Excellence in Compliance Solutions

Certification Test Report

FCC ID: 2AFWA-UMR-1

FCC Rule Part: 15.247

ACS Report Number: 15-3040.W03.1A

Manufacturer: ILS Technology LLC
Model: UMR-1

Test Begin Date: August 24, 2015
Test End Date: August 31, 2015

Report Issue Date: August 5, 2016

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code AT-1921

This report must not be used by the client to claim product certification, approval, or endorsement by ANAB, ANSI, or any agency of the Federal Government.

Prepared by:

Mario deAranzeta
Senior Wireless Test Engineer
Advanced Compliance Solutions, Inc.

Reviewed by:

Thierry Jean-Charles
EMC Engineer
Advanced Compliance Solutions, Inc.

This report contains 13 pages

TABLE OF CONTENTS

1 GENERAL

1.1 Purpose

The purpose of the report is a Class 2 change to add an antenna to an already approved module and then the integration of this module into a specific host. The antenna is the Jiaxing Jinchang Electronic Tech. Co., LTD antenna model JCE058. The module is FCC ID: 2AFWA-UMR-1. The host is FCC ID: 2AFWA-UMR-2 which uses only 802.11g mode and is integrated into the Universal Meter Reader product.

1.2 Product Description

The UMR-1 module is a 2.4 GHz 802.11 b, g, and n WIFI transceiver. The antenna is a multi-band antenna consisting of GPS (1575MHz) / GSM (824-960 and 1710- 2170 MHz) / WIFI (2.4 GHz).

The host product is:

A Universal Meter Reader (UMR) system that allows businesses and municipal agencies to read many of the leading water, power and gas meters that broadcast consumption information on the 900MHz ISM band. The UMR collects consumption data and transmits the data over one of many communication interfaces and is received by ILS Technology LLC's meter management cloud platform service using mesh network technology and a gateway device.

Technical Information:

Detail	Description
Frequency Range	2412 - 2462
Number of Channels	11
Modulation Format	802.11 g / OFDM
Data Rates	6 to 54 Mbps
Number of Inputs/Outputs	1
Gain	3 dBi

Manufacturer Information:
ILS Technology LLC
5300 Broken Sound Blvd NW #150
Boca Raton, FL 33487

EUT Serial Numbers: 60 and 62

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

The manufacturer provided test software to both set parameters and exercise the EUT.
The RF power level was set at 23 with the test software and all measurements were made at this setting.

The manufacturer is using firmware to lock the transceiver mode to 802.11g and fix the power level to 23.

The module was installed in the Universal Meter Reader product and the antenna mounted in its normal position and orientation on the product.

All available data rates were evaluated. The data presented in this report represents the worst case were applicable. For this EUT the worst case data rate was 6 Mbps.

The product was tested in its normal orientation.

The manufacturer declares that the 900 MHz and WIFI radios are capable of simultaneous transmission and that the antennas are co-located. A radiated inter-modulation test evaluating all combinations of simultaneous transmission between the pre-approved WIFI, and 900 MHz radio was undertaken. All emissions were found to be in compliance.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
2320 Presidential Drive, Suite 101
Durham, NC 27703
Phone: (919) 381-4235

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ANAB program and has been issued certificate number AT-1921 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC and Innovation, Science and Economic Development (ISED) Canada.

FCC Registered Test Site Number: 637011
ISED Canada Test Site Registration Number: 20446

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 18' x 28' x 18' shielded enclosure. The chamber is lined with Samwha Electronics Co. LTD Ferrite Absorber, model number SFA300 (HSN-1). The ferrite tile is 10cm x 10 cm and weighs approximately 1.4lbs. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber. On top of the ferrite tiles is DMAS HT-45 (Dutch Microwave Absorber Solutions) hybrid absorber on all walls except the wall behind the antenna mast which has a shorter DMAS HT-25 absorber.

The turntable is 1.50m in diameter and is located 150cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using short #6 copper wire. The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the turntable. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane.

Behind the turntable is a 2' x 6' x 1.5' deep shielded pit used for support equipment if necessary. The pit is equipped with 2 - 4" PVC chase from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

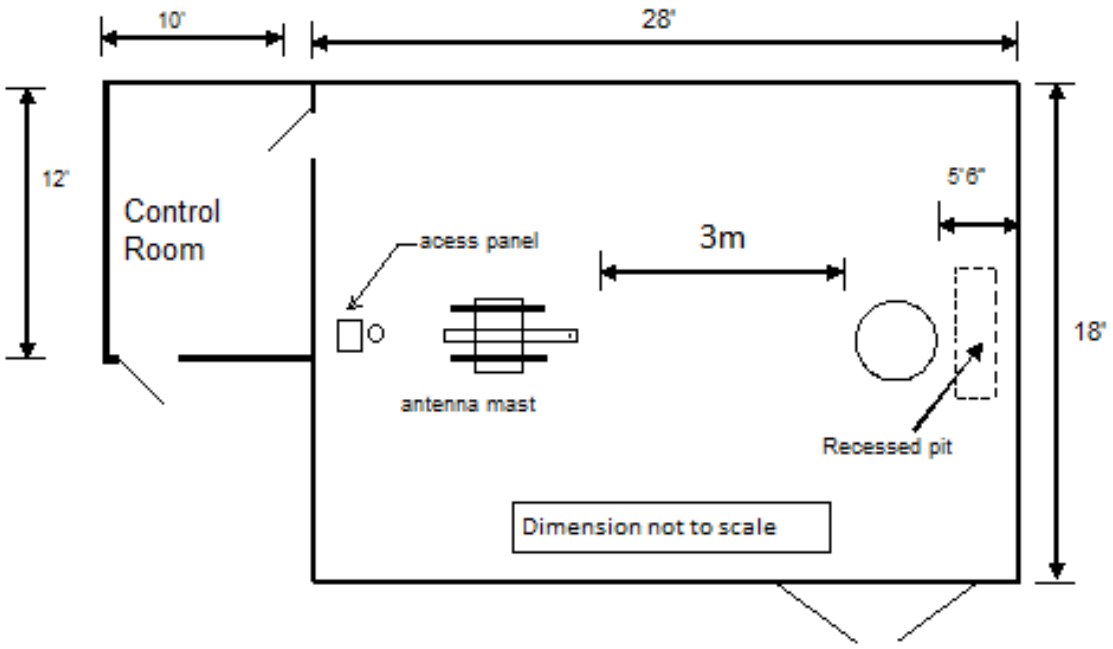

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 10' sheet galvanized steel horizontal ground reference plane (GRP) bonded every 6" to an 8' X 8' aluminum vertical ground plane.

A diagram of the room is shown below in figure 2.4-1:

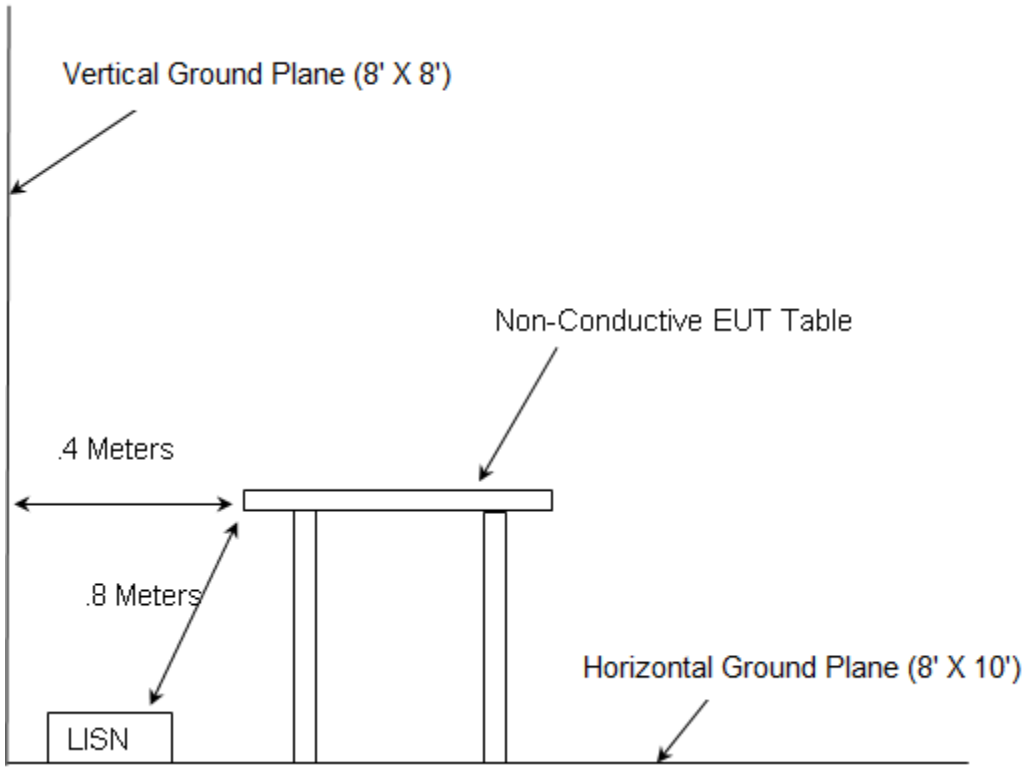

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2014 - American National Standard for Methods of Measurement of Radio-Noise Emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2016
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2016
- FCC KDB 558074 D01 DTS Meas Guidance v03r05 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247, January 7, 2016

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
277	Emco	93146	Antennas	9904-5199	9/2/2014	9/2/2016
626	EMCO	3110B	Antennas	9411-1945	2/26/2014	2/26/2016
3002	Rohde & Schwarz	ESU40	Receiver	100346	7/6/2015	7/6/2016
3006	Rohde & Schwarz	TS-PR18	Amplifiers	122006	6/29/2015	6/29/2016
3007	Rohde & Schwarz	TS-PR26	Amplifiers	100051	6/29/2015	6/29/2016
3008	Rohde & Schwarz	NRP2	Meter	103131	1/15/2015	1/15/2016
3009	Rohde & Schwarz	NRP-Z81	Meter	102397	1/15/2015	1/15/2016
3011	Rohde & Schwarz	ENV216	LISN	3011	7/10/2015	7/10/2016
3012	Rohde & Schwarz	EMC32-EB	Software	100731	NCR	NCR
3016	Fei Teng Wireless Technology	HA-07M18G-NF	Antennas	2013120203	1/14/2015	1/14/2016
3027	Micro-Tronics	BRM50702	Filter	175	1/17/2015	1/17/2016
3033	Hasco, Inc.	HLL142-S1-S1-36	Cables	1435	1/15/2015	1/15/2016
3038	Florida RF Labs	NMSE-290AW-60.0-NMSE	Cable Set	1448	1/12/2015	1/12/2016
3045	Aeroflex Inmet	18N10W-20	Attenuator	1437	1/18/2015	1/18/2016
3051	Mountain View Cable	BMS-RG400-264.0-BMS	Cables	3051	1/12/2015	1/12/2016
3055	Rohde & Schwarz	3005	Cables	3055	1/16/2015	1/16/2016
3057	Advanced Technical Materials	42-441-6/BR	Antennas	R110602	NCR	NCR

DMAS MT-25 RF absorber material was used on the floor for all final measurements above 1 GHz.
NCR = No Calibration Required
Firmware Version: 4.73 SP4
Software Version: EMC32-B is 9.15

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Host Device	ILS Tech LLC	UMR-2	62
2	EUT	ILS Tech LLC	UMR-1	Internal Part of 62

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

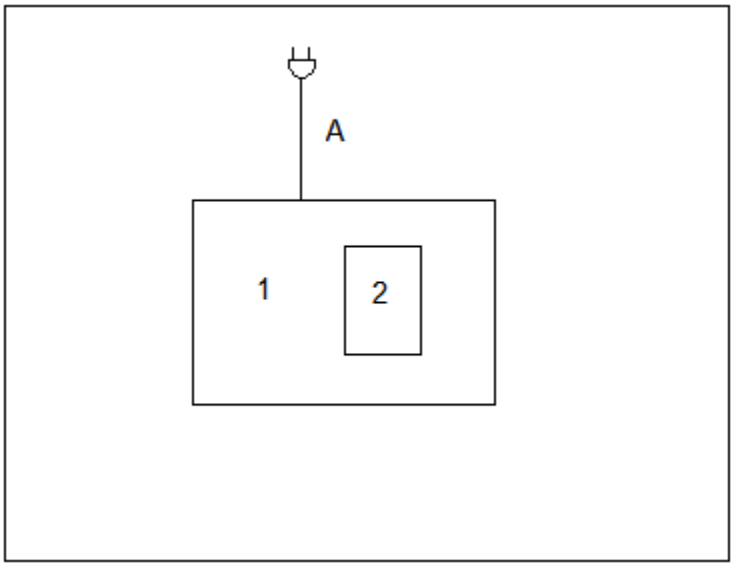

Figure 6-1: Test Setup Block Diagram

Table 6-1: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Host to AC Mains	2m	No	AC Mains

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC 15.203

The EUT is the module UMR-1 (FCC ID: 2AFWA-UMR-1) it is installed into the host unit model UMR-2. The antenna is permanently affixed to the housing of the host product model UMR-2. The peak gain of the antenna is 3 dBi. The manufacturer declares that the host product UMR-2 is only professionally installed.

7.2 Fundamental Emission Output Power – FCC 15.247(b)(3)

7.2.1 Measurement Procedure

The maximum peak conducted output power was measured in accordance with FCC KDB 558074 D01 DTS Measurement Guidance v03r05 utilizing the PKPM1 Peak power meter method. The RF output of the equipment under test was directly connected to the input of the peak power meter applying suitable attenuation.

7.2.2 Measurement Results

Test software setting: 23.

Table 7.2.2-1: Maximum Peak Conducted Output Power

Frequency (MHz)	Output Power (dBm)	Output Power (Watts)
2412	18.63	0.0729
2437	18.21	0.0662
2462	18.03	0.0635

7.3 Emission Levels – FCC 15.247(d), 15.205, 15.209

7.3.1 Emissions into Restricted Frequency Bands

7.3.1.1 Measurement Procedure

The unwanted emissions into restricted bands were measured radiated over the frequency range of 30 MHz to 25 GHz, 10 times the highest fundamental frequency.

The host model UMR-2 was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a RBW of 120 kHz and a VBW of 300 kHz. For frequencies above 1000 MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively.

Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209.

7.3.1.2 Duty Cycle Correction

The Duty Cycle Correction was not required.

7.3.1.3 Measurement Results

Table 7.3.1.3-1: Radiated Spurious Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
4824	51.30	40.50	V	6.67	57.97	47.17	74.0	54.0	16.0	6.8
2390	63.10	49.00	V	-2.17	60.93	46.83	74.0	54.0	13.1	7.2
Middle Channel										
4874	53.70	42.20	V	6.64	60.34	48.84	74.0	54.0	13.7	5.2
7311	46.50	35.30	V	9.69	56.19	44.99	74.0	54.0	17.8	9.0
High Channel										
4924	57.80	47.00	V	6.62	64.42	53.62	74.0	54.0	9.6	0.4
7386	45.60	33.00	V	9.72	55.32	42.72	74.0	54.0	18.7	11.3
2483.5	63.50	47.00	V	-1.89	61.61	45.11	74.0	54.0	12.4	8.9

Note: All other emissions falling within the restricted bands were attenuated below the limits and the noise floor of the measurement equipment.

7.3.1.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak

Corrected Level: 51.30 + 6.67 = 57.97 dBuV/m
Margin: 74dBuV/m – 57.97 dBuV/m = 16.03dB

Example Calculation: Average

Corrected Level: 49.00 + -2.17 = 46.83 dBuV/m
Margin: 54dBuV – 46.83 dBuV/m = 7.17dB

8 CONCLUSION

In the opinion of ACS, Inc. the UMR-1, manufactured by ILS Technology LLC, under the conditions stated in the test report meets the requirements of FCC Part 15 subpart C.

END REPORT