

LABORATORY TEST REPORT

RADIO PERFORMANCE MEASUREMENTS

for the

TBDH3G Base Station Transceiver

Tested in accordance with:

FCC 47 CFR Parts 22 and 90

Report Revision: 1
Issue Date: 8 June 2020

PREPARED BY: L. M. White


Test Technician

CHECKED & APPROVED BY: M. C. James


Laboratory Technical Manager



FCC Registration: 838288

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

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FCC ID: CASTBDH3G

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Issue Date: 8 June 2020

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REVISION HISTORY

Date	Revision	Comments
8 June 2020	1	Initial test report

INTRODUCTION

This report is to verify TBDH3G 40 watt Base Station Transceiver ongoing compliance with the addition of C4FM modulation. This report is to be read together with Teltest report 3880. It is also capable of Narrow band analogue, FFSK and DMR modulations.

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: TBDH3G
Product Code: TB7310-H3B0-0000-00AE-10
Serial Number(s): 18295485
Frequency range: 470 → 520 MHz
Transmit Power: 40

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
APCO P25 Phase 1	C4FM (TIA 102)	12.5 kHz	1	4800	9600

HARDWARE & SOFTWARE

Quantity: 1

Module	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter	T01-01403-MAAA	18295499	p25-3.05.00.0007	1.01
Power Amplifier	T01-01405-MAAA	18295502	n/a	0.01
Front Panel	T01-01410-AAAA	4682948	1.10.01.0001	0.01

TEST CONDITIONS

All testing was performed on 8 June 2020, and under the following conditions:

Ambient temperature: 15°C → 30°C
Relative Humidity: 20% → 75%
Standard Test Voltage: 13.8 V_{DC}

TEST REQUIREMENTS AND RESULT SUMMARY

FCC Specification	Test Name	Test Methods	Result
FCC 47 CFR 2.1046	Transmitter Output Power (Conducted)	ANSI C63.26 5.2.4.2	N
FCC 47 CFR 2.1047 (a)	Transmitter Audio Frequency Response – Pre-emphasis	ANSI C63.26 5.3.3.2	N
FCC 47 CFR 2.1047 (b)	Transmitter Modulation Limiting	ANSI C63.26 5.3.2	N
FCC 47 CFR 90.210	Transmitter Spectrum Masks	TIA-603-E 2.2.11	Pass
FCC 47 CFR 90.543	Adjacent Channel Power Ratio	ANSI C63.26 6.5.2.4	N
FCC 47 CFR 2.1051	Transmitter Spurious Emissions (Conducted)	ANSI C63.26 5.7	N
FCC 47 CFR 2.1053	Transmitter Spurious Emissions (Radiated)	ANSI C63.26 5.5	N
FCC CFR 90.543	Transmitter Radiated Emissions in the GNSS Band	ANSI C63.26 6.5.2.7.3	N
FCC 47 CFR 90.214	Transient Frequency Behaviour	ANSI C63.26 6.5.2.2	N
FCC 47 CFR 90.214	Transmitter Frequency Stability - Temperature	ANSI C63.26 5.6.4	N
FCC 47 CFR 2.1055 (d) (1)	Transmitter Frequency Stability - Voltage	ANSI C63.26 5.6.5	N

Comments:

N: No test performed

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: TBDH3G
Product Code: TB7310-H3B0-0000-00AE-10
Serial Number(s): 18295485

Module	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter	T01-01403-MAAA	18295499	p25-3.05.00.0007	1.01
Power Amplifier	T01-01405-MAAA	18295502	n/a	0.01
Front Panel	T01-01410-AAAA	4682948	1.10.01.0001	0.01

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

FCC 47 CFR Parts 22 and 90

Signature: 

Mike James
Technical Manager

Date: 15 June 2020

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.

CHANNEL TABLE

Label	Channel Number	Receive Frequency	Transmit Frequency	Power	Bandwidth
470 NH	1	470.2 MHz	470.1 MHz	40 watts	12.5 kHz
470 NL	2	470.2 MHz	470.1 MHz	2 watts	12.5 kHz
491 NH	3	491.2 MHz	491.1 MHz	40 watts	12.5 kHz
491 NL	4	491.2 MHz	491.1 MHz	2 watts	12.5 kHz
511 NH	5	511.8 MHz	511.9 MHz	40 watts	12.5 kHz
511 NL	6	511.8 MHz	511.9 MHz	2 watts	12.5 kHz

MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

MODULATION TYPES:

F1E	C4FM	4800 symbols/sec	9600 bps
F1D	C4FM	4800 symbols/sec	9600 bps

CHANNEL SPACING: 12.5 kHz

EMISSION DESIGNATORS:

P25 Phase 1 Digital Voice	8K10F1E
P25 Phase 1 Digital Data	8K10F1D

APCO P25 Phase 1:

Digital Voice / Data (C4FM - 4 level frequency shift keying)

Digital Voice/data transmissions use a 4 level frequency shift keying modulation scheme.

The necessary bandwidth has been measured using the 99% energy rule, and in accordance with FCC KDB 971168 D01.

Digital Voice 12.5 kHz Channel Spacing

99% bandwidth
= 8.1 kHz

Emission Designator

8K10F1E

F1E represents a digital FM voice transmission

Digital Data 12.5 kHz Channel Spacing

99% bandwidth
= 8.1 kHz

Emission Designator

8K10F1D

F1D represents a digital FM data transmission

TEST RESULTS

TRANSMITTER SPECTRUM MASKS

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA-102.CAAA-C 2.2.5 (Digital)

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.
2. For Data measurements: The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as noted on the recorded plots.

MEASUREMENT RESULTS:

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

MEASUREMENT UNCERTAINTY 95% $\pm 0.65\text{dB}$

LIMIT CLAUSE: FCC 47 CFR 90.210

EMISSION MASKS

Emission Mask D	12.5 kHz Channel Spacing	Digital Voice/Data
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DATA SPEED

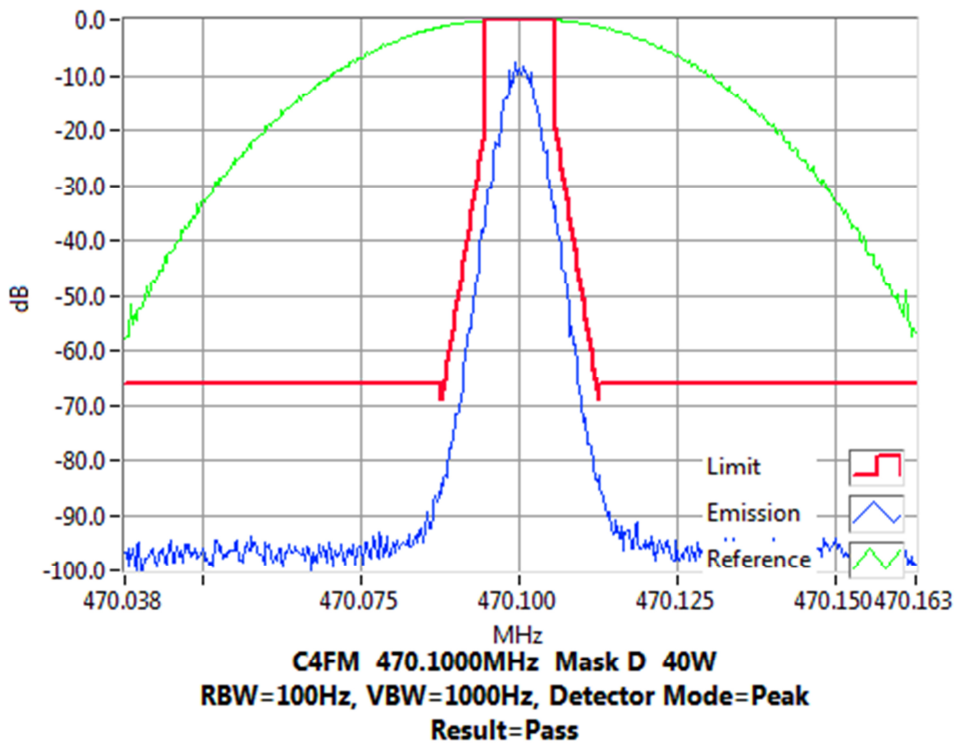
Digital Voice/Data	12.5 kHz Channel Spacing	9600 bps (P25 Phase I)
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Transmitter Spectrum Masks

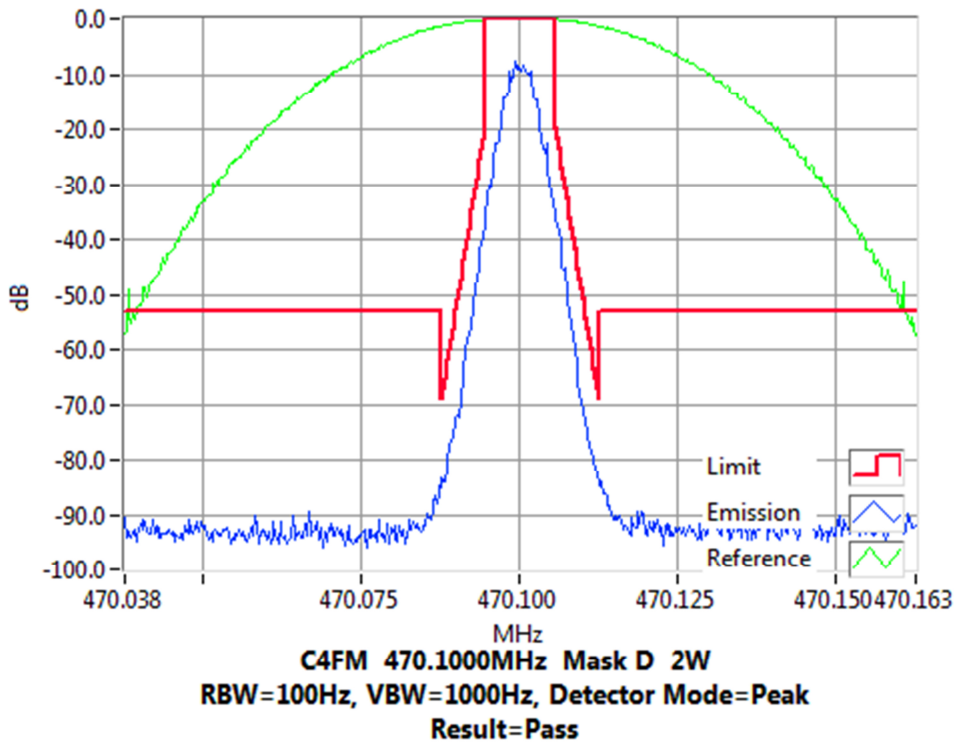
C4FM MODULATION

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 470.1 MHz 40 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 470.1 MHz 2 W 12.5 kHz Channel Spacing

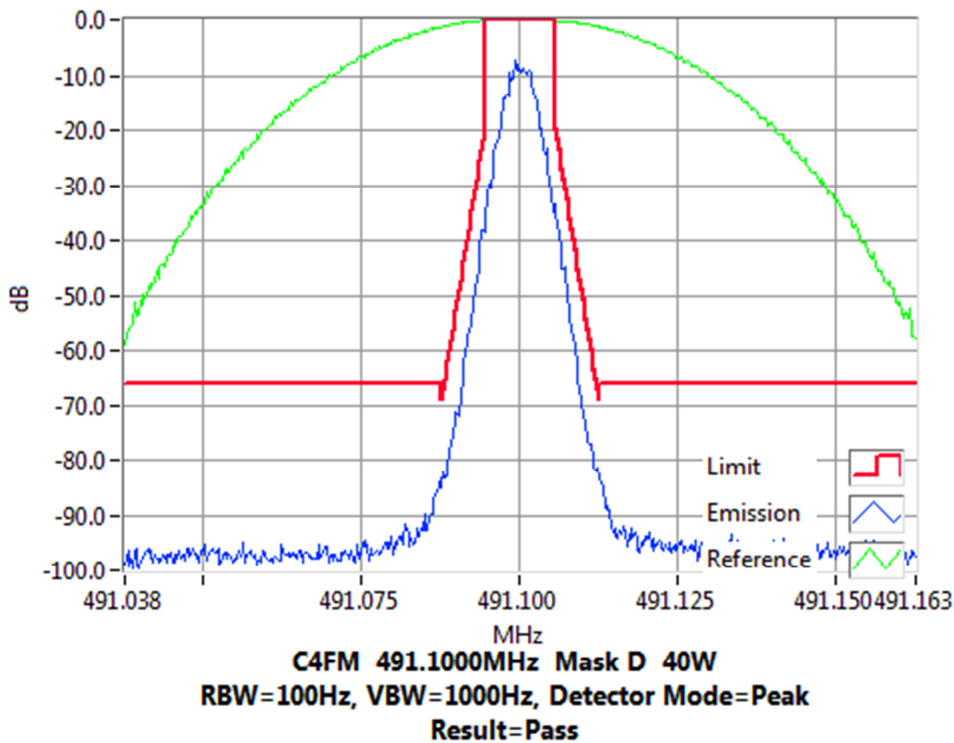


Transmitter Spectrum Masks

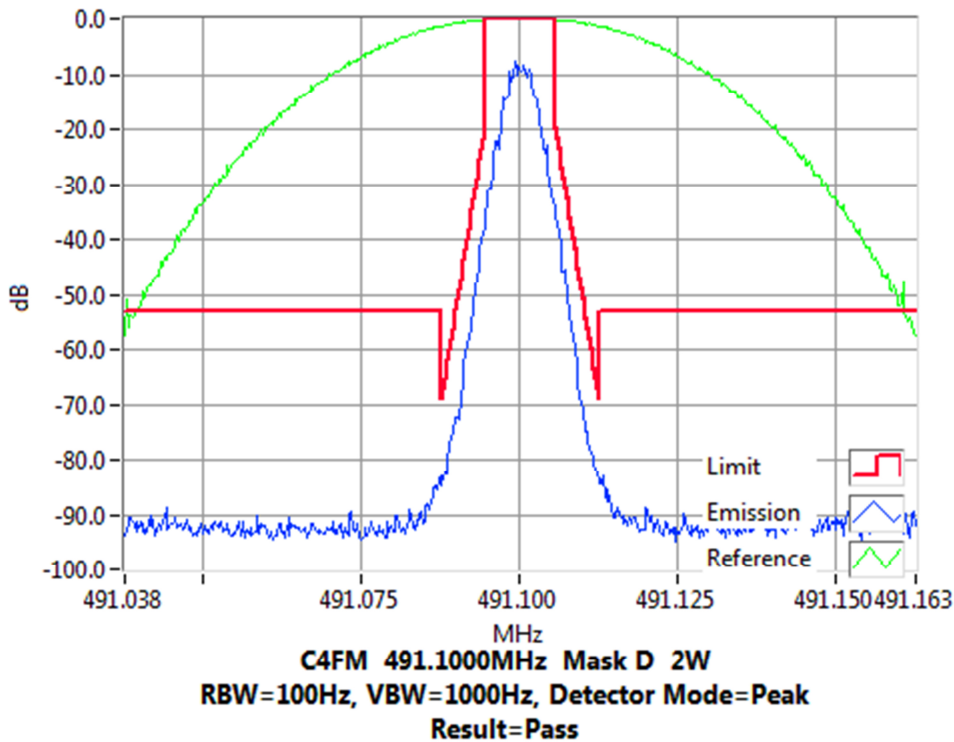
C4FM MODULATION

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 491.1 MHz 40 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 491.1 MHz 2 W 12.5 kHz Channel Spacing

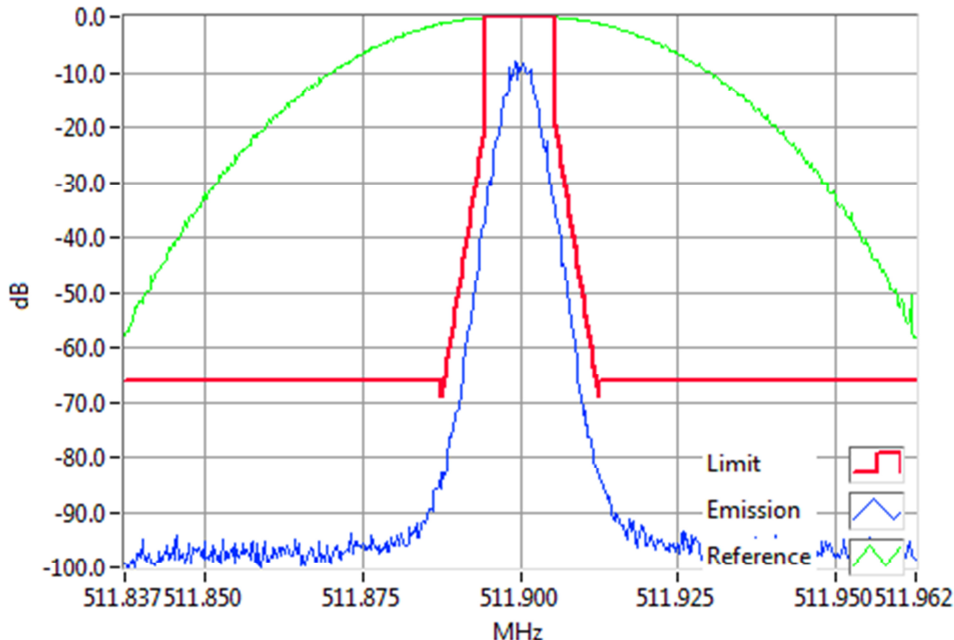


Transmitter Spectrum Masks

C4FM MODULATION

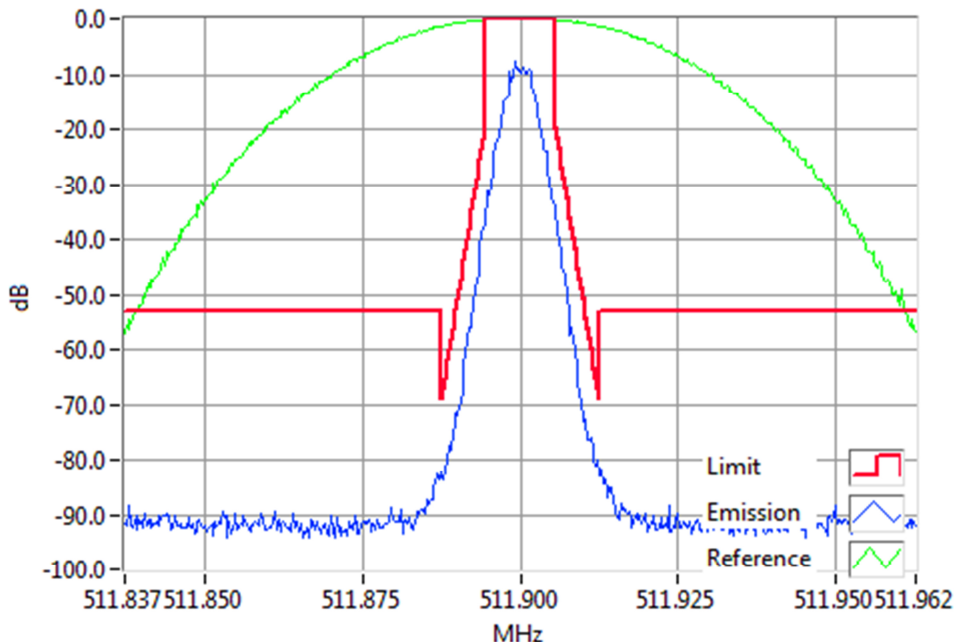
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 511.9 MHz 40 W 12.5 kHz Channel Spacing



C4FM 511.9000MHz Mask D 40W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 511.9 MHz 2 W 12.5 kHz Channel Spacing



C4FM 511.9000MHz Mask D 2W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

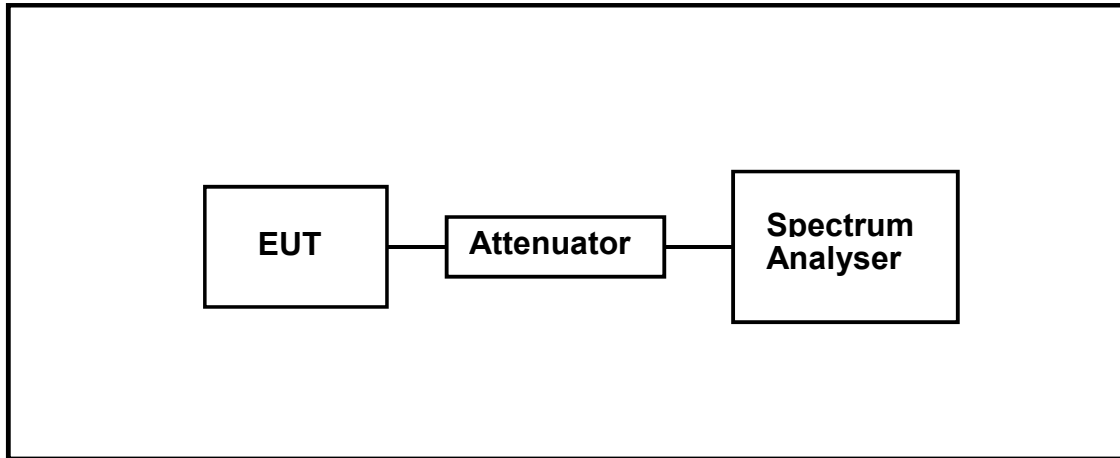
TEST EQUIPMENT LIST

Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack4	E4653	23-Oct-20
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack5	E4850	23-Oct-20
Power Supply	TREVA2 60V/25A	Agilent	N5767A	US09F4901H	E4656	3-Oct-21
RF Attenuator	33dB 350W	Weinschel	67-30-33 & BW-N3W5+	CK9178	E5023	15-Jul-20
Spectrum Analyser	26.5GHz	Agilent	PXA N9030A	MY49432161	E4907	27-Oct-20
Temp & Humidity datalogger		Hobo	U21-011	10134275	E4980	
Testware	Sideband Spectrum		February 2017	-	-	

NOTE: Items without calibration dates are calibrated immediately before use, or set using calibrated instruments.

ANNEX A – TEST SETUP DETAILS

The Spectrum Analyser is connected to the EUT via the attenuator network for Transmitter Spectrum Masks testing.



END OF REPORT