MEASUREMENT/TECHNICAL REPORT

FCC Part 15 Sections 15-207 and 15-209

Honeywell

FCC ID: HS9-CTU-K07

November 07th, 2002

This report concerns (check one): Original grant __X__ Class II change____

Equipment type: ACCESS CONTROL TERMINAL (ex.: computer, printer, modem, etc.)

Deferred grant request per 47 CFR 0.457(d)(1)(ii)? yes _____ no __X__

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

The CTU-K07 MIFARE prox reader Module, with the Tema Server controller, compose a terminal, designed for access control and time & attendance applications, that read MIFARE proximity cards.

The module is based on a OEM Philips reader (code MFCM200/FAA) controlled by a 3150 Neuron chip with 32K Flash and 16K RAM . The reader manages 13.56MHz antenna coils switching. The module includes 2 green directional LED, RED LED and a buzzer.

Figure 4.1 shows the CTU-K07 reader module block diagram.
The module is interfaced to the Tema Server controller via clock&data lines. The direction is coded using 0B<data>0F frame swapping.

From an FCC point of view the EUT CTU-K07 is an intentional radiator (tranceiver TX=RX=13.56MHz).

1.2 Related Submittal(s)/Grant(s)

None

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
CTU-K07 MIFARE Prox Reader Module (1) s/n EMC-02188	**HS9-CTU-K07**	**Prox Reader Module**	**Unshielded power and signal cable**
Tema Server S/n EMC-2001-294	Verified	Controller	Unshielded power cord Unshielded signal cables
TRN1 AL12F S/n none	None	Toroidal transformer	Unshielded power cords
I/O simulator S/n none	None	Input/Output simulator	Unshielded signal cables

Connected through 10BaseT LAN to a remote:

Dell PPX Latitude C family S/n 99080	D.o.C.	Personal Computer	Unshielded power cord Unshielded signal cables

(1) EUT submitted for grant.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the ANSI C63.4-1992 test procedures . Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

TÜV ITALIA test site No. 2 – Open field

The open field 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 12, 2000 submitted to your office, and accepted in a letter dated May 30, 2000 (registration Number: 90860)

1.6 Test equipment list:

Description	Model	serial No.	Cal due date
Test receiver	Rohde & Sch.ESH3	s/n 881364/012	10/03
Test receiver	Rohde & Sch.ESVP	s/n 892372/023	04/03
LISN	Schwarzb.NNLA 8120	s/n 8120471A	02/03
Loop antenna	Rohde & Sch.HFH2-Z2	s/n 881058/6	09/03
Biconical antenna	EMCO 3110	s/n 1735	03/03
Log-periodic antenna	EMCO 3146	s/n 3678	03/03

2 PRODUCT LABELING

Figure 2.1 FCC ID Label

See attached file: Label.pdf

Figure 2.2 Location of the Label on EUT

See attached file: label_location.jpg

3 SYSTEM TEST CONFIGURATION

3.1 Justification

The EUT was configured for testing in a typical fashion (as a customer would normally use it).
In order to simulate a real application , the EUT has been mounted and connected to a Tema Server controller in a typical configuration and operated according to normal use. (see Figure 3.1).

The EUT has been tested in vertical position simulating real operating placement attached to a wall

Conducted emission testing was performed on the power mains cord of the toroidal transformer.

3.2 EUT Exercise Software

The complete terminal CTUK07 is normally in an idle condition, waiting for a card. When the cardholder places the MIFARE card in front of the antenna reader, the card-ID is read by CTUK07 Module and the card code is sent to the Tema Server controller for the manage.

3.3 Special Accessories

None.

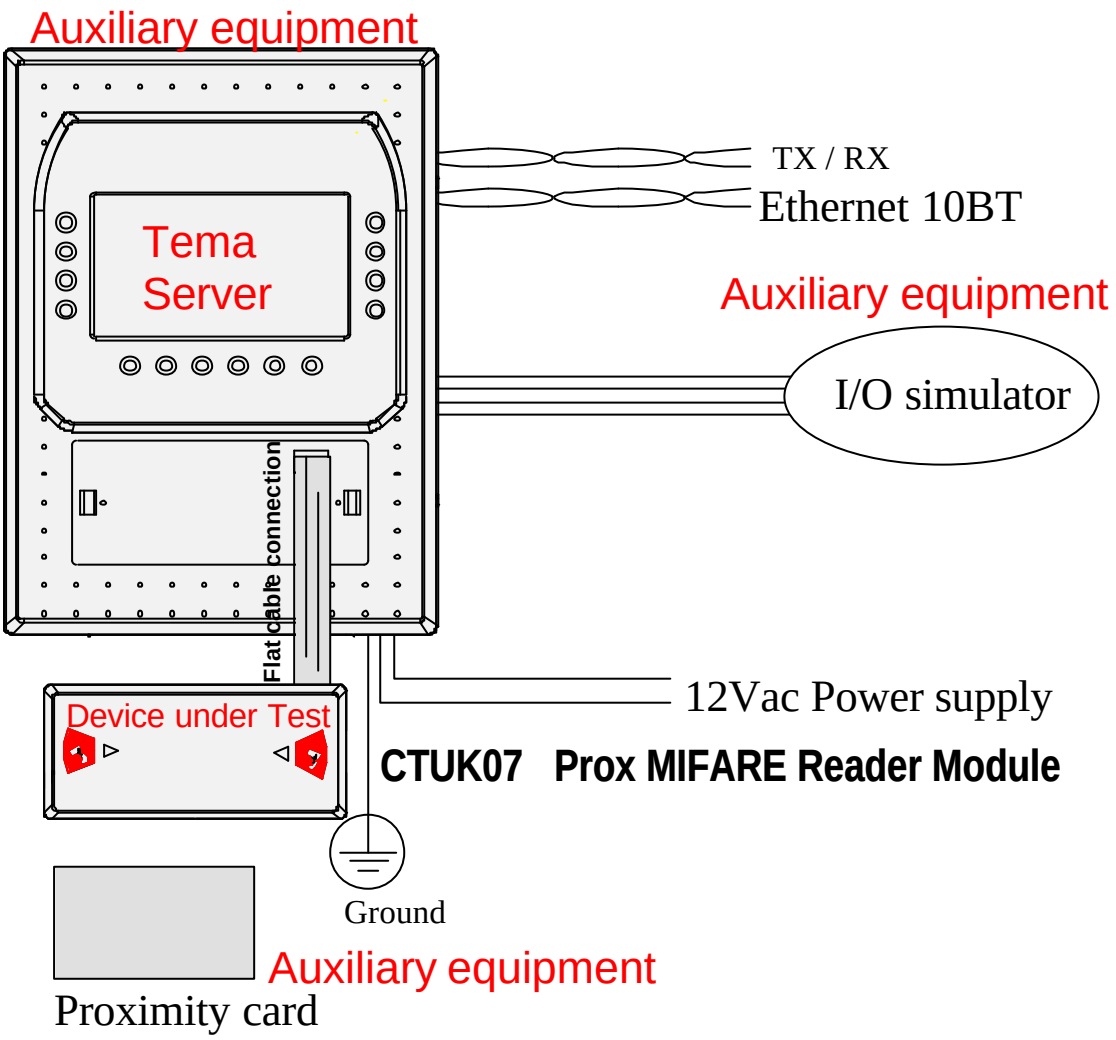
As shown in Figure 3.1 all interface cables used for compliance testing are unshielded as readily available on the market.

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



4 BLOCK DIAGRAM(S) OF THE EUT

4.1 Block Diagram Description

The **CPU Board 52235AB** of the EUT is provided with:

Crystals and oscillators (CPU clock):

X1: 10MHz

RF suppression devices:

VDC EMI Filters:

C29,C32,C33:	Capacitor 100nF 10% 50V	SMD 0805
C34:	Capacitor 22uF 10V	SMD (5x5,4) 10CV22BS Sanyo
L3,L4:	Inductor 33uH	SMD1812 Murata LQH4C330K04M00

Antenna signal EMI Filters:

C30,C31:	Capacitor 47pF NP0 +/-2%	SMD 0603
L1,L2:	Inductor 2.2uH +/- 10%	SMD 1206 Murata LQH1N2R2K04M00

The **Antenna Board 52255AD** of the EUT is provided with:

Antenna signal EMI/Tuning Filters:

C1,C2,C4,C5:	Capacitor 22pF +/-2%	SMD 0603
C3:	Capacitor 8-40pF Trimmer	SMD Murata TZBX4 P400 BA110
R1:	Resistor 270ohm	SMD 0805

EUT Shield:

None

Fig. 4.1 - Block Diagram of the EUT

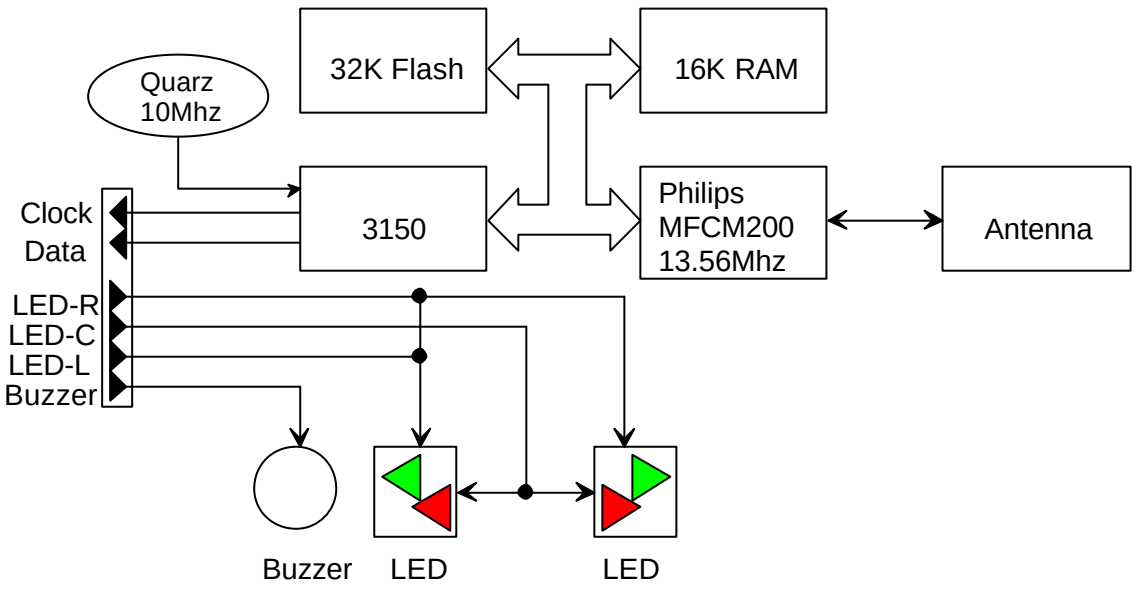


Fig. 4.2 - Block Diagram of Transceiver

Provided by Philips

5 CONDUCTED AND RADIATED MEASUREMENT PHOTOS

See attached files : TestSetup_photos

6 CONDUCTED EMISSION DATA
(According to section 15.207 of the FCC rules)

6.1 Tests of the worst case configuration.

The conducted tests are performed with a receiver in quasi-peak mode.

	Frequency (MHz)	Measured* (dBµV)	QP limit (dBµV)	AV Limit (dBµV)
Neutral	0.15	47	66	56
	0.20	43	63.7	53.7
	0.30	26	60.3	50.3
	5.5	22	60	50
	13.56	43	60	50
	27.1	25	60	50
Line	0.15	46	66	56
	0.20	42	63.7	53.7
	0.30	26	60.3	50.3
	5.5	23	60	50
	13.56	42	60	50
	27.1	24	60	50

* All readings are quasi-peak

Test Personnel:

Tester Signature  Date September 03, 2002

Typed/Printed Name Giuseppe MECCHIA .

7 RADIATED EMISSION DATA
(According to section 15.209 of the FCC rules)

- **frequency range 0.009 MHz – 1 GHz**
- **(from the lowest frequency to 1GHz: it includes a digital device)**

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 strenght calculation is given in paragraph 7.2.

Judgement: Passed by 5.5 dB

Fundamental and harmonics (limits according to section 15.209).

Frequency (MHz)	Receiver* Corrected Reading (dBμV/m)	3 Meter Limit (dBμV/m)
13.5612	58	73.5
27.1224	23	49.5

Frequency (kHz)	Receiver* Corrected Reading (dBμV/m)	10 Meter Limit (dBμV/m)
13.5612	46	51.5
27.1224	13	39.5

* below 30 MHz readings are quasi-peak with an IF bandwidth of 9 kHz,

Extrapolation data

Measurements were taken at the fundamental frequency of the intentional radiator with the Rohde & Schwarz loop antenna at the distances od 10 and 3 meters. The antenna was placed at a fixed height of 1 meter. **Measurements were taken in the three orthogonal orientation to find the maximum emission, vertical was observed to be worst case.** The turntable was rotate to maximize the emission. The first measurement was taken at 3 meters, then the antenna was moved to 10 meters and the emission was measured. These readings were then plotted to extrapolate the correct reading at a distance of 30 meters. The limit was then calculated using precisely the falloff rate which has been measured to be:

- 22dB/decade at 13.56MHz and
- 10dB/decade at 27.12MHz.

This limits were then plotted on the graph to extrapolate the limits at 10 and 3 meters. Reference measurements standards Part 15 section 15.31(f)(2).

Spurious emissions (limits according to section 15.209).

Judgement: Passed by 6 dB

Frequency (MHz)	Polarity (V/H)	Receiver* Reading (dBµV)	Correction Factor (dB/m)	Corrected Reading (dBµV/m)	3 Meter Limit (dBµV/m)
60	V	18	10.4	28.4	40
80	V	19.7	10.3	30	40
160	H	12.3	15.2	27.5	43.5
350	H	18.7	18.3	37	46
440	V	19.5	20.5	40	46
520	V	15.8	23	38.8	46

* above 30 MHz readings are quasi-peak, with an IF bandwidth of 120 kHz,

Test Personnel:

Tester Signature Date September 10, 2002

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 19.7 dBμV is obtained. The Antenna and Cable Factor of 10.3 is added, giving a field strength of 30 dBμV/m. The 30 dBμV/m value was mathematically converted to its corresponding level in μV/m.

FS = 19.7 + 10.3 = 30 dBμV/m

Level in μV/m = Common Antilogarithm [(30 dBμV/m)/20]= 31.6 μV/m

8 PHOTOS OF TESTED EUT

Fig. 8.1 EUT mounted on Tema Server
Fig. 8.2 Details of connection of EUT to Tema Server
Fig. 8.3 Upper view
Fig. 8.4 Lower view
Fig. 8.5 Unit partially disassembled
Fig. 8.6 Internal view – electronic boards
Fig. 8.7 52235AB CPU board – components side
Fig. 8.8 52235AB CPU board – foil side
Fig. 8.9 52255AD Antenna board – components side
Fig. 8.10 52255AD Antenna board – foil side

See attached files: internal_photos and external_photos

Other additional photos will be provided by Philips.

User Manual

See attached file : user_manual