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TEST REPORT

Micro Technologies MT-RX-3 Multi Band Receiver

tested to

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart A + B

for

Micro Technologies (NZ) Ltd

A handwritten signature in blue ink, appearing to read "Andrew Cutler".

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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EMC
Technologies

1. STATEMENT OF COMPLIANCE

The **Micro Technologies MT-RX-3 Multi Band Receiver** complies with FCC Part 15 Subparts A + B as a Class B device when the methods as described in ANSI C63.4 - 2003 are applied.

2. RESULTS SUMMARY

The results from testing carried out in November and December 2013, are summarised in the following table:

| Clause | Parameter | Result |
|--------|--|---|
| 15.101 | Equipment authorisation requirement. | Certification required as the device would be categorised as a Receiver. |
| 15.103 | Exempted devices. | Device is not exempt as it contains a receiver which contains a digital device. |
| 15.107 | Conducted Emissions 0.15 - 30 MHz | Complies (No results recorded within 15 dB of the limit). |
| 15.109 | Radiated Emissions 30 - 2000 MHz | Complies with a 16.9 dB margin at 640.000 MHz (Horizontal). |
| 15.111 | Antenna Terminal Disturbance 30 – 950 MHz | Complies with a 26.1 dB margin at 640.000 MHz (Horizontal). |

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.

4. CLIENT INFORMATION

| | |
|---------------------|-------------------------------------|
| Company Name | Micro Technologies (NZ) Limited |
| Address | 292 Marine Drive Church Bay, RD1 |
| City | Lyttelton 8971 |
| Country | New Zealand |
| Contact | Mr Shannon Reardon |

5. DESCRIPTION OF TEST SAMPLE

| | |
|--------------------------|---------------------------------|
| Brand Name | Micro Technologies |
| Model | MT-TX-3 |
| Product | Multi Band Receiver |
| Manufacturer | Micro Technologies (NZ) Limited |
| Country of Origin | New Zealand |
| Serial Number | 0813-002 |
| FCC ID | 2ACFPMTRX |

The device that has been tested is a multi-band emergency signal receiver

It operates in the following bands:

- can be programmed to receive between 120 MHz to 470 MHz but is primarily used to receive homing signals on 121.5 MHz
- AIS1 and AIS2 (161.975 MHz and 162.025 MHz) signals in the 156 – 165 MHz marine VHF band
- 406 MHz EPIRB band (406.020 MHz to 406.080 MHz in switchable ranges)

Each of these frequencies is continuously monitored with the receiver providing various alert signals when a distress signal is detected.

The device has many user options that can assist in the location of the distress signals that are used.

The device is powered using an external 6 Vdc battery pack and has outputs for RS-232 data and a normally open relay.

6. SETUPS AND PROCEDURES

Standard

The sample was tested in accordance with 47 CFR Part 15 Subpart A and B.

Methods and Procedures

The following measurement methods and procedures have been applied:

- ANSI C63.4 – 2003

Section 15.101: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for this device as it would be classed as a receiver.

Section 15.107: Conducted limits

Conducted emission testing has been carried out using a representative AC power supply at 115 Vac 60 Hz as this receiver could easily be attached to a power supply and attached to the public AC mains power supply.

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

Testing was carried out in accordance with section 15.107 using a measuring receiver and a 50 uH / 50 ohm artificial mains network which is also known as a line impedance stabilisation network (LISN).

Measurements on both the phase and neutral lines were made using either a Quasi Peak or an Average detector with a 9 kHz bandwidth.

The supplied conducted emission plot is a combined plot showing the worst case of the Peak, Quasi Peak and Average levels for both phase and neutral.

The Class A conducted limits have been applied

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

Conducted emissions tests (0.15 - 30 MHz) ± 2.2 dB

Conducted Emissions – AC Input Power Port

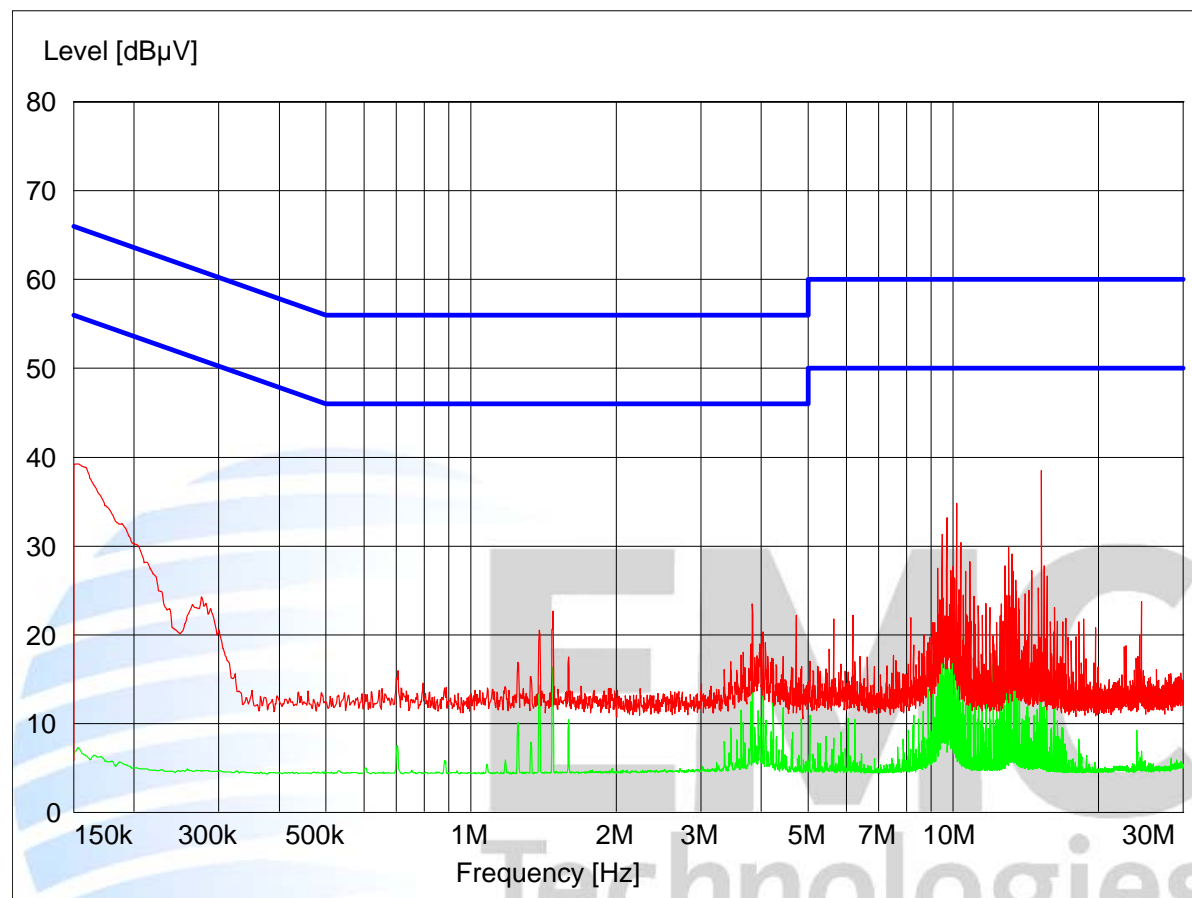
Setup: Device tested when powered at 6 Vdc using a representative AC adaptor when receiving a signal on 121.5 MHz

Peak ---

Average --

Quasi Peak X

Average +



Final Quasi-Peak Measurements

| Frequency MHz | Level dB μ V | Limit dB μ V | Margin dB | Phase | Rechecks dB μ V |
|------------------|---|---------------------|--------------|-------|------------------------|
| | No results recorded within 15 dB of the limit | | | | |

Final Average Measurements

| Frequency MHz | Level dB μ V | Limit dB μ V | Margin dB | Phase | Rechecks dB μ V |
|------------------|---|---------------------|--------------|-------|------------------------|
| | No results recorded within 15 dB of the limit | | | | |

Section 15.109 – Radiated emissions

Radiated emission testing was carried out over the frequency range of 30 to 2000 MHz as per section 15.33(b)(1).

The highest receiver frequency in use is 470 MHz which is less than 500 MHz.

In addition the highest local oscillator for this device will be 496 MHz.

Therefore as a receiver testing needs to be carried out to at least 992 MHz as per section 15.33(b)(3).

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.

Measurements of the radiated field were made with the antenna located at a 3 metre horizontal distance from the boundary of the devices under test with the Class A limits being applied.

Testing is carried out by manually scanning between 30 and 2000 MHz in 100 kHz steps while aurally and visually monitoring for emissions.

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.

The emission is measured in both vertical and horizontal antenna polarisations using a Quasi Peak detector with a bandwidth of 120 kHz below 1000 MHz.

Between 1000 – 2000 MHz an average detector and a peak detector were used which both had a bandwidth of 1 MHz.

During the test, a number of ambient emissions are identified (list of which can be provided upon request).

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)

Radiated Emissions 30 – 2000 MHz

The receiver was tested when powered using 4 x 1.5 Vdc batteries

The receiver under test was placed in the centre of the test table with the LCD display facing upwards.

Attached to the antenna port was a whip antenna.

The receiver was tested when attempting to receive distress messages on 406, AIS and 121.5 MHz.

The receiver was also tested in alarm mode having detected a signal on 121.5 MHz

Attached to the RS-232 port and the relay port was a 1 metre length of data cable.

| Frequency (MHz) | Vertical (dB μ V/m) | Horizontal (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Antenna | Detector |
|-----------------|-------------------------|---------------------------|----------------------|-------------|------------|----------|
| 160.0000 | 17.7 | 21.1 | 40.0 | 18.9 | Vertical | QP |
| 320.0000 | 17.3 | 23.8 | 47.0 | 23.2 | Vertical | QP |
| 480.0000 | < 20.0 | 20.5 | 47.0 | 26.5 | Horizontal | QP |
| 640.0000 | < 30.0 | 30.1 | 47.0 | 16.9 | Horizontal | QP |
| 800.0000 | < 25.0 | 25.6 | 47.0 | 21.4 | Horizontal | QP |

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 MHz – 2000 MHz) ± 4.1 dB

Section 15.111 – Antenna Terminal Disturbance

Testing was carried out at the receiver antenna terminal.

A spectrum analyser was directly connected to the antenna port using a 50 ohm coaxial cable.

Measurements were carried out up to the 2nd harmonic of the highest local oscillator which is 992 MHz

| Frequency (MHz) | Level (dBm) | Limit (dBm) | Margin (dB) |
|--------------------|----------------|----------------|----------------|
| 160.0000 | -93.9 | -57.0 | 36.9 |
| 320.0000 | -87.8 | -57.0 | 30.8 |
| 480.0000 | -87.6 | -57.0 | 30.6 |
| 640.0000 | -83.1 | -57.0 | 26.1 |
| 800.0000 | -96.8 | -57.0 | 39.8 |
| 960.0000 | -93.5 | -57.0 | 36.5 |

A limit of -57 dBm or 2 uW was applied.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

- Antenna conducted emission tests (30 MHz – 2000 MHz) ± 2.8 dB

7. TEST EQUIPMENT USED

| Instrument | Manufacturer | Model | Serial No | Asset Ref | Cal Due | Period |
|-------------------|-----------------|------------|------------|-----------|-------------|--------|
| Aerial Controller | EMCO | 1090 | 9112-1062 | RFS 3710 | N/a | N/a |
| Aerial Mast | EMCO | 1070-1 | 9203-1661 | RFS 3708 | N/a | N/a |
| Biconical Antenna | Schwarzbeck | BBA 9106 | - | RFS 3613 | 17 Jan 2014 | 1 year |
| Receiver | R & S | ESIB-40 | 100171 | R-27-1 | 20 Oct 2014 | 1 year |
| Receiver | R & S | ESHS 10 | 828404/005 | RFS 3728 | 22 Aug 2014 | 1 year |
| Spectrum Analyser | Hewlett Packard | E7405A | US39150142 | 3776 | 26 Feb 2015 | 1 year |
| Log Periodic | Schwarzbeck | VUSLP 9111 | 9111-228 | 3785 | 30 Jan 2015 | 1 year |
| Horn Antenna | EMCO | 3115 | 9511-4629 | E1526 | 21 Feb 2014 | 1 year |
| Mains Network | R & S | ESH2-Z5 | 881362/034 | 3628 | 29 Jul 2014 | 1 year |
| Variac | General Radio | 1592 | - | RFS 3690 | N/a | N/a |
| Turntable | EMCO | 1080-1-2.1 | 9109-1578 | RFS 3709 | N/a | N/a |
| VHF Balun | Schwarzbeck | VHA 9103 | - | RFS 3613 | 30 Jan 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 last 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.

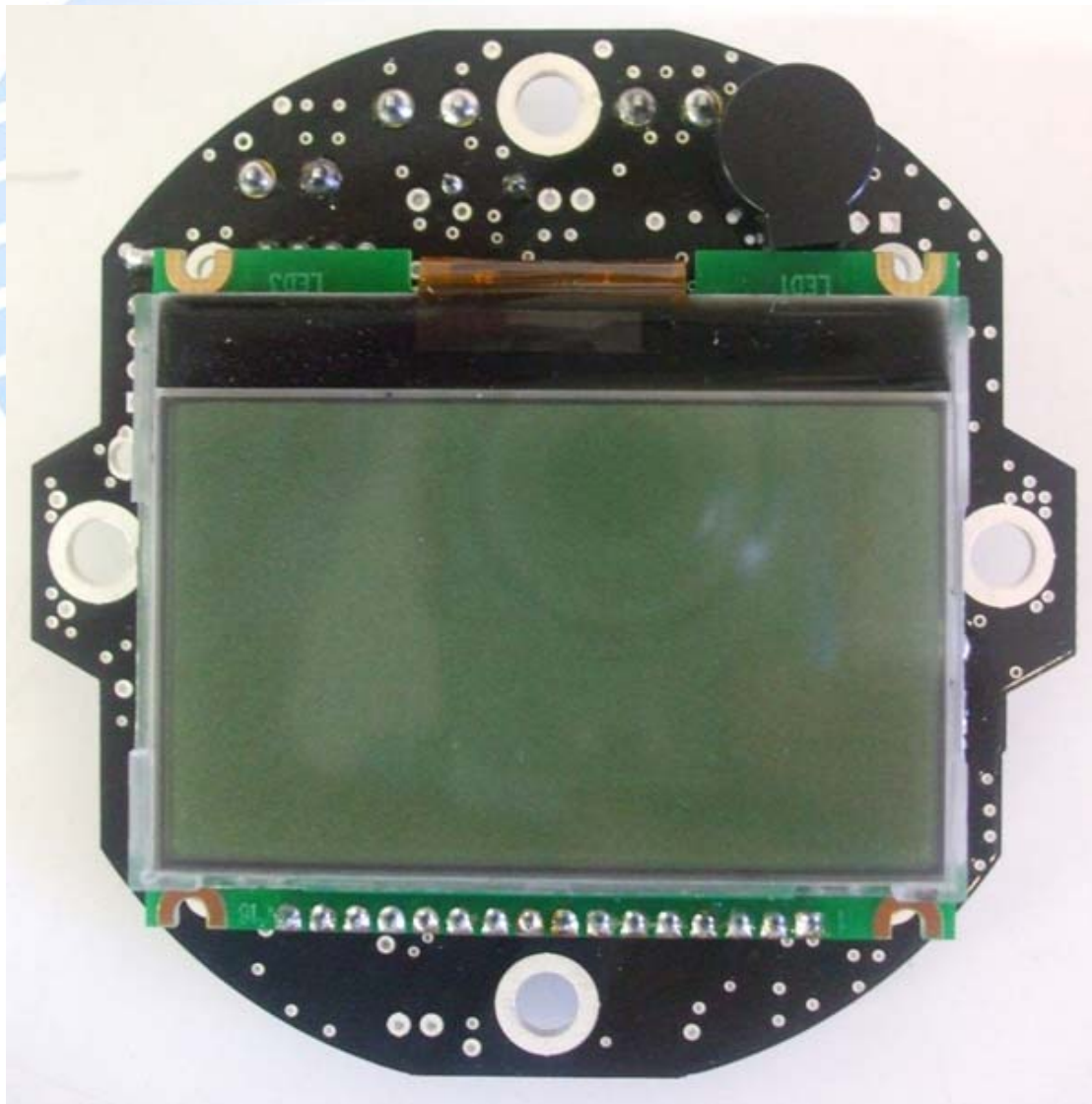
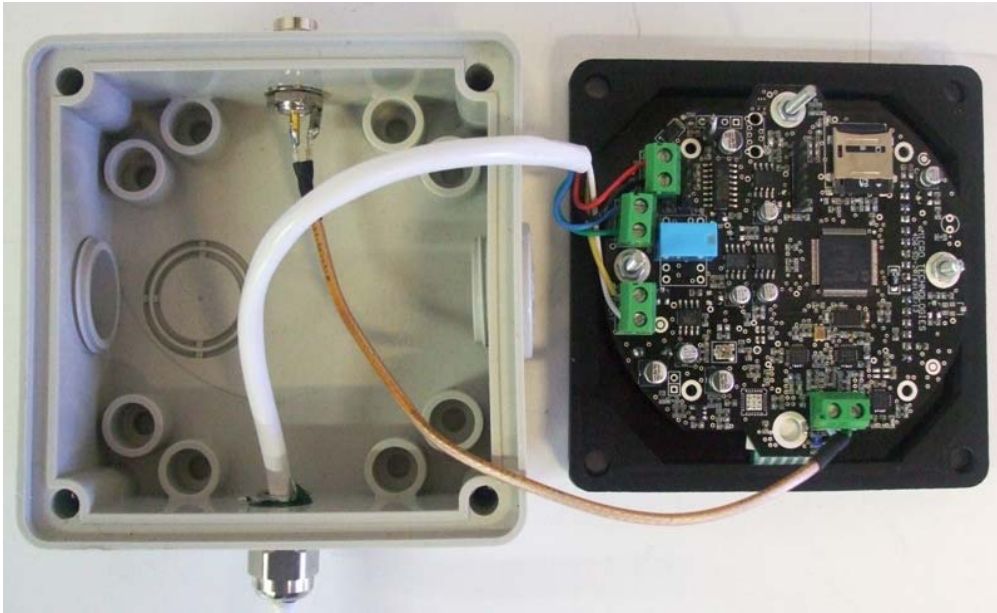
9. PHOTOGRAPHS

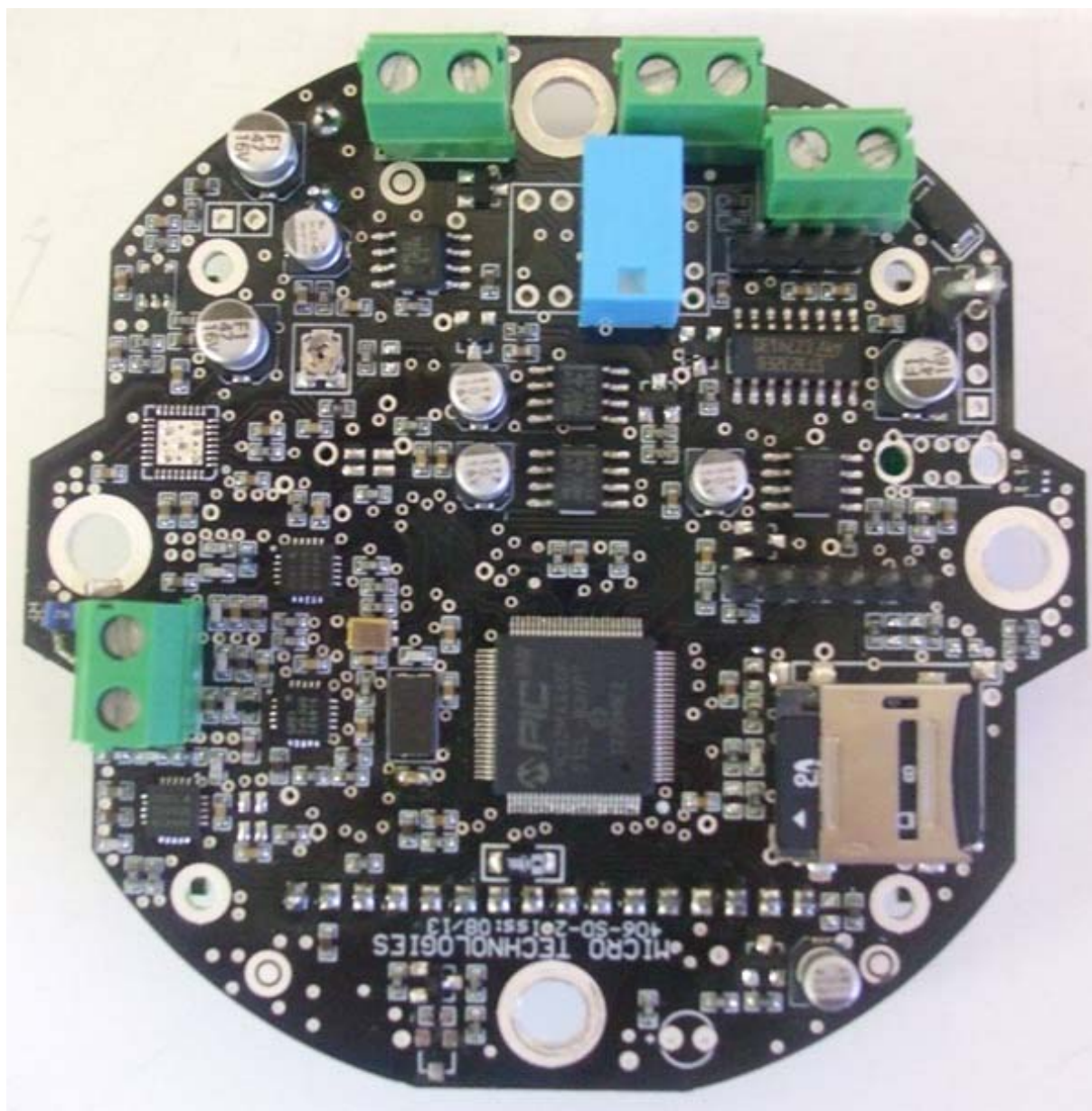
External Photos





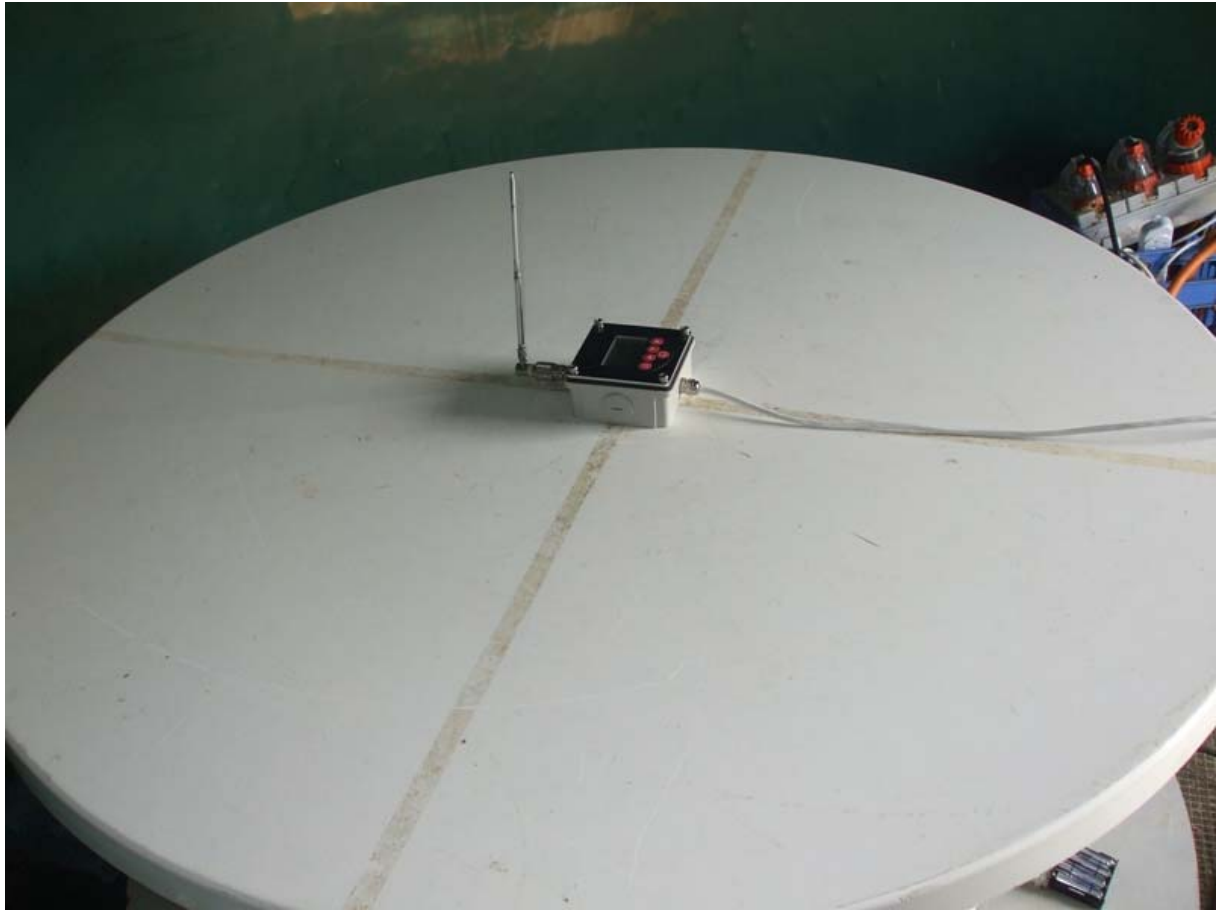
Internal Photos





Radiated emissions test set up photos





Conducted emissions test set up photos



