RF Exposure Lab

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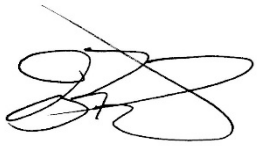
CERTIFICATE OF COMPLIANCE
MPE EVALUATION

Tait International Limited	Dates of Test: September 16, 2022
245 Wooldridge Road	Test Report Number: MPE.20220901
Harewood	Revision A
Christchurch 8051	Lab Designation Number: US1195
New Zealand	

FCC ID:	CASTBDB1F
IC Certificate:	737A-TBDB1F
Model:	TBDB1F
Test Sample:	Engineering Unit Same as Production
Equipment Type:	Wireless PTT Base Station Radio
Classification:	Mobile Transmitter
TX Frequency Range:	136 – 174 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	150 MHz – 46.00 dBm Conducted
Signal Modulation:	FM, FFSK
Antenna Type:	External
Application Type:	Certification
KDB Test Methodology:	KDB 447498 D01 v06
FCC Rules:	47 CFR 1.1310, 47 CFR 1.1307 & 47 CFR 2.1091
Industry Canada:	RSS-102 Issue 5, Safety Code 6
Maximum Power Density Value:	0.0966 mW/cm^2 (FCC); 0.966 W/m^2 (IC)
Maximum E-Field Value:	19.08 V/m
Maximum H-Field Value:	0.05062 A/m
Separation Distance:	650 cm for Body

This wireless mobile and/or portable device has been shown to be compliant for RF exposure requirements for uncontrolled environment/general exposure limits specified in 47 CFR 1.1310, 47 CFR 2.1307, 47 CFR 2.1091, RSS-102 Issue 5 & Safety Code 6 (See test report).

I attest to the accuracy of the data. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



Jay M. Moulton
Vice President

ACCREDITED
Certificate # 2387.01

Table of Contents

Comment/Revision	Date
Original Release	September 16, 2022
Revision A – Correct antenna type to external	October 13, 2022

Note: The latest version supersedes all previous versions listed in the above table. The latest version shall be used.

1. Introduction

This measurement report shows compliance of the Tait International Limited Model TBDB1F Wireless PTT Base Station Radio with 47 CFR 1.1310,47 CFR 1.1307, 47 CFR 2.1091, RSS-102 Issue 5 & Safety Code 6.

2. Characteristics of the Evaluation

2.1 Requirements and Methods

RF exposure assessment of the Tait International Limited Model TBDB1F Wireless PTT Base Station Radio.

Requirements	Frequency Bands
47 CFR 1.1310 Radio Frequency (RF) Radiation Exposure Limits, 47 CFR 1.1307 Actions Which May Have A Significant Environmental Effect & 47 CFR 2.1091 Radio Frequency Radiation Exposure Evaluation: Mobile Device.	136 – 174 MHz
RSS-102 Issue 5 Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands) & Safety Code 6 Recommended Limits for Safe Human Exposure to RF Electromagnetic Energy in the Frequency Range of 3 kHz to 300 GHz	136 – 174 MHz

3. Data Supplied by the Applicant

3.1 Applicant

Name/Company: Tait International Limited
Address: 245 Wooldridge Road, Harewood, Christchurch 8051
Country: New Zealand

3.2 US Representative

Name: Danielle Mellado
Address: 15354 Park Row Drive, Houston, TX 77084
Country: USA

3.3 Canadian Representative

Name: Ben Pearce
Address: Suite 2200, HSBS Building, West Georgia Street, Vancouver, BC V6C 3E8
Country: Canada

3.4 Identification of Item Evaluated

Product: Wireless PTT Base Station Radio
Model: TBDB1F
Manufacturer: Tait International Limited

4. Evaluation Results

Abbreviations used in the RESULTS column of the following tables are:

C Compliant with requirements
NC Not Compliant with requirements
NA Not Applicable
NE Not Evaluated

Document/Standard	Results
47 CFR 1.1310 Radio Frequency (RF) Radiation Exposure Limits, 47 CFR 1.1307 Actions Which May Have A Significant Environmental Effect & 47 CFR 2.1091 Radio Frequency Radiation Exposure Evaluation: Mobile Device.	C
RSS-102 Issue 5 Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands) & Safety Code 6 Recommended Limits for Safe Human Exposure to RF Electromagnetic Energy in the Frequency Range of 3 kHz to 300 GHz	C

5. Summary

Considering the results of the performed analysis and evaluation, stated in Appendix A and B, the item under evaluation is **IN COMPLIANCE** with the specifications listed in Section 2.1 “Requirements and Methods”.

Appendix A

Host Analysis

A.1. Device

The device is in a mobile exposure condition (antenna-to-user distance > 20 cm).

Main/Primary Transmitter:

PTT Transmitter:

Type of Equipment : Wireless PTT Base Station Radio
Model : TBDB1F
Duplexers Installed: : T993-050-02-01 Duplexer Notch 138-156MHz 50W 4-6MHz spacing
T993-050-02-02 Duplexer Notch 138-156MHz 50W 6-8MHz spacing
T993-050-02-03 Duplexer Notch 138-156MHz 50W 8-10MHz spacing
T993-050-05-01 Duplexer Notch 152-175MHz 50W 4-6MHz spacing
T993-050-05-02 Duplexer Notch 152-175MHz 50W 6-8MHz spacing
T993-050-05-03 Duplexer Notch 152-175MHz 50W 8-10MHz spacing
T993-050-05-04 Duplexer Notch 152-175MHz 50W 10-16MHz spacing
Antennas Evaluated : Model RFI OA40-41(11.1 dBi Gain)
Cable Use for Install: : AVA5-50FX
Minimum Cable Loss: : No Cable Loss was used for the evaluation. Therefore, any cable length could be used for the installation.
Maximum gain (Ant – Cable) : 11.1 dBi
Output power : 46.00 dBm

Frequency Band	Mode	Frequency Range (MHz)	Maximum Conducted output power (dBm)	Maximum Conducted output power (mW)	Duty Cycle	Equivalent conducted output power (mW)	Maximum antenna gain (dBi)	Maximum antenna gain (numerical)	EIRP (mW)
150 MHz	PTT	136-174	46.00	40,000	100%	40,000	11.1	12.88	515,200

Worst Case Considerations:

- Minimum Antenna-to-user distance: 650 cm
  - Any antenna-to-user distance > 650 cm would be covered by the analysis included in this report as far as it would provide better exposure conditions.
- Maximum Antenna gains: 150 MHz band PTT: 11.1 dBi
  - Any antenna gains below the specified would be covered by the analysis included in this report as far as it would provide better exposure conditions.

Appendix B

RF Exposure Assessment

B.1 Maximum Permissible Exposure (MPE) Limits

B.1.1 FCC MPE Limits

Normative document:

- 47 CFR 1.1310 Radio Frequency (RF) Radiation Exposure Limits, 47 CFR 1.1307 Actions Which May Have A Significant Environmental Effect & 47 CFR 2.1091 Radio Frequency Radiation Exposure Evaluation: Mobile Device: Mobile Device.

Reference levels:

The table below is excerpted from Table 1 of 47 CFR 1.1310 Radio Frequency (RF) Radiation Exposure Limits:

Frequency Range (MHz)	E-field strength (V/m)	H-field strength (A/m)	Power Density (S) (mW/cm^2)	Averaging Time (minutes)
0.3-3.0	614	1.63	100	30
3.0-30	842/f	2.19/f	$180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500	--	--	f/1500	30
1,00-100,000	--	--	1.0	30

Note: f is frequency in MHz.

MPE limits:

Frequency Band	Mode	Frequency Range (MHz)	Reference frequency (MHz)	MPE limit S_{eq} (mW/cm^2)	E-Field Strength (V/m)	H-Field Strength (A/m)
150 MHz	PTT	136-174	174	0.20	27.5	0.073

B.1.2 IC MPE Limits

Normative document:

- RSS-102 Issue 5 Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands) & Safety Code 6 Recommended Limits for Safe Human Exposure to RF Electromagnetic Energy in the Frequency Range of 3 kHz to 300 GHz

Reference levels:

The table below is excerpted from Table 6 of RSS-102 Issue 5 Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands):

Frequency Range (MHz)	E-field strength (V/m)	H-field strength (A/m)	Power Density (S) (W/m^2)	Averaging Time (minutes)
0.003-10^{23}	83	90	--	Instantaneous
0.1-10	--	0.73/f	--	6
1.29-10	$87/f^{0.5}$	--	--	6
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21x10^{-4}f^{0.5}$	$6.67x10^{-5}f$	$616000/f^{1.2}$

Note: f is frequency in MHz.

MPE limits:

Frequency Band	Mode	Frequency Range (MHz)	Reference frequency (MHz)	MPE limit S_{eq} (W/m^2)	E-Field Strength (V/m)	H-Field Strength (A/m)
150 MHz	PTT	136-174	174	1.291	22.06	0.05852

B.2 RF Exposure Assessment – Individual Transmitters

B.2.1 Introduction

Calculations to predict power density levels in the far-field of the antenna are made by use of the following equation:

$$S = \frac{P \bullet G}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$$

where: S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g. mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (in appropriate units, e.g. cm)

B.2.2 RF Exposure Assessment for TBDB1F Wireless PTT Base Station Radio

FCC Requirements

Frequency Band	Mode	Frequency Range (MHz)	EIRP (mW)	Evaluation distance (R) (cm)	Power Density (S_{eq}) $S = \frac{P \bullet G}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$ (W/m^2)	MPE limit (S_{lim}) (mW/cm^2)	Compliance ($S_{eq} < S_{lim}$) (mW/cm^2)
150 MHz	PTT	136-174	515,200	650	0.0966	0.2	**COMPLIANT**

Frequency Band	Mode	Frequency Range (MHz)	EIRP (mW)	Evaluation distance (R) (cm)	E-Field Strength (V/m)	E-Field limit	Compliance
150 MHz	PTT	136-174	515,200	650	19.08	27.5	**COMPLIANT**

Frequency Band	Mode	Frequency Range (MHz)	EIRP (mW)	Evaluation distance (R) (cm)	H-Field Strength (A/m)	H-Field limit	Compliance
150 MHz	PTT	136-174	515,200	650	0.05062	0.073	**COMPLIANT**

B.2.3 RF Exposure Assessment for TBDB1F Wireless PTT Base Station Radio

IC Requirements

Frequency Band	Mode	Frequency Range (MHz)	EIRP (mW)	Evaluation distance (R) (cm)	Power Density (S_{eq}) $S = \frac{P \bullet G}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$ (W/m^2)	MPE limit (S_{lim}) (W/m^2)	Compliance ($S_{eq} < S_{lim}$) (W/m^2)
150 MHz	PTT	136-174	515,200	650	0.966	1.291	**COMPLIANT**

Frequency Band	Mode	Frequency Range (MHz)	EIRP (mW)	Evaluation distance (R) (cm)	E-Field Strength (V/m)	E-Field limit	Compliance
150 MHz	PTT	136-174	515,200	650	19.08	22.06	**COMPLIANT**

Frequency Band	Mode	Frequency Range (MHz)	EIRP (mW)	Evaluation distance (R) (cm)	H-Field Strength (A/m)	H-Field limit	Compliance
150 MHz	PTT	136-174	515,200	650	0.05062	0.05852	**COMPLIANT**