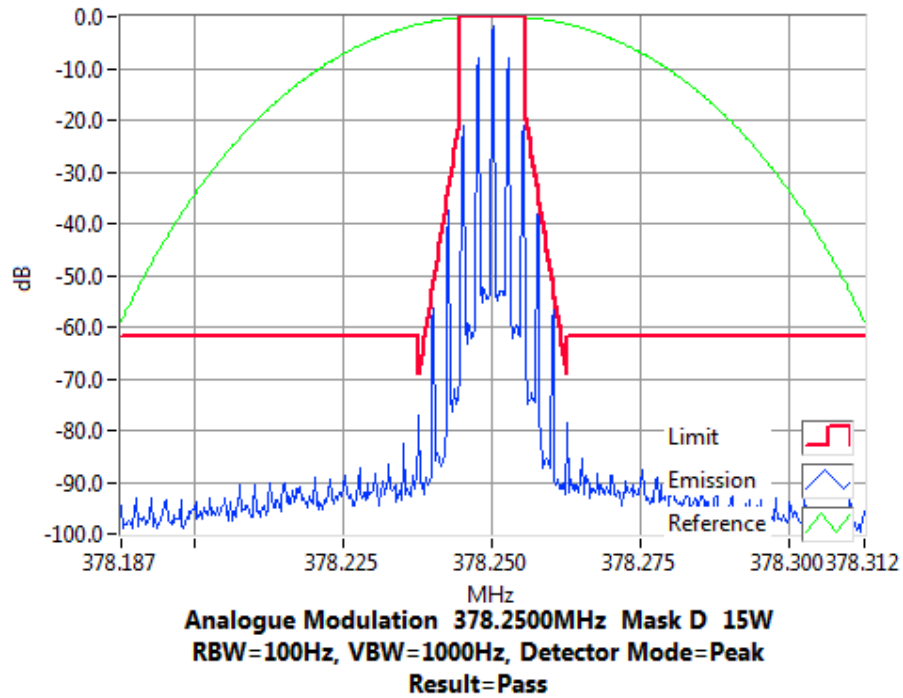


## Transmitter Spectrum Masks - Analogue

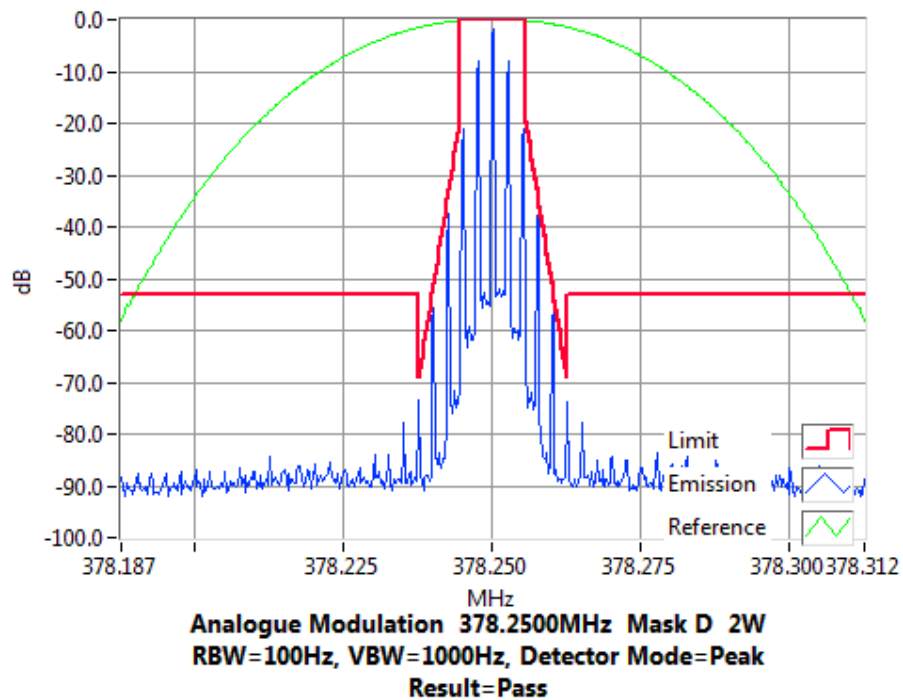
SPECIFICATION: FCC 47 CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 378.250 MHz 15 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 378.250 MHz 2 W 12.5 kHz Channel Spacing

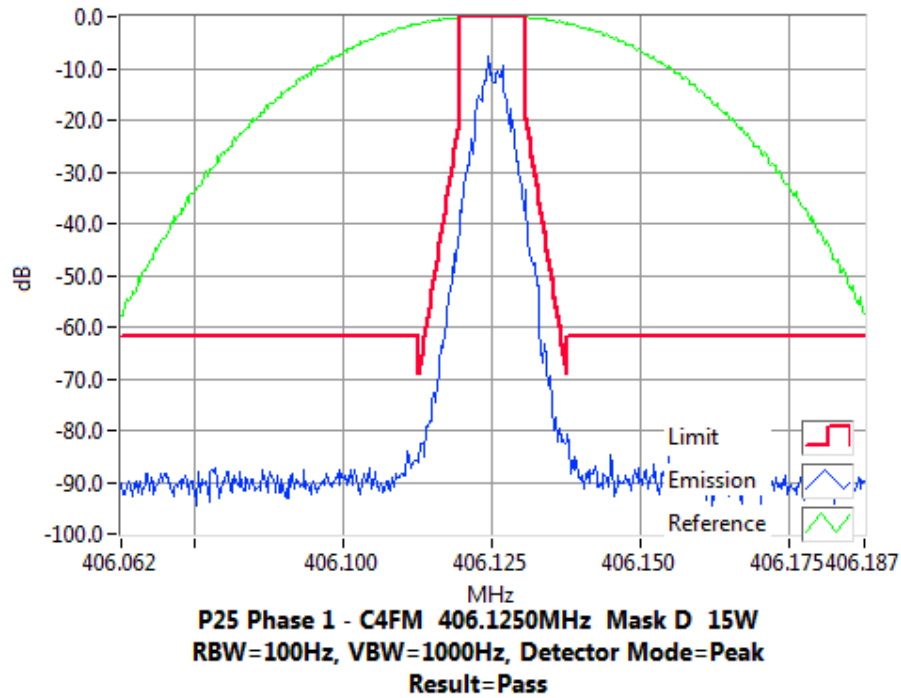


## Transmitter Spectrum Masks – P25 Phase 1 C4FM

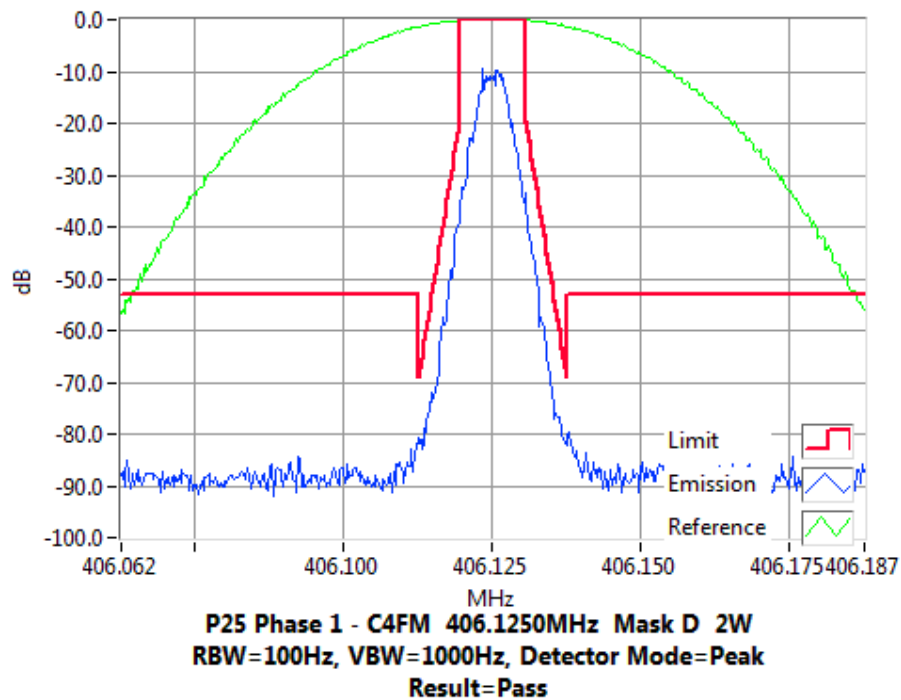
SPECIFICATION: FCC 47 CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 406.125 MHz 15 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 406.125 MHz 2 W 12.5 kHz Channel Spacing

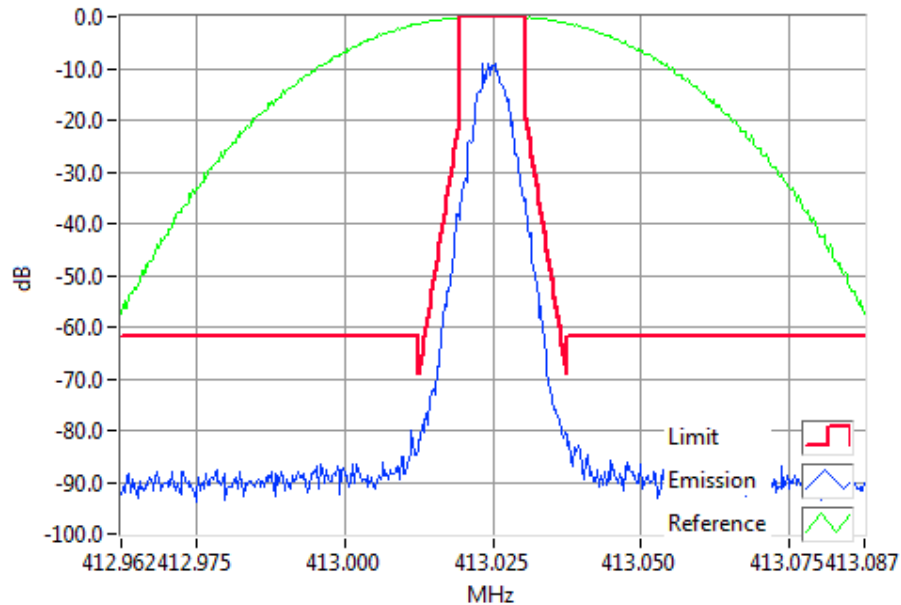


## Transmitter Spectrum Masks – P25 Phase 1 C4FM

SPECIFICATION: FCC 47 CFR 2.1049 (c)

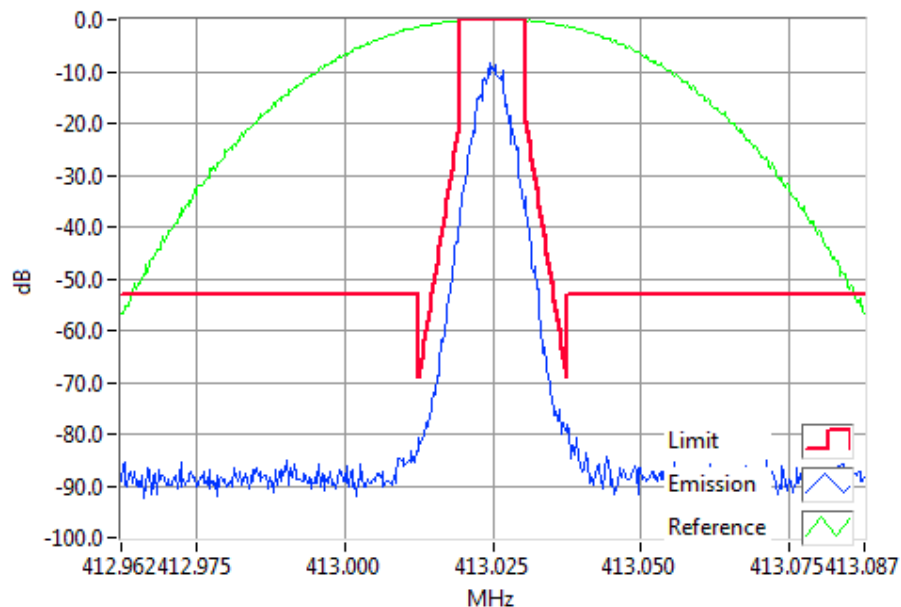
RSS-119 5.5

Tx FREQUENCY: 413.025 MHz 15 W 12.5 kHz Channel Spacing



**P25 Phase 1 - C4FM 413.0250MHz Mask D 15W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 413.025 MHz 2 W 12.5 kHz Channel Spacing



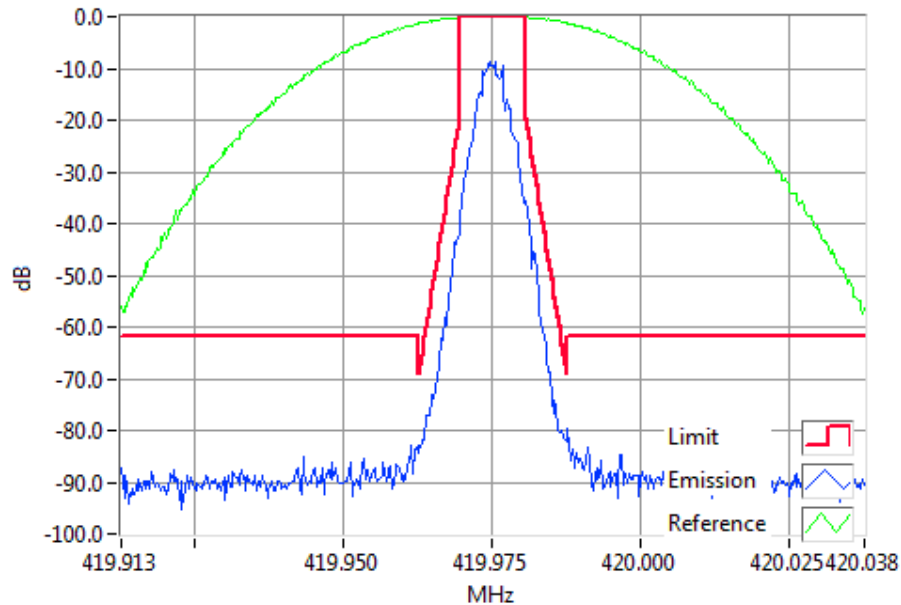
**P25 Phase 1 - C4FM 413.0250MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

## Transmitter Spectrum Masks – P25 Phase 1 C4FM

SPECIFICATION: FCC 47 CFR 2.1049 (c)

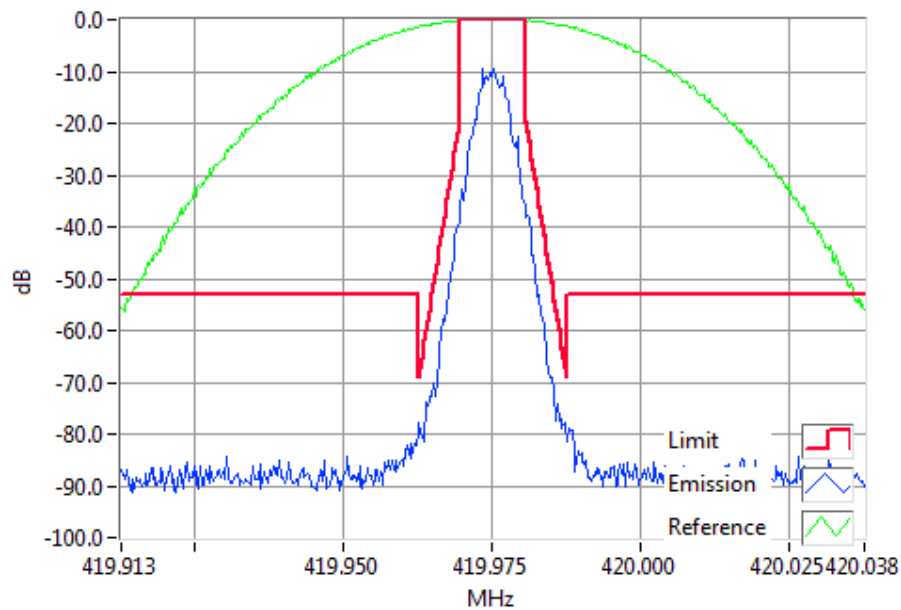
RSS-119 5.5

Tx FREQUENCY: 419.975 MHz 15 W 12.5 kHz Channel Spacing



**P25 Phase 1 - C4FM 419.9750MHz Mask D 15W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 419.975 MHz 2 W 12.5 kHz Channel Spacing



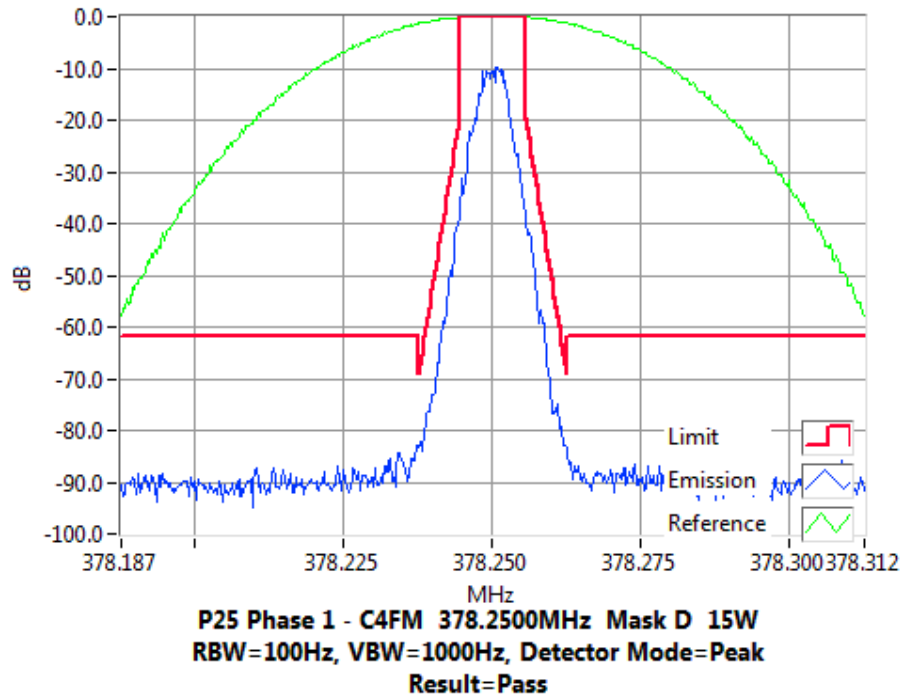
**P25 Phase 1 - C4FM 419.9750MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

## Transmitter Spectrum Masks – P25 Phase 1 C4FM

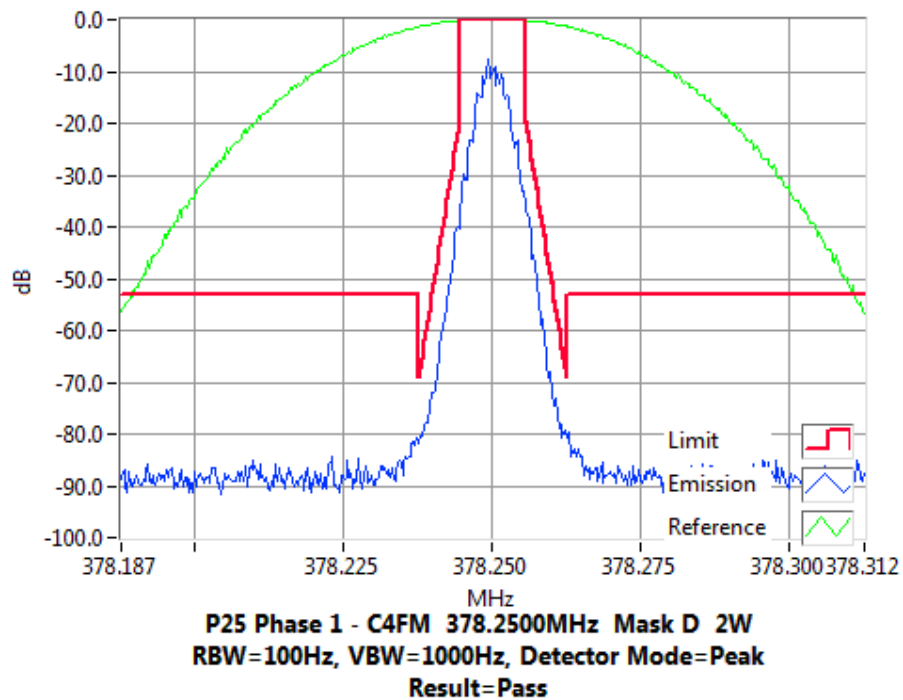
SPECIFICATION: FCC 47 CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 378.250 MHz 15 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 378.250 MHz 2 W 12.5 kHz Channel Spacing



## TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATIONS: FCC 47 CFR 2.1051

RSS-119 5.8

GUIDE: ANSI C63.26 5.7

### 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:  
9 kHz to Fc-BW  
Fc + BW to 10Fc (4.2 GHz)
3. The EUT was set to transmit high or low power. A scan is performed with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz for frequencies up to 1 GHz, and a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz for frequencies above 1 GHz.
4. For frequencies close to the carrier the spectrum was measured using a resolution bandwidth of 1kHz, the results were then integrated to give measurements for 100kHz bandwidth.
5. A band notch high-pass filter was used to reject carrier frequencies from 400MHz to 520MHz.
6. For each frequency range the spectrum analyser was loaded with the appropriate calibration figures to compensate for the cables, attenuator, and filter losses, allowing the emission levels to be read directly with no further calculation.
7. The results of the various sweeps were combined programmatically to give charts for frequencies near the carrier, up to 1GHz and above 1GHz.

The calibrations are loaded as an overall reference level offset plus a set of correction factors for the required frequency band.

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

Example of attenuation correction: (dB)

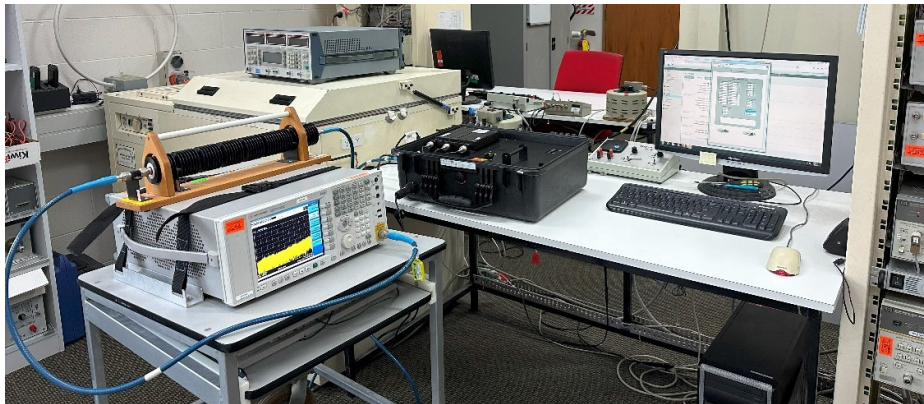
|                             |         |                                  |
|-----------------------------|---------|----------------------------------|
| 10 dB attenuator E3674      | 9.50 dB |                                  |
| 1.5 M blue cable E5028      | 0.28 dB |                                  |
| Total Attenuation @ 500 MHz | 9.78    | Sum of component attenuation (a) |
| Amplitude offset            | 10.00   | (b)                              |
| Correction @ 500 MHz        | -0.22   | (a-b)                            |

MEASUREMENT UNCERTAINTY:  $\leq 12.75$  GHz  $\pm 3.0$  dB

### MEASUREMENT RESULTS:

See the tables and plots on the following pages for 12.5 kHz channel spacing at 15W and 2W transmit power.

Photo: Conducted Emissions Test Setup



## Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

406.125 MHz @ 15 W

Emission Mask D

| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
|--------------------------|-------------|-------------|
|                          |             |             |
| ~                        | ~           | ~           |

12.5 kHz Channel Spacing

406.125 MHz @ 2 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. |             |             |

12.5 kHz Channel Spacing

413.025 MHz @ 15 W

Emission Mask D

| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
|--------------------------|-------------|-------------|
|                          |             |             |
| ~                        | ~           | ~           |

12.5 kHz Channel Spacing

413.025 MHz @ 2 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. |             |             |

## Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

419.975 MHz @ 15 W

Emission Mask D

| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
|--------------------------|-------------|-------------|
| 2119.224515              | -38.4       | -80.16      |
| ~                        | ~           | ~           |

12.5 kHz Channel Spacing

419.975 MHz @ 2 W

Emission Mask D

| Emission Frequency (MHz)                                                        | Level (dBm) | Level (dBc) |
|---------------------------------------------------------------------------------|-------------|-------------|
|                                                                                 |             |             |
| ~                                                                               | ~           | ~           |
| No other emissions were detected at a level greater than 20 dB below the limit. |             |             |

12.5 kHz Channel Spacing

378.250 MHz @ 15 W

Emission Mask D

| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
|--------------------------|-------------|-------------|
|                          |             |             |
| ~                        | ~           | ~           |

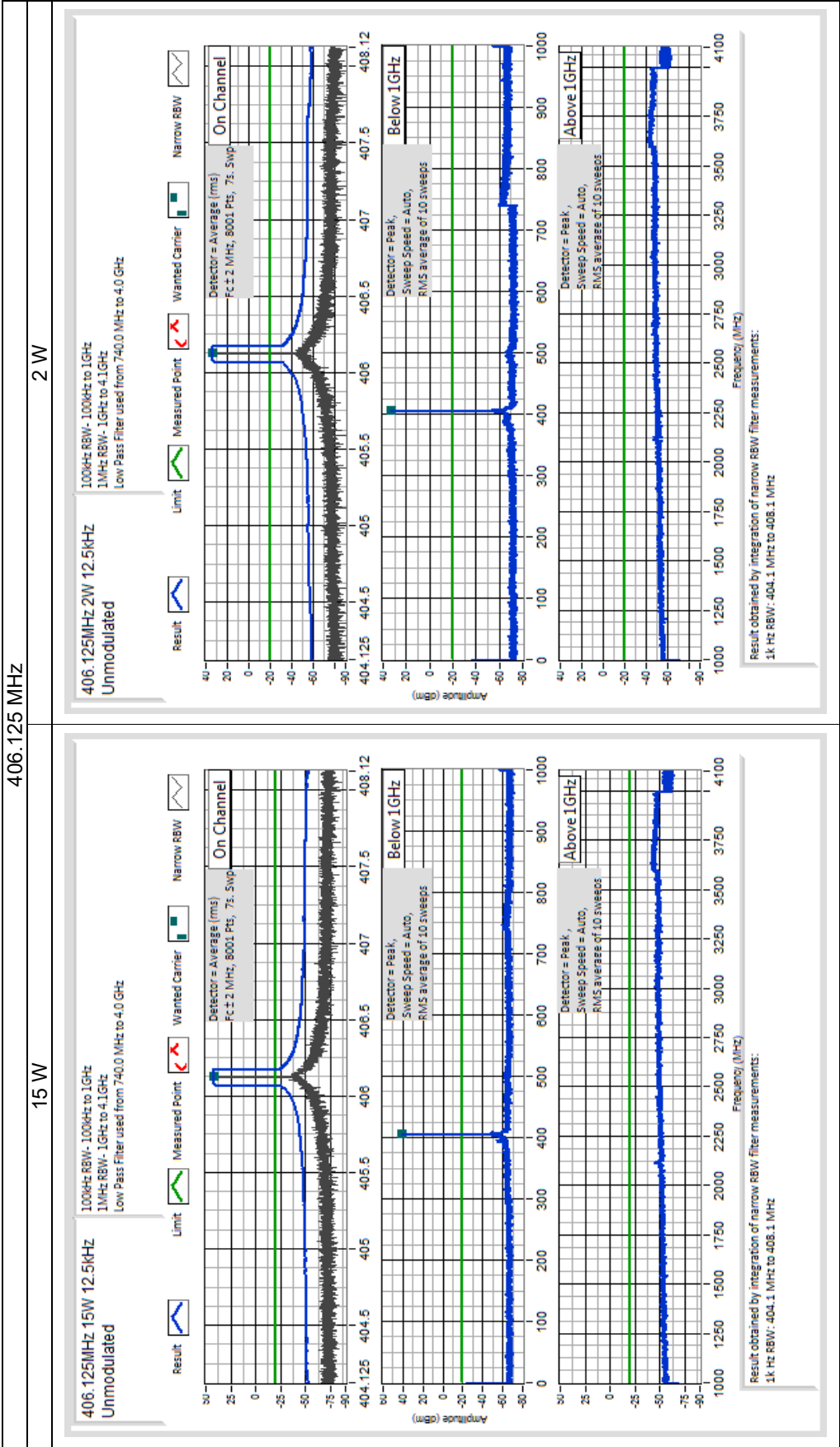
12.5 kHz Channel Spacing

378.250 MHz @ 2 W

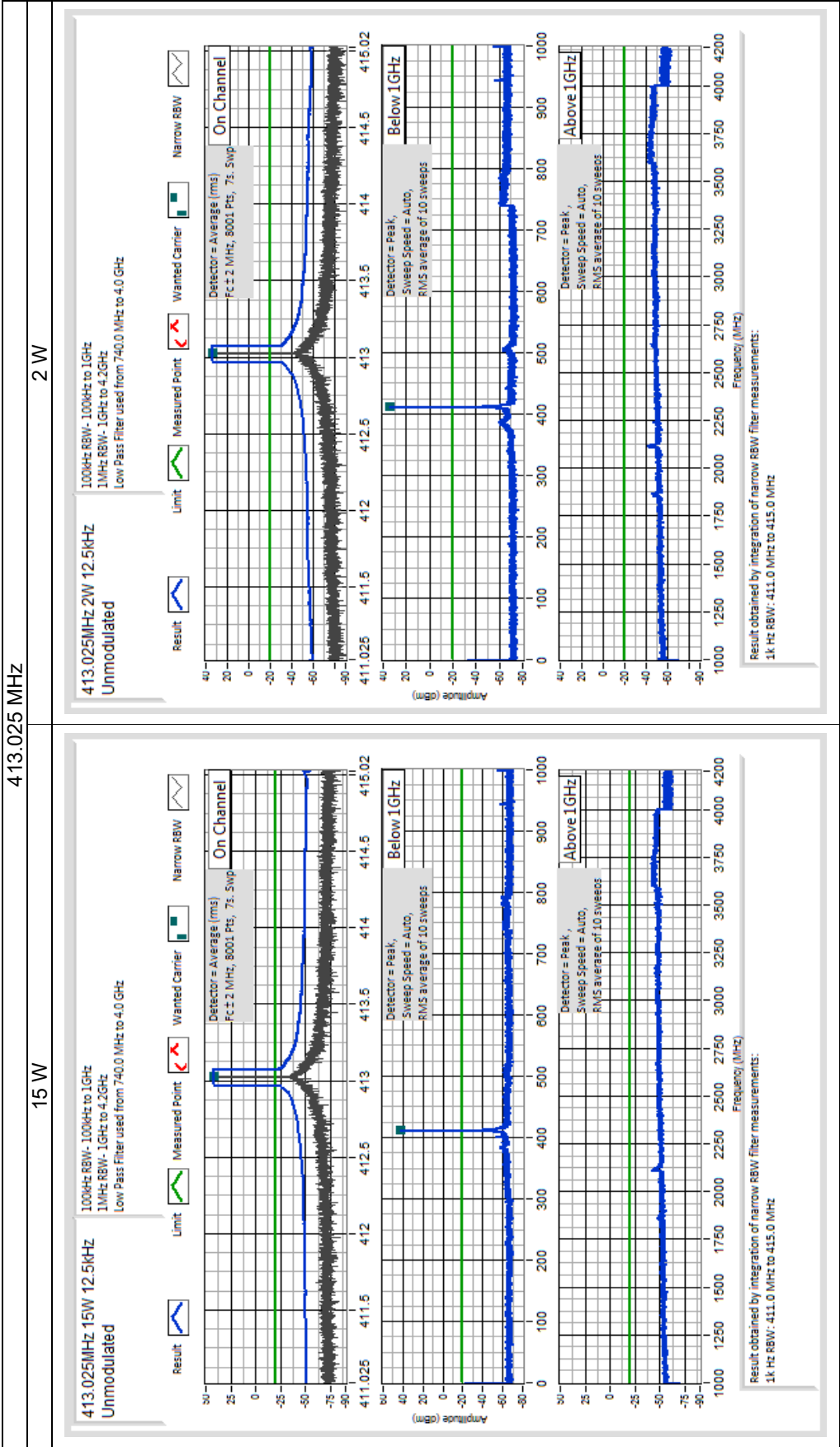
Emission Mask D

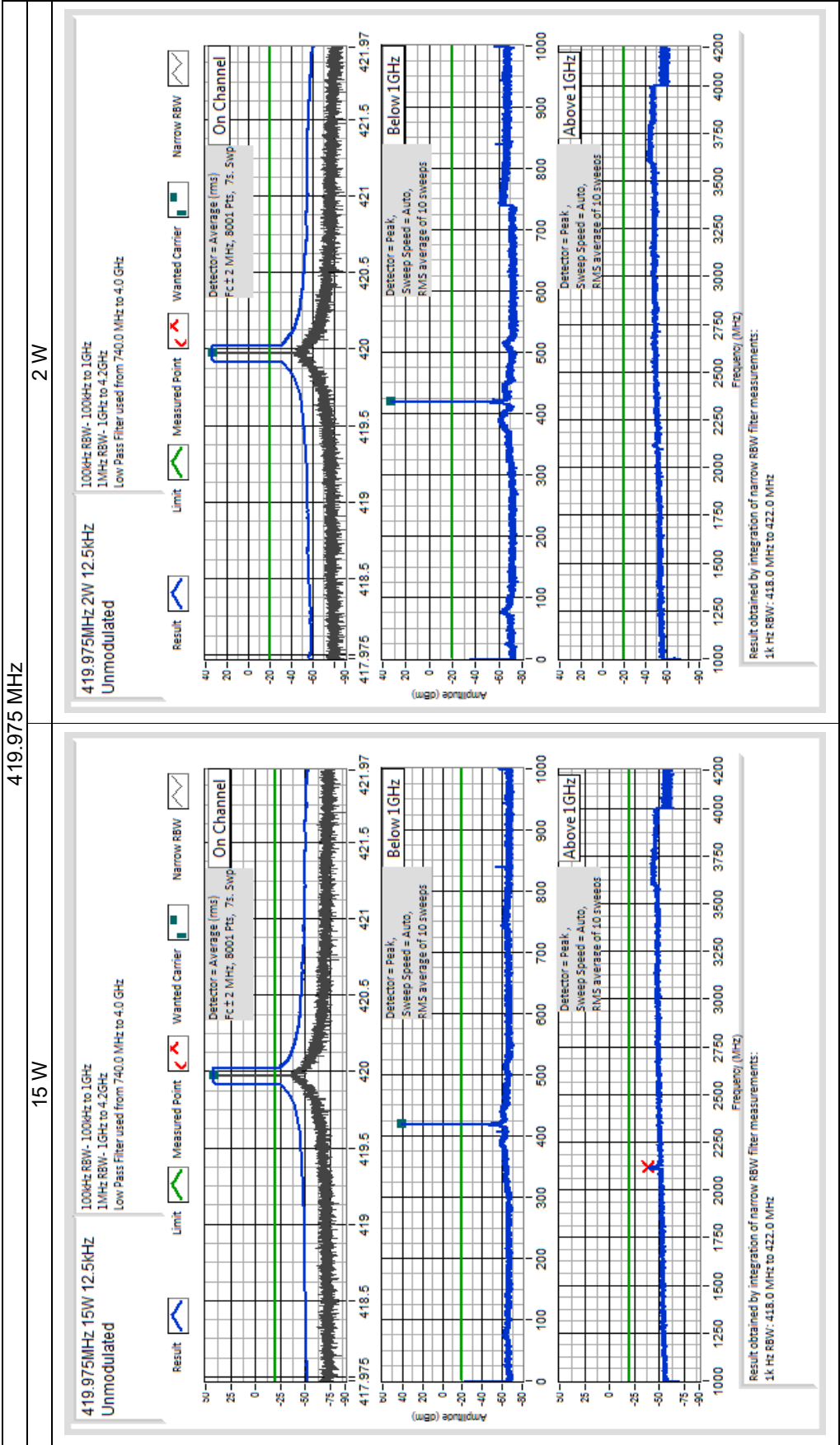
| Emission Frequency (MHz)                                                  | Level (dBm) | Level (dBc) |
|---------------------------------------------------------------------------|-------------|-------------|
|                                                                           |             |             |
| ~                                                                         | ~           | ~           |
| No emissions were detected at a level greater than 20 dB below the limit. |             |             |

Spurious Emissions (Tx Conducted)

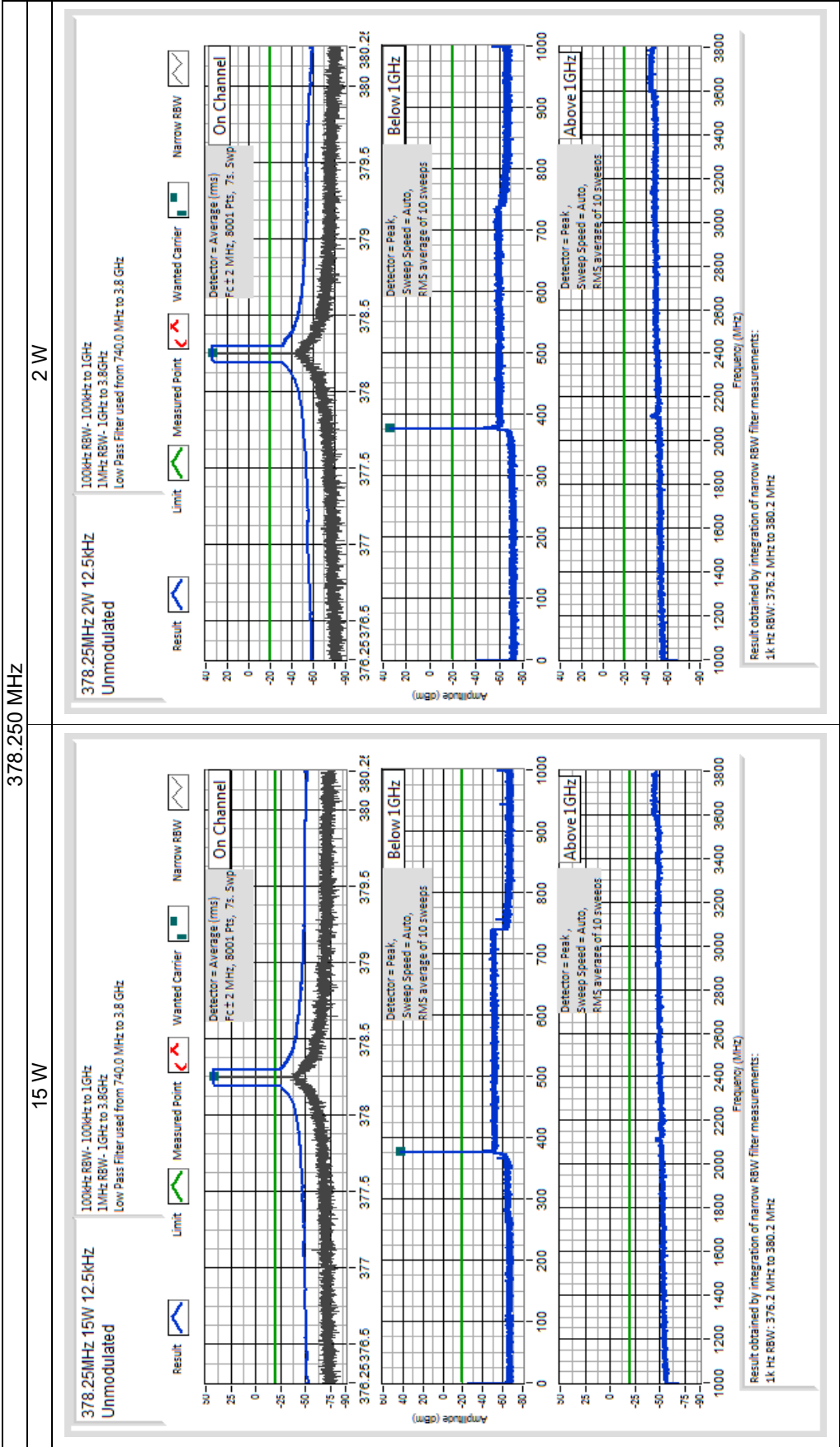


Spurious Emissions (Tx Conducted)





Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051 RSS-119 5.8  
LIMITS: FCC 47 CFR 90.210 RSS-119 5.8

| Carrier Output Power | Emission Mask D<br>12.5 kHz Channel Spacing<br>$50 + 10 \log_{10}(P_{\text{Watts}})$ |           |
|----------------------|--------------------------------------------------------------------------------------|-----------|
|                      | -20 dBm                                                                              | -61.8 dBc |
| 15 W                 | -20 dBm                                                                              | -61.8 dBc |
| 2 W                  | -20 dBm                                                                              | -53.0 dBc |

## TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603E 2.2.12

### MEASUREMENT PROCEDURE:

#### Initial Scan:

1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30 MHz to 800 MHz. Any emission within 20 dB of the limit is then re-tested on the OATS.
2. The EUT is placed in the reverberation chamber and emissions are measured from 800 MHz to the upper frequency required ( $10 \times F_c$ ). Any emission within 20 dB of the limit is then re-tested on the OATS.
3. The harmonics 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 metres from the test antenna. The output terminal is connected to an RF dummy load.
2. The test antenna is raised from 1 m to 4 m 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 UNCERTAINTY:  $\leq 12.75$  GHz  $\pm 4.6$  dB

### MEASUREMENT RESULTS:

See the tables on the following pages

## Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC 47 CFR 2.1053

12.5 kHz Channel Spacing

406.125 MHz @ 15 W

Emission Mask D

| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
|--------------------------|-------------|-------------|
| ~                        | ~           | ~           |
|                          |             |             |

12.5 kHz Channel Spacing

406.125 MHz @ 2 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. |             |             |

12.5 kHz Channel Spacing

413.025 MHz @ 15 W

Emission Mask D

| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
|--------------------------|-------------|-------------|
| ~                        | ~           | ~           |
|                          |             |             |

12.5 kHz Channel Spacing

413.025 MHz @ 2 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. |             |             |

## Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC 47 CFR 2.1053

12.5 kHz Channel Spacing      419.975 MHz @ 15 W      Emission Mask D

| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
|--------------------------|-------------|-------------|
| ~                        | ~           | ~           |
|                          |             |             |

12.5 kHz Channel Spacing      419.975 MHz @ 2 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. |             |             |

12.5 kHz Channel Spacing      378.250 MHz @ 15 W      Emission Mask D

| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
|--------------------------|-------------|-------------|
| ~                        | ~           | ~           |
|                          |             |             |

12.5 kHz Channel Spacing      378.250 MHz @ 2 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. |             |             |

LIMITS: FCC 47 CFR 2.1053

| Carrier Output Power | Emission Mask D<br>12.5 kHz Channel Spacing<br>$50 + 10 \log_{10}(P_{\text{Watts}})$ |           |
|----------------------|--------------------------------------------------------------------------------------|-----------|
| 15 W                 | -20 dBm                                                                              | -61.8 dBc |
| 2 W                  | -20 dBm                                                                              | -53.0 dBc |

## Tx Radiated Emissions - Continued

### Open Area Test Site Results:

12.5 kHz Channel Spacing

413.025 MHz @ 15 W

Emission Mask D

| Harmonics<br>Emission Frequency (MHz) | Level (dBm)           | Level (dBc) |
|---------------------------------------|-----------------------|-------------|
| 826.050                               | -57.87                | -99.63      |
| 1239.075                              | -55.43                | -97.19      |
| 1652.100                              | -68.64                | -110.40     |
| 2065.125                              | No emissions detected |             |
| 2478.150                              | No emissions detected |             |
| 2891.175                              | No emissions detected |             |
|                                       |                       |             |
| Measurement Uncertainty               | $\pm 4.6$ dB          |             |

| Sample Calculation       | Measurement           |               |                           |                    | Result |     |
|--------------------------|-----------------------|---------------|---------------------------|--------------------|--------|-----|
|                          | Reference             | Substitution  |                           |                    |        |     |
| Emission Frequency (MHz) | Reference Level (dBm) | Sig-gen Level | Cable and Attenuator Gain | Antenna Gain (dBd) | dBm    | nW  |
| 826.050                  | -89.5                 | -40.9         | -15.93                    | -1.04              | -57.87 | 1.6 |
|                          |                       | A             | B                         | C                  | D      |     |

Result (D) = A+B+C

Photo: OATS Setup



## TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

GUIDE: ANSI C63.26 6.5.2.2

### MEASUREMENT PROCEDURE:

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

MEASUREMENT UNCERTAINTY: 130Hz

### MEASUREMENT RESULTS:

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

## Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 406.125 MHz

15 W

12.5 kHz Channel Spacing

| TRANSIENT RESPONSE PERIOD | CARRIER PEAK VARIATION FROM NORMAL |               |
|---------------------------|------------------------------------|---------------|
|                           | Key ON (kHz)                       | Key OFF (kHz) |
| t1                        | -0.4                               | N/A           |
| t2                        | 0.7                                | N/A           |
| t3                        | N/A                                | -0.4          |

|                                                                                                                     |                                     |                          |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|
| Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation. | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Confirm that during the period t2 the frequency difference does not exceed half a channel separation.               | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.         | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

LIMIT: FCC 47 CFR 90.214

| TRANSIENT PERIODS | FREQUENCY RANGE   |                   |
|-------------------|-------------------|-------------------|
|                   | 150 MHz – 174 MHz | 421 MHz – 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.

## Transient Frequency Behaviour

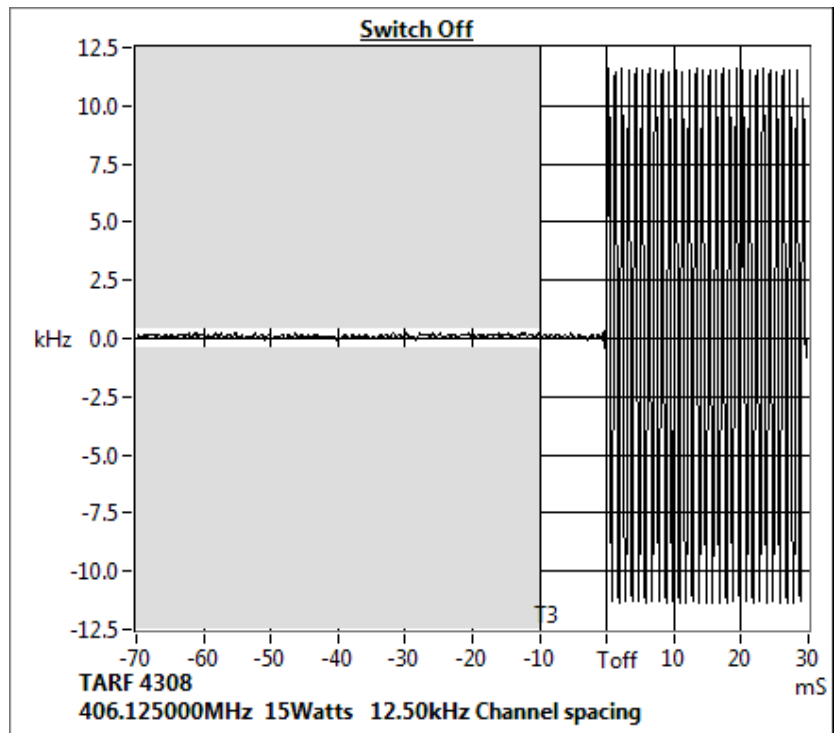
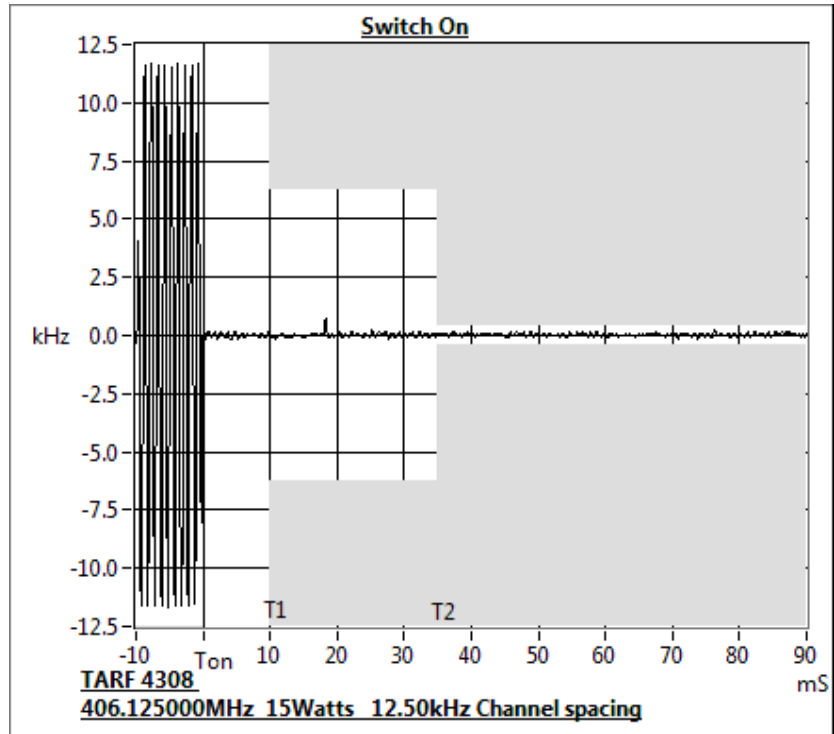
SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 406.125 MHz

15 W

12.5 kHz Channel Spacing



## Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 413.025 MHz 15 W 25.0 kHz Channel Spacing

| TRANSIENT RESPONSE PERIOD | CARRIER PEAK VARIATION FROM NORMAL |               |
|---------------------------|------------------------------------|---------------|
|                           | Key ON (kHz)                       | Key OFF (kHz) |
| t1                        | -0.2                               | N/A           |
| t2                        | 0.2                                | N/A           |
| t3                        | N/A                                | -1.2          |

|                                                                                                                     |                                     |                          |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|
| Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation. | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Confirm that during the period t2 the frequency difference does not exceed half a channel separation.               | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.         | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

LIMIT: FCC 47 CFR 90.214

| TRANSIENT PERIODS | FREQUENCY RANGE   |                   |
|-------------------|-------------------|-------------------|
|                   | 150 MHz – 174 MHz | 421 MHz – 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

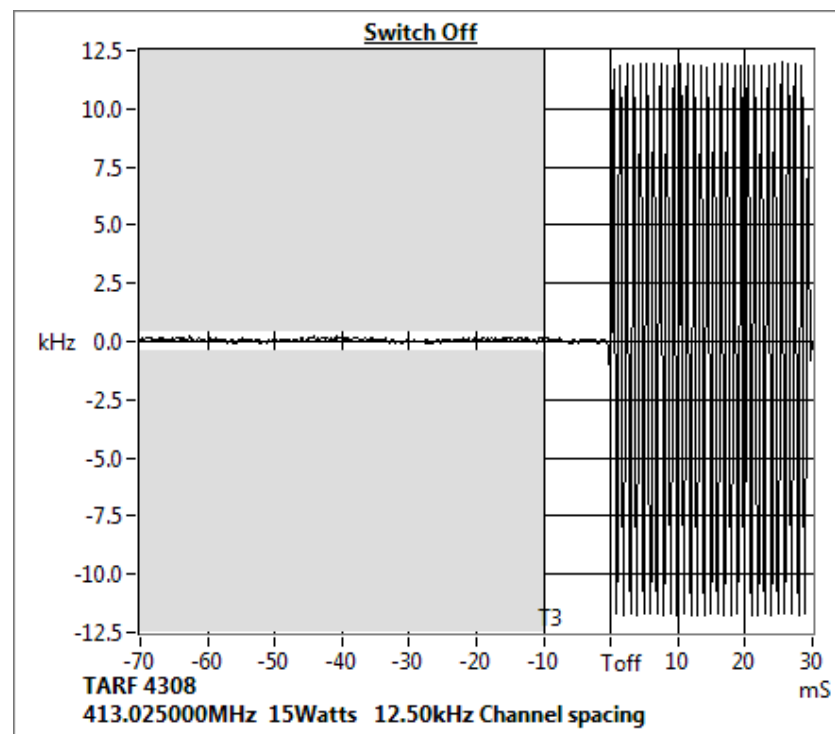
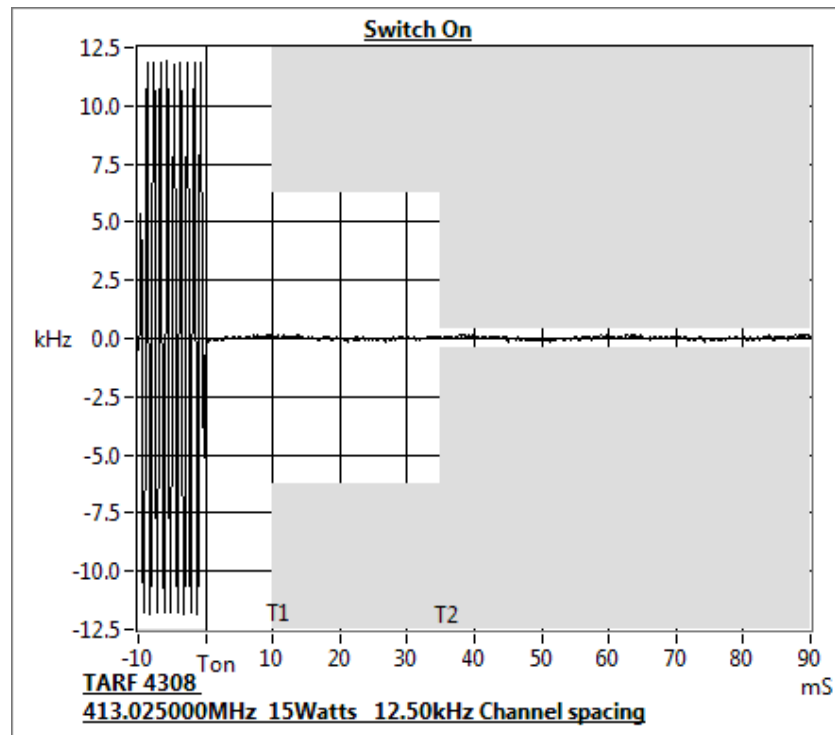
| Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels |                              |                 |                 |
|--------------------------------------------------------------------------------------|------------------------------|-----------------|-----------------|
| 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,

## Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 413.025 MHz 15 W 25.0 kHz Channel Spacing



## Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 419.975 MHz

15 W

12.5 kHz Channel Spacing

| TRANSIENT RESPONSE PERIOD | CARRIER PEAK VARIATION FROM NORMAL |               |
|---------------------------|------------------------------------|---------------|
|                           | Key ON (kHz)                       | Key OFF (kHz) |
| t1                        | -0.9                               | N/A           |
| t2                        | 0.2                                | N/A           |
| t3                        | N/A                                | -0.7          |

|                                                                                                                     |                                     |                          |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|
| Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation. | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Confirm that during the period t2 the frequency difference does not exceed half a channel separation.               | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.         | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

LIMIT: FCC 47 CFR 90.214

| TRANSIENT PERIODS | FREQUENCY RANGE   |                   |
|-------------------|-------------------|-------------------|
|                   | 150 MHz – 174 MHz | 421 MHz – 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.

## Transient Frequency Behaviour

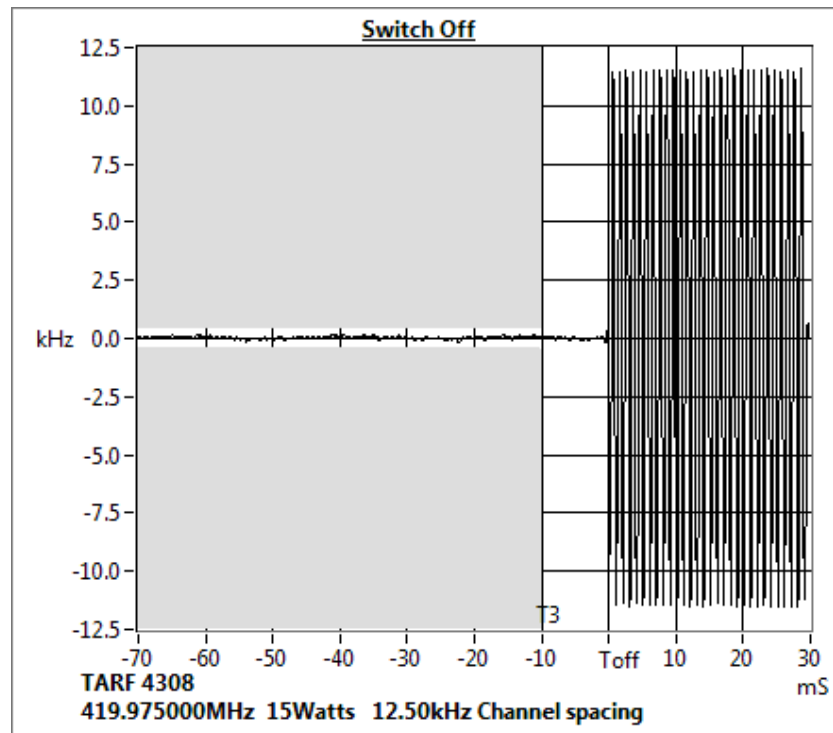
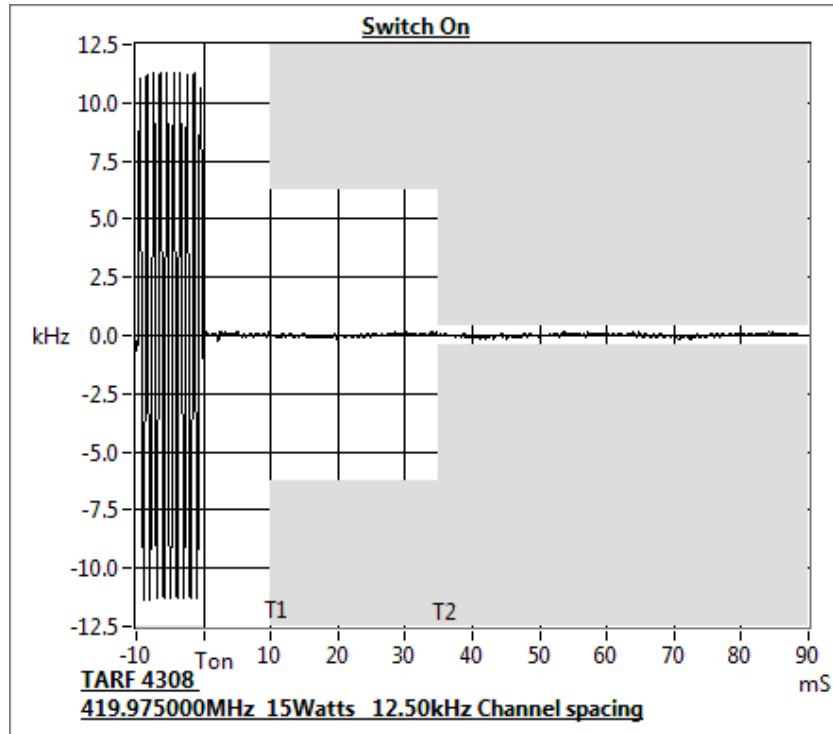
SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 419.975 MHz

15 W

12.5 kHz Channel Spacing



## Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 378.250 MHz 15 W 25.0 kHz Channel Spacing

| TRANSIENT RESPONSE PERIOD | CARRIER PEAK VARIATION FROM NORMAL |               |
|---------------------------|------------------------------------|---------------|
|                           | Key ON (kHz)                       | Key OFF (kHz) |
| t1                        | 0.9                                | N/A           |
| t2                        | -0.5                               | N/A           |
| t3                        | N/A                                | -1.2          |

|                                                                                                                     |                                     |                          |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|
| Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation. | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Confirm that during the period t2 the frequency difference does not exceed half a channel separation.               | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.         | YES                                 | NO                       |
|                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

LIMIT: FCC 47 CFR 90.214

| TRANSIENT PERIODS | FREQUENCY RANGE   |                   |
|-------------------|-------------------|-------------------|
|                   | 150 MHz – 174 MHz | 421 MHz – 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

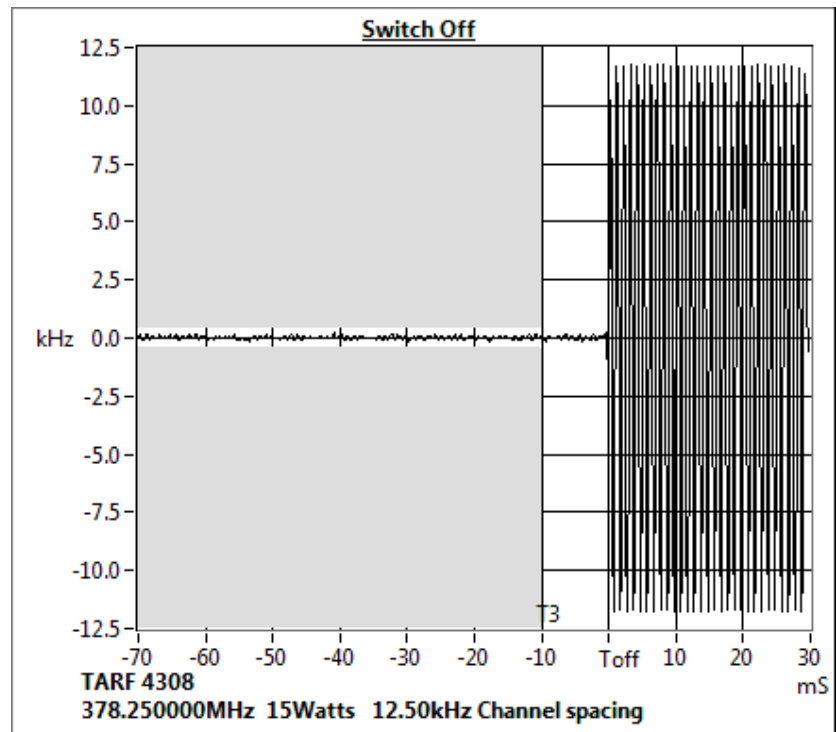
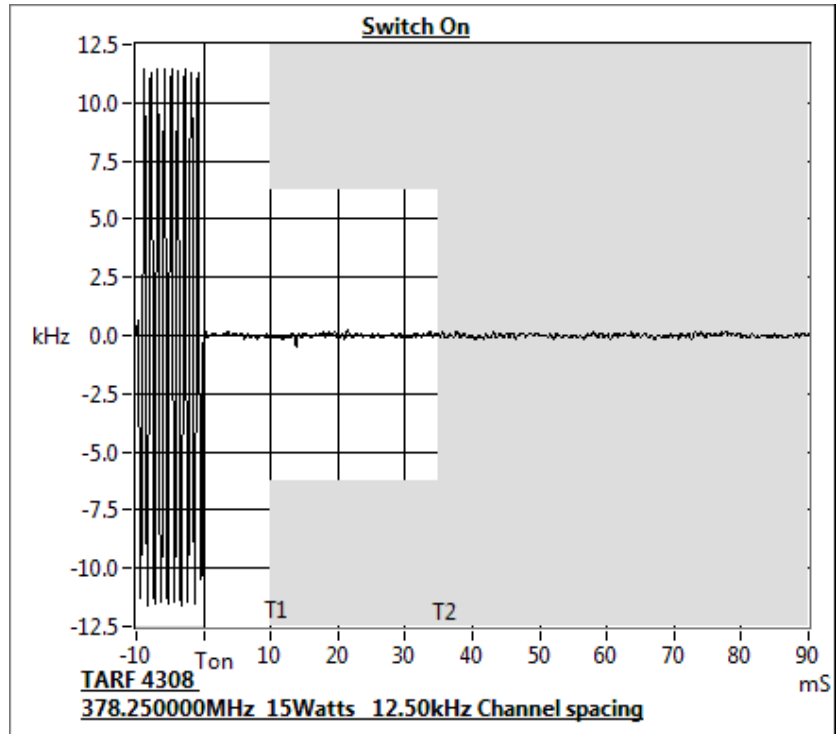
| Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels |                              |                 |                 |
|--------------------------------------------------------------------------------------|------------------------------|-----------------|-----------------|
| 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,

## Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 378.250 MHz 15 W 25.0 kHz Channel Spacing



## TRANSMITTER FREQUENCY STABILITY - TEMPERATURE

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

RSS-119 5.3

GUIDE: ANSI C63.26 5.6.4

### 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).

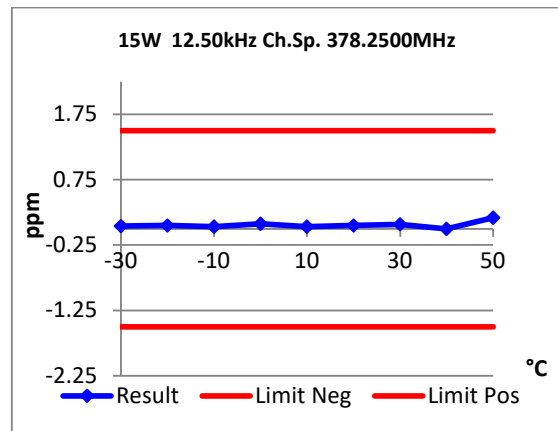
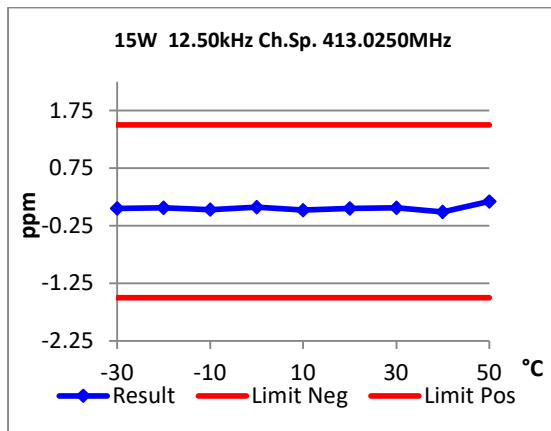
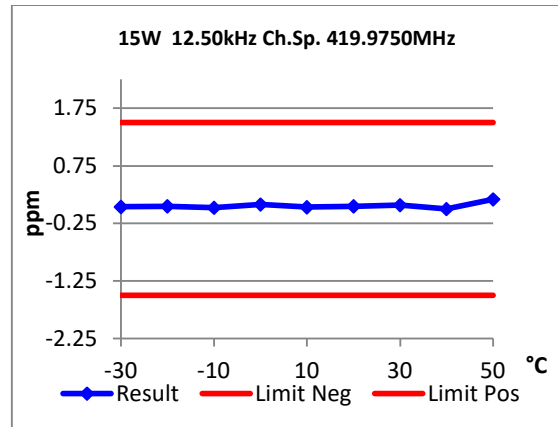
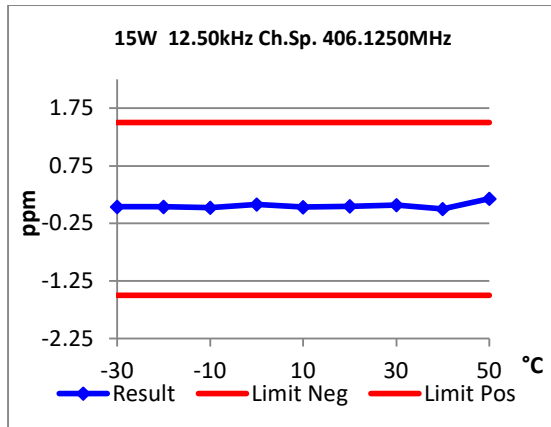
MEASUREMENT UNCERTAINTY:  $\pm 0.05\text{ppm}$

### MEASUREMENT RESULTS:

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

| Temperature ( $^{\circ}\text{C}$ ) | Error (ppm) |             |             |             |
|------------------------------------|-------------|-------------|-------------|-------------|
|                                    | 406.125 MHz | 413.025 MHz | 419.975 MHz | 378.250 MHz |
| -30                                | 0.04        | 0.05        | 0.04        | 0.04        |
| -20                                | 0.04        | 0.06        | 0.05        | 0.05        |
| -10                                | 0.02        | 0.03        | 0.02        | 0.03        |
| 0                                  | 0.08        | 0.07        | 0.08        | 0.08        |
| 10                                 | 0.03        | 0.02        | 0.03        | 0.03        |
| 20                                 | 0.05        | 0.05        | 0.05        | 0.05        |
| 30                                 | 0.07        | 0.06        | 0.07        | 0.07        |
| 40                                 | 0.00        | -0.01       | 0.00        | 0.00        |
| 50                                 | 0.18        | 0.17        | 0.17        | 0.17        |

## Transmitter Frequency Stability - Temperature



| LIMIT:                |  | FCC 47 CFR 90.213     | RSS-119 5.3 |
|-----------------------|--|-----------------------|-------------|
| Channel Spacing (kHz) |  | Frequency Error (ppm) |             |
| 12.5                  |  | 1.5                   |             |
| 25.0                  |  | 1.5                   |             |

## TRANSMITTER FREQUENCY STABILITY - VOLTAGE

SPECIFICATION: FCC 47 CFR 2.1055, FCC 47 CFR 90.213

RSS-119 5.3

GUIDE: ANSI C63.26 5.6.5

### 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 UNCERTAINTY:  $\pm 0.05\text{ppm}$

### MEASUREMENT RESULTS:

|             | FREQUENCY ERROR (ppm) for 12.5 kHz |                       |                       |
|-------------|------------------------------------|-----------------------|-----------------------|
|             | 13.8 V <sub>DC</sub>               | 11.73 V <sub>DC</sub> | 15.87 V <sub>DC</sub> |
| 406.125 MHz | 0.09                               | 0.09                  | 0.09                  |
| 413.025 MHz | 0.09                               | 0.08                  | 0.09                  |
| 419.975 MHz | 0.09                               | 0.09                  | 0.09                  |
| 378.250 MHz | 0.09                               | 0.09                  | 0.09                  |

LIMIT CLAUSES: FCC 47 CFR 90.213

RSS-119 5.3

| Channel Spacing (kHz) | Frequency Error (ppm) |
|-----------------------|-----------------------|
| 12.5                  | 1.0                   |
| 25.0                  | 1.0                   |

## RECEIVER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC 47CFR 15.111

RSS-Gen 7.4

GUIDE: TIA-603-E 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 20 dB below the limit were not recorded.
4. A scan is performed with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz for frequencies up to 1 GHz, and a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz for frequencies above 1 GHz
5. For each frequency range the spectrum analyser was loaded with the appropriate calibration figures to compensate for the cables and attenuator losses allowing the emission levels to be read directly with no further calculation.  
The calibrations are loaded as an overall reference level offset plus a set of correction factors for the required frequency band.

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

Example of attenuation correction: (dB)

|                             |         |                                  |
|-----------------------------|---------|----------------------------------|
| 10 dB attenuator E3674      | 9.50 dB |                                  |
| 1.5 M blue cable E5028      | 0.28 dB |                                  |
| Total Attenuation @ 500 MHz | 9.78    | Sum of component attenuation (a) |
| Amplitude offset            | 10.00   | (b)                              |
| Correction @ 500 MHz        | -0.22   | (a-b)                            |

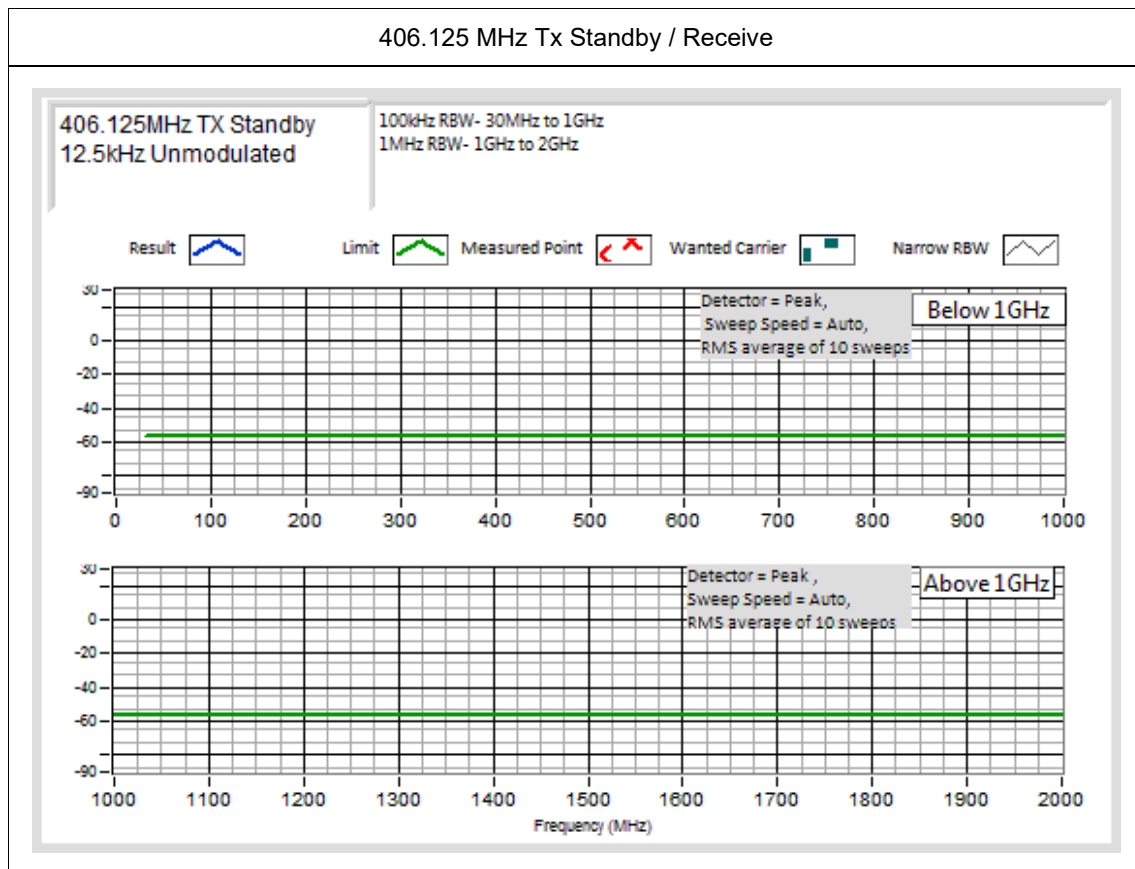
MEASUREMENT UNCERTAINTY:  $\pm 2.8\text{dB}$

LIMIT CLAUSE: RSS-Gen 7.4

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

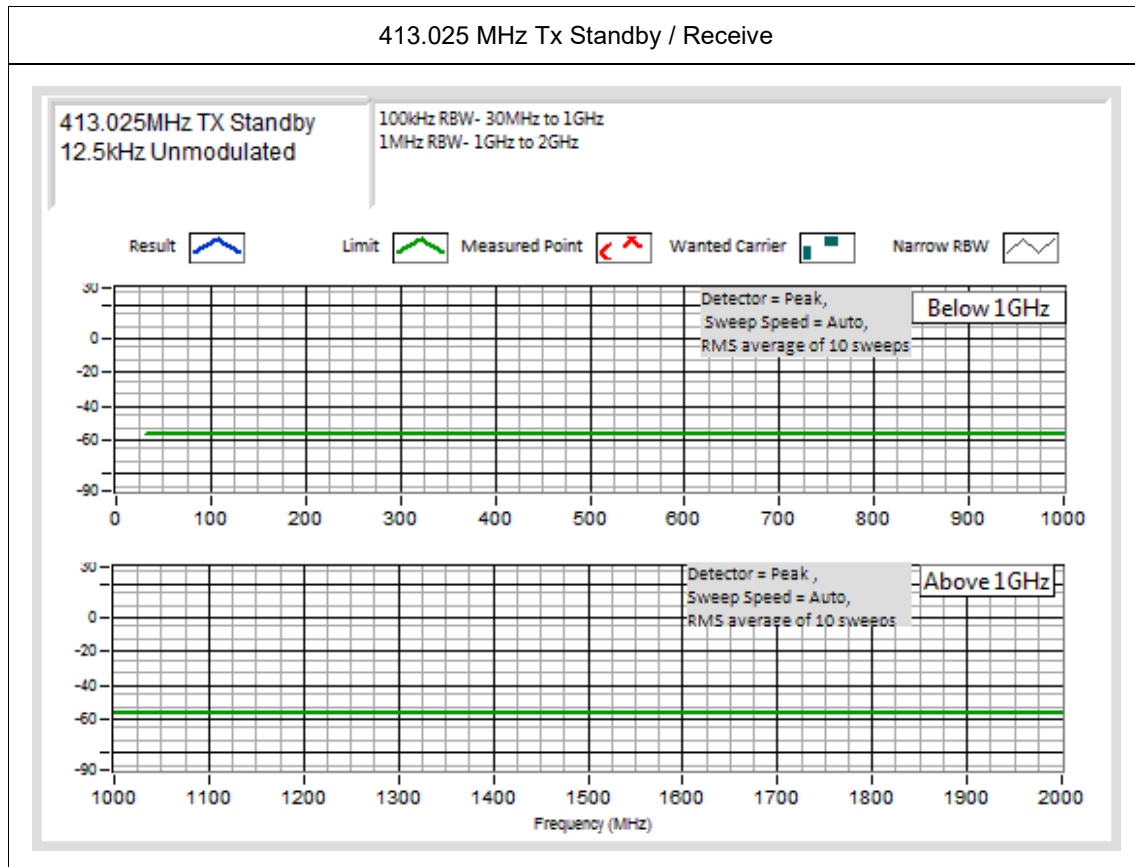
Receiver Spurious Emissions (Conducted) – Continued

| 406.125 MHz Tx Standby / Receive                  |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
| No emissions were detected within 20 dB of Limit. |            |             |



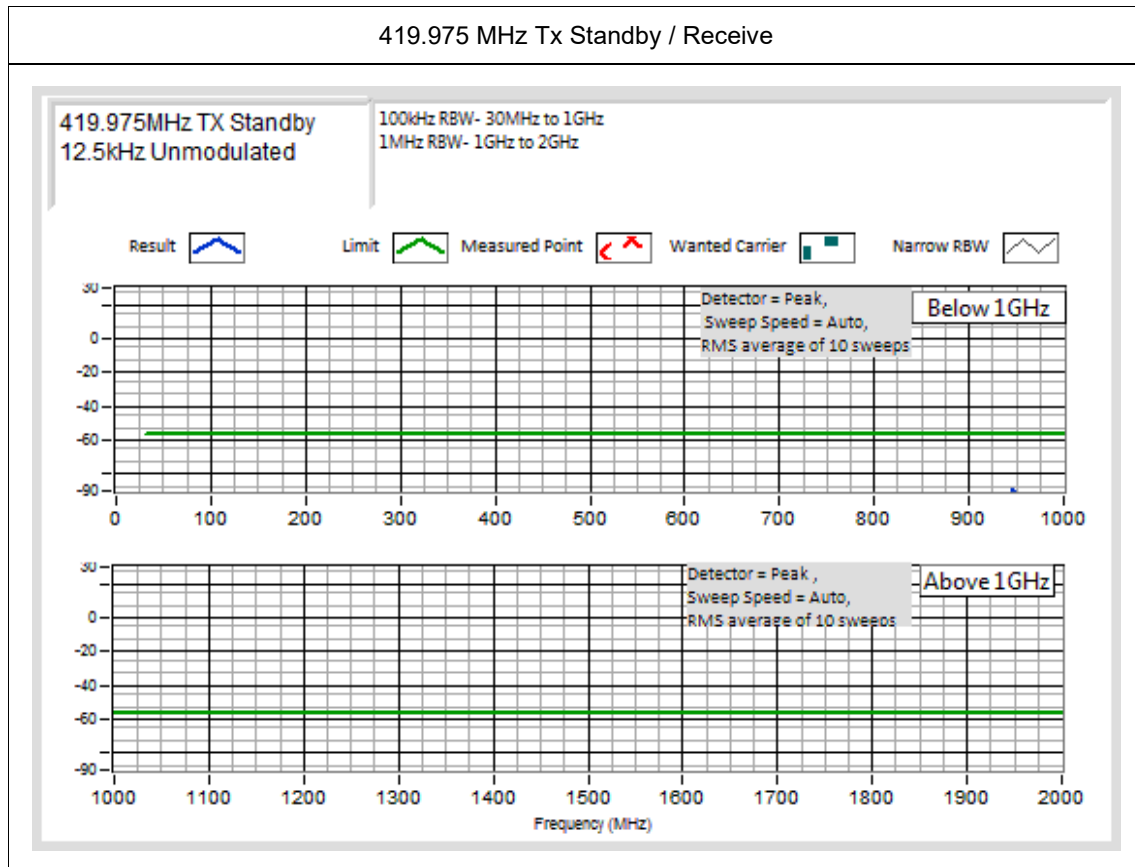
Receiver Spurious Emissions (Conducted) – Continued

| 413.025 MHz Tx Standby / Receive                  |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
| No emissions were detected within 20 dB of Limit. |            |             |



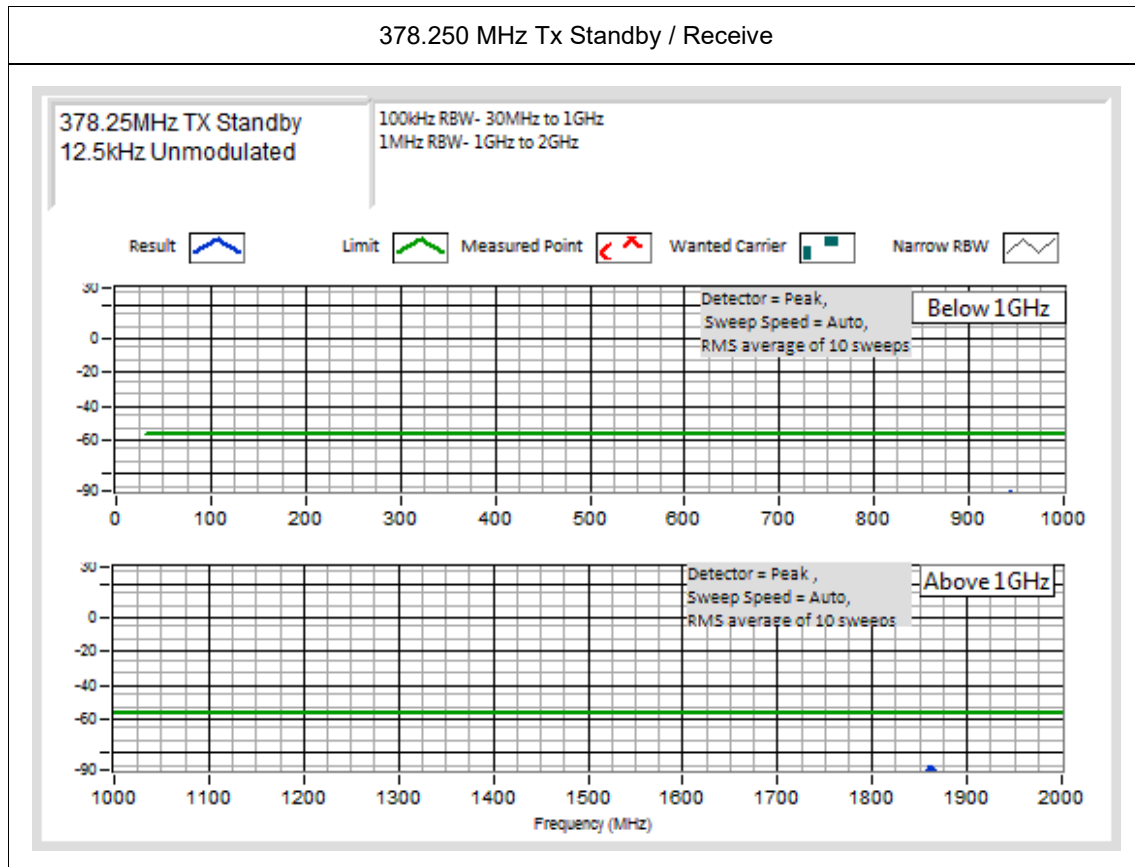
Receiver Spurious Emissions (Conducted) – Continued

| 419.975 MHz Tx Standby / Receive                  |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
| No emissions were detected within 20 dB of Limit. |            |             |



Receiver Spurious Emissions (Conducted) – Continued

| 378.250 MHz Tx Standby / Receive                  |            |             |
|---------------------------------------------------|------------|-------------|
| Emission Frequency (MHz)                          | Level (nW) | Level (dBm) |
| ~                                                 | ~          | ~           |
| No emissions were detected within 20 dB of Limit. |            |             |



## TEST EQUIPMENT LIST

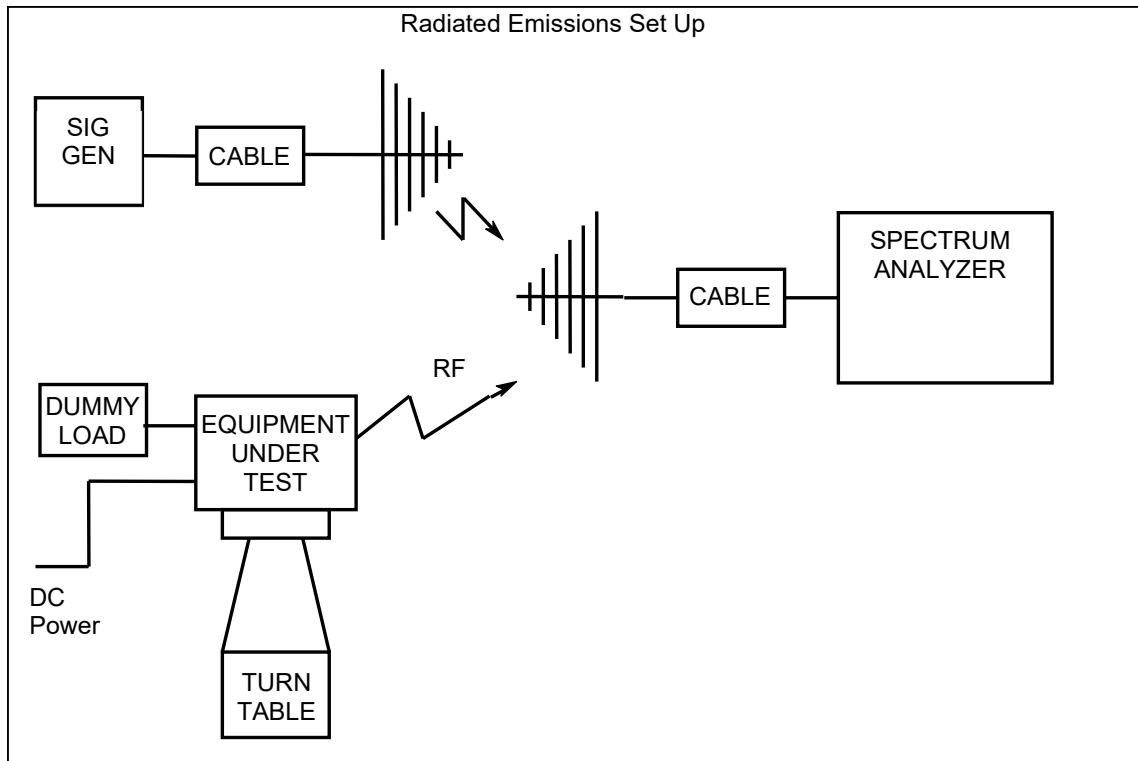
| Equipment Type         | Information                  | Manufacturer    | Model No               | Serial No#   | Tait ID | Cal Due   |
|------------------------|------------------------------|-----------------|------------------------|--------------|---------|-----------|
| Antenna                | 18GHz DRG                    | Emco            | DRG3115                | 2084         | E3076   | 12-Jul-24 |
| Antenna                | Reference Dipoles            | Emco            | 3121C DB1              | 9510-1164    | E3559   | 29-May-24 |
| Antenna                | 18GHz DRG                    | Emco            | DRG3115                | 9512-4638    | E3560   |           |
| Antenna                | Log Periodic                 | Schwarzbeck     | VUSLP                  | 9111-219     | E4617   |           |
| Coax Cable             | OATS Turntable Cable 1       | Intelcom        | RG214                  | OATS1        | E4621   | 08-Oct-24 |
| Coax Cable             | OATS Tower Cable             | Intelcom        | RG214                  | OATS2        | E4622   | 08-Oct-24 |
| Coax Cable             | OATS Turntable Cable 2       | Intelcom        | RG215                  | OATS3        | E4995   | 08-Oct-24 |
| RF Attenuator          | 10dB 50W                     | Weinschel       | 24-10-34               | AZ0401       | E3388   | 08-Oct-24 |
| Signal Generator       | Analog 3.2GHz                | Hewlett Packard | HP8648C                | 3443U00543   | E3558   | 08-Oct-24 |
| Antenna                | Reverb - 1-18GHz DRG         | Schwarzbeck     | BBHA 9120 D            | 9120D-885    | E4857   |           |
| Antenna                | Reverb - 1-18GHz DRG         | Schwarzbeck     | BBHA 9120 D            | 9120D-884    | E4858   |           |
| Audio Analyser         | TREVA2                       | Hewlett Packard | HP8903B                | 2818A04275   | E3710   | 11-Oct-24 |
| Audio Analyser         | TREVA1                       | Hewlett Packard | HP8903A                | 2437A04625   | E4986   | 04-Oct-24 |
| Coax Cable             | Reverb - 4.5m Multiflex 141  | TeltestBlue6    | MF 141                 | TeltestBlue6 | E4843   | 08-Oct-24 |
| Coax Cable             | Reverb - 2m Multiflex 141    | TeltestBlue5    | MF 141                 | TeltestBlue5 | E4844   | 08-Oct-24 |
| Coax Cable             | Reverb - 2m Multiflex 141    | TeltestBlue4    | MF 141                 | TeltestBlue4 | E4845   | 08-Oct-24 |
| Coax Cable             | Reverb - 1m Multiflex 141    | TeltestBlue3    | MF 141                 | TeltestBlue3 | E4846   | 08-Oct-24 |
| Coax Cable             | Reverb - 1m Multiflex 141    | TeltestBlue2    | MF 141                 | TeltestBlue2 | E4847   | 08-Oct-24 |
| Coax Cable             | Reverb - 1m Multiflex 141    | TeltestBlue1    | MF 141                 | TeltestBlue1 | E4848   | 08-Oct-24 |
| Coax Cable             | Conducted Disturbance Cable  | Tait            | RG223/U                | EMC1         | E5026   | 08-Oct-24 |
| Filter High Pass/Notch | 400 to 520MHz                | Tait            |                        | N/A          | E3384   | 07-Jun-24 |
| LISN                   | 50Ω/50μH+5Ω                  | Schwarzbeck     | NSLK 8117              | 7            | E5016   | 06-Oct-24 |
| Modulation Analyser    | TREVA2                       | Hewlett Packard | HP8901B (Opt 002)      | 2441A00393   | E3073   | 11-Oct-24 |
| Modulation Analyser    | TREVA1                       | Hewlett Packard | HP8901B (Opt 002)      | 3704A05837   | E3786   | 04-Oct-24 |
| Multimeter             |                              | Fluke           | 77                     | 35069359     | E3237   | 11-Oct-24 |
| Power Meter            | TREVA2 Power Head for HP8901 | Hewlett Packard | HP11722A               | 2716A02037   | 1575    | 10-Oct-24 |
| Power Meter            | TREVA1 Power Head for HP8901 | Hewlett Packard | HP11722A               | 3111A05573   | E7054   | 08-Oct-24 |
| Power Supply           | AC Variac                    | Yamabishi       | S-260-5                | TX-533       | E1737   |           |
| Power Supply           |                              | Rohde & Schwarz | NGS M32/10 192.0810.31 | Fnr 434      | E3556   | 02-May-24 |
| Power Supply           | 60V/50A/1000W                | Hewlett Packard | HP6012B                | 2524A00616   | E3712   | 05-Oct-25 |
| Power Supply           | TREVA 1 60V/25A              | Agilent         | N5767A                 | US23D6941R   | E11372  | 03-Oct-24 |
| Power Supply           | TREVA2 60V/25A               | Agilent         | N5767A                 | US09F4901H   | E4656   | 09-Oct-25 |
| Power Supply           | 40V/38A                      | Agilent         | N5766A                 | US09E4663L   | E4719   | 11-Oct-25 |
| RF Amplifier           | +21.7 dB 1GHz                | Tait            | ZFL-1000LN             | E3660        | E3360   | 15-Aug-24 |
| RF Amplifier           | Pre-amplifier                | Agilent         | 87405C                 | MY47010688   | E4941   | 16-Oct-24 |
| RF Attenuator          | 30+3dB 350W                  | Weinschel       | 67-30-33 & BW-N3W5+    | CK9178       | E5023   | 08-Oct-24 |
| RF Attenuator          | TREVA2 3dB                   | Weinschel       | Model 1                | BL9950       | E4080   | 08-Oct-24 |
| RF Attenuator          | TREVA1 3dB                   | Weinschel       | Model 1                | BL9958       | E4081   | 08-Oct-24 |
| RF Attenuator          | TREVA1 20dB 150W             | Weinschel       | 40-20-23               | MF817        | E4082   | 08-Oct-24 |

TELTEST Laboratories  
Tait International Ltd  
Report Number 4308a

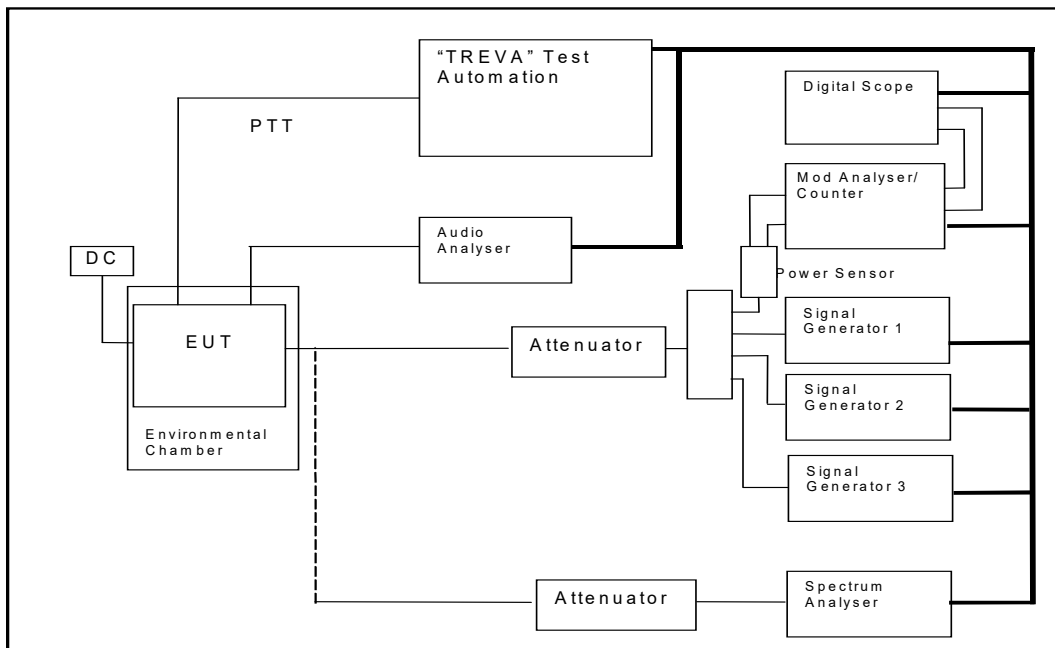
| Equipment Type             | Information                                    | Manufacturer    | Model No                 | Serial No# | Tait ID | Cal Due   |
|----------------------------|------------------------------------------------|-----------------|--------------------------|------------|---------|-----------|
| RF Chamber                 | S-LINE TEM CELL                                | Rohde & Schwarz | 1089.9296.02             | 338232/003 | E3636   | 07-May-25 |
| RF Chamber                 | Reverb - Stirrer controller for reverb chamber | Teseq           | Stirrer Controller       | 29765.1    | E4854   |           |
| RF Chamber                 | Reverb - 0.5 - 18GHz Reverberation Chamber     | Teseq           | RVC XS                   | 29765      | E4855   |           |
| RF Combiner                | TREVA1                                         | Minicircuits    | ZFSC-4-1                 | -          | E4083   |           |
| RF Combiner                | TREVA2                                         | Minicircuits    | ZFSC-4-1                 | -          | E4084   |           |
| RF Load                    | 150W                                           | Bird            | 8166                     | 524        | E3625   | 08-Oct-24 |
| Spectrum Analyser          | 13.2GHz                                        | Agilent         | PSA E4445A               | MY42510072 | E4139   | 18-Oct-24 |
| Spectrum Analyser          | 26.5GHz                                        | Agilent         | PXA N9030A               | MY49432161 | E4907   | 02-Mar-25 |
| Temp & Humidity datalogger |                                                | Hobo            | U21-011                  | 10134275   | E4980   | 07-Aug-24 |
| TREVA 1                    |                                                | Teltest         | -                        | 1          | -       | 23-Oct-24 |
| TREVA 2                    |                                                | Teltest         | -                        | 2          | -       | 23-Oct-24 |
| Testware                   | Base Station Network Audio Generator           |                 | December 2017            | -          | -       |           |
| Testware                   | Conducted Emissions                            |                 | March 2018               | -          | -       |           |
| Testware                   | Frequency Vs Temperature                       |                 | April 2018               | -          | -       |           |
| Testware                   | Occupied Bandwidth                             |                 | TTEL_OCCBW 2.00.01       | -          | -       |           |
| Testware                   | Reverb Emissions                               |                 | TTEL_REVEMIS 2.00.03     | -          | -       |           |
| Testware                   | Sideband Spectrum                              |                 | February 2017            | -          | -       |           |
| Testware                   | S-Line Radiated Emissions                      |                 | TTEL_SLINERADE M 2.00.01 | -          | -       |           |
| Testware                   | TREVA                                          |                 | TTEL_TREVA 2.00.00       | -          | -       |           |

NOTE: Items without calibration dates are calibrated immediately before use or was set using calibrated instruments.

## ANNEX A – TEST SETUP DETAILS



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



END OF REPORT