

TEST: FCC 47 CFR 1.1310 Maximum Permissible Exposure

ENVIRONMENTAL ASSESSMENT

On the T2020-643-F04 Mobile Transmitter

FCC ID: CASTEL0055

SN: 17052056

In accordance with

ANSI/IEEE Std C95.1, 1999
OET Bulletin 65 97-01

DATE: FEBRUARY 2001

PREPARED BY: M Ludwig _____
Test Technician

CHECKED & APPROVED BY: SA Crompton _____
Laboratory Manager

TELTEST LABORATORIES

Tait Electronics Ltd
PO Box 1645
558 Wairakei Road
Christchurch 8005
New Zealand
Phone: +64-3-3583399
Fax: +64-3-3580432

TABLE OF CONTENTS

	PAGE
Contents:	2
Operating Conditions and Exposure conditions, Minimum Safe Distance calculations.	3
Test results, Transmitter Power.	4
Test results, MPE, Average power calculations.	5
Information to be placed in Manual	6

Operating and Exposure conditions:

Operating Conditions: Mobile transmitter using vehicle mounted antennas only

Exposure conditions: Occupational/Controlled.

Minimum Safe Distance calculations:

$$R = (P G / 4 \pi S)^{1/2}$$

Antenna Type: Monopole ($\lambda/4$ whip)

Antenna Gain: 2.15 dBi

Transmitter Power: 30 Watts (includes allowance for influence conditions)

Limit: 300 – 1500 MHz: $f/300 \text{ mW/cm}^2$
For $f = 468.78125 \text{ MHz}$, $s = 1.5626$

Power gain product: $30000 \times 1.64 = 49000.2 \text{ mW}$

Minimum safe distance: $(49000.2 / 4\pi \times 1.5626)^{1/2} = 50.1 \text{ cm}$

Antenna Type: Monopole ($5\lambda/8$ whip)

Antenna Gain: 5.15 dBi

Transmitter Power: 30 Watts (includes allowance for influence conditions)

Limit: 300 – 1500 MHz: $f/300 \text{ mW/cm}^2$
For $f = 468.78125 \text{ MHz}$, $s = 1.5626$

Power gain product: $30000 \times 3.27 = 98202.21 \text{ mW}$

Minimum safe distance: $(98202.21 / 4\pi \times 1.5626)^{1/2} = 70.7 \text{ cm}$

Maximum Power Factor:

Although the nominal transmitter power is 25 watts, under some circumstances it may exceed this by up to 5 watts. Results increased by factor of 30/measured TX power are also shown.

Test Results:

NAME OF TEST: TRANSMITTER OUTPUT POWER (CONDUCTED)

TEST CONDITIONS: Ambient Temperature 21°C
Relative Humidity 60%
Standard Voltage 13.8V DC

SPECIFICATION: FCC 47 CFR 2.1046

GUIDE: TIA/EIA-603 2.2.1

MEASUREMENT PROCEDURE:

1. The Equipment Under Test (EUT) was connected to an RF Power meter using a coaxial attenuator with an impedance of 50 Ohms.
2. The unmodulated output power was measured.

MEASUREMENT RESULTS:

Frequency: 468.78125MHz	Manufacturer's Rated Output Power: 25 W nominal
POWER (W)	25.6
Measurement Uncertainty (dB)	+0.63, -0.68

NAME OF TEST: ENVIRONMENTAL ASSESSMENT

TEST CONDITIONS: Ambient Temperature 18°C
Relative Humidity 55%
Standard Voltage 13.8V DC

SPECIFICATION: FCC 47 CFR 1.1310

GUIDE: ANSI/IEEE Std C95.1, 1999, OET Bulletin 65 97-01

Test Method:

The antenna is mounted on a ground plane which is placed on a non metallic turntable 1.35 m high and clear of nearby objects. Peak power density readings are taken at 0.2m vertical increments using a calibrated isotropic probe at the calculated safe distance from the antenna. The measurement equipment is operated remotely using fibre optics to reduce field perturbations.

Test Distance metres	0.5 m (distance for $\lambda/4$ whip)		0.71 m (distance for $5\lambda/8$ whip)	
	Power Density, mW/cm ²		Power Density, mW/cm ²	
Probe Height metres	Result for 25.6 Watts TX power.	Result for 30 watts TX power (calc).	Result for 25.6 Watts TX power.	Result for 30 watts TX power (calc).
0.2	0.022	0.025	0.024	0.028
0.4	0.041	0.048	0.054	0.063
0.6	0.052	0.060	0.076	0.089
0.8	0.101	0.118	0.095	0.111
1.0	0.109	0.128	0.054	0.063
1.2	0.188	0.220	0.075	0.088
1.4	0.319	0.373	0.105	0.122
1.6	0.503	0.589	0.195	0.229
1.8	0.379	0.444	0.244	0.285
2.0	0.217	0.254	0.288	0.337

Calculations of average power (sum of results/number of results):

Test Distance, m	0.5 (distance for $\lambda/4$ whip)	0.71 (distance for $5\lambda/8$ whip)
Body part	Average Power Density, mW/cm ²	Average Power Density, mW/cm ²
Whole Body Probe Height 0.2 to 2.0m	0.226	0.141
Upper Body Probe Height 1.0 to 2.0m	0.287	0.161
Lower Body Probe Height 0.2 to 0.8m	0.063	0.073

Limit, Occupational/controlled exposure:

300 – 1500 MHz: f/300 mW/cm²
for 468.78 MHz: 1.56 mW/cm²

Test Equipment Used:

Power Meter:	Rohde and Schwarz NRVS	s/n 841954/005
Isotropic Probe	Holaday HI-422	s/n 95661
Antenna Mast	Tait	
Turntable	Tait	
TEM cell	Rohde and Schwarz S Line	s/n338232/003
Signal Generator	Agilent E4422B	s/nGB40050320
Linear Amplifier	Amplifier Research 25A250	s/n20444

Information to be placed in Installation manual:

Antenna Installation:

Warning: To comply with FCC RF exposure limits, this product must be installed using an antenna with a gain specified below. This antenna must not be mounted at a location such that any person or persons can come closer than the minimum safe distance to the antenna.

PRODUCT	ANTENNA GAIN (dBi)	MINIMUM SAFE DISTANCE	
T20X0-643	2.15	0.5 metres	20 inches
T20X0-643	5.15	0.71 metres	30 inches

Information to be placed in User Manual:

USA Users:

Safety Training Information.

WARNING:

This product generates Radio Frequency energy during transmissions. It is classified as suitable for "Occupational Use Only". It is not intended for general use in uncontrolled environments.

It must only be used with authorised accessories and antennas.

The operator must ensure that the minimum safe distance between persons and the antenna is not exceeded during transmissions.

Do not exceed a duty cycle ratio of 50% transmit mode to standby or receive modes. The radio is in transmit mode when the PTT button on the microphone is pressed and the "TX" annunciator or warning LED shows.

Antenna details and Safe Distance Table:

PRODUCT	ANTENNA GAIN (dBi)	MINIMUM SAFE DISTANCE	
T20X0-643	2.15	0.5 metres	20 inches
T20X0-643	5.15	0.71 metres	30 inches

END