

Laboratory Test Report
ELECTROMAGNETIC COMPATIBILITY
for the
TBCK4X Base Station Receiver

Tested In accordance with
47CFR 15.107, 15.109 & 15.111

Report Issue: 2
Issue Date: 21-November-2014
FCC ID: CASTBCK4X

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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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TABLE OF CONTENTS

REVISION HISTORY	2
INTRODUCTION	3
REPORT PREPARED FOR.....	3
DESCRIPTION OF SAMPLE	3
STATEMENT OF COMPLIANCE	3
TEST CONDITIONS.....	3
MEASUREMENT FREQUENCY RANGE FOR UNINTENTIONAL RADIATORS.....	4
TEST RESULTS.....	5
RADIATED SPURIOUS EMISSIONS – UNINTENTIONAL RADIATOR	5
CONDUCTED SPURIOUS EMISSIONS - RECEIVER	7
POWER LINE CONDUCTED EMISSIONS.....	9
TEST EQUIPMENT LIST	11
ANNEX A.....	12
TEST SETUP DETAILS.....	12

Revision History

Date	Issue	Comments
4-November-2014	1	Initial test report
21-November-2014	2	Test report with additional results for Power Line Conducted Emissions and Radiated Emissions not contained in 3608A Revision-1.

Introduction

Type Approval Testing of the
TBCK4X

760 → 869 MHz

in accordance with:

47CFR 15.107, 15.109 & 15.111

This report contains additional test results for Power Line Conducted Emissions and Radiated Emissions that were not part of the original test report 3608A Revision-1.

Report Prepared For

Tait Limited
PO Box 1645
558 Wairakei Rd
Christchurch
New Zealand

Description of Sample

Manufacturer: Tait Limited
Equipment: Base Station Receiver
Type: TBCK4X

Consisting of:

Description	Product Code	Serial Number	Firmware Version	Hardware Version
Reciter-1	T01-01104-NAAA	18202957	p25-1.40.00.0008	00.11
Reciter-2		18202956		
Reciter-3		18202958		
Reciter-4		18202955		
PMU	TBA30A0-0100	18202525	0316	01.00
Front Panel	T01-01110-DAAA	18202953	0.01.00.trunk.350370. 20140918T113436.0002	00.04

Statement of Compliance

The TBCK4X 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 31st October → 20th November 2014, 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	☐
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

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 1000 MHz. Any emission within 20 dB of the limit is then re-tested on the OATS along with measurements from 1000 MHz to the upper frequency required.
2. The EUT is placed in the reverberation chamber and emissions are measured from 1000 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. As the measurements were made on a 3m OATS the results were adjusted by -10.46dB to give the equivalent value to those made on a 10m site (as per the limit).
6. The resulting figure was converted to µV/m @ 10 m by the formula $10^{(dBµV/m / 20)}$.

LIMIT CLAUSE: FCC 47CFR 15.109 (b) Class A Digital Device

EMISSION FREQUENCY (MHz)	µVolts / Metre @ 10 Metres
30 → 88	90
88 → 216	150
216 → 960	210
960 →	300

RADIATED SPURIOUS EMISSIONS – Unintentional Radiator

SPECIFICATION: FCC 47CFR 15.109

12.5 kHz Channel Spacing

794.100 MHz; 800.100 MHz; 806.000 MHz; 813.500 MHz	
Emission Frequency (MHz)	Level (µV/m @ 10m)
3619.999	64.9
3679.500	33.3
821.000 MHz; 823.900 MHz	
Emission Frequency (MHz)	Level (µV/m)
*3392.099	49.2
No other emissions were detected within 20 dB of Limit.	

NOTES:

The EUT was tested with all four reciters installed and tuned to different frequencies

For testing of channels 821.0 MHz and 823.9 MHz, reciters 1 & 2 (originally 794.1 MHz & 800.1 MHz) were retuned to 821.0 MHz and 823.9 MHz. Reciters 3 & 4 were left unchanged on 806.0 MHz and 813.5 MHz.

The emission at *3392.099 MHz was present for only a few minutes immediately after EUT boot-up, and this was verified by rebooting the EUT several times.

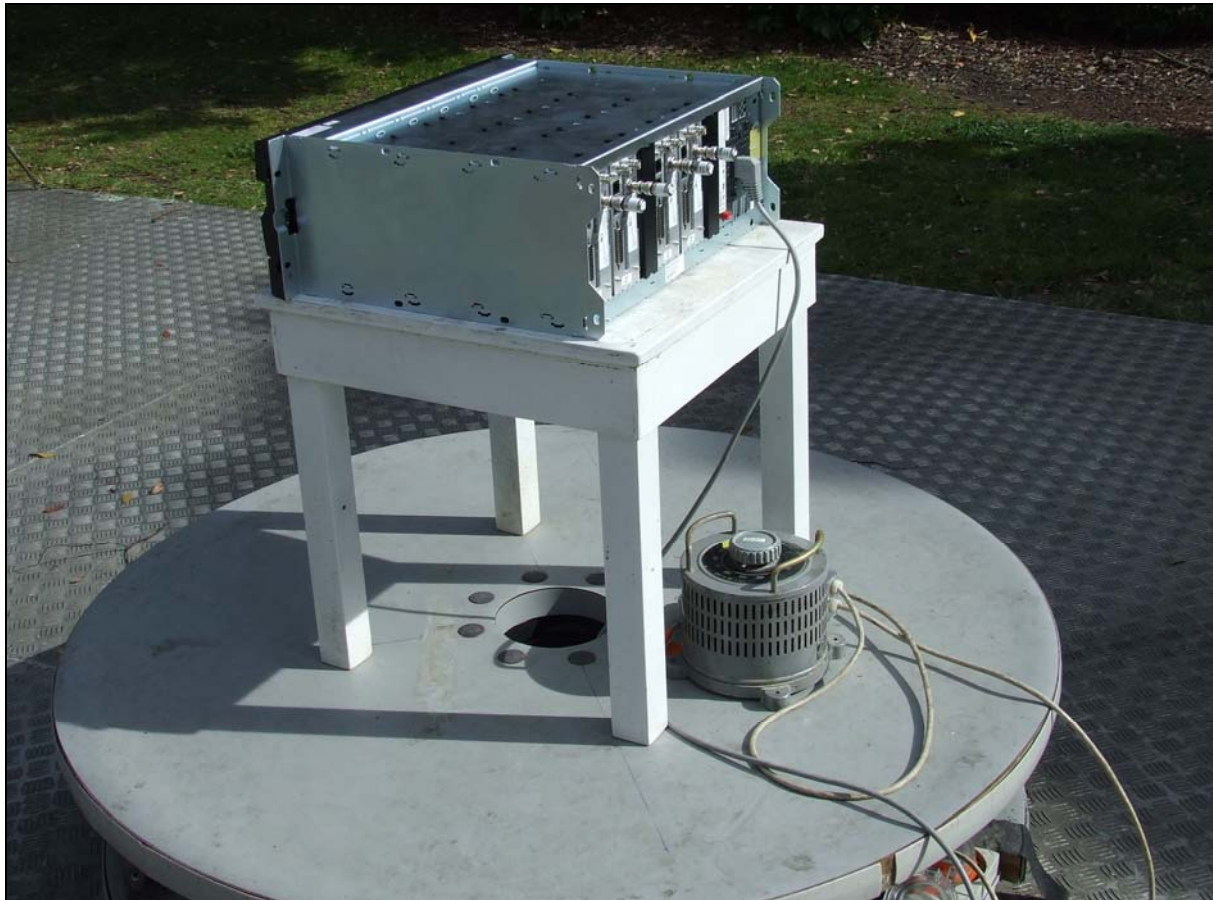


Photo: OATS Setup

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

794.100 MHz Rx	
Emission Frequency (MHz)	Level (nW)
~	~
800.100 MHz Rx	
Emission Frequency (MHz)	Level (nW)
~	~
806.000 MHz Rx	
Emission Frequency (MHz)	Level (nW)
~	~
813.500 MHz Rx	
Emission Frequency (MHz)	Level (nW)
~	~
821.000 MHz Rx	
Emission Frequency (MHz)	Level (nW)
~	~
823.900 MHz Rx	
Emission Frequency (MHz)	Level (nW)
~	~
No emissions were detected within 20 dB of Limit.	

NOTE:

For testing of channels 821.0 MHz and 823.9 MHz, reciters 1 & 2 (originally 794.1 MHz & 800.1 MHz) were retuned. Reciters 3 & 4 were left unchanged on 806.0 MHz and 813.5 MHz.

LIMITS:

LIMIT	2 nW
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CONDUCTED SPURIOUS EMISSIONS – Receiver



Photo: Conducted Emissions 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).

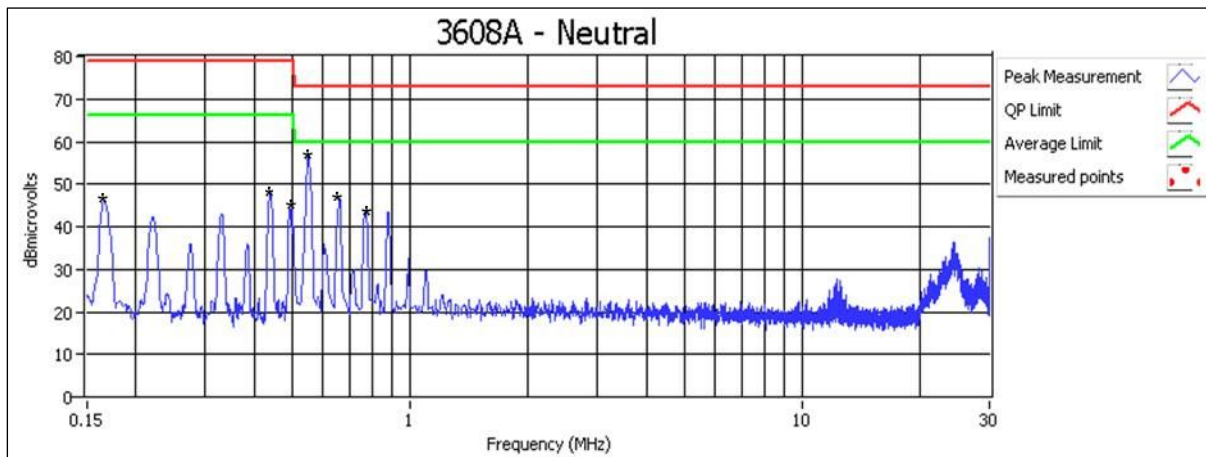
LIMIT CLAUSE: FCC 47CFR 15.107

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

Neutral

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
164.0	22.8	66	Pass	43.9	79	Pass
438.5	43.0	66	Pass	45.9	79	Pass
496.2	22.6	66	Pass	40.8	79	Pass
547.8	46.6	60	Pass	54.2	73	Pass
657.9	39.6	60	Pass	44.5	73	Pass
784.4	38.9	60	Pass	44.8	73	Pass



* Indicates measured emission from table.

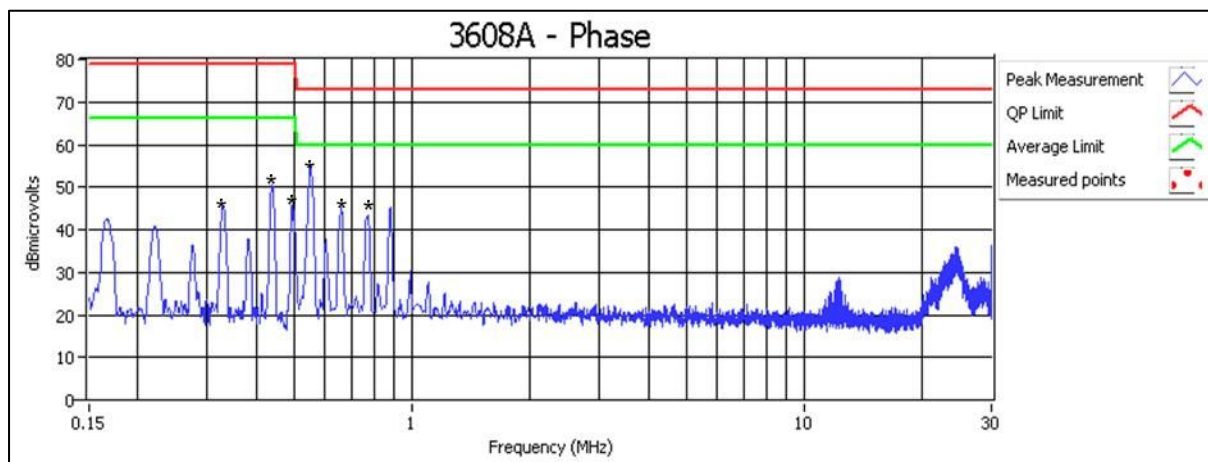
NOTE:

During testing all four reciters were installed in the rack and tuned to different frequencies.

POWERLINE CONDUCTED EMISSIONS – Continued

Phase

Frequency (MHz)	Average Measurement (dBµVolt)	Average Limit (dBµVolt)	Average Result	Quasi-Peak Measurement (dBµVolt)	Quasi-Peak Limit (dBµVolt)	Quasi-Peak Result
337.2	40.5	66	Pass	45.5	79	Pass
448.5	45.6	66	Pass	51.1	79	Pass
506.1	23.3	60	Pass	43.1	73	Pass
560.7	44.8	60	Pass	52.5	73	Pass
673.6	37.7	60	Pass	42.8	73	Pass
785.8	38.9	60	Pass	44.5	73	Pass



* Indicates measured emission from table.

A representative plot of all emissions was taken. Then a manual measurement of the six highest emissions found at the time of measurement was performed. Due to the variation of emissions levels with time, the table levels and frequencies will differ slightly from those shown in the plots.



Photo: Power Line Conducted Emissions Setup

TEST EQUIPMENT LIST

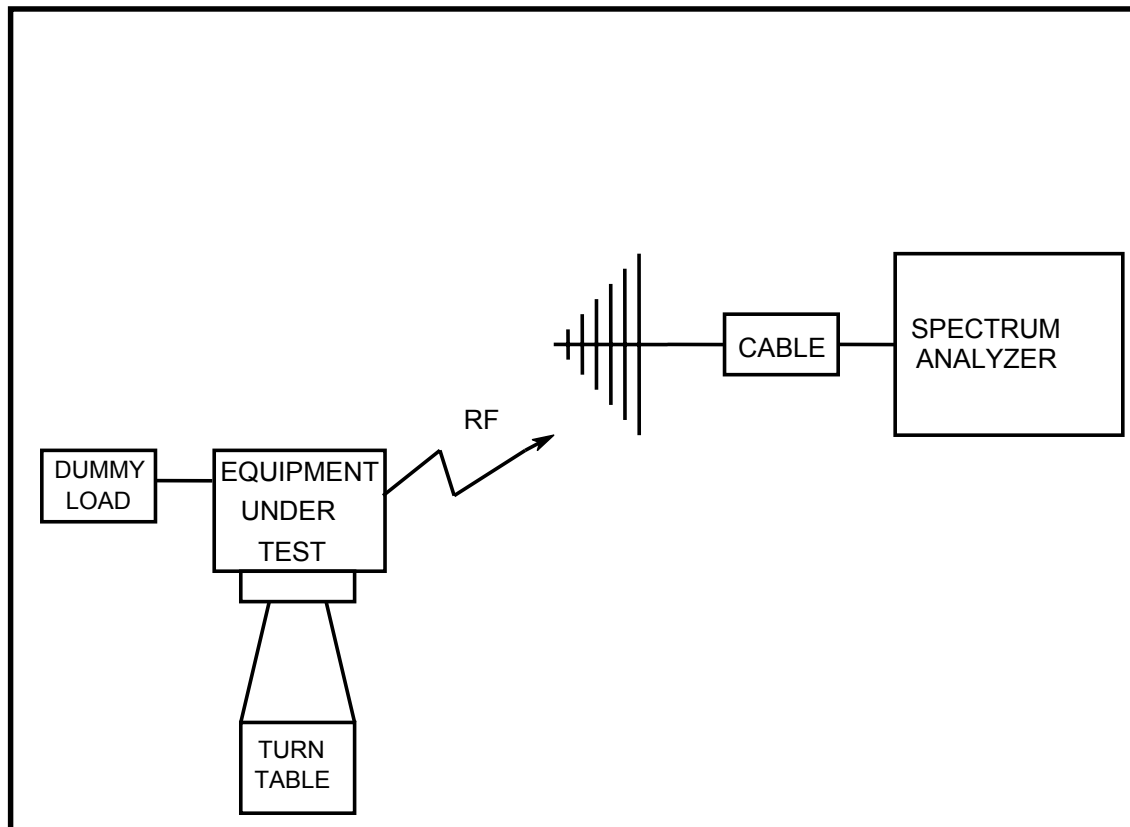
No#	Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
2	Signal Generator	Analog 1GHz	Hewlett Packard	HP8648A	3430U00344	E3579	16-Oct-15
27	Power Supply	AC Variac	Yamabishi	S-260-5	TX-533	E1737	
33	Spectrum Analyser	26.5GHz	Agilent	PXAN9030A	MY49432161	E4907	6-Jul-16
35	RF Chamber	S-LINE TEM CELL	Rohde & Schwarz	1089.9296.02	338232/003	E3636	31-Aug-15
38	RF Amplifier	+21.7 dB 1GHz	Tait	ZFL-1000LN	E3660	E3360	16-Jan-15
49	RF Attenuator	20dB 50W	Weinschel	24-20-44	AW1266	E3562	15-Oct-15
56	RF Load	2W	MCL	NTRM-50	951215	E3574	16-Jan-15
58	RF Load	2W	MCL	NTRM-50	954214	E3576	16-Jan-15
61	Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack2	E4623	14-Oct-15
63	Coax Cable	3m Blue	Suhner	Sucoflex 104A	44611/4A	E4620	16-Oct-15
103	Spectrum Analyser	13.2GHz	Agilent	E4445A	MY42510072	E4139	22-Oct-16
107	Coax Cable	OATS Tower Cable	Intelcom	RG214	OATS1	E4621	23-Oct-15
108	Coax Cable	OATS Turntable Cable	Intelcom	RG215	OATS2	E4622	23-Oct-15
109	OATS	Antenna Tower	Electrometrics	EM-4720-2	112	E4447	
110	OATS	Controller	Electrometrics	EM-4700	119	E4445	
111	OATS	Turntable	Electrometrics	EM-4704A	105	E4446	
112	RF Load	2W	MCL	NTRM-50	01		16-Jan-15
113	RF Load	2W	MCL	NTRM-50	02		16-Jan-15
118	Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack6	E4849	15-Oct-15
134	Coax Cable	Reverb - 4.5m Multiflex 141	TeltestBlue6	MF 141	TeltestBlue6	E4843	13-Oct-16
135	Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue5	MF 141	TeltestBlue5	E4844	14-Oct-15
136	Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue4	MF 141	TeltestBlue4	E4845	14-Oct-15
137	Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue3	MF 141	TeltestBlue3	E4846	14-Oct-15
138	Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue2	MF 141	TeltestBlue2	E4847	14-Oct-15
145	RF Chamber	Reverb - Stirrer controller for reverb chamber	Teseq	Stirrer Controller	29765.1	E4854	
146	RF Chamber	Reverb - 0.5 - 18GHz Reverberation Chamber	Teseq	RVC XS	29765	E4855	
148	Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-885	E4857	
149	Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-884	E4858	
150	RF Amplifier	Pre-amplifier	Agilent	87405C	MY47010688	E4941	16-Oct-15
159	OATS	FCC Listing Registration			837095		12-May-16

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

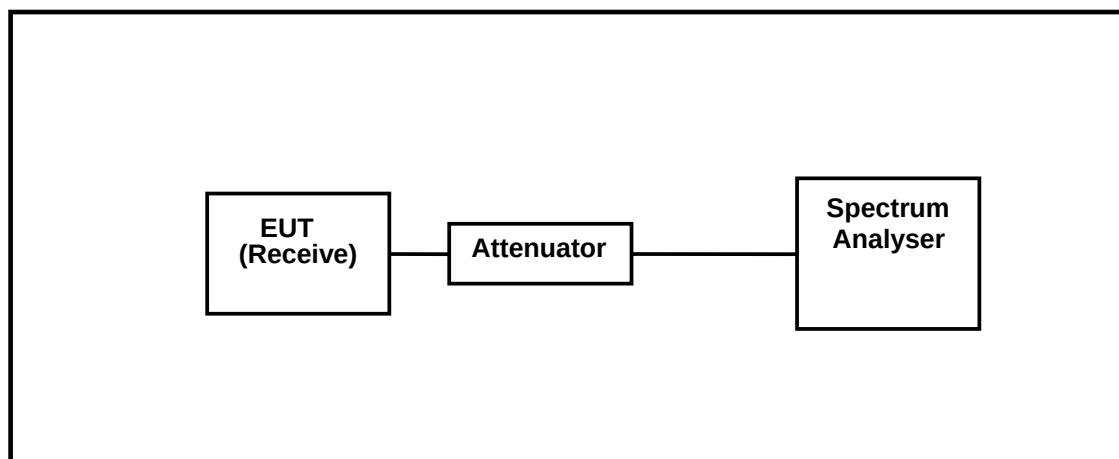
ANNEX A

TEST SETUP DETAILS

Radiated Emissions Set up.



Conducted Emissions Set up.



ANNEX A

Test Setup Details

Power Line Conducted Emissions Set up.

