

TEST REPORT

No. AR18-0031789-01

Tests performed in accordance with
ETSI EN 301 489-17 V3.1.1 (2017-02)

PRODUCT	Bluetooth Low Energy module
MODEL(s) TESTED	BLUENRG-M2SAY
TRADE MARK(s)	STMICROELECTRONICS

APPLICANT	STMICROELECTRONICS S.r.l. Centro Direzionale Colleoni Palazzo Andromeda 3 ~ I-20864 Agrate Brianza
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Tested 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 sign - AR18-0031789-01_TR_301 489-17 v3.1.1_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	
Date of acceptance of test item	2018-10-10	
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		
Parameter	Measured	
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"/> ETSI EN 301 489-17 (V3.1.1)	2017	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
<input checked="" type="checkbox"/> ETSI EN 301 489-1 (V2.1.1)	2017	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.

makes reference to the following Basic Standards:

DOCUMENT	DATE	TITLE
<input type="checkbox"/> EN 55032	2015 (*)	Electromagnetic compatibility of multimedia equipment - Emission Requirements
<input type="checkbox"/> CISPR 25 Corr.1	2 nd Ed. 2002 (*) 2004 (*)	Radio disturbance characteristics for the protection of receivers used on board vehicles, boats, and on devices - Limits and methods of measurement.
<input type="checkbox"/> EN 61000-3-2 A1 A2	2006 (*) 2009 (*) 2009 (*)	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
<input type="checkbox"/> EN 61000-3-3	2013 (*)	Electromagnetic compatibility (EMC) Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection
<input checked="" type="checkbox"/> EN 61000-4-2	2009 (*)	Electromagnetic compatibility (EMC) Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
<input checked="" type="checkbox"/> EN 61000-4-3 A1 A2	2006 (*) 2008 (*) 2010 (*)	Electromagnetic compatibility (EMC) Part 4-3: Testing and measurement techniques - Radiated, radio-frequency electromagnetic field immunity test
<input type="checkbox"/> EN 61000-4-4	2012 (*)	Electromagnetic compatibility (EMC) Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
<input type="checkbox"/> EN 61000-4-5	2006 (*)	Electromagnetic compatibility (EMC) Part 4-5: Testing and measurement techniques - Surge immunity test

	DOCUMENT	DATE	TITLE
<input type="checkbox"/>	EN 61000-4-6	2009 ^(*)	Electromagnetic compatibility (EMC) Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
<input type="checkbox"/>	EN 61000-4-11	2004 ^(*)	Electromagnetic compatibility (EMC) Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
<input type="checkbox"/>	ISO 7637-2	2011 ^(*)	Road vehicles - Electrical disturbances from conduction and coupling Part 2: Electrical transient conduction along supply lines only

According to § 2 of generic standard the signed standards, with ^(*), are dated. For other referenced standard is applied the latest edition (including any amendments).

3. UNIT UNDER TEST (EUT) DETAILS

GENERAL DATA

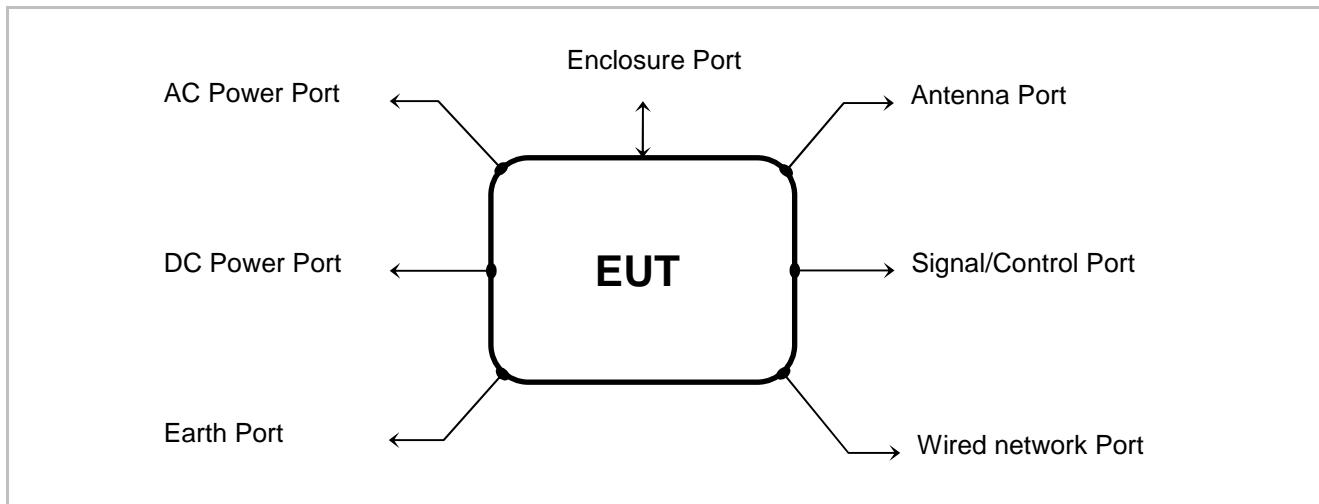
MODEL (basic)	Description
BLUENRG-M2SA	Bluetooth Low Energy module
VARIANTS (derived)	Description
/	/

MANUFACTURER	STMICROELECTRONICS
ASSEMBLY PLANT(s)	/

EUT IDENTIFICATION

UUT type	Bluetooth Low Energy module		
UUT use	<input type="checkbox"/> Portable	<input type="checkbox"/> Mobile	<input type="checkbox"/> Fixed <input checked="" type="checkbox"/> Other
UUT 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 UUT with radio module)			
Radio module(s) model	BLUENRG-M2SA		
Modulation	DSSS		
Number of channels	40	Channel bandwidth	2 MHz
Frequency band	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
Transmission protocol	/		

EUT PORTS



Port	Description	Cable >3 m	Cable Shielded
Enclosure	Open frame		
AC power	/	/	/
DC power	3.0 V (2 x AAA alkaline battery) by evaluation board	/	/
Earth	/	/	/
Wired network	/	/	/
Signal/ Control	/	/	/
Antenna	Dedicated	/	/

STATE OF THE EUT DURING TESTS

Ref.	Mode	Description
#1	Operating	Bluetooth link

SUPPORT EQUIPMENT

Defined as equipment needed for correct operation or loading of the EUT, but not considered as tested:

Equipment	Manufacturer	Model
PC with dedicated software for RF transmission management	/	/
Evaluation board	STM	STEVAL-IDB007V1M

ELECTROMAGNETICALLY RELEVANT COMPONENTS

Component	No.	Manufacturer	Model
Bluetooth Low Energy module	1	STMICROELECTRONICS	PC87B V01

RFI SUPPRESSION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

EMI PROTECTION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

UUT TECHNICAL DOCUMENTATION

Document	Reference
/	/

4. PERFORMANCE CRITERIA

In accordance to § 6 of ETSI EN 301 489-1 V2.1.1 (2017-02) and § 6 of ETSI EN 301 489-17 V3.1.1 (2017-02).

Performance criteria for Continuous phenomena applied to Transmitters (CT)

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Transmitters (TT)

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Continuous phenomena applied to Receivers (CR)

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Receivers (TR)

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

EUT PERFORMANCE ASSESSMENT

As declared by manufacturer:

Primary function	Bluetooth link
Representative parameter	Communication link
Acceptable level of performance	No loss of communication link and no unintentional transmission

5. SUMMARY OF TEST 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.

EMISSION TESTS

ENVIRONMENTAL PHENOMENON	PORT	RESULT
Radiated emission	Enclosure of ancillary equipment	N.A. ¹
Conducted emission	AC power input/output	N.A. ²
	DC power input/output	N.A. ²
	Wired network	N.A. ²
Harmonic current emissions	AC mains input	N.A. ²
Voltage fluctuations and flicker	AC mains input	N.A. ²

Note 1	According to table 1 of ETSI EN 301 489-1: applicable for stand alone testing
Note 2	Port not present

IMMUNITY TESTS

ENVIRONMENTAL PHENOMENON	PORT	RESULT
RF electromagnetic field (0.08 ÷ 6.0 GHz)	Enclosure	PASS
Electrostatic discharge	Enclosure	PASS
Fast transients common mode	AC power	N.A. ¹
	DC power	N.A. ¹
	Control/Signal	N.A. ¹
	Wired network	N.A. ¹
RF common mode 0,15 to 80 MHz	AC power	N.A. ¹
	DC power	N.A. ¹
	Control/Signal	N.A. ¹
	Wired network	N.A. ¹
Transients and surges in the vehicular environment	DC power input (for 12V power supply vehicular equipment)	N.A. ¹
	DC power input (for 24V power supply vehicular equipment)	N.A. ¹
Voltage dips and interruptions	AC mains power input	N.A. ¹
Surges, line to line and line to ground	AC mains power input	N.A. ¹
	Wired network	N.A. ¹

Note 1	Port not present
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6. TEST RESULTS

6.1 IMMUNITY TESTS

6.1.1 RF ELECTROMAGNETIC FIELD

TEST REQUIREMENT	
Reference standard	EN 61000-4-3
Test set-up	§ 6
Test specification	ETSI EN 301 489-1 § 9.2.2
IMQ operational instruction	/
Deviation to test procedure	None
EUT operating condition	#1
Testing dates	2018-10-10

Frequency (MHz)	Test field strength (V/m (rms)) (unmodulated) at 3 m	Modulation during the test	Observed performance criteria ETSI EN 301 489-1 § 9.2.3	Results
80 ÷ 6000	3	AM, 80 %, 1 kHz sinewave	A	PASS

Frequency step: 1%

Actuation time: 3 seconds

REMARKS

The tested sample continues to operate as intended during and after the test.

6.2.1 ELECTROSTATIC DISCHARGE IMMUNITY TEST

TEST REQUIREMENT	
Reference standard	EN 61000-4-2
Test set-up details	§ 7
Test specification	ETSI EN 301 489-1 § 9.3.2
IMQ operational instruction	/
Deviation to test procedure	None
EUT operating condition	#1
Testing dates	2018-10-10

Position	Test voltage (kV)	Polarity		Number of applications	Pulse per second	Observed Performance criteria ETSI EN 301 489-1 § 9.3.3	Results
		+	-				
Indirect discharge points							
Coupling plane	4	x	x	10	1	B	PASS
Contact discharge points							
Enclosure (conductive part)	4	x	x	10	1	B	N.A.
Air discharge points							
Enclosure (non conductive part)	8	x	x	10	1	B	N.A.

REMARKS

The tested sample during the test lost the RF Bluetooth link.
After the test to restore the RF Bluetooth link is necessary manual intervention by the operator.
In accordance to the applicant this condition is allowed.

7. 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.

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

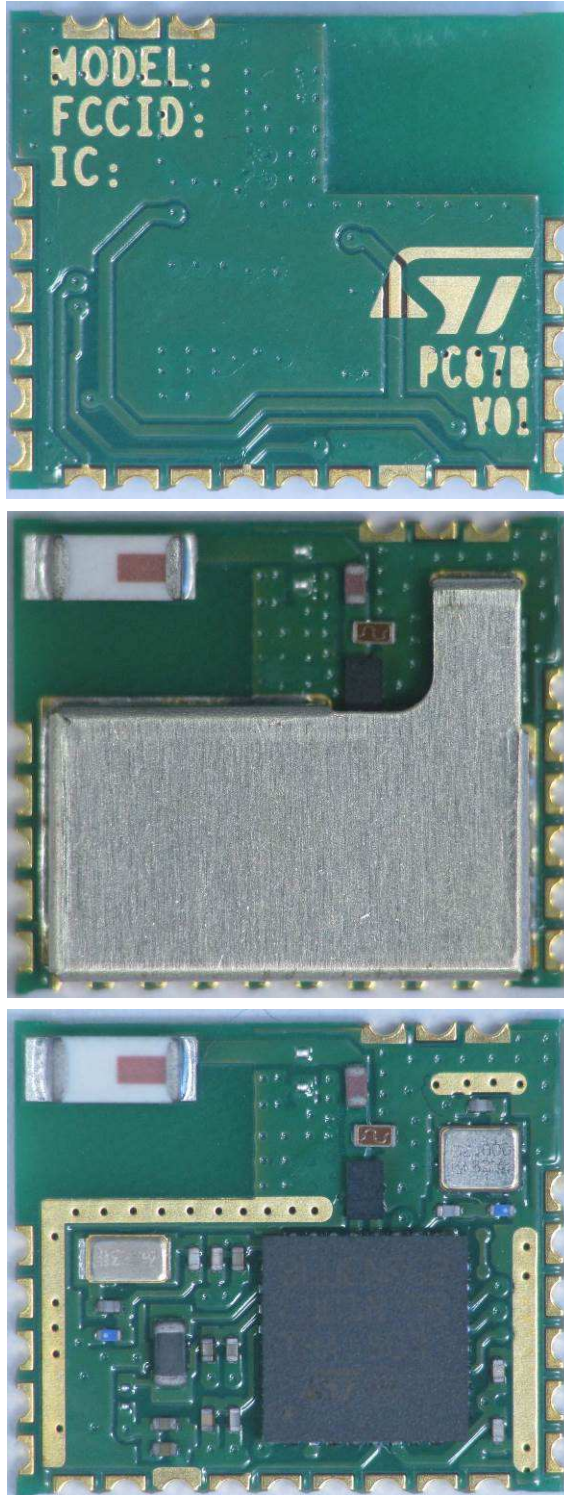
8. MEASUREMENT EQUIPMENT AND INSTRUMENTATION

RF ELECTROMAGNETIC FIELD (§ 6.1.1)			
Instrument	Manufacturer	Model	IMQ Ref.
Shielded anechoic chamber	SIDT	/	P-02386
RF generator	ROHDE & SCHWARZ	SMR20	S-03707
RF generator	ROHDE & SCHWARZ	SMG	S-00562
Log antenna	ARA	LPB-2513	S-02385
Horn antenna	SCHWARZBECK	BBHA 9120D	S-03463
RF amplifier	AMPLIFIER RESEARCH	100W1000M1A	S-02389
RF amplifier	AMPLIFIER RESEARCH	60S1G3	S-04261
RF amplifier	LOGIMETRICS	A340/S	S-03536
RF amplifier	LOGIMETRICS	A340/C	S-03537
Directional coupler	AMPLIFIER RESEARCH	DC6180	S-03509
Directional coupler	AMPLIFIER RESEARCH	DC7144A	S-04182
Directional coupler	AMPLIFIER RESEARCH	DC7350A	S-04957
Power sensor	ROHDE & SCHWARZ	NRP-Z91	S-04706
Power sensor	ROHDE & SCHWARZ	NRP-Z91	S-04707
Software	ROHDE & SCHWARZ	EMC 32 Vers. 8.53	W-00124-K1
PC	/	/	H-00098

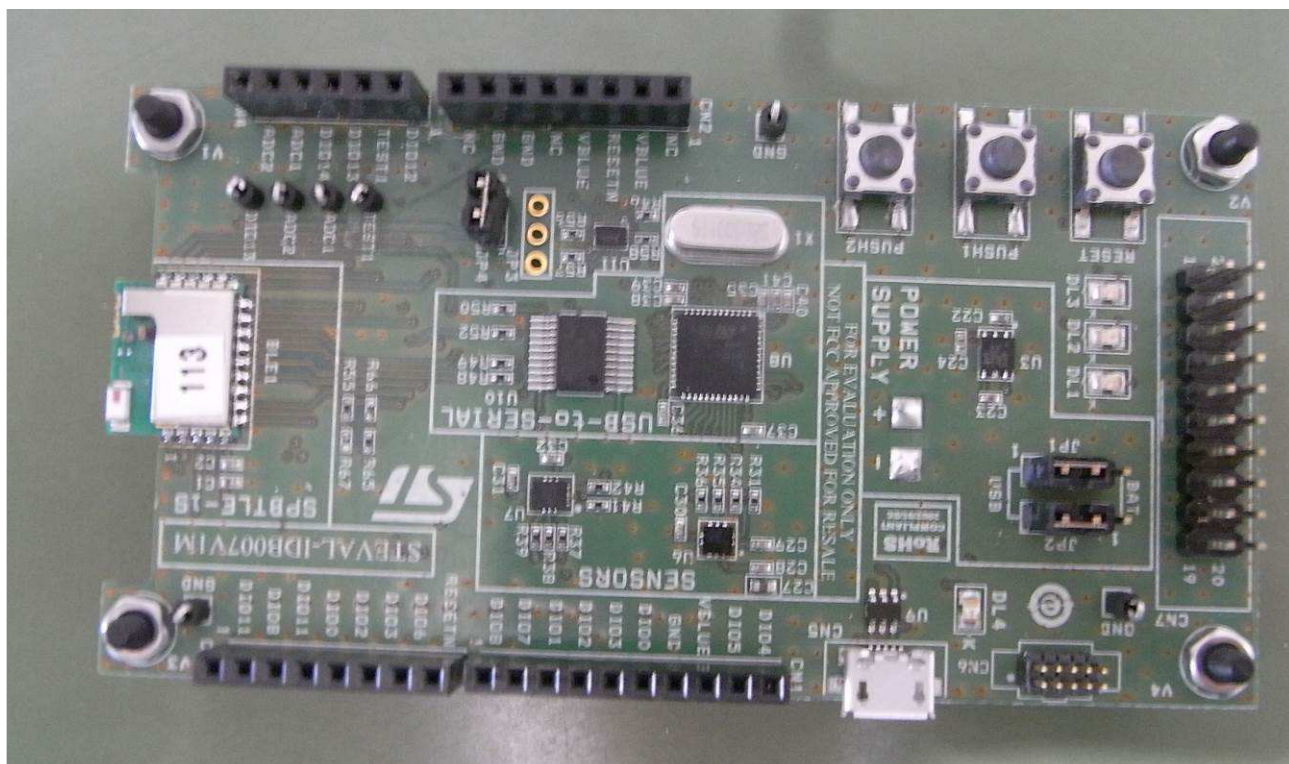
ELECTROSTATIC DISCHARGE (§ 6.1.2)			
Instrument	Manufacturer	Model	IMQ Ref.
ESD Generator	EM TEST	ESD NX30.1	S-07636

9. PHOTOGRAPHIC DOCUMENTATION

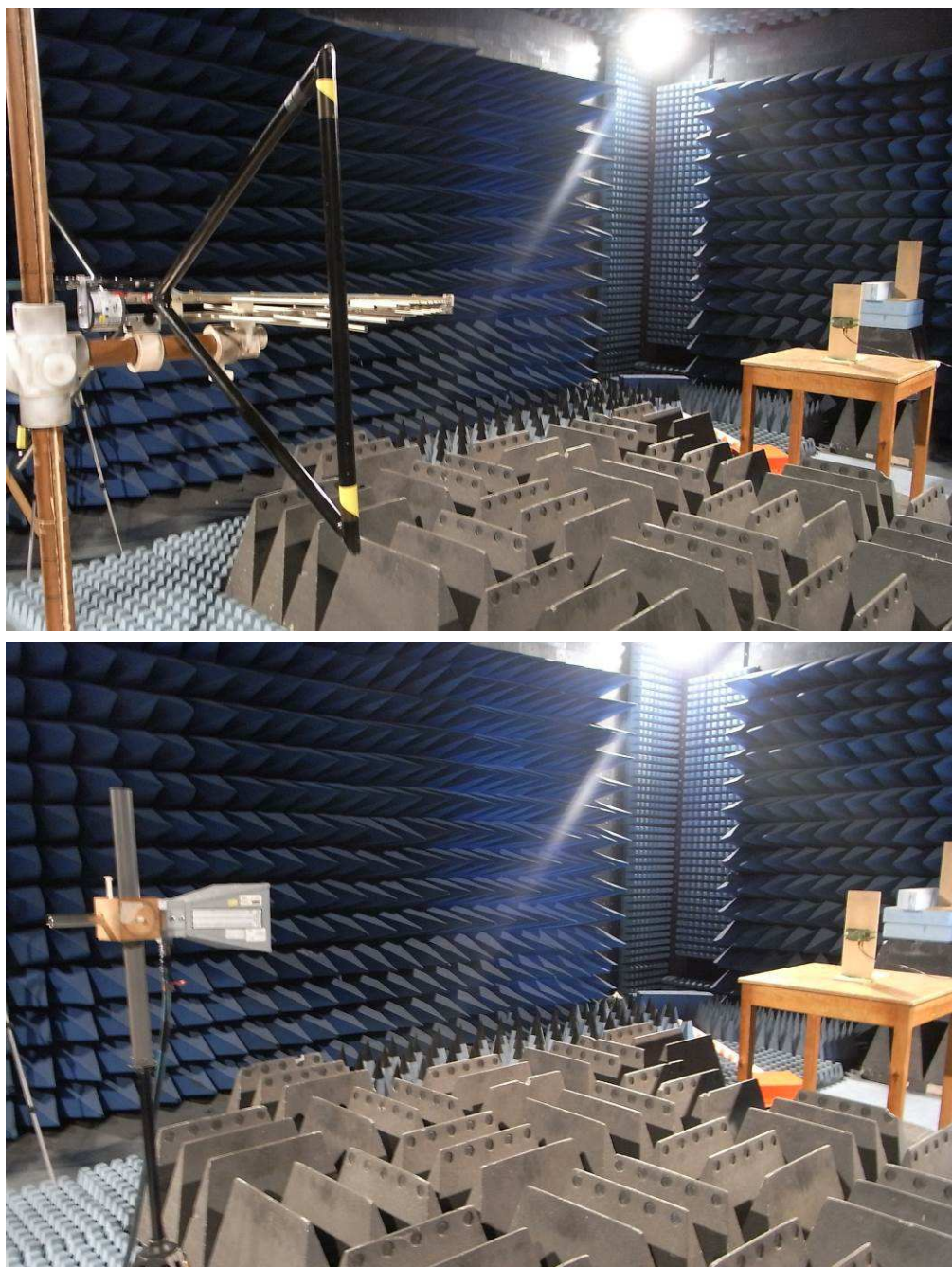
EUT IDENTIFICATION – External views



EVALUATION BOARD with radio module



SET-UP



END OF TEST REPORT