

Laboratory Test Report

For the
TPCL3A Handportable Transceiver

Tested In accordance with

FCC 47 CFR Part 90

Report Revision: 1
Issue Date: 10-March-2009
FCC ID: CASTPCL3A

PREPARED BY: Garry Pringle _____
Test Technician

CHECKED & APPROVED BY: Steve Crompton _____
Laboratory Manager



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

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REVISION HISTORY

Date	Revision	Comments
10-March-2009	1	Initial test report

INTRODUCTION

Type Approval Testing of the
T03-00003-FAAA
Serial No 25084005
Tx = 896 → 941 MHz
Rx = 935 → 941 MHz

in accordance with:

FCC CFR 47 Part 90

REPORT PREPARED FOR

Tait Electronics Ltd
PO Box 1645
558 Wairakei Rd
Christchurch
New Zealand

DESCRIPTION OF SAMPLE

Manufacturer	Tait Electronics Limited	
Equipment:	Handportable Transceiver	
Type:	TPCL3A	
Product code:	T03-00003-FAAA	
Serial Numbers:	25084005	
Quantity:	1	
Hardware & Software		
	Boot Code	QPC1B_std_1.00.00.0000
	Radio Application	QPC1C_std_1.08.00.0002

STATEMENT OF COMPLIANCE

The T03-00003-FAAA handportable transceiver as tested in this report was found to conform to the following standards:

FCC CFR 47 Part 90

TEST CONDITIONS

All testing was performed at the following conditions.

Ambient Temperature	15°C → 30°C
Relative Humidity	20% → 75%
Standard Test Voltage	7.5 V _{DC}

TEST RESULTS

TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046

GUIDE: TIA/EIA-603C 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.

MEASUREMENT RESULTS:

Manufacturer's Rated Output Power: Switchable: 3 W and 1 W

Nominal 3 W	900.9875 MHz	939.9875 MHz
Measured	2.8	2.8
Variation (%)	-6.7	-6.7
Nominal 1 W	900.9875 MHz	939.9875 MHz
Measured	0.85	0.87
Variation (%)	-15.0	-13.0
Measurement Uncertainty		± 0.6 dB

LIMIT CLAUSE: FCC 47 CFR 90.205 (s)

Radio Type: Mobile Transceiver
 Frequency Bands: 896 MHz ~ 901 MHz
 935 MHz ~ 940 MHz

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.

TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603C 2.2.6

MEASUREMENT PROCEDURE:

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

MEASUREMENT RESULTS:

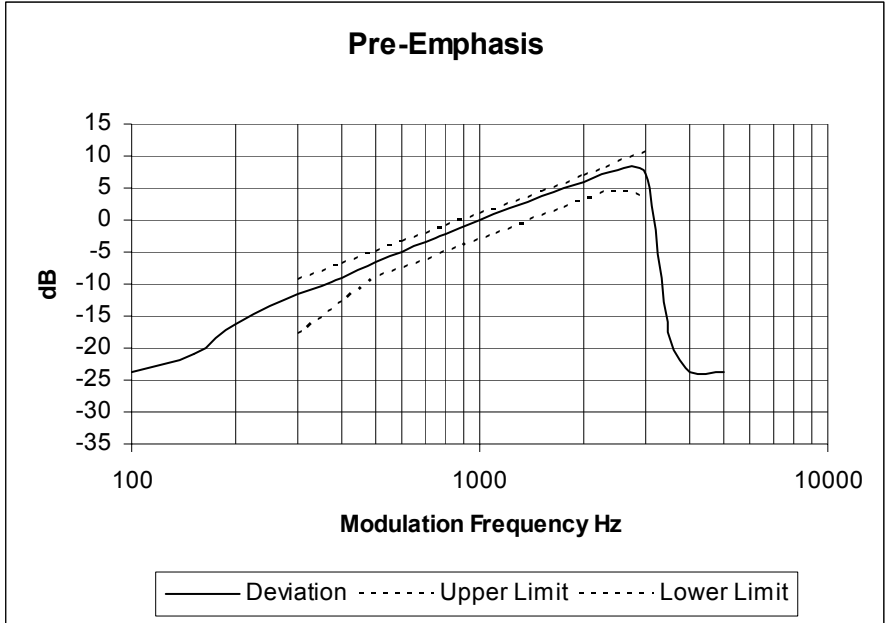
See the plots on the following pages for 12.5 kHz channel spacing.

LIMIT CLAUSE: TIA/EIA-603C 3.2.6

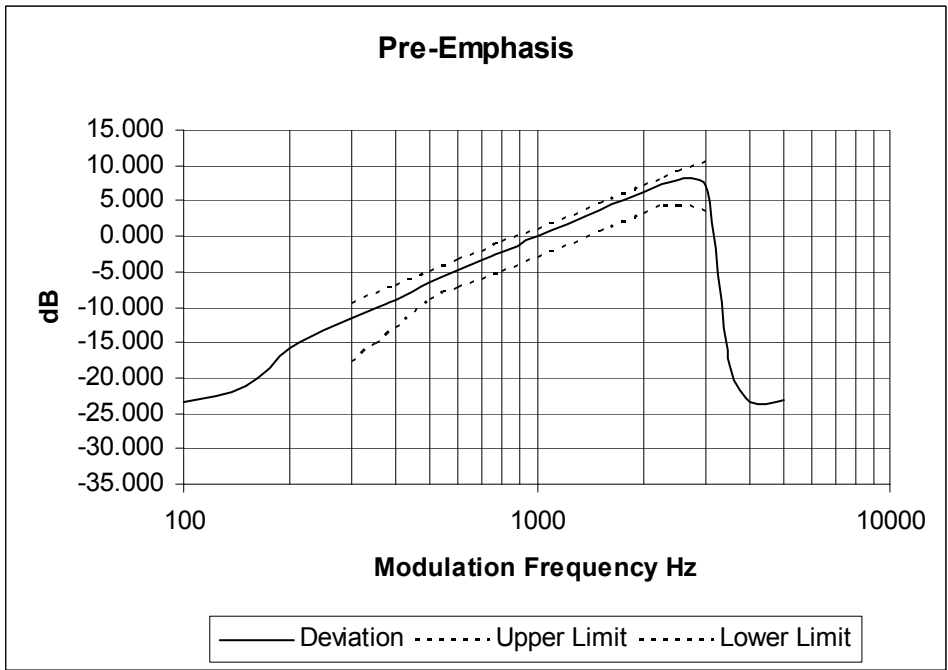
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 900.9875 MHz 12.5 kHz Channel Spacing



Tx FREQUENCY: 939.9875 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

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:

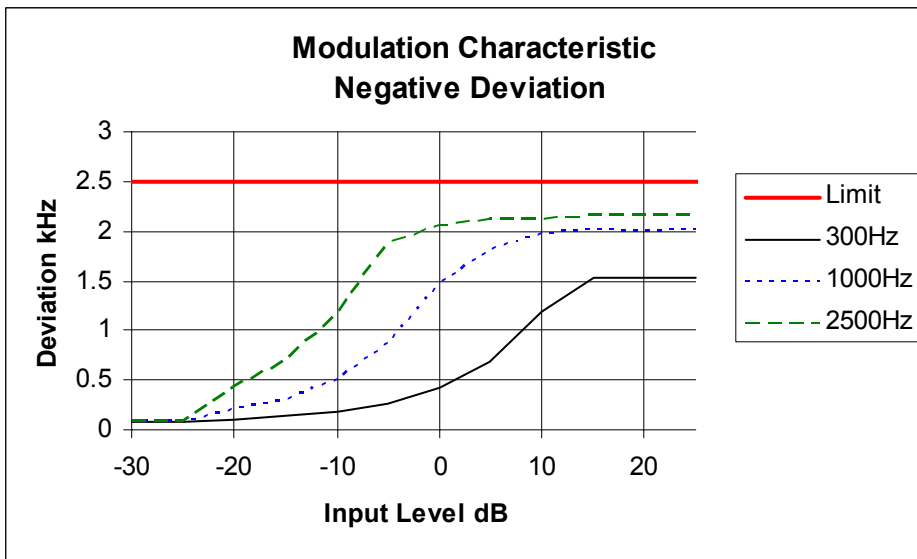
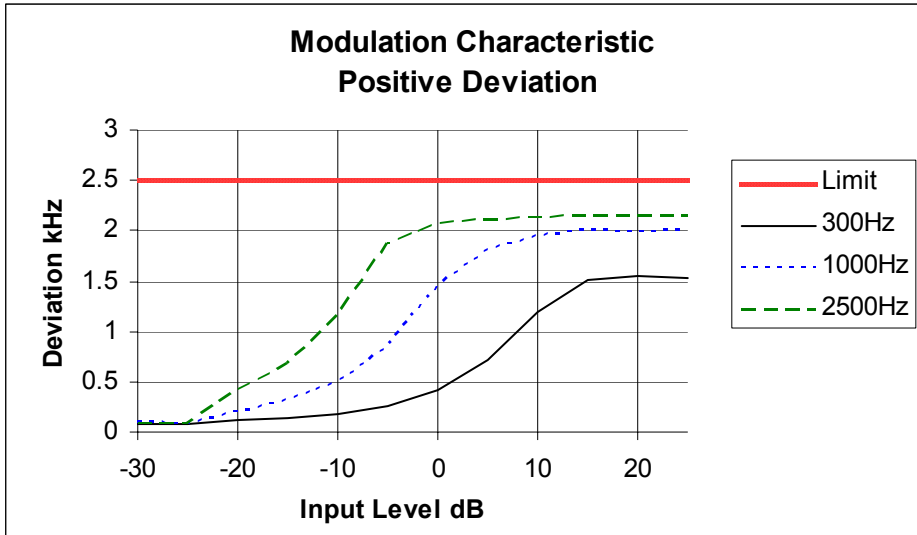
See the plots on the following pages for 12.5 kHz channel spacing.

LIMIT CLAUSE: TIA/EIA-603C 1.3.4.4

TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

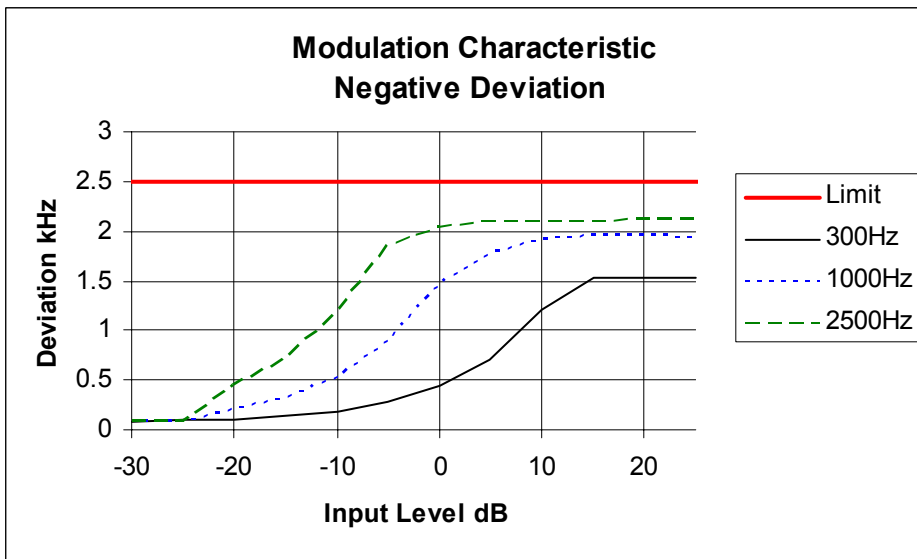
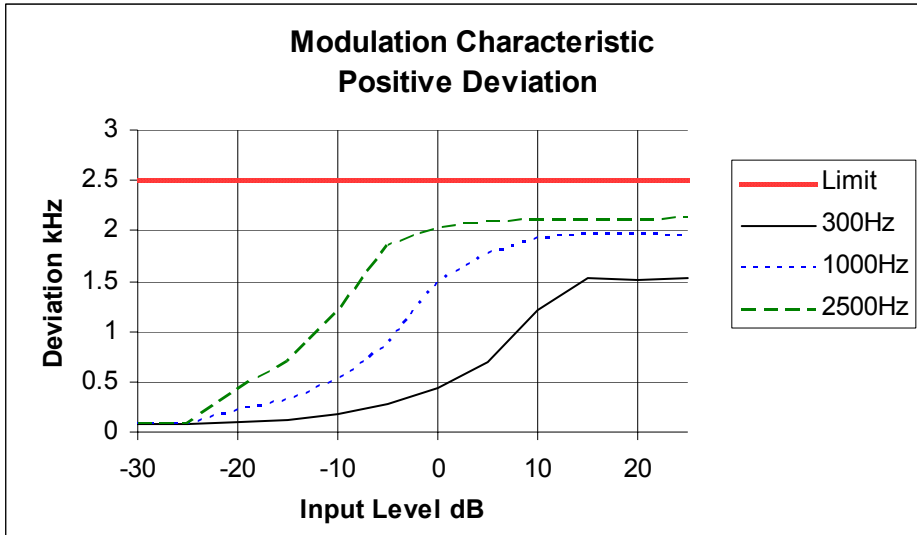
Tx FREQUENCY: 900.9875 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 939.9875 MHz 12.5 kHz Channel Spacing



OCCUPIED BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA/EIA-603C 2.2.11

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.
2. For analog measurements: The EUT was modulated by a 2500Hz tone at an input level 16dB 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 I – Resolution bandwidth = 300Hz, Video Bandwidth = 3 kHz

MEASUREMENT RESULTS:

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

LIMIT CLAUSE: FCC 47 CFR 90.210

EMISSION MASKS

Emission Mask I	12.5 kHz Channel Spacing	Analog; FFSK
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DATA SPEED

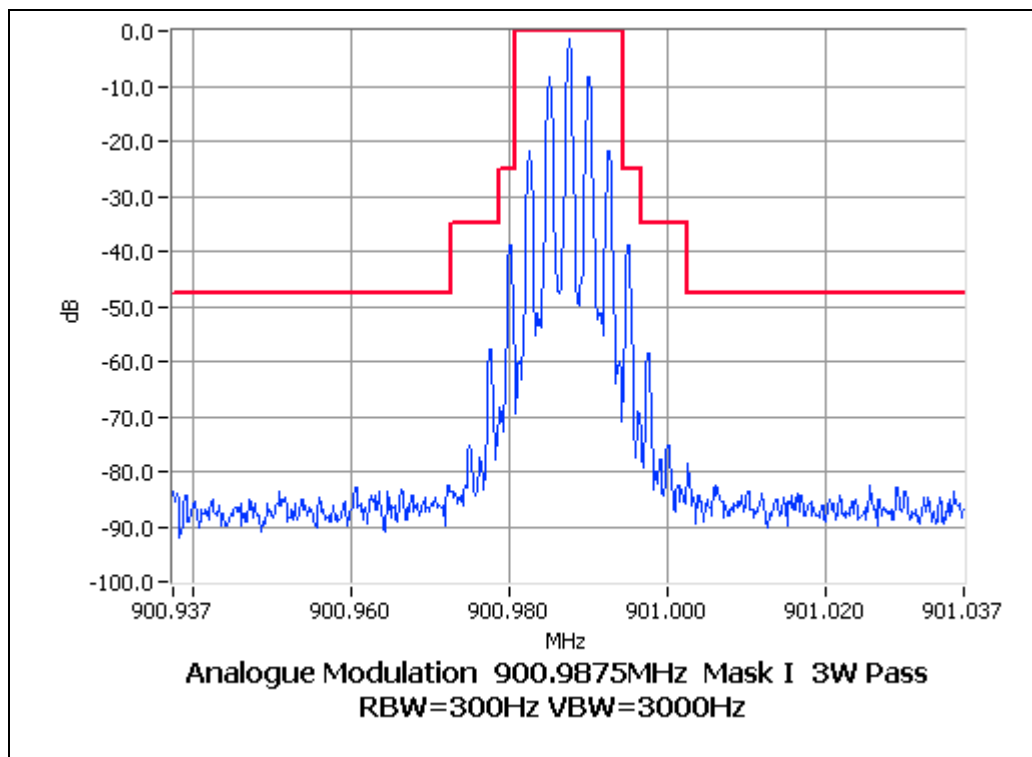
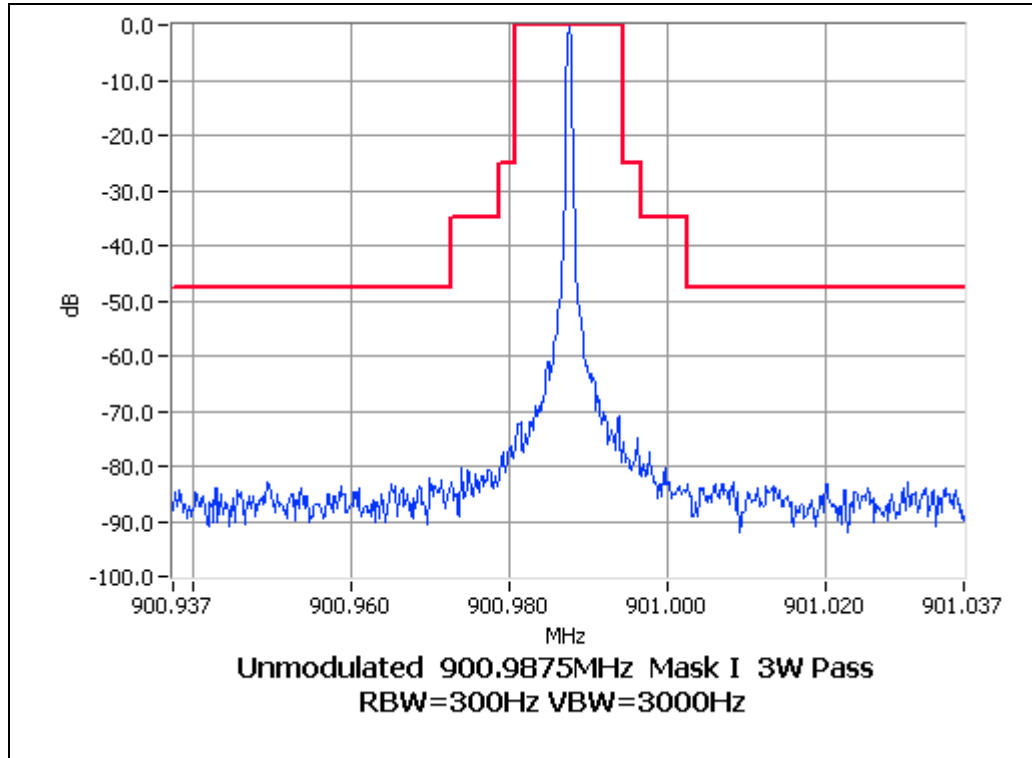
FFSK	12.5 kHz Channel Spacing	1200 bps
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OCCUPIED BANDWIDTH

ANALOG VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 900.9875 MHz 3 W 12.5 kHz Channel Spacing

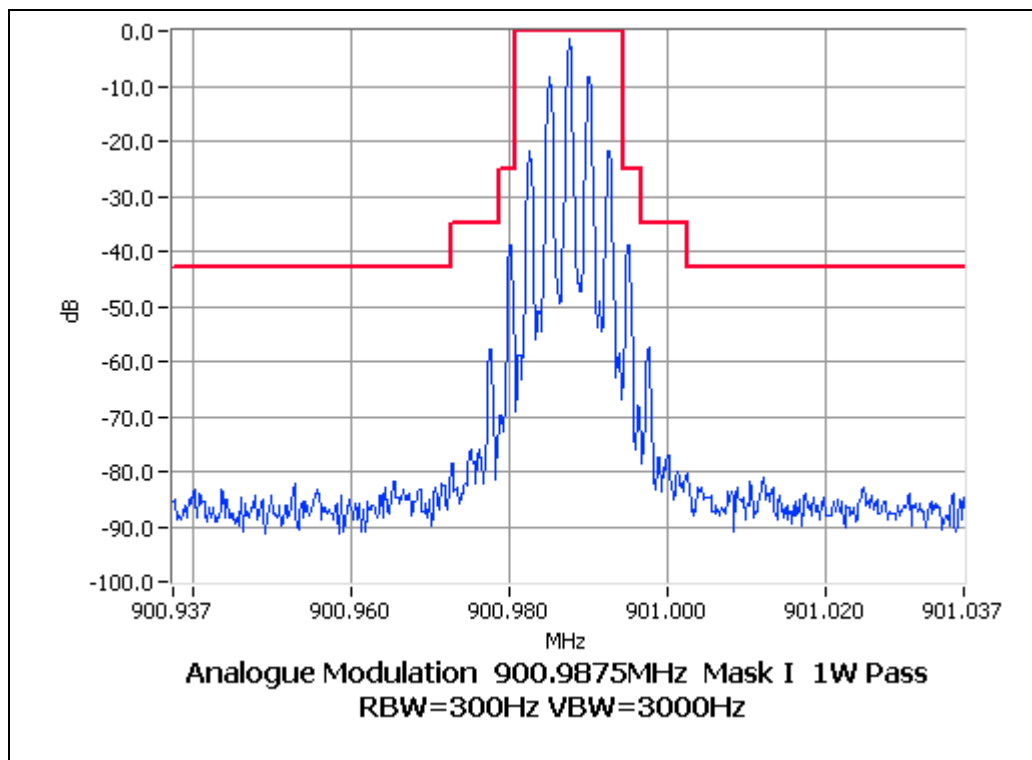
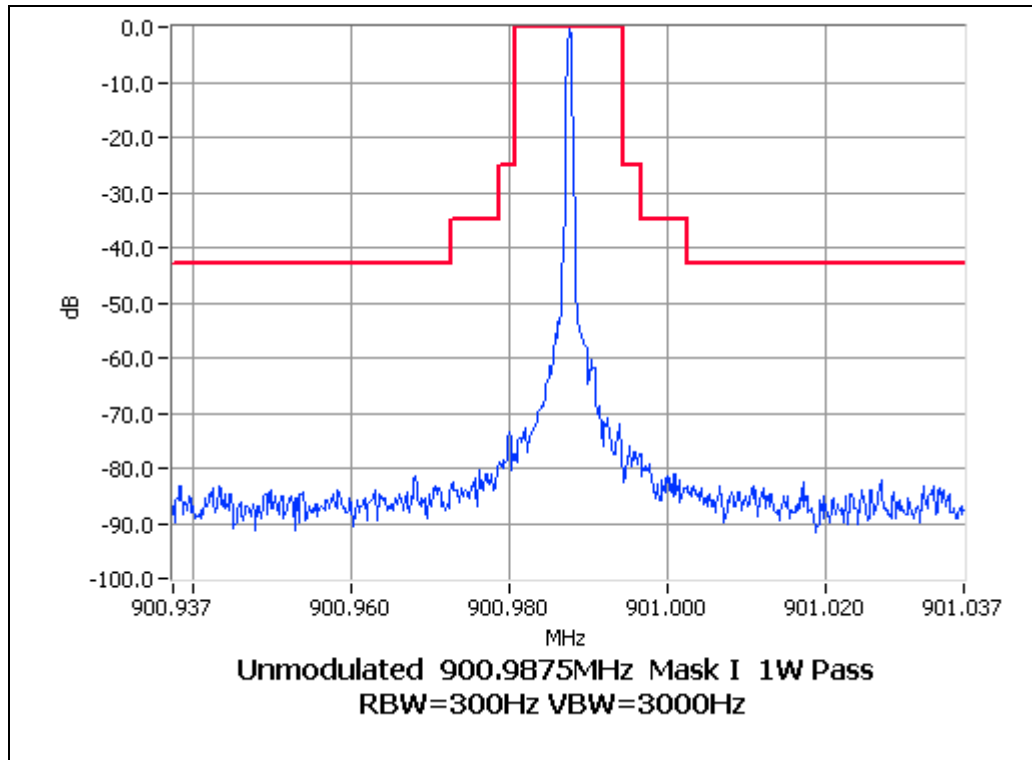


OCCUPIED BANDWIDTH

ANALOG VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 900.9875 MHz 1 W 12.5 kHz Channel Spacing

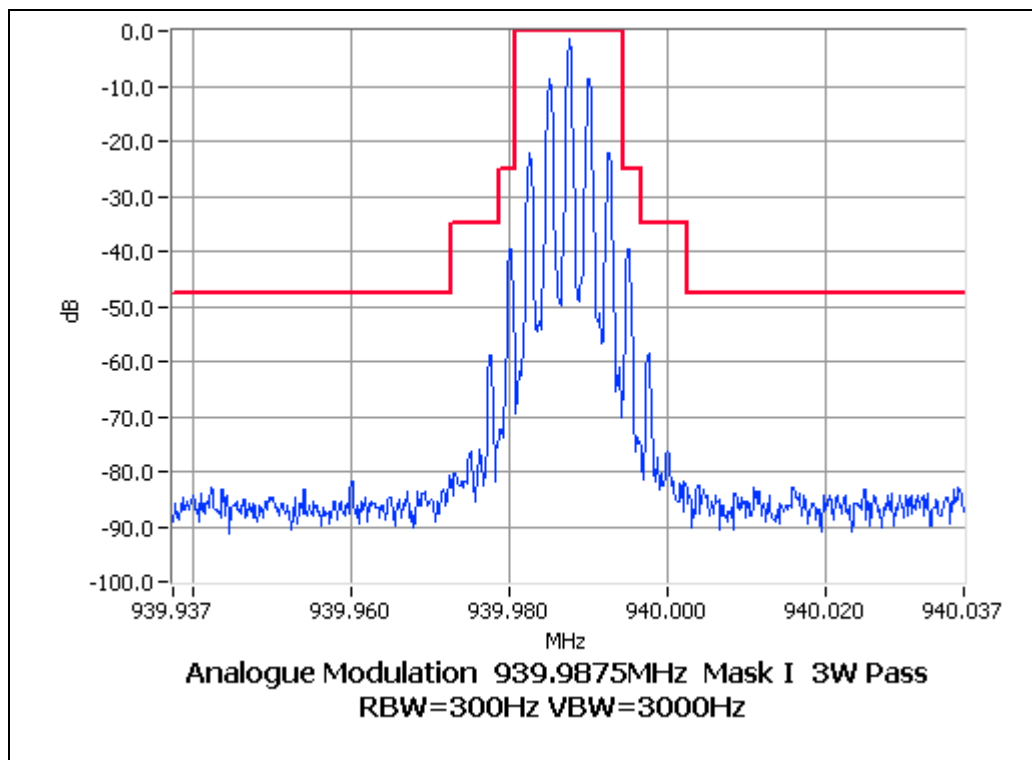
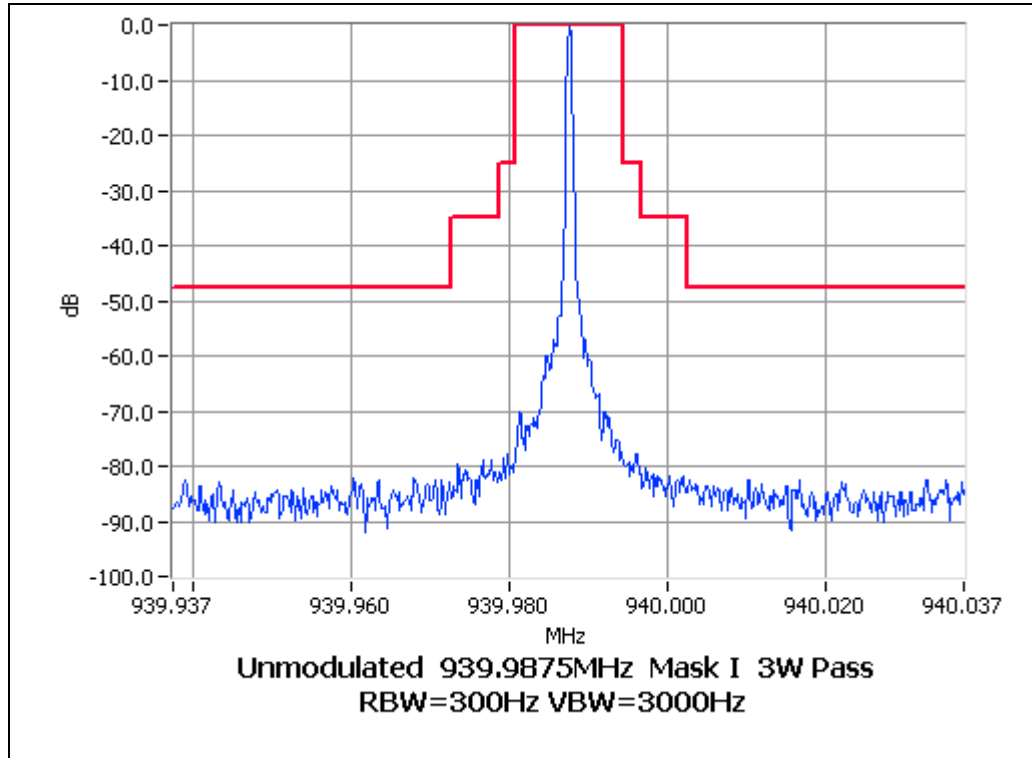


OCCUPIED BANDWIDTH

ANALOG VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 939.9875 MHz 3 W 12.5 kHz Channel Spacing

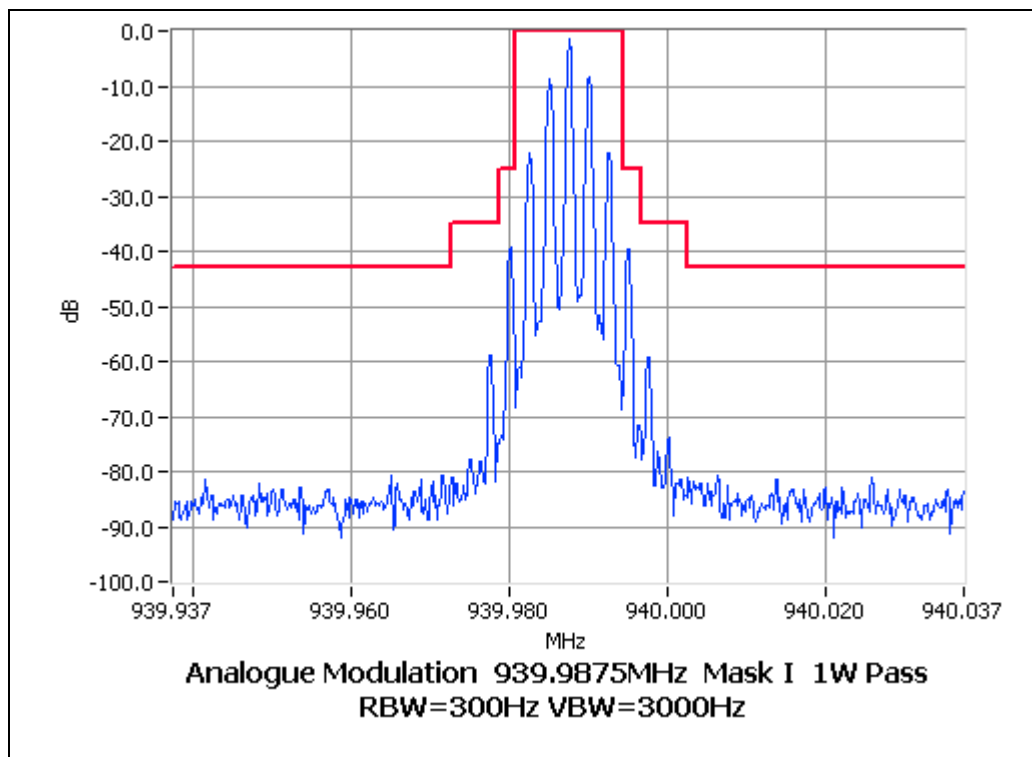
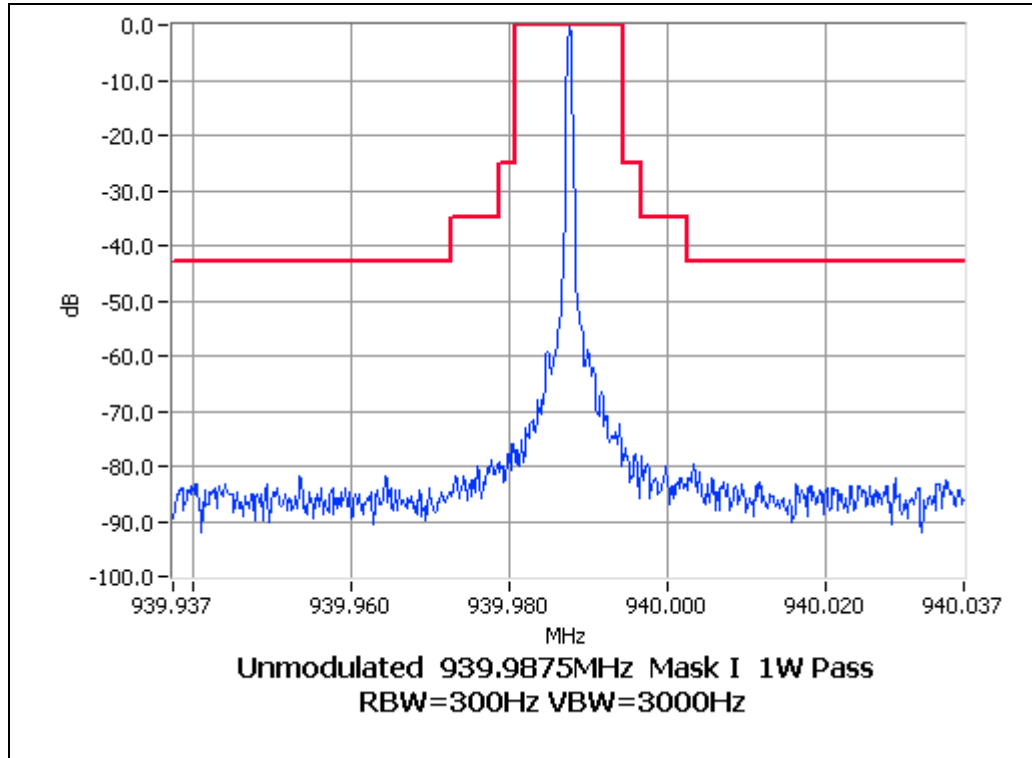


OCCUPIED BANDWIDTH

ANALOG VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 939.9875 MHz 1 W 12.5 kHz Channel Spacing

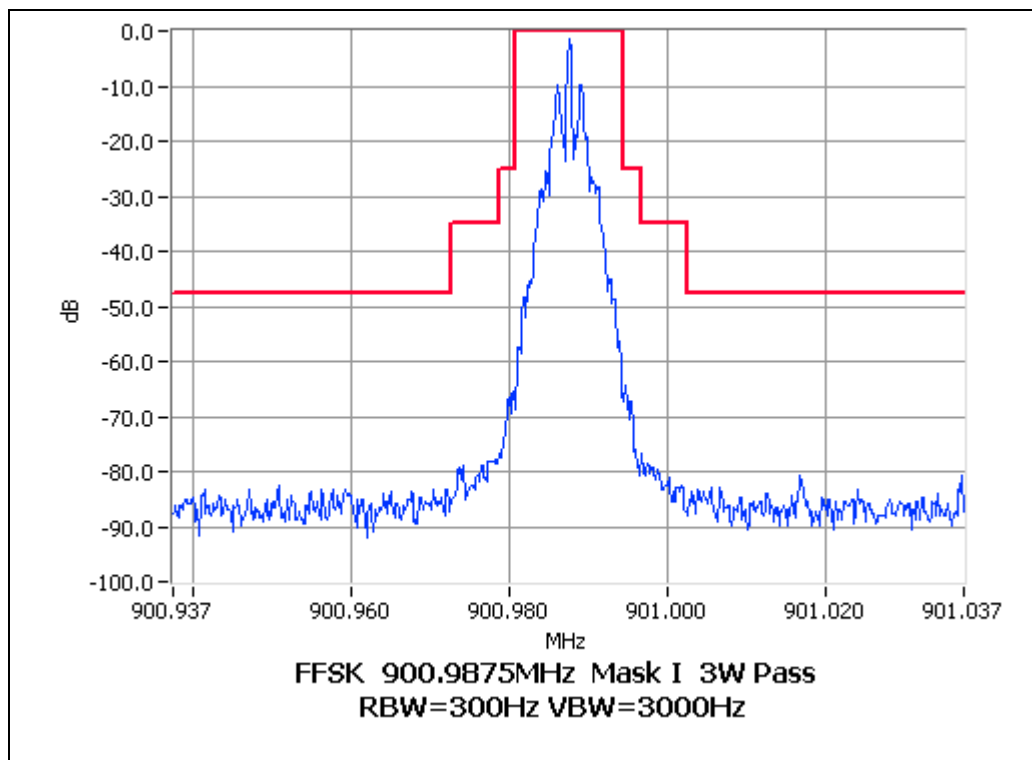
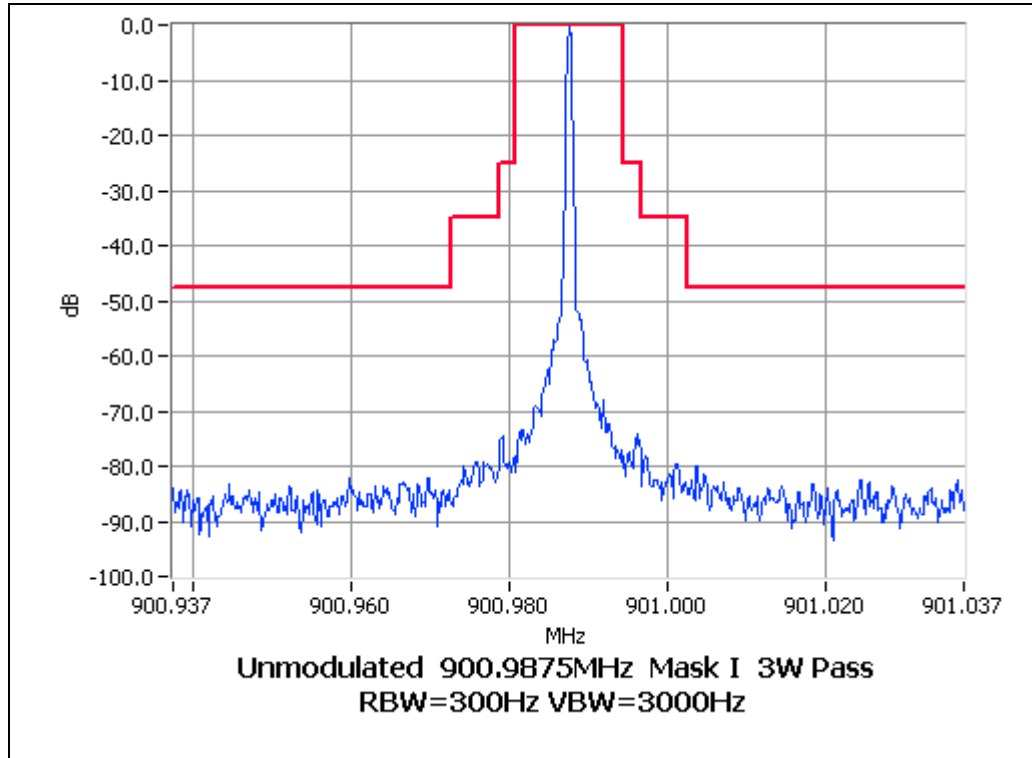


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 900.9875 MHz 3 W 12.5 kHz Channel Spacing

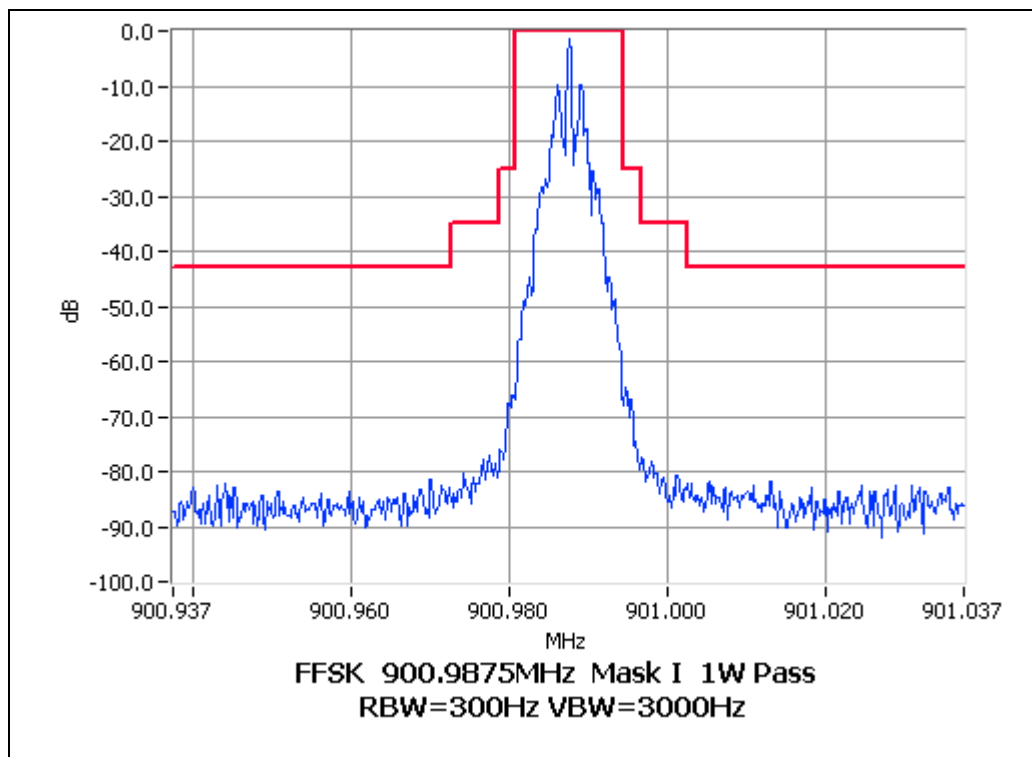
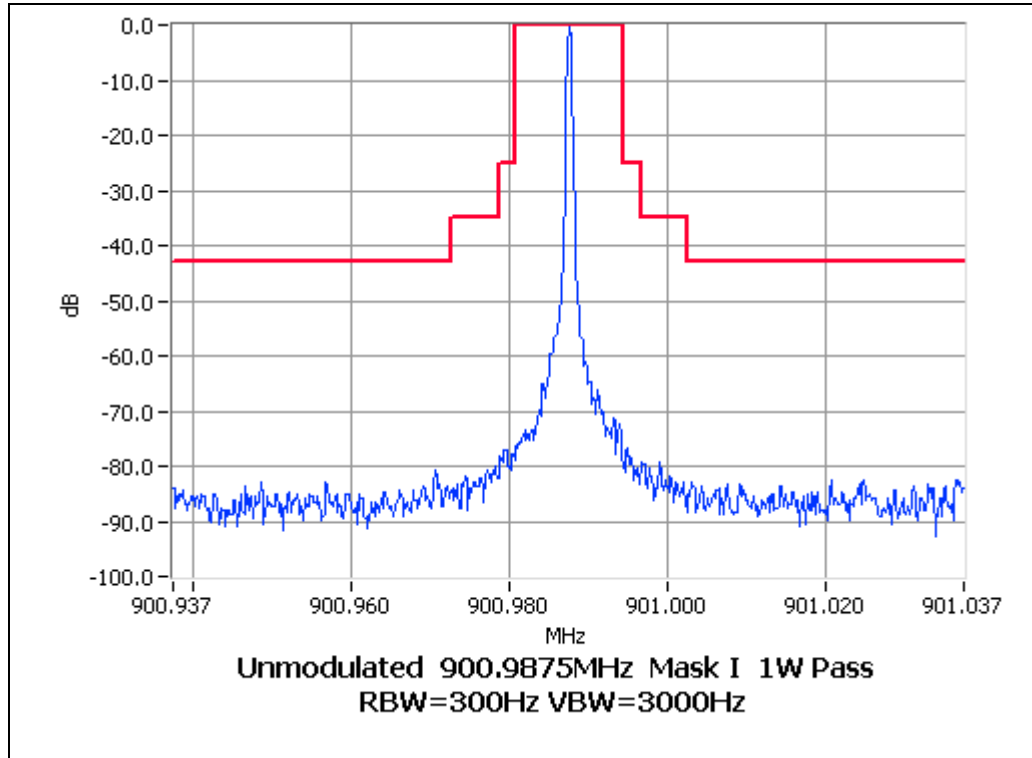


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 900.9875 MHz 1 W 12.5 kHz Channel Spacing

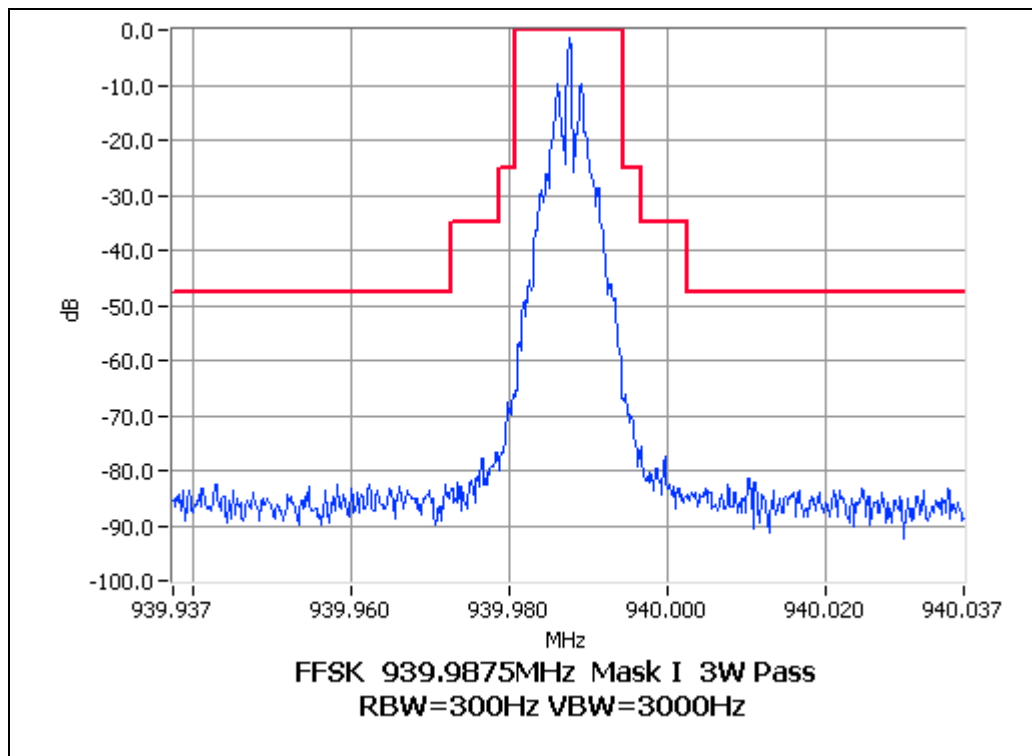
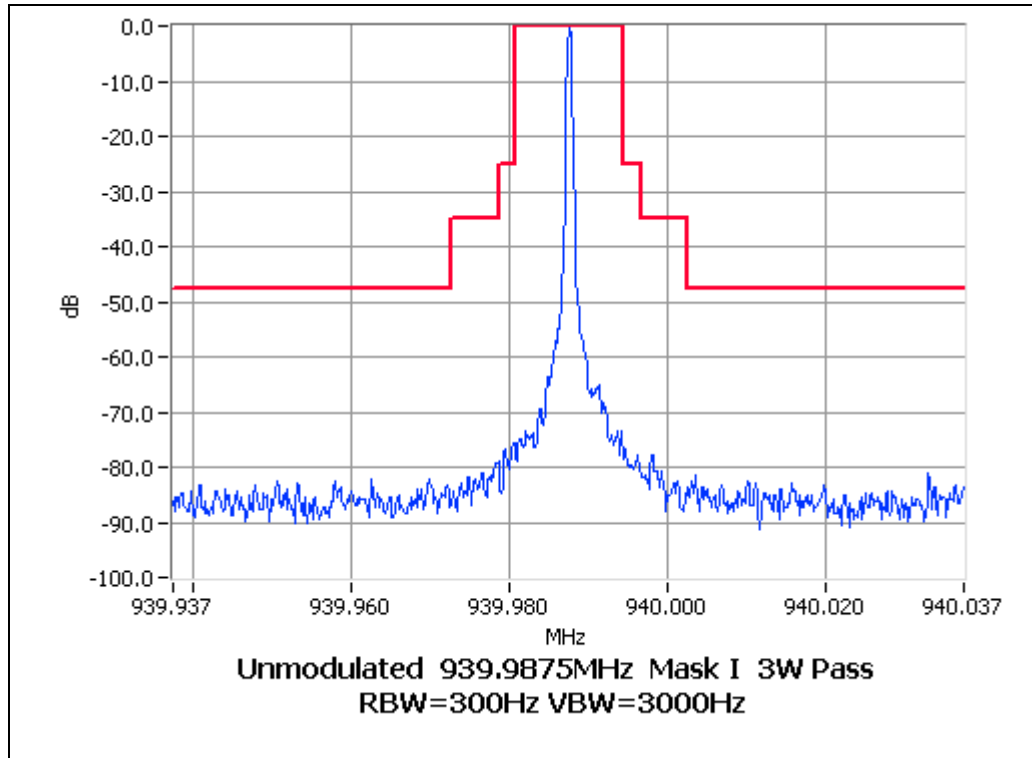


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 939.9875 MHz 3 W 12.5 kHz Channel Spacing

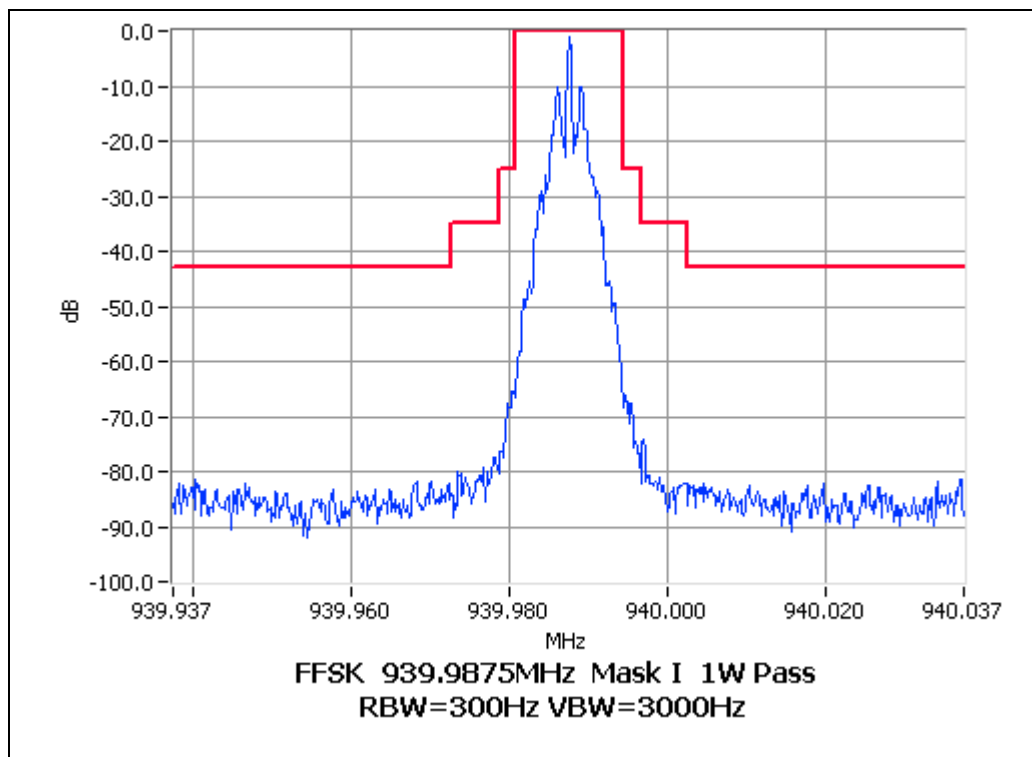
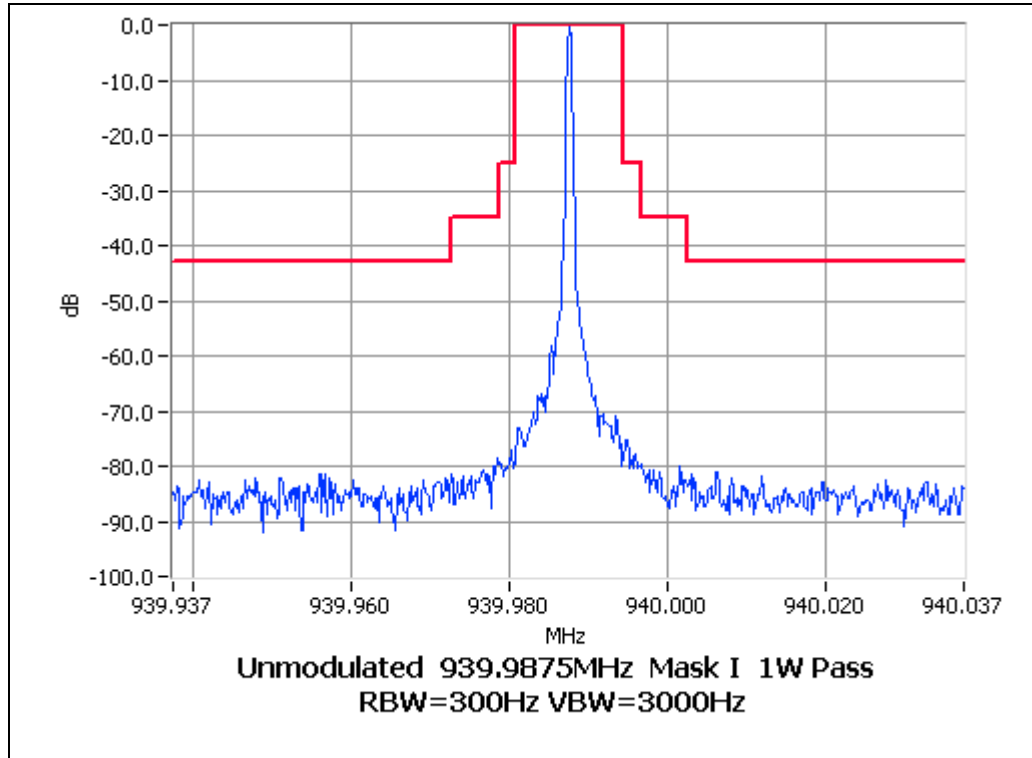


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 939.9875 MHz 1 W 12.5 kHz Channel Spacing



SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1051

GUIDE: TIA/EIA-603C 2.2.13

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 10th Harmonic: 100kHz to Fc-BW
Fc+BW to 10Fc GHz
3. A Pre-scan is performed with a resolution bandwidth of 1 kHz, and a video bandwidth of 3 kHz. If any emissions are found to be within 20dB of the limit a second measurement is made with the carrier modulated, and a resolution bandwidth of 10 kHz, and a video bandwidth of 30 kHz.

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

MEASUREMENT RESULTS:

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

LIMIT CLAUSE: FCC 47 CFR 90.210

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

12.5 kHz Channel Spacing		900.9875 MHz @ 3 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
12.5 kHz Channel Spacing		900.9875 MHz @ 1 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

12.5 kHz Channel Spacing		939.9875 MHz @ 3 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
12.5 kHz Channel Spacing		939.9875 MHz @ 1 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

LIMITS:

Carrier Output Power Watts	Emission Mask I 12.5 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
3 W	-13 dBm	47.8 dBc
1 W	-13 dBm	43.0 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603C 2.2.12

MEASUREMENT PROCEDURE:

Initial Scan:

1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30MHz to 1000MHz. Any emission within 10dB of the limit is then re-tested on the OATS along with measurements from 1000MHz to the 10th harmonic of the fundamental frequency.
2. The EUT is then placed on a wooden turntable at a distance of 0.5 metres from the test antenna and emissions are measured from 1000MHz to the upper frequency required. Any emission within 10 dB of the limit is then re-tested 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 1m to 4m 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 for 12.5 kHz channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing		900.9875 MHz @ 3 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
12.5 kHz Channel Spacing		900.9875 MHz @ 1 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 10 dB below the limit.			

12.5 kHz Channel Spacing		939.9875 MHz @ 3 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
12.5 kHz Channel Spacing		939.9875 MHz @ 1 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 10 dB below the limit.			

LIMITS:

Carrier Output Power Watts	Emission Mask I 12.5 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
3 W	-13 dBm	47.8 dBc
1 W	-13 dBm	43.0 dBc

TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

GUIDE: TIA/EIA-603C 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 $+50^{\circ}\text{C}$ in 10°C increments
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

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

LIMIT CLAUSE: FCC 47 CFR 90.213

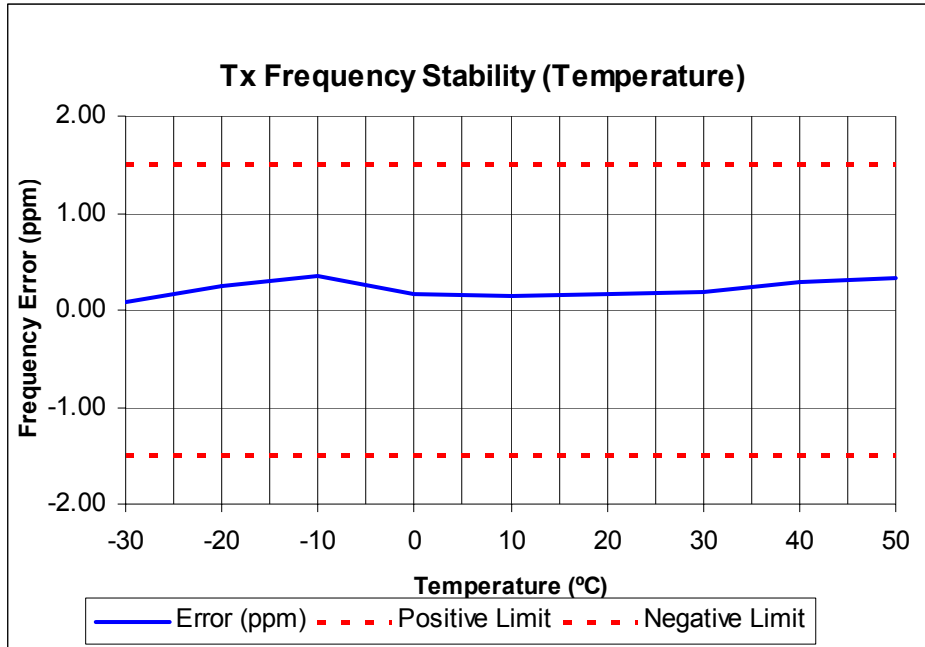
Frequency Bands: 896 MHz ~ 901 MHz
935 MHz ~ 940 MHz

Frequency	Channel Spacing (kHz)	Frequency Error (ppm)
900.9875 MHz	12.5	1.5
939.9875 MHz	12.5	1.5

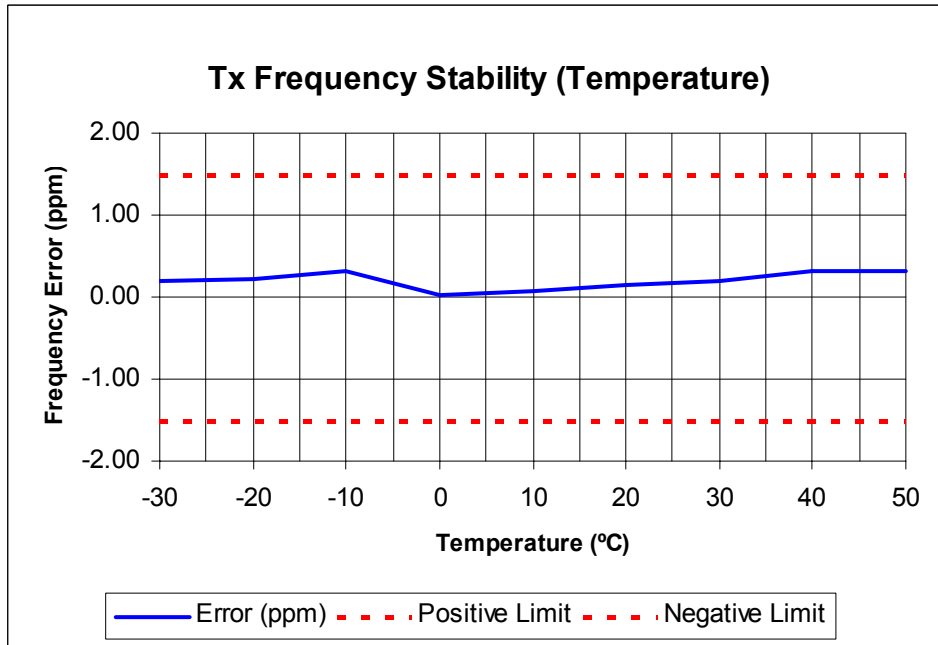
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

Tx FREQUENCY: 900.9875 MHz 3 W 12.5 kHz channel Spacing



Tx FREQUENCY: 939.9875 MHz 3 W 12.5 kHz channel Spacing



TRANSMITTER FREQUENCY STABILITY (VOLTAGE)

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

GUIDE: TIA/EIA-603C 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 nominal and battery endpoint..
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

Frequency Bands: 896 MHz ~ 901 MHz
935 MHz ~ 940 MHz

Voltage	FREQUENCY ERROR (ppm) for 12.5 kHz	
	900.9875 MHz	939.9875 MHz
7.5 V _{DC}	0.02	0.05
6.0 V _{DC}	0.04	0.06
V _{DC}	~	~

LIMIT CLAUSE: FCC 47 CFR 90.213

Frequency	Channel Spacing (kHz)	Frequency Error (ppm)
900.9875 MHz	12.5	1.5
939.9875 MHz	12.5	1.5

TELTEST Laboratories
Tait Electronics Limited
Report Number 2957

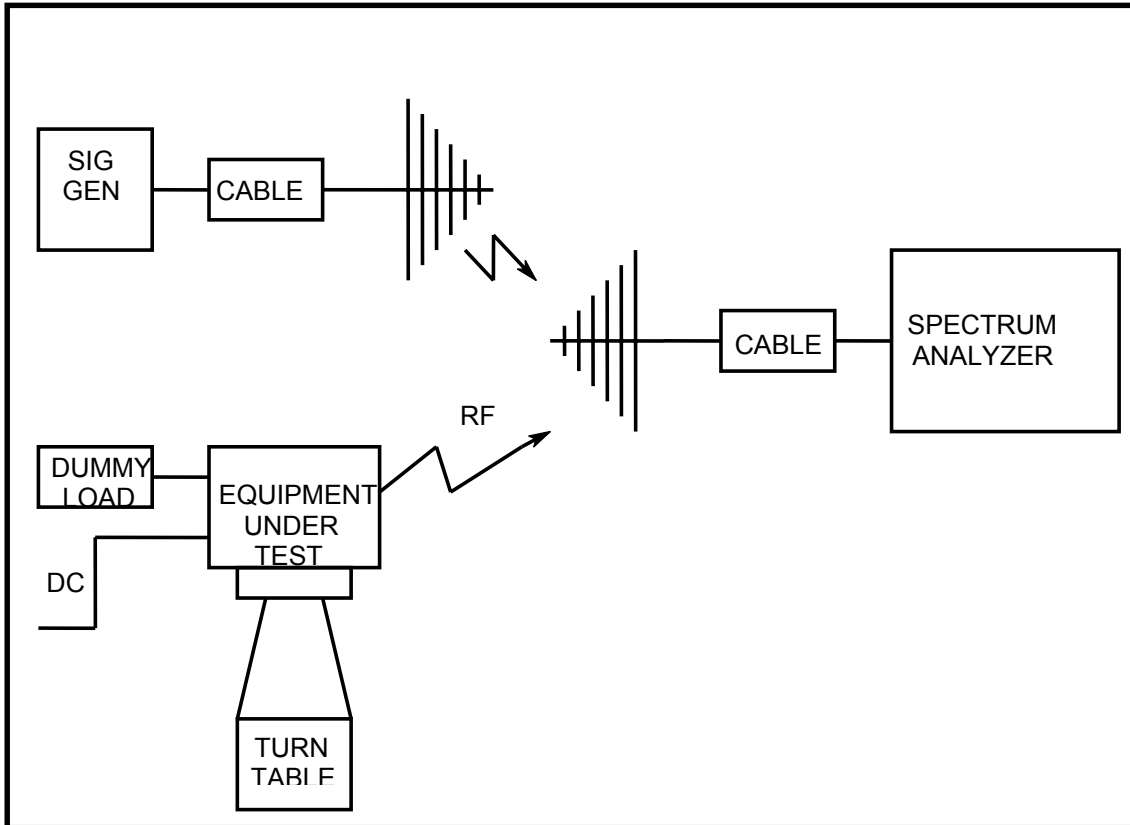
TEST EQUIPMENT USED

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
11	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	26-Nov-09
13	Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	26-Nov-09
42	Reference Horn Antenna	Emco	DRG3115	9512-4638	E3560	16-Nov-09
46	S-LINE TEM CELL	Rohde & Schwarz	1089.9296.02	338232/003	E3636	20-Mar-09
52	Amplifier +21.7 dB	Tait	ZFL-1000LN	E3660	E3360	
66	RF Attenuator 25W	Weinschel	33-20-33	BD5871	E3673	25-Nov-09
71	RF Load 50W	Weinschel	F1426	BF0487	E3675	29-Nov-09
81	2m Coax S-Line (Black1)	Intelcom	RG213/U-50	Black1	E3658	27-Nov-09
82	1m Coax Cable BLUE)	Suhner	Sucoflex 104A	44610/4A	E4619	24-Nov-09
83	2m Coax (Black2)	Suhner	RG214HF/Nm/Nm/2000	Black2	E4623	24-Nov-09
84	2m Coax (Black3)	Suhner	RG214HF/Nm/Nm/2000	Black2	E4624	24-Nov-09
85	3m Coax Cable (BLUE)	Suhner	Sucoflex 104A	44611/4A	E4620	24-Nov-09
88	Spectrum Analyser	Hewlett Packard	HP8562E	3821A00779	E3715	25-Nov-09
115	Environ. Chamber	Contherm	5400 RHSLT.M	1416	E4051	12-Jul-12
123	Spectrum Analyser	Agilent	E4445A	MY42510072	E4139	07-Aug-09

ANNEX A

TEST SETUP DETAILS

Radiated Emissions Set up.



TELTEST Laboratories
Tait Electronics Limited
Report Number 2957

All other testing is performed using the Teltest **R**adio **E**VALuation 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.

