FCC PART 24E

TEST AND MEASUREMENT REPORT

For

Intelibs Inc.

1500 Stony Brook Road,
Stony Brook, NY 11794, USA

FCC ID: Z69D01T4JX5

Report Type:	Product Type:
Original Report	Radio Hub Unit (RHU)

Prepared By:	Jose Martinez Associate Test Engineer
Report Number:	R1608091-24
Report Date:	2016-11-19
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1608091-24	Original	2016-11-19

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Intelibs, Inc.* and their product model: RHU, FCC ID: Z69D01T4JX5, which will henceforth be referred to as the EUT (Equipment under Test). The EUT is a Radio Hub Unit (RHU) with global positioning system (GPS) service. The EUT operates in the uplink ESMR, Cellular, 700 MHz, Broadband PCS, and the AWS-1 bands.

1.2 Mechanical Description

The EUT measured approximately 35.5 cm (L) x 44.5 cm (W) x 25.4 cm (H) and weighs 32 kg.

The test data gathered were from typical production sample, serial number: R1608092-1, assigned by BACL.

1.3 Objective

This type approval report was prepared on behalf of *Intelibs Inc.* in accordance with Part 2, Subpart J, Part 20.21, Part 24 Subpart E, of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC/IC rules for RF output power, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation and band edge

1.4 Related Submittal(s)/Grant(s)

FCC Part 22, Subpart H, Equipment B2I with FCC ID: Z69D01T4JX5
FCC Part 27, Subpart C, Equipment B2I with FCC ID: Z69D01T4JX5
FCC Part 90, Subpart S, Equipment B2I with FCC ID: Z69D01T4JX5

1.5 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 20.21 – Signal Boosters
Part 24 Subpart E – Broadband PCS

Applicable Standards: TIA/EIA603-D, FCC KDB 935210

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.57 dB
Unwanted Emissions, conducted	±1.57dB
All emissions, radiated	±4.0 dB
Temperature	±2 º C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.7 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.8 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3297.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment

[including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.03)*** to certify

- For the USA (Federal Communications Commission):
  - 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
  - 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
  - 3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
  - 1 All Scope 1-Licence-Exempt Radio Frequency Devices;
  - 2 All Scope 2-Licensed Personal Mobile Radio Services;
  - 3 All Scope 3-Licensed General Mobile & Fixed Radio Services;
  - 4 All Scope 4-Licensed Maritime & Aviation Radio Services;
  - 5 All Scope 5-Licensed Fixed Microwave Radio Services
  - 6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
  - 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
  - 2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
  - 1 All Radio Equipment, per KHCA 10XX-series Specifications;
  - 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  - 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  - 1 MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
  - 2 Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

1 Electronics and Office Equipment:
- for Telephony (ver. 3.0)
- for Audio/Video (ver. 3.0)
- for Battery Charging Systems (ver. 1.1)
- for Set-top Boxes & Cable Boxes (ver. 4.1)
- for Televisions (ver. 6.1)
- for Computers (ver. 6.0)
- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)

- for Computer Servers (ver. 2.0)

2 Commercial Food Service Equipment
- for Commercial Dishwashers (ver. 2.0)
- for Commercial Ice Machines (ver. 2.0)
- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

3 Lighting Products
- For Decorative Light Strings (ver. 1.5)
- For Luminaires (including sub-components) and Lamps (ver. 1.2)
- For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
- For Integral LED Lamps (ver. 1.4)

4 Heating, Ventilation, and AC Products
- for Residential Ceiling Fans (ver. 3.0)
- for Residential Ventilating Fans (ver. 3.2)

5 Other
- For Water Coolers (ver. 3.0)

D. A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Industry Canada - IC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EC US-EU EMC & Telecom MRA CAB
  - Radio & Teleterminal Equipment (R&TTE) Directive 1995/5/EC US -EU EMC & Telecom MRA CAB

  Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Development Authority - IDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
- Vietnam: APEC Tel MRA -Phase I;

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to TIA/EIA-603-D.
The final qualification test was performed with the EUT operating at normal mode.

2.2 EUT Exercise Software

There was no exercise software with the EUT; signal was sent through EUT using a signal generator.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 EUT Internal Configuration

Manufacturer	Description	Model	Serial Number
Intelibs	700MHz RHM Unit	-	-
Intelibs	850MHz RHM Unit	-	-
Intelibs	1900MHz RHM Unit	-	-
Intelibs	2100 RHM Unit	-	-
Intelibs	GPS FEM	-	-
Intelibs	RHOM	-	-
Intelibs	RF Controller	-	-
Intelibs	GPS Controller	-	-

2.5 Local Support Equipment List and Details

NA

2.6 Power Supply and Line Filters

Manufacturers	Descriptions	Models	Serial Numbers
TDK-Lambda	SMPS	-	-

2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF cable	< 1	Signal Generator	Support Equipment
RF cable	< 1	EUT Output	Spectrum Analyzer
Fiber Optic Cable	1	Support Equipment	EUT Input

3 Summary of Test Results

FCC Rules	Description of Tests	Results
§2.1091	RF Exposure	Compliant[2]
§2.1046, §24.232(a)	Output Power	Compliant[2]
§2.1049	26 dB Occupied Bandwidth	Compliant[3]
§2.1053, §24.238	Spurious Radiated Emissions	Compliant[3]
§2.1053, §24.238	Spurious Emissions at Antenna Terminals	Compliant[3]
§2.1053, §24.238	Band Edge & Intermodulation	Compliant[3]
§2.1055, §24.235	Frequency Stability	N/A[1]
§20.21	Out of Band Rejection	Compliant[3]

[1] The EUT was a signal booster.
[2]There was no change to the hardware, only the antenna gain changed.
[3] No modifications were made to the module. No change was made to the hardware, output power remained the same. Only the antenna gain changed. Please refer to FCC ID: Z69D01T4JX4 for compliance.

4 FCC §2.1091 - RF Exposure

4.1 Applicable Standards

According to §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz
* = Plane-wave equivalent power density

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.3 Test Results

Maximum peak output power at antenna input terminal (dBm):	20.64
Maximum peak output power at antenna input terminal (mW):	115.88
Prediction distance (cm):	40.00
Prediction frequency (MHz):	1889.26
Antenna Gain, typical (dBi):	18.00
Maximum Antenna Gain (numeric):	63.10
Power density at predication frequency and distance (mW/cm^2):	0.364
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Results
The highest power density levels at 40 cm are below the MPE uncontrolled exposure limit with an 18 dBi antenna gain.

5 FCC §2.1046 & §24.232(a) – Equivalent Isotropic Radiated Power

5.1 Applicable Standards

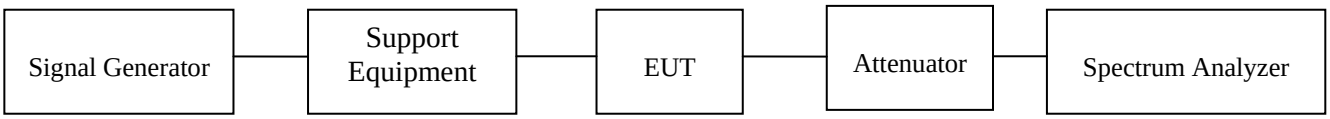
According to FCC §24.232 (a)

(1) Base station with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b).

5.2 Test Procedure

Conducted:
The signal generator was connected to the support equipment and the support equipment was connected to the EUT through a fiber cable. The output of the EUT was connected to a signal generator.



5.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US 42221851	2016-06-10	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2016-07-29	2 years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	10 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	SMA cable	-	C0001	Each Time[1]	Each Time[1]
-	SMA cable	-	C0002	Each Time[1]	Each Time[1]

[1]*Note: This equipment was calibrated for each test.*

***Statement of Traceability*:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

5.4 Test Environmental Conditions

Temperature:	21-23° C
Relative Humidity:	42-48 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Todd Moy 2016-02-19 in the RF Site.

5.5 Test Results

Signal Type	AGC	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Output EIRP (dBm)
Broadband	Off	-54.35	19.67	74.02	37.67
	On	-51.13	20.37	71.5	38.37
Narrowband	Off	-54.57	19.42	73.99	37.42
	On	-51.45	20.64	72.09	38.64

Note: EIRP (dBm)=Conducted Output Power (dBm) + Antenna Gain (dBi), gain of the antenna that applies to this device is 18 dBi.

Note: Calculation results of the amplifier gain listed in the table above contains two parts: gain of RHU (the EUT) and gain of SRU. The typical gain of SRU is around 30 dB, please refer to FCC ID: Z69D01T4JX2. Thus, the typical gain of RHU is around 40 dB.