

EMF ASSESSMENT REPORT

No. AR18-0031787-01

performed in accordance with
EN 62311 (2008)

PRODUCT	Bluetooth Low Energy module
MODEL(s) TESTED	BLUENRG-M2SA
TRADE MARK(s)	STMICROELECTRONICS
APPLICANT	STMICROELECTRONICS S.r.l. Centro Direzionale Colleoni Palazzo Andromeda 3 ~ I-20864 Agrate Brianza

Assessed by	Robertino Torri <i>[Laboratory technician]</i>	
Approved by	Giovanni Di Turi <i>[Laboratory manager]</i>	

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2018-10-26	First edition Digital signed - AR18-0031787-01_TR_EN 62311 _STM - BLUENRG-M2SA

The results of tests and checks reported in this Test Report refer exclusively to the samples tested and described in the Report itself.
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1. GENERAL DATA

SAMPLE		
Samples received on	2018-09-28	(Item(s) sampled and sent by applicant)
IMQ reference samples	BEM	92584
Samples tested No.	1	
Object under analysis recognition	Not carried out Except where stated, characteristics of products were taken from client description and were not verified by the laboratory	
TEST LOCATION		
Testing dates	2018-10-10	
Testing laboratory.	IMQ S.p.A. - Via Quintiliano, 43 – I-20138 Milano	
Testing site	Viale Lombardia, 20 – I-20021 Bollate (MI)	
ENVIRONMENTAL CONDITIONING		
<i>Parameter</i>	<i>Measured</i>	
Ambient Temperature	24.1 °C	
Relative Humidity	57 %	
Atmospheric Pressure	1005 mbar	
The laboratory is monitored by a continuous environmental conditions measurements system. Temperature, humidity and pressure data are recorded on a weekly basis and stored in local archive.		
REMARKS		
Throughout this report a point is used as the decimal separator. The ability or reliability of this product to perform its intended function in a particular application has not been investigated. IMQ declines any responsibility derived from missing or wrong information provided aside by the applicant.		

2. REFERENCE DOCUMENT

	DOCUMENT	DATE	TITLE
<input checked="" type="checkbox"/>	EN 62311	2008	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz to 300 GHz)
<input checked="" type="checkbox"/>	COUNCIL RECOMMENDATION 1999/519/EC	1999	COUNCIL RECOMMENDATION of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

3. UNIT UNDER TEST (EUT) DETAILS

GENERAL DATA

MODEL (basic)	Description
BLUENRG-M2SA	Bluetooth Low Energy module
VARIANTS (derived)	Description
/	/

MANUFACTURER	STMICROELECTRONICS
ASSEMBLY PLANT(s)	/

EUT IDENTIFICATION

EUT type		Bluetooth Low Energy module			
EUT use		<input type="checkbox"/> Portable	<input type="checkbox"/> Mobile	<input type="checkbox"/> Fixed	<input checked="" type="checkbox"/> Other
EUT single or system		<input type="checkbox"/> Single	<input type="checkbox"/> System	<input checked="" type="checkbox"/> Other	
EUT standing		To be integrated into final application			
Supply voltage		3.0 V (2 x AAA alkaline battery) by evaluation board			
Radio Data (necessary only for EUT with radio module)					
Radio module(s) model		BLUENRG-M2SA			
Modulation		DSSS			
Number of channels		40	Channel bandwidth		2 MHz
Operating frequency		2400 ÷2483.5 MHz			
Antenna	Gain:	+0.5 dBi max peak			
	Model:	2450AT18A100E of JOHANSON TECHNOLOGY			
	Type:	<input type="checkbox"/> Integral	<input checked="" type="checkbox"/> Dedicated	<input type="checkbox"/> External	
Remarks		/			

4. SUMMARY OF EMF ASSESSMENT RESULTS

POSSIBLE TEST CASE VERDICTS:	
Test object meets the requirement	PASS
Test object does not meet the requirement	FAIL
Test case does not apply to the test object	N.A.
Test not performed	N.P.

BASIC RESTRICTIONS	RESULT
Human exposure to electromagnetic fields	PASS

5. RESULTS OF RF EXPOSURE EVALUATION

GENERAL DESCRIPTION OF APPLIED STANDARD:

EN 62311 Generic Standard to demonstrate the compliance of electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic field (0Hz to 300GHz) is to demonstrate the compliance of apparatus with the basic restrictions or reference levels on exposure of the general public related to electric, magnetic, electromagnetic fields as well as induced and contact current.

LIMIT

According to EN 62311, the criteria listed in the below table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in the table 2 of Council Recommendation 1999/519/EC.

Reference levels of Council Recommendation 1999/519/EC for electric, magnetic and electromagnetic fields (0Hz to 300 GHz, unperturbed rms values)				
Frequency Range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density S_{eq} (W/m ²)
0÷1 Hz	----	$3,2 \times 10^4$	4×10^4	----
1÷8 Hz	10000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	----
8÷25 Hz	10000	4000/f	5000/f	----
0,025÷0,8 kHz	250/f	4/f	5/f	----
0,8÷3 kHz	250/f	5	6,25	----
3÷150 kHz	87	5	6,25	----
0,15÷1 MHz	87	0,73/f	0,92/f	----
1÷10 MHz	$87/f^{1/2}$	0,73/f	0,92/f	----
10÷400 MHz	28	0,073	0,092	2
400÷2000 MHz	$1,375 f^{1/2}$	$0,0073 f^{1/2}$	$0,0046 f^{1/2}$	f/200
2÷300 GHz	61	0,16	0,20	10

Notes:

- 1: f as indicated in the frequency range column
- 2: for frequencies between 100kHz and 10GHz, S_{eq} , E^2 , H^2 , and B^2 , are to be averaged over any six-minuted period.
- 3: for frequencies exceeding 10 GHz, S_{eq} , E^2 , H^2 , and B^2 , are to be averaged over any $68/f^{1.05}$ minute period (f in GHz)
- 4: No E-field value is provided for frequencies < 1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided.

TEST METHOD:

The antenna of the product, under normal use condition, is at least 20cm. away from the body of the user. Warning statement of the user for keeping 20cm. separation distance and the prohibition of operating to a person has been printed on the user manual. So, this product under normal use is located on electromagnetic far field between the human body.

FAR FIELD CALCULATION FORMULA:

According to EN 62311, the criteria listed in the below table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in the table 2 of Council Recommendation 1999/519/EC.

The field calculation does not take into account the antenna size, which is assumed to be a point source. An ideal isotropic antenna is used as a reference to compare the performance of practical antennas: P watts is radiated, from a point, uniformly over the surface of sphere of radius r .

The Pointing vector gives the power density: $S = E \times H = \frac{E^2}{\eta} = \frac{P}{4\pi r^2}$

RF Exposure evaluation

TECHNICAL DOCUMENTATION

Document	Reference	Standard
IMQ Test Report	No. AR18-0031790-01 of 2018-10-26	EN 300 328 V2.1.1

Frequency MHz	Max E.I.R.P. (dBm)	Max. E.I.R.P. (W)	Equivalent plane wave power density @ 20 cm (W/m ²)	Limits (W/m ²)
2400 ÷ 2483.5	4.60 (measured)	0.003	0.0057	10
2400 ÷ 2483.5	8.5 (declared) ^[1]	0.007	0.0141	10

^[1] 8.0 dBm max e.i.r.p. declared + +0.5 dBm max antenna gain

RESULT OF EVALUATION

This value is less than the reference level limit.

6. TESTS UNCERTAINTY

Unless otherwise stated the uncertainties for the tests and measurements are evaluated in according to IMQ Operational Instruction IO-LAB-001 and IO-LAB-004.

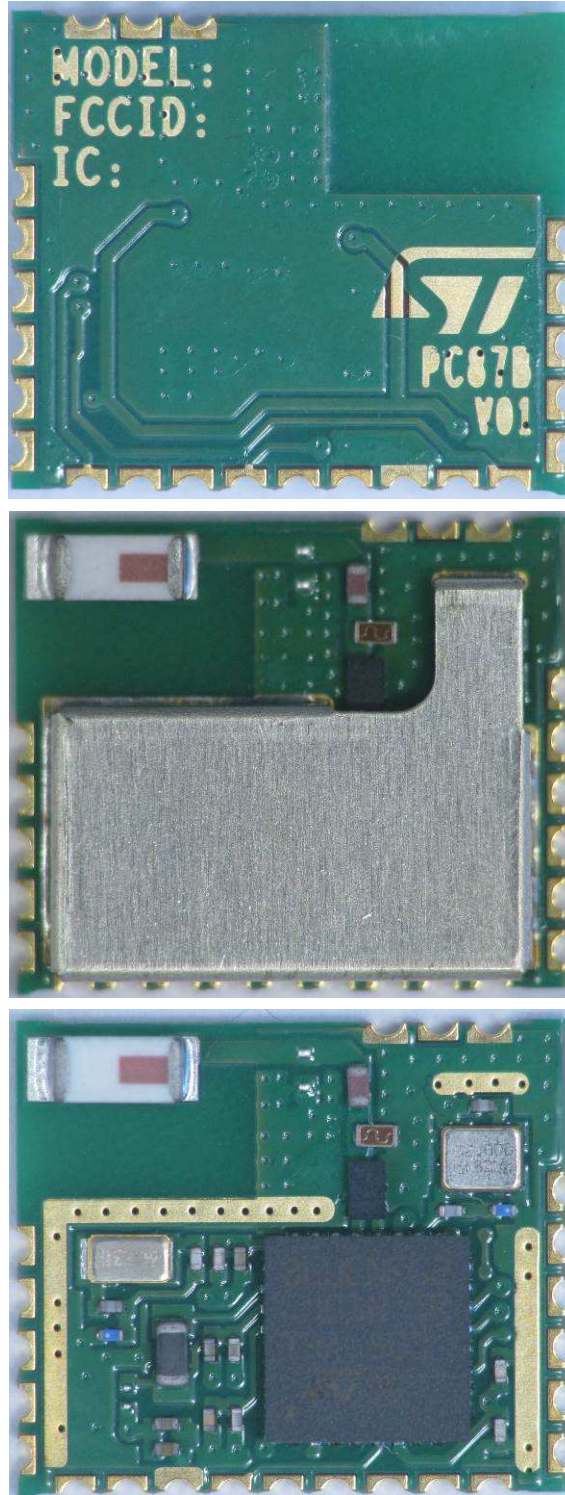
The expanded uncertainty was calculated for all measurements and tests listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainty in EMC Measurements", with UKAS document LAB 34 and is documented in the quality system accordance to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device

Internal Procedure PI-037 ensures that the requirements for traceability of calibrations, of all test equipment requiring calibration, and calibration intervals are met.

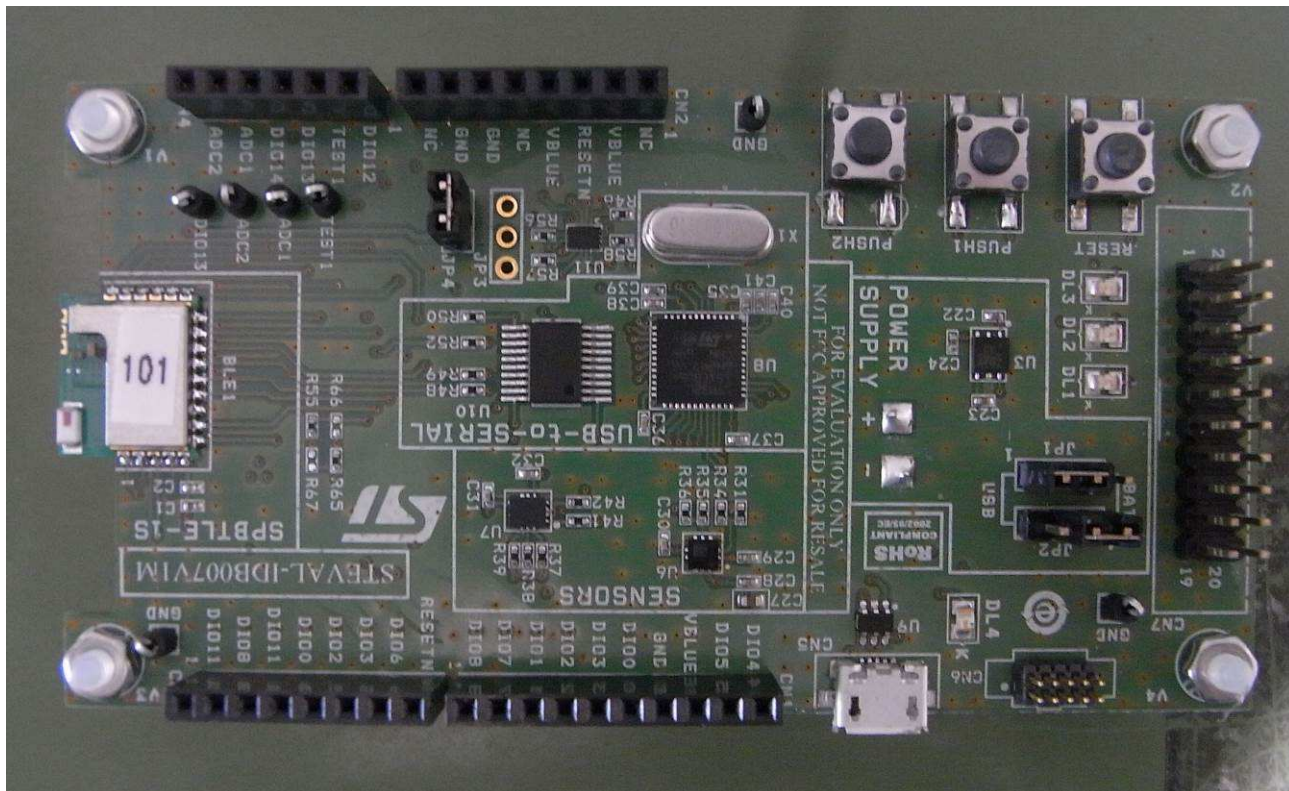
The expanded uncertainty of the assessment method is determined by calculating the expanded uncertainty using a confidence interval of 95 % (coverage factor $k = 2.00$).

7. PHOTOGRAPHIC DOCUMENTATION

EUT IDENTIFICATION



EVALUATION BOARD with radio module



END OF ASSESSMENT REPORT