



IMQ S.p.A. – Società con Socio Unico  
Via Quintiliano, 43 I-20138 MILANO  
tel 0250731 – info@imq.it – www.imq.it

# TEST REPORT

## No. ARSO00177

performed in accordance with

FCC Rules: Code of Federal Regulations (CFR) no. 47  
Part 15 Subpart B Section 15.107 and 15.109

<b>PRODUCT</b>	Radio modules integrated in modular instrument
<b>MODEL(s) TESTED</b>	STa 6000
<b>TRADE MARK(s)</b>	ATLAS COPCO BLM

<b>APPLICANT</b>	ATLAS COPCO BLM S.r.l. ~ Via G. Pepe, 11 ~ I-20037 Paderno Dugnano (MI)
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Approved by	Roberto Colombo [ <i>Laboratory manager</i> ]	
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### Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2015-03-11	First edition Digital signed - ARSO00177_TR_FCC Part B_ATLAS COPCO_STA 6000.doc

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	2014-11-24	(item sent and sampling by applicant)
IMQ reference samples	BEM	75370
Samples tested No.	1	
Object under analysis recognition	<b>Not carried out</b> Except where stated, characteristics of products were taken from client description and were not verified by the laboratory	
TEST LOCATION		
Testing dates	2014-12-09 ÷ 2015-03-10	
Testing laboratory.	IMQ S.p.A. - Via Quintiliano, 43 – I-20138 Milano	
Testing site	IMQ S.p.A. - Via Quintiliano, 43 – I-20138 Milano	
ENVIRONMENTAL CONDITIONING		
Parameter	Measured	
Ambient Temperature	25 ÷ 35 °C	
Relative Humidity	50 ÷ 60 %	
Atmospheric Pressure	900 ÷ 1000 mbar	



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## 2. REFERENCE DOCUMENT

	DOCUMENT	DATE	TITLE
<input checked="" type="checkbox"/>	47 CFR Part 15	2008	Radio Frequency Device
<input checked="" type="checkbox"/>	ANSI C63.4	2009	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
<input checked="" type="checkbox"/>	ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices



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### 3. UNIT UNDER TEST (EUT) DETAILS

#### GENERAL DATA

MODEL (basic)	Description
STa 6000	Radio modules integrated in modular instrument
VARIANTS (derived)	Description

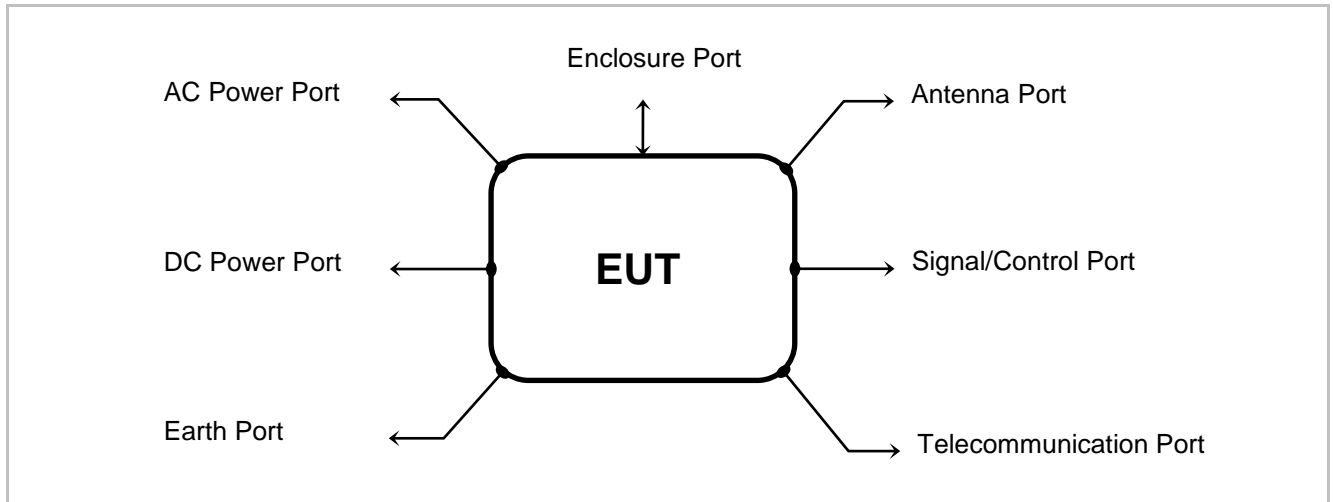
Contain module with FCC ID	PVH0946 for Bluetooth module PVH0941 for Wi-Fi module
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Manufacturer	ATLAS COPCO BLM S.r.l. ~ Via G. Pepe, 11 ~ I-20037 Paderno Dugnano (MI)
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Type of equipment	Modular instrument
Operating frequency:	/
Maximum RF radiated power:	/
Modulation:	/
Channel Spacing:	/
Antenna:	Integral
RX sensitivity:	/
Main SW identification	/
Main HW Board identification	/
Peripherals included (for system application)	/
Interfaces :	/
Integrated interfaces :	/
AC adapter:	/
Data cable	/
Telecom cable	/
Power supply type :	/
AC power input cable :	/
DC power input cable :	/

## 4. TEST CONFIGURATION OF UNIT UNDER TEST

### EUT PORTS



Port	Description	Max length
Enclosure	Plastic	/
AC power	6 V – 2.1 A by 1/N/PE 230 V 50Hz 6V 3A AC/DC adapter	/
DC power	/	/
Earth	/	/
Telecommunication	LAN	/
Signal	I/O input	/
Control	I/O input	/
Antenna	Dedicated	/

### STATE OF THE EUT DURING TESTS

Ref.	Mode	Description
#1	Operating	Normal operating with RF transmission



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## SUPPORT EQUIPMENT

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

Equipment	Manufacturer	Model
Dedicated radio interface for RF communication	ATLAS COPCO	IRC CONNECT

## ELECTROMAGNETICALLY RELEVANT COMPONENTS

Component	No.	Manufacturer	Model
QAT IRC-B Module	1	ATLAS COPCO	8059092010
Bluetooth radio module	1	u-blox	cB-0946 (cB-OBS421i)
QAT IRC-W Dual	1	ATLAS COPCO	8059092015
Wi-Fi radio module	1	u-blox	cB-0941 (OWL253i)
Mainboard	1	ATLAS COPCO	STa 6000

## RFI SUPPRESSION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

## EMI PROTECTION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

## EUT TECHNICAL DOCUMENTATION

Document	Reference
/	/



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## 5. METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4-2009, ANSI C63.10-2009 and Section 15.31 of CFR47 Part 15 – Subpart A (General).

Additional test requirements have been adopted according to the reference Section indicated in the § 6 of this test report.

### FREQUENCY RANGE INVESTIGATED

Conducted emission tests : from 150 kHz to 30 MHz.

Radiated emission tests: from 9 kHz to 1GHz



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## 6. SUMMARY OF TEST RESULTS

POSSIBLE TEST CASE VERDICTS:	
Test object does meet 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.

CFR47 Part 15	TITLE	RESULT
§ 15.107	Conducted emission	PASS
§ 15.109	Radiated disturbances	PASS





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## 7. TEST RESULTS

### 7.1 CONDUCTED EMISSION

#### TEST REQUIREMENT

Test setup	ANSI C63.4
Frequency range	150 kHz ÷ 30 MHz
IF bandwidth	9 kHz
EMC class	B
Limits	section 15.107
EUT operating condition	#1
Remark	None

#### TEST RESULT

The EUT meets the requirements of sections 15.107.

#### TEST PROCEDURE

- 1) The EUT was placed on a wooden table of size, 80 cm by 80 cm, raised 80 cm in which is located 40 cm away from the vertical wall the shielded room.
- 2) Each EUT power cord input cord was individually connected through a 50Ω/50μH LISN to the input power source.
- 3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
- 4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
- 5) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 10 kHz during the measurements.
- 6) The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are  $\geq$  (Q.P. limit - 6 dB).

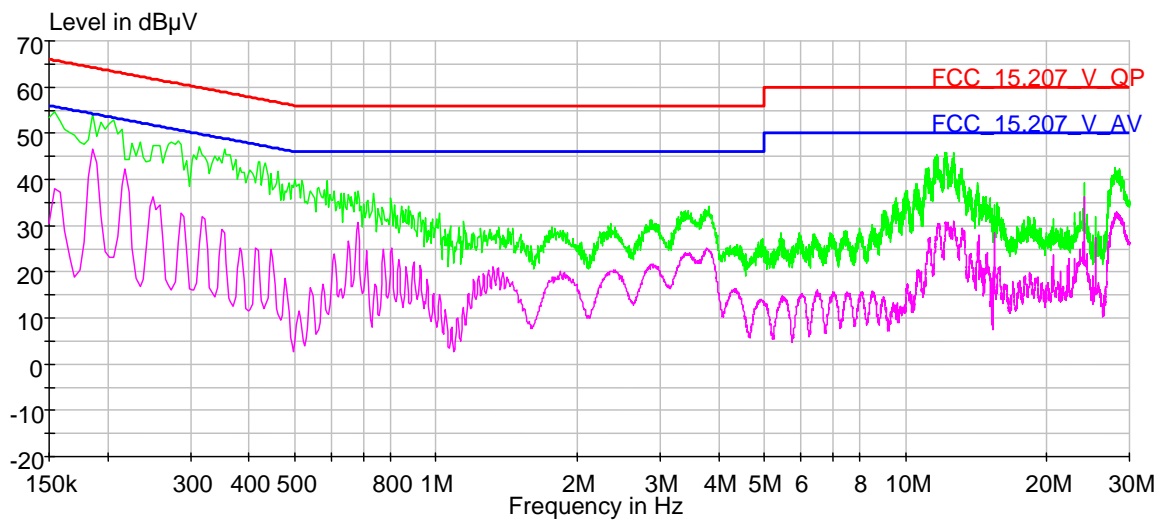


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## MEASUREMENTS RESULTS

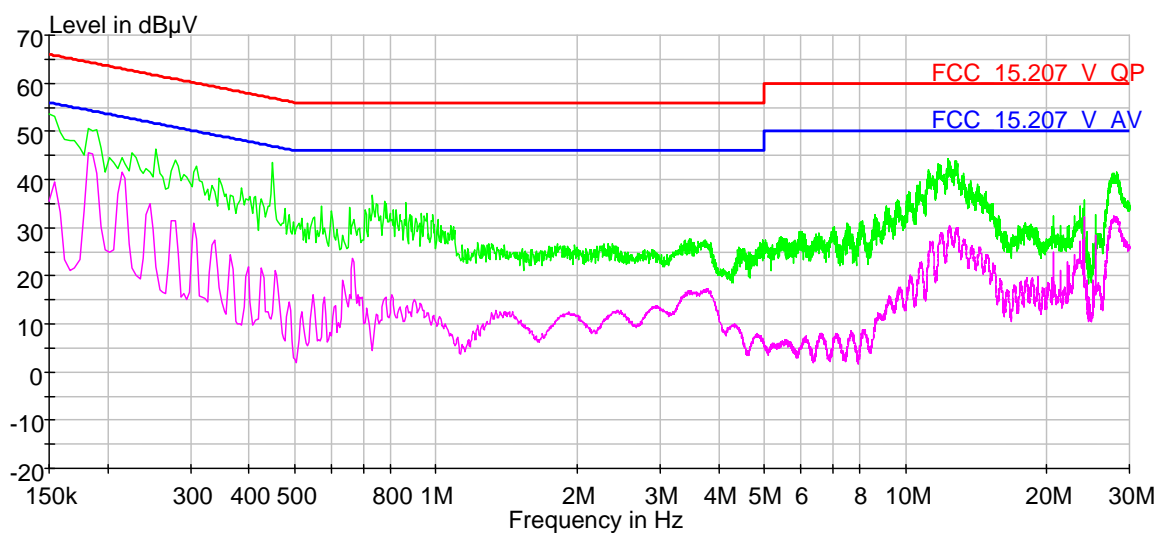
Port: AC MAINS POWER PORT OF AC/DC ADAPTER

Line: PHASE



Port: AC MAINS POWER PORT OF AC/DC ADAPTER

Line: NEUTRAL





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## 7.2 RADIATED DISTURBANCES

TEST REQUIREMENT	
Test setup	ANSI C63.4
Test facility	Semi-anechoic chamber
Test distance	3 meters
IF bandwidth (below 1,000 MHz)	120 kHz
Deviation to test procedure	None
Limits	sections 15.109
EUT operating condition	#1
Remark	(*) In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is: Extrapolation (dB) = $40\log(300\text{meter} / 3\text{meter}) = +80\text{db}$ Extrapolation (dB) = $40\log(30\text{meter} / 3\text{meter}) = +40\text{db}$

### TEST RESULT

The EUT meets the requirements of sections 15.109

LIMITS FOR SPURIOUS		
Band of operations	Limit $\mu\text{V/m}$	Limit $\text{dB}\mu\text{V/m}$
30÷88 MHz	100	40
88÷216 MHz	150	43,5
216÷960 MHz	200	46
Above 960MHz	500	54



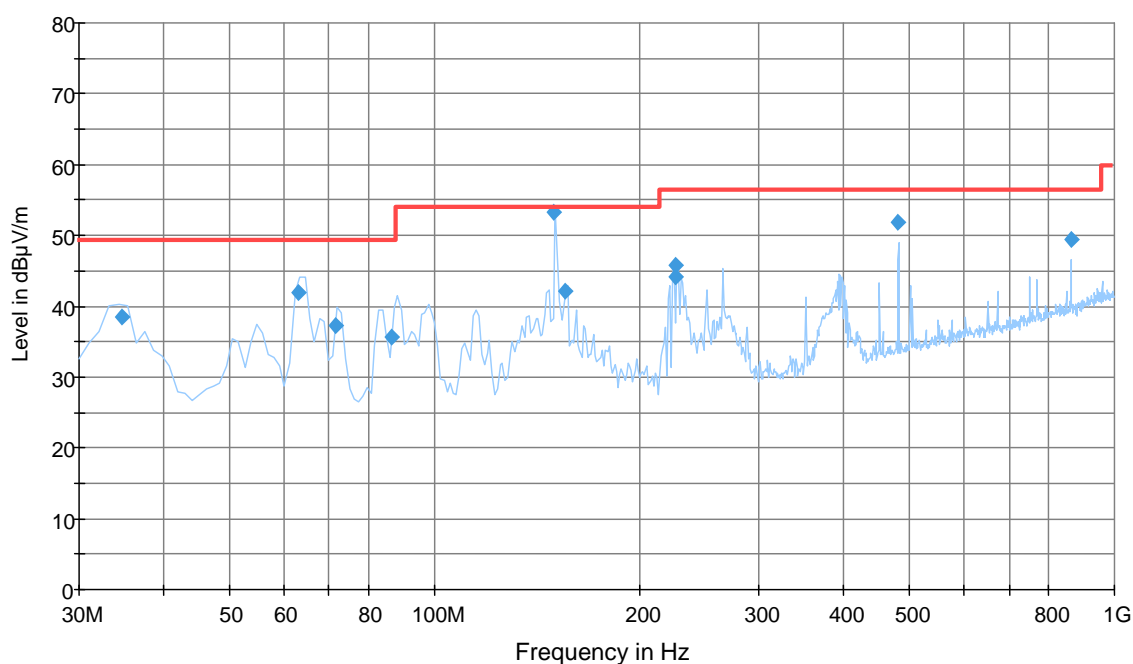
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## TEST PROCEDURE

- 1) The EUT was placed on turntable which is 0.8 m above the ground plane
- 2) The turntable shall rotate from 0° to 360° degrees to determine the position of maximum emission level.
- 3) The EUT is positioned 3 m away from the receiving antenna which varied from 1 to 4 m to find the highest emission.
- 4) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 100 kHz below 1000 MHz and 1 MHz above 1000 MHz.
- 5) The receiving antenna was positioned in both horizontal and vertical polarization.
- 6) The measurements with Quasi-Peak detector, below 1000 MHz are performed only for frequencies for which the Peak values are  $\geq$  (Q.P. limit – 6 dB).

## MEASUREMENTS RESULTS

Range: 30 ÷ 1000 MHz



Quasi-Peak measure ( " symbol)

Frequency	QuasiPeak	Margin	Limit
MHz	dBµV/m	dB	dBµV/m
34,631111	38,5	11,00	49,50
63,051111	42,0	7,50	49,50
71,713333	37,3	12,20	49,50
86,642222	35,6	13,90	49,50
149,951111	52,8	0,70	53,50
155,900000	42,1	11,40	53,50
225,877778	45,8	10,70	56,50
225,953333	44,1	12,40	56,50
479,948889	51,8	4,70	56,50
863,960000	49,4	7,10	56,50



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## 8. MEASUREMENTS AND TESTS UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the IMQ procedure No. IO-DT-U01 and requirement of NIST Technical Note 1297 and NIS 81: 1994 "The Treatment of Uncertainty in EMC Measurements"

Methods/Standard	Parameter	Expanded Uncertainty	Unit	Confidence level	Coverage Factor	Degree of freedom
Continuous disturbance	QP detector 9 – 150 kHz	2,47	dB	95%	2,00	25
	QP detector 150 k – 30 MHz	2,61	dB	95%	2,00	26
	QP detector using Voltage Probe	2,45	dB	95%	2,00	26
	QP detector using ISN	3,15	dB	95%	2,00	> 60
	QP detector using Current Probe	2,15	dB	95%	2,00	35
Radiated disturbance	QP detector (30 MHz - 100 MHz) H polarization	4,33	dB	95%	2,00	> 60
	QP detector (30 MHz - 100 MHz) V polarization	4,22	dB	95%	2,00	> 60
	QP detector (100 MHz - 200 MHz) H polarization	3,40	dB	95%	2,00	> 60
	QP detector (100 MHz - 200 MHz) V polarization	4,76	dB	95%	2,00	> 60
	QP detector (200 MHz - 1000 MHz) H polarization	3,91	dB	95%	2,00	> 60
	QP detector (200 MHz - 1000 MHz) V polarization	3,82	dB	95%	2,00	> 60
	P detector 1-6 GHz	4,77	dB	95%	2,00	> 60
	P detector 6 – 18 GHz	5,14	dB	95%	2,00	> 60



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## 9. LIST OF MEASURING EQUIPMENT AND CALIBRATION INFORMATION

IMQ Serial Number	Instrument	Manufacturer	Type	Last Cal.	Cal. Period.	Calibration Company
P01709	Shielded semi-anechoic chamber	SIDT	/	03-13	24	IMQ
P02486	Turntable controller unit	FRANKONIA	FCTAM01	/	/	/
S03629 B	Spectrum Analyzer	Rohde & Schwarz	FSP40	02-15	12	I.N.R.I.M.
S05563	EMI Receiver	ROHDE & SCHWARZ	ESCI 7	09-14	12	I.N.R.I.M.
S05562	EMI Receiver	Rohde & Schwarz	ESU 8	05-14	12	Rohde & Schwarz
P02488	Mast antenna	FRANKONIA	FAM4	/	/	/
S06463	Bilog Antenna	Schwarzbeck	VULB9160	03-13	36	NPL
S03463 B	Horn Antenna	SCHWARZBECK	BBHA 9120D	12-14	24	NPL
S03542 B	Preamplifier	Hewlett Packard	HP 8449B	06-13	24	IMQ
S03631 M	LISN	ROHDE & SCHWARZ	ENV216	02-15	12	I.N.R.I.M.
W-00199/E	Software	ROHDE & SCHWARZ	EMC32 Ver. 8.30	/	/	/
H-00165	PC		/	/	/	/

**Note:** The IMQ instruments are tested and calibrated according to UNI EN 45001, the IMQ procedure IP-037 "Calibration test equipment and measurement" and according to plans set on IMQ operating instruction IO-FT-034 "Criteria for the calibration of test equipment and measurement" which are an integral part of the Quality Manual of IMQ.

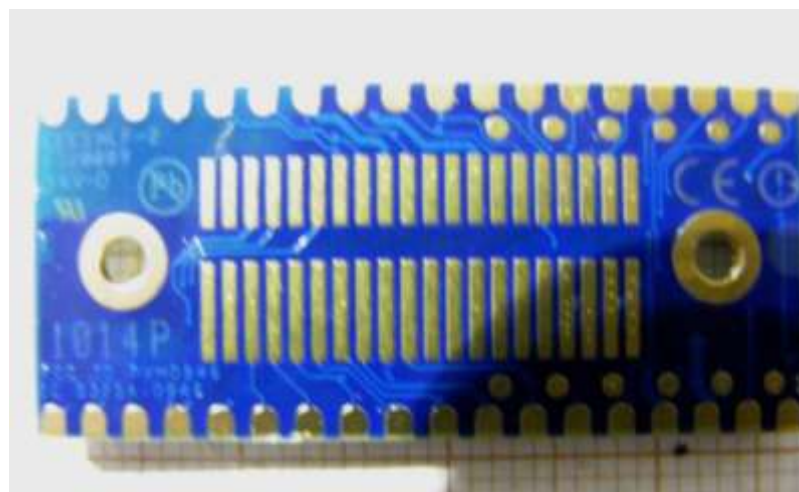
## 10. PHOTOGRAPHIC DOCUMENTATION

### UUT IDENTIFICATION

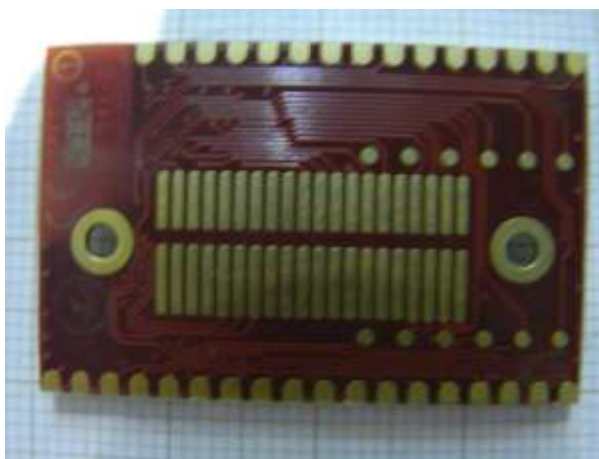
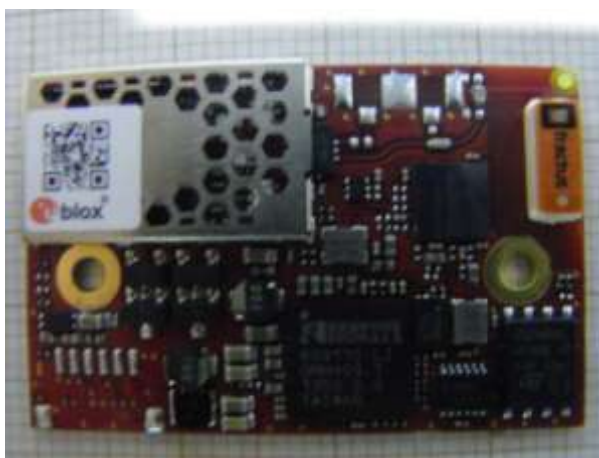




## EUT IDENTIFICATION – Internal view Bluetooth radio module

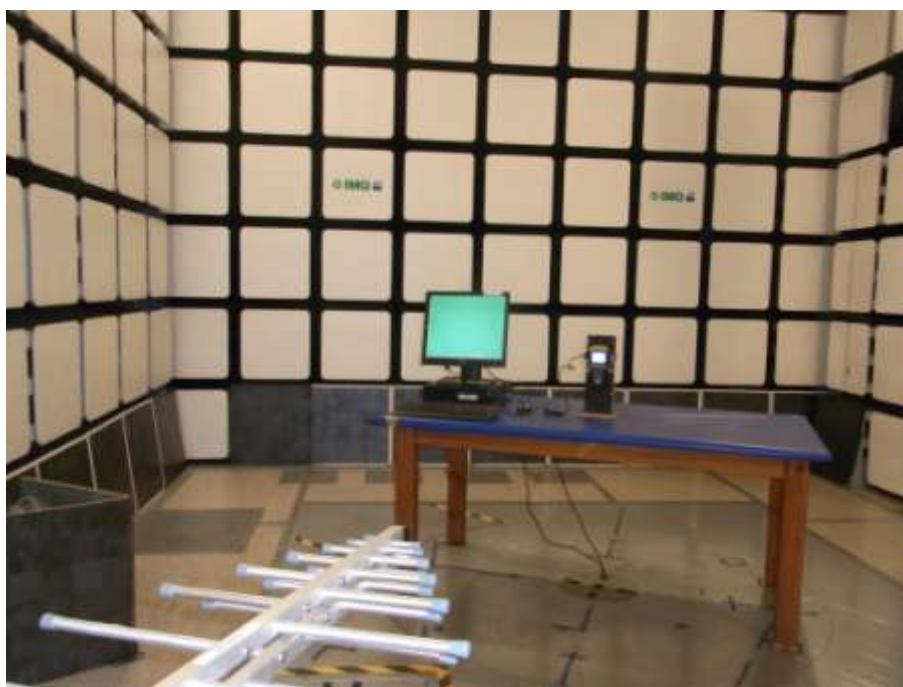


## EUT IDENTIFICATION – Internal view Wi-Fi radio module



## SET-UP

### Test set-up radiated emission test







**END OF REPORT**