



**Telecommunications & Telematics
for Transports Lab.**

TEST REPORT

Ref. No. ARSK00078

Date: 2010-04-15

Measurements performed in accordance with:

EN 60945 :2002 "Maritime navigation and radiocommunication equipment and systems –
General requirements - Methods of testing and required test results

PRODUCT : RADIOCONTROL
 TESTED MODEL : DUAL BAND
 MANUFACTURER : MICRO DEVICE S.r.l. – Via Bellini, 31/33 –I- 20095 Cusano Milanino (MI)
 APPLICANT : 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 : 2010-03-26÷2010-04-15
 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 | Test Results and Evaluation Report |

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1 TEST SPECIFICATIONS, METHODS & PROCEDURES

According to: EN 60945:2002 "Maritime navigation and radiocommunication equipment and systems – General requirements - Methods of testing and required test results"

1.1 ENVIRONMENTAL CONDITIONS

| TEST CONDITIONS | MEASURED |
|----------------------|-----------------|
| Ambient Temperature | 15 ÷ 35 °C |
| Relative Humidity | 20 ÷ 75 % |
| Atmospheric Pressure | 860 ÷ 1060 mbar |

1.2 EMISSION & IMMUNITY TESTS

The standard EN 60945:2002 + makes reference to the following Basic Standards:

| Basic Standard | Date | Title |
|----------------|------|---|
| EN 61000-4-2 | 1995 | Electromagnetic compatibility (EMC) |
| A1 | 1998 | Part 4: Testing and measurement techniques |
| A2 | 2001 | Section 2: Electrostatic discharge immunity tests - Basic EMC Publication |
| EN 61000-4-3 | 2002 | Electromagnetic compatibility (EMC) |
| A1 | 2002 | Part 4: Testing and measurement techniques Section 3: Radiated, radio-frequency, electromagnetic field immunity test |
| EN 61000-4-4 | 1995 | Electromagnetic compatibility (EMC) |
| A1 | 2001 | Part 4: Testing and measurement techniques |
| A2 | 2001 | Section 4: Electrical fast transient/burst immunity tests - Basic EMC Publication |
| EN 61000-4-5 | 1995 | Electromagnetic compatibility (EMC) |
| A1 | 2001 | Part 4: Testing and measuring techniques Section 5: Surge immunity test |
| EN 61000-4-6 | 1996 | Electromagnetic compatibility (EMC) |
| A1 | 2001 | Part 4: Testing and measurement techniques Section 6: Immunity to conducted disturbances, induced by radio-frequency fields |
| EN 61000-4-8 | 1993 | Electromagnetic compatibility (EMC) |
| | | Part 4: Testing and measurement techniques Section 8: Power frequency magnetic field immunity test |
| EN 61000-4-11 | 1994 | Electromagnetic compatibility (EMC) |
| A1 | 2001 | Part 4: Testing and measurement techniques Section 11: Voltage dips, short interruptions and voltage variations immunity tests |
| CISPR 16-1 | 1999 | Specification for radio disturbance and immunity measuring apparatus and methods Part 1: Radio disturbance and immunity measuring apparatus. |

REMARK: none

1.3 TEST CONDITIONS

The equipment has been tested according to the operative conditions described in the user/installation manual provided by the manufacturer and by following reference standards:

- EN 60945, clause No. 9

1.4 PERFORMANCE CRITERIA

With reference to the Standard **EN 60945 (2002)**, the verification of compliance is based on the following performance criteria :

- A:** The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.
- B:** The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer. During the test degradation of performance or loss of function which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.
- C:** Temporary degradation or loss of function or performance is allowed during the test, provided the function is self-recoverable, or can be restored at the end of the test by the operation of the controls, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.

1.5 EMISSION & IMMUNITY TEST APPLICABLES

With reference to the Standard **EN 60945 (2002)**, the verification of compliance is based on the following tests:

| ELECTROMAGNETIC EMISSION | | | | |
|---------------------------|----------------|------------|------------|----------------|
| | PORTABLE | PROTECTED | EXPOSED | SUBMERGED |
| Conducted Emission | Not Applicable | Applicable | Applicable | Applicable |
| Radiated Emission | Applicable | Applicable | Applicable | Not Applicable |

| ELECTROMAGNETIC IMMUNITY | | | | |
|---|----------------|------------|------------|----------------|
| | PORTABLE | PROTECTED | EXPOSED | SUBMERGED |
| Conducted Radio Frequency disturbances | Not Applicable | Applicable | Applicable | Applicable |
| Radiated disturbances | Applicable | Applicable | Applicable | Not Applicable |
| Fast Transient (Burst) | Not Applicable | Applicable | Applicable | Applicable |
| Slow Transient (Surges) | Not Applicable | Applicable | Applicable | Applicable |
| Power Supply short term variations | Not Applicable | Applicable | Applicable | Applicable |
| Power Supply failure | Not Applicable | Applicable | Applicable | Applicable |
| Electrostatic Discharge | Applicable | Applicable | Applicable | Not Applicable |

2 SUMMARY OF TEST RESULTS

2.1 Emission tests

| Phenomenon | Coupling port | Operating condition | Result | Test details |
|--|---------------|-----------------------------|----------|--------------|
| Emission conducted (10kHz ÷ 30 MHz) | AC power line | Not applicable ¹ | | |
| | DC power | #2 | Complies | 1 |
| Emission radiated (150kHz ÷ 2 GHz) | Enclosure | #2 #3 | Complies | 2 |

2.2 Immunity tests

| Phenomenon | Coupling port | Operating condition | Result | Test details |
|--|---------------------|-----------------------------|----------|--------------|
| RF electromagnetic field (0.08 ÷ 2 GHz) | Enclosure | #1 #2 | Complies | 3 |
| Electrostatic discharge | Enclosure | #1 #2 | Complies | 4 |
| Fast transients common mode | AC power line | Not applicable ¹ | | |
| | Power supply/Signal | #2 | Complies | 5 |
| RF common mode 0,15 MHz to 80 MHz | AC power line | Not applicable ¹ | | |
| | DC power | #2 | Complies | 6 |
| | Power supply/Signal | #2 | Complies | 6 |
| Power supply short term variation | AC power line | Not applicable ¹ | | |
| Power supply failure | AC power line | Not applicable ¹ | | |
| | DC power | #2 | Complies | 7 |
| Surges, line to line and line to ground | AC power line | Not applicable ¹ | | |
| REMARK: Detail of the result are showed on the next pages. Test uncertainties are in accordance with document IO-80-U01. | | | | |

¹ Port not present

3 EQUIPMENT UNDER TEST DETAILS

3.1 EUT IDENTIFICATION

| | |
|--|--|
| The EUT is composed by the following modules | <p>Radiocontrol, composed by:</p> <ul style="list-style-type: none"> • 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 |
| EUT single or system | <ul style="list-style-type: none"> ▪ System |
| EUT type | <ul style="list-style-type: none"> ▪ Transmitter unit: Portable ▪ Receiver unit: Protected |
| EUT standing | <ul style="list-style-type: none"> ▪ On yacht |

3.2 EUT TECHNICAL DATA

| Parameters | Value |
|------------------------------|--|
| Supply Voltage | <ul style="list-style-type: none"> ▪ TX unit: alkaline battery 3 x 1,5 V ▪ RX unit: 12÷24 V |
| Input Power / Current | <ul style="list-style-type: none"> ▪ TX unit: 45mA in transmission ▪ RX unit: max 2W |
| Dimension of EUT (W x H x D) | <ul style="list-style-type: none"> ▪ TX unit: 70 x 123 x 43 mm. ▪ RX unit: 175 x 170 x 130 mm. |

3.3 RADIO MODULE TECHNICAL DATA

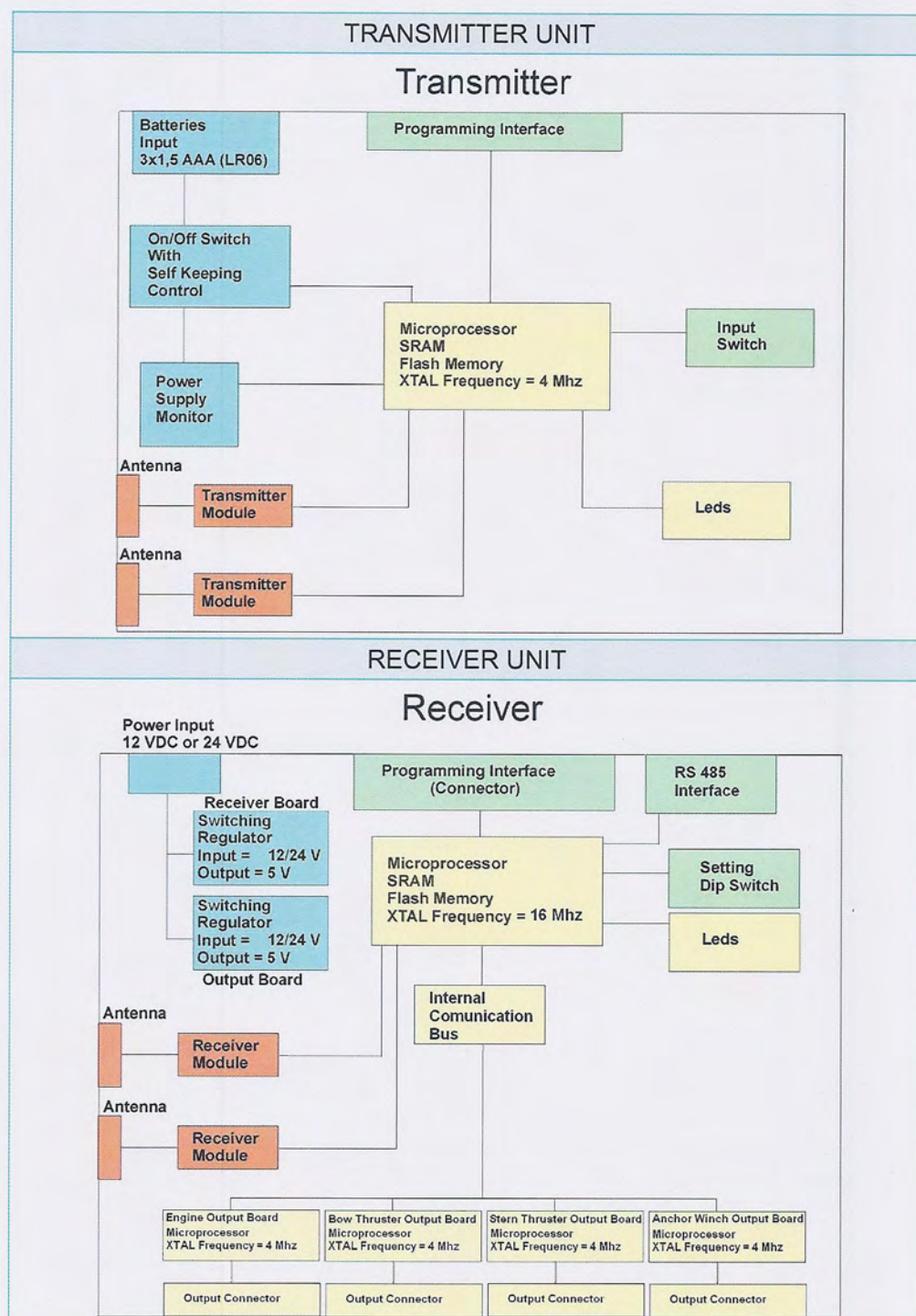
| 433,92 MHz TRANSMITTER Parameters | Value |
|-----------------------------------|------------------------------|
| Supply Voltage : | ▪ 2,5÷3,3 V (typ. 3 V) |
| Consumption : | ▪ Max. 25mA |
| Modulation type : | ▪ OOK |
| Number of channels : | ▪ Wideband |
| Operating frequency : | ▪ 433,92 MHz |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

| 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°C |

| 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°C |

| 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°C |

3.4 FLOW CHART



3.5 AUXILIARY EQUIPMENT

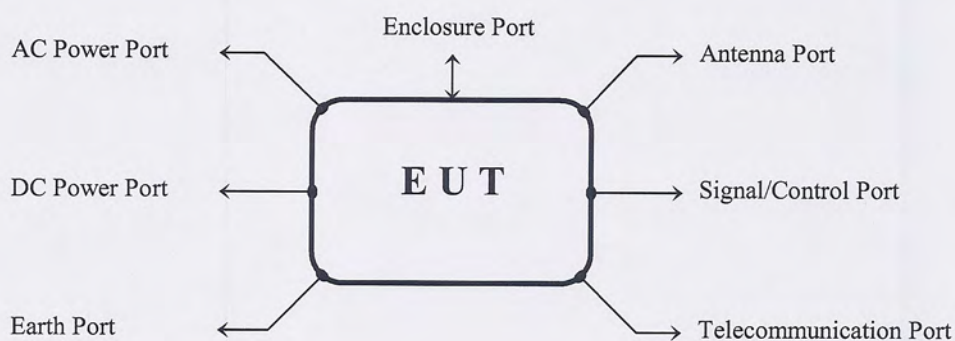
Defined as equipment needed for correct operation or loading of the EUT, but not considered as tested:

- None

3.6 TESTED SAMPLES

| SAMPLE Nr. | S/N |
|------------|-----|
| 1 | / |

3.7 PORTS IDENTIFICATION



| No. | Port | Description | Maximum length | Ref. Document |
|-----|----------------------------|---|----------------|---------------|
| 1 | Enclosure | Plastic enclosure | ---- | / |
| 2 | DC power input/output port | TX: N°3 Internal batteries 1,5V type AAA (LR03) RX: external supply 12÷24 V dc | ---- < 3 m. | / |
| 3 | AC power input/output port | Port not present | ---- | / |
| 4 | Power supply / Signal | N°5 Outputs command | < 3 m. | / |
| 5 | Telecommunication ports | Port not present | ---- | / |
| 6 | Antenna port | Integrated Antenna | < 17cm. | / |

3.8 DESCRIPTION OF SUPPORT EQUIPMENT

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

- None.

3.9 OPERATING TEST CONDITIONS

| Ref. | Description |
|------|--|
| #1 | Tx operating at 433,92 & 868,30 MHz at same time (continuous transmission of bit stream) |
| #2 | Rx operating at 433,92 & 868,30 MHz at same time (continuous reception mode) – N°1 Output active |
| #3 | Transmitter unit ON but not in transmitting mode (for radiated emission test only) |

4 EMC TEST DATA

| TEST No. 1 | Title "Conducted Emission" | Ref. Standard |
|-------------------|--|--|
| | | EN 60945 CISPR 16-1 |
| TEST REQUIREMENTS | TEST SETUP | EN 60945 par. 9.2.2 |
| | METHOD OF TEST | EN 60945 par. 9.2.2 |
| | LIMITS OF CONDUCTED EMISSION AT A.C. AND D.C. TERMINAL VOLTAGE | Table 5 of EN 60945 |
| | FREQUENCY RANGE | 10 kHz – 30 MHz |
| | MEASURING BANDWIDTH | 200Hz (10kHz÷150kHz) 9 kHz (150kHz÷30MHz) |
| | LENGTH OF CABLE BETWEEN EQUIPMENT AND LISN | Max. 0,8m |
| | NOTE: | |

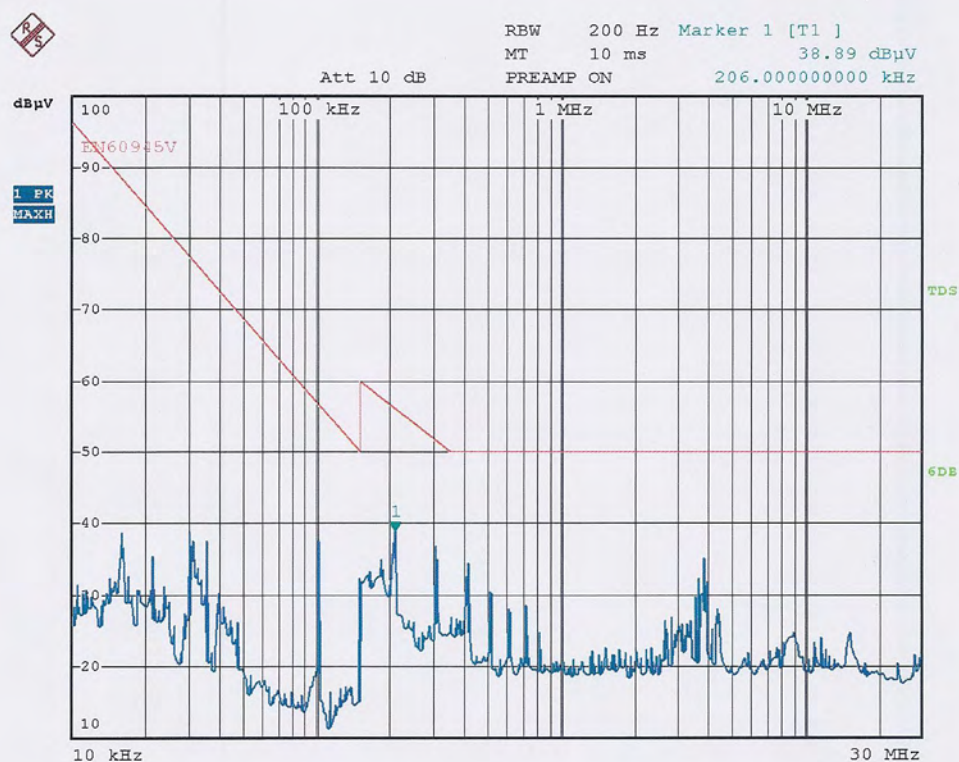
| TEST DATA | PORT UNDER TEST | OPERATING CONDITION (rif. 3.9) | RESULT | NOTES |
|-----------|-----------------|-----------------------------------|----------|-------|
| | DC port | #2 | Complies | / |

Modification during the test:

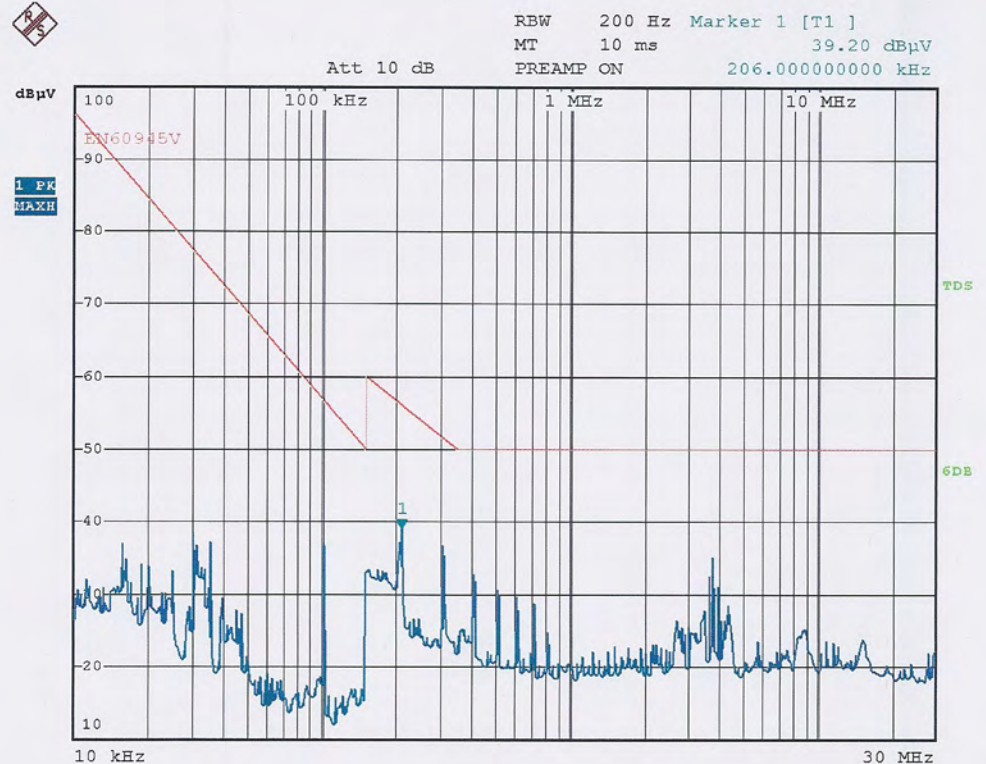
- None

CONDUCTED DISTURBANCES LEVEL DIAGRAM:

| | |
|----------------|-------------|
| Test condition | #2 |
| Range of test | 10kHz÷30MHz |
| Detector | Peak |
| Line | (+) |



| | |
|----------------|-------------|
| Test condition | #2 |
| Range of test | 10kHz÷30MHz |
| Detector | Peak |
| Line | (-) |

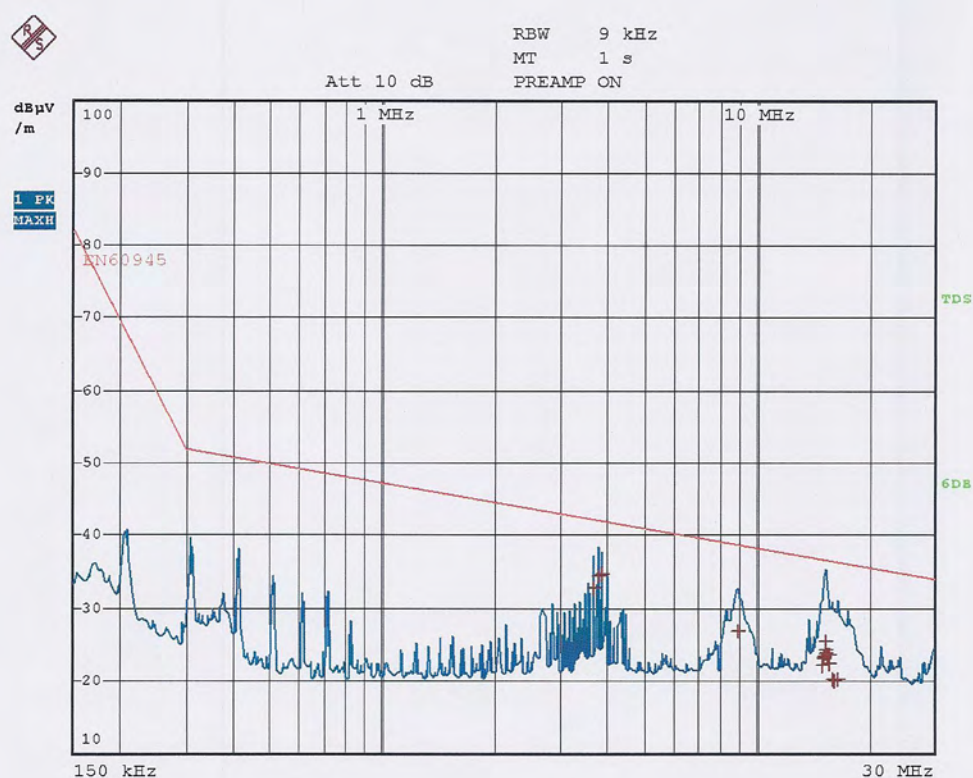


| TEST No. 2 | Title "Radiated emission" | Ref. Standard |
|-------------------|---|--|
| | | EN 60945 CISPR 16-1 |
| TEST REQUIREMENTS | TEST SETUP | EN 60945 par. 9.3.2 |
| | METHOD OF TEST | EN 60945 par. 9.3.2 |
| | TEST DISTANCE | 3 m |
| | LIMITS FOR RADIATED EMISSION | Table 5 of EN 60945 |
| | FREQUENCY RANGE | 0.15÷2000 MHz |
| | TYPE OF FIELD | <30MHz: Magnetic Field >30MHz: Electric Field |
| | MEASURING BANDWIDTH | 9kHz (150kHz÷30MHz) 120kHz (30MHz÷2GHz) |
| | ADDITION MEASUREMENT | 156÷165MHz with RBW at 9kHz |
| | NOTES: Broadband measurements with Quasi-Peak detector are performed only for frequencies which the Peak values are ≥ (Q.P. limit - 6 dB) | |

| TEST DATA | PORT UNDER TEST | OPERATING CONDITION (rif. 3.9) | RESULT | NOTES |
|-----------|-----------------|-----------------------------------|----------|-------|
| | Enclosure | #2 and #3 | Complies | --- |

RADIATED DISTURBANCES LEVEL DIAGRAM:

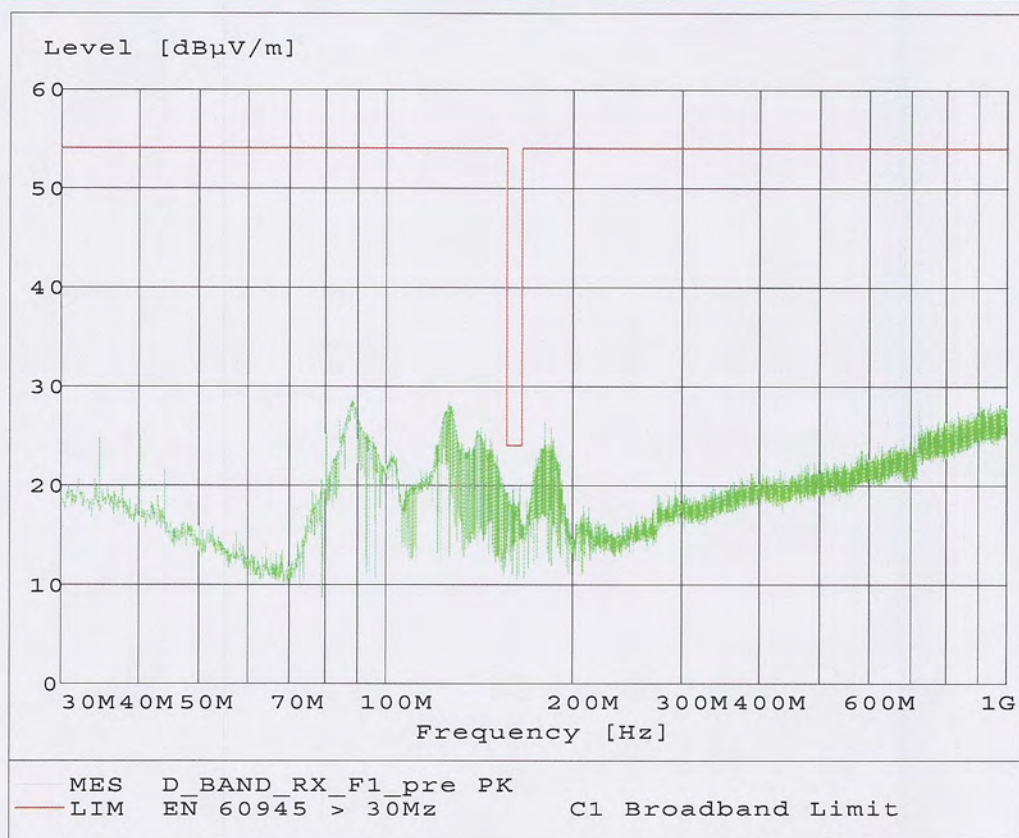
| | |
|----------------|--|
| Test condition | #2 + #3 (receiver + transmitter unit) |
| Range of test | 150kHz÷30MHz |
| Detector | Peak |



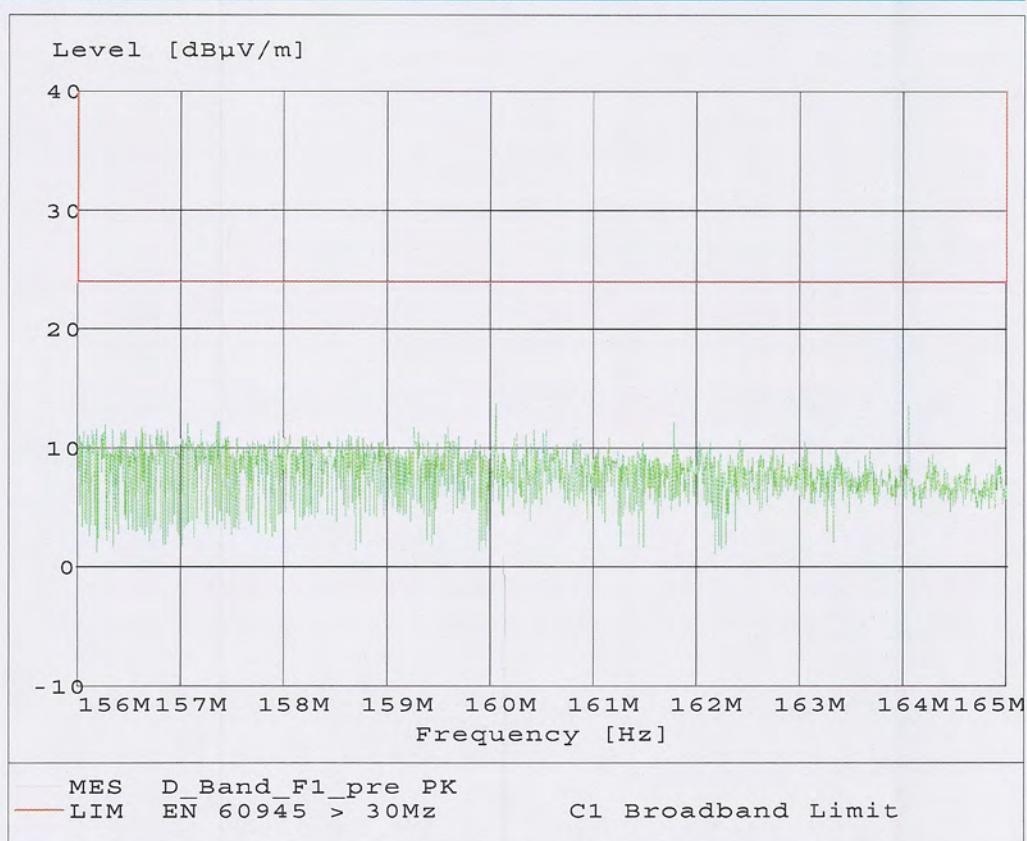
FINAL TEST (QUASI-PEAK DETECTOR)

| Frequency | Level | Limit | Margin |
|-----------|--------------|--------------|--------|
| MHz | dB μ V/m | dB μ V/m | dB |
| 3.682 | 32.79 | 42.19 | 9.40 |
| 3.782 | 34.38 | 42.08 | 7.70 |
| 3.886 | 34.56 | 41.98 | 7.42 |
| 8.954 | 26.79 | 38.72 | 11.93 |
| 15.034 | 22.05 | 36.69 | 14.64 |
| 15.150 | 23.30 | 36.67 | 13.37 |
| 15.234 | 23.18 | 36.64 | 13.46 |
| 15.338 | 24.36 | 36.62 | 12.26 |
| 15.450 | 25.45 | 36.58 | 11.13 |
| 15.470 | 23.81 | 36.58 | 12.77 |
| 15.538 | 23.66 | 36.57 | 12.91 |
| 15.646 | 23.61 | 36.54 | 12.93 |
| 15.742 | 22.49 | 36.51 | 14.02 |
| 16.054 | 20.23 | 36.44 | 16.21 |
| 16.154 | 20.02 | 36.41 | 16.39 |
| 16.590 | 20.33 | 36.30 | 15.97 |

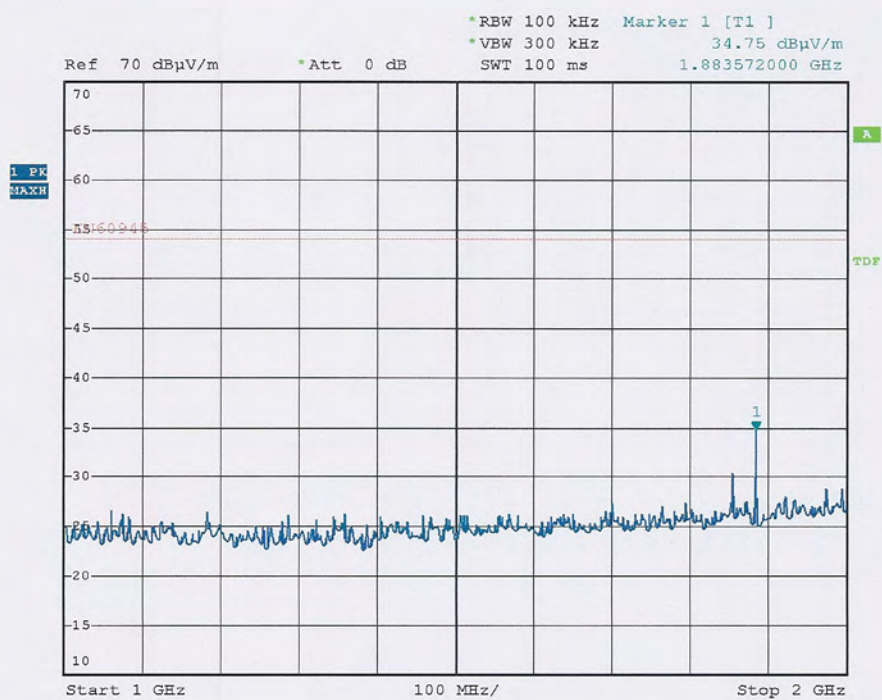
| | |
|----------------|--------------------|
| Test condition | #2 (receiver unit) |
| Range of test | 30MHz÷1000MHz |
| Detector | Peak |



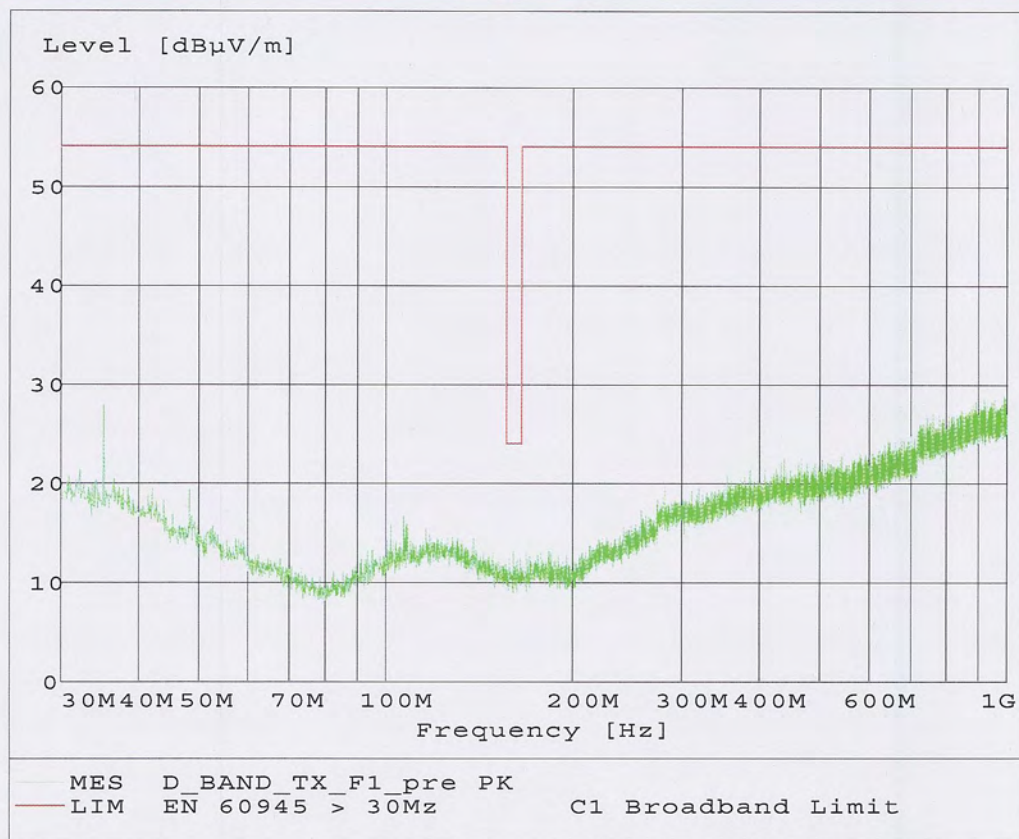
| | |
|----------------|--------------------------------|
| Test condition | #2 (receiver unit) |
| Range of test | 156MHz-165MHz with RBW at 9kHz |
| Detector | Peak |



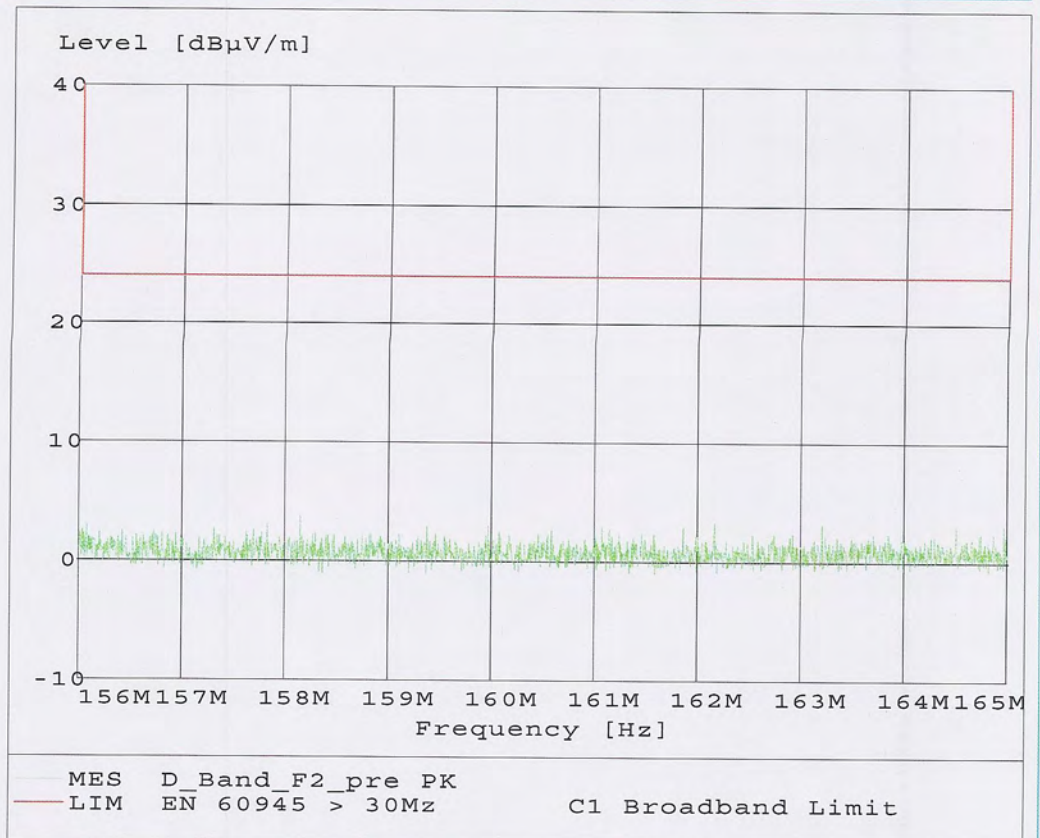
| | |
|----------------|--------------------|
| Test condition | #2 (receiver unit) |
| Range of test | 1000MHz÷2000MHz |
| Detector | Peak |



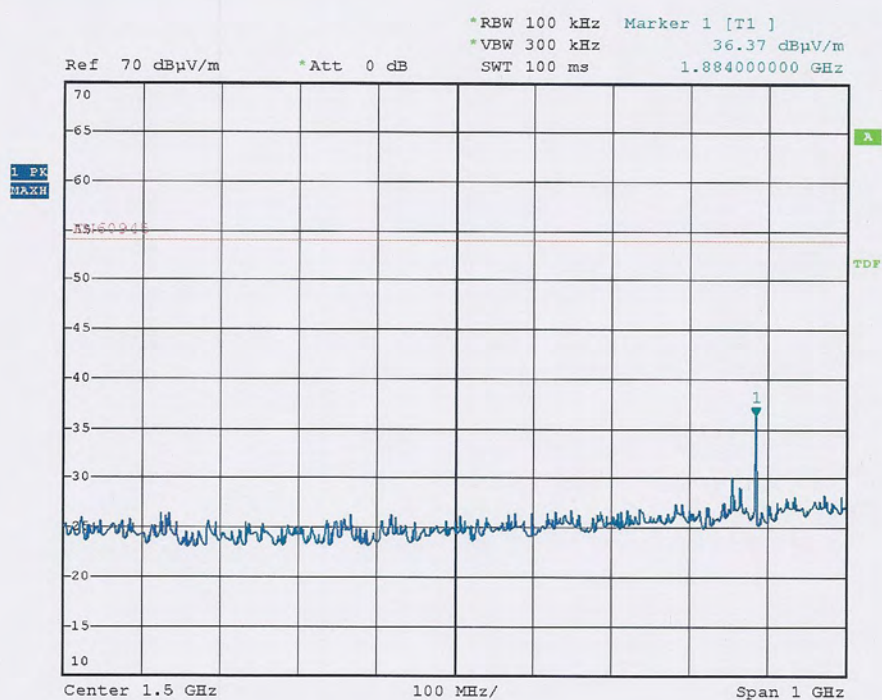
| | |
|----------------|-----------------------|
| Test condition | #3 (transmitter unit) |
| Range of test | 30MHz÷1000MHz |
| Detector | Peak |



| | |
|----------------|--------------------------------|
| Test condition | #3 (transmitter unit) |
| Range of test | 156MHz÷165MHz with RBW at 9kHz |
| Detector | Peak |



| | |
|----------------|-----------------------|
| Test condition | #3 (transmitter unit) |
| Range of test | 1000MHz~2000MHz |
| Detector | Peak |



| TEST No. 3 | Title "Immunity to radiated electromagnetic energy." | Ref. Standard |
|-------------------|---|--|
| | | EN 61000-4-3 EN 60945 |
| TEST REQUIREMENTS | TEST SETUP | Par. 10.1 & 10.4 of EN 60945 |
| | METHOD OF TEST | Par. 10.1 & 10.4 of EN 60945 |
| | FREQUENCY RANGE | <input checked="" type="checkbox"/> 80 – 1000 MHz <input checked="" type="checkbox"/> 1000 – 2000 MHz |
| | POSITION OF THE RADIATING ANTENNAS | 3 m (80 – 1000 MHz) 1 m (1000 – 2000 MHz) |
| | TEST LEVEL | <input type="checkbox"/> 3 V/m _{rms} unmodulated <input checked="" type="checkbox"/> 10 V/m _{rms} unmodulated |
| | MODULATING FREQUENCY & MODULATION TYPE | 400 Hz (sinusoidal signal) AM, 80% |
| | FREQUENCY SWEEP AND STEP SIZE | LOG 1 % |
| | DWELL TIME | 3 sec |
| | EXCLUSION BAND (if necessary) | Par. 10.2.1 of EN 60945 |
| | NOTE. | |

TEST RESULTS

| TEST DATA | PORT UNDER TEST | OPERATING CONDITION (rif. 3.9) | COUPLING METHOD | PERFORMANCE CRITERIA | RESULT |
|-----------|-----------------|-----------------------------------|-----------------|---|----------|
| | Enclosure | #1 & #2 | Antenna | 10V/m A See Par. 1.4 of this report | Complies |

Modification during the test:

- None

The parameters monitored during the test and the relative permitted value, are the following:

| Performance parameters | Values measured during tests | Permitted values during immunity tests | Result |
|--------------------------------------|---|--|----------|
| Communication link between TX and RX | No change of actual state during and after EMC immunity exposure. No loss of communication – Output active | | Complies |

EXCLUSION BAND FOR RECEIVERS

(according to par. 10.2.1 of Standard EN 60945)

Test 80÷1000 MHz; exclusion band in Radio Link mode (according to par. 10.2.1 of Standard EN 60945), with $f_0=433,92$ MHz, is:
412,224÷455,616MHz

Test 80÷1000 MHz; exclusion band in Radio Link mode (according to par. 10.2.1 of Standard EN 60945), with $f_0=868,30$ MHz, is:
824,885÷911,715MHz

| TEST No. 4 | Title "Immunity to Electro Static Discharge (ESD)" | | Ref. Standard |
|-------------------|---|--|--------------------------|
| | | | EN 61000-4-2 EN 60945 |
| TEST REQUIREMENTS | TEST METHOD | Par. 10.1 & 10.9 of EN 60945 | |
| | IMMUNITY LEVEL | ± 6kV (direct and indirect contact) ± 8kV (direct air) | |
| | DISCHARGE IMPEDANCE | 330 ohm / 150 pF | |
| | EUT POSITIONING | <input type="checkbox"/> table-top <input checked="" type="checkbox"/> floor-standing | |
| | NUMBER OF SINGLE DISCHARGES | ≥ 10 positive and 10 negative at the selected points | |
| | REPETITION RATE | ≥ 1 / sec | |
| | GENERATOR TRIGGER | Internal | |
| | NOTES | --- | |

▪ COUPLING MODE: DIRECT AIR (FOR NOT CONDUCTIVE SURFACES)

| TEST DATA | DISCHARGE POINT | OPERATING CONDITION (rif. 3.9) | TEST LEVEL | ESD POLAR. | PERFORMANCE CRITERIA | RESULT |
|-----------|---|-----------------------------------|--|------------|--|---------------------|
| | Transmitter – All sides | #1 | <input type="checkbox"/> 2 kV | POS | B See Par. 1.4 of this report | Complies Crit. A |
| | | | <input type="checkbox"/> 4 kV | NEG | | Complies Crit. A |
| | | | <input checked="" type="checkbox"/> 8 kV | | | |
| | Transmitter - Push buttons and led | #1 | <input type="checkbox"/> 2 kV | POS | B See Par. 1.4 of this report | Complies Crit. A |
| | | | <input type="checkbox"/> 4 kV | NEG | | Complies Crit. A |
| | | | <input checked="" type="checkbox"/> 8 kV | | | |

N.B.: How declared by client, no electrostatic discharge has been applied on RX unit; after installation, no points or surfaces are accessible to personnel during normal usage (according to par. 8.3.1 of Standard EN 61000-4-2) – It has been applied only indirect discharge on RX unit.

▪ **COUPLING MODE: INDIRECT CONTACT (HORIZONTAL & VERTICAL COUPLING PLANE)**

| TEST DATA | DISCHARGE POINT | OPERATING CONDITION (rif. 3.9) | TEST LEVEL | ESD POLAR. | PERFORMANCE CRITERIA | RESULT |
|-----------|----------------------------------|-----------------------------------|--|------------|---|------------------|
| | Vertical plane on TX & RX unit | #1 & #2 | <input type="checkbox"/> 2 kV | POS | B See Par. 1.4 of this report | Complies Crit. A |
| | | | <input type="checkbox"/> 4 kV | NEG | | Complies Crit. A |
| | | | <input checked="" type="checkbox"/> 6 kV | | | |
| | Horizontal plane: not applicable | | | | | |

Modification during the test:

- None

The parameters monitored during the test and the relative permitted value, are the following:

| Performance parameters | Values measured during tests | Permitted values during immunity tests | Result |
|--------------------------------------|---|--|----------|
| Communication link between TX and RX | No change of actual state during and after EMC immunity exposure. No loss of communication – Output active | | Complies |

| TEST No. 5 | Title | Ref. Standard |
|-------------------|-------------------|--|
| | | EN 61000-4-4 EN 60945 |
| TEST REQUIREMENTS | TEST METHOD | Par. 10.1 & 10.5 of EN 60945 |
| | LINE OF TESTING | A.C. & Signal/Control Lines |
| | IMMUNITY LEVEL | ± 2kV (A.C. lines) ± 1kV (signal/control lines) |
| | TEST DURATION | 3 min. to 5 min. for each of positive and negative polarity pulses |
| | REPETITION RATE | 2,5 kHz (± 2kV) 5 kHz (± 1kV) |
| | GENERATOR TRIGGER | Internal |
| | NOTE: | |

PORT UNDER TEST : SIGNAL LINES

| TEST DATA | OPERATING CONDITION (rif. 3.9) | COUPLING MODE / LINE | TEST LEVEL | BURST POLAR. | PERFORM CRITERIA | RESULT |
|-----------|--------------------------------------|---|---------------|-----------------|---|---------------------|
| #2 | Capacitive clamp | <input type="checkbox"/> 0,5 kV <input checked="" type="checkbox"/> 1 kV | | POS | B See Par. 1.4 of this report | Complies Crit. A |
| | | | | NEG | | Complies Crit. A |

Modification during the test:

- None

| Performance parameters | Values measured during tests | Permitted values during immunity tests | Result |
|--------------------------------------|---|--|----------|
| Communication link between TX and RX | No change of actual state during and after EMC immunity exposure. No loss of communication – Output active | | Complies |

| TEST No. 6 | Title | | Ref. Standard |
|-------------------|---|--|--------------------------|
| | “Immunity to conducted RF disturbances (common mode)” | | EN 61000-4-6 EN 60945 |
| TEST REQUIREMENTS | TEST METHOD | Par. 10.1 & 10.3 of EN 60945 | |
| | LINE OF TESTING | A.C., D.C & Signal/Control Lines | |
| | COUPLING METHOD | <input checked="" type="checkbox"/> CDN <input checked="" type="checkbox"/> EM CLAMP | |
| | FREQUENCY RANGE | <input checked="" type="checkbox"/> 150 kHz – 80 MHz | |
| | TEST LEVEL | <input checked="" type="checkbox"/> 3 V _{rms} unmodulated, in all Frequency Range <input checked="" type="checkbox"/> 10 V _{rms} unmodulated, at spot frequencies** | |
| | MODULATING FREQUENCY & MODULATION TYPE | 400 Hz (sinusoidal signal) AM, 80% | |
| | FREQUENCY SWEEP AND STEP SIZE | LOG 1 % | |
| | DWELL TIME | 3 sec | |
| | Note: **Spot frequencies indicated on Standard EN 60945: 2MHz, 3MHz, 4MHz, 6.2MHz, 8.2MHz, 12.6MHz, 16.5MHz, 18.8MHz, 22MHz & 25MHz. | | |

| TEST DATA | PORT UNDER TEST | OPERATING CONDITION (rif. 3.9) | COUPLING METHOD | PERFORMANCE CRITERIA | RESULT |
|-----------|-----------------------|--------------------------------|-----------------|---|----------|
| | DC port | #2 | CDN | A See Par. 1.4 of this report | Complies |
| | Signal/ Control lines | #2 | EM CLAMP | A See Par. 1.4 of this report | Complies |

N.B.: It has been executed test at DC port and signal ports with immunity level at 10V in a whole frequency range.

Modification during the test:

- none

The parameters monitored during the test and the relative permitted value, are the following:

| Performance parameters | Values measured during tests | Permitted values during immunity tests | Result |
|--------------------------------------|---|--|----------|
| Communication link between TX and RX | No change of actual state during and after EMC immunity exposure. No loss of communication – Output active | | Complies |

| TEST No. 7 | Title “Power supply failure” | | Ref. Standard |
|-------------------|---------------------------------|-----------------------------------|---------------------------|
| | | | EN 61000-4-11 EN 60945 |
| TEST REQUIREMENTS | TEST METHOD | Par. 10.1 & 10.8 of EN 60945 | |
| | LINE OF TESTING | A.C. & D.C. Lines | |
| | TEST LEVELS | Break of power supply for 60 sec. | |
| | NUMBER OF POWER SUPPLY FAILURE | 3 | |
| | NOTE: | | |

| TEST LEVEL | OPERATING CONDITION (rif. 3.9) | PERFORMANCE CRITERIA | RESULT |
|-------------------------------|--------------------------------------|---|------------------|
| Break of power supply for 60" | #2 | C See Par. 1.4 of this report | Complies Crit. B |

Modification during the test:

- none

The parameters monitored during the test and the relative permitted value, are the following:

| Performance parameters | Values measured during tests | Permitted values during immunity tests | Result |
|--------------------------------------|---|--|----------|
| Communication link between TX and RX | Change of actual state during EMC immunity exposure. Self-recover after EMC immunity exposure. Loss of communication during EMC immunity exposure – Self-recover after EMC immunity exposure. | | Complies |

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

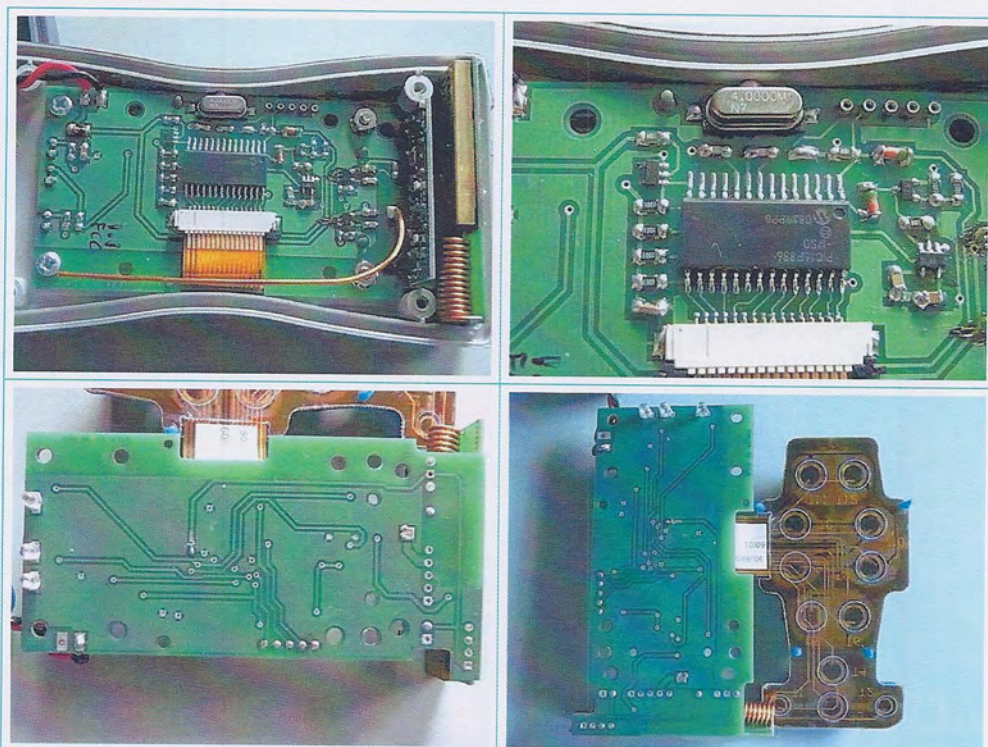
| DOCUMENT | REFERENCE |
|----------------------|--|
| Manuale Installatore | I-EVODB-Inst |
| Manuale utilizzatore | I-EVODB-Uti |
| Wiring Diagrams | <p>TX_EVO_DUAL_BAND – Rev. 2.0</p> <p>CPU_RX per EVO e DIVO Versione 2 – Rev. 3.1</p> <p>ADP_RX_EVO-DB – Rev. 1.0</p> <p>Modulo di comando di uscita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

7 PHOTOGRAPHIC DOCUMENTATION

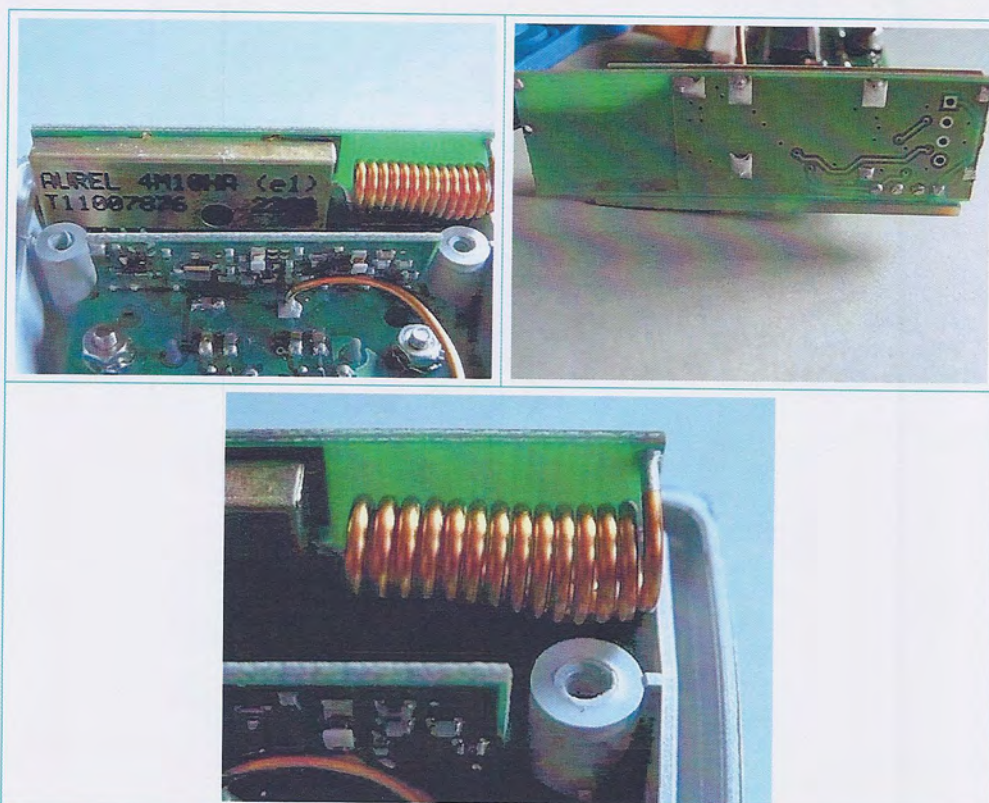
7.1 EUT IDENTIFICATION



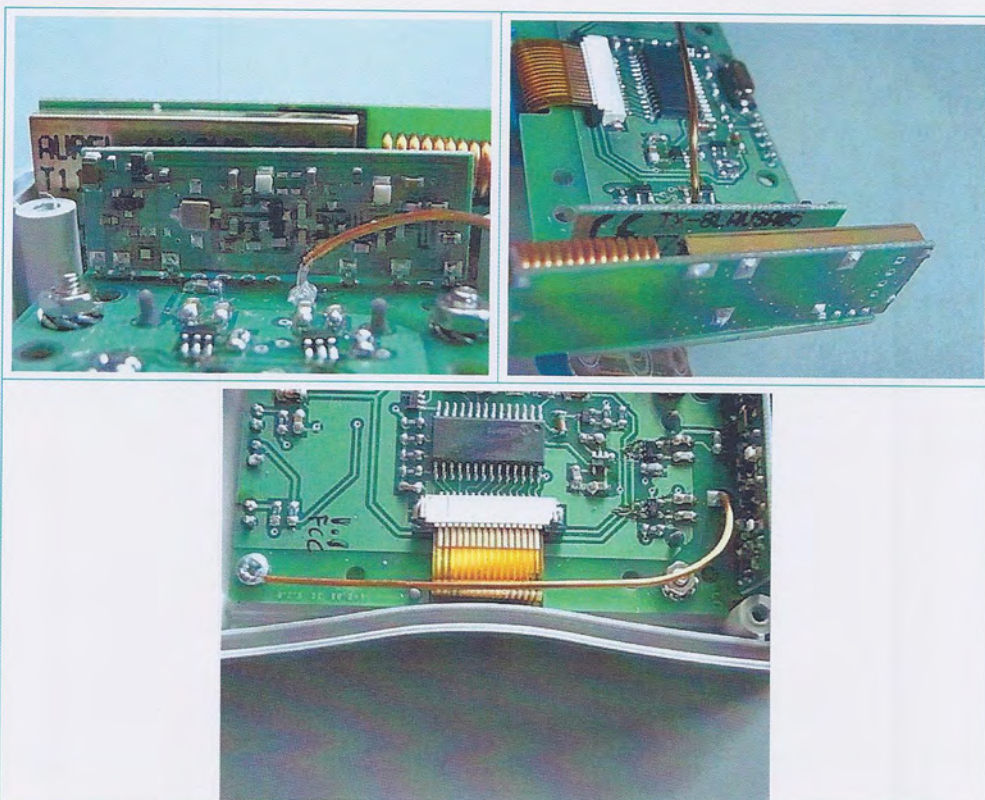
A. Equipment under test: transmitter unit



B. Internal view



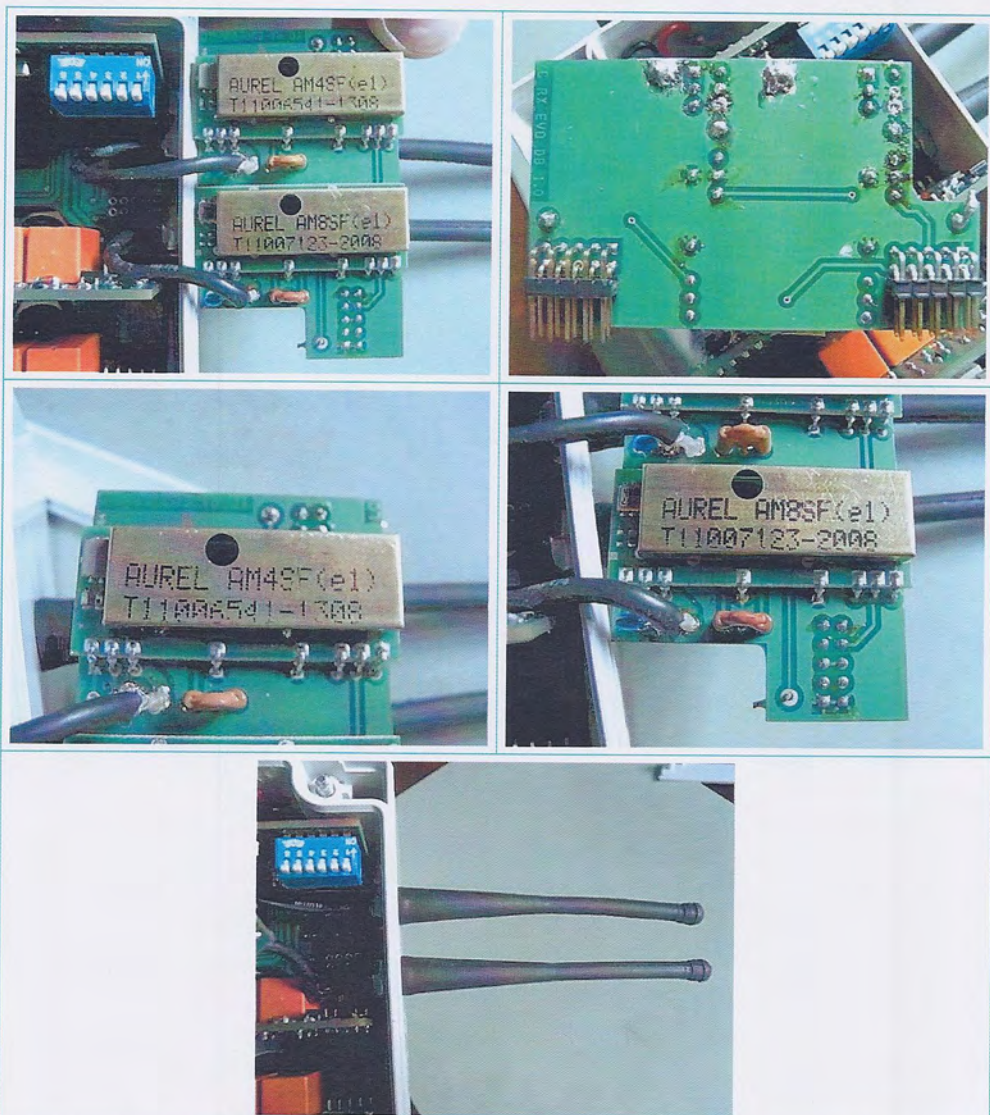
C. 433,92 MHz RF module and antenna



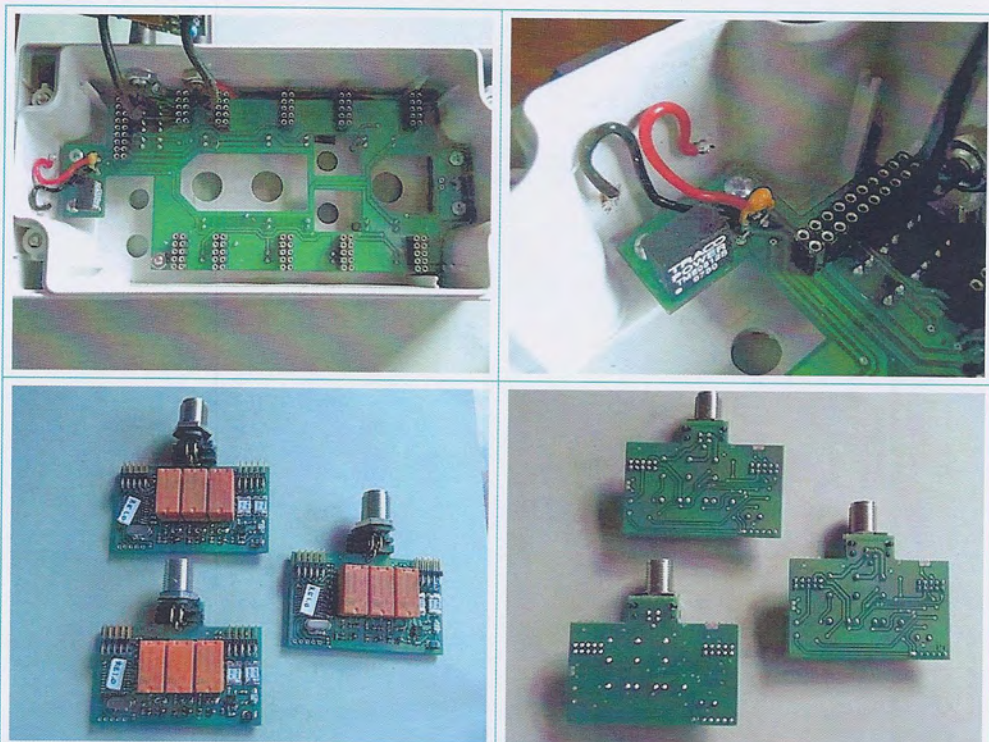
D. 868,30 MHz RF module and antenna



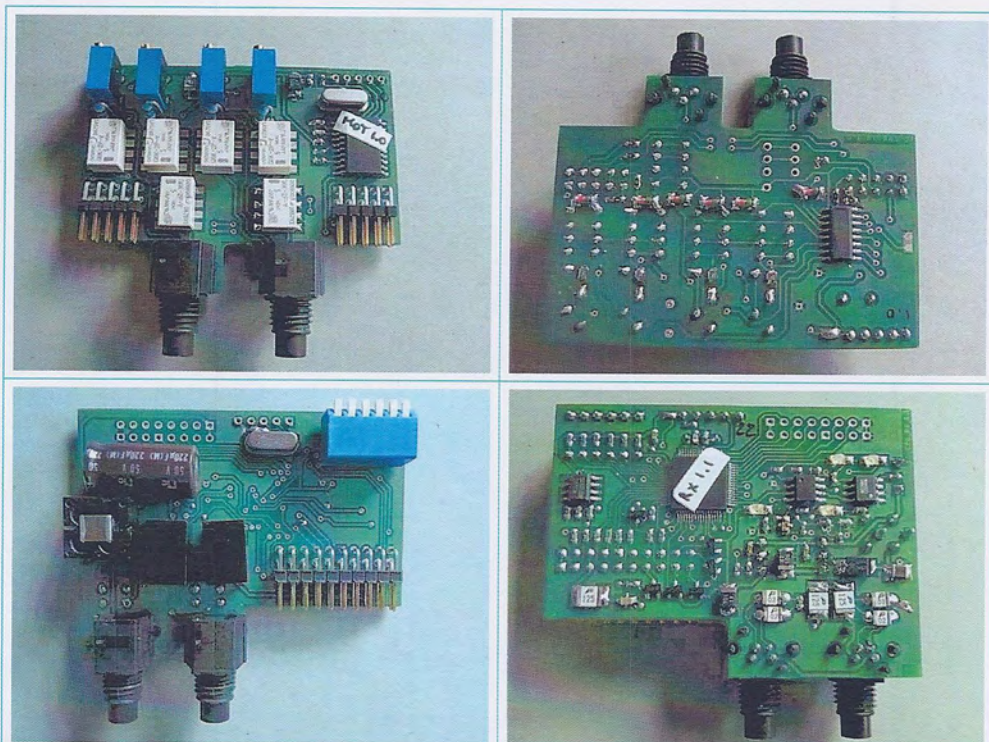
E. Equipment under test: receiver unit



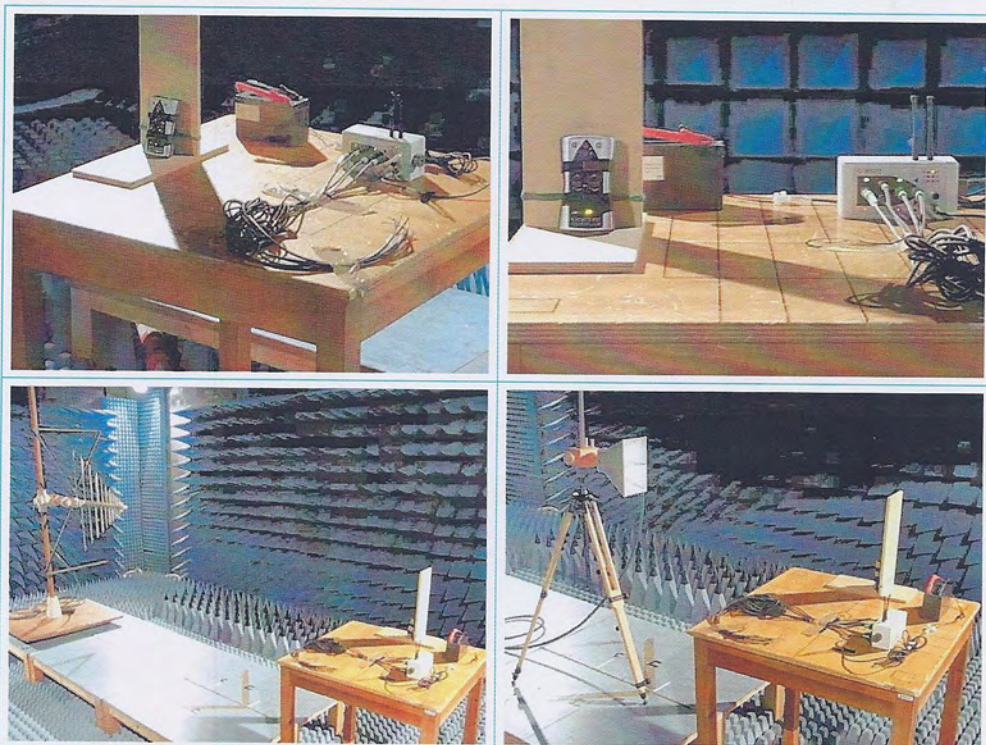
F. 433,92 & 868,30 MHz Receiver modules and antenna



G. Other modules on receiver unit



H. Other modules on receiver unit



I. Set-up immunity radiated test

8 MEASUREMENT AND TEST EQUIPMENT INSTRUMENTATION

| INSTRUMENTS | MANUFACTURER | MODEL | IMQ S/N | Ref. TEST |
|-------------------------------------|----------------------|-----------------|---------|-----------|
| Artificial Mains V-network | Rohde & Schwarz | ENV216 | S-03631 | 1 |
| Emi Receiver | Rohde & Schwarz | ESCI | S-04355 | 1,2 |
| Shielded chamber | SIDT | / | P-02391 | 1 |
| Emi Receiver | Rohde & Schwarz | ESVS | S-04197 | 2 |
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | S-03629 | 2 |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | S-02508 | 2 |
| RF generator | Rohde & Schwarz | SMG | S-00562 | 3 |
| RF generator | Rohde & Schwarz | SMR20 | S-03707 | 3 |
| RF amplifier | Amplifier Research | 100W1000M1A | S-02389 | 3 |
| RF amplifier | Amplifier Research | 60S1G3 | S-04261 | 3 |
| Directional coupler | AR | DC6180 | S-03509 | 3 |
| Directional coupler | AR | DC7144A | S-04182 | 3 |
| Power Sensor | Rohde & Schwarz | NRP-Z91 | S-04706 | 3 |
| Power Sensor | Rohde & Schwarz | NRP-Z91 | S-04707 | 3 |
| Antenna | ARA | LPE-2520/1 | S-03511 | 2,3 |
| Ridged horn antenna | Schwarzbeck | BBHA9120D | S-03464 | 2,3 |
| Shielded anechoic chamber | SIDT EUROPE | / | P-02386 | 2,3 |
| ESD generator | Schaffner | NSG 435 | / | 4 |
| Fast transients generator | EM TEST | UCS 500 | S-03711 | 5 |
| Capacitive Clamp | EM TEST | HFk | S-02624 | 5 |
| RF generator | Rohde & Schwarz | SMS2 | S-00475 | 6 |
| RF amplifier | Amplifier Research | 25A250A | S-03499 | 6 |
| Power attenuator | Pasternack | PE 7021-6 | / | 6 |
| Coupling / Decoupling Network (CDN) | MEB | M3 | S-03507 | 6 |
| Inductive Clamp | FCC | F203I | S-03500 | 6 |
| System | Spitzenberger +Spies | EMV E 5000/PASS | P-02355 | 7 |