

Laboratory Test Report
ELECTROMAGNETIC COMPATIBILITY
for the
TBCH0X Base Station Receiver

Tested In accordance with
47CFR 15.107, 15.109 & 15.111

Report Revision: 1
Issue Date: 8 November 2017
FCC ID: CASTBCH0X

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Laboratory Technical Manager



OATS FCC LISTING REGISTRATION: 837095

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

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Revision History

Date	Revision	Comments
8 November 2017	1	Initial test report

Introduction

Type Approval Testing of the
TBCH0X

400 → 480 MHz

in accordance with:

47CFR 15.107, 15.109 & 15.111

Report Prepared For

Tait Ltd
245 Wooldridge Road
Harewood
Christchurch 8051
New Zealand

Description of Sample

Manufacturer: Tait Limited
Equipment: Base Station Receiver
Type: TBCH0X

Frequency Band	Product Code	Serial Number	Firmware Version	Hardware Version
400-440 MHz	T01-01104-KAAA	18248101	p25-2.20.01.0001	1
440-480 MHz	T01-01104-LAAA	18248102	p25-2.20.01.0001	1

Tested in conjunction with:

Description	Product Code	Serial Number	Firmware Version	Hardware Version
PMU	TBA30A0-0100	18248123	316	1
Front Panel	T01-01110-DAAA	18248280	1.08.00.0002	0.04

Statement of Compliance

The TBCH0X Base Station Receiver as tested in this report was found to conform to the following standards:

47CFR 15.107, 15.109 & 15.111

Test Conditions

Environmental Conditions

All testing was performed between 31 October → 8 November 2016, and under the following conditions:

Ambient Temperature: 15° C → 30° C
Relative Humidity: 20% → 75%
Standard Test Voltage: 120 V_{AC}

Measurement Frequency Range for Unintentional Radiators

The measured frequency range is determined in accordance with FCC 47CFR 15.33 (b) (1)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement (MHz)	Upper frequency selected for test
Below 1.705	30	<input type="checkbox"/>
1.705 – 108	1000	<input type="checkbox"/>
108 – 500	2000	<input type="checkbox"/>
500 – 1000	5000	<input checked="" type="checkbox"/>
Above 1000	5 th Harmonic of highest frequency or 40 GHz, whichever is lower	<input type="checkbox"/> MHz

Test Results

RADIATED SPURIOUS EMISSIONS – Unintentional Radiator

SPECIFICATION: FCC 47 CFR 15.109

GUIDE: TIA-603D 2.1.1

MEASUREMENT PROCEDURE: Direct Measurement

Initial Scan:

1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30 MHz to 800 MHz. Any emission within 20 dB of the limit is then re-tested on the OATS.
2. The EUT is placed in the reverberation chamber and emissions are measured from 800 MHz to the upper frequency required. Any emission within 20 dB of the limit is then re-tested on the OATS.

OATS Measurement:

1. The EUT is placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal is connected to an RF dummy load.
2. A calibrated measurement antenna is raised from 1 m to 4 m to obtain a maximum reading; the turntable is then rotated through 360° to obtain the maximum response of each spurious emission. Valid emissions are determined by switching the EUT on and off.
3. The maximum response of each spurious emission is recorded.
4. The emission level is determined in field strength by taking the following into consideration:
Level (dBµV/m) = Receiver Reading (dBµV) + Antenna Factor (dB/m) + Coax Loss (dB)
5. The resulting figure was converted to µV/m @ 10 m by the formula $10^{(dBµV/m / 20)}$.

LIMIT CLAUSE: FCC 47CFR 15.109

EMISSION FREQUENCY (MHz)	µVolts / Metre @ 3 Metres
30 → 88	100
88 → 216	150
216 → 960	200
960 →	500

RADIATED SPURIOUS EMISSIONS – Unintentional Radiator

SPECIFICATION: FCC 47CFR 15.109

12.5 kHz Channel Spacing 418.1 MHz Receive	
Emission Frequency (MHz)	Level (µV/m)
130.0000	5.0
632.0000	2.8
680.0000	21.6
696.0000	2.3
760.0000	109.6*
875.0000	38.9
1375.0000	21.4
*760.0 MHz estimated as 42 µV/m in the TEM cell. High ambient noise in this frequency area when testing on OATS. Measurement given is the ambient noise level	

12.5 kHz Channel Spacing 459.9 MHz Receive	
Emission Frequency (MHz)	Level (µV/m)
130.0000	5.0
632.0000	2.9
680.0000	22.1
696.0000	7.2
760.0000	109.6*
875.0000	31.3
1375.0000	21.1
*760.0 MHz estimated as 38 µV/m in the TEM cell. High ambient noise in this frequency area when testing on OATS. Measurement given is the ambient noise level	
No other emissions were detected within 10 dB of Limit.	

RADIATED SPURIOUS EMISSIONS – Unintentional Radiator

Photo: Radiated Spurious Emissions test setup OATS



CONDUCTED SPURIOUS EMISSIONS – Receiver

SPECIFICATION: FCC 47CFR 15.111

GUIDE: TIA-603D 2.1.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
2. The measurement frequency range is from 30 MHz to the upper frequency limit as determined by FCC 47 CFR 15.33.
3. Spurious emissions which were attenuated more than 20 dB below the limit were not recorded.

LIMIT CLAUSE: FCC 47CFR 15.111

MEASUREMENT RESULTS:

12.5 kHz Channel Spacing

406.2 MHz	
Emission Frequency (MHz)	Level (nW)
~	~
418.1 MHz	
Emission Frequency (MHz)	Level (nW)
~	~
429.9 MHz	
Emission Frequency (MHz)	Level (nW)
~	~
450.1 MHz	
Emission Frequency (MHz)	Level (nW)
~	~
459.9 MHz	
Emission Frequency (MHz)	Level (nW)
~	~
469.9 MHz	
Emission Frequency (MHz)	Level (nW)
~	~
No emissions were detected within 20 dB of Limit.	

LIMITS:

LIMIT	2 nW
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CONDUCTED SPURIOUS EMISSIONS – Receiver
Photo: Conducted Emissions test setup



POWER LINE CONDUCTED EMISSIONS

SPECIFICATION: FCC 47CFR 15.107 Unintentional Radiator

MEASUREMENT PROCEDURE:

1. Refer Appendix A for Equipment set up.
2. The frequency range examined was from 150 kHz to 30 MHz.
3. Emissions were measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

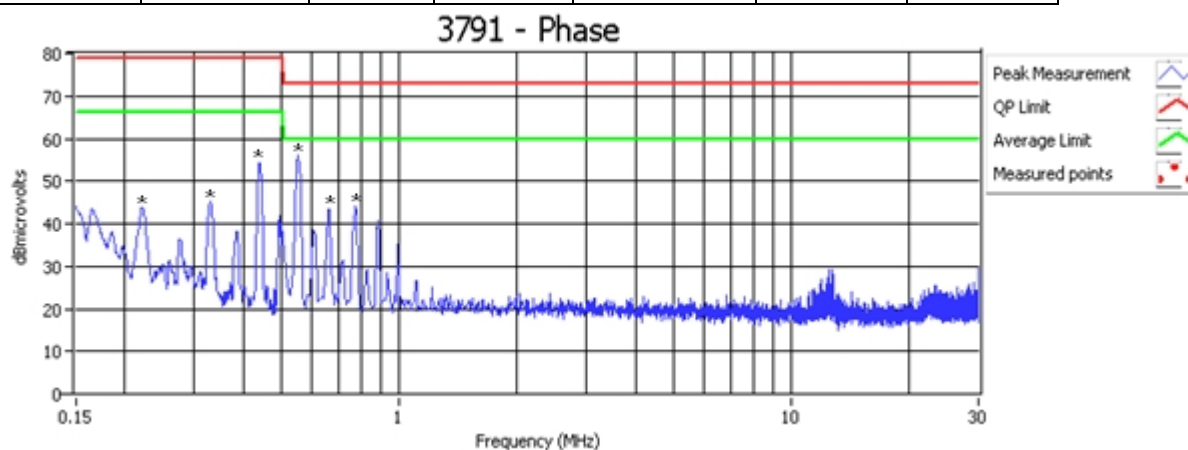
LIMIT CLAUSE: FCC 47CFR 15.107

LIMIT: CLASS A

Frequency Range MHz	Limits dB μ V	
	Quasi-Peak	Average
0.15 \rightarrow 0.5	79	66
> 0.5 \rightarrow 30	73	60

Phase

Frequency (kHz)	Average Measurement (dB μ Volt)	Average Limit (dB μ Volt)	Average Result	Quasi-Peak Measurement (dB μ Volt)	Quasi-Peak Limit (dB μ Volt)	Quasi-Peak Result
220.4	40.8	66	Pass	44.2	79	Pass
332.0	40.4	66	Pass	45.4	79	Pass
441.3	49.7	66	Pass	55.9	79	Pass
551.0	51.0	60	Pass	56.1	73	Pass
660.9	38.4	60	Pass	44.2	73	Pass
770.1	38.8	60	Pass	42.8	73	Pass



POWERLINE CONDUCTED EMISSIONS - Continued

Neutral

Frequency (kHz)	Average Measurement (dBμVolt)	Average Limit (dBμVolt)	Average Result	Quasi-Peak Measurement (dBμVolt)	Quasi-Peak Limit (dBμVolt)	Quasi-Peak Result
220.4	44.1	66	Pass	47.3	79	Pass
330.3	40.2	66	Pass	45.1	79	Pass
440.7	49.5	66	Pass	54.5	79	Pass
551.1	50.9	60	Pass	56.2	73	Pass
660.4	39.0	60	Pass	44.1	73	Pass
771.2	39.4	60	Pass	44.0	73	Pass

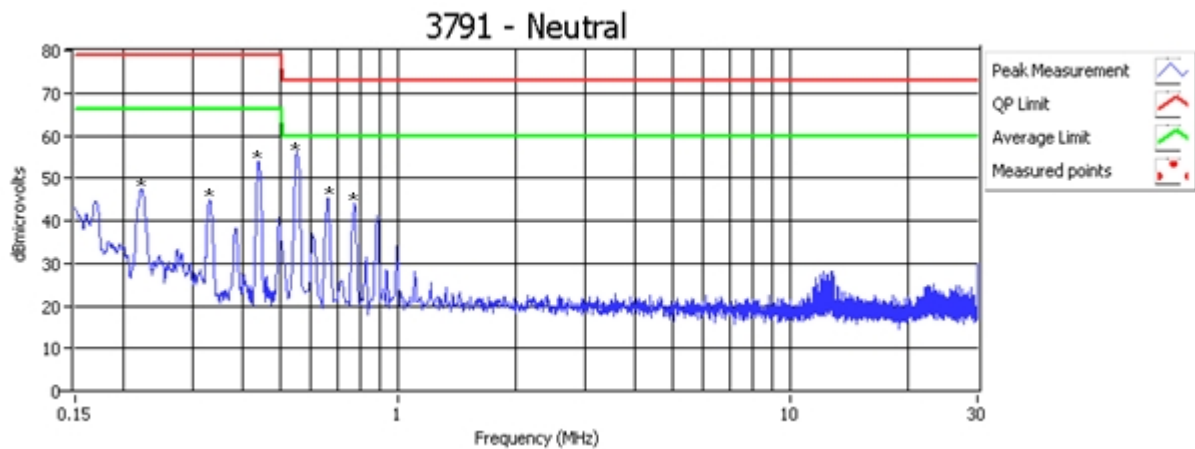


Photo: Power Line Conducted Emissions Test setup



TEST EQUIPMENT LIST

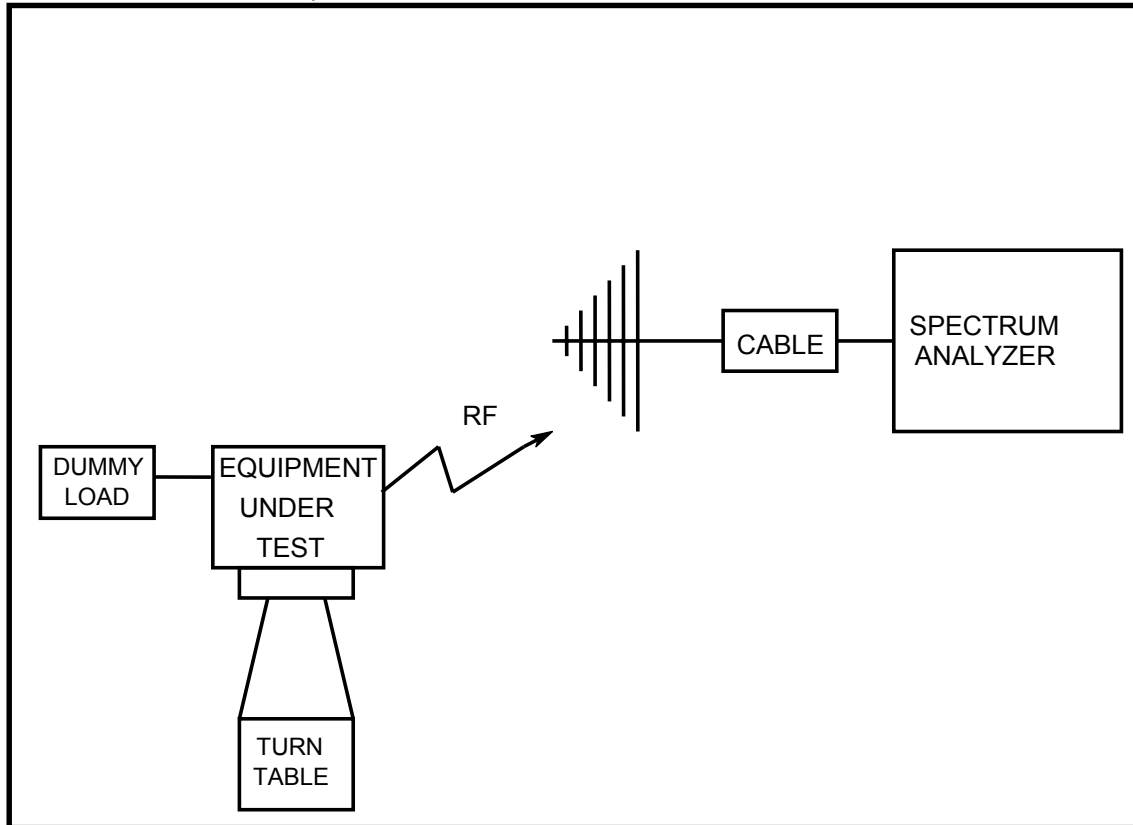
<i>Equipment Type</i>	<i>Information</i>	<i>Manufacturer</i>	<i>Model No</i>	<i>Serial No</i>	<i>Tait ID</i>	<i>Cal Due</i>
AC Voltmeter		Tait		1		8-Sep-17
Antenna	Reference Dipoles	Emco	3121C DB1	9510-1164	E3559	14-Apr-19
Antenna	18GHz DRG	Emco	DRG3115	2084	E3076	29-Apr-19
Antenna	Collapsible Biconical and Balun	Schwarzbeck	FBAB 9177,VHA 9103	9104-2459	E4616	5-Nov-16
Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-885	E4857	
Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-884	E4858	
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack2	E4623	20-Nov-16
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack3	E4624	20-Nov-16
Coax Cable	3m Blue	Suhner	Sucoflex 104A	44611/4A	E4620	20-Nov-16
Coax Cable	OATS Turntable Cable 1	Intelcom	RG214	OATS1	E4621	20-Nov-16
Coax Cable	OATS Tower Cable	Intelcom	RG214	OATS2	E4622	20-Nov-16
Coax Cable	Reverb - 4.5m Multiflex 141	TeltestBlue6	MF 141	TeltestBlue6	E4843	20-Nov-16
Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue5	MF 141	TeltestBlue5	E4844	20-Nov-16
Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue4	MF 141	TeltestBlue4	E4845	20-Nov-16
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue3	MF 141	TeltestBlue3	E4846	20-Nov-16
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue1	MF 141	TeltestBlue1	E4848	20-Nov-16
Coax Cable	OATS Turntable Cable 2	Intelcom	RG215	OATS3	E4995	20-Nov-16
LISN		Emco	3825/2	9204-1961	E3040	12-Oct-17
Multimeter		Fluke	77	35069359	E3237	10-Oct-17
OATS	NSA	Tait				20-Apr-17
OATS	Antenna Tower	Electrometrics	EM-4720-2	112	E4447	
OATS	Controller	Electrometrics	EM-4700	119	E4445	
OATS	Turntable	Electrometrics	EM-4704A	105	E4446	
OATS	FCC Listing Registration			837095		8-May-19
Power Supply	AC Variac	Yamabishi	S-260-5	TX-533	E1737	
RF Amplifier	+21.7 dB 1GHz	Tait	ZFL-1000LN	E3660	E3360	17-Jan-17
RF Amplifier	Pre-amplifier	Agilent	87405C	MY47010688	E4941	15-Oct-17
RF Chamber	Reverb - Stirrer controller for reverb chamber	Teseq	Stirrer Controller	29765.1	E4854	
RF Chamber	Reverb - 0.5 - 18GHz Reverberation Chamber	Teseq	RVC XS	29765	E4855	
RF Load	2W	MCL	NTRM-50	#02		17-Jan-17
RF Load	2W	MCL	NTRM-50	#03		17-Jan-17
Signal Generator	Analog 4GHz	Agilent	E4422B	GB40050320	E3788	15-Oct-17
Spectrum Analyser	26.5GHz	Agilent	PXA N9030A	MY49432161	E4907	18-Oct-18
Spectrum Analyser	13.2GHz	Agilent	E4445A	MY42510072	E4139	15-Oct-18
Transient Limiter	9kHz to 200MHz	Agilent	11947A	3107A03657	E4982	17-Oct-17

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

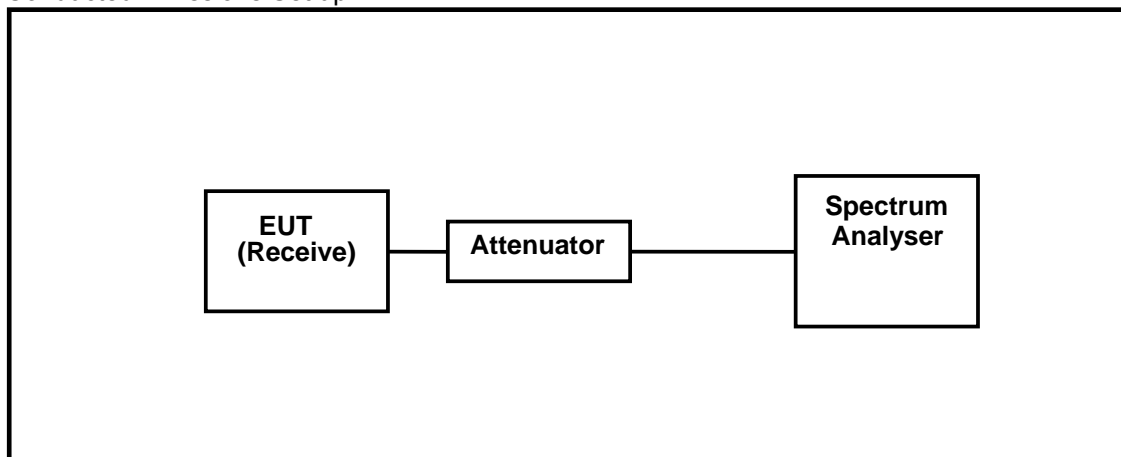
ANNEX A

TEST SETUP DETAILS

Radiated Emissions Set up.



Conducted Emissions Set up.



Power Line Conducted Emissions Set up.

