



## Test Certificate

A sample of the following product received on April 20, 2017 and tested on April 20, 2017 complied with some of the requirements of,

- EN 301 489-1 V2.1.1 "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 the Directive 2014/53/EU and the essential requirements of article 6 of the Directive 2014/30/EU"
- EN 301 489-17 V3.1.1 "ElectroMagnetic Compatibility (EMC) standard for radio equipment; 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"

given the measurement uncertainties as detailed in National Technical Systems - Silicon Valley report R104751 Rev 0.

### Cypress Semiconductor Model BCM20732S, BCM20736S, BCM20737S

Mark E Hill  
Staff Engineer

\_\_\_\_\_  
Cypress Semiconductor

\_\_\_\_\_  
Printed Name



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## ***EMC Test Report***

***EN 301 489-1 v2.1.1***

***EN 301 489-17 v3.1.1***

***Model: BCM20732S, BCM20736S, BCM20737S***

COMPANY: Cypress Semiconductor  
198 Champion Court  
San Jose, CA 95134

TEST SITE(S): National Technical Systems - Silicon Valley  
41039 Boyce Road.  
Fremont, CA. 94538-2435

REPORT DATE: May 18, 2017

FINAL TEST DATES: April 20, 2017

TOTAL NUMBER OF PAGES: 21



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**VALIDATING SIGNATORIES**

PROGRAM MGR



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Staff Engineer

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QUALITY ASSURANCE DELEGATE



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**REVISION HISTORY**

Rev#	Date	Comments	Modified By
-	May 18, 2017	First release	

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## SCOPE

The European Committee for Electrotechnical Standardization (CENELEC), the European Telecommunications Standards Institute (ETSI) and the International Electrotechnical Commission (IEC) publish standards regarding the electromagnetic compatibility of electronic devices. Electromagnetic compatibility tests have been performed on the Cypress Semiconductor model BCM20732S in accordance with these standards. The tests were performed in accordance with the current, published versions of the basic standards referenced in the following standards, as outlined in National Technical Systems - Silicon Valley test procedures. The test data has been provided as an appendix to this report for reference.

Standard	Title	Date
EN 301 489-1	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 the Directive 2014/53/EU and the essential requirements of article 6 of the Directive 2014/30/EU	2017-02 (V2.1.1)
EN 301 489-17	ElectroMagnetic Compatibility (EMC) standard for radio equipment; 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	2017-02 (V3.1.1)

## OBJECTIVE

The objective of the manufacturer is to declare conformity with one of the essential requirements of the Radio Equipment Directive 2014/53/EU. In order to demonstrate compliance, the manufacturer or a contracted laboratory makes measurements and takes the necessary steps to ensure that the equipment complies with the appropriate technical standards.

**STATEMENT OF COMPLIANCE**

The tested sample of Cypress Semiconductor model BMC20732S, given the performance criteria as specified by the manufacturer, complied with some of the requirements of the following standard(s):

Standard/Regulation	Version	Standard Date
EN 301 489-1	2.1.1	2017-02
EN 301 489-17	3.1.1	2017-02

The test results recorded herein are based on a single type test of the Cypress Semiconductor model BCM20732S and therefore apply only to the tested sample. The sample was selected and prepared by Juan Martinez on behalf of Cypress Semiconductor

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product that could result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different enclosure, different line filter or power supply, harnessing and/or interface cable changes, etc.).

The manufacturer stated that testing performed on the BCM20732S was considered representative of the BCM20736S and BCM20737S. The models only differ in the non-radio related software functionality.

**DEVIATIONS FROM THE STANDARD**

The following deviations were made from the published requirements listed in the scope of this report.

1. Only Radiated Immunity from 1-1.4 and 2.7-6GHz was performed. All other requirements of EN 301 489-1 and EN 301 489-17 were met in previous testing against EN 301 489-1 v1.9.2 and EN 301 489-17 v.2.2.1.

## TEST RESULTS

The following tests were performed on the Cypress Semiconductor model BCM20732S. The results are based upon performance criteria defined by the manufacturer. The actual test results and associated performance criteria are contained within an appendix of this report.

### IMMUNITY TESTING

Test	Basic Standard	Level Required	Level Tested	Criterion Met	Status
Radio frequency Electromagnetic Field	EN 61000-4-3	80-1000 MHz 1000-6000 MHz 3 V/m 80% 1 kHz AM	1.0-1.4 GHz and 2.7-6.0GHz 3 V/m 80% 1 kHz AM	A / CT / CR	Complied

### MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the test results be included in the report. The measurement uncertainties given below are based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a 95% confidence level and were calculated in accordance with NAMAS document LAB 34. For emissions tests, the uncertainties were calculated using the approach described in CISPR 16-4-2:2003 and the levels were found to be below levels of Ucispr and therefore no adjustment of the data for measurement uncertainty is required.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
Radiated Immunity	V/m	80-2700 MHz	- 26.3%, + 29.97%



**EQUIPMENT UNDER TEST (EUT) DETAILS****GENERAL**

The Cypress Semiconductor model BCM20732S is an BLE module. Since the EUT would be placed in a tabletop host during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The EUT is powered via the USB interface.

The sample was received on April 20, 2017 and tested on April 20, 2017. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number
Cypress	BCM20732S	BLE module	52

**ANTENNA SYSTEM**

The radio uses a PCB antenna, with a maximum gain of -1.5dBi.

**EUT CLASSIFICATION**

Fixed use equipment.

**ENCLOSURE**

The EUT does not have an enclosure. It is designed to be installed into a host device. It measures approximately 4.2 cm wide by 3.7 cm deep.

**MODIFICATIONS**

The EUT did not require modifications during testing in order to comply with the immunity specification.

## SUPPORT EQUIPMENT

The following equipment was used as local support equipment for immunity testing:

Manufacturer	Model	Description	Serial Number
Dell	Latitude E6410	Laptop	-
Dell	DA130PE1-00	AC/DC Adapter	-
Dell	Latitude E6410	Laptop	
Dell	DA130PE1-00	AC/DC Adapter	
Broadcom	-	Fixture Board (x2)	-

## EUT INTERFACE PORTS

The I/O cabling configuration during immunity testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT #1	Fixture Board	loose wire (x4)	Unshielded	0.1
EUT #2	Fixture Board	loose wire (x4)	Unshielded	0.1
Fixture Board	Laptop-USB	multiconductor	Unshielded	1.5
Fixture Board	Laptop-USB	multiconductor	Unshielded	1.5

## EUT OPERATION DURING IMMUNITY TESTING

Transmit Mode - The EUT was configured to transmit continuously on channel 0 in the 2402 MHz band. The 2.4GHz band was monitored using a spectrum analyzer for continuous transmissions.

Standby Mode - The EUT was configured to receive on channel 39 in the 2480 MHz. The 2.4GHz band was monitored using a spectrum analyzer for any un-intentional transmissions.

## EUT PERFORMANCE CRITERIA

### Criterion A:

During and after testing the EUT shall continue to operate as intended. There should be no loss of transmitted packets. In standby mode, there should be un-intentional transmissions..

## **IMMUNITY TEST DESCRIPTIONS**

### **GENERAL INFORMATION**

Final tests were performed at the National Technical Systems - Silicon Valley Test Sites located at 41039 Boyce Road, Fremont, CA 94538-2435. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent CENELEC and IEC standards.

All immunity tests were performed with the host system operating from an AC source voltage within the operating ranges specified for the product.

### **MEASUREMENT INSTRUMENTATION**

#### **ELECTROMAGNETIC FIELD TEST SYSTEM**

A signal generator and power amplifiers are used to provide a signal at the appropriate power and frequency to an antenna to obtain the required electromagnetic field at the position of the EUT in accordance with the EN 61000-4-3 basic EMC publication.

#### **INSTRUMENT CALIBRATION**

All test equipment is regularly checked to ensure that performance is maintained in accordance with the company's specifications. An appendix of this report contains the list of test equipment used and calibration information.

**IMMUNITY TEST PROCEDURES****EQUIPMENT PLACEMENT**

IEC 61000-4-3 specifies that a tabletop EUT shall be placed on a non-conducting table 80 centimeters high and that floor-mounted equipment should be mounted on non-conductive supports 0.05 to 0.15 m high or may be placed on an 80 centimeter high platform, if practicable. During the IEC 61000-4-3 tests, the EUT was positioned in a shielded anechoic test chamber on an insulating support in conformance with this requirement. The anechoic materials are used to reduce reflections from the internal surfaces of the chamber.

**APPLICATION OF ELECTROMAGNETIC FIELD**

The electromagnetic field is established at the front edge of the EUT. The frequency range is swept through the frequency range of the test using a power level necessary to obtain the required field strength at the EUT. The field is amplitude modulated using a 1 kHz or 400Hz sine wave to a depth of 80% for the swept frequency test in accordance with EN 61000-4-3.

The test is repeated with each of the four sides of the EUT facing the field generating antenna. For small, portable products the test is also performed with the top and bottom sides of the EUT facing the antenna.

## Appendix A Test Equipment Calibration Data

### Radiated Immunity, 1,000 - 6,000 MHz, 20-Apr-17

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Calibrated</u>	<u>Cal Due</u>
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1070	8/10/2016	8/10/2017
EMCO	Antenna, Horn, 1-18 GHz (SA40-Purple). Used for Chamber 6	3115	1779	1/18/2016	1/18/2018
Anritsu	Anritsu 68347C Signal Generator, 10MHz-20GHz	68347C	1785	3/10/2017	3/10/2018
Rohde & Schwarz	Power Meter, Dual Channel, DC to 40 GHz, 100 pW to 30 W, 9 kHz to 3 GHz, 200µV to 1000V	NRVD	1787	2/10/2017	2/10/2018
Amplifier Research	Amplifier, 25w, 0.8-4.2GHz	25S1G4AM3	1805		N/A
Amplifier Research	Amplifier, 15W, 4.2 to 18 GHz	15T4G18M1	2065		N/A
ETS Lindgren	Field Probe, RF, 10 MHz - 40 GHz	HI-6053	2202	1/24/2017	1/24/2018
Advanced Technical Materials	Directional Coupler, 1.0-11.0GHz, 35dB, 50w	CHP223G-35FNF	2521		N/A

## ***Appendix B Test Data Log Sheets***

### ***ELECTROMAGNETIC EMISSIONS***

#### ***TEST LOG SHEETS***

#### ***AND***

#### ***MEASUREMENT DATA***

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## *EMC Test Data*

Client:	Cypress Semiconductor	Job Number:	JD104544
Product	BCM20732S; BCM20736S; BCM20737S	T-Log Number:	T104597
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Juan Martinez	Project Coordinator:	-
Emissions Standard(s):	EN 300 328 v2.1.1	Class:	-
Immunity Standard(s):	EN 301 489-1 v2.1.1 / EN 301 489-17 v3.1.1	Environment:	-

# **EMC Test Data**

For The

## **Cypress Semiconductor**

Product

BCM20732S; BCM20736S; BCM20737S

Date of Last Test: 5/3/2017

Client:	Cypress Semiconductor	Job Number:	JD104544
Product:	BCM20732S; BCM20736S; BCM20737S	T-Log Number:	T104597
		Project Manager:	Christine Krebill
Contact:	Juan Martinez	Project Coordinator:	-
Immunity Standard(s):	EN 301 489-1 v2.1.1 / EN 301 489-17 v3.1.1	Environment:	-

## Radiated Immunity (EN 61000-4-3)

### Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 04/20/17  
 Test Engineer: M. Birgani  
 Test Location: Fremont Chamber #6

Config. Used: 1  
 Config Change: -  
 Host EUT Voltage: 230V/50Hz

### General Test Configuration

The EUT and all local support equipment were located on a turntable in an anechoic chamber.  
 Unless otherwise noted, the "right side" of the EUT is considered the side on the right when standing behind the EUT and the "left side" of the EUT is considered the side on the left when standing behind the EUT.

**Ambient Conditions:**  
 Temperature: 18-20 °C  
 Rel. Humidity: 35-40 %

### Summary of Results-Radiated Immunity

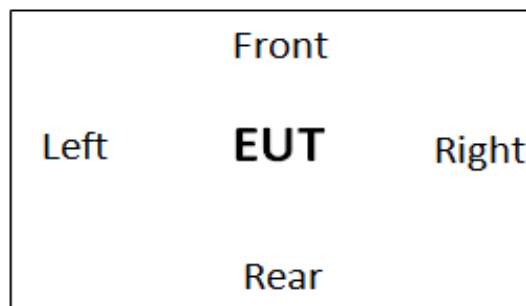
Run #	Port	Test Level		Performance Criteria		Comments
		Required	Applied	Required	Met / Result	
EN 301 489-1 V2.1.1 Requirements						
1	Enclosure	1.0-6.0GHz 1kHz 80% AM	1.0-6.0GHz 1kHz 80% AM	A	A/ Pass	Transmit Mode - BLE
2		3 V/m	3 V/m		A/ Pass	Standby Mode - BLE

### Modifications

No modifications were made to the EUT during testing

### Deviations From The Standard

Front and Rear was tested only.





Client:	Cypress Semiconductor	Job Number:	JD104544
Product:	BCM20732S; BCM20736S; BCM20737S	T-Log Number:	T104597
Contact:	Juan Martinez	Project Manager:	Christine Krebill
Immunity Standard(s):	EN 301 489-1 v2.1.1 / EN 301 489-17 v3.1.1	Project Coordinator:	-
		Environment:	-

## Run #1: Radiated Immunity, 1-6 GHz (EN61000-4-3), Tx Mode (BLE).

Frequency:	1-4.2 GHz	4.2-6.0 GHz
Step Size:	1 %	1 %
Dwell time:	2874 ms	2874 ms
Field Uniformity:	1.0m x 1.0m	1.0m x 1.0m
Test Distance:	2.0m	2.0m

Modulation Details	
Modulating Frequency:	1 kHz
Modulation:	AM
Depth / Deviation:	80%

Frequency Range (MHz)	Level V/m	Front		Left Side		Rear		Right		Top		Bottom	
		Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.
1000-1400	3	X	X			X	X						
2700-4200	3	X	X			X	X						
4200-6000	3	X	X			X	X						

The following calibration files from U:\EMC Stuff\Radiated Immunity Playback Files\CH6\Current\ .....were used:

Antenna 1.25m from field, 1.25m high 1000 MHz - 4200 MHz H 3Vm.crf

Antenna 1.8m from UFA, 1.25m high 4.2-6.0GHz H 3Vm.crf

Antenna 1.8m from UFA, 1.25m high 4.2-6.0GHz V 3Vm.crf

Antenna 1.25m from field, 1.25m high 1000 MHz - 4200 MHz V 3Vm.crf

Note 1	An "X" indicates that the EUTs continued to operate as intended. All EUTs continued to transmit without interruption, both during & after the test.
Note 2	Previous testing covered the frequency range 1400-2700 MHz.

## EN 301 489-1 Exclusion Bands:

	Band		Bandwidth (MHz)	Exclusion Band	
	Start (MHz)	Stop (MHz)		Start (MHz)	Stop (MHz)
Bluetooth	2400	2483.5	-	2280	2603.5

Client:	Cypress Semiconductor	Job Number:	JD104544
Product:	BCM20732S; BCM20736S; BCM20737S	T-Log Number:	T104597
Contact:	Juan Martinez	Project Manager:	Christine Krebill
Immunity Standard(s):	EN 301 489-1 v2.1.1 / EN 301 489-17 v3.1.1	Project Coordinator:	-
		Environment:	-

## Run #2: Radiated Immunity, 1-6 GHz (EN61000-4-3), Standby Mmode (BLE).

Frequency:	1-4.2 GHz	4.2-6.0 GHz
Step Size:	1 %	1 %
Dwell time:	2874 ms	2874 ms
Field Uniformity:	1.0m x 1.0m	1.0m x 1.0m
Test Distance:	2.0m	2.0m

Modulation Details	
Modulating Frequency:	1 kHz
Modulation:	AM
Depth / Deviation:	80%

Frequency Range (MHz)	Level V/m	Front		Left Side		Rear		Right		Top		Bottom	
		Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.
1000-1400	3	X	X			X	X						
2700-4200	3	X	X			X	X						
4200-6000	3	X	X			X	X						

The following calibration files from U:\EMC Stuff\Radiated Immunity Playback Files\CH6\Current\ .....were used:

Antenna 1.25m from field, 1.25m high 1000 MHz - 4200 MHz H 3Vm.crf

Antenna 1.8m from UFA, 1.25m high 4.2-6.0GHz H 3Vm.crf

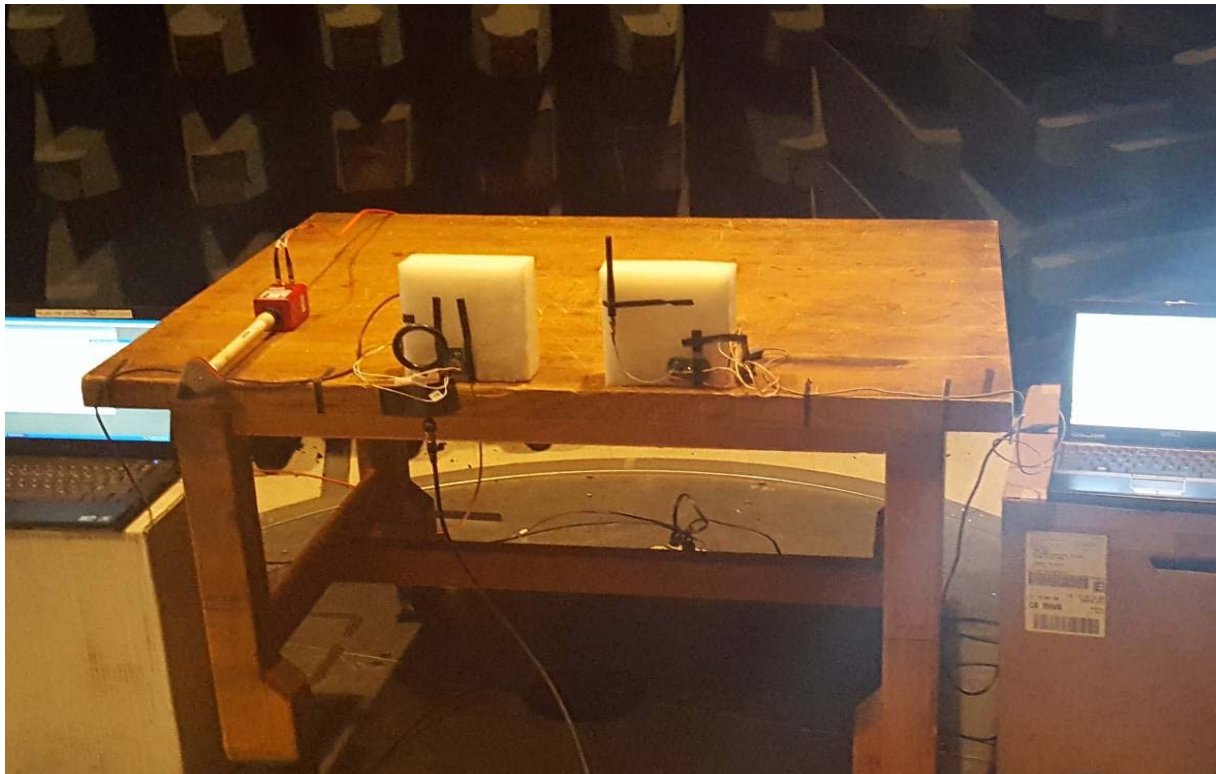
Antenna 1.8m from UFA, 1.25m high 4.2-6.0GHz V 3Vm.crf

Antenna 1.25m from field, 1.25m high 1000 MHz - 4200 MHz V 3Vm.crf

Note 1	An "X" indicates that the EUTs continued to operate as intended. No transmissions were observed, both during & after the test, as monitored on a spectrum analyzer.
Note 2	Previous testing to this standard, for all EUTs, covered the frequency range 1400-2700 MHz.

Client:	Cypress Semiconductor	Job Number:	JD104544
Product:	BCM20732S; BCM20736S; BCM20737S	T-Log Number:	T104597
		Project Manager:	Christine Krebill
Contact:	Juan Martinez	Project Coordinator:	-
Immunity Standard(s):	EN 301 489-1 v2.1.1 / EN 301 489-17 v3.1.1	Environment:	-

Test Configuration Photograph #1  
 (Radiated Immunity, EN 61000-4-3)



Client:	Cypress Semiconductor	Job Number:	JD104544
Product:	BCM20732S; BCM20736S; BCM20737S	T-Log Number:	T104597
Contact:	Juan Martinez	Project Manager:	Christine Krebill
Immunity Standard(s):	EN 301 489-1 v2.1.1 / EN 301 489-17 v3.1.1	Project Coordinator:	-
		Environment:	-

Test Configuration Photograph #1  
(Radiated Immunity, EN 61000-4-3)



### ***End of Report***

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