

Laboratory Test Report

For the
TOP-J2610-B0 Handportable Transceiver

Tested In accordance with

FCC 47 CFR Parts 22 and 90

Report Revision: 1
Issue Date: 12-March-2007
FCC ID: CASTEL0037

PREPARED BY: Garry Pringle _____
Test Technician

CHECKED & APPROVED BY: Steve Crompton _____
Laboratory Manager



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

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REVISION HISTORY

| Date | Revision | Comments |
|---------------|----------|---------------------|
| 12-March-2007 | 1 | Initial test report |
| | | |

INTRODUCTION

Replacement devices for the final power amplifier stage plus the associated driver stage have been fitted due to component obsolescence.

Refer also to previous reports, numbers 1522, & 2399.

Type Approval Testing of the TOP-J2610 handportable transceiver (Serial No 14367930) in accordance with:

FCC CFR 47 Parts 22 & 90

REPORT PREPARED FOR

Tait Electronics Ltd
PO Box 1645
558 Wairakei Rd
Christchurch
New Zealand

DESCRIPTION OF SAMPLE

| | |
|-----------------|--------------------------|
| Equipment: | Handportable Transceiver |
| Type: | TOP-J2610 |
| Product code: | TOP-J2610-B0 |
| Serial Numbers: | 14367930 |
| Quantity: | 1 |

STATEMENT OF COMPLIANCE

The ORCA-5020 handheld transceiver as tested in this report was found to conform to the following standards:

FCC CFR 47 Parts 22 & 90

TEST CONDITIONS

All testing was performed at the following conditions.

| | |
|-----------------------|---------------------|
| Ambient Temperature | 15 °C → 30 °C |
| Relative Humidity | 20 % → 75 % |
| Standard Test Voltage | 7.5 V _{DC} |

TEST RESULTS

TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046

GUIDE: TIA/EIA-603C 2.2.1

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
2. The coaxial attenuator has an impedance of 50 Ohms.
3. The unmodulated output power was measured with an RF Power meter.

MEASUREMENT RESULTS:

Manufacturer's Rated Output Power: Switchable: 3 W and 1 W

| 807.5125 MHz | 3 W nominal | 1 W nominal |
|----------------------------|-------------|-------------|
| POWER (W) | 2.83 | 0.93 |
| Variation from Nominal (%) | -5.7 | -7.0 |
| Measurement Uncertainty | ± 0.6 dB | |

| 816.5125 MHz | 3 W nominal | 1 W nominal |
|----------------------------|-------------|-------------|
| POWER (W) | 2.72 | 0.91 |
| Variation from Nominal (%) | -9.3 | -9.0 |
| Measurement Uncertainty | ± 0.6 dB | |

LIMIT CLAUSE: FCC 47 CFR 90.205 (r)

Radio Type: Handportable Transceiver

Frequency Band: 806 MHz ~ 870 MHz

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

TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603C 2.2.6

MEASUREMENT PROCEDURE:

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

MEASUREMENT RESULTS:

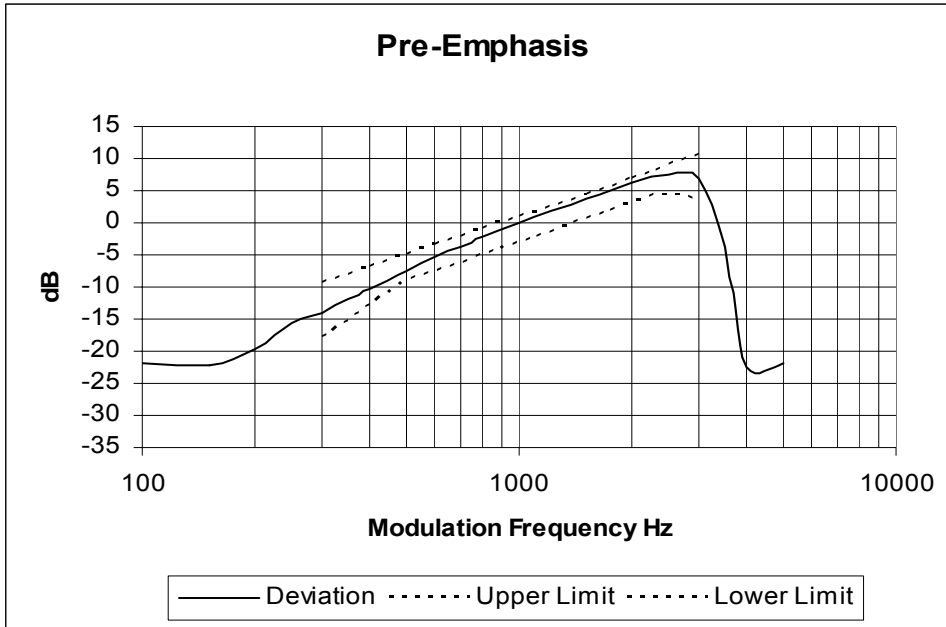
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603C 3.2.6

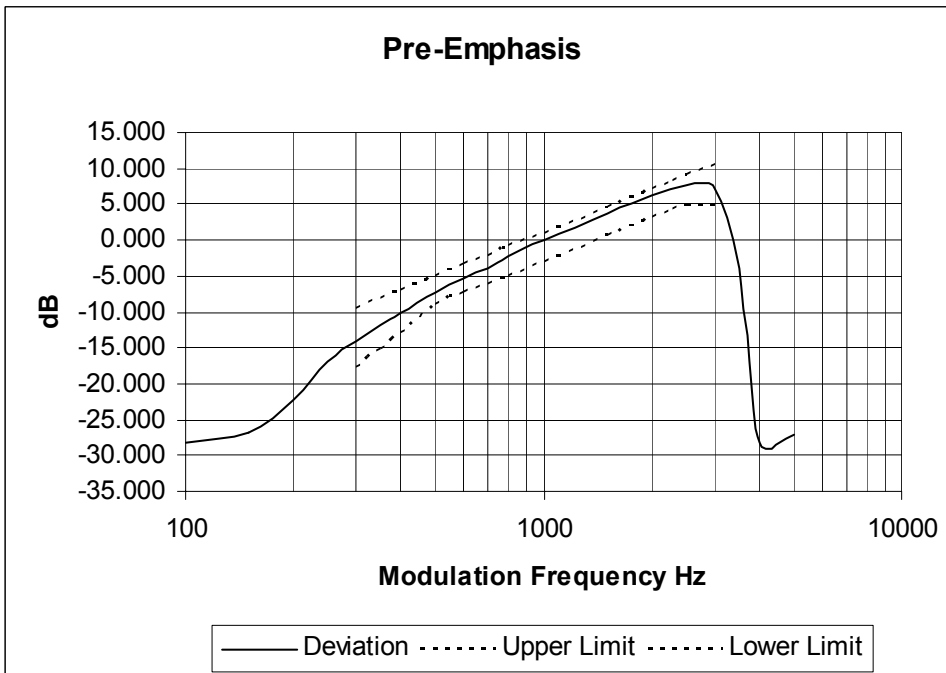
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 807.5125 MHz 12.5 kHz Channel Spacing



Tx FREQUENCY: 816.5125 MHz 25.0 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

MEASUREMENT PROCEDURE:

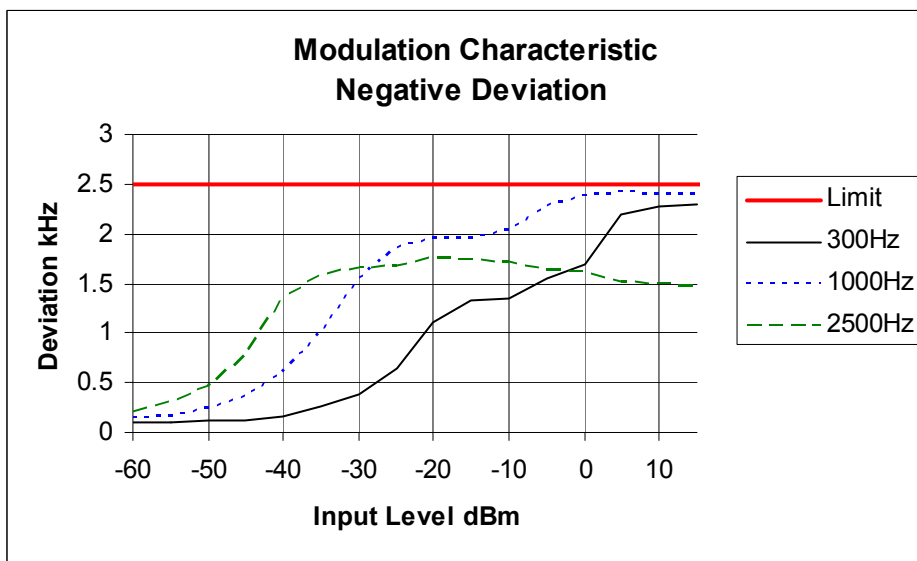
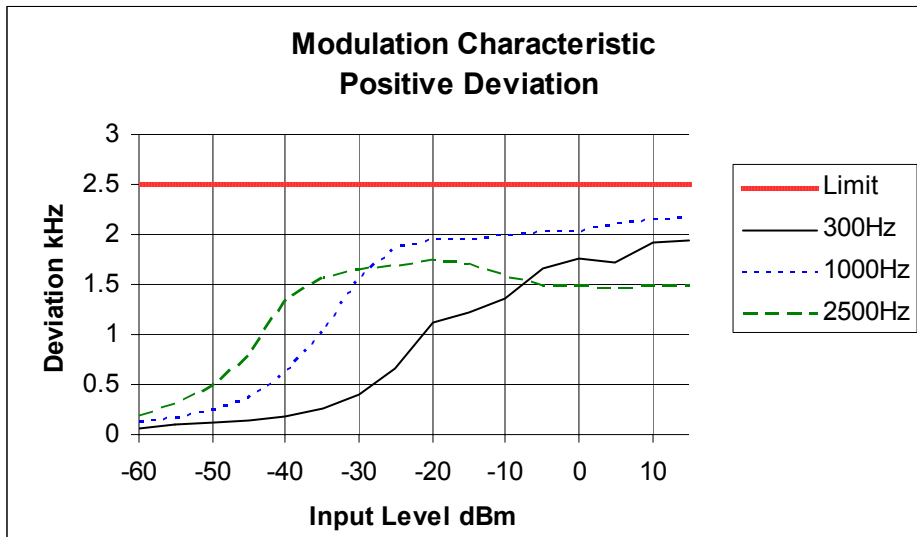
1. Refer Annex A for Equipment set up.
2. The modulation response was measured at three audio frequencies while varying the input level.
3. Measurements were made for both Positive and Negative Deviation.

MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603C 1.3.4.4

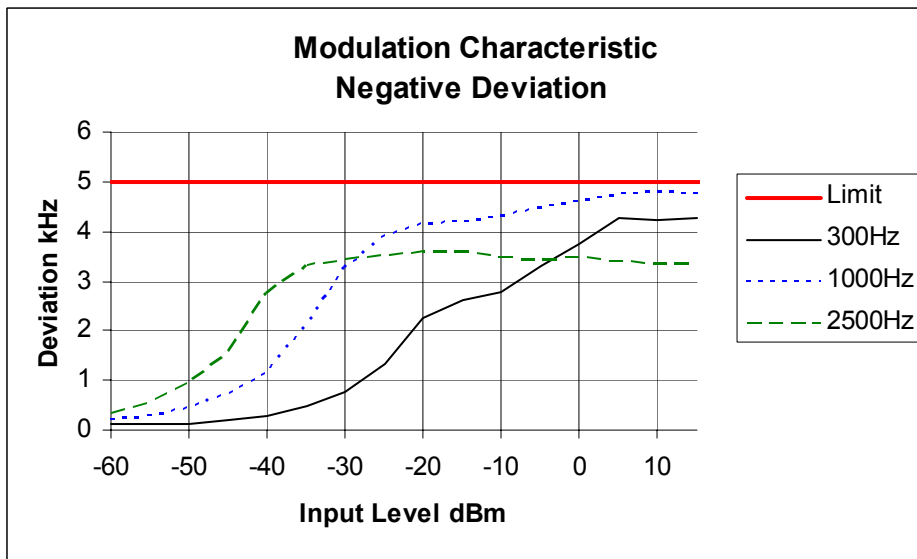
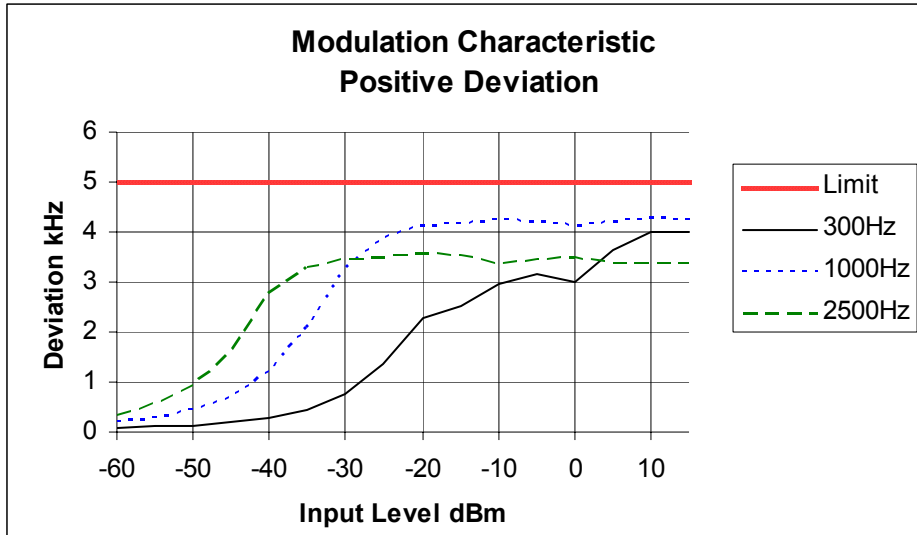
Tx FREQUENCY: 807.5125 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 816.5125 MHz 25.0 kHz Channel Spacing



OCCUPIED BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA/EIA-603C 2.2.11

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.
2. For analogue measurements: The EUT was modulated by a 2500Hz tone at an input level 16dB above a level that produced 50% deviation. The input level was established at the frequency of maximum response of the audio modulating circuit.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as follows.

Emission Mask B – Resolution Bandwidth = 300Hz, Video Bandwidth = 3 kHz

MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: FCC 47 CFR 90.210

EMISSION MASKS

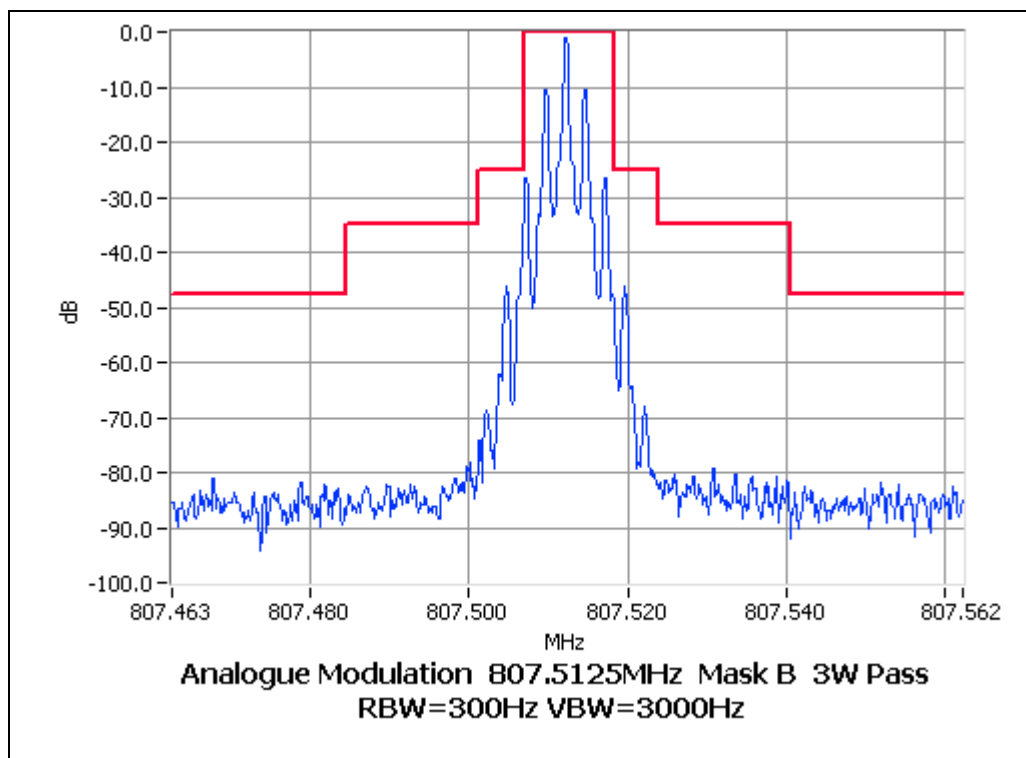
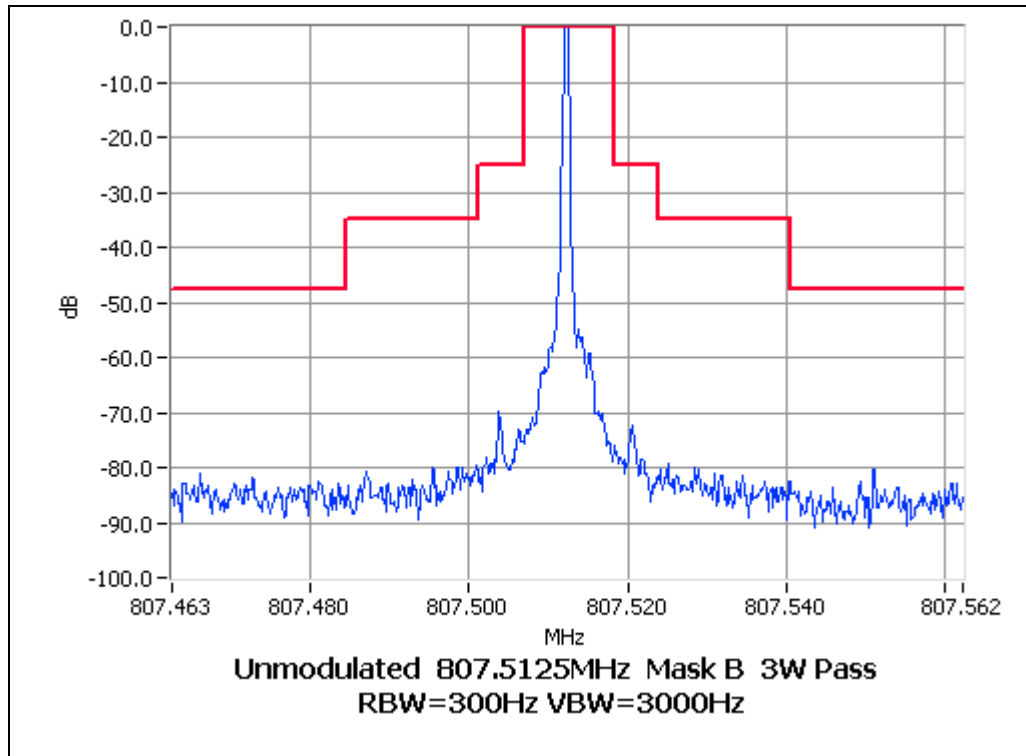
| | | |
|-----------------|--------------------------|---------|
| Emission Mask B | 12.5 kHz Channel Spacing | Analog; |
| Emission Mask B | 25.0 kHz Channel Spacing | Analog; |

OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 807.5125 MHz 3 W 12.5 kHz Channel Spacing

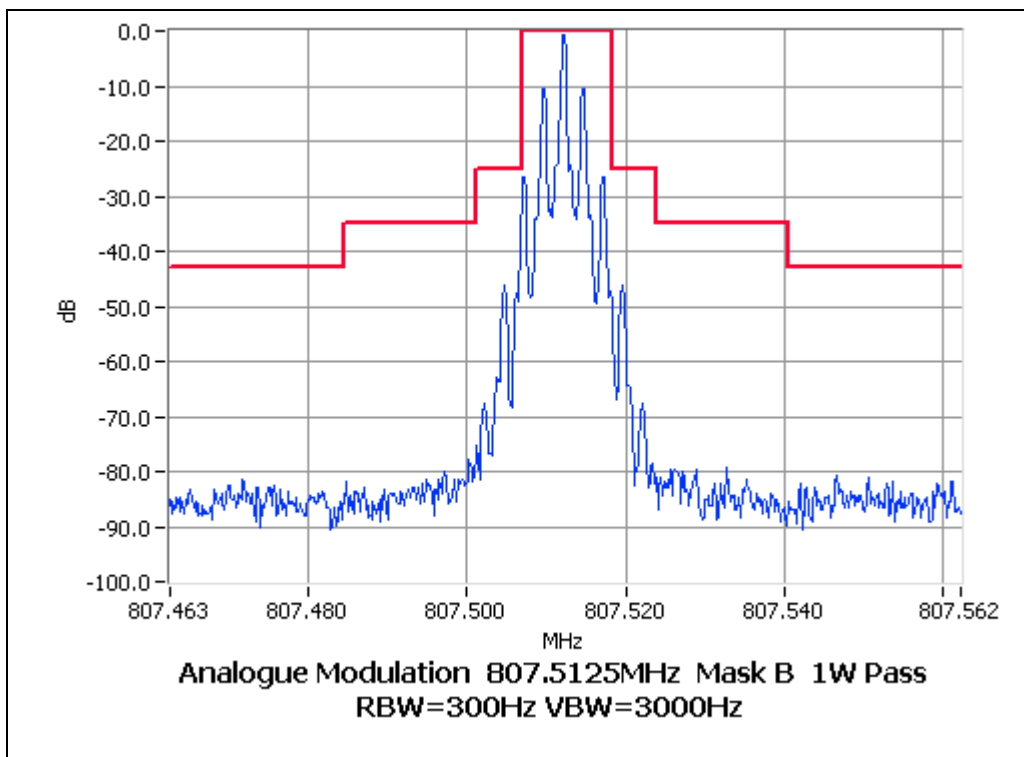
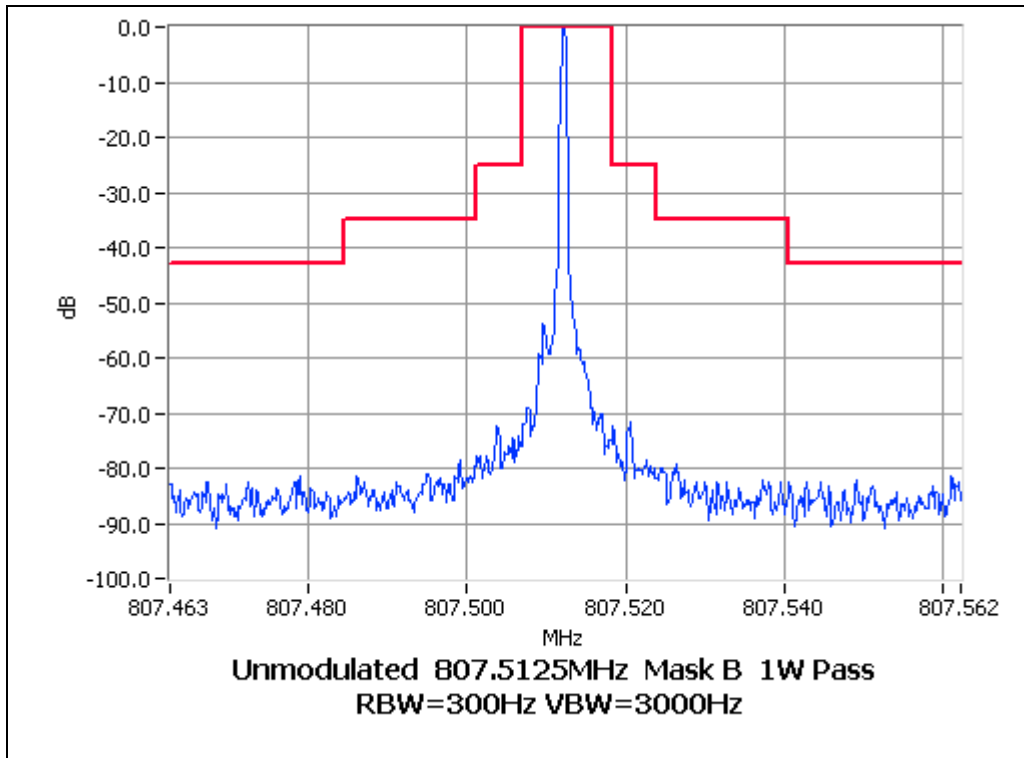


OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 807.5125 MHz 1 W 12.5 kHz Channel Spacing

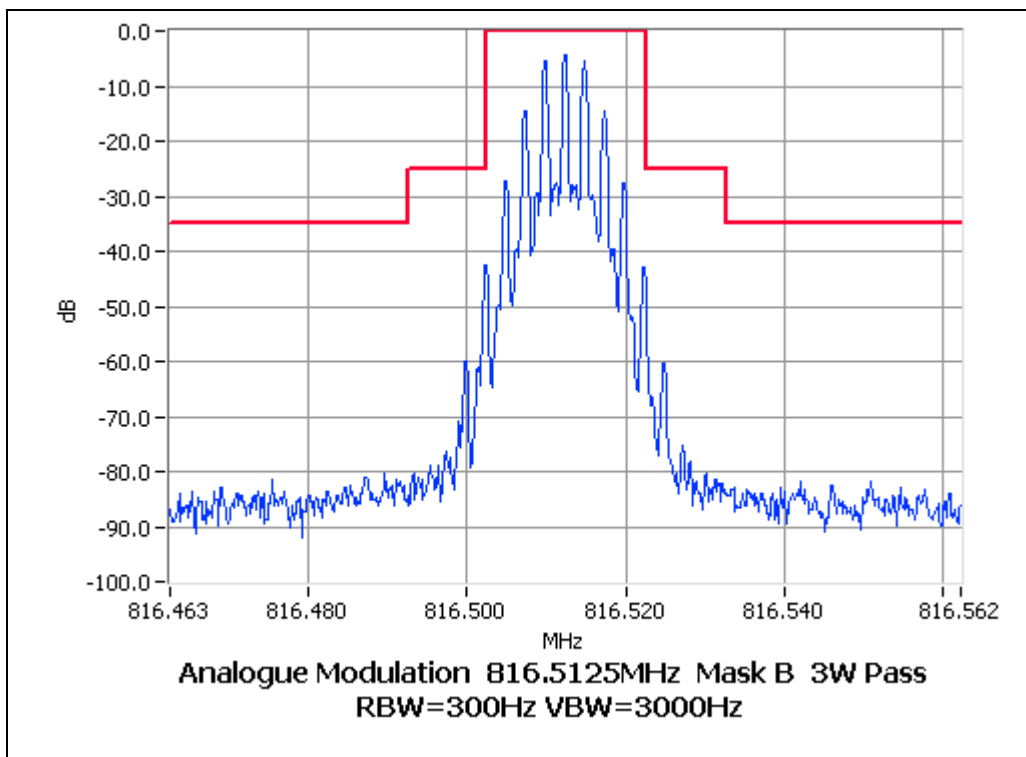
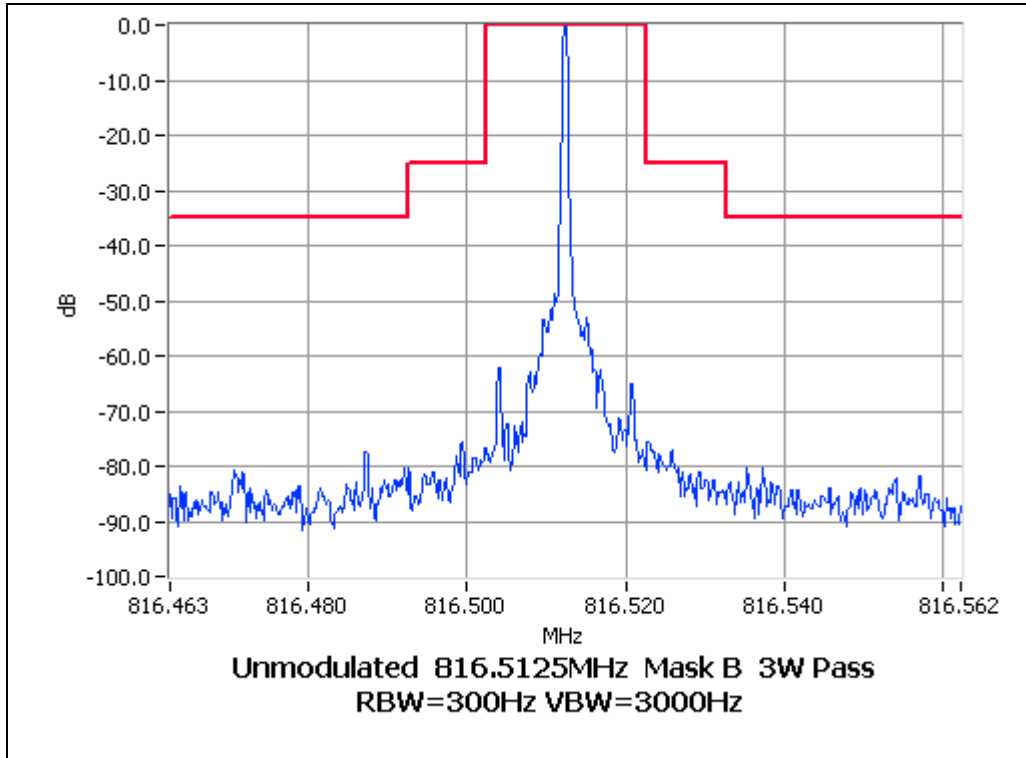


OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 816.5125 MHz 3 W 25.0 kHz Channel Spacing

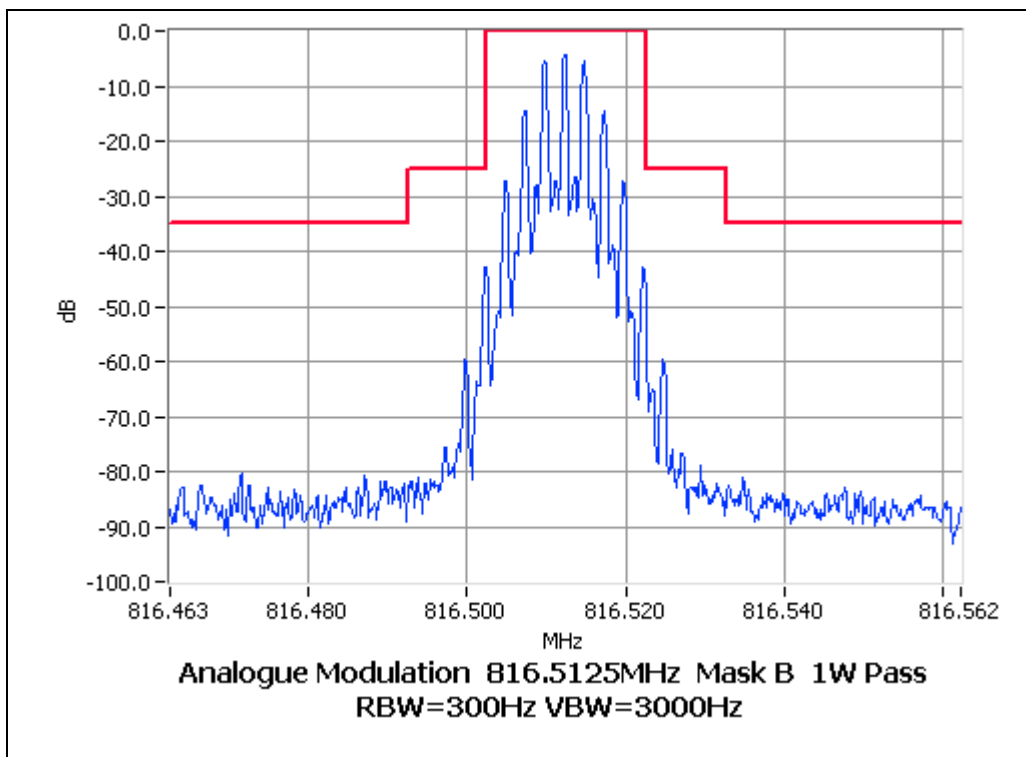
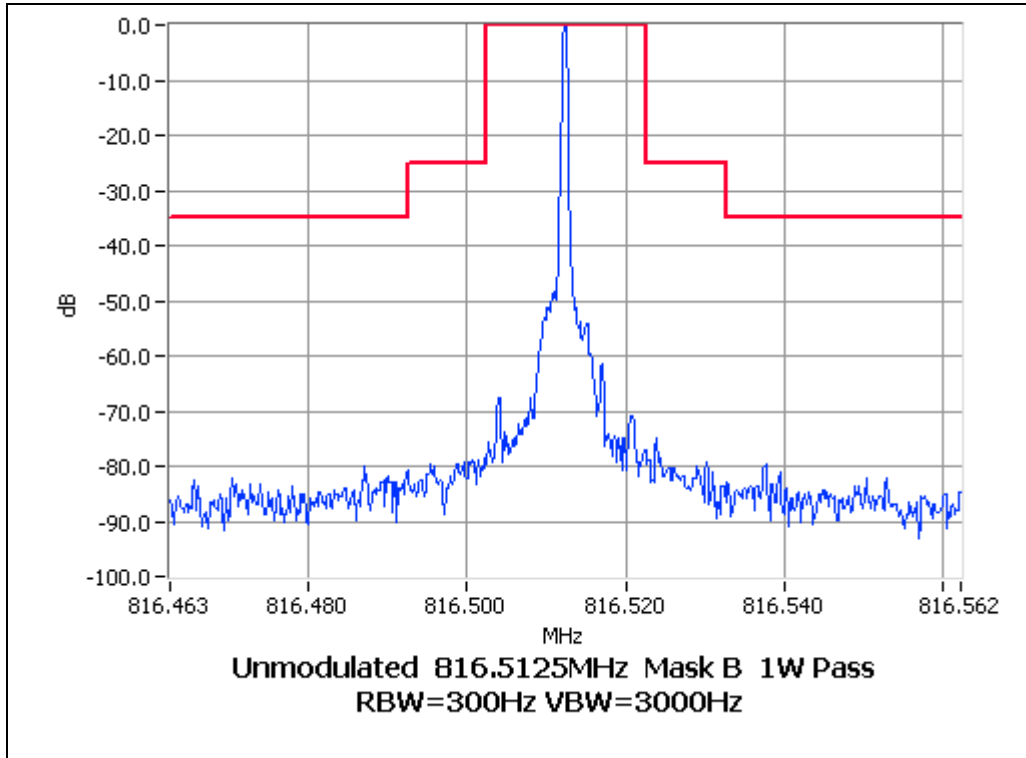


OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 816.5125 MHz 1 W 25.0 kHz Channel Spacing



SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1051

GUIDE: TIA/EIA-603C 2.2.13

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The frequency range examined was from the lowest frequency generated within the EUT, to a frequency higher than the 10th Harmonic: 100kHz to Fc-BW
Fc+BW to 10Fc GHz
3. A Pre-scan is performed with a resolution bandwidth of 1 kHz, and a video bandwidth of 3 kHz. If any emissions are found to be within 20dB of the limit a second measurement is made with the carrier modulated, and a resolution bandwidth of 10 kHz, and a video bandwidth of 30kHz.

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

MEASUREMENT RESULTS:

See the tables on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: FCC 47 CFR 90.210

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 807.5125 MHz

| 12.5 kHz Channel Spacing | | 807.5125 MHz @ 3 W | Emission Mask B |
|---|-------------|--------------------|-----------------|
| 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 | | 807.5125 MHz @ 1 W | Emission Mask B |
|---|-------------|--------------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) | |
| | | | |
| | | | |
| | | | |
| | | | |
| No emissions were detected at a level greater than 20 dB below the limit. | | | |

LIMITS:

| Carrier Output Power Watts | Emission Mask B 12.5 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ | |
|-------------------------------|--|-----------|
| 3 W | -13 dBm | 47.77 dBc |
| 1 W | -13 dBm | 43.00 dBc |

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 816.5125 MHz

| 25.0 kHz Channel Spacing | | 816.5125 MHz @ 3 W | Emission Mask B |
|---|-------------|--------------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| No emissions were detected at a level greater than 20 dB below the limit. | | | |

| 25.0 kHz Channel Spacing | | 816.5125 MHz @ 1 W | Emission Mask B |
|---|-------------|--------------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| No emissions were detected at a level greater than 20 dB below the limit. | | | |

LIMITS:

| Carrier Output Power Watts | Emission Mask B 25.0 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ | |
|-------------------------------|--|-----------|
| 3 W | -13 dBm | 47.77 dBc |
| 1 W | -13 dBm | 43.00 dBc |

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603C 2.2.12

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
2. Initial Scan
 - a) The EUT is placed in S-Line TEM cell and emissions are measured from 30MHz to 1000MHz.
Any emission within 10dB of the limit is them re-tested on the OATS along with measurements from 1000MHz to the 10th harmonic of the fundamental frequency.
3. OATS Measurement
 - a) The EUT was placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal was connected to an RF dummy load.
 - b) The test antenna was raised from 1m to 4m to obtain a maximum reading, the turntable was then rotated through 360° to obtain the maximum response of each spurious emission. Valid emissions were determined by switching the EUT on and off.
 - c) The EUT was then replaced by a signal generator and substitution antenna to make measurements by the substitution method.

MEASUREMENT RESULTS:

See the tables on the following pages

LIMIT CLAUSE: FCC 47 CFR 90.210

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 807.5125 MHz

| | | |
|---|--------------------|-----------------|
| 12.5 kHz Channel Spacing | 807.5125 MHz @ 3 W | Emission Mask B |
| 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 | 807.5125 MHz @ 1 W | Emission Mask B |
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
| ~ | ~ | ~ |
| | | |
| | | |
| | | |
| No emissions were detected at a level greater than 20 dB below the limit. | | |

LIMITS:

| | | |
|-------------------------------|--|-----------|
| Carrier Output Power Watts | Emission Mask B 12.5 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ | |
| 3 W | -13 dBm | 47.77 dBc |
| 1 W | -13 dBm | 43.00 dBc |

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 816.5125 MHz

| 25.0 kHz Channel Spacing | | 816.5125 MHz @ 3 W | Emission Mask B |
|---|-------------|--------------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) | |
| ~ | ~ | ~ | |
| | | | |
| | | | |
| | | | |
| No emissions were detected at a level greater than 20 dB below the limit. | | | |

| 25.0 kHz Channel Spacing | | 816.5125 MHz @ 1 W | Emission Mask B |
|---|-------------|--------------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) | |
| ~ | ~ | ~ | |
| | | | |
| | | | |
| | | | |
| No emissions were detected at a level greater than 20 dB below the limit. | | | |

LIMITS:

| Carrier Output Power Watts | Emission Mask D 25.0 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ | |
|-------------------------------|--|-----------|
| 3 W | -13 dBm | 47.77 dBc |
| 1 W | -13 dBm | 43.00 dBc |

TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

GUIDE: TIA/EIA-603C 2.2.2

MEASUREMENT PROCEDURE:

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

MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: FCC 47 CFR 90.213

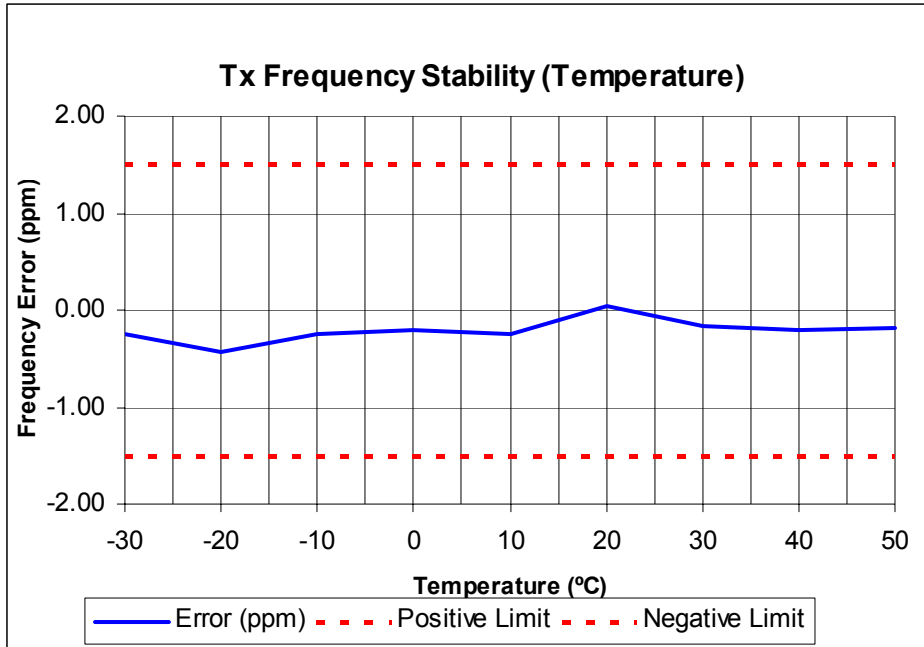
Frequency Range: 806 MHz ~ 870 MHz

| Channel Spacing (kHz) | Frequency Error (ppm) |
|-----------------------|-----------------------|
| 12.5 | 1.5 |
| 25.0 | 2.5 |

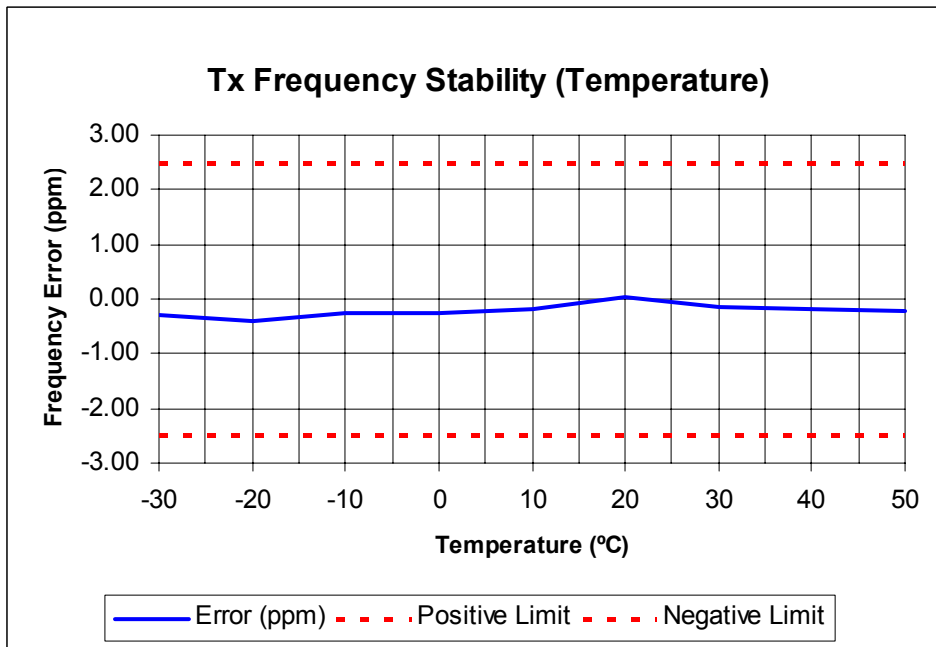
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

Tx FREQUENCY: 807.5125 MHz 3 W 12.5 kHz channel Spacing



Tx FREQUENCY: 816.5125 MHz 3 W 25.0 kHz channel Spacing



TRANSMITTER FREQUENCY STABILITY (VOLTAGE)

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

GUIDE: TIA/EIA-603C 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error at an input voltage to the radio of 85% to 115%.
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS: Frequency Range: 806 MHz ~ 870 MHz

| Channel Spacing (kHz) | FREQUENCY ERROR (ppm) @ 807.5125 MHz | | |
|-----------------------|--------------------------------------|----------|------|
| | 6.5 V DC | 7.5 V DC | V DC |
| 12.5 | 0.02 | 0.08 | |
| 25.0 | -0.04 | -0.05 | |

LIMIT CLAUSE: FCC 47 CFR 90.213

| Channel Spacing (kHz) | Frequency Error (ppm) |
|-----------------------|-----------------------|
| 12.5 | 1.5 |
| 25.0 | 2.5 |

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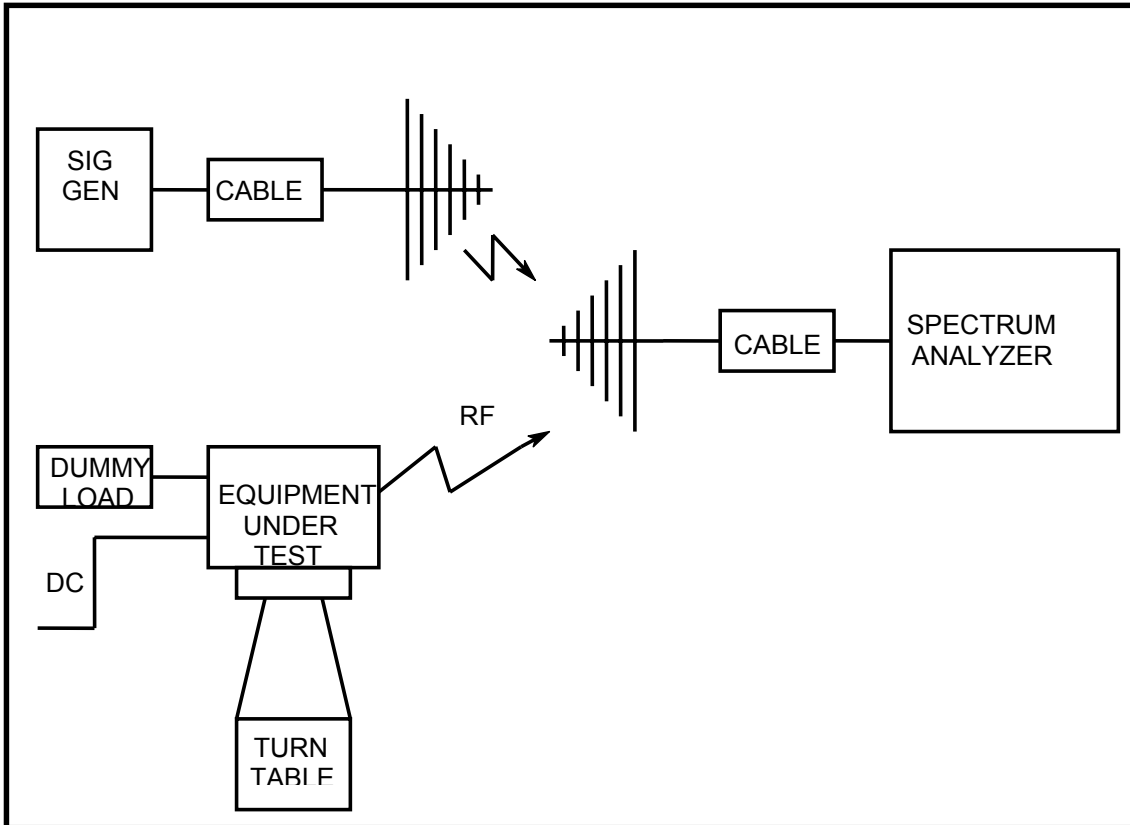
TEST EQUIPMENT USED

| No# | Equipment | Manufacturer | Model No | Serial No# | Tait ID | Cal Due |
|-----|--------------------------|-----------------|---------------------------|------------|---------|-----------|
| 11 | Modulation Analyser | Hewlett Packard | HP8901B (Opt 002) | 2441A00393 | E3073 | 02-Nov-07 |
| 13 | Audio Analyser | Hewlett Packard | HP8903A | 2308A02597 | E3074 | 02-Nov-07 |
| 20 | Power Supply | Hewlett Packard | HP6032A | 2441A00412 | E3075 | 21-Nov-07 |
| 21 | Power Supply | Rohde & Schwarz | NGS M32/10 192.0810.31 | Fnr 434 | E3556 | 16-Oct-07 |
| 22 | Oscilloscope | Tektronics | TDS340 | B013611 | E3585 | 02-Nov-07 |
| 24 | Environ. Chamber | Contherm | Spatial Cal | E3397 | E3397 | 21-Apr-07 |
| 24 | Environ. Chamber | Contherm | Temp Control | E3397 | E3397 | 21-Apr-07 |
| 46 | S-LINE TEM CELL | Rohde & Schwarz | 1089.9296.02 | 338232/003 | E3636 | 20-Mar-09 |
| 52 | Amplifier +21.7 dB | Tait | ZFL-1000LN | E3660 | E3360 | |
| 65 | RF Attenuator 50W | Weinschel | 24-20-44 | AW1266 | E3562 | 31-Oct-07 |
| 66 | RF Attenuator 25W | Weinschel | 33-20-33 | BD5871 | E3673 | 31-Oct-07 |
| 72 | RF Load 50W | Weinschel | F1426 | AE2490 | E3624 | 31-Oct-07 |
| 83 | 1m Coax Cable (BLUE) | Suhner | Sucoflex 104A | 25006/4A | E3693 | 30-Oct-07 |
| 87 | Audio Analyser | Hewlett Packard | HP8903B | 2818A04275 | E3710 | 01-Nov-07 |
| 100 | Oscilloscope | Tektronics | TDS380 | B017095 | E3782 | 02-Nov-07 |
| 111 | Modulation Analyser | Hewlett Packard | HP8901B (Opt 002) | 3704A05837 | E3786 | 01-Nov-07 |
| 116 | Power Head | Hewlett Packard | HP11722A | 3111A05573 | E7054 | 02-Nov-07 |
| 117 | RF Attenuator | Weinschel | Model 1 | BL9950 | E4080 | 28-Nov-07 |
| 118 | RF Attenuator | Weinschel | Model 1 | BL9958 | E4081 | |
| 119 | RF Attenuator 150W Treva | Weinschel | 40-20-23 | MF817 | E4082 | 30-Oct-07 |
| 120 | RF Splitter Combiner | Minicircuits | ZFSC-4-1 | - | E4083 | |
| 121 | RF Splitter Combiner | Minicircuits | ZFSC-4-1 | - | E4084 | |
| 122 | RF Splitter Combiner | Minicircuits | ZFSC-4-1 | - | E4085 | |
| 123 | Spectrum Analyser | Agilent | E4445A | MY42510072 | E4139 | 04-Jul-07 |
| 137 | 1m Multiflex Cable | Suhner | MF141 | TT007 | E4443 | 30-Oct-07 |
| 138 | 1m Multiflex Cable | Suhner | MF141 | TT086 | E4444 | 30-Oct-07 |

ANNEX A

TEST SETUP DETAILS

Radiated Emissions Set up.



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Report Number 2553

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

