

# LABORATORY TEST REPORT

## RADIO PERFORMANCE MEASUREMENTS

for the

TBCB1B Base Station Transceiver

Tested in accordance with:

FCC 47 CFR Parts 22, 74 & 90

RSS-119 Issue 12  
RSS-Gen Issue 4

Report Revision: 1  
Issue Date: 13-July-2015

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\_\_\_\_\_  
Test Technician

CHECKED & APPROVED BY: M. C. James  
\_\_\_\_\_  
Laboratory Technical Manager



OATS FCC LISTING REGISTRATION: 837095  
OATS 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: CASTBCB1B  
IC : 737A-TBCB1B

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Report Revision: 2  
Issue Date: 13-July-2015

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## REVISION

<b>Date</b>	<b>Revision</b>	<b>Comments</b>
8-June-2015	1	Initial test report
13-July-2015	2	RSS-119 updated to issue 12 – No change in results or relevant limits

## INTRODUCTION

Type approval testing of the TBCB1B 100 Watt Base Station transceiver in order to demonstrate compliance with FCC 47 Parts 22, 74 & 90, and RSS-119 Issue 12 & RSS-Gen Issue 4. This Class-2 Permissive Change report adds Analogue FM to the list of modulations supported. The original test report is TARF 3490.

### REPORT PREPARED FOR

Tait Communications  
PO Box 1645  
558 Wairakei Road  
Christchurch  
New Zealand

### DESCRIPTION OF SAMPLE

Manufacturer Tait Limited  
Equipment: Base Station Transceiver  
Type: TBCB1B  
Sales Package Code TB9435-B3M0-0000-A1AA-10  
Frequency range 148 → 174 MHz  
Transmit Power 100W

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
Analogue	FM	12.5 kHz	1	~	~

### HARDWARE & SOFTWARE – Analogue Modulation Testing

Quantity: 1 of each

Description	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter	T01-01103-DAAA	18184237	p25-trunk.20150508T172430	00.11
Power Amplifier	T01-01121-DBAA	18184285	0.01.00.trunk.360976.20140918 T113436.0002	0006
PMU	TBA30A0-0100	18183953	0316	00.03
Front Panel	T01-01110-AAAA	18184275	0.01.00.trunk.375640.20150225 T133901.0002	00.04

TEST CONDITIONS

All testing was performed between 3<sup>rd</sup> June → 5<sup>th</sup> June 2015, and under the following conditions:

Ambient temperature: 15°C → 30°C

Relative Humidity: 20% → 75%

Standard Test Voltage 120 V<sub>AC</sub>

Analogue modulation is provided via an Ethernet UDP connection and is encoded according to ITU-T G.711 (μ-law).

## STATEMENT OF COMPLIANCE

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

Equipment: Base Station Transceiver  
Type: TBCB1B  
Sales Package Code: TB9435-B3M0-0000-A1AA-10  
Quantity: 1 of each

Consisting Of:

### HARDWARE & SOFTWARE – Analogue Modulation Testing

Description	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter	T01-01103-DAAA	18184237	p25-trunk.20150508T172430	00.11
Power Amplifier	T01-01121-DBAA	18184285	0.01.00.trunk.360976.20140918 T113436.0002	0006
PMU	TBA30A0-0100	18183953	0316	00.03
Front Panel	T01-01110-AAAA	18184275	0.01.00.trunk.375640.20150225 T133901.0002	00.04

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

FCC 47 CFR Parts 22, 74 & 90

RSS-119 Issue 12 & RSS-Gen Issue 4

**Signature:** \_\_\_\_\_

M. C. James  
Laboratory Technical Manager

**Date:** \_\_\_\_\_

## MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

### MODULATION TYPES:

F3E Analogue Frequency Modulation (FM)

### EMISSION DESIGNATORS:

Channel Spacing 12.5 kHz	
FM	11K0F3E

### CALCULATIONS

FM

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 Bandwidth

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

## TEST RESULTS

### TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603D 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 50 W transmit power.

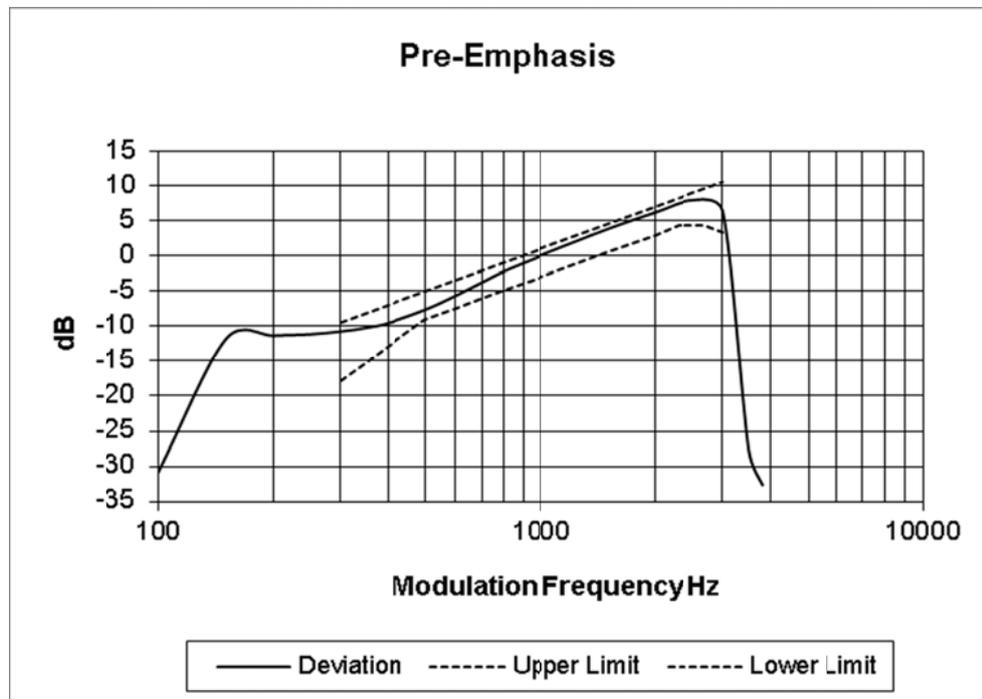
NOTE: The upper audio frequency tested was 3800 Hz due to the 8000 Hz sample rate of the modulating signal.

LIMIT CLAUSE: TIA/EIA-603D 3.2.6

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 148.100 MHz

12.5 kHz Channel Spacing

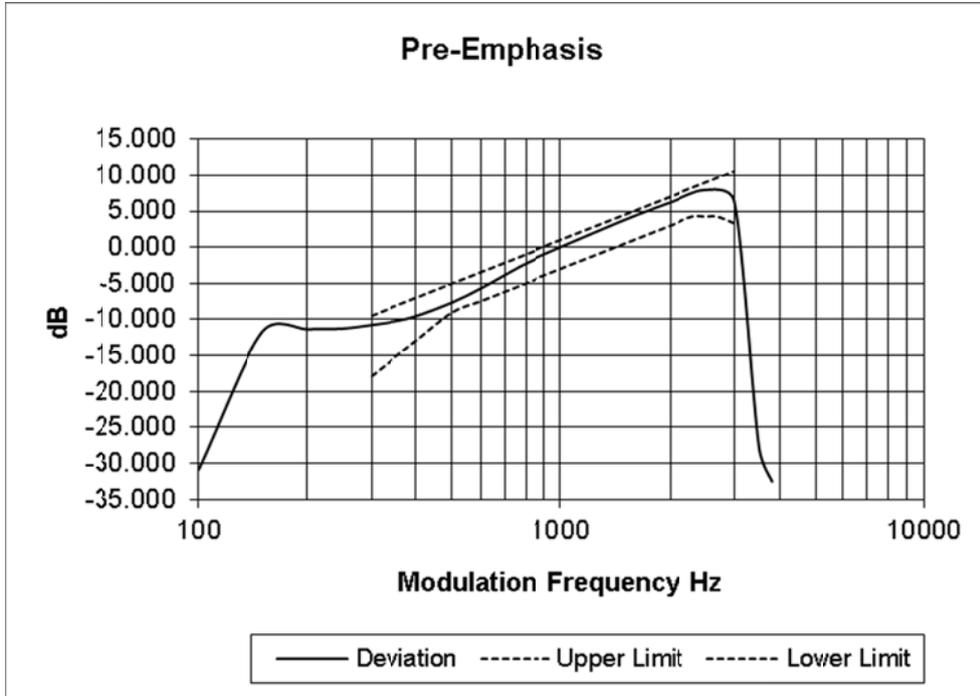


### Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 149.800 MHz

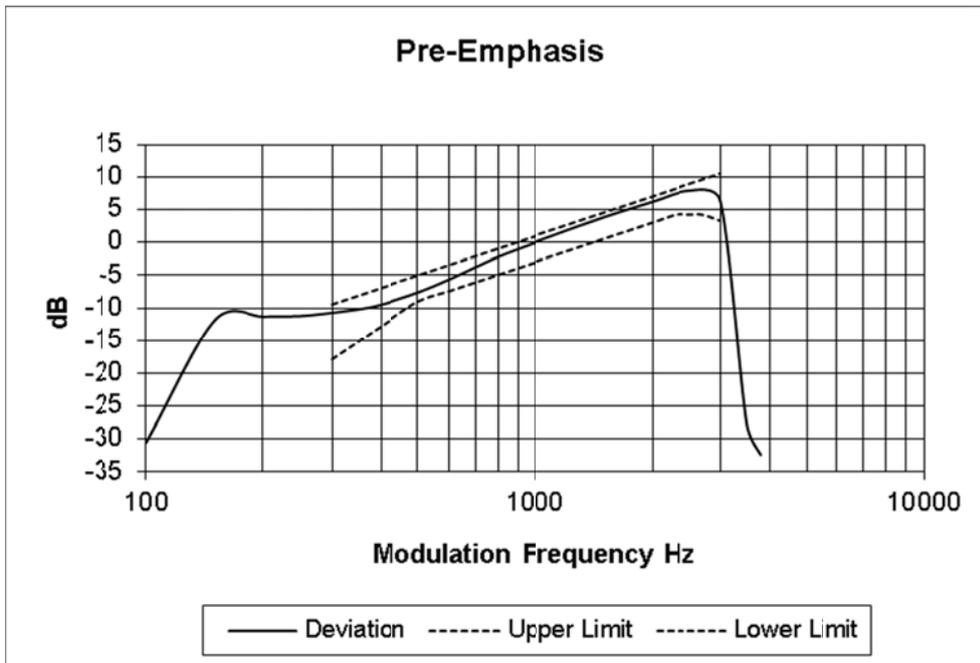
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 151.100 MHz

12.5 kHz Channel Spacing

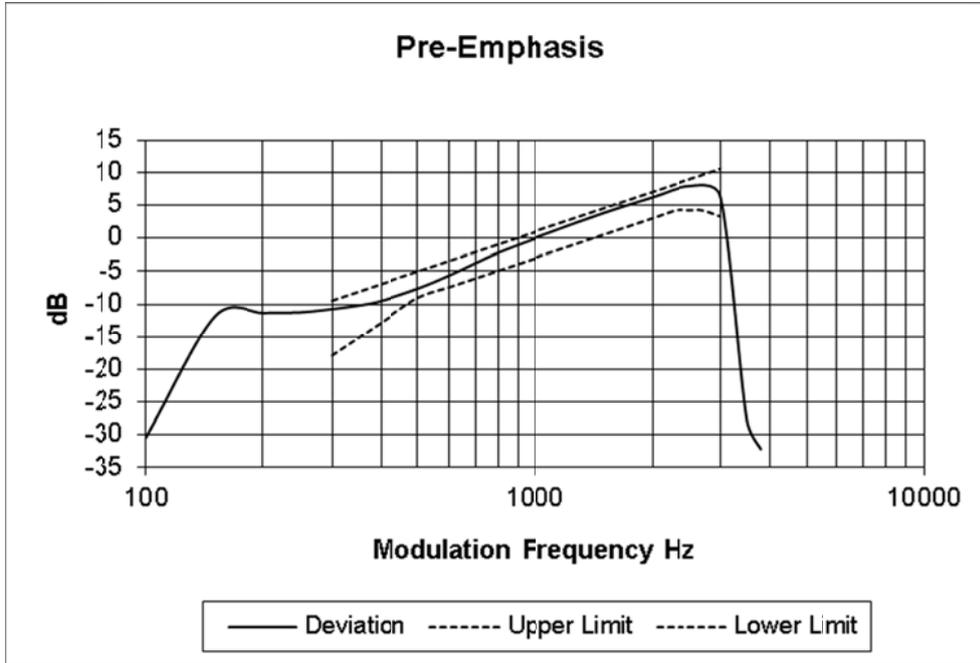


### Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 153.100 MHz

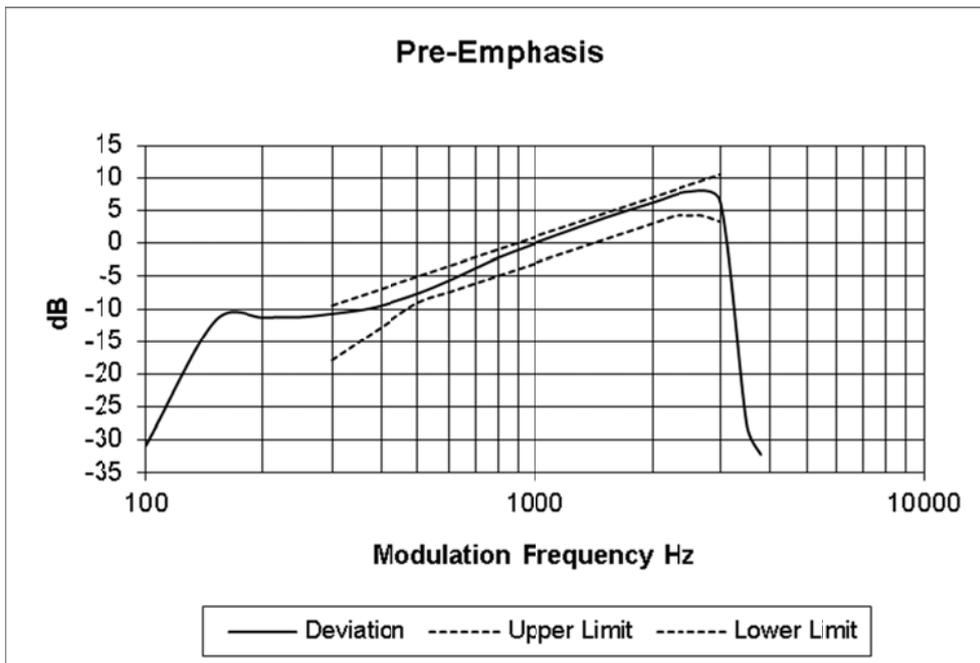
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 155.100 MHz

12.5 kHz Channel Spacing

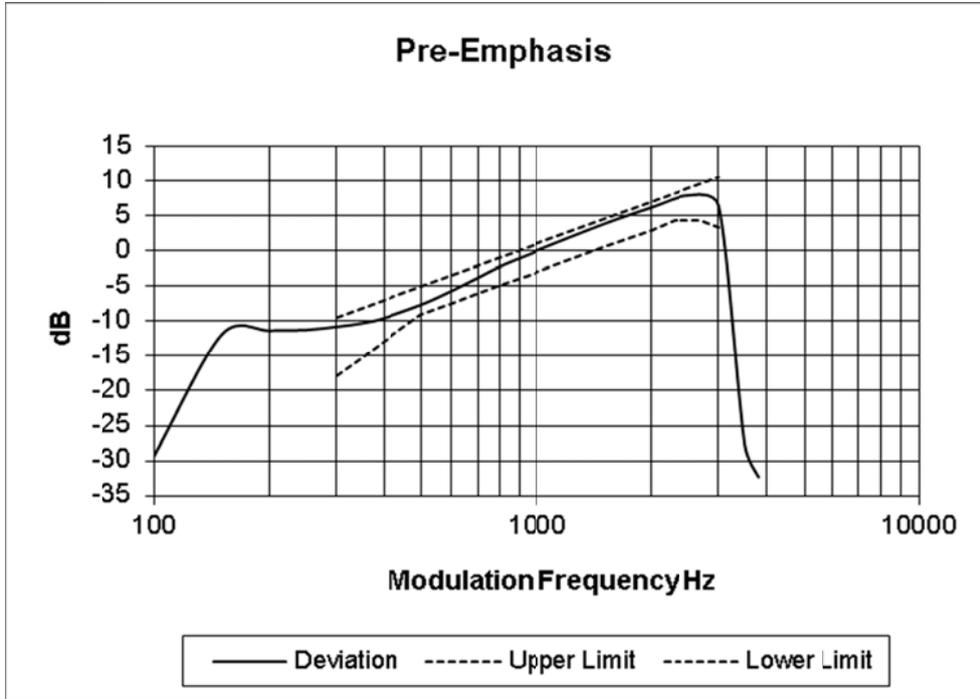


### Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 159.100 MHz

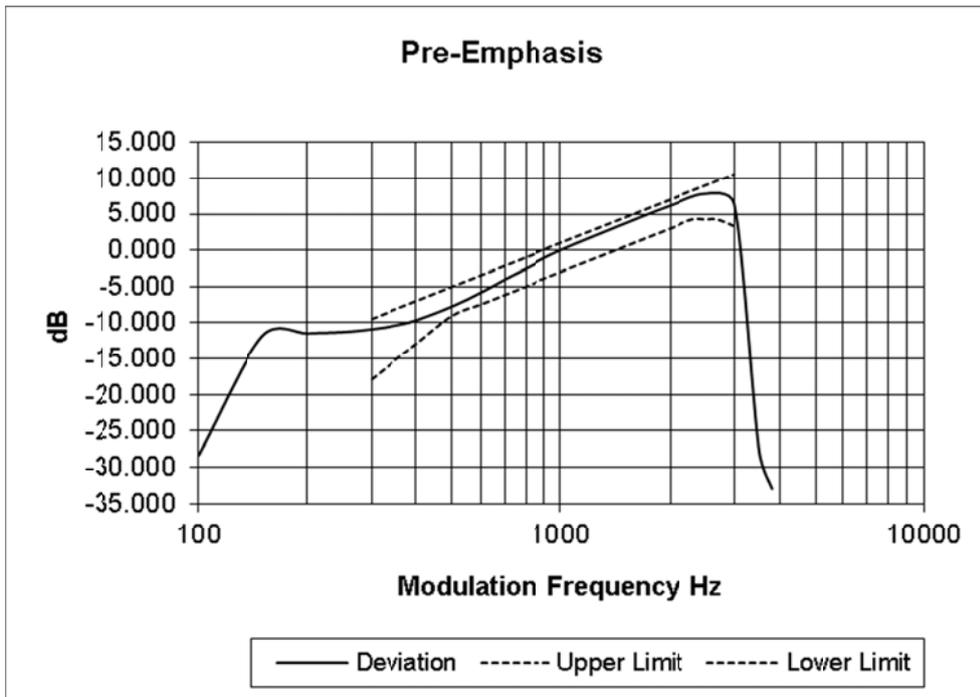
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 173.100 MHz

12.5 kHz Channel Spacing



## TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

GUIDE: TIA/EIA-603D 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.

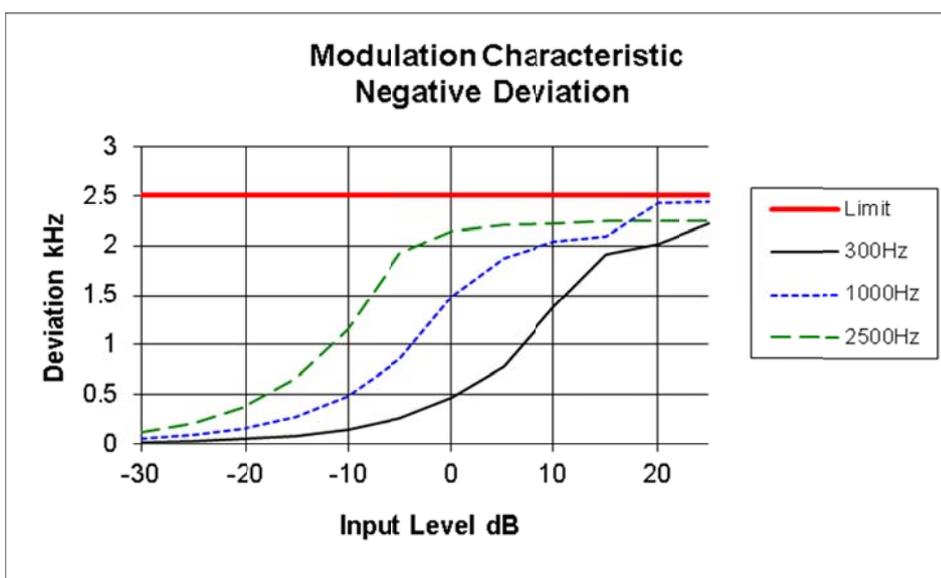
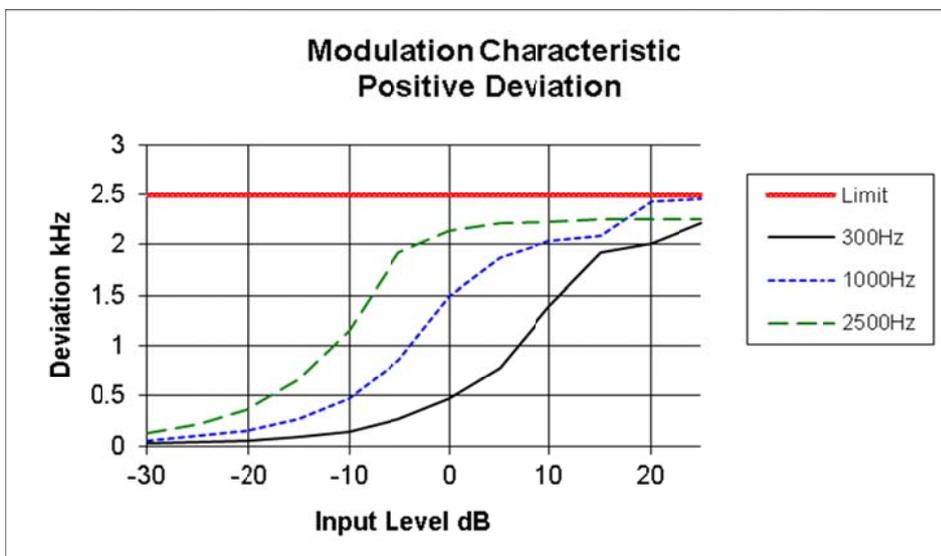
### MEASUREMENT RESULTS:

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

LIMIT CLAUSE: TIA/EIA-603D 1.3.4.4

Tx FREQUENCY: 148.100 MHz

12.5 kHz Channel Spacing

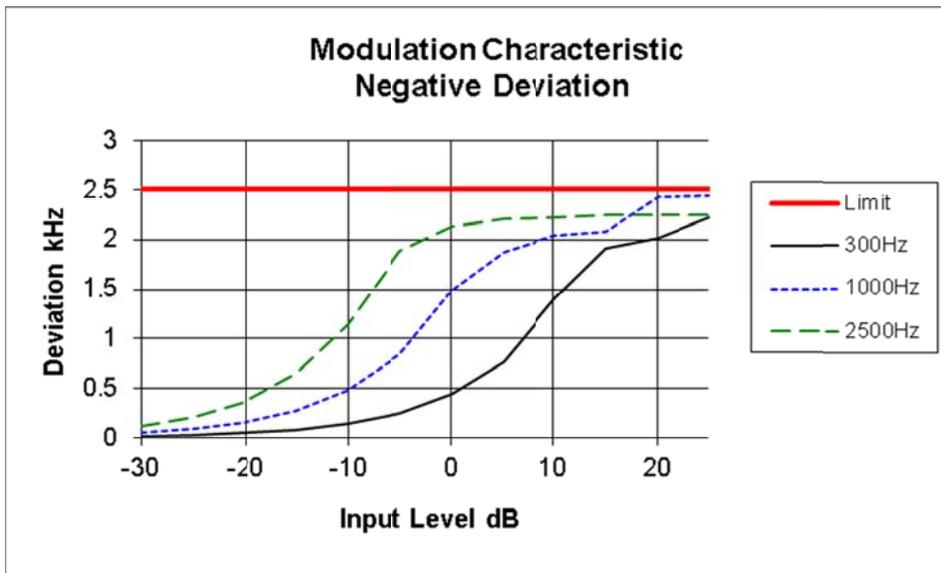
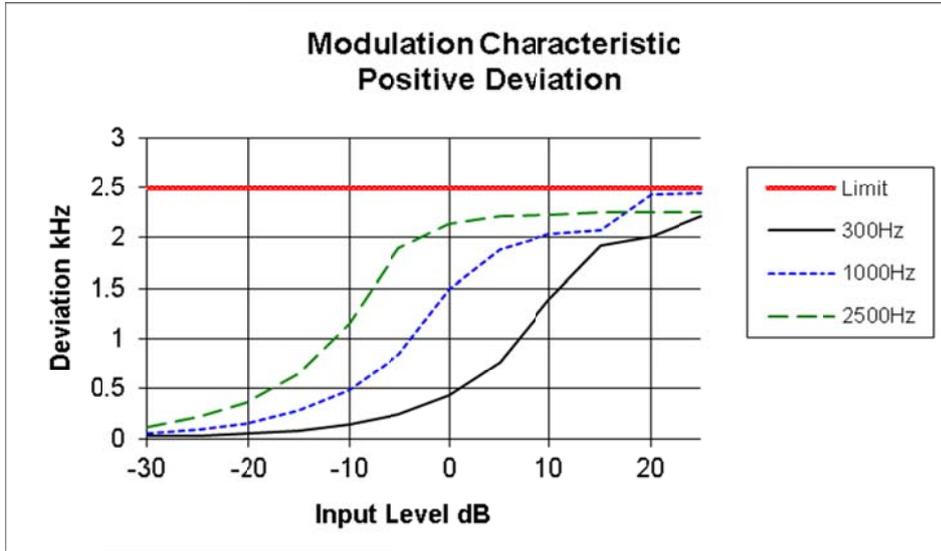


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 149.800 MHz

12.5 kHz Channel Spacing

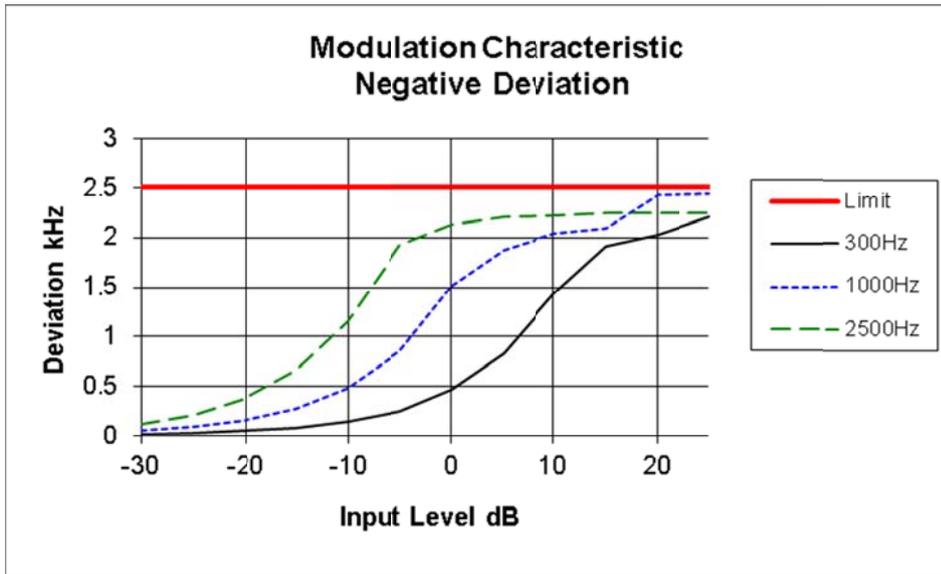
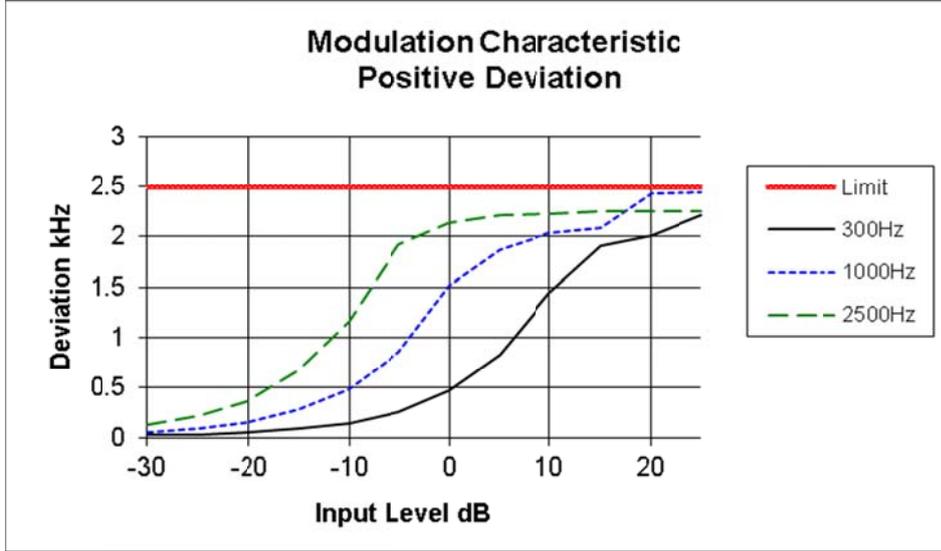


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 151.100 MHz

12.5 kHz Channel Spacing

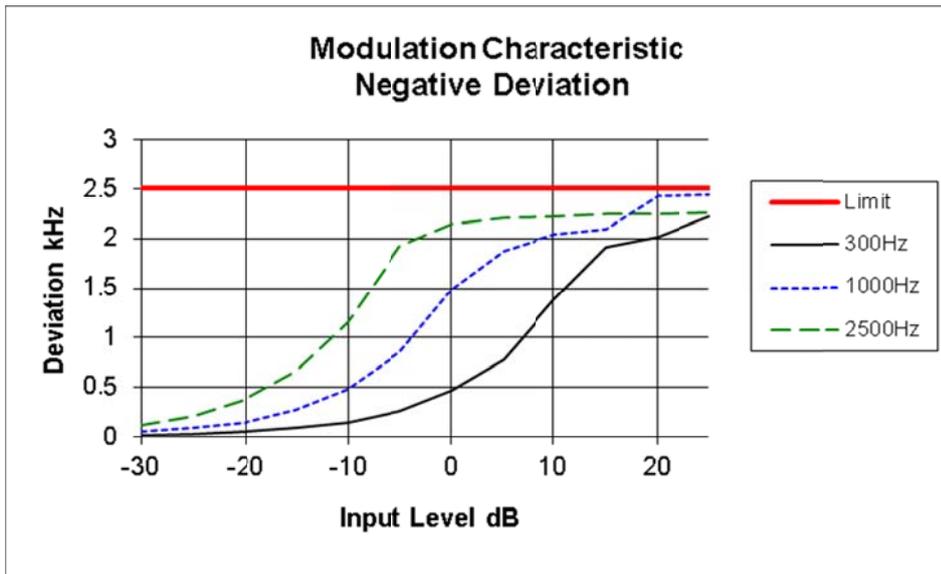
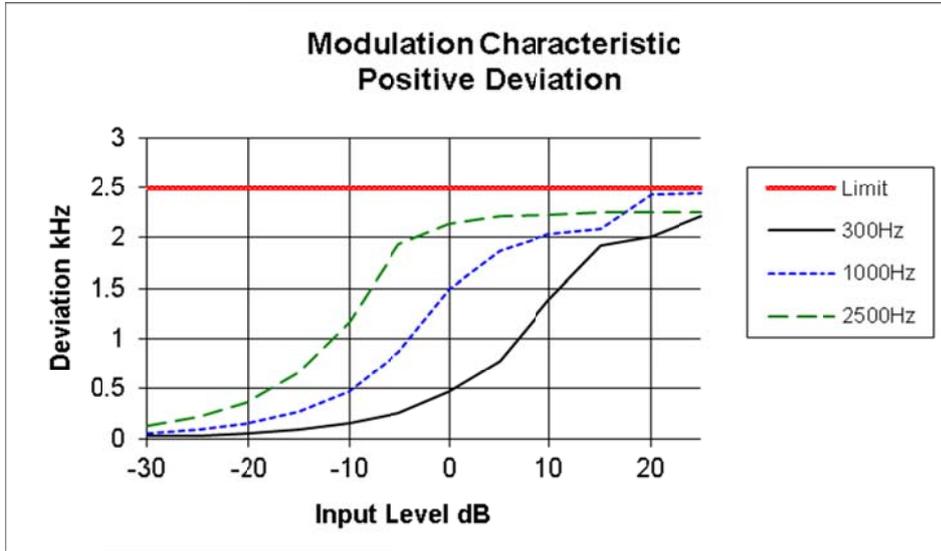


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 153.100 MHz

12.5 kHz Channel Spacing

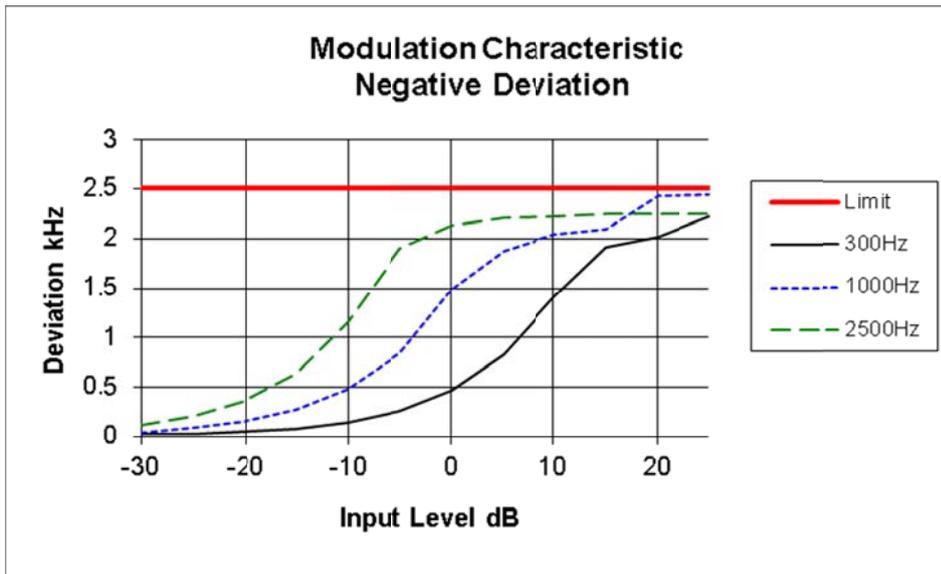
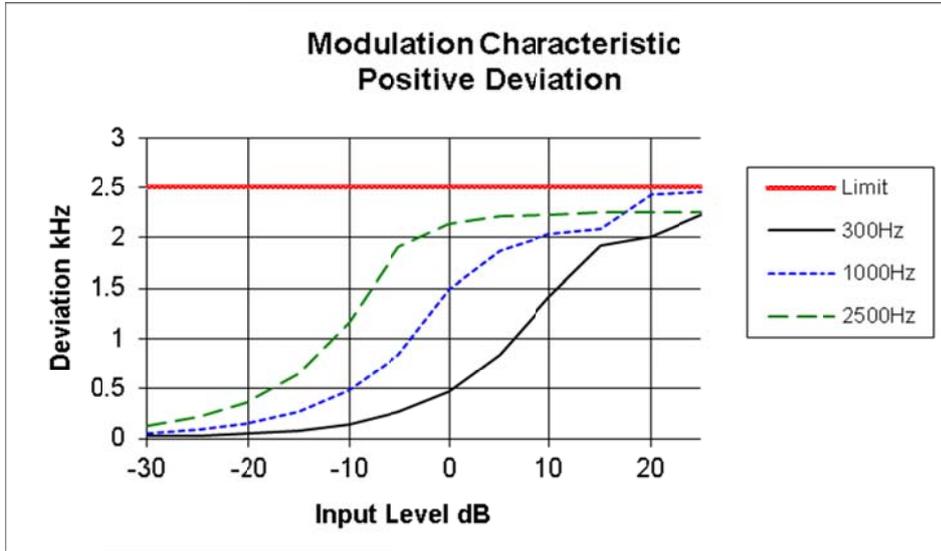


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 155.100 MHz

12.5 kHz Channel Spacing

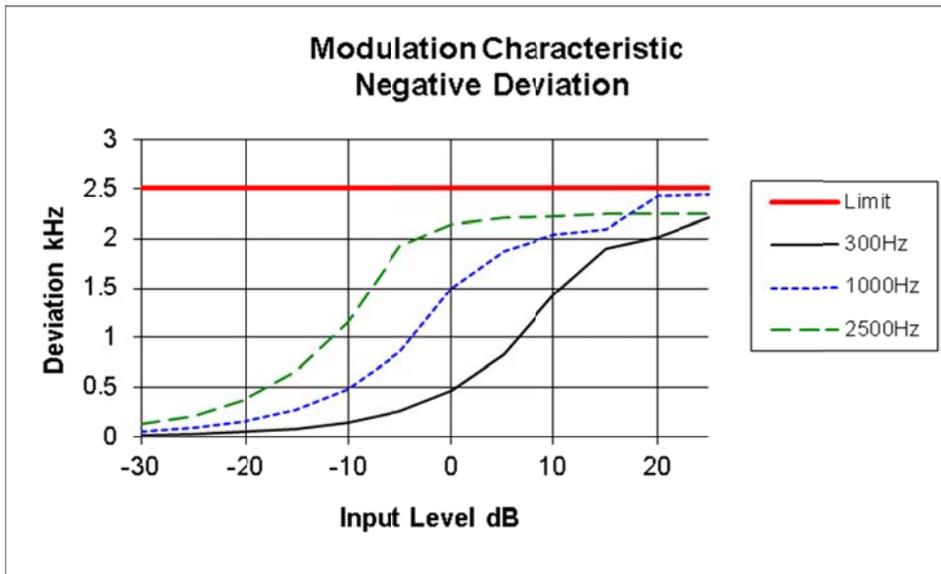
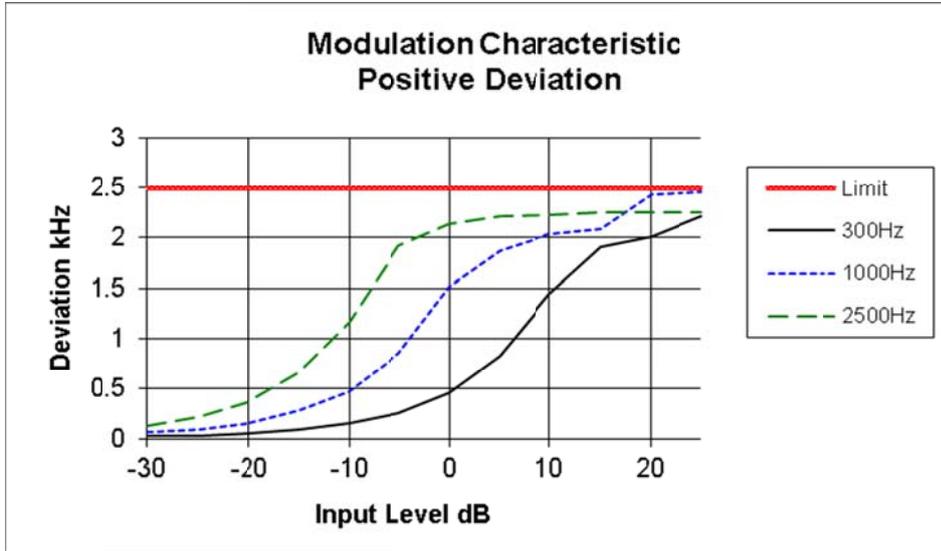


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 159.100 MHz

12.5 kHz Channel Spacing

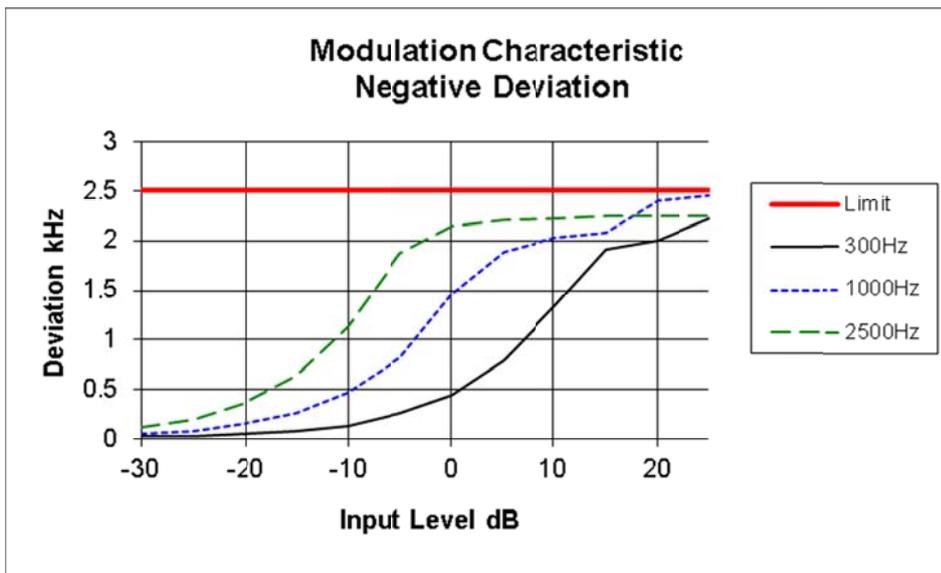
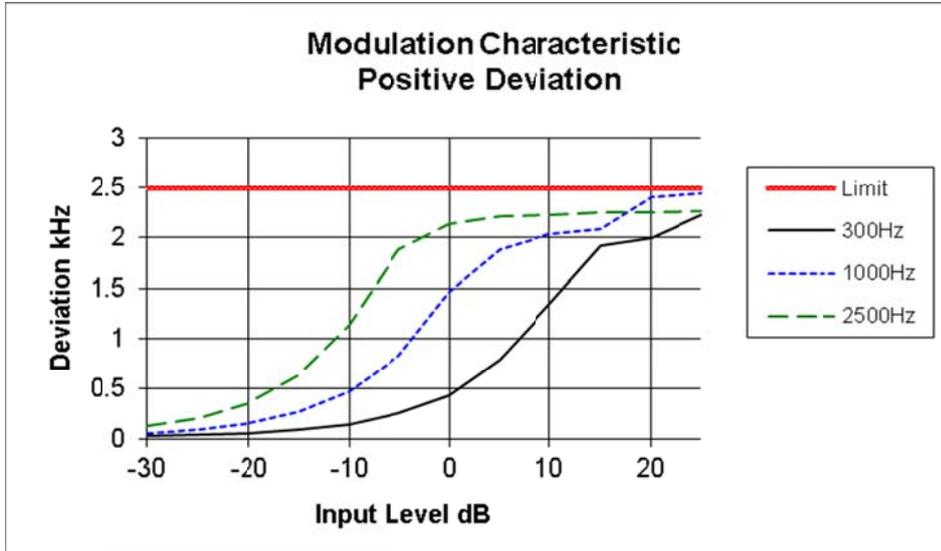


### Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 173.100 MHz

12.5 kHz Channel Spacing



TRANSMITTER OCCUPIED BANDWIDTH AND SPECTRUM MASKS

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

GUIDE: TIA/EIA-603D 2.2.11

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.
2. For 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.
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.

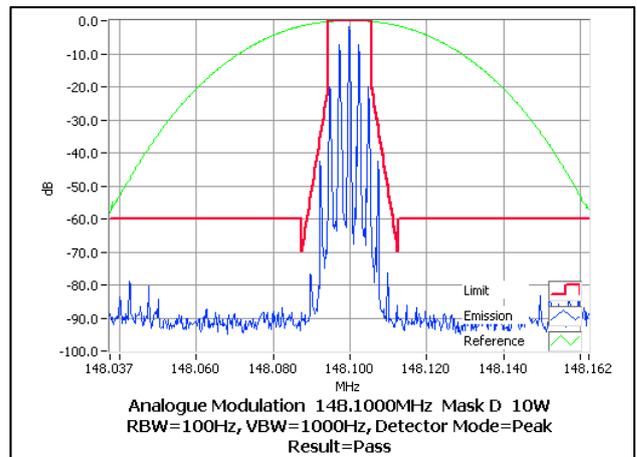
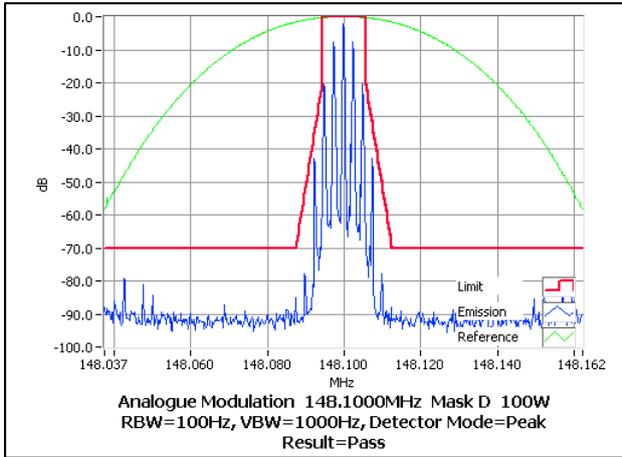
LIMIT CLAUSE: FCC 47 CFR 90.210 RSS-119 5.5

EMISSION MASKS

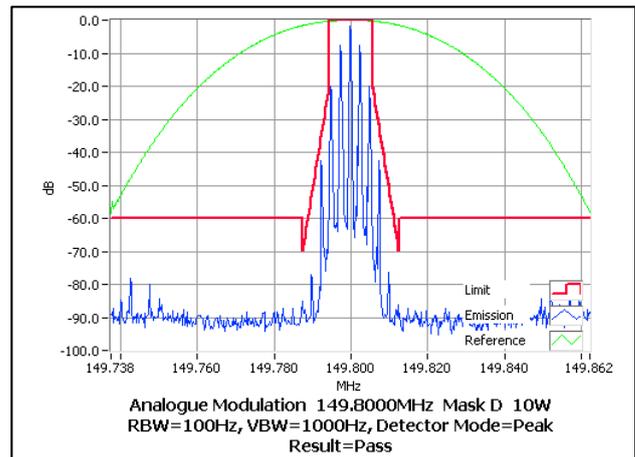
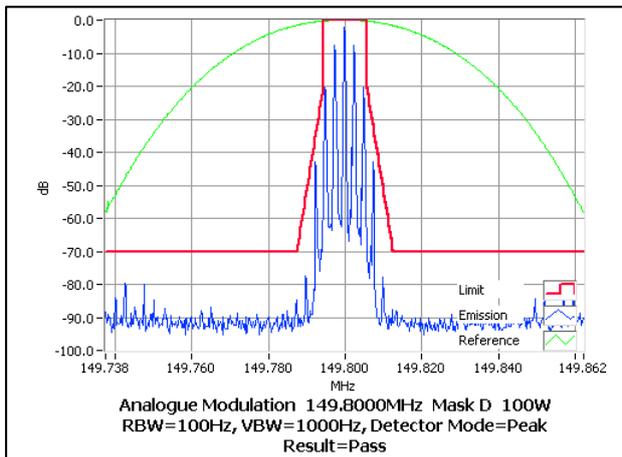
Emission Mask D 12.5 kHz Channel Spacing Analog

### Occupied Bandwidth and Spectrum Masks

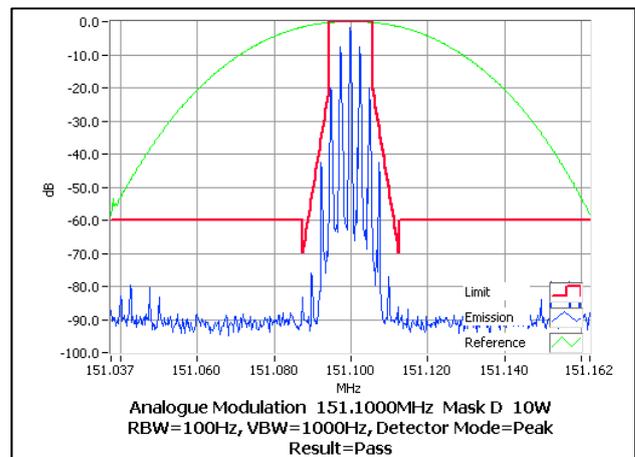
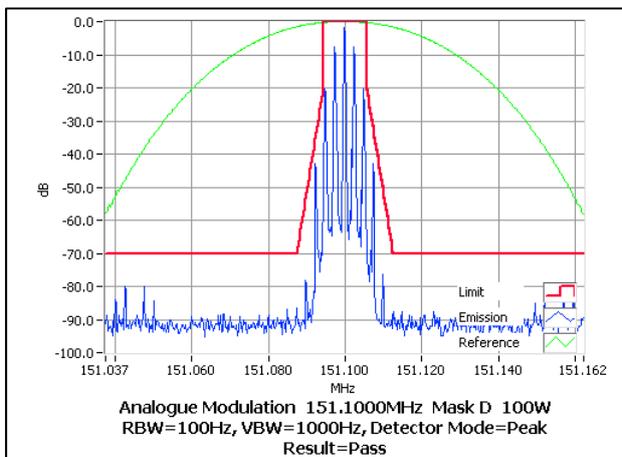
Tx FREQUENCY: 148.100MHz 100 W & 10 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 149.800MHz 100 W & 10 W 12.5 kHz Channel Spacing

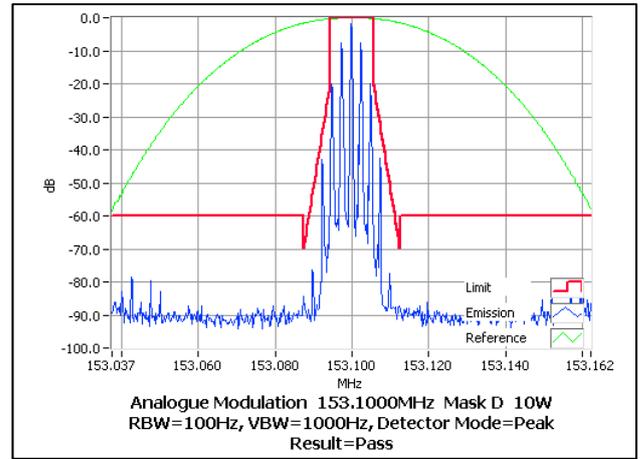
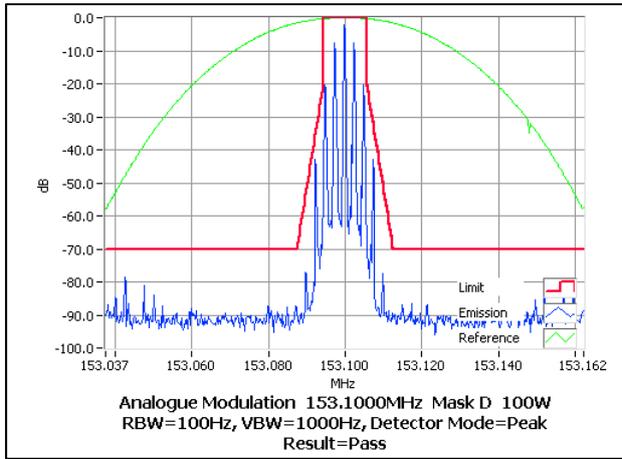


Tx FREQUENCY: 151.100 MHz 100 W & 10 W 12.5 kHz Channel Spacing

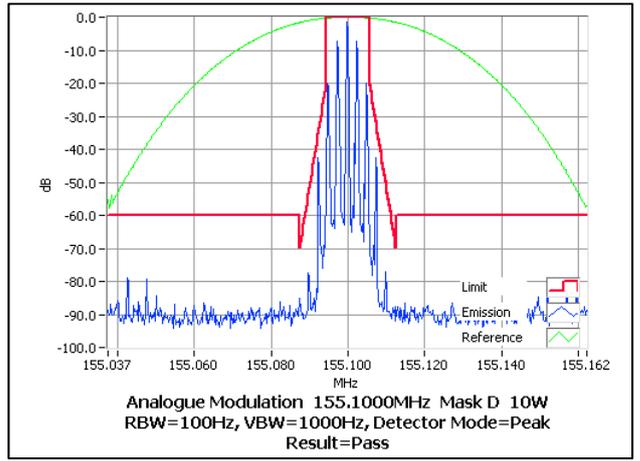
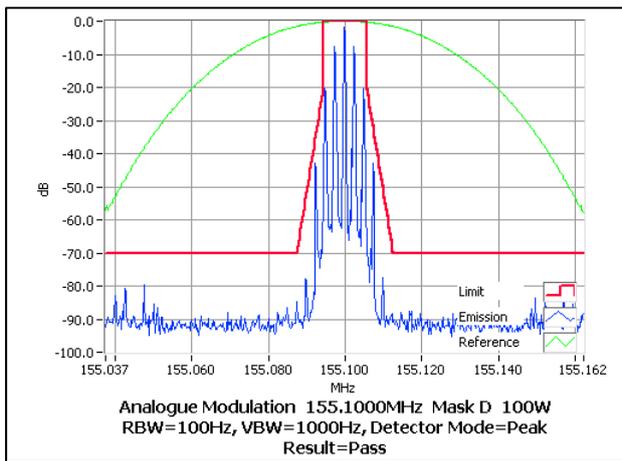


### Occupied Bandwidth and Spectrum Masks

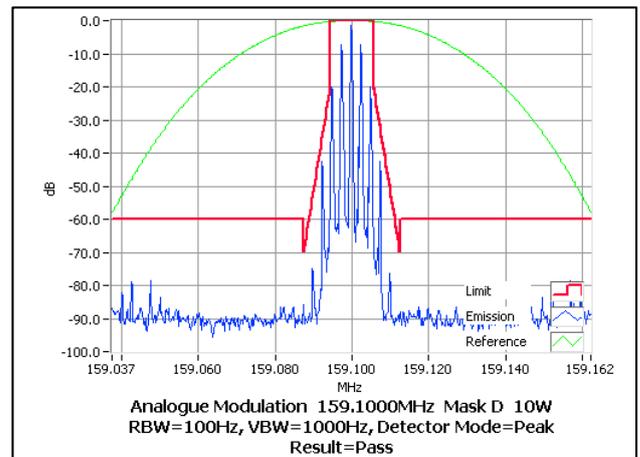
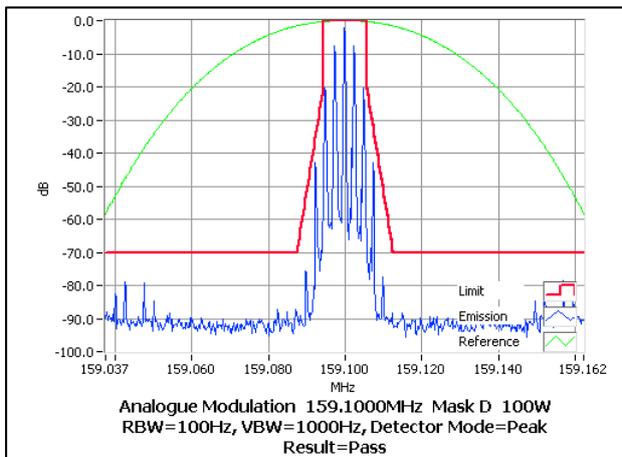
Tx FREQUENCY: 153.100 MHz 100 W & 10 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 155.100 MHz 100 W & 10 W 12.5 kHz Channel Spacing

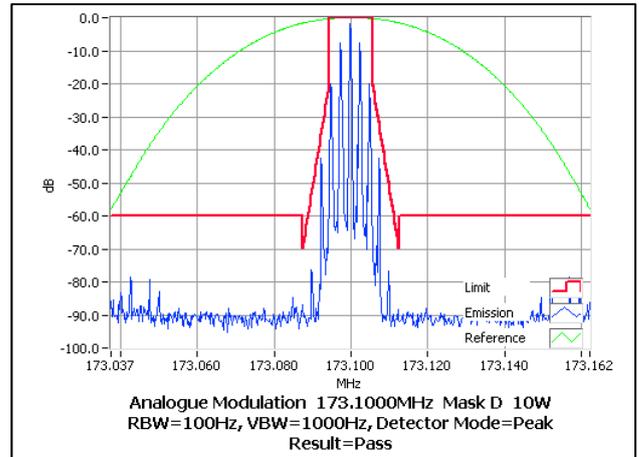
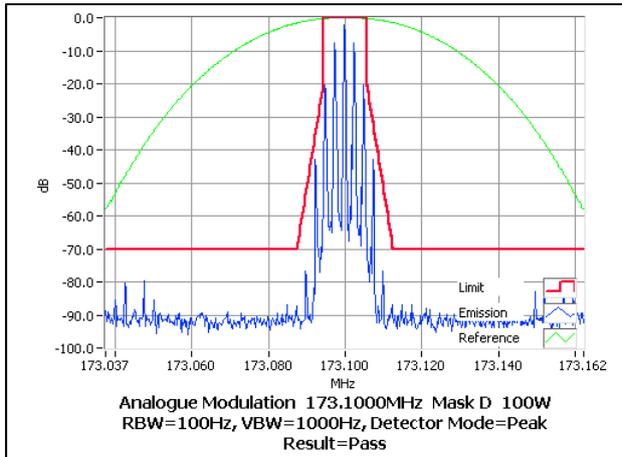


Tx FREQUENCY: 159.100 MHz 100 W & 10 W 12.5 kHz Channel Spacing



### Occupied Bandwidth and Spectrum Masks

Tx FREQUENCY: 173.100 MHz      100 W & 10 W      12.5 kHz Channel Spacing



## TEST EQUIPMENT LIST

No#	Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
27	Power Supply	AC Variac	Yamabishi	S-260-5	TX-533	E1737	
33	Spectrum Analyser	26.5GHz	Agilent	PXAN9030A	MY49432161	E4907	6-Jul-16
51	RFA attenuator	TREVA2 20dB 150W	Weinschel	40-20-33	CJ405	E3733	15-Oct-15
90	Modulation Analyser	TREVA2	Hewlett Packard	HP8901B (Opt 02)	3704A05837	E3786	18-Oct-15
97	RFA attenuator	TREVA2 3dB	Weinschel	Model 1	BL9950	E4080	
101	RF Combiner	TREVA2	Minicircuits	ZFSC-4-1	-	E4084	
103	Spectrum Analyser	13.2GHz	Agilent	E4445A	MY42510072	E4139	22-Oct-16
117	Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack5	E4850	14-Oct-15
127	Power Meter	TREVA2 Power Head for HP8901	Hewlett Packard	HP11722A	2716A02037	1575	18-Oct-15
133	TREVA2		Teltest	-	2	-	3-Nov-15

\* 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 **EVAL**uation system (TREVA), which is configured as shown below. The Spectrum Analyser is connected to the EUT via the attenuator network for Conducted Emissions testing, and Occupied Bandwidth.

