MEASUREMENT AND TECHNICAL REPORT

CUBIC TRANSPORTATION SYSTEMS
5650 Kearney Mesa Road
San Diego, CA 92111

DATE: 28 March 2005

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	ACT 7, Model 061-1311 Rev. B	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: **Defer until:**	No: X
Company Name **agrees to notify the Commission by:** **of the intended date of announcement of the product so that the grant can be issued on that date.**	N/A	
Transition Rules Request per 15.37?	Yes:	No: X*

(*) FCC Part 15, Paragraph(s) **15.209(a), 15.225(a), 15.225(e)**

Report Prepared by:

TÜV AMERICA, INC
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 678 1400
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TÜV AMERICA

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TÜV AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 678 1400 FAX 858 546 0364

1.0 GENERAL INFORMATION

1.1 Product Description

Form

EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- ***NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.***

Company: Cubic Transportation Systems, Inc.

Address: 5650 Kearny Mesa Road
San Diego, CA 92111

Contact: Chuck Burns Position: Sr. Compliance Specialist

Phone: (858) 627-4676 Fax: (858) 292-9987

E-mail Address: chuck.burns@cubic.com

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description: Contactless Smart Card Reader for Access Control System

EUT Name: ACT 7

Model No.: 061-1311 Rev. B Serial No.: 550

Product Options: None

Configurations to be tested: One (with updated Rev. B antenna shield)

Test Objective

- ☐ EMC Directive 89/336/EEC (EMC) Std: _____
- ☐ Machinery Directive 89/392/EEC (EMC Std: _____
- ☐ Medical Device Directive 93/42/EEC (EMC) Std: _____
- ☐ Vehicle Directive 72/245/EEC (EMC) Std: _____
- ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

- ☒ FCC: Class ☐ A ☐ B Part 15
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BSMI: Class ☐ A ☐ B
- ☐ Canada: Class ☐ A ☐ B
- ☐ Australia: Class ☐ A ☐ B
- ☐ Other: _____

TÜV Product Service Certification Requested

- ☐ Attestation of Conformity (AoC)
- ☐ Certificate of Conformity (CoC)
- ☐ EMC Certification (used with Octagon Mark)
- ☐ Compliance Document

Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III

(Press **F1** when field is selected to show additional information on Protection Class.)

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

FILE: EMCU_F09.02E, REVISION 2, Effective: 03 October 2002 Page 1 of 6

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Form

EMC Test Plan and Constructional Data Form

Failure - ***Complete this section if testing will not be attended by the customer.***

If a failure occurs, TUV Product Service should:

☐ Call contact listed above, if not available then stop testing. (After hrs phone): _____
☐ Continue testing to complete test series.
☐ Continue testing to define corrective action.
☐ Stop testing.

EUT Specifications and Requirements

Length: 4.5 in Width: 2.75 in Height: 1.5 in Weight: 14 oz

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 12Vdc (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

Current (Amps/phase(max)): 0.200A Current (Amps/phase(nominal)): 0.100A

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Office building

EUT Power Cable

☒ Permanent OR ☐ Removable Length (in meters): <150m
☐ Shielded OR ☒ Unshielded
☐ Not Applicable

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Form

EMC Test Plan and Constructional Data Form

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EUT Interface Ports and Cables

Interface				Shielding								
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	☒	2	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
DC power	☒	☐	2	☒	☐	Foil shield	unterminated	Terminal block	No	150	☐	☒
Wiegand comms	☐	☒	2	☒	☐	Foil shield	unterminated	Terminal block	No	150	☐	☒
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Form

EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: 1.00

Description: ACT7/Web Target PIC CPU Firmware, Part No. 061-9906-1.01.00GCWEB

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Active, polling for cards
2.
3.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #

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EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)

Description	*Model #*	*Serial #*	*FCC ID #*

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
7.3728 MHz		Y1, RF Board	Microprocessor clock
13.56 MHz		Y2, RF Board	RF Carrier

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*

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Form

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

Foil shield on antenna surface

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1.2 Related Submittal Grant

None

1.3 Tested System Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system are:

None

1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the following tests.

Test Summary					
		Summary of Results			
Test Description	Paragraph Number	Low Channel	Mid Channel	High Channel	Pass/Fail
Field Strength of Emissions	15.225(a)		54.5 dBuV/m at 13.56 MHz		Pass
Field Strength of Emissions	15.209(a)		-4.9 dB at 40.68 MHz		Pass
Frequency Tolerance of Carrier Signal	15.225(e)		Voltage Variation of 10.2 VDC to 13.8 VDC from rated operating voltage (12 VDC) at +20ºC		Pass
Frequency Stability Over Voltage	15.225(e)		No frequency variation over the operating range of 8 VDC to 28 VDC		Pass

Testing was performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8-M1983.

1.5 Test Facility

The open area test site and conducted measurement data were tested by:

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10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 678 1400
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The Test Site Data and performance comply with ANSI C63.4 and are registered with the FCC, 7435 Oakland Mills Road, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was initially tested for FCC emissions in the following configuration:

See Test Setup Photos Exhibit

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Equipment Modifications

None

2.5 Configuration of Test System

See Test Setup Photos Exhibit

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3.0 FIELD STRENGTH OF EMISSIONS EQUIPMENT/DATA
FREQUENCY TOLERANCE OF CARRIER SIGNAL EQUIPMENT/DATA
FREQUENCY STABILITY OVER VOLTAGE EQUIPMENT/DATA

Test Conditions: FIELD STRENGTH OF EMISSIONS: Parts 15.225(a) and 15.209(a)
FREQUENCY TOLERANCE OF CARRIER SIGNAL: Part 15.225(e)
FREQUENCY STABILITY OVER VOLTAGE: Part 15.225(e)

The following measurements were performed at the San Diego Testing Facility:

☐ **- Test not applicable**

■ - TR-2, Test Room
■ - Canyon #2 (3- and 10-Meter Open Area Test Site), Carroll Canyon, San Diego

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
LPB 2520/A	739	Antenna, Bilog	Antenna Research	1170	05/04
ESVS 30	466	EMI Test Receiver	Rhode & Schwarz	833825/003	05/04
6228B	6485	Dual DC Power Supply	Hewlett Packard	3441A-05771	VBU*
34401A	6709	Digital Multimeter	Hewlett Packard	3146A03945	07/04
HP8568B	187/188	Spectrum Analyzer	Hewlett Packard	2304A02500	04/04
T30RC	6225	Environmental Chamber	Tenney Environmental	27244-02	05/04

Remarks: One year calibration cycle for all test equipment and sites. (*) Verified Before Use.

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Cubic Transportation **SC405767**
ACT7

Field Strength of Emissions (15.225(a))

Frequency	Maximum	Limit
13.56 MHz	54.5 dBμV/m = 530 μV/m	84 dBμV/m = 15,848 μV/m

NOTE: Measured at 30 meters. No extrapolation required.

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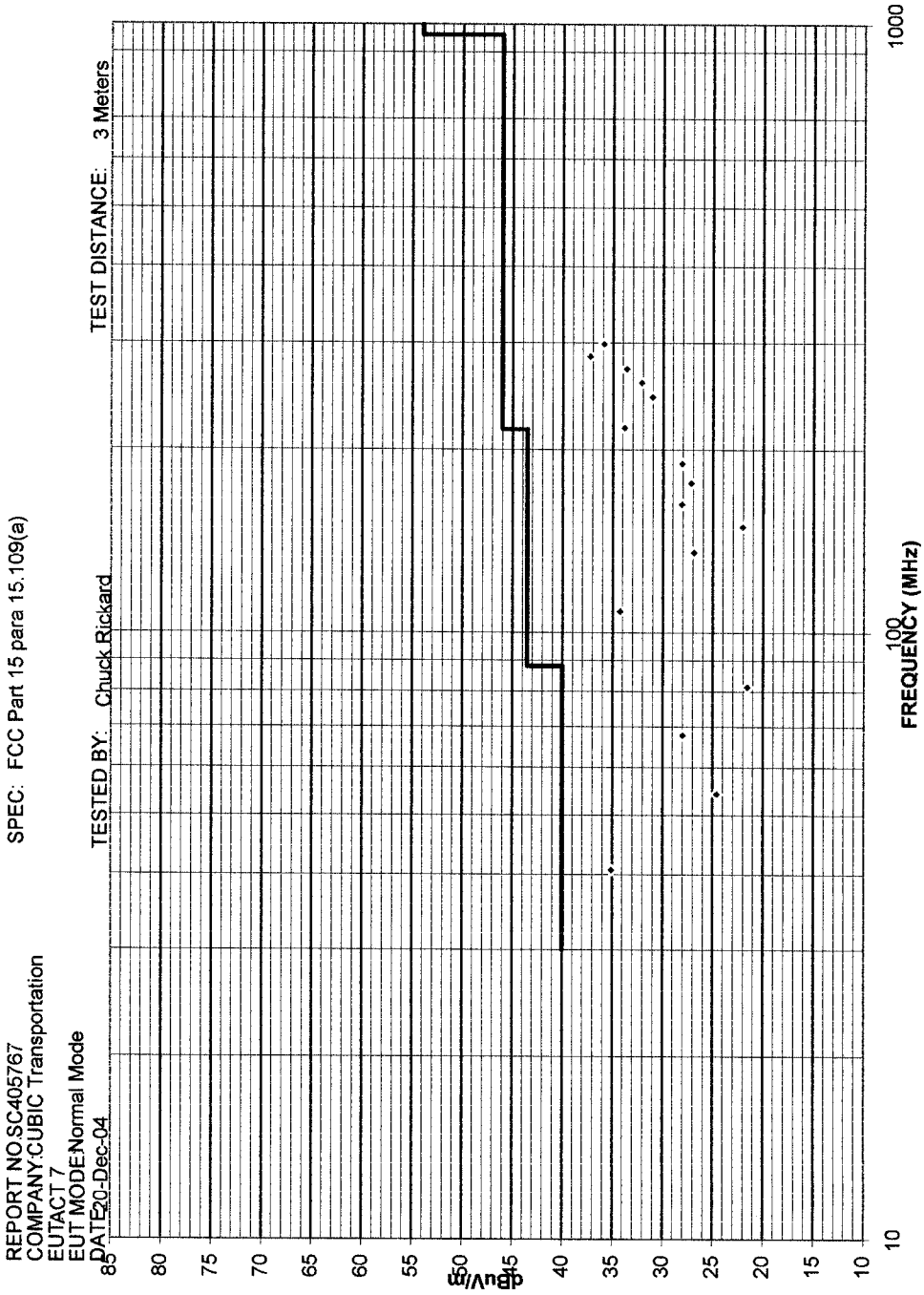
REPORT NO:SC405767
COMPANY:CUBIC Transportation
EUTACT 7
EUT MODE:Normal Mode
DATE:20-Dec-04
SPEC: FCC Part 15 para 15.109(a)
TESTED BY: Chuck Rickard
TEST DISTANCE: 3 Meters
dBuV/m
FREQUENCY (MHz)
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
10
100
1000

REPORT No: SC405767 SPEC: FCC Part 15 para 15.109(a)

CUSTOMER: CUBIC Transportation TEST DIST: 3 Meters

E U T: ACT 7 TEST SITE: 2

EUT MODE: Normal Mode BICONICAL: 739

DATE: 20-Dec-04 TESTED BY: Chuck Rickard LOG PERIODIC: 739

NOTES: Quasi-Peak with 120 KHz measurement bandwidth. RCVR: 466

Temperature: Relative Humidity:

ver 1.8b

FREQUENCY (MHz)	VERTICAL measured (dBuv)	HORIZONTAL measured (dBuV)	CORRECTION FACTOR (dB/m)	MAXIMUM CORRECTED (dBuV/m)	SPECIFIED LIMIT (dBuV/m)	EUT MARGIN (dB)	EUT ROTATION (degrees)	ANTENNA HEIGHT (meters)
-	-	-	-	-	-	-	0	1
-	-	-	-	-	-	-	0	1
-	-	-	-	-	-	-	0	1
-	-	-	-	-	-	-	0	1
40.68	16	6.2	19.1	**35.1**	40	-4.9	180	1
67.80	18.1	8	9.9	**28.0**	40	-12.0	0	1
81.36	12.2	8.6	9.4	**21.6**	40	-18.4	0	1
54.24	14.8	8.8	15.8	**24.6**	40	-15.4	180	1
135.60	14	11	12.9	**26.9**	43.5	-16.6	180	1
149.16	10.7	8.1	11.4	**22.1**	43.5	-21.4	0	1
162.72	16.6	8.9	11.5	**28.1**	43.5	-15.4	180	1
189.84	15.2	10.2	12.9	**28.1**	43.5	-15.4	150	1
216.96	18.8	13.7	15.1	**33.9**	46	-12.1	150	1
244.08	14.7	8.7	16.4	**31.1**	46	-14.9	180	1
271.20	17	13.2	16.6	**33.6**	46	-12.4	300	1
257.64	15.5	12.3	16.7	**32.2**	46	-13.8	300	1
108.50	20.7	10.9	13.6	**34.3**	43.5	-9.3	300	1
176.30	15.1	9.7	12.1	**27.2**	43.5	-16.3	250	1
284.78	20.5	16	16.8	**37.3**	46	-8.7	30	1
298.36	18.6	15	17.3	**35.9**	46	-10.1	150	1

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Cubic Transportation **SC405767**

Frequency Tolerance **15.225(e)**

Temp (°C)	Frequency (Hz)
+50	13 559 864
+40	13 559 868
+30	13 559 876
+20	See Table Below
+10	13 559 912
0	13 559 928
-10	13 559 930
-20	13 559 912
Limit (Hz)	13 558 644 to 13 561 356

Voltage Variation at 20°C

V(dc)	Frequency (Hz)
10.2	13 559 895
10.8	13 559 890
11.4	13 559 890
12.0	13 559 900
12.6	13 559 895
13.2	13 559 890
13.8	13 559 885
Limit (Hz)	13 558 644 to 13 561 356

Remarks

Measurements taken at 1 hour intervals to allow for temperature stabilization.
Frequency tolerance limit is +/-0.01% of normal operating frequency.
Extreme voltage test range is 85% to 115% of rated operating voltage (12vdc). This equates to 10.2vdc to 13.8vdc.

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Cubic Transportation **SC501493**
ACT7

Frequency Stability Over Voltage (15.225(e))

12 VDC Nomonal Voltage, 8-28 VDC Operating Range.

The specification states that the frequency may not vary more than 0.01% of the operating frequency (± 0.001356 MHz).

Voltage	Frequency	Change
12.0 VDC	13.559 875 MHz	None
8.00 VDC	13.559 875 MHz	None
6.80 VDC	13.559 875 MHz	None
28.00 VDC	13.559 875 MHz	None
32.20 VDC	13.559 875 MHz	None
12.00 VDC	13.559 875 MHz	None

Conclusion: There was no frequency variation over the operating voltage range, even when extended ±15 %. Pass.

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4.0 ATTESTATION STATEMENT

GENERAL REMARKS:

Additional test results provided under TUV report number SC501493 for Frequency Stability Over Voltage (15.225(e)).

SUMMARY:

All tests were performed per CFR 47, Part(s) 15.209(a), 15.225(a), 15.225(e)

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, Part(s) 15.209(a), 15.225(a), 15.225(e)

Testing Start Date: 20 December 2004

Testing End Date: 25 March 2005

- TÜV AMERICA, INC. -

Responsible Engineer:

Jim Owen
(EMC Manager)

Responsible Engineer:

Chuck Rickard
(EMC Engineer)

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