

Technical Brief # 05042-3

RSP-100

Appendix II

Test Report Cover Sheet

COMPANY NUMBER: 1557A- M2S Electronics LTD

MODEL NUMBER: E1000

MANUFACTURER: M2S Electronics LTD

TESTED TO RADIO STANDARDS SPECIFICATION (RSS) NO. : RSS-210 issue 6, RSS Gen

OPEN AREA TEST SITE INDUSTRY CANADA NUMBER: 2068 - Aprel Laboratories

FREQUENCY RANGE (or fixed frequency): 2405.00-2450.00 MHz in 8 fixed channels

R.F. POWER IN WATTS: e.i.r.p 0.004Wpk, 0.00000016Wave

FIELD STRENGTH (at what distance): 68.46dBuV/m @3m

OCCUPIED BANDWIDTH (99% BW): 3.00MHz

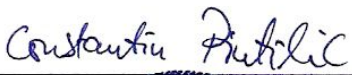
TYPE OF MODULATION: phase modulation O-QPSK

EMISSION DESIGNATOR (TRC-43): G1D--

TRANSMITTER SPURIOUS (worst case): -37.38dBm/-41.2dBc

RECEIVER SPURIOUS (worst case):

ATTESTATION: I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned departmental standard(s), and that the radio equipment identified in this application has been subject to all the applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

Signature: Constantin Pintilei 

Date: August 11, 2006

NAME AND TITLE (Please print or type):

Constantin Pintilei, Eng
Certification Adviser
Linear Hertz Inc



Note: This form must be completed and provided with the submission.

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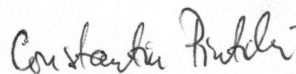
**Assessment of Compliance
with Technical Requirements of
FCC part 15 (USA)
and
RSS-210 and RSS-Gen (Canada) for
DTS Unlicensed Transmitter**

Technical Brief # 05042-3**AFFIDAVIT (FCC part 2.911(d))**

The technical data included in this Technical Brief has been accumulated through tests that were performed by me or under the supervision of a professional engineer. To the best of my knowledge, all of the data is true and correct. This technical brief relates only to the items tested.

DECLARATION OF RF EXPOSURE COMPLIANCE (Industry Canada RSS102 Annex B)

I attest that the RF Exposure information provided in this Technical Brief is correct; that the device evaluation was performed or supervised by me; that applicable measurement methods and evaluation methodologies have been followed and that the device meets the SAR and/or RF exposure limits of RSS-102.

A handwritten signature in black ink, reading "Constantin Pintilei".

Constantin Pintilei, P Eng
Certification Adviser
Linear Hertz Inc

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General Information

This technical brief provides cross-reference to the **technical requirements** for certification tests as demanded by either Canadian certification procedure RSP 100 (issue 8 of May 2002), paragraph 5.1 (d) or FCC rules 2.1033 (change FCC/2-175 of January 2006) paragraph (b)(6).

FCC technical requirements are the ones of FCC Part 15 subparts A and C for unlicensed transmitters together with Part 15.247 and 15.249 for digital modulation systems transmitters operating in 2400-2483.5MHz band (change FCC/15-56 of September 2005).

Canadian standards applied are RSS-Gen (issue 1, September 2005) for Category 1 transmitters together with RSS 210 (issue 6 September 2005) - Annex 8 A8.2 for digital transmit systems devices operating in 2400-2483.5MHz band.

The equipment under test (EUT) is a DTS transceiver, model Santorio Meteo System, based on MC13192FC Freescale-made transceiver chip in 2.4GHz ISM frequency band

Grantee & Manufacturer

M2S Electronics LTD
2855 De Celles, Quebec city
G2C 1K7, Quebec, Canada

Applicant & Technical Advisor

Linear Hertz Inc
6550 Francois Mauriac, Laval
H7R 6B7, Quebec, Canada

Technical characteristics (frequency, power, RF circuitry, functional capabilities)

FREQUENCY RANGE: 2400.0-2450.0 MHz , antenna incorporated in the unit.

NUMBER OF CHANNELS : 8 Channels possible, selectable through DIP switches

MAX POWER RATING: max 4mW peak EIRP, 0.016µW average EIRP on integral antenna
(note: 1mW is RF typical output power in the MC13192 data sheet)

VOLTAGE REQUIREMENTS: 3,0 VDC batteries (2xAAA indoor unit, 2xAA outdoor unit)

DIGITAL MODULATION TYPE: 250kbps O-QPSK as specified in MC13192 data sheet

OPERTATING MODES: Txonly @0.004 % duty cycle - outdoor unit (4 times 2 ms at 200sec)

Rx/Tx @0.0012% duty cycle-indoor unit when relays data for other indoor units

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Test Information

Equipment under test (EUT) and label assignment. The manufacturer supplied 4 units recorded at the reception at Linear Hertz as follows:

Linear Hertz label	Serial nr from M2S	Description of EUT
LHZ05042#1	s/n 372951	Receiver (indoor unit) casual firmware Rx/Tx
LHZ05042#2	s/n 372986	Transmitter (outdoor unit) casual firmware Tx
LHZ05042#3	s/n 372945	Receiver (indoor unit) test firmware Tx @2ms 50% duty cycle (max attainable, modulated)
LHZ05042#4	s/n 372977	Transmitter (outdoor unit) test firmware Tx @2ms 50% duty cycle (max attainable, modulated)

Testing period. The EUT was received on July 12, 2006 . The tests were conducted July 13-Aug 4, 2006

Description of modifications - no modifications were required during the tests.

Test equipment, test environment and test procedures

The tests to reveal the duty cycle and channel occupancy were conducted at Linear Hertz, in standard indoor environment (22°C temperature, 25% Humidity), using a rented spectrum analyzer HP8563EC from TRS Rentelco. The equipment has calibration due date on Feb 25, 2007 and its calibration certificate is available upon request

The tests involving field strength measurements were subcontracted to be made using a calibrated open area test site at Aprel Laboratories. Aprel's registration number with FCC is 90416. Aprel's Industry Canada approval for the OATS is IC2068. The test report issued by Aprel Laboratories is provided as Annex A1 and contains the list of equipment used for tests and the test environment.

The test procedures follow FCC Part 15.31 and Industry Canada RSS Gen chapter 4.

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Test report summary

<i>Name of test</i>	<i>IC rule</i>	<i>FCC rule</i>	<i>Result</i>	<i>Test data</i>
Number of operating frequencies	-	15,31(m)	passed	Tech Brief page 8
99% Occupied Bandwidth	RSS Gen 4.4.	-	passed	Tech Brief pages 10-12
External Controls	RSS Gen 5.3	-	NA	No controls
Multiple Band Operation	RSS Gen 5.4	-	NA	1 band / channel Tx
Exposure of Humans to RF Fields	RSS Gen 5.5 RSS102	2.1093 Bulletin 65	passed	Tech Brief pages 8-9
Radiocommunication Antenna Systems	RSS Gen 5.6	15.203	NA	Incorporated antenna
Spurious Emission 30MHz-960MHz	RSS Gen 6, RSS Gen 7.2.3	15,209(a)	passed	Annex A1 pages 18,19
Receiver Spurious Emission Standard	RSS Gen 6, RSS Gen 7.2.3	15,109(a)	passed	Annex A1 pages 20,21
Emission Limits for Pulsed Operation Devices	RSS Gen 7.2.1	-	NA	
Transmitter and Receiver AC Power Lines Conducted Emission Limits	RSS Gen 7.2.2	15.107(a) 15.207(a)	NA	Battery powered
Transmitter Frequency Stability	RSS Gen 7.2.4	-	passed	Tech brief page 7
Bandwidth 6dB	RSS 210 A8.2(1)	15.247(a)(2)	passed	Annex A1 pages 10-12
Peak Power Output, (EIRP)	RSS 210 A8.4(5)	15.247(b)(3)	passed	Annex A1 pages 7-9
Operation with directional antenna	RSS 210 A8.4(6)	15,247(c)	NA	It does not have antenna connector
Power Spectral Density	RSS 210 A8.5)	15.247(d)	passed	Annex A1 pages 13-15
Conducted Power Spectral Density	RSS 210 A8.2(2)	15.247(e)	NA	Incorporated antenna
Spurious & Harmonics Radiated Emissions	RSS Gen 7.2.3	15.249, 15.209(a)	passed	Annex A1 pages 16,17

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Tests conducted at Linear Hertz

Test set-up: Spectrum Analyzer Agilent 8563 rented from TRS Rentelco # 996005, EMC loop antenna probe. Time/ frequency radiated measurements.



Transmitter Frequency Stability IC RSS Gen 7.2. 4

The EUT can not transmit either unmodulated carrier (CW) or continuously (100% duty cycle), therefore the frequency stability cannot be measured as prescribed. Since the RF belongs to MC13192 Freescale chip, the specifications of the chip will also apply for the unit. Frequency Stability specification is on page 18, Chapter "8.1 Crystal Oscillator Reference Frequency" (data sheet- http://www.freescale.com/files/rf_if/doc/data_sheet/MC13192DS.pdf) and it reads $\pm 40\text{ppm}$. No specific value is required.

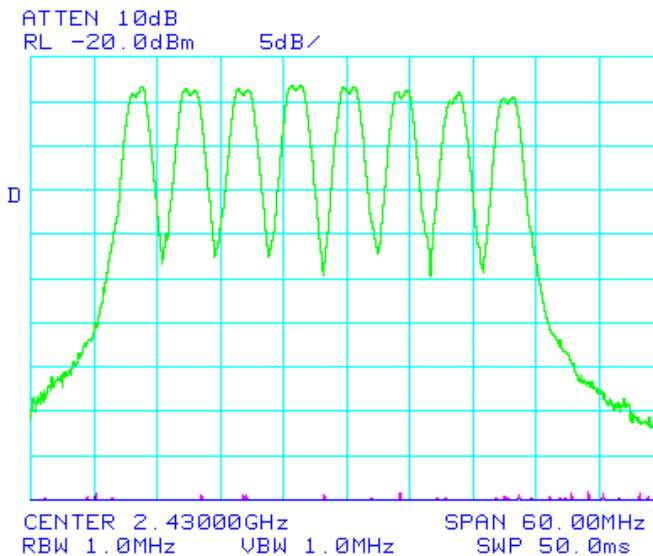
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Transmit Number of Channels -FCC part 15.31

EUT - LHZ05042#4, Spectrum analyzer in peak hold mode, channel DIP switch set before batteries are installed.

Test Performed by : *Constantin Pintilei*, on: July 13, 2006

Test result: 8 Channels



Project 050402

CP, 07/13/2006

8 transmit channels

As per 15.31(m) ,channels 1, 5 and 8 were used for tests.

Routine RF exposure calculation FCC part 2.1093 and IC RSS 102

EUT - LHZ05042#1and 2, Spectrum analyzer in zero span mode

Test Performed by : *Constantin Pintilei*, on: July 13 & Aug 2, 2006

Test result (plots next page) :

Tx duty cycle $\eta = 0.004\%$ (4 times 2ms Tx on) $\Leftrightarrow$ 8ms Tx on/ 200sec tx off

Max e.i.r.p. power 5.18 dBm (Annex A1 page 8) $\Leftrightarrow$ 3.953mW , **P peak = 4mW**

Averaged power is $P_{ave} = \eta * P_{peak} \Rightarrow$ **Pave= 0.0016mW.**

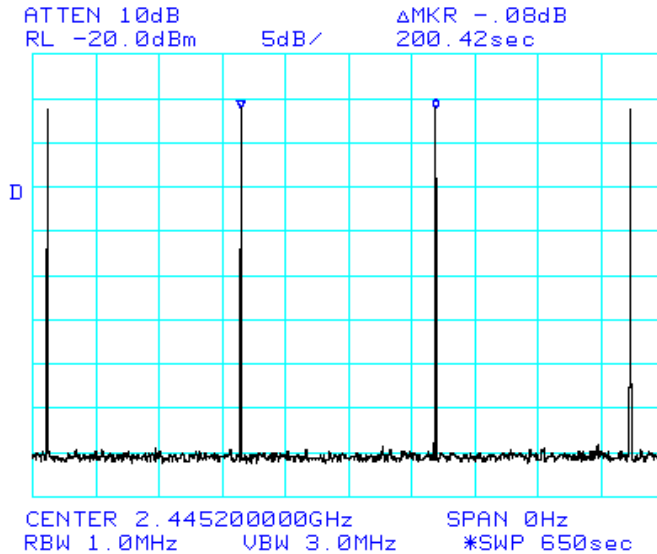
FCC Part 2.1093 Limits for Waiver of SAR Evaluation in 2.4GHz band $P_{MAX}(W) = 60/f(MHz)$

worst case $f = F_{min} = 2400MHz \Rightarrow P_{MAX} = 0.025W = 25mW$ **e.i.r.p>Ppeak - passed**

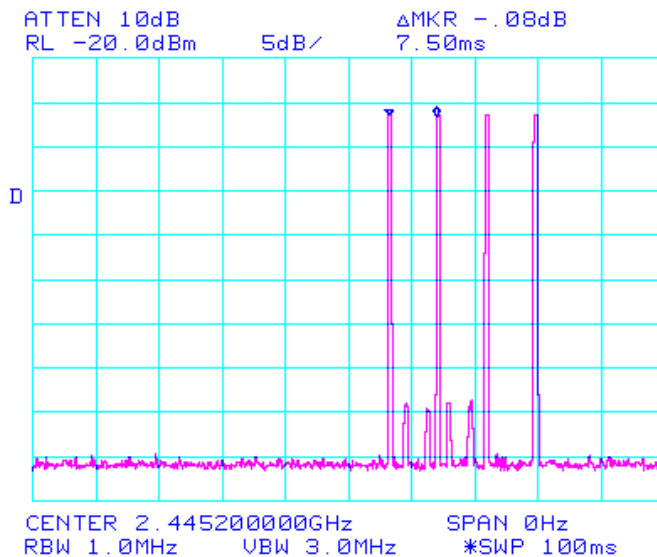
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Industry Canada RSS102- Exemption from Routine Evaluation Limits in 2.4GHz band

PMAX=20mW e.i.r.p >Ppeak - passed



Tx outdoor cycle @ 200sec.



Detailed capture for 1 transmit burst.

Tx outdoor have higher RF levels on the display capture.

Tx outdoor: 4 times 2ms Tx slots repeated at 7.5ms

Rx/Tx indoor have lower RF levels on the display capture.

Tx indoor: 4 times 2ms slots repeated at 3.5 ms

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EUT - LHZ05042#4, Spectrum analyzer in peak hold mode, Span 20MHz, RBW 300Khz, channel DIP switch set before batteries are installed.

Test Performed by : *Constantin Pintilei*, on: July 17, 2006

Test results.

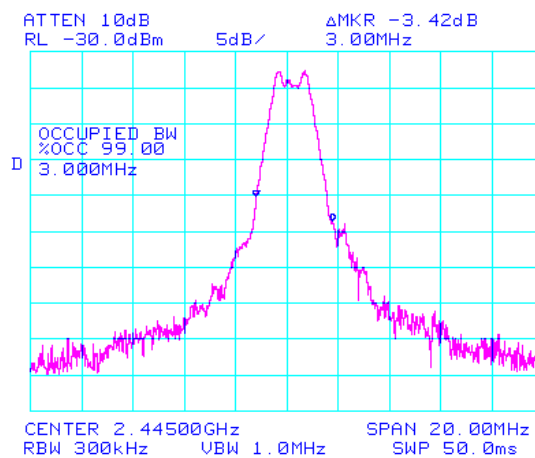
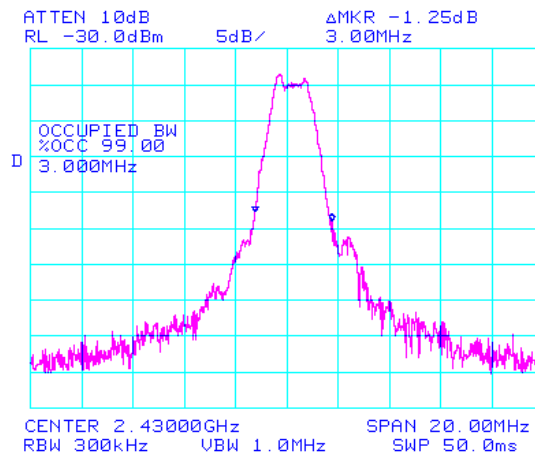
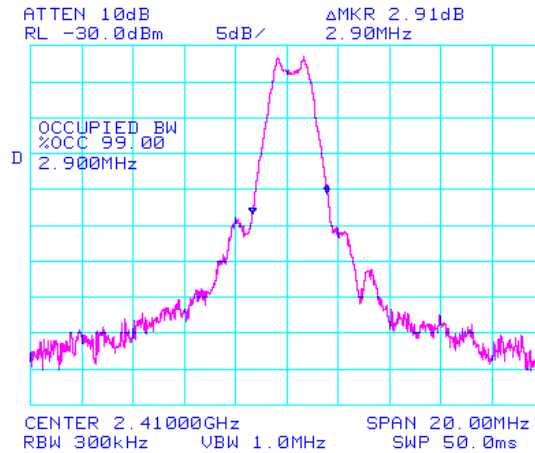
99% Occupied Bandwidth 3MHz, Emission designator 3M00G1D; 6dB bw>500kHz

<i>Channel</i>	<i>99% bw</i>	<i>6dB bw</i>
#1 2410MHz	2.9MHz	1.73MHz
#5 2430MHz	3.0MHz	1.70MHz
#8 2445 MHz	3.0MHz	1.70MHz

Plot captures (next pages):

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99% bandwidth



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6dB Bandwidth

