

**LABORATORY TEST REPORT**  
**RADIO PERFORMANCE MEASUREMENTS**

for the

TBCH2B Base Station Transceiver

Tested in accordance with:

FCC 47 CFR Parts 22 and 90

RSS-119 Issue 12  
RSS-Gen Issue 5

Report Revision: 1

Issue Date: 22 October 2019

PREPARED BY: L. M. White

  
Test Technician

CHECKED & APPROVED BY: M. C. James

  
Laboratory Technical Manager



**IANZ**  
ACCREDITED LABORATORY

FCC Registration: 838288  
ISED Registration: 737A

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

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TELTEST Laboratories (A Division of Tait International Ltd)  
PO Box 1645, 558 Wairakei Road, Christchurch, New Zealand.

Telephone: 64 3 358 3399  
FAX: 64 3 359 4632

FCC ID: CASTBCH2B  
IC : 737A-TBCH2B

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Report Revision: 1  
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## REVISION

Date	Revision	Comments
22 October 2019	1	Initial test report

## INTRODUCTION

This report is to prove continued compliance of the TBCH2B 100 watt Base Station Transceiver, after a change to the IQ Filter which affects Analogue Modulation, and also adding two further modulation types; Digital FFSK and Digital Mobile Radio (DMR). This radio also supports APCO P25 phase-1 and APCO P25 phase-2 modulations. This report is to be read in combination with TELTEST reports 3587, 3742, 3807 and 3814.

Type Approval Testing of the TBCH2B  
Frequency range 440 → 480 MHz

in accordance with:  
FCC 47 CFR Parts 22 and 90  
RSS-119 Issue 12 & RSS-Gen Issue 5

### REPORT PREPARED FOR

Tait International Limited  
245 Wooldridge Road  
Harewood  
Christchurch 8051  
New Zealand

### DESCRIPTION OF SAMPLE

Manufacturer Tait International Limited  
Equipment: Base Station Transceiver  
Type: TBCH2B  
Quantity: 1

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
Analogue FM		12.5 kHz	1	-	-
FFSK	Fast Frequency Shift Keying	12.5 kHz	-	1200	1200
Digital Mobile Radio (DMR)	4 Level FSK (2 slot TDMA) (ETSI TS102 361-1)	12.5 kHz	2	4800	9600

### HARDWARE & SOFTWARE

Module	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter	T01-01103-LAAA	18302470	dmr-trunk.20191015T084706	1.01
Power Amplifier	T01-01121-LBAA	18302478	0.01.00.master.20191001T185944.0001	0.06
Front Panel	T01-01110-AAAA	18302587	0.01.00.master.20190702T175230.0001	1.00
Power management unit	TBA30A0-0100	18302486	3.16	1.00

### TEST CONDITIONS

All testing was performed on 21 October 2019, and under the following conditions:

Ambient temperature: 15°C → 30°C  
Relative Humidity: 20% → 75%  
Standard Test Voltage 120 V<sub>AC</sub>

## TEST REQUIREMENTS AND RESULT SUMMARY

ISED Specification	FCC Specification	Test Items	Test Methods	Result
RSS-119 5.3	FCC 47 CFR 90.214	Transmitter Frequency Stability - Temperature	RSS-Gen 6.11 ANSI C63.26 5.6.4	N1
RSS-119 5.3	FCC 47 CFR 2.1055 (d) (1)	Transmitter Frequency Stability - Voltage	RSS-Gen 6.11 ANSI C63.26 5.6.5	N1
RSS-119 5.4	FCC 47 CFR 2.1046	Transmitter Output Power (Conducted)	RSS-Gen 6.12 ANSI C63.26 5.2.4.2	N1
RSS-119 5.5	FCC 47CFR 90.209	Transmitter 99% Emission Bandwidth	RSS-Gen 6.7 ANSI C63.26 5.4.4	Pass
RSS-119 5.5	FCC 47 CFR 2.1049 (c)	Transmitter Occupied Bandwidth and Spectrum Mask	RSS-119 4.2.2 TIA-603-E 2.2.11	Pass
RSS-119 5.8	FCC 47 CFR 2.1051	Transmitter Spurious Emissions (Conducted)	RSS-Gen 6.13 ANSI C63.26 5.7	N2
RSS-119 5.8	FCC 47 CFR 2.1053	Transmitter Spurious Emissions (Radiated)	RSS-Gen 6.13 ANSI C63.26 5.5	N2
RSS-119 5.9	FCC 47 CFR 90.214	Transient Frequency Behaviour	TIA 603E 2.2.2	N/A
RSS-Gen 7	FCC 47CFR 15.111	Receiver Spurious Emissions (Conducted)	RSS-Gen 7.4 TIA-603E 2.1.2	N1

### Test Case Result Definitions

No test Performed	N
Test does not apply to the test object	N/A
Test object meets requirements	P (Pass)
Test object does not meet requirements	F (Fail)
Test object is not conclusive	I (Inconclusive)

### Comments

N1: This report is for a Class 2 permissive change to add Analogue, FFSK and DMR modulations. There are no changes affecting these parameters. See the original submission.

N2: The original report (Teltest 3586) tested these parameters using P25 Phase 1 C4FM modulation (TIA 102)  
The added modulations have constant envelope characteristics and it has been assessed that they are highly unlikely to give significantly different results outside the spectrum masks.

## STATEMENT OF COMPLIANCE

We, TELTEST LABORATORIES of 558 Wairakei Road, Christchurch, New Zealand, declare under our sole responsibility that the product:

Equipment: Base Station Transceiver  
Type: TBCH2B

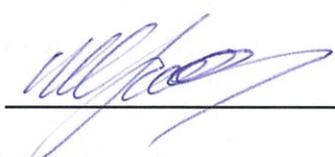
Module	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter	T01-01103-LAAA	18302470	dmr-trunk.20191015T084706	1.01
Power Amplifier	T01-01121-LBAA	18302478	0.01.00.master.20191001T185944.0001	0.06
Front Panel	T01-01110-AAAA	18302587	0.01.00.master.20190702T175230.0001	1.00
Power management unit	TBA30A0-0100	18302486	3.16	1.00

to which this declaration relates, is in conformity with the following standards:

FCC 47 CFR Parts 22 and 90

RSS-119 Issue 12 & RSS-Gen Issue 5

Signature: \_\_\_\_\_



Mike James  
Technical Manager

Date: \_\_\_\_\_

29 November 2019

The results obtained in this test report pertain only to the item(s) tested. Teltest does not make any claims of compliance for samples or variants that were not tested.

## MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

### MODULATION TYPES:

F3E	FM Analogue Voice	-	-
F2D	Fast Frequency Shift Keying	1200 symbols/sec	1200 bps
FXW	Digital Voice / Data	4800 symbols/sec	9600 bps
FXD	Digital Data	4800 symbols/sec	9600 bps

CHANNEL SPACING: 12.5 kHz

### EMISSION DESIGNATORS:

Analogue Voice	11K0F3E
FFSK	7K60F2D
DMR Digital Voice / Data	7K60FXW
DMR Digital Data	7K60FXD

Equation:  $B_n = 2M + 2Dk$

(M is highest modulating frequency; D is peak allowable deviation; k is a constant of 1 for FM)

#### Analogue Voice 12.5 kHz Channel Spacing

Necessary bandwidth	Emission Designator
M = 3.0 kHz	<b>11K0F3E</b>
D = 2.5 kHz	F3E represents an FM voice transmission
$B_n = (2 \times 3.0) + (2 \times 2.5) \times 1$ = 11.0 kHz	

#### Fast Frequency Shift Keying (FFSK – 1200 bps) 12.5 kHz Channel Spacing

Necessary bandwidth	Emission Designator
M = 1.8 kHz	<b>7K60F2D</b>
D = 2.0 kHz	F2D represents a FM data transmission with the use of a modulating sub carrier
$B_n = (2 \times 1.8) + (2 \times 2.0) \times 1$ = 7.6 kHz	

Digital Mobile Radio (DMR) 4 level FSK (as per ETSI TS 102 361-1)  
4800 symbols/sec 9600 bps

#### Digital Data 12.5 kHz Channel Spacing – 7K60FXW

99% bandwidth = 7.6 kHz	Emission Designator <b>7K60FXW</b> FXW represents FM combination of data and telephony.
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#### Digital Data 12.5 kHz Channel Spacing – 7K60FXD

99% bandwidth = 7.6 kHz	Emission Designator <b>7K60FXD</b> FXD represents FM data only
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## TEST RESULTS

### TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603E 2.2.6

#### MEASUREMENT PROCEDURE:

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

#### MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz channel spacing tested at 100 W transmit power.

LIMIT CLAUSE: TIA/EIA-603E 3.2.6

MEASUREMENT UNCERTAINTY:  $\pm 1.5 \%$

Photo: Measurement Setup

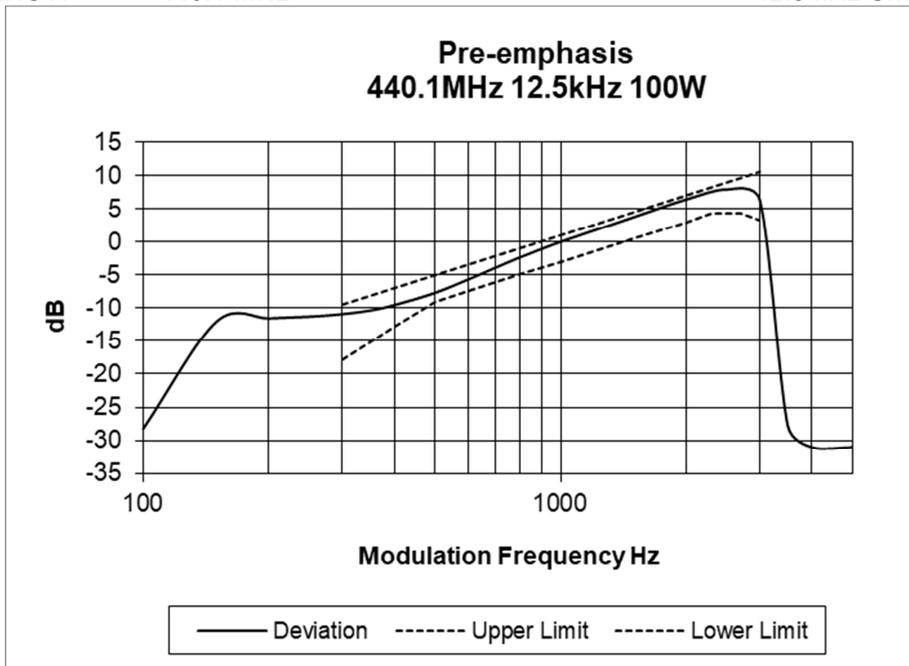


### Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 440.1 MHz

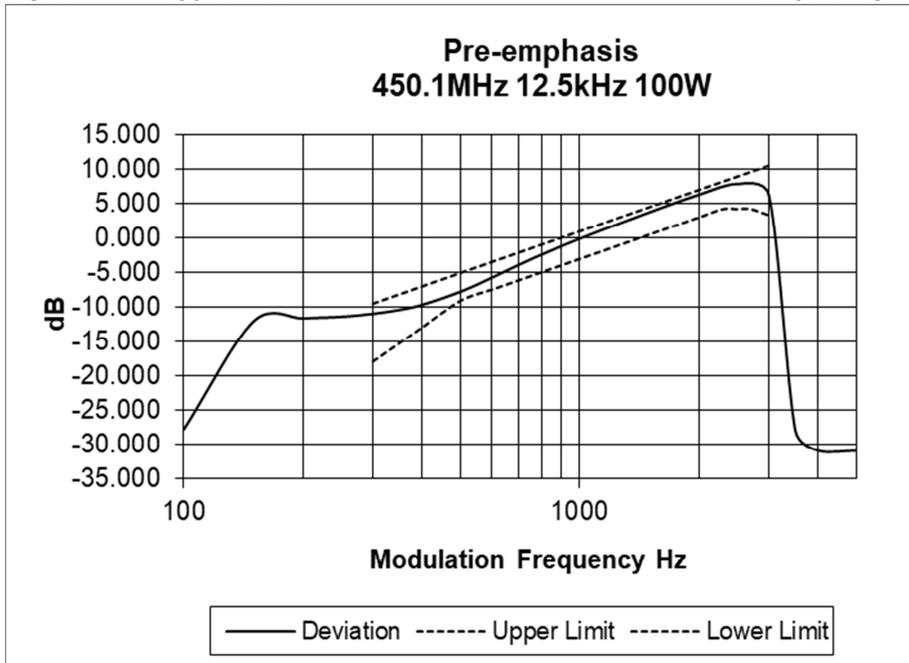
12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 450.1 MHz

12.5 kHz Channel Spacing

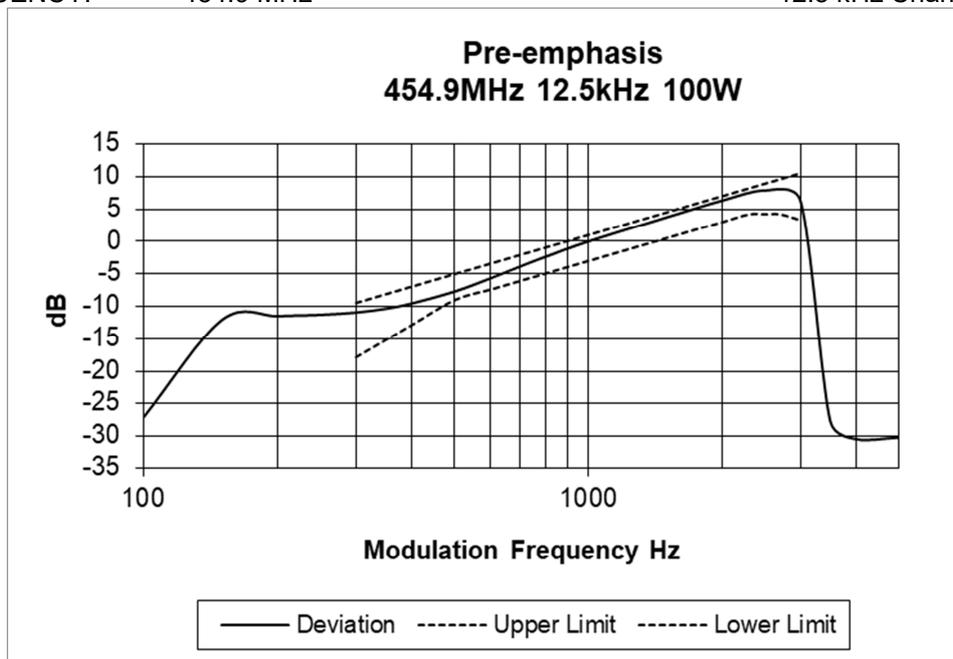


### Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 454.9 MHz

12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 456.1 MHz

12.5 kHz Channel Spacing

