TELTEST Laboratories
Tait Limited
Report Number 3445

LABORATORY TEST REPORT

Class-2 Permissive Change

RADIO PERFORMANCE MEASUREMENTS

for the

TMBB1A Mobile Transceiver

Tested in accordance with:

FCC 47 CFR Parts 22, 74 and 90

RSS-119 Issue 11
RSS-Gen Issue 3

Report Revision:	1
Issue Date:	25-January-2013
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REVISION

Date	Revision	Comments
25-January-2013	1	Initial test report

INTRODUCTION

This report covers the requirements of FCC 47 Parts 22, 74 & 90, and RSS-119 Issue 11 & RSS-Gen Issue 3 for a Class-2 Permissive Change and is additional to the original test report 3408.

It presents test results of APCO P25 Phase 2 modulation, enabled by a firmware upgrade, so that APCO P25 Phase 2 modulation can be added to the CASTMBB1A Grant of Equipment Authorization.

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
APCO P25 Phase 2	H-CPM (2 slot TDMA) (TIA 102)	12.5 kHz	2	6000	12000

Type Approval Testing of the T02-00014-BAAA
Serial number 20019522
Frequency range 136 → 174 MHz

in accordance with:
FCC 47 CFR Parts 22, 74 and 90
RSS-119 Issue 11 & RSS-Gen Issue 3

REPORT PREPARED FOR
Tait Limited
PO Box 1645
558 Wairakei Road
Christchurch
New Zealand

DESCRIPTION OF SAMPLE

Manufacturer	Tait Limited
Equipment:	Mobile Transceiver
Type:	TMBB1A
Product Code:	T02-00014-BAAA
Serial Number(s):	20019522
Quantity:	1

HARDWARE & SOFTWARE

	P25 Phase 2
Type	Code and Version
Hardware ID	TMBB14-B100_0006
Boot Code	QMB1B_S00_3.00.03.0001
DSP	QMB1A_A00_1.00.02.0050
Radio Application	QMB1F_A00_1.00.02.0050
FPGA Image	QMB1G_S00_1.00.02.0001_P2.a

TEST CONDITIONS
All testing was performed between 22 - 24 January 2013 under the following conditions:
Ambient temperature: 15°C → 30°C
Relative Humidity: 20% → 75%
Standard Test Voltage 13.8 V_{DC}

STATEMENT OF COMPLIANCE

The TMBB1A mobile transceiver as tested in this report was found to conform to the following standards:

FCC 47 CFR Parts 22, 74 and 90

RSS-119 Issue 11 & RSS-Gen Issue 3

MODULATION TYPES, NECESSARY BANDWIDTH and EMISSION DESIGNATORS

MODULATION TYPE:
F1W Digital Voice / Data 12000 bps

CHANNEL SPACINGS: 12.5 kHz

EMISSION DESIGNATOR:
Digital Voice / Data 8K10F1W

Measured Bandwidth:

Digital Voice/data transmissions use a 4 level frequency shift keying modulation scheme.
The necessary bandwidth has been measured using the 99% energy rule in accordance with TIA/EIA 102 CAAB 2.2.5.2.

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

OCCUPIED BANDWIDTH AND SPECTRUM MASKS

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

GUIDE: TIA/EIA-603D 2.2.11

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

MEASUREMENT RESULTS:
See the plots on the following pages for 12.5 kHz channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210 RSS-119 5.5

EMISSION MASKS

Emission Mask D	12.5 kHz Channel Spacing	Digital Voice/Data

DATA SPEED

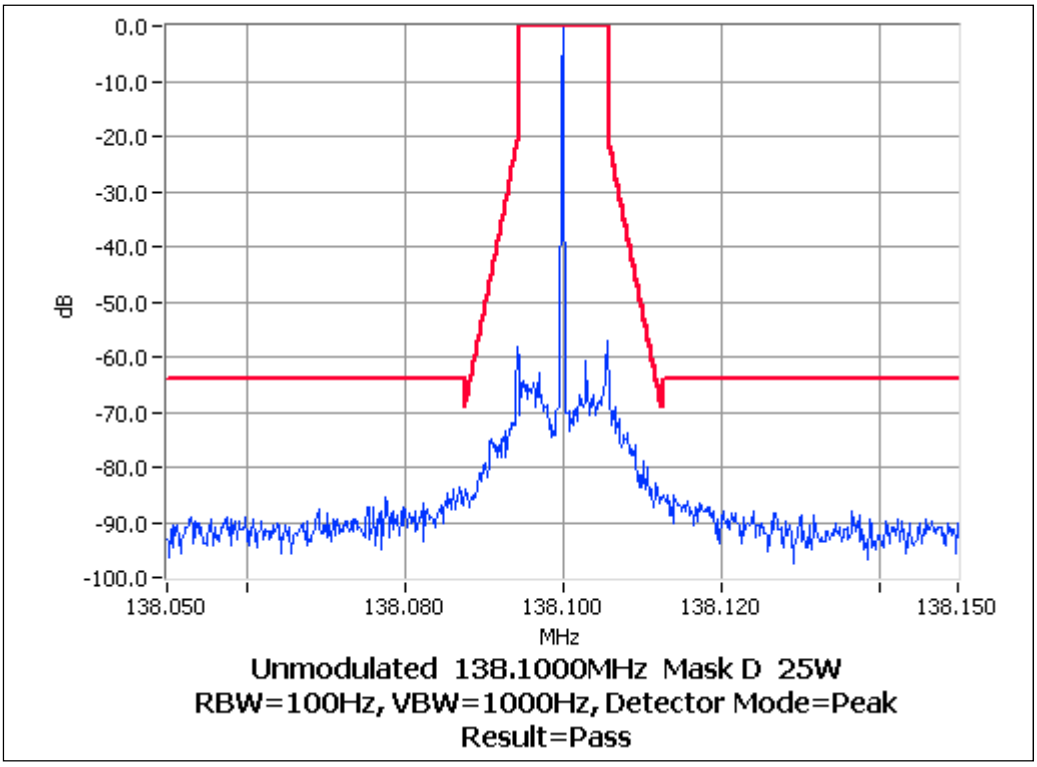
Digital Voice/Data	12.5 kHz Channel Spacing	12000 bps

Occupied Bandwidth and Spectrum Masks

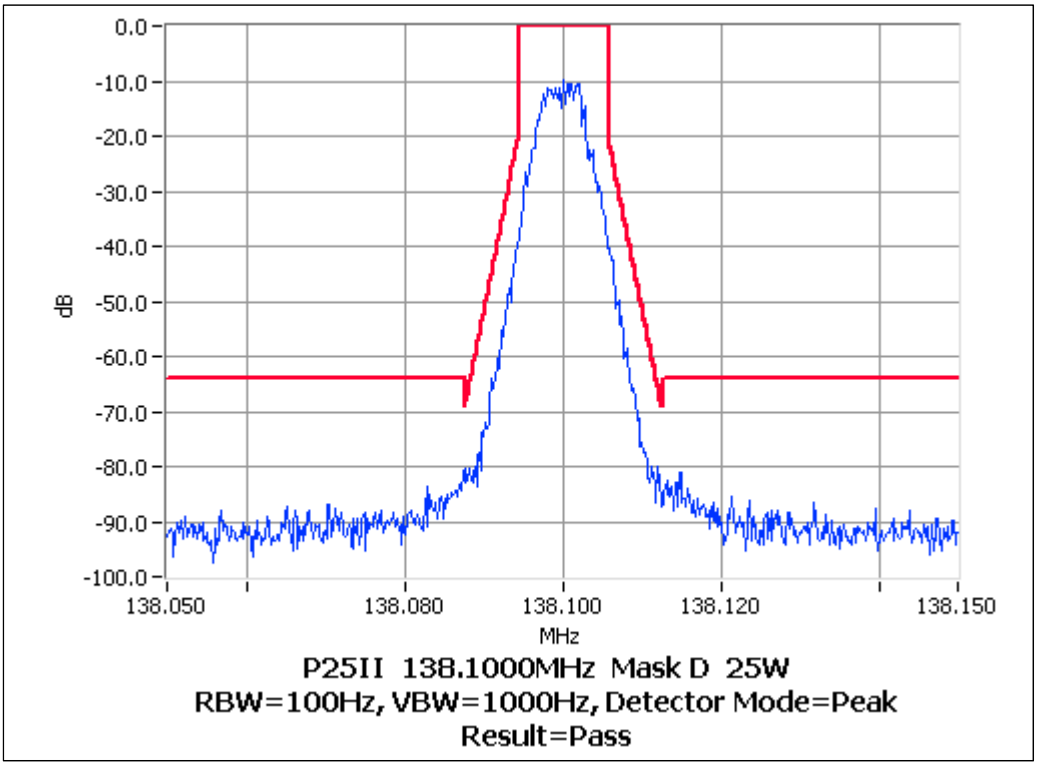
P25 Phase 2

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

Tx FREQUENCY: 138.1 MHz 25 W 12.5 kHz Channel Spacing



Unmodulated 138.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

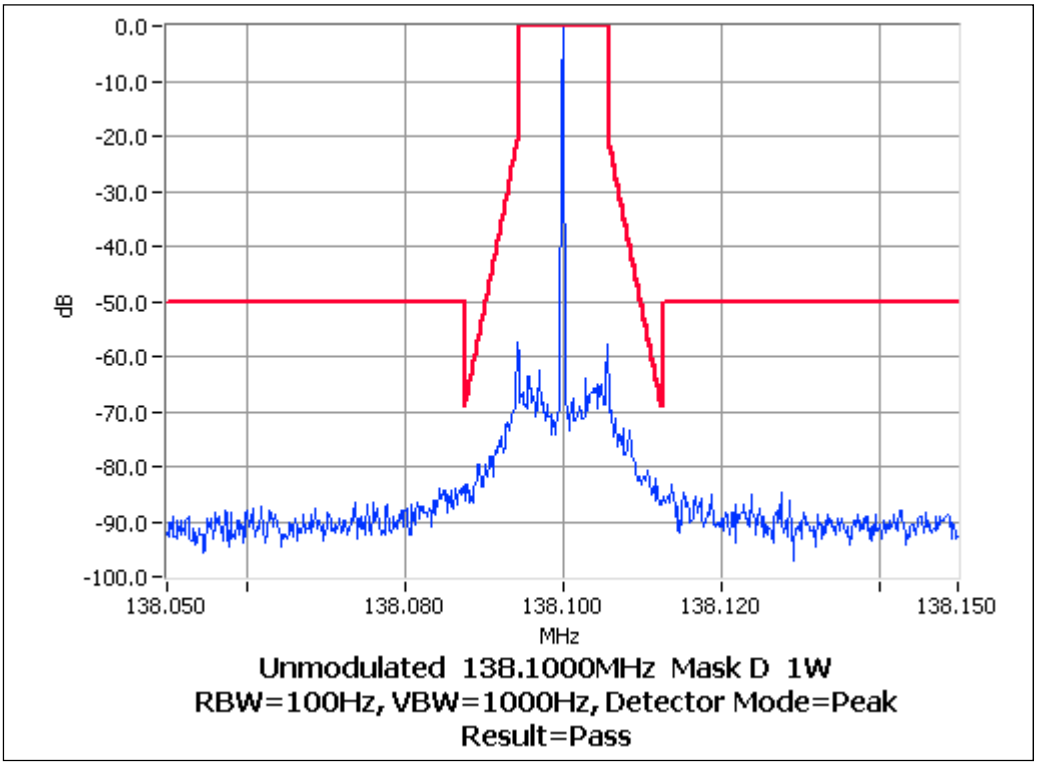


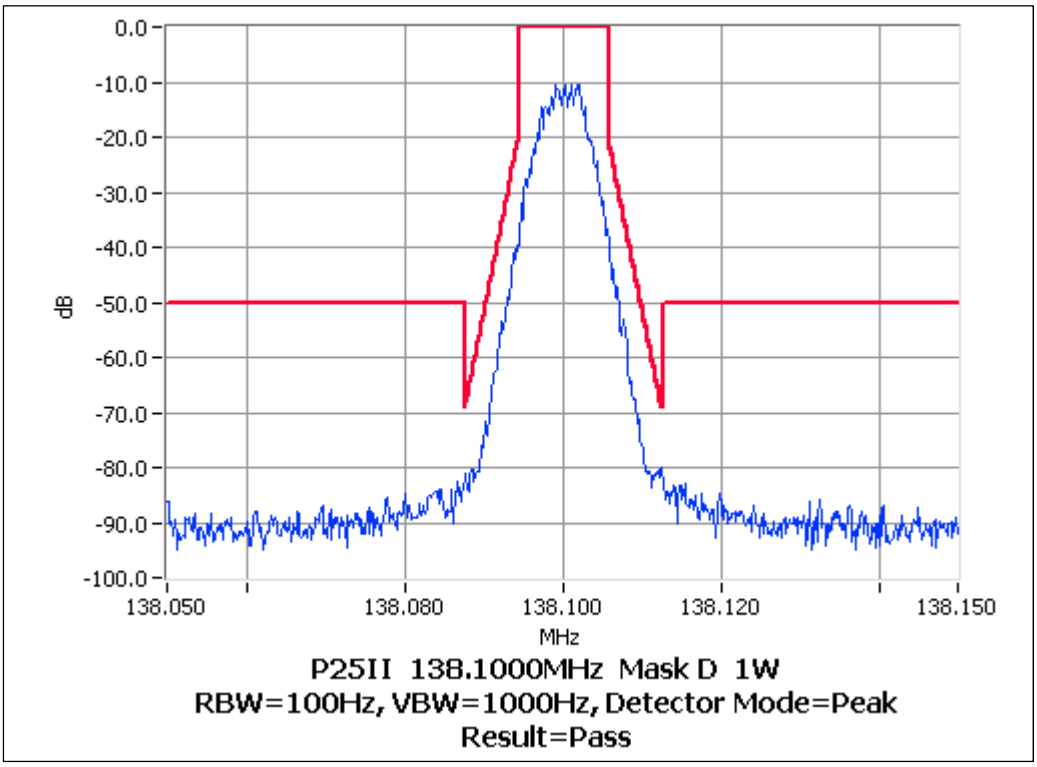
P25II 138.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

P25 Phase 2

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

Tx FREQUENCY: 138.1 MHz 1 W 12.5 kHz Channel Spacing

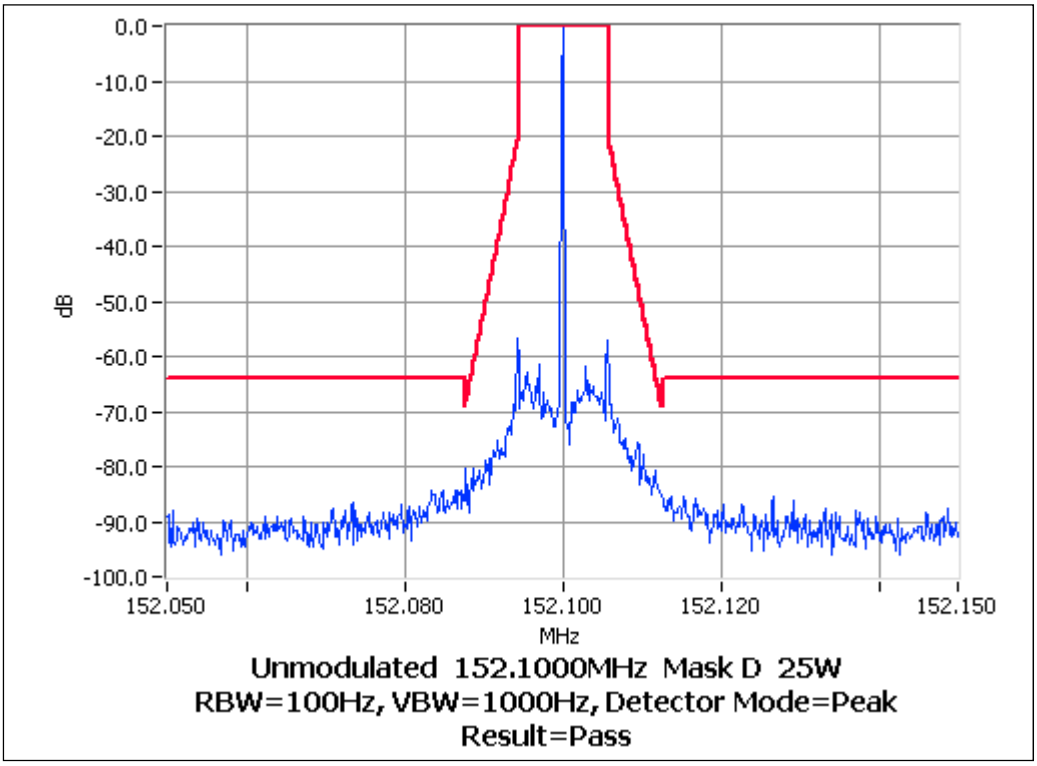




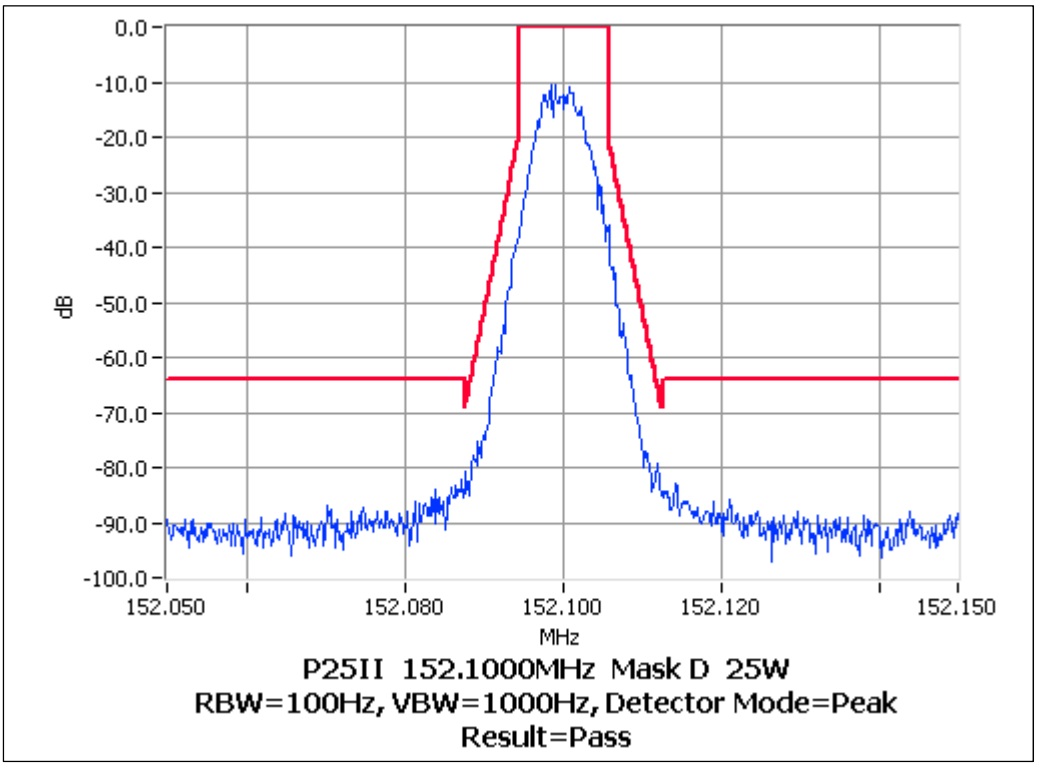
P25 Phase 2

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

Tx FREQUENCY: 152.1 MHz 25 W 12.5 kHz Channel Spacing



Unmodulated 152.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

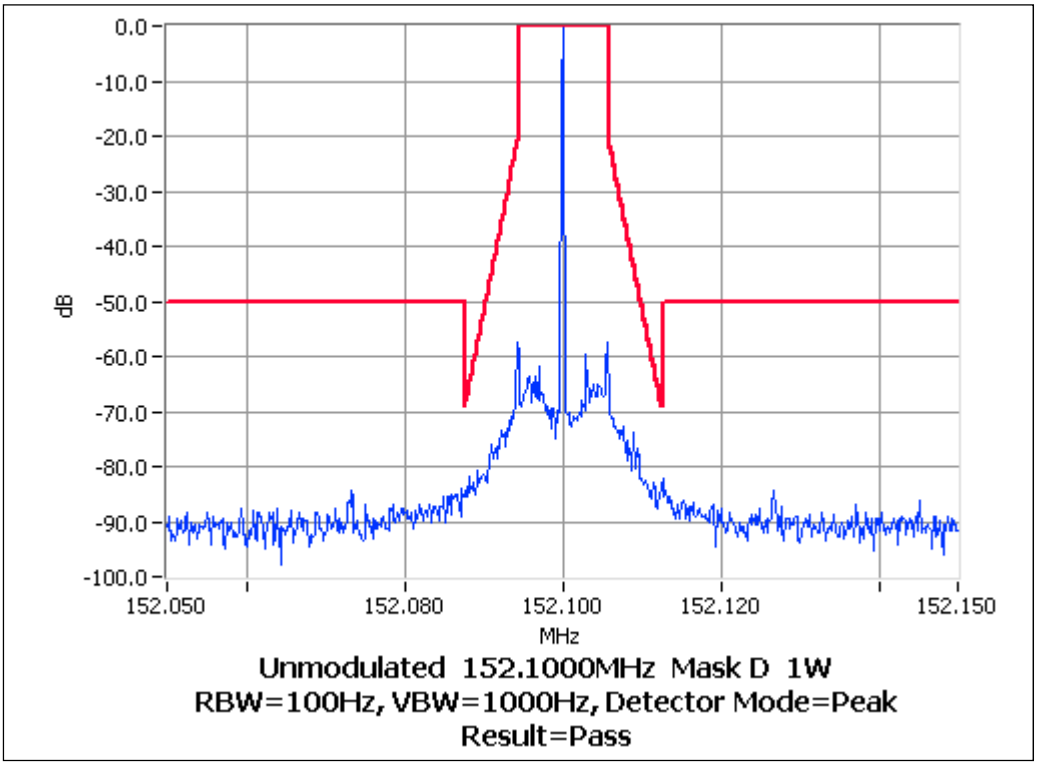


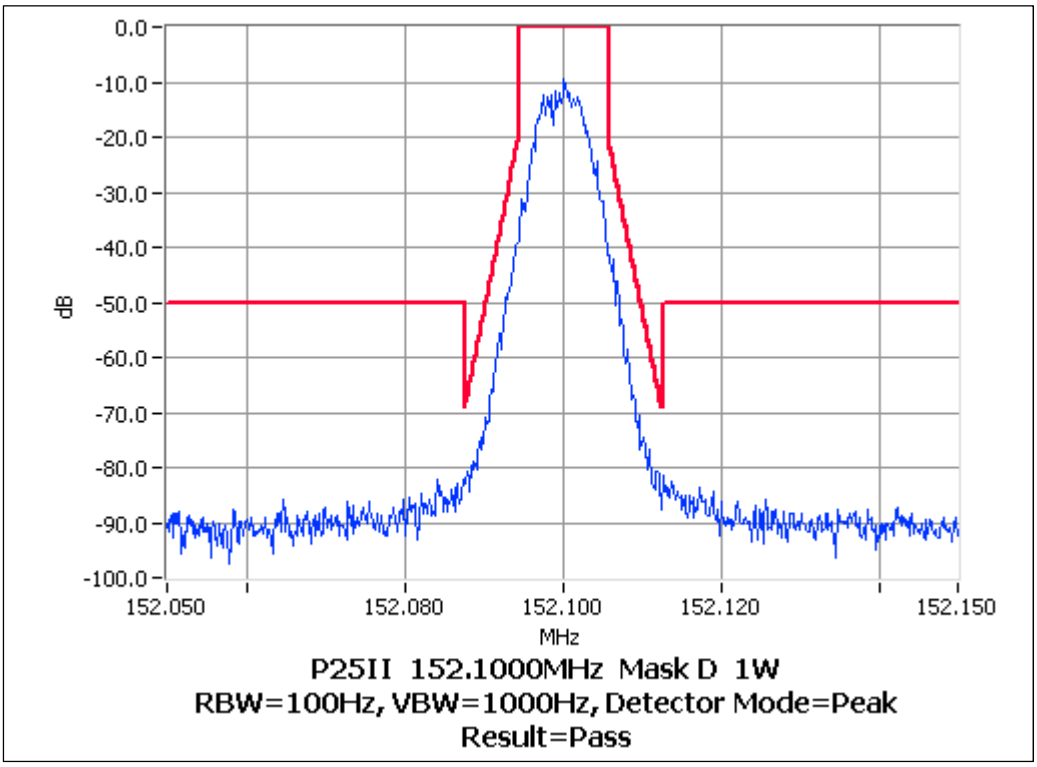
P25II 152.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

P25 Phase 2

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

Tx FREQUENCY: 152.1 MHz 1 W 12.5 kHz Channel Spacing

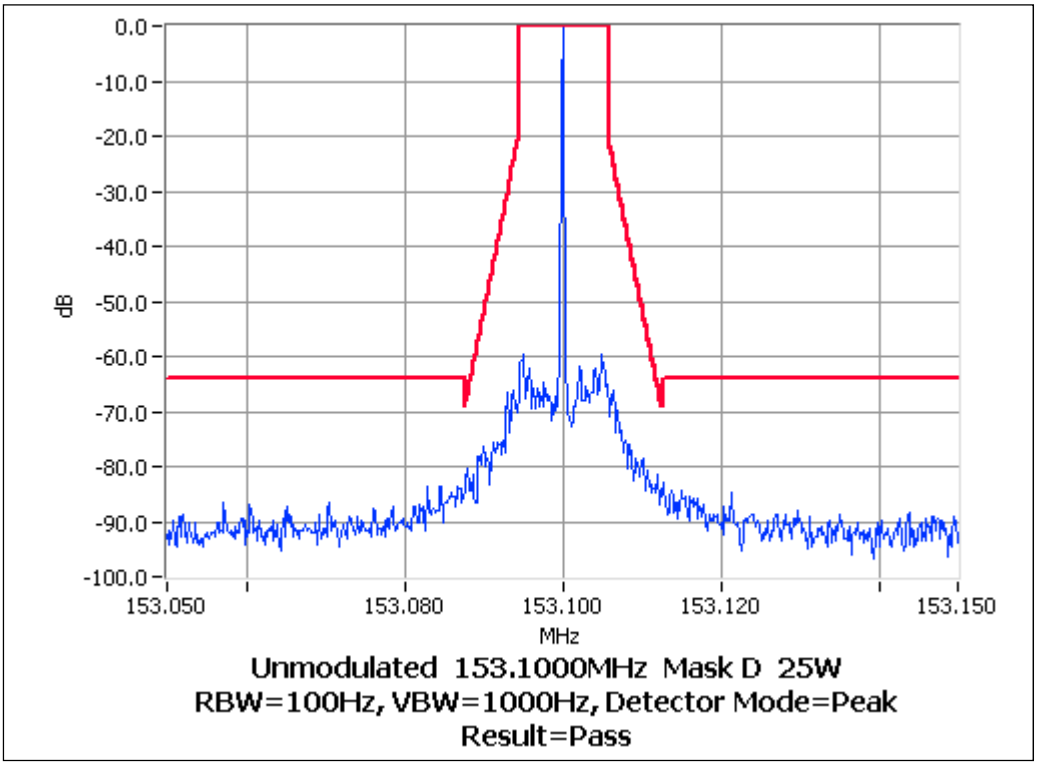




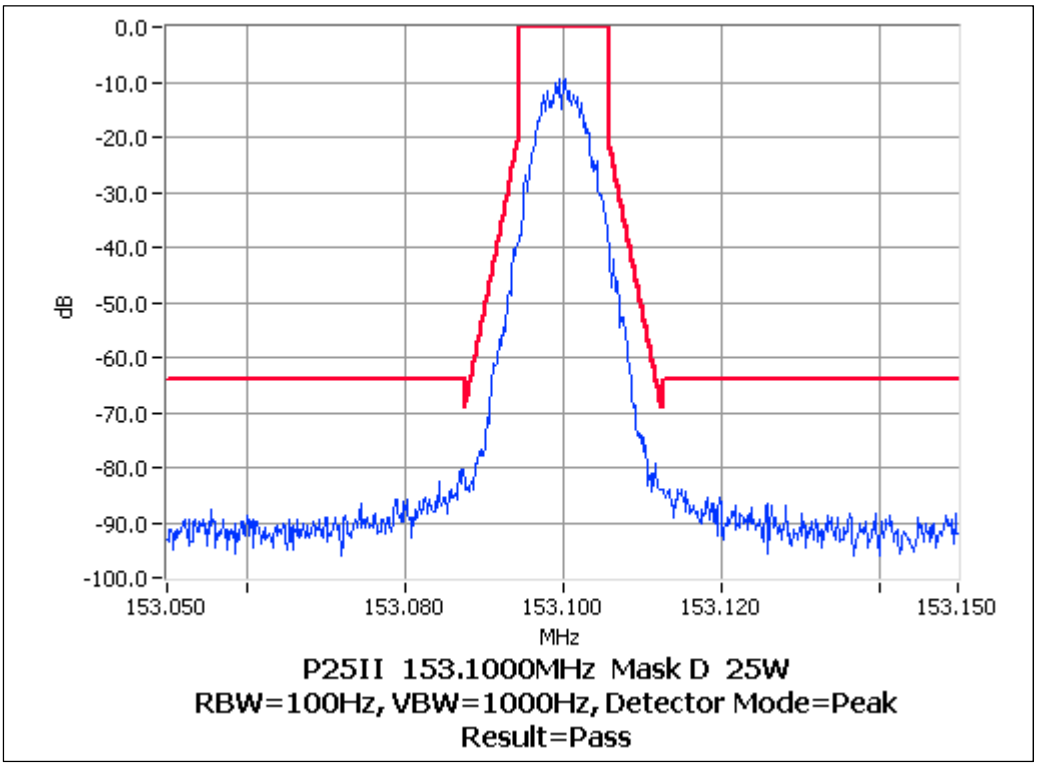
P25 Phase 2

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

Tx FREQUENCY: 153.1 MHz 25 W 12.5 kHz Channel Spacing



Unmodulated 153.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

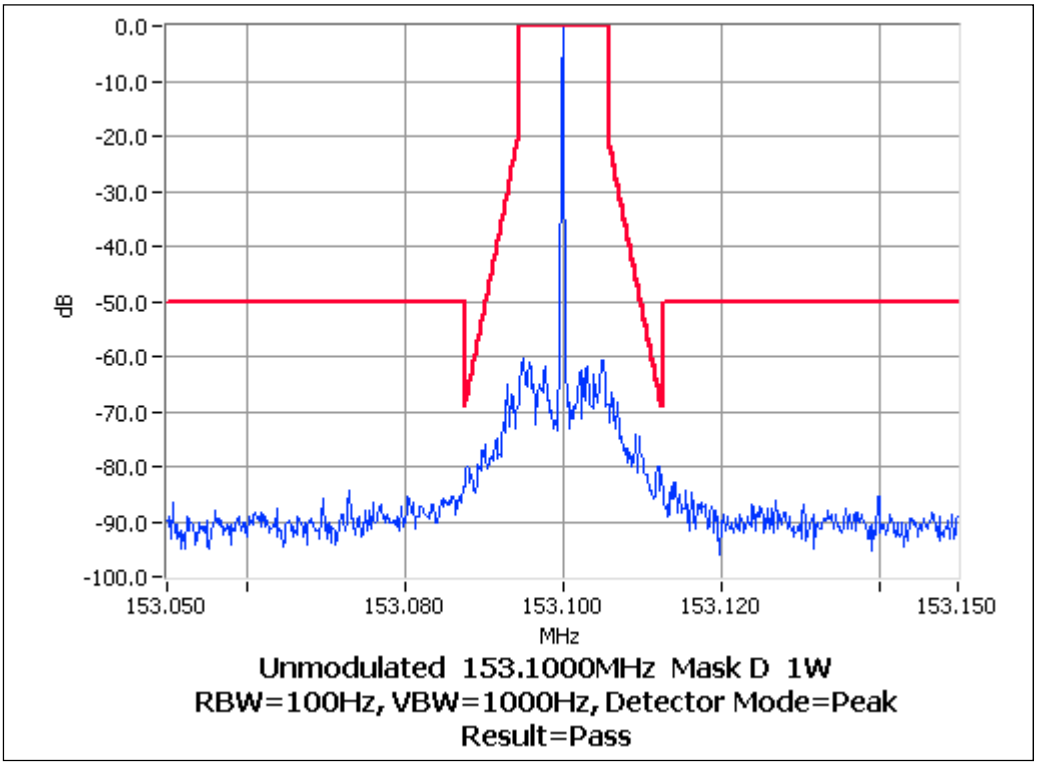


P25II 153.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

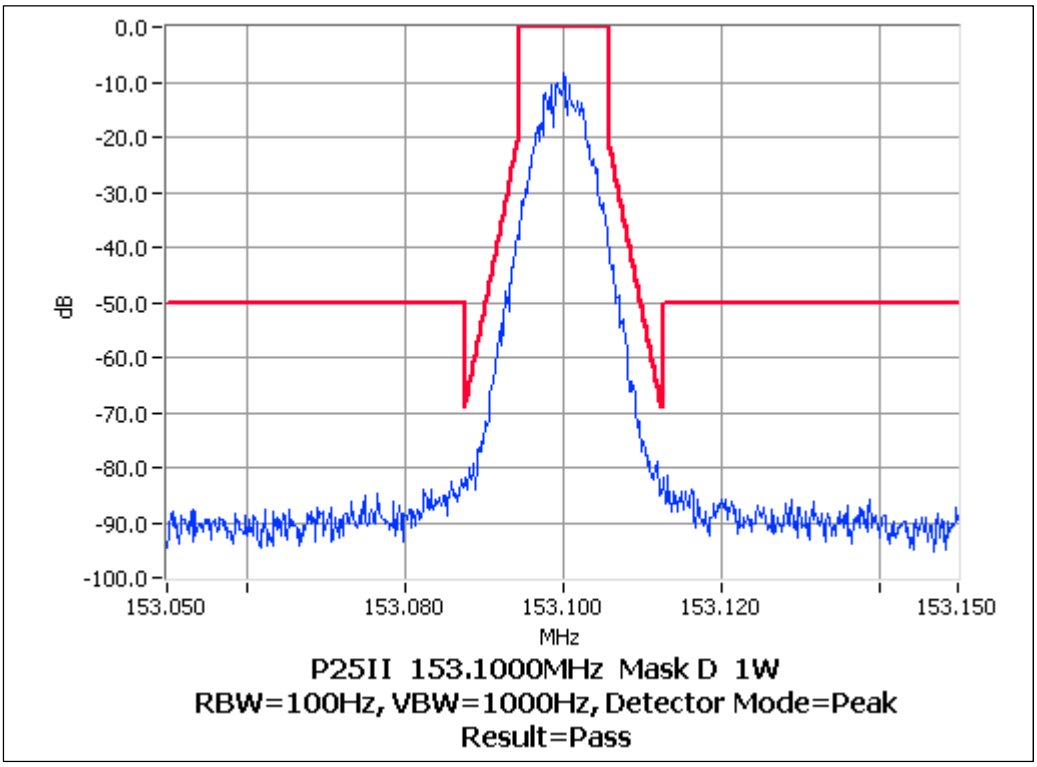
P25 Phase 2

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

Tx FREQUENCY: 153.1 MHz 1 W 12.5 kHz Channel Spacing



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

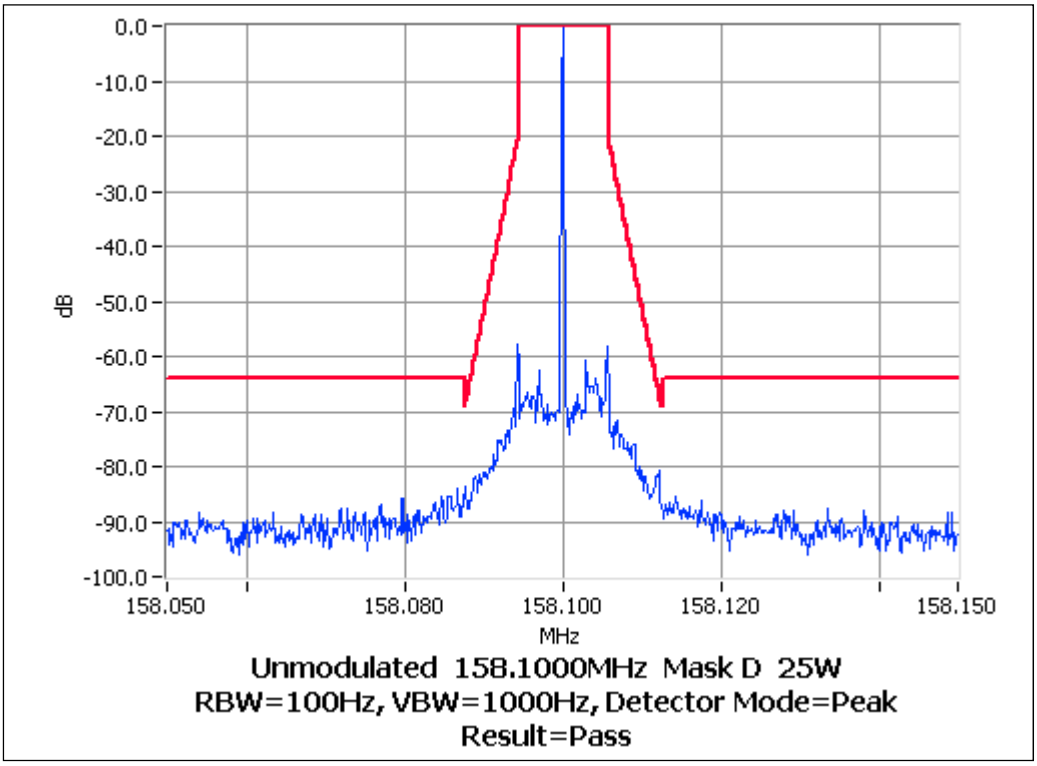


P25II 153.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

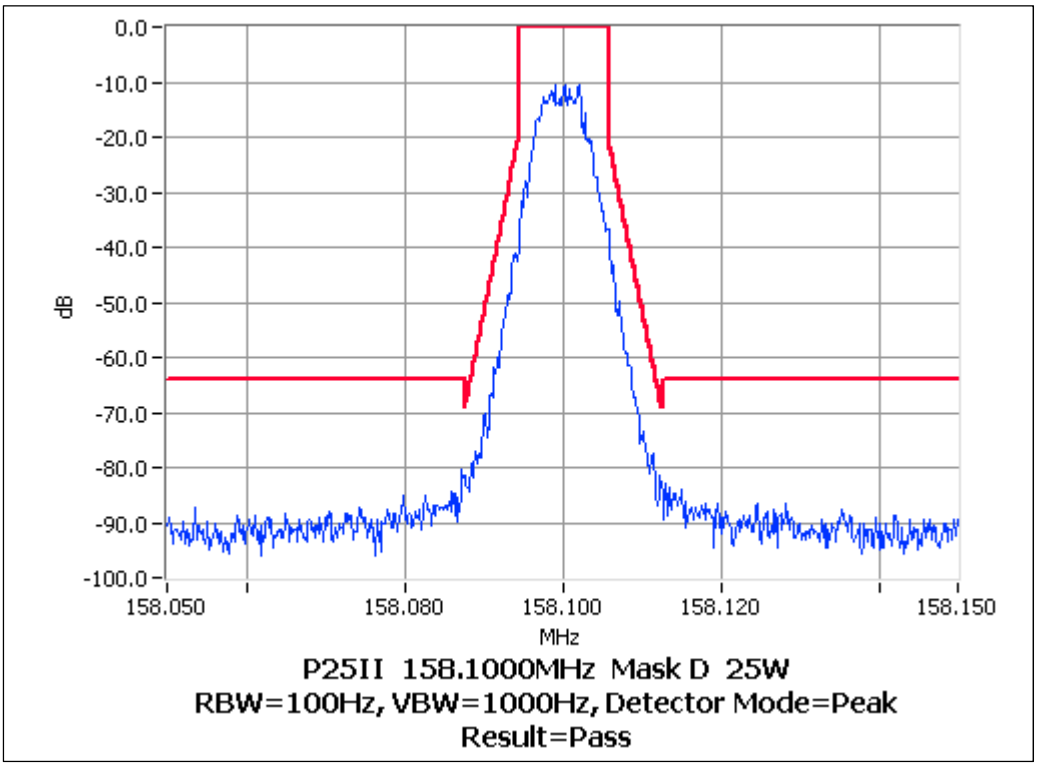
P25 Phase 2

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

Tx FREQUENCY: 158.1 MHz 25 W 12.5 kHz Channel Spacing



Unmodulated 158.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

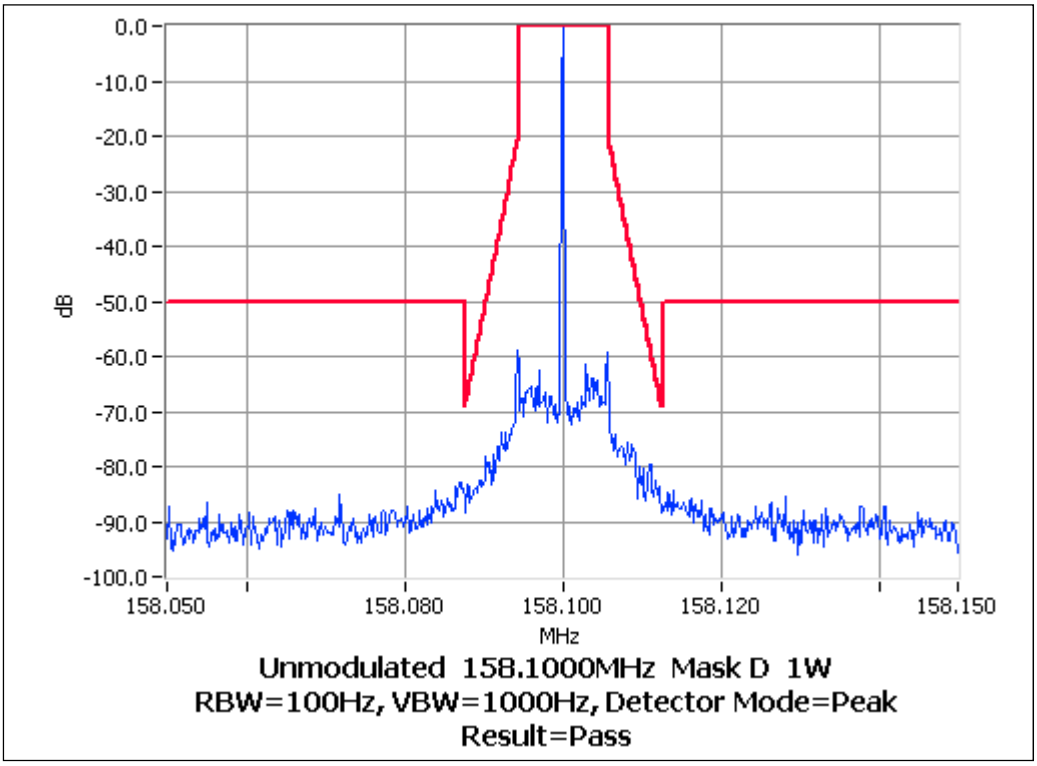


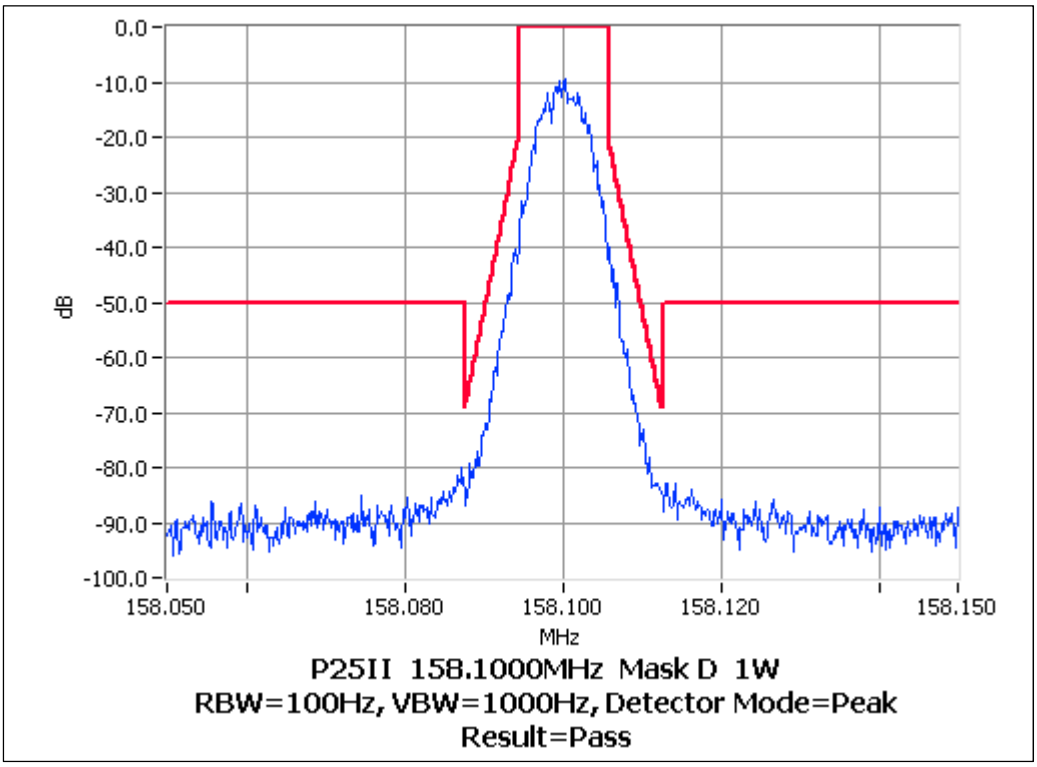
P25II 158.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

P25 Phase 2

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

Tx FREQUENCY: 158.1 MHz 1 W 12.5 kHz Channel Spacing

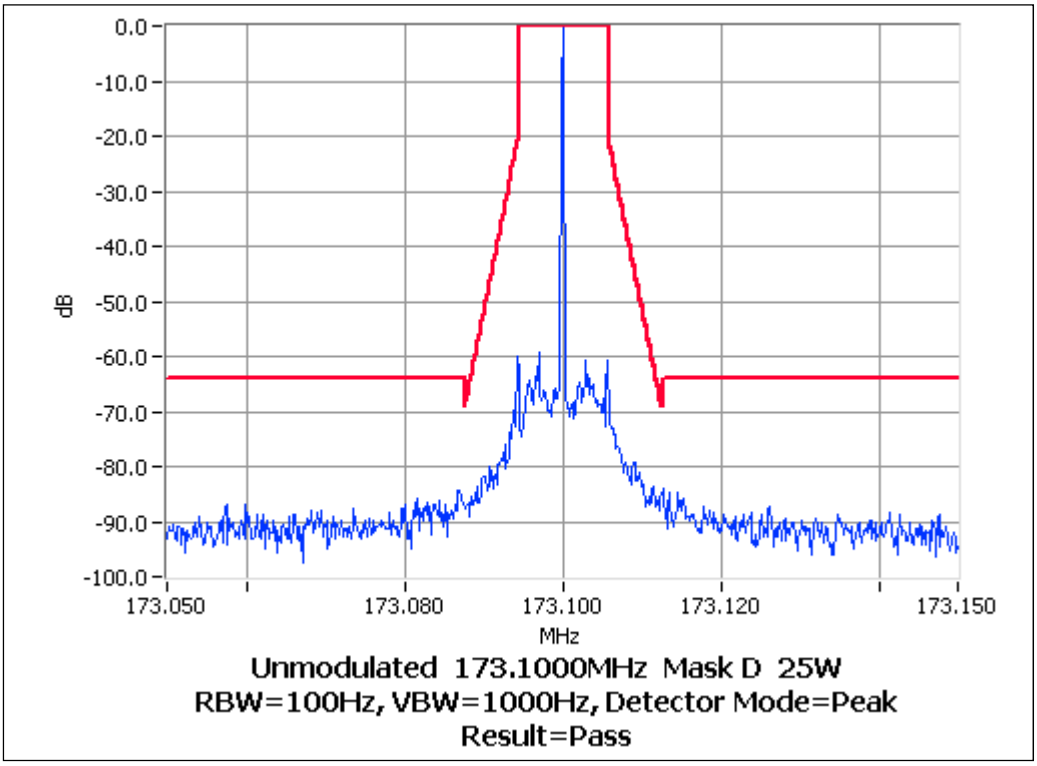




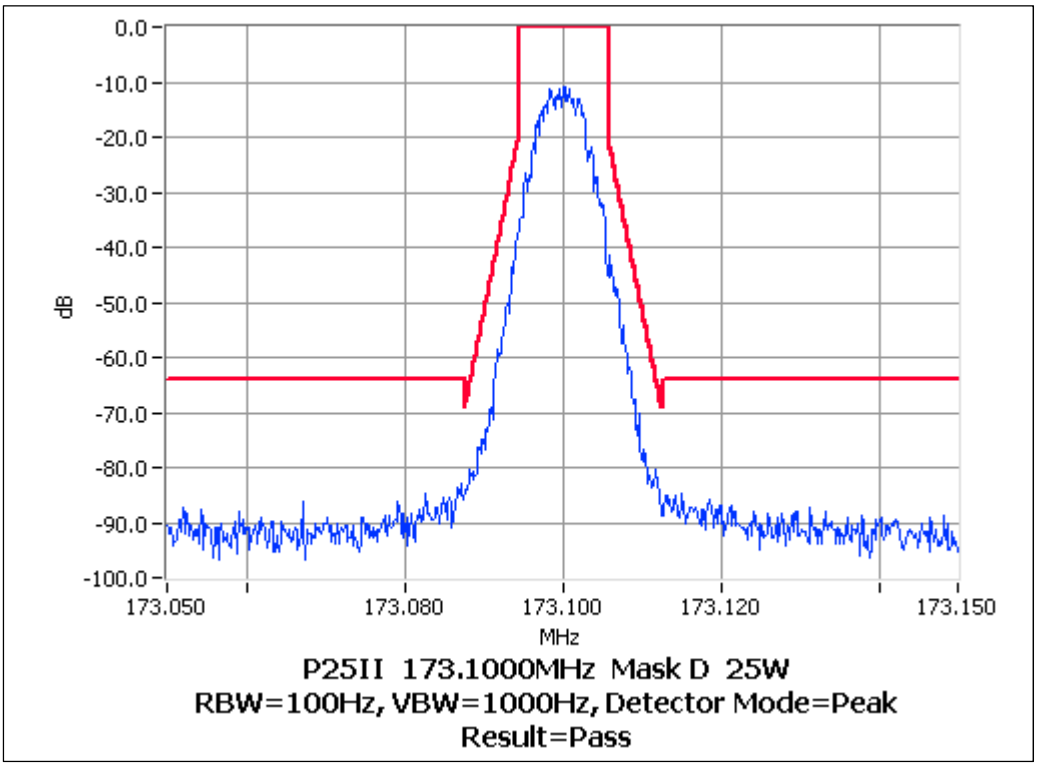
P25 Phase 2

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

Tx FREQUENCY: 173.1 MHz 25 W 12.5 kHz Channel Spacing



Unmodulated 173.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

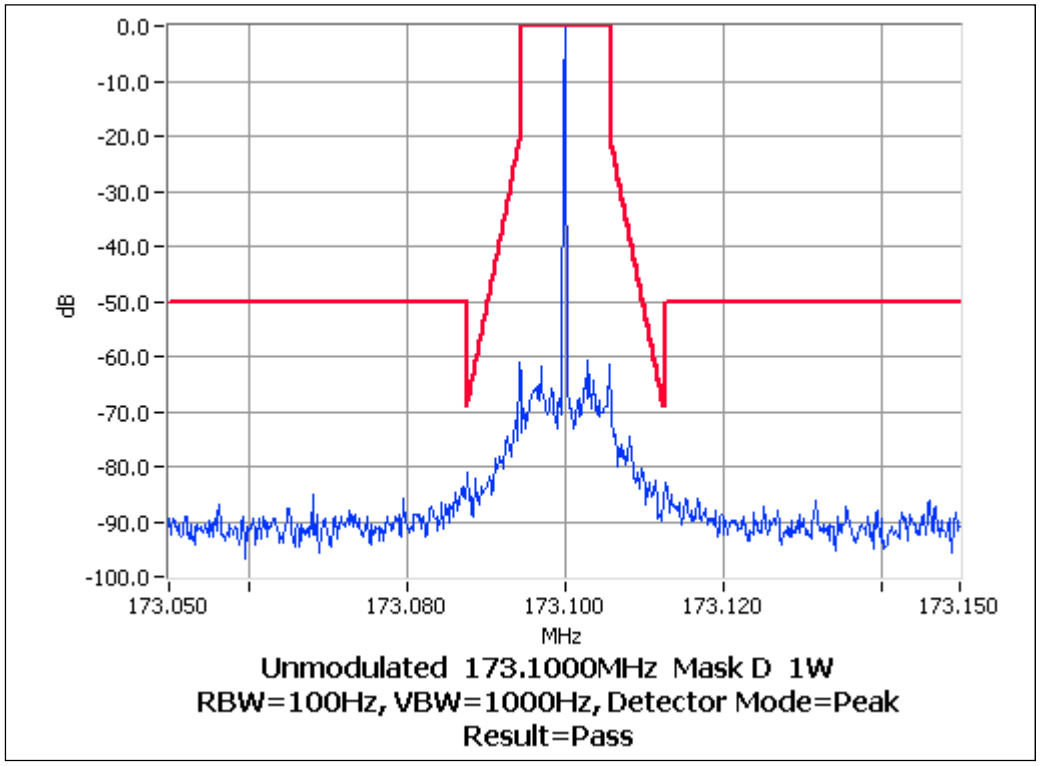


P25II 173.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

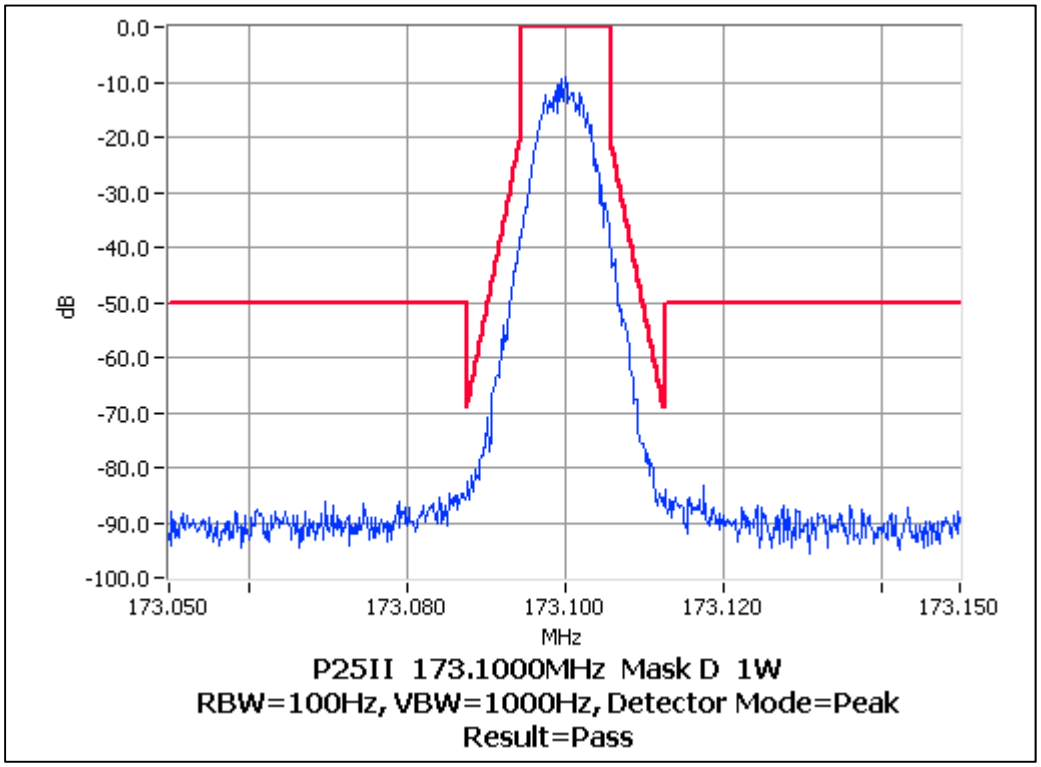
P25 Phase 2

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

Tx FREQUENCY: 173.1 MHz 1 W 12.5 kHz Channel Spacing



Unmodulated 173.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

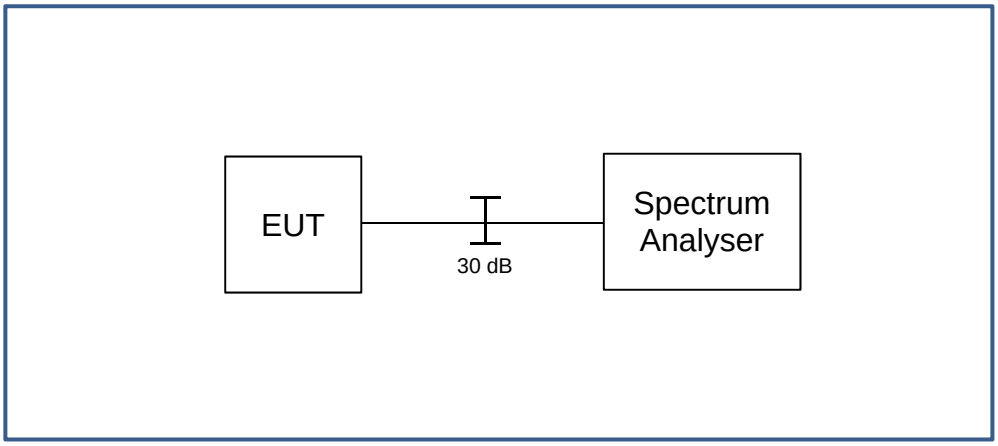


P25II 173.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

TEST EQUIPMENT LIST

Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
Power Supply	60V/25A	Agilent	N5767A	US09F4901H	E4656	8-Oct-13
RF Attenuator	30dB 250W	Weinschel	45-30-34	JW663	E3386	13-Oct-13
Coax Cable	1m Blue	Suhner	Sucoflex 104A	44610/4A	E4619	12-Oct-13
Coax Cable	3m Blue	Suhner	Sucoflex 104A	44611/4A	E4620	13-Oct-13
Spectrum Analyser	13.2GHz	Agilent	PSA E4445A	MY42510072	E4139	21-Nov-14

ANNEX A – TEST SETUP DETAILS



Test setup for Occupied Bandwidth tests.