TELECOMMUNICATIONS & TELEMATICS FOR TRANSPORTS LABORATORY

Telecommunications & Telematics for Transports Lab.

TEST REPORT

Ref. No. ARSK00076/r

Date: 2010-04-15

Measurements performed in accordance with:

EN 300 220-2 V2.1.2 (2007-06): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive"

PRODUCT	:	**RADIOCONTROL**
TESTED MODEL	:	**DUAL BAND**
MANUFACTURER	:	**MICRO DEVICE S.r.l. – Via Bellini, 31/33 –I- 20095 Cusano Milanino (MI)**
APPLICANT / ASSEMBLY PLANT	:	**MICRO DEVICE S.r.l. – Via Bellini, 31/33 –I- 20095 Cusano Milanino (MI)**
TRADEMARK	:	**MICRO DEVICE; YACHT CONTROLLER**
RATING	:	**TX: 3 x 1,5 V Alkaline battery; RX: DC 12÷24 V**
OTHER INFORMATION	:	Sample received on : 2010-03-31 (sample sent by applicant)
		No. of B.E.M. (IMQ ref.) : 53669 & 53784
		Testing dates : 2010-03-31÷2010-04-14
		Samples tested No. : 1
		Testing Laboratory : IMQ S.p.A. Via Quintiliano, 43 – I-20138 Milano
		Testing site : Viale Lombardia, 20 – I-20021 Bollate

Tested by :	R. Radice	Signature:	Roberto Radice	Date :	2010-04-15
Checked by:	R. Colombo (Lab. deputy)	Signature:	Roberto Colombo	Date :	2010-04-15

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2010-04-15	First Edition

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CONTENTS

1 TEST SPECIFICATIONS, METHODS & PROCEDURES 3
1.1 EUT CLASSIFICATION 4
1.1.1 TRANSMITTER POWER CLASS 4
1.1.2 RECEIVER CLASS 4
1.2 RADIO TEST SUITES 5
1.3 ENVIRONMENTAL CONDITIONS 6
1.4 TEST CONDITIONS 7
1.4.1 NORMAL TEST CONDITIONS 7
1.4.2 EXTREME TEST CONDITION 7

2 SUMMARY OF TEST RESULTS 8

3 EQUIPMENT UNDER TEST DETAILS 10
3.1 EUT IDENTIFICATION 10
3.2 RADIO MODULE TECHNICAL DATA 11
3.3 FLOW CHART 13
3.4 AUXILIARY EQUIPMENT 14
3.5 TESTED SAMPLES 14

4 RADIO SUITES TEST DATA 15

5 ADDITIONAL TECHNICAL INFORMATION 33
5.1 ELECTROMAGNETICALLY RELEVANT COMPONENTS: 33
5.2 RFI SUPPRESSION DEVICES: 33
5.3 EMI PROTECTION DEVICES: 33

6 TECHNICAL DOCUMENTATION 34

7 PHOTOGRAPHIC DOCUMENTATION 35
7.1 EUT IDENTIFICATION 35

8 MEASUREMENT AND TEST EQUIPMENT INSTRUMENTATION 36

1 TEST SPECIFICATIONS, METHODS & PROCEDURES

According to: **EN 300 220-2** V2.1.2 (2007-06): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive"

The standard **EN 300 220-2** V2.1.2 (2007-06) makes reference to **EN 300 220-1** V2.1.1 (2006-04) "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Technical characteristics and test methods".

1.1 EUT CLASSIFICATION

1.1.1 Transmitter Power class

In acc. to par. 8.2.3 of EN 300 220-1 Table 7, the radio equipment covered by this document is divided into several power classes based on maximum output power, as shown in the following table:

Power Class	Power level (conducted or radiated) mW
5a	0.025
7a	5
8	10
9	25
11	100
12	500

1.1.2 Receiver class

In acc. to par. 4.1.1 of EN 300 220-1 Table 2, the receiver used in short range devices are divided into three classes, as shown in the following table:

Receiver Class	Risk assessment of receiver performance
1	Safety critical SRD communication media
2	Functional critical SRD communication media
3	Non-critical SRD communication media

1.2 RADIO TEST SUITES

No.	Ref.	Title
		TRANSMITTER
1	8.1	Frequency error or frequency drift
2	8.2	Carrier Power (Conducted)
3	8.3	Effective radiated power
4	8.4	Spread spectrum modulation
5	8.5	Transient Power
6	8.6	Adjacent channel power
7	8.7	Modulation bandwidth for wide band equipment
8	8.8	Spurious emissions
9	8.9	Frequency stability under low-voltage condition
10	8.10	Duty cycle
11	8.11	Principle for Listen Before Talk (LBT)

No.	Ref.	Title
		RECEIVER
1	9.1	Maximum usable sensitivity (conducted)
2	9.2	Receiver LBT threshold and transmitter max on-time
3	9.3	Adjacent channel selectivity
4	9.4	Blocking or desensitization
5	9.5	Intermodulation response rejection
6	9.6	Spurious response rejection
7	9.7	Receiver Spurious radiations

1.3 ENVIRONMENTAL CONDITIONS

NORMAL TEST CONDITIONS	MEASURED
Ambient Temperature	15 ÷ 35 °C
Relative Humidity	20 ÷ 75 %
Atmospheric Pressure	900 ÷ 1000 mbar

1.4 TEST CONDITIONS

In acc. to par. 5.1 of ETSI EN 300 220-1, testing shall be performed under normal test conditions, and also, where stated, under extreme test conditions.

1.4.1 Normal test conditions

The normal test conditions are shown in the following table:

TEST CONDITIONS	PARAMETER	MEASURED
Normal temperature and humidity	Temperature	+15 °C to 35 °C
	Relative Humidity	20 % to 75 %
Normal test power source	Mains voltage	Nominal mains voltage
	Regulated lead-acid battery power sources	1.1× V_{nom} (battery)
	Other power sources	Declared by manufacturer

1.4.2 Extreme test condition

The extreme test conditions are shown in the following table:

TEST CONDITIONS	PARAMETER	MEASURED
Extreme temperature ranges	Category I (General)	-20 °C to +55 °C
	Category II (Portable Equipment)	-10 °C to +55°C
	Category III (Equipment for normal indoor use)	+5 °C to +35°C
Extreme test source voltages	Mains voltage	Nominal ± 10 %
	Regulated lead-acid battery power sources	1.3 × V_{nom} (battery) 0.90 × V_{nom} (battery)
	Float charge gel-cell battery	1.15 × V_{nom} (battery) 0.85 × V_{nom} (battery)
	Leclanché or lithium battery	1.00 × V_{nom} (battery) 0.85 × V_{nom} (battery
	Nickel-cadmium battery	1.00 × V_{nom} (battery) 0.90 × V_{nom} (battery
	Other types of battery: Lower declared by manufacturer	
	Other power sources: See par. 5.4.2.4 of ETSI EN 300 220-1	

2 SUMMARY OF TEST RESULTS

No.	Ref.	Title	Method	Result
		TRANSMITTER		
1	8.1	Frequency error	Radiated	Complies
---	8.2	Carrier power (conducted)	Not performed[1]	
2	8.3	Effective radiated power	Radiated	Complies
---	8.4	Spread spectrum modulation	Not performed	
3	8.5	Transient Power	Radiated	Complies
---	8.6	Adjacent channel power	Not performed	
4	8.7	Modulation bandwidth for wide band equipment	Radiated	Complies
5	8.8	Spurious emissions	Radiated	Complies
6	8.9	Frequency stability under low-voltage condition	Radiated	Complies
7	8.10	Duty cycle	Radiated	Complies
---	8.11	Principle for Listen Before Talk (LBT)	Not performed	

[1] Applicable only equipment with an external antenna connector and supplied with a dedicate antenna

No.	Ref.	Title	Method	Result
		RECEIVER		
---	9.1	Maximum usable sensitivity (conducted)	Not performed[2]	
---	9.2	Receiver LBT threshold and transmitter max on-time	Not performed[3]	
---	9.3	Adjacent channel selectivity	Not performed[2]	
8	9.4	Blocking or desensitization	Conducted	Complies
---	9.5	Intermodulation response rejection	Not performed[2]	
---	9.6	Spurious response rejection	Not performed[2]	
9	9.7	Receiver Spurious radiations	Radiated	Complies

[2] This requirement apply only to class 1 canalized receivers

[3] The measurements apply to a transceiver that facilitates a receiver with a LBT protocol.

3 EQUIPMENT UNDER TEST DETAILS

3.1 EUT IDENTIFICATION

The EUT is composed by the following modules	:	Radiocontrol, composed by: • Portable unit, with internal Radio transmitter module AUR.EL at 433,92 MHz mod. TX-4M10HA & transmitter module AUR.EL at 868,30 MHz mod. TX-8LAVSA05 ▪ Fixed unit, with internal Radio receiver module AUR.EL at 433,92 MHz RX-AM4SF & receiver module AUR.EL at 868,30 MHz mod. RX-AM8SF
Transmitter power class	:	▪ 8 (max. 10mW) for 433,92 MHz ▪ 9 (max. 25mW) for 868,30 MHz
Receiver class	:	▪ 2; Function critical SRD communication media; i.e. when a failure to operate correctly causes loss of function but does not constitute a safety hazard.
EUT type (Cab radio, general purpose radio, operational radio)	:	▪ General purpose radio
EUT classification (fixed / vehicular use / portable use)	:	▪ Nautical use
Power Supply	:	▪ TX unit: alkaline battery 3 x 1,5 V ▪ RX unit: 12÷24 V
Consumption	:	▪ TX unit: 45mA in transmission ▪ RX unit: max 2W
EUT single or system	:	▪ System
EUT standing	:	▪ TX unit: portable ▪ RX unit: on yacht
Dimension of EUT (W x H x D):	:	▪ TX unit: 70 x 123 x 43 mm. ▪ RX unit: 175 x 170 x 130 mm.

3.2 RADIO MODULE TECHNICAL DATA

433,92 MHz TRANSMITTER Parameters	Value
Supply Voltage :	▪ 2,5÷3,3 V (typ. 3 V)
Consumption :	▪ Max. 25mA
Modulation type :	▪ OOK
Number of channels :	▪ Wideband
Operating frequency :	▪ 433,92 MHz
Assigned frequency band :	▪ 433,05÷434,79 MHz
Power :	▪ < 10 mW
Antenna :	▪ Integrated helical Antenna
Extreme operating conditions :	▪ Declared -20°÷+80℃

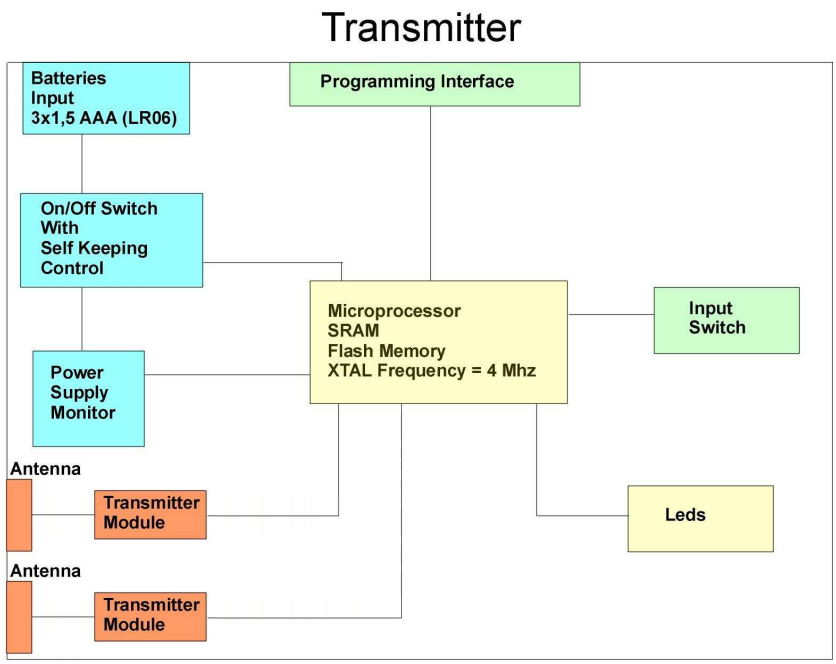
433,92 MHz RECEIVER Parameters	Value
Supply Voltage :	▪ 4,75÷5,25 V (typ. 5 V)
Number of RF channels :	▪ Wideband
Receiving frequency :	▪ 433,92 MHz
Assigned frequency band :	▪ 433,05÷434,79 MHz
Sensitivity :	▪ Declared -109 dBm
Antenna :	▪ Integrated Antenna (wire < 17cm.)
Extreme operating conditions :	▪ Declared -20°÷+80℃

868,30 MHz TRANSMITTER Parameters	Value
Supply Voltage :	▪ 2,7÷5 V (typ. 3 V)
Consumption :	▪ Max. 50mA (at 5V)
Modulation type :	▪ OOK
Number of channels :	▪ Wideband
Operating frequency :	▪ 868,30 MHz
Assigned frequency band :	▪ 868,00÷868,60 MHz
Power :	▪ < 25 mW
Antenna :	▪ Integrated Antenna wire < 10cm.
Extreme operating conditions :	▪ Declared -20°÷+80℃

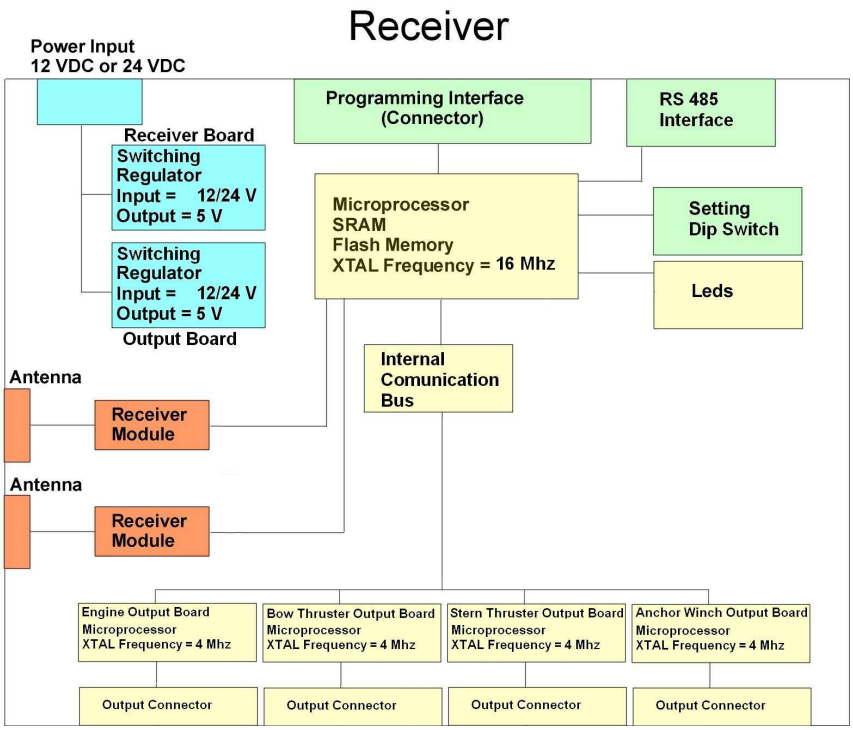
868,30 MHz RECEIVER Parameters	Value
Supply Voltage :	▪ 4,5÷5,5 V (typ. 5 V)
Number of RF channels :	▪ Wideband
Receiving frequency :	▪ 868,30 MHz
Assigned frequency band :	▪ 868,00÷868,60 MHz
Sensitivity :	▪ Declared -108 dBm
Antenna :	▪ Integrated Antenna (wire < 17cm.)
Extreme operating conditions :	▪ Declared -20°÷+80℃

3.3 FLOW CHART

TRANSMITTER UNIT



RECEIVER UNIT



3.4 AUXILIARY EQUIPMENT

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

- None

3.5 TESTED SAMPLES

SAMPLE Nr.	S/N
1	/

4 RADIO SUITES TEST DATA

TEST No. 1	Title “ Frequency error or frequency drift”		Ref. standard EN 300 220-2 V2.1.2 (2007-06) § 4.2.1.1
TEST REQUIREMENTS	TEST PROCEDURE	Sub-clause 8.1 of EN 300 220-1 V2.1.1 (2006-04)	
	TEST METHOD	☒ Radiated ☐ Conducted	
	TEST CONDITIONS	☒ Normal ☒ Extreme	(sub clause 5.3) (sub clause 5.4)
	EQUIPMENT CATEGORY	☐ Narrowband ☒ Wideband	
	RBW	1 kHz	
	FREQUENCY ERROR LIMIT	☐ Narrowband: Table 6a of EN 300 220-1 ☒ Wideband (>200kHz) : ±100ppm	
	MODULATION	OFF	
	V MIN. & V. MAX	3,825 V & 4,5 V	
	NOTES	---	

RESULT

Test conditions 433,92 MHz			Measured frequency (MHz)	Frequency drift (kHz) (limit: 43,3 kHz)
T_{nom}	25℃	V_{nom} 4,5 (V)	433,919200	
T_{min}	-10℃	V_{min} 3,825 (V)	433,931198	11,998
		V_{max} 4,5 (V)	433,933570	14,370
T_{max}	+55℃	V_{min} 3,825 (V)	433,884870	34,330
		V_{max} 4,5 (V)	433,885270	33,930
Measurement uncertainty			$< \pm 1 \cdot 10^{-7}$	

Test conditions 868,30 MHz			Measured frequency (MHz)	Frequency drift (kHz) (limit: 86,8 kHz)
T_{nom}	25℃	V_{nom} 4,5 (V)	868,351900	
T_{min}	-10℃	V_{min} 3,825 (V)	868,310380	41,520
		V_{max} 4,5 (V)	868,310350	41,550
T_{max}	+55℃	V_{min} 3,825 (V)	868,327640	24,260
		V_{max} 4,5 (V)	868,326850	25,050
Measurement uncertainty			$< \pm 1 \cdot 10^{-7}$	

TEST No. 2	Title “ Effective radiated power (erp) ”		Ref. standard EN 300 220-2 V2.1.2 (2007-06) § 4.2.1.3
TEST REQUIREMENTS	TEST PROCEDURE	Sub-clause 8.3 of EN 300 220-1 V2.1.1 (2006-04)	
	TEST METHOD	☒ Radiated ☐ Conducted	
	TEST CONDITIONS	☒ Normal (sub clause 5.3) ☐ Extreme (sub clause 5.4)	
	RBW	100 kHz	
	LIMITS	10 dBm (10 mW) for 433,92 MHz (sub clause 8.3.3) 14 dBm (25 mW) for 868,30 MHz (sub clause 8.3.3)	
	MODULATION	ON	
	NOTES	---	

Modification during the test:

- None

RESULT

Test conditions 433,92 MHz				Measured power	
				MEAS (dBm)	ERP (mW)
T_{nom}	25℃	V_{nom}	4,5 (V)	-7,92	0,161
Measurement uncertainty				< ± 1.5 dB	

Test conditions 868,30 MHz				Measured power	
				MEAS (dBm)	ERP (mW)
T_{nom}	25℃	V_{nom}	4,5 (V)	-5,06	0,311
Measurement uncertainty				< ± 1.5 dB	

TEST No. 3	Title “ Transient Power ”		Ref. standard EN 300 220-2 V2.1.2 (2007-06) § 4.2.1.4
TEST REQUIREMENTS	TEST PROCEDURE	Sub-clause 8.5 of EN 300 220-1 V2.1.1 (2006-04)	
	TEST METHOD	☒ Radiated ☐ Conducted	
	TEST CONDITIONS	☒ Normal ☐ Extreme	(sub clause 5.3) (sub clause 5.4)
	RBW	8,5 kHz	
	VBW	30 kHz	
	LIMITS	For alternate channel: 40dB below the power of the transmitter For measurements at 4 and 10 times the channel spacing: 50dB below the power of the transmitter	
	MODULATION	ON	
	NOTES	---	

Test conditions **433,92 MHz** V_{nom}: 4,5 (V) T_{nom}: 25℃		Level meas. respect to 0 dBc (dB)	Limit (dB)
Test frequency (MHz)			
operating frequency + (2 x sub-band)	437,40	-68,59	-40
operating frequency – (2 x sub-band)	430,44	-78,55	-40
operating frequency + (4 x sub-band)	440,88	-75,46	-50
operating frequency – (4 x sub-band)	426,96	-80,12	-50
operating frequency + (10 x sub-band)	451,32	-78,98	-50
operating frequency – (10 x sub-band)	416,52	-82,66	-50
Measurement uncertainty		< ± 1.5 dB	

Test conditions **868,30 MHz** V_{nom}: 4,5 (V) T_{nom}: 25℃		Level meas. respect to 0 dBc (dB)	Limit (dB)
Test frequency (MHz)			
operating frequency + (2 x sub-band)	869,50	-71,86	-40
operating frequency – (2 x sub-band)	867,10	-72,09	-40
operating frequency + (4 x sub-band)	870,70	-75,55	-50
operating frequency – (4 x sub-band)	865,90	-75,29	-50
operating frequency + (10 x sub-band)	874,30	-78,81	-50
operating frequency – (10 x sub-band)	862,30	-78,45	-50
Measurement uncertainty		< ± 1.5 dB	

TEST No. 4	Title "Modulation bandwidth for wide band equipment (>200 kHz) "		Ref. standard EN 300 220-2 V2.1.2 (2007-06) § 4.2.1.6
TEST REQUIREMENTS	TEST PROCEDURE	Sub-clause 8.7 of EN 300 220-1 V2.1.1 (2006-04)	
	TEST METHOD	☒ Radiated ☐ Conducted	
	TEST CONDITIONS	☒ Normal ☒ Extreme	(sub clause 5.3) (sub clause 5.4)
	RBW	1 kHz	
	LIMITS	Assigned frequency band 433,05 MHz ÷ 434,79 MHz (sub clause 8.7.3) 868,00 MHz ÷ 868,60 MHz (sub clause 8.7.3)	
	MODULATION	ON	
	V MIN. & V. MAX	3,825V. & 4,5V.	
	NOTES	---	

Modification during the test:

- none

RESULT

Test conditions 433,92 MHz			Measured frequency (MHz)	
T_{nom}	25℃	V_{nom} 4,5 (V)	433,837	433,929
T_{min}	-10℃	V_{min} 3,825 (V)	433,908	433,945
		V_{max} 4,5 (V)	433,917	433,947
T_{max}	+55℃	V_{min} 3,825 (V)	433,878	433,909
		V_{max} 4,5 (V)	433,878	433,907
Measurement uncertainty			$< \pm 1 \cdot 10^{-7}$	

Test conditions 868,30 MHz			Measured frequency (MHz)	
T_{nom}	25℃	V_{nom} 4,5 (V)	868,309	868,367
T_{min}	-10℃	V_{min} 3,825 (V)	868,271	868,329
		V_{max} 4,5 (V)	868,248	868,329
T_{max}	+55℃	V_{min} 3,825 (V)	868,290	868,351
		V_{max} 4,5 (V)	868,292	868,351
Measurement uncertainty			$< \pm 1 \cdot 10^{-7}$	

TEST No. 5	Title “ Spurious emissions ”		Ref. standard EN 300 220-2 V2.1.2 (2007-06) § 4.2.1.7
TEST REQUIREMENTS	TEST PROCEDURE	Sub-clause 8.8 of EN 300 220-1 V2.1.1 (2006-04)	
	TEST METHOD	☐ Conducted ☒ Radiated	
	TEST CONDITIONS	☒ Normal (sub clause 5.3) ☐ Extreme (sub clause 5.4)	
	RBW	100 kHz (<1000 MHz); 1 MHz (>1000 MHz)	
	LIMITS	Tables 12 (sub clause 8.8.5)	
	MODULATION	OFF	
	NOTES	---	

Modification during the test:

- none

TRANSMITTER STATE: OPERATING (433,92 MHz)

Radiated Spurious emission level					
Frequency (MHz)	**Bandwidth (MHz)**	**Level (dBm)**	**Level (nW)**	**Limit (nW)**	**Result**
867,769	0,1	-45,70	26,91	250	COMPLY
1301,05	1	-36,64	216,77	1000	COMPLY
1735,68	1	-51,41	7,22	1000	COMPLY
2169,38	1	-50,36	9,20	1000	COMPLY
2603,24	1	-46,73	21,23	1000	COMPLY
3037,34	1	-47,06	19,68	1000	COMPLY
3471,36	1	-41,32	73,79	1000	COMPLY
3904,96	1	-51,37	7,29	1000	COMPLY
Measurement Uncertainty		± 4.5 dB			

TRANSMITTER STATE: STAND-BY

There were no emissions found above system measuring level (at least 10 dB below the limit).

TRANSMITTER STATE: OPERATING (868,30 MHz)

Radiated Spurious emission level					
Frequency (MHz)	**Bandwidth (MHz)**	**Level (dBm)**	**Level (nW)**	**Limit (nW)**	**Result**
1736,60	1	-46,95	20,18	1000	COMPLY
2604,90	1	-50,67	8,57	1000	COMPLY
3473,20	1	-48,26	14,92	1000	COMPLY
4341,52	1	-54,74	3,35	1000	COMPLY
5209,80	1	-49,03	12,50	1000	COMPLY
6078,10	1	-49,92	10,18	1000	COMPLY
6946,40	1	-54,80	3,31	1000	COMPLY
7814,70	1	<-55	<3,16	1000	COMPLY
8683,00	1	<-55	<3,16	1000	COMPLY
9551,30	1	<-55	<3,16	1000	COMPLY
10419,6	1	<-55	<3,16	1000	COMPLY
11287,8	1	<-55	<3,16	1000	COMPLY
12156,2	1	<-55	<3,16	1000	COMPLY
Measurement Uncertainty		± 4.5 dB			

TRANSMITTER STATE: STAND-BY

There were no emissions found above system measuring level (at least 10 dB below the limit).

TEST No. 6	Title “ Frequency stability under low voltage condition ”		Ref. standard EN 300 220-2 V2.1.2 (2007-06) § 4.2.1.8
TEST REQUIREMENTS	TEST PROCEDURE	Sub-clause 8.9 of EN 300 220-1 V2.1.1 (2006-04)	
	TEST METHOD	☒ Radiated ☐ Conducted	
	TEST CONDITIONS	☒ Normal ☐ Extreme	(sub clause 5.3) (sub clause 5.4)
	RBW	100 kHz	
	LIMITS	Assigned frequency band 433,05 MHz ÷ 434,79 MHz (sub clause 8.9.3) 868,00 MHz ÷ 868,60 MHz (sub clause 8.9.3)	
	MODULATION	ON	
	NOTES	---	

Modification during the test:

- none

RESULT

Voltage conditions	Frequency (MHz)	Level (dBc)
4,5 V	433,919	0
3,82 V	433,919	-0,08
3,5 V**	433,923	-0,13
3,2 V	433,934	-1,81
3,0 V	433,941	-3,34
2,8 V	433,951	-5,09
2,6 V	433,960	-7,26
2,51 V	433,955	-12,24
2,5 V	The equipment ceases to function	

: at this voltage, the equipment turn on the red led "battery low"

Voltage conditions	Frequency (MHz)	Level (dBc)
4,5 V	868,351	0
3,82 V	868,351	-0,07
3,5 V**	868,351	+0,11
3,2 V	868,349	-1,20
3,0 V	868,347	-2,25
2,8 V	868,345	-3,52
2,6 V	868,340	-6,39
2,51 V	868,335	-10,91
2,5 V	The equipment ceases to function	

: at this voltage, the equipment turn on the red led "battery low"

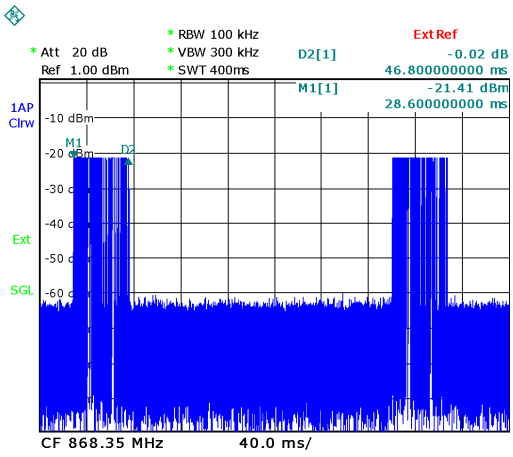
TEST No. 7	Title " Duty Cycle "		Ref. standard EN 300 220-2 V2.1.2 (2007-06) § 4.2.1.9
TEST REQUIREMENTS	TEST PROCEDURE	Sub-clause 8.10 of EN 300 220-1 V2.1.1 (2006-04)	
	TEST METHOD	☒ Radiated ☐ Conducted	
	TEST CONDITIONS	☒ Normal ☐ Extreme	(sub clause 5.3) (sub clause 5.4)
	RBW	------	
	LIMITS	< 10% (for band 433,05 MHz ÷ 434,79 MHz) < 1% (for band 868,00 MHz ÷ 868,60 MHz)	
	MODULATION	ON	
	NOTES	---	

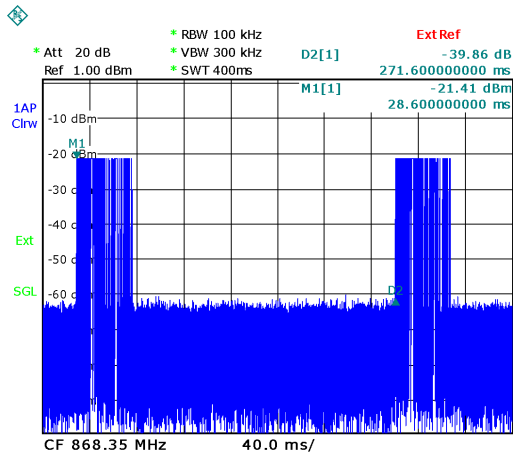
Modification during the test:

- none

RESULT

4,5 V T_{nom} : +20℃	The equipment transmit at 433,92 and 868,30 MHz contemporaneously, limit of use in 1 hour is 1%. The equipment transmits continuously when the push button is pressed. In this time, the transmitter module transmits 1 packed data of 46,80 mseconds (tx on 18,18ms & tx off 28,62ms) every 271 ,60ms. If considering that the TX ON is 18,18ms every 271,60ms (6,69%), max. permitted time of transmission in 1 hour is 8,58 min. ⇒ (36 sec x 100) : 6,69 = 538,11 sec (≈ 8,58 min.) The manufacturer shall be declared on user manual max. permitted time of transmission in 1 hour.





TEST No. 8	Title "Blocking or desensitization "	Ref. Subclause EN 300 220-2 V2.1.2 (2007-06) § 4.3.4
TEST REQUIREMENTS	TEST PROCEDURE	Sub-clause 9.4.2 of EN 300 220-1 V2.1.2 (2006-04)
	TEST METHOD	☒ Conducted via a combining network ☐ Radiated via a combining network
	WANTED TEST SIGNAL	At the nominal frequency of the receiver, with normal test modulation, with minimum level which still gives sufficient response of the receiver, plus +3dB
	UNWANTED TEST SIGNAL	At ±2MHz and ±10MHz of nominal frequency of the receiver, without modulation, with amplitude signal according to sub-clause 9.4.2 of EN 300 220-1
	LIMITS	Class 1: shall not be less than -20.0 dBm Class 2 at ±2MHz: shall not be less than -69.0 dBm Class 2 at ±10MHz: shall not be less than -44.0 dBm
	NOTES	Only for class 1, repetition of test with wanted test signal increased +40dB to determine the receiver saturation; limit > -10dBm

Test conditions		Reception Frequency: 433,92 MHz			
Voltage & Temperature	**Frequency**	**Wanted Level (dBm)**	**UnWanted Level (dBm) where the wanted criteria is just exceeded.**	**Limit (dBm)**	**Result**
12 V dc +25 ℃	+2MHz (435,92 MHz)	-86	-25	-69	Complies
	-2MHz (431,92 MHz)	-86	-32	-69	Complies
	+10MHz (443,92 MHz)	-86	-14	-44	Complies
	-10MHz (423,92 MHz)	-86	-4	-44	Complies
Measurement uncertainty		< ± 1.5 dB			

Test conditions		Reception Frequency: 868,30 MHz			
Voltage & Temperature	**Frequency**	**Wanted Level (dBm)**	**UnWanted Level (dBm) where the wanted criteria is just exceeded.**	**Limit (dBm)**	**Result**
12 V dc +25 ℃	+2MHz (870,30MHz)	-108	-38	-69	Complies
	-2MHz (866,30 MHz)	-108	-42	-69	Complies
	+10MHz (878,30 MHz)	-108	-35	-44	Complies
	-10MHz (858,30 MHz)	-108	-23	-44	Complies
Measurement uncertainty		< ± 1.5 dB			

TEST No. 9	Title “ Receiver Spurious emissions ”	Ref. standard EN 300 220-2 V2.1.2 (2007-06) § 4.3.7
TEST REQUIREMENTS	TEST PROCEDURE	Sub-clause 9.7 of EN 300 220-1 V2.1.1 (2006-04)
	TEST METHOD	☐ Conducted ☒ Radiated (Sub clause 9.4.4)
	TEST CONDITIONS	☒ Normal (sub clause 5.3) ☐ Extreme (sub clause 5.4)
	RBW	100 kHz (<1000 MHz); 1MHz (>1000 MHz)
	LIMITS	F<1GHz= 2nW; F>1GHz= 20nW;
	NOTES	---

Modification during the test:

- none

RECEIVER STATE: 433,92 & 868,30 MHz ACTIVE

Radiated Spurious emission level				
Frequency (MHz)	**Bandwidth (kHz)**	**Narrowband Level (dBm)**	**Limit (dBm)**	**Result**
450,040	100	-78,39	-57,00	Complies
846,452	100	-71,74	-57,00	Complies
857,600	100	-75,07	-57,00	Complies
1883,60	1000	-66,15	-47,00	Complies
F>1900	1000	<-70	-47,00	Complies
Measurement Uncertainty		< ± 6 dB		

5 ADDITIONAL TECHNICAL INFORMATION

5.1 ELECTROMAGNETICALLY RELEVANT COMPONENTS:

Components	No.	Manufacturer	Type – Technical data
Radio Transmitter	1	Aur.el	TX-4M10HA
Radio Transmitter	1	Aur.el	TX-8LAVSA05
Radio Receiver	1	Aur.el	RX-AM4SF
Radio Receiver	1	Aur.el	RX-AM8SF

5.2 RFI SUPPRESSION DEVICES:

Components	N°	Manufacturer	Type – Technical data
Emi Suppression Filter For DC	1	Murata	BNX002-01

5.3 EMI PROTECTION DEVICES:

Components	N°	Manufacturer	Type – Technical data
Varistor	1	/	CT1210K25G

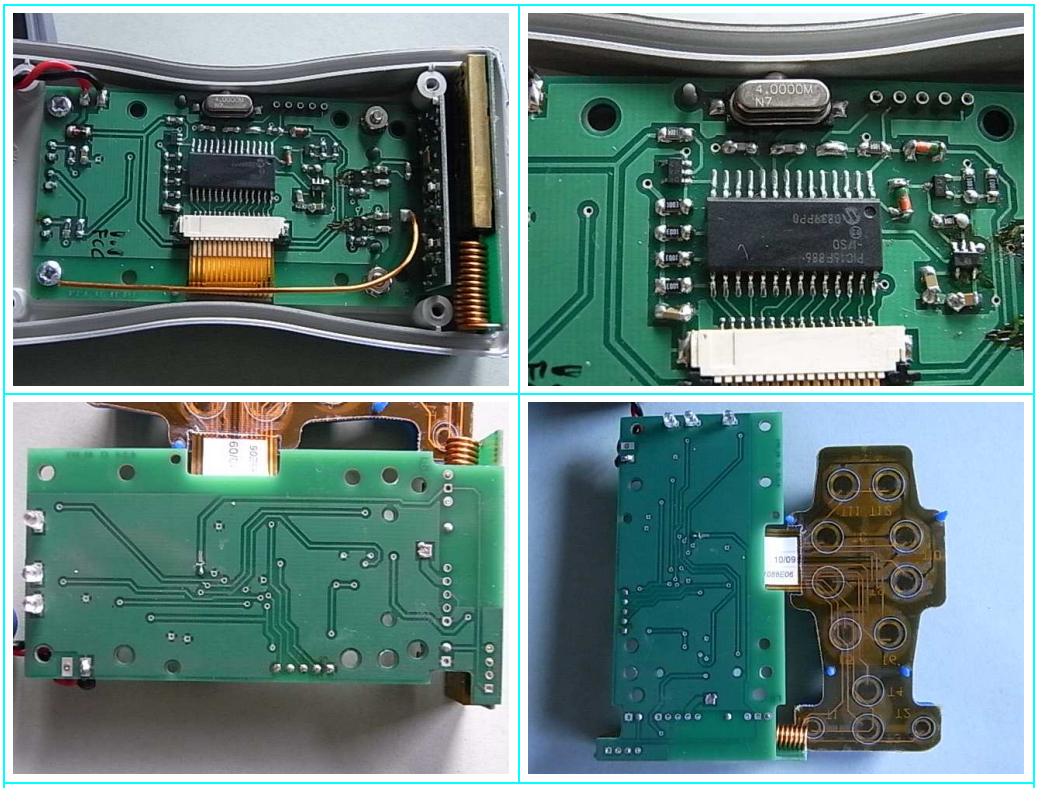
6 TECHNICAL DOCUMENTATION

DOCUMENT	REFERENCE
Manuale Installatore	I-EVODB-Inst
Manuale utilizzatore	I-EVODB-Uti
Wiring Diagrams	TX_EVO_DUAL_BAND – Rev. 2.0 CPU_RX per EVO e DIVO Versione 2 – Rev. 3.1 ADP_RX_EVO-DB – Rev. 1.0 Modulo di commando di uscita eliche e verricello per YC_EVO – Rev. 3 Scheda base per ricevitore YC per EVO e DIVO – Rev. 2.1 MODULO_OUT_MOTORI_EVO_3W – Rev. 1.0
Bills of materials	TX_EVO_DUAL_BAND – Rev. 2.0 – June 08, 2009 CPU_RX per EVO e DIVO Versione 2 – Rev. 3.1 – December 02, 2009 ADP_RX_EVO-DB – Rev. 1.0 – May 25, 2009 Modulo di commando di uscita eliche e verricello per YC_EVO – Rev. 3 – December 02, 2009 Scheda base per ricevitore YC per EVO e DIVO – Rev. 2.1 – June 04, 2009 MODULO_OUT_MOTORI_EVO_3W – Rev. 1.0 – May 28, 2009

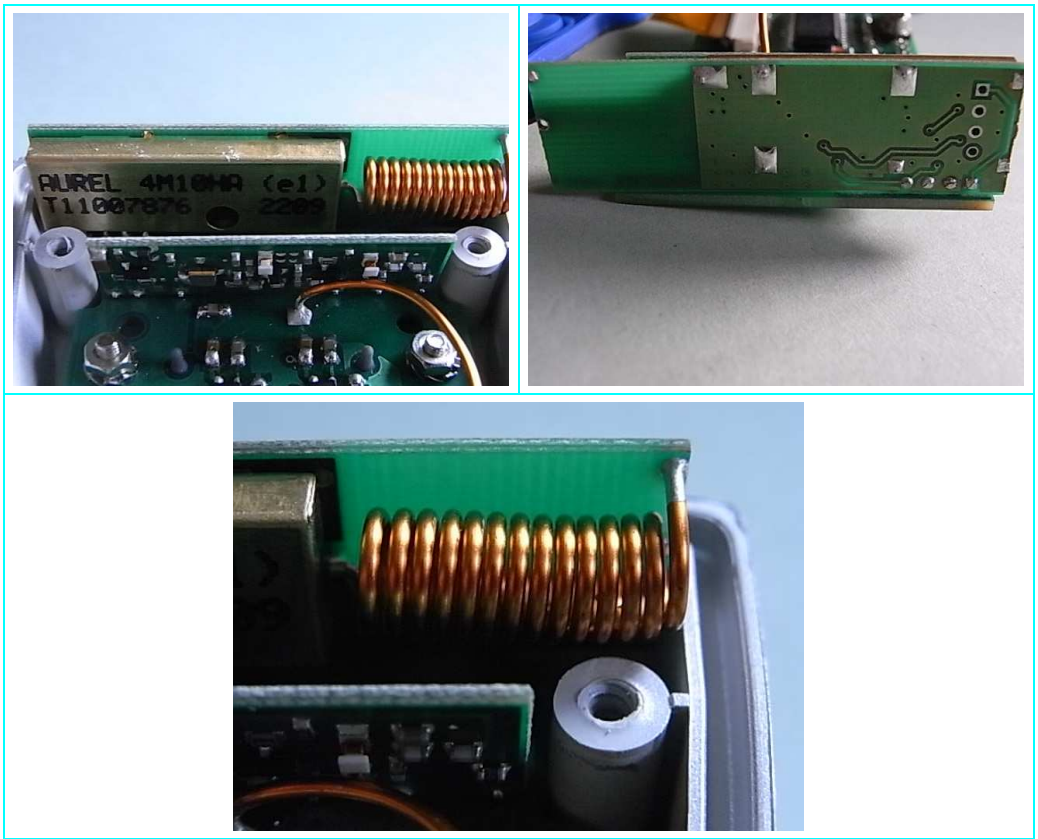
7 PHOTOGRAPHIC DOCUMENTATION

7.1 EUT IDENTIFICATION

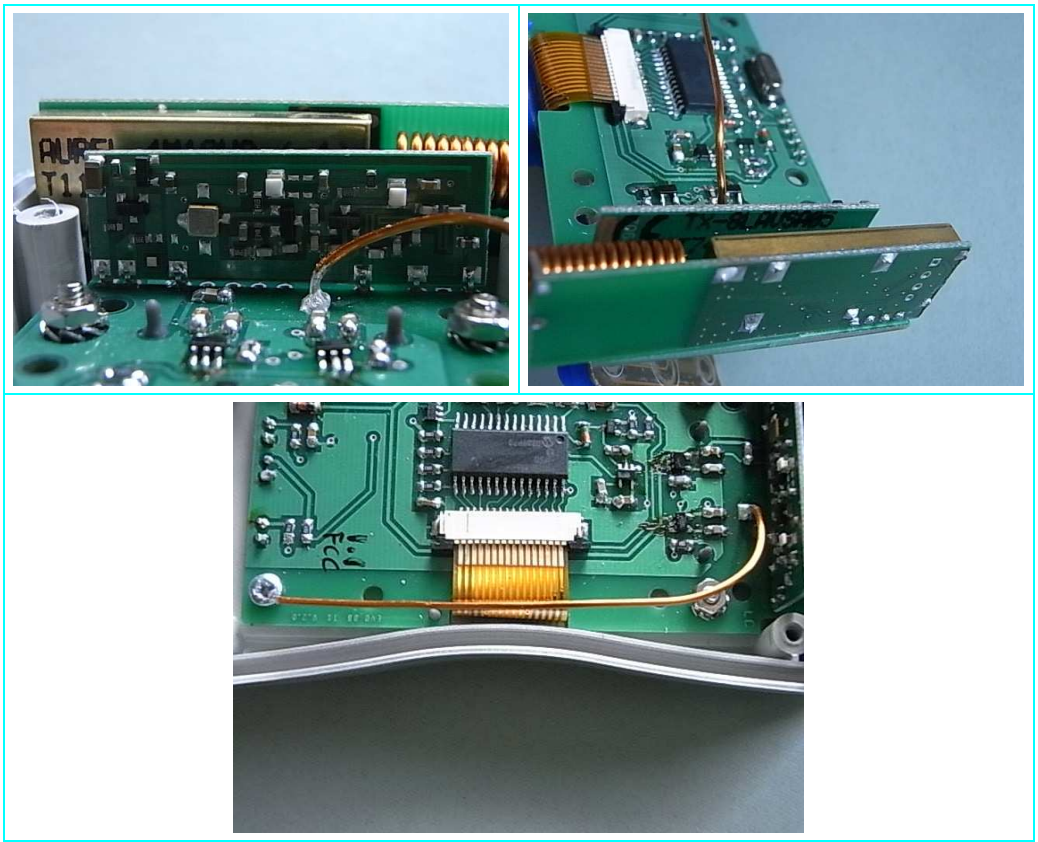
A. Equipment under test: transmitter unit



B. Internal view

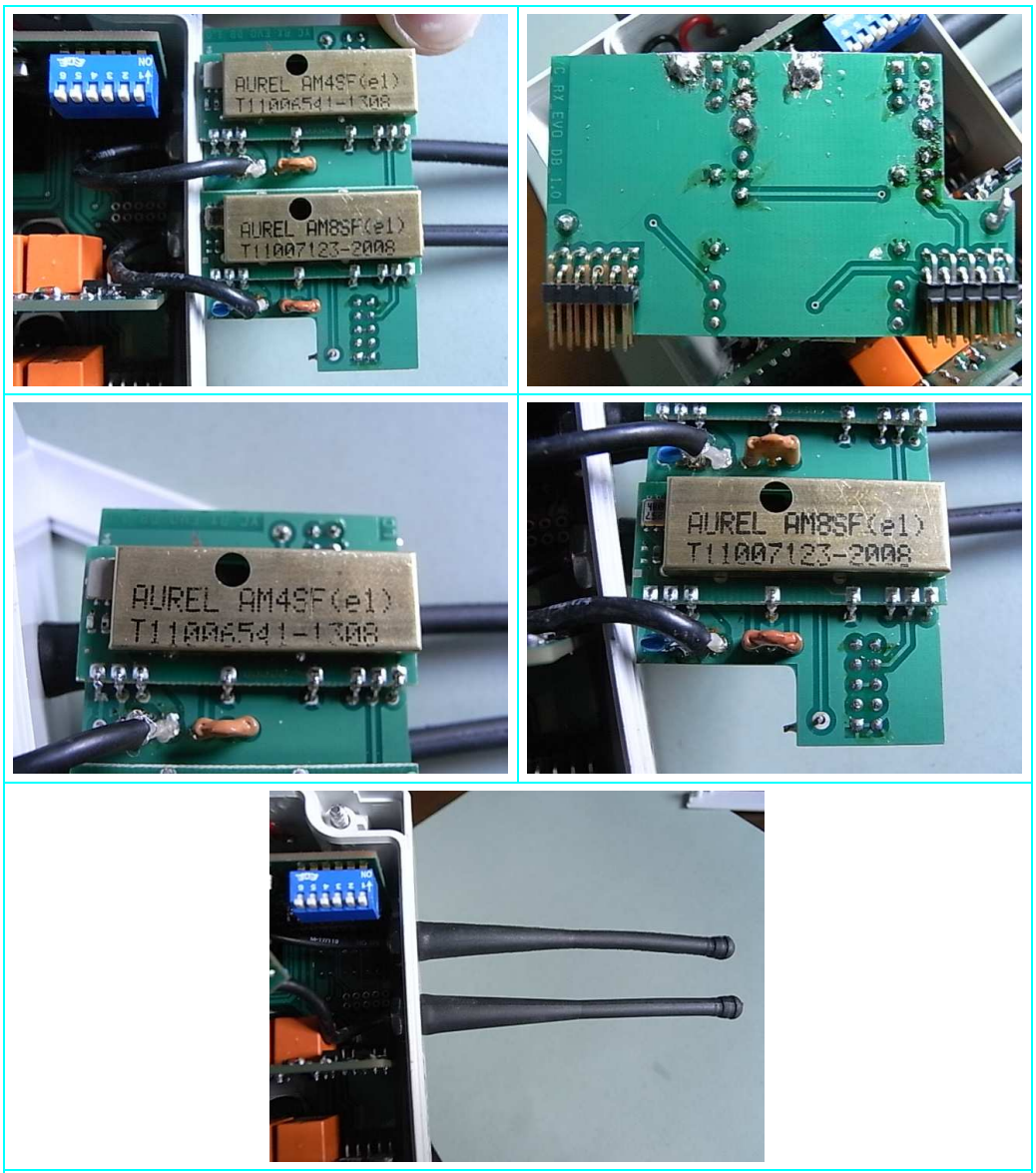


C. 433,92 MHz RF module and antenna

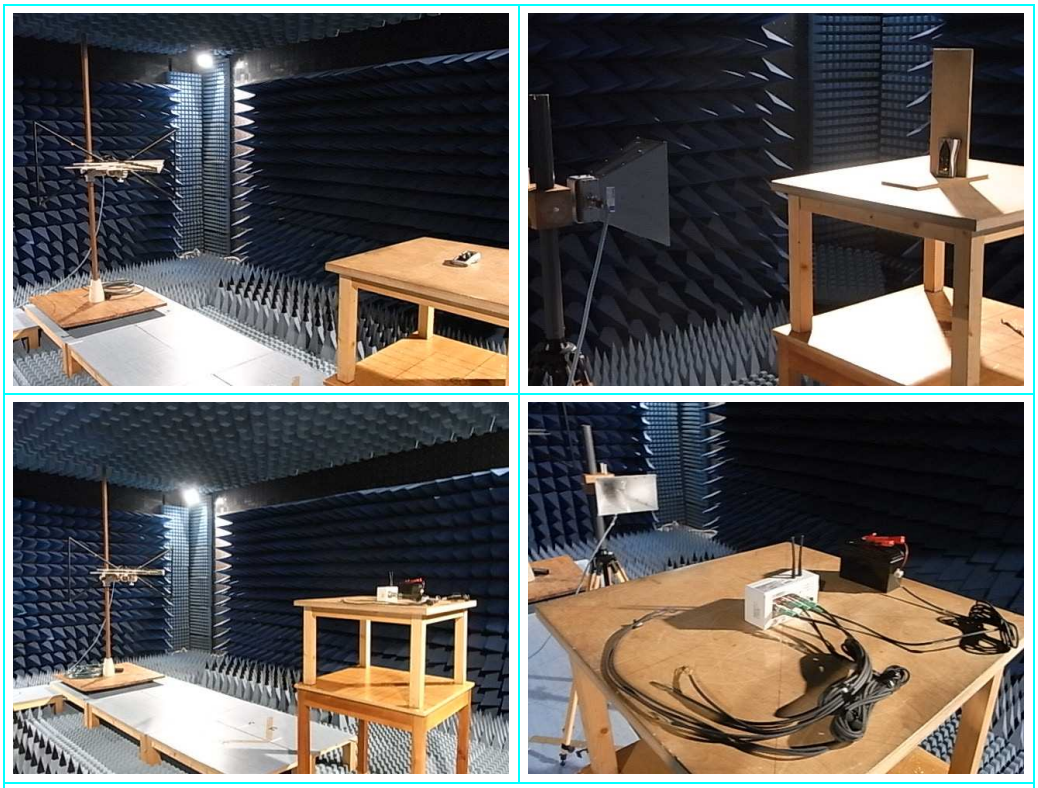


D. 868,30 MHz RF module and antenna

E. Equipment under test: receiver unit



F. 433,92 & 868,30 MHz Receiver modules and antenna



G. Set-up Spurious Radiated test

8 MEASUREMENT AND TEST EQUIPMENT INSTRUMENTATION

INSTRUMENTS	MANUFACTURER	MODEL	IMQ s/n
Spectrum analyzer 9kHz÷40GHz	Rohde & Schwarz	FSP40	S-03629
Pre-amplifier 30-1000MHz	Bonn Electronik	BLNA	S-04193
Pre-amplifier 1-26,5GHz	HP	HP 8439 B	S-03542
Log periodic antenna	ARA	LPE-2520/1	S-03511
Horn antenna	Schwarzbeck	BBHA9120D	S-03464
RF generator	Rohde & Schwarz	SMR20	S-03707
RF generator	Rohde & Schwarz	SMG	S-00562
RF generator	Rohde & Schwarz	SMS2	S-00475
3-way Combiner	3B Elettronica	5521-2SPN8	/
Oscilloscope	Yokogawa	DL7200	S-03745
Passive Probe	TEK	P5100 100x	S-03746
Shielded anechoic chamber	SIDT	/	P-02386
Climatic chamber	Angelantoni	UV300	P-00484
System Power Supply	Hewlett Packard	6038A	S-03529