LABORATORY TEST REPORT

RADIO PERFORMANCE MEASUREMENTS

for the

TPDB1B Handportable 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:	6 September 2018	
PREPARED BY:	L. M. White	*signature*
		Test Technician
CHECKED & APPROVED BY:	M. C. James	*signature*
		Laboratory Technical Manager

FCC REGISTRATION: 838288
IC LISTING REGISTRATION: SITE# 737A-1

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REVISION

Date	Revision	Comments
6 September 2018	1	Initial test report

INTRODUCTION

This report is to prove continued compliance of the TPDB1B 136 MHz to 174 MHz handportable transceiver after component changes in the transmitter sub-system (exiter IC), digital sub-system (FPGA and memory devices) and the receiver sub-system (front end LNA) due to component obsolescence. The transceiver is capable of analogue, FFSK, P25 phase 1, P25 phase 2 and DMR modulations

REPORT PREPARED FOR

Tait International Ltd
245 Wooldridge Road
Harewood
Christchurch 8051
New Zealand

DESCRIPTION OF SAMPLE

Manufacturer	Tait International Limited
Equipment:	Handportable Transceiver
Type:	TPDB1B
Product Code:	T03-22412-BBDY
Serial Number(s):	26054500
Frequency range	136 → 174 MHz
Transmit Power	5 W

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
Analogue FM		12.5 kHz	1	-	-
FFSK	Fast Frequency Shift Keying	12.5 kHz	-	1200	1200
		12.5 kHz	-	2400	2400
Digital Mobile Radio (DMR)	4 Level FSK (2 slot TDMA) (ETSI TS102 361-1)	12.5 kHz	2	4800	9600
APCO P25 Phase 1	C4FM (TIA 102)	12.5 kHz	1	4800	9600
APCO P25 Phase 2	H-CPM (2 slot TDMA) (TIA 102)	12.5 kHz	2	6000	12000

HARDWARE & SOFTWARE
Quantity: 1
DMR / Analogue

Type	Code and Version
Hardware ID	TPDB5X-B102_0001
Boot Code	QPD5B_S00_3.05.11.0001
DSP	QPD5A_E00_2.18.04.0059
Radio Application	QPD5F_E00_2.18.04.0059
Firmware Package	QI93P_E00_2.18.04.0059
FPGA Image	QPD5G_S00_1.12.13.0001

P25 Phase I & II

Type	Code and Version
Hardware ID	TPDB5X-B102_0001
Boot Code	QPD5B_S00_3.05.11.0001
DSP	QPD5A_A02_2.12.11.0061
Radio Application	QPD5F_A00_2.12.11.0061
Firmware Package	QI94P_A02_2.12.11.0061
FPGA Image	QPD5G_S00_1.12.13.0001

TEST CONDITIONS
All testing was performed between 5 → 6 September 2018, under the following conditions:
Ambient temperature: $15^{o}C$ → $30^{o}C$
Relative Humidity: 20% → 75%
Standard Test Voltage   7.5 V_{DC}

STATEMENT OF COMPLIANCE

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

Equipment: Handportable Transceiver
Type: TPDB1B
Product Code: T03-22412-BBDY
Serial Number(s):   26054500
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

Signature: _____

M. C. James
Laboratory Technical Manager

Date: 17 September 2018

MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

MODULATION TYPES:

F3E	Analogue Frequency Modulation (FM)	
F2D	FFSK	1200 bps and 2400 bps
FXW	DMR Digital Voice	9600 bps
FXD	DMR Digital Data	9600 bps
F1E	P25 phase 1 Digital Voice	9600 bps
F1D	P25 phase 1 Digital Data	9600 bps
F1W	P25 phase 2 Digital Voice / Data	12000 bps

CHANNEL SPACINGS: 12.5 kHz

EMISSION DESIGNATORS:

	12.5 kHz
Analog FM	11K0F3E
FFSK Data 1200 bps	6K60F2D
FFSK Data 2400 bps	7K80F2D
Digital Voice DMR	7K60FXW
Digital Data DMR	7K60FXD
Digital Voice P25 phase 1	8K10F1E
Digital Data P25 phase 1	8K10F1D
Digital Voice P25 phase 2	8K10F1W
Digital Data P25 phase 2	8K10F1W

CALCULATIONS

Equation: $Bn = 2M + 2Dk$

(M is highest modulating frequency; D is peak allowable deviation; k is a constant of 1 for FM)

Analog Voice 12.5 kHz Bandwidth

Necessary bandwidth

M = 3.0 kHz

D = 2.5 kHz

$$Bn = (2 \times 3.0) + (2 \times 2.5) \times 1$$
$$= 11.0 \text{ kHz}$$

Emission Designator

11K0F3E

F3E represents an FM voice transmission

Fast Frequency Shift Keying (FFSK – 1200 bps) 12.5 kHz Bandwidth

Necessary bandwidth

M = 1.8 kHz

D = 1.5 kHz (60% of peak deviation)

$$Bn = (2 \times 1.8) + (2 \times 1.5) \times 1$$
$$= 6.6 \text{ kHz}$$

Emission Designator

6K60F2D

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

Fast Frequency Shift Keying (FFSK – 2400 bps) 12.5 kHz Bandwidth

Necessary bandwidth

M = 2.4 kHz

D = 1.5 kHz (60% of peak deviation)

$$Bn = (2 \times 2.4) + (2 \times 1.5) \times 1$$
$$= 7.8 \text{ kHz}$$

Emission Designator

7K80F2D

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

Emission Designators – Continued

Digital Voice 12.5 kHz Bandwidth DMR

99% bandwidth

= 7.6 kHz

Emission Designator

7K60FXW

FXW represents a FM Time Division Multiple Access (TDMA) combination of data and telephony

Digital Data 12.5 kHz Bandwidth DMR

99% bandwidth

= 7.6 kHz

Emission Designator

7K60FXD

FXD represents FM Time Division Multiple Access (TDMA) data only

Digital Voice 12.5 kHz Bandwidth P25 phase 1

99% bandwidth

= 8.1 kHz

Emission Designator

8K10F1E

F1E represents a digital FM voice transmission

Digital Data 12.5 kHz Bandwidth P25 phase 1

99% bandwidth

= 8.1 kHz

Emission Designator

8K10F1D

F1D represents an digital FM data transmission

Digital Voice 12.5 kHz Bandwidth P25 phase 2

99% bandwidth

= 8.1 kHz

Emission Designator

8K10F1W

F1W represents a single FM telephony channel

Digital Data 12.5 kHz Bandwidth P25 phase 2

99% bandwidth

= 8.1 kHz

Emission Designator

8K10F1W

F1W represents digital FM data transmission

TEST RESULTS

TRANSMITTER OCCUPIED BANDWIDTH AND SPECTRUM MASKS

SPECIFICATION: FCC 47 CFR 2.1049 (c)   RSS-119 5.5

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

MEASUREMENT PROCEDURE:
1. Refer Annex A for Equipment Set up.
2. For analog 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 spacing.

MEASUREMENT UNCERTAINTY 95%   ±0.65dB

LIMIT CLAUSE: FCC 47 CFR 90.210   RSS-119 5.5

EMISSION MASKS
Emission Mask D   12.5 kHz Channel Spacing   Analog, FFSK, Digital Voice/Data

DATA SPEED
Digital Voice/Data   12.5 kHz Channel Spacing   9600 bps
FFSK   12.5 kHz Channel Spacing   1200 bps & 2400 bps

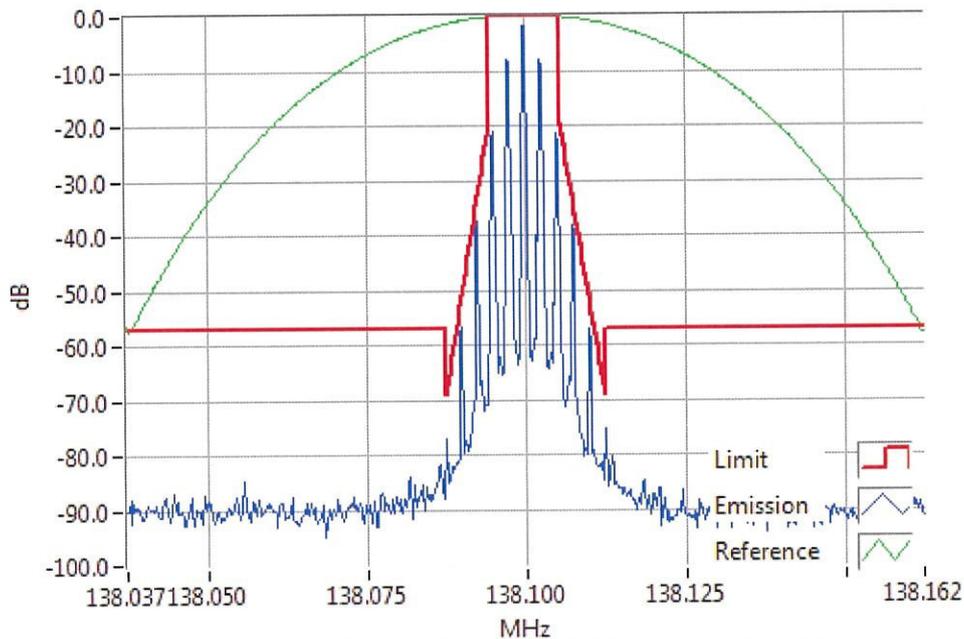## Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

SPECIFICATION: FCC CFR 2.1049 (c)   RSS-119 5.5
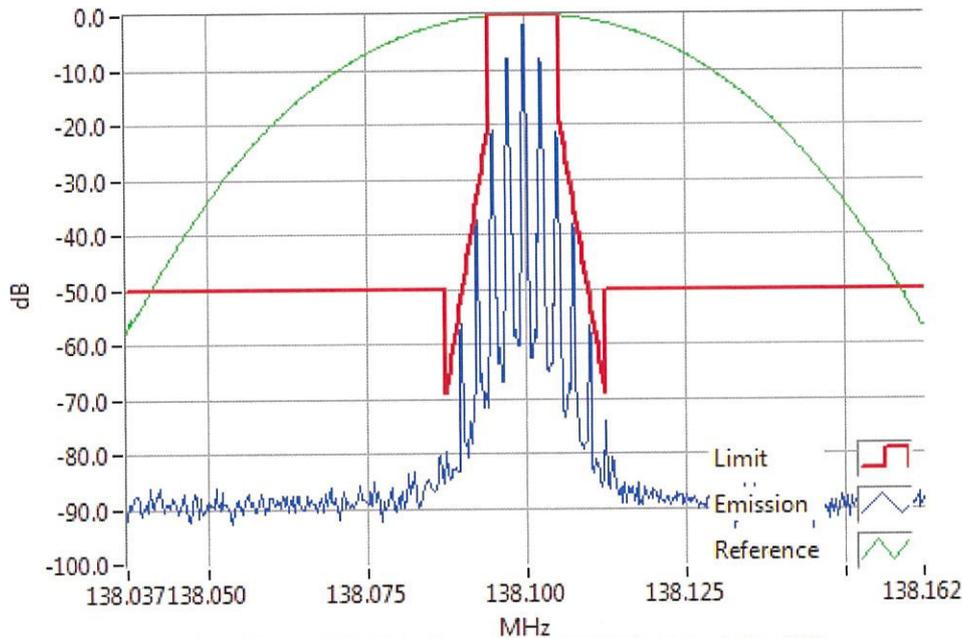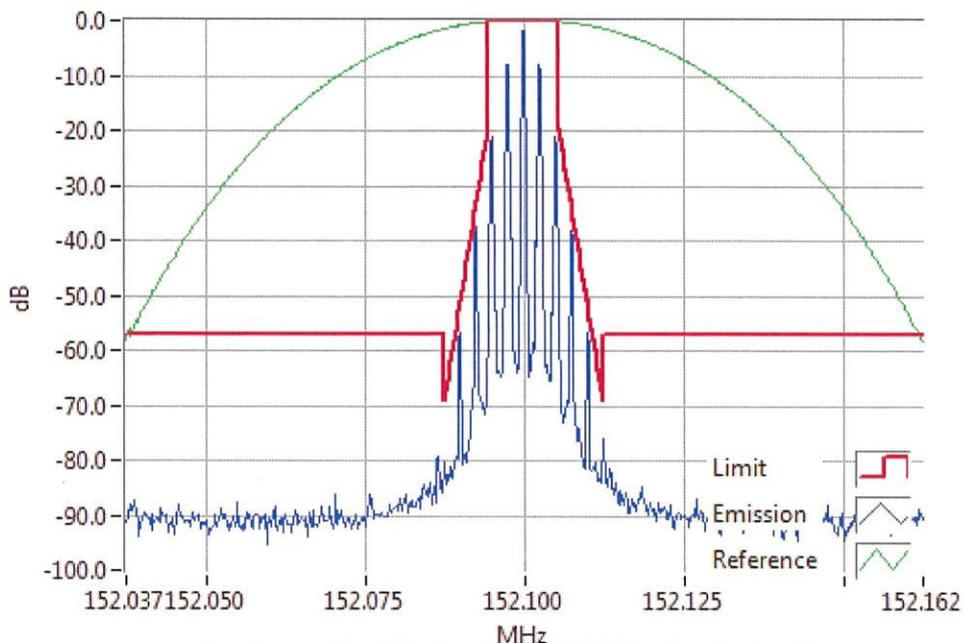
Tx FREQUENCY: 138.1 MHz   5 W   12.5 kHz Channel Spacing

**Analogue Modulation 138.1000MHz Mask D 5W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass**

Tx FREQUENCY: 138.1 MHz   1 W   12.5 kHz Channel Spacing

**Analogue Modulation 138.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass**

Occupied Bandwidth and Spectrum Masks
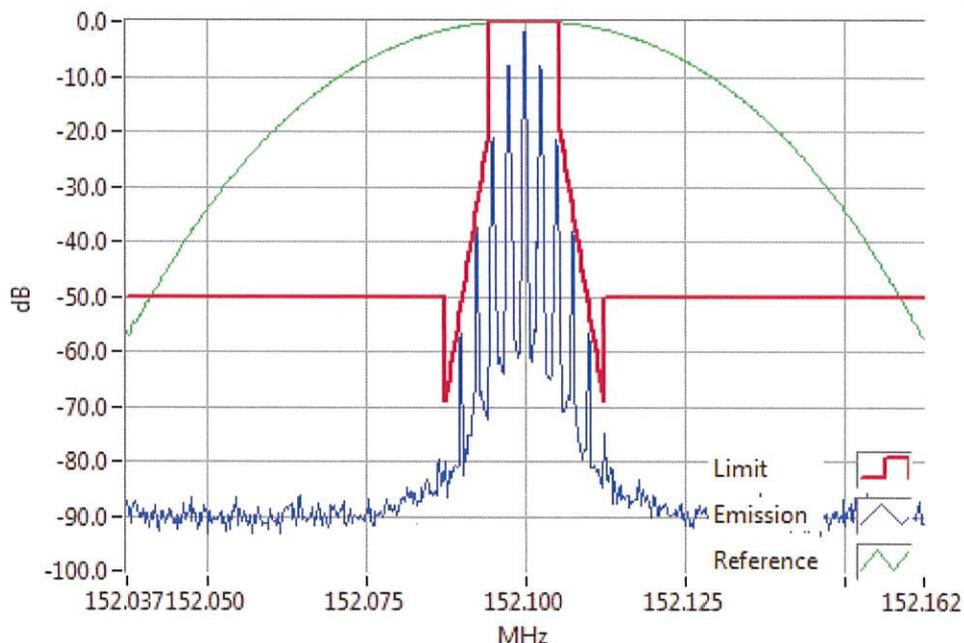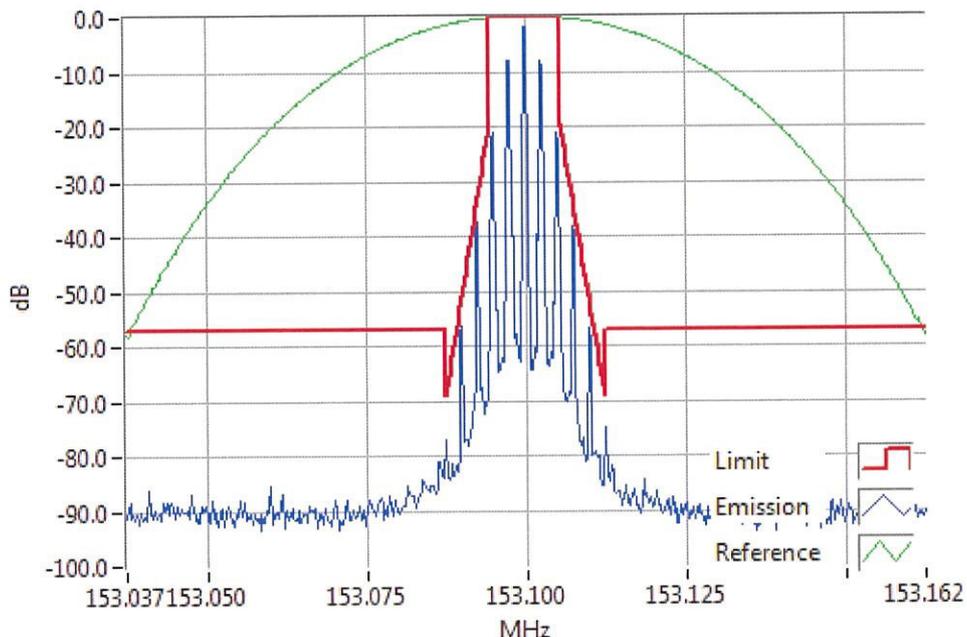
ANALOG VOICE

SPECIFICATION: FCC CFR 2.1049 (c)   RSS-119 5.5
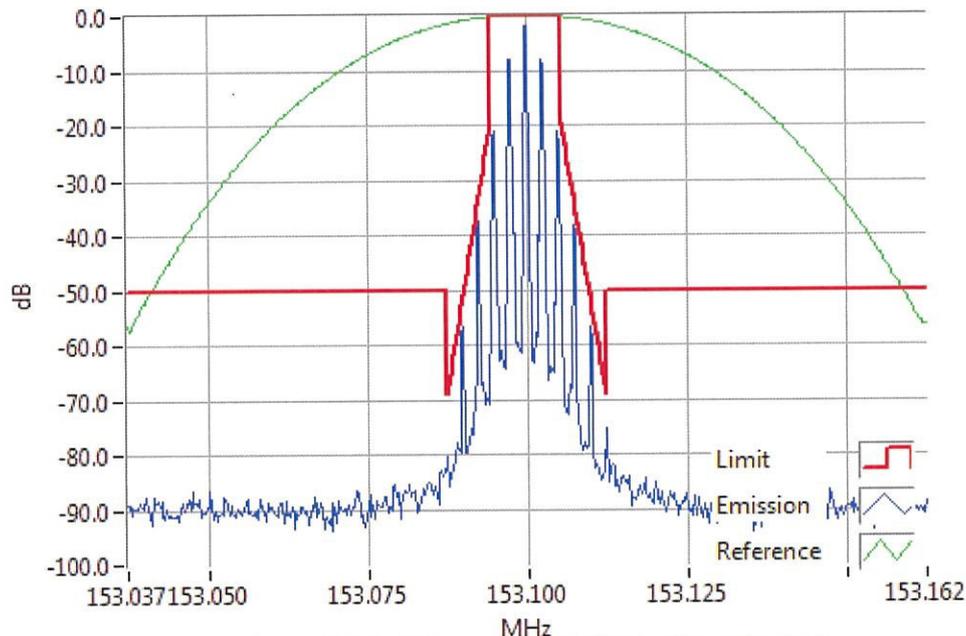
Tx FREQUENCY: 152.1 MHz   5 W   12.5 kHz Channel Spacing

Analogue Modulation 152.1000MHz Mask D 5W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 152.1 MHz   1 W   12.5 kHz Channel Spacing

Analogue Modulation 152.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

## Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

SPECIFICATION: FCC CFR 2.1049 (c)   RSS-119 5.5

Tx FREQUENCY: 153.1 MHz   5 W   12.5 kHz Channel Spacing

Analogue Modulation 153.1000MHz Mask D 5W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 153.1 MHz   1 W   12.5 kHz Channel Spacing

Analogue Modulation 153.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

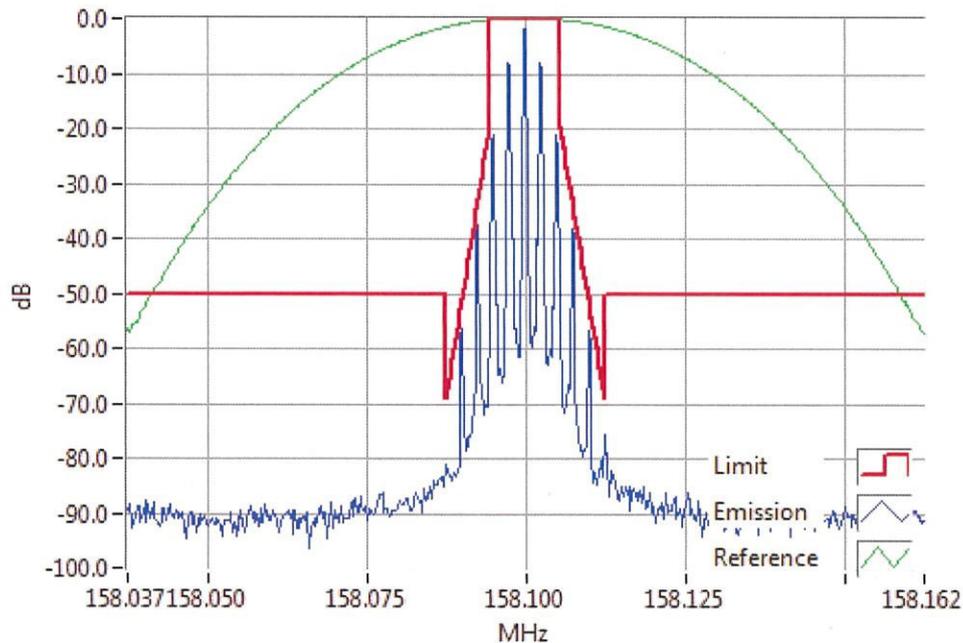SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 158.1 MHz 5 W 12.5 kHz Channel Spacing
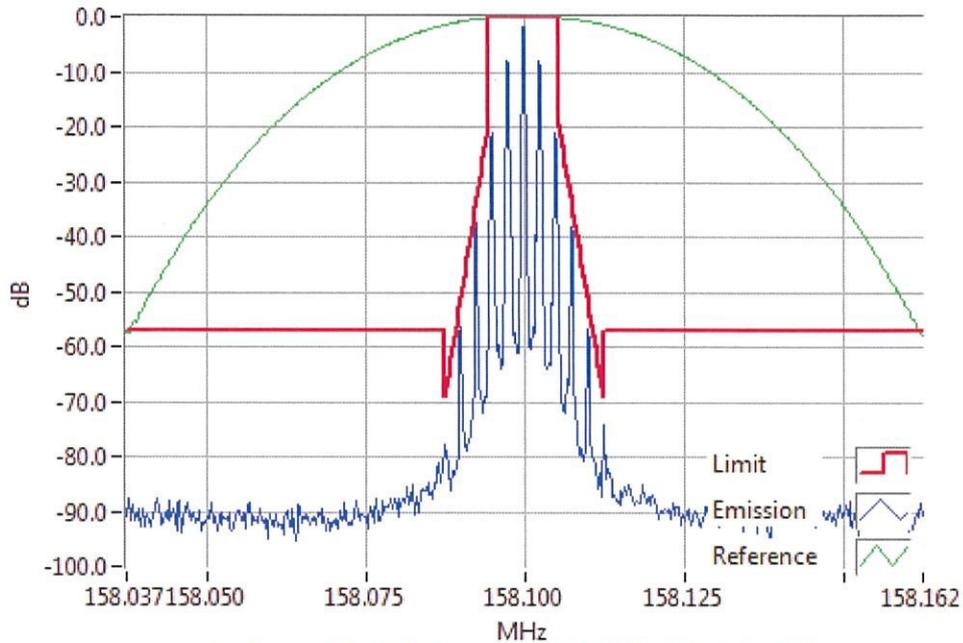
Analogue Modulation 158.1000MHz Mask D 5W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 158.1 MHz 1 W 12.5 kHz Channel Spacing

Analogue Modulation 158.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass