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TEST REPORT

JANUS Short Range Transmitter

tested to the

Code of Federal Regulations (CFR) 47

Part 15 – Radio Frequency Devices, Subpart C – Intentional Radiators

Section 15.249 – Operation in the band 902.000 – 928.000 MHz

for

MAS Zengrange Ltd

This Test Report is issued with the authority of:

A handwritten signature in blue ink, appearing to read "Andrew Cutler", is shown within a light blue rectangular box.

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 **JANUS Short Range Transmitter** complies with 47 CFR Part 15 and in particular Sections, 15.205, 15.207, 15.209, 15.215 and 15.249 as detailed below when tested in accordance with ANSI C63.4 – 2003.

2. RESULTS SUMMARY

The results of testing, carried out in May and June 2012, are listed below

Clause	Description	Result
15.201	Equipment authorisation requirement	Applied
15.203	Antenna requirement	Complies
15.204	External power amplifiers	Not applicable
15.205	Operation in restricted bands	Complies
15.207	Conducted emissions	Not applicable
15.209	Radiated emissions	See below
15.215	Additional provisions	Complies
15.249 (a)	Field strength of fundamental	Complies
15.249 (a)	Field strength of harmonics	Complies
15.249 (b)	Fixed, point to point operations	Not applicable
15.249 (c)	3 metre measurement distance	Noted
15.249 (d)	Spurious emission levels except harmonics	Complies
15.249 (e)	Detectors above 1000 MHz	Noted
15.249 (f)	Reference to section 15.37(d)	Noted

3. CLIENT INFORMATION

Company Name MAS Zengrange NZ Ltd
Address PO Box 30-448
City Lower Hutt 5010
Country New Zealand
Contact Mr Adam Holdaway

4. DESCRIPTION OF TEST SAMPLE

Brand Name	JANUS
Model Number	-
Product	Short Range Transmitter
Manufacturer	MAS Zengrange NZ Ltd
Country of Origin	New Zealand
Serial Number	NZ136-A
FCC ID	QVG173M1TX
FCC Band:	902 – 928 MHz
Band of operation:	904.425 – 909.675 MHz using 16 channels with a spacing of 350 kHz
Test Frequencies:	904.425 MHz and 909.325 MHz
Rated Conducted Power:	0.001 W (0 dBm) approximately
Modulation Type:	F2D
Antenna Type:	Integral antenna
Power Supply:	Internal battery
Ports:	Portable device that has no external ports

The device tested is described as a short range UHF radio transmitter that is part of a radio controlled initiation system designed to initiate a shock tube receiver.

The shock tube receiver in turn detonates an explosive device.

The system is intended for use by specialist demolition experts and by law enforcement agencies for explosive methods of entry.

5. ATTESTATION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification with the following conditions:

The client selected the test sample.

The report relates only to the sample tested.

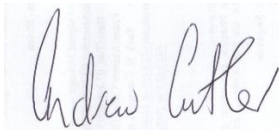
This report does not contain corrections or erasures.

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.

In addition this equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations.

To the best of my knowledge, these tests were performed using measurement procedures that are consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards.

I further certify that the necessary measurements were made by EMC Technologies NZ Ltd, 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand.



Andrew Cutler
General Manager
EMC Technologies NZ Ltd

6. TEST RESULTS

Section 15.201: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for this device as it contains a short range transmitter.

Section 15.203 – Antenna requirement

The antenna for this device is integral to the device as can be seen from the photographs

Result: Complies

Section 15.204: External radio frequency power amplifiers and antenna modifications

An external power amplifier is not supplied with this device and it is not possible to attach an external power amplifier.

Result: Complies.

Section 15.205 – Restricted bands of operation

Refer to measurements made with reference to Section 15.249 (a).

This device operates in the 902 - 928 MHz which is not a restricted band.

Result: Complies

Section 15.207 – Conducted emissions

Not applicable.

This device is powered using an internal dc battery.

This device cannot be directly or indirectly powered using the public AC mains supply.

Result: Complies

Section 15.209 – Radiated emissions

In accordance with section 15.249 (d) the general emission limits specified in Section 15.209 (a) have been applied to all emissions.

For emissions above 30 MHz see Section 15.249 (a) for further details.

As the device contains devices that operate using frequencies below 30 MHz measurements were made between 9 kHz – 30 MHz at the open area test site over a distance of 10 metres using a loop antenna the centre of which was 1 metre above the ground.

Details of the general test set up are provided in the photograph section of this report.

The general limits described in 15.209 have been applied with the 300 metre and 30 metre limits being extrapolated by a factor of 40 dB per decade as allowed for in section 15.31(d)(2).

Between 9 – 90 kHz and between 110 – 490 kHz an Average detector and a Peak detector were used.

Where a peak detector was used the limit was increased by +20 dB

Between 90 kHz and 110 kHz band between 490 kHz and 30 MHz a Quasi Peak detector was used.

No emissions were detected from this device over these frequency ranges with all emissions therefore having a margin to the limit that exceed 20 dB over the range of 9 kHz – 30 MHz

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (9 kHz – 30 MHz) \pm 4.8 dB

Section 15.215 (c) – Additional provisions to the general radiated emission limitations

The device operates in the 902 – 928 MHz band and in particular between 904.425 – 909.675 MHz.

Spectrum mask measurements have been made at 904.425 and 909.675 MHz.

The 20 dB bandwidth of the modulated signal on the two test frequencies was measured to ensure they were contained within the assigned frequency band.

Measurements show compliance with the -20 dB requirements

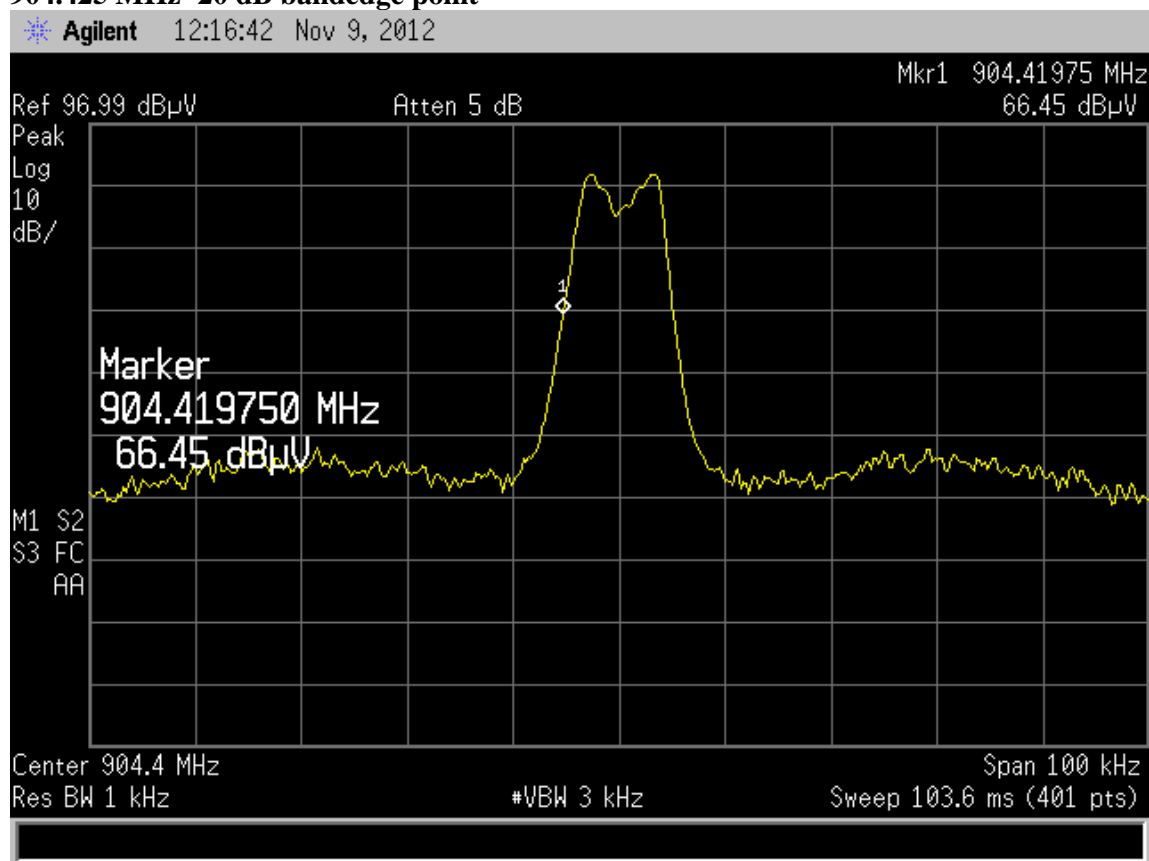
Frequency (MHz)	F low (MHz)	F high (MHz)
904.4250	904.41975	Not applicable
909.6750	Not applicable	909.68000

The device can be seen to stay within the band of 902 – 928 MHz at the -20 dB points

The actual measurement plots are detailed below

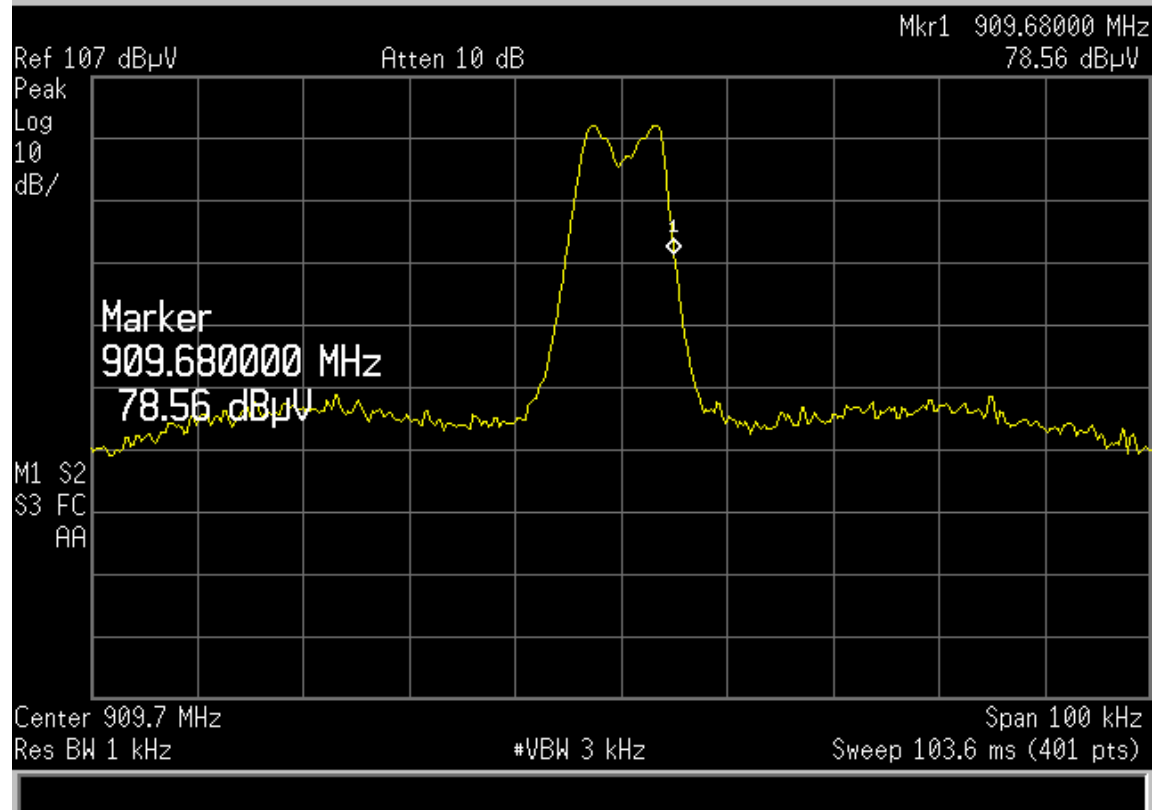
Results: Complies

904.425 MHz -20 dB bandedge point



909.675 MHz -20 dB bandedge point

Agilent 12:14:55 Nov 9, 2012



Section 15.249 (a) – Field strength of the Fundamental and Harmonics

Radiated emission measurements were carried out with the limits as per section 15.249 (a) being applied to the Fundamental and Harmonics of each transmitter.

Testing was carried out at EMC Technologies NZ Ltd Open Area Test Site, which is located at 670 Kawakawa Orere Rd, RD5, Papakura, New Zealand

The transmitter was placed on the test table top which was a total of 0.8 m above the test site ground plane.

Measurements of the radiated field were made 3 metres from the transmitting antenna.

As required by section 15.31(m) testing was carried out on two frequencies where one frequency is near the bottom of the band of operations and the other frequency is near the top of the band of operations.

Measurements below 1000 MHz were made using a Peak Detector with a bandwidth of 120 kHz as an alternative as allowed for by Section 15.35(a).

Measurements above 1000 MHz were made using an average detector with a bandwidth of 1.0 MHz and also a peak detector with a bandwidth of 1.0 MHz.

The limit as specified section 15.249 was applied to the average detector levels with a factor of 20 dB being applied to these levels when they were then measured using a peak detector.

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 is measured in both vertical and horizontal antenna polarisations with no measurements were made above the 10th harmonic

The device was tested transmitting continuously using pseudo random modulation on a low and high frequency of operation.

As the device is portable testing was carried out in the standing up right, laying flat and standing on its edge.

Spurious emission testing was carried out in all 3 axis's with only the highest emission level being reported in order simplify the test report

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

Level (dBµV/m) = Receiver Reading (dBµV) + Antenna Factor (dB) + Coax Loss (dB) – Amplifier Gain (dB)

Fundamental

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Orientation	Margin (dB)
904.4250	88.5	92.3	94.0	Upright	1.7
	85.3	92.8	94.0	Laying flat	1.2
	92.1	88.5	94.0	On edge	1.9
909.3250	88.7	93.0	94.0	Upright	1.0
	85.4	93.2	94.0	Laying flat	0.8
	92.8	88.5	94.0	On edge	1.2

Section 15.249 specifies a limit of 50 mV/m when a quasi detector is used for devices operating the band 902 - 928 MHz.

As allowed for by Section 15.35(a) measurements were made using a peak detector with a 120 kHz RBW as an alternative.

This limit has been converted to dBuV/m using the formula $20 * (\log 0.050 / 0.000001)$

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests $(30 - 25,000 \text{ MHz}) \pm 4.1 \text{ dB}$

Spurious emissions

The device was tested transmitting continuously using pseudo random modulation on a low and high frequency of operation.

Spurious emission testing was carried out in all 3 axis's with only the highest emission level being reported in order simplify the test report

Transmitting on 902.425 MHz

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1808.85	50.8	50.1	74.0	23.2	Peak
	37.0	37.7	54.0	16.3	Average
2713.275	59.5	59.9	74.0	14.1	Peak
	46.8	47.5	54.0	6.5	Average
3617.700	54.1	56.1	74.0	17.9	Peak
	45.6	47.9	54.0	6.1	Average
4522.125	< 55.5	< 58.1	74.0	> 15.9	Peak
	< 43.8	< 46.4	54.0	> 7.6	Average
5426.550	< 59.1	< 58.9	74.0	> 14.9	Peak
	< 45.4	< 45.8	54.0	> 8.2	Average
6330.975	< 61.0	< 61.0	74.0	> 13.0	Peak
	< 48.1	< 48.1	54.0	> 5.9	Average
7235.400	< 57.0	< 56.7	74.0	> 17.0	Peak
	< 43.2	< 44.8	54.0	> 9.2	Average
8139.825	< 57.5	< 58.2	74.0	> 15.8	Peak
	< 44.5	< 45.2	54.0	> 8.8	Average
9044.250	< 58.3	< 58.3	74.0	> 15.7	Peak
	< 45.4	< 45.4	54.0	> 8.6	Average

Transmitting on 909.325 MHz

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1818.650	51.5	51.9	74.0	22.1	Peak
	38.6	39.3	54.0	14.7	Average
2727.975	60.1	60.1	74.0	13.9	Peak
	48.1	48.9	54.0	5.1	Average
3637.300	56.1	56.1	74.0	17.9	Peak
	44.1	46.4	54.0	7.6	Average
4546.625	< 56.7	< 56.1	74.0	> 17.3	Peak
	< 44.7	< 42.2	54.0	> 9.3	Average
5455.950	< 58.3	< 58.1	74.0	> 15.7	Peak
	< 45.2	< 45.2	54.0	> 8.8	Average
6365.275	< 61.5	< 61.5	74.0	> 12.5	Peak
	< 48.1	< 48.1	54.0	> 5.9	Average
7274.600	< 56.1	< 56.5	74.0	> 17.5	Peak
	< 42.7	< 43.1	54.0	> 10.9	Average
8183.925	< 57.7	< 58.0	74.0	> 16.0	Peak
	< 44.5	< 44.5	54.0	> 9.5	Average
9093.250	< 58.3	< 58.5	74.0	> 15.5	Peak
	< 45.1	< 45.1	54.0	> 8.9	Average

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

Level (dBuV/m) = Receiver Reading (dBuV) + Antenna Factor (dB) + Coax Loss (dB) – Microwave Preamplifier Gain (dB)

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 – 25,000 MHz) ± 4.1 dB

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applic
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applic
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applic
Receiver	R & S	ESIB 40	100171	R-27-1	10 Oct 2013
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3776	8 Dec 2012
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603	30 Jan 2013
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612	30 Jan 2013
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	30 Jan 2013
Horn Antenna	EMCO	3115	9511-4629	E1526	3 May 2013

8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies NZ Ltd registration with the Federal Communications Commission as a listed facility, Registration Number: 90838, which was updated in February 2011.

In addition testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/IEC/ISO 17025:2005.

All measurement equipment has been calibrated in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/IEC/ISO 17025: 2005.

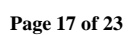
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with a number of accreditation bodies in various economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied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

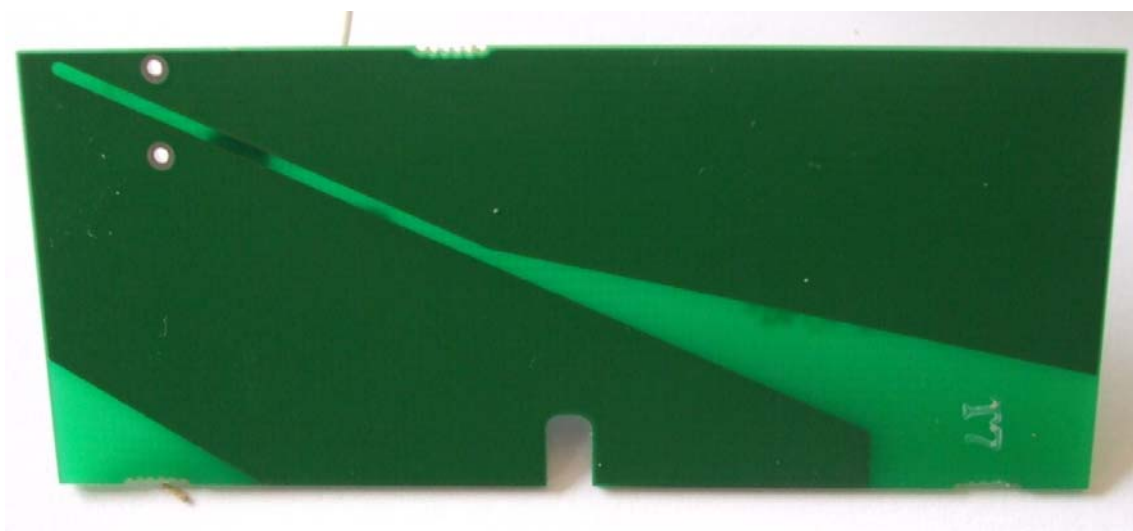
9. PHOTOGRAPHS

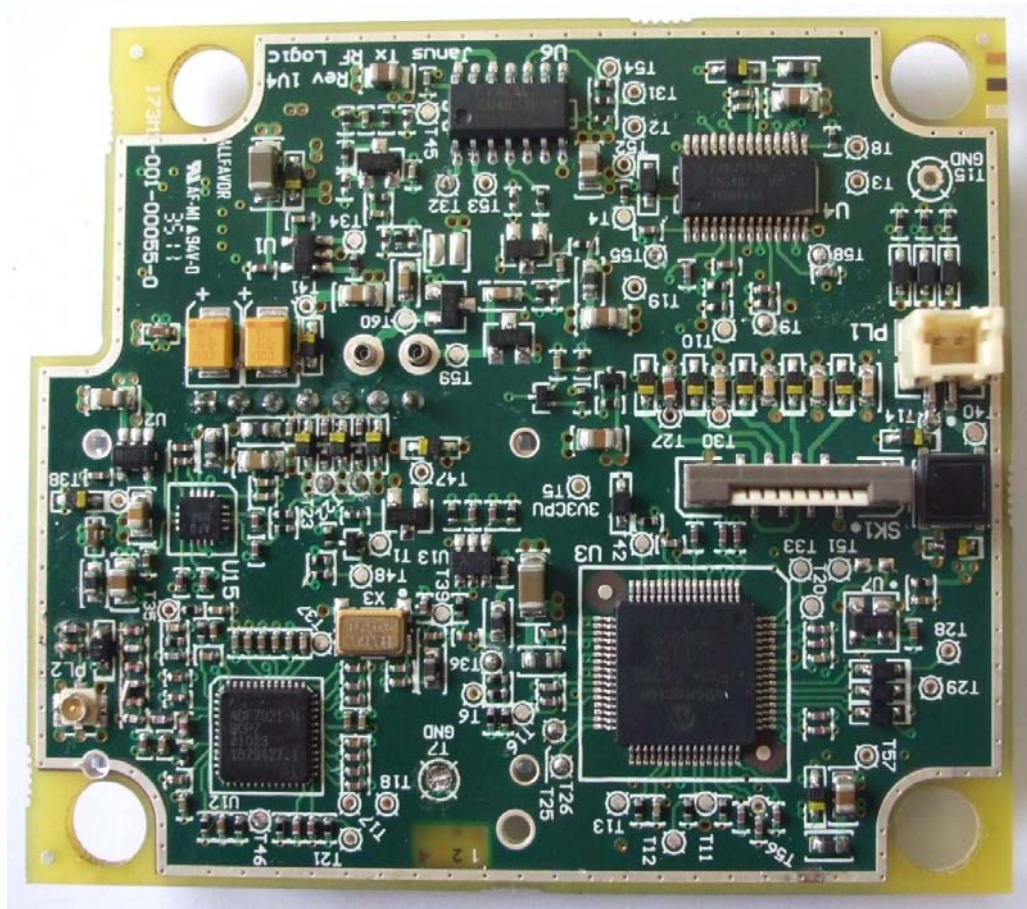
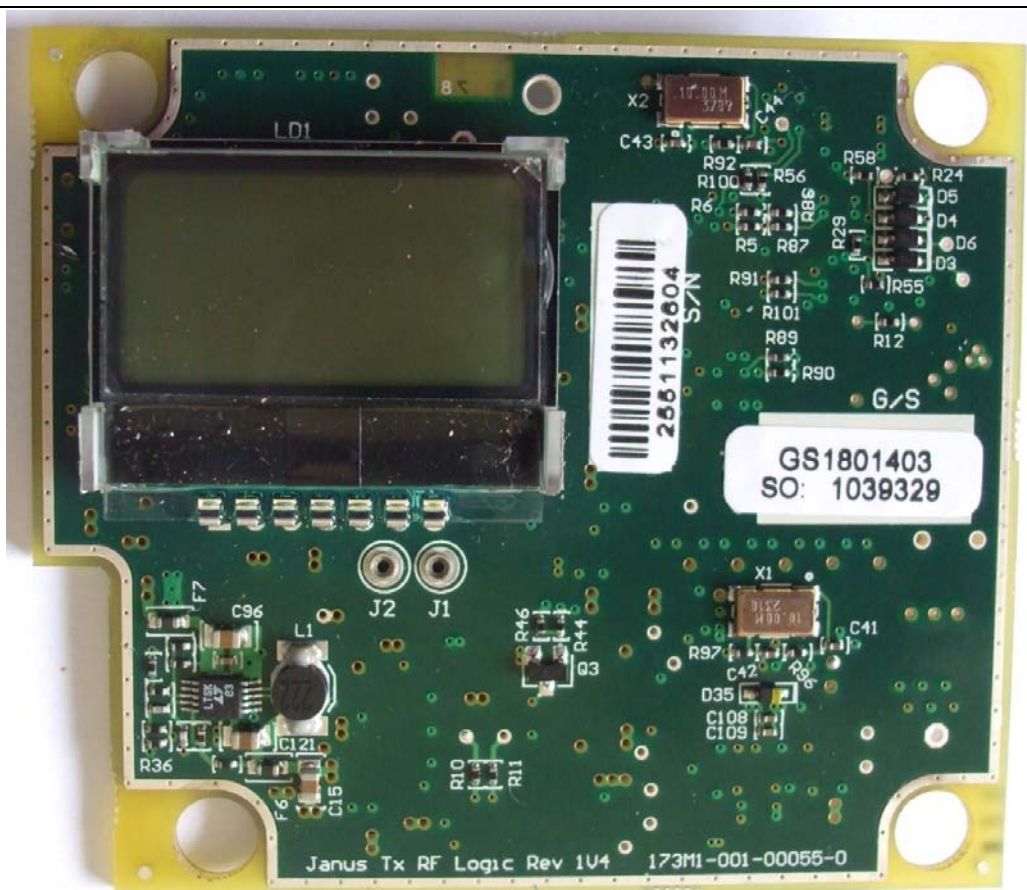
External views



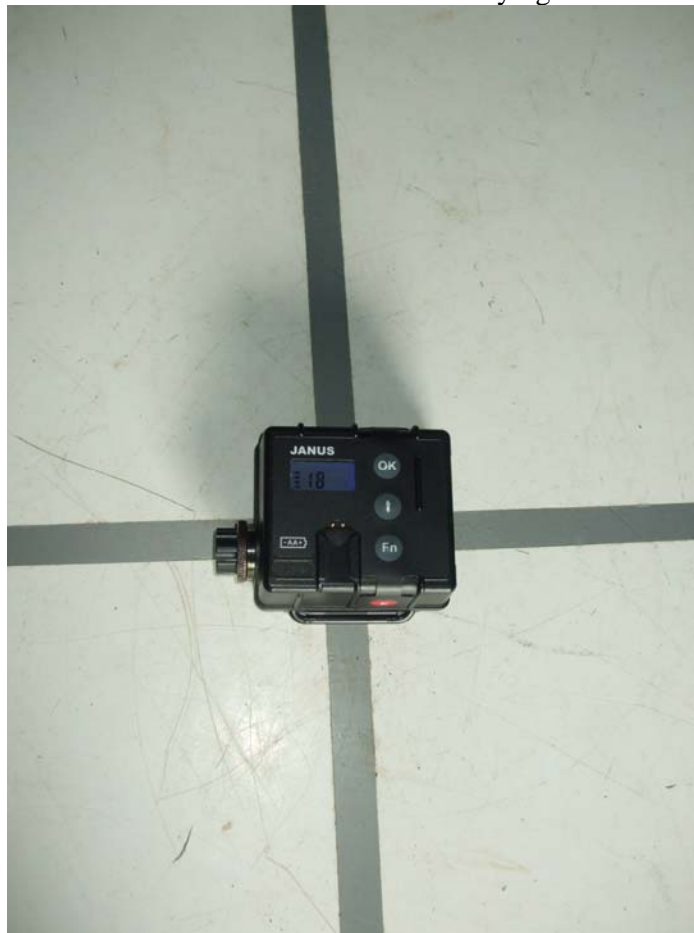








Radiated emissions test set – Laying flat



Standing up right



Standing on edge



Radiated emissions test set up photos – Below 30 MHz



Radiated emissions test set up photos – Above 30 MHz

