

# Laboratory Test Report

## ELECTROMAGNETIC COMPATIBILITY

for the

TBDB3F TRANSPORTABLE BASE STATION Transceiver

Tested In accordance with

47CFR 15.107, 15.109 & 15.111

Report Revision: 1  
Issue Date: 25 February 2019  
FCC ID: CASTBDB3F

PREPARED BY: Alfred Schinkelshoek

  
Test Technician

CHECKED & APPROVED BY: M. C. James

  
Laboratory Technical Manager



**IANZ**  
ACCREDITED LABORATORY

Tests indicated as not accredited are outside the laboratory's scope of accreditation.

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TELTEST Laboratories (A Division of Tait International Ltd) Telephone: 64 3 358 3399  
PO Box 1645, 558 Wairakei Road, Christchurch, New Zealand. FAX: 64 3 359 4632

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## Revision History

| <b>Date</b>      | <b>Revision</b> | <b>Comments</b>     |
|------------------|-----------------|---------------------|
| 25 February 2019 | 1               | Initial test report |
|                  |                 |                     |

## Introduction

Type Approval Testing of the  
TBDB3F  
148 → 174 MHz  
in accordance with:

47CFR 15.107, 15.109 & 15.111

## Report Prepared For

Tait International Ltd  
245 Wooldridge Road  
Harewood  
Christchurch 8051  
New Zealand

## Description of Sample

Manufacturer Tait International Limited  
Equipment: TRANSPORTABLE BASE STATION Transceiver  
Type: TBDB3F  
Product Code: TB7304-B330  
Quantity: 1  
Hardware & Software:  
HARDWARE & SOFTWARE

| Module          | Product Code   | Serial Number | Firmware Version   | Hardware Version |
|-----------------|----------------|---------------|--------------------|------------------|
| Reciter         | T01-01403-DBAA | 18286344      | dmr-2.50.01.0003   | 01.01            |
| Power Amplifier | T01-01405-BCAA | 18286345      | < Not Applicable > | 00.01            |

## Statement of Compliance

The TBDB3F TRANSPORTABLE BASE STATION Transceiver 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 15 January 2019 → 19 February 2019, and under the following conditions:

Ambient Temperature 15° C → 30° C  
Relative Humidity 20% → 75%  
Standard Test Voltage 120 V<sub>AC</sub> and 13.8 V<sub>DC</sub>

## 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 checked="" type="checkbox"/> |
| 500 – 1000   | 5000  | <input type="checkbox"/>            |
| Above 1000   | 5 <sup>th</sup> Harmonic of highest frequency or 40 GHz, whichever is lower | <input type="checkbox"/> MHz        |

## Test Results

### RADIATED SPURIOUS EMISSIONS – Unintentional Radiator

Note: This test is not accredited

SPECIFICATION: FCC 47 CFR 15.109

GUIDE: TIA-603E 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 10 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 10 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. The test 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.

LIMIT CLAUSE: FCC 47CFR 15.109

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

|                              |         |
|------------------------------|---------|
| Measurement Uncertainty (dB) | ±4.6 dB |
|------------------------------|---------|

RADIATED SPURIOUS EMISSIONS – Unintentional Radiator

SPECIFICATION: FCC 47CFR 15.109

|                          |  |  |  |
|--------------------------|--|--|--|
| 12.5 kHz Channel Spacing |  | 156.1 MHz Receive MHz / 148.1 MHz Tx Standby |  |
| Emission Frequency (MHz) |  | Level (µV/m)                                 |  |
| 47.68                    |  | 40.0   |  |
| ~                        |  | ~  |  |
| 12.5 kHz Channel Spacing |  | 157.8 MHz Receive / Tx 149.8 MHz Standby     |  |
| Emission Frequency (MHz) |  | Level (µV/m)                                 |  |
| 45.85                    |  | 43.05  |  |
| ~                        |  | ~  |  |
| 12.5 kHz Channel Spacing |  | 158.8 MHz Receive / Tx 150.8 MHz Standby     |  |
| Emission Frequency (MHz) |  | Level (µV/m)                                 |  |
| ~                        |  | ~  |  |
| 12.5 kHz Channel Spacing |  | 166.3 MHz Receive / 156.3 Tx MHz Standby     |  |
| Emission Frequency (MHz) |  | Level (µV/m)                                 |  |
| ~                        |  | ~  |  |
| 12.5 kHz Channel Spacing |  | 166.67 MHz Receive / 156.67 Tx MHz Standby   |  |
| Emission Frequency (MHz) |  | Level (µV/m)                                 |  |
| ~                        |  | ~  |  |
| 12.5 kHz Channel Spacing |  | 167.2 MHz Receive / 157.2 Tx MHz Standby     |  |
| Emission Frequency (MHz) |  | Level (µV/m)                                 |  |
| ~                        |  | ~  |  |
| 12.5 kHz Channel Spacing |  | 171.8 MHz Receive / 161.8 Tx MHz Standby     |  |
| Emission Frequency (MHz) |  | Level (µV/m)                                 |  |
| 72.22                    |  | 32.6   |  |
| ~                        |  | ~  |  |

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Report Number 3696a  
Radiated Spurious Emissions - continued

|                          |  |  |  |
|--------------------------|--|--|--|
| 12.5 kHz Channel Spacing |  | 172.0 MHz Receive / 162.0 MHz Tx Standby |  |
| Emission Frequency (MHz) |  | Level (μV/m)                             |  |
| 53.06                    |  | 67.6                                     |  |
| ~                        |  | ~  |  |
| 12.5 kHz Channel Spacing |  | 172.1 MHz Receive / 162.1 MHz Tx Standby |  |
| Emission Frequency (MHz) |  | Level (μV/m)                             |  |
| 50.67                    |  | 39.9                                     |  |
| ~                        |  | ~  |  |
| 12.5 kHz Channel Spacing |  | 158.0 MHz Receive / 168.0 MHz Tx Standby |  |
| Emission Frequency (MHz) |  | Level (μV/m)                             |  |
| ~                        |  | ~  |  |
| 12.5 kHz Channel Spacing |  | 163.3 MHz Receive / 173.3 MHz Tx Standby |  |
| Emission Frequency (MHz) |  | Level (μV/m)                             |  |
| 52.29                    |  | 42.4                                     |  |
| ~                        |  | ~  |  |

|   |         |
|---|---------|
| Measurement Uncertainty (dB)                            | ±4.6 dB |
| No other emissions were detected within 10 dB of Limit. |         |

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Report Number 3696a

**CONDUCTED SPURIOUS EMISSIONS - Receiver**

SPECIFICATION: FCC 47CFR 15.111

GUIDE: TIA-603E 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.
4. Rx and Tx (Standby) ports are both tested on the duplexer Antenna port.

LIMIT CLAUSE: FCC 47CFR 15.111

**MEASUREMENT RESULTS:**

|  |            |
|--|------------|
| 12.5 kHz Channel Spacing      156.1 MHz Receive MHz / 148.1 MHz Tx Standby |            |
| Emission Frequency (MHz)   | Level (nW) |
| ~  | ~          |
| 12.5 kHz Channel Spacing      157.8 MHz Receive / Tx 149.8 MHz Standby     |            |
| Emission Frequency (MHz)   | Level (nW) |
| ~  | ~          |
| 12.5 kHz Channel Spacing      158.8 MHz Receive / Tx 150.8 MHz Standby     |            |
| Emission Frequency (MHz)   | Level (nW) |
| ~  | ~          |
| 12.5 kHz Channel Spacing      166.3 MHz Receive / 156.3 Tx MHz Standby     |            |
| Emission Frequency (MHz)   | Level (nW) |
| ~  | ~          |
| 12.5 kHz Channel Spacing      166.67 MHz Receive / 156.67 Tx MHz Standby   |            |
| Emission Frequency (MHz)   | Level (nW) |
| ~  | ~          |

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Tait International Ltd  
Report Number 3696a  
Conducted Spurious Emissions - continued

|                          |  |  |  |
|--------------------------|--|--|--|
| 12.5 kHz Channel Spacing |  | 167.2 MHz Receive / 157.2 Tx MHz Standby |  |
| Emission Frequency (MHz) |  | Level (nW)                               |  |
| ~                        |  | ~  |  |
|                          |  |  |  |
| 12.5 kHz Channel Spacing |  | 171.8 MHz Receive / 161.8 Tx MHz Standby |  |
| Emission Frequency (MHz) |  | Level (nW)                               |  |
| ~                        |  | ~  |  |
|                          |  |  |  |
| 12.5 kHz Channel Spacing |  | 172.0 MHz Receive / 162.0 MHz Tx Standby |  |
| Emission Frequency (MHz) |  | Level (nW)                               |  |
| ~                        |  | ~  |  |
|                          |  |  |  |
| 12.5 kHz Channel Spacing |  | 162.1 MHz Receive / 172.1 MHz Tx Standby |  |
| Emission Frequency (MHz) |  | Level (nW)                               |  |
| ~                        |  | ~  |  |
|                          |  |  |  |
| 12.5 kHz Channel Spacing |  | 158.0 MHz Receive / 168.0 MHz Tx Standby |  |
| Emission Frequency (MHz) |  | Level (nW)                               |  |
| ~                        |  | ~  |  |
|                          |  |  |  |
| 12.5 kHz Channel Spacing |  | 163.3 MHz Receive / 173.3 MHz Tx Standby |  |
| Emission Frequency (MHz) |  | Level (nW)                               |  |
| ~                        |  | ~  |  |
|                          |  |  |  |

No emissions were detected within 20 dB of Limit.

LIMITS:

|       |      |
|-------|------|
| LIMIT | 2 nW |
|-------|------|

**TELTEST Laboratories**  
Tait International Ltd  
Report Number 3696a  
**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 50Ω/50μH+5Ω line impedance stabilization network (LISN).

LIMIT CLAUSE: FCC 47CFR 15.107

LIMIT: CLASS A (*Base Stations*)

| Frequency Range<br>MHz | Limits<br>dBμV |         |
|------------------------|----------------|---------|
|                        | Quasi-Peak     | Average |
| 0.15 → 0.5             | 79             | 66      |
| > 0.5 → 30             | 73             | 60      |

LIMIT: CLASS B

| Frequency Range<br>MHz  | Limits<br>dBμV       |                      |
|---|----------------------|----------------------|
|   | Quasi-Peak           | Average              |
| 0.15 → 0.5  | 66 → 56 <sup>1</sup> | 56 → 46 <sup>1</sup> |
| 0.5 → 5.0   | 56                   | 46                   |
| 5.0 → 30  | 60                   | 50                   |
| 1. The limit decreases linearly with the logarithm of the frequency |                      |                      |

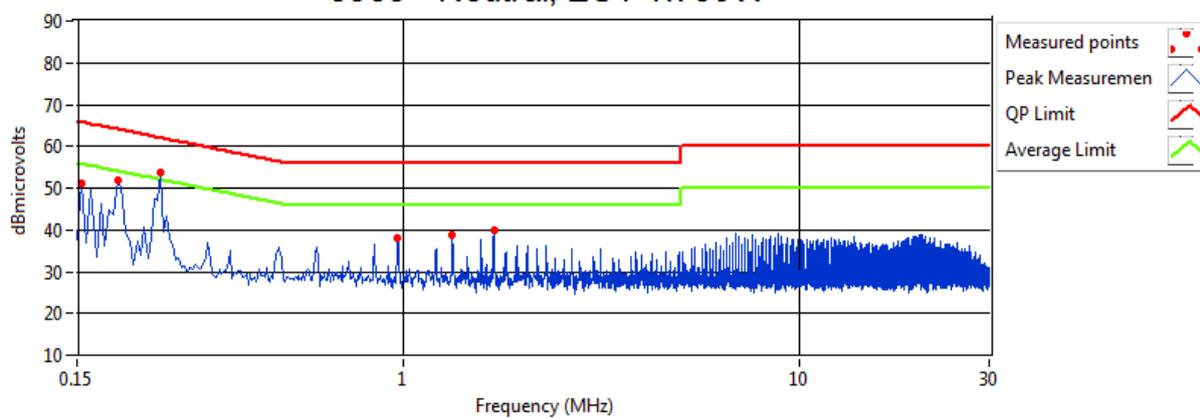
150.8 MHz @ 30 W

Neutral

Class B

| Frequency (MHz) | Peak Measurement (dBμVolt) | Average Measurement (dBμVolt) | Average Limit (dBμVolt) | Average Result | Quasi-Peak Measurement (dBμVolt) | Quasi-Peak Limit (dBμVolt) | Quasi-Peak Result |
|-----------------|----------------------------|-------------------------------|-------------------------|----------------|----------------------------------|----------------------------|-------------------|
| 0.129           | 74.1                       | 37.4                          | 55.8                    | Pass           | 42.2                             | 65.8                       | Pass              |
| 0.193           | 52.8                       | 47.8                          | 54.0                    | Pass           | 51.7                             | 64.0                       | Pass              |
| 0.242           | 54.1                       | 46.4                          | 52.0                    | Pass           | 52.1                             | 62.0                       | Pass              |
| 0.965           | 38.9                       | 35.2                          | 46.0                    | Pass           | 37.4                             | 56.0                       | Pass              |
| 1.327           | 39.8                       | 36.5                          | 46.0                    | Pass           | 38.5                             | 56.0                       | Pass              |
| 1.689           | 41.4                       | 38.4                          | 46.0                    | Pass           | 39.9                             | 56.0                       | Pass              |

**3969 - Neutral, EUT Tx 30W**



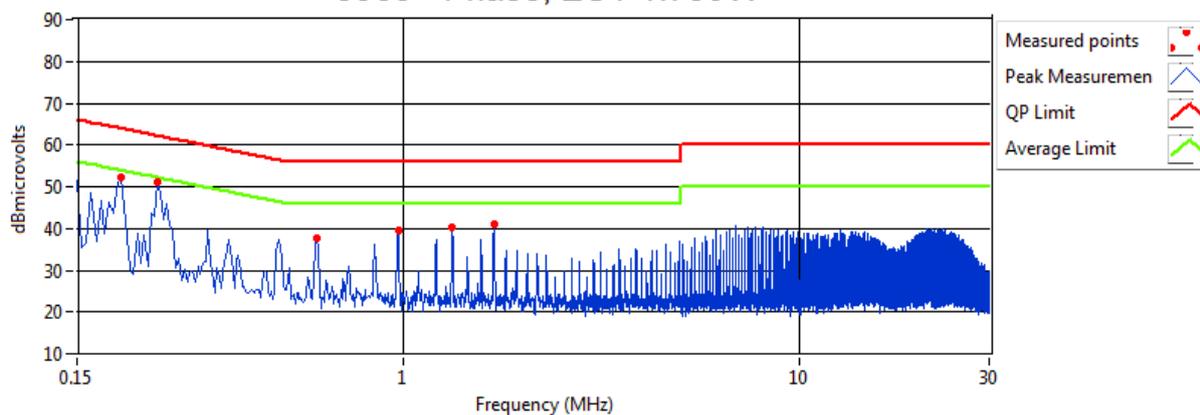
150.8 MHz @ 30 W

Phase

Class B

| Frequency (MHz) | Peak Measurement (dBμVolt) | Average Measurement (dBμVolt) | Average Limit (dBμVolt) | Average Result | Quasi-Peak Measurement (dBμVolt) | Quasi-Peak Limit (dBμVolt) | Quasi-Peak Result |
|-----------------|----------------------------|-------------------------------|-------------------------|----------------|----------------------------------|----------------------------|-------------------|
| 0.192           | 53.7                       | 49.2                          | 53.8                    | Pass           | 53.0                             | 63.8                       | Pass              |
| 0.243           | 53.6                       | 47.1                          | 52.1                    | Pass           | 50.7                             | 62.1                       | Pass              |
| 0.603           | 38.5                       | 36.7                          | 46.0                    | Pass           | 37.8                             | 56.0                       | Pass              |
| 0.965           | 39.7                       | 37.9                          | 46.0                    | Pass           | 39.0                             | 56.0                       | Pass              |
| 1.328           | 41.0                       | 39.5                          | 46.0                    | Pass           | 40.5                             | 56.0                       | Pass              |
| 1.690           | 41.4                       | 40.1                          | 46.0                    | Pass           | 41.0                             | 56.0                       | Pass              |

**3969 - Phase, EUT Tx 30W**



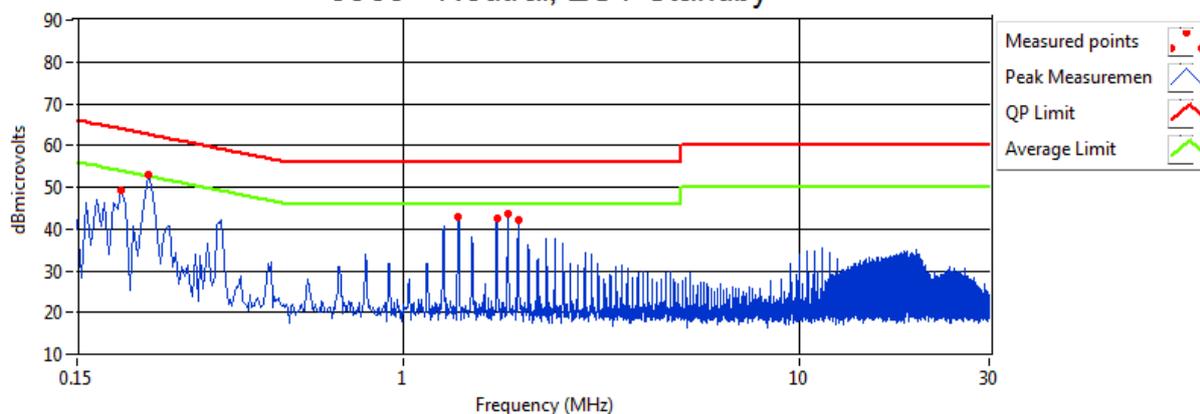
150.8 MHz Rx/Tx Sby

Neutral

Class B

| Frequency (MHz) | Peak Measurement (dBμVolt) | Average Measurement (dBμVolt) | Average Limit (dBμVolt) | Average Result | Quasi-Peak Measurement (dBμVolt) | Quasi-Peak Limit (dBμVolt) | Quasi-Peak Result |
|-----------------|----------------------------|-------------------------------|-------------------------|----------------|----------------------------------|----------------------------|-------------------|
| 0.192           | 53.3                       | 45.0                          | 53.8                    | Pass           | 51.4                             | 63.8                       | Pass              |
| 0.230           | 55.0                       | 48.2                          | 52.6                    | Pass           | 53.4                             | 62.6                       | Pass              |
| 1.374           | 43.0                       | 42.0                          | 46.0                    | Pass           | 42.5                             | 56.0                       | Pass              |
| 1.719           | 43.1                       | 42.2                          | 46.0                    | Pass           | 42.8                             | 56.0                       | Pass              |
| 1.833           | 43.8                       | 43.0                          | 46.0                    | Pass           | 43.3                             | 56.0                       | Pass              |
| 1.948           | 42.2                       | 41.4                          | 46.0                    | Pass           | 42.0                             | 56.0                       | Pass              |

**3969 - Neutral, EUT Standby**



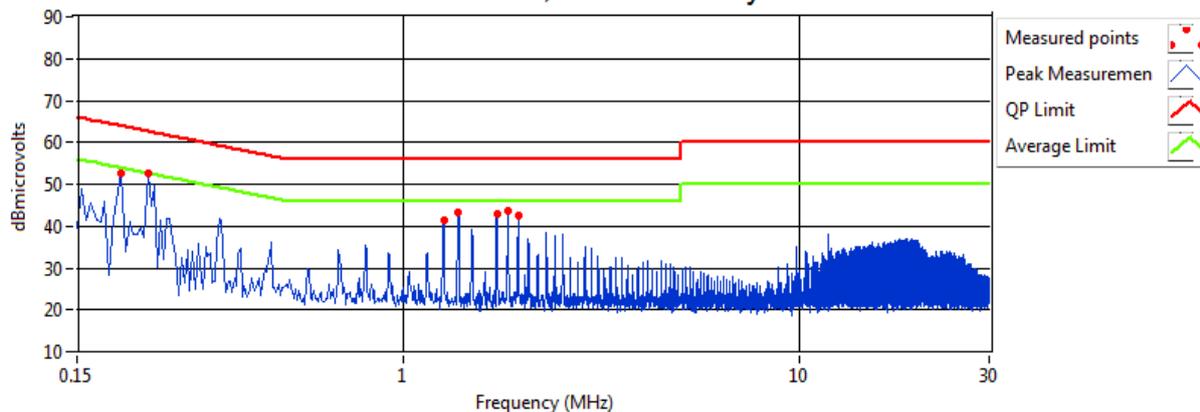
150.8 MHz Rx/Tx Sby

Phase

Class B

| Frequency (MHz) | Peak Measurement (dBμVolt) | Average Measurement (dBμVolt) | Average Limit (dBμVolt) | Average Result | Quasi-Peak Measurement (dBμVolt) | Quasi-Peak Limit (dBμVolt) | Quasi-Peak Result |
|-----------------|----------------------------|-------------------------------|-------------------------|----------------|----------------------------------|----------------------------|-------------------|
| 0.193           | 53.3                       | 45.2                          | 53.8                    | Pass           | 51.6                             | 63.8                       | Pass              |
| 0.230           | 54.2                       | 46.4                          | 52.6                    | Pass           | 52.4                             | 62.6                       | Pass              |
| 1.261           | 42.1                       | 41.1                          | 46.0                    | Pass           | 41.8                             | 56.0                       | Pass              |
| 1.376           | 43.8                       | 43.0                          | 46.0                    | Pass           | 43.5                             | 56.0                       | Pass              |
| 1.719           | 43.5                       | 42.6                          | 46.0                    | Pass           | 43.1                             | 56.0                       | Pass              |
| 1.833           | 44.1                       | 43.1                          | 46.0                    | Pass           | 43.6                             | 56.0                       | Pass              |

**3969 - Phase, EUT Standby**



Measurement Uncertainty:

|                              |  |
|------------------------------|--|
| Measurement Uncertainty (dB) | with a 95% confidence interval is $\pm 3.5$ dB |
|------------------------------|--|

## TEST EQUIPMENT LIST

| Equipment Type    | Information                                    | Manufacturer    | Model No           | Serial No#    | Tait ID | Cal Due   |
|-------------------|--|-----------------|--------------------|---------------|---------|-----------|
| Antenna           | Reference Dipoles                              | Emco            | 3121C DB1          | 9510-1164     | E3559   | 14-Apr-19 |
| Antenna           | Reverb - 1-18GHz DRG                           | Schwarzbeck     | BBHA 9120 D        | 9120D-885     | E4857   |           |
| Antenna           | Reverb - 1-18GHz DRG                           | Schwarzbeck     | BBHA 9120 D        | 9120D-884     | E4858   |           |
| Antenna           | Collapsible Biconical and Balun                | Schwarzbeck     | FBAB 9177,VHA 9103 | 9104-2459     | E4616   | 17-May-20 |
|                   |  |                 |                    |               |         |           |
|                   |  |                 |                    |               |         |           |
| Coax Cable        | OATS Turntable Cable 1                         | Intelcom        | RG214              | OATS1         | E4621   | 15-Nov-19 |
| Coax Cable        | OATS Tower Cable                               | Intelcom        | RG214              | OATS2         | E4622   | 14-Nov-19 |
| Coax Cable        | OATS Turntable Cable 2                         | Intelcom        | RG215              | OATS3         | E4995   | 14-Nov-19 |
| Coax Cable        | 2.5m Blue                                      | Suhner          | Sucoflex 104A      | 33449/4PEA    | E4997   | 19-Oct-19 |
| Coax Cable        | 2m Black                                       | Suhner          | RG214HF/Nm/Nm/2000 | TeltestBlack8 | E5005   | 17-Oct-19 |
| Coax Cable        | 3m Blue  | Suhner          | Sucoflex 126EA     | 503429/126EA  | E5015   | 19-Oct-19 |
| Coax Cable        | 2m Black                                       | Suhner          | RG214HF/Nm/Nm/2000 | TeltestBlack2 | E4623   | 17-Oct-19 |
| Coax Cable        | 2m Black                                       | Suhner          | RG214HF/Nm/Nm/2000 | TeltestBlack3 | E4624   | 17-Oct-19 |
| Coax Cable        | Reverb - 2m Multiflex 141                      | TeltestBlue5    | MF 141             | TeltestBlue5  | E4844   | 18-Oct-19 |
| Coax Cable        | Reverb - 2m Multiflex 141                      | TeltestBlue4    | MF 141             | TeltestBlue4  | E4845   | 18-Oct-19 |
| Coax Cable        | Reverb - 1m Multiflex 141                      | TeltestBlue3    | MF 141             | TeltestBlue3  | E4846   | 18-Oct-19 |
| Coax Cable        | Reverb - 1m Multiflex 141                      | TeltestBlue2    | MF 141             | TeltestBlue2  | E4847   | 18-Oct-19 |
| OATS              | Controller                                     | Electrometrics  | EM-4700            | 119           | E4445   |           |
| OATS              | Antenna Tower                                  | Electrometrics  | EM-4720-2          | 112           | E4447   |           |
| OATS              | NSA  | Tait            |                    |               |         |           |
| Spectrum Analyser | 26.5GHz  | Agilent         | PXA N9030A         | MY49432161    | E4907   | 27-Oct-20 |
| Spectrum Analyser | 13.2GHz  | Hewlett Packard | HP8562E            | 3821A00779    | E3715   | 26-Sep-19 |
| Coax Cable        | 2m Black                                       | Suhner          | RG214HF/Nm/Nm/2000 | TeltestBlack7 | E5004   | 17-Oct-19 |
| Testware          | Radiated Emissions                             |                 | April 2018         | -             | -       |           |
| Testware          | Reverb Emissions                               |                 | June 2018          | -             | -       |           |
| Testware          | S-Line Radiated Emissions                      |                 | April 2018         | -             | -       |           |
| AC Voltmeter      |  | Tait            |                    | 1             |         | 17-Apr-19 |
| ISN               |  | Rohde & Schwarz | ENY41              | 100136        | E4277   |           |
| ISN               | CISPR22 2006                                   | TESEQ           | ISN T800           | 27956         | E4658   | 18-Aug-16 |
| Power Supply      | AC Variac                                      | Yamabishi       | S-260-5            | TX-533        | E1737   |           |
| RF Amplifier      | +21.7 dB 1GHz                                  | Tait            | ZFL-1000LN         | E3660         | E3360   | 17-Apr-19 |
| RF Amplifier      | Pre-amplifier                                  | Agilent         | 87405C             | MY47010688    | E4941   | 2-Oct-19  |
| RF Chamber        | S-LINE TEM CELL                                | Rohde & Schwarz | 1089.9296.02       | 338232/003    | E3636   | 12-Sep-20 |
| 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           | 150W   | Bird            | 8166               | 524           | E3625   | 17-Oct-19 |
| Spectrum Analyser | 13.2GHz  | Agilent         | E4445A             | MY42510072    | E4139   | 19-Jul-20 |

**TELTEST Laboratories**  
Tait International Ltd  
Report Number 3696a

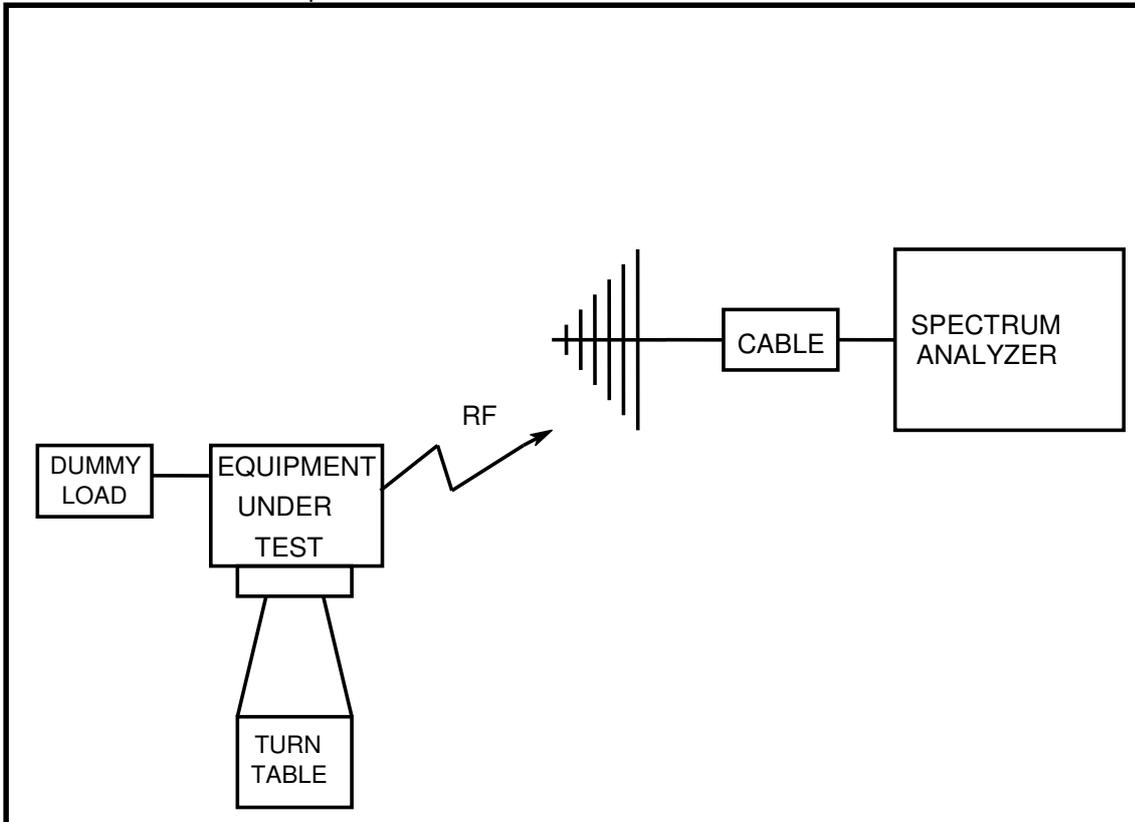
|                            |                        |                 |            |            |       |           |
|----------------------------|------------------------|-----------------|------------|------------|-------|-----------|
| Temp & Humidity datalogger |                        | Hobo            | U21-011    | 10134276   | E4981 | 22-Apr-19 |
| LISN                       | 50Ω/50μH+5Ω            | Schwarzbeck     | NSLK 8117  | 7          | E5016 | 12-Mar-19 |
| RF Attenuator              | 10dB 150W              | Weinschel       | 57-10-34   | LB590      | E3674 | 18-Oct-19 |
| Signal Generator           | Analog 3.2GHz          | Hewlett Packard | HP8648C    | 3443U00543 | E3558 | 2-Oct-19  |
| Signal Generator           | Analog 4GHz            | Agilent         | E4422B     | GB40050320 | E3788 | 27-Sep-19 |
| Transient Limiter          | 9kHz to 200MHz         | Agilent         | 11947A     | 3107A03657 | E4982 | 26-Sep-19 |
| Testware                   | Conducted Disturbances |                 | March 2018 | -          | -     |           |

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

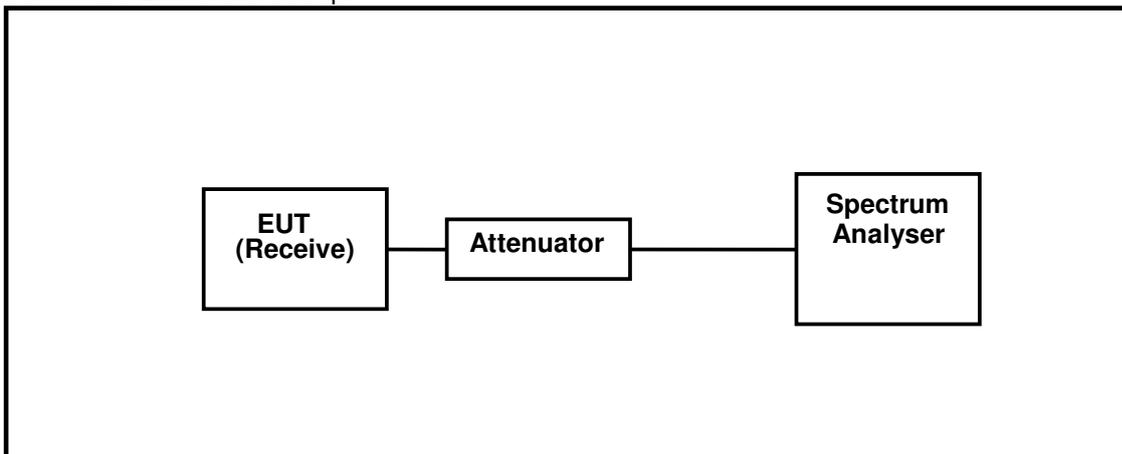
**ANNEX A**

**Test Setup Details**

Radiated Emissions Set up.



Conducted Emissions Set up.



Power Line Conducted Emissions Set up.

