

REPORT NUMBER 2158

January 2005

Class II Permissive Change to EMC Technology Test
Report Number EMC10831 FCC and TELTest Test
Report Number 1664

RADIO PERFORMANCE MEASUREMENTS

On the T2020-M27-J00 Mobile Transceiver

FCC ID: CASTEL0057

SN: 17316192

In accordance with

FCC 47 CFR Parts 90.353

PREPARED BY:	Marcus Ludwig	_____
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REPORT ON :

Type Approval Testing of the T2020-M27-J00 (Serial No 17316192)
in accordance with:

FCC CFR 47 Parts 90.353

FCC ID: CASTEL0057

PREPARED FOR :

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PO Box 1645
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Senior Technician

Date :

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

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DECLARATION OF CONFORMITY

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

Equipment: Mobile Transceiver

Type: T2020

Product code: T2020-M27-J00

Serial Numbers: 17316192

Quantity: 1

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

FCC CFR 47 Parts 90.353

Signature: _____

S. A. Crompton
Compliance Laboratory Manager.

Date: _____

Test Results

TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046

GUIDE: TIA/EIA-603B 2.2.1

MEASUREMENT PROCEDURE:

1. Refer Appendix 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: 5 W and 15 W

904.1 MHz	5 W nominal	15 W nominal
POWER (W)	5.2	17.3
Variation from Nominal (%)	4.0	15.3
Measurement Uncertainty (dB)	+0.63 -0.68	

LIMIT CLAUSE: FCC 47 CFR 90.205

Radio Type: Mobile Transceiver
Frequency Band: 902 MHz ~ 928 MHz

- (o) 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-603B 2.2.6

MEASUREMENT PROCEDURE:

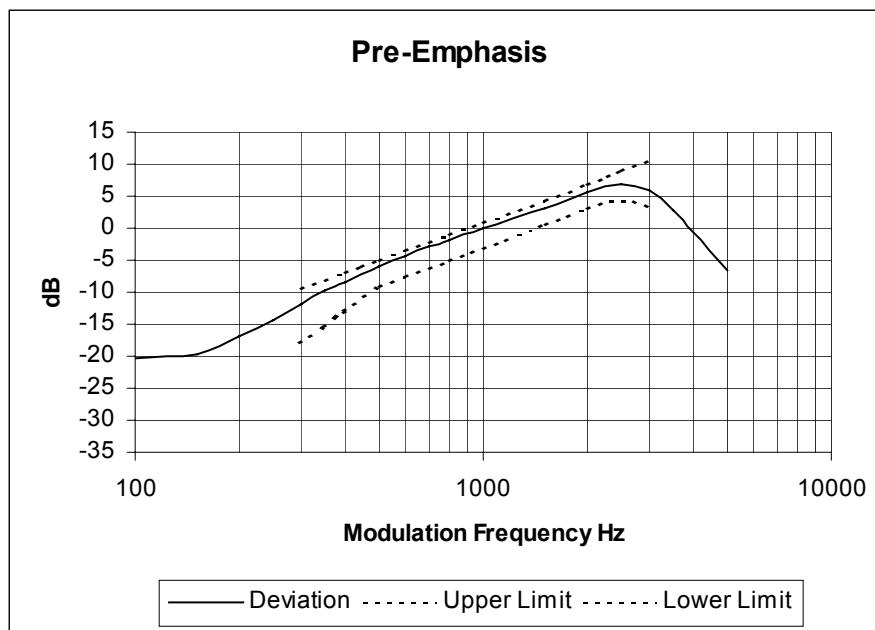
1. Refer Appendix A for Equipment set up.
2. An audio input tone of 1000Hz was applied with the level set to obtain 20% of maximum deviation. This was used as the 0dB reference point.
3. The AF was varied while the audio level was held constant.
4. The response in dB relative to 1000Hz was measured.

MEASUREMENT RESULTS:

Refer measurement plot below.

LIMIT CLAUSE: TIA/EIA-603B 3.2.6

Tx FREQUENCY: 904.1 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

MEASUREMENT PROCEDURE:

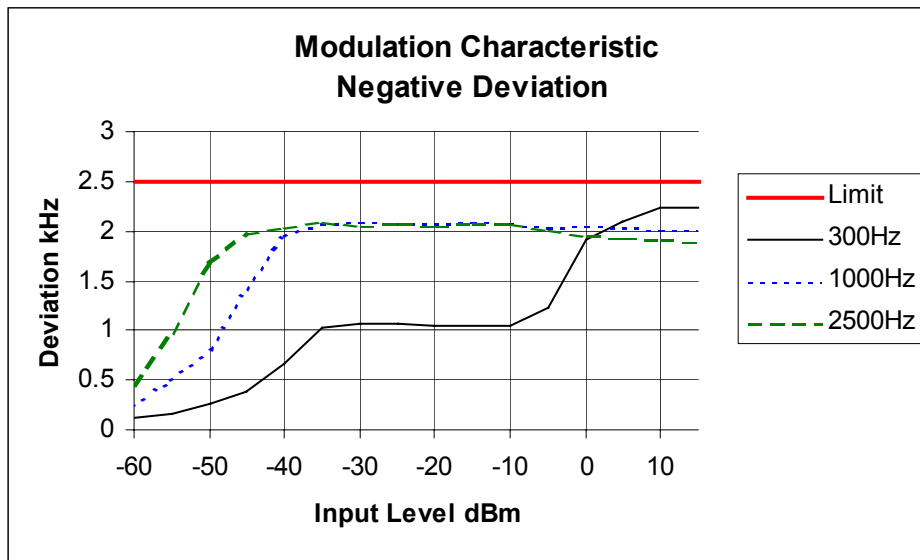
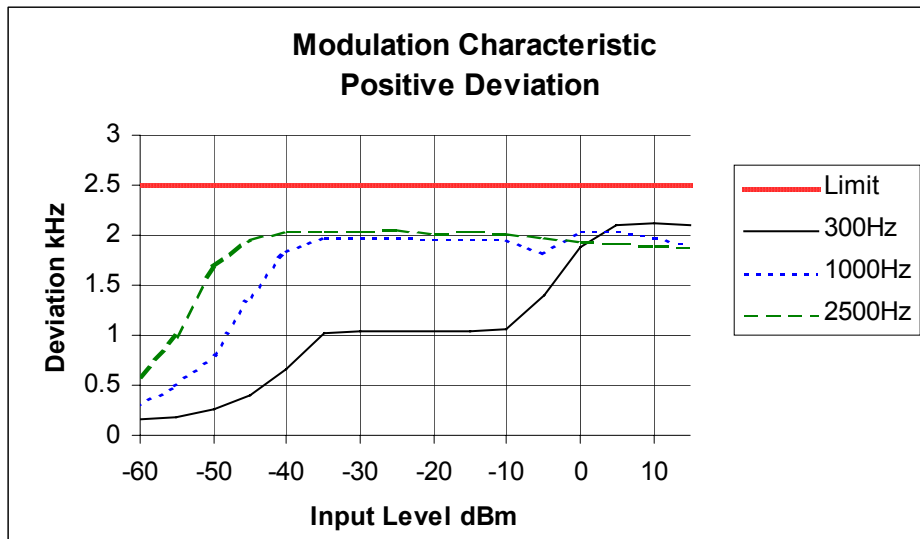
1. Refer Appendix A for Equipment set up.
2. The modulation response was measured at three audio frequencies while varying the input level.
3. Measurements were made for both Positive and Negative Deviation.

MEASUREMENT RESULTS:

Refer measurement plots below.

LIMIT CLAUSE: TIA/EIA-603B 1.3.4.4

Tx FREQUENCY: 904.1 MHz 12.5 kHz Channel Spacing



OCCUPIED BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA/EIA-603B 2.2.11

MEASUREMENT PROCEDURE:

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

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

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

MEASUREMENT RESULTS:

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

LIMIT CLAUSE: FCC 47 CFR 90.210

EMISSION MASKS

Emission Mask D	12.5 kHz Channel Spacing	Analogue; FFSK
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DATA SPEED:

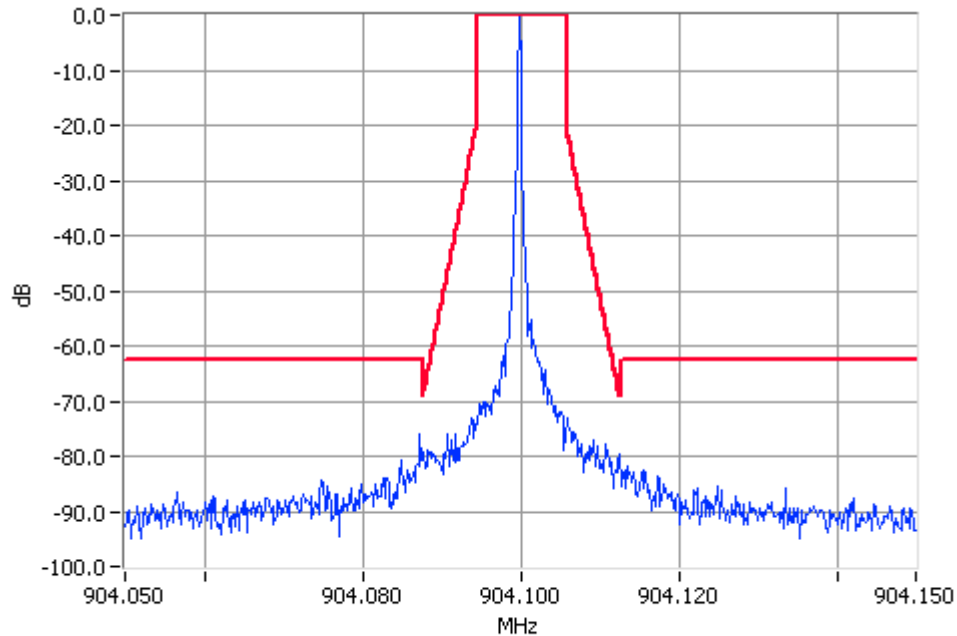
FFSK	1200 bps	12.5 kHz Channel Spacing
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OCCUPIED BANDWIDTH

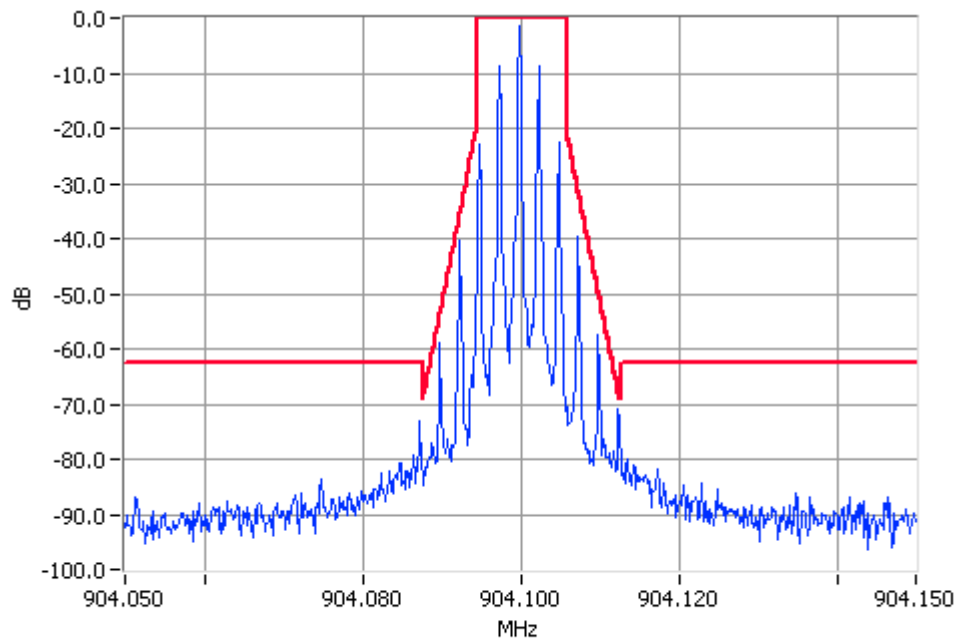
ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 904.1 MHz 15 W 12.5 kHz Channel Spacing



Unmodulated 904.1000MHz Mask D 15W Pass
RBW=100Hz VBW=1000Hz



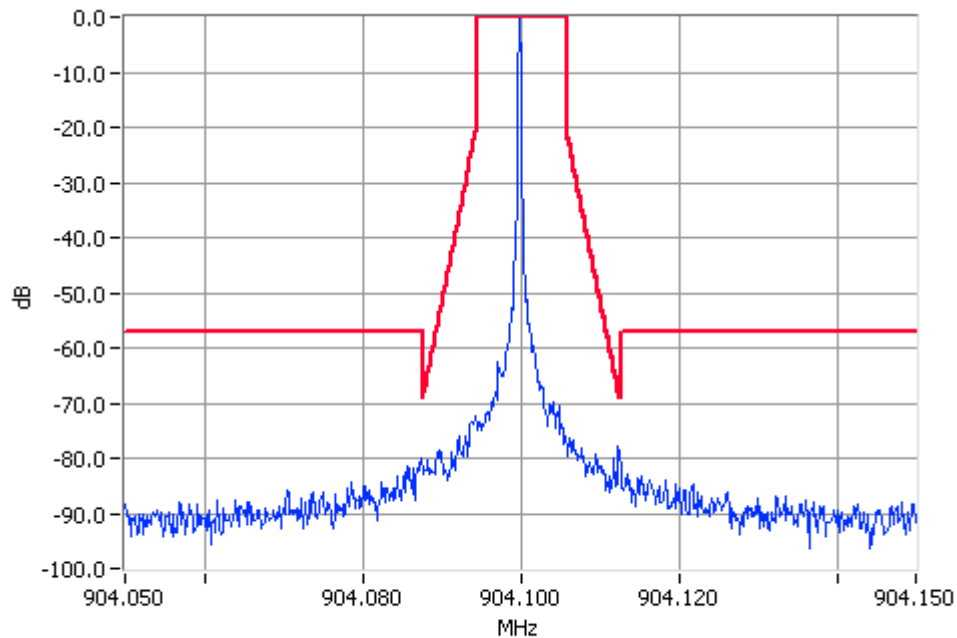
Analogue Modulation 904.1000MHz Mask D 15W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

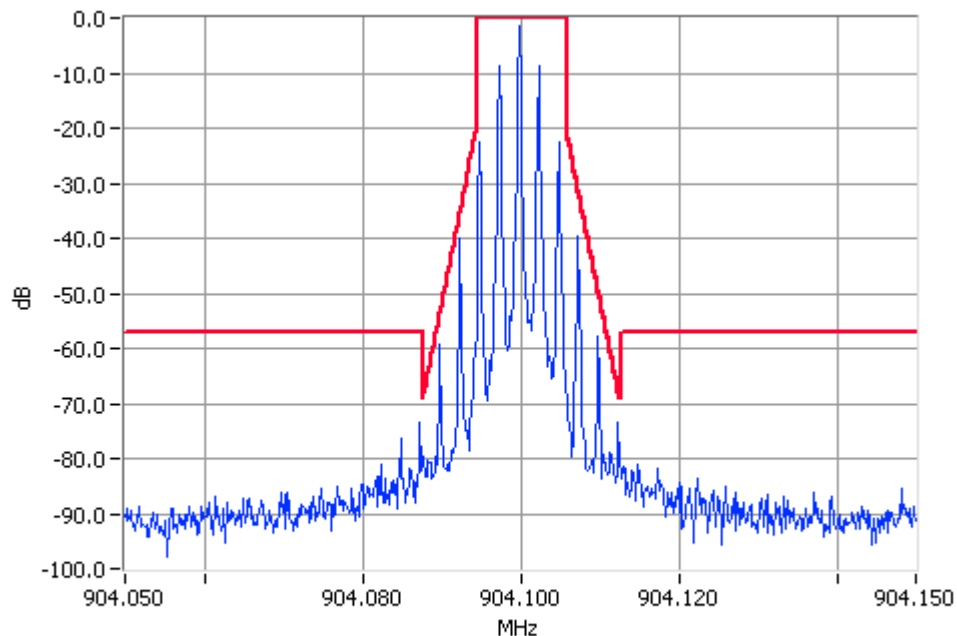
ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 904.1 MHz 5 W 12.5 kHz Channel Spacing



Unmodulated 904.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz



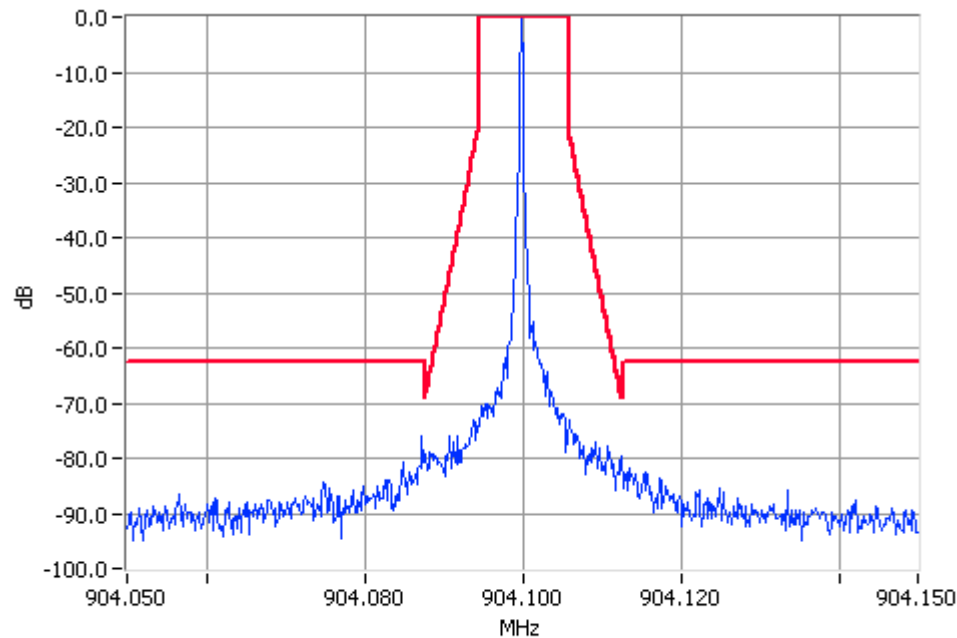
Analogue Modulation 904.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

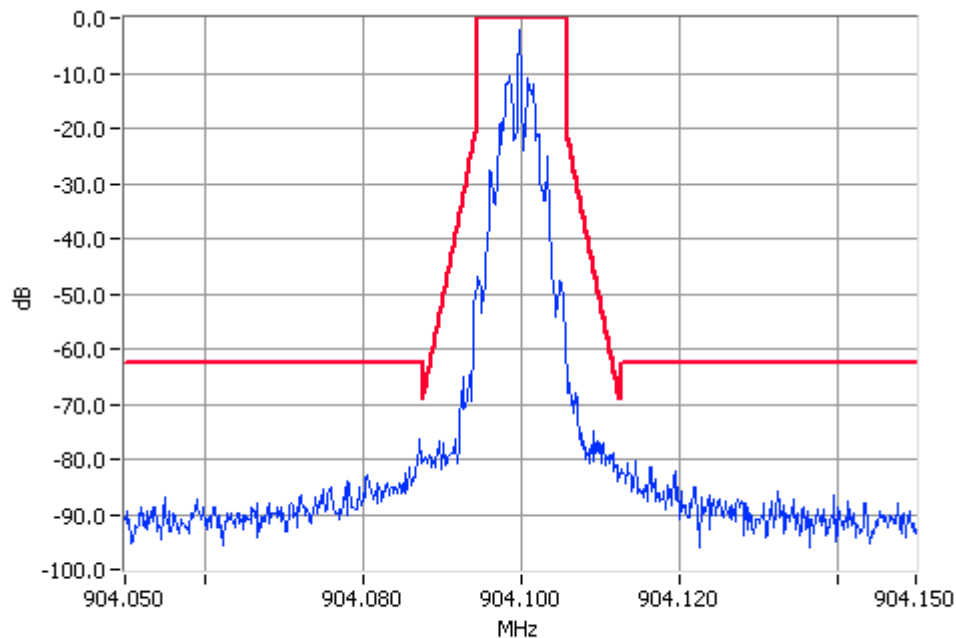
FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 904.1 MHz 15 W 12.5 kHz Channel Spacing



Unmodulated 904.1000MHz Mask D 15W Pass
RBW=100Hz VBW=1000Hz



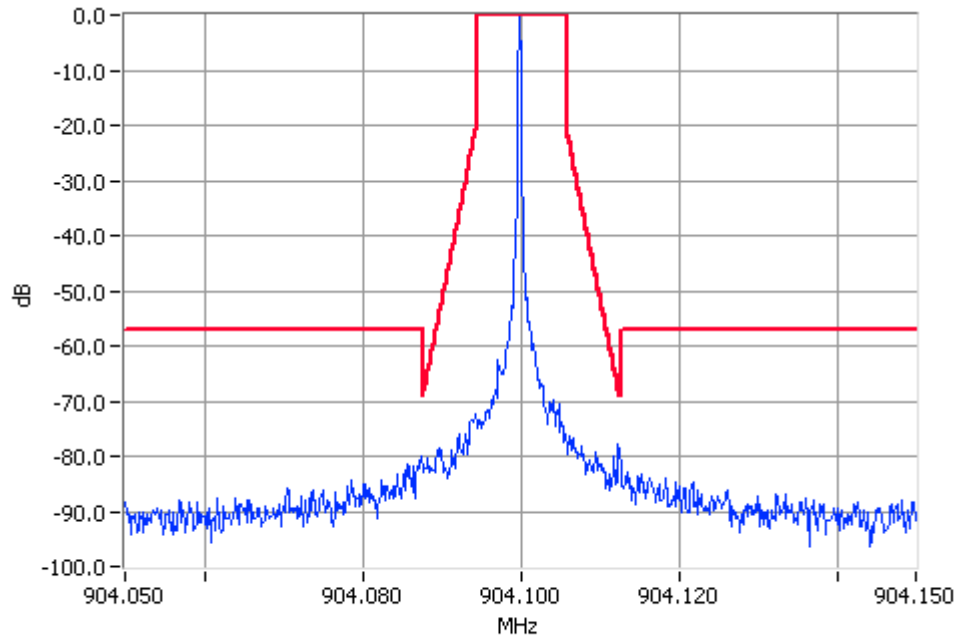
Digital Modulation 904.1000MHz Mask D 15W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

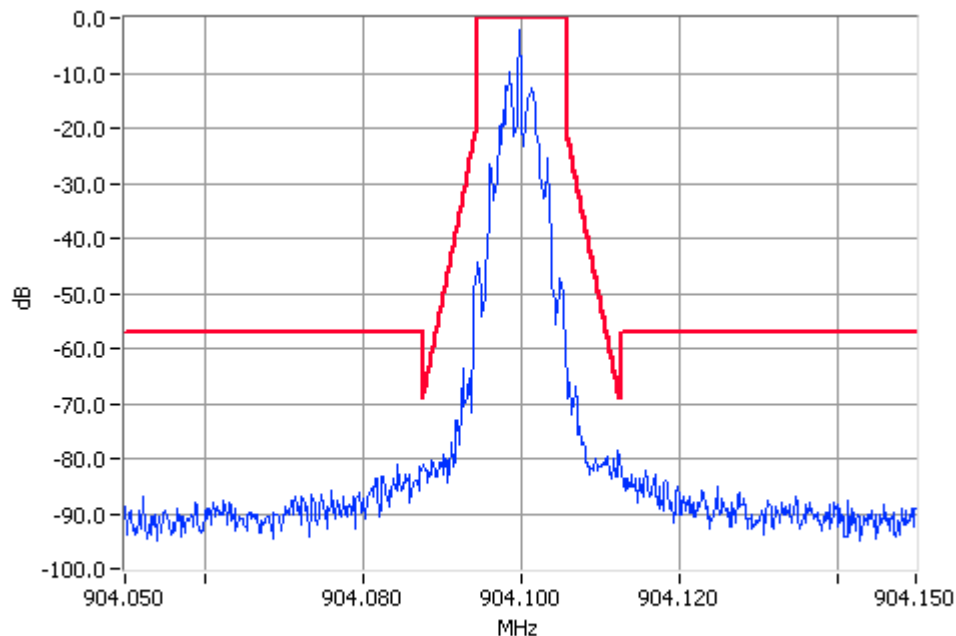
FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 904.1 MHz 5 W 12.5 kHz Channel Spacing



Unmodulated 904.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz



Digital Modulation 904.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz

TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

GUIDE: TIA/EIA-603B 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Appendix 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:

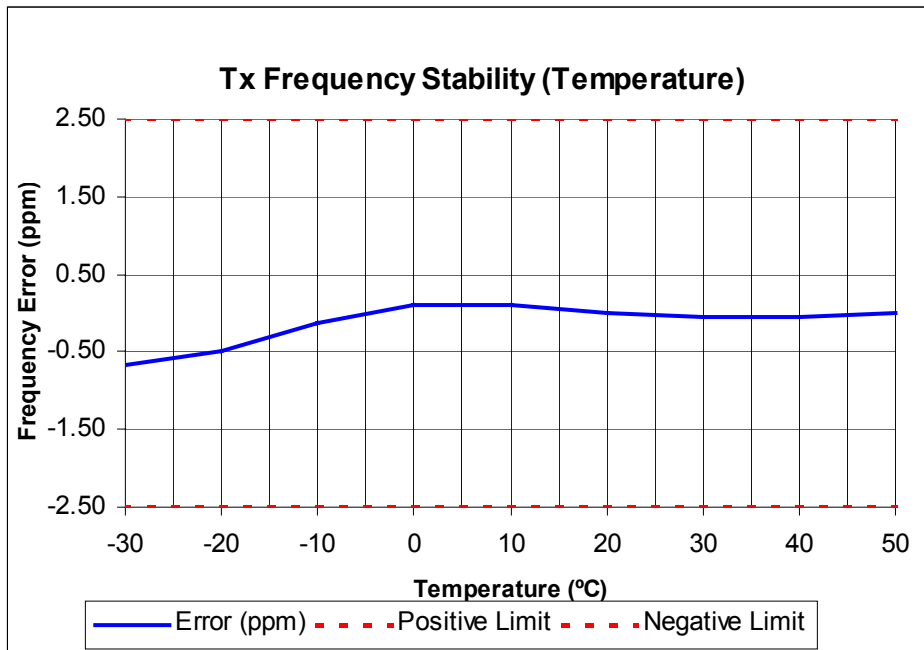
Refer measurement plots below.

LIMIT CLAUSE: FCC 47 CFR 90.213

Frequency Range: 902 MHz ~ 928 MHz

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	2.5

Tx FREQUENCY: 904.1 MHz 15 W 12.5 kHz channel Spacing



TRANSMITTER FREQUENCY STABILITY (VOLTAGE)

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

GUIDE: TIA/EIA-603B 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Appendix 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: 902 MHz ~ 928 MHz

Channel Spacing (kHz)	FREQUENCY ERROR (ppm) @ 904.1 MHz		
	11.7 V DC	13.8 V DC	15.9 V DC
12.5	-0.10	-0.08	-0.10

LIMIT CLAUSE: FCC 47 CFR 90.213

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	2.5

TEST EQUIPMENT USED

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
1	Signal Generator	Hewlett Packard	HP8642B (Opt 001)	2512A00176	E3064	15-Nov-05
11	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	11-Sep-05
13	Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	15-Sep-05
14	Power Head	Hewlett Packard	HP11722A	2320A00688	E3307	08-Nov-05
86	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25003/4A	E3690	13-Aug-05
87	Audio Analyser	Hewlett Packard	HP8903B	2818A04275	E3710	12-Nov-05
111	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	06-Nov-05
114	Signal Generator	Rohde & Schwarz	SML03 1090.3000.13	100597	E4050	08-Nov-05
115	Environ. Chamber	Contherm	5400 RHSLT.M	1416	E4051	04-Mar-05

APPENDIX A

TEST SETUP DETAILS

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

