



Electromagnetic Compatibility EMC TEST REPORT 288405-4-2

Test Report

Electromagnetic Compatibility (EMC)



Equipment Under Test: WiFi module

Model: WF111-A, WF111-E
WF121-A, WF121-E
WGM110A, WGM110E

Trademark: Silicon Labs / Bluegiga

Manufacturer/Customer: Silicon Laboratories Finland Oy
Bertel Jungin aukio 3
FI-02600, ESPOO
FINLAND

The Equipment Under Test Was Tested According to Following Standard(s)

Title of the standard - Product / test environment	Reference standard	Version
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU	EN 301 489-1	v2.1.1
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU	EN 301 489-17	v3.1.1

-Partial testing, see test suite for details

Date: 15 May 2017

Issued by: 
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Date: 15 May 2017

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Equipment Under Test (EUT)

WiFi module

Model: WF111-A, WF111-E, WF121-A, WF121-E, WGM110A, WGM110E

Trademark: Silicon Labs / Bluegiga

Difference between model variants WF111-A, WF111-E, WF121-A, WF121-E, WGM110A and WGM110E is that A variants have integrated chip antenna while E variants have an u.fl connector for connecting an external antenna. Model variants WF111-E, WF121-E and WGM110E were tested. Where similar models had a variant making use of the external antenna, this was tested as representing the worst case scenario, given the higher gain of the external antenna.

General description

The equipment under test is a WiFi module. Model specific information is provided in the table below:

Model:	Description:	Rated RF Output power:	Receiver Category:
WF111-A, WF111-E	IEEE 802.11 b/g/n radio	+16 dBm	1
WF121-A, WF121-A	IEEE 802.11 b/g/n radio	+16 dBm	1
WGM110A, WGM110E	IEEE 802.11 b/g/n radio	+16 dBm	1

Power requirements

Type: Supplied by the end product
Rated voltage: Tested with 3.3 V
Rated current: -
Rated frequency: DC

Specifications of the of the EUT

Highest antenna gain: 2.14 dBi (declared by the manufacturer)
EUT dimensions: Smaller than 40 x 40 x 40 mm

Equipment category and characteristics

Operating Frequency Range (OFR): 2412 - 2472 MHz
Channels: 13
Channel separation: 5 MHz
Channel bandwidth: 20 MHz
Transmission technique: DSSS
Modulation: CCK, QPSK, OFDM
Geo-location capability: -

Peripherals

- Test PC
- Evaluation board
- WiFi router

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. This document cannot be reproduced except in full, without prior approval of the Company.

Performance Criteria A for Immunity Testing

The EUT shall continue to operate as intended. No degradation of performance or loss of function is allowed to the EUT. Wireless communication between models must stay on, but short delay in the data transmission of few bytes or temporary increase in ping round-trip times is acceptable. Performance criteria was determined by the manufacturer.

EUT Test Conditions during EMC-Testing

Configuration of the EUT system was made to correspond to actual assembling conditions as far as possible. EUTs were connected to evaluation boards. EUTs were sending and receiving data during the test and the received data was monitored with manufacturers computer software.

WF111 was pinged via WiFi router using remote test PC.

WF121 and WGM110 were linked together by establishing a raw TCP data exchange between modules where one side was the access point and the other was the station; such data exchange was in the form of ten bursts of 50 bytes sent every second.

Model variants WF111-E, WF121-E and WGM110E were tested.

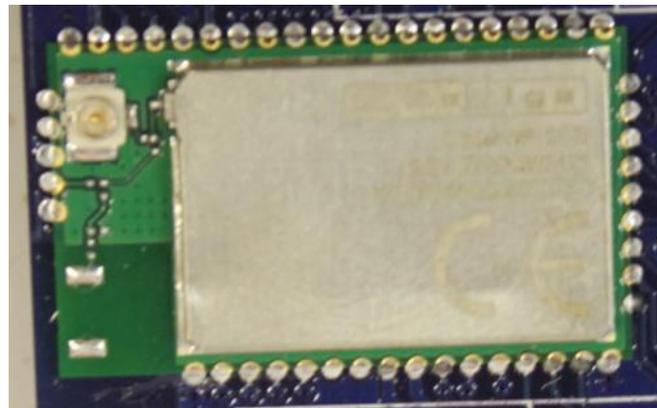
WF111-E paired with WiFi router

WF121-E paired with WGM110E

Photographs Of The EUT



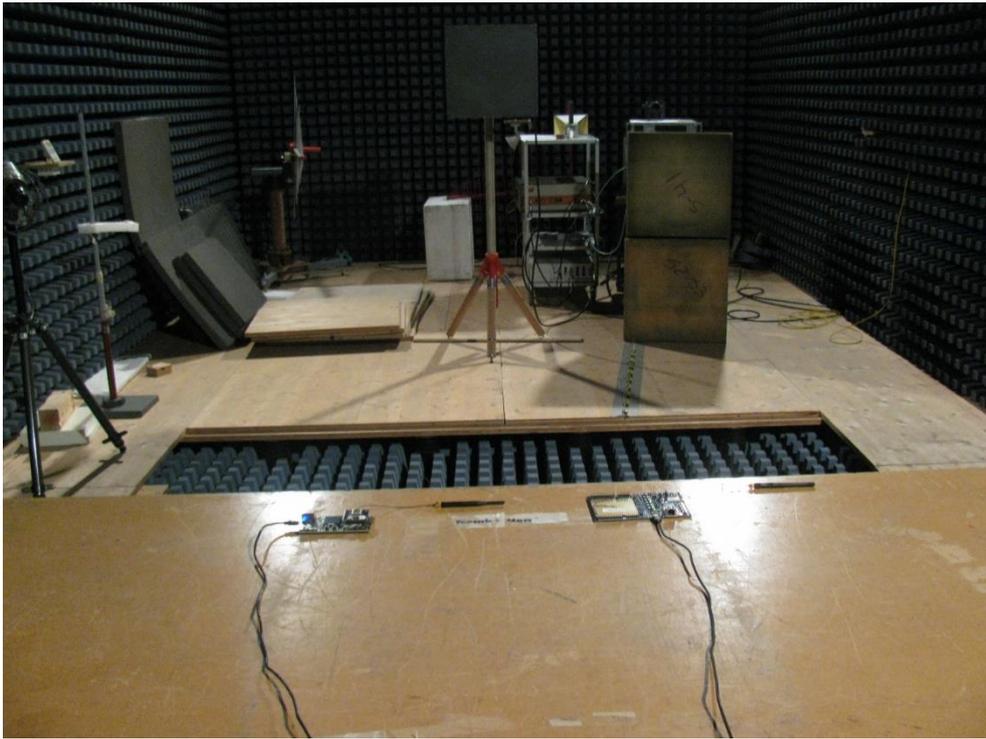
Photograph 1. WF111



Photograph 2. WF121



Photograph 3. WGM110



Photograph 4. The EUTs and test set-up for radiated immunity test (module combination may vary).

Test Suite

Measurement/Test	Reference		Test site	Result
Radiated Emissions	EN 55032:2015	-	-	N/A ⁽¹⁾
Conducted Emissions	EN 55032:2015	-	-	N/A ⁽²⁾
Harmonic Current Emissions	EN 61000-3-2:2006	A1:2009, A2:2009	-	N/A ⁽²⁾
Voltage Fluctuation And Flicker	EN 61000-3-3:2013	-	-	N/A ⁽²⁾
Electrostatic Discharge Immunity	EN 61000-4-2:2009	-	-	N/T ⁽⁴⁾
Radiated RF-field Immunity	EN 61000-4-3:2006	A1:2008, A2:2010	FAR	PASS ⁽³⁾
Electrical Fast Transient Immunity	EN 61000-4-4:2012	-	-	N/A ⁽²⁾
Surge Immunity	EN 61000-4-5:2006	-	-	N/A ⁽²⁾
Conducted RF-field Immunity	EN 61000-4-6:2009	-	-	N/A ⁽²⁾
Voltage Dips and Short Interruptions Immunity	EN 61000-4-11:2004	-	-	N/A ⁽²⁾
<p>1) No equipment which is not incorporated in the radio equipment 2) No AC mains, cables shorter than 3m 3) Tested partially by the request of the customer: 1.0 GHz to 1.4 GHz and 2.7 GHz to 6.0 GHz due to the test already performed and reported in existing other document. 4) Not tested by the request of the customer, due to the test already performed and reported in existing other document.</p>				
<p>Possible test case verdicts: Test case does not apply to the EUT: N/A EUT does meet the requirement: P (Pass) EUT does not meet the requirement: F (Fail) Test was not performed: N/T</p>				

Testing location:	
<input type="checkbox"/> CB Testing Laboratory:	
<input type="checkbox"/> Testing Location / address:	SGS Fimko Ltd Särkiniementie 3 FI-00210, HELSINKI FINLAND
<input checked="" type="checkbox"/> Testing Location / address:	SGS Fimko Ltd Karakaarenkuja 4 FI-02610, ESPOO FINLAND
<input type="checkbox"/> Testing Location / address:	SGS Fimko Ltd Kalliotie 2 FI-04360, TUUSULA FINLAND

RF-radiated Field Immunity

Basic standard: EN 61000-4-3
Tested by: JSU
Date: 18 April 2017
Humidity: 43 %
Temperature: 23 °C
Barometric pressure: 999-1033 hPa

Performance criteria: A

Test result: **PASS**

Test plan

Test was done in a fully-anechoic chamber. Signal generator was set to 1 % logarithmic step size with used dwell time in each frequency. The floor of the chamber was covered by ferrite tiles. Due the small size of the EUTs two sides were tested with both antenna polarizations. EUT and support were on table 0.8 m above ground plane. The EUT was working as described in the section "EUT Test Conditions".

Test results

Frequency range: 1-1.4 GHz
Modulation: 80% AM with 1 kHz modulation frequency
Test level: 3 V/m
Dwell time: 1 s
Antenna polarization: Horizontal and vertical
EUT test side: Front and right
Test remark: No loss of performance was observed

Frequency range: 2.7-6 GHz
Modulation: 80% AM with 1 kHz modulation frequency
Test level: 3 V/m
Dwell time: 1 s
Antenna polarization: Horizontal and vertical
EUT test side: Front and right
Test remark: No loss of performance was observed

Radiated RF-field Immunity Test

Equipment	Manufacturer	Type	Inv or serial	Prev Calib	Next Calib	(Serial)
ANTENNA	AR	AT4002A	inv:7937	2016-04-19	2017-04-19	301758
ANTENNA	ETS LINDGREN	3142C	inv:7916	2005-09-28	-	00050690
ANTENNA	EMCO	3115	inv:9541	2016-05-04	2017-05-04	23905
DIRECTIONAL COUPLER	CMC	DC440165	inv:5006	2009-01-26	-	P950
DIRECTIONAL COUPLER	AR	DC7144	inv:10363	2016-04-19	2017-04-19	301904
POWER METER	ROHDE & SCHWARZ	NRVD 0857.8008.02	inv:8018	2017-01-17	2018-01-17	845125/033
POWER SENSOR	ROHDE & SCHWARZ	NRV-Z5	inv:8956	2016-01-28	2018-01-28	106694
RF POWER AMPLIFIER	AR	25S1G4A	inv:7912	2016-04-19	2017-04-19	301955
RF POWER AMPLIFIER	BONN ELEKTRONIK	TWAL 0208-300	inv:9612	2016-05-04	2017-05-04	128778A
RF POWER AMPLIFIER	AR	10S1G4M2	inv:7945	-	-	20896
RF POWER AMPLIFIER	MILMEGA	AS0825-65	inv:9564	2013-04-09	-	1011966
RF POWER AMPLIFIER	AR	200W1000M7A	inv:7936	-	-	21867
RF POWER AMPLIFIER	AR	500W1000AM4	inv:9568	2016-04-19	2017-04-19	325886
RF POWER AMPLIFIER	BONN ELEKTRONIK	TWAL 0818-320	inv:9613	2012-10-08	-	128778B
RF SIGNAL GENERATOR	ROHDE & SCHWARZ	SMR20	inv:7950	2016-09-12	2019-09-12	100977
SPECTRUM ANALYZER	ADVANTEST	R3361A	inv:7933	-	-	41832701

All used measurement equipment were calibrated (if required).