

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

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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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Revision History

Date	Revision	Comments
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_{AC} and 13.8 V_{DC}

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	☐
1.705 – 108	1000	☐
108 – 500	2000	☒
500 – 1000	5000	☐
Above 1000	5 th Harmonic of highest frequency or 40 GHz, whichever is lower	☐ 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 (MHz)	µVolts / Metre @ 3 Metres
30 → 88	100
88 → 216	150
216 → 960	200
960 →	500

Measurement Uncertainty (dB)	±4.6 dB
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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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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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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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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
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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 MHz	Limits dBμV	
	Quasi-Peak	Average
0.15 → 0.5	79	66
> 0.5 → 30	73	60

LIMIT: CLASS B

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

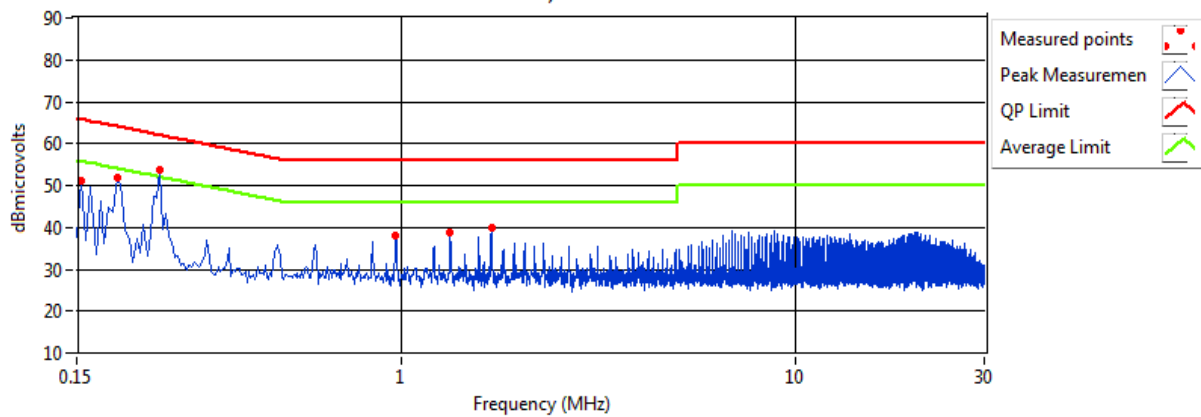
150.8 MHz @ 30 W

Neutral

Class B

Frequency (MHz)	Peak Measurement (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)	Average Result	Quasi-Peak Measurement (dBμV)	Quasi-Peak Limit (dBμV)	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



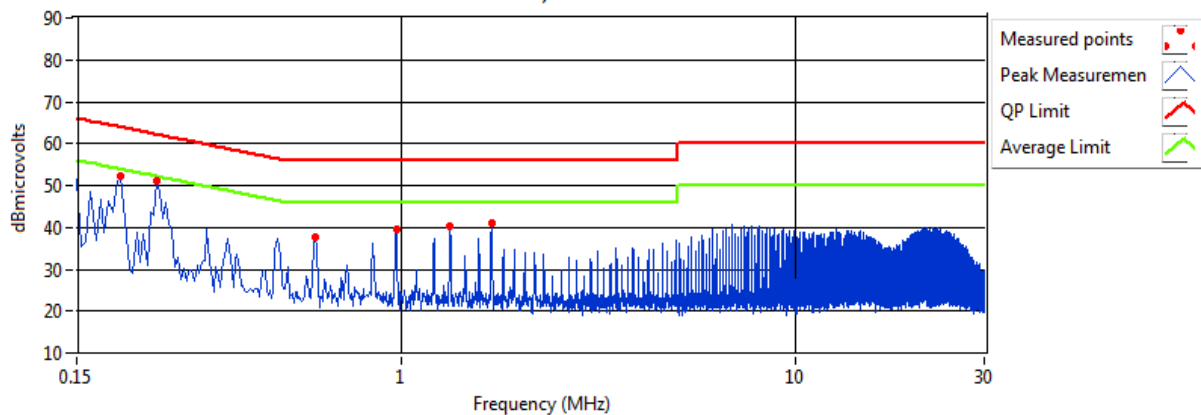
150.8 MHz @ 30 W

Phase

Class B

Frequency (MHz)	Peak Measurement (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)	Average Result	Quasi-Peak Measurement (dBμV)	Quasi-Peak Limit (dBμV)	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



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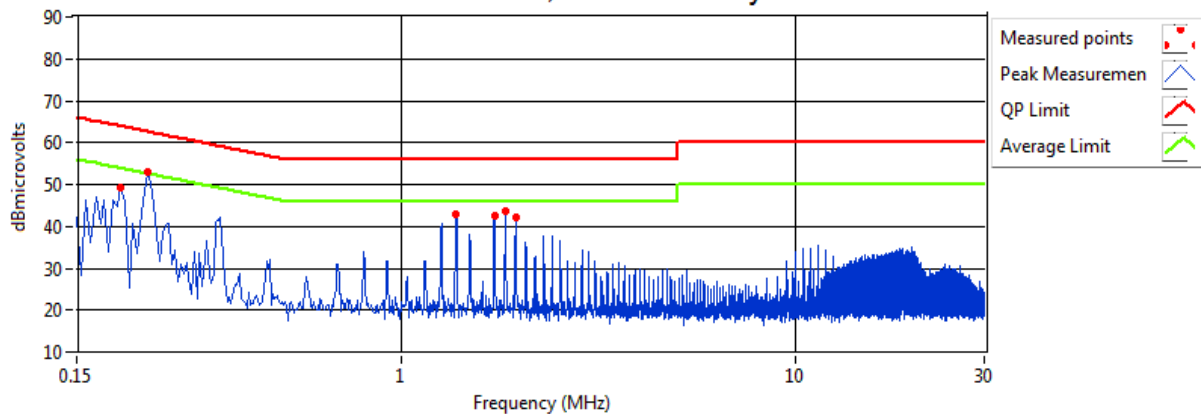
150.8 MHz Rx/Tx Sby

Neutral

Class B

Frequency (MHz)	Peak Measurement (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)	Average Result	Quasi-Peak Measurement (dBμV)	Quasi-Peak Limit (dBμV)	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



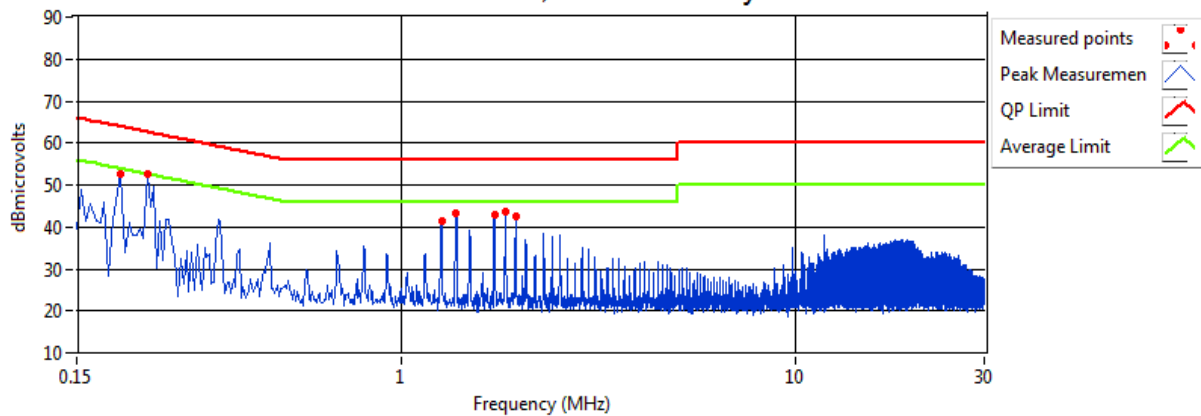
150.8 MHz Rx/Tx Sby

Phase

Class B

Frequency (MHz)	Peak Measurement (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)	Average Result	Quasi-Peak Measurement (dBμV)	Quasi-Peak Limit (dBμV)	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



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Measurement Uncertainty:

Measurement Uncertainty (dB)	with a 95% confidence interval is ± 3.5 dB
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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

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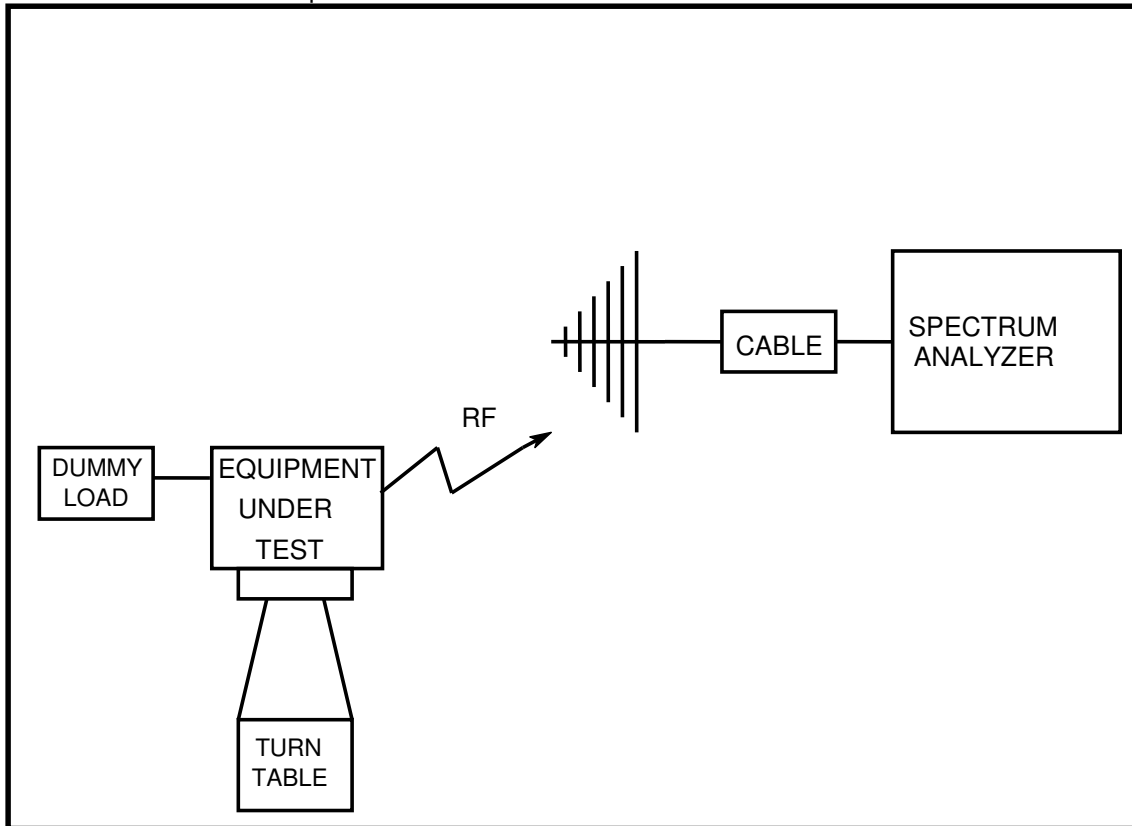
Temp & Humidity datalogger		Hobo	U21-011	10134276	E4981	22-Apr-19
LISN	50Ω/50μH+5Ω	Schwarzbeck	NSLK 8117	7	E5016	12-Mar-19
RF Attenuator	10dB 150W	Weinschel	57-10-34	LB590	E3674	18-Oct-19
Signal Generator	Analog 3.2GHz	Hewlett Packard	HP8648C	3443U00543	E3558	2-Oct-19
Signal Generator	Analog 4GHz	Agilent	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.

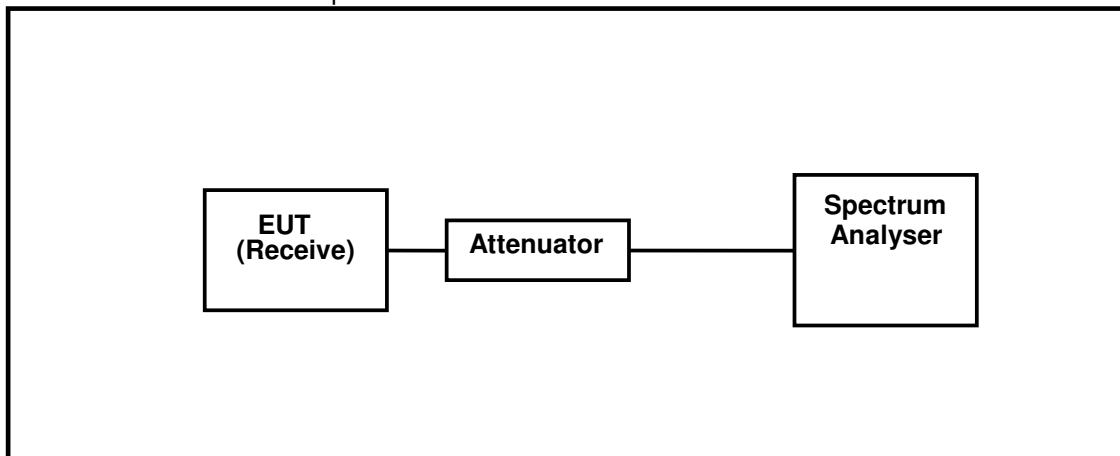
ANNEX A

Test Setup Details

Radiated Emissions Set up.



Conducted Emissions Set up.



Power Line Conducted Emissions Set up.

