

Laboratory Test Report

Class II Permissive Change

On the

TMAB1Z External Radio Frequency Power Amplifier

Tested In accordance with

FCC 47 CFR Parts 22 and 90

Report Revision: 1
Issue Date: 14-Aug-2006
FCC ID: CASTMAB1Z

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

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Tait Electronics Limited

Report Number 2472

FCC ID:CASTMAB1Z

REVISION HISTORY

Date	Revision	Comments
14-Aug-2006	1	Initial test report

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INTRODUCTION

This is a Class II permissive change to the TMAB1Z External Radio Frequency Power Amplifier (FCC ID: CASTMAB1Z), following circuit changes to overcome overheating issues, and confirms compliance with:

FCC CFR 47 Parts 22 & 90

The TMAB1Z was originally tested as Teltest Laboratories Report 2290

REPORT PREPARED FOR

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

DESCRIPTION OF SAMPLE

FCC ID: CASTMAB1Z
Type: TMAB1Z
Product code: TMAA42-B100
Serial Numbers: 13144477

The TMAB1Z is an External Radio Frequency Power Amplifier designed to operate in the 136MHz to 174MHz band. It has a fixed output power of 110W, and output impedance of 50 ohms. It has been tested with the TMAB32-B100 (serial number 19057434) mobile transceiver, which has its output power fixed at 1 watt. The mobile performs all modulation, and the TMAB1Z is only used to increase the output power of the mobile.

STATEMENT OF COMPLIANCE

The TMAA42-B100 External Radio Frequency Power Amplifier as tested in this report was found to conform to the following standards:

FCC CFR 47 Parts 22 & 90

TEST CONDITIONS

Unless otherwise stated, all testing was performed at the following conditions.

Ambient Temperature	15°C → 30°C
Relative Humidity	20% → 75%
Standard Test Voltage	13.8Vdc

NECESSARY BANDWIDTH AND EMISSION DESIGNATORS

The TMAA42-B100 ERFPA does not provide any modulation.
It is intended to be used with the following types of emissions as defined in 90.207

F3E – FM, Analogue Voice
F1E – FM, Digital Voice
F1D – FM, Digital Data, no subcarrier
F2D – FM, Digital Data, modulated subcarrier
F7E – FM, Two or more channels containing quantized or digital voice information
F7D – FM, Two or more channels containing quantized or digital information

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:

162.1 MHz	110 W nominal	W nominal
POWER (W)	111.8	
Variation from Nominal (%)	+1.6	
Measurement Uncertainty (dB)	±0.6	

LIMIT CLAUSE: FCC 47 CFR 90.205 (r)

Radio Type: Mobile Transceiver
Frequency Band: 150 MHz → 174 MHz

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

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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:
3. Spurious emissions that were attenuated more than 20dB below the limit were not recorded.

MEASUREMENT RESULTS:

See the table on the following page for 12.5 kHz channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 162.1 MHz

12.5 kHz Channel Spacing		162.1 MHz @ 110 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)		Level (dBc)
149.0878	-33.8		-84.2
161.8748	-38.6		-89.0
162.0621	-35.2		-85.6
162.1370	-35.9		-86.3
162.3253	-38.6		-89.0
175.1119	-32.0		-82.4
324.1999	-39.6		-90.0
No other emissions were detected at a level greater than 20 dB below the limit.			
Measurement Uncertainty (dB)		±3	

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
110 W	-20 dBm	70.4 dBc

SPURIOUS EMISSIONS (RADIATED)

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FCC ID:CASTMAB1Z

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603C 2.2.12

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The EUT was placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal was connected to an RF dummy load.
3. The turntable was rotated through 360° to obtain the maximum response of each spurious emission. Valid emissions were determined by switching the EUT on and off.
4. The EUT was replaced by a signal generator and substitution antenna to make measurements by the substitution method.

MEASUREMENT RESULTS:

See the table on the following page

LIMIT CLAUSE: FCC 47 CFR 90.210

Test Conditions on Open Area Test Site

Ambient Temperature	6°C
Relative Humidity	75%
Standard Test Voltage	13.8Vdc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 162.1 MHz

12.5 kHz Channel Spacing		162.1 MHz @ 110 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)		Level (dBc)
486.3	-29.1		-79.5
648.4	-22.4		-72.8
810.5	-28.4		-78.8
No other emissions were detected at a level greater than 20 dB below the limit.			
Measurement Uncertainty (dB)		±4.6	

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
110 W	-20 dBm	70.4 dBc

TRANSIENT FREQUENCY BEHAVIOR

SPECIFICATION: FCC 47 CFR 90.214

GUIDE: TIA/EIA-603C 2.2.19

MEASUREMENT PROCEDURE:

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

MEASUREMENT RESULTS:

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

LIMIT CLAUSE: FCC 47 CFR 90.214

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TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 162.1 MHz 110 W 12.5 kHz Channel Spacing

FREQUENCY	162.1 MHz @ 110 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t_1	-0.6	N/A
t_2	-0.3	N/A
t_3	N/A	0.3
$t_2 \rightarrow t_3$ ppm	-1.3	
ERROR LIMIT ($t_2 \rightarrow t_3$) ppm	2.5	
Measurement Uncertainty	Freq ± 130 Hz Time ± 0.2 %	

Confirm that during periods t_1 and t_3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	Y	
Confirm that during the period t_2 the frequency difference does not exceed half a channel separation.	YES	NO
	Y	
Confirm that during the period t_2 to t_3 the frequency difference does not exceed the frequency error limit.	YES	NO
	Y	

LIMIT:

TRANSIENT PERIODS	FREQUENCY RANGE 150MHz – 174 MHz	FREQUENCY RANGE 421MHz – 512 MHz
t_1 (ms)	5 ms	10 ms
t_2 (ms)	20 ms	25 ms
t_3 (ms)	5 ms	10 ms

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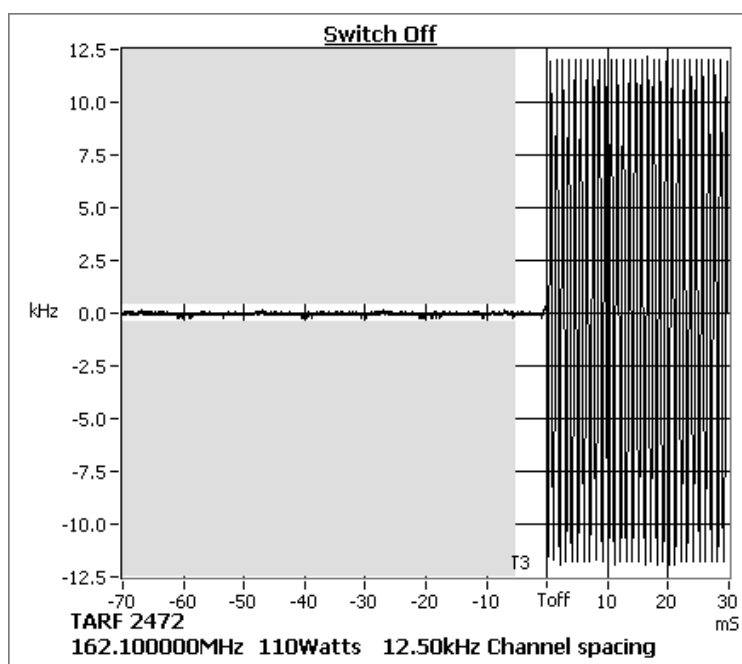
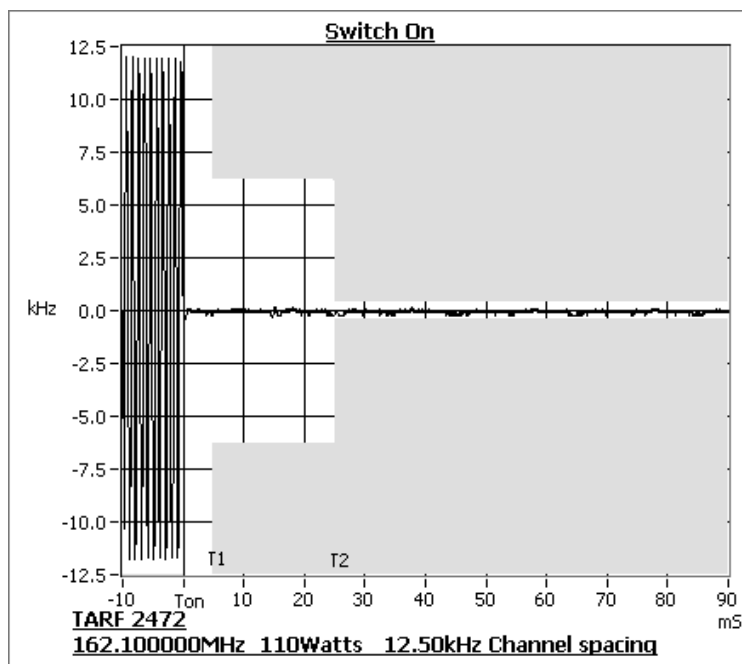
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TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 162.1 MHz 110 W 12.5 kHz Channel Spacing



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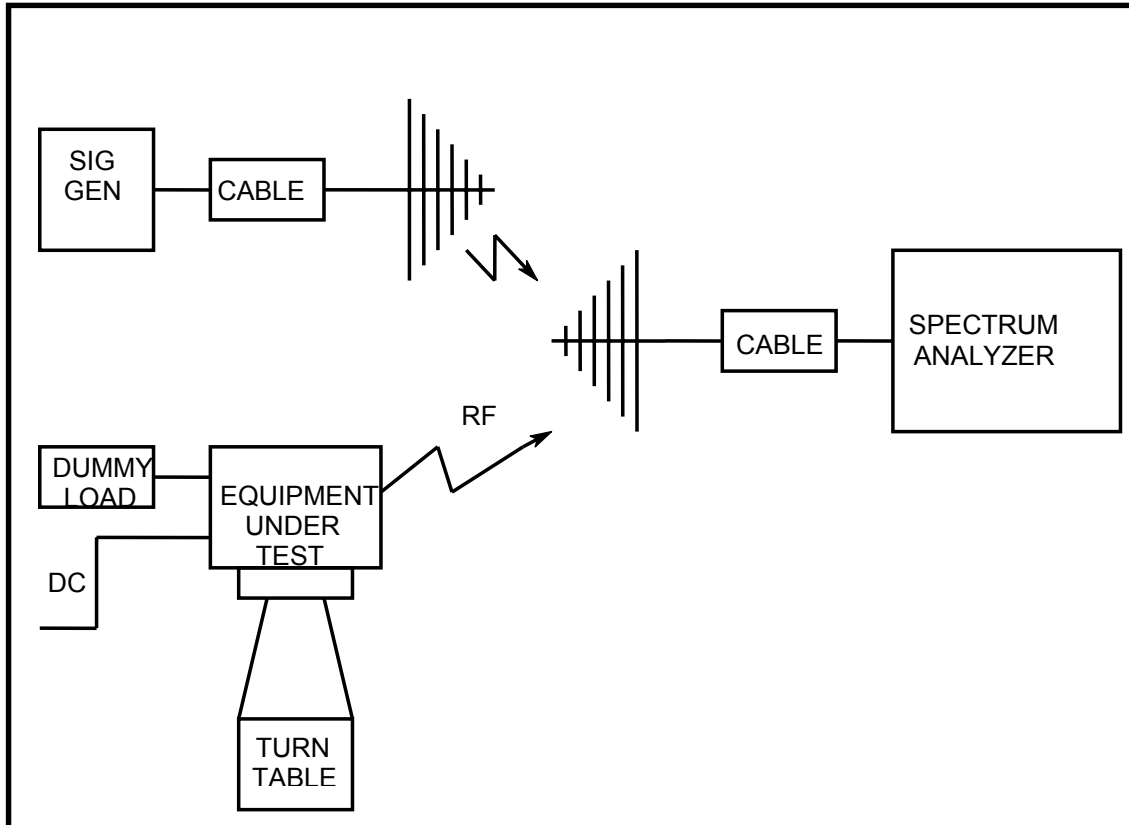
TEST EQUIPMENT USED

Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
Signal Generator	Hewlett Packard	HP8642B (Opt 001)	2512A00176	E3064	26-Nov-06
Signal Generator	Agilent	E4422B	GB40050320	E3788	22-Nov-06
Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	26-Nov-06
Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	28-Nov-06
Power Supply	Hewlett Packard	HP6032A	2441A00412	E3075	26-Nov-06
Oscilloscope	Tektronics	TDS340	B013611	E3585	26-Nov-06
Reference Dipoles	Emco	3121C DB1	9510-1164	E3559	17-Oct-06
Horn Antenna	Emco	DRG3115	2084	E3076	27-Sep-06
20m Coax Cable		RG214/U-50 (Ext Cal)	CBL01	E3404	29-Nov-06
Power Head	Hewlett Packard	HP11722A	2716A02037	E1575	26-Nov-06
RF Splitter Combiner	Minicircuits	ZFSC-4-1	-	E4083	18-Jan-07
Antenna Tower	Electrometrics	EM-4720-2	112	E4447	N/A
Controller	Electrometrics	EM-4700	119	E4445	N/A
Turntable	Electrometrics	EM-4704A	105	E4446	N/A
Attenuator	Weinschel	67-30-33	BR0531	E4280	26-Nov-06

ANNEX A

TEST SETUP DETAILS

Radiated Emissions.



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Conducted Measurements

The Spectrum Analyser is connected to the EUT via a 30dB attenuator for Conducted Emissions testing.

