Compliance Engineering Ireland Ltd

Clonross Lane, Derrockstown, Dunshaughlin, Co. Meath

Tel: +353 1 8256722 Fax: +353 1 8256733

Project Number: 13E4815-3b

Prepared for:

Itronik Interconnect Limited

By

Compliance Engineering Ireland Ltd

Clonross Lane

Derrockstown

Dunshaughlin

Co. Meath

FCC Site Registration: 92592

Industry Canada Assigned Site Code: 8517A-2

Date

18 April 2014

FCC EQUIPMENT AUTHORISATION

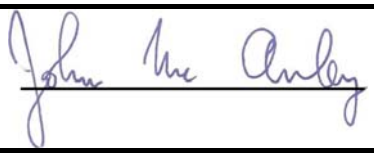
Test Report

EUT Description

Zone Control unit with Tag Module fitted.

Authorised :

John McAuley



TEST SUMMARY

Emissions were assessed to the following standards:

FCC CFR 47 Part 15
Federal Communications Commission: Part 15 Radio Frequency Devices

The equipment complies with the requirements according to the following standards.

FCC Part	TEST PARAMETERS	Test Result
15.109	RADIATED EMISSIONS	PASS

Exhibit A – Technical Report

Table of Contents

1.0 EUT Description

The EUT was a zone control which contained a transceiver module as below.

The module used a short range 433 MHz band transceiver for RFID.

Zone Control

Manufacturer:	Itronik Interconnect Limited
Make:	Zone Control unit
Model:	Zone Control unit

Module

Model:	105TAG
Type:	433 MHz Radio Transceiver for RFID
FCC ID:	2ABFL105TAG
IC ID:	11591A-105TAG

1.1 EUT Operation

Operating Conditions during Test:

The equipment under test was operated during the measurement under the following conditions:

The EUT was powered from a 3v battery.

The module was operated in continuous modulated mode for the Spurious Emissions tests. In this mode the EUT transmitted with a duty cycle with Ton of 50uS and Toff of 30uS.

The EUT was operated by triggering the PIR in normal operating mode for duty cycle test.

Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: +15 to +35 ° C

Humidity: 20-75 %

1.2 Modifications

No modifications were required in order to pass the test specifications.

1.3 Date of Test

The tests were carried out on one sample of the EUT on the 10th December 2013.

1.4 Electromagnetic Emissions Testing

The guidelines of CISPR 16-4 were used for all uncertainty calculations, estimates and expressions thereof for EMC testing. A copy of Compliance Engineering Ireland Ltd.'s policy for EMC Measurement Uncertainty is available on request.

RF Requirements: Spurious emissions in accordance with FCC CFR 15.107, 15.109 and 15.209. Tests were carried out to the requirements of CISPR 16-4 and ANSI C63.4-2003.

1.4.1 Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for the conducted emissions test was ±3.5 dB.

The measurement uncertainty (with a 95% confidence level) for the radiated emissions test was ±5.3 dB (from 30 to 100 MHz), ±4.7 dB (from 100 to 300 MHz), ±3.9 dB (from 300 to 1000 MHz) and ±3.8 dB (from 1 GHz to 40 GHz).

2.0 Emissions Measurements

2.1 Conducted Emissions Measurements

Test not performed as EUT was battery powered.

2.2 Radiated Emissions Measurements

Radiated Power measurements were made at the Compliance Engineering Ireland Ltd anechoic chamber located in Dunshaughlin, Co. Meath, Ireland to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

The EUT was centred on a motorized turntable, which allows 360 degree rotation. A measurement antenna was positioned at a distance of 3 metres as measured from the closest point of the EUT. The radiated emissions were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 meters.

Emissions below 1GHz were measured using a bi-log antenna. In this case the resolution bandwidth was 100kHz.

Emissions above 1GHz were measured using a horn antenna located at 3 metres distance from the EUT. In this case the resolution bandwidth was 1MHz and video bandwidth was 1MHz.

2 Duty Cycle Normal operation

TEST PROCEDURE

EUT was tested in modulated mode.

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 100 kHz and the VBW is set to 1MHz. The sweep time is coupled and the span is set to 0 Hz.

RESULTS

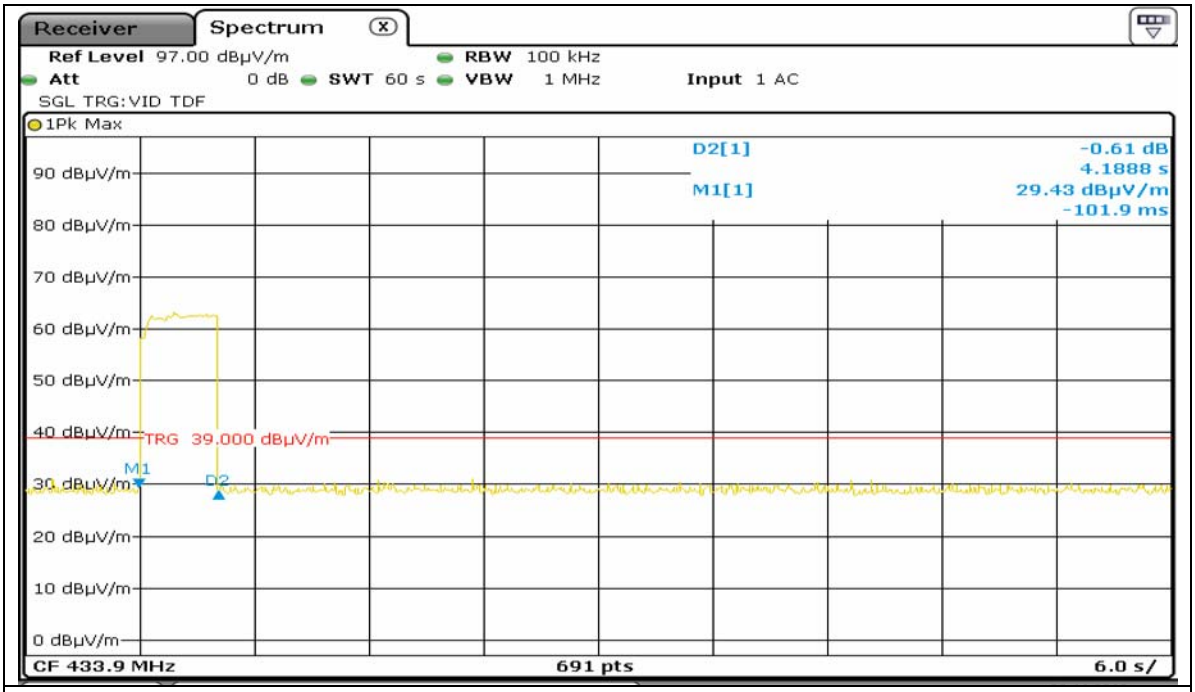


Fig 1 Repetition of transmitted pulse

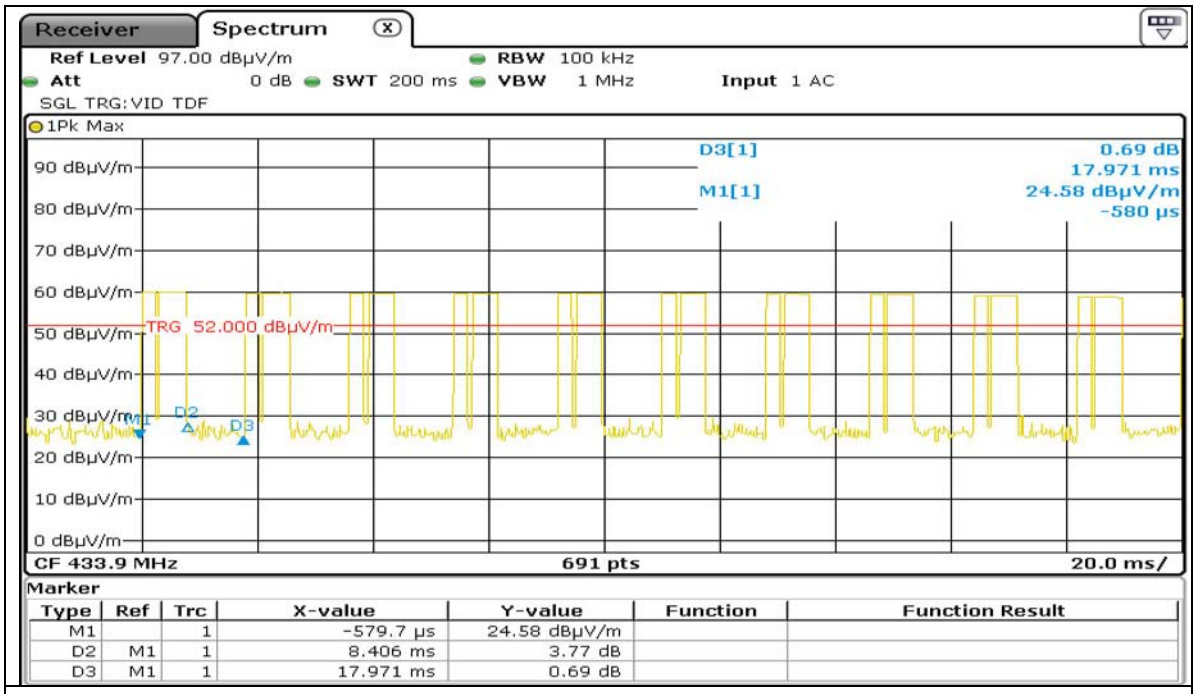


Fig 2 Repetition of transmitted pulse

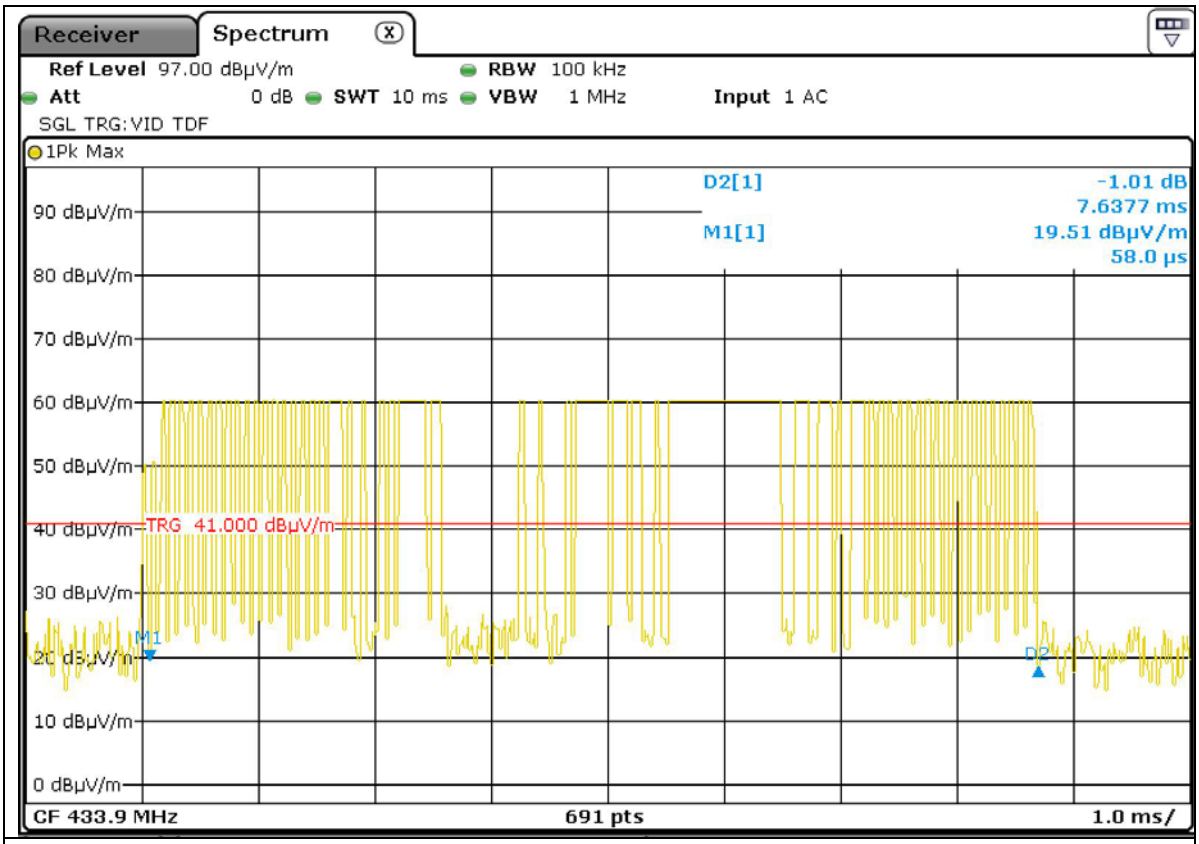


Fig 3 Repetition of transmitted pulse

Duty cycle for normal operation mode

3 Field Strength of Spurious Radiated Emissions

Note this is the Average limit for 3 metre measurement.

For the spurious and harmonics measurements, the EUT was set up in an anechoic chamber. The EUT was rotated 360 degrees azimuth and the search antenna height was varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT were then recorded to determine margin to the limits. Distance of EUT to the measurement antenna was 3m.

4.0 Results for Radiated emissions

Appendix 3 shows the results of the scans in the anechoic chamber.

4.1 Measurements with Bilog Antenna (30MHz to 1GHz)

Frequency MHz	Quasi peak Level dBuV/m	Antenna Polarity	Antenna Factor dB	Cable loss dB	Final Field Strength Quasi Peak dBuV/m
97.26	19.5	Vertical	10.3	0.2	30.0
119.25	4.0	Vertical	11.8	0.2	16.0
385.77	10.8	Vertical	14.6	1.2	26.6
771.57	7.1	Vertical	21.6	1.4	30.1
868.20	14.4	Vertical	22.2	1.4	38.0
79.77	-2.6	Horizontal	8.4	0.2	6.0
385.77	16.5	Horizontal	14.6	1.2	32.3
771.57	0.4	Horizontal	21.6	1.4	23.4
868.20	15.1	Horizontal	22.2	1.4	38.7

Frequency MHz	Final Field Strength Quasi Peak dBuV/m	Antenna Polarity	Average Limit dBuV/m	Margin dB
97.26	30.0	Vertical	43.5	13.5
119.25	16.0	Vertical	43.5	27.5
385.77	26.6	Vertical	46	19.4
771.57	30.1	Vertical	46	16.0
868.20	38.0	Vertical	46	8.0
79.77	6.0	Horizontal	40	34.0
385.77	32.3	Horizontal	46	13.7
771.57	23.4	Horizontal	46	22.7
868.20	38.7	Horizontal	46	7.3

Result: Pass

4.2 Horn antenna measurements (1GHz – 6 GHz)

Frequency GHz	Peak Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss	Antenna Polarity	Final Peak Level dBuV/m	Average Limit +20dB dBuV/m	Margin dB
1.7365	45.3	24.8	20	2.8	Vertical	52.9	74.0	21.1
1.7365	48.5	24.8	20	2.8	Vertical	56.1	74.0	17.9

Frequency GHz	Average Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss	Antenna Polarity	Final Average Level dBuV/m	Average Limit dBuV/m	Margin dB
1.7365	34.3	24.8	20	2.8	Vertical	41.9	54.0	12.0
1.7365	40.7	24.8	20	2.8	Vertical	48.3	54.0	5.6

Test Result Pass

Appendix 1

List of Test Equipment

Instrument	Mftr.	Model	CEI Ref No.	Cal Due Date
Bilog Antenna	Chase	CBL 6140	690	03/10/2015
Preamplifier	Hewlett Packard	83017A	805	10/04/2014
Horn Antenna	AH Systems	SAS 200 571	839	16/05/2016
Spectrum Analyser	Rohde & Schwarz	FSP 40	850	18/06/2014
Spectrum Analyser/Receiver	Rohde & Schwarz	ESR	869	25/05/2014

Appendix 2

Test Configurations

Fig 1 Radiated Emissions -

Fig 2 Radiated Emissions

Fig 3 Radiated Emissions -

Appendix 3:

Test Results

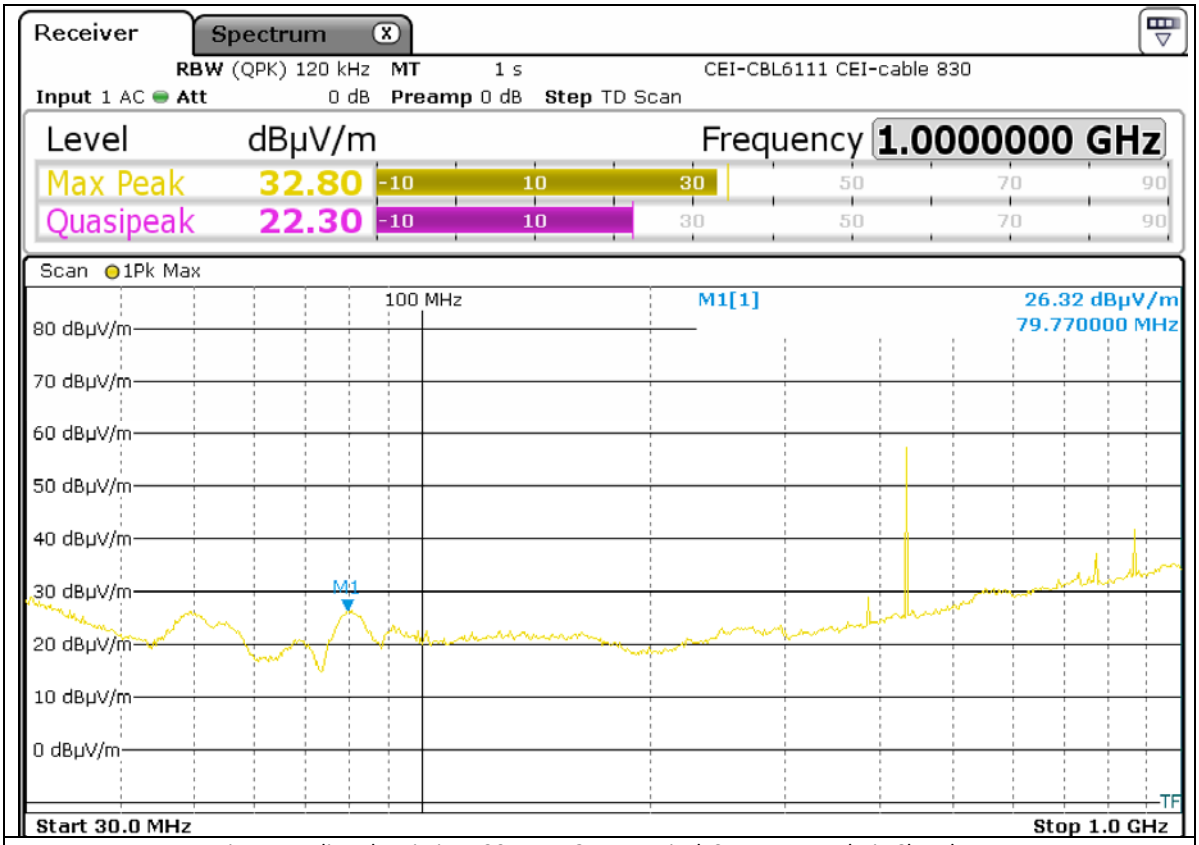


Fig 1 Radiated Emissions 30MHz-1GHz Vertical 3metres Anechoic Chamber

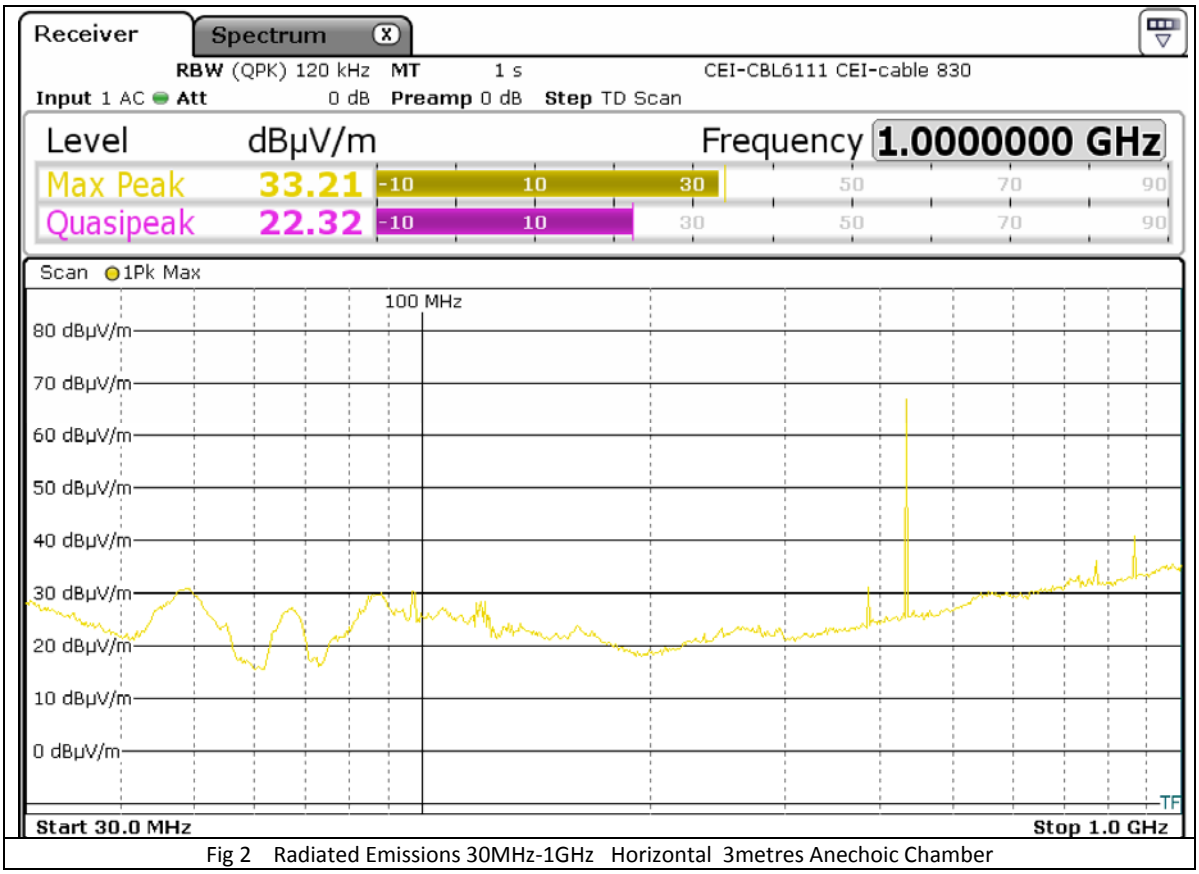


Fig 2 Radiated Emissions 30MHz-1GHz Horizontal 3metres Anechoic Chamber

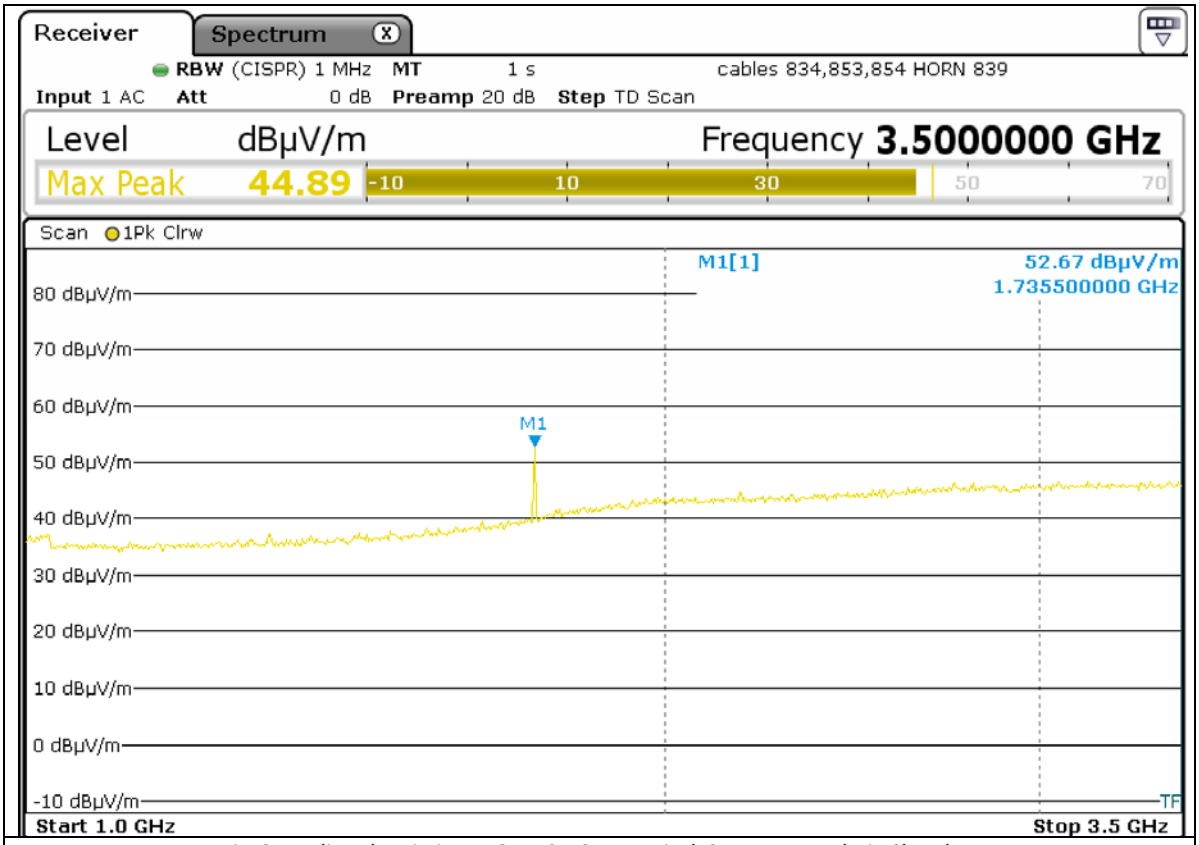


Fig 3 Radiated Emissions 1GHz -3.5GHz Vertical 3metres Anechoic Chamber

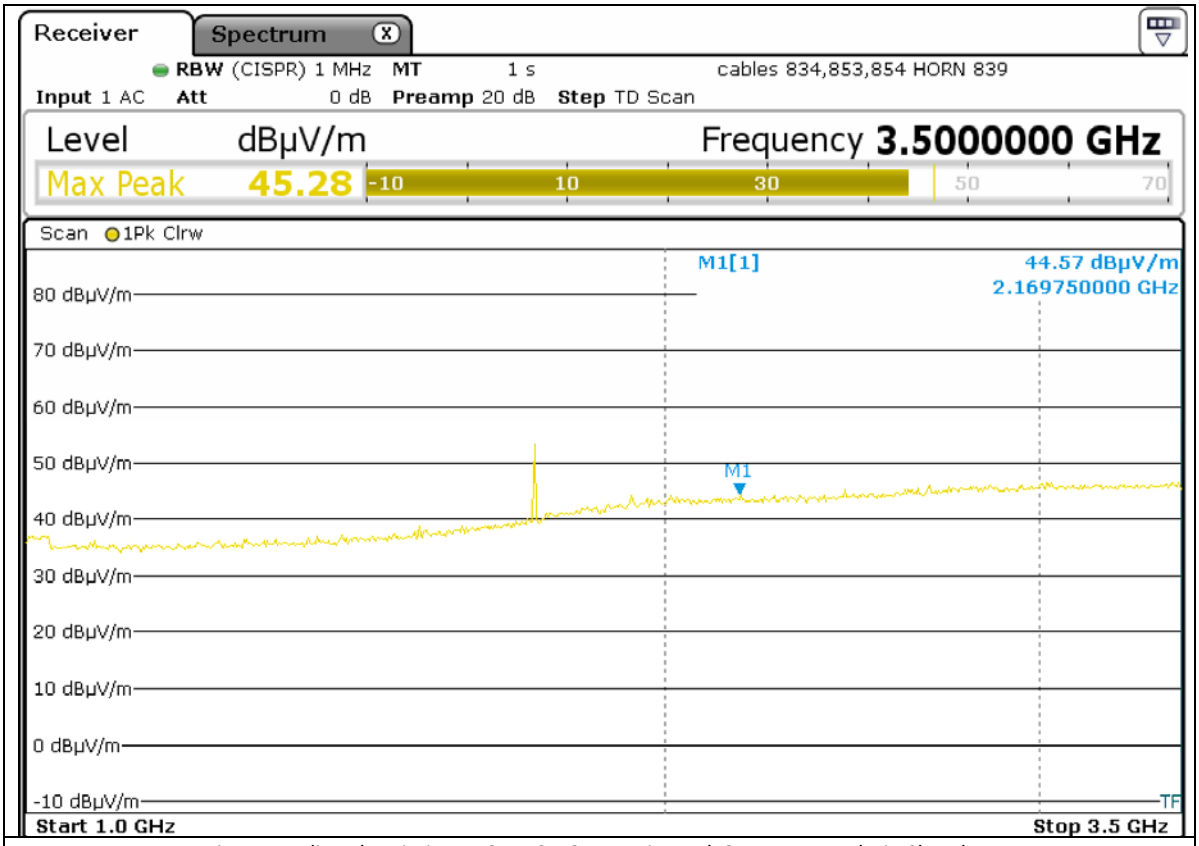


Fig 4 Radiated Emissions 1GHz -3.5GHz Horizontal 3metres Anechoic Chamber

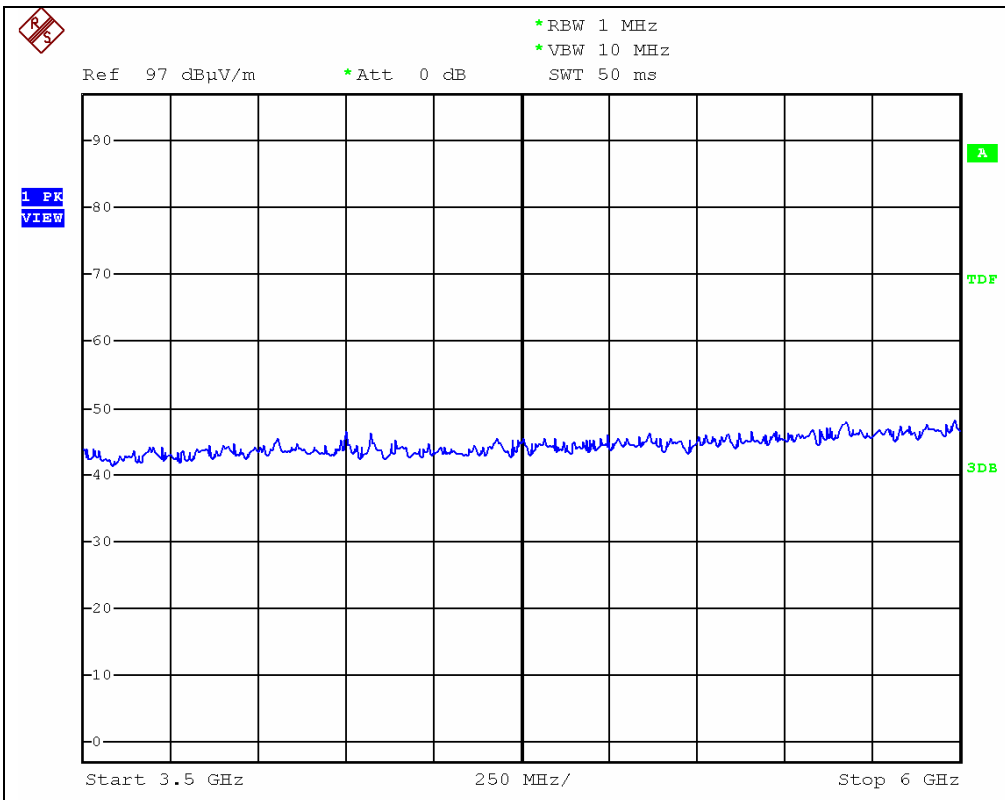


Fig 5 Radiated Emissions 3.5GHz -6 GHz Vertical 3metres Anechoic Chamber

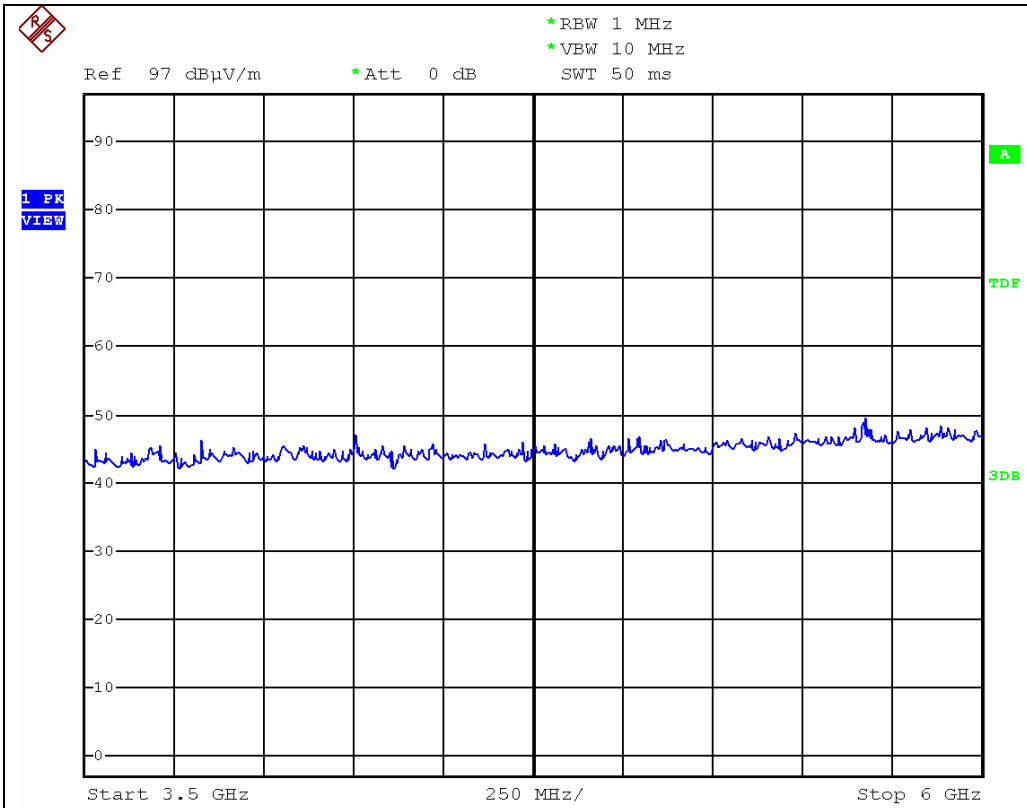


Fig 6 Radiated Emissions 3.5GHz -6 GHz Horizontal 3metres Anechoic Chamber