

# 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

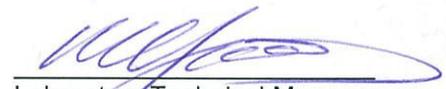
Report Revision: 1

Issue Date: 19 February 2019

PREPARED BY: Alfred Schinkelshoek

  
Test Technician

CHECKED & APPROVED BY: M. C. James

  
Laboratory Technical Manager



**IANZ**  
ACCREDITED LABORATORY

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

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

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FCC ID: CASTBDB3F  
IC : 737A-TBDB3F

Page 1 of 123

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## Table of Contents

REVISION .....	3
INTRODUCTION .....	4
STATEMENT OF COMPLIANCE .....	5
MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS	6
TEST RESULTS.....	7
TRANSMITTER OUTPUT POWER (CONDUCTED) .....	7
TRANSMITTER MODULATION LIMITING .....	15
TRANSMITTER OCCUPIED BANDWIDTH AND SPECTRUM MASKS .....	21
TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED).....	55
TRANSMITTER SPURIOUS EMISSIONS (RADIATED).....	79
TRANSIENT FREQUENCY BEHAVIOR.....	87
TRANSMITTER FREQUENCY STABILITY - TEMPERATURE .....	110
RECEIVER/TRANSMITTER STANDBY SPURIOUS EMISSIONS (CONDUCTED) .....	114
TEST EQUIPMENT LIST.....	121
ANNEX A – TEST SETUP DETAILS.....	123

## REVISION

Date	Revision	Comments
19 February 2019	1	Initial test report

## INTRODUCTION

Type approval testing of the TBDB3F, 30 Watt, TRANSPORTABLE BASE STATION transceiver in order to demonstrate compliance with FCC 47 Parts 22 & 90, and RSS-119 Issue 12 & RSS-Gen Issue 5. This radio supports analogue, digital FFSK, Digital Mobile Radio (DMR).

Type Approval Testing of the TBDB3F  
Frequency range 148 → 174 MHz

in accordance with:  
FCC 47 CFR Parts 22 and 90  
RSS-119 Issue 12 & RSS-Gen Issue 5

### REPORT PREPARED FOR

Tait International Limited  
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

Quantity: 1

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

### HARDWARE & SOFTWARE

Module	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter	T01-01403-DBAA	18286344	dmr-2.50.01.0003	01.01
Power Amplifier	T01-01405-BCAA	18286345	< Not applicable >	00.01

### TEST CONDITIONS

All testing was performed between 15 January 2019 → 19 February 2019, and under the following conditions:

Ambient temperature: 15°C → 30°C  
Relative Humidity: 20% → 75%  
Standard Test Voltages 120 V<sub>AC</sub> and 13.8 V<sub>DC</sub>

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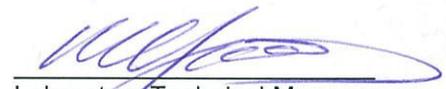
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Page 1 of 123

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## MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

### MODULATION TYPES:

F3E	FM Analogue Voice	-	-
F2D	Fast Frequency Shift Keying	1200 symbols/sec	1200 bps
FXW	Digital Voice / Data	4800 symbols/sec	9600 bps
FXD	Digital Data	4800 symbols/sec	9600 bps

CHANNEL SPACING: 12.5 kHz

### EMISSION DESIGNATORS:

	12.5 kHz
Analog FM	11K0F3E
FFSK Data 1200 bps	7K60F2D
Digital Voice DMR	7K60FXW
Digital Data DMR	7K60FXD

Equation:  $B_n = 2M + 2Dk$

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

### Analogue Voice 12.5 kHz Channel Spacing

Necessary bandwidth

M = 3.0 kHz

D = 2.5 kHz

$$B_n = (2 \times 3.0) + (2 \times 2.5) \times 1$$

$$= 11.0 \text{ kHz}$$

Emission Designator

**11K0F3E**

F3E represents an FM voice transmission

### Fast Frequency Shift Keying (FFSK – 1200 bps) 12.5 kHz Channel Spacing

Necessary bandwidth

M = 1.8 kHz

D = 2.0 kHz

$$B_n = (2 \times 1.8) + (2 \times 2.0) \times 1$$

$$= 7.6 \text{ kHz}$$

Emission Designator

**7K60F2D**

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

Digital Mobile Radio (DMR)

4 level FSK (as per ETSI TS 102 361-1)

4800 symbols/sec 9600 bps

### Digital Data 12.5 kHz Channel Spacing – 7K60FXW

99% bandwidth

= 7.6 kHz

Emission Designator

**7K60FXW**

FXW represents FM combination of data and telephony.

### Digital Data 12.5 kHz Channel Spacing – 7K60FXD

99% bandwidth

= 7.6 kHz

Emission Designator

**7K60FXD**

FXD represents FM data only

## TEST RESULTS

### TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046  
RSS-119 5.4

GUIDE: TIA-102.CAAA-C 2.2.1

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
2. The coaxial attenuator has an impedance of 50 Ohms.
3. The unmodulated output power was measured with an RF Power meter.
4. The output power was measured at the antenna port of the duplexer when the Transmitter was transmitting the nominal prescribed power into the duplexer.

MEASUREMENT RESULTS:

Manufacturer's Rated Output Power: 30 W

Nominal 30 W	Measured	Variation (%)	Variation (dB)
148.1 MHz	25.3	-15.7	-0.7
149.8 MHz	26.3	-12.4	-0.6
150.8 MHz	26.6	-11.4	-0.5
156.3 MHz	27.2	-9.2	-0.4
156.67 MHz	28.2	-6.0	-0.3
157.2 MHz	24.1	-19.8	-1.0
161.8 MHz	25.9	-13.8	-0.6
162.0 MHz	25.7	-14.2	-0.7
162.1MHz	26.3	-12.2	-0.6
168.0 MHz	26.7	-11.1	-0.5
173.3 MHz	26.8	-10.7	-0.5
Measurement Uncertainty		± 0.6 dB	

0 Manufacturer's Rated Output Power: 2 W

Nominal 30 W	Measured	Variation (%)	Variation (dB)
148.1 MHz	2.0	-0.5	0.0
149.8 MHz	1.8	-10.7	-0.5
150.8 MHz	1.8	-10.9	-0.5
156.3 MHz	1.8	-9.1	-0.4
156.67 MHz	1.9	-7.1	-0.3
157.2 MHz	1.8	-7.9	-0.4
161.8 MHz	2.1	3.9	0.2
162.0 MHz	2.1	3.2	0.1
162.1MHz	2.0	1.9	0.1
168.0 MHz	2.0	1.7	0.1
173.3 MHz	2.2	8.4	0.4
Measurement Uncertainty		± 0.6 dB	

LIMIT CLAUSES:

FCC 47 CFR 90.205 (s)

The output power shall not exceed by more than 20%... the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

RSS-119 5.4

The output power shall be within ±1.0 dB of the manufacturer's rated power.

## TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603E 2.2.6

### MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
2. An audio input tone of 1000 Hz was applied with the level set to obtain 20% of maximum deviation. This was used as the 0 dB reference point.
3. The AF was varied while the audio level was held constant.
4. The response in dB relative to 1000 Hz was measured.

### MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz channel spacing tested at 30 W transmit power.

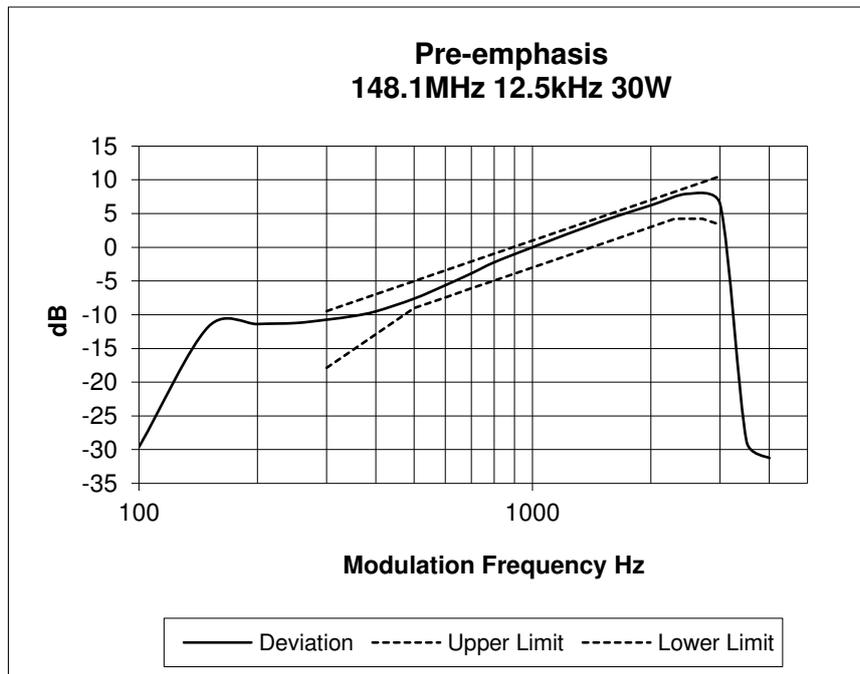
LIMIT CLAUSE: TIA/EIA-603E 3.2.6

MEASUREMENT UNCERTAINTY:  $\pm 1.5\%$

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 148.1 MHz

12.5 kHz Channel Spacing



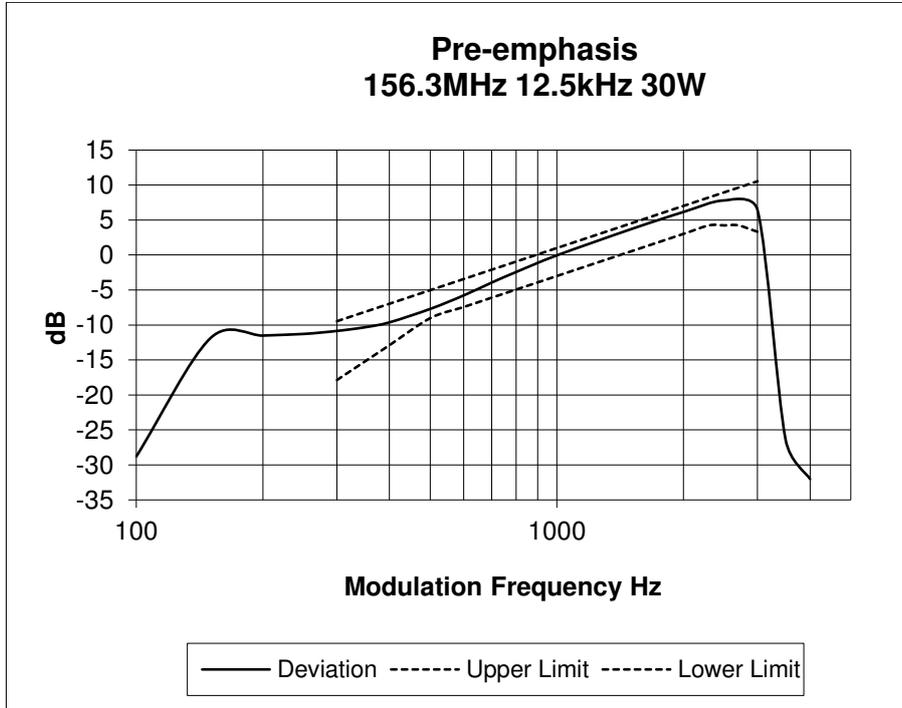


### Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 156.3 MHz

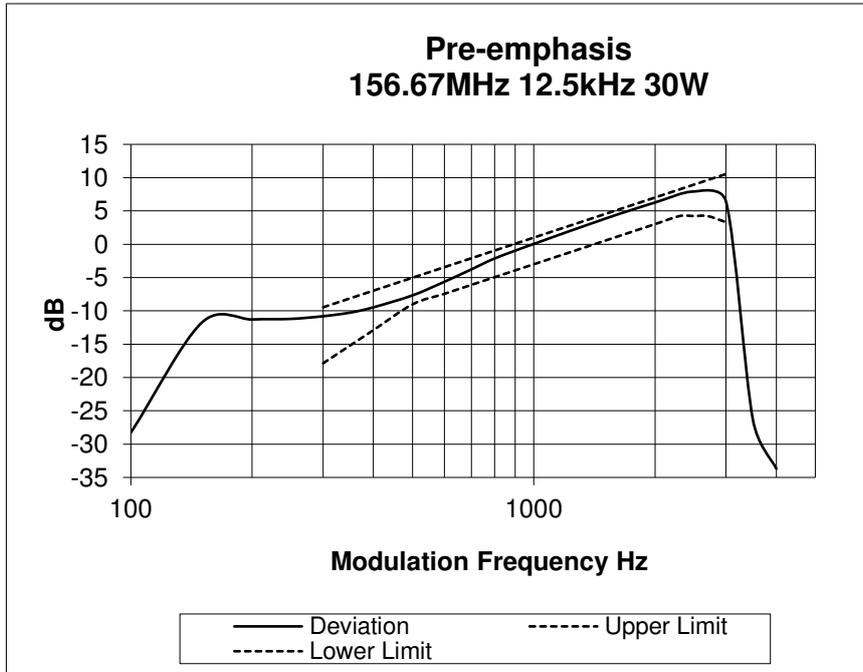
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 156.67 MHz

12.5 kHz Channel Spacing

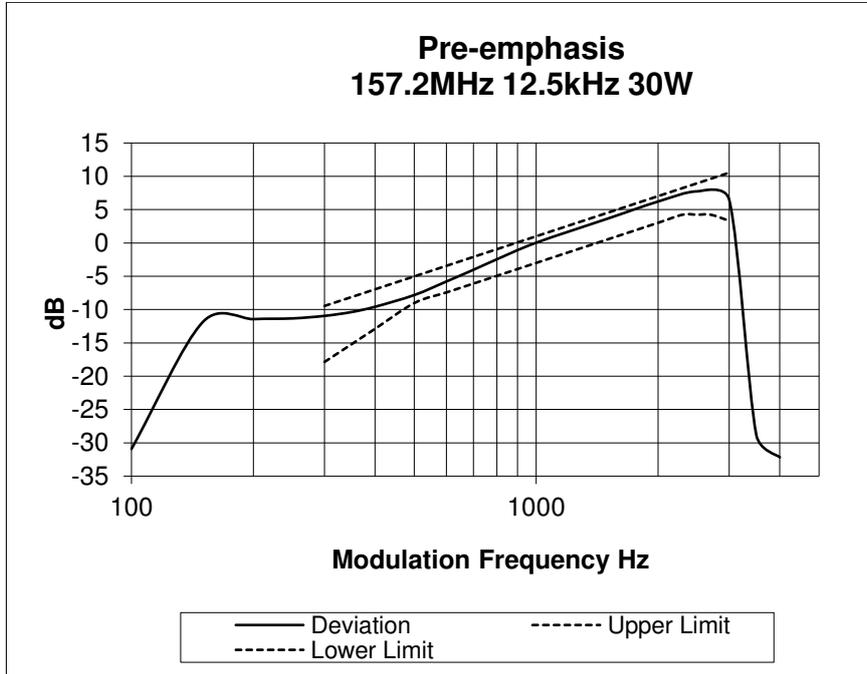


### Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 157.2 MHz

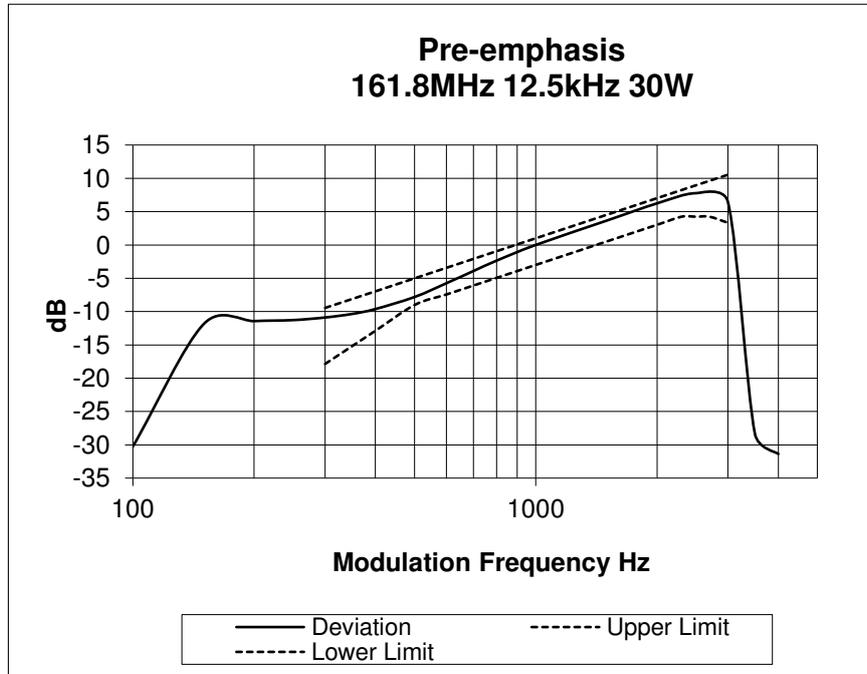
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 161.8 MHz

12.5 kHz Channel Spacing

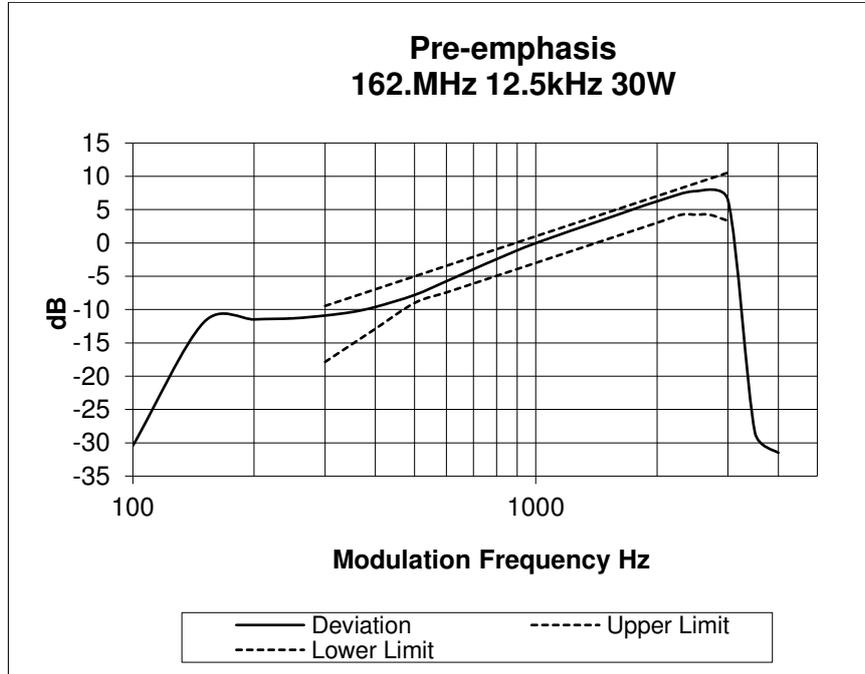


### Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 162.0 MHz

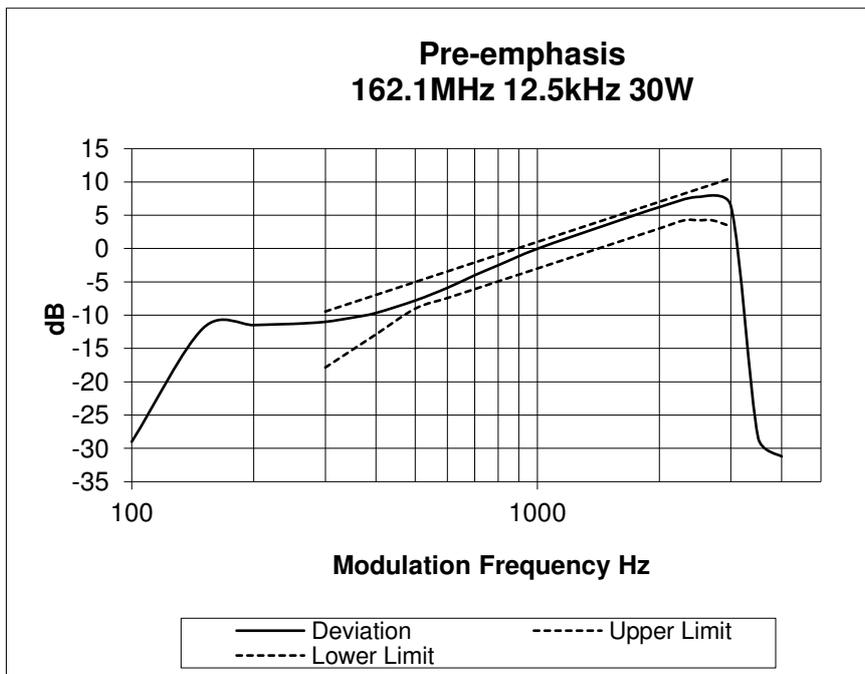
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 162.1 MHz

12.5 kHz Channel Spacing

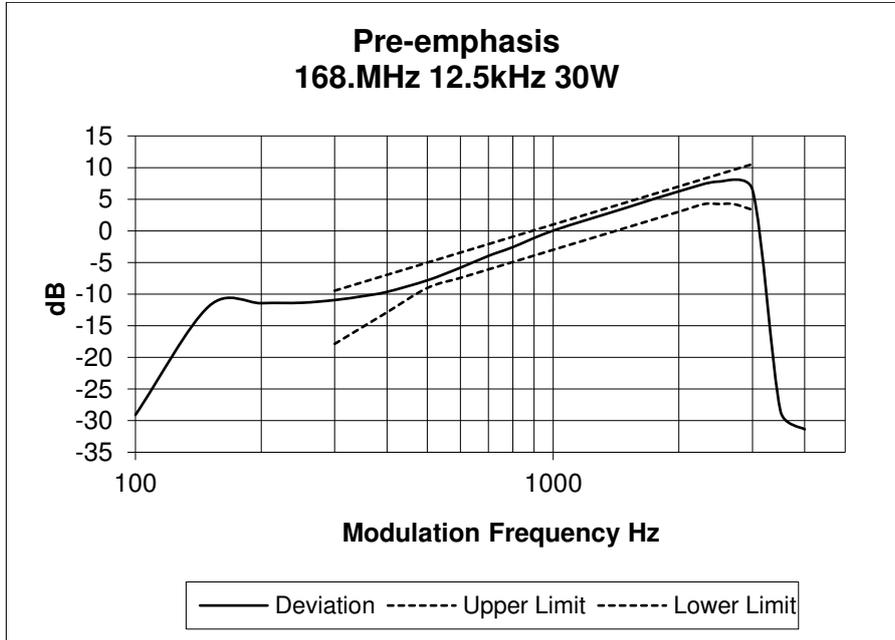


### Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 168.0 MHz

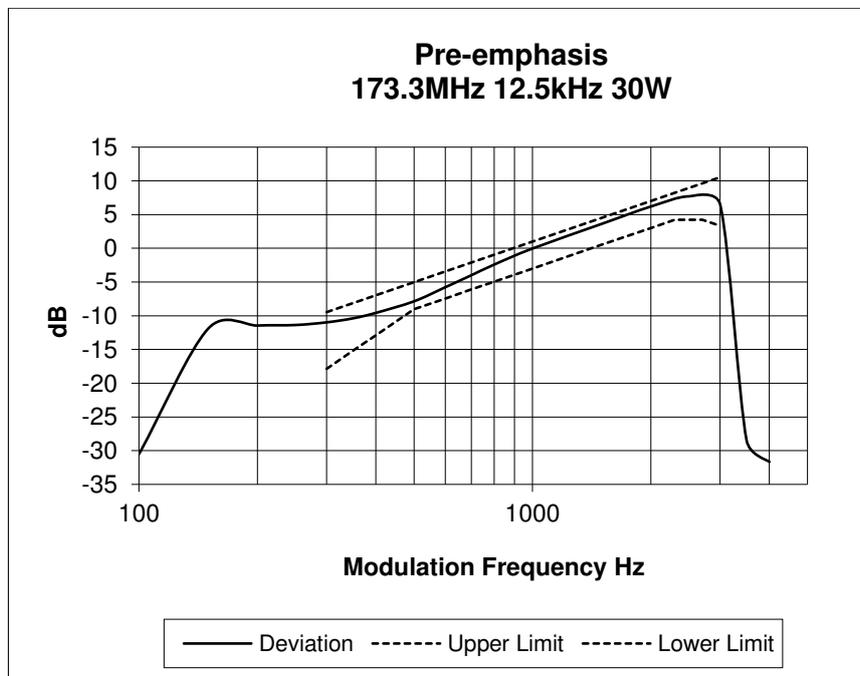
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 173.3 MHz

12.5 kHz Channel Spacing



## TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

GUIDE: TIA/EIA-603E 2.2.3

### MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
2. The modulation response was measured at three audio frequencies while varying the input level.
3. Measurements were made for both Positive and Negative Deviation.

### MEASUREMENT RESULTS:

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

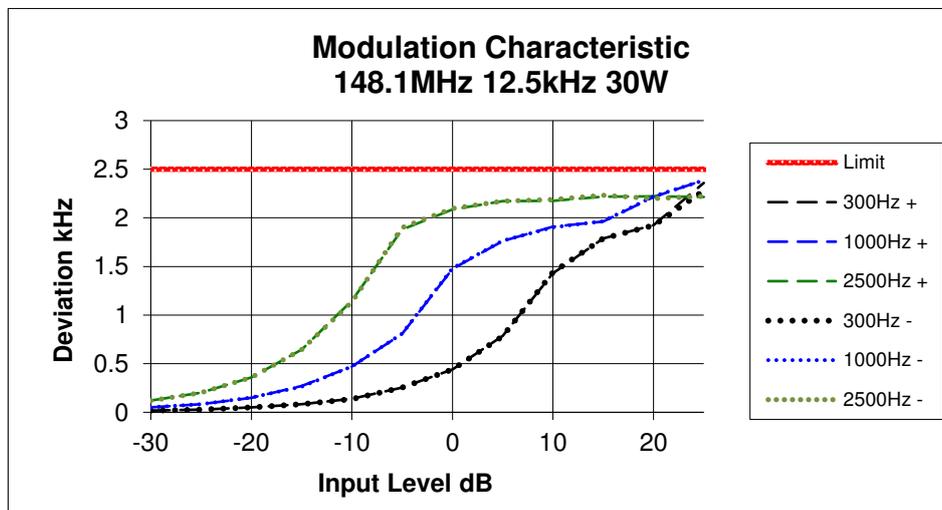
LIMIT CLAUSE: TIA/EIA-603E 1.3.4.4

MEASUREMENT UNCERTAINTY:  $\pm 1.5\%$

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 148.1 MHz

12.5 kHz Channel Spacing

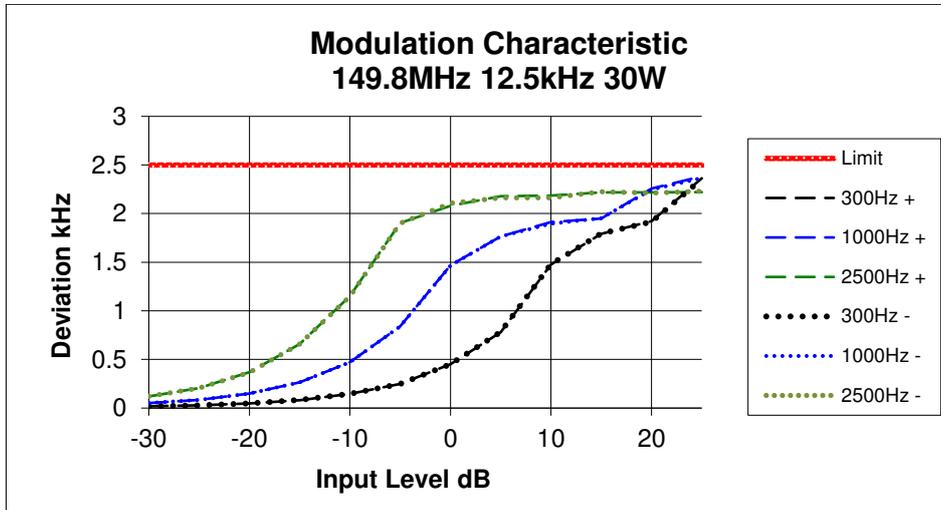


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 149.8 MHz

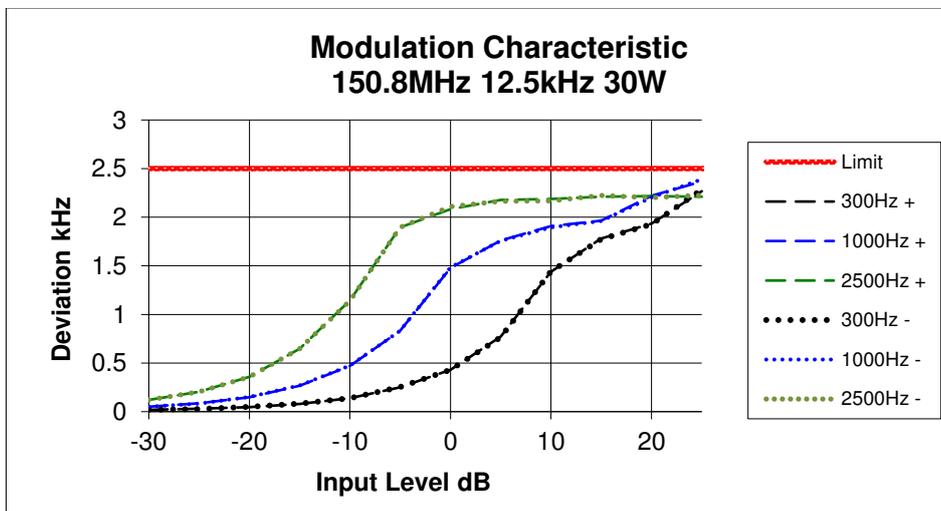
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 150.8 MHz

12.5 kHz Channel Spacing

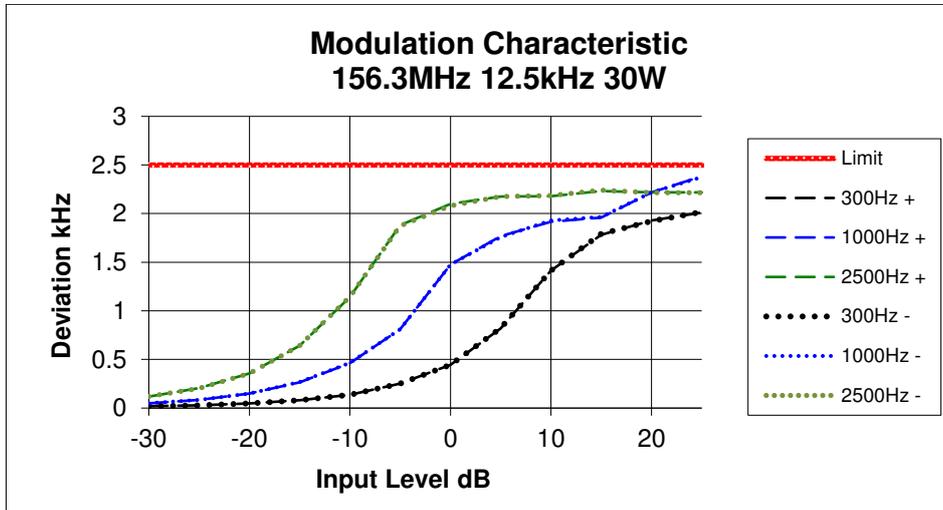


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 156.3 MHz

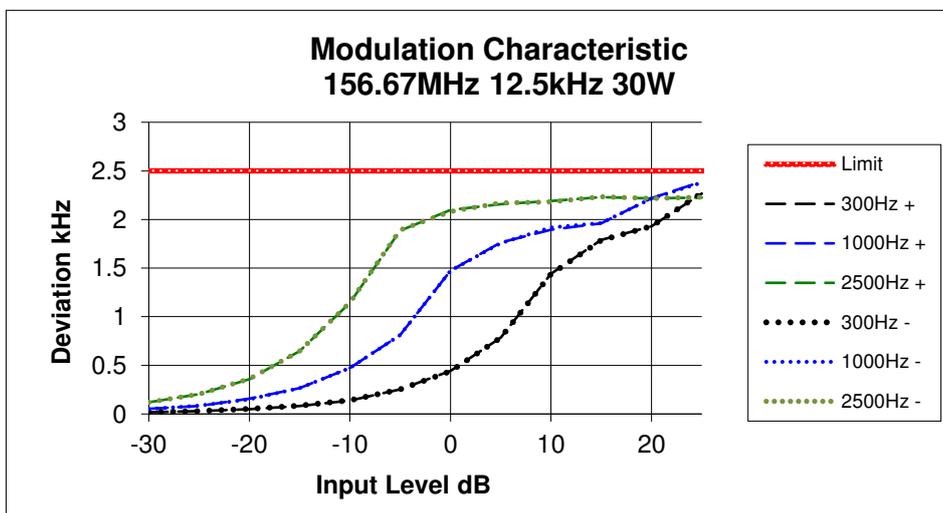
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 156.67 MHz

12.5 kHz Channel Spacing

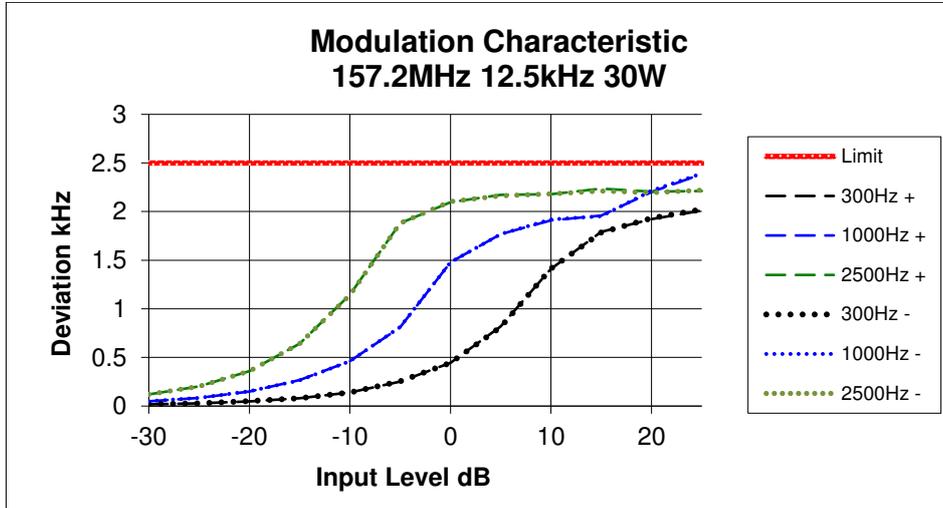


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 157.2 MHz

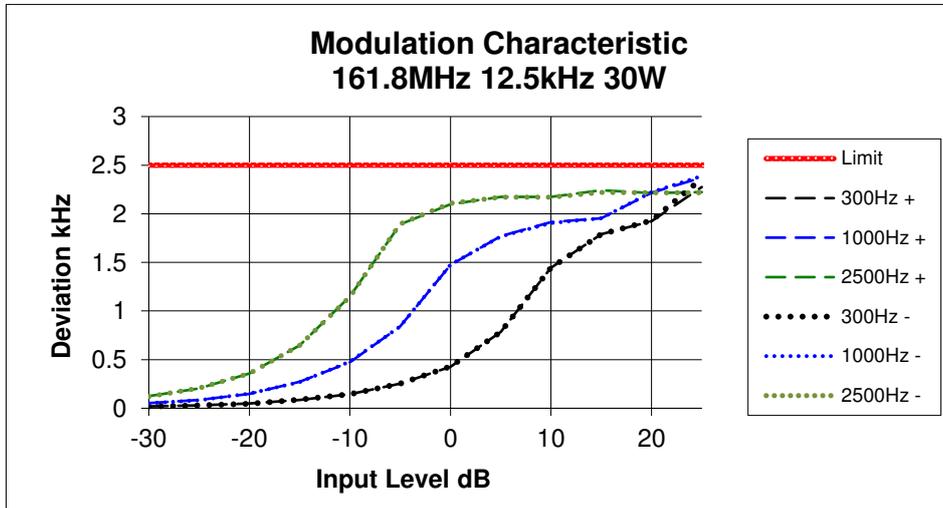
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 161.8 MHz

12.5 kHz Channel Spacing

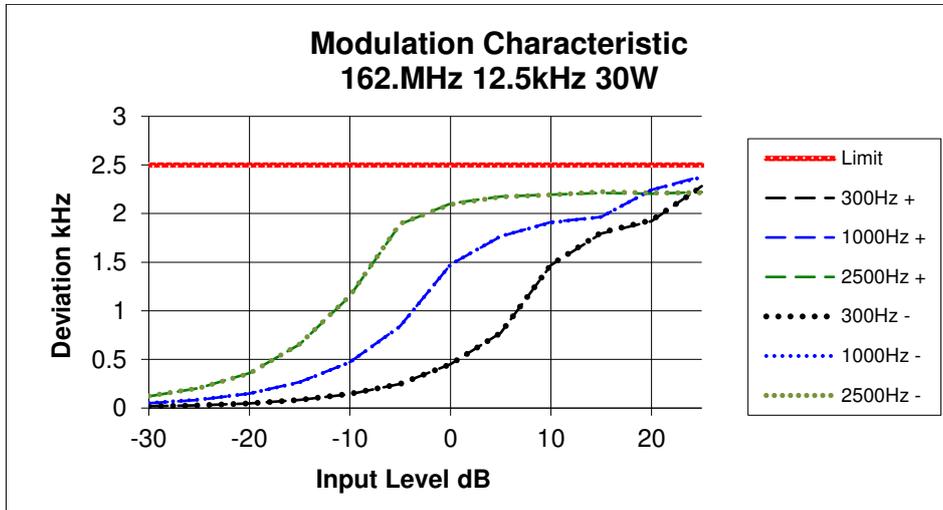


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 162.0 MHz

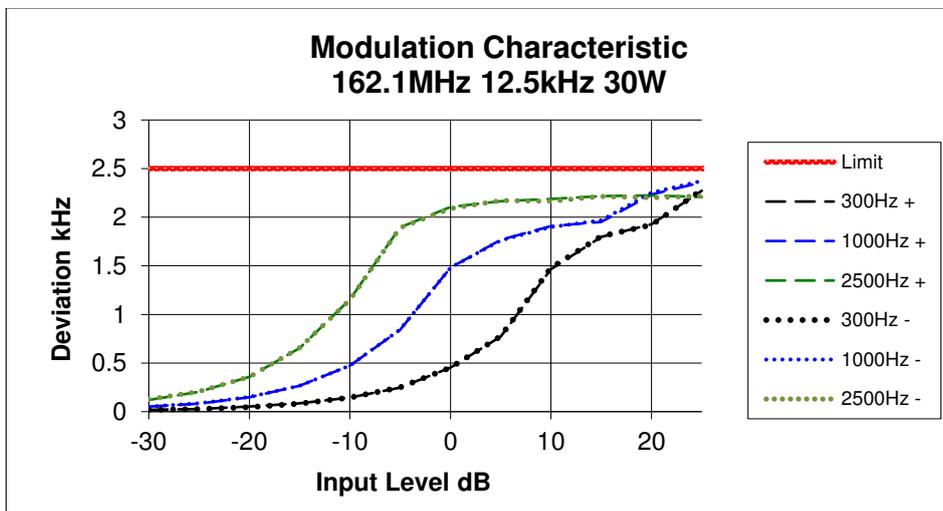
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 162.1 MHz

12.5kHz Channel Spacing

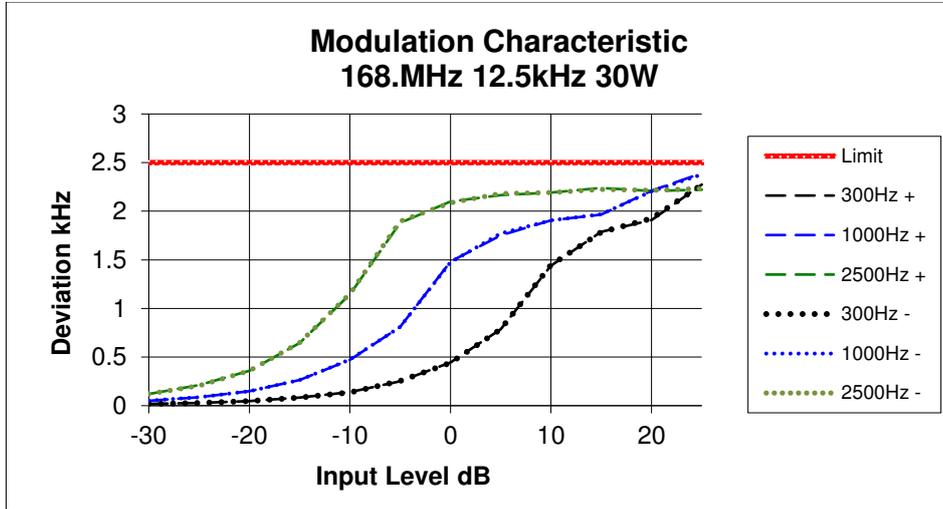


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 168.0 MHz

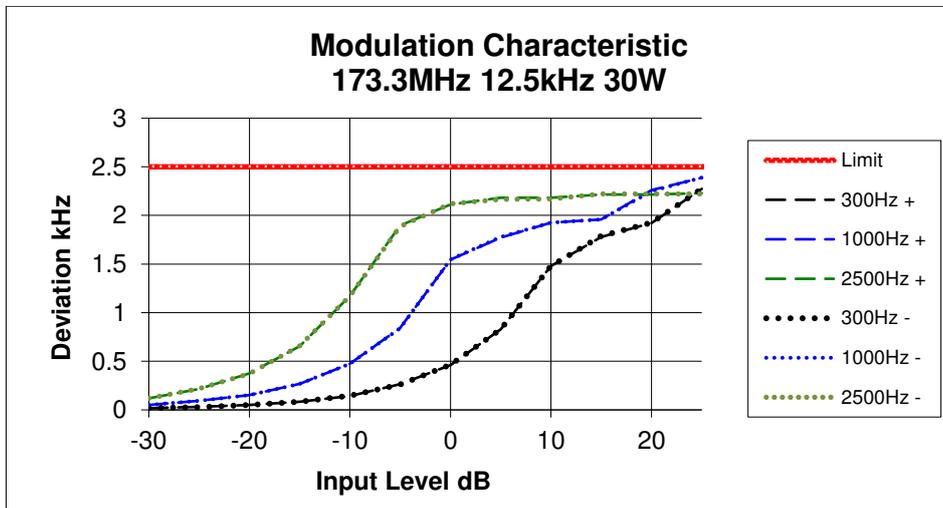
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 173.3 MHz

12.5kHz Channel Spacing



## TRANSMITTER OCCUPIED BANDWIDTH AND SPECTRUM MASKS

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

GUIDE: TIA/EIA-603E 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%  $\pm 0.65$ dB

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

FFSK	12.5 kHz Channel Spacing	1200 bps
Digital Voice/Data	12.5 kHz Channel Spacing	9600 bps
Digital Data	12.5 kHz Channel Spacing	9600 bps

### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

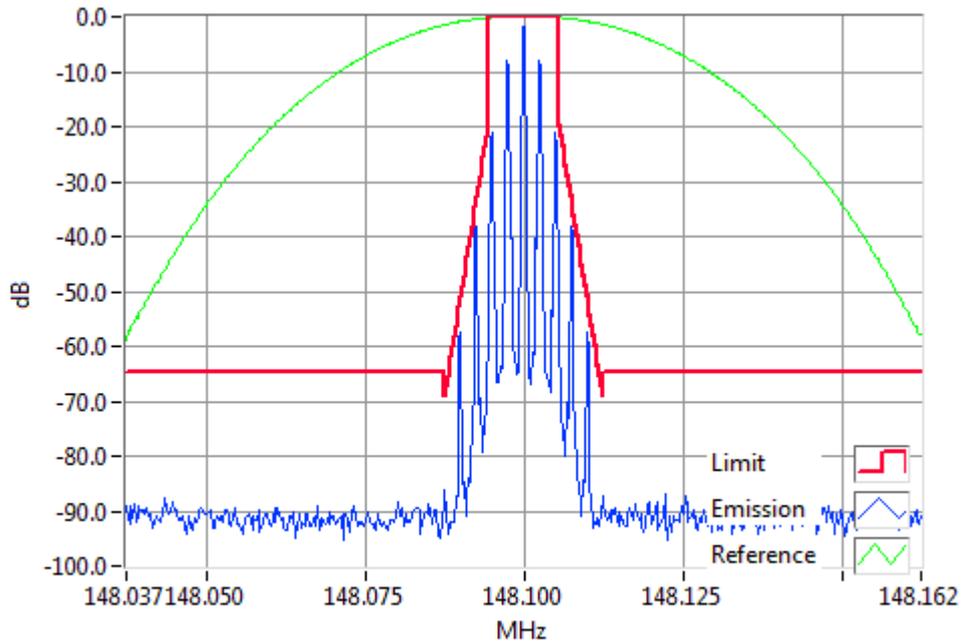
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 148.1 MHz

30 W

12.5 kHz Channel Spacing

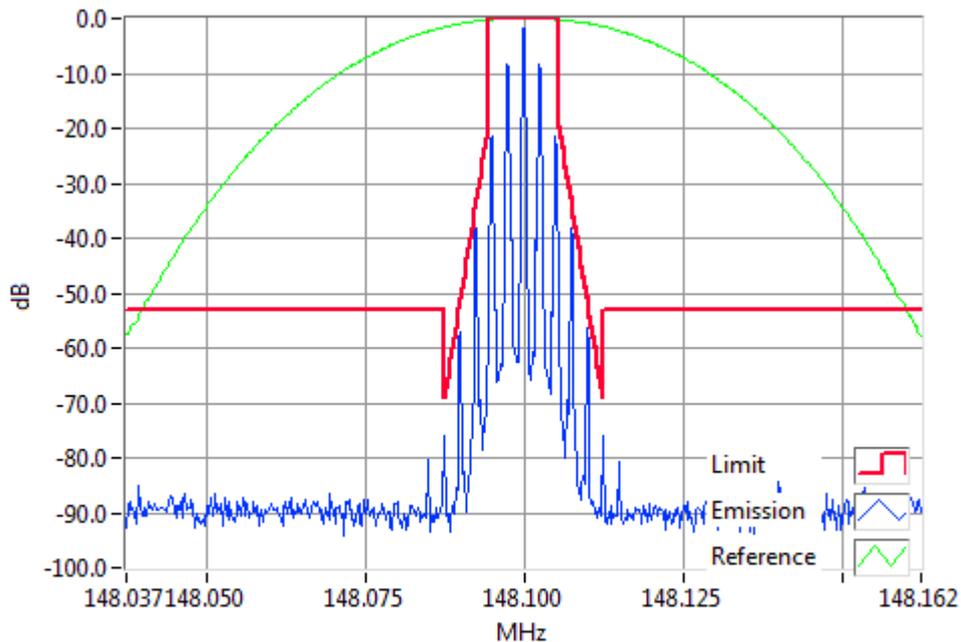


**Analogue Modulation 148.1000MHz Mask D 30W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

Tx FREQUENCY: 148.1 MHz

2 W

12.5 kHz Channel Spacing



**Analogue Modulation 148.1000MHz Mask D 2W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

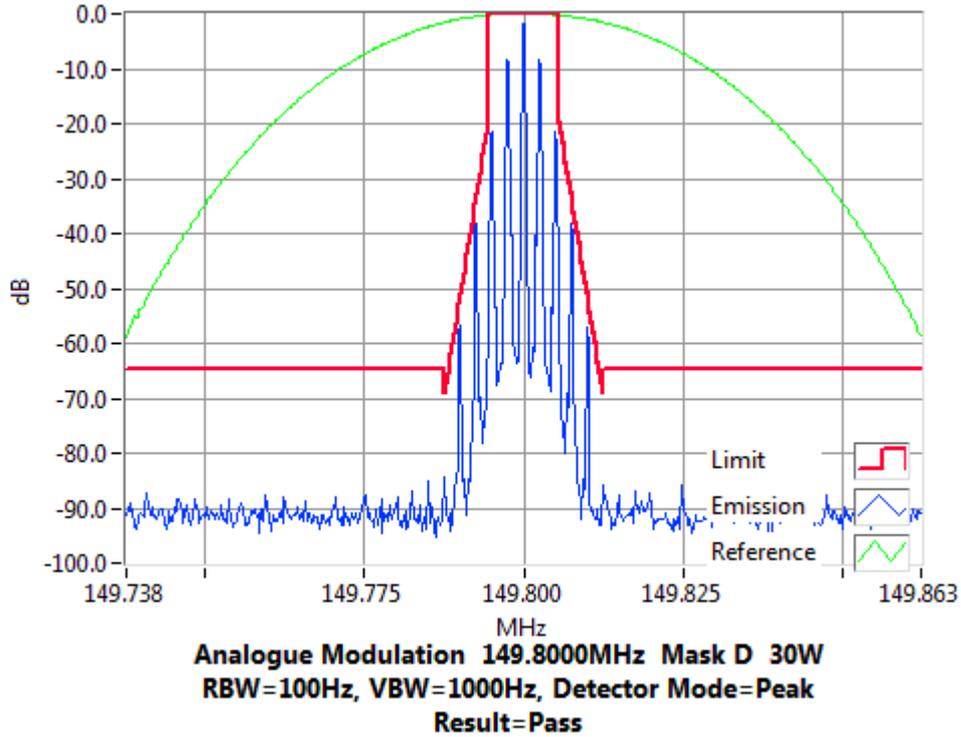
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

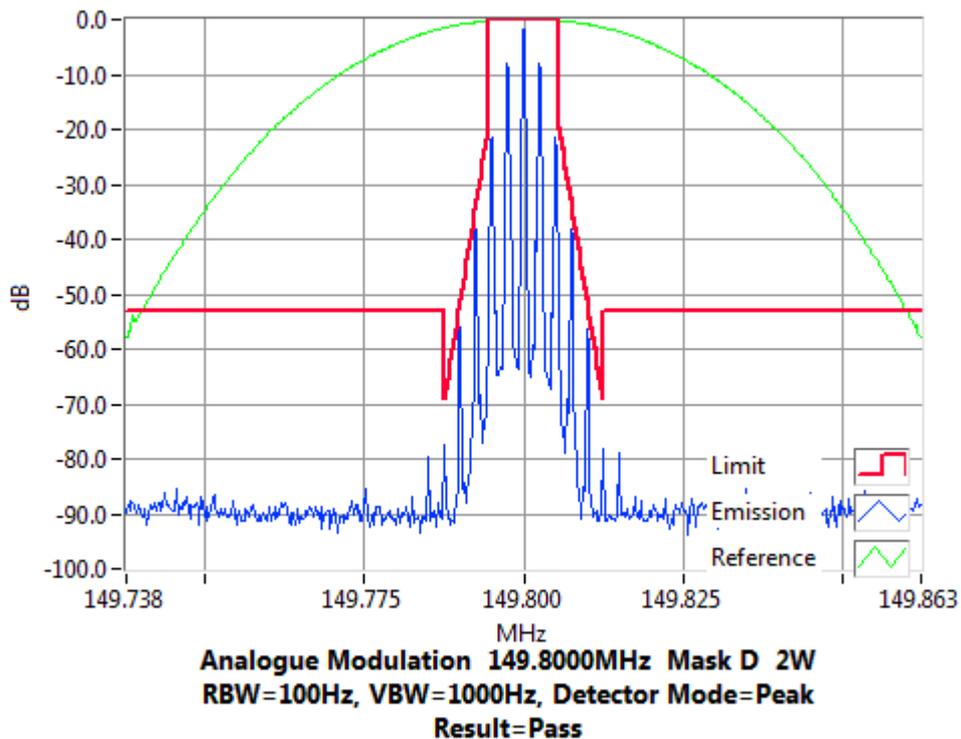
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 149.8 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 149.8 MHz 2 W 12.5 kHz Channel Spacing



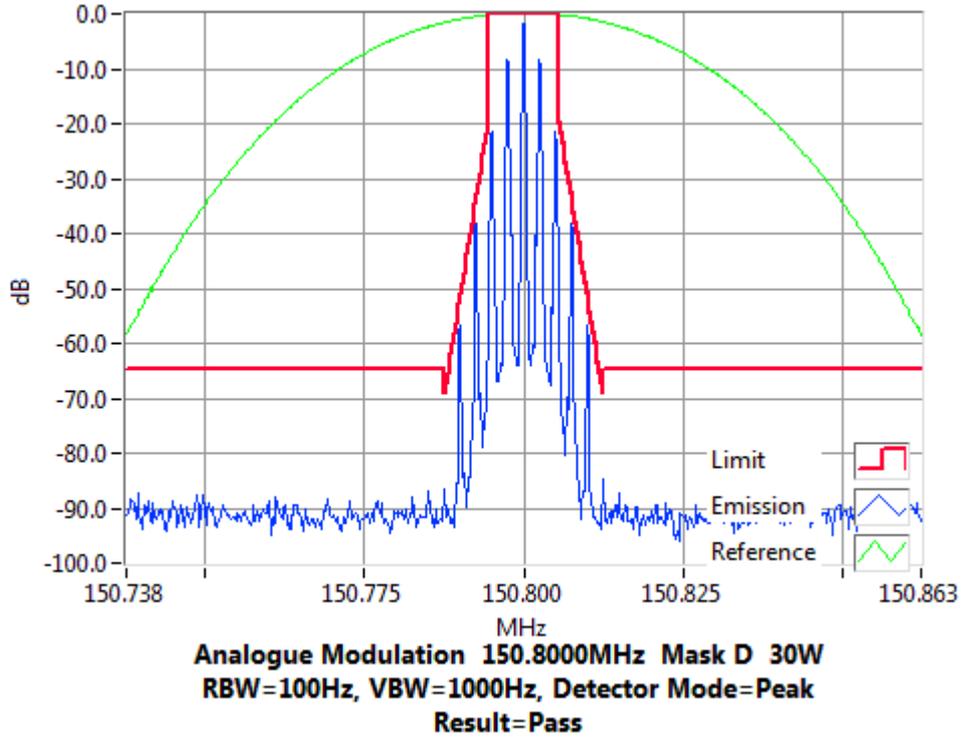
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

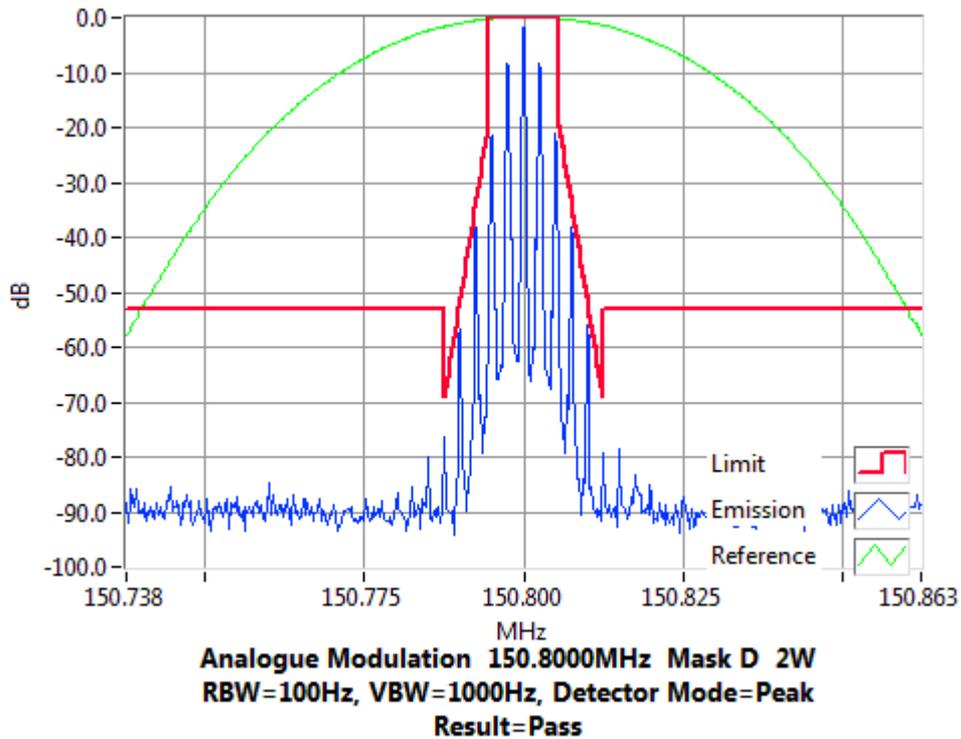
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 150.8 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 150.8 MHz 2 W 12.5 kHz Channel Spacing



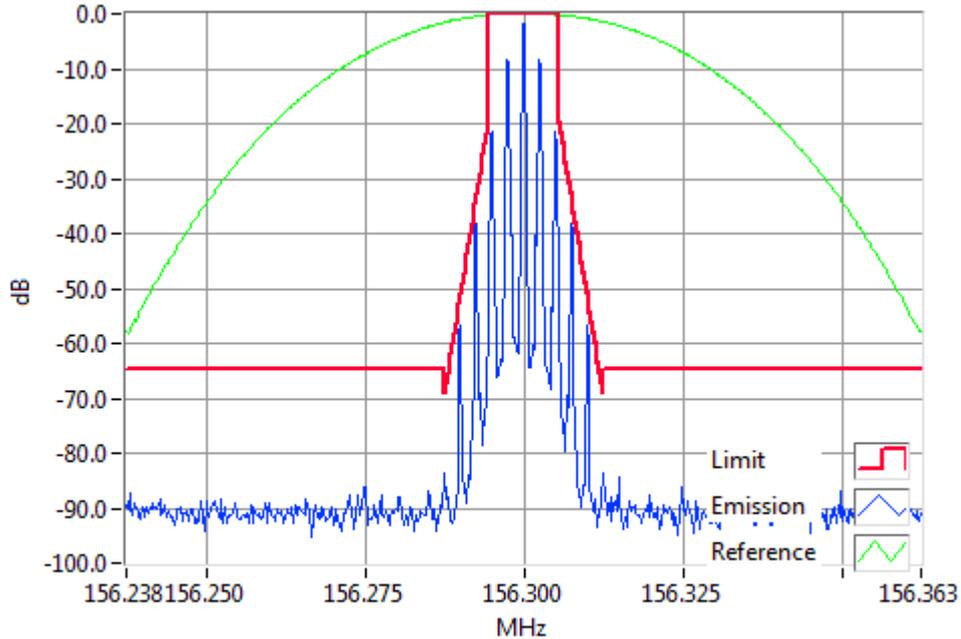
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

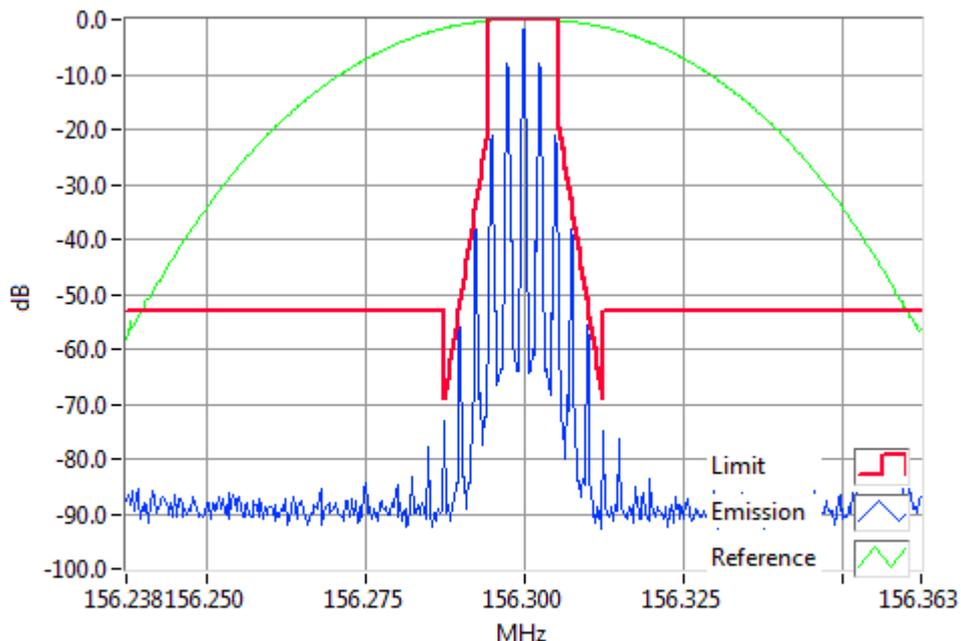
RSS-119 5.5

Tx FREQUENCY: 156.3 MHz 30 W 12.5 kHz Channel Spacing



**Analogue Modulation 156.3000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 156.3 MHz 2 W 12.5 kHz Channel Spacing



**Analogue Modulation 156.3000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

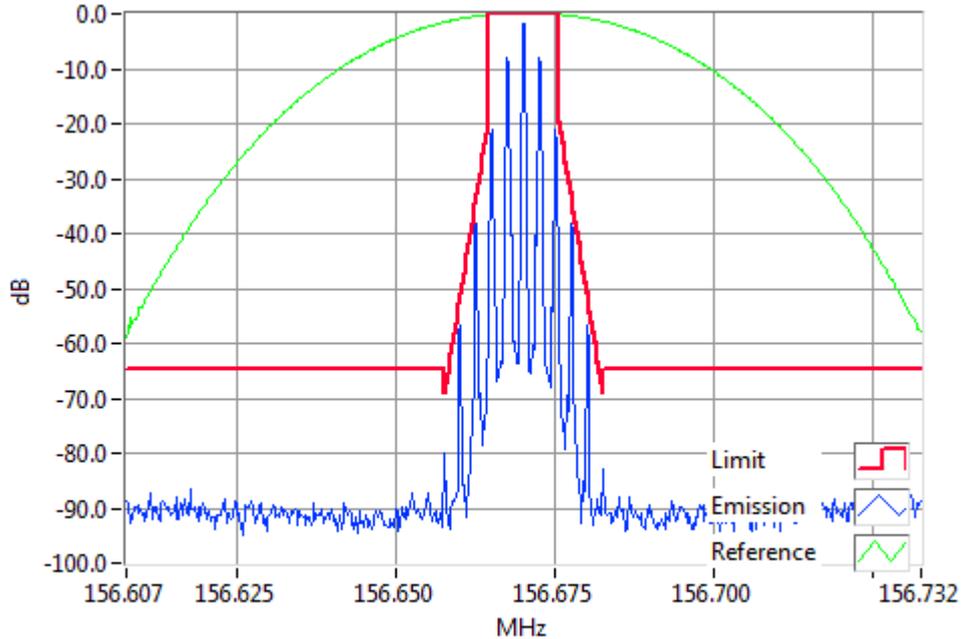
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

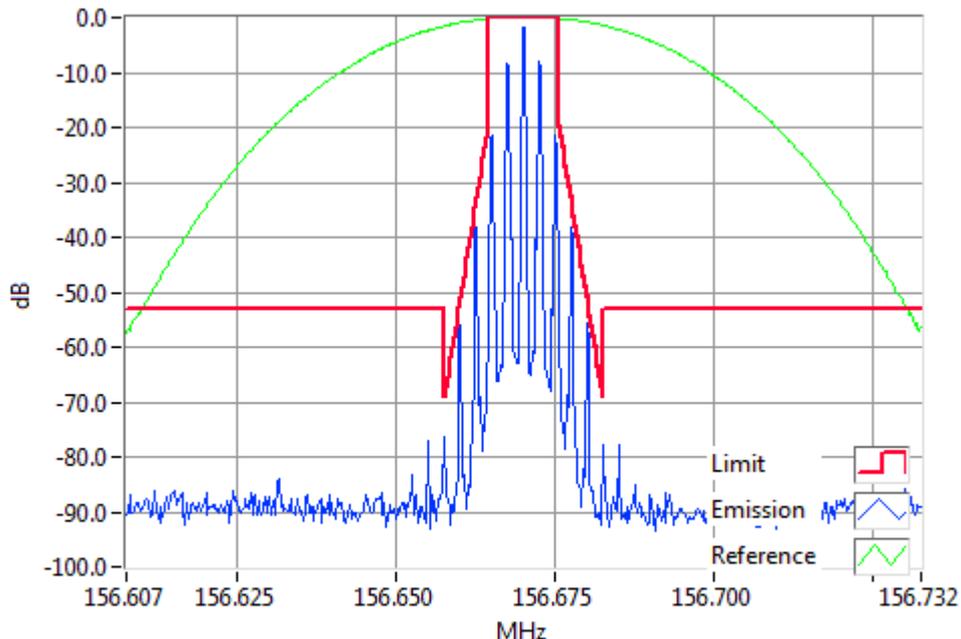
RSS-119 5.5

Tx FREQUENCY: 156.67 MHz 30 W 12.5 kHz Channel Spacing



**Analogue Modulation 156.6700MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 156.67 MHz 2 W 12.5 kHz Channel Spacing



**Analogue Modulation 156.6700MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

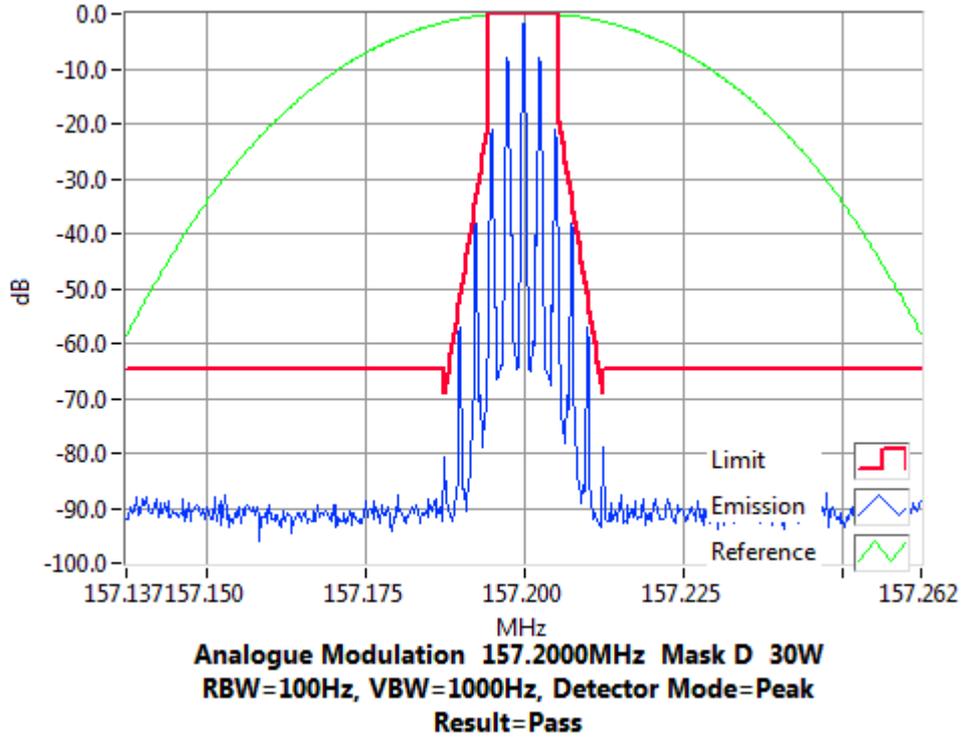
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

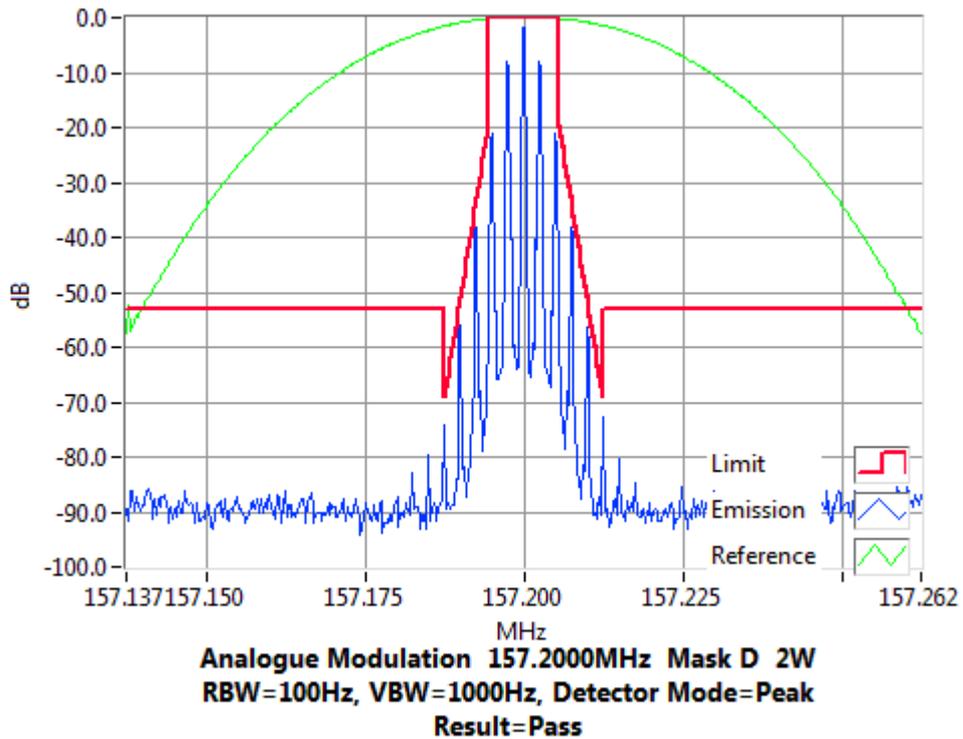
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 157.2 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 157.2 MHz 2 W 12.5 kHz Channel Spacing



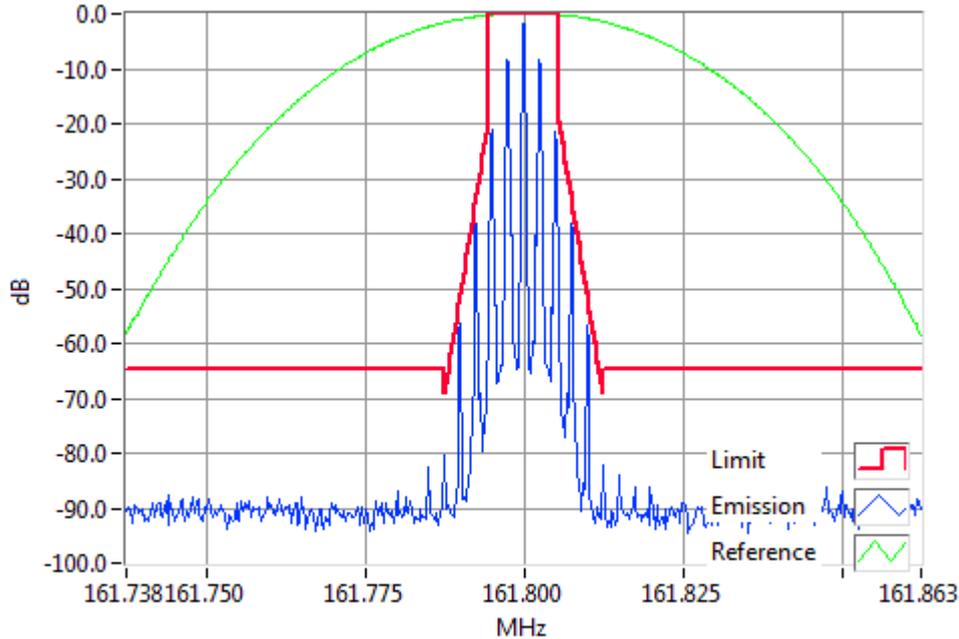
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

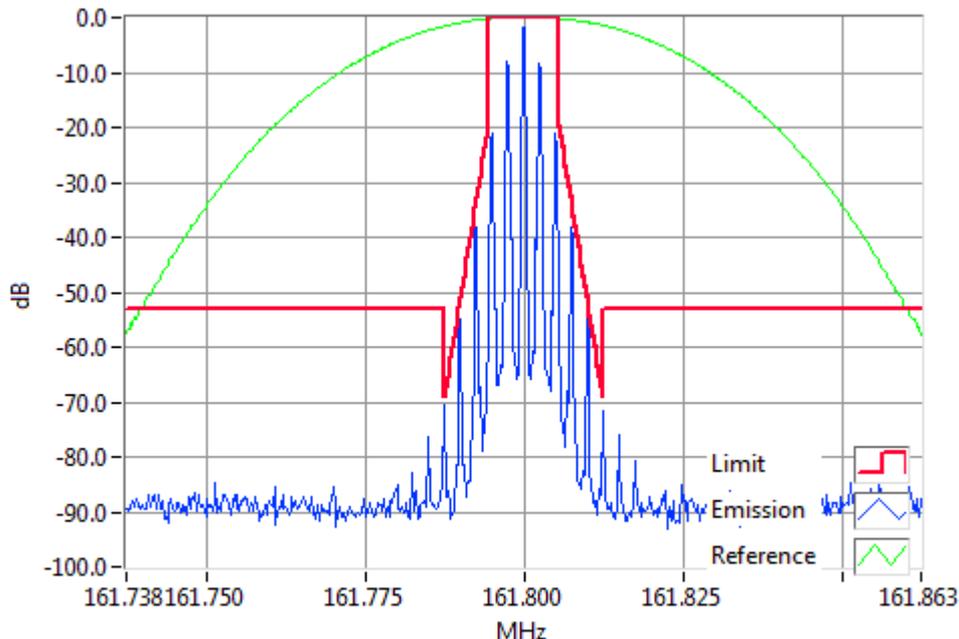
RSS-119 5.5

Tx FREQUENCY: 161.8 MHz 30 W 12.5 kHz Channel Spacing



**Analogue Modulation 161.8000MHz Mask D 30W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

Tx FREQUENCY: 161.8 MHz 2 W 12.5 kHz Channel Spacing



**Analogue Modulation 161.8000MHz Mask D 2W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

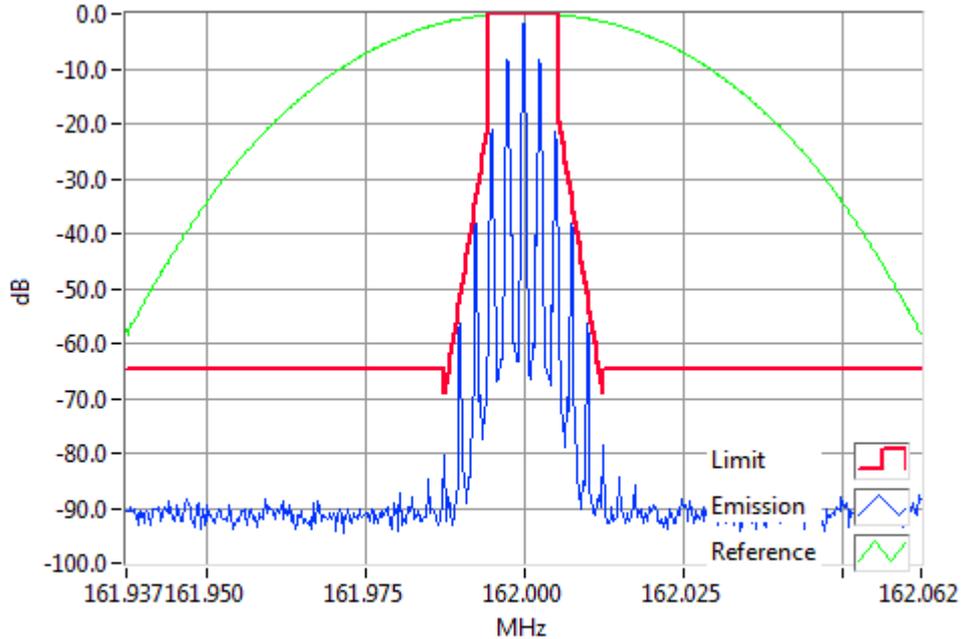
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

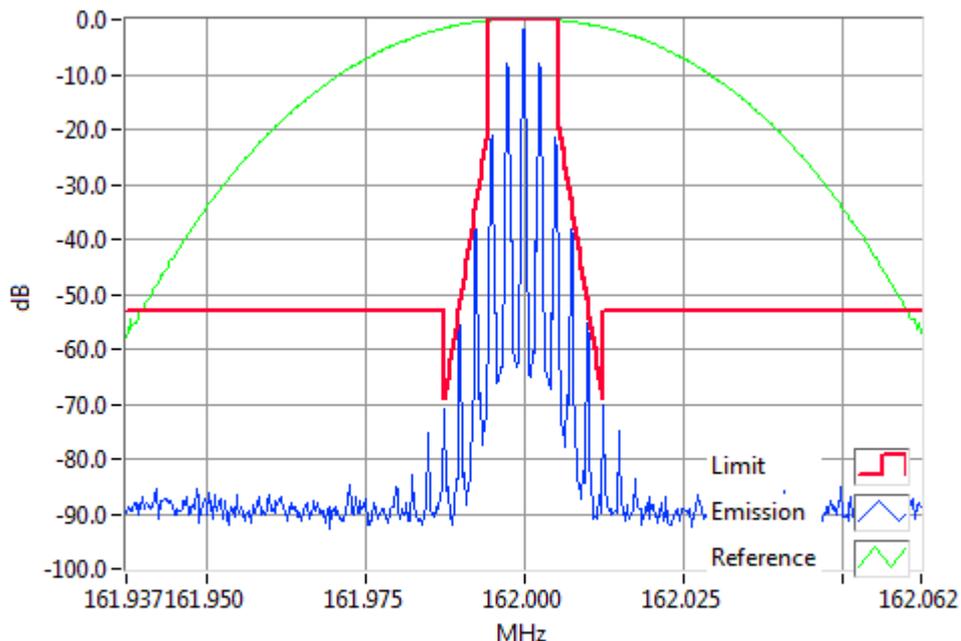
RSS-119 5.5

Tx FREQUENCY: 162.0 MHz 30 W 12.5 kHz Channel Spacing



**Analogue Modulation 162.0000MHz Mask D 30W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

Tx FREQUENCY: 162.0 MHz 2 W 12.5 kHz Channel Spacing



**Analogue Modulation 162.0000MHz Mask D 2W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

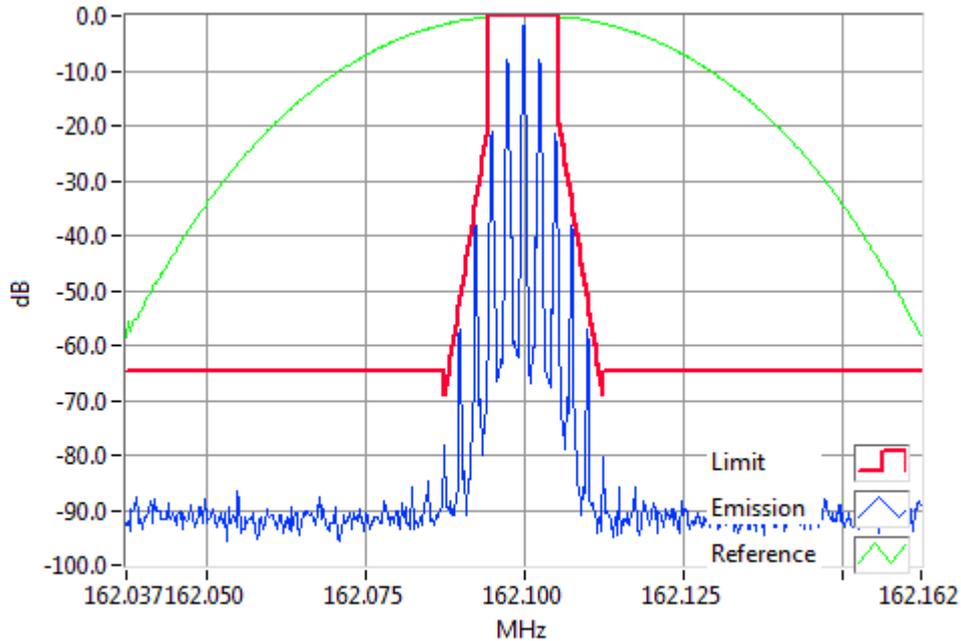
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

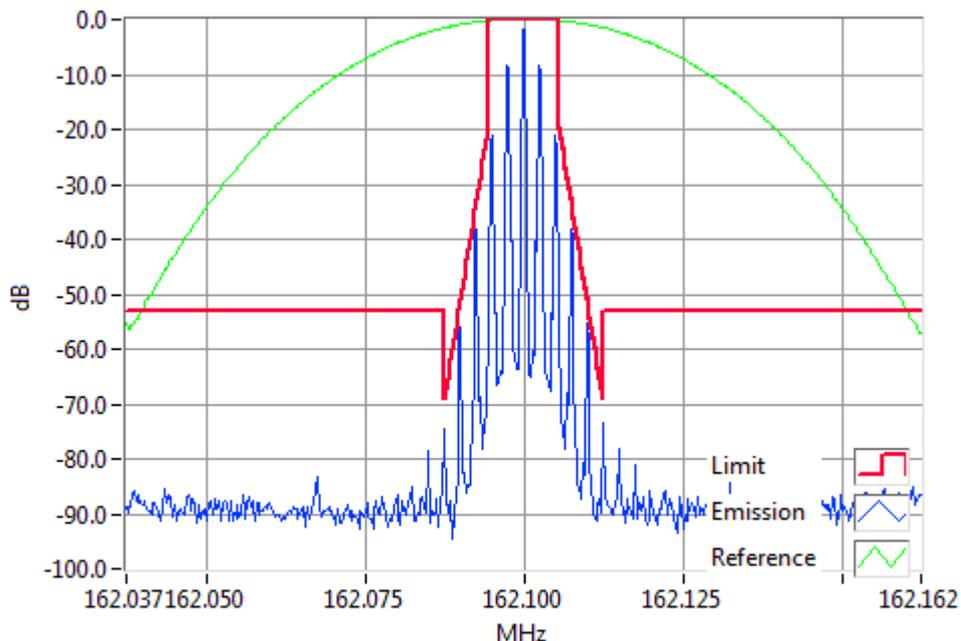
RSS-119 5.5

Tx FREQUENCY: 162.1 MHz 30 W 12.5 kHz Channel Spacing



**Analogue Modulation 162.1000MHz Mask D 30W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

Tx FREQUENCY: 162.1 MHz 2 W 12.5 kHz Channel Spacing



**Analogue Modulation 162.1000MHz Mask D 2W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

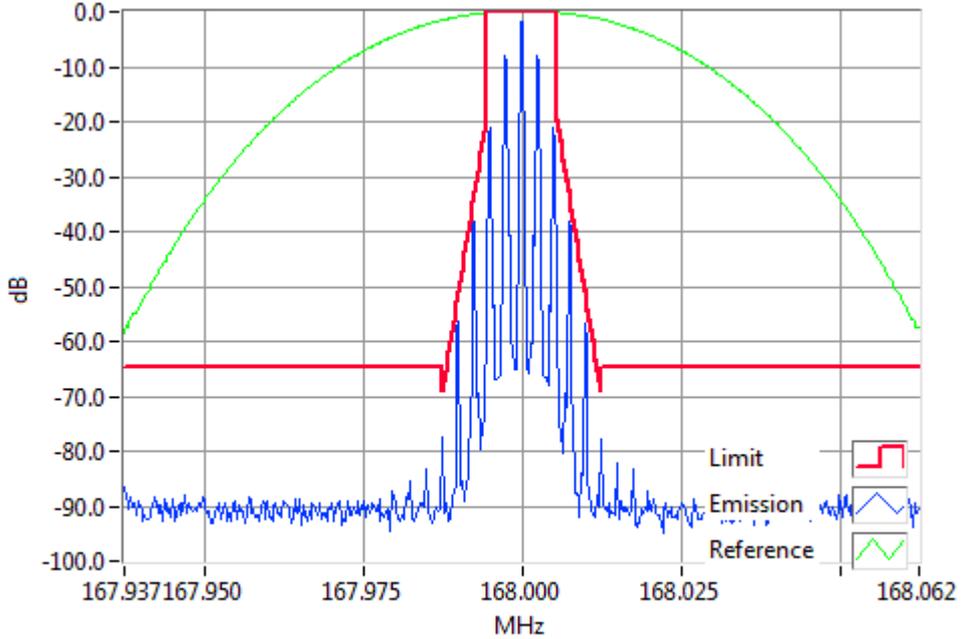
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

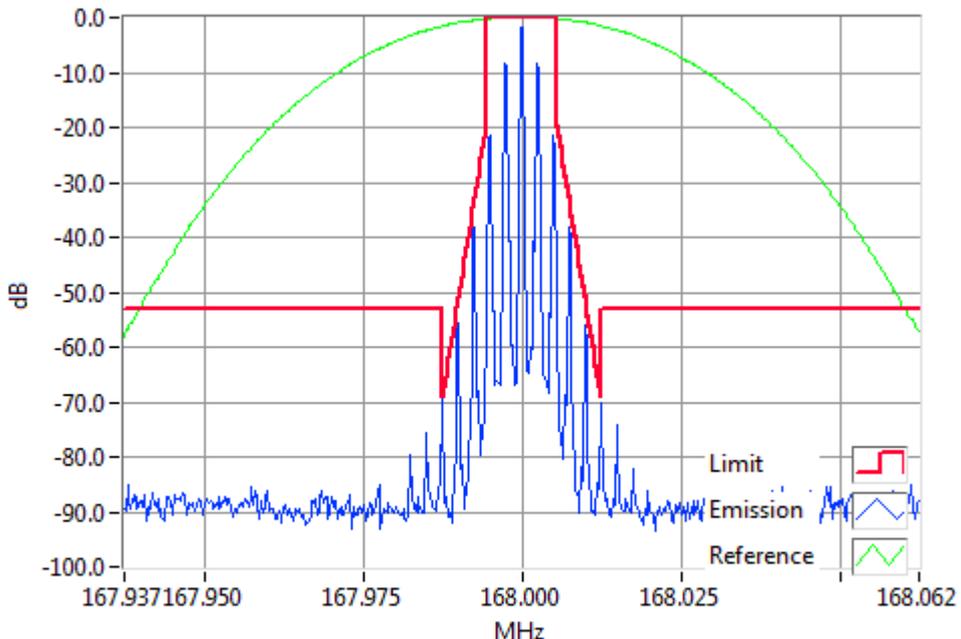
RSS-119 5.5

Tx FREQUENCY: 168.0 MHz 30 W 12.5 kHz Channel Spacing



**Analogue Modulation 168.0000MHz Mask D 30W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

Tx FREQUENCY: 168.0 MHz 2 W 12.5 kHz Channel Spacing



**Analogue Modulation 168.0000MHz Mask D 2W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

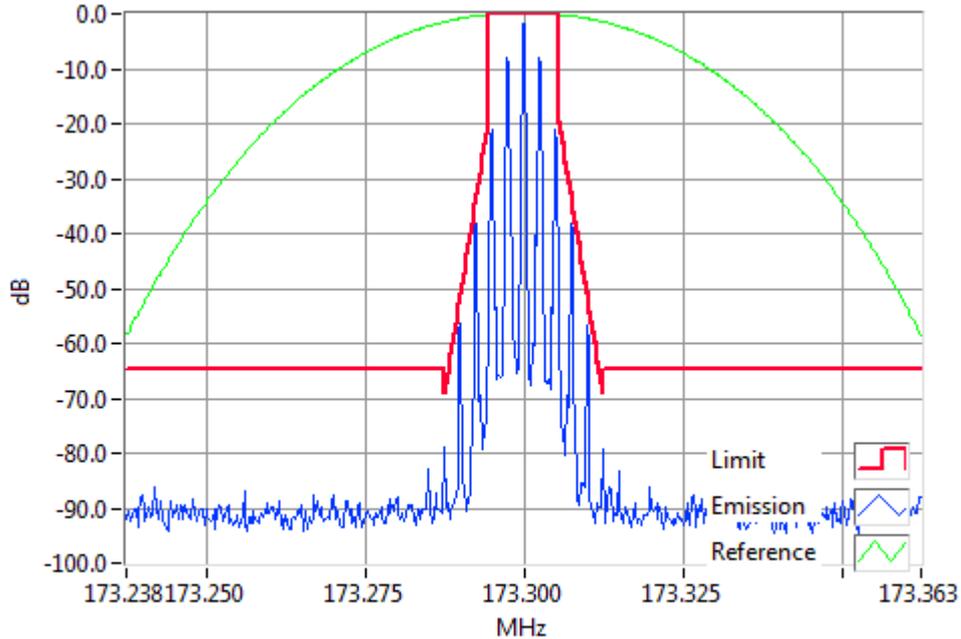
### Occupied Bandwidth and Spectrum Masks

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

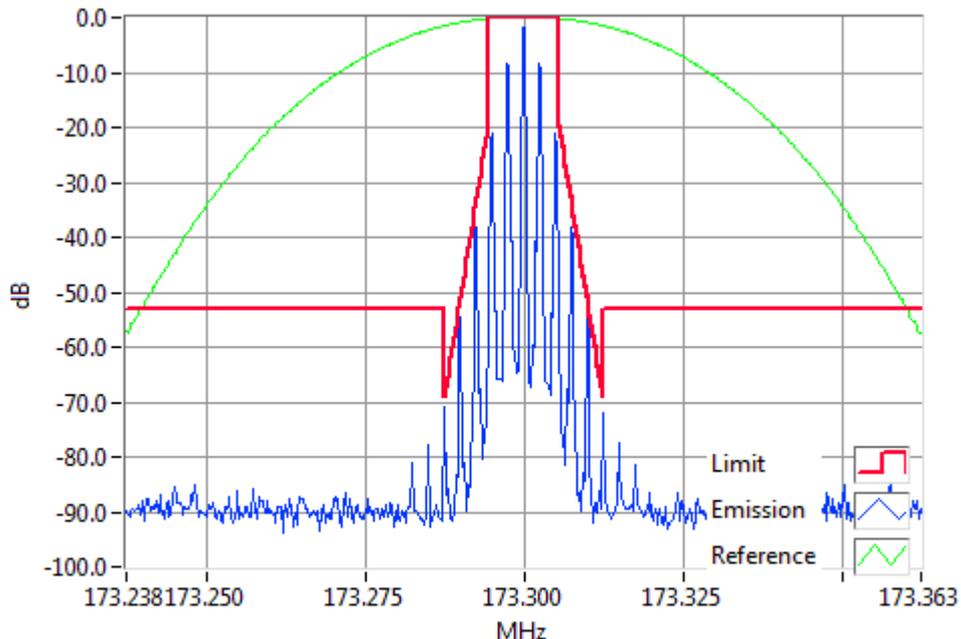
RSS-119 5.5

Tx FREQUENCY: 173.3 MHz 30 W 12.5 kHz Channel Spacing



**Analogue Modulation 173.3000MHz Mask D 30W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

Tx FREQUENCY: 173.3 MHz 2 W 12.5 kHz Channel Spacing



**Analogue Modulation 173.3000MHz Mask D 2W  
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak  
Result=Pass**

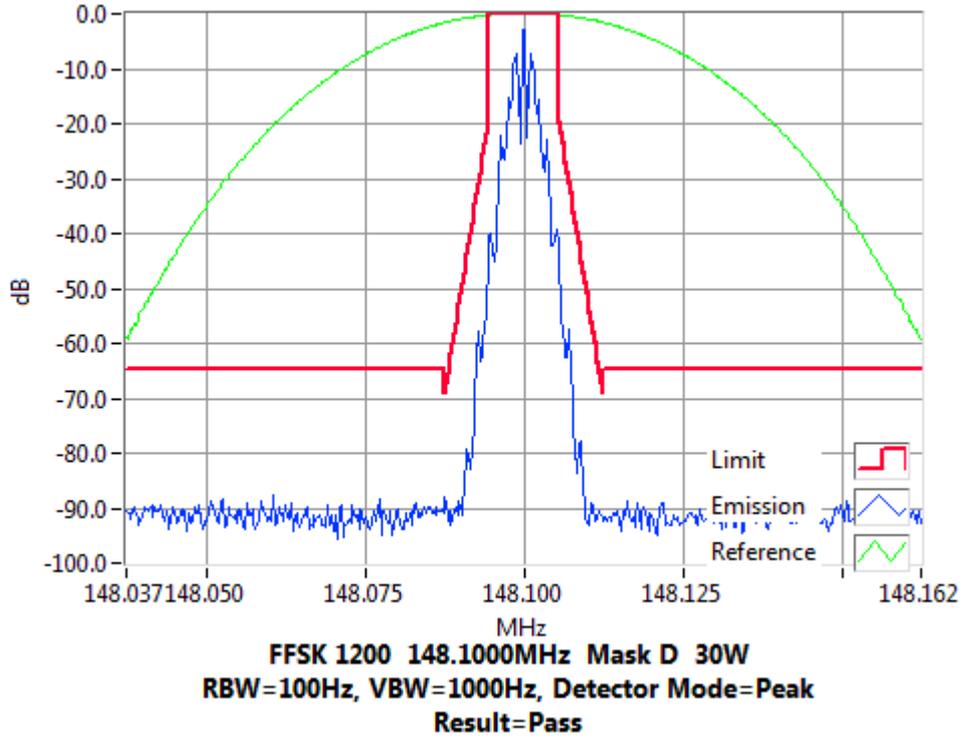
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

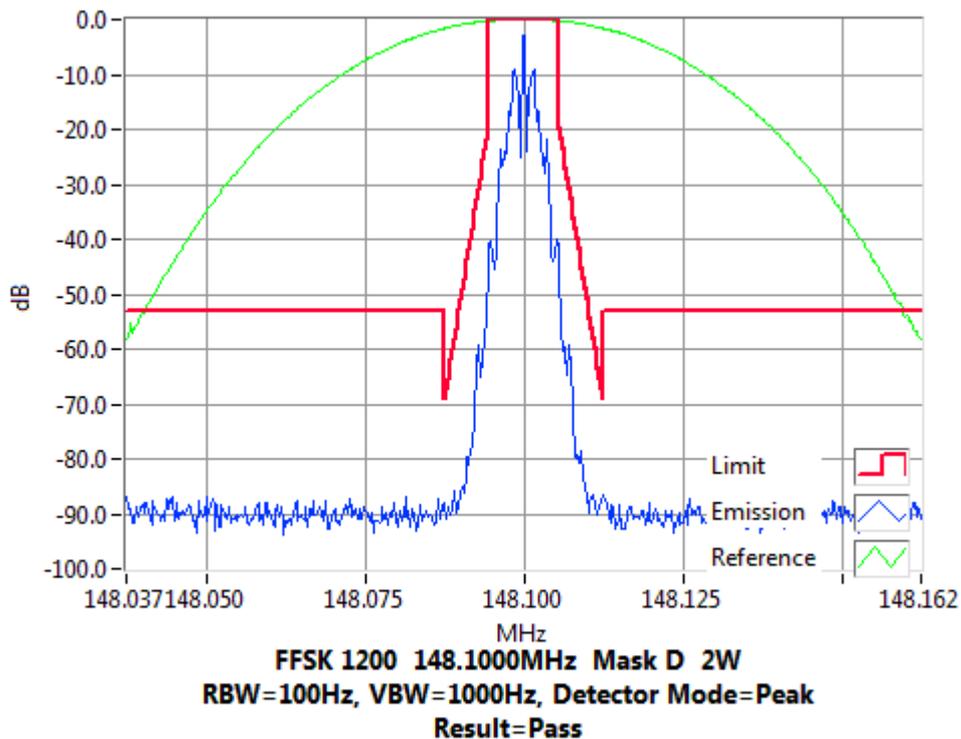
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 148.1 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 148.1 MHz 2 W 12.5 kHz Channel Spacing



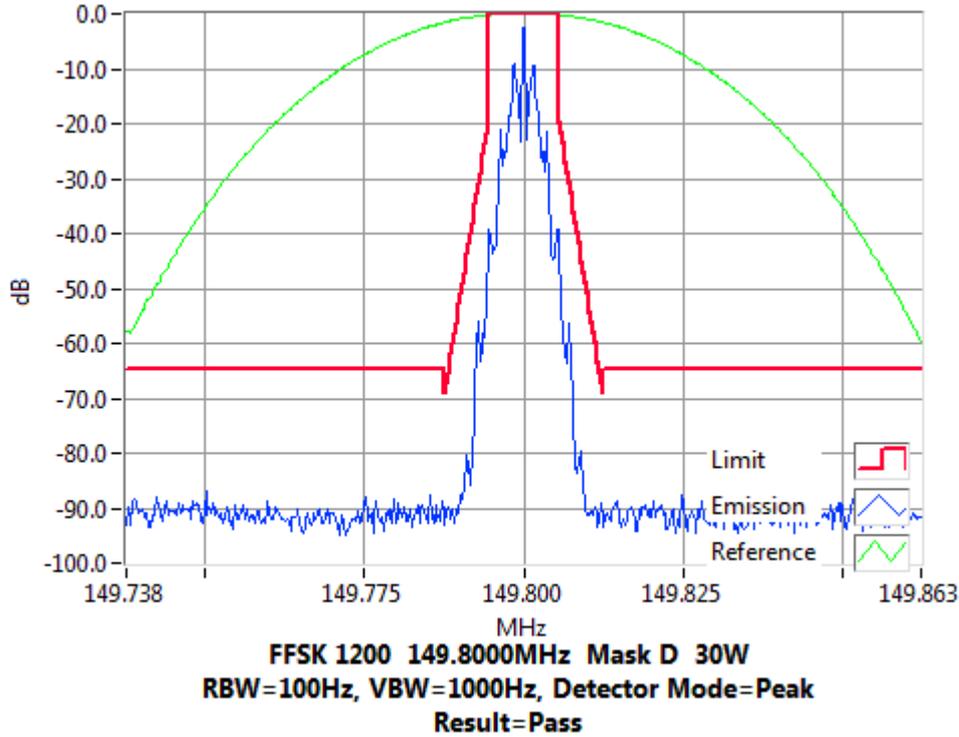
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

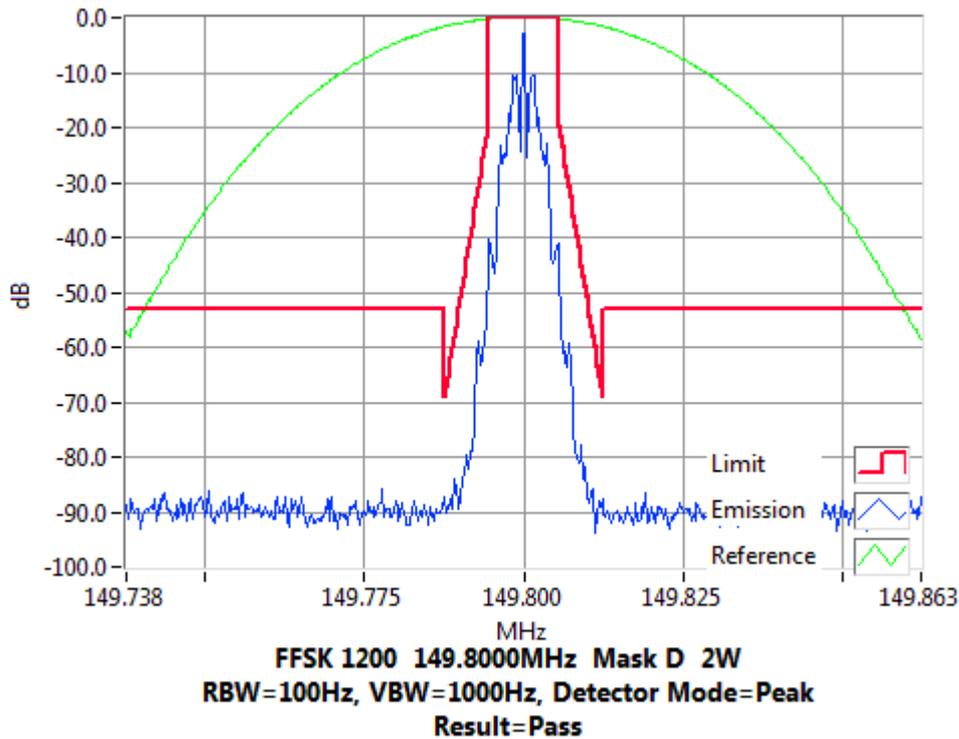
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 149.8 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 149.8 MHz 2 W 12.5 kHz Channel Spacing



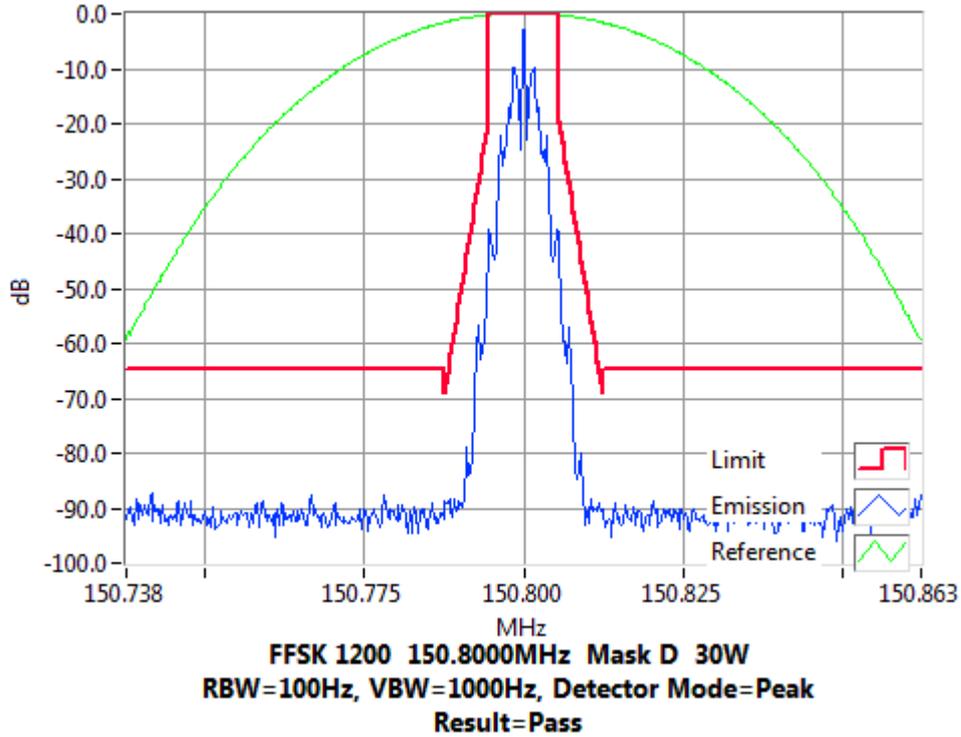
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

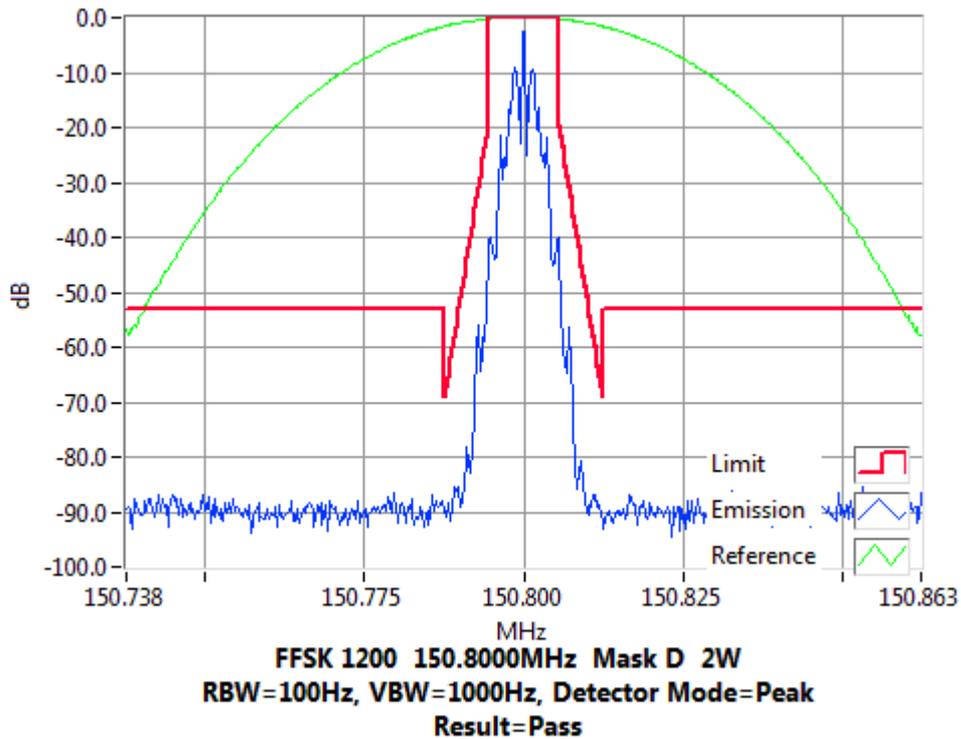
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 150.8 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 150.8 MHz 2 W 12.5 kHz Channel Spacing



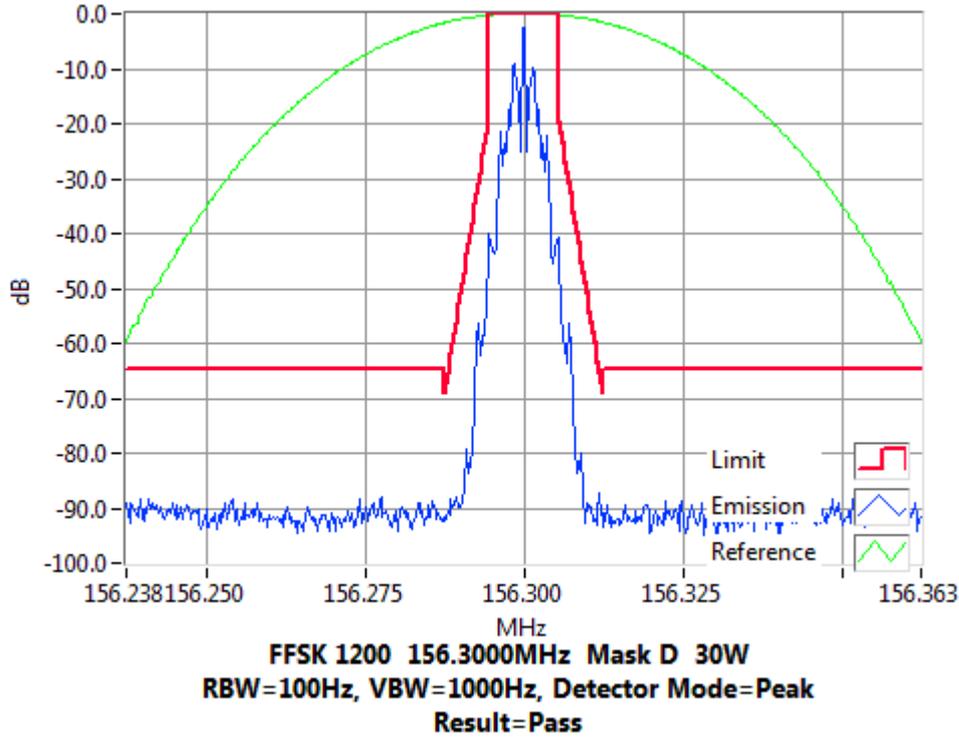
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

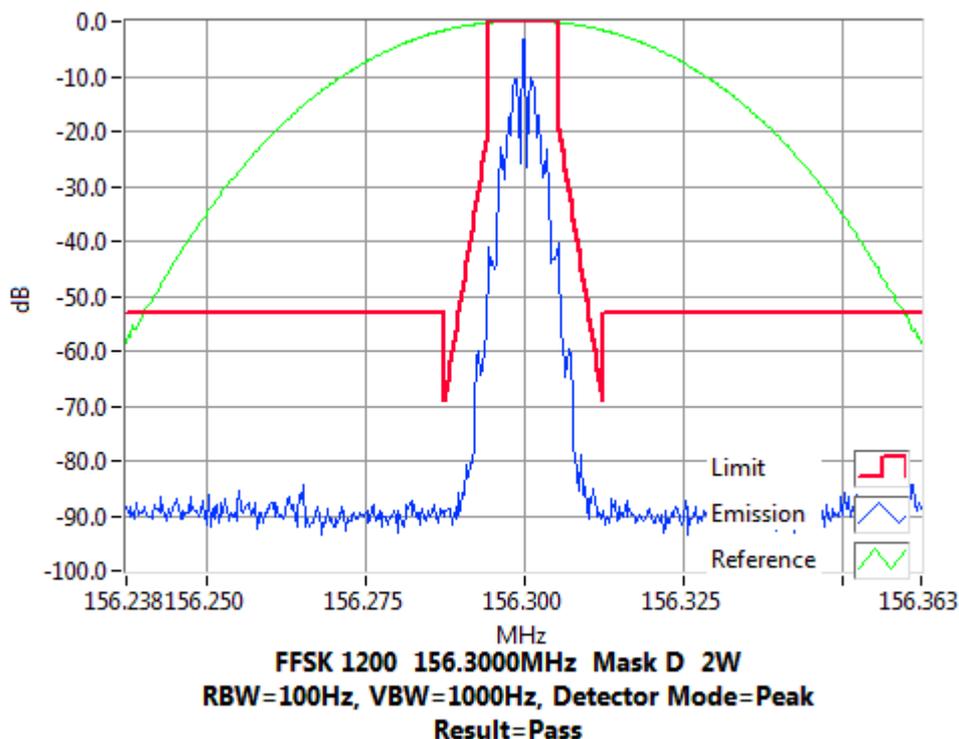
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 156.3 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 156.3 MHz 2 W 12.5 kHz Channel Spacing



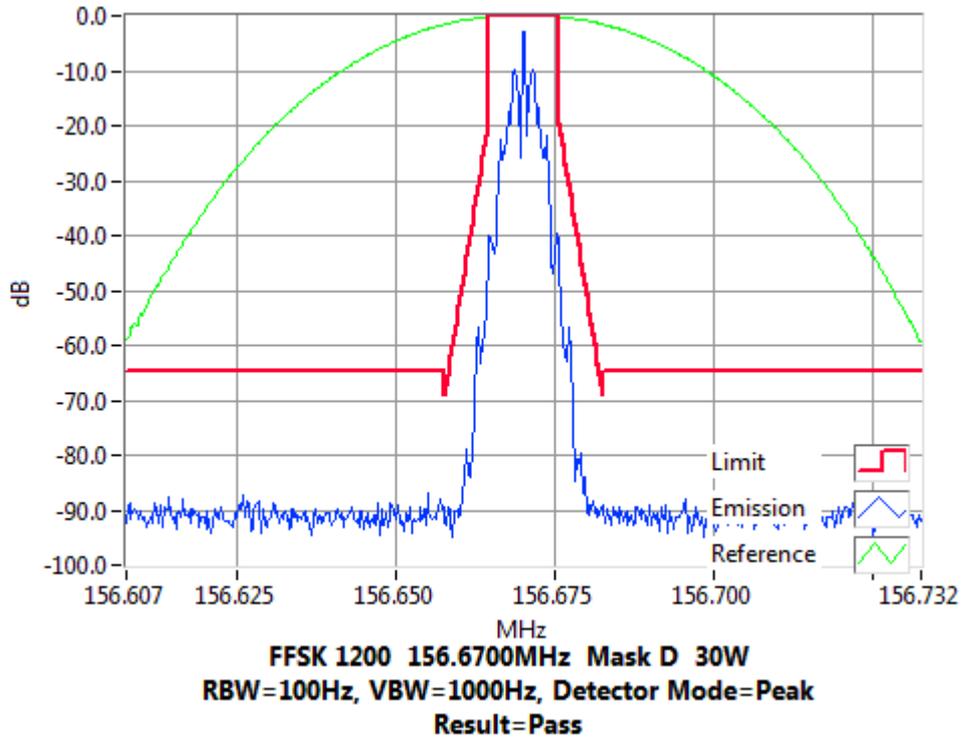
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

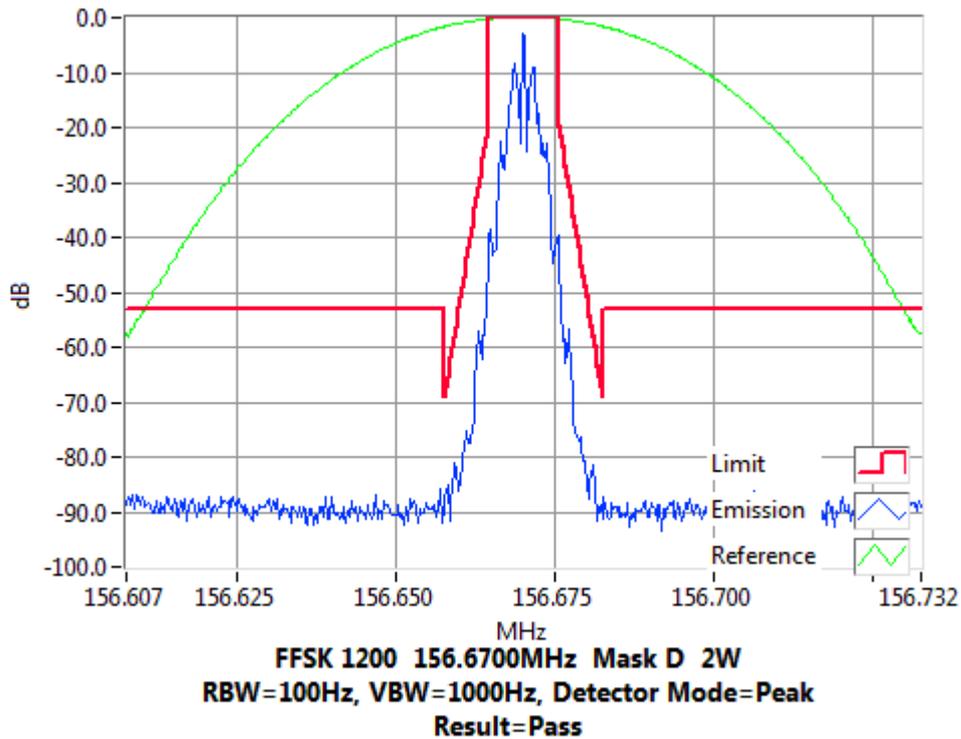
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 156.67 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 156.67 MHz 2 W 12.5 kHz Channel Spacing



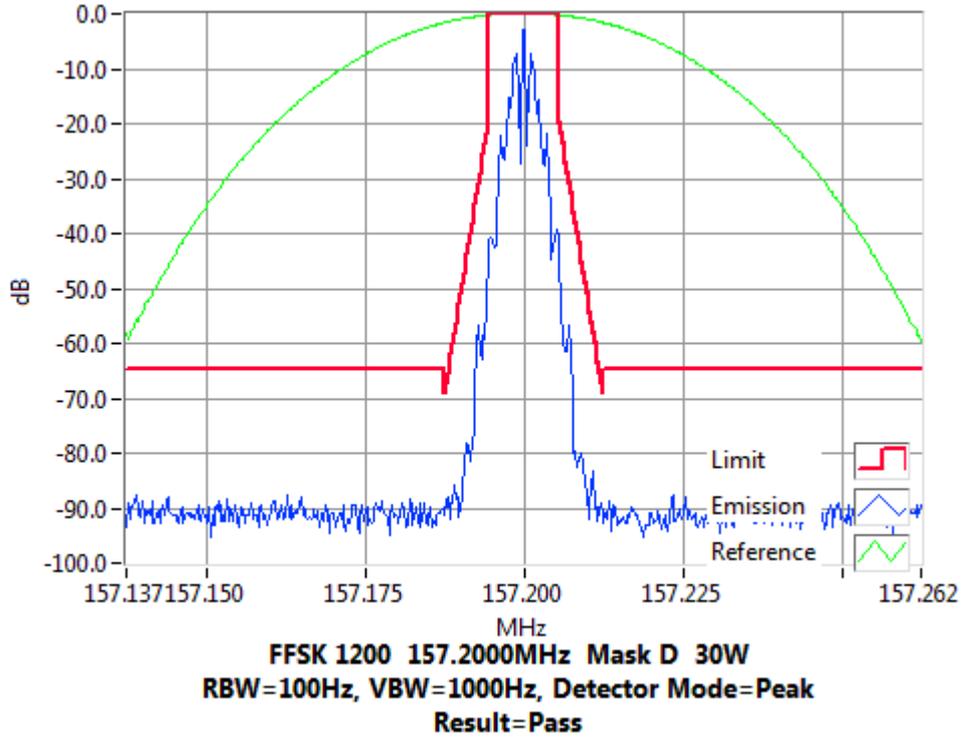
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

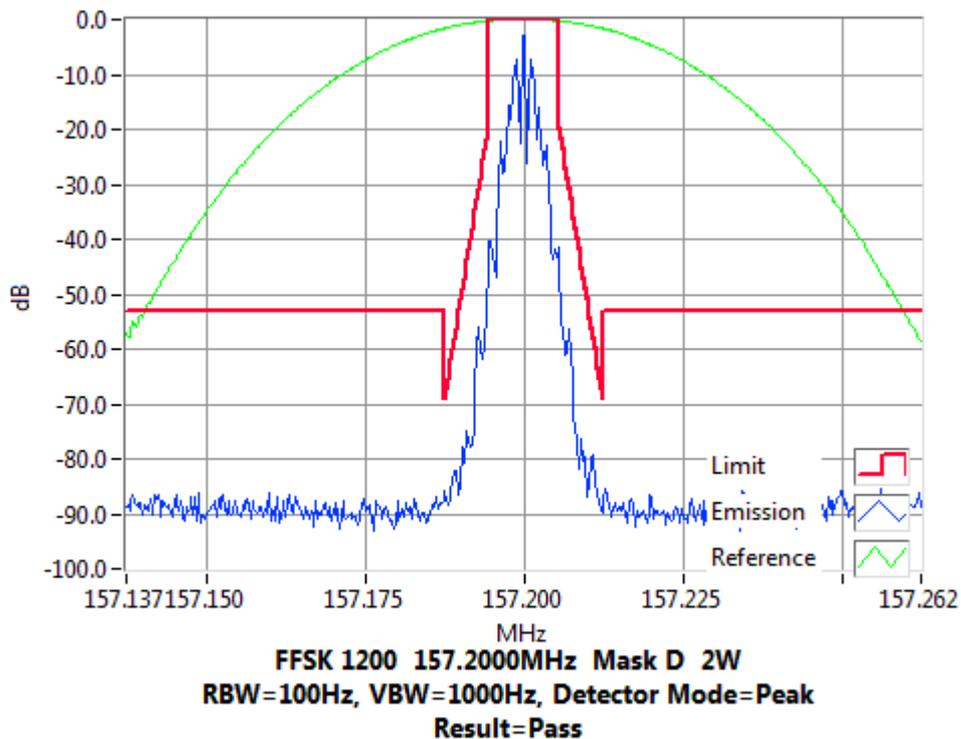
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 157.2 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 157.2 MHz 2 W 12.5 kHz Channel Spacing



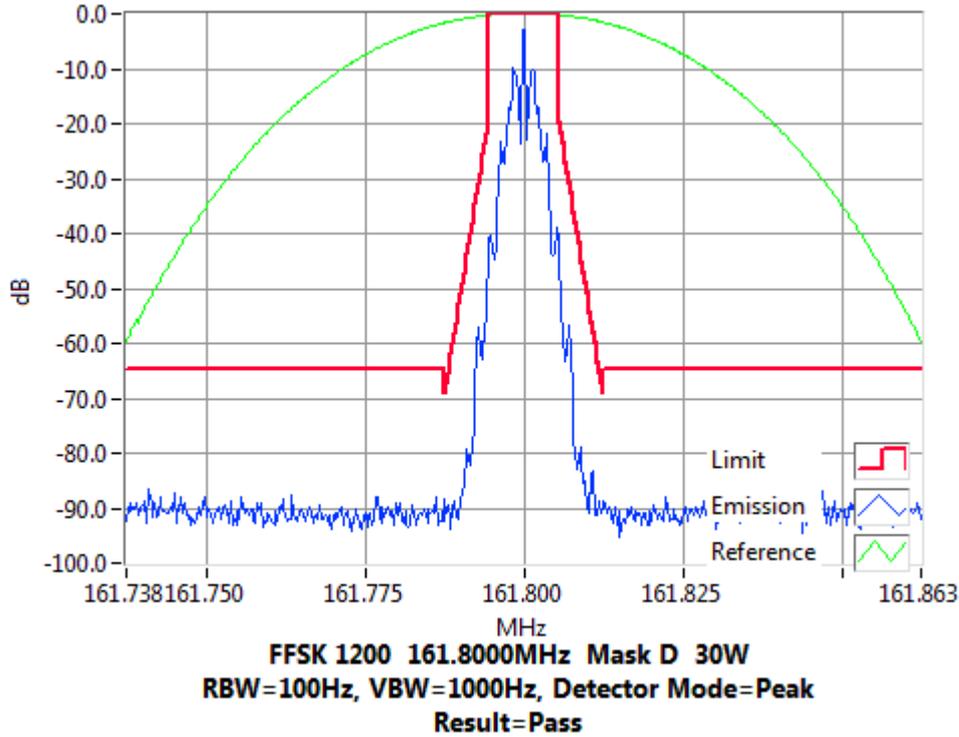
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

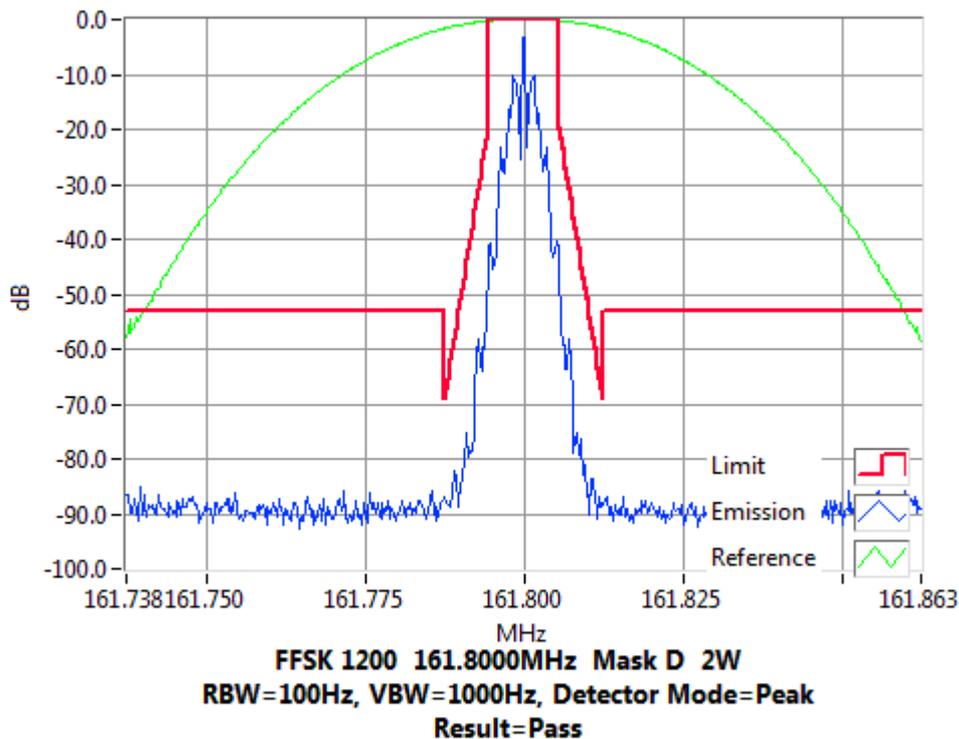
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 161.8 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 161.8 MHz 2 W 12.5 kHz Channel Spacing



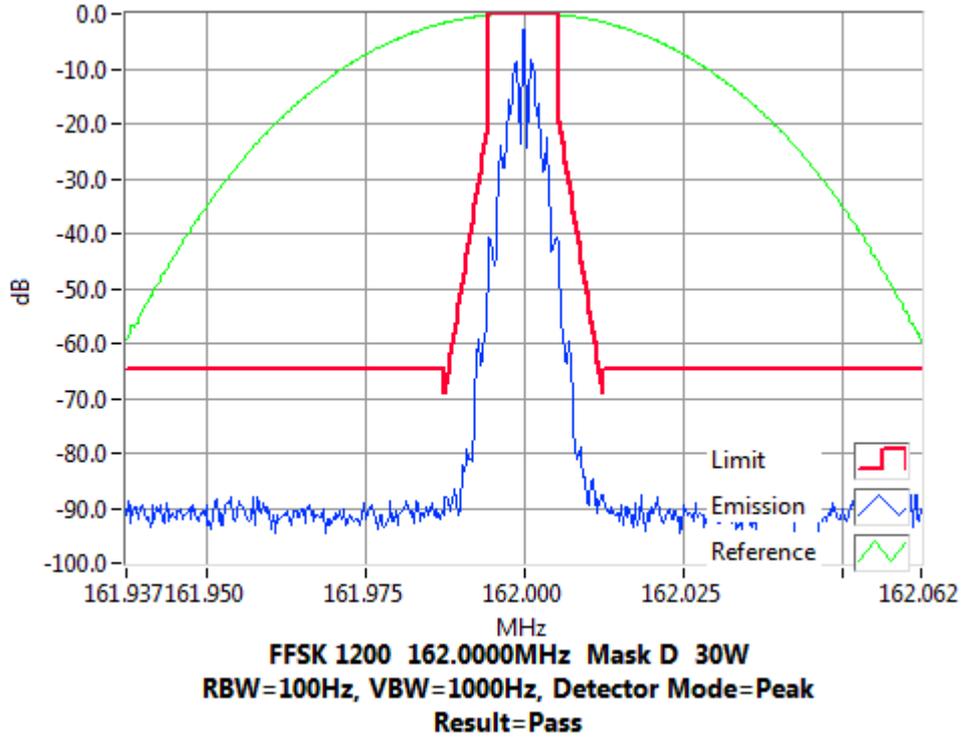
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

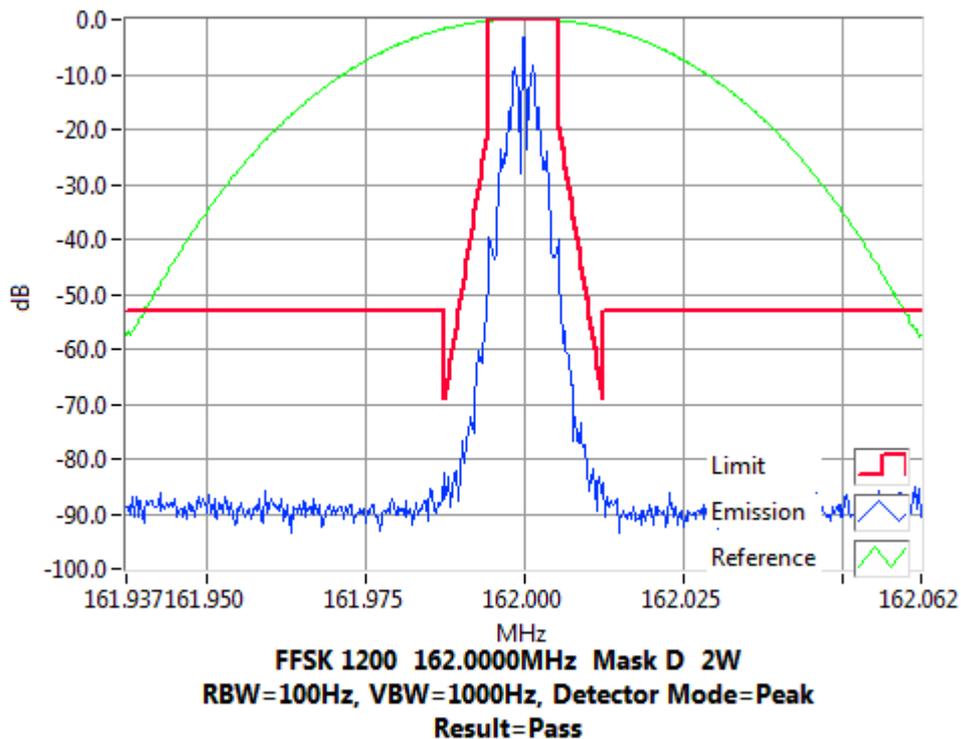
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 162.0 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 162.0 MHz 2 W 12.5 kHz Channel Spacing



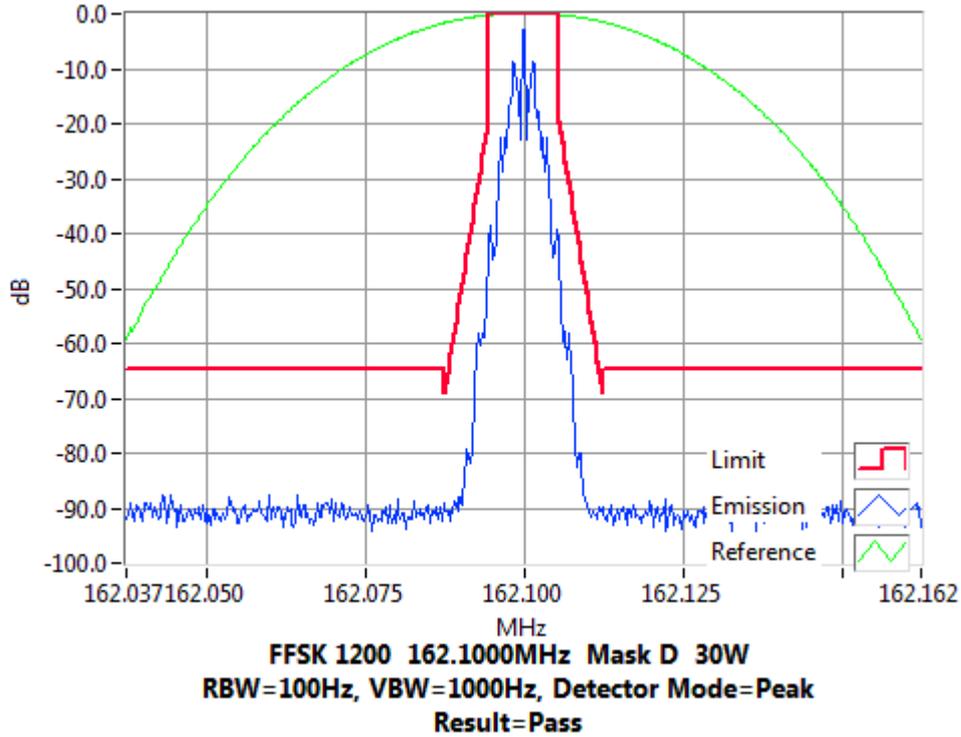
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

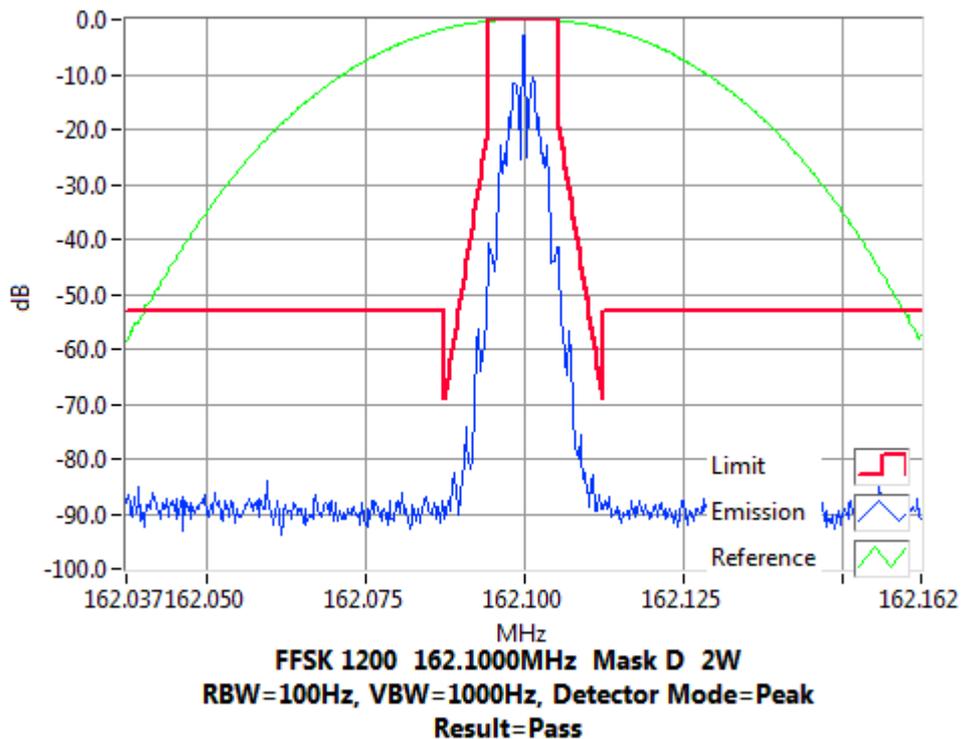
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 162.1 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 162.1 MHz 2 W 12.5 kHz Channel Spacing



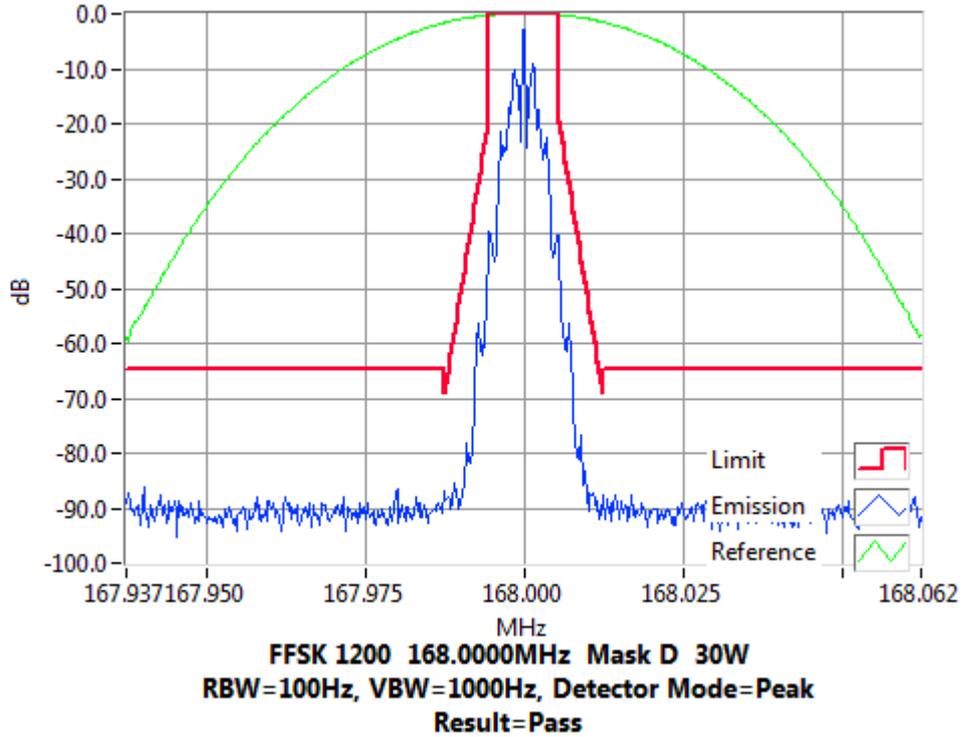
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

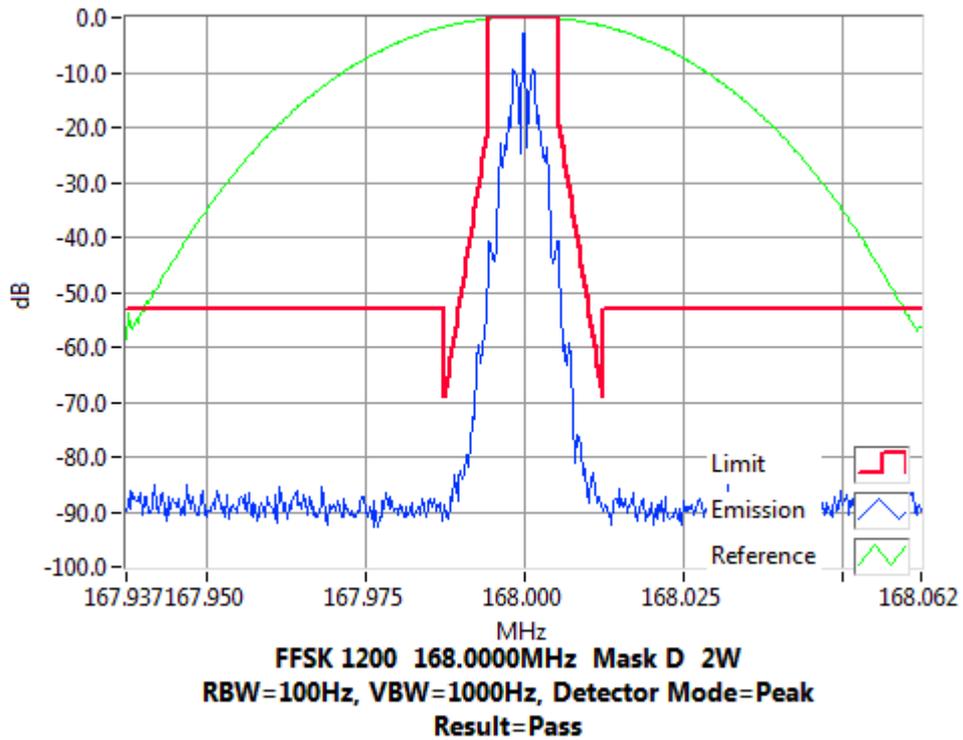
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 168.0 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 168.0 MHz 2 W 12.5 kHz Channel Spacing



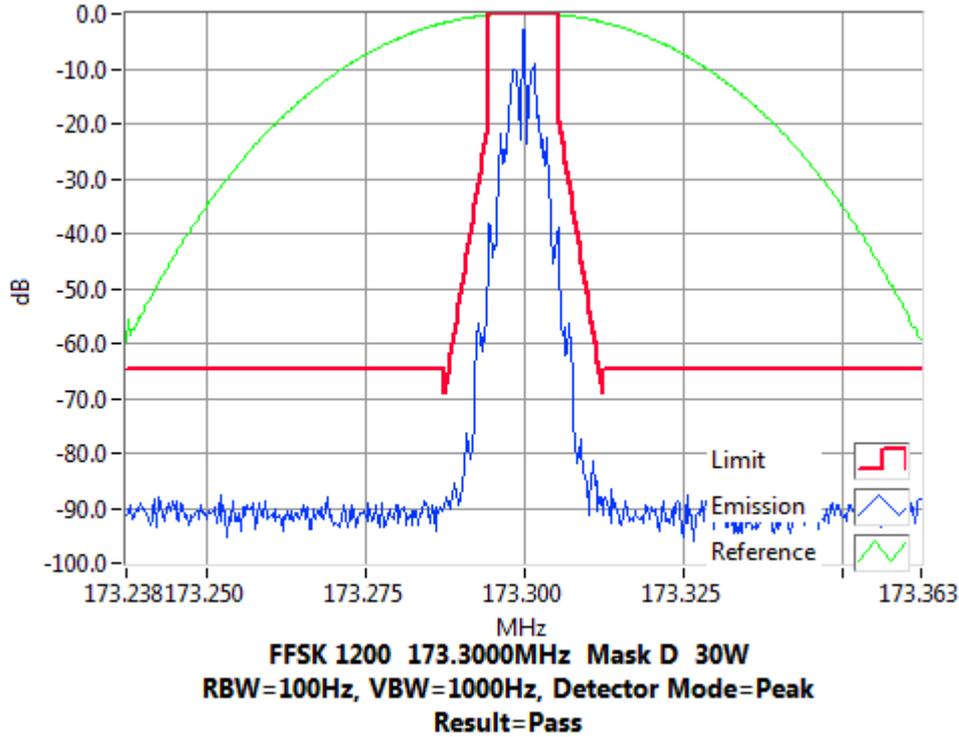
### Occupied Bandwidth and Spectrum Masks

FFSK, 1200 bps

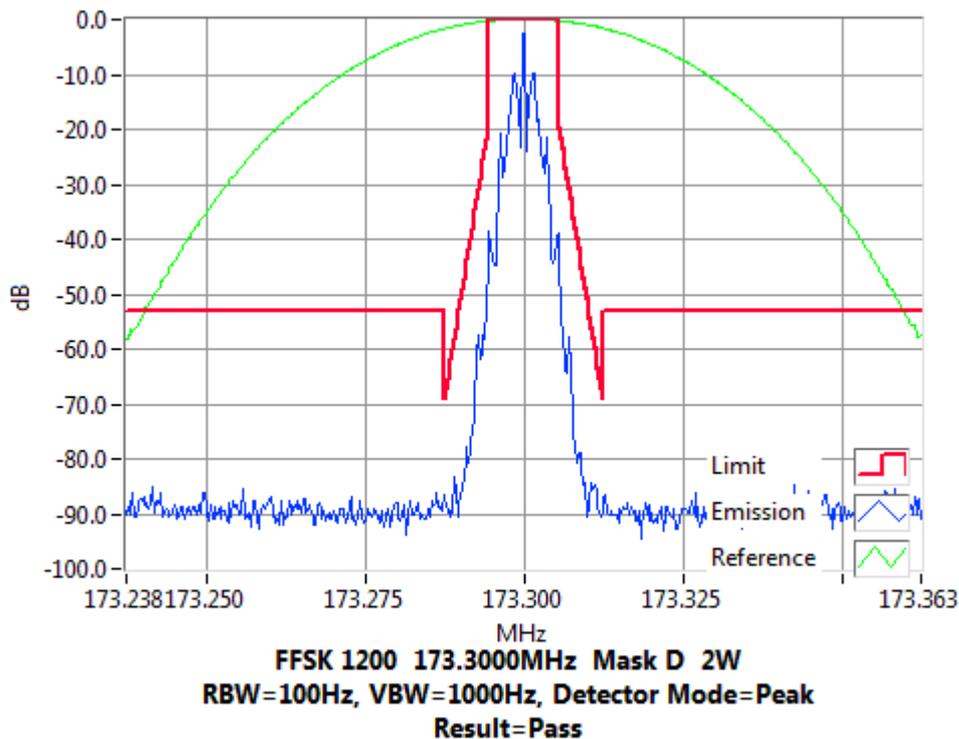
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 173.3 MHz 30 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 173.3 MHz 2 W 12.5 kHz Channel Spacing



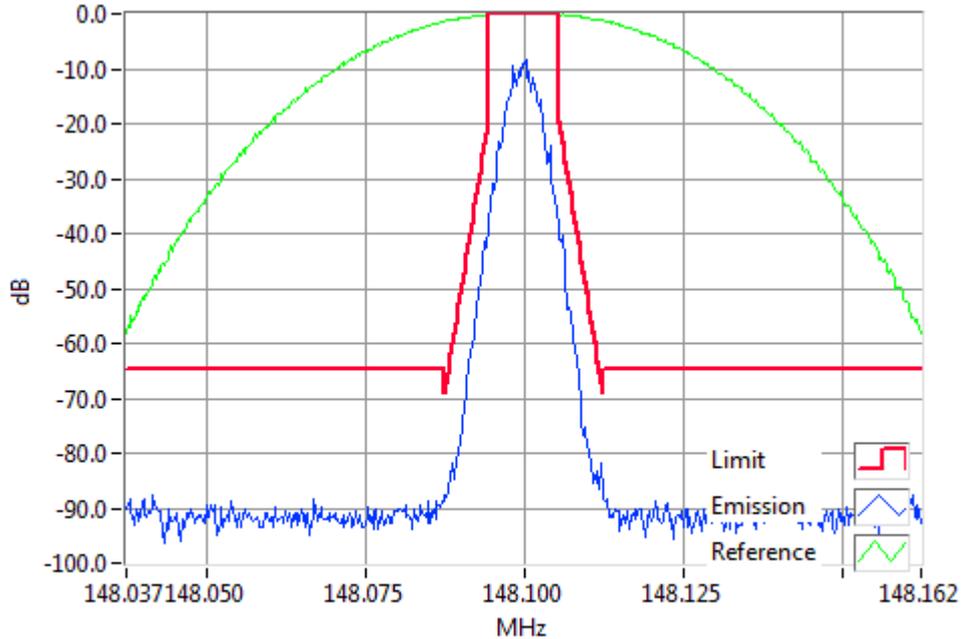
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

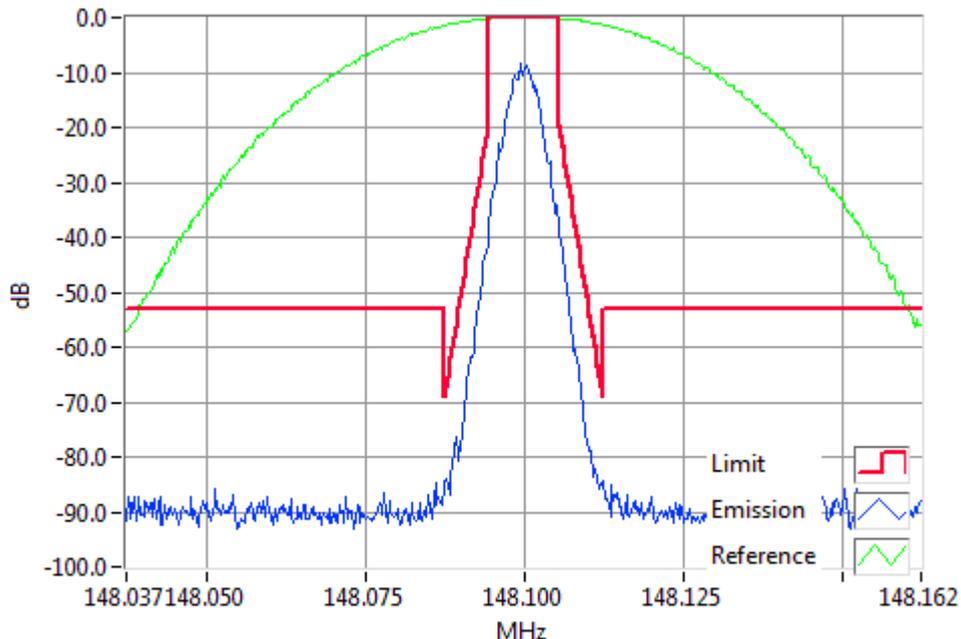
RSS-119 5.5

Tx FREQUENCY: 148.1 MHz 30 W 12.5 kHz Channel Spacing



**DMR 148.1000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 148.1 MHz 2 W 12.5 kHz Channel Spacing



**DMR 148.1000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

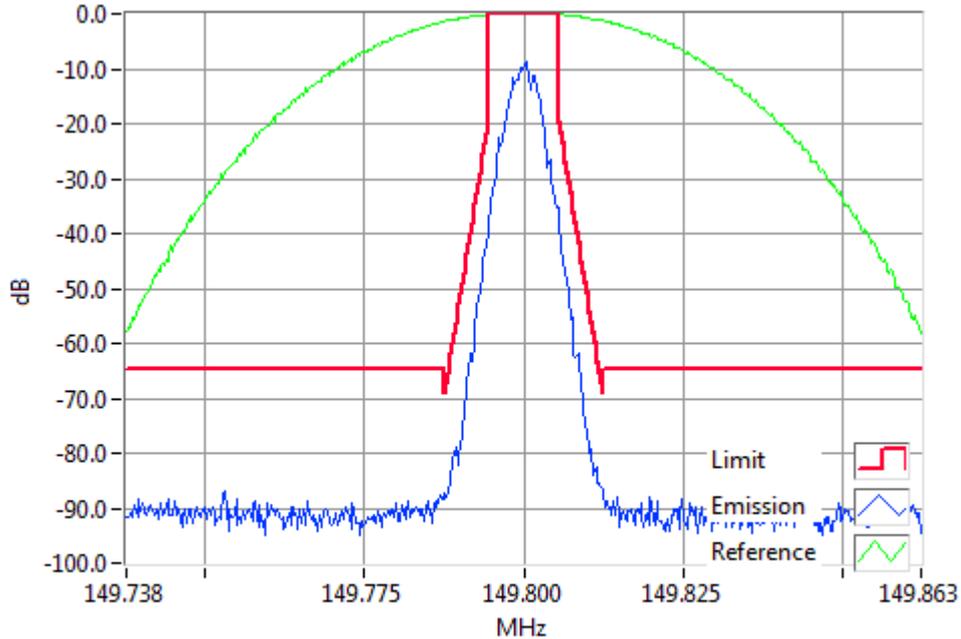
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

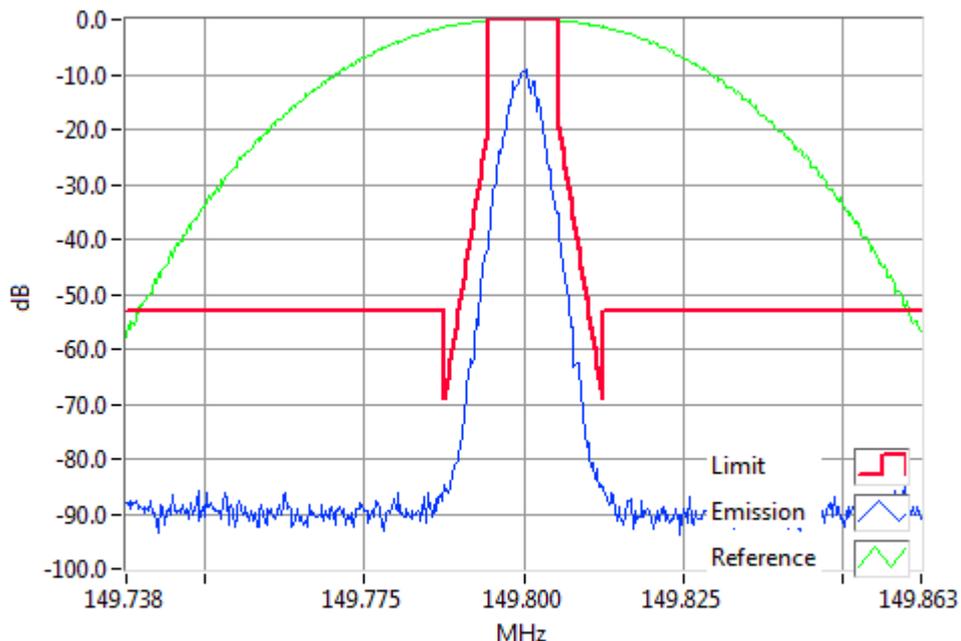
RSS-119 5.5

Tx FREQUENCY: 149.8 MHz 30 W 12.5 kHz Channel Spacing



**DMR 149.8000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 149.8 MHz 2 W 12.5 kHz Channel Spacing



**DMR 149.8000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

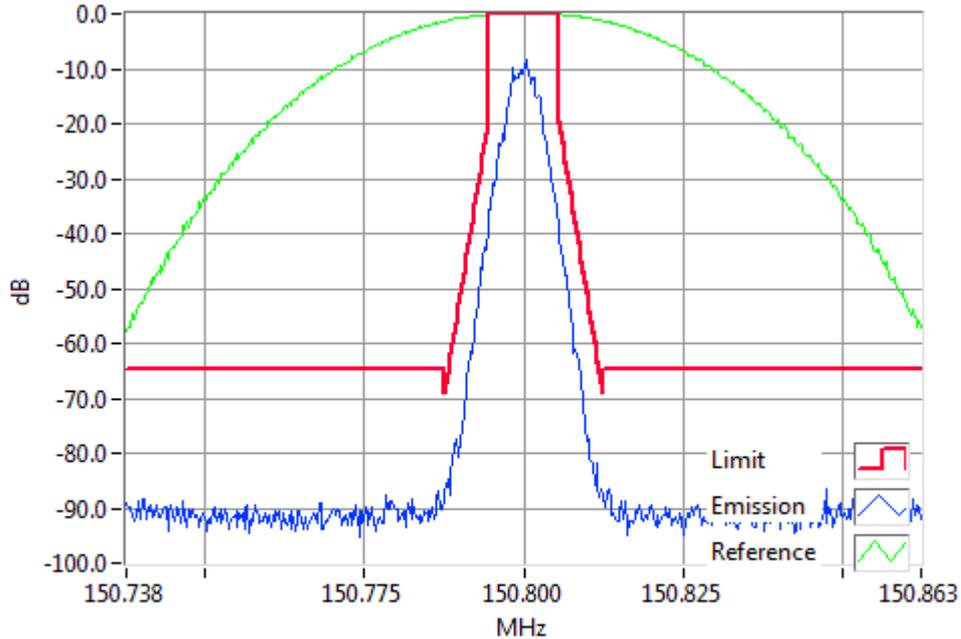
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

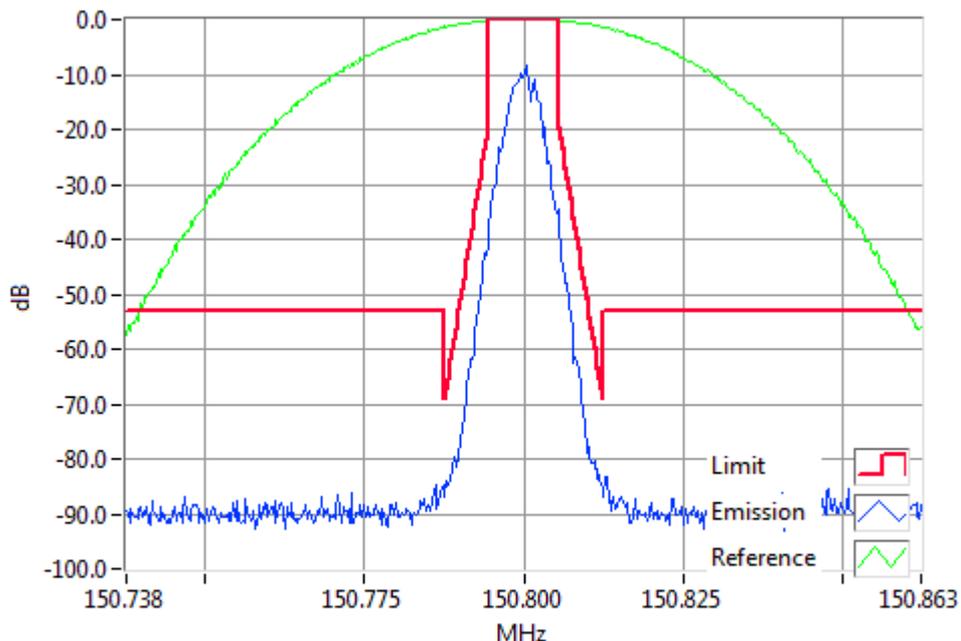
RSS-119 5.5

Tx FREQUENCY: 150.8 MHz 30 W 12.5 kHz Channel Spacing



**DMR 150.8000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 150.8 MHz 2 W 12.5 kHz Channel Spacing



**DMR 150.8000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

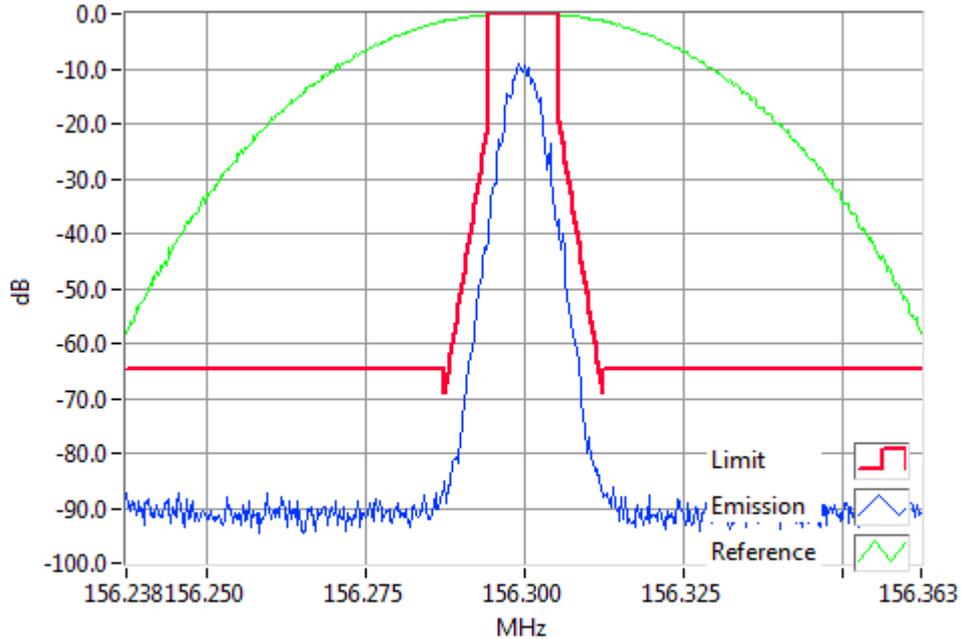
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

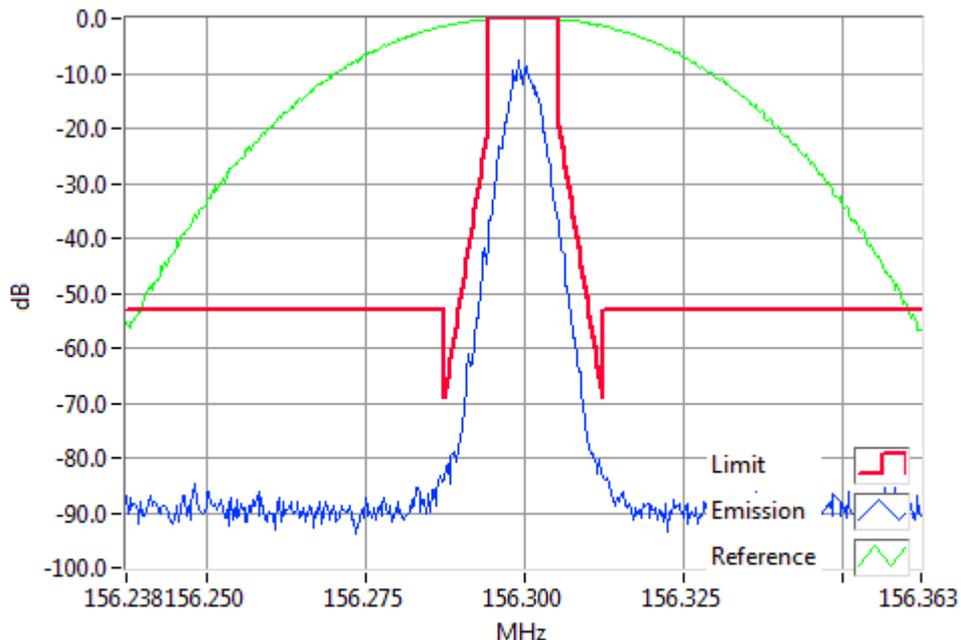
RSS-119 5.5

Tx FREQUENCY: 156.3 MHz 30 W 12.5 kHz Channel Spacing



**DMR 156.3000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 156.3 MHz 2 W 12.5 kHz Channel Spacing



**DMR 156.3000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

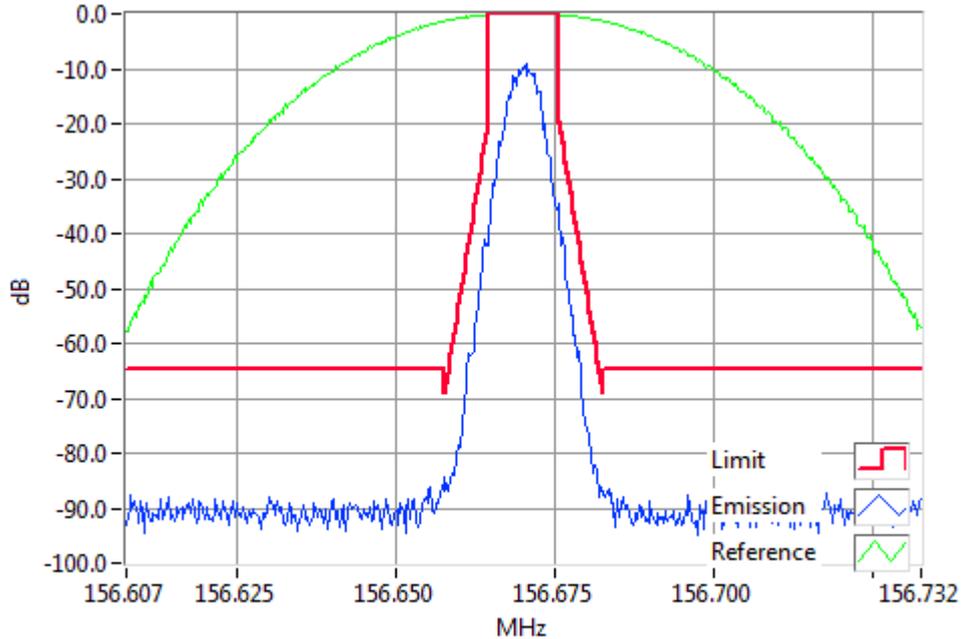
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

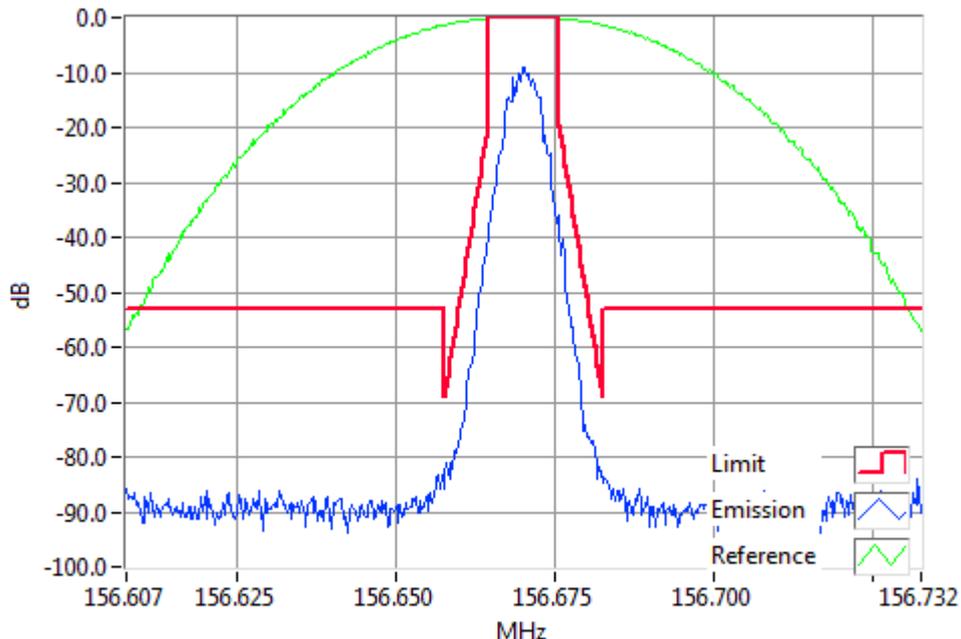
RSS-119 5.5

Tx FREQUENCY: 156.67 MHz 30 W 12.5 kHz Channel Spacing



**DMR 156.6700MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 156.67 MHz 2 W 12.5 kHz Channel Spacing



**DMR 156.6700MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

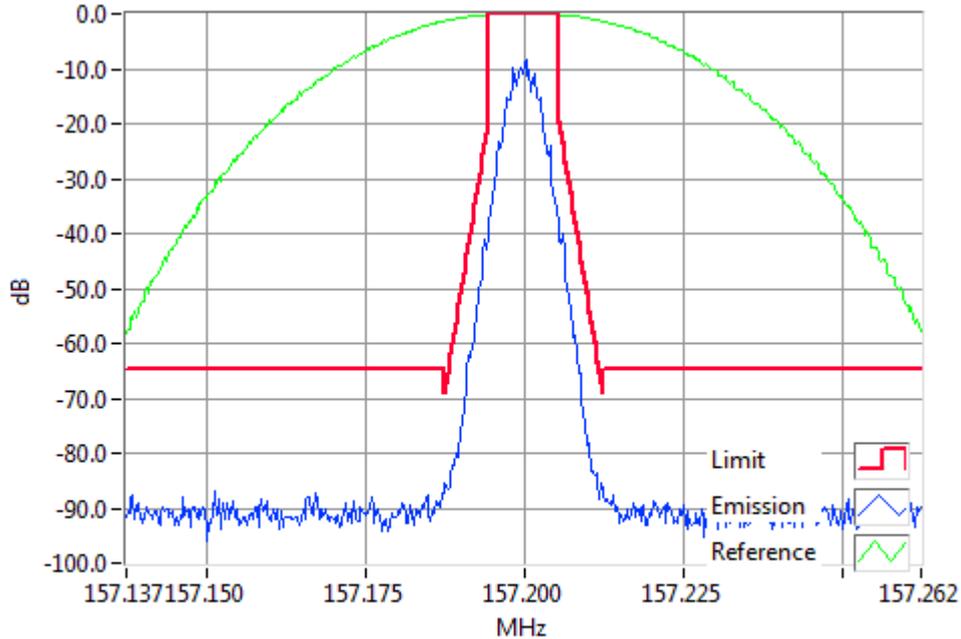
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

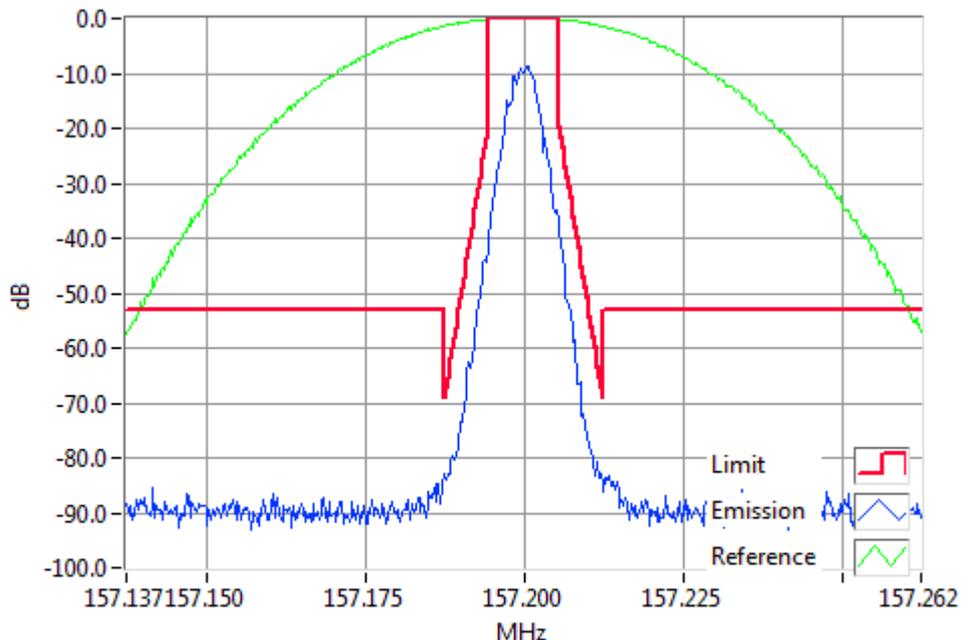
RSS-119 5.5

Tx FREQUENCY: 157.2 MHz 30 W 12.5 kHz Channel Spacing



**DMR 157.2000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 157.2 MHz 2 W 12.5 kHz Channel Spacing



**DMR 157.2000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

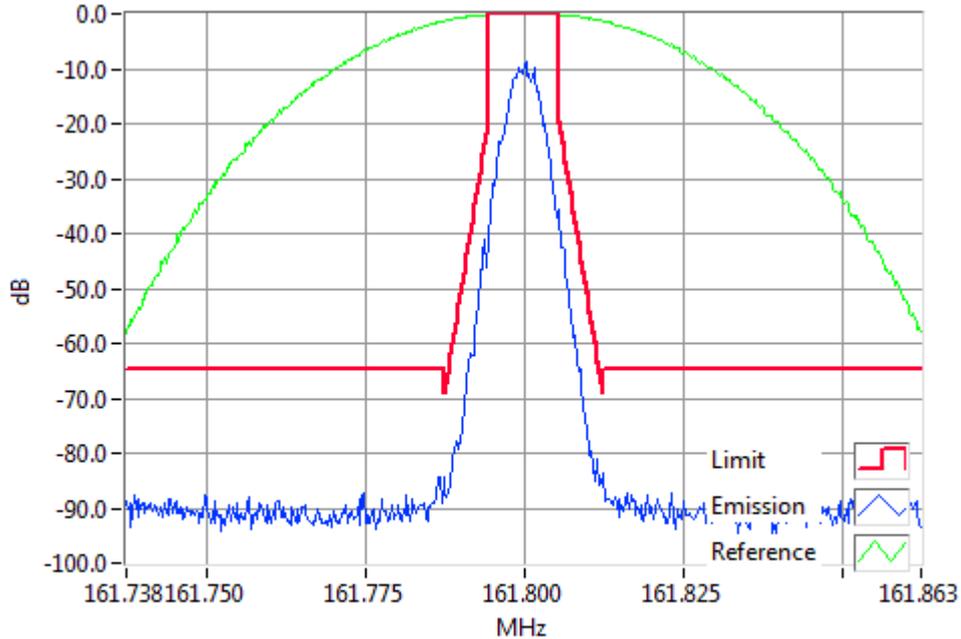
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

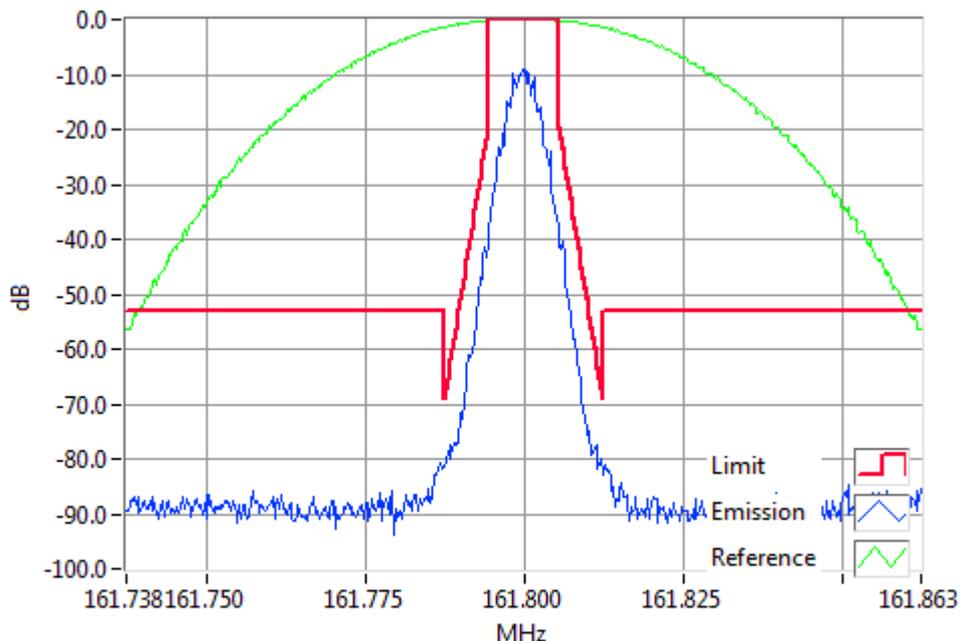
RSS-119 5.5

Tx FREQUENCY: 161.8 MHz 30 W 12.5 kHz Channel Spacing



**DMR 161.8000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 161.8 MHz 2 W 12.5 kHz Channel Spacing



**DMR 161.8000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

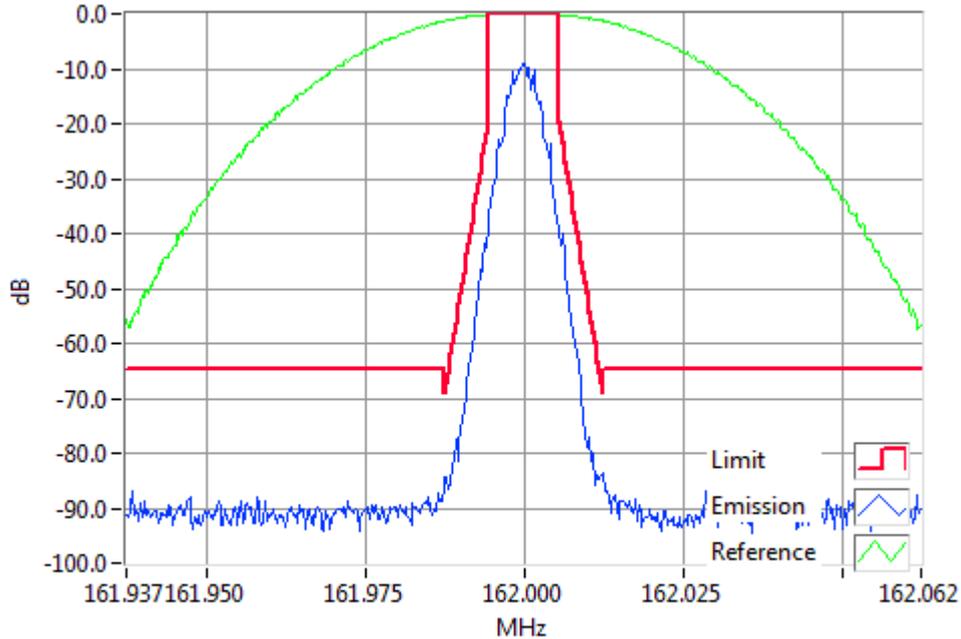
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

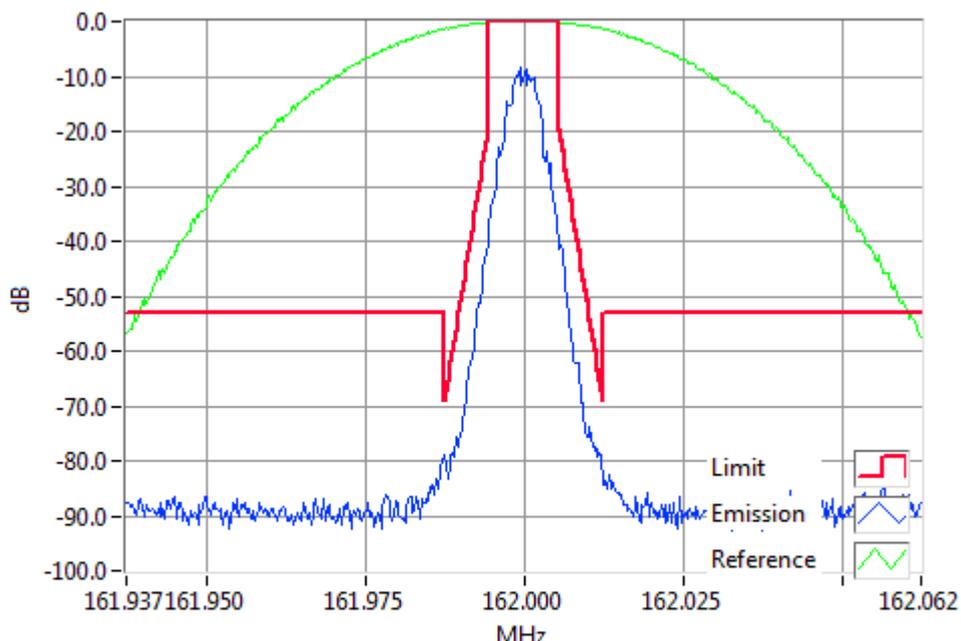
RSS-119 5.5

Tx FREQUENCY: 162.0 MHz 30 W 12.5 kHz Channel Spacing



**DMR 162.0000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 162.0 MHz 2 W 12.5 kHz Channel Spacing



**DMR 162.0000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

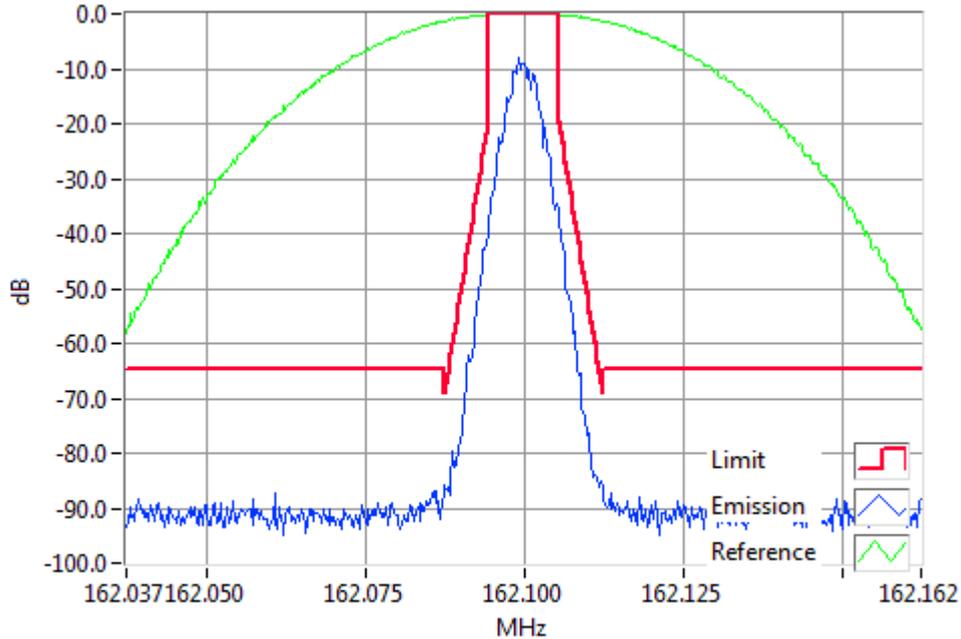
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

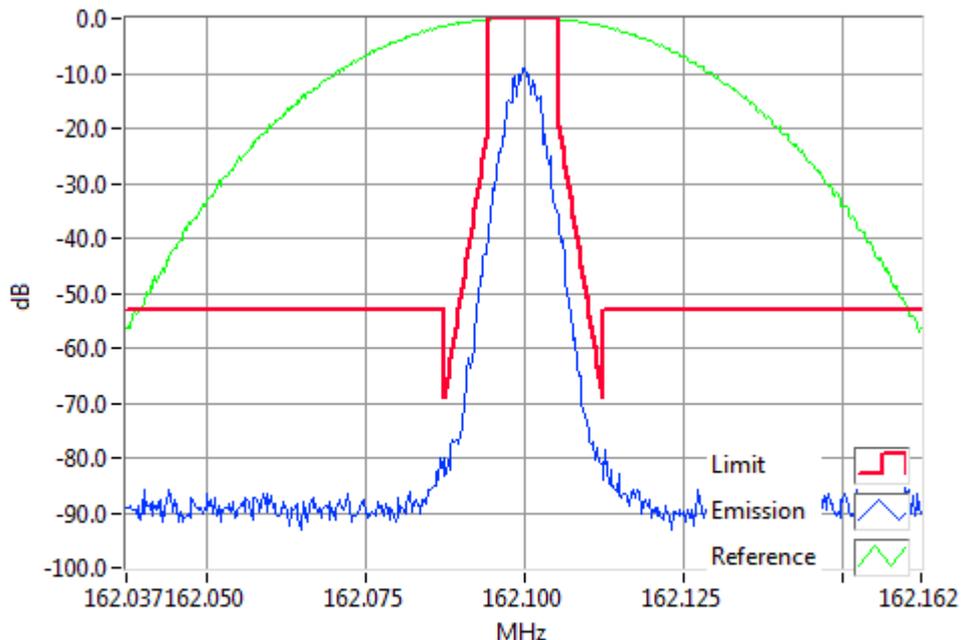
RSS-119 5.5

Tx FREQUENCY: 162.1 MHz 30 W 12.5 kHz Channel Spacing



**DMR 162.1000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 162.1 MHz 2 W 12.5 kHz Channel Spacing



**DMR 162.1000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

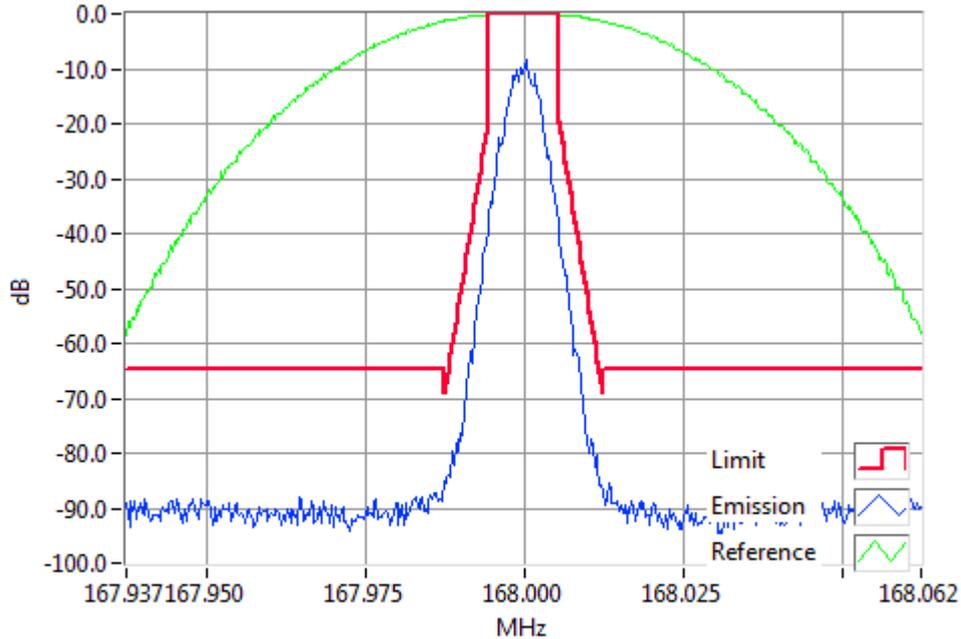
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

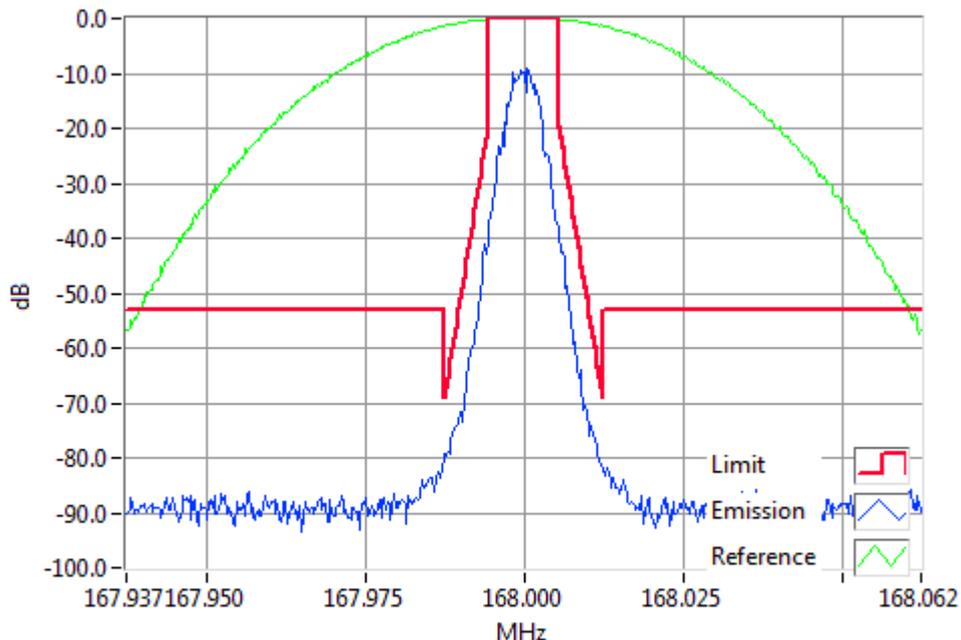
RSS-119 5.5

Tx FREQUENCY: 168.0 MHz 30 W 12.5 kHz Channel Spacing



**DMR 168.0000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 168.0 MHz 2 W 12.5 kHz Channel Spacing



**DMR 168.0000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

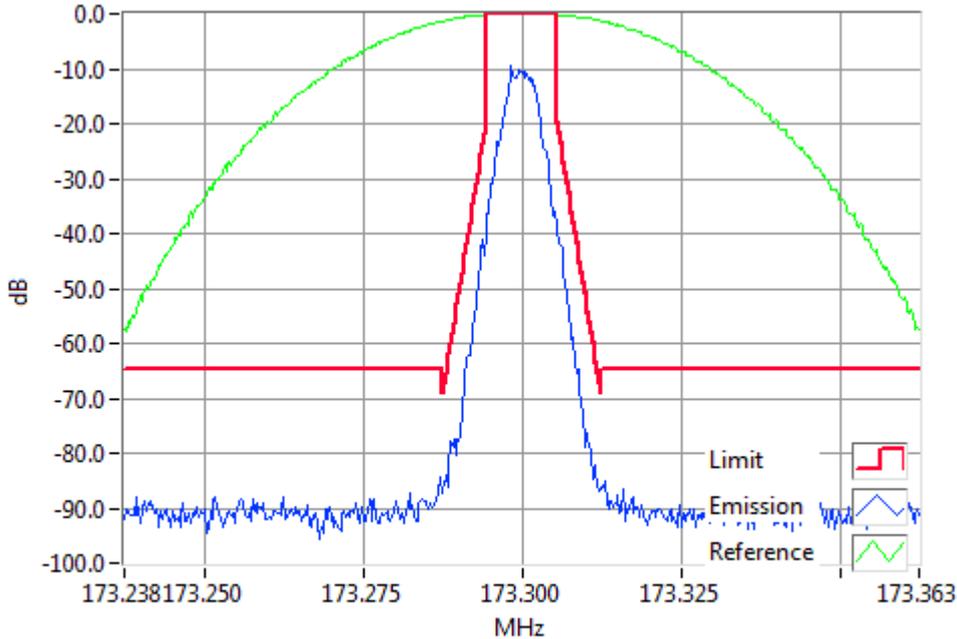
### Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

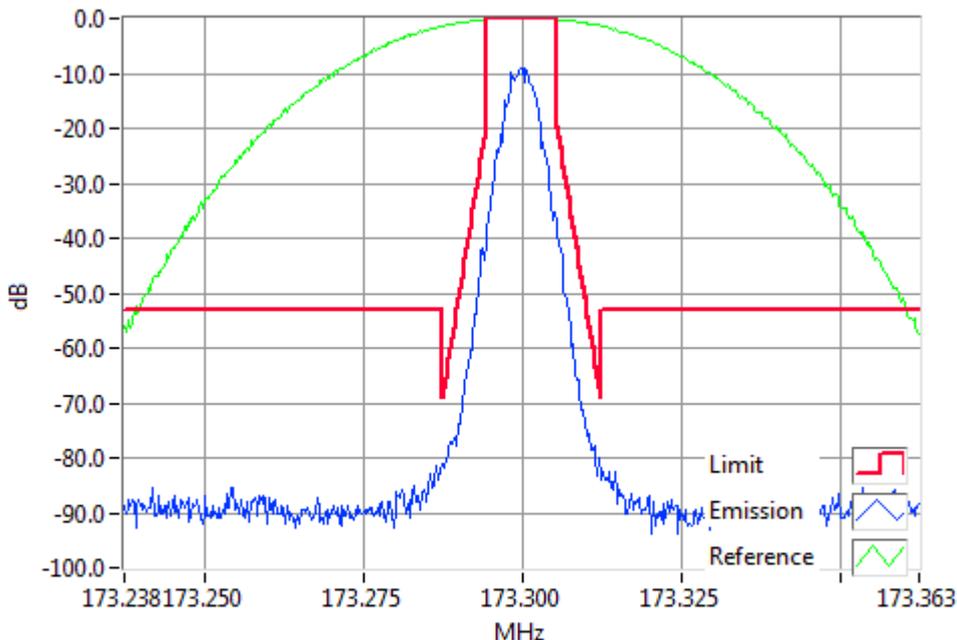
RSS-119 5.5

Tx FREQUENCY: 173.3 MHz 30 W 12.5 kHz Channel Spacing



**DMR 173.3000MHz Mask D 30W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

Tx FREQUENCY: 173.3 MHz 2 W 12.5 kHz Channel Spacing



**DMR 173.3000MHz Mask D 2W**  
**RBW=100Hz, VBW=1000Hz, Detector Mode=Peak**  
**Result=Pass**

## TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATIONS: FCC 47 CFR 2.1051

RSS-119 5.8

GUIDE: TIA-102.CAAA-C 2.2.7

### MEASUREMENT PROCEDURE:

1. Refer Annex A 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:  
100 kHz to Fc-BW  
Fc+ BW to 10Fc (1.750 GHz)
3. The EUT was set to transmit high or low power modulated with DMR. A scan is performed with a resolution bandwidth of 10 kHz and a video bandwidth of 30 kHz for frequencies up to 1 GHz, and a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz for frequencies above 1 GHz. A filter was used for frequencies just below the second harmonic to 1.0 GHz.
4. The spectrum analyser was loaded with the appropriate calibration figures to compensate for the cables, attenuator and filter losses.

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

A photograph of the test set-up is included below.

### MEASUREMENT RESULTS:

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

LIMIT CLAUSES: FCC 47 CFR 90.210

RSS-119 5.8

Photo: Conducted Emissions Test Setup



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing                      148.1 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      148.1 MHz @ 2 W                      Emission Mask D

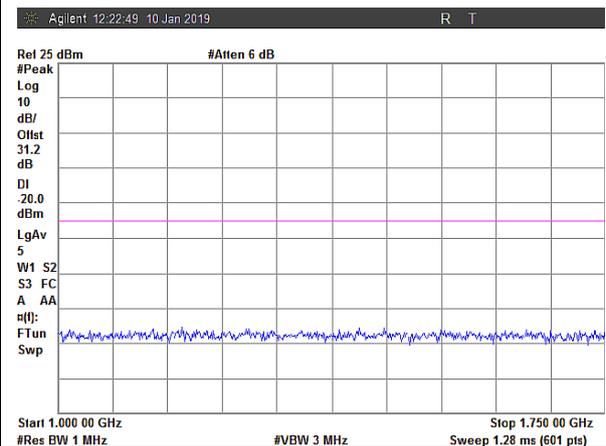
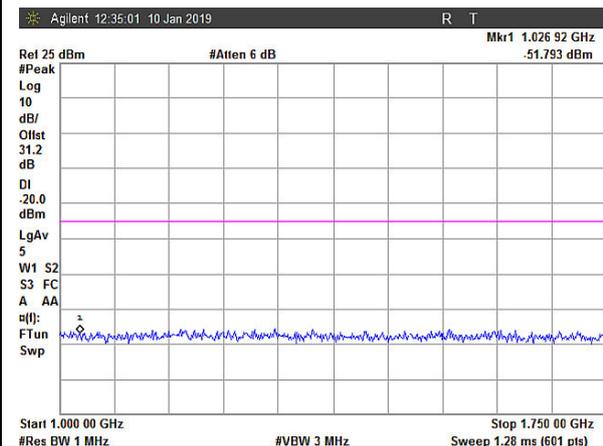
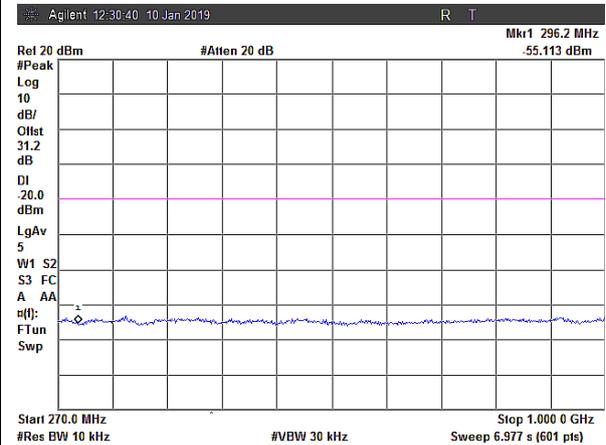
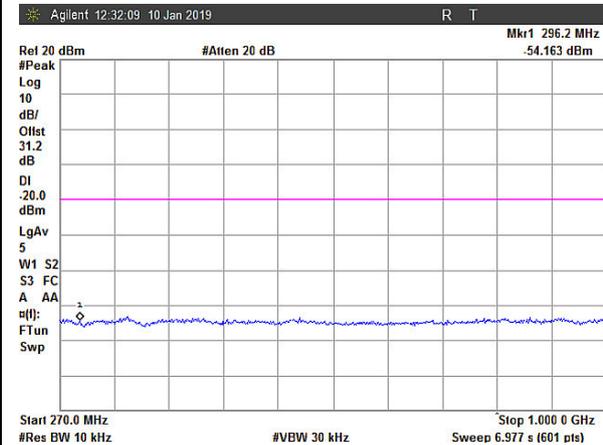
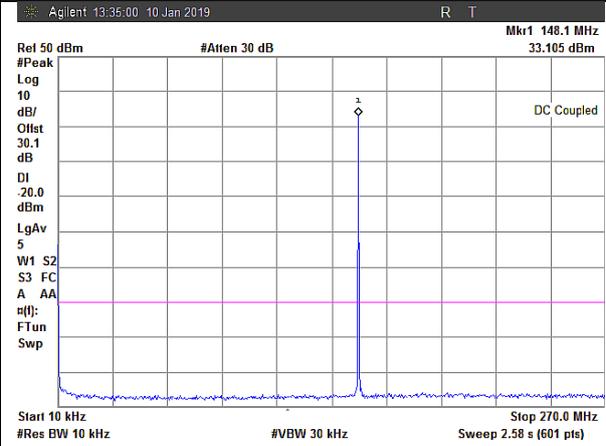
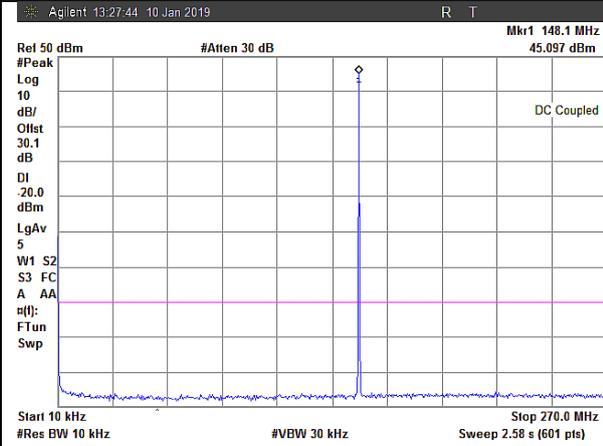
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)

148.1 MHz

30 W

2 W



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing                      149.8 MHz @ 30 W                      Emission Mask D

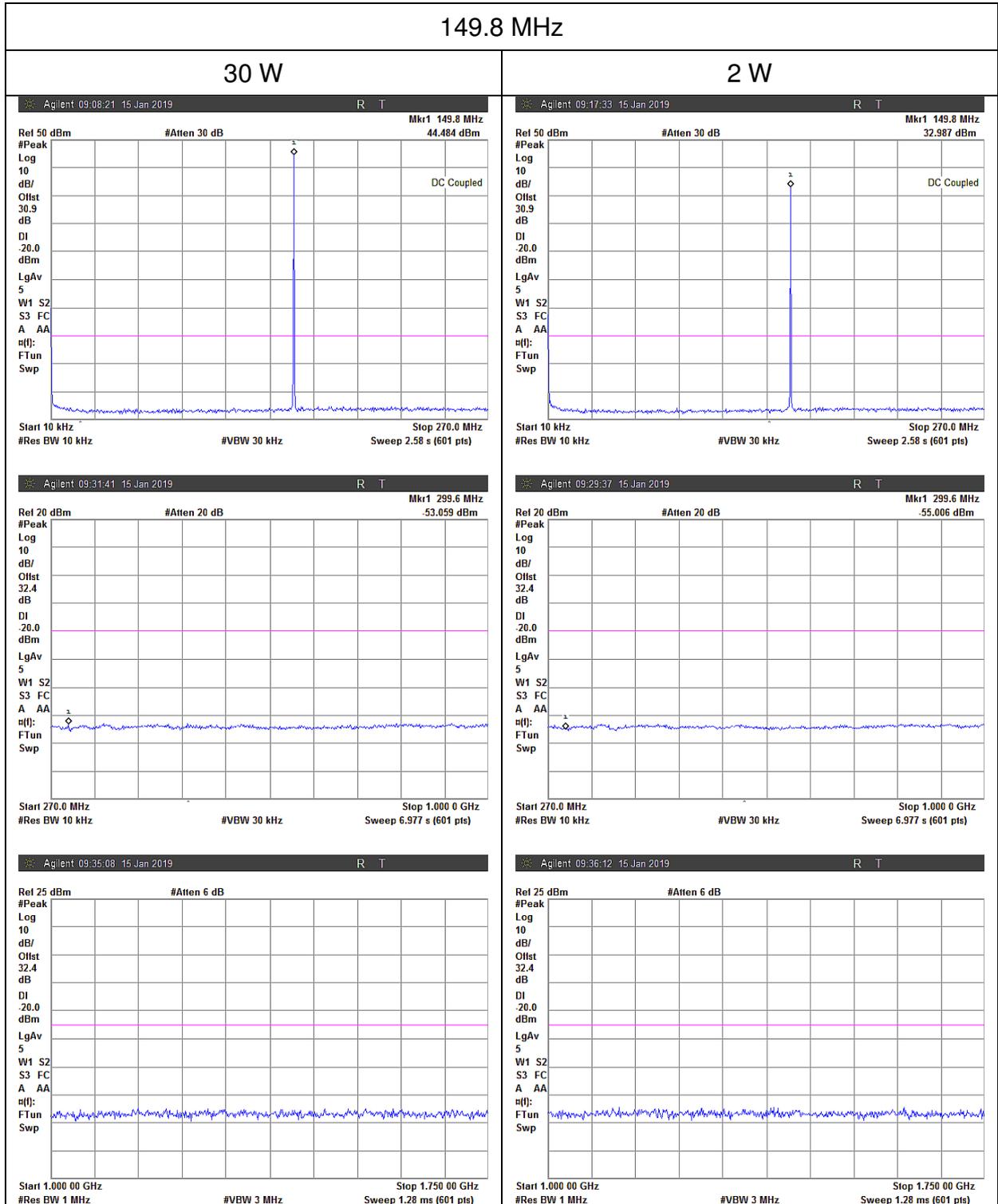
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      149.8 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)

Tx FREQUENCY: 149.8 MHz



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

150.8 MHz @ 30 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

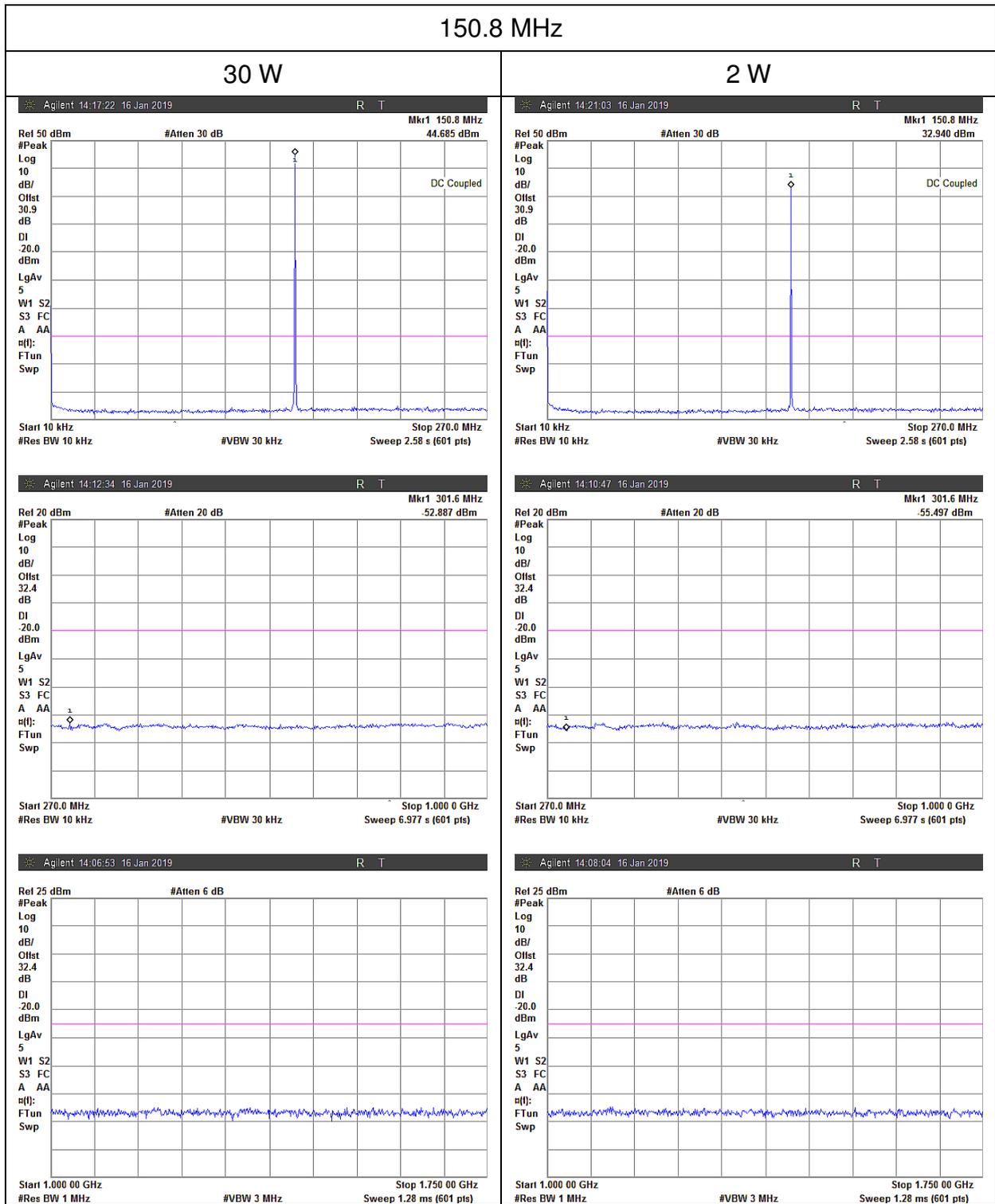
12.5 kHz Channel Spacing

150.8 MHz @ 2 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

156.3 MHz @ 30 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

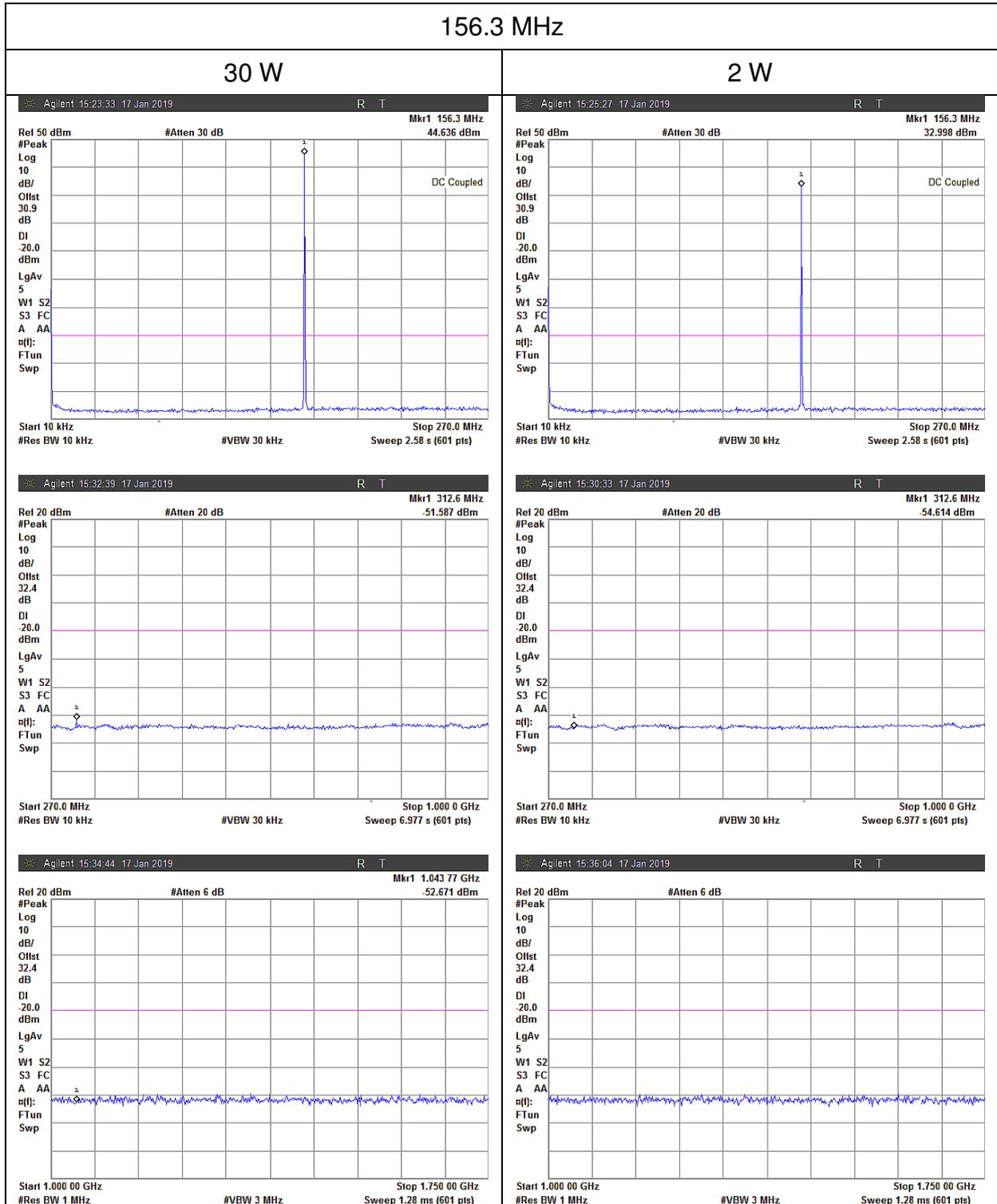
12.5 kHz Channel Spacing

156.3 MHz @ 2 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

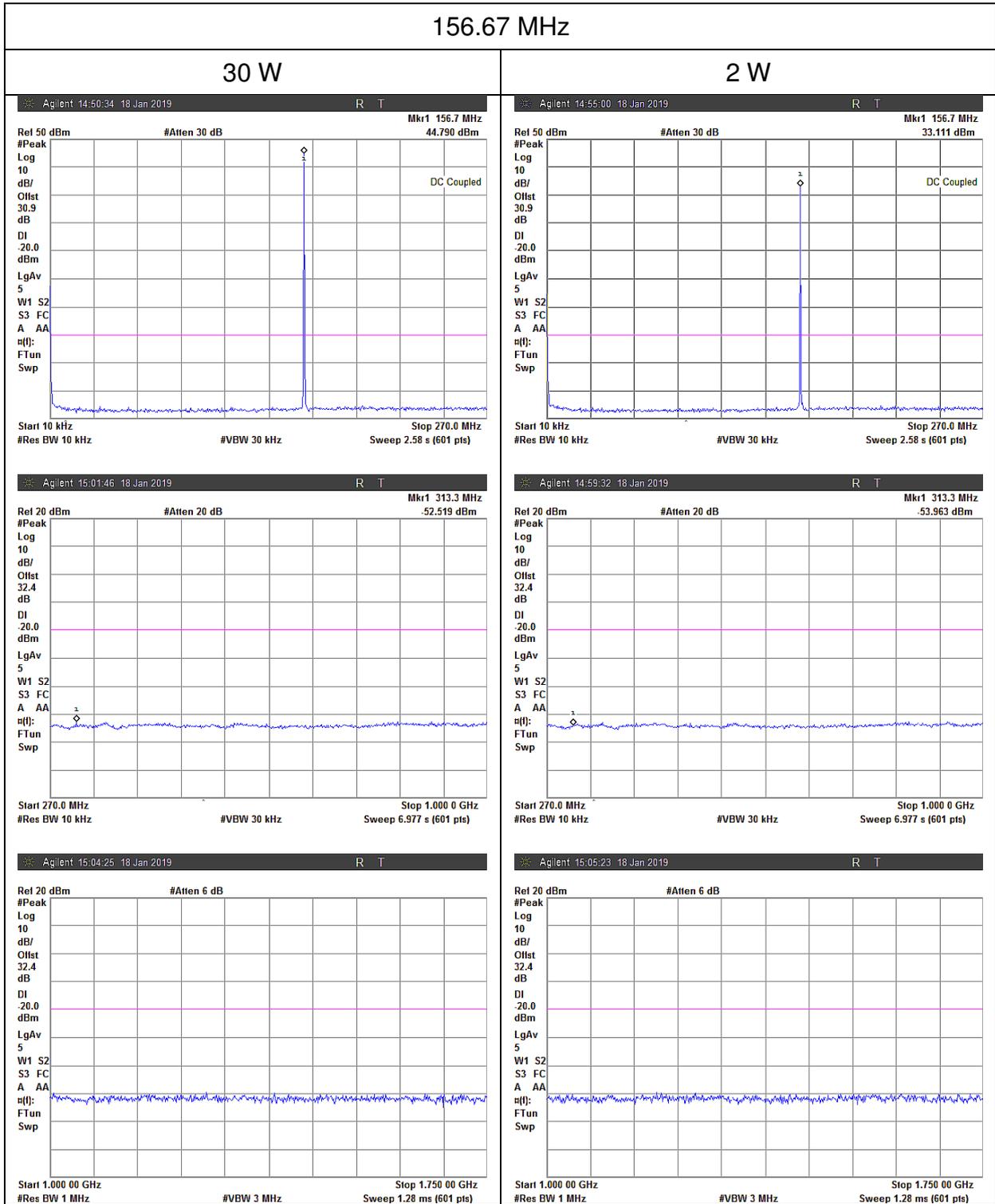
12.5 kHz Channel Spacing                      156.67 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      156.67 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

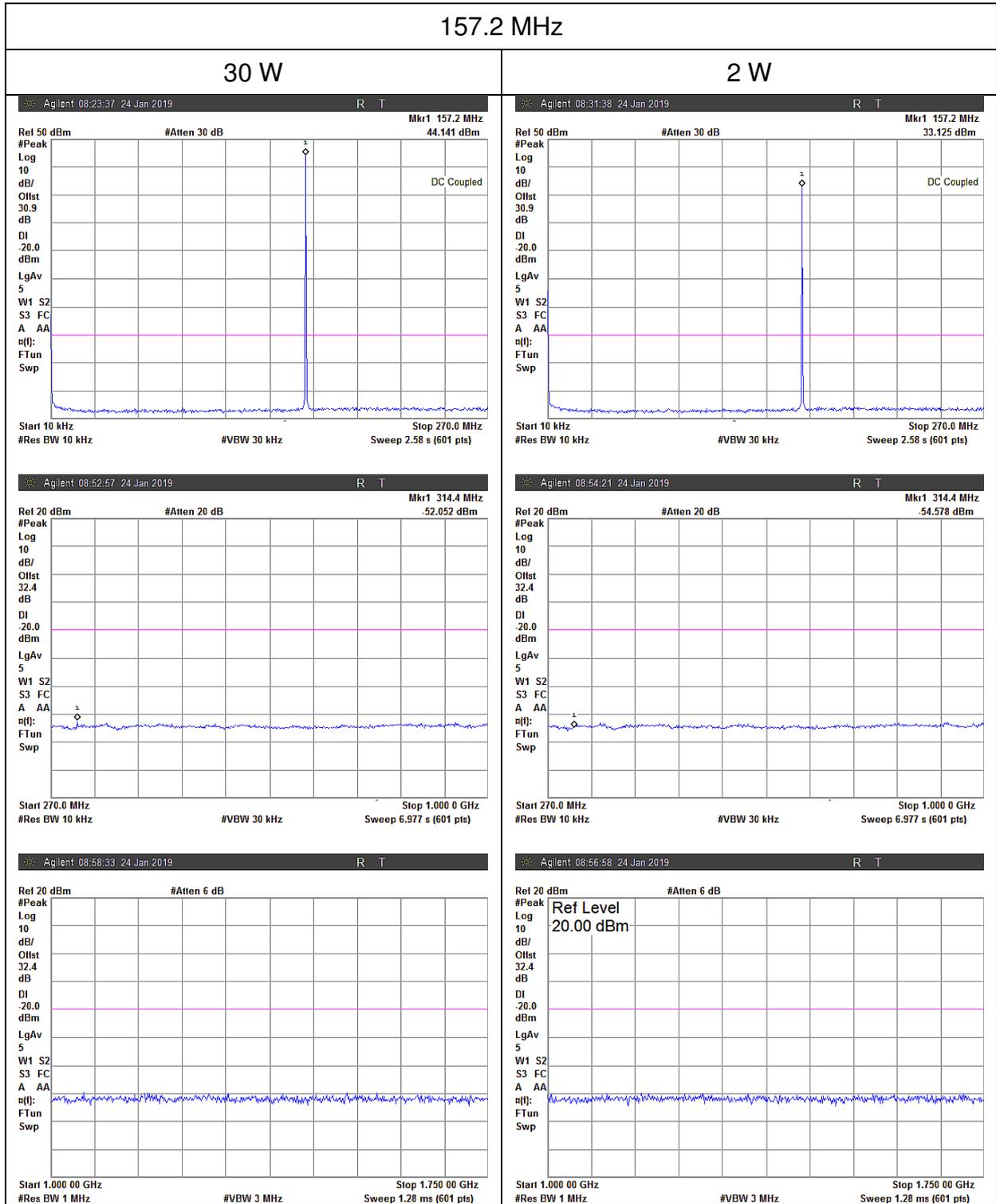
12.5 kHz Channel Spacing                      157.2 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      157.2 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz    ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

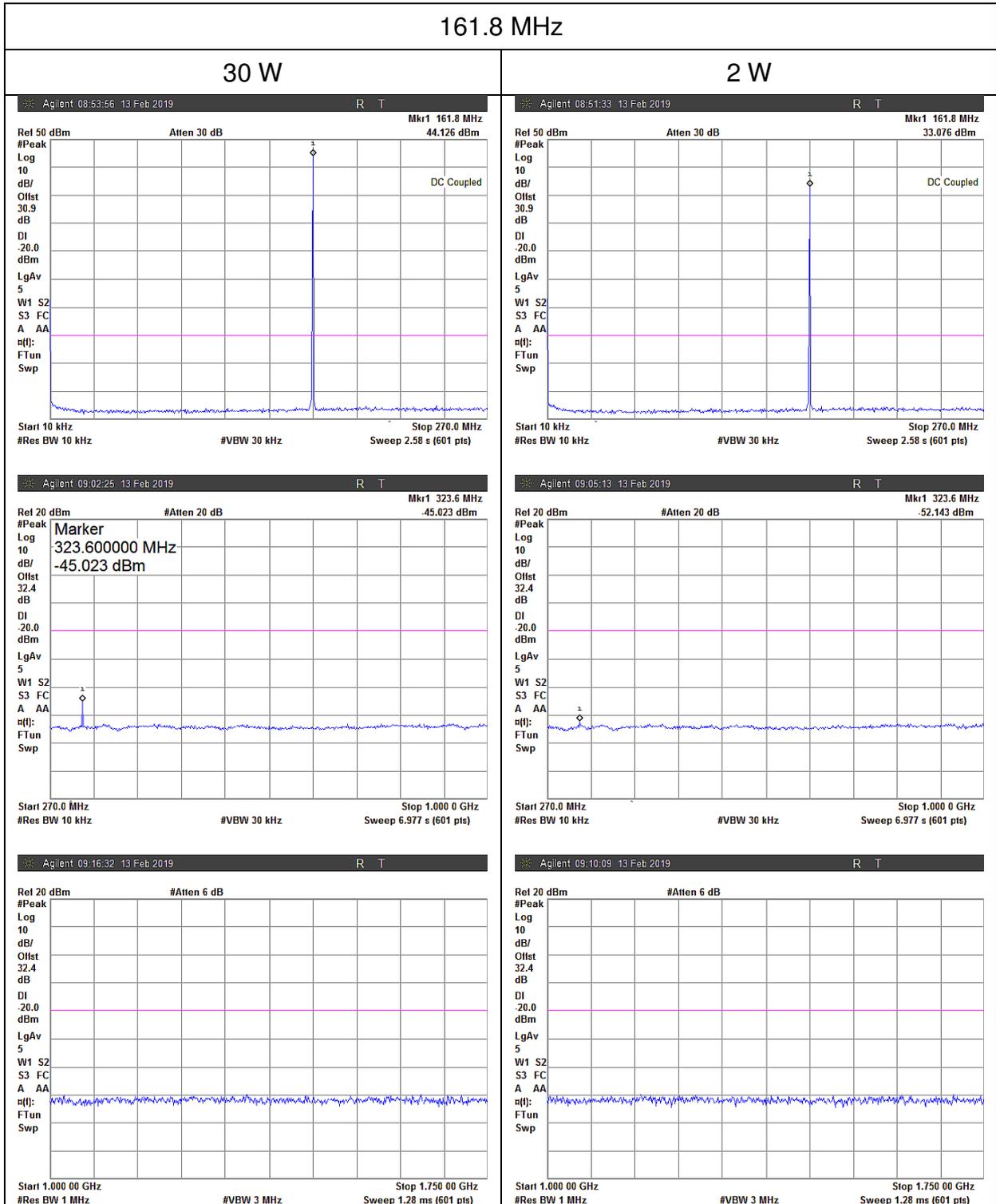
12.5 kHz Channel Spacing                      161.8 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      161.8 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

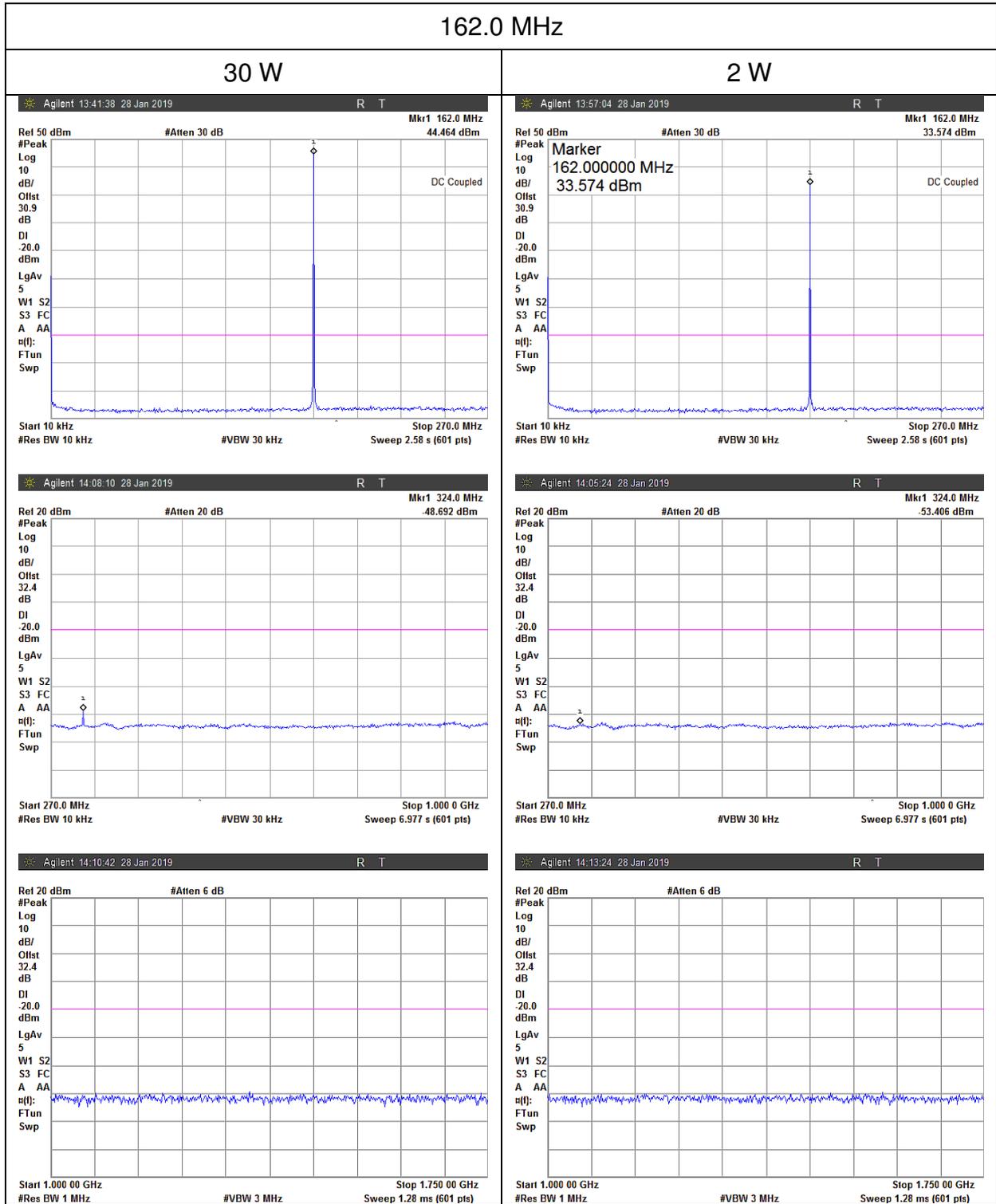
12.5 kHz Channel Spacing                      162.0 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      162.0 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

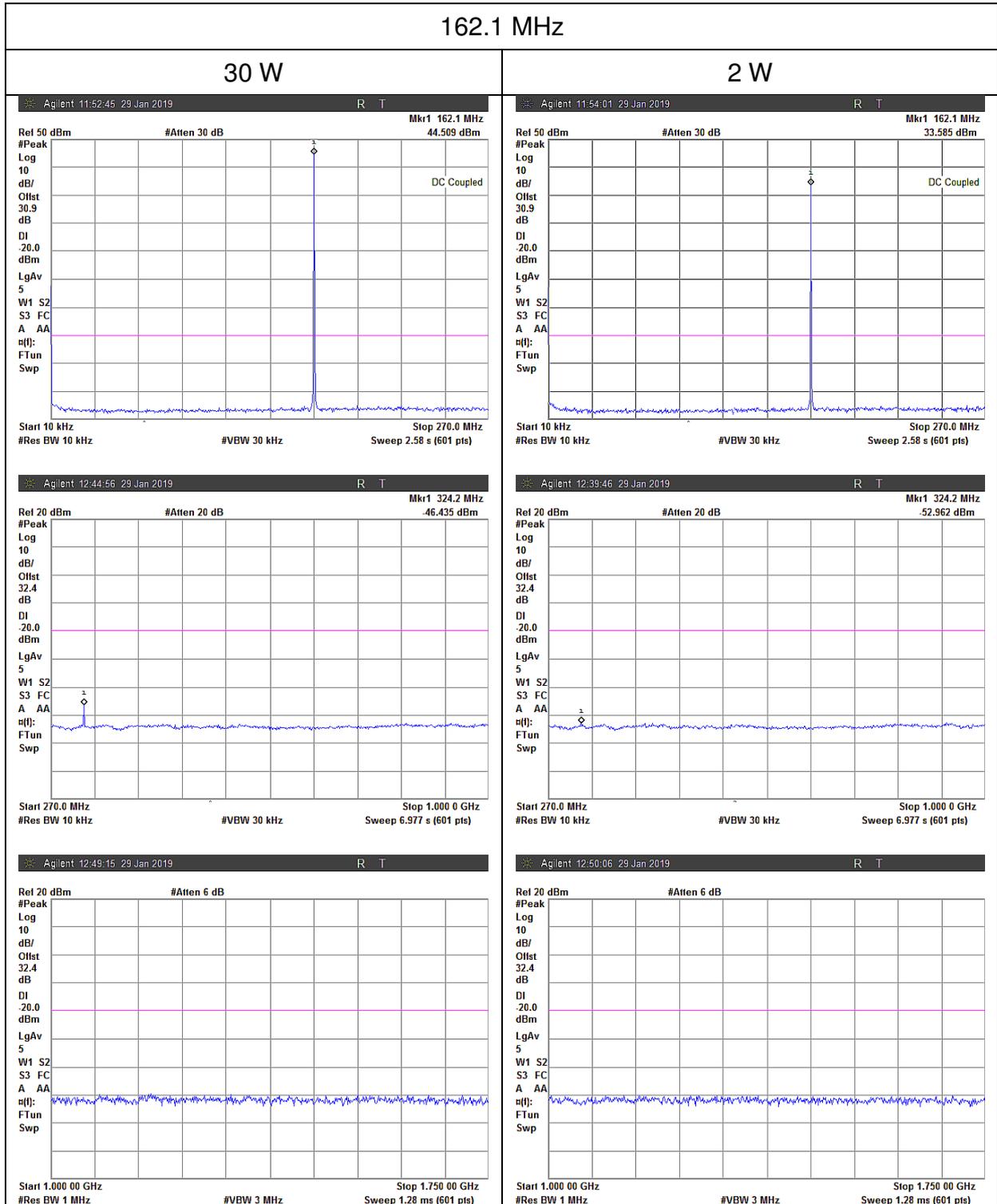
12.5 kHz Channel Spacing                      162.1 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      162.1 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

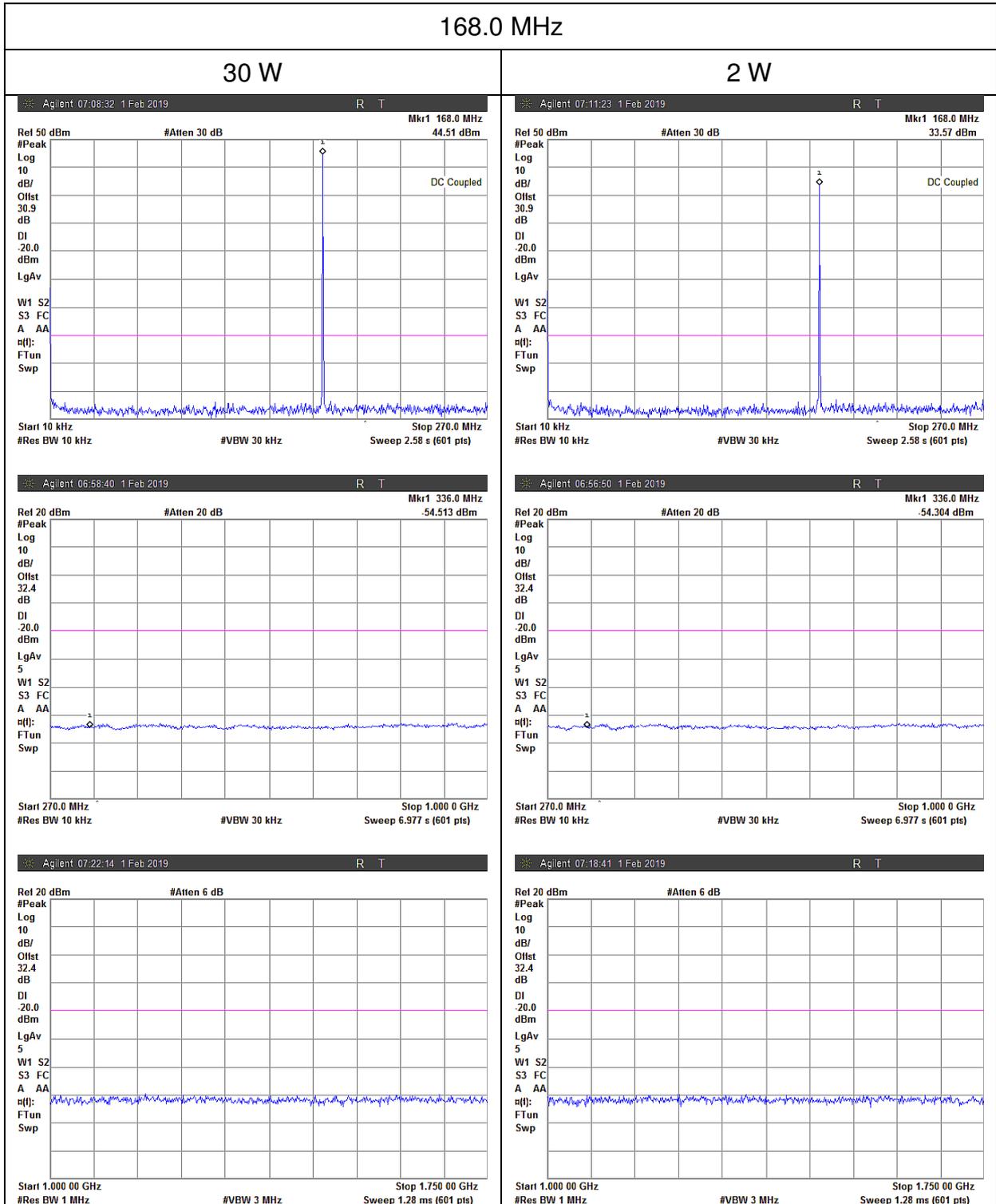
12.5 kHz Channel Spacing                      168.0 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      168.0 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz    ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

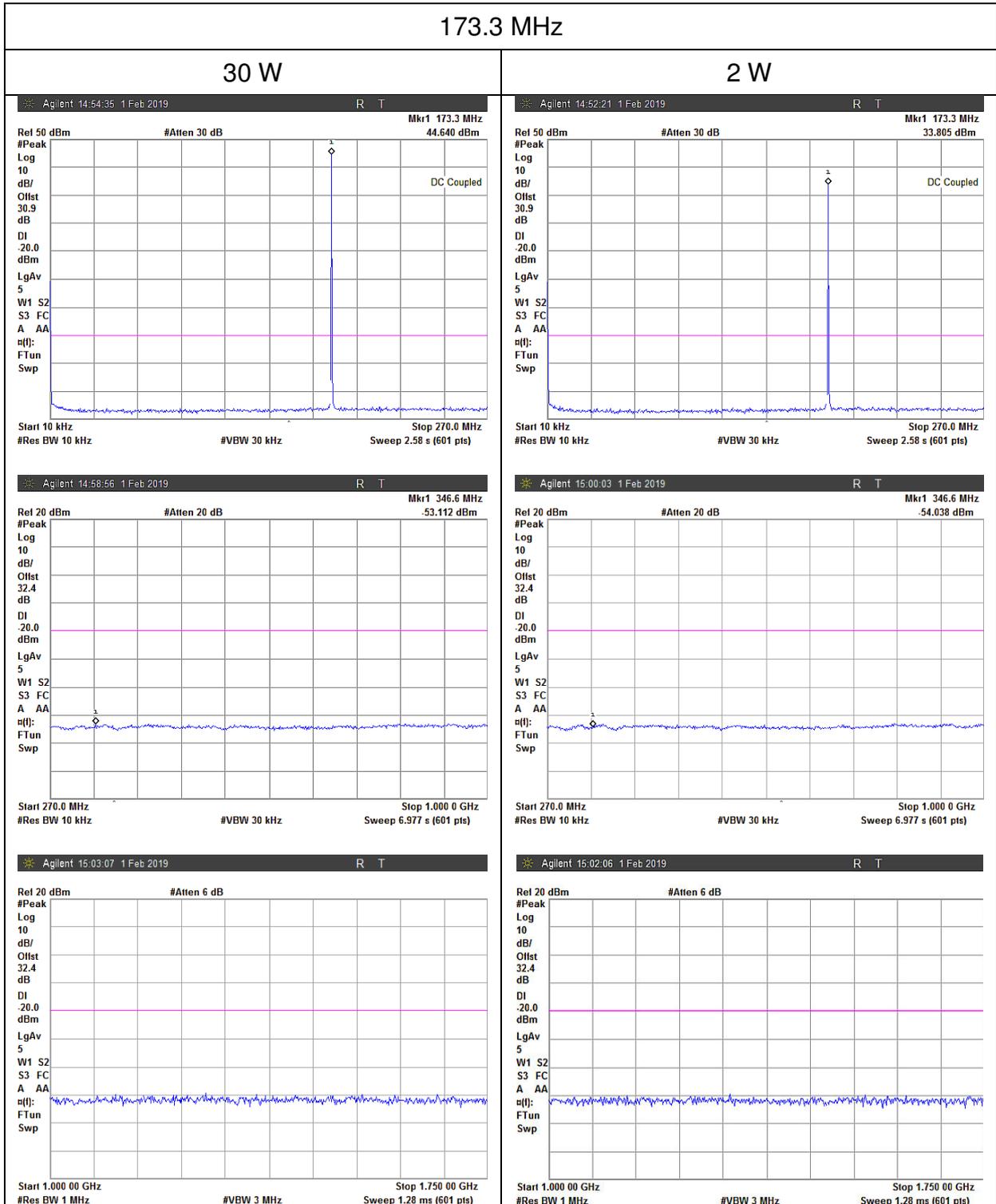
12.5 kHz Channel Spacing                      173.3 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      173.3 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051 RSS-119 5.8  
LIMITS: FCC 47 CFR 90.210 RSS-119 5.8

Carrier Output Power	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
	30 W	-20 dBm
2 W	-20 dBm	-53.0 dBc

## TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA-102.CAAA-C 2.2.6

### MEASUREMENT PROCEDURE:

#### Initial Scan:

1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30 MHz to 800 MHz. Any emission within 20 dB of the limit is then re-tested on the OATS.
2. The EUT is placed in the reverberation chamber and emissions are measured from 800 MHz to the upper frequency required. Any emission within 20 dB of the limit is then re-tested on the OATS.
3. The harmonics emissions up to the 6<sup>th</sup> harmonic of the fundamental frequency are measured on the OATS

#### OATS Measurement:

1. The EUT is placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal is connected to an RF dummy load.
2. The test antenna is raised from 1 m to 4 m to obtain a maximum reading; the turntable is then rotated through 360° to obtain the maximum response of each spurious emission. Valid emissions are determined by switching the EUT on and off.
3. The EUT is then replaced by a signal generator and substitution antenna to make measurements by the substitution method.

### MEASUREMENT RESULTS:

See the tables on the following pages

LIMIT CLAUSE: FCC 47 CFR 90.210

Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing                      148.1 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      148.1 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing                      149.8 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      149.8 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing                      150.8 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      150.8 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing                      156.3 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      156.3 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing                      156.67 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      156.67 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing                      157.2 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      157.2 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing                      161.8 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      161.8 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing                      162.0 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      162.0 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing                      162.1 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      162.1 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing                      168.0 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      168.0 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing                      173.3 MHz @ 30 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing                      173.3 MHz @ 2 W                      Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

LIMITS: FCC CFR 2.1053

Carrier Output Power	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
30 W	-20 dBm	-65 dBc
2 W	-20 dBm	-53 dBc

Tx Radiated Emissions - Continued

Open Area Test Site Results:

12.5 kHz Channel Spacing

156.3 MHz @ 30 W

Emission Mask D

Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
314.400000	-57.83	-102.83
471.600000	-47.11	-92.11
628.800000	-69.62	-114.62
786.000000	-74.14	-119.14
943.200000	-51.57	-96.57
1100.400000	-82.07	-127.07
Measurement Uncertainty	± 4.6 dB	

Sample Calculation	Measurement					Result	
	Reference	Substitution					
Emission Frequency (MHz)	Reference Level (dBm)	Sig-gen Level	Cable and Attenuator Gain	Antenna Gain (dBd)	Path and Boresight corrections	dBm	nW
471.600000	-73.56	-31.73	-14.91	-0.35	-0.12	-47.11	19.44382
		A	B	C	D	E	

Result (E) = A+B+C+D

Photo: OATS Setup



## TRANSIENT FREQUENCY BEHAVIOR

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

GUIDE: TIA-102.CAAA-C 2.2.18

### MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. Measurements and plots were made following the TIA procedure.

### MEASUREMENT RESULTS:

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

LIMIT CLAUSES: FCC 47 CFR 90.214 RSS-119 5.9

### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 148.1 MHz

30 W

12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.4	N/A
t2	-0.2	N/A
t3	N/A	-0.4

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

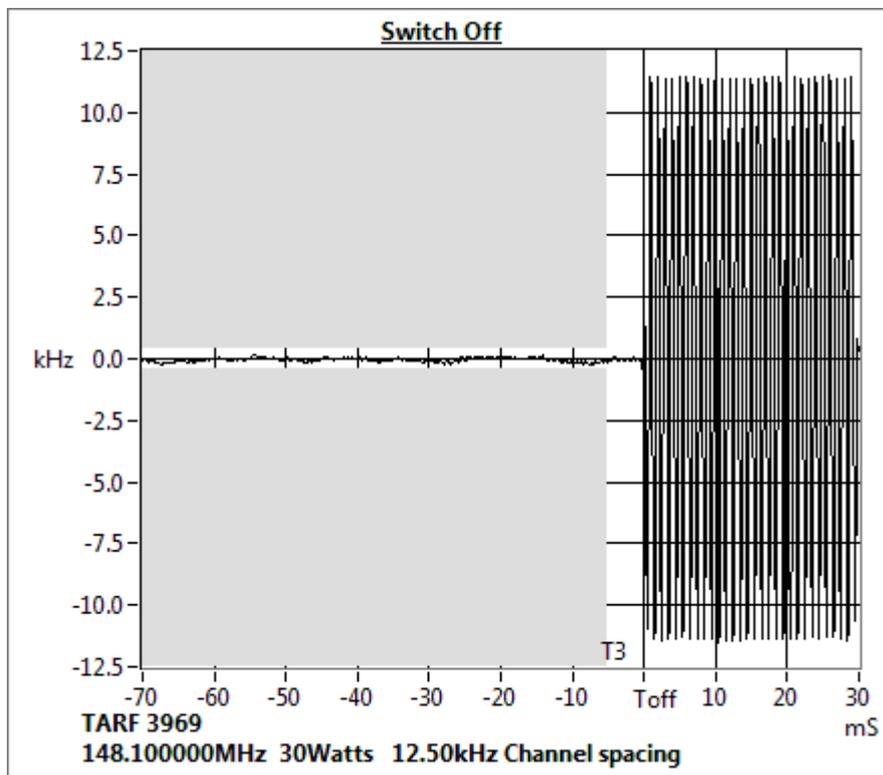
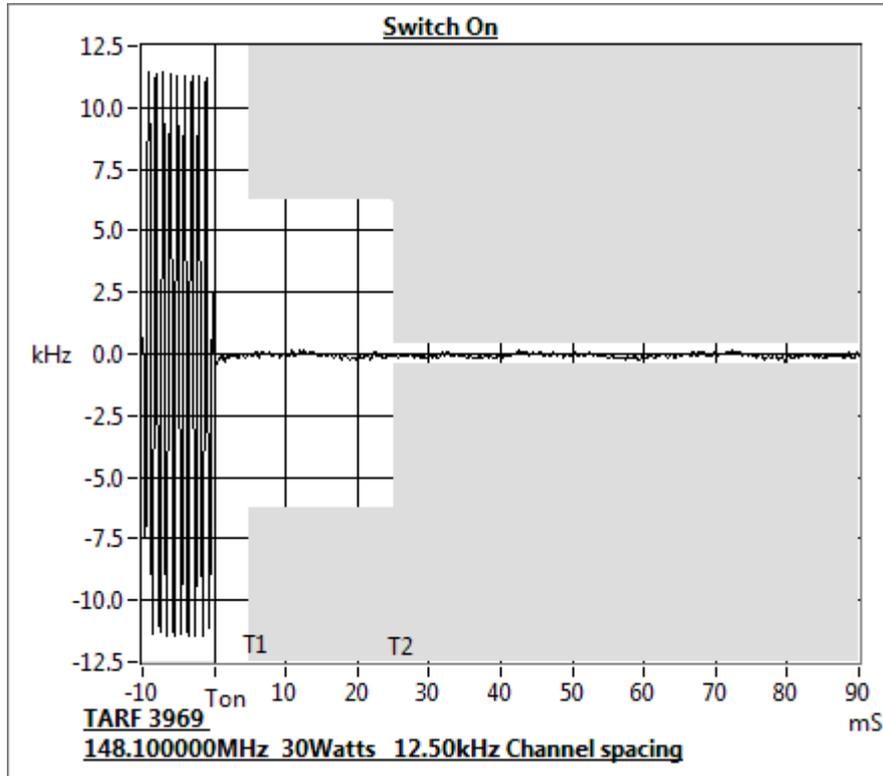
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods.

### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 148.1 MHz 30 W 12.5 kHz Channel Spacing



## Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 149.8 MHz 30 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.6	N/A
t2	-0.3	N/A
t3	N/A	-0.6

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

### Transient Frequency Behaviour

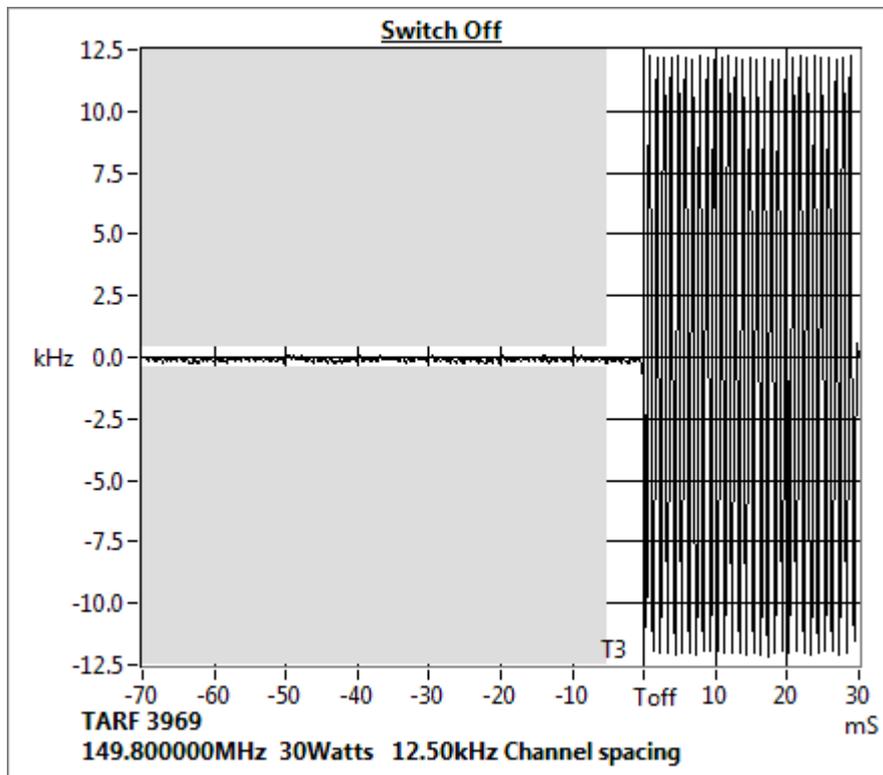
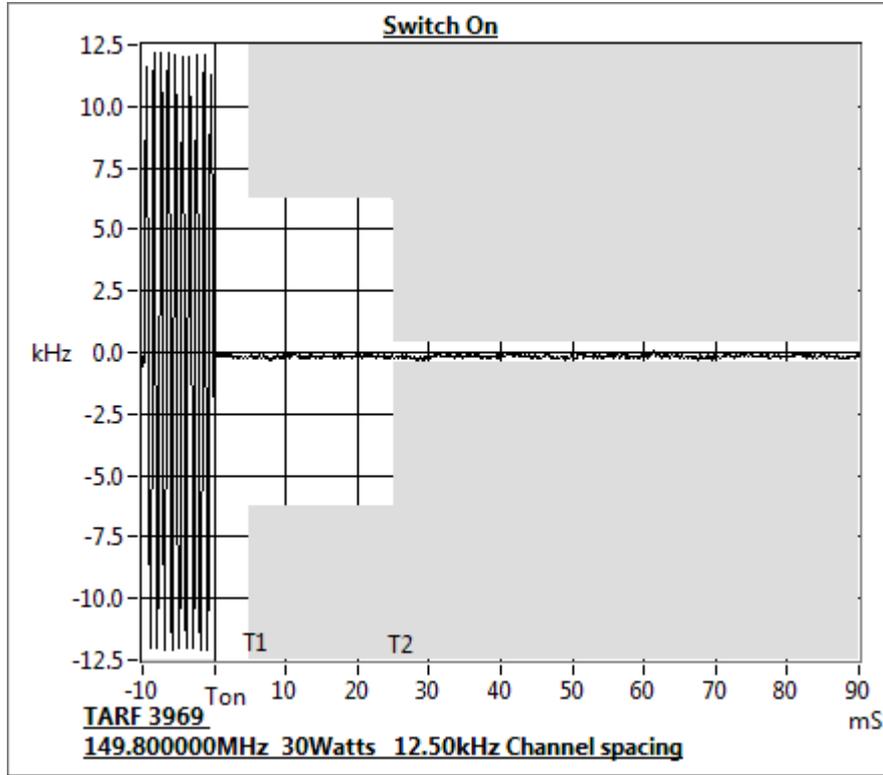
SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 149.8 MHz

30 W

12.5 kHz Channel Spacing



### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 150.8 MHz

30 W

12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.5	N/A
t2	-0.3	N/A
t3	N/A	0.2

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods.

### Transient Frequency Behaviour

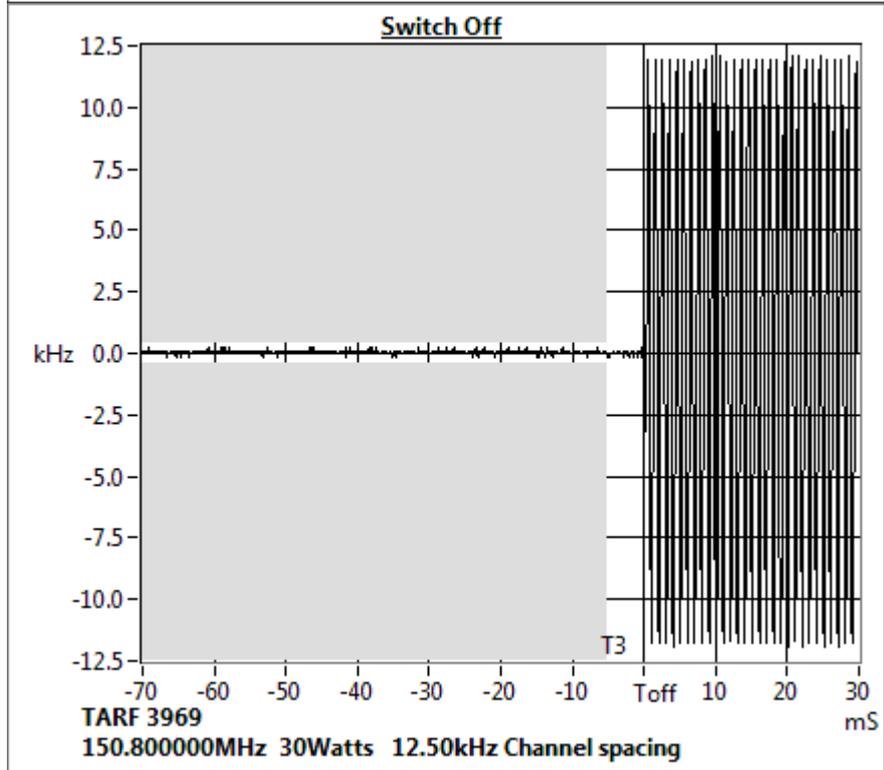
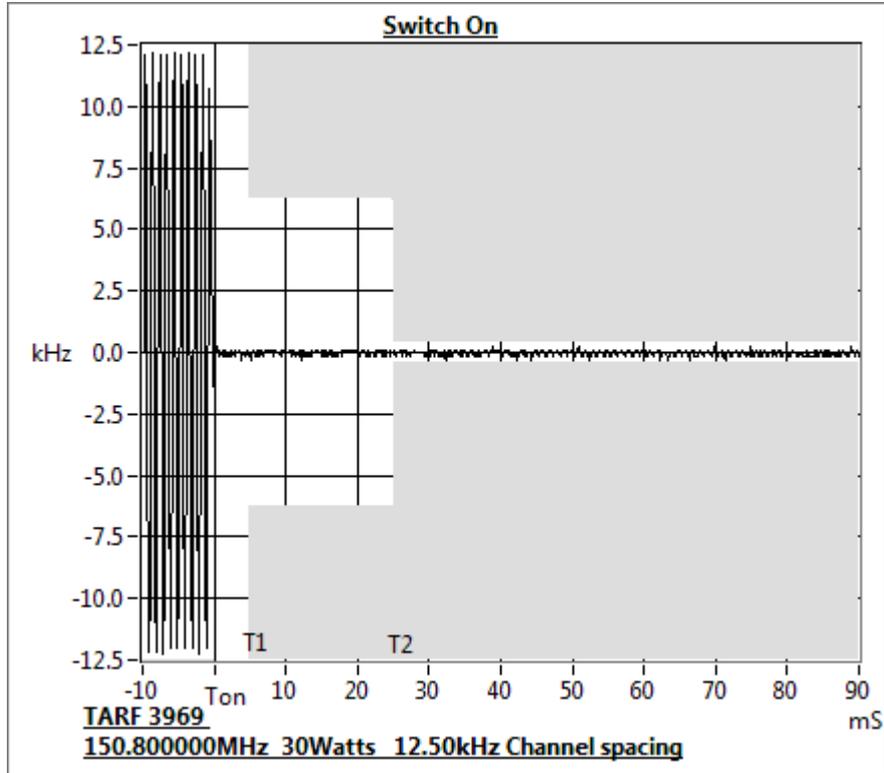
SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 150.8 MHz

30 W

12.5 kHz Channel Spacing



### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 156.3 MHz 30 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.3	N/A
t2	-0.3	N/A
t3	N/A	-0.7

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

### Transient Frequency Behaviour

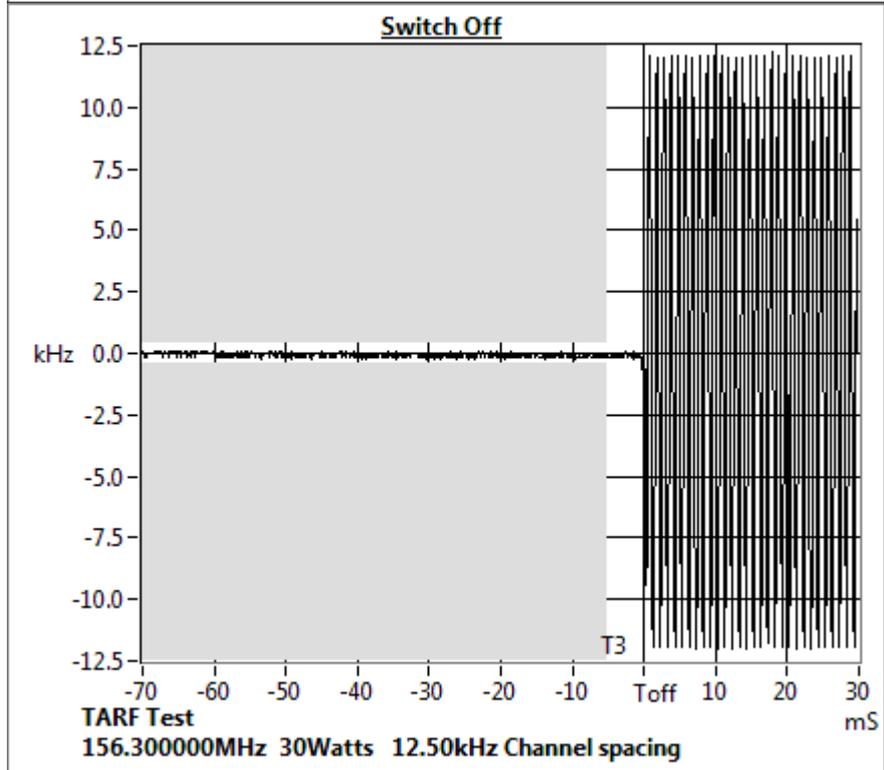
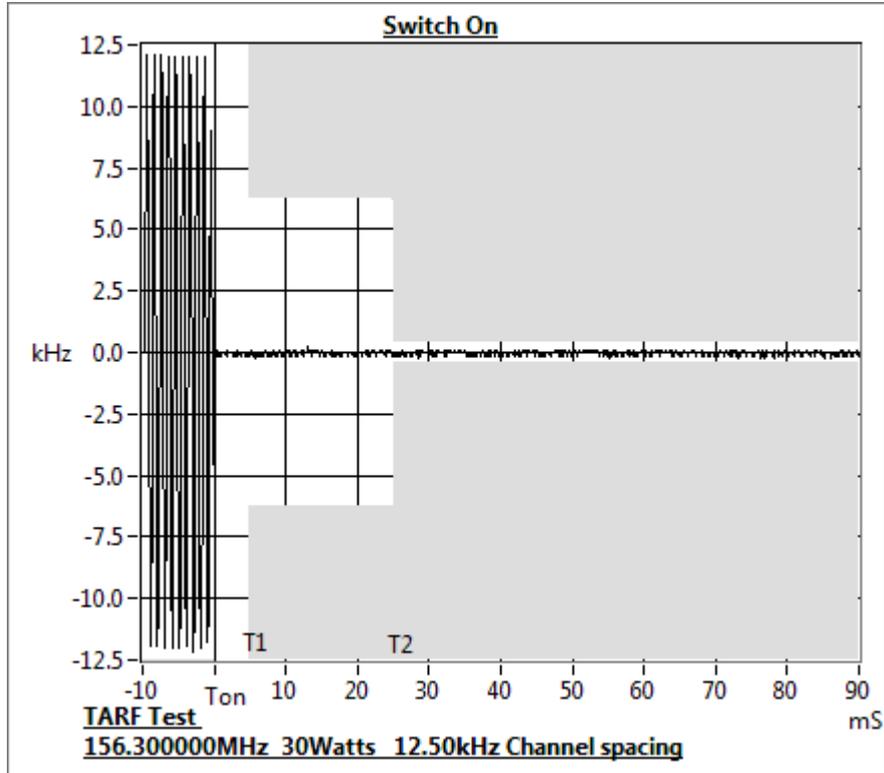
SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 156.3 MHz

30 W

12.5 kHz Channel Spacing



### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 156.67 MHz

30 W

12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.5	N/A
t2	-0.2	N/A
t3	N/A	-0.7

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods.

### Transient Frequency Behaviour

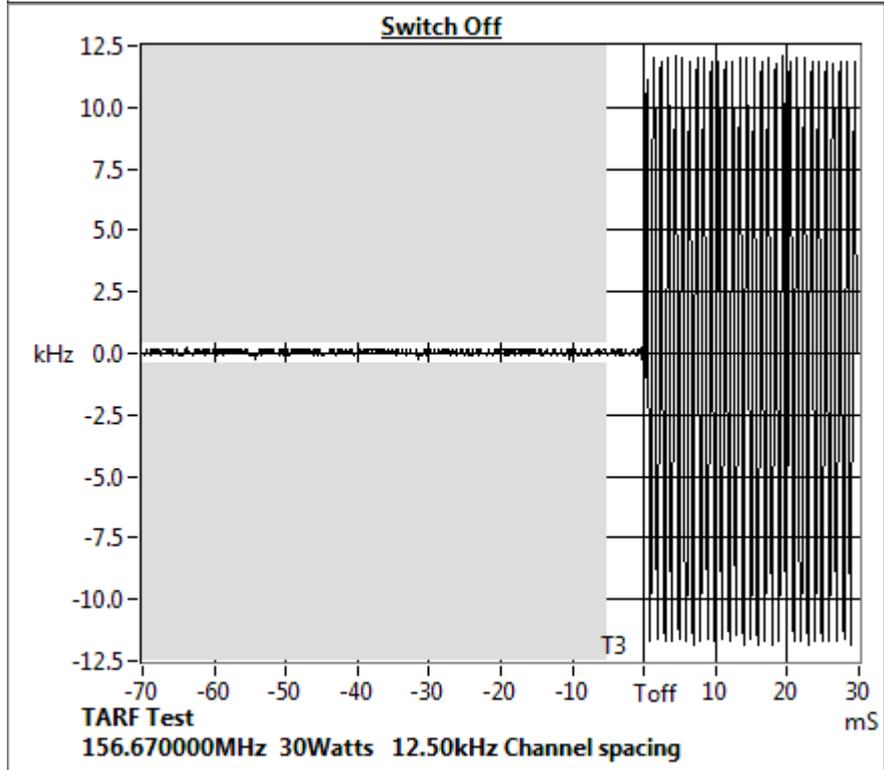
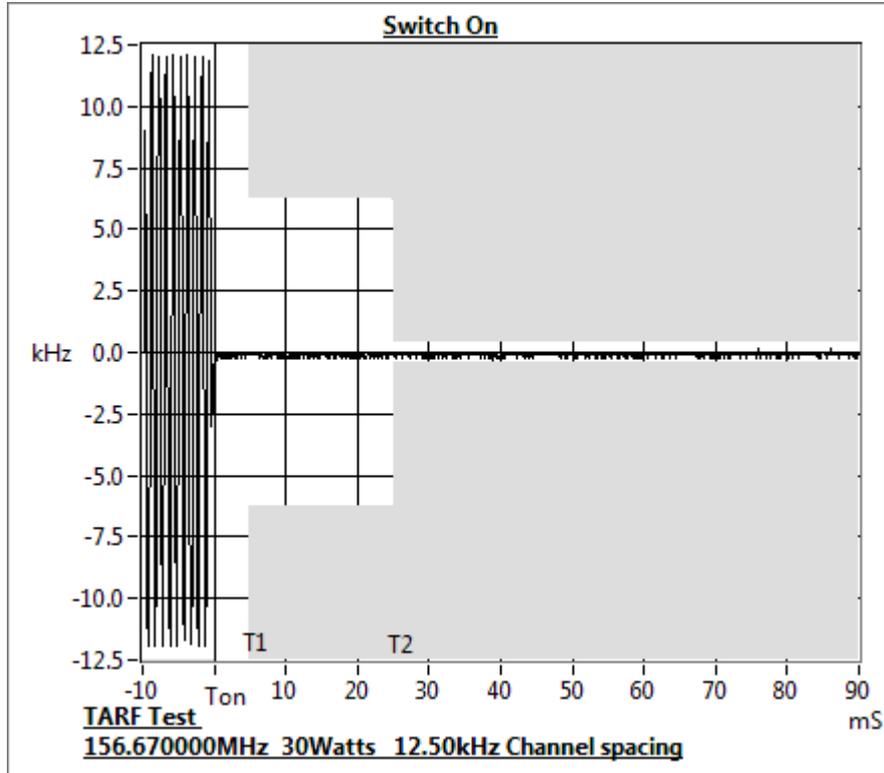
SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 156.67 MHz

30 W

12.5 kHz Channel Spacing



### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 157.2 MHz 30 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.3	N/A
t2	-0.3	N/A
t3	N/A	-1.5

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

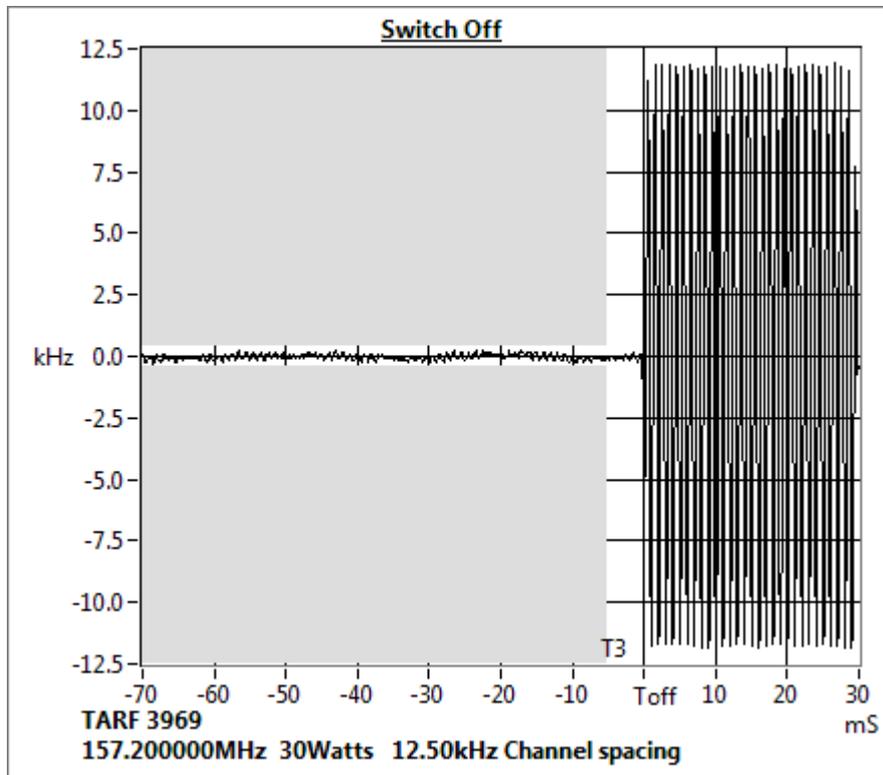
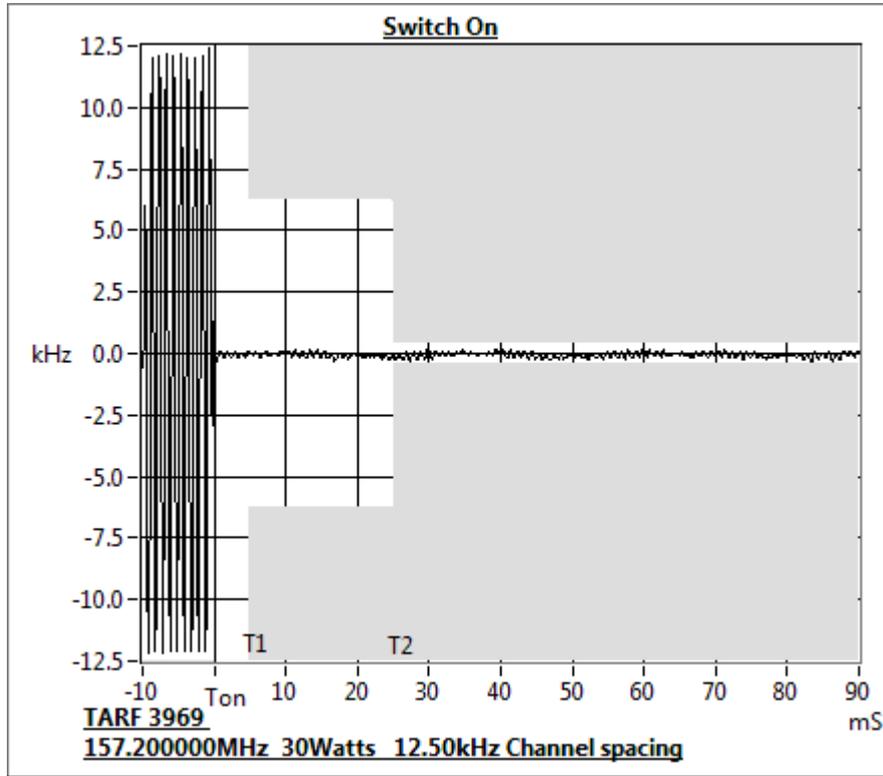
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 157.2 MHz 30 W 12.5 kHz Channel Spacing



### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 161.8 MHz 30 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.4	N/A
t2	-0.2	N/A
t3	N/A	-0.4

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

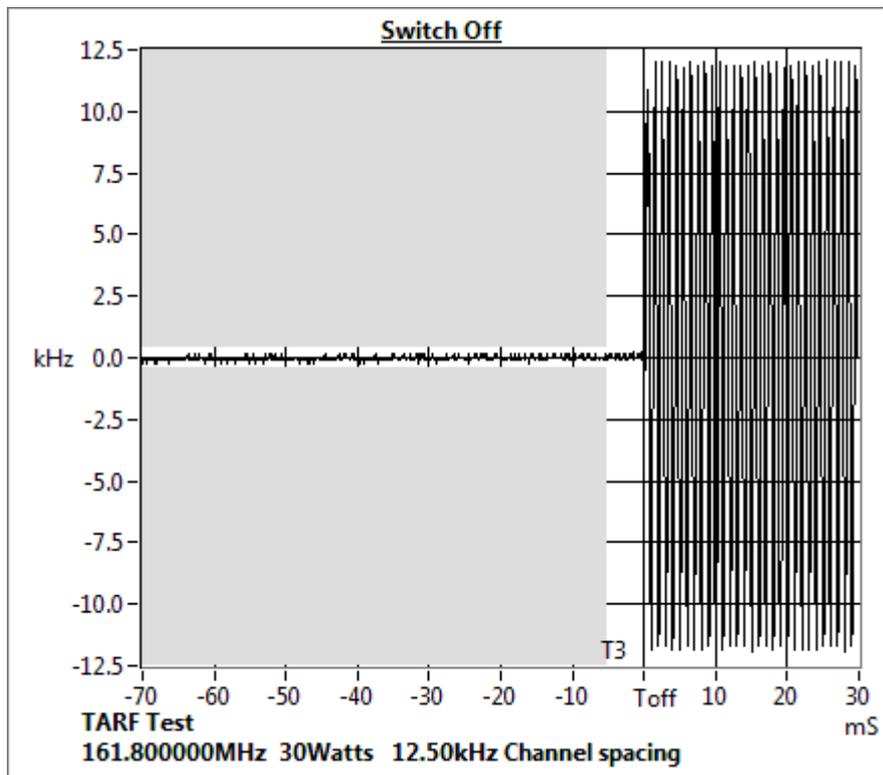
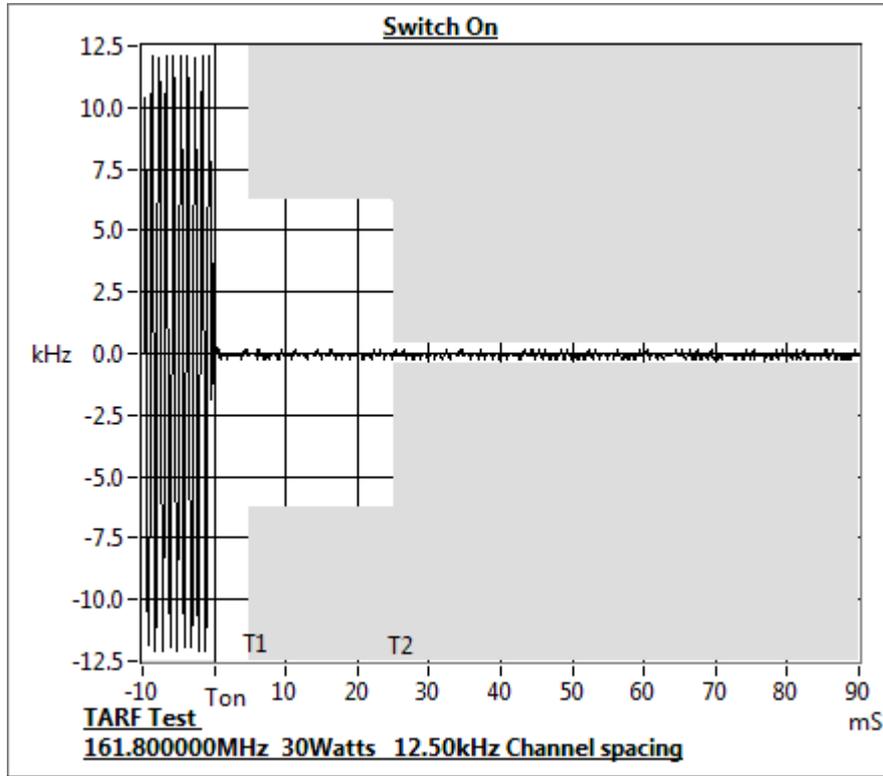
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 161.8 MHz 30 W 12.5 kHz Channel Spacing



### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 162.0 MHz 30 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.4	N/A
t2	0.3	N/A
t3	N/A	-0.5

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

### Transient Frequency Behaviour

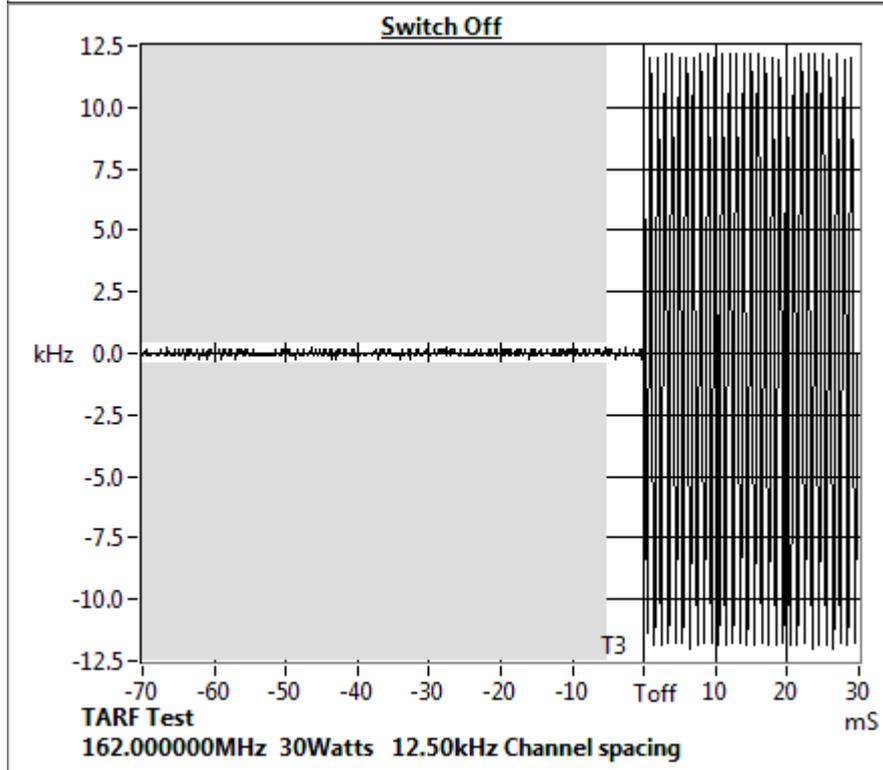
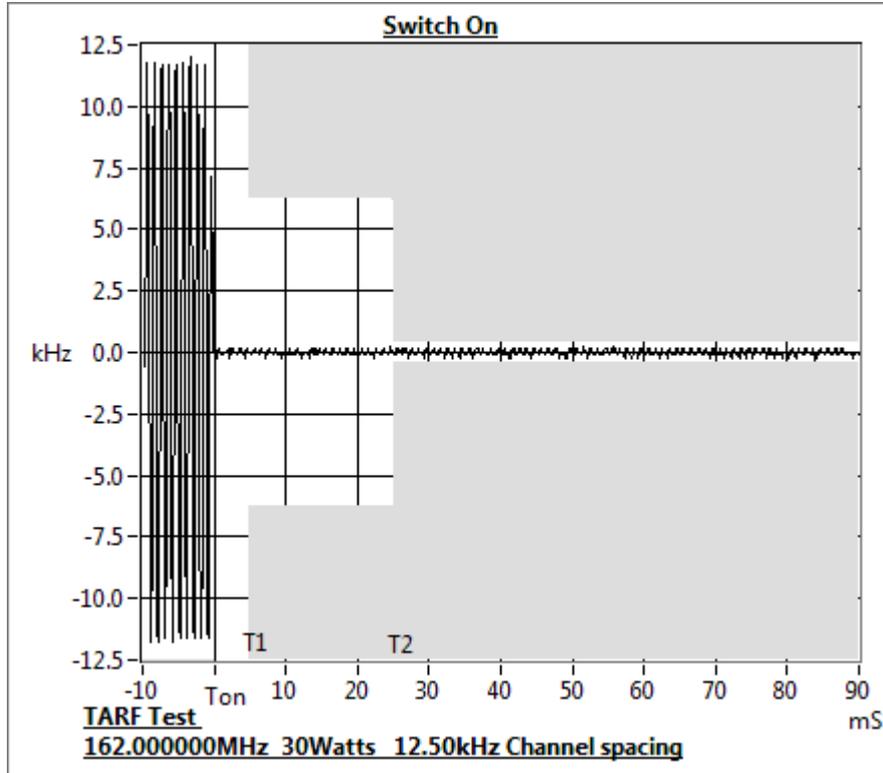
SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 162.0 MHz

30 W

12.5 kHz Channel Spacing



### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 162.1 MHz 30 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.3	N/A
t2	-0.2	N/A
t3	N/A	0.3

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

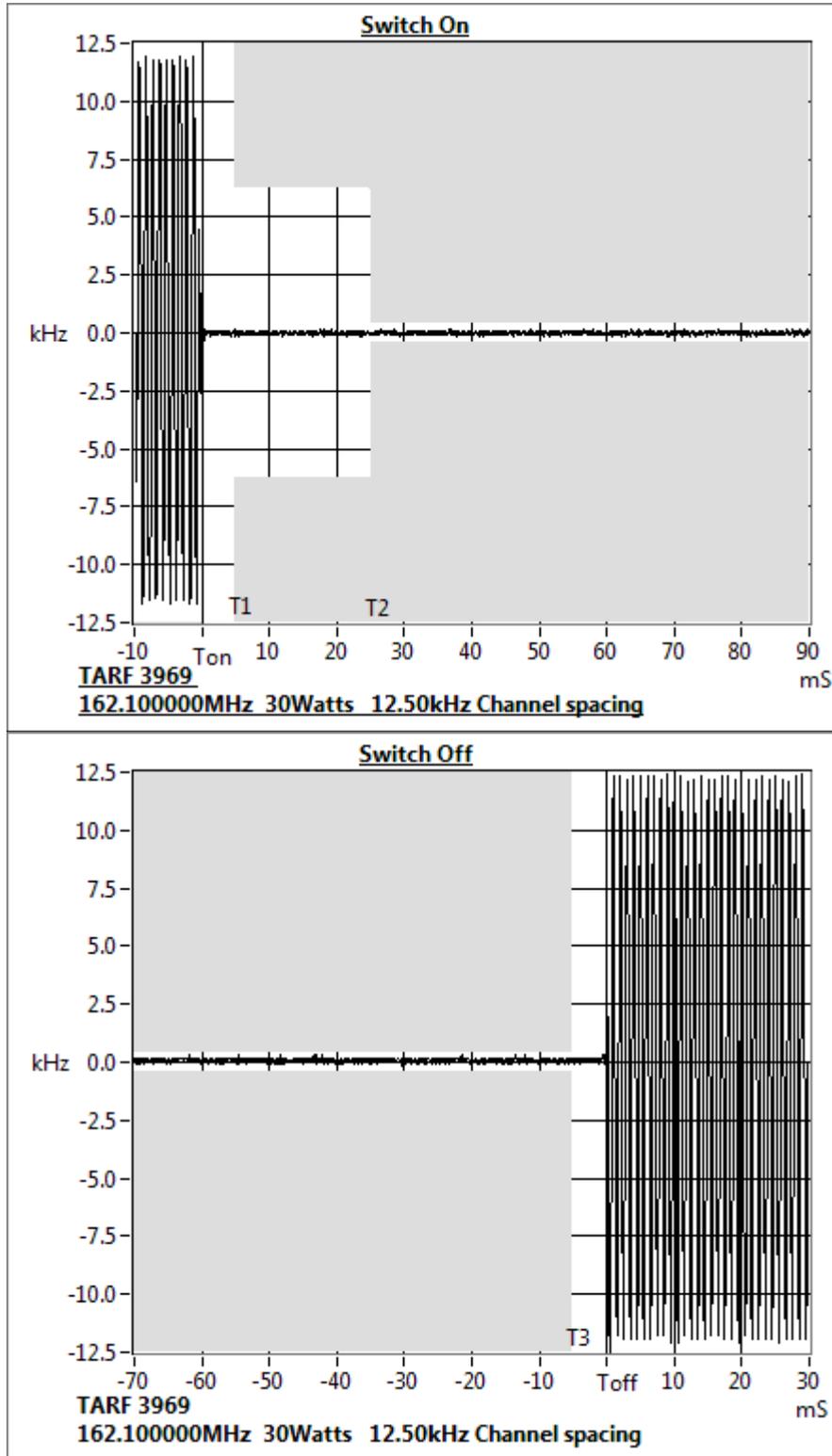
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 162.1 MHz 30 W 12.5 kHz Channel Spacing



### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 168.0 MHz 30 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.9	N/A
t2	-0.3	N/A
t3	N/A	-0.5

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty: Frequency  $\pm$  130 Hz; Time  $\pm$  0.2%

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

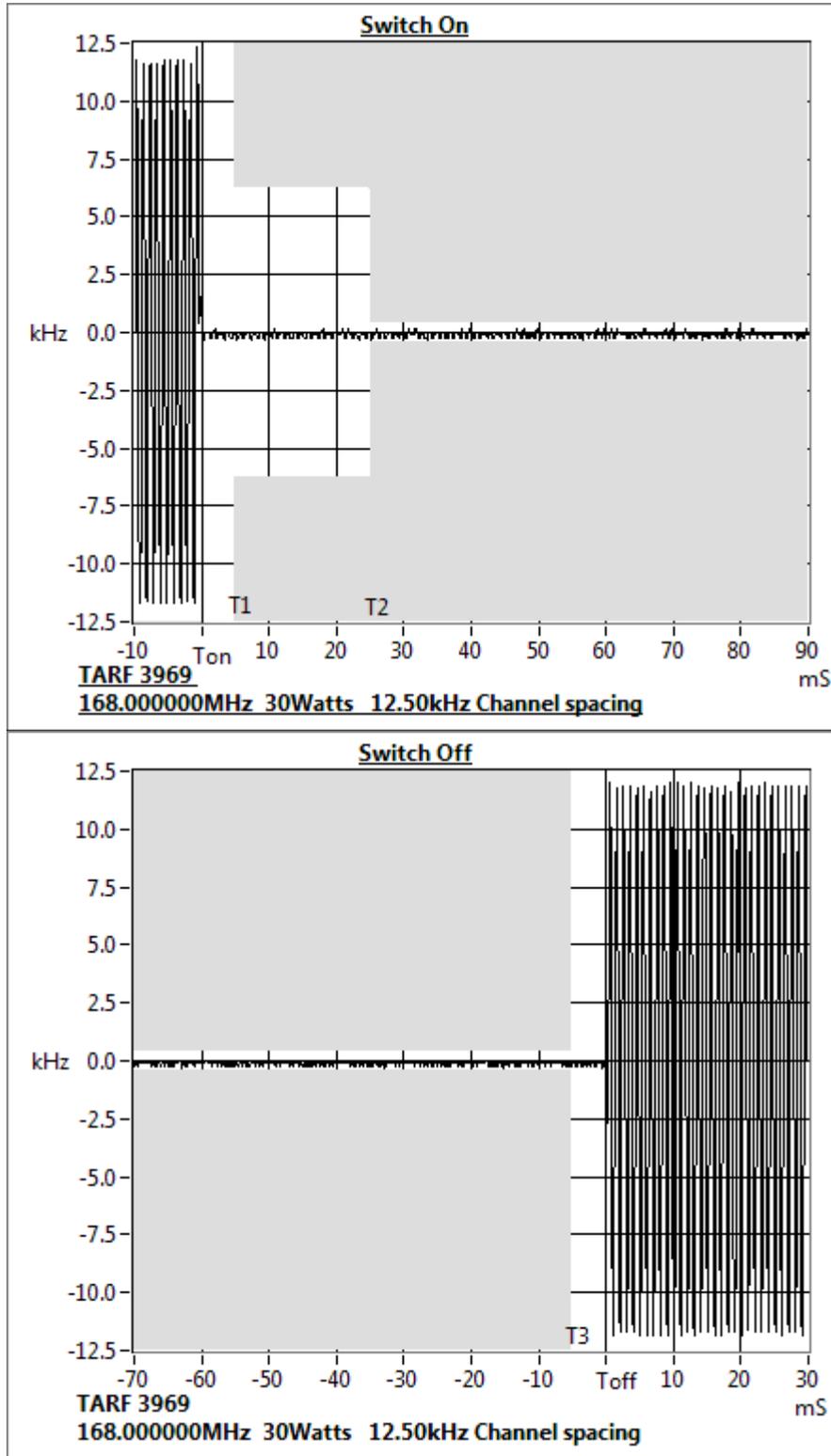
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 168.0 MHz 30 W 12.5 kHz Channel Spacing



### Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 173.3 MHz                      30 W                      12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.5	N/A
t2	-0.3	N/A
t3	N/A	-0.7

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

Measurement Uncertainty:      Frequency  $\pm$  130 Hz;      Time  $\pm$  0.2%

LIMIT:                      FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT:                      RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms
t2 (ms)	$\pm$ 6.25 kHz	20 ms	25 ms
t3 (ms)	$\pm$ 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

### Transient Frequency Behaviour

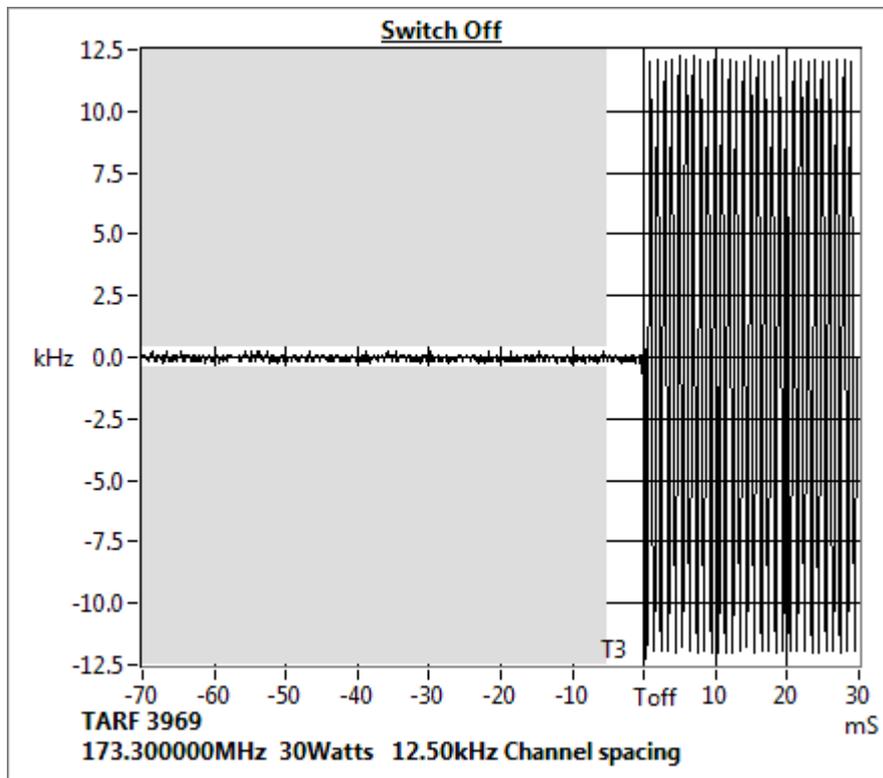
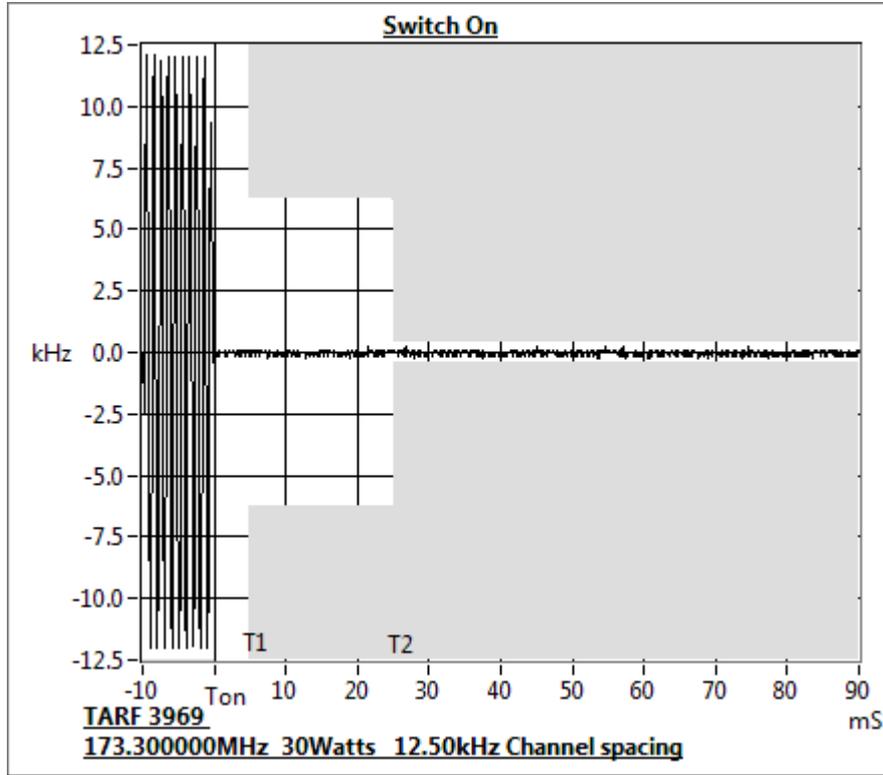
SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 173.3 MHz

30 W

12.5 kHz Channel Spacing



**TRANSMITTER FREQUENCY STABILITY - TEMPERATURE**

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

RSS-119 5.3

GUIDE: TIA-102.CAAA-C 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error from -30° C to +50° C in 10° C increments
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

See the plots on the following pages.

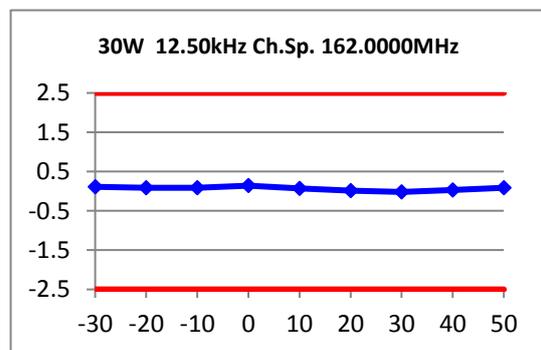
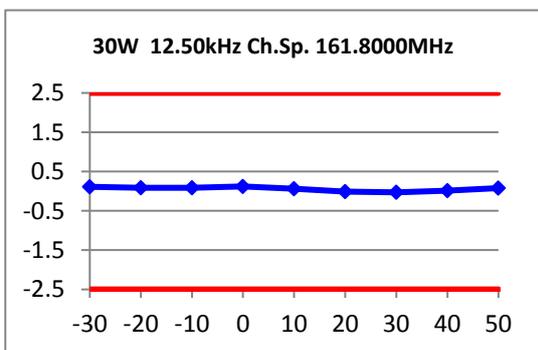
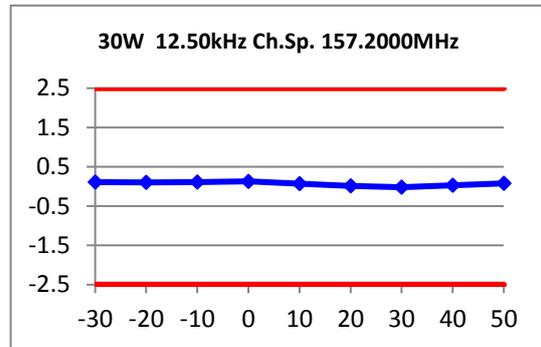
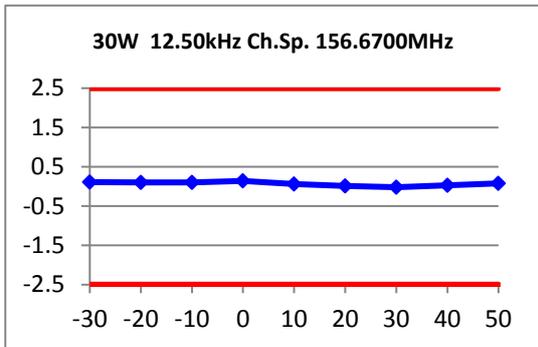
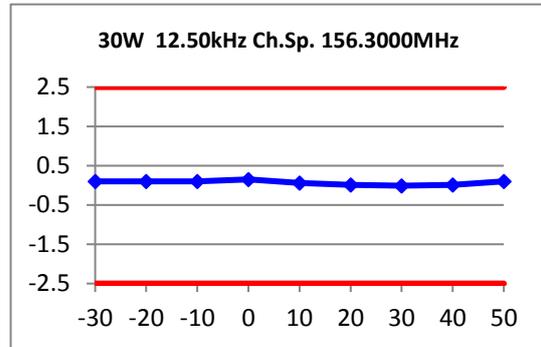
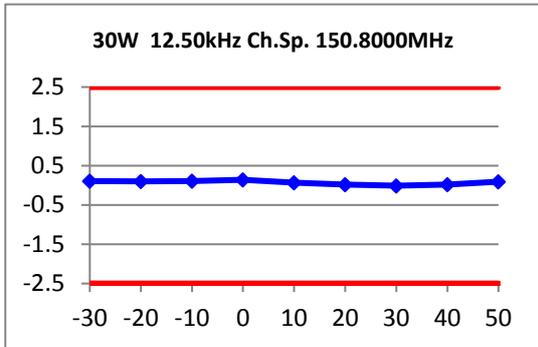
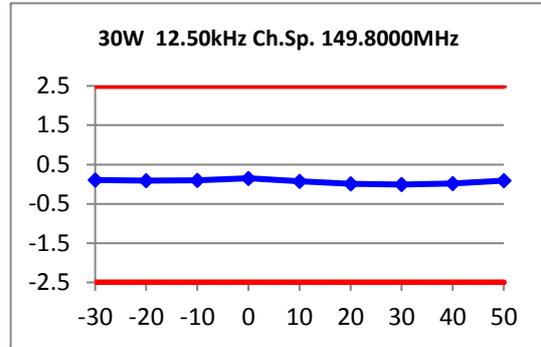
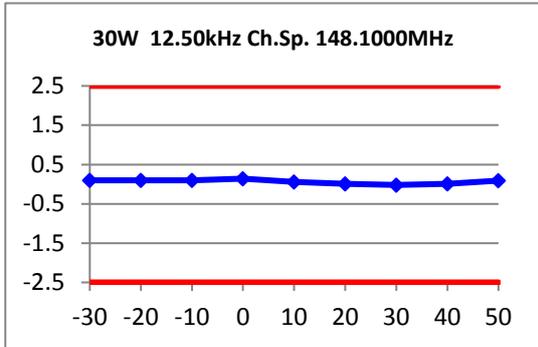
Temperature (°C)	Error (ppm)					
	148.1 MHz	149.8 MHz	150.8 MHz	156.3 MHz	156.67 MHz	157.2 MHz
-30	0.10	0.11	0.11	0.10	0.11	0.11
-20	0.10	0.09	0.10	0.10	0.10	0.10
-10	0.10	0.10	0.11	0.10	0.10	0.11
0	0.14	0.15	0.14	0.15	0.14	0.13
10	0.06	0.07	0.07	0.06	0.06	0.07
20	0.01	0.01	0.02	0.01	0.01	0.01
30	-0.02	-0.01	-0.01	-0.01	-0.02	-0.02
40	0.01	0.02	0.02	0.01	0.03	0.03
50	0.09	0.09	0.09	0.1	0.08	0.08
Measurement Uncertainty				± 7 x 10 <sup>-8</sup>		

Temperature (°C)	Error (ppm)				
	161.8 MHz	162.0 MHz	162.1 MHz	168.0 MHz	173.3 MHz
-30	0.11	0.11	0.11	0.13	0.12
-20	0.09	0.09	0.10	0.09	0.10
-10	0.09	0.09	0.10	0.08	0.08
0	0.12	0.14	0.14	0.12	0.12
10	0.06	0.07	0.07	0.05	0.05
20	-0.01	0.01	0.02	0.00	-0.01
30	-0.03	-0.02	-0.01	-0.03	-0.05
40	0.01	0.03	0.02	0.00	0.00
50	0.08	0.09	0.09	0.08	0.07
Measurement Uncertainty				± 7 x 10 <sup>-8</sup>	

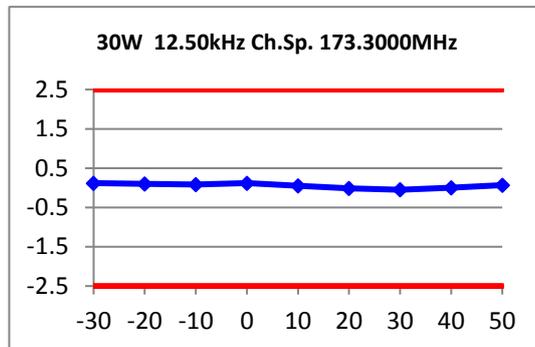
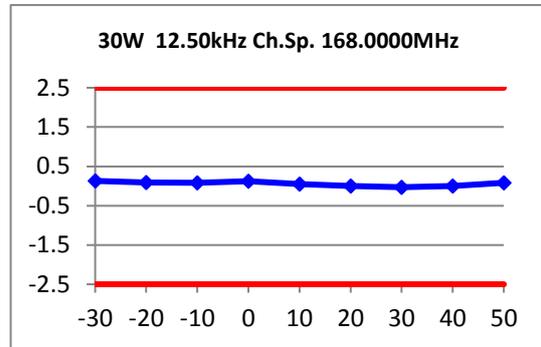
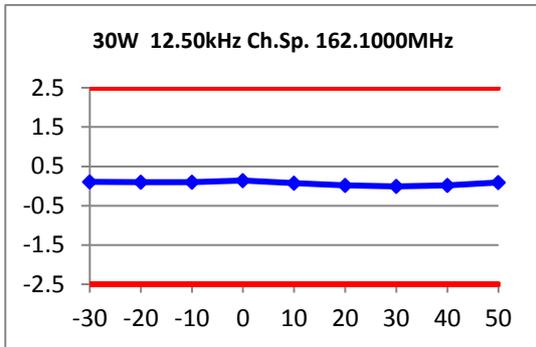
Transmitter Frequency Stability - Temperature

LIMIT: FCC 47 CFR 90.213 RSS-119 5.3

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	2.5



Transmitter Frequency Stability – Temperature (continued)



TRANSMITTER FREQUENCY STABILITY - VOLTAGE

SPECIFICATION: FCC 47 CFR 2.1055 (d) (1)

RSS-119 5.3

GUIDE: TIA-102.CAAA-C 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error at an input voltage to the radio of 85% to 115%.
3. The frequency error was recorded in parts per million (ppm).

Nominal 30 W	FREQUENCY ERROR (ppm) for 12.5 kHz		
	13.8 V <sub>DC</sub>	11.73 V <sub>DC</sub>	15.87 V <sub>DC</sub>
Voltage			
148.1 MHz	0.01	0.01	0.01
149.8 MHz	0.03	0.03	0.03
150.8 MHz	0.03	0.03	0.03
156.3 MHz	0.02	0.03	0.03
156.67 MHz	0.03	0.03	0.03
157.2 MHz	0.00	0.01	0.00
161.8 MHz	0.01	0.00	-0.01
162.0 MHz	0.02	0.02	0.03
162.1 MHz	-0.02	-0.01	-0.01
168.0 MHz	0.01	0.01	0.01
173.3 MHz	-0.01	-0.01	-0.01
Measurement Uncertainty		± 7 x 10 <sup>-8</sup>	

LIMIT CLAUSES: FCC 47 CFR 90.213

RSS-119 5.3

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	2.5

**RECEIVER/TRANSMITTER STANDBY SPURIOUS EMISSIONS (CONDUCTED)**

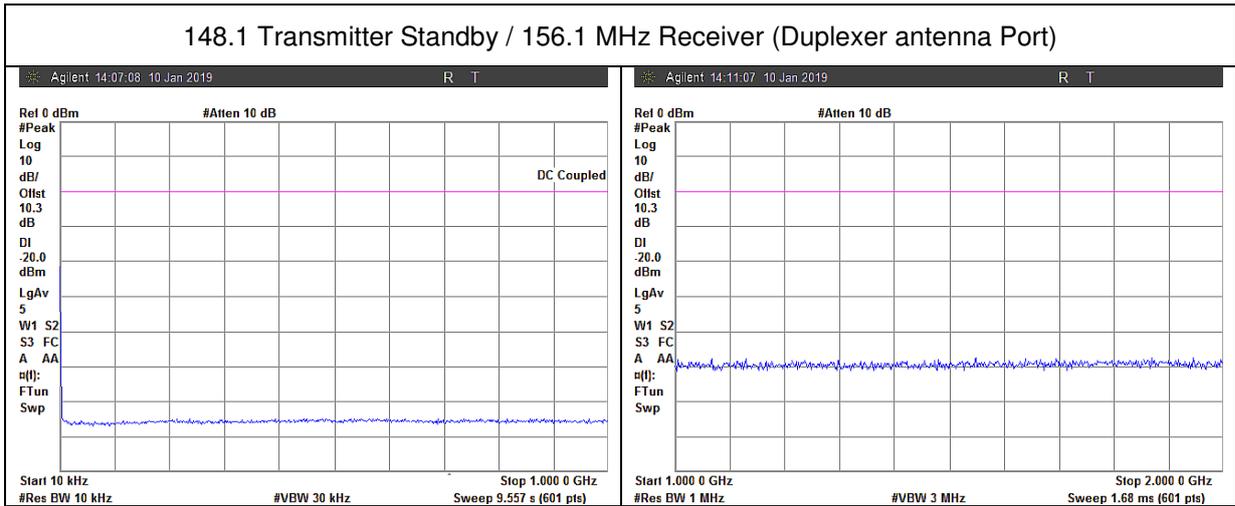
SPECIFICATION: RSS-119 5.11

GUIDE: TIA/EIA-603D 2.2.13

MEASUREMENT PROCEDURE:

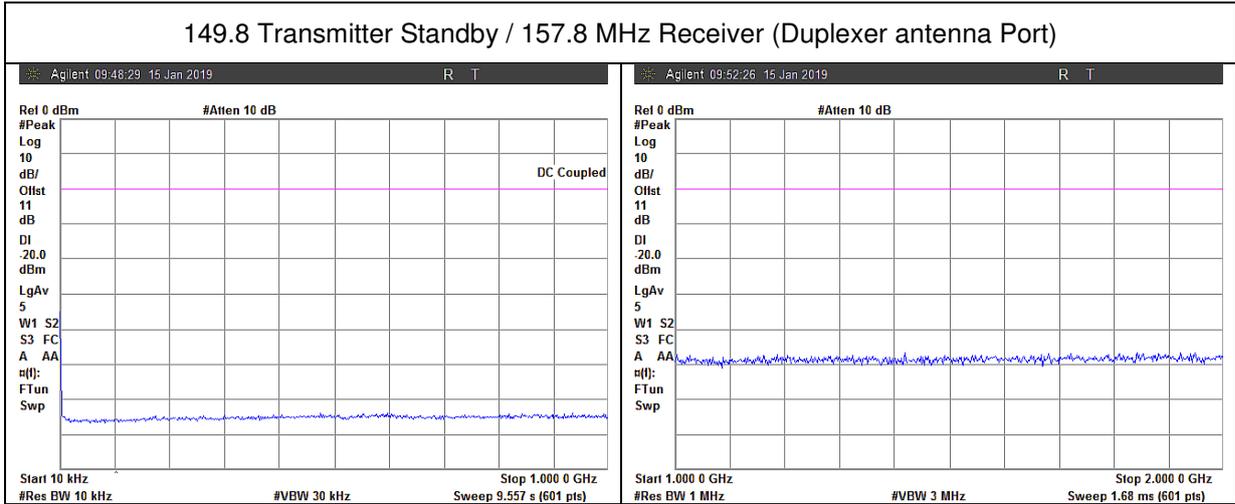
1. Refer Annex A for Equipment set up diagram.
2. The frequency range examined was from 30 MHz to 3 times the highest tunable frequency.
3. Spurious emissions which were attenuated more than 20 dB below the limit were not recorded.

148.1 Transmitter Standby / 156.1 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		

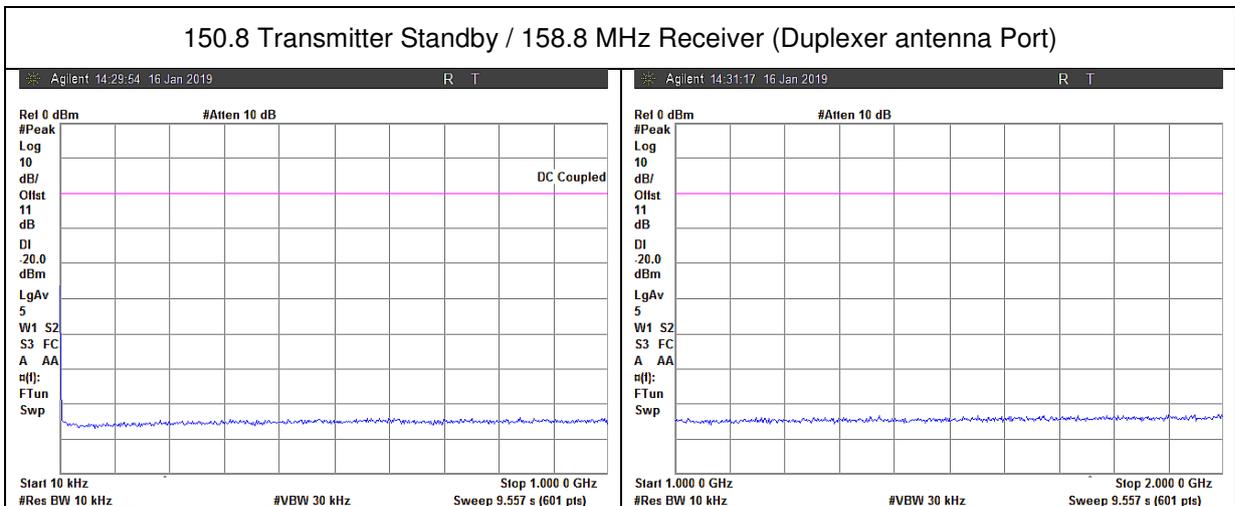


Receiver/Transmitter Standby Spurious Emissions (Conducted) – Continued

149.8 Transmitter Standby / 157.8 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		

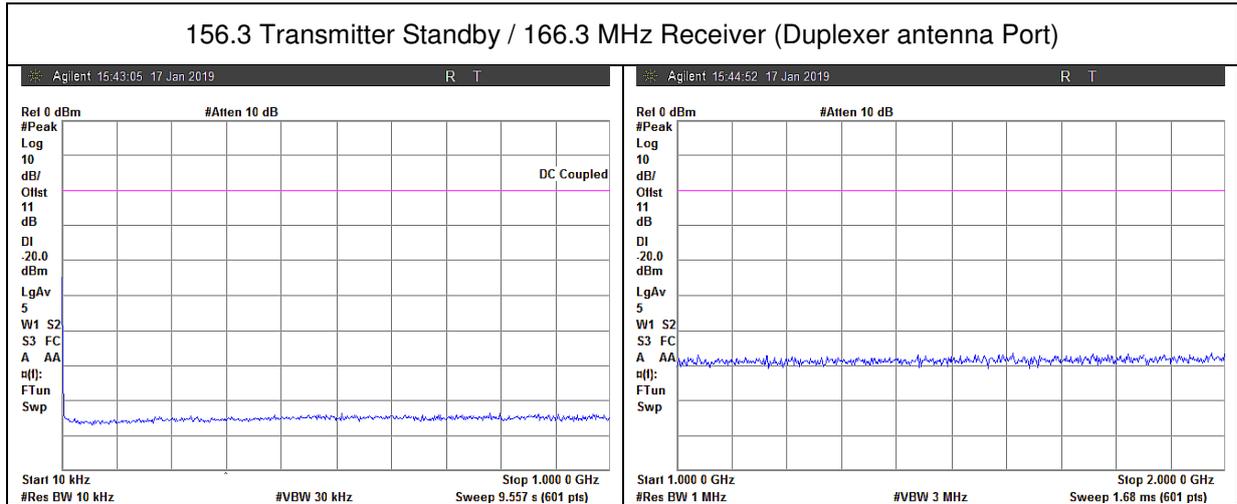


150.8 Transmitter Standby / 158.8 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		

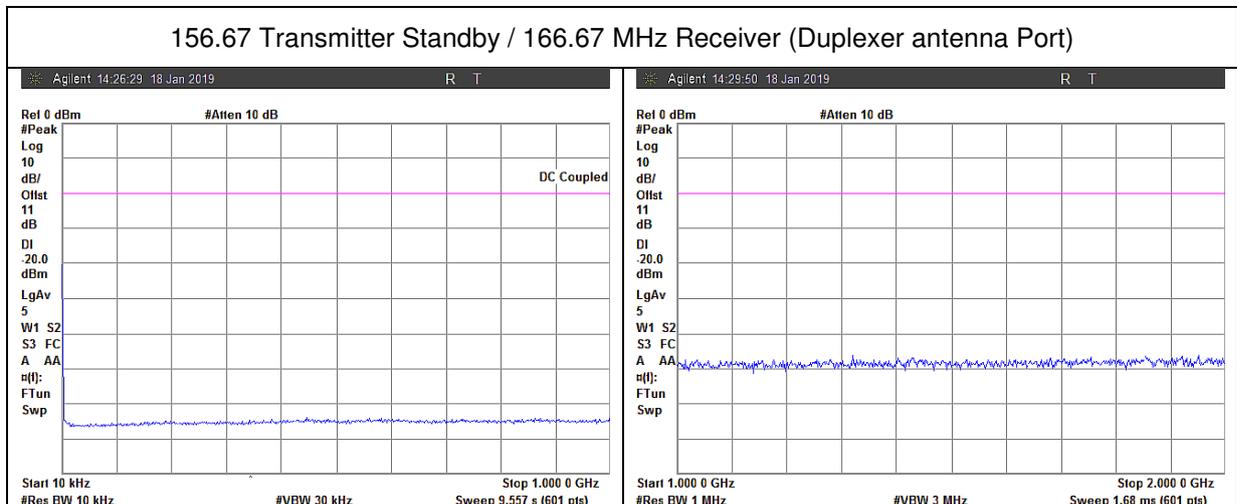


Receiver/Transmitter Standby Spurious Emissions (Conducted) – Continued

156.3 Transmitter Standby / 166.3 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		

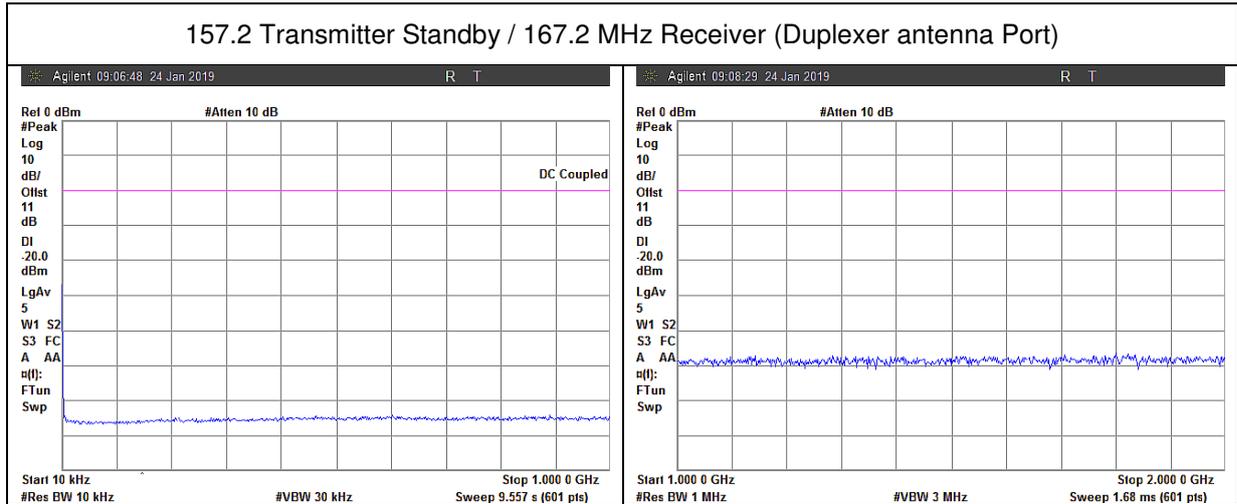


156.67 Transmitter Standby / 166.67 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		

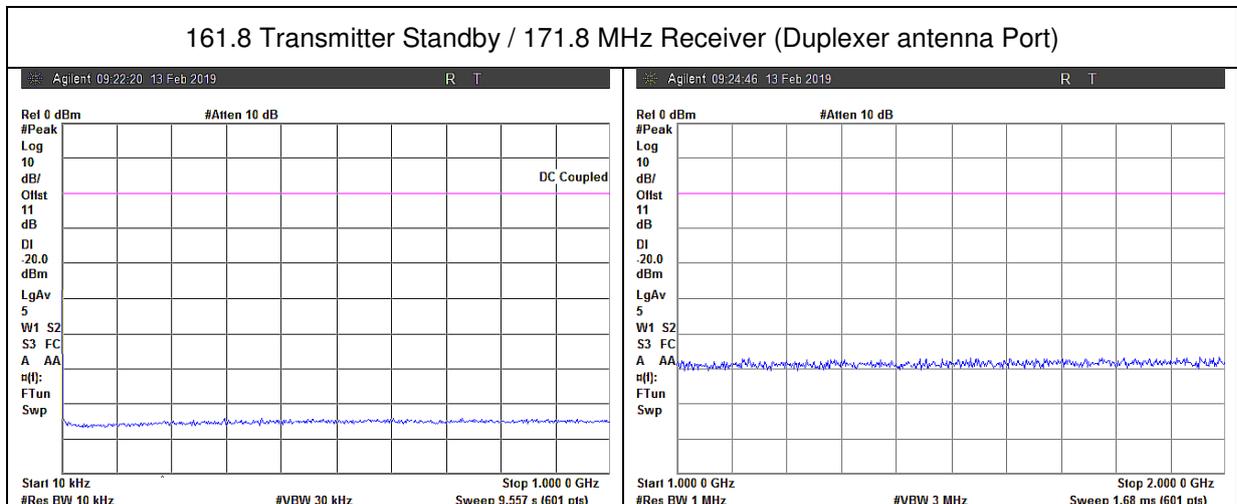


Receiver/Transmitter Standby Spurious Emissions (Conducted) – Continued

157.2 Transmitter Standby / 167.2 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		

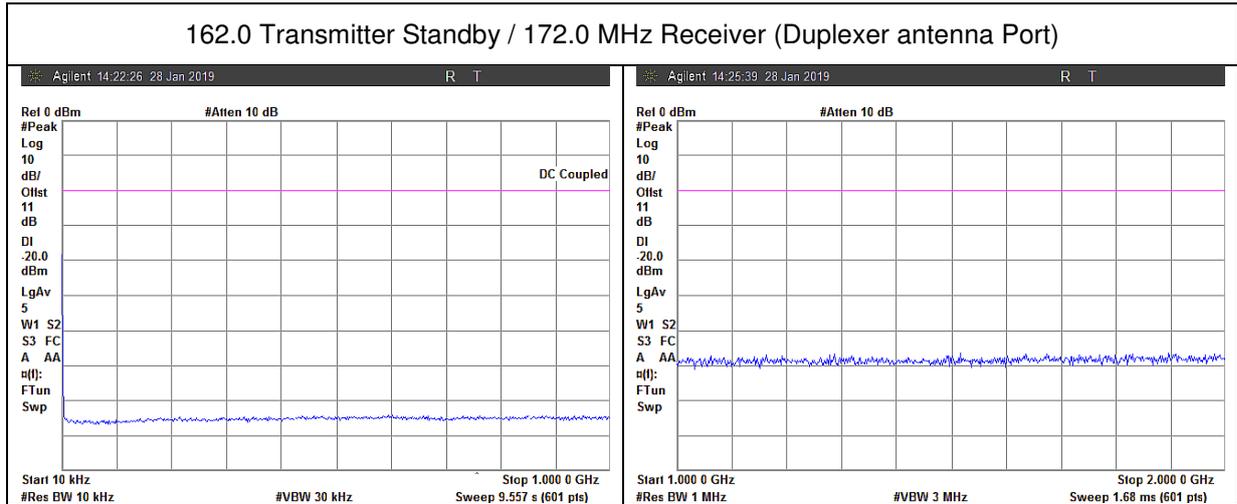


161.8 Transmitter Standby / 171.8 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		

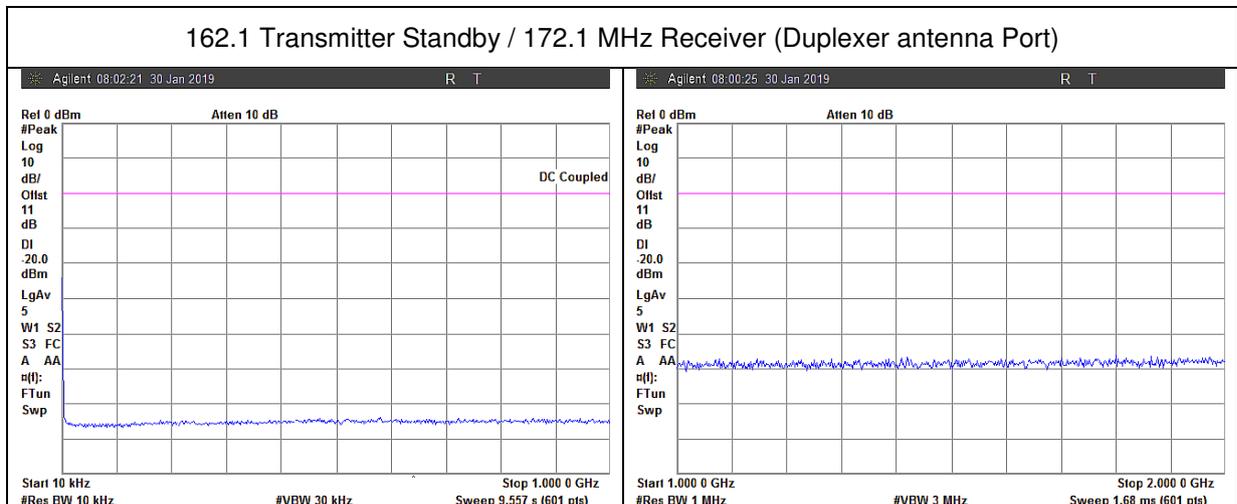


Receiver/Transmitter Standby Spurious Emissions (Conducted) – Continued

162.0 Transmitter Standby / 172.0 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		

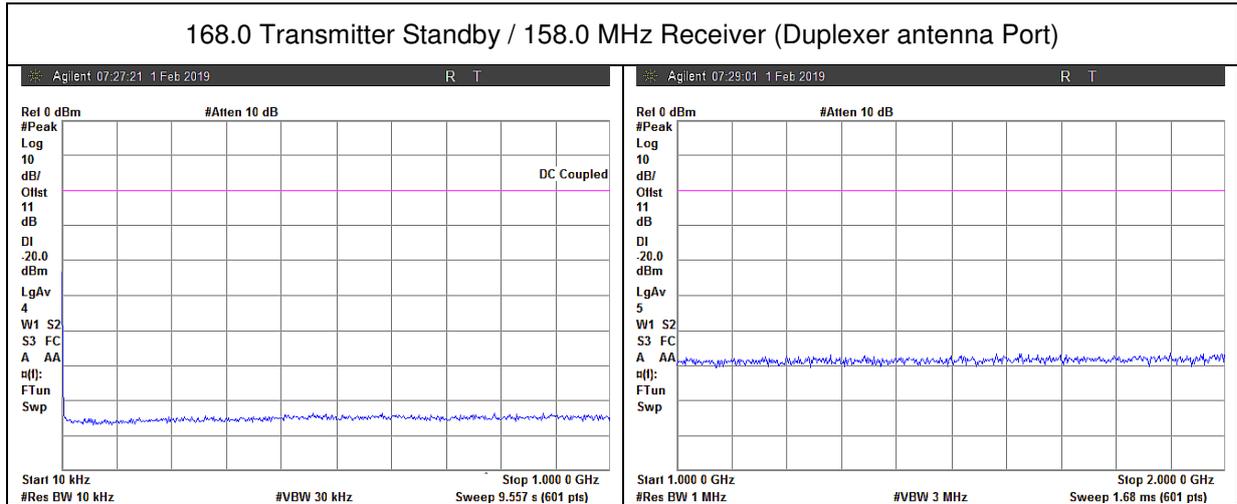


162.1 Transmitter Standby / 172.1 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		

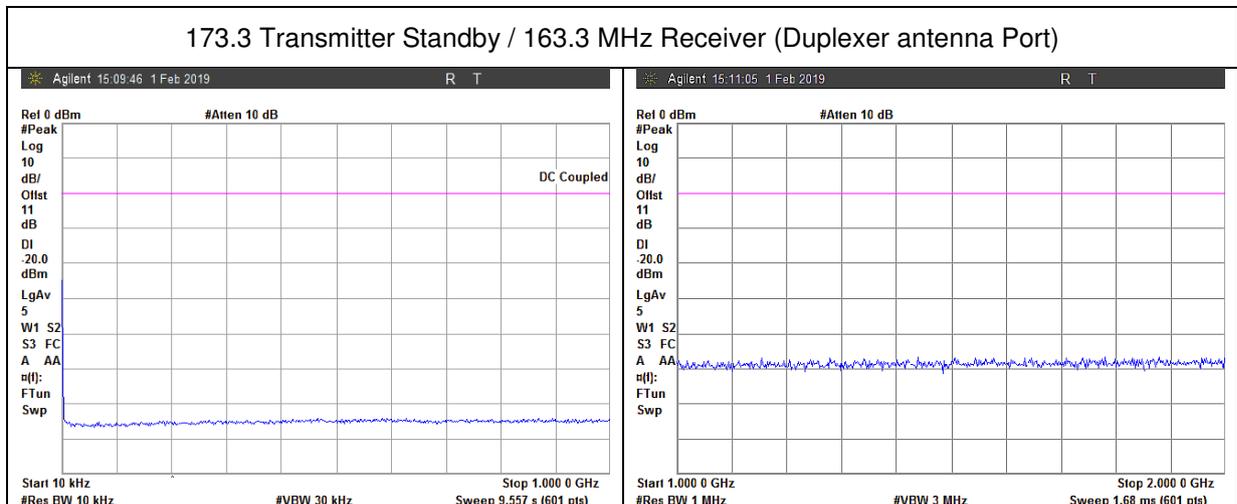


Receiver/Transmitter Standby Spurious Emissions (Conducted) – Continued

168.0 Transmitter Standby / 158.0 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		



173.3 Transmitter Standby / 163.3 MHz Receiver (Duplexer antenna Port)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 3.0 dB	
No emissions were detected within 20 dB of Limit.		



LIMIT CLAUSE:RSS-Gen 6(b)

LIMIT	30 → 1000 MHz	2 nW	- 57 dBm
	> 1000 MHz	5 nW	- 53 dBm

## TEST EQUIPMENT LIST

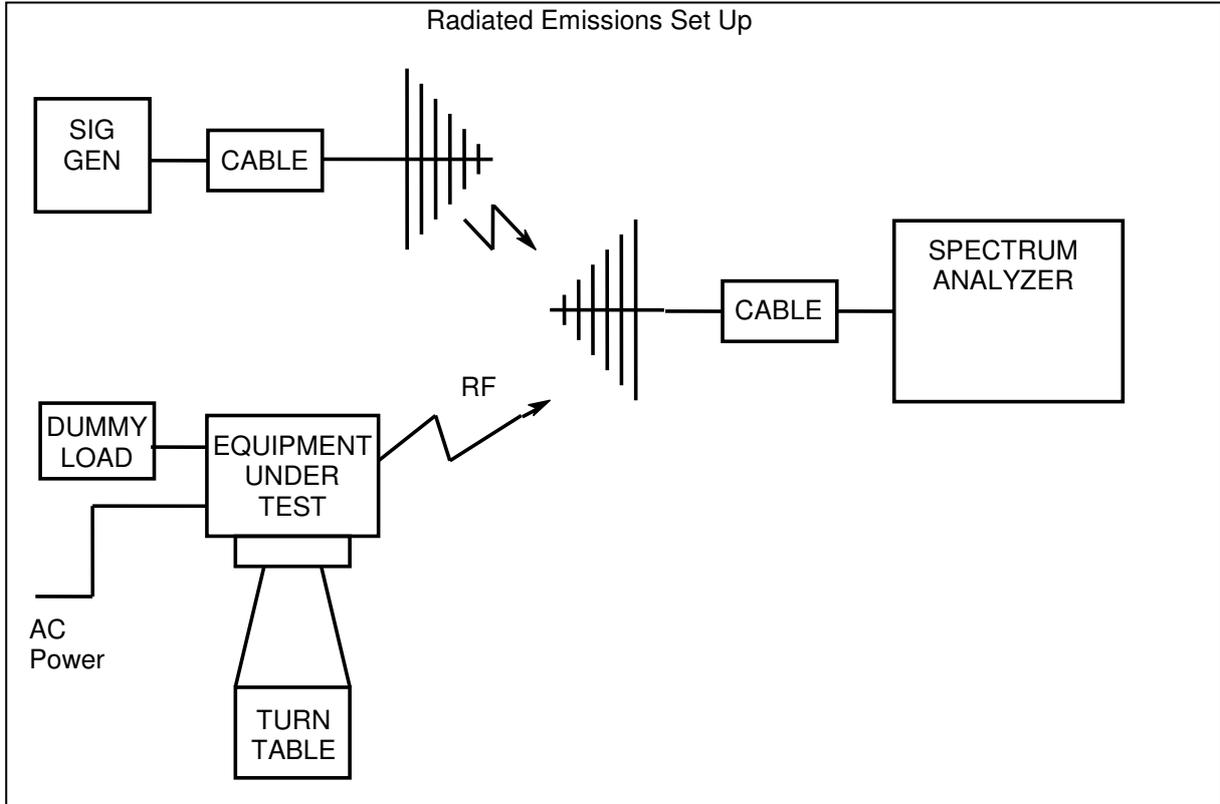
Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
AC Voltmeter		Tait		1		17-Apr-19
Antenna	Reference Dipoles	Emco	3121C DB1	9510-1164	E3559	14-Apr-19
Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-885	E4857	
Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-884	E4858	
Antenna	Collapsible Biconical and Balun	Schwarzbeck	FBAB 9177,VHA 9103	9104-2459	E4616	17-May-20
Antenna	Biconical	Emco	3110B	9307-1680	E3033	
Audio Analyser	TREVA2	Hewlett Packard	HP8903B	2818A04275	E3710	28-Sep-19
Audio Analyser	TREVA1	Hewlett Packard	HP8903A	2437A04625	E4986	4-Oct-19
Coax Cable	OATS Turntable Cable 1	Intelcom	RG214	OATS1	E4621	15-Nov-19
Coax Cable	OATS Tower Cable	Intelcom	RG214	OATS2	E4622	14-Nov-19
Coax Cable	OATS Turntable Cable 2	Intelcom	RG215	OATS3	E4995	14-Nov-19
Coax Cable	2.5m Blue	Suhner	Sucoflex 104A	33449/4PEA	E4997	19-Oct-19
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack8	E5005	17-Oct-19
Coax Cable	3m Blue	Suhner	Sucoflex 126EA	503429/126EA	E5015	19-Oct-19
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack2	E4623	17-Oct-19
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack3	E4624	17-Oct-19
Coax Cable	Reverb - 4.5m Multiflex 141	TeltestBlue6	MF 141	TeltestBlue6	E4843	18-Oct-19
Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue5	MF 141	TeltestBlue5	E4844	18-Oct-19
Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue4	MF 141	TeltestBlue4	E4845	18-Oct-19
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue3	MF 141	TeltestBlue3	E4846	18-Oct-19
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue2	MF 141	TeltestBlue2	E4847	18-Oct-19
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue1	MF 141	TeltestBlue1	E4848	18-Oct-19
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack7	E5004	17-Oct-19
Environ. Chamber	Upright	Contherm	5400 RHSLT.M	1416	E4051	7-Aug-23
Environ. Chamber	Upright	Contherm	5400 RHSLT.M	1416	E4051	23-Apr-19
Filter High Pass/ Notch	135 to 175MHz	Tait		N/A	E3382	25-Sep-19
ISN		Rohde & Schwarz	ENY41	100136	E4277	
ISN	CISPR22 2006	TESEQ	ISN T800	27956	E4658	18-Aug-16
Modulation Analyser	TREVA2	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	28-Sep-19
Modulation Analyser	TREVA1	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	4-Oct-19
OATS	Controller	Electrometrics	EM-4700	119	E4445	
OATS	Turntable	Electrometrics	EM-4704A	105	E4446	
OATS	Antenna Tower	Electrometrics	EM-4720-2	112	E4447	
OATS	NSA	Tait				
Oscilloscope	400MHz	Tektronics	TDS380	B017095	E3782	29-Sep-19
Power Meter	TREVA2 Power Head for HP8901	Hewlett Packard	HP11722A	2716A02037	1575	28-Sep-19
Power Meter	TREVA1 Power Head for HP8901	Hewlett Packard	HP11722A	3111A05573	E7054	28-Sep-19
Power Supply	TREVA2 60V/25A	Agilent	N5767A	US09F4901H	E4656	7-Oct-19
Power Supply	TREVA1	Agilent	HP6032A	MY41000319	E4045	24-Sep-20
Power Supply	AC Variac	Yamabishi	S-260-5	TX-533	E1737	

TELTEST Laboratories  
Tait International Ltd  
Report Number 3969

RF Amplifier	+21.7 dB 1GHz	Tait	ZFL-1000LN	E3660	E3360	17-Apr-19
RF Amplifier	Pre-amplifier	Agilent	87405C	MY47010688	E4941	2-Oct-19
RF Attenuator	20dB 50W	Weinschel	24-20-44	AW1266	E3562	17-Oct-19
RF Attenuator	10dB 150W	Weinschel	57-10-34	LB590	E3674	18-Oct-19
RF Attenuator	TREVA2 20dB 150W	Weinschel	40-20-33	CJ405	E3733	17-Oct-19
RF Attenuator	10dB 50W	Weinschel	24/10/1934	AZ0401	E3388	17-Nov-19
RF Attenuator	TREVA2 3dB	Weinschel	Model 1	BL9950	E4080	17-Oct-19
RF Attenuator	TREVA1 3dB	Weinschel	Model 1	BL9958	E4081	17-Oct-19
RF Attenuator	TREVA 1 20dB 150W	Weinschel	40-20-23	MF817	E4082	17-Oct-19
RF Chamber	S-LINE TEM CELL	Rohde & Schwarz	1089.9296.02	338232/003	E3636	12-Sep-20
RF Chamber	Reverb - Stirrer controller for reverb chamber	Teseq	Stirrer Controller	29765.1	E4854	
RF Chamber	Reverb - 0.5 - 18GHz Reverberation Chamber	Teseq	RVC XS	29765	E4855	
RF Combiner	TREVA2	Minicircuits	ZFSC-4-1	-	E4084	
RF Combiner	TREVA1	Minicircuits	ZFSC-4-1	-	E4083	
RF Load	150W	Bird	8166	524	E3625	17-Oct-19
Signal Generator	TREVA2 Analog 3.3GHz	Rohde & Schwarz	SML03 1090.3000.13	100597	E4050	29-Sep-19
Signal Generator	Digital 3GHz	Agilent	E4438C	MY49070242	E4657	9-Oct-19
Signal Generator	Digital 4GHz	Agilent	E4437B	US39260389	E4764	30-Sep-19
Spectrum Analyser	13.2GHz	Hewlett Packard	HP8562E	3821A00779	E3715	26-Sep-19
Spectrum Analyser	13.2GHz	Agilent	E4445A	MY42510072	E4139	19-Jul-20
Spectrum Analyser	13.2GHz	Agilent	E4445A	MY42510072	E4139	19-Jul-20
Temp & Humidity datalogger		Hobo	U21-011	10134276	E4981	22-Apr-19
Testware	Radiated Emissions		Apr-18	-	-	
Testware	Reverb Emissions		Jun-18	-	-	
Testware	S-Line Radiated Emissions		Apr-18	-	-	
Testware	Base Station Network Audio Generator		Dec-17	-	-	
Testware	Frequency Vs Temperature		Apr-18	-	-	
Testware	Occupied Bandwidth		Mar-18	-	-	
Testware	TREVA		Apr-18	-	-	
Testware	Sideband Spectrum		Feb-17	-	-	
Testware	Conducted Emissions		Mar-18	-	-	
Testware	Conducted Disturbances		Mar-18	-	-	
TREVA 1		Teltest	-	1	-	2-May-19
TREVA 2		Teltest	-	2	-	3-May-19

\* 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 Radio **EVA**luation 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.

