

# LABORATORY TEST REPORT

## RADIO PERFORMANCE MEASUREMENTS

for the

TBA9B1 Base Station Transceiver

Tested in accordance with:

FCC 47 CFR Parts 22, 74 & 90

Report Revision: 1  
Issue Date: 4 July 2017

PREPARED BY: M. C. James

  
Laboratory Technical Manager  
Authorised IANZ Signatory



OATS FCC LISTING REGISTRATION: 837095

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

This document must not be reproduced except in full, without the written permission of the Compliance Laboratory Manager

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

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

## TABLE OF CONTENTS

REVISION.....	3
INTRODUCTION .....	4
STATEMENT OF COMPLIANCE.....	6
MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS	7
TEST RESULTS .....	8
TRANSMITTER OCCUPIED BANDWIDTH AND SPECTRUM MASKS .....	8
ANNEX A – TEST SETUP DETAILS .....	15
ANNEX B – MODEM INSTRUCTIONS.....	16

## REVISION

<b>Date</b>	<b>Revision</b>	<b>Comments</b>
4 July 2017	1	Initial test report

## INTRODUCTION

Type approval testing of the TBA9B1, 100 Watt, Base Station transceiver in order to demonstrate compliance with FCC 47 Parts 22, 74 & 90,  
This Class-2 Permissive Change report adds 11000bps 4FSK to the list of modulations supported using an IQ2248I modem supplied by Radio Mobile INC.

The original test report is TARF 2684.

This report 3837 adds 4FSK modulation to frequencies covered by the TBA40B3 reciter (148MHz to 174MHz).

### REPORT PREPARED FOR

Tait Ltd  
245 Wooldridge Road  
Harewood  
Christchurch 8051  
New Zealand

### DESCRIPTION OF SAMPLE

Radio  
Manufacturer: Tait Limited  
Equipment: Base Station Transceiver  
Type: TBA9B1  
Frequency range: 148 → 174 MHz  
Transmit Power: 100W

Modem  
Manufacturer: Radio Mobile Inc.  
Equipment: Data modem  
Type: IQ2248 Modem

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
4FSK	Four Level Frequency Shift Keying	12.5 kHz	~	5500	11000

### HARDWARE & SOFTWARE –

Quantity: 1 of each  
Radio

Description	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter 148-174MHz	TBA40B3-0K0	18241226	03.30	00.05
Power Amplifier	T01-01136-CBAA	18218549	03.14	01.00
PMU	TBA30A0-0100	18070626	03.16	00.03

### Modem

Description	Product Code	Serial Number	Firmware Version	Hardware Version
Modem	IQ2248	-	11/04/14 17:46	-

#### TEST CONDITIONS

All testing was performed on 3 July 2017, and under the following conditions:

Ambient temperature: 15°C → 30°C

Relative Humidity: 20% → 75%

Standard Test Voltage 120 V<sub>AC</sub>

#### TEST PATTERNS

4FSK tests were performed using a pseudo-random sequence.

## STATEMENT OF COMPLIANCE

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

Equipment: Base Station Transceiver  
Type: TBA9B1  
With reciter: TBA40B3 (148 to 174 MHz)  
With modem: IQ2248  
Quantity: 1 of each

Consisting Of:

### HARDWARE & SOFTWARE

Description	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter 148-174MHz	TBA40B3-0K0	18241226	03.30	00.05
Power Amplifier	T01-01136-CBAA	18218549	03.14	01.00
PMU	TBA30A0-0100	18070626	03.16	00.03
Modem	IQ2248	-	11/04/14 17:46	-

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

FCC 47 CFR Parts 22, 74 & 90

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



M. C. James  
Laboratory Technical Manager

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

5 July 2017

## MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

MODULATION TYPES:  
F1D 4FSK 11000bps

### EMISSION DESIGNATORS:

Channel Spacing 12.5 kHz	
4FSK digital data	6K50F1D

### CALCULATIONS

99% bandwidth  
= 6.5 kHz

Emission Designator  
**6K50F1D**  
F1D represents an digital FM data transmission

## TEST RESULTS

### TRANSMITTER OCCUPIED BANDWIDTH AND SPECTRUM MASKS

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA/EIA-603E 2.2.11 (Analog)  
TIA-102.CAAA-E 2.2.5 (Digital)

#### MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.  
For Data measurements: The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
2. 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 spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210

#### EMISSION MASKS

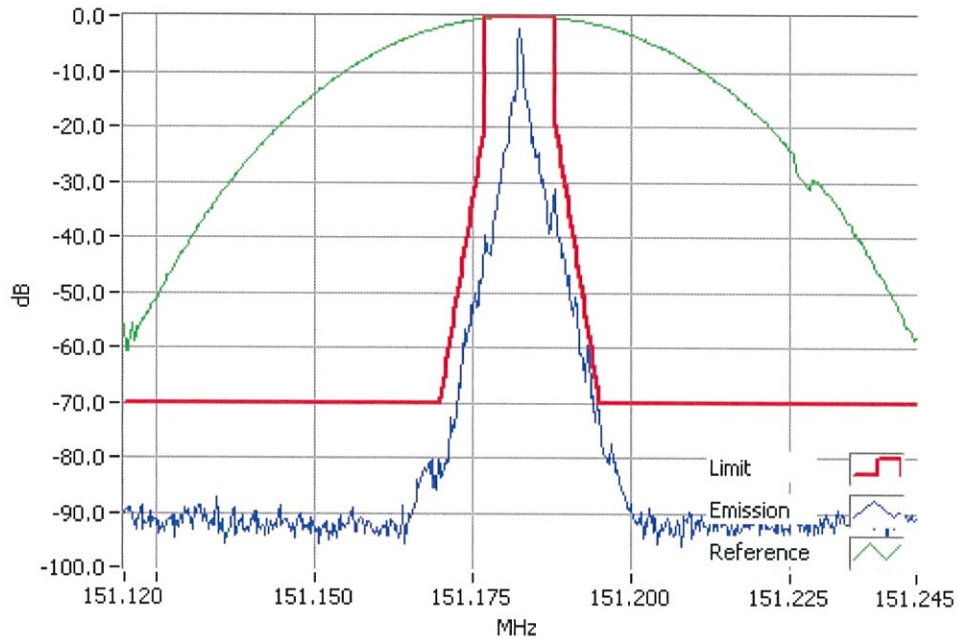
Emission Mask D      12.5 kHz Channel Spacing      4FSK 11000bps



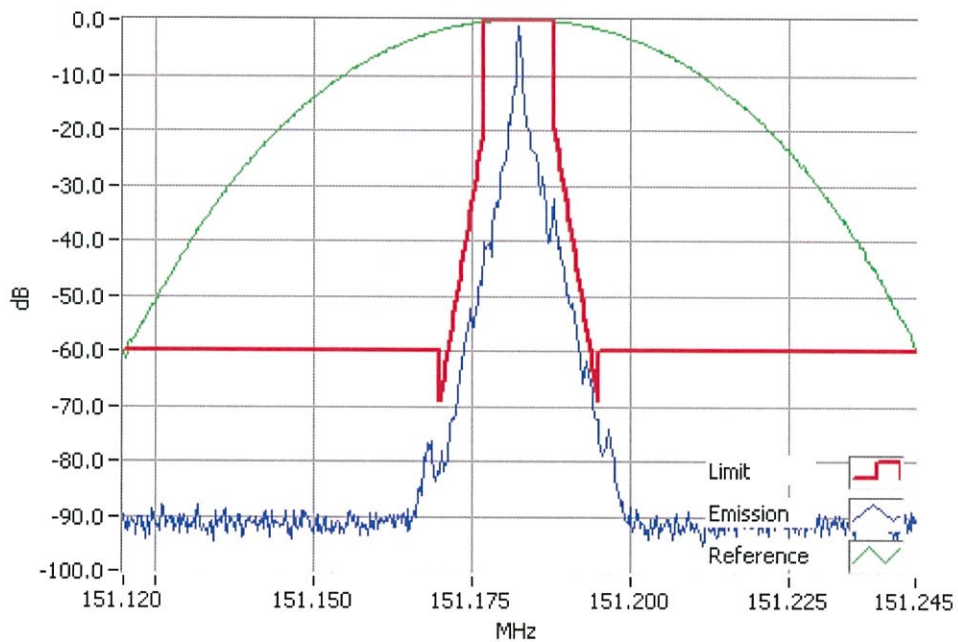
### Occupied Bandwidth and Spectrum Masks

SPECIFICATION: FCC CFR 2.1049 (c) Mask- D

Tx FREQUENCY: 151.1825 MHz      100W & 10W      12.5 kHz Channel Spacing



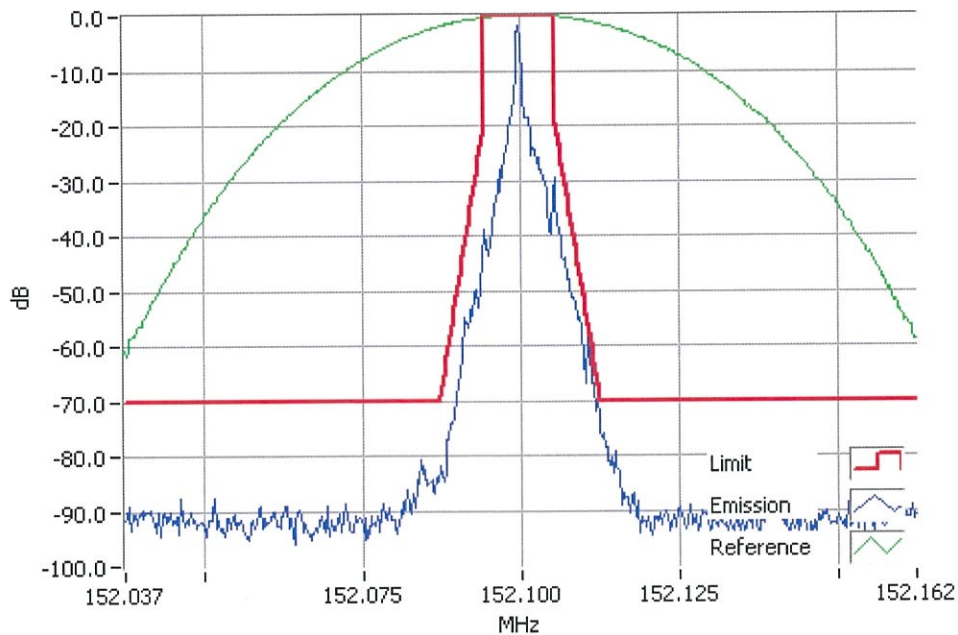
**4FSK 151.1825MHz Mask D 100W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



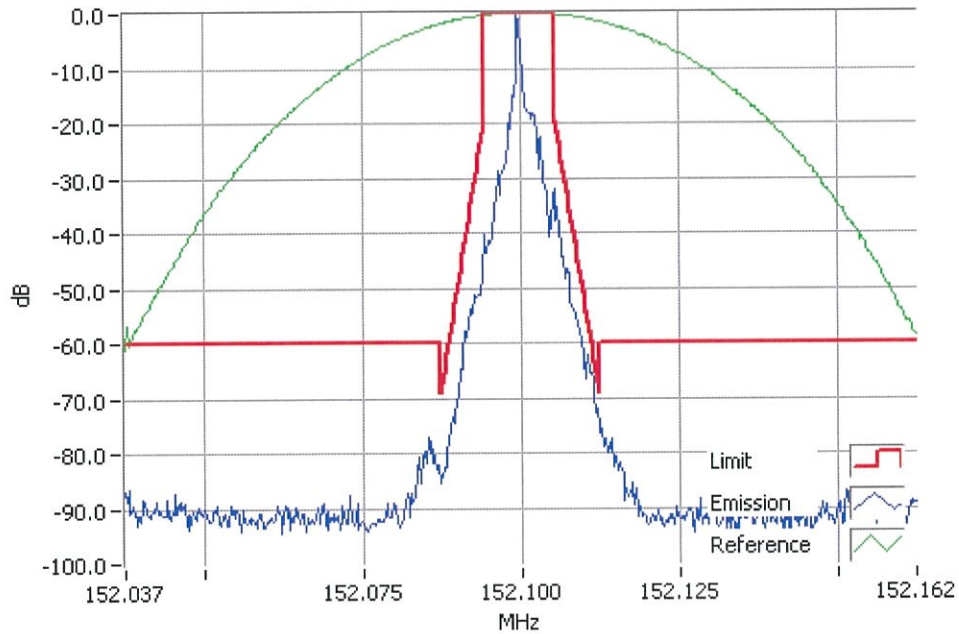
**4FSK 151.1825MHz Mask D 10W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

### Occupied Bandwidth and Spectrum Masks

Tx FREQUENCY: 152.1 MHz      100W & 10W      12.5 kHz Channel Spacing



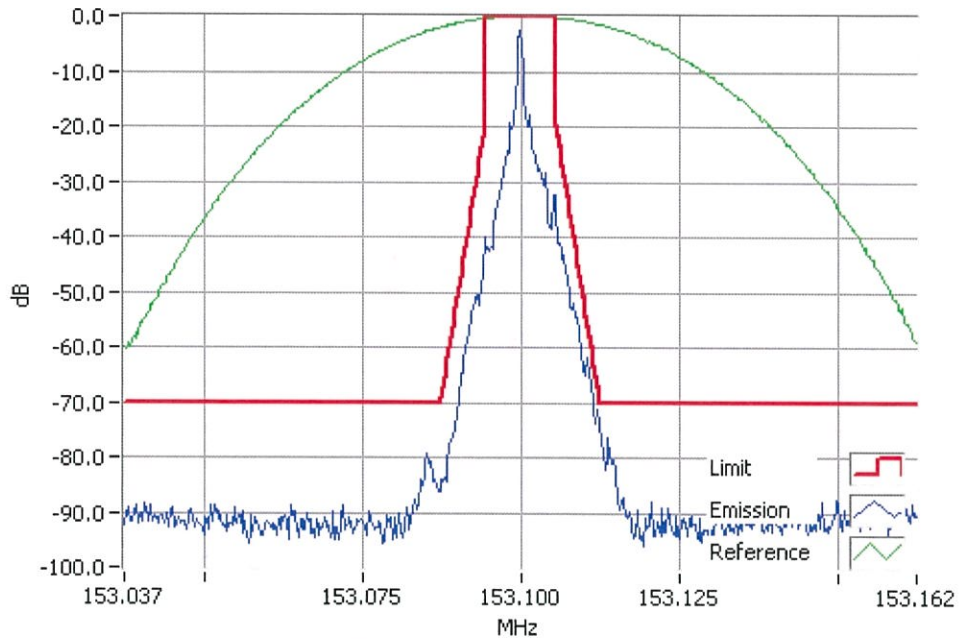
**4FSK 152.1000MHz Mask D 100W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



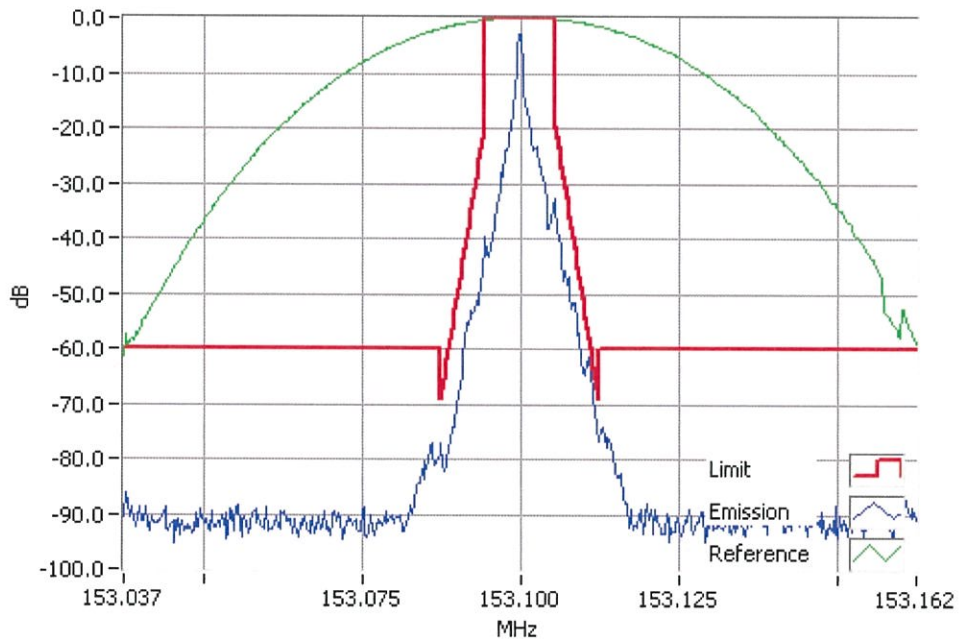
**4FSK 152.1000MHz Mask D 10W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

### Occupied Bandwidth and Spectrum Masks

Tx FREQUENCY: 153.1 MHz 100W & 10W 12.5 kHz Channel Spacing



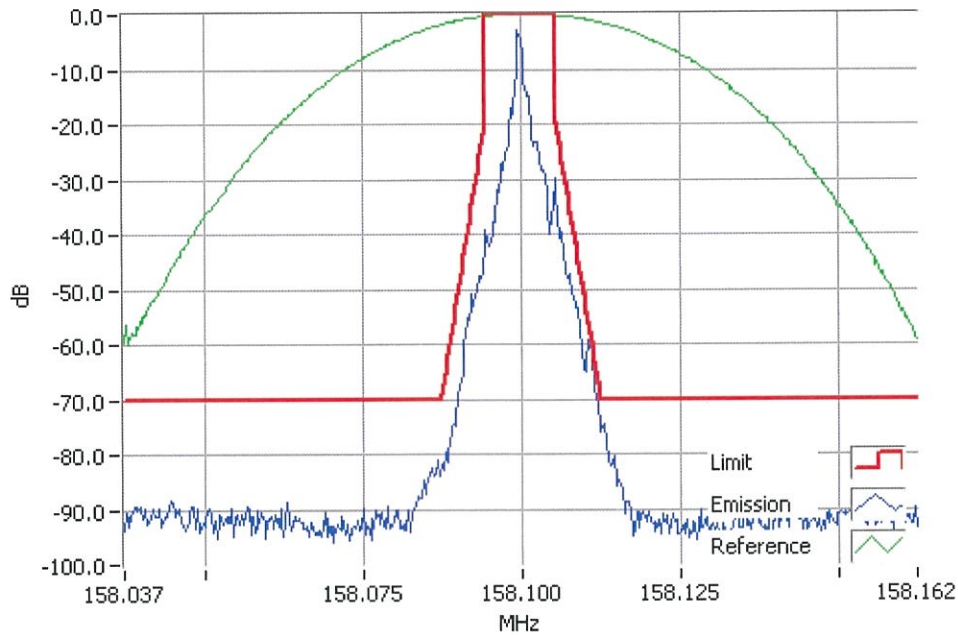
**4FSK 153.1000MHz Mask D 100W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



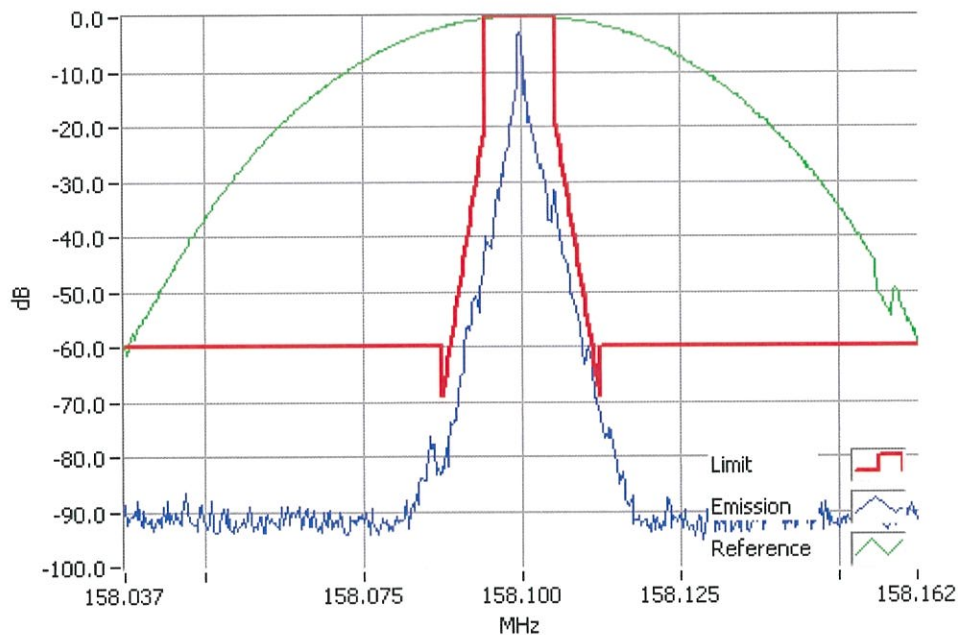
**4FSK 153.1000MHz Mask D 10W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

### Occupied Bandwidth and Spectrum Masks

SPECIFICATION: FCC CFR 2.1049 (c)  
Tx FREQUENCY: 158.1 MHz      100W & 10W      12.5 kHz Channel Spacing



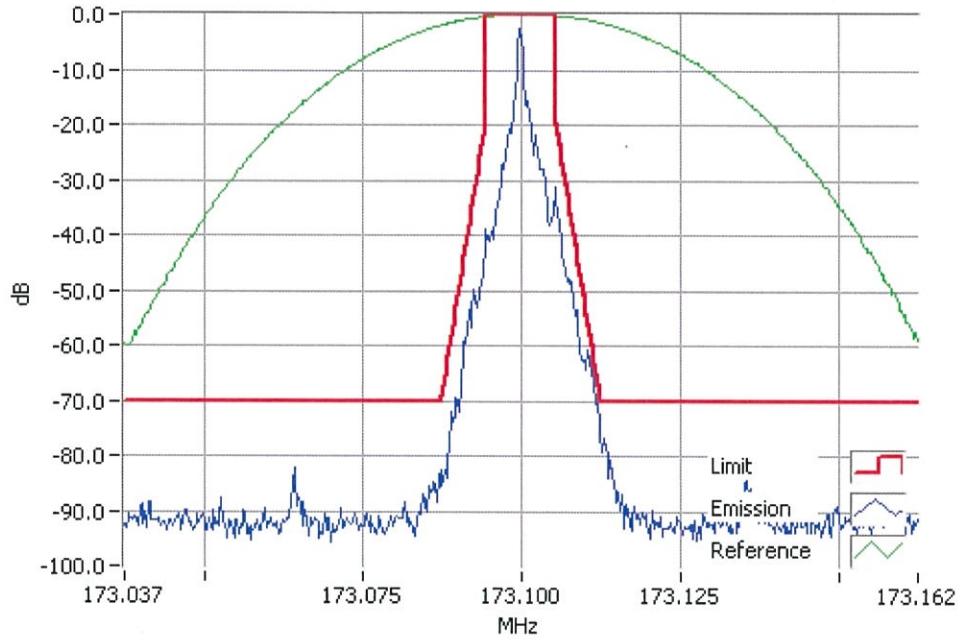
**4FSK 158.1000MHz Mask D 100W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



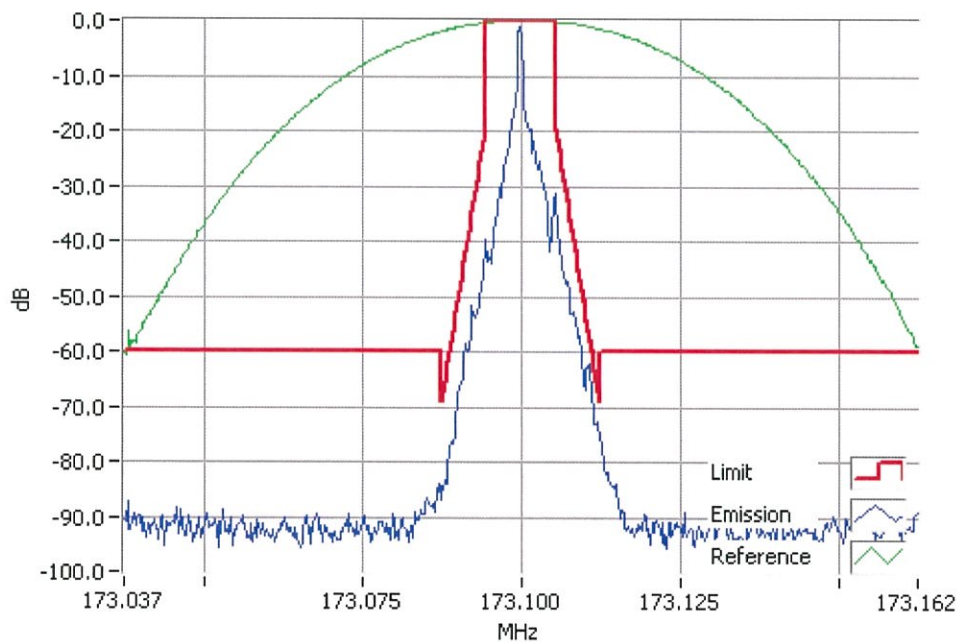
**4FSK 158.1000MHz Mask D 10W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

### Occupied Bandwidth and Spectrum Masks

Tx FREQUENCY: 173.1 MHz 100W & 10W 12.5 kHz Channel Spacing



**4FSK 173.1000MHz Mask D 100W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass



**4FSK 173.1000MHz Mask D 10W**  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass

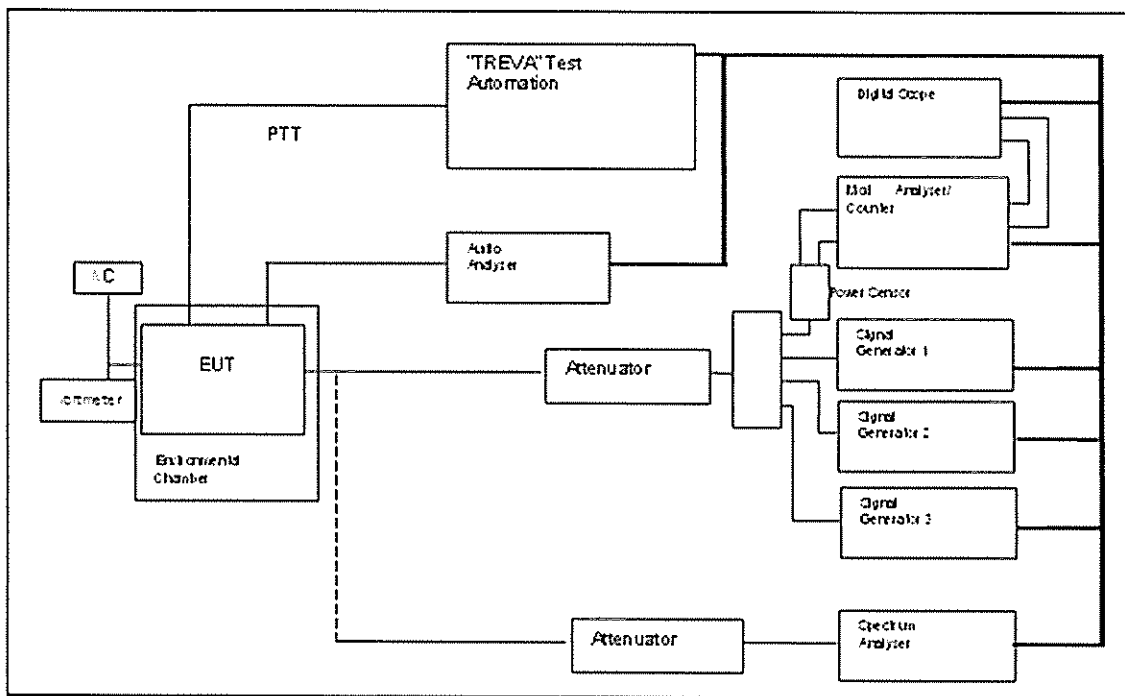
TEST EQUIPMENT LIST

Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
AC Voltmeter		Tait		1		7-Mar-18
Audio Analyser	TREVA1	Hewlett Packard	HP8903A	2437A04625	E4986	13-Oct-17
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack7	E5004	6-Dec-17
Modulation Analyser	TREVA1	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	14-Oct-17
Power Meter	TREVA1 Power Head for HP8901	Hewlett Packard	HP11722A	3111A05573	E7054	13-Oct-17
Power Supply	TREVA1	Hewlett Packard	HP6032A	2441A00412	E3075	13-Oct-17
RF Attenuator	TREVA1 3dB	Weinschel	Model 1	BL9958	E4081	30-Nov-17
RF Attenuator	TREVA 1 20dB 150W	Weinschel	40-20-23	MF817	E4082	28-Nov-17
RF Combiner	TREVA1	Minicircuits	ZFSC-4-1	-	E4083	
Signal Generator	TREVA1 Analog 3.2GHz	Agilent	E8663D	MY50420224	E4908	20-Oct-18
Spectrum Analyser	26.5GHz	Agilent	PXA N9030A	MY49432161	E4907	18-Oct-18
Testware	Sideband Spectrum		August 2015	-	-	

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

## ANNEX A – TEST SETUP DETAILS

All 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.

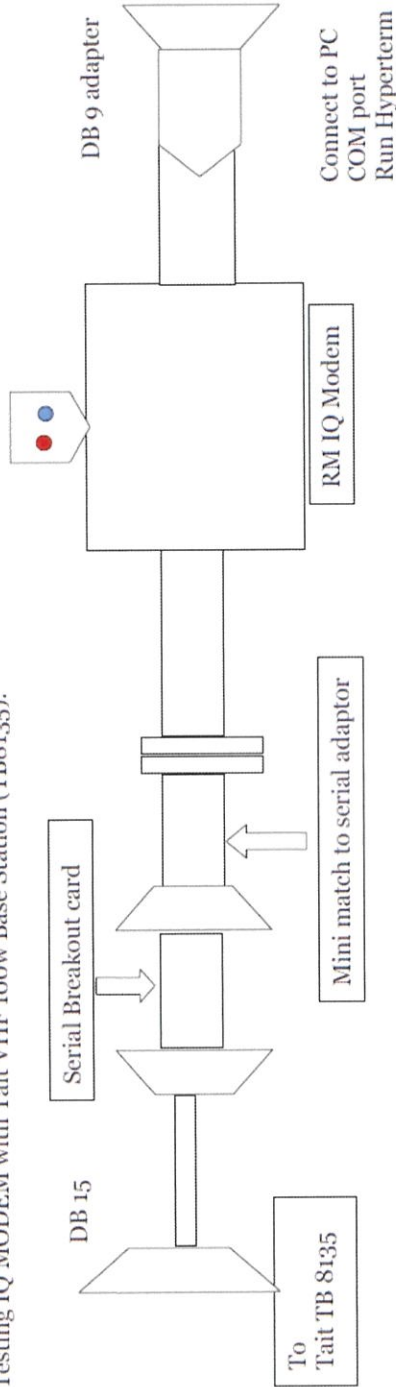


## ANNEX B – MODEM INSTRUCTIONS

8801 Kenamar Dr ■ San Diego CA 92126  
Ph: 858 530 1060 ■ Fax: 858 530 1063  
Web: www.radiomobile.com

**RadioMobile**  
Hardware – Software – Networking

Testing IQ MODEM with Tait VHF 100w Base Station (TB8135).



Connect devices as shown.

1. Power up TB8135 base station for test. Use program emailed for Mobile configuration.
2. Connect the DB15 to the Base Stations Interface connector on the Reciter.
3. Connect the DB9 to a PC's Com port and run Hyperterm. The Baud rate is 115Kb, no hardware control. 8bits, N parity
4. With TB8135 powered, modem should also power and a Green LED should begin to blink at 1 second rate.
5. ON the PC keyboard, press the "." (period) a list of options should appear on the screen. If not recheck all connections and Hyperterm setup. If a USB to Serial adapter is used in many cases it is the problem.
6. Select #2. Personality; and validate modem type is TX BASE and 11kb. If you change make sure you select "F" to save the configuration. Press ESC then the "." And you are back to Main screen.
7. Select #1 option. Then check Item 2 for value of 2Z. Press ENTER. This is the gain set value for Deviation. (2 khz). If you change you must SAVE. "c".
8. Press #8 twice to switch audio type to *random*. That is the 11kb signal, with Random data.
9. Press #9 to cause the mobile to transmit this signal. It will last about 5 seconds, then release, press 9 again or press it several times to have it continue for 5 seconds times number of presses on the 9 key.
10. Note Base will continue to stay in Transmit, (key release is not high enough), disconnect serial connectors to dekey base.

Jim Moore, 858 530- 1064, jmoore@radiomobile.com