Global EMC Inc. Labs

EMC & RF Test Report

As per

Industry Canada Safety Code 6

&

FCC Part 15 Subpart C: 2007 15.247i

FCC Part 1, Section 1.1310 Table 1 (B)

on the

Lyngsoe Systems Handheld scanner

TT8350LSA

Ashwani Malhotra
Global EMC Inc.
180 Brodie Dr, Unit 2
Richmond Hill, ON L4B 3K8
Canada
Ph: (905) 883-3919

Testing produced for

Lyngsoe Systems
elevating logistics

See Appendix A for full customer & EUT details.

Industry Canada
LAB REGISTRATION #6844A-1

FCC REGISTRATION #612361

ACCREDITED
TESTING LABORATORY
CERTIFICATE #2565.01

Table of Contents

Report Scope

This report addresses the EMC verification testing and test results of the Lyngsoe Systems Handheld scanner TT8350LSA, herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was evaluated for compliance against the following standards:

IC Safety Code 6 & FCC Part 1, Section 1.1310 Table 1 (B)

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.

Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

Client	Lyngsoe Systems
Product	TT8350LSA
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2006

Summary

The results contained in this report relate only to the item(s) tested.

EUT FCC Certification #, FCC ID:	PQG-TT8350LSA
EUT Industry Canada Certification #, IC:	4113A-TT8350LSA
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Ashwani Malhotra

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure	2.5 cm separation.	Pass See justification and calculations
Overall Result			**PASS**

All tests were performed by Ashwani Malhotra.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued.

Justifications, Descriptions, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 (RSS 210 section 5.5), the manufacturer has a permanently connected antenna which is not accessible to the end user.

For the Restricted Bands of operation, the EUT is designed to only operate between 902 to 928 MHz.

The EUT uses a patch antenna; gain of this is less than 6 dbi. Acutal gain of antenna is 4.1 dbi.

For maximum permissible exposure, this device operates at less then 1 Watt at 902-928 MHz. No testing is required, however worst case calculated exposure compliance follows later in this report.

Applicable Standards, Specifications and Methods

ANSI C63.4:2003	- Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CFR 47 FCC 15	- Code of Federal Regulations – Radio Frequency Devices
CISPR 22:1997	- Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
ICES-003:2004	- Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
ISO 17025:2005	- General Requirements for the competence of testing and calibration laboratories
RSS 210:2007	- Issue 7: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power Licence-Exempt Radiocommunication Devices
IC Safety Code 6	- Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 KHZ to 300 GHZ

Sample calculation(s)

Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)
Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)
Margin = 8.5 dB

Document Revision Status

Revision 1 - Initial report released October 8th, 2009

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxiallary Equipment.

BW – Bandwidth. Unless otherwise stated, this is refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

ITE – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency

Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations

The measurement site used is registered with Federal Communications Commission (FCC) and Industry Canada (IC). This site is calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (ºC)	Humidity (%)	Pressure (kPa)
Oct 1 – 5, 2008	All	AM	21-23ºC	39.4-42.3%	100.2 - 100.9kPa

Detailed Test Results Section

Maximum Permissible Exposure

Purpose

The purpose of this test is to ensure that the RF energy intentionally transmitted, in terms of power density emitted from the EUT at a stated operating distance does not exceed the limits listed below as defined in the applicable test standard, as calculated based upon readings obtained during testing. This helps protect human exposure to excessive RF fields.

Limit(s) and Method

The limits, as defined in FCC 15.247(i) and FCC 1.1310 Table 1 (A) limits for occupational/controlled exposure was applied. The limit for the frequency range of <300 MHz to 1500 MHz is f/300 mW/cm^2,> where f is the frequency in MHz. For a worst case limit, the lowest frequency used was for limit calculation purposed. The limit was calculated to be 900/300, or 3.0 mW/cm^2. The distance used for calculations was 2.5cm, as this is the minimum distance an operator will be from the EUT during normal operation.

Measurement Uncertainty

Measurement uncertainty does not apply to this requirement, as this is a calculated result based upon readings obtained. The measurement uncertainty of this calculation can be approximated by the measurement uncertainty of the peak power, combined with the measurement uncertainty of the antenna gain, which was not available at the time of evaluation.

Results

The EUT passed the requirements. The worst case calculated power density was 1.24 mW/cm^2 this is under the 3.0 mW/cm^2 requirement.

Calculations

Method 1 (conducted power)

$P_d = (P_t * G) / (4 * pi * R^2)$
Where Pt = 15.8 dBm or 38.0 mW as per Peak power conducted output
Where G = 4.1 dB, or numerically 2.57
Where R = 2.5 cm

$P_d = (38.0 \text{ mW} * 2.57) / (4 * pi * 2.5\text{cm}^2)$
$P_d = 97.72 \text{ mW} / 78.53 \text{ cm}^2$
$P_d = 1.24 \text{ mW/cm}^2$

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	2008-02-28	2010-02-28	GEMC 6
Quasi Peak Adapter	85650A	HP	2008-02-28	2010-02-28	GEMC 7
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Pre-Amplifier	PA-2.5-26	Vican	8/26/2008	8/26/2010	GEMC 9
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev1.doc"

Appendix A – EUT Summary

For further details for filing purposes, refer to filing package.

General EUT Description

Manufacturer	Lyngsoe Systems 5570 Kennedy Road, Unit B, Mississauga, ON, Canada L4Z 2A9 www.lyngsoesystems.com
EUT Name	TT8350LSA
Equipment Category (Commercial / Residential / Medical)	Industrial use RF transmitter.
Input Voltage and Frequency	Operated from DC power supply
Intentional RF (If yes describe)	Yes – 912.5 to 917.5 MHz FHSS
Table Top / Wall mount / Floor standing (choose table top if unsure)	Handheld.
Peripherals required for test	No peripherals are needed to exercise the EUT.
Minimum Separation distance from operator	2.5 cm

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT & Test Setup Photographs'.

EUT Functional Description

EUT Configuration

The EUT is a battery operated device that can is used for tracking delivery / postal applications. It is charged using an AC-DC power supply brick. The EUT was tested on all 3 axes and the worst case (vertical) is recorded here. The EUT required a ferrite bead on the antenna cable in order to comply spurious radiated emissions.

Operational Setup

For medium, low and high channel measurements software was available such that the transmitter could to be tuned to those frequencies.

For spurious emissions, number of channels occupied, frequency allocation radiated tests were performed. For all other tests an SMA connector was provided by the manufacturer on the output of the antenna port and all other tests were carried out using conducted measurements.

Test Signals Required For Test

The following patterns or signals were generated during test by the peripherals as described above to exercise the EUT during testing.

None required.

Modifications Required for Compliance

A steward ferrite bead (28A0434-0A2) with no turns was used on the antenna cable in order to comply with radiated emission requirements.

Appendix B – EUT and Test Setup Photographs

Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.

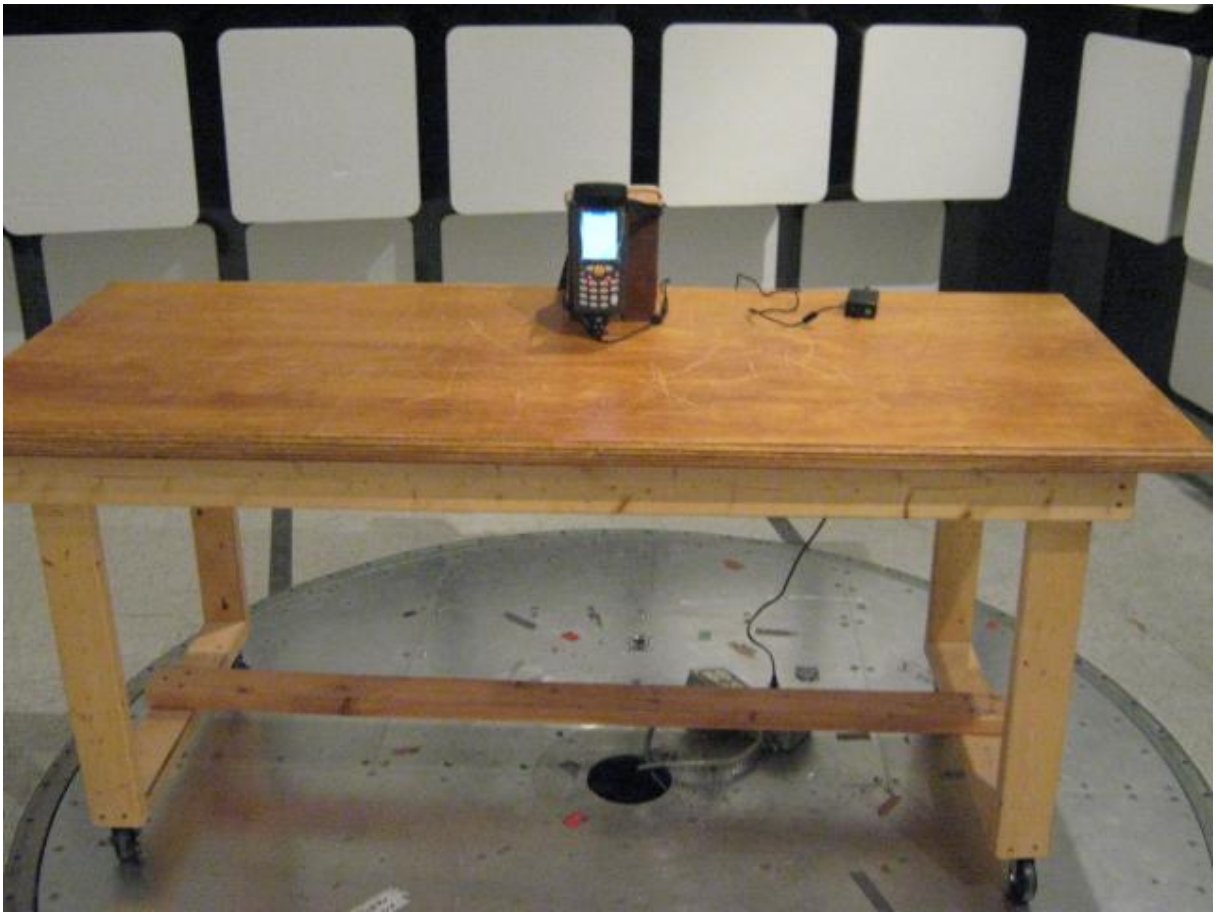

Figure 1: EUT