TELECOMMUNICATIONS & TELEMATICS FOR TRANSPORTS LABORATORY

*Telecommunications & Telematics for Transports Lab.*

# TEST REPORT

Ref. No. ARSG00133/1

Date: 2007-03-07

Measurements performed in accordance with:

**FCC Rules: Code of Federal Regulations (CFR) no. 47 - PART 15 – RADIO FREQUENCY DEVICES**

| | | |
|---|---|---|
| PRODUCT | : | Radio control transmitter |
| APPLICANT | : | SIST&MATICA S.r.l. – Via S.Pertini, 17 – I-12030 Manta |
| MANUFACTURER | : | SIST&MATICA S.r.l. – Via S.Pertini, 17 – I-12030 Manta |
| TRADEMARK | : | SIST&MATICA |
| TESTED MODEL | : | EASY4 |
| FCC ID | : | PPMTXEASY4 |
| SERIAL NUMBER | : | 0270107 |
| RATING | : | DC 2 x 1.5 V size AAA alkaline battery |
| OTHER INFORMATION | : | Samples received on : 2007-03-01 |
| | | Testing dates : 2007-03-06 ÷ 2007-03-07 |
| | | Samples tested No. : 1 |
| | | Testing site : IMQ S.p.A – Via Quintiliano, 43 I-20138 MILANO |

| | | | | | |
|---|---|---|---|---|---|
| Tested by : | R. Torri | Signature: | Roberto Torri | Date : | 2007-03-07 |
| Checked by: | R. Colombo (EMC and R&TTE Lab. deputy) | Signature: | Roberto Colombo | Date : | 2007-03-09 |

**Revision Sheet**

| Release No. | Date | Revision Description |
|---|---|---|
| Rev. 0 | 2006-09-01 | Test Results and Evaluation Report |
| Rev. 1 | 2007-03-07 | Test report format and measurement updating |

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# CONTENTS



# 1 TEST SPECIFICATIONS, METHODS & PROCEDURES

The following tests and relevant standards have been applied to the Equipment Under Test (EUT):

## 1.1 EMISSION TESTS

| Product family standard | Date | Title |
|---|---|---|
| FCC Rules | February 1, 2006 | Code of Federal Regulations (CFR) no. 47 PART 15 – RADIO FREQUENCY DEVICES |

## 1.2 EQUIPMENT CLASSIFICATION

According to the definition 15.3 (o) EUT is a Class B digital device. A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public. Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use so it shall fulfil provisions of **47CFR Part 15 Subpart C – Intentional radiators** – Section 15.231 and 15.209.

## 1.3 ENVIRONMENTAL CONDITIONS

| TEST CONDITIONS | MEASURED |
|---|---|
| Ambient Temperature | 20 ÷ 25 °C |
| Relative Humidity | 50 ÷ 60 % |
| Atmospheric Pressure | 900 ÷ 1000 mbar |

# 2 EQUIPMENT UNDER TEST DETAILS

## 2.1 EUT IDENTIFICATION

| | | |
|---|---|---|
| **The EUT is composed by the following modules/parts:** | ▪ | Transmitter module 433,92 MHz |
| **EUT classification** | ▪ | Intentional radiator |
| **EUT use / installation (fixed/vehicular use/portable use) :** | ▪ | Portable |
| **EUT single or system:** | ▪ | Single |
| **EUT standing (floor-standing/Table-top-wall-mounted) :** | ▪ | --- |
| **Dimension of EUT (H x W x D):** | ▪ | 96 x 47 x 25 mm |
| **Weight of EUT:** | ▪ | --- |

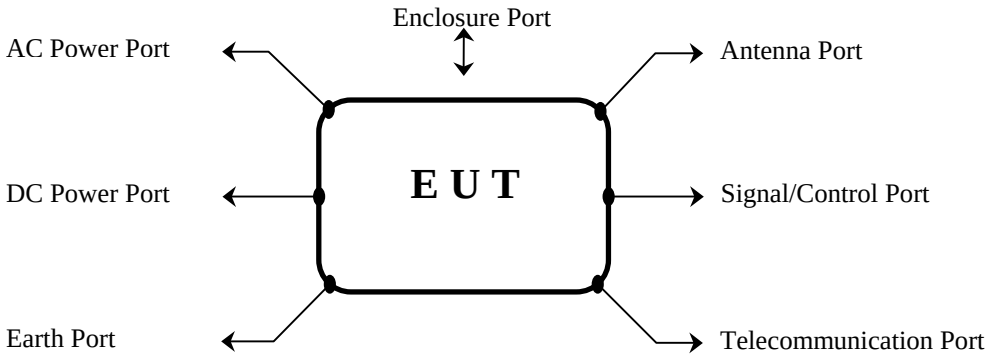
## 2.2 EUT TECHNICAL DATA

| | | |
|---|---|---|
| Power supply | : | ▪ DC 2 x 1.5 V size AAA alkaline battery |
| Power specification | : | ▪ --- |
| Working frequency | : | ▪ 433.92 MHz |
| Modulation | : | ▪ --- |
| Bit rate | : | ▪ --- |
| RX Sensitivity | : | ▪ --- |
| Processor | : | ▪ --- |
| Main Battery | : | ▪ --- |
| Main SW identification | : | ▪ --- |
| Main HW Board identification | : | ▪ --- |
| Peripherals included (for system application) | : | ▪ --- |
| Interfaces | : | ▪ --- |
| Integrated interfaces | : | ▪ --- |
| AC adapter | : | ▪ --- |

## 2.3 TESTED SAMPLES

| SAMPLE Nr. | S/N |
|---|---|
| 1 | 0270107 |

## 2.4 SYSTEM INTERFACE IDENTIFICATION




| # | Interface | Description | Maximum length | Ref. Document |
|---|---|---|---|---|
| 1 | Enclosure | Plastic surface | ---- | ---- |

## 2.5 DESCRIPTION OF SUPPORT EQUIPMENT

Here following the details concerning equipment needed for correct operation or loading of the EUT, but not considered as part of equipment under test:

| EQUIPMENT | MANUFACTURER | MODEL |
|---|---|---|
| None | --- | --- |

# 3 GENERAL MEASUREMENT CONDITIONS

Unless special conditions specified in the present test report, EUT configuration and general measurement conditions used are based on requirements of ANSI C63.4-2003 and CISPR Pub. 22:1997.

## 3.1 OPERATION OF THE EQUIPMENT (EUT)

The operational condition of the EUT was determined by the manufacturer according to the typical use of the EUT with respect to the expected highest level of emission.

These operational modes are described in the following table:

| Ref. | Description |
|---|---|
| #1 | Transmitter in continuous transmission without modulation (CW) |
| #2 | Transmitter in continuous transmission with modulation |

## 3.2 EUT PERFORMANCE ASSESSMENT

As declared by manufacturer the following settings have been adopted:

| PRIMARY FUNCTIONS | REPRESENTATIVE PARAMETER | TEST INSTRUMENTATION | ACCEPTABLE LEVEL OF PERFORMANCE |
|---|---|---|---|
| Data transmission | Radio data transmission | --- | Radio data received by radio receiver |

The test instrumentation used for monitoring the parameters has the following identification:

| TEST INSTRUMENTS | MANUFACTURER | MODEL | SERIAL NUMBER |
|---|---|---|---|
| --- | --- | --- | --- |
| --- | --- | --- | --- |

# 4 SUMMARY OF TEST RESULTS

## 4.1 Emission tests

| CFR47 Part 15 Subpart C Section: | Title | Port | Operating condition | Result | Test details |
|---|---|---|---|---|---|
| 15.203<br>15.204 | Antenna requirement | Antenna | --- | Complies | 1 |
| 15.207 | Conducted emission | AC power supply | --- | Not applicable[1] | --- |
| 15.209 | Radiated emission | Enclosure | #1 | Complies | 2 |
| 15.231a) | Deactivation of transmitter | --- | --- | Complies | 3 |
| 15.231b) | Radiated emission | Enclosure | #1 | Complies | 4 |
| 15.231c) | Bandwidth of emission | Enclosure | #2 | Complies | 5 |
| 15.231d) | Bandwidth of emission in band 40.66÷40.70 MHz | Enclosure | --- | Not applicable | --- |
| 15.231e) | Radiated emission | Enclosure | --- | Not applicable | --- |

[1] Port not present

# 5 EMC TEST DATA

| TEST No. 1 | Title "Antenna Requirements" | 47CFR Part 15 Ref. Section |
|---|---|---|
| | | 15.203 |
| TEST REQUIREMENTS | An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded. | |

| Antenna specifications | |
|---|---|
| N° of authorized antenna types : | ▪ 1 |
| Antenna type: | ▪ Integral antenna (PCB strip printed) |
| Total gain : | ▪ < 6 dBi |
| External R.F. power amplifier: | ▪ Not present |

**Test Result:**

The transmitter meets the requirements of section 15.203 and 15.204

| TEST No. 2 | Title "Deactivation of transmitter" | 47CFR Part 15 Ref. Section 15.231 a) |
|---|---|---|

**TEST REQUIREMENTS**

The provisions of this Section are restricted to periodic operation within the band 40.66 -MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmission are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

| Requirement | Description |
|---|---|
| 15.231 a) 1 | The transmitter is switch manually activated and cease transmission when switch it's released within not more than 5 seconds. |
| 15.231 a) 2 | The transmitter is only switch manually activated. |
| 15.231 a) 3 | Periodic transmission not contemplate by transmitter. |
| 15.231 a) 4 | The transmitter is not employed in radio control purpose during emergency |
| 15.231 a) 5 | The transmitter is not employed in security system. |

**Test Result:**

The transmitter meets the requirements of section 15.231 a)

| TEST No. 3 | Title "Radiated disturbances" | 47CFR Part 15 Ref. Section 15.231 b) 15.209 |
|---|---|---|
| TEST REQUIREMENTS | TEST SETUP | CISPR Pub. 22 :1997 |
| | TEST FACILITY | Anechoic chamber |
| | TEST DISTANCE | 3 m |
| | LIMITS FOR RADIATED DISTURBANCES | 47CFR Part 15 Ref. Section: 15.231b) |
| | FREQUENCY RANGE | 0.009 – 30 MHz<br>30 ÷ 1000 MHz<br>1000 MHz ÷ up to 10th fundamental harmonics |
| | DETECTOR | PEAK / QUASI-PEAK (0.009 ÷ 1000 MHz)<br>PEAK / AVERAGE (1000 MHz ÷ 10th harmonics) |
| | IF BANDWIDTH | 9 kHz (0.009 – 30 MHz)<br>120 KHz (30 ÷ 1000 MHz)<br>1 MHz (1000 MHz ÷ 10th harmonics) |
| | NOTE: In search of max noise (EUT rotation: from 0° to 360°; receiving antenna height: from 1 m to 4 m; receiving antenna polarization: horizontal and vertical). The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are ≥ Q.P. limit -6 dB. | |

| TEST DATA | PORT UNDER TEST | OPERATING CONDITION | RESULT | NOTES |
|---|---|---|---|---|
| | Enclosure | #1 | Complies | --- |

**LIMITS FOR FUNDAMENTAL**

| Frequency (MHz) | Quasi-Peak Limit (dBμV/m) | Quasi-Peak Limit (μV/m) |
|---|---|---|
| 433,92 | 80,82 | 10.996,68 |

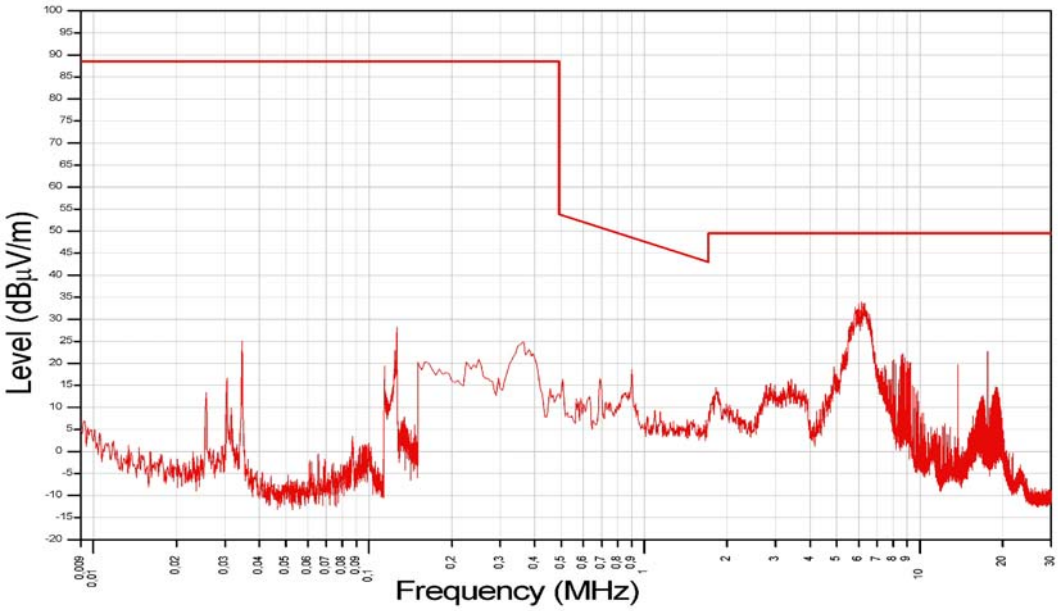
**LIMITS FOR SPURIOUS**

| Band of operations | Peak (dBμV/m) | Average Limit (dBμV/m) |
|---|---|---|
| Restricted bands | 74,00 | 54,00 |
| Other bands | According to 15.231 (b) | According to 15.231 (b) |

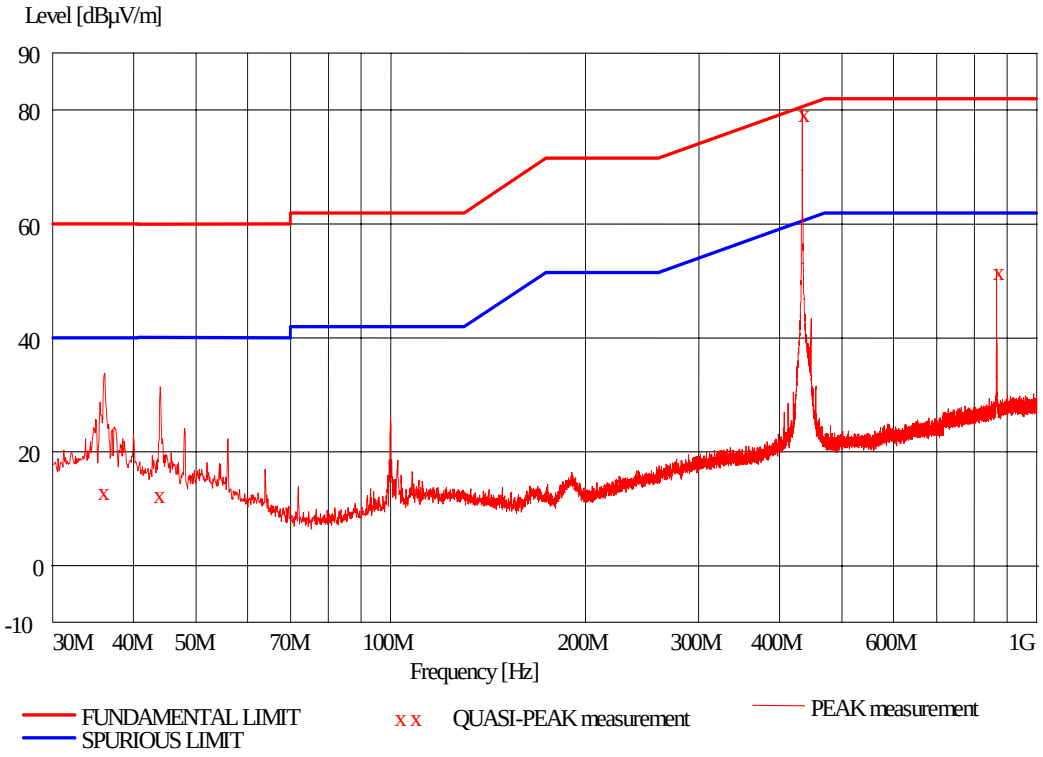
***MEASUREMENTS RESULTS***

**RADIATED DISTURBANCE AT ENCLOSURE PORT**

Radiated emission 0.009 ÷ 30 MHz



Radiated emission 30 MHz ÷ 1000 MHz

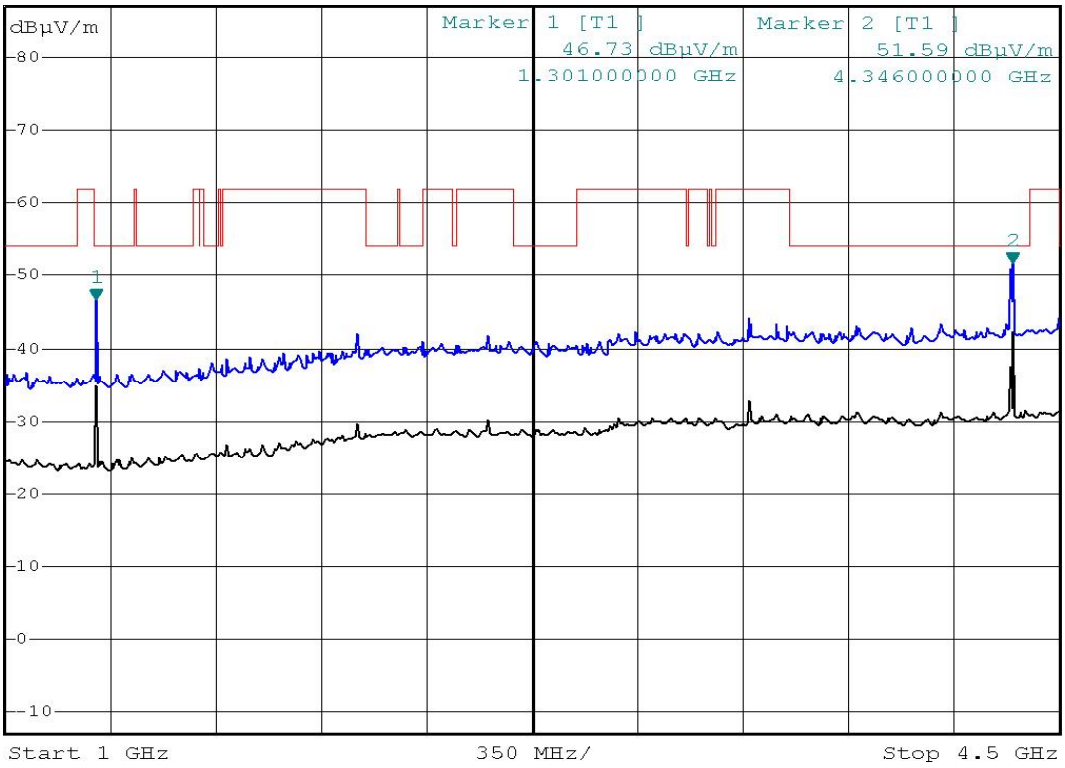



**QUASI-PEAK RESULT**

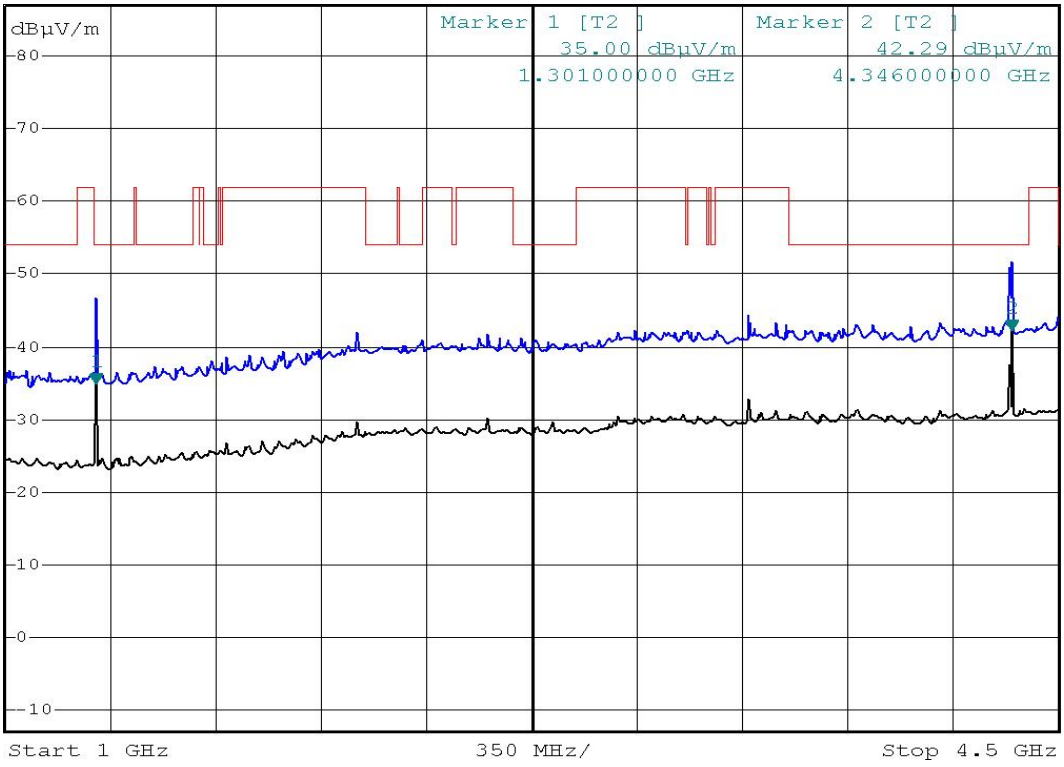
| Frequency (MHz) | Measured (dBµV/m) | Limit (dBµV/m) | Limit (µVolt/meter) | Margin (dB) |
|---|---|---|---|---|
| 36.100 | 13.40 | 40 | 100 | 26.6 |
| 44.000 | 12.80 | 40 | 100 | 27.2 |
| 433.919 | 79.70 | 80.825 | 10,996.64 | 1.125 |
| 867.850 | 52.05 | 61.938 | 1,250 | 9.888 |

**Radiated emission 1,000 MHz ÷ 4,500 MHz (Vertical Polarization)**

Markers on PEAK measurements




Markers on AVERAGE measurements



**PEAK measurement result**

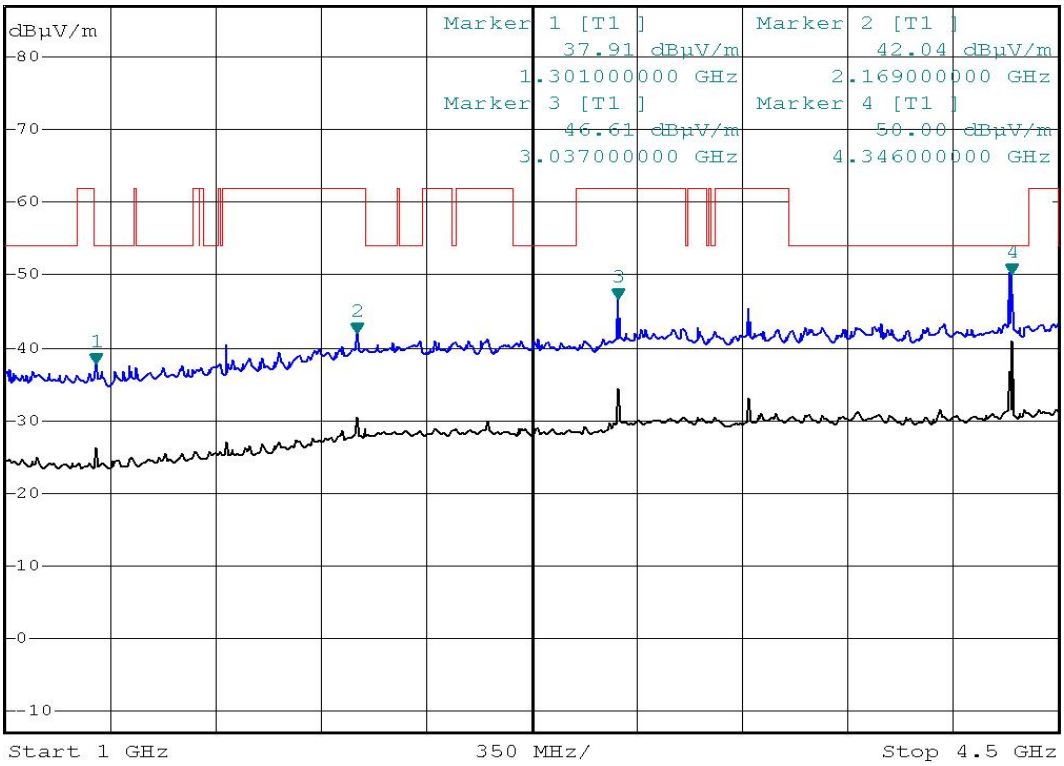
| Frequency (MHz) | Measured (dBµV/m) | Limit (dBµV/m) | Limit (µVolt/meter) | Margin (dB) |
|---|---|---|---|---|
| 1,301 | 46.73 | 81.94 | 12,500 | 35.21 |
| 4,346 | 51.59 | 81.94 | 12,500 | 30.35 |

**AVERAGE measurement result**

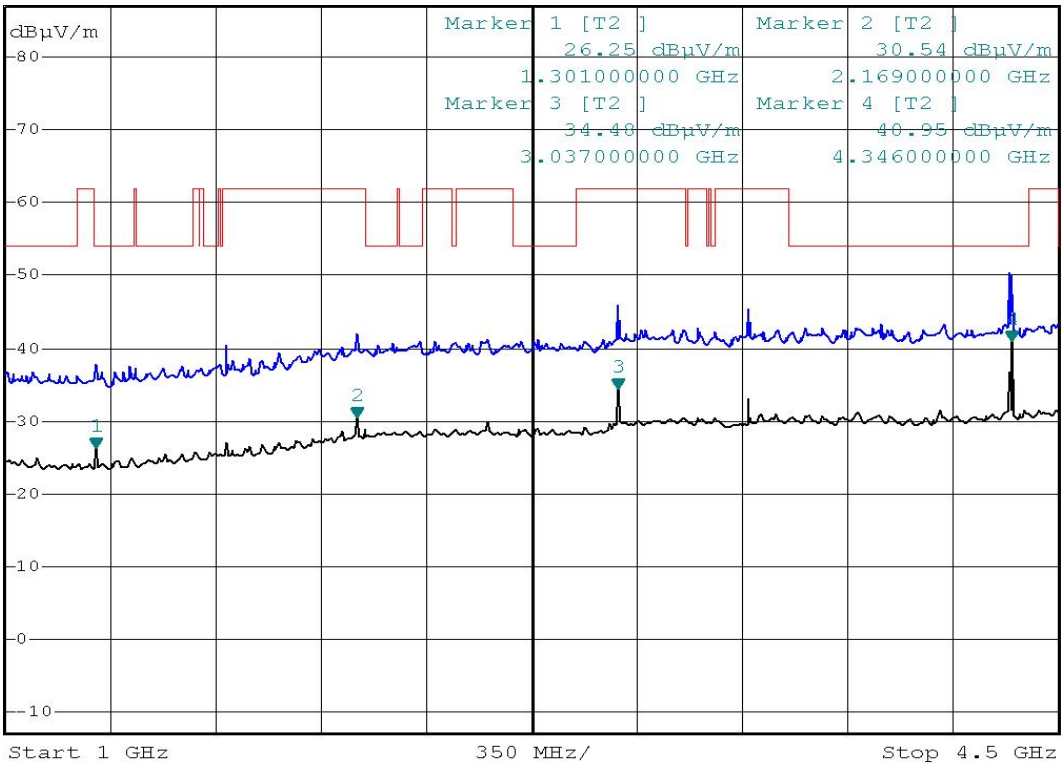
| Frequency (MHz) | Measured (dBµV/m) | Limit (µVolt/meter) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|
| 1,301 | 35.00 | 61.94 | 1,250 | 26.94 |
| 4,346 | 42.29 | 61.94 | 1,250 | 19.61 |

**Radiated emission 1,000 MHz ÷ 4,500 MHz (Horizontal Polarization)**

Markers on PEAK measurements




Markers on AVERAGE measurements



**PEAK measurement result**

| Frequency (MHz) | Measured (dBµV/m) | Limit (dBµV/m) | Limit (µVolt/meter) | Margin (dB) |
|---|---|---|---|---|
| 1,301 | 37.91 | 81.94 | 12,500 | 44.03 |
| 2,169 | 42.04 | 81.94 | 12,500 | 39.90 |
| 3,037 | 46.61 | 81.94 | 12,500 | 35.33 |
| 4,346 | 50.00 | 81.94 | 12,500 | 31.94 |

**AVERAGE measurement result**

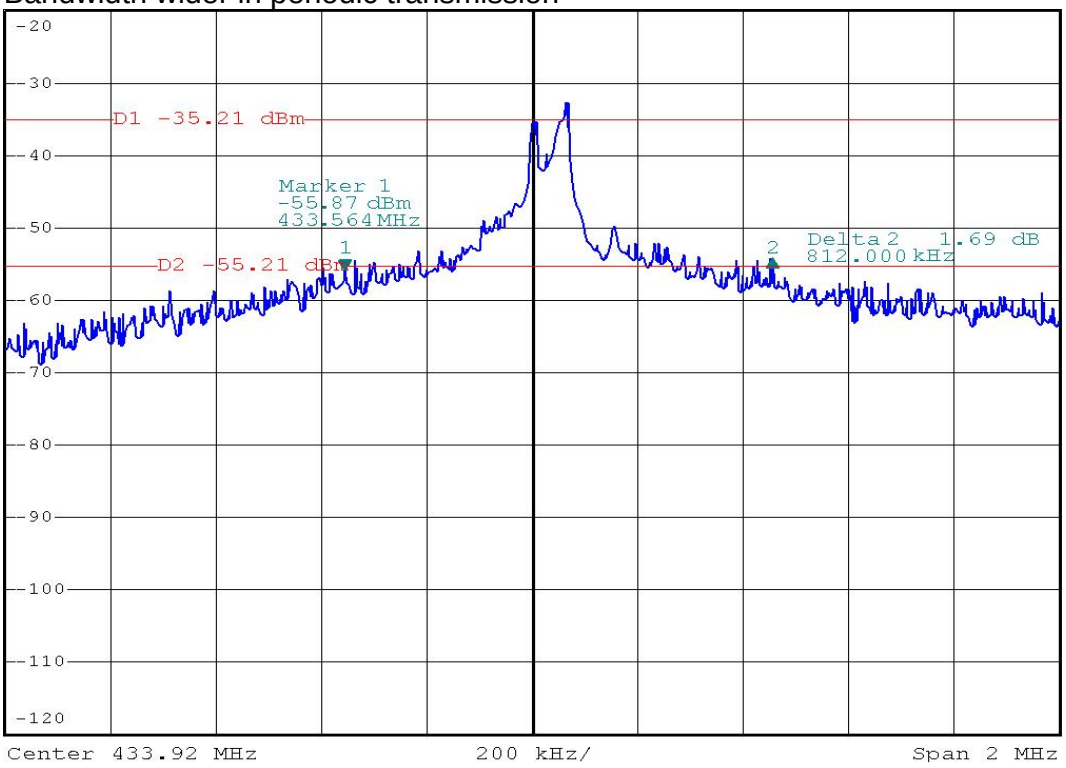
| Frequency (MHz) | Measured (dBµV/m) | Limit (µVolt/meter) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|
| 1,301 | 26.25 | 61.94 | 1,250 | 35.69 |
| 2,169 | 30.54 | 61.94 | 1,250 | 31.44 |
| 3,037 | 34.40 | 61.94 | 1,250 | 27.54 |
| 4,346 | 40.95 | 61.94 | 1,250 | 20.99 |

| TEST No. 4 | Title "Radiated disturbances and Bandwidth in periodic transmission" | 47CFR Part 15 Ref. Section 15.231 c) |
|---|---|---|
| TEST REQUIREMENTS | TEST SETUP | CISPR Pub. 22 :1997 |
| | TEST FACILITY | Anechoic chamber |
| | TEST DISTANCE | 3 m |
| | LIMITS FOR BANDWIDTH WIDER | 47CFR Part 15 Ref. Section: 15.231 (c) |
| | FREQUENCY RANGE | Fundamental frequency |
| | DETECTOR FOR BANDWIDTH WIDER | PEAK |
| | IF BANDWIDTH | 120 KHz |
| | NOTES: / | |

| TEST DATA | PORT UNDER TEST | OPERATING CONDITION | RESULT | NOTES |
|---|---|---|---|---|
| | Enclosure | #1 | Complies | --- |

***MEASUREMENTS RESULTS***

Bandwidth wider in periodic transmission




| Frequency | Bandwidth at -20 dB point down | Limit (0,25% of 433,92 MHz) | Margin |
|---|---|---|---|
| 433.92 MHz | 812 kHz | 1,084.8 kHz | 272.8 kHz |

# 6 ADDITIONAL TECHNICAL INFORMATION

## 6.1 Electromagnetically relevant components:

| Components | N° | Manufacturer | Type – Technical data |
|---|---|---|---|
| Transmitter | 1 | SIST&MATICA | TXEASY4 |

## 6.2 RFI suppression devices:

| Components | N° | Manufacturer | Type – Technical data |
|---|---|---|---|
| None | | | |

## 6.3 EMI protection devices:

| Components | N° | Manufacturer | Type – Technical data |
|---|---|---|---|
| None | | | |

# 7 TECHNICAL DOCUMENTATION

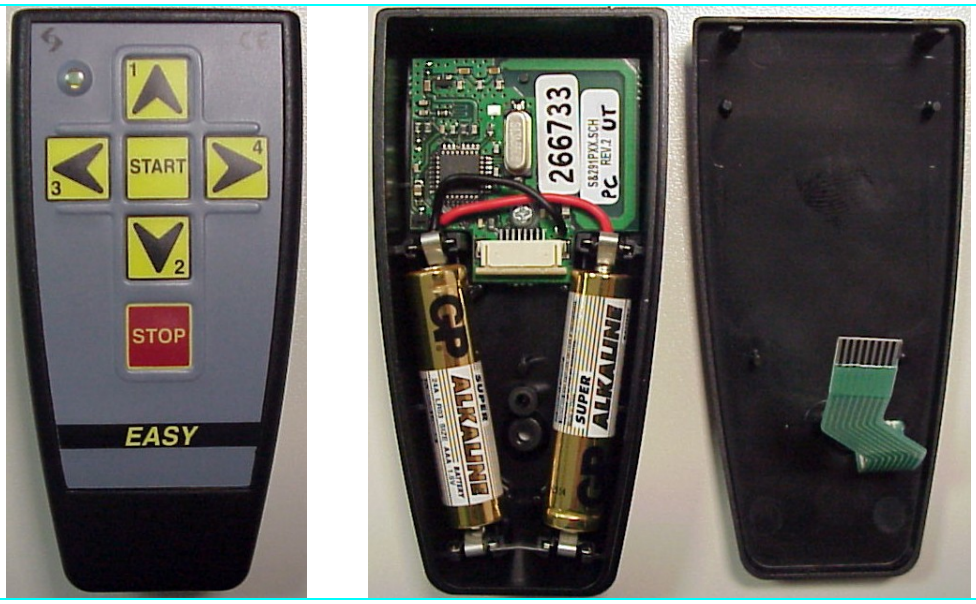
| DOCUMENT | REFERENCE |
|---|---|
| --- | |

# 8 PHOTOGRAPHIC DOCUMENTATION

## 8.1 EUT IDENTIFICATION

Test set-up 30÷1000 MHz and 1÷4,5 GHz

Particular of EUT test set-up arrangement during the test




Front and internal view of EUT


Particular of EUT label marking

# 9 MEASUREMENT AND TEST EQUIPMENT

| INSTRUMENTS | MANUFACTURER | MODEL | IMQ s/n |
|---|---|---|---|
| EMI receiver | Rohde & Schwarz | ESVS10 | S-04197 |
| Spectrum analyzer | Rohde & Schwarz | FSP40 | S-02350 |
| Pre-amplifier | HP | HP 8439 B | S-03542 |
| Log-periodic antenna | ARA | LPE-2520/1 | S-03511 |
| Ridged horn antenna | Schwarzbeck | BBHA9120D | S-03464 |
| Shielded anechoic chamber | SIDT EUROPE | / | P-02386 |
| PC and SW for test automation | / | / | / |