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Report On

FCC Testing of the
Crane Electronics Ltd
Torque Module

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA6IQVT1

Document 75925573 Report 07 Issue 3

December 2014



Product Service

TÜV SÜD Product Service, Octagon House, Concorde Way, Segensworth North,
Fareham, Hampshire, United Kingdom, PO15 5RL
Tel: +44 (0) 1489 558100. Website: www.tuv-sud.co.uk

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Torque Module

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December 2014

PREPARED FOR

Crane Electronics Ltd
Watling Drive, Sketchley Meadows
Hinckley
United Kingdom
LE10 3EY

PREPARED BY

Jo-Anne Hindmarsh
Project Administrator

APPROVED BY

David West
Authorised Signatory

DATED

09 December 2014

Note: Report Up-issued to show FCC ID.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 15B. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

Tom Genders



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Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Crane Electronics Ltd
Torque Module



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Crane Electronics Ltd, Torque Module to the requirements of FCC CFR 47 Part 15B.

| | |
|--------------------------------|---|
| Objective | To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out. |
| Manufacturer | Crane Electronics Ltd |
| Model Number(s) | Not Applicable |
| Serial Number(s) | 93270 |
| Software Version | Not Applicable |
| Hardware Version | 101-452 issue B |
| Number of Samples Tested | 1 |
| Test Specification/Issue/Date | FCC CFR 47 Part 15B: 2012 |
| Test Plan/Issue/Date | Not Applicable |
| Incoming Release Date | Declaration of Build Status 12 March 2014 |
| Disposal Reference Number Date | Held Pending Disposal Not Applicable Not Applicable |
| Order Number Date | 044237 30 January 2014 |
| Start of Test | 26 February 2014 |
| Finish of Test | 26 February 2014 |
| Name of Engineer(s) | T Genders |
| Related Document(s) | ANSI C63.4: 2009 |



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 15B is shown below.

| Configuration 1 - 2.4GHz SRD | | | | | | |
|------------------------------|-------------|-------------------------------------|------|-----------|--------|---------------|
| Section | Spec Clause | Test Description | Mode | Mod State | Result | Base Standard |
| | 15.107 | Conducted Emissions (AC Power Port) | Idle | | N/A | ANSI 63.4 |
| 2.1 | 15.109 | Radiated Emissions (Enclosure Port) | Idle | 0 | Pass | ANSI 63.4 |

N/A – Not Applicable; N/R – Not Requested; N/T – Not Tested

1.3 DECLARATION OF BUILD STATUS

Manufacturer Crane Electronics Ltd.

Country of Origin UK

UK Agent N/A

Description Torque Module

Model Number N/A

Declared Variants No Variants

Part Number IQVT1-0001-CRXxRX

Serial Number 93270

Drawing Number N/A

Build Status Iss.B

Software Issue N/A

Firmware Issue N/A

Highest Frequency 16MHz
(Generated or used within EUT (FCC testing only))

Signature
Representatives of
Customer Neil McDonald

Date 12th March 2014

BSD Serial Number _____

Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

No responsibility will be accepted by TÜV SÜD Product Service as to the accuracy of the information declared in this document by the manufacturer.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Crane Electronics Ltd, Torque Module as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test

1.4.2 Test Configuration

Idle mode was set up with the transmitter disabled. The spectrum analyser was used to ensure there was not an unintended transmission. The EUT was also connected to a torque meter and displayed data received via the signal cable.

Configuration 1: 2.4GHz SRD

The EUT was configured in accordance with FCC CFR 47 Part 15B.

1.4.3 EUT Cable / Port Identification

| Port | Max Cable Length specified | Usage | Type | Screened |
|--------|----------------------------|----------------------|-----------|----------|
| Signal | 0.5m | External Floppy Disk | Multicore | Yes |
| Signal | 5.0m | Network | Cat 5 | No |
| Earth | 1.0m | Earth | Braid | No |

1.4.4 Modes of Operation

Modes of operation of each EUT during testing were as follows:

Mode 1 - Idle

Information on the specific test modes utilised are detailed in the test procedure for each individual test.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

The EUT was powered from a Battery supply.

FCC Measurement Facility Registration Number
667968 Bearley, Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.7 MODIFICATION RECORD

No modifications were made to the EUT during testing.

SECTION 2

TEST DETAILS

FCC Testing of the
Crane Electronics Ltd
Torque Module

2.1 RADIATED EMISSIONS (ENCLOSURE PORT)

2.1.1 Specification Reference

FCC CFR 47 Part 15B

2.1.2 Equipment Under Test

Torque Module, S/N: 93270

2.1.3 Date of Test and Modification State

26 February 2014 - Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of ANSI 63.4.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1

2.1.6 Environmental Conditions

26 February 2014

Ambient Temperature 17.4 to 19.5°C

Relative Humidity 40 to 44%

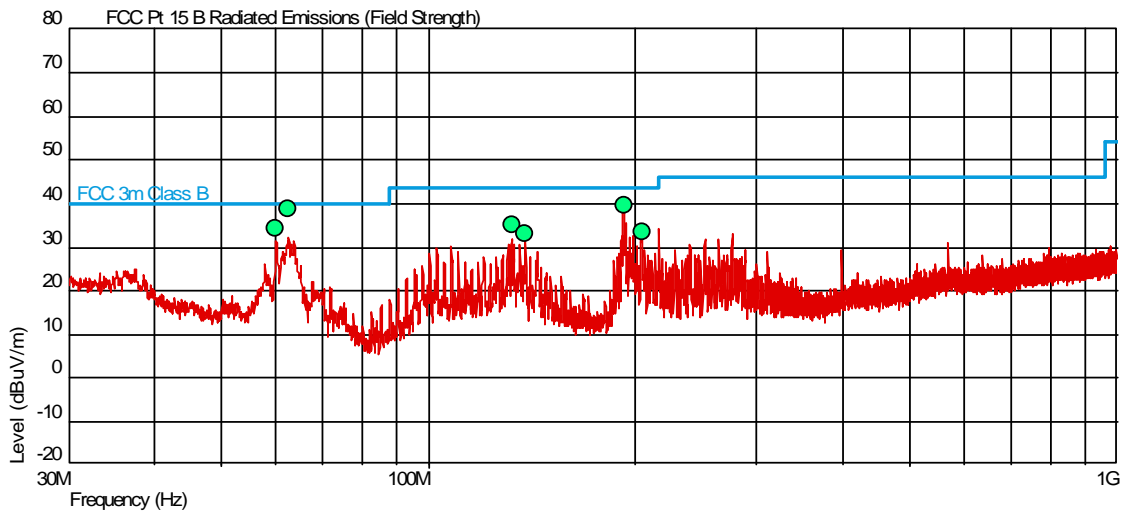
Atmospheric Pressure 1010mbar

2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15B for Radiated Emissions (Enclosure Port).

The test results are shown below.

Configuration 1 - Mode 1

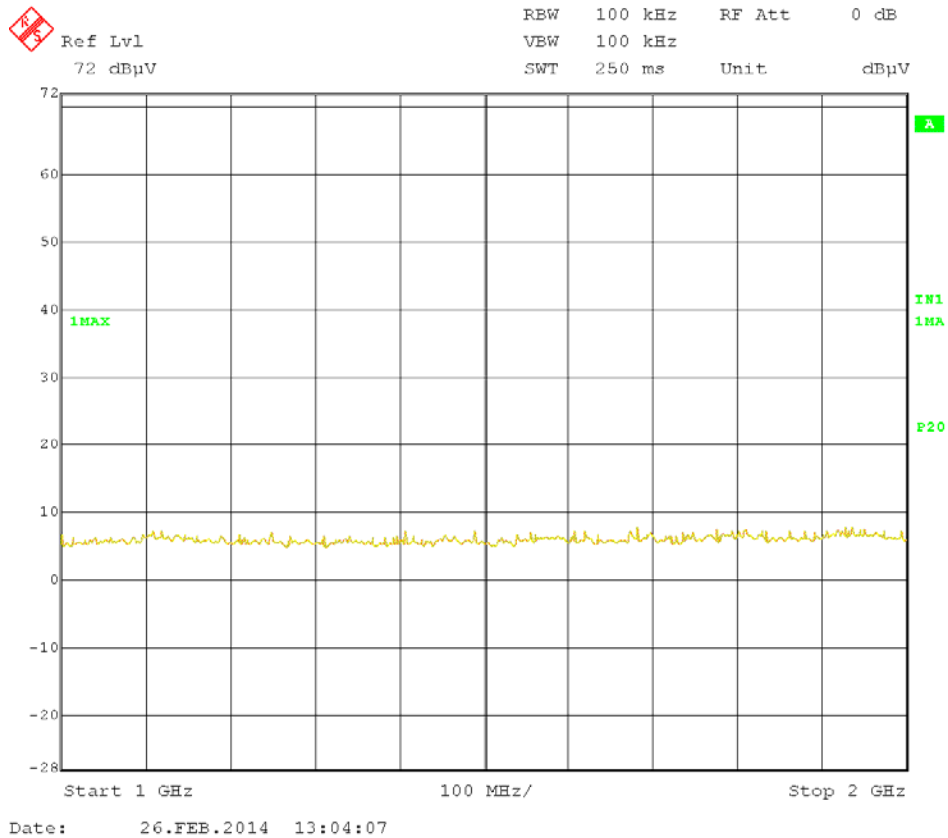


| Frequency (MHz) | QP Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | Angle(Deg) | Height(m) | Polarity |
|-----------------|-----------------|-----------------|------------------|------------|-----------|------------|
| 60.052 | 34.2 | 40.0 | -5.8 | 270.00 | 3.50 | Vertical |
| 62.701 | 38.8 | 40.0 | -1.2 | 210.00 | 3.00 | Horizontal |
| 132.015 | 34.9 | 43.5 | -8.6 | 140.00 | 2.00 | Horizontal |
| 137.739 | 33.0 | 43.5 | -10.5 | 150.00 | 2.60 | Horizontal |
| 192.002 | 39.7 | 43.5 | -3.8 | 300.00 | 1.00 | Horizontal |
| 204.003 | 33.5 | 43.5 | -10.0 | 150.00 | 1.00 | Horizontal |

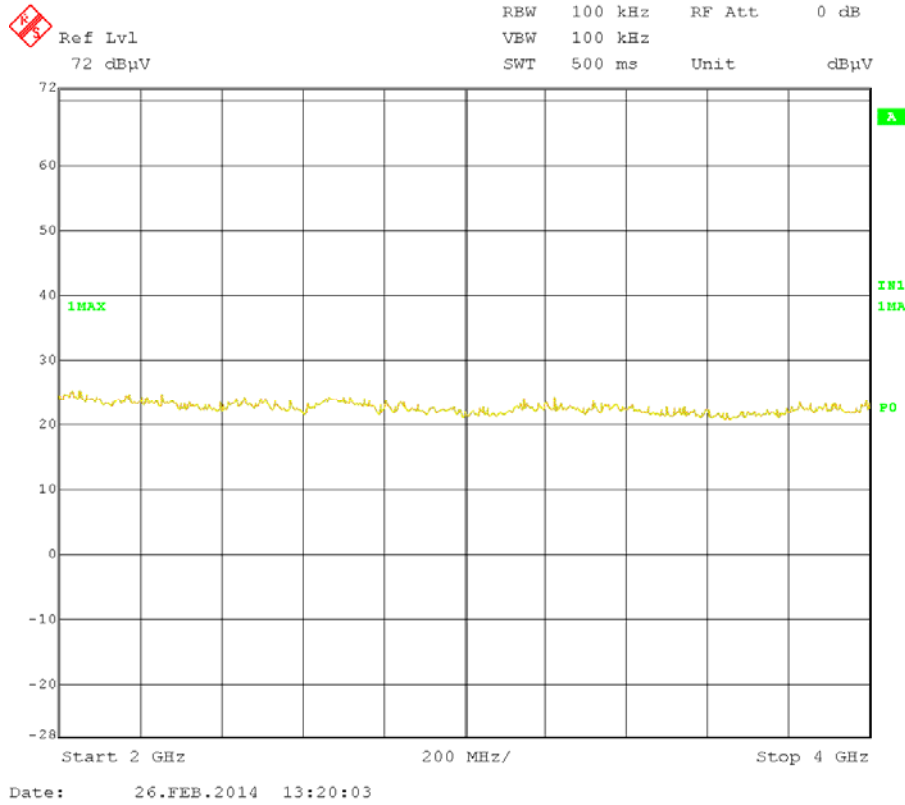
Table of results 1GHz - 12.5GHz

No table of results available as no emissions found within 10dB of the limit.

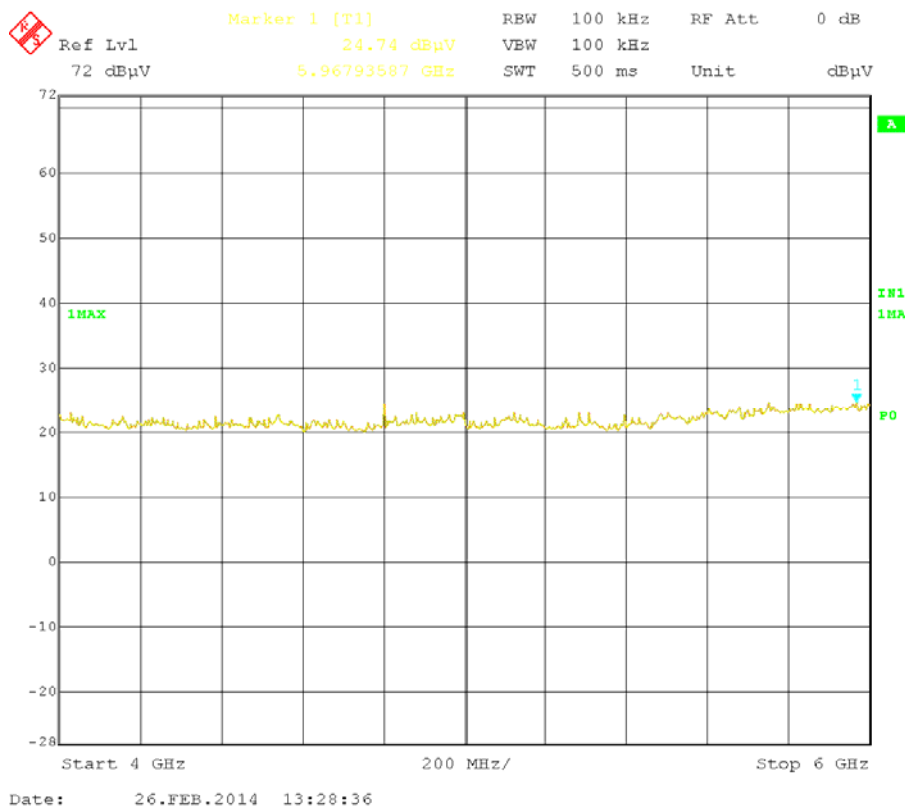
1 – 2 GHz



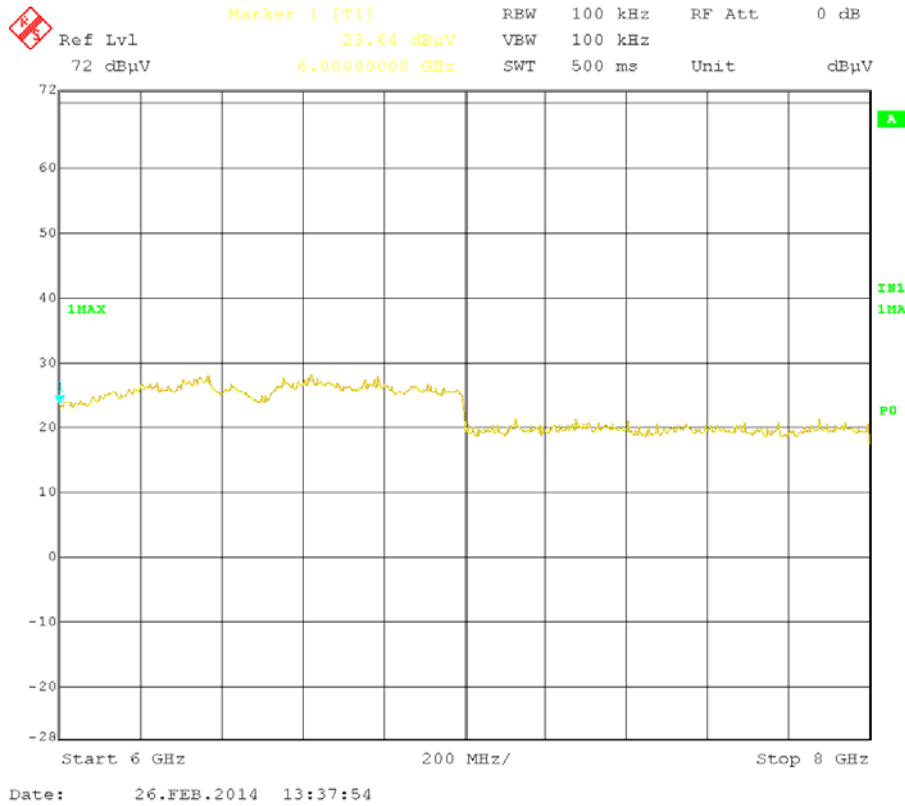
2 – 4 GHz



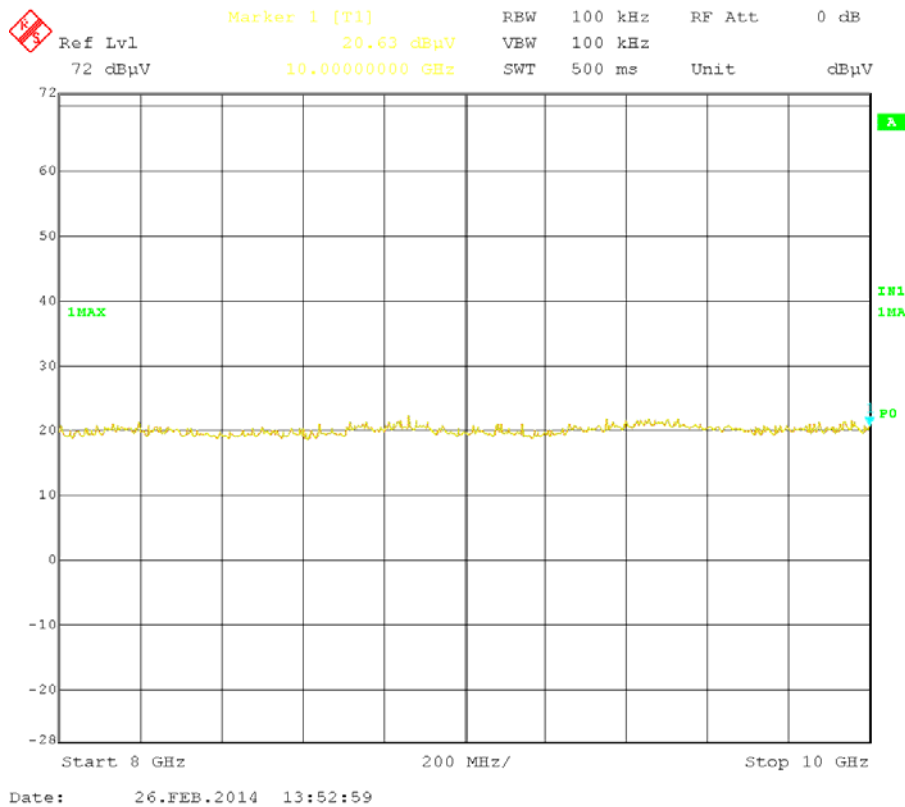
4 – 6 GHz



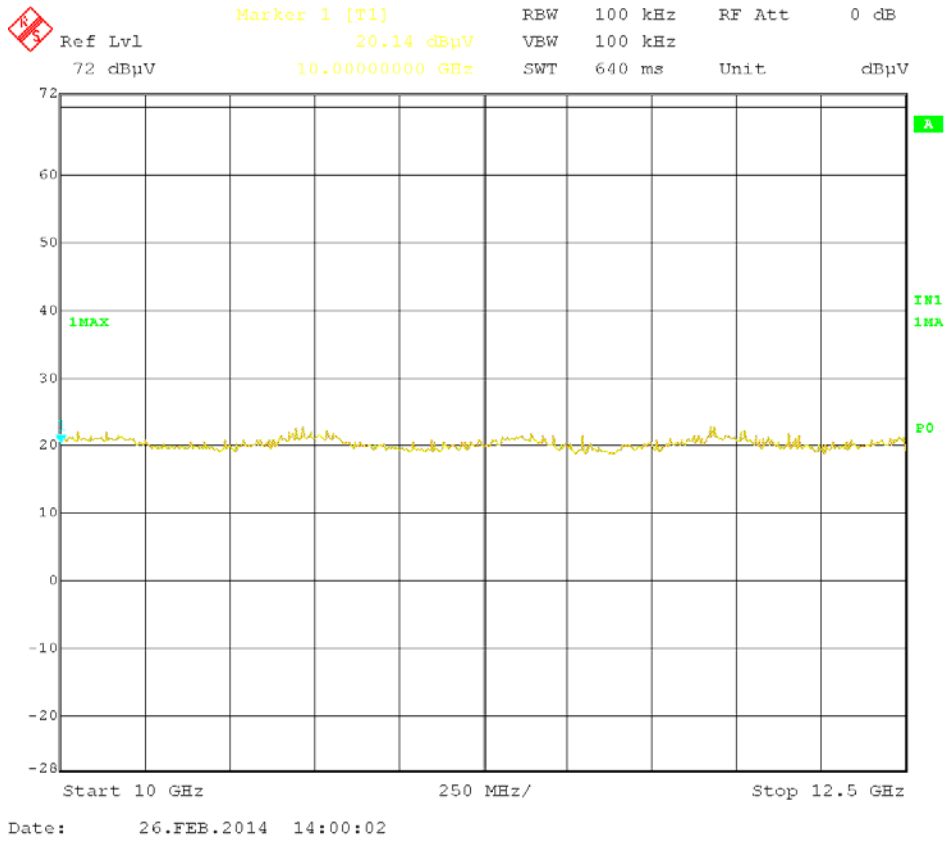
6 – 8 GHz



8 – 10 GHz



10 – 12.5 GHz



SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| Instrument | Manufacturer | Type No. | TE No. | Calibration Period (months) | Calibration Due |
|---|-----------------|----------|--------|-----------------------------|-----------------|
| Section 2.1 EMC - Radiated Emissions | | | | | |
| Turntable Controller | Various | RH253 | 1708 | - | TU |
| Antenna (Double Ridge Guide) | EMCO | 3115 | 1711 | 12 | 13-Dec-2014 |
| Bilog Antenna | Schaffner | CBL6143 | 1858 | 24 | 05-Sep-2014 |
| EMI Test Receiver | Rohde & Schwarz | ESIB26 | 3763 | 12 | 22-Mar-2014 |

TU – Traceability Unscheduled

OP MON – Output Monitored with Calibrated Equipment

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

| Test Discipline | Frequency / Parameter | MU |
|--|---|--------|
| Radiated Emissions, Bilog Antenna, AOATS | 30MHz to 1GHz Amplitude | 5.2dB* |
| Radiated Emissions, Horn Antenna, AOATS | 1GHz to 40GHz Amplitude | 6.3dB* |
| Conducted Emissions, LISN | 150kHz to 30MHz Amplitude | 3.2dB* |
| Conducted Emissions, ISN | 150kHz to 30MHz Amplitude | 2.1dB |
| Substitution Antenna, Radiated Field | 30MHz to 18GHz Amplitude | 2.6dB |
| Discontinuous Interference | 150kHz to 30MHz Amplitude | 3.0dB* |
| Interference Power | 30MHz to 300MHz Amplitude | 3.0dB* |
| Radiated E-Field Susceptibility | 10MHz to 6GHz Test Amplitude | 2.0dB† |
| Conducted Susceptibility RF | 50kHz to 1000MHz Amplitude | 3.1dB• |
| | EM Clamp Method of Test | 1.2dB• |
| | CDN Method of Test | 1.1dB• |
| | BCI Clamp Method of Test | 1.2dB• |
| | Direct Injection Method of Test | 1.2dB• |
| Conducted Susceptibility LF | DC to 150kHz | 1.0%† |
| Power Frequency Magnetic Field | 50Hz/60Hz Amplitude | 0.45% |
| Magnetic Emissions | 9kHz to 30MHz Amplitude | 3.4dB* |
| Magnetic Field/Flux iaw EN 50366 | 10Hz to 400kHz | 2.64% |
| Harmonics and Flicker | The test was applied using proprietary equipment that meets the requirements of EN 61000-3-2 and EN 61000-3-3 | — |
| Mains Voltage Variations and Interrupts | The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11 | — |
| Fast Transient Burst | The test was applied using proprietary equipment that meets the requirements of EN 61000-4-4 | — |
| Electrostatic Discharge | The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2 | — |
| Surge | The test was applied using proprietary equipment that meets the requirements of EN 61000-4-5 | — |
| Vehicle Transients | The test was applied using proprietary equipment that meets the requirements of ISO 7637-1 and 2 | — |
| Compass Safe Distance | Azimuth Accuracy | 0.10° |

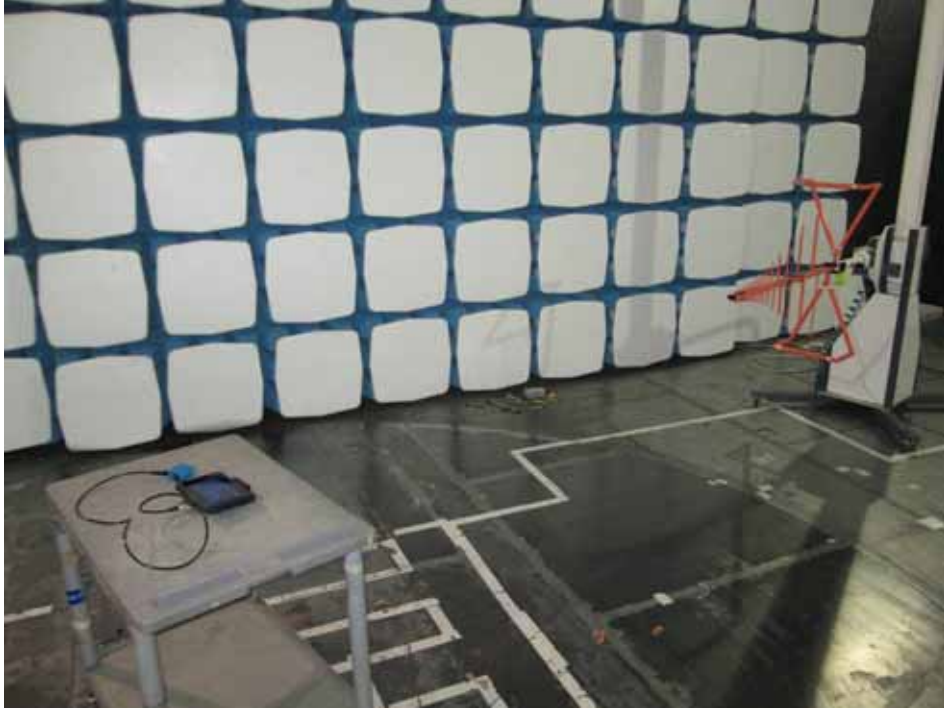
Worst case error for both Time and Frequency measurement 12 parts in 10⁶.

- * In accordance with CISPR 16-4-2
- † In accordance with UKAS Lab 34
- In accordance with EN 61000-4-6: 2009

SECTION 4

PHOTOGRAPHS

4.1 TEST SET UP PHOTOGRAPHS



Radiated Emissions (Enclosure Port)

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA
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