

# LABORATORY TEST REPORT

## RADIO PERFORMANCE MEASUREMENTS

for the

TBDB3F Transportable Base Station 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: 20 January 2020

PREPARED BY: A. Schinkelshoek

  
Test Technician

CHECKED & APPROVED BY: M. C. James

  
Laboratory Technical Manager



**IANZ**  
ACCREDITED LABORATORY

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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## REVISION

Date	Revision	Comments
20 January 2020	1	Initial test report

## INTRODUCTION

Type approval testing of the TBDB3F, 50-Watt, BASE STATION transceiver in order to demonstrate compliance with FCC 47 Parts 22 & 90 when using APCO P25 phase 1 modulation. This radio has previously been tested analogue, FFSK and DMR modulations in Teltest reports 3969 and 3969a.

### REPORT PREPARED FOR

Tait International Ltd  
245 Wooldridge Road  
Harewood  
Christchurch 8051  
New Zealand

### DESCRIPTION OF SAMPLE

Manufacturer Tait International Limited  
Equipment: Transportable Base Station Transceiver  
Type: TBDB3F  
Product Code: TB7304-B330  
Serial Number(s): 18286805  
Frequency range 148 → 174 MHz  
Transmit Power 30 W

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
APCO P25 Phase 1	C4FM (TIA 102)	12.5 kHz	1	4800	9600

### HARDWARE & SOFTWARE

Quantity: 1

Module	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter	T01-01403-DBAA	18286344	p25-3.00.00.0003	01.01
Power Amplifier	T01-01405-BCAA	18286345	< Not applicable >	00.01

### TEST CONDITIONS

All testing was performed on 13 → 14 January 2020, 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 Items	Test Methods	Result
RSS-119 5.3	FCC 47 CFR 90.214	Transmitter Frequency Stability - Temperature	RSS-Gen 6.11 ANSI C63.26 5.6.4	N/T
RSS-119 5.3	FCC 47 CFR 2.1055 (d) (1)	Transmitter Frequency Stability - Voltage	RSS-Gen 6.11 ANSI C63.26 5.6.5	N/T
RSS-119 5.4	FCC 47 CFR 2.1046	Transmitter Output Power (Conducted)	RSS-Gen 6.12 ANSI C63.26 5.2.4.2	N/T
RSS-119 5.5	FCC 47CFR 90.209	Transmitter 99% Emission Bandwidth	RSS-Gen 6.7 ANSI C63.26 5.4.4	Pass
RSS-119 5.5	FCC 47 CFR 2.1049 (c)	Transmitter Occupied Bandwidth and Spectrum Mask	RSS-119 4.2.2 TIA-603-E 2.2.11	Pass
RSS-119 5.8	FCC 47 CFR 2.1051	Transmitter Spurious Emissions (Conducted)	RSS-Gen 6.13 ANSI C63.26 5.7	N/T
RSS-119 5.8	FCC 47 CFR 2.1053	Transmitter Spurious Emissions (Radiated)	RSS-Gen 6.13 ANSI C63.26 5.5	N/T
RSS-119 5.9	FCC 47 CFR 90.214	Transient Frequency Behaviour	TIA 603E 2.2.2	N/T
RSS-Gen 7	FCC 47CFR 15.111	Receiver Spurious Emissions (Conducted)	RSS-Gen 7.4 TIA-603E 2.1.2	N/T

Comments
N/T – Not tested. The radio has already been tested for these parameters. The manufacturer declares that the addition of another constant envelope modulation will have no effect on the previously reported results. See Teltest report 3969.

## 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: TBDB3F  
Product Code: TB7304-B330  
Serial Number(s): 18286805  
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: 26 January 2020

## MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

### MODULATION TYPES:

F1E	P25 phase 1 Digital Voice	9600 bps
F1D	P25 phase 1 Digital Data	9600 bps

CHANNEL SPACING: 12.5 kHz

### EMISSION DESIGNATORS:

	12.5 kHz
Digital Voice P25 phase 1	8K10F1E
Digital Data P25 phase 1	8K10F1D

### CALCULATIONS

Equation:  $B_n = 2M + 2Dk$

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

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

## TEST RESULTS

### TRANSMITTER 99% EMISSION BANDWIDTH

SPECIFICATION: RSS-119 5.5

GUIDE: RSS-Gen 6.7

#### 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.  
Resolution Bandwidth = 150 Hz, Video Bandwidth = 300 Hz

#### MEASUREMENT RESULTS:

		Bandwidths (kHz)
Channel Spacing (MHz)	Channel Spacing (kHz)	APCO P25 phase I
148.1 MHz	12.5	7.95
150.8 MHz	12.5	8.00
156.475 MHz	12.5	7.97
157.2 MHz	12.5	7.93
161.9 MHz	12.5	7.97
162.1 MHz	12.5	8.00
173.3 MHz	12.5	7.97
Limit Authorized Bandwidth 47 CFR 90.209 RSS 119 5.5		11.25
Necessary BW used in emission designator		8.1
Result		Pass



## TRANSMITTER OCCUPIED BANDWIDTH AND SPECTRUM MASKS

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

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

### MEASUREMENT PROCEDURE:

4. Refer Annex A for Equipment Set up.
5. 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.
6. 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 12.5 kHz channel spacing.

MEASUREMENT UNCERTAINTY 95%  $\pm 0.65\text{dB}$

LIMIT CLAUSE: FCC 47 CFR 90.210 RSS-119 5.5

### EMISSION MASKS

Emission Mask D 12.5 kHz Channel Spacing Analogue, FFSK, Digital Voice/data

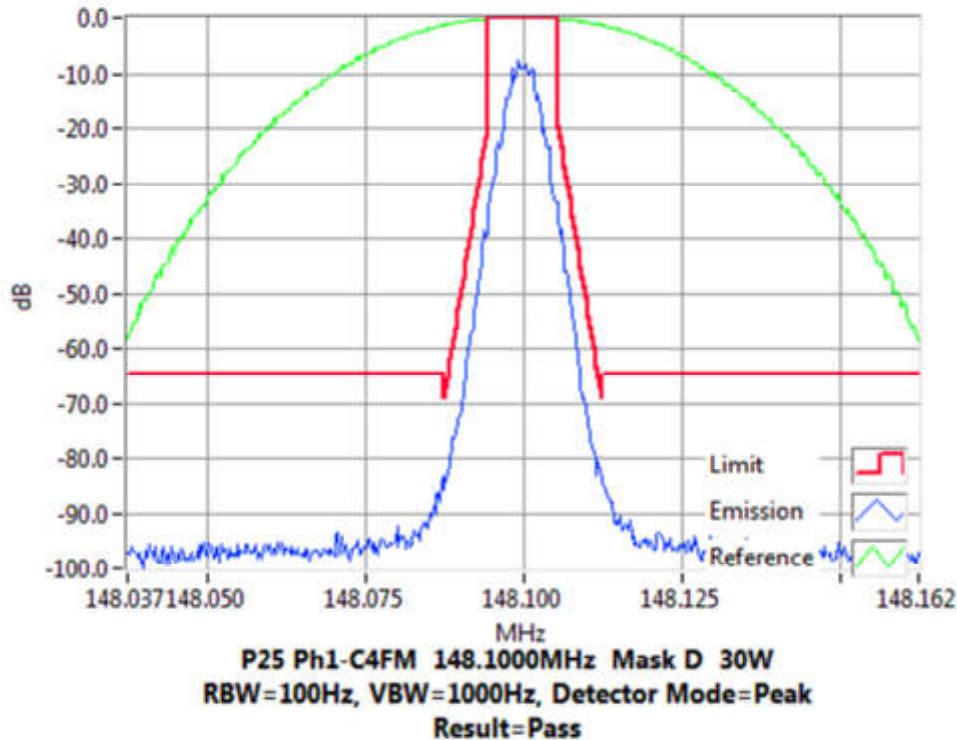
### DATA SPEED

Digital Voice/Data 12.5 kHz Channel Spacing 9600 bps

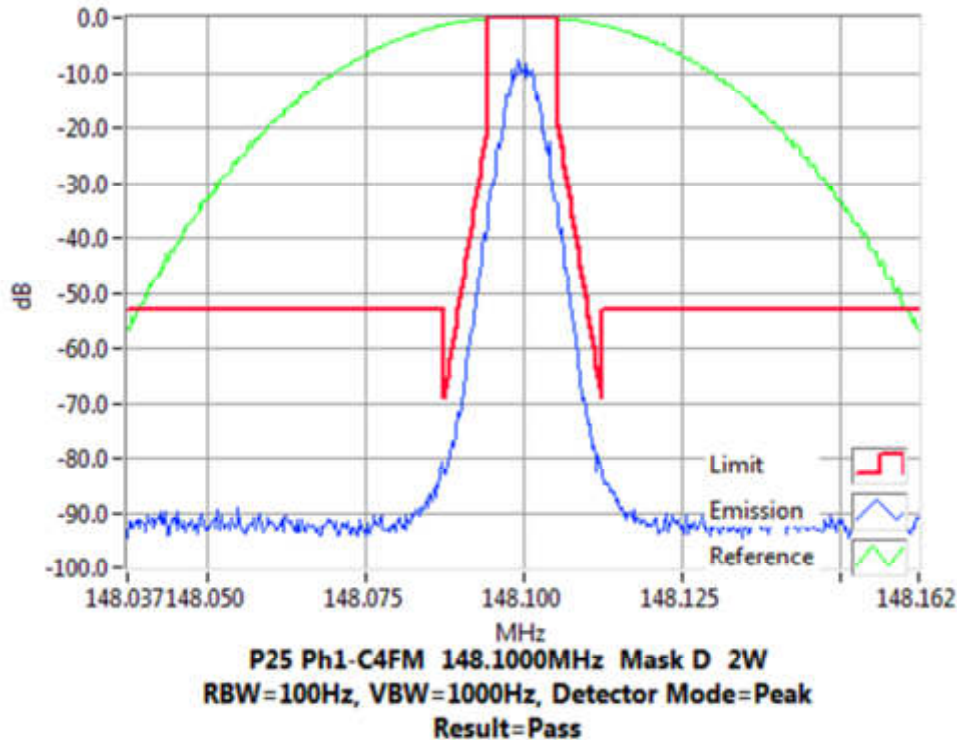
Occupied Bandwidth and Spectrum Masks

APCO P25 phase-1

Tx FREQUENCY: 148.1 MHz 30 W 12.5 kHz Channel Spacing



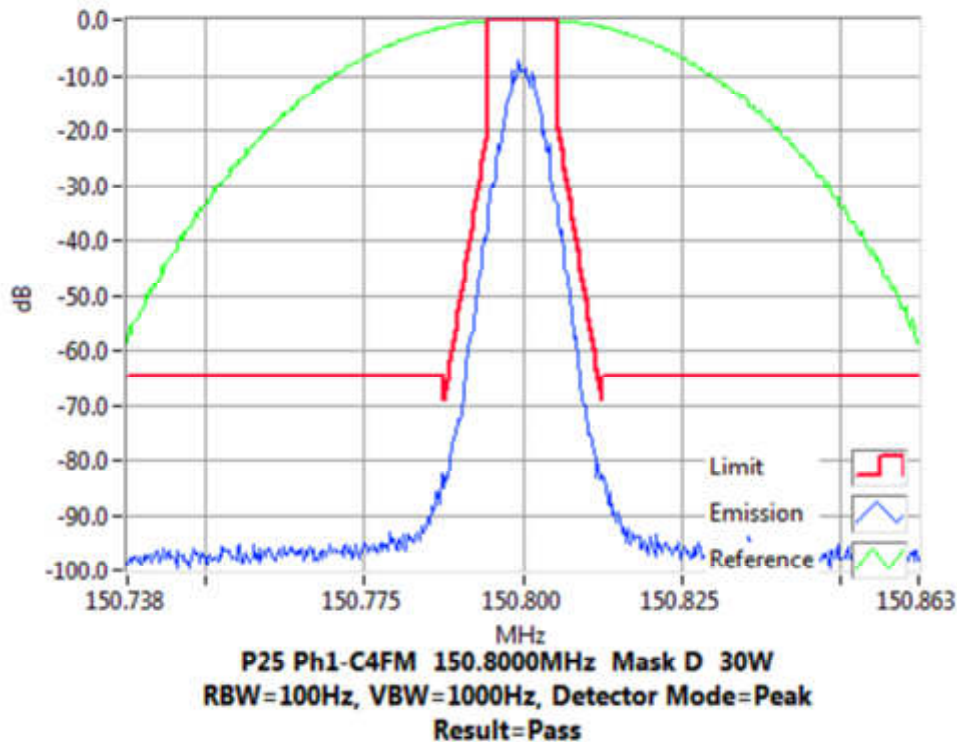
Tx FREQUENCY: 148.1 MHz 2 W 12.5 kHz Channel Spacing



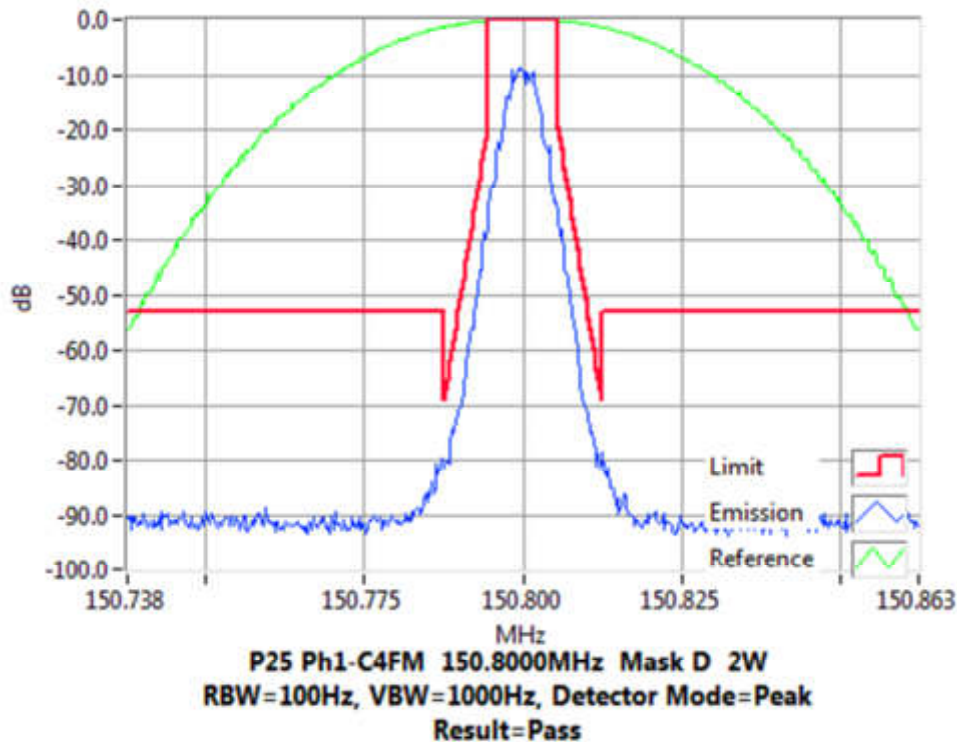
Occupied Bandwidth and Spectrum Masks

APCO P25 phase-1

Tx FREQUENCY: 150.8 MHz 30 W 12.5 kHz Channel Spacing



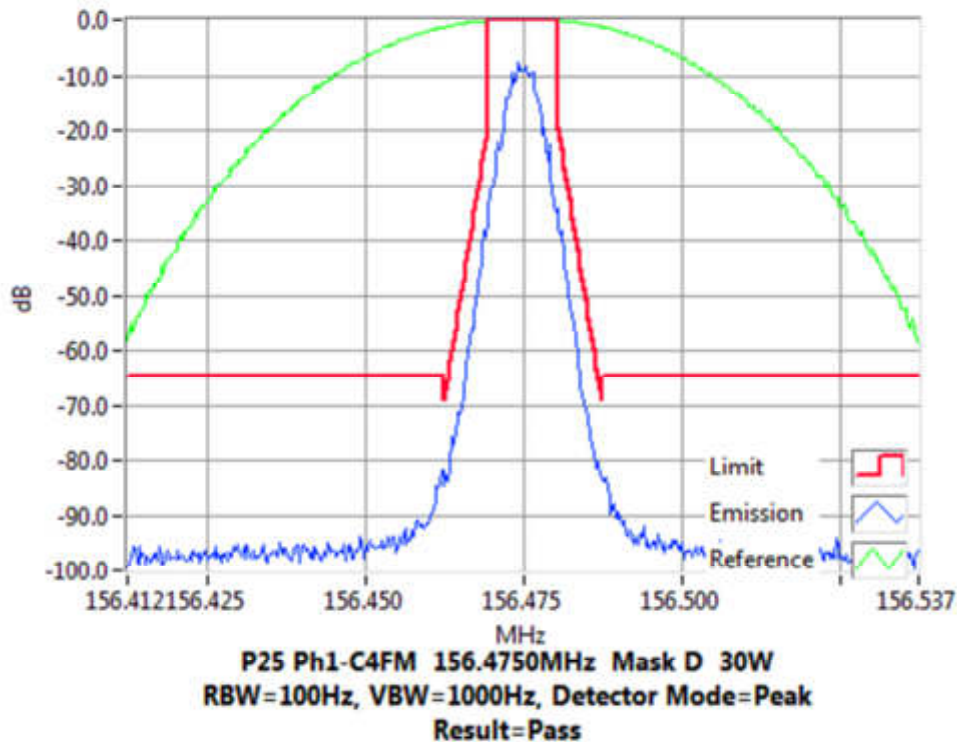
Tx FREQUENCY: 150.8 MHz 2 W 12.5 kHz Channel Spacing



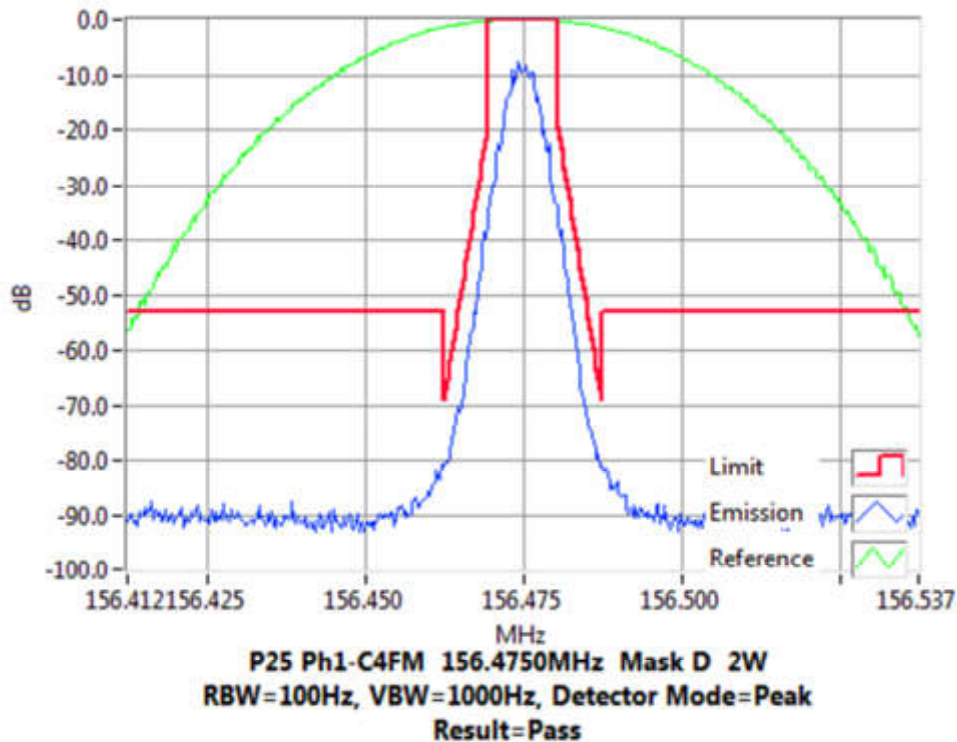
Occupied Bandwidth and Spectrum Masks

APCO P25 phase-1

Tx FREQUENCY: 156.475 MHz 30 W 12.5 kHz Channel Spacing



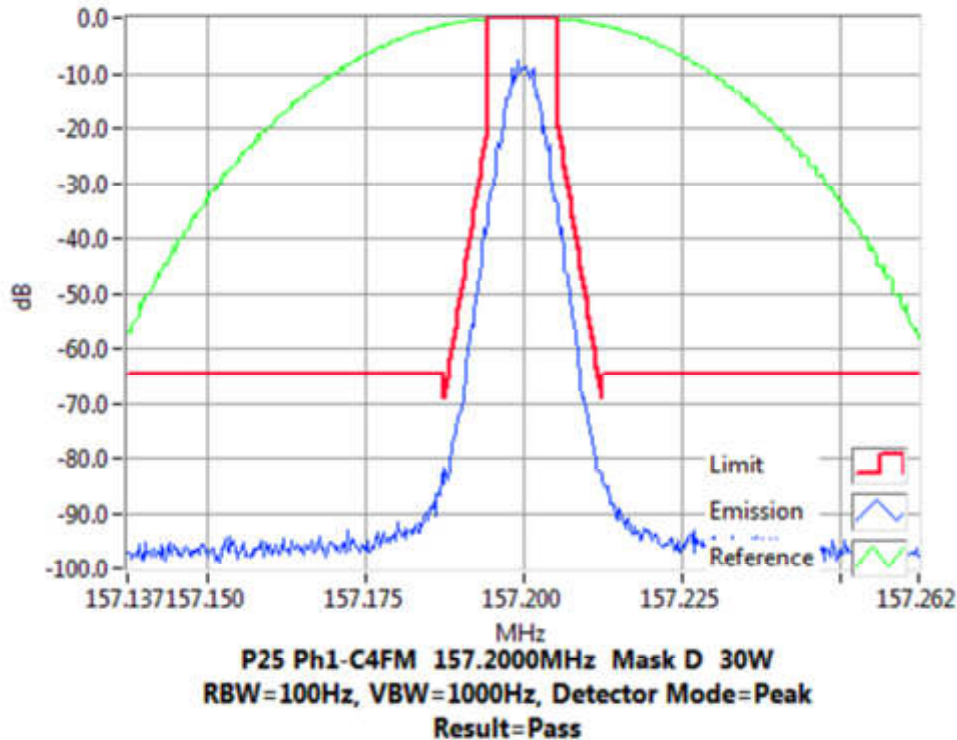
Tx FREQUENCY: 156.475 MHz 2 W 12.5 kHz Channel Spacing



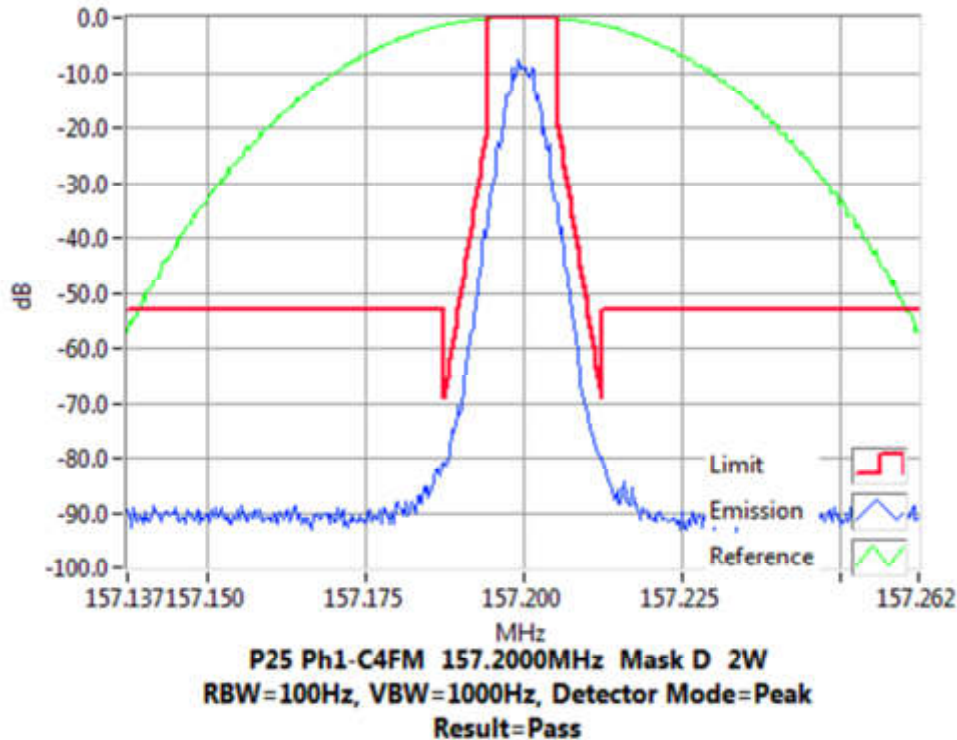
Occupied Bandwidth and Spectrum Masks

APCO P25 phase-1

Tx FREQUENCY: 157.2 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 157.2 MHz 2 W 12.5 kHz Channel Spacing

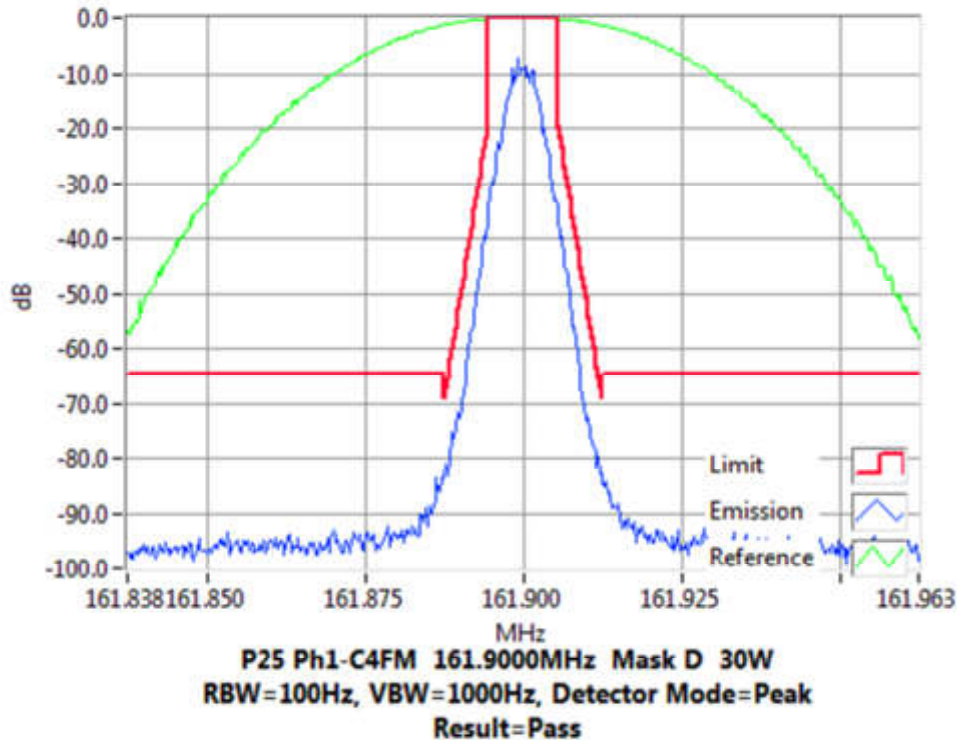




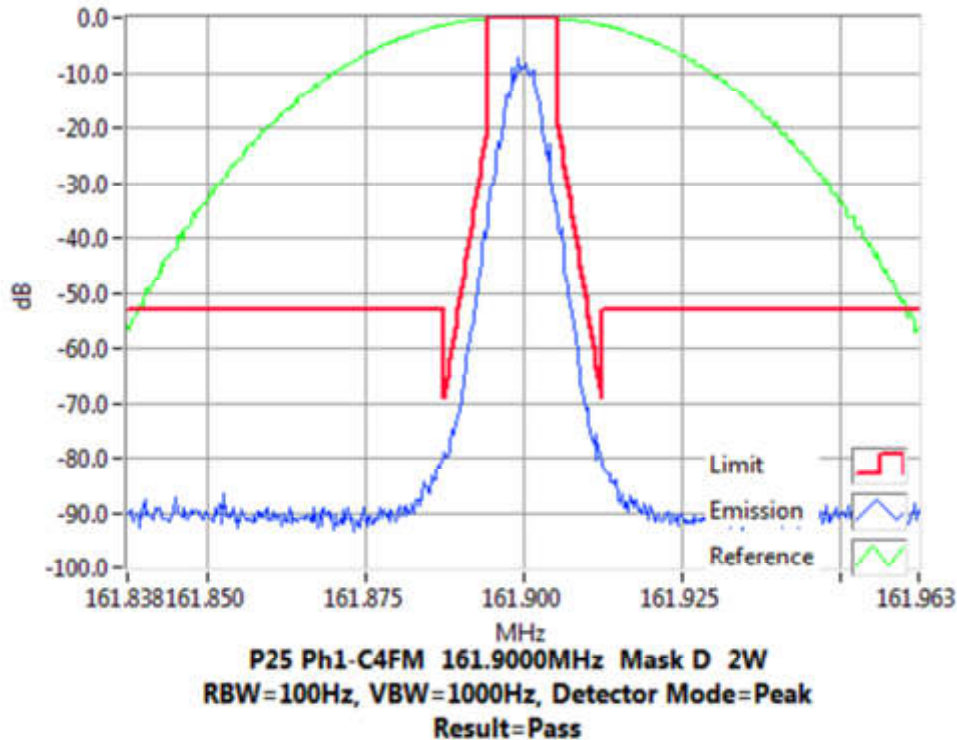
Occupied Bandwidth and Spectrum Masks

APCO P25 phase-1

Tx FREQUENCY: 161.9 MHz 30 W 12.5 kHz Channel Spacing



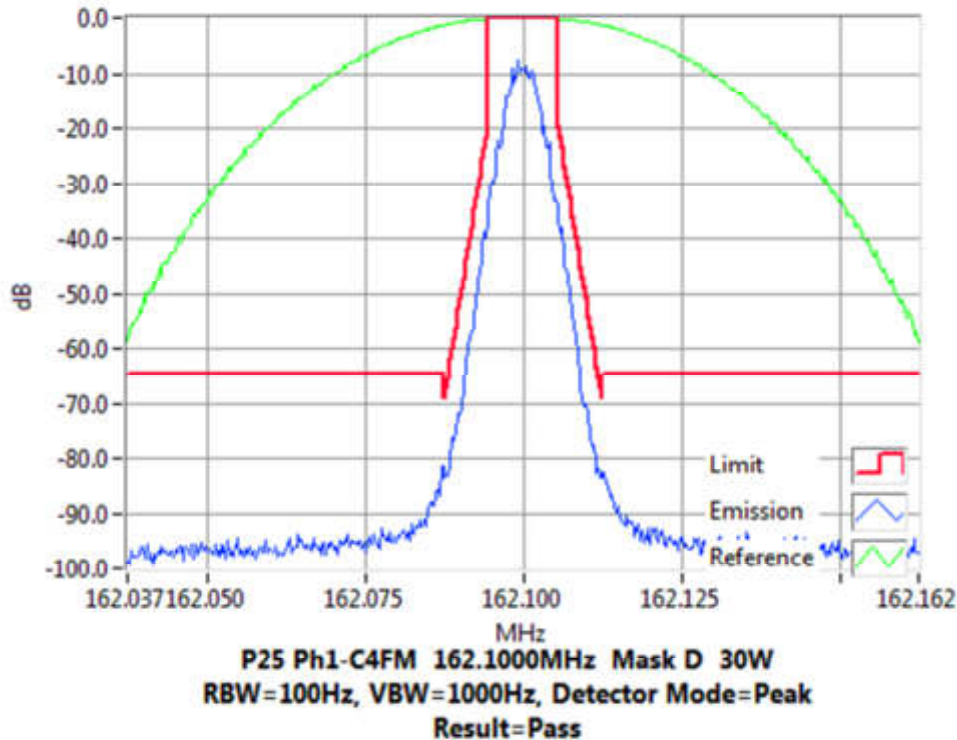
Tx FREQUENCY: 161.9 MHz 2 W 12.5 kHz Channel Spacing



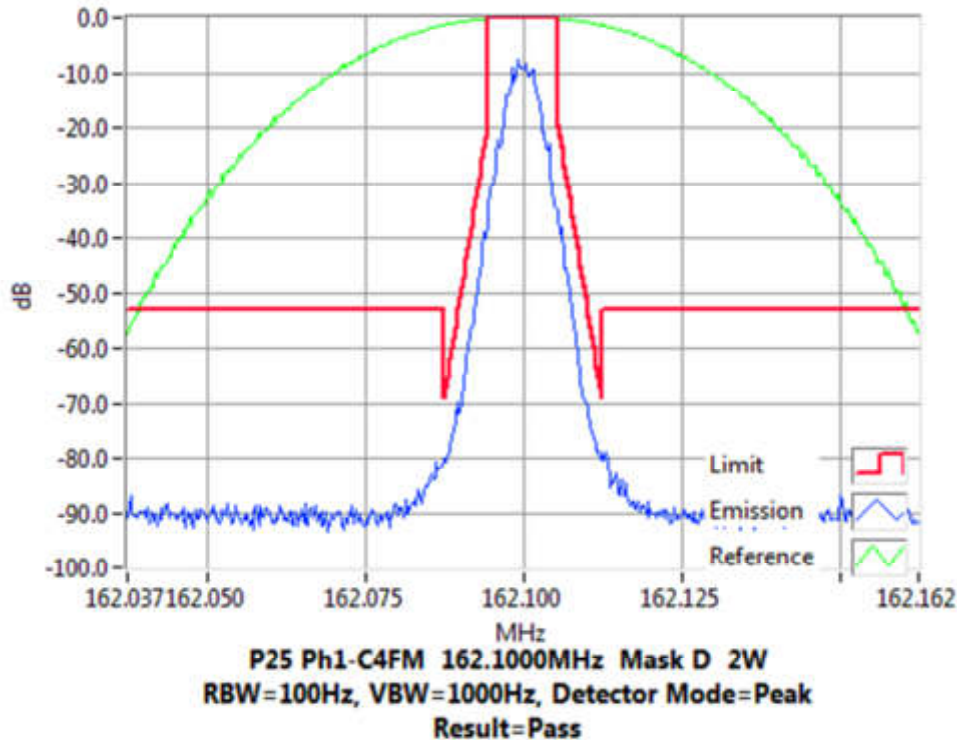
Occupied Bandwidth and Spectrum Masks

APCO P25 phase-1

Tx FREQUENCY: 162.1 MHz 30 W 12.5 kHz Channel Spacing



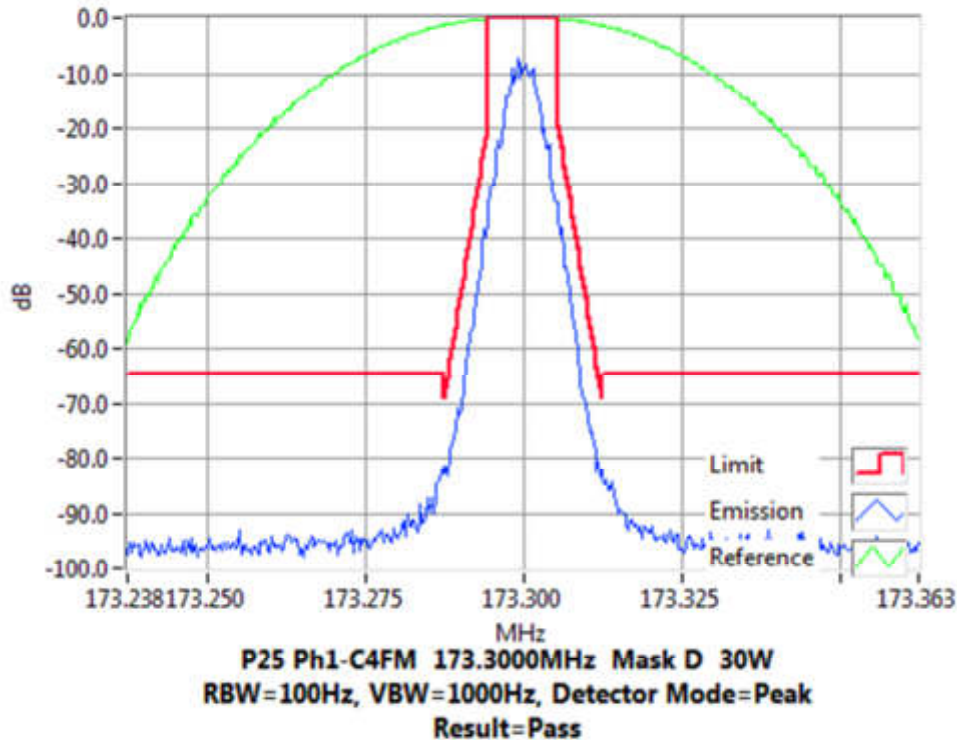
Tx FREQUENCY: 162.1 MHz 2 W 12.5 kHz Channel Spacing



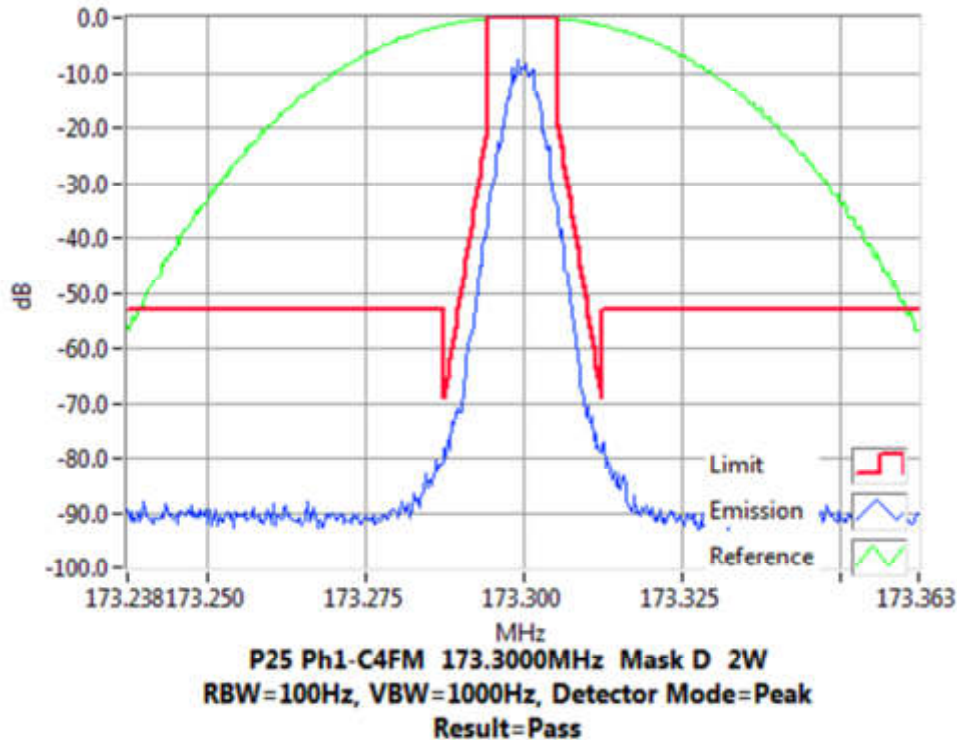
Occupied Bandwidth and Spectrum Masks

APCO P25 phase-1

Tx FREQUENCY: 173.3 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 173.3 MHz 2 W 12.5 kHz Channel Spacing





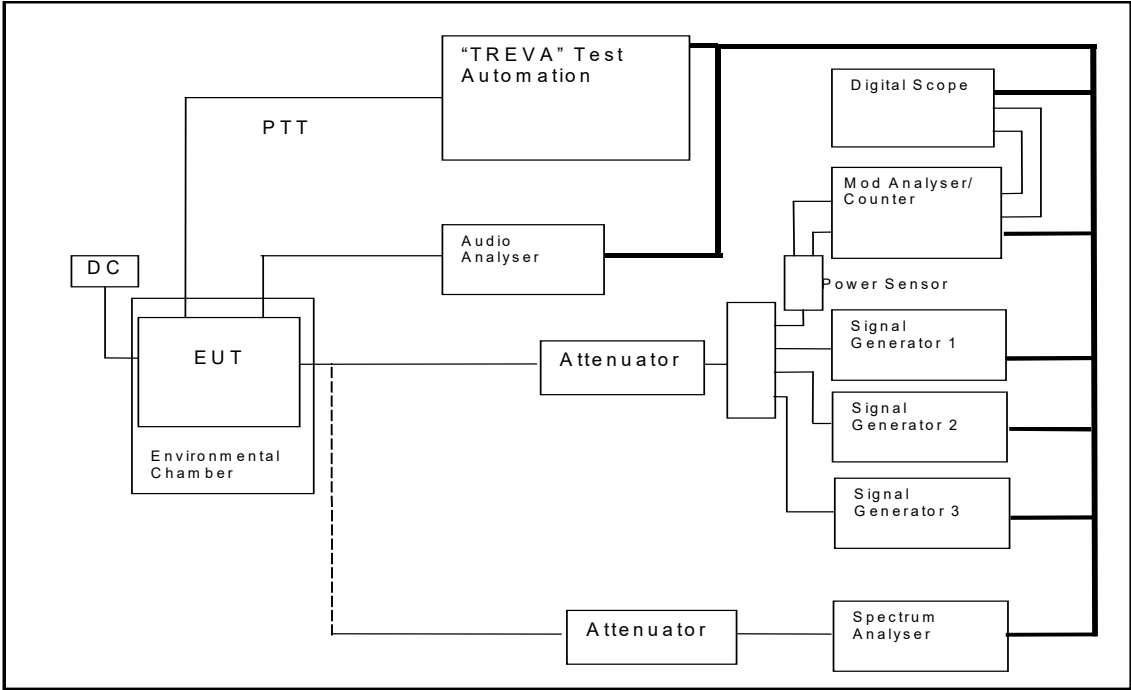
## TEST EQUIPMENT LIST

Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack6	E4849	23-Oct-20
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack5	E4850	23-Oct-20
Power Supply	TREVA2 60V/25A	Agilent	N5767A	US09F4901H	E4656	3-Oct-21
RF Attenuator	33dB 350W	Weinschel	67-30-33 & BW-N3W5+	CK9178	E5023	15-Jul-20
Spectrum Analyser	26.5GHz	Agilent	PXA N9030A	MY49432161	E4907	27-Oct-20
Testware	Occupied Bandwidth		July 2019	-	-	
Testware	99% Emission Bandwidth		July 2019	-	-	

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

ANNEX A – TEST SETUP DETAILS

All other testing is performed using the Teltest **R**adio **E**VAuation 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.



END OF REPORT