



Electromagnetic Compatibility EMC TEST REPORT 281857-3

Test Report

Electromagnetic Compatibility (EMC)

Equipment Under Test: Bluetooth Smart Module

Model: BGM111

Brand: Silicon Laboratories Finland Oy

Manufacturer: Silicon Laboratories Finland Oy
Sinikalliontie 5A
FI-02630 Espoo
FINLAND

Customer: Silicon Laboratories Finland Oy
Sinikalliontie 5A
FI-02630 Espoo
FINLAND

The Equipment Under Test Complies With Following Standard(s)

Title of the standard - Product / test environment	Reference standard	Amendment(s) of the standard
Product family standard – <i>Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment; Part 17: Specific conditions for Broadband Data Transmission Systems</i>	EN 301 489-17 V2.2.1 (2011)	
Product family standard – <i>Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements</i>	EN 301 489-1 V1.9.2 (2011)	

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Issued by:



Niko Kotsalo
Testing Engineer

Date: 7.1.2016

Checked by:



Pekka Kälviäinen
Testing Engineer

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Equipment Under Test (EUT)

Bluetooth Smart Module
Model: BGM111

Description of the EUT

BGM111 is a Bluetooth 4.1 compliant Bluetooth smart module. BGM111 integrates: Bluetooth radio, software stack, GATT based profiles and it can host end user applications. Module is targeted at applications requiring high RF performance with low power consumption and can be operated using standard 3 V coin cell battery.

Type of the EUT

The EUT will be tested as a tabletop unit.

Power Requirements

Operating voltage range: 2.4 – 3.8 VDC

During testing the EUT was powered with external DC power supply. 3.3 VDC voltage was used during testing.

Mechanical Size of the EUT

Height: 2.2 mm	Width: 15.0 mm	Length: 15.0 mm
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Peripherals

- External DC power supply Thandar TS3021S.
- HP ProBook 4740s

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Performance criteria

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

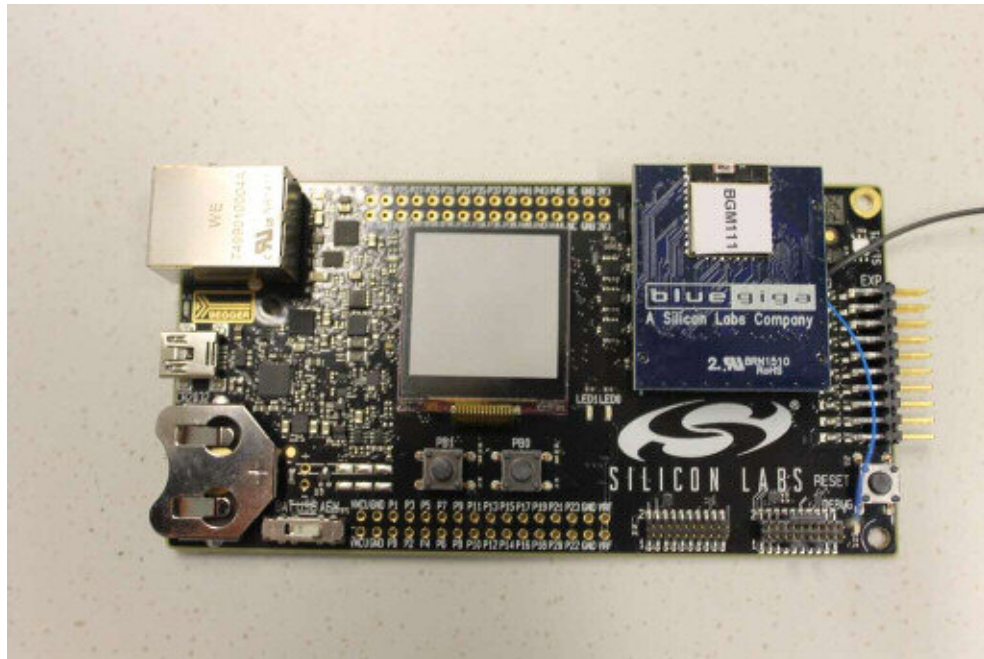
The equipment shall meet the minimum performance criteria as specified in the following clauses.

Criteria	During test	After test
A	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2).
<p>NOTE 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p>NOTE 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p>		

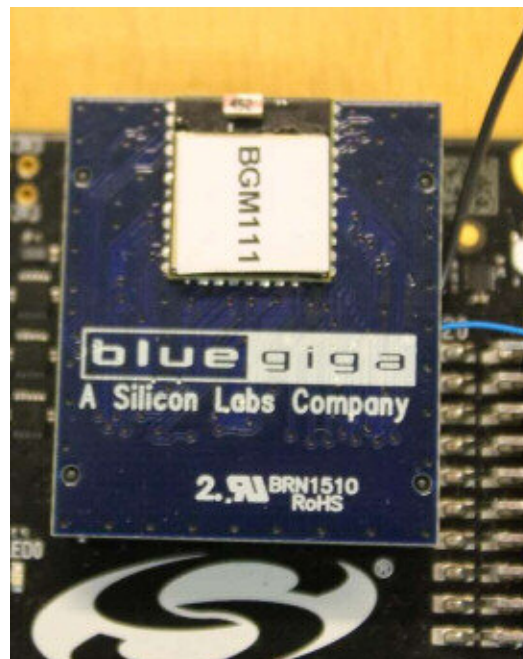
EUT Test Conditions during Testing

Configuration of the EUT was made to correspond to the actual assembling conditions as far as possible. EUT was paired with another BGM111 module. The EUT was put into advertising mode with Silicon Labs BGTool software. The AE BGM111 module was paired with the EUT BGM111 by using the BGTool software. The communication link was monitored from the screen of the laptop PC.

Photographs of the EUT



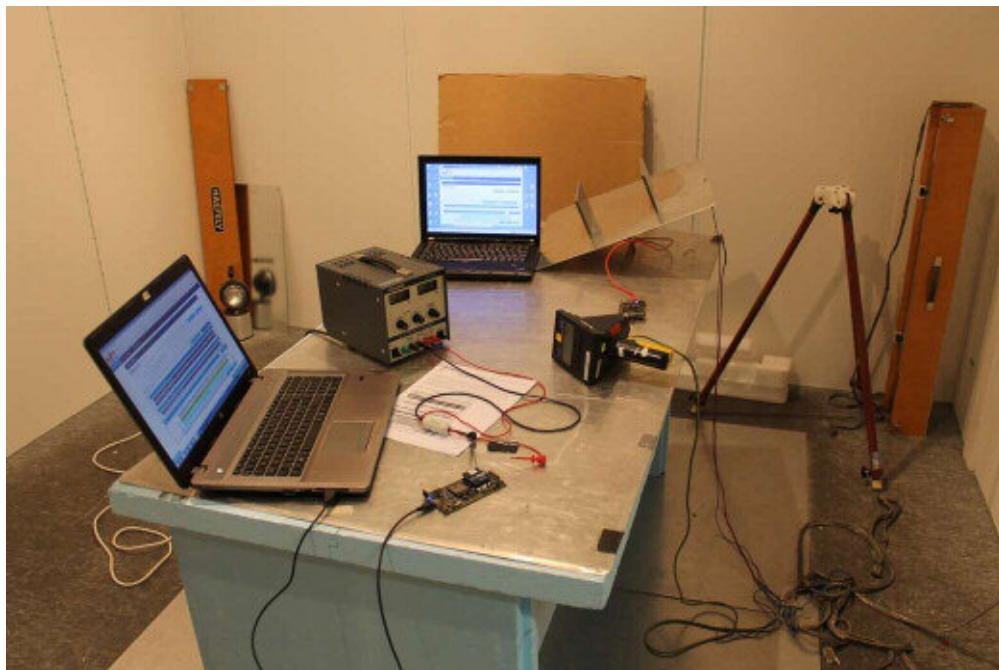
Photograph 1. The EUT attached to the development board.



Photograph 2. The EUT.



Photograph 3. Radiated immunity test set-up.



Photograph 4. ESD test set-up.

Test Suite

Measurement/Test	Reference standard		Test site	Result
Electrostatic Discharge Immunity	EN 61000-4-2:2009			PASS
Radiated RF-field Immunity	EN 61000-4-3:2006	A1:2008, A2:2010	5m	PASS

Testing location:

<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

Electrostatic Discharge Immunity

Basic standard: EN 61000-4-2
Tested by: NKO/JSU
Date: 23.12.2015
Temperature: 21 °C
Humidity: 35 %
Barometric pressure: 1008 hPa

Performance criteria: B
Test result: **PASS**

Test plan

Tests were done by using the air discharge to non-conductive and the contact discharge to all conductive parts of the EUT. Also the indirect contact discharges were given to VCP (Vertical Coupling Plane) and HCP (Horizontal Coupling Plane) in order to simulate the objects placed near to the EUT. All four sides of the EUT were tested with both polarities. At least ten discharges were given with both polarities to the selected points.

Test results

Discharge method: Air discharge
Test levels: ± 2 kV, ± 4 kV, ± 8 kV
EUT test point: No points for air contact
Test remarks: No loss of function was observed

Discharge method: Contact discharge
Test levels: ± 2 kV, ± 4 kV
EUT test point: No points for direct contact.
Test remarks: No loss of function was observed

Discharge method: Indirect contact discharge
Test level: ± 2 kV, ± 4 kV
EUT test side: Bottom, front, rear, left and right sides
Test remarks: No loss of function was observed

Radiated RF-field Immunity

Basic standard: EN 61000-4-3
Tested by: NKO/JSU
Date: 22.12.2015
Temperature: 21 °C
Humidity: 35 %
Barometric pressure: 1006 hPa

Performance criteria: A
Test result: **PASS**

Test plan

Test was done in an 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. The EUT was placed on non-conductive table 0.8 m above the ground plane.

Test results

Frequency range: 80-1000 MHz
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 rear side
Test remark: No loss of performance was observed

Frequency range: 1.4-2.7 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 rear side
Test remark: No loss of performance was observed

Electrostatic Discharge Immunity

Manufacturer	Type	Serial no	Inv. no
SCHAFFNER INSTRUMENTS			
ESD generator	NSG 435	1179	7887
SGS-FIMKO			
Vertical coupling plane	0.5 m x 0.5 m	-	-
WOLFGANG WARMBIER			
Electrostatic Field Meter	EFM®51	31890413	-

Radiated RF-field Immunity

Manufacturer	Type	Serial no	Inv. no
AMPLIFIER RESEARCH			
Amplifier 60W	60S1G3	313200	7915
Amplifier 200W	200W1000M2A	-	5027
Antenna (1-4.2 GHz)	AT4002	20738	8014
AGILENT			
Signal generator	E8257C	MY43320718	7292
A.H. SYSTEMS			
Antenna	SAS-200/518	199	7873
ROHDE & SCHWARZ			
Antenna (80-1300 MHz)	HL 023 A1	354135/016	8015
Test software	EMC-32	-	-
BOONTON			
Power meter	4300	87105ED	4962
Power sensor	51013-4E	29017	5030
HEWLETT PACKARD			
EMC spectrum analyzer	8594EM	3520100111	7893
DEISEL			
Antenna mast	MA 240	240/455	7896
Turntable	DS 430	-	-
COMTEST			
Controller	HD 100	100/457	-

All used measurement equipment was calibrated (if required).