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## **TEST REPORT**

**4RF SR+ Point to Multi-point  
Digital Radio SQ215M141  
(215-240 MHz)**

*tested to*

**47 Code of Federal Regulations**

**Part 15 - Radio Frequency Devices**

**Subpart A + B**

*for*

**4RF Limited**

A handwritten signature in black ink, appearing to read "Andrew Cutler", is written over a light blue rectangular background.


This Test Report is issued with the authority of: \_\_\_\_\_  
**Andrew Cutler - General Manager**



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

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## 1. STATEMENT OF COMPLIANCE

The **4RF SR+ SQ215M141 Point to Multi-point Digital Radio** complies with FCC Part 15 Subpart A + B as a Class B Device when the methods as described in ANSI C63.4 - 2003 are applied.

## 2. RESULTS SUMMARY

The results of testing, carried out between 17<sup>th</sup> March and 27<sup>th</sup> March 2014, are summarised below.

Clause	Parameter	Result
15.101	Equipment authorisation requirement.	The device tested is a receiver contained within a transceiver that can be attached to a computer using the Ethernet Port.
15.103	Exempted devices.	Device is not exempt as it contains a receiver and a digital device.
15.107	Conducted Emissions 0.15 - 30 MHz	Complies with no emissions within 20 dB of the applicable limits.
15.109	Radiated Emissions 30 - 1000 MHz	Complies with a 5.8 dB margin at 31.4 MHz in vertical antenna polarisation.
15.111	Antenna Terminal Disturbance 30 – 950 MHz	Complies.

## 3. INTRODUCTION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification.

**The client selected the test sample.**

**This report relates only to the sample tested.**

**This report contains no corrections or erasures.**

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

## 2. CLIENT INFORMATION

**Company Name** 4RF Limited  
**Address** 26 Glover Street  
Ngauranga  
Wellington  
**Country** New Zealand  
**Contact** Mr Paul Young

## 3. TEST SAMPLE DESCRIPTION

**Brand Name** Aprisa SR+  
**Model Number** SQ215M141  
**Product** Point to Multi Point Digital Radio  
**Manufacturer** 4RF Limited  
**Manufactured in** New Zealand  
**Designed in** New Zealand  
**Serial Numbers** -  
**FCC ID** UIPSQ215M141

EMC  
Technologies

## 6. RESULTS

### Standard

The sample was tested in accordance with 47 CFR Part 15 Subparts A and B as a Receiver and as Class B digital device.

### Methods and Procedures

The measurement methods and procedures as described in ANSI C63.4 - 2003 were used.

### Section 15.107: Conducted emissions testing

Conducted Emissions testing was carried out over the frequency range of 150 kHz to 30 MHz which was carried out at the laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 m screened room

The device was placed on top of the emissions table, which is 1 m x 1.5 m, 80 cm above the screened room floor which acts as the horizontal ground plane.

In addition the device was positioned 40 cm away from the screened room wall which acts as the vertical ground plane.

The artificial mains network was bonded to the screened room floor.

At all times the device was kept more than 80 cm from the artificial mains network.

The Class B limits have been applied.

The supplied plot is combined plot showing the worst case quasi peak and average results of both the phase and neutral lines to the representative AC to DC power supply.

Quasi peak and average detectors have been used with resolution bandwidths of 9 kHz.

Measurement uncertainty with a confidence interval of 95% is:

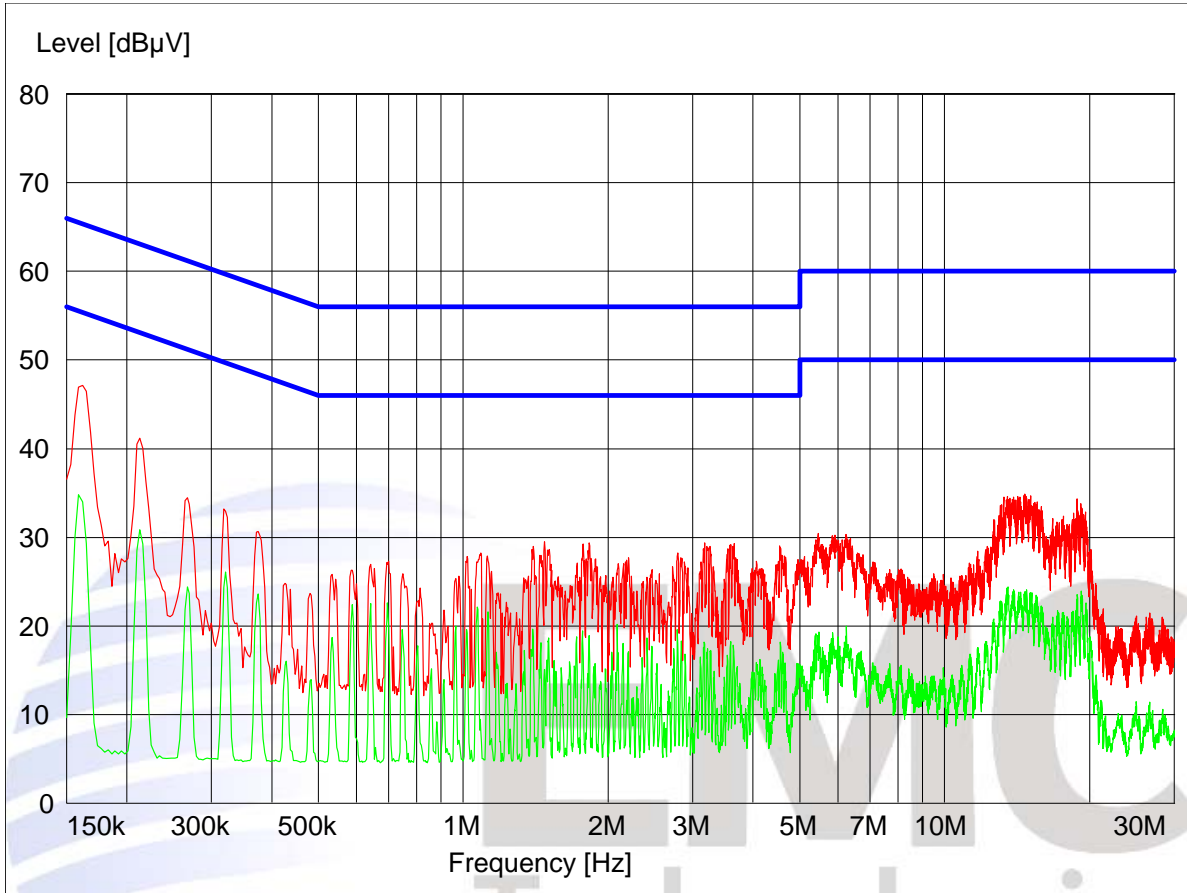
- AC Mains port                      (0.15 - 30 MHz)  $\pm$  2.8 dB

**Result:** Complies.

### Conducted Emissions – AC Input Power Port

**Setup:** Device powered by representative AC to DC power supply whilst in Receive mode.

Peak ---  
 Average --  
 Quasi Peak X  
 Average +



**Final Quasi-Peak Measurements**

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions within 20 dB of the limit					

**Final Average Measurements**

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions within 20 dB of the limit					

## Section 15.109 – Radiated emissions

Radiated emission testing was carried out over the frequency range of 30 to 1000 MHz.

Testing was carried out at the laboratory's open area test site - located at 670 Kawakawa Orere Rd, RD3, Papakura, New Zealand.

This site conforms to the requirements of CISPR 16 and ANSI C63.4 - 2003.

Before testing was carried out, a receiver Self Test and Internal Calibration was undertaken along with a check of all connecting cables and programmed antenna factors.

The device was placed on the test tabletop, which was a total of 0.8 m above the test site ground plane.

Testing was carried out when the device was placed horizontally in the centre of the test table at a height of 80 cm above the ground plane.

Measurements of the radiated field were attempted at 3 metres from the device.

The Class B limits have been applied.

Measurements below 1000 MHz were made using a Quasi Peak Detector with a bandwidth of 120 kHz.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height with an automated antenna tower.

All emissions were measured in both vertical and horizontal antenna polarisations.

The emission level is determined in field strength by taking the following into consideration:

Level (dB $\mu$ V/m) = Receiver Reading (dB $\mu$ V) + Antenna Factor (dB/m) + Coax Loss (dB) – Amplifier Gain (dB)

## Radiated emissions 30 – 1000 MHz

The device tested lying flat on top of the test table at height of 80 cm

The device was powered at 12 Vdc using a lead acid battery that was placed on the test site ground plane

50 ohm dummy loads were attached to the transmitting and receiving antenna ports

Attached to the device was a laptop computer that was attached to the Ethernet port.

Device was tested in standby / receive mode at 217.575 MHz

Frequency MHz	Vertical dB $\mu$ V/m	Limit dB $\mu$ V/m	Margin dB	Result	Antenna	Detector
31.400	34.2	40.0	5.8	Pass	Vertical	QP
44.000	31.5	40.0	8.5	Pass	Vertical	QP
44.000	21.0	40.0	19.0	Pass	Horizontal	QP
44.500	30.3	40.0	9.7	Pass	Vertical	QP
44.500	20.9	40.0	19.1	Pass	Horizontal	QP
44.800	32.5	40.0	7.5	Pass	Vertical	QP
44.800	21.0	40.0	19.0	Pass	Horizontal	QP
45.000	32.0	40.0	8.0	Pass	Vertical	QP
45.000	21.1	40.0	18.9	Pass	Horizontal	QP
45.200	33.7	40.0	6.3	Pass	Vertical	QP
45.200	21.2	40.0	18.8	Pass	Horizontal	QP
45.600	31.3	40.0	8.7	Pass	Vertical	QP
45.600	21.0	40.0	19.0	Pass	Horizontal	QP
46.000	22.8	40.0	17.2	Pass	Vertical	QP
46.000	20.0	40.0	20.0	Pass	Horizontal	QP
54.000	25.1	40.0	14.9	Pass	Vertical	QP
54.200	29.2	40.0	10.8	Pass	Vertical	QP
54.400	23.0	40.0	17.0	Pass	Vertical	QP
61.800	25.4	40.0	14.6	Pass	Vertical	QP
62.000	31.8	40.0	8.2	Pass	Vertical	QP
62.000	18.6	40.0	21.4	Pass	Horizontal	QP
62.200	32.2	40.0	7.8	Pass	Vertical	QP
62.200	18.6	40.0	21.4	Pass	Horizontal	QP
62.400	27.0	40.0	13.0	Pass	Vertical	QP
62.600	26.5	40.0	13.5	Pass	Vertical	QP
62.800	31.8	40.0	8.2	Pass	Vertical	QP
63.000	32.5	40.0	7.5	Pass	Vertical	QP
63.000	18.3	40.0	21.7	Pass	Horizontal	QP
63.200	27.1	40.0	12.9	Pass	Vertical	QP
68.200	33.0	40.0	7.0	Pass	Vertical	QP
68.400	32.5	40.0	7.5	Pass	Vertical	QP



## Radiated emissions 30 – 1000 MHz continued

Frequency MHz	Vertical dB $\mu$ V/m	Limit dB $\mu$ V/m	Margin dB	Result	Antenna	Detector
68.900	31.5	40.0	8.5	Pass	Vertical	QP
69.000	34.0	40.0	6.0	Pass	Vertical	QP
70.800	31.1	40.0	8.9	Pass	Vertical	QP
71.000	27.1	40.0	12.9	Pass	Vertical	QP
78.000	31.5	40.0	8.5	Pass	Vertical	QP
81.200	31.0	40.0	9.0	Pass	Vertical	QP
239.500	31.6	46.0	14.4	Pass	Vertical	QP
262.499	33.5	46.0	12.5	Pass	Vertical	QP

### Receiver radiated emissions

Receive frequency: 219.575 MHz

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Polarity	Margin (dB)	Result	Detector
264.575	29.0	46.0	Vertical	17.0	Pass	QP
264.575	28.4	46.0	Vertical	17.6	Pass	QP

Receive frequency: 217.575 MHz

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Polarity	Margin (dB)	Result	Detector
262.575	29.2	46.0	Vertical	16.8	Pass	QP
262.575	28.4	46.0	Horizontal	17.6	Pass	QP

Receive frequency: 216.575 MHz

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Polarity	Margin (dB)	Result	Detector
261.575	29.3	46.0	Vertical	16.7	Pass	QP
261.575	28.4	46.0	Horizontal	17.6	Pass	QP

**Result:** Complies.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 MHz – 1000 MHz)  $\pm$  4.1 dB

## Section 15.111

### Receiver spurious emissions at antenna terminals

#### Receiver spurious conducted emissions

Frequency: 219.575 MHz

Frequency (MHz)	Level (dBm)	Limit (dBm)
264.575	<-100 dBm	-57.0

Frequency: 217.575 MHz

Frequency (MHz)	Level (dBm)	Limit (dBm)
262.575	<-100 dBm	-57.0

Frequency: 216.575 MHz

Frequency (MHz)	Level (dBm)	Limit (dBm)
261.575	<-100 dBm	-57.0

*No other emissions observed greater than -100.00 dBm.*

**Limit:**

In accordance with CFR 47 Part 15, section 15.111 the power of any emission at the antenna terminal should not exceed 2 nW (-57.0 dBm).

**Result:** Complies.

**Measurement Uncertainty:**  $\pm 3.3$  dB.

## 7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial #	Asset	Cal Due	Interval
Aerial Controller	EMCO	1090	9112-1062	3710	N/a	N/a
Aerial Mast	EMCO	1070-1	9203-1661	3708	N/a	N/a
Turntable	EMCO	1080-1-2.1	9109-1578	3709	N/a	N/a
VHF Balun	Schwarzbeck	VHA9103	-	3603	12/01/2015	1 year
Biconical Antenna	Schwarzbeck	BBA 9106	-	3612	12/01/2015	1 year
Log Periodic	Schwarzbeck	VUSLP 91111	9111-228	3785	12/01/2015	1 year
Horn Antenna	Electrometrics	RGA-60	6234	E1494	04/07/2014	1 year
Measuring receiver	Rohde & Schwarz	ESIB-40	100171	EMC4003	29/01/2015	1 year
Modulation Analyzer	Rohde & Schwarz	FMA	837807/020	E1552	15/01/2015	1 year
Oscilloscope	Tektronics	745A	B010643	E1569	15/01/2015	1 year
Power Attenuator	Weinschel	49-20-43	GC104	E1308	N/a	N/a
Power Supply	Hewlett Packard	6032A	2743A-02859	E1069	N/a	N/a
Signal Generator	Rohde & Schwarz	SMHU	838923/028	E1493	22/01/2015	1 year
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	RFS 3776	26/05/2014	1 year
Thermal chamber	Contherm	M180F	86025	E1129	01/06/2014	1 year
Thermometer	DSIR	RT200	035	E1049	01/06/2014	1 year

## 8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was updated in July 2013.

All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

All measurement equipment has been calibrated in accordance with the terms of the EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

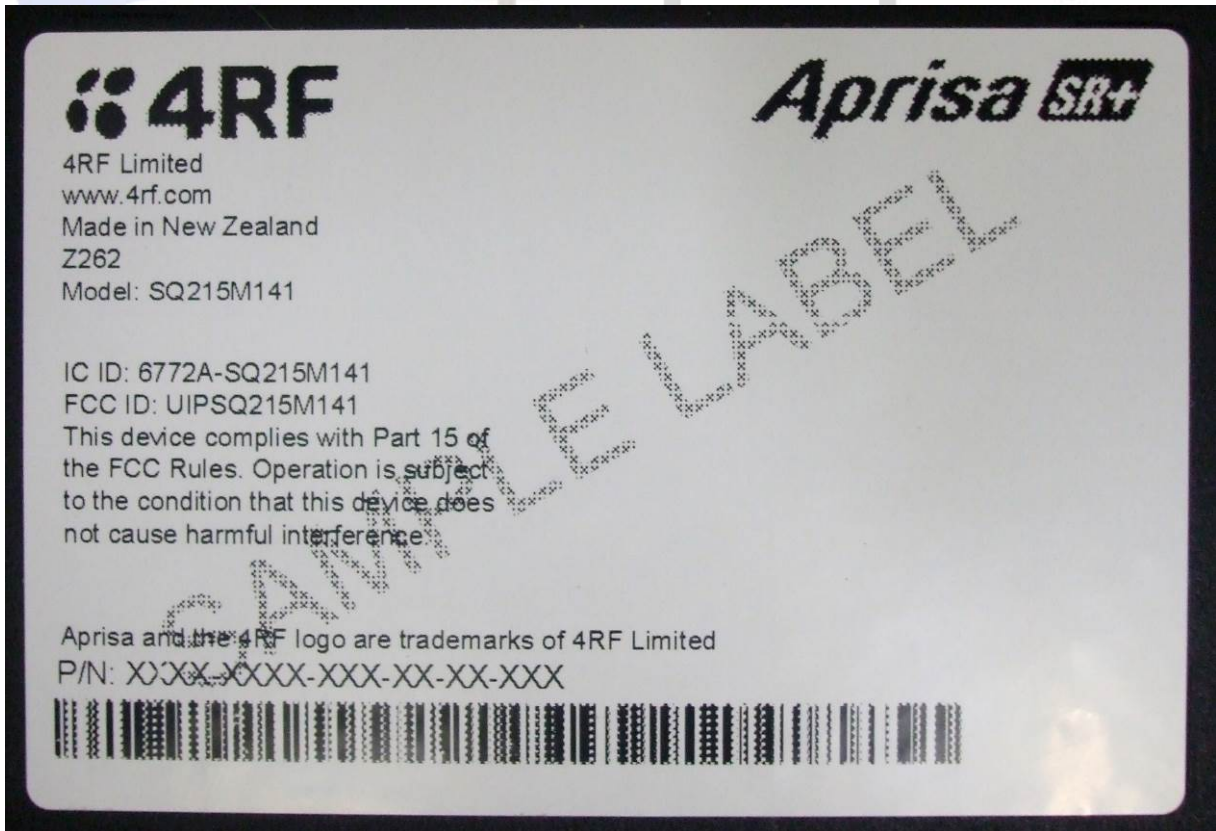
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with various accreditation bodies in a number of economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

## 9. PHOTOGRAPHS

External photos of the device tested

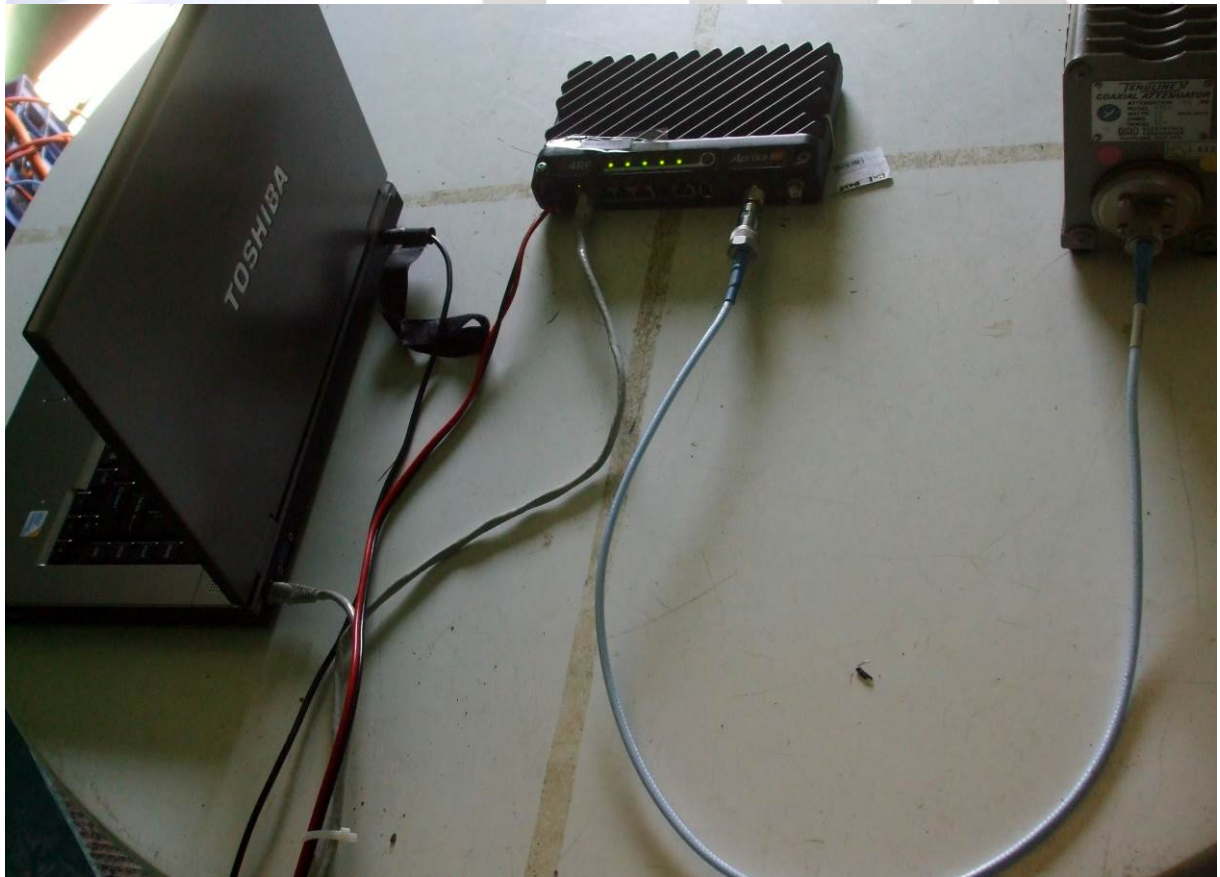
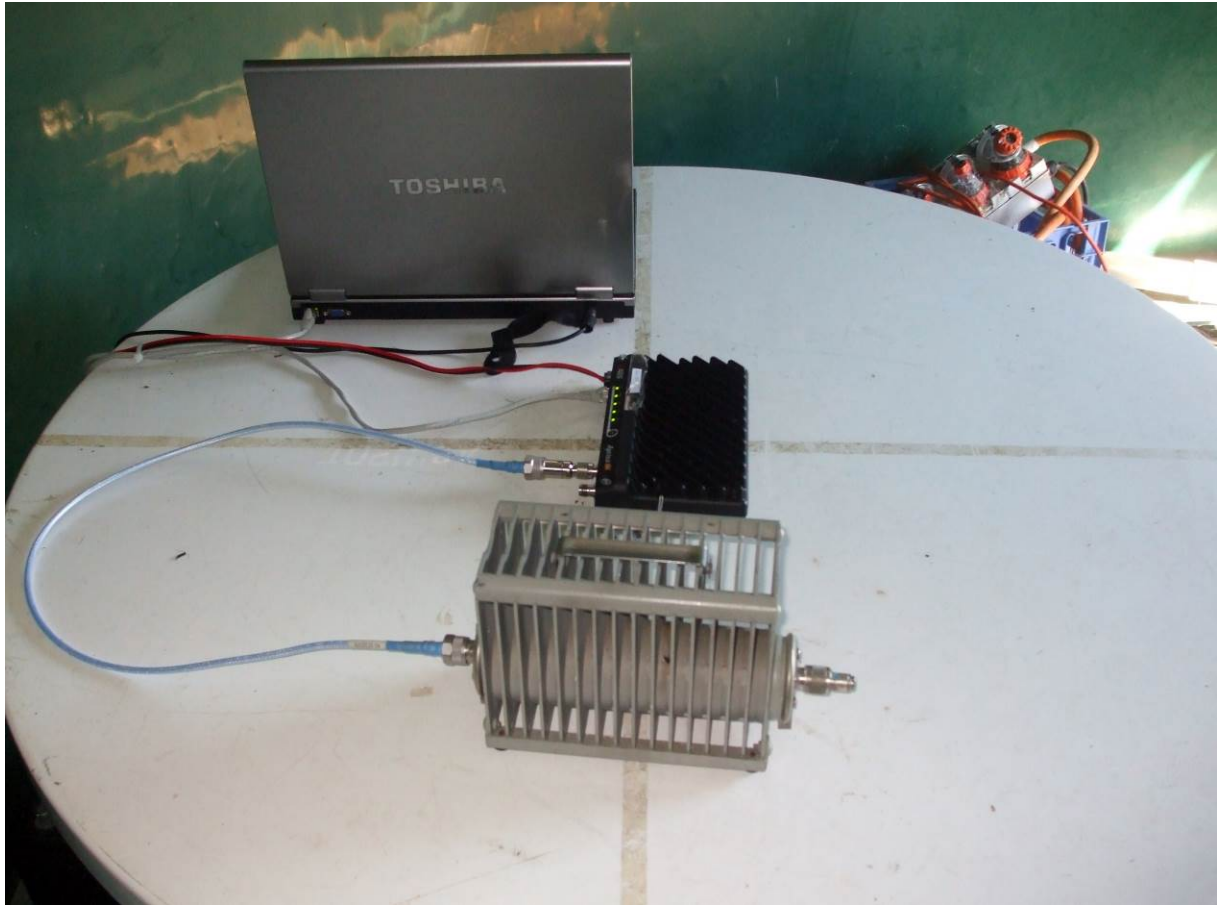


Labels



Radiated emissions test set up photos





## Conducted emissions setup

