

## MEASUREMENT/TECHNICAL REPORT

FCC Part 15 Sections 15.209, 15.249

Logos Av Com

FCC ID: OM4TLV-MA-US

November 30<sup>th</sup>, 2003

This report concerns (check one): Original grant ☒ Class II change ☐

Equipment type: TELEVOTER VOTING KEYPAD (ex.: computer, printer, modem, etc.)

Deferred grant request per 47 CFR 0.457(d)(1)(ii)? yes ☐ no ☒

If yes, defer until: \_\_\_\_\_  
date

Company Name agrees to notify the Commission by \_\_\_\_\_

Date  
of the intended date of announcement of the product so that the grant can be issued  
on that date.

Report prepared by: Giuseppe MECCHIA



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## 1 GENERAL INFORMATION

### 1.1 Product description

EUT is a transceiver designed to be the keypad of a voting system.

The voting pad is composed of the following elements:

- A plastic container with antenna cover containing:
  - an electronic card with logic, transmit and receive section (transceiver) and TX/RX antenna mounted (welded on PCB)
  - battery
  - keyboard with 10 numeric keys (0-9) and 2 function keys
  - 1 green led and 3 red led

Each keyboard have an identifying number from 1 to 16.383, divided in 32 block of 512.

#### 1.1.1 Operational description

A command, sent by slaves antennas to all the pads present in the area, open the voting. After this moment, the pad owners are allowed, by pressing a key, to record their choice into an internal memory of the voting pad.

When a proper command is received from the slave antennas (FCC IC:OM4SLV-MA-US) the voting pads, pertaining to the requested block, send, one after the other, the data of the recorded choice to the slave antennas, which are, at the moment, switched in receiving mode.

The data are sent by air (radio TX mode) on the frequency of 916.50 MHz.

When collected, the data of the first block, are sent, from the slave antennas to the Master unit (MST-MA-US), by cable on a RS 485 line, and from the Master Unit to the PC, through the RS232 port for their processing and displaying.

Immediately, the system will poll the further blocks present in the area.

#### 1.1.2 Modulation upon the carrier:

- only one frequency is used: 916,50 MHz
- modulation type: AFK
- data rate max: 56 Kbps

### 1.2 Related Submittal(s)/Grant(s)

FCC ID: OM4SLV-MA-US

### 1.3 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

Model & Serial No.	FCC ID	Description	Cable Descriptions
<b>TLV-MA-US (1) s/n EMC03-381</b>	<b>OM4TLV-MA-US</b>	<b>Televoter Voting Keypad</b>	<b>No cable provided</b>
Remotely connected to:			
SLV-MA-US s/n EMC03-380	OM4SLV-MA-US	Televoter slave RS 485 I/F	Shielded signal/power cable
MST-MA-US s/n EMC03-379	None Verified unit	Televoter Master RS 232 I/F	Unshielded power cord Shielded signal cables
Hitek power Mod. 1AA12018 S/n /	none	Power supply for Master	Unshielded power cords
Dell Dimension 4100 mod. MMS s/n FN9010J	D.o.C.	Personal Computer	Unshielded power cord Shielded signal cables
Highscreen mod. MS1990E type J91B s/n 8016001183	AMPJ91B	Monitor	Unshielded power cord Shielded signal cable
Dell SK 8000 S/n CN-037JMY- 38844-08N-J491	D.o.C.	Keyboard	Shielded signal cable
Microsoft Intellimouse S/n 4526477-2	D.o.C.	Mouse	Shielded signal cable
DM 119 s/n 3031602	DYKDM119	Printer, parallel I/F	Unshielded power cord Shielded signal cable

(1) EUT submitted for grant.

## 1.4 Test Methodology

Rdiated testing was performed according to the ANSI C63.4-2001 test procedures at an antenna to EUT distance of 3 meters.

## 1.5 Test Facility

### TÜV ITALIA test site No. 3 – semi-anechoic chamber

The semi-anechoic chamber test site and conducted measurement facility used to collect the radiated data are located at Via Montalenghe 12, Scarmagno, Italy. This site has been fully described in a report dated May 14, 2003 submitted to your office, and accepted in a letter dated May 16, 2003 (registration Number: 90860)

By a decision of the Joint Committee of the EU-US Mutual Recognition Agreement, TÜV ITALIA has been listed under the Sectoral Annex on Electromagnetic Compatibility as Conformity Assessment Body (CAB)

This decision is effective from 20 September 2002.

### 1.6 Test equipment list:

Description	Model	serial No.	Cal due date
Spectrum analyzer	HP 8568B+QP adapter	s/n 2601A02134	04/04
Spectrum analyzer	HP 8562A	s/n 3043A05627	10/04
Biconical antenna	Tensor 4104	s/n 2222	03/04
Log-periodic antenna	Electro-metrix LPA-25	s/n 1117	03/04
Horn antenna	EMCO 3115	s/n 3572	11/04

## **2 PRODUCT LABELING**

> See exhibit < Label and label location

### **3 SYSTEM TEST CONFIGURATION**

#### **3.1 Justification**

The EUT was configured for testing in a typical fashion (as a customer would normally use it).

IT has been tested in stand alone mode; EUT is normally in receive mode, but when it receive a request to send, it become a transmitter and send the data stored in it

A Televoter controller Slave (FCC ID: OM4SLV-MA-US) has been placed in the chamber, at a convenient distance, in order to operate the EUT, but not to interfere with testing.

Test conditions:

- a new battery has been installed
- modulation and operational frequency were fixed (no regulation are permitted by the operator or factory settings)
- during tests EUT has been rotate through the three ortogonal axes to determine which condition produces the highest emission with reference to the limits.

#### **3.2 EUT Exercise Software**

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

The EUT has been tested in continuous transmission of data in both direction from TLV-MA-US to SLV-MA-US and return, in order to activate respectively the transmit and the receive section of EUT.

Software used:

The P.C. software is used to communicate to the Televoter controller the kind of polling, the numbers of keyswitches enable, the numbers of voting keypads enable, and the numbers of the keyboard enable. The Televoter controller transmits the request of poll to the voting keypads and waits to the answer. This operation is made for every number of the voting keypads enable from the software of P.C.

After receiving of all polls the Televoter controller transfers the polling to the P.C and goes to sleep mode. Its wake up is controlled from P.C when it needs to do a new polling.

The voting keypads, after transmission of its data, close the transmitter. In this status the receiver is active.

### **3.3 Special Accessories**

None.

EUT is housed in a plastic box,  
No interface cable are provided.

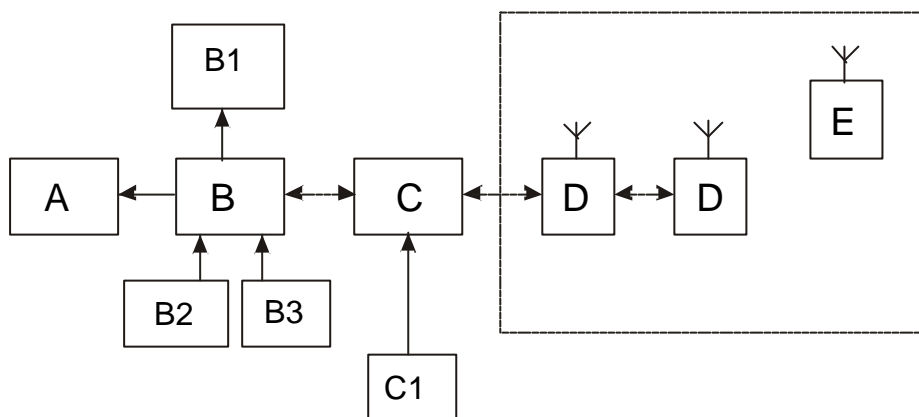
### **3.4 Equipment Modifications**

To achieve compliance to Class B levels, no changes were made during compliance testing.



### 3.5 Configuration of the Tested System

Figure 3.1 Configuration of the Tested System



**A** = Printer  
**B** = PC box,  
B1 = Monitor  
B2 = Keyboard  
B3 = Mouse  
**C** = Master  
C1 = additional power supply  
**D** = Slave  
**E** = EUT Televoter keypad

## **4 BLOCK DIAGRAM(S) OF THE EUT**

### **4.1 Block Diagram Description**

The controller board of the EUT is provided with:

Crystals and oscillator:

- Quartz oscillator 5 MHz model MEC QSXTMO 5000 BG55LR
- Hybrid transceiver (TX/RX) model RFM TR1000 916.50 MHz

RF suppression devices :

- Zener diode 15 V.
- Ferrite Bead BLM11 Murata on TX side of the transceiver

**Fig. 4.1 - Block Diagram of the EUT**

> See exhibit < block diagram

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## **RADIATED MEASUREMENT PHOTOS**

> See exhibit < test setup photos

## 7 RADIATED EMISSION DATA

- frequency range 30 MHz – 10 GHz (10<sup>th</sup> Harmonic of highest fundamental frequency generated).

### 7.1 Tests of the worst case configuration

The following data list the significant emission frequencies, measured levels, correction factors (including cable and antenna corrections), the corrected reading, plus the limit. Field strength calculation is given in paragraph 7.2.

Judgement: Passed by 0.3 dB

Spurious emissions (limits according to section 15.209).

No spurious emissions detected above noise floor  
Section 15.205 Restricted band requirements is fulfilled

Fundamental and harmonics (limits according to section 15.249).  
(worst case of the three orthogonal planes, continuous transmission cw, signal always on)

Frequency (MHz)	Polarity (V/H)	Receiver* Reading (dB $\mu$ V)	Correction Factor (dB/m)	Corrected Reading (dB $\mu$ V/m)	3 Meter Limit (dB $\mu$ V/m)
916.5	H	62.8 63.1	30.6	93.4 QP 93.7 PK	94
1833	V	12.4	27.2	39.6 PK	54
2749.5	V	10.7	30.5	41.2 PK	54
3666	V	10.1	32.1	42.2 PK	54
4582.5	H	10.2	33.3	43.5 PK	54
5499	V	11.3	34.4	45.7 PK	54

No other harmonics detected above noise floor.

\* below 1 GHz readings are quasi-peak or peak, with an IF bandwidth of 120 kHz,  
above 1 GHz are peak with an IF bandwidth of 1 MHz.  
Video bandwidth used for both frequency ranges is 1 MHz

Test Personnel:

Tester Signature  Date October 16, 2003

Typed/Printed Name Giuseppe MECCHIA

## 7.2 Field Strength Calculation

7.2.1 The field strength is calculated by adding the Antenna and Cable Factor to the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where

FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

Assume a receiver reading of 62.8 dB $\mu$ V is obtained. The Antenna and Cable Factor of 30.6 is added, giving a field strength of 93.4 dB $\mu$ V/m. The 93.4 dB $\mu$ V/m value was mathematically converted to its corresponding level in  $\mu$ V/m.

$$FS = 62.8 + 30.6 = 93.4 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(93.4 \text{ dB}\mu\text{V/m})/20] = 46,773.5 \mu\text{V/m}$$

## **8 PHOTOS OF TESTED EUT**

> See exhibit < internal & external photos

# User Manual

➤ See exhibit <