TEST REPORT.

Reference Number : T93165A

Date :   2 December 1993

EQUIPMENT MAKE   : TAIT

EQUIPMENT MODEL : T2010-613

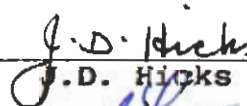**SERIAL NUMBER**   : 385527

COUNTRY OF ORIGIN : NEW ZEALAND

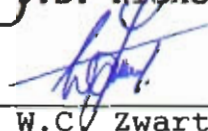**SUBMITTER**   :

>   TAIT ELECTRONICS LTD
>   558 WAIRAKEI RD
>   PO BOX 1645
>   CHRISTCHURCH
>   NEW ZEALAND

Technical Officer _____
                                    J.D. Hicks

Chief Technical Officer _____
                                    W.C Zwart

The results in this report relate only to the item tested.

This Report Contains: **6** pages of Preamble/Results
                        5 pages of Appendices

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Code of Federal Regulation 47

Part 90

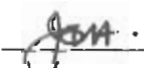# PRIVATE LAND-MOBILE RADIO SERVICES

SUMMARY OF TEST RESULTS

2.993   Radiated Spurious Emissions   Complies

2 December 1993   ~~~~~ ·   Technical Officer

TEST CONDITIONS.

Transmitter

Transmit Frequency   470.1 MHz

Transmit RF power   22.6 Watts

Test Voltage   13.8 Volts

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TEST METHOD.

2.993 Radiated Spurious Emissions

1. Test Site.

An open area test site located in Auckland was used.

For a description of this test site refer to the formal submission document provided to the FCC to demonstrate compliance with ANSI C63.4-1991, requirements for test sites.

A copy of the covering letter that accompanied this submission is enclosed labelled Appendix B.

2. Test Method

(a) The sample transmitter was checked for correct operation on the test bench.

(b) At the test site, the transmitter was placed on the rotating table and positioned approximately one metre from the appropriate aerial.

A careful RF spectrum search up to the tenth harmonic was carried out to identify all signals radiated by the transmitter.

(c) For each signal identified in (b) the specification limit for radiated signal strength was converted to an equivalent power level (in dBm) at the measuring receiver.

This calculation was performed manually and uses values for Aerial calibration factor, measurement distance and cable loss. Calculation details are provided in Appendix A.

(d) Using "far field" distances (>5 wavelengths) for each frequency, the maximum radiated level was recorded for the horizontal and vertical polarization planes.

(i)   below 1.0 GHz:
150kHz-30MHz Schwarzbeck FMZ 1514, FMZA 15142,
              FMZA 15141 Loop Aerials
30MHz-300MHz Scwarzbeck BBA9106 Biconical Aerial
300MHz-1.0GHz Schwarzbeck UHALP9107 Log Periodic Aerial

(ii) above 1.0 GHz: Emco Conical Log Spiral Model 3102

In order to obtain the maximum signal level the supporting platform was rotated and the receiving aerial raised and lowered.

(e) Measured signal level maxima were compared to the calculated specification limit, and a "difference" (delta) in dB obtained.

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TEST RESULTS.

2.993 Radiated Spurious Emissions

All emissions were found to be more than 20 dB below the
specified limit.

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Calculation of Radiated Signal Power Level.

When using a calibrated receiving aerial it is possible to calculate the equivalent measureable power level for a known radiated power level.

The actual measured level can therefore be immediately compared with the calculated specification limit and the pass fail status obtained.

Specification Limit: 90.209 (c) (1) [iii]

Spurious attenuation $= 43 + 10 \log_{10}$ (Mean Output Power[W])

$= -13$ dBm (all cases)

Equivalent radiating
element $= \frac{1}{2}$ wave dipole for each frequency

Field strength for a $\frac{1}{2}$ wave dipole, in the direction of maximum radiation and in the far-field is given by:

$$E = 1/R (49.2\ Pt)^{\frac{1}{2}} \quad \text{(Note 1)}$$

Where R is the distance, and Pt is the transmitter power (watts).

Calculations

(a) Convert specification limit from dBm to Watts

$$Pt = P_1 * \text{antilog (dBm/10)} \quad [P_1 = 1mW]$$

(b) Calculate radiated field strength for $\frac{1}{2}$ wave dipole

$$E_1 = 1/R (49.2\ Pt)^{\frac{1}{2}}$$

(c) Convert field strength to dBuV/m

$$E_2 = 20 \log_{10} (E_1/10^{-6})$$

(d) Determine output voltage from receiving aerial

$$V_1 = E_2 - C.F.$$

   Where C.F. is aerial calibration factor at each frequency.

(e) Convert aerial voltage to power level (dBm)

$$P_a = V_1 - 107$$

Note 1. ITT Publication " Reference Data for Radio Engineers"
         section 25.7
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(f) Subtract cable loss (dB) to determine power level at the test receiver.

$$P_m = P_a - (cable\ loss) \quad dBm$$

Pm is the power level in dBm which would be produced in the test receiver by a ½ wave dipole radiating the specification power level.

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APPENDIX B (Page 1)

ENG 3/5
KJB:KF

FILE COPY

3 November 1993

Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia MD 21046
UNITED STATES OF AMERICA

Attention Mr H L van Tuyl

Dear Sir

Enclosed is a formal submission document, together with attachments, which provide a detailed description of the test facilities owned and operated by the New Zealand Ministry of Commerce.

This document provides the information required by the FCC Rules, Section 2.948, and Public Notice dated August 25 1992, to demonstrate compliance with ANSI C63.4-1991, requirements for test sites.

I would be pleased for the submission to be evaluated, and if acceptable, for the Ministry's test facilities to be included on the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for certification or notification under Parts 15 or 18 of the Commission's Rules.

Please also note that the test site is available to provide measurement services for the public on a fee paying basis.

Assuming the facility is acceptable for FCC listing, the preferred address information to be included in the listing is:

Firm Name   Address

New Zealand Ministry of Commerce   P O Box 68307
Laboratory Services   Newton
Attn: A D Cutler   Auckland
                                                                                 New Zealand

Phone +64 9 360 0862
Fax   +64 9 360 0861

COMMUNICATIONS DIVISION – RADIO OPERATIONS

We strive to provide the best Radio Spectrum environment for New Zealand

Head Office: Ministry of Commerce Building. 33 Bowen Street. P.O Box 2847,Wellington. New Zealand. Telephone 0-4-472 0030. Fax 0-4-473 2489

I would also be interested in receiving information from the FCC regarding requirements to be met for the FCC to accept test reports for radio equipment certification.

As you can see from the enclosed brochure the Ministry also owns and operates a radio laboratory, and I would like to prepare a submission to obtain formal acceptance of this facility as well.

I look forward to your reply.

Yours faithfully

K J Bramley
Section Manager Laboratory Services

EQUIPMENT USED IN TESTING.

Equipment No.	Make/Model	Description
E1030	Hewlett Packard HP8566B	Spectrum Analyser
3602	Schwarzbeck FMZ 1514	ATU
3654	Schwarzbeck FMZA 15142	0.15-2.0 MHz Aerial
3653	Schwarzbeck FMZA 15141	2.0-30.0 MHz Aerial
3708	Emco 1070-1	Aerial Mast
3709	Emco 1080-1-2.1	Turntable
Nil	Emco 3102 1.0-10.0 GHz	Conical Log Spiral Ae.
3612	Schwarzbeck BBA9106	Biconical Aerial 30-300 MHz
3702	Schwarzbeck UHALP9107	Log Periodic Aerial 300-1000 MHz

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