

# LABORATORY TEST REPORT

## RADIO PERFORMANCE MEASUREMENTS

for the

TMBK5B Mobile Transceiver

Tested in accordance with:

FCC 47 CFR Parts 22 and 90

RSS-119 Issue 12

RSS-Gen Issue 5

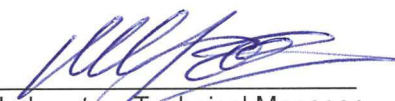
Report Revision: 1

Issue Date: 21 January 2025

PREPARED BY: I. D. Russell

  
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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FCC ID: CASTMBK5B  
IC : 737A-TMBK5B

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Issue Date: 21 January 2025

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## REVISION HISTORY

| Date            | Revision | Comments            |
|-----------------|----------|---------------------|
| 21 January 2025 | 1        | Initial test report |
|                 |          |                     |

## INTRODUCTION

This report is an addendum to Teltest Report 4380. It provides test results for operation on 762.025MHz.

This report supports a "Class 2" permissive change to add 20kHz channel spacing operation for this radio. This relates to Analogue and FFSK (1200bps and 2400bps) modulations.

Refer to Teltest Report 4380 for results for other frequencies

Tested in accordance with: FCC 47 CFR Parts 22 and 90  
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: Mobile Transceiver  
Type: TMBK5B  
Product Code: T02-00014-XFAA  
Serial Number(s): 21660155  
Frequency of addition: 762.025 MHz  
Transmit Power:

| Frequency   | Very Low Power | High Power |
|-------------|----------------|------------|
| 762.025 MHz | 2 W            | 30 W       |

| Modulation  |                             | Channel Spacing | Speech Channels | Symbol Rate (symbols/sec) | Data Rate (bps) |
|-------------|-----------------------------|-----------------|-----------------|---------------------------|-----------------|
| Analogue FM |                             | 20 kHz          | 1               | -                         | -               |
| FFSK        | Fast Frequency Shift Keying | 20 kHz          | -               | 1200                      | 1200            |
|             |                             | 20 kHz          | -               | 2400                      | 2400            |

### HARDWARE & SOFTWARE

Quantity: 1

| Unit  | Type             | Code and Version       |
|-------|------------------|------------------------|
| Head  | Hardware ID      | TMBC62-0100_0001       |
|       | Firmware Package | QIDMR_3.03.08.0133     |
|       | FPGA Image       | QCB6G_S03_3.10.00.0000 |
| Torso | Hardware ID      | TMBB34-K510_0002       |
|       | Firmware Package | QIDMR_3.03.08.0133     |
|       | FPGA Image       | QMB3G_S02_3.12.01.0000 |

### TEST CONDITIONS

All testing was performed between 20 → 21 January 2025, 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

| 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                      | N1     |
| 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 | N1     |
| RSS-119 5.8         | FCC 47 CFR 2.1051                            | Transmitter Spurious Emissions (Conducted)          | ANSI C63.26 5.7                          | N1     |
| RSS-119 5.8         | FCC 47 CFR 2.1053                            | Transmitter Spurious Emissions (Radiated)           | TIA-603-E 2.2.12                         | N1     |
| No specification    | FCC CFR 90.543                               | Transmitter Radiated Emissions in the GNSS Band     | TIA-603-E 2.2.12                         | N1     |
| RSS-119 5.8.9.2 rad | No specification                             | Transmitter Conducted Emissions in the GNSS Band    | ANSI C63.26 6.5.2.7.4                    | N1     |
| RSS-119 5.9         | FCC 47 CFR 90.214                            | Transient Frequency Behaviour                       | ANSI C63.26 6.5.2.2                      | N/A 3  |
| RSS-119 5.3         | FCC 47 CFR 2.1055, FCC 47 CFR 90.213         | Transmitter Frequency Stability - Temperature       | ANSI C63.26 5.6.4                        | N1     |
| 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                        | N1     |
| RSS-Gen 7.4         | FCC 47 CFR 15.111                            | Receiver Spurious Emissions (Conducted)             | TIA-603-E 2.1.2                          | N1     |

| 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) |

|                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Comments:</b>                                                                                                                        |
| 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                                                       |
| N1: Not tested, as this parameter is unlikely to be affected by the addition of the 762.025 MHz channel and the 20 kHz channel spacing. |

## STATEMENT OF COMPLIANCE

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

Equipment: Mobile Transceiver  
Type: TMBK5B  
Product Code: T02-00014-XFAA  
Serial Number(s): 21660155  
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:**

3 February 2025

The results obtained in this test report pertain only to the item 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

| <b>Label</b> | <b>Channel Number</b> | <b>Transmit Frequency MHz</b> | <b>Power Watts</b> | <b>Channel Spacing kHz</b> |
|--------------|-----------------------|-------------------------------|--------------------|----------------------------|
| 762.025H     | 1                     | 762.025                       | 30                 | 20                         |
| 762.025L     | 2                     | 762.025                       | 2                  | 20                         |

**Programming Application Name**  
Terminals Programming Application

**Version**  
0.0.0.37 (Alpha)

## MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

### MODULATION TYPES:

F3E Analogue Frequency Modulation (FM)  
F2D FFSK 1200 bps and FFSK 2400 bps

CHANNEL SPACING: 20.0 kHz

### EMISSION DESIGNATORS:

|                    |         |
|--------------------|---------|
| Analogue FM        | 14K0F3E |
| FFSK Data 1200 bps | 8K40F2D |
| FFSK Data 2400 bps | 9K60F2D |

### 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: 20.0 kHz Bandwidth

Necessary bandwidth

M = 3.0 kHz

D = 4.0 kHz

$$B_n = (2 \times 3.0) + (2 \times 4.0) \times 1 \\ = 14.0 \text{ kHz}$$

Emission Designator

**14K0F3E**

F3E represents an FM voice transmission

Fast Frequency Shift Keying (FFSK – 1200 bps): 20.0 kHz Channel Spacing

Necessary bandwidth

M = 1.8 kHz

D = 2.4 kHz (60% of peak deviation)

$$B_n = (2 \times 1.8) + (2 \times 2.4) \times 1 \\ = 8.4 \text{ kHz}$$

Emission Designator

**8K40F2D**

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

Fast Frequency Shift Keying (FFSK – 2400 bps): 20.0 kHz Channel Spacing

Necessary bandwidth

M = 2.4 kHz

D = 2.4 kHz (60% of peak deviation)

$$B_n = (2 \times 2.4) + (2 \times 2.4) \times 1 \\ = 9.6 \text{ kHz}$$

Emission Designator

**9K60F2D**

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

## TEST RESULTS

### TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: ANSI C63.26 5.3.3.2

#### MEASUREMENT PROCEDURE:

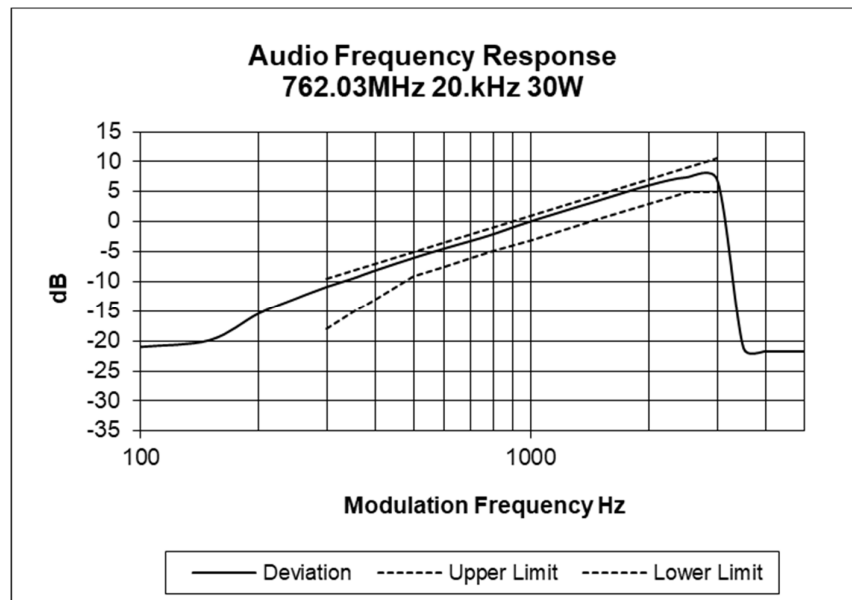
1. Refer Annex A for Equipment set up.
2. An audio input tone of 1000 Hz was applied with the level set to obtain 20% of maximum deviation. This was used as the 0 dB reference point.
3. The AF was varied while the audio level was held constant.
4. The response in dB relative to 1000 Hz was measured.

#### MEASUREMENT RESULTS:

See the plots on the following pages for 20kHz channel spacing tested at 30W transmit power.

MEASUREMENT UNCERTAINTY:  $\pm 1.5\%$

Tx FREQUENCY: 762.025 MHz 30 W 20 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. An audio input tone of 1000 Hz was applied with the level set to obtain 60% of maximum deviation. This was used as the 0 dB reference point.
3. The modulation response was measured at four audio frequencies while increasing the input level in 5dB steps.
4. Additionally, the level used to measure sideband spectrum (occupied bandwidth) was included in the level sweep.
5. Measurements were made for both Positive and Negative Deviation.

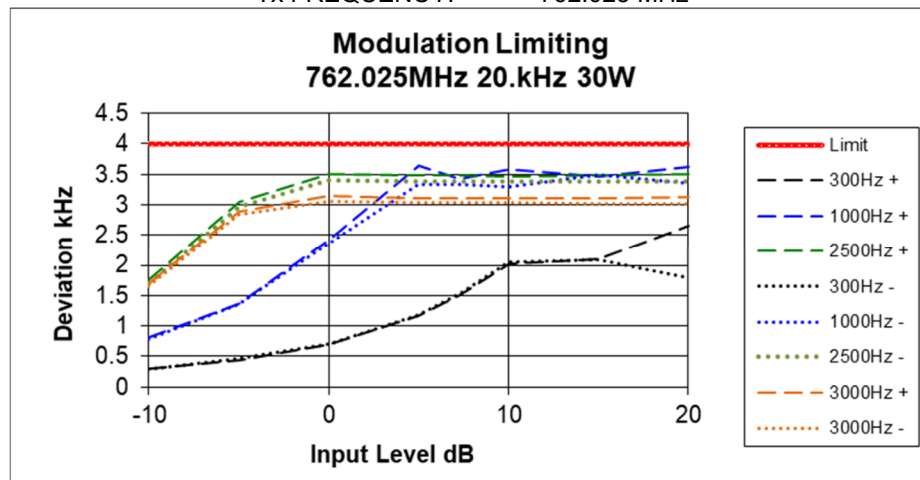
### MEASUREMENT RESULTS:

See the plots on the following pages for 20 kHz channel spacing tested at 30W transmit power.

LIMIT CLAUSE: TIA/EIA-603E 1.3.4.4

MEASUREMENT UNCERTAINTY:  $\pm 1.5\%$

Tx FREQUENCY: 762.025 MHz



## TRANSMITTER OCCUPIED (99%) BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1046  
RSS-119 5.5

GUIDE: ANSI C63.26 5.4.4

### MEASUREMENT PROCEDURE:

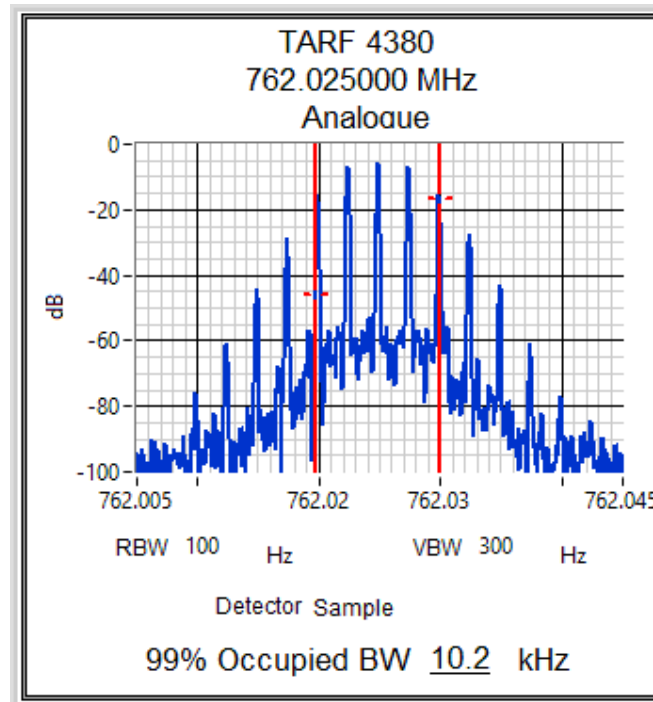
1. Refer Annex A for Equipment Set up.
2. For Analogue measurements: The EUT was modulated by a 2500 Hz tone at an input level 16 dB above a level that produced 50% deviation. The input level was established at the frequency of maximum response of the audio modulating circuit.  
For Data measurements: 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         | FFSK 1200 bps | FFSK 2400 bps |
| 762.025 MHz                                                          | 20.0                  | 10.2             | 7.67          | 9.07          |
| <u>Limit</u><br>Authorized Bandwidth<br>47 CFR 90.209<br>RSS 119 5.5 |                       | 20.0             | 20.0          | 20.0          |
| Necessary BW used in emission designator                             |                       | 14.0             | 8.4           | 9.6           |
| Result                                                               |                       | Pass             | Pass          | Pass          |

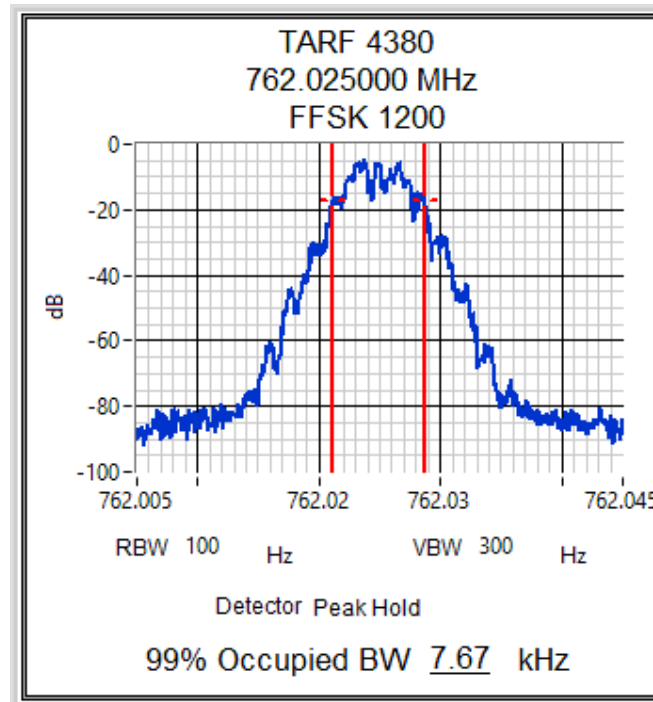
Transmitter Occupied (99%) Bandwidth – Analogue

762.025 MHz, 30 W



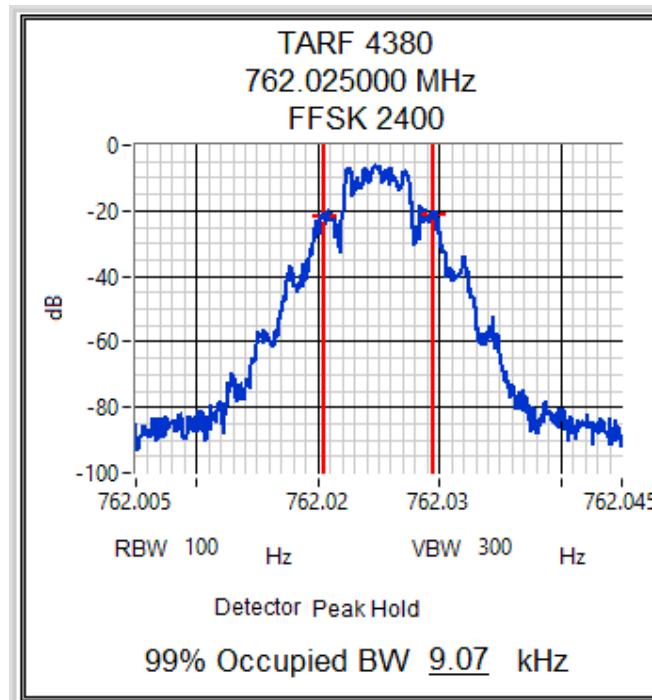
Transmitter Occupied (99%) Bandwidth – FFSK 1200 bps

762.025 MHz, 30 W



Transmitter Occupied (99%) Bandwidth – FFSK 2400 bps

762.025 MHz, 30W



## 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 noted on the recorded plots.

### MEASUREMENT RESULTS:

See the plots on the following pages for 20.0 kHz channel spacing.

MEASUREMENT UNCERTAINTY: 95%  $\pm$  0.65dB

LIMIT CLAUSE: FCC 47 CFR 90.210 RSS-119 5.5

### EMISSION MASKS

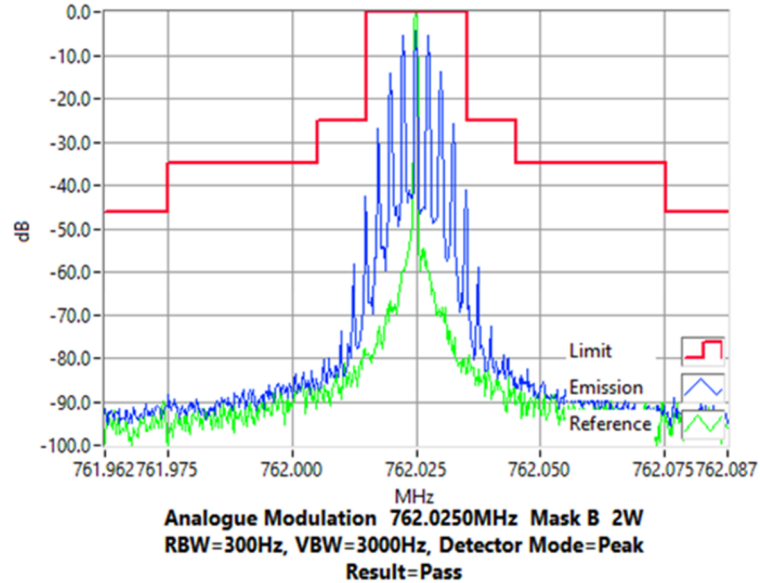
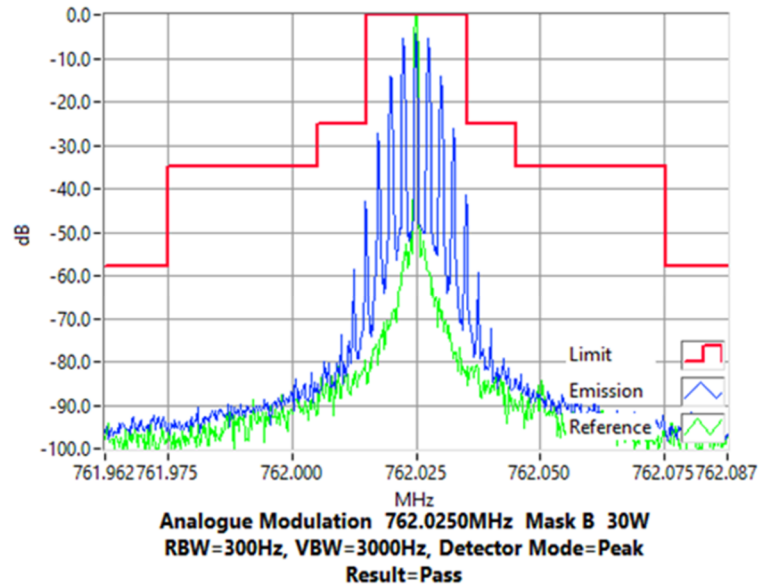
|                 |                        |                             |
|-----------------|------------------------|-----------------------------|
| Emission Mask B | 20 kHz Channel Spacing | Analogue                    |
| Emission Mask G | 20 kHz Channel Spacing | FFSK 1200bps & FFSK 2400bps |

### DATA SPEED

|      |                        |                     |
|------|------------------------|---------------------|
| FFSK | 20 kHz Channel Spacing | 1200 bps & 2400 bps |
|------|------------------------|---------------------|

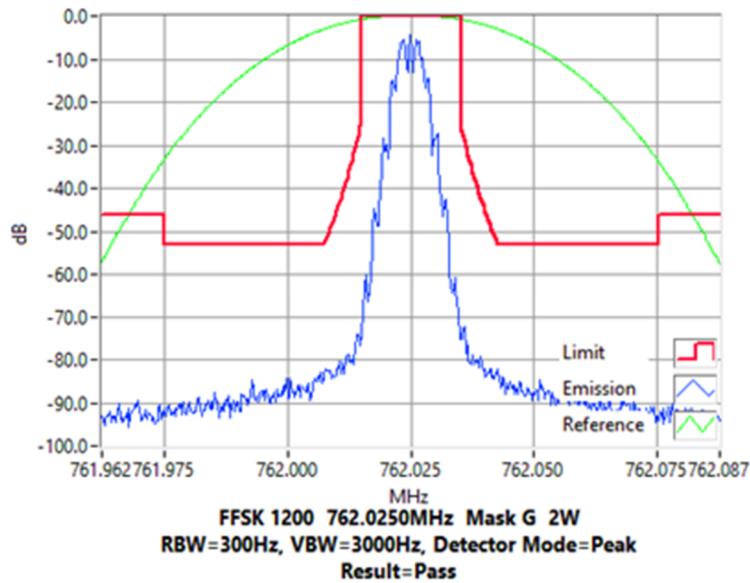
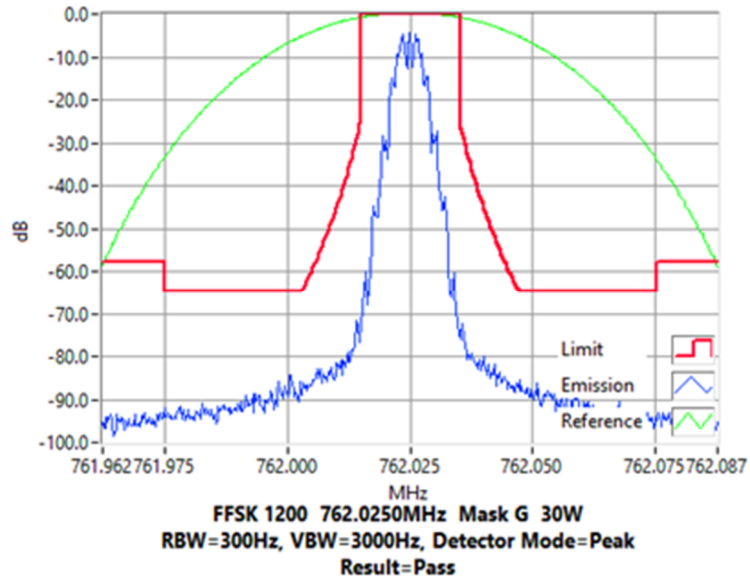
## Transmitter Spectrum Masks – Analogue

762.025 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



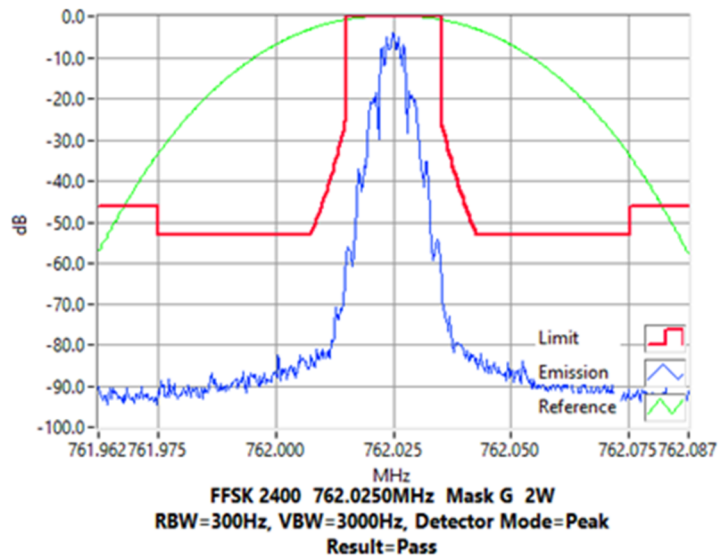
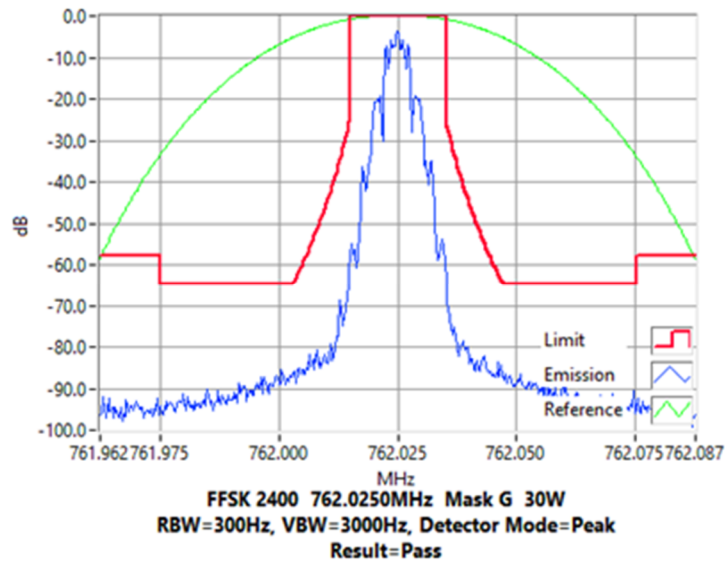
## Transmitter Spectrum Masks – FFSK 1200 bps

762.025 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



## Transmitter Spectrum Masks – FFSK 2400 bps

762.025 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



## TEST EQUIPMENT LIST

| Equipment Type             | Information                  | Manufacturer    | Model No               | Serial No#    | Tait ID | Cal Due   |
|----------------------------|------------------------------|-----------------|------------------------|---------------|---------|-----------|
| Audio Analyser             | TREVA1                       | Hewlett Packard | HP8903A                | 2437A04625    | E4986   | 5-Oct-25  |
| Coax Cable                 | 2m Black                     | Suhner          | RG214HF/Nm/<br>Nm/2000 | TeltestBlack4 | E4653   | 10-Sep-25 |
| Coax Cable                 | 3m Blue                      | Suhner          | Sucoflex 126EA         | 503429/126EA  | E5015   | 11-Sep-25 |
| Modulation Analyser        | TREVA1                       | Hewlett Packard | HP8901B (Opt 002)      | 3704A05837    | E3786   | 9-Oct-25  |
| Power Meter                | TREVA1 Power Head for HP8901 | Hewlett Packard | HP11722A               | 3111A05573    | E7054   | 7-Oct-25  |
| Power Supply               | TREVA 1 60V/25A              | Agilent         | N5767A                 | US23D6941R    | E11372  | 5-Oct-25  |
| RF Attenuator              | 20dB 50W                     | Weinschel       | 24-20-44               | AW1266        | E3562   | 13-Sep-25 |
| RF Attenuator              | TREVA1 3dB                   | Weinschel       | Model 1                | BL9958        | E4081   | 13-Sep-25 |
| RF Attenuator              | TREVA1 20dB 150W             | Weinschel       | 40-20-23               | MF817         | E4082   | 13-Sep-25 |
| RF Combiner                | TREVA1                       | Minicircuits    | ZFSC-4-1               | -             | E4083   |           |
| Spectrum Analyser          | 26.5GHz                      | Agilent         | PXA N9030A             | MY49432161    | E4907   | 2-Mar-25  |
| Temp & Humidity datalogger |                              | TP-Link TAPO    | T315                   | 22383M6000671 | E11377  | 8-Feb-25  |
| TREVA 1                    |                              | Teltest         | -                      | 1             | -       | 23-Oct-25 |
| Testware                   | Occupied Bandwidth           |                 | TTEL_OCCBW 2.00.01     | -             | -       |           |
| Testware                   | Sideband Spectrum            |                 | February 2017          | -             | -       |           |
| Testware                   | TREVA                        |                 | TTEL_TREVA 2.00.00     | -             | -       |           |

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

[illegible]

Report Revision: 1  
Issue Date: 21 January 2025