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FCC PART 15 and IC RSS-247
RADIATION EMISSION CO-LOCATION REPORT

Applicant	YAESU MUSEN CO., LTD.
Address	TENNOZU PARKSIDE BUILDING 2-5-8 HIGASHI-SHINAGAWA, SHINAGAWA-KU, TOKYO 140-0002 JAPAN
Product Model Number	GS2100MIE
Product Description	ULTRA LOW POWER WIFI MODULE
FCC ID:	K660A300910
IC:	511B-0A300910
Date Sample Received	8/30/2017
Date Tested	8/30/2017
Tested By	Tim Royer
Approved By	Sid Sanders
Test Results	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

Report Number	Version Number	Description	Issue Date
1583BIC17TestReport	Rev1	Initial Issue	10/10/2017
	Rev2	Revised report	10/19/2017
	Rev4	Revised report	11/8/2017
	Rev5	Updated requirements page 4	11/15/2017

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

- ☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.
- ☐ Not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669



Tested by:

Name and Title: Tim Royer, Project Manager/Testing Engineer

Sr. EMC Engineer
EMC-003838-NE



Date: 10/10/2017

Reviewed and approved by:

Name and Title: Sid Sanders



Date: 10/10/2017

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GENERAL INFORMATION

EUT Specification

EUT Description	ULTRA LOW POWER WIFI MODULE
FCC ID	K660A300910
IC	511B-0A300910
Module Model Number	GS2100MIE
Host Model Number	SCU-30
Operating Frequency	2400 to 2483.5MHz
EUT Power Source	<input type="checkbox"/> 110–120Vac/50– 60Hz
	<input checked="" type="checkbox"/> DC Power 12V
	<input type="checkbox"/> Battery Operated Exclusively
Test Item	<input type="checkbox"/> Prototype
	<input checked="" type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
Type of Equipment	<input type="checkbox"/> Fixed
	<input checked="" type="checkbox"/> Mobile
	<input type="checkbox"/> Portable
Test Conditions	Temperature: 24-26°C Relative humidity: 50-65% Barometric Pressure: 30.01"
Modification to the EUT	None
Test Exercise	The EUT was operated in a normal mode, under a co-location condition.
Applicable Standards	FCC Pt 15.247
Test Procedure	ANSI C63.4: 2013
Test Facility	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA.

TEST RESULTS SUMMARY

Specification – Rules Part No.	RESULTS – Pass/Fail/NA
FCC Rule 15.247 Harmonics & Spurious	Pass

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RADIATION EMISSIONS:

Rules Part No.: 15.247, 15.209

Requirements: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below

In addition, Emissions found in restricted bands the levels must comply with the general limits found in FCC part 15.209

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu\text{V/m}$ @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu\text{V/m}$ @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu\text{V/m}$ @ 30 meters
30 – 88	40.0 dB $\mu\text{V/m}$ @ 3 meters
80 – 216	43.5 dB $\mu\text{V/m}$ @ 3 meters
216 – 960	46.0 dB $\mu\text{V/m}$ @ 3 meters
Above 960	54.0 dB $\mu\text{V/m}$ @ 3 meters

Method of Measurement: ANSI C63.4, Radiation Interference: ANSI C63.4 using a spectrum analyzer, a preselector, a quasi-peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz with an appropriate sweep speed and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3 MHz above 1 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worst case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

Formula of Conversion Factors: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dB μV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+ CL = FS
33	20 dB μV	+ 10.36 dB	+ 0.5 = 30.86 dB $\mu\text{V/m}$ @ 3m

RADIATION EMISSIONS; RESTRICTED BANDS OF OPERATION

RULE PART: 15.247

REQUIREMENT: Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

The Restricted Bands are shown next:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

RADIATION INTERFERENCE (Cont.):

Test Data: All values are peak unless noted.
Items mark with an * designate a frequency in a restricted band.

Emission Frequency MHz		Detector	Meter Reading dBu V	Antenna Polarity	Field Strength dBu V/M	Limit dBuV/m	Margin dB
33.26		PK	16.28	V	30.46	40	9.54
63.76		PK	19.90	V	27.39	40	12.61
68.95		PK	22.29	V	29.47	40	10.53
68.95		PK	12.81	H	19.99	40	20.01
75.49		PK	20.60	V	28.99	40	11.01
75.49		PK	13.13	H	21.52	40	18.48
122.60		PK	13.57	V	26.15	43.5	17.35
132.43	*	PK	14.02	V	29.01	43.5	14.49
208.97		PK	14.46	V	26.99	43.5	16.51
208.97		PK	12.70	H	25.23	43.5	18.27
7965.10		PK	-5.32	H	41.22	74	32.78
7965.10		PK	-8.12	V	38.42	74	35.58
10859.70	*	AV	1.82	H	52.08	54	1.92

(*) denotes restricted band

Emissions were measured from the generated in the unit to the tenth harmonic. It was discovered that emissions past the fifth harmonic were not measurable, only the noise floor was present past the 5th harmonic of each frequency tested. Therefore no emissions past the 5th harmonic are reported for each of the frequencies measured.

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconical 1096	Eaton	94455-1	1096	08/01/17	08/01/19
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/26/17	07/26/19
CHAMBER	Panashield	3M	N/A	04/25/16	12/31/17
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	03/01/17	03/01/19
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/18
Coaxial Cable - Chamber 3 cable set (Primary)	Micro-Coax	Chamber 3 cable set (Primary)	KMKM-0244-01; KMKM-0670-00; KFKF-0198-01	08/09/16	08/09/18
Band Reject Filter 2.4 GHz	Micro-Tronics	BRM50702-02	-G042	09/27/16	09/27/18

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

END OF TEST REPORT

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