

# LABORATORY TEST REPORT

Class-2 Permissive Change

RADIO PERFORMANCE MEASUREMENTS

for the

TBCK4B Base Station Transceiver

Tested in accordance with:

FCC 47 CFR Part 90

RSS-119 Issue 11  
RSS-Gen Issue 3

Report Revision: 1

Issue Date: 10-April-2012

PREPARED BY: Garry Pringle \_\_\_\_\_  
Test Technician

CHECKED & APPROVED BY: Steve Crompton \_\_\_\_\_  
Laboratory Manager



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 3 358 0432

## TABLE OF CONTENTS

REVISION.....	3
INTRODUCTION .....	4
STATEMENT OF COMPLIANCE.....	5
MODULATION TYPES, NECESSARY BANDWIDTH, and EMISSION DESIGNATORS.....	6
ADJACENT CHANNEL POWER .....	7
OCCUPIED BANDWIDTH AND SPECTRUM MASKS .....	8
SPURIOUS EMISSIONS (Tx CONDUCTED) .....	25
Tx CONDUCTED EMISSION PLOTS.....	29
TEST EQUIPMENT LIST .....	41
ANNEX 1 – AUTOMATED EMISSIONS TEST SETUP DETAILS .....	42

## REVISION

<b>Date</b>	<b>Revision</b>	<b>Comments</b>
10-April-2012	1	Initial test report



HARDWARE & SOFTWARE Details:

FUNCTIONAL DESCRIPTION	FIRMWARE VERSION	HARDWARE VERSION
Reciter	p25-p25.0.08.00.0002.0002	00.00
Power Amplifier	0.01.00.trunk.20120322091717-jenkins-r0.3.5	00.01
Power Management Unit	0314	00.03
Front Panel	0.01.00.trunk.20120322091720-jenkins-r4.5	00.01

TEST CONDITIONS

All testing was performed between 28<sup>th</sup> March 2012 → 10<sup>th</sup> April 2012, and under the following conditions:

Ambient temperature: 20°C → 30°C  
Relative Humidity: 20% → 75%  
Standard Test Voltage 120 V<sub>AC</sub>

Test Frequency Pair 769.06875 MHz (Tx) / 799.08675 MHz (Rx) used for adjacent channel power measurement

External 10 MHz Frequency Reference was used on the spectrum analyzer for all tests..

## STATEMENT OF COMPLIANCE

The TBCK4B base station transceiver as tested in this report was found to conform to the following standards:

**FCC CFR 47 Part 90**

**RSS-119 Issue 11 & RSS-Gen Issue 3**

## MODULATION TYPES, NECESSARY BANDWIDTH, and EMISSION DESIGNATORS

### MODULATION TYPES:

D7W	H-DQPSK	6000 symbols/sec	12000 bps
D7W	H-D8PSK	4000 symbols/sec	12000 bps

### CHANNEL SPACINGS:

12.5 kHz

### EMISSION DESIGNATORS:

H-DQPSK                      9k80D7W

H-D8PSK                      6k80D7W

#### H-DQPSK Digital Data 12.5 kHz Bandwidth

99% bandwidth  
= 9.8 kHz

Emission Designator

**9K80D7W**

D7W represents two or more channels containing quantized or digital information combining of two modulation modes simultaneously (amplitude + angle) for a data/telephony combination.

#### H-D8PSK Digital Data 12.5 kHz Bandwidth

99% bandwidth  
= 6.8 kHz

Emission Designator

**6K80D7W**

D7W represents two or more channels containing quantized or digital information combining of two modulation modes simultaneously (amplitude + angle) for a data/telephony combination.

**TEST RESULTS**

**ADJACENT CHANNEL POWER**

SPECIFICATION: FCC 47 CFR 90.543

MEASUREMENT PROCEDURE:

1. Refer Annex 1 for equipment set up.
2. The transmitter is modulated with H-DQPSK and H-D8PSK modulating signals.
3. The test is performed in accordance with 47 CFR 90.543

LIMIT CLAUSE: FCC 47 CFR 90.543

MEASUREMENT RESULTS:

H-DQPSK

Tx FREQUENCY: 769.06875 MHz 100 W

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP (dBc)
9.375 kHz	6.25 kHz	-41.35	-43.69	-40
15.625 kHz	6.25 kHz	-73.43	-72.85	-60
21.875 kHz	6.25 kHz	-75.44	-75.03	-60
37.5 kHz	25 kHz	-70.86	-70.98	-60
62.5 kHz	25 kHz	-73.85	-73.82	-65
87.5 kHz	25 kHz	-76.71	-77.05	-65
150 kHz	100 kHz	-75.30	-74.80	-65
250 kHz	100 kHz	-80.83	-80.86	-65
350 kHz	100 kHz	-84.99	-85.02	-65
>400 kHz to 12 MHz	30 kHz (swept)	-80.63		-80
12 MHz to paired receive band	30 kHz (swept)	-87.84		-80
In the paired receive band	30 kHz (swept)	<-100		-100

H-D8PSK

Tx FREQUENCY: 769.06875 MHz 100 W

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP (dBc)
9.375 kHz	6.25 kHz	-70.30	-71.07	-40
15.625 kHz	6.25 kHz	-72.85	-73.61	-60
21.875 kHz	6.25 kHz	-75.01	-74.88	-60
37.5 kHz	25 kHz	-71.21	-71.2	-60
62.5 kHz	25 kHz	-74.04	-74.07	-65
87.5 kHz	25 kHz	-77.30	-76.95	-65
150 kHz	100 kHz	-75.52	-74.86	-65
250 kHz	100 kHz	-80.88	-80.76	-65
350 kHz	100 kHz	-84.69	-84.95	-65
>400 kHz to 12 MHz	30 kHz (swept)	-80.51		-80
12 MHz to paired receive band	30 kHz (swept)	-88.02		-80
In the paired receive band	30 kHz (swept)	<-100		-100

## 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 1 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  
Emission Mask H and G Resolution Bandwidth = 300Hz, Video Bandwidth = 3 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	H-DQPSK, H-D8PSK
Emission Mask H	12.5 kHz Channel Spacing	H-DQPSK, H-D8PSK
Emission Mask G	12.5 kHz Channel Spacing	H-DQPSK, H-D8PSK

### DATA SPEED

H-DQPSK	12.5 kHz Channel Spacing	12000 bps
H-D8PSK	12.5 kHz Channel Spacing	12000 bps

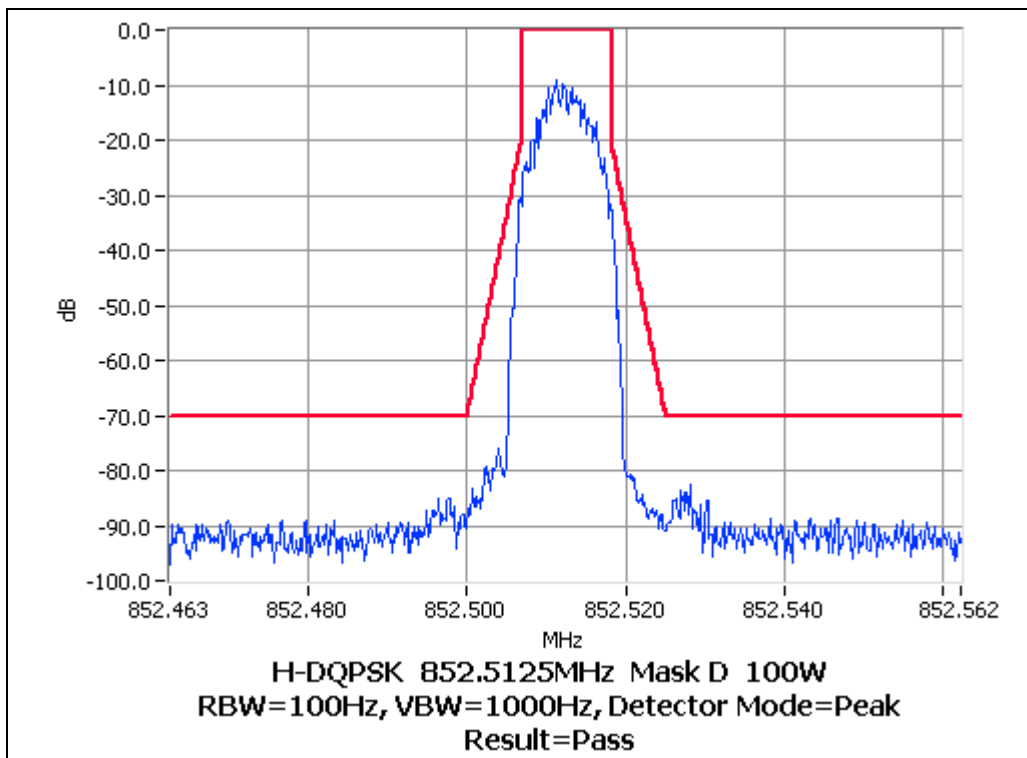
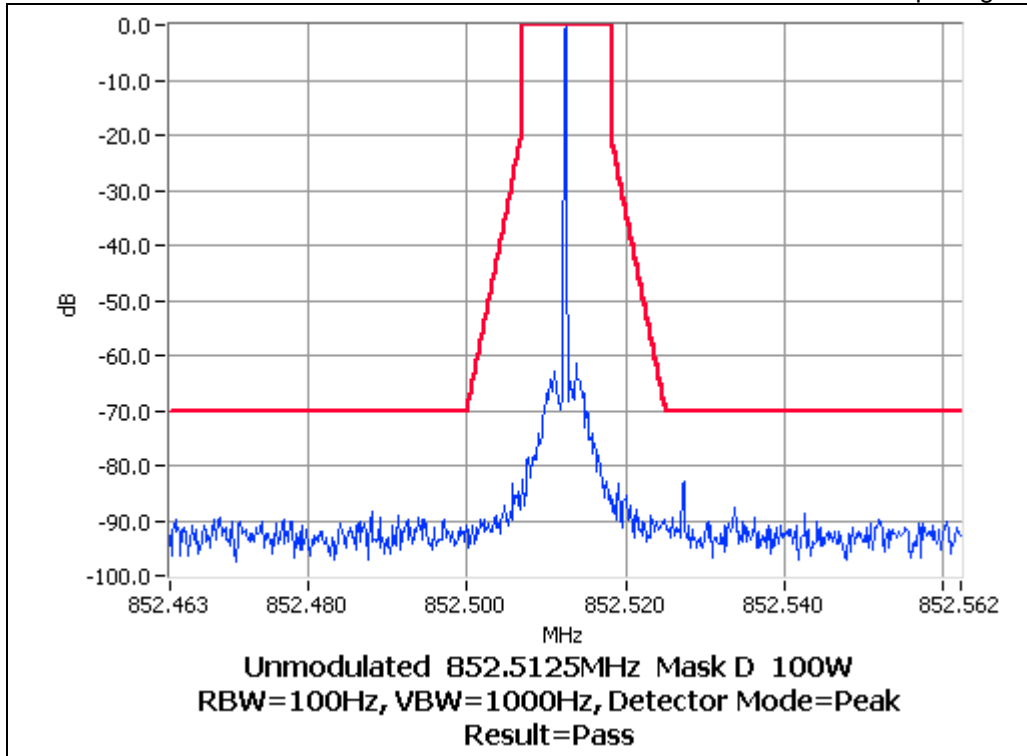


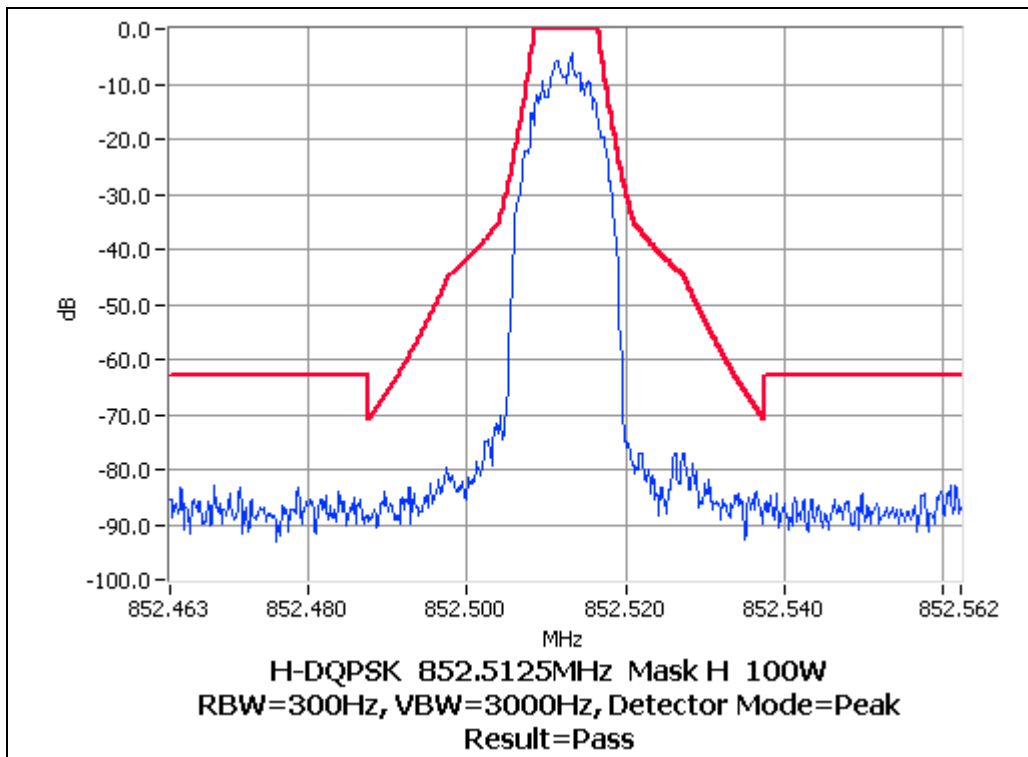
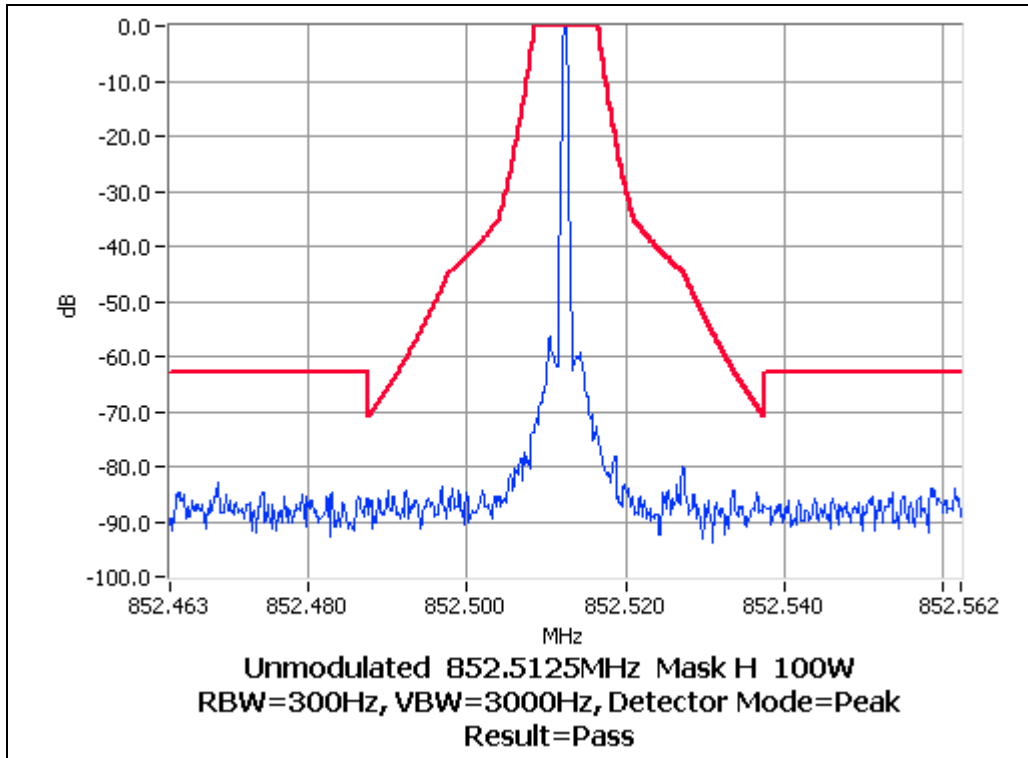
### Occupied Bandwidth and Spectrum Masks

H-DQPSK

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

Tx FREQUENCY: 852.5125 MHz 100 W 12.5 kHz Channel Spacing



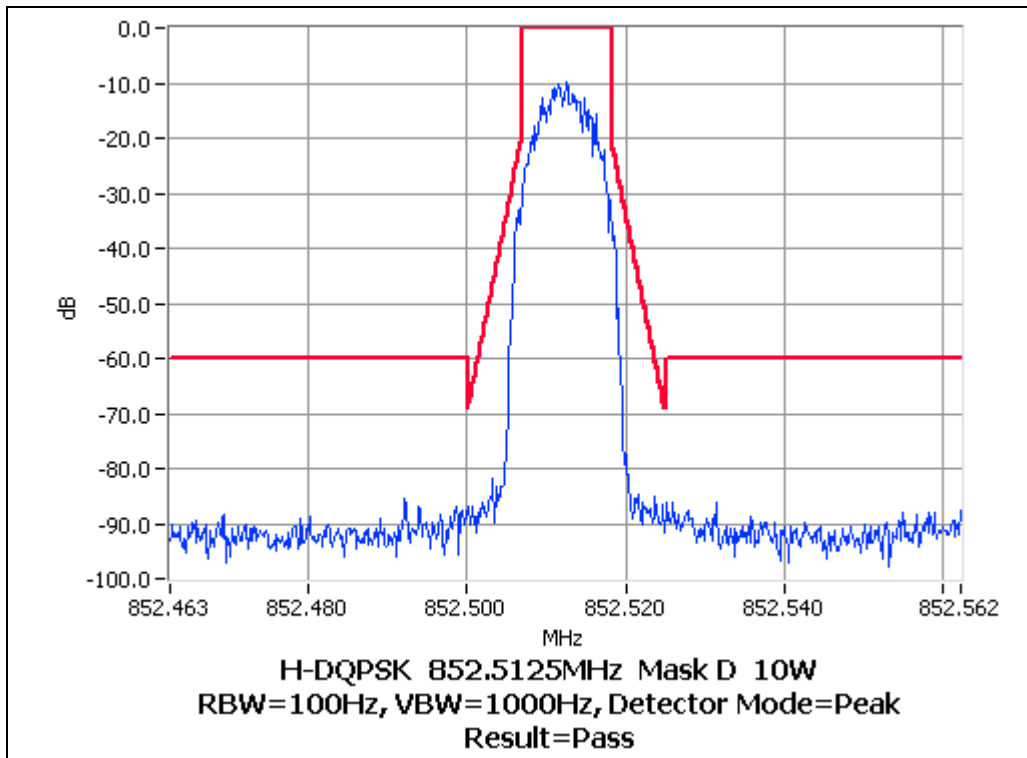
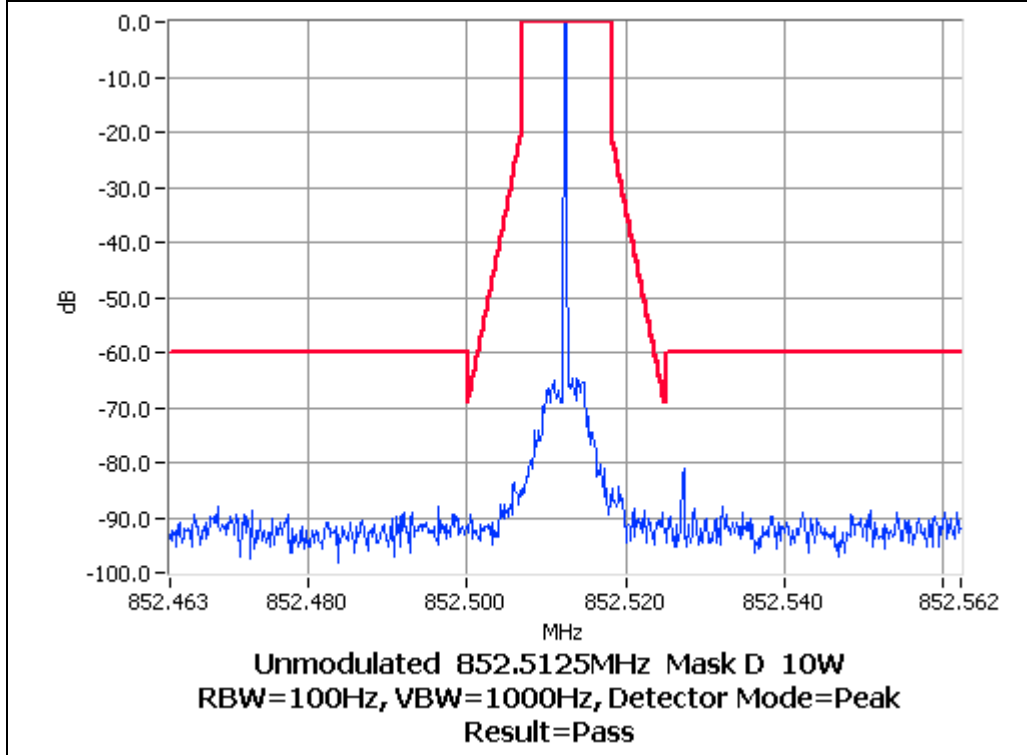


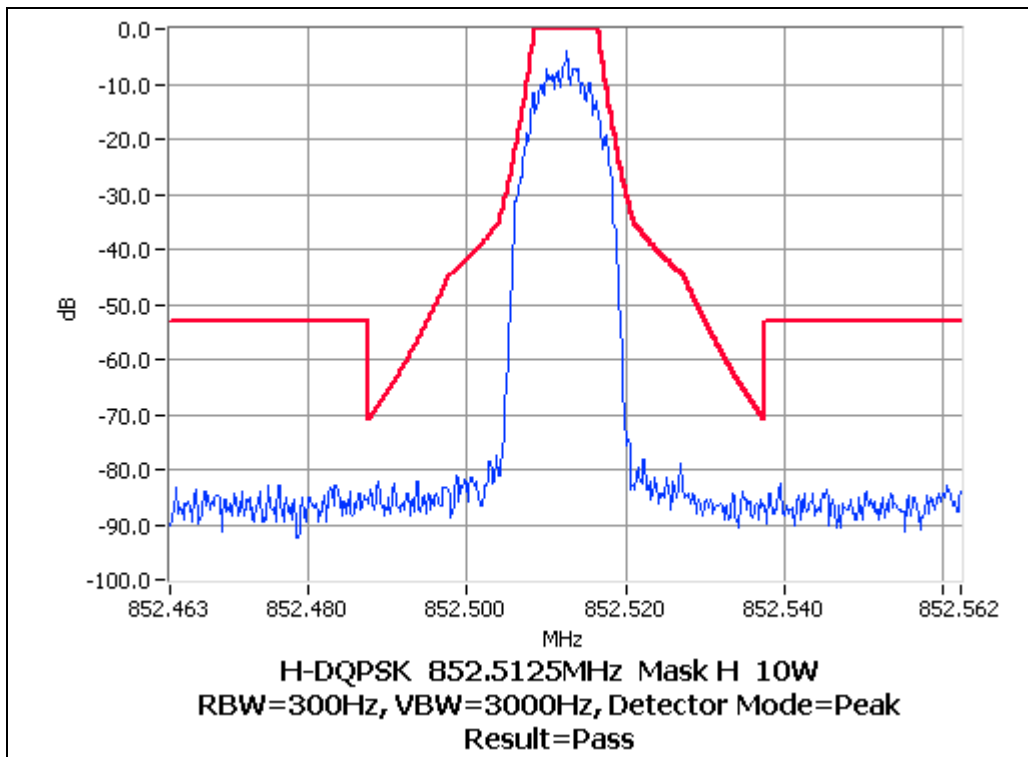
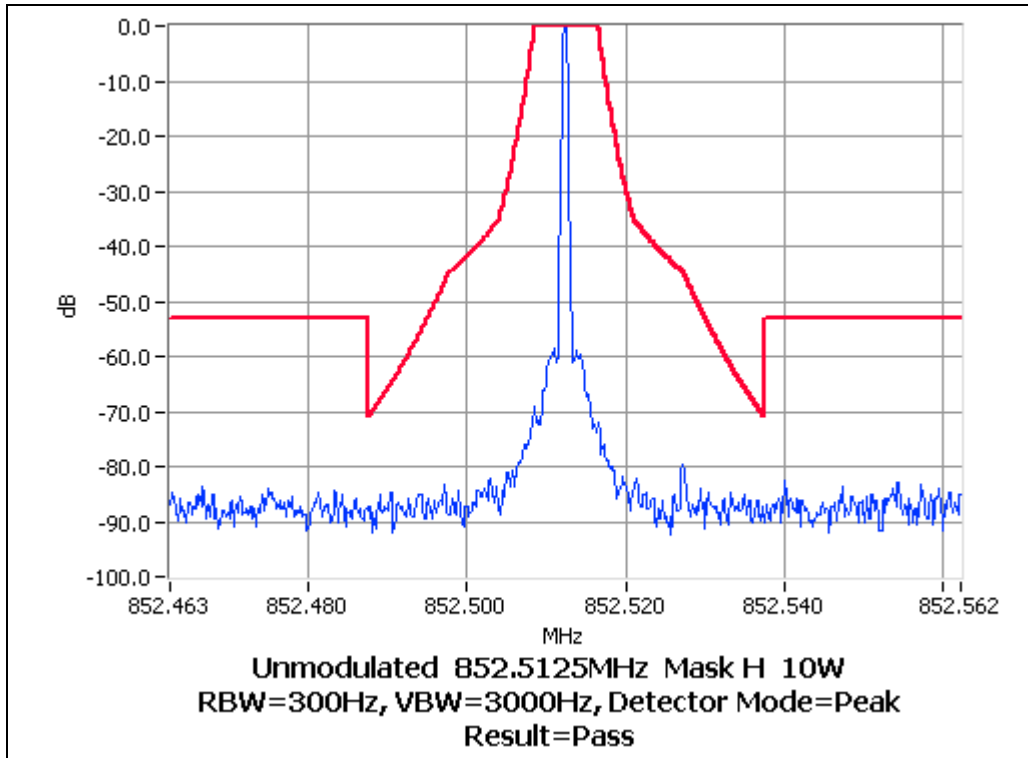
### Occupied Bandwidth and Spectrum Masks

H-DQPSK

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

Tx FREQUENCY: 852.5125 MHz 10 W 12.5 kHz Channel Spacing



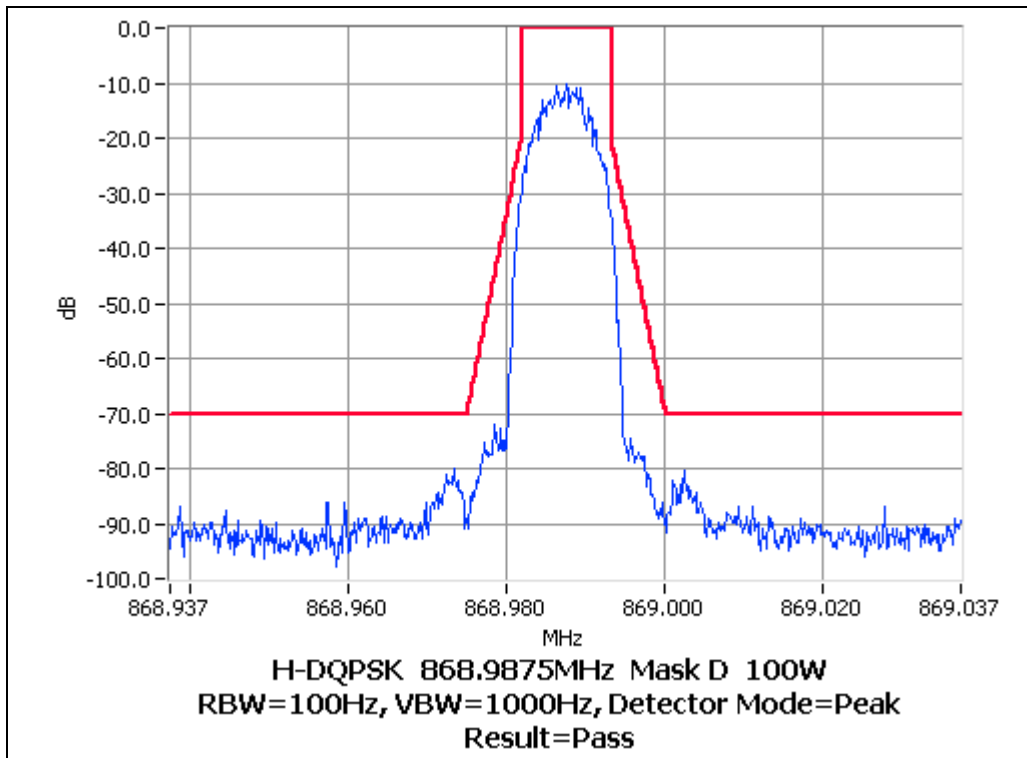
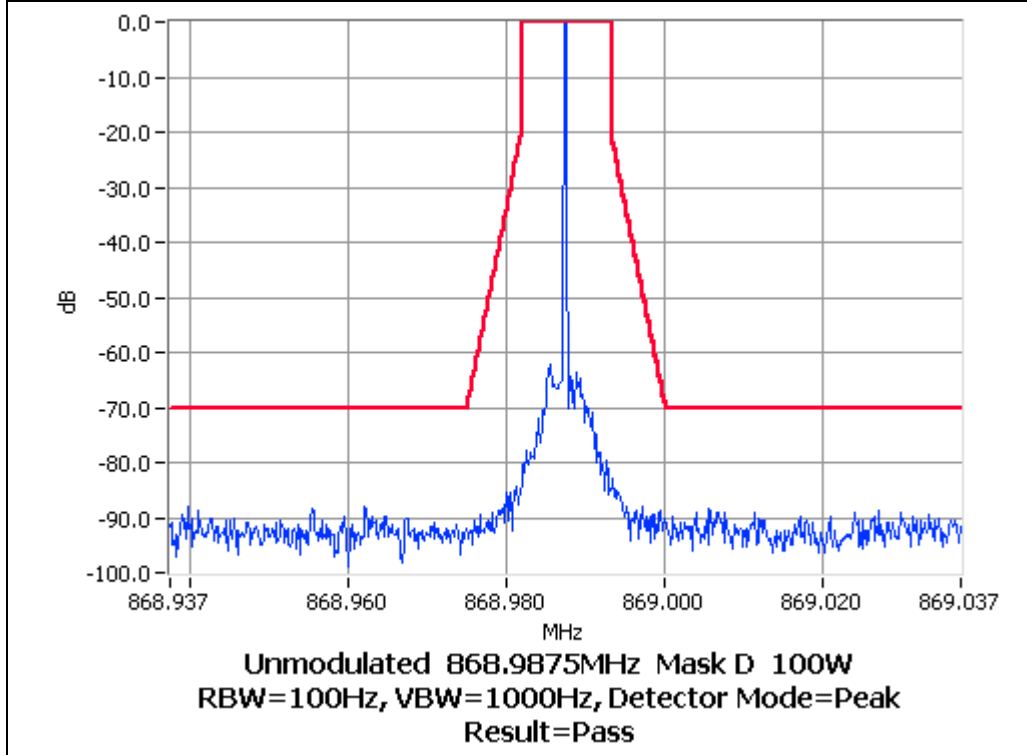


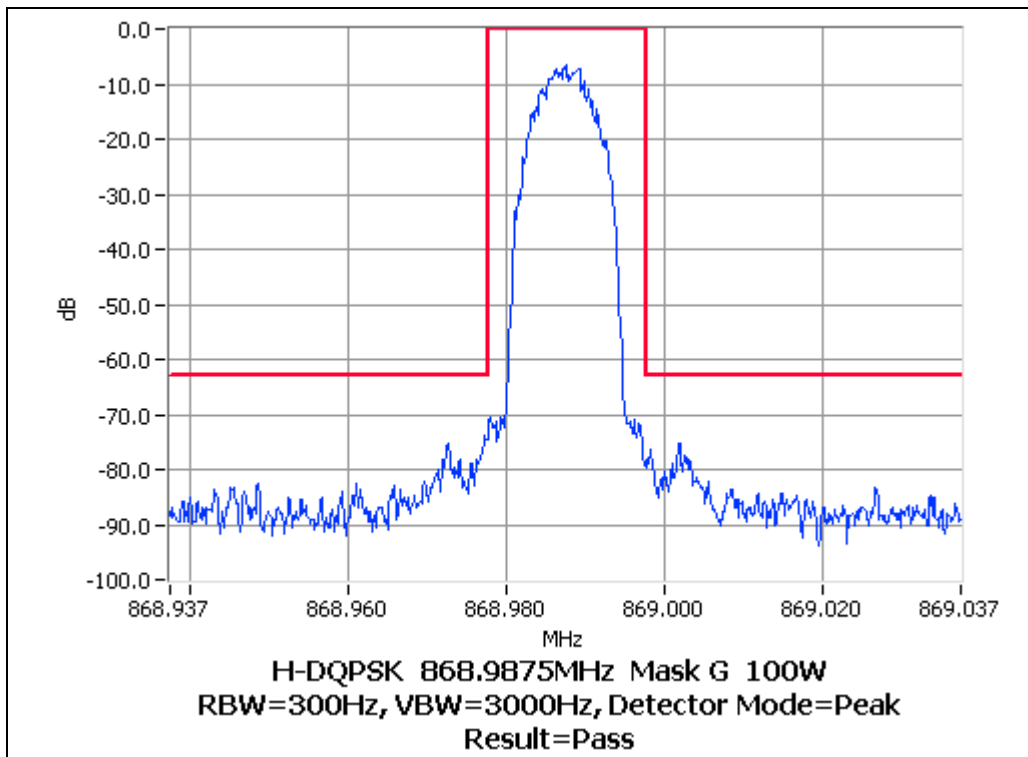
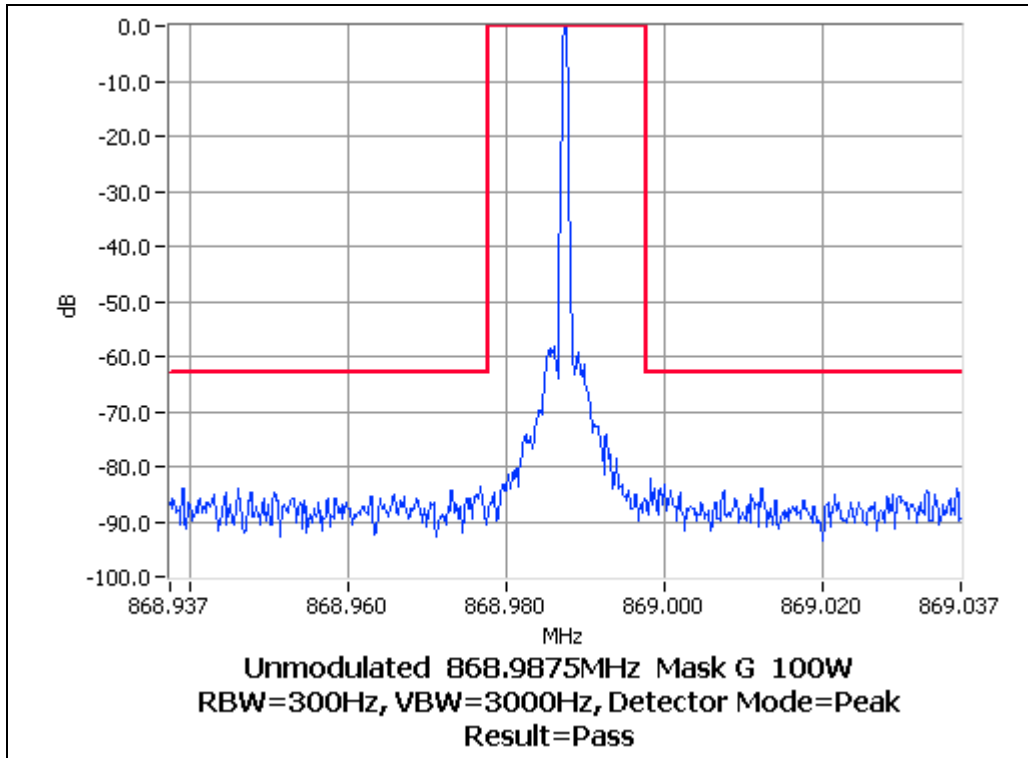
### Occupied Bandwidth and Spectrum Masks

H-DQPSK

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

Tx FREQUENCY: 868.9875 MHz 100 W 12.5 kHz Channel Spacing



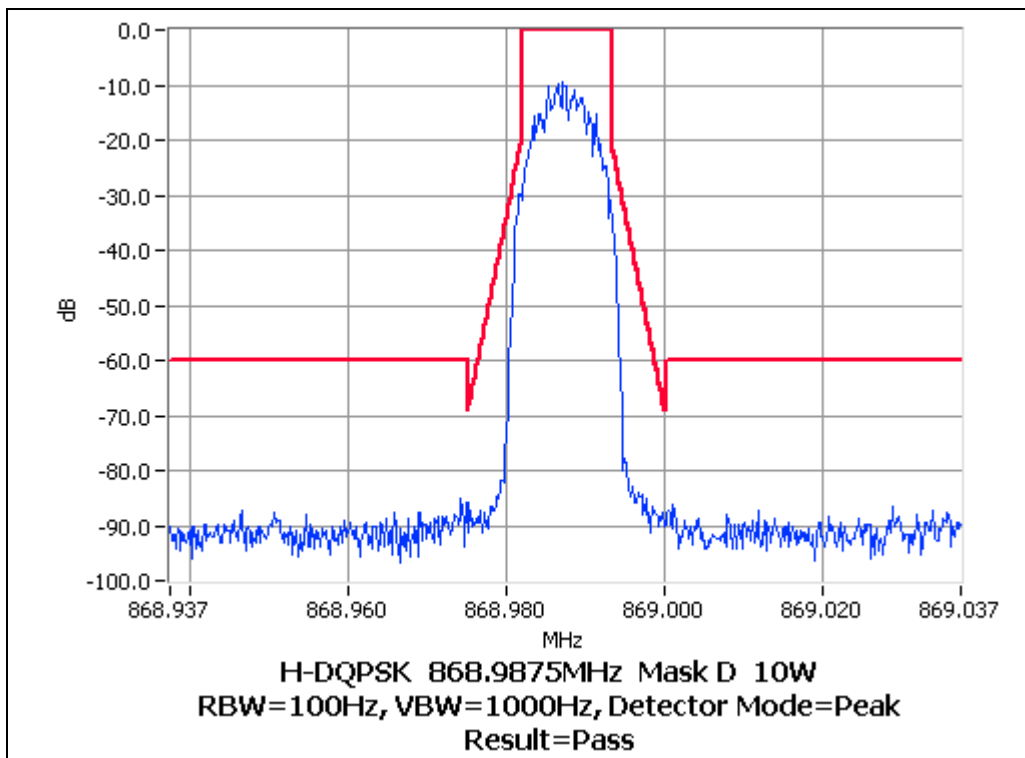
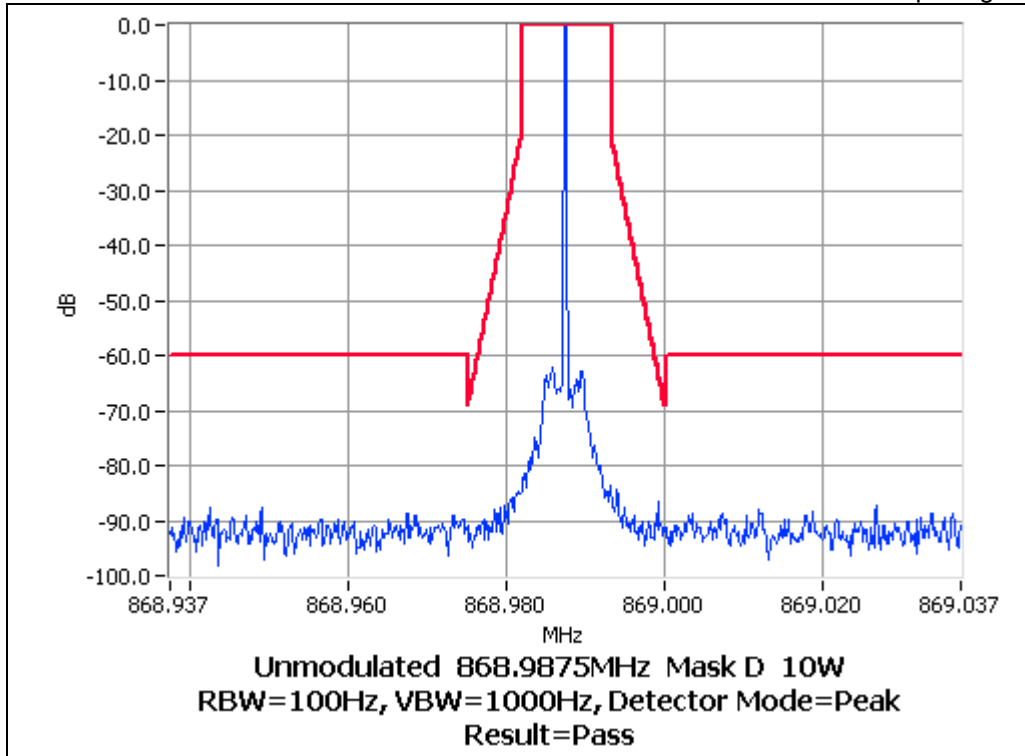


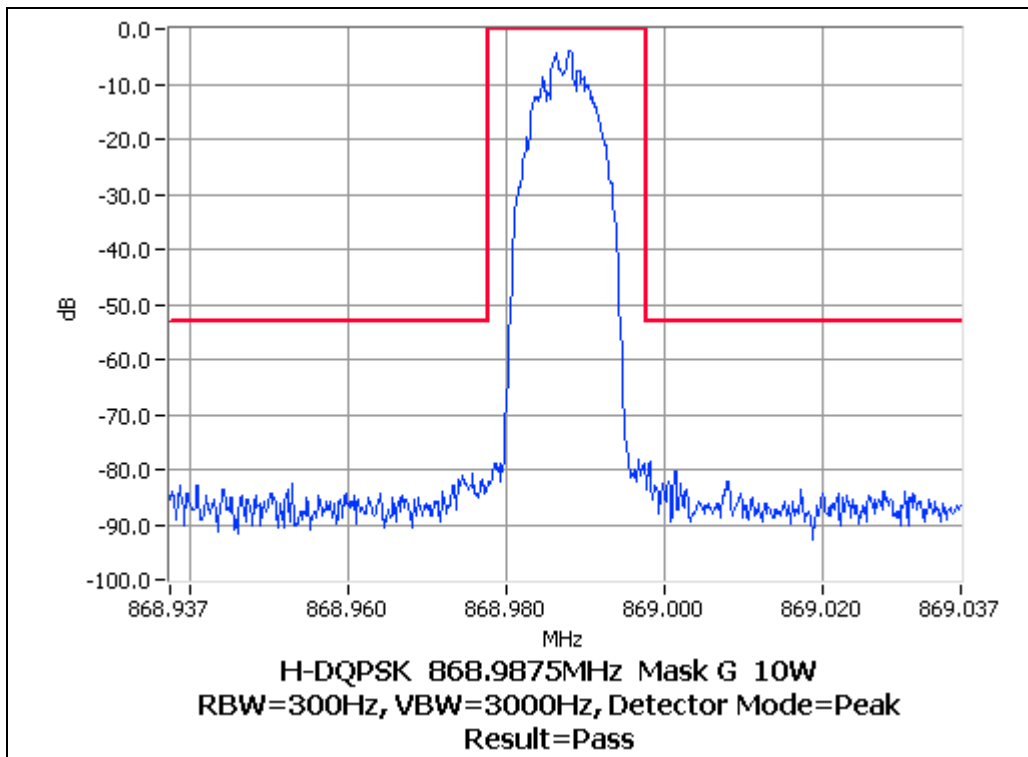
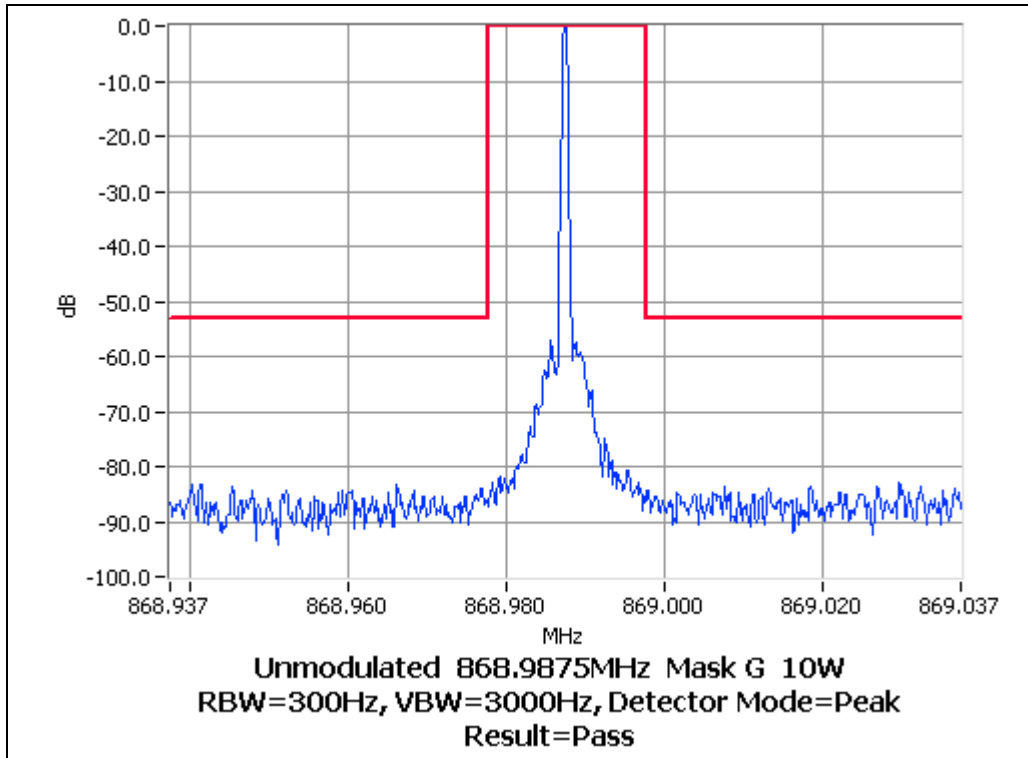
### Occupied Bandwidth and Spectrum Masks

H-DQPSK

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

Tx FREQUENCY: 868.9875 MHz 10 W 12.5 kHz Channel Spacing





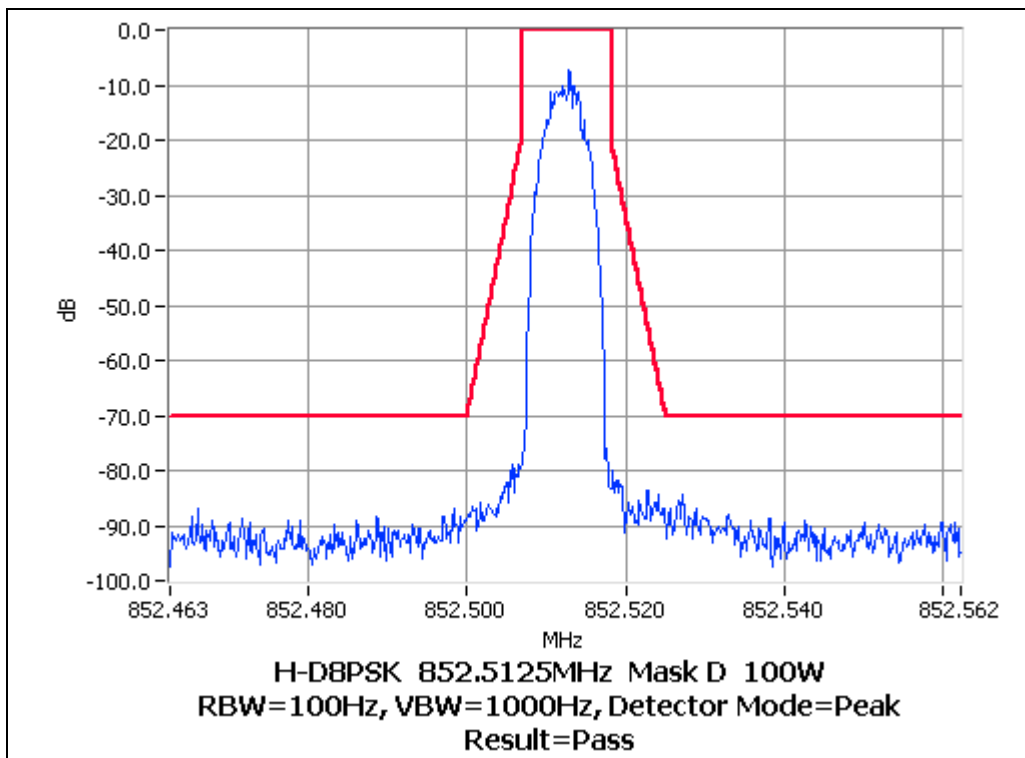
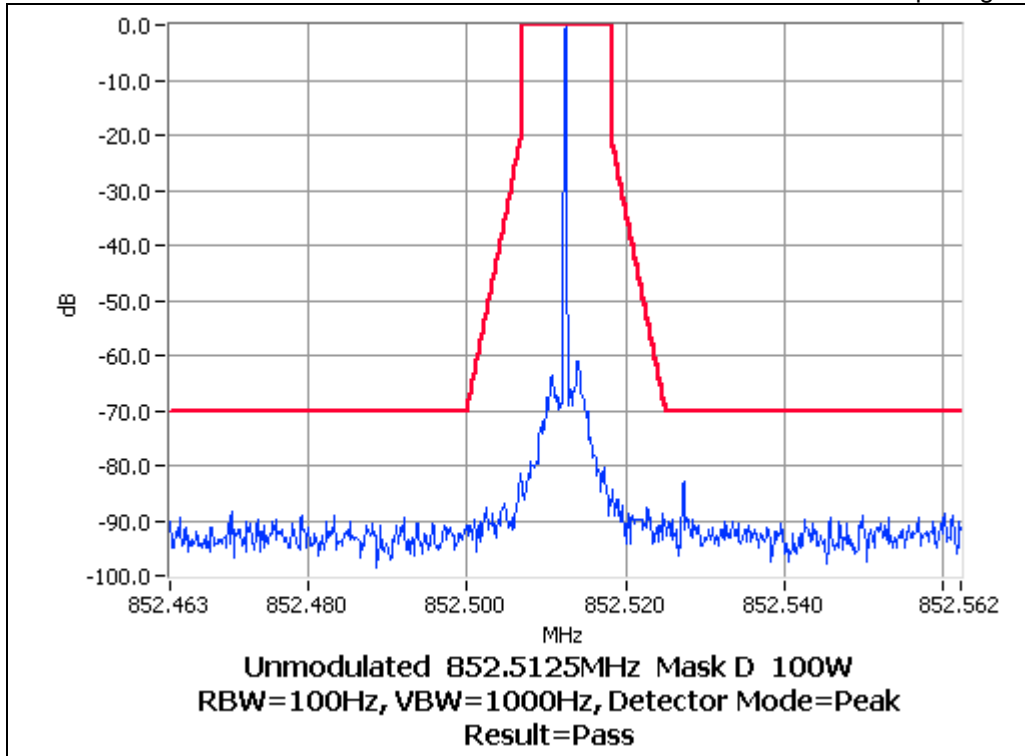


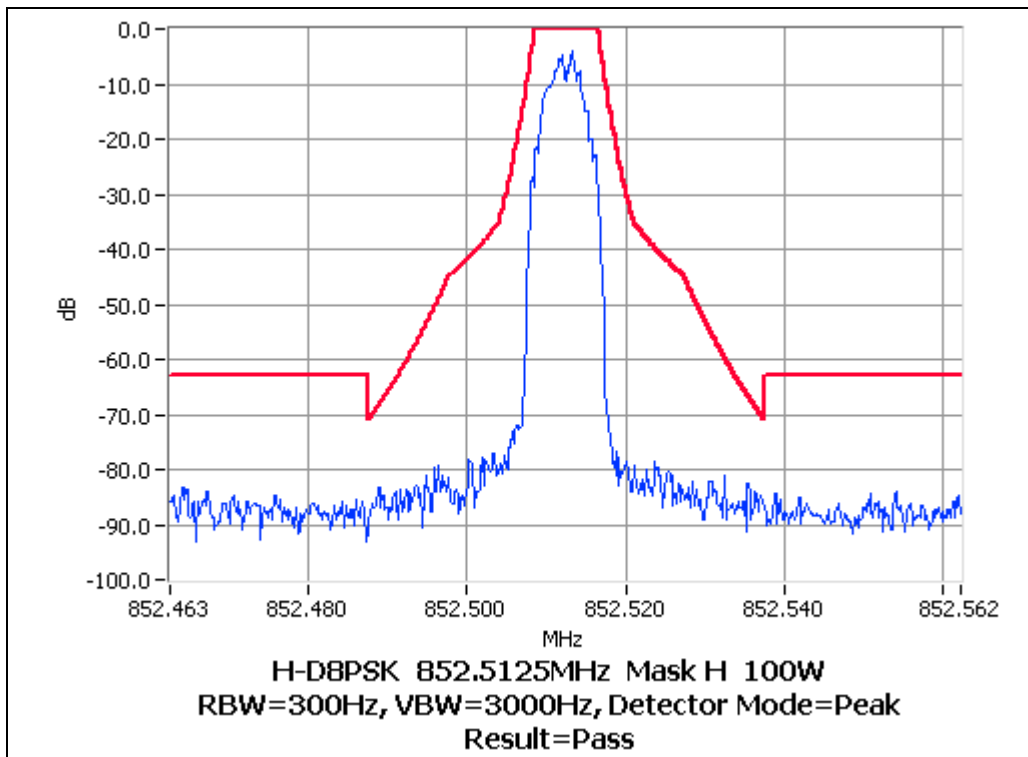
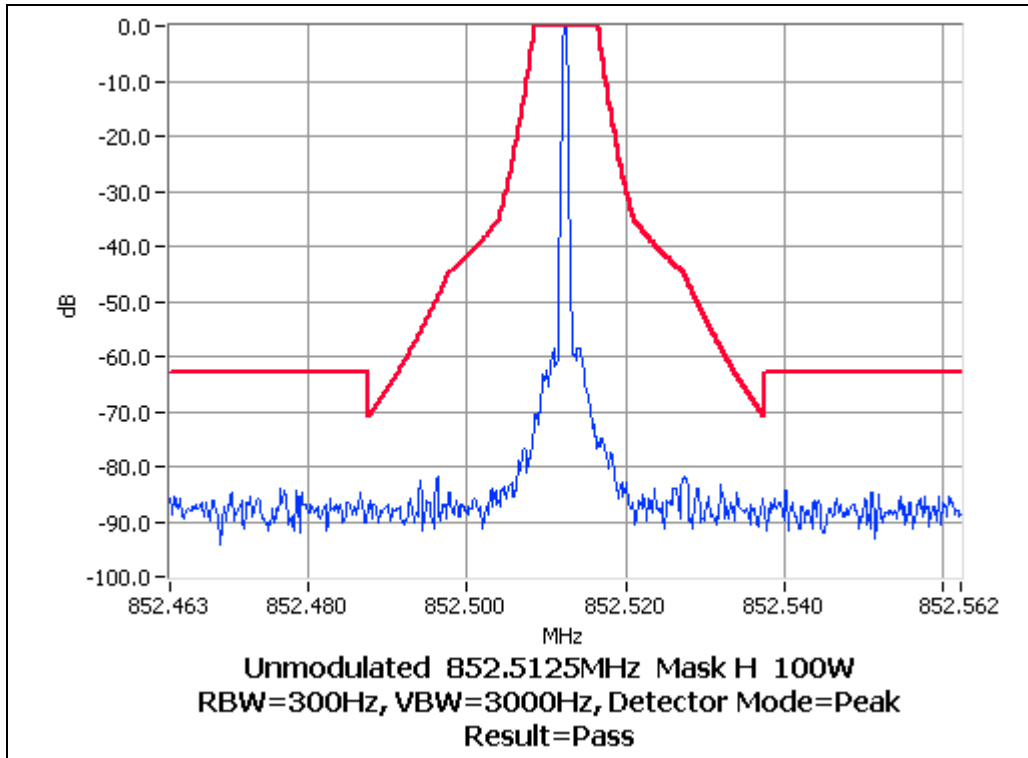
### Occupied Bandwidth and Spectrum Masks

H-D8PSK

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

Tx FREQUENCY: 852.5125 MHz 100 W 12.5 kHz Channel Spacing



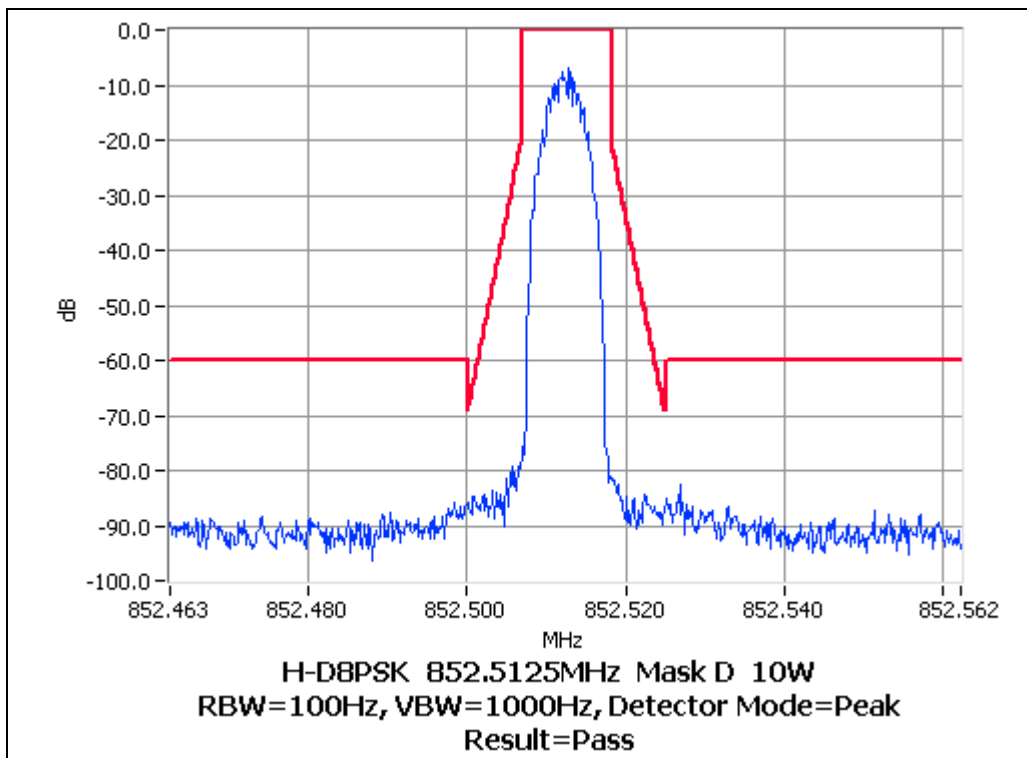
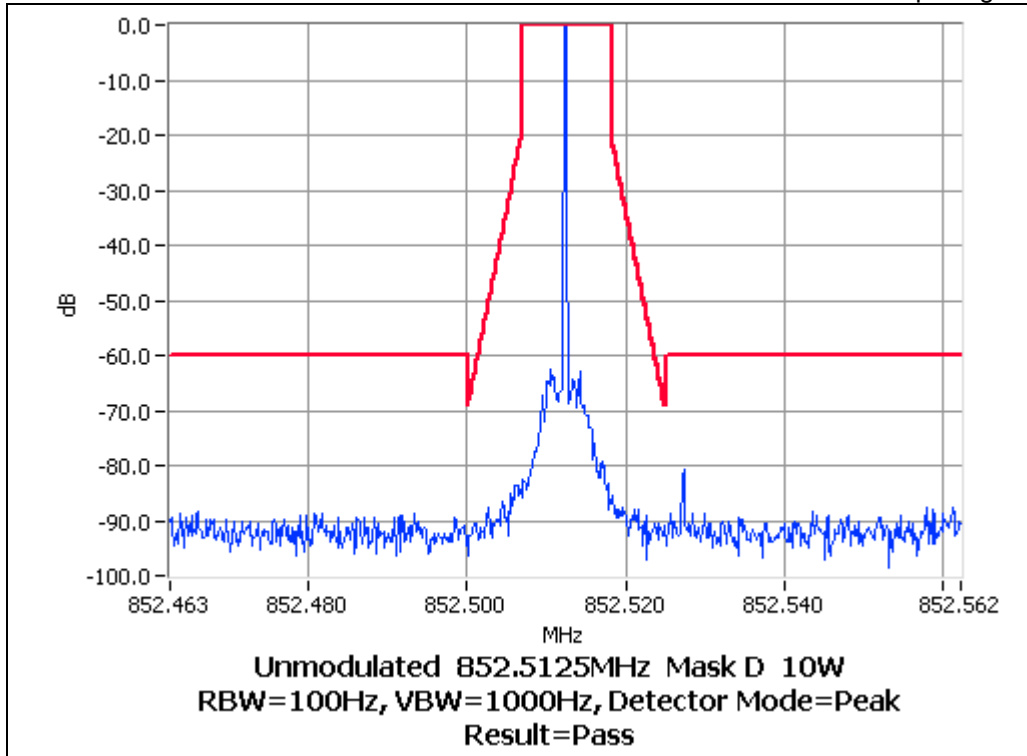


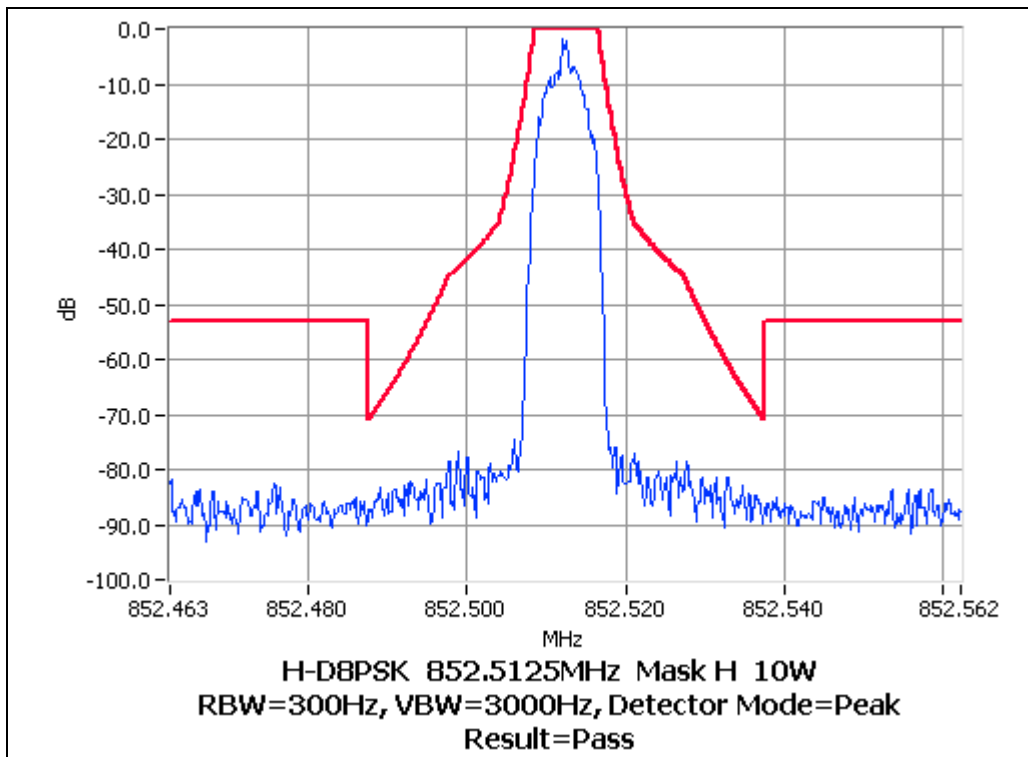
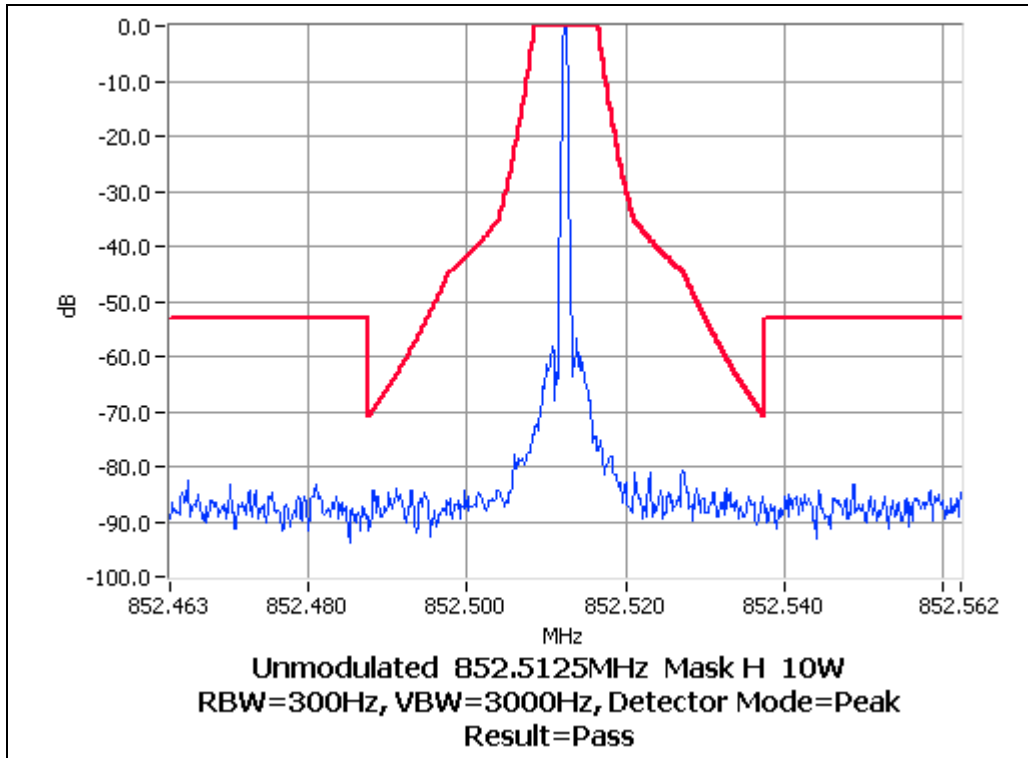
### Occupied Bandwidth and Spectrum Masks

H-D8PSK

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

Tx FREQUENCY: 852.5125 MHz 10 W 12.5 kHz Channel Spacing



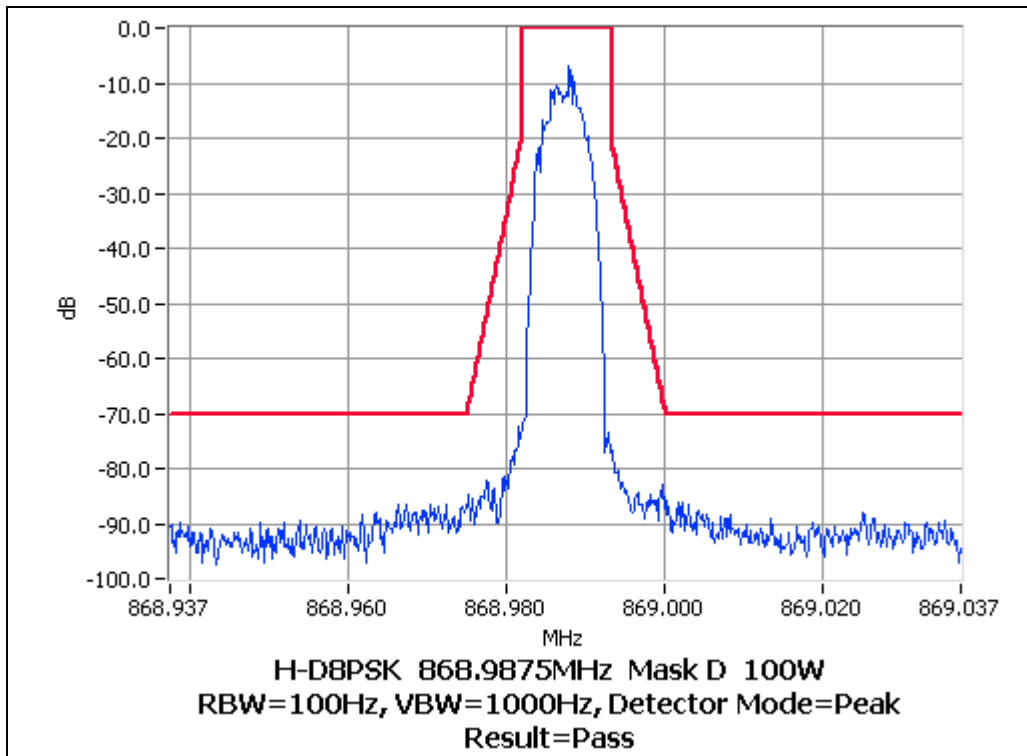
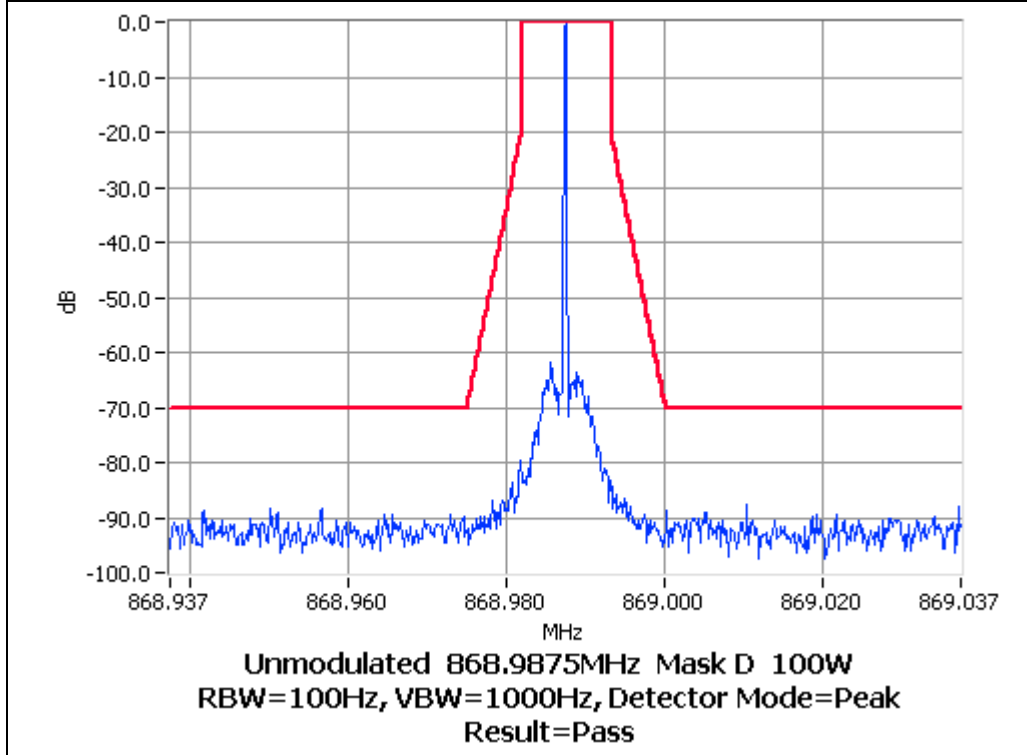


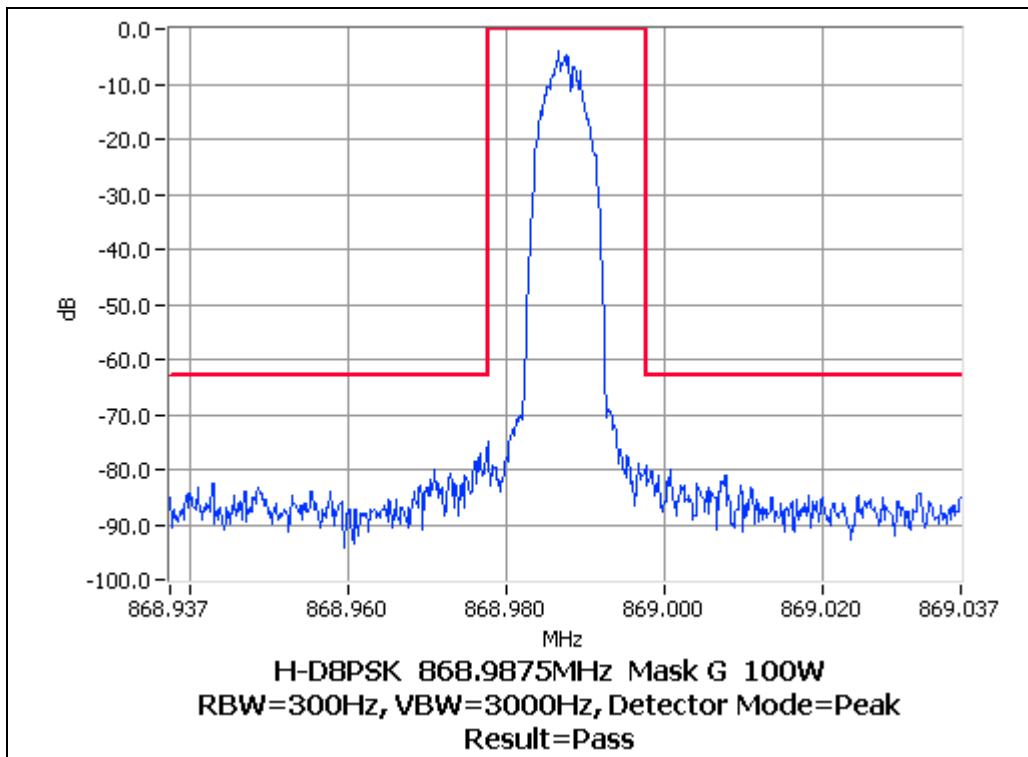
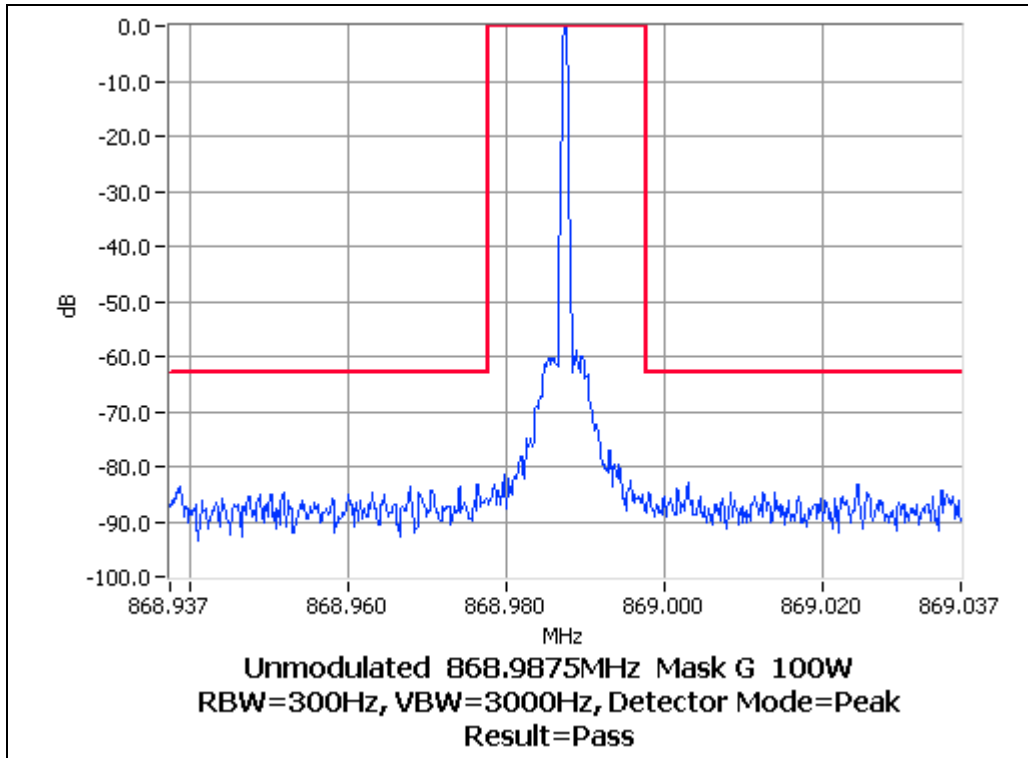
### Occupied Bandwidth and Spectrum Masks

H-D8PSK

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

Tx FREQUENCY: 868.9875 MHz 100 W 12.5 kHz Channel Spacing



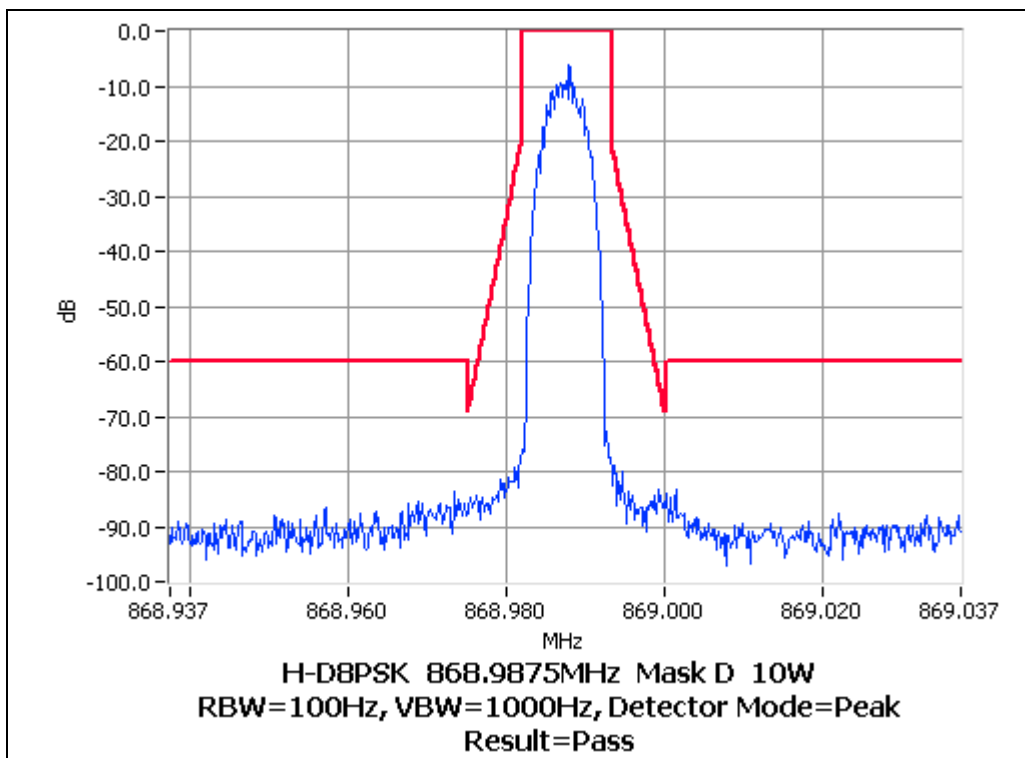
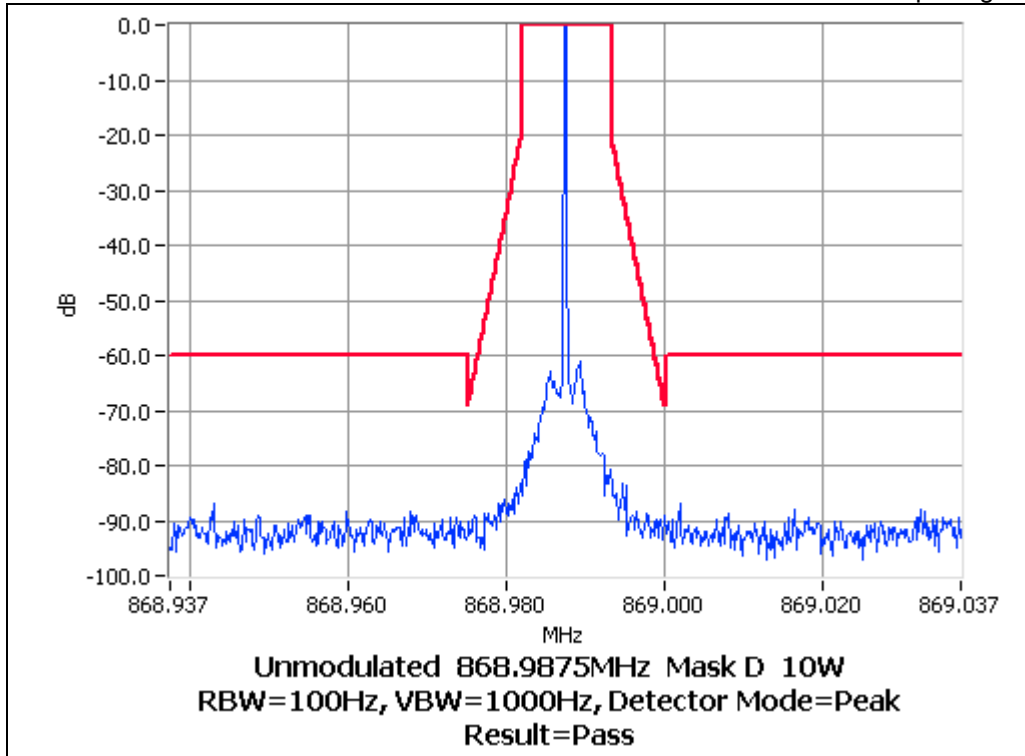


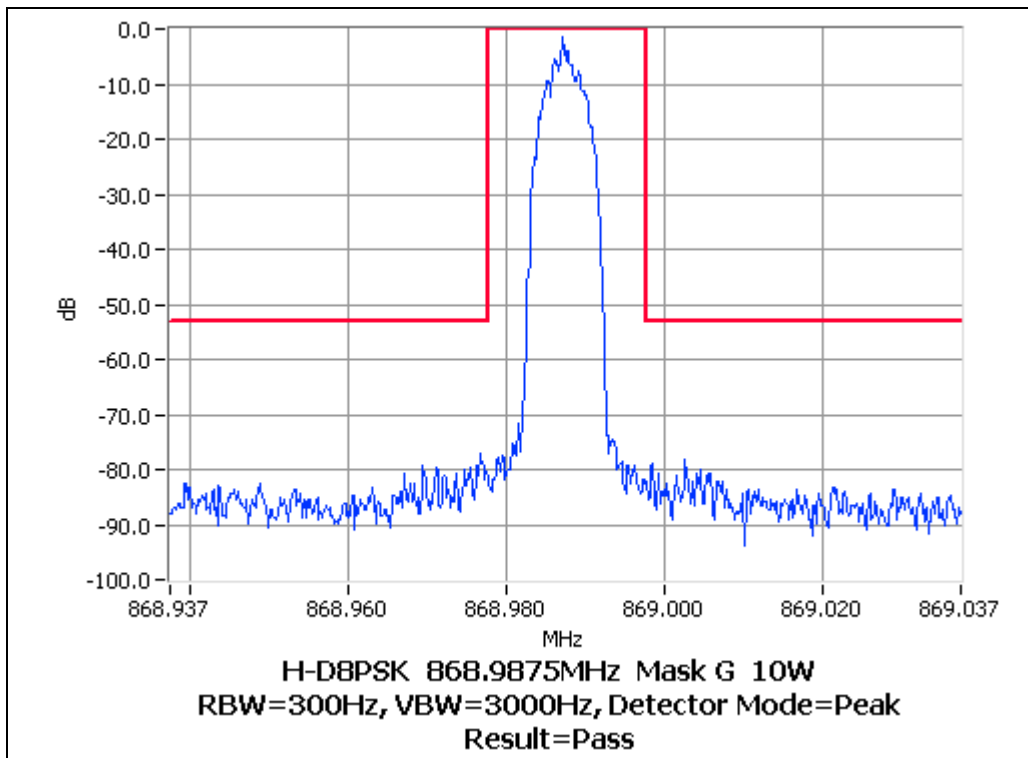
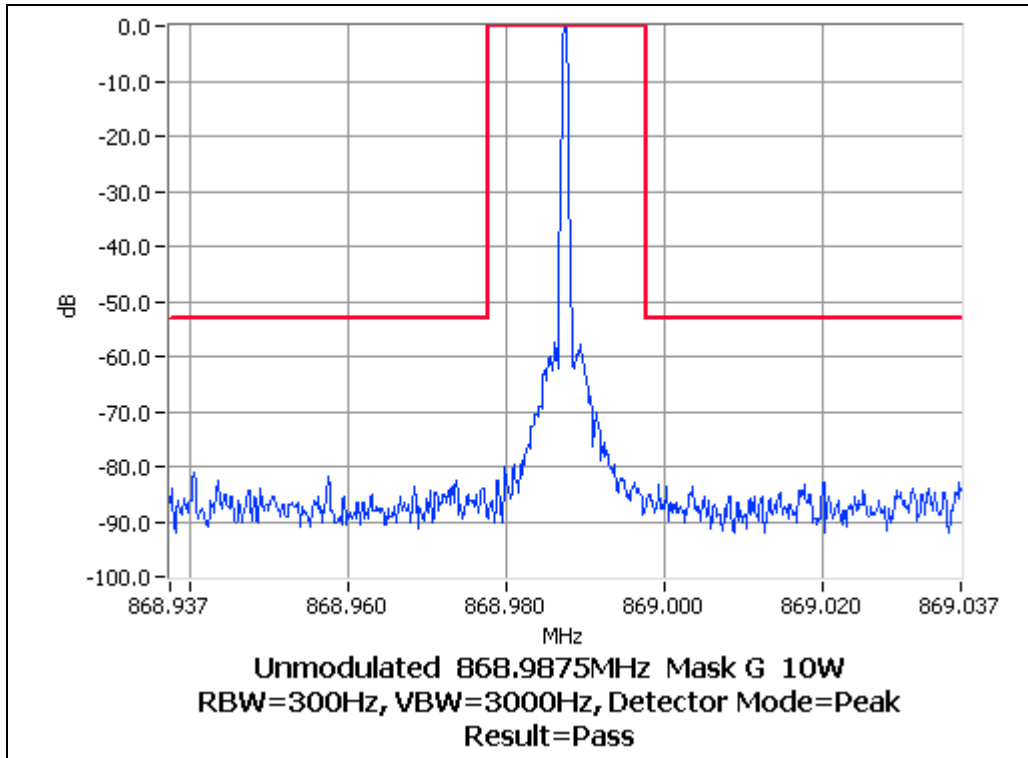
### Occupied Bandwidth and Spectrum Masks

H-D8PSK

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

Tx FREQUENCY: 868.9875 MHz 10 W 12.5 kHz Channel Spacing







## SPURIOUS EMISSIONS (Tx CONDUCTED)

SPECIFICATIONS: FCC 47 CFR 2.1051 RSS-119 5.8

GUIDE: TIA/EIA-603D 2.2.13

### MEASUREMENT PROCEDURE:

1. Refer Annex 1 for equipment set up.
2. The frequency range examined was from the lowest frequency generated within the EUT, to a frequency higher than the 10<sup>th</sup> Harmonic: 100kHz to Fc-BW  
Fc+ BW to 10Fc GHz
3. A Pre-scan is performed with a resolution bandwidth of 1 kHz, and a video bandwidth of 3 kHz. If any emissions are found to be within 20dB of the limit a second measurement is made with the carrier modulated, and a resolution bandwidth of 10 kHz, and a video bandwidth of 30 kHz.

Spurious emissions which were attenuated by more than 20 dB below the limit were not recorded.

### MEASUREMENT RESULTS:

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

LIMIT CLAUSES: FCC 47 CFR 90.210 RSS-119 5.8

MEASUREMENT UNCERTAINTY:  $\pm 3.0$  dB

### NOTE:

The conducted emissions plots included in this report are indicative only and were not used for measurements.

Actual measurements were performed according to Measurement Procedure above.

Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 90.543 (c) RSS-119 5.8.9.2

Tx FREQUENCY: 769.06875 MHz

H-DQPSK 769.06875 MHz @ 100 W		
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
H-DQPSK 769.06875 MHz @ 10 W		
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

Tx FREQUENCY: 769.06875 MHz

H-D8PSK 769.06875 MHz @ 100 W		
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
769.1218	-25.9	-75.9
H-D8PSK 769.06875 MHz @ 10 W		
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS: FCC CFR 90.543 (c) RSS-119 5.8.9.2

Carrier Output Power Watts	12.5 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
100 W	-13 dBm	-63 dBc
10 W	-13 dBm	-53 dBc

Conducted Emissions - Continued

H-DQPSK		852.5125 MHz @ 100 W	Emission Mask D, G and H
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
H-DQPSK		852.5125 MHz @ 10 W	Emission Mask D, G and H
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

Tx FREQUENCY: 852.5125 MHz

H-D8PSK		852.5125 MHz @ 100 W	Emission Mask D, G and H
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
H-D8PSK		852.5125 MHz @ 10 W	Emission Mask D, G and H
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

LIMITS: FCC 47 CFR 90.210      RSS-119      5.8

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
100 W	-20 dBm	-70 dBc
10 W	-20 dBm	-60 dBc
Carrier Output Power Watts	Emission Mask G and H 12.5 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
100 W	-13 dBm	-63 dBc
10 W	-13 dBm	-53 dBc

Conducted Emissions - Continued

Tx FREQUENCY: 868.9875 MHz

H-DQPSK		868.9875 MHz @ 100 W	Emission Mask D, G and H
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
H-DQPSK		868.9875 MHz @ 10 W	Emission Mask D, G and H
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

Tx FREQUENCY: 852.5125 MHz

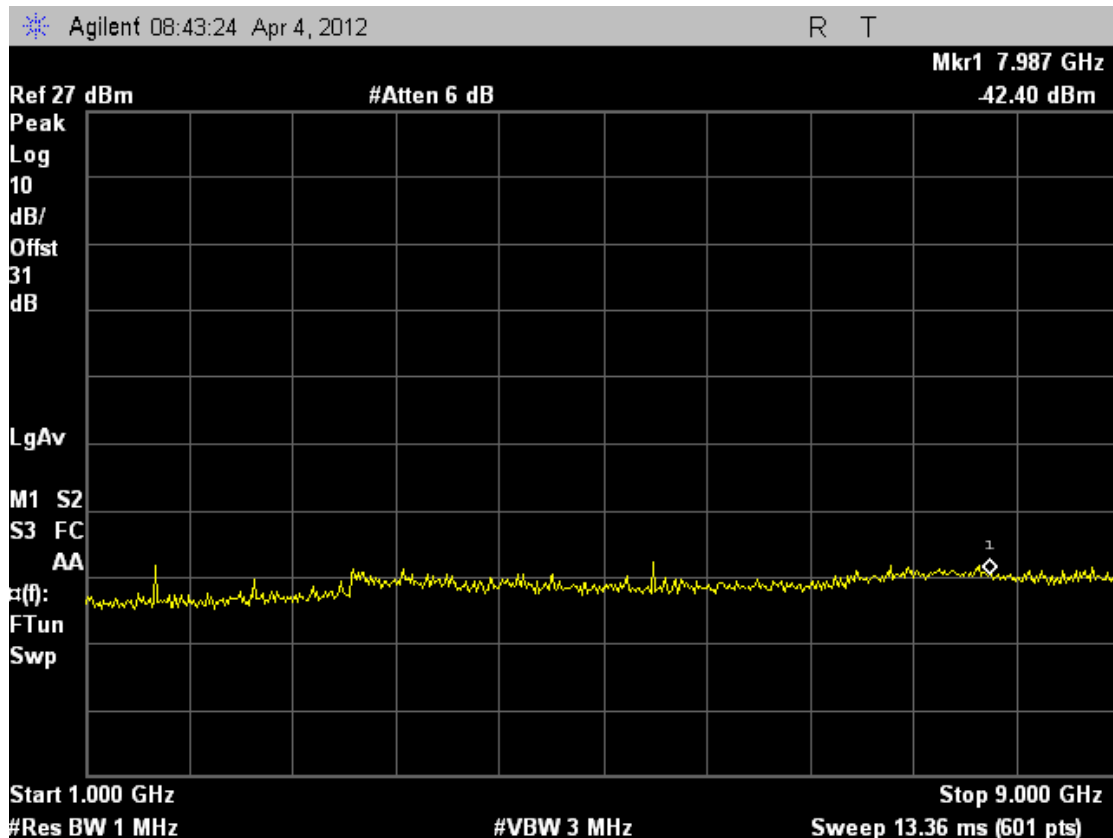
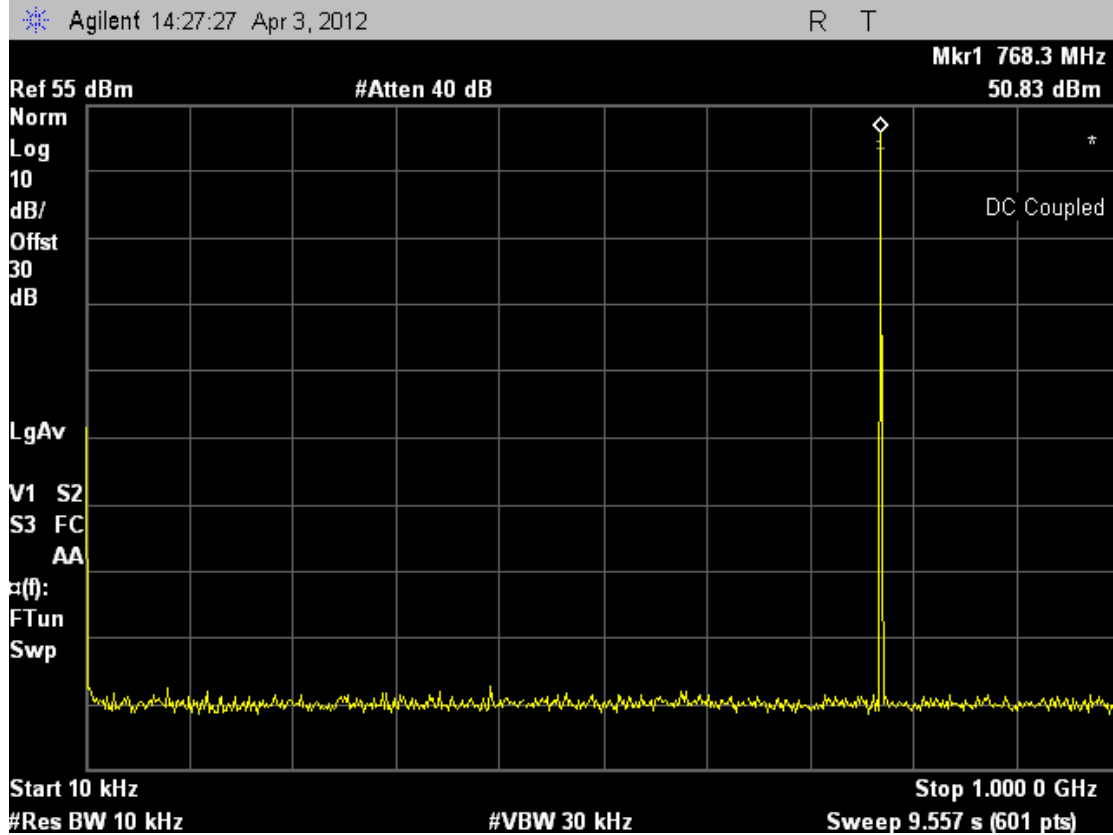
H-D8PSK		868.9875 MHz @ 100 W	Emission Mask D, G and H
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
H-D8PSK		868.9875 MHz @ 10 W	Emission Mask D, G and H
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

LIMITS: FCC 47 CFR 90.210      RSS-119      5.8

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
100 W	-20 dBm	-70 dBc
10 W	-20 dBm	-60 dBc
Carrier Output Power Watts	Emission Mask G and H 12.5 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
100 W	-13 dBm	-63 dBc
10 W	-13 dBm	-53 dBc

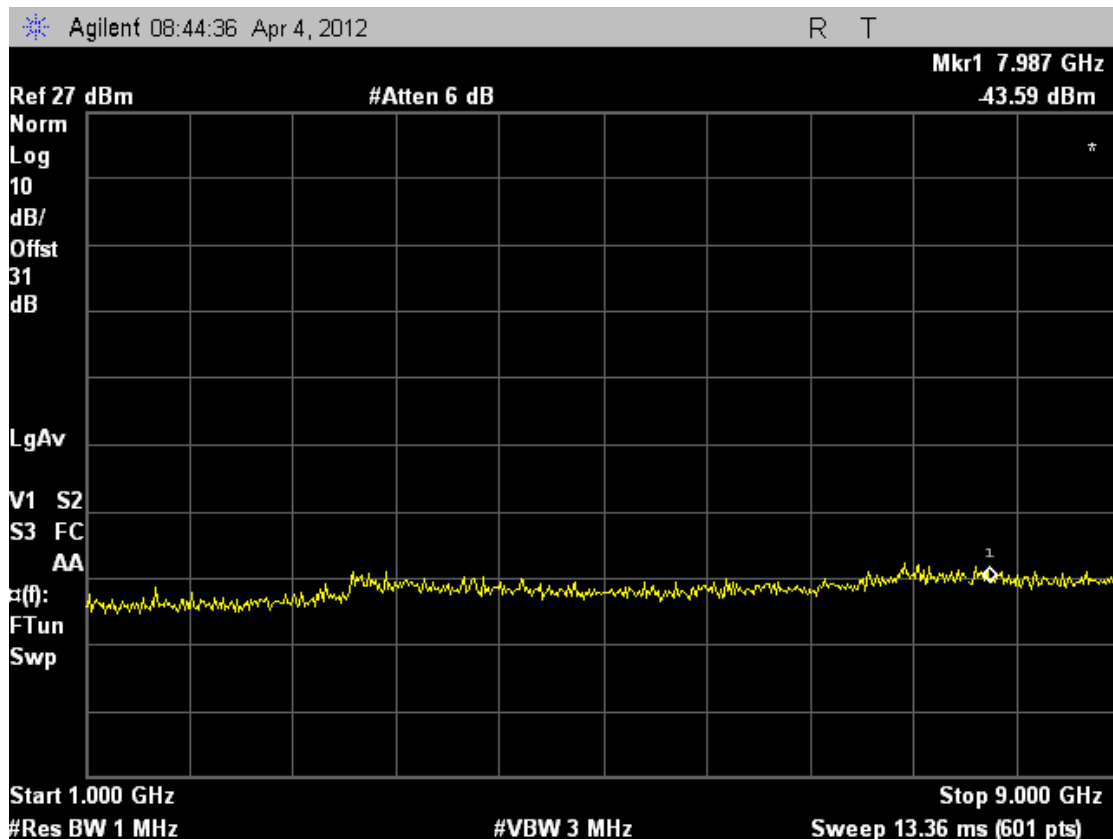
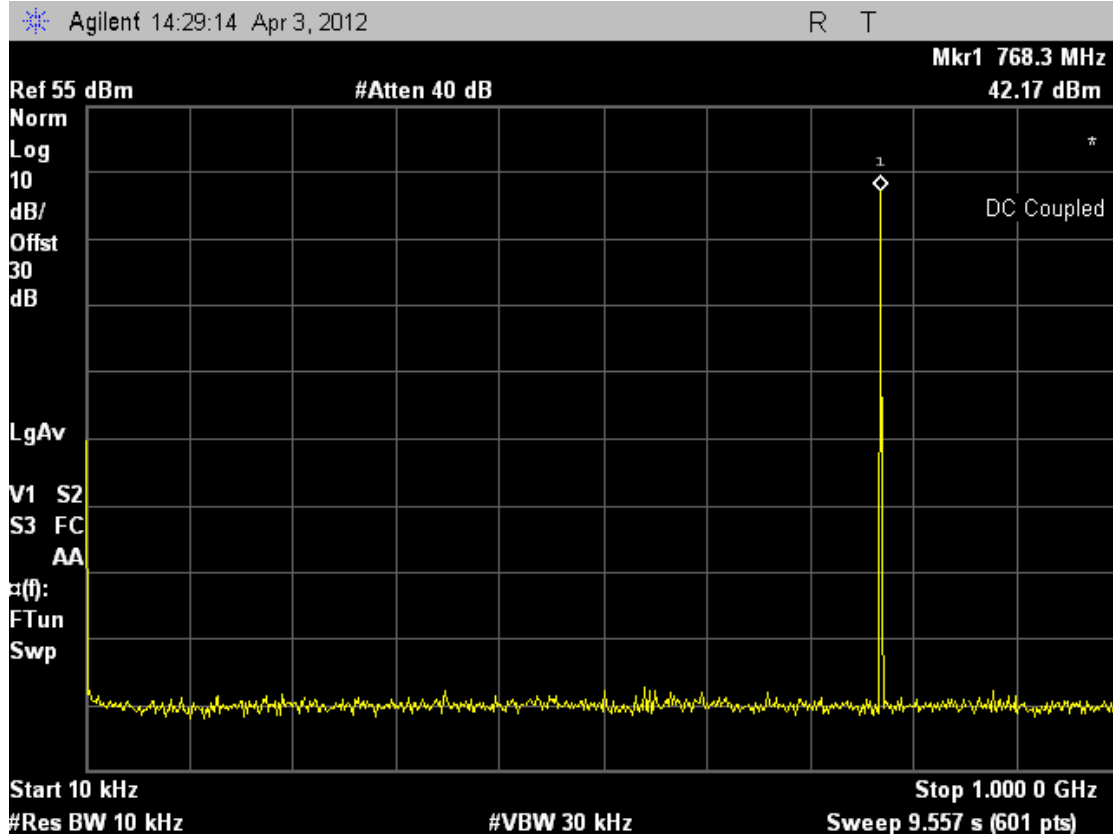
### Tx CONDUCTED EMISSION PLOTS

Tx FREQUENCY: 769.06875 MHz 100 Watts H-DQPSK



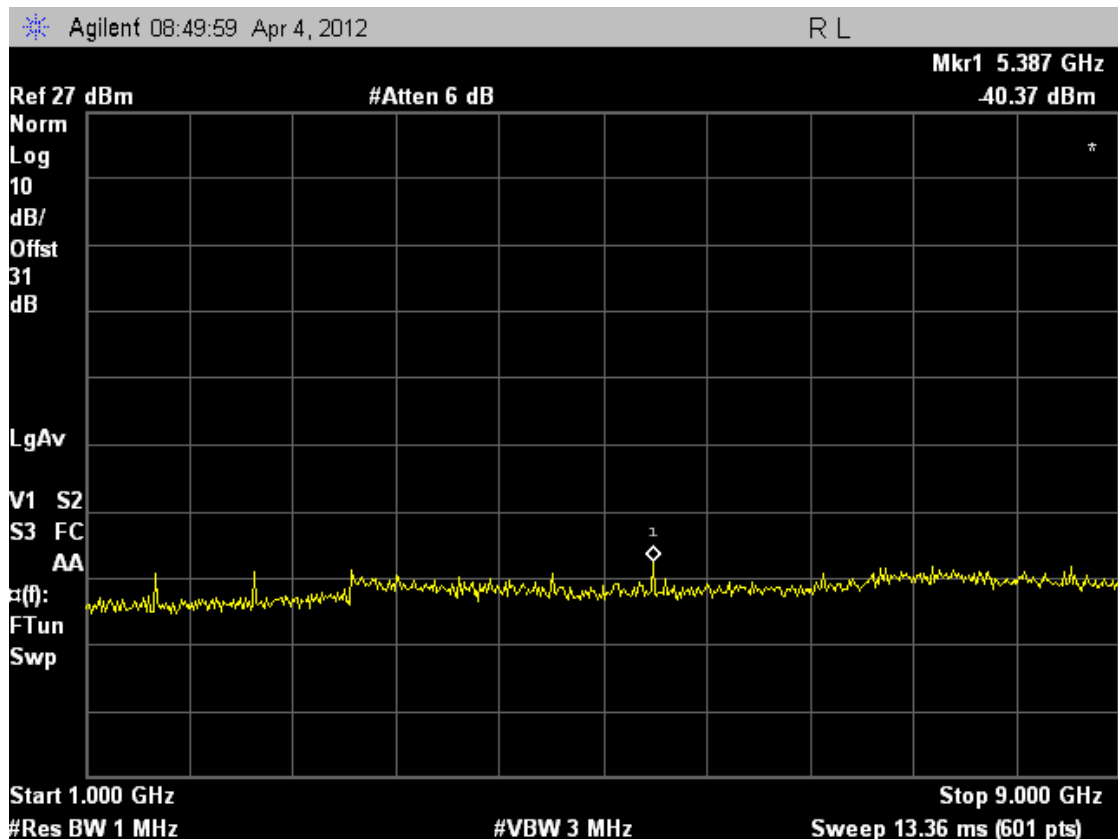
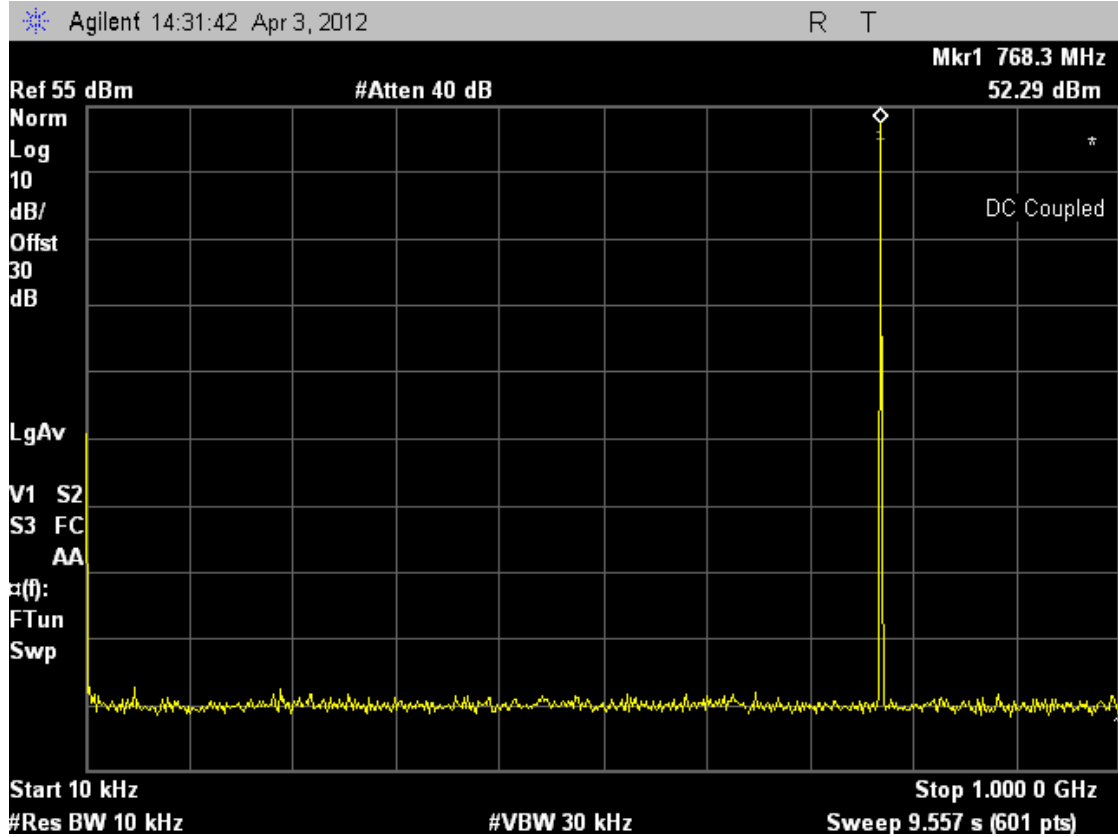
Tx Conducted Emissions Plots - Continued

Tx FREQUENCY: 769.06875 MHz 10 Watts H-DQPSK



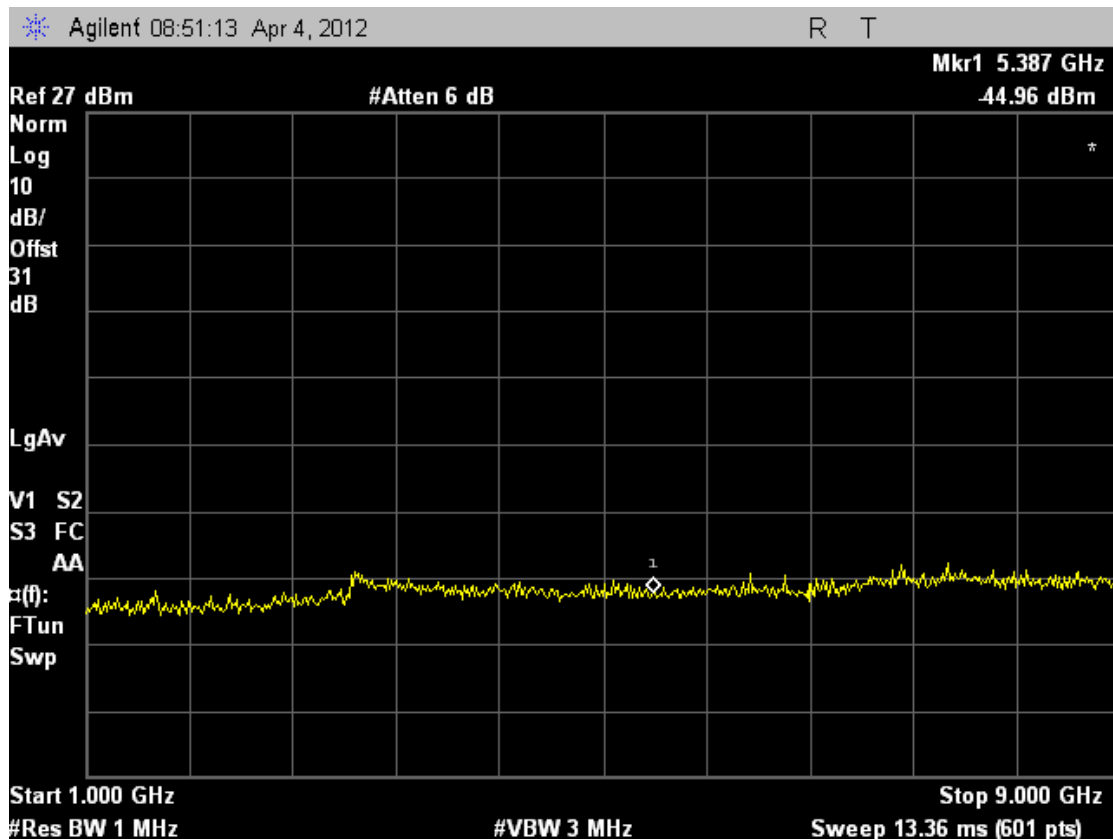
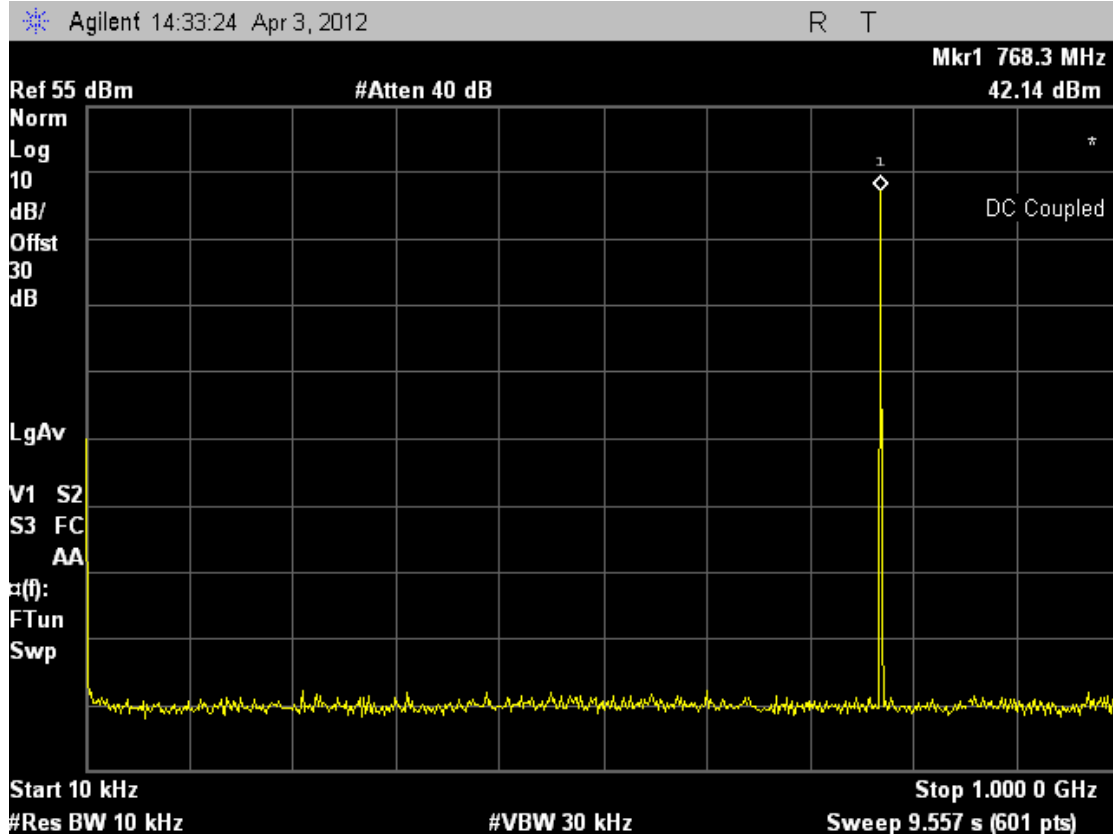
Tx Conducted Emissions Plots - Continued

Tx FREQUENCY: 769.06875 MHz 100 Watts H-D8PSK



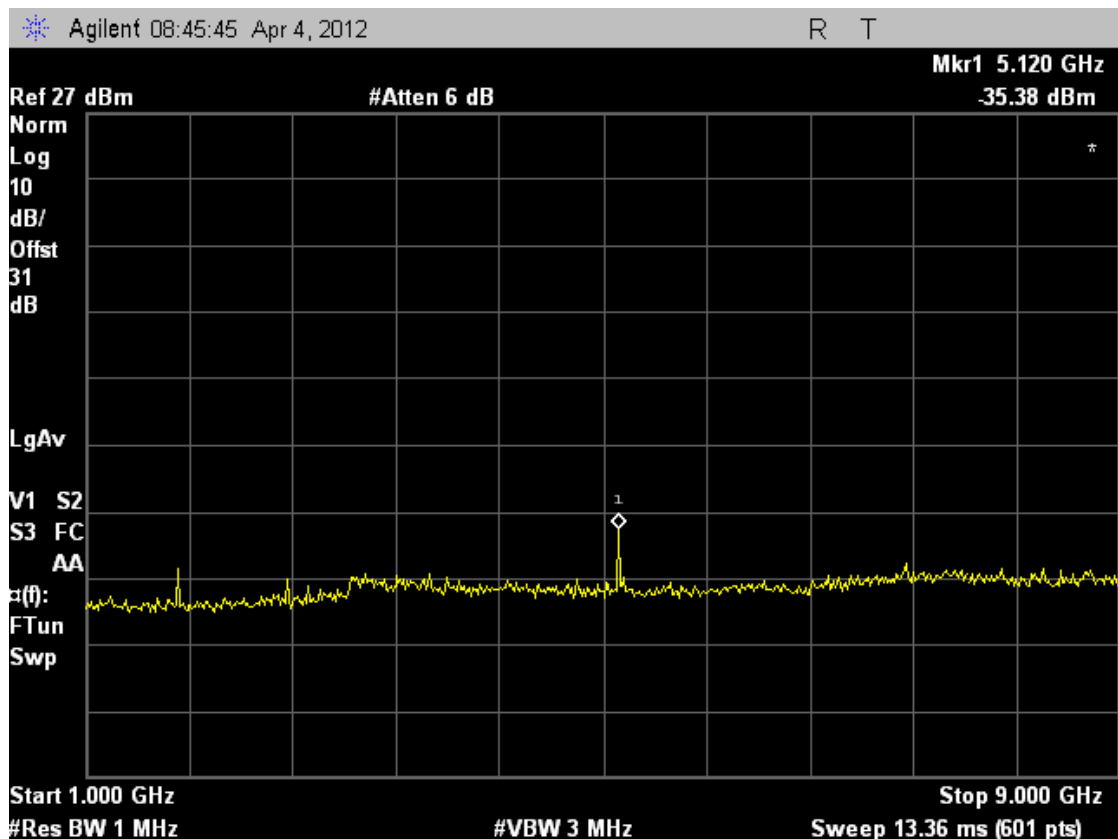
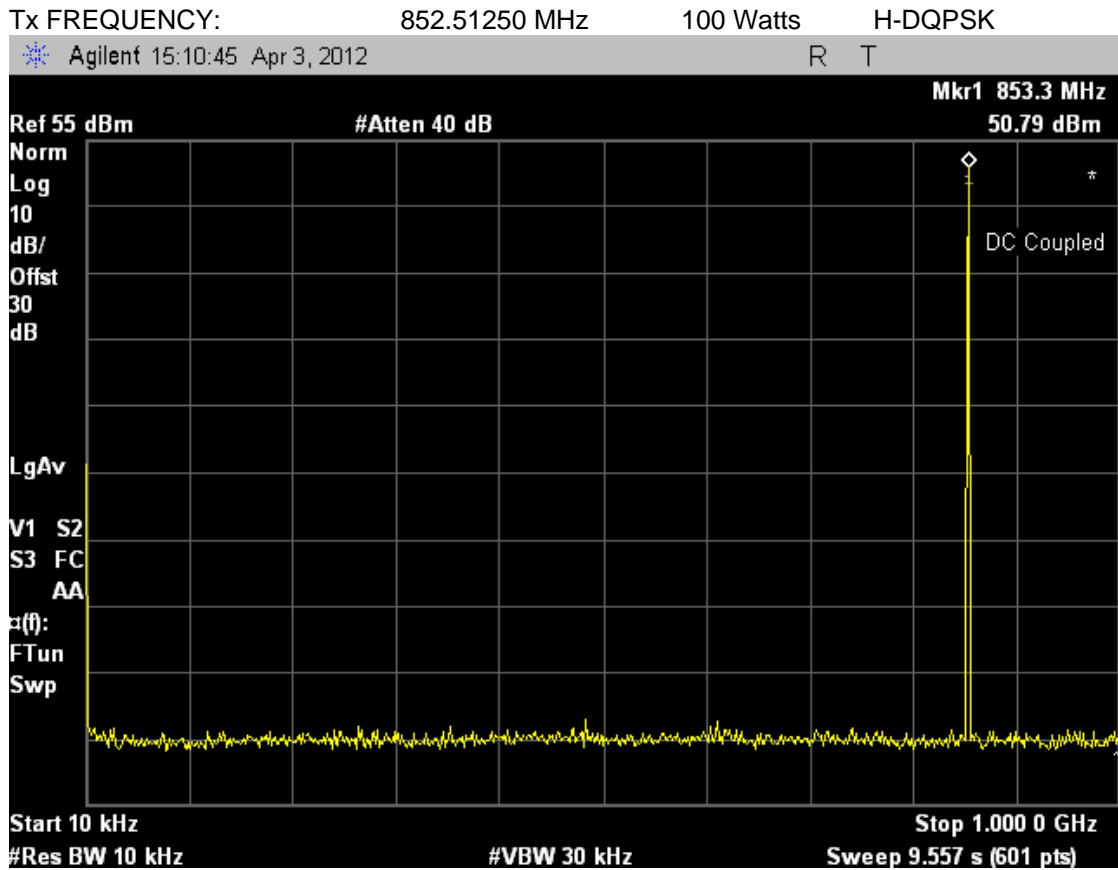
Tx Conducted Emissions Plots - Continued

Tx FREQUENCY: 769.06875 MHz 10 Watts H-D8PSK



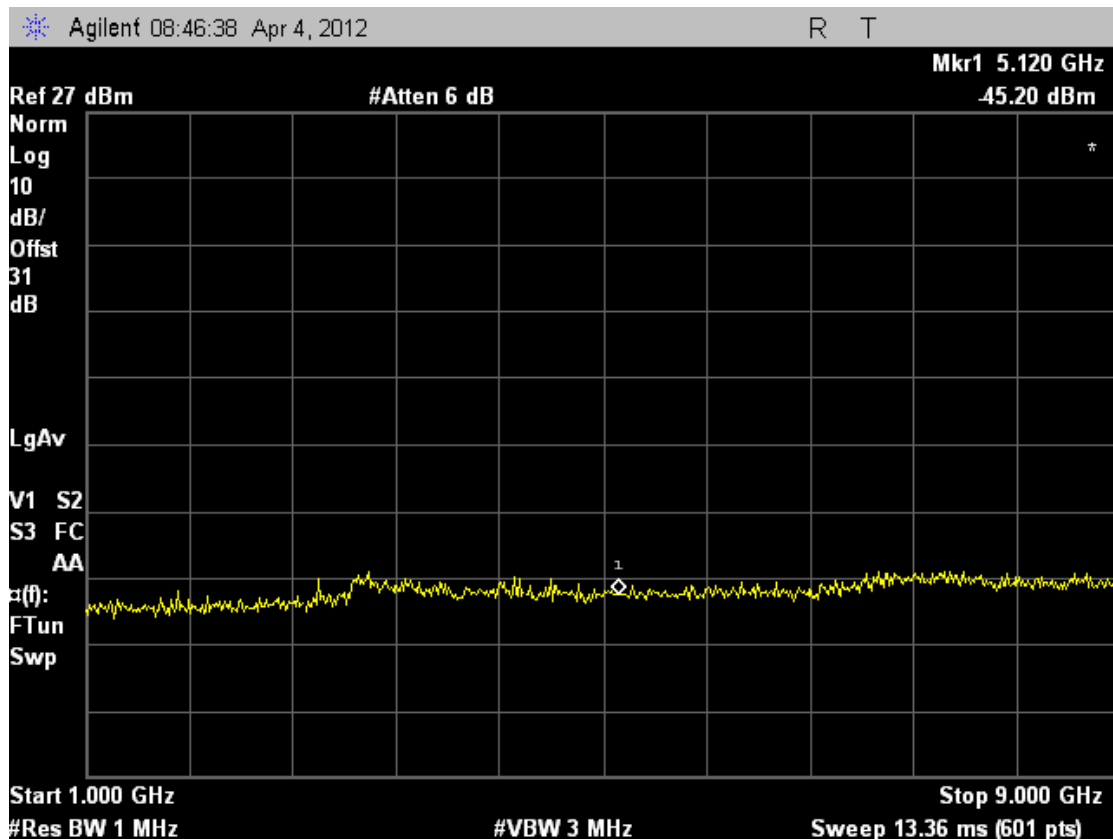
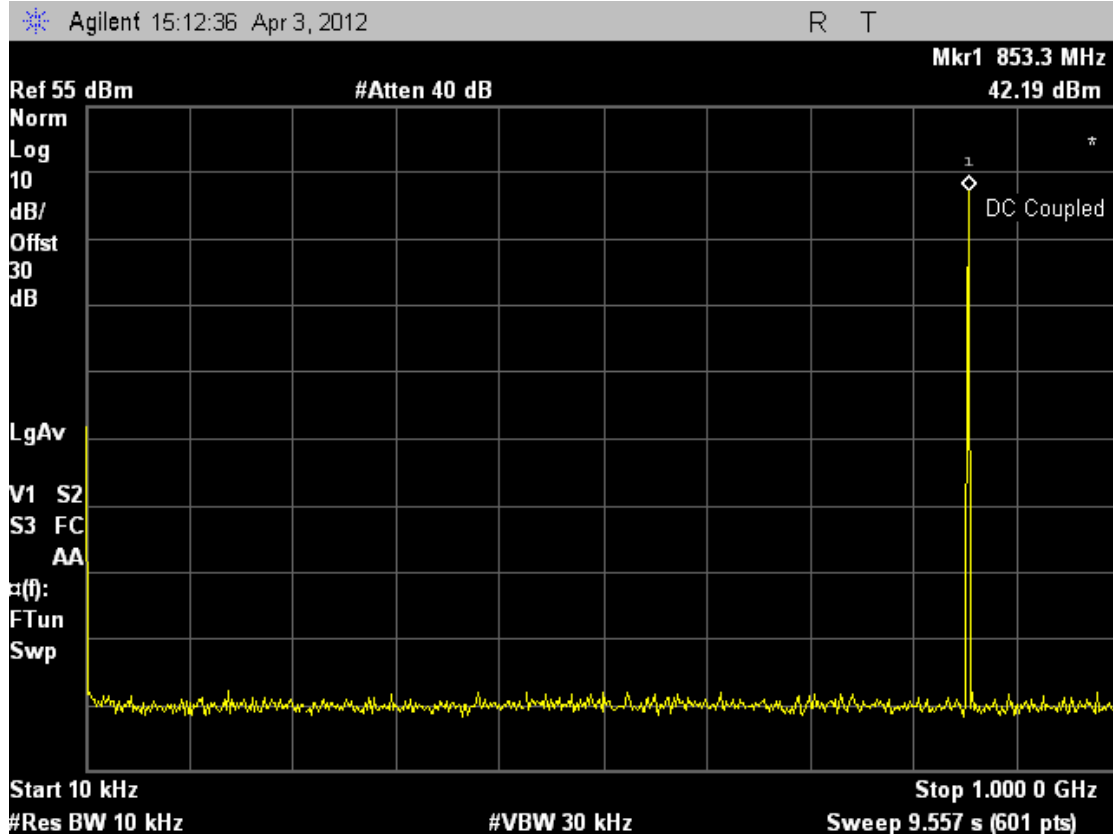


Tx Conducted Emissions Plots - Continued



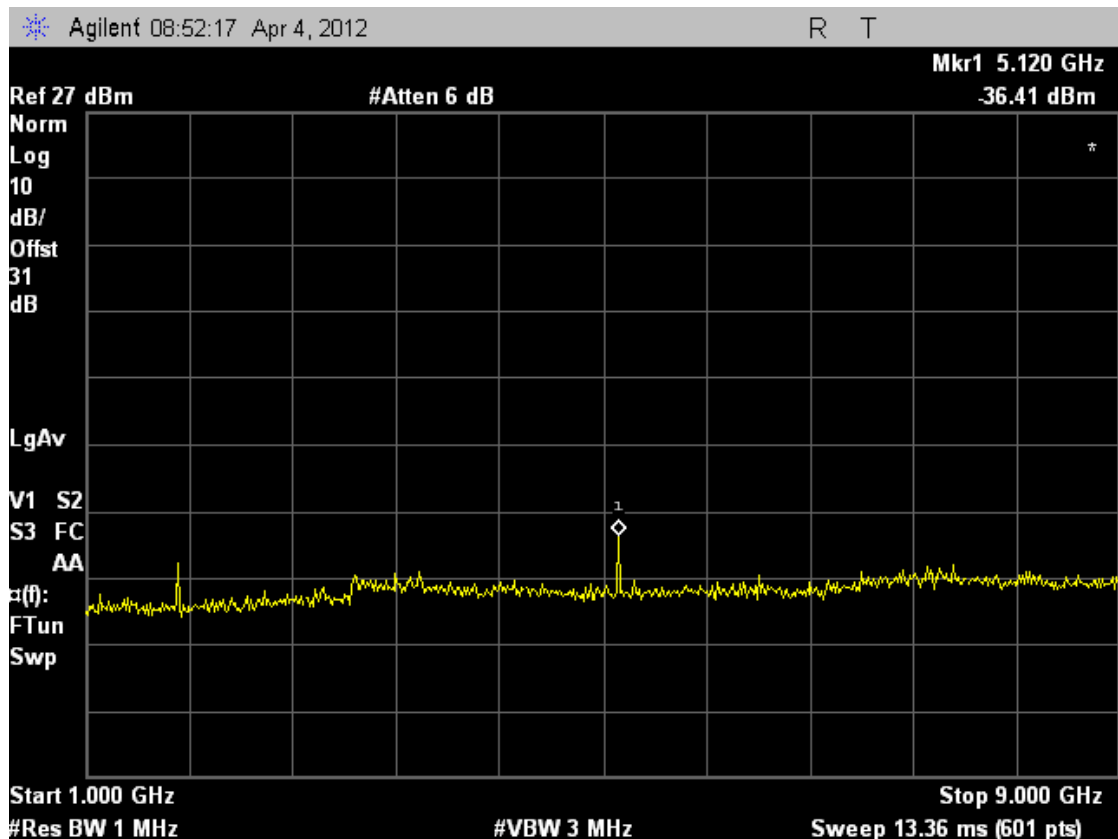
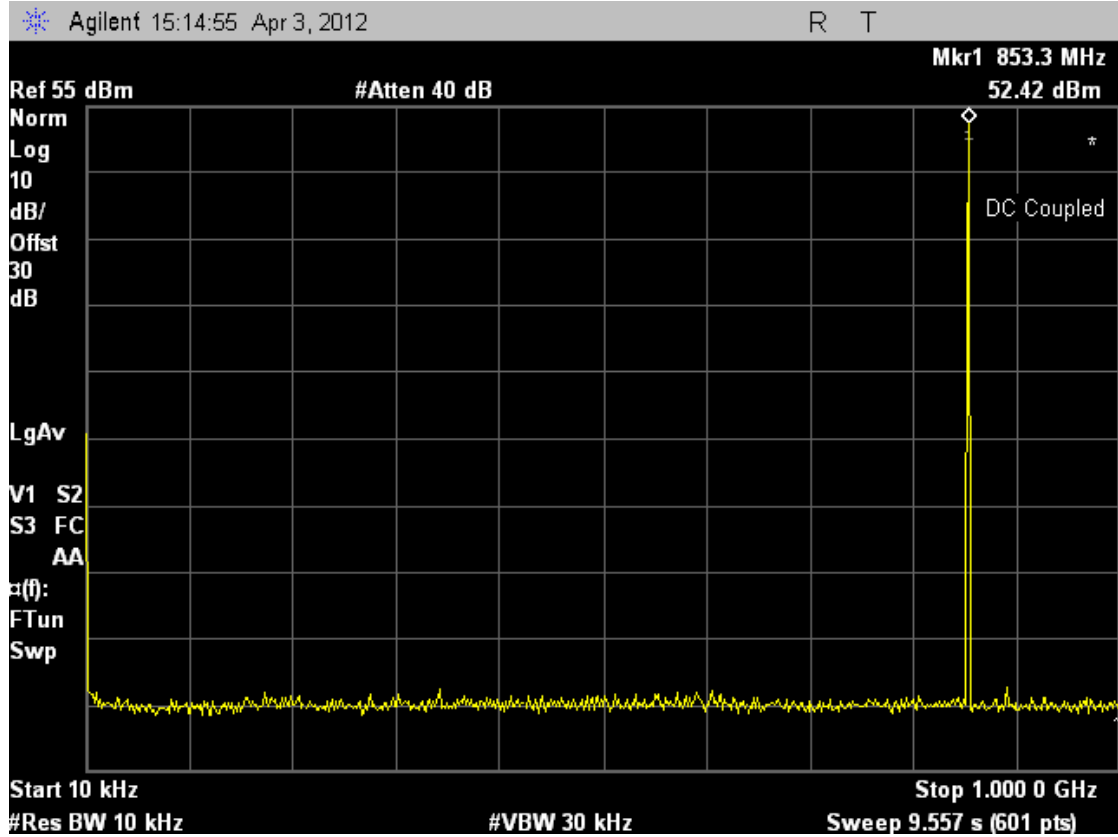
Tx Conducted Emissions Plots - Continued

Tx FREQUENCY: 852.51250 MHz 10 Watts H-DQPSK



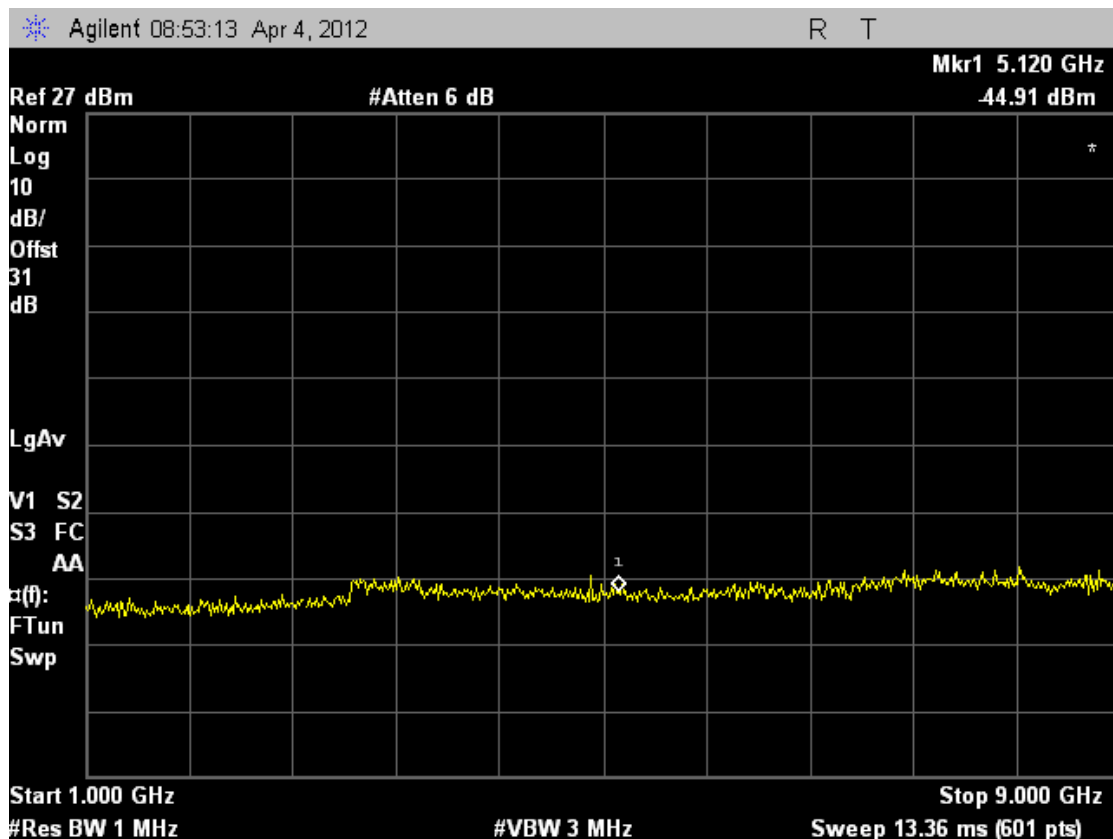
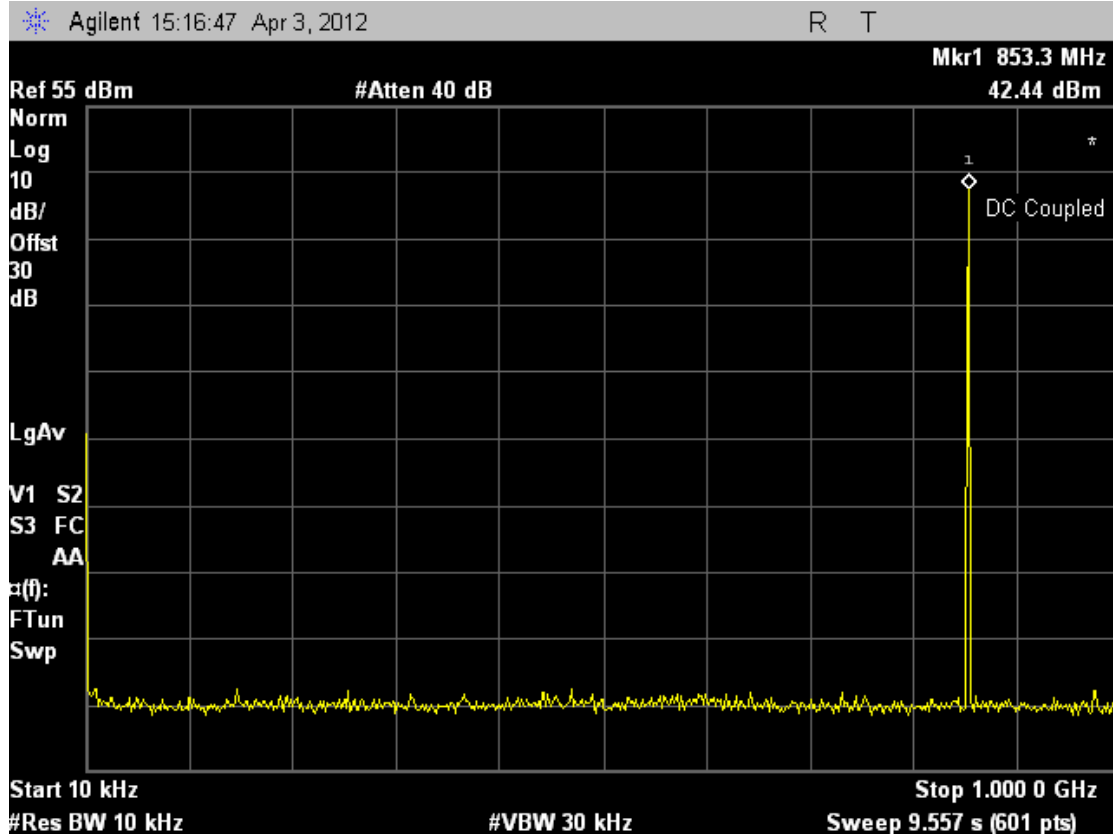
Tx Conducted Emissions Plots - Continued

Tx FREQUENCY: 852.51250 MHz 100 Watts H-D8PSK

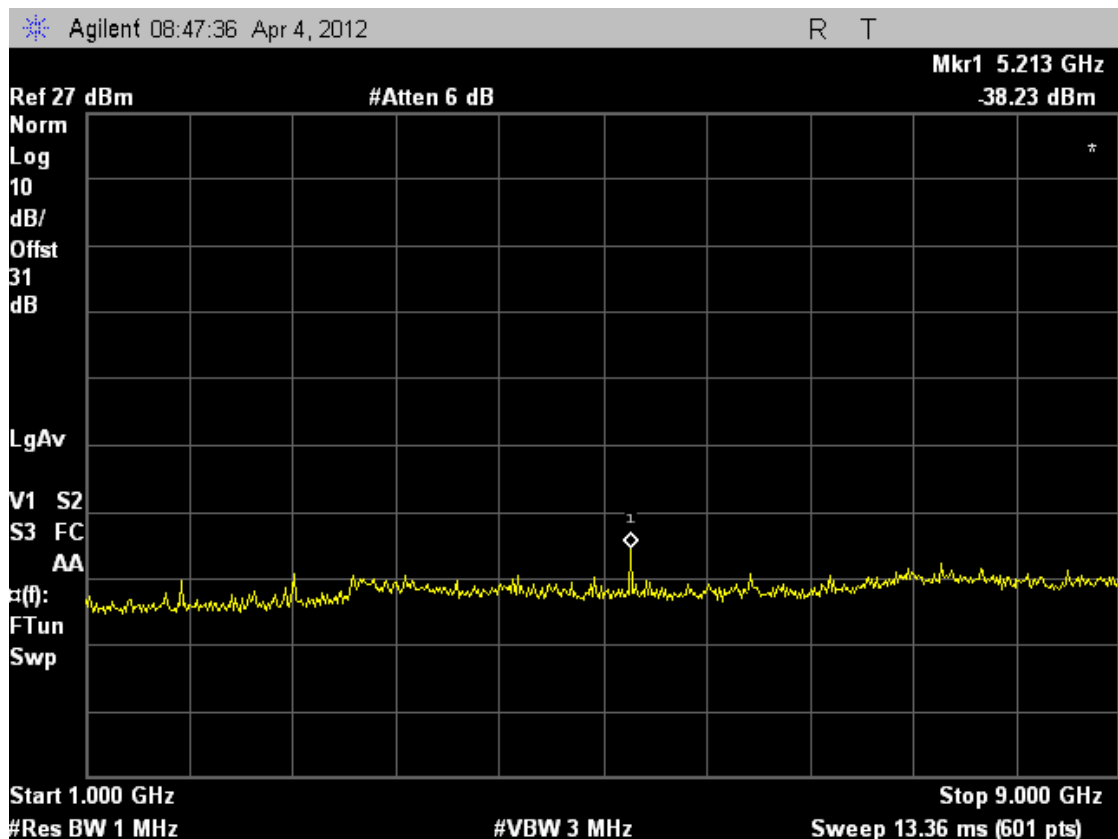
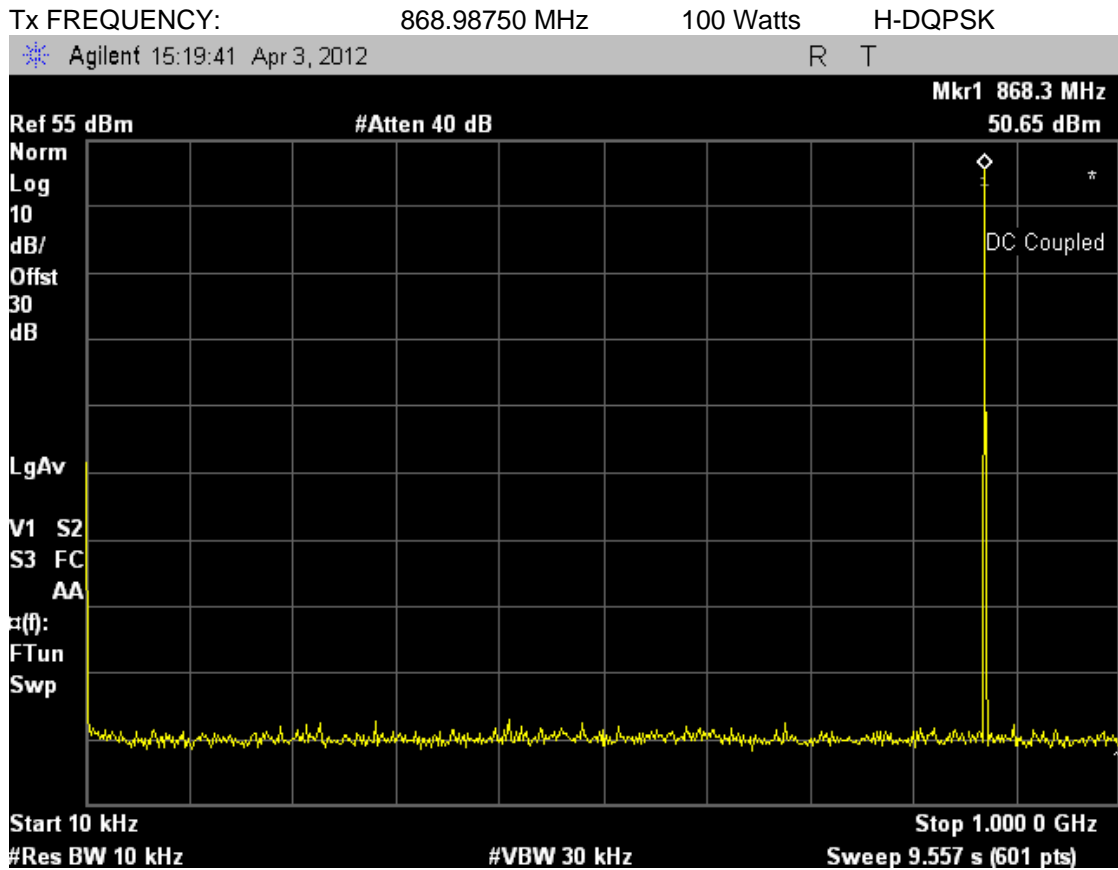


Tx Conducted Emissions Plots - Continued

Tx FREQUENCY: 852.51250 MHz 10 Watts H-D8PSK

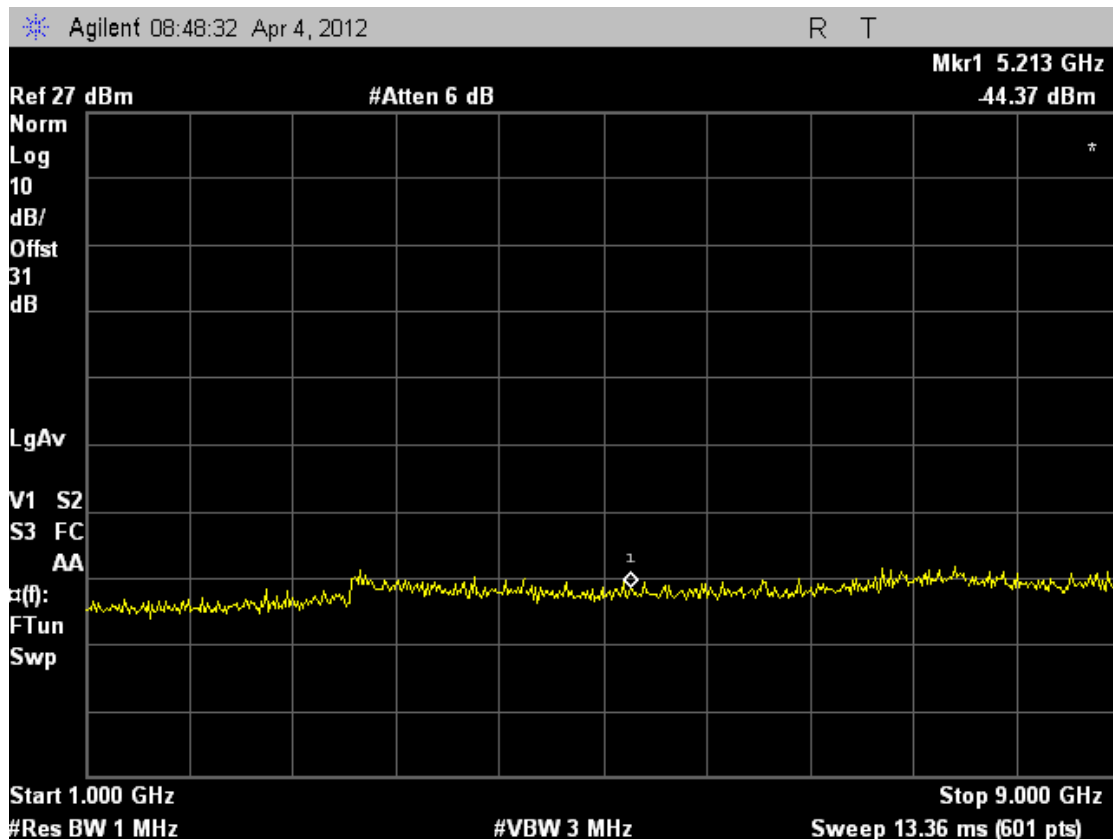
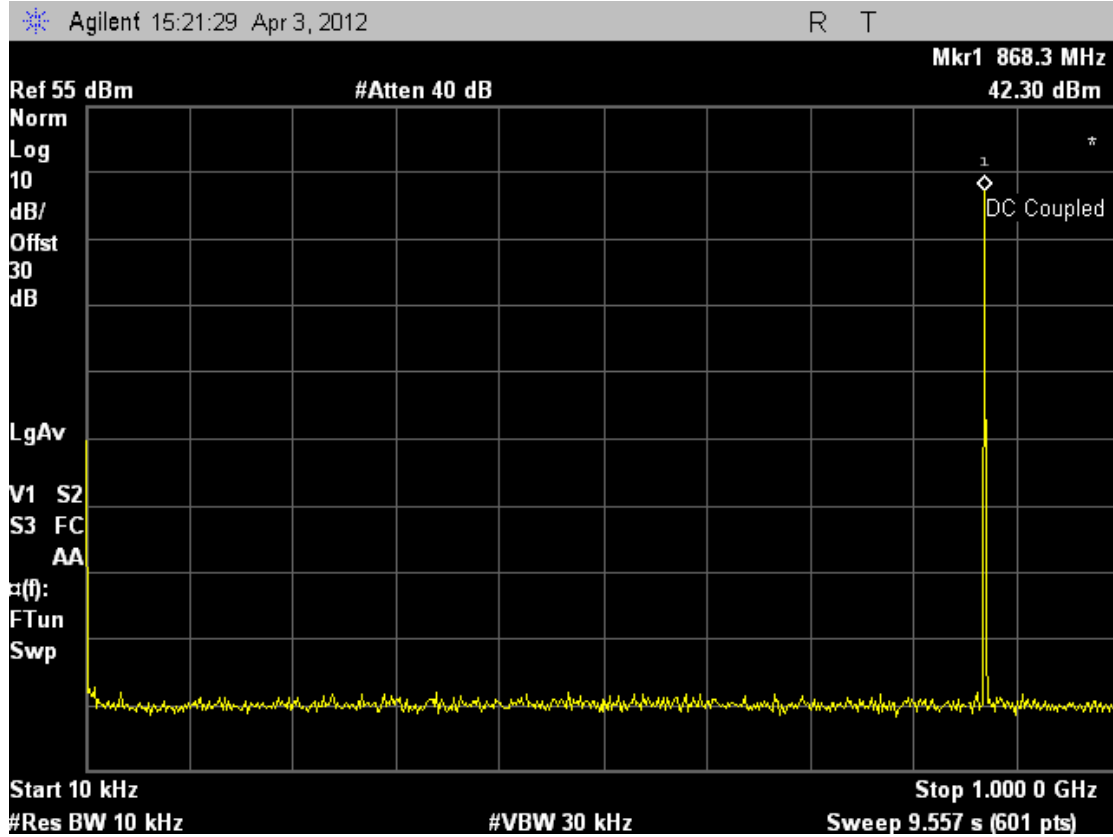


Tx Conducted Emissions Plots - Continued



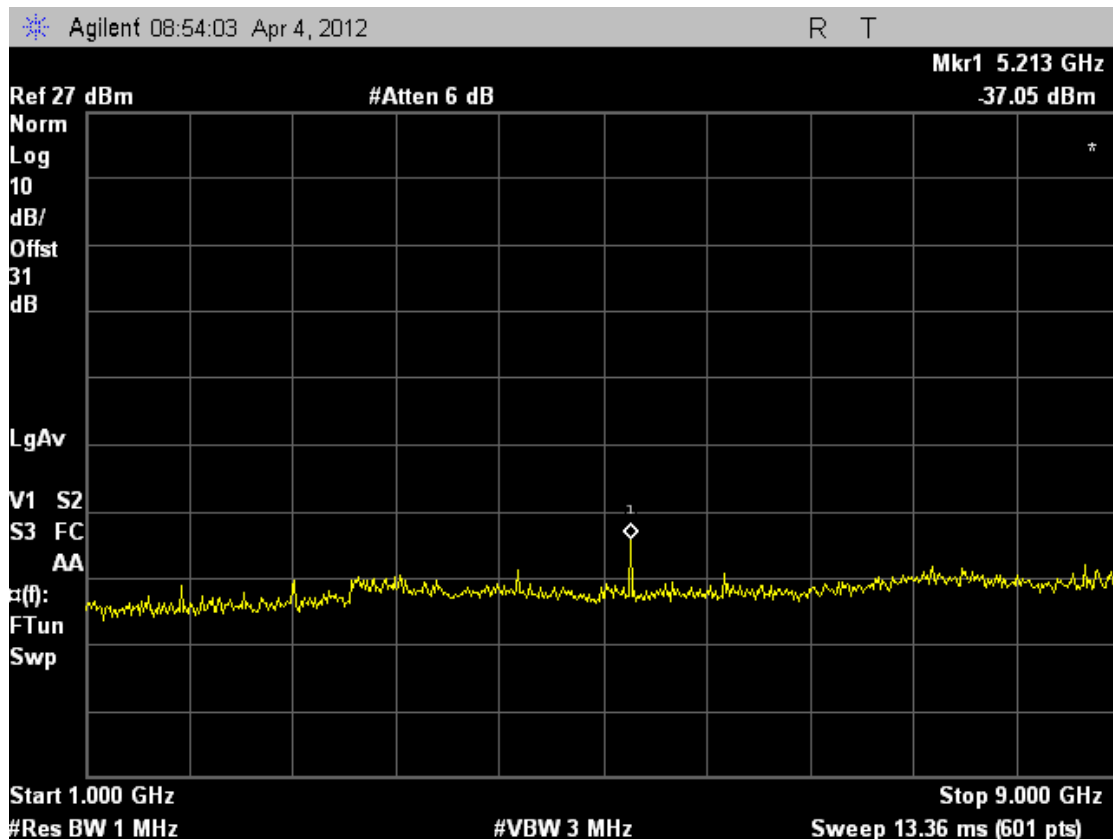
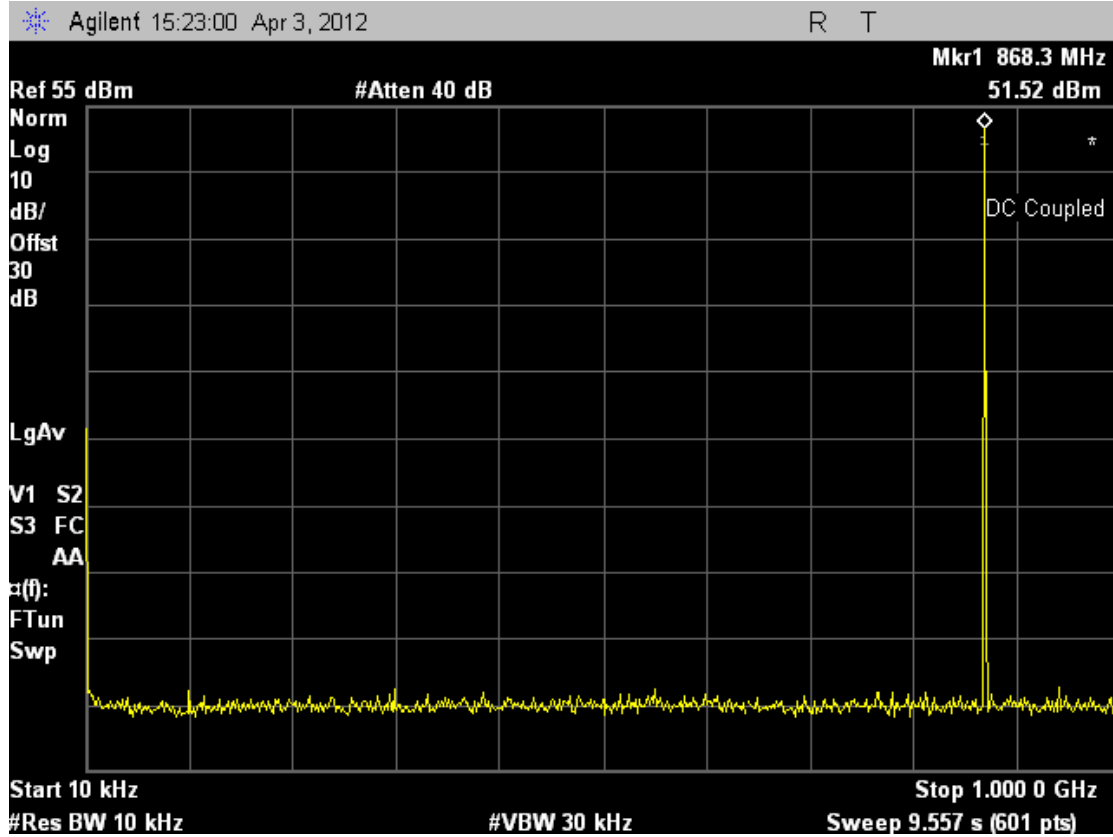
Tx Conducted Emissions Plots - Continued

Tx FREQUENCY: 868.98750 MHz 10 Watts H-DQPSK



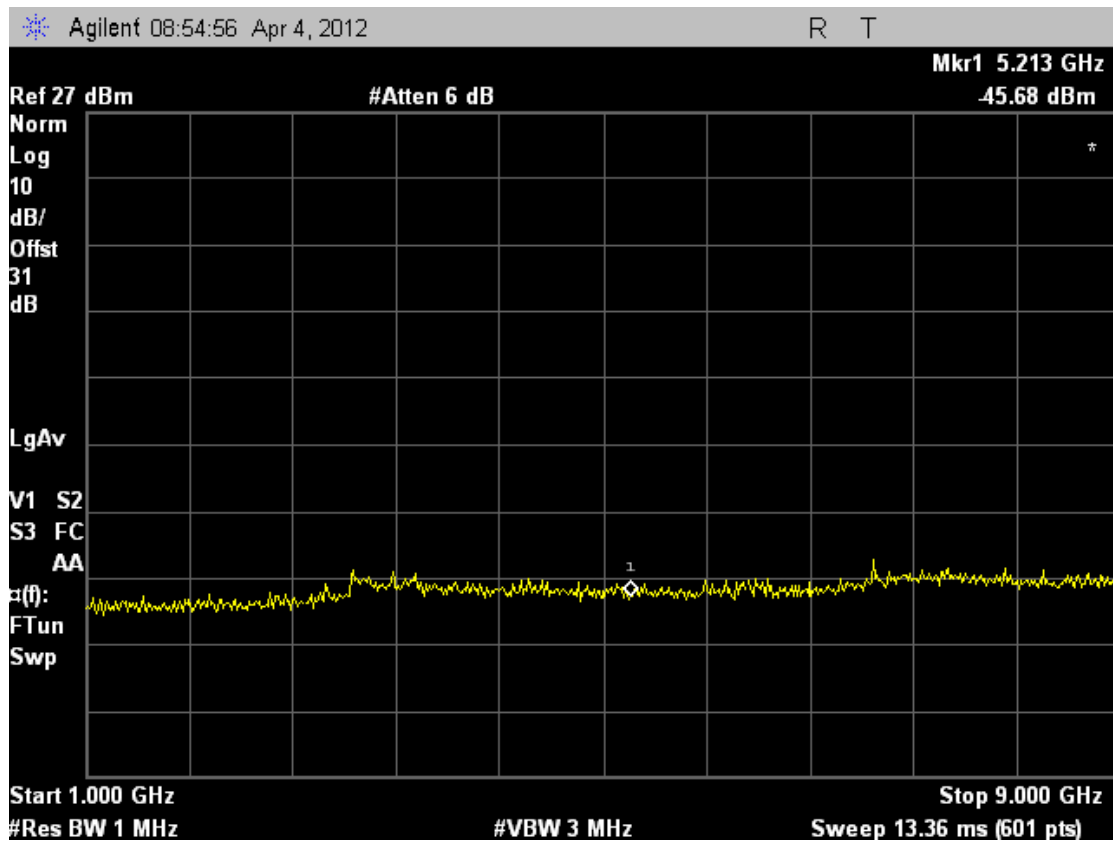
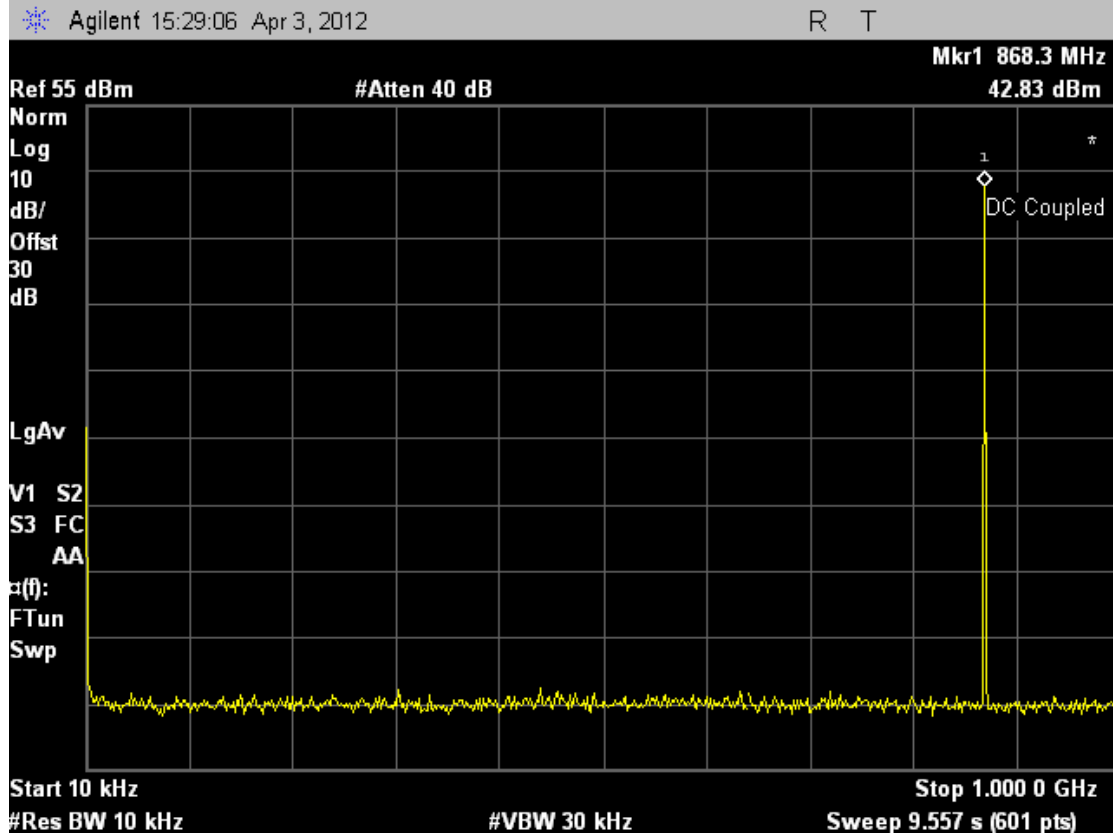
Tx Conducted Emissions Plots - Continued

Tx FREQUENCY: 868.98750 MHz 100 Watts H-D8PSK



Tx Conducted Emissions Plots - Continued

Tx FREQUENCY: 868.98750 MHz 10 Watts H-D8PSK





### TEST EQUIPMENT LIST

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
37	Variac	Yamabishi	S-260-5	TX-533	E1737	
82	1m Coax Cable BLUE	Suhner	Sucoflex 104A	44610/4A	E4619	8-Oct-12
85	3m Coax Cable BLUE	Suhner	Sucoflex 104A	44611/4A	E4620	8-Oct-12
123	Spectrum Analyser	Agilent	E4445A	MY4251007 2	E4139	26-Aug-12
135	Attenuator	Weinschel	67-30-33	BR0531	E4280	10-Oct-12
~	Filter High Pass	Tait	HPF	NA	E3785	Cal on use

## ANNEX 1 – AUTOMATED EMISSIONS 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.

