



Electromagnetic Compatibility EMC TEST REPORT 283004-1-2

Test Report

Electromagnetic Compatibility (EMC)

Equipment Under Test: Bluetooth Smart Module

Model: BGM113

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) | |

Date: 14.3.2016

Issued by:



Niko Kotsalo
Testing Engineer

Date: 14.3.2016

Checked by:



Rauno Repo
Testing Engineer

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Equipment Under Test (EUT)

Bluetooth Smart Module
Model: BGM113

Description of the EUT

BGM113 is Bluetooth Smart Module (Bluetooth 4.1) targeted for Bluetooth Smart applications. BGM113 integrates all of the necessary elements required for a Bluetooth Smart application: Bluetooth radio, software stack and GATT based profiles.

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: 1.9 mm Width: 9.15 mm Length: 15.73 mm

Peripherals

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

Disclaimer

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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.

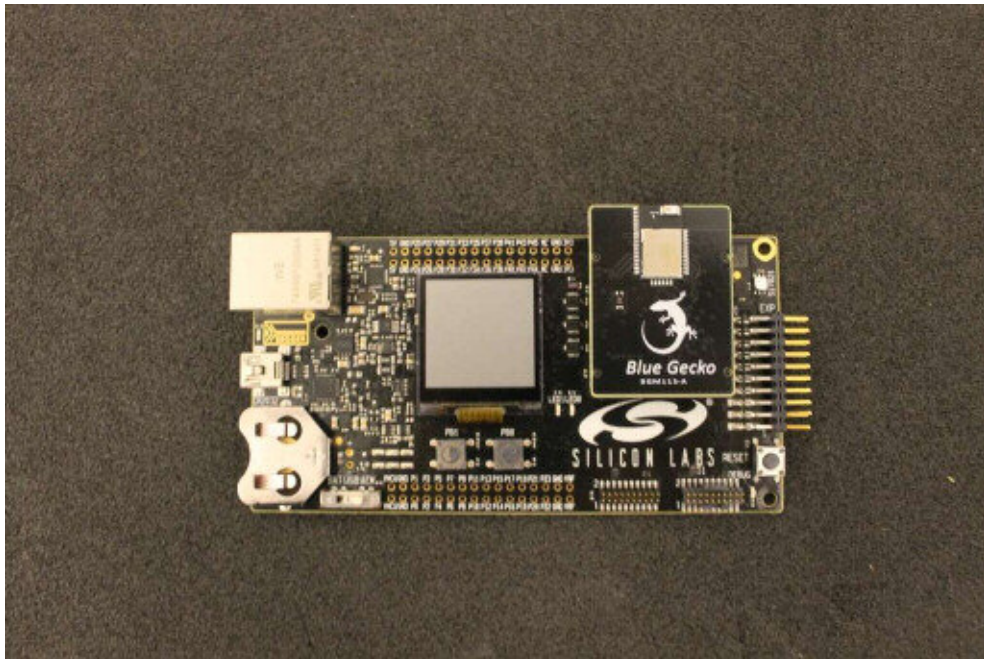
The equipment shall meet the minimum performance criteria as specified in the following clauses.

| 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 Silicon Laboratories Bluetooth Smart module. The EUT was put into advertising mode with Silicon Labs BGTool software. The AE module was paired with the EUT by using the BGTool software. The communication link was monitored from the screen of the laptop PC. The immunity tests were made with the EUT in continuous communication link on and in continuous receive mode. During receive mode testing it was monitored that the EUT does not transmit unintentionally.

Photographs of the EUT



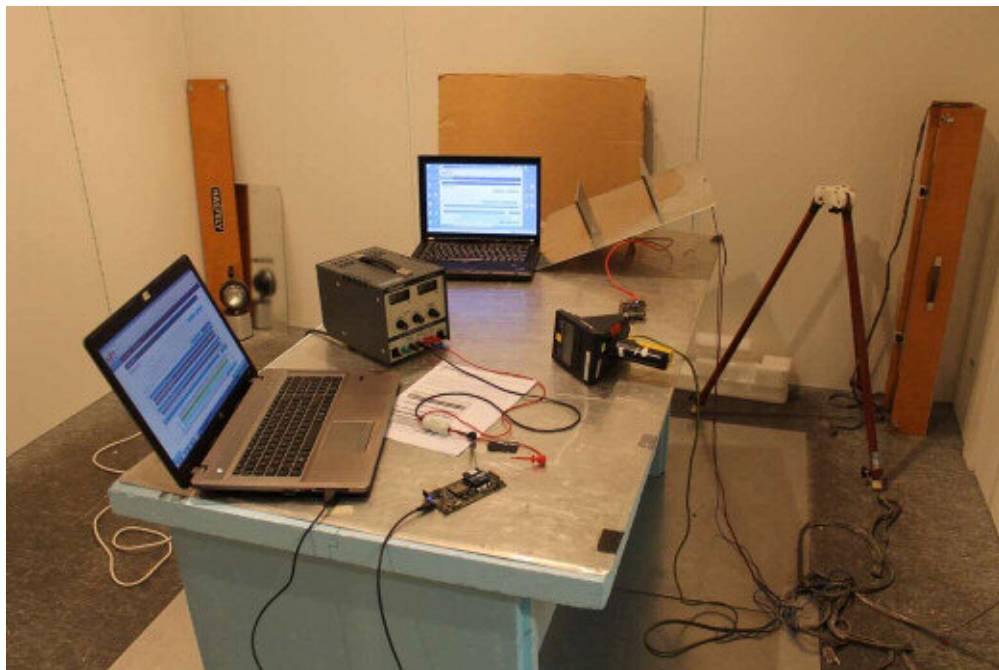
Photograph 1. The EUT attached to the development board.



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
Date: 23.12.2015
Temperature: 21 °C
Humidity: 35 %
Barometric pressure: 1008 hPa

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

Test plan

Only the indirect contact discharges were given to VCP (Vertical Coupling Plate) 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
Date: 23.12.2015
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. Radiated RF-field immunity test were made with the EUT in idle mode and the communication mode on.

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

| Equipment | Manufacturer | Type | Serial no | Inv.no |
|---------------------------|-------------------|---------------|-----------------|--------|
| ESD GENERATOR | SCHAFFNER | NSG 435 | 1179 | 7887 |
| VERTICAL COUPLING PLANE | SGS FIMKO | 0.5 m x 0.5 m | - | - |
| IONIZING AIR BLOWER | AEROSTAT PC | SOMCO ION | 124140033683062 | - |
| ELECTROSTATIC FIELD METER | WOLFGANG WARMBIER | EFM51 | 31890413 | - |

Radiated RF-field Immunity

| Equipment | Manufacturer | Type | Serial no | Inv.no |
|-----------------------|--------------------|-------------|------------|--------|
| TEST SOFTWARE | ROHDE & SCHWARZ | EMC-32 | - | - |
| ANTENNA (80-1300 MHz) | ROHDE & SCHWARZ | HL 023 A1 | 354135/016 | 8015 |
| ANTENNA (1-4.2GHz) | AMPLIFIER RESEARCH | AT4002 | 20738 | 8014 |
| AMPLIFIER 60W | AMPLIFIER RESEARCH | 60S1G3 | 313200 | 7915 |
| AMPLIFIER 200W | AMPLIFIER RESEARCH | 200W1000M2A | - | 5027 |
| SIGNAL GENERATOR | AGILENT | E8257C | MY43320718 | 7292 |
| ANTENNA | A.H. SYSTEMS | SAS-200/518 | 199 | 7873 |
| POWER METER | BOONTON | 4300 | 87105ED | 5029 |
| POWER SENSOR | BOONTON | 51013-4E | 29017 | 5030 |
| SPECTRUM ANALYZER | AGILENT | E7405A | MY45107081 | 9746 |
| ANTENNA MAST | DEISEL | MA240 | 240/455 | 5017 |
| CONTROLLER | COMTEST | HD100 | 100/457 | 5018 |

All used measurement equipment was calibrated (if required).