

LABORATORY TEST REPORT

RADIO PERFORMANCE MEASUREMENTS

for the

TMBK5B Mobile 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: 21 August 2024

PREPARED BY: J. J. Aro


Test Technician

CHECKED & APPROVED BY: M. C. James


Laboratory Technical Manager



FCC Registration: 838288
ISED Registration: 737A

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

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FCC ID: CASTMBK5B
IC : 737A-TMBK5B

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REVISION HISTORY

Date	Revision	Comments
21 August 2024	1	Initial test report

INTRODUCTION

This report supports a “Class 2” permissive change to add 20kHz channel spacing operation for the 757 to 870MHz frequency range of this radio. This additional frequency spacing only relates to Analogue and FFSK (1200bps and 2400bps) modulations.

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

REPORT PREPARED FOR

Tait International Ltd
245 Wooldridge Road
Harewood
Christchurch 8051
New Zealand

DESCRIPTION OF SAMPLE

Manufacturer: Tait International Limited
Equipment: Mobile Transceiver
Type: TMBK5B
Product Code: T02-00014-XFAA
Serial Number(s): 21660155
Frequency range of addition: 757 → 870 MHz
Transmit Power:

Frequency Range	Very Low Power	High Power
757-806 MHz	2 W	30 W
806-870 MHz	2 W	35 W

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
Analogue FM		20 kHz	1	-	-
FFSK	Fast Frequency Shift Keying	20 kHz	-	1200	1200
		20 kHz	-	2400	2400

HARDWARE & SOFTWARE

Quantity: 1

Unit	Type	Code and Version
Head	Hardware ID	TMBC62-0100_0001
	Firmware Package	QIDMR_3.03.08.0133
	FPGA Image	QCB6G_S03_3.10.00.0000
Torso	Hardware ID	TMBB34-K510_0002
	Firmware Package	QIDMR_3.03.08.0133
	FPGA Image	QMB3G_S02_3.12.01.0000

TEST CONDITIONS

All testing was performed between 19 → 21 August 2024, and under the following conditions:

Ambient temperature: 15°C → 30°C
Relative Humidity: 20% → 75%
Standard Test Voltage: 13.8 V_{DC}

TEST REQUIREMENTS AND RESULT SUMMARY

ISED Specification	FCC Specification	Test Name	Test Methods	Result
RSS-119 5.4	FCC 47 CFR 2.1046	Transmitter Output Power (Conducted)	ANSI C63.26 5.2.4.2	N1
No specification	FCC 47 CFR 2.1047 (a)	Transmitter Audio Frequency Response – Pre-emphasis	ANSI C63.26 5.3.3.2	P
No specification	FCC 47 CFR 2.1047 (b)	Transmitter Modulation Limiting	ANSI C63.26 5.3.2	P
RSS-119 5.5	FCC 47 CFR 2.1049 (c)	Transmitter Occupied (99%) Bandwidth	ANSI C63.26 5.4.4	P
RSS-119 5.5	FCC 47 CFR 90.210	Transmitter Spectrum Masks	ANSI C63.26.5.7.3	P
RSS-119 5.8.9	FCC 47 CFR 90.543	Adjacent Channel Power Ratio	TIA-603-E 2.2.14 TIA-102.CAAA-E 2.2.8	P
RSS-119 5.8	FCC 47 CFR 2.1051	Transmitter Spurious Emissions (Conducted)	ANSI C63.26 5.7	N1
RSS-119 5.8	FCC 47 CFR 2.1053	Transmitter Spurious Emissions (Radiated)	TIA-603-E 2.2.12	N1
No specification	FCC CFR 90.543	Transmitter Radiated Emissions in the GNSS Band	TIA-603-E 2.2.12	N1
RSS-119 5.8.9.2 rad	No specification	Transmitter Conducted Emissions in the GNSS Band	ANSI C63.26 6.5.2.7.4	N1
RSS-119 5.9	FCC 47 CFR 90.214	Transient Frequency Behaviour	ANSI C63.26 6.5.2.2	N/A 3
RSS-119 5.3	FCC 47 CFR 2.1055, FCC 47 CFR 90.213	Transmitter Frequency Stability - Temperature	ANSI C63.26 5.6.4	N1
RSS-119 5.3	FCC 47 CFR 2.1055 (d) (1), FCC 47 CFR 90.213	Transmitter Frequency Stability - Voltage	ANSI C63.26 5.6.5	N1
RSS-Gen 7.4	FCC 47 CFR 15.111	Receiver Spurious Emissions (Conducted)	TIA-603-E 2.1.2	N1

Test Case Result Definitions	
No test Performed	N
Test does not apply to the test object	N/A
Test object meets requirements	P (Pass)
Test object does not meet requirements	F (Fail)
Test object is not conclusive	I (Inconclusive)

Comments:
N/A 1: Only required where the EUT is capable of Analogue modulation
N/A 2: Only required where the EUT transmits in the 768-776 or 798-806 MHz band (ISED), or 769-775 or 799-805 MHz band (FCC).
N/A 3: Only required where the EUT transmits in the 138-174 or 406.1-512 MHz band
N1: Not tested, as this parameter is unlikely to be affected by the addition of the 20 kHz channel spacing.

STATEMENT OF COMPLIANCE

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

Equipment: Mobile Transceiver
Type: TMBK5B
Product Code: T02-00014-XFAA
Serial Number(s): 21660155
Quantity: 1

to which this declaration relates, is in conformity with the following standards:

FCC 47 CFR Parts 22 and 90

RSS-119 Issue 12 & RSS-Gen Issue 5

for the parameters tested in this report.

Signature: 

M. C. James
Laboratory Technical Manager

Date: 26 August 2024

The results obtained in this test report pertain only to the item tested. Teltest does not make any claims of compliance for samples or variants that were not tested.

95% measurement uncertainties are stated in this report but are not applied in the assessment of results.

CHANNEL TABLE

Label	Channel Number	Transmit Frequency MHz	Power Watts	Channel Spacing kHz
757.500H	1	757.500	30	20
757.500L	2	757.500	2	20
768.025H	3	768.025	30	20
768.025L	4	768.025	2	20
769.075H	5	769.075	30	20
769.075L	6	769.075	2	20
774.900H	7	774.900	30	20
774.900L	8	774.900	2	20
775.975H	9	775.975	30	20
775.975L	10	775.975	2	20
787.500H	11	787.500	30	20
787.500L	12	787.500	2	20
798.025H	13	798.025	30	20
798.025L	14	798.025	2	20
799.075H	15	799.075	30	20
799.075L	16	799.075	2	20
804.900H	17	804.900	30	20
804.900L	18	804.900	2	20
805.500H	19	805.500	30	20
805.500L	20	805.500	2	20
805.975H	21	805.975	30	20
805.975L	22	805.975	2	20
806.025H	23	806.025	35	20
806.025L	24	806.025	2	20
815.025H	25	815.025	35	20
815.025L	26	815.025	2	20
823.975H	27	823.975	35	20
823.975L	28	823.975	2	20
851.025H	29	851.025	35	20
851.025L	30	851.025	2	20
860.025H	31	860.025	35	20
860.025L	32	860.025	2	20
868.975H	33	868.975	35	20
868.975L	34	868.975	2	20

Programming Application Name
Terminals Programming Application

Version
0.0.0.37 (Alpha)

MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

MODULATION TYPES:

F3E Analogue Frequency Modulation (FM)
F2D FFSK 1200 bps and FFSK 2400 bps

CHANNEL SPACING: 20.0 kHz

EMISSION DESIGNATORS:

Analogue FM	14K0F3E
FFSK Data 1200 bps	8K40F2D
FFSK Data 2400 bps	9K60F2D

CALCULATIONS

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: 20.0 kHz Bandwidth

Necessary bandwidth

M = 3.0 kHz

D = 4.0 kHz

$$B_n = (2 \times 3.0) + (2 \times 4.0) \times 1 \\ = 14.0 \text{ kHz}$$

Emission Designator

14K0F3E

F3E represents an FM voice transmission

Fast Frequency Shift Keying (FFSK – 1200 bps): 20.0 kHz Channel Spacing

Necessary bandwidth

M = 1.8 kHz

D = 2.4 kHz (60% of peak deviation)

$$B_n = (2 \times 1.8) + (2 \times 2.4) \times 1 \\ = 8.4 \text{ kHz}$$

Emission Designator

8K40F2D

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

Fast Frequency Shift Keying (FFSK – 2400 bps): 20.0 kHz Channel Spacing

Necessary bandwidth

M = 2.4 kHz

D = 2.4 kHz (60% of peak deviation)

$$B_n = (2 \times 2.4) + (2 \times 2.4) \times 1 \\ = 9.6 \text{ kHz}$$

Emission Designator

9K60F2D

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

TEST RESULTS

TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: ANSI C63.26 5.3.3.2

MEASUREMENT PROCEDURE:

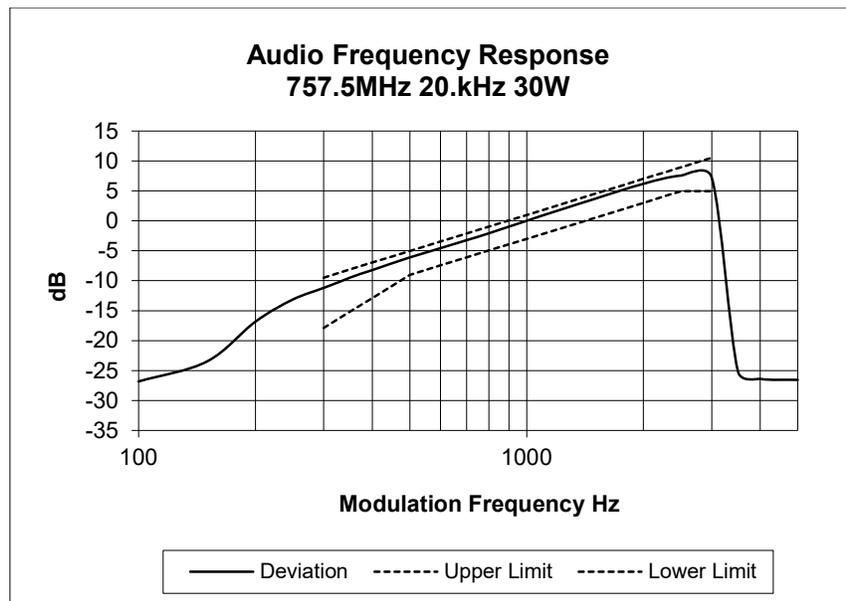
1. Refer Annex A for Equipment set up.
2. An audio input tone of 1000 Hz was applied with the level set to obtain 20% of maximum deviation. This was used as the 0 dB reference point.
3. The AF was varied while the audio level was held constant.
4. The response in dB relative to 1000 Hz was measured.

MEASUREMENT RESULTS:

See the plots on the following pages for 20kHz channel spacing tested at 30W & 35W transmit power.

MEASUREMENT UNCERTAINTY: $\pm 1.5\%$

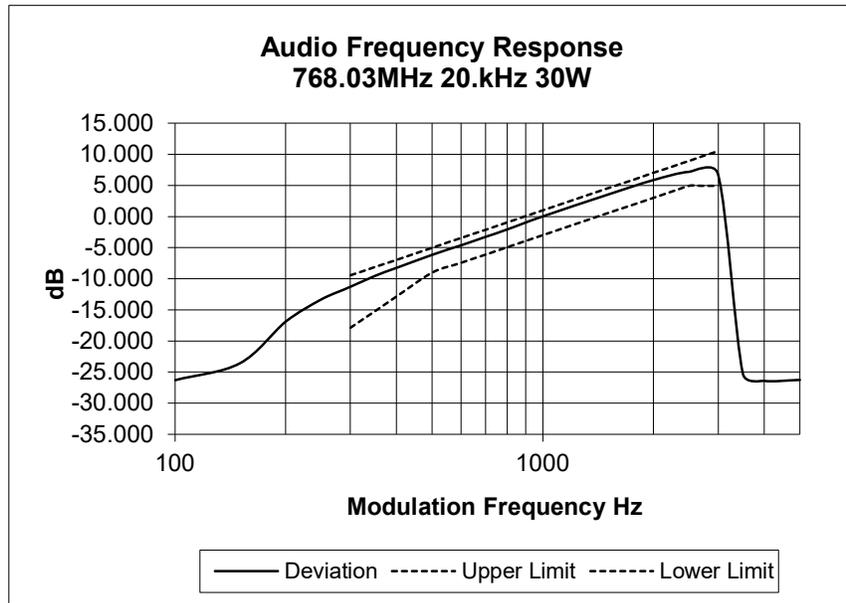
Tx FREQUENCY: 757.500 MHz 30 W 20 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

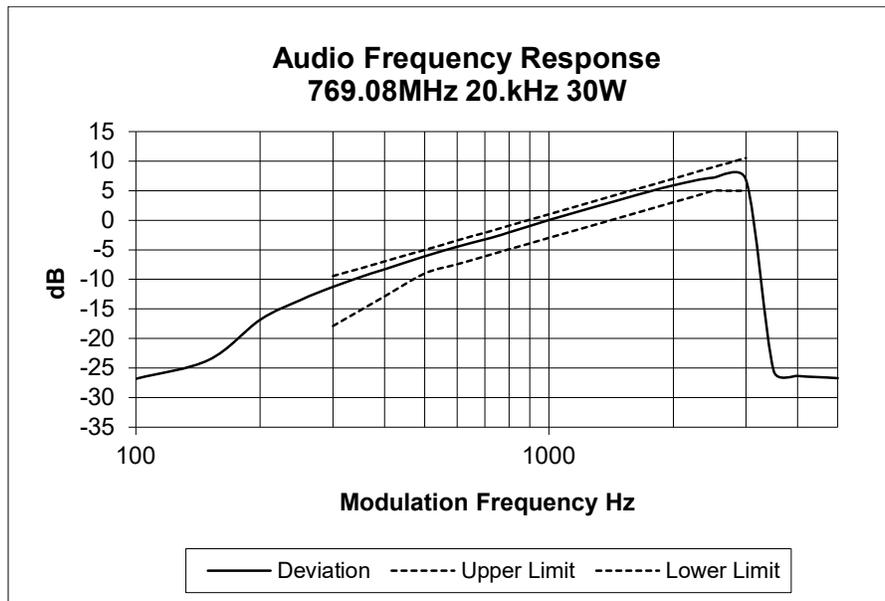
Tx FREQUENCY: 768.025 MHz

20 kHz Channel Spacing



Tx FREQUENCY: 769.075 MHz

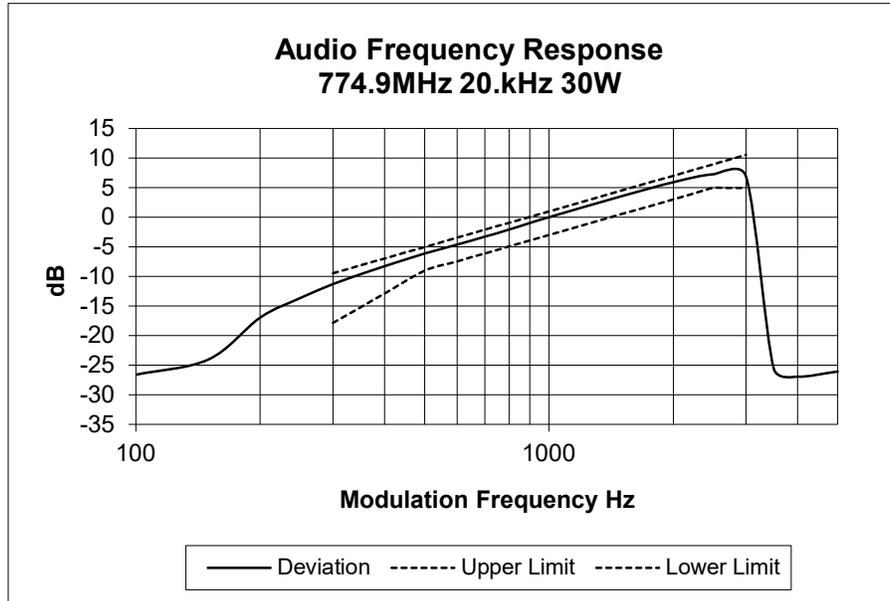
20 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

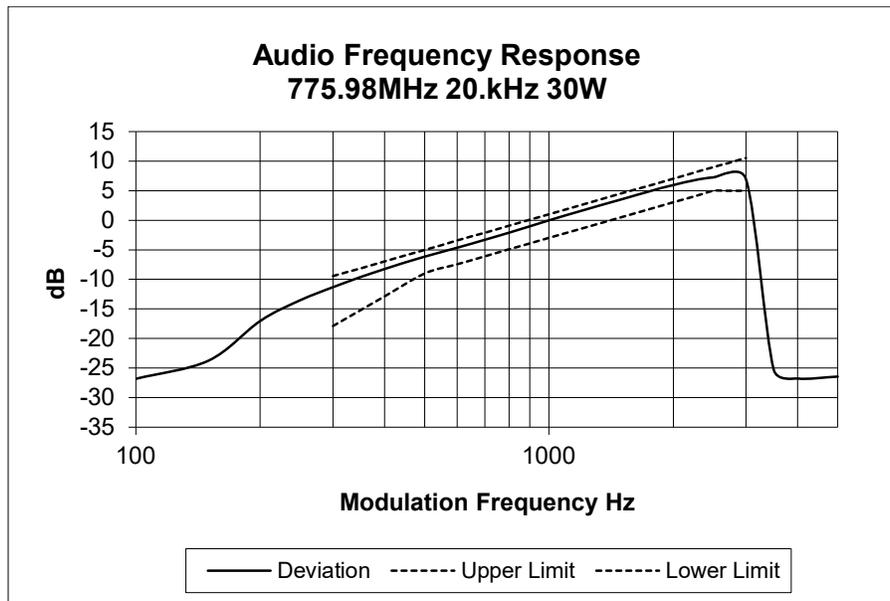
Tx FREQUENCY: 774.900 MHz

20 kHz Channel Spacing



Tx FREQUENCY: 775.975 MHz

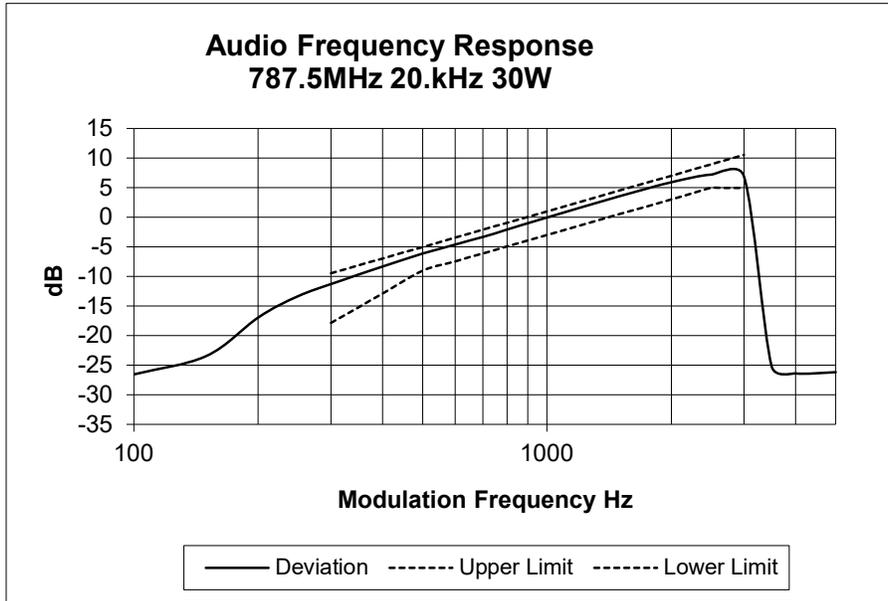
20 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

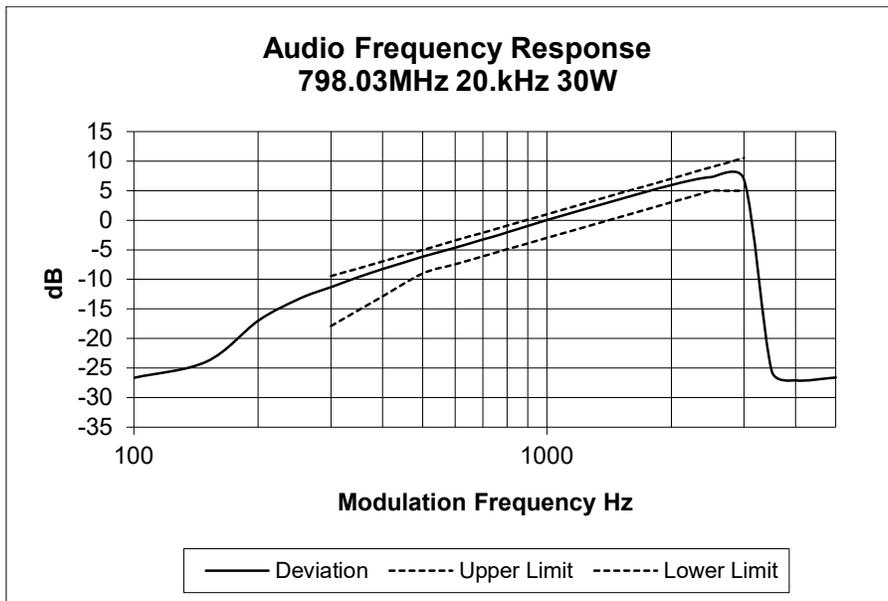
Tx FREQUENCY: 787.500 MHz

20 kHz Channel Spacing



Tx FREQUENCY: 798.025 MHz

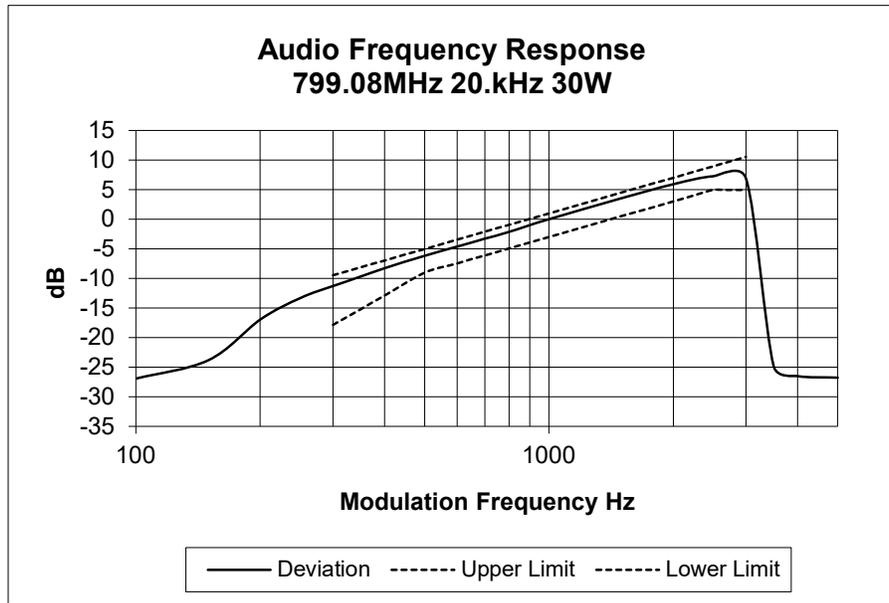
20 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

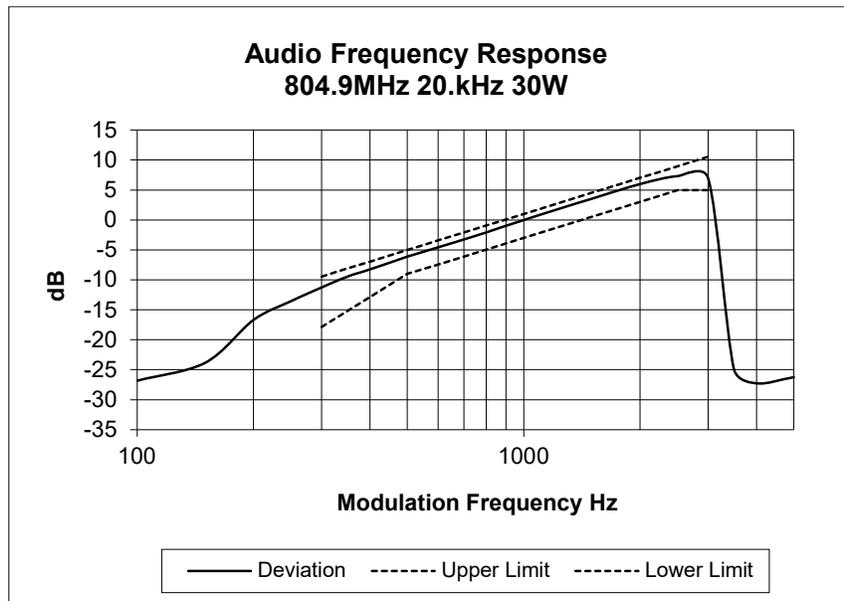
Tx FREQUENCY: 799.075 MHz

20 kHz Channel Spacing



Tx FREQUENCY: 804.900 MHz

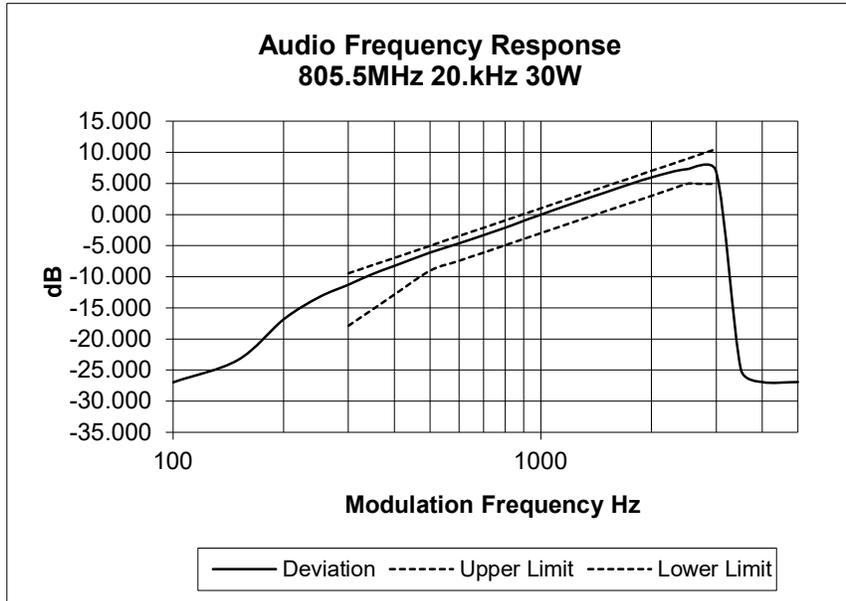
20 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

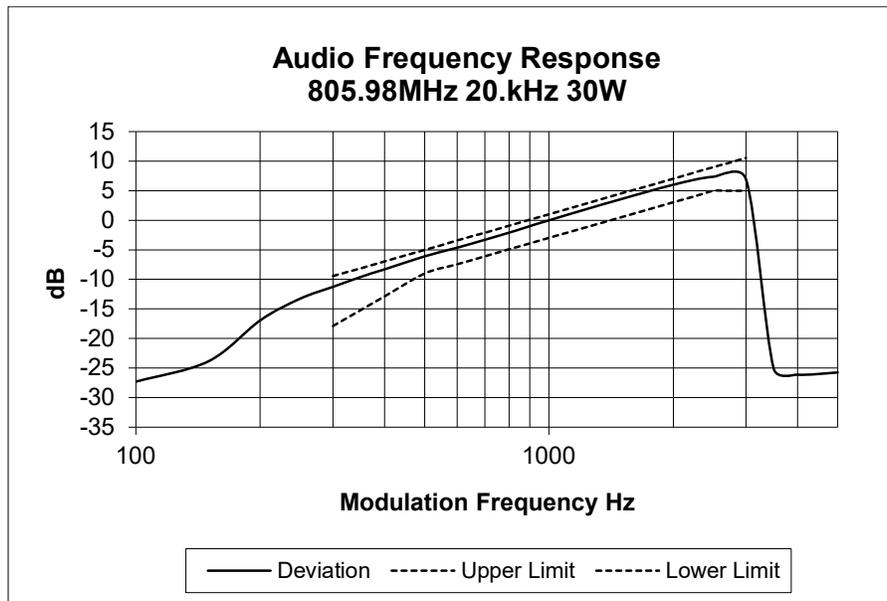
Tx FREQUENCY: 805.5000 MHz

20 kHz Channel Spacing



Tx FREQUENCY: 805.975 MHz

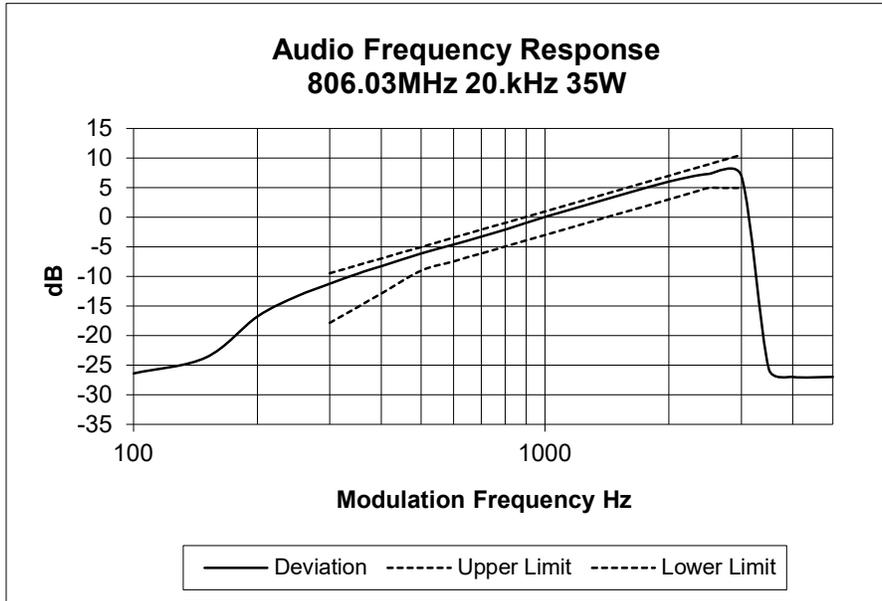
20 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

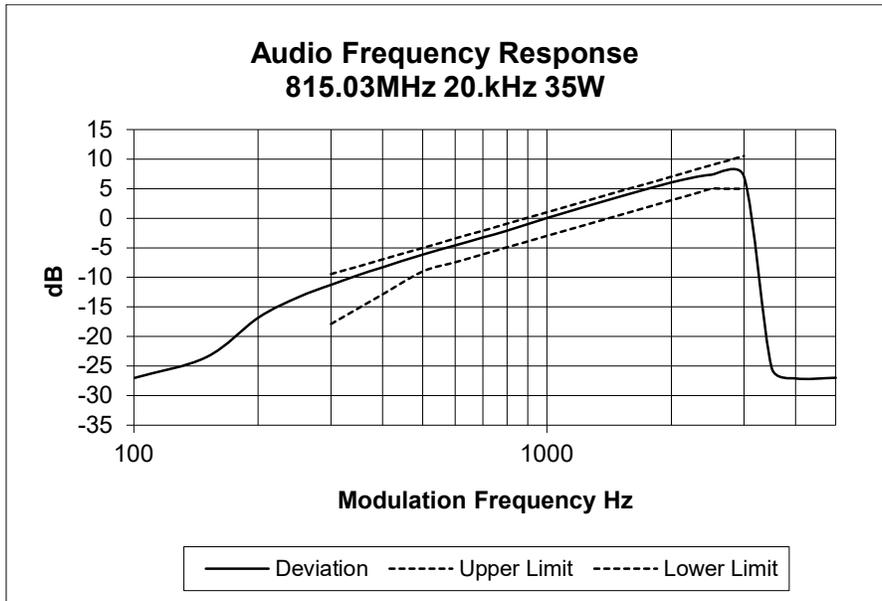
Tx FREQUENCY: 806.025 MHz

20 kHz Channel Spacing



Tx FREQUENCY: 815.025 MHz

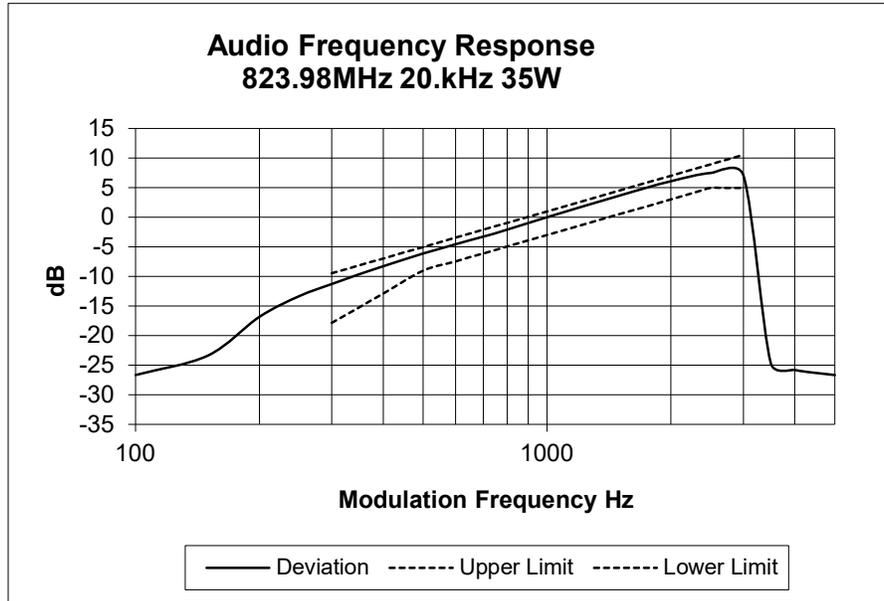
20 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

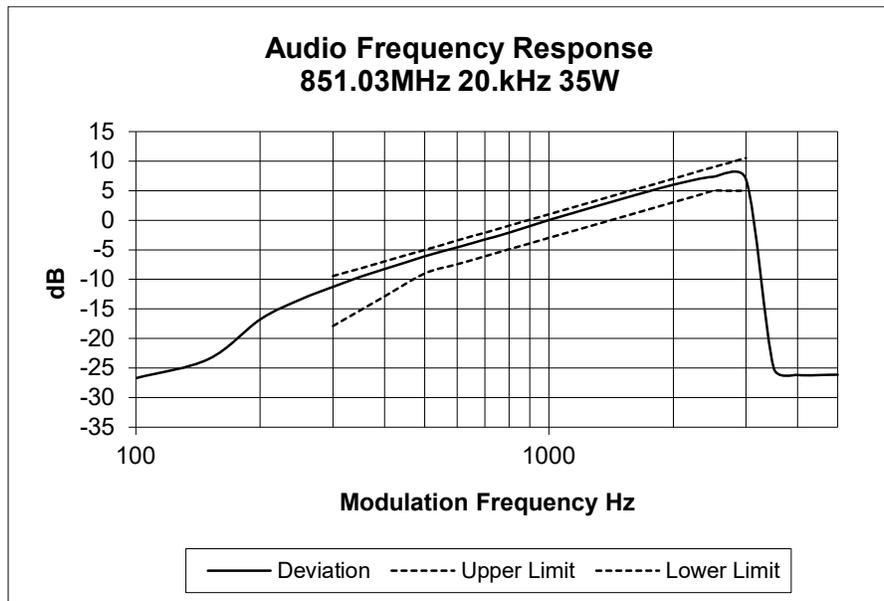
Tx FREQUENCY: 823.975 MHz

20 kHz Channel Spacing



Tx FREQUENCY: 851.025 MHz

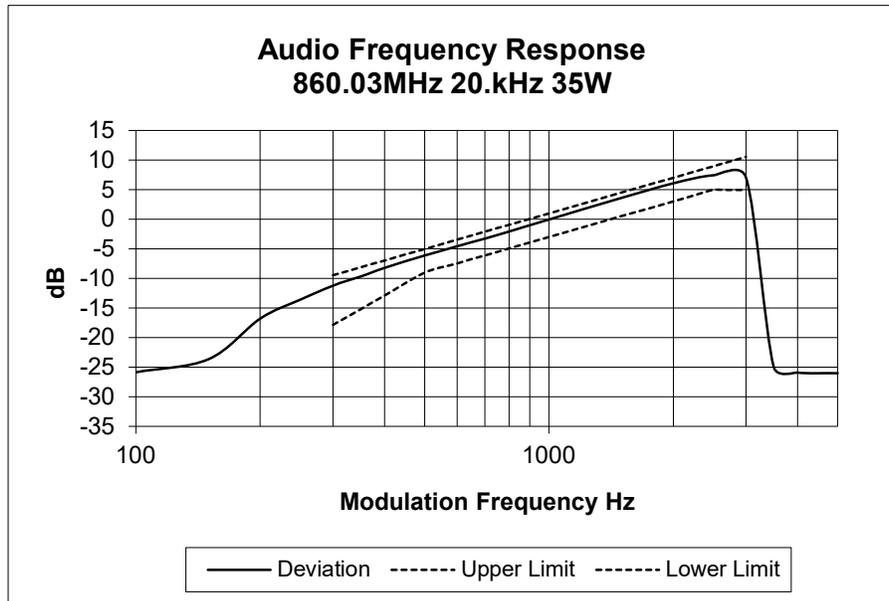
20 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

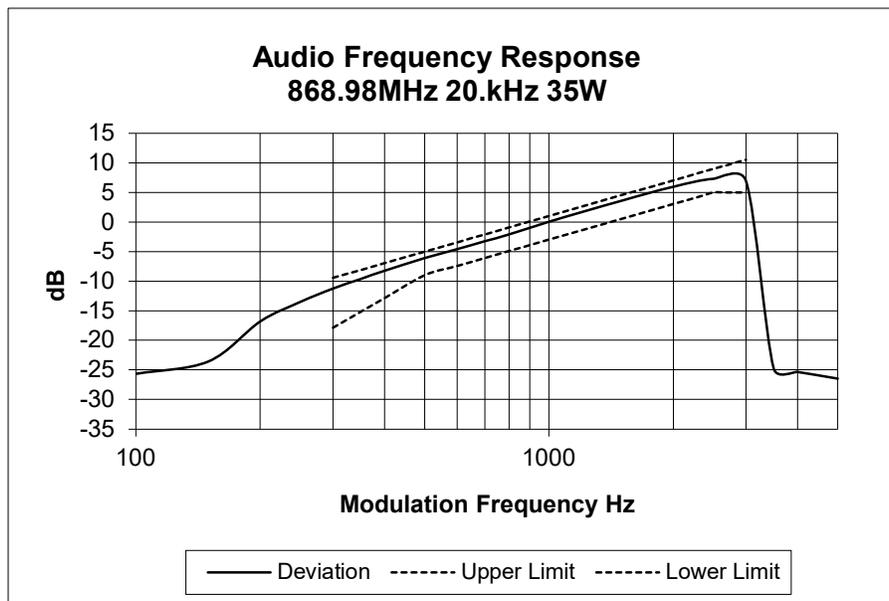
Tx FREQUENCY: 860.025 MHz

20 kHz Channel Spacing



Tx FREQUENCY: 868.975 MHz

20 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

GUIDE: ANSI C63.26 5.3.2

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 60% of maximum deviation. This was used as the 0 dB reference point.
3. The modulation response was measured at four audio frequencies while increasing the input level in 5dB steps.
4. Additionally, the level used to measure sideband spectrum (occupied bandwidth) was included in the level sweep.
5. Measurements were made for both Positive and Negative Deviation.

MEASUREMENT RESULTS:

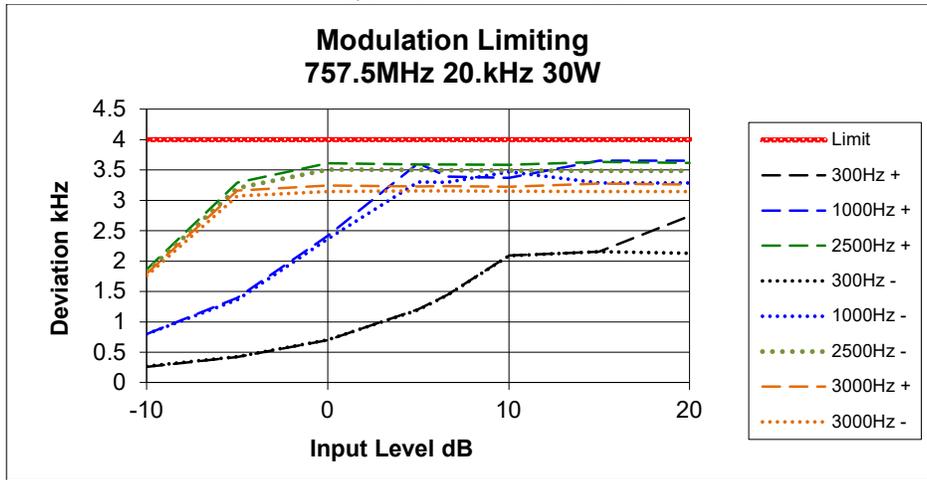
See the plots on the following pages for 20 kHz channel spacing tested at 30W & 35W transmit power.

LIMIT CLAUSE: TIA/EIA-603E 1.3.4.4

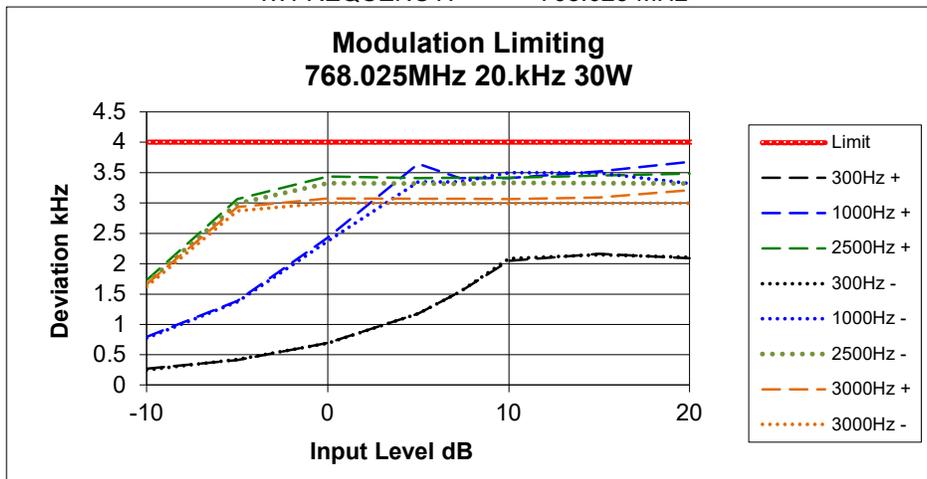
MEASUREMENT UNCERTAINTY: $\pm 1.5 \%$

Transmitter Modulation Limiting

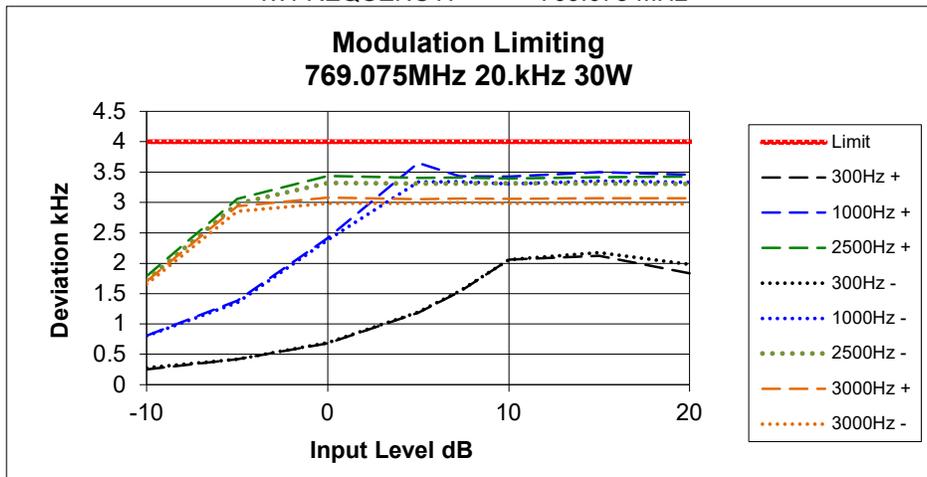
Tx FREQUENCY: 757.500 MHz



Tx FREQUENCY: 768.025 MHz

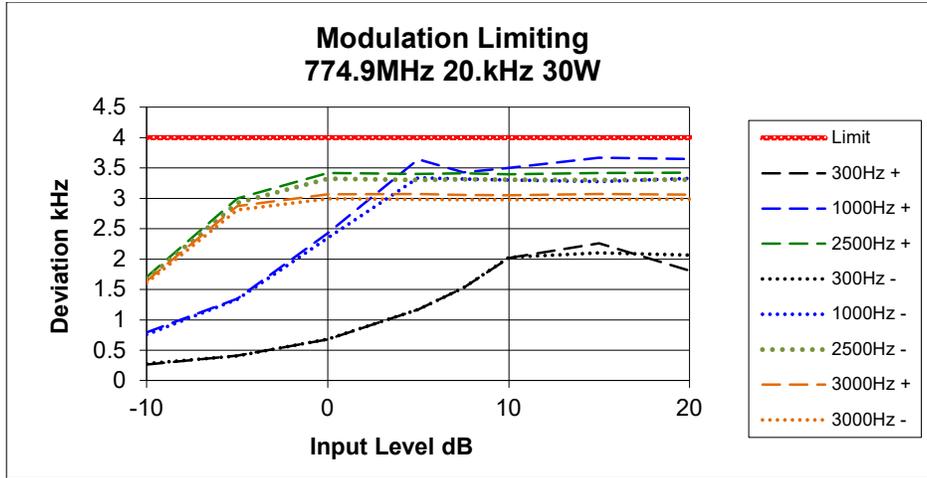


Tx FREQUENCY: 769.075 MHz

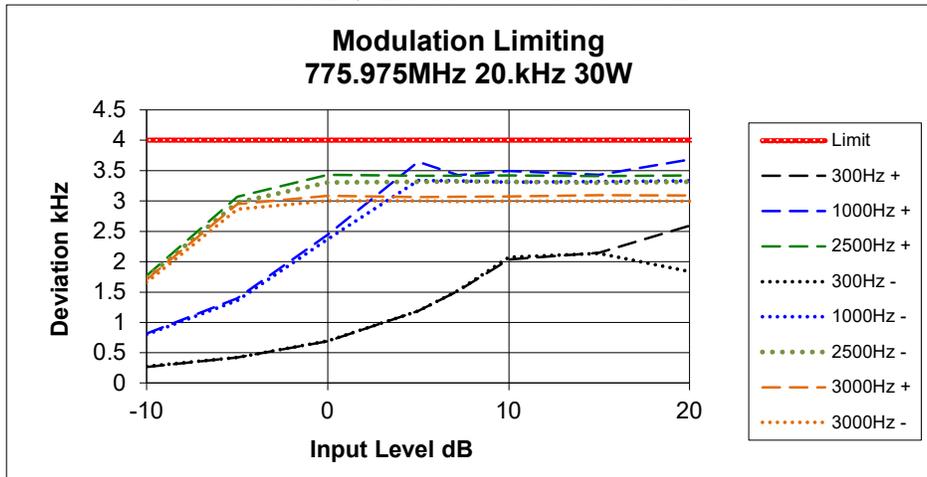


Transmitter Modulation Limiting

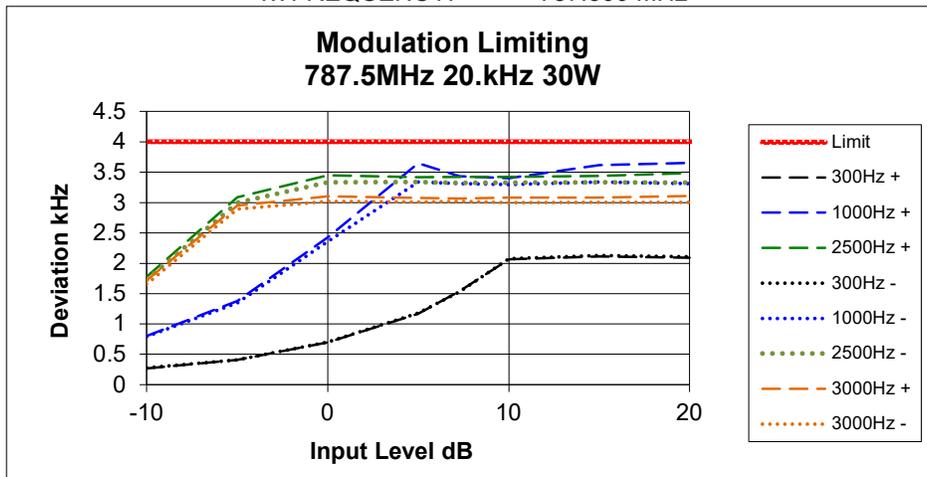
Tx FREQUENCY: 774.900 MHz



Tx FREQUENCY: 775.975 MHz

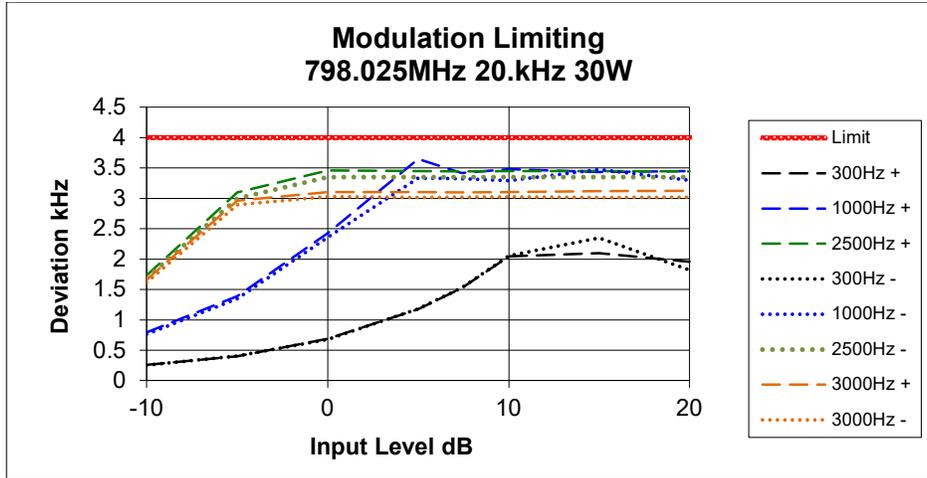


Tx FREQUENCY: 787.500 MHz

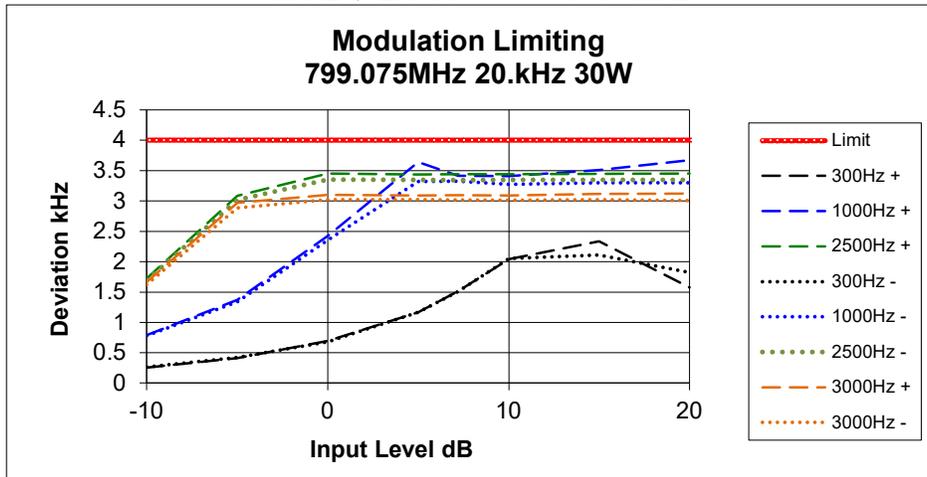


Transmitter Modulation Limiting

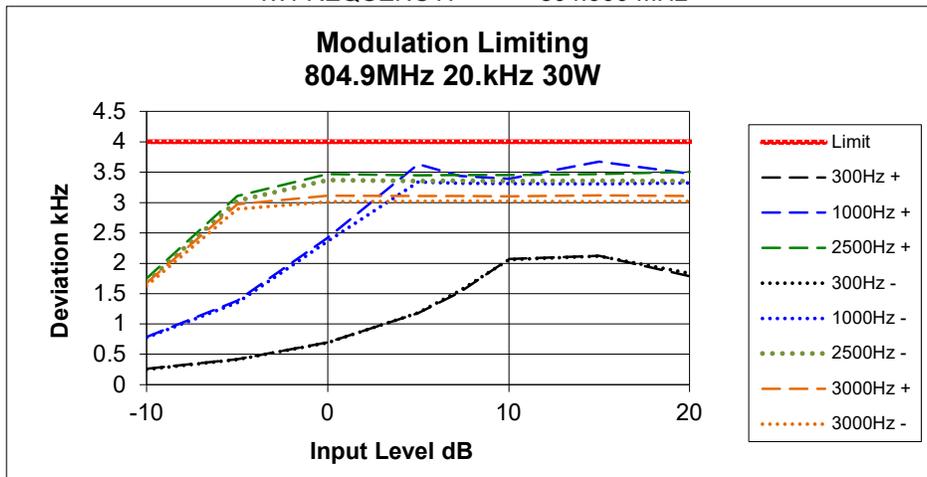
Tx FREQUENCY: 798.025 MHz



Tx FREQUENCY: 799.075 MHz

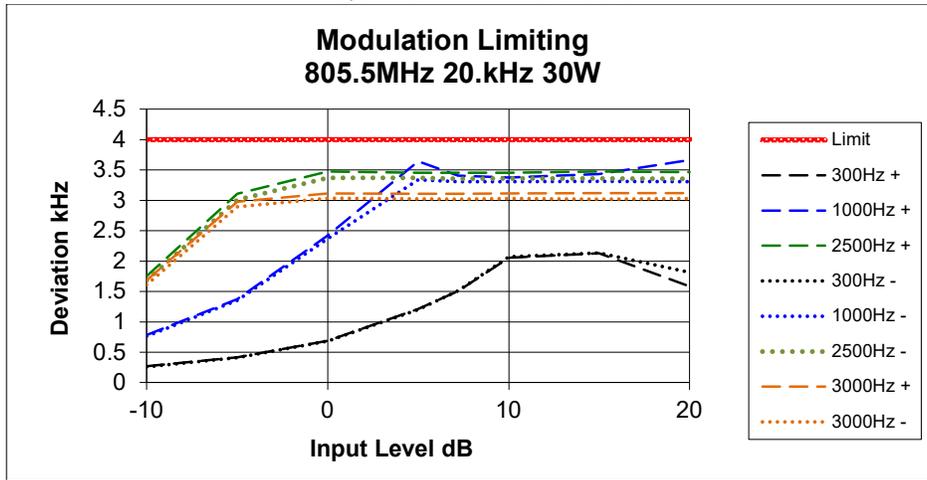


Tx FREQUENCY: 804.900 MHz

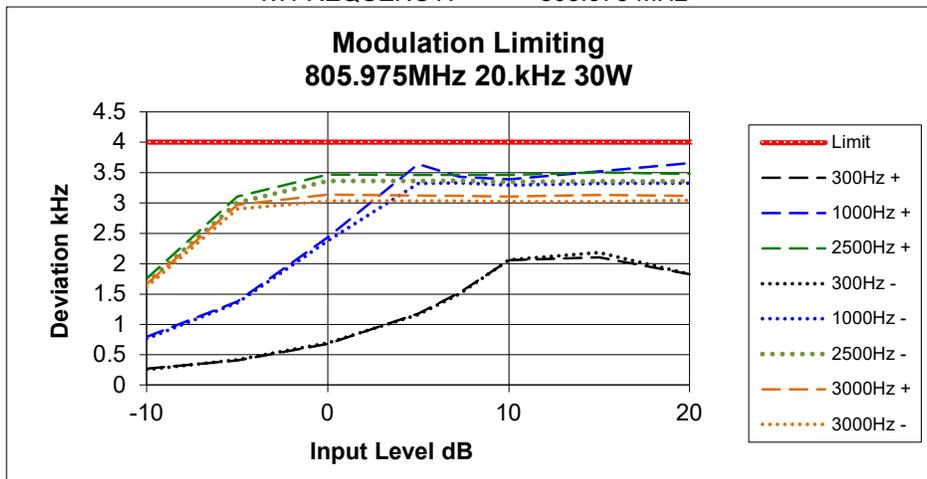


Transmitter Modulation Limiting

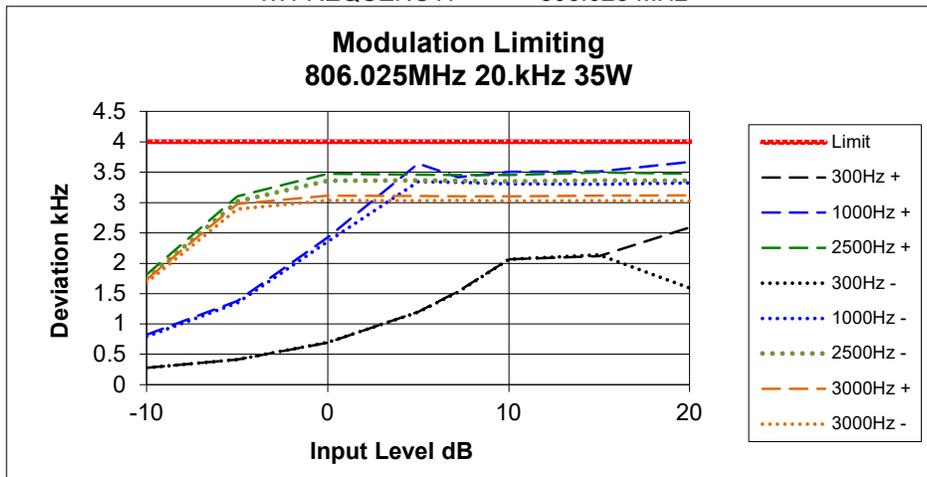
Tx FREQUENCY: 805.5000 MHz



Tx FREQUENCY: 805.975 MHz

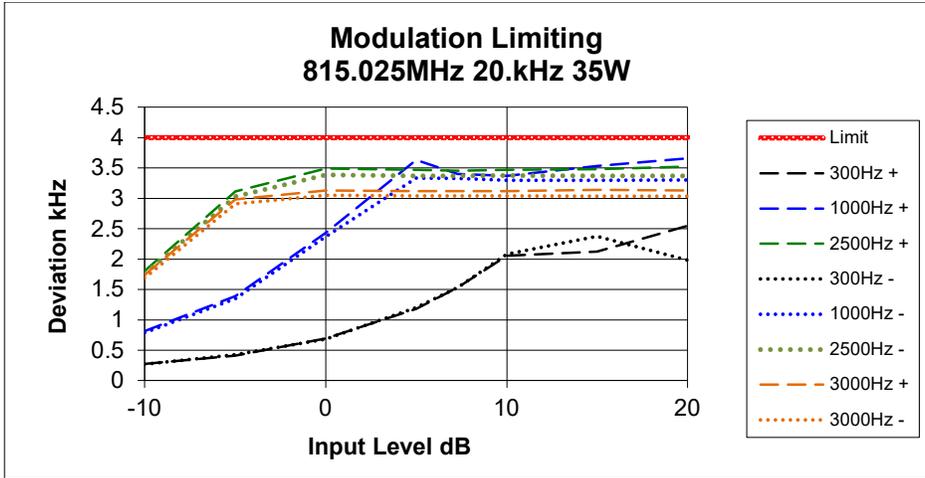


Tx FREQUENCY: 806.025 MHz

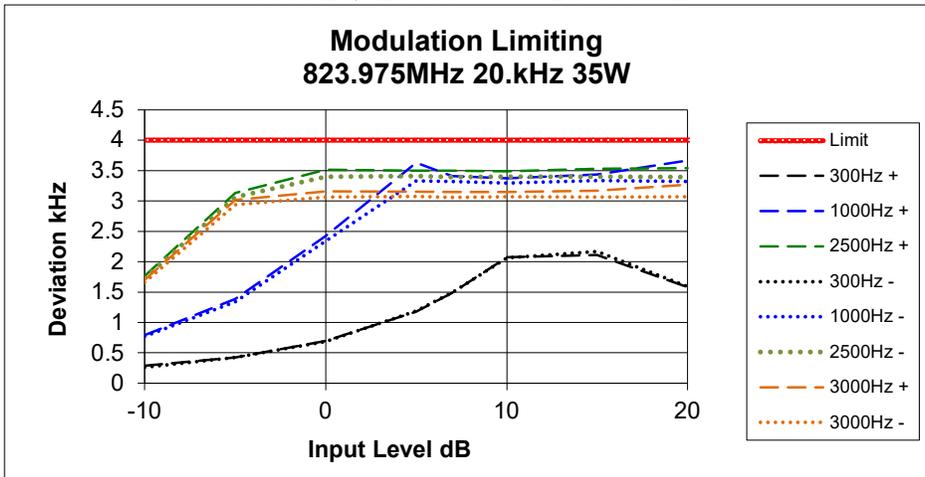


Transmitter Modulation Limiting

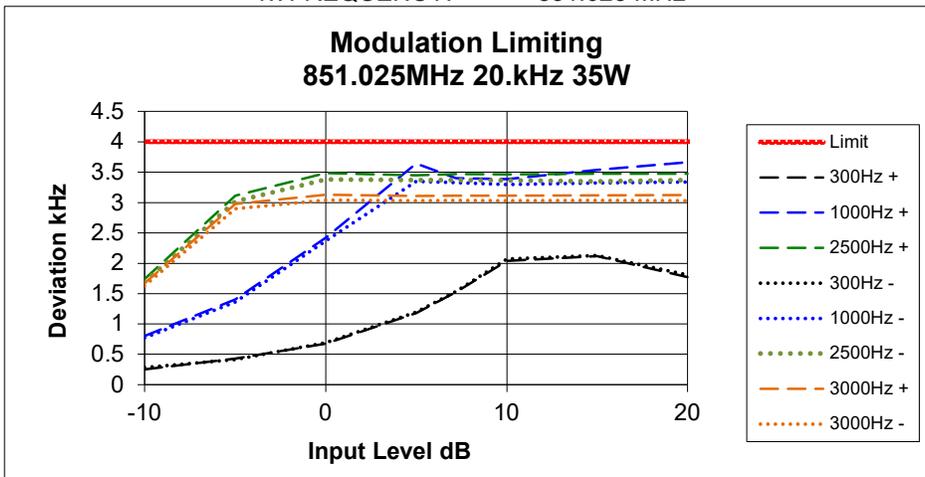
Tx FREQUENCY: 815.025 MHz



Tx FREQUENCY: 823.975 MHz

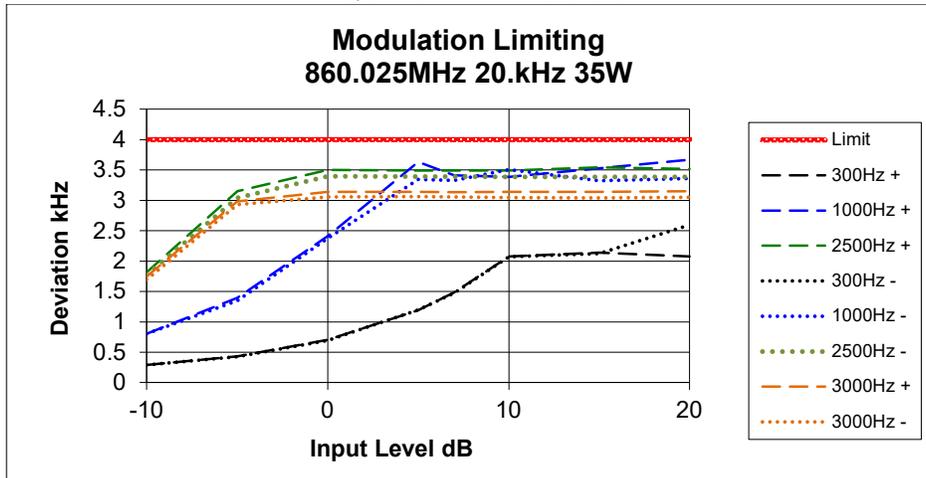


Tx FREQUENCY: 851.025 MHz

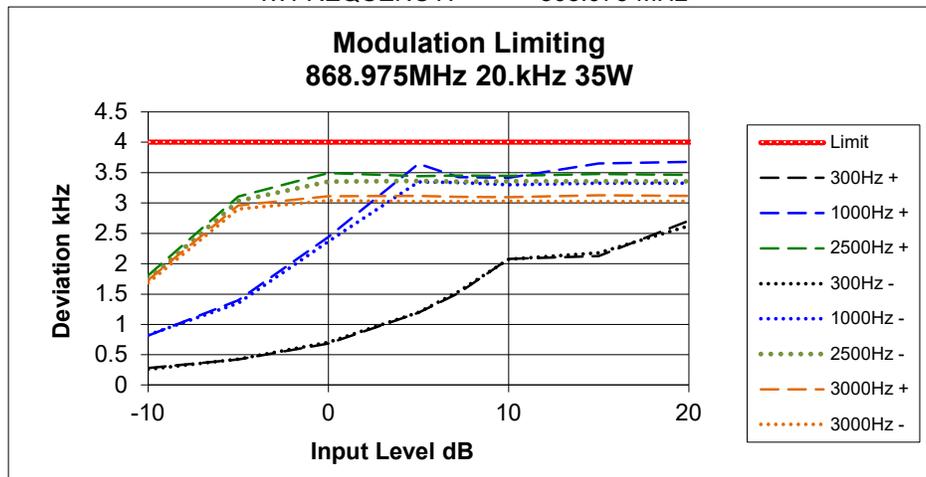


Transmitter Modulation Limiting

Tx FREQUENCY: 860.025 MHz



Tx FREQUENCY: 868.975 MHz



TRANSMITTER OCCUPIED (99%) BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1046
RSS-119 5.5

GUIDE: ANSI C63.26 5.4.4

MEASUREMENT PROCEDURE:

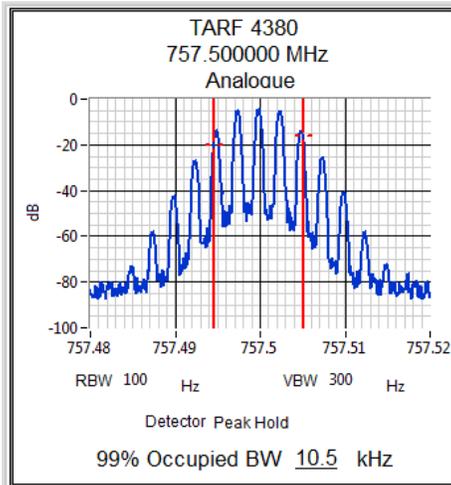
1. Refer Annex A for Equipment Set up.
2. For Analogue measurements: The EUT was modulated by a 2500 Hz tone at an input level 16 dB above a level that produced 50% deviation. The input level was established at the frequency of maximum response of the audio modulating circuit.
For Data measurements: The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as follows.
Resolution Bandwidth = 100 Hz, Video Bandwidth = 300 Hz

MEASUREMENT RESULTS:

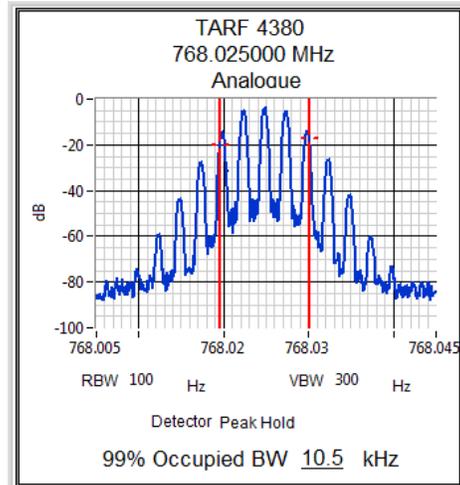
Channel Frequency (MHz)	Channel Spacing (kHz)	Bandwidths (kHz)		
		Analogue	FFSK 1200 bps	FFSK 2400 bps
757.500 MHz	20.0	10.5	7.73	9.20
768.025 MHz	20.0	10.5	7.73	9.20
769.075 MHz	20.0	10.5	7.67	9.00
774.900 MHz	20.0	10.5	7.73	9.20
775.975 MHz	20.0	10.5	7.73	9.00
787.500 MHz	20.0	10.5	7.73	9.13
798.025 MHz	20.0	10.5	7.73	9.07
799.075 MHz	20.0	10.5	7.73	9.20
804.900 MHz	20.0	10.5	7.60	9.00
805.500 MHz	20.0	10.5	7.67	9.07
805.975 MHz	20.0	10.5	7.67	9.07
806.025 MHz	20.0	10.5	7.67	9.20
815.025 MHz	20.0	10.5	7.73	9.13
823.975 MHz	20.0	10.5	7.67	9.20
851.025 MHz	20.0	10.5	7.73	9.20
860.025 MHz	20.0	10.5	7.73	9.07
868.975 MHz	20.0	10.5	7.80	9.13
<u>Limit</u> Authorized Bandwidth 47 CFR 90.209 RSS 119 5.5		20.0	20.0	20.0
Necessary BW used in emission designator		14.0	8.4	9.6
Result		Pass	Pass	Pass

Transmitter Occupied (99%) Bandwidth – Analogue

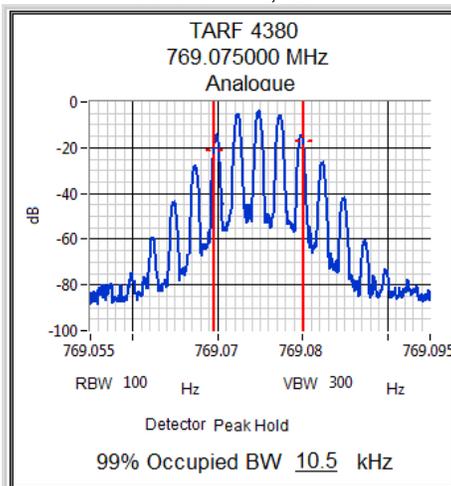
757.500 MHz, 30 W



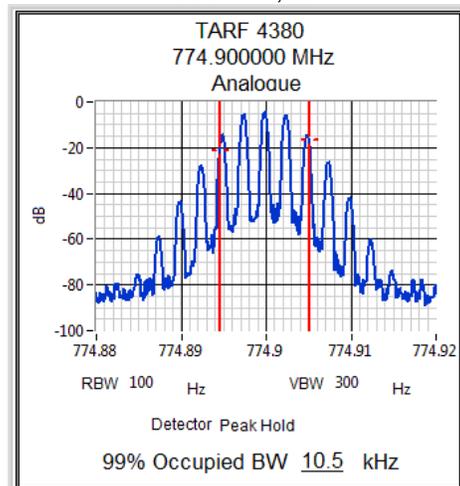
768.025 MHz, 30 W



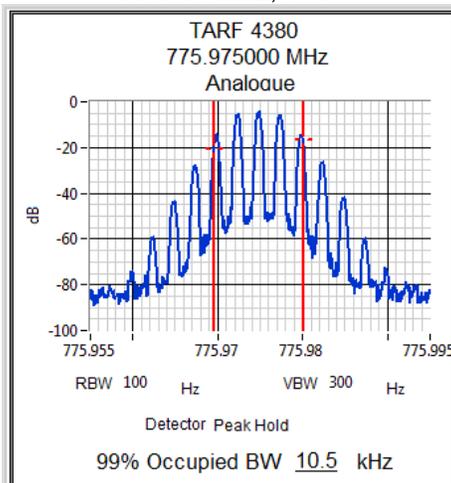
769.075 MHz, 30 W



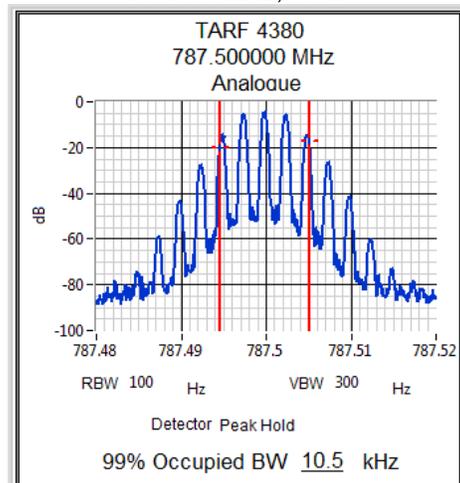
774.900 MHz, 30 W



775.975 MHz, 30 W

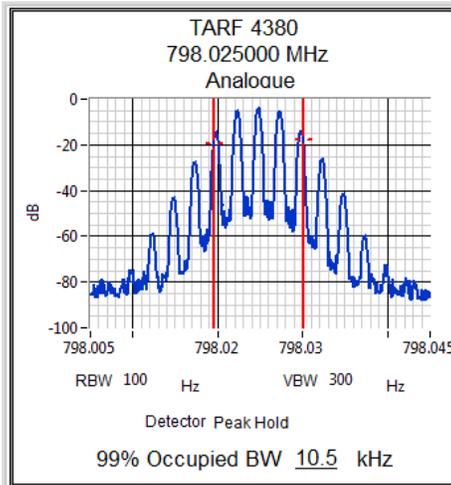


787.500 MHz, 30 W

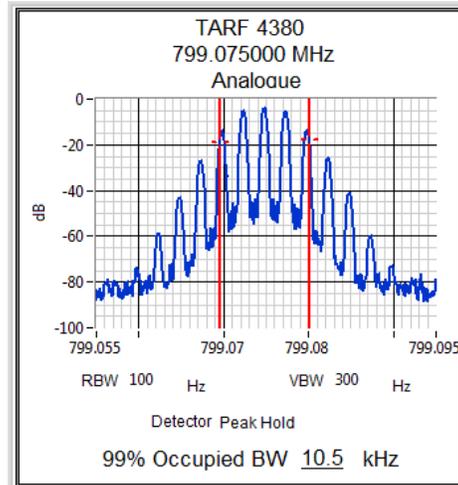


Transmitter Occupied (99%) Bandwidth – Analogue

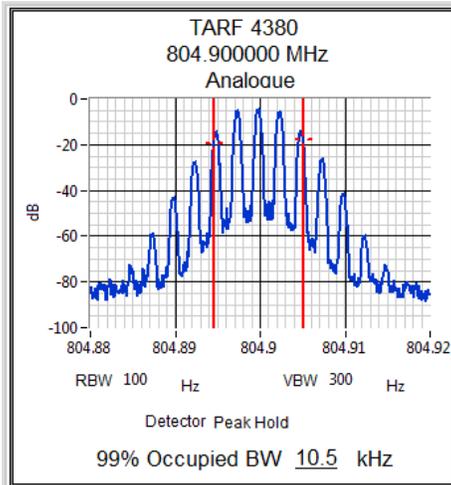
798.025 MHz, 30 W



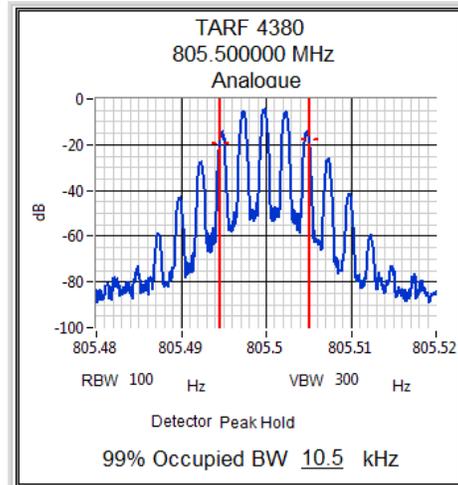
799.075 MHz, 30 W



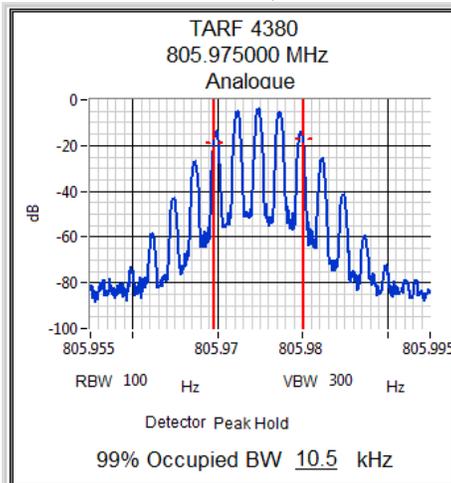
804.900 MHz, 30 W



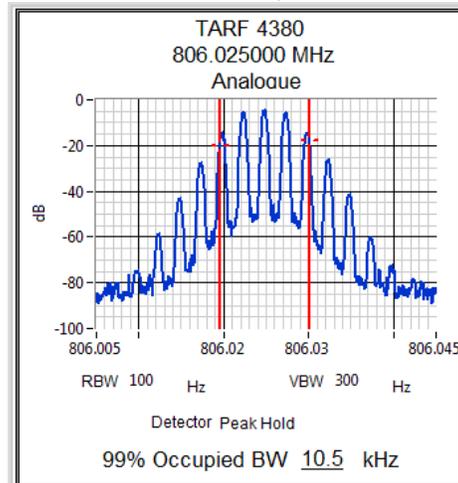
805.500 MHz, 30 W



805.975 MHz, 30 W

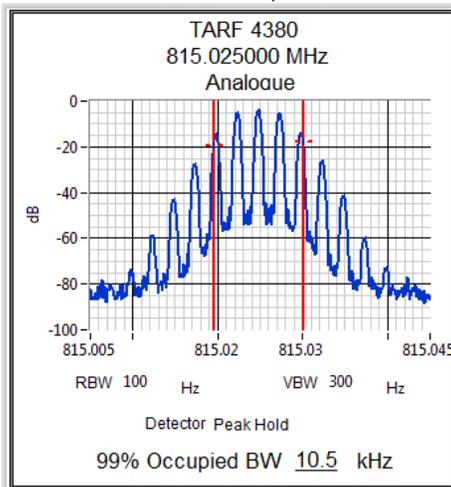


806.025 MHz, 35 W

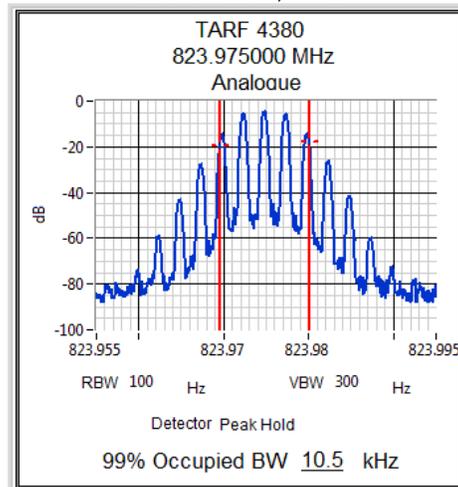


Transmitter Occupied (99%) Bandwidth – Analogue

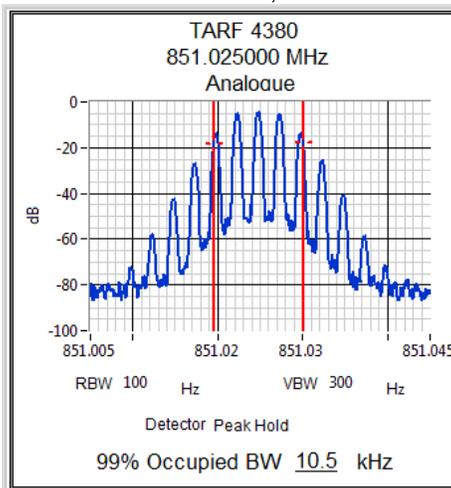
815.025 MHz, 35 W



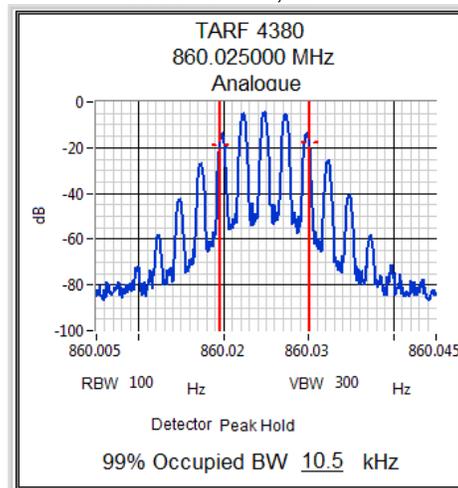
823.975 MHz, 35 W



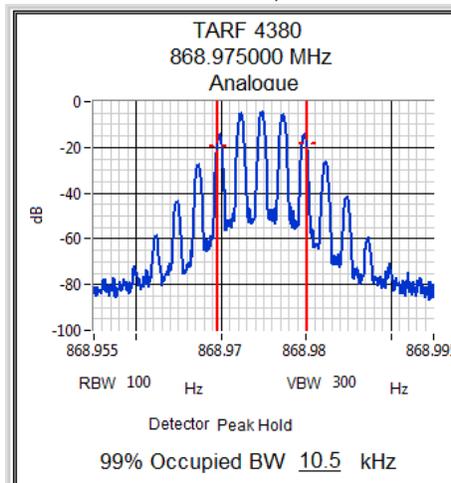
851.025 MHz, 35 W



860.025 MHz, 35 W

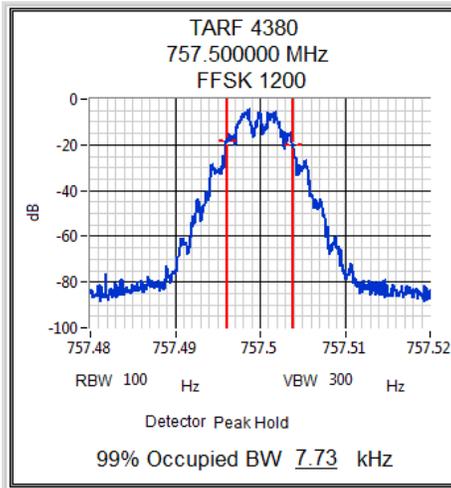


868.975 MHz, 35 W

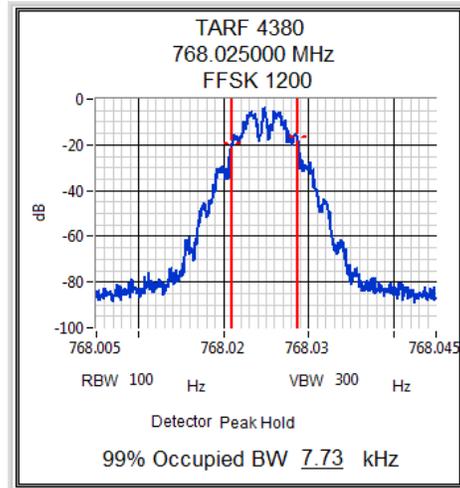


Transmitter Occupied (99%) Bandwidth – FFSK 1200 bps

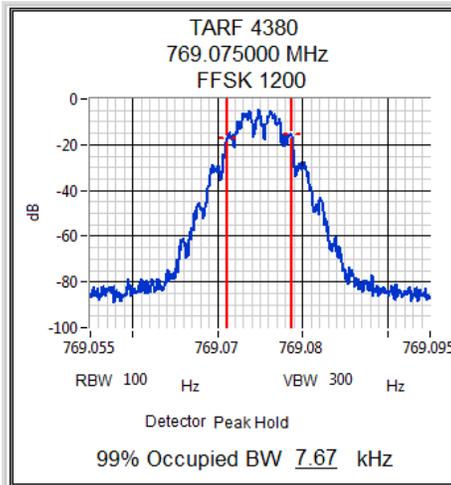
757.500 MHz, 30 W



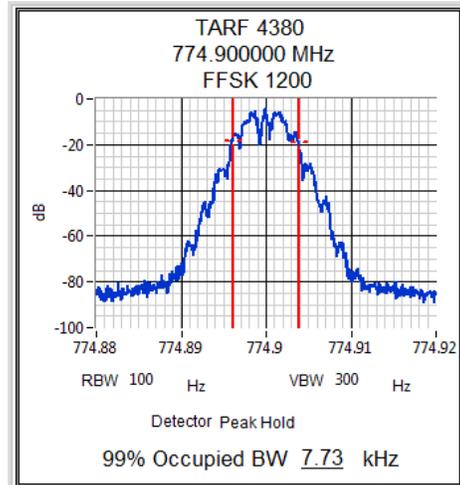
768.025 MHz, 30 W



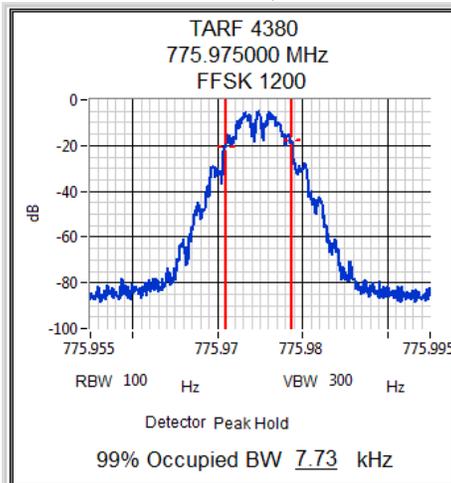
769.075 MHz, 30 W



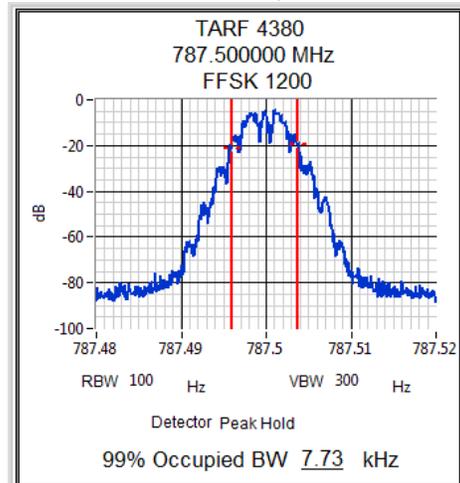
774.900 MHz, 30 W



775.975 MHz, 30 W

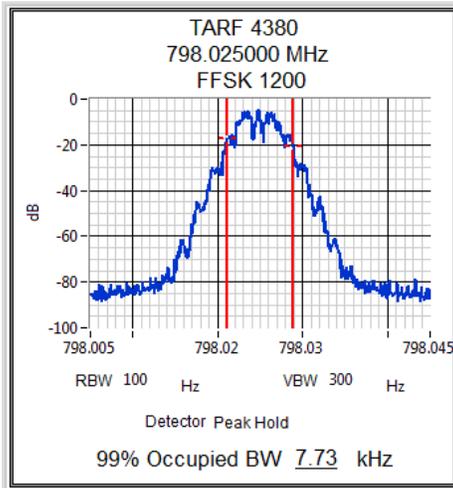


787.500 MHz, 30 W

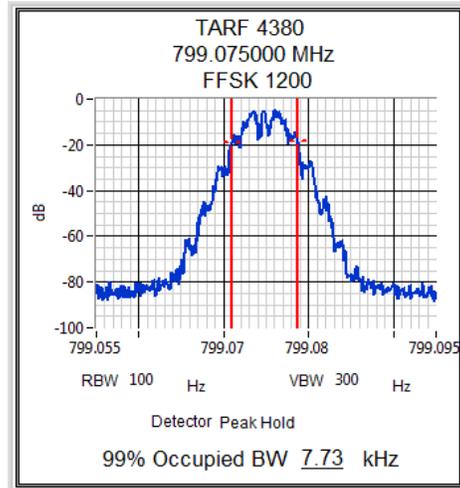


Transmitter Occupied (99%) Bandwidth – FFSK 1200 bps

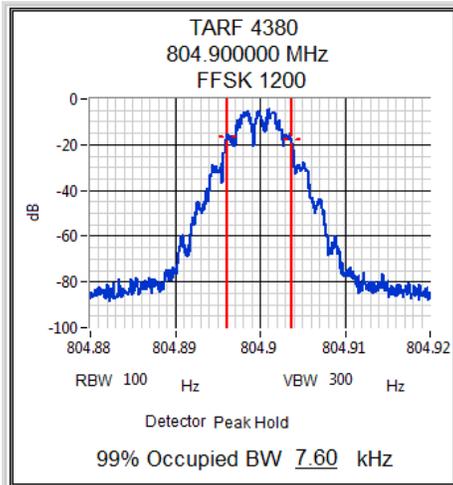
798.025 MHz, 30 W



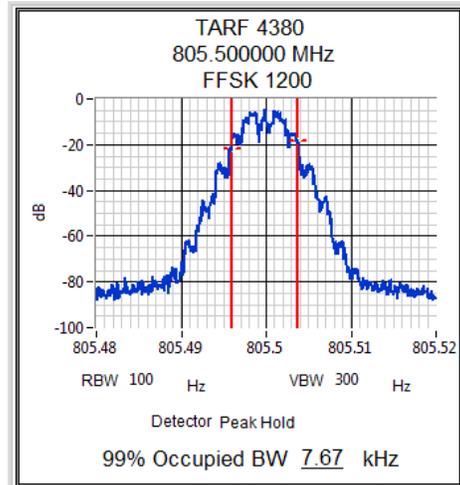
799.075 MHz, 30 W



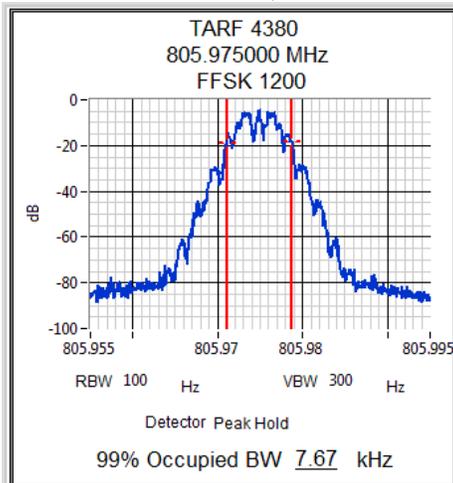
804.900 MHz, 30 W



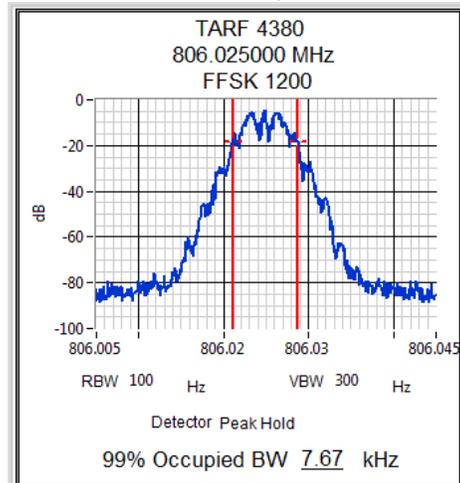
805.500 MHz, 30 W



805.975 MHz, 30 W

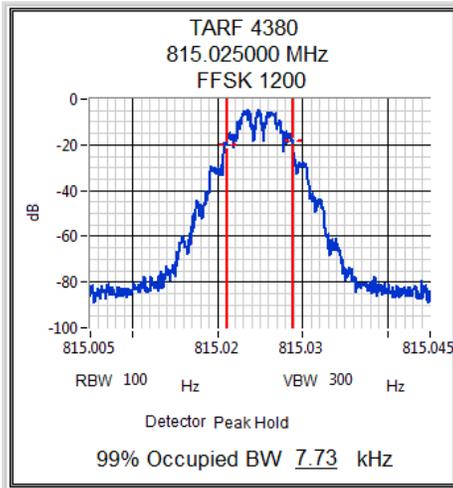


806.025 MHz, 35 W

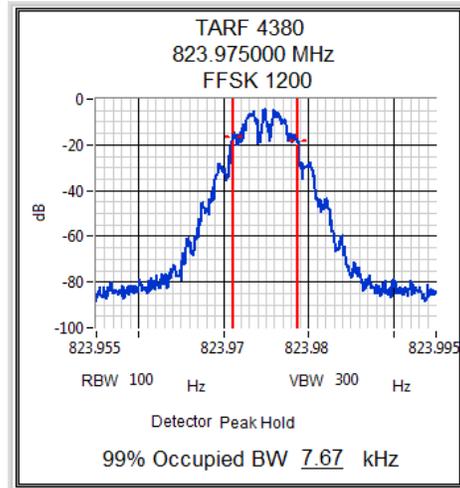


Transmitter Occupied (99%) Bandwidth – FFSK 1200 bps

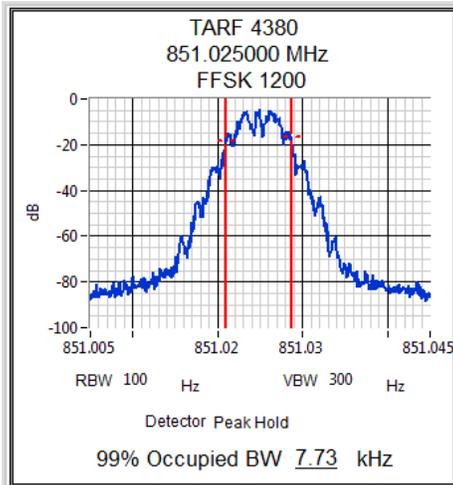
815.025 MHz, 35 W



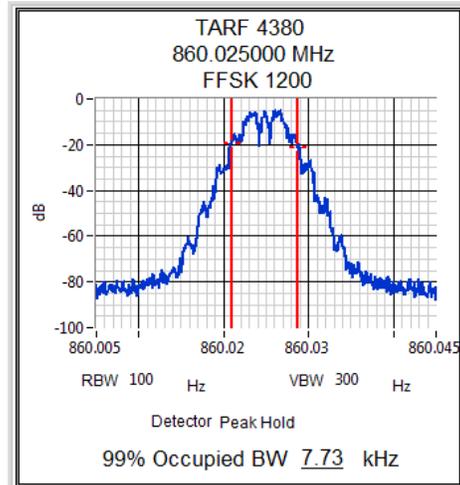
823.975 MHz, 35 W



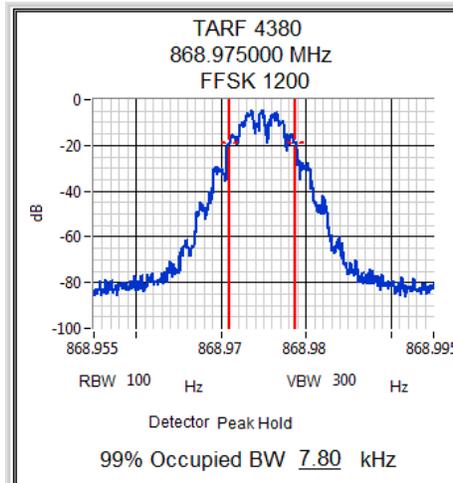
851.025 MHz, 35 W



860.025 MHz, 35 W

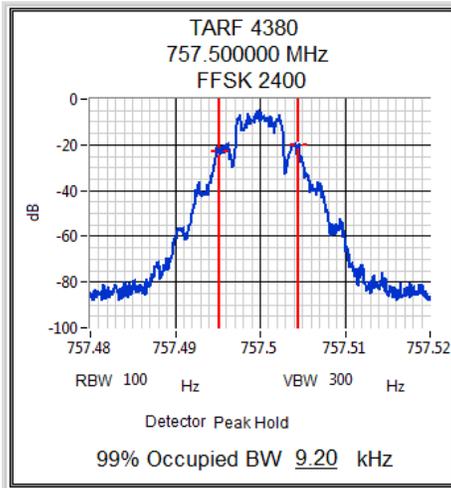


868.975 MHz, 35 W

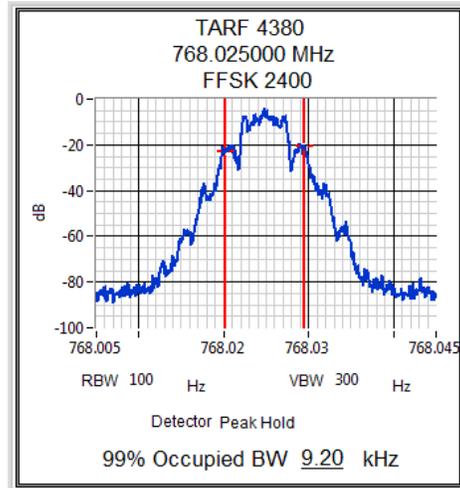


Transmitter Occupied (99%) Bandwidth – FFSK 2400 bps

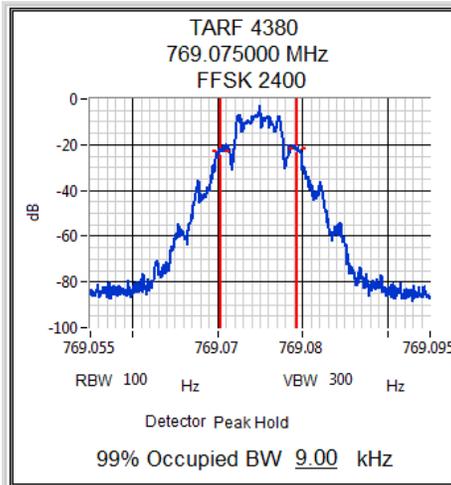
757.500 MHz, 30 W



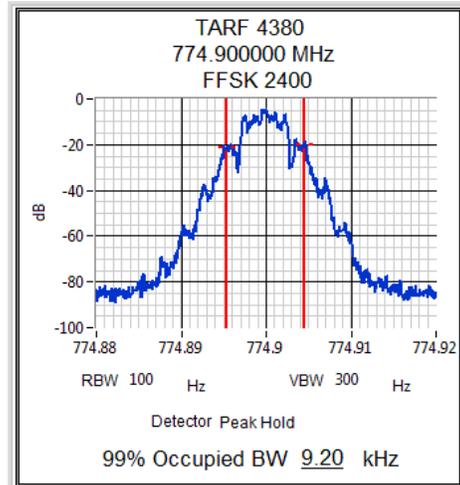
768.025 MHz, 30 W



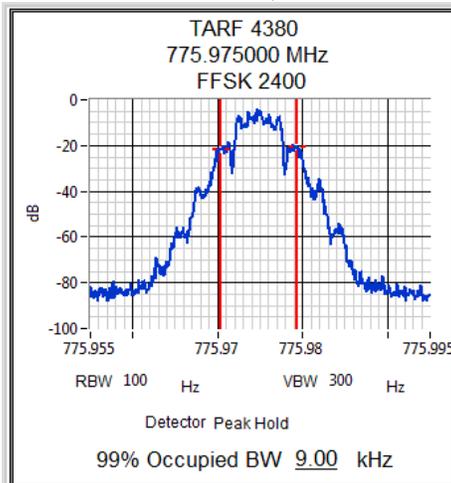
769.075 MHz, 30 W



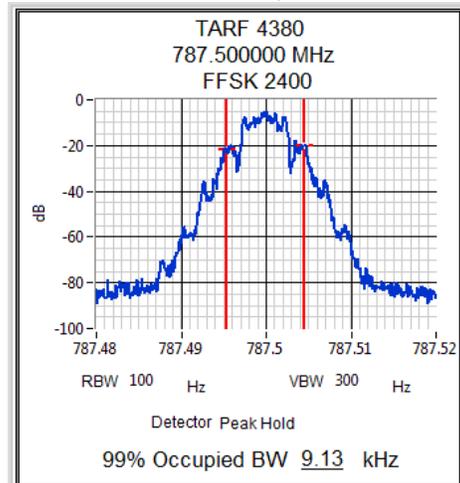
774.900 MHz, 30 W



775.975 MHz, 30 W

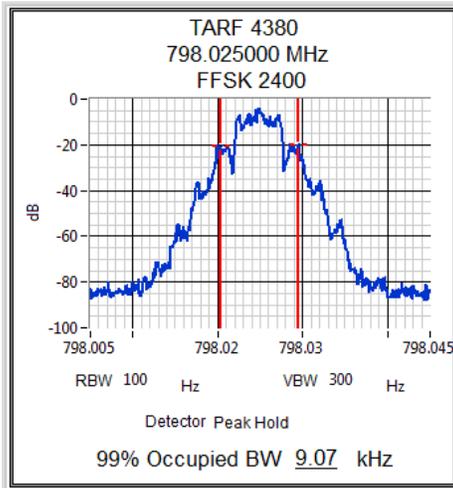


787.500 MHz, 30 W

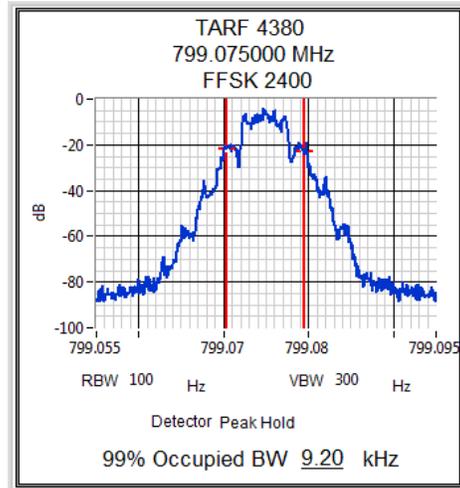


Transmitter Occupied (99%) Bandwidth – FFSK 2400 bps

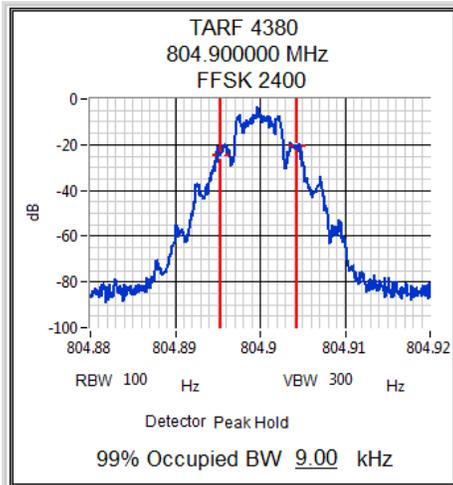
798.025 MHz, 30 W



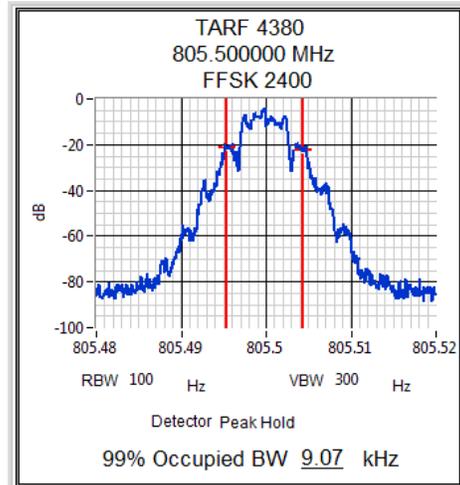
799.075 MHz, 30 W



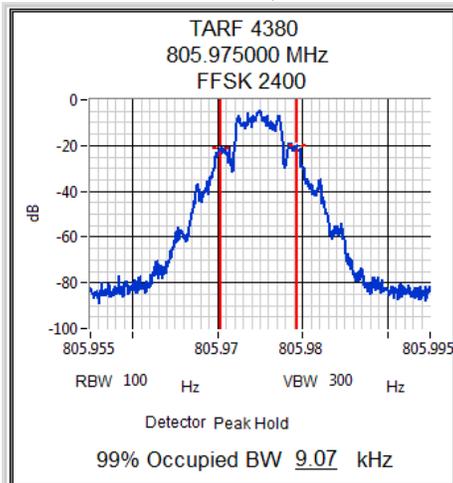
804.900 MHz, 30 W



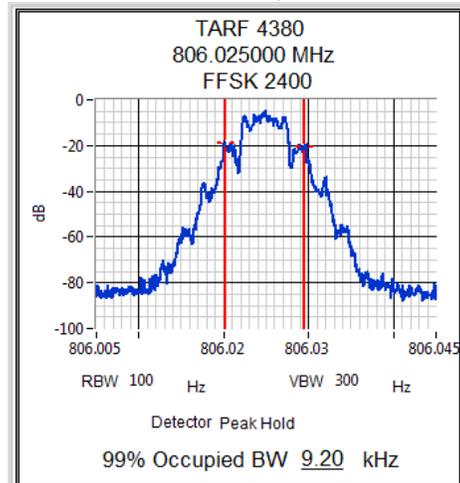
805.500 MHz, 30 W



805.975 MHz, 30 W

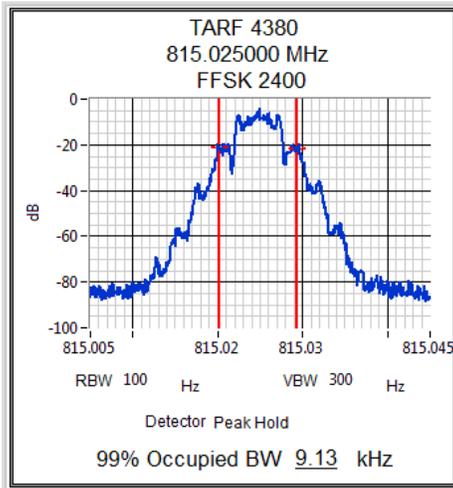


806.025 MHz, 35 W

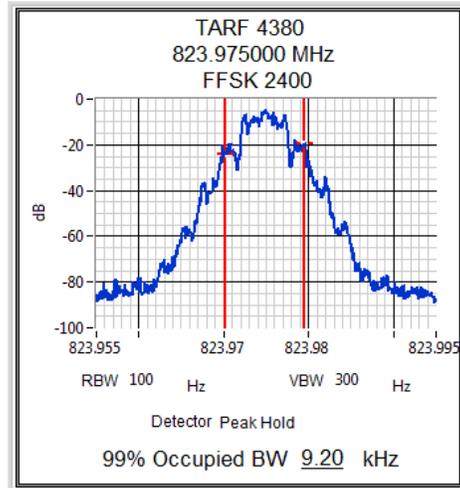


Transmitter Occupied (99%) Bandwidth – FFSK 2400 bps

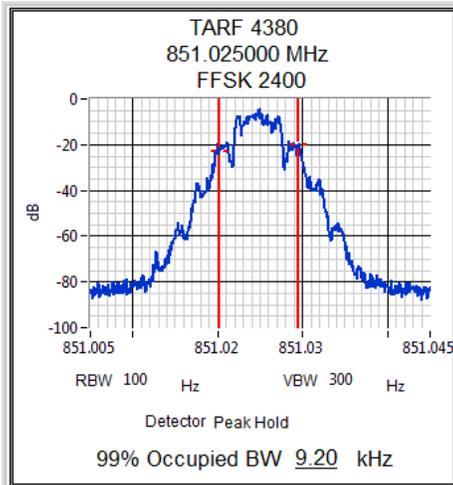
815.025 MHz, 35 W



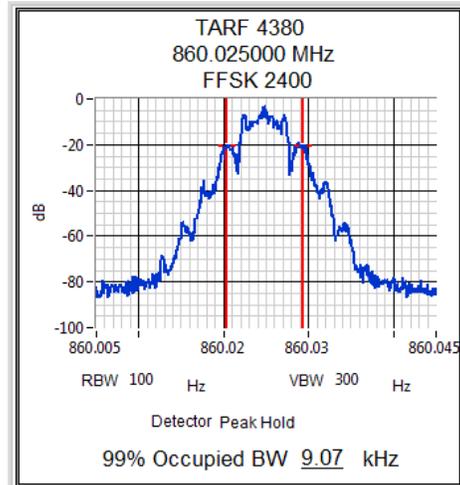
823.975 MHz, 35 W



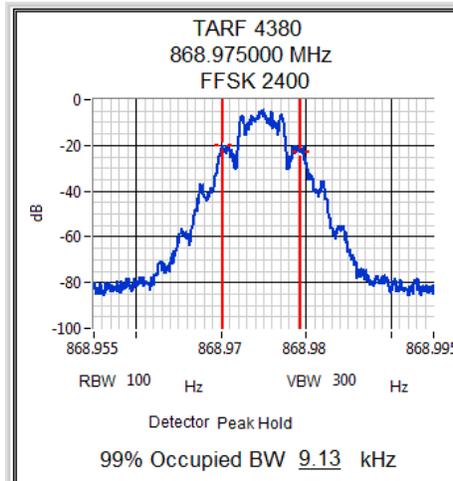
851.025 MHz, 35 W



860.025 MHz, 35 W



868.975 MHz, 35 W



TRANSMITTER SPECTRUM MASKS

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

GUIDE: ANSI C63.26.5.7.3

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.
2. For Analogue measurements: The EUT was modulated by a 2500 Hz tone at an input level 16 dB above a level that produced 50% deviation. The input level was established at the frequency of maximum response of the audio modulating circuit.
For Data measurements: The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as noted on the recorded plots.

MEASUREMENT RESULTS:

See the plots on the following pages for 20.0 kHz channel spacing.

MEASUREMENT UNCERTAINTY: 95% ± 0.65dB

LIMIT CLAUSE: FCC 47 CFR 90.210 RSS-119 5.5

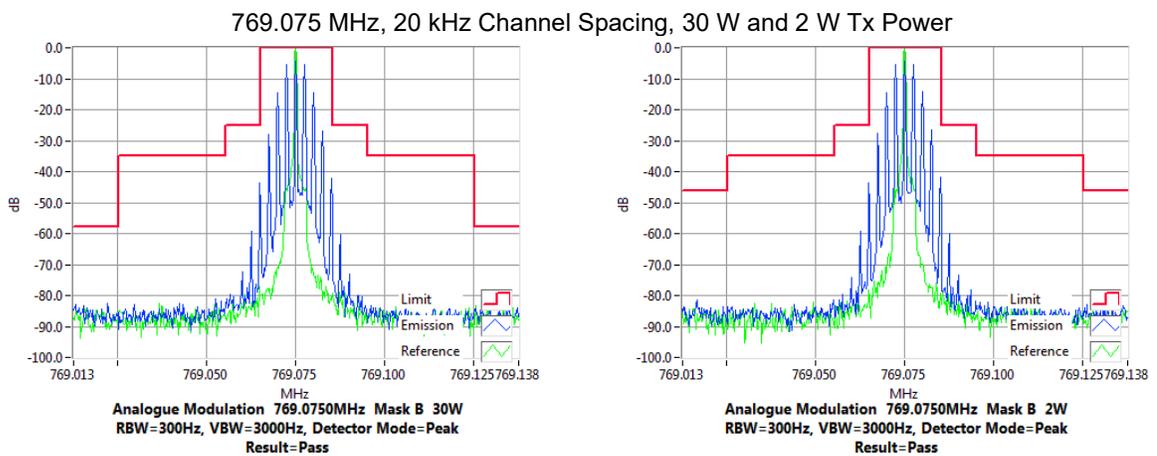
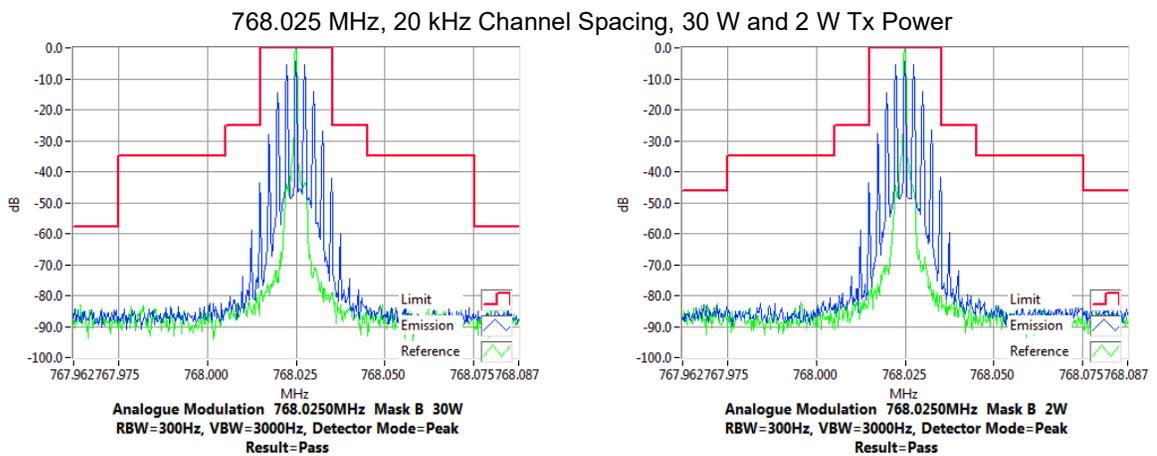
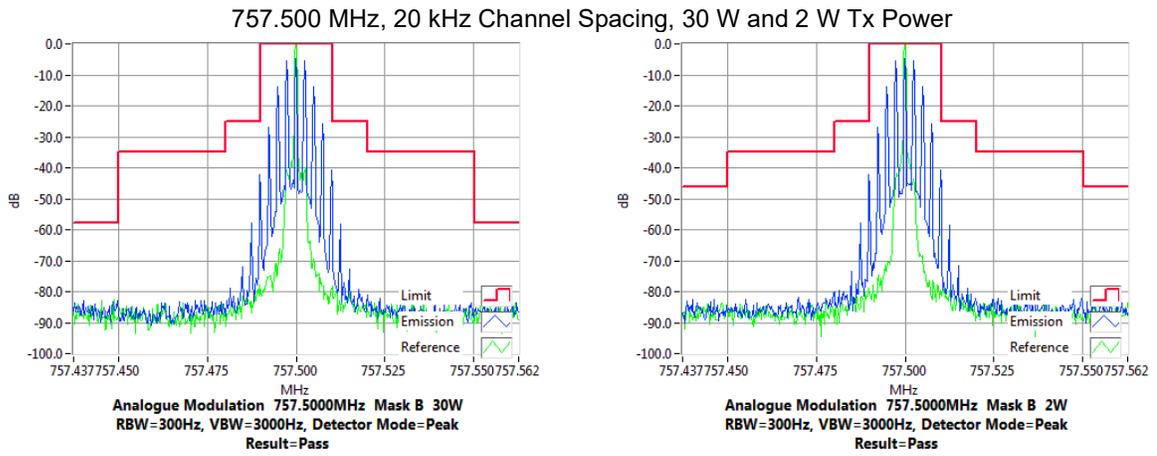
EMISSION MASKS

Emission Mask B	20 kHz Channel Spacing	Analogue
Emission Mask G & H	20 kHz Channel Spacing	FFSK 1200bps & FFSK 2400bps

DATA SPEED

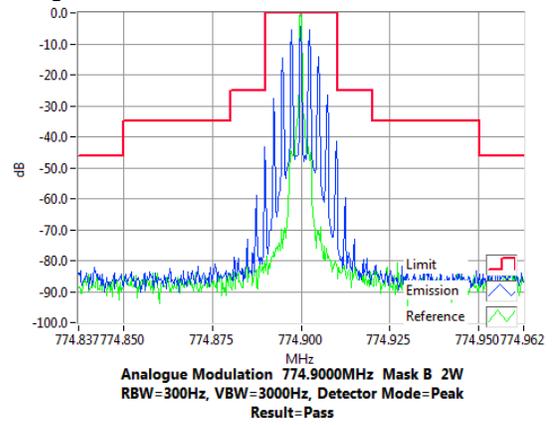
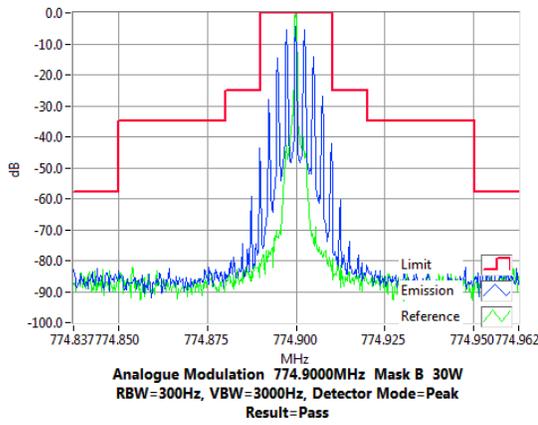
FFSK	20 kHz Channel Spacing	1200 bps & 2400 bps
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Transmitter Spectrum Masks – Analogue

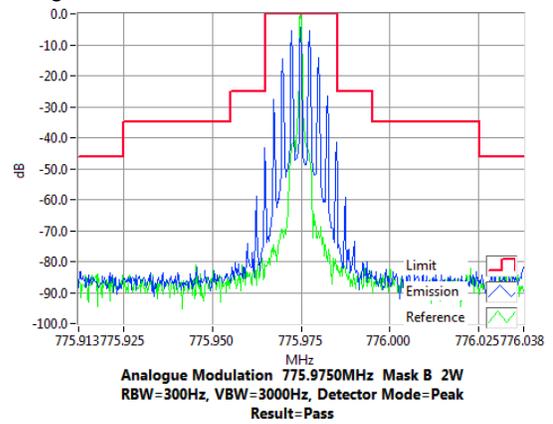
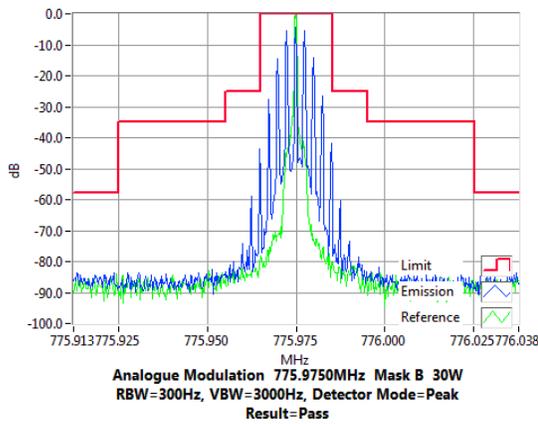


Transmitter Spectrum Masks – Analogue

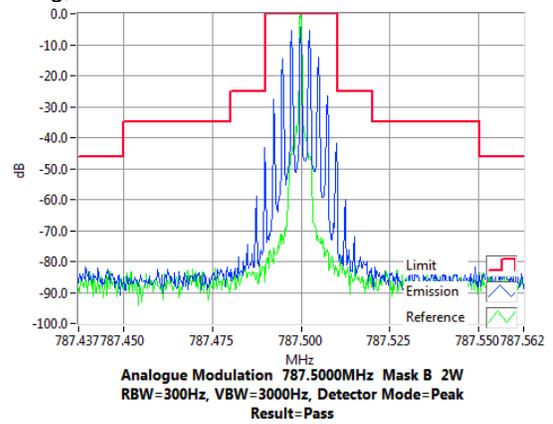
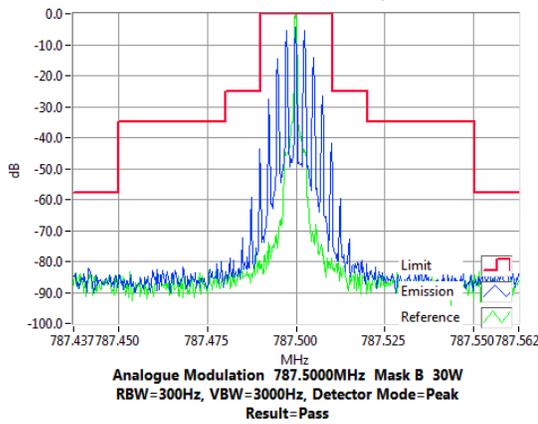
774.900 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



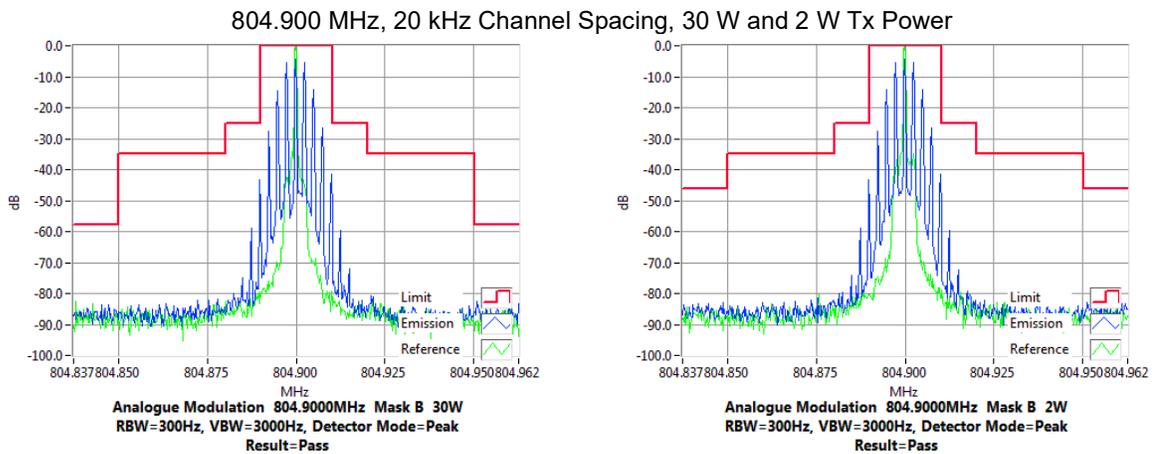
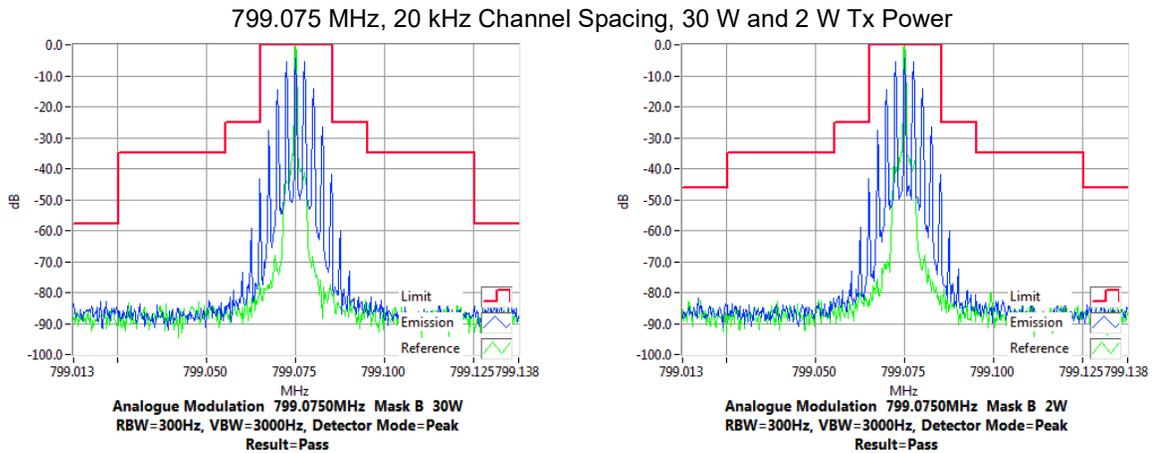
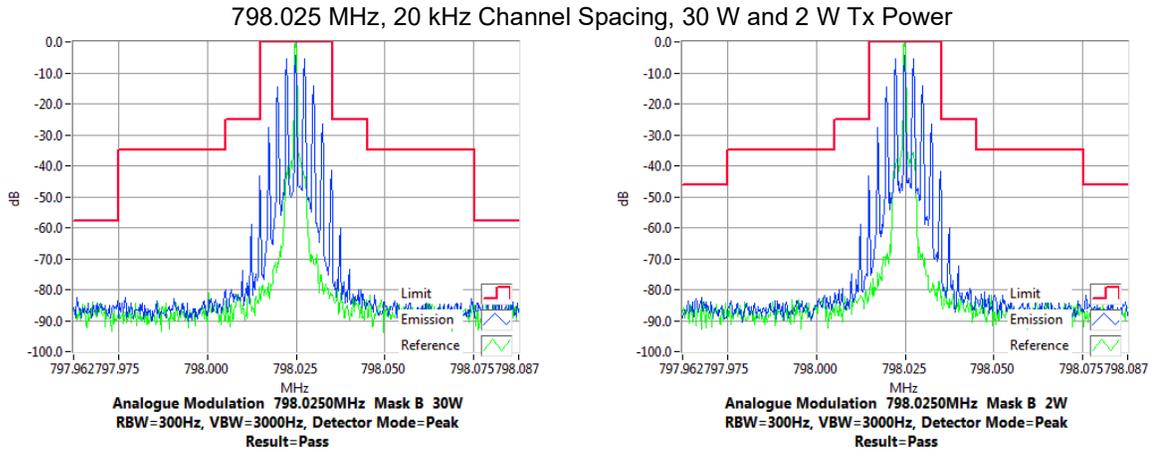
775.975 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



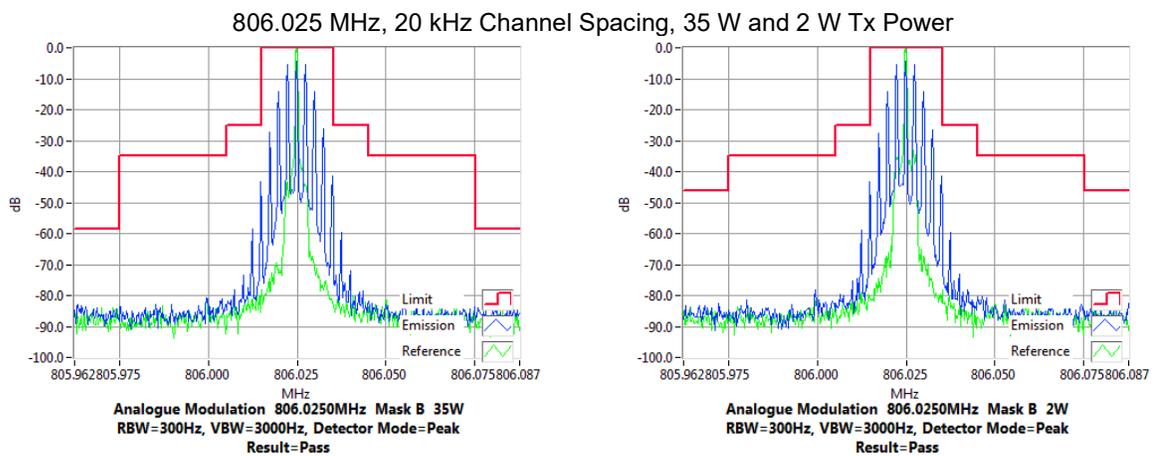
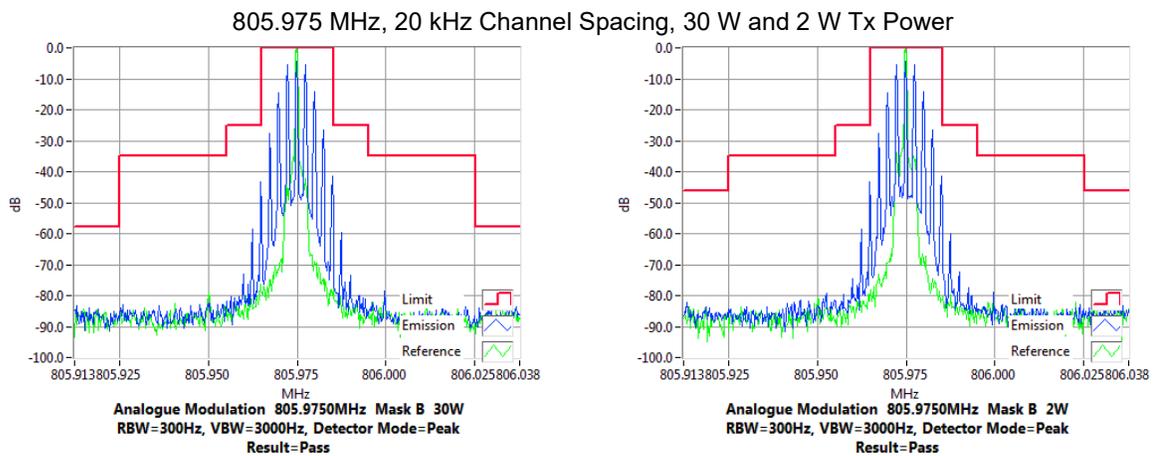
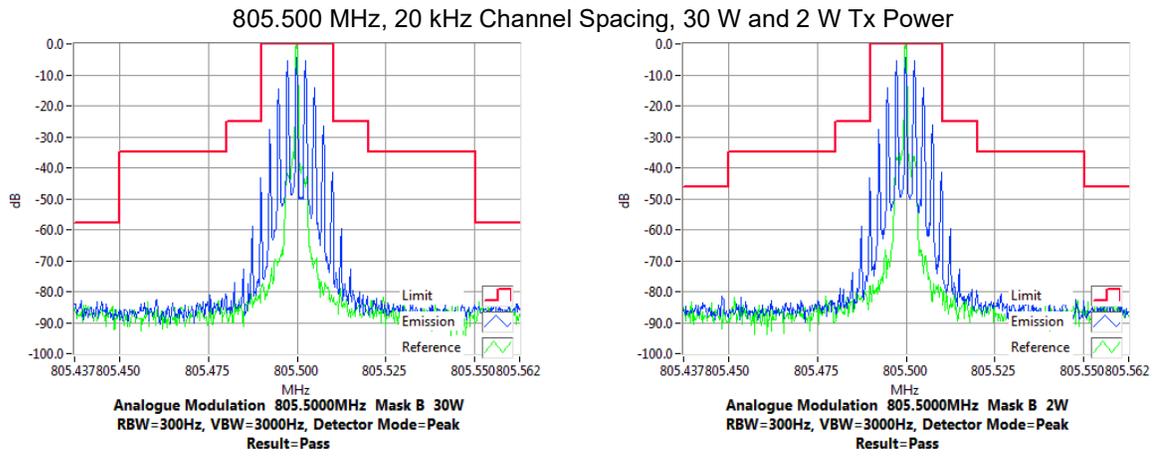
787.500 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



Transmitter Spectrum Masks – Analogue

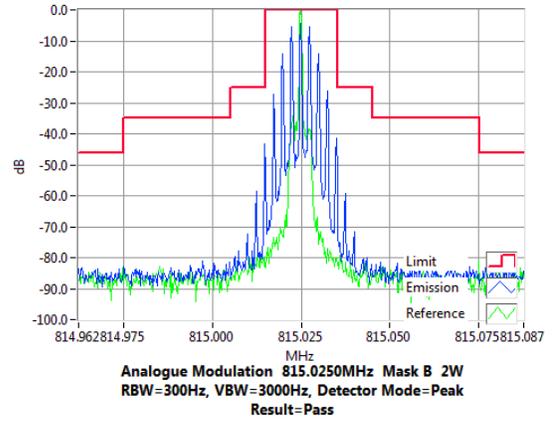
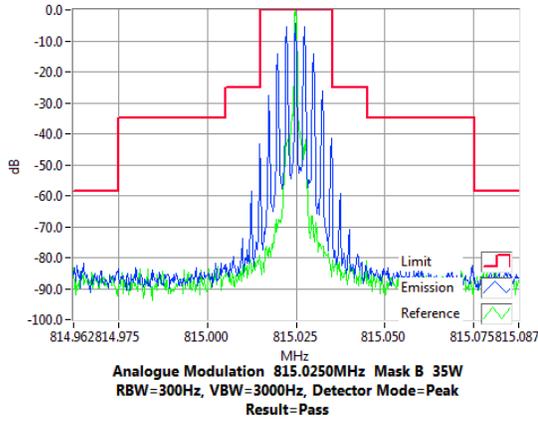


Transmitter Spectrum Masks – Analogue

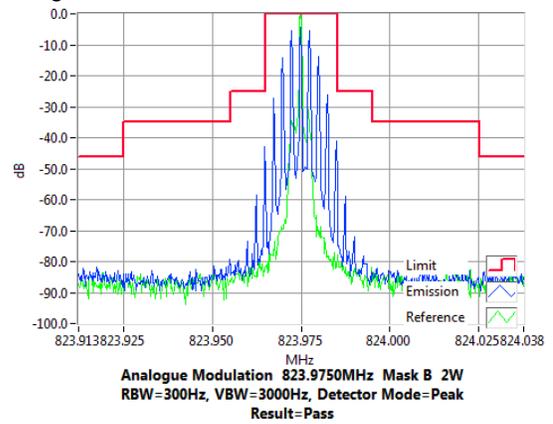
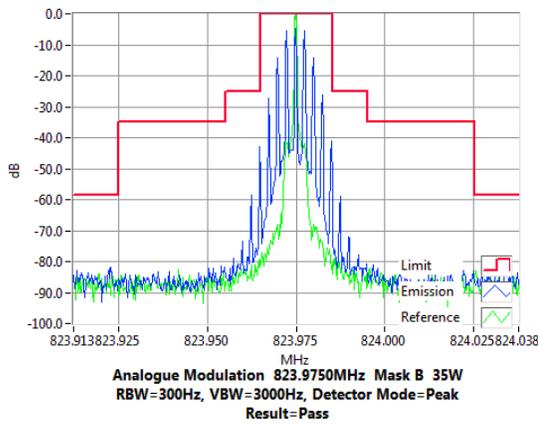


Transmitter Spectrum Masks – Analogue

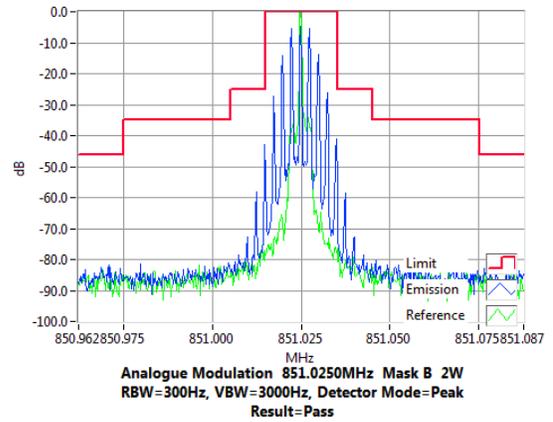
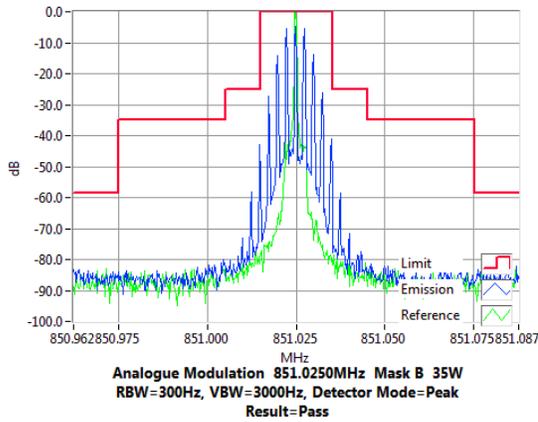
815.025 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power



823.975 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power

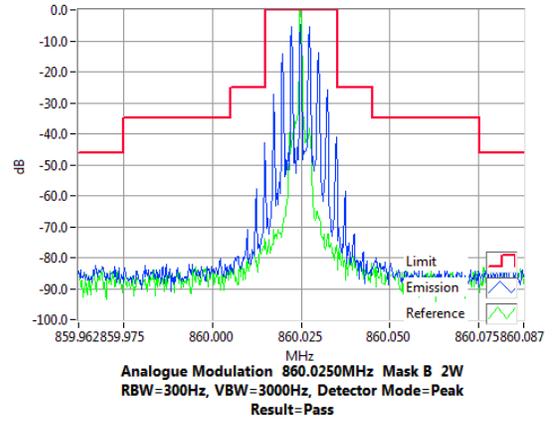
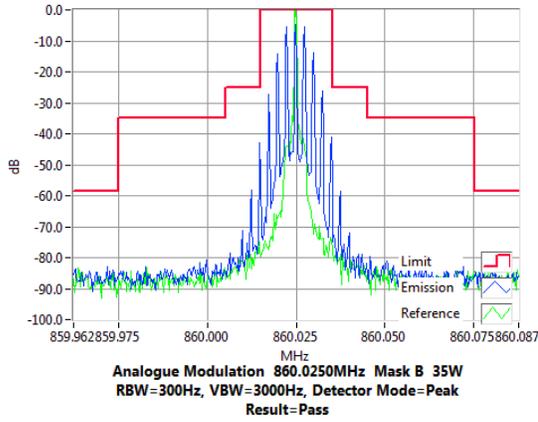


851.025 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power

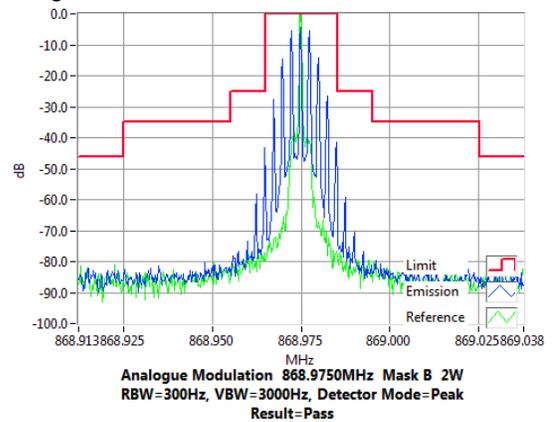
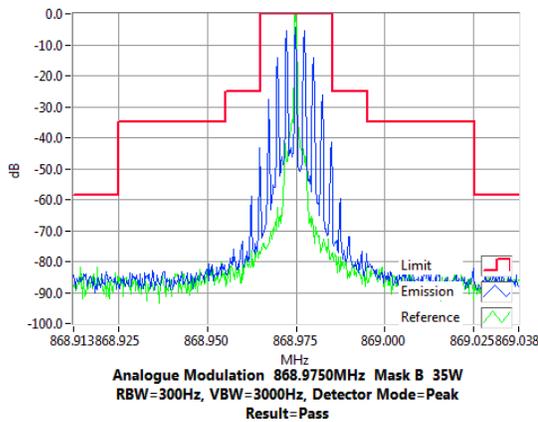


Transmitter Spectrum Masks – Analogue

860.025 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power

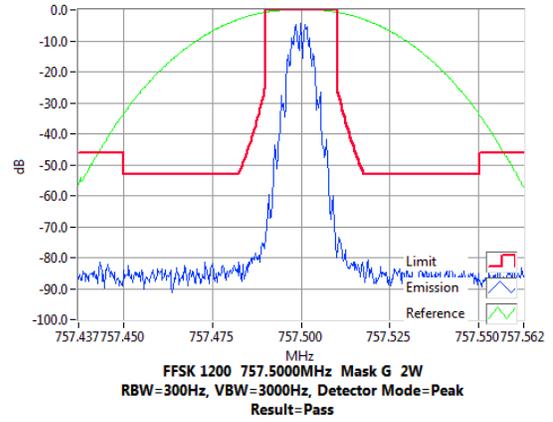
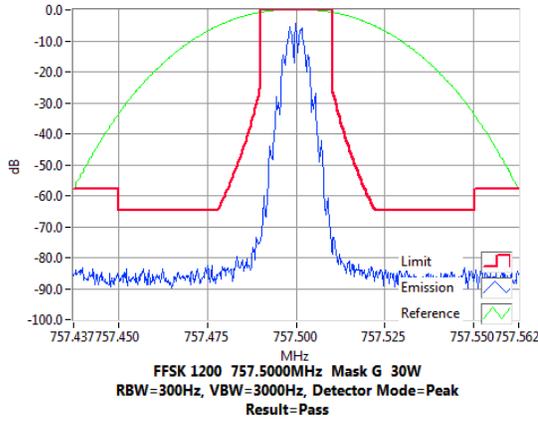


868.975 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power

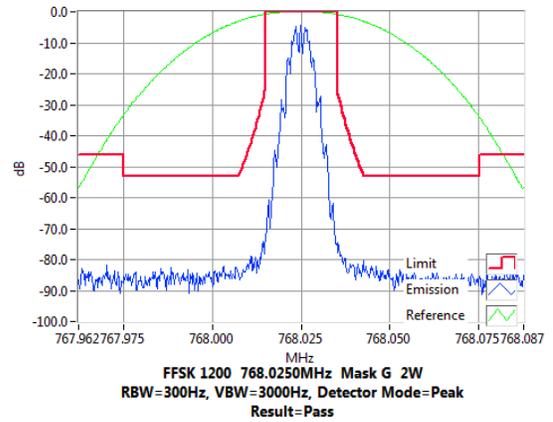
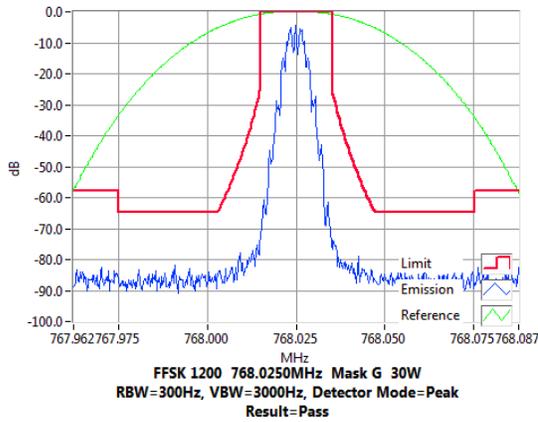


Transmitter Spectrum Masks – FFSK 1200 bps

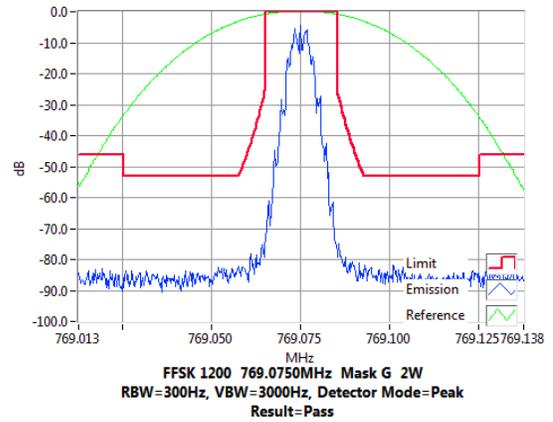
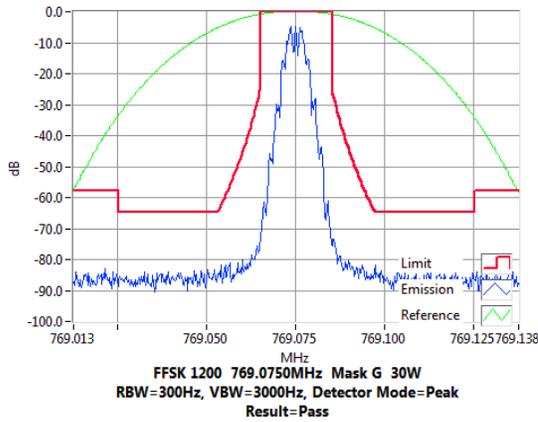
757.500 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



768.025 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power

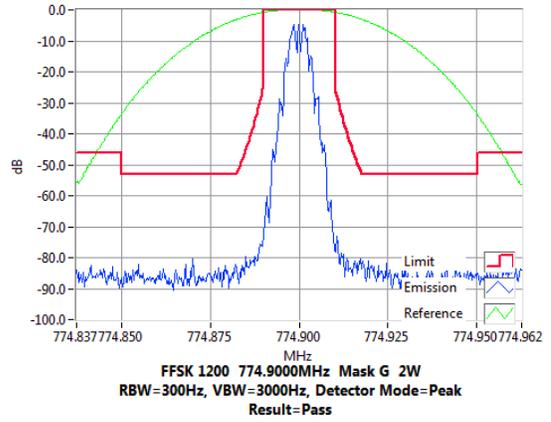
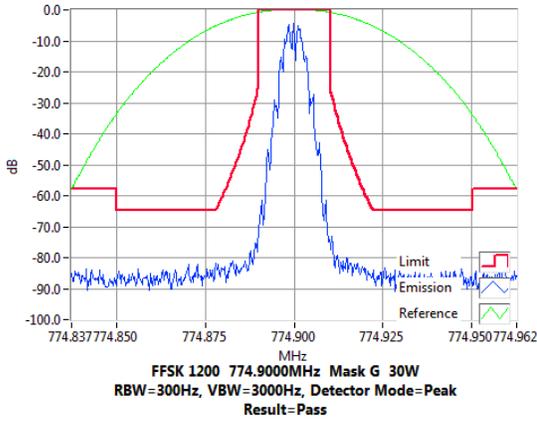


769.075 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power

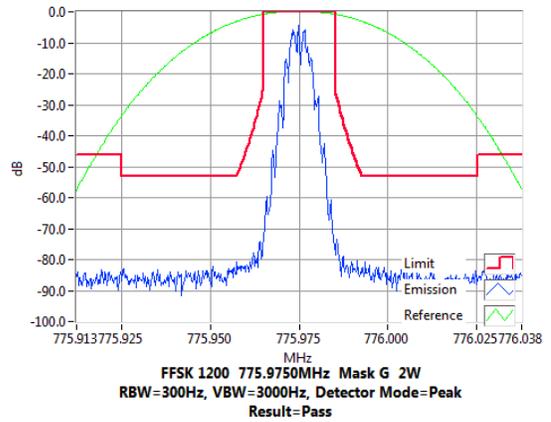
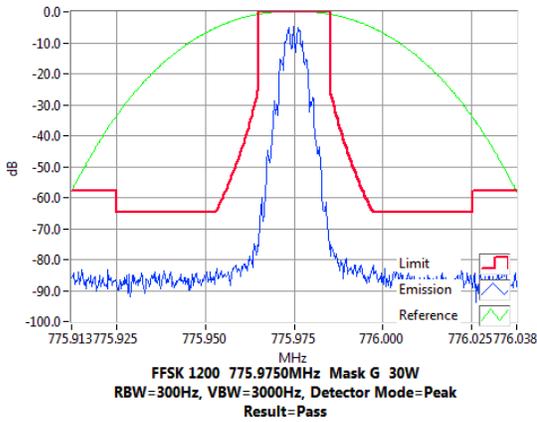


Transmitter Spectrum Masks – FFSK 1200 bps

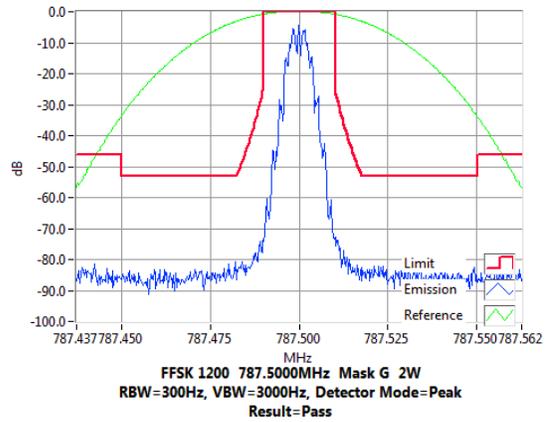
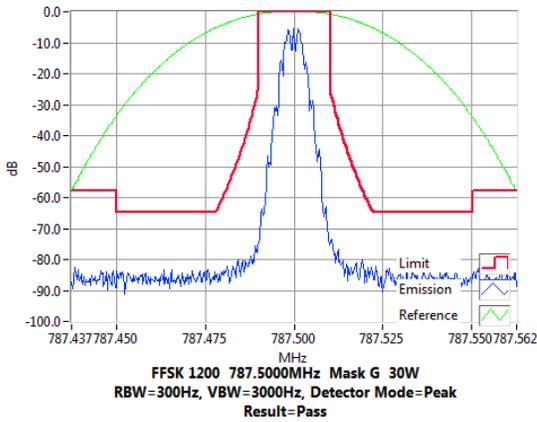
774.900 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



775.975 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power

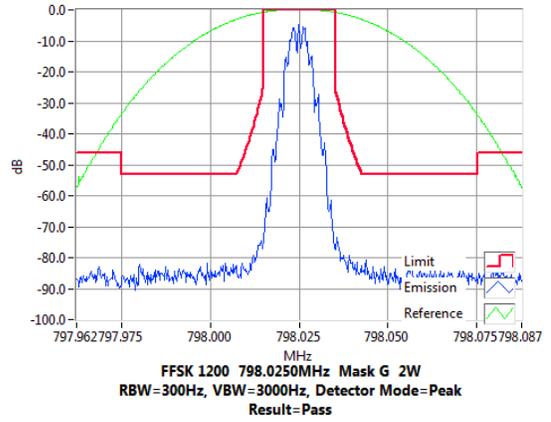
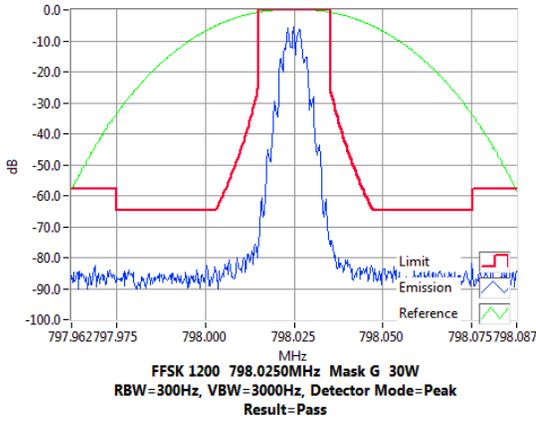


787.500 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power

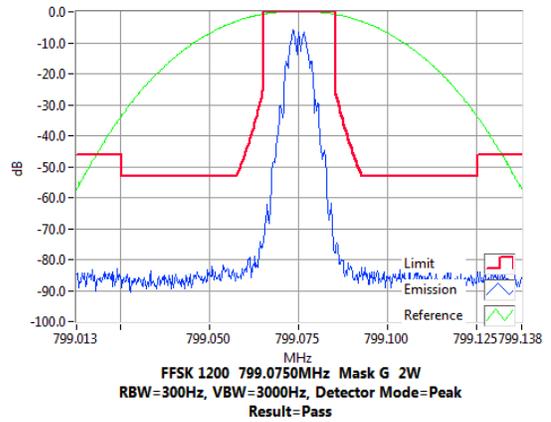
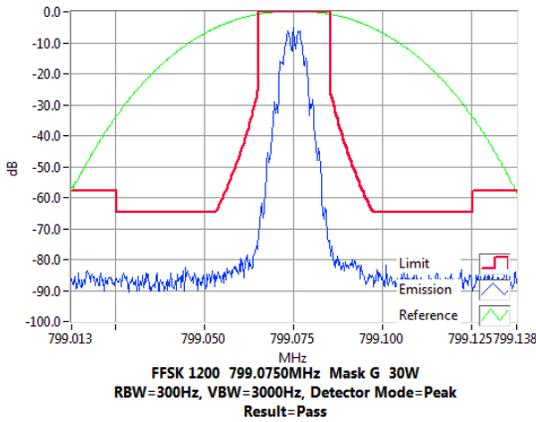


Transmitter Spectrum Masks – FFSK 1200 bps

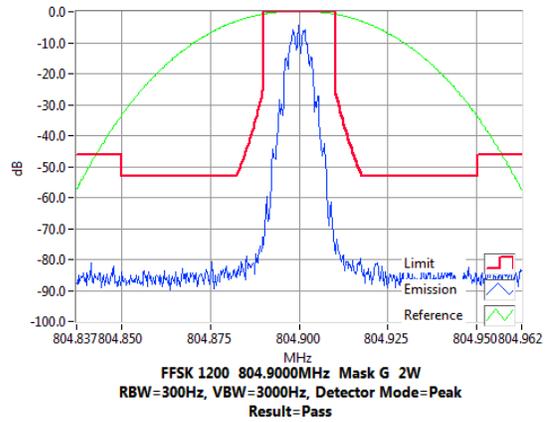
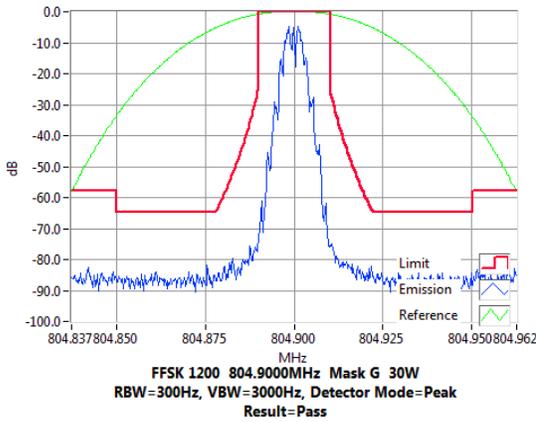
798.025 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



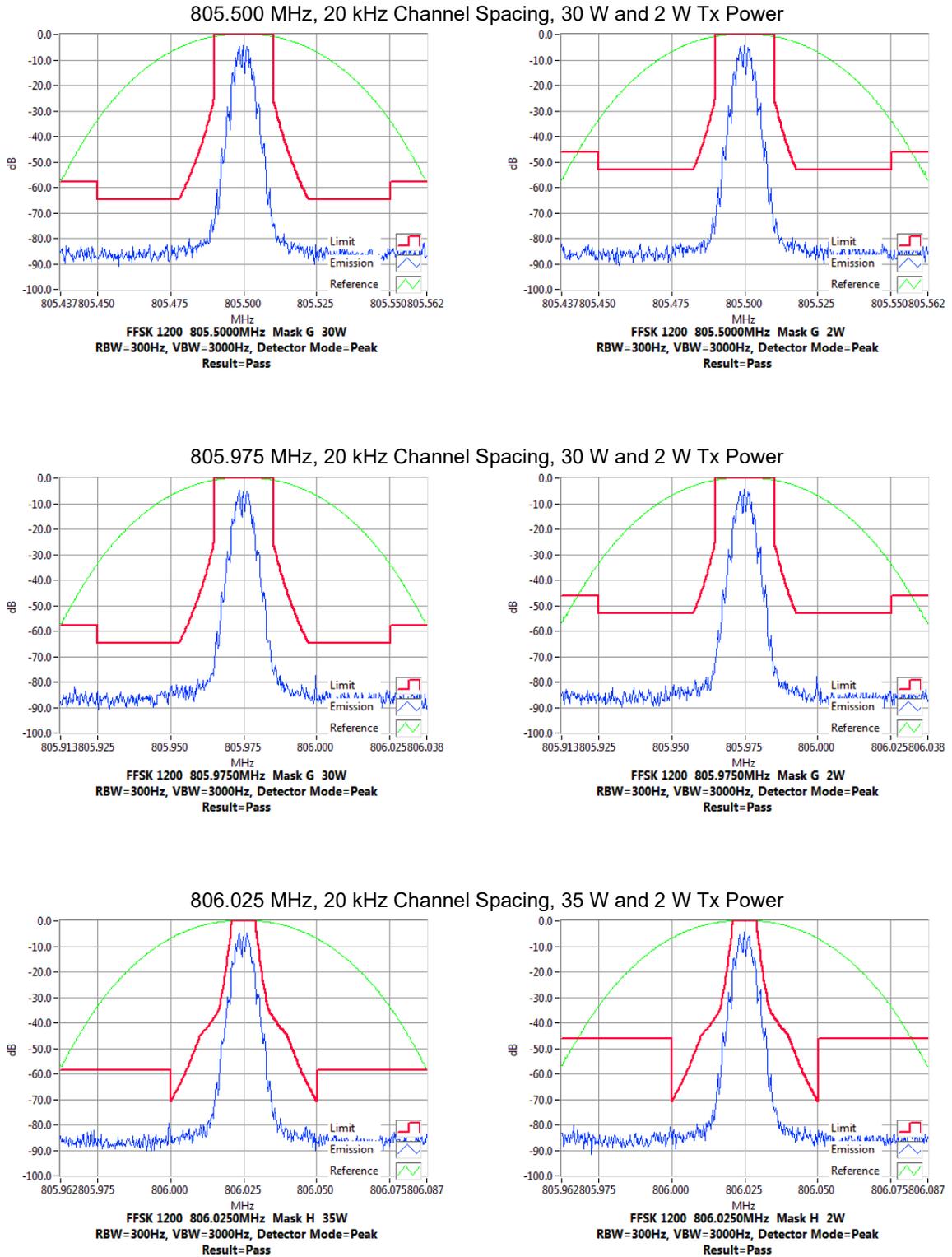
799.075 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



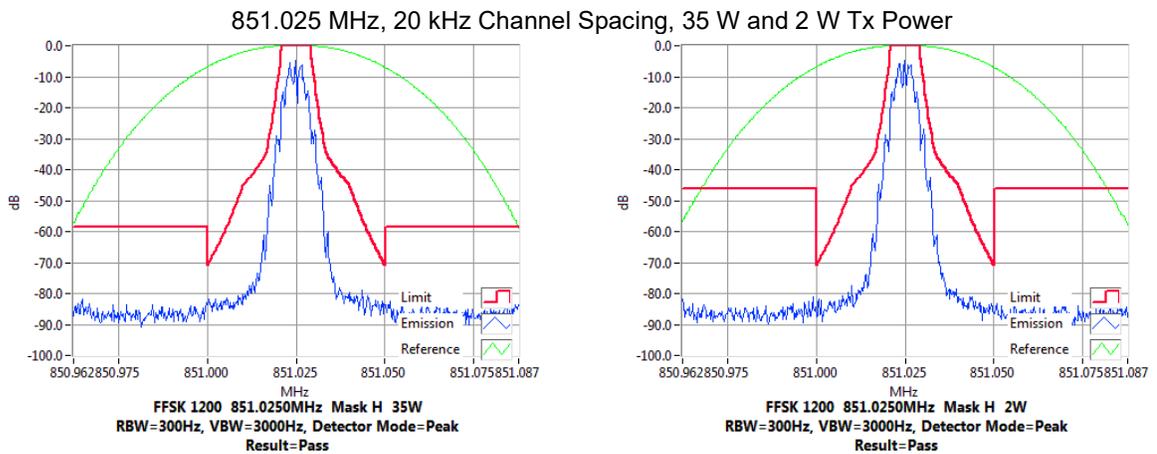
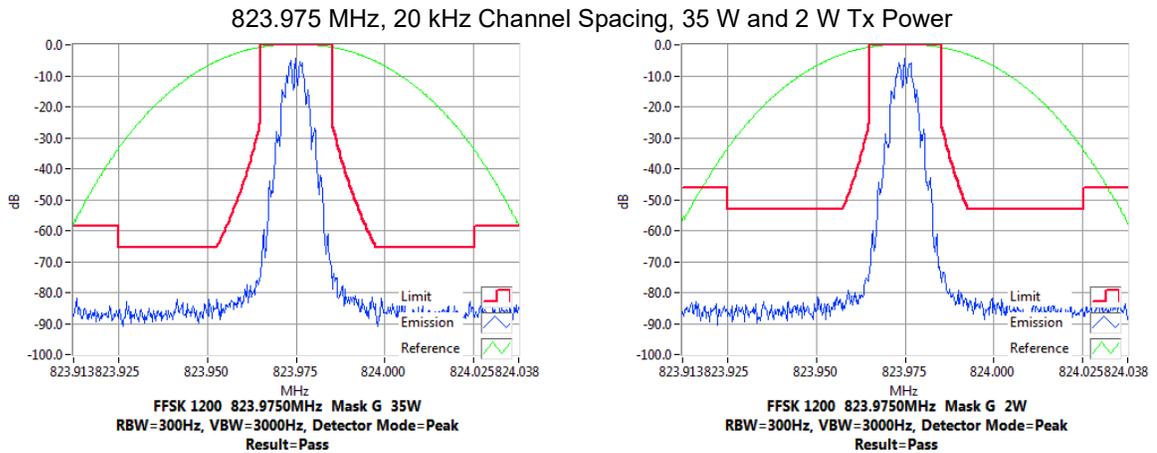
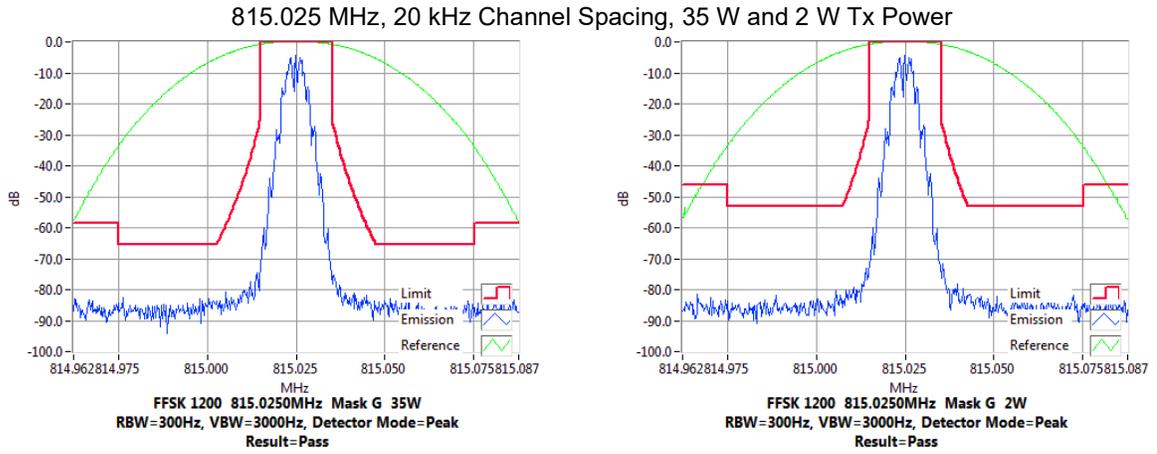
804.900 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



Transmitter Spectrum Masks – FFSK 1200 bps

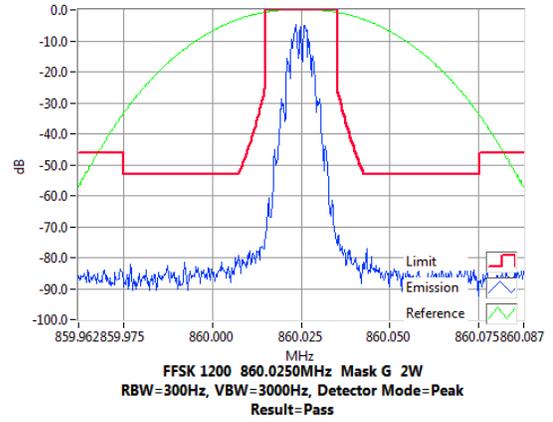
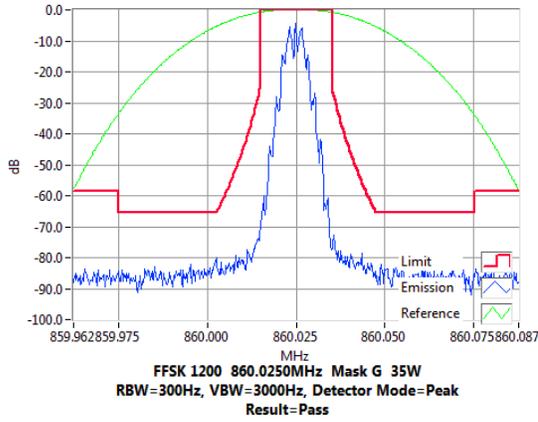


Transmitter Spectrum Masks – FFSK 1200 bps

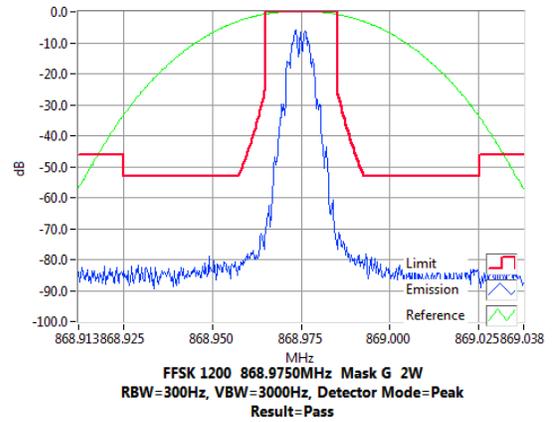
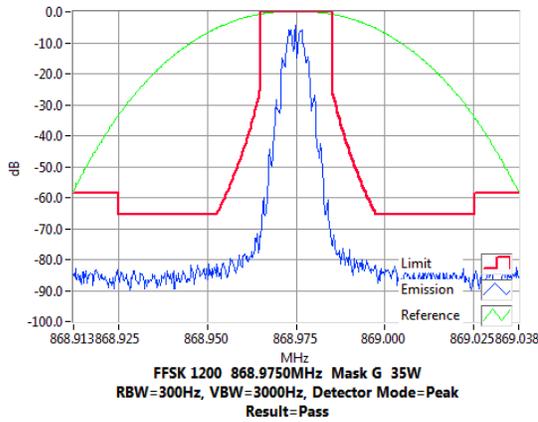


Transmitter Spectrum Masks – FFSK 1200 bps

860.025 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power

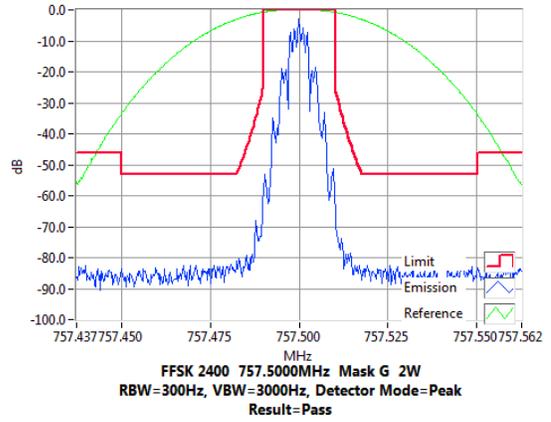
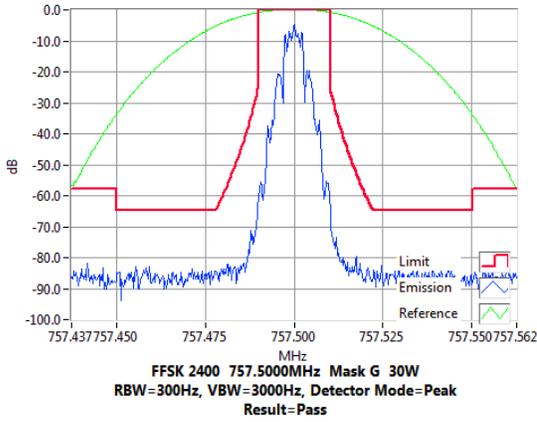


868.975 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power

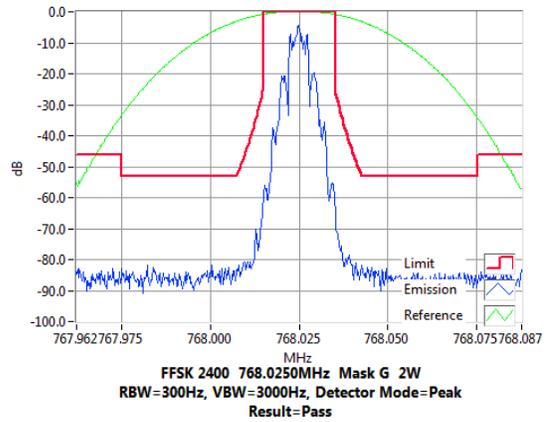
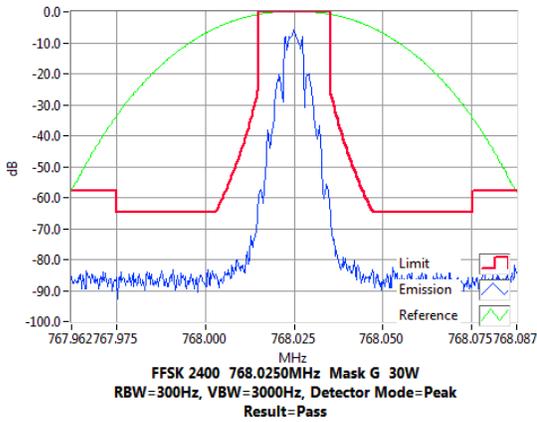


Transmitter Spectrum Masks – FFSK 2400 bps

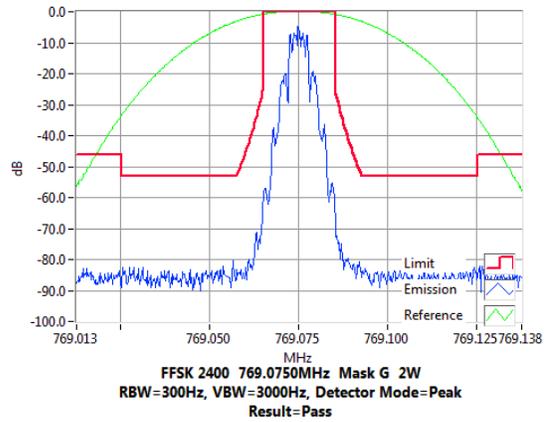
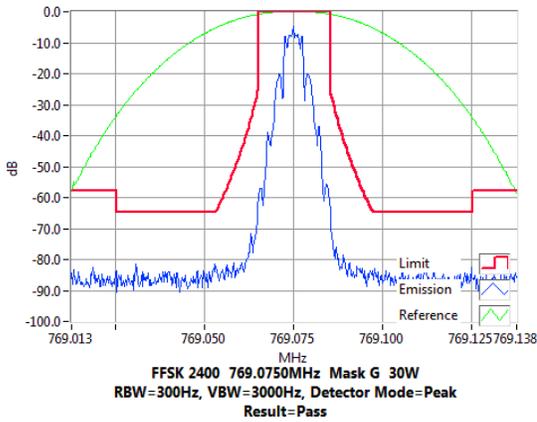
757.500 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



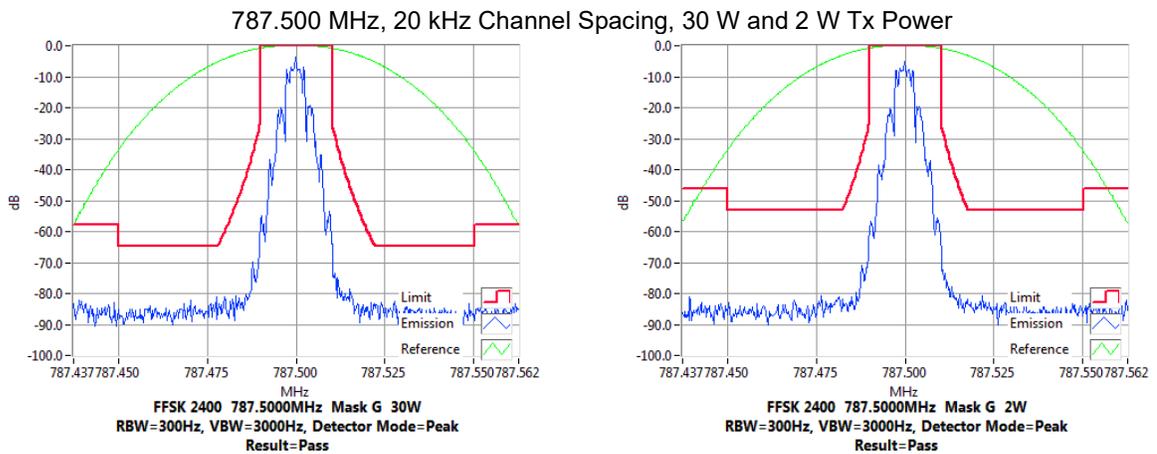
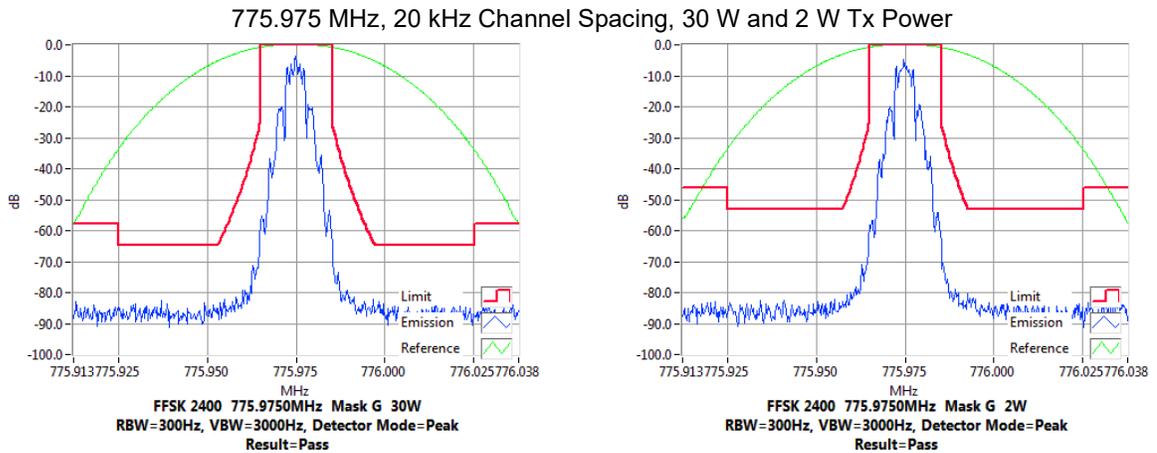
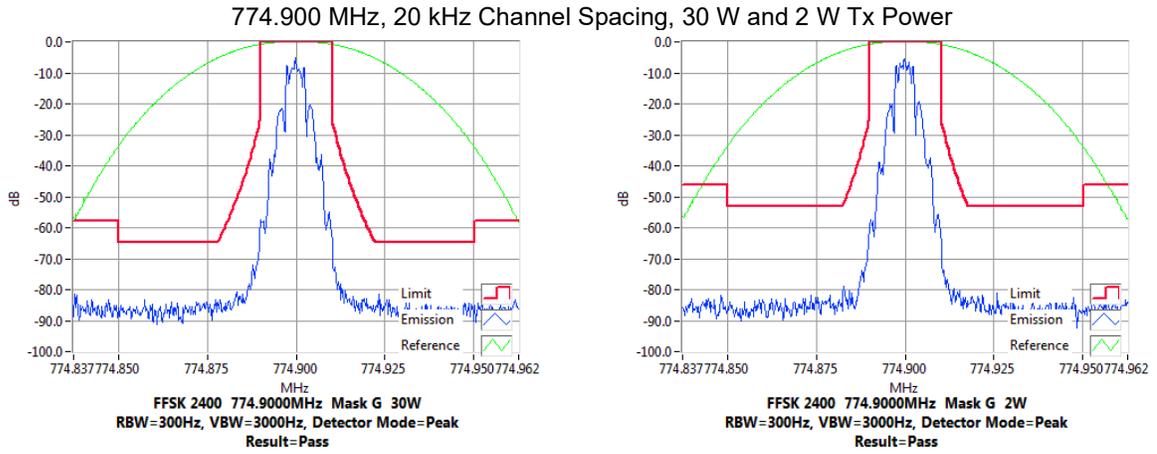
768.025 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



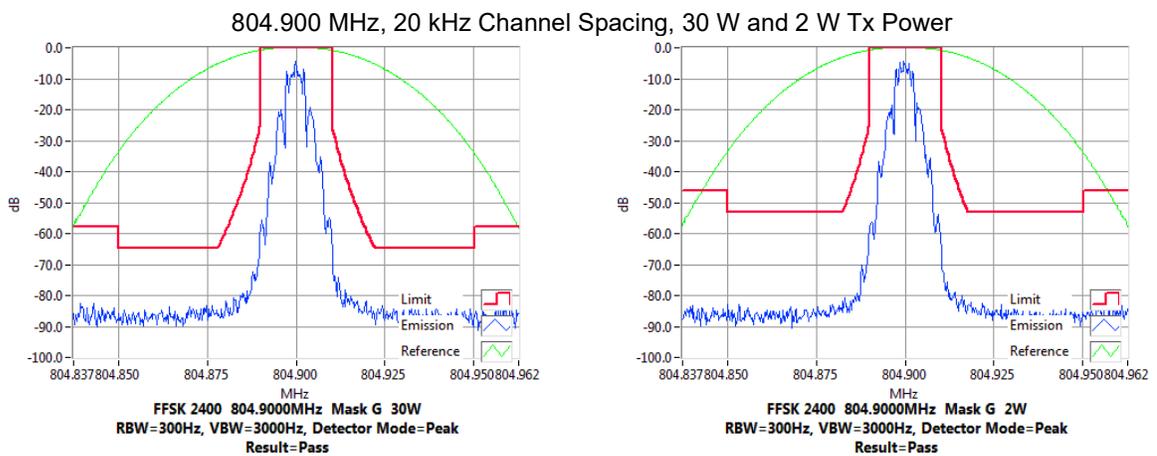
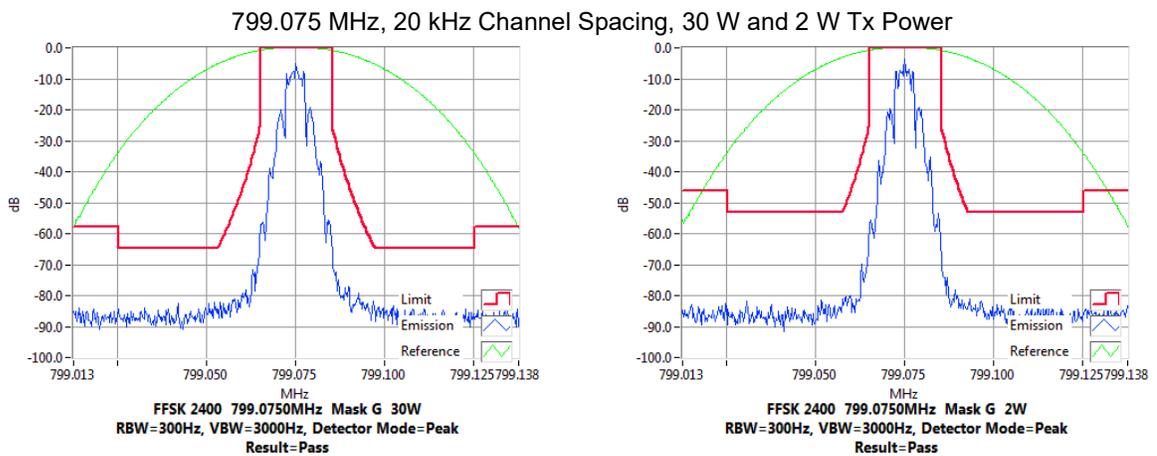
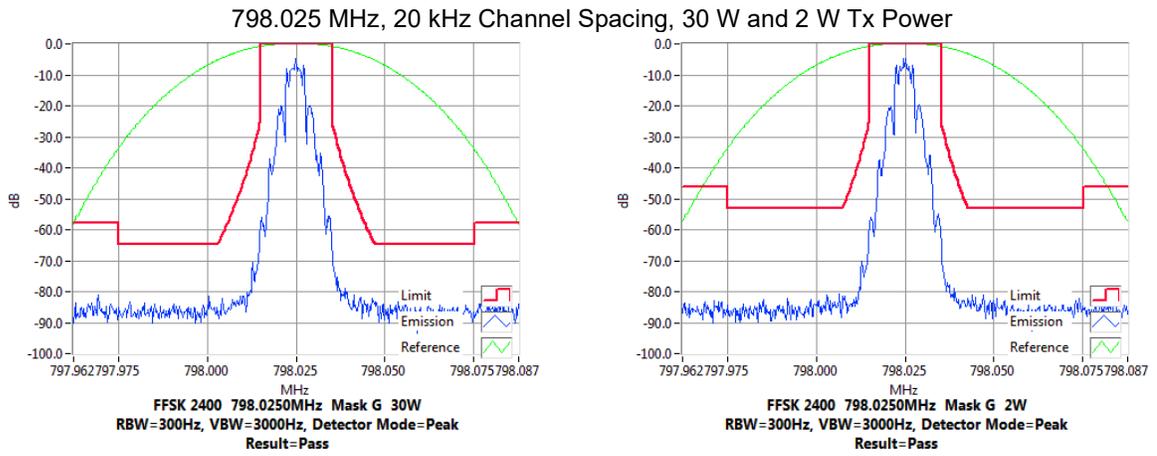
769.075 MHz, 20 kHz Channel Spacing, 30 W and 2 W Tx Power



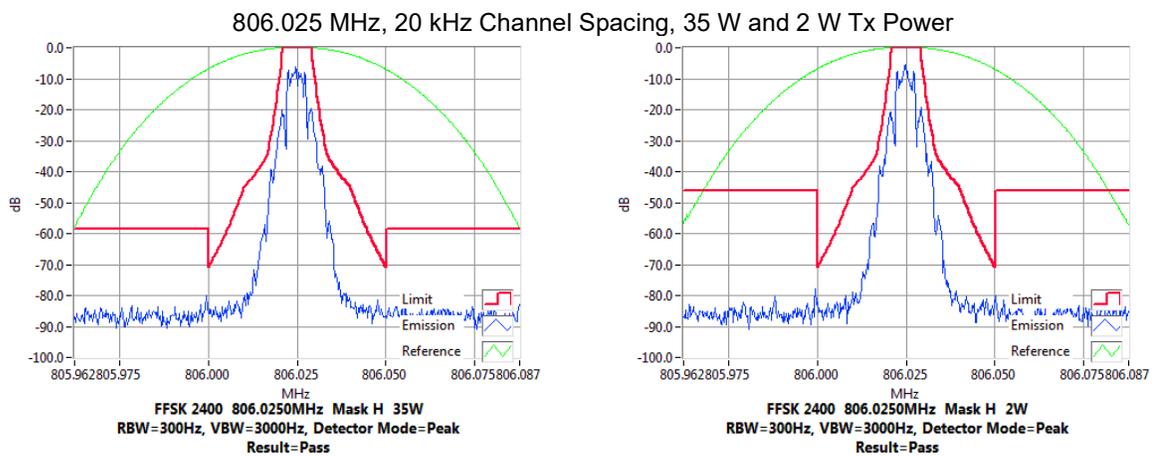
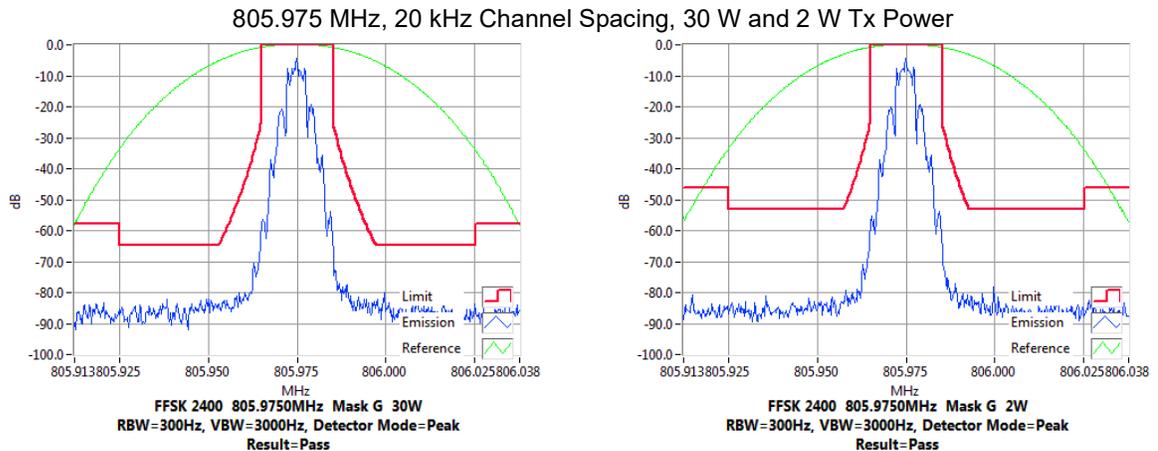
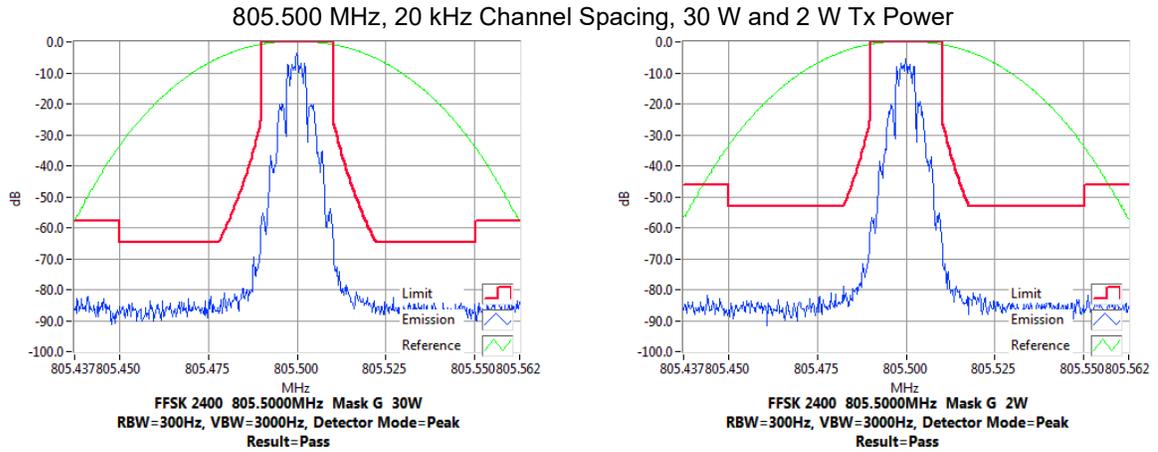
Transmitter Spectrum Masks – FFSK 2400 bps



Transmitter Spectrum Masks – FFSK 2400 bps

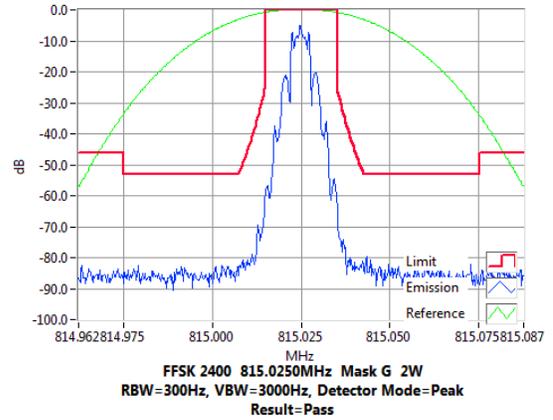
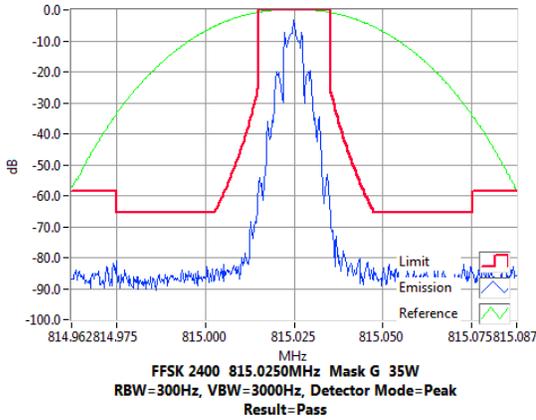


Transmitter Spectrum Masks – FFSK 2400 bps

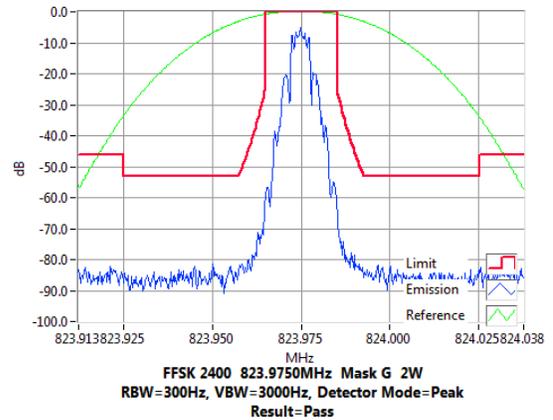
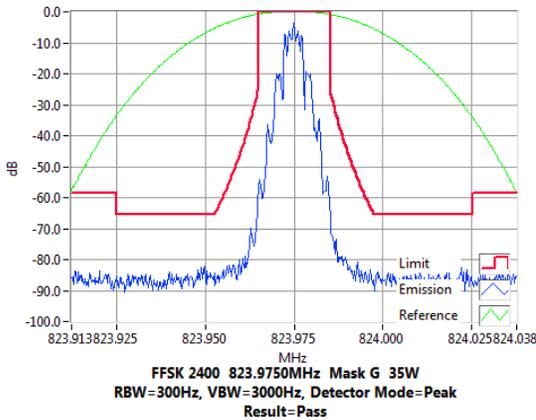


Transmitter Spectrum Masks – FFSK 2400 bps

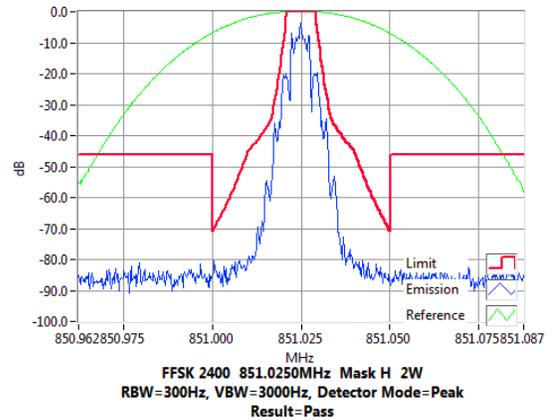
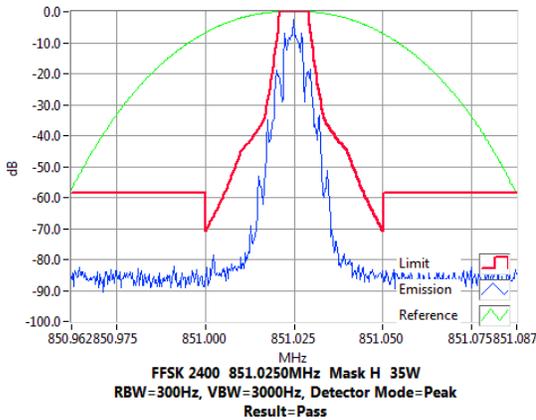
815.025 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power



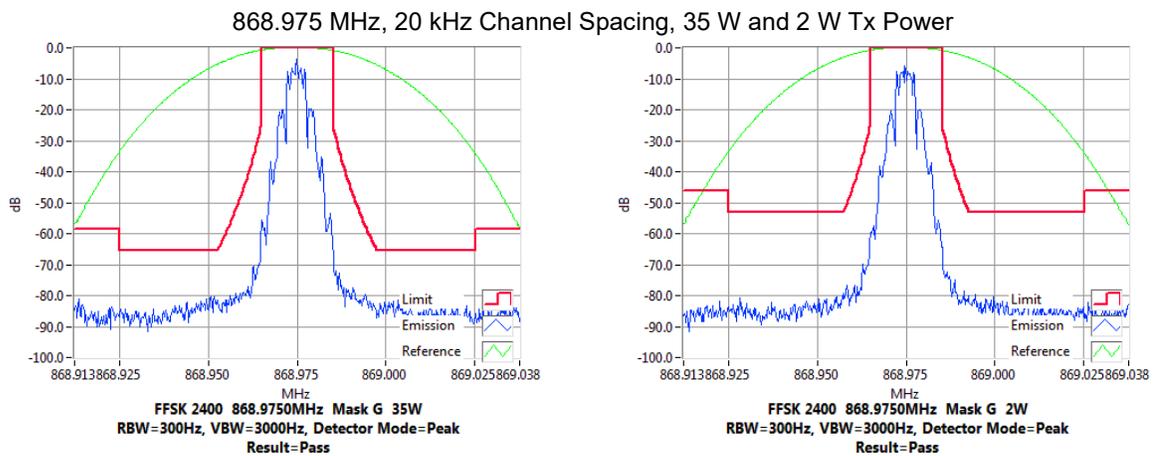
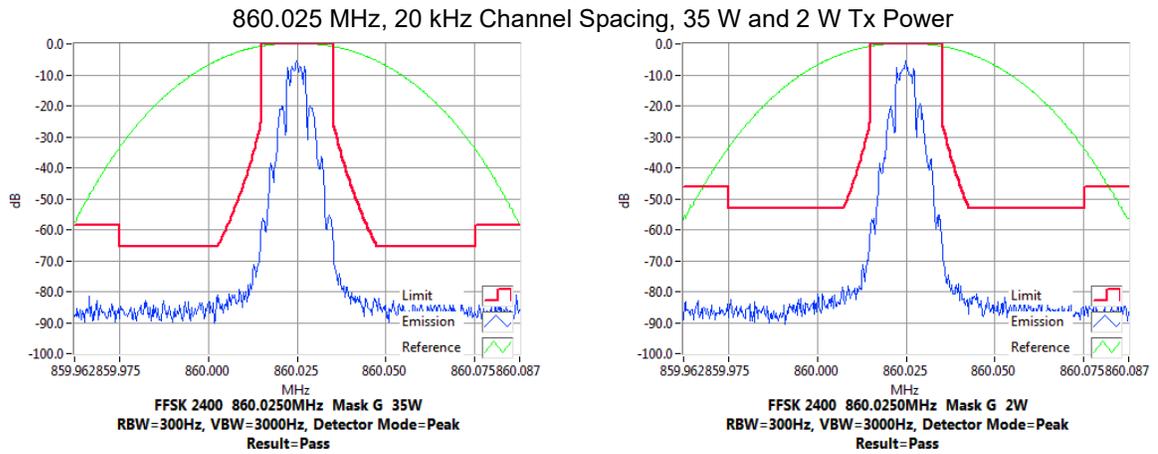
823.975 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power



851.025 MHz, 20 kHz Channel Spacing, 35 W and 2 W Tx Power



Transmitter Spectrum Masks – FFSK 2400 bps



ADJACENT CHANNEL POWER RATIO

SPECIFICATION: FCC 47 CFR 90.543 RSS-119 5.8.9

GUIDE: TIA-603-E 2.2.14
TIA-102.CAAA-E 2.2.8

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The transmitter is modulated with the standard test pattern for digital modulation.
3. The test is performed in accordance with 47 CFR 90.543

MEASUREMENT UNCERTAINTY: ≤ 12.75 GHz ± 3.0 dB

MEASUREMENT RESULTS:

Adjacent Channel Power Ratio

Analogue

Tx FREQUENCY: 769.075 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-65.07	-65.12	-40
21.875 kHz	6.25 kHz	-73.03	-73.18	-60
37.5 kHz	25 kHz	-76.65	-76.91	-60
62.5 kHz	25 kHz	-74.06	-74.11	-65
87.5 kHz	25 kHz	-77.34	-77.54	-65
150 kHz	100 kHz	-76.30	-76.60	-65
250 kHz	100 kHz	-81.83	-82.42	-65
350 kHz	100 kHz	-85.31	-85.49	-65
>400 kHz to 12 MHz	30 kHz (swept)	-87.9		-75
12 MHz to paired receive band	30 kHz (swept)	-91.2		-75
In the paired receive band	30 kHz (swept)	-109.6		-100

FFSK 1200 bps

Tx FREQUENCY: 769.075 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-72.55	-72.68	-40
21.875 kHz	6.25 kHz	-74.82	-74.70	-60
37.5 kHz	25 kHz	-76.78	-76.95	-60
62.5 kHz	25 kHz	-73.99	-74.20	-65
87.5 kHz	25 kHz	-77.30	-77.40	-65
150 kHz	100 kHz	-75.95	-76.30	-65
250 kHz	100 kHz	-81.74	-82.10	-65
350 kHz	100 kHz	-85.09	-85.42	-65
>400 kHz to 12 MHz	30 kHz (swept)	-87.7		-75
12 MHz to paired receive band	30 kHz (swept)	-91.5		-75
In the paired receive band	30 kHz (swept)	-109.9		-100

FFSK 2400 bps

Tx FREQUENCY: 769.075 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-72.58	-72.74	-40
21.875 kHz	6.25 kHz	-74.64	-74.91	-60
37.5 kHz	25 kHz	-76.67	-76.70	-60
62.5 kHz	25 kHz	-74.12	-74.21	-65
87.5 kHz	25 kHz	-77.23	-77.54	-65
150 kHz	100 kHz	-75.99	-76.38	-65
250 kHz	100 kHz	-81.69	-81.96	-65
350 kHz	100 kHz	-84.88	-85.31	-65
>400 kHz to 12 MHz	30 kHz (swept)	-88.3		-75
12 MHz to paired receive band	30 kHz (swept)	-91.4		-75
In the paired receive band	30 kHz (swept)	-110.6		-100

Adjacent Channel Power Ratio

Analogue

Tx FREQUENCY: 774.900 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-66.24	-64.92	-40
21.875 kHz	6.25 kHz	-73.71	-74.15	-60
37.5 kHz	25 kHz	-76.75	-76.75	-60
62.5 kHz	25 kHz	-73.92	-74.18	-65
87.5 kHz	25 kHz	-77.48	-77.60	-65
150 kHz	100 kHz	-76.18	-76.43	-65
250 kHz	100 kHz	-81.77	-82.15	-65
350 kHz	100 kHz	-84.84	-85.12	-65
>400 kHz to 12 MHz	30 kHz (swept)	-86.8		-75
12 MHz to paired receive band	30 kHz (swept)	-90.4		-75
In the paired receive band	30 kHz (swept)	-110.1		-100

FFSK 1200 bps

Tx FREQUENCY: 774.900 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-72.78	-72.82	-40
21.875 kHz	6.25 kHz	-74.91	-74.73	-60
37.5 kHz	25 kHz	-76.48	-76.71	-60
62.5 kHz	25 kHz	-73.97	-74.23	-65
87.5 kHz	25 kHz	-77.48	-77.69	-65
150 kHz	100 kHz	-76.28	-76.43	-65
250 kHz	100 kHz	-81.79	-81.92	-65
350 kHz	100 kHz	-84.86	-85.12	-65
>400 kHz to 12 MHz	30 kHz (swept)	-87.4		-75
12 MHz to paired receive band	30 kHz (swept)	-92.0		-75
In the paired receive band	30 kHz (swept)	-109.5		-100

FFSK 2400 bps

Tx FREQUENCY: 774.900 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-72.36	-72.37	-40
21.875 kHz	6.25 kHz	-74.45	-74.79	-60
37.5 kHz	25 kHz	-76.64	-76.92	-60
62.5 kHz	25 kHz	-74.10	-74.17	-65
87.5 kHz	25 kHz	-77.33	-77.52	-65
150 kHz	100 kHz	-76.09	-76.23	-65
250 kHz	100 kHz	-81.52	-81.79	-65
350 kHz	100 kHz	-84.41	-85.01	-65
>400 kHz to 12 MHz	30 kHz (swept)	-88.7		-75
12 MHz to paired receive band	30 kHz (swept)	-92.1		-75
In the paired receive band	30 kHz (swept)	-109.8		-100

Adjacent Channel Power Ratio

Analogue

Tx FREQUENCY: 799.075 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-66.34	-64.52	-40
21.875 kHz	6.25 kHz	-73.42	-73.98	-60
37.5 kHz	25 kHz	-76.50	-76.74	-60
62.5 kHz	25 kHz	-74.16	-74.27	-65
87.5 kHz	25 kHz	-77.51	-77.53	-65
150 kHz	100 kHz	-76.20	-76.58	-65
250 kHz	100 kHz	-81.92	-81.93	-65
350 kHz	100 kHz	-85.33	-85.46	-65
>400 kHz to 12 MHz	30 kHz (swept)	-88.6		-75
12 MHz to paired receive band	30 kHz (swept)	-91.3		-75
In the paired receive band	30 kHz (swept)	-111.4		-100

FFSK 1200 bps

Tx FREQUENCY: 799.075 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-72.51	-72.75	-40
21.875 kHz	6.25 kHz	-74.70	-74.60	-60
37.5 kHz	25 kHz	-76.57	-76.58	-60
62.5 kHz	25 kHz	-73.95	-74.10	-65
87.5 kHz	25 kHz	-77.44	-77.57	-65
150 kHz	100 kHz	-76.32	-76.52	-65
250 kHz	100 kHz	-81.90	-82.13	-65
350 kHz	100 kHz	-85.15	-85.53	-65
>400 kHz to 12 MHz	30 kHz (swept)	-86.9		-75
12 MHz to paired receive band	30 kHz (swept)	-91.8		-75
In the paired receive band	30 kHz (swept)	-112.0		-100

FFSK 2400 bps

Tx FREQUENCY: 799.075 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-72.28	-72.58	-40
21.875 kHz	6.25 kHz	-74.24	-74.65	-60
37.5 kHz	25 kHz	-77.19	-76.76	-60
62.5 kHz	25 kHz	-74.19	-74.16	-65
87.5 kHz	25 kHz	-77.61	-77.46	-65
150 kHz	100 kHz	-76.18	-76.51	-65
250 kHz	100 kHz	-81.69	-81.85	-65
350 kHz	100 kHz	-84.91	-85.32	-65
>400 kHz to 12 MHz	30 kHz (swept)	-88.2		-75
12 MHz to paired receive band	30 kHz (swept)	-91.7		-75
In the paired receive band	30 kHz (swept)	-111.0		-100

Adjacent Channel Power Ratio

Analogue

Tx FREQUENCY: 804.900 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-64.32	-66.37	-40
21.875 kHz	6.25 kHz	-73.20	-73.62	-60
37.5 kHz	25 kHz	-76.72	-76.68	-60
62.5 kHz	25 kHz	-74.27	-74.08	-65
87.5 kHz	25 kHz	-77.50	-77.54	-65
150 kHz	100 kHz	-76.45	-76.72	-65
250 kHz	100 kHz	-82.08	-82.37	-65
350 kHz	100 kHz	-85.46	-85.67	-65
>400 kHz to 12 MHz	30 kHz (swept)	-87.3		-75
12 MHz to paired receive band	30 kHz (swept)	-90.7		-75
In the paired receive band	30 kHz (swept)	-111.2		-100

FFSK 1200 bps

Tx FREQUENCY: 804.900 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-72.61	-72.44	-40
21.875 kHz	6.25 kHz	-74.23	-74.53	-60
37.5 kHz	25 kHz	-76.98	-76.59	-60
62.5 kHz	25 kHz	-73.95	-74.03	-65
87.5 kHz	25 kHz	-77.35	-77.68	-65
150 kHz	100 kHz	-76.31	-76.45	-65
250 kHz	100 kHz	-81.69	-81.93	-65
350 kHz	100 kHz	-85.31	-85.33	-65
>400 kHz to 12 MHz	30 kHz (swept)	-87.2		-75
12 MHz to paired receive band	30 kHz (swept)	-92.0		-75
In the paired receive band	30 kHz (swept)	-111.8		-100

FFSK 2400 bps

Tx FREQUENCY: 804.900 MHz 30 W 20 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-72.57	-72.38	-40
21.875 kHz	6.25 kHz	-74.46	-74.38	-60
37.5 kHz	25 kHz	-76.71	-77.00	-60
62.5 kHz	25 kHz	-74.14	-74.06	-65
87.5 kHz	25 kHz	-77.46	-77.43	-65
150 kHz	100 kHz	-76.16	-76.46	-65
250 kHz	100 kHz	-81.55	-81.89	-65
350 kHz	100 kHz	-84.73	-85.10	-65
>400 kHz to 12 MHz	30 kHz (swept)	-89.3		-75
12 MHz to paired receive band	30 kHz (swept)	-90.9		-75
In the paired receive band	30 kHz (swept)	-110.6		-100

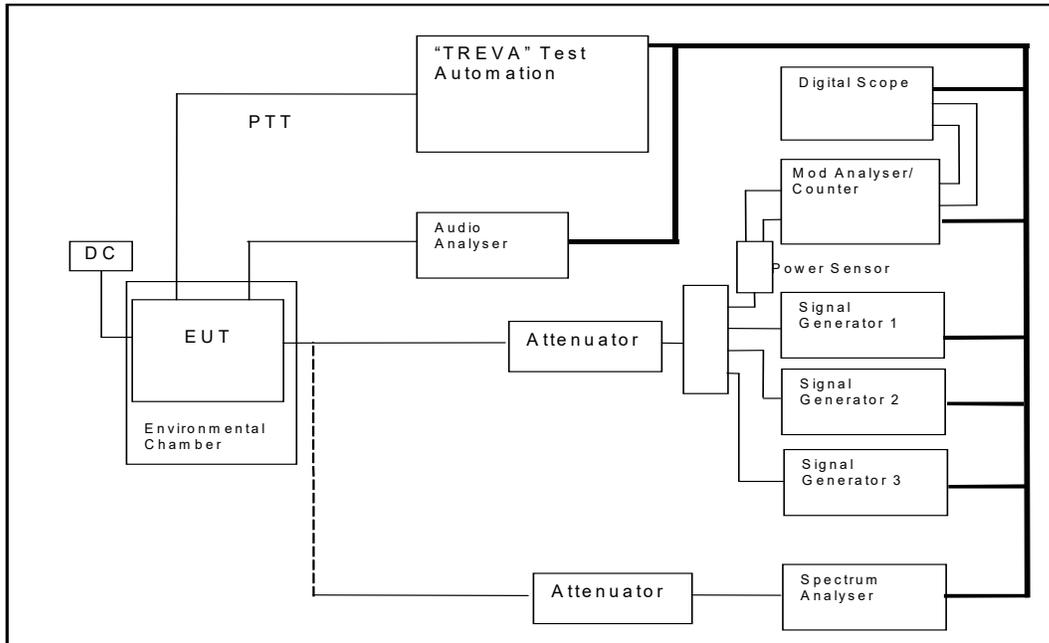
TEST EQUIPMENT LIST

Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
Audio Analyser	TREVA2	Hewlett Packard	HP8903B	2818A04275	E3710	11-Oct-24
Coax Cable	1.5m Blue	Suhner	Sucoflex 126EA	502868/126EA	E5028	08-Oct-24
Modulation Analyser	TREVA2	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	11-Oct-24
Modulation Analyser	Includes Audio Analyser	Rohde & Schwarz	FMA0852.8500.52	842541/001	E3554	03-Apr-25
Power Meter	TREVA2 Power Head for HP8901	Hewlett Packard	HP11722A	2716A02037	1575	10-Oct-24
Power Supply	TREVA2 60V/25A	Agilent	N5767A	US09F4901H	E4656	09-Oct-25
RF Attenuator	TREVA2 20dB 150W	Weinschel	40-20-33	CJ405	E3733	08-Oct-24
RF Attenuator	TREVA2 3dB	Weinschel	Model 1	BL9950	E4080	08-Oct-24
RF Combiner	TREVA2	Minicircuits	ZFSC-4-1	-	E4084	
Coax Cable	3m Blue	Suhner	Sucoflex 126EA	503429/126EA	E5015	08-Oct-24
Coax Cable	1.5m Blue	Suhner	Sucoflex 126EA	502868/126EA	E5028	08-Oct-24
RF Attenuator	30+3dB 350W	Weinschel	67-30-33 & BW-N3W5+	CK9178	E5023	08-Oct-24
Spectrum Analyser	13.2GHz	Agilent	PSA E4445A	MY42510072	E4139	18-Oct-24
Temp & Humidity datalogger		TP-Link TAPO	T315	22383M6000671	E11377	08-Feb-25
TREVA 2		Teltest	-	2	-	23-Oct-24
Testware	Occupied Bandwidth		TTEL_OCCBW 2.00.01	-	-	
Testware	Sideband Spectrum		February 2017	-	-	
Testware	TREVA		TTEL_TREVA 2.00.00	-	-	

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

ANNEX A – TEST SETUP DETAILS

All testing is performed using the Teltest Radio EVALuation system (TREVA), which is configured as shown below. The spectrum analyzer is connected to the EUT via the attenuator network for occupied bandwidth, sideband spectrum, and ACPR tests.



END OF REPORT